INTRODUCTION TO BUS SYSTEMS

Model: All from E38 to Present

Production: All

INTRODUCTION TO BUS SYSTEMS

Up until the introduction of the E31, all of the information transferred between control units was transmitted on dedicated signal lines. As the various electronic systems grew more complex, the size of the wiring harness increased beyond practical limits.

Signals such as engine RPM, coolant temperature, throttle position, road speed etc. each used a dedicated signal line going to the control module that required this information. Each of these lines differed in the method of signal transmission. Some of the methods used were variable duty cycle, switched DC signals and signals with variable frequencies. This created a need for larger and more complex wiring harnesses.

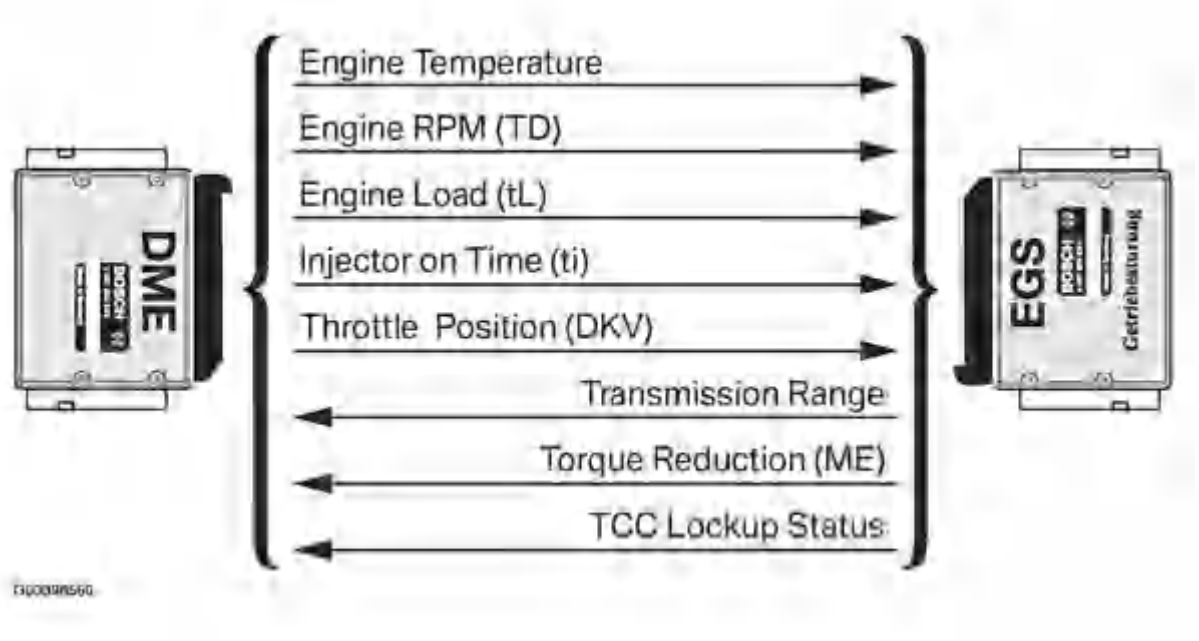


Fig. 1: Identifying Signal Line Control Module
Courtesy of BMW OF NORTH AMERICA, INC.

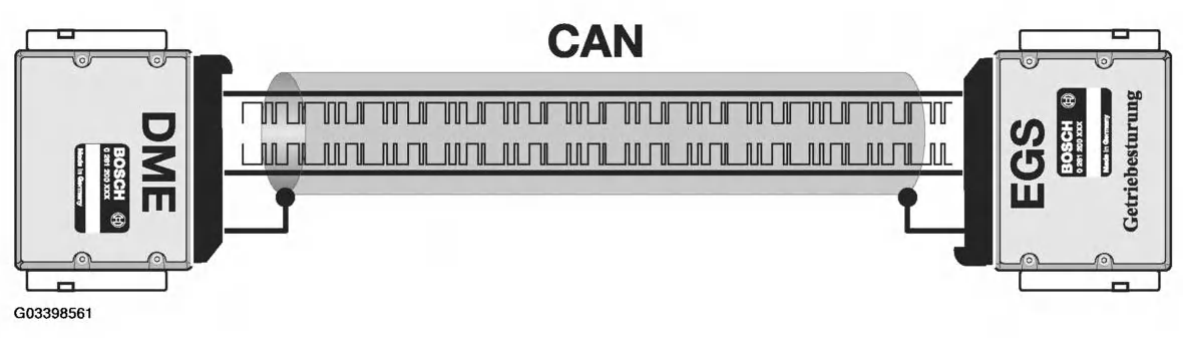


Fig. 2: Identifying CAN System
Courtesy of BMW OF NORTH AMERICA, INC.

A solution to this problem was found by introducing bus networks to BMW Group vehicles. A bus system uses multiplexing technology similar to that used in the electronics and telecommunications industry. Multiplexing is a system of transmitting several messages on the same circuit or channel.

This technology allows control modules to transfer data bi-directionally at high speed and enables control modules to share sensor information. This also allows control modules to send and receive control commands at a faster rate than with conventional methods.

With the amount and complexity of features now available in modern vehicles, multiplexing is a necessary technology. There are numerous benefits to in-vehicle bus networks such as:

- A reduction in the size of the wiring harness by decreasing the number of interfaces between control units to one or two wires.
- Greater system reliability by reducing the number of connectors and components.
- A reduction in the number of redundant sensors by allowing the sharing of sensor information.
- Reduction of costs for components, assembly and troubleshooting.
- Flexibility in system configuration for addition of new systems.

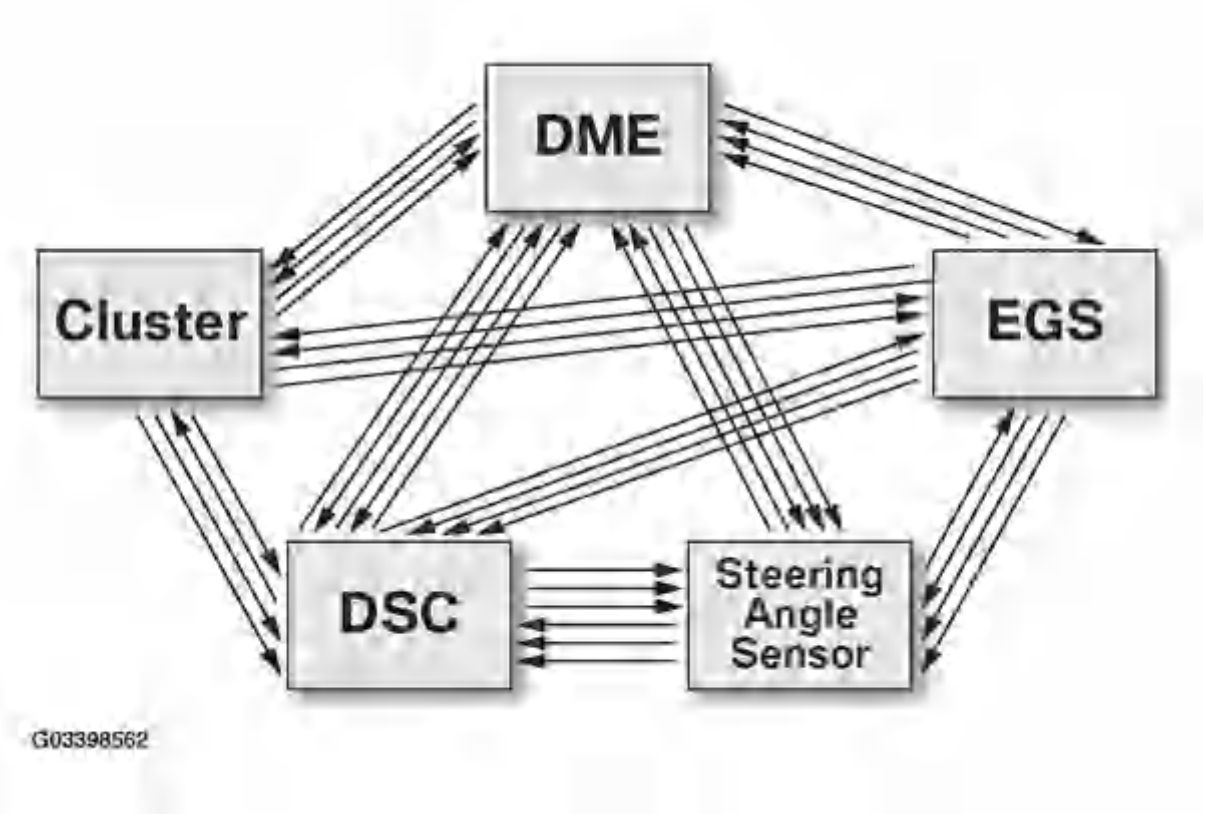


Fig. 3: Communication Control Module Using Individual Signal Lines
Courtesy of BMW OF NORTH AMERICA, INC.

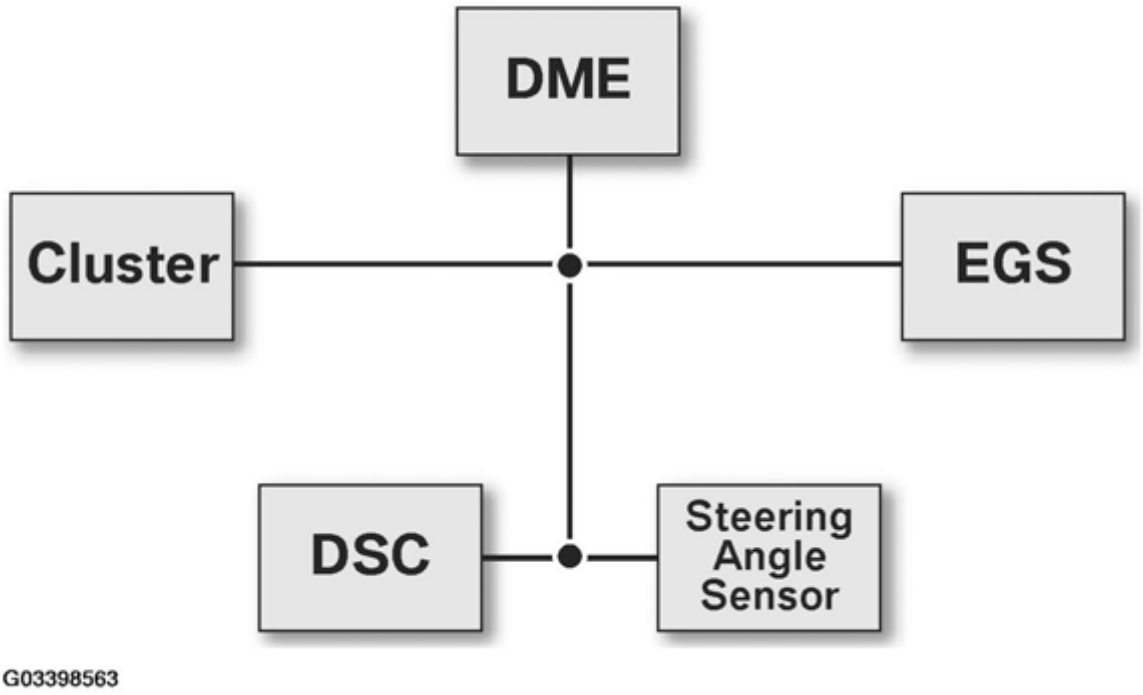


Fig. 4: Communication Control Module Using Bus Network
Courtesy of BMW OF NORTH AMERICA, INC.

MULTIPLEXING

Multiplexing relies on the use of digital communication between control units. A digital signal consists of a series of high and low voltage signals which represent "bits" of information.

Using the example of morse code for explanation, the letters SOS are represented in morse code as three dots - three dashes - three dots. Expressed as an electrical signal SOS would be represented as three short pulses - three long pulses - three short pulses.

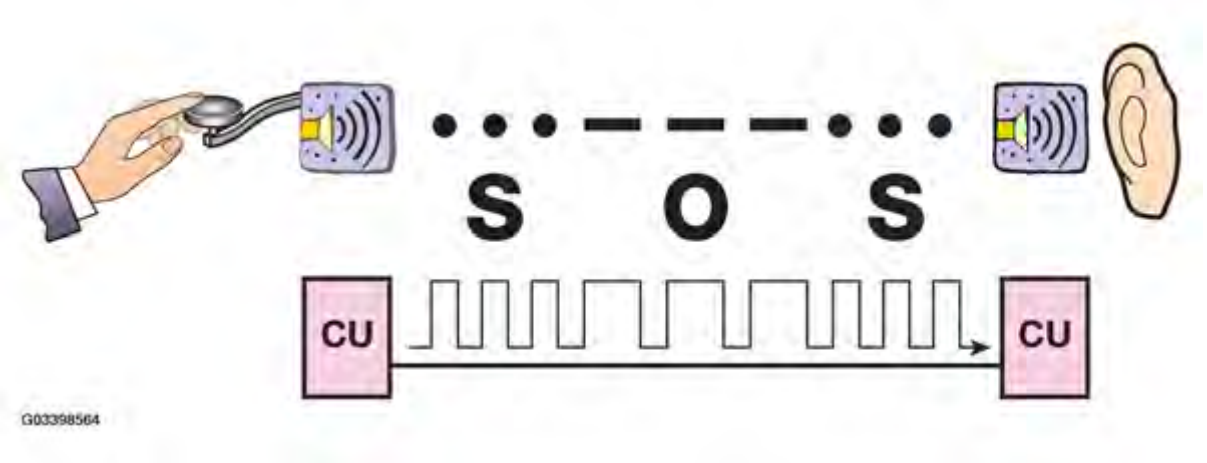


Fig. 5: Identifying SOS Electrical Signal
Courtesy of BMW OF NORTH AMERICA, INC.

The basis for digital communication is binary code. Binary code uses only 2 digits - 0 and 1. Electrically, 1 is represented by a voltage pulse and 0 is represented by a low voltage signal usually 0 volts.

In digital communication, each pulse represents a "bit" of data. Eight "bits" of information in a series of pulses makes up one "byte". A byte represents a character in a line of information (data).

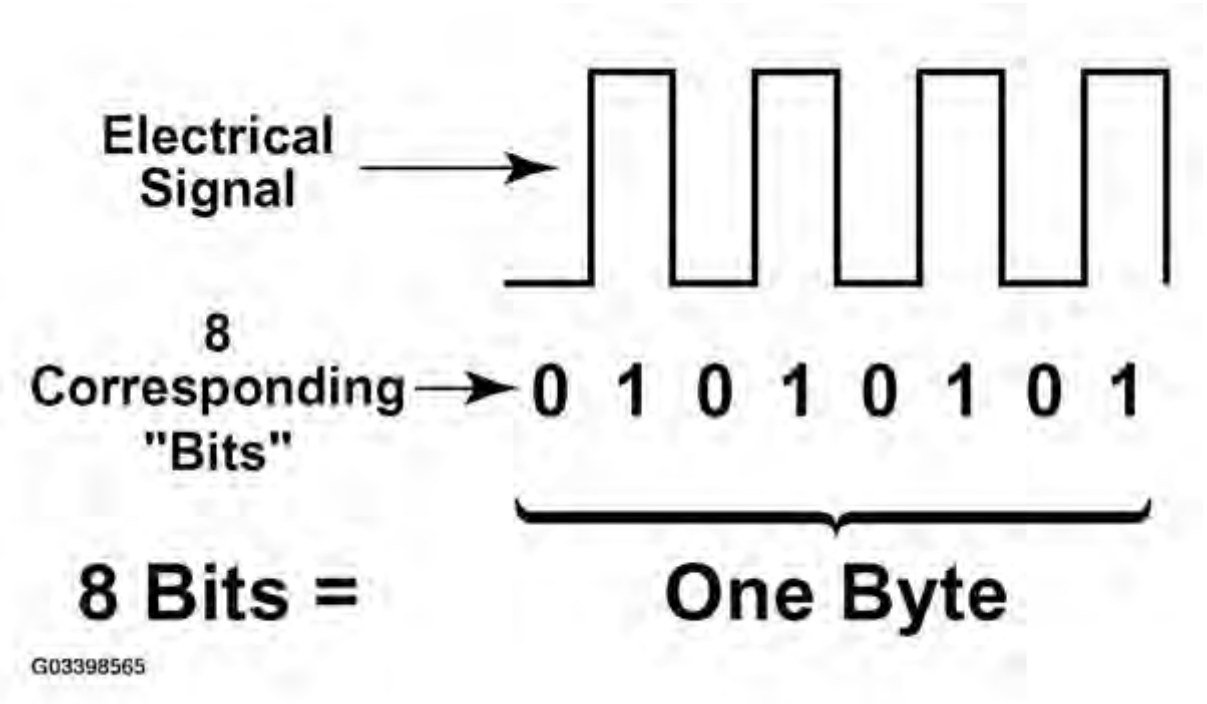


Fig. 6: Identifying Electrical Signal
Courtesy of BMW OF NORTH AMERICA, INC.

In order to illustrate multiplexing in a vehicle application, an example of a K-Bus circuit will be used. The K-Bus (Body Bus) was introduced in the E38 as a low speed data transfer bus. One of the benefits of multiplexing is sensor sharing. The outside (ambient) temperature circuit is an example of "sharing" sensor information.

In the illustration shown below, the ambient temperature sensor is an analog input to the instrument cluster. The temperature information is used by the cluster for the outside temperature display for the driver. The outside temperature information is also needed by the climate control system (IHKA) for temperature control and additional functions.

In previous models (before bus systems), the IHKA required an additional dedicated outside temperature sensor. Using multiplexing principles, the K-Bus can transfer the temperature information (as well as additional data) from the cluster to the climate control system which eliminates the need for an additional sensor.

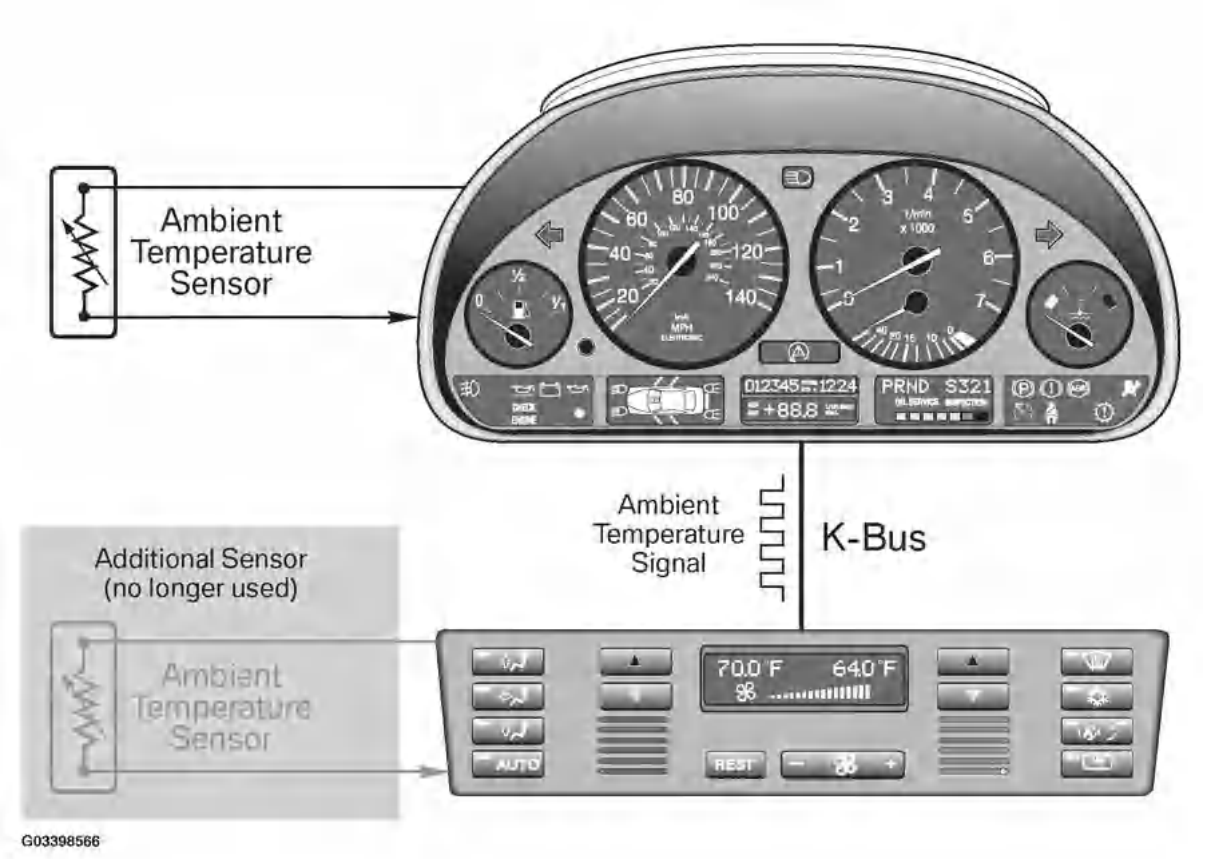


Fig. 7: Locating Ambient Temperature Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

BUS COMMUNICATION SPEEDS

Data must be transmitted at high speed in order to make digital communication practical. The speed of these signal is referred to as the data rate (formerly baud rate). Depending on the type of bus network used, data can be transmitted from 9600 bits per second (9.6k/bps) to 500K bits per second (500K/bps).

Current fiber optic systems can transmit and receive data up to 22.5 M/bps.

BUS COMMUNICATION SPEEDS SPECIFICATION

Model	Bus	Data Rate	Structure
E38	I/K/P Bus	9.6 K/bps	Linear
E38	CAN	500 K/bps	Linear
E38	D-Bus	9.6 K/bps	Linear
E65	K-CAN-S	100 Kbps	Linear
E65	K-CAN-P	100 Kbps	Linear
E65	PT-CAN	500 Kbps	Linear
E65	MOST	22.5 Mbps	Ring
E65	byteflight	10 Mbps	Star
E65	Sub-Busses	9.6 Kbps	Linear

Depending on the system requirements, bus networks communicate at different speeds. Systems such as powertrain control require a large amount of data to be transferred due to constantly changing values such as RPM, road speed and throttle position etc. Therefore the CAN-Bus (or PT-CAN) operates at 500 K/bps.

Faster communication speeds are required for video and audio signals. Therefore, the MOST-Bus is designed to handle these needs and can communicate at 22.5 M/bps.

To accurately describe the speed of data transmission the term "bps" (bit per second) is used. This is not to be

confused with baud rate. Baud rate refers to the rate that a change of state occurs on a signal line. Any voltage change on the signal line is a change of state, but this does not relate directly to the amount of bits per second. In other words, more that one bit can be transferred per baud. This is dependent upon the type of communication protocol.

In this course, data communication speed will be referred to as bit per second (bps). A "bit" is an abbreviation for binary digit. A bit is the smallest information unit that a computer can process. A series of 8 bits make up one byte and a series of bytes make up a bus telegram message.

BUS SYSTEM STRUCTURE

There are 3 possible arrangements for bus system structure in BMW vehicles. They are:

- Linear (or Tree Structure)
- Ring
- Star

The linear bus structure is the most common arrangement. Up until the introduction of the E65, the linear structure was used exclusively. The 2 other bus structures are currently used for fiber optic networks. The ring structure is used on the MOST-Bus and the star structure is used on the byteflight system.

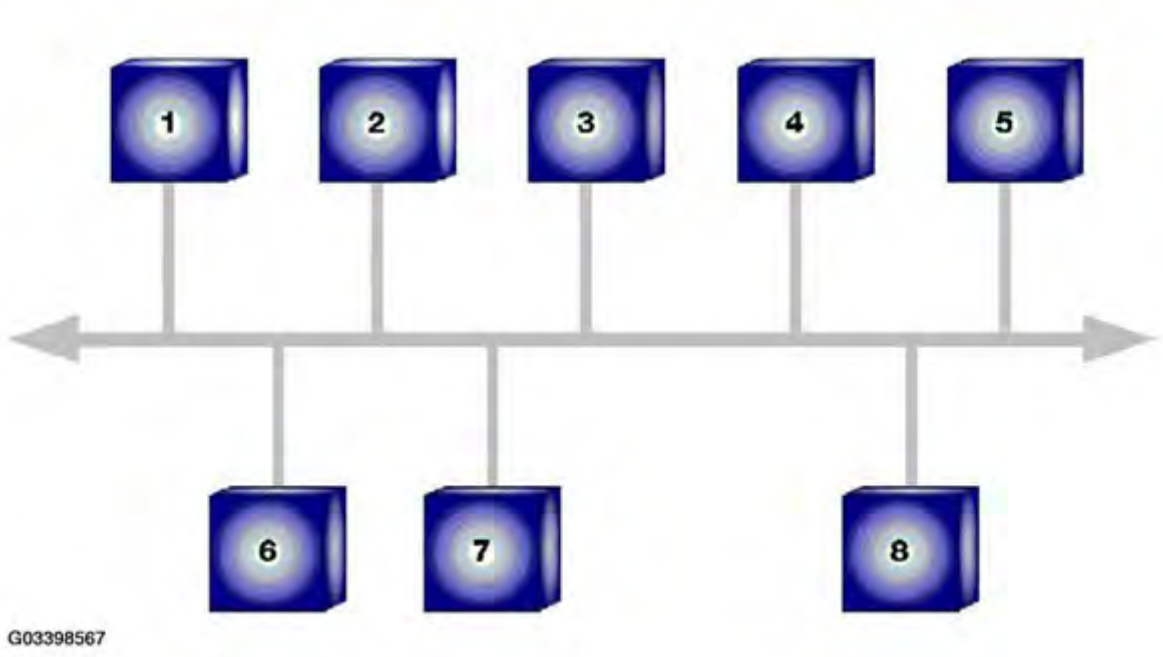


Fig. 8: Identifying Linear Or Tree Structure
Courtesy of BMW OF NORTH AMERICA, INC.

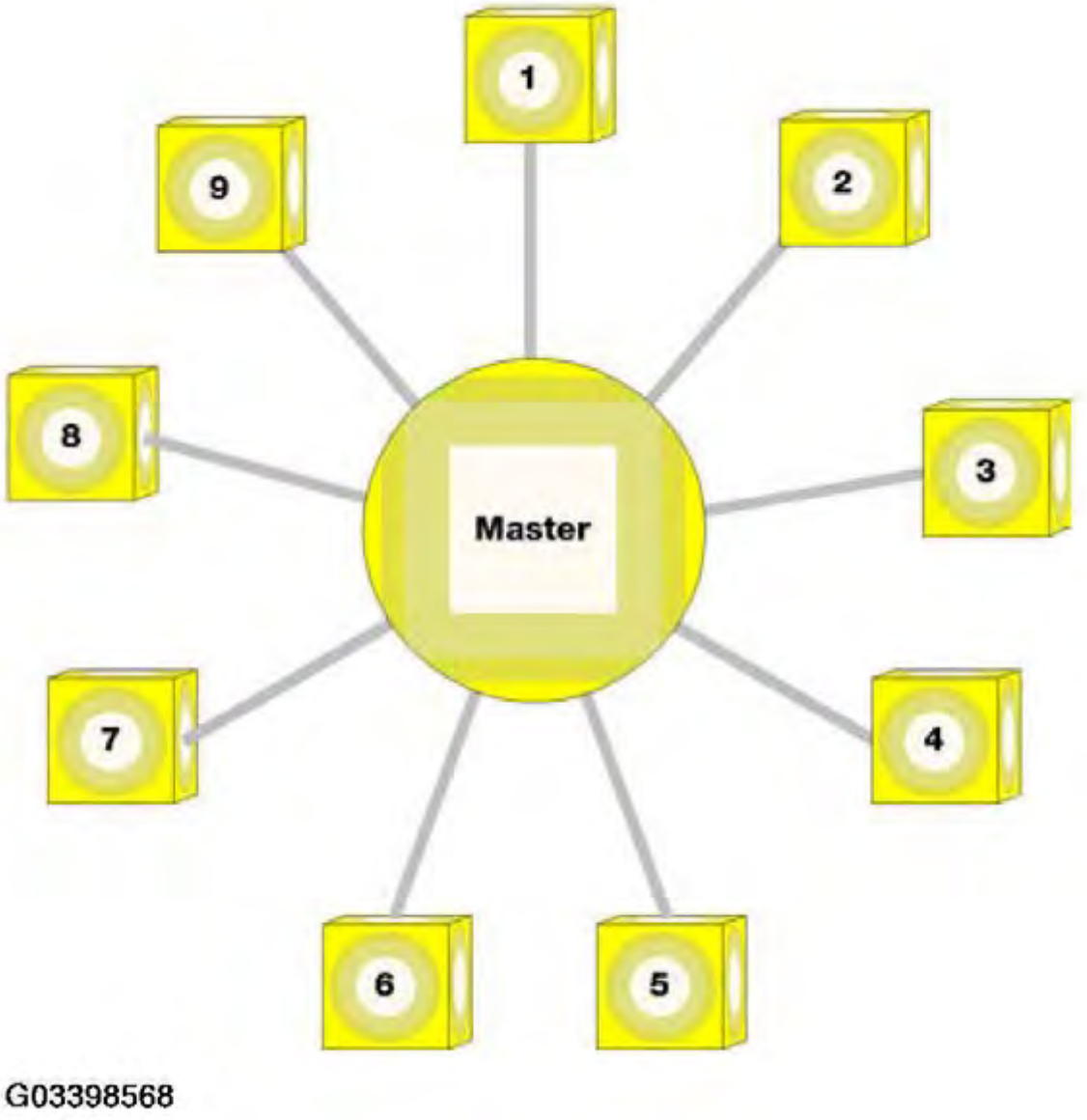


Fig. 9: Identifying Star Structure
Courtesy of BMW OF NORTH AMERICA, INC.

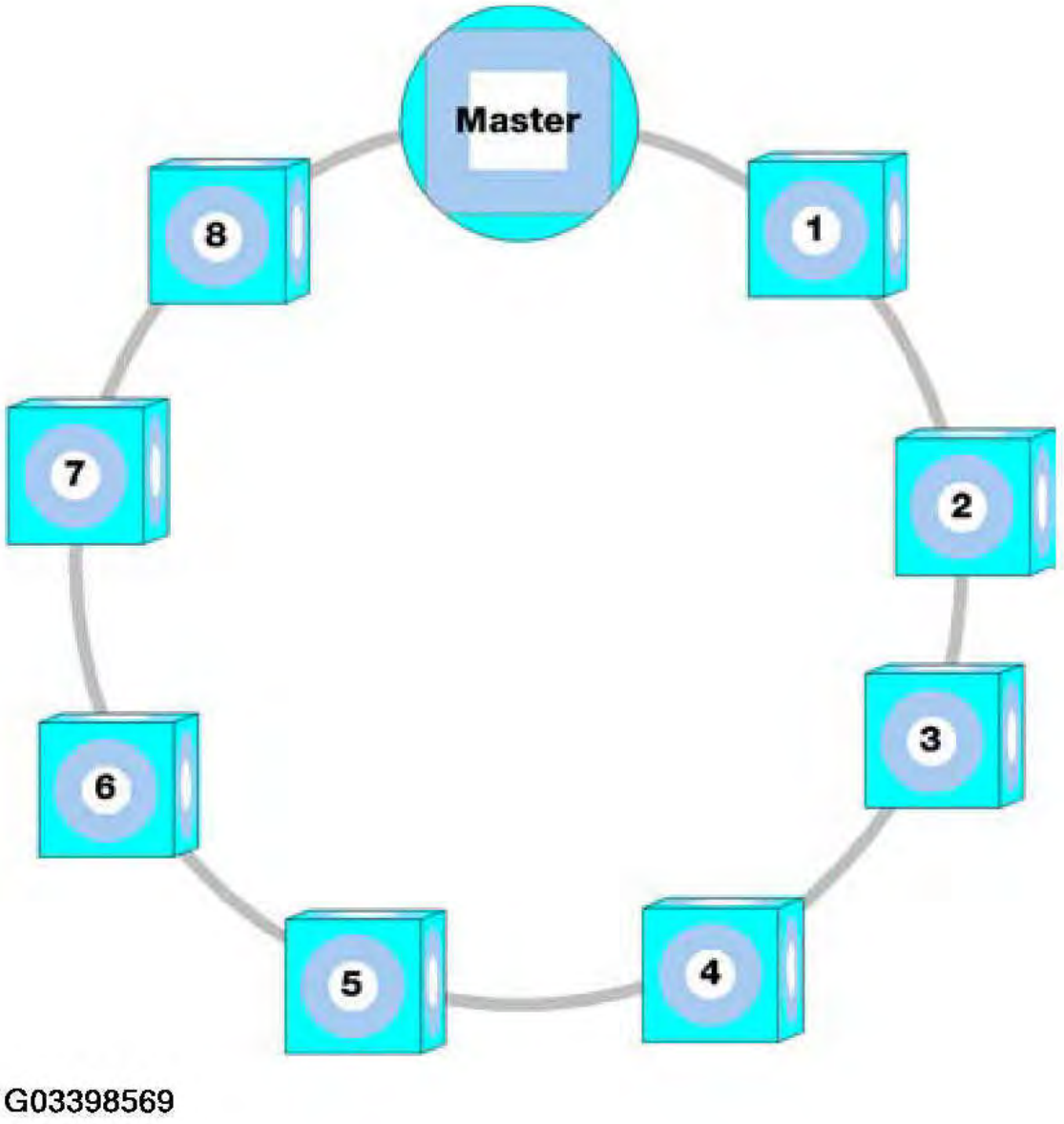


Fig. 10: Identifying Ring Structure
Courtesy of BMW OF NORTH AMERICA, INC.

BUS SYSTEM APPLICATION

In the following pages of this course and subsequent courses, all BMW bus systems will be discussed. Starting from the earliest bus networks up to the latest fiber optic networks used today. Below is a listing by model of the major bus networks in use. (Some sub busses are not shown)

BUS SYSTEM APPLICATION SPECIFICATION

Â	TXD/RXD	D-Bus	can-bus	I-Bus	K-Bus	P-Bus	M-Bus	K-Can (P & S)	PT-CAN	MOST-bus	byteflight	LIN-Bus	Notes
E31	X	Â	X	X	Â	Â	Â	Â	Â	Â	Â	Â	CAN-Bus used on M60, M62 and M73 engines.

E32	X	Â	X	Â	Â	Â	Â	Â	Â	Â	Â	Â	CAN-Bus used on M60 engine.
E34	X	Â	X	Â	Â	Â	Â	Â	Â	Â	Â	Â	CAN-Bus used on M60 engine.
E36	X	Â	X	Â	Â	Â	X	Â	Â	Â	Â	Â	CAN-Bus used on M52 engine. M-Bus used from 96 model year.
E38	X	X	X	X	X	X	X	Â	Â	Â	Â	Â	New bus systems introduced in 95 model year (D, K, P and M-Bus)
E39	X	X	X	X	X	X	X	Â	Â	Â	Â	Â	I-Bus used on vehicles with high version cluster.
E46	X	X	X	Â	X	Â	X	Â	Â	Â	Â	X	LIN-Bus added in 2003 model year (face lift). CAN changed PT-CAN in 2000 model year.
E53	X	X	X	X	X	X	X	Â	Â	Â	Â	Â	I-Bus used on vehicles with high version cluster.
E65/E66	Â	X	Â	Â	Â	Â	X	X	X	X	X	X	E65 introduced new bus systems in 2002. First BMW to use fiber optics.

E60	Â	X	Â	Â	Â	Â	Â	X	X	X	X	X	K-CAN S and K-CAN P are combined into K-CAN. LIN used on IHKA, AHL and driver's switch block.
E63/E64	Â	X	Â	Â	Â	Â	Â	X	X	X	X	X	K-CAN S and K-CAN P is combined into K-CAN.
E83	Â	X	Â	Â	X	Â	X	Â	X	X	Â	X	E83 Does not use byteflight. LIN-Bus is used on

DIAGNOSIS BUS (D-BUS)

The D-Bus is actually the oldest bus system used in BMW vehicles. It is used as a serial communications bus to transmit data between the DISplus or GT-1 and the connected control units for diagnosis purposes.

The D-Bus was introduced as TXD (and RXD) in 1987. The term D-Bus was adopted with the introduction of the E38 in 1995, however it is still referred to as TXD in the ETM.

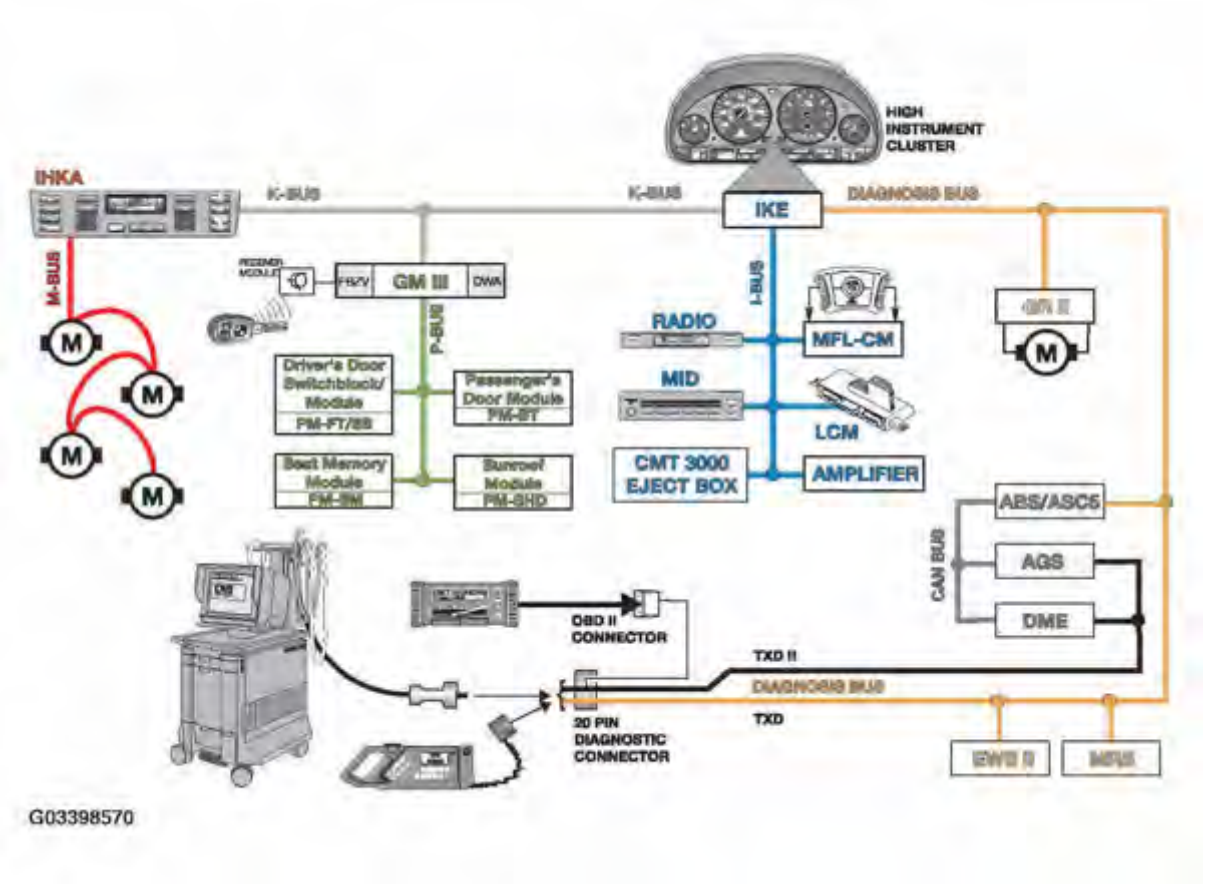


Fig. 11: Diagnosis Bus (D-Bus) Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

The control unit subject to diagnosis is selected by sending a diagnosis telegram to the control unit address. By request from the diagnosis equipment (DISplus/GT-1), the control unit will transmit information such as the contents of the fault memory or activate a control unit output.

All modules in the vehicle are not connected directly to the D-Bus, some systems are connected through a gateway such as the IKE or cluster. The gateway handles all diagnostic "traffic" and routes the necessary information to the correct bus system.

The D-Bus is only active when the DISplus or GT-1 is connected to the diagnostic socket and communicating. Data over the D-Bus operates at a rate of up to 9.6 Kbps (9600 bits per second) on earlier vehicles. The D-Bus on current models (from E65) operates at 110 K/bps.

The D-Bus connects various diagnosable control units to the DISplus or GT-1 via the diagnostic connector. Earlier vehicles also used a second diagnosis line called RXD to allow the diagnostic equipment to establish communication. RXD is not a bus line but a one way communication link used to wake up the diagnosis of the connected control unit.

Diagnostic Connector

There have been numerous changes to the diagnostic connector since it's introduction in 1988. Early vehicles until the 2001 model year used the 20-pin diagnostic connector located in the engine compartment. On vehicles equipped with the 20-pin connector, diagnostic communication is carried out through the TXD/RXD interface (D-Bus).

RXD is a 12 volt one-way digital signal which is sent to the module subject to diagnosis. This signal was used to wake-up the control module and initiate diagnostic communication. RXD was gradually phased out starting in 1997 (until 2001) and TXD (D-Bus) is now used for all diagnostic communication.

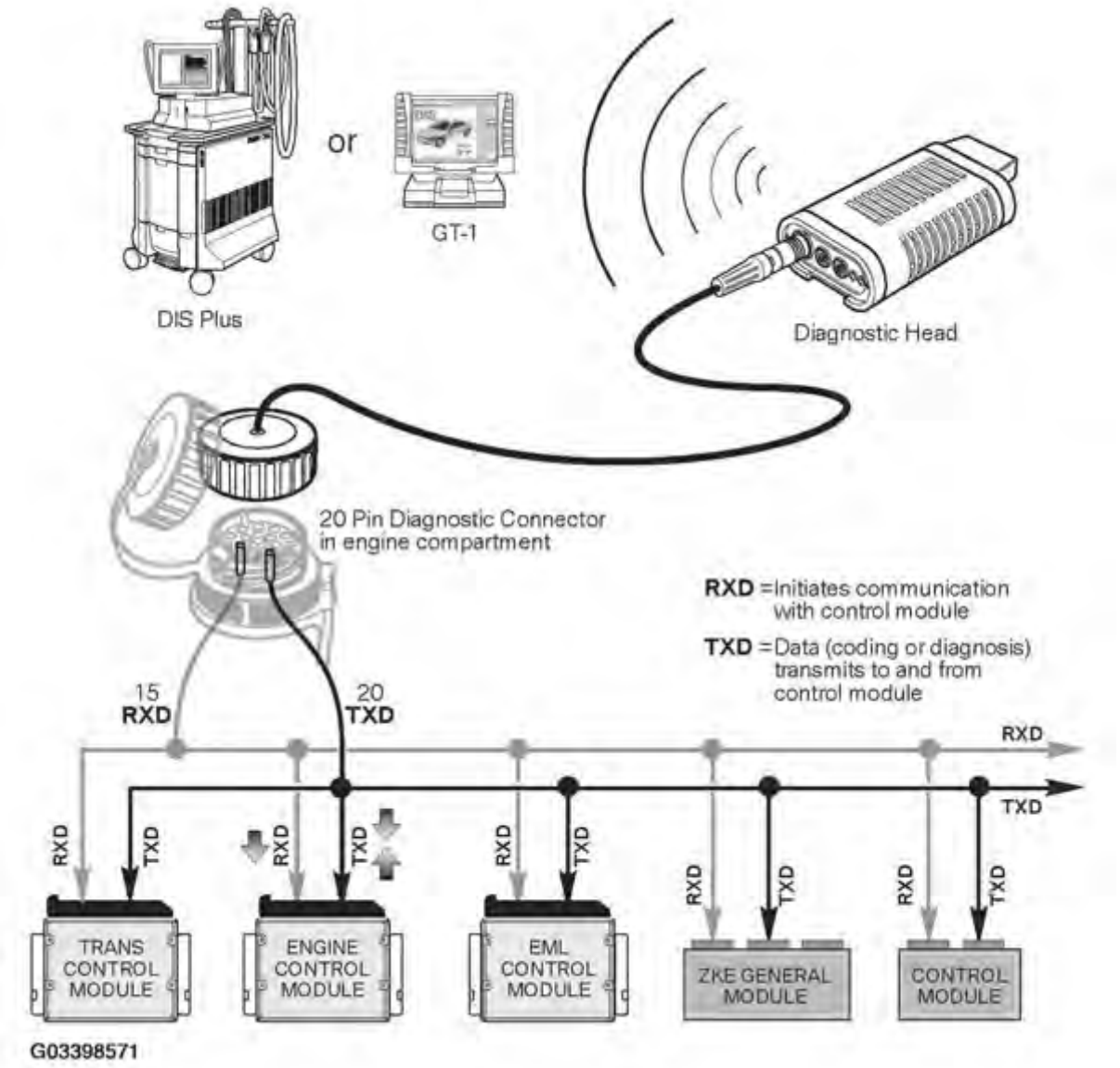


Fig. 12: Identifying Diagnostic Connector
Courtesy of BMW OF NORTH AMERICA, INC.

The TXD signal line is bi-directional and allows information to be retrieved (such as fault codes) and commands to be carried out (such as component activation). On vehicles equipped with the 20-pin diagnostic connector, TXD is in pin 20 and RXD in pin 15.

Later control modules (from 1997) no longer required the separate RXD to establish communication, (DS2 protocol) so Pin 15 was removed from the Diagnostic socket of most vehicles. Pin 15 (RXD) was still used in the E38 until the end of production in 2001.

In 1995, to satisfy the requirements of OBD II, a standardized 16-pin connector was installed inside of all vehicles. Up until 2001, the 16-pin OBD II connector was not used by BMW diagnostic equipment to access diagnosis, it was reserved for aftermarket scan tool usage. The 20-pin connector was eliminated from all BMW vehicles from 2001 and the 16-pin OBD connector is now used exclusively.

TXD II (pin 17) was introduced as a communication line exclusive to DME (ECM), AGS (TCM) and EML. Pin 2 provided a connection to the 16 pin OBD connector via a bridge in the cap of the 20-pin connector. TXD II is technically identical to the D-Bus (TXD).

NOTE: On vehicles equipped with both the 20-Pin and 16-Pin OBD connector, the cap on the 20-pin connector must be installed to access diagnostic information

from the OBD II connector.

Beginning with the introduction of the E65, TXD has been omitted and TXD II is now used exclusively for diagnostic communication. TXD II is in pin 7 of the 16 pin OBD connector.

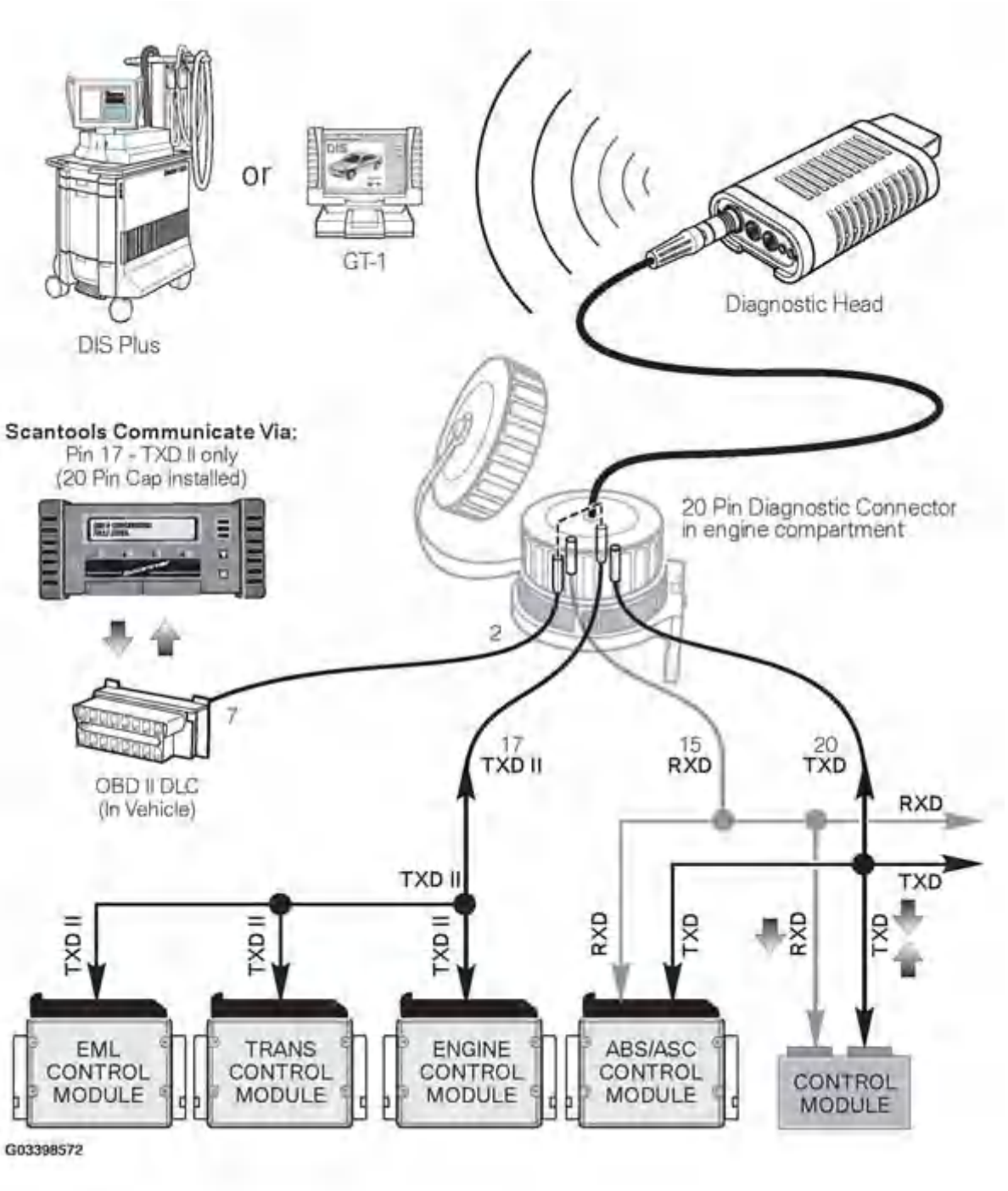


Fig. 13: Identifying Diagnostic Communication
Courtesy of BMW OF NORTH AMERICA, INC.

Gateways

On some of the early models the D-Bus was connected directly to some modules. Some modules were diagnosed through a gateway module such as the IKE or cluster. For instance as the diagram below shows, modules that are on the I, K and P-Bus must be diagnosed through the IKE. In this case the IKE acts as a "gateway" module. The gateway routes all diagnostic "traffic" to the correct bus system.

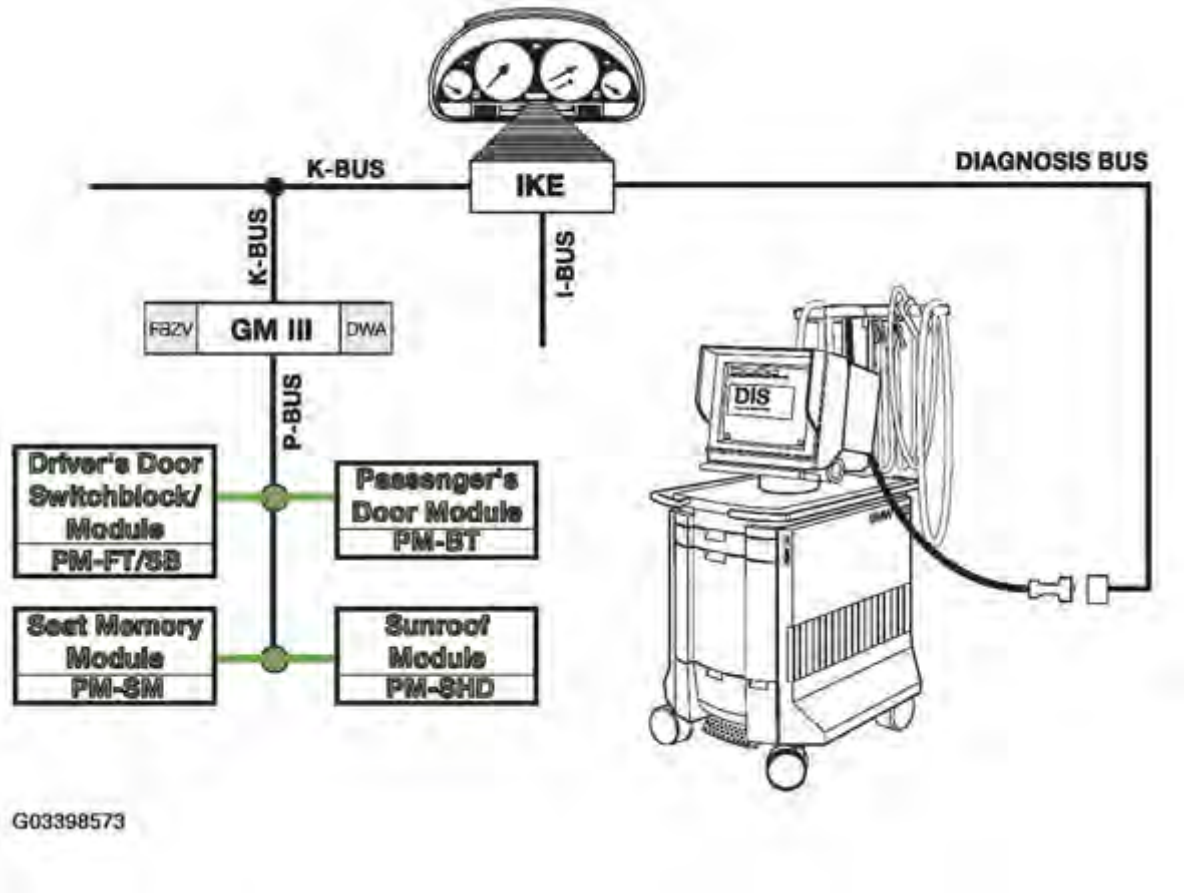


Fig. 14: Identifying Gateways Model
Courtesy of BMW OF NORTH AMERICA, INC.

On newer vehicles such as the E65, the ZGM acts as a gateway and all diagnostic data is routed through this module.

A gateway allows information to be transferred from one bus system to another. Due to the difference in communication speed, the gateway must "translate" the data and then route the data to the correct network.

In addition to the above functions, the gateway will also allow data messages with a higher priority to be transmitted first.

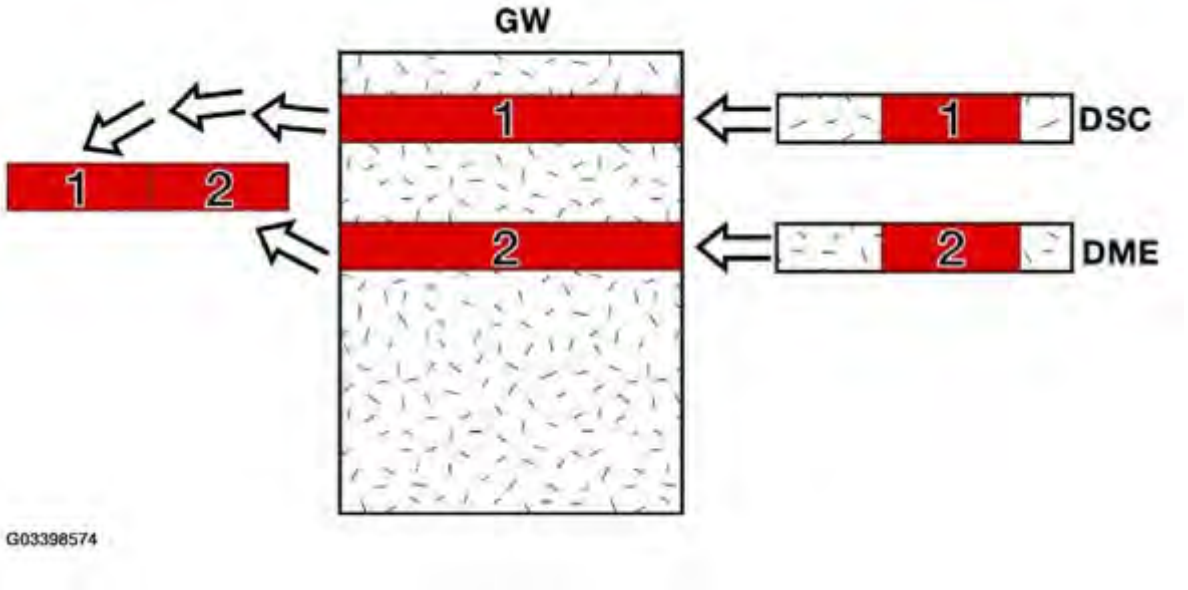


Fig. 15: Identifying Gateway And Diagnostic Data Route
Courtesy of BMW OF NORTH AMERICA, INC.

CONTROLLER AREA NETWORK (CAN-BUS)

The CAN protocol was originally developed by Intel™ and Bosch in 1988 for use in the automotive industry. CAN provides a standardized, reliable and cost-effective communications network which allows vehicle manufacturers to combat the increasing size of vehicle wiring harnesses.

The CAN-Bus was introduced on BMW vehicles in 1993 in the 7 and 5 series vehicles with the M60 engine and automatic transmission. The CAN-Bus connected the DME (ECM) with the EGS (TCM) control units. This network allowed data to be transferred between DME and EGS at rate of up to 500 Kbps (Kilobits per second).

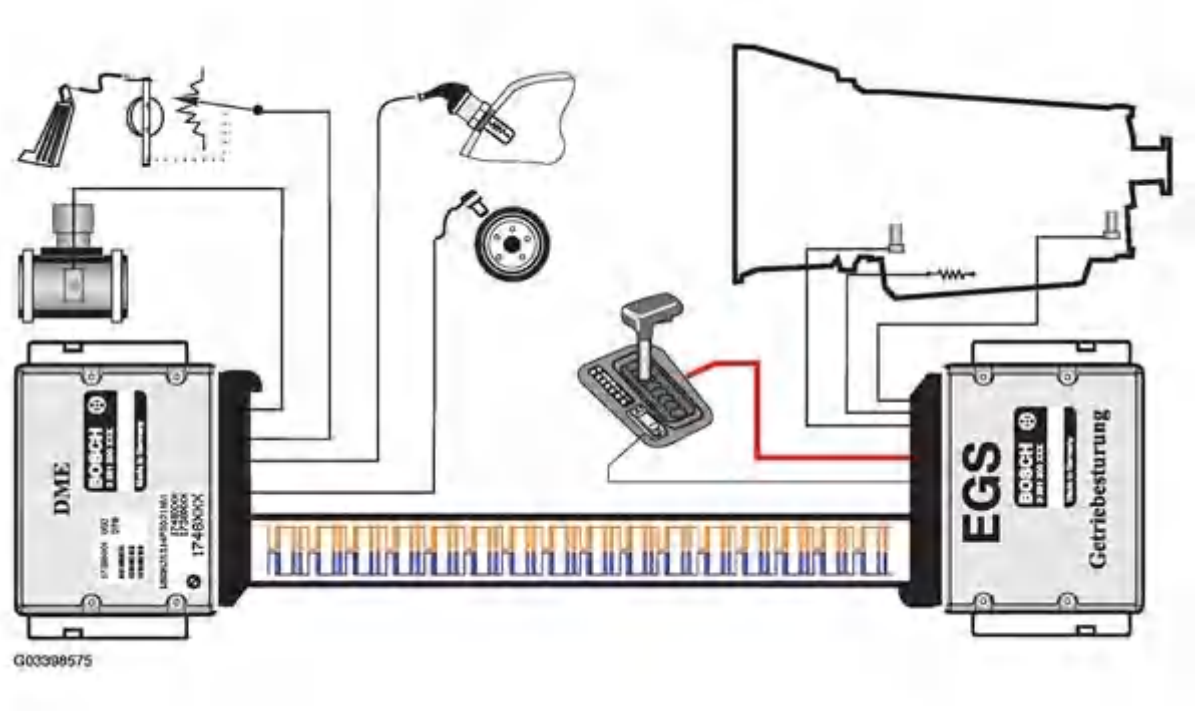


Fig. 16: Identifying Example Of Early CAN-Bus On M60 Engine
Courtesy of BMW OF NORTH AMERICA, INC.

As shown in the above picture, the original CAN-Bus network contained only 2 control units or "subscribers". Since it's introduction, subscribers on CAN have increased as system needs dictated.

Beginning with the 1995 model year, new systems were added to the CAN-Bus. The introduction of the E38 750iL necessitated major changes to the CAN-Bus structure. EML and DSC were added as well as DME II for the M73 engine.

For the 1998 model year, the instrument cluster and the steering angle sensor were also added to expand the signal sharing capabilities of the vehicle.

When introduced, the CAN-Bus consisted of 2 copper wires and a third connection which served as a shield. The shield was needed to protect the CAN-Bus from electrical interference. Since the CAN-Bus uses relatively low voltage (approx 2.5), it is vulnerable to signal interruption from higher voltage circuits or aftermarket systems such as cell phones etc.

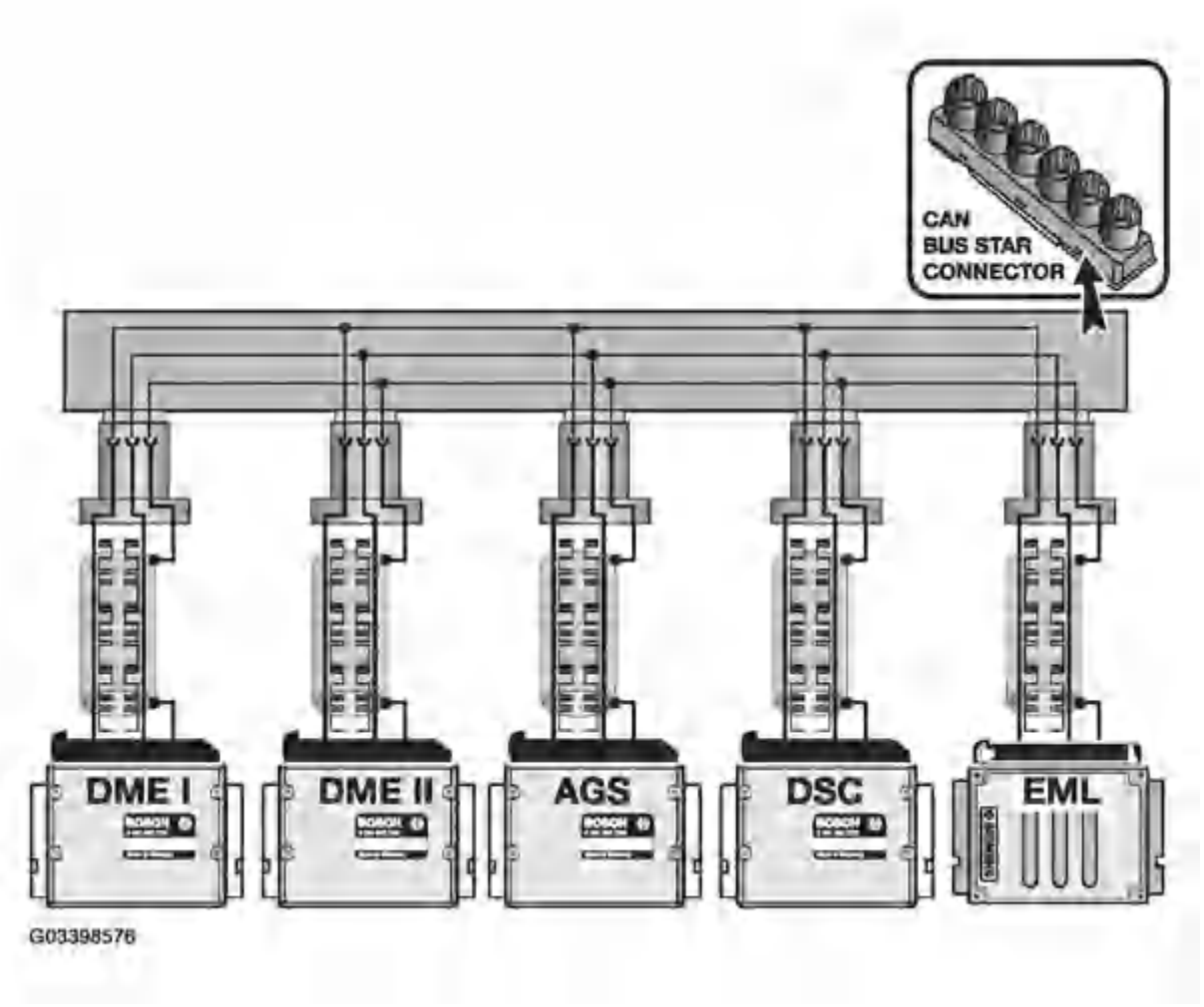


Fig. 17: Identifying Tree Structure And Star Connector
Courtesy of BMW OF NORTH AMERICA, INC.

The shield on the CAN-Bus was only used until the 99 model year, after which the entire CAN-Bus network went to twisted pair wiring. Twisted pair configuration allows the same level of interference suppression and creates more flexibility in wiring due to the elimination of the extra shielding.

The two signal wires used in CAN are referred to as CAN-High and CAN-Low. Each wire carries the same information bi-directionally. The two wire configuration is used for redundancy in the event of failure.

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.

Currently, the CAN-Bus is used on all BMW vehicles and has been expanded to other systems. The introduction of the E65 brought about new variations of CAN. The new PT-CAN and K-CAN will be discussed in a later module.

CAN-Bus Operation

The primary function of the CAN-Bus is to exchange data at a high transfer rate between CAN subscribers. This is accomplished using two signal lines referred to as CAN-High and CAN-Low. Both of these signal lines transfer the same data at the same time. Two signal lines are used for redundancy in the event of a signal line failure.

Voltage on the CAN-Bus is divided between the two data lines. for an average of 2.5 volts per line. Voltage is measured from each data line to ground. Each module on CAN contributes to this voltage.

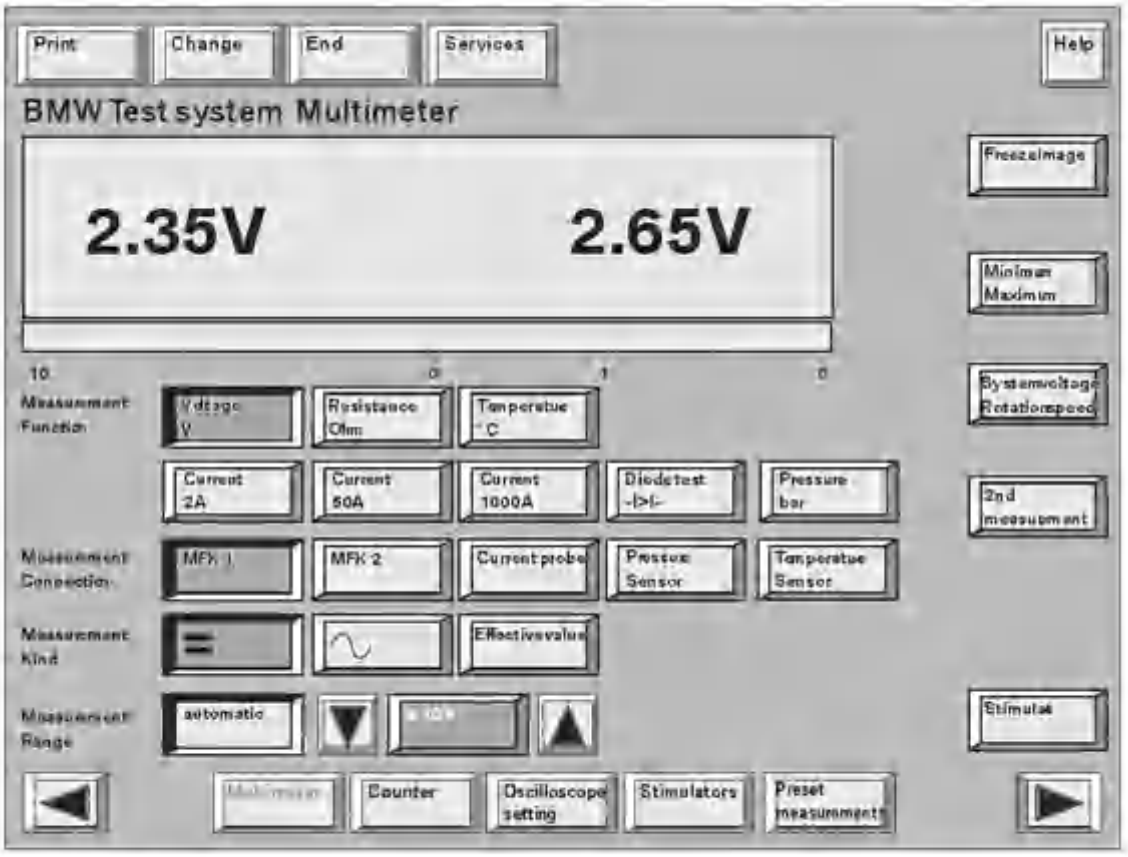


Fig. 18: Identifying CAN-Bus View On Multimeter
Courtesy of BMW OF NORTH AMERICA, INC.

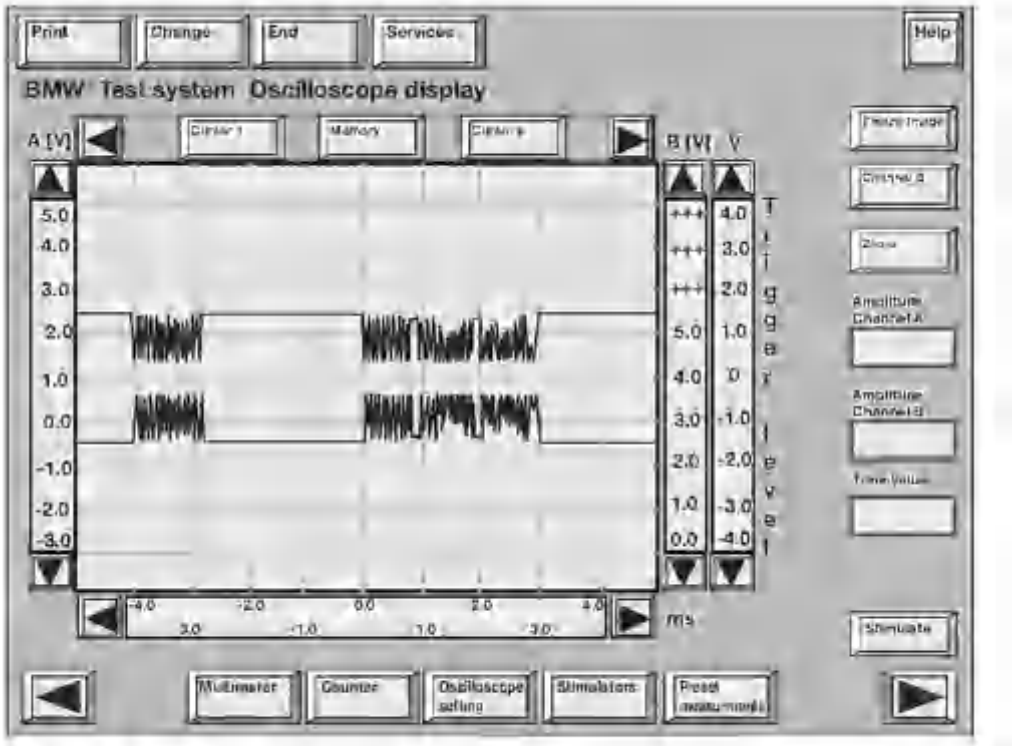


Fig. 19: Identifying CAN-Bus View On Oscilloscope
Courtesy of BMW OF NORTH AMERICA, INC.

When viewing the CAN-Bus signals on an oscilloscope, CAN-Low with be approximately 2.5 volts. The signal will be "pulled" low during communication. CAN-High will be at 2.5 volts, but the signal will be "pulled" high during communication. However, the fact that 2.5 volts are present does not indicate that the CAN-Bus is fault free, it just means that the voltage level is sufficient to support communication.

Terminal Resistors

Two 120 Ohm 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 CAN-H and CAN-L. The value at these control units should be between 10 kOhms and 50 kOhms.

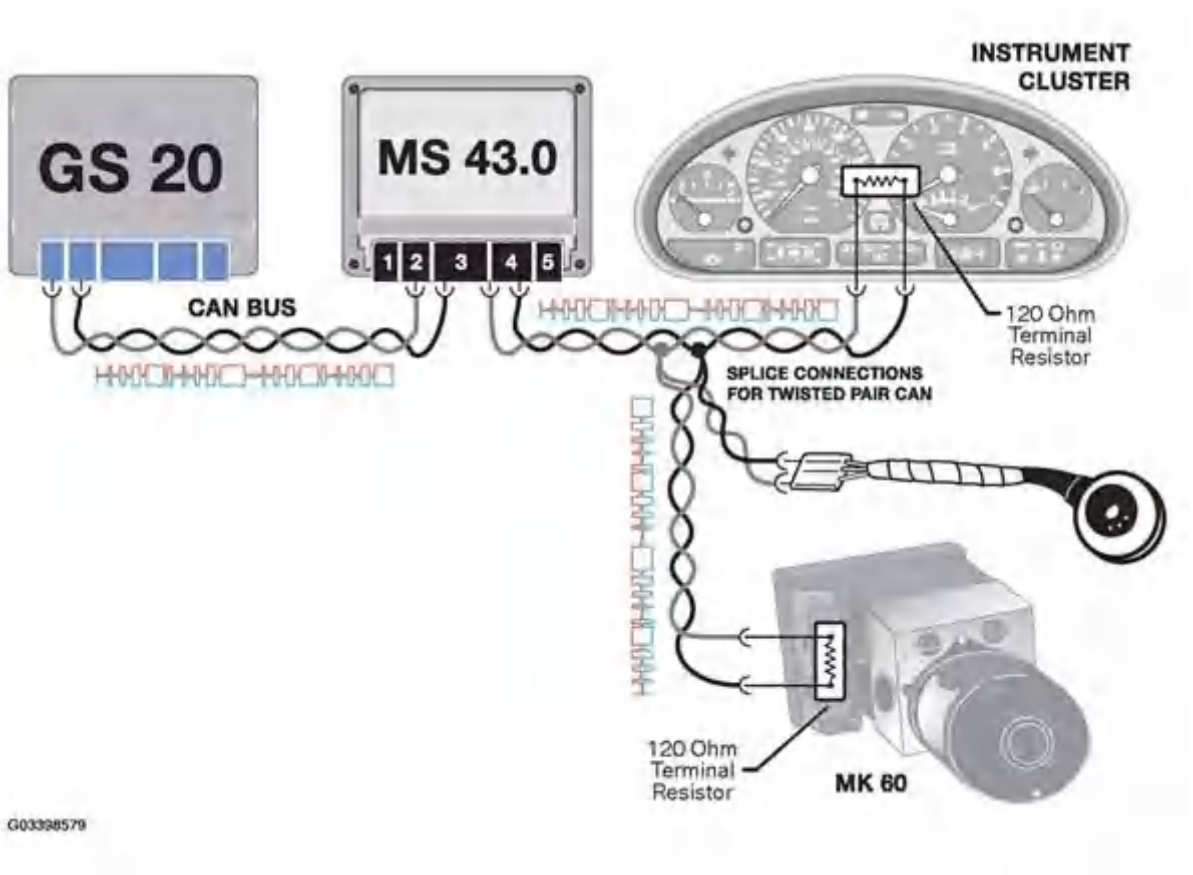


Fig. 20: Identifying Terminal Resistors Modules
Courtesy of BMW OF NORTH AMERICA, INC.

CAN Communication Protocol

The CAN-Bus network uses a unique communication protocol. Bus telegram messages are not "addressed" to the intended receiver (module) as on other bus networks. Instead, the content of the message (RPM, TD, Temp, etc) is labeled by an identifier code that is unique throughout the CAN. All of the subscribers receive the message and each one checks the message to see if it is relevant to that particular control unit.

If the message is relevant then it will be processed, if not, it will be ignored. The identifier code also determines the priority of the message. In a case where two control units attempt to send a message over a free bus line, the message with the higher priority will be transmitted first. The protocol of the CAN ensures that no message is lost, but stored by the Master Controller and then re-transmitted later when it is possible.

INFORMATION AND BODY BUS (I AND K-BUS)

Initially the I-Bus was introduced on the E31 as the information bus. The E31 version of the I-Bus was used for body electronics and driver information systems. With the introduction of the E38, the I-Bus is now referred to as the instrument bus. The K-Bus was added to the E38 along with the I-Bus. Models without Navigation or IKE will use the K-Bus only. Both of these bus systems are technically identical, the only difference is their use by model.

The I and K-Buses are a serial communications bus in which all connected control units can send as well as receive information over one wire. From this point forward they will be referred to as the I/K-Bus and differences will be pointed out separately.

The data transfer rate is approximately 9.6 Kbps (bits per second).

The I/K-Bus is always active when terminal R is switched on. If the bus line is quiet more than 60 seconds, all of the control modules will go into Sleep Mode.

When receiving messages over the bus line, the control unit first determines if the message is error free before accepting it.

The information sent over the bus is configured serially. Each message consists of:

1. Transmitter address (8 bit address)
    - The senders name.
2. Length of data (number of following message bytes)
    - How long the sender will speak.
3. Receiver address (8 bit address)
    - Whom the sender wishes to speak to.
4. Command or Information
    - What the sender wants done.
5. Detailed description of message (maximum 32 bytes of data)
    - How the sender wants it done.
6. Summary of transmitted information (check sum)
    - The sender summarizes everything said.

The sender of the message then waits (100 ms) for an acknowledgment that the message was received.

All of the connected control units will receive the information, but only the module addressed will accept and react to the data.

The rules for communication on the bus line are:

- Only one module speaks at a time.
- Everybody speaks at the same speed.
- Messages are acknowledged by the recipient.
- The message is repeated if the addressed module fails to respond.
- The Master Controller has priority.
- Quit sending message after 5 failed attempts.

Communication between busses - On vehicles equipped with an I-Bus (E38, E39, E53 High) messages to be sent back and forth between the K-Bus and I-Bus have to be transferred via a Gateway. This Gateway is the IKE. The IKE determines by the address of the message recipient whether the message needs to be passed along to the other bus. The D-Bus and CAN-Bus also utilize the IKE or KOMBI as a gateway.

Polling - Each module on the I/K-Bus is informed by a message from the Master Controller as to the ready status of all of the other connected modules. The modules polled are according to the coding of the Master Controller. Every 30 seconds after KL R is switched on, each module on the bus line is polled.

A message concerning bus subscriber status is updated continuously based on the results of these polls. If a subscriber fails to respond with "device status ready" the Master will try again after 1 second.

If the module fails to reply again, the Master will assume that the subscriber is defective and send the message "subscriber inactive" to all connected modules. The inactive module will continue to be polled until the key is switched off in case the module resets itself.

Bus System Overview

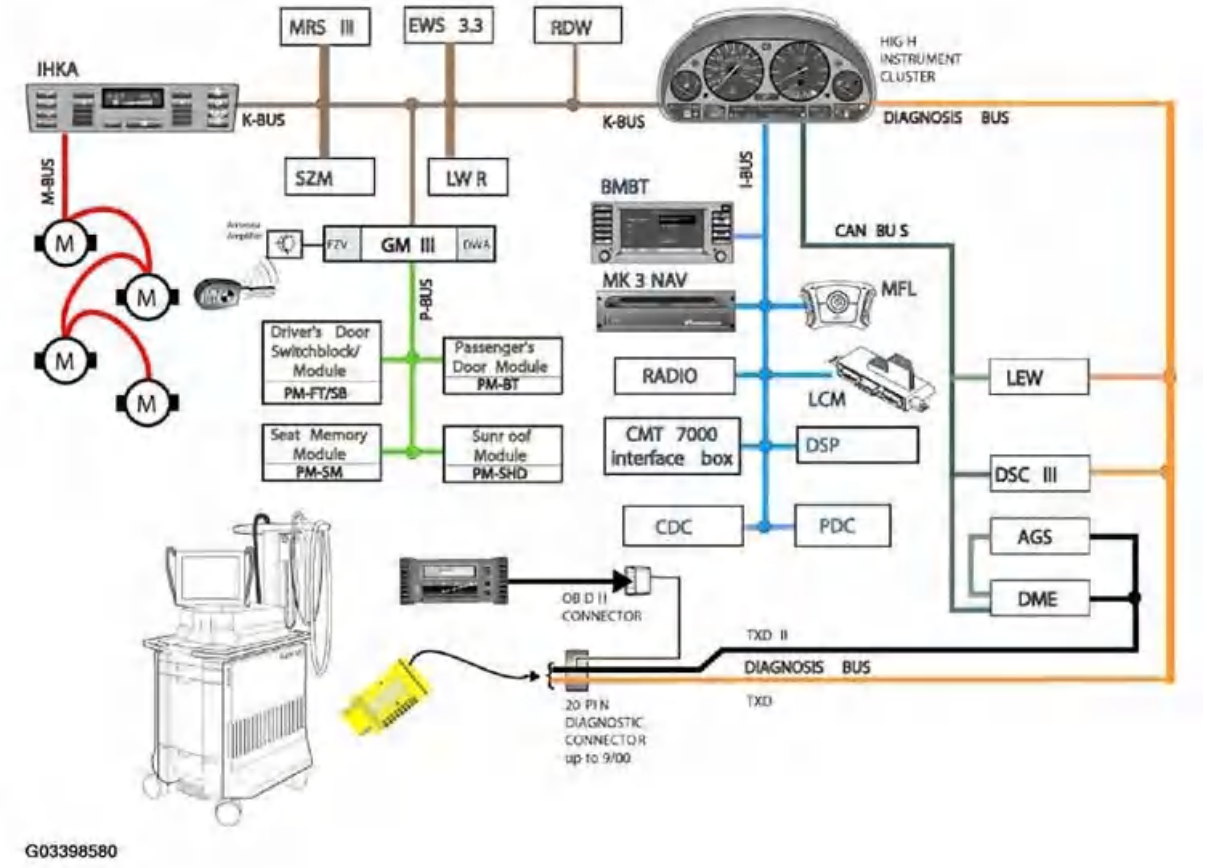


Fig. 21: Identifying Vehicle With I And K-Bus Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

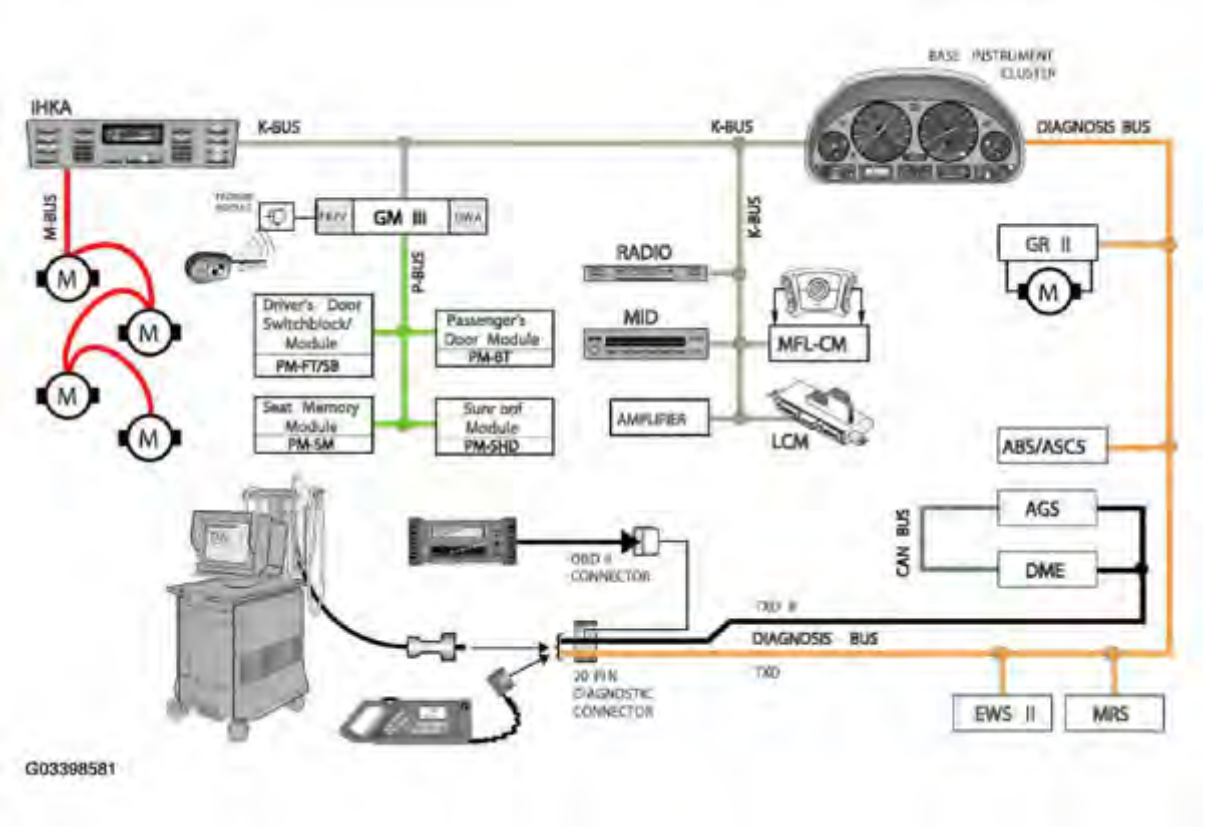


Fig. 22: Identifying Vehicle With K-Bus Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

The I/K-Bus consists of a single copper wire. The wire color of the I and K-Bus is uniform throughout the

vehicle with: I-Bus WS/GR/GE and the K-Bus WS/RT/GE (Note: 2001 E39s with base Kombi have changed K-Bus wire color to the same as the I-Bus, WS/GR/GE).

Due to the linear structure of the network, the I/K-Bus is available for other modules in the event of a disconnected or failed control unit. Just as the CAN-Bus, this is referred to as a "Tree" structure with each control unit occupying a branch. The I/K-Bus provides the diagnostic connection to the control units located on those busses (except IKE/KOMBI).

Always refer to the to determine the exact wiring configuration and color for a specific model.

Troubleshooting The I/K-Bus

The failure of communication on the I/K-Bus can be caused by several sources:

- Failure of the bus cable.
- Failure of one of the control units attached to the bus.
- Failure of the voltage supply to individual modules.
- Interference in the bus cables.

The I/K-Bus is active when KL R is switched on, it remains active until 60 seconds after the last message. If the key is switched off (KL30) the bus may be activated for a time by individual users via a "wake-up" message.

Unlike the CAN-Bus where each control unit (subscriber) provides voltage for communication, the I/K-Busses use only determined Main (master) or Stand-by Controllers to supply B+ for communication. The voltage level on the I/K-Bus must be above 7 V. The nominal value should be close to the system voltage of the vehicle.

Just like the CAN-Bus, the fact that voltage is present does not mean that the bus is fault free, it just means that the voltage level is sufficient to support communication.

Control units that provide operating voltage to the I/K-Bus are:

On E38 and E39/E53 High version vehicles:

- The LCM is the Main (master) Controller of the I-Bus. The IKE and MID/BMBT are Stand-by Controllers.
- The GM is the Main (master) Controller of the K-Bus.

On E46, E52 and E39/E53 Base version vehicles:

- The GM is the Master Controller for vehicles equipped with only the K-Bus.
- The LCM/LSZ is the Stand-by Controller.

Failure Of The Bus Cable

The following faults can occur to the I/K-Bus wiring:

- Short Circuit to B+
- Short Circuit to B-
- Bus line down (open)
- Defective plug connections (damaged, corroded, or improperly crimped)

Short Circuit to B+: Modules that send a message see that the message was not received and that the bus remains high. However, subscribers are unable to decide whether the fault is due to a shorted line or a defect in the communication interface. The module will repeat its message 5 times before discontinuing and faulting. The module will continue to operate as normal minus any commands that could not be delivered by the bus.

Short Circuit to B-: The subscribers do not interpret a low bus line as a fault but just as a bus line deactivation. The Master and Standby controllers do detect the short and enter it as a bus fault. (No communication).

Bus Line Down: The bus line may be open at any of several locations. As long as the Master or Stand-by is still connected, communication can occur with any modules still remaining. The fault situation will be the same as if the disconnected modules were defective themselves.

Checking the bus line is carried out just like any other wiring. Perform continuity tests between the connections of different modules (all modules disconnected) without forgetting to make sure that the bus has not shorted to ground or another wire. It is recommended to use the "Wire Test" in "Preset Measurements" which is more sensitive than just a resistance check.

If Voltage level and the wire test are O.K. then looking at the communication signal may be useful. In order to get a signal, operate different devices on the I/K-Bus (e.g. MID/MFL) to stimulate conversations.

The following are some examples of scope patterns that may be observed when checking the I/K-Bus.

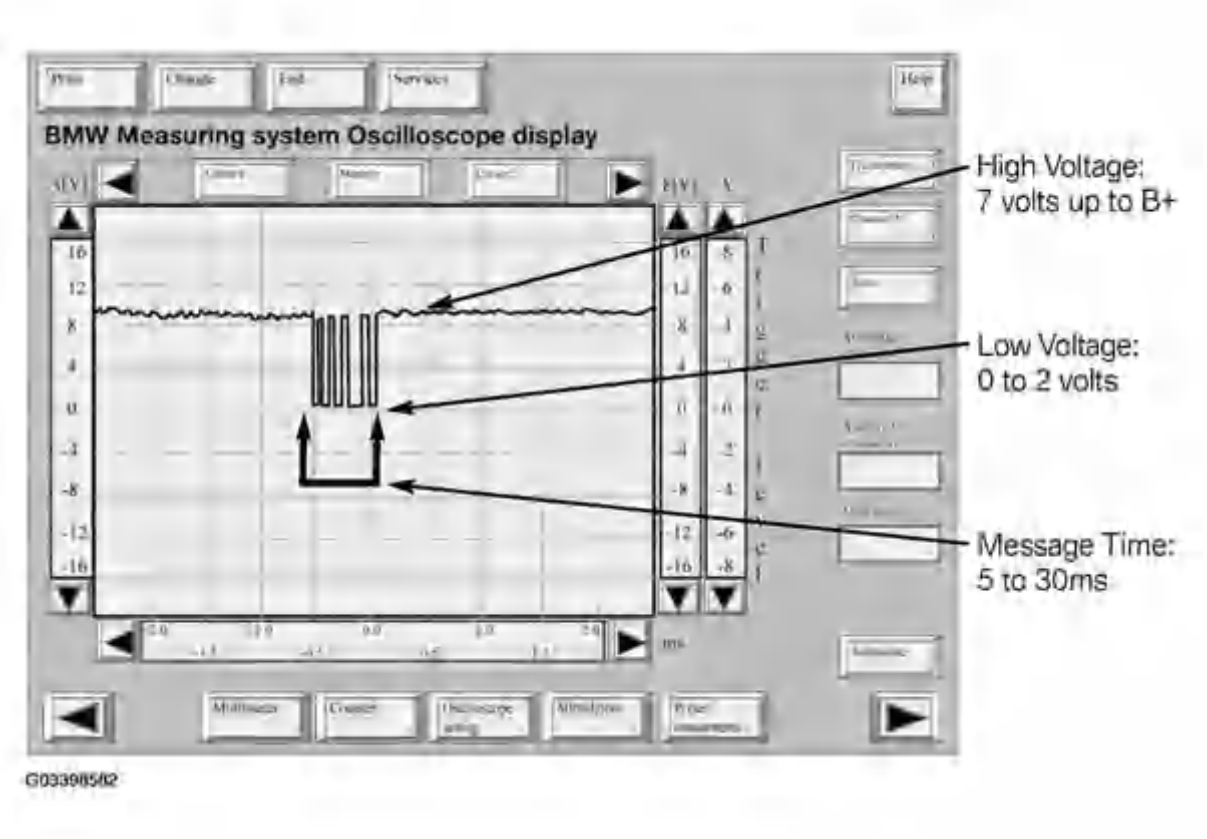


Fig. 23: BMW Measuring System Oscilloscope Display
Courtesy of BMW OF NORTH AMERICA, INC.

The example shown above is of a correctly operating K-Bus signal. The high portion of the signal is approximately 12 volts. The signal is active when communication is occurring of the bus.

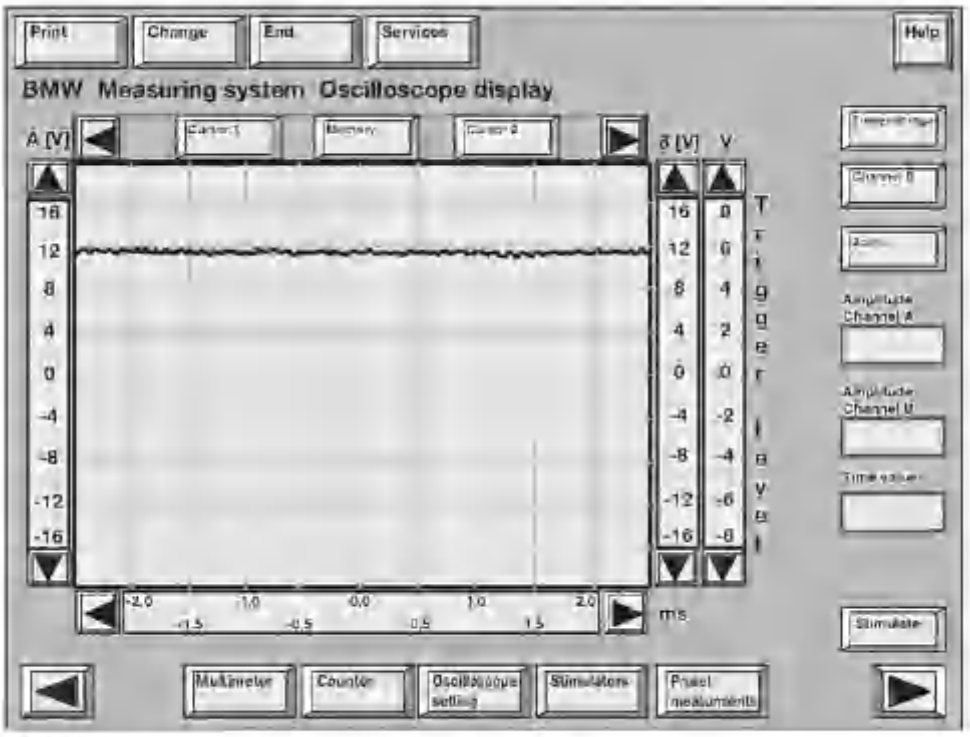


Fig. 24: Identifying Flat Line At 12 Volts
Courtesy of BMW OF NORTH AMERICA, INC.

No communication is taking place. The bus may be temporarily off line or shorted to B+.

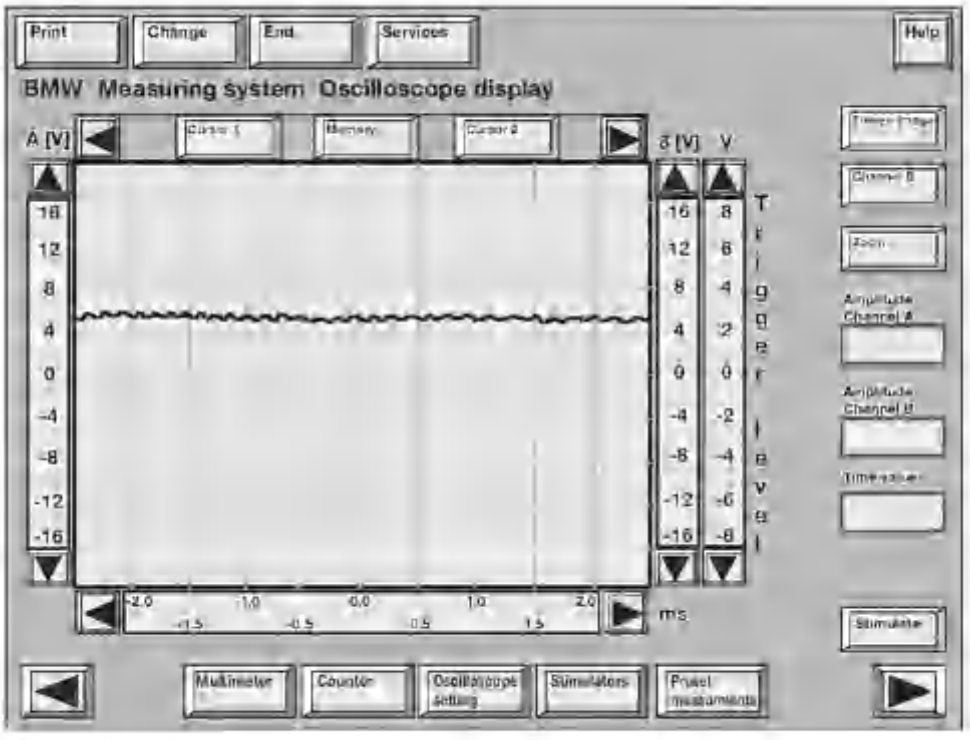


Fig. 25: Identifying Flat Line At 5 Volts
Courtesy of BMW OF NORTH AMERICA, INC.

No output voltage from the Main (master) or standby controllers. Bus line may be open or control unit may be defective.

Failure Of One Of The Control Units Attached To The I/K-Bus.

Each control unit connected to the bus has an integrated communication module that makes it possible for that control unit to exchange information. Failure of a control unit normally triggers a fault code in the other control units connected to the bus.

As a quick check for the I/K-Bus, activate the four way flashers. The flash indicators must light up in the instrument cluster. Switch on the Radio, and adjust volume using the MFL or MID/BMBT, the volume must change accordingly.

On High version vehicles press the recirculation button on the MFL, The IHKA should respond to the request. This test checks the gateway link as well as the I and K-Bus communication.

If the tests prove O.K, this means that communication on the bus is O.K. Any faults still existing can only be related to faults specific to a control unit or a local I/K-Bus wiring defect to a module.

There are instances where failures may be software related. A faulted module may paralyze or take down the entire bus. This scenario would be evident by functions not being carried out and possible faults stored.

In order to isolate the defective control unit, the control units can be disconnected one at a time. Repeat the bus test after each disconnected control unit. If the disconnected control module is the defective one the faults will only point to communication with that interrupted module and no one else.

Once the module has been replaced (observing current S.I.Bs) and coded, perform the I or K-Bus Test Module in the Diagnosis Program to ensure that communication is O.K.

Failure Of The Voltage Supply To Individual Modules.

A slowly dropping battery voltage on a vehicle with discharged battery can lead to sporadic communication faults in various control units on the bus. The reason is that not all control units will switch off communication at the same voltage level leaving some modules still trying to communicate. Always verify a properly charged battery and charging system and fuses before beginning troubleshooting on the bus. Also, do not forget to check for a proper ground to a control unit, this may not allow the bus to see a signal low (0-2 V)

Interference In The Bus Cables.

Interference will have a similar effect to shorting or disturbing the bus wiring. Excessive interference created by a defective alternator or aftermarket devices such as cell phones or amplifiers may induce a voltage into the bus line and disrupt communication. This type of interruption may be intermittent and faults may only be stored in some modules and not in others. These faults are often difficult to reproduce. Isolate any aftermarket wiring in the vehicle and see if the fault returns.

Peripheral Bus (P-Bus)

The P-Bus is a single wire serial communications bus that is used exclusively on vehicle that are equipped with ZKE III. These vehicles are the E38, E39 and E53.

The P-Bus provides the Central Body Electronics system with a low speed bus for use by the General Module (GM) to control various functions. These functions are carried out by various peripheral modules. The peripheral modules are located in areas of the vehicle close to sensors or actuators where wiring the components separately would create an excessively large wiring harness. In some cases (e.g. Sunroof module) these peripheral modules are integrated into an actuator or switch to create one unit.

The P-Bus is only used within the ZKE system and is very similar in communication protocol and speed to the

I/K-Bus. The P-Bus is not designed for a rapid exchange of continuous information. Instead, the messages on the P-Bus are short control commands. This limited message flow allows for fast reaction time by the Peripheral module. (e.g. a door lock request).

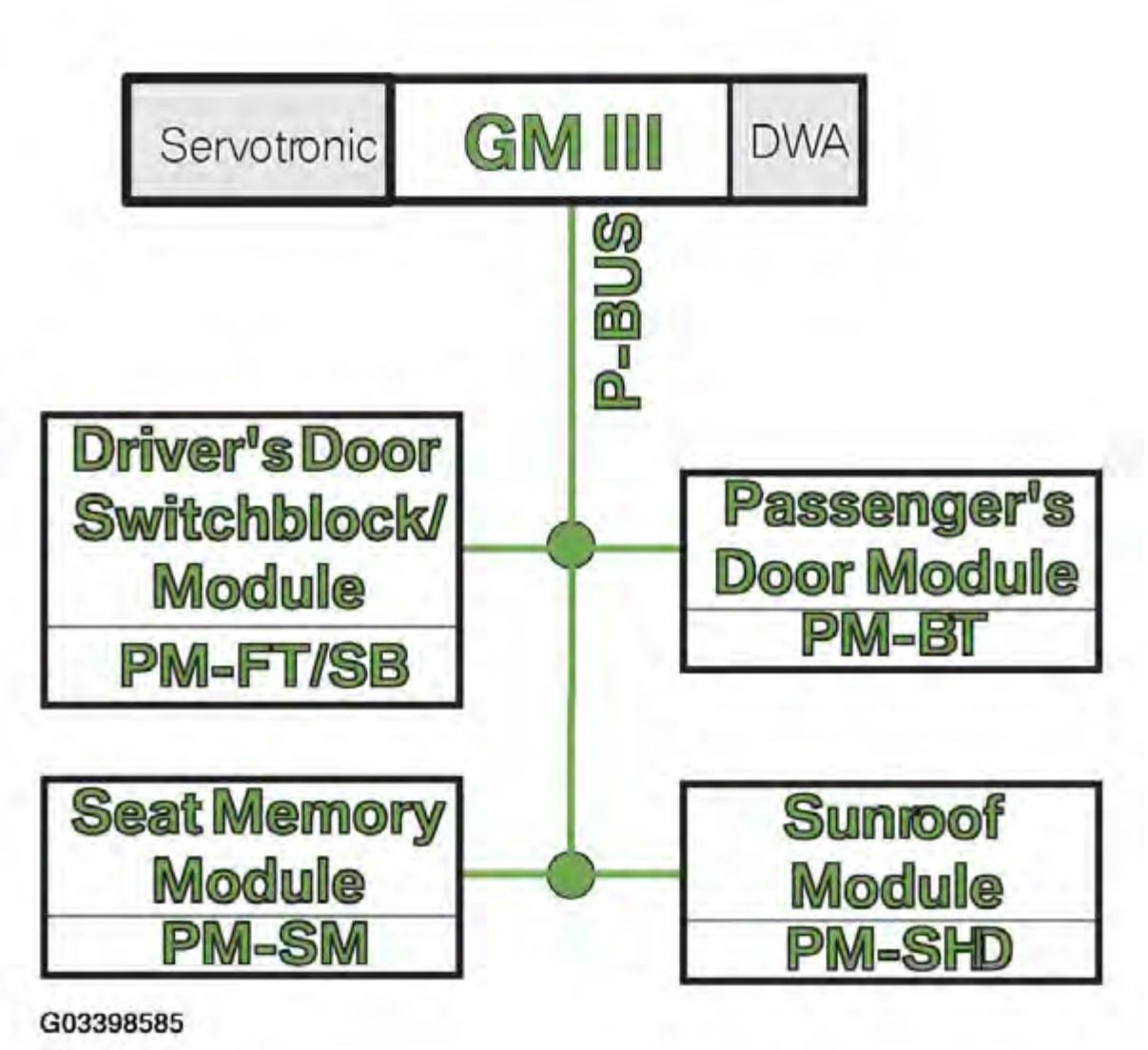


Fig. 26: Identifying P-Bus
Courtesy of BMW OF NORTH AMERICA, INC.

In comparison with previous electronic systems, bus networks provide a simple method to operate various body electronic systems. Using the example of a power window circuit, the previous methods to operate a window were inefficient. The power window circuit carried a large amount of current which required larger gauge wires and heavy duty switches. Window switches were subject to wear from arcing contacts and the wiring size did not allow much flexibility when passing through bulkheads and door jamb areas.

A bus network needs less high current circuits and uses a smaller amount of heavy gauge wire. The switches are only used to signal the modules and they do not carry high current. The switches are used to provide a low current ground input signal which increases the life of the switch and improves reliability considerably.

The drivers side window switch is a control unit on the P-Bus. If the driver needs to open the front passenger side window, a signal is sent from the driver's side switch block module to the passenger side door module. The passenger side door module contains the load circuits for switching the window motor. The passenger side door module will respond to the "window open" telegram from the drivers door switchblock by actuating the switching circuit for the window motor.

(Early E36)

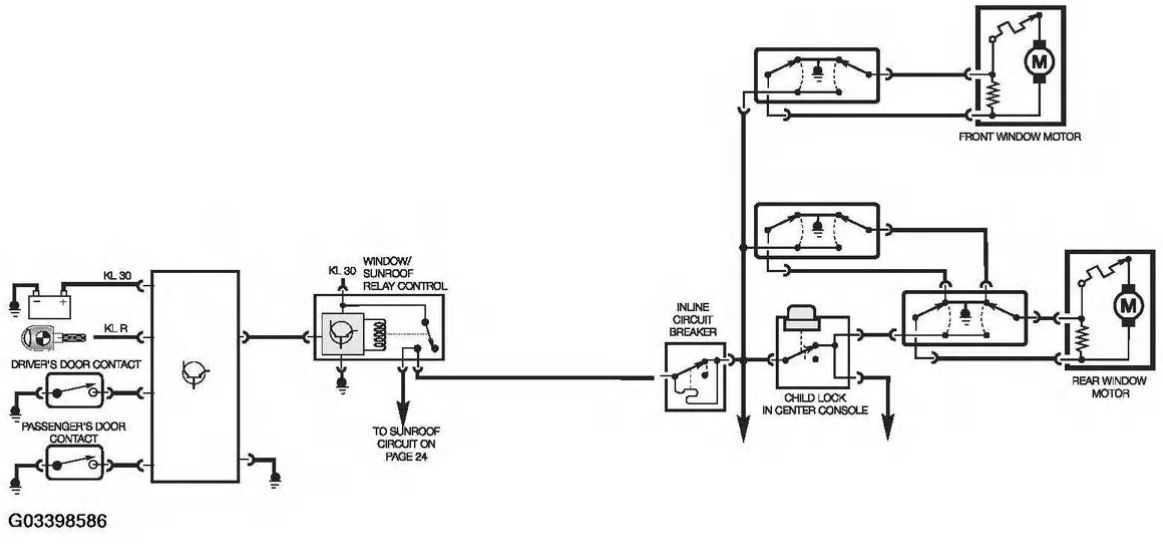


Fig. 27: Conventional Power Window Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

In addition to simplifying the power window circuit, the bus network also allows functions that were not possible with a conventional power window circuit. For example, the remote operation of the power windows from the key transceiver (convenience open feature).

The convenience open feature on the E38 operates by a radio frequency signal from the key transceiver. The "open request" signal is received by the FBZV module. The FBZV module sends a digital signal to the General Module (GM III). The GM then sends an "open windows and sunroof" telegram over the P-Bus and all 4 windows and sunroof will open. This type of feature is much too complex for a conventional window circuit. The bus network allows new features like this to be possible.

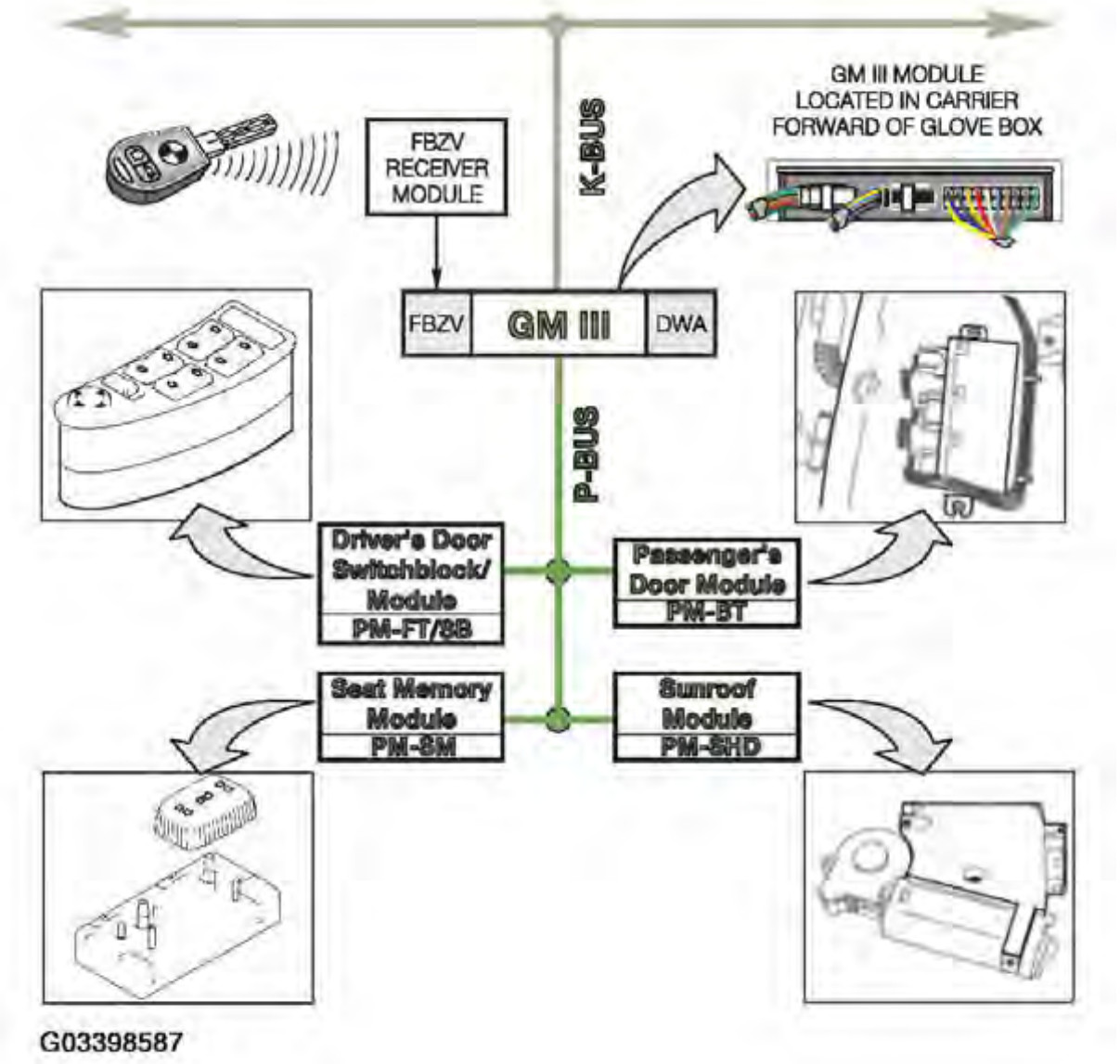


Fig. 28: Identifying P-Bus Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Troubleshooting The P-Bus

The failure of communication on the P-Bus can be caused by several sources:

- Failure of the bus cable.
- Failure of one of the control units attached to the bus.
- Failure of the voltage or ground supply to individual modules.
- Interference in the bus cables.

The P-Bus may be active at anytime following a wakeup call. The GM provides the voltage necessary to support communication. The voltage level of the P-Bus is 12V.

The Diagnosis of the central body electronics is carried out via the K-Bus. The GM converts diagnosis request from the DISplus into diagnostic mode messages and transmits them the peripheral modules over the P-Bus.

Automatic testing of the P-Bus connection is carried out every time the GM communicates with the diagnosis program (not during a short test).

Checking the bus line is carried out just like any other wiring. Perform continuity tests between the connections of different modules (all modules disconnected) without forgetting to make sure that the bus has not shorted to ground or another wire. It is recommended to use the "Wire Test" in "Preset Measurements" which is more sensitive than just a resistance check.

Troubleshooting of the P-Bus network is carried out the same as the I/K-Bus.

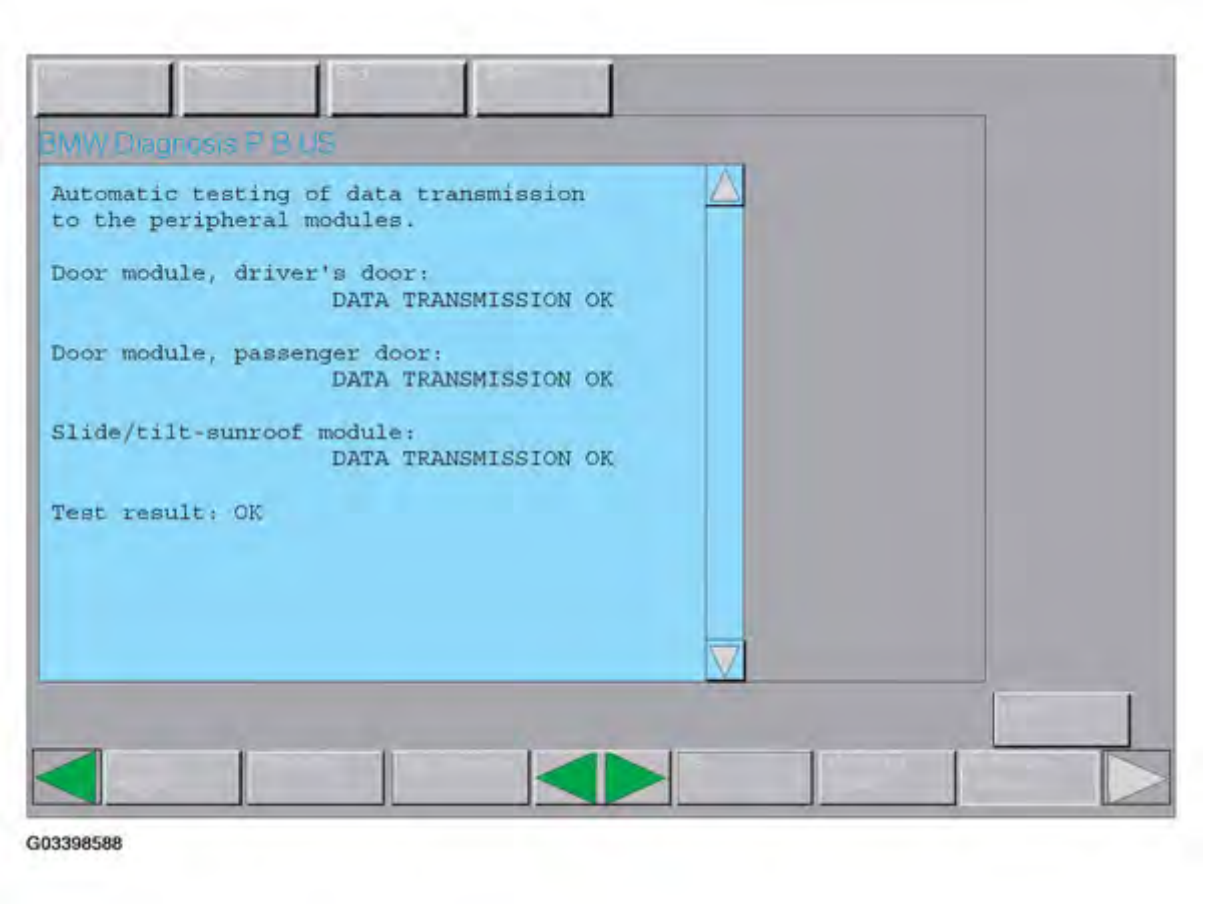


Fig. 29: Identifying Troubleshooting P-Bus Display
Courtesy of BMW OF NORTH AMERICA, INC.

M-BUS

The M-Bus is used exclusively in the climate control systems for the control of the "smart:" stepper motors. These stepper motors are used to control various air distribution flaps. In previous climate control systems, such as E32/E34, the stepper motors were directly controlled by the climate control module.

The M-Bus was introduced on the E38 climate control system (IHKA). The M-Bus was also installed on subsequent models equipped with IHKA and IHKR.

The M-Bus communicates with the "smart" stepper motors which contain a processor capable of transmitting and receiving messages. The stepper motor is then operated by final stage transistors located within the stepper motor electronics.

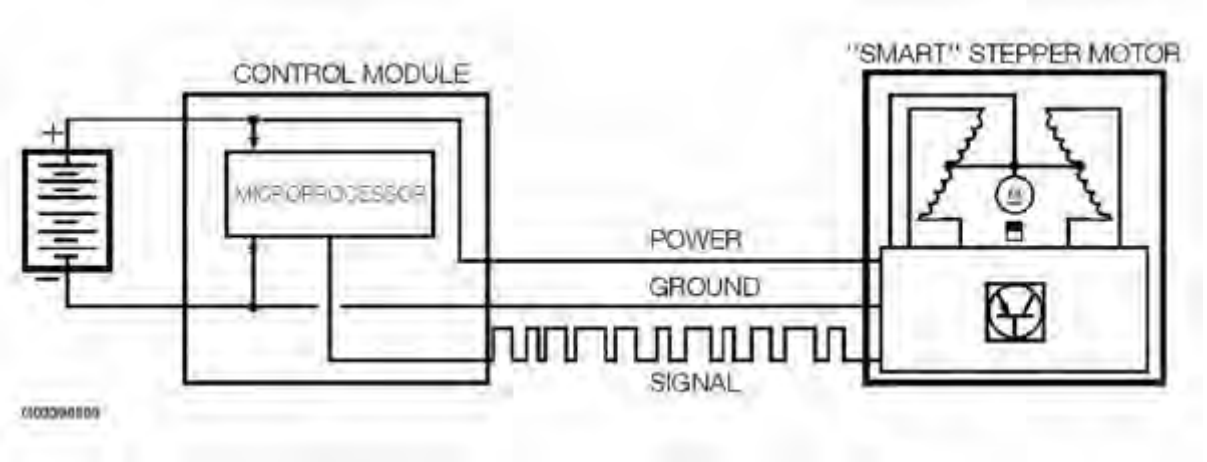


Fig. 30: Identifying M-Bus
Courtesy of BMW OF NORTH AMERICA, INC.

The M-Bus consists of a three wire ribbon cable containing the following wires:

- Power (B+)
- Ground
- Bidirectional Signal Line

Each stepper motor on the M-Bus has a unique part number to distinguish it's location on the climate control housing. The part number corresponds to a unique electronic address on the M-Bus. Since each stepper motor contains a unique electronic address, the motor will only respond specific commands. A stepper motor installed in the wrong location would result in improper operation.

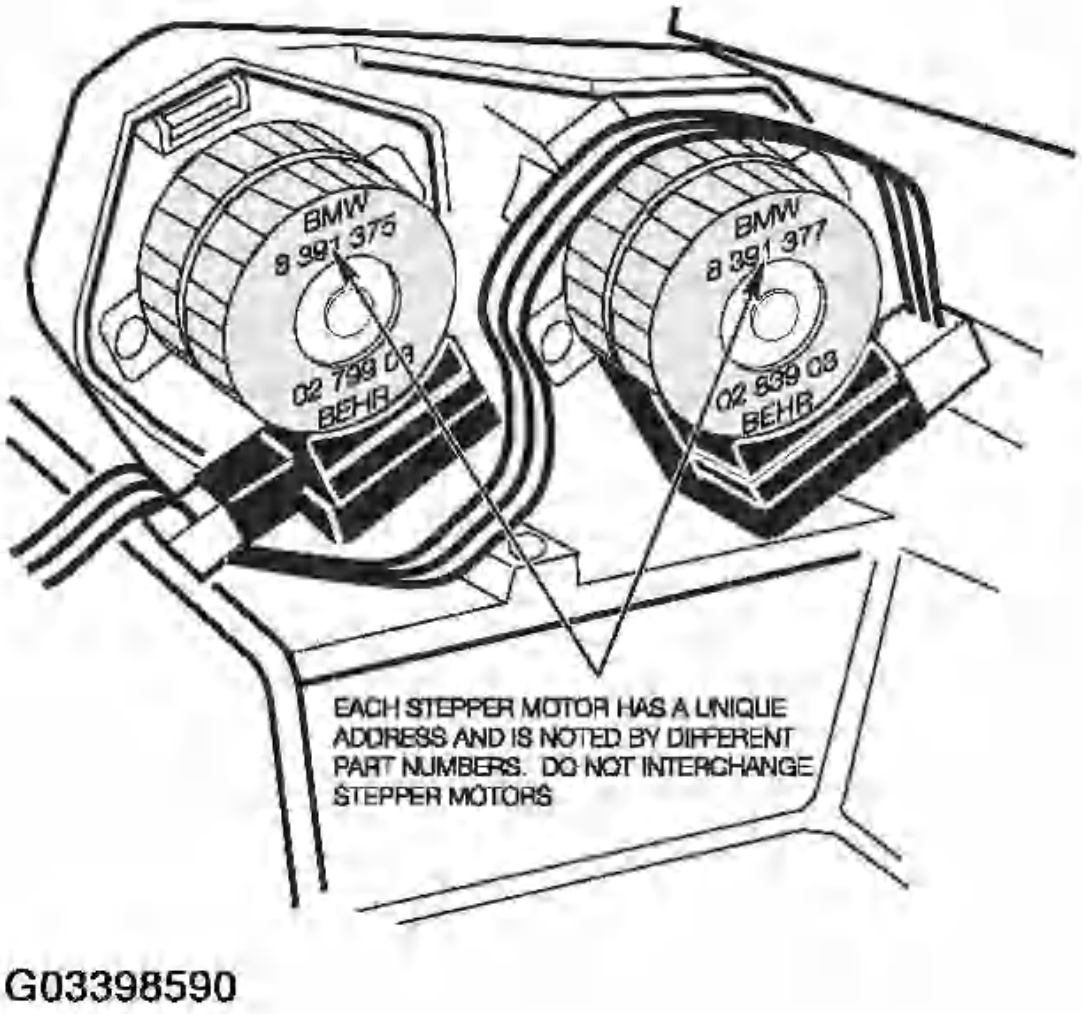


Fig. 31: Identifying Stepper Motors
Courtesy of BMW OF NORTH AMERICA, INC.

Communication Protocol

Each stepper motor acts as a "subordinate" module, it listens to all data on the bus, but only responds as long as the message is transmitted without errors and recognizes it's own address.

The M-Bus protocol differs from the CAN and the I/K/P-Busses in that communication takes place within a framework time of 650 microseconds.

When the climate control module (IHKA/R) is commanding a change in position of one or more stepper motors, the sequence of data is:

1. Start bit - Informs the stepper motors that a command is coming.
2. Synchro bit - Establishes the message as originating from the IHK control module.
3. Data Field - The command to move a stepper motor to a particular position.
4. Address Field - The IHK control unit names the stepper motor the command is intended for.

If the message was received by the stepper motor without error, the stepper motor will carry out the command and transmit it's acknowledgment which is as follows:

1. Synchro Bit - Establishes the message as originating from the stepper motor
2. Data Field - Status information from the actuator (feedback)
3. End of Frame - Closes the communication Session

Communication continues on the M-Bus until the GM send the "go to sleep" command over the K-Bus.

M-Bus Topology

The M-Bus consists of a three wire ribbon attached to the climate control housing and connecting all of the "smart" stepper motors in the system. The number of stepper motors depends upon the vehicle model and climate control system (IHKA, IHKR etc.).

For example, the E38 (shown) with IHKA uses 9 "smart" stepper motors and one motor that is conventionally controlled. The M-Bus is divided into two circuits due to the large number of stepper motors. Other models such as the E39, E46 and E53 only use one circuit for the M-Bus and less stepper motors.

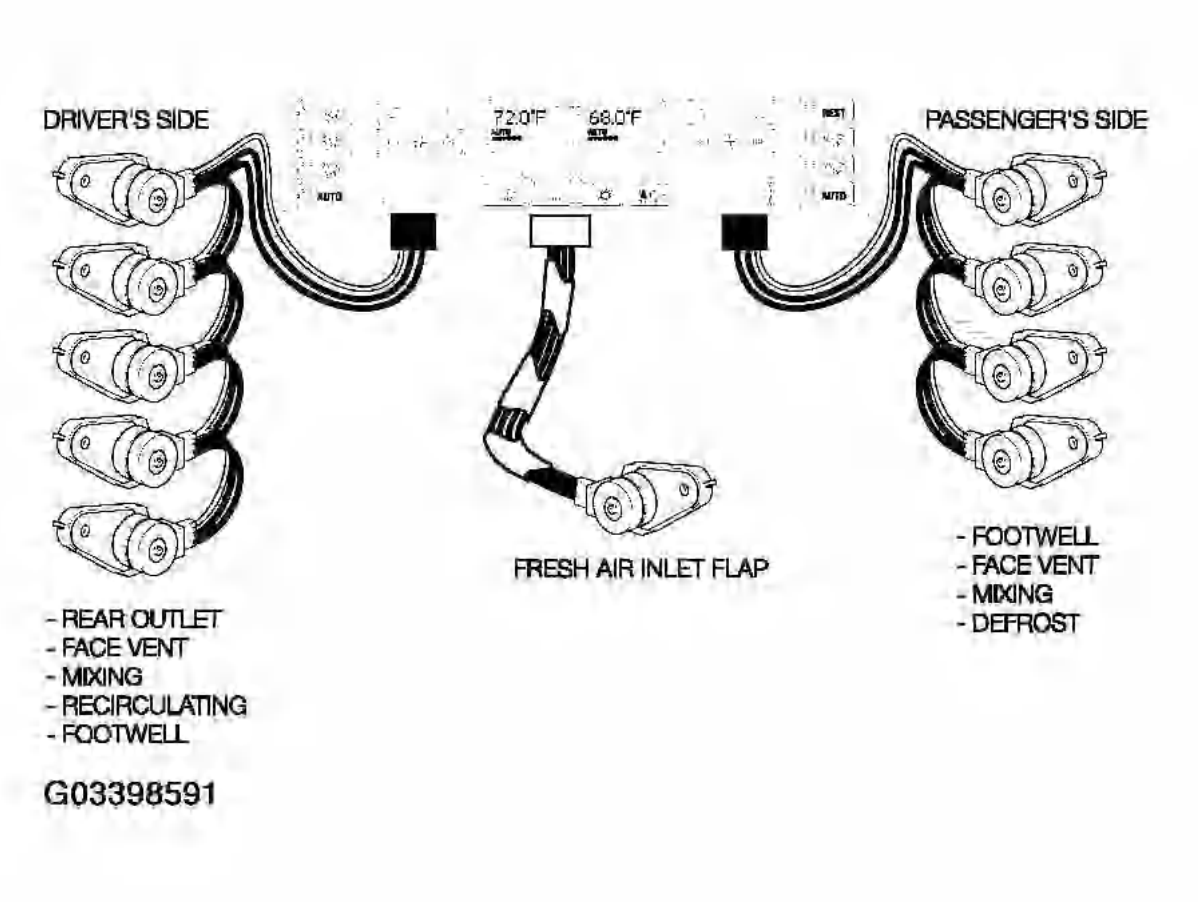


Fig. 32: Identifying M-Bus Topology
Courtesy of BMW OF NORTH AMERICA, INC.

M-Bus Troubleshooting

The failure of communication on the M-Bus can be caused by several sources:

- Failure of the bus ribbon, e.g. open or shorted.
- Failure of one of the stepper motors attached to the bus, e.g. shorted to B+ or B-.
- Failure of the voltage or ground supply to the IHK control unit.

The M-Bus is active at any time following KLR on. The IHK module provides the voltage necessary to support communication. The voltage level of the M-Bus is 5 V, but because status communication occurs at an average 50% duty cycle the observed voltage is approximately 2.5 V. The presence of 2.5 V means that communication is occurring.

Checking the M-Bus ribbon is carried out just like any other wiring. Perform continuity tests between the connections of the stepper motors (all motors disconnected) and the control unit without forgetting to make sure that the data line has not shorted to ground or power.

It is recommended to use the "Wire Test" in "Preset Measurements" which is more sensitive than just a resistance check.

If Voltage level and the wire test are O.K, then looking at the communication signal may be useful.

The following is an example of a scope pattern that may be observed when checking the M-Bus. Notice the very high frequency of the signal at approximately 20 kHz.

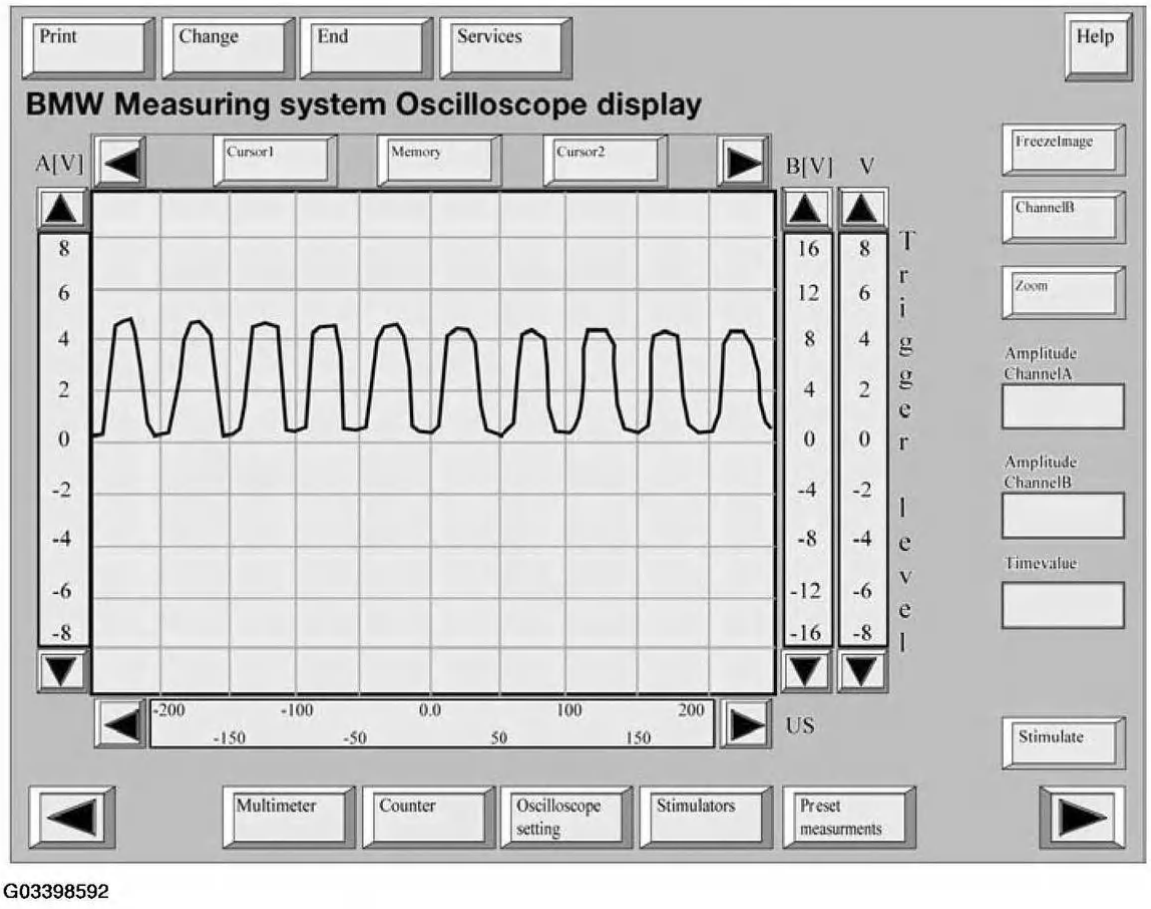


Fig. 33: Identifying Scope Pattern (M-Bus)
Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00212595

LAMPS SETTINGS

63 10 HEADLIGHT ADJUSTMENT, RHD/LHD VEHICLES

Z3:

When crossing the border into countries where vehicles drive on the opposite side of the road to the country in which a vehicle is licensed, the asymmetric wedge on the low-beam headlight must be covered.

CAUTION: To do so, use only genuine strip supplied by BMW because the reflector is made from plastic and strips with unsuitable glue could damage the reflector. It should be possible to remove the genuine strip without leaving glue residues. If there are still glue residues, they may only be removed with the cleaning cloth provided or with pure alcohol. Do not under any circumstances use solvents (e.g. paint thinner). This can damage the plastic by discoloring the lens.

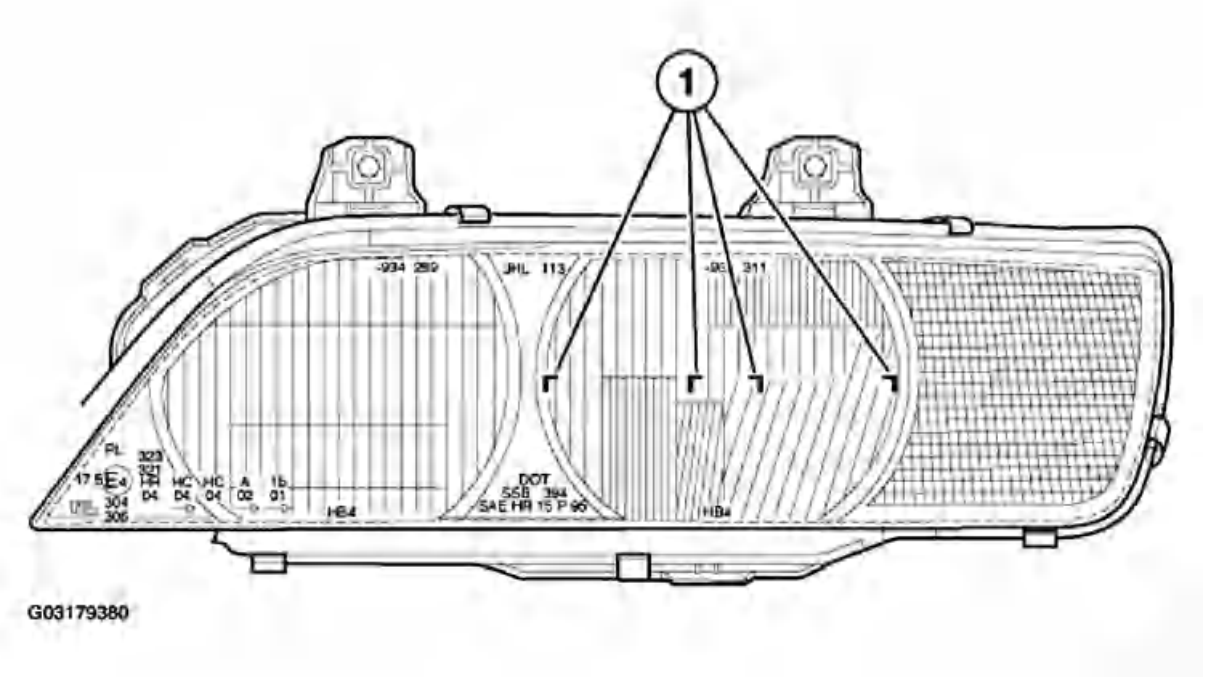


Fig. 1: Identifying Marking Angles On Left Headlights Reflectors
Courtesy of BMW OF NORTH AMERICA, INC.

Left Headlights In Direction Of Travel:

Marking angles are provided on the reflector.

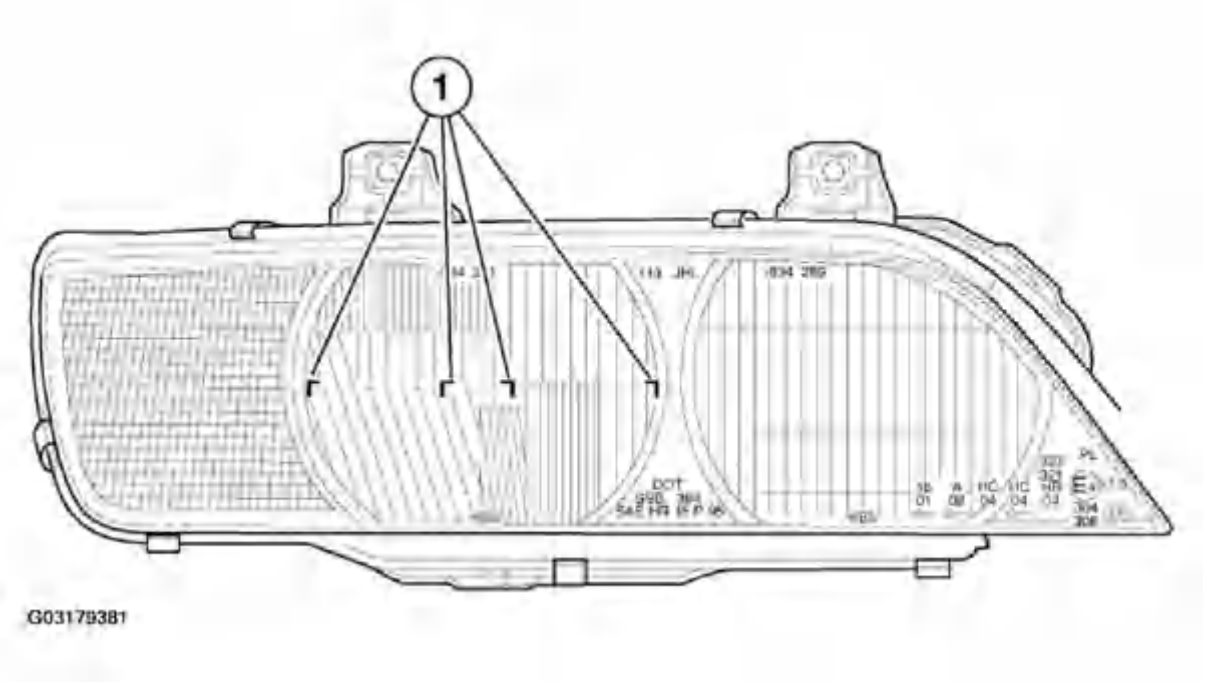


Fig. 2: Identifying Marking Angles On Right Headlights Reflectors
Courtesy of BMW OF NORTH AMERICA, INC.

Left Headlight In Direction Of Travel:

Marking angles are provided on the reflector.

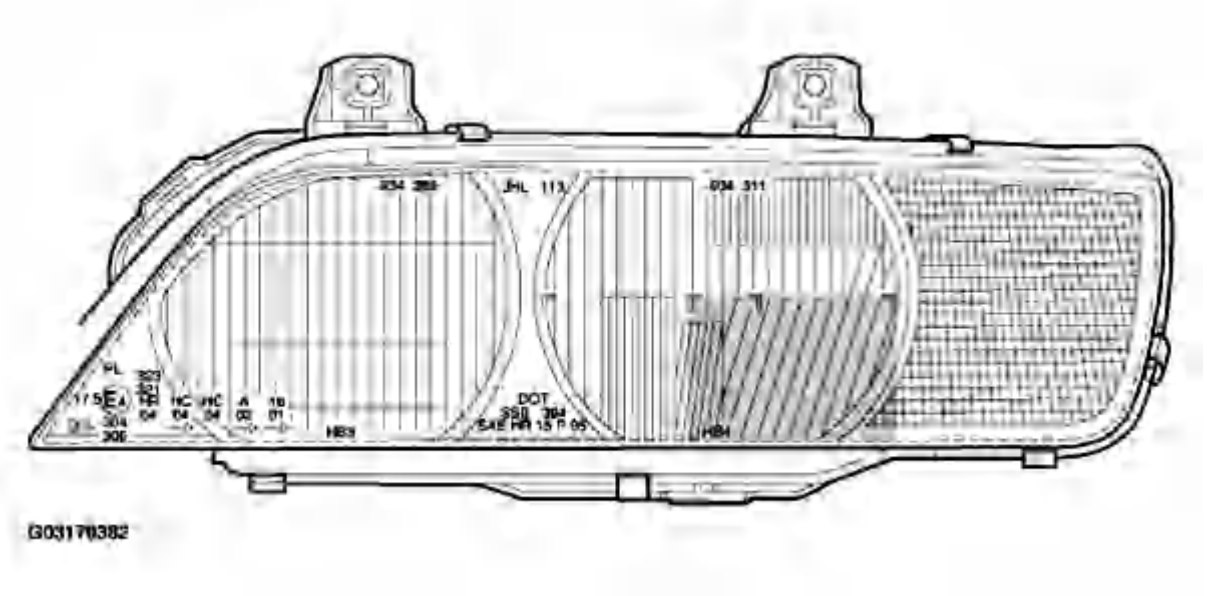


Fig. 3: Identifying Covered Area Of LHD Vehicle In RHD Country
Courtesy of BMW OF NORTH AMERICA, INC.

Left Headlight In Direction Of Travel:

Covered area of a LHD vehicle in a RHD country.

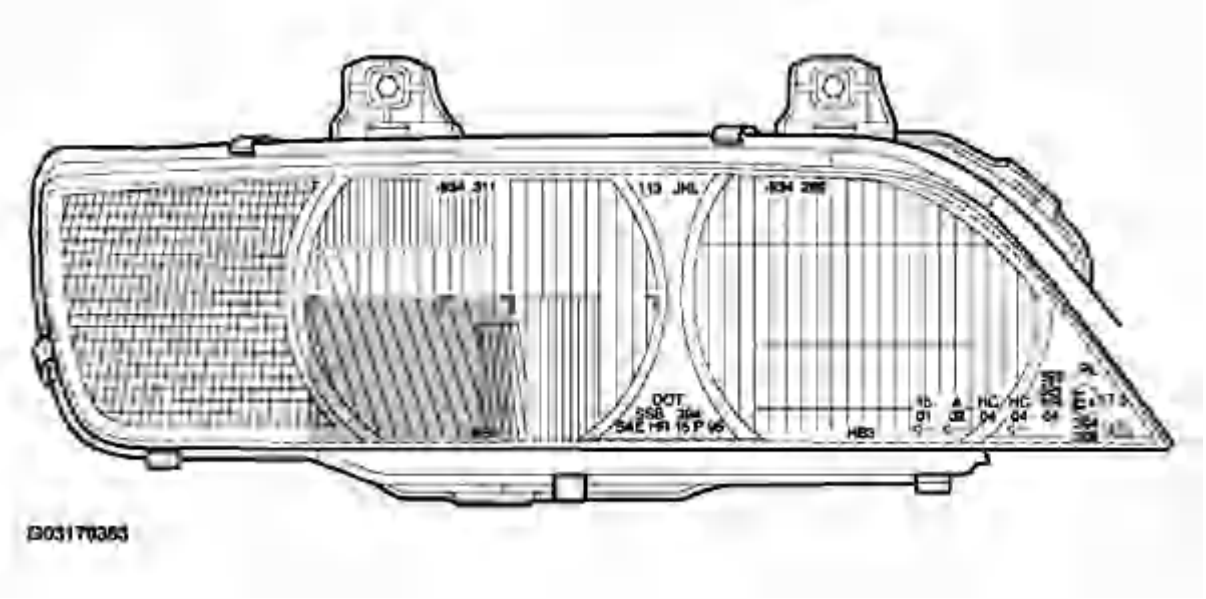


Fig. 4: Identifying Covered Area Of RHD Vehicle In RHD Country
Courtesy of BMW OF NORTH AMERICA, INC.

Right Headlight In Direction Of Travel:

Covered area of a LHD vehicle in a RHD country.

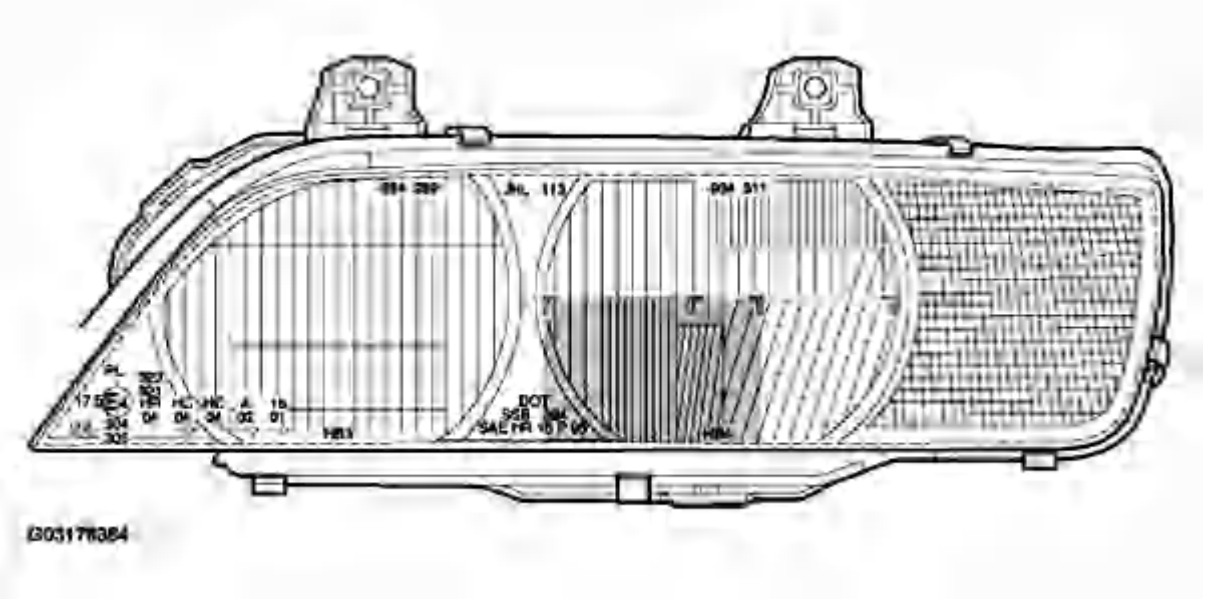


Fig. 5: Identifying Left Headlight In LHD Country
Courtesy of BMW OF NORTH AMERICA, INC.

Left Headlight In Direction Of Travel:

Covered area of a RHD vehicle in a LHD country.

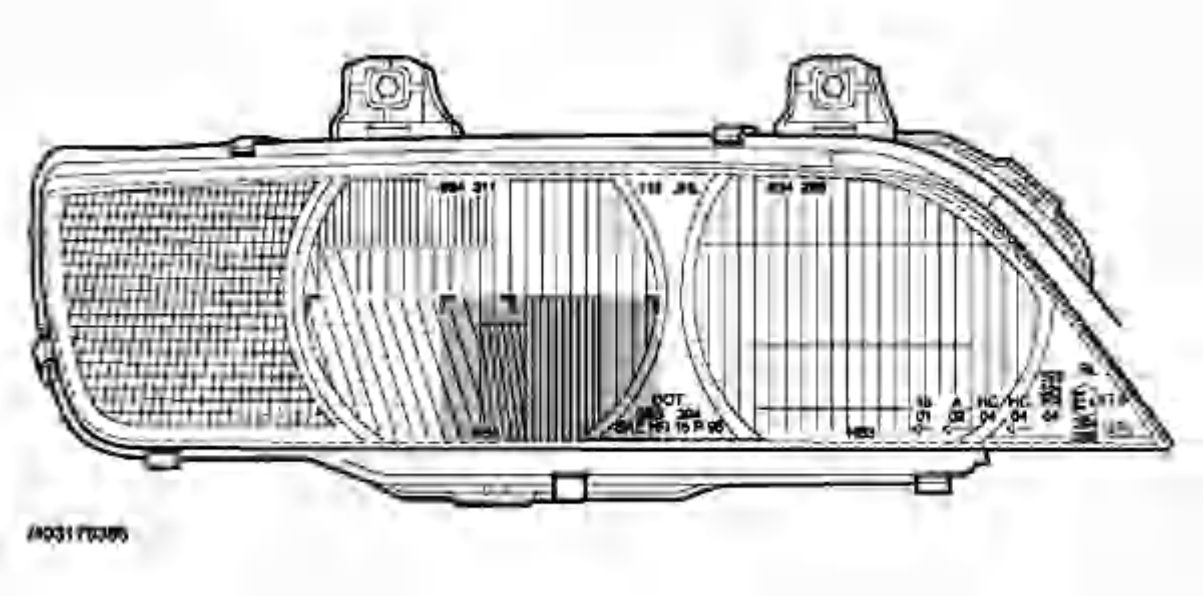


Fig. 6: Identifying Right Headlight In LHD Country
Courtesy of BMW OF NORTH AMERICA, INC.

Right Headlight In Direction Of Travel:

Covered area of a RHD vehicle in a LHD country.

63 10 ... TEST REQUIREMENTS FOR HEADLIGHT VERTICAL AIM ADJUSTMENT

- Car parked on level ground.
- Replace faulty glass and mirrors and blackened light bulbs.
- Check tyre 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.

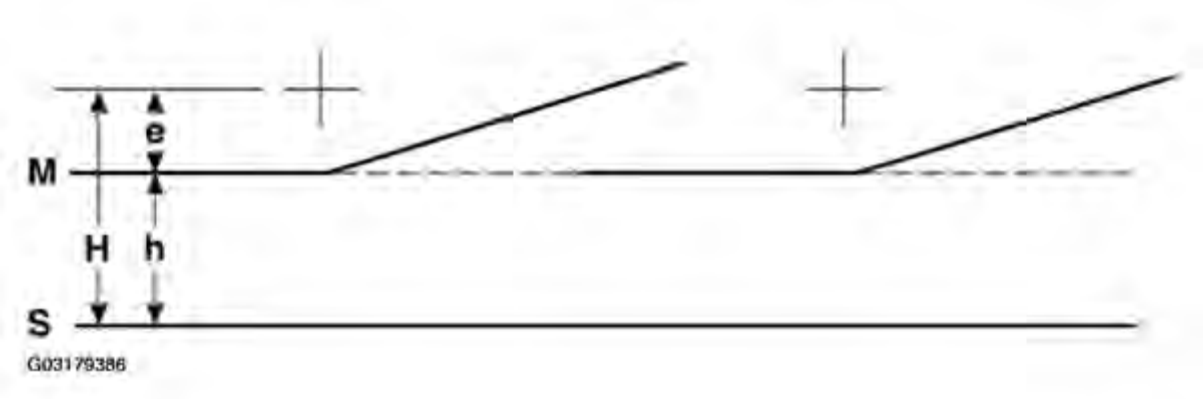


Fig. 7: Adjusting Headlight Beam
Courtesy of BMW OF NORTH AMERICA, INC.

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 test prerequisites for adjusting headlights, refer to 63 10 ... TEST REQUIREMENTS FOR HEADLIGHT VERTICAL AIM ADJUSTMENT .

Compact, Z3:

Adjust headlights by turning adjusting screws (1) and (2).

A definite allocation of adjusting screws is not possible.

1. Adjusting screw for vertical adjustment.
2. Adjusting screw for lateral adjustment.

NOTE: Adjusting screws are shown on a removed headlight.

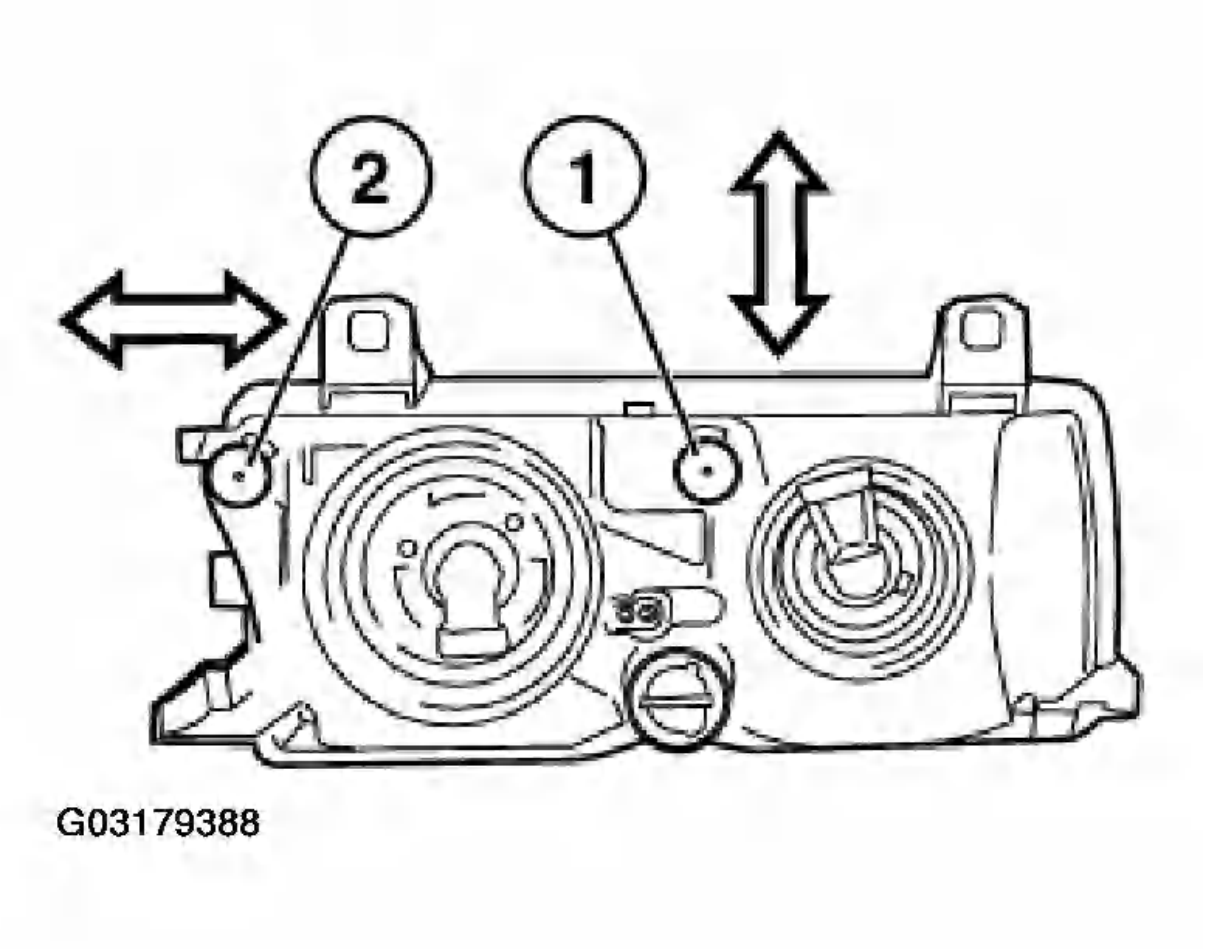


Fig. 8: Identifying Adjusting Screws On Removed Headlight
Courtesy of BMW OF NORTH AMERICA, INC.

63 10 014 ADJUSTING FOGLIGHTS

NOTE: Comply with test preconditions. Refer to 63 10 ... TEST REQUIREMENTS FOR HEADLIGHT VERTICAL AIM ADJUSTMENT .

Adjustment dimension (e) for foglights is 20 cm.

Foglight height adjustment at adjusting screw (1) at lower opening of air inlet grill.

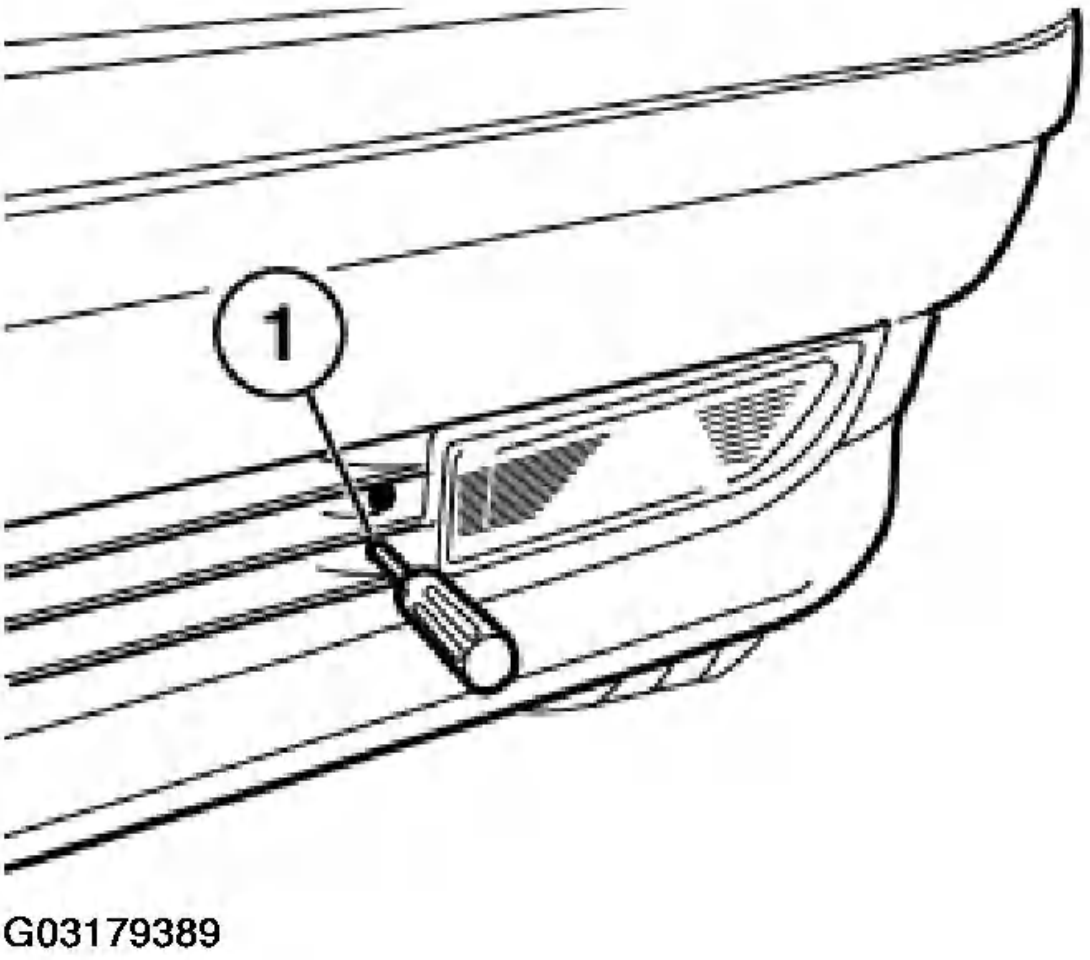


Fig. 9: Identifying Foglight Height Adjustment
Courtesy of BMW OF NORTH AMERICA, INC.

HEADLIGHTS

63 12 001 REMOVING AND INSTALLING/REPLACING ENTIRE LEFT HEADLIGHT (Z3 ROADSTER, Z3 COUPE)

Disconnect all plug connectors.

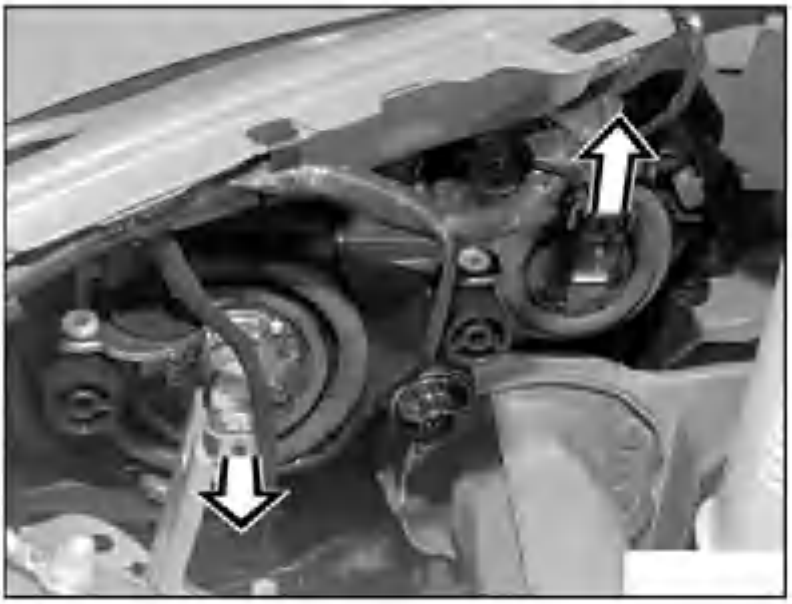


Fig. 10: Disconnecting All Plug Connectors
Courtesy of BMW OF NORTH AMERICA, INC.

Twist lamp socket and pry out.

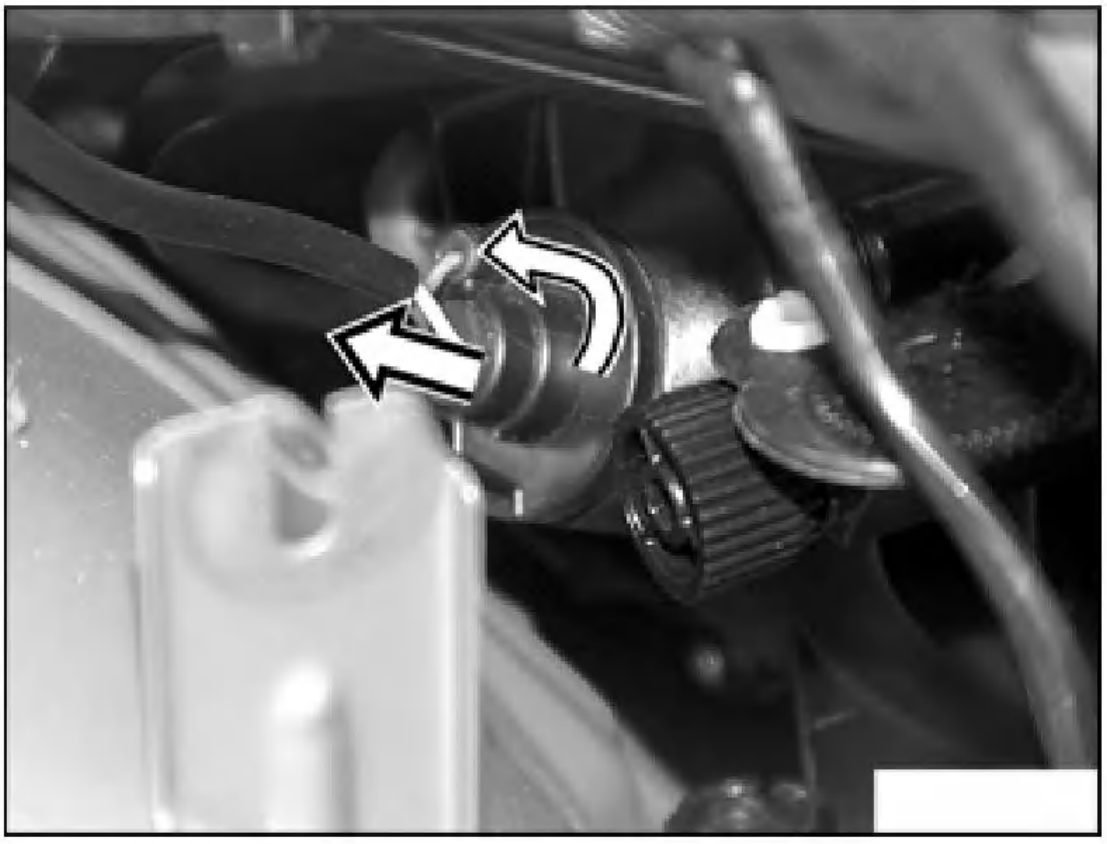


Fig. 11: Twisting Lamp Sockets And Lift Out
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Brace expanding rivets when unfastening the screws. The headlight is adapted to suit the body using the expanding rivets.

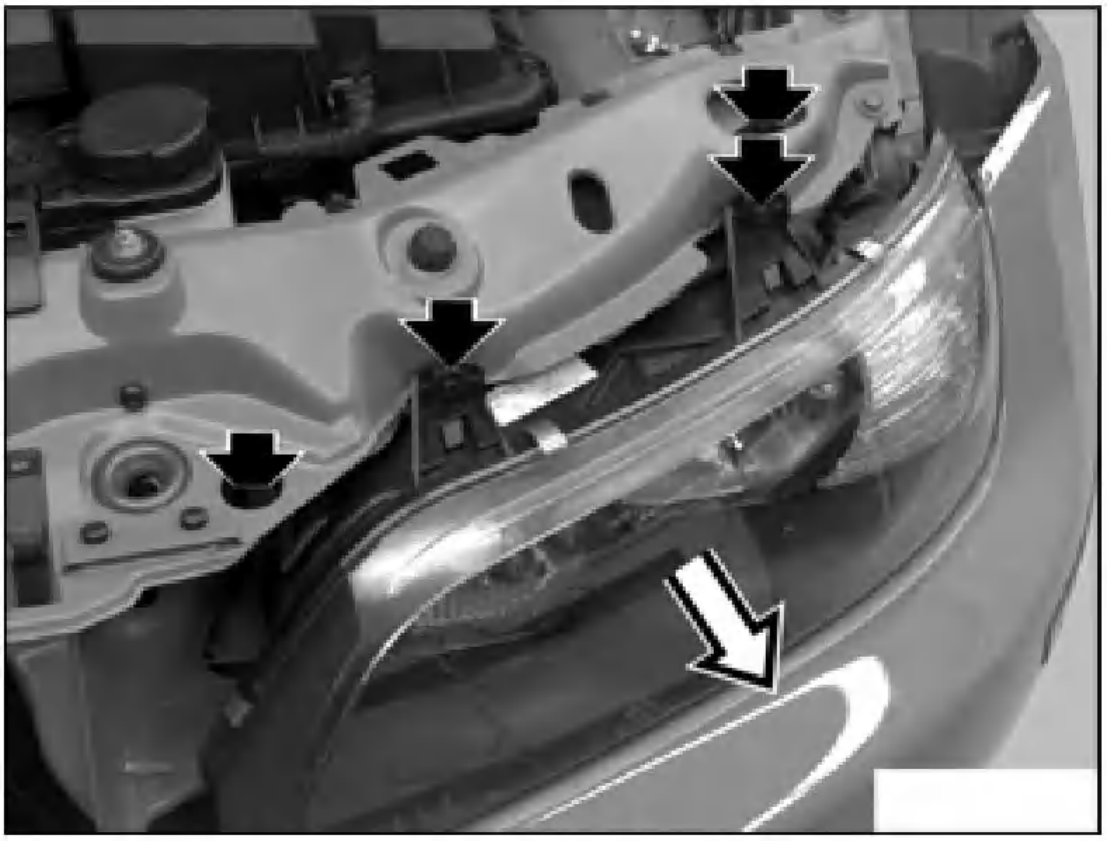


Fig. 12: Twisting Lamp Socket And Pry Out
Courtesy of BMW OF NORTH AMERICA, INC.

When installing a headlight, first screw in lower screws as far as last thread, at the same time bracing the expanding rivets.

Check gap (C and D) between bumper and headlight. If necessary, twist the lower expanding rivets to adjust gap (D) to approx. 5 mm. Adjust gap (C) in lower range to approx. 5 mm by moving the headlight to one side. The gap (C) narrows towards the top to approx. 2.5 mm. Then tighten screws while counterholding expanding rivets.

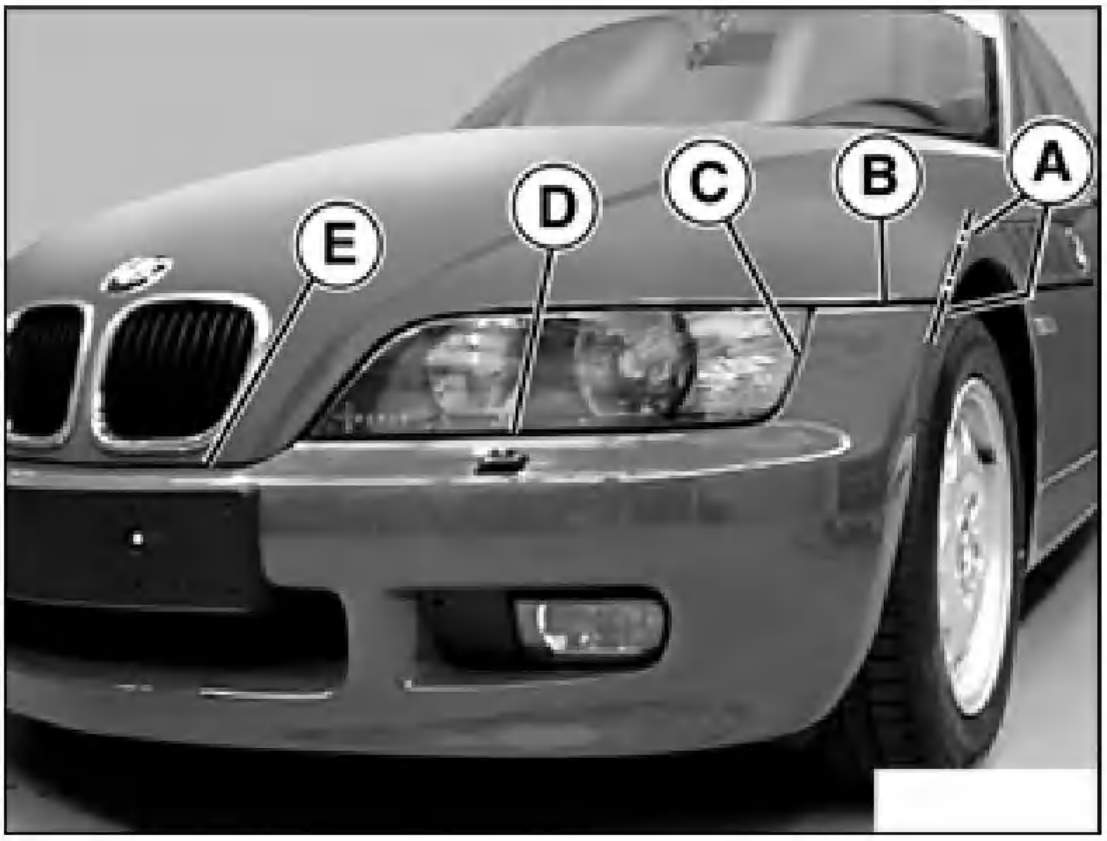


Fig. 13: Removing Suction-Filter Housing And Air-Mass Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

To adjust the lower gap, remove headlight again. Twist expanding rivets (1) and reinstall headlight.

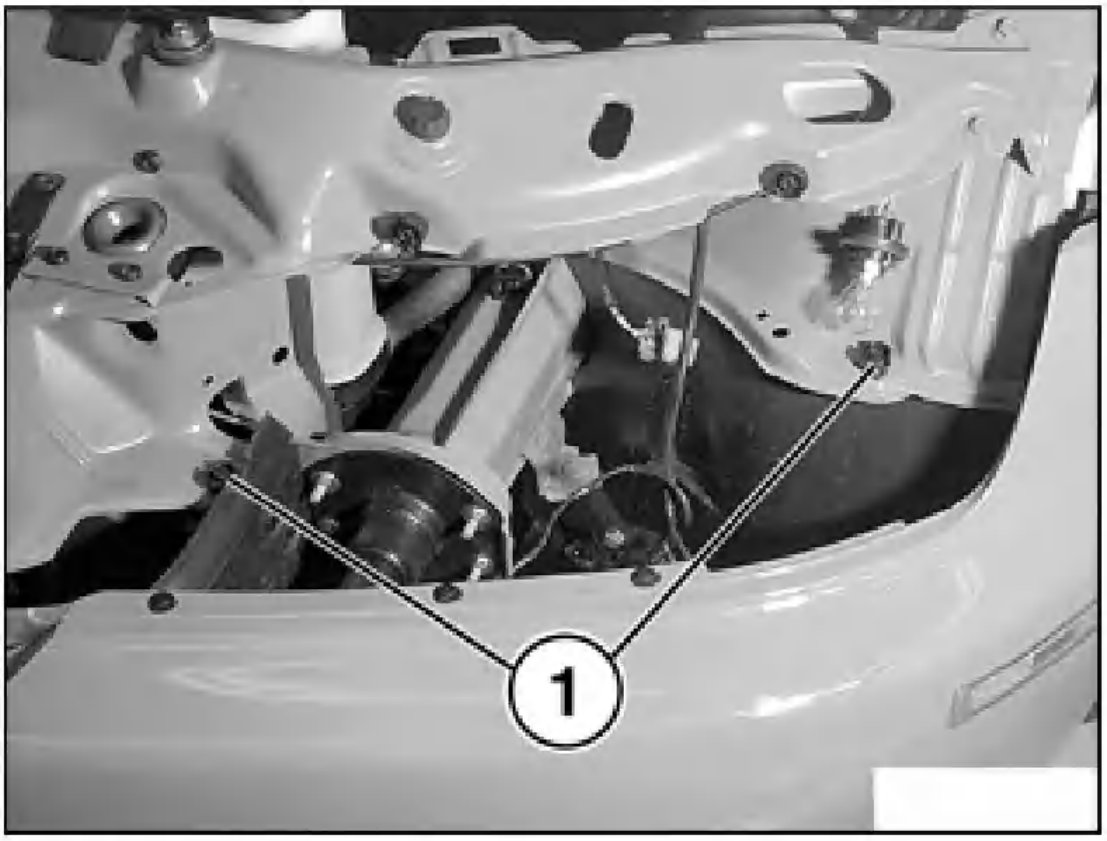


Fig. 14: Adjusting Lower Gap
Courtesy of BMW OF NORTH AMERICA, INC.

Close bonnet and check gap (B).

Adjust to approx. 0 mm if necessary by turning upper expanding rivets (1). Then tighten down the top screws (2) by bracing the expanding rivets (1).

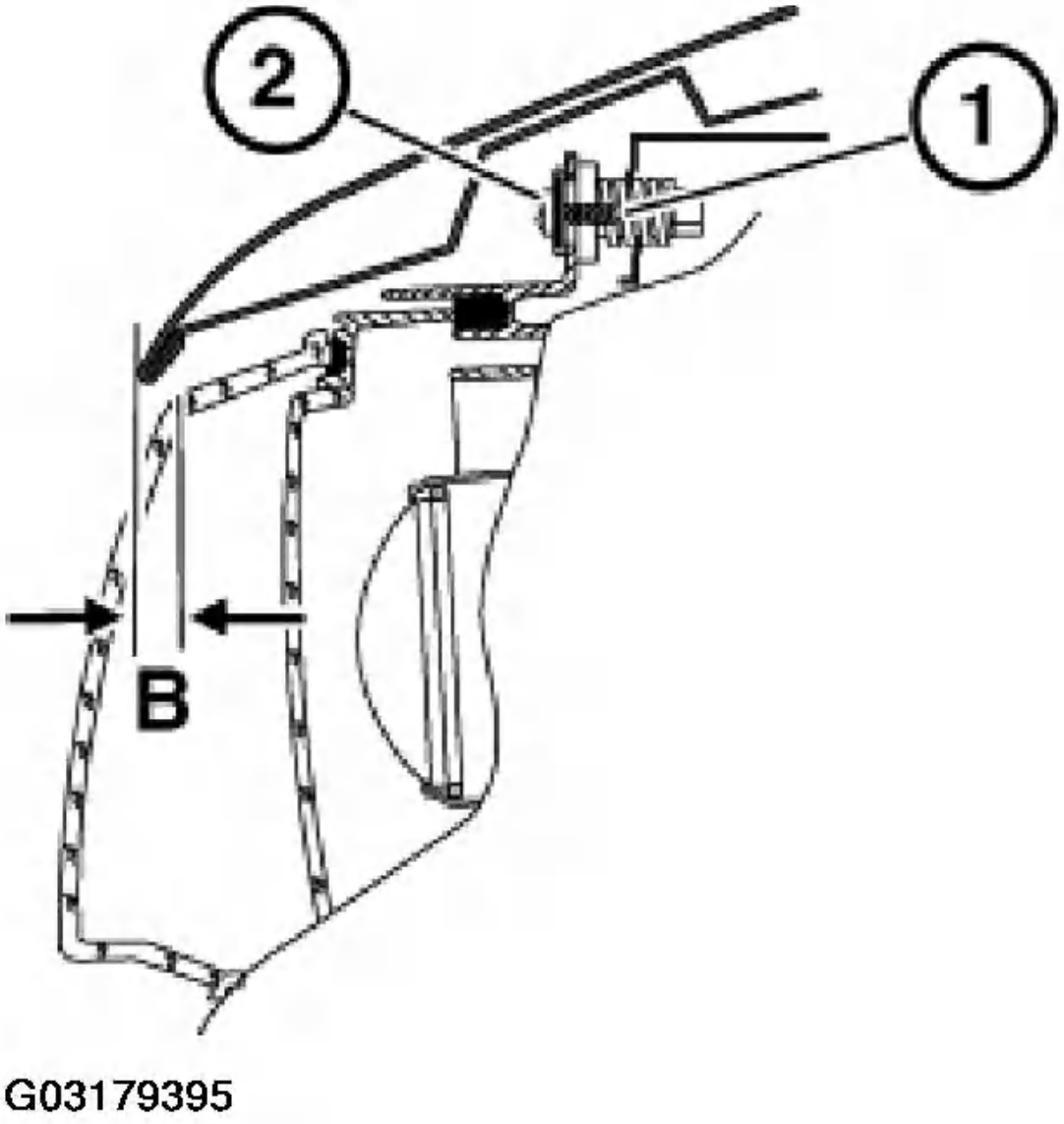


Fig. 15: Removing Headlight And Adjusting Lower Gap
Courtesy of BMW OF NORTH AMERICA, INC.

Adjusting headlights, refer to 63 10 004 ADJUSTING HEADLIGHTS .

63 12 200 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT AUXILIARY TURN INDICATOR LIGHT (Z3 ROADSTER, Z3 COUPE)

Press side lights backwards and press forwards to pry out.

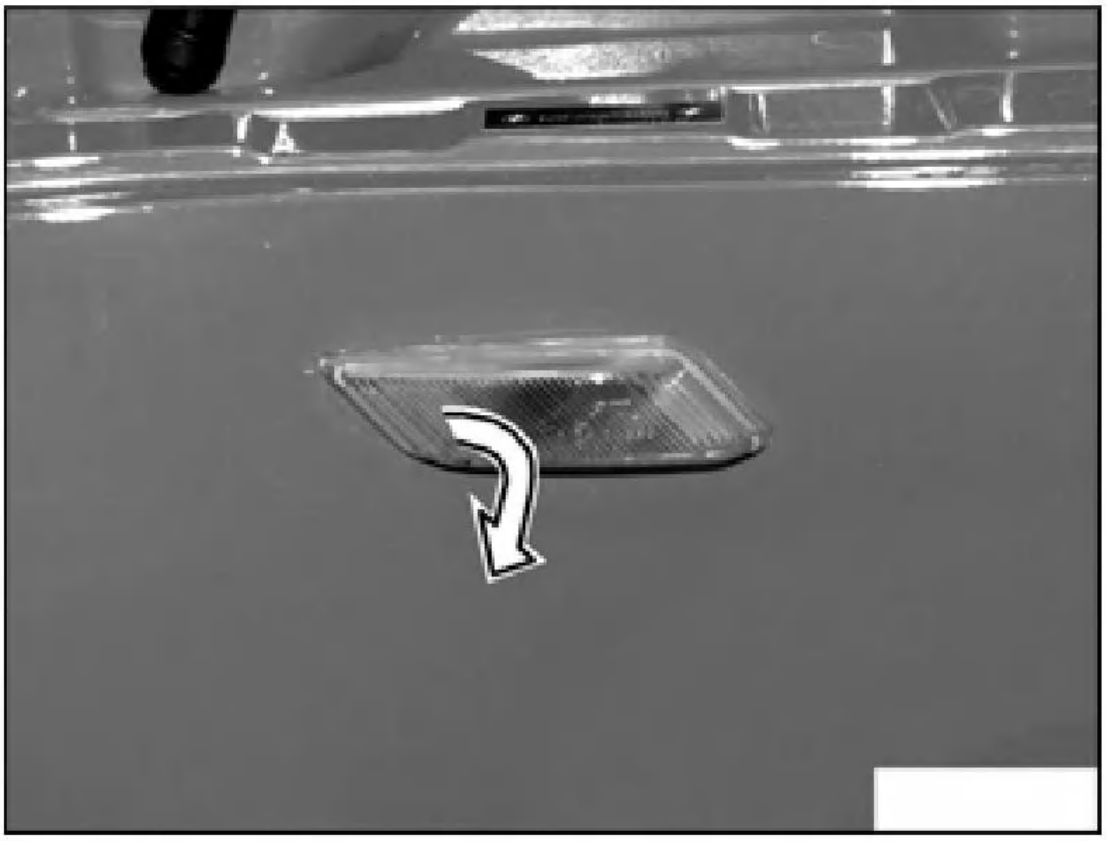


Fig. 16: Pressing Side Lights Backwards And Forwards To Pry Out
Courtesy of BMW OF NORTH AMERICA, INC.

Twist lamp socket and lift out.

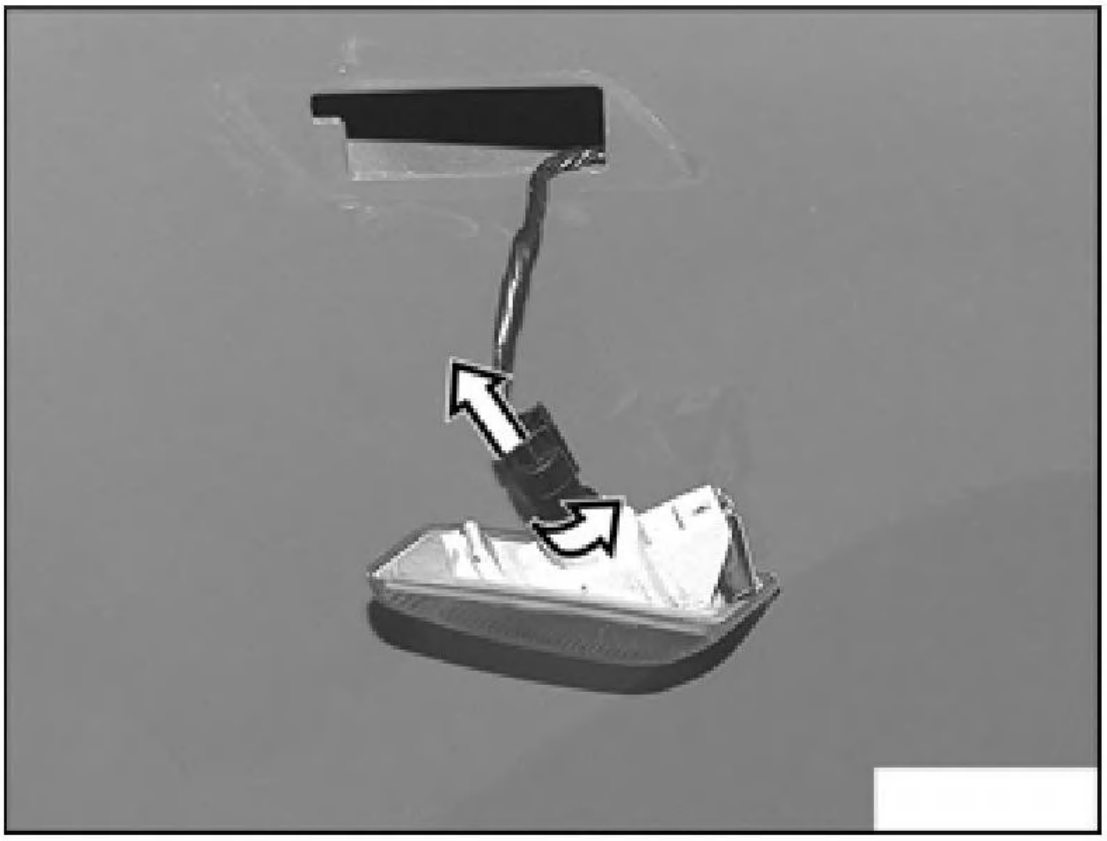


Fig. 17: Twisting Lamp Socket And Lift Out
Courtesy of BMW OF NORTH AMERICA, INC.

63 14 020 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT SIDE MARKING LIGHTS (Z3 ROADSTER US)

Press light outwards and pry out.

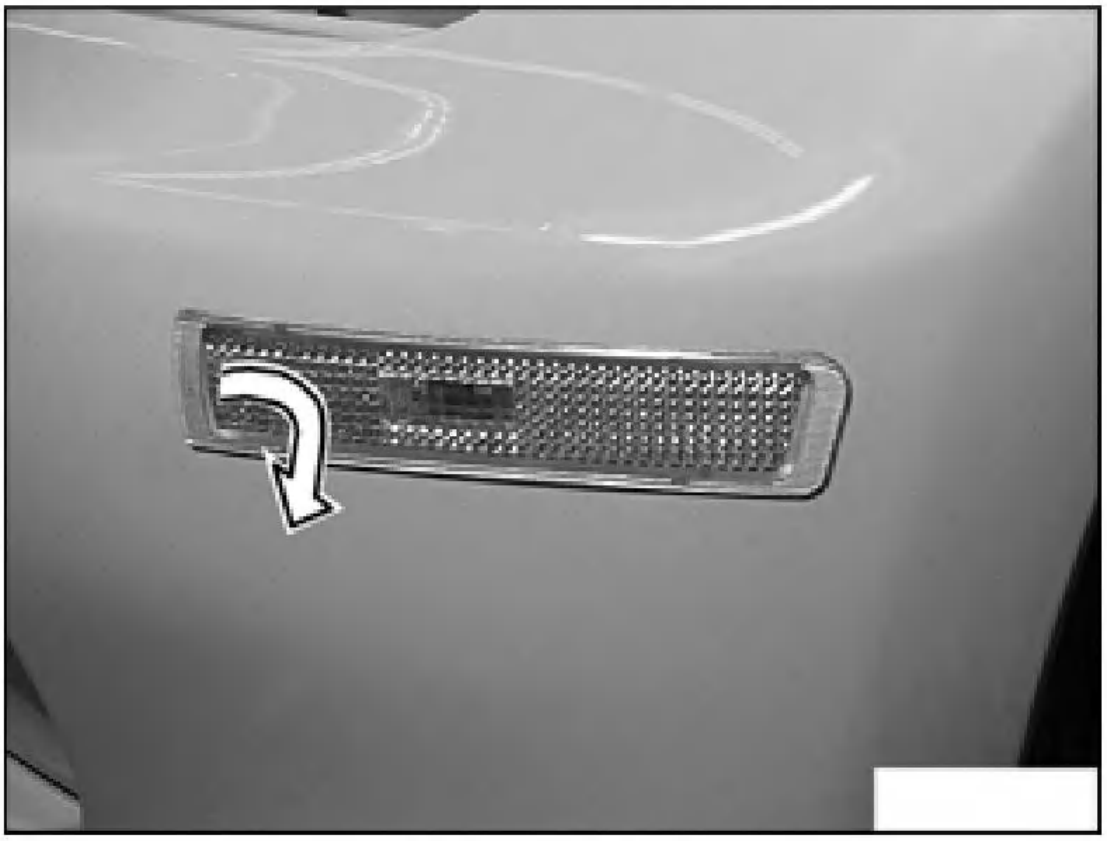


Fig. 18: Pressing Light Outwards And Pry Out
Courtesy of BMW OF NORTH AMERICA, INC.

Twist lamp socket and lift out.

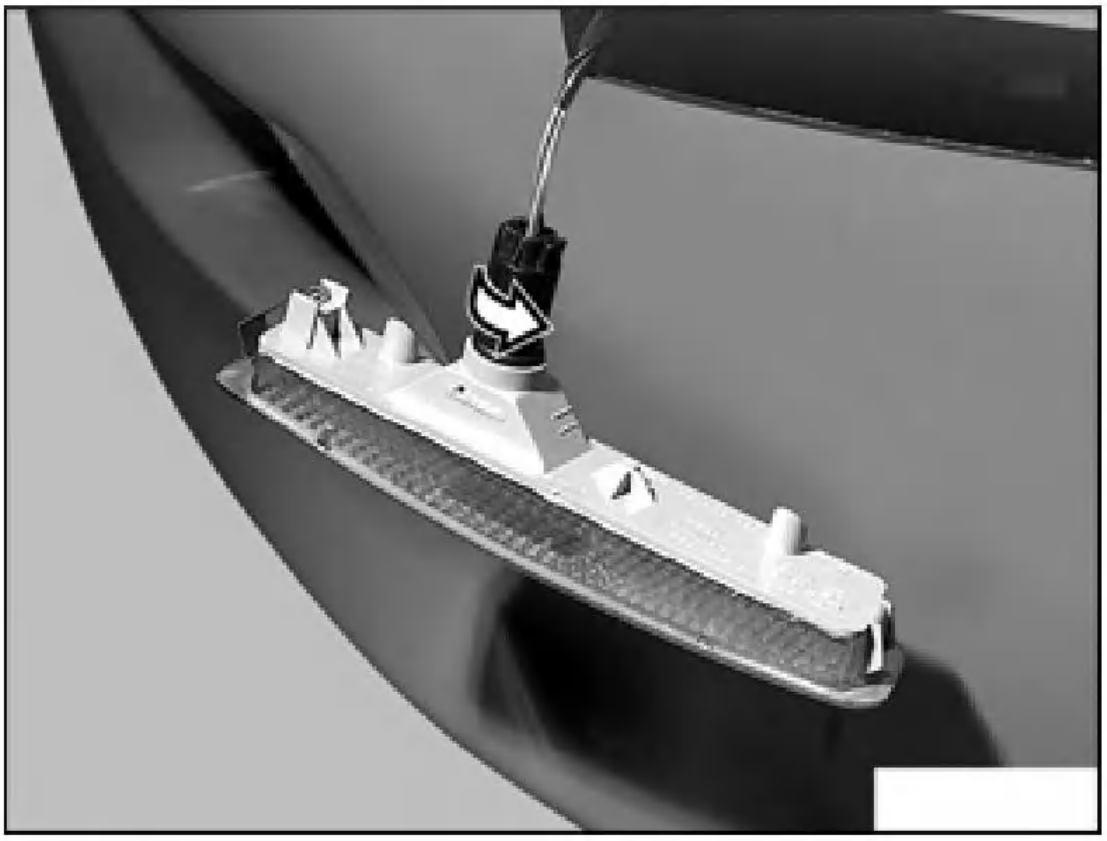


Fig. 19: Twisting Lamp Socket And Lift Out
Courtesy of BMW OF NORTH AMERICA, INC.

CLEARANCE AND SIDE MARKER LIGHTS

63 14 020 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT SIDE MARKING LIGHTS (Z3 ROADSTER US)

Press light outwards and pry out.

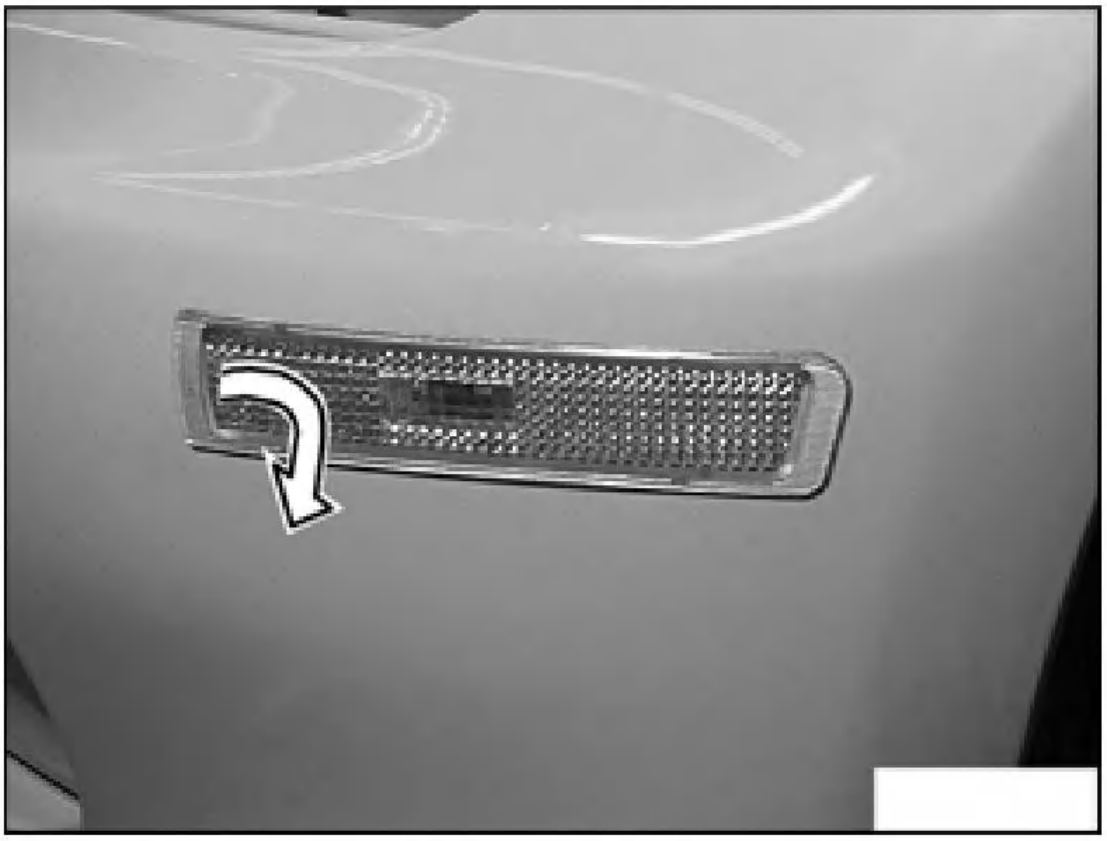


Fig. 20: Pressing Light Outwards And Pry Out
Courtesy of BMW OF NORTH AMERICA, INC.

Twist lamp socket and lift out.

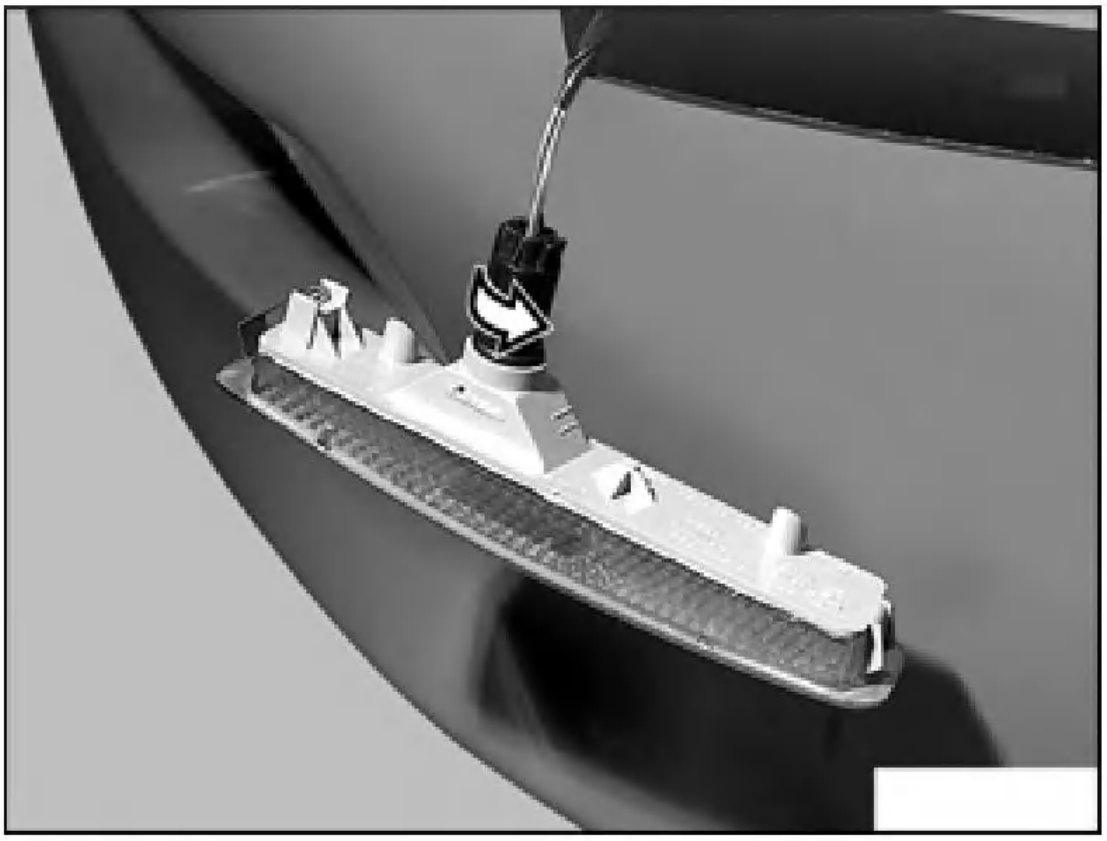


Fig. 21: Twisting Lamp Socket And Lifting Out
Courtesy of BMW OF NORTH AMERICA, INC.

FOG LIGHTS, AUXILIARY ...

63 17 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT FOGLIGHT INSERT

Unclip headlight by inserting a screwdriver through upper aperture. Pull off connector. Disconnect steel-wire clamp and pull out light bulb.

CAUTION: Do not take hold of glass part of bulb with bare fingers. Only take hold of bulb on base or with a clean cloth or packaging of light bulb. If necessary, adjust foglight, refer to 63 10 014 ADJUSTING FOGLIGHTS .

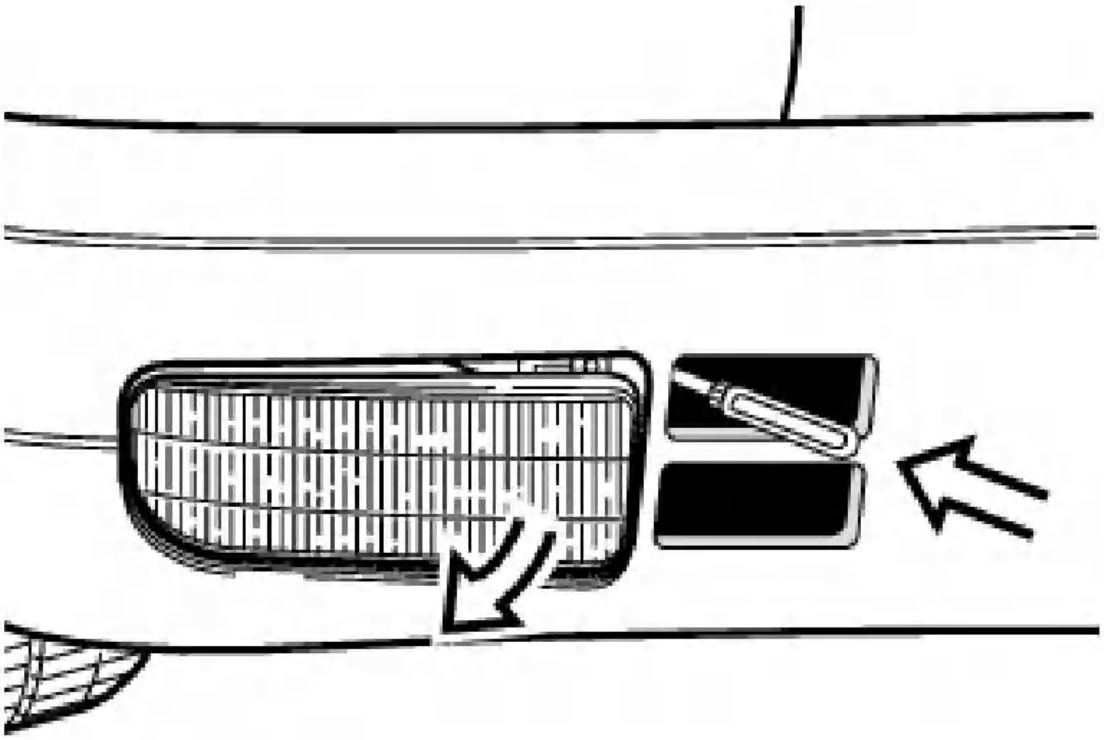


Fig. 22: Identifying Left Or Right Light Replacing
Courtesy of BMW OF NORTH AMERICA, INC.

Roadster:

Unclip and remove finisher.

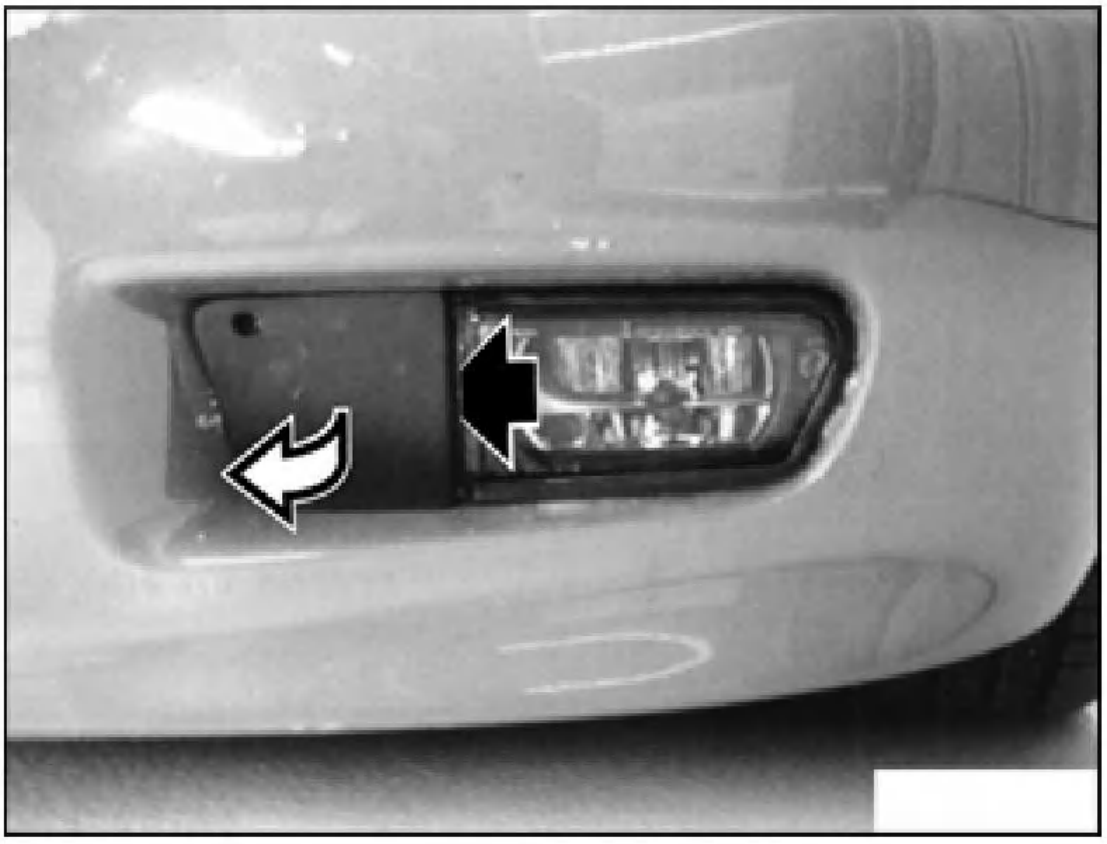


Fig. 23: Unclipping And Removing Finisher
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws, pry out headlight insert and remove connector.

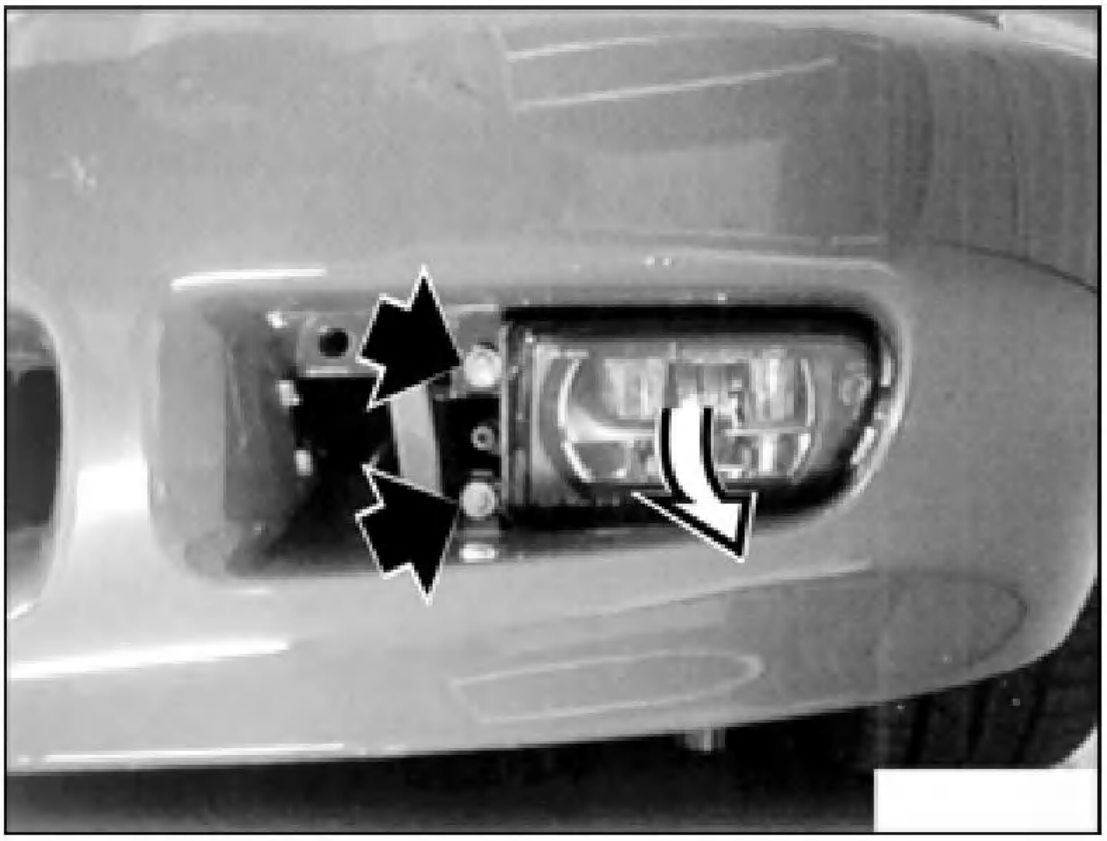


Fig. 24: Identifying Insert And Remove Connector Pry Out
Courtesy of BMW OF NORTH AMERICA, INC.

REAR LIGHTS CLUSTER

63 21 055 REPLACING SOCKET HOUSING FOR LEFT OR RIGHT TAIL LIGHT (Z3 ROADSTER)

Unfasten nut and remove lamp socket housing.

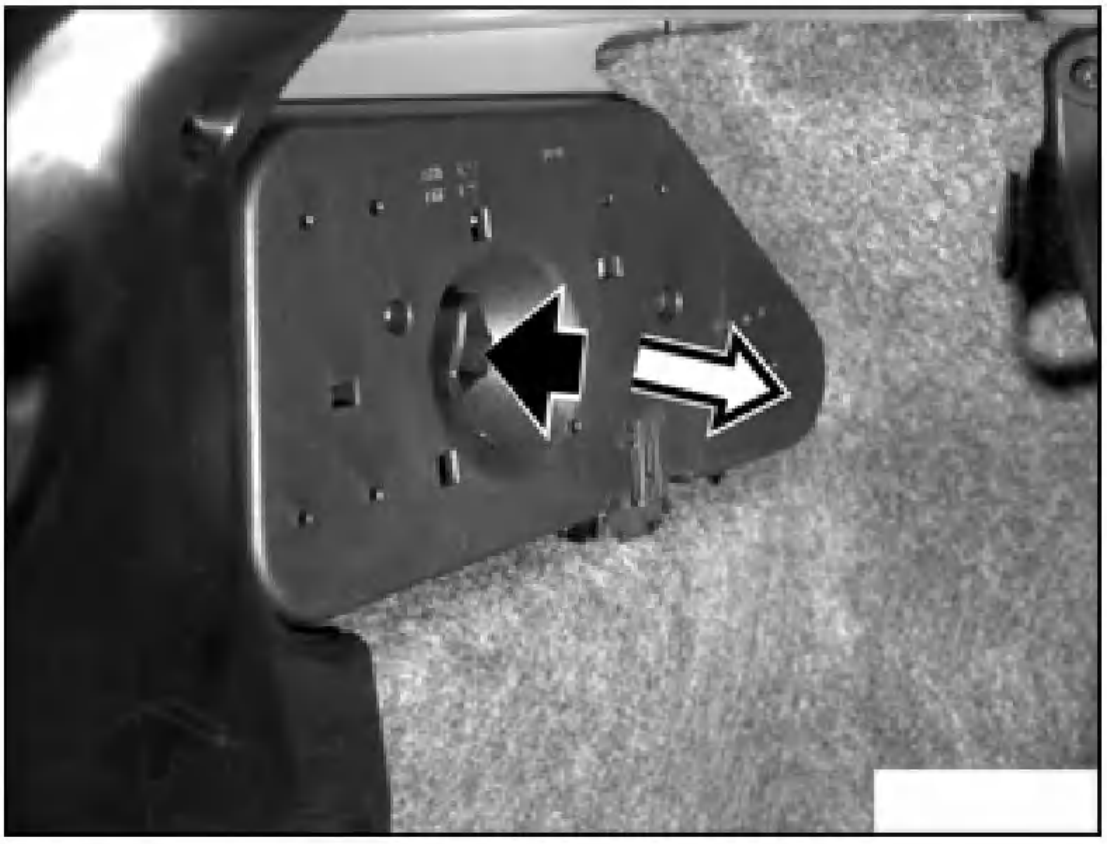


Fig. 25: Removing Lamp Socket Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Remove connector and fit light bulb.



Fig. 26: Removing Connector And Fit Light Bulb
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Using correct bulb type, refer to 63 21 REAR LIGHT CLUSTER E36 .

Do not take hold of glass part of bulb with bare fingers. Only take hold of bulb on base or with a clean cloth or packaging of light bulb.

63 21 180 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT REAR LIGHT (Z3 ROADSTER)

From 04/99:

Release nut (1) and remove trim (2).

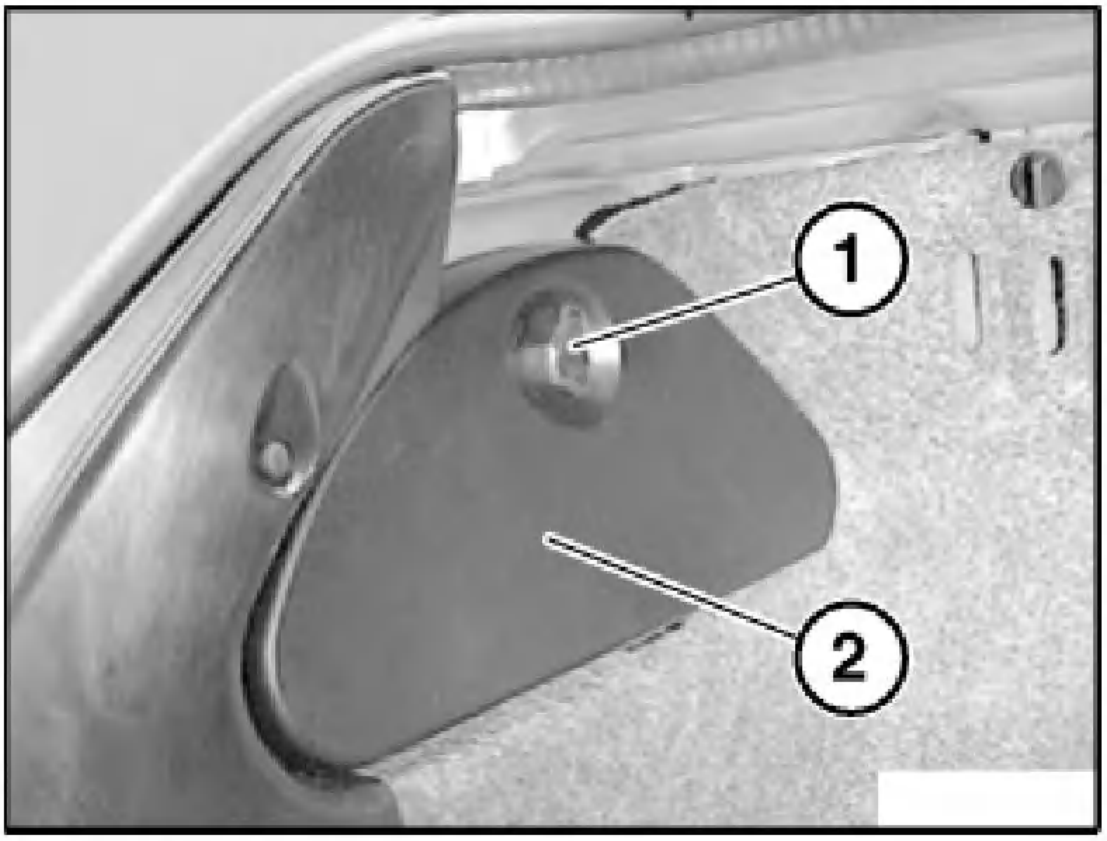


Fig. 27: Removing Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Disconnect plug connection (2) and pull out rear light.

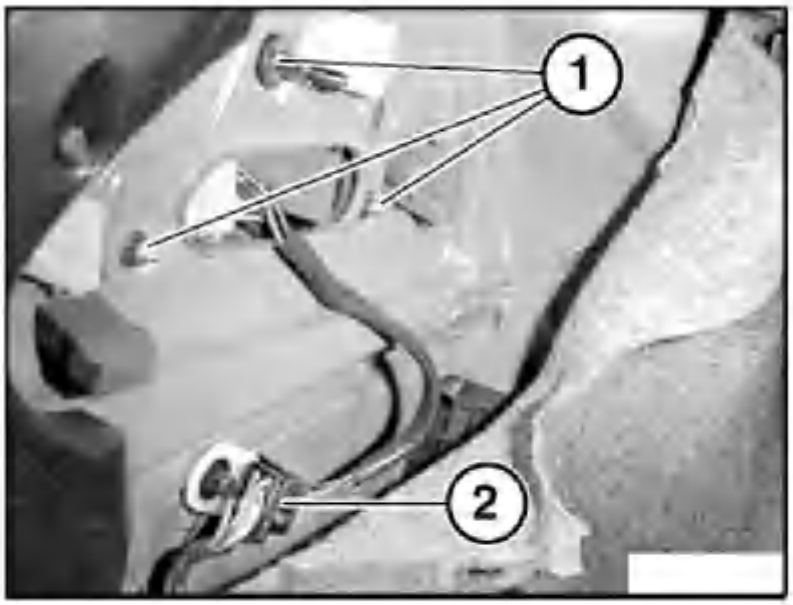


Fig. 28: Disconnecting Plug Connection And Pulling Out Rear Light
Courtesy of BMW OF NORTH AMERICA, INC.

63 31 080 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT LIGHT (Z3,M ROADSTER)

Pry out light at left.

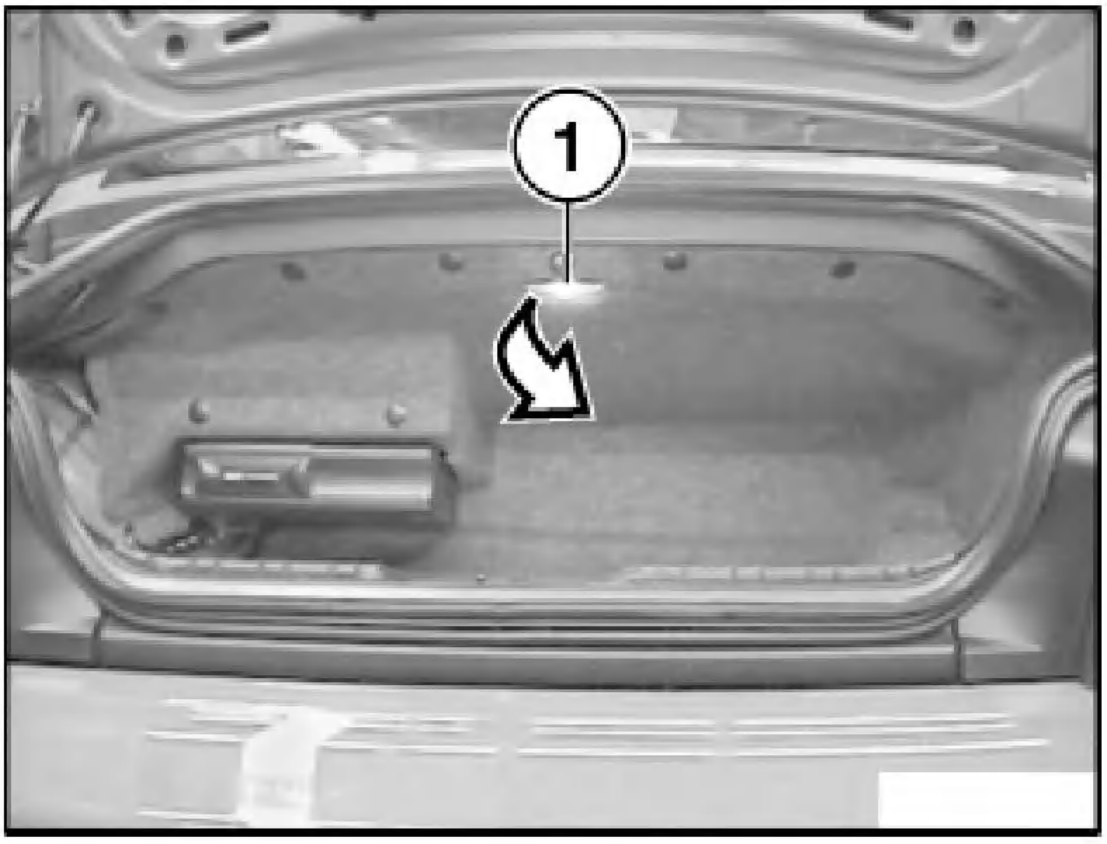


Fig. 29: Prying Out Light At Left
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off plug (2).

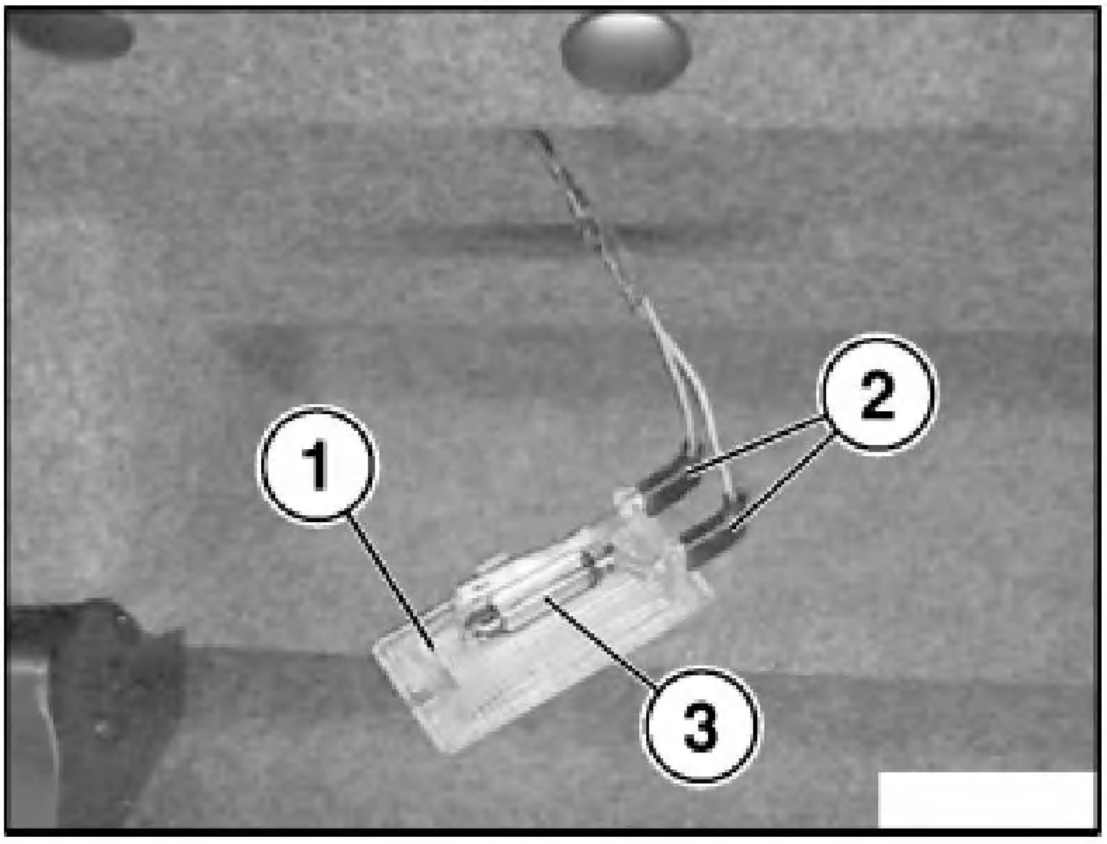


Fig. 30: Pulling Off Plug
Courtesy of BMW OF NORTH AMERICA, INC.

BRAKE LIGHTS

63 25 000 REMOVING AND INSTALLING/REPLACING ADDITIONAL STOP LIGHT

From 04/99:

Open trunk lid.

Remove covers (1) and release nuts.

Remove cover (2) and disconnect plug connection.

Pull out additional stop light towards top.

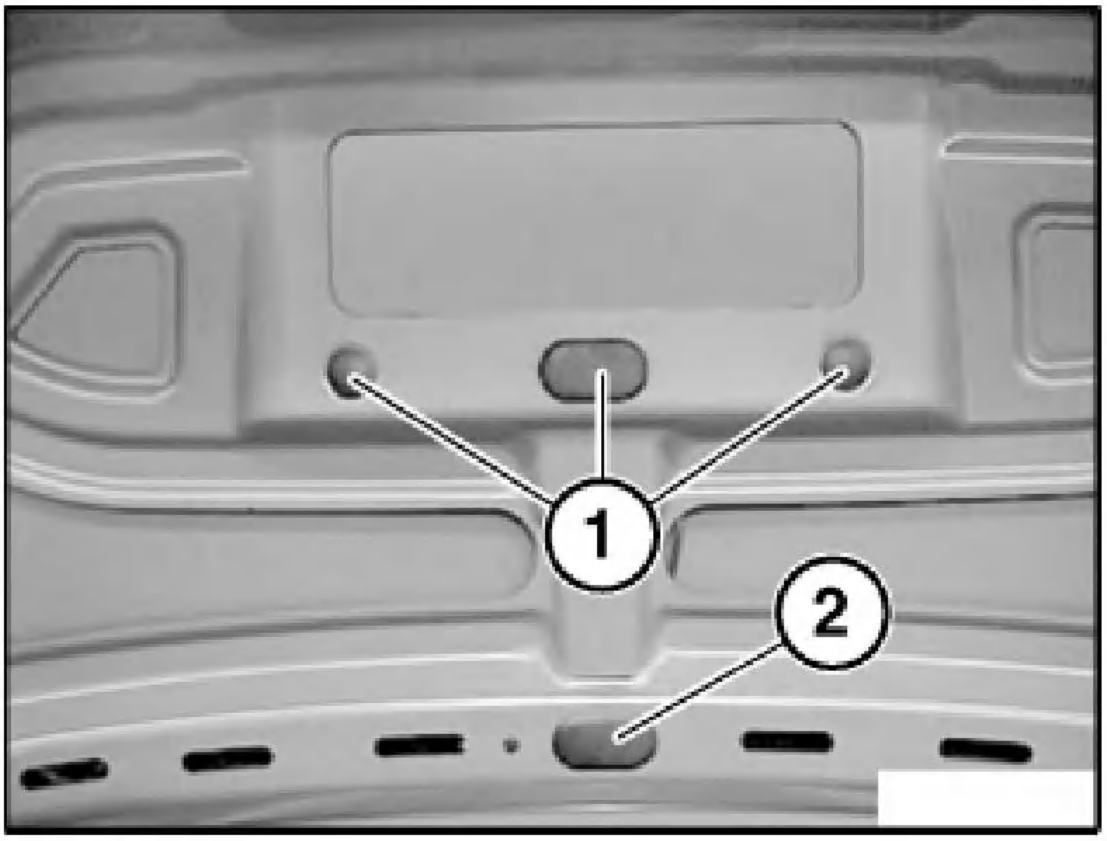


Fig. 31: Pulling Out Additional Stop Lights Towards Top
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove brake light (3).

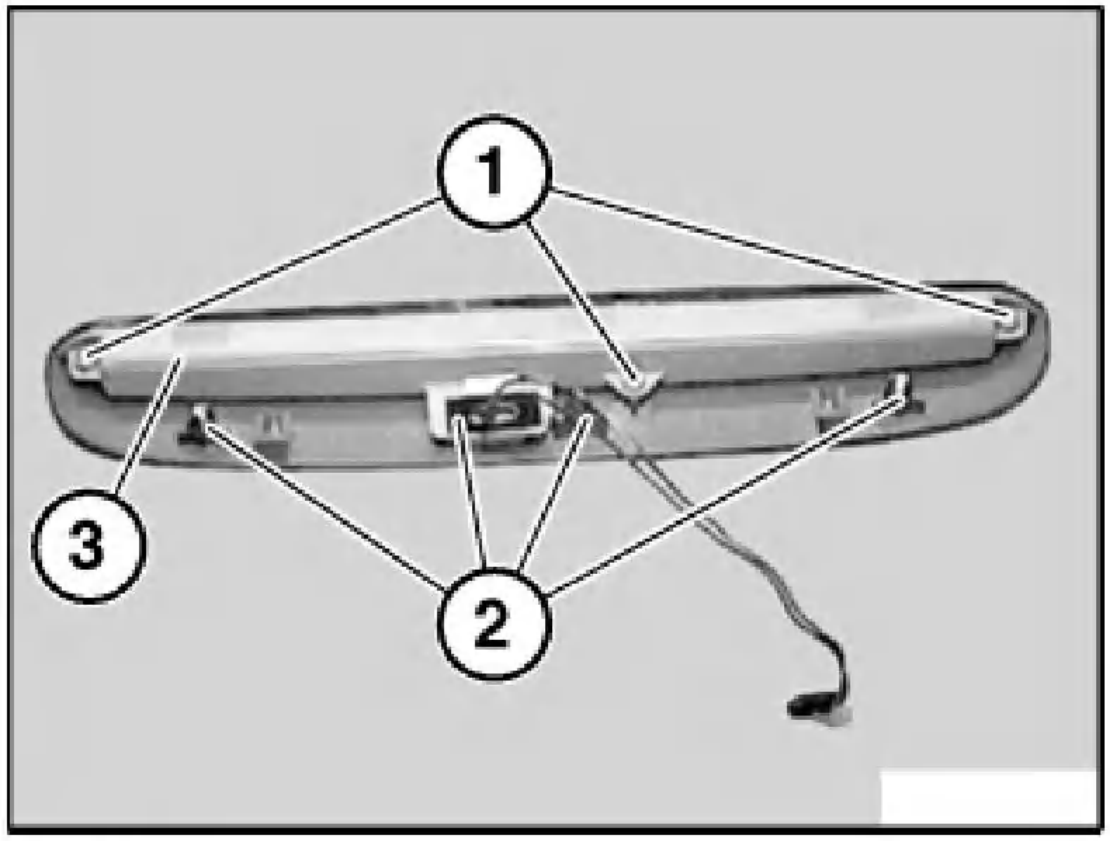


Fig. 32: Releasing Screws Of Brake Light
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace seals (2).

63 99 375 REPLACING LIGHT BULB FOR ADDITIONAL BRAKE LIGHT (Z3 ROADSTER)

Open trunk lid. Unclip cover.

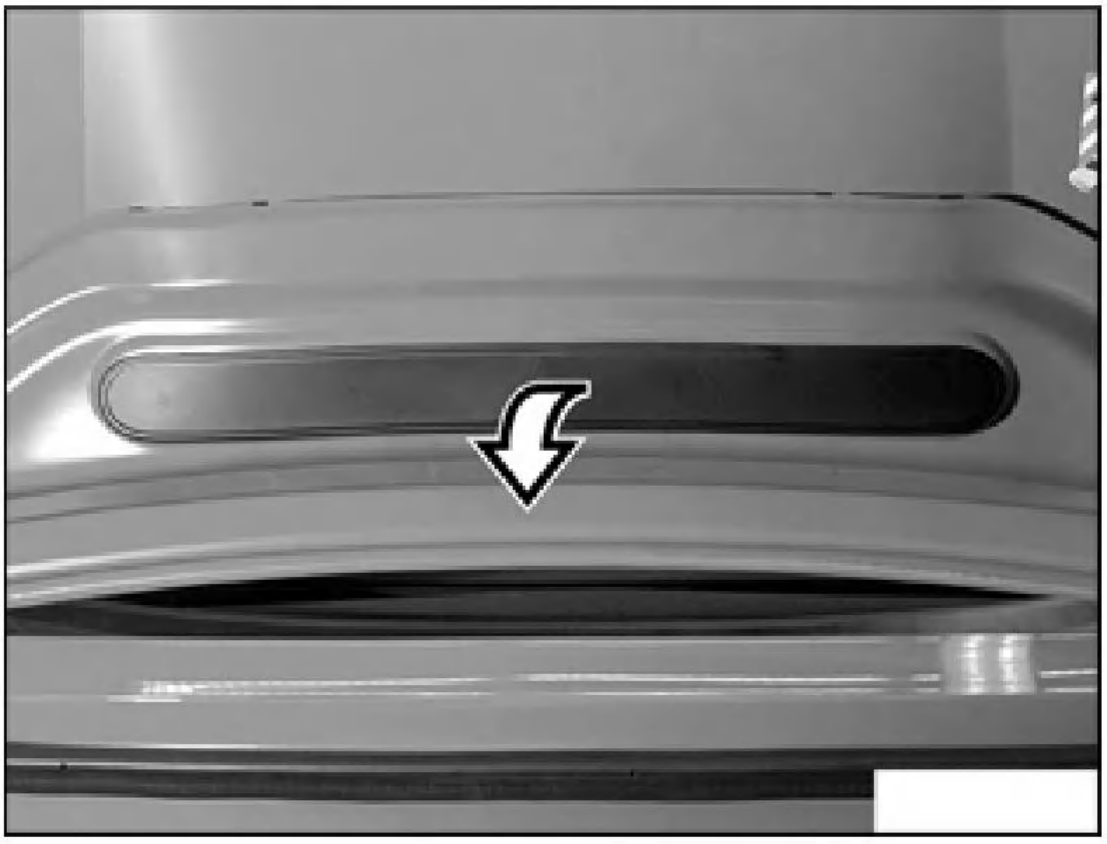


Fig. 33: Opening Trunk Lid
Courtesy of BMW OF NORTH AMERICA, INC.

Twist the defective lamp socket and remove.

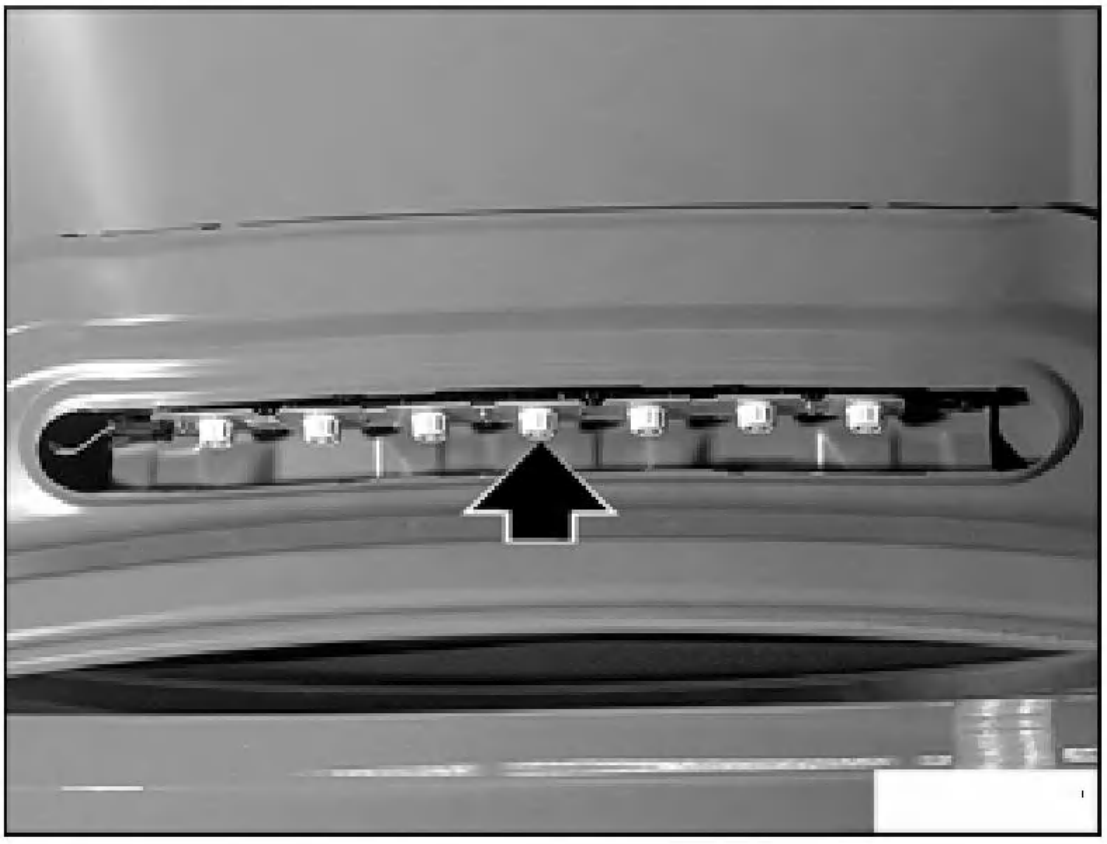


Fig. 34: Twisting Lamp Socket And Removing
Courtesy of BMW OF NORTH AMERICA, INC.

Light bulb out of socket.4

CAUTION: Do not take hold of glass part of bulb with bare fingers. Only take hold of bulb on base or with a clean cloth or packaging of light bulb. Note type of bulb.

LICENSE PLATE LIGHTS

63 26 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT LICENSE PLATE LIGHT (Z3 ROADSTER)

WARNING: Follow instructions for replacing light bulbs (exterior lights). Refer to 63 99 ... INSTRUCTIONS FOR HANDLING LIGHT BULBS (EXTERIOR LIGHTS) .

Unclip license plate light (1) at wide ridge. Disconnect plug connection underneath and remove license plate light (1).

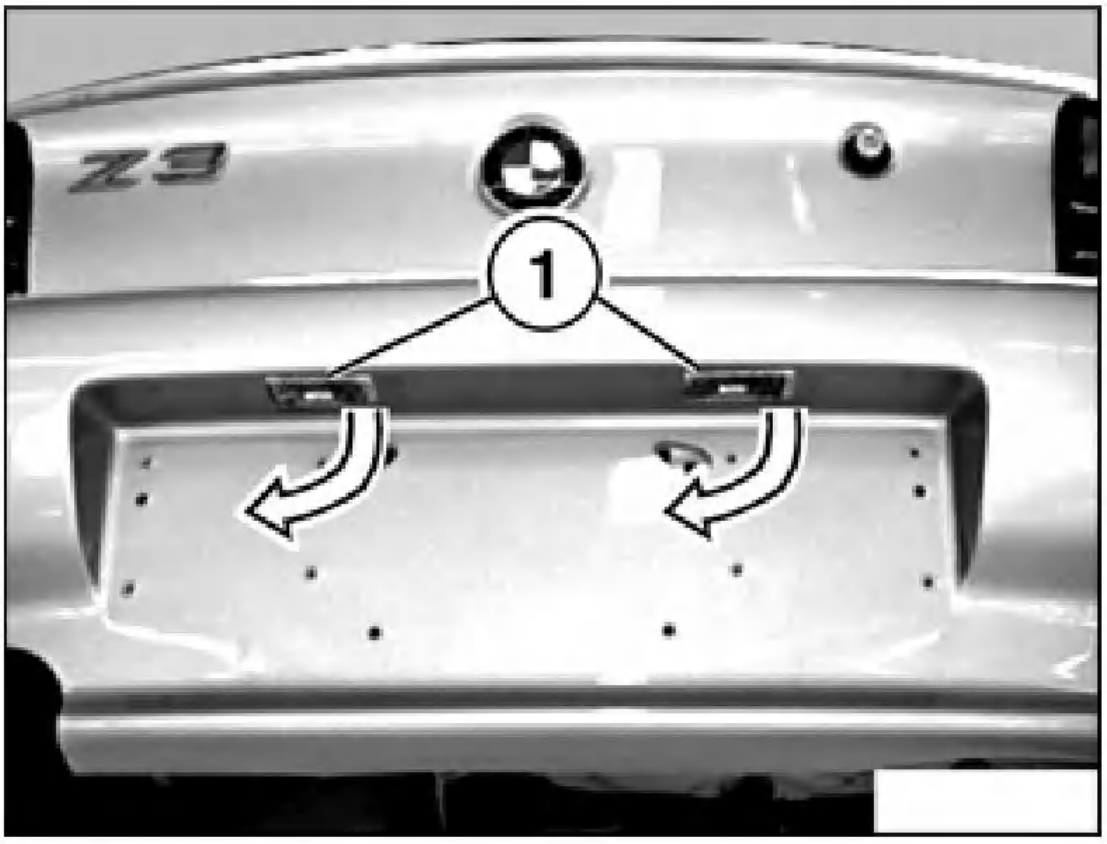


Fig. 35: Removing License Plate Light
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Note type of bulb. Refer to 63 26 LICENSE PLATE LIGHTS E36 .

INTERIOR LIGHTS

63 31 000 REMOVING AND INSTALLING/REPLACING COMPLETE CEILING LIGHT (Z3 ROADSTER)

Unclip lamp glass.



Fig. 36: Unclipping Lamp Glass
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip ceiling light from one side.

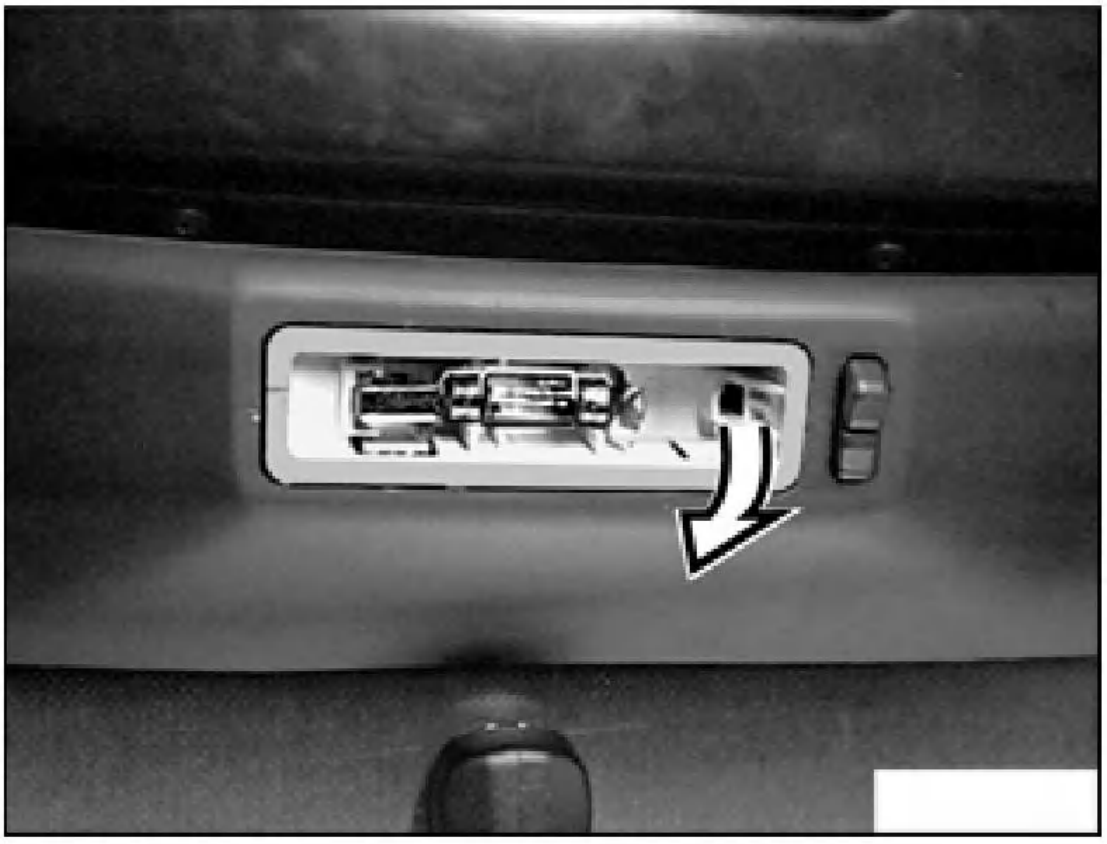


Fig. 37: Unclipping Ceiling Light From One Side
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off connectors.



Fig. 38: Pulling Off Connectors
Courtesy of BMW OF NORTH AMERICA, INC.

63 31 080 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT LIGHT (Z3,M ROADSTER)

Pry out light at left.

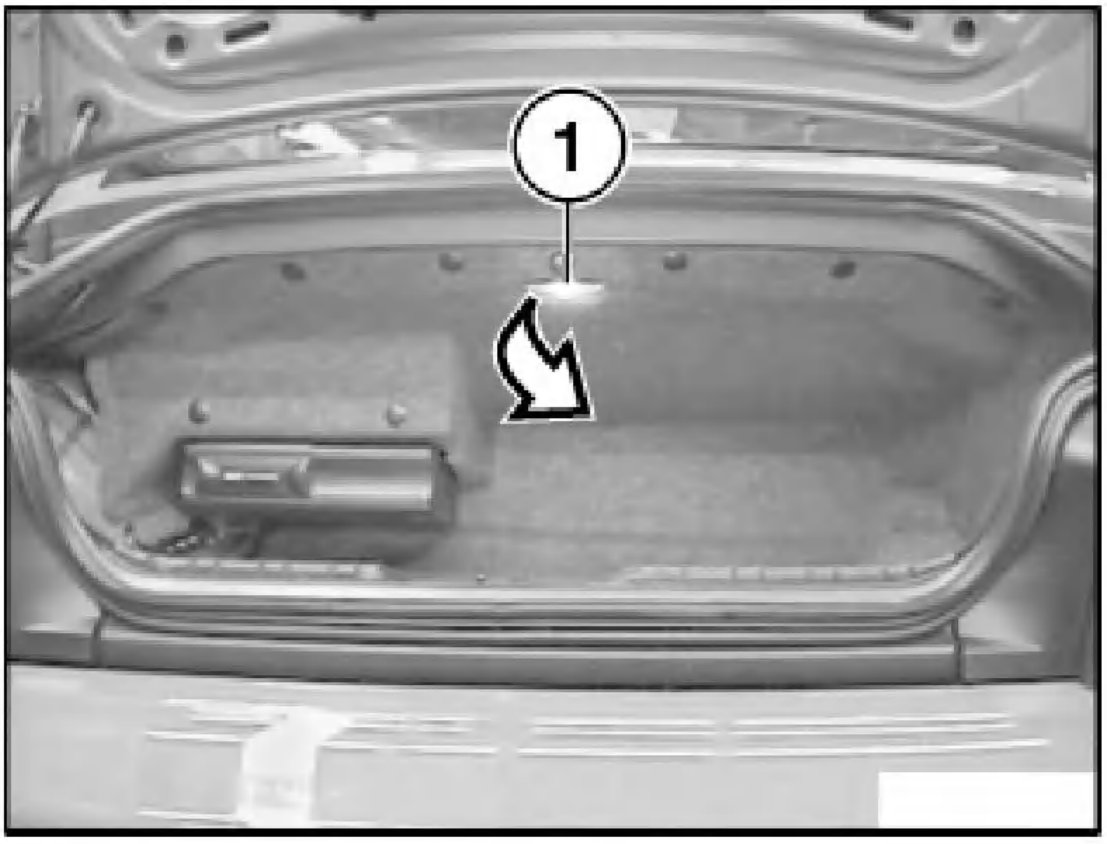


Fig. 39: Prying Out Light At Left
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off plug (2).

Fig. 40: Pulling Off Light
Courtesy of BMW OF NORTH AMERICA, INC.

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 99 375 REPLACING LIGHT BULB FOR ADDITIONAL BRAKE LIGHT (Z3 ROADSTER)

Open trunk lid.

Unclip cover.

Fig. 41: Unclipping Lamp Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Twist the defective lamp socket and remove light bulb out of socket.

Fig. 42: Twisting Defective Lamp Socket
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not take hold of glass part of bulb with bare fingers. Only take hold of bulb on base or with a clean cloth or packaging of light bulb.

Note type of bulb.

63 99 431 REPLACING LIGHT BULB(S) FOR CEILING LIGHT (Z3 ROADSTER)

Unclip lamp glass.

Fig. 43: Unclipping Lamp Glass
Courtesy of BMW OF NORTH AMERICA, INC.

Remove light bulb.

Fig. 44: Removing Light Bulb
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not take hold of glass part of bulb with bare fingers. Only take hold of bulb on base or with a clean cloth or packaging of light bulb.

Note type of bulb.

63 99 451 REPLACING LIGHT BULB FOR LUGGAGE COMPARTMENT LIGHT (Z3 ROADSTER)

CAUTION: Follow instructions for replacing light bulbs (interior lights). Refer to 63 99 ... INSTRUCTIONS FOR REPLACING LIGHT BULBS (INTERIOR LIGHTS) .

Lever out luggage compartment light (1) on left in direction of arrow.

Fig. 45: Levering Out Luggage Compartment Light
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, detach plug connections (2).

Fig. 46: Detaching Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Remove bulb (3) from luggage compartment light (1).

Installation:

Note type of bulb. Refer to 63 31 INTERIOR LIGHTS E36 .

63 99 793 REPLACING LIGHT BULB FOR FRONT LEFT OR RIGHT SIDE-MARKER LIGHTS (Z3 US, M ROADSTER ALL)

Lever out side-marker lights at front with special tool 00 9 322 (plastic wedge).

Fig. 47: Levering Out Side Marker Light
Courtesy of BMW OF NORTH AMERICA, INC.

Turn lamp socket by approx. 90Â° and pull out.

Turn light bulb and lift out.

Fig. 48: Lifting Out Light Bulb
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not take hold of glass part of bulb with bare fingers. Only take hold of bulb on base or with a clean cloth or packaging of light bulb.

Note type of bulb.

Article GUID: A00202368

LAMP SETTINGS

63 10 ADJUSTMENT OF LIGHTS ALL WITH HEADLIGHT VERTICAL AIM CONTROL

ADJUSTMENT OF LIGHTS ALL WITH HEADLIGHT VERTICAL AIM CONTROL TECHNICAL SPECIFICATION

Low-beam dip unit	.....	e = 10

HEADLIGHTS

63 12 HEADLIGHTS E36

HEADLIGHTS E36 TECHNICAL SPECIFICATION

Light bulb - driving lights EUR	Type	H1 12V 55 W H7 12V 55W HB4 12V 51W
Light bulb - driving lights USA	Type	9006
Light bulb - high beam EUR	Type	H1 12V 55 W H7 12V 55W HB3 12V 60W
Light bulb - high beam USA	Type	9005
Light bulb - side marker lamp EUR	Type	12V 5W

TURN SIGNAL INDICATOR

63 13 TURN SIGNALS E36

TURN SIGNALS E36 TECHNICAL SPECIFICATION

Light bulb EUR	Type	12V 21W
Light bulb USA	Type	12 V 21/5 W

FOG LIGHTS, AUXILIARY

63 17 FRONT FOG LAMPS, ADDITIONAL LAMPS E36

FRONT FOG LAMPS, ADDITIONAL LAMPS E36 TECHNICAL SPECIFICATION

Light bulb, fog lamp EUR	Type	H1 12V 55W
Light bulb, fog lamp USA	Type	9006
Auxiliary turn signal lamp, front/side	Type	12V 5W

REAR LIGHT CLUSTER

63 21 REAR LIGHT CLUSTER E36

REAR LIGHT CLUSTER E36 TECHNICAL SPECIFICATION

Light bulb - brake light	Type	12V 21W
Light bulb - turn signal	Type	12V 21W
Light bulb - tail light	Type	12V 5W,

		Compact only: 12V 10W
Light bulb - fog warning lamp	Type	12V 21W
Light bulb - backup light	Type	12V 21W
Light bulb - 3rd brake light	Type	Saloon/sedan, coupe: 12V 21W, Compact: 12V 5W, Touring: 12V 3W, Convertible: LED

LICENCE PLATE LIGHTS

63 26 LICENSE PLATE LIGHTS E36

LICENSE PLATE LIGHTS E36 TECHNICAL SPECIFICATION

Light bulb	Type	12V 5W

INTERIOR LIGHTS

63 31 INTERIOR LIGHTS E36

INTERIOR LIGHTS E36 TECHNICAL SPECIFICATION

Ceiling light, front	Type	Festoon 12V 10W
Inside reading light, front	Type	12V 10W
Inside light, side	Type	Festoon 12V 5W
Inside reading light, rear	Type	Festoon 12V 6W
Trunk light	Type	Festoon 12V 10W
Glovebox light	Type	Festoon 12V 5W
Engine compartment light	Type	Festoon 12V 10W
Symbol light bulbs	Type	12V 1.2W
Footwell light	Type	Festoon 12V 5W
Mirror light	Type	Festoon 12V 5W

Article GUID: A00202381

BUS SYSTEM TROUBLESHOOTING

Model: All Models Using Bus Systems

Production Date: From Model Year 1991

INTRODUCTION

Up until the introduction of the E31, all information (e.g. RPM, temperature, vehicle speed, etc.) received and transmitted from a control unit were delivered by a dedicated wire. As the electronic systems used in the vehicle increased, so did the necessary wiring.

Wiring each device separately became a headache for production and finding space in the body to hold all of this wiring was becoming difficult, not to mention the effect on reliability and ever more complicated troubleshooting.

It soon became clear that a solution must be found, that solution was the bus system. The benefits of the bus system are:

- Greater reliability by reducing the number of wiring, connectors and components.
- Reduction in wire harness size by decreasing the number of interfaces between control units to one or two wires.
- Multiple utilization of sensors by transmitting information from one control unit to the next.
- Flexibility in system configuration and future applications.
- Reduction in costs for components, assembly and troubleshooting.

Today's vehicles have several bus systems that are divided according to groups of control units which share common functionality and information. Currently the bus systems in use are:

- CAN-bus.
- D-bus.
- I-bus.
- K-bus.
- P-bus.
- M-bus.

In the very near future the complexity and number of control units in the vehicle will change, as will the structure and construction of the bus systems. However, the principle of operation will remain similar. Efficient troubleshooting of the new bus systems will rely on a thorough understanding and knowledge of the systems currently in use.

DEFINITIONS

Bus Line

A bus line is a group signal line that transmits serial data in both directions. It may consist of one wire or two. All control units are connected in parallel in current bus systems, this means that the information sent can be heard by all of the connected units.

Bus Subscriber

Any control module connected to a bus line. e.g. DME, IKE, GM, etc.

Gateway

A Gateway module provides a link between different bus lines to provide a means of sending information from a subscriber of one bus line to the subscriber of another. The Gateway module recognizes from the receiver address whether a message is to be routed through the gateway or not. e.g. IKE, KOMBI.

Master controller

A Master Controller of a bus system provides the operating voltage and wake up signals to the subscriber modules. This task may also be performed by several Standby Masters within a bus system, e.g. GM, LCM.

Serial Data

Serial means one event at a time. In data transmission, the technique of time division is used to separate bits of data sent. The messages sent over a bus are configured serially. Each message consists of:

1. Transmitter address.
2. Length of data.
3. Receiver address.
4. Command or Information.
5. Detailed description of message (data).
6. Summary of transmitted information (check sum).

All of the connected control units will receive the information but only the unit in the address will accept and react to the data.

NOTE: This message format is not used for the CAN Bus.

Topology

In the context of communication networks, Topology describes the configuration or arrangement of a network.

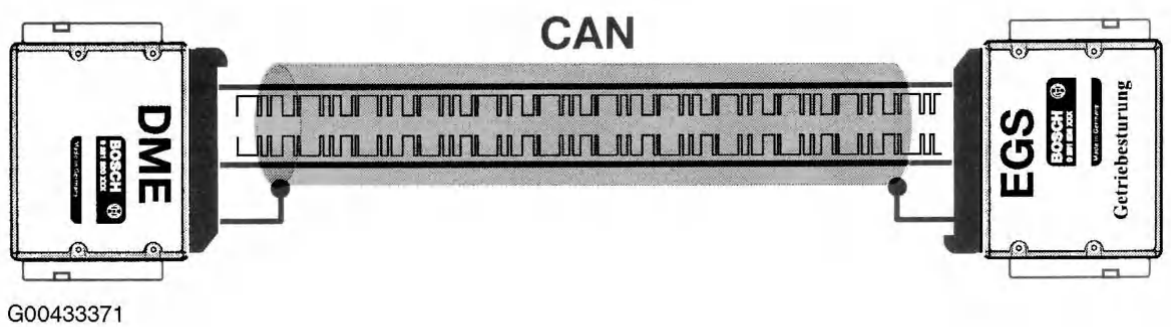
CONTROLLER AREA NETWORK (CAN BUS)

Introduction

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 operates at a rate of up to 500 K/bps (kilobits per second).

The CAN protocol was originally developed by Intel(tm) and Bosch in 1988 for use in the automotive industry to provide a standardized, reliable and cost-effective communications bus for a cars electronics to combat the increasing size of wiring harnesses.

The CAN bus was originally introduced on BMW automobiles in the 1993 740i/iL as a data link between the DME and AGS control units.



G00433371

Fig. 1: Identifying CAN Bus
Courtesy of BMW OF NORTH AMERICA, INC.

Data transmitted from any subscriber on a CAN bus does not contain addresses of the transmitting or receiving control unit. Instead, the content of the message (RPM, TD, Temp, etc.) is labeled by an identifier code that is unique throughout the CAN. All of the subscribers receive the message and each one checks the message to see if it is relevant to that particular control unit.

If the message is relevant then it will be processed, if not, it will be ignored. The identifier code also determines the priority of the message. In a case where two control units attempt to send a message over a free bus line, the message with the higher priority will be transmitted first. The protocol of the CAN ensures that no message is lost, but stored by the sender and then re-transmitted later when it is possible.

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.

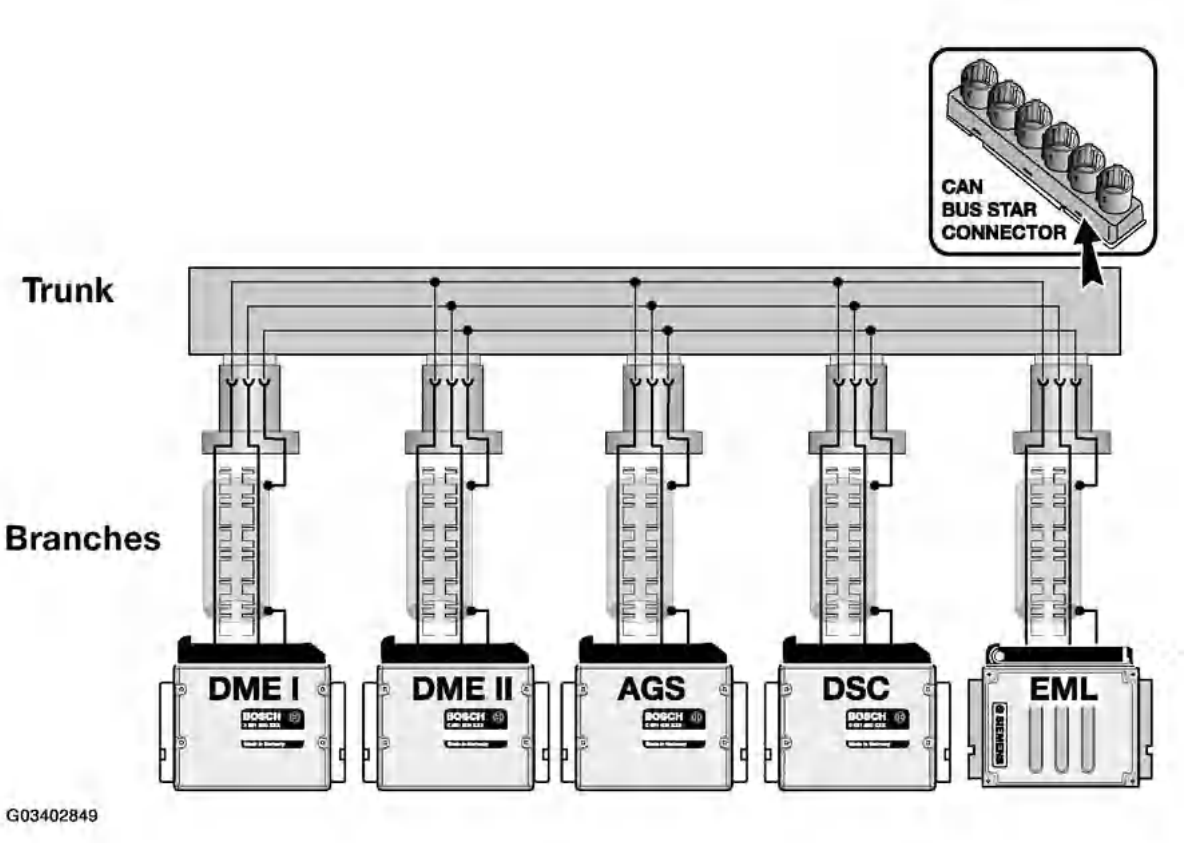


Fig. 2: Identifying CAN Bus Topology
Courtesy of BMW OF NORTH AMERICA, INC.

Example Of Tree Structure 95-97 E38 750iL

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.

Always refer to the appropriate article to determine the exact wiring configuration for a specific model.

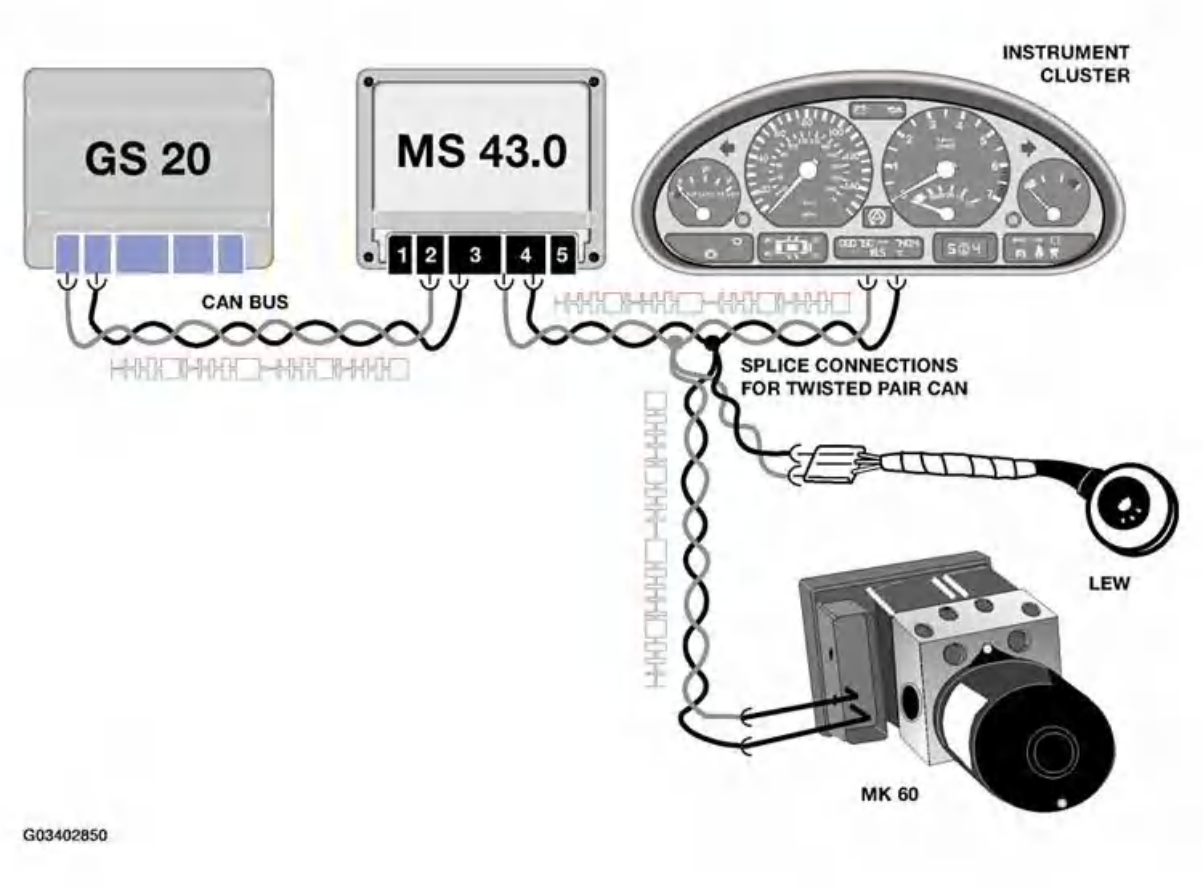


Fig. 3: Connecting CAN Bus To Module
Courtesy of BMW OF NORTH AMERICA, INC.

On most current models the CAN bus provides data exchange between the following modules:

- DME
- EML (750iL)
- AGS/EGS
- ASC/DSC
- IKE/KOMBI
- 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 a CAN bus resistor.

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).

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. CAN does not utilize a Master Controller, each module on the CAN provides operating 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 available to support communication.

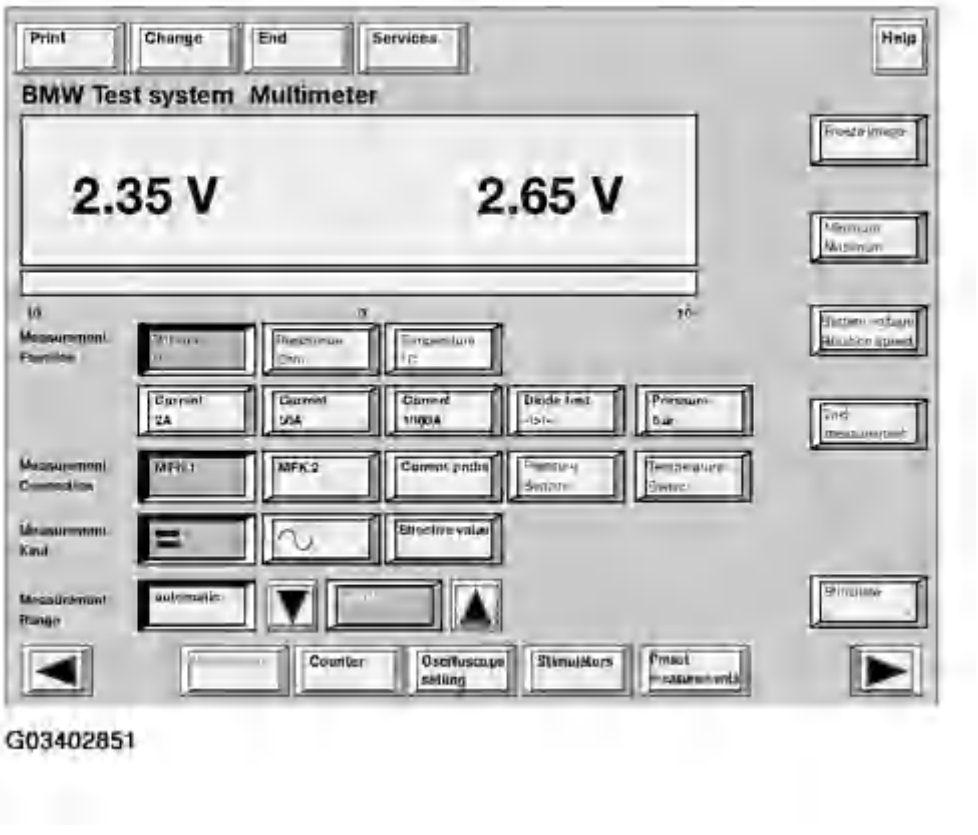


Fig. 4: View Of BMW Test System Multimeter Display
Courtesy of BMW OF NORTH AMERICA, INC.

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 CAN-H and CAN-L. The value at these control units should be between 10kOhms and 50kOhms.

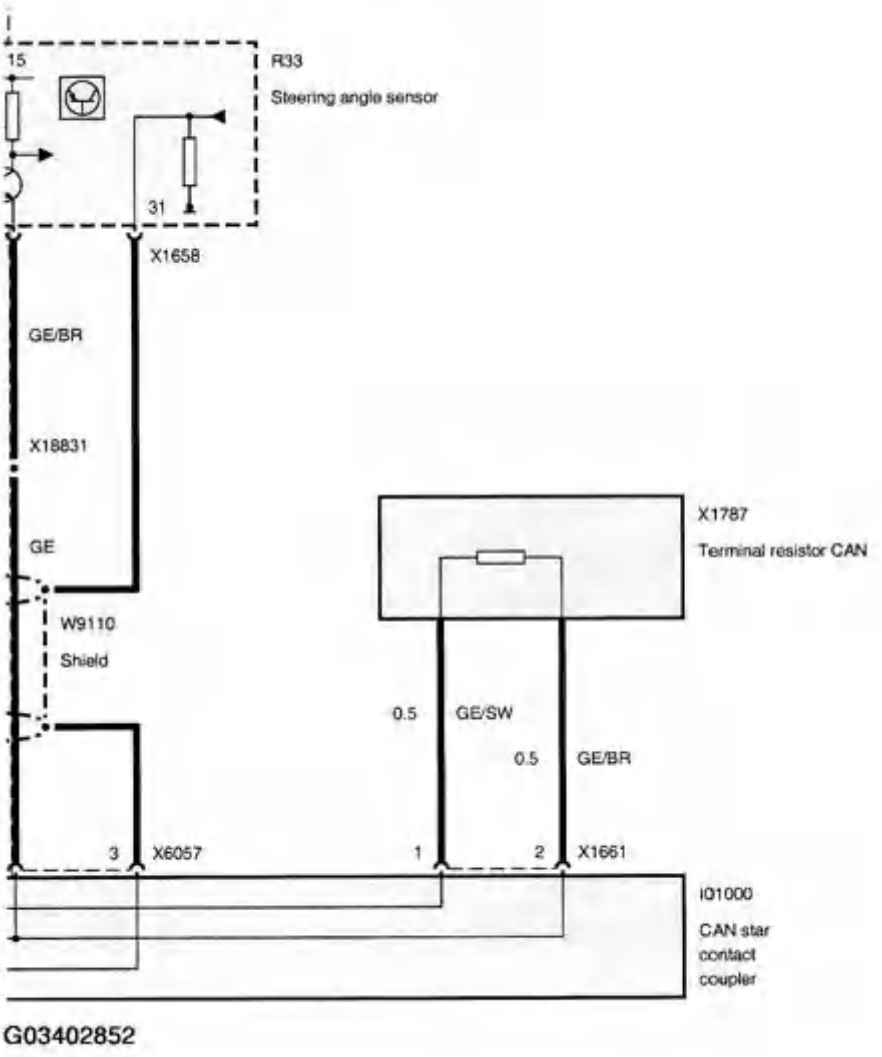


Fig. 5: Identifying Terminal Resistors Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

If there are CAN communication faults that use the term "Timeout" this refers to a module not being able to communicate with another on the bus. Each module on the CAN bus will attempt communication several times. If unsuccessful, the module will store a "Timeout" or "CAN bus" fault and determine that there is a problem with either the bus line or the module that it is trying to communicate with.

These types of faults may indicate a problem with the bus wiring, interference, missing data or failure of the communication module of an individual control unit.

Checking the CAN lines is carried out just like any other wiring. Perform continuity tests between the connections of different modules (all modules disconnected) without forgetting to make sure that the two CAN lines have not shorted to ground or to each other. It is recommended to use the "Wire Test" in "Preset Measurements" which is more sensitive than just a resistance check.

If Voltage level and the wire test are O.K, then looking at the communication signal may be useful.

The following are some examples of scope patterns that may be observed when checking the CAN bus.

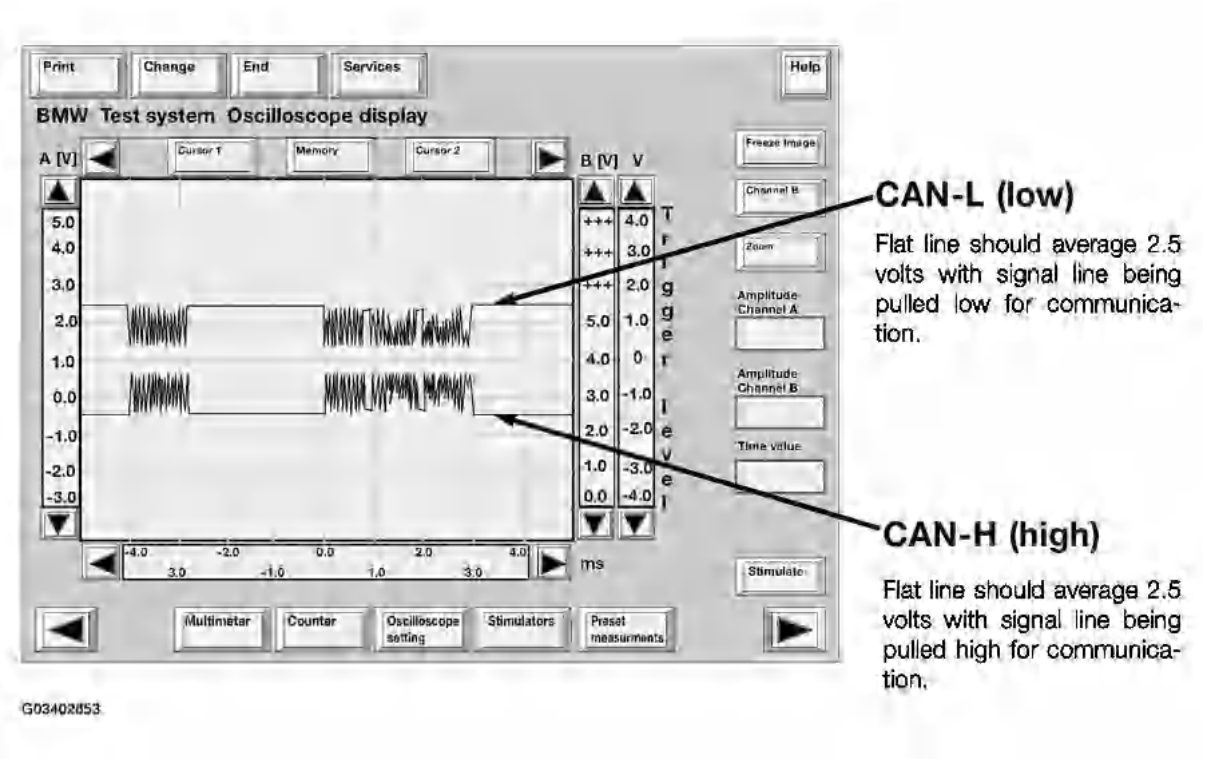


Fig. 6: View Of Correctly Operating CAN Bus Scope Pattern
Courtesy of BMW OF NORTH AMERICA, INC.

Example of correctly operating CAN bus.

Correct communication on the CAN bus occurs in sporadic bursts with short periods of steady voltage.

Examples of Defective CAN bus signals:

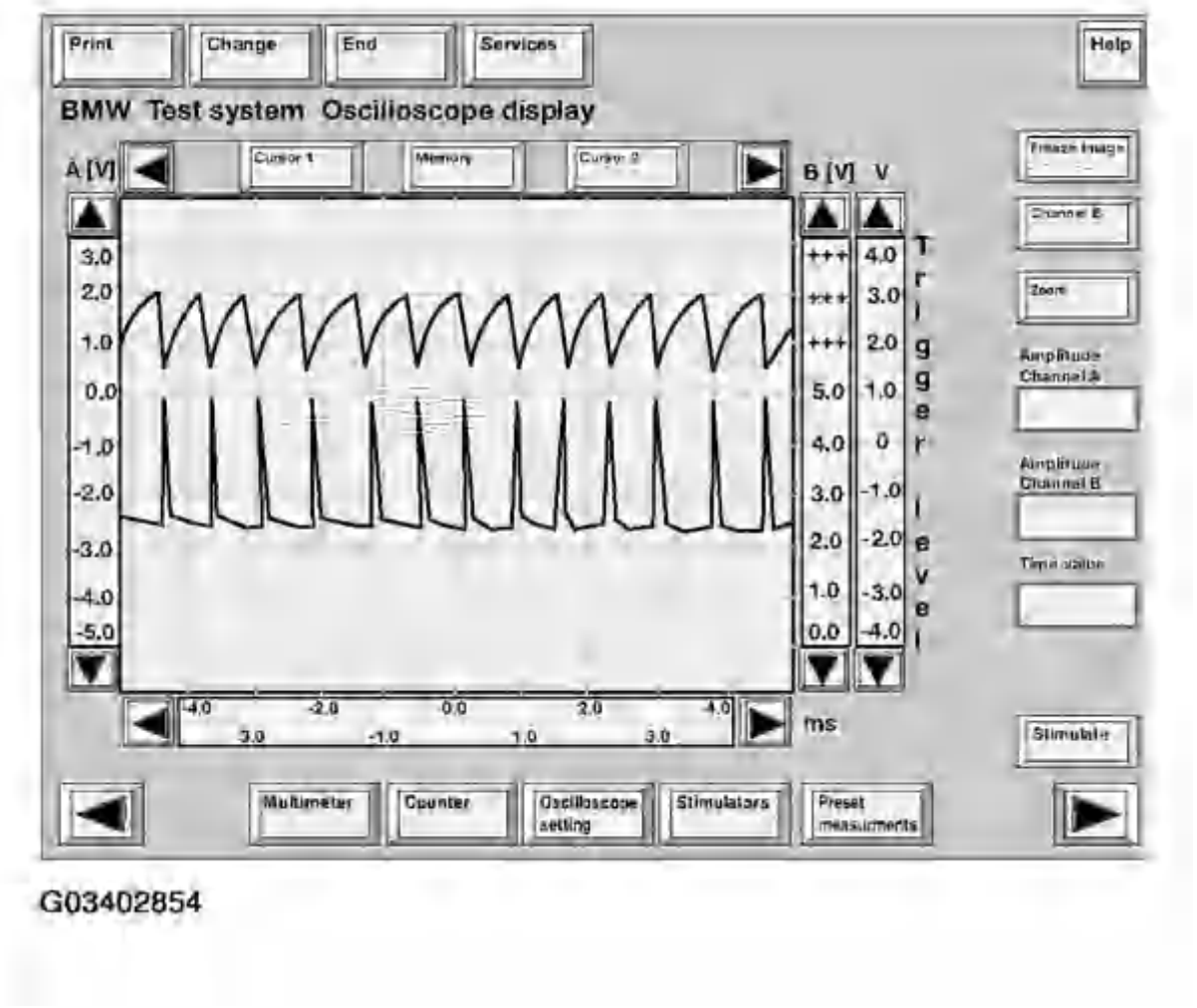


Fig. 7: View Of Rapid Constant Fixed Duty Cycle Scope Pattern
Courtesy of BMW OF NORTH AMERICA, INC.

Rapid Constant fixed duty cycle for 10 seconds.

This example represents the output signal produced by an AGS module that is isolated from the bus. This pattern times out after 10 seconds and remains a flat line at 2.5 volts until the key is cycled and the event is repeated.

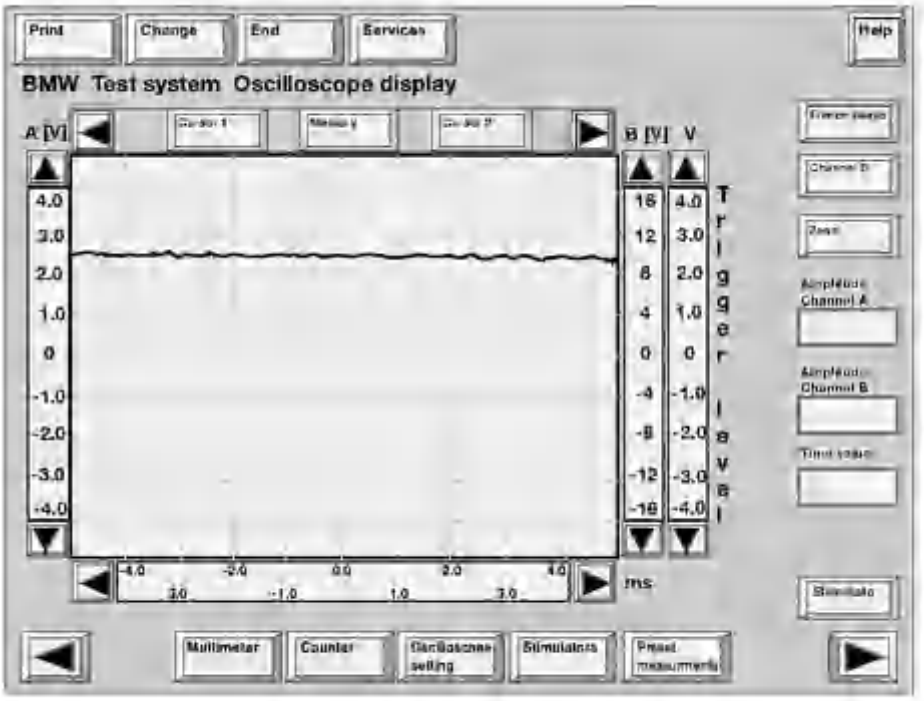


Fig. 8: View Of Flat Line At 2.5 Volts Scope Pattern
Courtesy of BMW OF NORTH AMERICA, INC.

Flat line at 2.5 volts.

If a continuous flat line is present at one or both CAN lines of a particular control unit, this may indicate that the CAN is open to that particular module. The module may have timed out and is waiting for a signal from another control unit. Check the CAN bus at other points to see if communication is occurring else where on the bus.

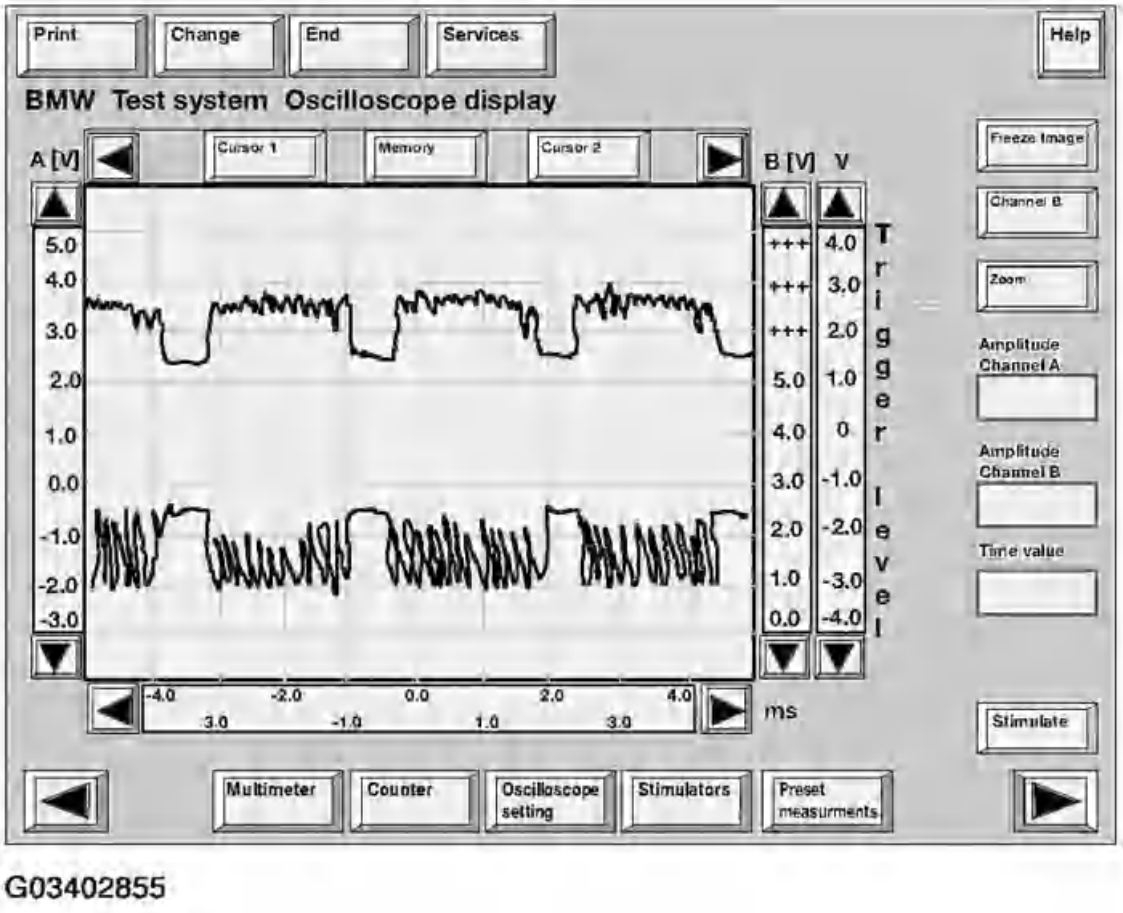


Fig. 9: Identifying Constant Fixed Duty Scope Pattern
Courtesy of BMW OF NORTH AMERICA, INC.

Constant fixed duty no time limit.

All of the other control units with the exception of most current AGS modules will continue to try and send information even though the control unit has already stored a "Timeout" or CAN fault. This type of signal may only be seen if a section or all of the CAN bus is disconnected.

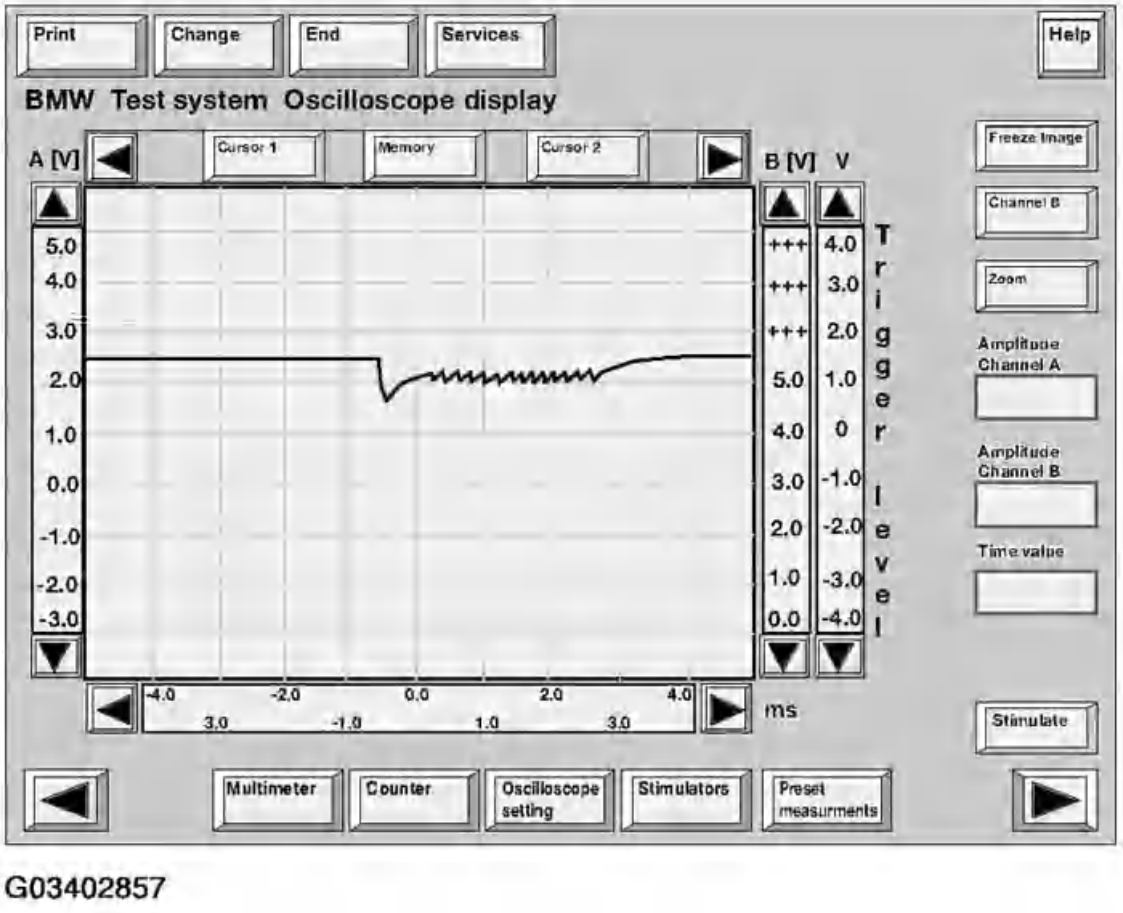


Fig. 10: View Of CAN High Shorted To CAN Low Scope Pattern
Courtesy of BMW OF NORTH AMERICA, INC.

CAN High shorted to CAN Low.

If the CAN bus lines were to become shorted to one another then the signals would cancel each other out and effectively be a flat line.

Failure of one of the control units attached to the CAN.

Each control unit connected to the CAN has an integrated communication module that makes it possible for that control unit to exchange information on the CAN. Failure of a control unit normally triggers a fault code in the other control units connected to the bus.

There are instances where failure of a module may paralyze or take down the entire CAN bus. This scenario would be evident by CAN faults stored in every control unit on the bus.

In order to isolate the defective control unit, the control units can be disconnected one at a time while monitoring the status of the CAN using a Voltmeter or oscilloscope. This can be further reinforced by clearing the faults of the remaining control units and then reading them again. If the disconnected control module is the defective one, the faults will only point to communication with that interrupted module and no one else.

As a quick check on vehicles produced after 9/97 (3/98 for the E39 528i) that have the CAN connection to the Instrument cluster, the indicators provide visual indication of whether communication is restored.

If for example the tachometer and temperature display are plausible then communication is occurring between the DME and IKE/KOMBI. Other indicators such as transmission range or the DSC light may give clues to the

communication status with those control units.

Once the module has been replaced and coded or programmed, perform the CAN bus Test Module in each control unit to ensure that communication is OK.

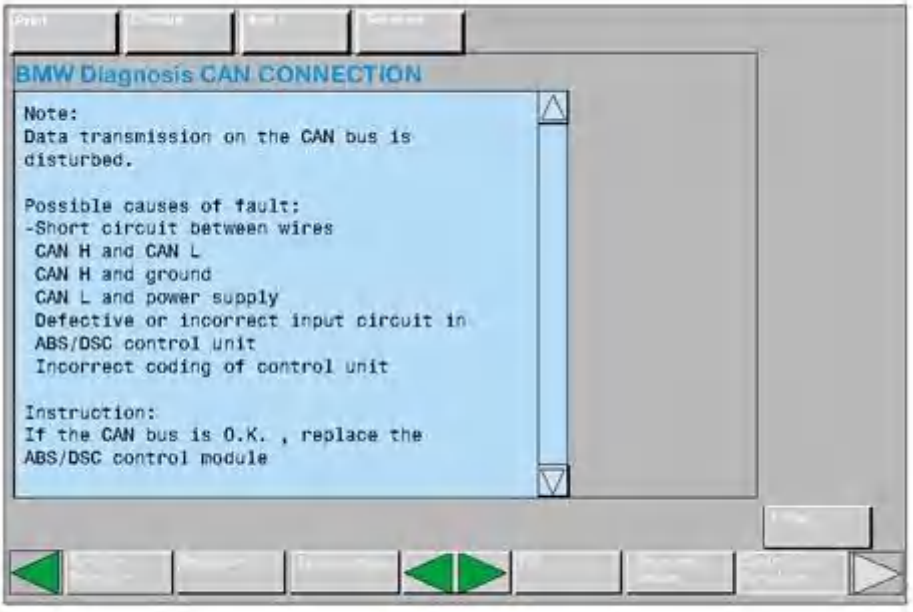


Fig. 11: View Of E38/E39 Style Diagnosis Test Module
Courtesy of BMW OF NORTH AMERICA, INC.

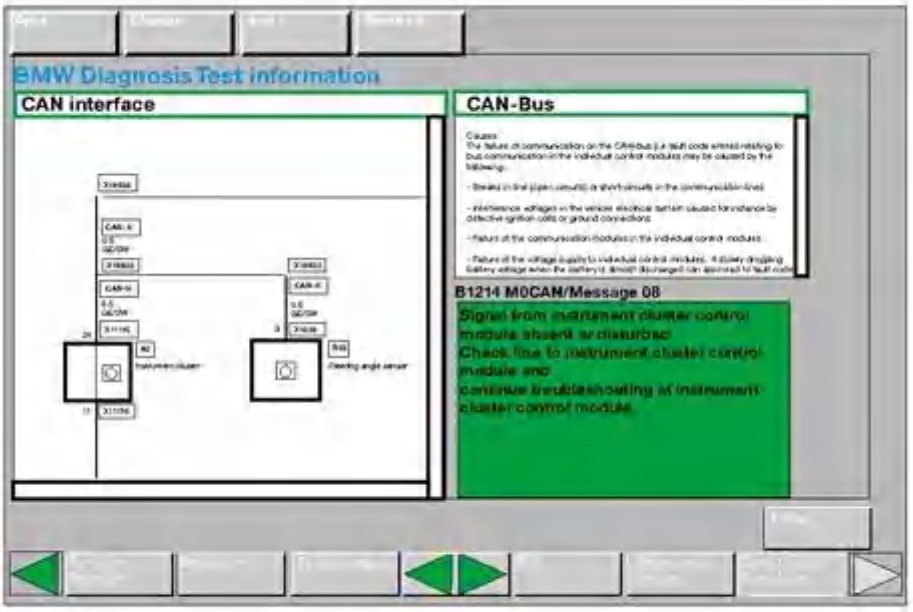


Fig. 12: View Of E46 Style Diagnosis Test Module
Courtesy of BMW OF NORTH AMERICA, INC.

Failure of the voltage supply to individual modules.

A slowly dropping battery voltage or a vehicle with discharged battery can lead to sporadic communication faults in various control units on the bus. The reason is that not all control units will switch off communication at the same voltage level leaving some modules still trying to communicate. Always verify a properly charged battery and charging system before beginning troubleshooting on the CAN.

Interference in the CAN bus cables.

Interference will have a similar effect to shorting or disturbing the CAN bus wiring. Excessive interference created by a defective alternator or aftermarket devices such as cell phones or amplifiers may induce a voltage into the CAN bus line and disrupt communication. This type of interruption may be intermittent and faults may only be stored in some modules and not in others. These faults are often difficult to reproduce. Begin by eliminating any problems with the CAN bus wiring itself and verify that the generator is operating fault free. Isolate any aftermarket wiring in the vehicle and see if the fault returns.

Programming:

During programming it should be noted that the module being programmed will not be communicating and therefore the other control units on the bus will store faults. These faults stored during programming should be deleted and then the fault memory should be read again to verify that they do not return. An incorrectly programmed module results in CAN faults that are not able to be cleared. Remember to always verify the correct Programmed Part Number after programming.

DIAGNOSIS BUS (D-BUS)

Introduction

The D-bus is a serial communications bus which can transmit data between the BMW DIS or MoDiC and the connected control units. The control unit to be subject to diagnosis is selected by sending a diagnosis telegram to the control unit address. By request from the tester, the control unit can transmit information and the contents of the fault memory or activate a control unit output. The D-bus is only active when the DIS or MoDiC is connected to the diagnostic socket and communicating.

The D-bus is actually the oldest bus system used in BMW vehicles, it was introduced in 1987 as TXD which provided communication between DME and the Sun 2013 Service Tester. The D-bus is still referred to as TXD in the ETM.

Data over the D-bus currently operates at a rate of up to 9.6 Kbps (bits per second).

D-Bus Topology

The D-bus (TXD) is connected to various control units that are diagnosed using DIS or MoDiC. Earlier vehicles also used a second diagnosis line called RXD to allow the test equipment to establish communication. RXD is not a bus line but a one way communication link used to wake up the diagnosis of the connected control unit.

On vehicles produced up to model year 2001 and use the 20 pin under-hood diagnostic connector, the locations of the two links are:

- RXD-Pin 15.
- TXD-Pin 20.

Later control modules (from 1997) no longer required the separate RXD to establish communication, (DS2 protocol) so Pin 15 was removed from the Diagnostic socket of most vehicles.

To satisfy the requirements of OBD II, in 1995 a standardized connector was installed inside of all vehicles. This connector has to provide access to all powertrain modules via an after-market scan tool. TXD II (pin 17) was introduced as a separate communication line exclusive to DME (ECM), AGS (TCM) and EML. TXD II is technically identical to the D bus (TXD).

On vehicles that use only the 16 pin OBD connector in the vehicle, TXD is installed in pin 8. TXD II remains in pin 7.

The term D bus was actually coined with the introduction of the E38 and the expanded use of bus systems in the vehicle. On vehicles from E38 on (except Z3), the D-bus is directly wired to:

- ASC/DSC.
- EDC (if equipped).
- LEW.
- IKE/KOMBI.

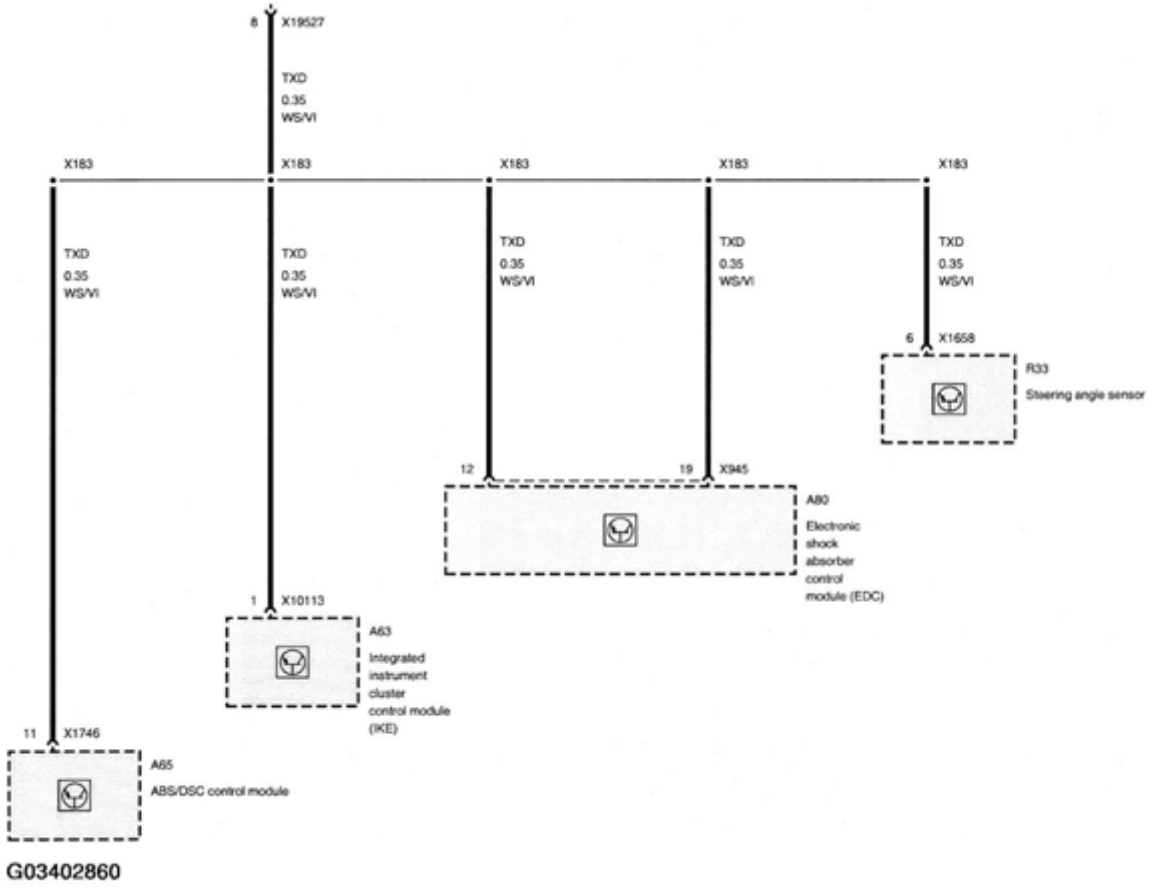


Fig. 13: View Of D-Bus Topology Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

The IKE/KOMBI serves as the gateway for the D-bus that converts the telegram format of the I/K bus to the format of the D-bus.

The wire color of the D-bus is uniform throughout the vehicle, it is a single WS/VI wire.

Troubleshooting the D-Bus

The failure of communication with one or several control units via the D-bus can be caused by:

- Failure of the D-bus cable or its individual connections.
- Failure of the IKE/KOMBI control unit.
- Failure of the I/K or P-bus or its individual connections.
- Failure of the voltage supply or ground to individual modules.
- Interference in the D-bus cable.

Failure of the D-bus cable:

The following faults can occur to the D-bus wiring:

- D-bus interrupted.
- D-bus shorted to battery voltage.
- D-bus shorted to ground.
- Defective plug connections (damaged, corroded, or improperly crimped).

The operating voltage of the D-bus is 12 volts. The voltage measurement is taken from each data line connection to ground. Each module on the D-bus provides its own voltage.

The fact that 12V are present does not mean that the D-bus is fault free, it just means that the voltage level is sufficient to support communication.

Minimum voltages that are needed for fault free communication are:

- D-bus (TXD)/TXD II > 2.0V.
- RXD (if equipped) > 10.5V.

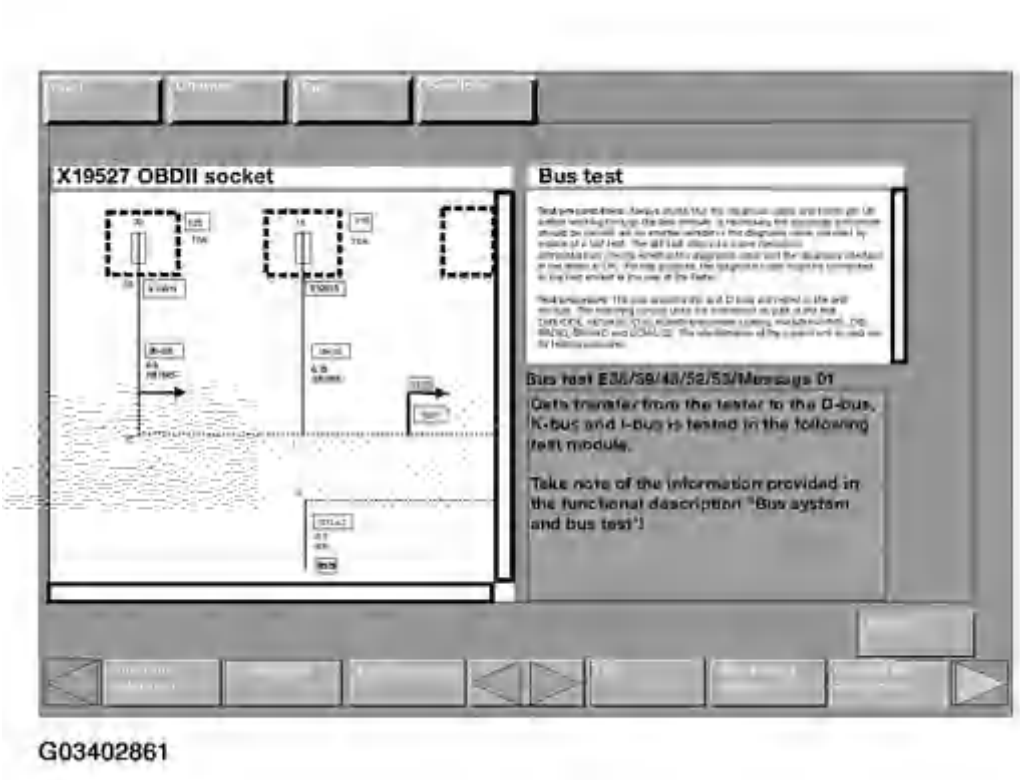
If problems are encountered trying to establish communication consider first:

- Battery charge level of the vehicle. Maintain a battery charger on the vehicle at all times during diagnosis.
- Always check that the diagnosis head and connection are OK before working through a test module for lack of communication.

On vehicles that use the IKE/KOMBI as a gateway:

If identification of the vehicle is carried out by the diagnostics without any problems then the D-bus is OK.

If several control units are not recognized this indicates that a bus link is defective. Continue troubleshooting using the test modules for those particular bus systems.



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Fig. 14: View Of D-Bus Test Module
Courtesy of BMW OF NORTH AMERICA, INC.

D-bus test module.

INFORMATION AND BODY BUS (I AND K BUS)

Introduction

The I and K buses are a serial communications bus in which all connected control units can send as well as receive information over one wire. The I and K bus are technically identical, the only difference is their use by model. From this point forward they will be referred to as the I/K bus and differences will be pointed out separately.

The I bus was originally introduced in the E31 to provide a standardized, reliable and cost-effective communications bus for a cars electronics to combat the increasing size of wiring harnesses.

The E38 expanded the use of bussing in BMW vehicles by adding three more busses (K, P and M) and adding more control units to the network.

The data transfer rate is approximately 9.6Kbps (bits per second).

The l/K-bus is always active when terminal R is switched on. If the bus line is quiet more than 60 seconds, all of the control modules will go into Sleep Mode.

When receiving messages over the bus line, the control unit first determines if the message is error free before accepting it.

The information sent over the bus is configured serially. Each message consists of:

1. Transmitter address (8 bit address):
    - The senders name.
2. Length of data (number of following message bytes):
    - How long the sender will speak.
3. Receiver address (8 bit address):
    - Whom the sender wishes to speak to.
4. Command or Information:
    - What the sender wants done.
5. Detailed description of message (maximum 32 bytes of data):
    - How the sender wants it done.
6. Summary of transmitted information (check sum):
    - The sender summarizes everything said.

The sender of the message then waits (100ms) for an acknowledgement that the message was received.

All of the connected control units will receive the information, but only the module addressed will accept and react to the data.

The rules for communication on the bus line are:

- Only one module speaks at a time.
- Everybody speaks at the same speed.
- Messages are acknowledged by the recipient.
- The message is repeated if the addressed module fails to respond.
- The Master Controller has priority.

- Quit sending message after 5 failed attempts.

Communication between busses: On vehicles equipped with an l-bus (E38, E39, E53 High) messages to be sent back and forth between the K-bus and l-bus have to be transferred via a Gateway. This Gateway is the IKE. The IKE determines by the address of the message recipient whether the message needs to be passed along to the other bus. The D-Bus and CAN-Bus also utilize the IKE or KOMBI as a gateway.

Polling: Each module on the I/K bus is informed by a message from the Master Controller as to the ready status of all of the other connected modules. The modules polled are according to the coding of the Master Controller. Every 30 seconds after KL R is switched on, each module on the bus line is polled.

A message concerning bus subscriber status is updated continuously based on the results of these polls. If a subscriber fails to respond with "device status ready" the Master will try again after 1 second.

If the module fails to reply again, the Master will assume that the subscriber is defective and send the message "subscriber inactive" to all connected modules. The inactive module continue to be polled until the key is switched off in case the module resets itself.

I/K Bus Topology

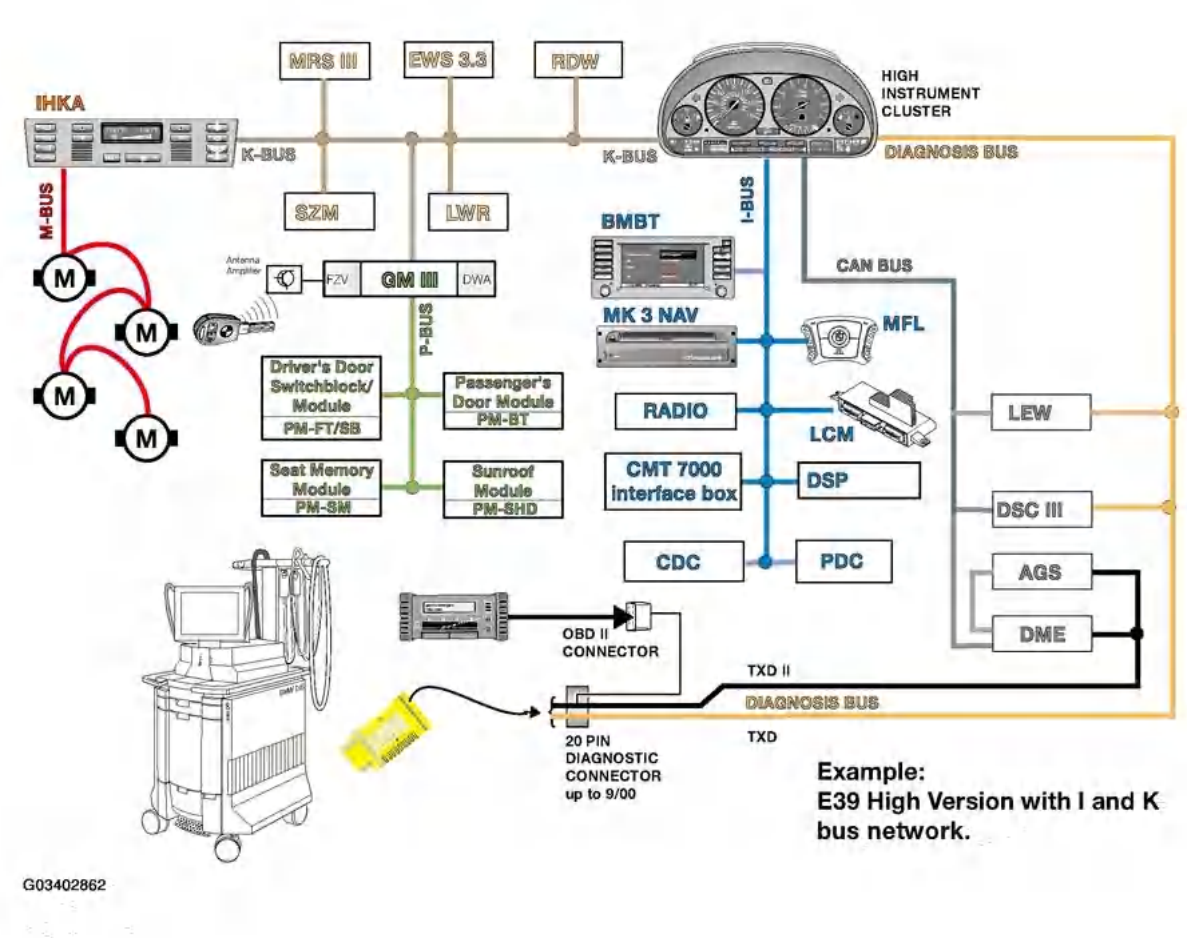


Fig. 15: Identifying E39 High Version With I And K Bus Network
Courtesy of BMW OF NORTH AMERICA, INC.

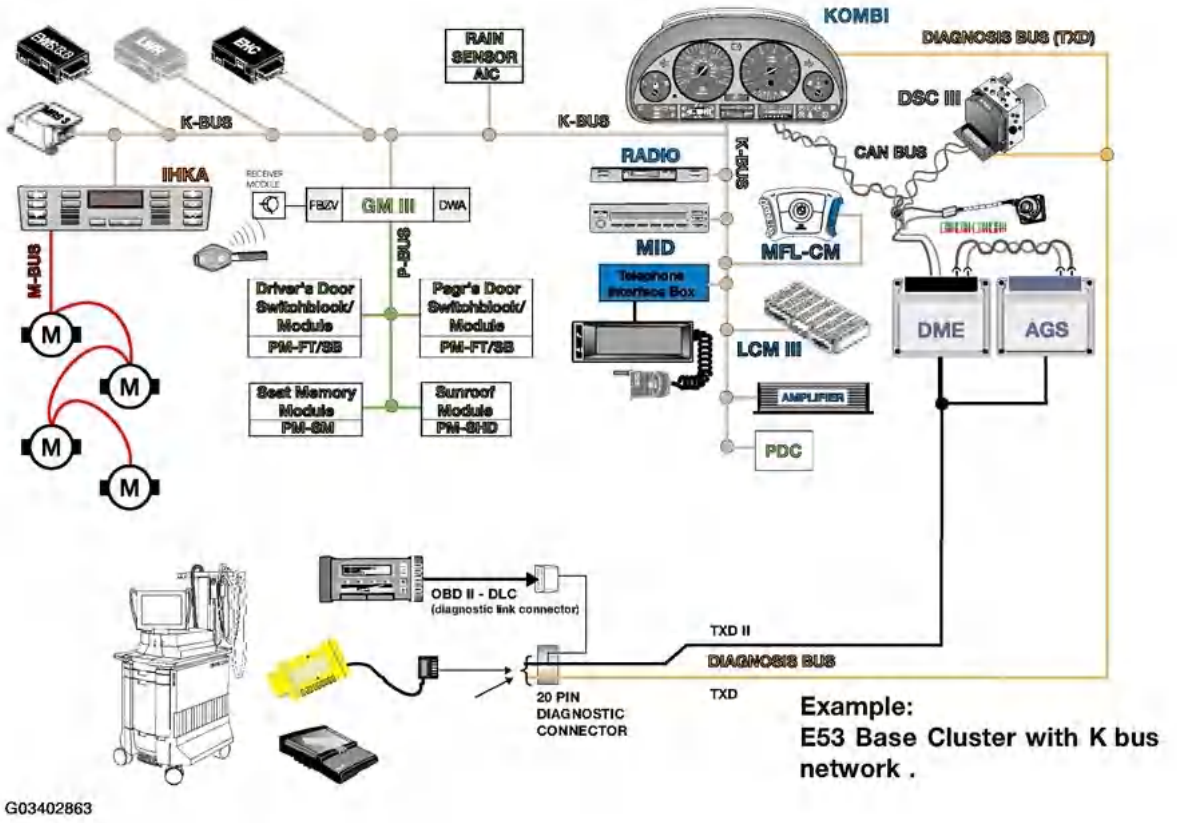


Fig. 16: View Of E53 Base Cluster With K Bus Network
Courtesy of BMW OF NORTH AMERICA, INC.

The I/K bus consists of a single copper wire. The wire color of the I and K bus is uniform throughout the vehicle with: l-bus WS/GR/GE and the K-bus WS/RT/GE (Note: 2001 E39s with base KOMBI have changed K-bus wire color to the same as the I-bus, WS/GR/GE).

Due to the linear structure of the network, the I/K bus is available for other modules in the event of a disconnected or failed control unit. Just as the CAN bus, this is referred to as a "Tree" structure with each control unit occupying a branch. The l/K-bus provides the diagnostic connection to the control units located on those busses (except IKE/KOMBI).

Always refer to the appropriate article to determine the exact wiring configuration and color for a specific model.

Troubleshooting the I/K bus

The failure of communication on the I/K bus can be caused by several sources:

- Failure of the bus cable.
- Failure of one of the control units attached to the bus.
- Failure of the voltage supply to individual modules.
- Interference in the bus cables.

The I/K bus is active when KL R is switched on, it remains active until 60 seconds after the last message. If the key is switched off (KL30) the bus may be activated for a time by individual users via a "wake-up" message.

Unlike the CAN bus where each control unit (subscriber) provides voltage for communication, the l/K-busses use only determined Master or Stand-by Controllers to supply B+ for communication. The voltage level on the I/K bus must be above 7V. The nominal value should be close to the system voltage of the vehicle.

Just like the CAN bus, the fact that voltage is present does not mean that the bus is fault free, it just means that

the voltage level is sufficient to support communication.

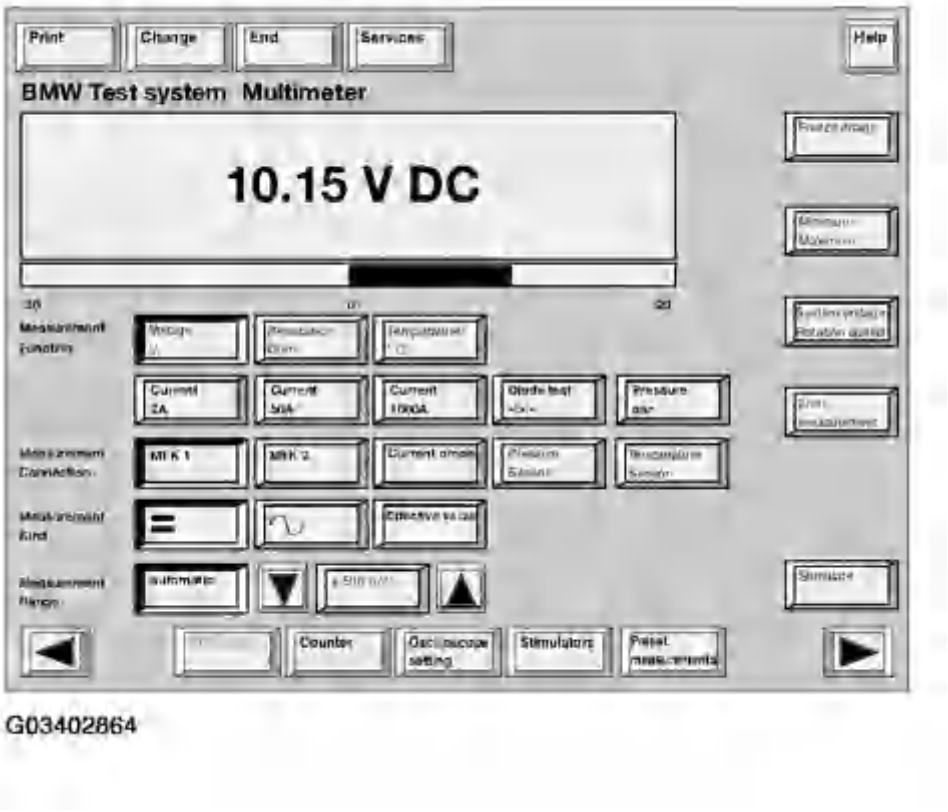


Fig. 17: View Of I/K Bus Voltage Level
Courtesy of BMW OF NORTH AMERICA, INC.

Control units that provide operating voltage to the I/K bus are:

On E38 and E39/E53 High version vehicles:

- The LCM is the Master Controller of the l-bus. The IKE and MID/BMBT are Stand-by Controllers.
- The GM is the Master Controller of the K-bus.

On E46, E52 and E39/E53 Base version vehicles:

- The GM is the Master Controller for vehicles equipped with only the K-bus.
- The LCM/LSZ is the Stand-by Controller.

Failure of the Bus cable:

The following faults can occur to the I/K bus wiring:

- Short Circuit to B+.
- Short Circuit to B-.
- Bus line down (open).
- Defective plug connections (damaged, corroded, or improperly crimped).

Short Circuit to B+: Modules that send a message see that the message was not received and that the bus remains high. However, subscribers are unable to decide whether the fault is due to a shorted line or a defect in the communication interface. The module will repeat its message 5 times before discontinuing and faulting. The module will continue to operate as normal minus any commands that could not be delivered by the bus.

Short Circuit to B-: The subscribers do not interpret a low bus line as a fault but just as a bus line deactivation.

The Master and Standby controllers do detect the short and enter it as a bus fault. (No communication).

Bus Line Down: The bus line may be open at any of several locations. As long as the Master or Stand-by is still connected, communication can occur with any modules still remaining. The fault situation will be the same as if the disconnected modules were defective themselves.

Checking the bus line is carried out just like any other wiring. Perform continuity tests between the connections of different modules (all modules disconnected) without forgetting to make sure that the bus has not shorted to ground or another wire. It is recommended to use the "Wire Test" in "Preset Measurements" which is more sensitive than just a resistance check.

If Voltage level and the wire test are O.K then looking at the communication signal may be useful. In order to get a signal, operate different devices on the I/K bus (e.g. MID/MFL) to stimulate conversations.

The following are some examples of scope patterns that may be observed when checking the I/K bus.

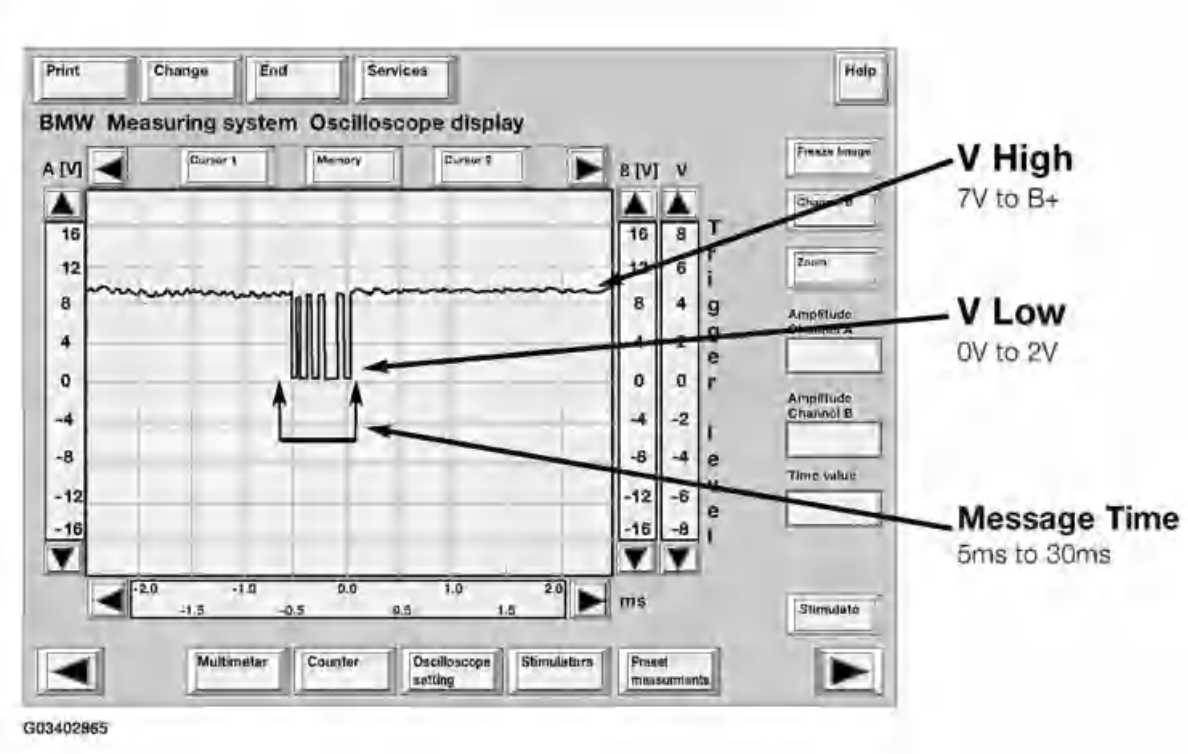


Fig. 18: View Of Correctly Operating I/K Bus Scope Pattern
Courtesy of BMW OF NORTH AMERICA, INC.

Example of correctly operating I/K bus during communication.

Correct communication on the I/K bus occurs in sporadic bursts with periods of steady voltage around 12V.

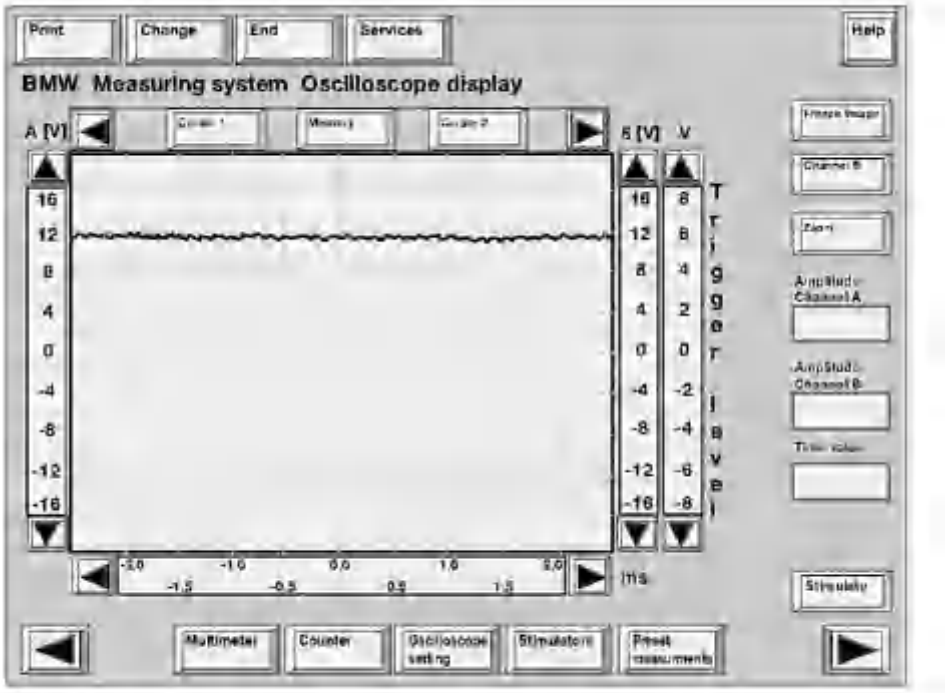


Fig. 19: View Of Flat Line At 12 Volts Scope Pattern
Courtesy of BMW OF NORTH AMERICA, INC.

Flat line at 12 volts.

No communication is currently taking place. The bus may be temporarily offline or shorted to B+.

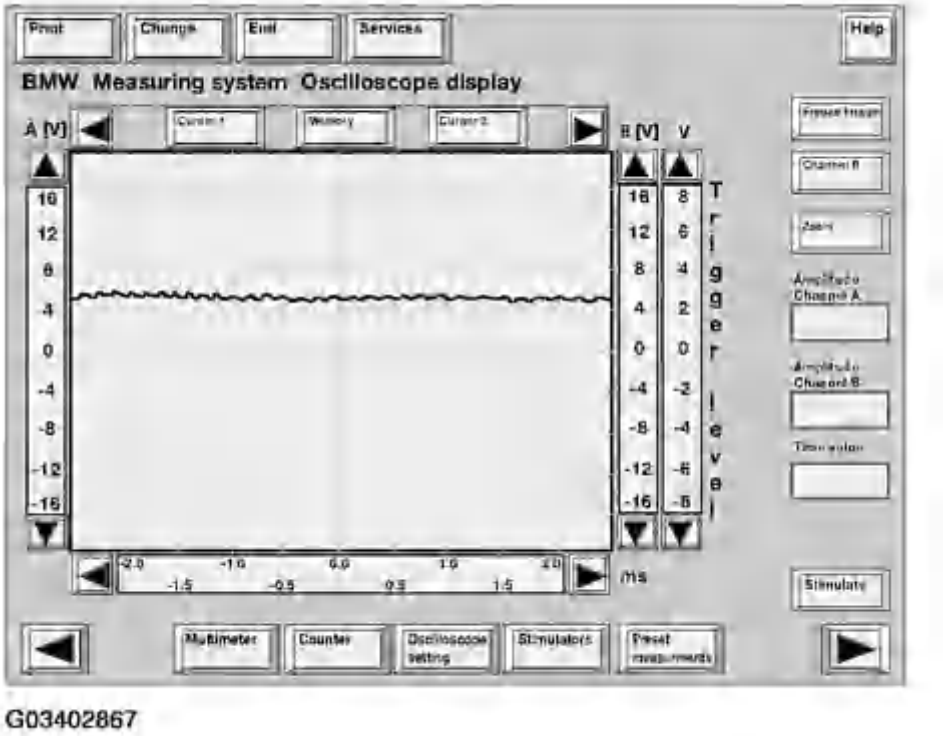


Fig. 20: Identifying Flat Line At 5 Volts Scope Pattern

No output voltage from the Master or Standby controllers. Bus line may be open or control unit may be defective.

Failure of one of the control units attached to the I/K bus.

Each control unit connected to the bus has an integrated communication module that makes it possible for that control unit to exchange information. Failure of a control unit normally triggers a fault code in the other control units connected to the bus.

As a quick check for the l/K-bus, activate the four way flashers. The flash indicators must light up in the instrument cluster. Switch on the Radio, and adjust volume using the MFL or MID/BMBT, the volume must change accordingly.

On High version vehicles press the recirculation button on the MFL, The IHKA should respond to the request. This test checks the gateway link as well as the I and K bus communication.

If the tests prove O.K, this means that communication on the bus is O.K. Any faults still existing can only be related to faults specific to a control unit or a local l/K-bus wiring defect to a module.

There are instances where failures may be software related. A faulted module may paralyze or take down the entire bus. This scenario would be evident by functions not being carried out and possible faults stored.

In order to isolate the defective control unit, the control units can be disconnected one at a time. Repeat the bus test after each disconnected control unit. If the disconnected control module is the defective one the faults will only point to communication with that interrupted module and no one else.

Once the module has been replaced (observing current S.I.Bs) and coded, perform the I or K bus Test Module in the Diagnosis Program to ensure that communication is O.K.

Failure of the voltage supply to individual modules.

A slowly dropping battery voltage on a vehicle with discharged battery can lead to sporadic communication faults in various control units on the bus. The reason is that not all control units will switch off communication at the same voltage level leaving some modules still trying to communicate. Always verify a properly charged battery and charging system and fuses before beginning troubleshooting on the bus. Also, do not forget to check for a proper ground to a control unit, this may not allow the bus to see a signal low (0-2V)

Interference in the bus cables.

Interference will have a similar effect to shorting or disturbing the bus wiring. Excessive interference created by a defective alternator or aftermarket devices such as cell phones or amplifiers may induce a voltage into the bus line and disrupt communication. This type of interruption may be intermittent and faults may only be stored in some modules and not in others. These faults are often difficult to reproduce. Isolate any aftermarket wiring in the vehicle and see if the fault returns.

PERIPHERAL BUS (P-BUS)

Introduction

The P-bus is single wire serial communications bus that is used exclusively on vehicles that are equipped with ZKE III. When the E38 was introduced the objective was to reduce the complexity of the wiring harness. Peripheral modules are located in areas of the vehicle close to sensors or actuators where wiring the components separately would create an excessively large harness (e.g. door). In some cases (e.g. Sunroof module) these peripheral modules are integrated with an actuator or switch to create one unit. The peripheral modules are connected to the GM III by the P-bus.

The P-bus is only used in the body electronics area and is very similar in communication protocol and speed to the l/K-bus. The P-bus is not designed for rapid exchange of continuous information, rather, the messages on

the P-bus are short control commands. This limited message flow allows for fast reaction time by the Peripheral module (e.g. a door lock or window request).

Go to Sleep Mode: The ZKE III goes to sleep after the key is switched off, no messages are being sent and after 16 minutes. The GM is responsible for sending the "GO TO SLEEP" command to all of the P-bus subscribers.

Wake up: Controllers that have the capability of sending the wake-up call are the GM and the driver and passenger door modules. The wake up call is simply a P-bus low.

P-bus polling: When KL R is switched on the GM sends out a P-bus poll every 5 seconds to the modules that are coded as being installed. The P-module must respond in 5 seconds. If it does not respond the GM tries two more times. If the poll is still unanswered the GM enters it into fault memory.

Coding: The GM informs the P-modules of relevant coding data.

P-bus Topology

The extent of the P-bus depends on the special equipment of the vehicle.

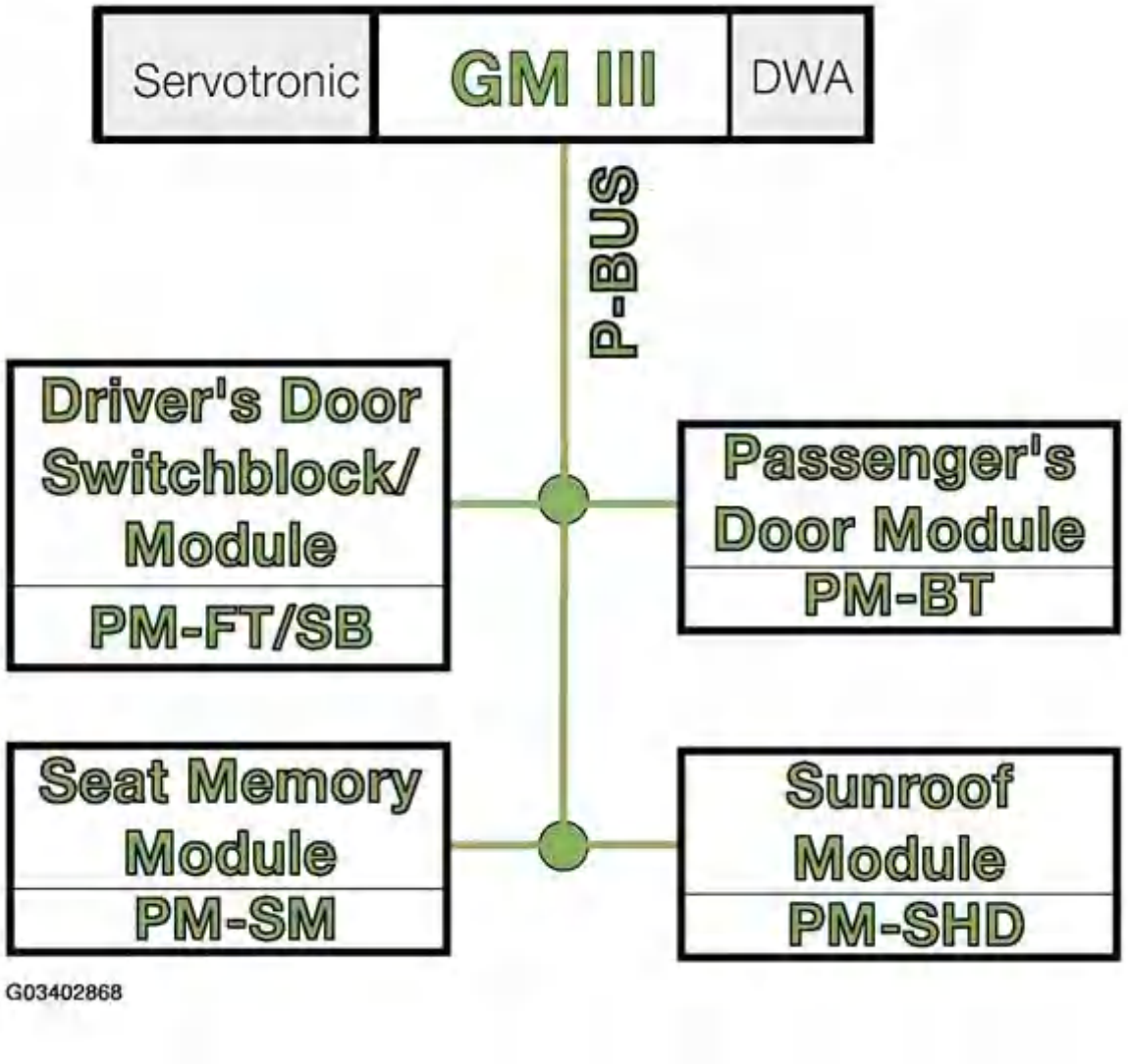


Fig. 21: View Of P-Bus Topology Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

The P-bus consists of a single copper wire. The wire color of the bus is uniform throughout the vehicle: BL/RT.

Due to the linear structure of the network, the P-bus is available for other modules in the event of a

disconnected or failed control unit. The P-bus provides the diagnostic connection to the P-modules.

Always refer to the appropriate article to determine the exact wiring configuration for a specific model.

Troubleshooting the P-bus

The failure of communication on the P-bus can be caused by several sources:

- Failure of the bus cable.
- Failure of one of the control units attached to the bus.
- Failure of the voltage or ground supply to individual modules.
- Interference in the bus cables.

The P-bus may be active at any time following a wakeup call. The GM provides the voltage necessary to support communication. The voltage level of the P-bus is 12V.

The Diagnosis of the central body electronics is carried out via the K-bus. The GM converts diagnosis request from the DIS plus into diagnostic mode messages and transmits them the peripheral modules over the P-bus.

Automatic testing of the P-bus connection is carried out every time the GM communicates with the diagnosis program (not during a short test).

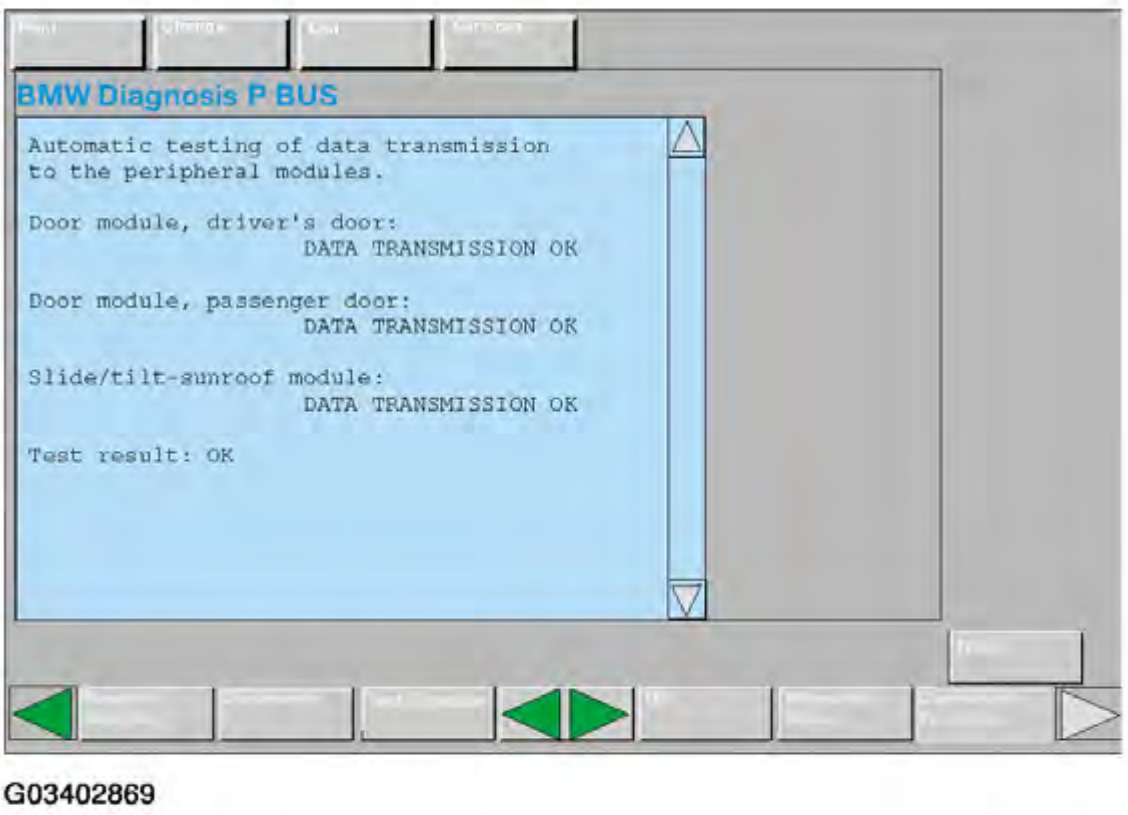


Fig. 22: View Of P Bus Diagnostic Mode Message
Courtesy of BMW OF NORTH AMERICA, INC.

Checking the bus line is carried out just like any other wiring. Perform continuity tests between the connections of different modules (all modules disconnected) without forgetting to make sure that the bus has not shorted to ground or another wire. It is recommended to use the "Wire Test" in "Preset Measurements" which is more sensitive than just a resistance check.

Troubleshooting of the P-bus network is carried out the same as the I/K bus.

MOTOR BUS (M-BUS)

Introduction

The M-bus is used exclusively between a climate control module, e.g. IHKA/IHKR and a set of stepper motors used to move various air distribution doors.

These "smart" stepper motors have an integrated communication I.C. that allows them to listen as well as transmit information over a single bi-directional data link.

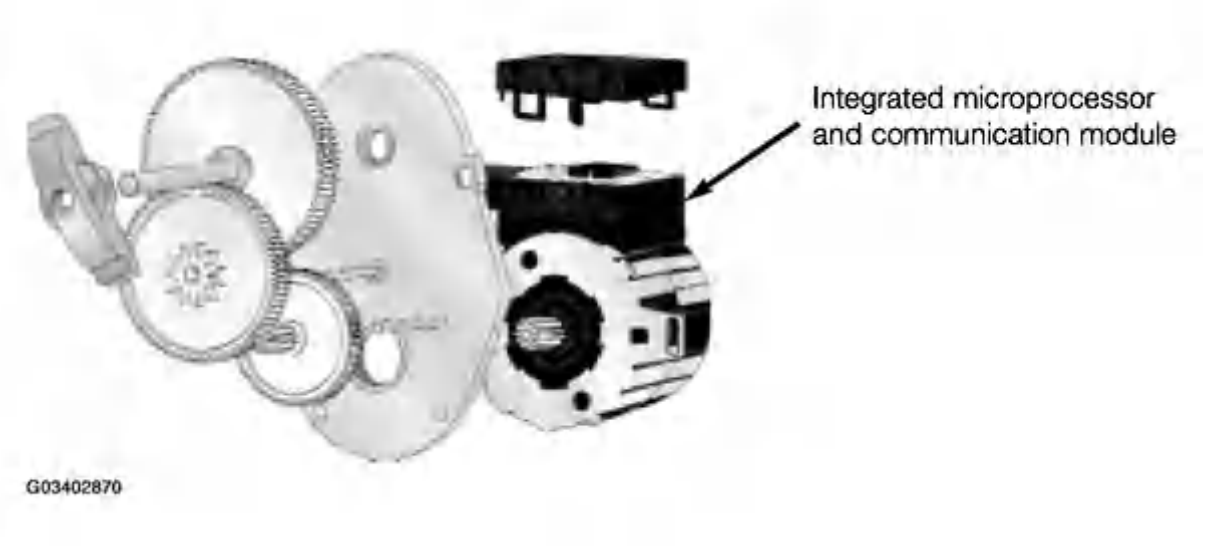


Fig. 23: Identifying Integrated Microprocessor And Communication Module
Courtesy of BMW OF NORTH AMERICA, INC.

To distinguish its position in the IHK housing, each stepper motor is programmed by the manufacturer with its own electronic address.

Each stepper motor on the M-bus also has a unique part number that is printed on the body of the motor. It is vital that each stepper motor be installed in its correct location for proper operation due to the addressing.

A three wire ribbon connector is used to connect the stepper motor to the IHK control unit. All of the stepper motors are connected in parallel to each other via the M-bus ribbon cable.

The ribbon contains:

- Power.
- Ground.
- Bi-directional signal wire.

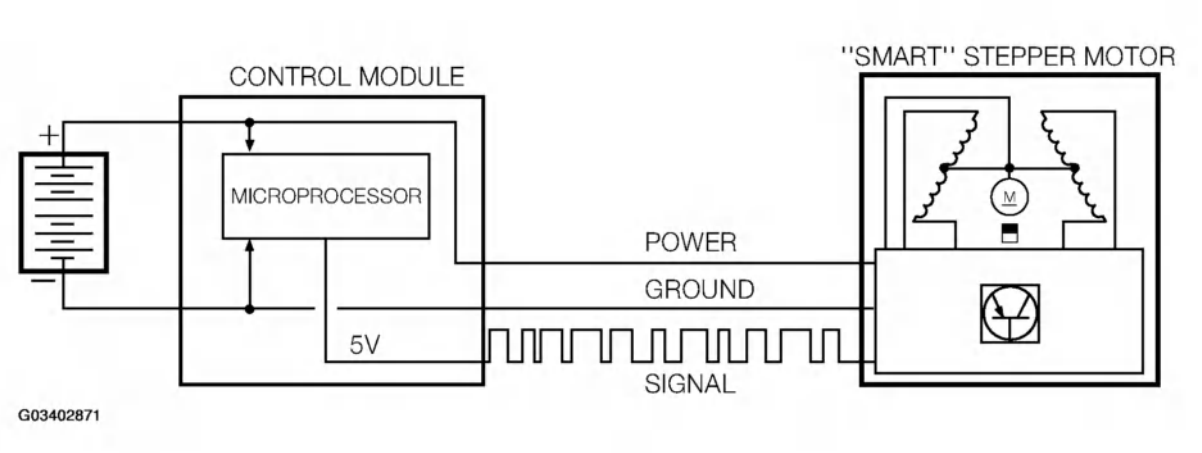


Fig. 24: Identifying Stepper Motor Wiring Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Each stepper motor acts as a "slave", it listens to all data on the bus, but only accepts or responds as long as the message is transmitted without errors and it recognizes it's own address.

M-bus protocol: The M-bus protocol differs from the CAN and the I/K/P busses in that communication takes place on a constant basis within a framework time of 650 mus.

When the IHK module is commanding a change in position of one or more stepper motors the sequence of data is:

1. Start bit:
   - Informs the stepper motors that a command is coming.
2. Synchro bit:
   - Establishes the message as originating from the IHK control unit.
3. Data field:
   - The command to move a stepper motor to a particular position.
4. Address field:
   - The IHK control unit names the stepper motor the command is intended for.

If the message was received by the stepper motor without error (oversampling) the stepper will carry out the command and transmit its acknowledgement:

1. Synchro bit:
   - Establishes the message as originating from the stepper motor.
2. Data field:
   - Status information from the actuator (feedback).
3. End of frame:
   - Closes the communication session.

Communication continues on the M-bus until the GM sends the "go to sleep" command over the K-bus.

M-bus Topology

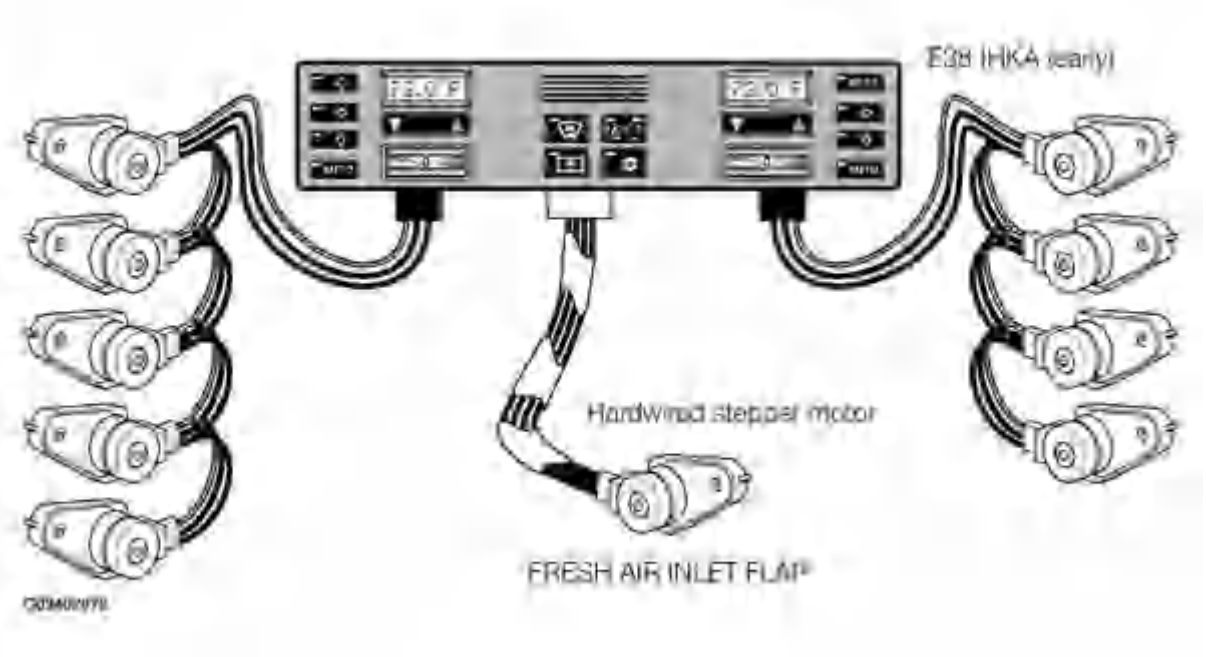


Fig. 25: Identifying M-Bus Topology
Courtesy of BMW OF NORTH AMERICA, INC.

The M-bus consists of a three wire ribbon. On E38 vehicles because of the large number of stepper motors used, the M-bus is divided into two separate circuits. All other vehicles use a single M-bus cable. The M-bus wire ribbon is not routed with the rest of the vehicle harness but is a separate harness attached to the IHK housing.

Always refer to the appropriate article to determine the exact wiring configuration for a specific model.

Troubleshooting the M-bus

The failure of communication on the M-bus can be caused by several sources:

- Failure of the bus ribbon, e.g. open or shorted.
- Failure of one of the stepper motors attached to the bus, e.g. shorted to B+ or B-.
- Failure of the voltage or ground supply to the IHK control unit.

The M-bus is active at any time following KLR on. The IHK module provides the voltage necessary to support communication. The voltage level of the M-bus is 5V, but because status communication occurs at an average 50% duty cycle the observed voltage is approximately 2.5V. The presence of 2.5V means that communication is occurring.

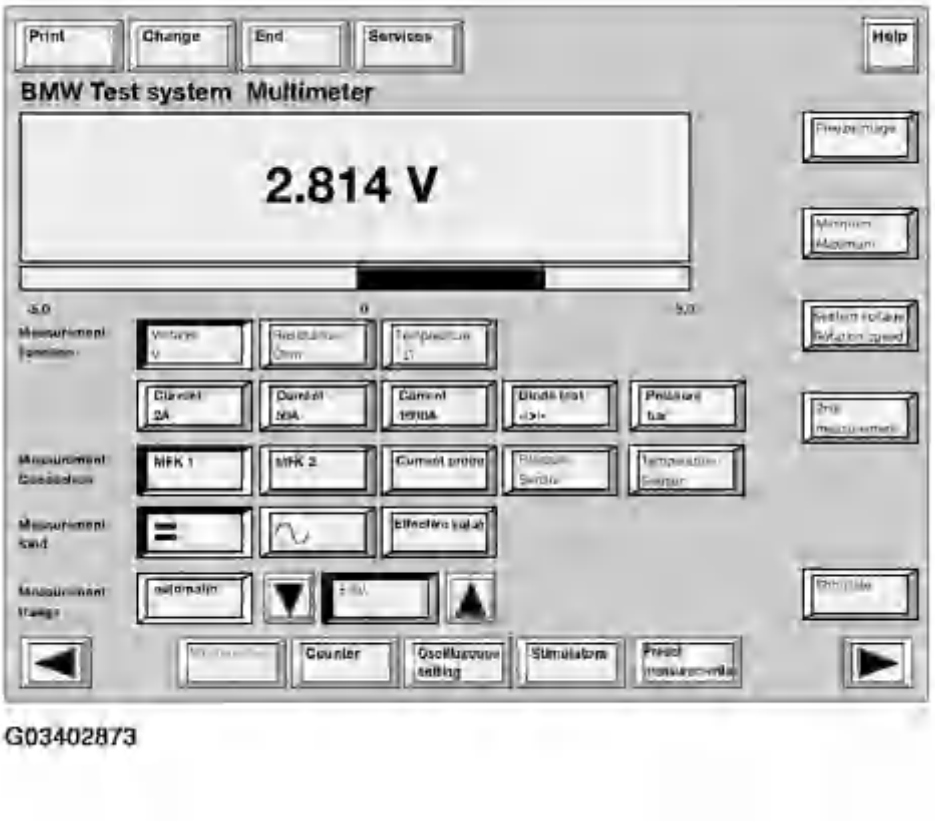


Fig. 26: Identifying M-Bus Voltage Display Screen
Courtesy of BMW OF NORTH AMERICA, INC.

Checking the M-bus ribbon is carried out just like any other wiring. Perform continuity tests between the connections of the stepper motors (all motors disconnected) and the control unit without forgetting to make sure that the data line has not shorted to ground or power.

It is recommended to use the "Wire Test" in "Preset Measurements" which is more sensitive than just a resistance check.

If Voltage level and the wire test are O.K, then looking at the communication signal may be useful.

The following is an example of a scope pattern that may be observed when checking the M-bus. Notice the very high frequency of the signal at approximately 20 kHz.

Fig. 27: Identifying Correctly Operating M-Bus Scope Pattern
Courtesy of BMW OF NORTH AMERICA, INC.

Example of correctly operating M-bus:

Communication on the M-bus occurs continuously with an average Period duration of 50 mus. When a command is issued by the IHK control unit the pattern will briefly change in period length and then return to the constant signal.

Failure of the Bus ribbon:

The following faults can occur to the M-bus wiring:

- Short Circuit to B+.
- Short Circuit to B-.
- Bus line down (open).

- Defective plug connections (damaged, corroded, or improperly crimped).

The IHK control module checks the M-bus for continuous position feedback from the stepper motors. If the M-bus is interrupted then the control unit will store a fault for every stepper motor on the bus.

In order to determine if a stepper motor is at fault for the lack of communication, disconnect one stepper motor at a time while monitoring the M-bus signal line with a voltmeter or oscilloscope. The pattern or voltage should return to normal when the defective stepper is found. As a confirmation that communication is restored, change the setting on the IHK panel, if the remaining connected flap motors assume the selected position communication is OK.

Diagnosis of the M-bus is carried out by the DISplus/MoDiC via the IHK module. Available in the Diagnosis Program are:

- Fault/symptom driven test modules
- Diagnosis request (flap position)
- Component activation (flap activation)

Fig. 28: Identifying M-Bus Diagnostic Screen
Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00212589

MOST BUS DIAGNOSTICS

Model: All

Production: All

After completion of this module you will be able to:

- Diagnose the MOST Bus using module resets.
- Store the sequence of the MOST Bus.
- Diagnose the E65 MOST Bus.

MOST BUS DIAGNOSIS

The MOST network uses a ring bus for data communication between the various modules. Signal transmission is by means of a fiber-optic cable. Data transmission on the ring bus takes place in one direction only. On the the MOST ring, messages can only be transmitted provided the bus ring complete and fully functional.

If for example the power supply or the diode of a control module is defective, the MOST bus in non-operational and no communication is able to take place. Exceptions are the gateway control module (CCC or MASK) and the HUD control module.

CCC/MASK

E60 series vehicles are fitted with either the CCC or the MASK. Either of these control modules are the interface between the MOST bus and the K-CAN.

To diagnose the CCC or MASK:

- CCC (Car Communication Computer) all the control modules with the abbreviation CCC must be selected (e.g. CCC-GW).
- MASK (Multi Audio System Controller) all the control modules the the abbreviation MASK must be selected (e.g. MASK-GW).

Diagnosis Excessive Temperature

If a control module becomes too hot, this control module switches off for up to 10 minutes. This switches the ENTIRE MOST bus down for 10 minutes. After the control module cools down it (and the MOST bus) is functional again.

If this fault, "Deactivation excess temperature", is stored in the CCC (or MASK) and any of the other MOST control modules there are two possibilities:

- If the fault is ONLY in the CCC (MASK), then this module is responsible for the MOST bus shut down.
- If the fault is stored in the CCC (MASK) and one or more other control modules on the MOST bus, the most likely cause of MOST bus failure is the other control module. However, this does not rule out the possibility that the CCC (MASK) is also defective.

Control Module Resets

Using the DISplus or GT1 a Test Plan may be run to check number of control module resets for each control module on the MOST bus.

A control module with 0 (zero) resets has performed no reset, is not installed in the vehicle, or can not be found

with the diagnostic equipment.

The control module with the highest number of resets is the most probable cause of a fault with the MOST bus.

Below is an example of a readout from the DISplus or GT1:

HEAD-UP DISPLAY

Head-Up Display	15
CD Changer	0
Headset Interface	0
Amplifier	0
Video Module	0
Telephone	0
Satellite Radio	0
Nav System Japan	0
MASK (or CCC)	15

NOTE: Resets at a rate of less than 10 may be normal for a control module. When the number of resets is less than 10, this is only an indication on the possible cause of a fault. The control module should generally NOT be replaced with less than 10 resets.

MOST CONFIGURATION

On the E60, certain control units are always arranged in the same order.

Other control units, on the other hand, can be connected in a different sequence.

Same Sequence

Depending on the equipment configuration, the multi-audio system controller/car communication computer is always followed by the CDC, HUD and then the MOST bus terminal.

Different Sequence

The sequence can change as from the MOST bus terminal. Possible control units include:

- Top HiFi amplifier.
- Telephone.
- Video module.

From the MOST bus terminal, the fibre-optic cable is routed back via the flash plug to the multi-audio system controller/car communication computer.

Store Configuration:

On the E60, the sequence of control units in the MOST system network is identical in the front area of the vehicle. All control units located in the luggage compartment can be connected to the MOST bus terminal in any arbitrary order so that the sequence of the control units can change.

Diagnosis on the MOST bus is only possible over a known sequence of control units in the MOST. When storing the MOST ring configuration, the control units are written in their installed sequence to a registration file. It is first necessary to check whether communication on the MOST bus is possible (stability check).

The configuration is automatically restored after replacing or retrofitting a control unit in the MOST system network. This takes place after programming/encoding with CIP so that the control unit sequence is up-to-date.

The "Store configuration" function is not activated automatically when the control units sequence is changed manually in the area of the luggage compartment (e.g. accident damage repair).

MOST control unit sequence, E60

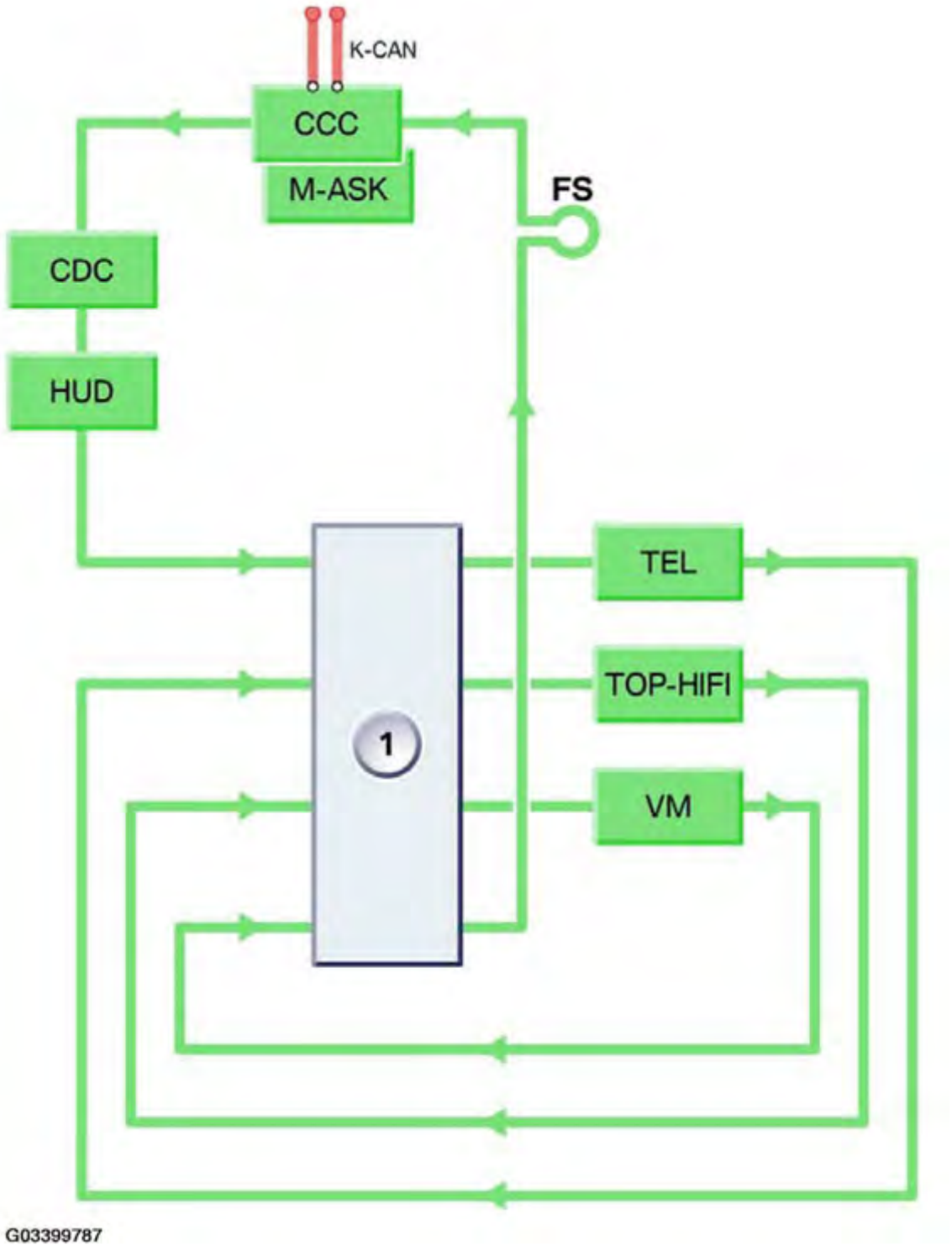


Fig. 1: Most Control Unit Sequence Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Ring Break Diagnosis

Ring break diagnosis is already known from the E65. During ring break diagnosis on the E65, the voltage supply is interrupted directly at the battery.

Contrary to the E65, restart of the MOST users on the E60 is realized via "Transport mode." The following relays are switched off:

- Relay 1 MPM.
- Terminal 30g.

These relays supply voltage to all control units in the MOST system network. On activating transport mode, the relays are switched off and the voltage supply interrupted.

After the relays have been switched on again and the control units started up, the multiaudio system controller/car communication computer can detect the control units that still have communication capabilities and evaluate the results. Consequently, the BMW diagnosis system specifies a nodal point that provides an indication of the interruption on the MOST bus.

The functional description in the BMW diagnosis system provides detailed information on determining the nodal position on the MOST bus.

Stability Check

On the E60, the antenna tuner and the audio system controller are located in one unit.

The radio is still operable in the stereo and in the HiFi system in the event of a communication fault in the MOST system network. The stability check module was introduced for the purpose of checking the MOST bus in such cases.

Effective operation of the MOST bus on the E60 can be checked with the stability check function.

MOST Control Unit Supply

The "MOST control unit supply" module makes available schematic circuit diagrams and information on the power supply of the MOST control units so that specific information is quickly available as required.

E65 MOST BUS DIAGNOSIS

Fault Symptoms E65

Particularly when carrying out troubleshooting in the MOST system network it is important to know the precise significance of visible and audible symptoms. With this information it is possible to locate and correct faults much faster.

The starting point for locating faults should always be to pose detailed questions relating to the fault to the customer. This information can then be used to formulate initial consideration before the BMW diagnosis system is connected.

The following information should be available to the technician:

- When does the fault occur? E.g. already during engine start or while driving?
- Since when does the fault occur?
- Does the fault depend on temperature? When cold, hot or after longer period of vehicle operation?
- Do several functions fail simultaneously? If so, which?
- Is the fault still present after shutting down and restarting the vehicle?
- Was something switched on or off immediately before the fault occurred?
- Is it necessary to enter the telephone PIN after restarting the system?
- Does the radio/CD need to be switched on separately after restarting the system?
- How often does the system fail?
- How long does audio failure last?
- Can a loud clicking noise be heard in connection with the fault?

- Is the system OK again after switching terminal 15 off and on?
- What was shown on the main screen and in the assistance window?
- Does the control display fail?
- Is the display white or black or does it flicker in connection with the fault?
- Can a status line still be seen?
- What is shown after resetting the MOST bus (last menu, basic menu/start menu, BMW logo)?
- Does the CD changer make a noise after audio failure?

In addition, various factors that could also cause malfunctions in the system should be clarified:

- What control units have already been replaced?
- Did the fault symptom change after replacing control units?
- Was the light intensity reduced for the control units?
- Were the plug connections at the MOST control units checked?
- Was another or new road DVD inserted?
- What road DVD was used?
- Was something retrofitted on the vehicle or a repair carried out?
- To what CIP status (integration stage) does the vehicle correspond?
- Were other-make parts retrofitted in the electrical systems?

Based on the information provided by the customer and after examining any changes in the system it may be possible to determine faults already at this stage.

Why are these statements important? Examples from visual applications:

Creating Images

The control display (CD) contains two control units, i.e. the CD gateway that establishes the connection to the other bus systems and the CD graphics stage that builds up the graphics in the control display. Not all images in the CD are created by the CD graphics stage. All basic menus, submenus and the status line are created by the graphics stage (blue). The map is presented by the navigation computer via RGB lines (red).

Consequently:

If only the map is not displayed but the rest, e.g. the on-board computer, is still visible and if other menus can still be selected via the controller, in all probability the fault will be in the area of the navigation system.

IMPORTANT: The navigation map can also be displayed on the left-hand side.

Non-Digitized Area

A road map DVD, on which an area is not completely digitized can cause the navigation screen to turn green.

Self-Burnt DVDs

A self-burnt or faults road map DVD can cause the navigation computer to crash. Also a defective computer can trigger a reset of the navigation system, indicating "Initialization running" in the control display.

Telephone E65

The telephone AF is routed via the MOST bus in the form of light signals to the ASK. The light is converted in the ASK and the AF is output from the speakers by means of a hardwired electrical signal.

The microphone is connected via copper cables directly to the telephone control unit. Even if an SVS is installed, it does not have anything directly to do with hands-free telephone operation.

SVS is activated when voice commands are executed. The cause of a fault in hands-free operation should be sought in the area of the microphone, telephone and ASK.

If the telephone PIN is necessary after failure of the MOST bus, this indicates that the telephone control unit triggered a reset and in all probability the fault can be rectified by replacing the telephone control unit.

If the MOST bus is blocked, a telephone conversation via the cordless keypad handset should still be possible provided the telephone itself is not defective.

Audio

The two models E60 and E65 differ considerably in the area of the audio systems. These design differences necessitate different assessment methods for the purpose of locating faults.

The ASK is responsible for audio output on the E65. If the vehicle is equipped with a Top HiFi amplifier, the audio signal is sent in the form of a light signal from the audio source to the Top HiFi amplifier and forwarded to the speakers as an electrical signal.

Some of the speakers are activated directly by the ASK and some by the Top HiFi amplifier (LOGIC 7).

If the E65 is equipped with a HiFi amplifier, the sound information is transferred hardwired to the amplifier.

In connection with the Top HiFi system on the E60, all sound signals are routed from the multi-audio system controller/car communication computer in the form of light signals to the Top HiFi amplifier.

No sound signals are transmitted along fibre-optic cables in connection with the stereo and HiFi systems. The multi-audio system controller/car communication computer itself is responsible for the control of the speakers.

BYTEFLIGHT

As already in the E65 and E85, the byteflight is used in the safety system on the E60/E63. The system was adapted to the specific requirements of the vehicle.

The star-shaped arrangement of the satellites about the SGM (safety and gateway module) is a characteristic feature for the byteflight. The data are transmitted by means of light signals.

Diagnosis

In addition to the test options: fault code memory check, diagnosis check and component activation, this system can also be used to measure the light attenuation to ensure complete operability of the light section.

Light Attenuation

The maximum permissible light attenuation in the byteflight is -20 dB. Values between -3 dB and -8 dB are normally measured in the system. Different methods of contacting must be used depending on the light section to be measured in the system.

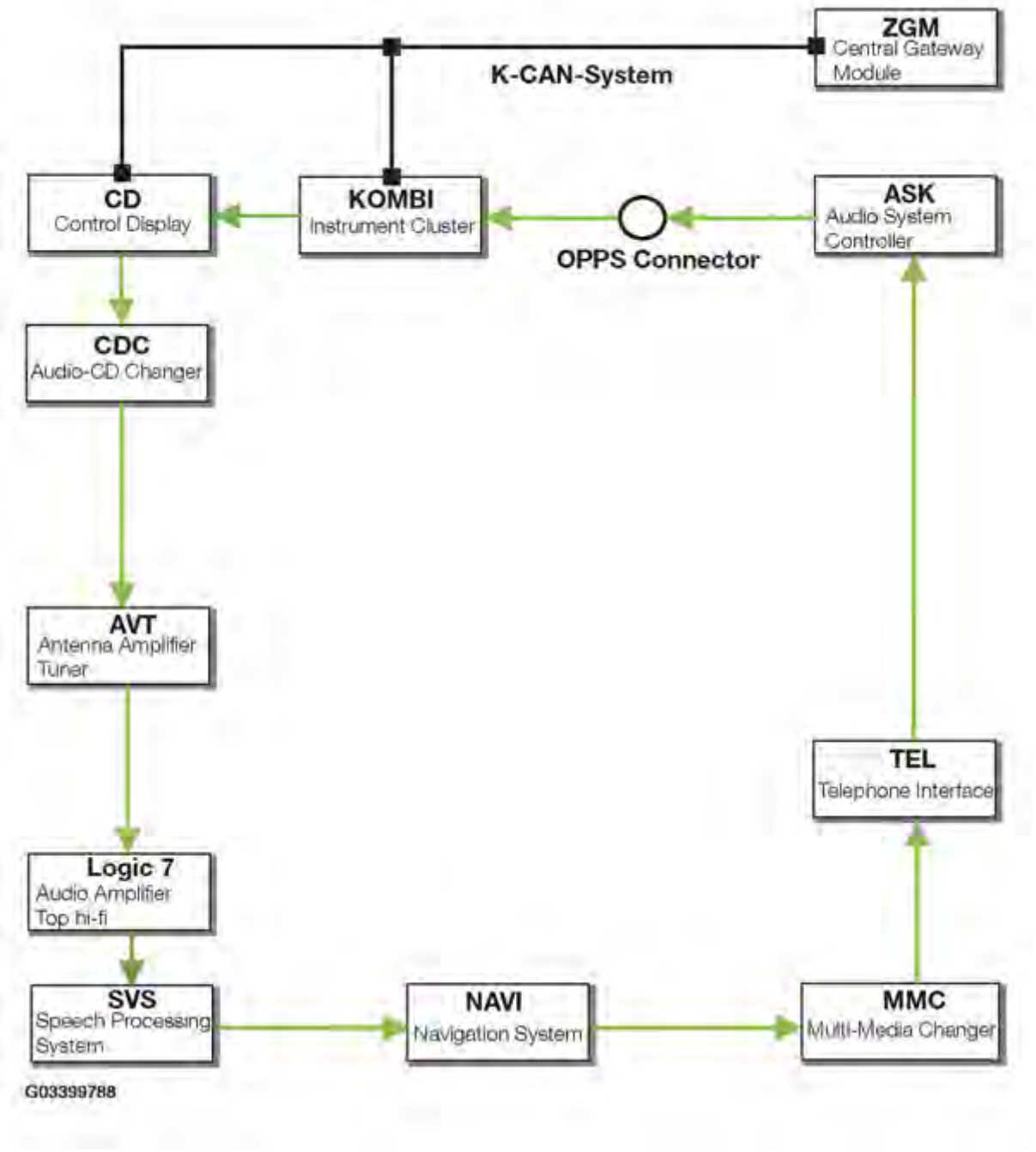


Fig. 2: Light Attenuation Blocking Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00212585

NEW RADIO REMOTE CONTROL (RKE)

All Models Beginning 09/99

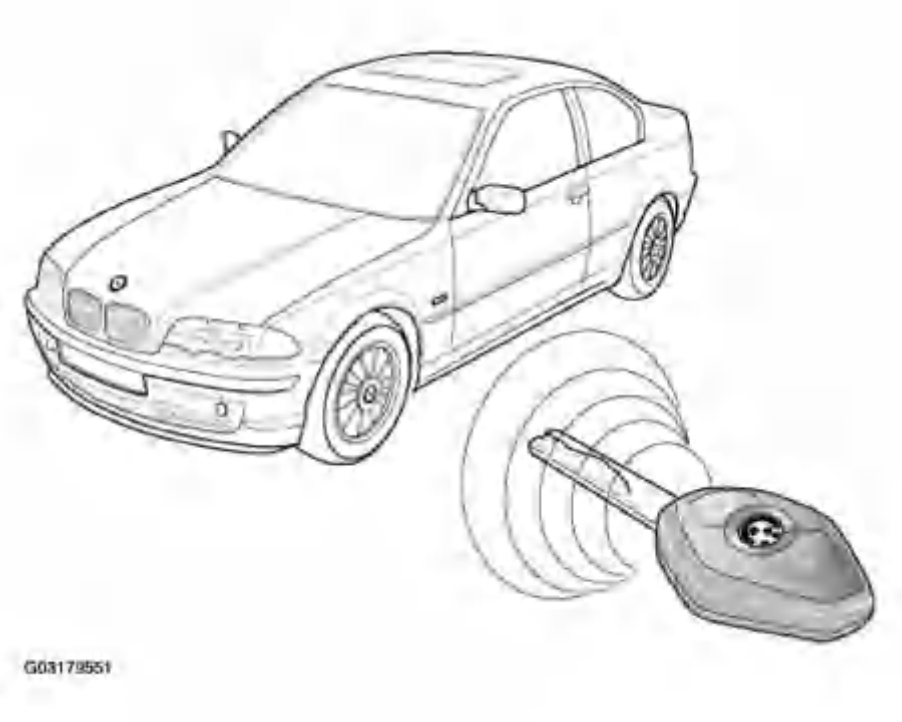


Fig. 1: Identifying New Radio Remote Control
Courtesy of BMW OF NORTH AMERICA, INC.

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

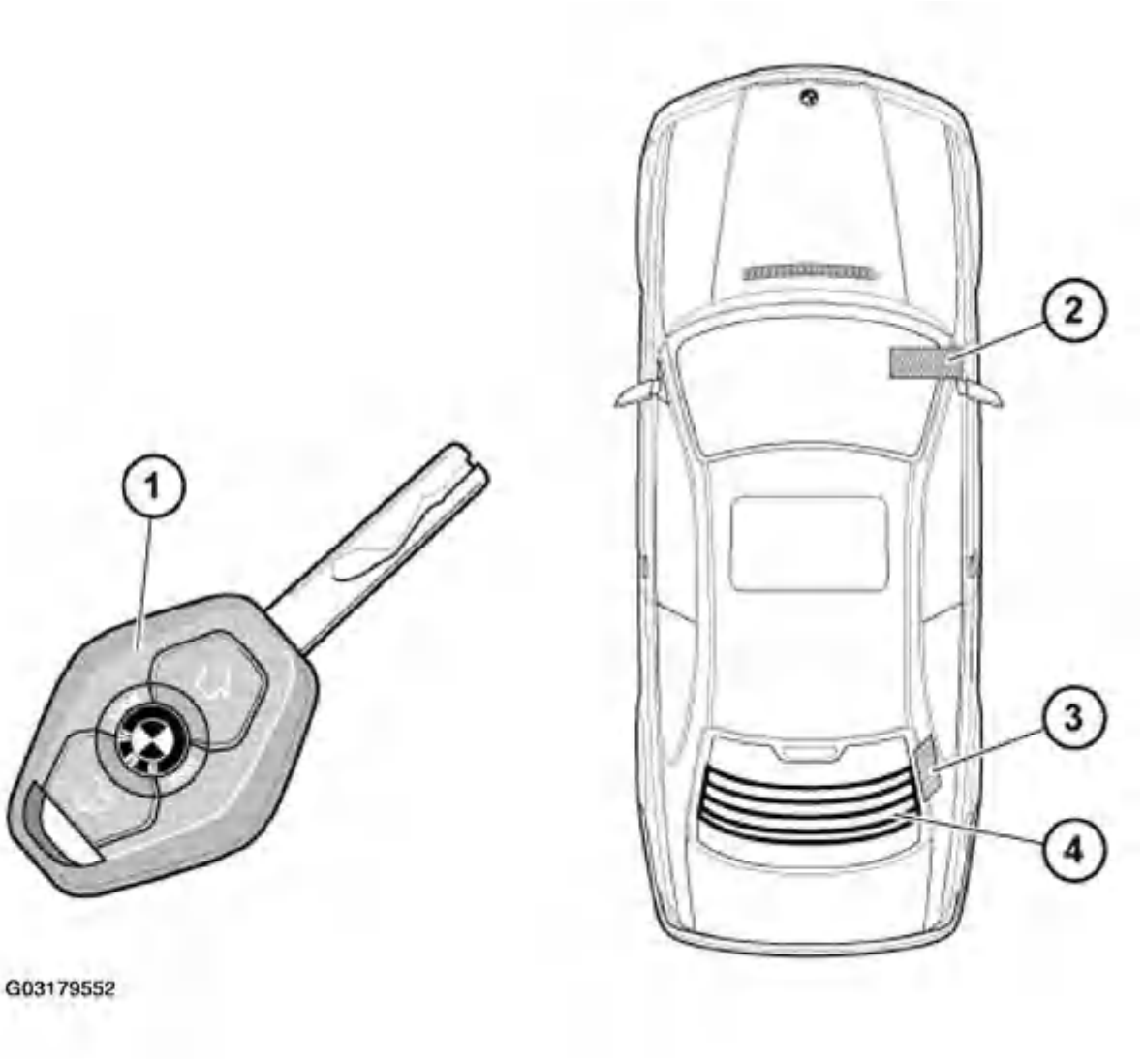


Fig. 2: Identifying RKE Components & Locations
Courtesy of BMW OF NORTH AMERICA, INC.

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).

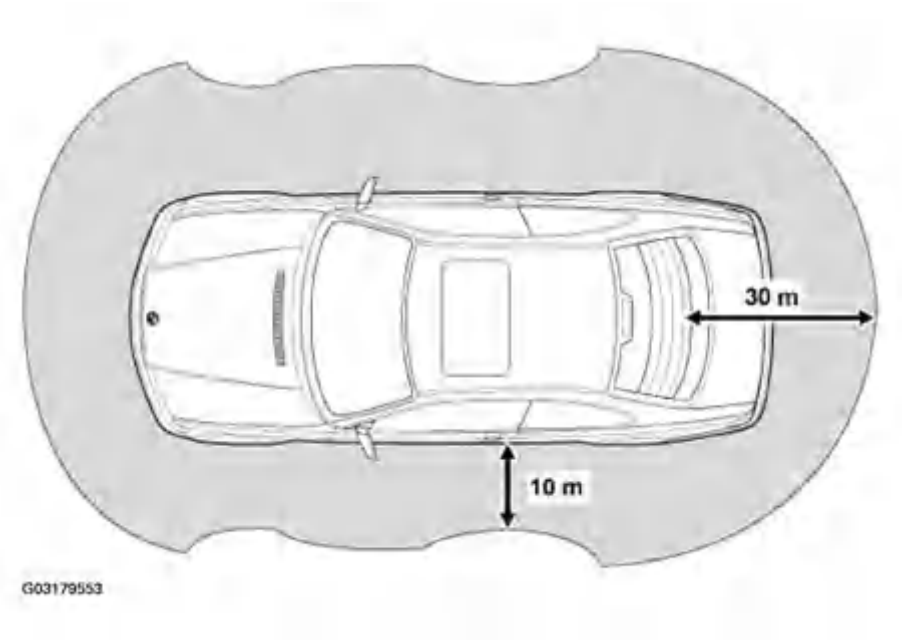


Fig. 3: Identifying RKE Range Of Operation
Courtesy of BMW OF NORTH AMERICA, INC.

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.

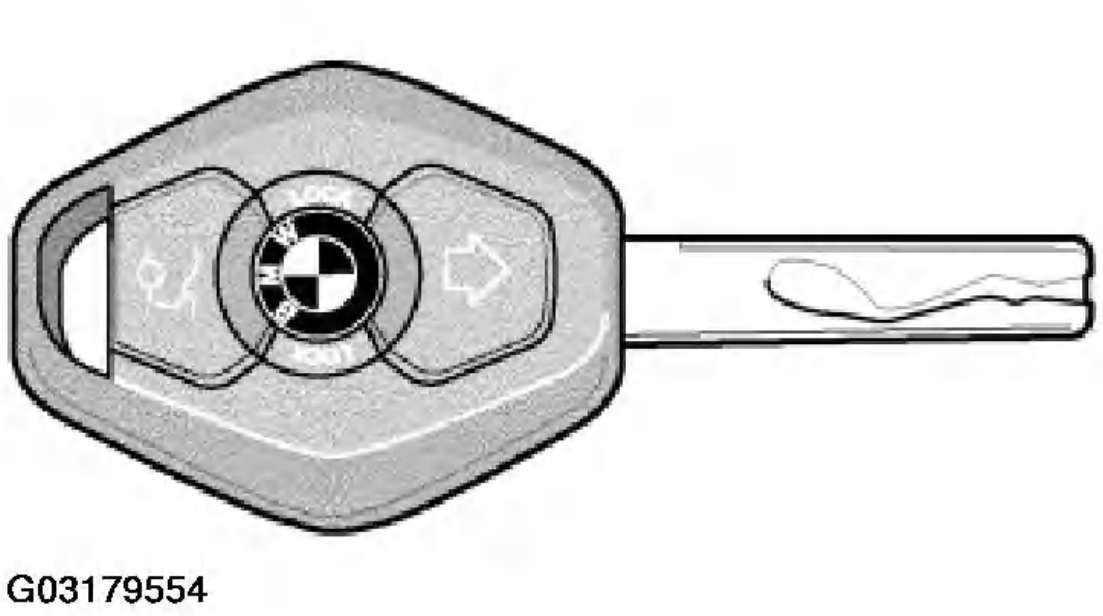


Fig. 4: Identifying New Radio Transmitter (Front Of Key)
Courtesy of BMW OF NORTH AMERICA, INC.

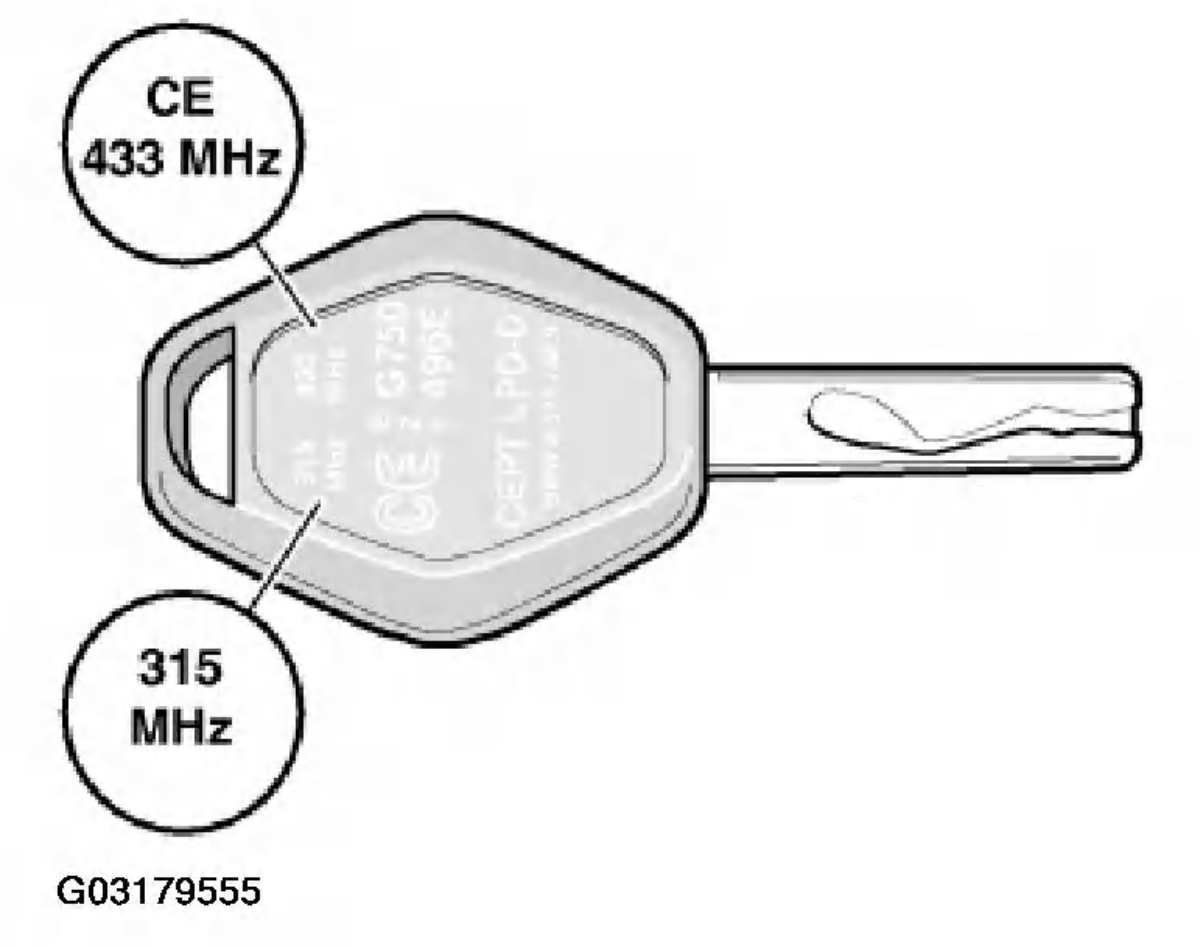


Fig. 5: Identifying New Radio Transmitter (Back Of Key)
Courtesy of BMW OF NORTH AMERICA, INC.

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)

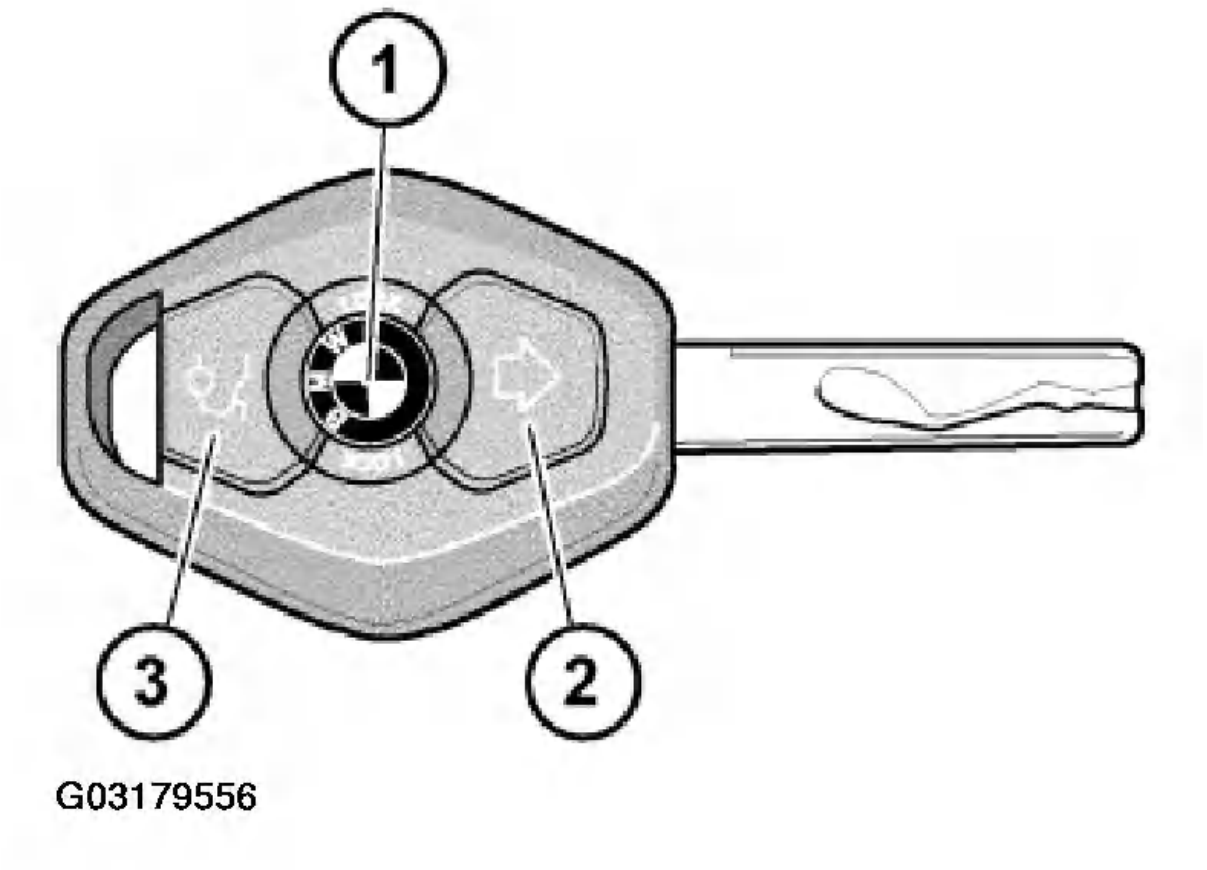


Fig. 6: Identifying RKE Input Buttons
Courtesy of BMW OF NORTH AMERICA, INC.

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.

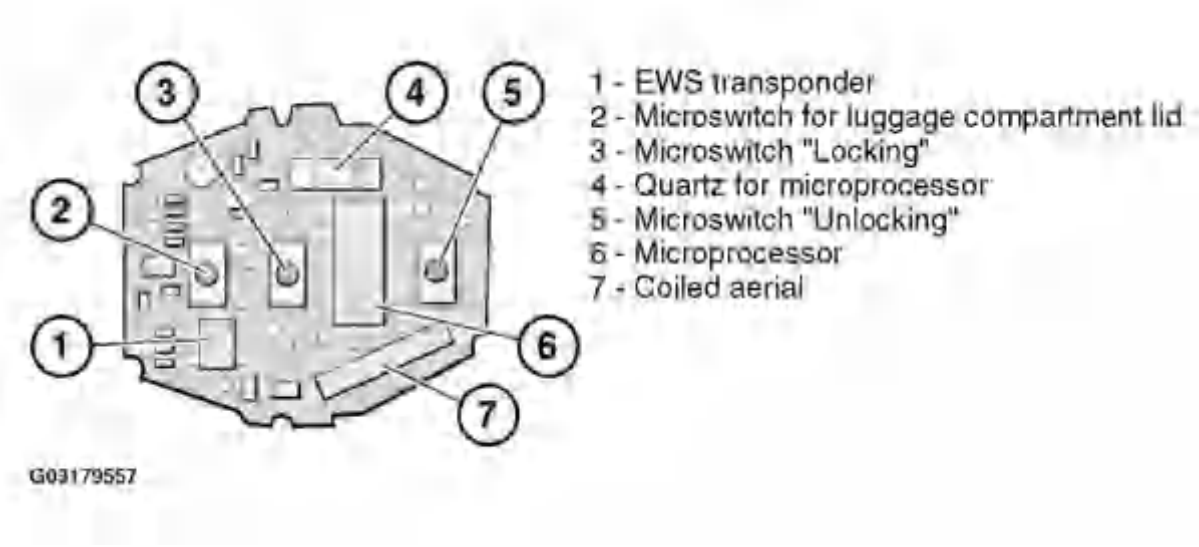


Fig. 7: Identifying RKE Components On Printed Circuit Board Of Key
Courtesy of BMW OF NORTH AMERICA, INC.

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.

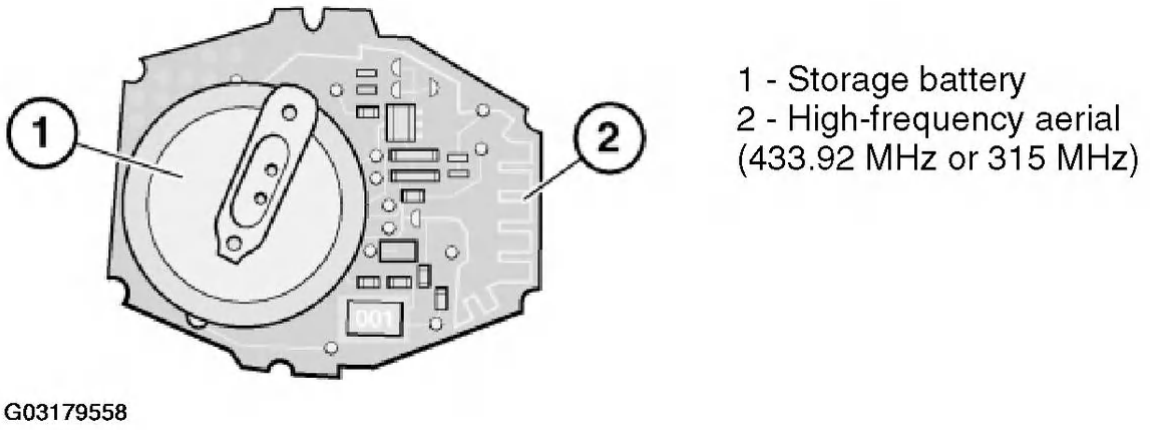


Fig. 8: Identifying Storage Battery And High-Frequency Aerial
Courtesy of BMW OF NORTH AMERICA, INC.

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.

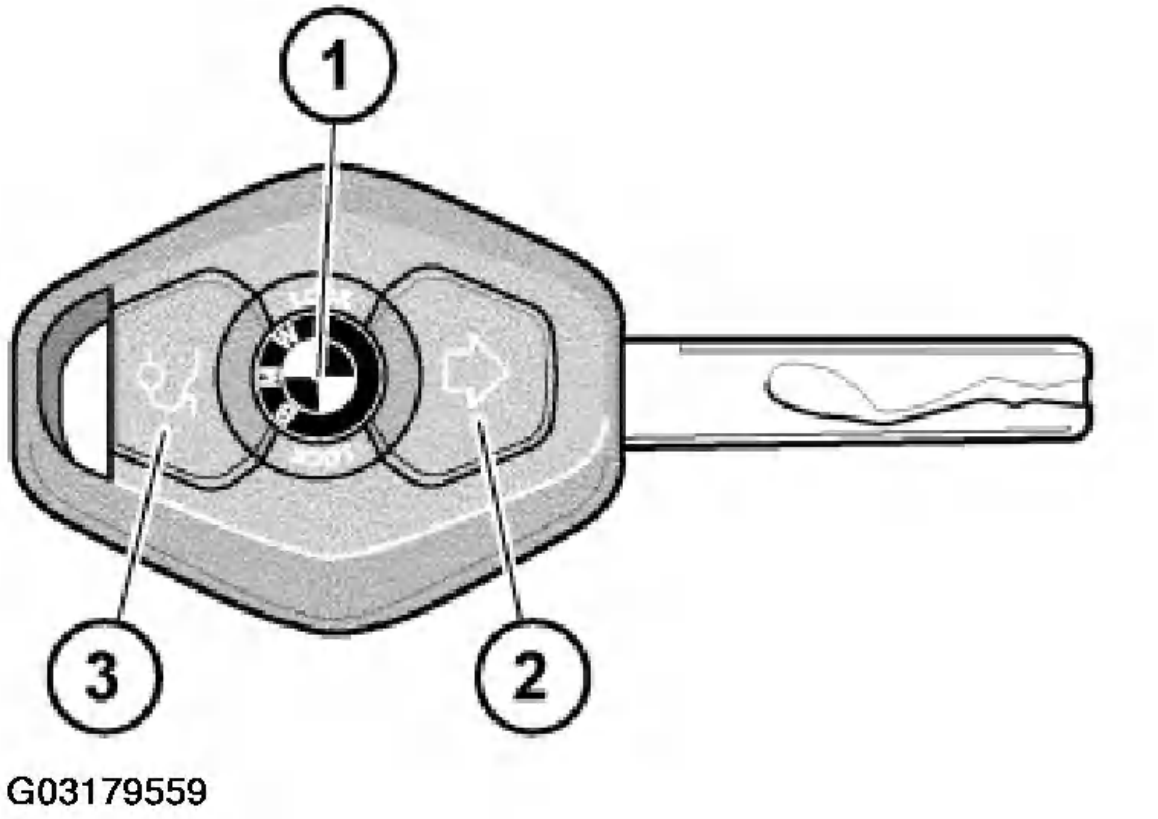


Fig. 9: Identifying RKE Input Buttons
Courtesy of BMW OF NORTH AMERICA, INC.

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.

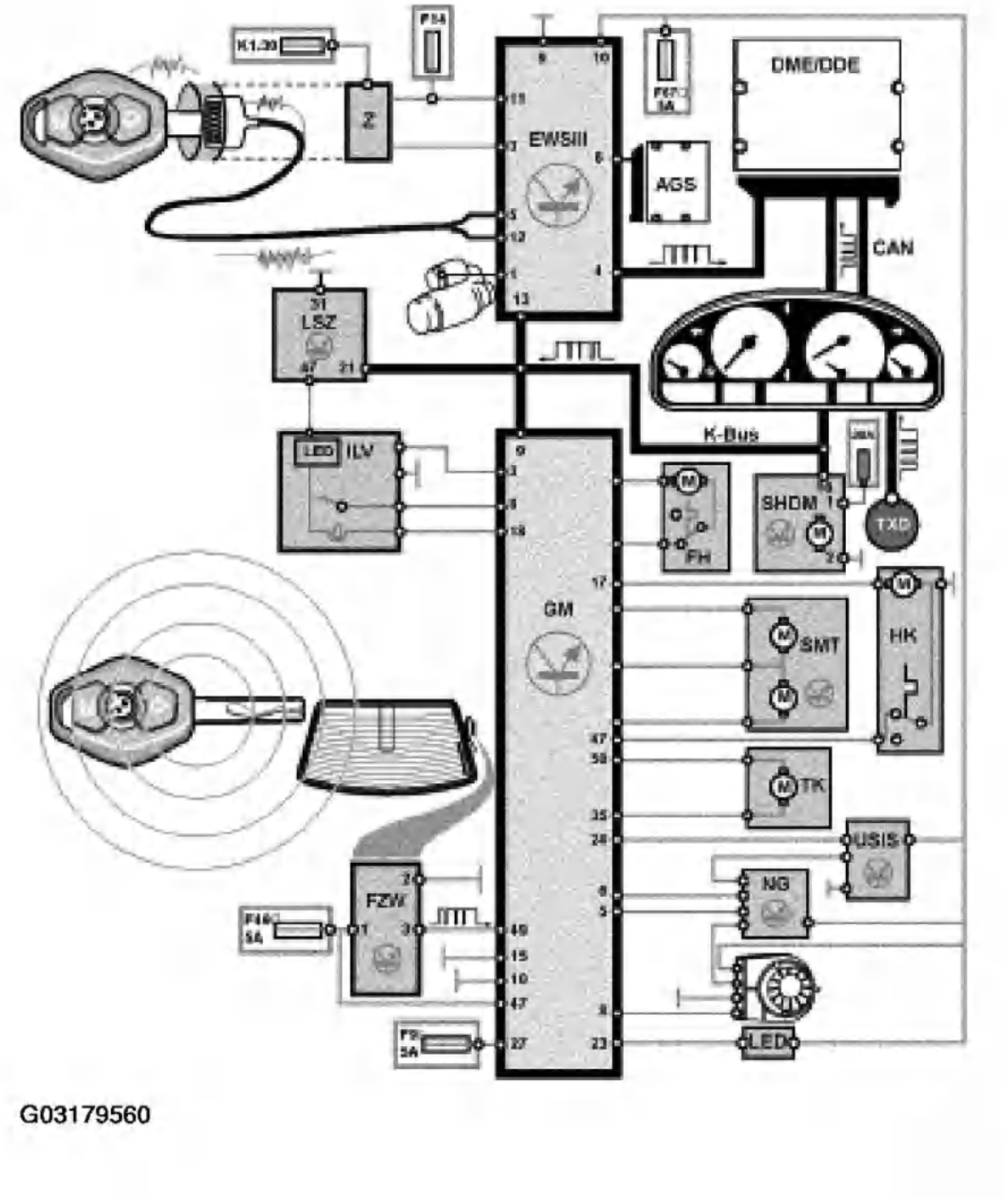


Fig. 10: Identifying System Interconnections And Function (E46 Shown)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Article GUID: A00215458

TROUBLESHOOTING

12 00 ... EXTERNAL JUMP-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 starting cable wires are to appropriate cross-section size.

Only use fuse-protected starting cables.

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 under current - dangerous high tension!

Operation:

Always conform with the procedures to avoid injury to persons or damage to parts.

Select range P in vehicles with an automatic transmission and apply the parking brake.

Move the shift lever of vehicles with manual transmission into neutral and apply the parking brake.

Ensure that the starting cables cannot get caught in rotating parts, e.g. fan.

First connect both positive poles of the batteries with one starting cable (red).

Use the positive connection point in the engine compartment for vehicles with the battery in the trunk.

Then connect the second starting cable (black) between the negative pole of the current supplying battery and engine or body earth of the vehicle to be started.

CAUTION: Never connect the second starting cable (black) on the negative pole of the battery in the vehicle to be started. Produced gas could be ignited by sparks.

Danger Of Explosion!

If the battery in the vehicle supplying power is weak, start the engine of this vehicle and let it run at idling speed.

After the engine of the vehicle to be started has started up, first disconnect the starting cable on the negative pole/earth connection. Then remove the starting cable from the positive poles.

12 00 ... EXTERNAL JUMP-STARTING AID AND CAR TELEPHONE!

Siemens C 2:

When starting the vehicle engine with outside help from another vehicle, remember that overvoltage could

damage the Siemens C 2 telephone. For this reason, always disconnect the sender and receiver from the electric system before using outside starting aids.

Siemens C 3 And Motorola C 451:

Senders and receivers of Siemens C 3 and Motorola C 451 telephones are protected against overvoltage, but calls may not be made or received during outside starting.

Always pay attention to the operating instructions of different type and different make telephones. In case of doubt disconnect the sender and receiver from the vehicle electric system.

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:

- Disconnecting battery, refer to 12 00 ... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY .
- Battery charging, refer to 61 00 ... BATTERY CHARGING .
- External jump-starting aid, refer to 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 sulfated and/or heavily contaminated plates will also lead to incorrect acid density test results.

61 00 ... BATTERY CARE AND MAINTENANCE

Safety instructions for handling vehicle battery, refer to 61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY .

Electrolyte level of present low-maintenance batteries should be checked at least annually and corrected to max. mark (specified by battery supplier) with distilled water when necessary.

Due to the increasing number of control units used in vehicles today, discharging by the power consumption of control units even in standby mode is added to the natural self-discharging of a battery. In order to achieve the battery service life and to avoid total discharging, recharge the batteries of stored vehicles at the latest every 6 weeks. The time for self-discharging depends on vehicle model and equipment.

61 00 ... 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. Refer to 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 00 ... EXTERNAL JUMP-STARTING AID

Do not start the engine with help of starting sprays.

Preparations:

Conform with the following when starting engine with starting cable.

1. Ensure that starting cable wires are of appropriate cross-section size.
2. Only use fuse-protected starting cables.
3. Check whether the current supplying battery has 12 V voltage.
4. If the engine is started from the battery of another vehicle, ensure that there is no contact between the bodies of both vehicles.

If the battery in the current-supplying vehicle is weak, start the engine of this vehicle and let it run at idling speed.

IMPORTANT: Do not touch any live components of the ignition system. High voltage - mortal danger! Refer to 12 00 ... WORKING INSTRUCTIONS FOR IGNITION SYSTEM, DME (DIGITAL MOTOR ELECTRONICS) AND ENGINE ELECTRICS and 12 00 ... BREAKERLESS IGNITION DISTRIBUTION .

Procedures:

Always conform with the procedures to avoid injury to persons or damage to parts.

Select range P in vehicles with an automatic transmission and apply the parking brake.

Move the shift lever of vehicles with manual transmission into neutral and apply the parking brake.

Ensure that the starting cables cannot get caught in rotating parts, e.g. fan.

First connect both positive poles of the batteries with one starting cable (red).

Use the positive connection point in the engine compartment for vehicles with the battery in the trunk.

Then connect second starting cable (black) between negative terminal of current-supplying battery and engine or body earth of vehicle to be started.

IMPORTANT: Never connect the second starting cable (black) on the negative pole of the battery in the vehicle to be started. Produced gas could be ignited by sparks.

Danger Of Explosion!

After engine of vehicle to be started has started up, first disconnect starting cable at negative terminal/earth connection. Then remove the starting cable from the positive poles.

61 00 ... EXTERNAL JUMP-STARTING AID AND CAR TELEPHONE!

Siemens C 2:

When starting engine with assistance of another vehicle, remember that overvoltage could damage the Siemens C 2 telephone. For this reason, always disconnect the sender and receiver from the electric system before using outside starting aids.

Siemens C 3 And Motorola C 451:

Sensors and receivers of Siemens C 3 and Motorola C 451 telephones are protected against overvoltage, but calls may not be made or received during external starting procedures.

Always pay attention to the operating instructions of different type and different make telephones. In case of doubt, disconnect sensor and receiver from vehicle electrical system.

61 00 ... IMPORTANT WHEN ENGINE BONNET RAISED TO WORKING POSITION

CAUTION: Do not switch on windscreen wipers with the engine hood raised! In case of unfavorable tolerances, the wiper arm on driver's side could collide with the engine hood and windscreen when the wipers are switched on. Remove fuse for windscreen wipers to avoid damaging engine bonnet and windscreen.

61 00 ... IMPORTANT WITH CONNECTED BATTERY!

Safety instructions for handling vehicle battery. Refer to 61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY .

Work on components, terminal connections, etc. could result in errors being stored in the fault memories of the affected control units.

61 00 ... REPAIRING AIR BAG CABLES

Refer to 61 00 ... REPAIRING AIRBAG CABLES .

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 00 ... WORKING INSTRUCTIONS FOR REMOVING AND INSTALLING ELECTRONIC CONTROL UNIT

CAUTION: Disconnecting the vehicle battery will cancel the fault memories of control units. For this reason, prior to disconnection of the vehicle battery fault

memories should be interrogated and faults printed by the printer of a BMW Service tester. Investigate stored faults. Ignition must always be switched off before disconnecting or connecting control-unit connectors. Removal and installation of components, relays, fuse, etc. could cause the storage of faults in fault memories of control units capable of self-diagnosis. For this reason, fault memories must always be interrogated after working on the electrical system. Stored faults must be investigated and cancelled.

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.

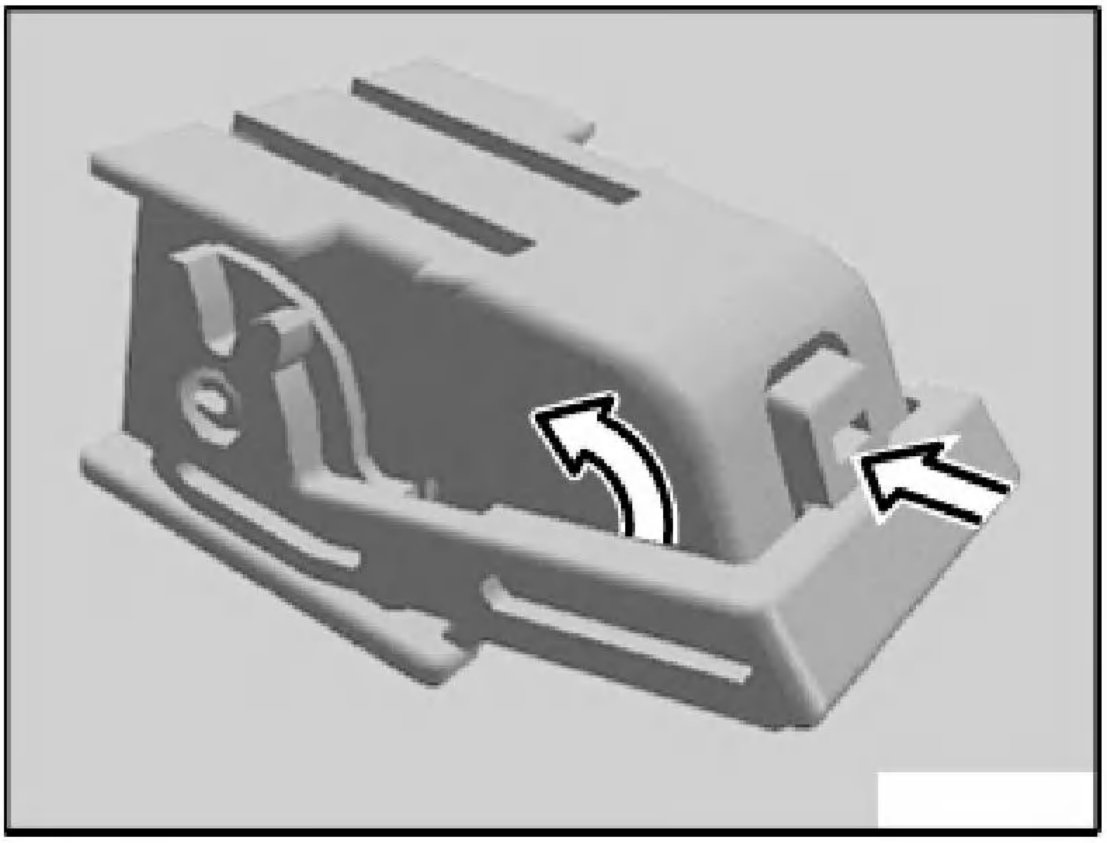


Fig. 1: Pressing Lock And Open Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection.

Press lock and open clip in direction of arrow.

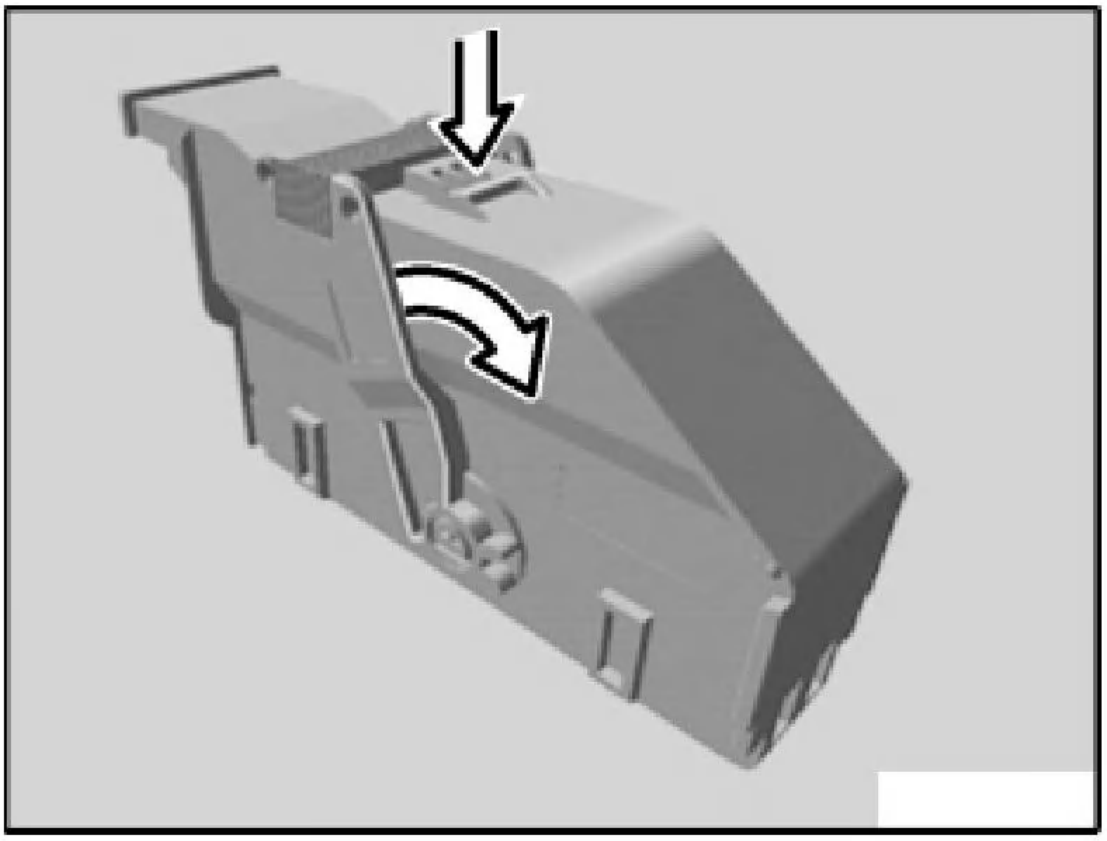


Fig. 2: Pressing Lock And Open Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection.

Open clip in direction of arrow and disconnect plug connection in direction of arrow.

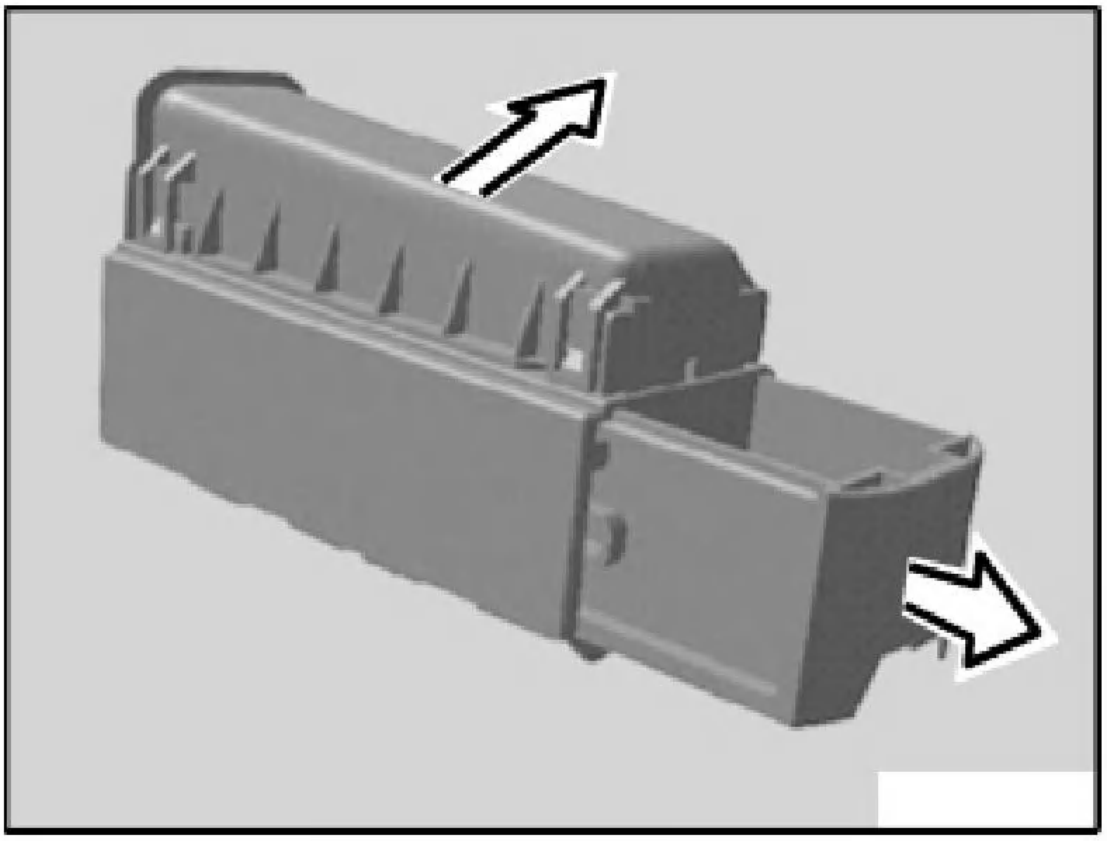


Fig. 3: Opening Clip And Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

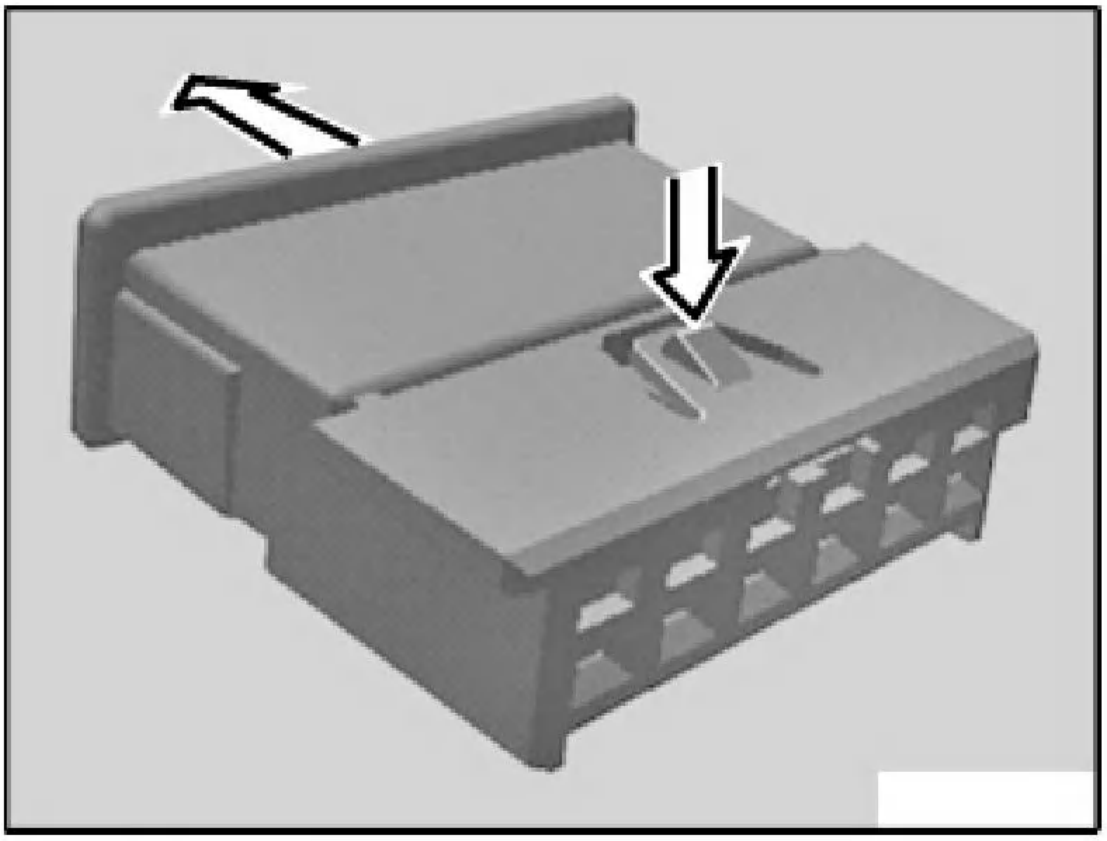


Fig. 4: Pressing Lock And Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

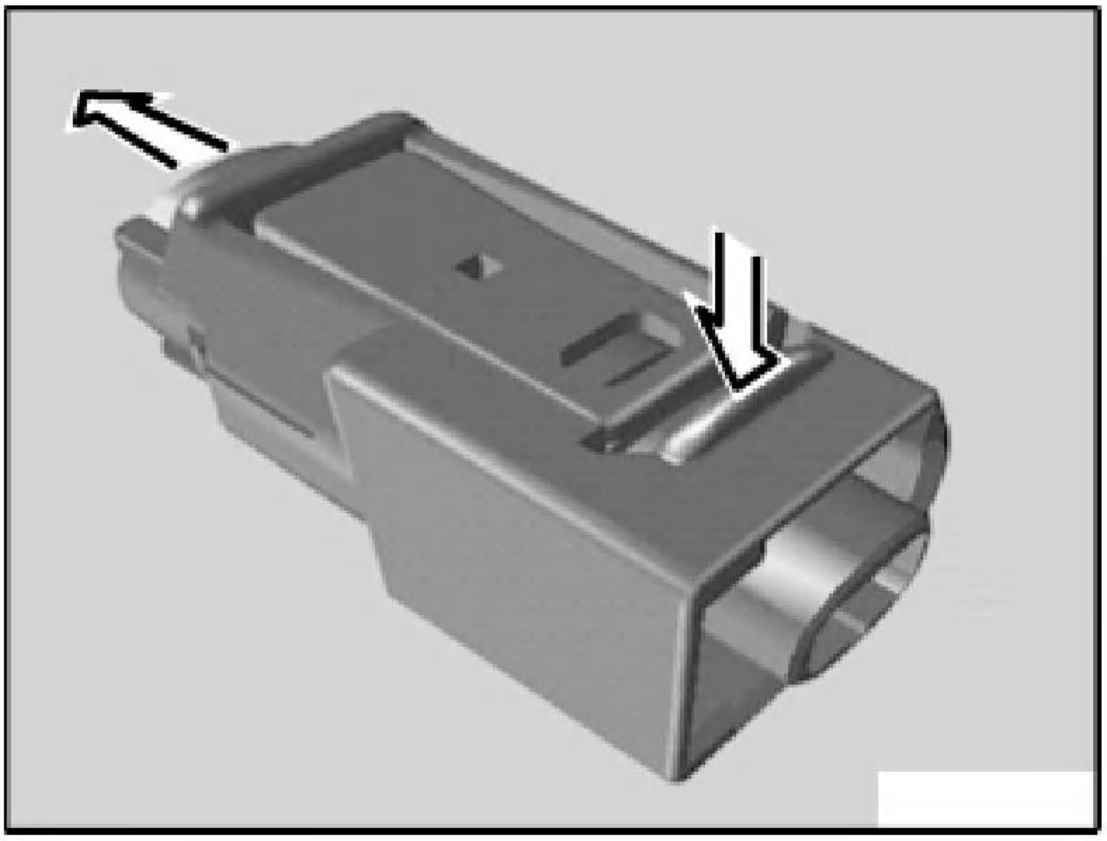


Fig. 5: Pressing Lock And Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

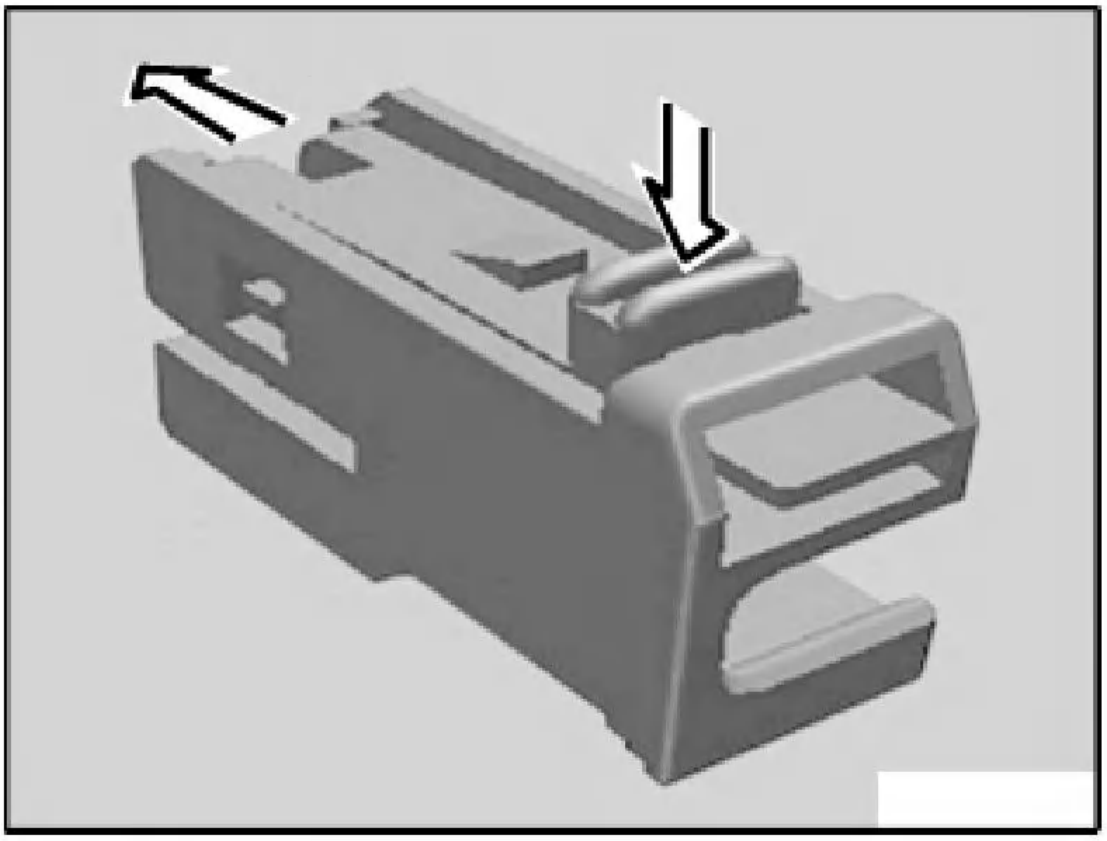


Fig. 6: Pressing Lock And Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

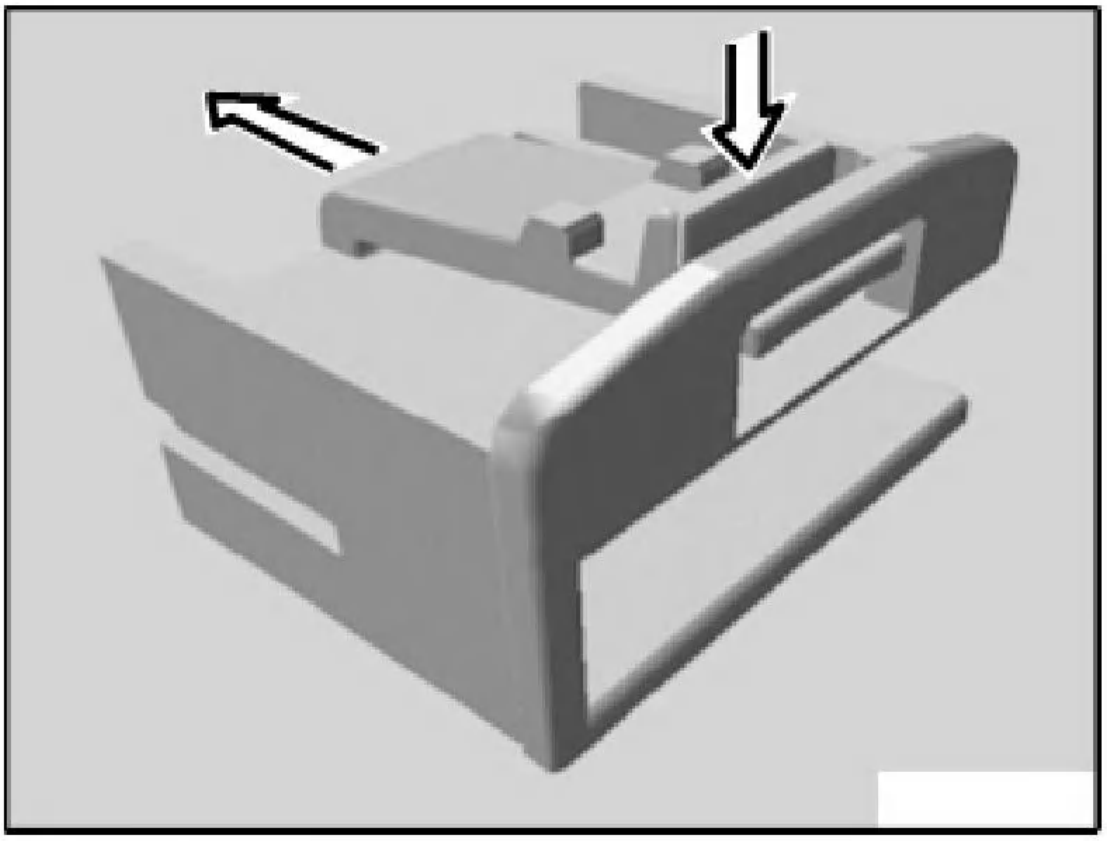


Fig. 7: Pressing Lock And Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

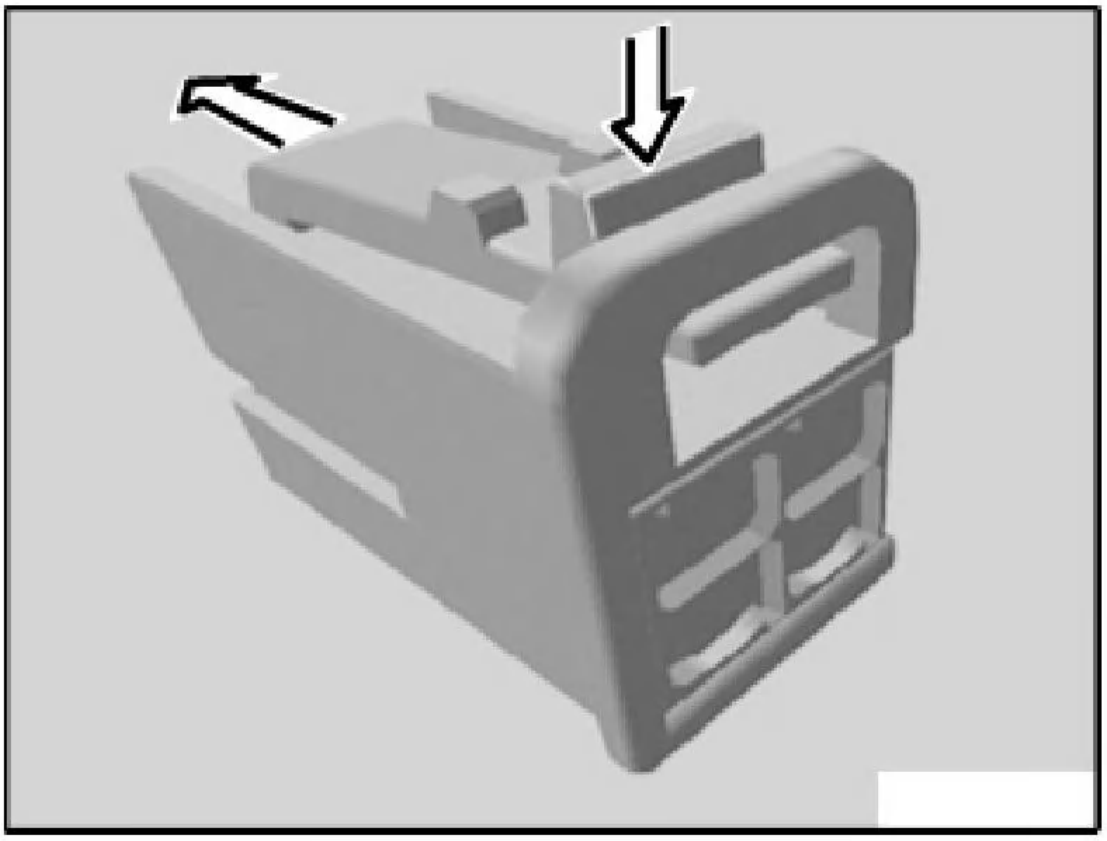


Fig. 8: Pressing Lock And Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and disconnect plug connection in direction of arrow.

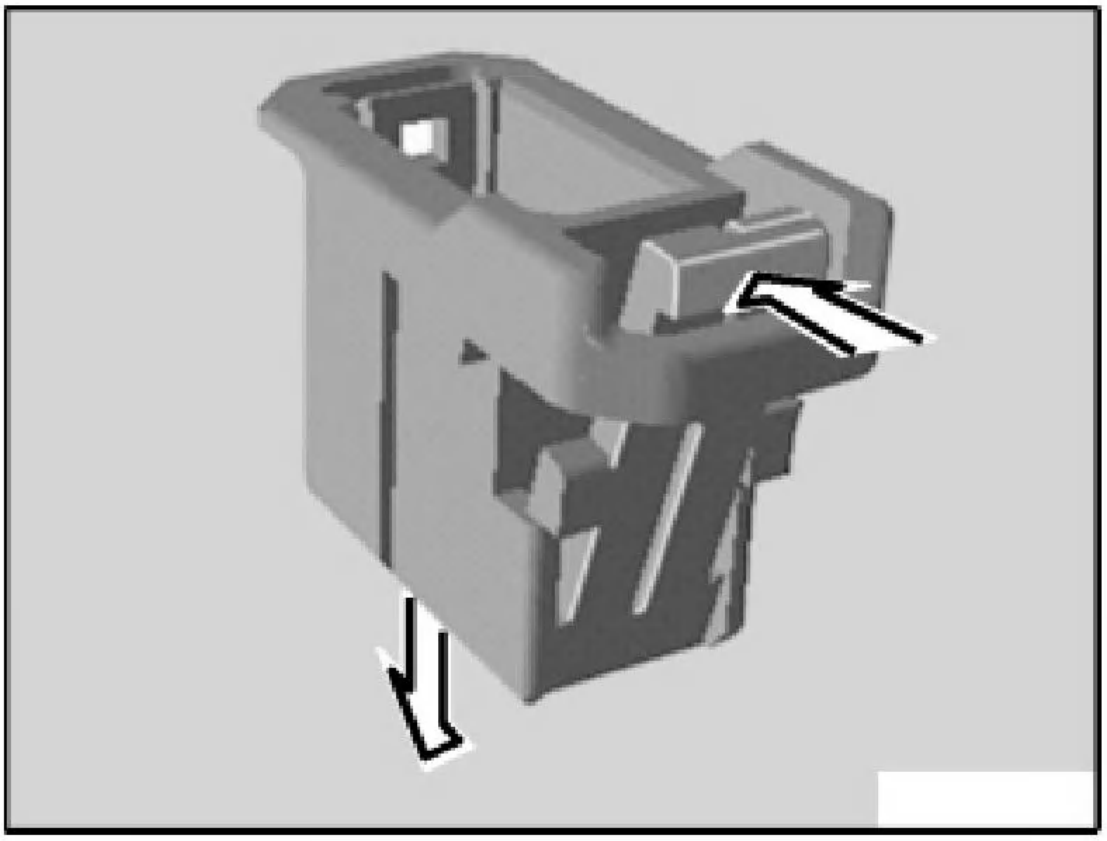
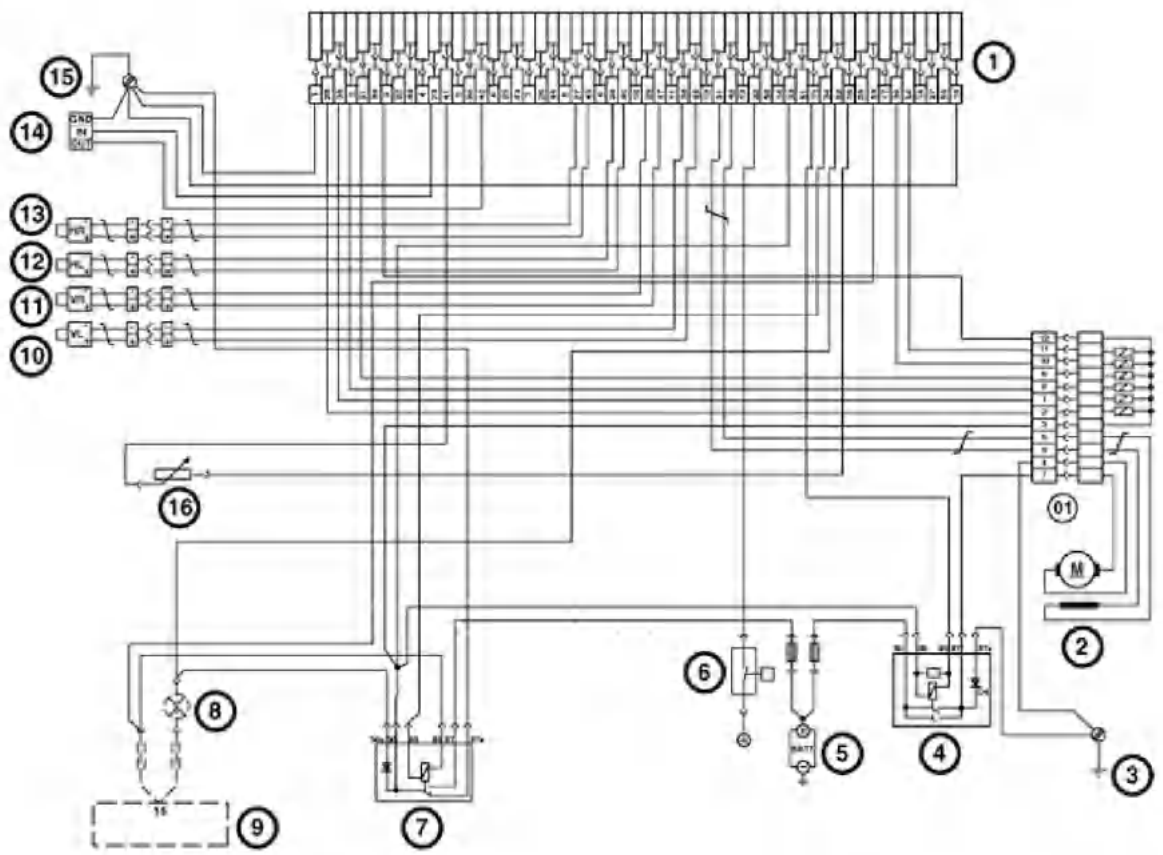


Fig. 9: Pressing Lock And Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

AUXILIARY CABLE

61 12 ... ABS WIRING DIAGRAM



1	ABS control unit	9	Ignition lock, terminal 15
2	Engine sensor	10	Sensor, front left
3	Earth	11	Sensor, front right
4	Pump relay	12	Sensor, rear left
5	Battery	13	Sensor, rear right
6	Brake-light switch	14	Diagnosis connector
7	Master relay	15	Earth
8	ABS warning light	16	Travel sensor

G03179224

Fig. 10: Wiring Diagram - ABS
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For troubleshooting pin assignment, refer to INTRODUCTION in Pin Voltage Charts.

61 12 515 REPLACING BOTH FRONT IMPULSE SENSORS FOR ABS

NOTE: Remove front wheel, refer to 36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL .

Open protective box for ABS sensor.

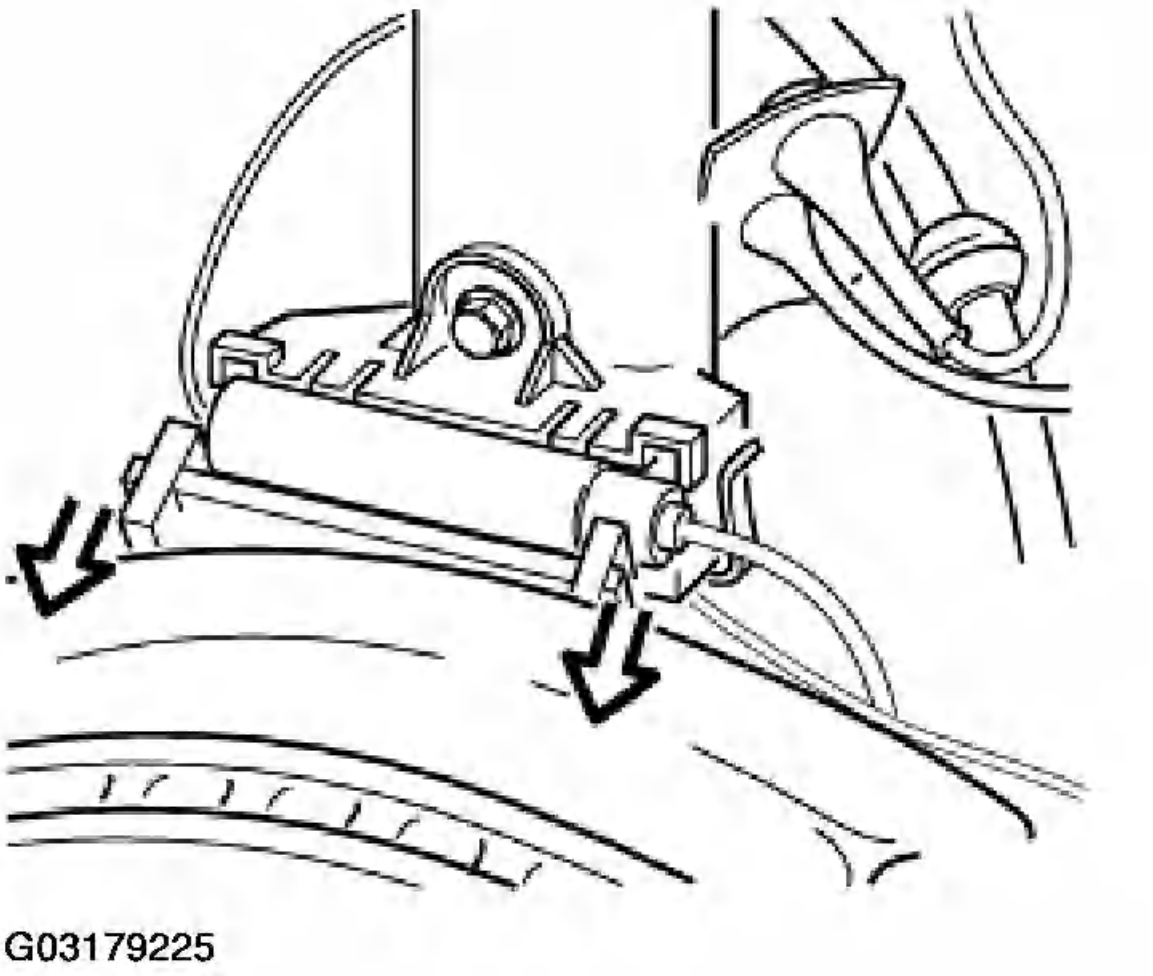


Fig. 11: Opening Protective Box For ABS Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Procedures for front-left sensor are analogous to those for front-right sensor.

Lift out plug-in connection.

Disconnect plug-in connection.

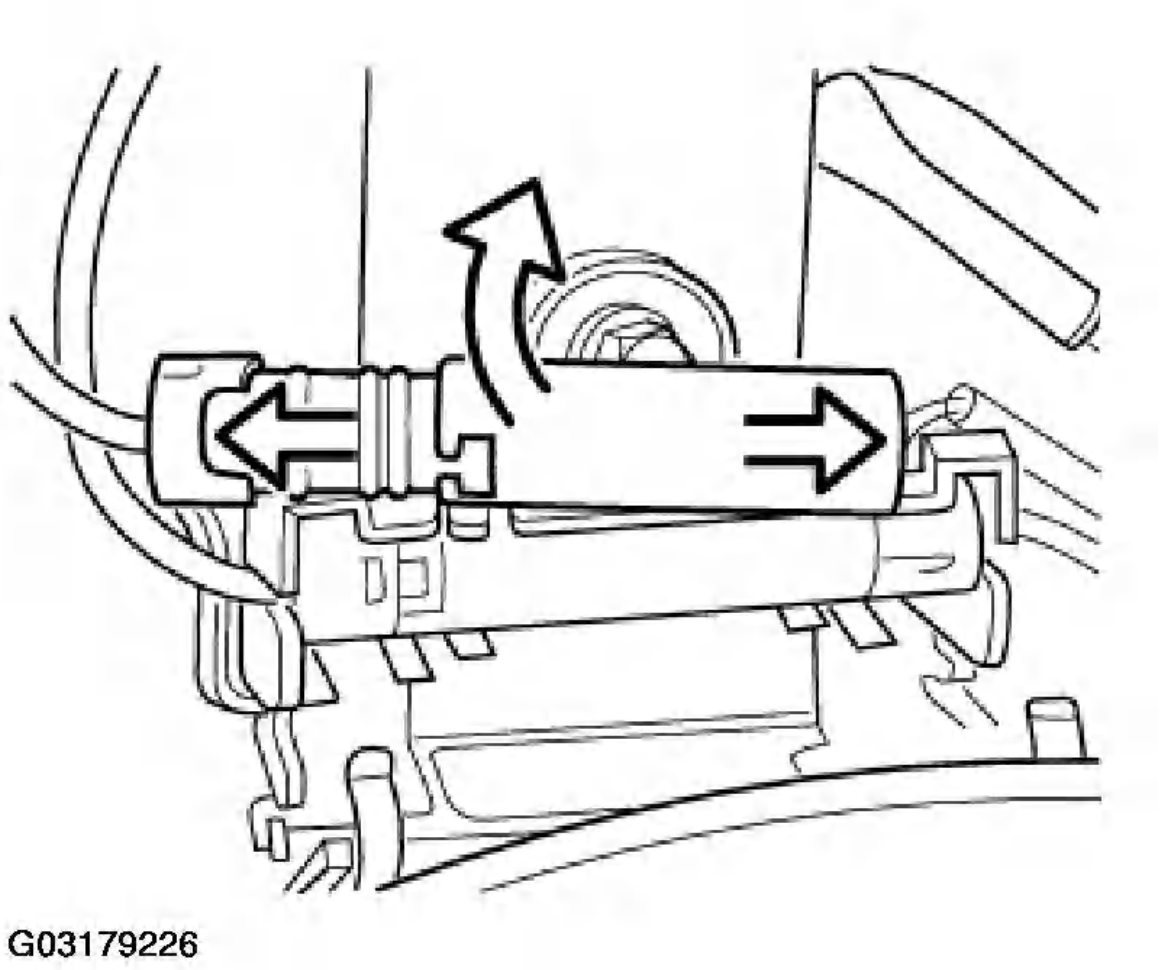


Fig. 12: Lifting Out Plug-In Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew hexagon screw.

Lift out sensor.

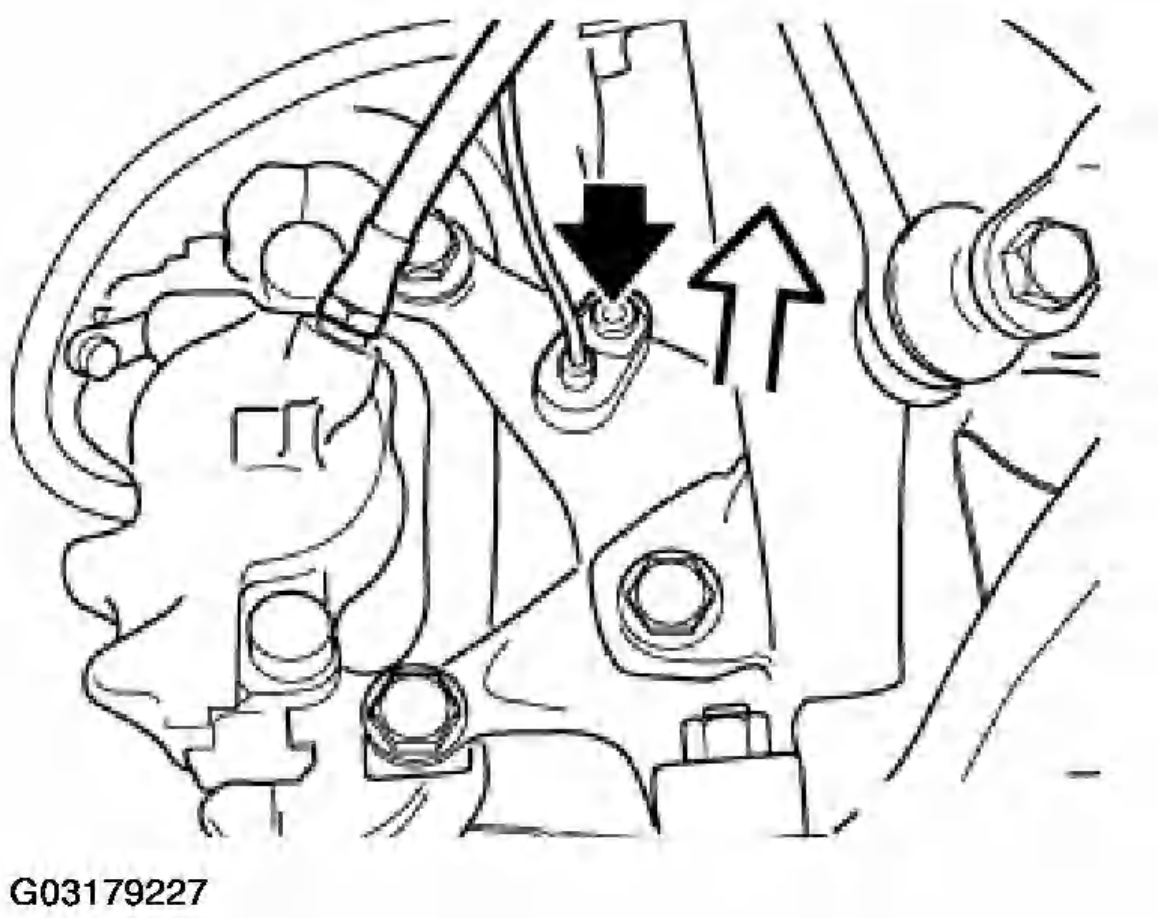


Fig. 13: Lifting Out Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean and lubricate dowel-pin bore with Staborax NBU 12/k.

61 12 525 REPLACING BOTH REAR IMPULSE SENSORS FOR ABS

NOTE: Remove rear wheel, refer to 36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL .

Open protective box for ABS sensor.

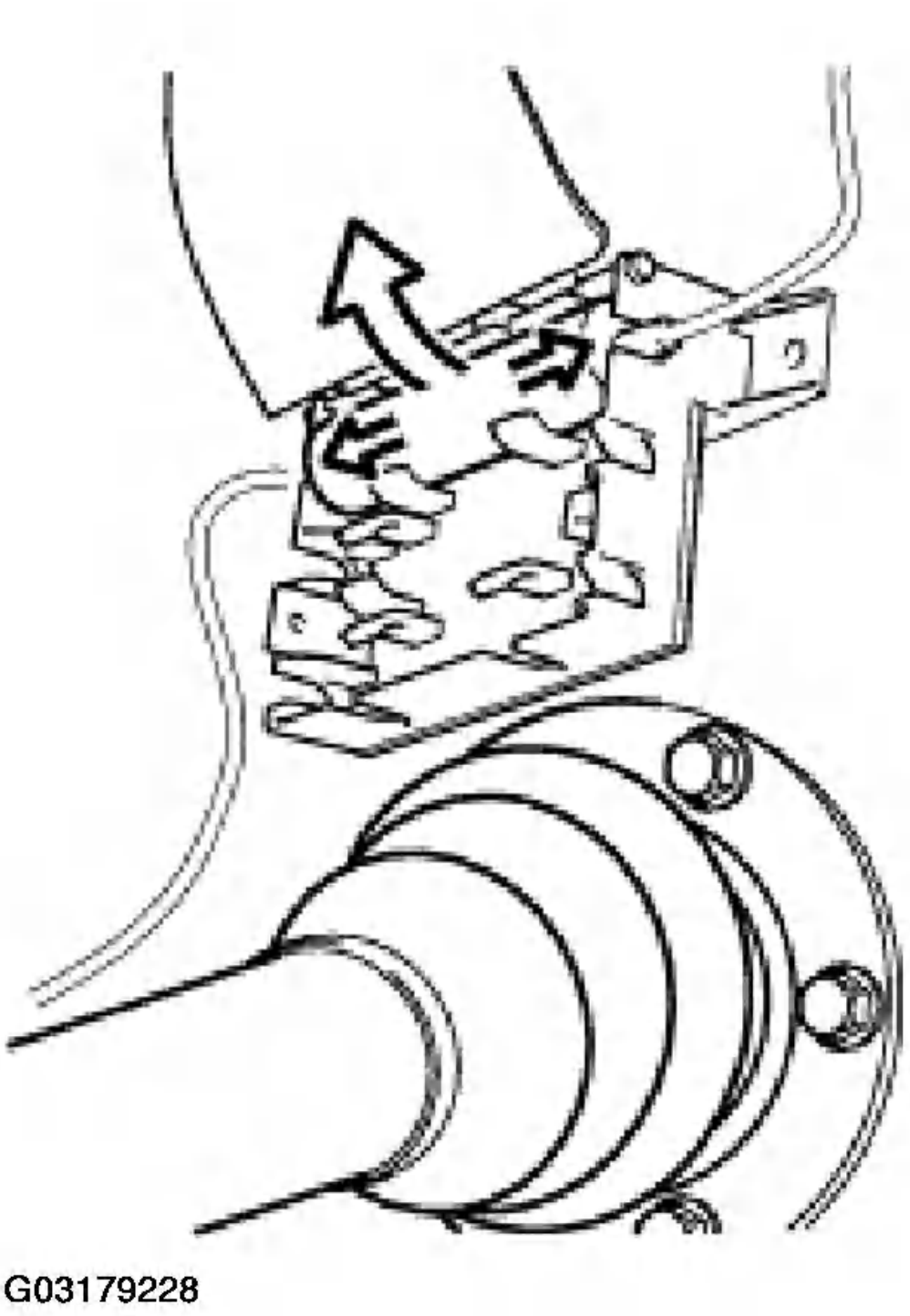


Fig. 14: Opening Protective Box For ABS Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Procedures for rear-left sensor are analogous to those for rear-right sensor.

Lift out plug-in connection.

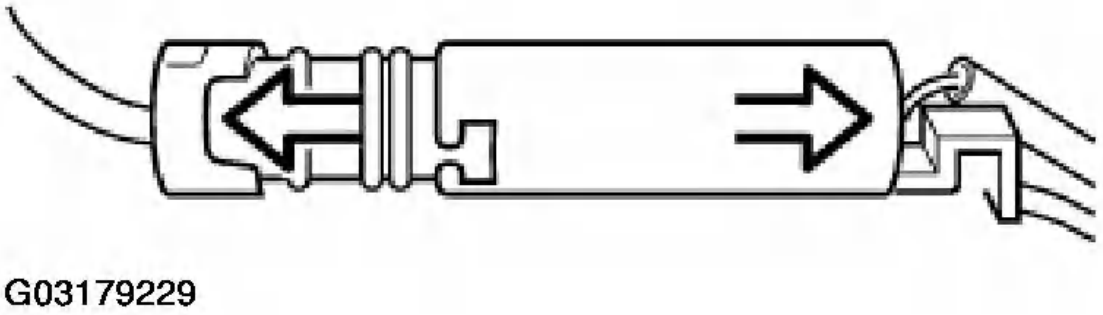


Fig. 15: Lifting Out Plug-In Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect connector.

Unscrew hexagon screw.

Lift out sensor.

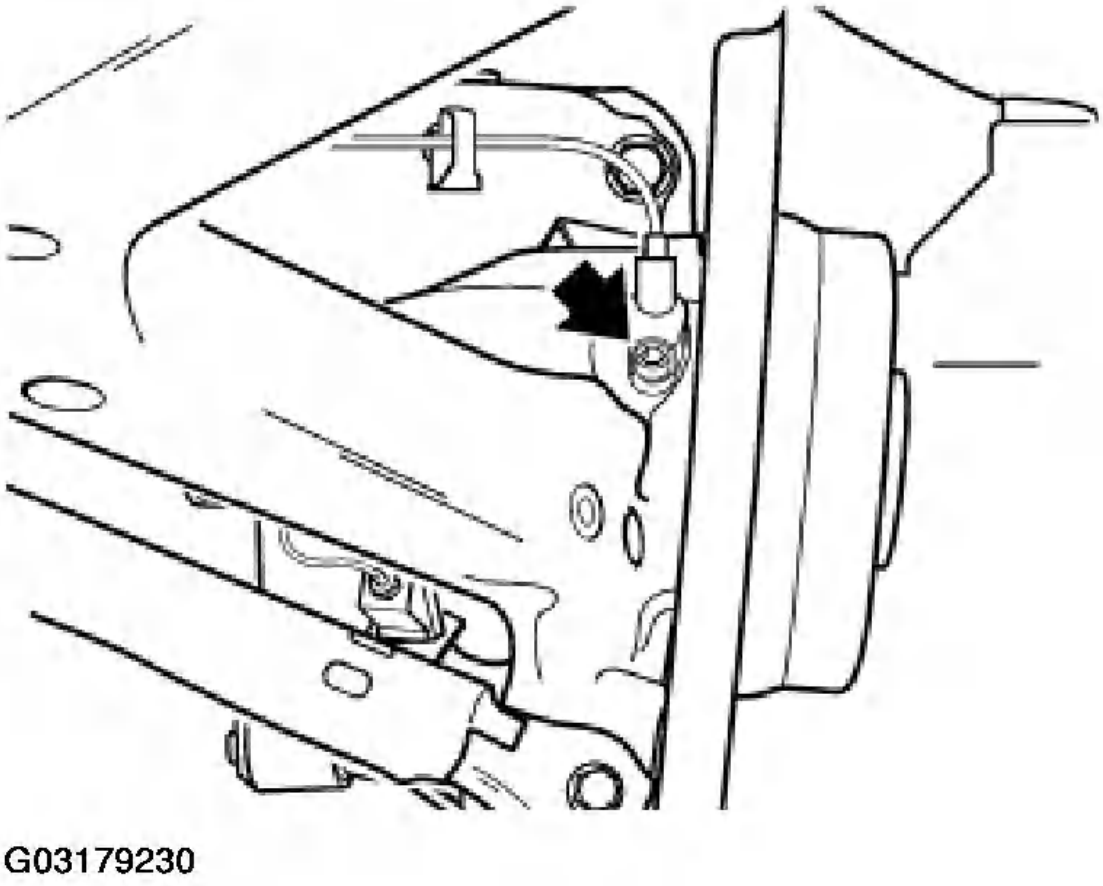


Fig. 16: Lifting Out Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean and lubricate dowel-pin bore with Staborax NBU 12/k, refer to BMW Parts Service.

61 13 .. UNLOCKING AND DISCONNECTING DIFFERENT PLUG CONNECTIONS

Refer to 61 13 .. UNLOCKING AND DISCONNECTING DIFFERENT PLUG CONNECTIONS .

PLUG CONNECTION, TERMINAL

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..

Safety Regulations:

Safety regulations for handling components of airbag system, refer to AIR BAG SAFETY PRECAUTIONS .

Instructions for disconnecting and connecting battery, refer to 12 00 ... 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, 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 installing and removing contacts, refer to 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, 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 installing and removing contacts, refer to 61 13 ... OPENING PLUG HOUSINGS AND REMOVING CONTACTS OF DIFFERENT PLUG SYSTEMS .

61 13 ... DME MASTER RELAY CONNECTOR

Unlock locking flap (1) of corresponding cable.

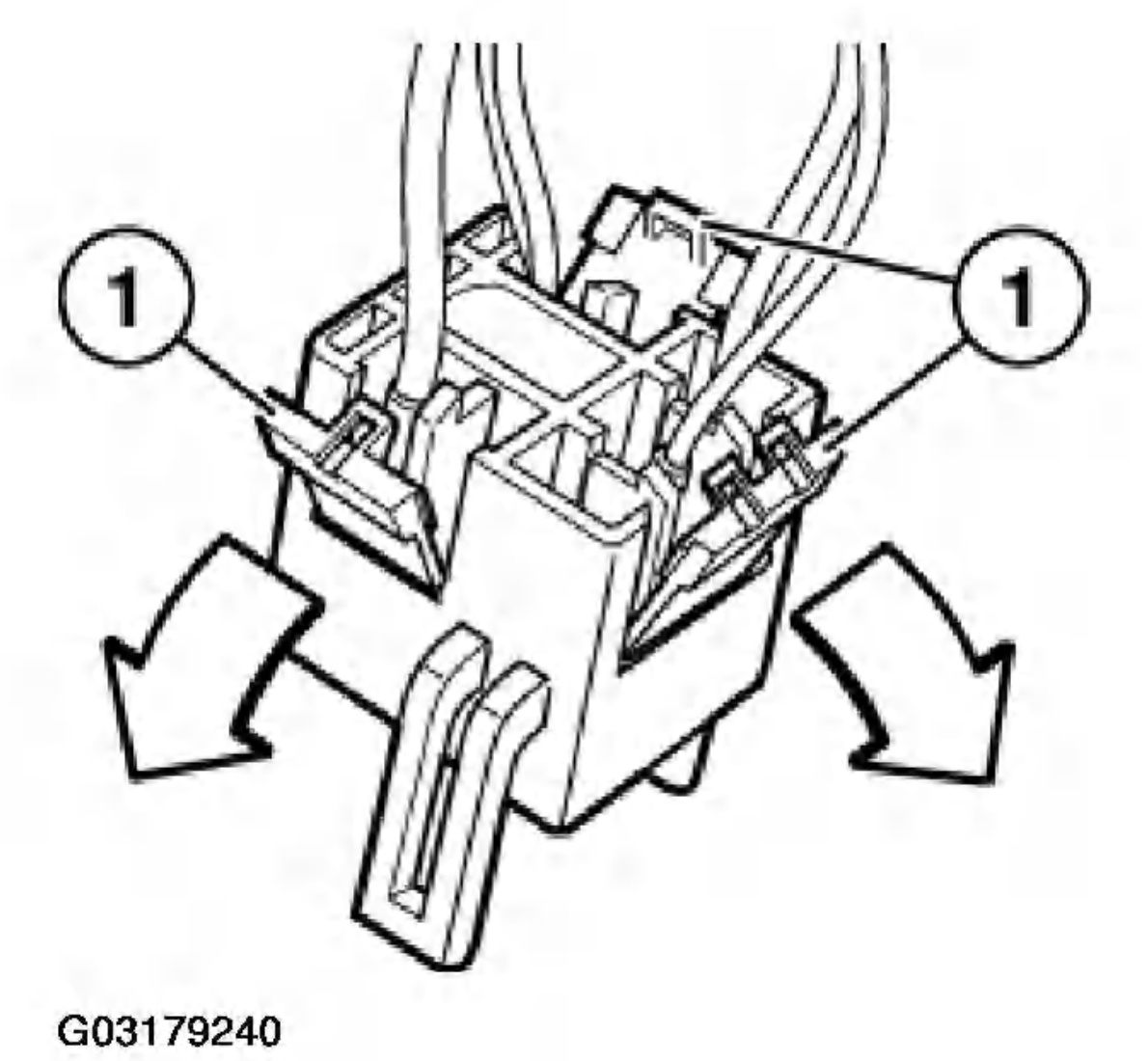


Fig. 17: Unlocking Locking Flap Of Corresponding Cable
Courtesy of BMW OF NORTH AMERICA, INC.

With special tool 61 1 136 or 61 1 137 (ejector), press back arrester hook (2) of appropriate contact and pull out cable.

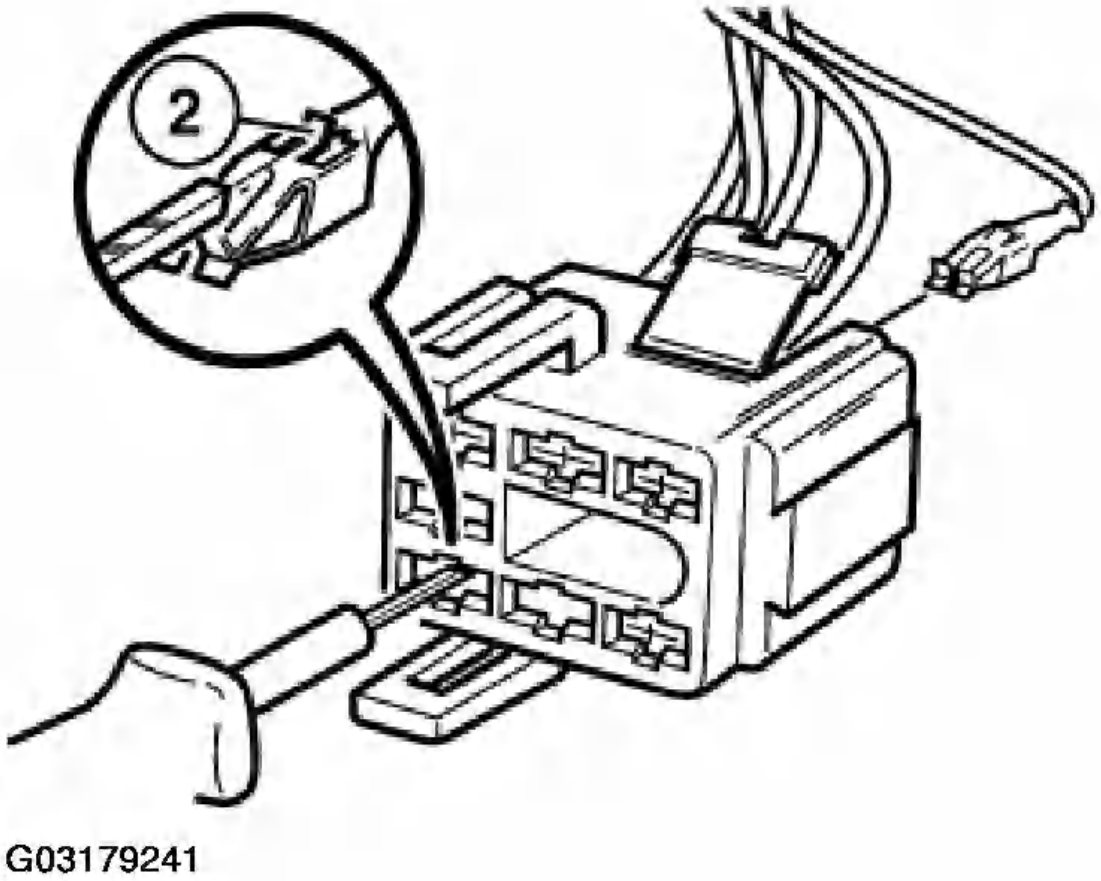


Fig. 18: Pressing Back Arrester Hook Of Appropriate Contact Using Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

61 13 SPECIAL TOOLS FOR WIRING HARNESS REPAIRS

NOTE: For Special Tools identification, see SPECIAL TOOLS - Z3 .

Special Tools Required:

- 61 1 150
- 61 1 190
- 61 4 320
- 61 8 084
- 61 9 020
- 61 9 029
- 61 9 041
- 61 9 042
- 61 9 043
- 61 9 044

Repair ranges I, II, III for vehicle electrical system.

I. Order No.: 81 24 9 408 080.
II. Order No.: 81 24 9 408 300.

III. Order No.: 81 24 9 408 400.



Fig. 19: Identifying Wiring Harness Repairs Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Repair range IV for vehicle electrical system, special tool 61 9 020:

Contents:

- Special tool 61 9 041 (hand pliers).
- Special tool 61 9 042 (matrix).
- Special tool 61 9 043 (wire stripper).
- Special tool 61 9 044 (matrix).

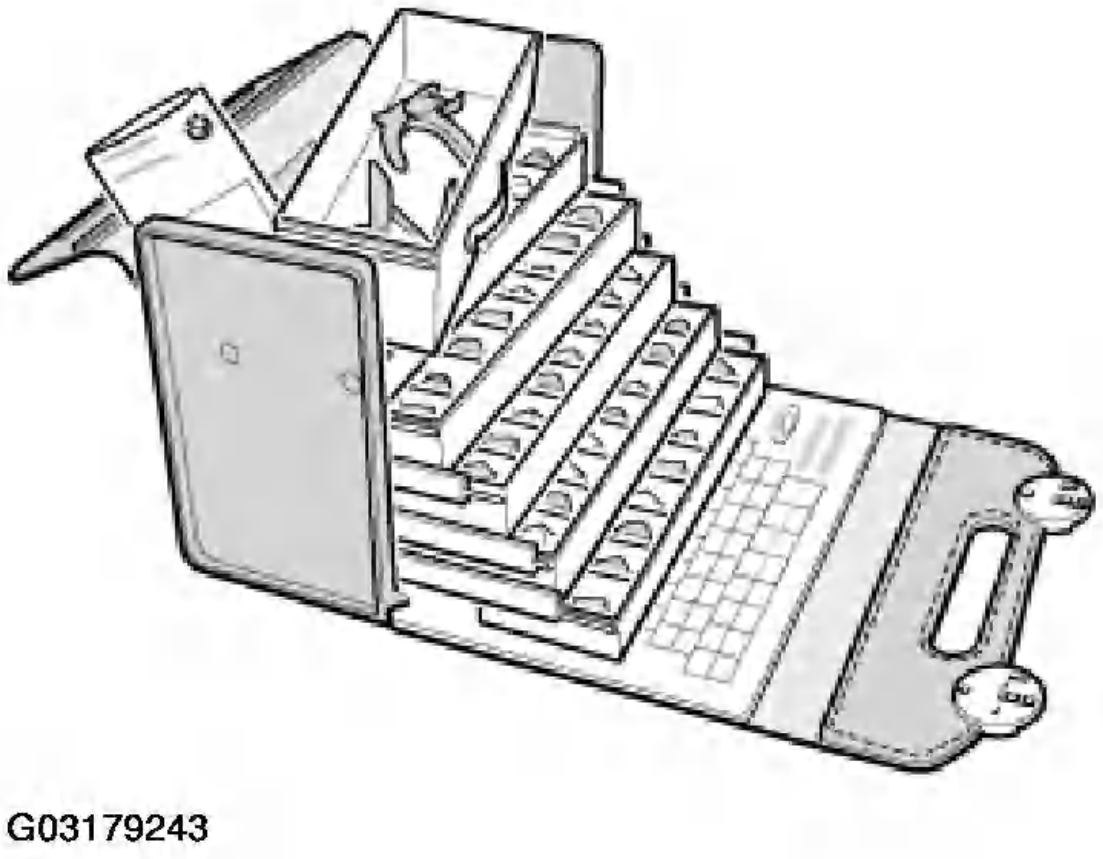


Fig. 20: Identifying Wiring Harness Repairs Special Tool 61 9 020
Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 61 9 043 (wire stripper with wire cutter) for cutting and stripping wires.

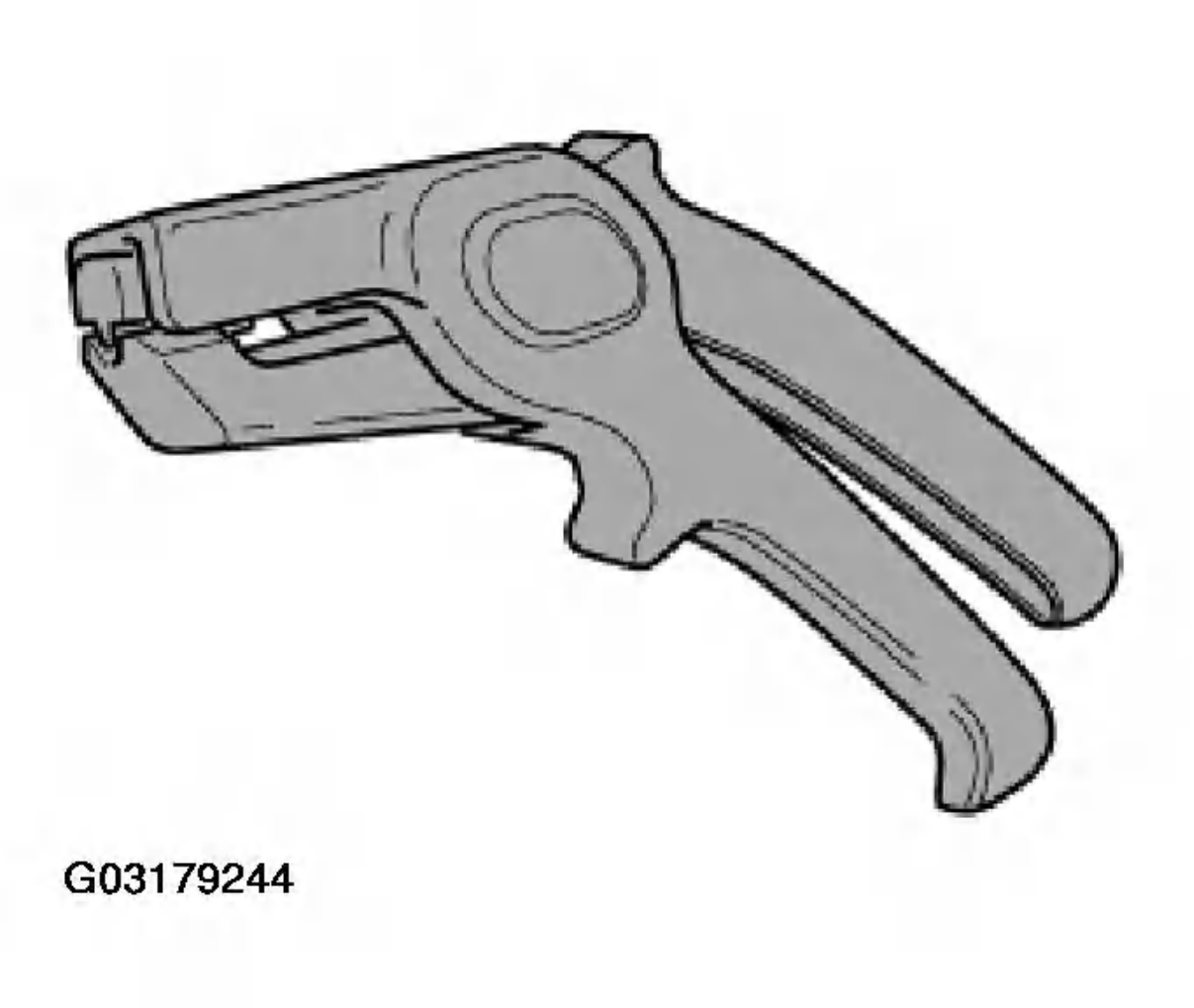


Fig. 21: Identifying Wiring Harness Repairs Special Tool 61 9 043
Courtesy of BMW OF NORTH AMERICA, INC.

Handling:

Cutting to length and stripping insulating from cables.

Special tool 61 9 041 (hand pliers) with special tool 61 9 042 (matrix) for crimping connectors and contact tubes for fan connectors up to a wire cross-section of 2.5 mm and for pushing on contact tubes for fan connectors.

Handling:

Crimping stop parts (contacts).

Fan connector for retrofitting/repairs.

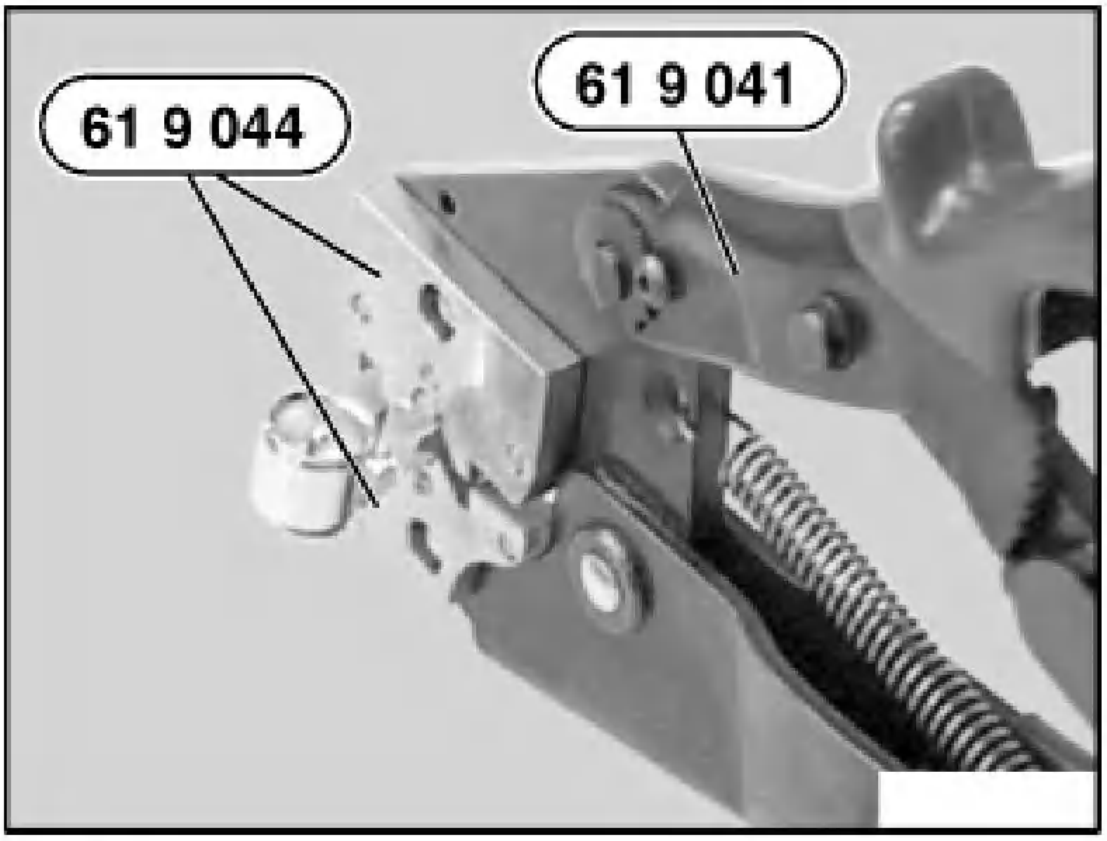


Fig. 22: Identifying Wiring Harness Repairs Special Tool 61 9 041 & 61 9 044
Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 61 1 150 (release and pressing-out tool) for:

- Releasing round plug housings.
- Releasing relay carriers.
- Pressing out contacts.
- Removing indicator lights.



Fig. 23: Identifying Wiring Harness Repairs Special Tool 61 1 150
Courtesy of BMW OF NORTH AMERICA, INC.

Handling:

Opening plug housings and removing contacts of different plug systems, refer to 61 13 ... OPENING PLUG HOUSINGS AND REMOVING CONTACTS OF DIFFERENT PLUG SYSTEMS .



Fig. 24: Identifying Wiring Harness Repair Tool Kit
Courtesy of BMW OF NORTH AMERICA, INC.

Repair kit for ignition cables and for crimping fan connector receptacles 4 mm^2 .

Handling:

Crimping stop parts (contacts).

Special tool 61 4 320 (crimping set with pliers) for:

- Crimping MPQ contacts, refer to 61 13 ... CRIMPING MICRO POWER QUADLOCK CONTACTS (MPQ) .
- Crimping MQS contacts, refer to 61 13 ... CRIMPING MICRO QUADLOCK SYSTEM CONTACTS (MQS) .



Fig. 25: Identifying Wiring Harness Repairs Special Tool 61 4 320
Courtesy of BMW OF NORTH AMERICA, INC.

61 13 .. UNLOCKING AND DISCONNECTING DIFFERENT PLUG CONNECTIONS

Refer to 61 13 .. UNLOCKING AND DISCONNECTING DIFFERENT PLUG CONNECTIONS .

61 13 ... ANTENNA ELBOW PLUG ON RADIO RECEIVER

IMPORTANT: This repair solution is only possible up to model year 10/ 2000. Replace entire antenna cable on affected vehicles. Refer to 65 21 020 REMOVING AND INSTALLING/REPLACING REAR ANTENNA (Z3 ROADSTER) .

61 13 ... BASE OF TAB CONNECTOR HOUSINGS

Unlock hook (1) with special tool 61 1 360 and slide plug housing downwards out of base.

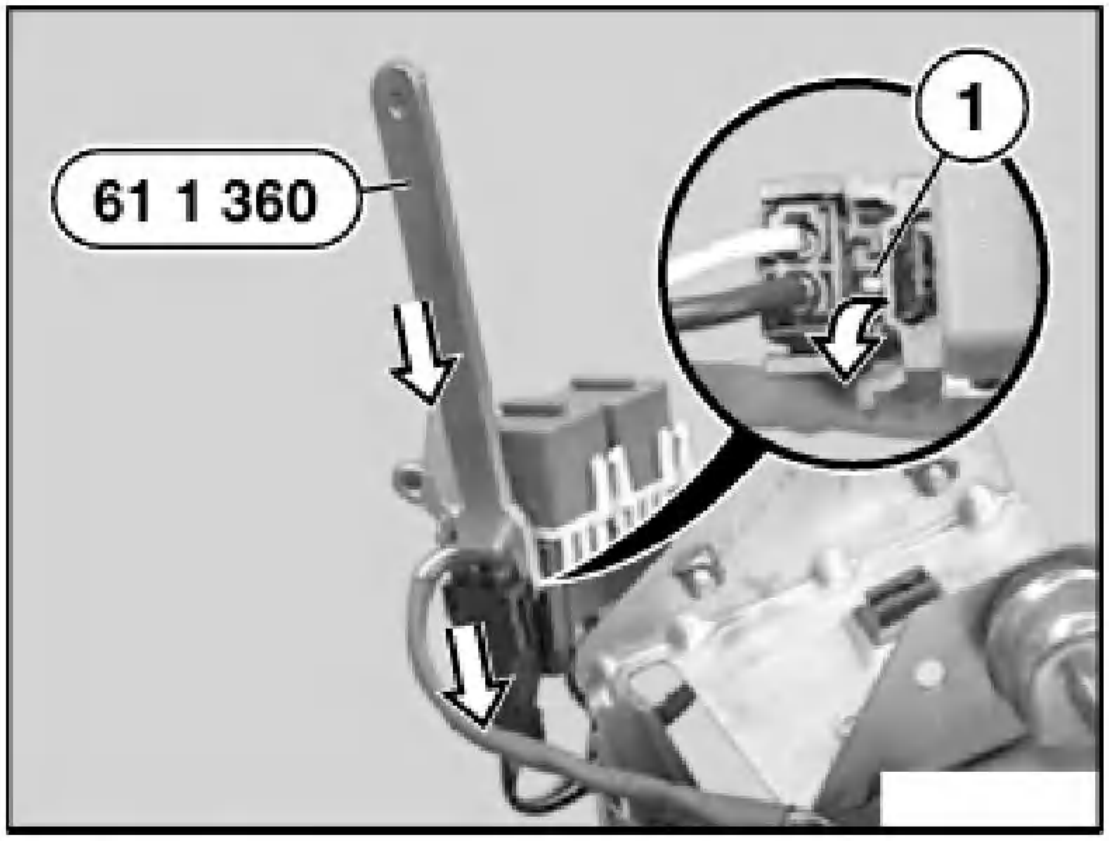


Fig. 26: Unlocking Hook With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... CRIMPING MICRO POWER QUADLOCK CONTACTS (MPQ)

NOTE: For Special Tool identification, see SPECIAL TOOLS - Z3 .

Special Tools Required:

- 61 4 320

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.

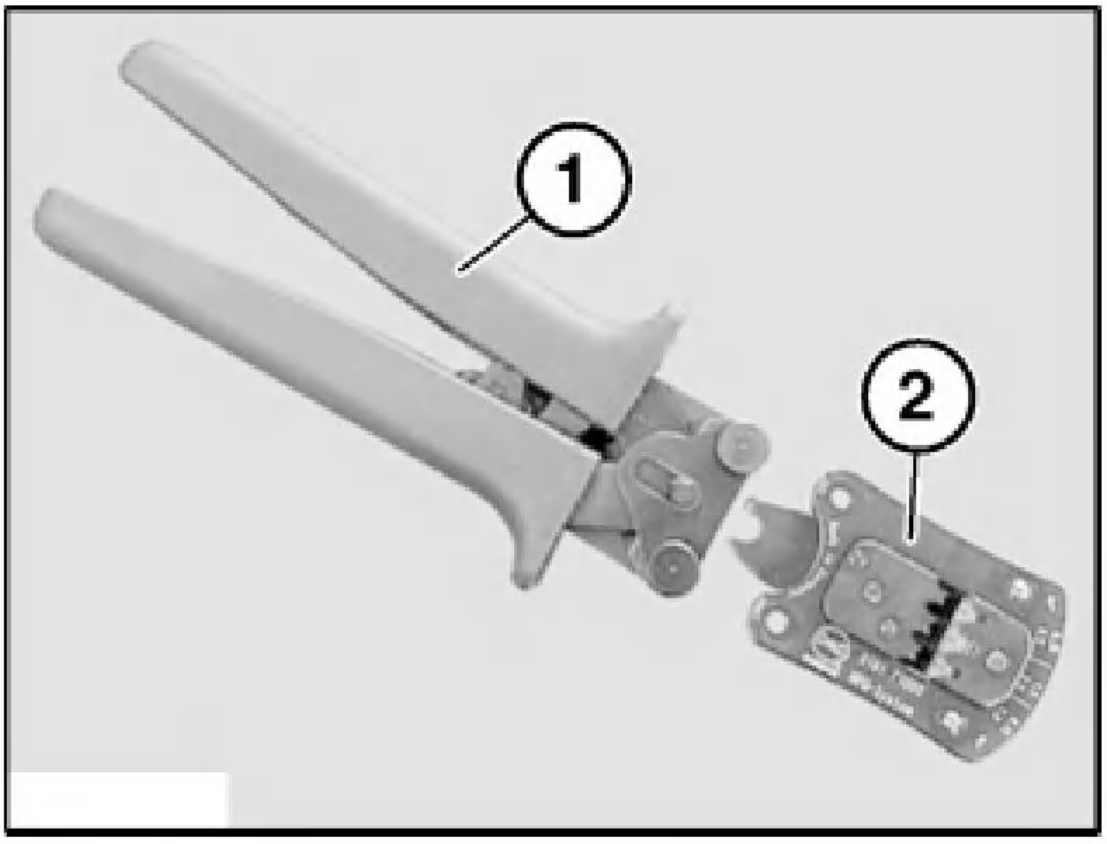


Fig. 27: Crimping MPQ Contacts Using Pliers
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Pliers (1) open automatically as far as they will go when handles are pressed together.

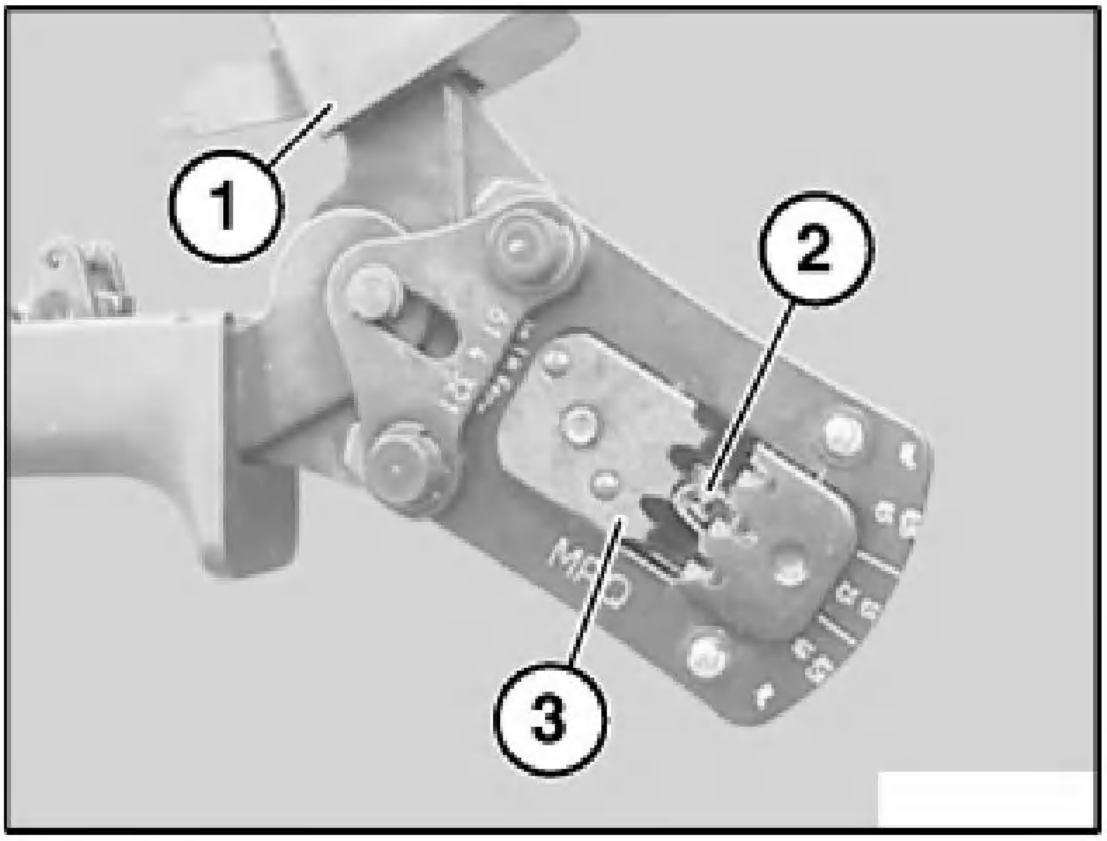


Fig. 28: Placing MPQ Contact In Crimping Head
Courtesy of BMW OF NORTH AMERICA, INC.

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.

NOTE: Follow procedure for cutting and stripping insulation from cables.

Insert stripped cable (2).

Close pliers (1) fully.

Open pliers (1) and remove cable (2).

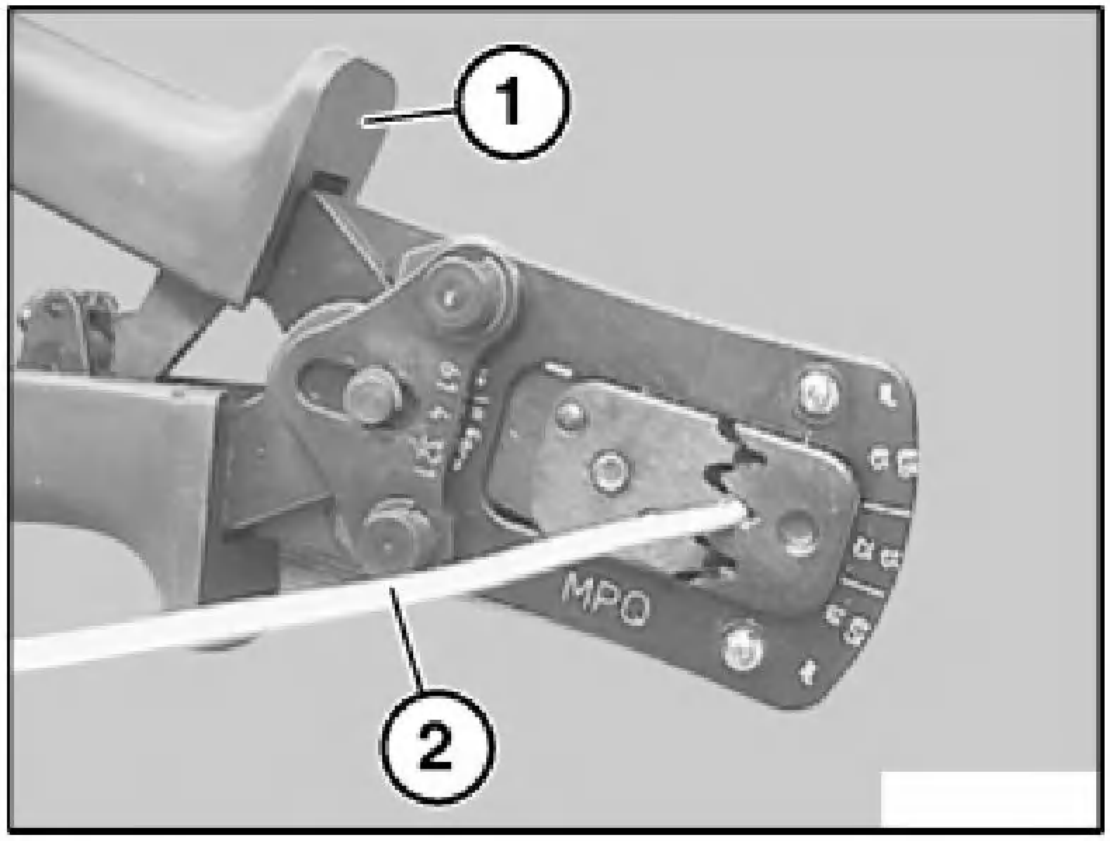


Fig. 29: Opening Pliers And Removing Cable
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check contact for correct crimping.

61 13 ... CRIMPING MICRO QUADLOCK SYSTEM CONTACTS (MQS)

NOTE: For Special Tools identification, see SPECIAL TOOLS - Z3 .

Special Tools Required:

- 61 4 320

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. 30: Crimping MQS Contacts Using Pliers
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. 31: Inserting MQS Contact In Contact Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Follow procedure for cutting and stripping insulation from cables.

Close pliers (1) one notch.

Insert stripped cable (2).

Close pliers (1) fully.

Fig. 32: Inserting Stripped 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. 33: Opening Contact Carrier Gently And Removing MQS Contact
Courtesy of BMW OF NORTH AMERICA, INC.

61 13 ... CRIMPING ANNULAR CONTACTS

CrimpacII crimping pliers from repair kit 1 are used to crimp annular contacts.

Fig. 34: Identifying CrimpacII Crimping Pliers
Courtesy of BMW OF NORTH AMERICA, INC.

Open crimping pliers (1).

NOTE: Place contact (2) in designated nest (observe wire cross-section) with particular care. Make sure it is exactly positioned.

Insert annular contact (2) in crimping pliers (1).

Close crimping pliers (1) gently and keep closed.

Fig. 35: Placing Contact In Designated Nest With Particular Care
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Follow procedure for cutting and stripping insulation from cables.

Feed stripped cable (1) into annular contact (2) completely.

Fig. 36: Feeding Stripped Cable Into Annular Contact Completely
Courtesy of BMW OF NORTH AMERICA, INC.

Close crimping pliers (3) fully.

Open crimping pliers (3) and remove cable (2).

NOTE: Check contact for correct crimping.

61 13 ... OPENING PLUG HOUSINGS AND REMOVING CONTACTS OF DIFFERENT PLUG SYSTEMS

Abbreviations And What They Mean:

ABBREVIATIONS MEANING

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.
D 1.5/2.5	Round contacts of 1.5 mm or 2.5 mm diameter.

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. 37: 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.

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. 38: Placing Special Tool On Relay Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Pull relay carrier (2) in direction of arrow into first catch (3).

Fig. 39: 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. 40: Pressing Out Double Flat Spring Contact With Special Tool
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. 41: Pulling Locking Slide Out Of 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. 42: Pressing Back Arrester Hook Using Special Tool
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. 43: Detaching Secondary Lock From Radio Plug
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. 44: 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. 45: Pressing Lock And Pull Housing Out Of Radio Plug
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. 46: Pulling Contact Carrier 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).

NOTE: The illustration shows an 8-pin socket housing where removal of the contacts is identical.

Fig. 47: Holding Down Retaining Hook Of Socket Contact In Opening Of Contact Carrier With Screwdriver
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. 48: Holding Down Arrester Hook In Secondary Lock
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. 49: Pulling Contact Carrier Out Of Radio Plug
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. 50: 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. 51: Pulling Wire With Socket Contact Out Of Contact Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

BATTERY

12 00 ... EXTERNAL JUMP-STARTING AID

Refer to 12 00 ... EXTERNAL JUMP-STARTING AID .

12 00 ... EXTERNAL JUMP-STARTING AID AND CAR TELEPHONE!

Refer to 12 00 ... EXTERNAL JUMP-STARTING AID AND CAR TELEPHONE! .

12 00 ... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY

Observe safety instructions for handling vehicle battery. Refer to 61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY .

Before Disconnecting Battery:

Switch off ignition.

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 fitting terminal for battery negative lead: Tightening torque, 61 21 1AZ. Refer to 61 21 BATTERY WITH TERMINAL .

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 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 >= ace; 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:

Increased closed-circuit current consumption can be compensated with the aid of the battery trickle charger (special tool 61 2 410) via the jump start terminal.

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

Refer to 12 00 ... INSTRUCTIONS ON STARTING AID .

61 00 ... BATTERY

Refer to 61 00 ... BATTERY .

61 00 ... BATTERY CARE AND MAINTENANCE

Refer to 61 00 ... BATTERY CARE AND MAINTENANCE .

61 00 ... BATTERY CHARGING

Refer to 61 00 ... BATTERY CHARGING .

61 00 ... EXTERNAL JUMP-STARTING AID

Refer to 61 00 ... EXTERNAL JUMP-STARTING AID .

61 00 ... EXTERNAL JUMP-STARTING AID AND CAR TELEPHONE!

Refer to 61 00 ... EXTERNAL JUMP-STARTING AID AND CAR TELEPHONE! .

61 00 ... IMPORTANT WITH CONNECTED BATTERY!

Refer to 61 00 ... IMPORTANT WITH CONNECTED BATTERY! .

61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY

Refer to 61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY .

61 20 . . . THRESHOLD VALUES FOR BATTERY INSPECTION OF ALL BATTERY (TELEPHONE EXCEPT FOR (TELEPHONE BATTERY)

Safety instructions for handling vehicle battery, refer to 61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY .

Test Step 1 - Before Charging The Battery:

BATTERY REFERENCE (BEFORE CHARGING)

Charge State 1)	Starting Capability <2)	Test Result
Not testable.	-	Charge.
Less than 50 % 2) .	-	Charge.
More than 50 %.	Less than 75 %.	Charge.
More than 50 %.	More than 75 % 3) .	Charge.
More than 80 %.	More than 75 %.	O.K.

Test Step 2 - After Charging The Battery:

BATTERY REFERENCE (AFTER CHARGING)

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 ... BATTERY OPEN-CIRCUIT CURRENT TEST

NOTE: Observe safety instructions for handling vehicle battery, refer to 61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY .

Fig. 52: Identifying Diagnosis And Information System
Courtesy of BMW OF NORTH AMERICA, INC.

The open-circuit current test is performed using the Diagnosis and Information System (DIS).

61 21 030 CHARGING BATTERY

NOTE: Only chargers with the following properties are suitable for charging a battery in vehicle with connected electrical system:

1. Current limitation.
2. Exponential drop of charge current when 14.2 V is reached.

Always use the B+ terminal in the engine compartment.

U/I Charge Curve Shows:

Charging with maximum current up to gassing limit voltage of 14.2 V. The charging process in the range of approx. 13.2 V - 14.2 V can take up a relative long period of time because charging is conducted with very low currents in this limit range. The battery is full charged with a charge current of < 5A.

Fig. 53: Identifying U/I Charge Curve
Courtesy of BMW OF NORTH AMERICA, INC.

Battery chargers without these properties can lead to vehicle damage (lights).

NOTE: Remove battery from vehicle when using unregulated chargers.

BATTERY/VAPOR SEPARAT...

61 21 030 CHARGING BATTERY

Refer to 61 21 030 CHARGING BATTERY .

SWITCH

61 31 . . . REPLACING ALL SWITCHES AND INDICATOR LAMPS IN CENTER CONSOLE (Z3 ROADSTER, Z3 COUPE)

Unclip shift-lever cover.

Remove insulation sheet.

Carefully press hazard warning light switch or window regulator switch downwards to remove from trim.

Disconnect connector.

Fig. 54: Unclipping Shift-Lever Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Remove radio finisher or, if necessary, radio. Refer to 65 11 030 RADIO (BAVARIA C II OR C REVERSE II) or 65 11 030 REMOVING AND INSTALLING OR REPLACING RADIO (BAVARIA C III OR C REVERSE III RDS) or 65 11 030 REMOVING AND INSTALLING/REPLACING RADIO (BUSINESS) .

Fig. 55: Removing Radio Finisher

Courtesy of BMW OF NORTH AMERICA, INC.

Push A/C switch or indicator lamp forwards through radio aperture to unclip and remove connector.

61 31 016 REMOVING AND INSTALLING / REPLACING DIP SWITCH FOR DIRECTION OF TRAVEL

Turn steering wheel to straight-ahead position.

Remove steering wheel, refer to STEERING WHEEL .

Remove instrument paneling at bottom left.

Fig. 56: Removing Instrument Paneling At Bottom Left
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew screw.

Fig. 57: Unscrewing Bottom Trim Panel Screw (Bottom)
Courtesy of BMW OF NORTH AMERICA, INC.

Pull bottom trim panel to the side out of the clips.

Fig. 58: Pulling Bottom Trim Panel To Side Out Of Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw and take off lower section of steering-column paneling.

Fig. 59: Removing Screw And Taking Off Lower Section Of Steering-Column Panelling
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw for holder of steering-column stalk.

Fig. 60: Removing Screw For Holder Of Steering-Column Stalk
Courtesy of BMW OF NORTH AMERICA, INC.

Lever off holder in downwards direction using a screwdriver.

Fig. 61: Levering Off Holder In Downwards Direction Using Screwdriver
Courtesy of BMW OF NORTH AMERICA, INC.

Compress retainers on both sides and pull out lever.

Fig. 62: Compressing Retainers On Both Sides And Pulling Out Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen cable straps on steering column.

Disconnect plug connection.

Fig. 63: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Do not damage self-cancelling cam of turn-indicator lever.

Move turn-indicator lever to middle position, then install.

61 31 018 REMOVING AND INSTALLING/REPLACING CRUISE CONTROL SWITCH

Unscrew screw.

Fig. 64: Unscrewing Bottom Trim Panel Screw (Front)
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew screw.

Fig. 65: Unscrewing Bottom Trim Panel Screw (Bottom)
Courtesy of BMW OF NORTH AMERICA, INC.

Pull bottom trim panel to the side out of the clips.

Fig. 66: Pulling Bottom Trim Panel To Side Out Of Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw and take off lower section of steering-column panelling.

Fig. 67: Removing Screw And Taking Off Lower Section Of Steering-Column Panelling
Courtesy of BMW OF NORTH AMERICA, INC.

Compress retainers and pull out switch.

Disconnect plug connection.

Fig. 68: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 020 REMOVING AND INSTALLING/REPLACING IGNITION STARTER SWITCH

Unscrew screw.

Fig. 69: Unscrewing Bottom Trim Panel Screw (Front)
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew screw.

Fig. 70: Unscrewing Bottom Trim Panel Screw (Bottom)
Courtesy of BMW OF NORTH AMERICA, INC.

Pull bottom trim panel to the side out of the clips.

Fig. 71: Pulling Bottom Trim Panel To Side Out Of Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw and take off lower section of steering-column panelling.

Fig. 72: Removing Screw And Taking Off Lower Section Of Steering-Column Panelling
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew headless screws on both sides, pull out switch.

Disconnect plug connection.

Fig. 73: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check position of ignition-start switch in relation to steering-wheel lock.

Check position of turn-indicator lever in relation to steering wheel.

Secure headless screws with varnish.

CAUTION: After installation, carry out mechanical test (lock cylinder) and electric operational check (e.g ignition, radio, etc.)

61 31 028 REPLACING LIGHT SWITCH (Z3 ROADSTER, Z3 COUPE)

Unclip button cover.

Fig. 74: Unclipping Button Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten lock nut and twist button to remove.

Fig. 75: Unfastening Lock Nut And Twisting Button To Remove
Courtesy of BMW OF NORTH AMERICA, INC.

Press together retaining clips with special tool 61 3 100 and slide backwards to remove.

Fig. 76: Pressing Together Retaining Clips With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off connectors.

Fig. 77: Pulling Off Connectors
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 040 REPLACING WINDSHIELD WIPER SWITCH

Turn steering wheel to straight-ahead position.

Remove steering wheel, refer to STEERING WHEEL .

Remove instrument panelling at bottom left.

Fig. 78: Removing Instrument Panelling At Bottom Left
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew bolts.

Fig. 79: Unscrewing Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Pull bottom trim panel to the side out of the clips.

Fig. 80: Pulling Bottom Trim Panel To Side Out Of Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw and take off lower section of steering-column panelling.

Fig. 81: Removing Screw And Taking Off Lower Section Of Steering-Column Panelling
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw for holder of steering-column stalk.

Fig. 82: Remove Screw For Holder Of Steering-Column Stalk
Courtesy of BMW OF NORTH AMERICA, INC.

Lever off holder in downwards direction using a screwdriver.

Fig. 83: Levering Off Holder In Downwards Direction Using Screwdriver
Courtesy of BMW OF NORTH AMERICA, INC.

Compress retainers on both sides and pull out lever.

Fig. 84: Compressing Retainers On Both Sides And Pulling Out Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen cable straps on steering column.

Disconnect connector.

Fig. 85: Disconnecting Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Be careful not to damage self-cancelling cams of turn-indicator lever. Turn turn-indicator lever to middle position before mounting.

61 31 295 REPLACING CLUTCH SWITCH FOR CRUISE CONTROL SYSTEM

Remove trim panel for pedal assembly.

Press clutch pedal with pedal support down to flow and lock in position.

Disconnect plug connection (1).

Withdraw sleeve (3) in direction of arrow up to stop.

Press both retaining clips together at front end and pull out switch (2) in direction of arrow towards rear.

Fig. 86: Pulling Out Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Slowly move clutch pedal to initial position.

61 31 300 REPLACING BRAKE-LIGHT-TEST SWITCH

Brake-light-test switch is in same housing as brake-light switch.

For removal and adjustment, refer to 61 31 310 REPLACING BRAKE-LIGHT SWITCH .

Can be recognized on 4-pin connector.

Fig. 87: Replacing Brake-Light-Test Switch
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 310 REPLACING BRAKE-LIGHT SWITCH

Removing instrument panelling at bottom left, refer to 61 31 016 REMOVING AND INSTALLING / REPLACING DIP SWITCH FOR DIRECTION OF TRAVEL

Disconnect connector.

Fig. 88: Disconnecting Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Depress brake pedal as far as possible.

1. Pull tappet and sleeve forward completely.
2. Press together clips and pull back switch.

Fig. 89: Depressing Brake Pedal
Courtesy of BMW OF NORTH AMERICA, INC.

Installation Note:

Adjustment is made automatically after installation.

Slowly release pedal to neutral position.

Tie back lead with cable clip (1).

Fig. 90: Tie Back Lead With Cable Clip
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Adjustment of the switch can be changed if brake pedal springs back.

Check function.

Connector assignment for brake-light switch and brake-light-test switch:

1 and 2 brake light switches.

3 and 4 brake light test switches.

Fig. 91: Identifying Connector Assignment For Brake-Light Switch And Brake-Light-Test Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Schematics of brake-light-test switch and brake-light switch.

Fig. 92: Schematics - Brake-Light-Test Switch And Brake-Light Switch
Courtesy of BMW OF NORTH AMERICA, INC.

61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT

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 the following components have been replaced/coded.
- Steering column switch cluster.
- DSC control unit.
- ARS control unit.

Connect vehicle to BMW diagnosis system.

Select and carry out steering angle sensor adjustment under Service functions.

ECUS, MODULES

61 00 ... WORKING INSTRUCTIONS FOR REMOVING AND INSTALLING ELECTRONIC CONTROL UNIT

Refer to 61 00 ... WORKING INSTRUCTIONS FOR REMOVING AND INSTALLING ELECTRONIC CONTROL UNIT .

61 35 ... NOTE ON REPLACING CODABLE/PROGRAMMABLE CONTROL UNITS

Replacement:

Carry out coding/programming.

Observe following IDC specifications:

- Programming.
- Coding.

Fig. 93: Identifying Codable/Programmable Control Units
Courtesy of BMW OF NORTH AMERICA, INC.

61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE)

NOTE: For Special Tools identification, see SPECIAL TOOLS - Z3 .

Special Tools Required:

- 12 7 060

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.

Statically charged persons can discharge by touching electrical components.

Fig. 94: Precaution - Do Not Touch Pins Or Multi-Pin Connectors Directly Or Static Discharge May Occur
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Important!

Do Not Touch Pins Or Multi-Pin Connectors Directly!

Touch electrical components by their housings only.

Fig. 95: Precaution - Touch Electrical Components By Their Housings Only
Courtesy of BMW OF NORTH AMERICA, INC.

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 ESD special tool 12 7 060, refer to SPECIAL TOOLS - Z3 .

61 35 900 REMOVING AND INSTALLING/REPLACING RING ANTENNA OF ELECTRONIC IMMOBILIZER

Remove instrument panelling at bottom left.

Release screws.

Fig. 96: Removing Instrument Panelling At Bottom Left
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew screw.

Fig. 97: Unscrewing Bottom Trim Panel Screw (Front)
Courtesy of BMW OF NORTH AMERICA, INC.

Pull panelling to side out of clips.

Fig. 98: Pulling Panelling To Side Out Of Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Pull front end of panelling in downward direction and remove.

Fig. 99: Pulling Front End Of Panelling In Downward Direction
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew screw.

Pull lower section of steering-column casing off upper section.

Installation:

Check for correct position of lock.

Fig. 100: Pulling Lower Section Of Steering-Column Casing Off Upper Section
Courtesy of BMW OF NORTH AMERICA, INC.

Slide in special tool 61 3 300 with flattened end (A) facing ring antenna and lever out ring antenna.

Fig. 101: Levering Out Ring Antenna
Courtesy of BMW OF NORTH AMERICA, INC.

Cut open cable connector and remove ring antenna.

Fig. 102: Cutting Open Cable Connector And Removing Ring Antenna
Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSIS PROGRAMMING/CODING

Using the current TIS CD:

- Document type: Select SI Diagnosis Coding.
- Index number 11: Select Programming Information to display the table of contents.
- Select the current IDC for the appropriate vehicle.

RELAYS

61 13 ... DME MASTER RELAY CONNECTOR

Refer to 61 13 ... DME MASTER RELAY CONNECTOR .

61 13 ... RELAY CARRIER

Refer to 61 13 ... RELAY CARRIER .

PLUG CONNECTION TERMINAL

61 13 ... DME MASTER RELAY CONNECTOR

Refer to 61 13 ... DME MASTER RELAY CONNECTOR .

61 13 ... RELAY CARRIER

Refer to 61 13 ... RELAY CARRIER .

WINDSCREEN WIPERS

61 61 010 CHECKING OR ADJUSTING CONTACT ANGLE OF WIPER ARMS ON WINDSHIELD

The contact angle of the wiper arm on the windshield primarily determines the wiping quality during intermittent operation and the wiping quality at low vehicle speeds.

On vehicles with contact pressure control, the clearance between the adjusting screw (1) and the tappet (2) must be A = 0-0.2 mm with the ignition off and the wiper blade fitted.

Fig. 103: Identifying Clearance Between Adjusting Screw And Tappet
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 00 9 230 beside fulcrum of wiper blade on windscreen.

Fig. 104: Fitting Special Tool Beside Fulcrum Of Wiper Blade On Windscreen
Courtesy of BMW OF NORTH AMERICA, INC.

If the contact angle is incorrect, the wiper arm must be turned into correct position using two special tools 00 9 220.

Procedure:

Select largest possible distance "A" between special tool (1) and special tool (2).

Hold special tool (1) firmly to ensure that no load is applied to joint (3) when bending.

Twist special tool (2).

Check function.

Fig. 105: Turning Wiper Arm Into Correct Position
Courtesy of BMW OF NORTH AMERICA, INC.

61 61 041 REPLACING BOTH WINDSHIELD WIPER BLADES

Engine bonnet closed.

Wipers switched off.

Fig. 106: Identifying Engine Bonnet Closed
Courtesy of BMW OF NORTH AMERICA, INC.

Compress retainer. Push wiper blades forward.

Fig. 107: Pushing Wiper Blades Forward
Courtesy of BMW OF NORTH AMERICA, INC.

61 61 100 REMOVING AND INSTALLING/REPLACING BOTH WINDSHIELD WIPER ARMS

Detach caps.

Unscrew left and right nuts.

Installation:

Tightening torque, 61 61 10AZ. Refer to 61 61 WINDSHIELD WIPERS .

Fig. 108: Unscrewing Left And Right Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Fold up wiper arms up to end position and detach from drive shaft.

Fig. 109: Detaching Wiper Arms From Drive Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Adjusting dimensions of wiper arms:

Reference points are the mountings of the wiper blades on the wiper arms to the sealing lip of the cowl panel.

A = 45 mm.

B = 25 mm.

Fig. 110: Adjusting Dimensions Of Wiper Arms
Courtesy of BMW OF NORTH AMERICA, INC.

61 61 250 REPLACING WINDSHIELD WIPER MOTOR (Z3 ROADSTER, Z3 COUPE)

NOTE: Prior to removal, allow wiper motor to run into rest position (if still possible).

Necessary Preliminary Tasks:

- Disconnect battery negative lead, refer to 12 00 ... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY .
- Remove complete bracket for windshield wiper system, refer to 61 61 270 REMOVING AND INSTALLING MOUNTING BRACKET FOR WINDSHIELD WIPER SYSTEM COMPLETE WITH MOTOR (Z3 ROADSTER, Z3 COUPE, M ROADSTER, M COUPE) .

Unfasten nut on motor crank and pry off crank from motor.

NOTE: Drive rods remain fitted, illustrated without drive rods for sake of clarity.

Fig. 111: Prying Off Crank From Motor
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws and remove wiper motor from console.

Tightening torque, 61 61 1AZ. Refer to 61 61 WINDSHIELD WIPERS.

Installation:

Replace screws.

Screw new wiper motor onto wiper bracket, connect to vehicle wiring harness and run into rest position.

Fig. 112: Removing Wiper Motor From Console

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Position motor crank on shaft so that it forms a line with drive rod on passenger side.

Fig. 113: Positioning Motor Crank On Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Turn motor crank at nut out of rest position slightly, then grip firmly and screw down.

Fig. 114: Turning Motor Crank At Nut Out Of Rest Position
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque, 61 61 4AZ. Refer to 61 61 WINDSHIELD WIPERS .

61 61 270 REMOVING AND INSTALLING MOUNTING BRACKET FOR WINDSHIELD WIPER SYSTEM COMPLETE WITH MOTOR (Z3 ROADSTER, Z3 COUPE, M ROADSTER, M COUPE)

Necessary Preliminary Tasks:

- Remove grill for air intake/heating. refer to 51 13 077 REMOVING AND INSTALLING/REPLACING GRILL FOR AIR INTAKE/HEATER (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Unfasten screws.

Feed mounting bracket for wiper system sideways out of upper guide (A) and pull out.

Fig. 115: Feeding Mounting Bracket For Wiper System Sideways Out Of Upper Guide And Pulling Out
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug connection, disconnect and remove mounting bracket for wiper system completely.

Fig. 116: Removing Mounting Bracket For Wiper System Completely
Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00202366

65 1 010 TEST LEAD

Minimum set: Measuring and testing equipment

TEST LEAD GENERAL SPECIFICATION

In conjunction with:	65 1 020, 81 12 9 425 091
Note:	For cellular telephone - C-network
Series:	E12, E21, E23, E24, E28, E30, E31, E32,E34, E36, E38, E39
Storage	location: W 2..
SI number:	2 08 89(122)
Order number:	65 1 010
Â	Test lead

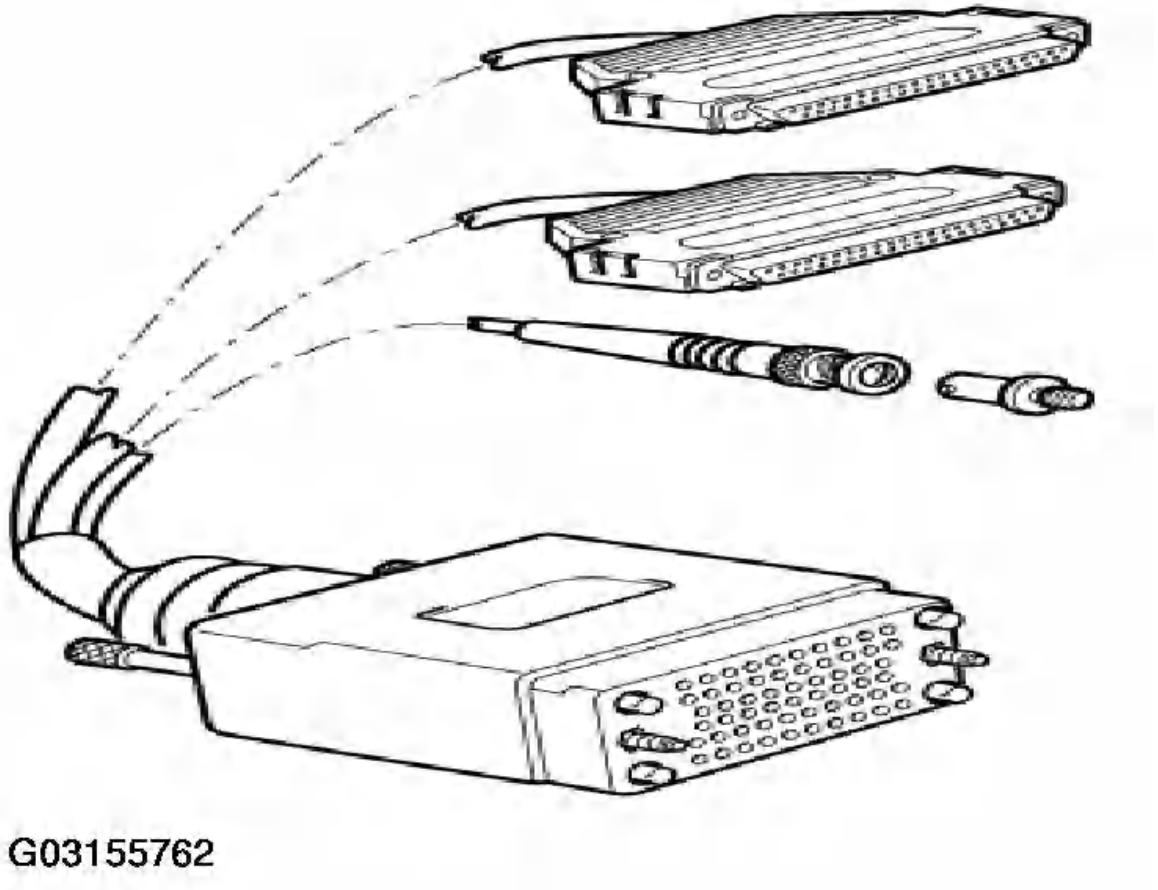


Fig. 1: Identifying Test Lead
Courtesy of BMW OF NORTH AMERICA, INC.

65 1 030 SHORT-CIRCUIT JUMPER V1/V2

SHORT-CIRCUIT JUMPER V1/V2 GENERAL SPECIFICATION

Note:	For checking continuity of connecting lines V 1 and V 2 for radio Bavaria C Professional - 10-pin ELO connector
Series:	E31, E32, E34, E36
Storage location:	1 109
SI number:	2 12 91(450)
Order number:	65 1 030
Â	Short-circuit jumper V1/V2

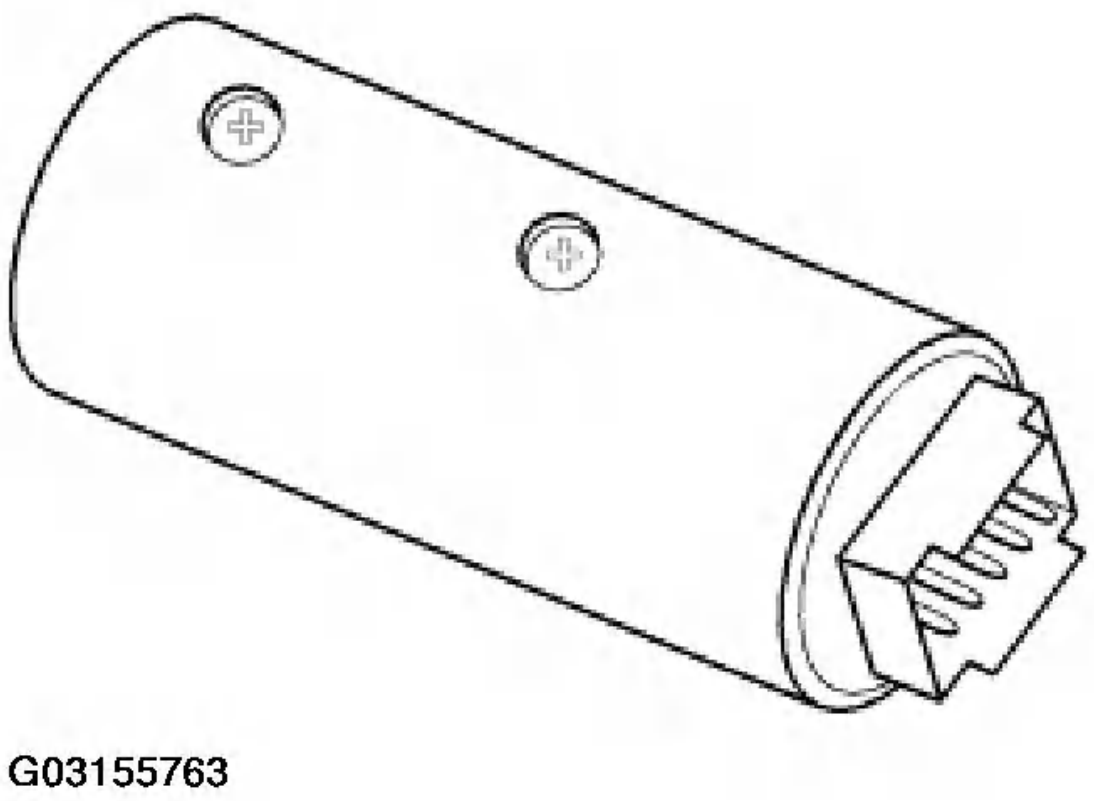


Fig. 2: Identifying Short-Circuit Jumper V1/V2
Courtesy of BMW OF NORTH AMERICA, INC.

65 1 040 SHORT-CIRCUIT JUMPER

SHORT-CIRCUIT JUMPER GENERAL SPECIFICATION

Note:	For checking continuity of connecting line V 3 for radio Bavaria, Bavaria C Professional
Series:	E31, E32, E34, E36
Storage location:	1 109
SI number:	2 12 91(450)
Order number:	65 1 040
Â	Short-circuit jumper

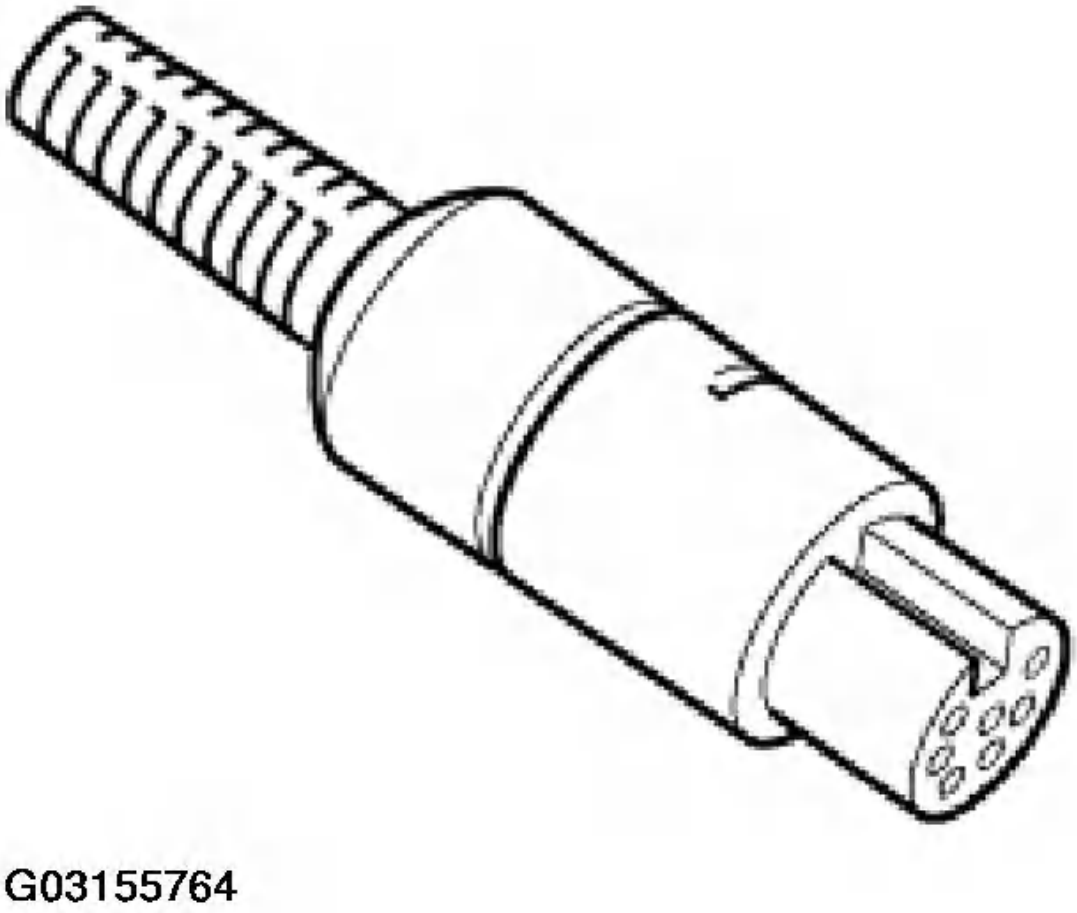


Fig. 3: Identifying Short-Circuit Jumper
Courtesy of BMW OF NORTH AMERICA, INC.

65 2 000 SPANNER

SPANNER GENERAL SPECIFICATION

Note:	For releasing and tightening union nut for mounting antenna
Series:	E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39
Storage location:	B18
Order number:	65 2 000
Â	Spanner

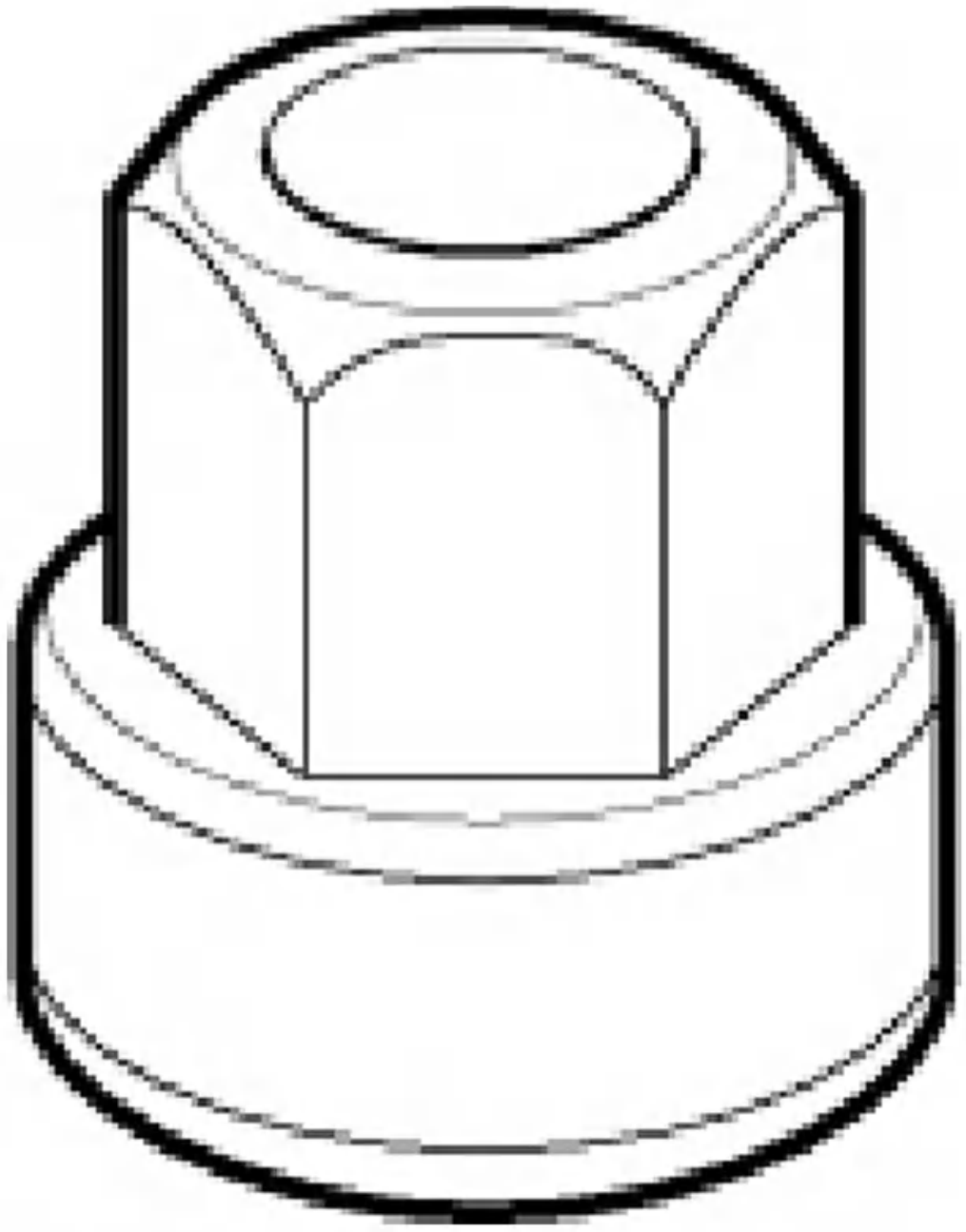


Fig. 4: Identifying Spanner
Courtesy of BMW OF NORTH AMERICA, INC.

65 2 100 TOOL

Minimum set: Mechanical tools

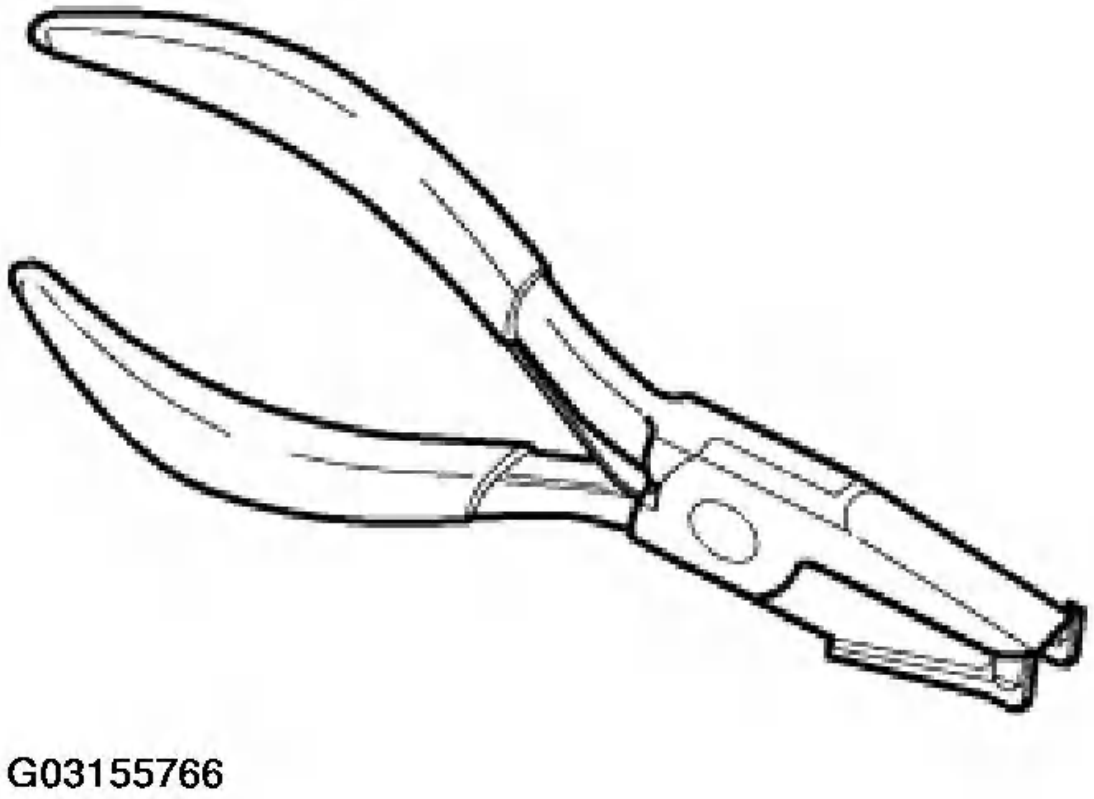


Fig. 5: Identifying Tool
Courtesy of BMW OF NORTH AMERICA, INC.

65 2 400 ANGLE CONNECTOR (5)

ANGLE CONNECTOR (5) GENERAL SPECIFICATION

In conjunction with:	61 9 041 and 61 9 044
Note:	For antenna cable connection at radio
Series:	E31, E36, E36/2, E36/3, E36/5, E36/C, E38, E38/3, E39, E39tou
Storage location:	K 108
SI number:	1 20 97(237)
Order number:	65 2 400
Â	Angle connector (5)

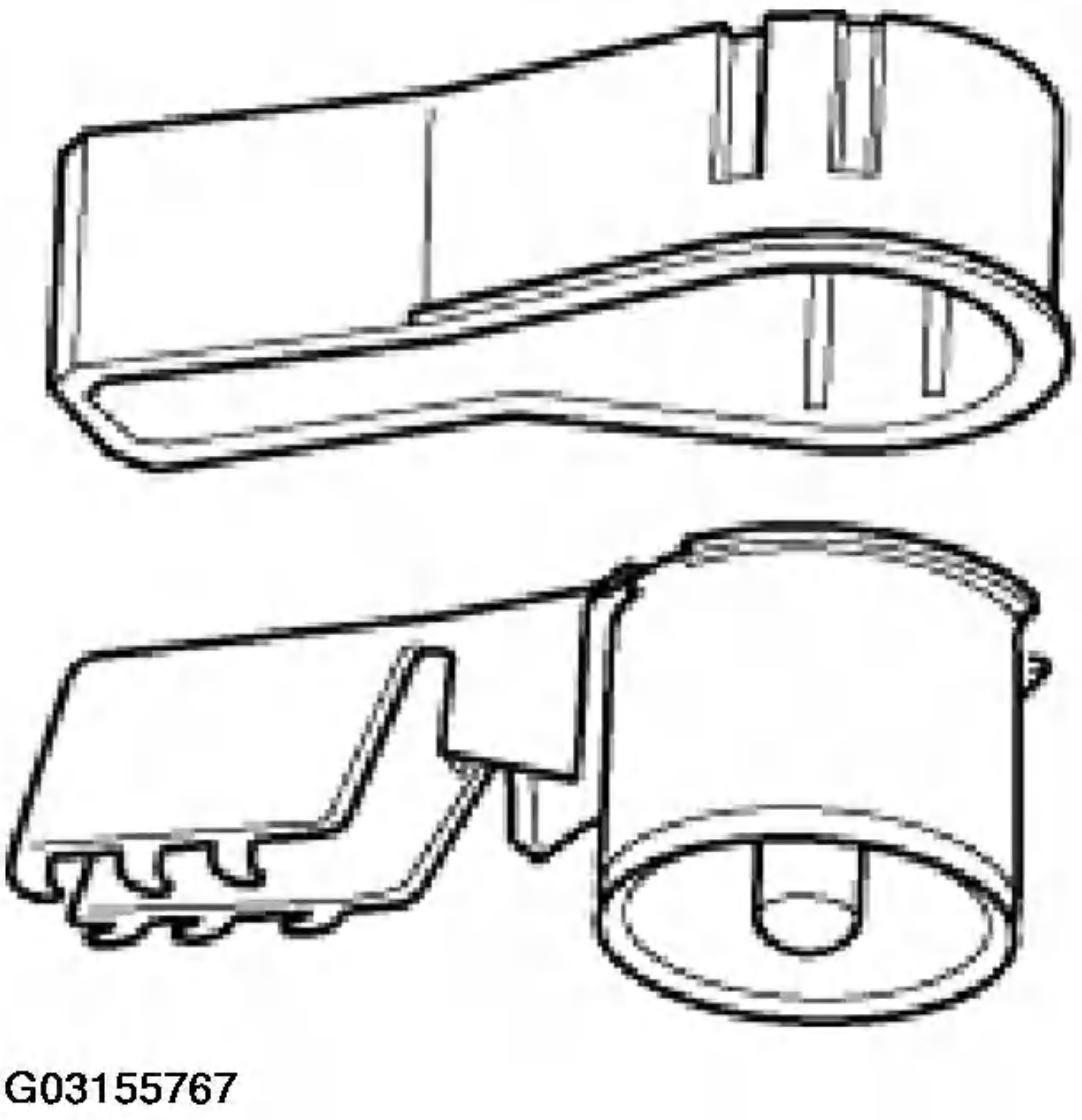


Fig. 6: Identifying Angle Connector (5)
Courtesy of BMW OF NORTH AMERICA, INC.

65 5 400 RELEASE BRACKET

RELEASE BRACKET GENERAL SPECIFICATION

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, E87, E90, R50, R52, R53, RR1
Order number:	65 5 400
Â	Release bracket

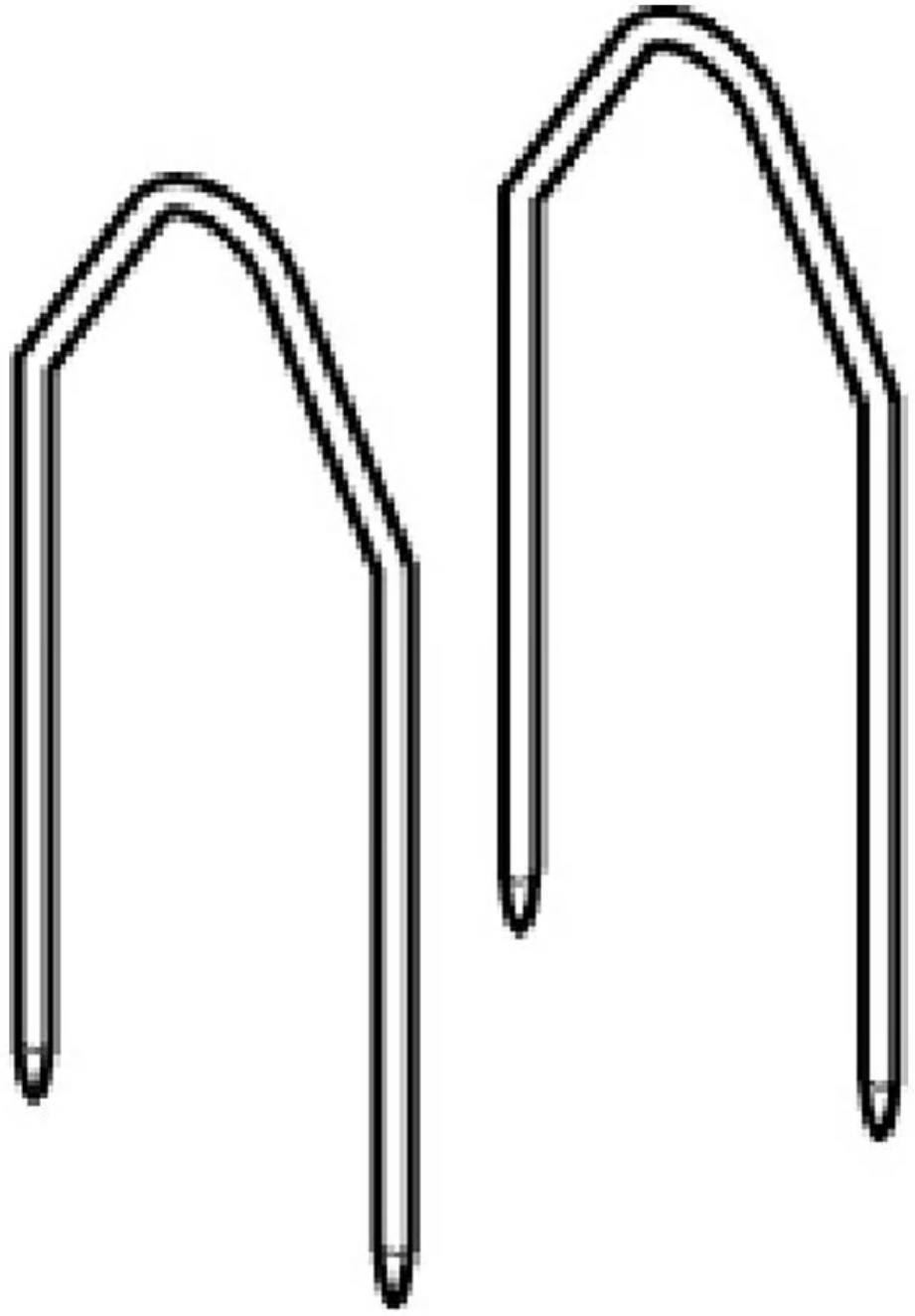


Fig. 7: Identifying Release Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

65 7 110 ADAPTER LEAD

ADAPTER LEAD GENERAL SPECIFICATION

In conjunction with:	61 4 390
Note:	For MRS 3 airbag for locating faults in peripherals of airbag control unit - from 03/99
Series:	E36/7, E38, E39, E46
Storage location:	O 210

SI number:	2 03 99(405)
Order number:	65 7 110
Â	Adapter lead

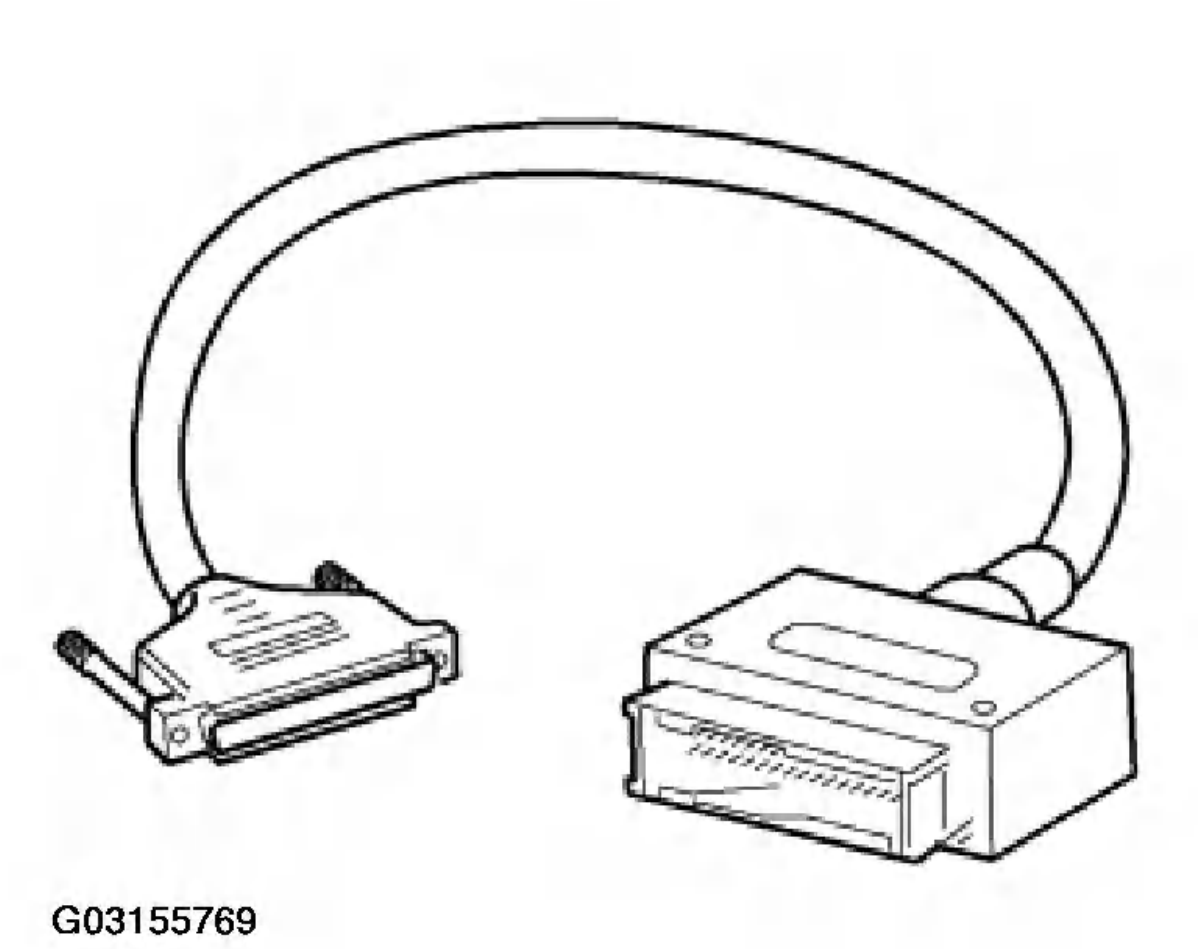


Fig. 8: Identifying Adapter Lead
Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00202815

MONO RADIO

65 11 ... NOTES ON HANDLING CD CHANGERS

NOTE: For Special Tools identification, see SPECIAL TOOLS - Z3 .

Special Tools Required:

- 00 9 341

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 illustrations show the CD changer removed.

Emergency changer magazine release:

Insert special tool 00 9 341 as illustrated into CD changer (1) and release changer magazine (2).

Important!

Do not use force to remove changer magazine (2).

Remove changer magazine (2) after ejection from CD changer (1).

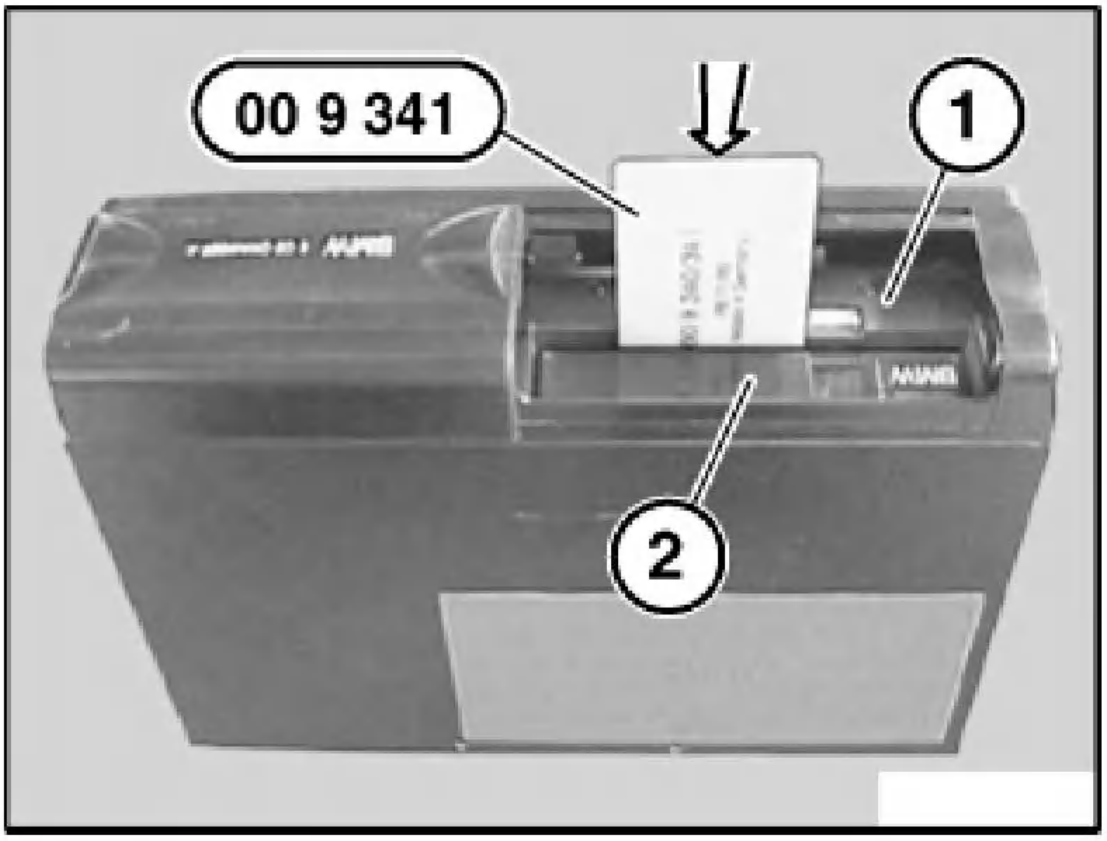


Fig. 1: Inserting Special Tool 00 9 341
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The following work steps are only possible in installed state.

If there is still a CD in the CD changer after the changer magazine has been removed, proceed as follows.

Insert the empty changer magazine into the CD changer. When the eject button is pressed, the CD remaining in the changer magazine is transported back and ejected.

NOTE: If there are still two or more CDs in the CD changer after the changer magazine has been removed, the following work steps must be carried out.

After the changer magazine has been manually removed, the eject button must be pressed again.

Slide back eject lever (2) with a flat plastic ruler (1).

NOTE: Guide plastic ruler (1) as illustrated flat on inside of housing (3).

The CDs (4) are ejected as soon as the eject lever (2) has reached its rear position.

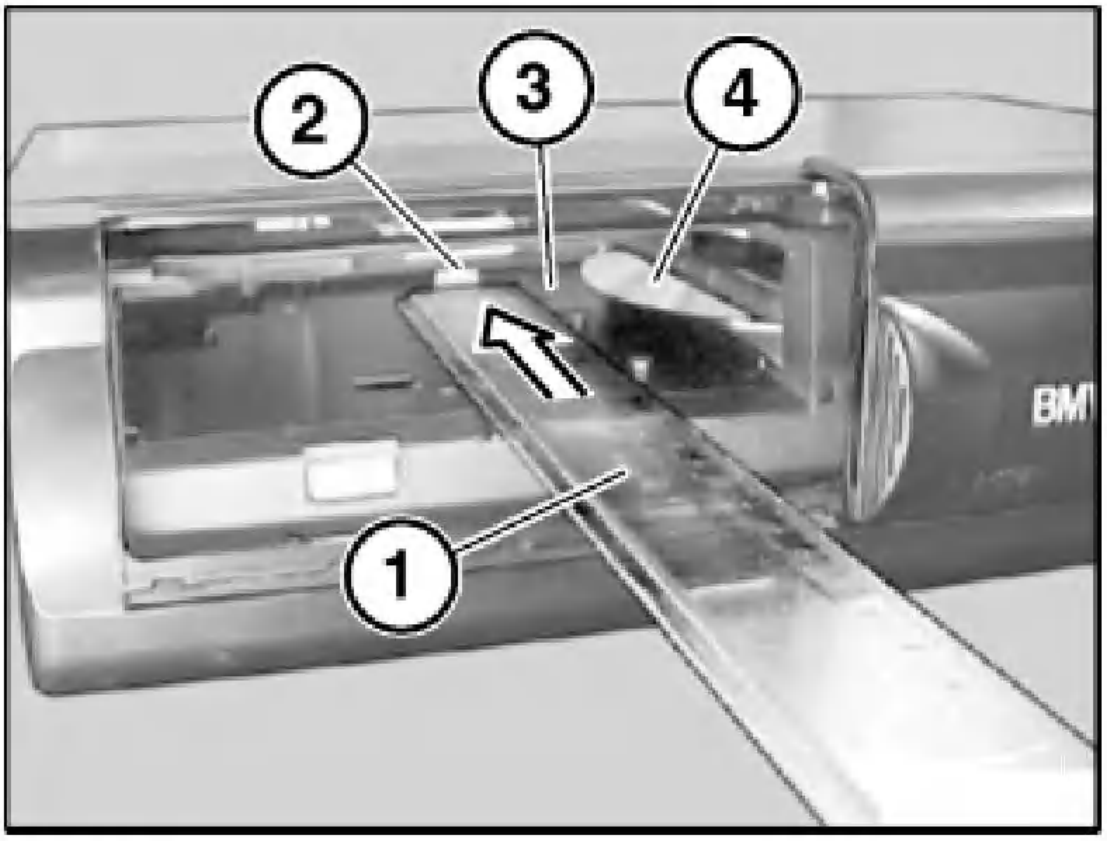


Fig. 2: Sliding Back Eject Lever With Flat Plastic Ruler
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Hold eject lever in this position with plastic ruler (1) until CDs (2) are completely ejected.

Remove CDs (2) from CD changer (3).

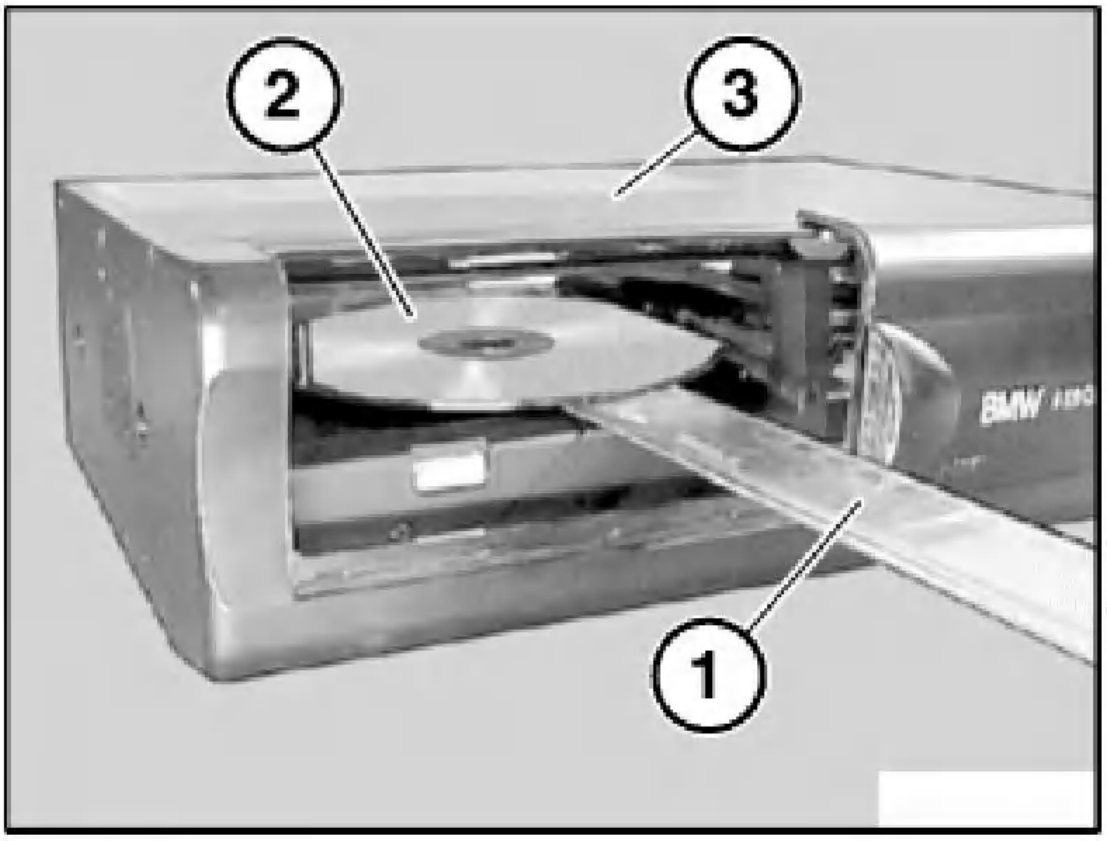


Fig. 3: Removing CDs From CD Changer
Courtesy of BMW OF NORTH AMERICA, INC.

65 11 030 RADIO (BAVARIA C II OR C REVERSE II)

Press unlocking hooks (1) into radio on left and right sides.

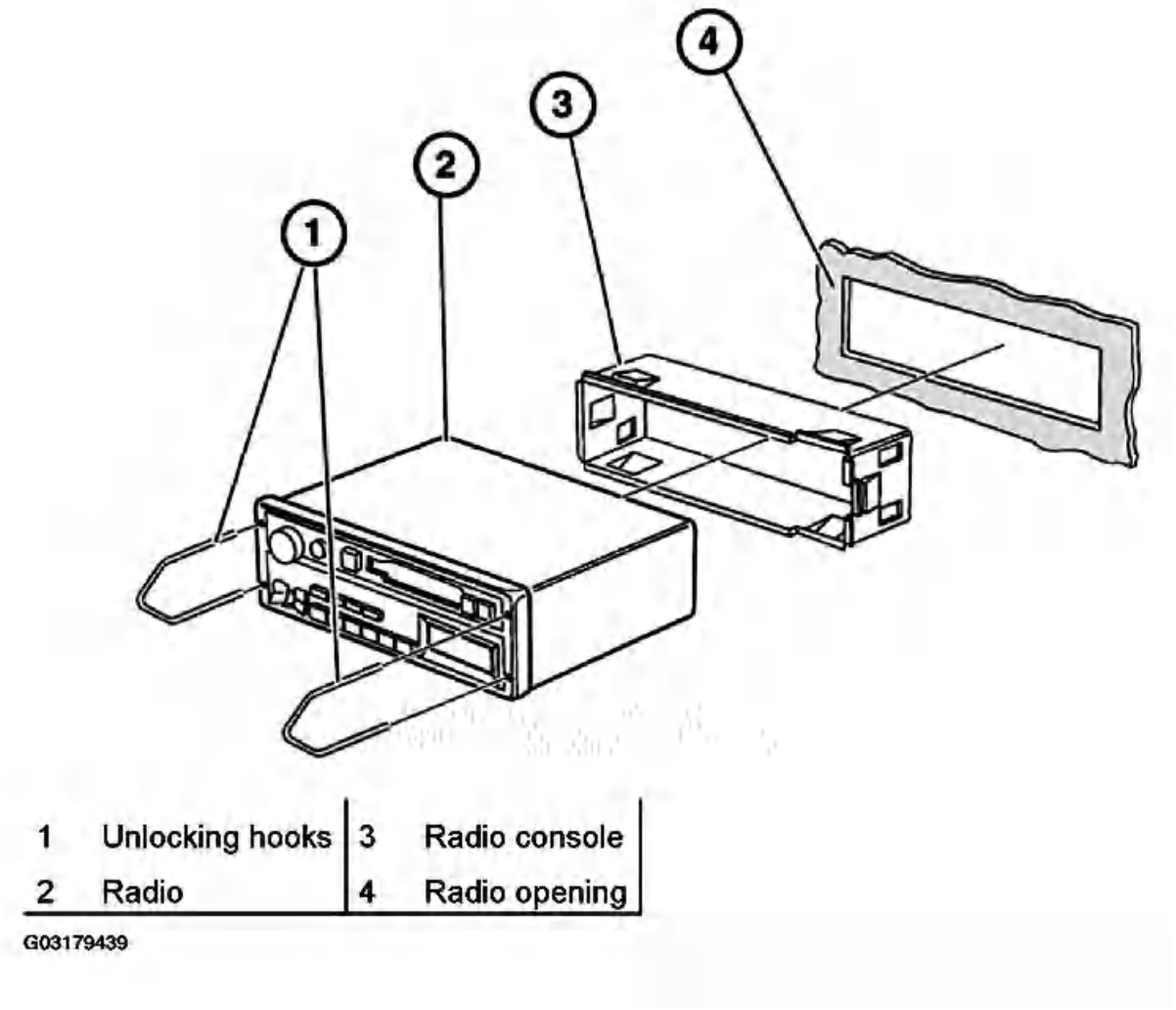


Fig. 4: Removing Radio (Bavaria C II Or C Reverse II)
Courtesy of BMW OF NORTH AMERICA, INC.

Pull out radio carefully with hooks.

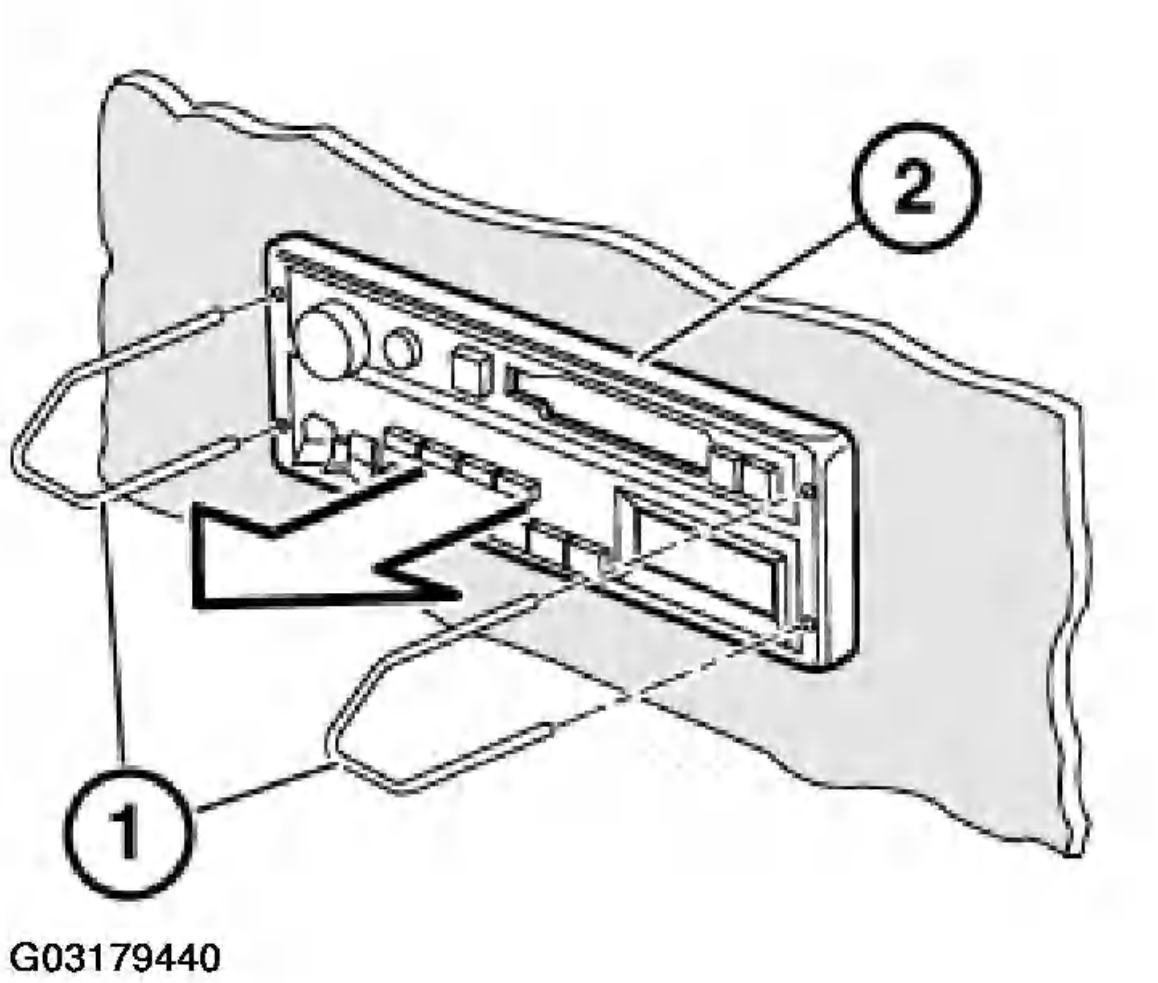


Fig. 5: Pressing Unlocking Hooks
Courtesy of BMW OF NORTH AMERICA, INC.

Remove retaining bracket (1) and remove connector (2) from radio (3).

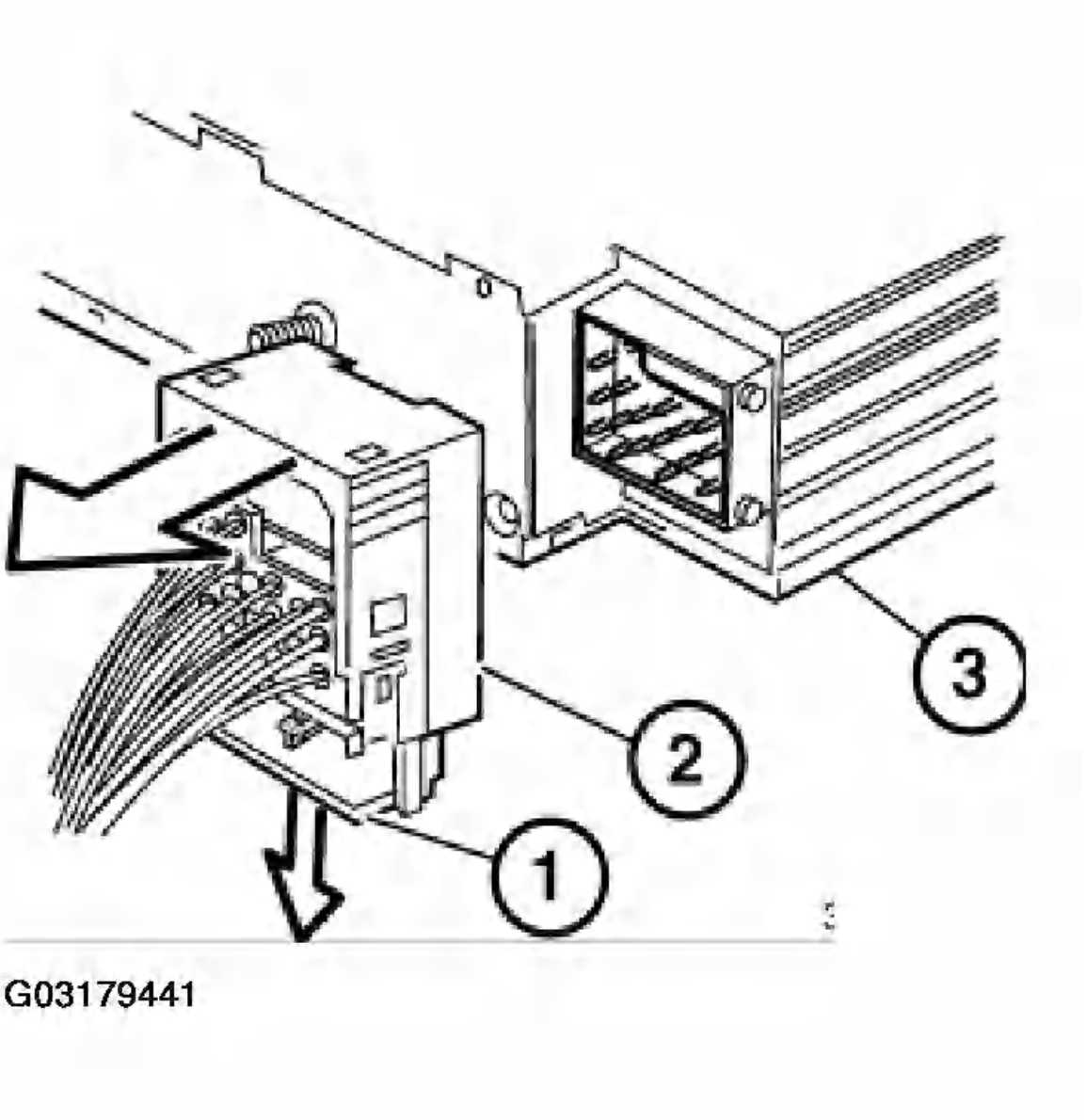


Fig. 6: Removing Retaining Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

65 11 030 REMOVING AND INSTALLING OR REPLACING RADIO (BAVARIA CIII OR C REVERS III RDS)

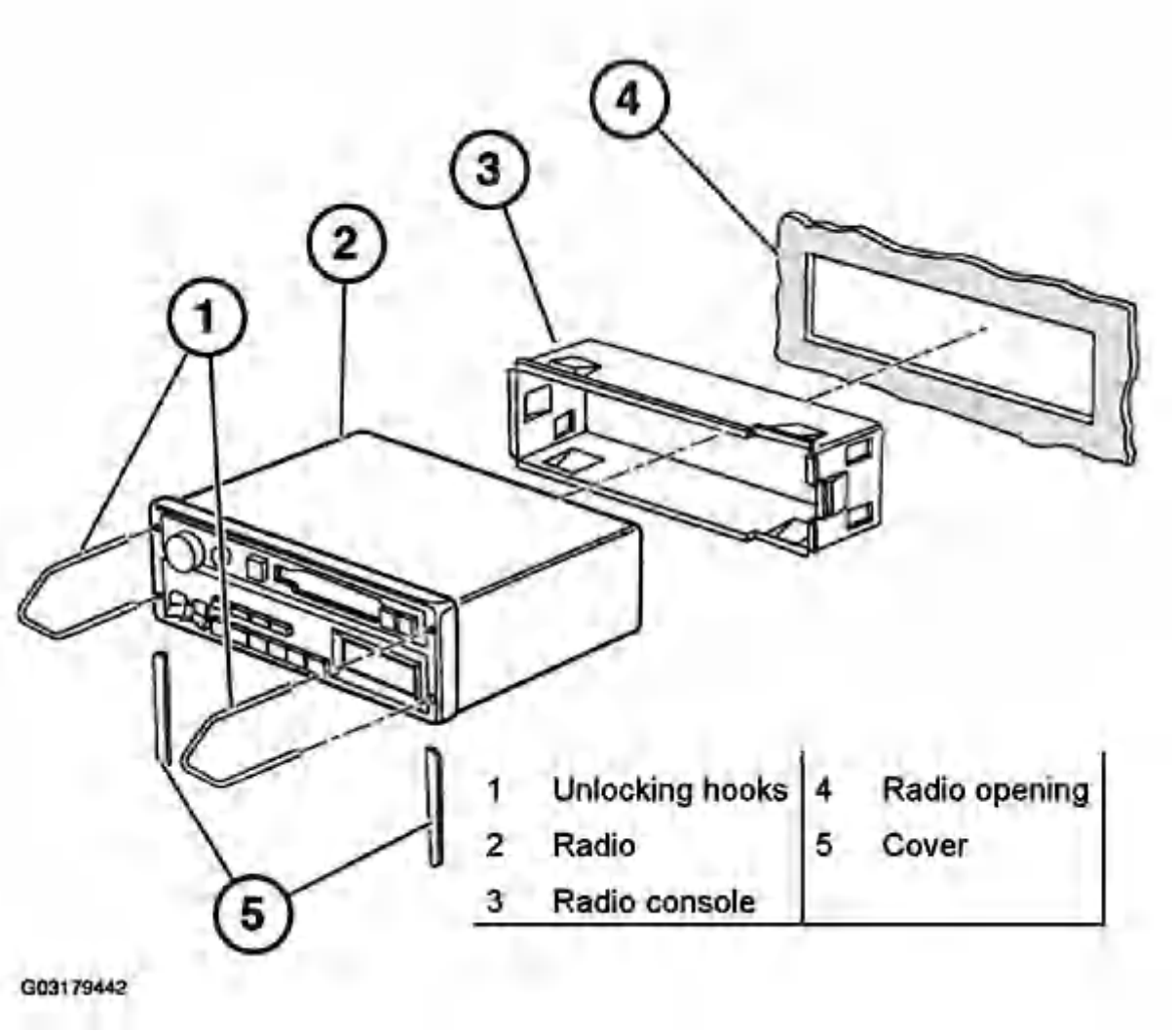


Fig. 7: Removing Radio (Bavaria CIII Or C Revers III RDS)
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip covers (3) and remove.

Press unlocking hooks (1) into radio on left and right sides.

Pull out radio carefully with hooks.

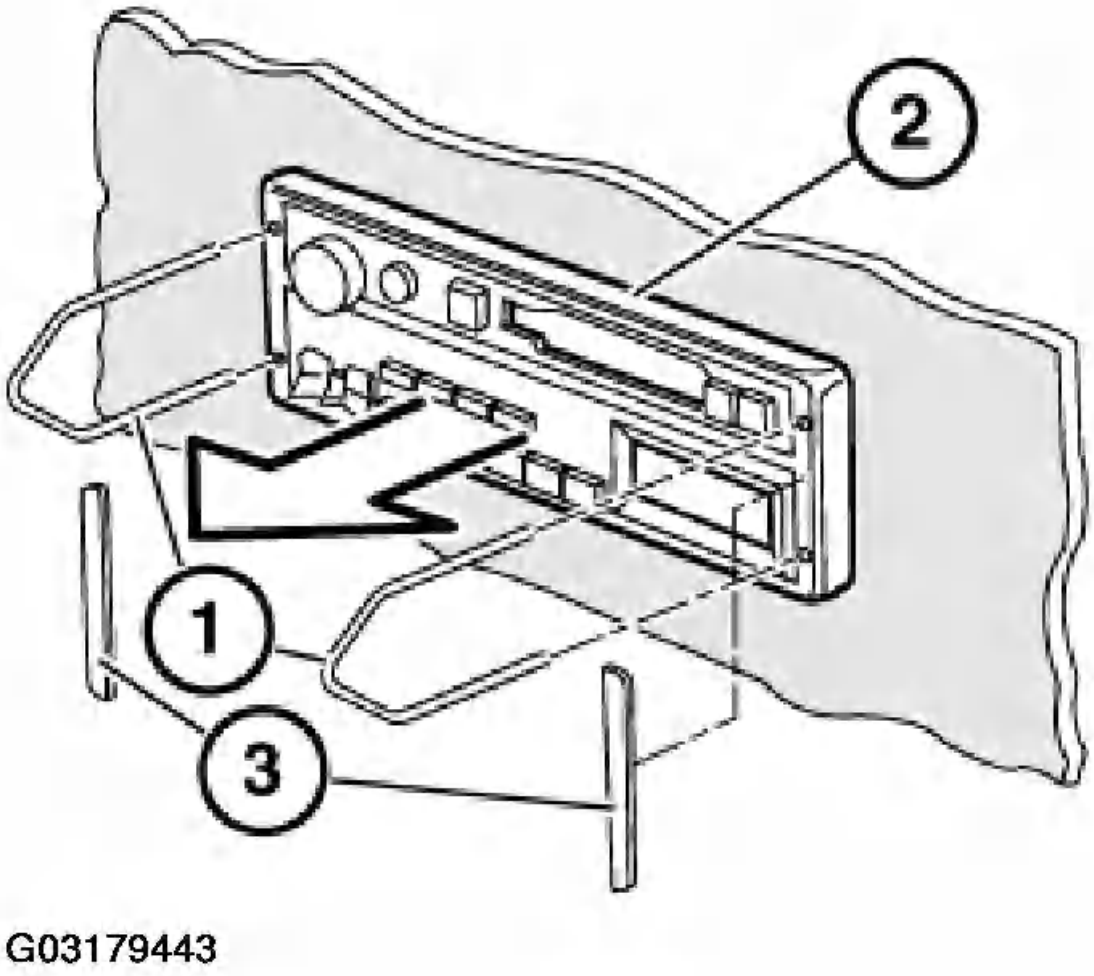


Fig. 8: Removing Covers
Courtesy of BMW OF NORTH AMERICA, INC.

Remove retaining bracket (1) and remove connector (2) from radio (3).

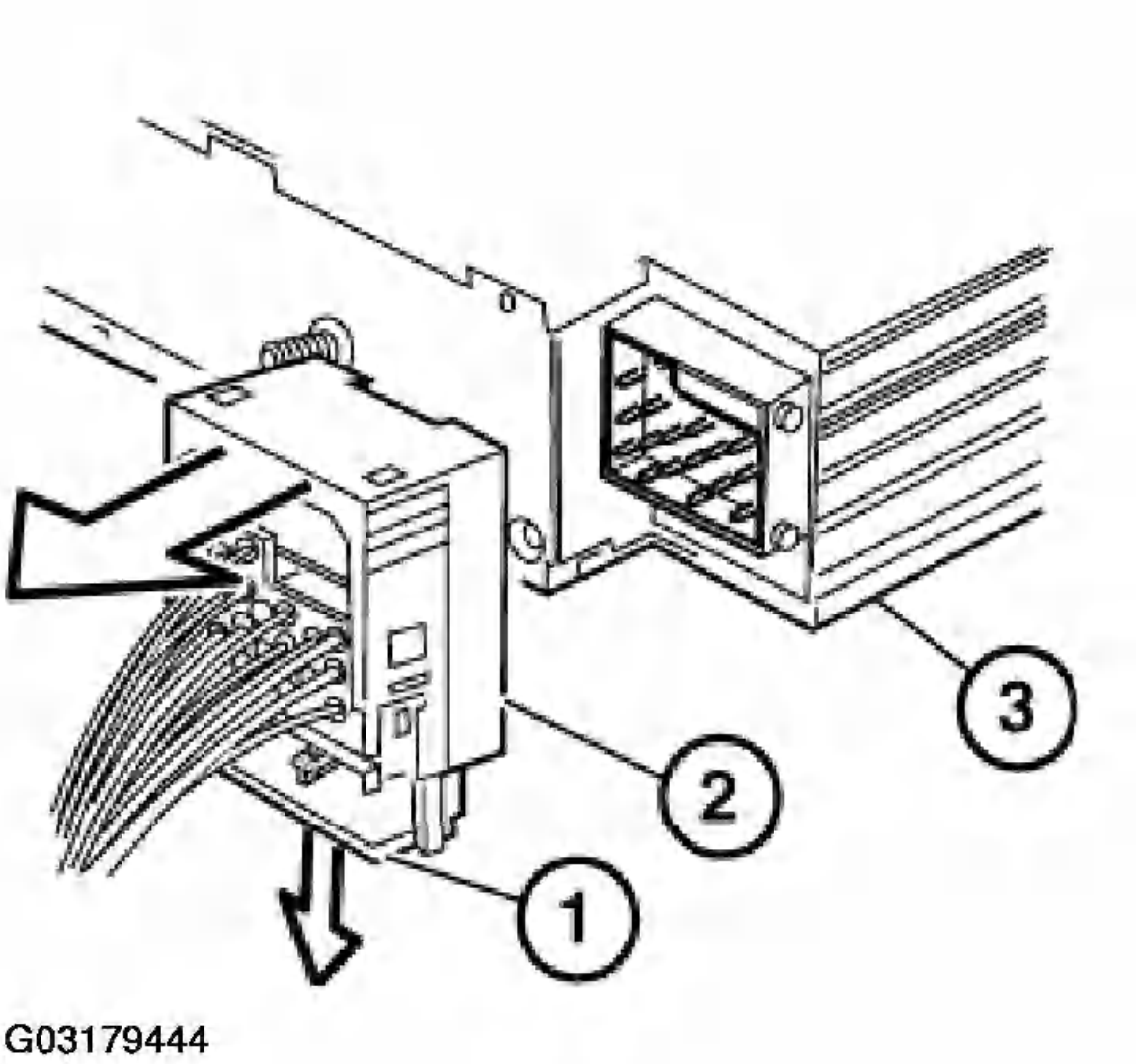


Fig. 9: Removing Retaining Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

65 11 030 REMOVING AND INSTALLING/REPLACING RADIO (BUSINESS)

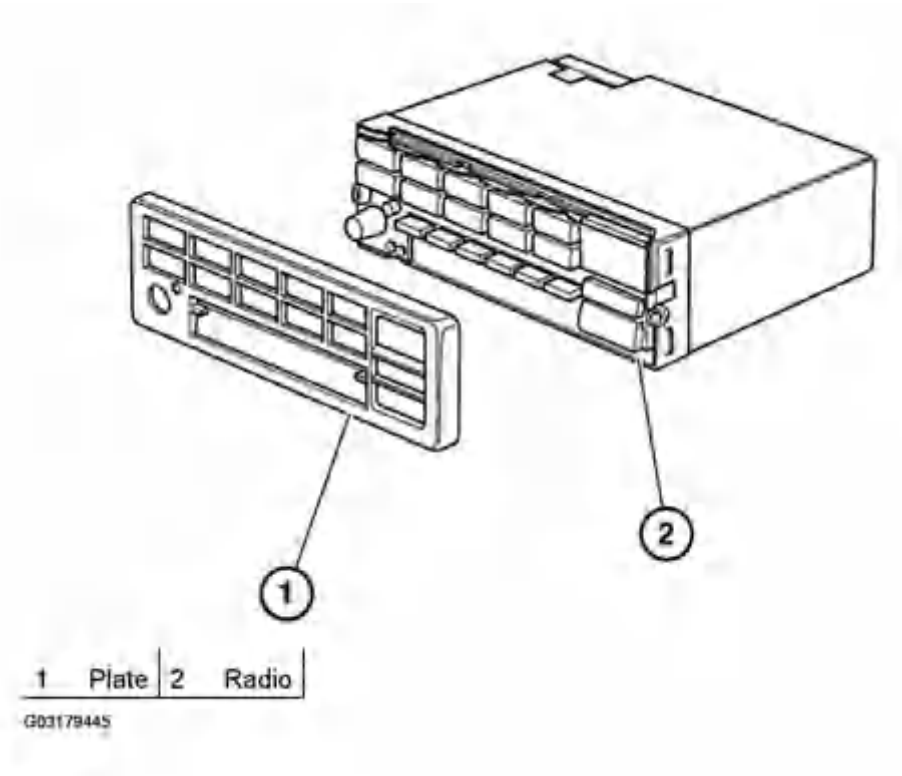


Fig. 10: Removing Radio (Business)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove finisher (1), unfasten left or right screws (3) and remove radio (2) through radio aperture.

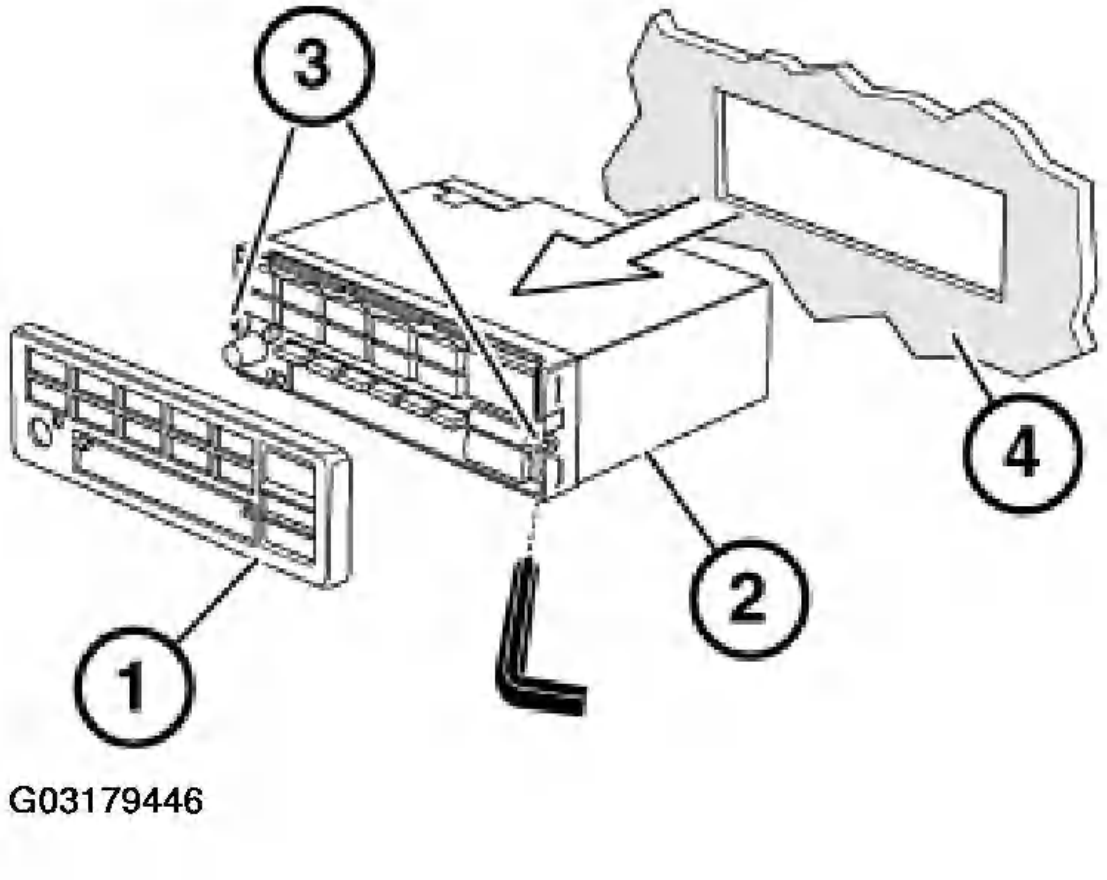


Fig. 11: Removing Finisher

Courtesy of BMW OF NORTH AMERICA, INC.

Remove retaining bracket (1) and remove connector (2) from radio (3).

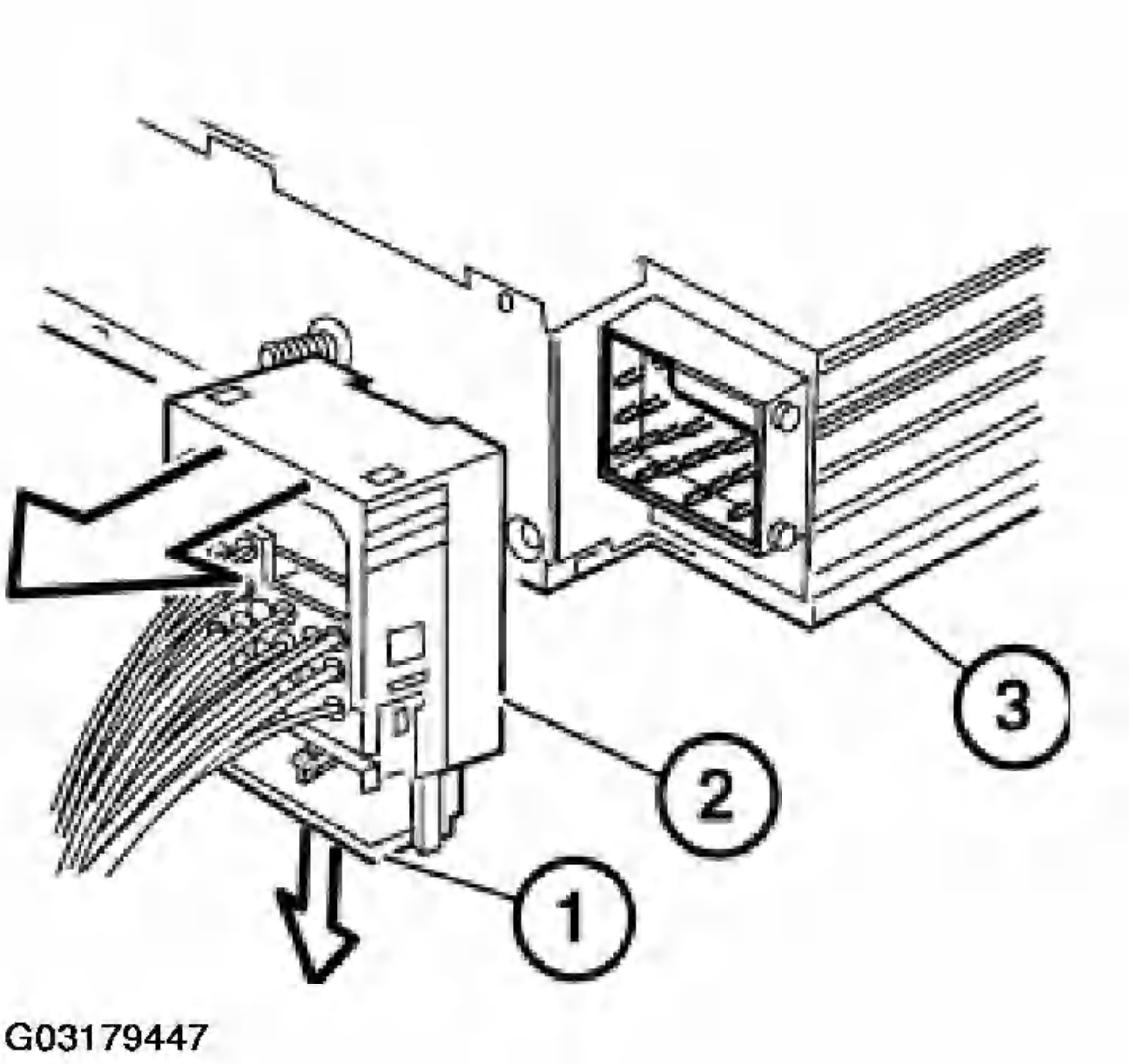


Fig. 12: Removing Retaining Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

65 11 070 REMOVING AND INSTALLING/REPLACING CD CHANGER (Z3 ROADSTER)

Necessary Preliminary Tasks:

- Partially remove panel for luggage compartment partition. Refer to 51 47 140 REMOVING AND INSTALLING / REPLACING PANEL FOR LUGGAGE COMPARTMENT SEPARATING WALL (Z3 ROADSTER, M ROADSTER) .

Release screws (1) and lower holder (2) complete with amplifier and CD changer.

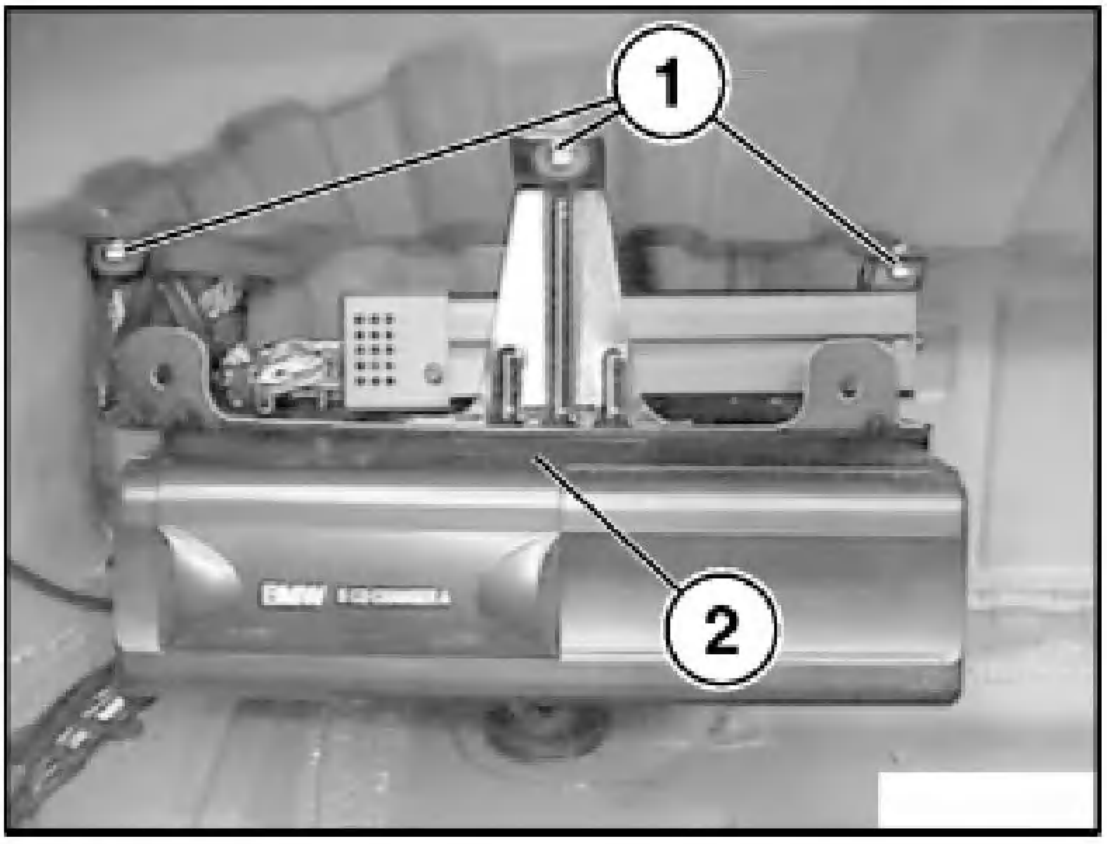


Fig. 13: Removing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connections (1) and (2) on amplifier.

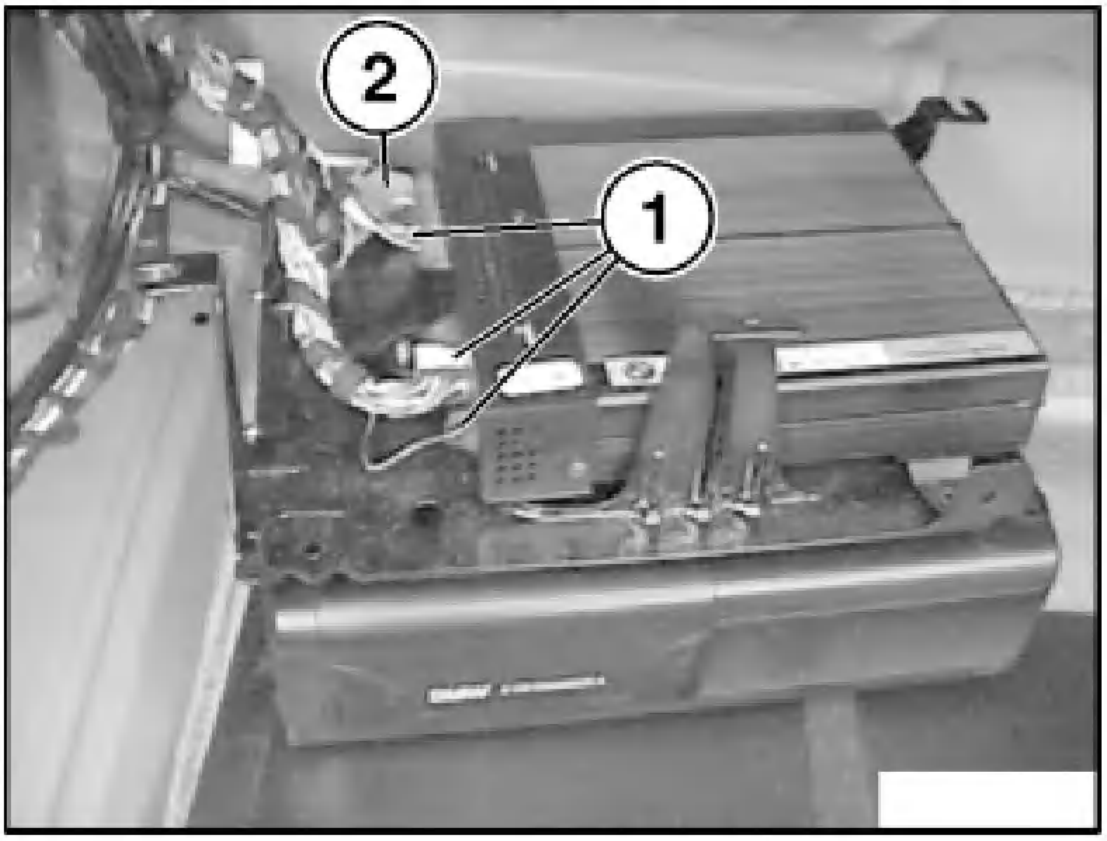


Fig. 14: Disconnecting Plug Connections Amplifier
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) and remove holder (2) complete with amplifier and CD changer.

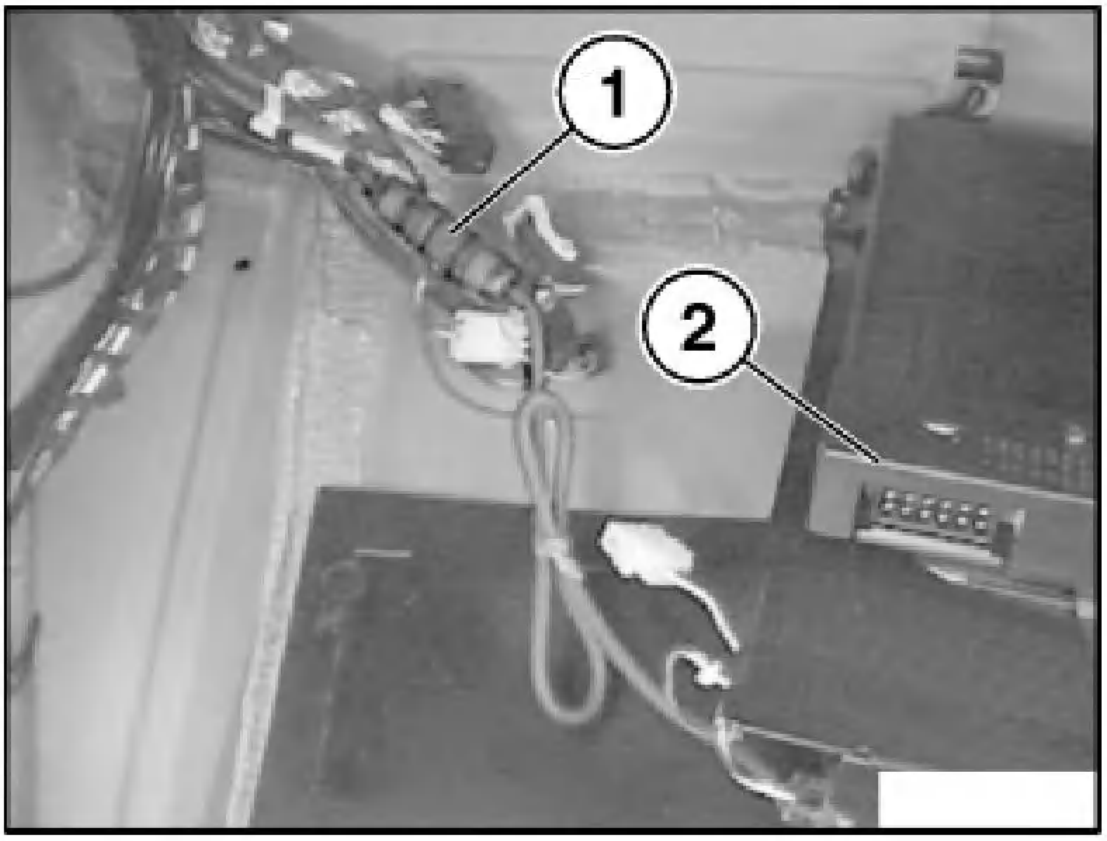


Fig. 15: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws on both sides and remove CD changer from holder.

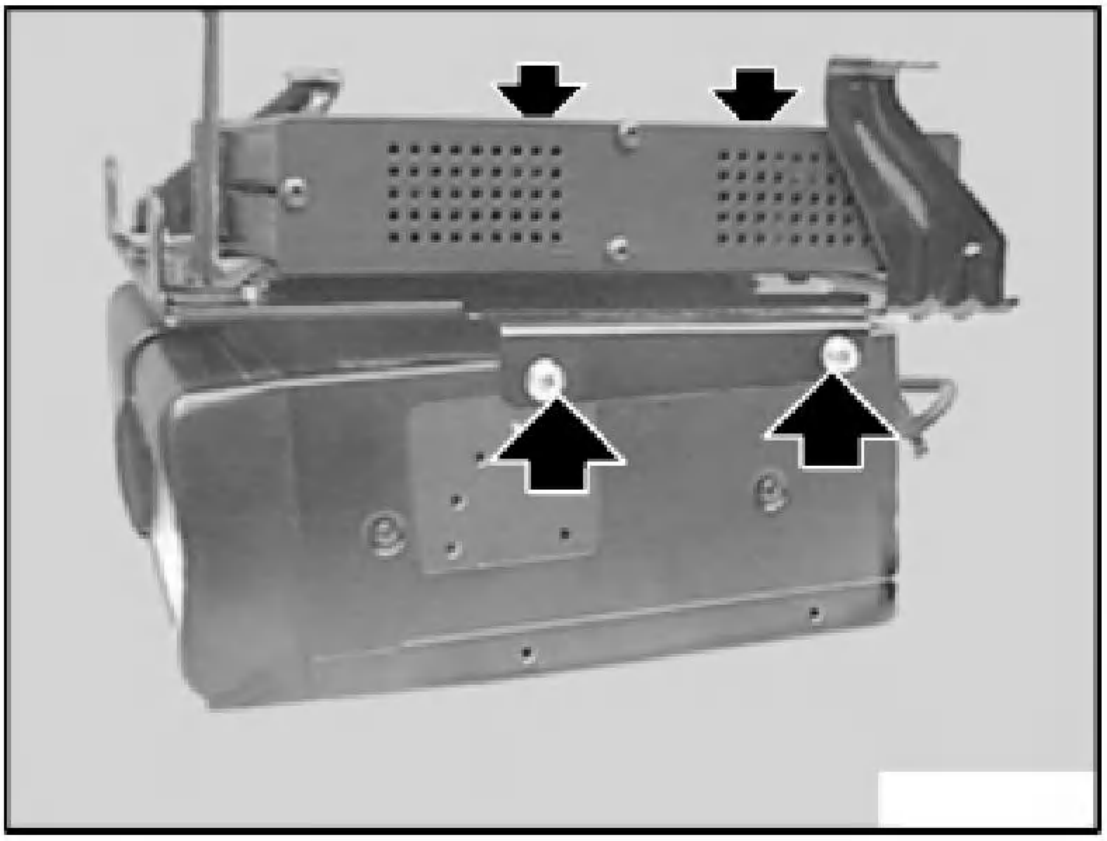


Fig. 16: Releasing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Unscrew transportation locks (1) from CD changer (2).

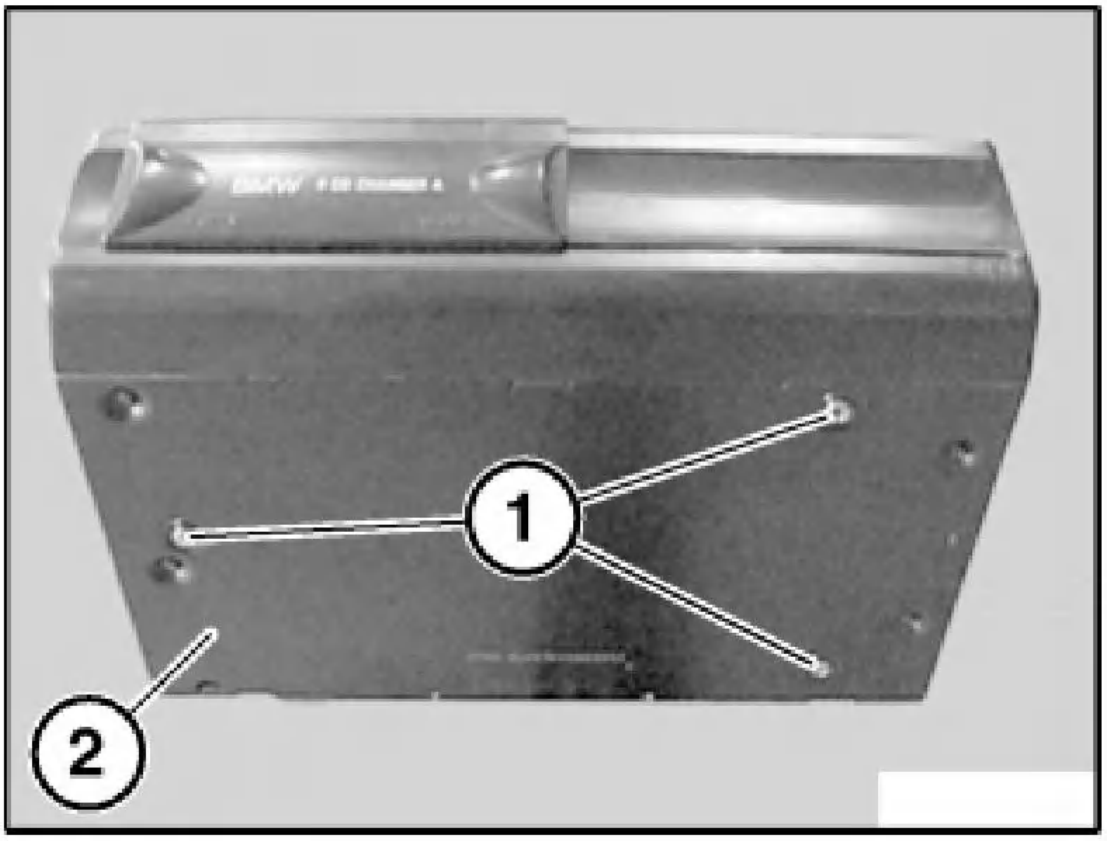


Fig. 17: Removing Screws Transportation Locks
Courtesy of BMW OF NORTH AMERICA, INC.

STEREO RADIO, AMPLIFIER ...

65 12 070 REMOVING AND INSTALLING OR REPLACING AMPLIFIER (Z3 ROADSTER HARMANN KARDON)

Partly remove panel for luggage compartment separating wall, refer to 51 47 140 REMOVING AND INSTALLING / REPLACING PANEL FOR LUGGAGE COMPARTMENT SEPARATING WALL (Z3 ROADSTER, M ROADSTER) .

Unfasten screws (1) and lower entire bracket with amplifier and, if installed, CD changer.

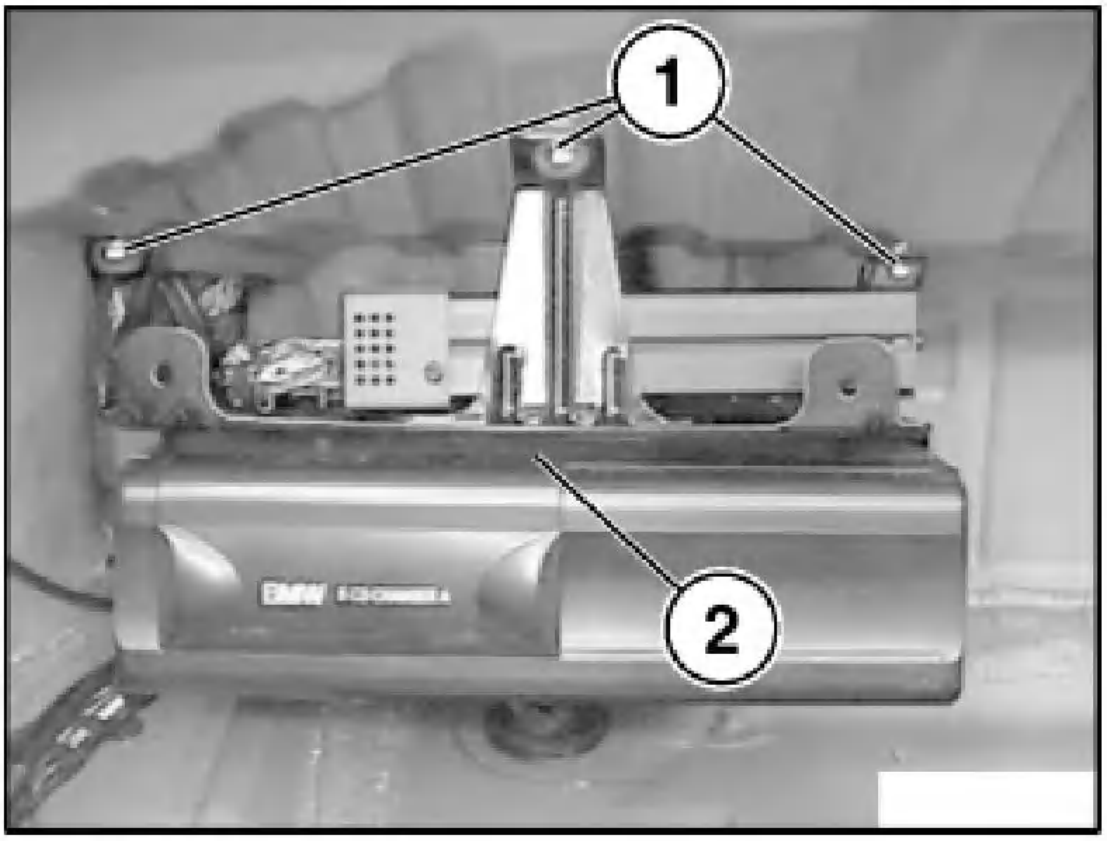


Fig. 18: Removing Amplifier (Z3 Roadster Harmann Kardon)
Courtesy of BMW OF NORTH AMERICA, INC.

Pull connector (1 and 2) on amplifier.

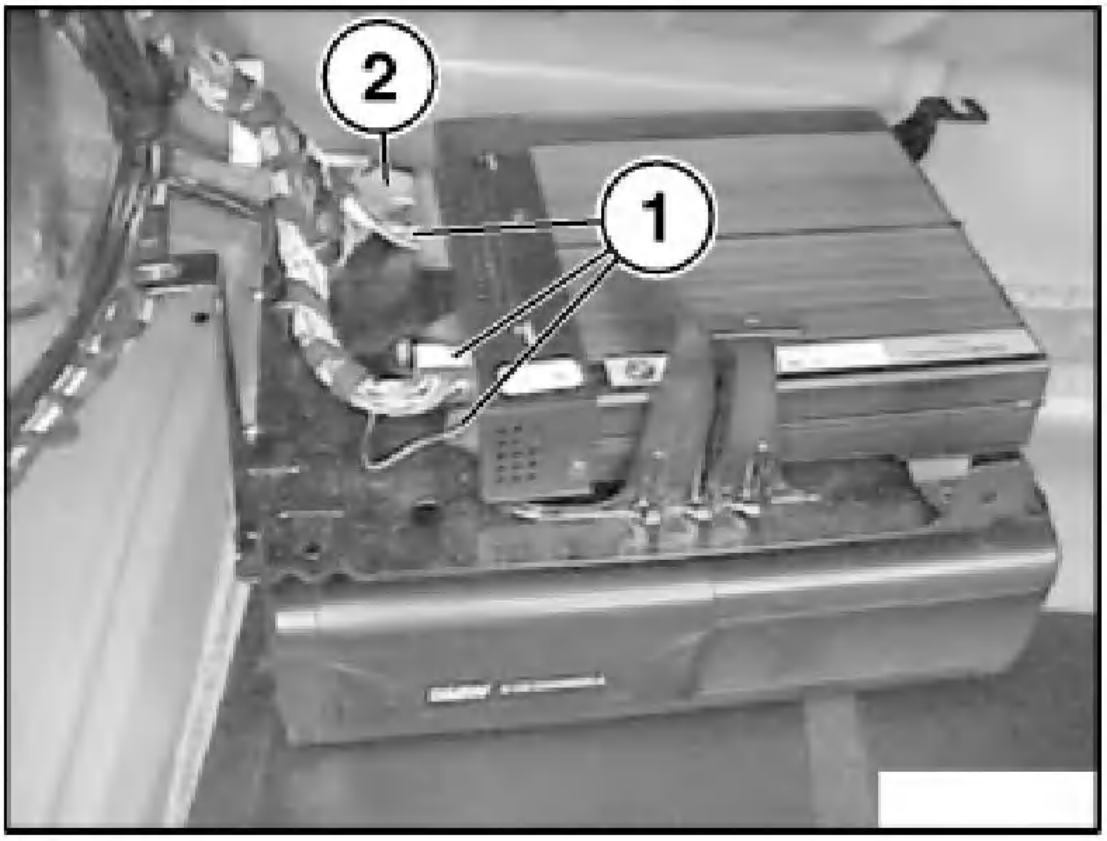


Fig. 19: Pulling Connector Amplifier
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, disconnect plug connector from CD changer and remove bracket with amplifier and, if installed, CD changer.

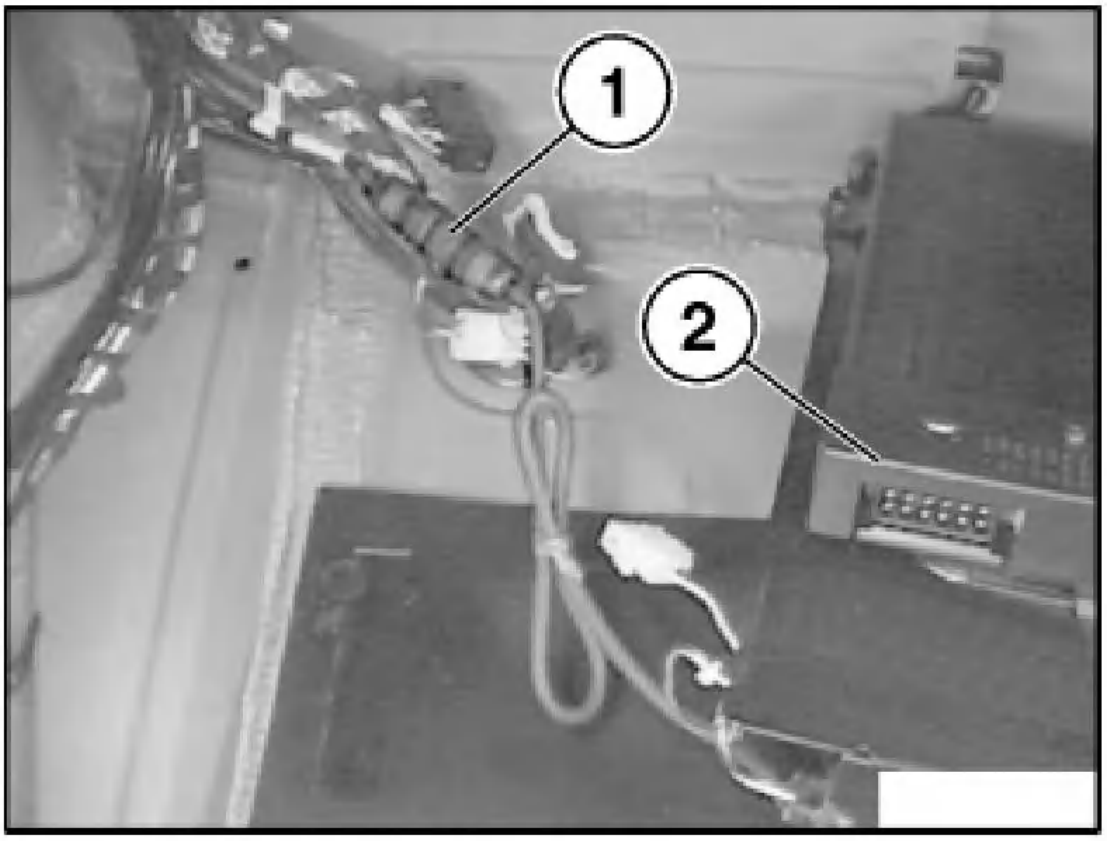


Fig. 20: Disconnecting Plug Connector From CD Changer
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, unfasten screws on right and left and take CD changer off bracket.

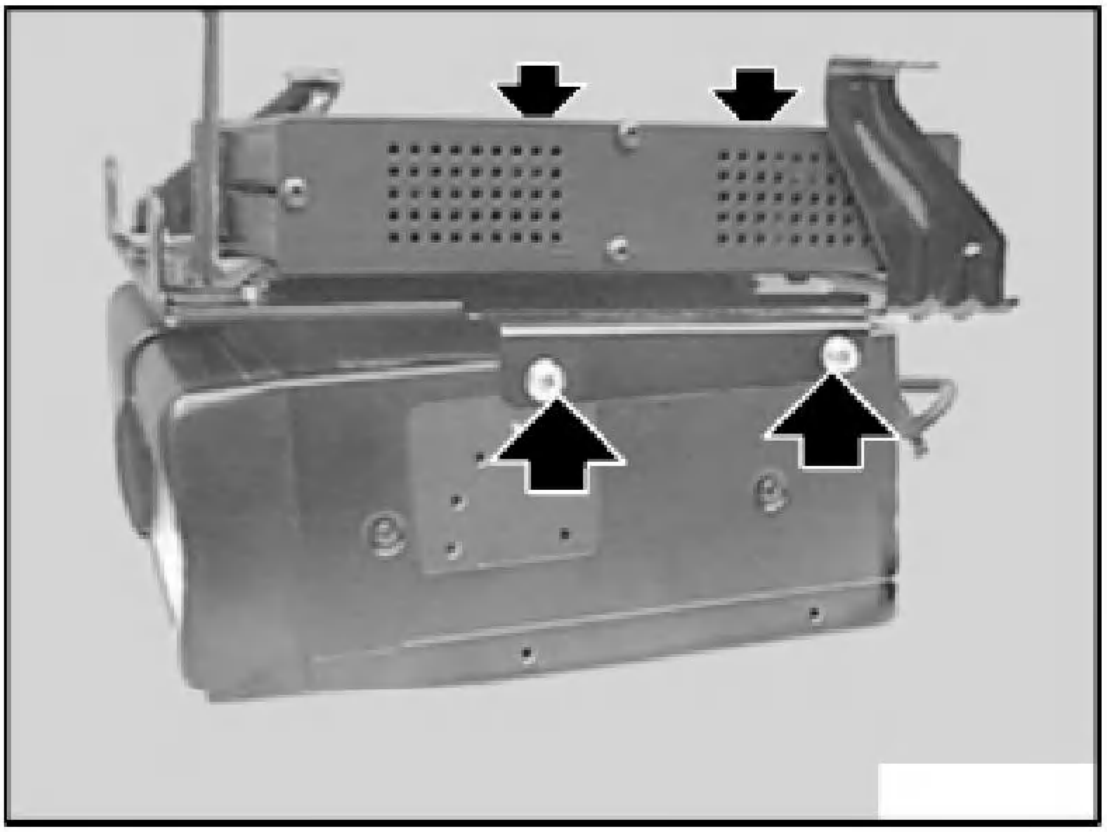


Fig. 21: Removing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws and remove amplifier.

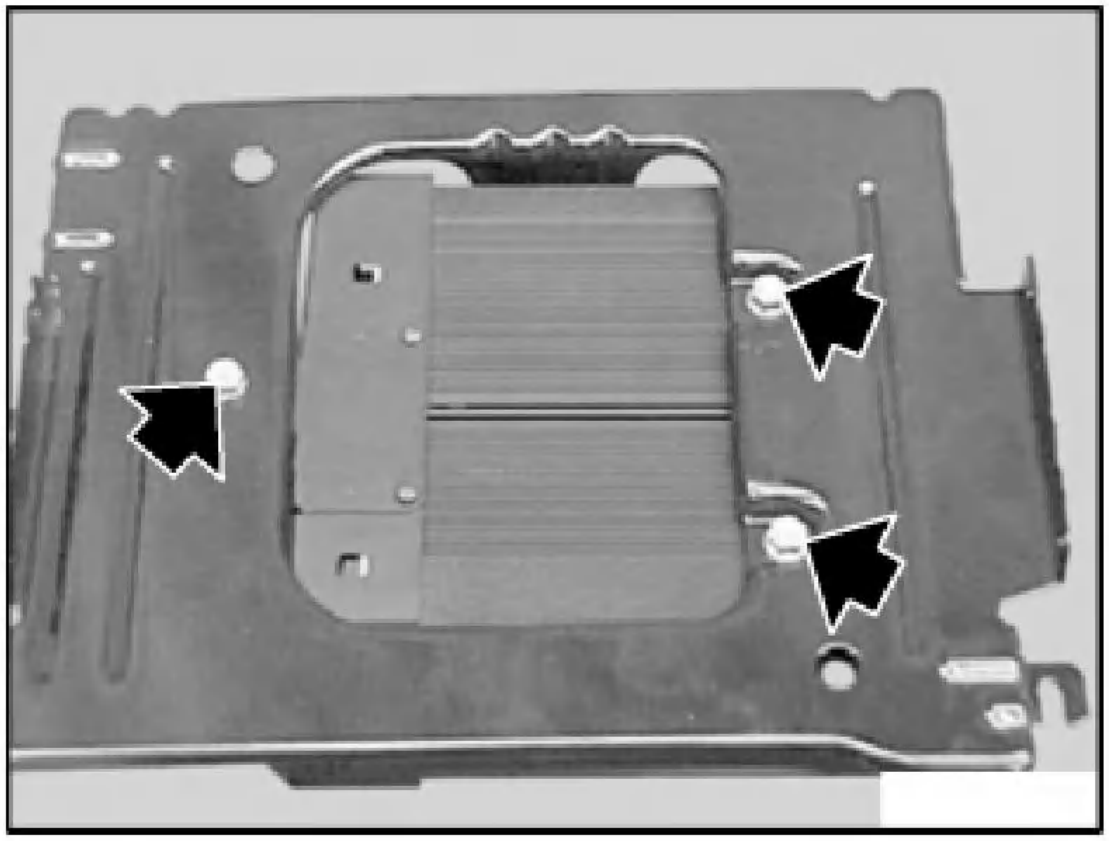


Fig. 22: Removing Amplifier
Courtesy of BMW OF NORTH AMERICA, INC.

SPEAKER AND COVER

65 13 300 REMOVING AND INSTALLING/REPLACING COMPLETE SUBWOOFER SPEAKER FOR TOP HI-FI SYSTEM (Z3 ROADSTER, M ROADSTER HARMANN KARDON)

Unclip cover (1) in direction of arrow.

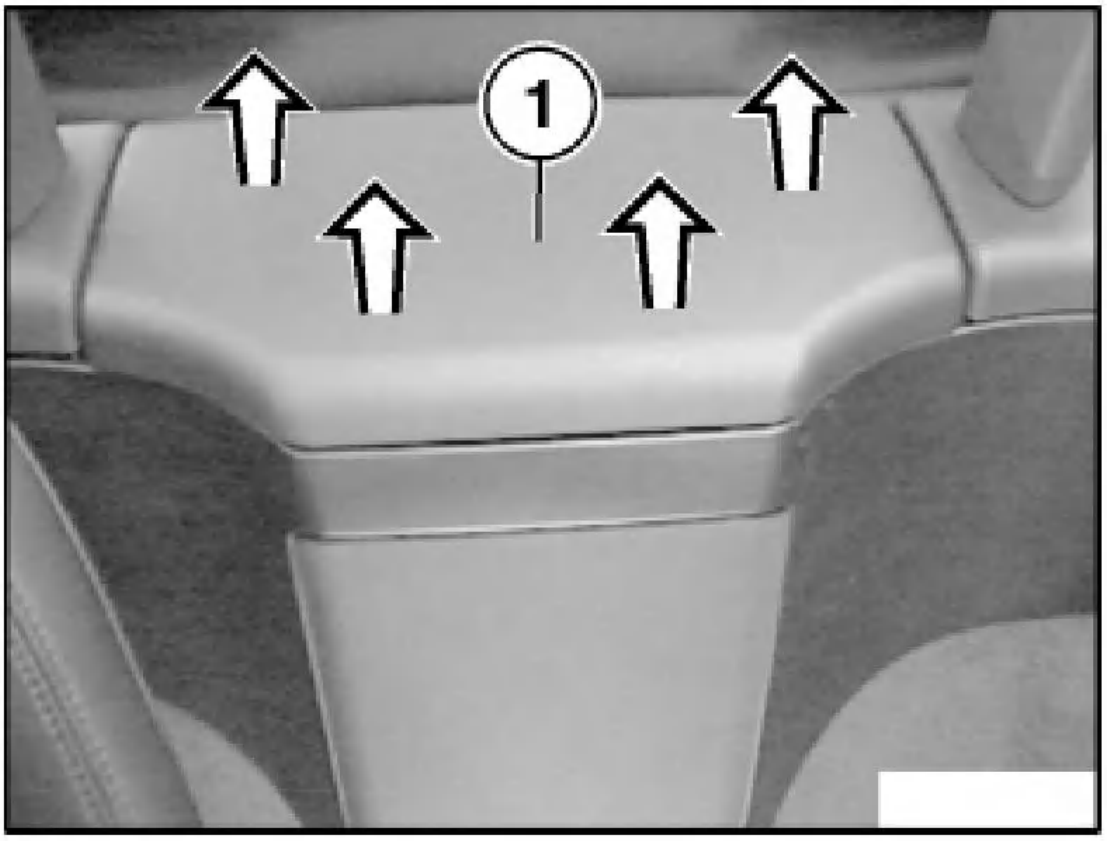


Fig. 23: Unclipping Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace faulty clips (1).

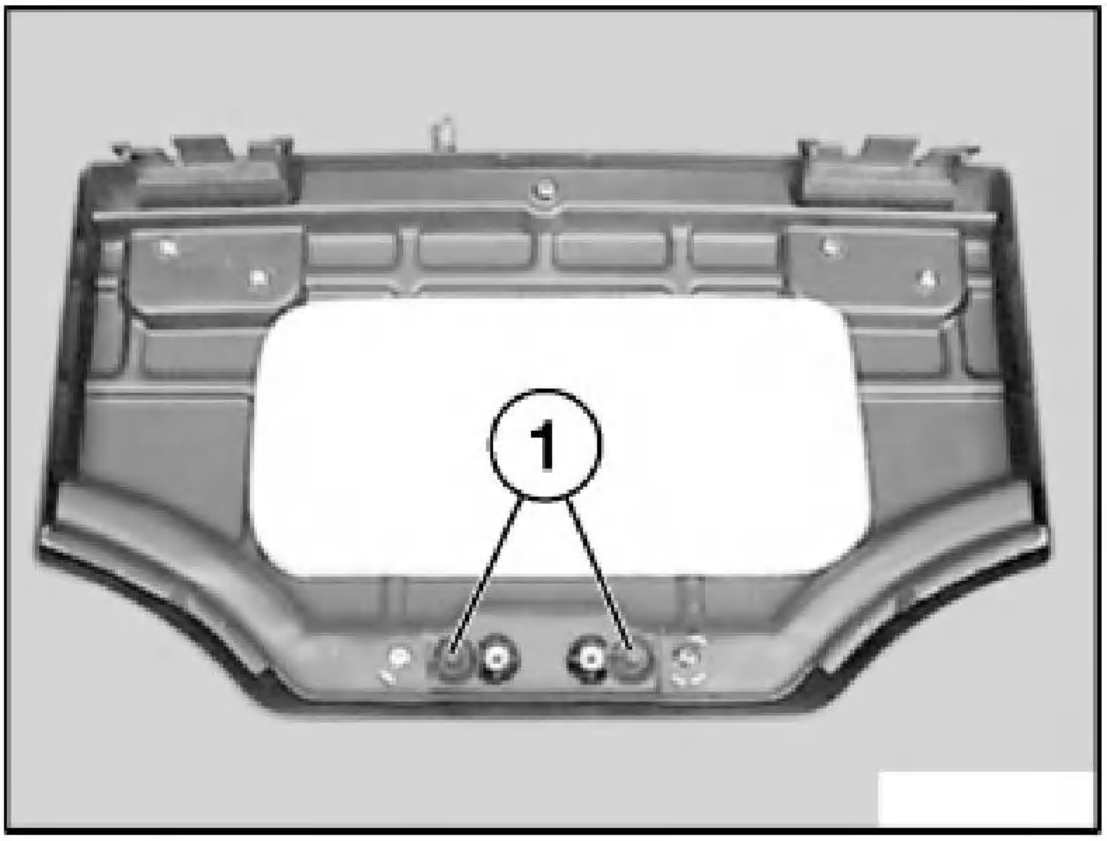


Fig. 24: Locating Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen screws (1).

Remove bracket (2).

Release screws (3).

Pull out subwoofer speaker (4) in direction of arrow.

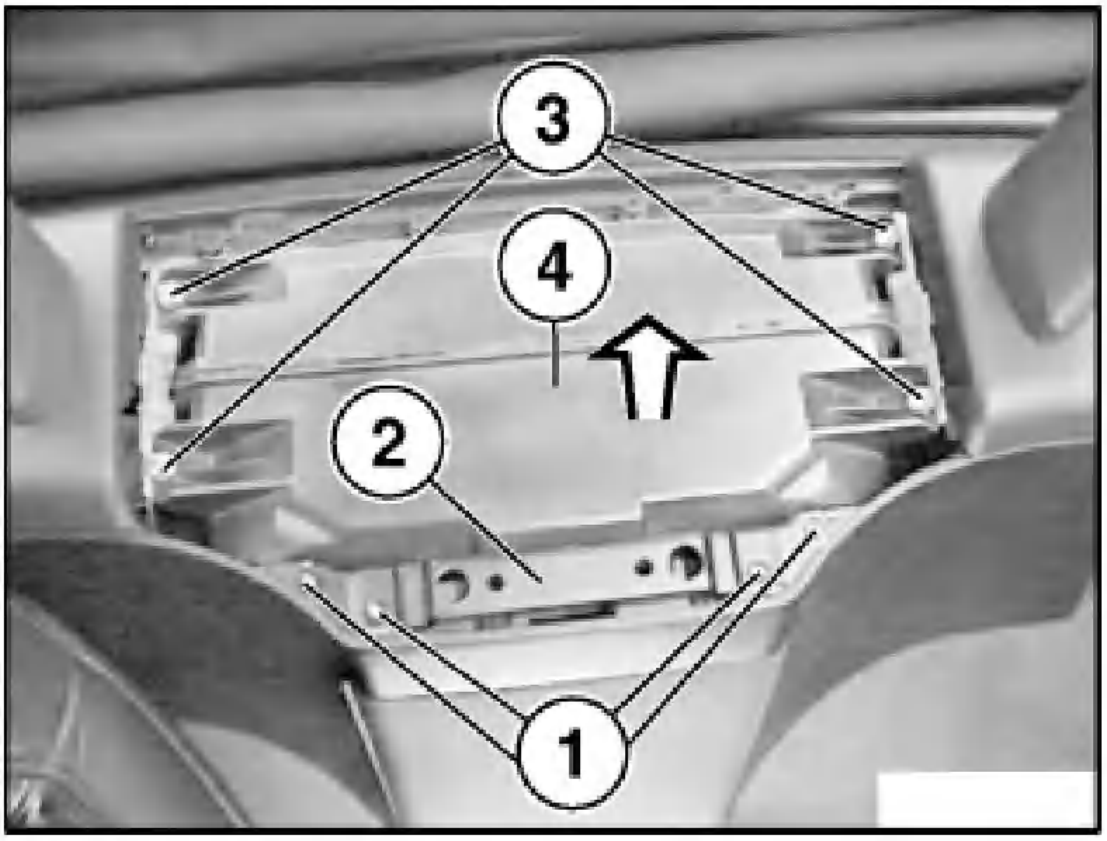


Fig. 25: Locating Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Remove subwoofer speaker from car.

Installation:

Under no circumstances bring plug connection (1) into area of speaker (2) (risk of damage to diaphragm).

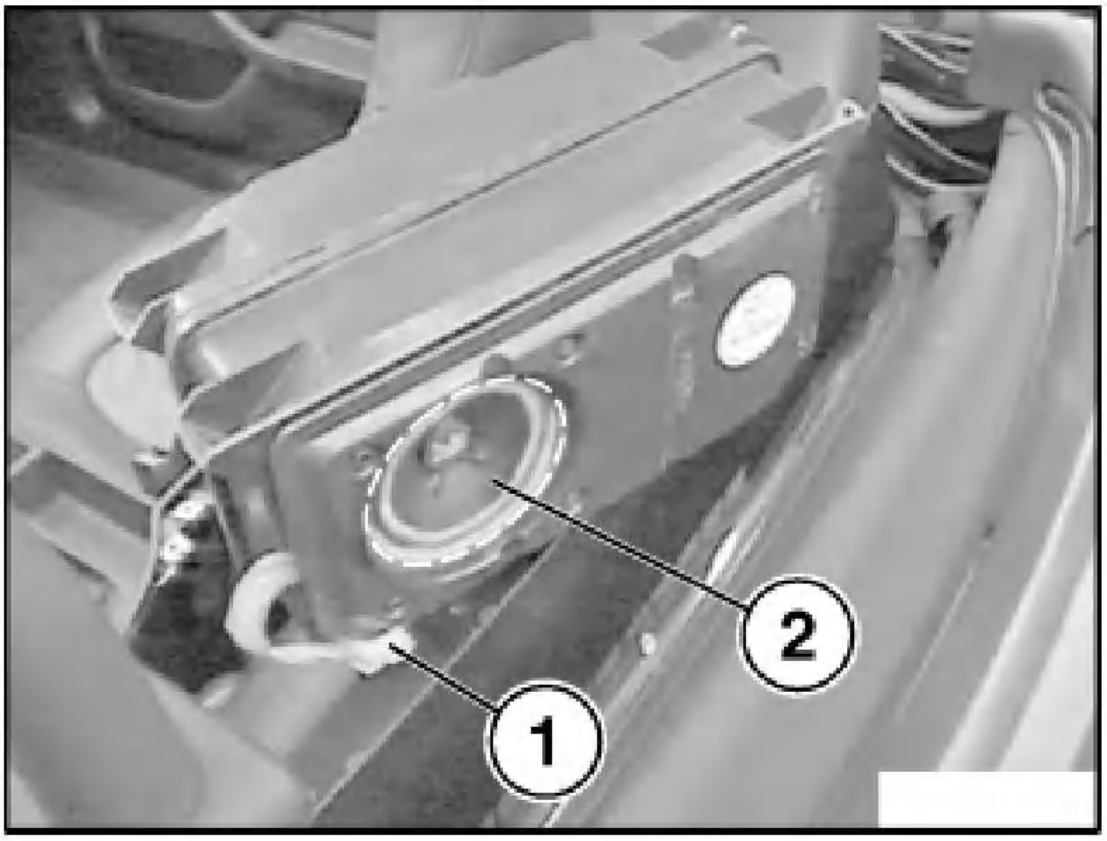


Fig. 26: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Compress subwoofer speaker tube (1) a little.

Subwoofer speaker tube (1) must not be kinked while it is installed (droning noises).

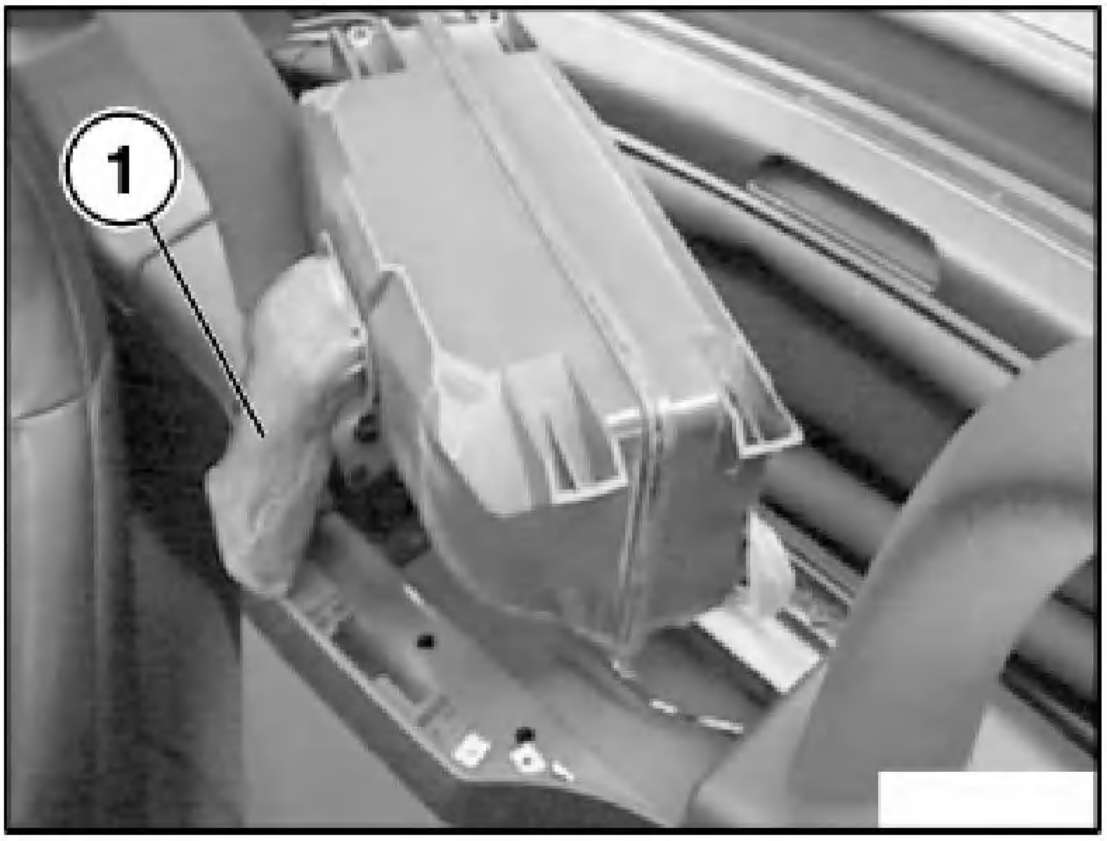


Fig. 27: Compressing Subwoofer Speaker Tube
Courtesy of BMW OF NORTH AMERICA, INC.

65 13 310 REMOVING AND INSTALLING/REPLACING REAR LOUDSPEAKER (Z3 ROADSTER HARMANN KARDON SYSTEM)

Removing loudspeaker box, refer to 65 13 300 REMOVING AND INSTALLING/REPLACING COMPLETE SUBWOOFER SPEAKER FOR TOP HI-FI SYSTEM (Z3 ROADSTER, M ROADSTER HARMANN KARDON) .

Release screws and remove cover.

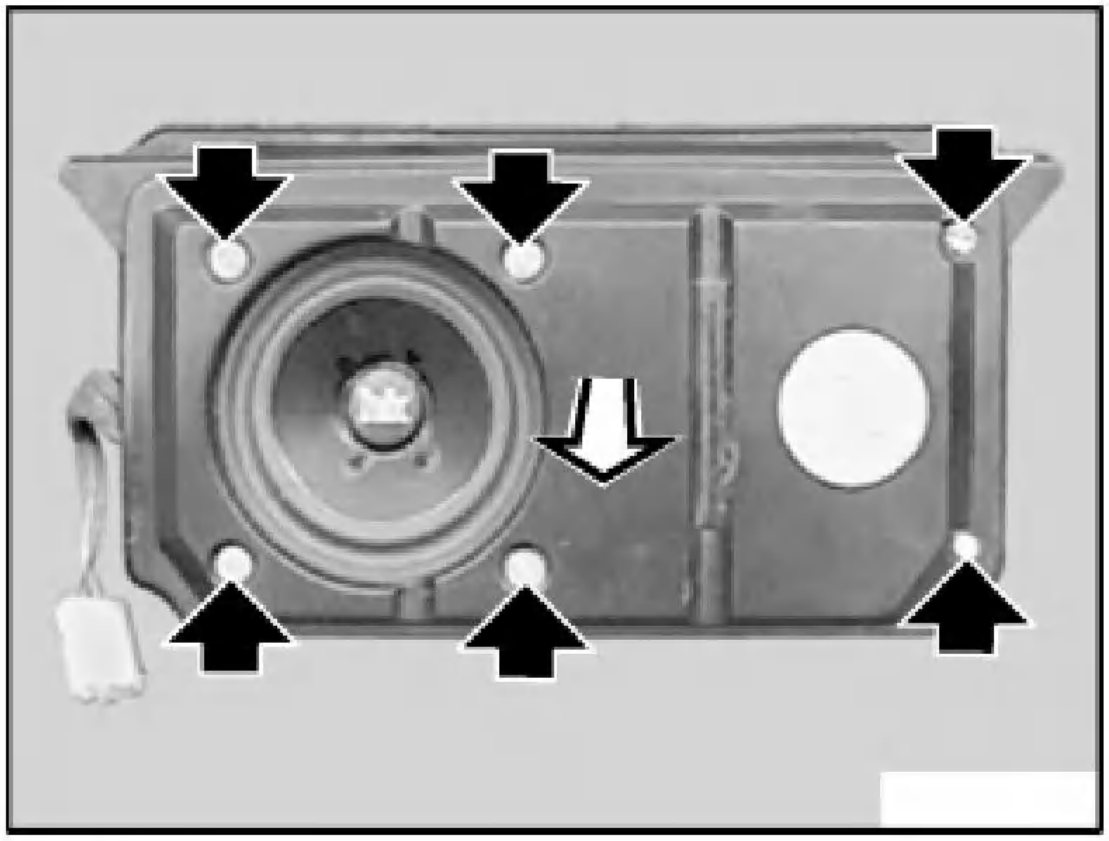


Fig. 28: Locating Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws, pull off connector and remove both loudspeakers.

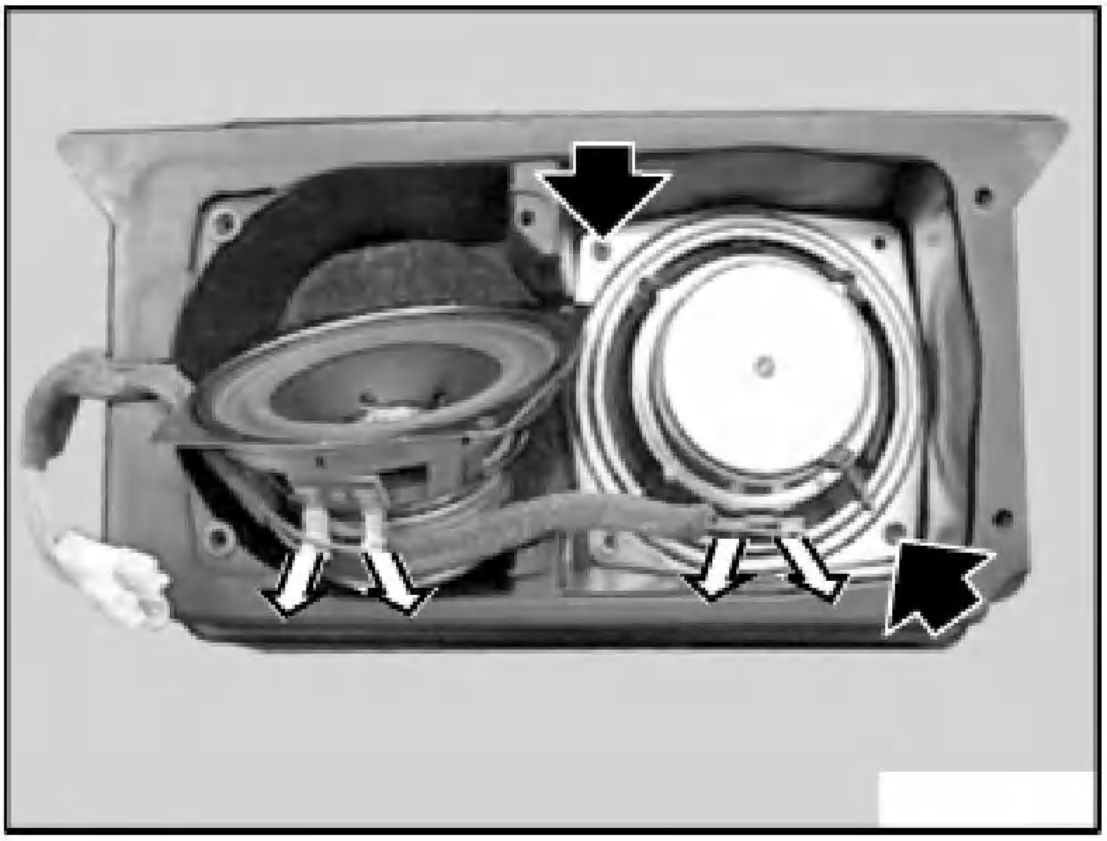


Fig. 29: Pulling Off Connector
Courtesy of BMW OF NORTH AMERICA, INC.

AERIAL/ANTENNA

61 13 ... ANTENNA ELBOW PLUG ON RADIO RECEIVER

Cut off faulty antenna angle plug directly after strain relief.

Carefully and with precision, strip insulation from antenna cable as illustrated (lengths given in mm).

Brush shield (copper braid) towards rear.

Important!

There must be no more copper wire protruding in the direction of the inner conductor on the inner conductor insulation (risk of short circuits).

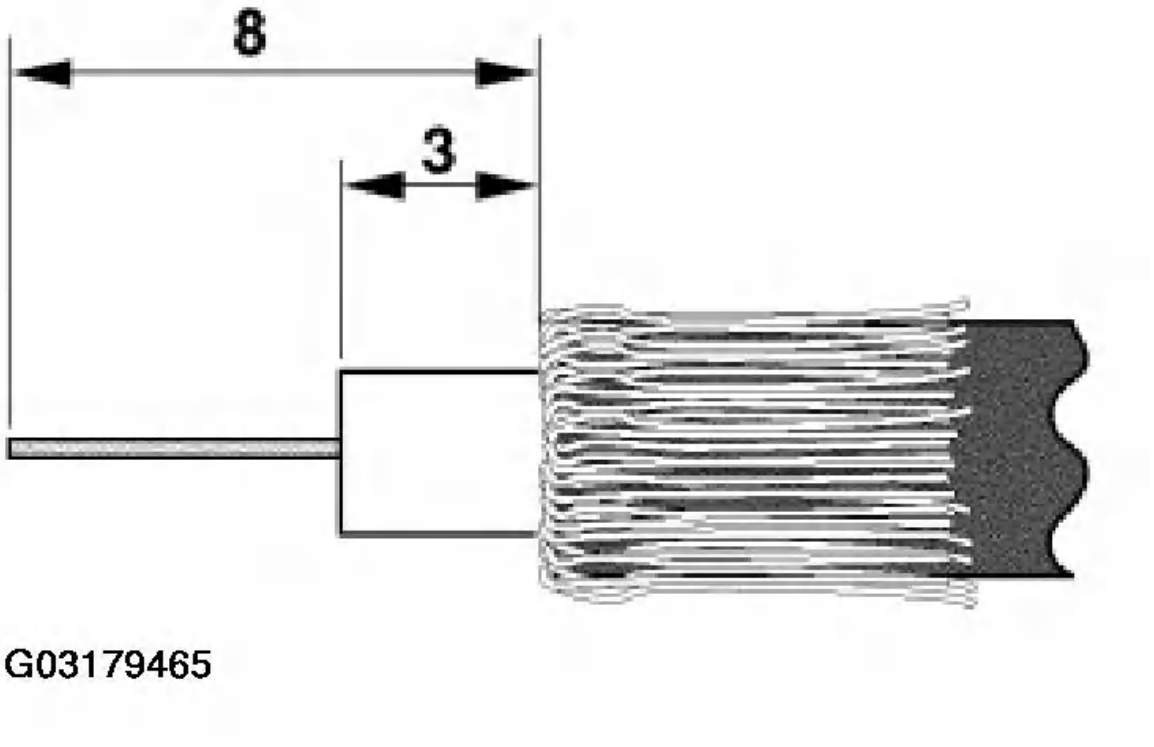


Fig. 30: Measuring Strip Insulation Antenna Cable Length
Courtesy of BMW OF NORTH AMERICA, INC.

Create a loop on inner conductor.

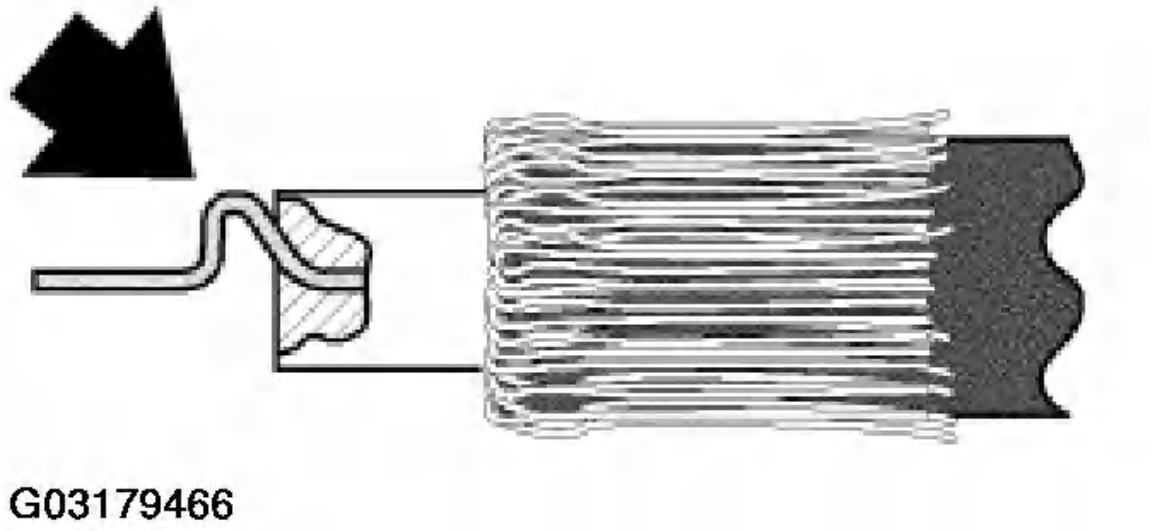


Fig. 31: Locating Loop On Inner Conductor
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Cover soldering area extensively in center console all round radio aperture.

Avoid blobs of melted solder in inside area.

Tin-plate center connection on antenna angle plug and stripped inner conductor.

Solder inner conductor on center connection with a small soldering iron (max. 50 watts) and matching soldering tip (1).

Gently push insulation forward to soldering point and pay attention to correct position of loop.

NOTE: The loop must not under any circumstances come into contact with the metal parts of the antenna plug.



Fig. 32: Locating Soldering Tip
Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 61 9 041 (hand pliers) in conjunction with special tool 61 9 044 (matrix) is used to crimp antenna angle plug.

Refer to repair instructions in 61 13 SPECIAL TOOLS FOR WIRING HARNESS REPAIRS .

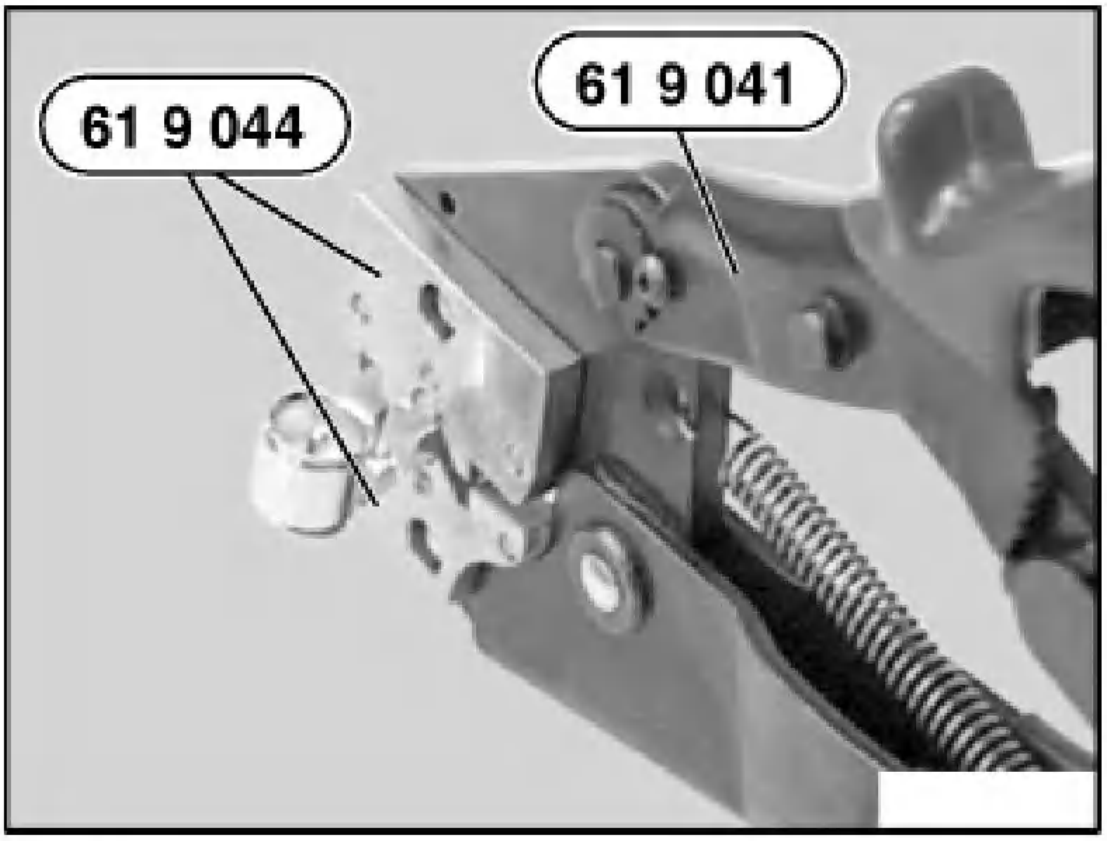


Fig. 33: Installing Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

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.

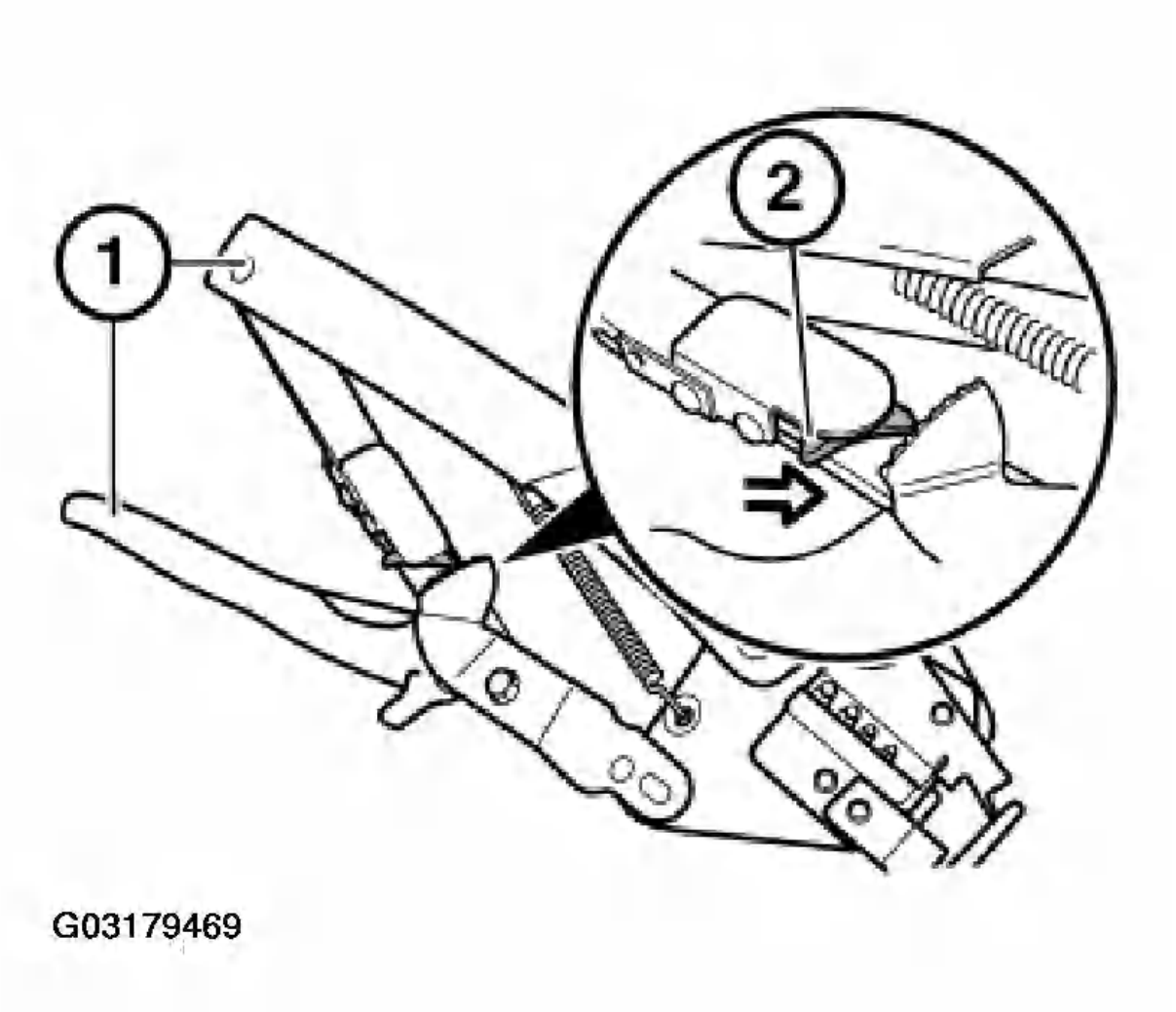


Fig. 34: Unlocking Special Tool 61 9 041
Courtesy of BMW OF NORTH AMERICA, INC.

Place antenna angle plug with cable guide and strain relief in matrix (1).

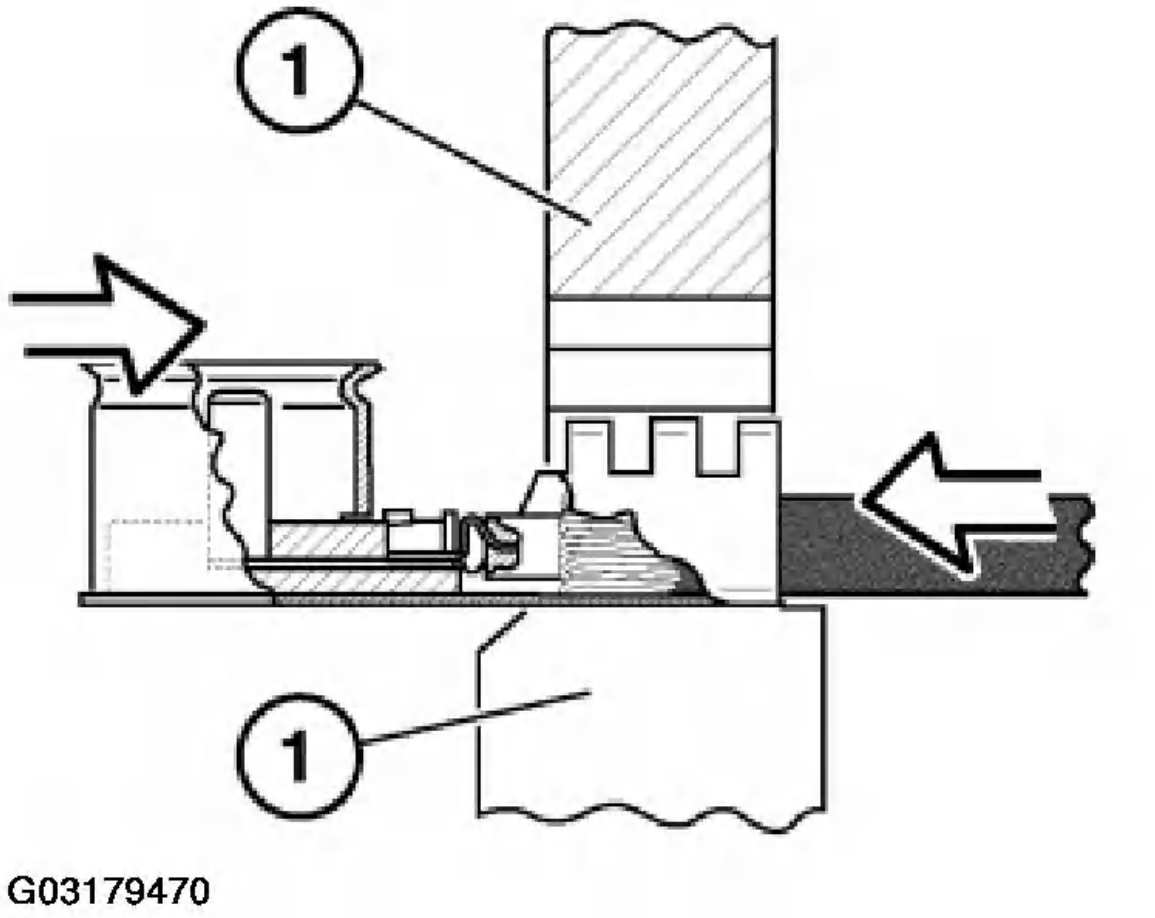


Fig. 35: Placing Antenna Angle Plug With Cable Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Compress special tool 61 9 041 as far as it will go.

Special tool 61 9 041 unlocks automatically.

Remove antenna angle plug with antenna cable from special tool 61 9 044.

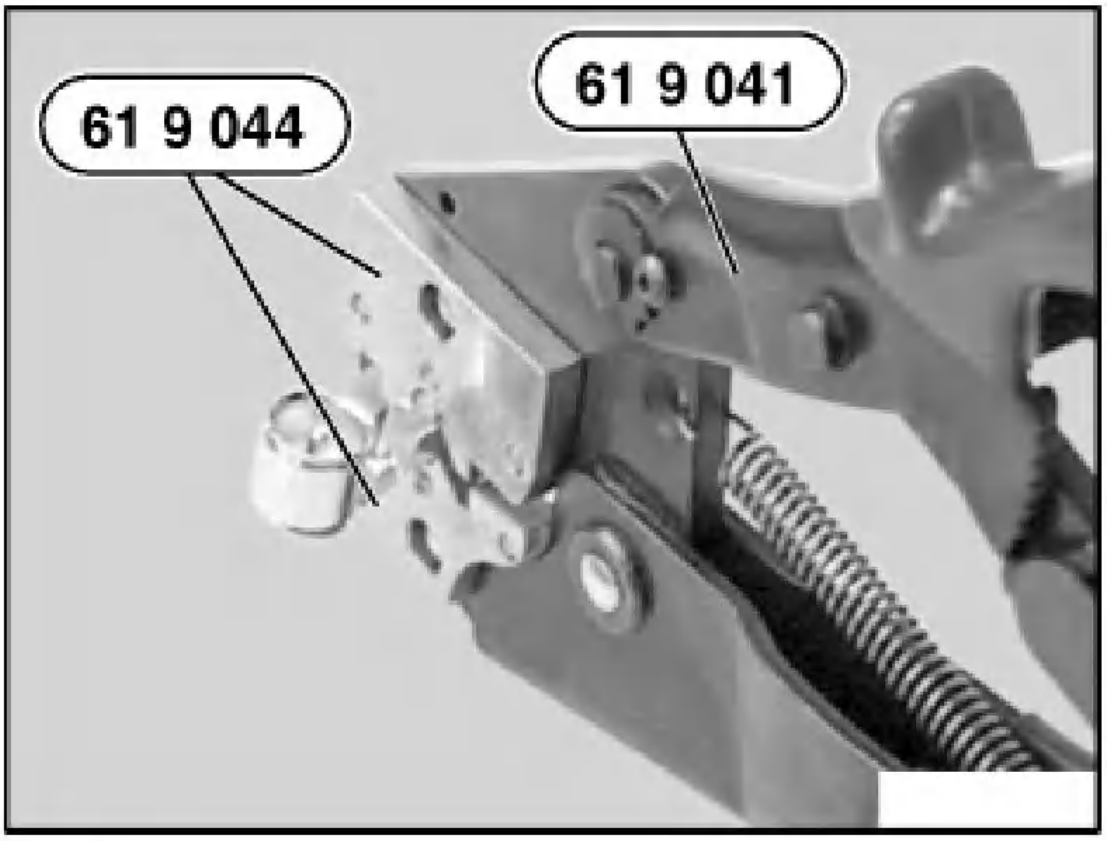


Fig. 36: Installing Special Tool 61 9 041
Courtesy of BMW OF NORTH AMERICA, INC.

HAND AERIAL/ANTENNA

65 21 020 REMOVING AND INSTALLING/REPLACING REAR ANTENNA (Z3 ROADSTER)

Removing left luggage compartment trim, refer to 51 47 151 REMOVING AND INSTALLING/REPLACING LEFT TRUNK WHEEL HOUSING TRIM (Z3 ROADSTER, M ROADSTER) .

Unfasten antenna rod.

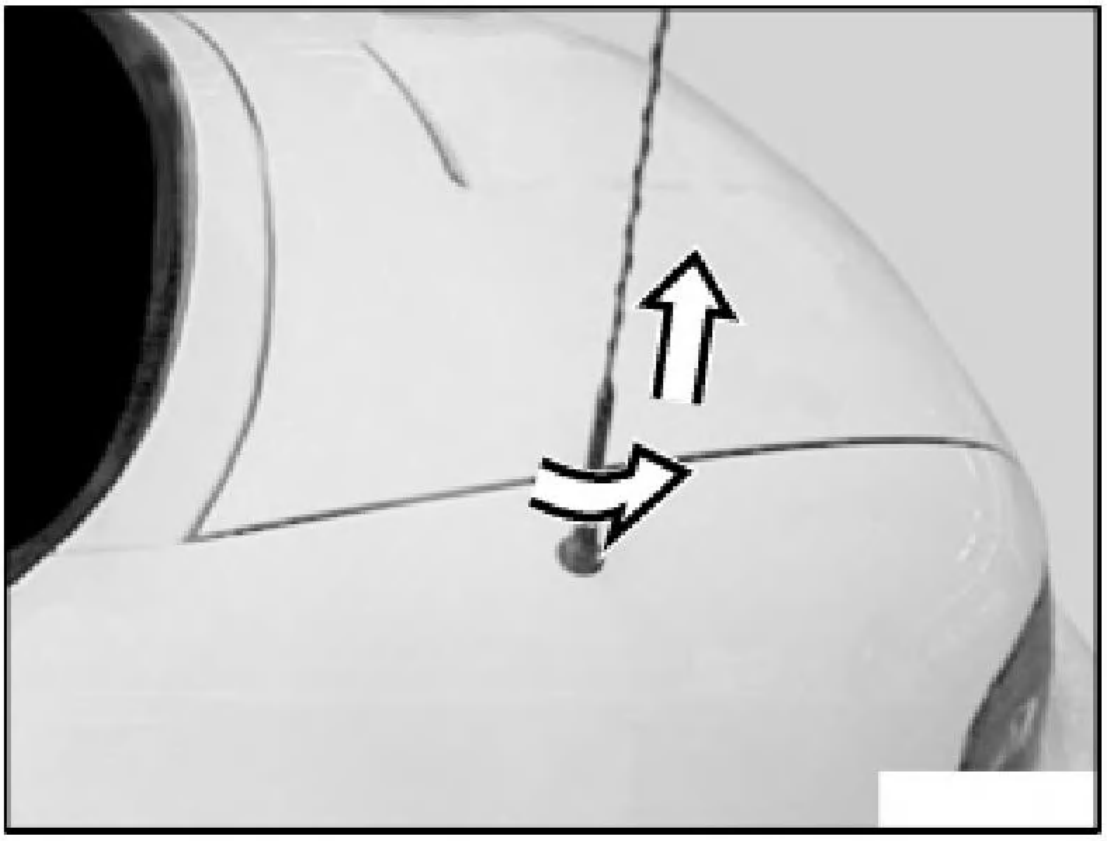


Fig. 37: Removing Antenna Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten nut and pull antenna downward out of rubber grommet by twisting back and forth.

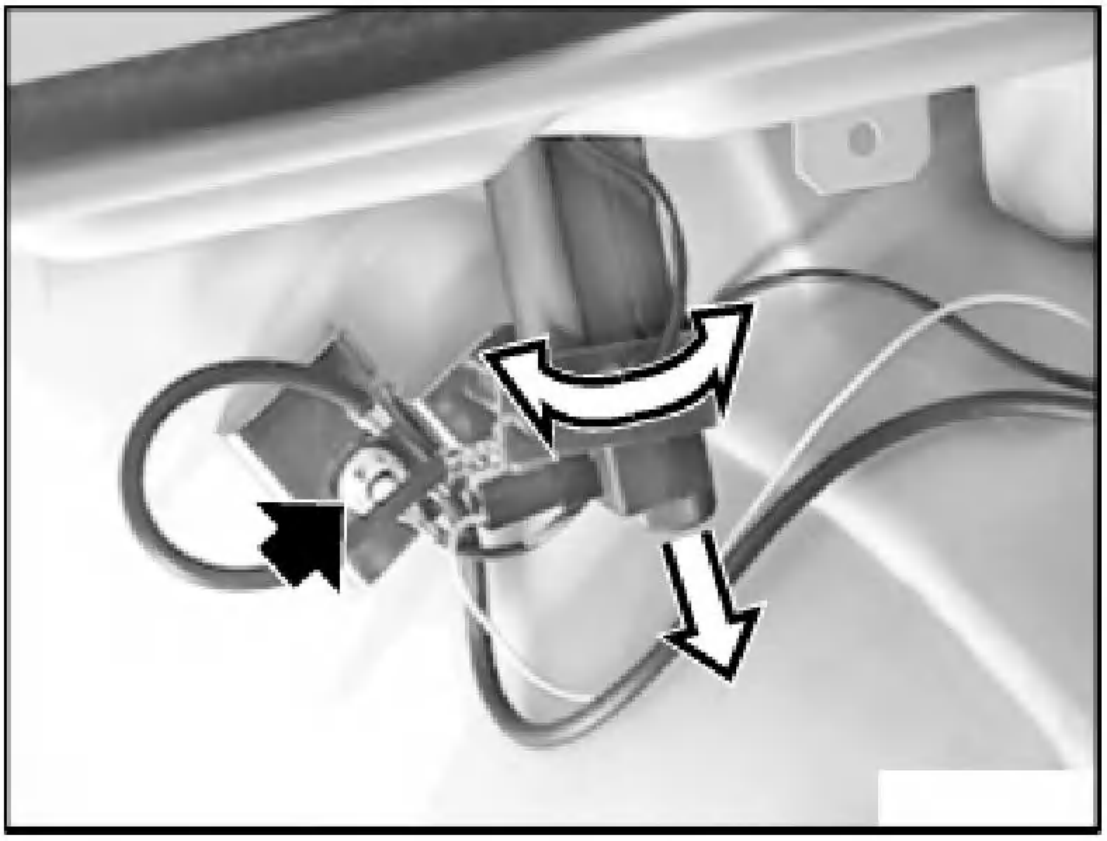


Fig. 38: Locating Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen screws, pull off connector and remove antenna from bracket.

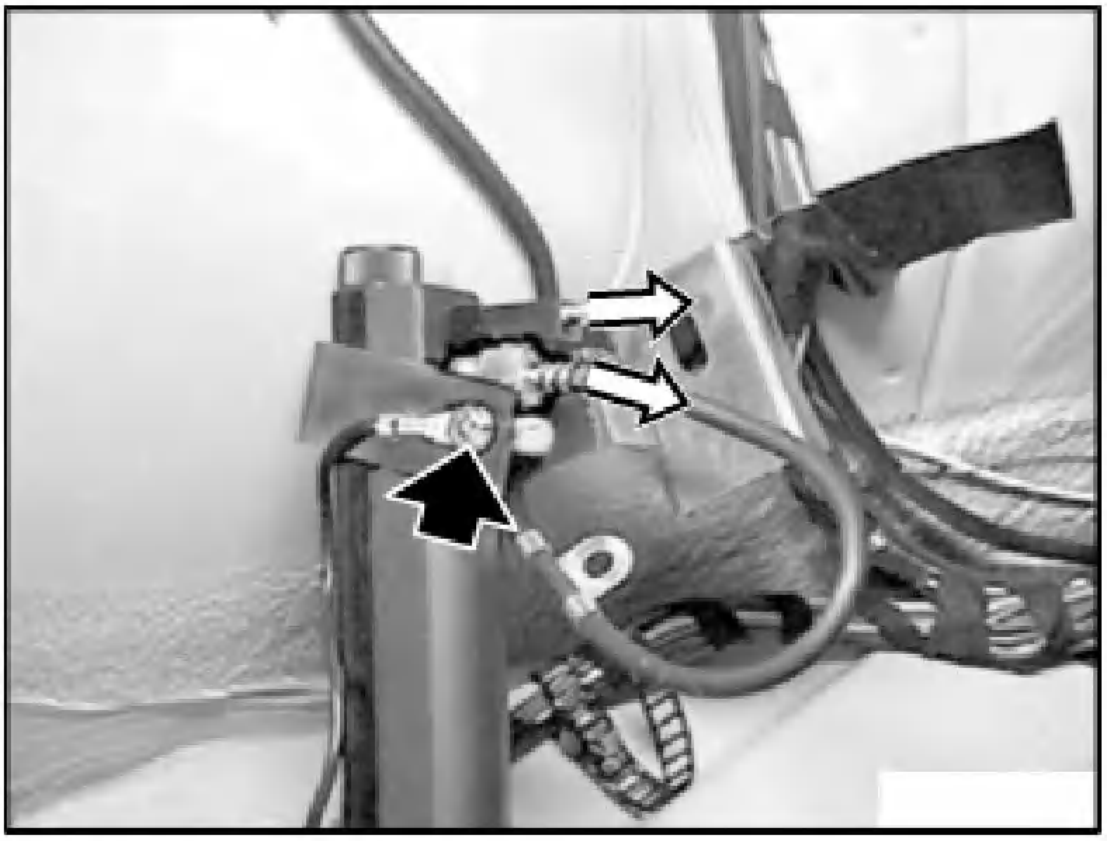


Fig. 39: Locating Screws
Courtesy of BMW OF NORTH AMERICA, INC.

AIRBAG TRIGGER DEVICE,...

65 77 016 REMOVING AND INSTALLING AIRBAG CONTROL UNIT (BASIC/CENTRAL AIRBAG UNIT OR MULTIPLE RESTRAINT SYSTEM)

WARNING: Comply with safety precautions! An incorrect procedure can lead to activation of the airbag and possible injury. Disconnect battery and cover negative pole or terminal. Perform system check after assembly. Refer to BMW (1986-04) .

Z3 Coupe, Z3 Roadster, M Coupe, M Roadster:

Remove center console. Refer to 51 16 200 REMOVING AND INSTALLING ODDMENTS TRAY (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Disconnect plug connection.

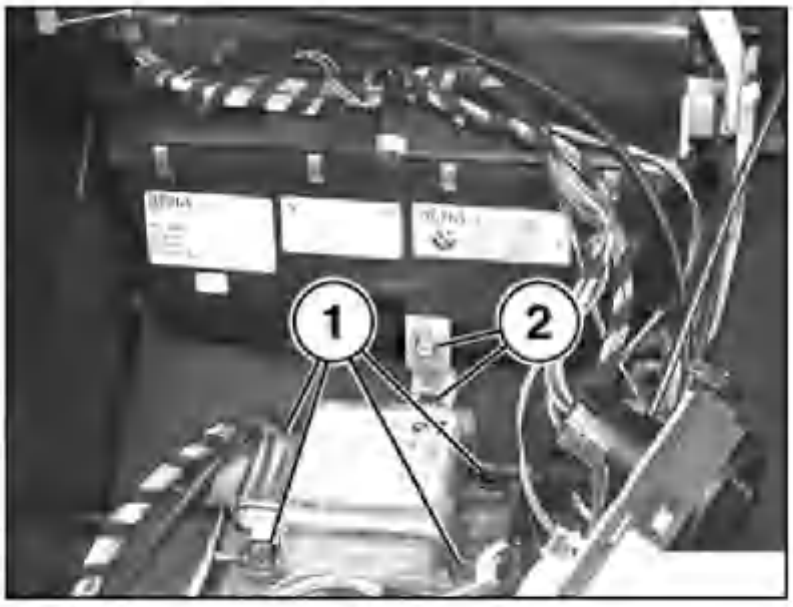


Fig. 40: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove airbag control unit.

Installation:

Observe tightening torque, 65 77 1AZ. Refer to 65 77 AIRBAG TRIGGERING CONTROL .

65 77 518 REPLACING AIRBAG CONTROL UNIT

Necessary Preliminary Tasks:

- Remove airbag control unit. Refer to 65 77 016 REMOVING AND INSTALLING AIRBAG CONTROL UNIT (BASIC/CENTRAL AIRBAG UNIT OR MULTIPLE RESTRAINT SYSTEM) .

Installation:

Carry out programming/coding.

65 77 550 REMOVING AND INSTALLING/REPLACING COLLISION SENSOR FOR LEFT OR RIGHT SIDE AIRBAG

WARNING: Note airbag safety instructions! Incorrect handling can activate airbag and cause injury. Refer to BMW (1986-04) .

Turn ignition key to position 0.

Remove entrance cover strip. Refer to 51 47 000 REMOVING AND INSTALLING/REPLACING ENTRANCE COVER STRIP (INTERIOR), FRONT LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Remove driver's seat. Refer to 52 10 000 REMOVING AND INSTALLING FRONT SEAT (NORMAL/ELECTRIC), LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Fold back carpet floor in area of driver's seat.

Disconnect plug connection.

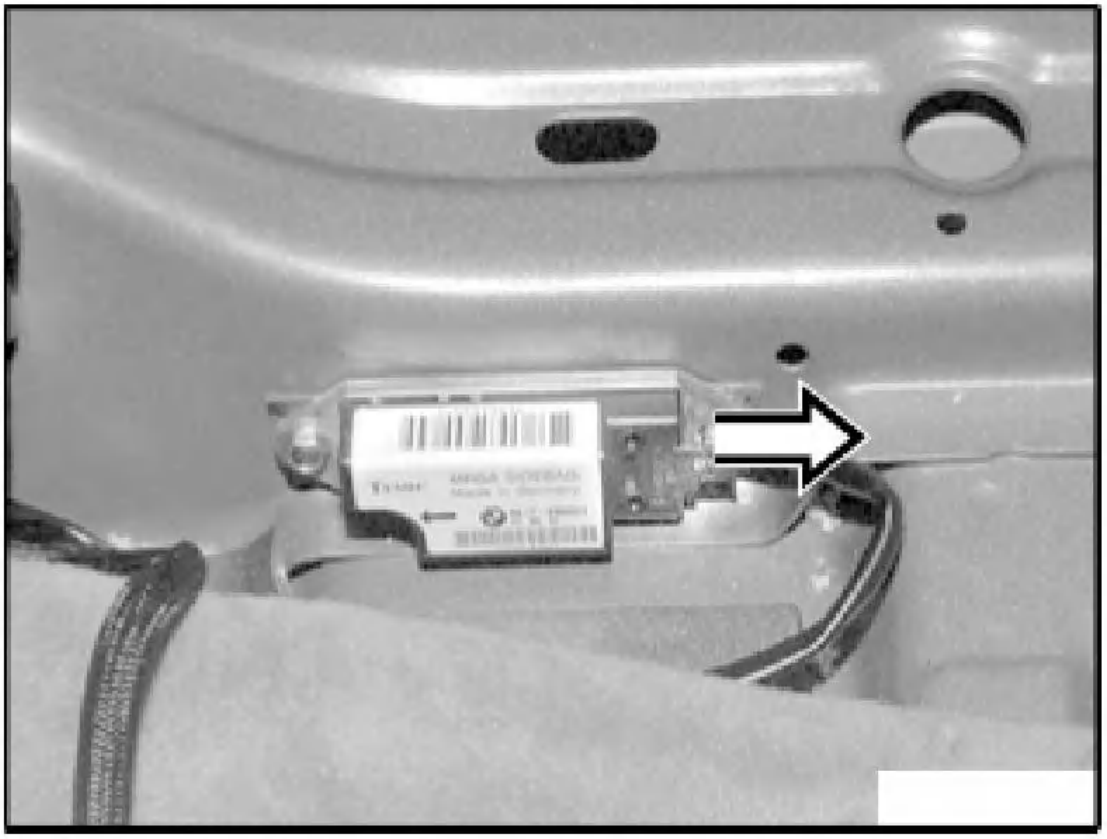


Fig. 41: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws and remove impact sensor for side airbag.

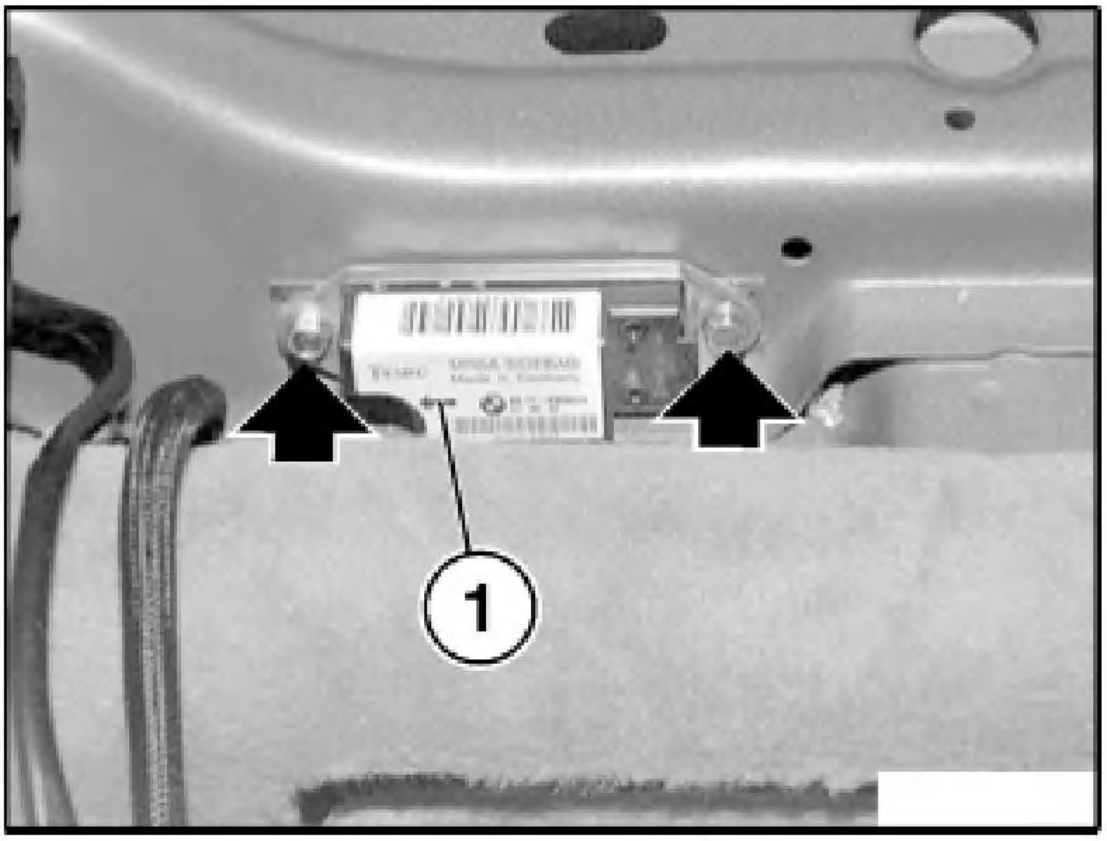


Fig. 42: Releasing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Arrow (1) on impact sensor for side airbag must point to sill.

Observe tightening torque, 65 77 2AZ. Refer to 65 77 AIRBAG TRIGGERING CONTROL .

TROUBLESHOOTING

65 99 ... TEST MODE FOR BMW CAR RADIO (BAVARIA C III)

The "BAVARIA C III" device has a test mode with which various items of internal information can be displayed and with which various operating modes can be adjusted.

Starting Test Operation:

Press keys "2" and "5" simultaneously while switching the radio on. A capital "S" appears in the display next to the wave range. The selected station is still received.

This service mode is abandoned by switching the radio on and off once.

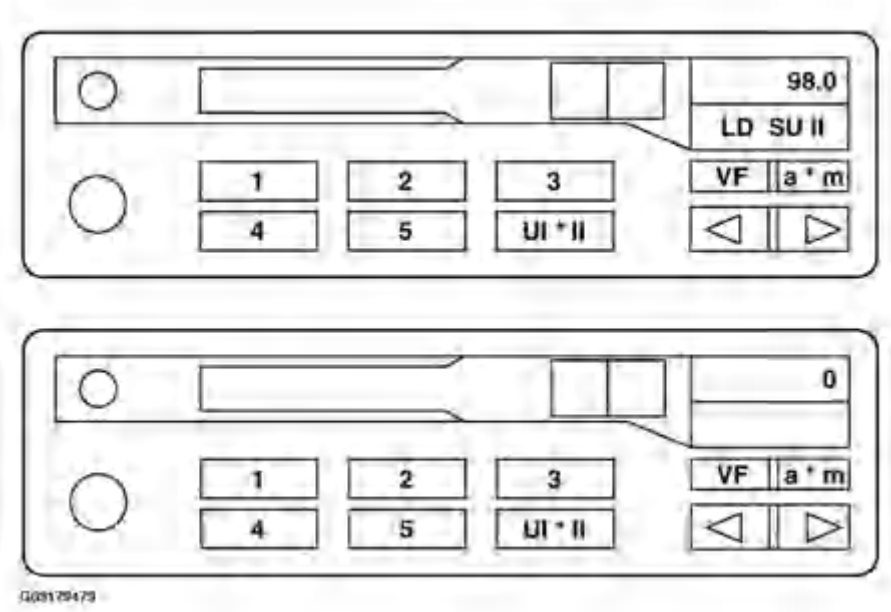


Fig. 43: Identifying Radio Switch Display
Courtesy of BMW OF NORTH AMERICA, INC.

Change Increase In Loudspeaker Volume When Traffic Information Is Broadcast:

Press the "VF" button for approx. 4 seconds until a "0" appears in the display. The station will be a little louder. With search run button, volume can be raised in 5 steps.

The factory setting is "0".

The regulating range amounts to +/- 6,25 dB.

This mode is abandoned by pressing "VF" key again. The test mode remains activated.

Adjusting Roadspeed-Dependent Volume (GAL):

Press station button "3" for approx. 4 seconds until a "2" appears in the display. This value can be changed by using the automatic tuning rocker.

The factory setting is "2".

Regulation range:

"1": weak increase.

"2": medium increase.

"3": strong increase.

This mode is abandoned by pressing the "3" key again. The test mode remains activated.

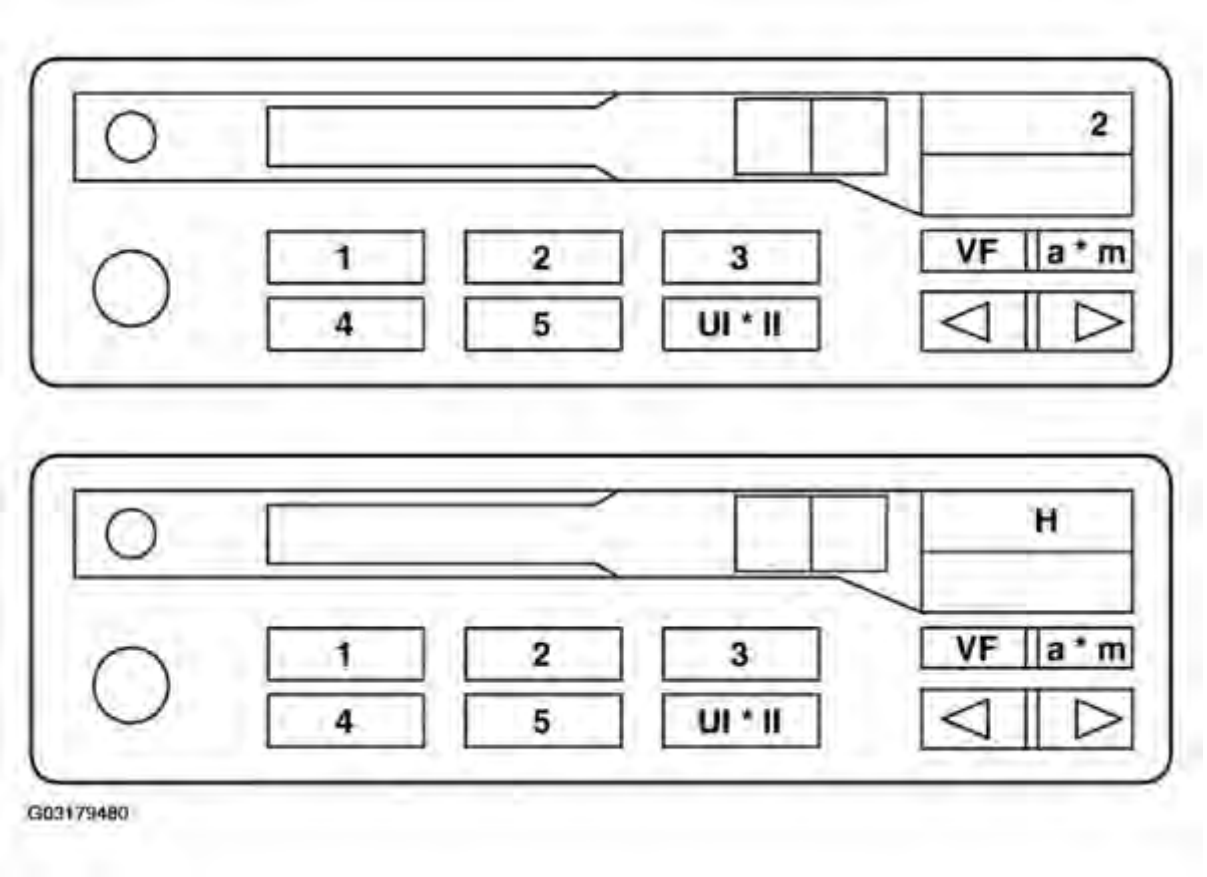


Fig. 44: Identifying Radio Switch Display
Courtesy of BMW OF NORTH AMERICA, INC.

Switching From "distance" To "local" In Italy Mode:

Press toggle switch "m" for approx. 4 seconds until an "H" or "L" appears in the display. This setting can be changed by using the automatic tuning rocker.

The factory setting is "H".

Regulation range: "H": distance; "L": local.

This mode is abandoned by pressing the "a*m" key again. The test mode remains activated.

65 99 ... TEST MODE FOR BMW CAR RADIO (BAVARIA C REVERSE RDS)

"BAVARIA C Reverse RDS" radios contain a test mode, with which various types of internal information can be displayed and various operating conditions set.

Starting Test Mode:

Press keys "2" and "5" simultaneously while switching the radio on. A capital "S" appears in the display.

This service mode is abandoned by switching the radio on and off once.

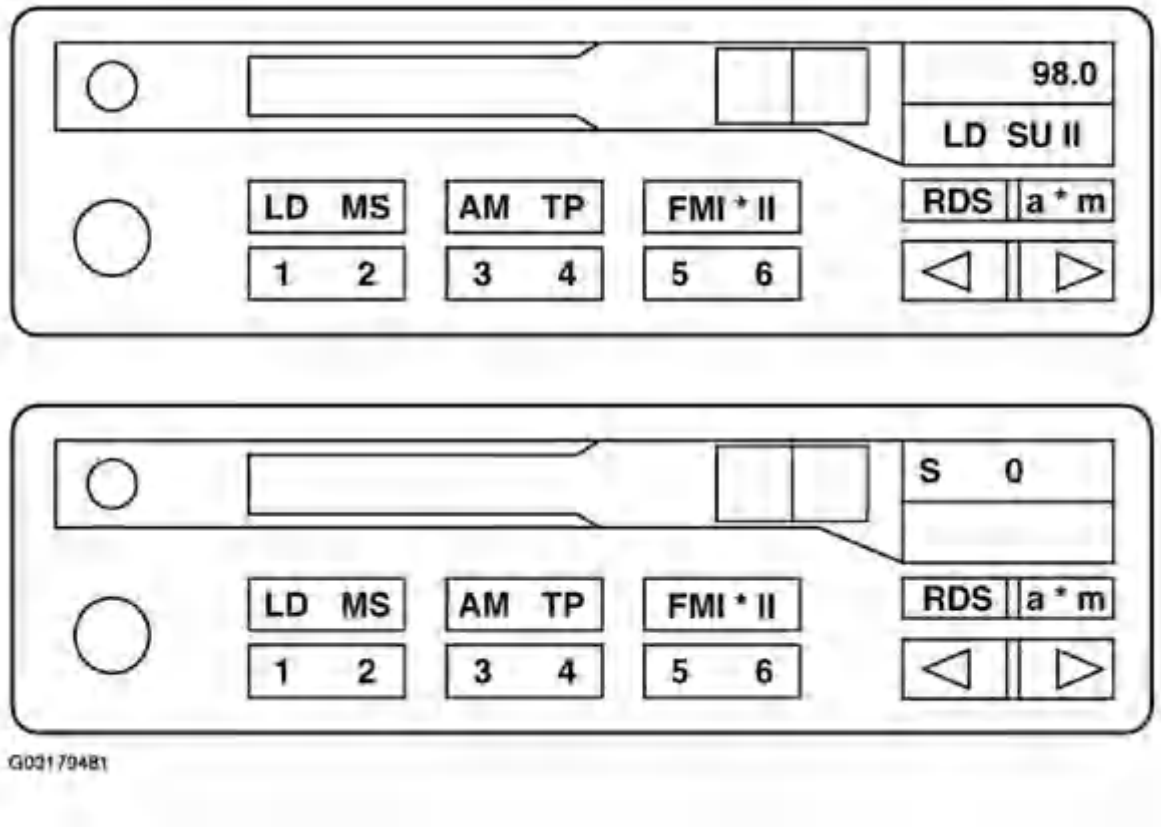


Fig. 45: Identifying Radio Display Button
Courtesy of BMW OF NORTH AMERICA, INC.

Changing Increase In Volume When Traffic Information Is Broadcast:

Press the "TP" button for approx. 4 seconds until a "0" appears in the display. The station will be a little louder. With search run button, volume can be raised in 5 steps.

The factory setting is "0".

The regulating range amounts to +/- 6,25 dB

This mode is abandoned by pressing "TP" key again. The test mode remains activated.

Adjusting The Roadspeed-Dependent Volume (GAL):

Press station button "3" for approx. 4 seconds until a "2" appears in the display. This value can be changed by using the automatic tuning rocker.

The factory setting is "2".

Regulation range:

"1": weak increase.

"2": medium increase.

"3": strong increase.

This mode is abandoned by pressing the "3" key again. The test mode remains activated.

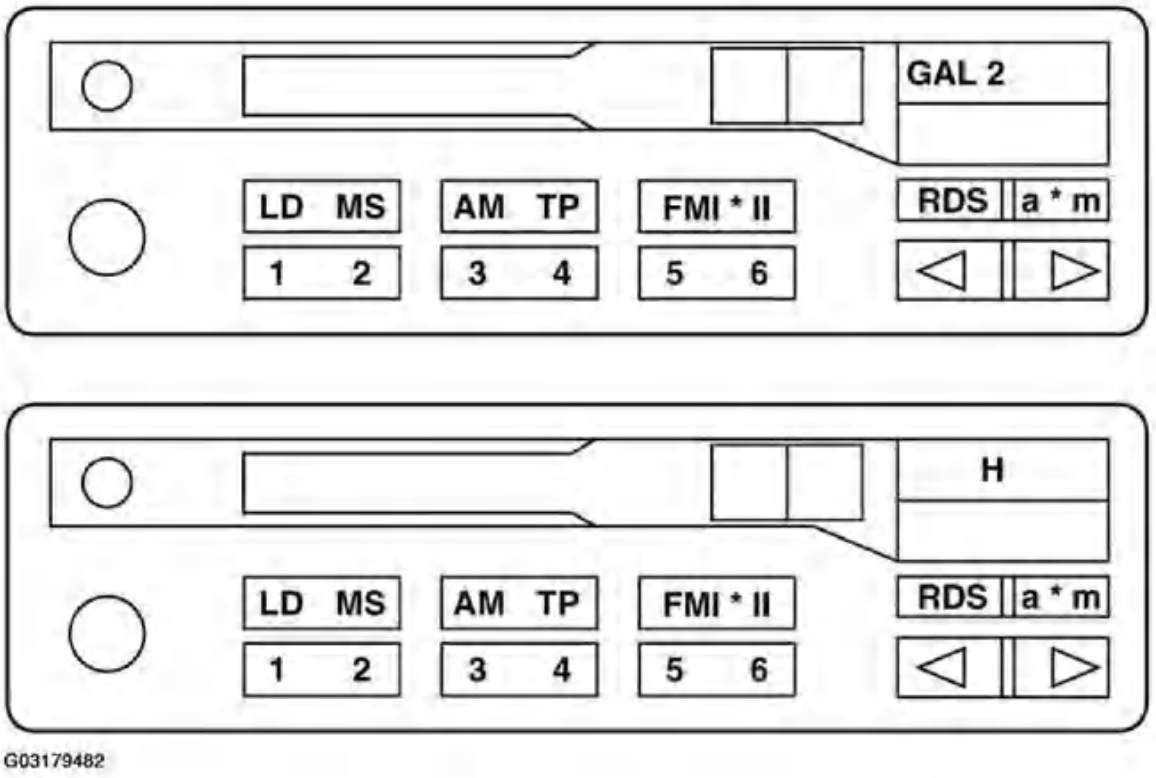


Fig. 46: Identifying Radio Display Button
Courtesy of BMW OF NORTH AMERICA, INC.

Changing From "distance" To "local" In Italy Mode:

Press toggle switch "a*m" for approx. 4 seconds until an "H" or "L" appears in the display. This setting can be changed by using the automatic tuning rocker.

The factory setting is "H".

Regulation range:

"H": distance.

"L": local.

This mode is abandoned by pressing the "a*m" key again. The test mode remains activated.

Adjusting Viewing Angle for Display:

The angle of view can be changed by pressing the "RDS" key (E-31).

Factory setting: dark display with direct view.

65 99 ... TEST MODE FOR BMW CAR RADIO (BAVARIA C REVERSE III)

The device "Bavaria C Reverse III(c)" has a test mode with which various device-internal items of information can be displayed and various operating modes can be set.

Starting Test Mode:

Press keys "2" and "5" simultaneously while switching the radio on. A capital "S" appears in the display.

This service mode is abandoned by switching the radio on and off once.

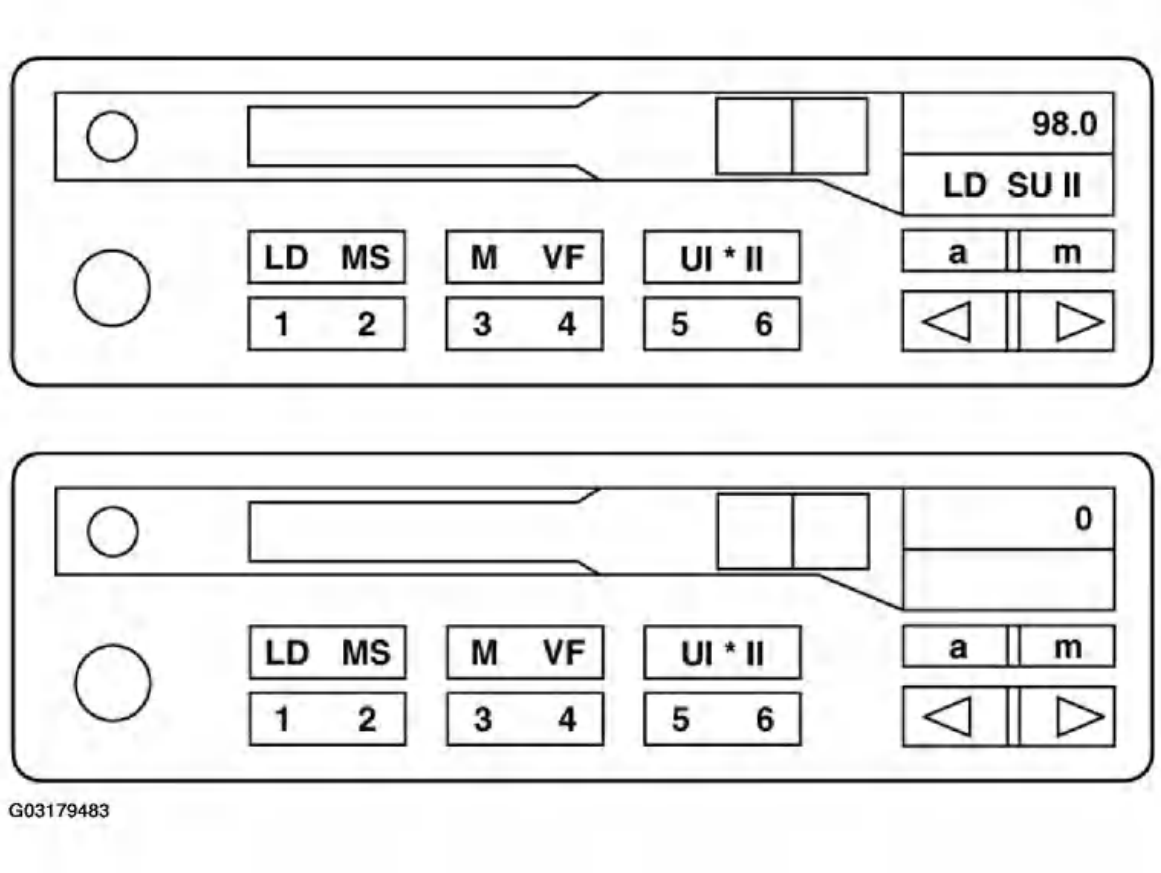


Fig. 47: Identifying Radio Display Button
Courtesy of BMW OF NORTH AMERICA, INC.

Changing Increase In Volume When Traffic Information Is Broadcast:

Press the "VF" button for approx. 4 seconds until a "0" appears in the display. The station will be a little louder. With search run button, volume can be raised in 5 steps.

The factory setting is "0".

The regulating range amounts to +/- 6,25 dB.

This mode is abandoned by pressing "VF" key again. The test mode remains activated.

Adjusting Roadspeed-Dependent Volume (GAL):

Press station button "3" for approx. 4 seconds until a "2" appears in the display. This value can be changed by using the automatic tuning rocker.

The factory setting is "2".

Regulation range:

"1": weak increase.

"2": medium increase.

"3": strong increase.

This mode is abandoned by pressing the "3" key again. The test mode remains activated.

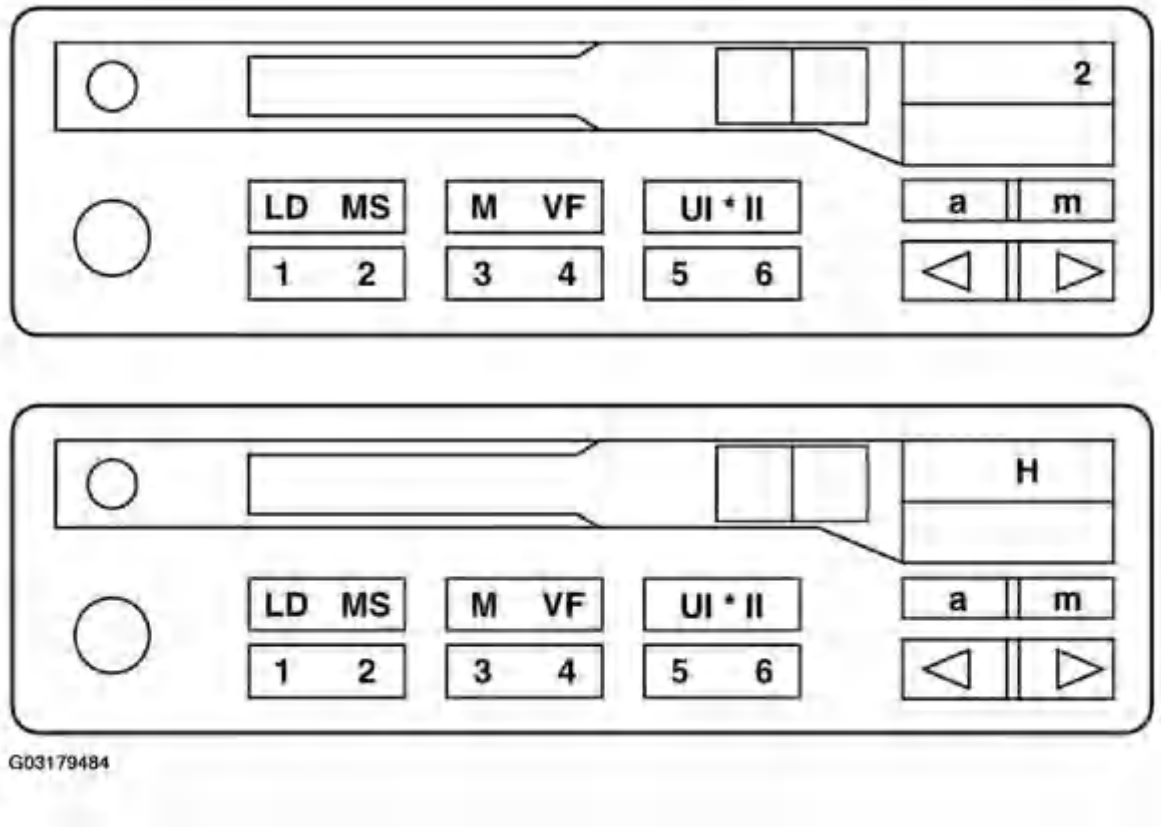


Fig. 48: Identifying Radio Display Button
Courtesy of BMW OF NORTH AMERICA, INC.

Changing From "Distance" To "local" In Italy Mode:

Press toggle switch "m" for approx. 4 seconds until an "H" or "L" appears in the display. This setting can be changed by using the automatic tuning rocker.

The factory setting is "H".

Regulation range: "H": distance; "L": local.

This mode is abandoned by pressing the "m" key again. The test mode remains activated.

65 99 ... TROUBLESHOOTING FOR BAVARIA RADIOS

TROUBLESHOOTING CHART

Condition	Cause	Remedy
Scale light on, but no sound or noise in speakers with loudness set at maximum. Automatic tuning works perfectly.	a. Speaker connector on radio loose. b. Break in speaker wiring. c. Connectors on fade control loose. d. Speakers defective. e. Radio defective.	a. Tighten connector. b. Replace wiring. c. Tighten plug-in connections. d. Replace speakers. e. Replace radio.
Noise with loudness set at	a. Aerial connector not connected to radio. b. Break in aerial wiring.	a. Connect connector. b. Replace wiring.

maximum, but no reception.	c. Aerial. d. Radio defective.	c. refer during "antenna check". d. Replace radio.
Loud noise while driving.	a. Aerial wiring and connector. b. Aerial. c. Local reception range was abandoned. d. Station key or station tuned in incorrectly. e. Station too weak. f. Radio set to sound-off for traffic reports.	a. Check, replace or tighten if necessary. b. refer during "antenna check". c. Tune in new station. d. Tune in station. e. Tune in stronger station. f. Unset sound-off and tune in station correct.
Condition.	Cause.	Remedy
Unsatifactory sound quality.	a. Foreign particles in speaker diaphragm or diaphragm damaged. b. Speaker installed with tension. c. All speakers are not connected identically when using more than one speaker per channel. d. Fade control not in middle position. e. Only when cassette player is used.	a. Remove foreign particles or replace speaker. b. Loosen and screw on speaker without tension. c. Check for identical poles. d. Adjust fade control to middle position. e. Clean the cassette drive using the cleaning cassette.
Cassette ejected while playing.	a. Cassette without SM mechanism. b. Cassette tape unwinds too hard. c. Cassette housing distorted. d. C 90 or C 120 cassette used.	b) Run cassette forwards and backwards completely once. c) Use a different cassette. d) These cassettes have very thin tape and tend very quickly to unwind to hard; for this reason, only use C 60 cassettes.

TROUBLESHOOTING CHART

Condition	Cause	Remedy
		Tune in a weak station. Run engine up to approx. 5,000 rpm, then switch off ignition. Radio must maintain reception. If interference noise stops by switching off the ignition, it concerns ignition interference. Checking. Distributor cap shielding. Earth strap for shielding connected.

Crackling and sizzling noise.	Engine or ignition interference.	Shielded capacitor 2.2Â°F on ignition coil on terminal (15). Caution! Not for thyristor ignition. Suppressor filter in line 1. Check ignition cable - spark plug connector / distributor cap / ignition coil for perfect connections and resistance. Refer to 12 13 IGNITION COIL E36 . Hairline cracks in distributor cap, distributor rotor, ignition coil neck, spark plugs, plug connectors. Earth strap from engine to body. Earth strap from engine hood to body. Earth connection of radio. Engine hood closed correctly.
Condition	Cause	Remedy
Crackling and clicking noise.	Defective alternator regulator.	Race engine enough until interference noise can be clearly heard. Now switch on headlights and rear window defogger. The regulator is defective if the interference noise stops or changes.
Howling or whistling noise, depending on engine speed.	Interference from alternator.	Remove drive belts and run engine briefly. If this produces interference, replace or service install capacitor on terminal (+) of alternator.
Sizzling and clicking noise only while driving, but stops after operating brake pedal.	Electrostatic charge.	Install wheel hub contacts on front axle.
Howling and crackling noise when equipment is switched on.	Windshield wiper motor, additional water pump, additional fan.	Installing suppressor filter 2 x 0.47 mF.
Scale lighting not lit or no monitor display and no reception.	a. Fuse blown. b. Power supply wire loose or not connected. c. Radio defective.	a. Replace fuse. b. Connect wire. c. Replace radio

Article GUID: A00202369

51 0 030 TWIN CARTRIDGE GUN

TWIN CARTRIDGE GUN GENERAL SPECIFICATION

Note:	With twin cartridges (adhesive & hardener) for bonding work No longer permitted as of E60 and will then be discontinued.
Series:	E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39, E53, E65, E66, E67, E85
SI number:	1 05 91(386)
Order number:	51 0 030
Â	Twin cartridge gun
Consisting of:	Â
1 = 51 0 031	Twin cartridge gun, individual
2 = 51 0 032	Twin cartridge (cement & hardener)
3 = 51 0 033	Mixing tip

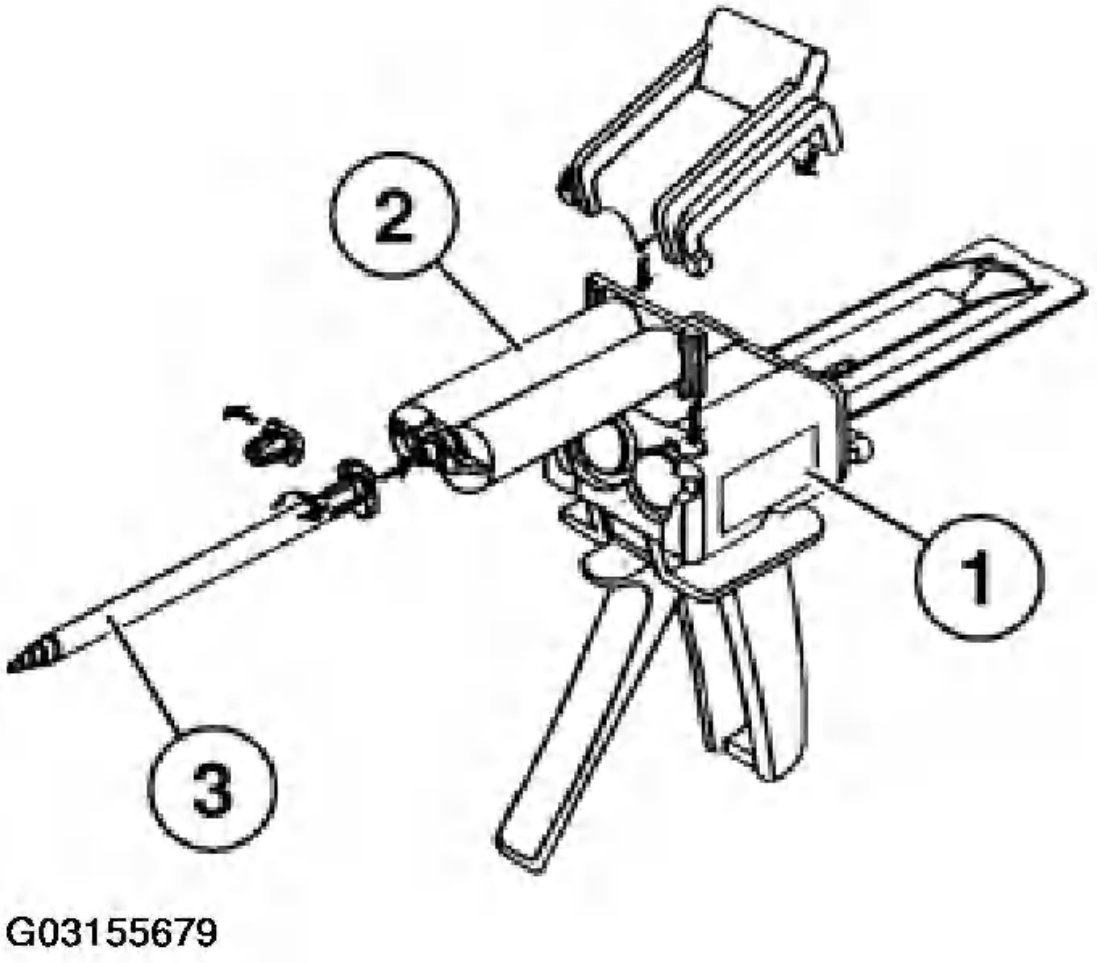


Fig. 1: Identifying Twin Cartridge Gun
Courtesy of BMW OF NORTH AMERICA, INC.

51 0 101 SUPPORT, RIGHT

SUPPORT, RIGHT GENERAL SPECIFICATION

Note:	Gantry crane
SI number:	6 04 03 (046)
Order number:	51 0 101
Â	Support, right

51 0 102 SUPPORT, LEFT

SUPPORT, LEFT GENERAL SPECIFICATION

Note:	Gantry crane
SI number:	6 04 03 (046)
Order number:	51 0 102
Â	Support, left

51 0 103 BRIDGE

BRIDGE GENERAL SPECIFICATION

Note:	Gantry crane
SI number:	6 04 03 (046)
Order number:	51 0 103
Â	Bridge

51 0 104 WINDSCREEN/REAR WINDOW LOCATING FIXTURE

WINDSCREEN/REAR WINDOW LOCATING FIXTURE GENERAL SPECIFICATION

Note:	Gantry crane
SI number:	6 04 03 (046)
Order number:	51 0 104
Â	Windscreen/rear window locating fixture

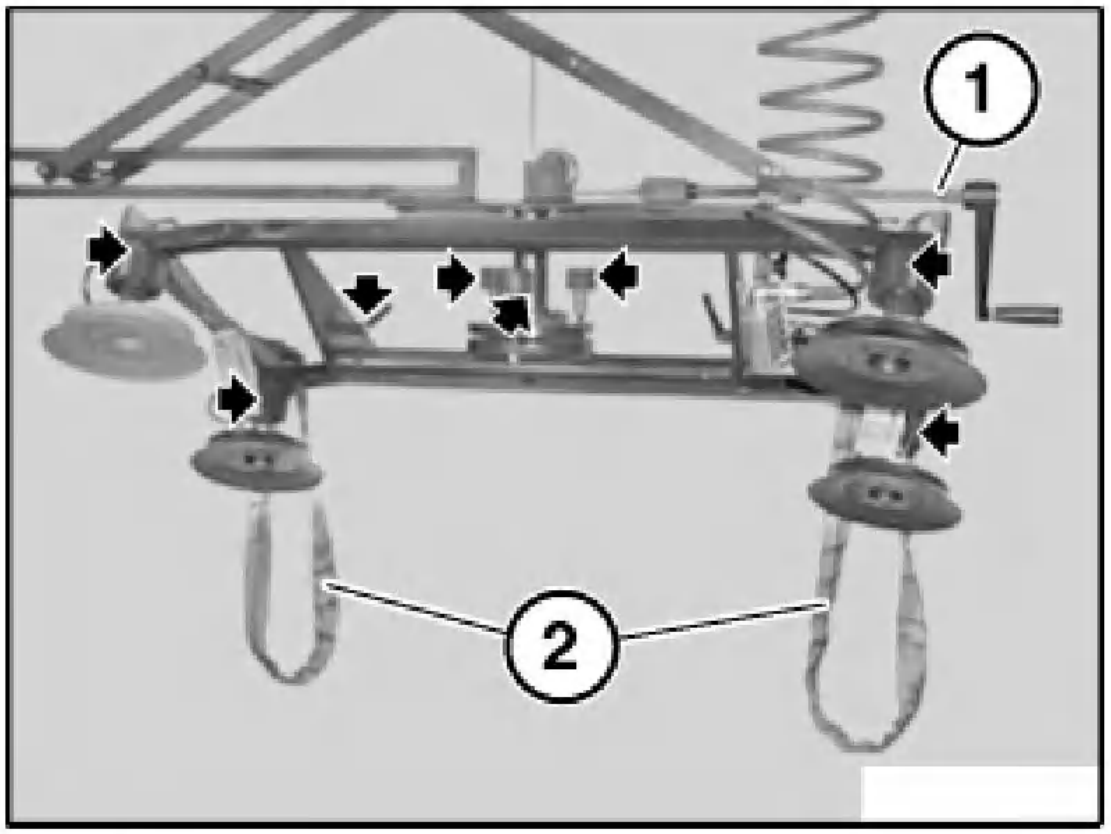


Fig. 2: Identifying Windscreen/Rear Window Locating Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

51 0 105 SIDE WINDOW LOCATING FIXTURE

SIDE WINDOW LOCATING FIXTURE GENERAL SPECIFICATION

Note:	for gantry crane
SI number:	6 04 03 (046)
Order number:	51 0 105
Â	Side window locating fixture

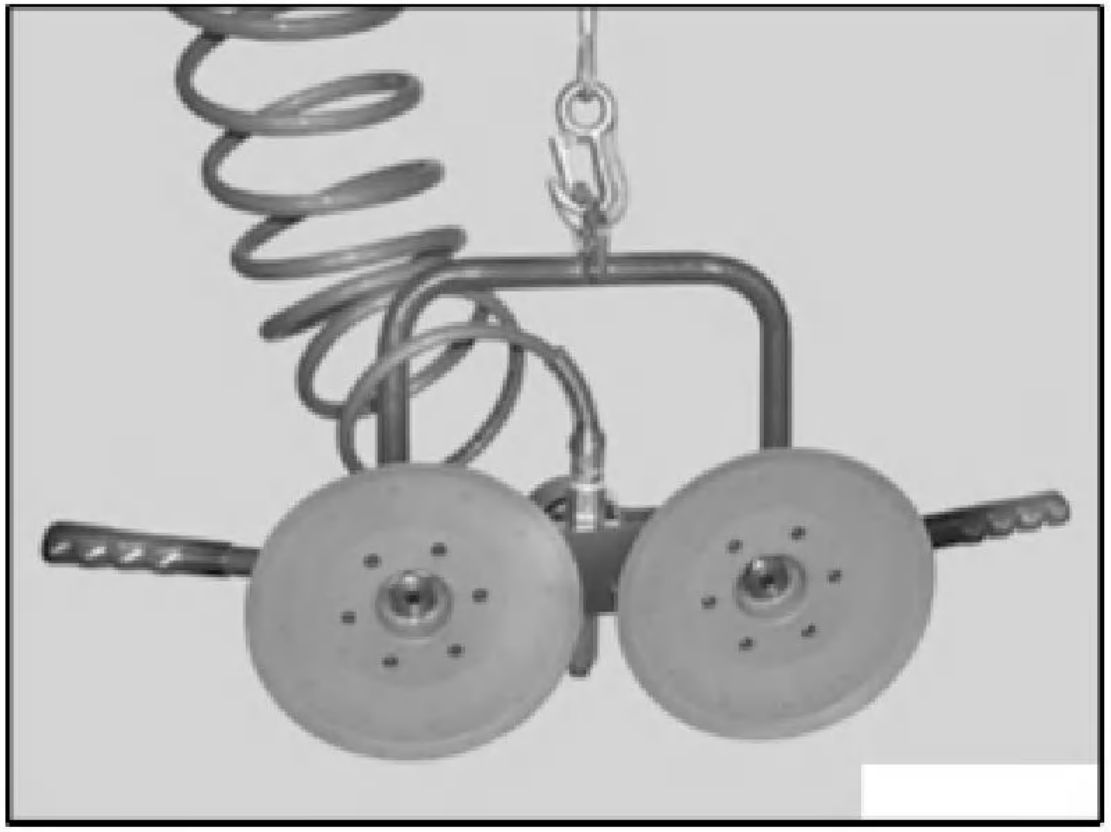


Fig. 3: Identifying Side Window Locating Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

51 0 106 VACUUM PUMP

VACUUM PUMP GENERAL SPECIFICATION

Note:	for gantry crane
SI number:	6 04 03 (046)
Order number:	51 0 106
Â	Vacuum pump

51 0 107 HOISTING WINCH

HOISTING WINCH GENERAL SPECIFICATION

Note:	for windscreen/rear window locating fixture on gantry crane
SI number:	6 04 03 (046)
Order number:	51 0 107
Â	Hoisting winch

51 0 108 HOISTING WINCH

HOISTING WINCH GENERAL SPECIFICATION

Note:	for side window locating fixture on gantry crane

SI number:	6 04 03 (046)
Order number:	51 0 108
Â	Hoisting winch

51 0 109 SUCTION CUP

SUCTION CUP GENERAL SPECIFICATION

Note:	Gantry crane
SI number:	6 04 03 (046)
Order number:	51 0 109
Â	Suction cup

51 1 010 PUNCHING FIXTURE

PUNCHING FIXTURE GENERAL SPECIFICATION

Note:	For punching vehicle identification number in type identification plate (E-plate)
Series:	E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, E38, E39
Order number:	51 1 010
Â	Punching fixture
Consisting of:	Â
1 = 51 1 011	Punching tool, single
2 = 51 1 012	Number punches 0...9 (set)
3 = 51 1 013	Letter punches A...Z (set)

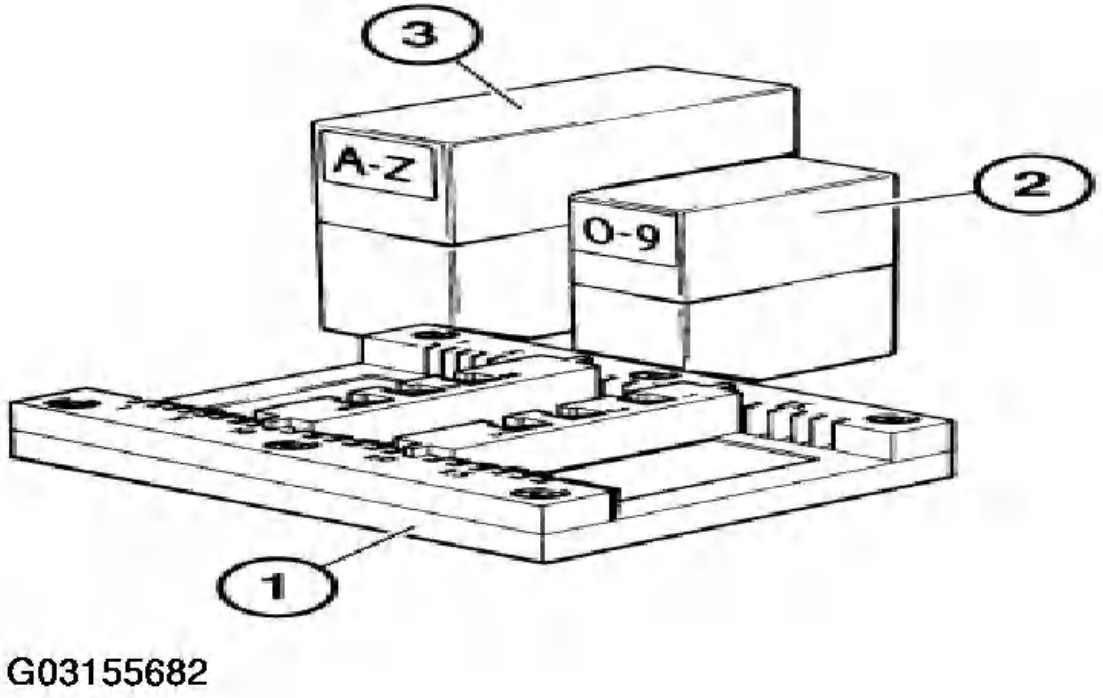


Fig. 4: Identifying Punching Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

51 1 070 FIXTURE

FIXTURE GENERAL SPECIFICATION

Note:	For forming door seals before mounting
Series:	E36
Order number:	51 1 070
Â	Fixture

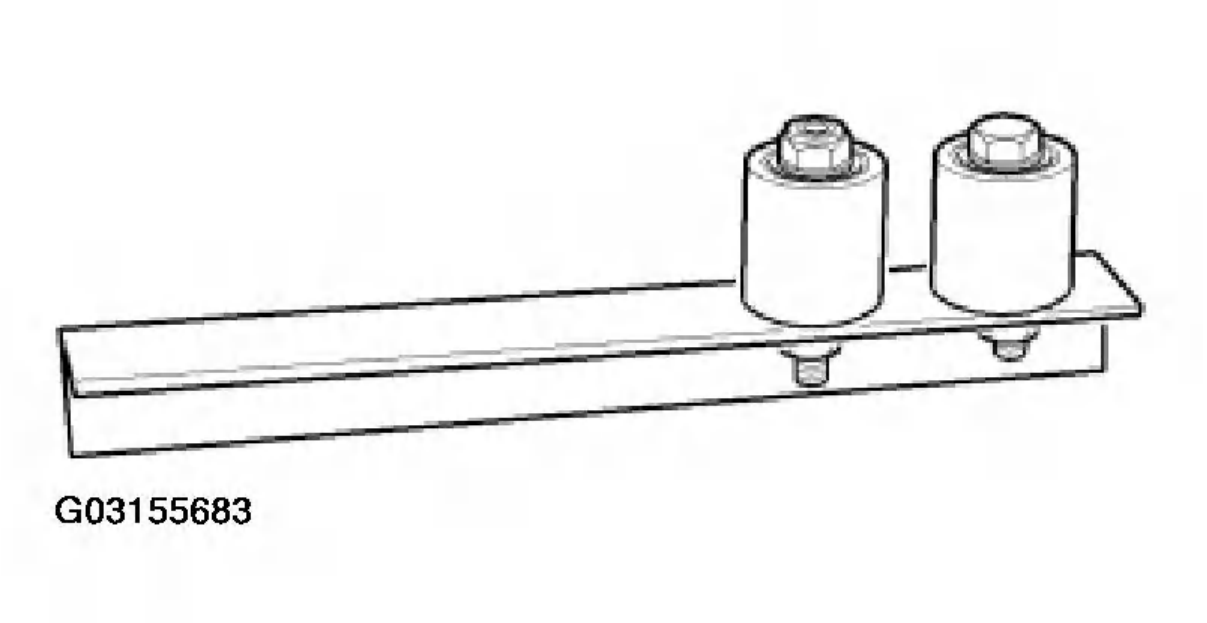


Fig. 5: Identifying Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

51 2 010 PILLAR GUARD (2)

Minimum set: Mechanical tools

PILLAR GUARD GENERAL SPECIFICATION

Note:	For preventing damage to A-pillar and B-pillar when removing and installing pin in door stop
Series:	E32, E34, E36, E38, E39
Storage location:	B24
SI number:	1 03 97(179)
Order number:	51 2 010
Â	Pillar guard (2)

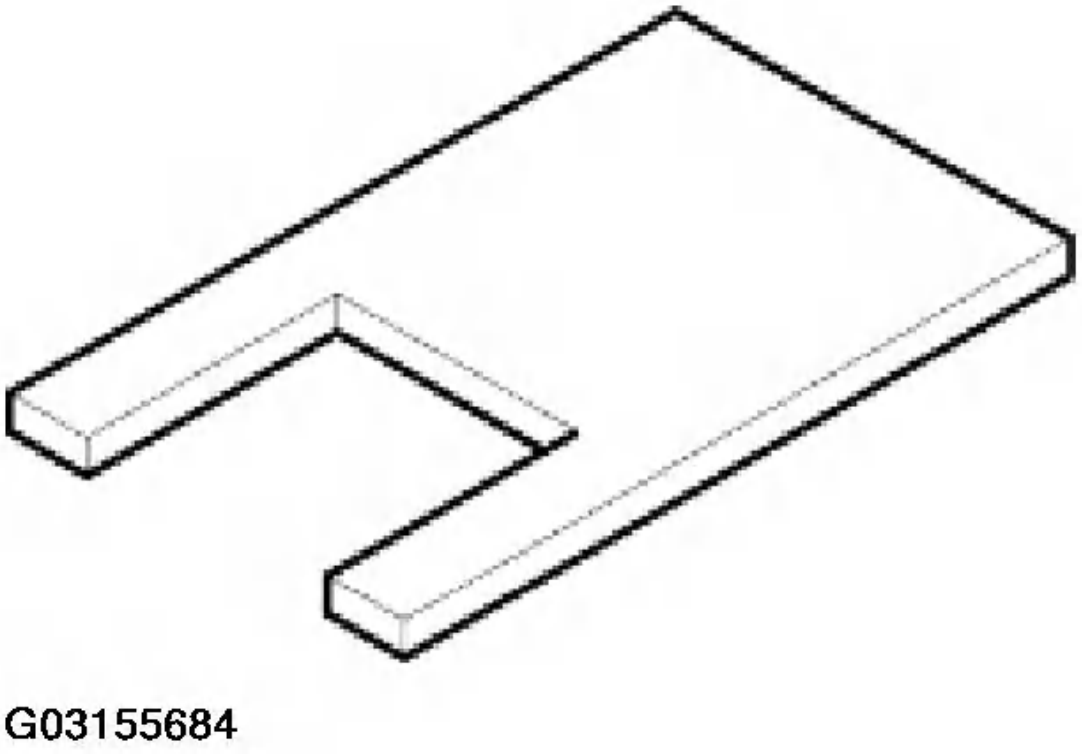


Fig. 6: Identifying Pillar Guard
Courtesy of BMW OF NORTH AMERICA, INC.

51 2 070 PIN WRENCH

PIN WRENCH GENERAL SPECIFICATION

Note:	For releasing and tightening securing nut on door lock
Series:	E32, E34, E36
Storage location:	C24
SI number:	1 04 88(566)
Order number:	51 2 070
Â	Pin wrench



Fig. 7: Identifying Pin Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

51 2 080 GAUGE

GAUGE GENERAL SPECIFICATION

Note:	For checking door contact switch
Series:	E36
Storage location:	B25, C25
Order number:	51 2 080
Â	Gauge

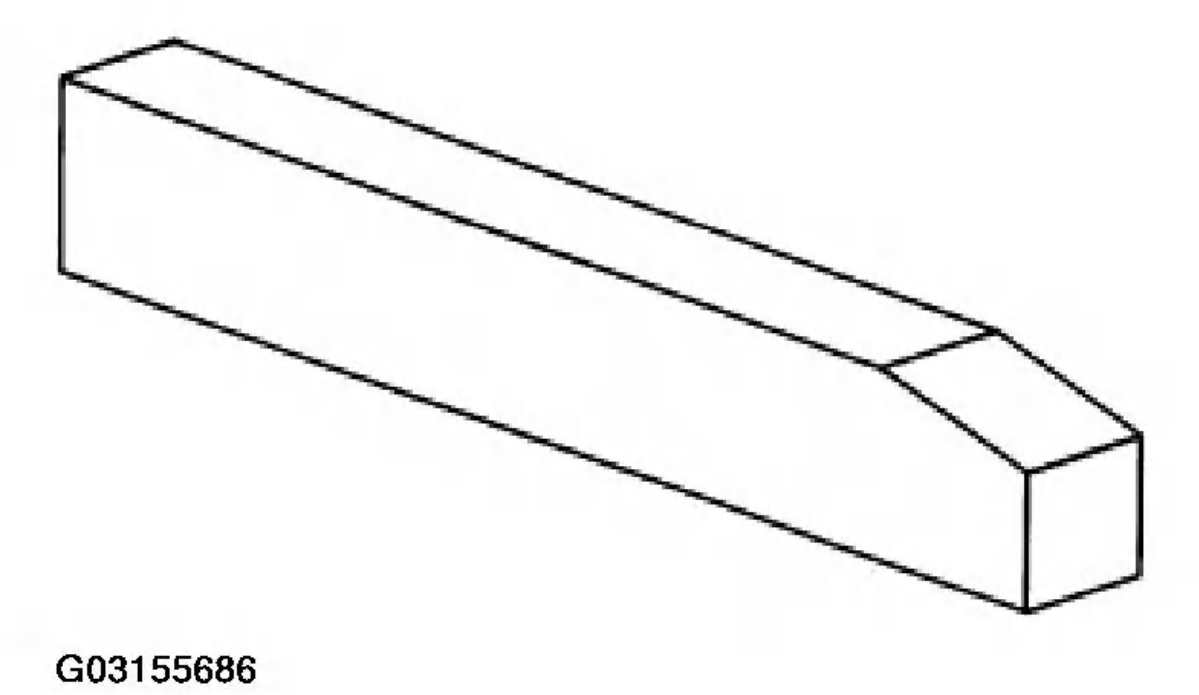


Fig. 8: Identifying Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

51 2 090 FIXTURE

FIXTURE GENERAL SPECIFICATION

Note:	For press-fitting door lock striker on rear doors
Series:	E36, E38, E39
Storage location:	A24
Order number:	51 2 090
Â	Fixture

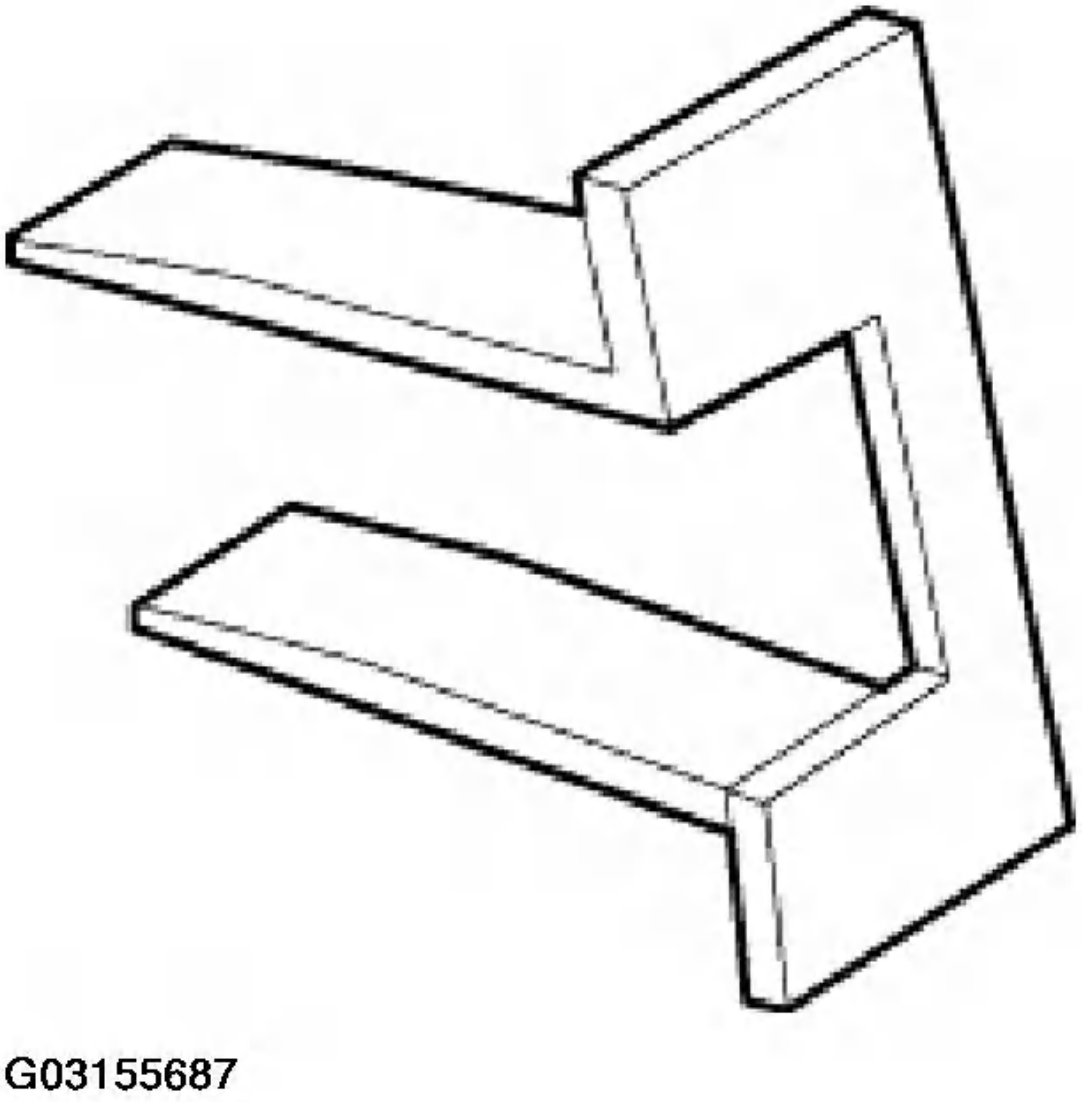


Fig. 9: Identifying Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

51 2 140 SUPPORT

SUPPORT GENERAL SPECIFICATION

Note:	For raising engine hood during assembly work
Series:	E28, E36
Storage location:	A3, B3, C3
SI number:	1 12 92(606)
Order number:	51 2 140
Â	Support

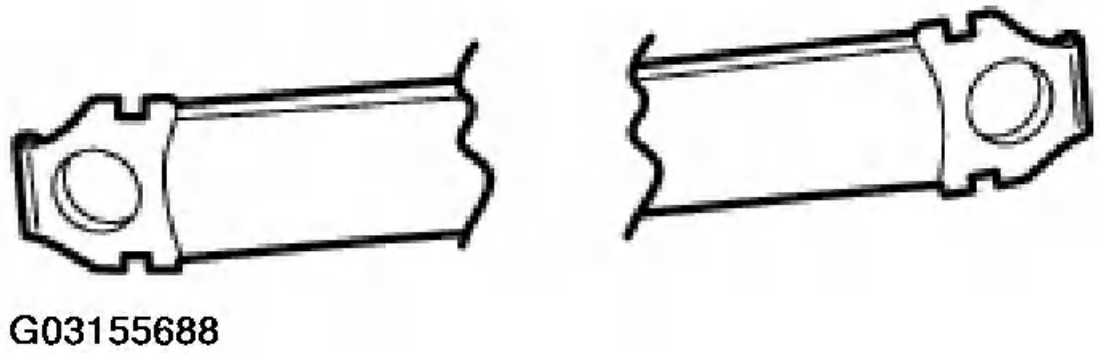


Fig. 10: Identifying Support
Courtesy of BMW OF NORTH AMERICA, INC.

51 2 196 PROTECTION

PROTECTION GENERAL SPECIFICATION

Note:	Replaces protection 51 2 193
Order number:	51 2 196
Â	Protection

51 2 197 DRIFT

DRIFT GENERAL SPECIFICATION

Note:	Replaces drift 51 2 194
Order number:	51 2 197
Â	Drift

51 3 010 SUCTION LIFT (2 X)

Minimum set: Mechanical tools

SUCTION LIFT (2 X) GENERAL SPECIFICATION

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, E83, E85, E87, E90, R50, R52, R53, RR1
SI number:	1 05 86(604)
Order number:	51 3 010
Â	Suction lift (2 x)
Consisting of:	Â
1 = 51 3 011	Suction cup
Â	NOTE: With elongated hole, suspension moveable about all axes

2 = 51 3 012	Suction cup
Â	NOTE: With bore, suspension only moveable in longitudinal direction
3 = 51 3 013	Grab handle

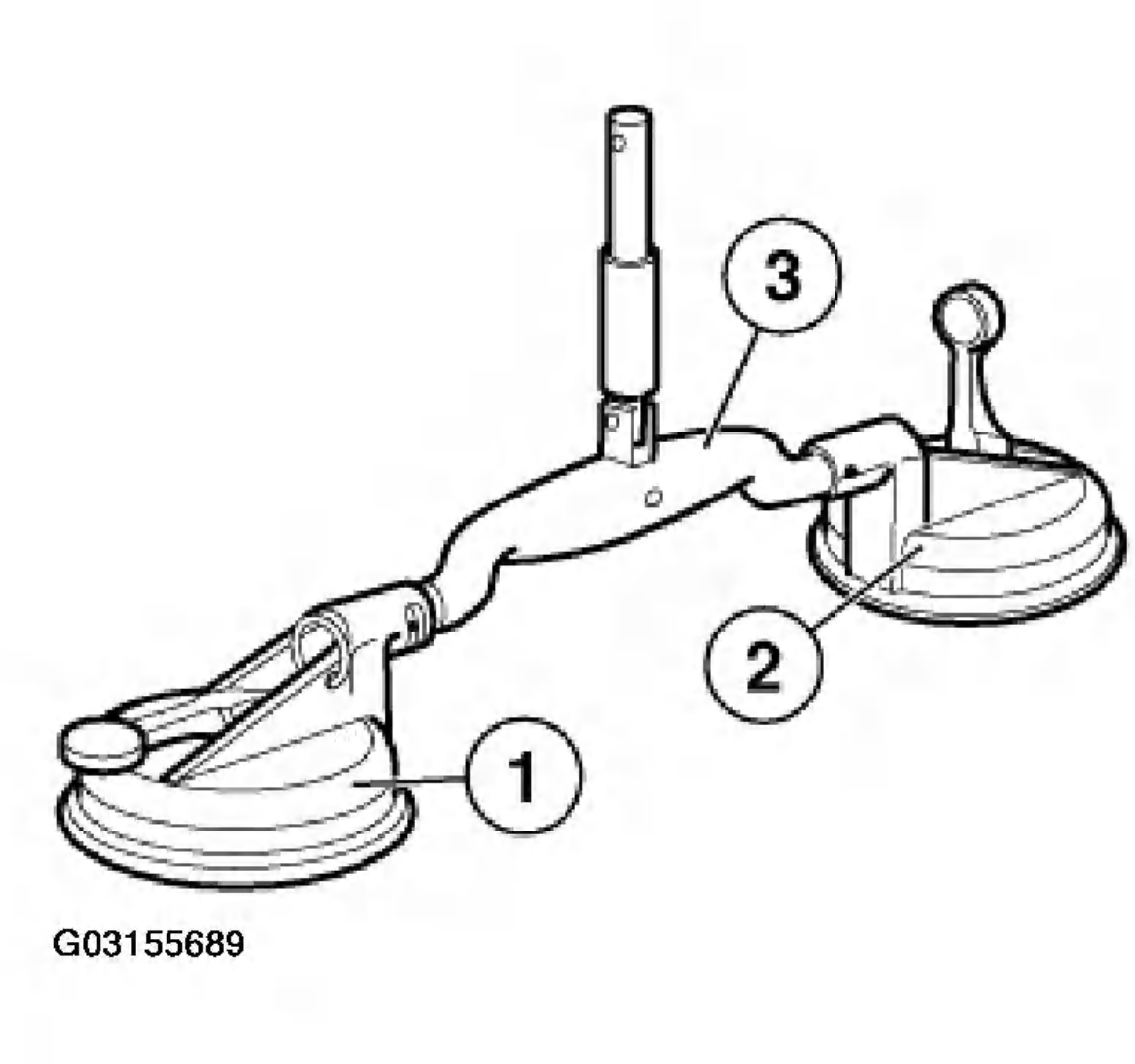


Fig. 11: Identifying Suction Lift (2 X)
Courtesy of BMW OF NORTH AMERICA, INC.

51 3 030 INSTALLATION KIT

INSTALLATION KIT GENERAL SPECIFICATION

Note:	For bonding windscreen and rear window
Series:	E36, E60, E63, E65, E66, RR1
Storage location:	B26
SI number:	1 10 90(288)
Order number:	51 3 030
Â	Installation kit
Consisting of:	Â
1 = 51 3 031	Spacer block for A-pillar (2 x)
Â	NOTE: Model series: RR1

2 = 51 3 032	Gap gauge (2 x)
Â	NOTE: Model series: RR1, E60

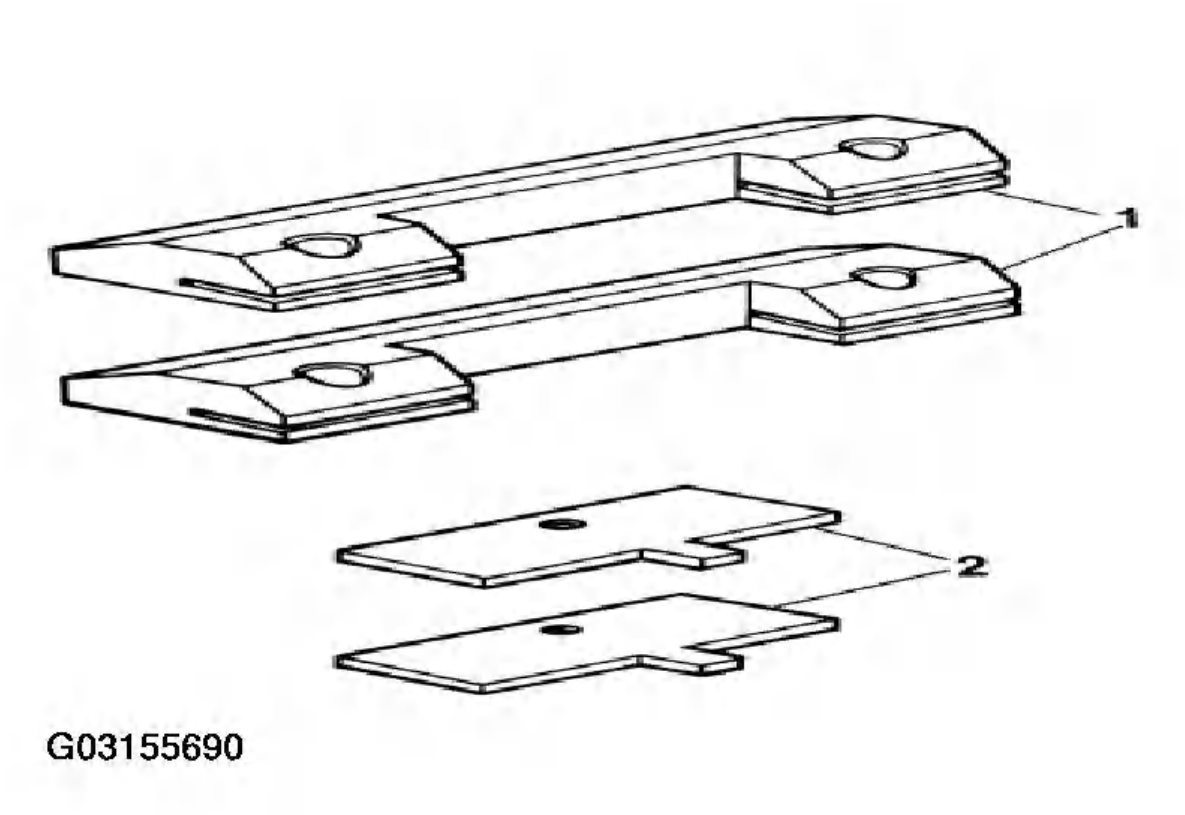


Fig. 12: Identifying Installation Kit
Courtesy of BMW OF NORTH AMERICA, INC.

51 3 080 TOOL

TOOL GENERAL SPECIFICATION

Note:	For checking wind-down distance when installing side window
Series:	E31, E36/2, E36/C, E46/2, E46/5, E46/C, E52, E53, E63, E64, E85, R50, R52, R53
Storage location:	C16
SI number:	1 05 90 (207)
Order number:	51 3 080
Â	Tool



Fig. 13: Identifying Tool
Courtesy of BMW OF NORTH AMERICA, INC.

51 3 160 HOOK

HOOK GENERAL SPECIFICATION

Note:	For fitting rubber strips on bumper
Series:	E12, E21, E23, E24, E28, E36
Storage location:	B27
Order number:	51 3 160
Â	Hook

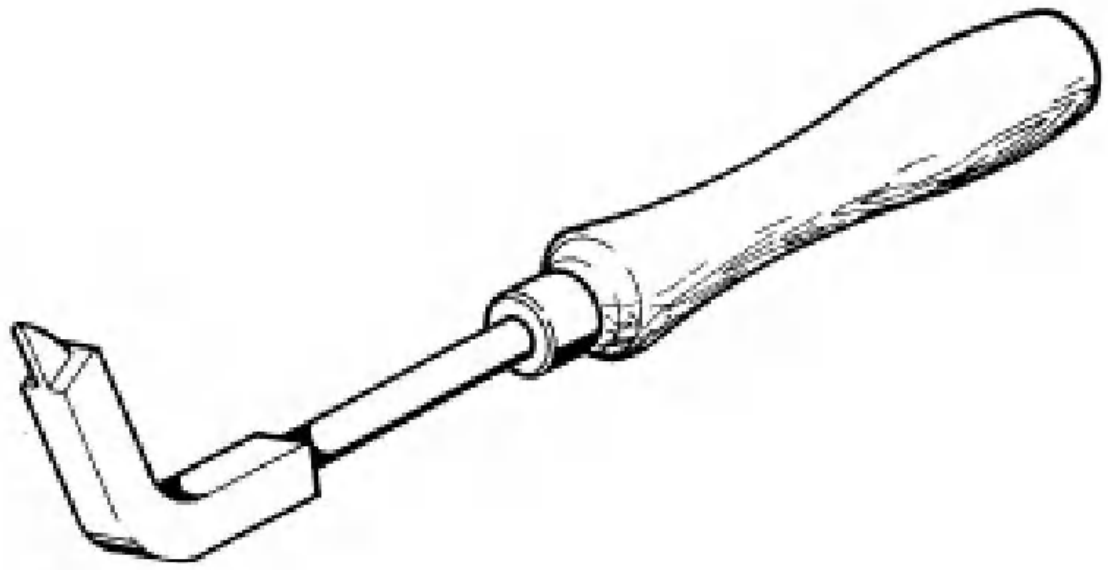


Fig. 14: Identifying Hook
Courtesy of BMW OF NORTH AMERICA, INC.

51 3 190 SPANNER

SPANNER GENERAL SPECIFICATION

Note:	For removing door lock finisher panel
Series:	E31, E32, E34, E36
Storage location:	B19
SI number:	1 08 94(820)
Order number:	51 3 190
Â	Spanner

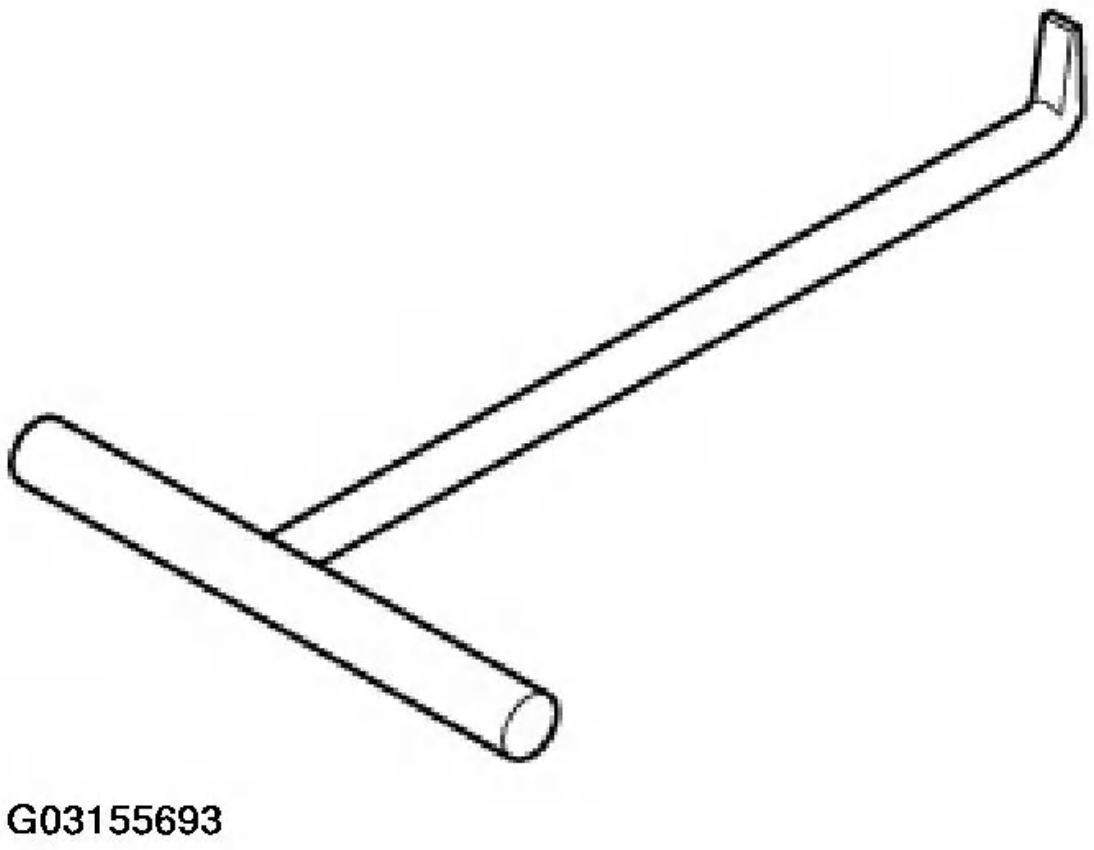


Fig. 15: Identifying Spanner
Courtesy of BMW OF NORTH AMERICA, INC.

51 3 220 HAND-HELD SUCTION CUP

HAND-HELD SUCTION CUP GENERAL SPECIFICATION

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, E83, E85, E87, E90, R50, R52, R53
SI number:	1 17 00(623)
Order number:	51 3 220
Â	Hand-held suction cup

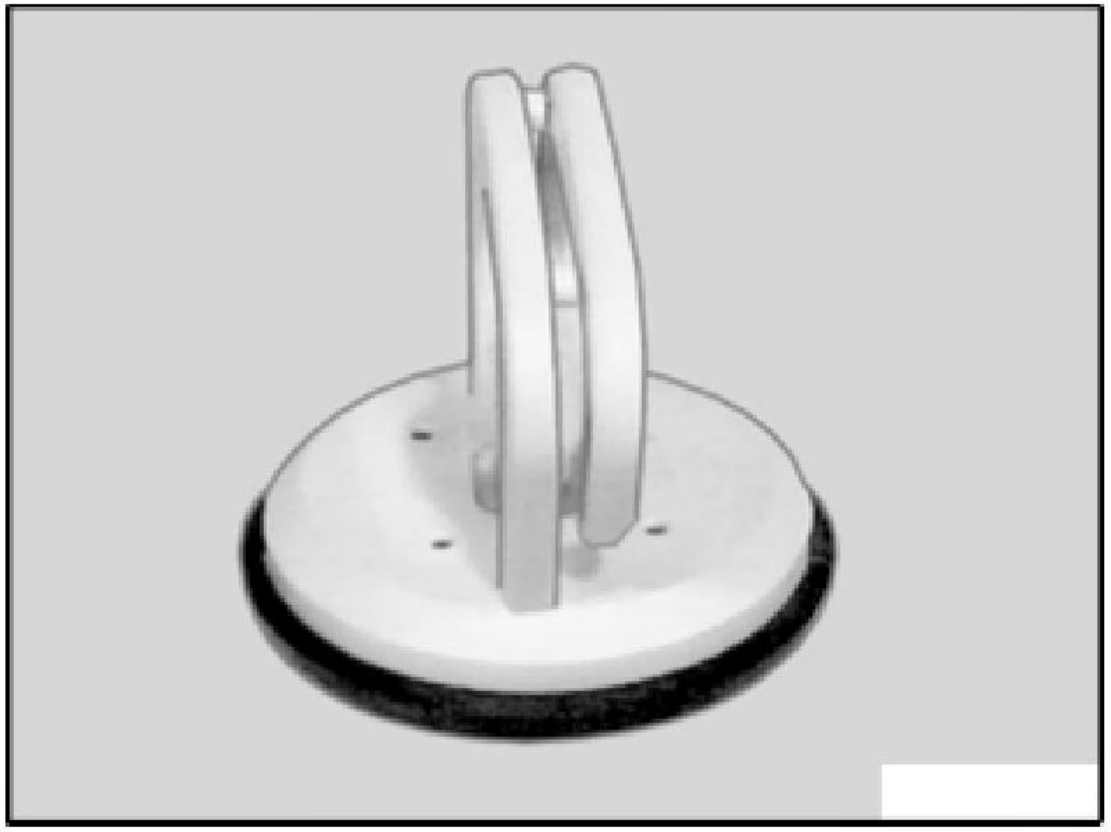


Fig. 16: Hand-Held Suction Cup
Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00202809

CELLULAR TELEPHONE

12 00 ... EXTERNAL JUMP-STARTING AID AND CAR TELEPHONE!

Siemens C 2:

When starting the vehicle engine with outside help from another vehicle, remember that overvoltage could damage the Siemens C 2 telephone. For this reason, always disconnect the sender and receiver from the electric system before using outside starting aids.

Siemens C 3 and Motorola C 451:

Senders and receivers of Siemens C 3 and Motorola C 451 telephones are protected against overvoltage, but calls may not be made or received during outside starting.

Always pay attention to the operating instructions of different type and different make telephones. In case of doubt disconnect the sender and receiver from the vehicle electric system.

61 00 ... EXTERNAL JUMP-STARTING AID AND CAR TELEPHONE!

Siemens C 2:

When starting engine with assistance of another vehicle, remember that overvoltage could damage the Siemens C 2 telephone. For this reason, always disconnect the sender and receiver from the electric system before using outside starting aids.

Siemens C 3 and Motorola C 451:

sensors and receivers of Siemens C 3 and Motorola C 451 telephones are protected against overvoltage, but calls may not be made or received during external starting procedures.

Always pay attention to the operating instructions of different type and different make telephones. In case of doubt, disconnect sensor and receiver from vehicle electrical system.

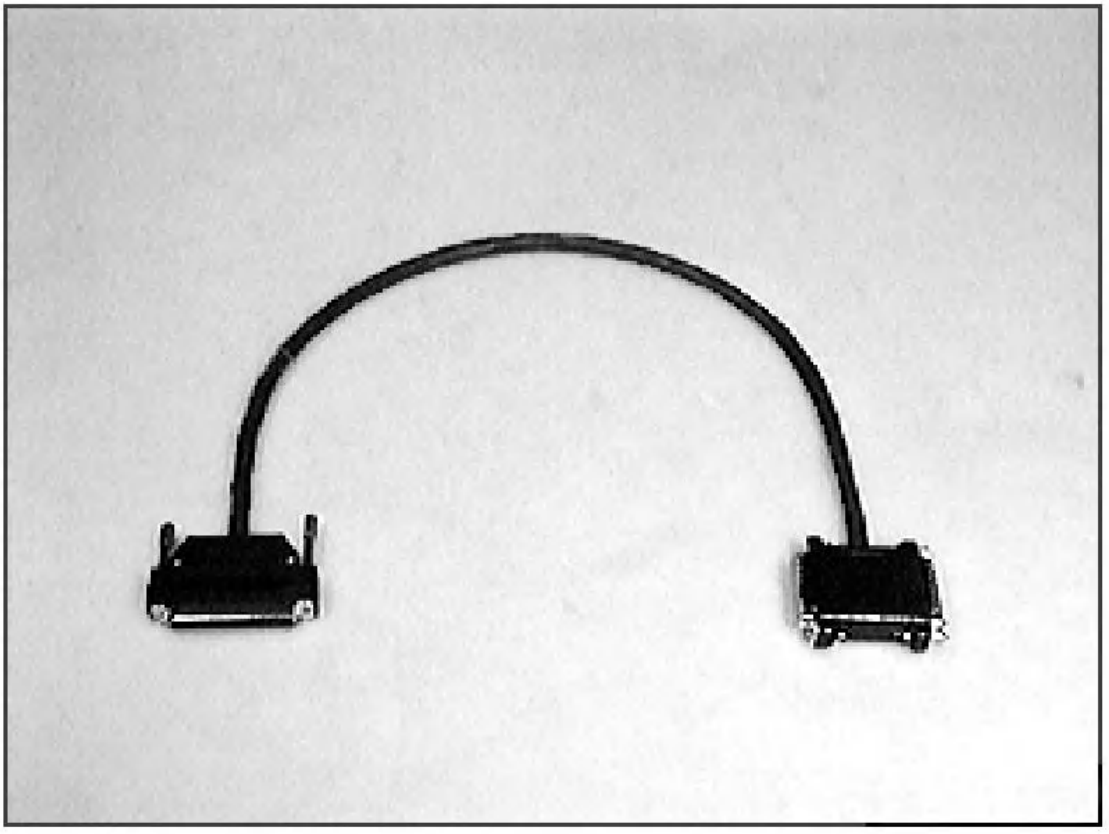
Article GUID: A00202370

COMMUNICATION SYSTEM

84 1 000 TEST CABLE FOR TELEPHONE BEMI TEST

TEST CABLE FOR TELEPHONE BEMI TEST GENERAL SPECIFICATION

In conjunction with:	61 1 459
Note:	T/R device = transmit/receive device
Series:	E30, E31, E32, E34, E36, E38, E39, R50, R53
Storage location:	C 101
SI number:	2 01 97(206)
Order number:	84 1 000
Â	Test cable for telephone BEMI TEST



G03155771

Fig. 1: Identifying Test Cable For Telephone BEMI Test
Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00202817

DISTANCE SYSTEM, CRUISE CONTROL SYSTEMS

66 2 100 SET OF TOOLS

Minimum set: Mechanical tools

SET OF TOOLS GENERAL SPECIFICATION

Note:	For removing and installing PDC sensors - Park Distance Control.
Series:	E31, E32, E34, E36, E38
Storage location:	B27
SI number:	1 04 88(906)
Order number:	66 2 100
Â	Set of tools
Consisting of:	Â
1 =66 2 101	Needle for sensors
Â	NOTE: Front/center bumper
2 = 66 2 102	Installation drift
Â	NOTE: For installing sensors, side
3 = 66 2 103	Installation drift
Â	NOTE: For removing sensors, side

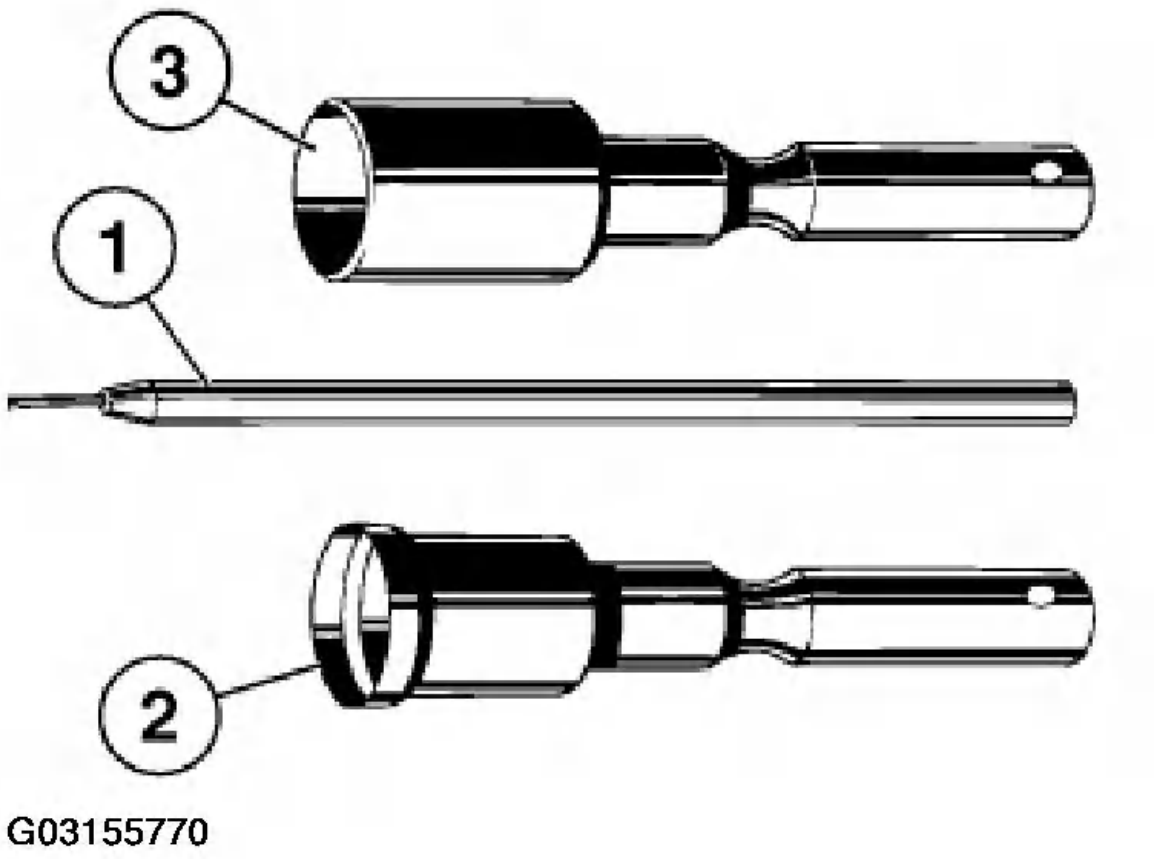


Fig. 1: Identifying Set Of Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00202816

GENERAL

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.

FRONT BUMPER

51 11 000 REMOVING AND INSTALLING COMPLETE FRONT BUMPER (Z3 ROADSTER, M ROADSTER)

Unfasten hexagon bolts (1) and Torx screws (2) at left/right.

NOTE: Screw (2) for mounting on impact absorber is Torx T50.

Version without foglights and/or headlight cleaning system: Pull bumper forwards to remove.

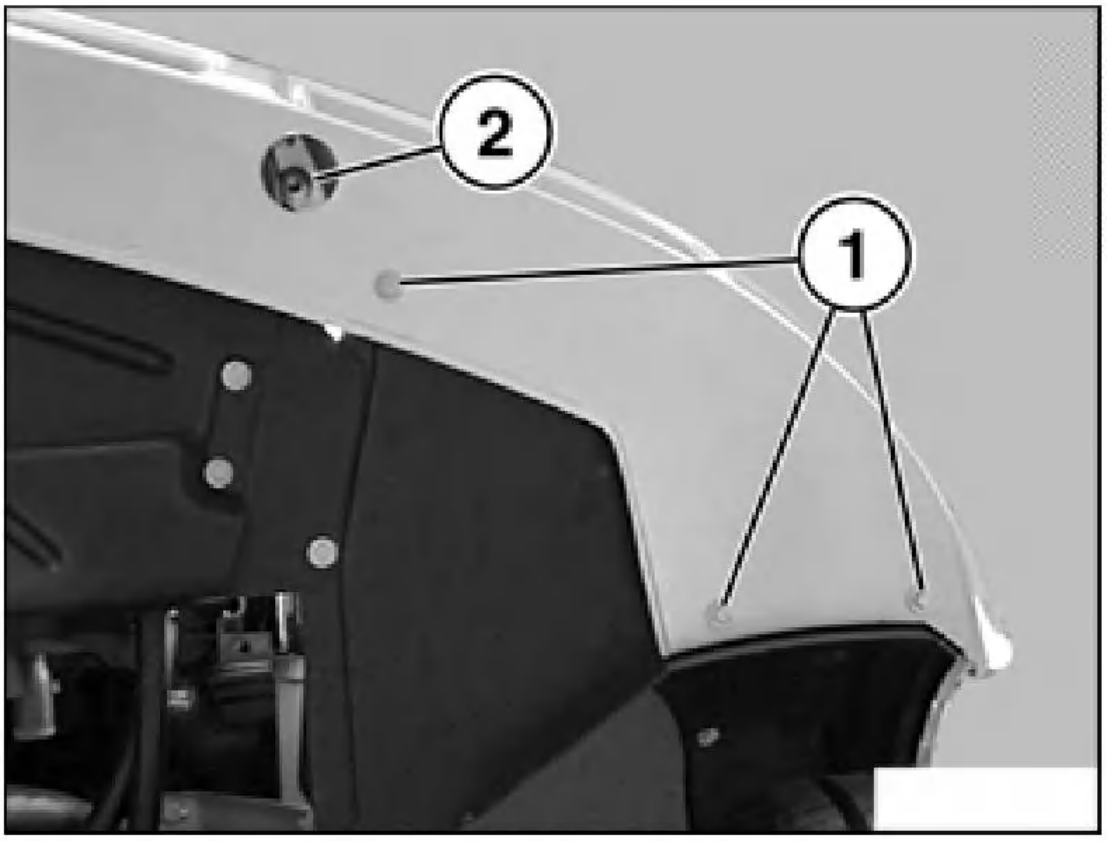


Fig. 1: Locating Hexagon Bolts And Torx Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Version With Foglights:

If necessary, remove left/right plug connection (1) from foglights.

Version With Headlight Cleaning System:

If necessary, unfasten hose clip (2) and seal hose firmly.

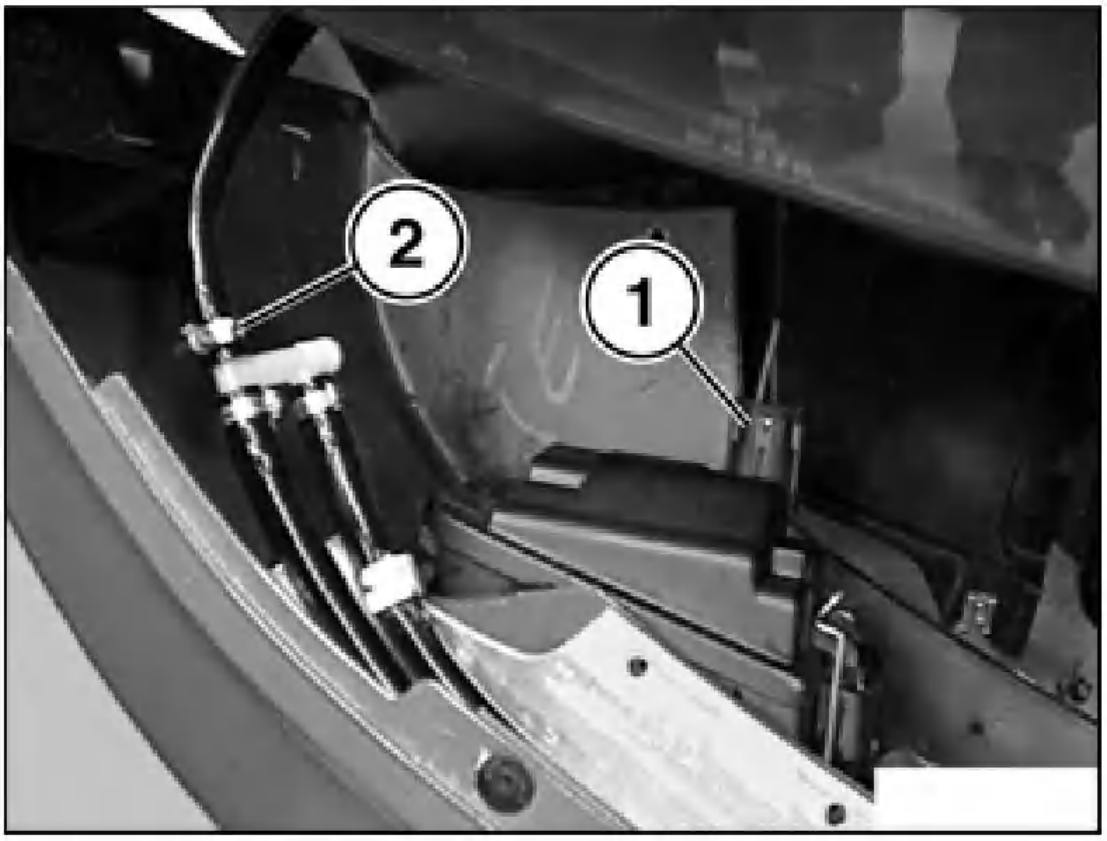


Fig. 2: Identifying Foglights Connection And Hose Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust Bumper:

Ideal setting (dimension):

Transition (A) should be flush on left/right side.

(B) 5 mm (tolerance + 0.5/-1 mm).

(C) Transition from below 5 mm (tolerance + 1/-0.5 mm) upwards to 2.5 mm (tolerance + 0.5/-1 mm).

(D) 5 mm (tolerance + 1/-0.5 mm).

(E) 5 mm (tolerance + 1/-0.5 mm).

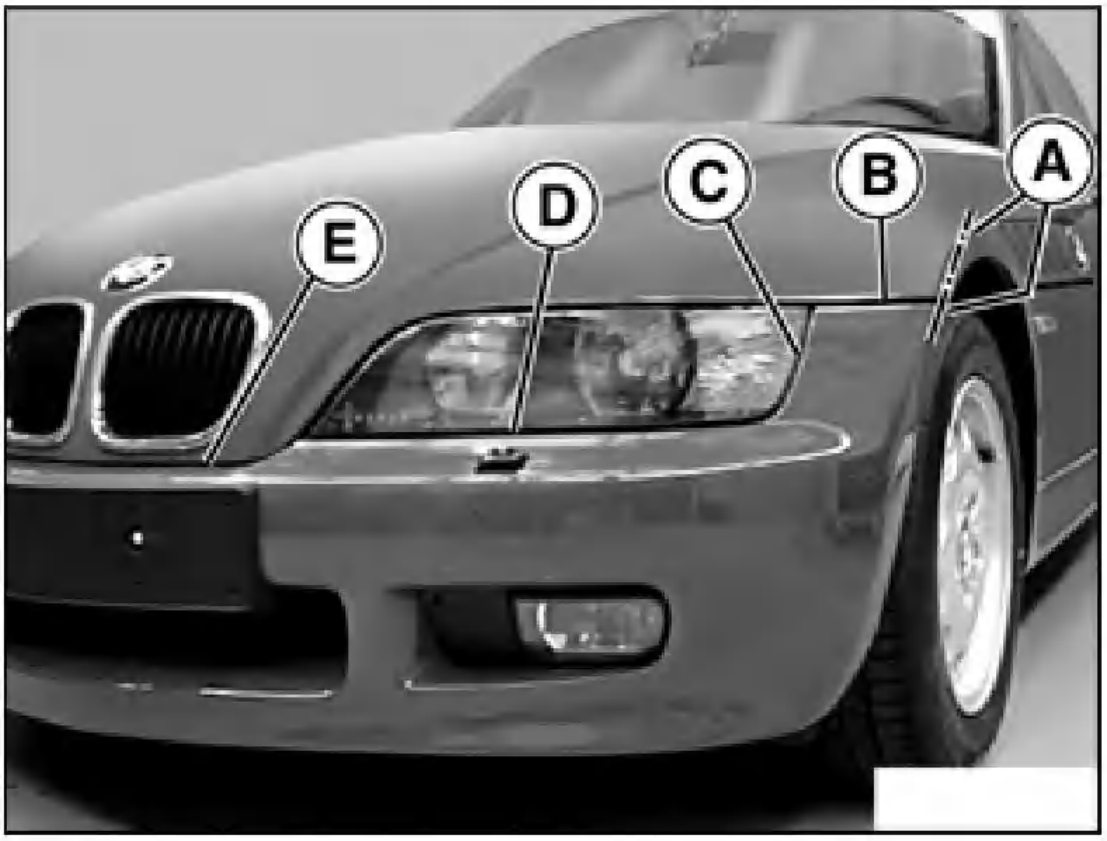


Fig. 3: Adjusting Bumper
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen nut (1) from wheel arch and adjust bracket (2).

NOTE: Adjustment possible with bumper fitted.

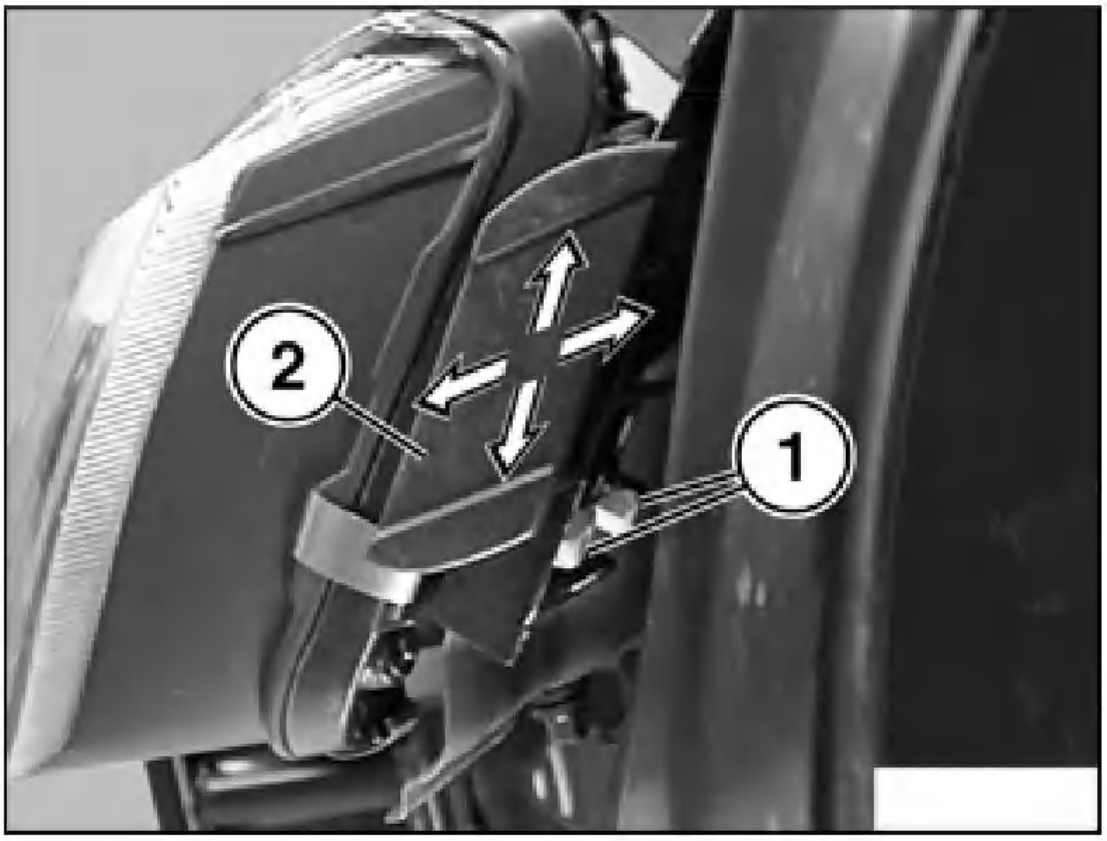


Fig. 4: Adjusting Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen left/right hexagon bolts (1).

Loosen left/right screw (2).

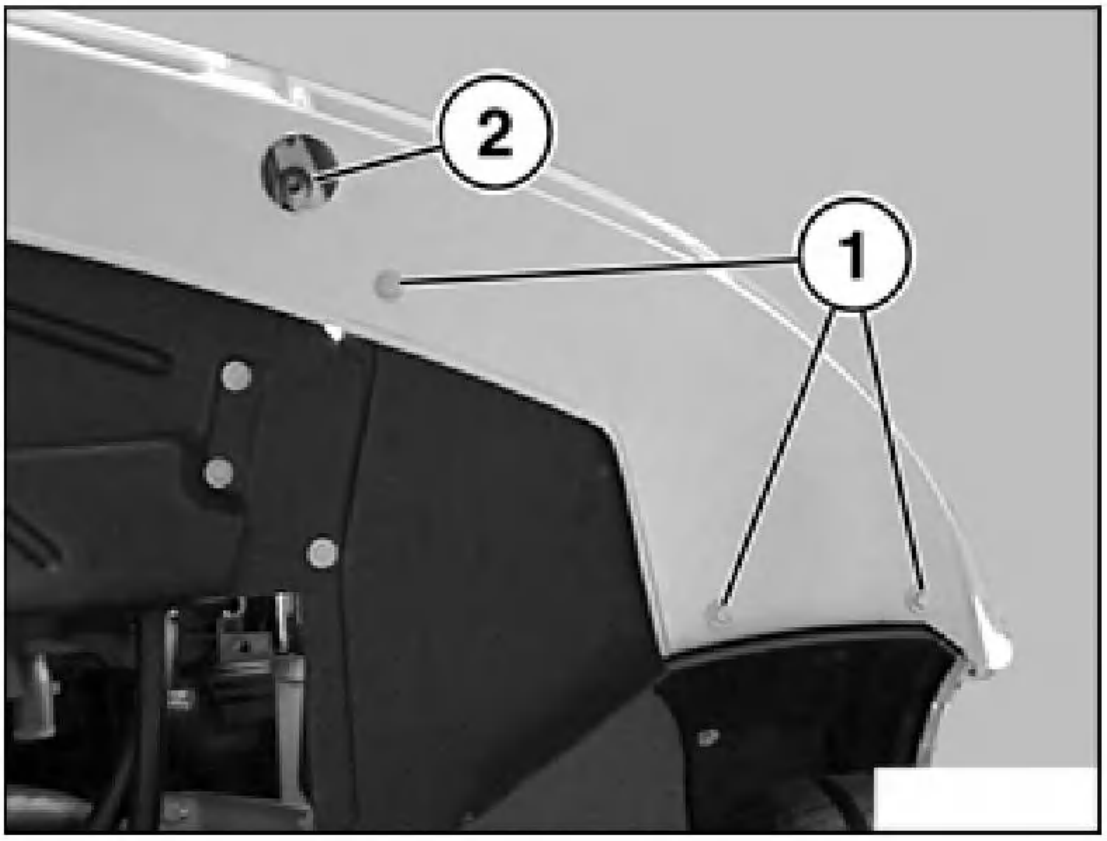


Fig. 5: Removing Left/Right Hexagon Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Height adjustment with fitted bumper:

Fit special tool 51 1 130 to standard extension (1) with reversible handle (2) and insert through bore (3) in bumper (4) of shock absorber (5).

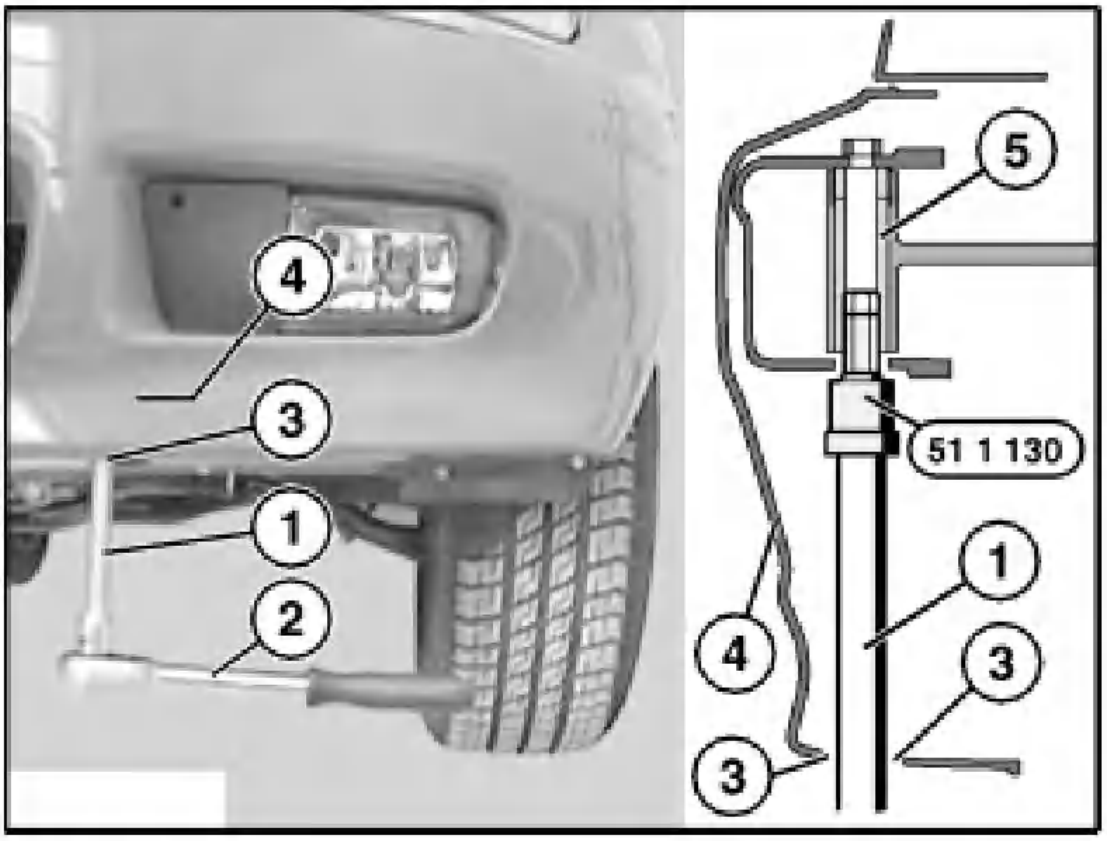


Fig. 6: Adjusting Bumper Height Using Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Height of bumper (in front area) is now adjusted by turning socket head cap screw (1) in shock absorber (2).

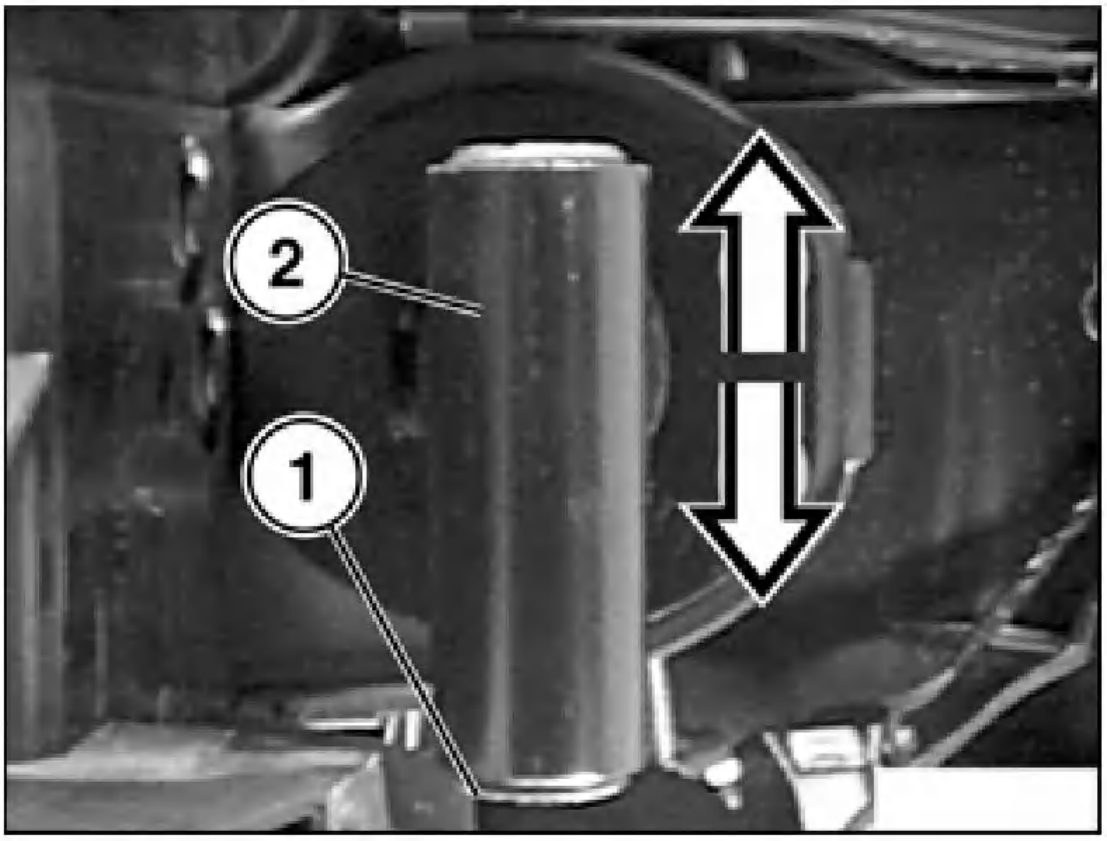


Fig. 7: Turning Socket Head Cap Screw In Shock Absorber
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Adjustment only possible when bumper is fitted using special tool 51 1 130.

51 11 001 REPLACING FRONT BUMPER (Z3 ROADSTER, Z3 COUPE)

Unscrew And Remove License Plate:

Remove complete front bumper, refer to 51 11 000 REMOVING AND INSTALLING COMPLETE FRONT BUMPER (Z3 ROADSTER, M ROADSTER) .

Version With Fog Light:

Remove foglight insert, refer to 63 17 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT FOGLIGHT INSERT .

Replace Center Section (Support Member) Of Front Bumper:

Unfasten screws (1) and remove license plate baseplate (2).

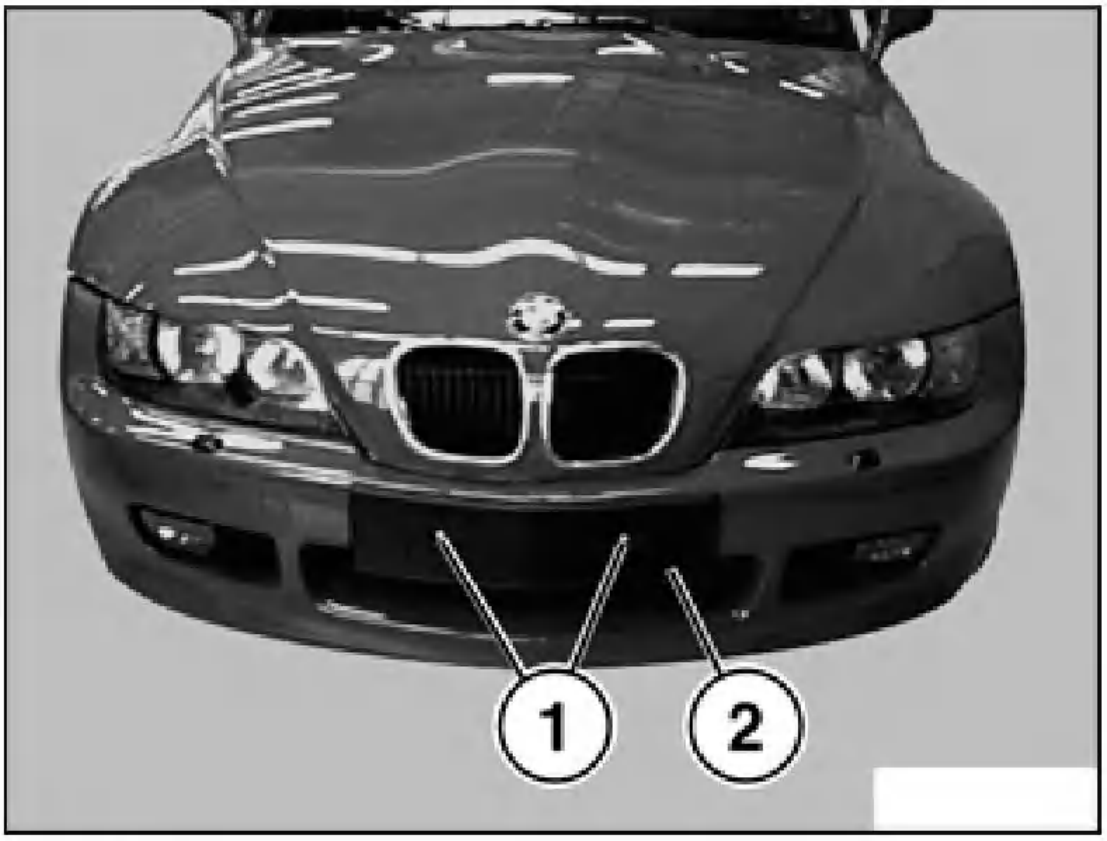


Fig. 8: Removing License Plate Baseplate
Courtesy of BMW OF NORTH AMERICA, INC.

Version With Headlight Cleaning System:

Lift out detent (1) and remove hose connection (2).

Unfasten nut (3).

Remove spray nozzle (4) and left/right clamping ring (5).

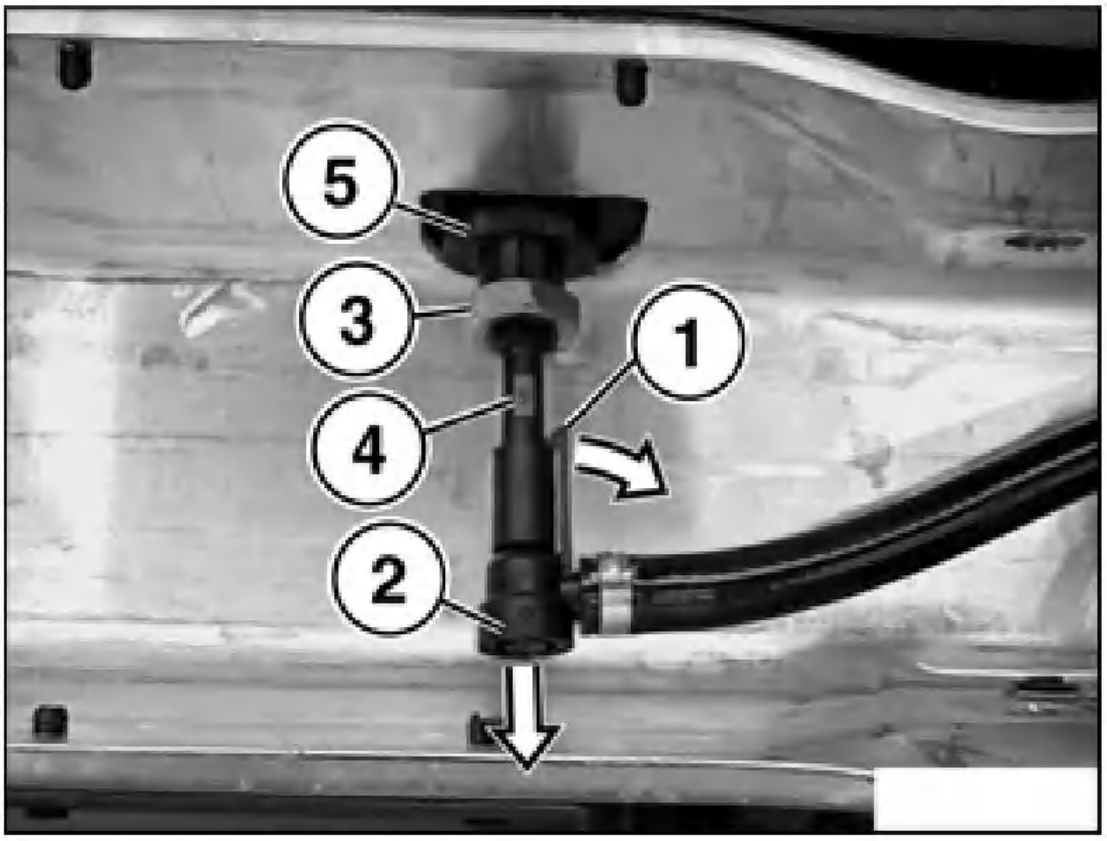


Fig. 9: Removing Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Version With Headlight Cleaning System:

Installation:

Lug in spray nozzle (1) must be aligned with recess in clamping ring (2).

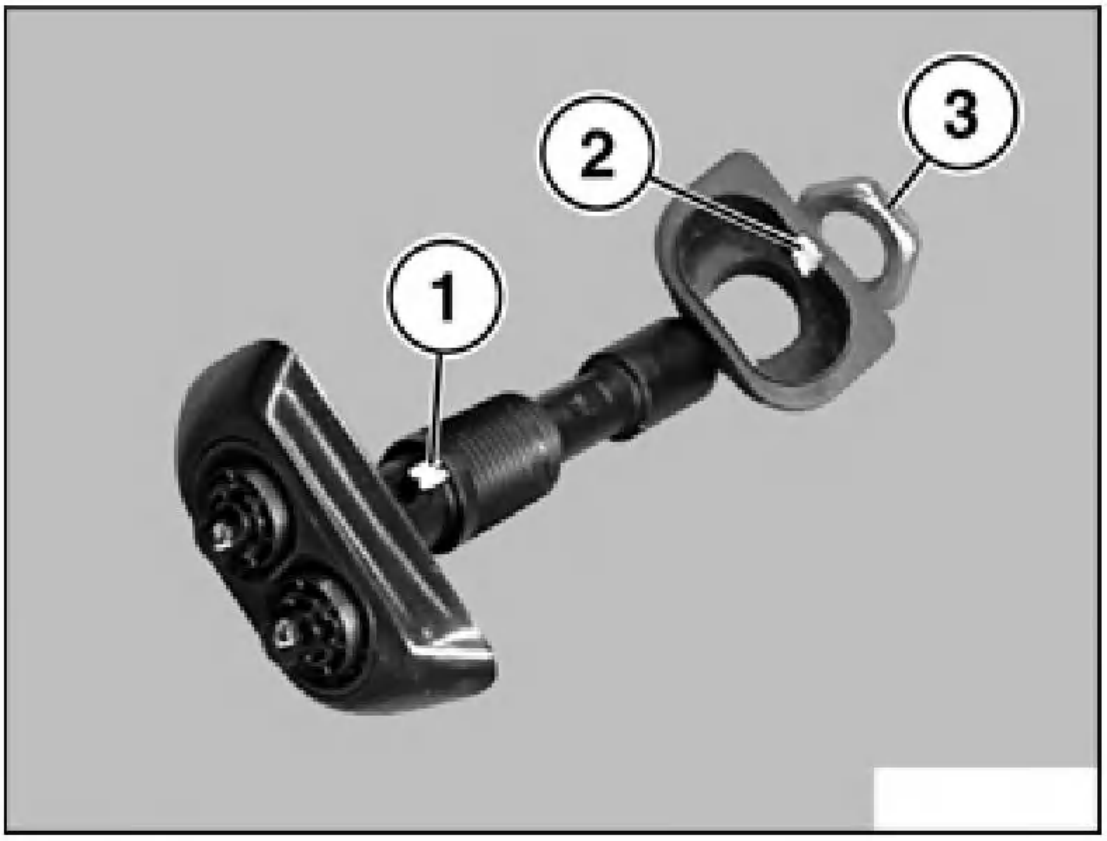


Fig. 10: Identifying Headlight Cleaning System
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten with the nut (3).

Lift out expanding rivets (1) and remove bumper carrier (2).

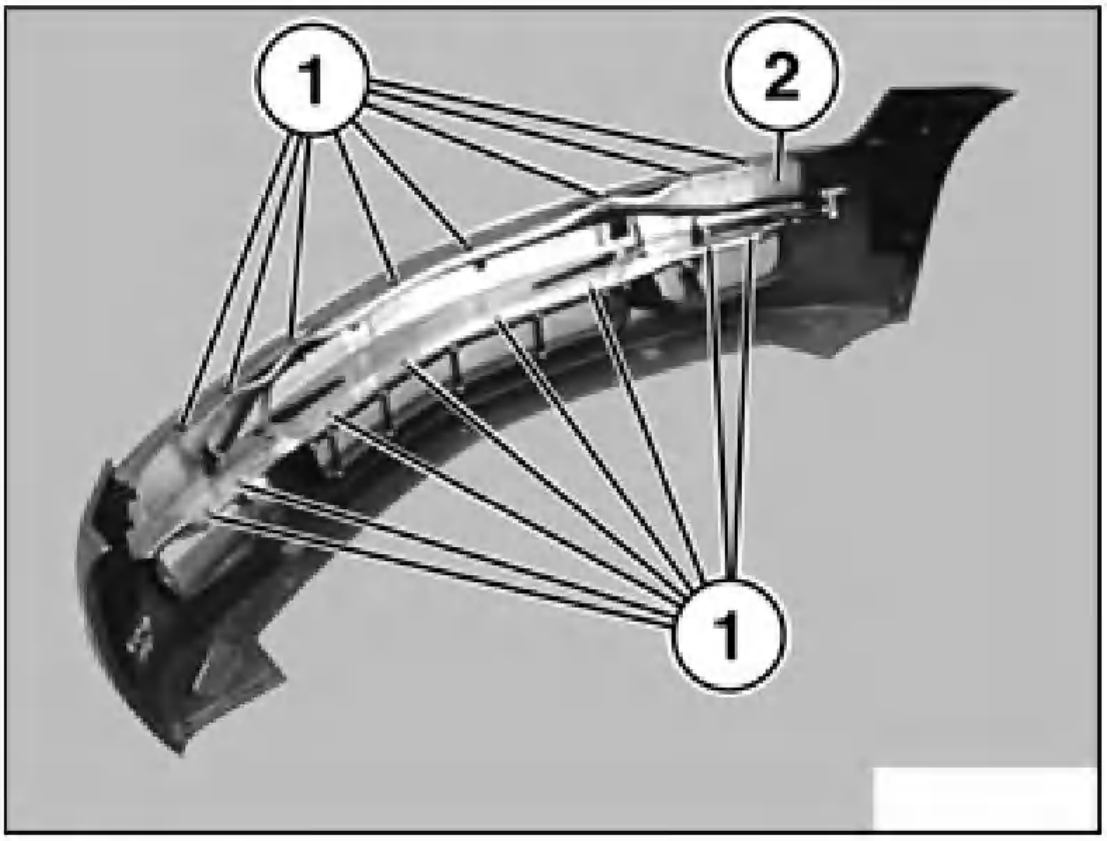


Fig. 11: Removing Bumper Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Version With Headlight Cleaning System:

If necessary, unfasten expanding rivets (1) and screws (2).

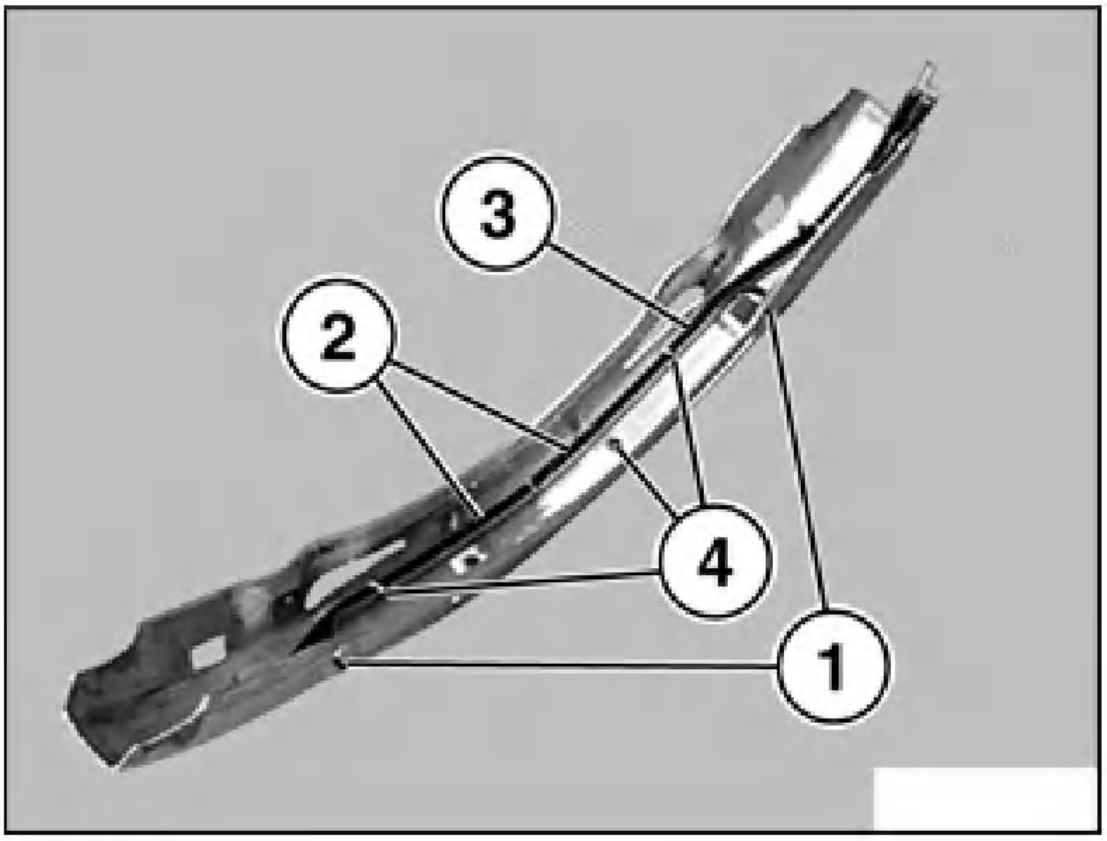


Fig. 12: Checking Headlight Cleaning System
Courtesy of BMW OF NORTH AMERICA, INC.

Remove support member (3) with hoses, replace faulty cable ties (4) if necessary.

NOTE: The operation "Removing center section of front bumper (support beam)" ends here.

Unfasten retaining washers and remove air grill.

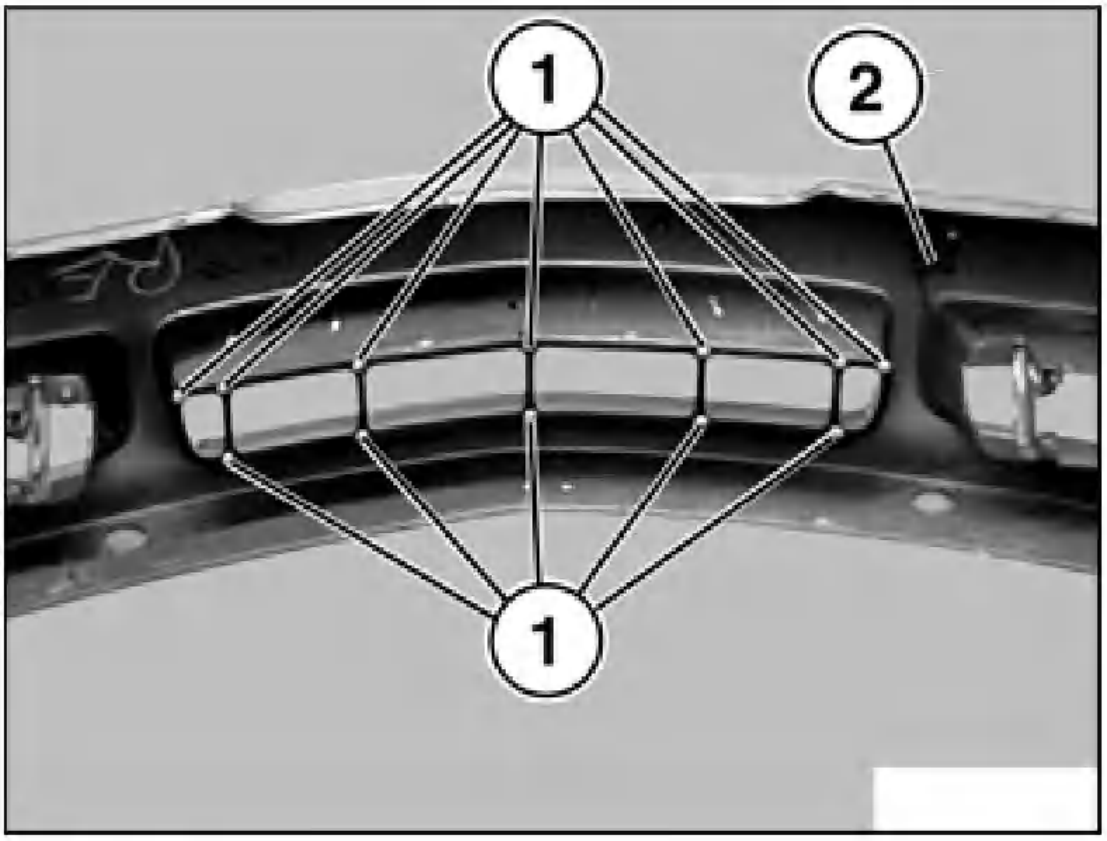


Fig. 13: Removing Air Grill
Courtesy of BMW OF NORTH AMERICA, INC.

Lift cover (2) off towing eye and unfasten catch band.

51 11 011 REPLACING BUMPER CENTER SECTION (CARRIER), FRONT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Operation Is Described In:

Replacing front bumper, refer to 51 11 001 REPLACING FRONT BUMPER (Z3 ROADSTER, Z3 COUPE) .

51 11 157 REPLACING BUMPER TRIM, FRONT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Operation Is Identical To:

Replacing front bumper, refer to 51 11 001 REPLACING FRONT BUMPER (Z3 ROADSTER, Z3 COUPE) .

51 11 158 REPLACING BASEPLATE FOR LICENSE PLATE (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Unscrew and remove license plate.

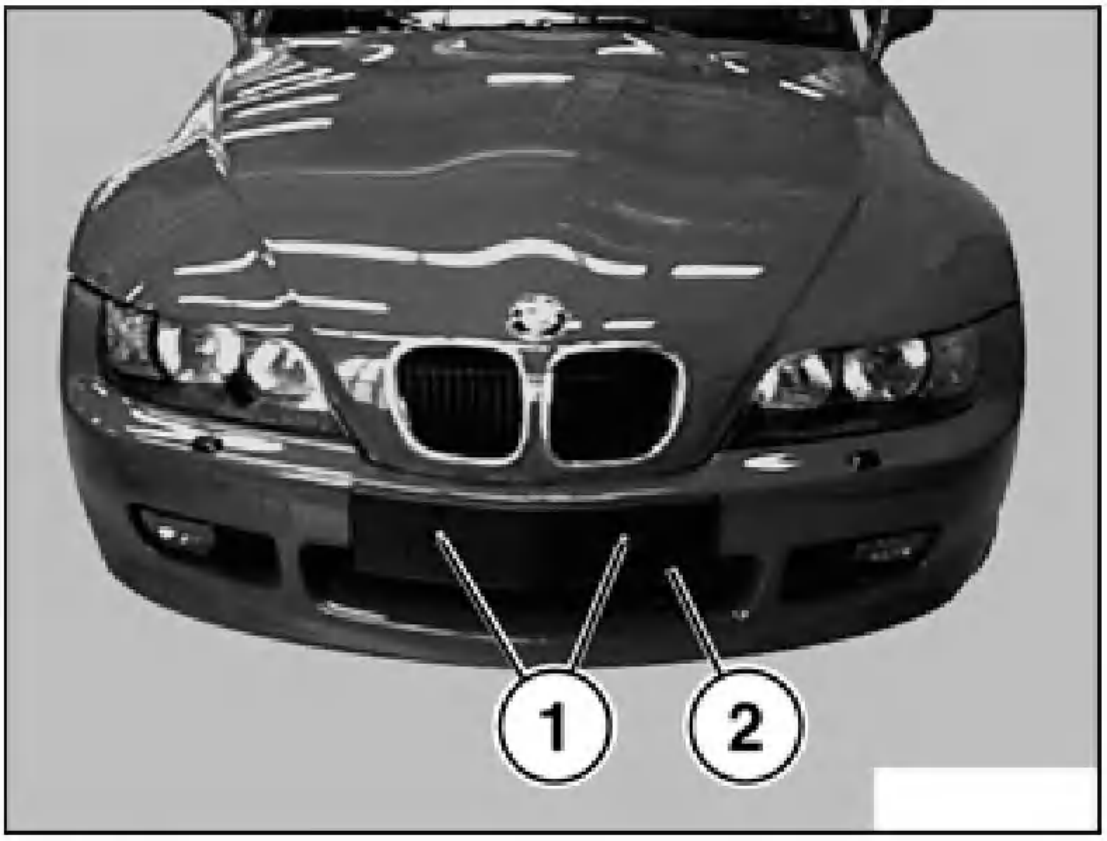


Fig. 14: Removing License Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out expanding wedges (1).

Remove baseplate for licence plate (2) from lower left/right sides.

51 11 701 REPLACING BRACKET FOR BUMPER, FRONT LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

(Bumper Removed)

(If necessary, remove front bumper, refer to 51 11 000 REMOVING AND INSTALLING COMPLETE FRONT BUMPER (Z3 ROADSTER, M ROADSTER) .)

Installation:

If necessary, mark position of bracket on body.

Unfasten nut (1) from wheel arch and remove bracket (2).

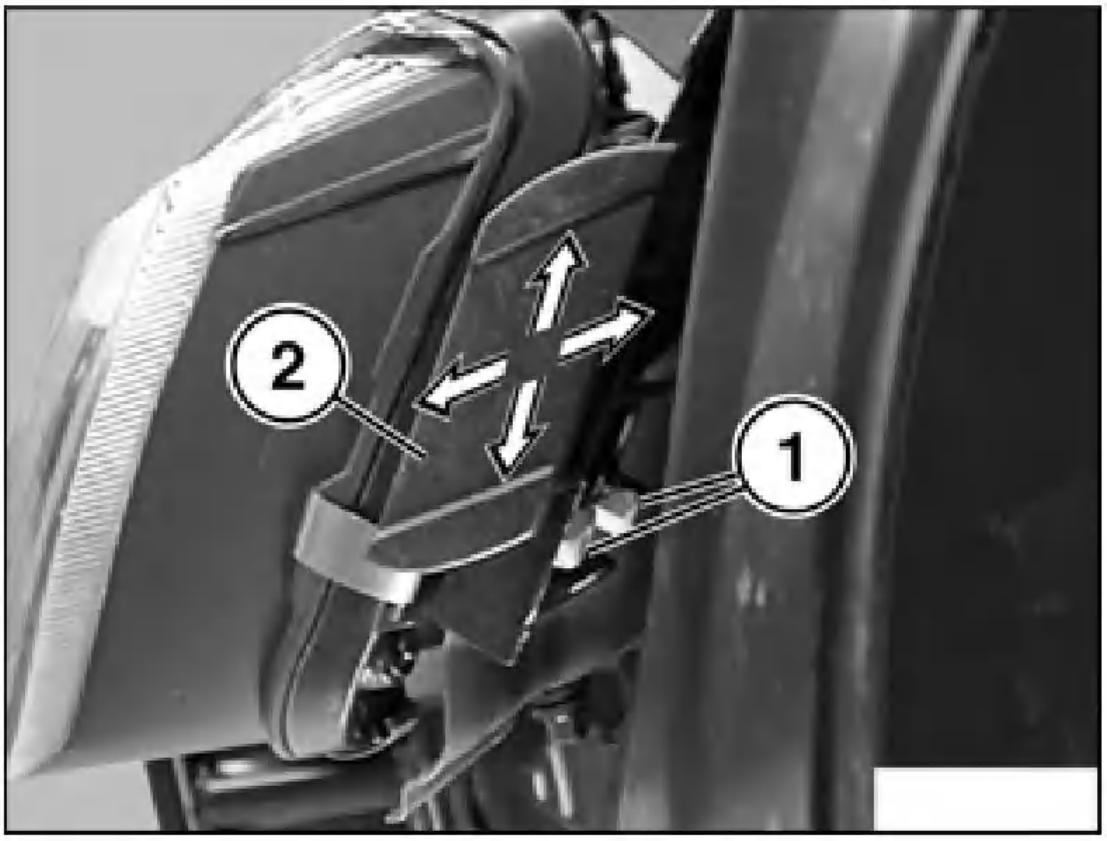


Fig. 15: Adjusting Front Bumper
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Adjust front bumper, refer to 51 11 000 REMOVING AND INSTALLING COMPLETE FRONT BUMPER (Z3 ROADSTER, M ROADSTER) .

51 11 794 REPLACING A SHOCK ABSORBER FOR BUMPER, FRONT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

(Bumper Removed)

(If necessary, remove front bumper, refer to 51 11 000 REMOVING AND INSTALLING COMPLETE FRONT BUMPER (Z3 ROADSTER, M ROADSTER) .)

Unfasten nut (1) and remove shock absorber (2).

Tightening Torque, 51 11 3AZ. Refer to 51 11 FRONT BUMPER .

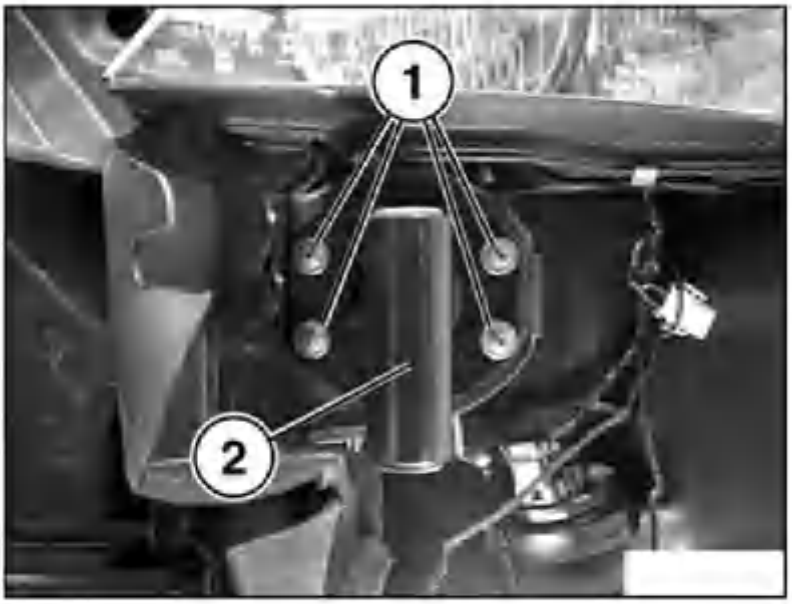


Fig. 16: Removing Shock Absorber
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Height of bumper is determined by turning the socket head cap screw (1) on the shock absorber (2).

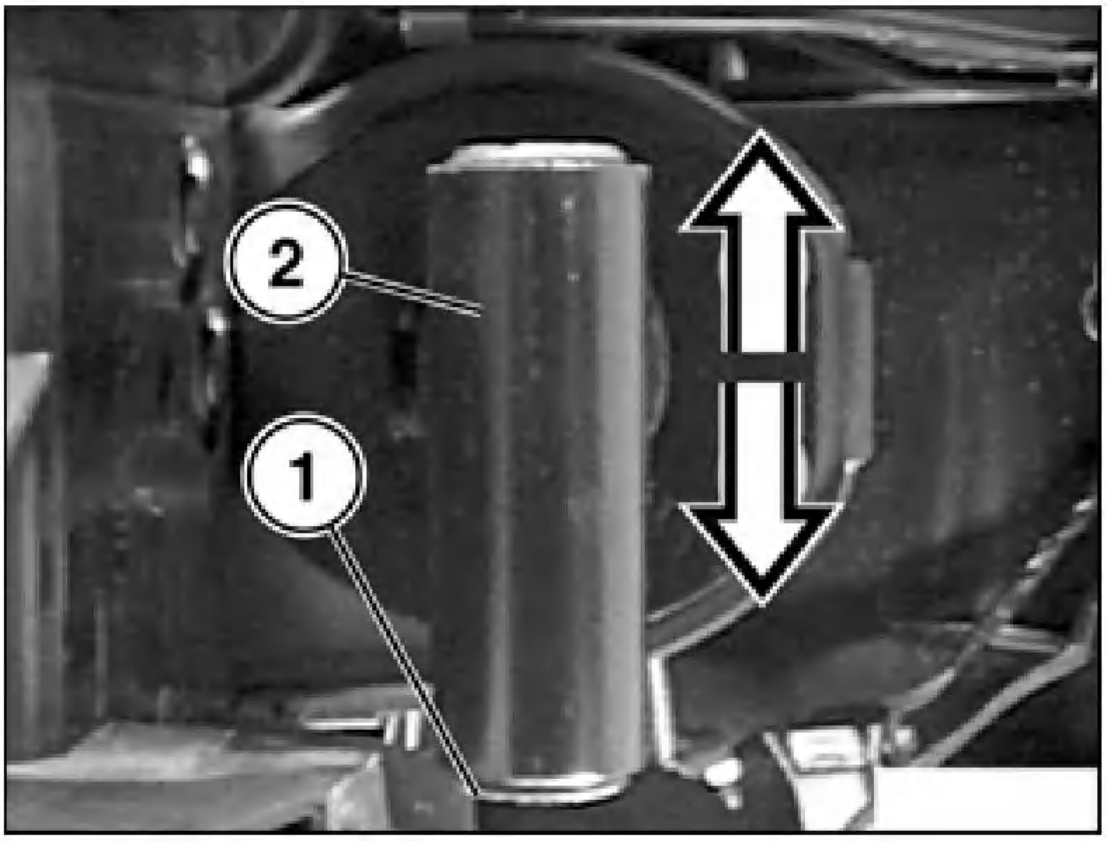


Fig. 17: Identifying Shock Absorber
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust front bumper, refer to 51 11 000 REMOVING AND INSTALLING COMPLETE FRONT BUMPER (Z3 ROADSTER, M ROADSTER) .

REAR BUMPER

51 12 000 REMOVING AND INSTALLING COMPLETE REAR BUMPER (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Remove spare wheel.

Remove and install rear wheel housing cover, left and right, refer to 51 71 041 REMOVING AND INSTALLING/REPLACING WHEEL ARCH COVER, REAR LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Z3 roadster only:

Unclip lamps (1) from license plate lighting on broad rib.

Unfasten connector and remove license plate lighting.

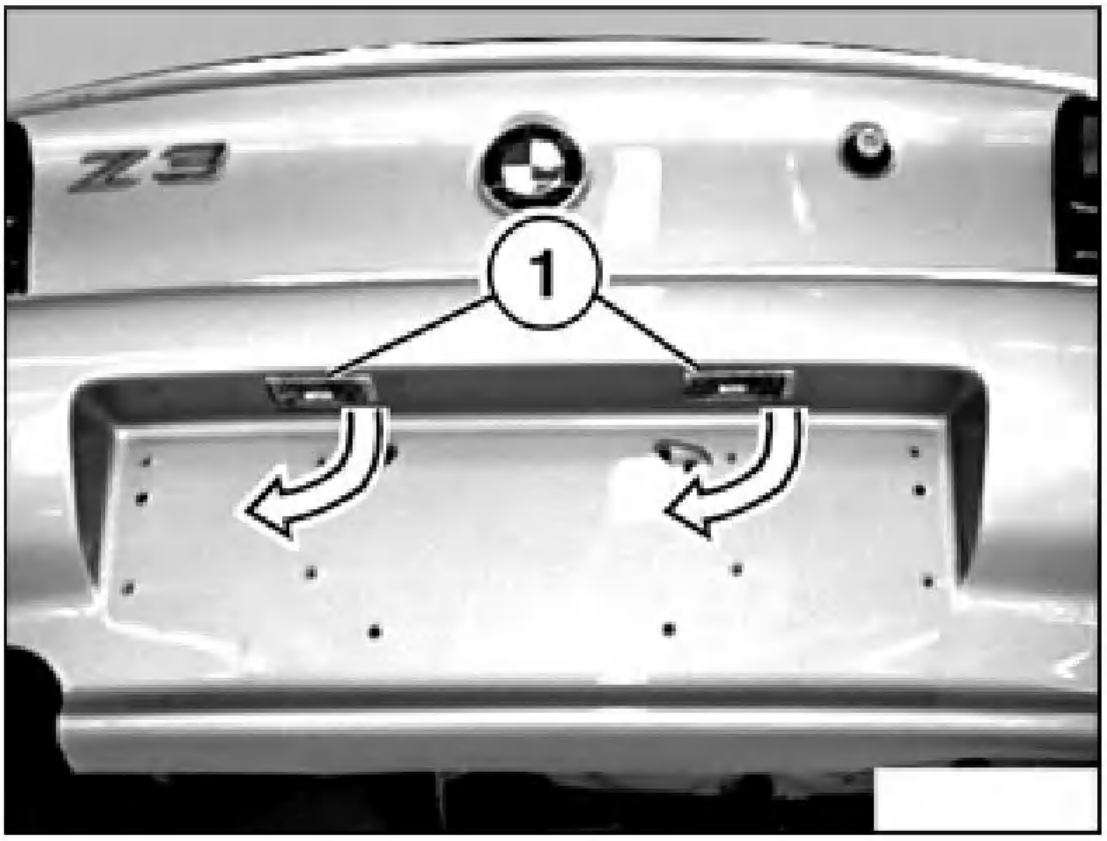


Fig. 18: Identifying License Plate Lighting
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew bolts (1).

Installation:

Tightening Torque, 51 12 2AZ. Refer to 51 12 REAR BUMPER .

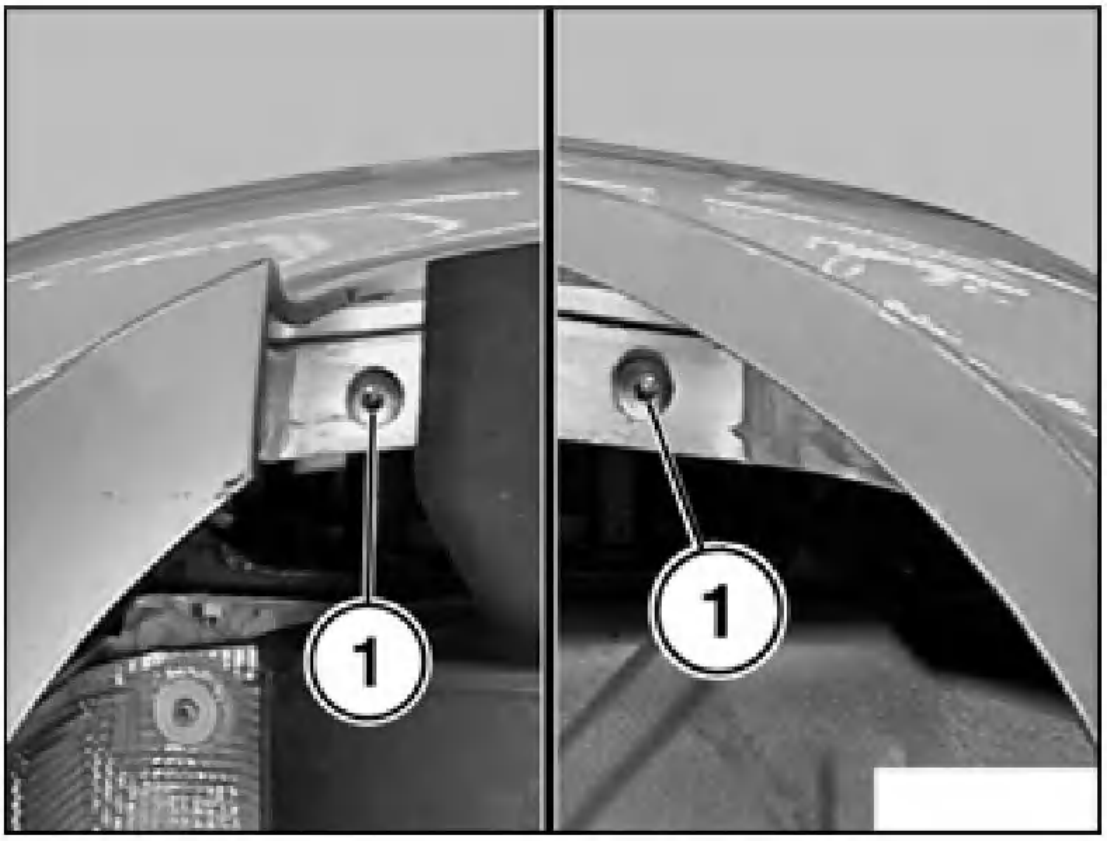


Fig. 19: Tightening Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Z3 roadster with 4-cylinder engines only:

Unfasten expanding rivet (1) in left/right wheel housing.



Fig. 20: Identifying Left/Right Wheel Housing
Courtesy of BMW OF NORTH AMERICA, INC.

6-cylinder engines only:

Push bumper (1) forward until clips (2) are located in assembly opening.

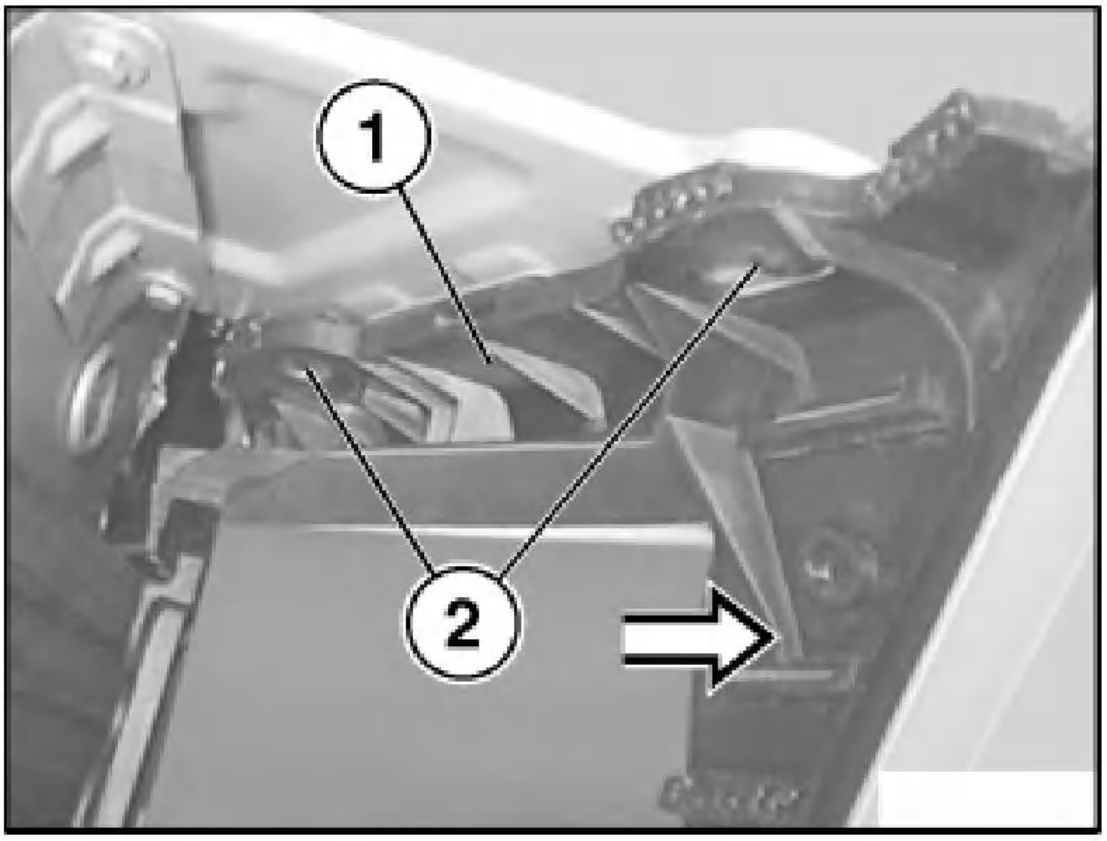


Fig. 21: Aligning Bumper Forward
Courtesy of BMW OF NORTH AMERICA, INC.

6-cylinder engines only:

Press bumper (1) downwards/towards rear until clips (2) are out of assembly opening (3).

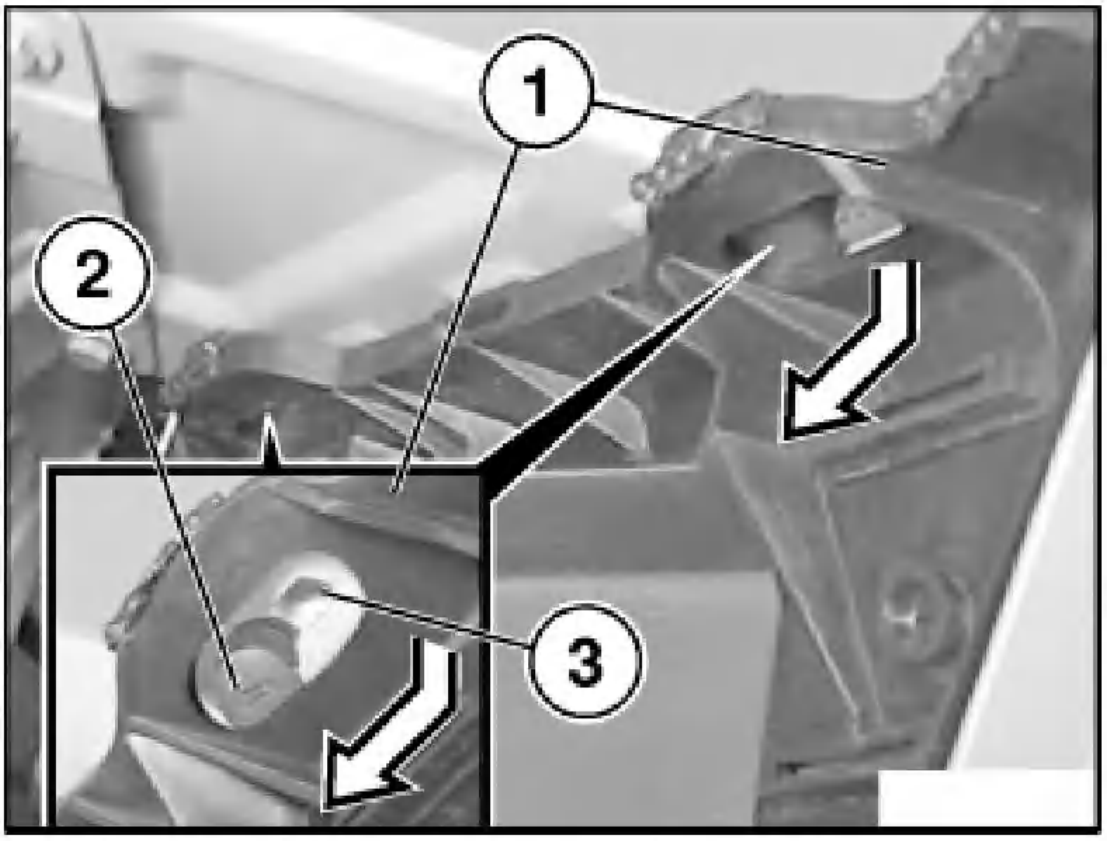


Fig. 22: Pressing Bumper Downwards Until Clips Are Out Of Assembly Opening
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully press bumper (1) from wheel housing over tail lights (2) on left/right (risk of damage to tail light rubber) and remove bumper (1) towards rear.

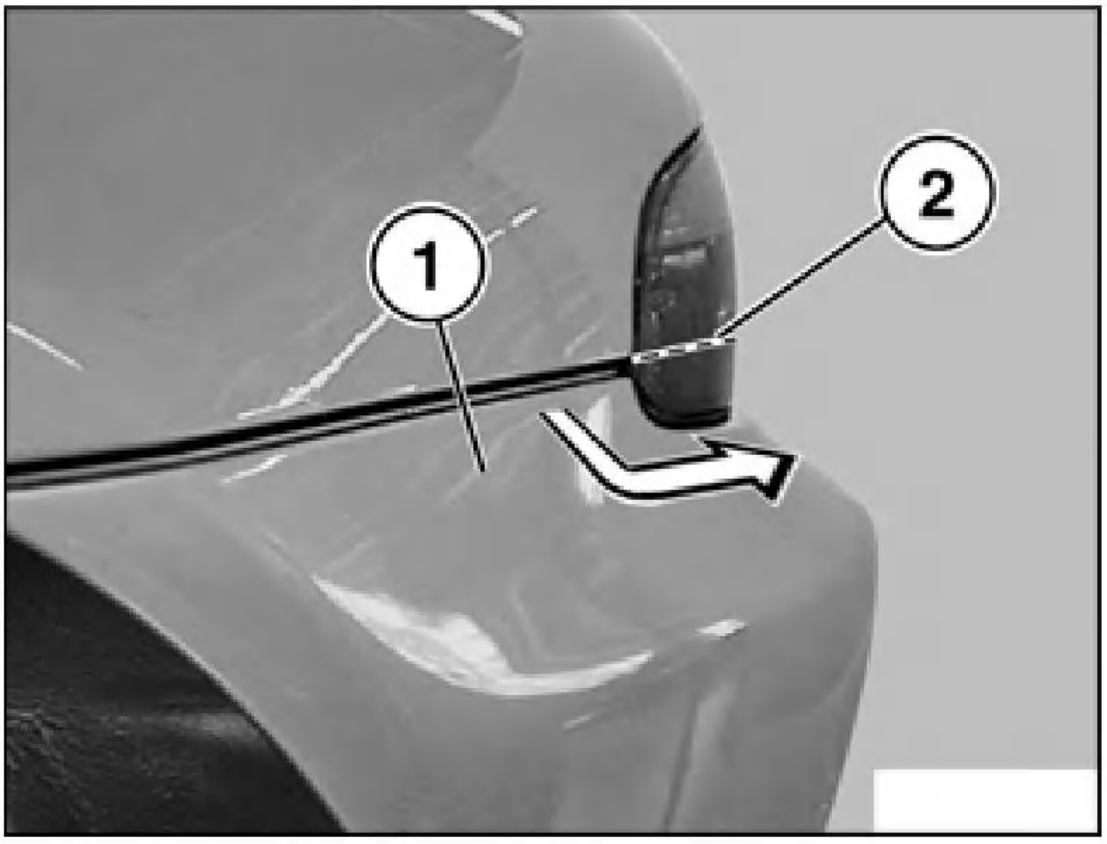


Fig. 23: Removing Bumper
Courtesy of BMW OF NORTH AMERICA, INC.

6-cylinder engines only:

If necessary, replace defective clips (1).

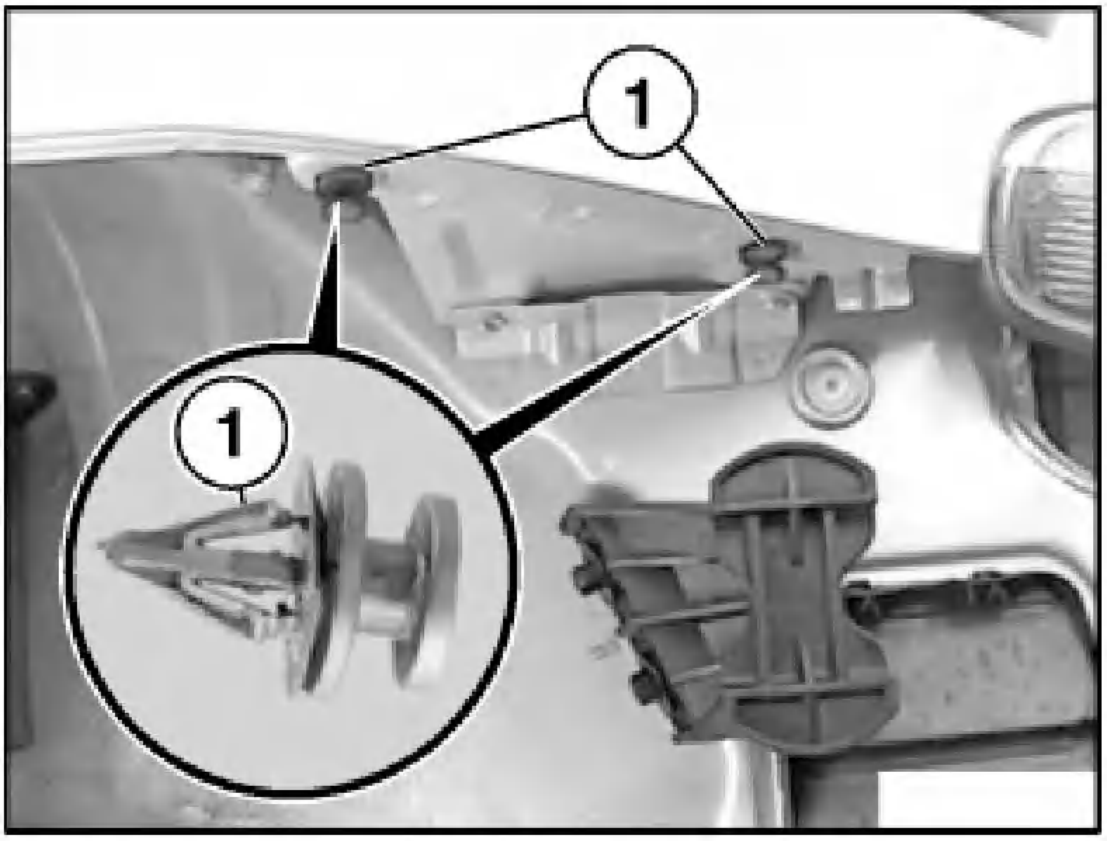


Fig. 24: Replacing Defective Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust Bumper:

Ideal setting (dimension):

Transition (A) should be flush on left/right side.

(B) 5.5 mm (tolerance + 0.5/-1 mm).

(C) 1 mm (tolerance + 1.5/-0 mm).

(D) 5 mm (tolerance + 0.5/-1 mm).

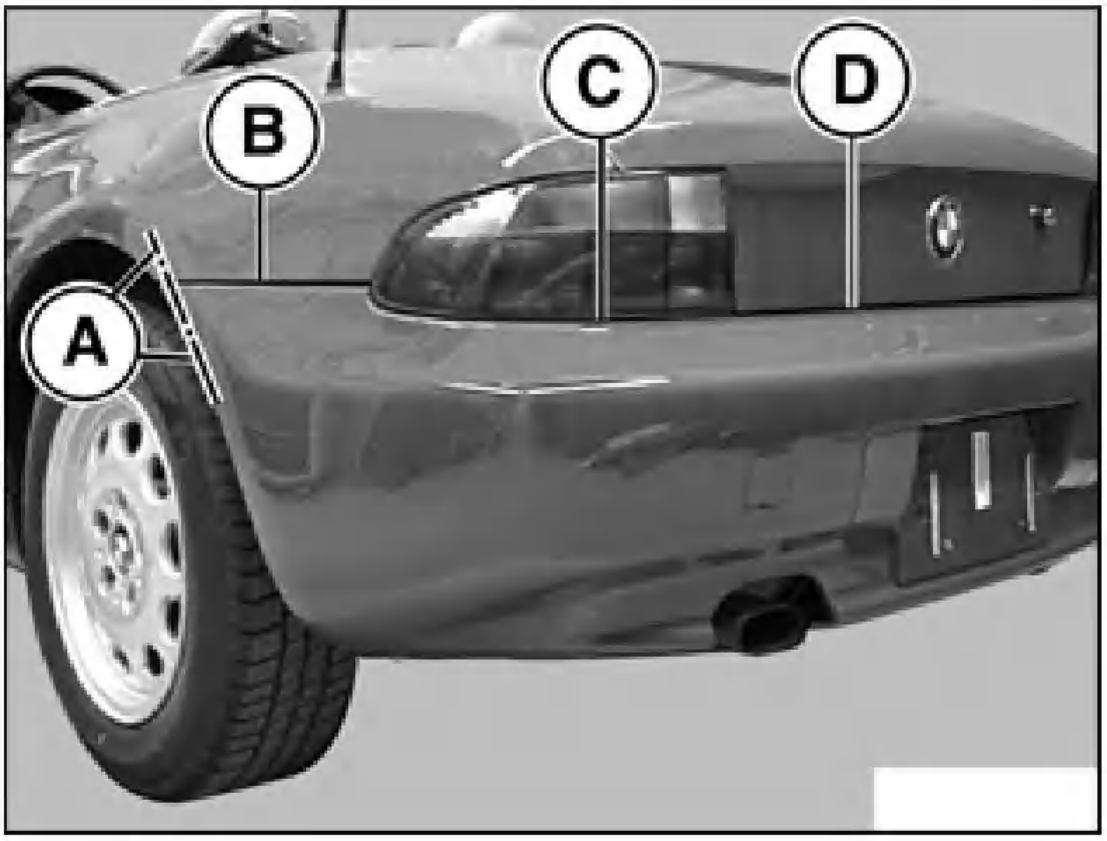


Fig. 25: Identifying Bumper Adjustment Settings
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen nut (1) from wheel housing and adjust bracket (2).

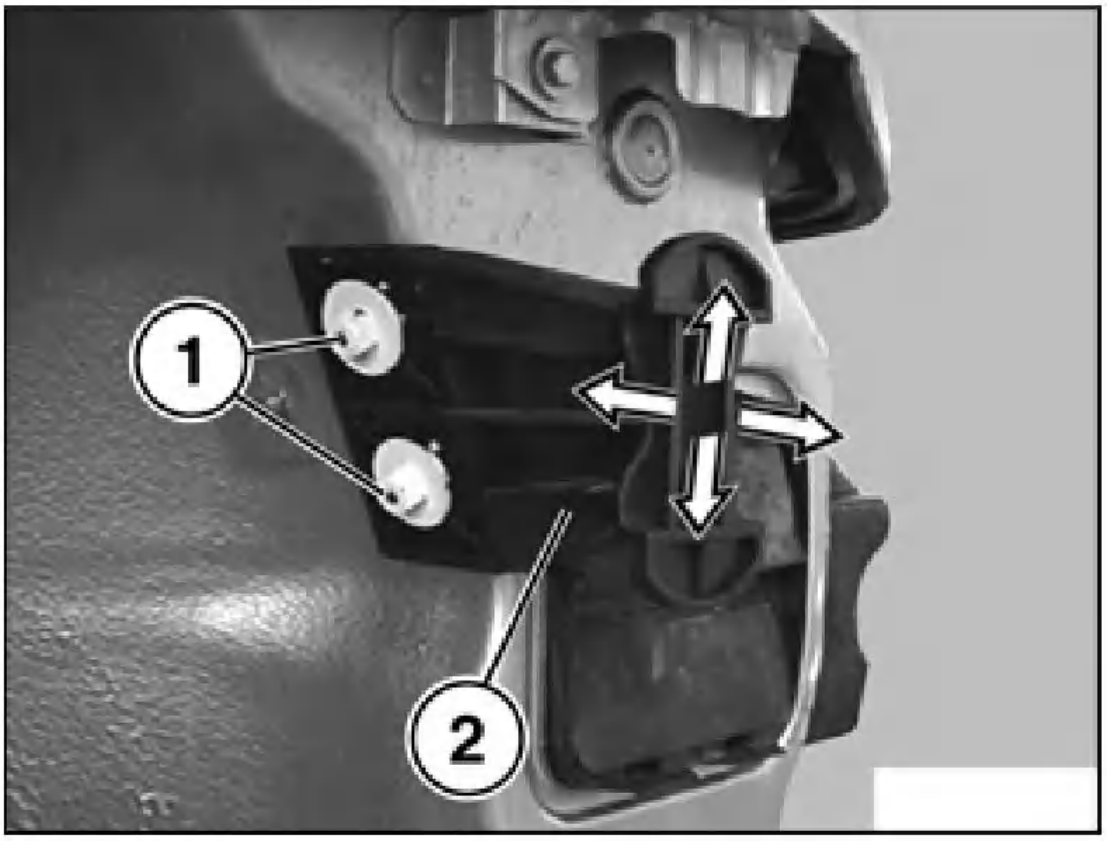


Fig. 26: Adjusting Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Adjustment at shock absorber is also possible with bumper installed if spare wheel is removed.

Unfasten left/right screws (1).

Installation:

Tightening Torque, 51 12 2AZ. Refer to 51 12 REAR BUMPER .

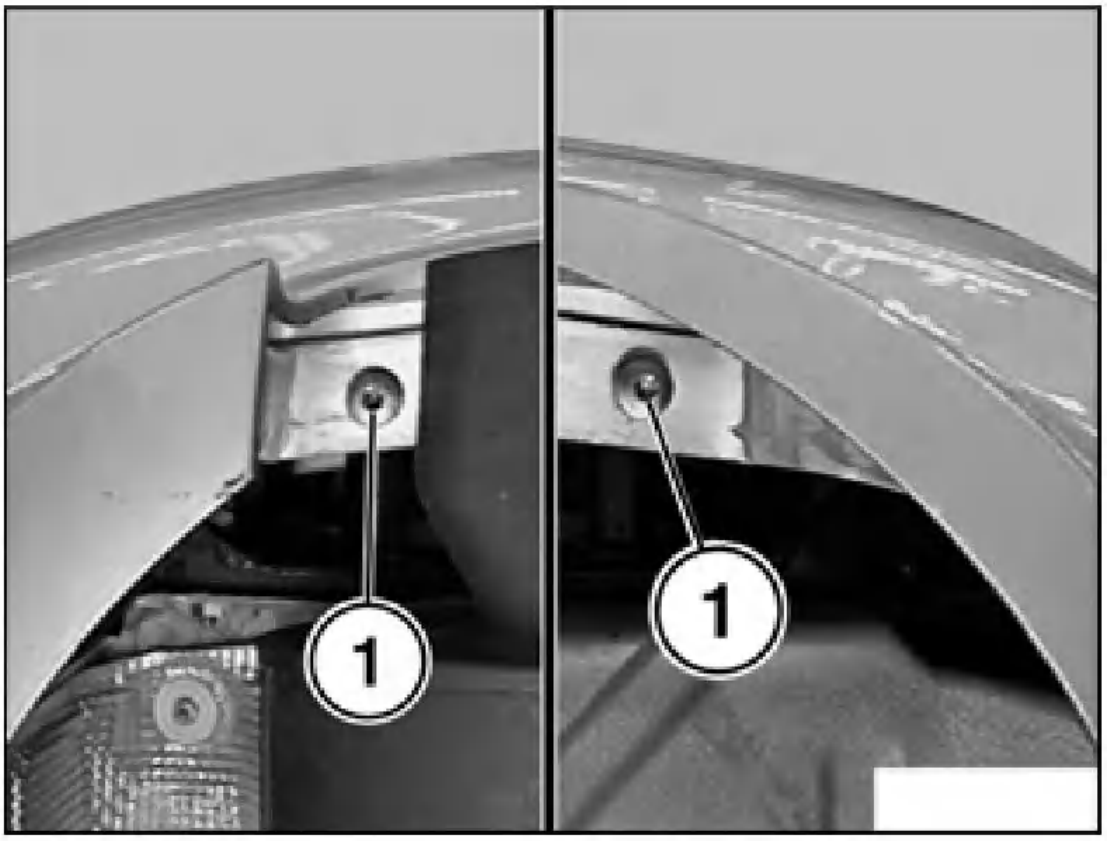


Fig. 27: Adjusting Shock Absorber
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 51 1 130 on standard extension (1) through bore with reversible handle into shock absorber (2).

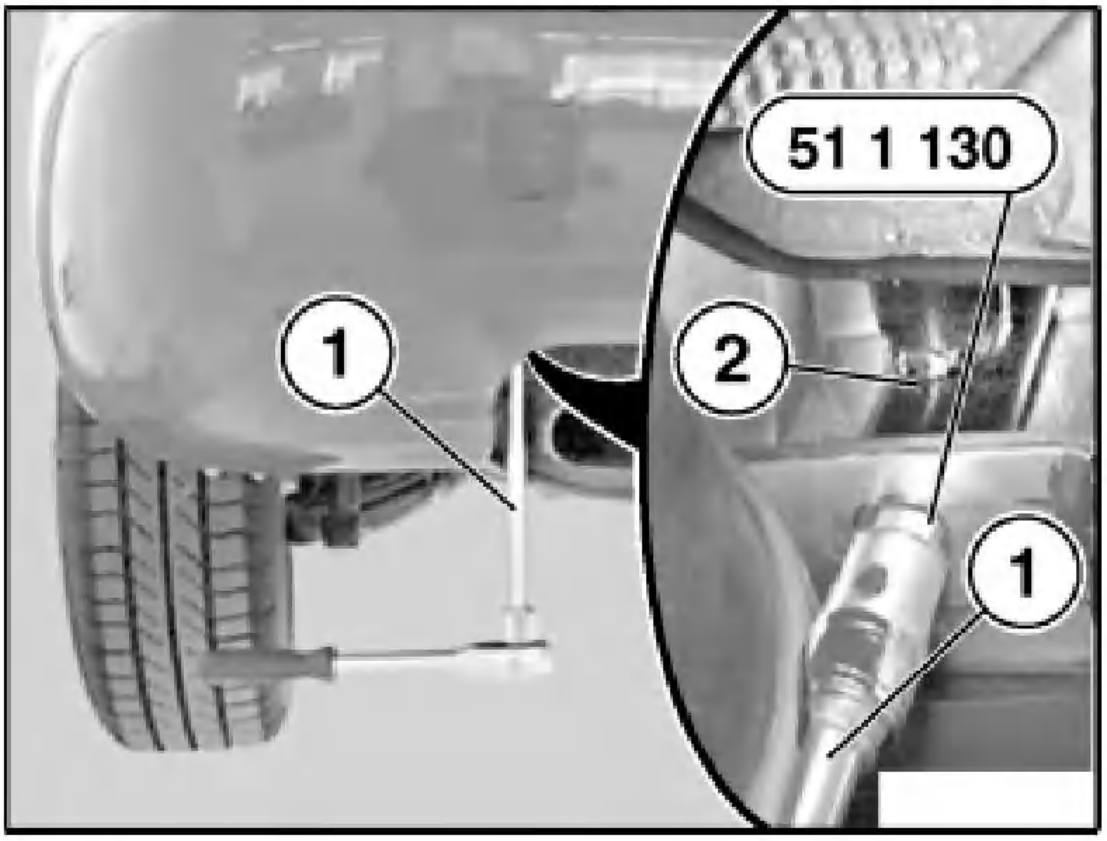


Fig. 28: Installing Special Tool In Shock Absorber
Courtesy of BMW OF NORTH AMERICA, INC.

Height of bumper (in rear area) is now set by twisting socket head cap screw (1) in shock absorber (2).

NOTE: Adjustment only possible when bumper is fitted using special tool 51 1 130.

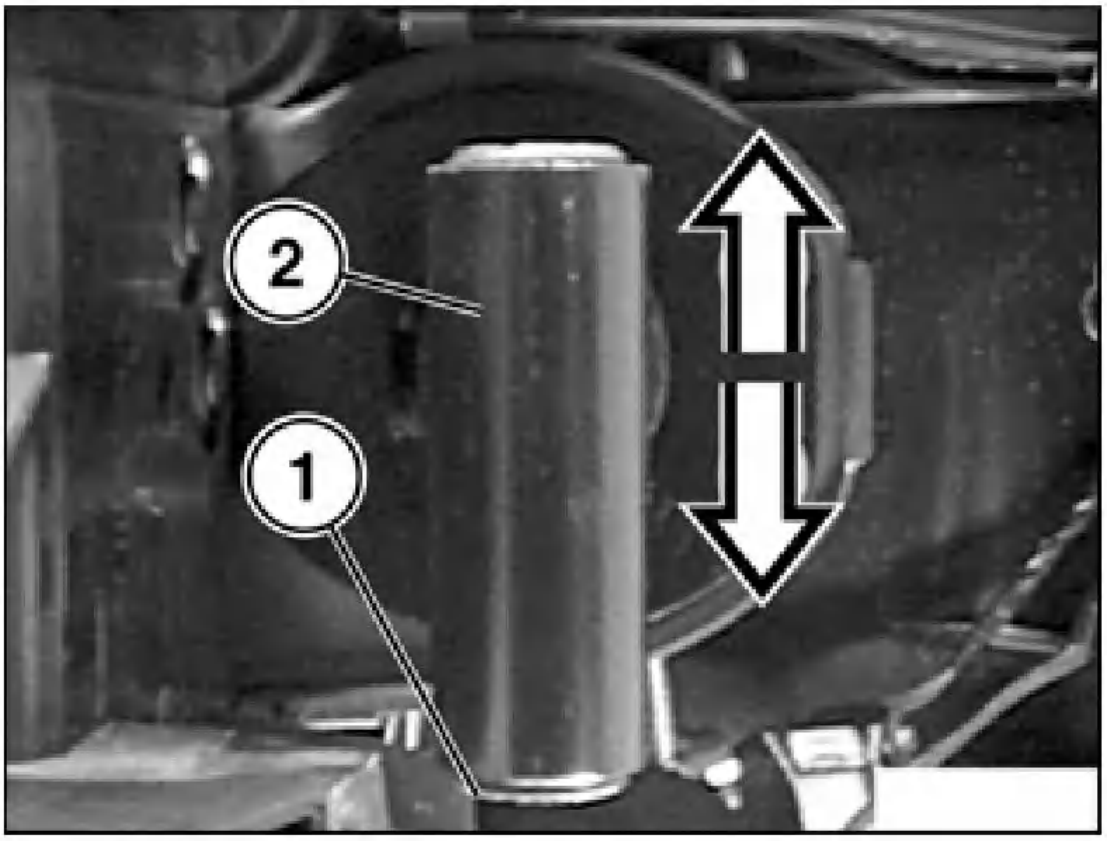


Fig. 29: Adjusting Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

51 12 001 REPLACING REAR BUMPER (Z3 ROADSTER, M ROADSTER)

Unscrew License Plate (Z3 Roadster Only):

Remove complete rear bumper, refer to 51 12 000 REMOVING AND INSTALLING COMPLETE REAR BUMPER (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

US version also (Z3 roadster only):

Unfasten screws (1) (from below/inside) and (2) and remove baseplate (3) from licence plate.

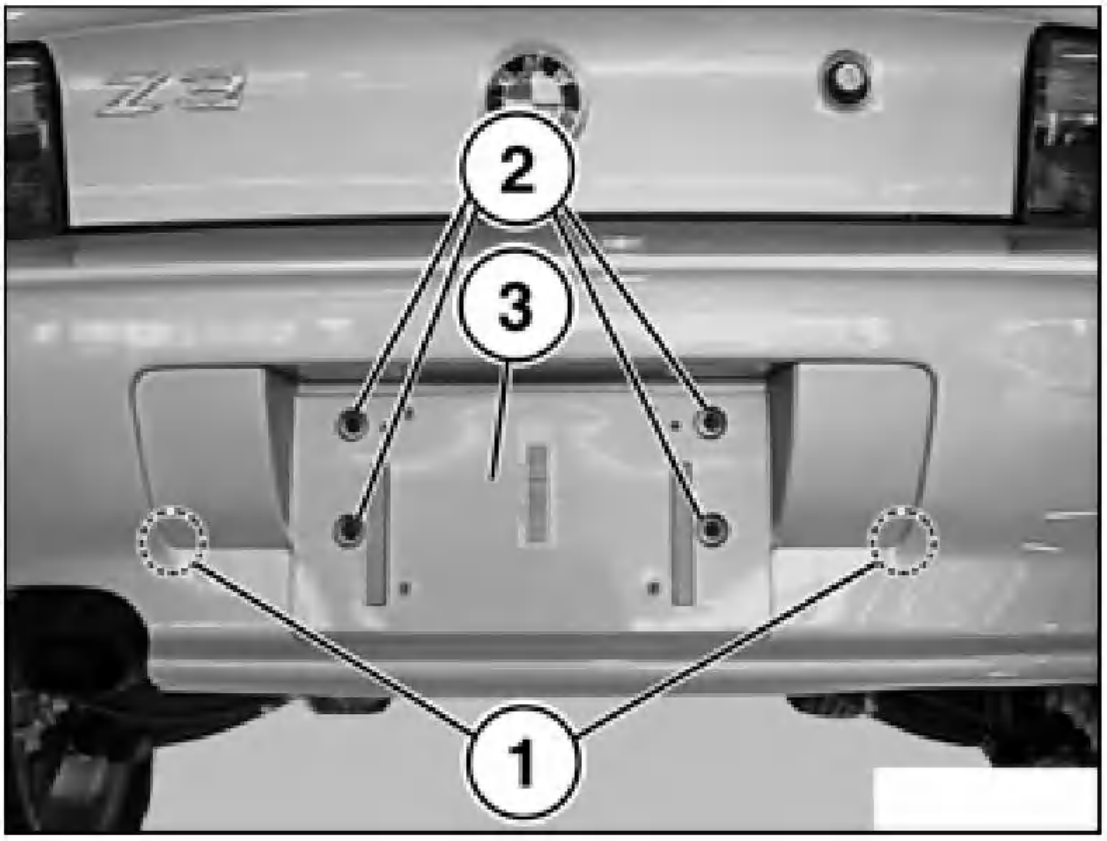


Fig. 30: Removing Baseplate From Licence Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Remove Rear Bumper Center Section (Support Member):

Unfasten expanding rivets (1) and remove center section of bumper (2).

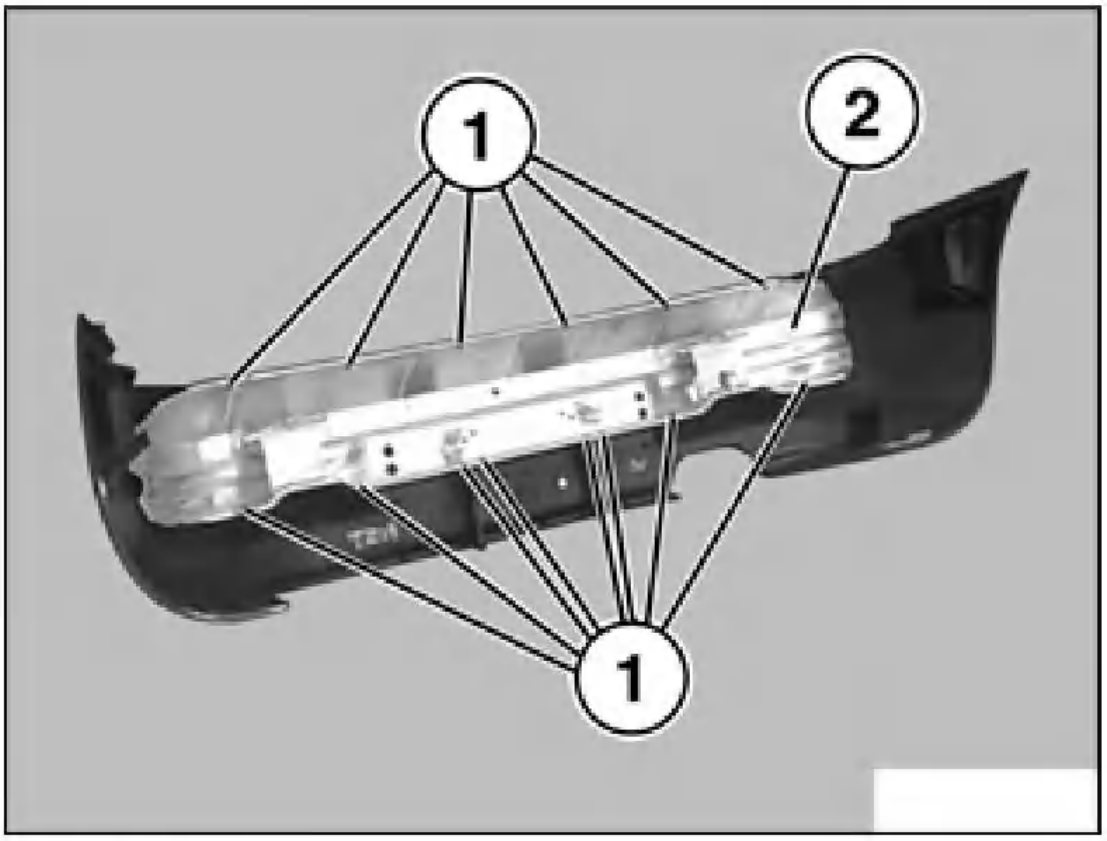


Fig. 31: Removing Center Section Of Bumper
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operations 51 12 011 REPLACING REAR CENTER SECTION OF BUMPER (CARRIER) (Z3 ROADSTER) end here.

Only Replacement Of "Rear Bumper Trim And Bumper":

Unclip finisher strip for towing eye and remove catch band.

51 12 011 REPLACING REAR CENTER SECTION OF BUMPER (CARRIER) (Z3 ROADSTER)

Operation Is Described In:

Replacing rear bumper, refer to 51 12 001 REPLACING REAR BUMPER (Z3 ROADSTER, M ROADSTER) .

51 12 157 REPLACING REAR BUMPER TRIM (Z3 ROADSTER)

Operation Is Described In:

Replacing rear bumper, refer to 51 12 001 REPLACING REAR BUMPER (Z3 ROADSTER, M ROADSTER) .

51 12 158 REMOVING AND INSTALLING/REPLACING BASEPLATE FOR LICENSE PLATE (US) (Z3 ROADSTER, Z3 COUPE)

Remove spare wheel.

Unscrew and remove license plate.

Only US version:

Unfasten screws (1) (from below/inside) and (2), and remove baseplate (3) from licence plate.

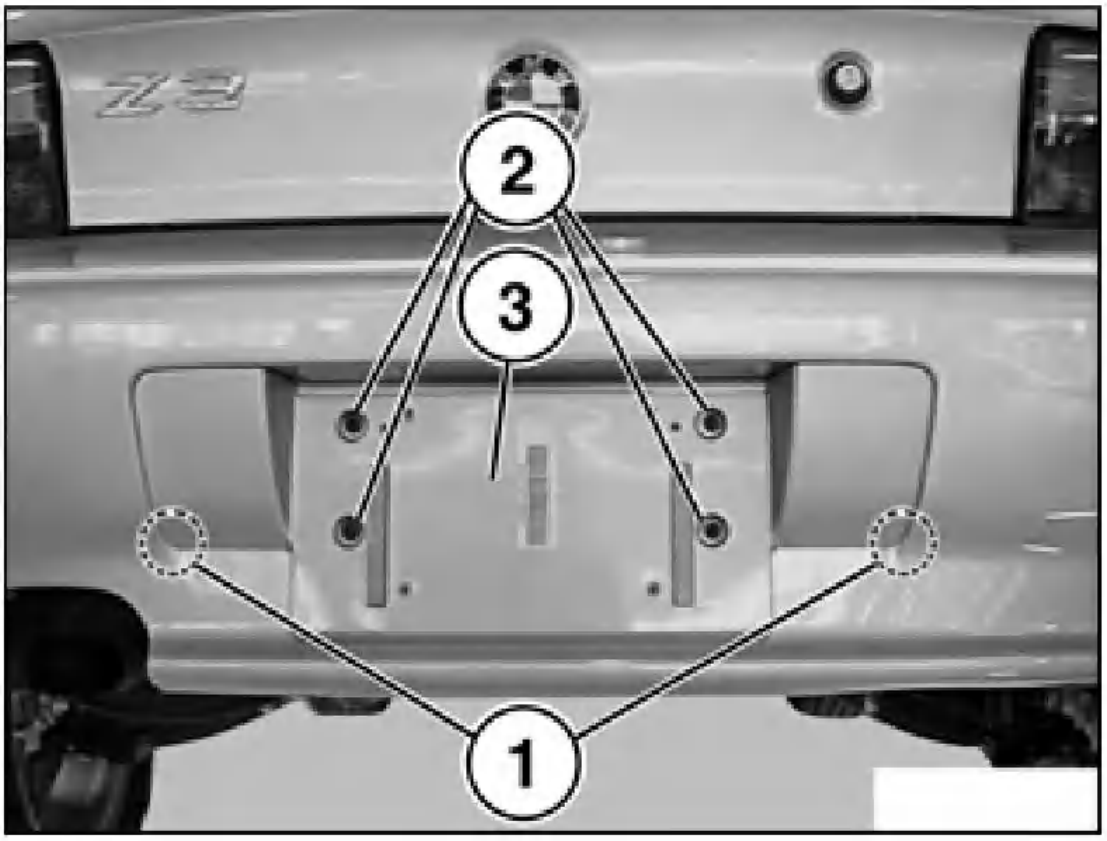


Fig. 32: Removing Baseplate From Licence Plate
Courtesy of BMW OF NORTH AMERICA, INC.

51 12 742 REPLACING A SHOCK ABSORBER FOR BUMPER, REAR (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

(Bumper Removed)

(If necessary remove rear bumper, refer to 51 12 000 REMOVING AND INSTALLING COMPLETE REAR BUMPER (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .)

Left shock absorber:

Press floor mat (1) to one side and unfasten nut (2).

Tightening Torque, 51 12 3AZ. Refer to 51 12 REAR BUMPER .

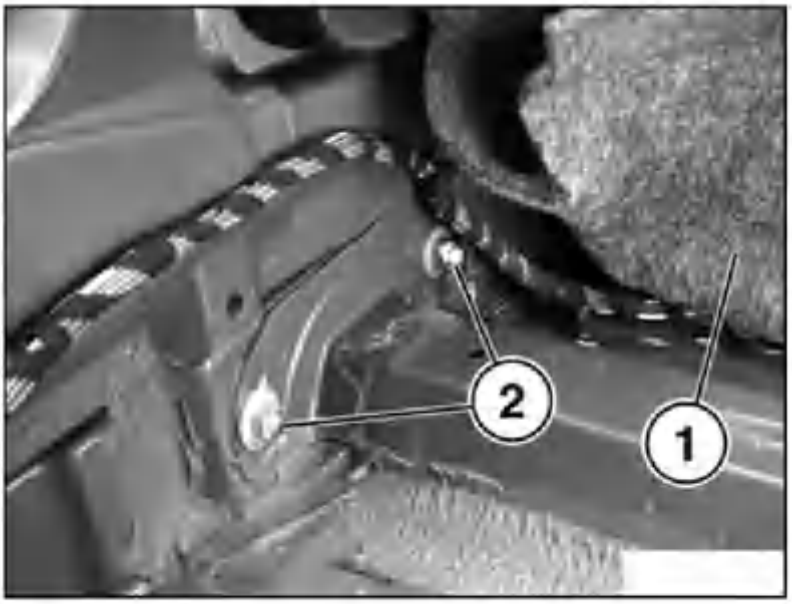


Fig. 33: Identifying Left Shock Absorber Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten nut (1) and remove shock absorber (2).

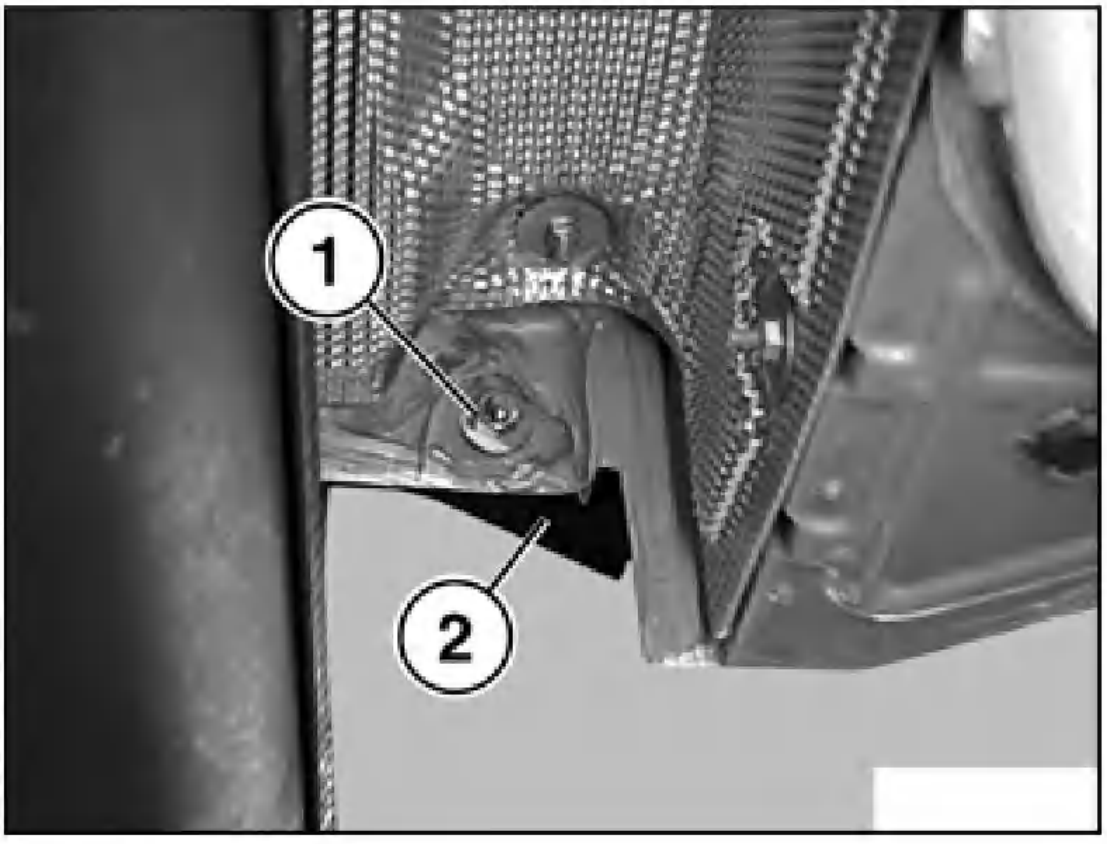


Fig. 34: Removing Shock Absorber Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening Torque, 51 12 3AZ. Refer to 51 12 REAR BUMPER .

Right shock absorber:

Press floor mat (1) to one side, unfasten nut (2) and pull out shock absorber.

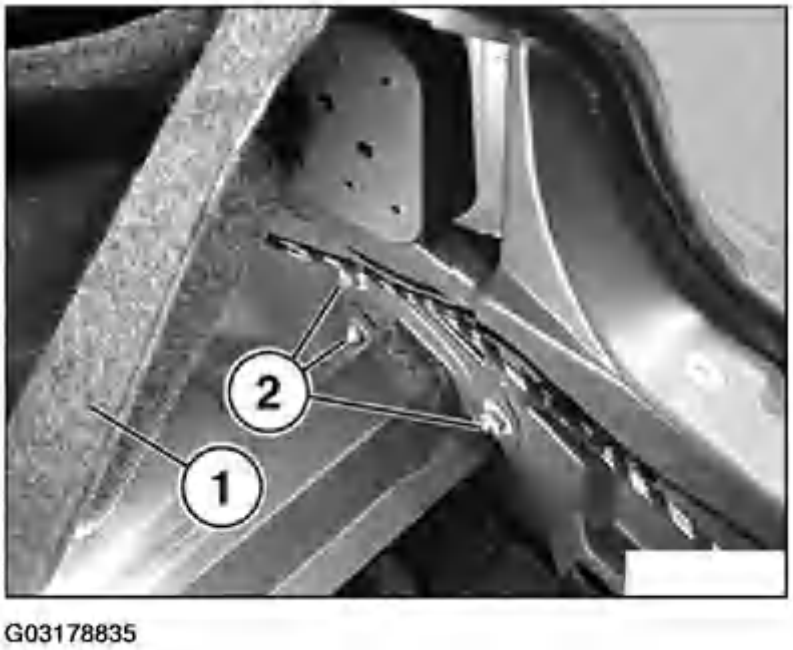


Fig. 35: Identifying Right Shock Absorber Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tightening Torque, 51 12 3AZ. Refer to 51 12 REAR BUMPER .

Adjust rear bumper, refer to 51 12 000 REMOVING AND INSTALLING COMPLETE REAR BUMPER (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

51 12 801 REPLACING BRACKET FOR BUMPER, REAR LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

(Bumper removed)

(If necessary, remove rear bumper, refer to 51 12 000 REMOVING AND INSTALLING COMPLETE REAR BUMPER (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .)

Unfasten screws (1) and remove bracket (2).

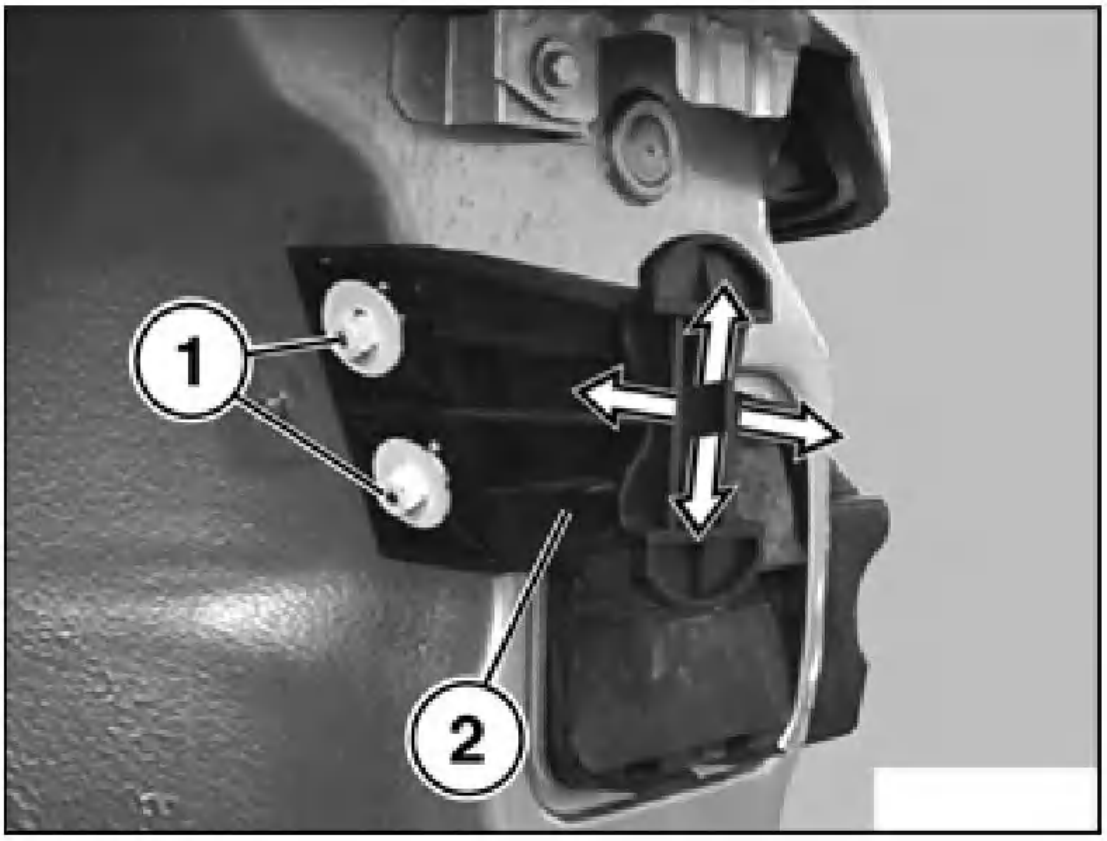


Fig. 36: Removing Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tightening Torque, 51 12 5AZ. Refer to 51 12 REAR BUMPER .

Adjust rear bumper, refer to 51 12 000 REMOVING AND INSTALLING COMPLETE REAR BUMPER (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

TRIM, COVERS, HANDLE TRIM

51 13 077 REMOVING AND INSTALLING/REPLACING GRILL FOR AIR INTAKE/HEATER (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Removing both windscreen wiper arms, refer to 61 61 100 REMOVING AND INSTALLING/REPLACING BOTH WINDSHIELD WIPER ARMS .

Remove left/right rubber seal (1) from beside protective grill (2).

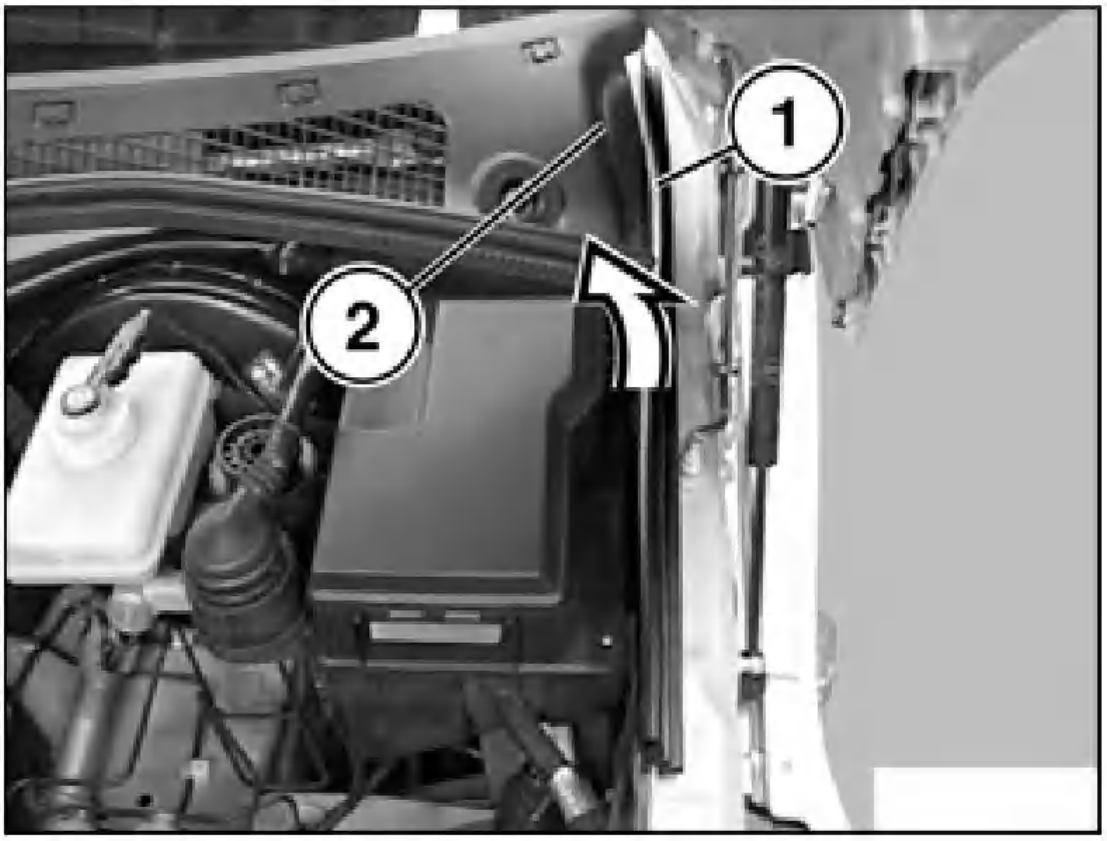


Fig. 37: Removing Windscreen Wiper Arms
Courtesy of BMW OF NORTH AMERICA, INC.

Remove rubber seal from protective grill.

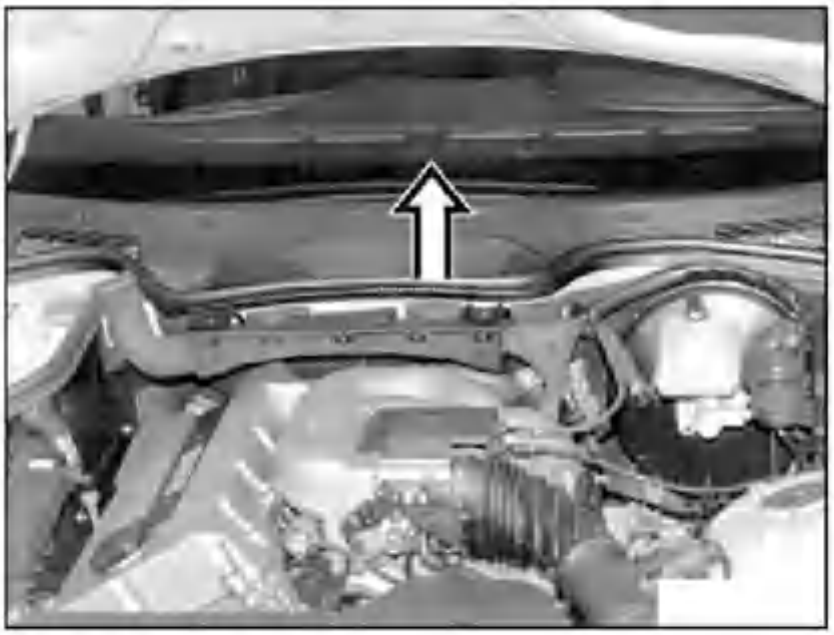


Fig. 38: Removing Rubber Seal From Protective Grill
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten all expanding rivets and remove protective grill.

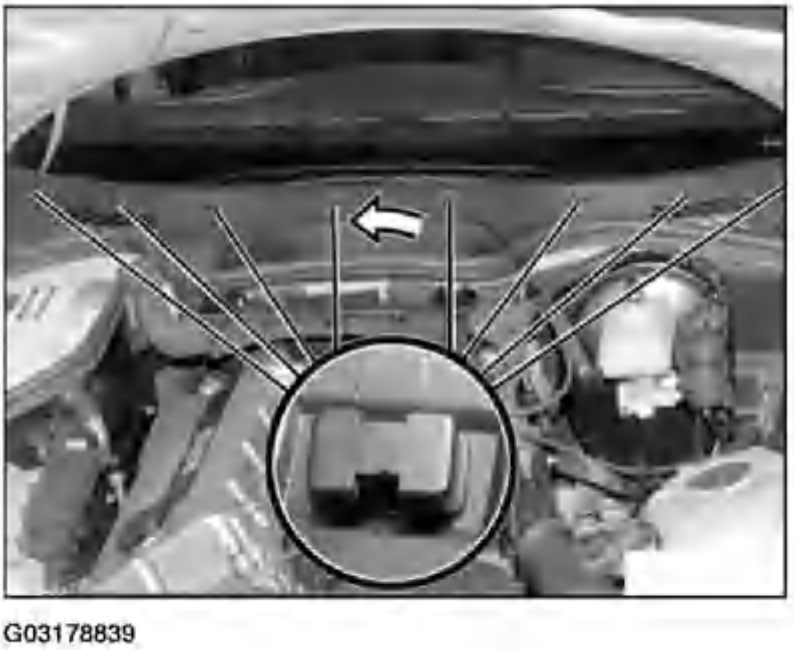


Fig. 39: Removing Protective Grill
Courtesy of BMW OF NORTH AMERICA, INC.

BMW EMBLEMS, MODEL EMBLEMS

51 14 110 REMOVING AND INSTALLING/REPLACING MODEL DESIGNATION (EMBLEM) AT

REAR (Z3 ROADSTER, M ROADSTER)

The model sign is glued and cannot be reused after removal. The model sign must be installed at room temperature.

Coat nylon string or thread with Tenside (e.g. dish detergent), cut through adhesive layer and remove with washing benzene.

At paint baking temperatures exceeding 80Â°C, the model designation must be removed.

Z3 Roadster:

Apply adhesive tape up to upper edge "A" and mark dimensions as per table.

Dimension in mm

A = 88, B = 30, C = 10.

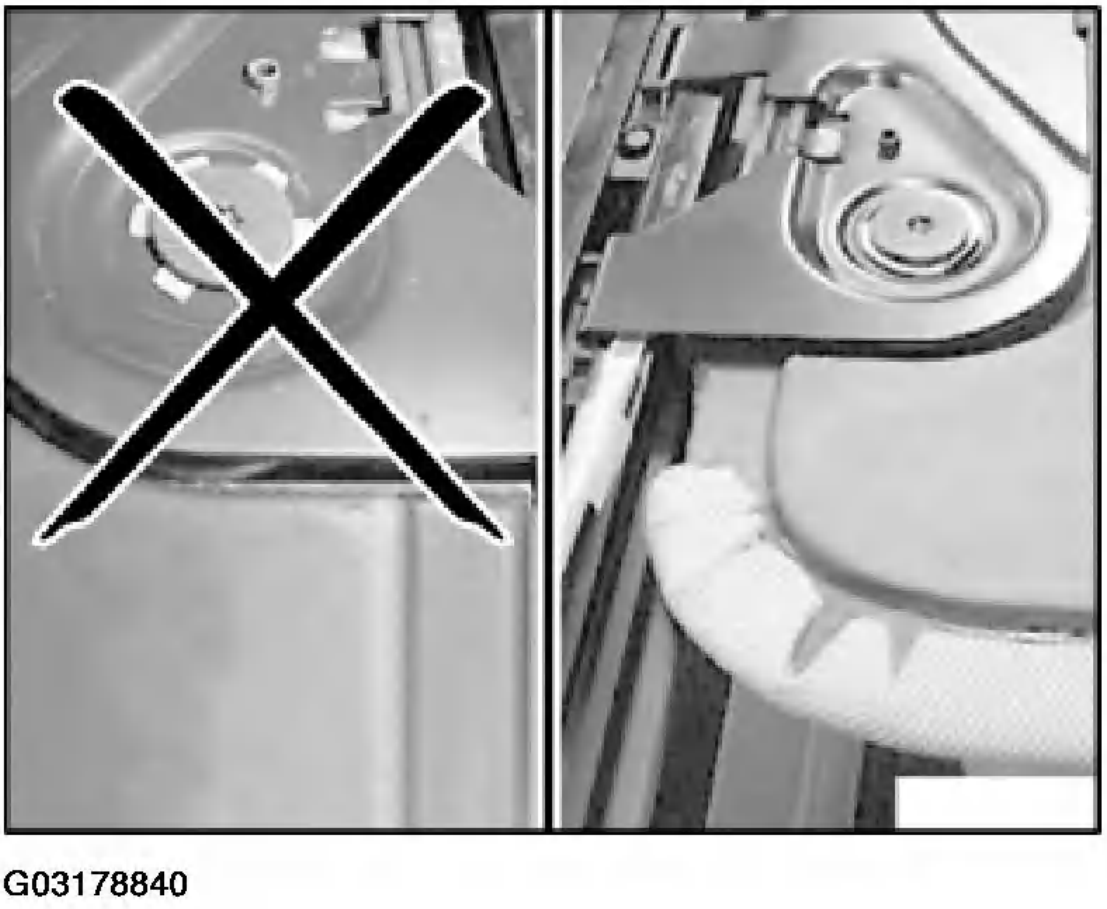


Fig. 40: Identifying Correct Way Of Applying Adhesive Tape
Courtesy of BMW OF NORTH AMERICA, INC.

MIRRORS/COVERS/ASHTRAYS/SHELVES/TRAYS

51 16 ... CEMENTING OF MIRROR BASE

Material Requirements:

Repair set for cementing of mirror base.

Primer XW 775.

1. Preparations:

   1.1. 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.

   1.2. Mark location of the mirror mount on the outside of the windshield. Scratch off cement residue on glass and base with a sharp tool.

   1.3. Clean cement area on window and base with clean non-fluffing cloth and alcohol/acetone 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:

   3.1. 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, ream-free color mixture.

   3.2. Application:

   At 20 ... 25 Â°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 Â°C.

   3.3. 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).

3.4. 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.

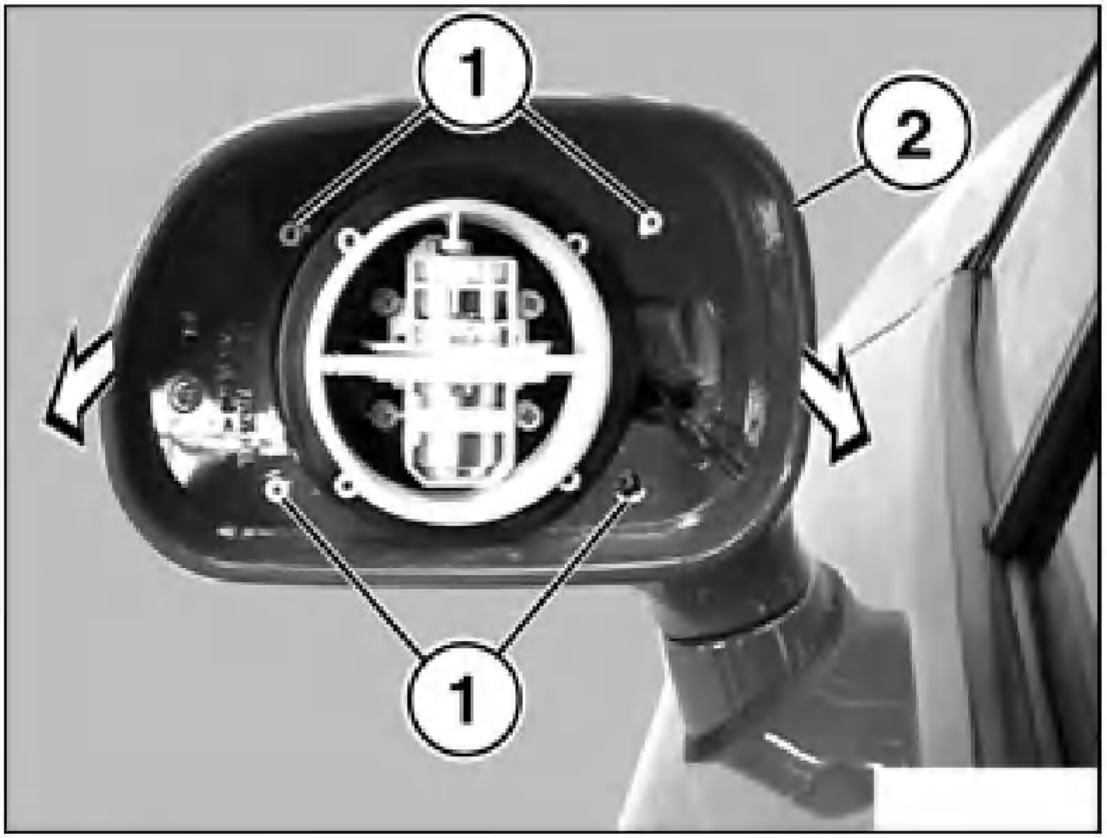
4. Working Hygiene:

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 allergic reaction 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 a doctor. Make sure that the room is well ventilated and gloves are worn for the application of cement.

51 16 ... REPLACING HOUSING ON LEFT OR RIGHT OUTSIDE MIRROR (Z3 ROADSTER)

Remove mirror glass, refer to 51 16 026 REPLACING MIRROR GLASS FOR REAR-VIEW MIRROR (ON FRONT DOOR) .

Unfasten screws (1) and pull front section of housing (2) backwards to remove.



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Fig. 41: Removing Front Section Of Housing

Courtesy of BMW OF NORTH AMERICA, INC.

Carefully slide guide (1) forwards (risk of damage) and remove rear section of housing (2).

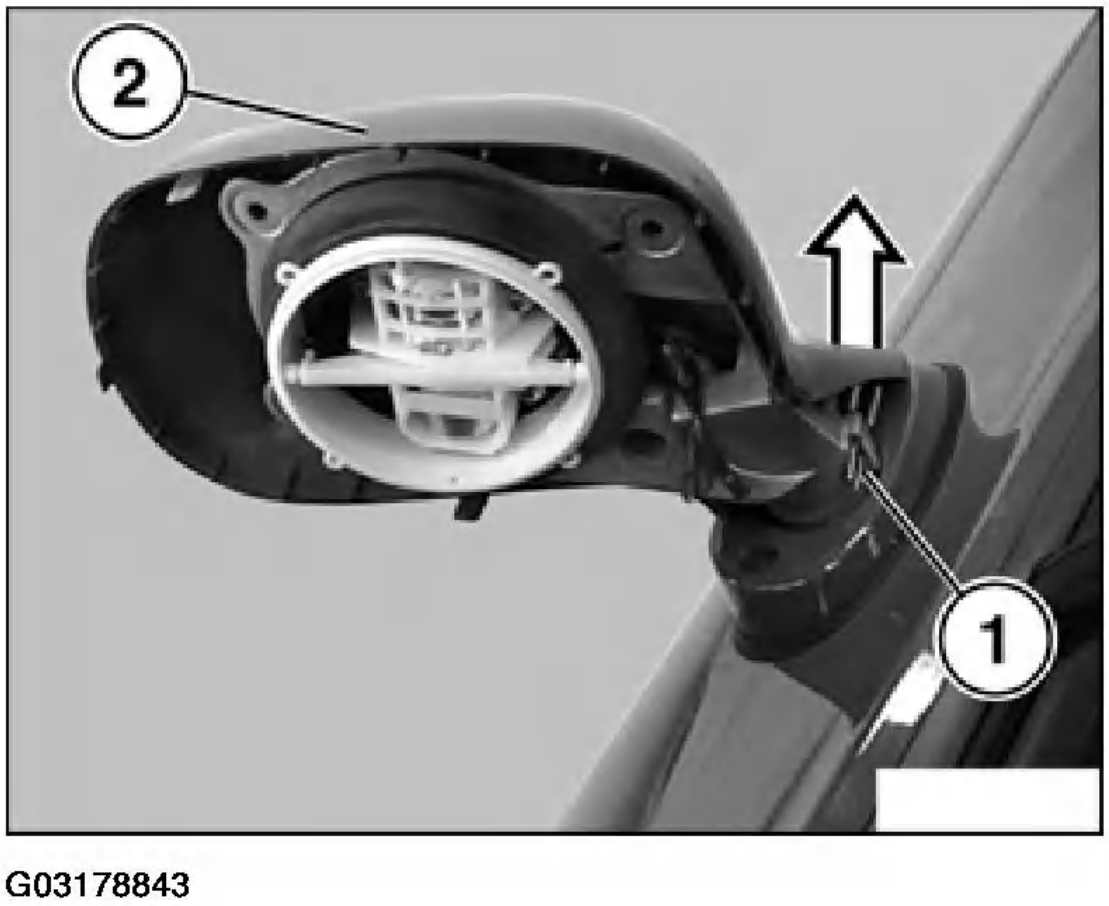


Fig. 42: Removing Rear Section Of Housing
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 000 REMOVING AND INSTALLING/REPLACING REAR-VIEW MIRROR ON LEFT OR RIGHT FRONT DOOR (Z3 ROADSTER)

Removing door trim, refer to 51 41 000 REMOVING AND INSTALLING FRONT LEFT OR RIGHT DOOR TRIM PANEL (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Partially remove foil from front door (1).

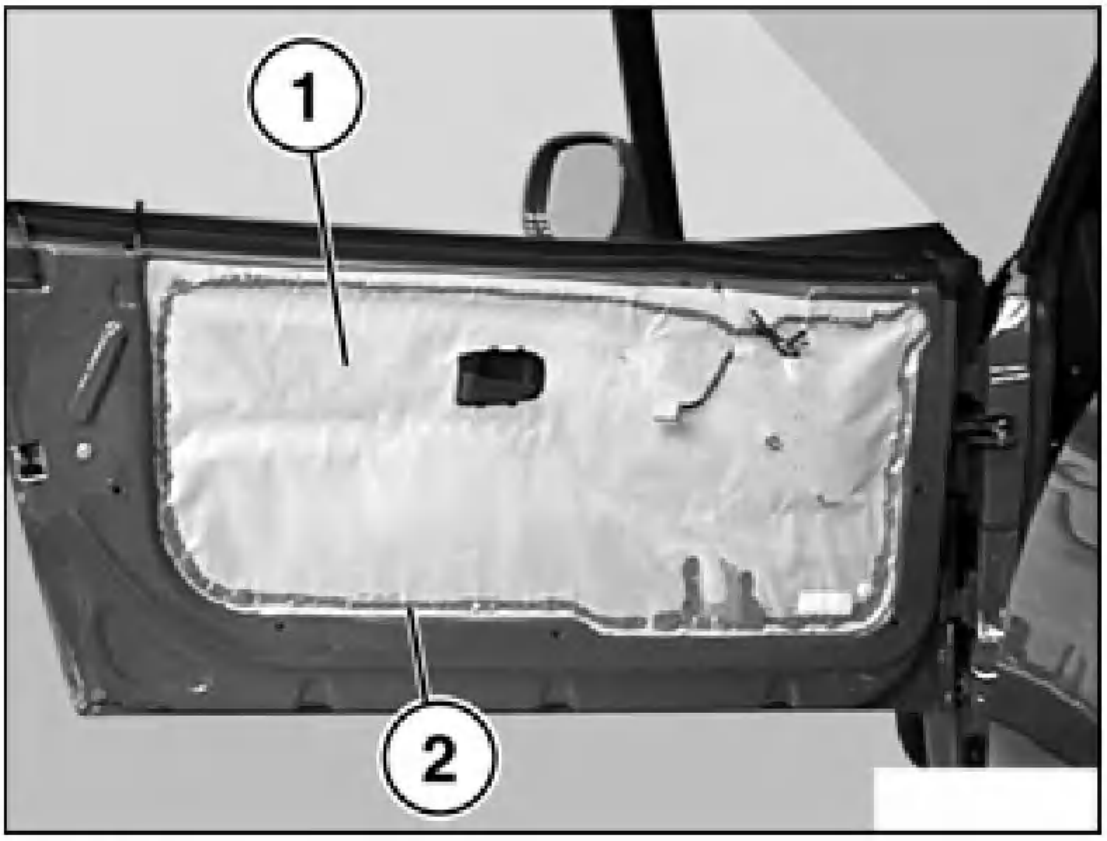


Fig. 43: Removing Foil From Front Door
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If the cement bead (2) is broken, seal with butylene thread.

Unfasten connector (1), lift out Omega clip (2) and expose cable.

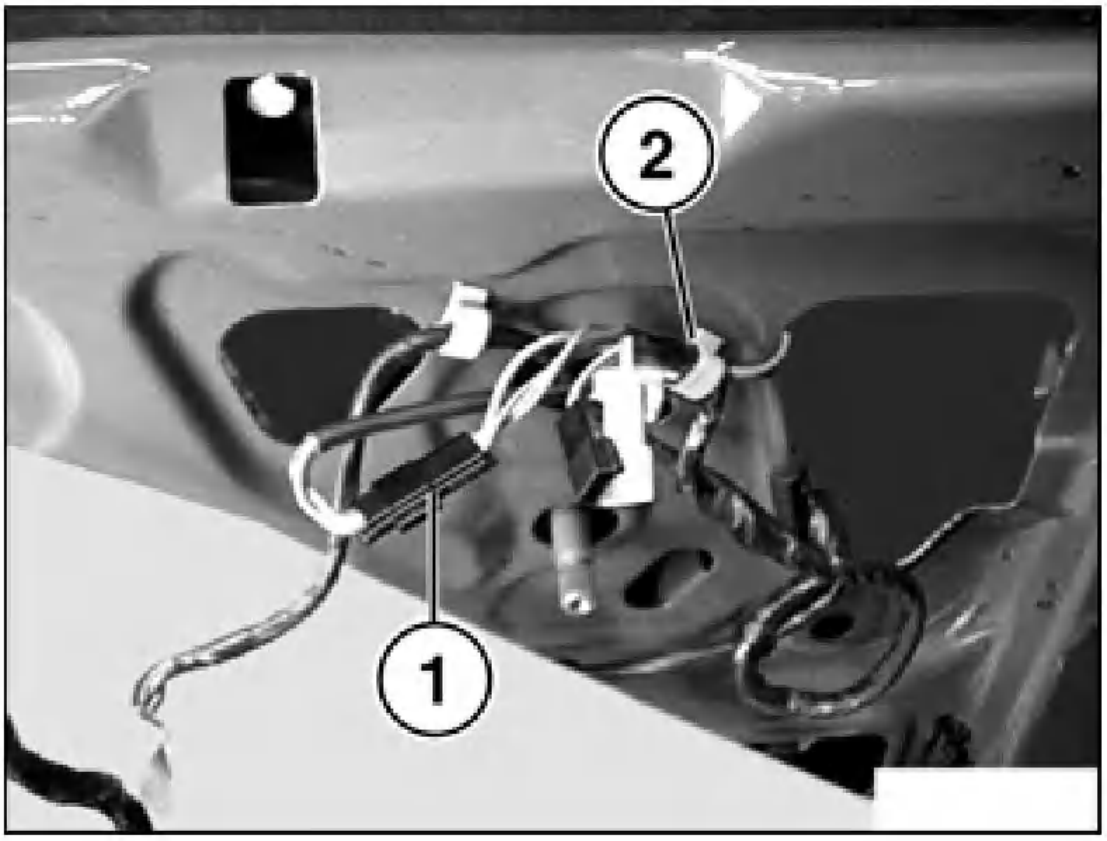


Fig. 44: Identifying Omega Clip And Exposing Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Turn rear-view mirror 90Â° to face forward.

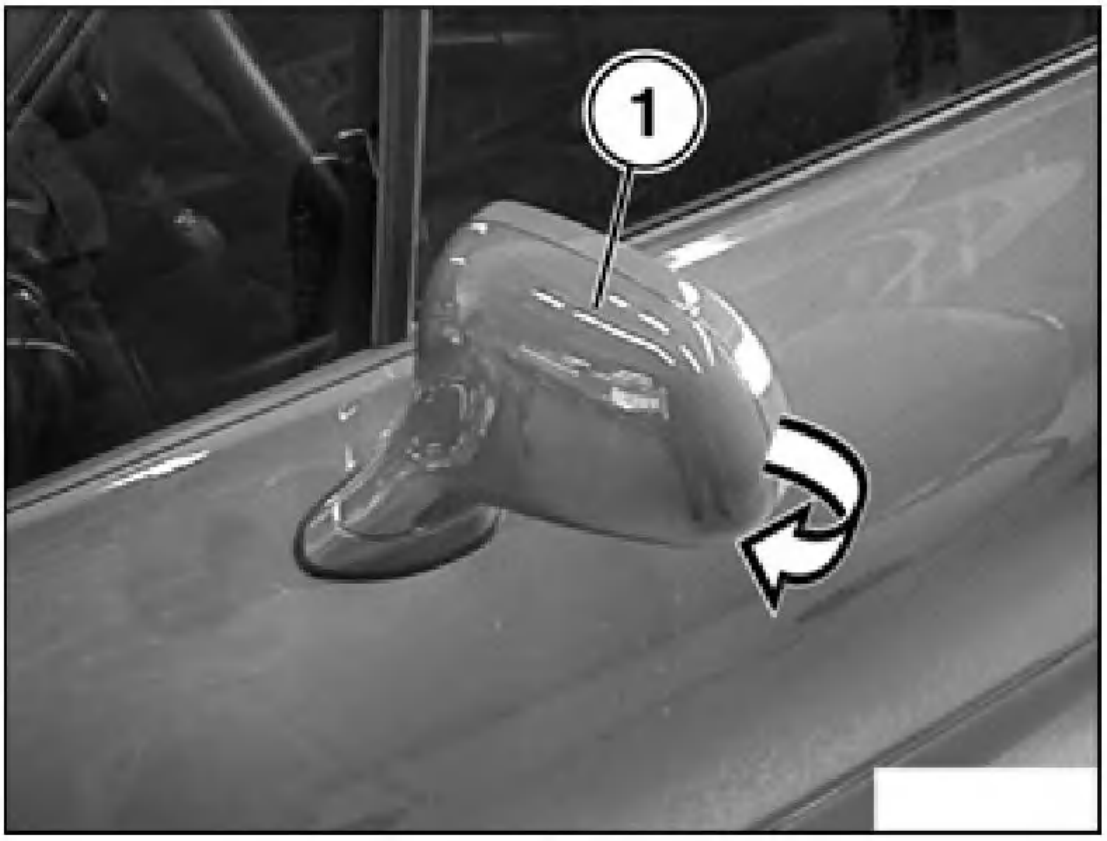


Fig. 45: Turning Rear-View Mirror 90Â° To Face Forward
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen screws (1).

Remove rear-view mirror (2) and pull out cables.

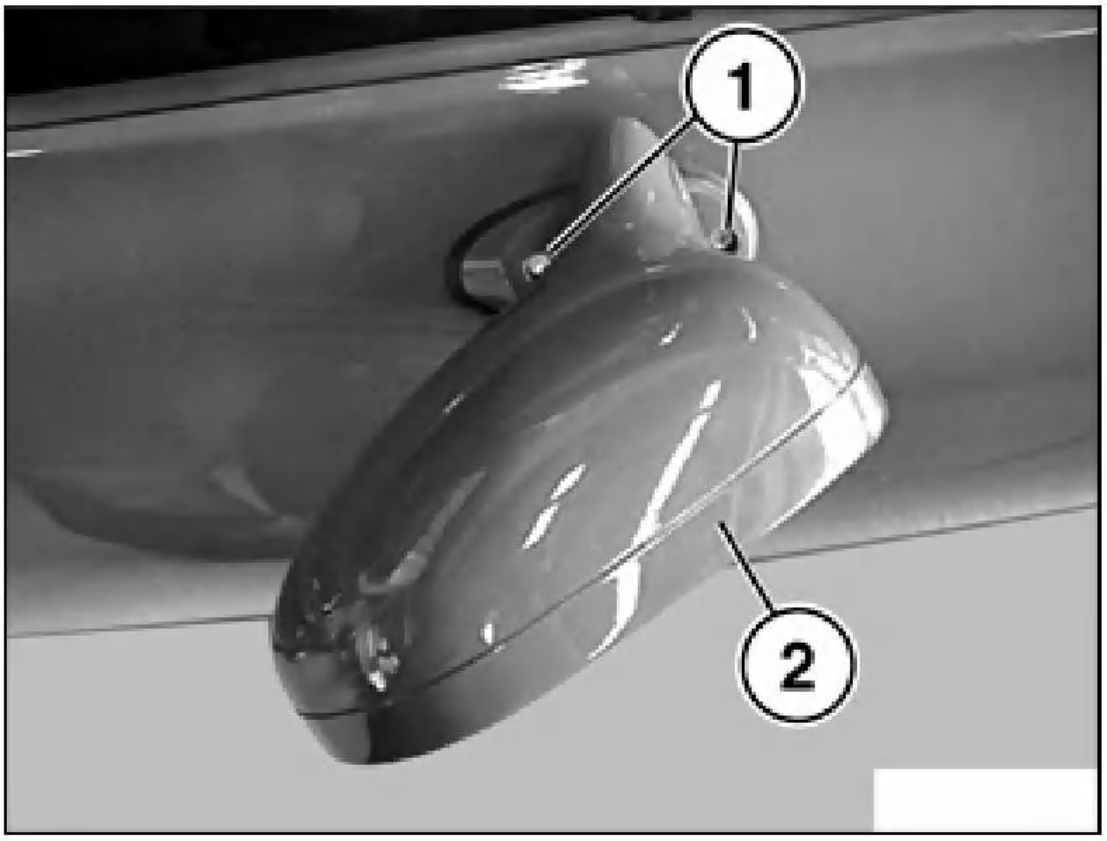


Fig. 46: Removing Rear-View Mirror
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tightening torque, 51 16 1AZ. Refer to 51 16 MIRRORS, FINISHERS, ASHTRAYS, CONSOLES .

Check function.

Only replace:

Remove seal (1) and pull out cables (2).

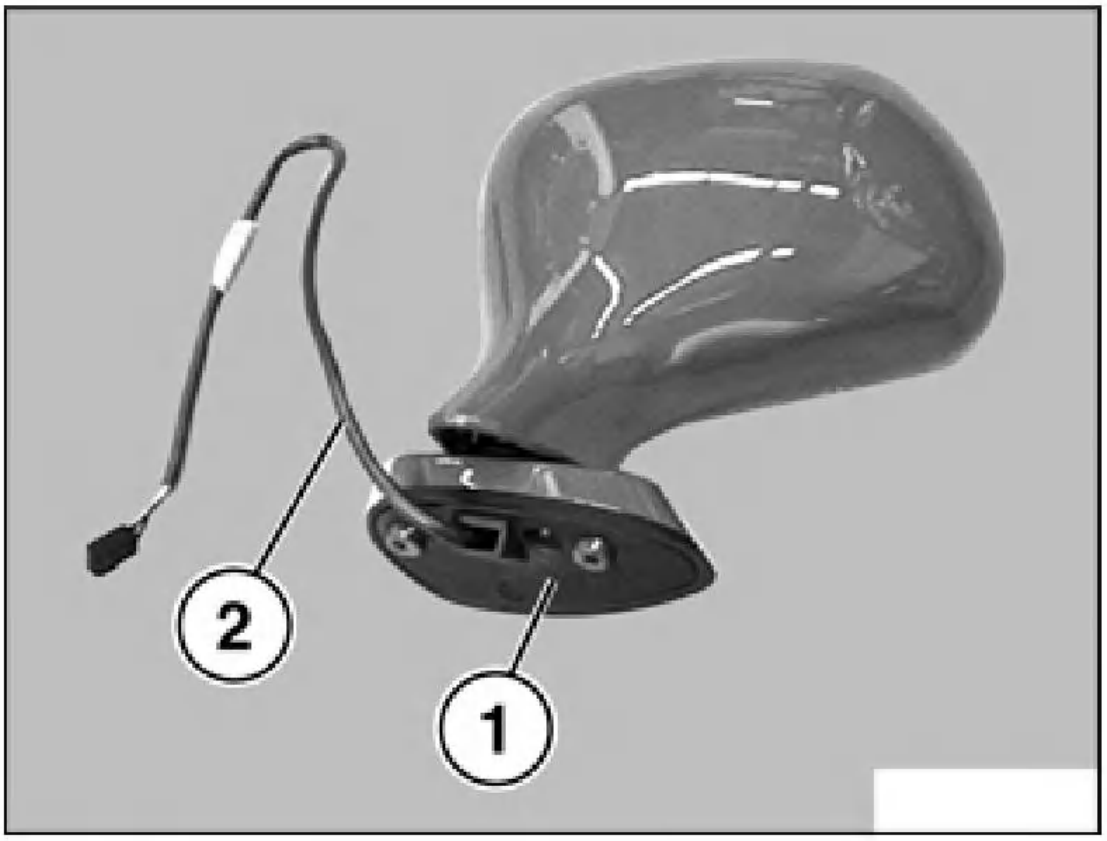


Fig. 47: Removing Seal
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 026 REPLACING MIRROR GLASS FOR REAR-VIEW MIRROR (ON FRONT DOOR)

CAUTION: Make sure car has room temperature to prevent the clips from breaking off.

Tilt mirror glass.

Remove cement between mirror glass and edge of housing (risk of damage).

Unclip mirror glass using a wooden wedge.

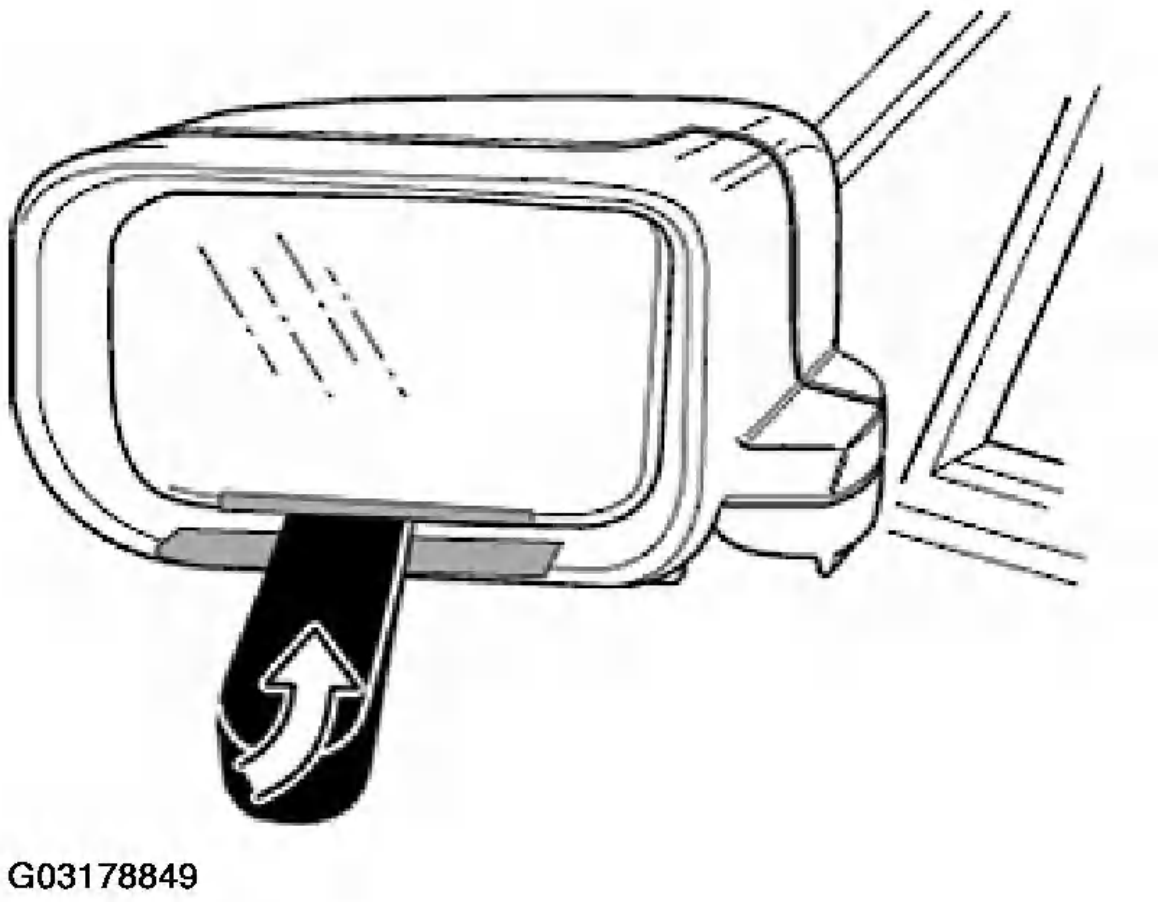


Fig. 48: Unclipping Mirror Glass Using Wooden Wedge
Courtesy of BMW OF NORTH AMERICA, INC.

If applicable, remove connector (mirror glass heating) and remove mirror glass.

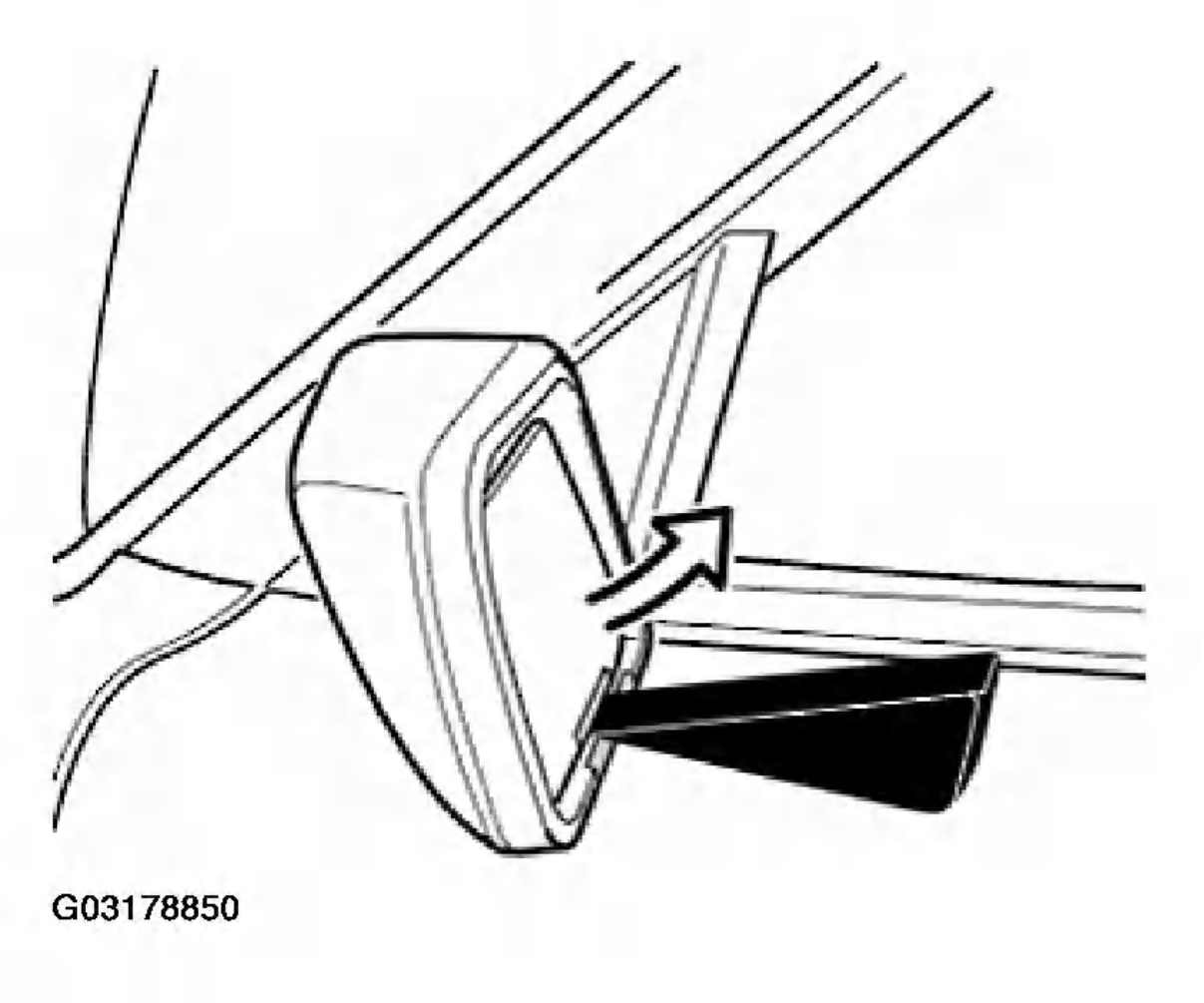


Fig. 49: Removing Mirror Glass
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install mirror glass that clips are seated on tabs and clip on glass.

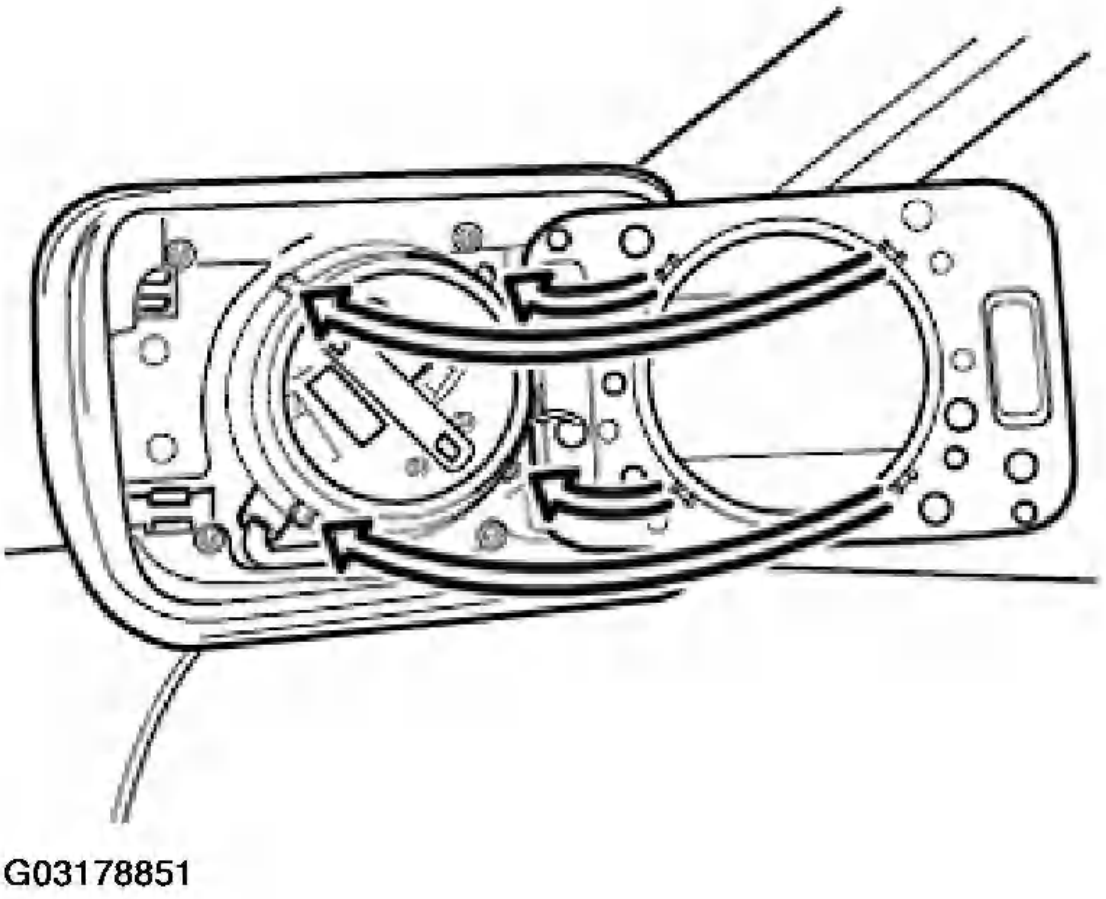


Fig. 50: Identifying Mirror Glass Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Ensure correct engagement.

Check function.

51 16 060 REMOVING AND INSTALLING OR REPLACING INTERIOR REAR-VIEW MIRROR.

NOTE: On version with remote control for central locking: If necessary, disconnect negative lead to battery, refer to 12 00 ... DISCONNECTING AND CONNECTING BATTERY .

Version with automatic dip action (electro-chrome plating technology) for interior mirror and/or infrared remote control:

Remove panel and disconnect plug connection.

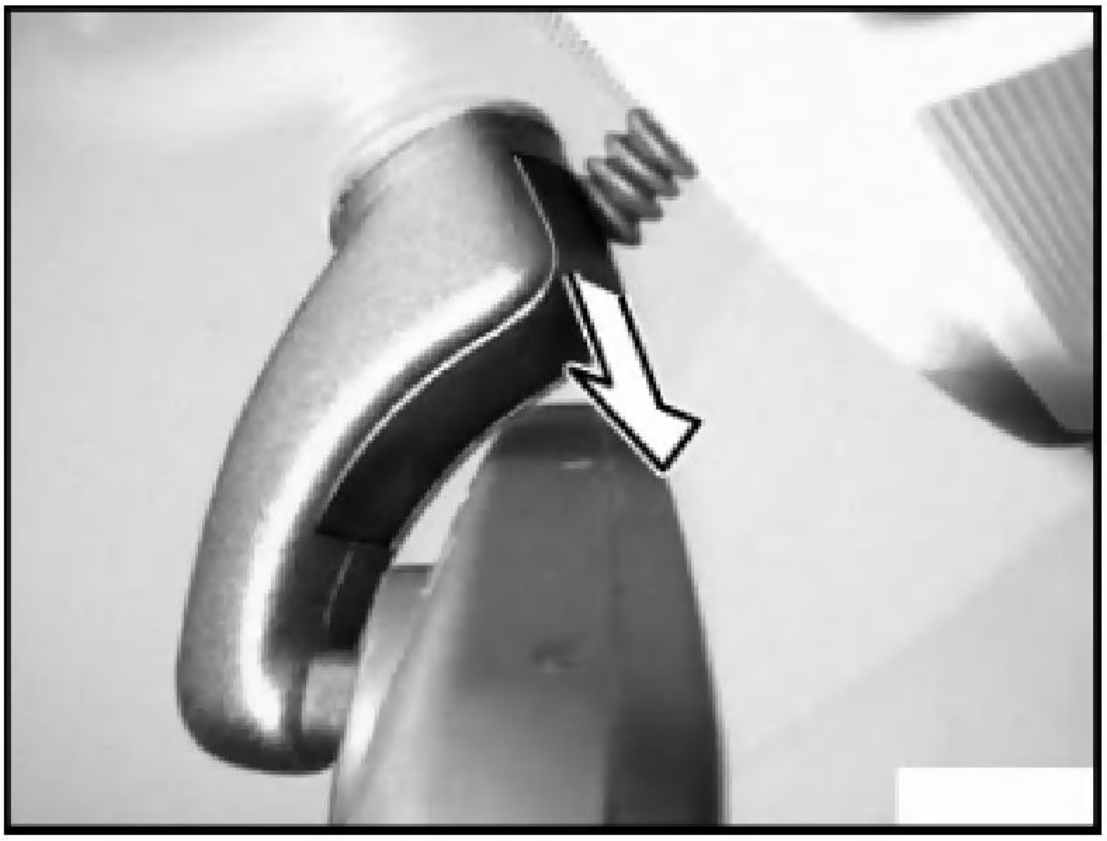


Fig. 51: Removing Panel And Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Snap mirror (1) forwards out of mirror mount and remove.

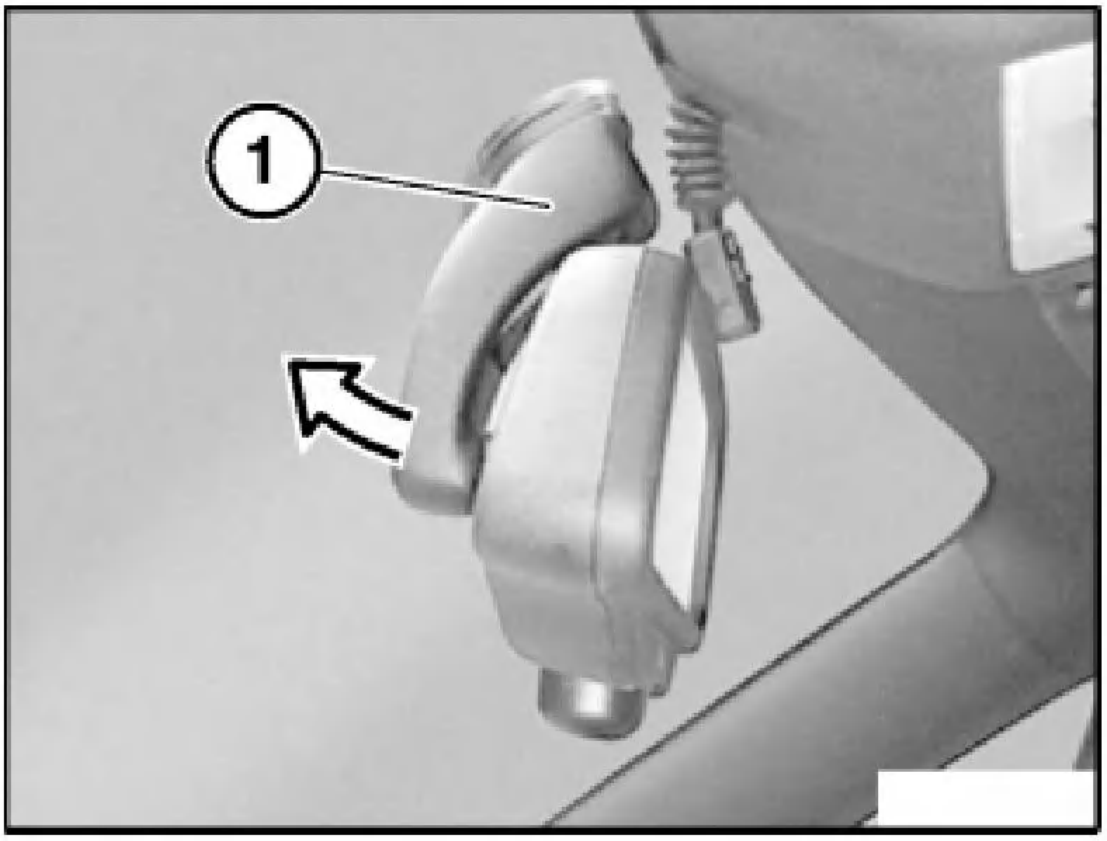


Fig. 52: Removing Mirror From Mirror Mounting
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not snap mirror backwards (risk of damage).

Installation:

1. Twist mirror base by approx. 45Â° and fit to mirror mount.

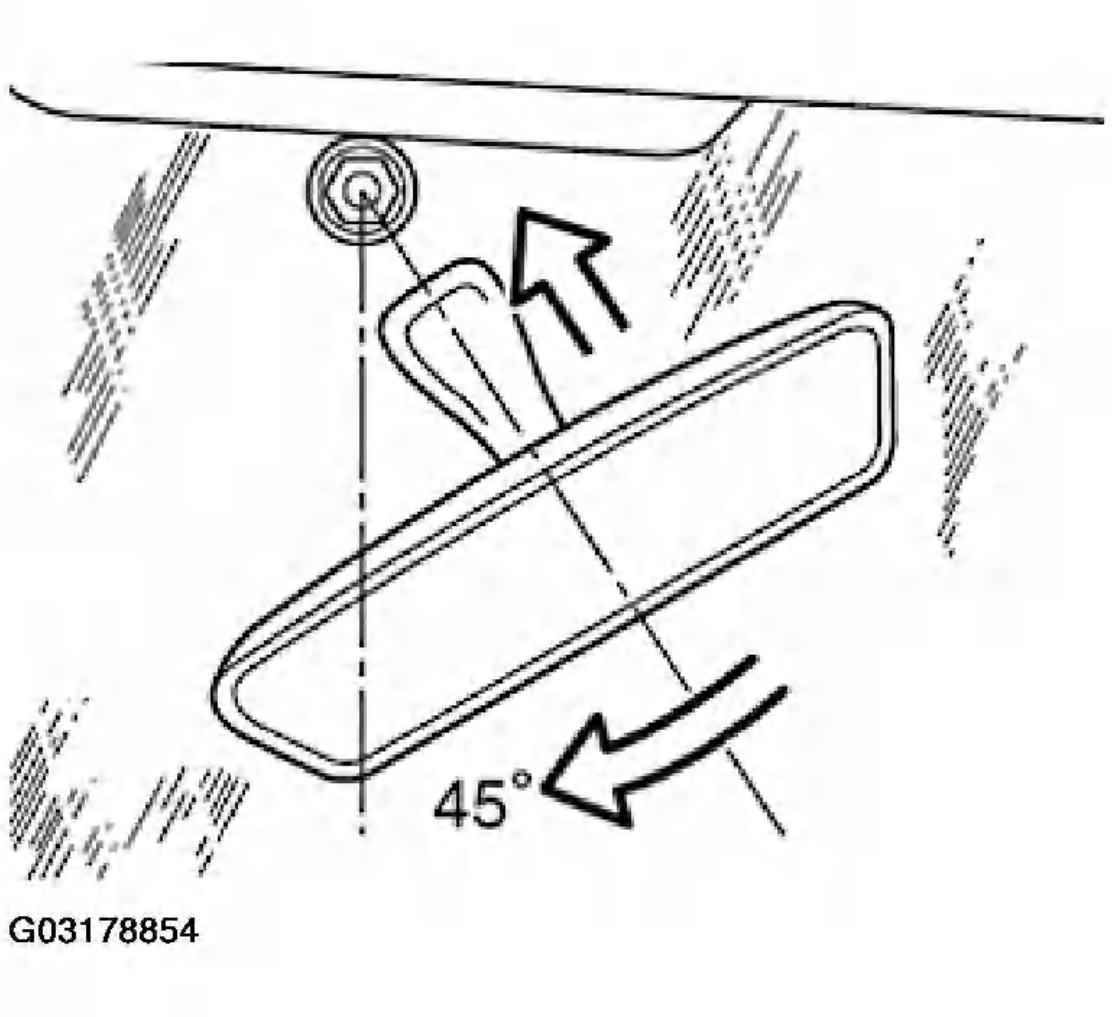


Fig. 53: Installing Mirror Base
Courtesy of BMW OF NORTH AMERICA, INC.

2. Turn mirror foot until it engages on mirror base.

Only replace with version with infrared remote control for central locking:

Installation:

Initialize all transmitters (key).

51 16 063 REMOVING AND INSTALLING / REPLACING INTERIOR REARVIEW MIRROR (WITH REMOTE CONTROL)

Operation Is Identical To:

Removing and installing/replacing interior rearview mirror. Refer to 51 16 060 REMOVING AND INSTALLING OR REPLACING INTERIOR REAR-VIEW MIRROR. .

51 16 104 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT SON VISOR (Z3 ROADSTER)

Unfasten screws (1) and remove sun visor (2).

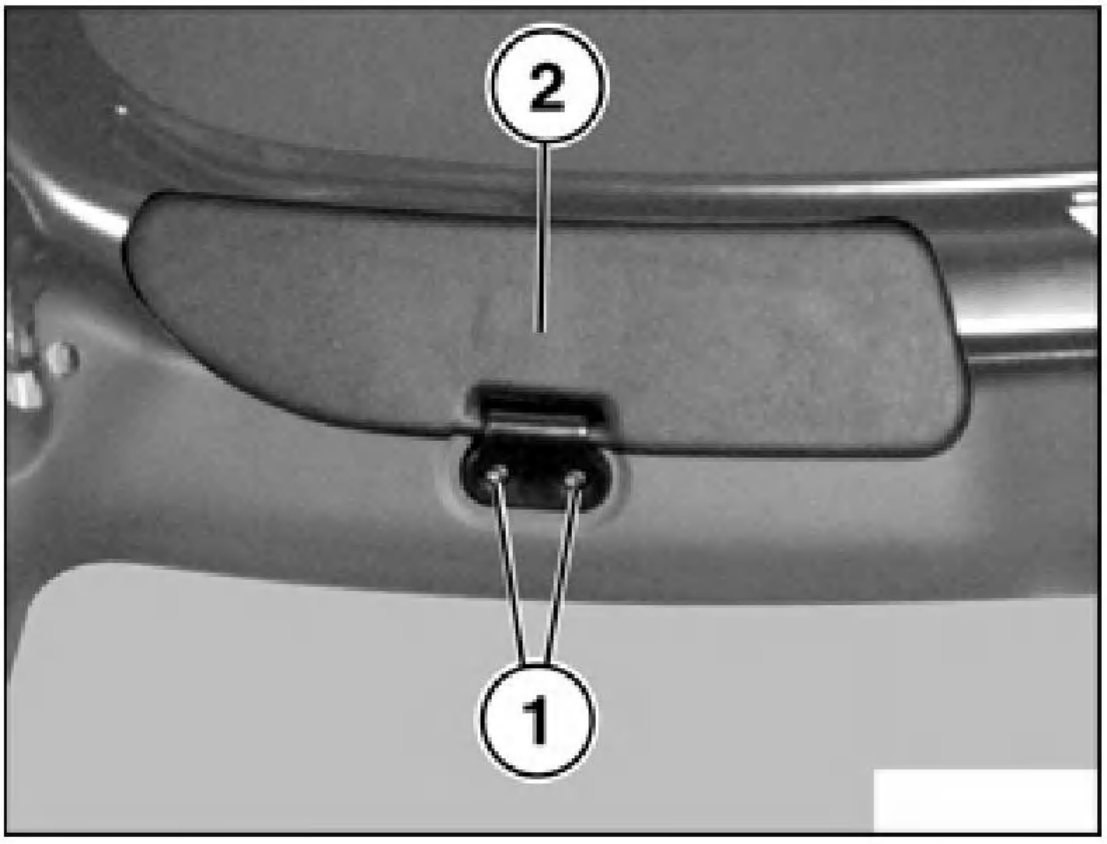


Fig. 54: Removing Sun Visor
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 200 REMOVING AND INSTALLING ODDMENTS TRAY (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Releasing And Removing Oddments Tray:

If necessary, remove radio receiver, refer to 65 11 030 RADIO (BAVARIA C II OR C REVERSE II) , 65 11 030 REMOVING AND INSTALLING OR REPLACING RADIO (BAVARIA CIII OR C REVERS III RDS) or 65 11 030 REMOVING AND INSTALLING/REPLACING RADIO (BUSINESS) .

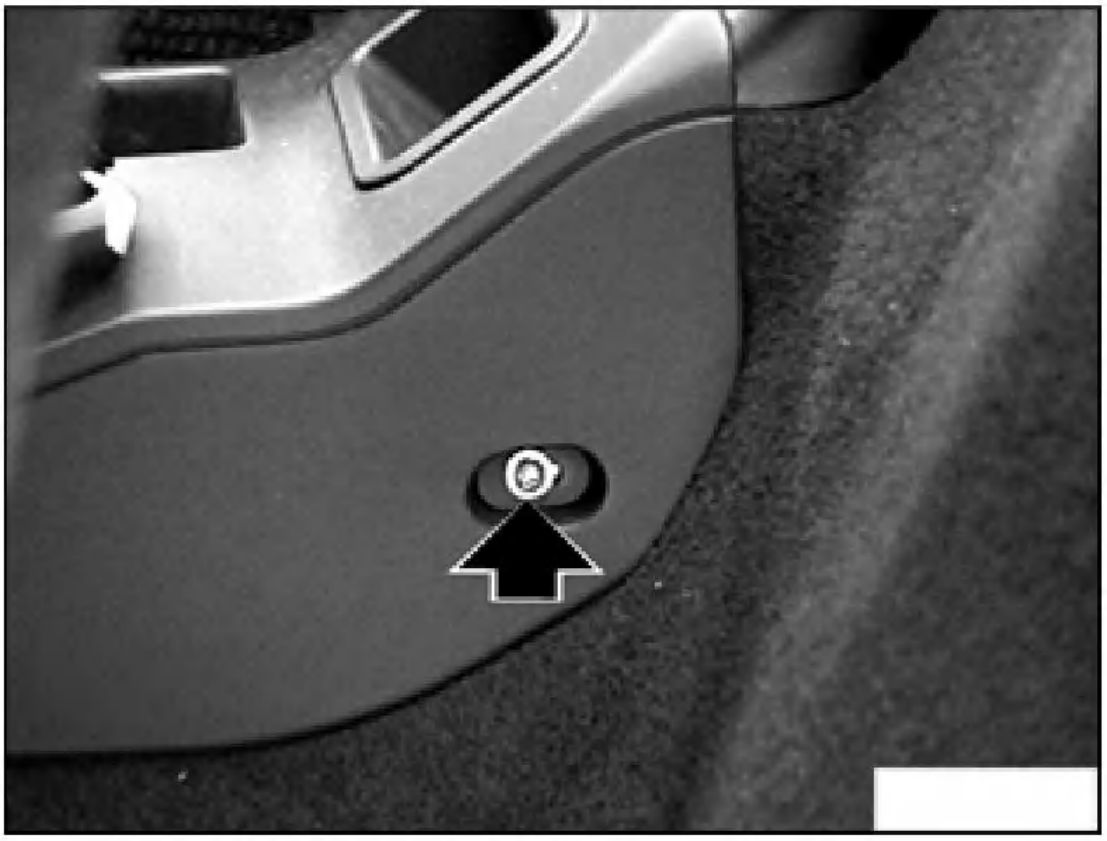
Version with manual transmission:

Remove shift lever knob with cover and sound insulation.

Version with automatic transmission:

Remove handle with cover and sound insulation.

Unfasten screws on left/right side.



G03178856

Fig. 55: Removing Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out rubber gaiter (1).



G03178857

Fig. 56: Removing Rubber Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

Pull finisher strip (1) approx. 5 mm backwards and remove upwards.

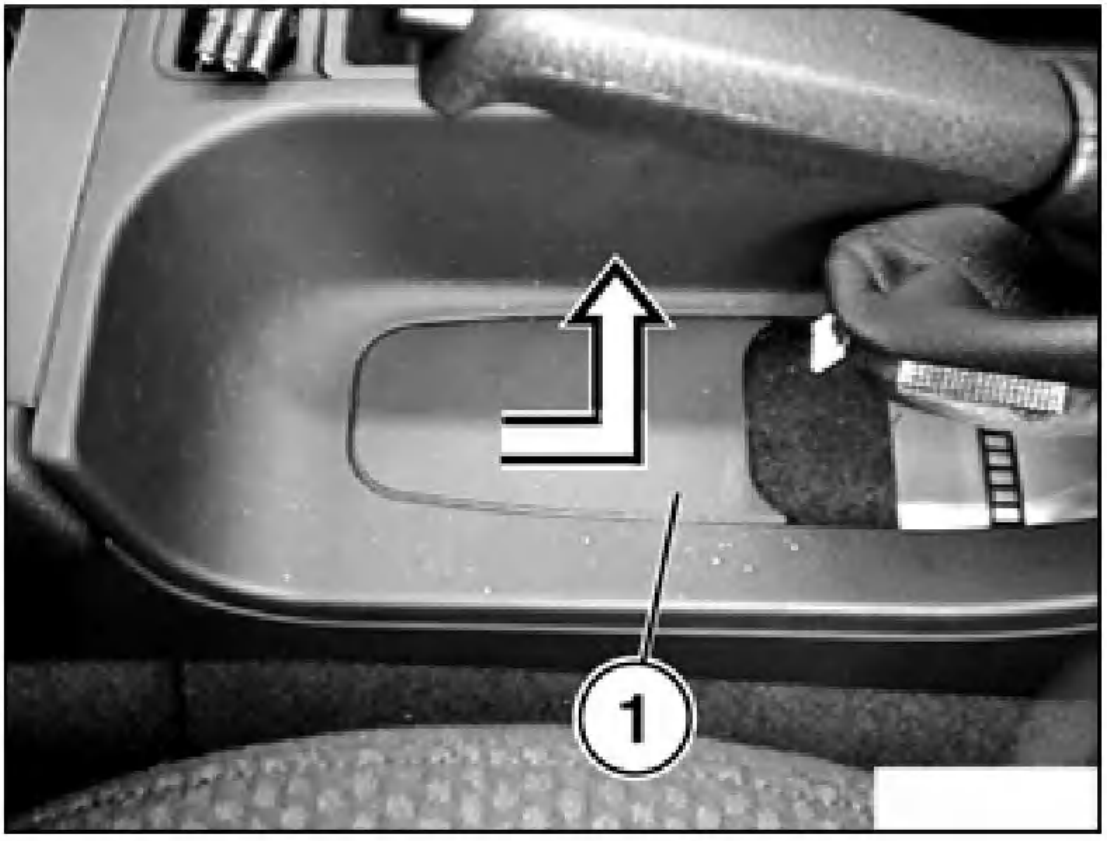


Fig. 57: Removing Finisher Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Lift off finisher strips (1) and unfasten left/right screws.

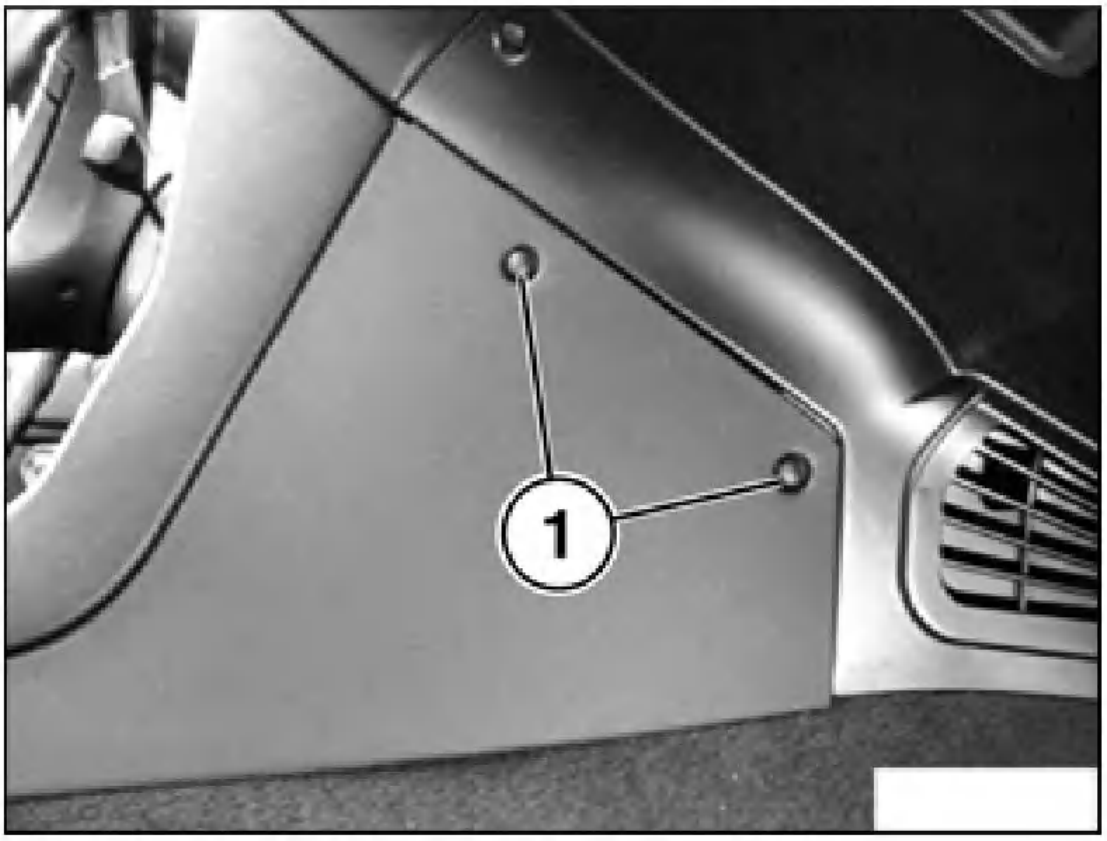


Fig. 58: Removing Finisher Strip And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1).

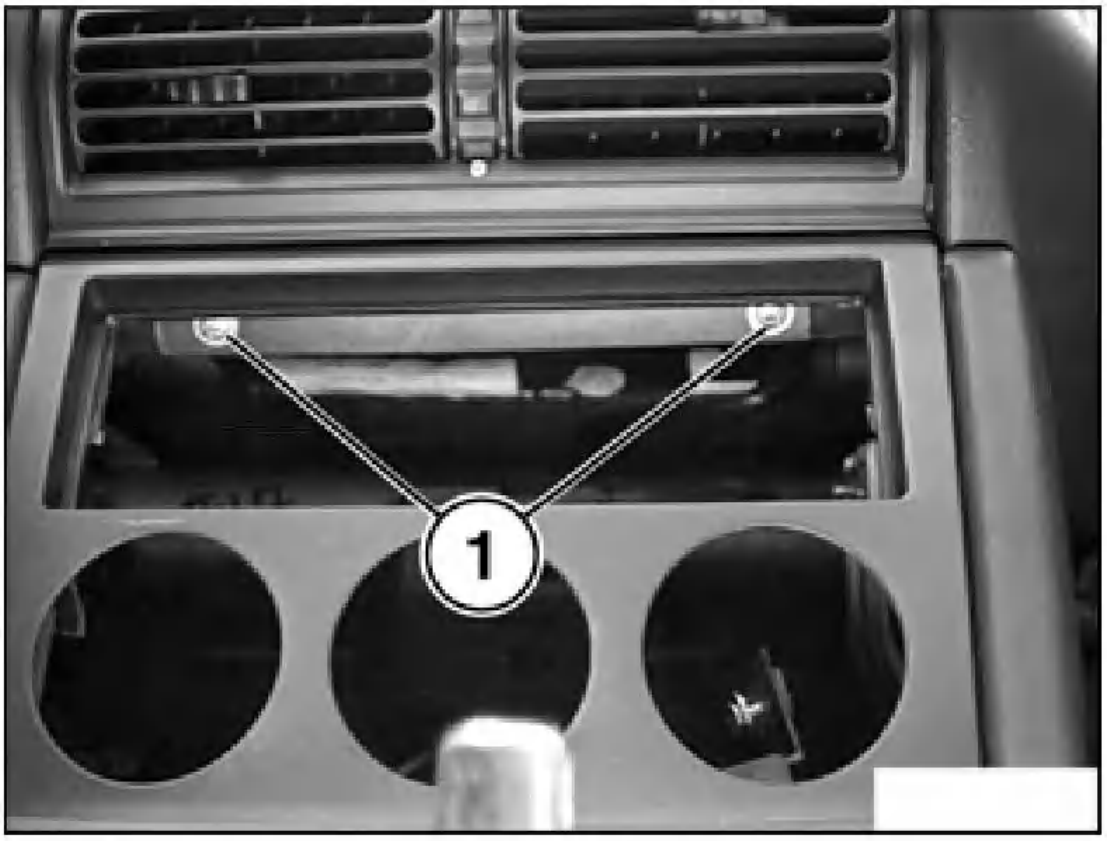


Fig. 59: Removing Screw
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operation "Unfastening oddments tray" ends here.

Removing Oddments Tray:

Remove all switches from oddments tray, refer to 61 31 . . . REPLACING ALL SWITCHES AND INDICATOR LAMPS IN center CONSOLE (Z3 ROADSTER, Z3 COUPE) .

Remove clock, refer to 62 13 050 REMOVING AND INSTALLING/REPLACING CLOCK .

Z3 Roadster From 04/99:

Disconnect plug connection for clock/on-board computer.

Push oddments tray (1) forward at an angle and guide out of parking brake lever (2).



Fig. 60: Aligning Oddments Tray
Courtesy of BMW OF NORTH AMERICA, INC.

Remove oddments tray (1) from vehicle.



Fig. 61: Removing Oddments Tray
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 201 REPLACING ODDMENTS TRAY (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Removing center console, refer to 51 16 200 REMOVING AND INSTALLING ODDMENTS TRAY (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Unclip tray (1).

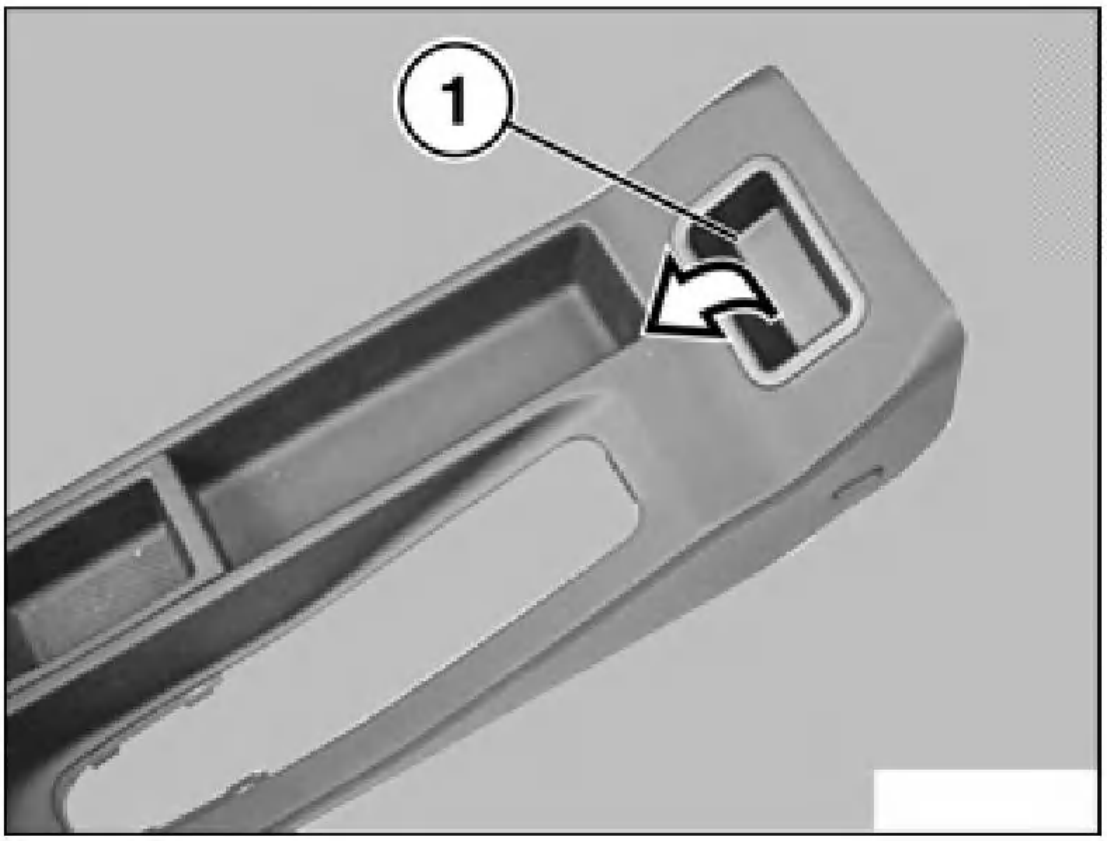


Fig. 62: Removing Center Console
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clip tray (1) correctly into frame (2).

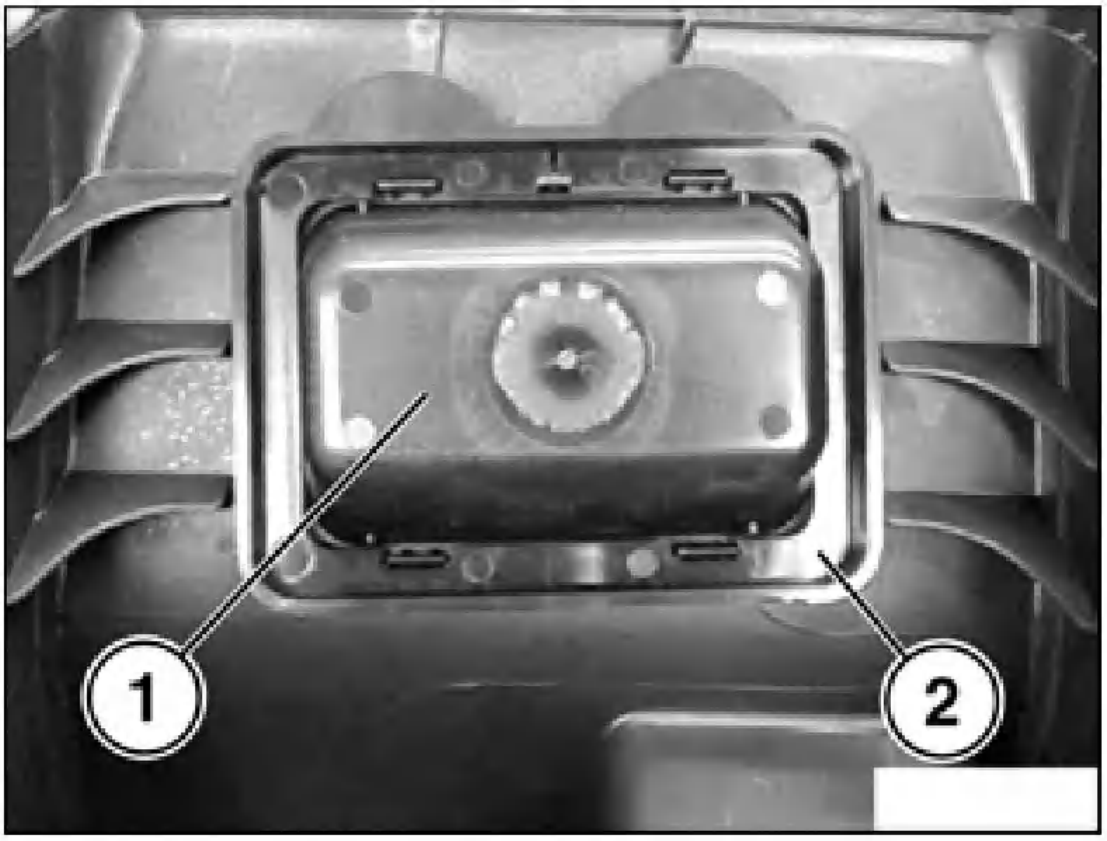


Fig. 63: Installing Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip tray (1).

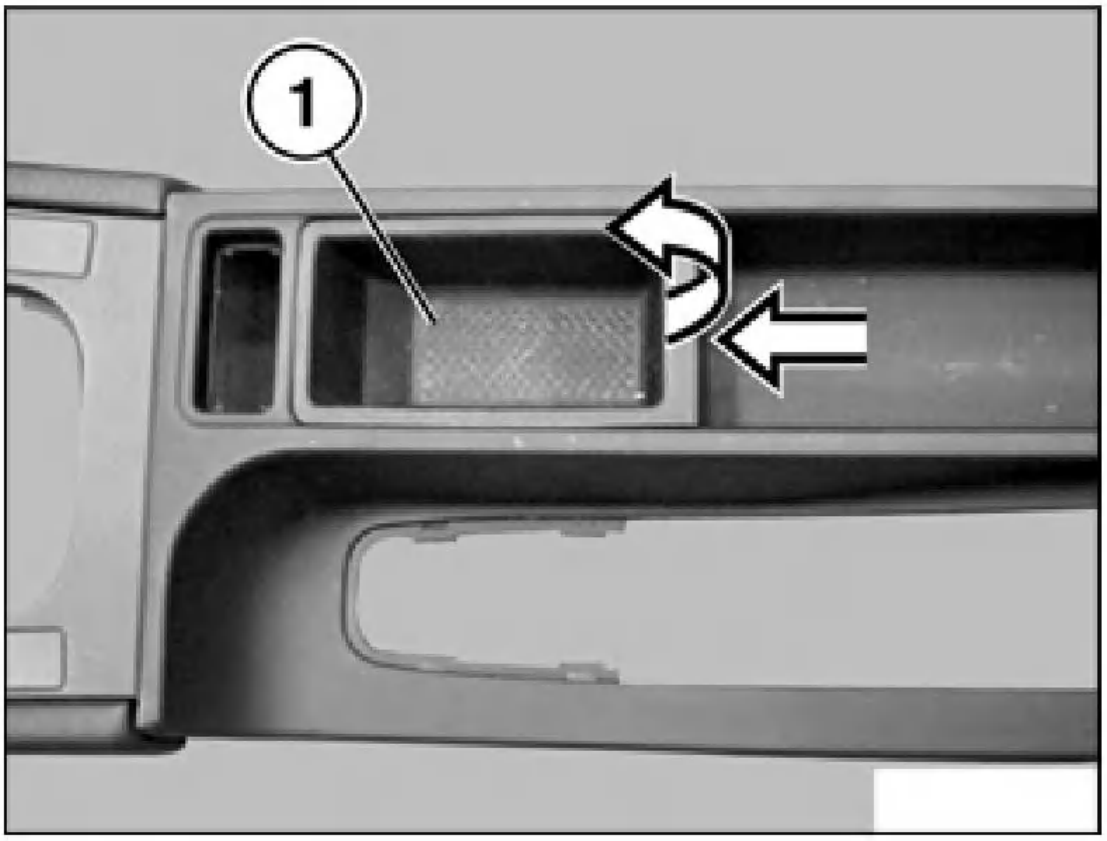


Fig. 64: Removing Tray
Courtesy of BMW OF NORTH AMERICA, INC.

Remove cigar lighter (1).

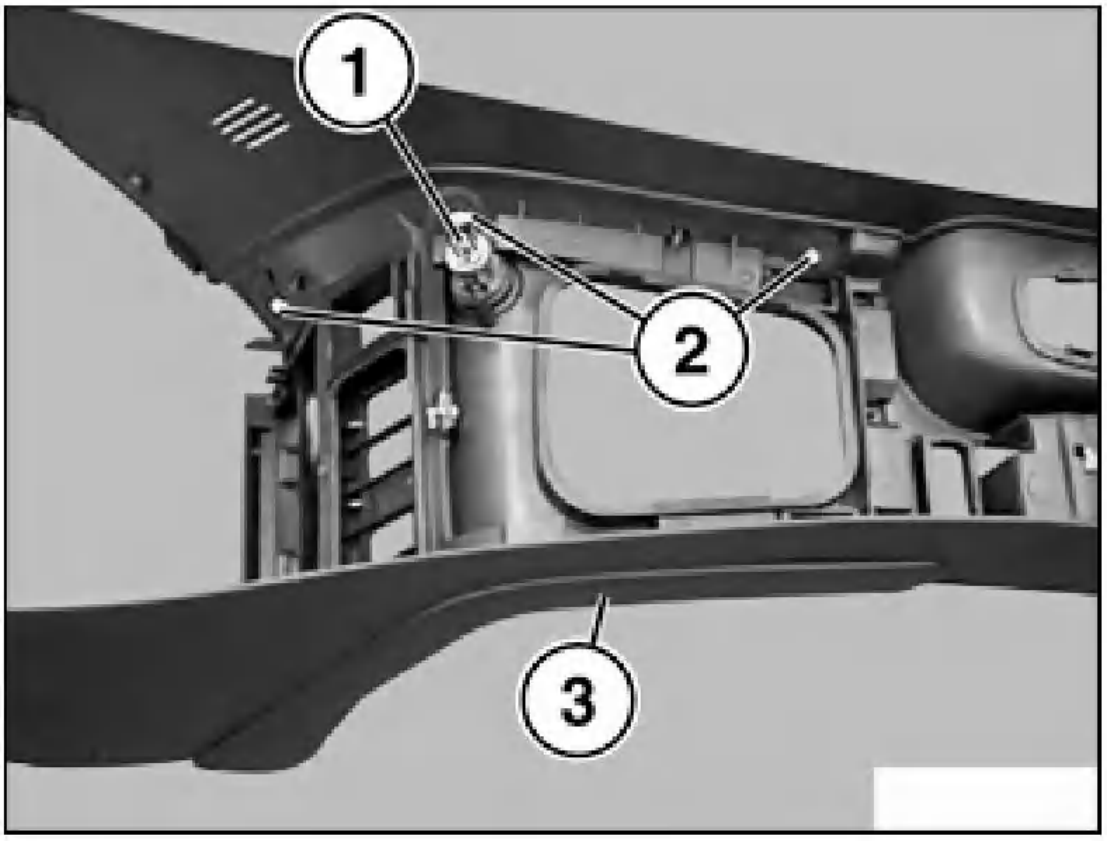


Fig. 65: Removing Cigar Lighter
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten left/right screws (2) and remove left / right finisher strips (3).

Unfasten screws (1) and remove selector lever finisher strip (2).

Installation:

Insert correctly in supports (3).

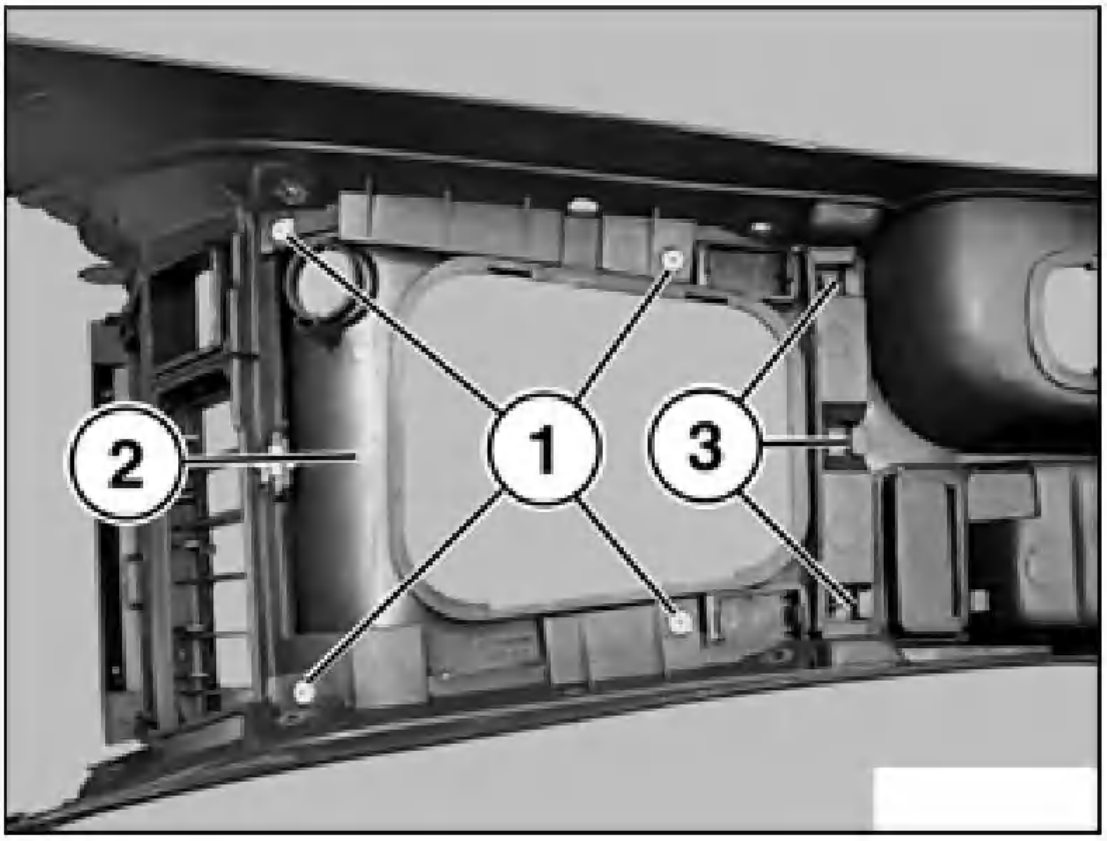


Fig. 66: Removing Selector Lever Finisher Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1) and remove radio finisher strip (2).

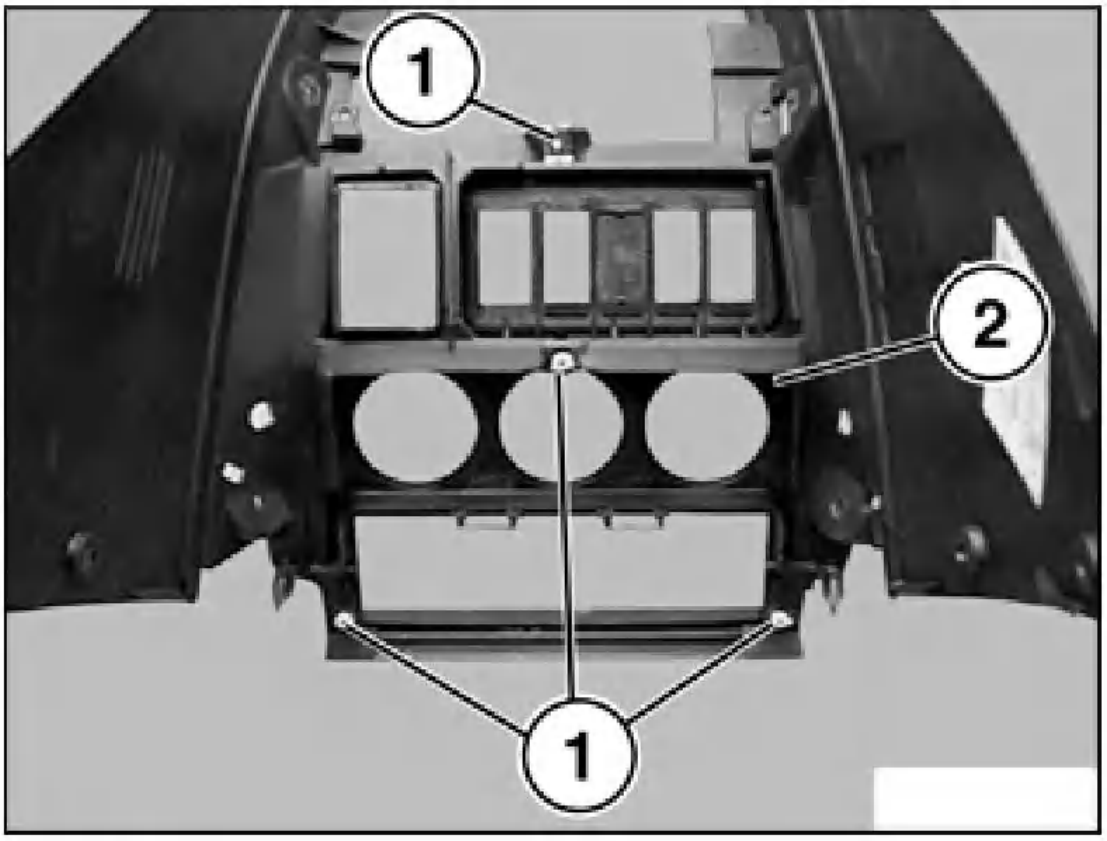


Fig. 67: Removing Radio Finisher Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Remove speed nuts (1).

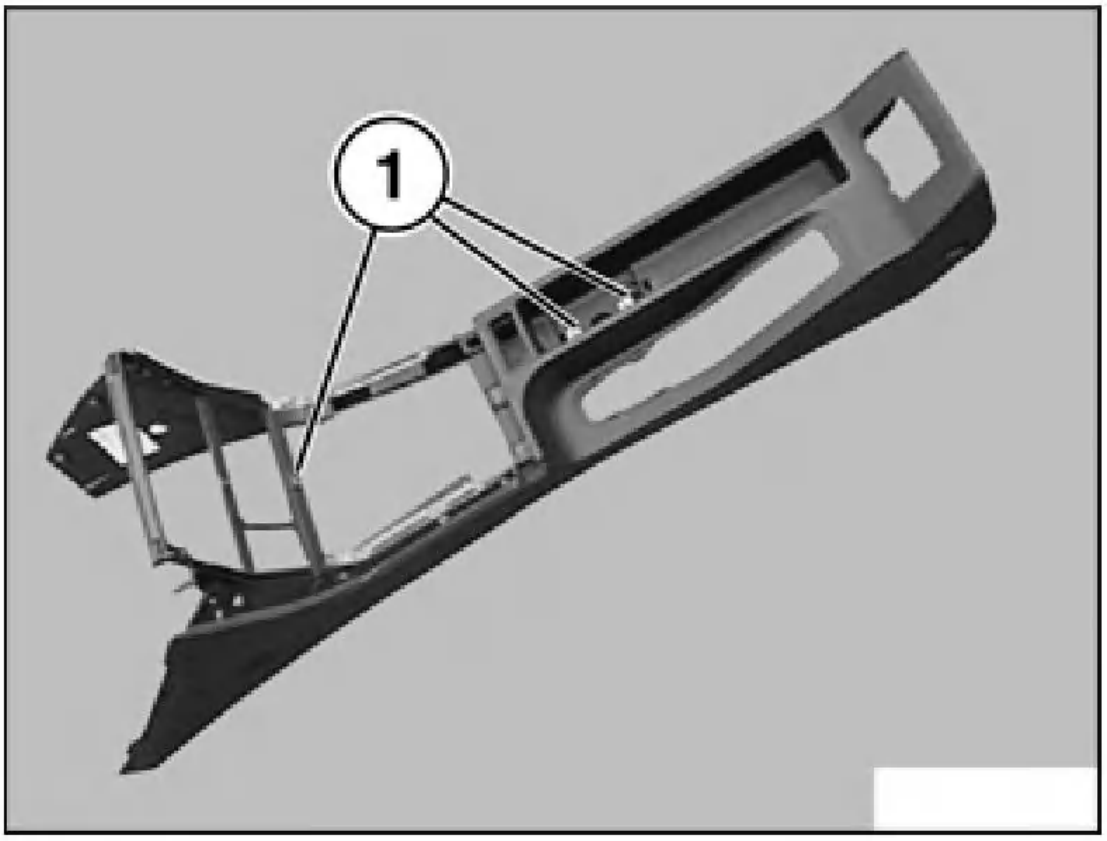


Fig. 68: Removing Speed Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 240 REMOVING AND INSTALLING REAR ODDMENTS BOX (Z3 ROADSTER, M ROADSTER)

Loosen oddments tray (do not remove), refer to 51 16 200 REMOVING AND INSTALLING ODDMENTS TRAY (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Press up oddments tray (1) and unfasten screws (2).

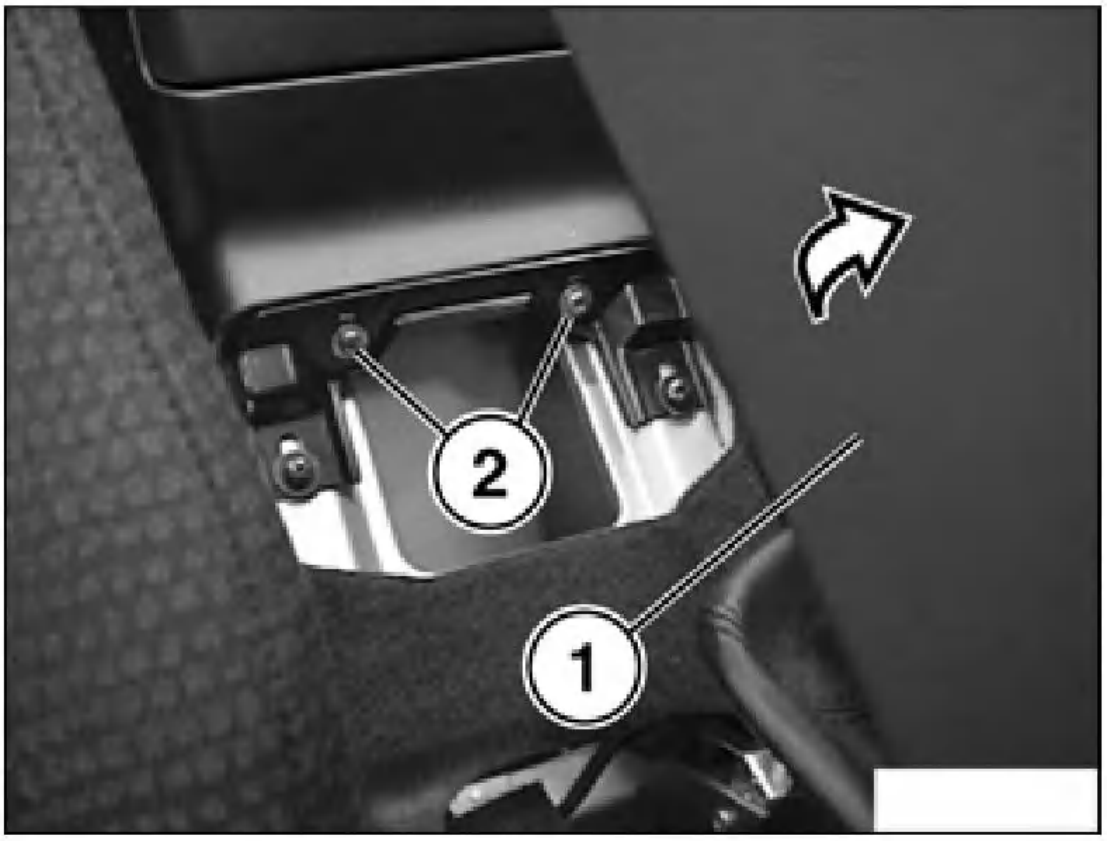


Fig. 69: Removing Oddments Tray
Courtesy of BMW OF NORTH AMERICA, INC.

Version (A):

Without rollover protection bar, without subwoofer, without "Harman-Kardon" Hi-Fi system:

Open cover and unfasten screws (1).

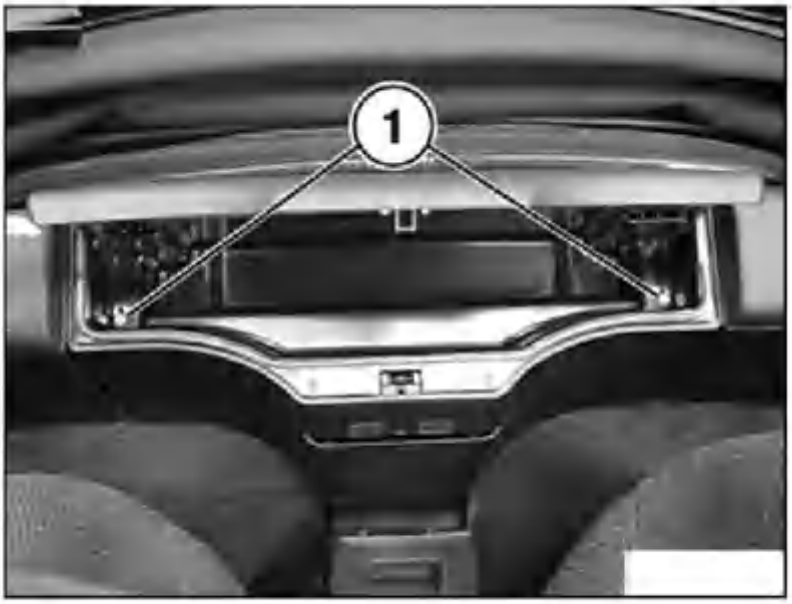


Fig. 70: Opening Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Without rollover protection bar, without subwoofer, without "Harman-Kardon" Hi-Fi system:

Unfasten screws (1) and remove oddments box (2).

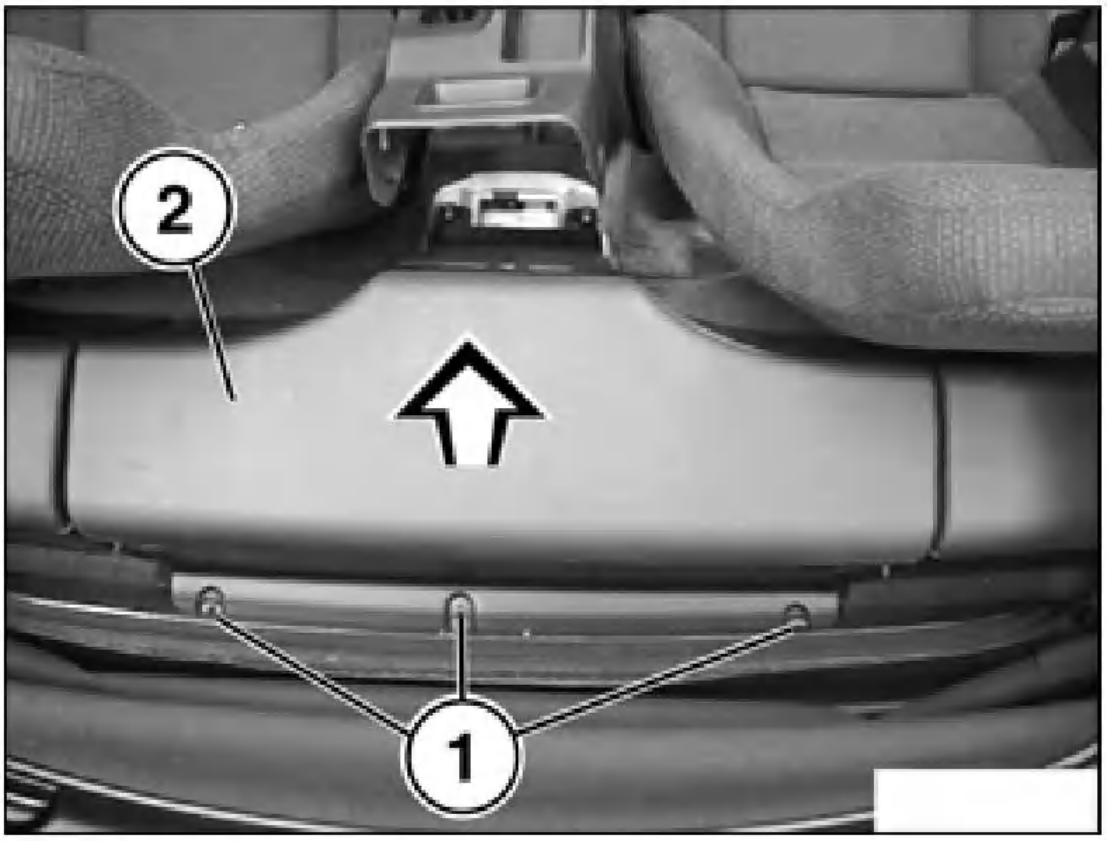


Fig. 71: Removing Oddments Box
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The procedures for "removing and installing rear oddments box" version (A) ends here.

Version (B):

With rollover protection bar:

Removing and installing rollover protection bar, refer to 54 61 001 REMOVING AND INSTALLING / REPLACING .

Pull off finisher (1) (lock) upward.

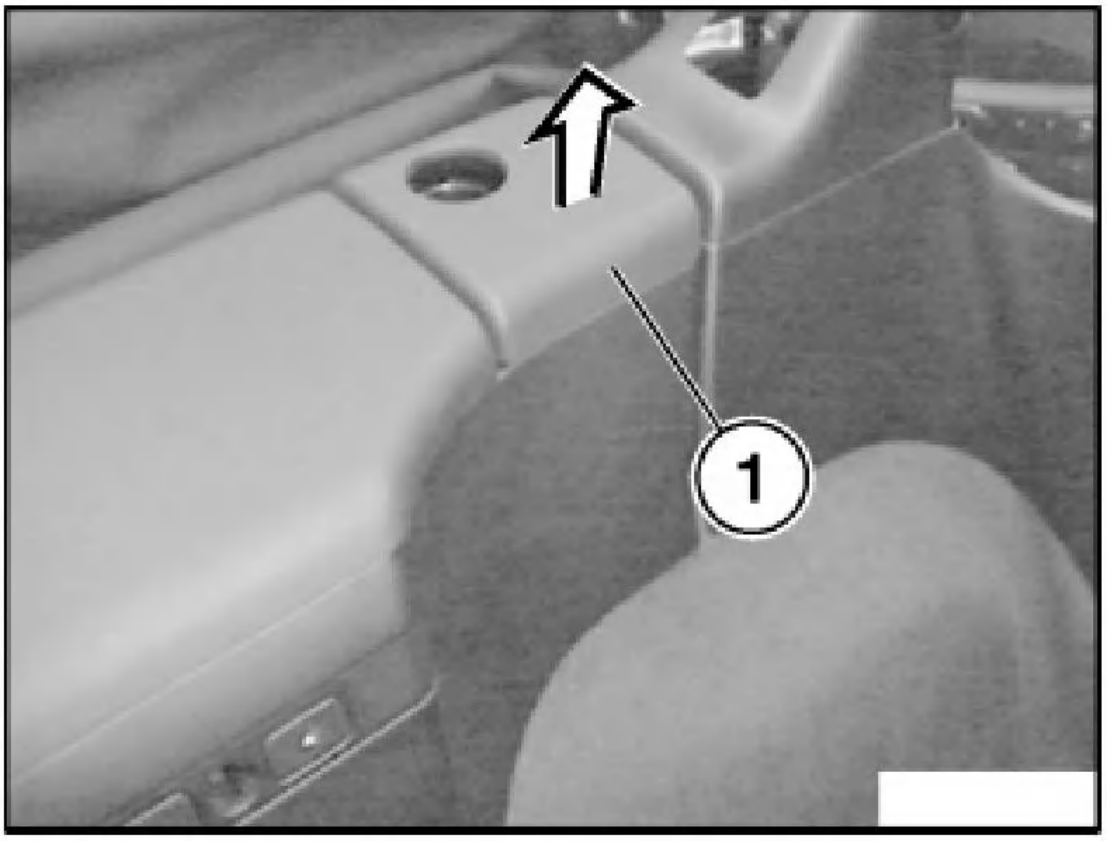


Fig. 72: Removing Finisher
Courtesy of BMW OF NORTH AMERICA, INC.

Version (B):

With rollover protection bar:

Lift out covers (1) and unfasten screws. Unfasten screws (2) and take off oddments box upward.

NOTE: The procedure for removing and installing the "rear oddments box" Version (B) ends here.

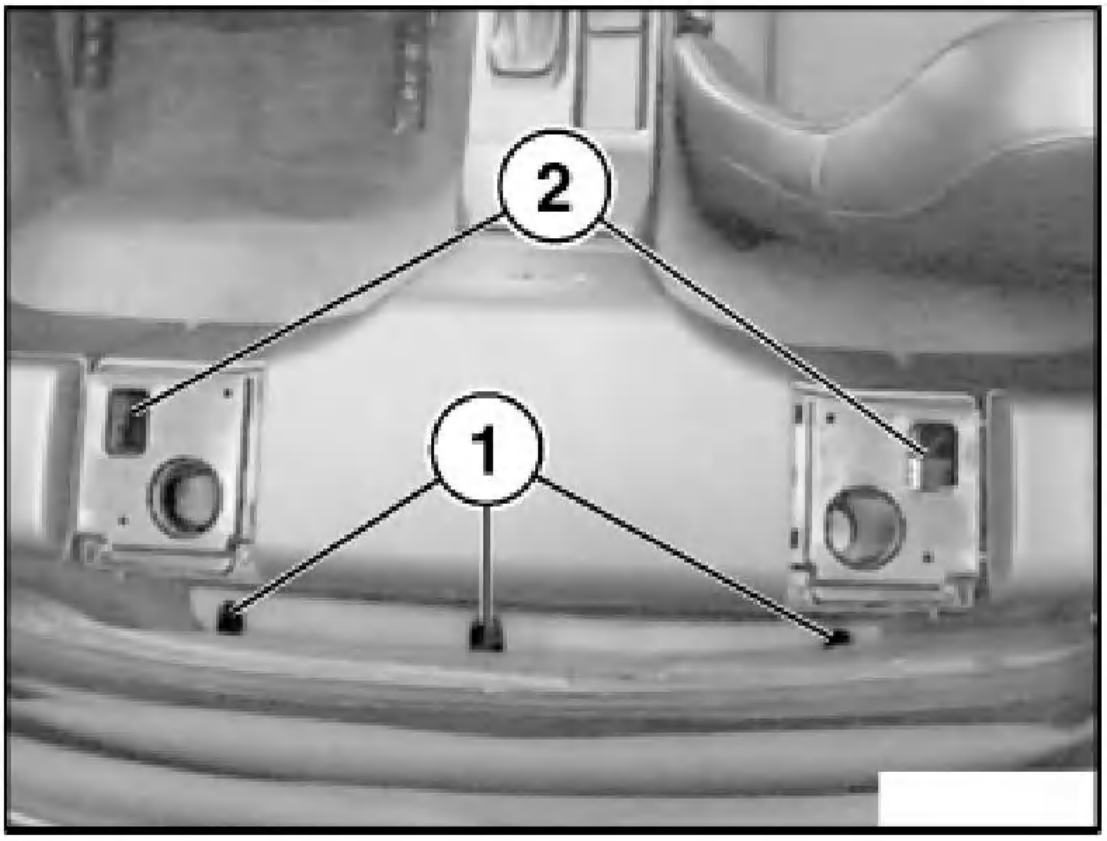


Fig. 73: Removing Covers And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Version (C):

With rollover protection bar, with "Harman-Kardon" Hi-Fi system:

Removing and installing loudspeaker box, refer to 65 13 300 REMOVING AND INSTALLING/REPLACING COMPLETE SUBWOOFER SPEAKER FOR TOP HI-FI SYSTEM (Z3 ROADSTER, M ROADSTER HARMANN KARDON) .

Unclip cover (1) upward.

Removing and installing left and right rollover protection bar, refer to 54 61 001 REMOVING AND INSTALLING / REPLACING LEFT OR RIGHT ROLLOVER PROTECTION BAR (Z3 ROADSTER, M ROADSTER) .

Lift out detent (1) and pull off finisher strip (2) (lock) upward.

Installation:

Glue on seal (3) if necessary.

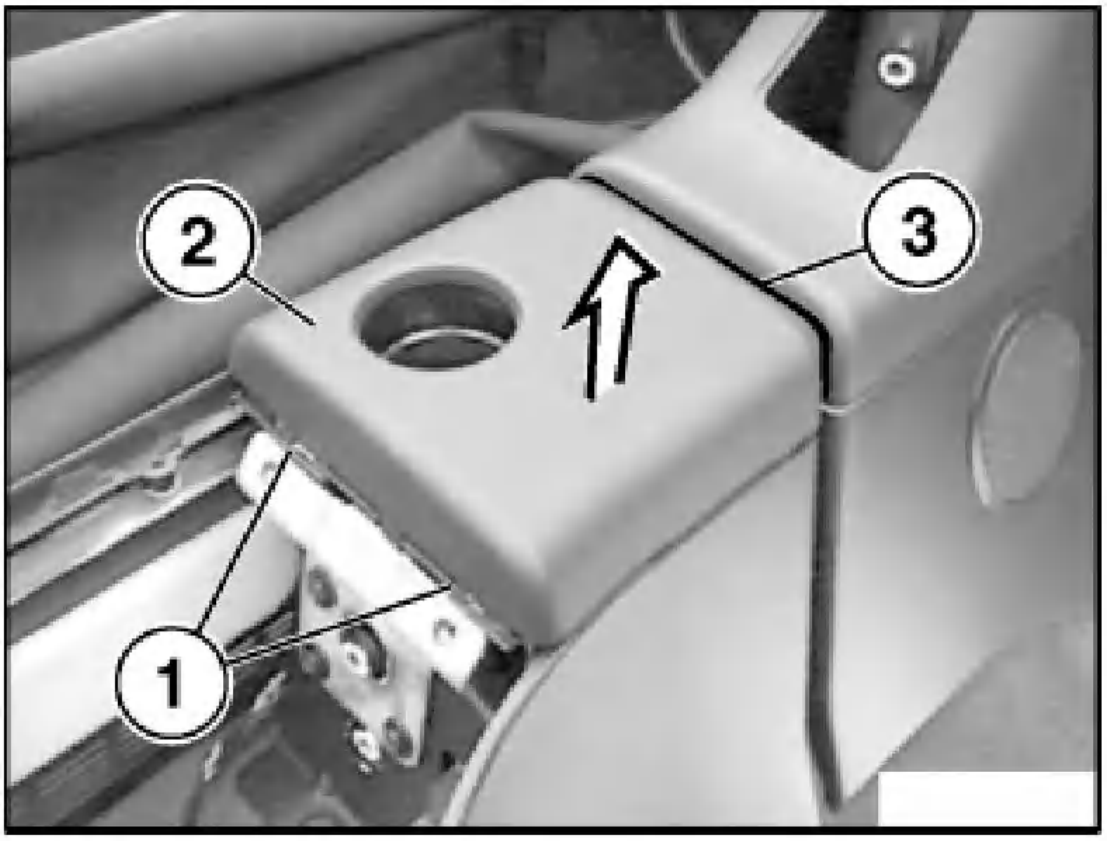


Fig. 74: Identifying Detent And Finisher Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Version (C):

With rollover protection bar, with "Harman-Kardon" Hi-Fi system:

Lift out covers (1) and unfasten screws. Unfasten screws (2) and take off oddments box upward.

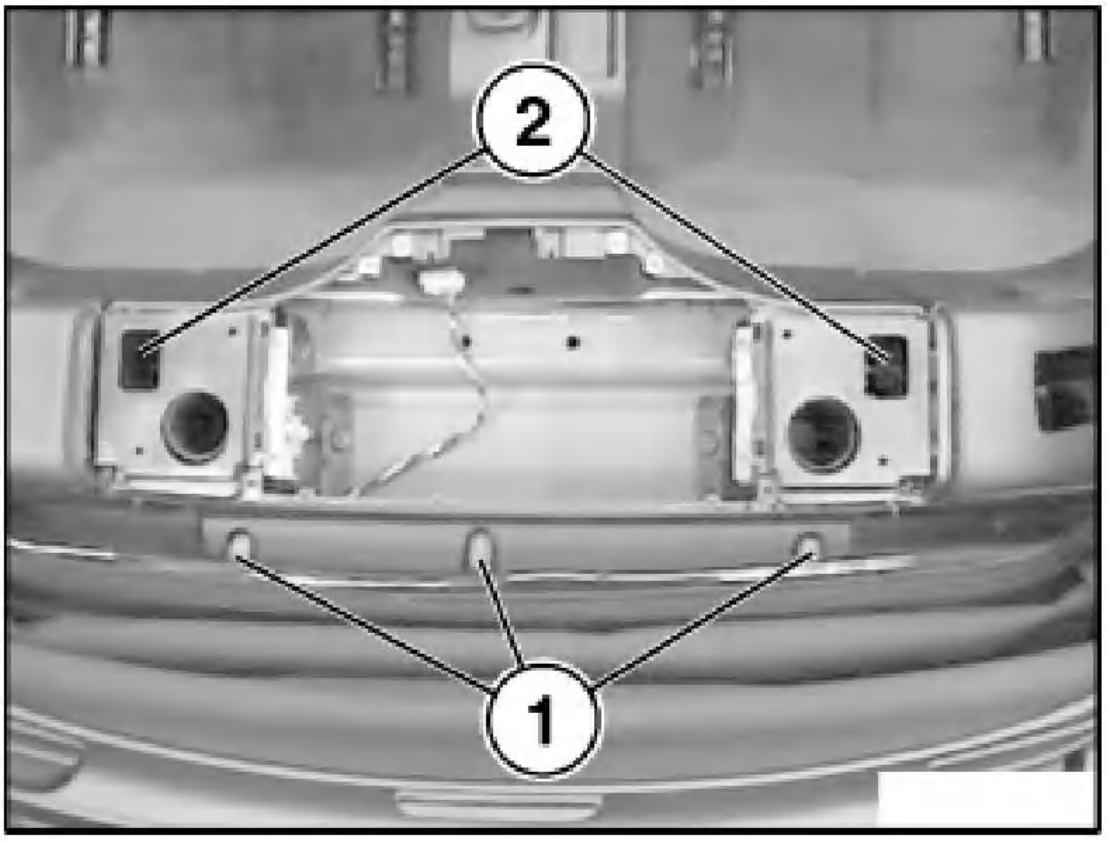


Fig. 75: Removing Oddments Box
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 340 REMOVING AND INSTALLING/REPLACING LOCK FOR GLOVEBOX, RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Only US version:

Unfasten screws (1) and remove upper (2) and lower sections of lock.

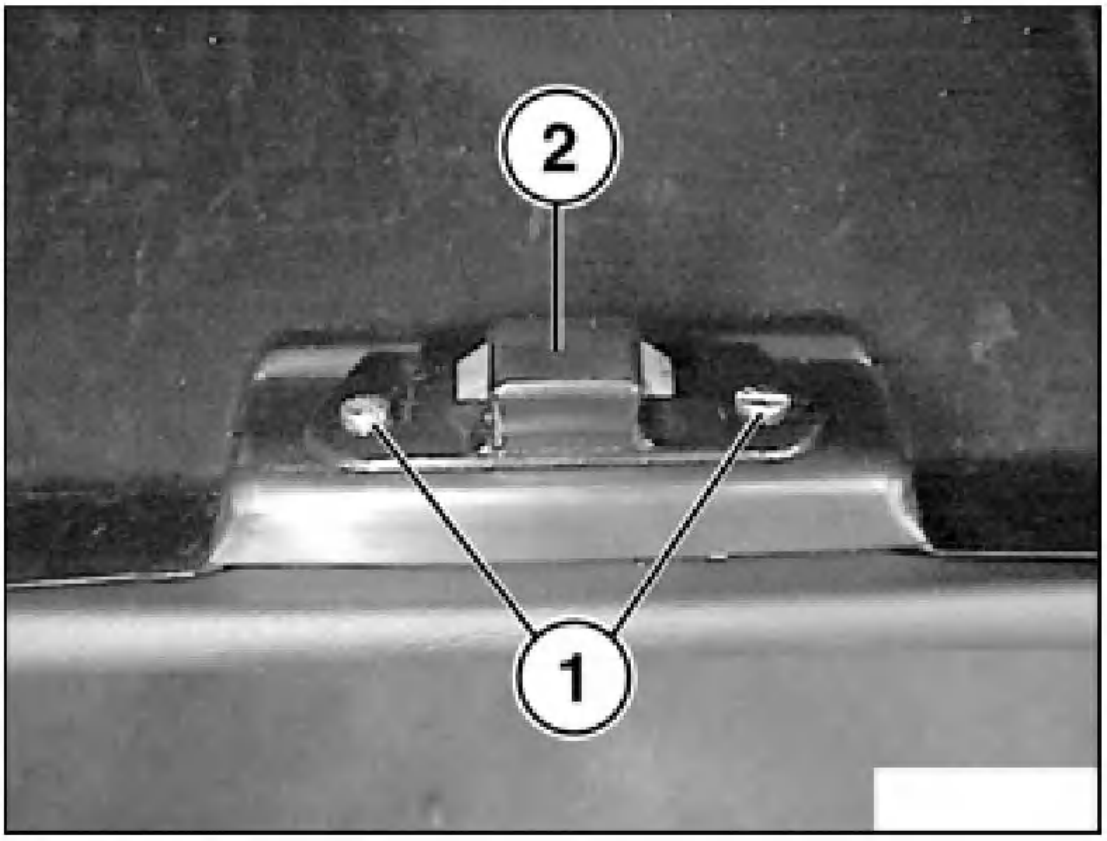


Fig. 76: Removing Upper And Lower Sections Of Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Only replacement (US version):

Insert vehicle key in lock cylinder (2).

Break open locks (1) if necessary and pull out lock cylinder (2) with vehicle key.

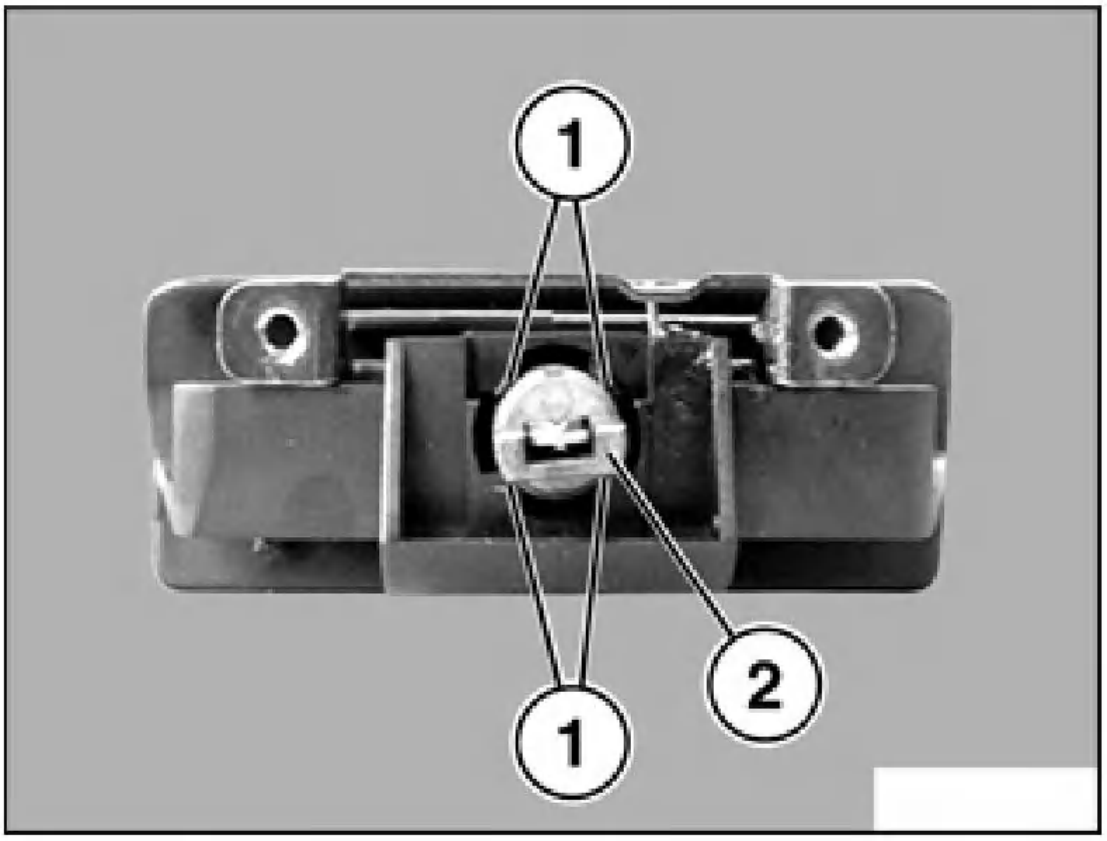


Fig. 77: Installing Vehicle Key In Lock Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not pull on vehicle key. Do not pull vehicle key out of removed lock cylinder (retainers and springs would drop out of lock cylinder).

Installation:

Perform function check on removed lock.

NOTE: The operation "Removing and installing/replacing glovebox lock" for US version ends here.

Unfasten screws (1) and remove lock (2).

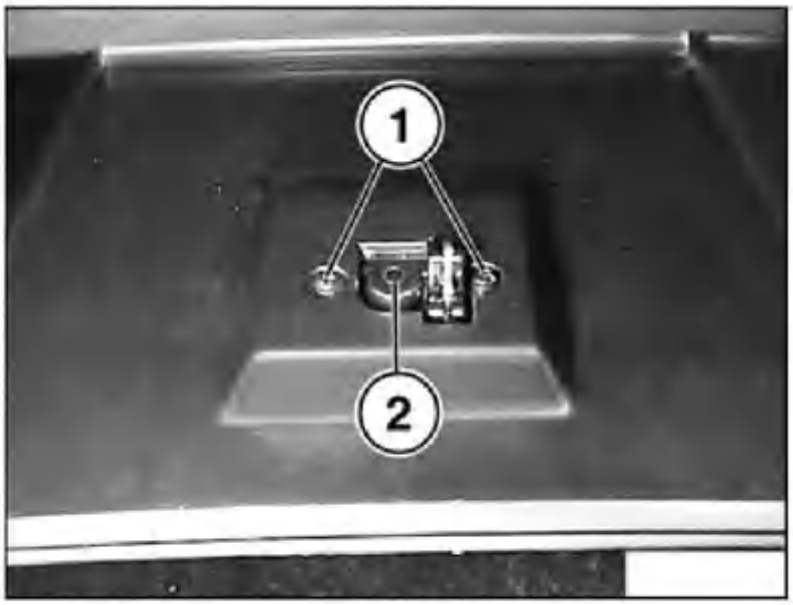


Fig. 78: Removing Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Only replace:

NOTE: The lock cylinder (1) must remain in open position.

Clamp lock in vise. Drive out pin with punch (2) until handle (3) can be pulled upwards and removed.

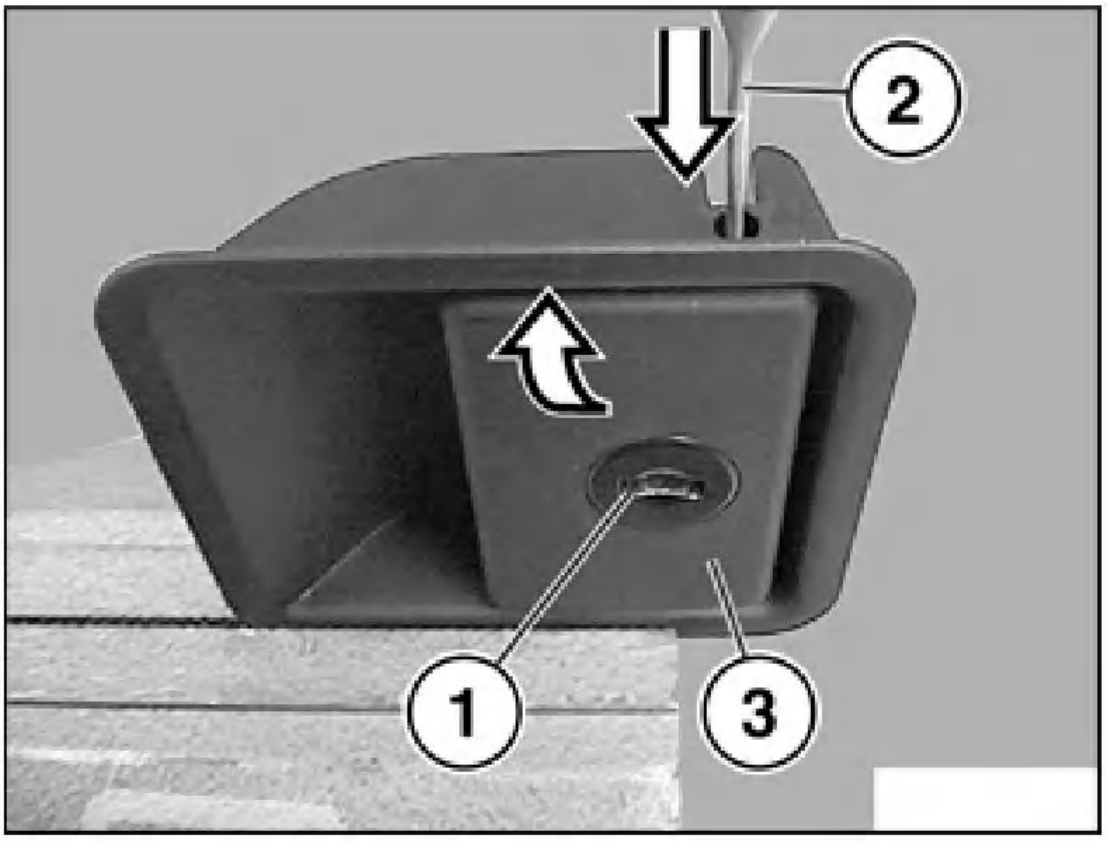


Fig. 79: Driving Out Pin With Punch
Courtesy of BMW OF NORTH AMERICA, INC.

Insert vehicle key in lock cylinder (2).

Break open locks (1) if necessary and pull out lock cylinder (2) with vehicle key.

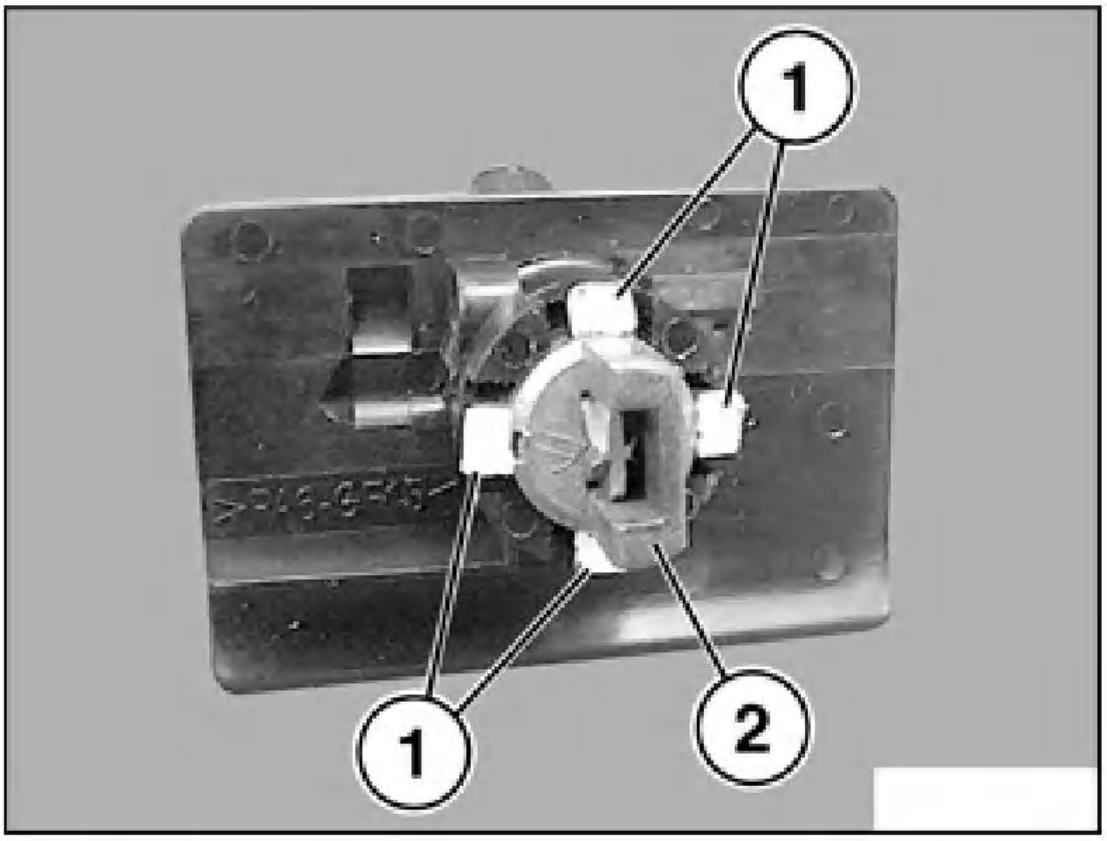


Fig. 80: Identifying Vehicle Key In Lock Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not pull vehicle key. Do not pull vehicle key out of removed lock cylinder (retainers and springs would drop out of lock cylinder).

Installation:

Insert lock cylinder with aperture (1) in groove (2) of locking disc.

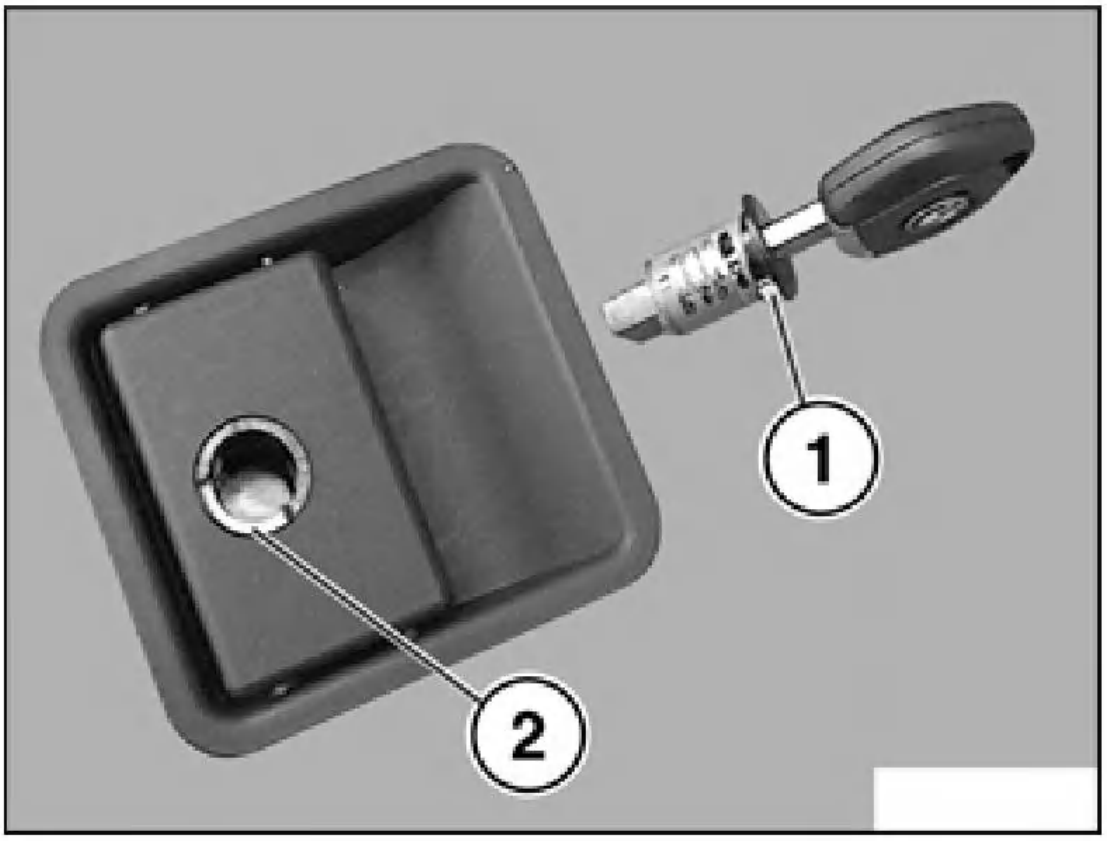


Fig. 81: Installing Lock Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Perform function check on removed lock.

51 16 360 REMOVING AND INSTALLING GLOVEBOX, RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Release rotary clips (1) at bottom and lever out lower trim panel on left (risk of damage) and center.

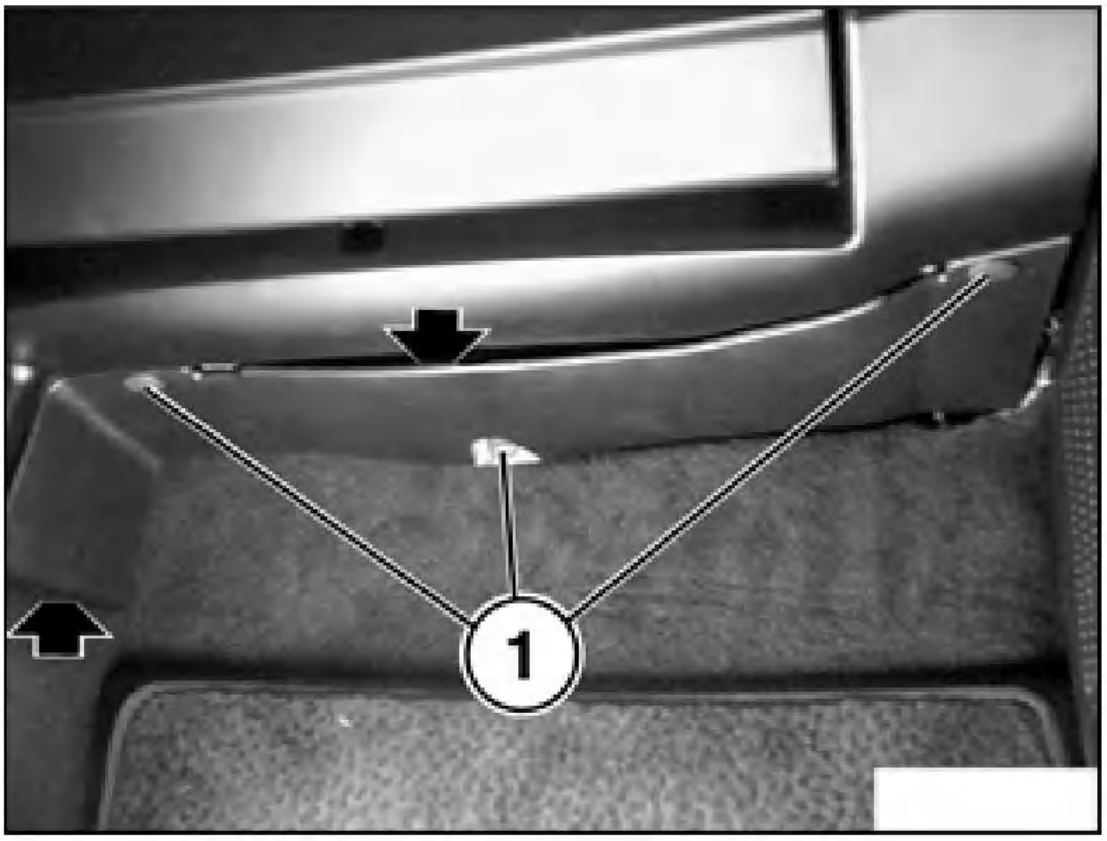


Fig. 82: Identifying Rotary Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Open glove compartment cover.

Lift out finisher strips (1) and unfasten screws.

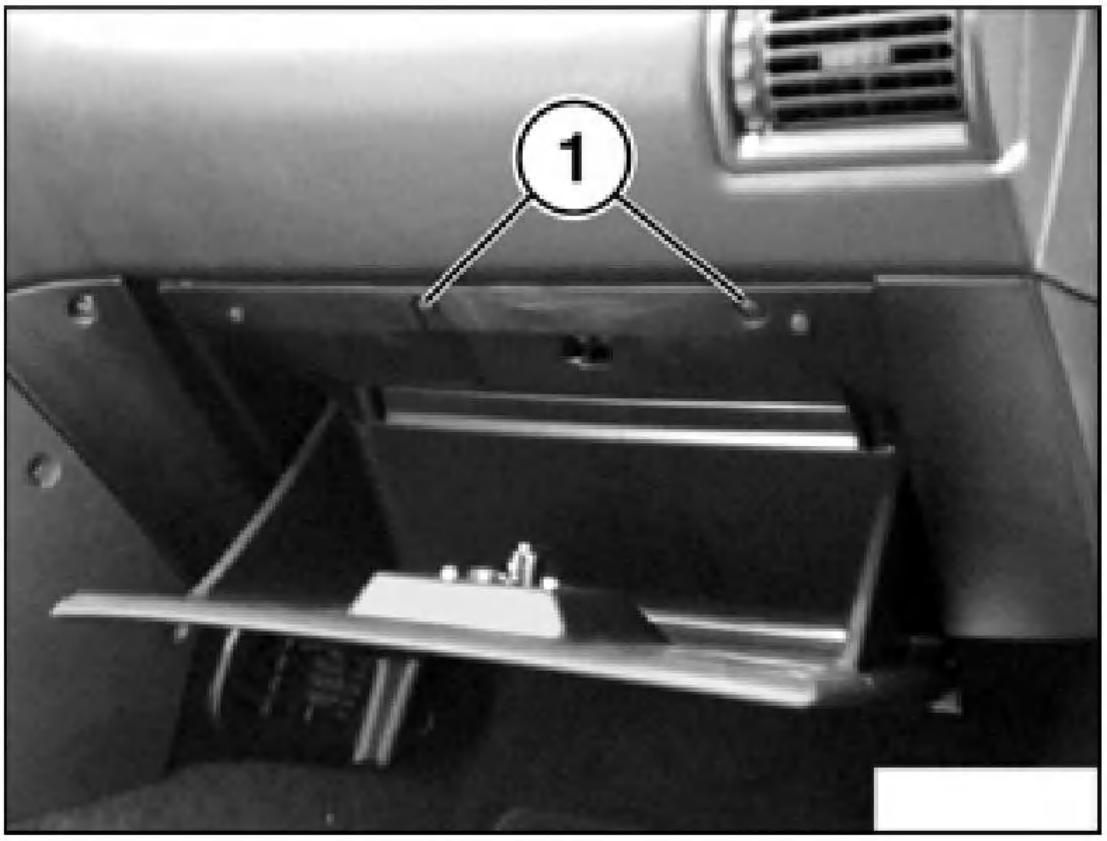


Fig. 83: Removing Finisher Strips
Courtesy of BMW OF NORTH AMERICA, INC.

Close glove compartment cover.

Lift out finisher strips (1) and unfasten screws. Remove glove compartment outward/downward.

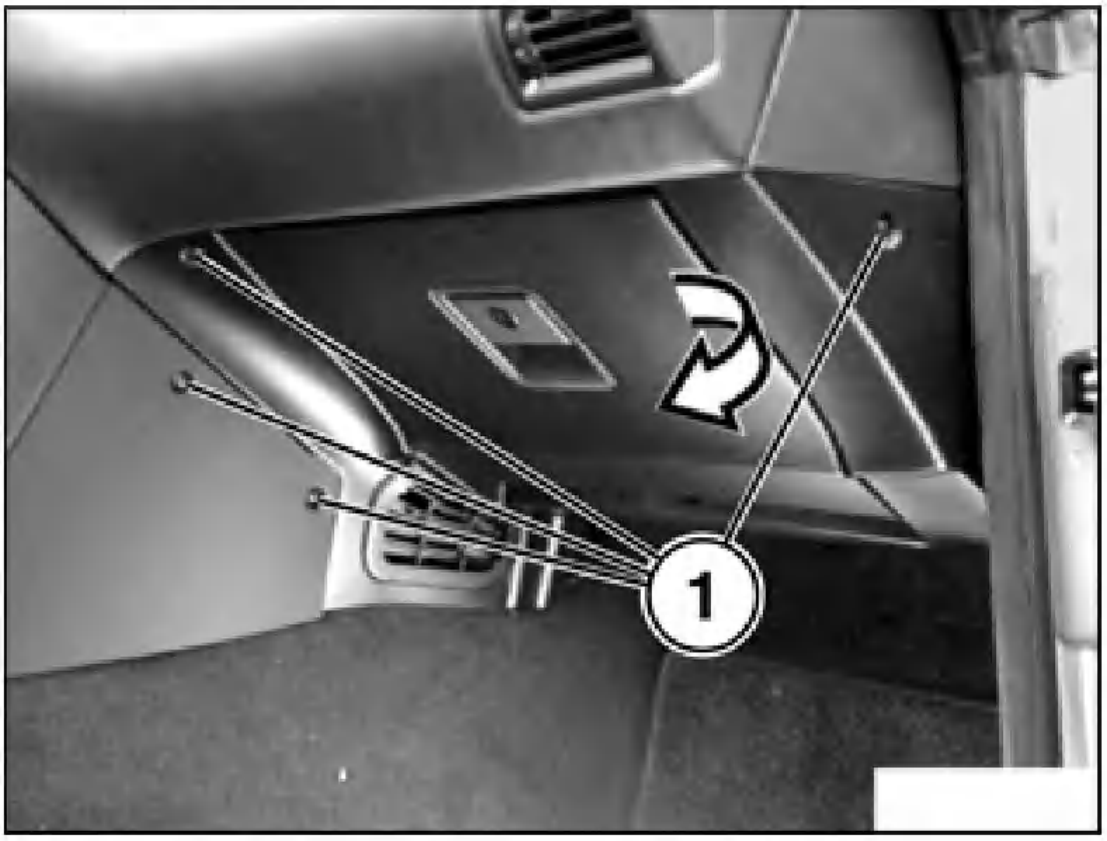


Fig. 84: Removing Glove Compartment Outward/Downward
Courtesy of BMW OF NORTH AMERICA, INC.

51 16 361 REPLACING RIGHT GLOVEBOX

Remove lock for right glovebox. Refer to 51 16 340 REMOVING AND INSTALLING/REPLACING LOCK FOR GLOVEBOX, RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Remove right glovebox. Refer to 51 16 360 REMOVING AND INSTALLING GLOVEBOX, RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

LIDS

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.

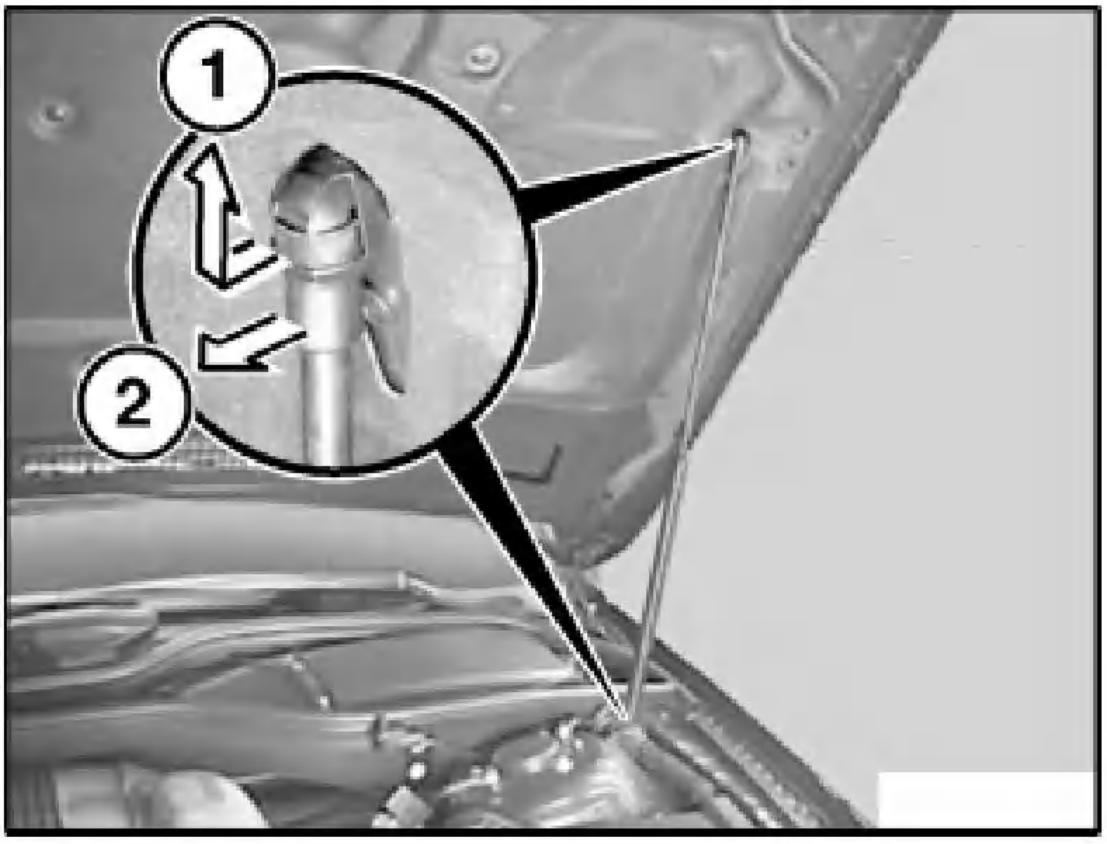


Fig. 85: Removing Gas Spring Strut At Top And Bottom
Courtesy of BMW OF NORTH AMERICA, INC.

FRONT DOOR LOCKS, HANDLES, FITTINGS

51 21 003 REPLACING DOOR DETENT (LOCK STRIKER), FRONT LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Remove rear side trim (lower section), refer to 51 43 015 REMOVING AND INSTALLING / REPLACING REAR LEFT OR RIGHT LOWER SECTION OF SIDE TRIM (Z3 ROADSTER, M ROADSTER) .

Lift off cover (1). Unfasten connector (2) and withdraw cable.

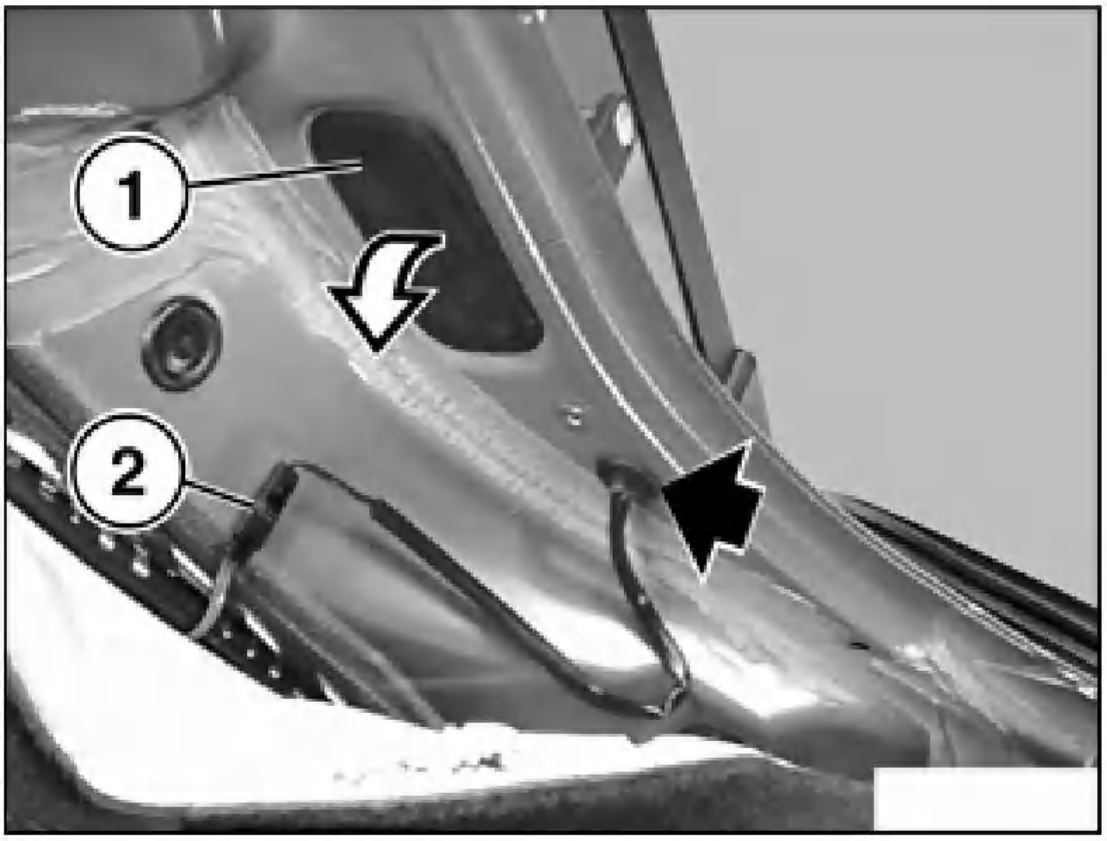


Fig. 86: Removing Cover And Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1) then remove threaded plate (2) and striker (3).

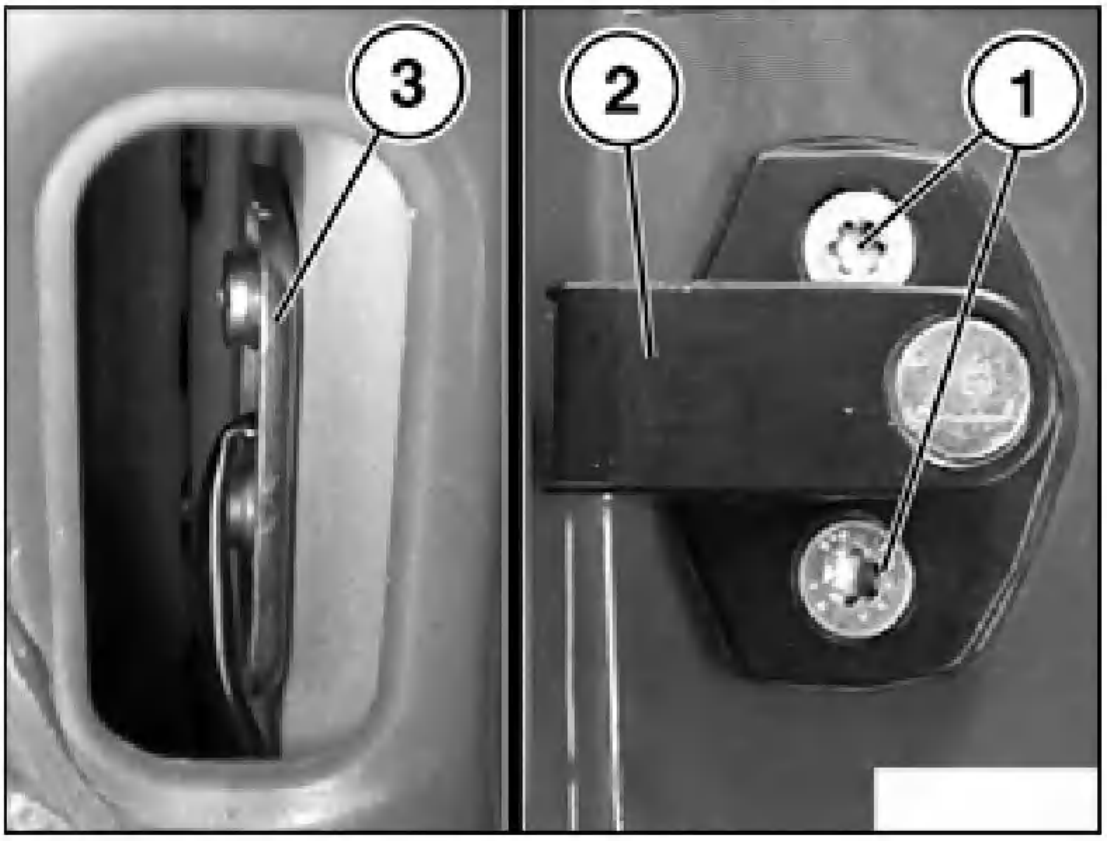


Fig. 87: Removing Threaded Plate And Striker
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Adjust striker.

51 21 090 REMOVING AND INSTALLING/REPLACING DOOR LOCK ON FRONT LEFT OR RIGHT DOOR (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Removing front door window, refer to 51 32 170 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT DOOR WINDOWS (Z3 ROADSTER) .

Unscrew bolt. Unhook door opener on linkage and remove.

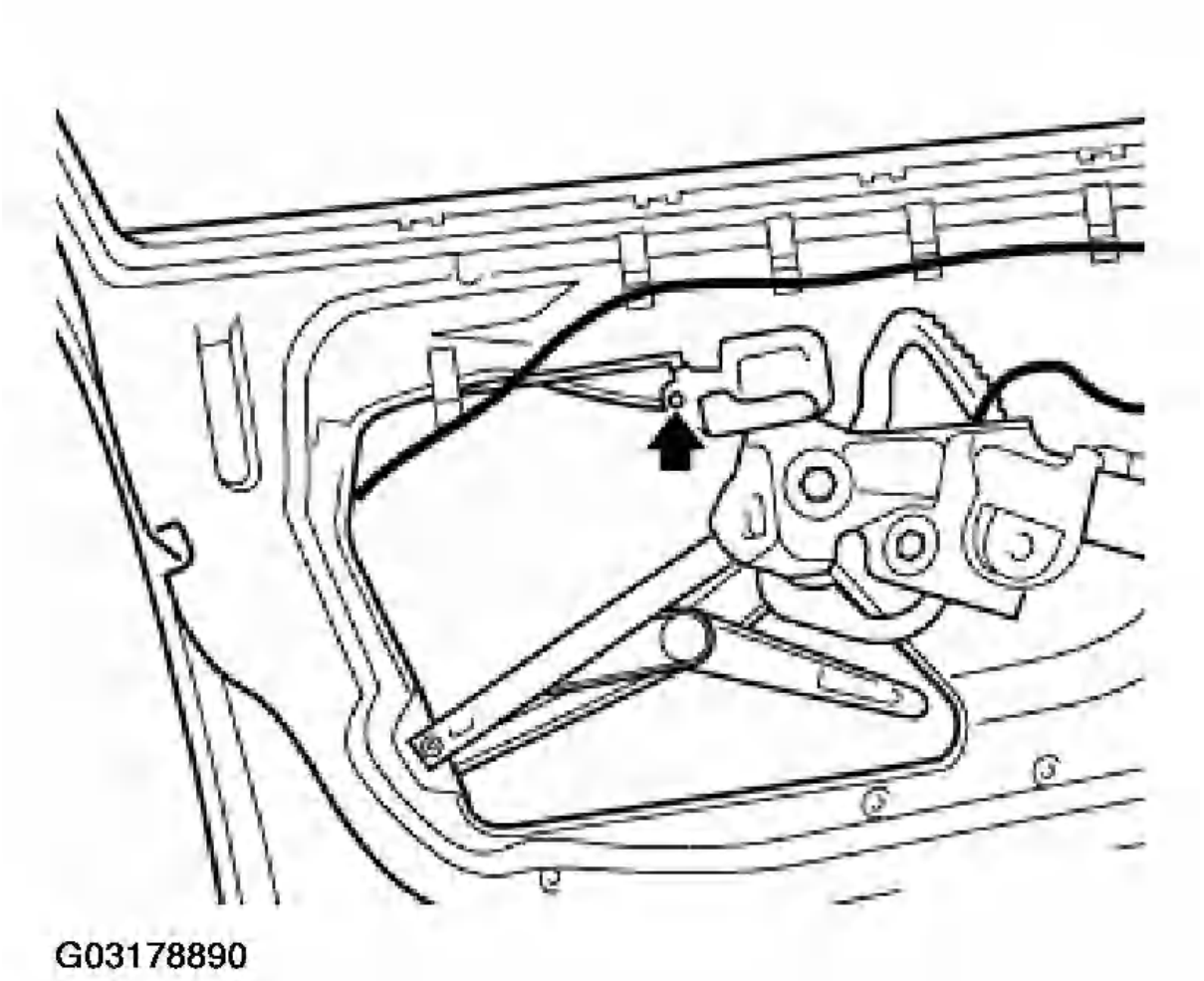


Fig. 88: Removing Door Opener On Linkage
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten lower screw on window guide rail.

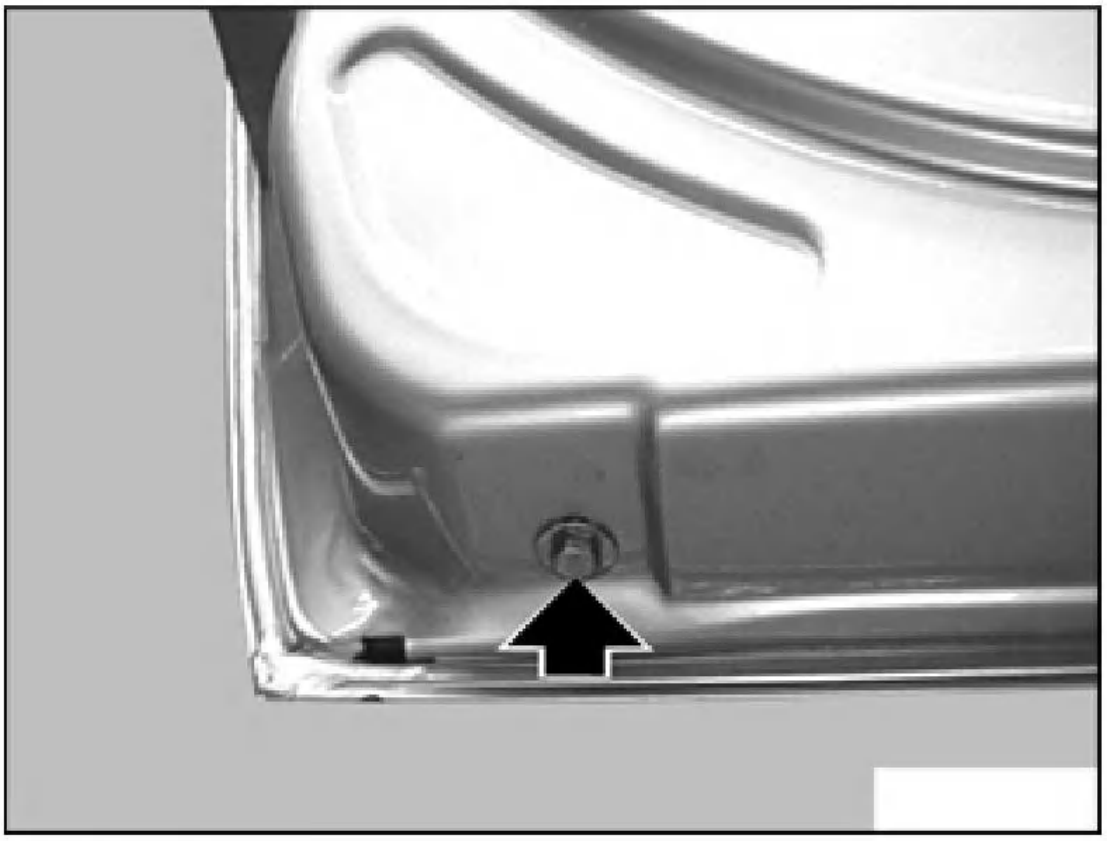


Fig. 89: Removing Lower Screw On Window Guide Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew bolt (1). Twist window guide rail (2) towards door hinge and remove through aperture in metal panel.

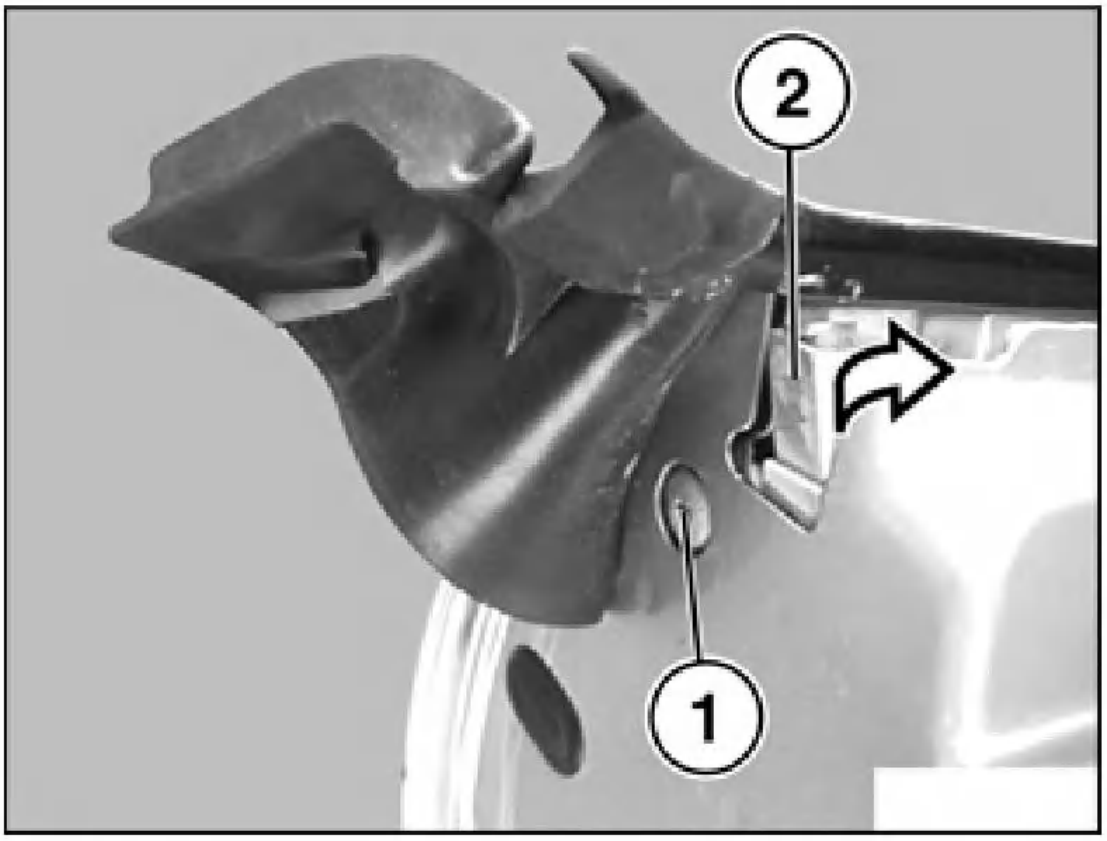


Fig. 90: Removing Window Guide Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit muckets (1) and (2) to window guide rail (3).

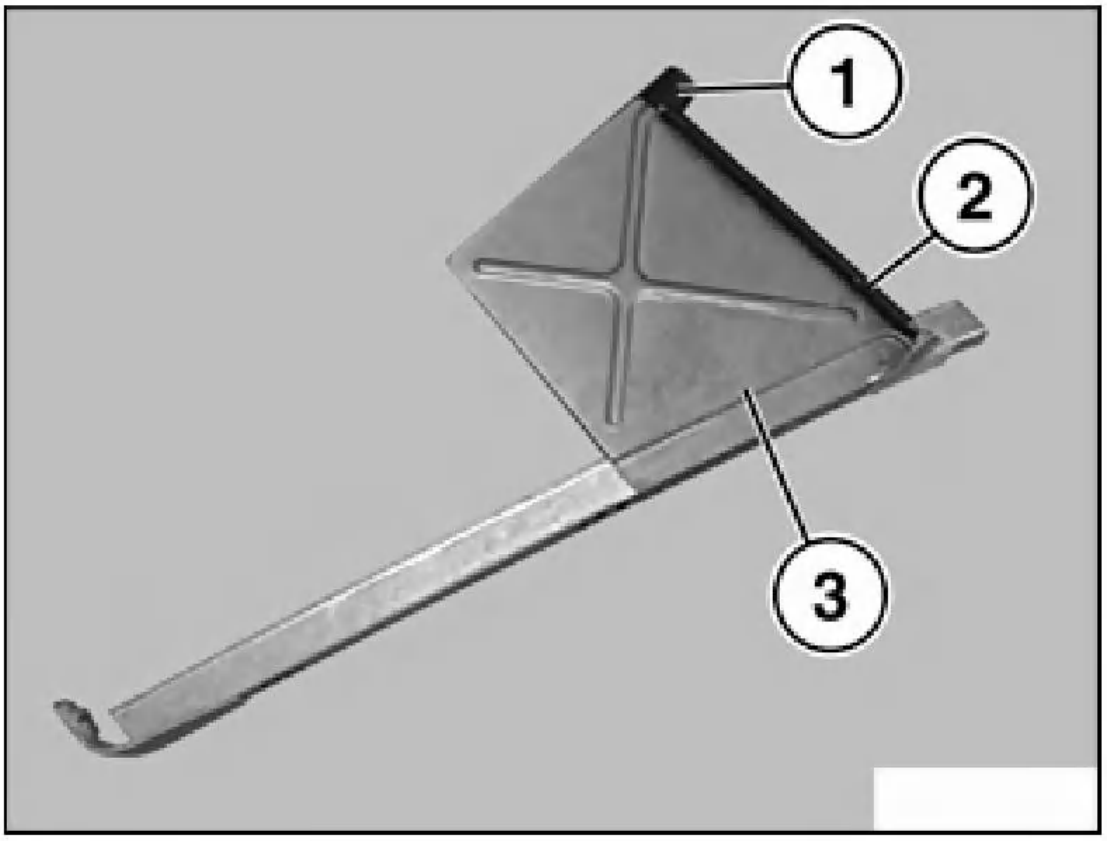


Fig. 91: Installing Window Guide Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws.

Installation:

Install screws with Loctite 270.

Tightening Torque, 51 21 1AZ. Refer to 51 21 FRONT DOOR LOCKS .

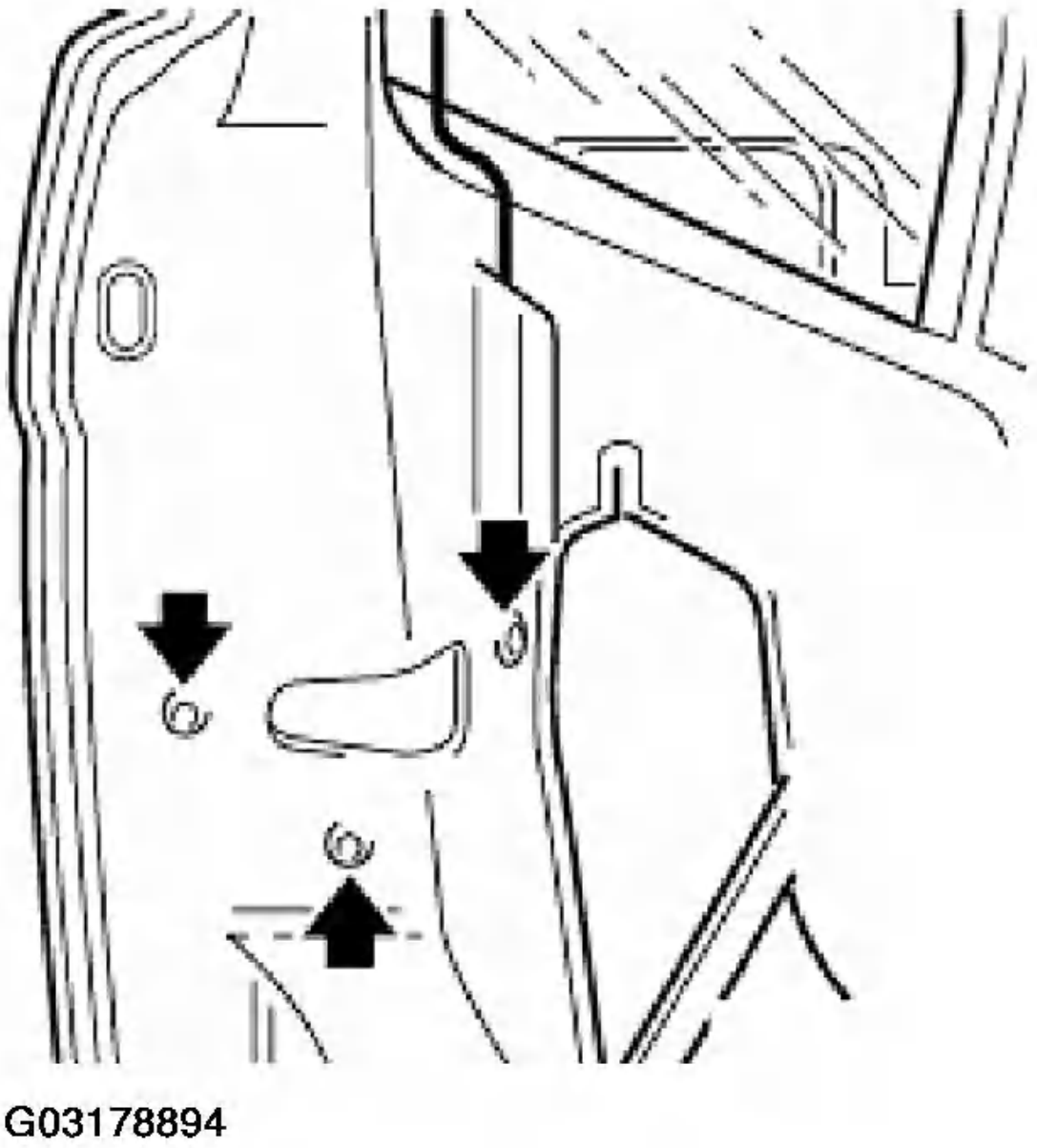


Fig. 92: Installing Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip retainer (1) and lift out linkage (2).

Lift door lock (3) up slightly and disconnect linkage (4) from outside door handle.

Remove door lock downwards.

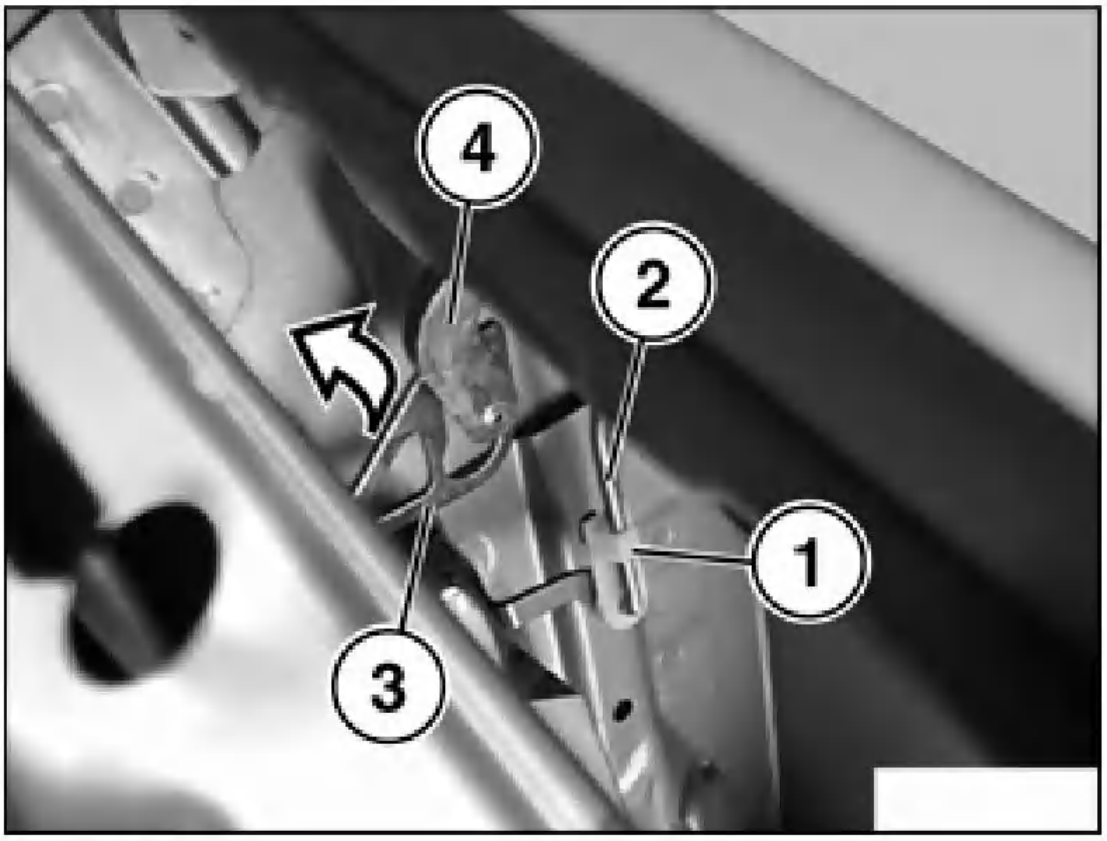


Fig. 93: Removing Door Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert frame for catch button through opening in inner door panel. Do not bend linkage.

Lift cable (1) out of brackets (2) on door lock (3).

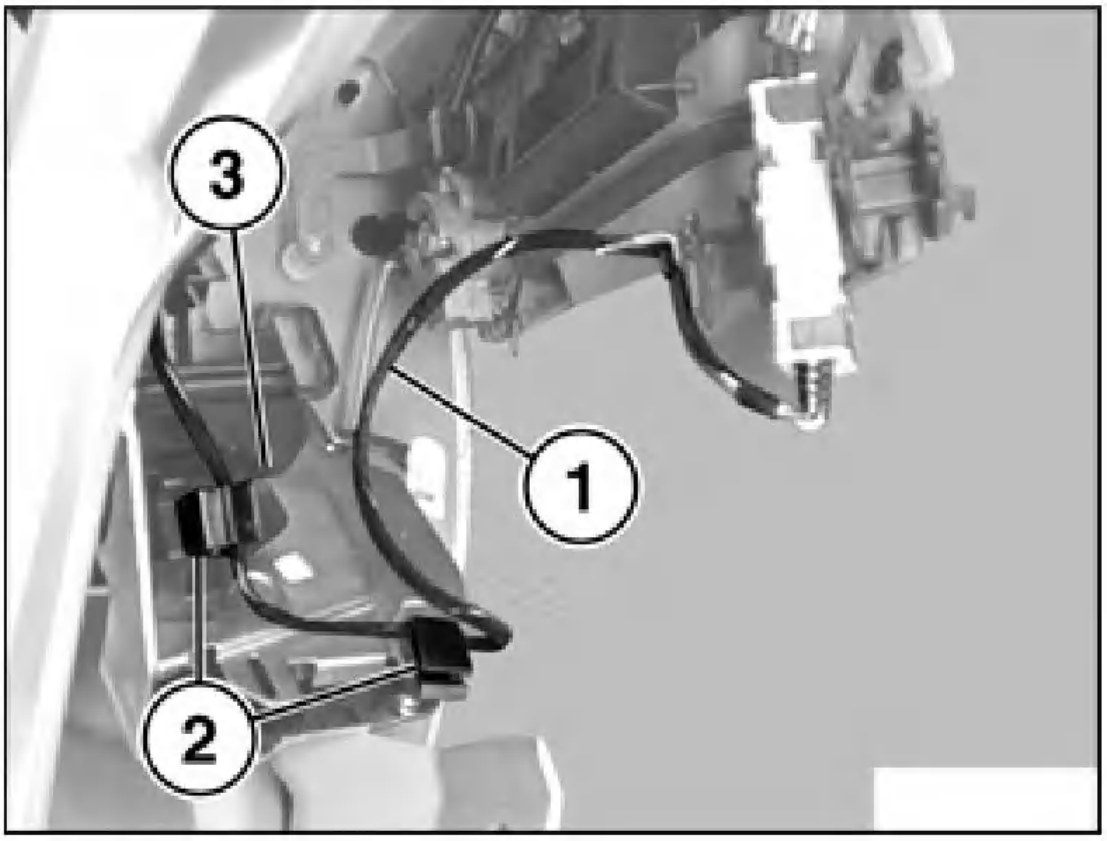


Fig. 94: Removing Brackets On Door Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten connector (1) and remove door lock (2).

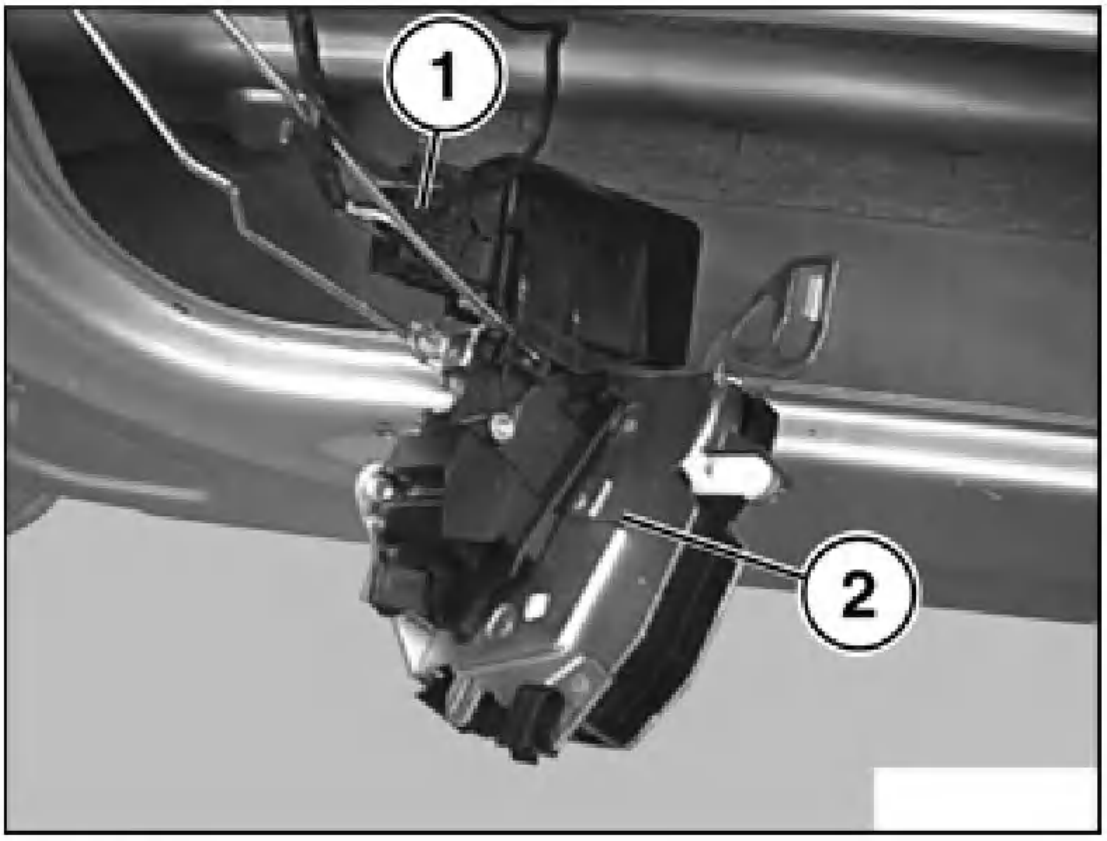


Fig. 95: Removing Connector And Door Lock
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operation "Removing lock from front door" ends here.

Only replacement (central locking drive):

Lift out lock and remove actuator drive (1) from central locking mechanism.

Installation:

Check actuating rod (2), locking rod (3), clip and cable tie (4) for wear and replace if necessary.

Check function.

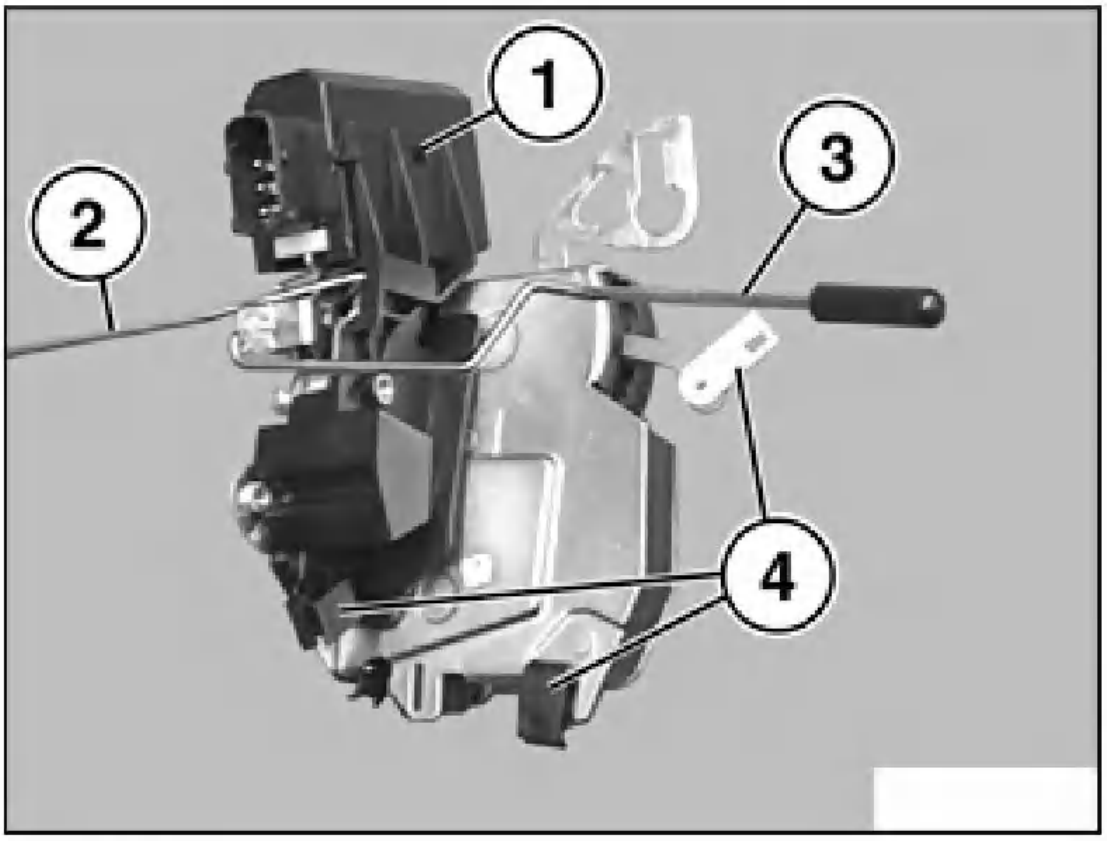


Fig. 96: Removing Actuator Drive From Central Locking Mechanism
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operation "Replacing switch on front door" ends here.

Only replacement (door lock):

Lift out lock and remove actuator drive (1) from central locking mechanism.

Disconnect actuating rod (2) and locking rod (3). Replace clip and cable tie (4).

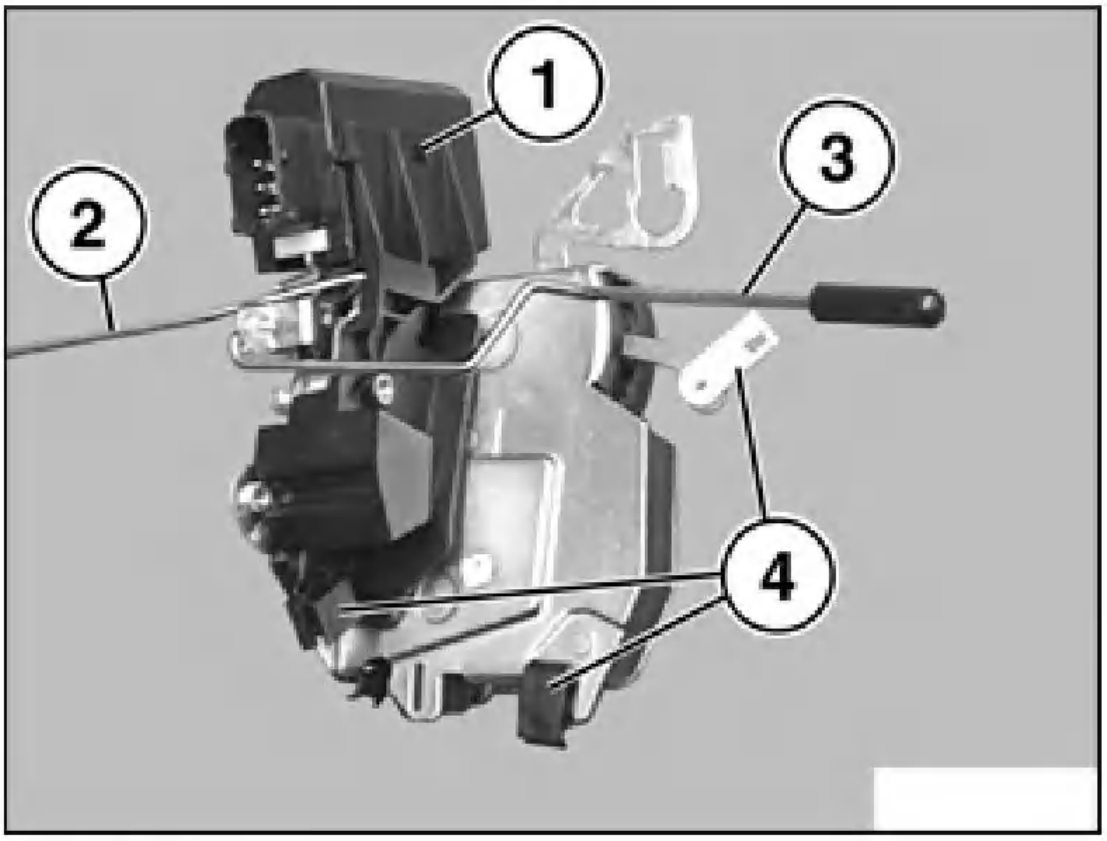


Fig. 97: Removing Actuating Rod And Locking Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check function.

51 21 140 REMOVING AND INSTALLING/REPLACING COMPLETE LOCK CYLINDER

Operation Is Described In:

Removing and installing/replacing outside handle on left or right front door, refer to 51 21 170 REMOVING AND INSTALLING/REPLACING OUTSIDE HANDLE ON FRONT LEFT OR RIGHT DOOR (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

51 21 170 REMOVING AND INSTALLING/REPLACING OUTSIDE HANDLE ON FRONT LEFT OR RIGHT DOOR (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Remove finisher strip for outside handle on front door, refer to 51 21 194 REMOVING AND INSTALLING/REPLACING FINISHER FROM OUTSIDE HANDLE ON LEFT OR RIGHT FRONT DOOR .

Remove front door trim, refer to 51 41 000 REMOVING AND INSTALLING FRONT LEFT OR RIGHT DOOR TRIM PANEL (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Turn and remove holder on outside handle.

Cut through connector (1) on central locking mechanism and disconnect cable (2) from retaining tab (3).

Remove retaining plate (4) and lift out pin.

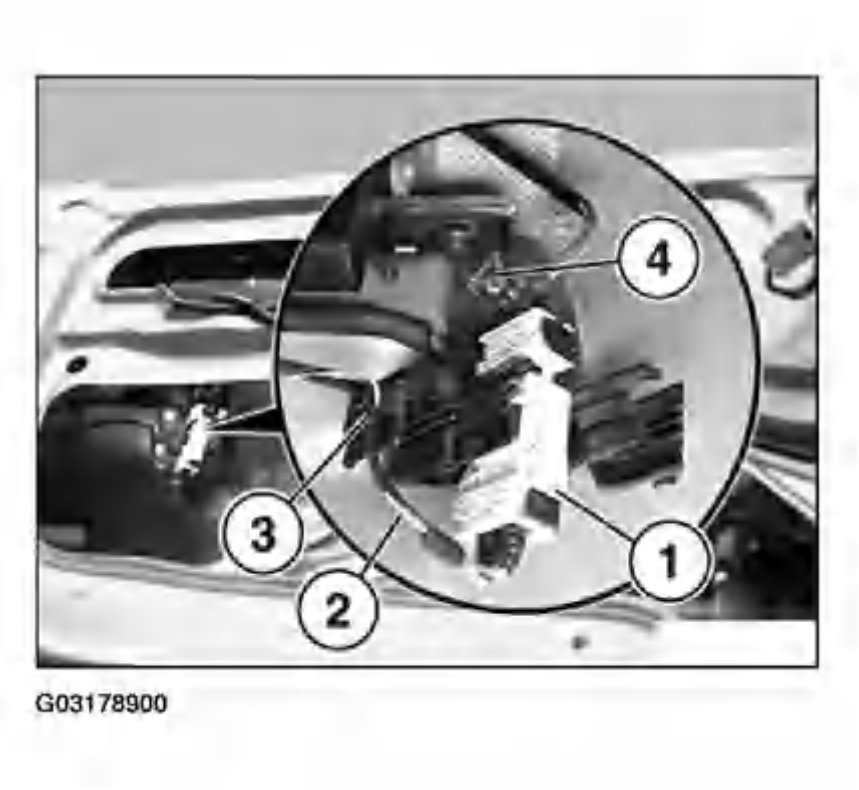


Fig. 98: Removing Retaining Plate And Lift Out Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nut using special tool 51 2 070 and take off outside handle.

Installation:

Tightening Torque, 51 21 2AZ. Refer to 51 21 FRONT DOOR LOCKS .

Check function.

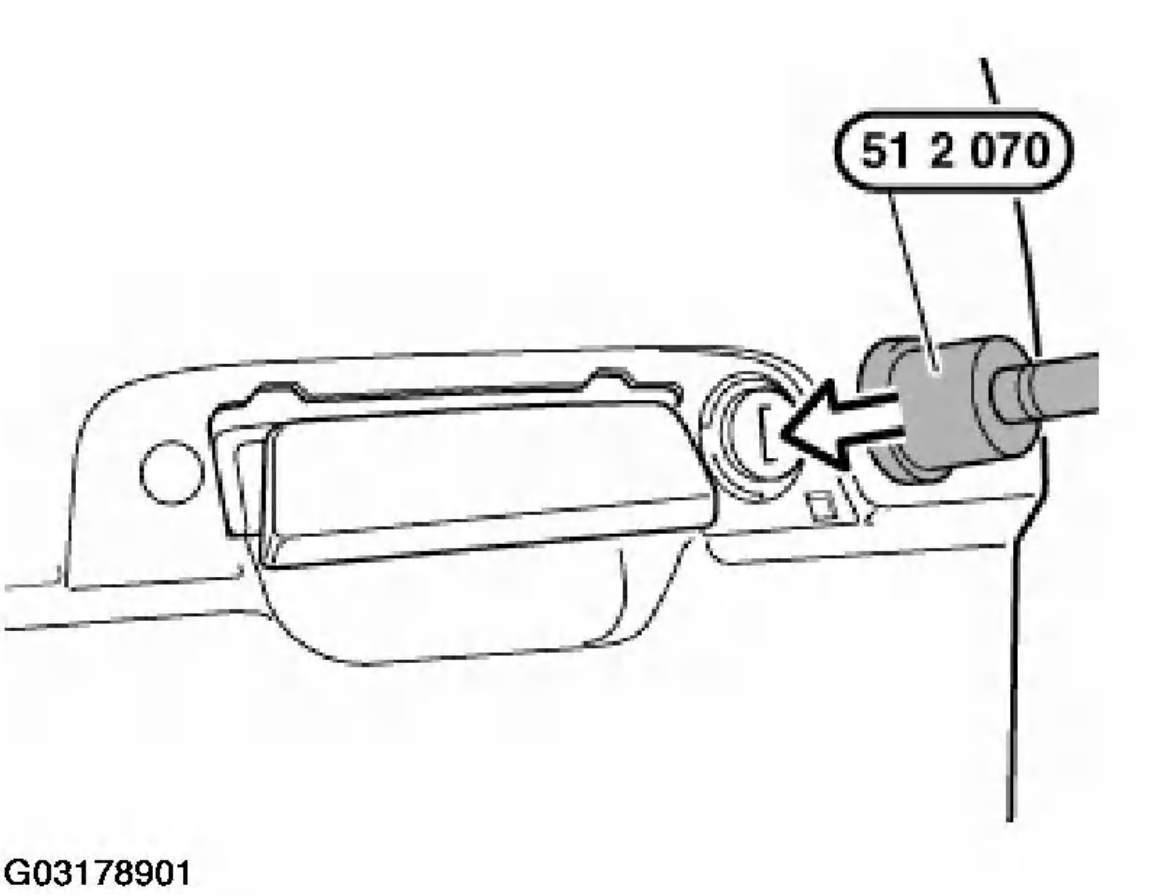


Fig. 99: Removing Outside Handle
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip retainer (1) and lift out linkage (2). Press outside handle (3) slightly down, disconnect from gate on door lock (4) and remove.

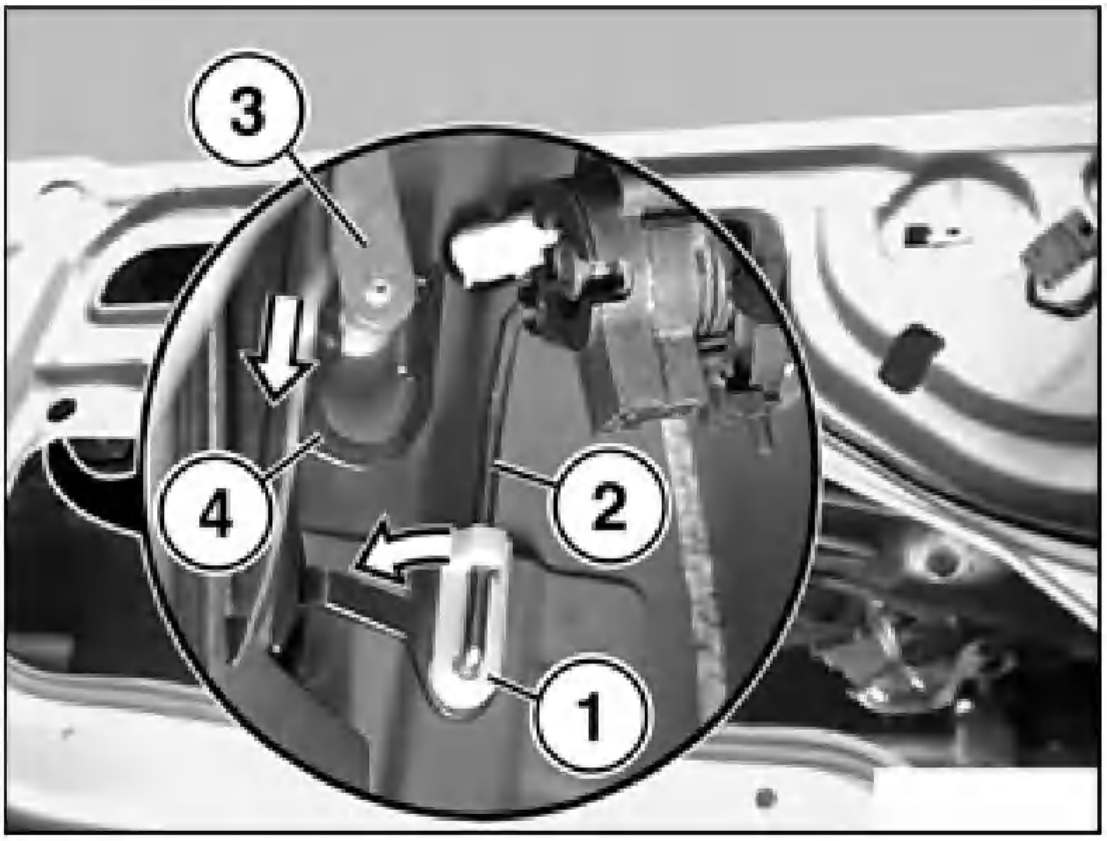


Fig. 100: Removing Retainer And Lift Out Linkage
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operation "Removing outside handle from left or right front door" ends here.

Only For Replacement Of Lock Cylinder:

Insert key (1) in lock cylinder (3).

Drive out pin (2) using much and press out lock cylinder (3) using the vehicle key (1) (do not pull on the key (1)).

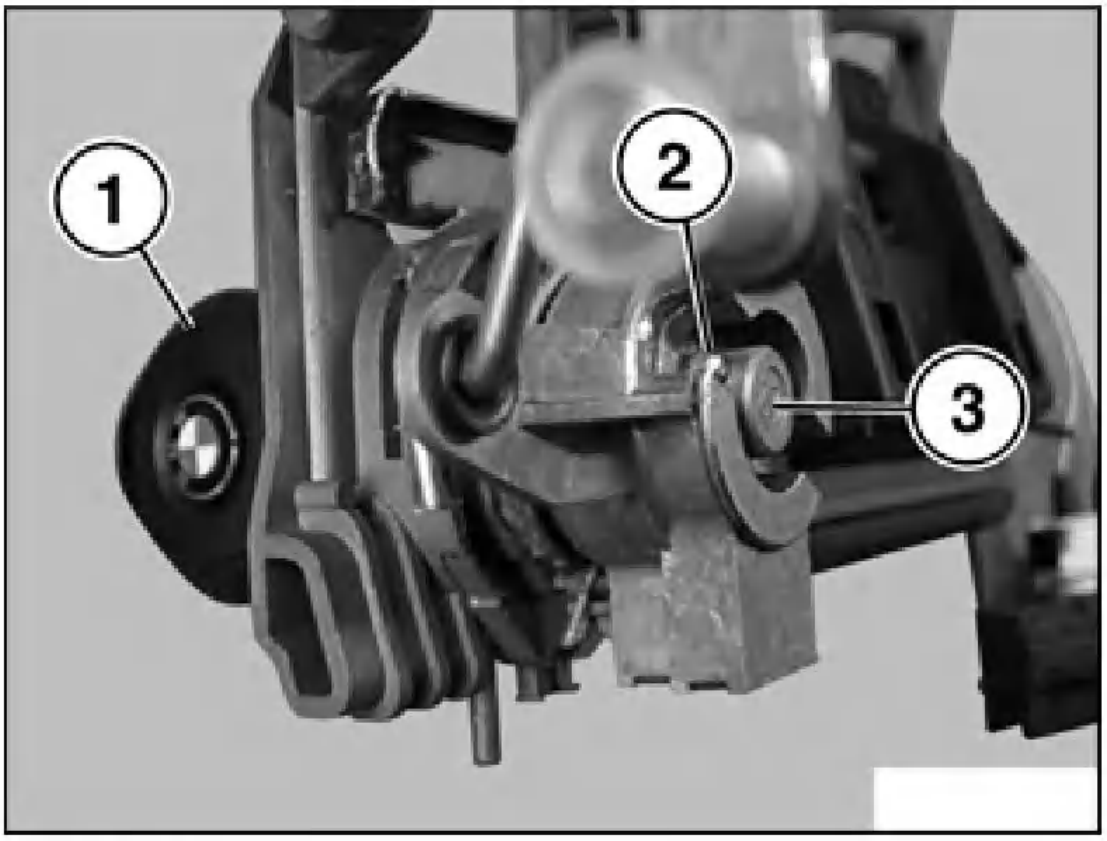


Fig. 101: Removing Outside Handle From Left Or Right Front Door
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If the key (1) is removed from the lock cylinder (2) during disassembly, the encoding plates (3) drop out.

Installation:

When installed, the tip (4) is at the top.

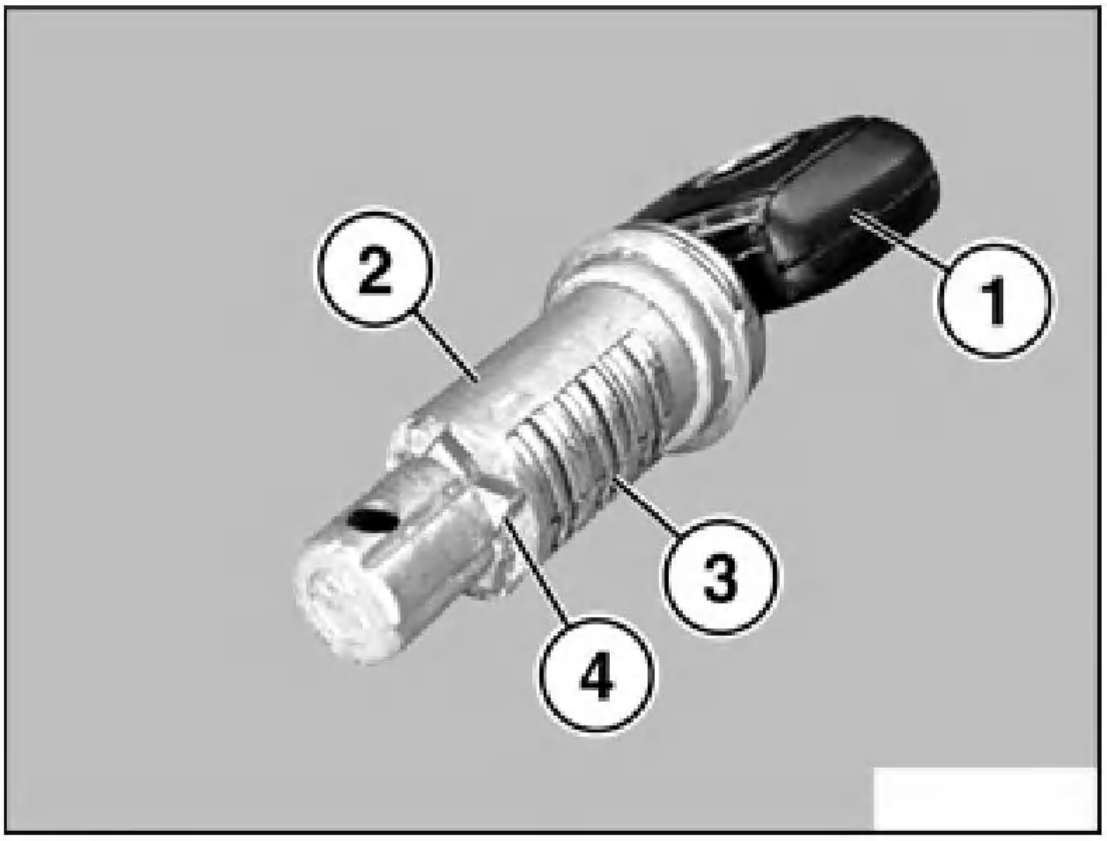


Fig. 102: Identifying Lock Assembly
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The operation "Removing and installing/replacing complete lock cylinder on left or right front door" ends here.

Remove clip (1) and lift out micro-switch (2). Remove cable (3) from the guide (4). Twist contactor socket (5) and remove. Remove actuating rod (6).

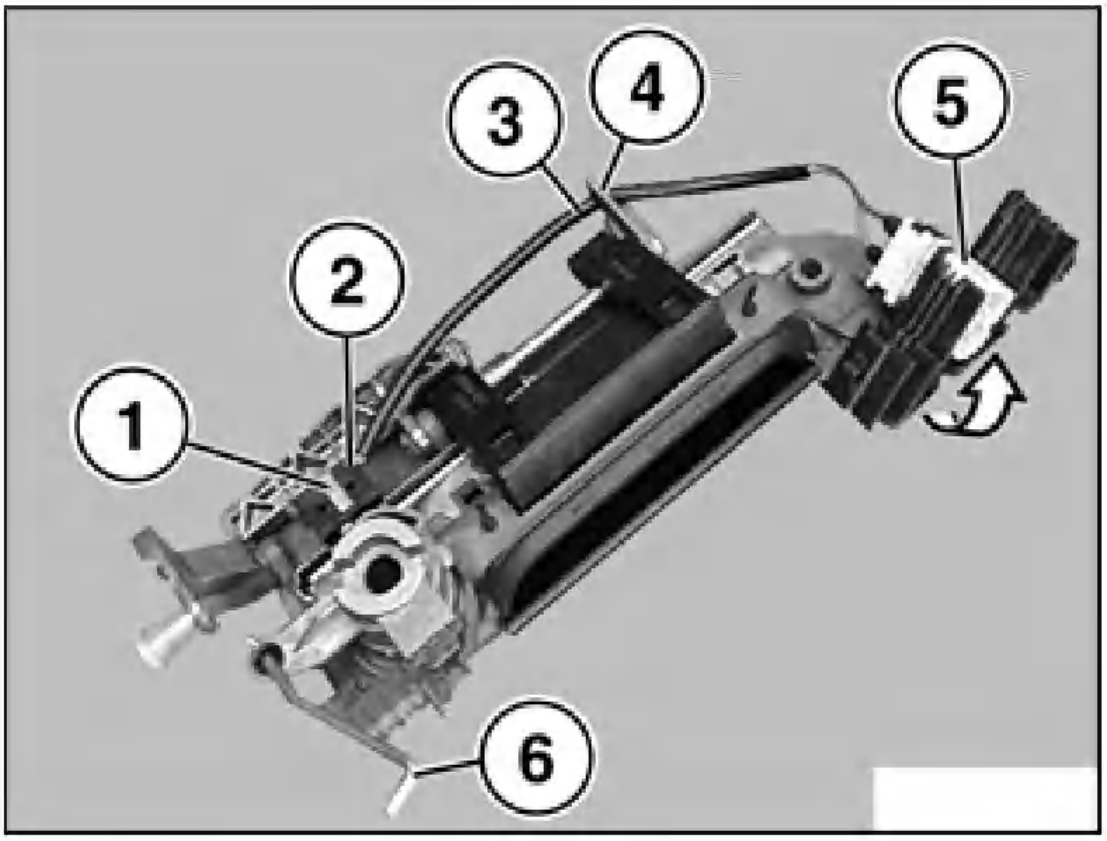


Fig. 103: Removing Actuating Rod
Courtesy of BMW OF NORTH AMERICA, INC.

51 21 194 REMOVING AND INSTALLING/REPLACING FINISHER FROM OUTSIDE HANDLE ON LEFT OR RIGHT FRONT DOOR

Unclip cover.

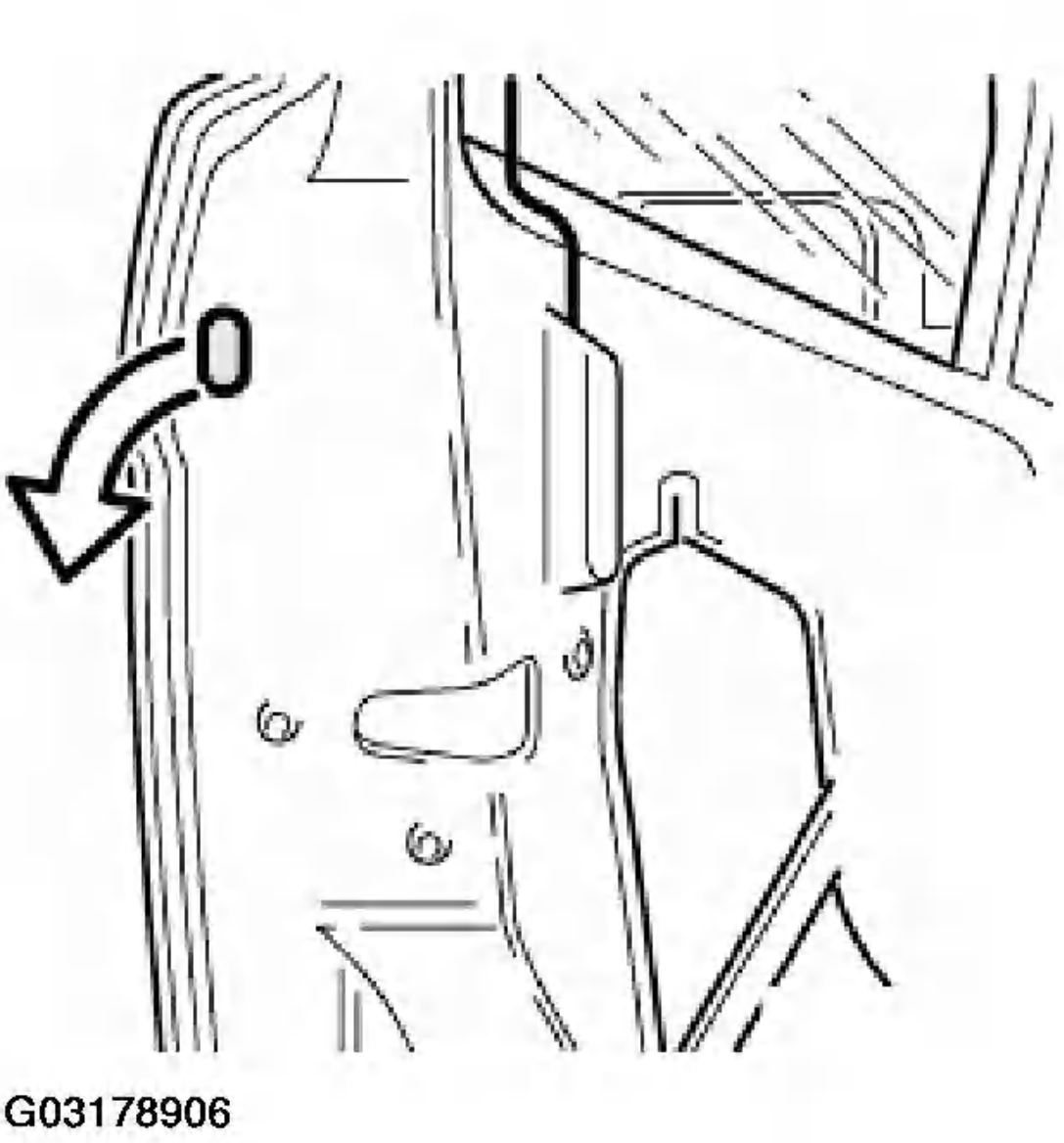


Fig. 104: Removing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Push slide forwards with special tool 51 3 190 and remove finisher from outside handle.

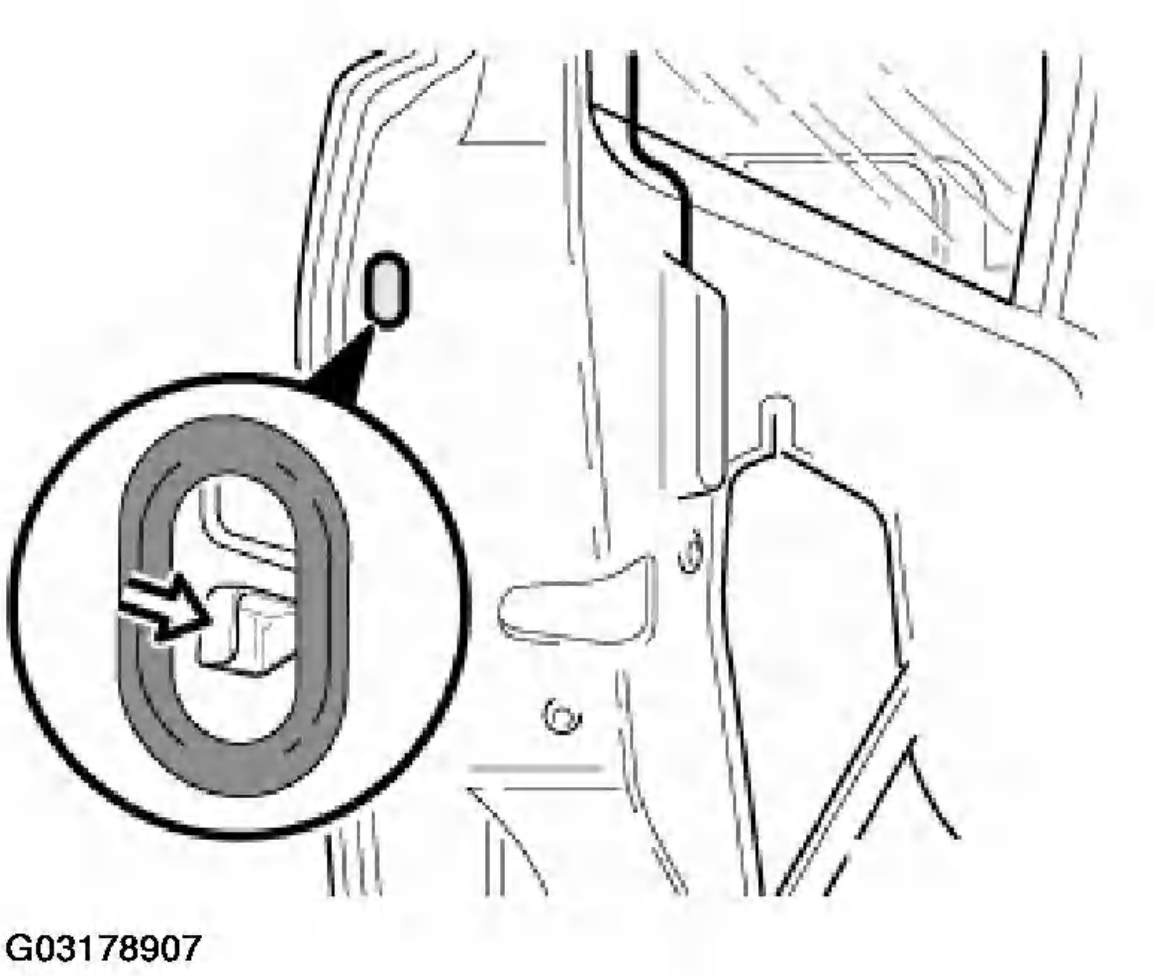


Fig. 105: Removing Finisher From Outside Handle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install finisher for outside handle, pull slide backwards with special tool 51 3 190 and ensure it is correctly engaged.

51 21 200 REMOVING AND INSTALLING/REPLACING OUTSIDE HANDLE AND LOCK ACTUATOR ON FRONT LEFT OR RIGHT DOOR (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Operation Is Described In:

Removing and installing/replacing outside handle from front left or right door (Z3 Roadster), refer to 51 21 170 REMOVING AND INSTALLING/REPLACING OUTSIDE HANDLE ON FRONT LEFT OR RIGHT DOOR (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

51 21 225 REMOVING AND INSTALLING/REPLACING INSIDE DOOR HANDLE IN LEFT OR RIGHT FRONT DOOR

Remove door trim panel, refer to 51 41 000 REMOVING AND INSTALLING FRONT LEFT OR RIGHT DOOR TRIM PANEL (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Unfasten screw, unclip door handle from linkage and remove.

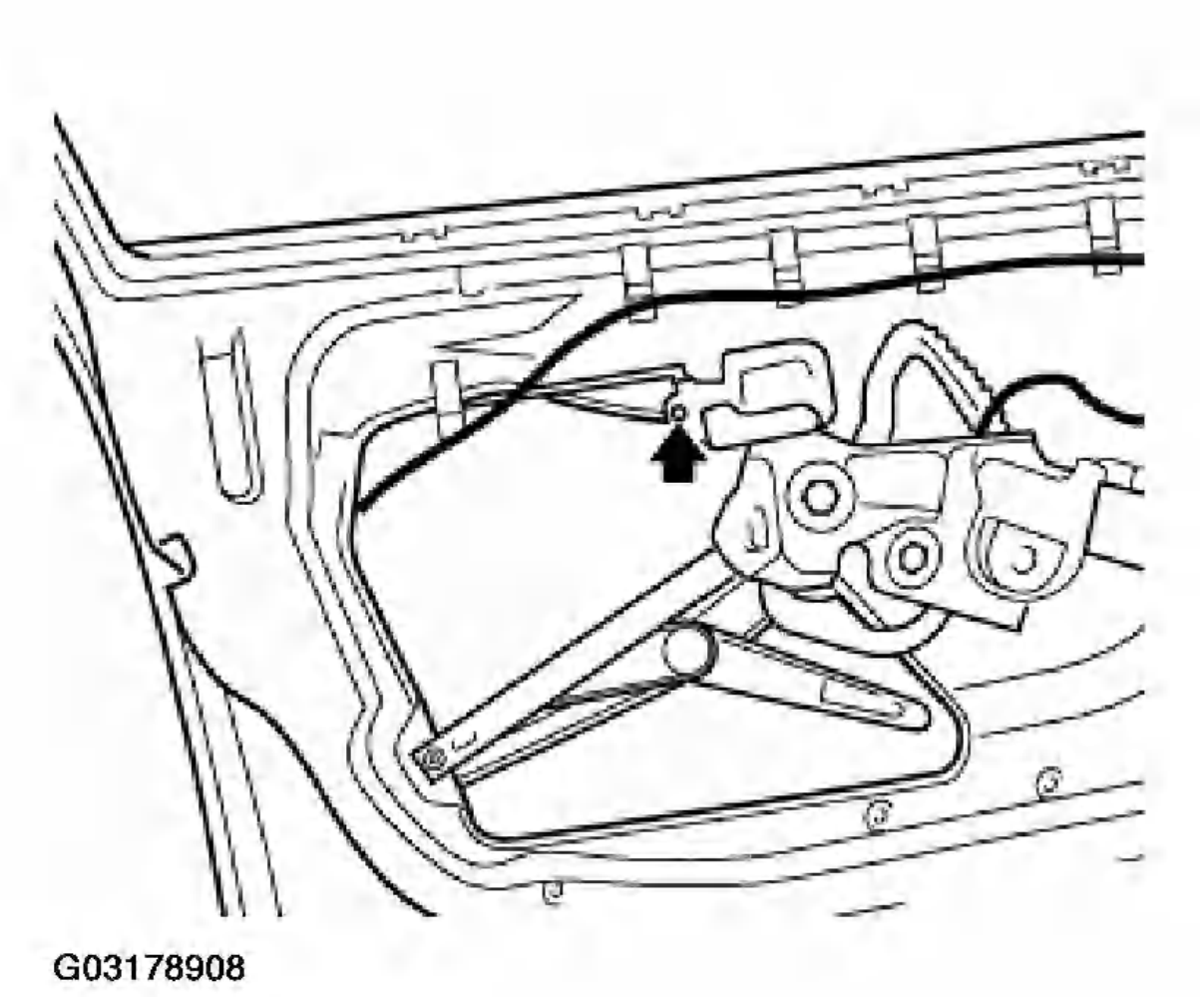


Fig. 106: Removing Door Handle From Linkage
Courtesy of BMW OF NORTH AMERICA, INC.

51 21 280 REMOVING AND INSTALLING OR REPLACING DOOR STOP ON LEFT OR RIGHT FRONT DOOR

Remove door trim panel, refer to 51 41 000 REMOVING AND INSTALLING FRONT LEFT OR RIGHT DOOR TRIM PANEL (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Pull off inner foil and/or part of front acoustic insulation.

NOTE: To prevent damage to paintwork, mask the area around the rivet with fabric adhesive tape.

Slide rubber grommet to one side and, if necessary, unfasten cable strap.

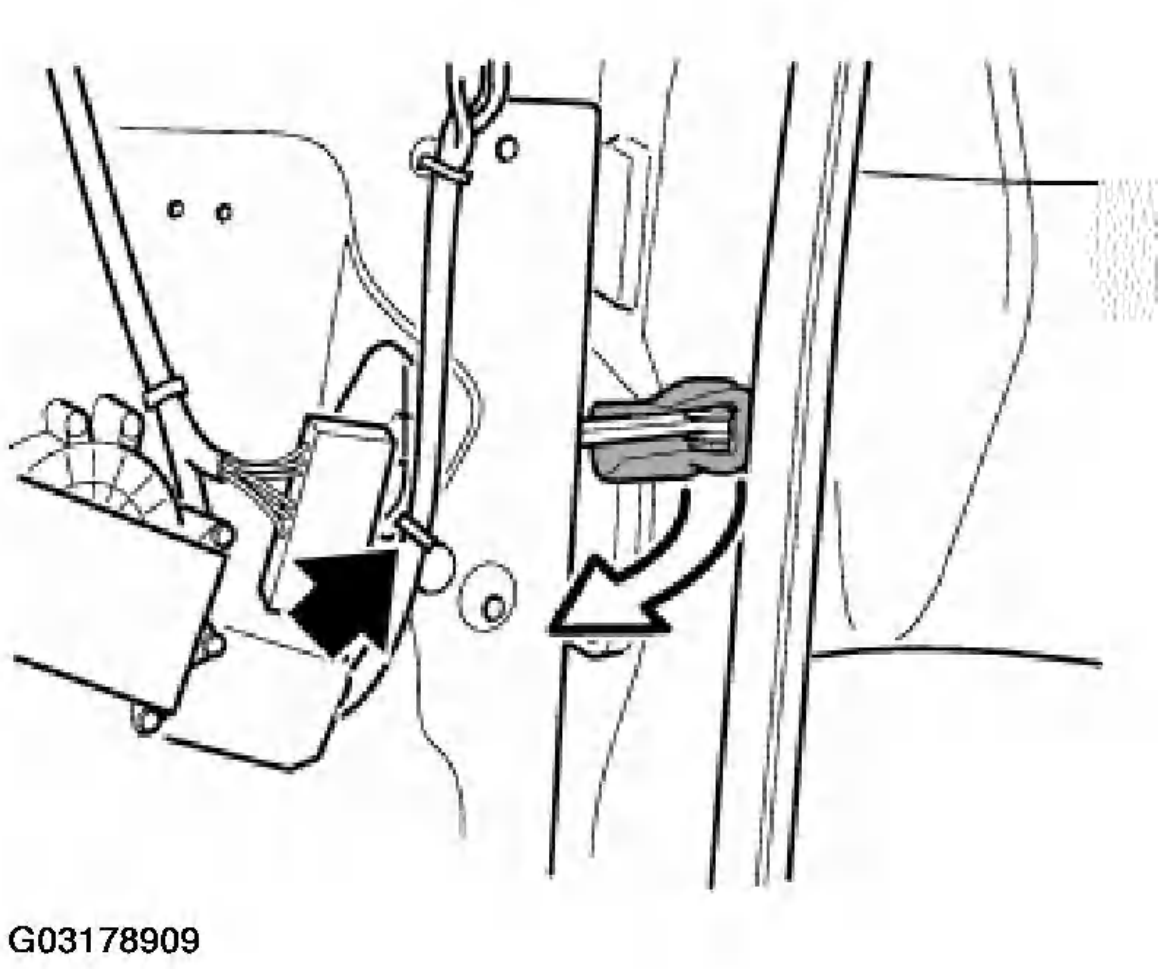


Fig. 107: Removing Cable Strap
Courtesy of BMW OF NORTH AMERICA, INC.

Old Build Status:

Pull lock plate off towards rear.

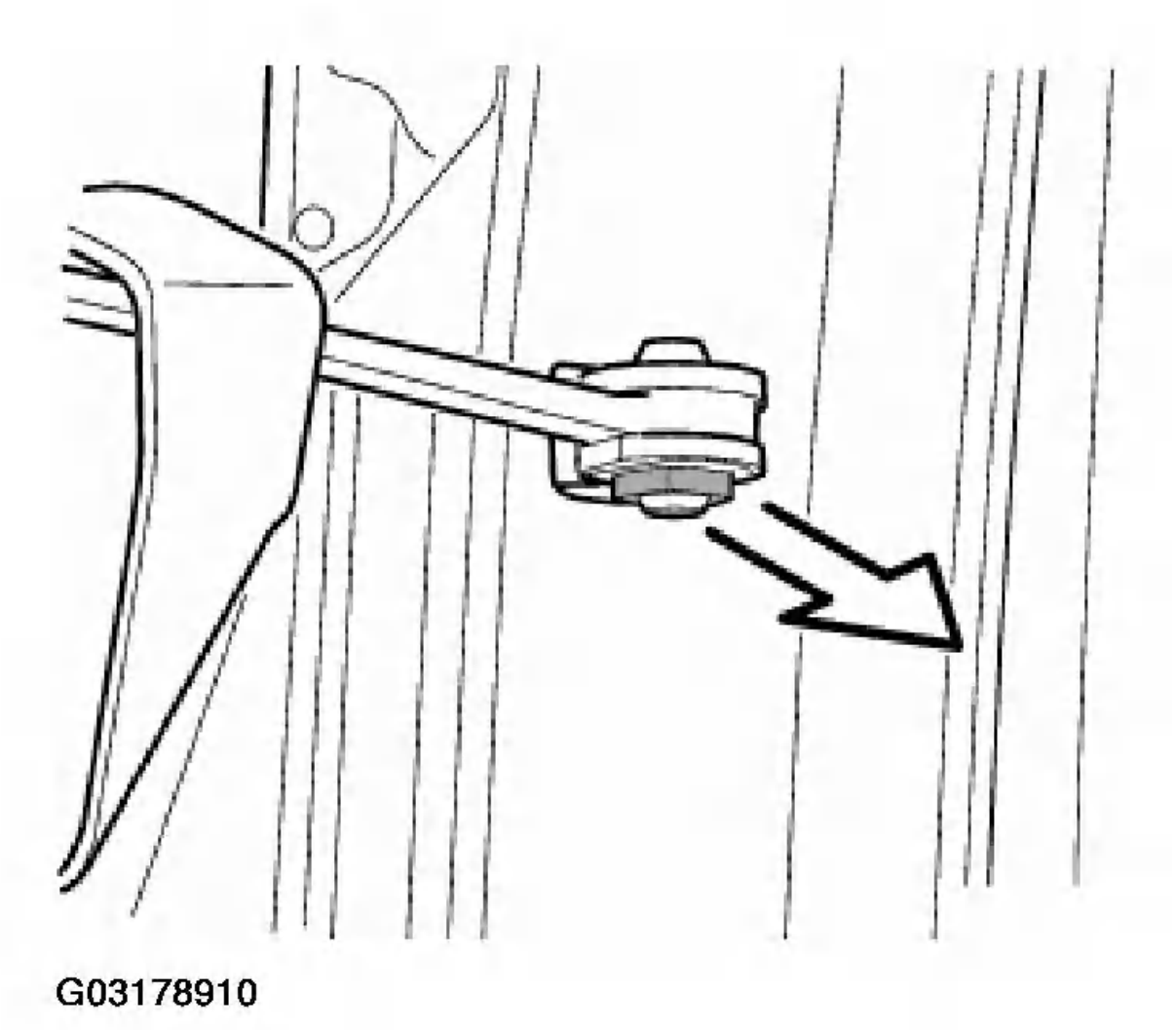


Fig. 108: Removing Lock Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Old Build Status:

Drive rivet out in upwards direction.

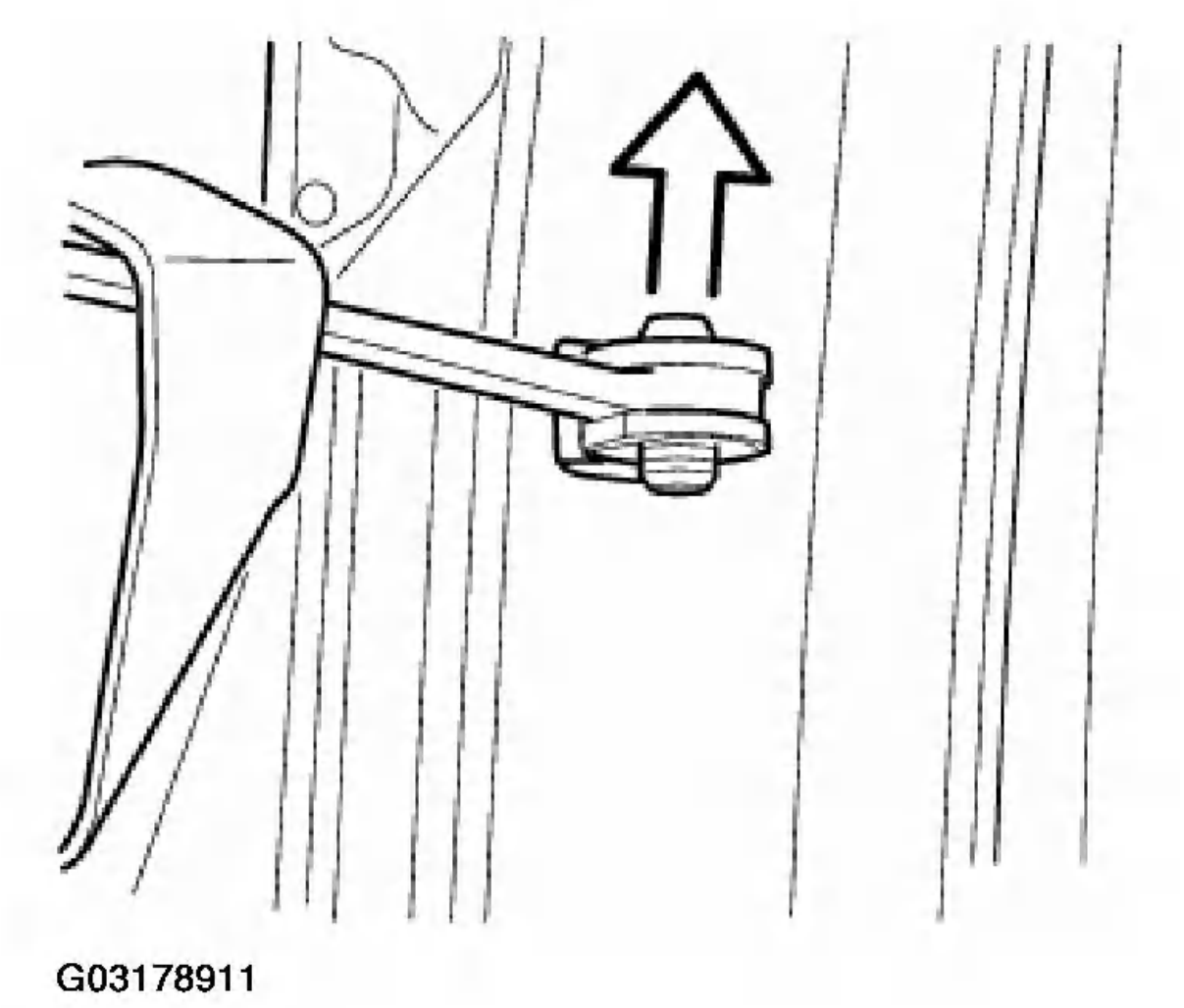


Fig. 109: Driving Rivet Out
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off rubber grommet.

New Build Status:

To brace a socket nut (1) (e.g. size 10 mm), mask with fabric adhesive tape (damage to paintwork) and use hammer (500 grammes).

Drive rivet (2) upwards to remove.

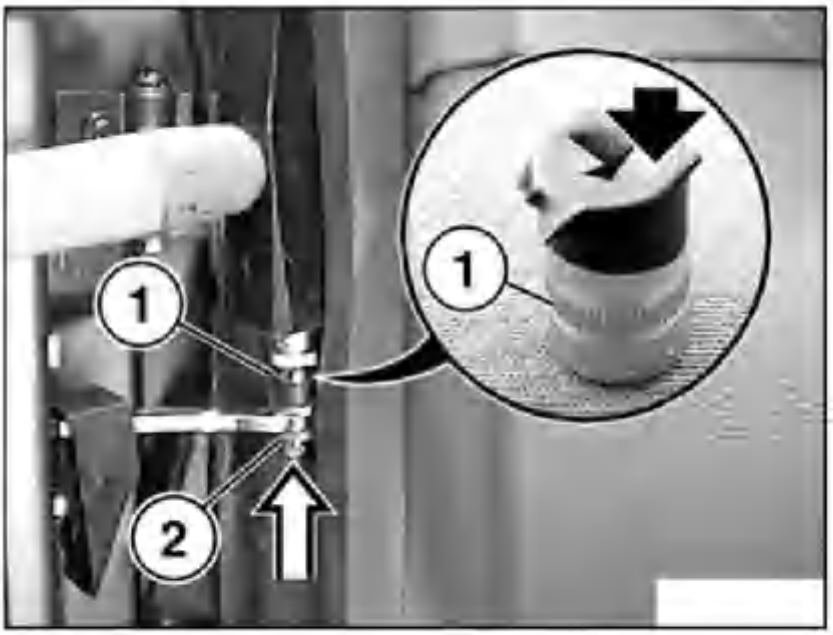


Fig. 110: Identifying Socket Nut
Courtesy of BMW OF NORTH AMERICA, INC.

New Build Status:

Installation:

Insert lug (1) in bore. Fit tab (2) on rivet (3) facing door. Pull off fabric adhesive tape (4).

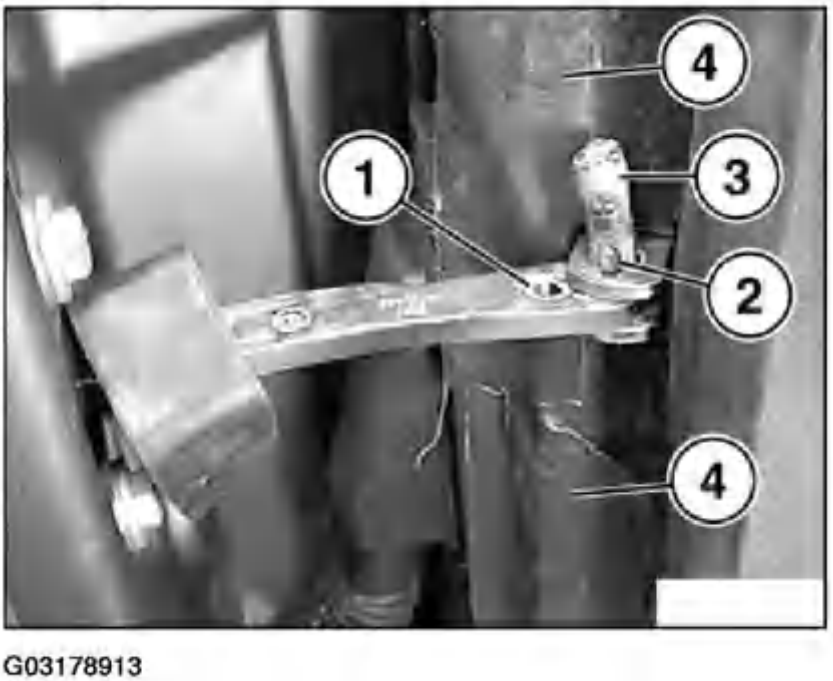


Fig. 111: Identifying Lug In Bore

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws.

Push retarder upwards into door and remove.

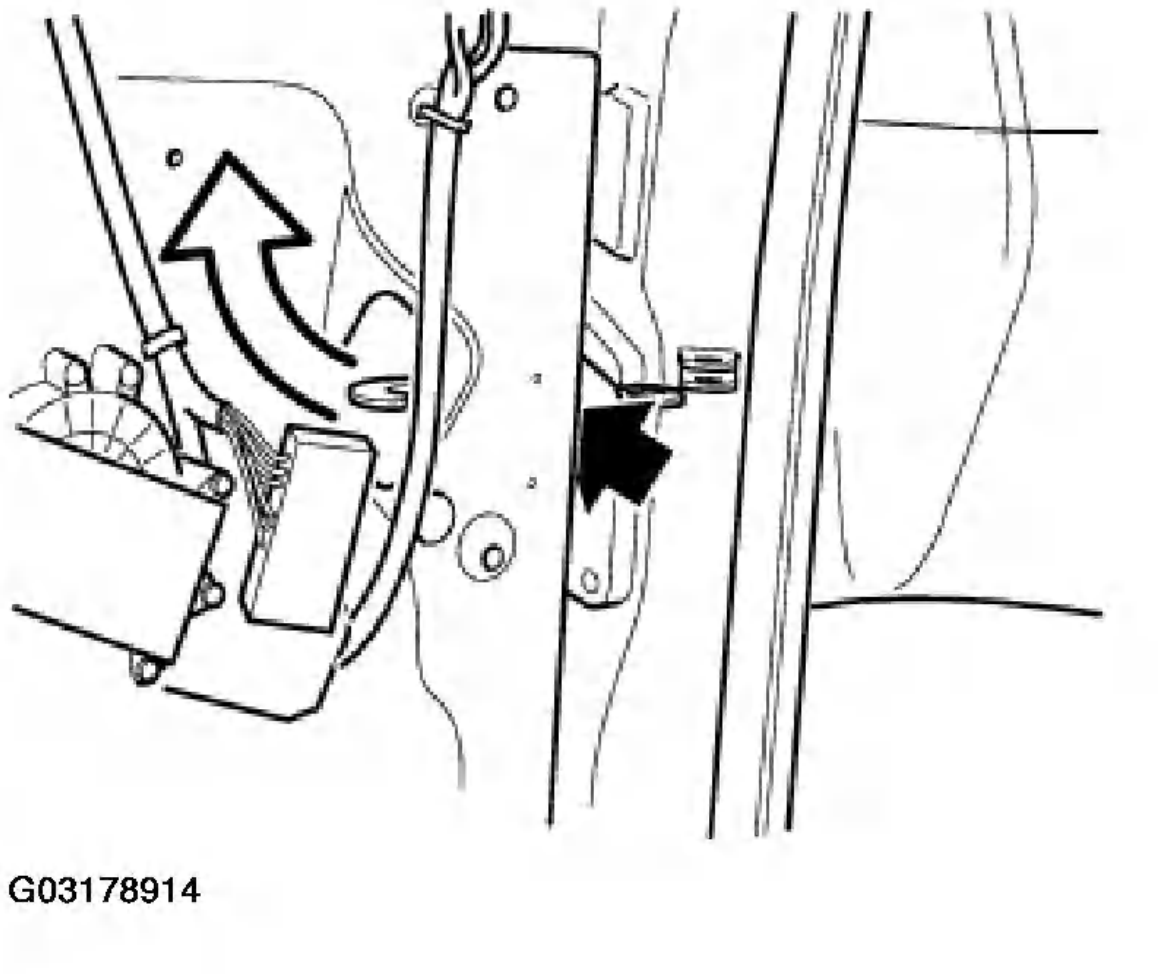


Fig. 112: Removing Retarder
Courtesy of BMW OF NORTH AMERICA, INC.

51 21 300 REMOVING AND INSTALLING OR REPLACING WINDOW RECESS COVER STRIP ON OUTSIDE OF LEFT OR RIGHT FRONT DOOR

Attach adhesive tape (1) below window cavity cover strip (2) (risk of damage).

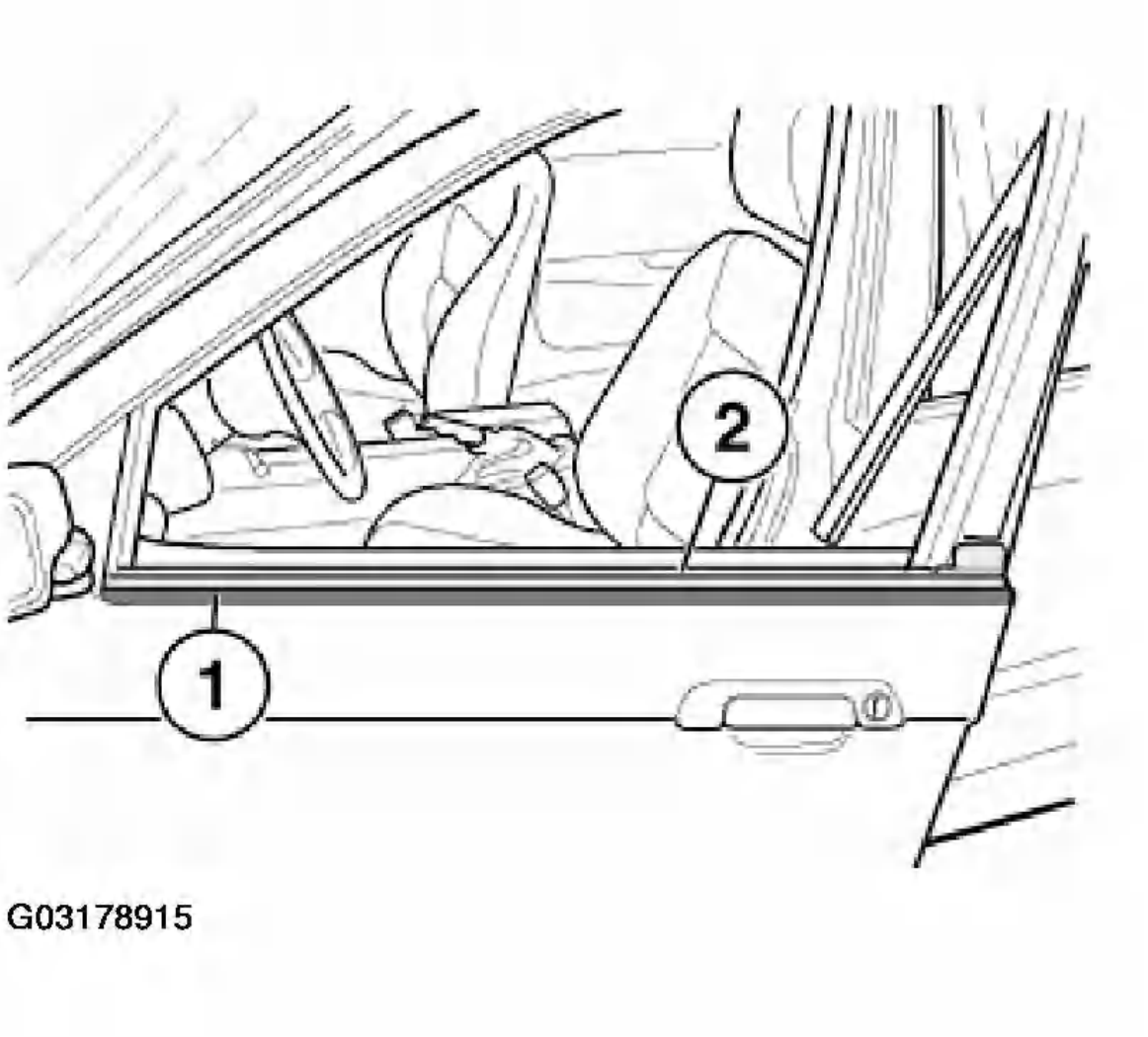


Fig. 113: Identifying Cavity Cover Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Using special tool 00 9 311, starting at back, (1) and moving to front (2), lift out window cavity cover strip.

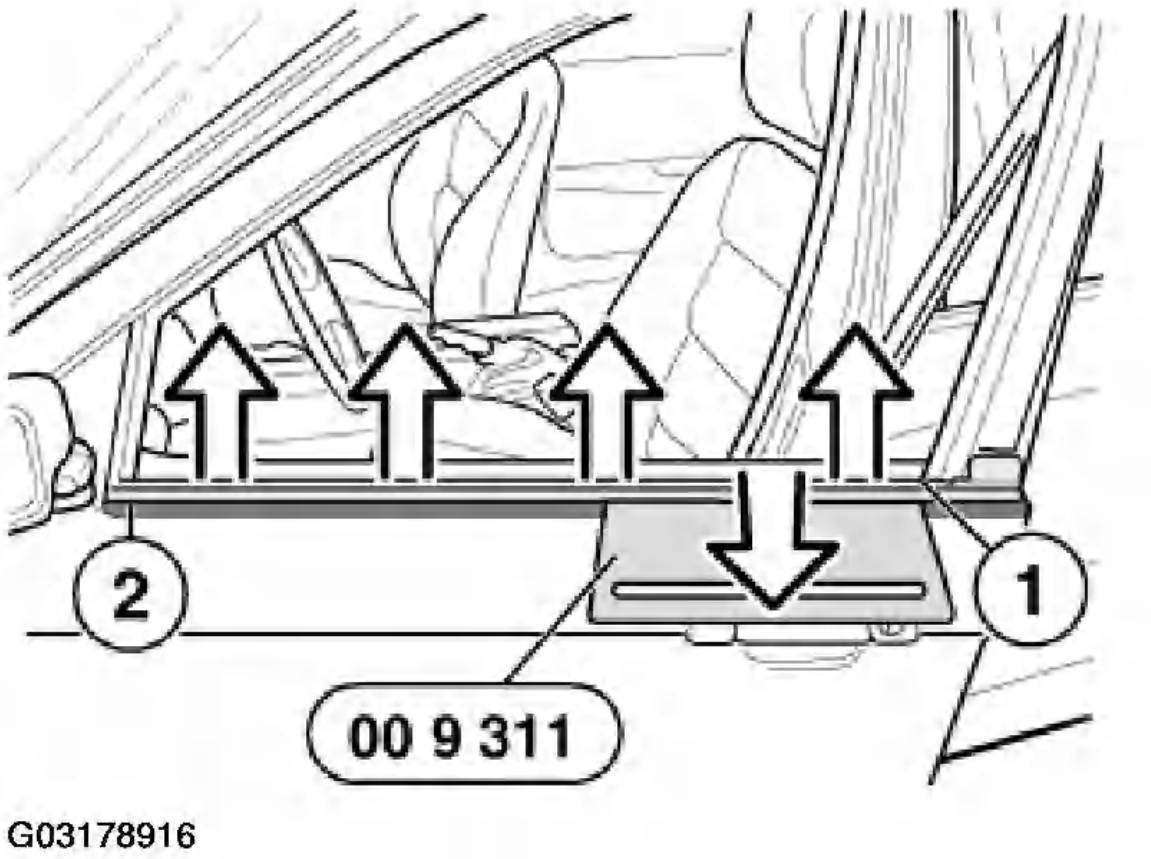


Fig. 114: Removing Window Cavity Cover Strip
Courtesy of BMW OF NORTH AMERICA, INC.

51 21 351 REPLACING WINDOW CAVITY SEAL ON FRONT LEFT OR RIGHT DOOR, INSIDE (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Operation Is Identical To:

Removing and installing door trim panel, refer to 51 41 000 REMOVING AND INSTALLING FRONT LEFT OR RIGHT DOOR TRIM PANEL (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

HOOD LATCH, LOCKS

51 23 265 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT GAS STRUT FOR ENGINE BONNET/HOOD

Refer to 51 23 265 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT GAS STRUT FOR ENGINE BONNET/HOOD .

TRUNK LATCH, LOCKS

51 24 004 ADJUSTING TRUNK LID LOCK (Z3 ROADSTER)

Requirement:

Trunk lid and gaskets must be correctly fitted and adjusted.

If necessary, adjust trunk lid to fit.

Completely screw down detent buffer in left/right trunk lid.

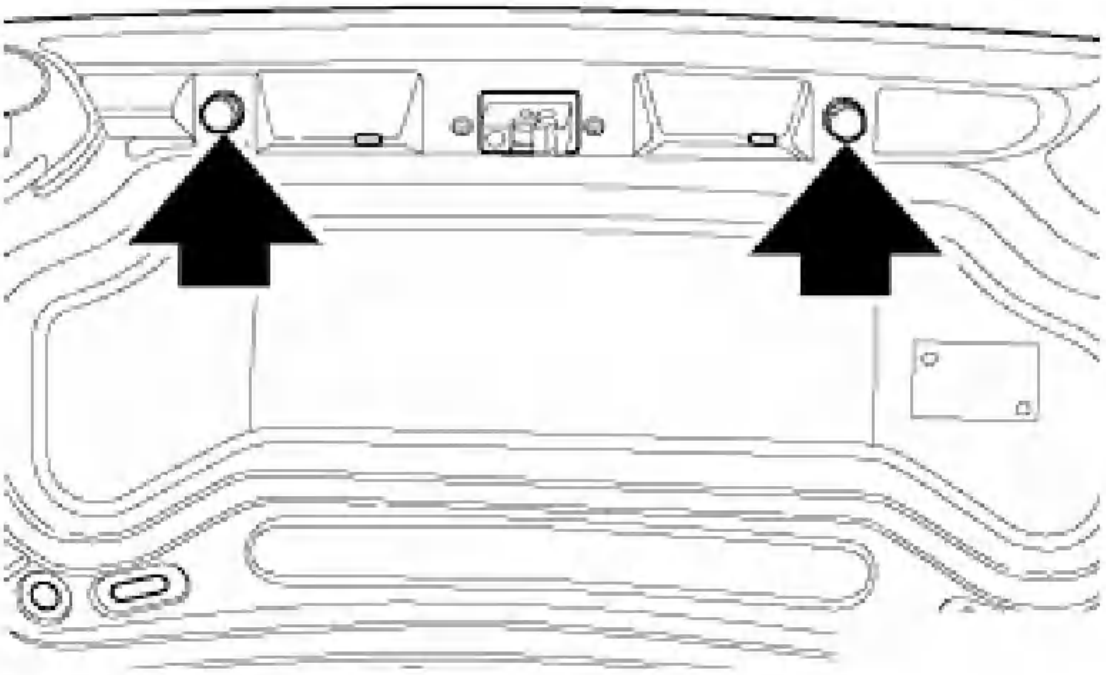


Fig. 115: Identifying Screws For Removing Detent Buffer
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen screws in lower section of trunk lid until it is just still able to move, allowing it to center itself.

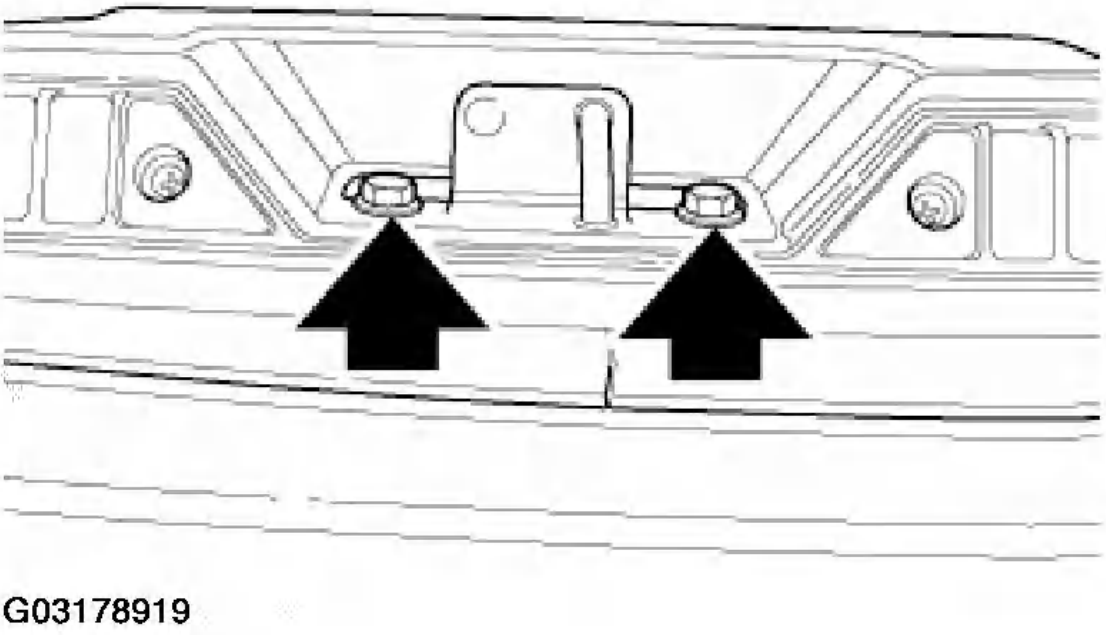


Fig. 116: Loosening Trunk Lid Lock Screws
Courtesy of BMW OF NORTH AMERICA, INC.

The lower section of the trunk lid lock must not scrape against the trunk lid lock.

Adjust lower section of trunk lid lock:

Close trunk lid, holding down the lock button to prevent the trunk lid lock from engaging.

This enables lower section of trunk lid lock to adjust itself correctly.

Open trunk lid.

Tighten screws on lower section of trunk lid lock.

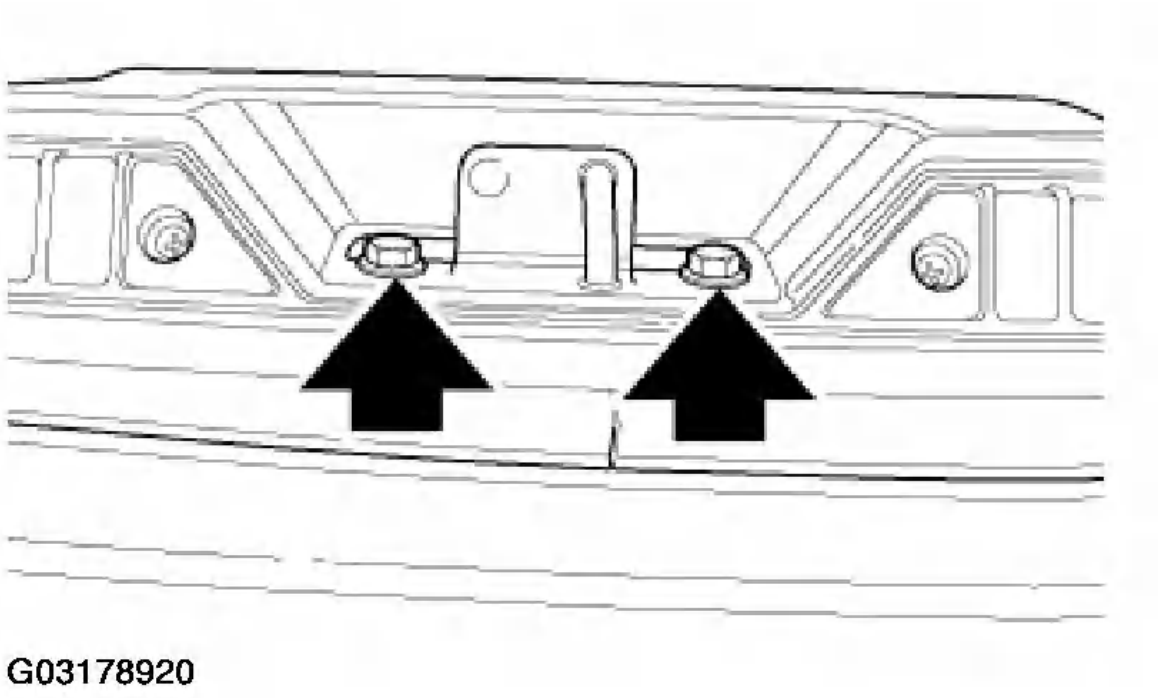


Fig. 117: Tightening Trunk Lid Lock Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Check adjustment of trunk lid and trunk lid lock, repeating adjustment if necessary.

Unscrew detent buffer until closed trunk lid is flush on left/right detent buffers.

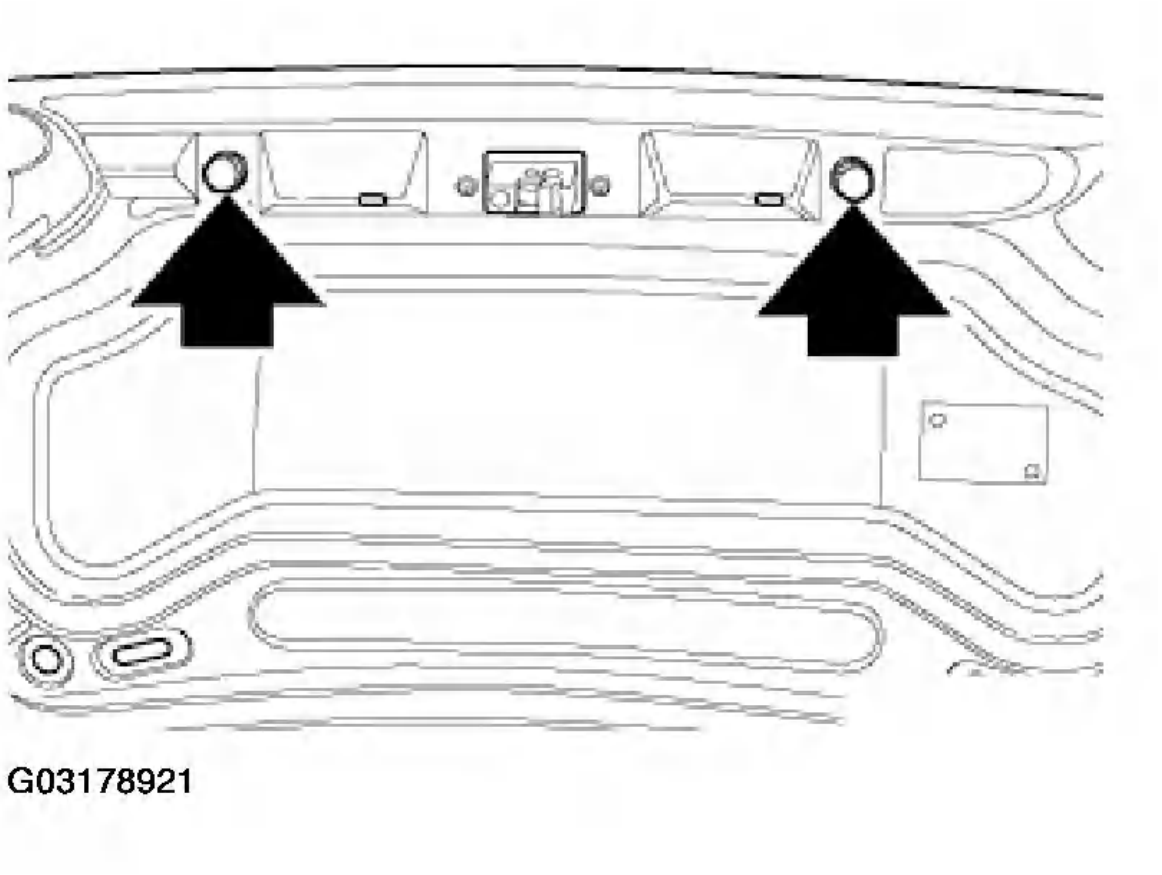


Fig. 118: Identifying Screws For Removing Detent Buffer
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: The trunk lid must not be higher than the side panels, otherwise preload would affect height adjustment!

CENTRAL LOCKING SYSTEM

51 26 000 REPLACING SWITCHES (CENTRAL LOCKING DRIVE) FOR DOOR LOCKING ON LEFT OR RIGHT SIDES

Operation Is Described In:

Removing and installing/replacing lock on left or right front door, refer to 51 21 090 REMOVING AND INSTALLING/REPLACING DOOR LOCK ON FRONT LEFT OR RIGHT DOOR (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

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 5Â°C to 25Â°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 < 80Â°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 or 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 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 15Â°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. Refer to 00 00... INFORMATION / WARNING LABELS .

Tools For Cutting Through Adhesive Bead:

SPECIAL TOOL SPECIFICATION

Type	Model	Order/Part Number
Special cutter (manufacturer: Fein) with oscillating blade.	Pneumatically operated. Electrically operated.	81 43 9 429 183. 81 43 9 427 786.
BMW blade set.	All required blades.	81 43 9 428 596.
Blade (U-shape).	19.5mm (1). 24 mm. 36 mm. 45 mm.	6 39 03 118 01 3. 6 39 03 076 01 6. 6 39 03 079 01 2. 6 39 03 154 01 0.
Blade (straight with stop roller).	16 to 35 mm (adjustable). 10 mm (fixed) (1). 14 mm (fixed).	6 39 03 143 01 3. 6 39 03 189 01 0. 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 513 270.
(1) Not included in BMW blade set		

Storage Temperature:

Storage temperature of all adhesive products of 5Â°C to 25Â°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).

Adhesive is applied to window glass with cartridge gun.

When Using Accelerator (Hot Processing):

- Temperature (min. 80 +/- 5Â°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 to 80 +/- 5Â°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 +/- 5 Â°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 +/- 5Â°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". Refer to 51 31 ... REMOVING WINDSCREEN WITH "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. Refer to 51 31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000" .
- with special cutter and oscillating blade.

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 (coating thickness 30 ... 40 ace;m).

Hardening time:

- With infrared, at least 10 minutes.
- Without infrared for at least 60Â°C, at least 30 minutes.
- Without infrared for at least 20Â°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.	a. Clean with spirit (available in pharmacies). b. Observe an air drying time of at least 1 minute (at least 15 minutes when applied to residual bead). c. Apply "Paint Activator A" to paint and residual bead. d. Observe 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: • BMW 83 19 0 147 370, MINI 83 19 0 147 372. Cold cementing: • BMW 83 19 0 147 369, MINI 83 19 0 147 371.	a. Clean with spirit (available in pharmacies). b. Observe an air drying time of at least 1 minute. c. Apply a thin coating of "Glass Activator 1". d. Observe an air drying time of at least 10 minutes.

Adhesive cartridge: • BMW 83 19 0 152 031, MINI 83 19 0 152 032.	

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:

ADHESIVE QUANTITIES EFFECT

Too little adhesive:	Too much adhesive:
• Windscreen rests too low in body cutout. • Strains/tensions may occur (windscreen breakage). • Insufficient squeezing of adhesive bead (leaking).	• 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.

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 (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). 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 22Â°C and 38 % relative air humidity.

At ambient temperatures above 23Â°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 5Â°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 below, Minimum Hardening Time "Without Passenger Airbag"), such as e.g.:

- One wheel on curb.
- 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 below, Minimum Hardening Time "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	Minimum Hardening Time "With Passenger Airbag" (Countries Where Seatbelt Use Is

	Vehicle Can Be Moved)	Not Required By Law)
Hot processing with accelerator.	2 hours.	3 hours (1) .
Cold processing.	9 hours.	20 hours (1) .

(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.

If necessary, seal leakage with appropriate nozzle.

Work Steps For Removing And Installing Windscreens:

Refer to 51 31 000 REMOVING AND INSTALLING WINDSHIELD (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

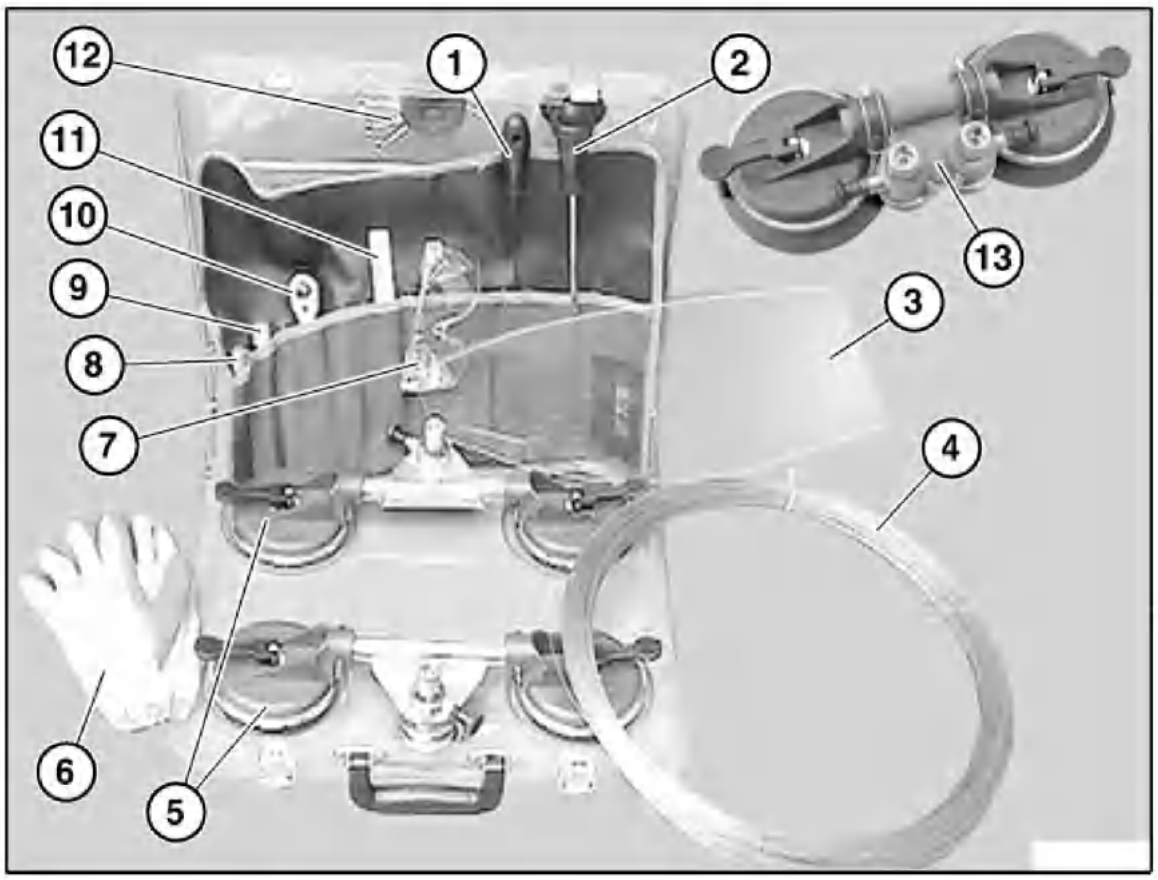
51 31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000"

NOTE: For Special Tool identification, see SPECIAL TOOLS - Z3

Special Tools Required:

- 51 3 270

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		

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Fig. 119: Identifying Components Of Windscreen Removal System "Roll Out 2000"
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Using the "Roll Out 2000" system 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). Refer to 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.

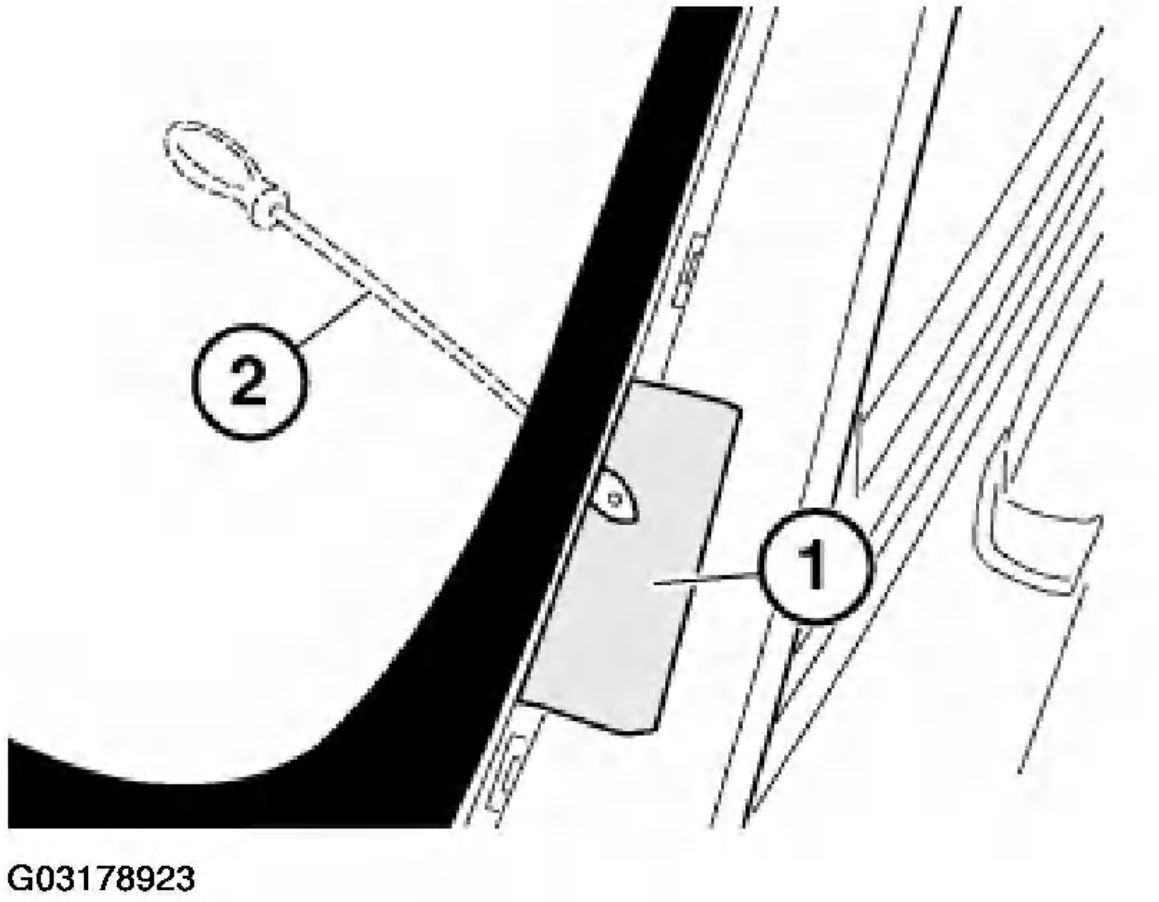


Fig. 120: Identifying Wire Starter
Courtesy of BMW OF NORTH AMERICA, INC.

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.

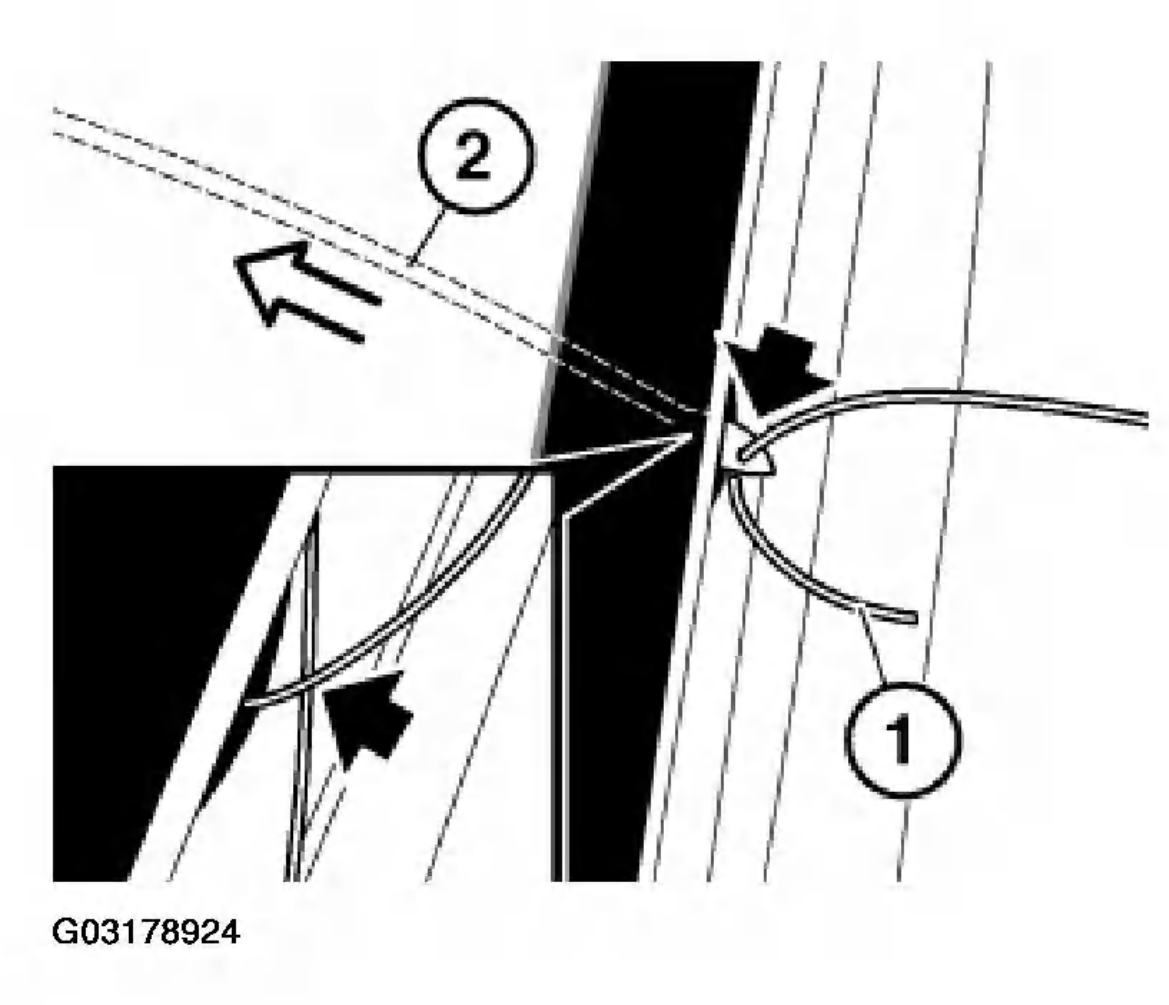


Fig. 121: Pulling Cutting Wire Into Car
Courtesy of BMW OF NORTH AMERICA, INC.

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.

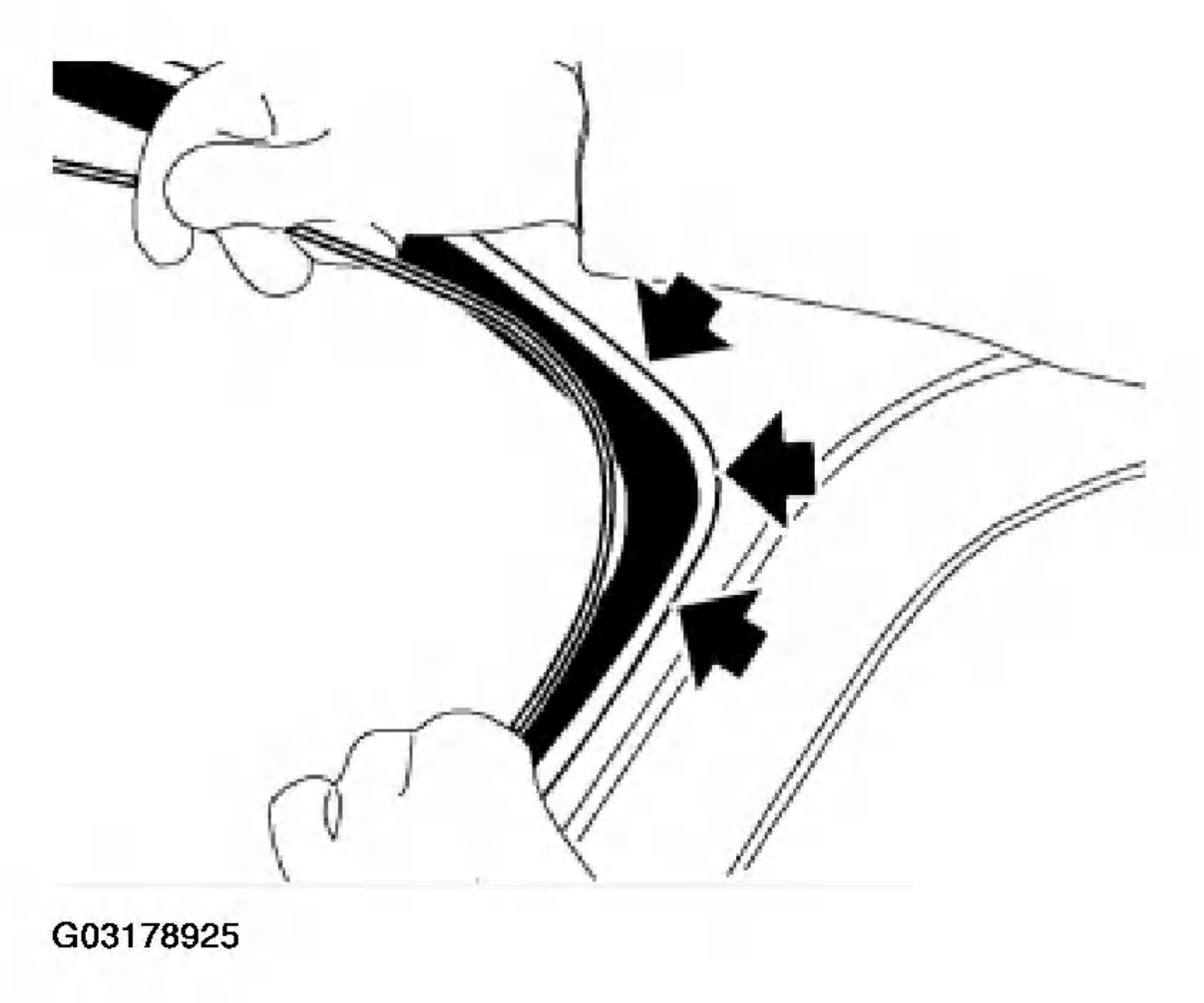


Fig. 122: Laying Cutting Wire Around Windscreen
Courtesy of BMW OF NORTH AMERICA, INC.

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).

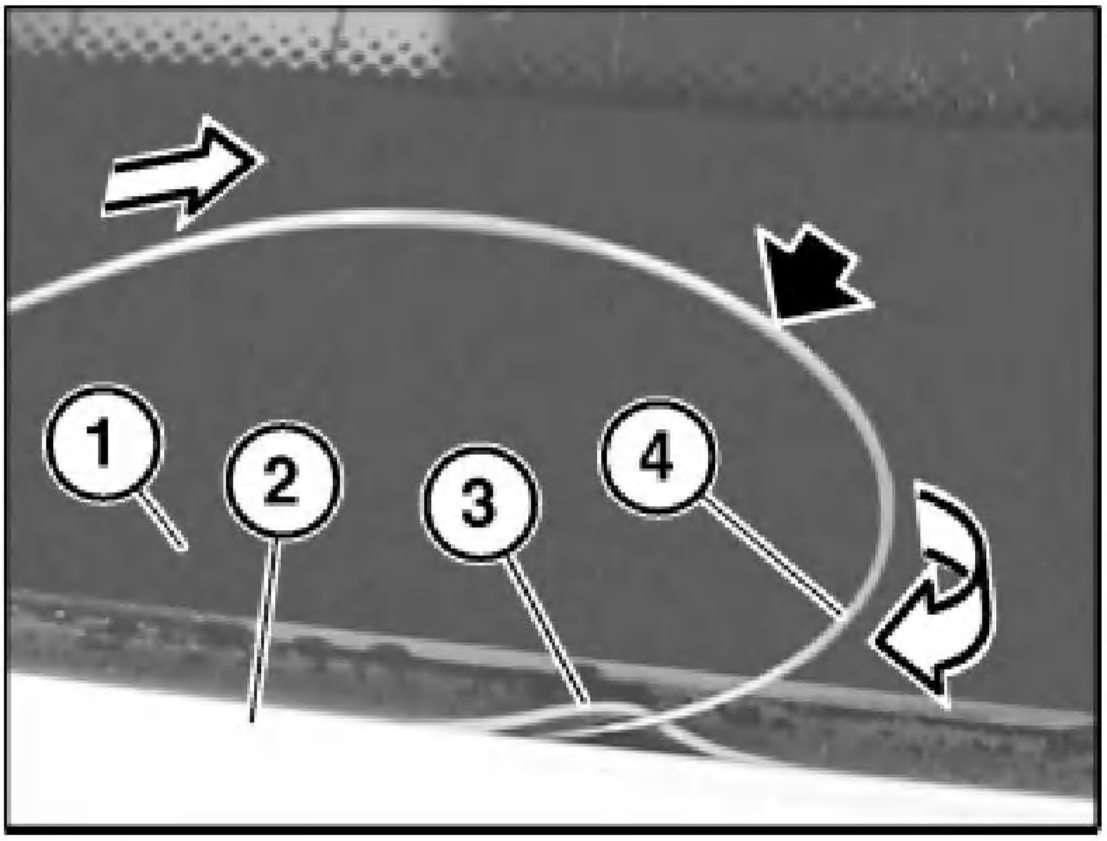


Fig. 123: Identifying Moistened Cutting Wire
Courtesy of BMW OF NORTH AMERICA, INC.

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).

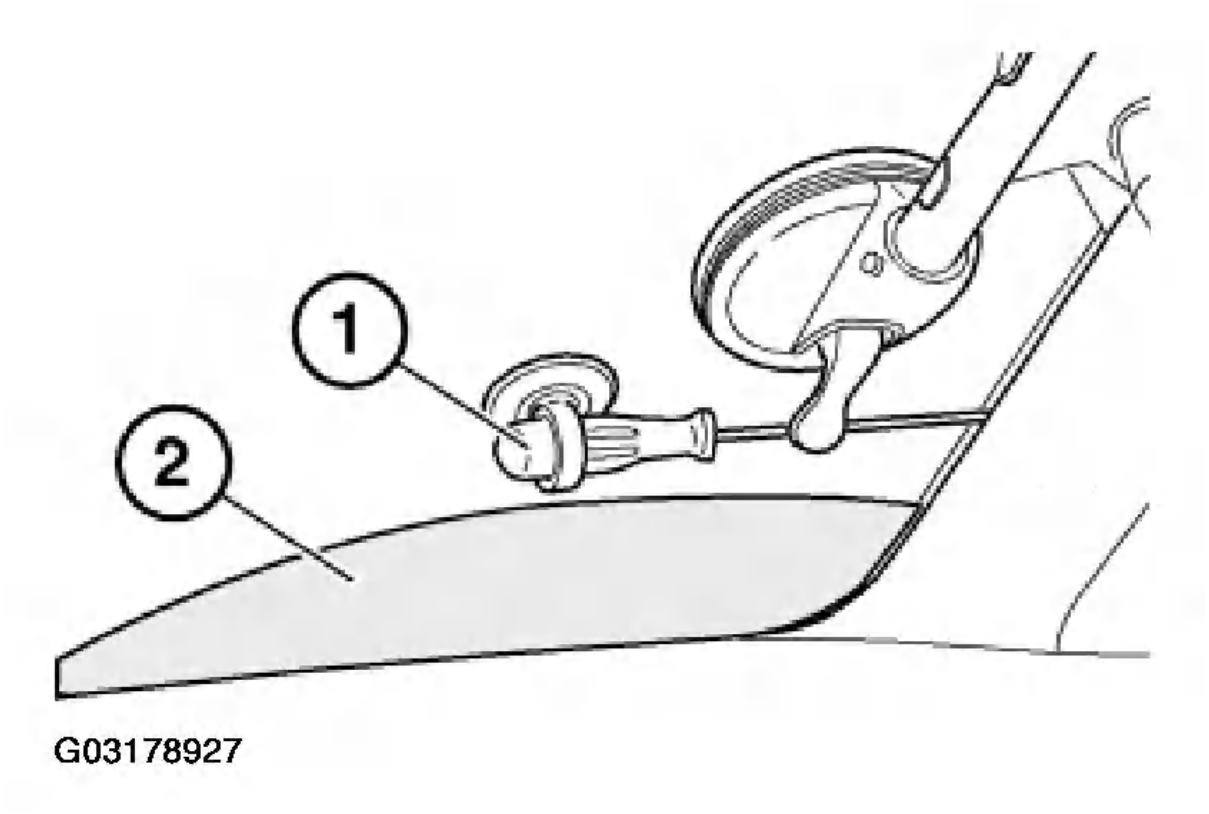


Fig. 124: Identifying Parabolic Tool And Plastic Washer
Courtesy of BMW OF NORTH AMERICA, INC.

- Move parabolic tool (1) during removal so that wire cannot get caught.
- Always guide plastic washer (2) between wire and panel.

Starting Removal:

- Place windlass (1) on windscreen.

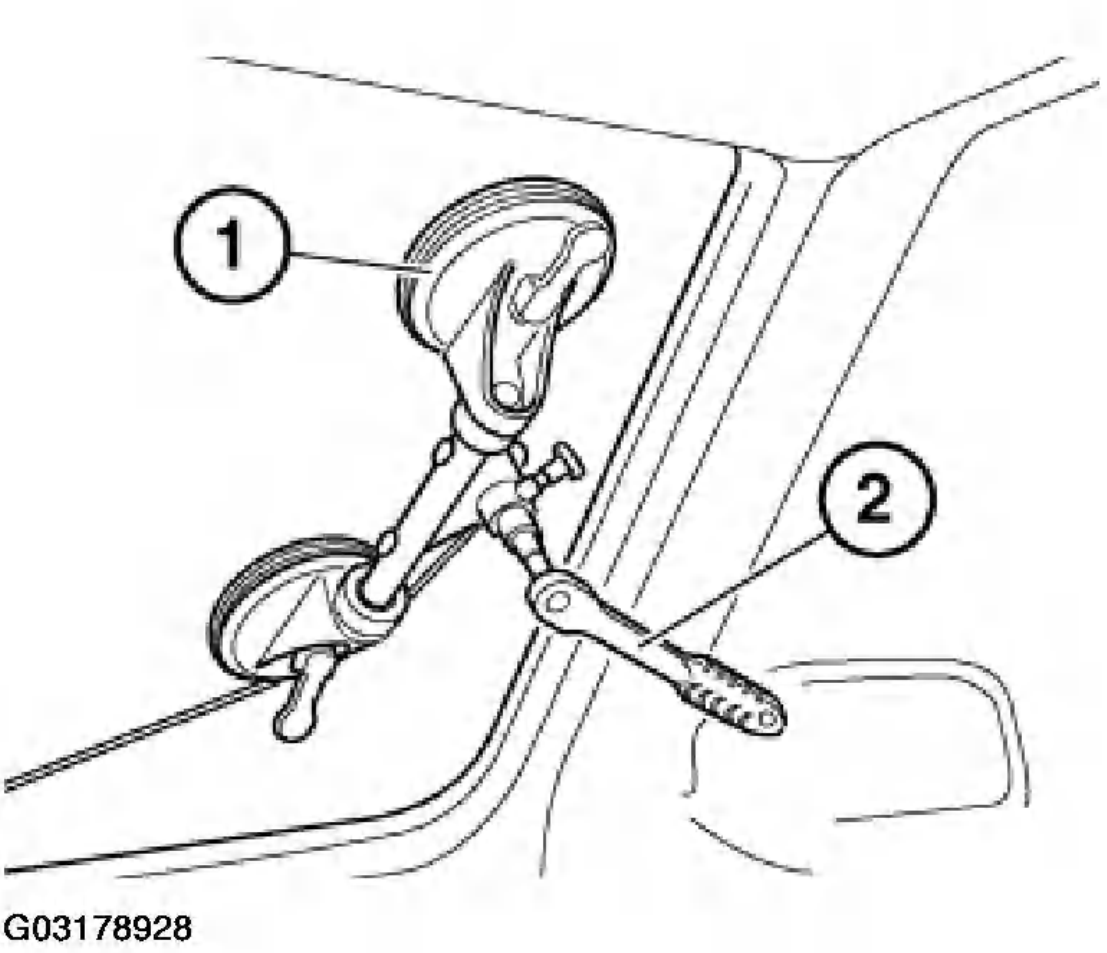


Fig. 125: Placing Windlass On Windscreen
Courtesy of BMW OF NORTH AMERICA, INC.

- 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.

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.

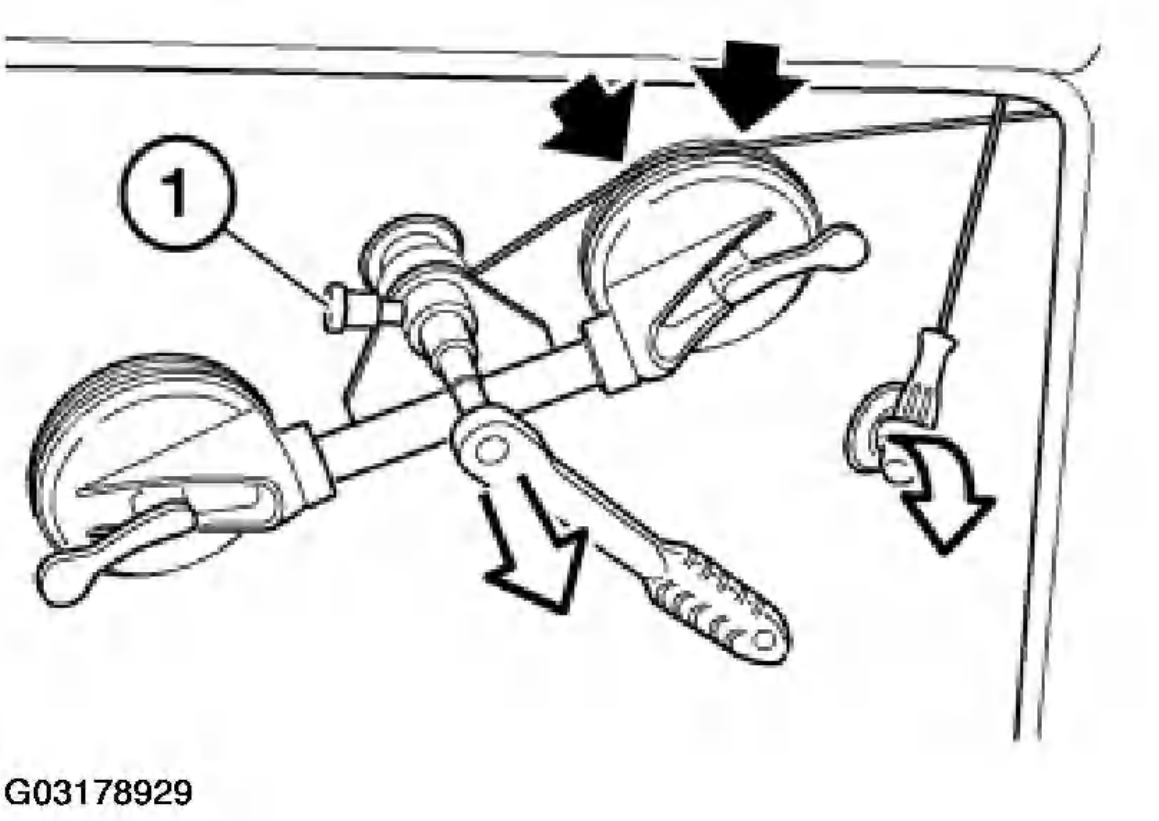


Fig. 126: Moving Windlass
Courtesy of BMW OF NORTH AMERICA, INC.

- 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.

Installing Second Windlass:

- Secure second windlass by suction on windscreen.

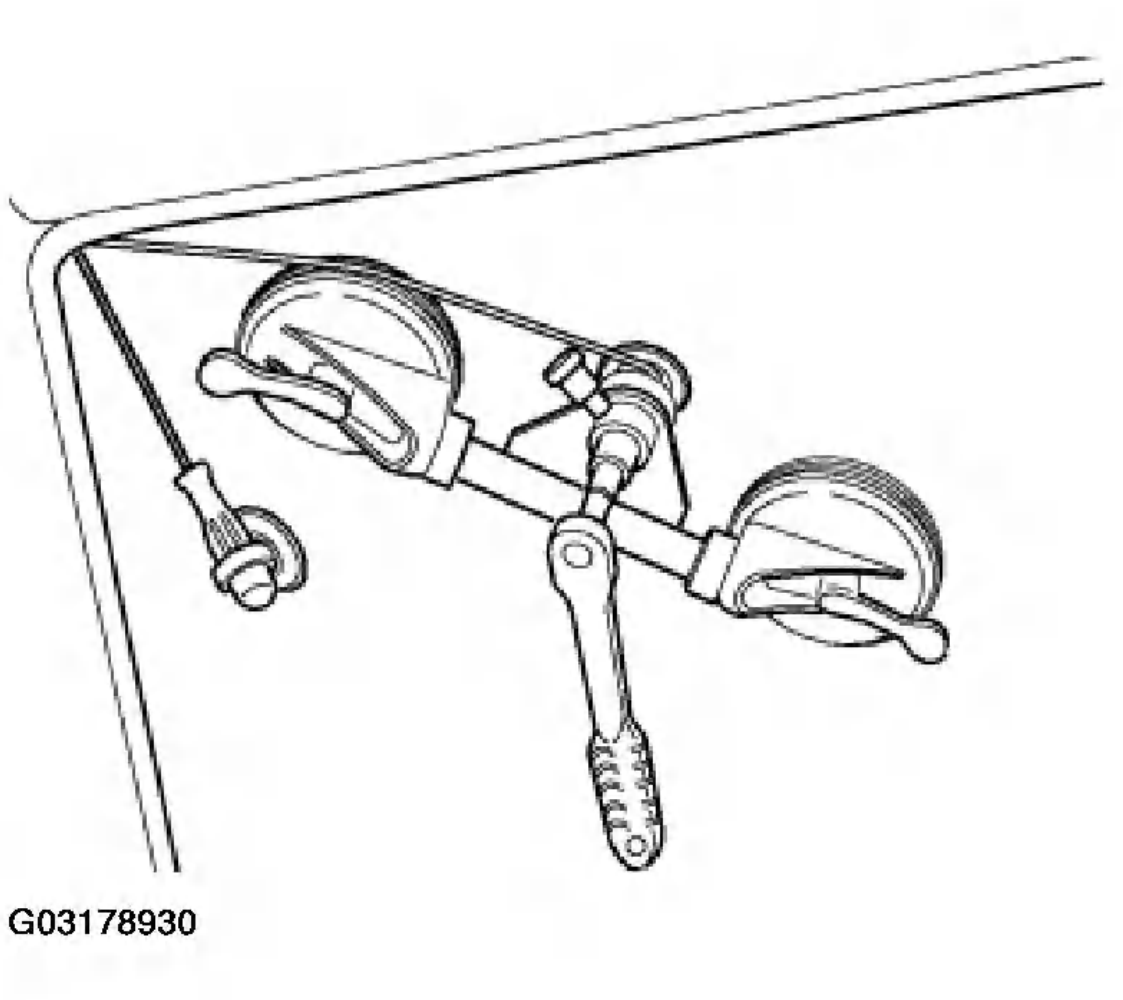


Fig. 127: Installing Second Windlass
Courtesy of BMW OF NORTH AMERICA, INC.

- Feed second wire end into coil.
- Cut left side and top left corner point, as described above.
- Finish removal.
- Remove "Roll Out 2000".

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.

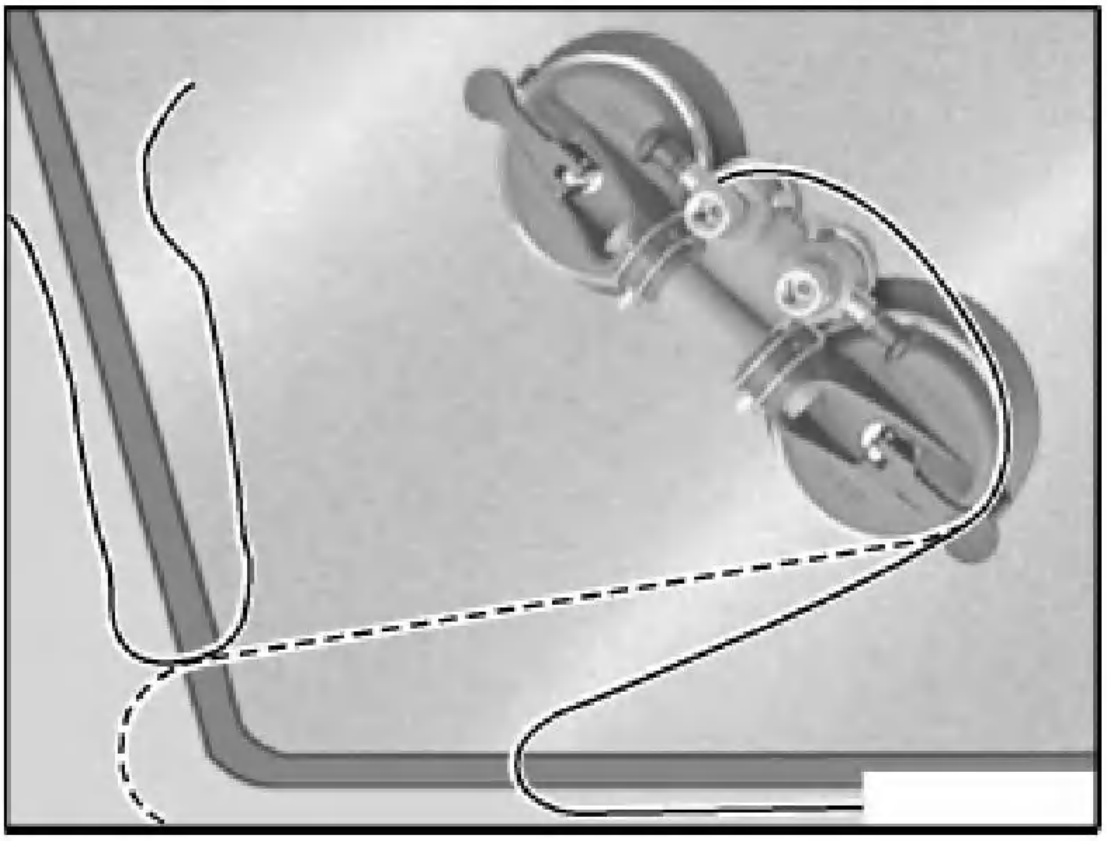


Fig. 128: Identifying Windlass With Double Coil
Courtesy of BMW OF NORTH AMERICA, INC.

- 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.
- Feed other wire end into free coil so that the wires cross.

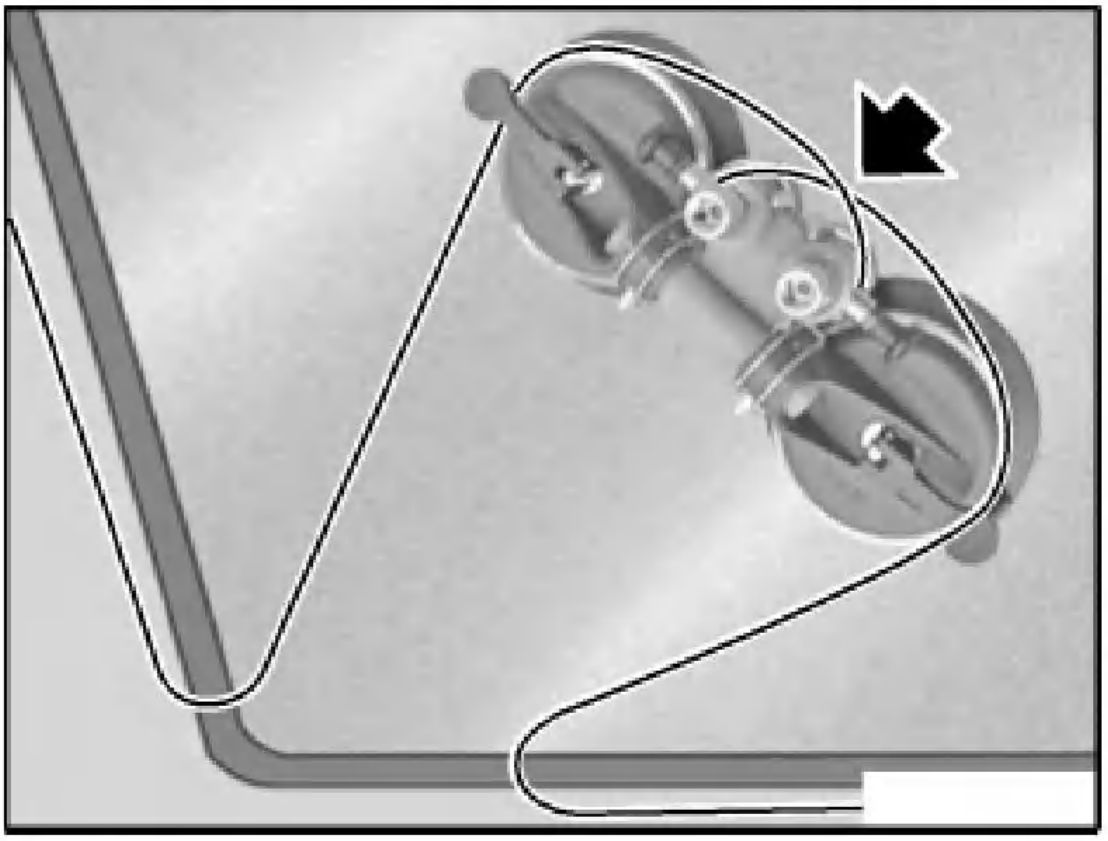


Fig. 129: Identifying Wires Crossing
Courtesy of BMW OF NORTH AMERICA, INC.

- Continue cutting bonding joint by alternately using the coils.
- Both wires meet ahead of both coils when removal is completed.
- Remove "Roll Out 2000".

51 31 000 REMOVING AND INSTALLING WINDSHIELD (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

NOTE: To bond windshield: Adhesives for cold and hot working are permitted. Remove interior rearview mirror, refer to 51 16 060 REMOVING AND INSTALLING OR REPLACING INTERIOR REAR-VIEW MIRROR . Remove trim pieces for front roof pillar (A-pillar), refer to 51 43 201 REMOVING AND INSTALLING/REPLACING PANEL FOR ROOF PILLAR, FRONT LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) . Remove grill for air intake/heater, refer to 51 13 077 REMOVING AND INSTALLING/REPLACING GRILL FOR AIR INTAKE/HEATER (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Cold Processing:

Comply with instructions on gluing windows, refer to 51 31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000" .

Warm Processing:

Open aluminum membrane at rear end of cartridge.

Place cartridge in cartridge oven.

Heat glue cartridges to 80Â° C for one hour in oven.

Comply with instructions on gluing windows, refer to 51 31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000" .

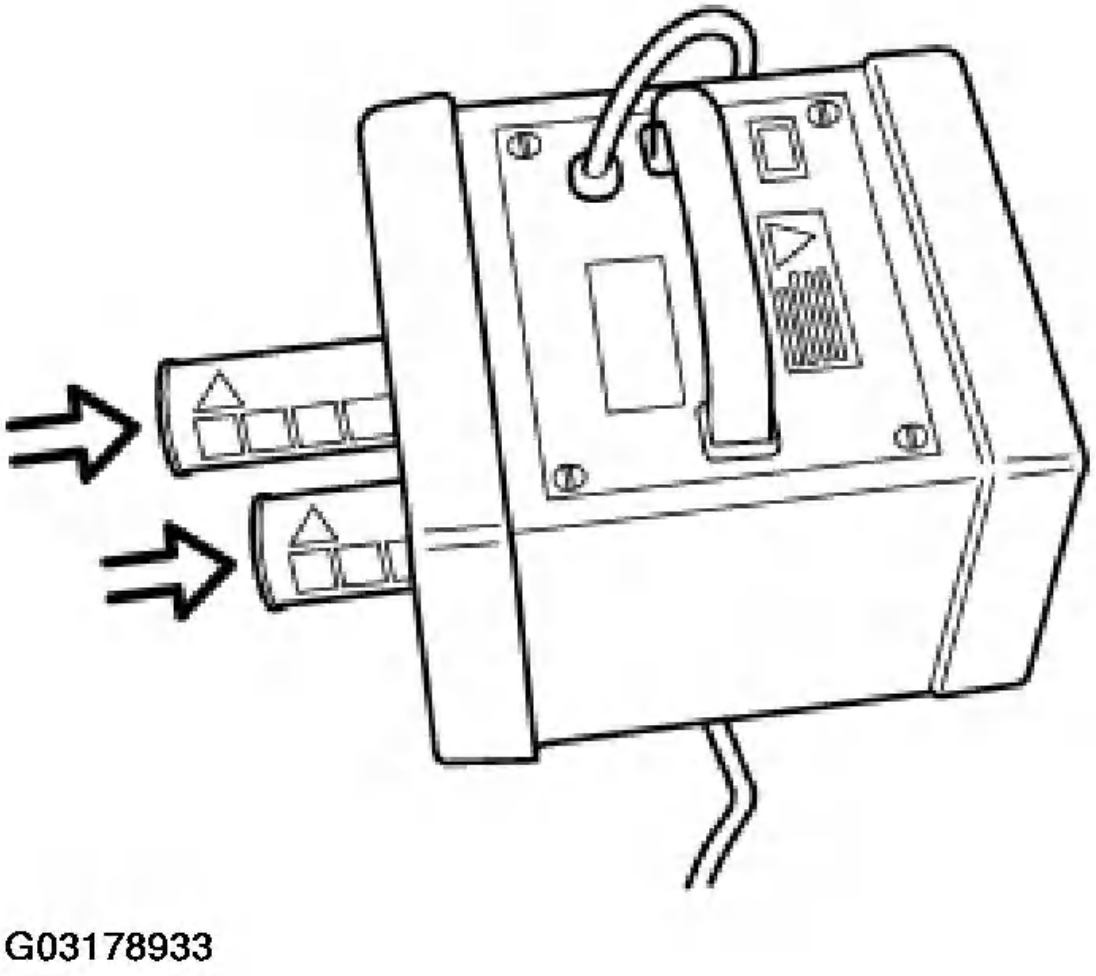


Fig. 130: View Of Cartridge Oven
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Cover radiator/engine compartment (top) and front side walls with protective covers.

Pull seal (1) down from left to right.

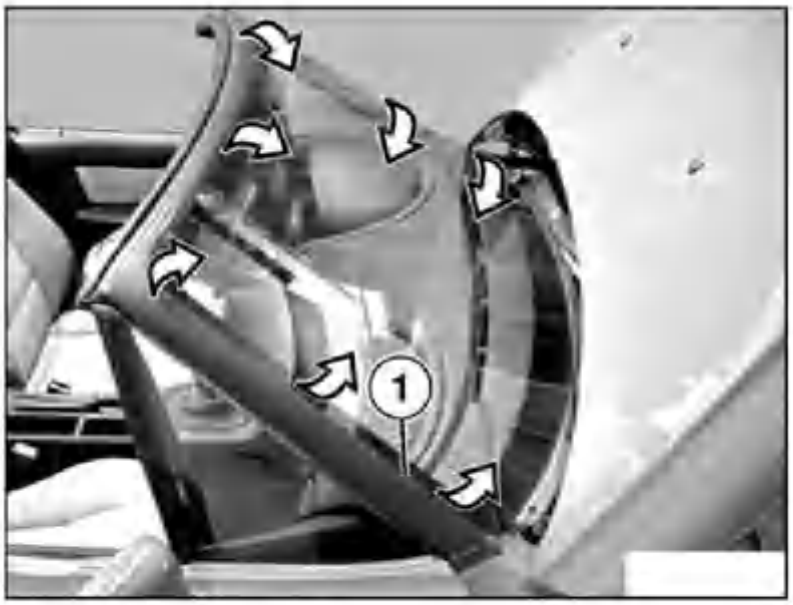


Fig. 131: Removing Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Left/right seals (1) must be pushed over seal (2).



Fig. 132: Installing Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Mask body along roof connection with narrow fabric adhesive tape (e.g. Tesa).

1. Windshield.

2. Glue bead.
3. Body opening.
4. Fabric adhesive tape.

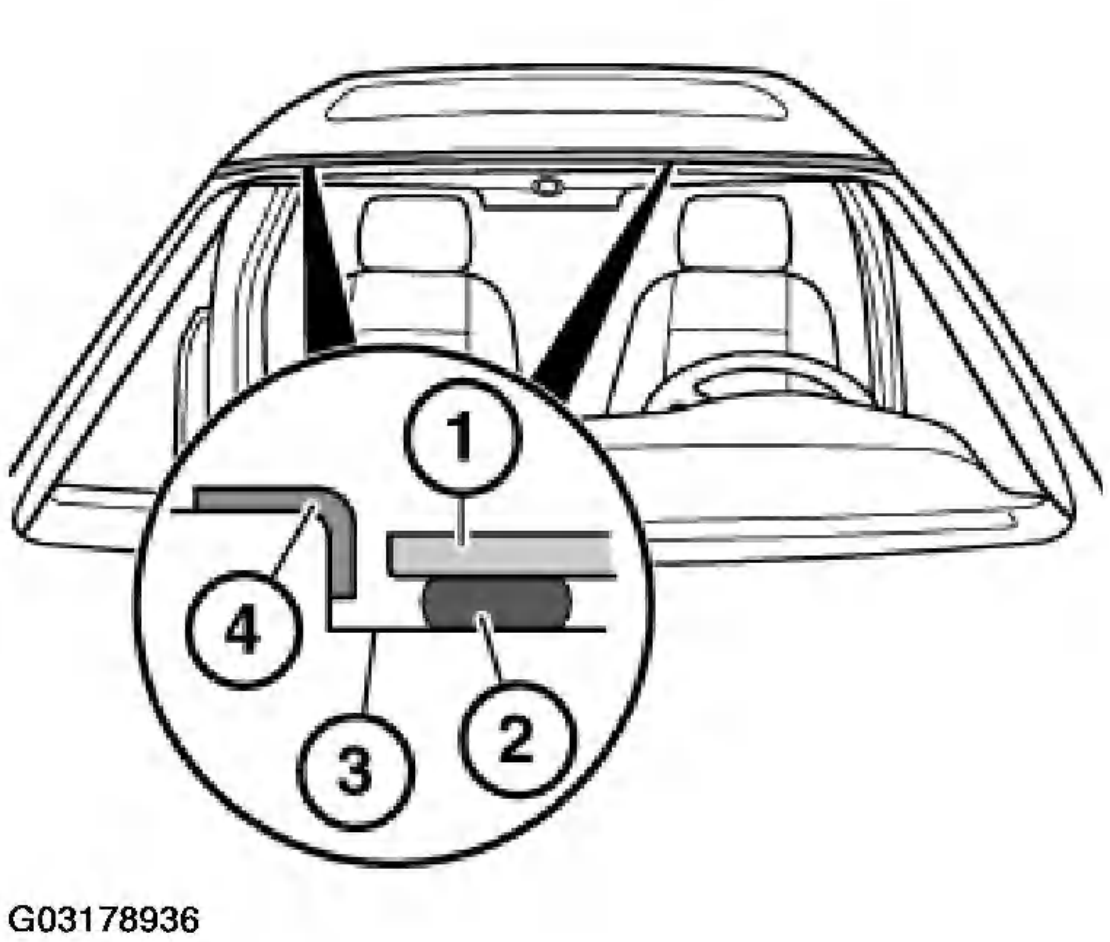


Fig. 133: Identifying Windshield, Glue Bead, Body Opening And Fabric Adhesive Tape
Courtesy of BMW OF NORTH AMERICA, INC.

Cover cowl panel bottom edge with tape.

Attach adhesive to edges on front side panels.

1. Windshield.
2. Glue bead.
3. Body opening.
4. Fabric adhesive tape.

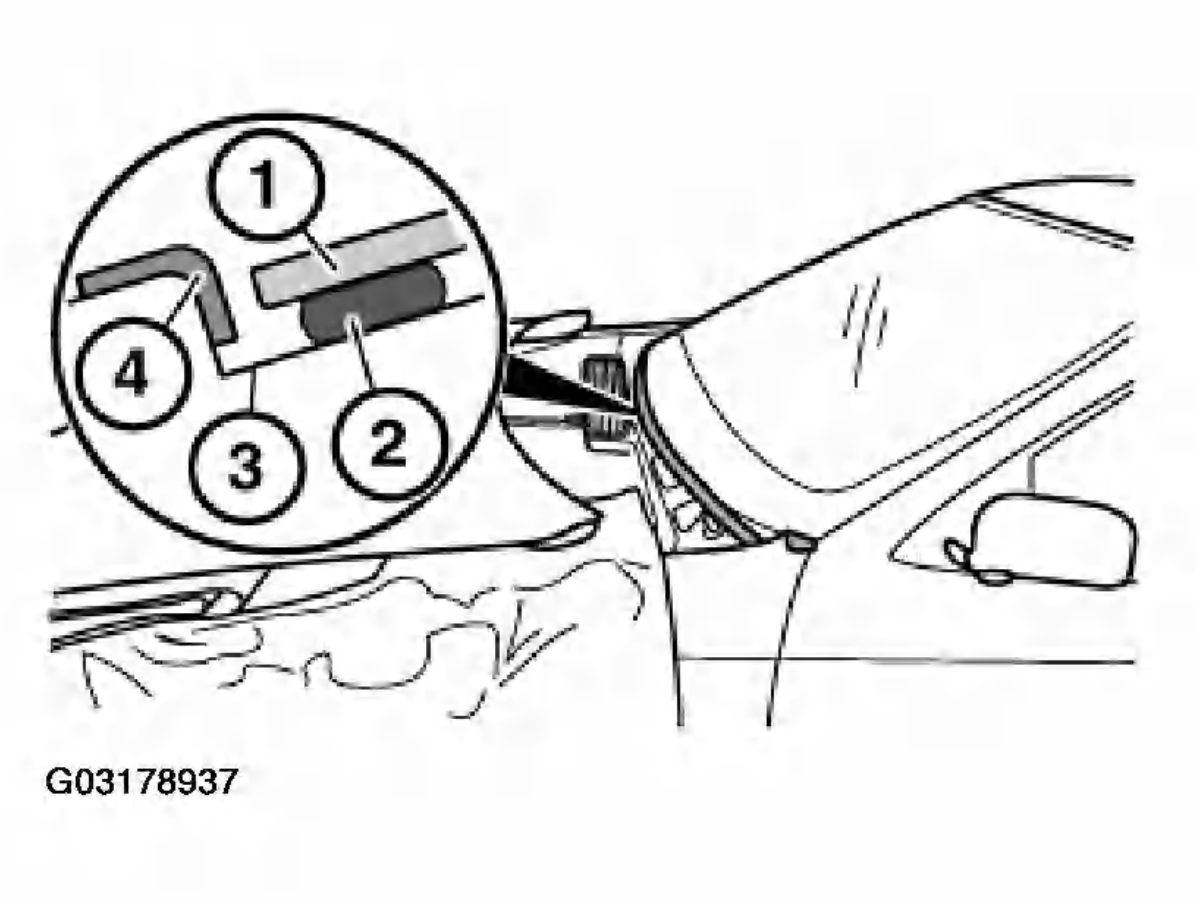


Fig. 134: Locating Windshield, Glue Bead, Body Opening And Fabric Adhesive Tape
Courtesy of BMW OF NORTH AMERICA, INC.

Fit long knife (36 mm blade length) to the tool.

NOTE: Resharpen knife with machine running.

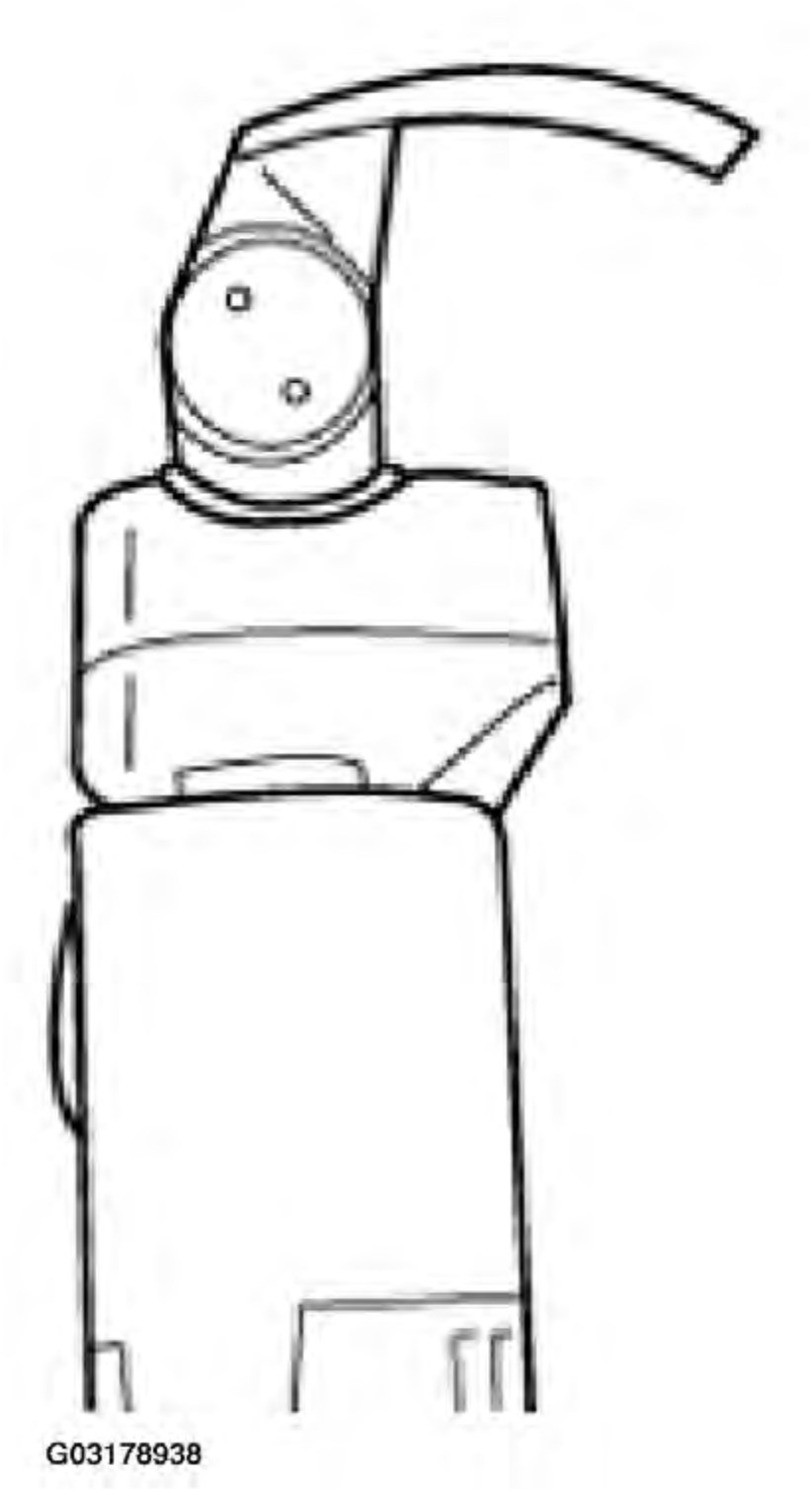


Fig. 135: Fitting Knife To Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully insert knife between body and windshield.

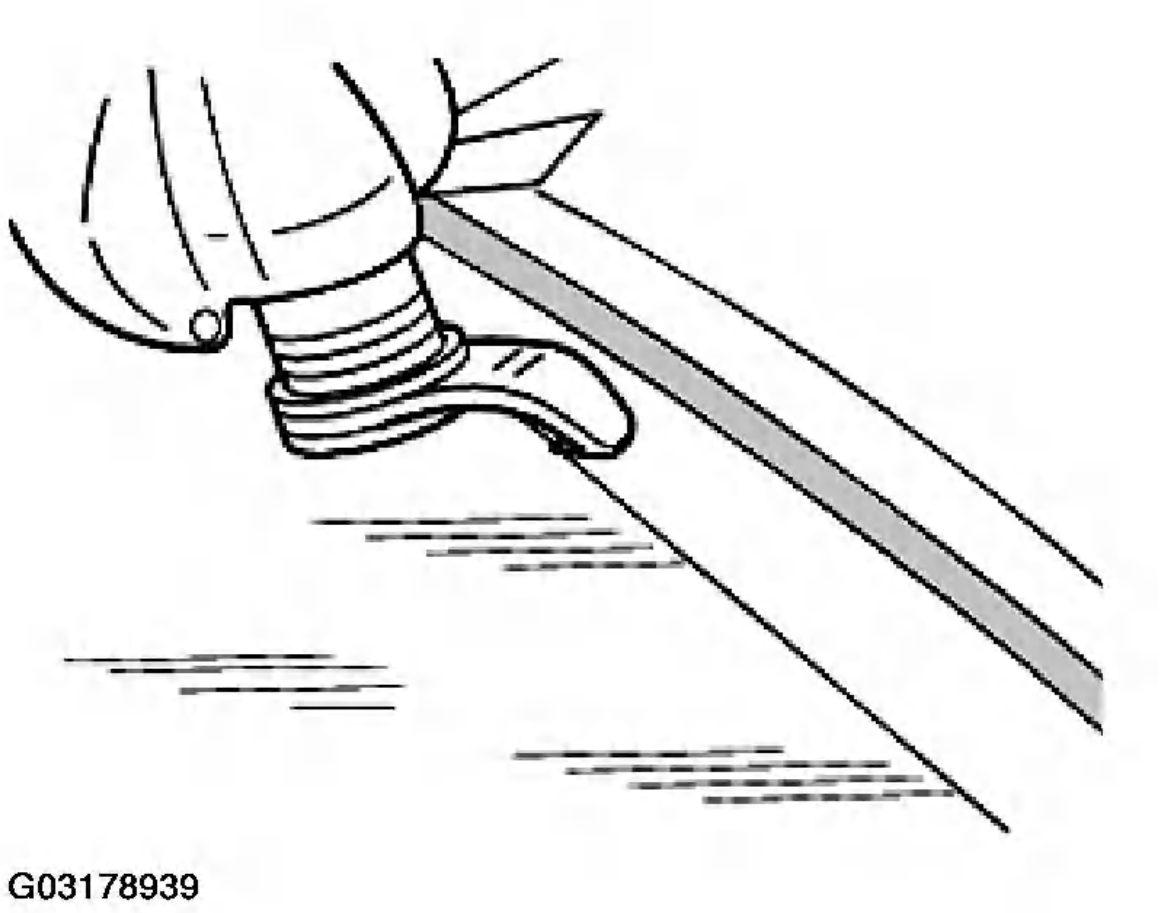


Fig. 136: Inserting Knife Between Body And Windshield
Courtesy of BMW OF NORTH AMERICA, INC.

Guide handle of knife parallel to windshield.

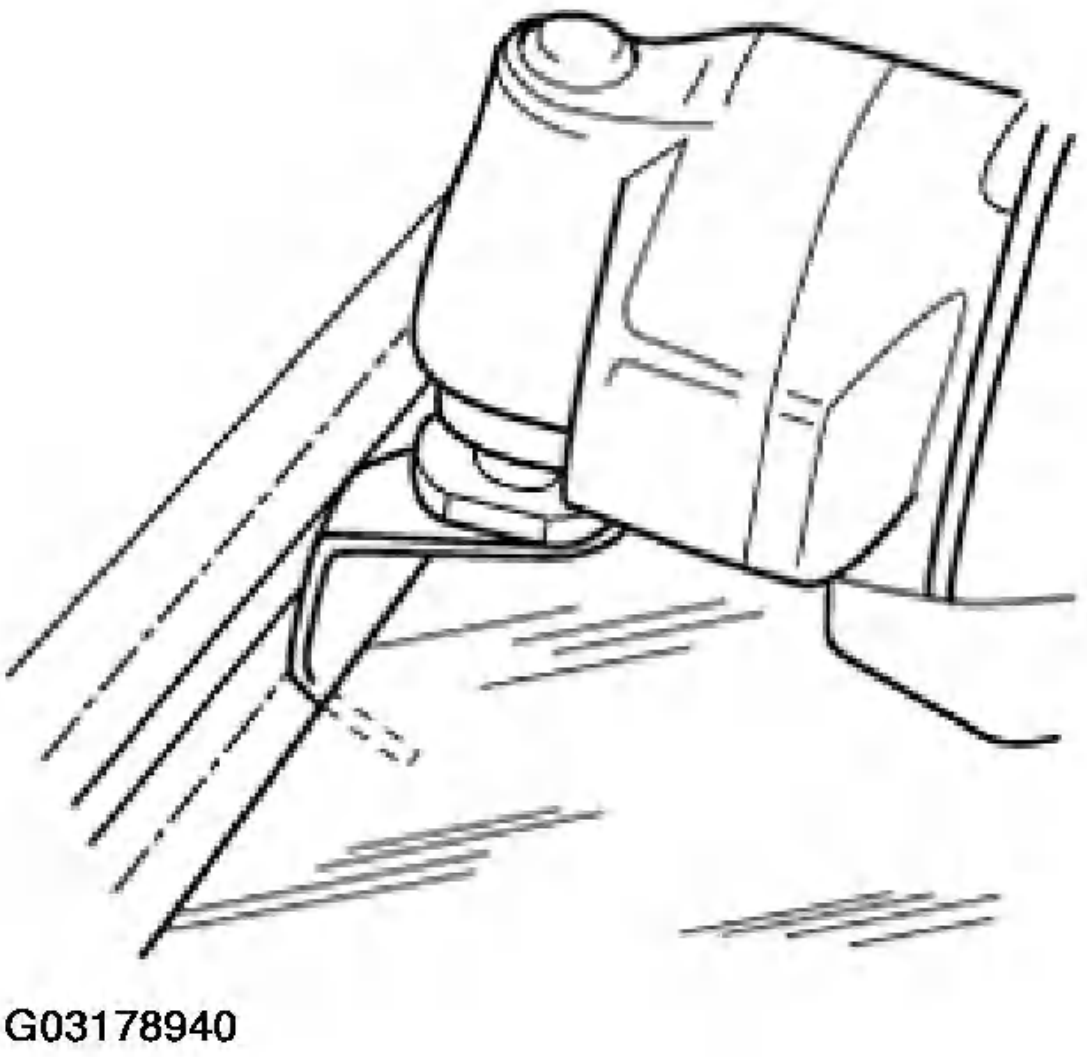


Fig. 137: Guiding Handle Of Knife Parallel To Windshield
Courtesy of BMW OF NORTH AMERICA, INC.

Cut through glue bead all around and as close as possible to windscreen glass.

1. Body opening.
2. Glue bead.
3. Knife.
4. Windshield.

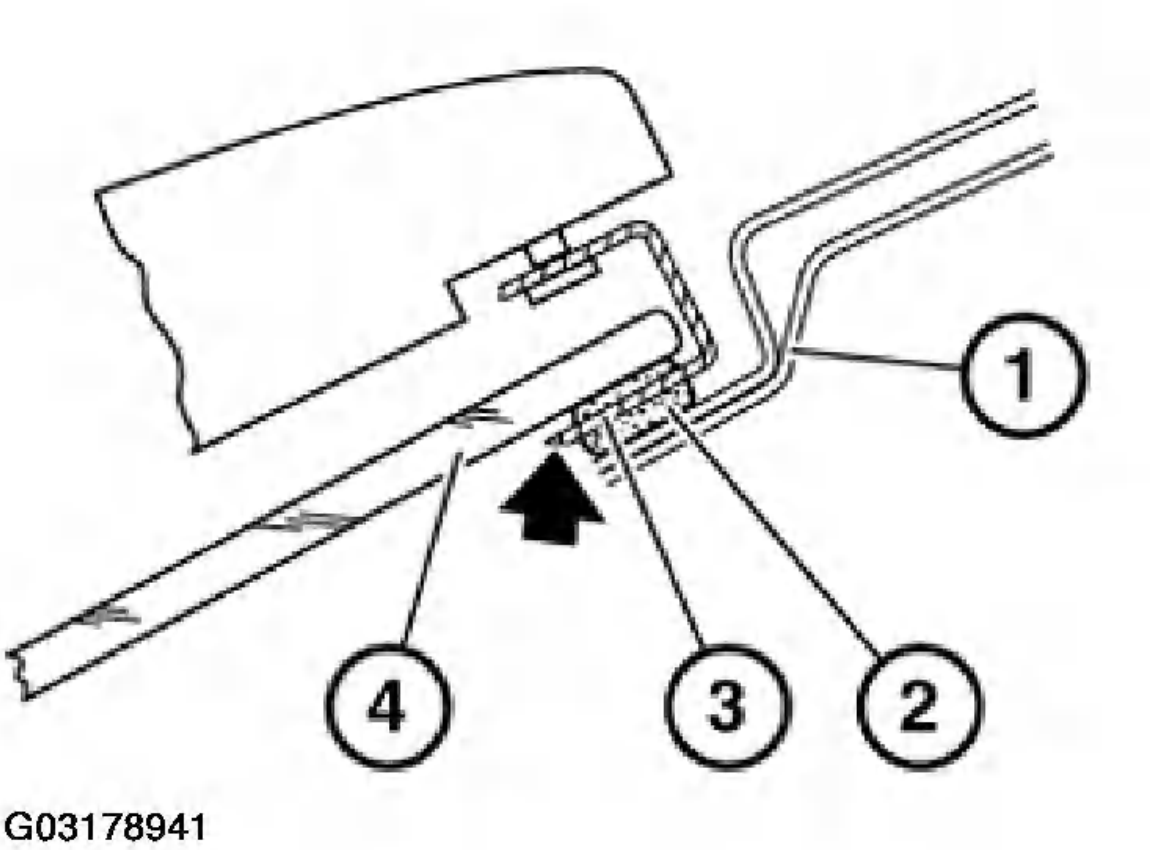


Fig. 138: Locating Windshield, Glue Bead, Body Opening And Fabric Adhesive Tape
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out the windscreen using special tool 51 3 010.

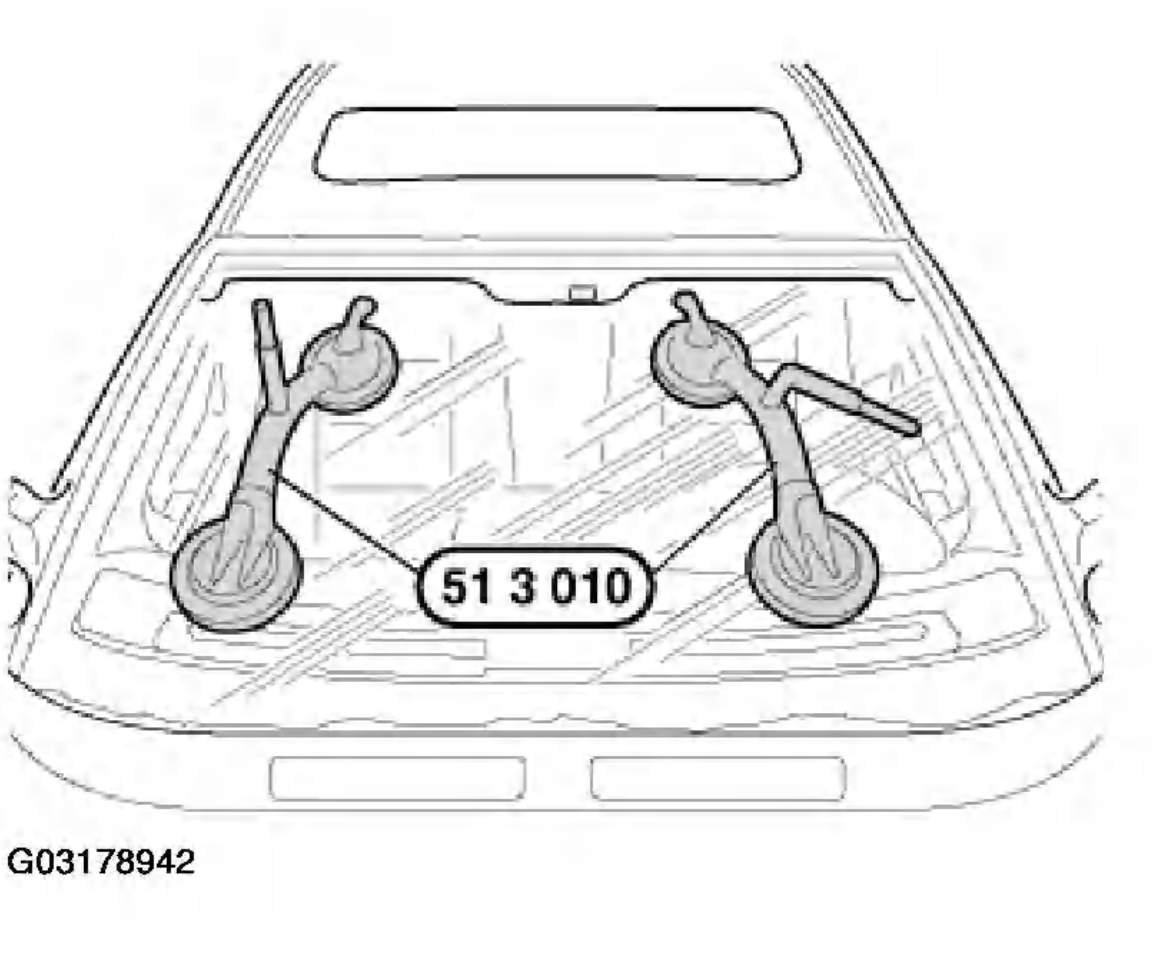


Fig. 139: Removing Windscreen
Courtesy of BMW OF NORTH AMERICA, INC.

Cut off old glue in body opening to a thickness of approx. 0.5 mm.

Cut off old glue carefully with a universal knife (sharp as a razor blade) to avoid damaging the paint finish in body opening.

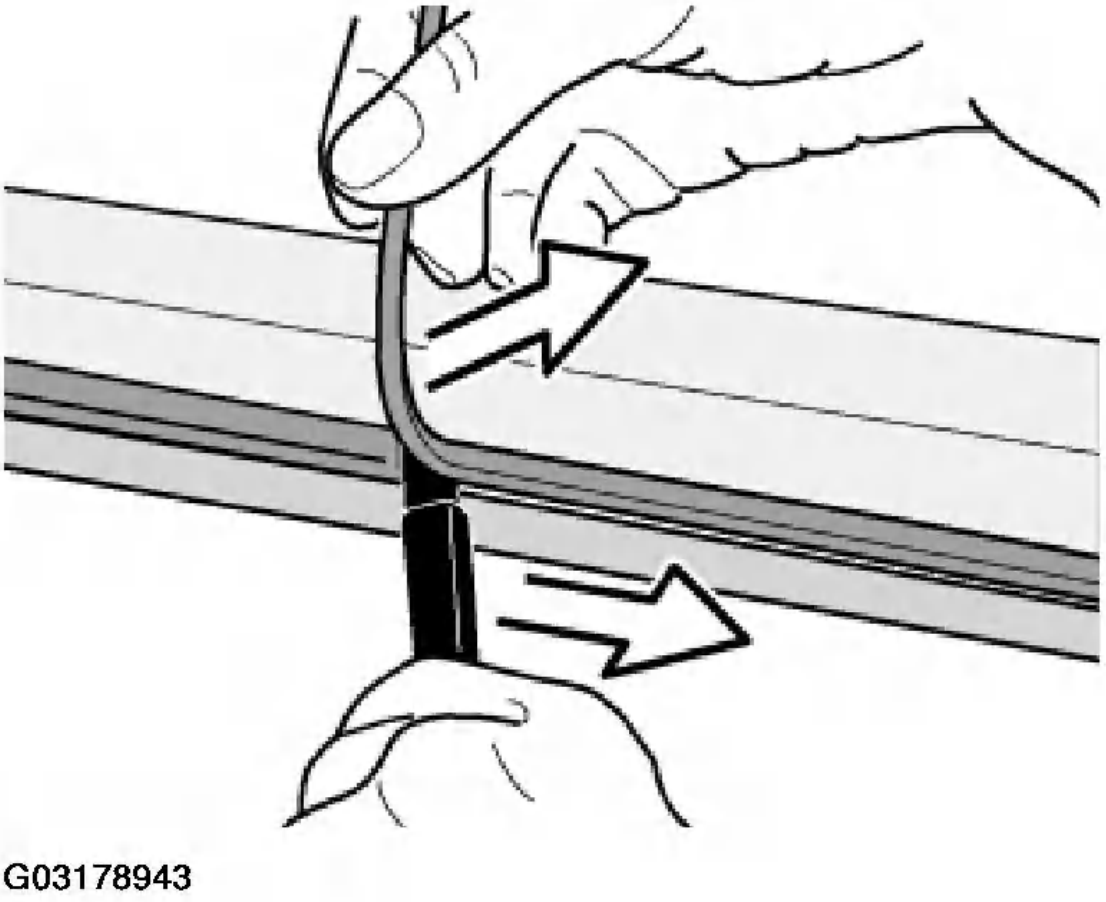


Fig. 140: Removing Old Glue
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off adhesive tapes all round.

CAUTION: To ensure long-term corrosion protection, it is absolutely essential to repair paintwork damage (scratches and large-surface damage), refer to 51 31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000" .

When reusing the windshield:

Remove glue residue on windshield with a heavy-duty scalpel to approx. 0.5 mm.

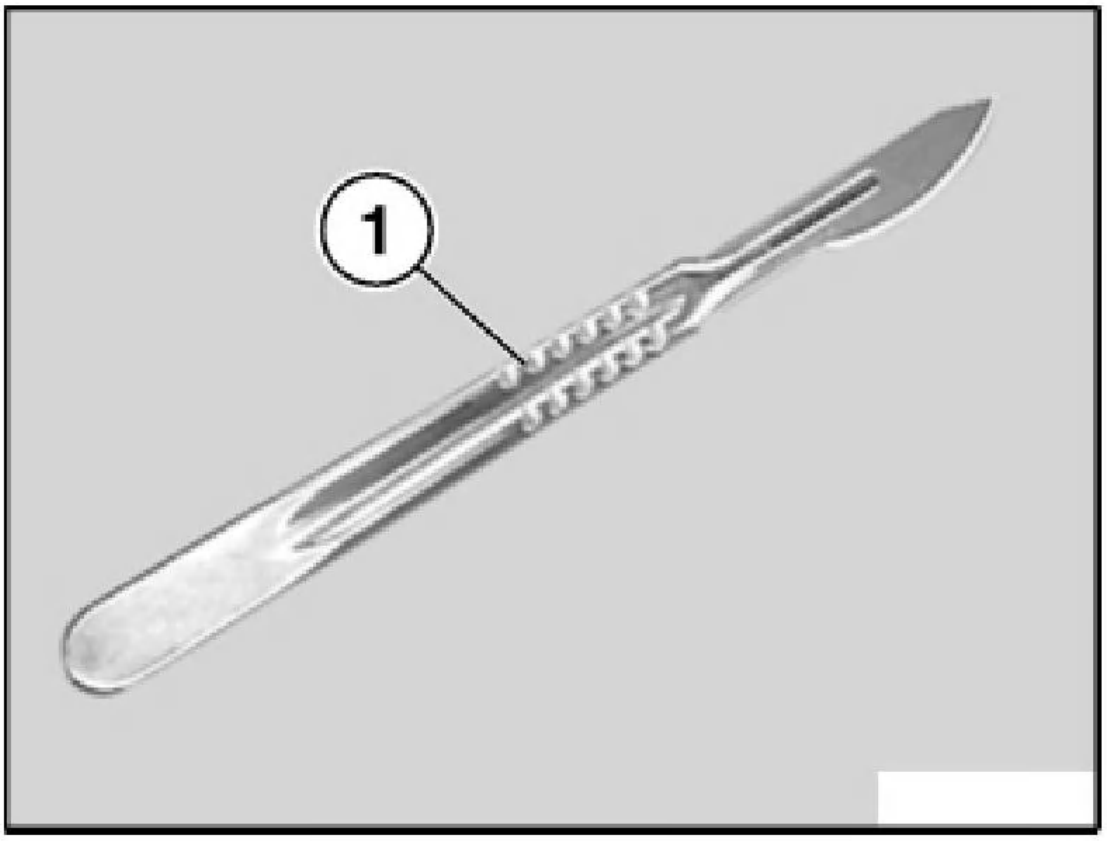


Fig. 141: Identifying Heavy-Duty Scalpel
Courtesy of BMW OF NORTH AMERICA, INC.

Install seal from bottom left to bottom right and press on.

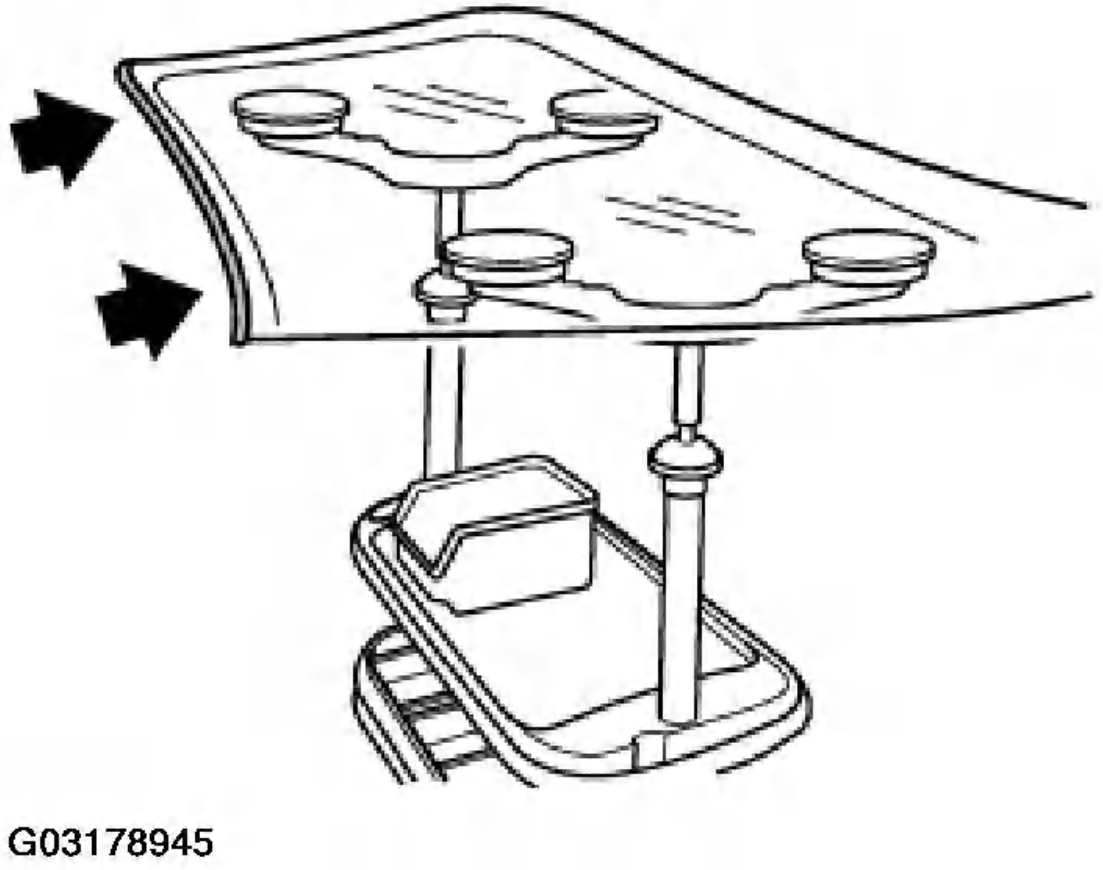


Fig. 142: Installing Seal
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: The basic filler must have hardened!

Treat windshield and body around glued area with BMW-approved materials, refer to 51 31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000" .

NOTE: Note ventilation time!

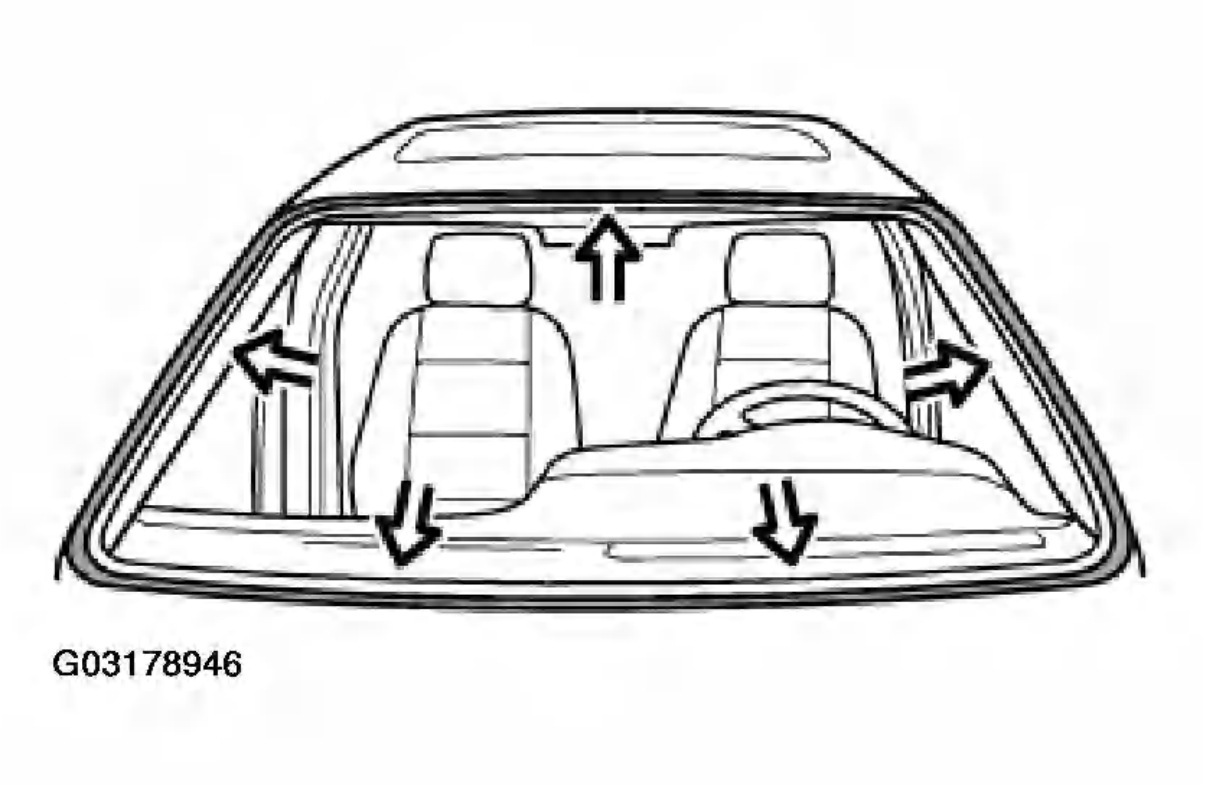


Fig. 143: Installing Windshield
Courtesy of BMW OF NORTH AMERICA, INC.

Stick on 1 spacer buffer (2) in each case in center and at distances (A) and (B) from center of cowl panel.

Dimensions:

A. 500 mm.
B. 500 mm.
C. 18 mm.

1. Windshield.
2. Spacer buffer.
3. Glue bead.
4. Windshield.

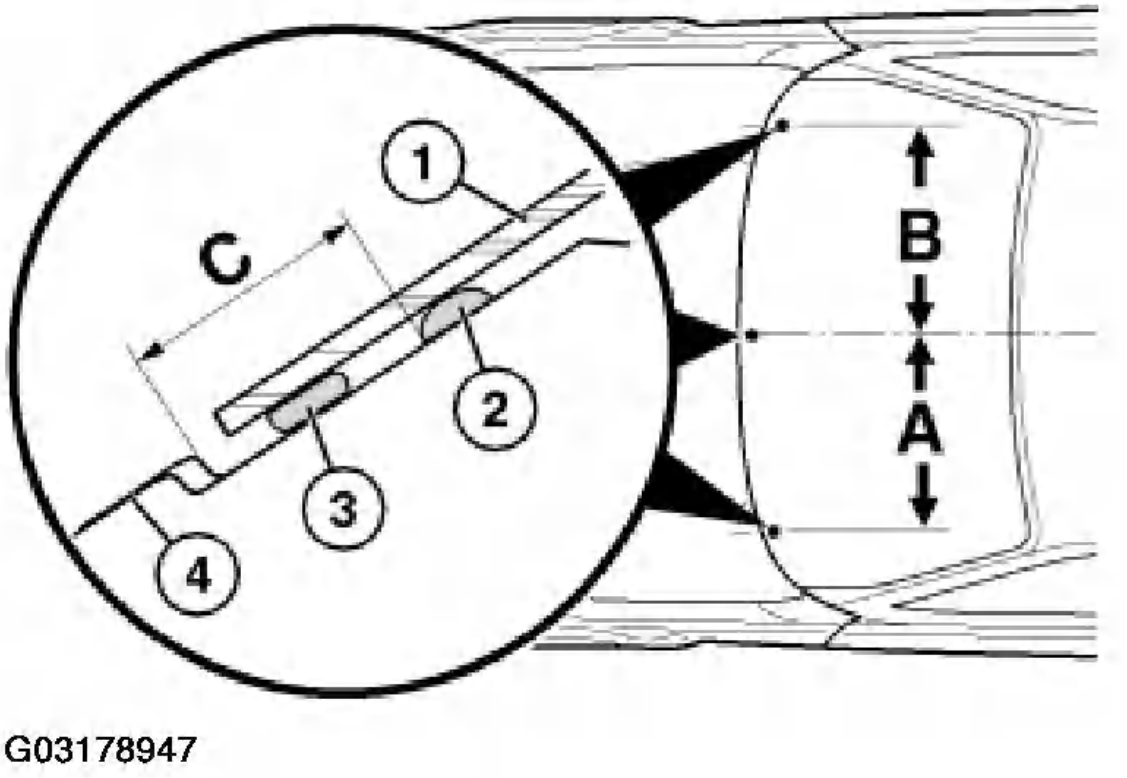


Fig. 144: Identifying Spacer Buffer Locations
Courtesy of BMW OF NORTH AMERICA, INC.

Cut nozzle to size.

Dimensions:

A. 8 $_{-2}$ 2 mm.

B. 11 $_{-2}$ mm.

NOTE: For an even application of adhesive bead: Use a cartridge gun (operated pneumatically or electrically).

Check expiration date of glue!

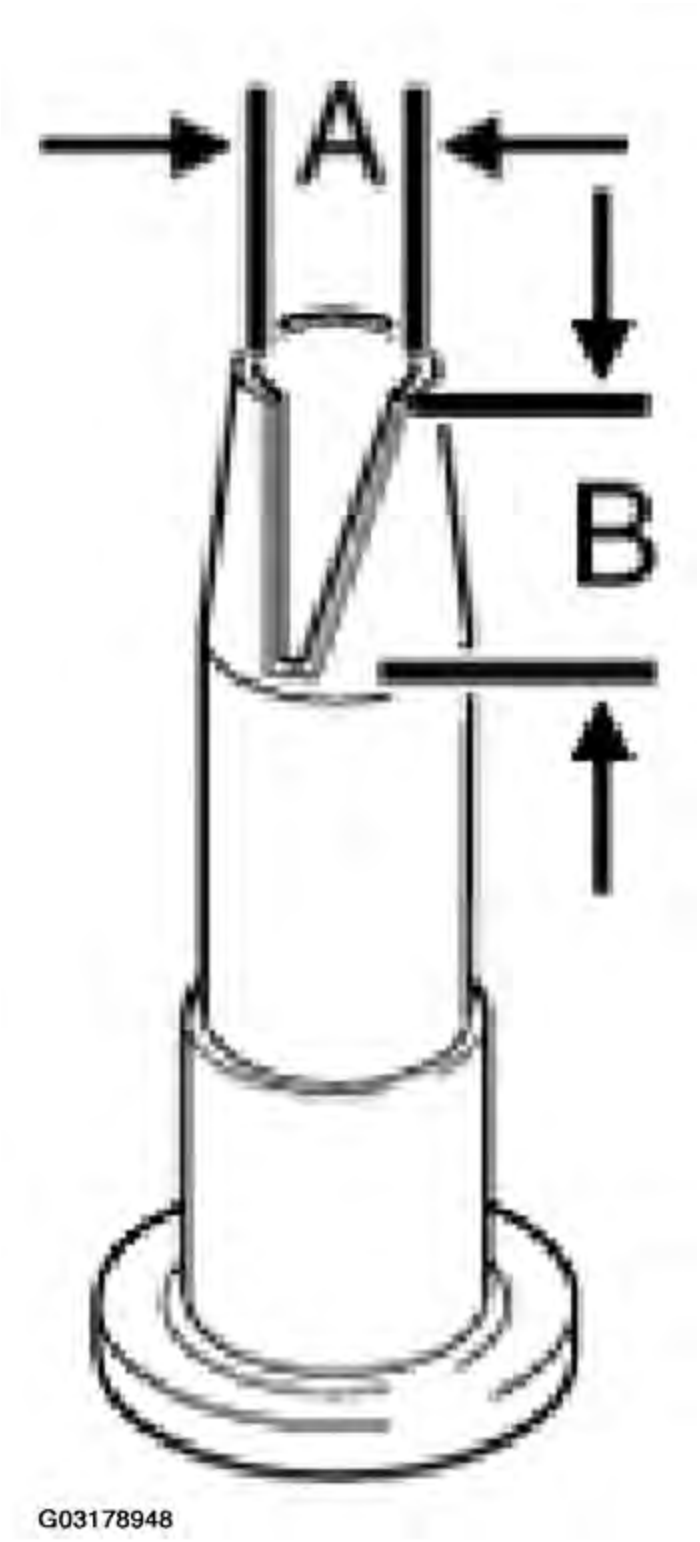


Fig. 145: Identifying Nozzle Dimensions
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, apply a test bead before gluing.

Cartridge must be held perpendicular to the windscreen glass.

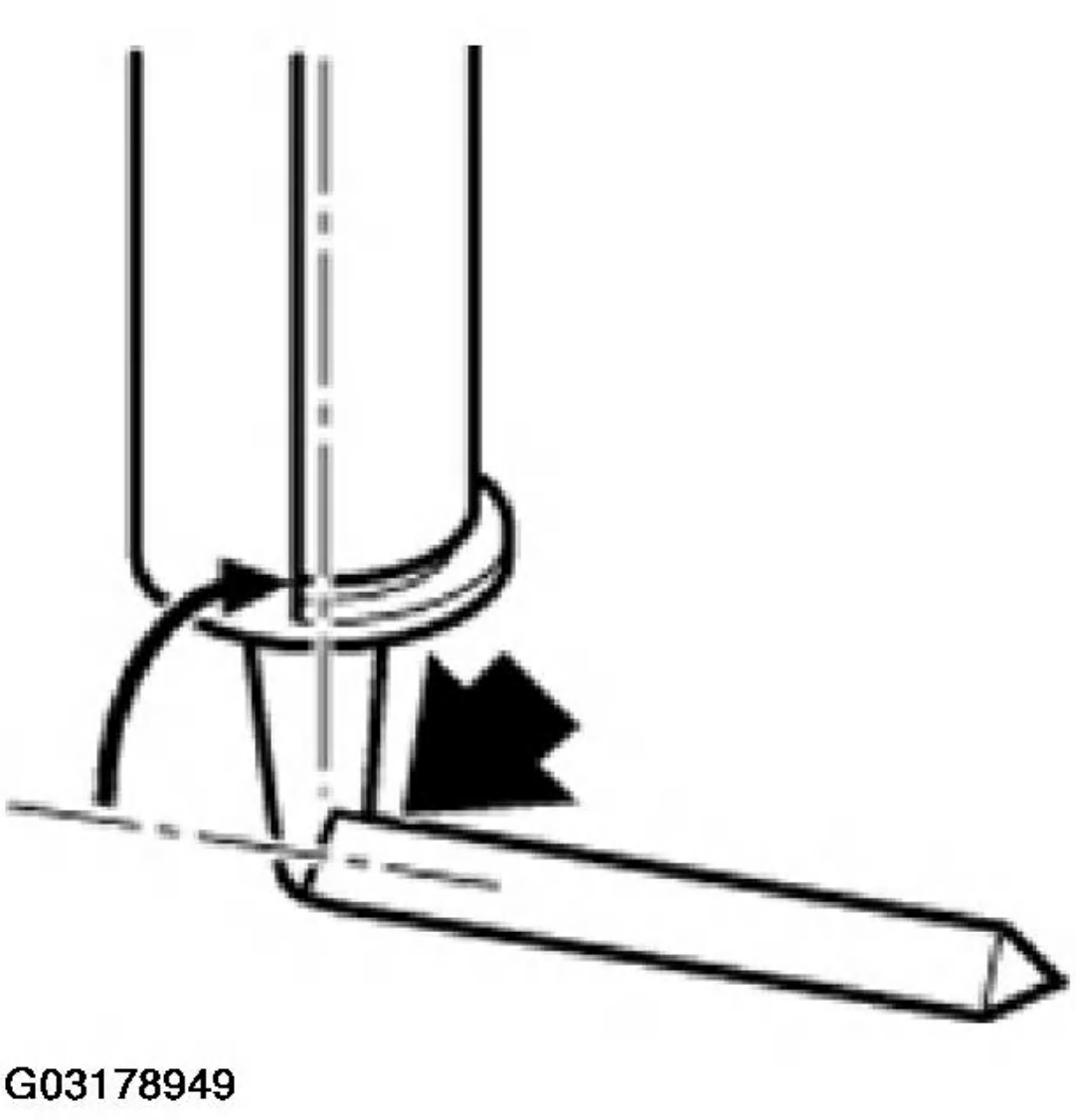


Fig. 146: Testing Glue
Courtesy of BMW OF NORTH AMERICA, INC.

Shape of glue bead:

A. 8 $_{-2}$ mm.

B. 11 $_{-2}$ mm.

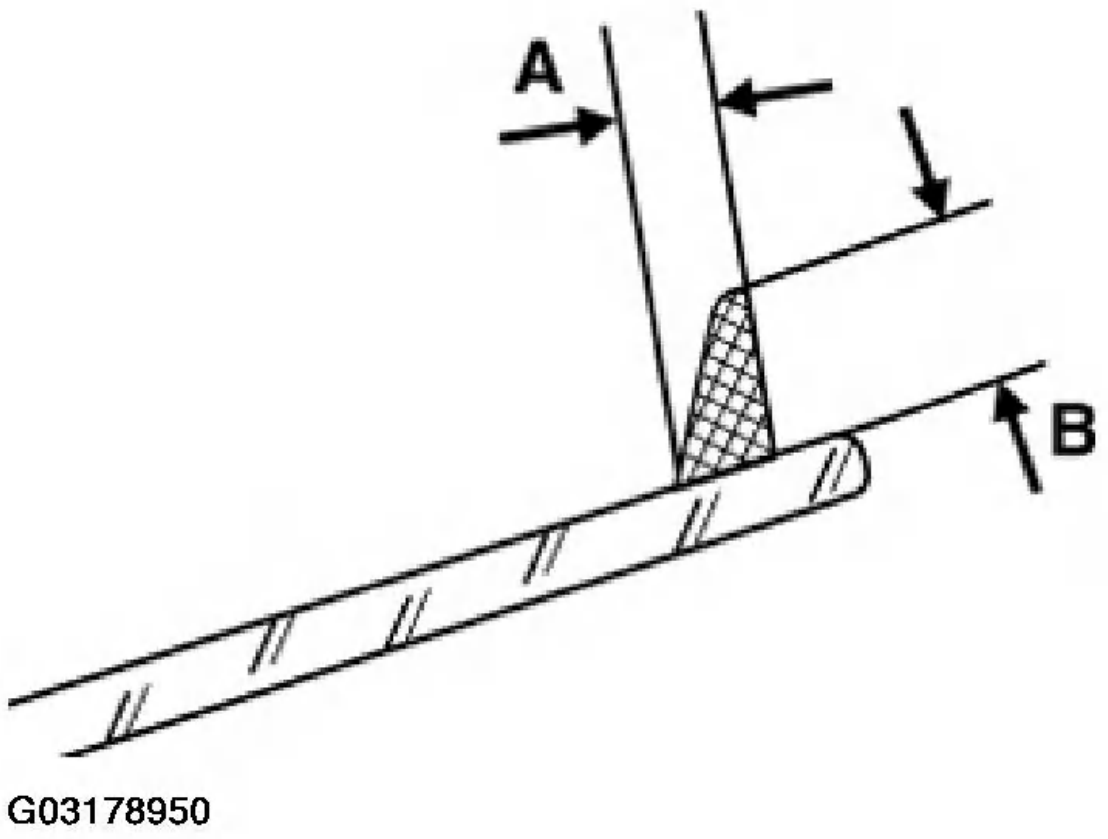


Fig. 147: Identifying Shape Of Glue Bead
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Apply glue bead quickly and insert windscreen glass. Skin formation time of glue, maximum 10 minutes.

GLUE BEAD THICKNESS SPECIFICATION

(A) = 8 mm.	Distance of glue bead to edge of windshield/bottom of windshield.
(B) = 8 mm.	Distance between glue bead and edge of windshield.
(C) = 8 mm.	Distance between glue bead and edge of windshield.

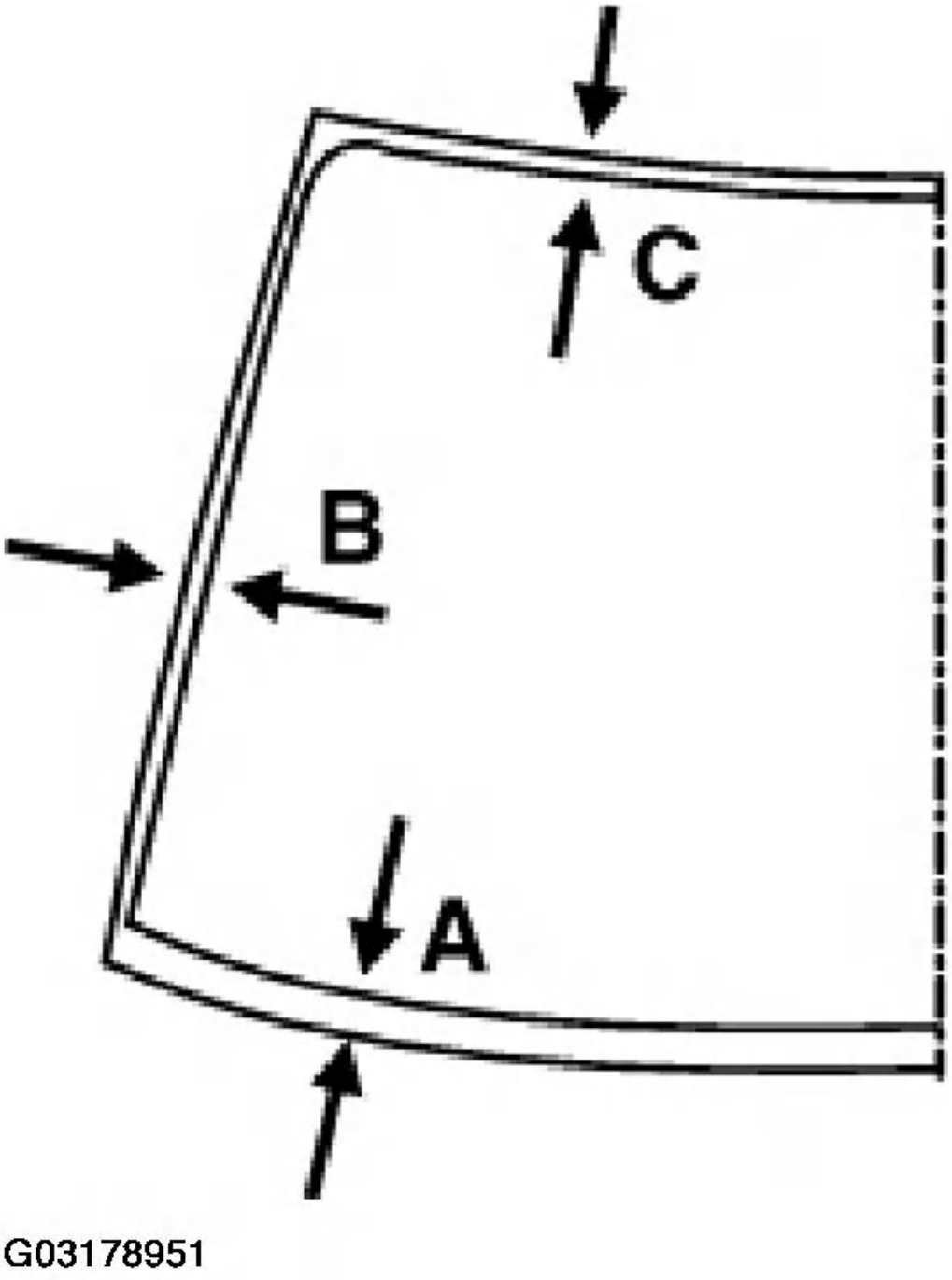


Fig. 148: Glue Bead Thickness Specification
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The adhesive area for the plastic adhesive tapes must be free of grease and dust.

Attach two yellow plastic adhesive tapes (1) to roof at distance (A) from outer corners.

Length: 500 mm.

Width: 50 mm.

(A) 250 mm.

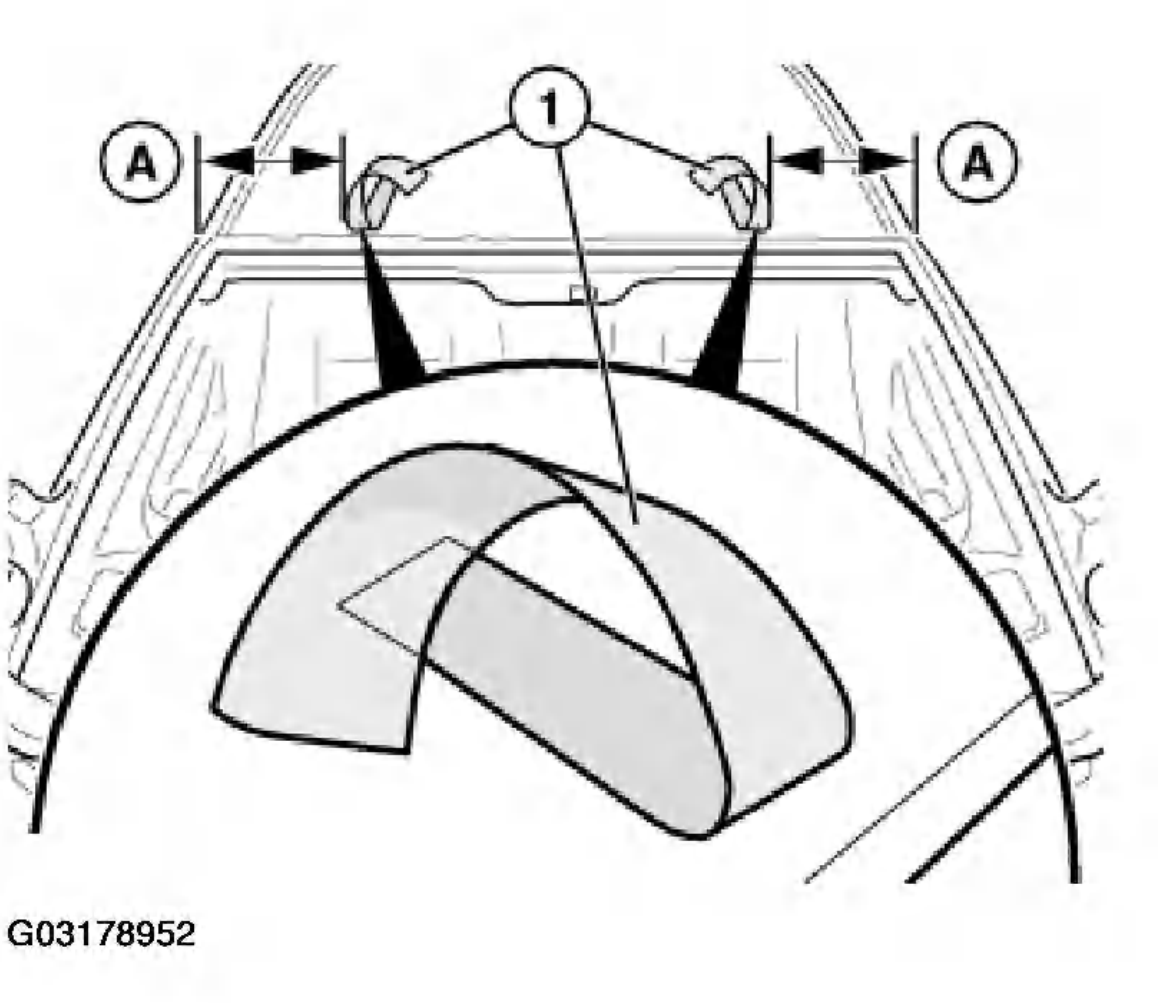


Fig. 149: Identifying Plastic Adhesive Tapes
Courtesy of BMW OF NORTH AMERICA, INC.

Using special tool 51 3 010, first position windshield at top, align sides, then install at bottom and press into place.

Press windshield upwards until seal rests uniformly on roof.

Fix windshield in this location at top with two yellow plastic adhesive tapes.

If necessary, support windshield glass from below with wooden wedge.

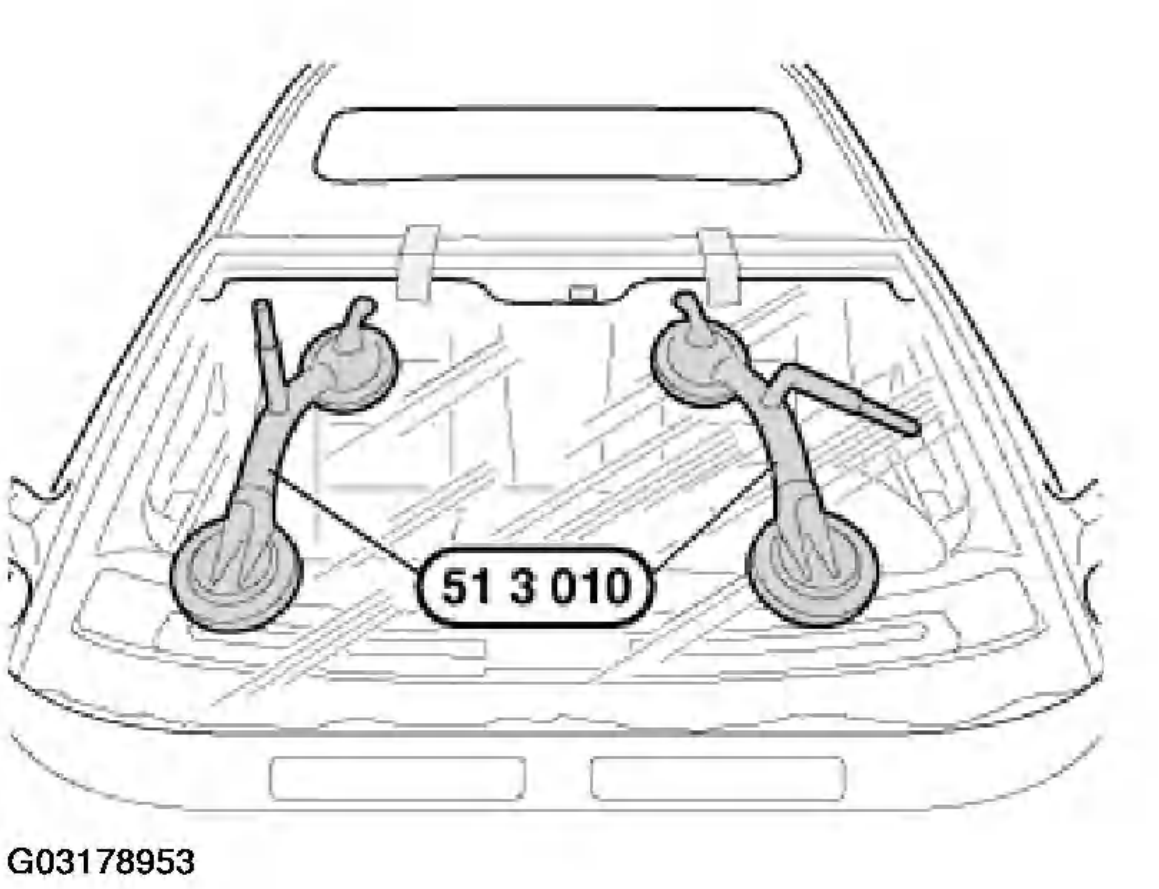


Fig. 150: Installing Windshield Glass
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Remove dirt from residual glue with Sika-Entferner 208 before glue is hard. Do not press out windscreen glass again for this purpose. Hardened glue can only be removed by machine.

Assemble car.

After hardening time, remove support.

NOTE: Any leakages are located by spraying water under the sealing lips or by using an ultrasonic leak detector and sealed with the appropriate nozzle.

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. Refer to 51 31 ... INSTRUCTIONS ON GLUING WINDSCREEN .

51 31 011 REPLACING WINDSCREEN (COMPLETE WINDSCREEN)

Operation Is Described In:

Removing and installing windscreen, refer to 51 31 000 REMOVING AND INSTALLING WINDSHIELD (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

51 31 015 REPAIRING DAMAGE TO WINDSCREENS CAUSED BY PITTING (STONE CHIPS)

(CLEAR AND TINTED LAMINATED SAFETY GLASS)

Field Of Vision (No Repairs Acceptable):

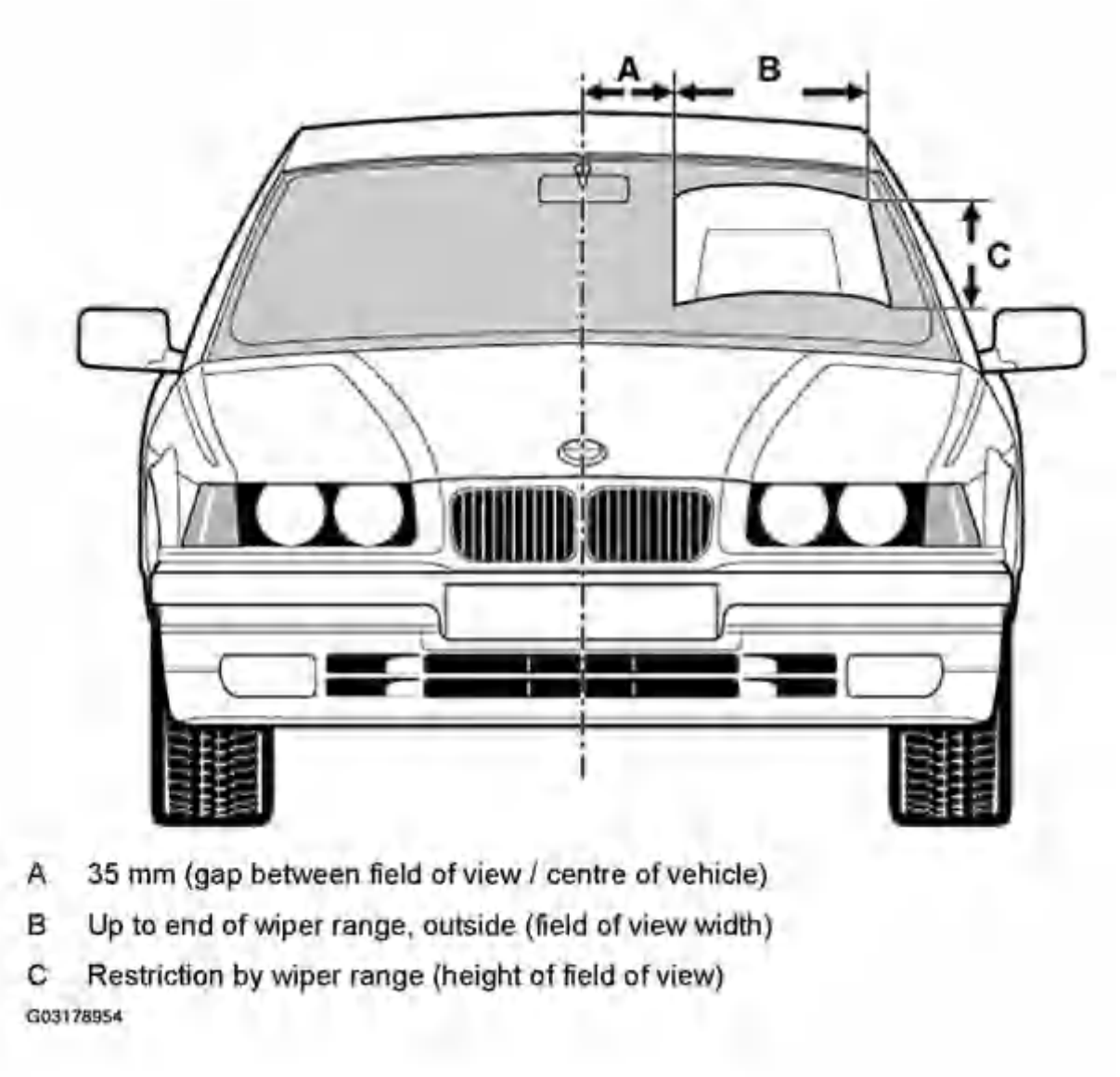


Fig. 151: Identifying Field Of Vision
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Repairs must only be carried out outside of the field of vision (refer to sketch).

If the stone chip damage is outside the field of vision, refer to 51 31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000" .

54 21 150 REMOVING AND INSTALLING/REPLACING REAR WINDOW FOR HARD TOP

NOTE: For gluing the rear window, cements for cold and hot processing are permitted.

Cold Processing:

Comply with instructions on gluing windows, refer to 51 31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000" .

Warm Processing:

Open aluminum membrane at rear end of cartridge. Place cartridge in cartridge oven.

Heat glue cartridges to 80Â°C for one hour in oven.

Comply with instructions on gluing windows, refer to 51 31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000" .

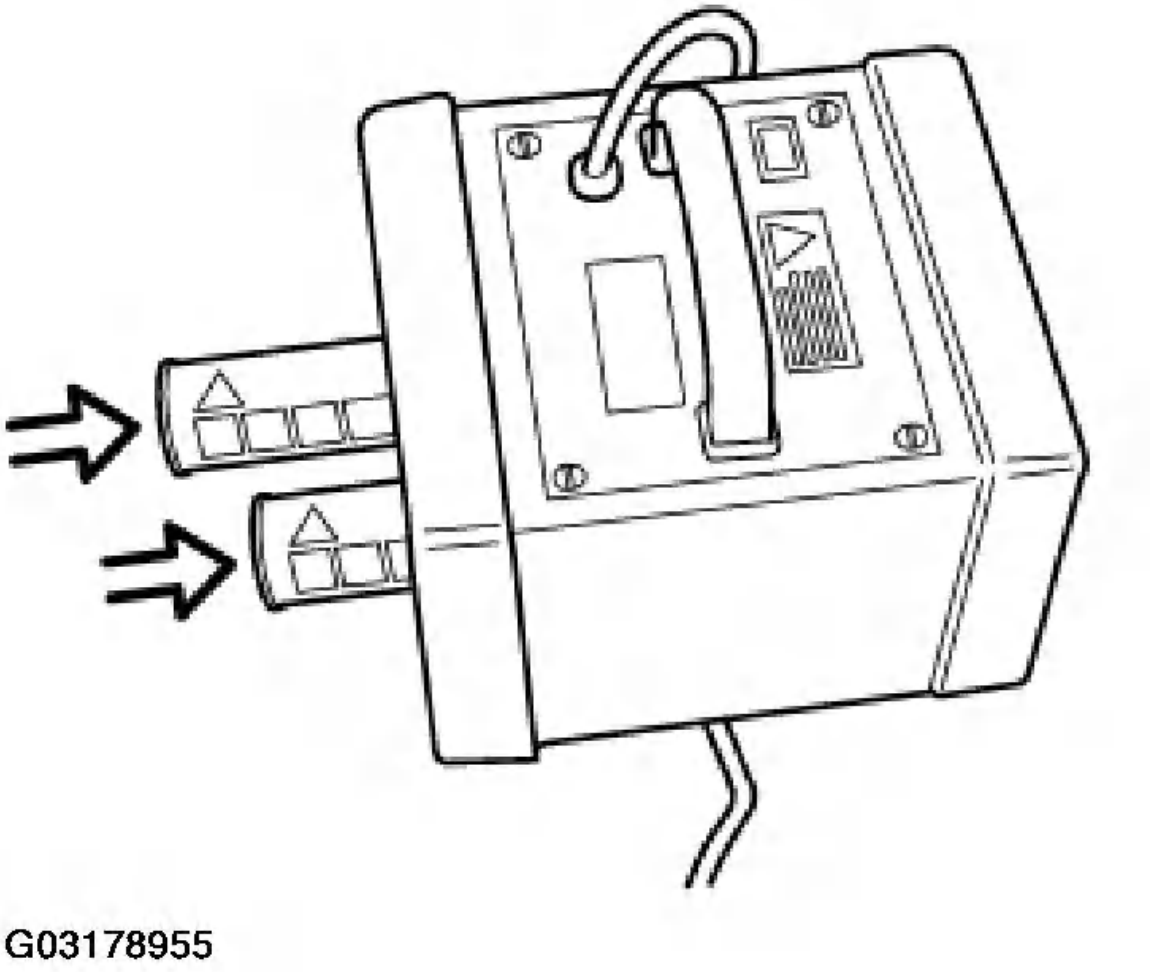


Fig. 152: View Of Cartridge Oven
Courtesy of BMW OF NORTH AMERICA, INC.

Remove hard top, refer to 54 21 001 REMOVING HARD TOP .

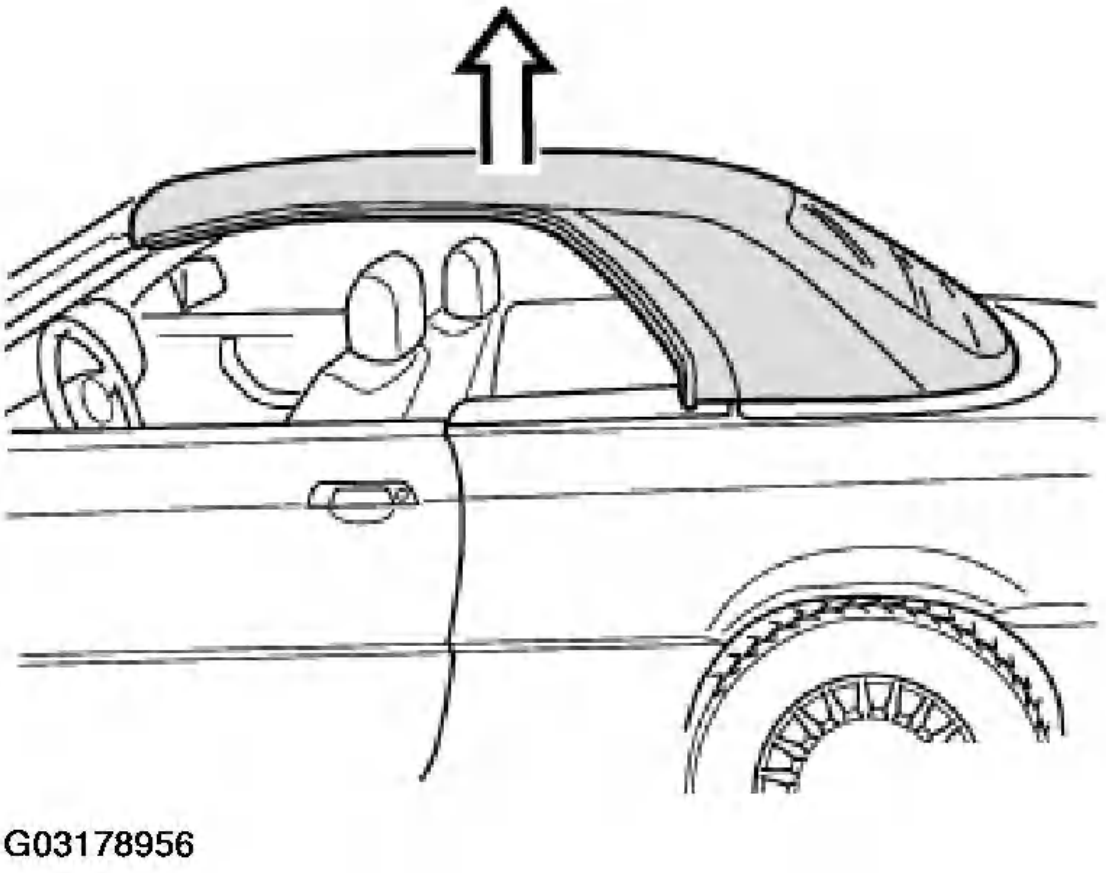


Fig. 153: Removing Hard Top
Courtesy of BMW OF NORTH AMERICA, INC.

Remove molded roof lining from hard top, refer to 54 21 100 REMOVING AND INSTALLING/REPLACING MOLDED ROOF LINING ON HARD TOP .

Disconnect plug (1) for rear window heater (2) on left and right.

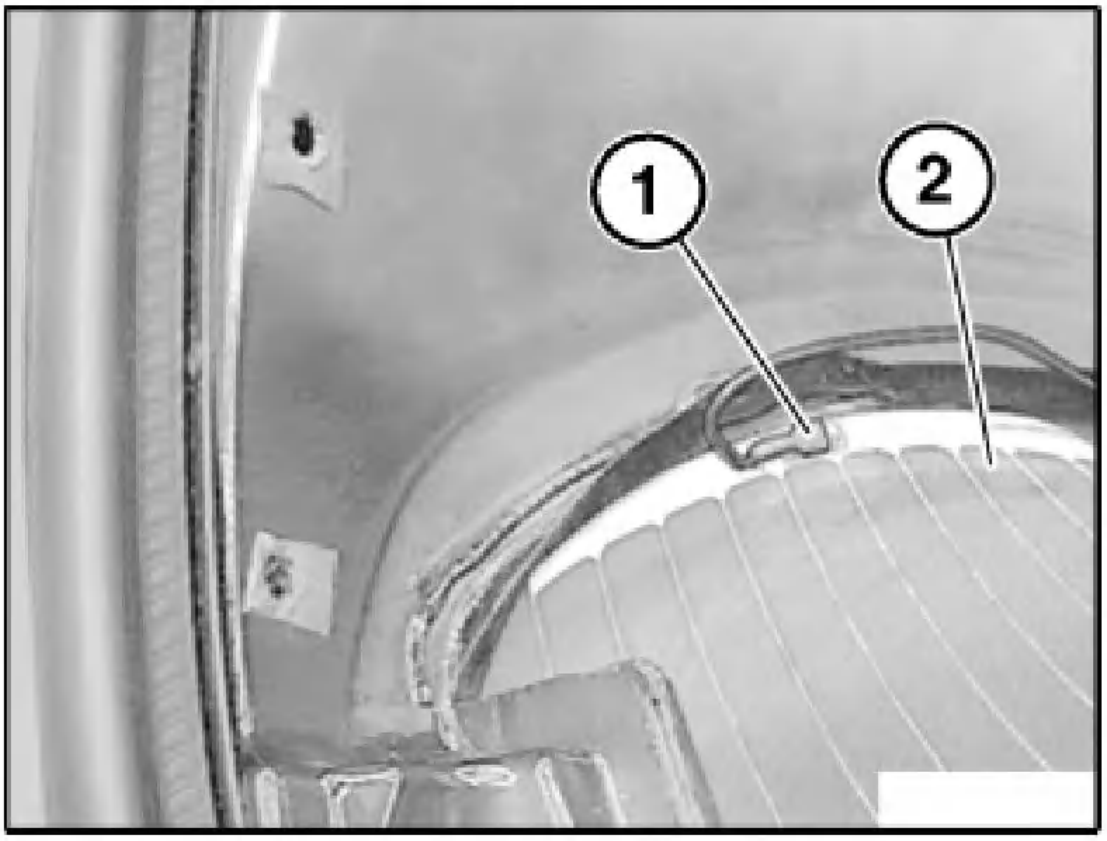


Fig. 154: Disconnecting Plug For Rear Window Heater
Courtesy of BMW OF NORTH AMERICA, INC.

Pull out seal (1) from transition area of gutter (2).

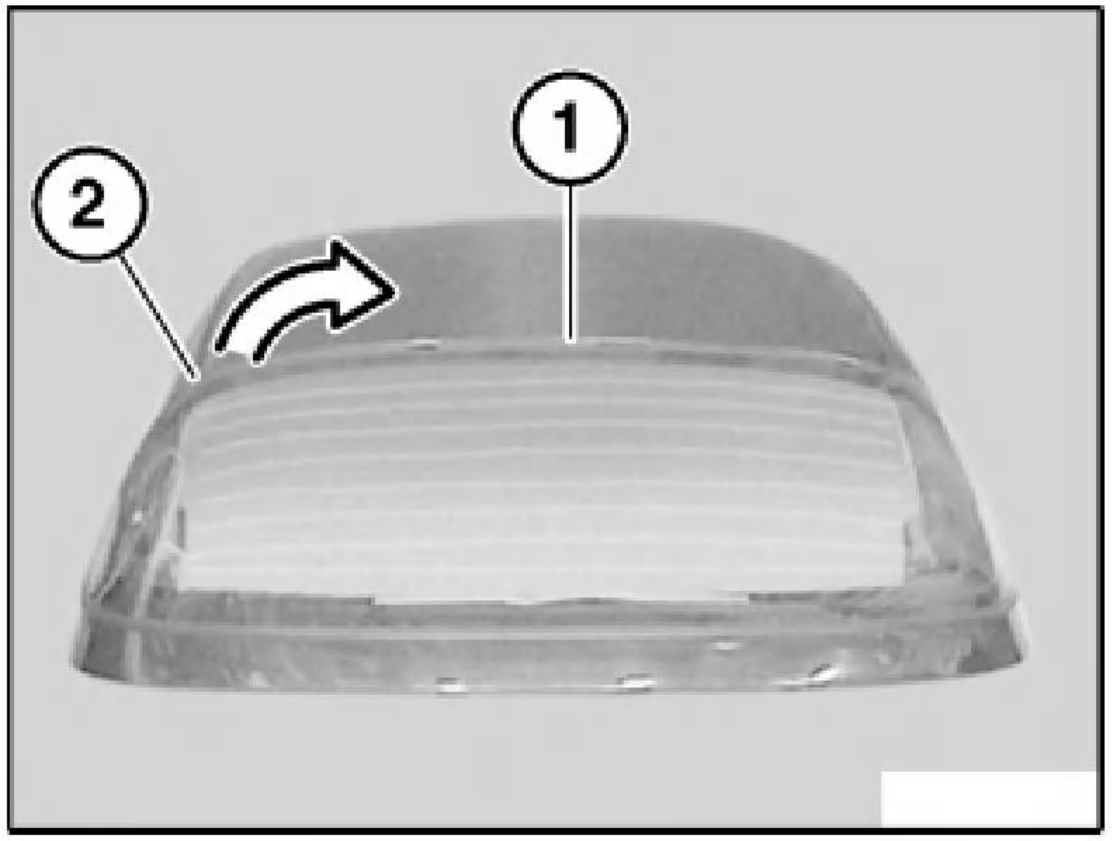


Fig. 155: Removing Seal From Transition Area Of Gutter
Courtesy of BMW OF NORTH AMERICA, INC.

Mask trunk lid corners and hard top with fabric adhesive tape (e.g. Tesa).

1. Rear window.
2. Glue bead.
3. Hard top flange.
4. Fabric adhesive tape.

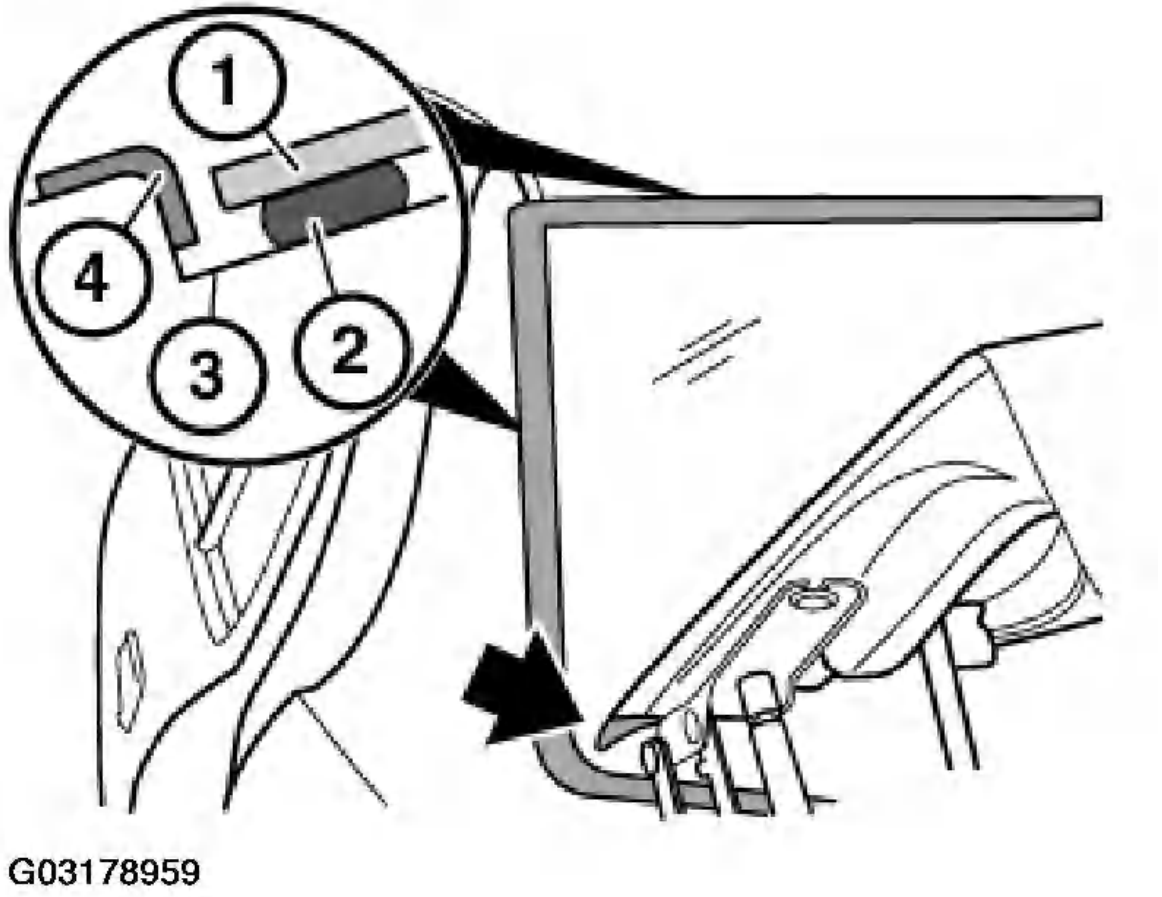


Fig. 156: Identifying Rear Window, Glue Bead, Hard Top Flange And Fabric Adhesive Tape
Courtesy of BMW OF NORTH AMERICA, INC.

Fit knife (24 mm blade length) to the tool.

NOTE: If necessary, resharpen knife with machine running.

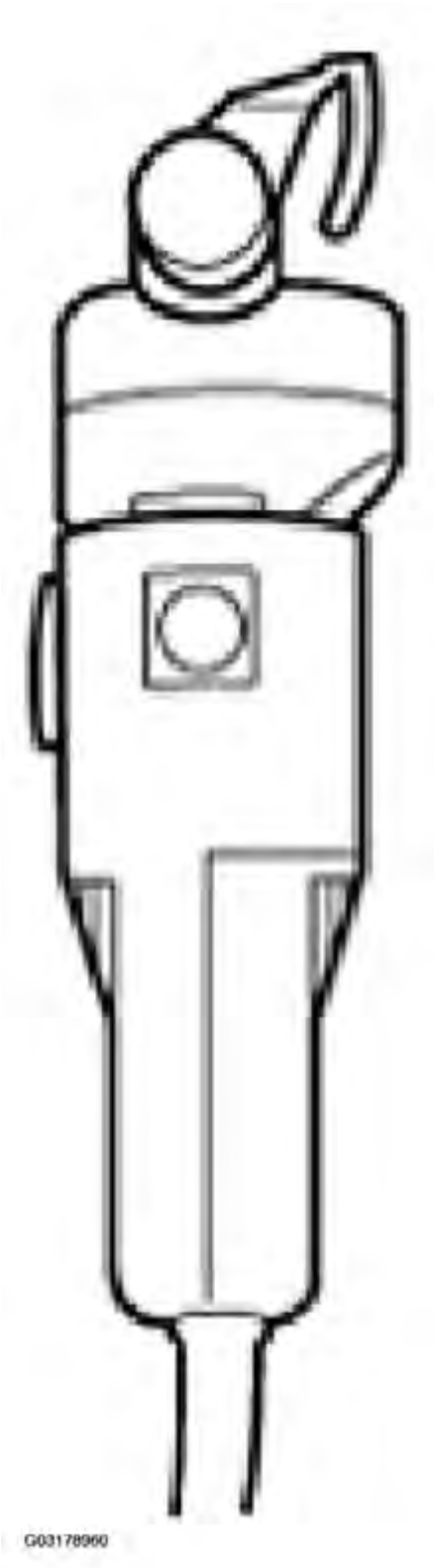


Fig. 157: Fitting Knife To Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: When reusing the rear window: Do not damage wires for rear window heater.

Carefully insert knife between hard top and rear window.

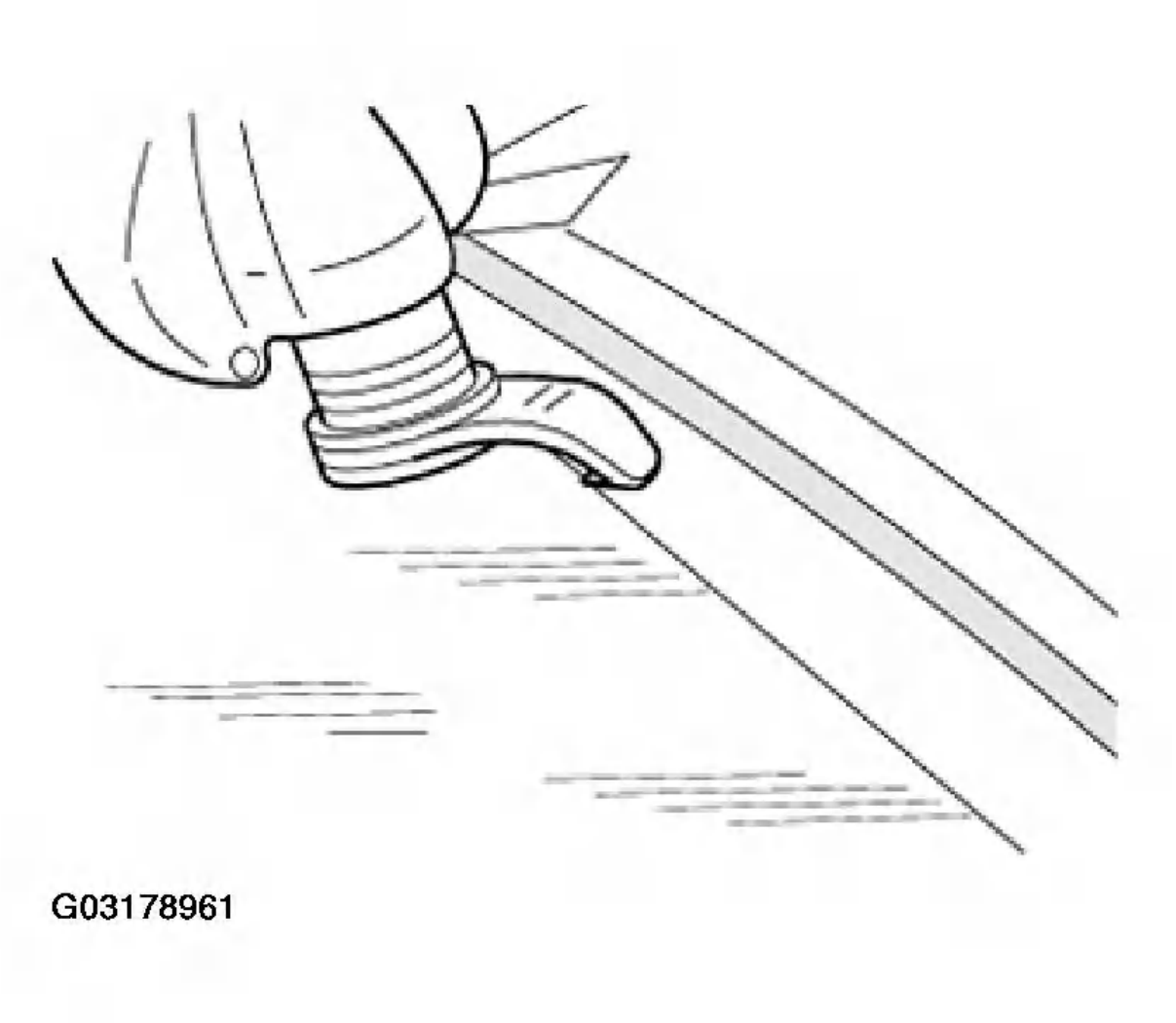


Fig. 158: Inserting Knife Between Hard Top And Rear Window
Courtesy of BMW OF NORTH AMERICA, INC.

Guide web of knife parallel to rear window.

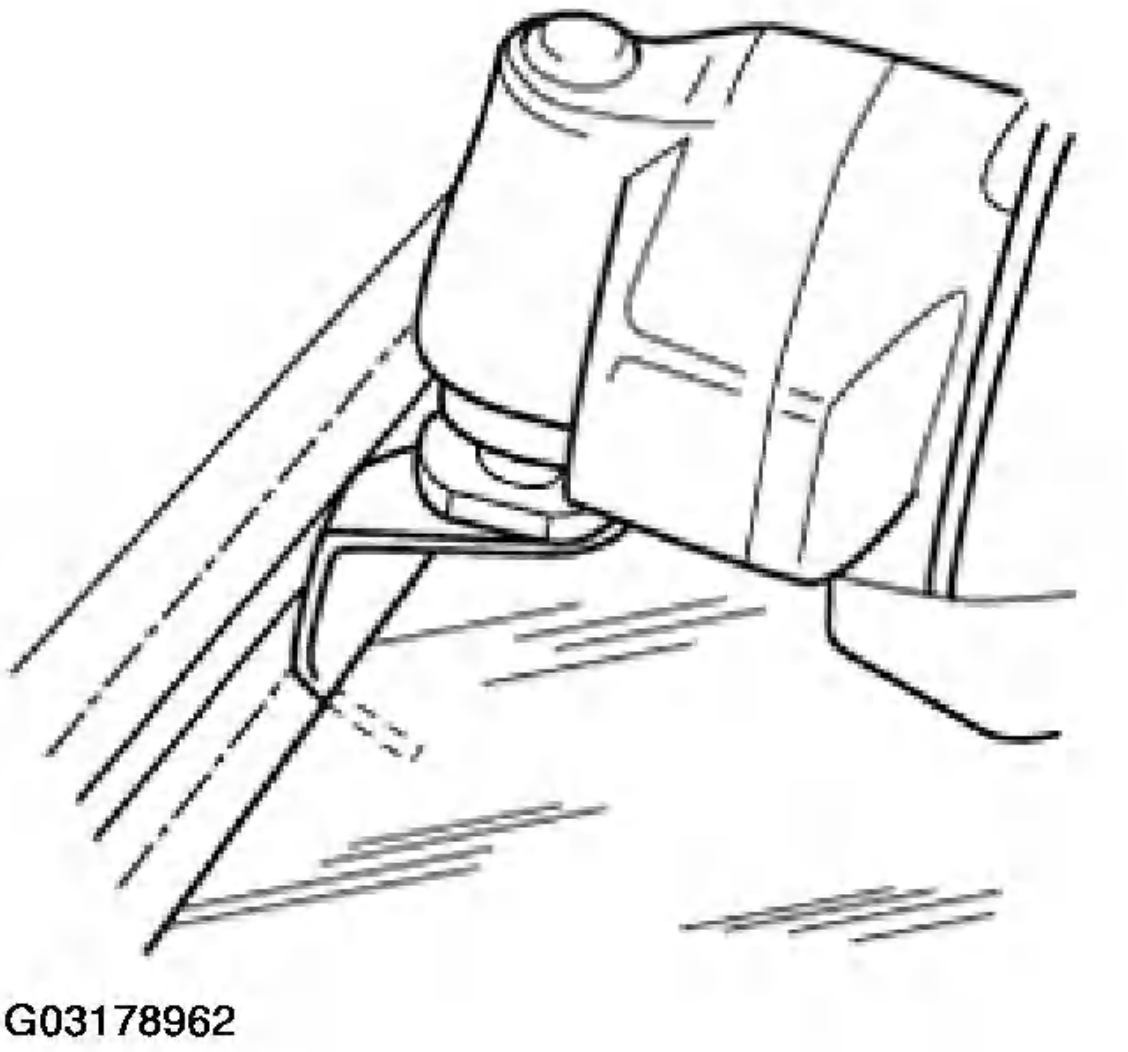


Fig. 159: Guiding Web Of Knife Parallel To Rear Window
Courtesy of BMW OF NORTH AMERICA, INC.

Cut through glue bead all around as close as possible to the rear window glass.

1. Hard top cutout.
2. Glue bead.
3. Knife.
4. Rear window.

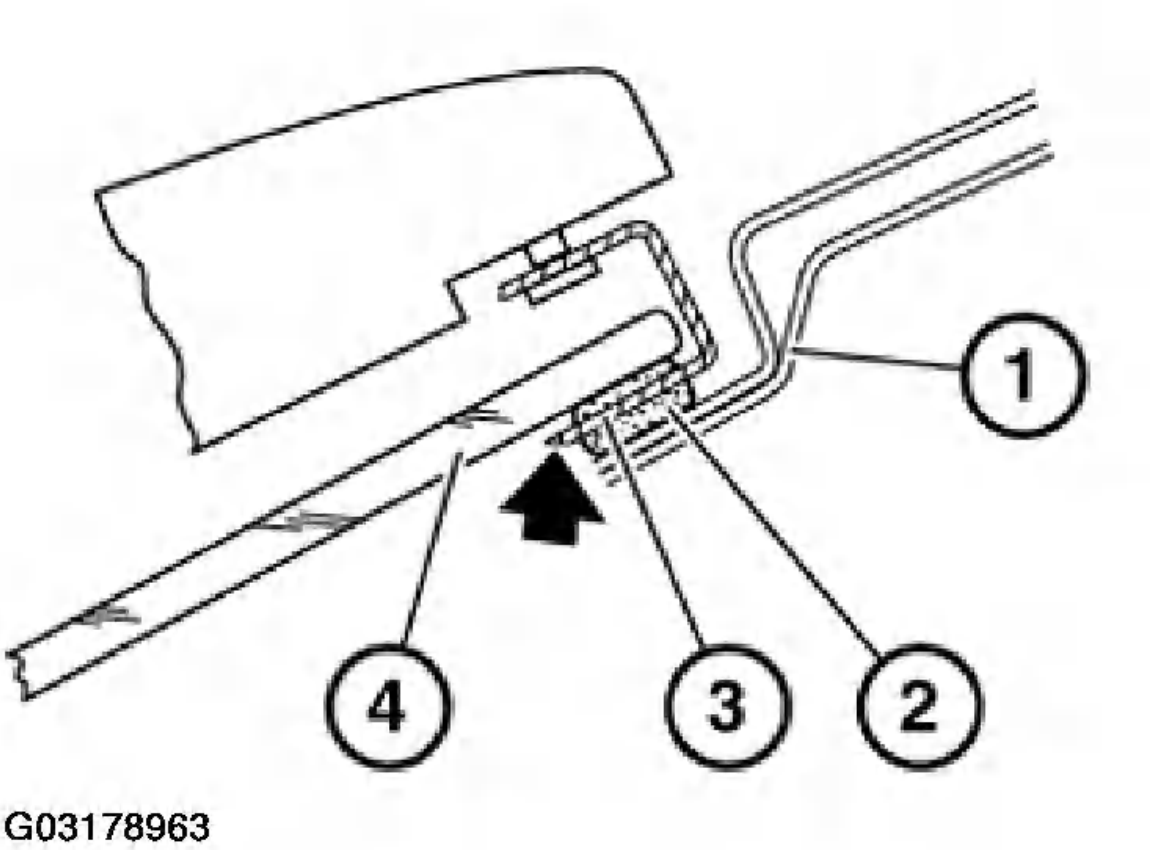


Fig. 160: Identifying Rear Window, Glue Bead, Hard Top Flange And Fabric Adhesive Tape
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out rear window with special tool 51 3 010.

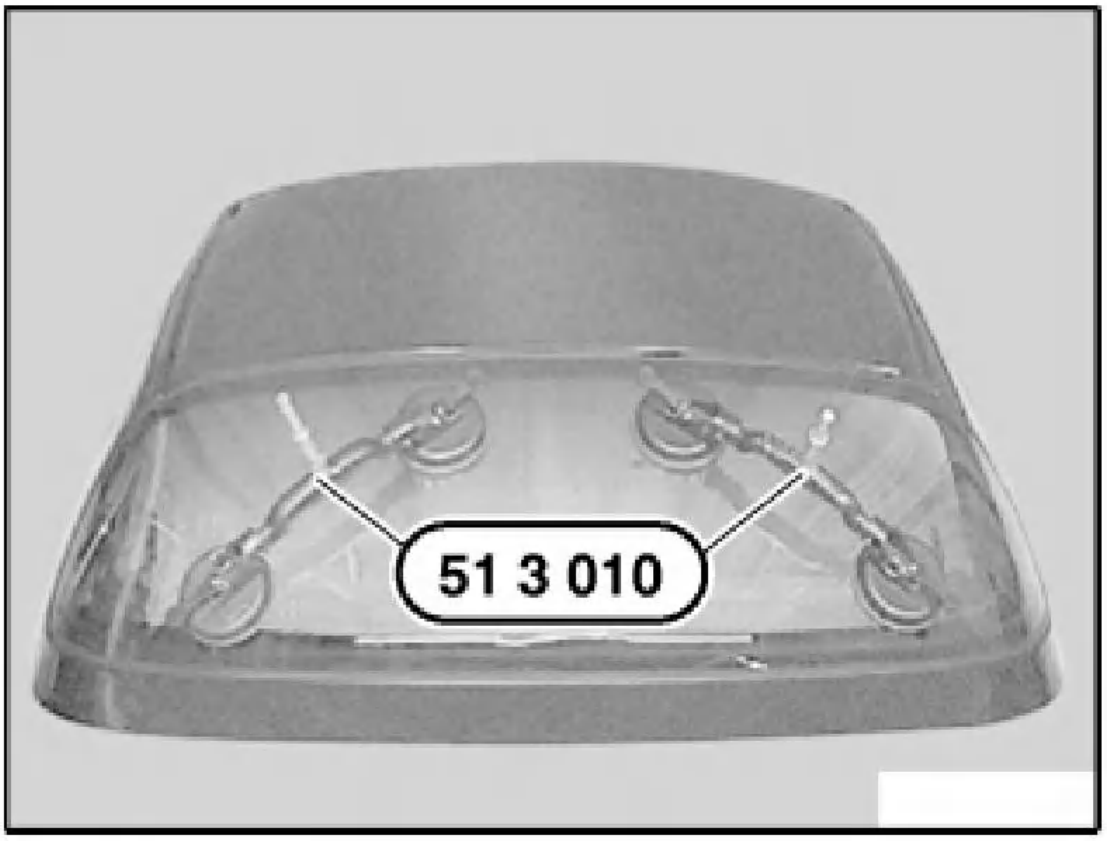


Fig. 161: Removing Rear Window
Courtesy of BMW OF NORTH AMERICA, INC.

Remove residual adhesive in hard top cutout to a thickness of approx. 0.5 mm.

To avoid damage to paintwork in hard top cutout, cut off residual adhesive with universal knife (razor sharp).

Pull off adhesive tapes all round.

CAUTION: To ensure long-term corrosion protection, it is essential to touch up damage to paintwork (scratches and large-surface damage).

Refer to 51 31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000" .

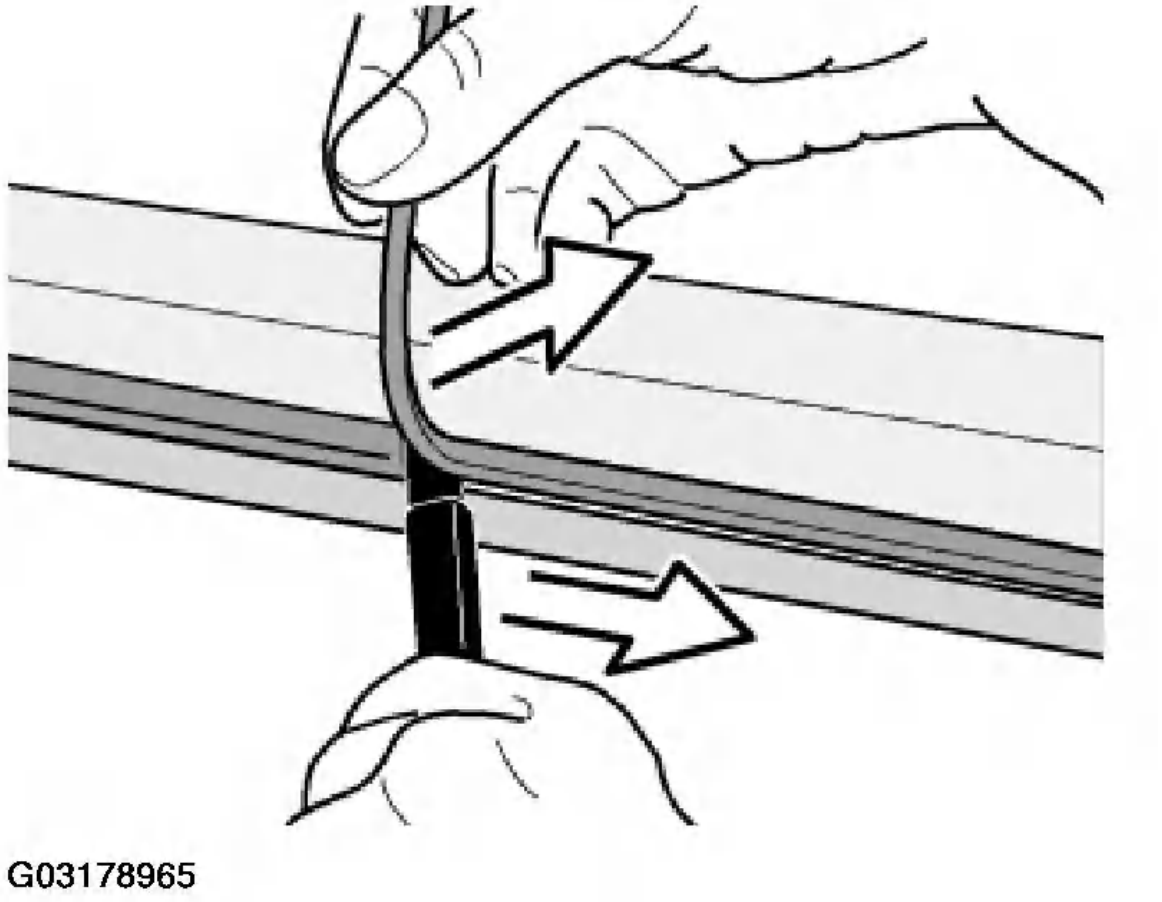


Fig. 162: Removing Residual Adhesive In Hard Top
Courtesy of BMW OF NORTH AMERICA, INC.

When reusing the rear window:

Scrape away glue residue on rear window to depth of 0.5 mm with scraper.

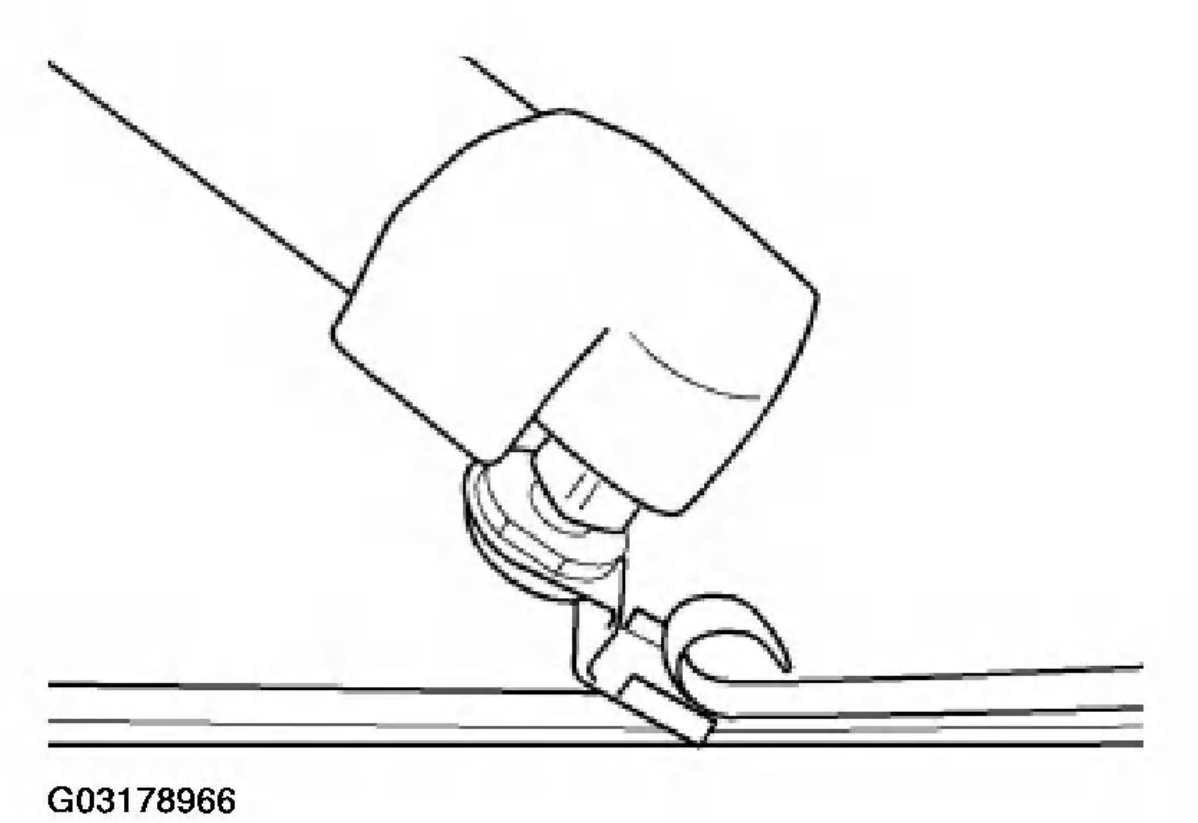


Fig. 163: Scraping Glue Residue On Rear Window
Courtesy of BMW OF NORTH AMERICA, INC.

Mount and press seal on to rear window glass at bottom.

Mount and press seal on to rear window glass at top and sides.

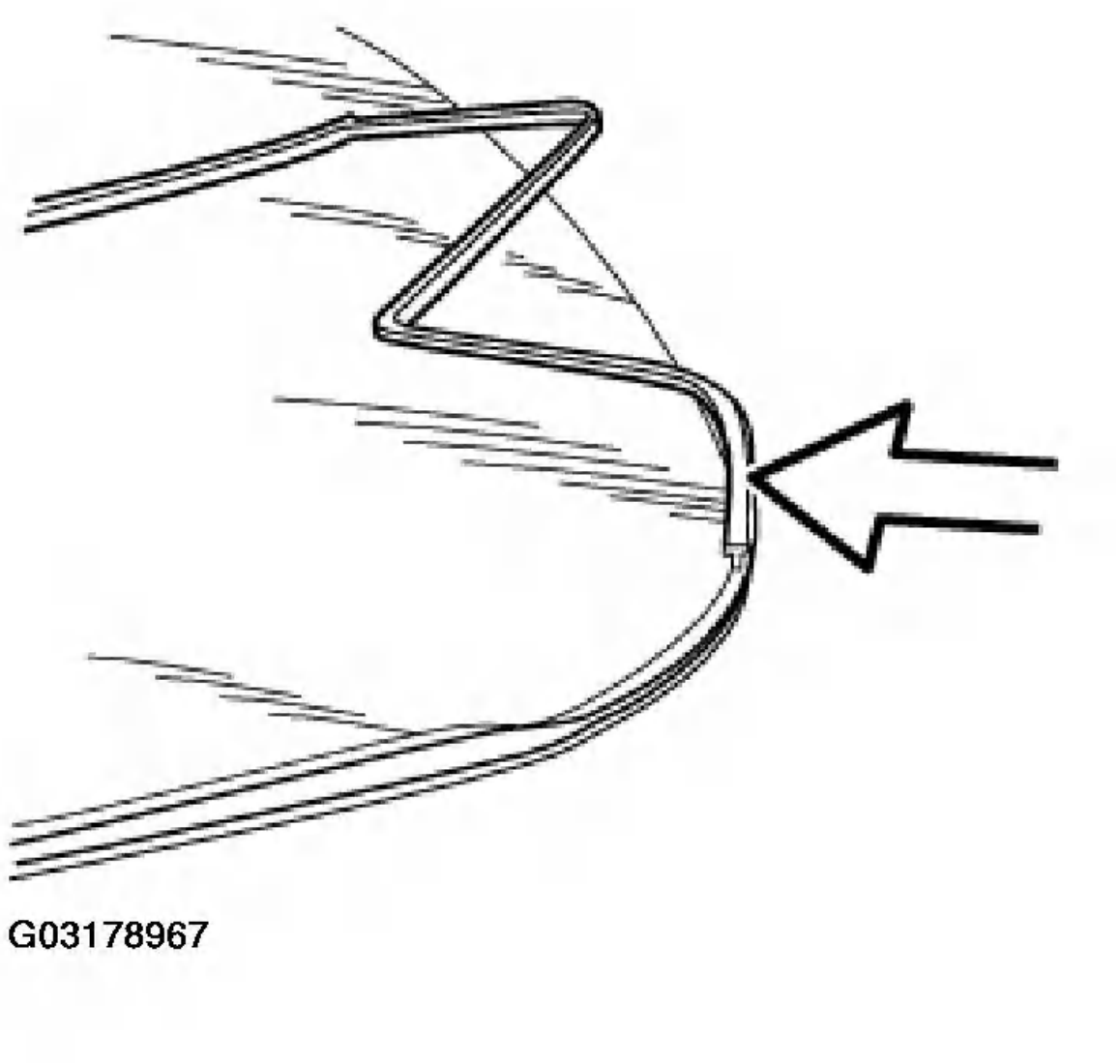


Fig. 164: Pressing Seal On Rear Window Glass At Bottom
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: The basic filler must have hardened!

Treat rear window and hard top in adhesive area with BMW-approved materials, refer to 51 31 ... REMOVING WINDSCREEN WITH "ROLL OUT 2000" .

NOTE: Note specified ventilation time.

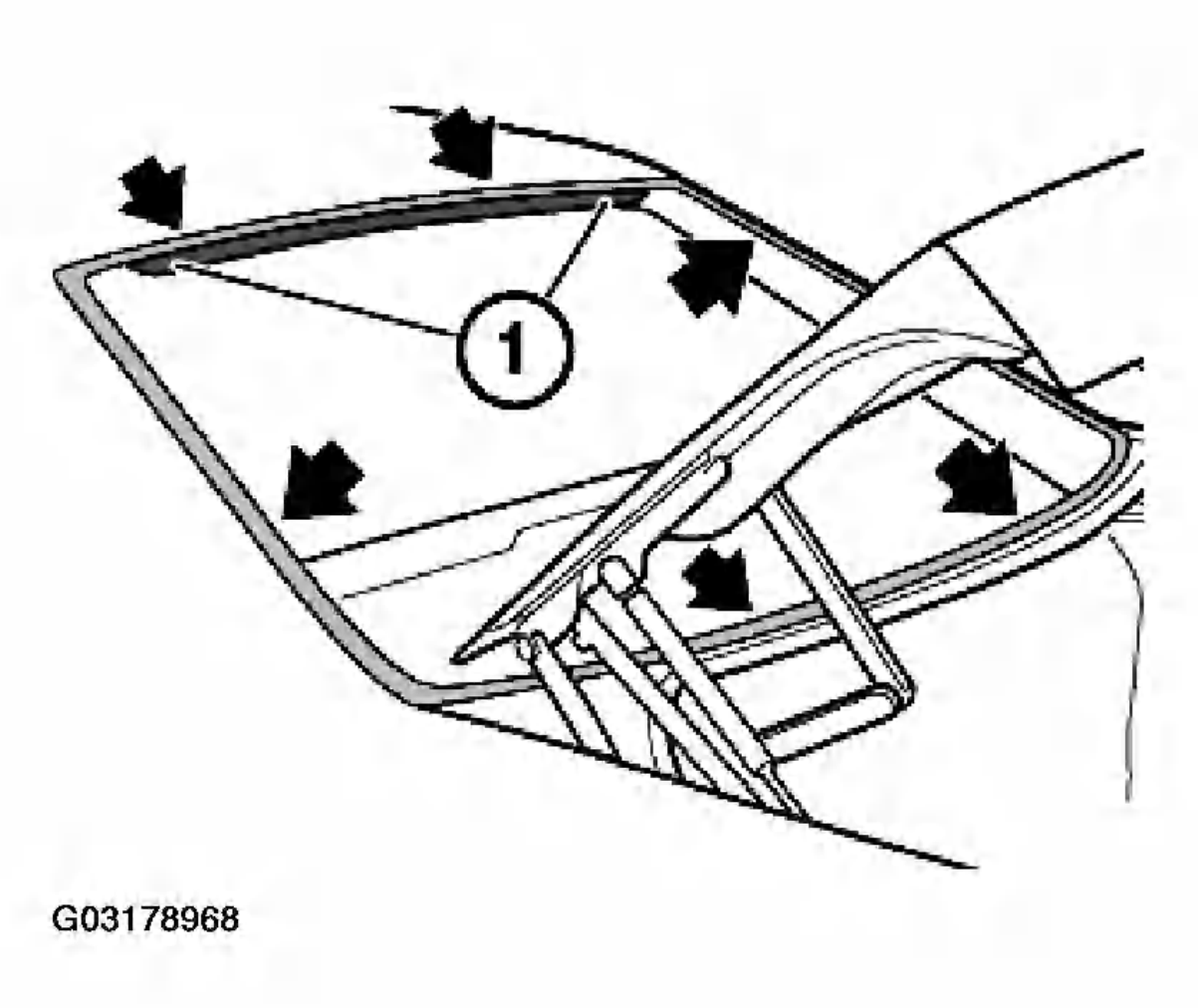


Fig. 165: Installing Rear Window
Courtesy of BMW OF NORTH AMERICA, INC.

Cut nozzle to size.

(A) = 9 mm.

(B) = 6 mm.

NOTE: To apply a uniform glue bead, use cartridge pistol.

Check expiry date of glue!

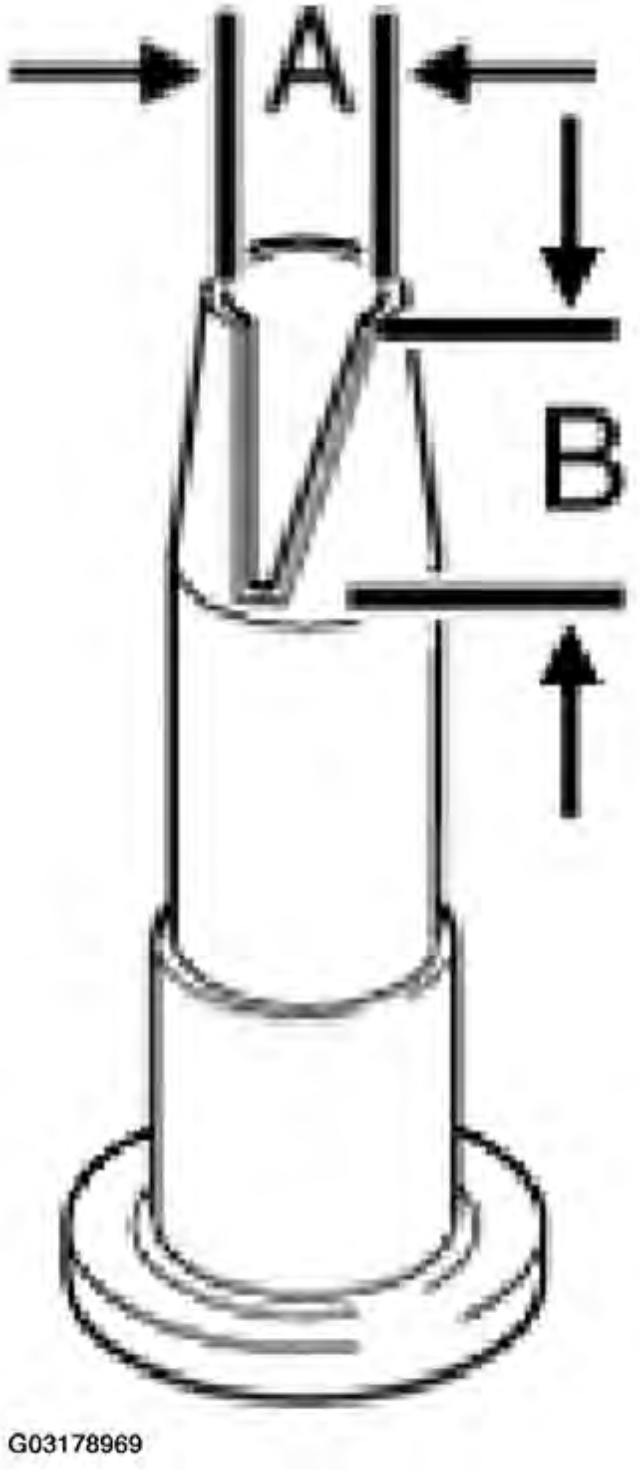


Fig. 166: Identifying Nozzle Size
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, apply a test bead before gluing.

Cartridge must be arranged vertically against rear window.

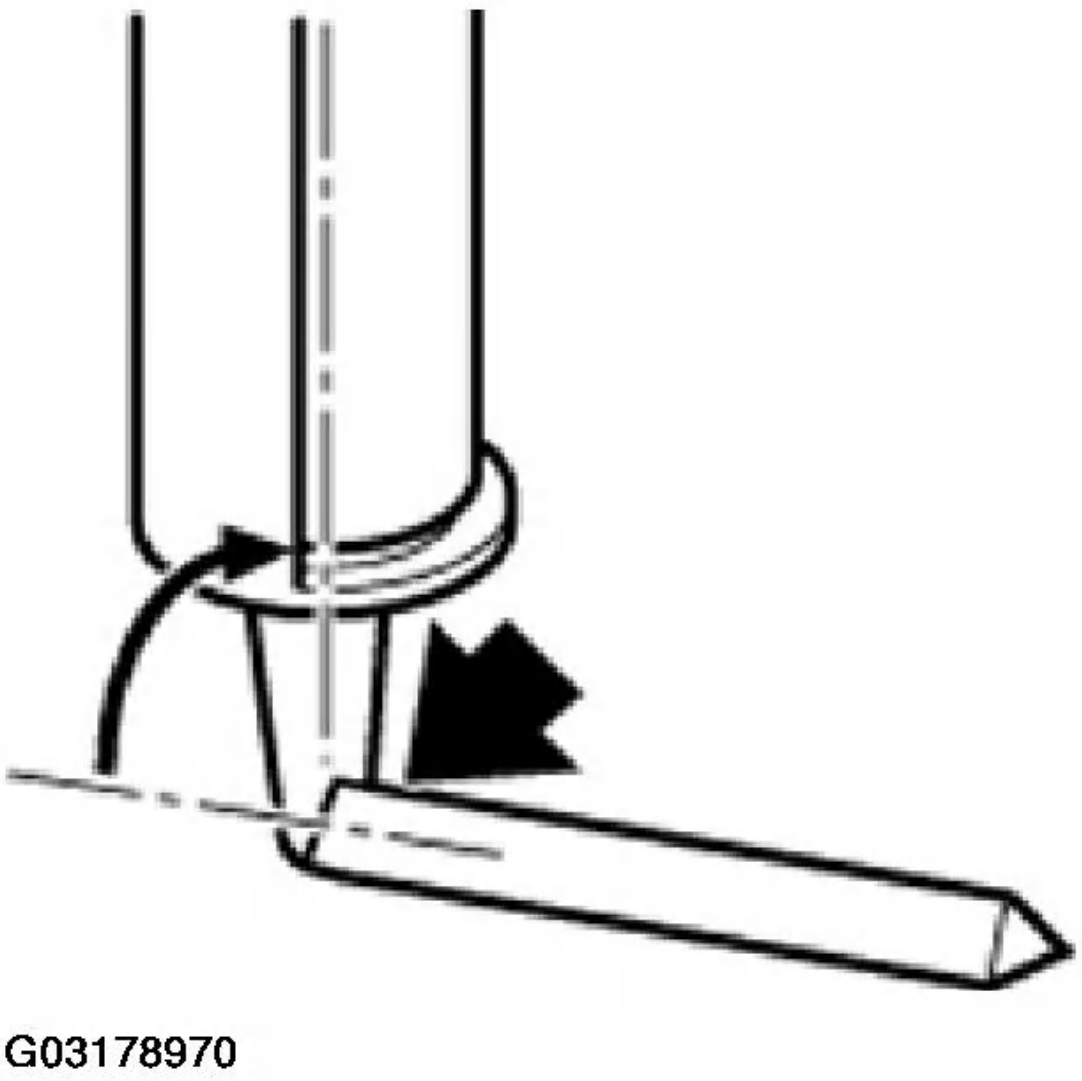


Fig. 167: Testing Before Gluing
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: There must be no adhesive on the connection contacts of the rear window heater.

Shape of adhesive bead:

(A) = 9 mm

(B) = 6 mm

CAUTION: Apply glue bead quickly and insert window. Skin formation time of glue, maximum 10 minutes.

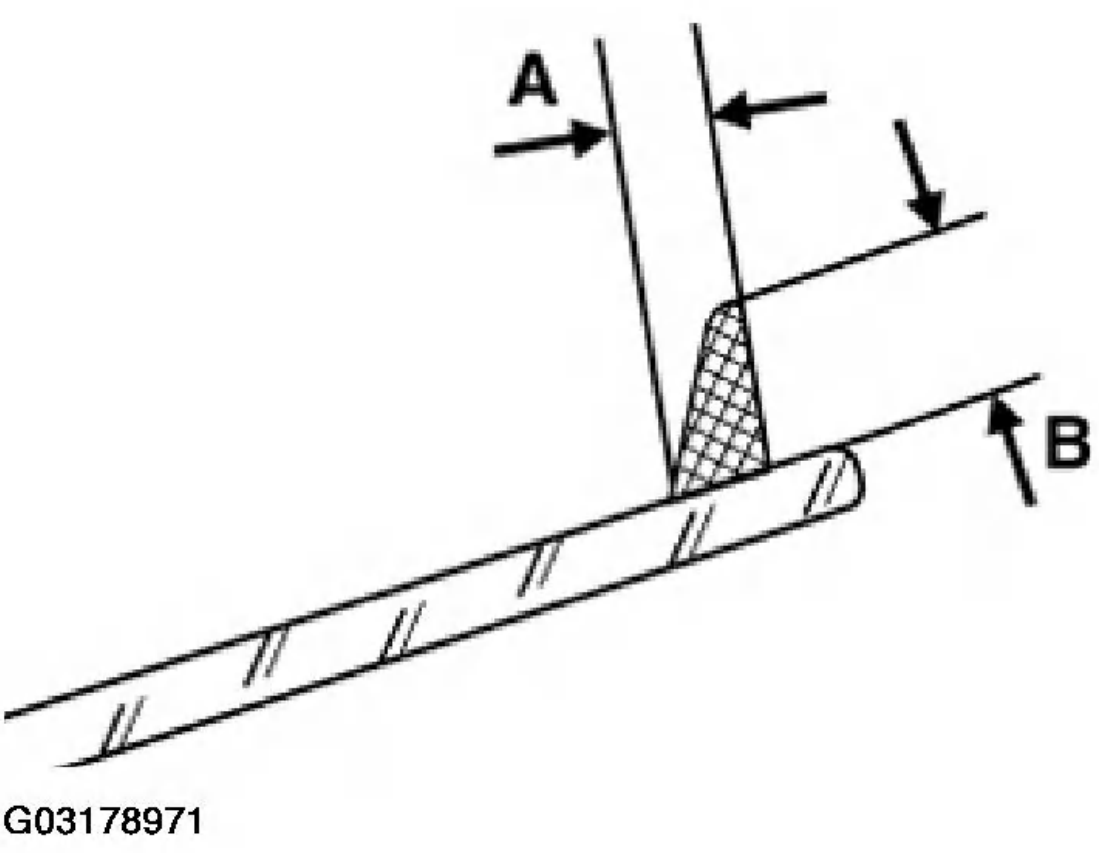


Fig. 168: Identifying Shape Of Adhesive Bead (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Maintain uniform distance (A) between glue bead and seal.

Distance (A) = 3 mm.

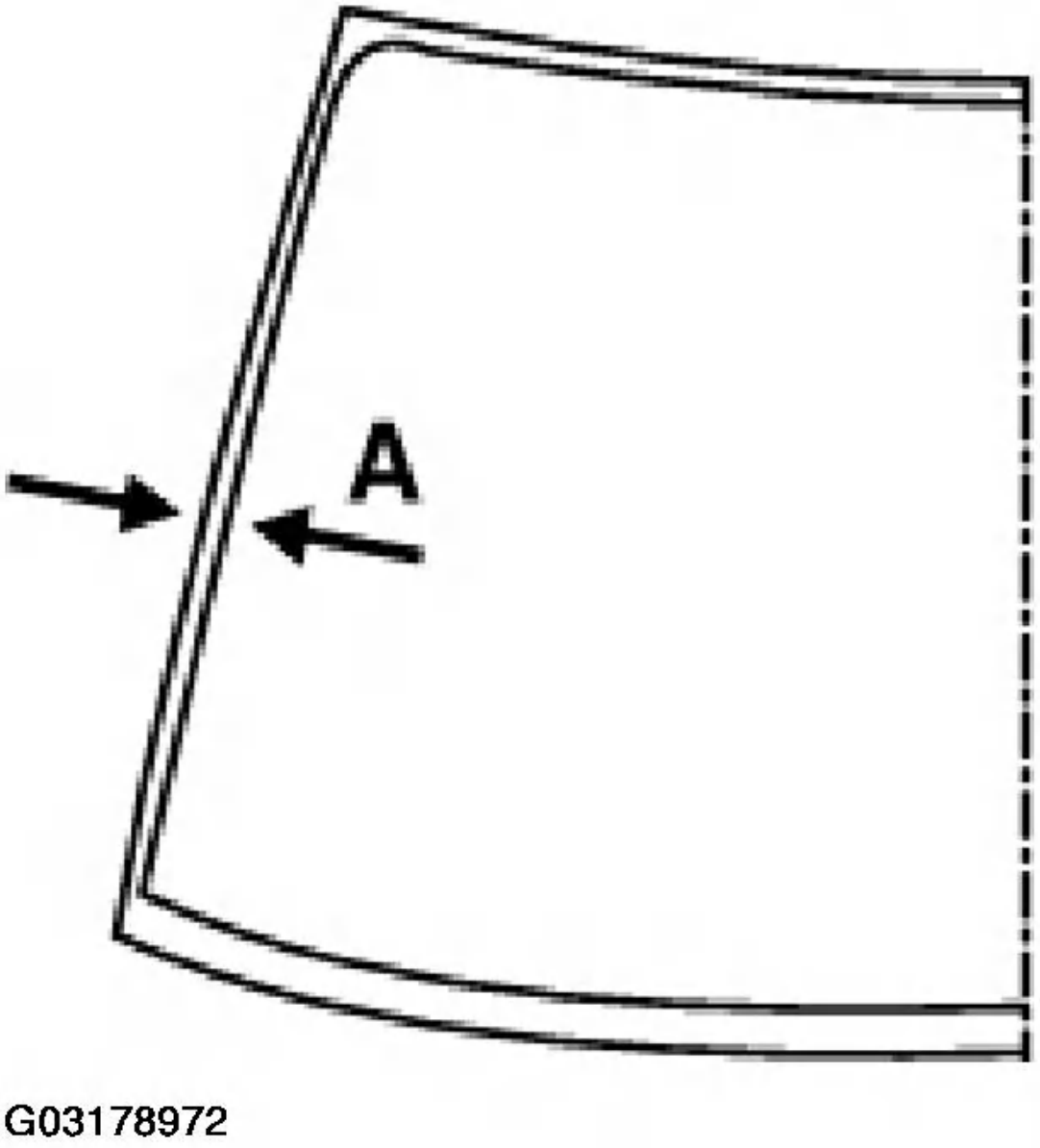


Fig. 169: Identifying Uniform Distance Of Glue
Courtesy of BMW OF NORTH AMERICA, INC.

Install rear window carefully using special tool 51 3 010. Seal must fit uniformly on the sides. Push up rear window glass until seal bears uniformly on the roof flange.

Align rear window to roof flange and evenly at sides. Press-fit rear window and secure in this position with fabric adhesive tape (e.g. Tesa).

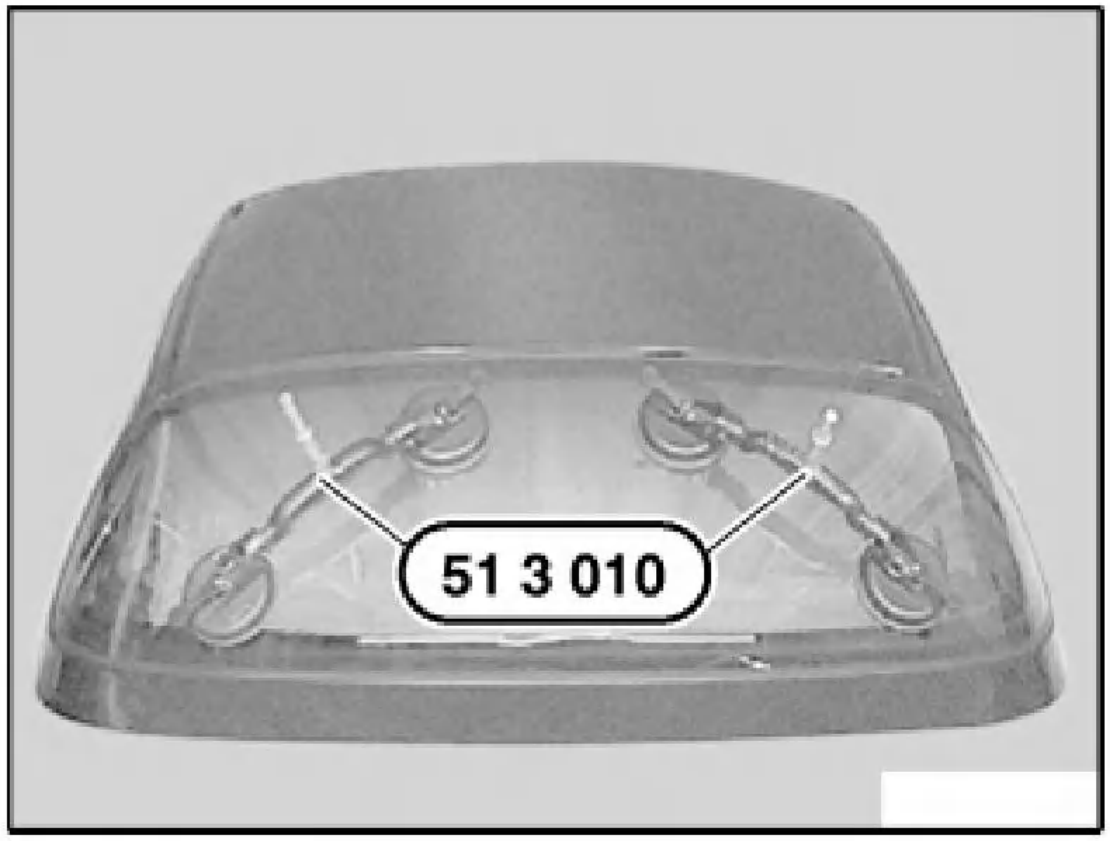


Fig. 170: Installing Rear Window
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Before hardening, remove contamination by residual adhesive with Sika remover 208. Do not press out rear window glass again for this purpose. Hardened glue can only be removed by machine.

Assemble car.

After the hardening time, remove adhesive tapes.

NOTE: Leaks can be found by spraying water on the sealing lips or with an ultrasonic leak detector and then eliminated by using a suitable nozzle.

FRONT MANUALLY OPERATED WINDOWS

51 32 020 REMOVING AND INSTALLING/REPLACING CRANK UNIT IN LEFT OR RIGHT FRONT DOOR (Z3 ROADSTER)

Remove front door window, refer to 51 32 170 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT DOOR WINDOWS (Z3 ROADSTER) .

Unscrew bolts (1).



Fig. 171: Identifying Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1) and carefully turn crank unit (2) to remove from front door.

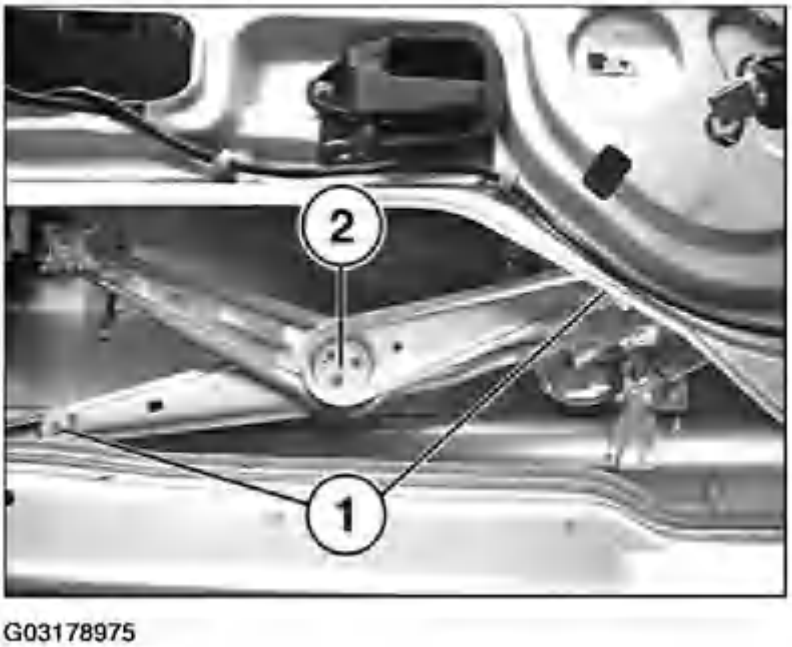


Fig. 172: Removing Crank Unit From Front Door
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If tolerances are unfavorable, untighten screws (1) and remove support (2).

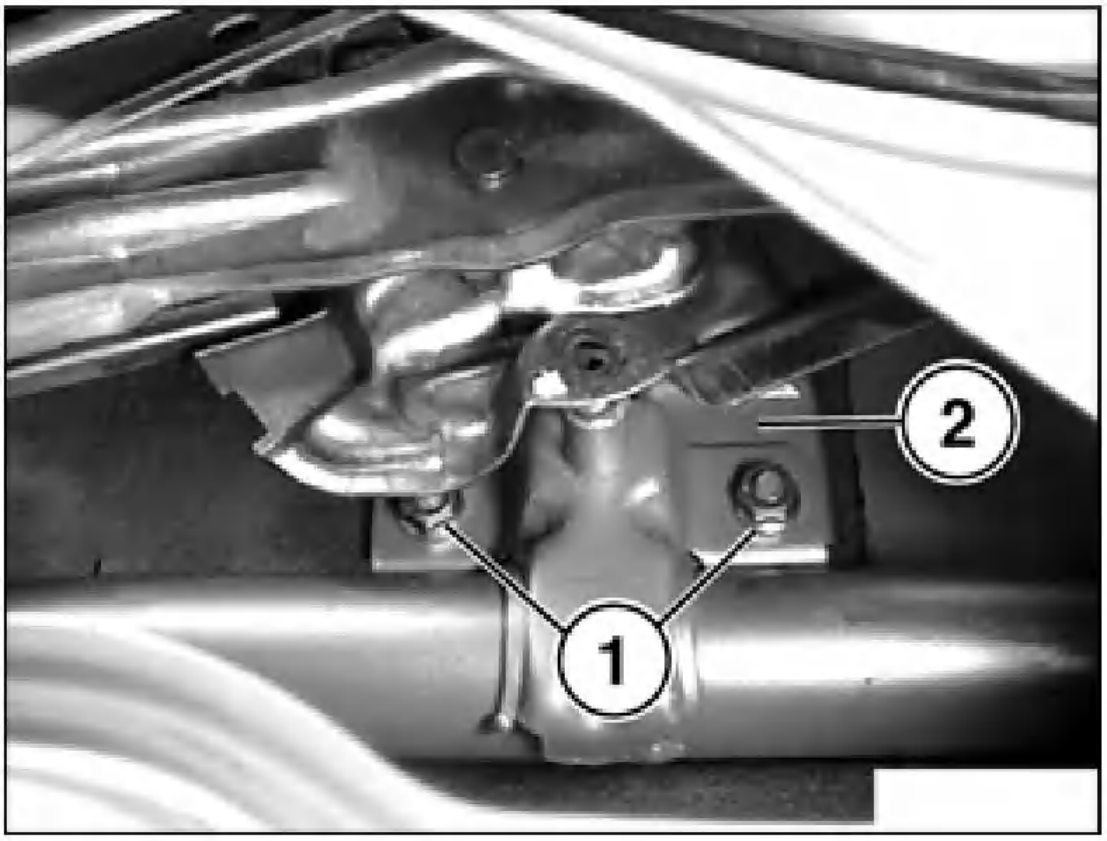


Fig. 173: Removing Support
Courtesy of BMW OF NORTH AMERICA, INC.

51 32 140 REMOVING AND INSTALLING OR REPLACING FRONT LEFT OR RIGHT DOOR WINDOW (FIXED) (Z3 ROADSTER)

Remove door trim panel, refer to 51 41 000 REMOVING AND INSTALLING FRONT LEFT OR RIGHT DOOR TRIM PANEL (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Partially remove inner foil.

Installation:

If necessary, replace defective inner foil.

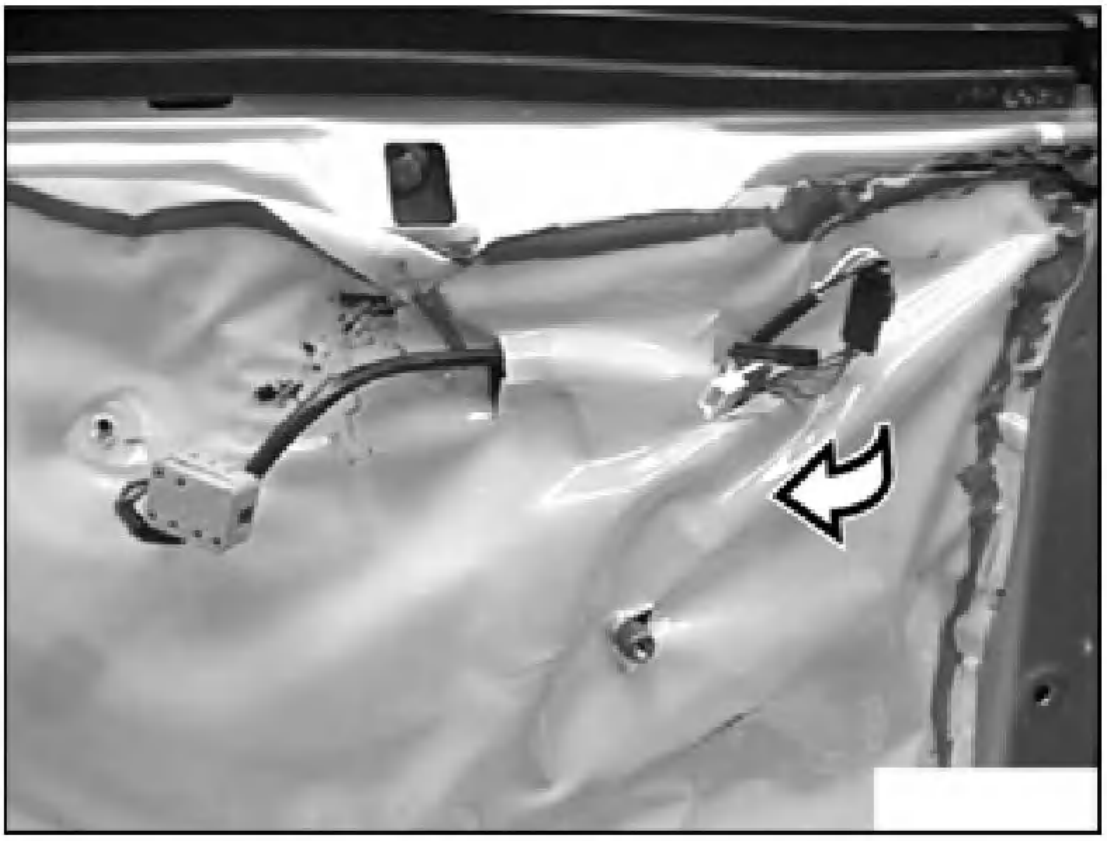


Fig. 174: Removing Defective Inner Foil
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screw.

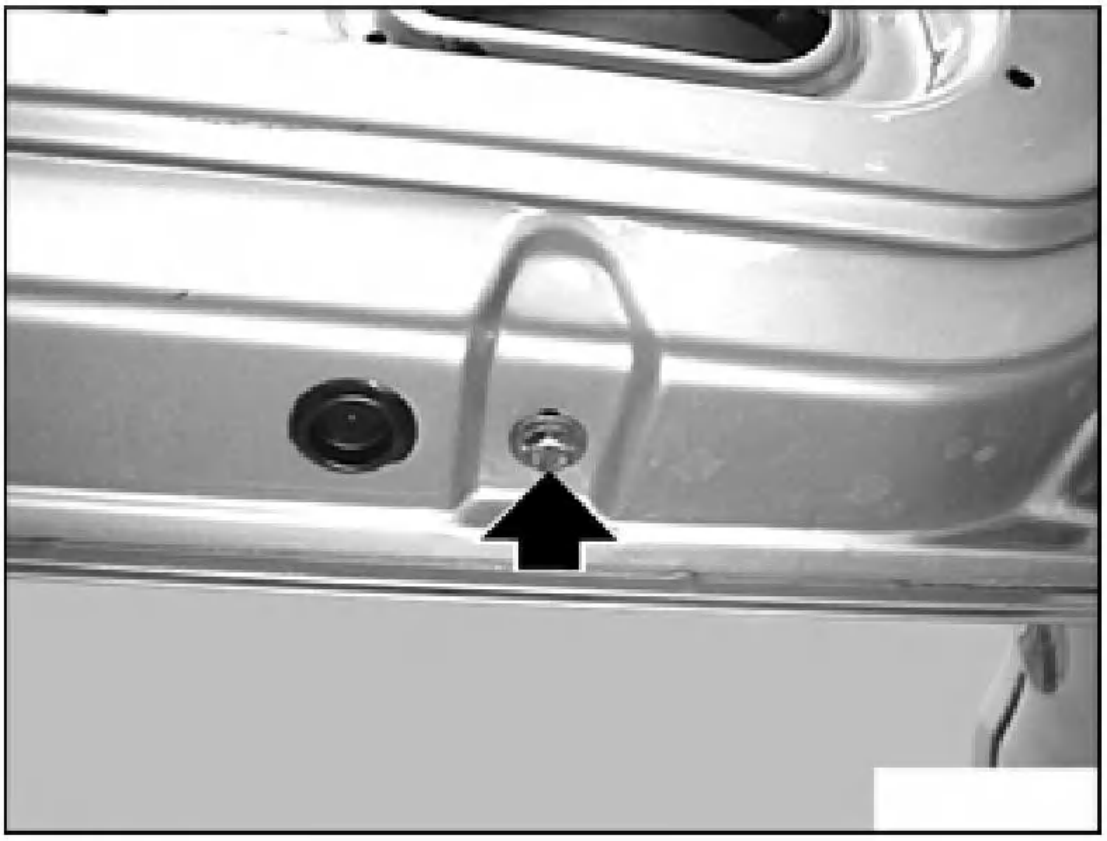


Fig. 175: Removing Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1 ... 2) and carefully lift door window (3) up to remove.

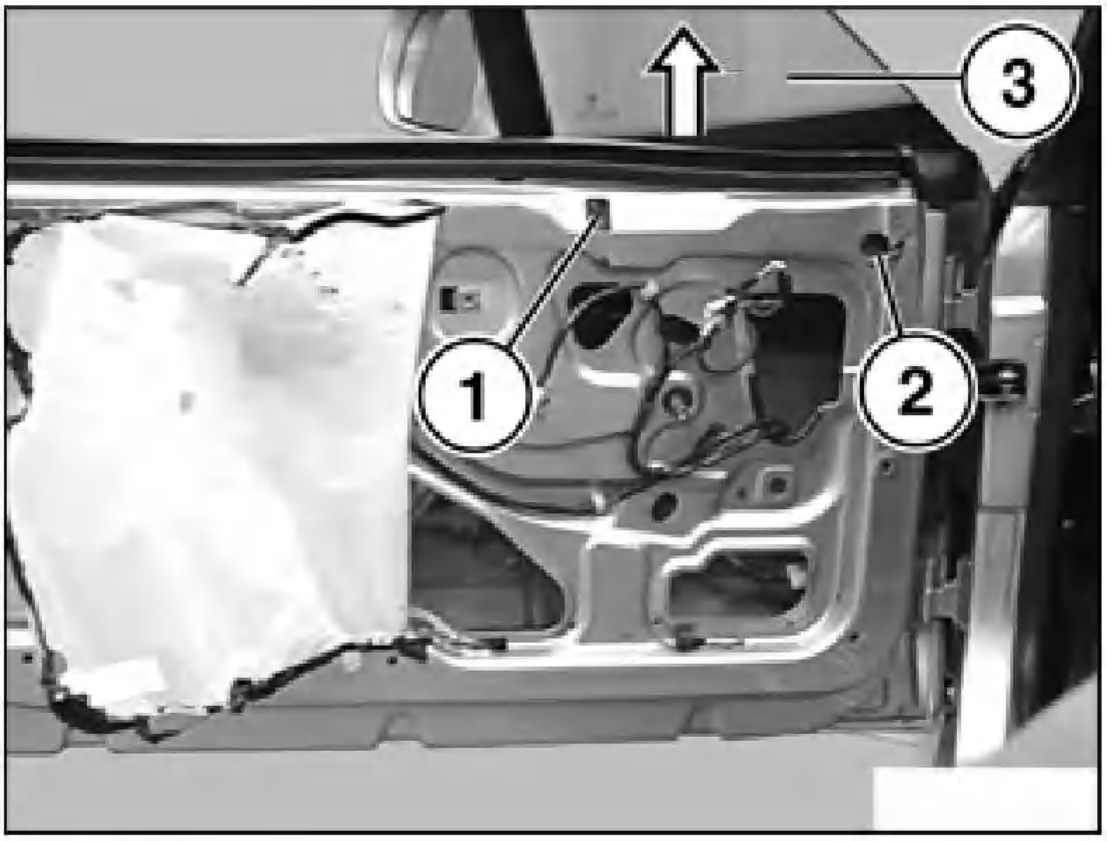


Fig. 176: Adjusting Door Window
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Screw (1) is longer than the remaining screw.

Adjusting door window, refer to 51 32 154 ADJUSTING FRONT LEFT OR RIGHT DOOR WINDOW (Z3 ROADSTER) .

Only replace:

If necessary, remove guide rubber (1).

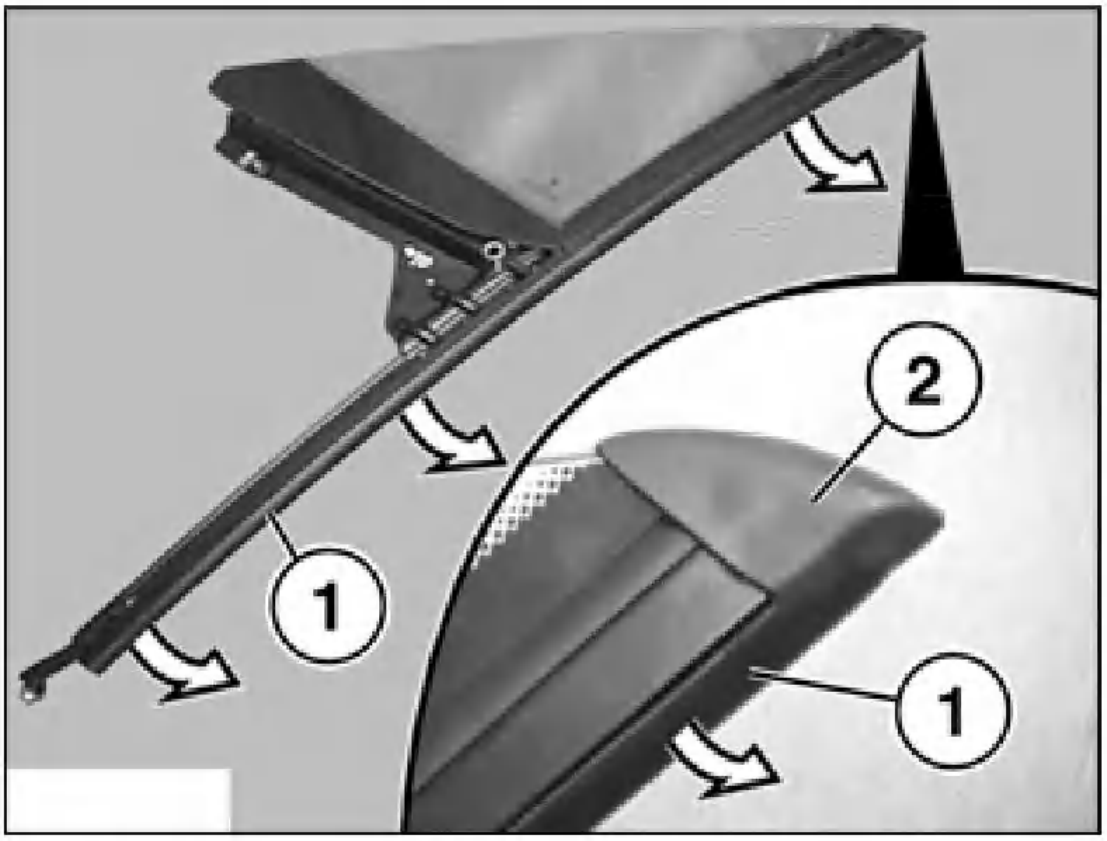


Fig. 177: Removing Guide Rubber
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guide rubber (1) is cemented in area (2).

51 32 154 ADJUSTING FRONT LEFT OR RIGHT DOOR WINDOW (Z3 ROADSTER)

Remove door trim panel, refer to 51 41 000 REMOVING AND INSTALLING FRONT LEFT OR RIGHT DOOR TRIM PANEL (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Ideal adjustment:

The door window (1) gasket (2) must locate evenly all round (wind noise, water ingress).

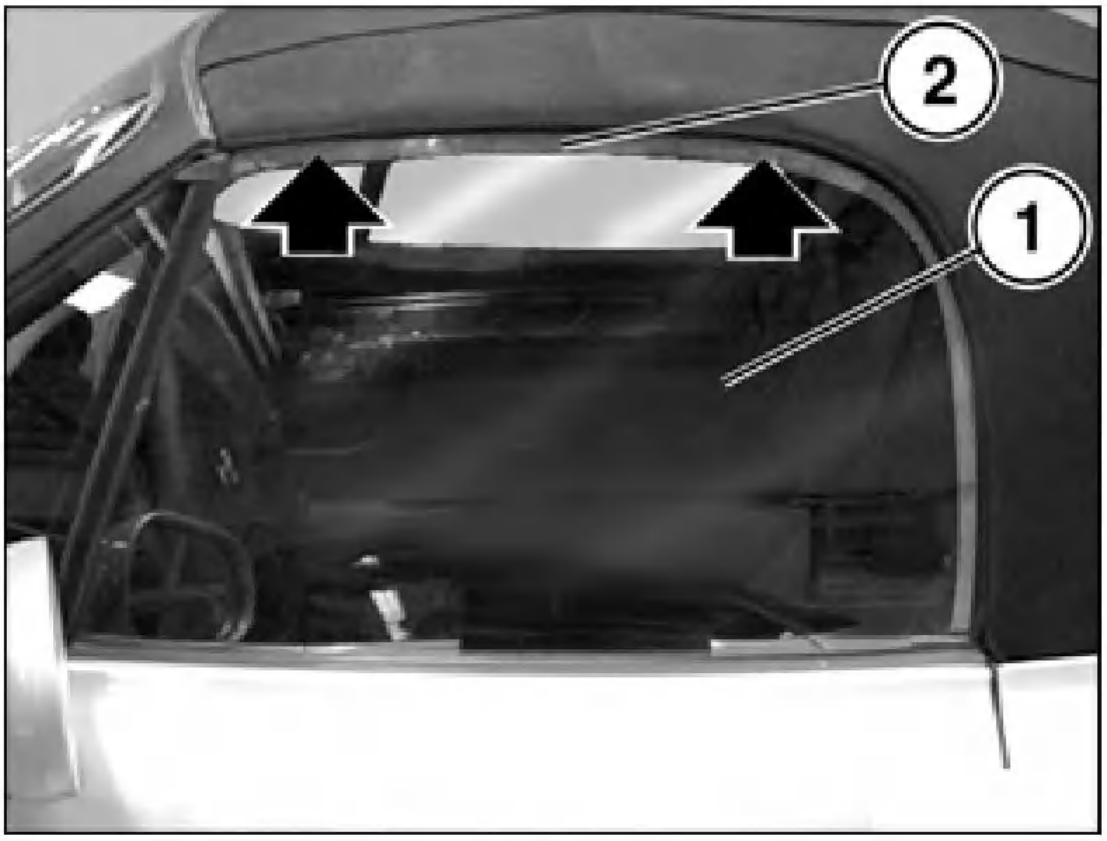


Fig. 178: Identifying Door Window Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

Ideal adjustment:

Door window (1) locates flush against A-pillar (2).

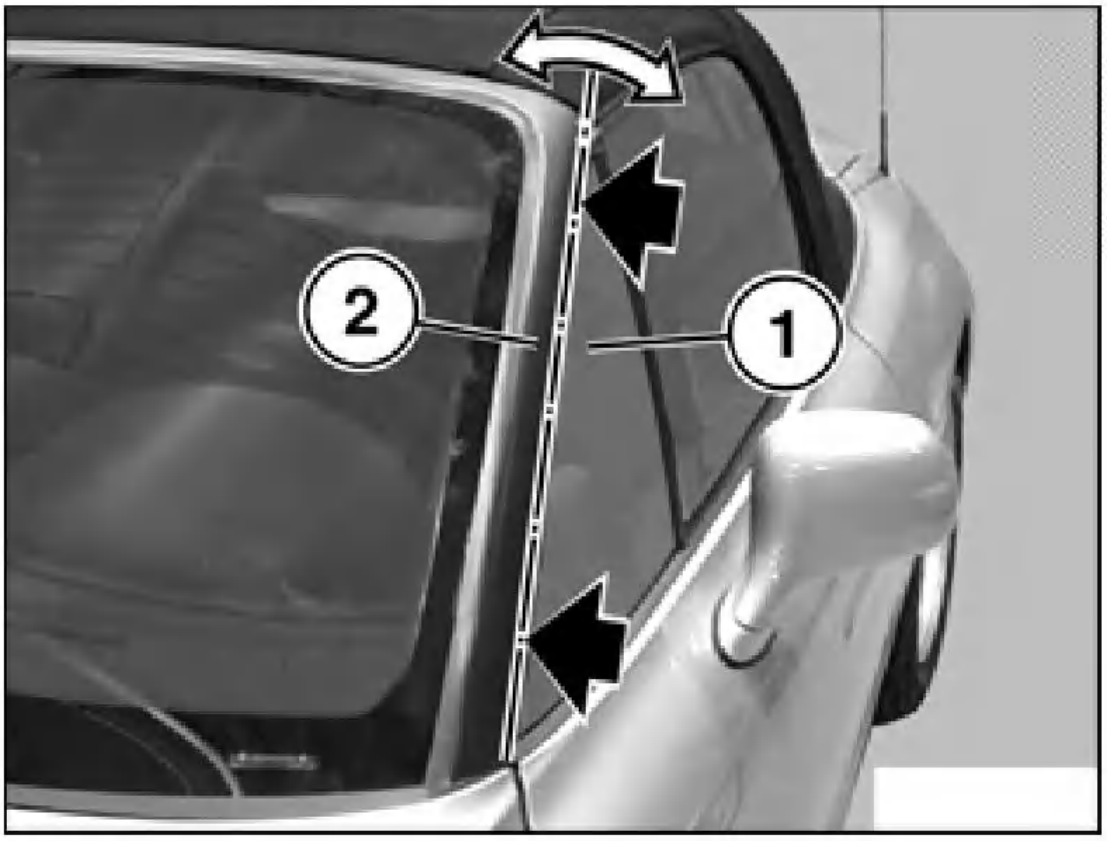


Fig. 179: Identifying Door Window And A-Pillar
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off cover.

Installation:

Replace cover.

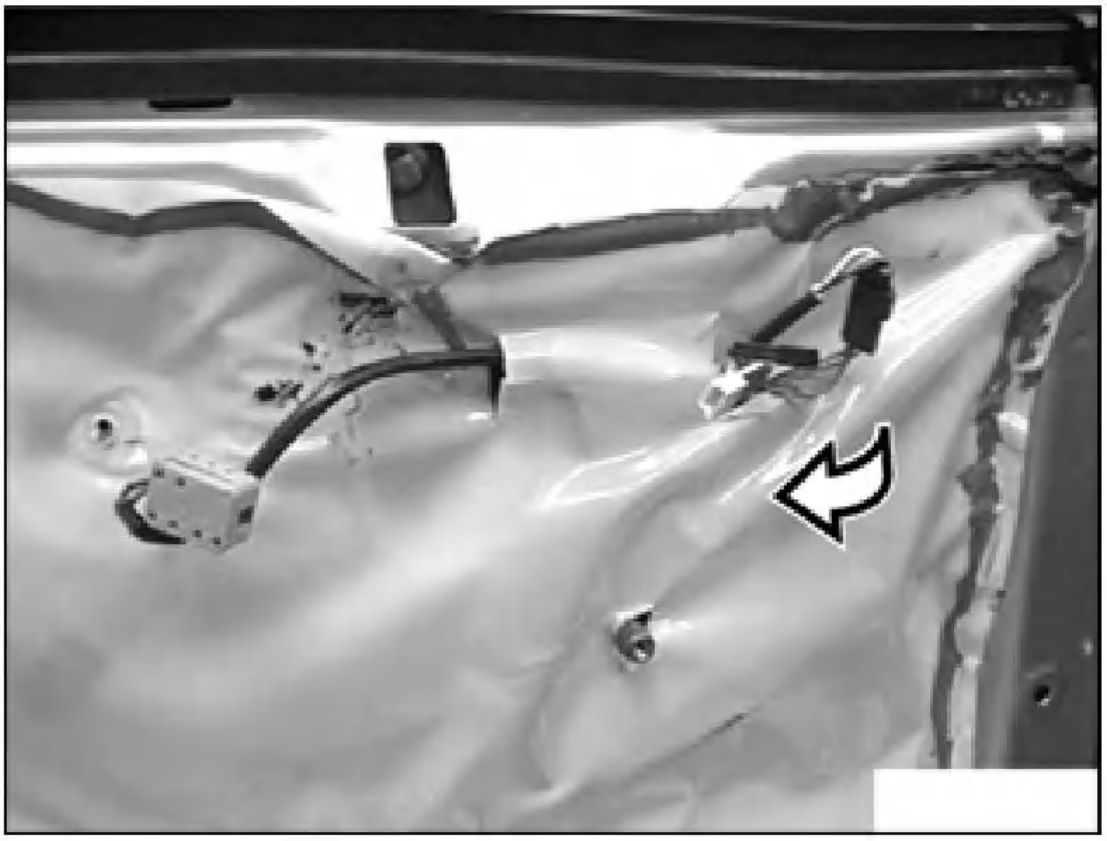


Fig. 180: Replacing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Parallelism:

Adjust door window so that it is parallel to the window frame by adjusting the guide rails.

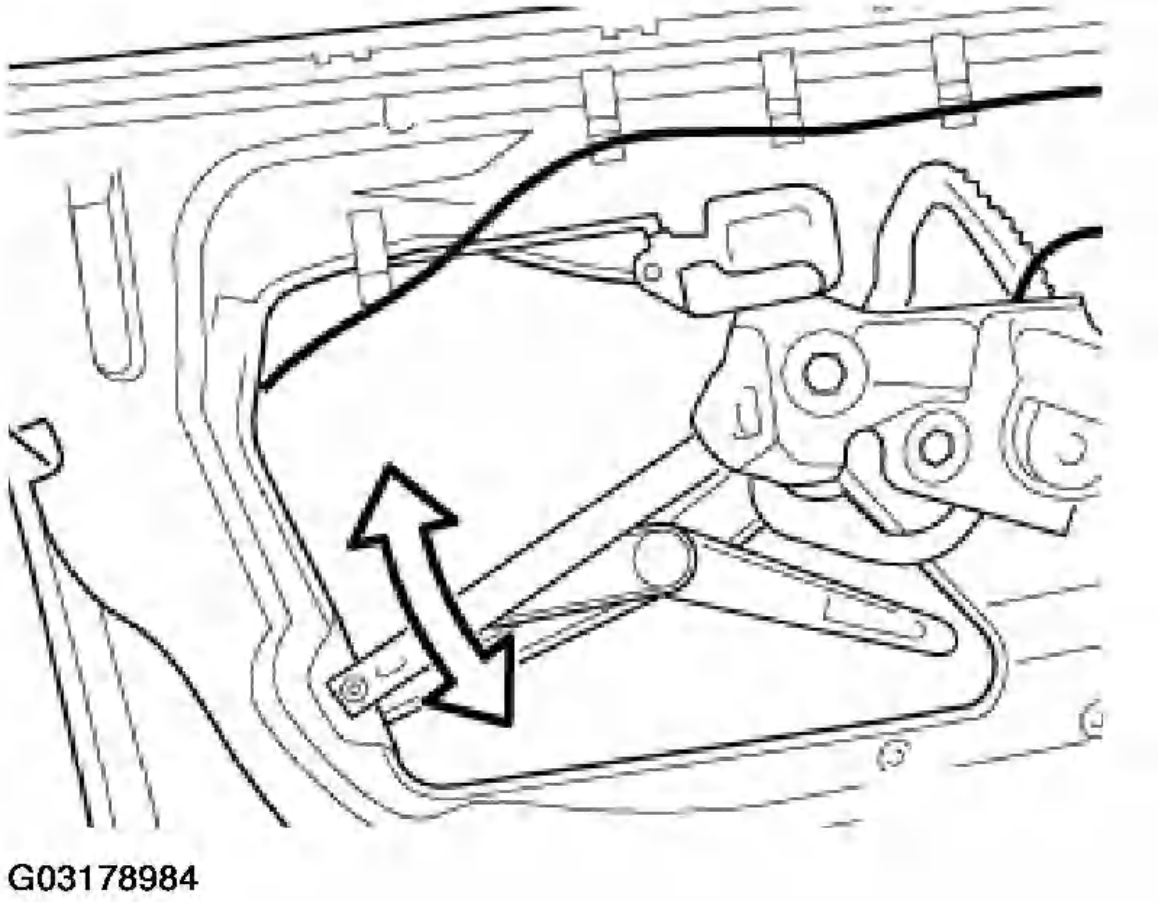


Fig. 181: Adjusting Guide Rails
Courtesy of BMW OF NORTH AMERICA, INC.

Preload on door window (fixed):

Adjust window guide rail until door window (1) locates flush against the A-pillar (2).

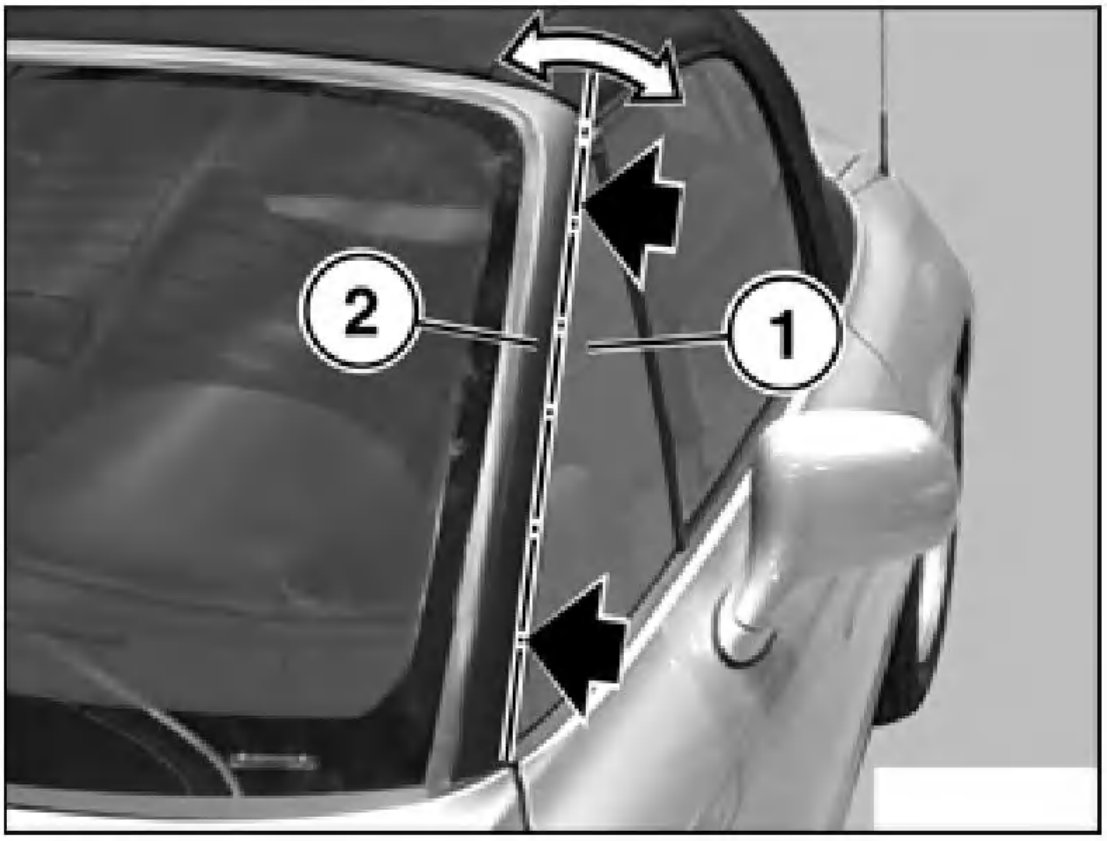


Fig. 182: Identifying Door Window And A-Pillar
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen screw (1) and adjust window guide rail (front).

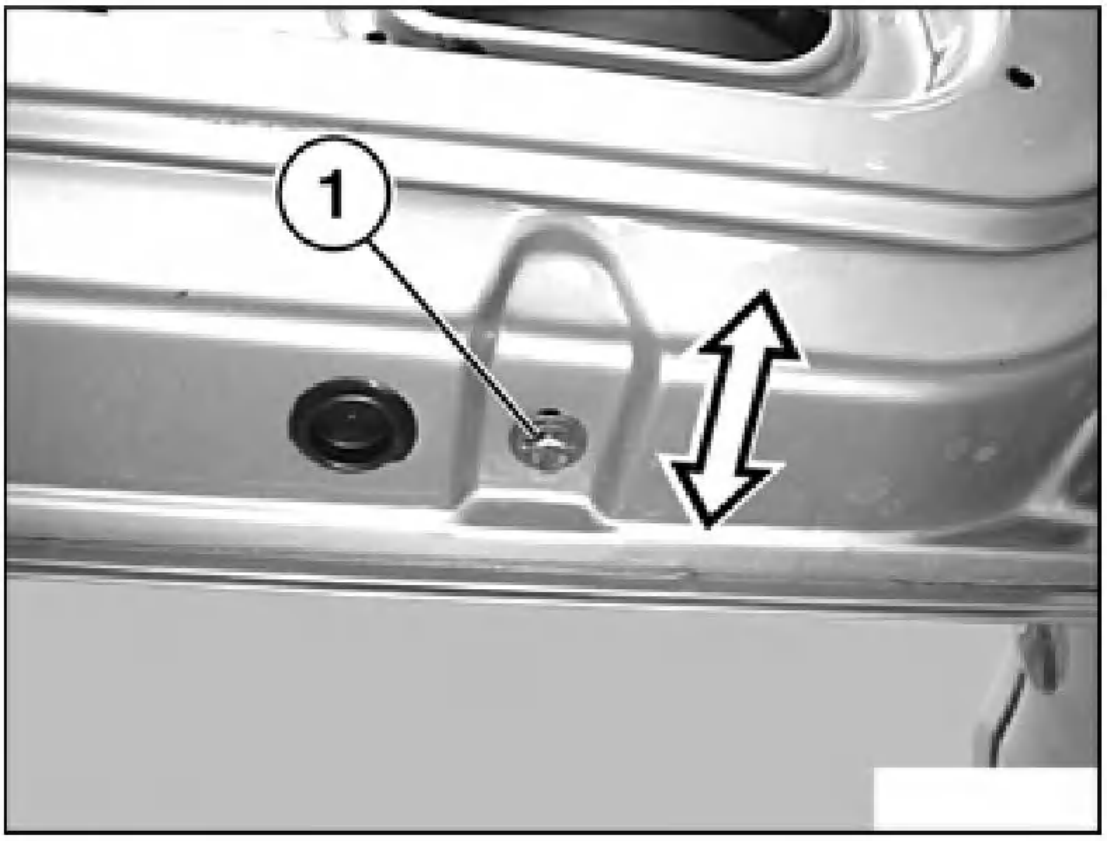


Fig. 183: Loosening Window Guide Rail Screw (Front)
Courtesy of BMW OF NORTH AMERICA, INC.

Preload on door window:

Loosen screw (1) and adjust window guide rail (rear).

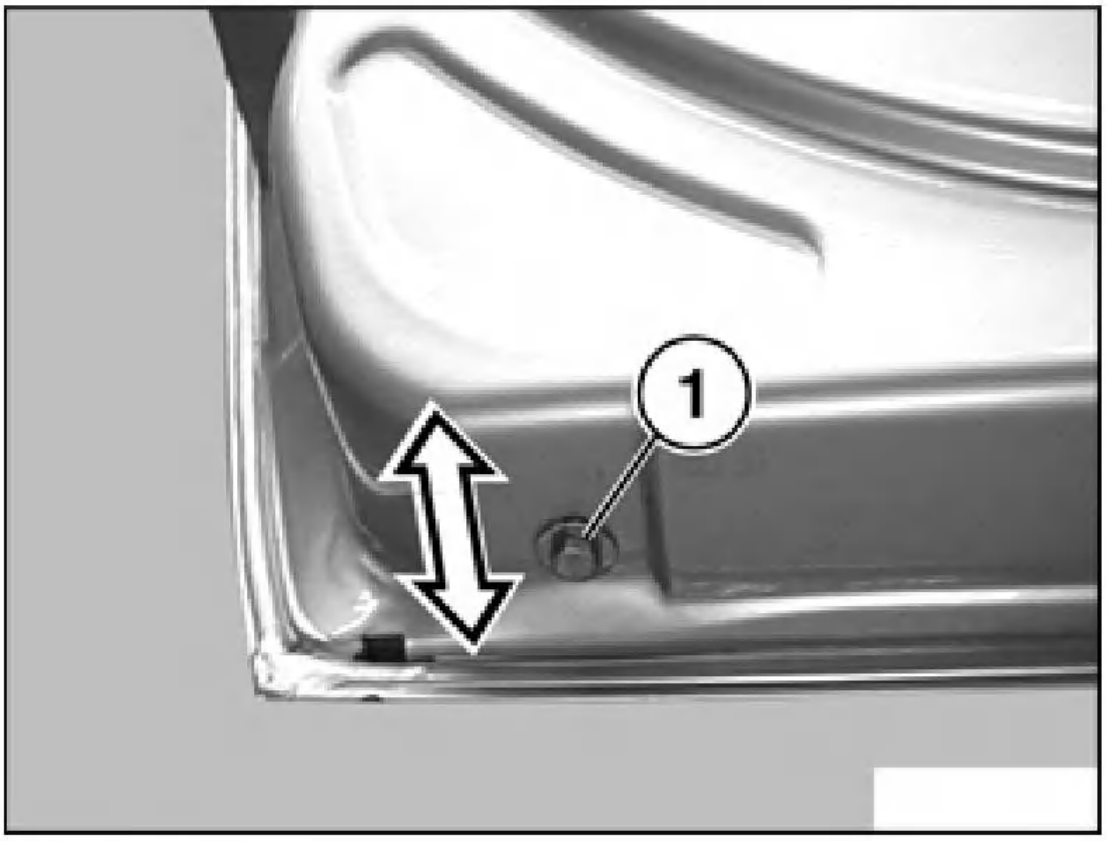


Fig. 184: Loosening Window Guide Rail Screw (Rear)
Courtesy of BMW OF NORTH AMERICA, INC.

Ideal adjustment:

Adjust height of door window (1) until transition from fixed door window (3) to rubber window seal (2) forms a smooth line.

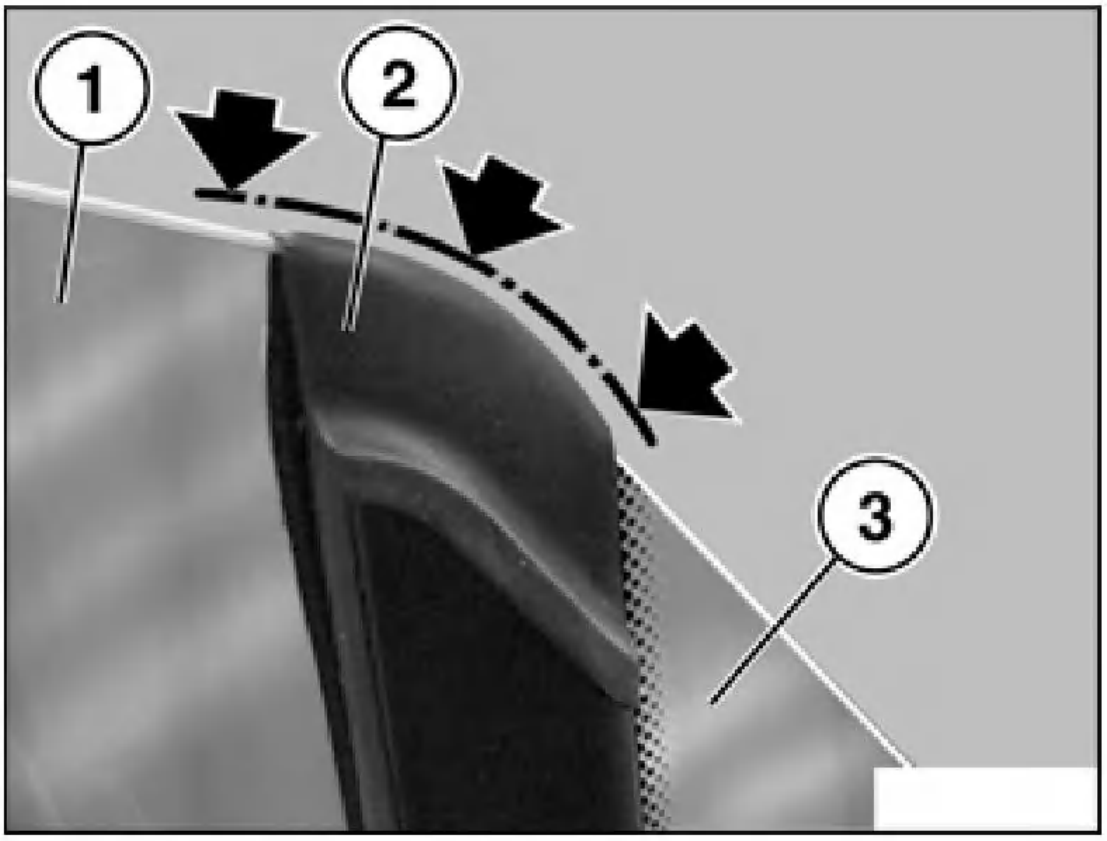


Fig. 185: Adjusting Door Window Height
Courtesy of BMW OF NORTH AMERICA, INC.

Height of door window is adjusted by turning the screw (1) on the window regulator (2).

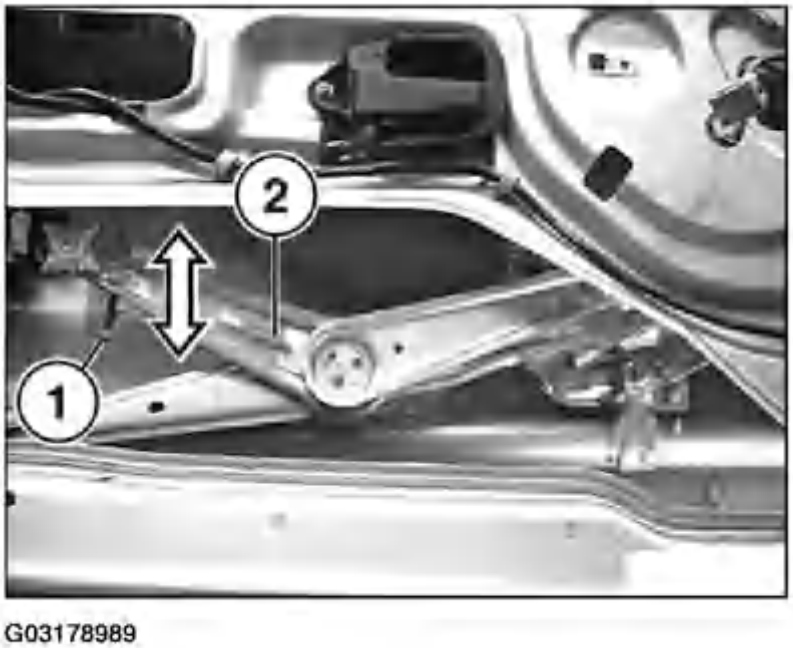


Fig. 186: Identifying Window Regulator
Courtesy of BMW OF NORTH AMERICA, INC.

51 32 155 ADJUSTING LIMIT STOP FOR FRONT LEFT OR RIGHT DOOR WINDOW (Z3 ROADSTER),

Operation Is Described In:

Adjusting front left or right door window (Z3 roadster) refer to 51 32 154 ADJUSTING FRONT LEFT OR RIGHT DOOR WINDOW (Z3 ROADSTER) .

51 32 170 REMOVING AND INSTALLING/REPLACING FRONT LEFT OR RIGHT DOOR WINDOWS (Z3 ROADSTER)

Removing front door window (fixed), refer to 51 32 140 REMOVING AND INSTALLING OR REPLACING FRONT LEFT OR RIGHT DOOR WINDOW (FIXED) (Z3 ROADSTER) .

Fit window crank (1) and close door window (2) down to dimension (A).

Distance (A) = approx. 100 ... 200 mm.

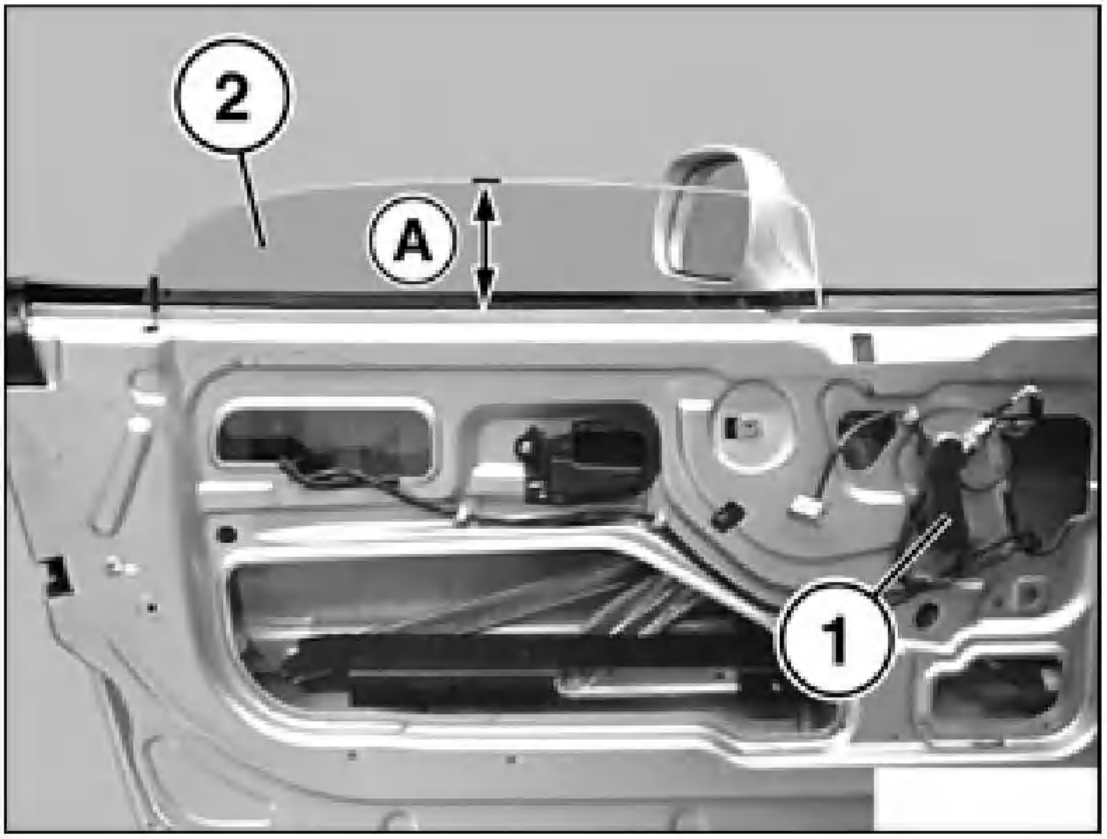


Fig. 187: Adjusting Door Window Height
Courtesy of BMW OF NORTH AMERICA, INC.

Slide door window (1) forwards out of window regulator support (2).

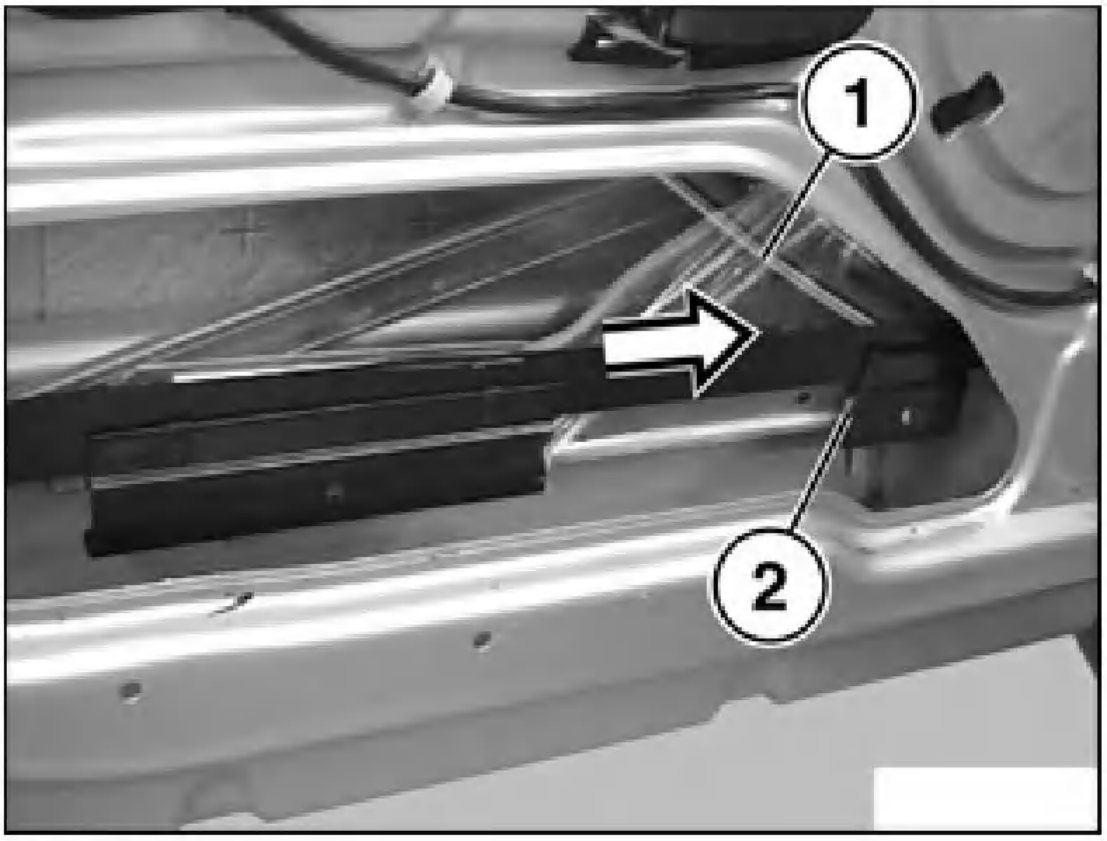


Fig. 188: Identifying Window Regulator Support
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully push door window (1) upwards and slide bracket (2) out of window regulator support (3).

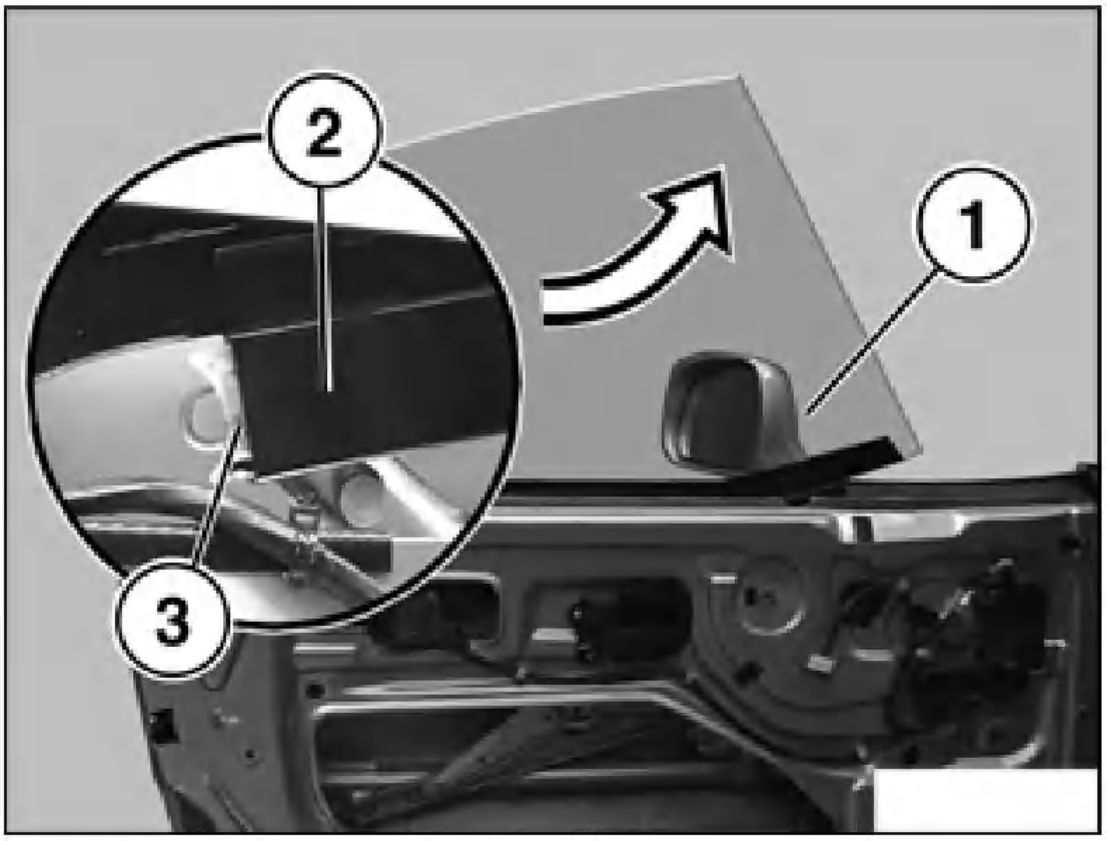


Fig. 189: Identifying Window Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Height of door window is adjusted by turning screw (1).

Adjust door window, refer to 51 32 154 ADJUSTING FRONT LEFT OR RIGHT DOOR WINDOW (Z3 ROADSTER) .

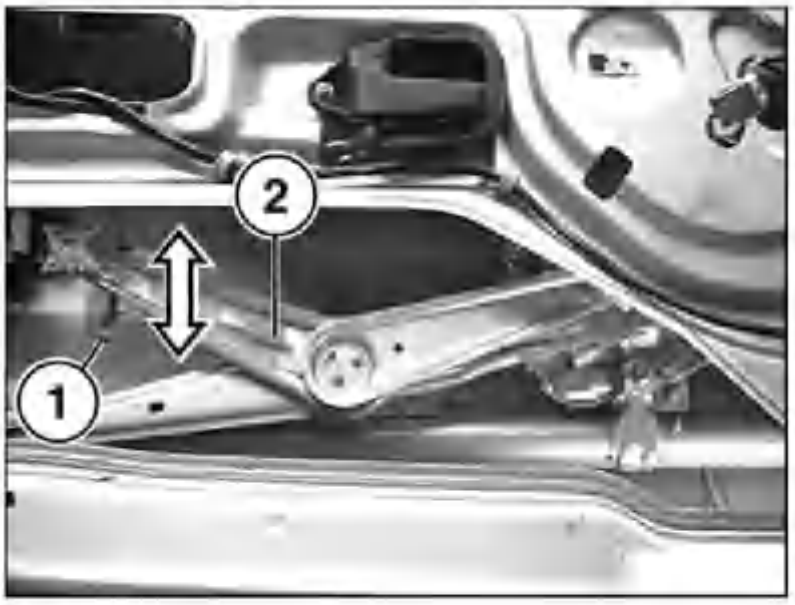


Fig. 190: Adjusting Door Window
Courtesy of BMW OF NORTH AMERICA, INC.

51 32 211 REPLACING RUBBER GUIDE FROM FRONT LEFT OR RIGHT DOOR WINDOW (Z3 ROADSTER)

Removing and installing/replacing left or right front door window (Fixed) (Z3 Roadster), refer to 51 32 140 REMOVING AND INSTALLING OR REPLACING FRONT LEFT OR RIGHT DOOR WINDOW (FIXED) (Z3 ROADSTER) .

Remove rubber guide (1).

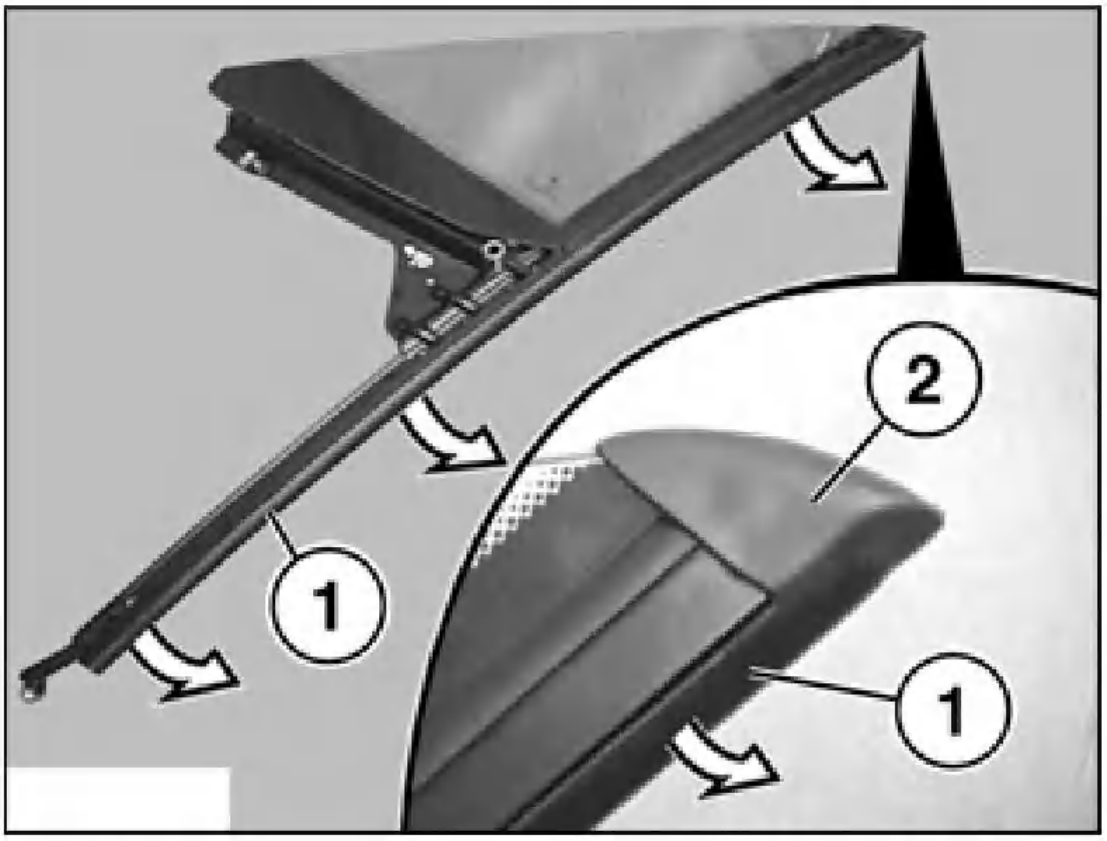


Fig. 191: Removing Rubber Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Rubber guide is cemented in area (2).

FRONT ELECTRICALLY OPERATED WINDOWS

12 00 ... DISCONNECTING AND CONNECTING BATTERY

Safety instructions for handling vehicle battery. Refer to 61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY .

Disconnect Battery:

If the battery is not disconnected when working on components, cable connections etc., faults can occur in the fault memories of the relevant control units.

CAUTION: Disconnecting the vehicle battery will cancel the fault memories of control units. For this reason, before disconnecting the battery, always interrogate the fault memories and print out the faults on the printer attached to the BMW Service-Tester. Investigate stored faults. Once the Stored settings of the on-board computer and clock will also be lost. On door closing systems with infrared operation, all keys must be receded. Battery has been disconnected, the radio can only be restarted with the radio code; for this reason, ask the

customer for his/her radio code card beforehand. Note stored stations and restore them after connecting the battery. Stored settings of the on-board computer and clock will also be lost. On door closing systems with infrared operation, all keys must be receded.

REAR ELECTRICALLY OPERATED WINDOWS

12 00 ... DISCONNECTING AND CONNECTING BATTERY

Refer to 12 00 ... DISCONNECTING AND CONNECTING BATTERY .

FRONT DOOR TRIM PANEL WITH ARM REST

51 41 000 REMOVING AND INSTALLING FRONT LEFT OR RIGHT DOOR TRIM PANEL (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

WARNING: Model with side airbag: Follow safety instructions for working on cars with airbag systems, refer to 51 00 ... SAFETY INSTRUCTIONS FOR WORKING ON CARS WITH AIRBAG SYSTEMS

Lift out cover plate.

Release screw and remove window crank.

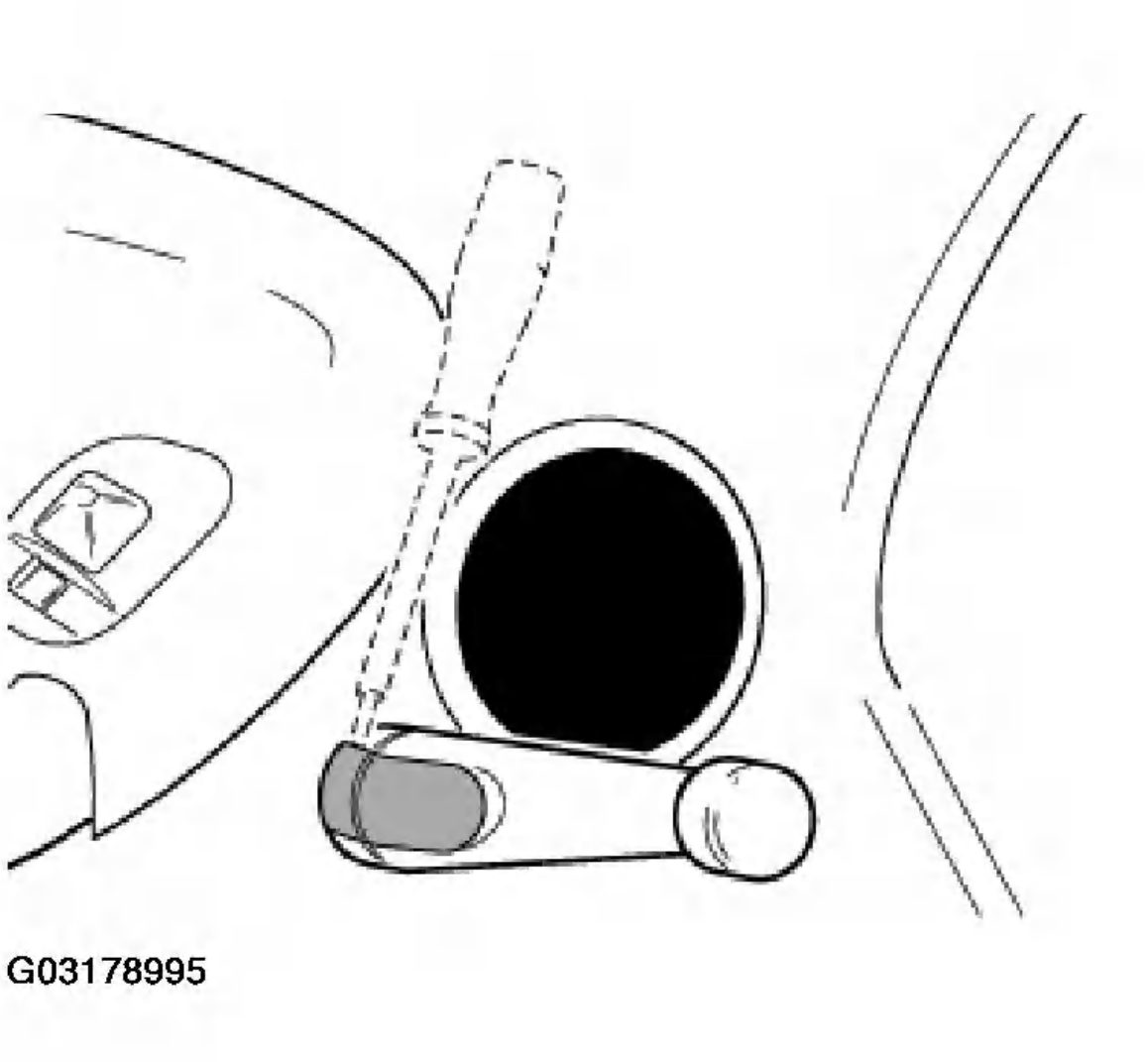


Fig. 192: Removing Window Crank
Courtesy of BMW OF NORTH AMERICA, INC.

Remove outside mirror adjusting button.

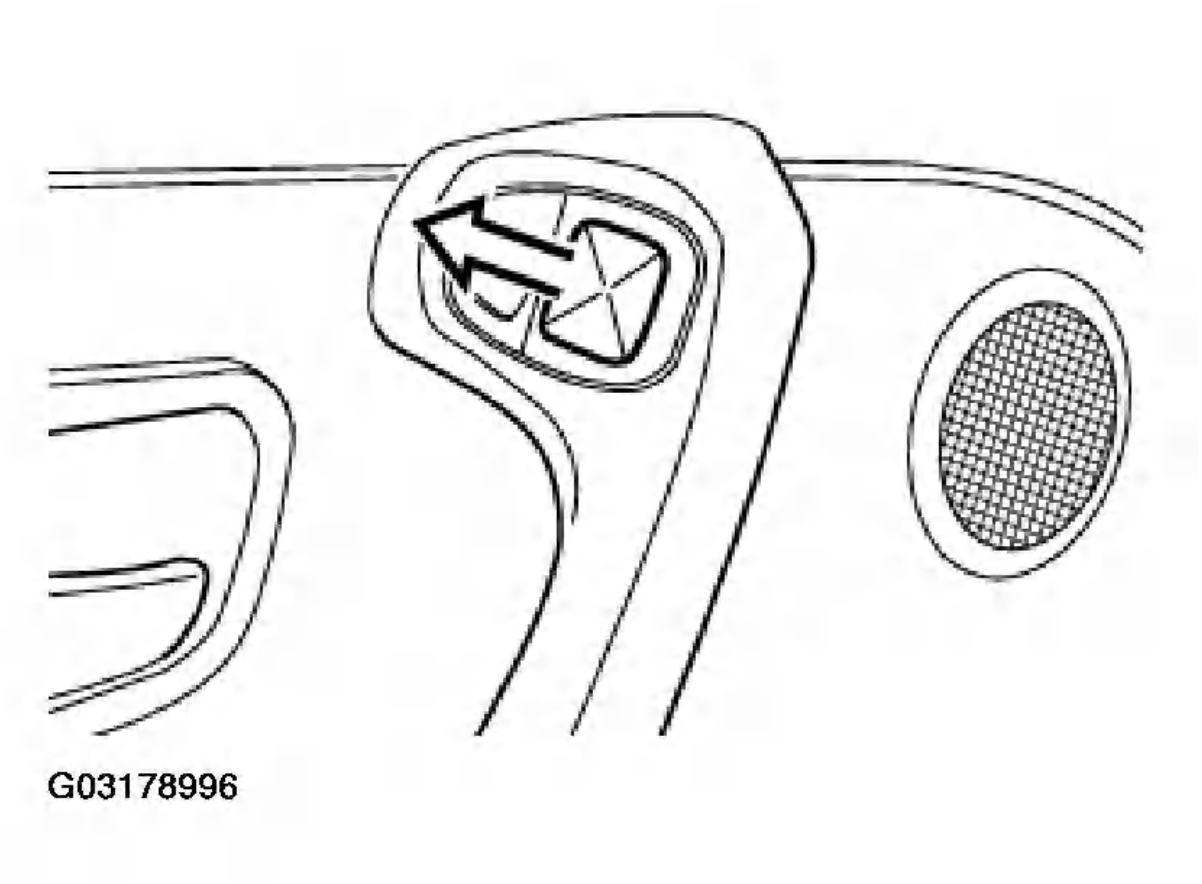


Fig. 193: Removing Outside Mirror Adjusting Button
Courtesy of BMW OF NORTH AMERICA, INC.

Remove mirror switch with special tool 61 1 300 and pull apart plug connection.

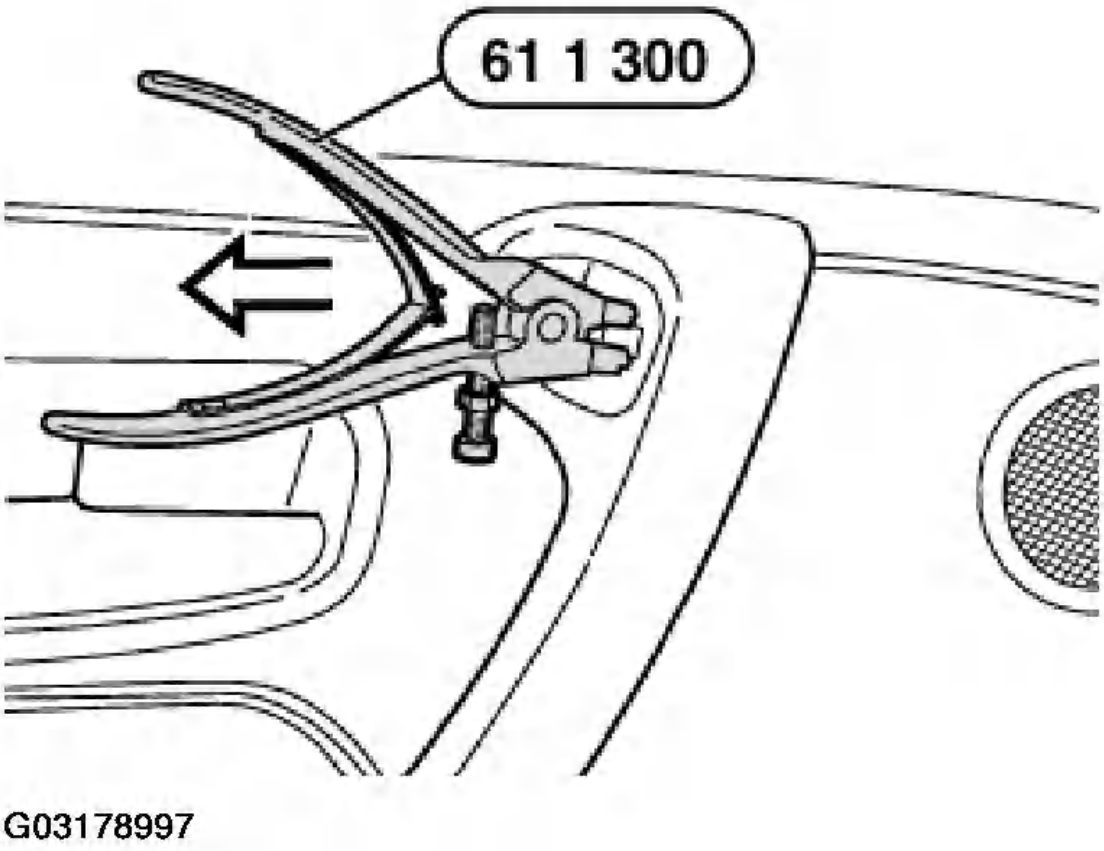


Fig. 194: Removing Mirror Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Align plate forward.

Unscrew screw.

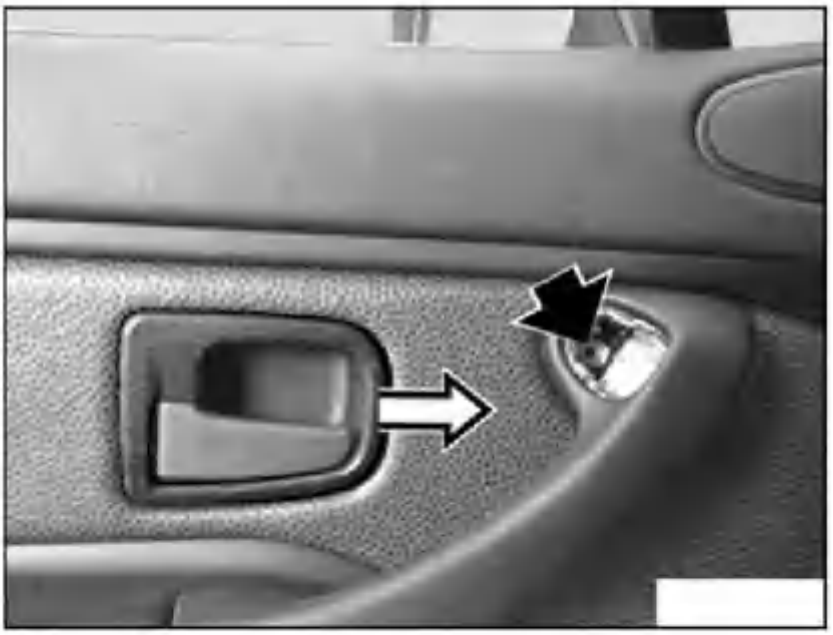


Fig. 195: Aligning Plate Forward
Courtesy of BMW OF NORTH AMERICA, INC.

Model with side airbag:

If necessary, lever out cover cap (1) and release screw underneath.

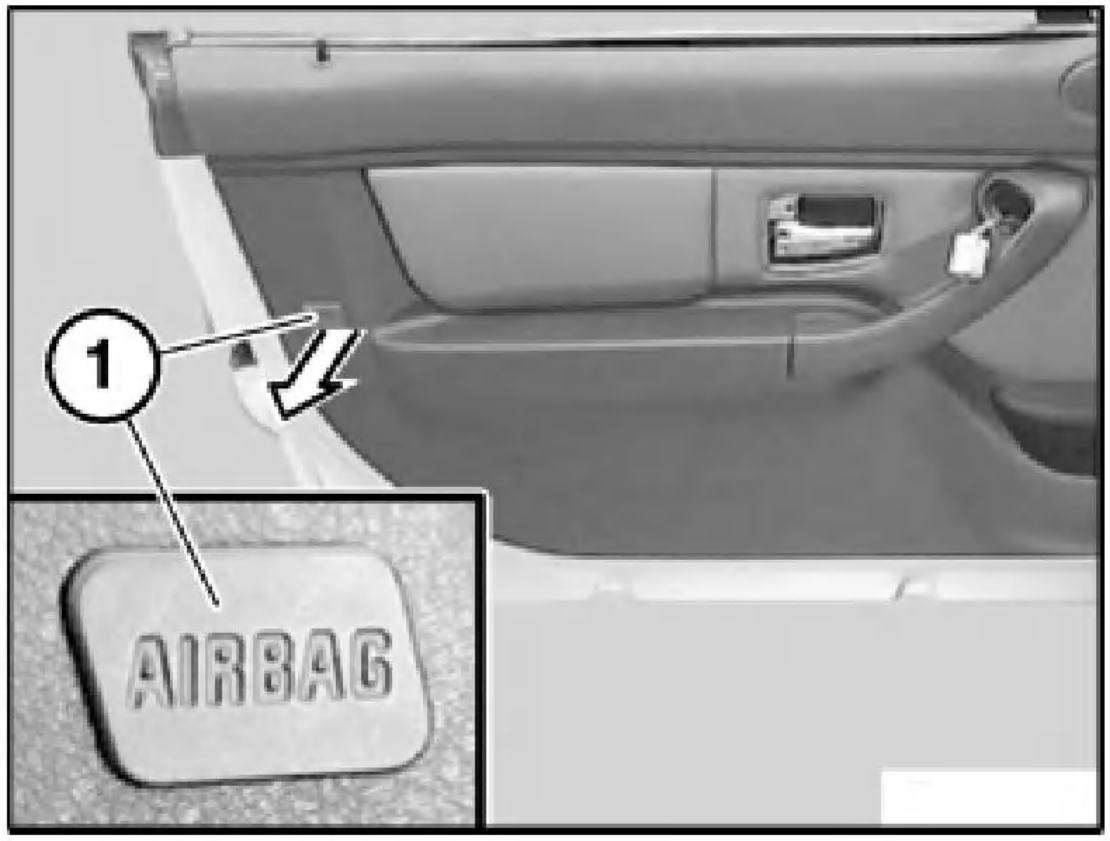


Fig. 196: Identifying Cover Cap
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not pull handle (risk of damage).

Unclip door trim panel.

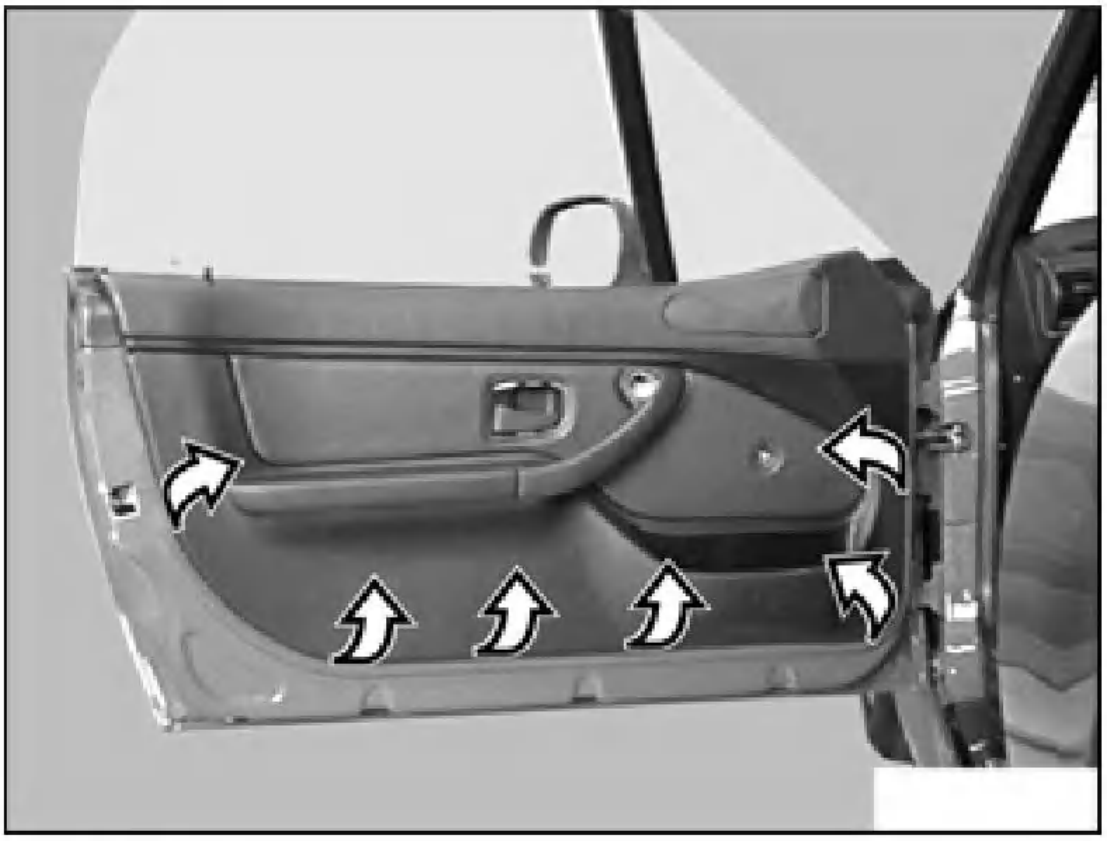


Fig. 197: Unclipping Door Trim Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Lift off door trim panel upwards.

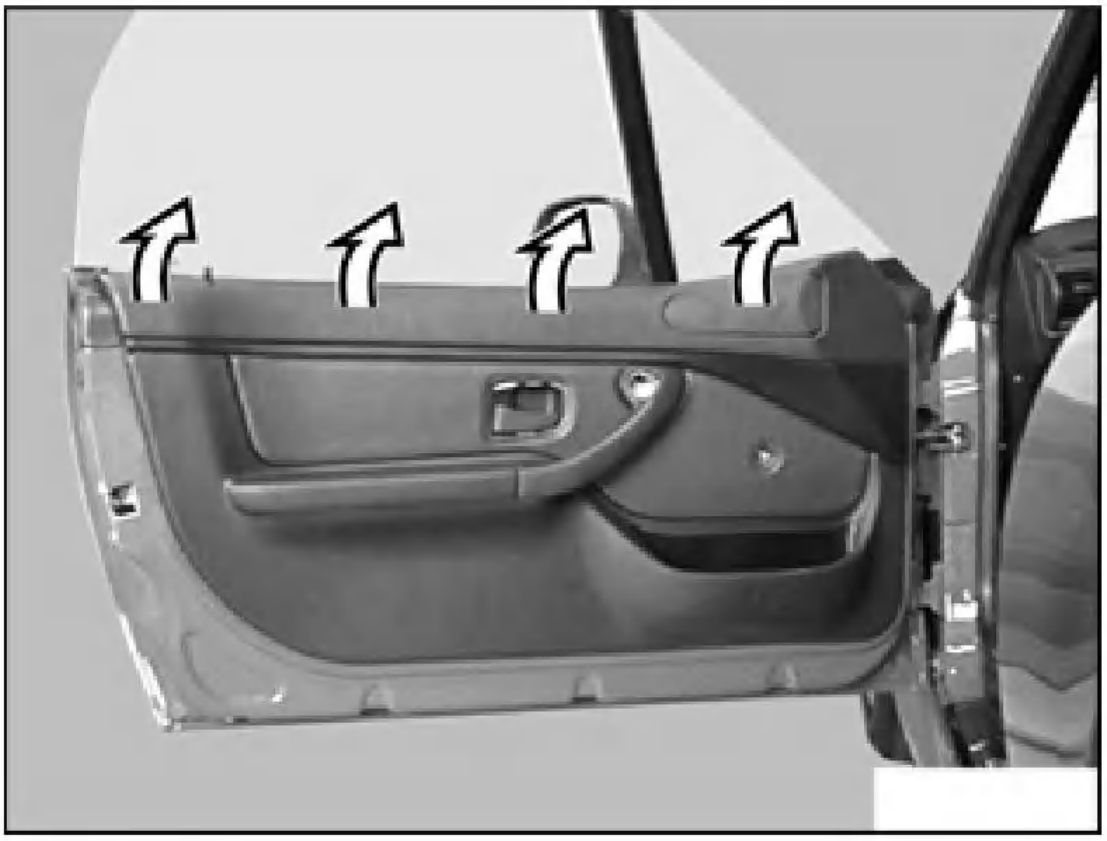


Fig. 198: Lifting Door Trim Panel Upwards
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, disconnect plug connection on speaker.

Installation:

If necessary, replace damaged clips.

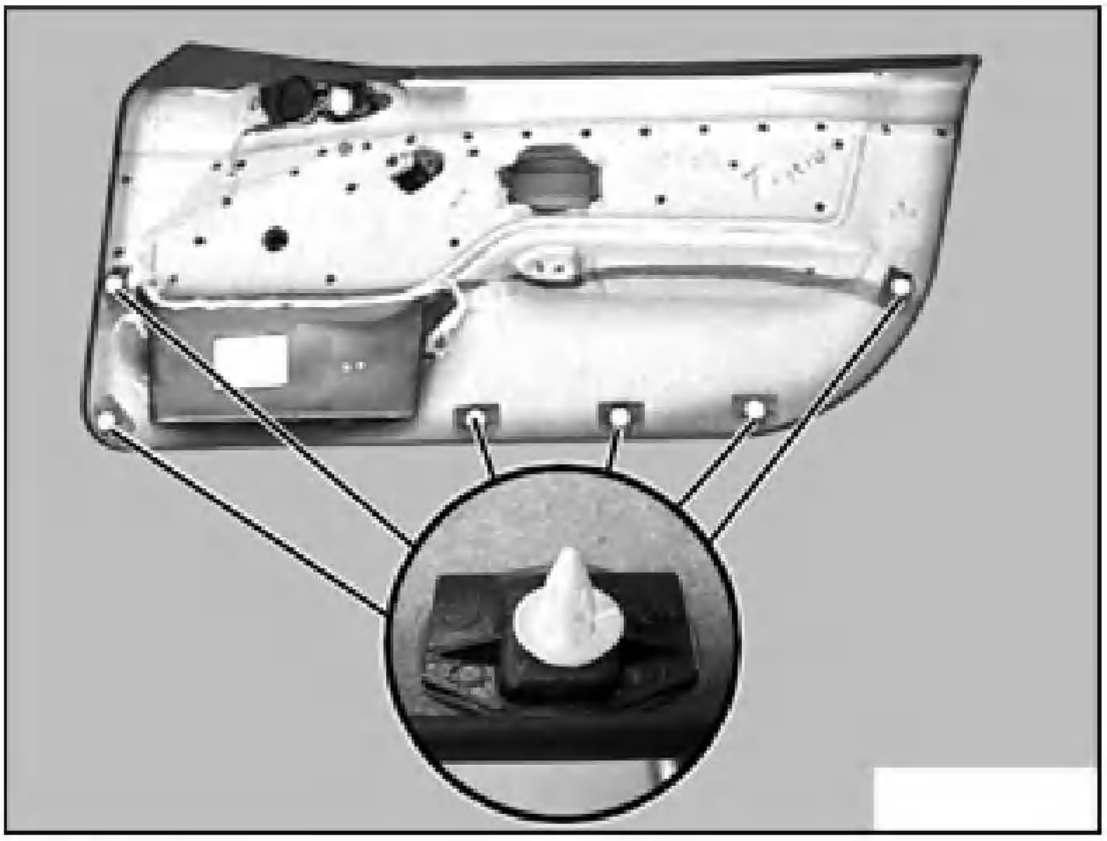


Fig. 199: Identifying Door Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Model with side airbag:

Installation:

If necessary, replace damaged clips.

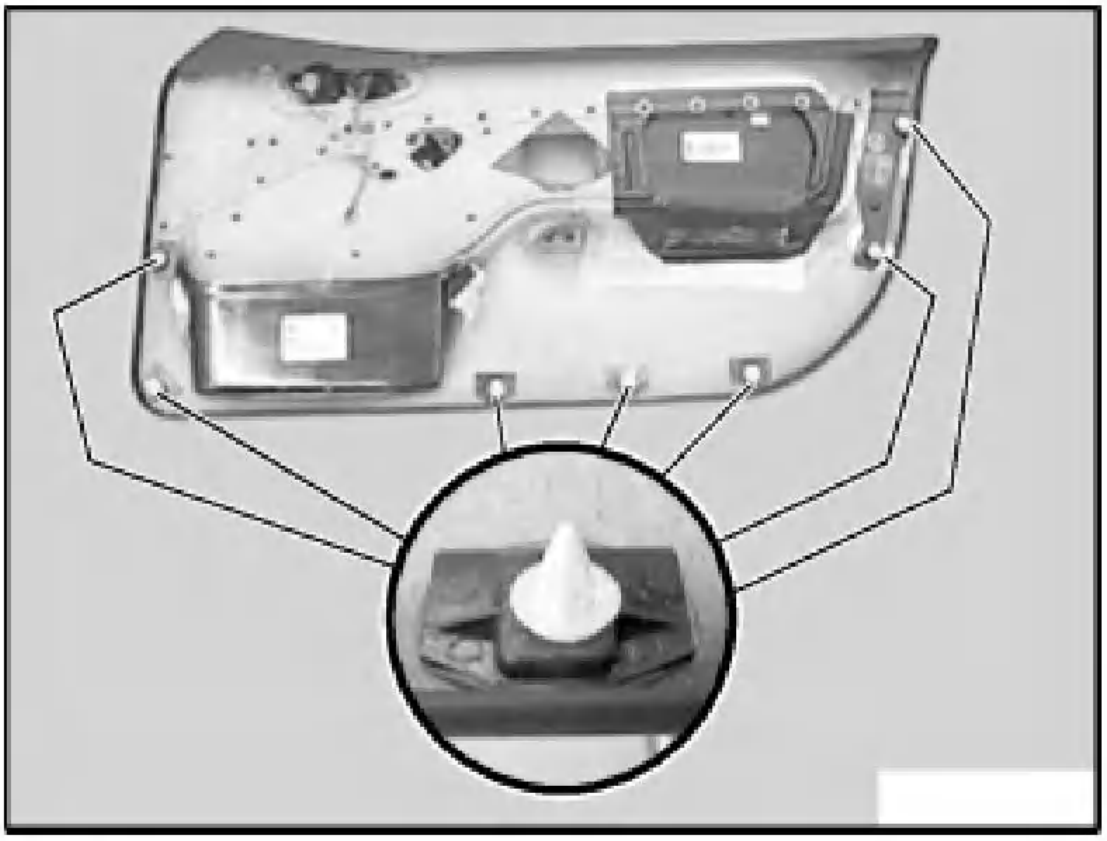


Fig. 200: Identifying Door Clips (Model With Side Airbag)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Pull inner cavity cover strip (1) upwards to remove.

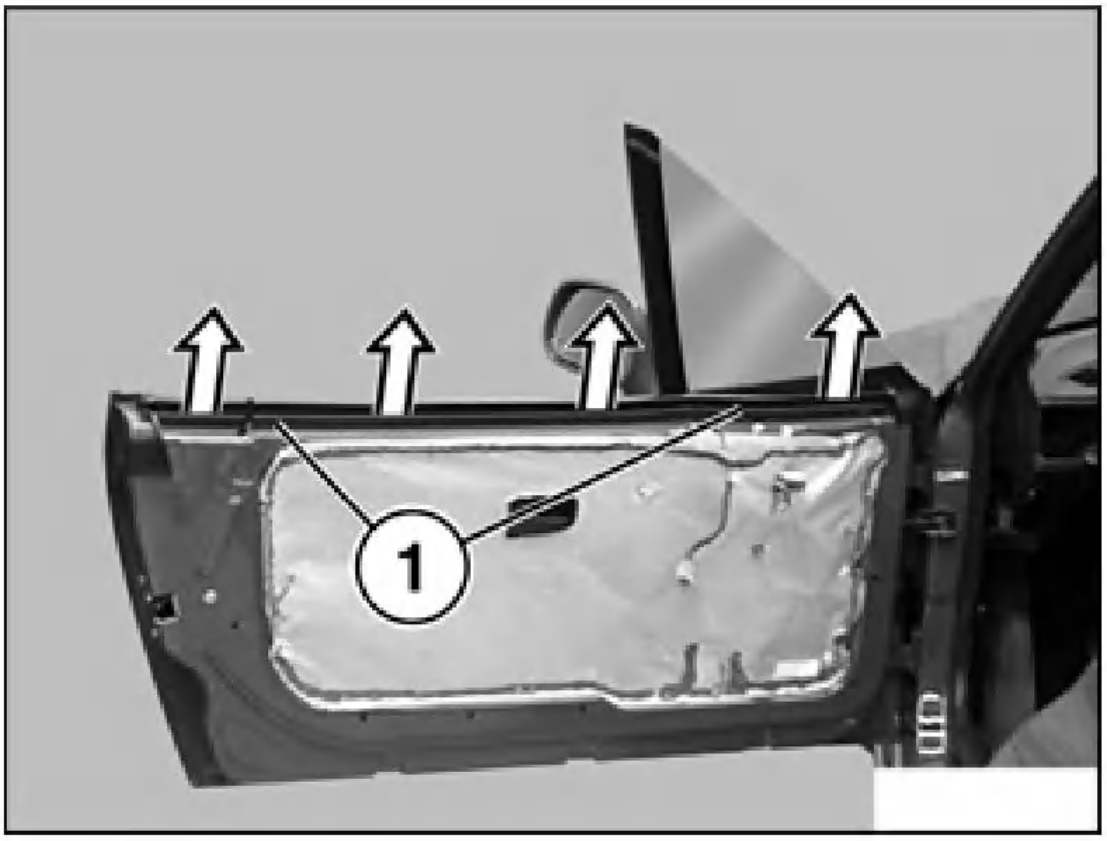


Fig. 201: Removing Inner Cavity Cover Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit cavity cover strip (1) at back with distance (A) to door trim (2).

Lift sealing lip (3).

Dimension (A) = approx. 8 mm.

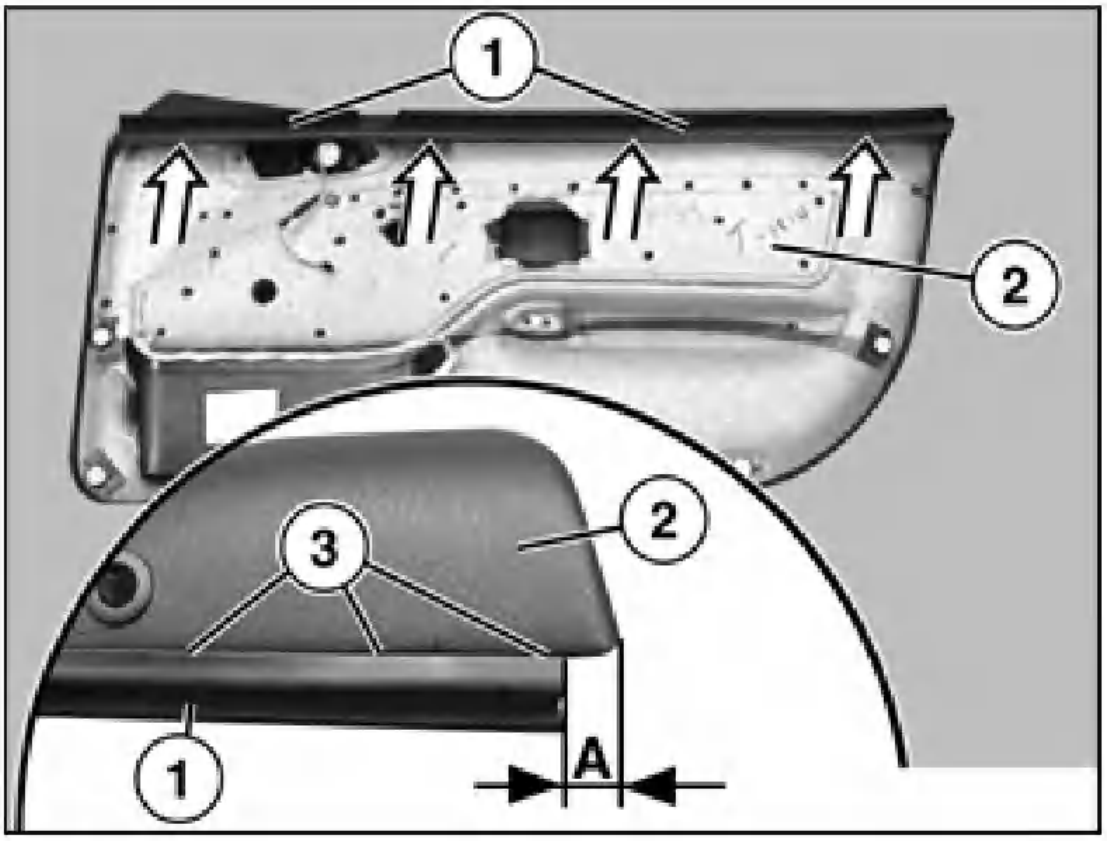


Fig. 202: Installing Cavity Cover Strip
Courtesy of BMW OF NORTH AMERICA, INC.

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 41 001 REPLACING DOOR TRIM PANEL, FRONT LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Remove door trim panel, refer to 51 41 000 REMOVING AND INSTALLING FRONT LEFT OR RIGHT DOOR TRIM PANEL (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Lift out finisher strip (1) and remove.

Unfasten screw (2) and remove loudspeaker finisher strip (3).

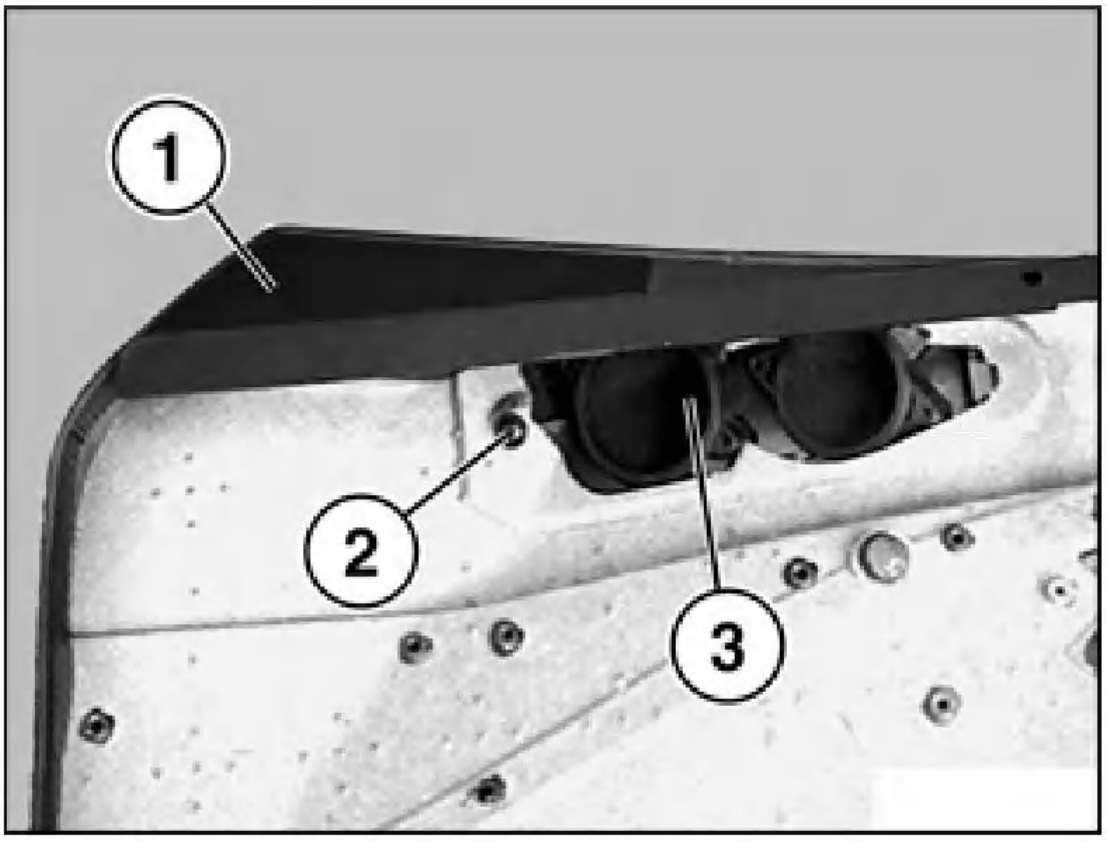


Fig. 203: Removing Finisher Strip
Courtesy of BMW OF NORTH AMERICA, INC.

SIDE COVERING WITH ARMRESTS

51 43 010 REMOVING AND INSTALLING/REMOVING REAR LEFT OR RIGHT UPPER SECTION OF SIDE TRIM PANEL (Z3 ROADSTER, M ROADSTER)

Removing and installing rear oddments box, refer to 51 16 240 REMOVING AND INSTALLING REAR ODDMENTS BOX (Z3 ROADSTER, M ROADSTER) .

Unfasten seatbelt screw (1).

Installation:

Tightening torque, refer to TORQUE SPECIFICATIONS .

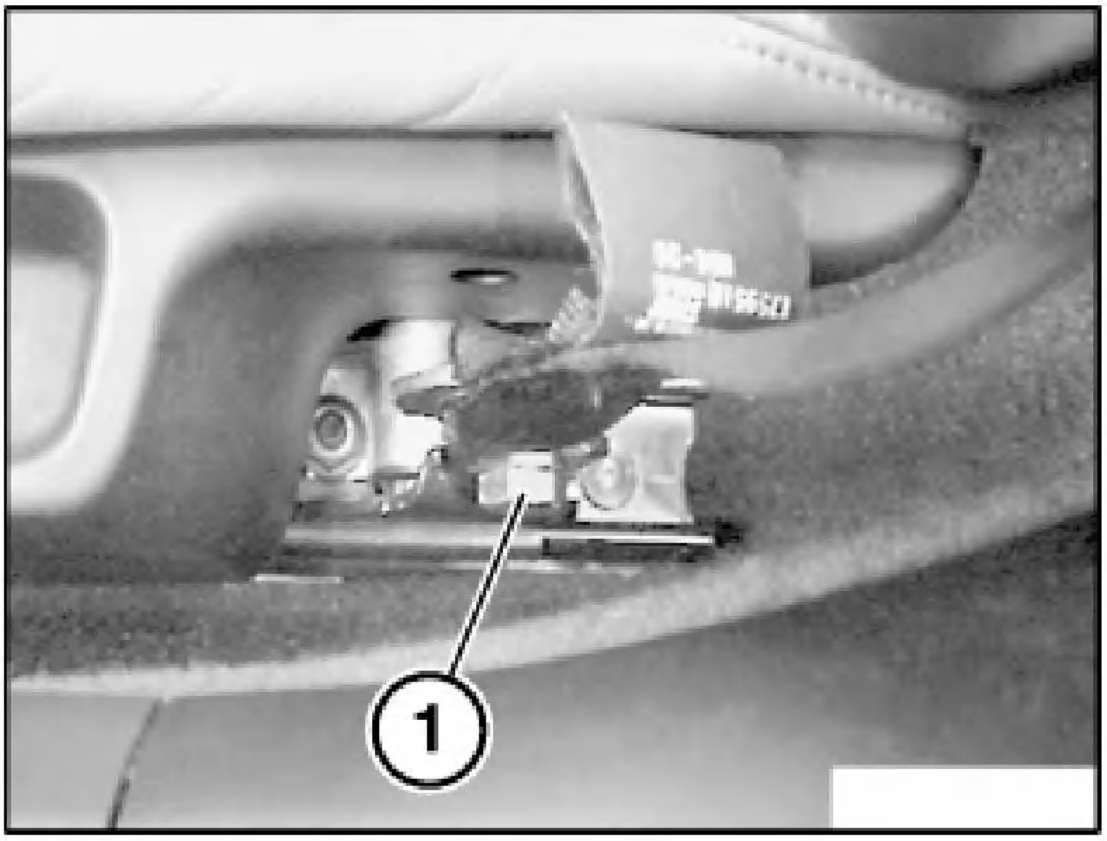


Fig. 204: Removing Seatbelt Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten cover cap (1) and screw.

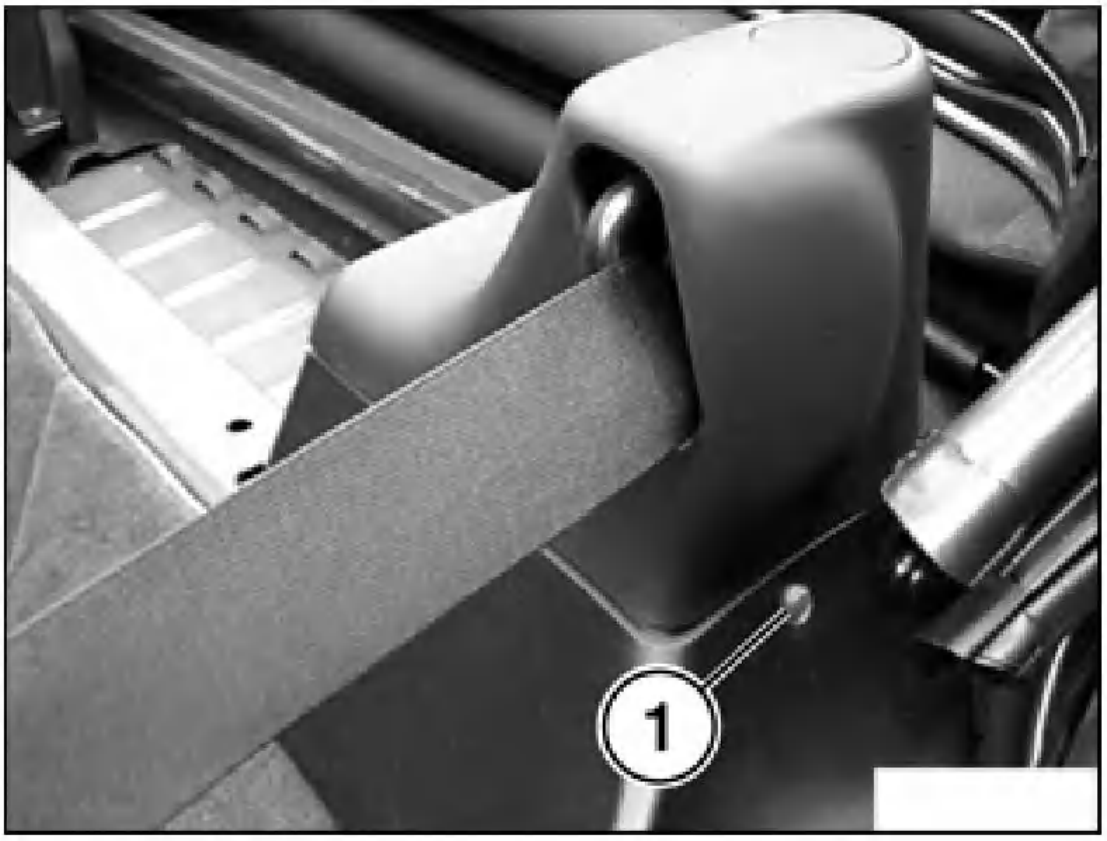


Fig. 205: Removing Cover Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Remove caps (1) and screws. Pull out upper section of side trim panel (2) upward/forward over the seat belt roller (3).

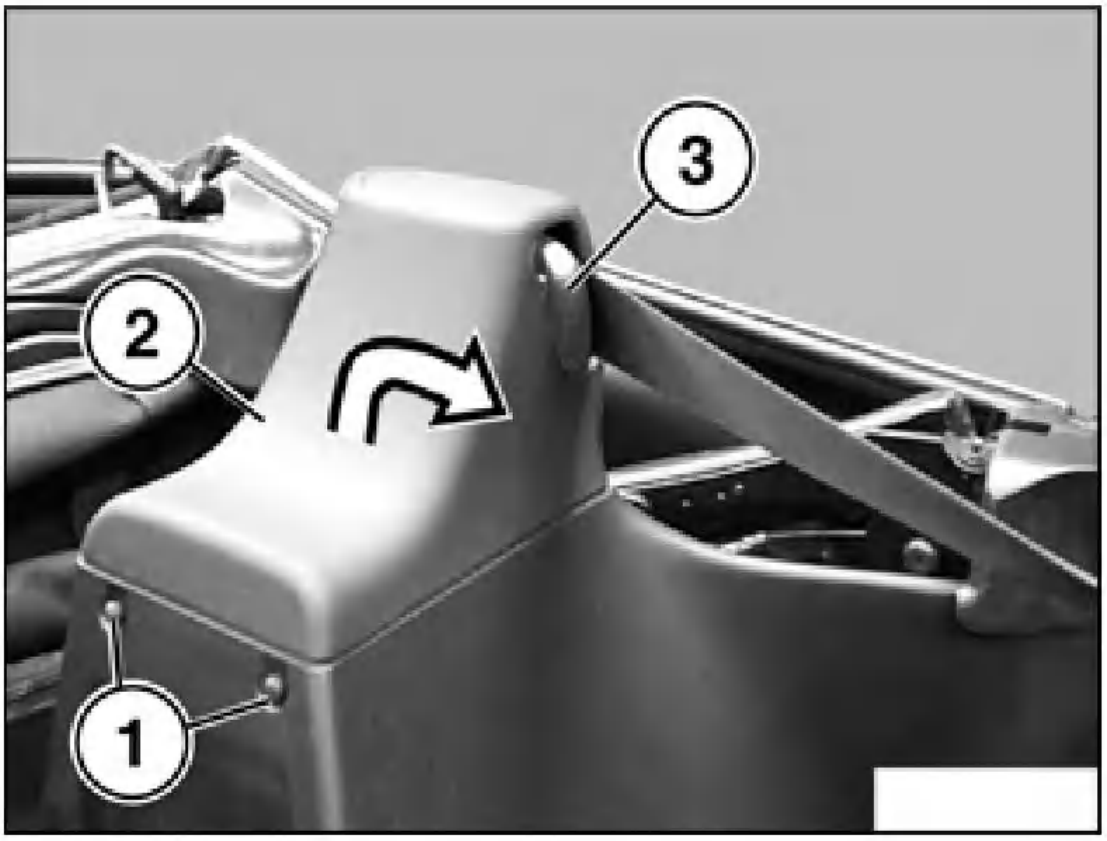


Fig. 206: Removing Upper Section Of Side Trim Panel
Courtesy of BMW OF NORTH AMERICA, INC.

51 43 015 REMOVING AND INSTALLING / REPLACING REAR LEFT OR RIGHT LOWER SECTION OF SIDE TRIM (Z3 ROADSTER, M ROADSTER)

Removing and installing rear upper section of side trim panel, refer to 51 43 010 REMOVING AND INSTALLING/REMOVING REAR LEFT OR RIGHT UPPER SECTION OF SIDE TRIM PANEL (Z3 ROADSTER, M ROADSTER) .

Removing and installing rocker panel cover strip (inside), refer to 51 47 000 REMOVING AND INSTALLING/REPLACING ENTRANCE COVER STRIP (INTERIOR), FRONT LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Version with Hi-Fi system:

Unfasten plug connection (1).

Only replace:

Unfasten screw connection (2) and take off loudspeaker (3).

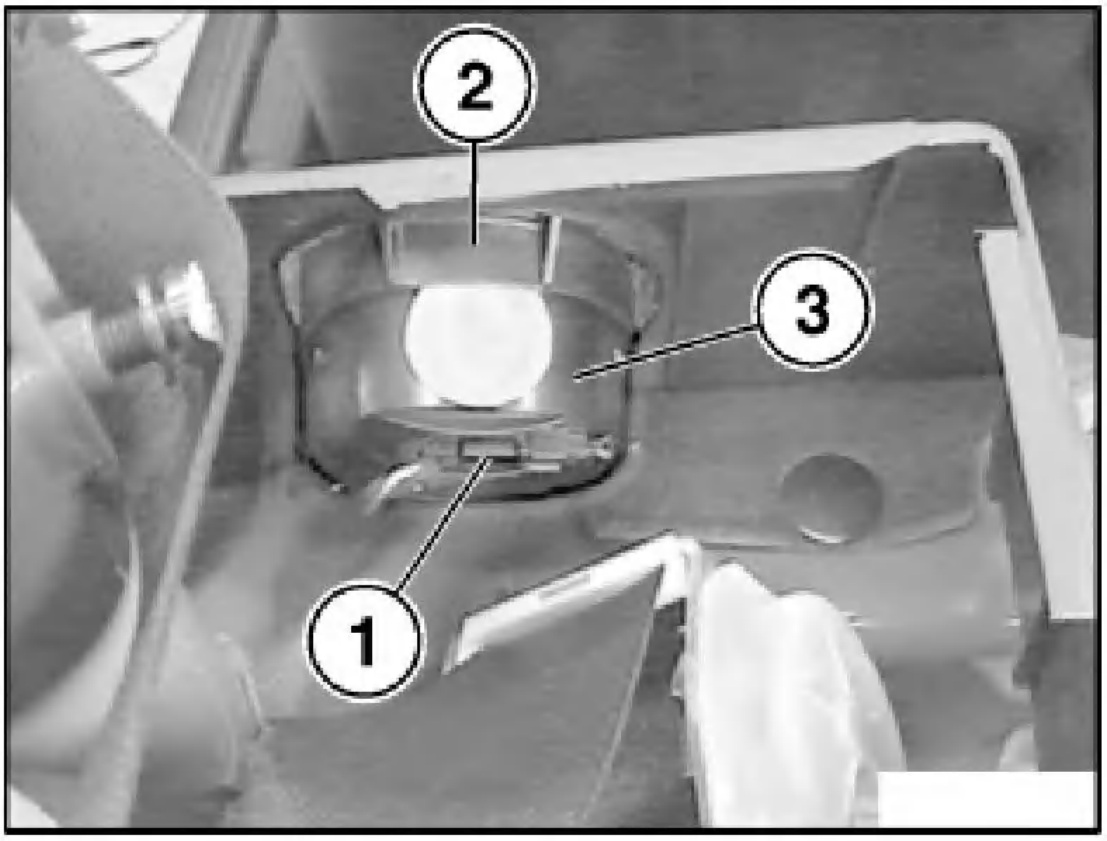


Fig. 207: Removing Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The convertible top lid must be closed to remove the side trim panel (4).

Partially unfasten cover (1) and edge protector (2). Unfasten screws (3) and pull lower section of side trim (4) upward/forward over the belt anchor (5).

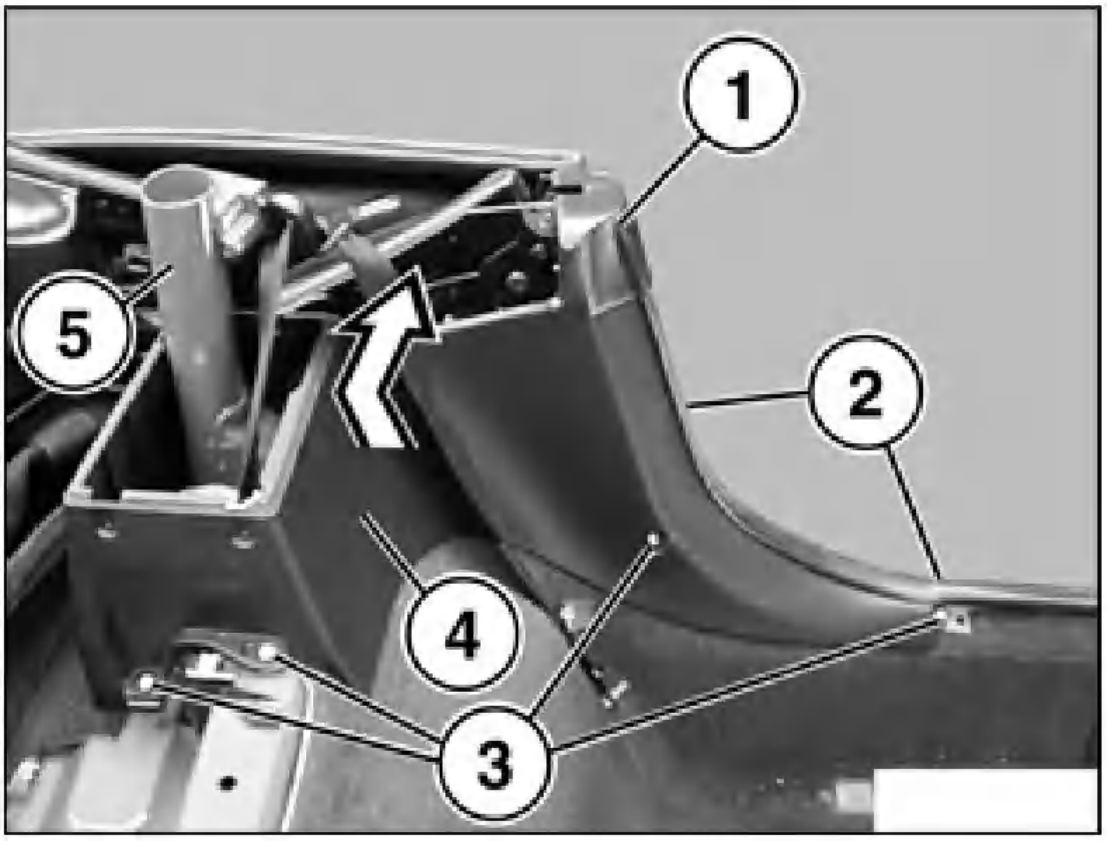


Fig. 208: Removing Cover And Edge Protector
Courtesy of BMW OF NORTH AMERICA, INC.

51 43 201 REMOVING AND INSTALLING/REPLACING PANEL FOR ROOF PILLAR, FRONT LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Remove mucket from front roof column (A-column finisher).

Pull trim (1) inwards to unclip; then pull obliquely upwards to remove.

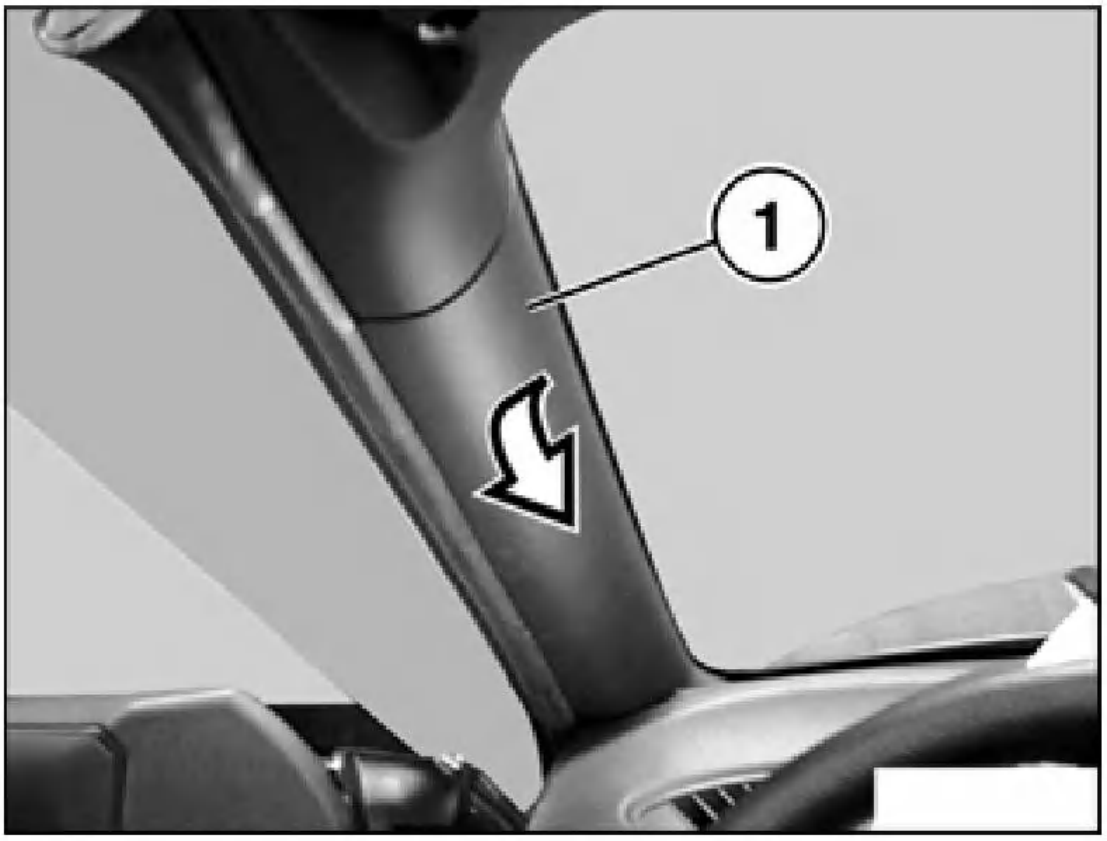


Fig. 209: Removing Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace damaged clips.

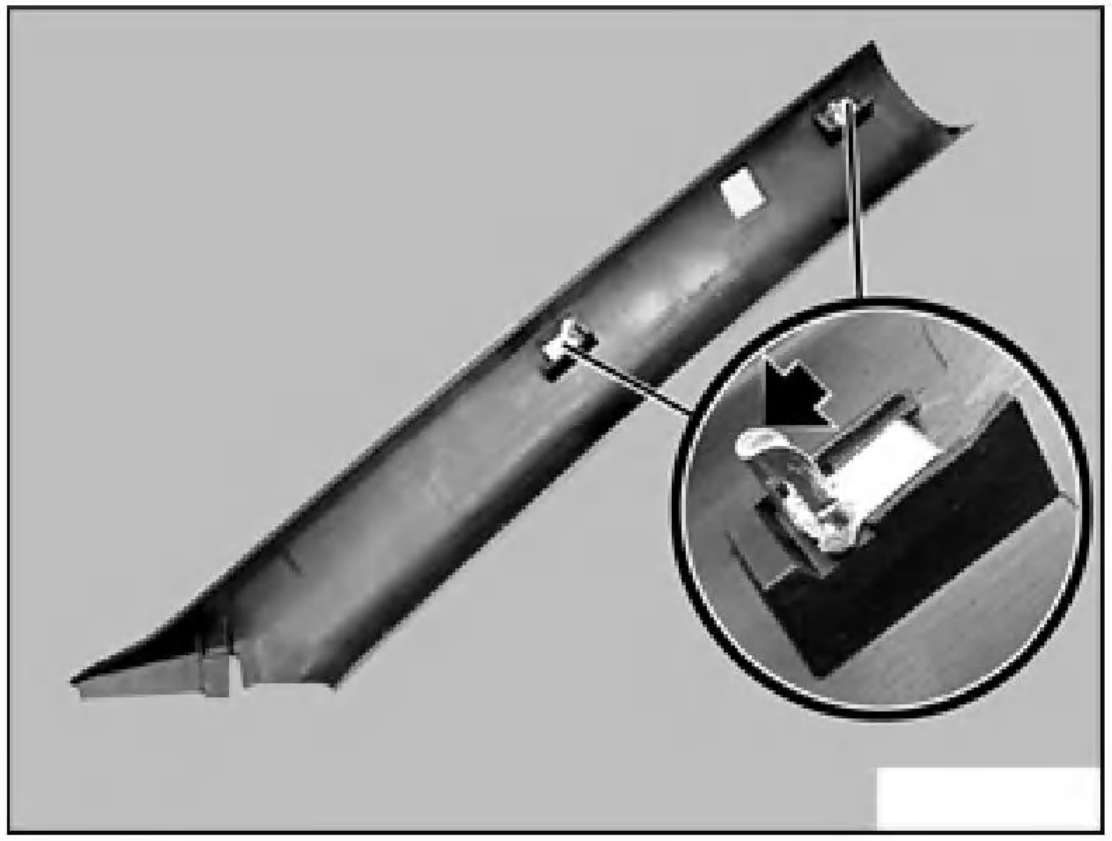


Fig. 210: Replacing Damaged Clips
Courtesy of BMW OF NORTH AMERICA, INC.

ROOF TRIM PANEL

51 44 150 REMOVING AND INSTALLING/REPLACING FINISHER FOR HEADLINER, FRONT (COWL PANEL, TOP) (Z3 ROADSTER, M ROADSTER)

Removing and installing both trim sections for front roof pillar (A-pillar finishers), refer to 51 43 201 REMOVING AND INSTALLING/REPLACING PANEL FOR ROOF PILLAR, FRONT LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Removing and installing both sun visors, refer to 51 16 104 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT SON VISOR (Z3 ROADSTER) .

Removing and installing complete ceiling light, refer to 63 31 000 REMOVING AND INSTALLING/REPLACING COMPLETE CEILING LIGHT (Z3 ROADSTER) .

Unfasten screw (1) on finisher strip (2).

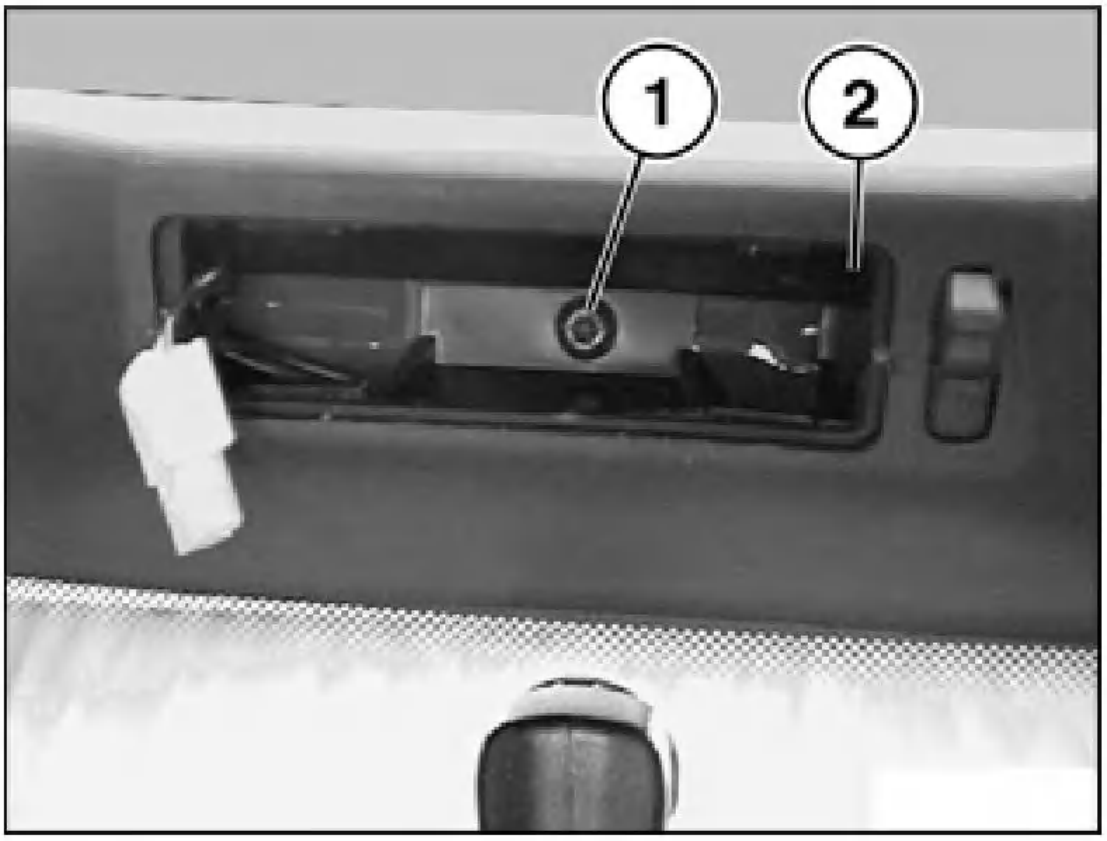


Fig. 211: Removing Screw On Finisher Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Lift finisher strip (1) up sideways and remove.

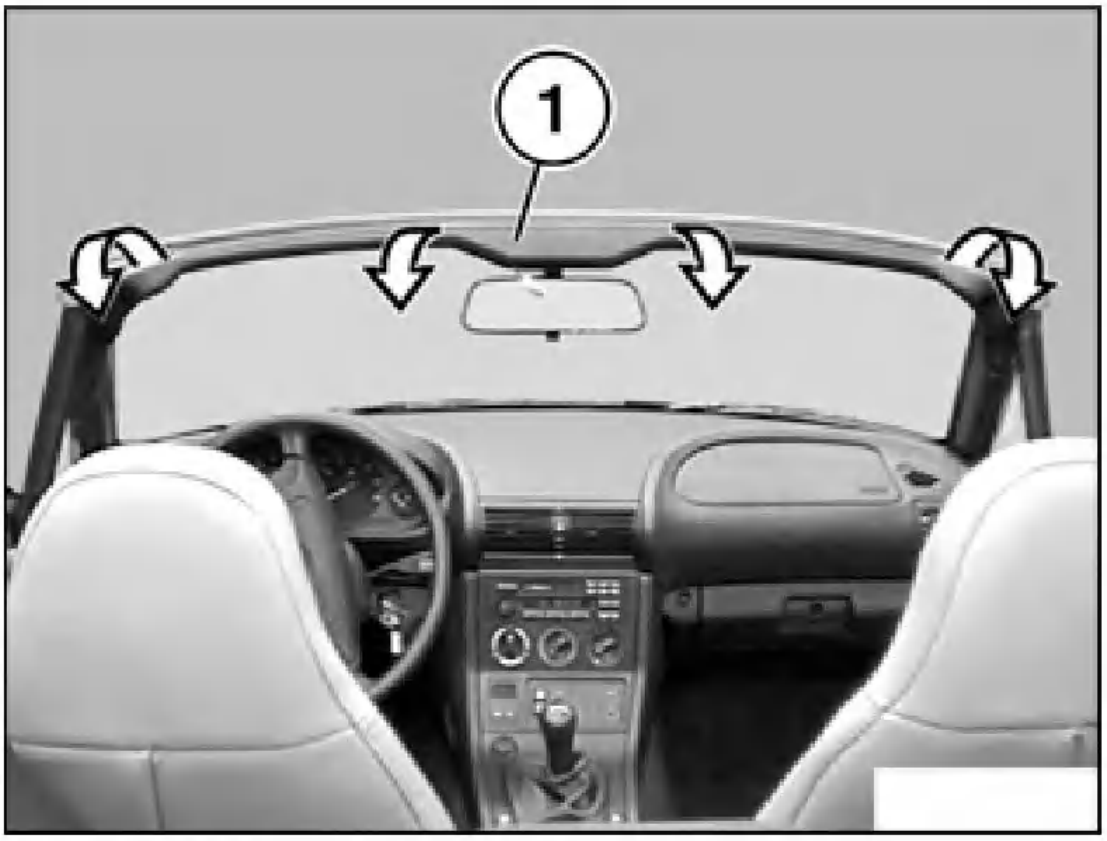


Fig. 212: Removing Finisher Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect connector (1).

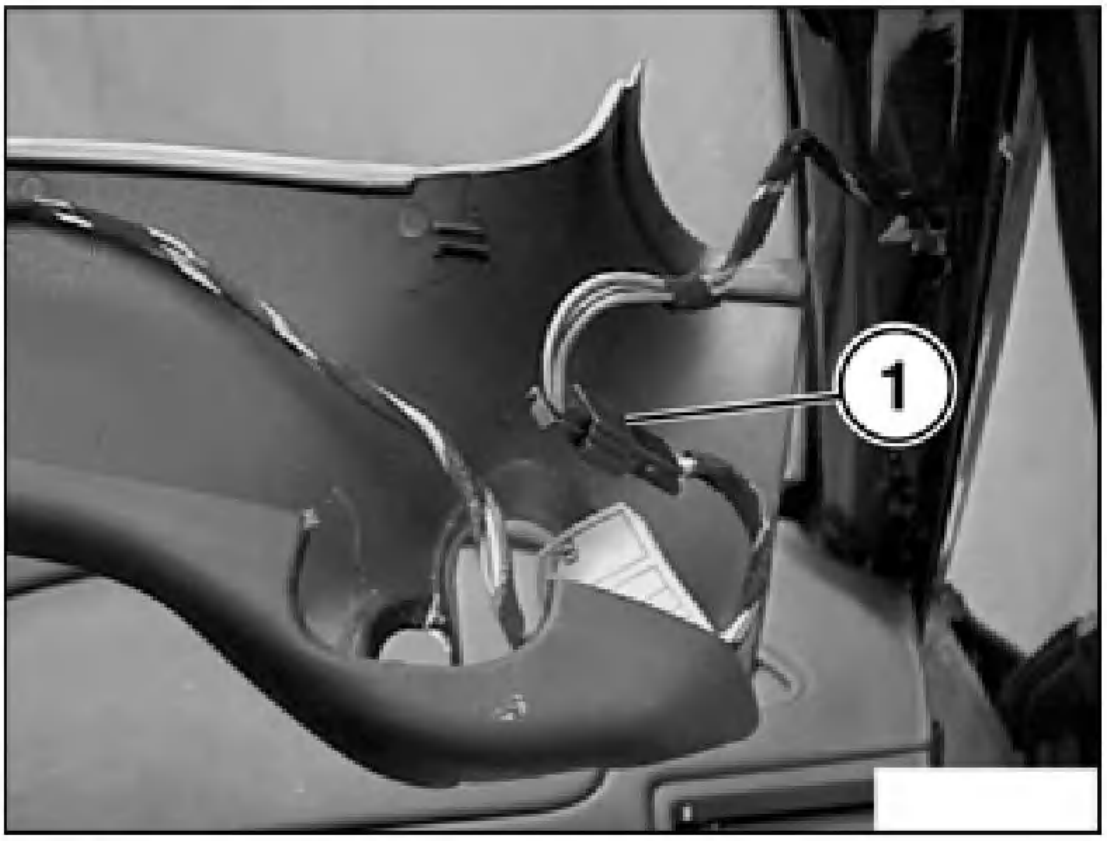


Fig. 213: Disconnecting Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Only replace:

Lift cable (1) out of brackets (2).

Unfasten retaining disks (3) and remove bracket for interior light (4).

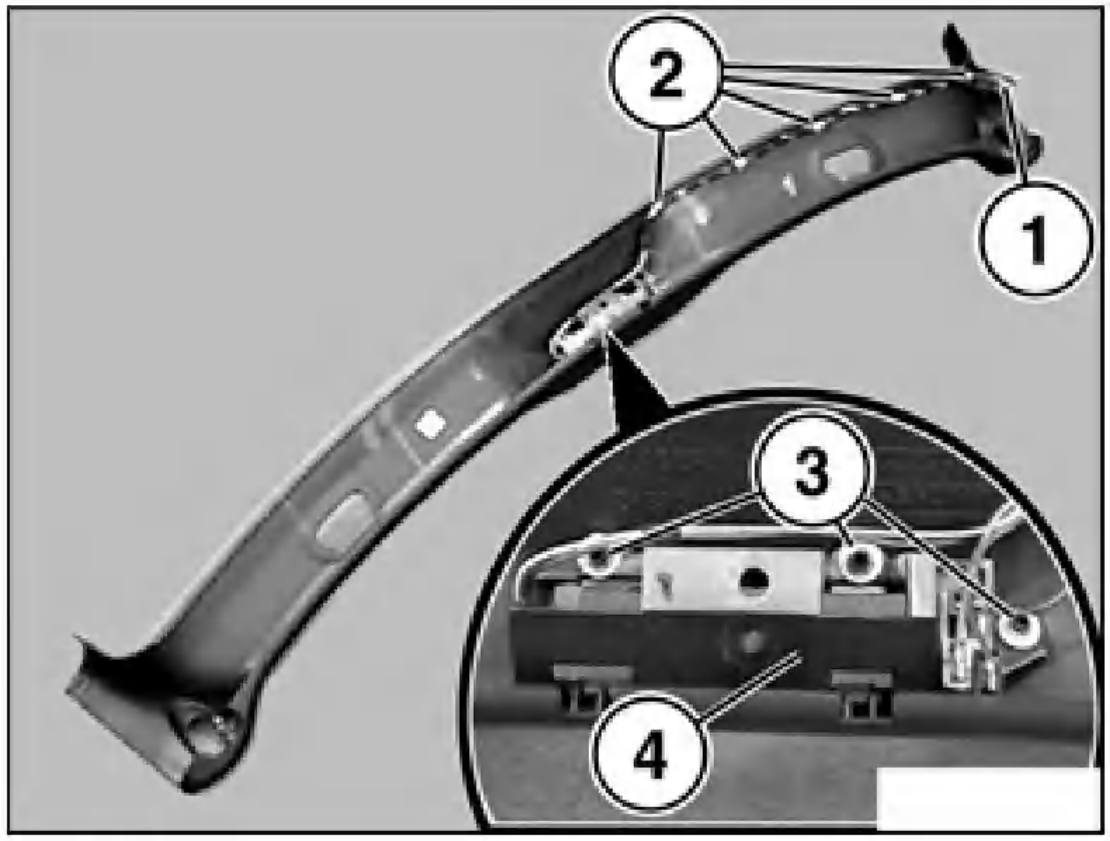


Fig. 214: Removing Bracket For Interior Light
Courtesy of BMW OF NORTH AMERICA, INC.

INSTRUMENT CLUSTER TRIM PANEL

51 45 030 REMOVING AND INSTALLING TRIM FOR INSTRUMENT PANEL (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Removing center console, refer to 51 16 200 REMOVING AND INSTALLING ODDMENTS TRAY (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Removing airbag module on passenger side, refer to PASSENGER-SIDE AIR BAG MODULE .

Removing complete instrument panel, refer to 62 21 000 REMOVING AND INSTALLING ENTIRE INSTRUMENT CARRIER (Z3 ROADSTER, Z3 COUPE) .

Unfastening switch for windshield wiper and indicator light from steering column, refer to 61 31 040 REPLACING WINDSHIELD WIPER SWITCH

Removing light switch, refer to 61 31 028 REPLACING LIGHT SWITCH (Z3 ROADSTER, Z3 COUPE) .

Removing plate for heating control, refer to CENTER CONSOLE .

Unfasten left/right screws (1).

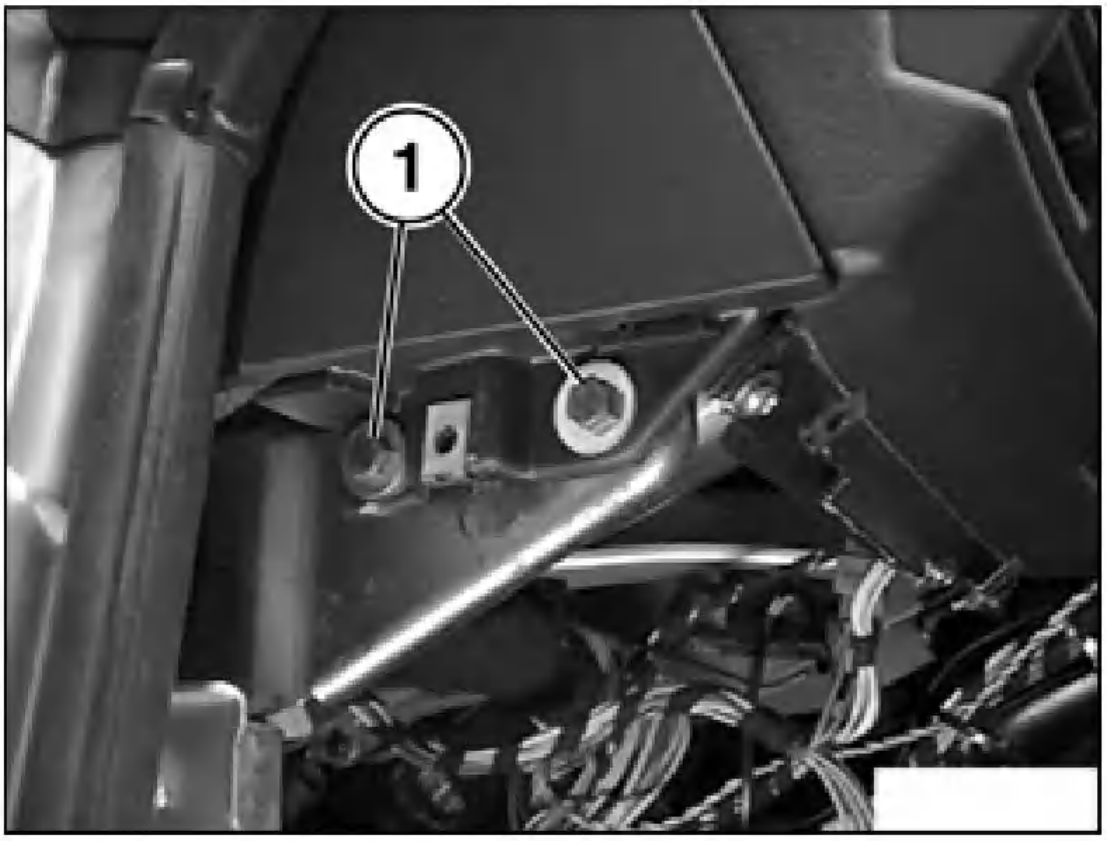


Fig. 215: Removing Plate For Heating Control
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1) under center of ventilation grill.

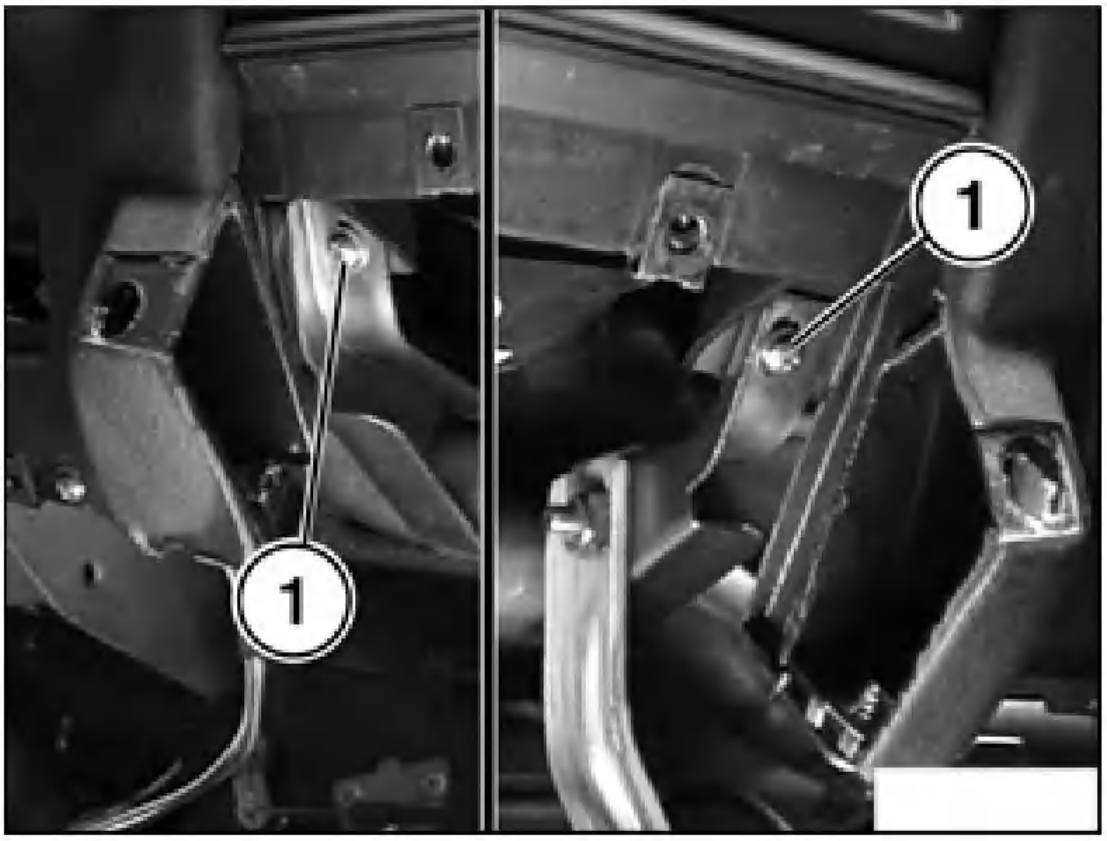


Fig. 216: Removing Ventilation Grill Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out finisher strips (1) and unfasten screws (2).

Installation:

Screw down screws (2) with spacer sleeve (3).

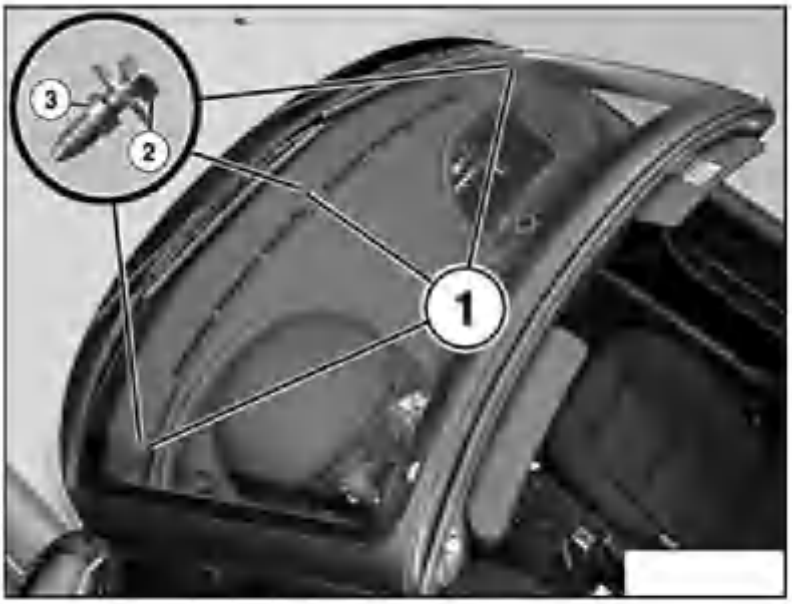


Fig. 217: Identifying Screw With Spacer Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Lift instrument panel (1) upwards and backwards (A) and remove on passenger side (B).

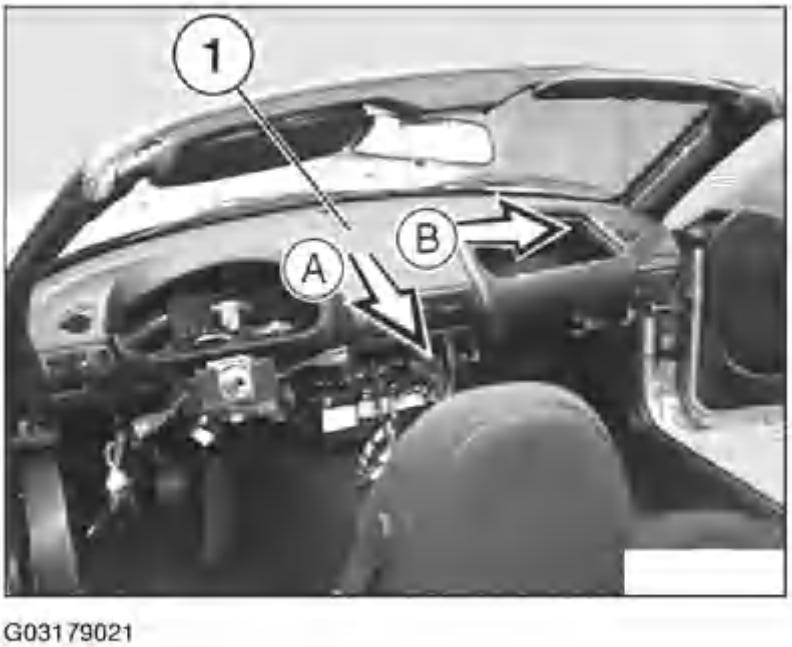


Fig. 218: Removing Passenger Side Instrument Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Slide on speed nuts (1).



Fig. 219: Installing Speed Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

51 45 031 REPLACING TRIM FOR INSTRUMENT PANEL (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Remove trim for instrument panel, refer to 51 45 030 REMOVING AND INSTALLING TRIM FOR INSTRUMENT PANEL (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Unfasten left/right screw (1) and remove left/right air guide (2).

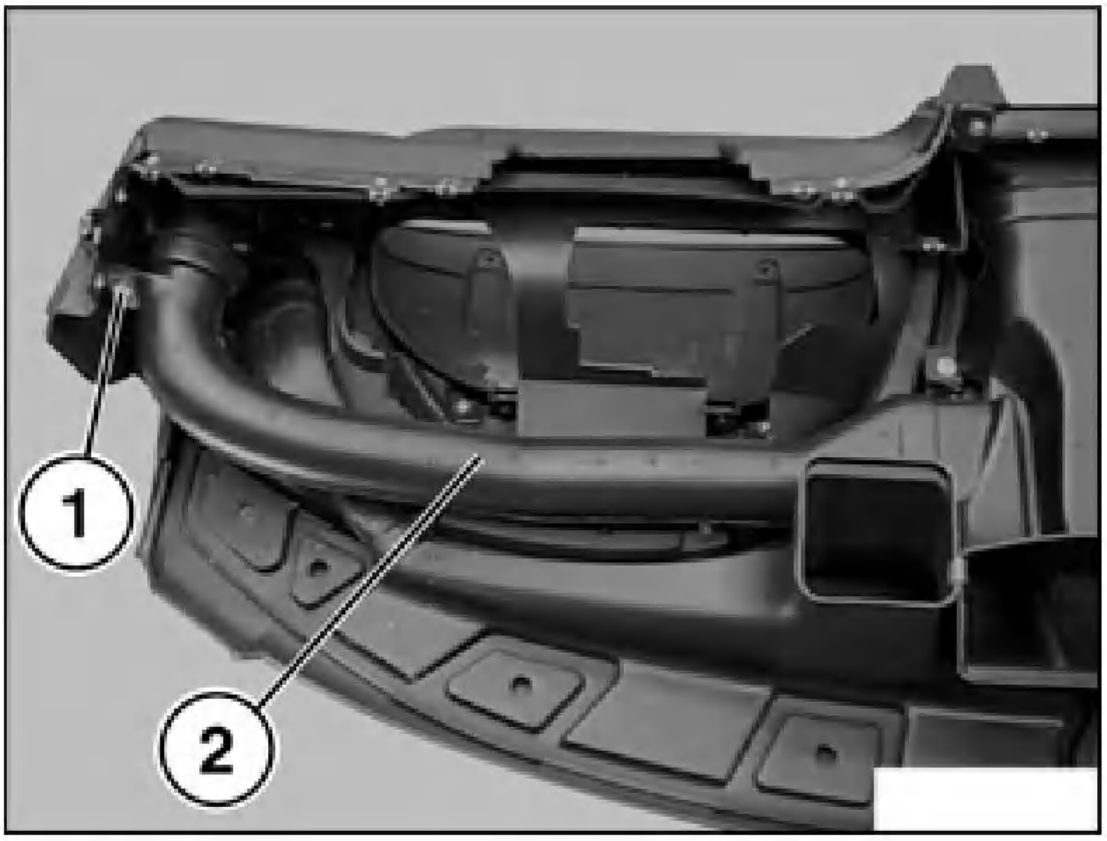


Fig. 220: Removing Left/Right Air Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1) and metal tabs (2) and remove center of air guide (3).

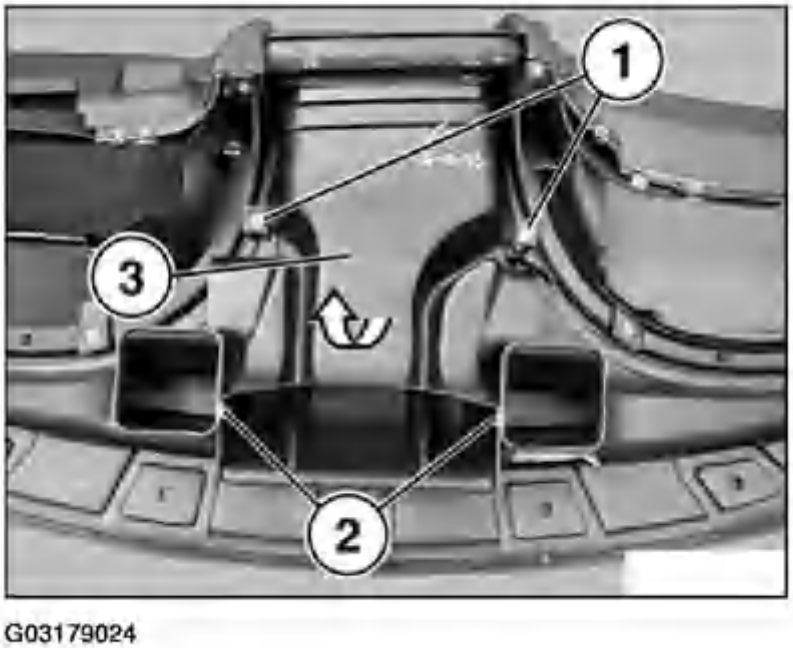


Fig. 221: Removing Center Of Air Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out interlock (1) and pull out center of air vent (2).

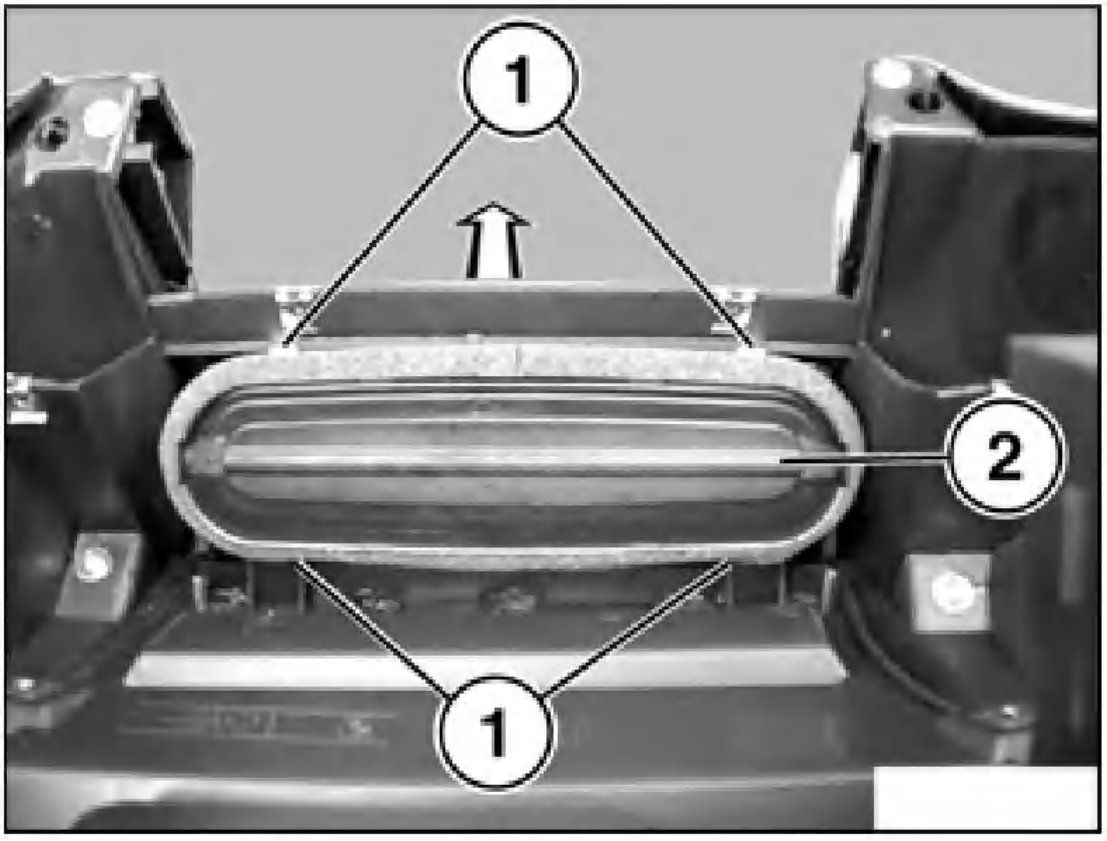


Fig. 222: Removing Center Of Air Vent
Courtesy of BMW OF NORTH AMERICA, INC.

Pull left/right air vent (1) downwards (with feeler gauge) and remove.

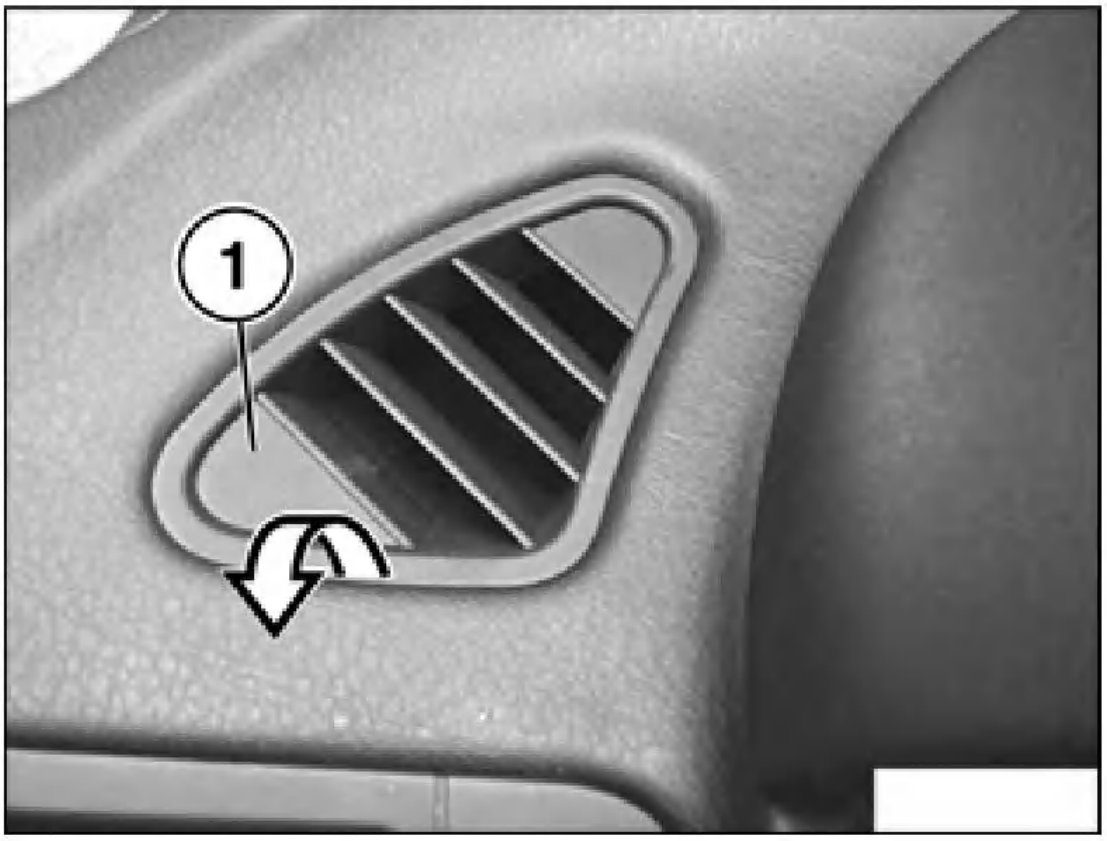


Fig. 223: Removing Left/Right Air Vent
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Interlock (1) and guide (2) on air vent (3) must not be damaged.

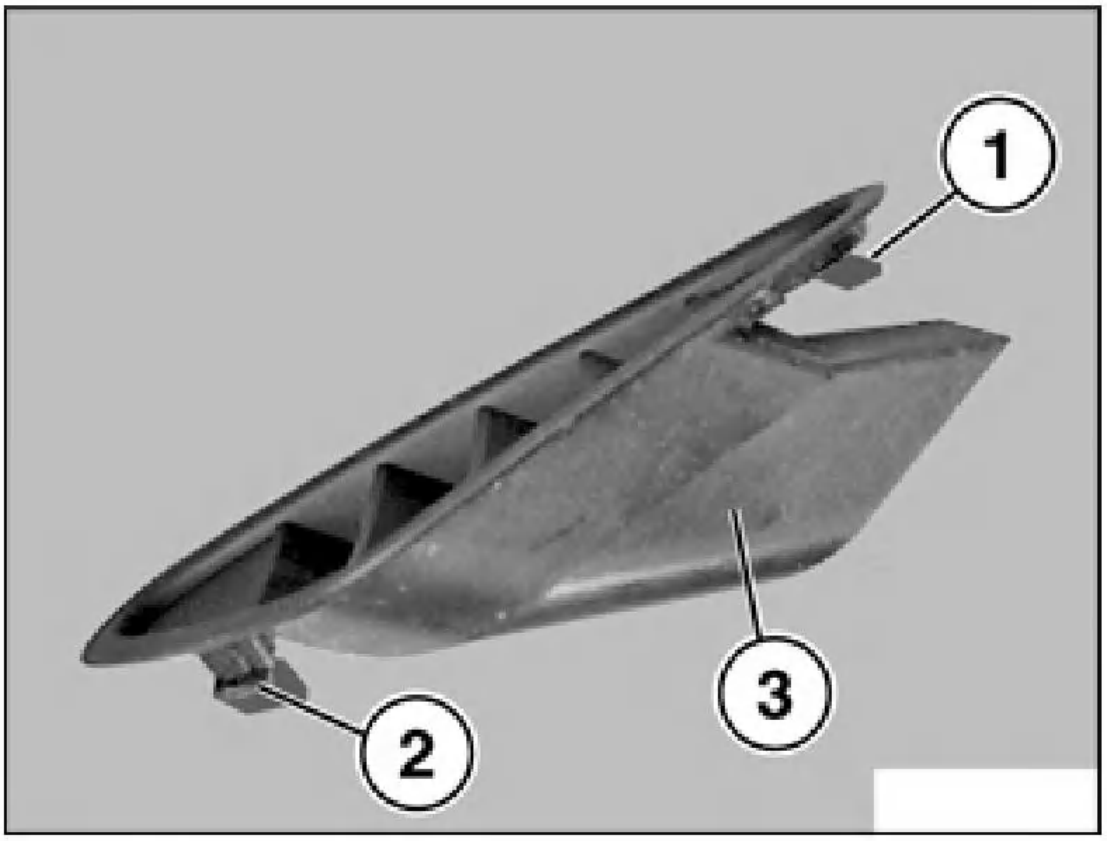


Fig. 224: Installing Guide On Air Vent
Courtesy of BMW OF NORTH AMERICA, INC.

Pull left/right air guide (1) forwards to remove.

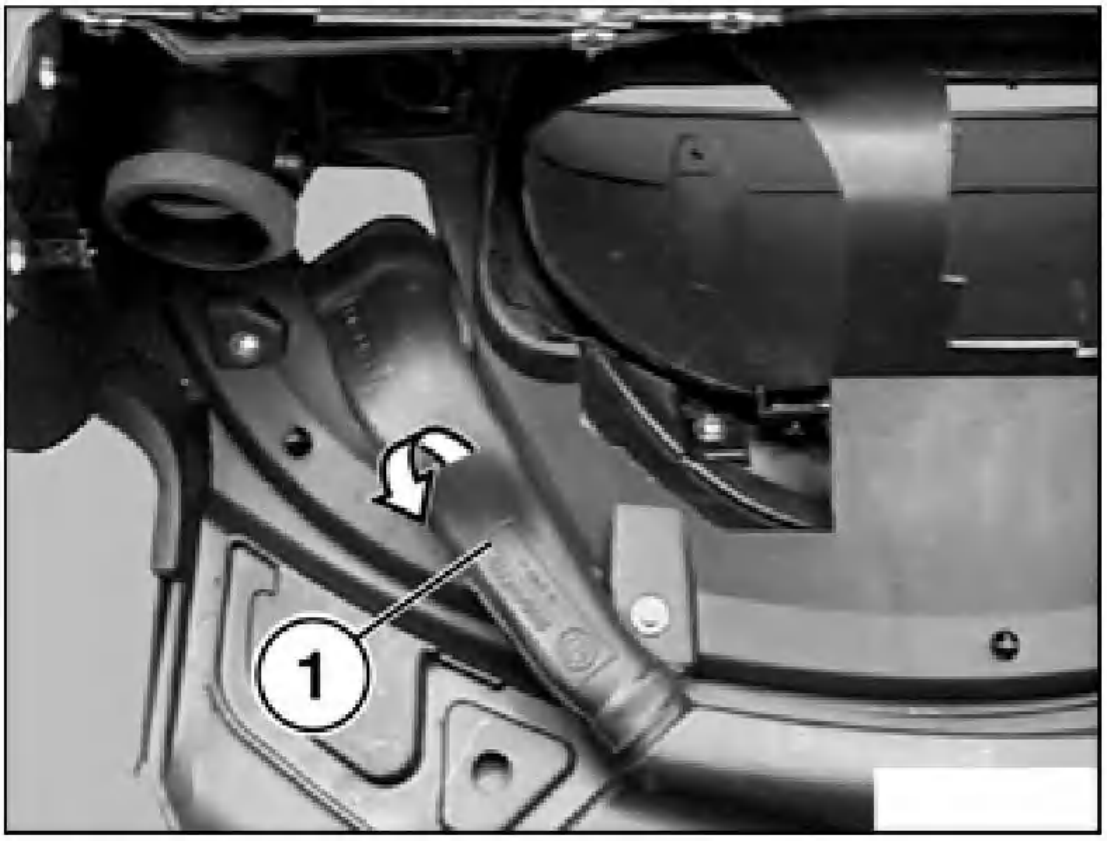


Fig. 225: Removing Left/Right Air Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1) and lift off insert (2).

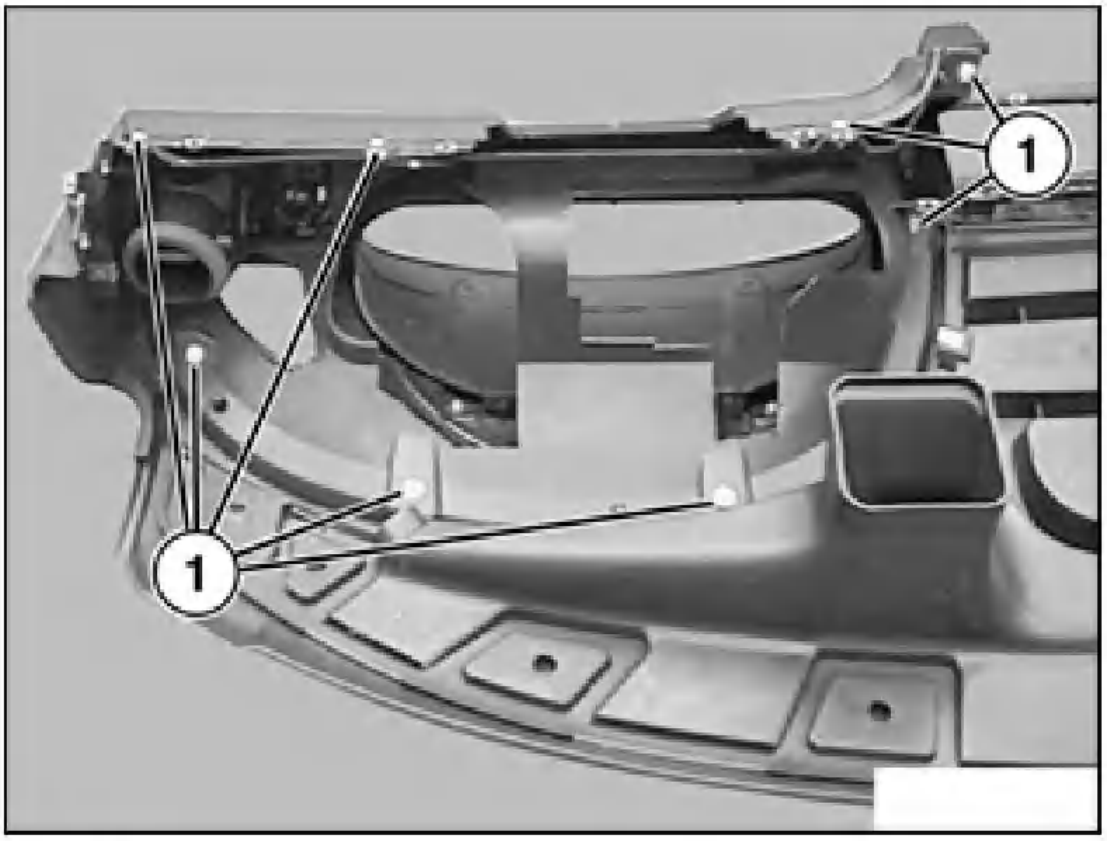


Fig. 226: Removing Insert
Courtesy of BMW OF NORTH AMERICA, INC.

Lift off finisher strips (1) and unfasten screw (2).

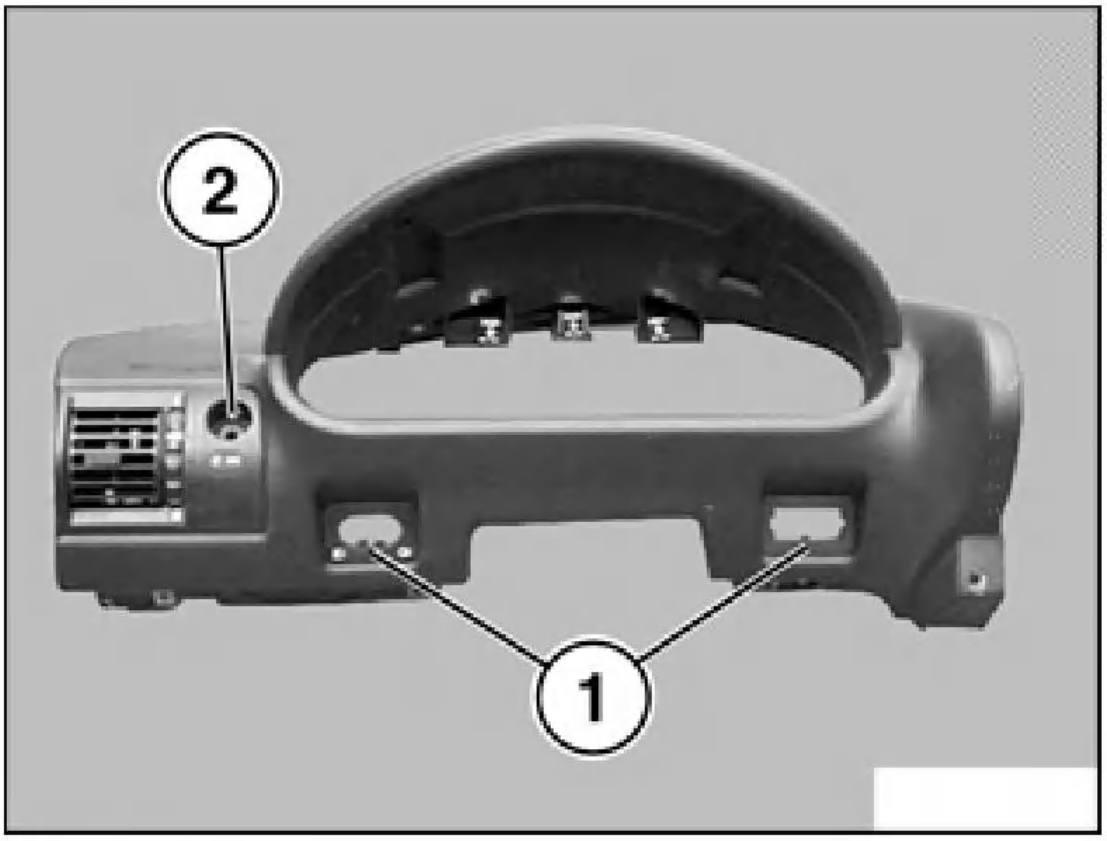


Fig. 227: Removing Finisher Strips
Courtesy of BMW OF NORTH AMERICA, INC.

Lift off interlocks (1) and pull air vents (2) forwards to remove.

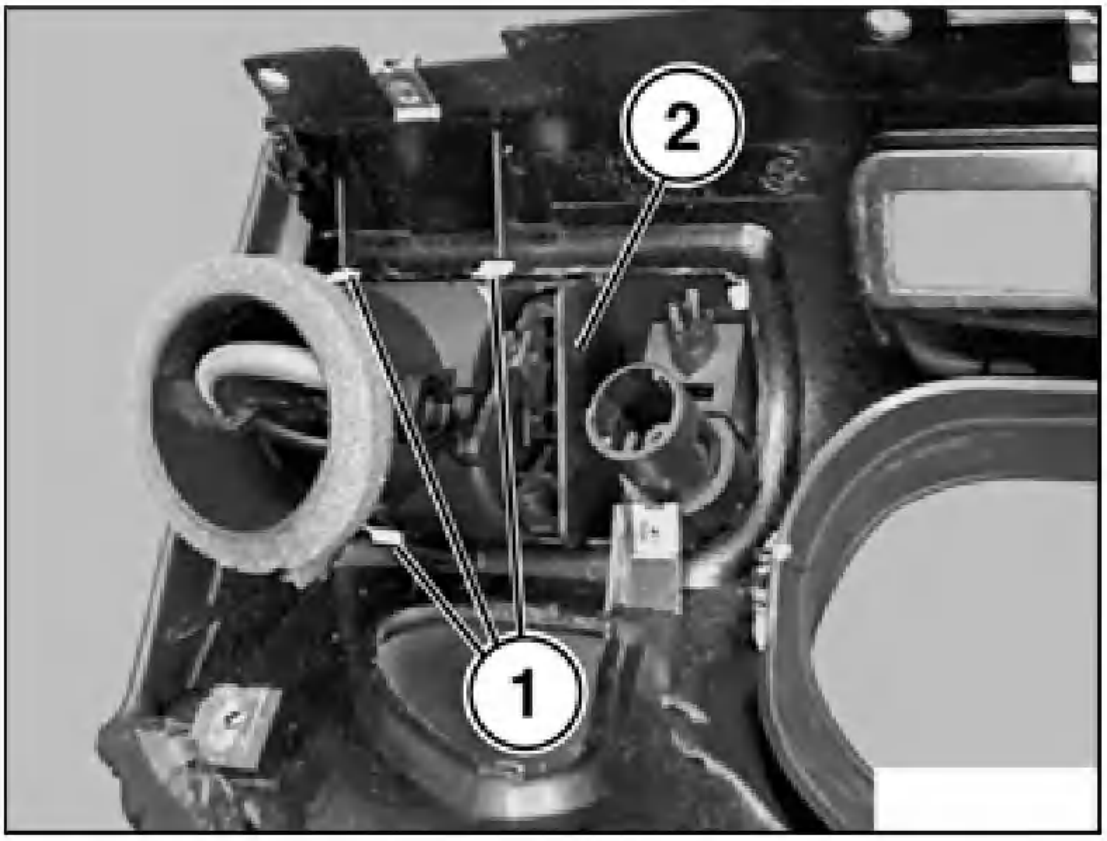


Fig. 228: Removing Air Vents
Courtesy of BMW OF NORTH AMERICA, INC.

Press air vents (1) apart until the interlocks (2) are released and remove light insert (3).

If necessary, remove symbol disc (4).

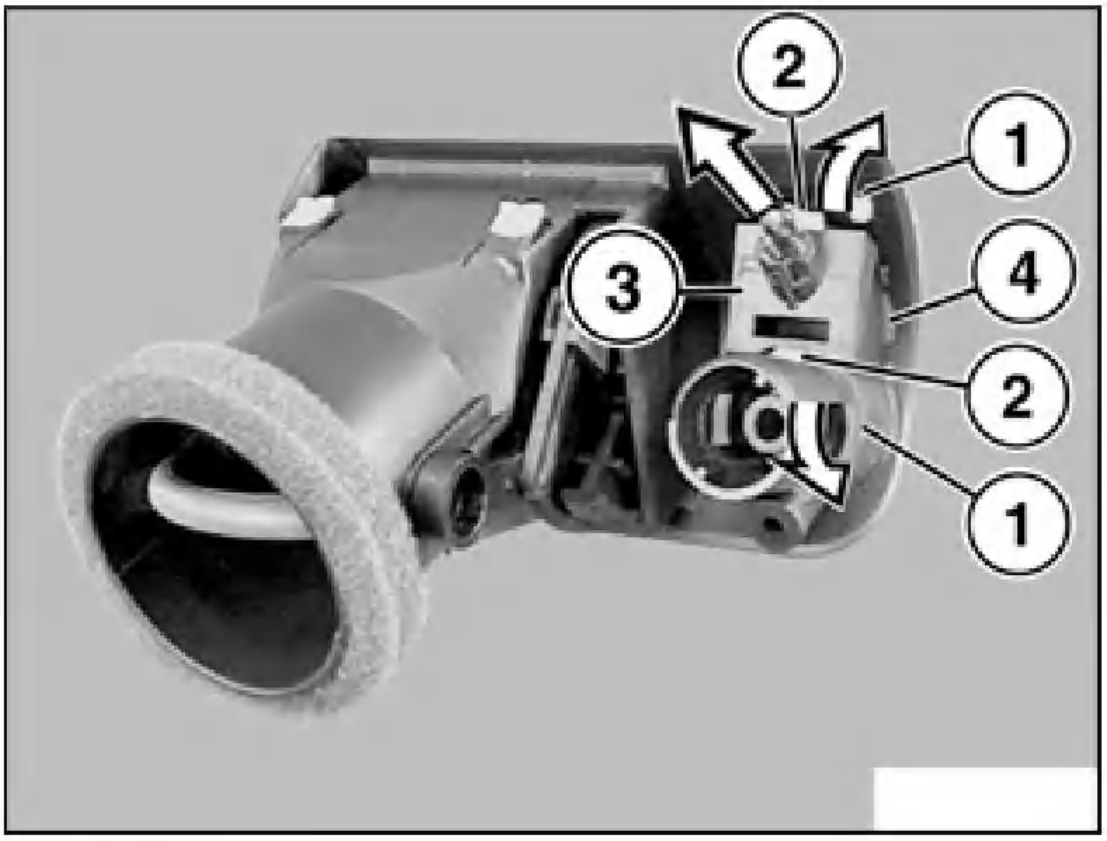


Fig. 229: Removing Symbol Disc
Courtesy of BMW OF NORTH AMERICA, INC.

Remove speed nuts (1).

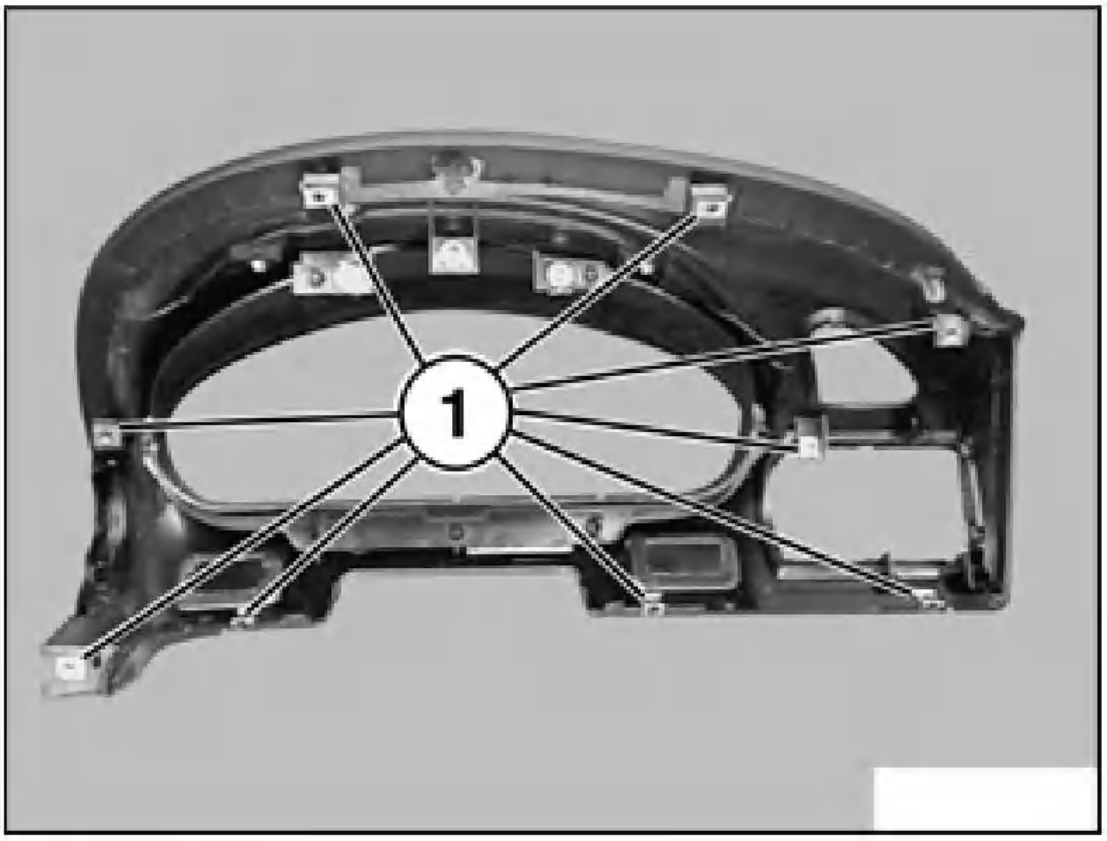


Fig. 230: Removing Speed Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1) and lift off frame (2).

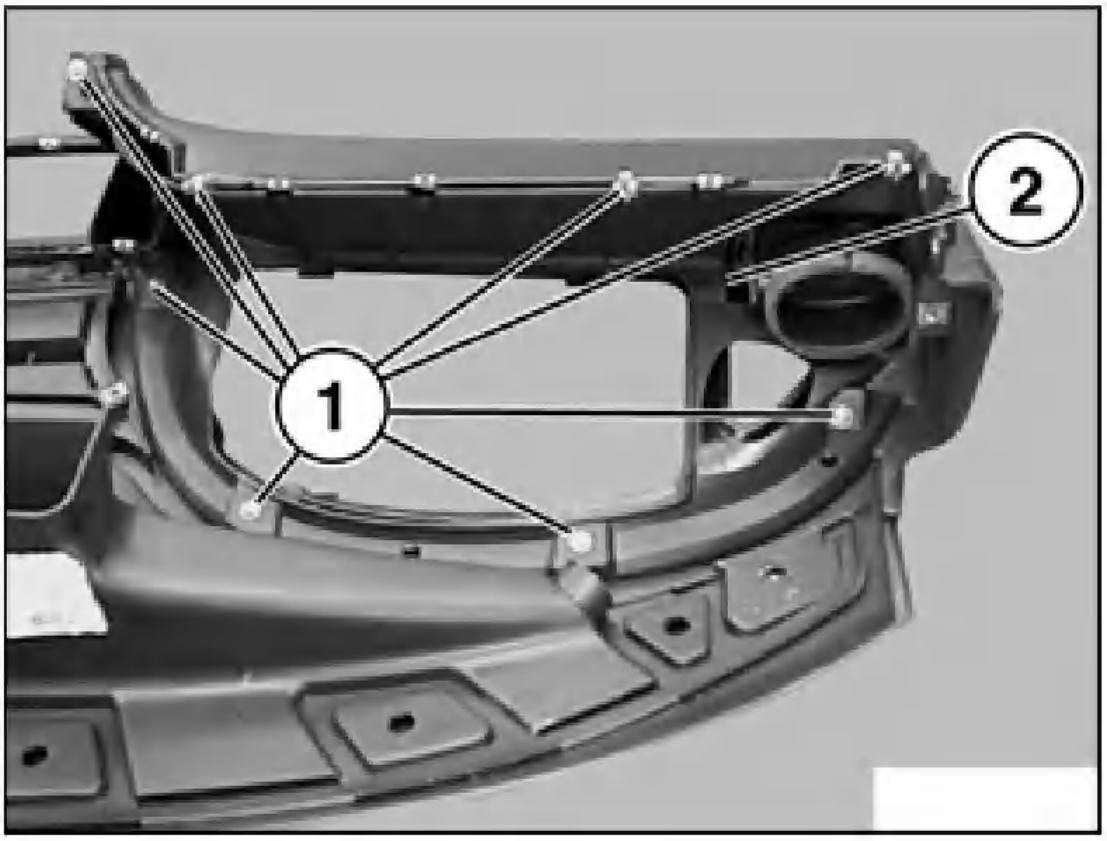


Fig. 231: Removing Frame
Courtesy of BMW OF NORTH AMERICA, INC.

Lift off interlocks (1) and remove air vents (2).

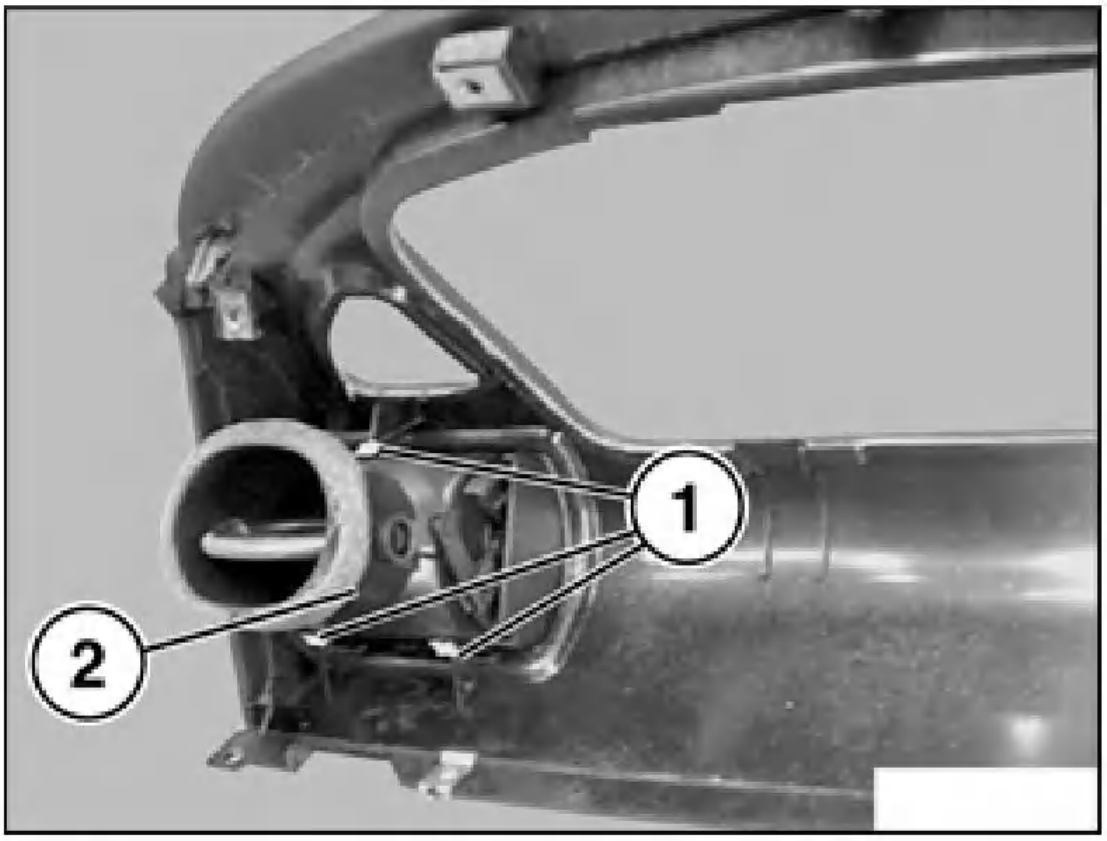


Fig. 232: Removing Air Vents
Courtesy of BMW OF NORTH AMERICA, INC.

Remove speed nuts (1).

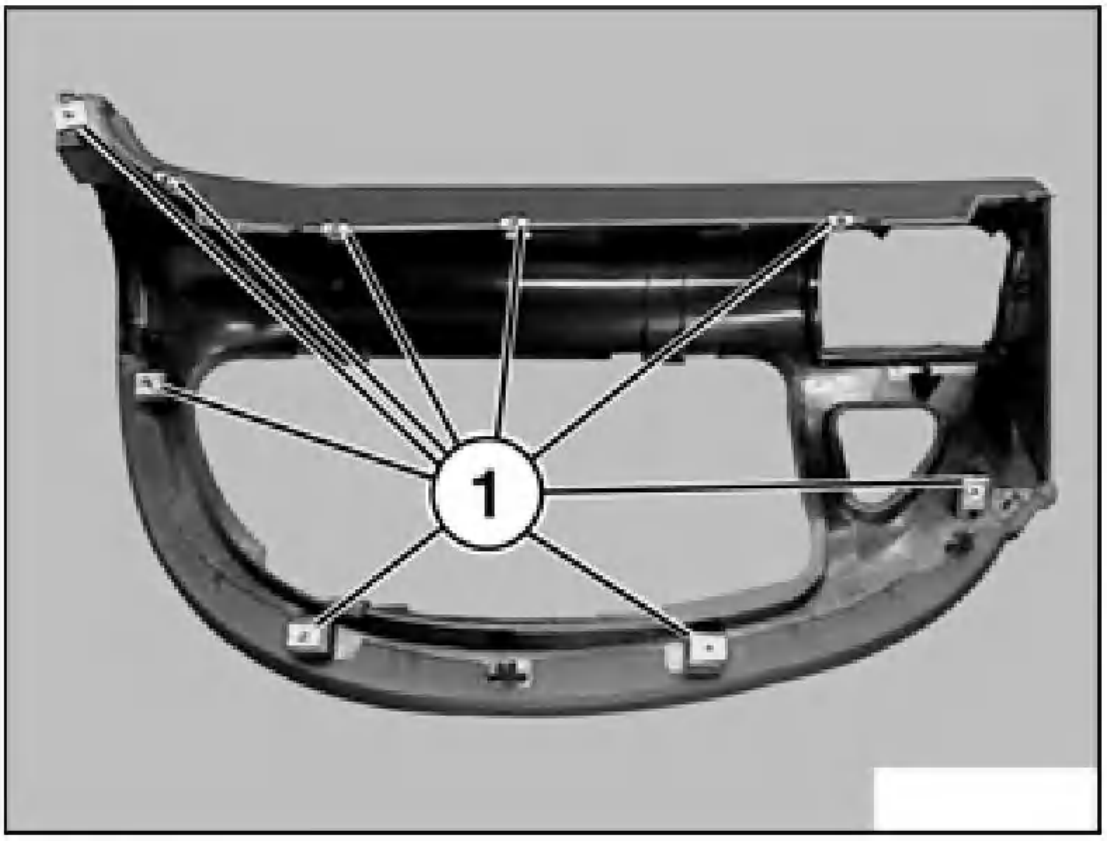


Fig. 233: Removing Speed Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove speed nuts (1).

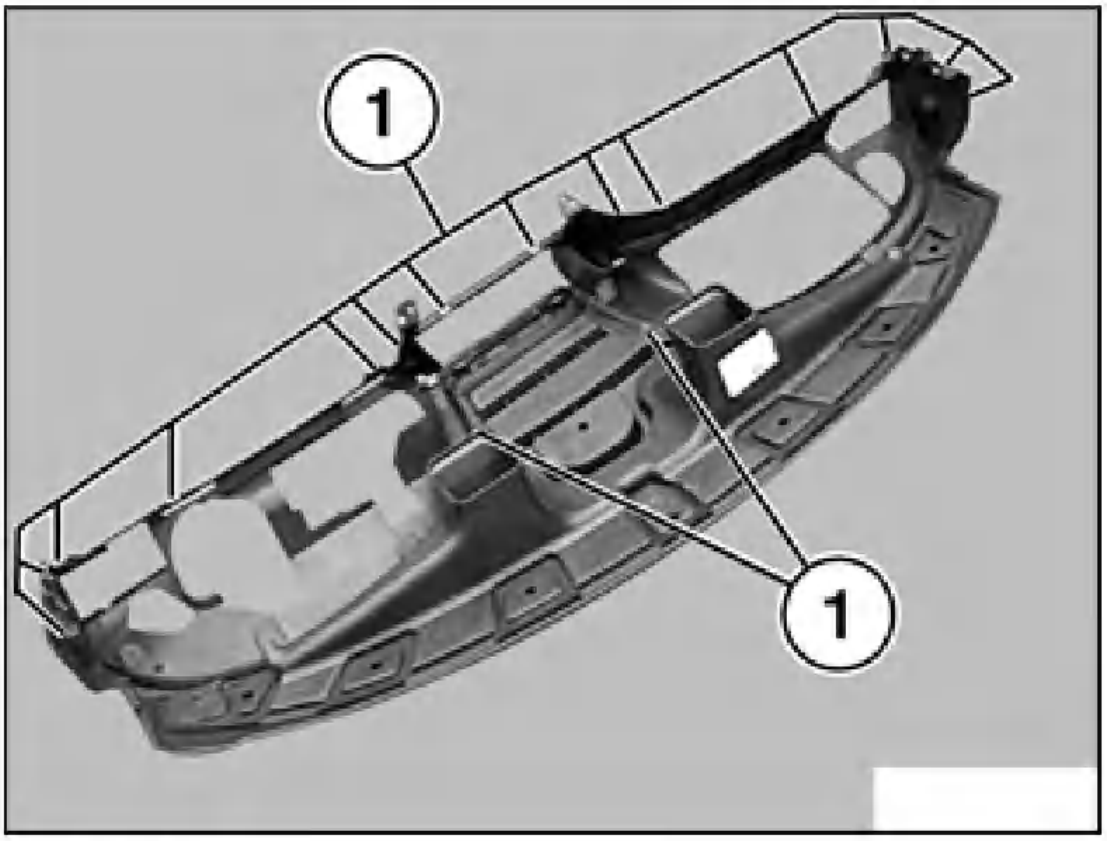


Fig. 234: Removing Speed Nuts From Frame
Courtesy of BMW OF NORTH AMERICA, INC.

51 45 180 REMOVING AND INSTALLING/REPLACING TRIM FOR INSTRUMENT PANEL, BOTTOM LEFT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Turn rotary clips (1) through 90Â° and remove. Pull trim (2) downwards/backwards to remove.

NOTE: Do not damage the guides (3).

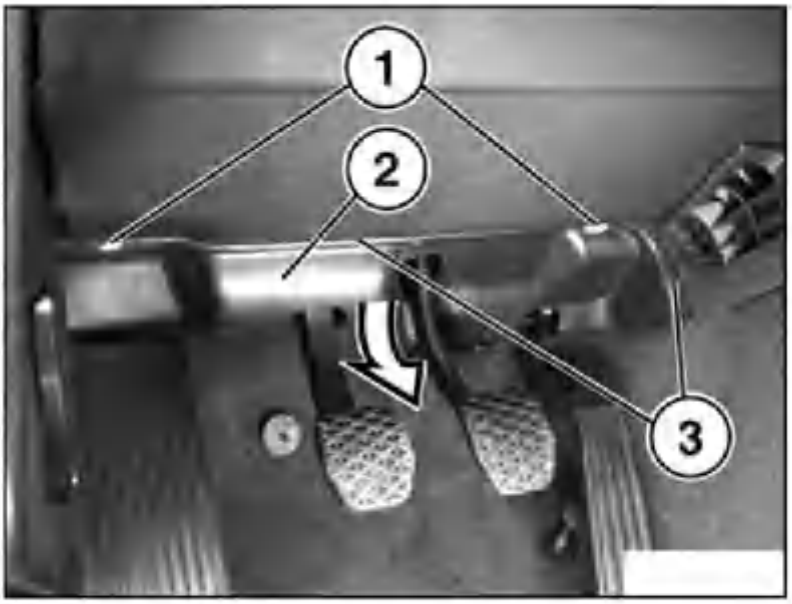


Fig. 235: Identifying Rotary Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Guides (1) on the trim (2) must not be damaged.

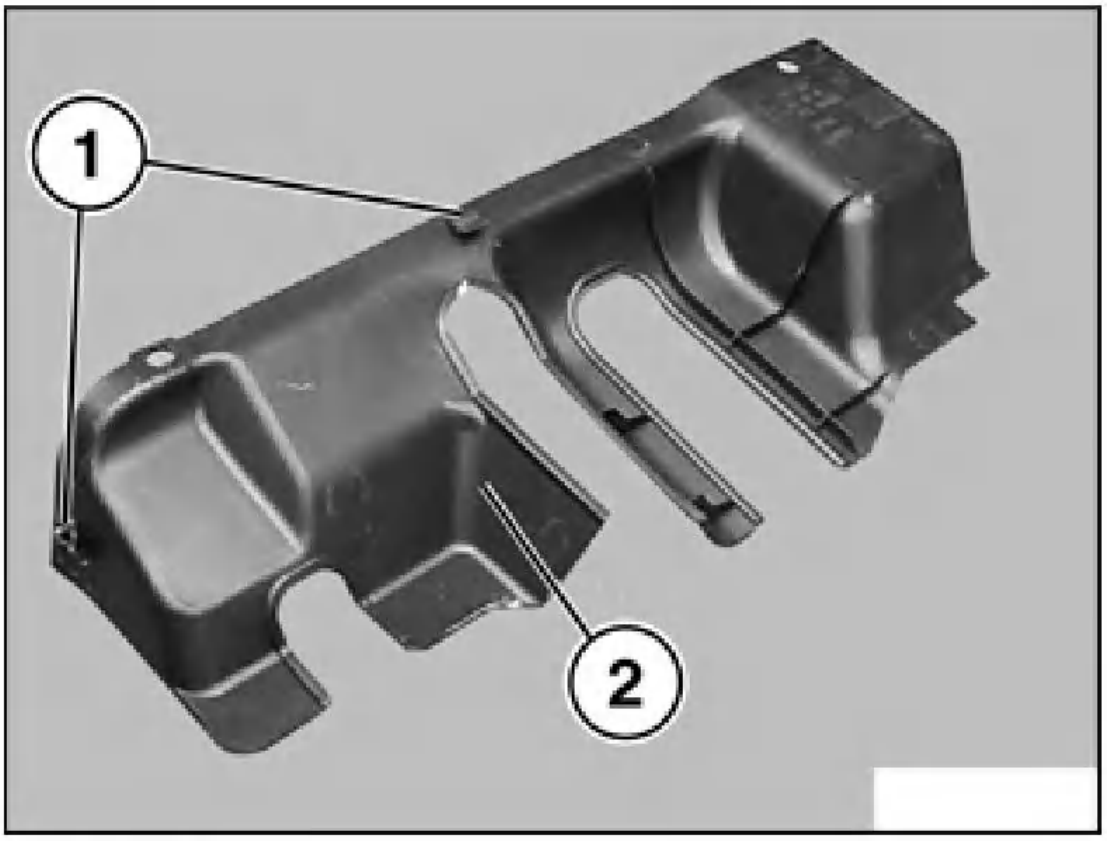


Fig. 236: Identifying Trim Guides
Courtesy of BMW OF NORTH AMERICA, INC.

Remove caps (1) and screws. Unscrew trim (2) and pull outwards/downwards to remove from oddments tray (3).

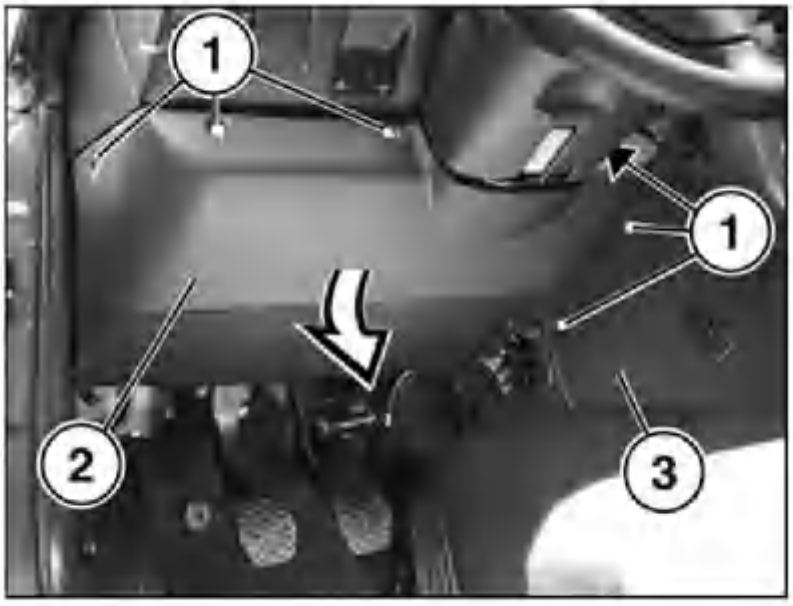


Fig. 237: Removing Trim From Oddments Tray
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace defective covers (1).

Installation:

Slide on speed nuts (1). Fit seal (2) on steering column and seal (3) on air outlet (heating) correctly.

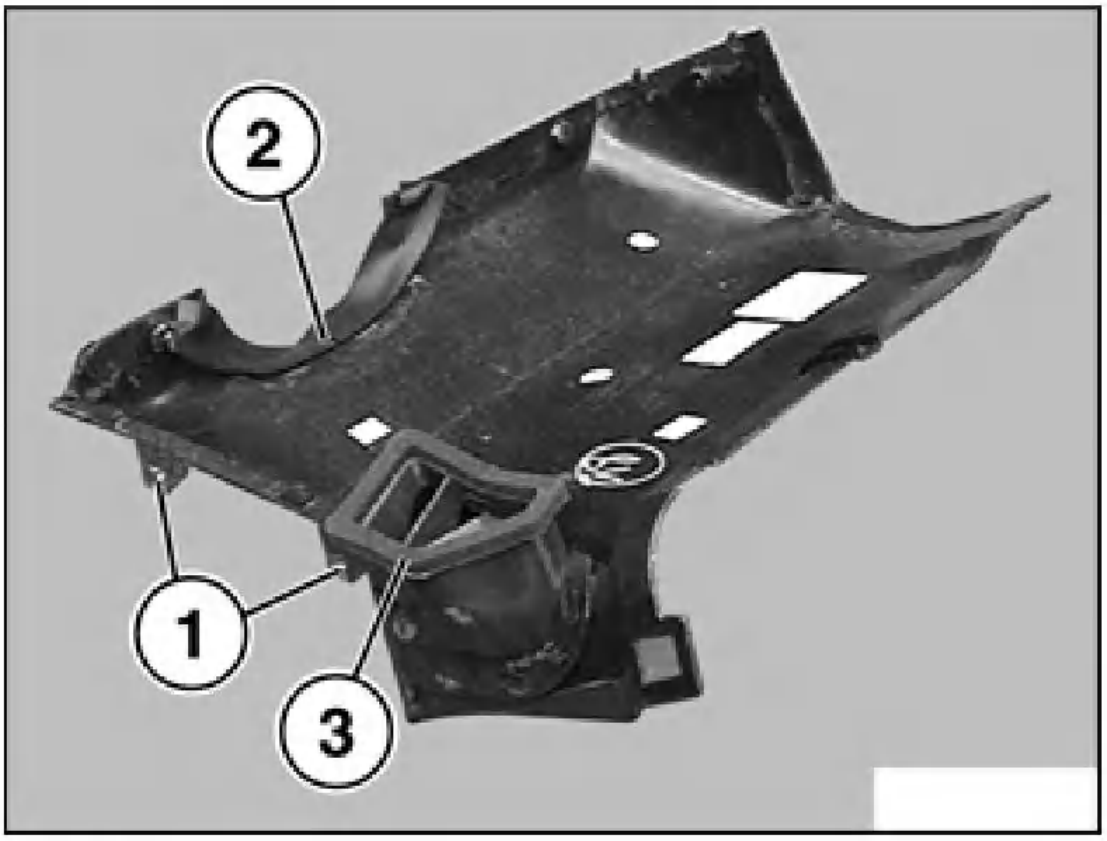


Fig. 238: Installing Steering Column Seal
Courtesy of BMW OF NORTH AMERICA, INC.

PARCEL SHELF TRIM PANEL

51 46 050 REMOVING AND INSTALLING/REPLACING FINISHER FOR TAIL PANEL, TOP (Z3 ROADSTER, M ROADSTER)

Remove Hazard Warning Triangle. Refer To 00 00... INFORMATION / WARNING LABELS .

Remove floor mat (1).

Unfasten screws (2) and expanding rivets (3) and lift off finisher strip.

If necessary, unfasten screws (4).

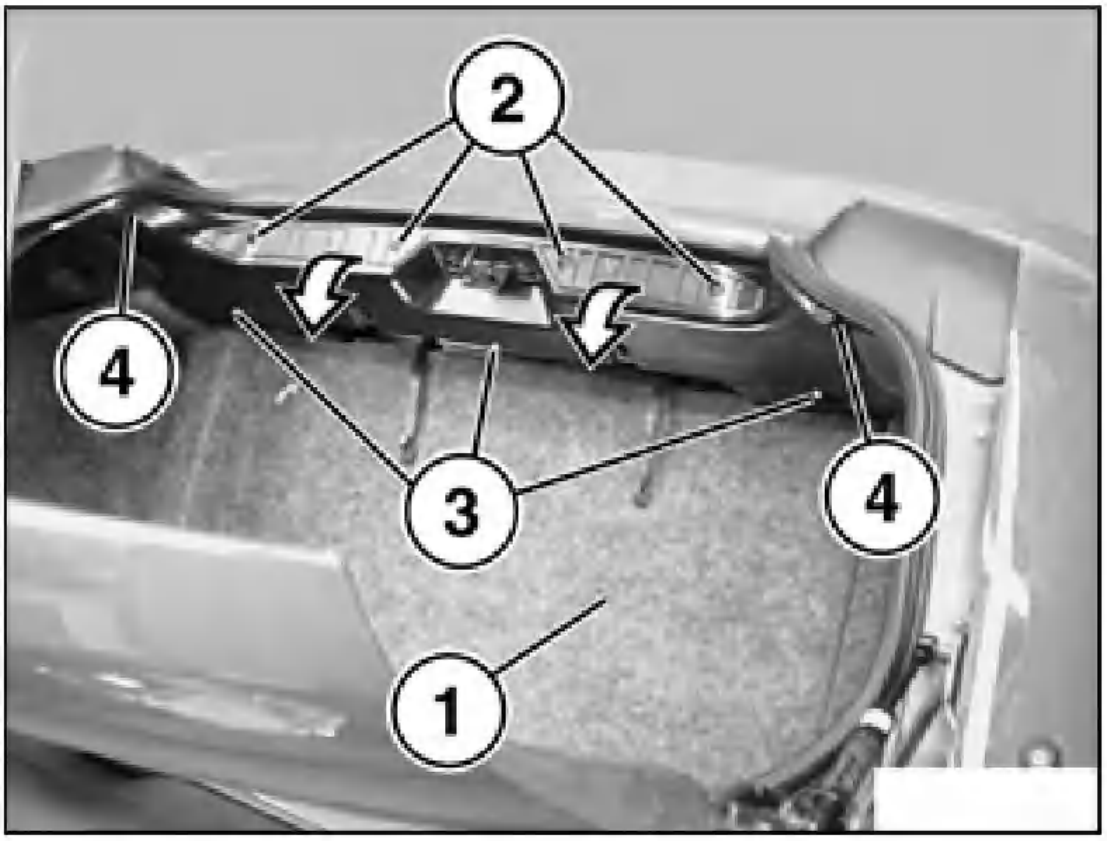


Fig. 239: Removing Finisher Strip
Courtesy of BMW OF NORTH AMERICA, INC.

FLOOR - LUGGAGE COMPARTMENT - ENGINE COMPARTMENT TRIM PANELS

51 47 000 REMOVING AND INSTALLING/REPLACING ENTRANCE COVER STRIP (INTERIOR), FRONT LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Pull rocker panel strip upwards to unclip.

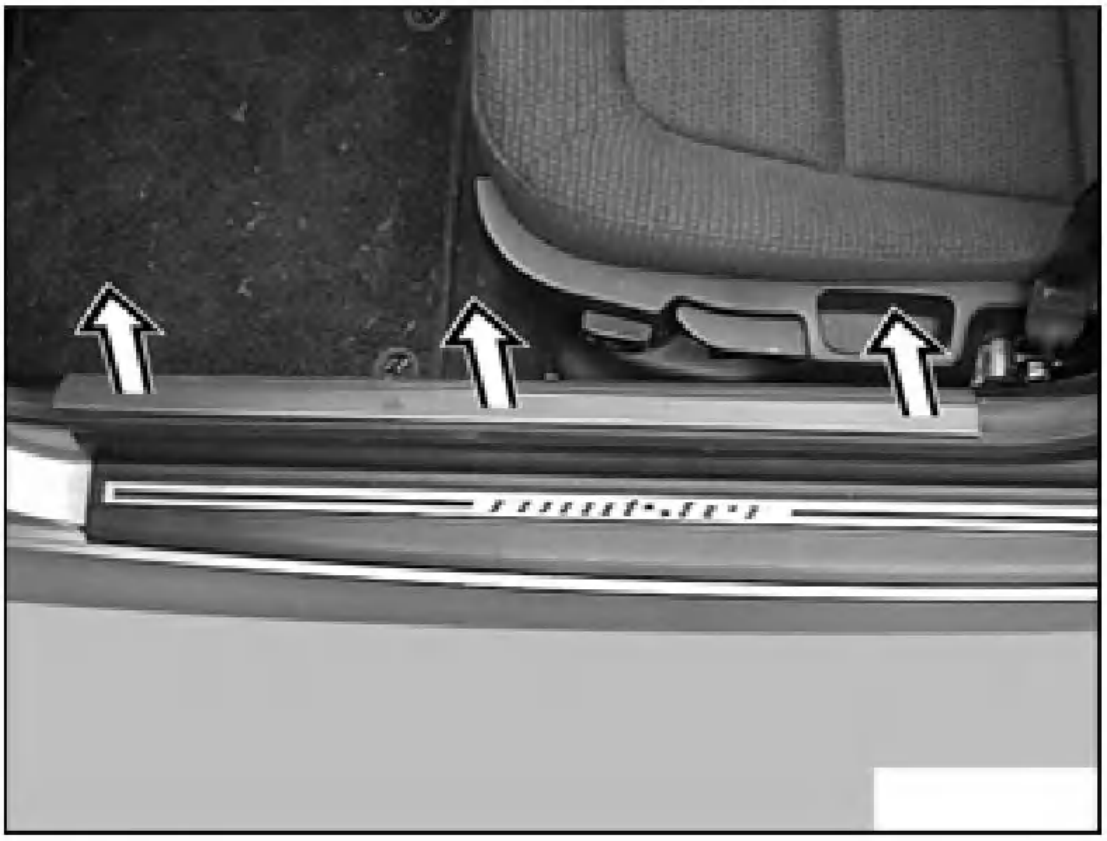


Fig. 240: Removing Rocker Panel Strip Upwards To Unclip
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, squeeze clips together with pliers and lift out (head of pliers ground smooth).

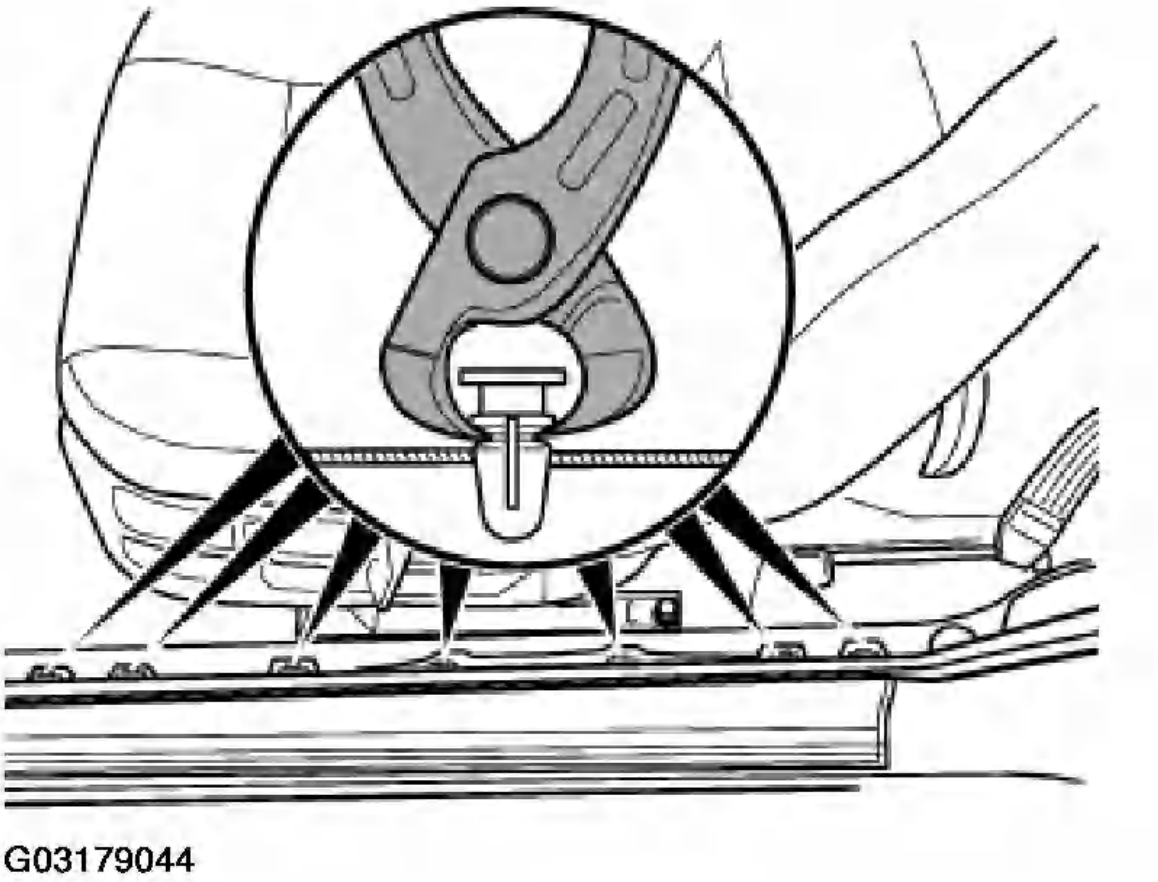


Fig. 241: Removing Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Soak clips in water for a short time.

Slide on clips (1) and align.

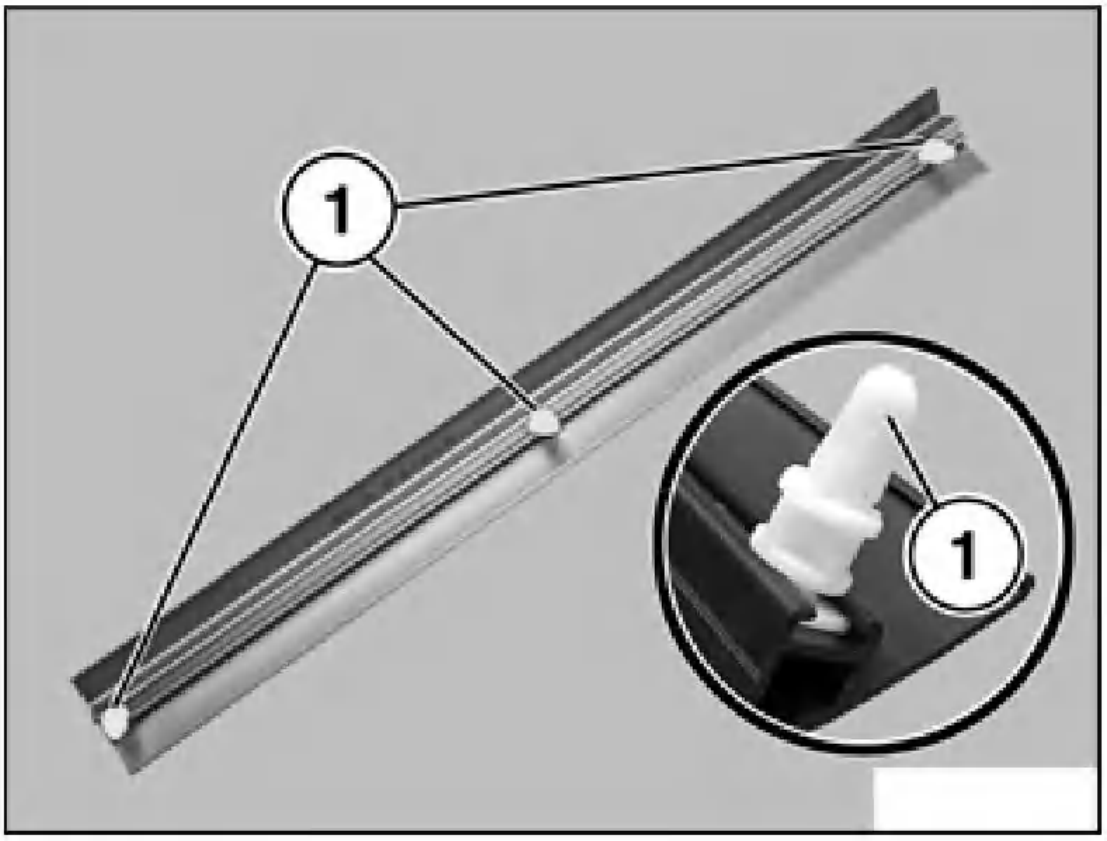


Fig. 242: Identifying Clips
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, replace damaged clips.

51 47 065 REMOVING AND INSTALLING/REPLACING COVER STRIP AT ENTRANCE, FRONT LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Unfasten clip (1).

Carefully pull finisher strip, first upwards then forwards to unclip.

If necessary, lift clips off entrance.

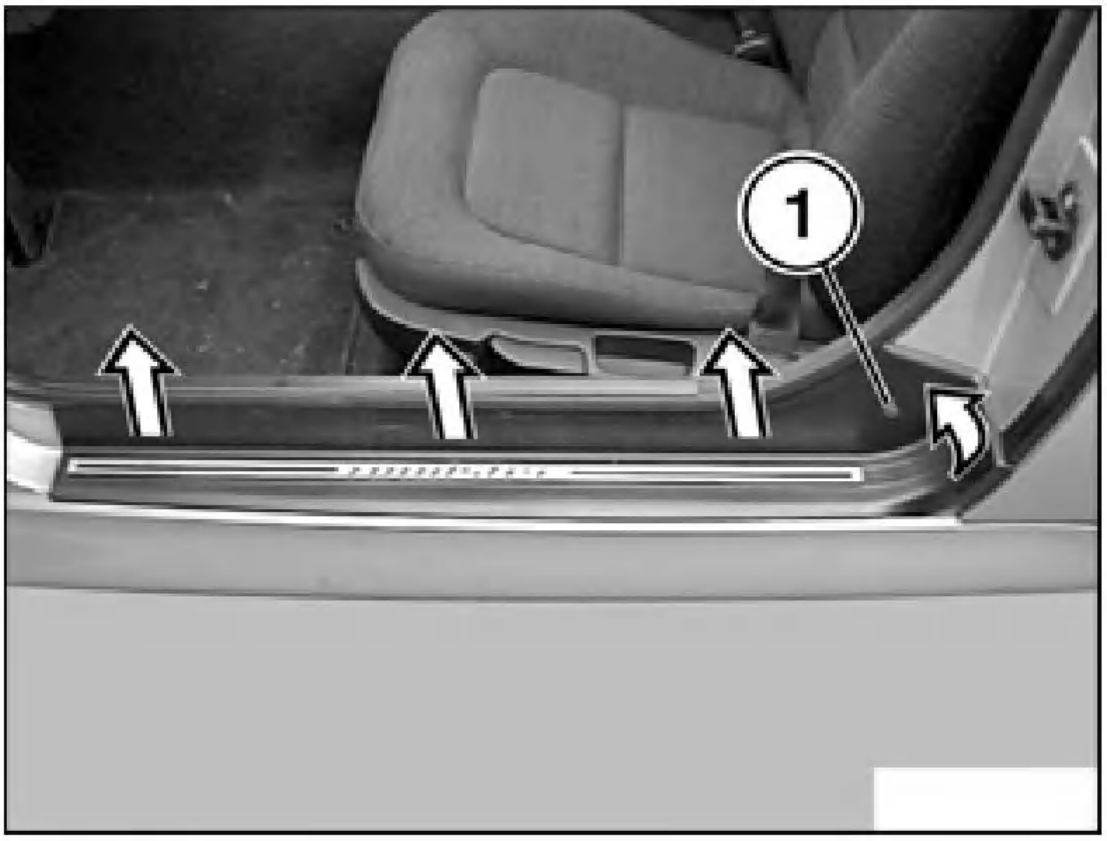


Fig. 243: Removing Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Soak clips in water for a short time.

Install clips and align.

If necessary, replace damaged clips.

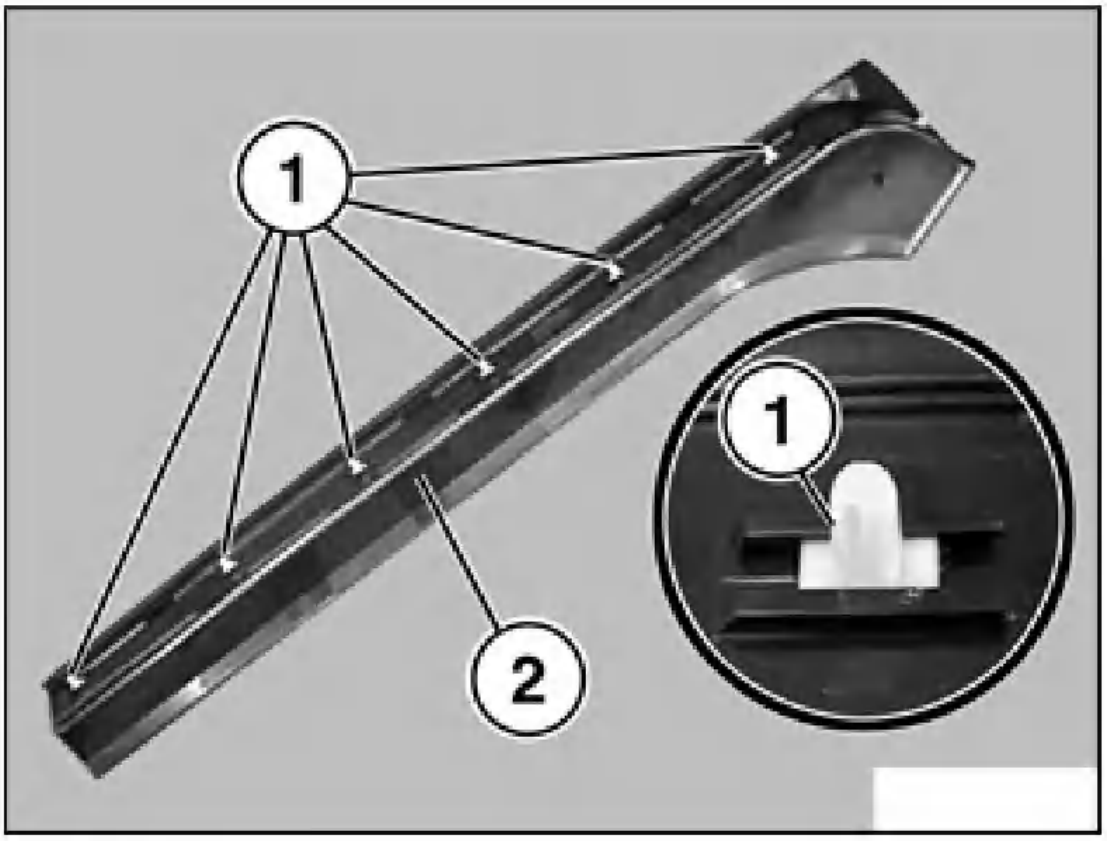


Fig. 244: Installing Clips And Aligning
Courtesy of BMW OF NORTH AMERICA, INC.

Only replace:

Remove seal (1) from finisher strip (2).

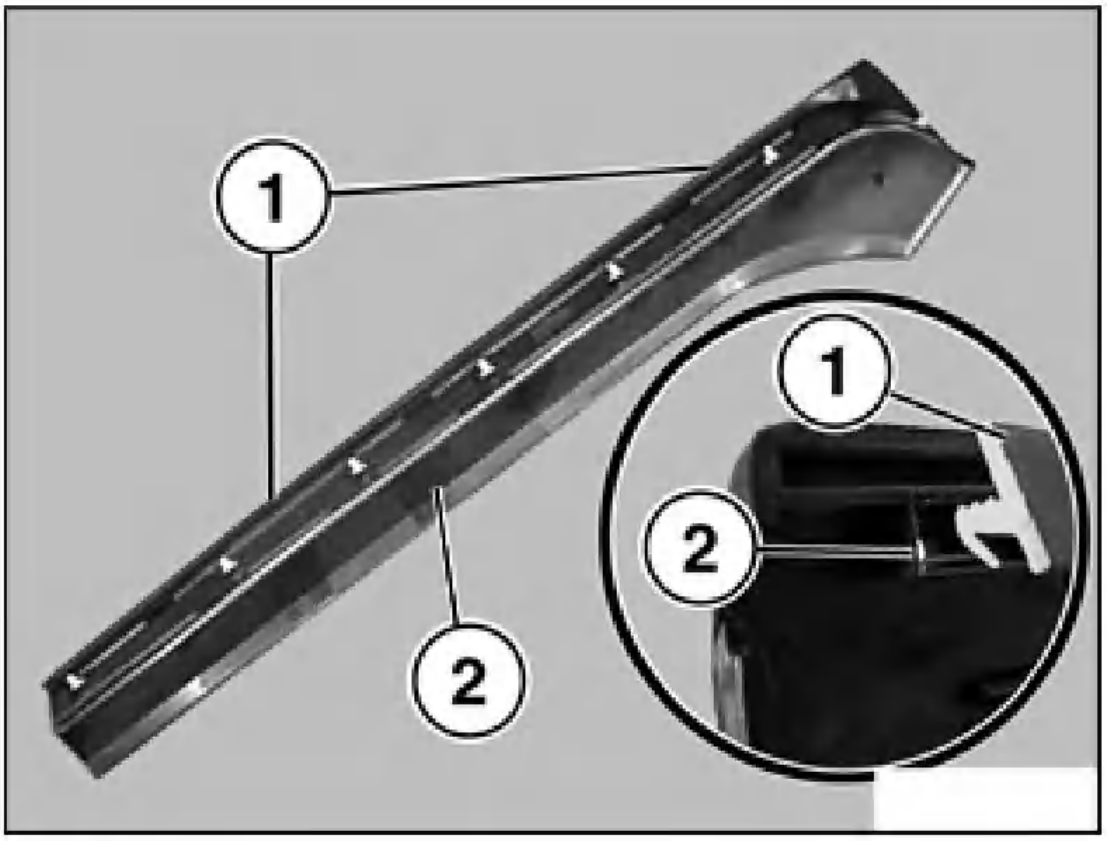


Fig. 245: Removing Seal From Finisher Strip
Courtesy of BMW OF NORTH AMERICA, INC.

51 47 080 REMOVING AND INSTALLING/REPLACING FINISHER ON B-PILLAR, LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Remove finisher strip off front rocker panel, refer to 51 47 065 REMOVING AND INSTALLING/REPLACING COVER STRIP AT ENTRANCE, FRONT LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Pull finisher strip (1) forwards to unclip.

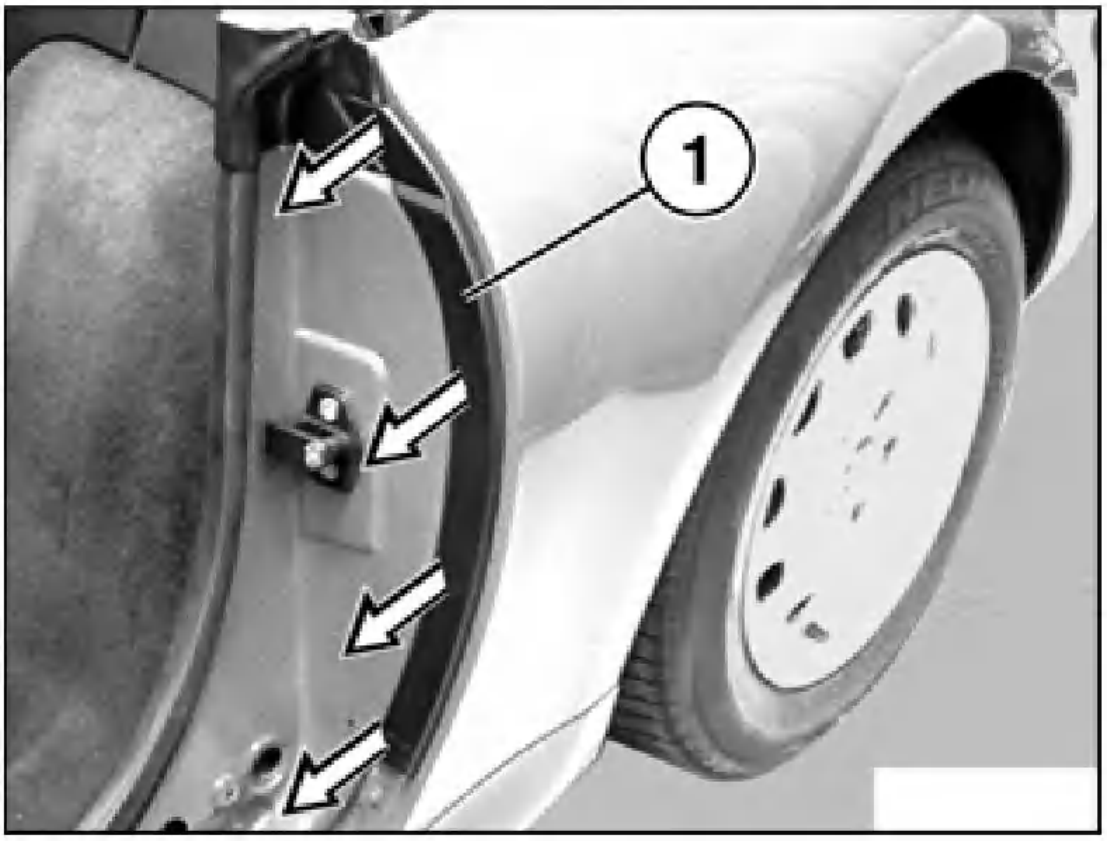


Fig. 246: Removing Finisher Strip
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, lift clips off panel.

Installation:

Soak clips (1) in water for a short time.

Slide on clips (1).

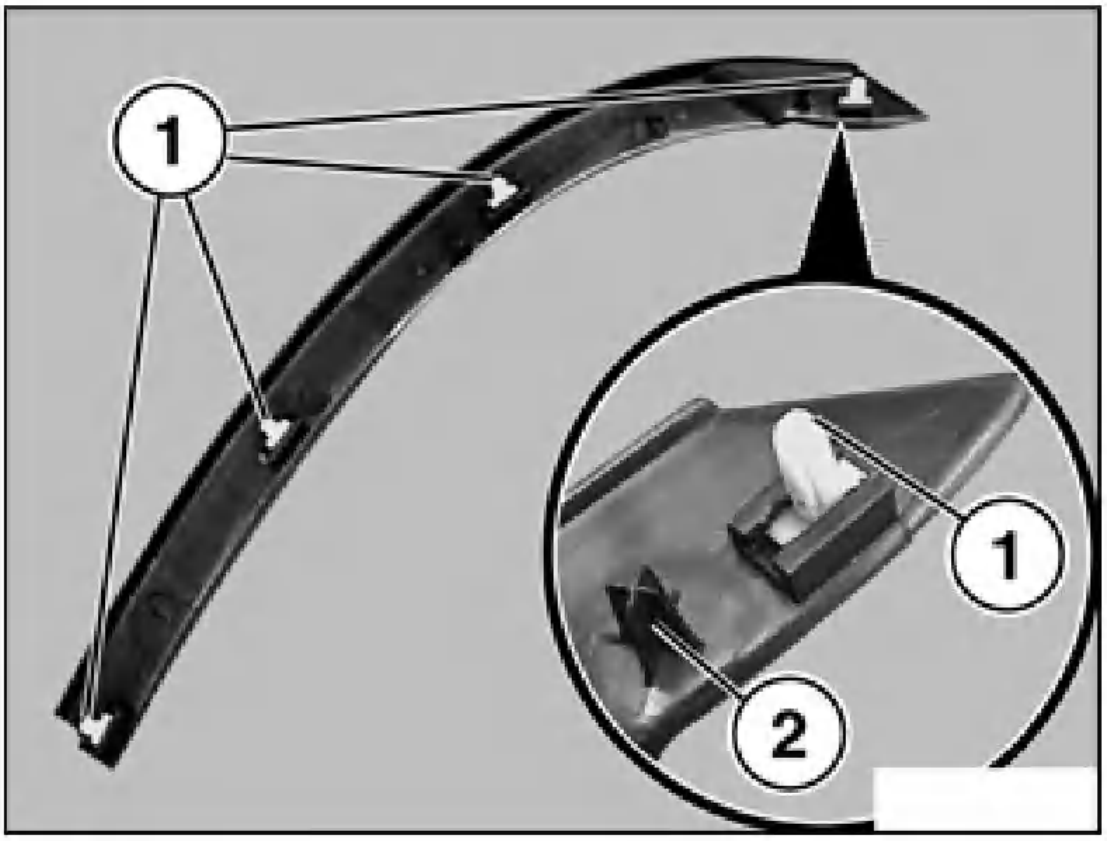


Fig. 247: Replacing Clips
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, replace defective clips (1).

Guide (2) must not be damaged.

51 47 140 REMOVING AND INSTALLING / REPLACING PANEL FOR LUGGAGE COMPARTMENT SEPARATING WALL (Z3 ROADSTER, M ROADSTER)

Removing and installing/replacing left trunk wheel housing trim, refer to 51 47 151 REMOVING AND INSTALLING/REPLACING LEFT TRUNK WHEEL HOUSING TRIM (Z3 ROADSTER, M ROADSTER) .

Removing and installing/replacing right trunk wheel housing trim, refer to 51 47 161 REMOVING AND INSTALLING / REPLACING RIGHT TRUNK WHEEL HOUSING TRIM (Z3 ROADSTER, M ROADSTER) .

Removing and installing luggage compartment light, refer to 63 31 080 REMOVING AND INSTALLING/REPLACING LUGGAGE COMPARTMENT LIGHT (Z3, M ROADSTER) .

Version Without Hi-Fi System, Without CD Changer:

Unfasten clips (1) and remove trim (2) for luggage compartment separating wall.

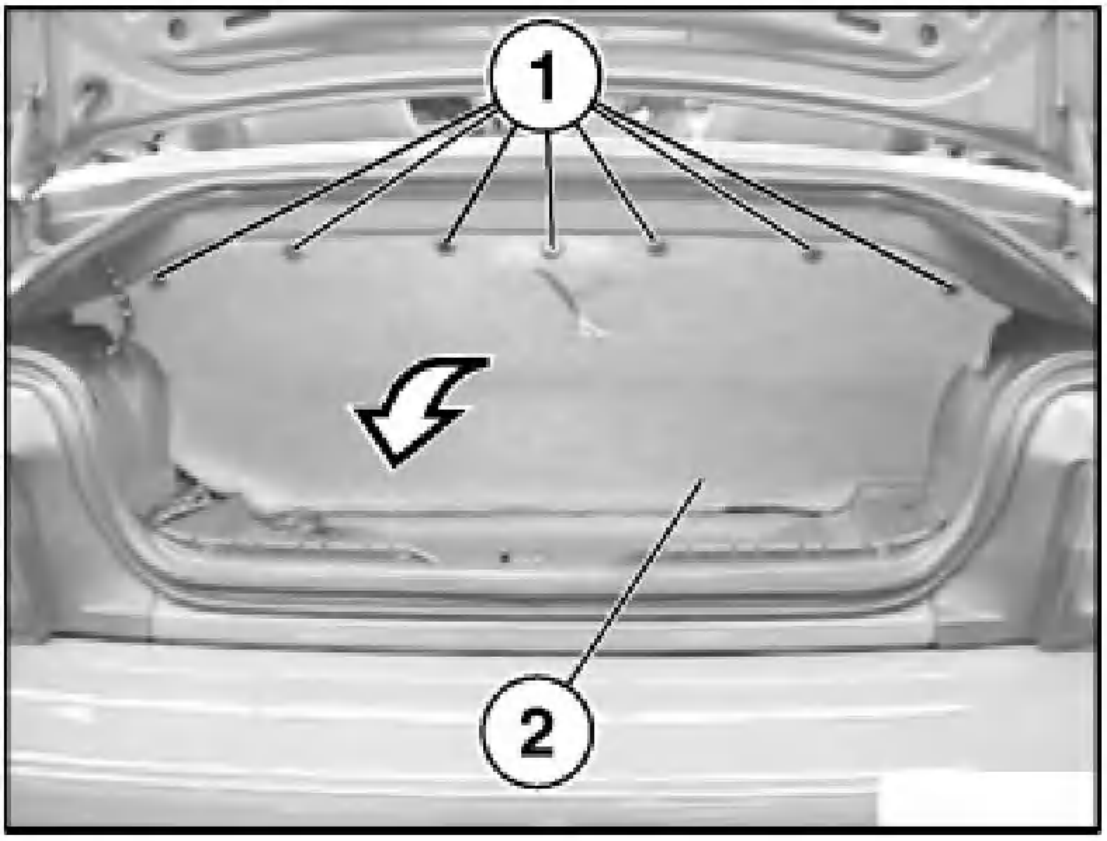


Fig. 248: Removing Trim For Luggage Compartment (Without Hi-Fi System)
Courtesy of BMW OF NORTH AMERICA, INC.

Version With Hi-Fi System:

Unfasten clips (1) and remove trim (2) for luggage compartment separating wall.

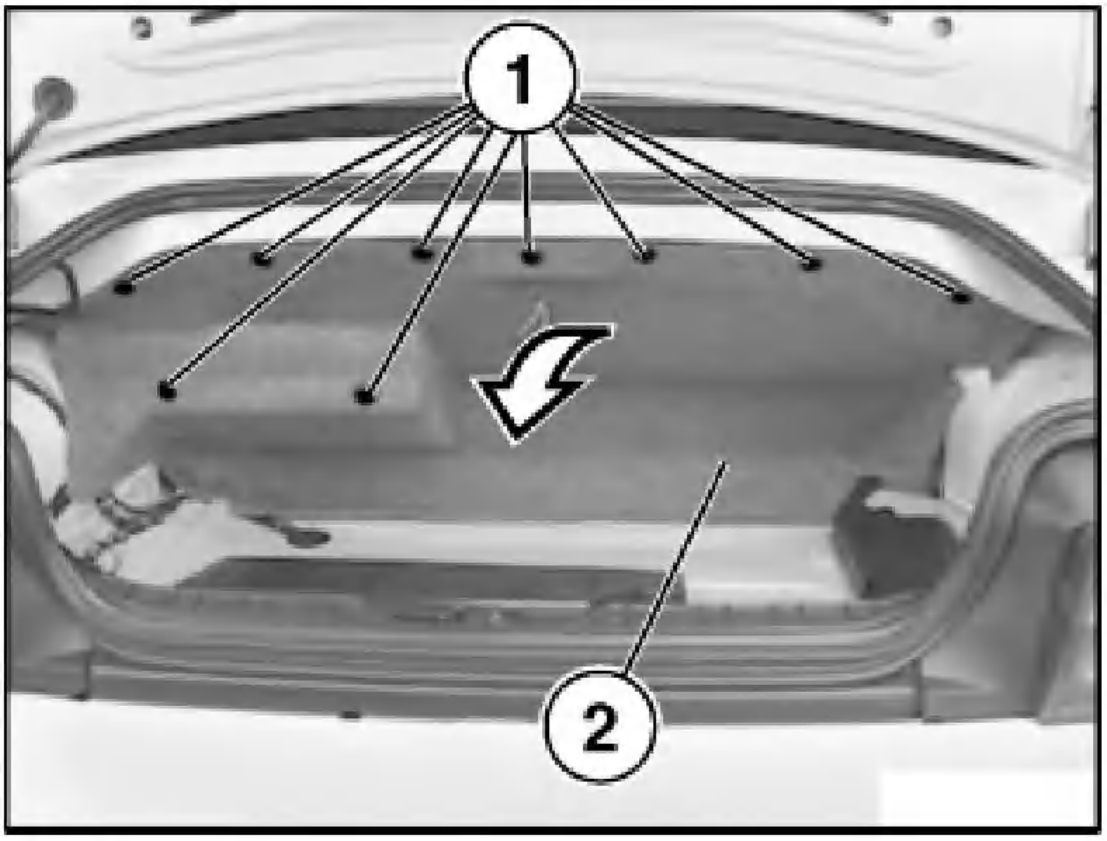


Fig. 249: Removing Trim For Luggage Compartment (With Hi-Fi System)
Courtesy of BMW OF NORTH AMERICA, INC.

Version With CD Changer (3):

Unfasten clips (1), lift out trim (2) for luggage compartment separating wall of CD changer (3) and remove.

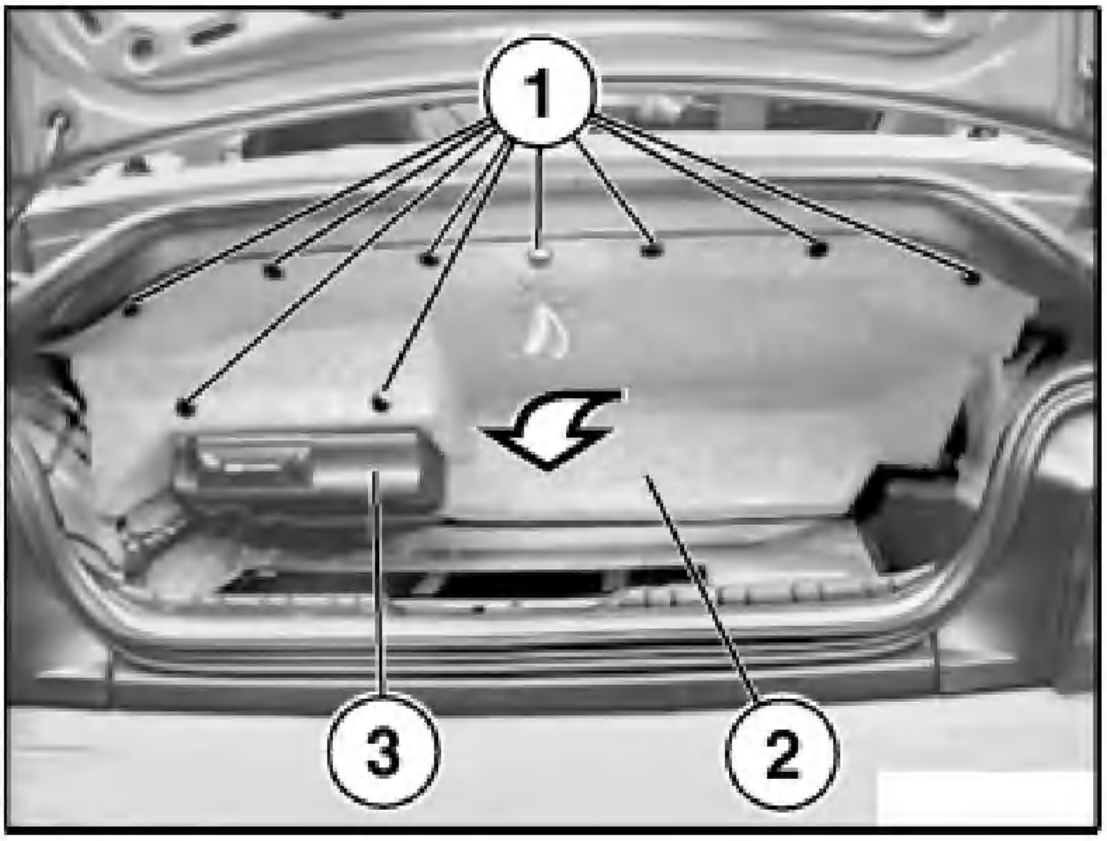


Fig. 250: Removing Trim For Luggage Compartment (With CD Changer)
Courtesy of BMW OF NORTH AMERICA, INC.

51 47 151 REMOVING AND INSTALLING/REPLACING LEFT TRUNK WHEEL HOUSING TRIM (Z3 ROADSTER, M ROADSTER)

Necessary Preliminary Tasks:

- If necessary, remove first aid kit.
- Remove floor mat.

Without EH convertible top:

- Remove socket housing for left rear light. Refer to 63 21 055 REPLACING SOCKET HOUSING FOR LEFT OR RIGHT TAIL LIGHT (Z3 ROADSTER) .

Version Without Electrohydraulic Convertible Top, Without Battery In The Luggage Compartment:

- Release fastener (1).
- If necessary, remove holder (2) for first aid kit.
- Release clip (3).
- Remove luggage compartment wheel arch trim (4).

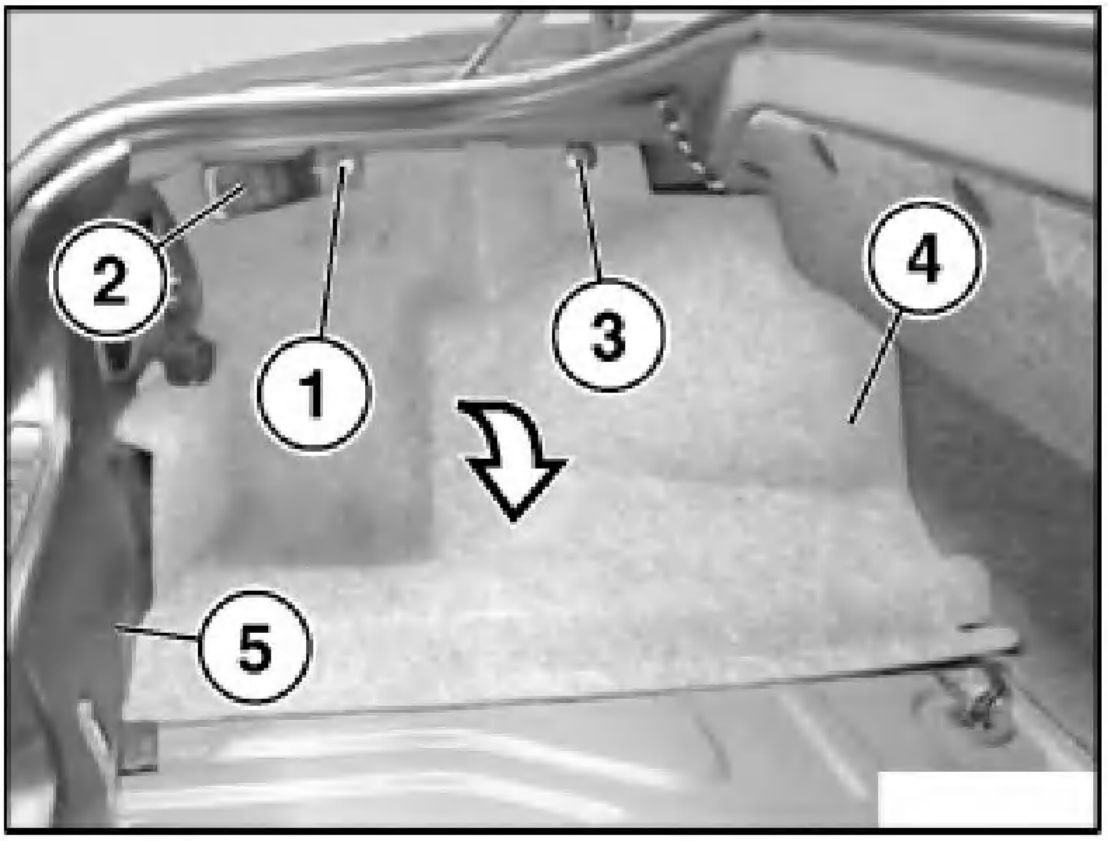


Fig. 251: Installing Luggage Compartment Wheel Arch Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert luggage compartment wheel arch trim (4) at bottom into rear panel trim (5).

Version With Battery In Luggage Compartment:

- Release clips (1).
- Remove luggage compartment wheel arch trim (2).

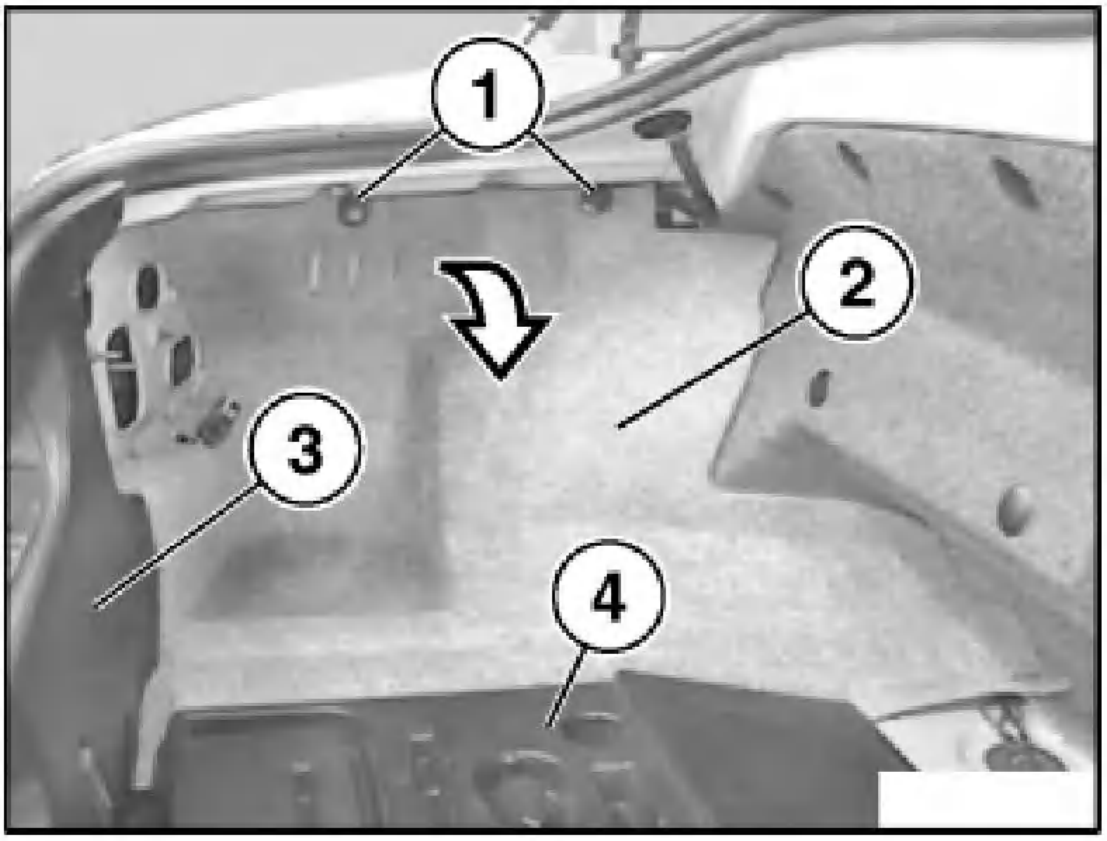


Fig. 252: Installing Luggage Compartment Wheel Arch Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert luggage compartment wheel arch trim (2) at bottom into rear panel trim (3) and storage compartment (4).

Version With EH Convertible Top:

- Release fastener (1).
- Release clip (2).
- Feed out luggage compartment wheel arch trim (3) at socket housing (4) and remove.

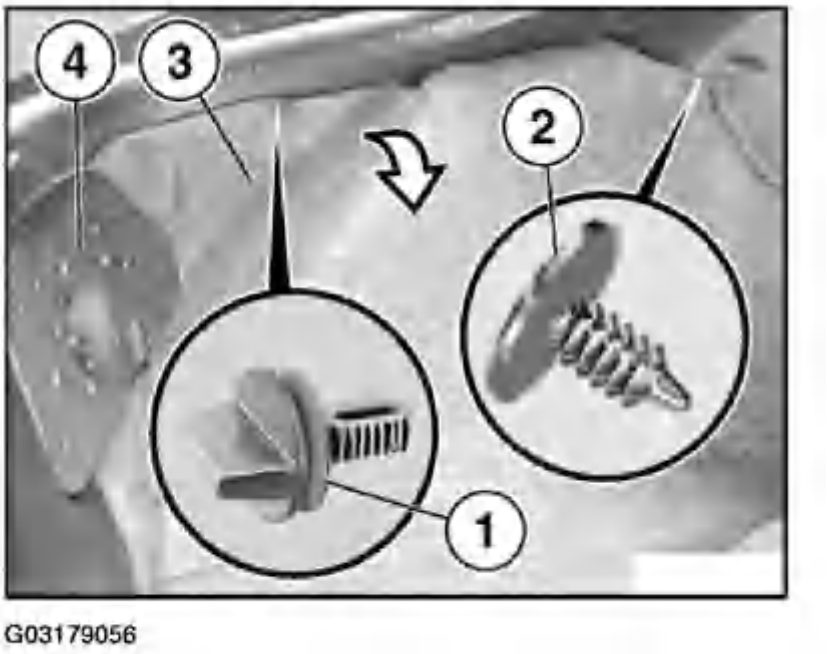


Fig. 253: Installing Luggage Compartment Wheel Arch Trim Behind Socket Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert luggage compartment wheel arch trim (3) behind socket housing (4) and if necessary below storage compartment.

51 47 161 REMOVING AND INSTALLING / REPLACING RIGHT TRUNK WHEEL HOUSING TRIM (Z3 ROADSTER, M ROADSTER)

Removing and installing socket housing for right tail light, refer to 63 21 055 REPLACING SOCKET HOUSING FOR LEFT OR RIGHT TAIL LIGHT (Z3 ROADSTER) .

Remove floor mat.

Version without battery in the luggage compartment:

Unfasten clip (1) and remove trunk wheel housing trim (2).

Installation:

Guide trunk wheel housing trim (2) into the rear apron trim (3) at the bottom.

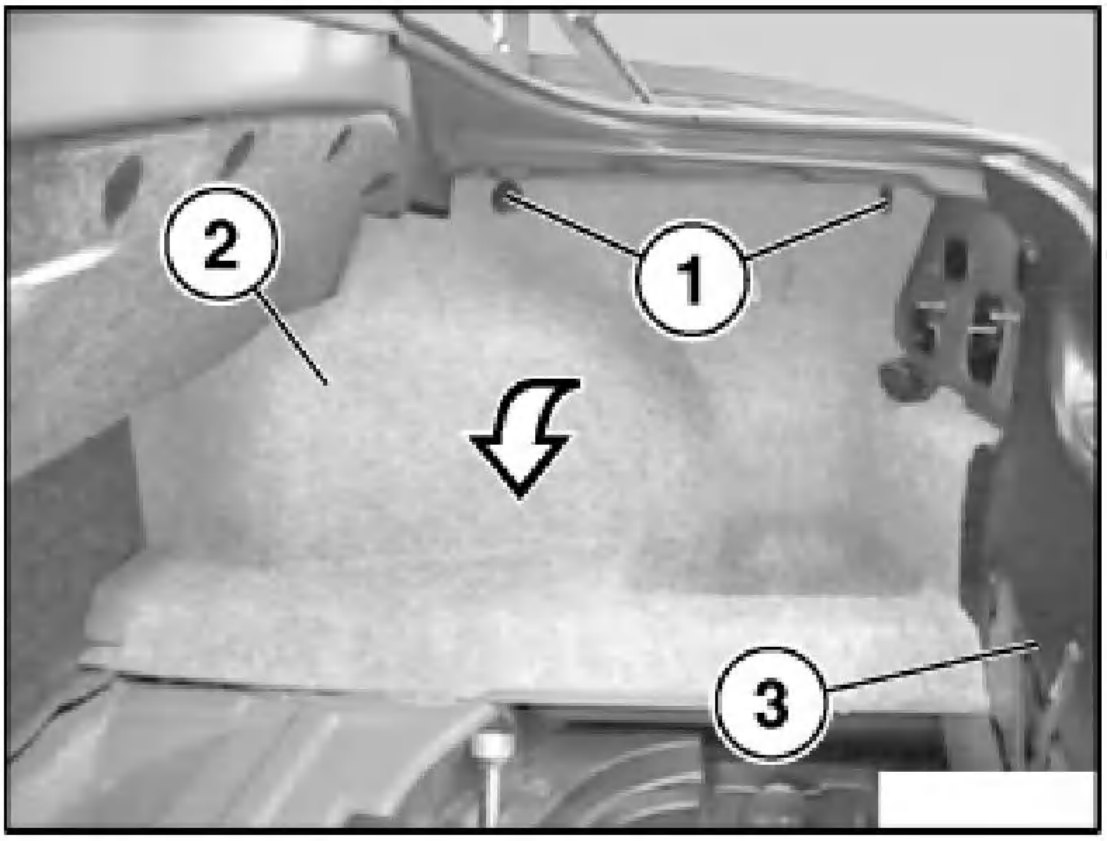


Fig. 254: Removing Trunk Wheel Housing Trim
Courtesy of BMW OF NORTH AMERICA, INC.

Version with battery in the luggage compartment:

Unfasten nut (1) and take out tray (2).

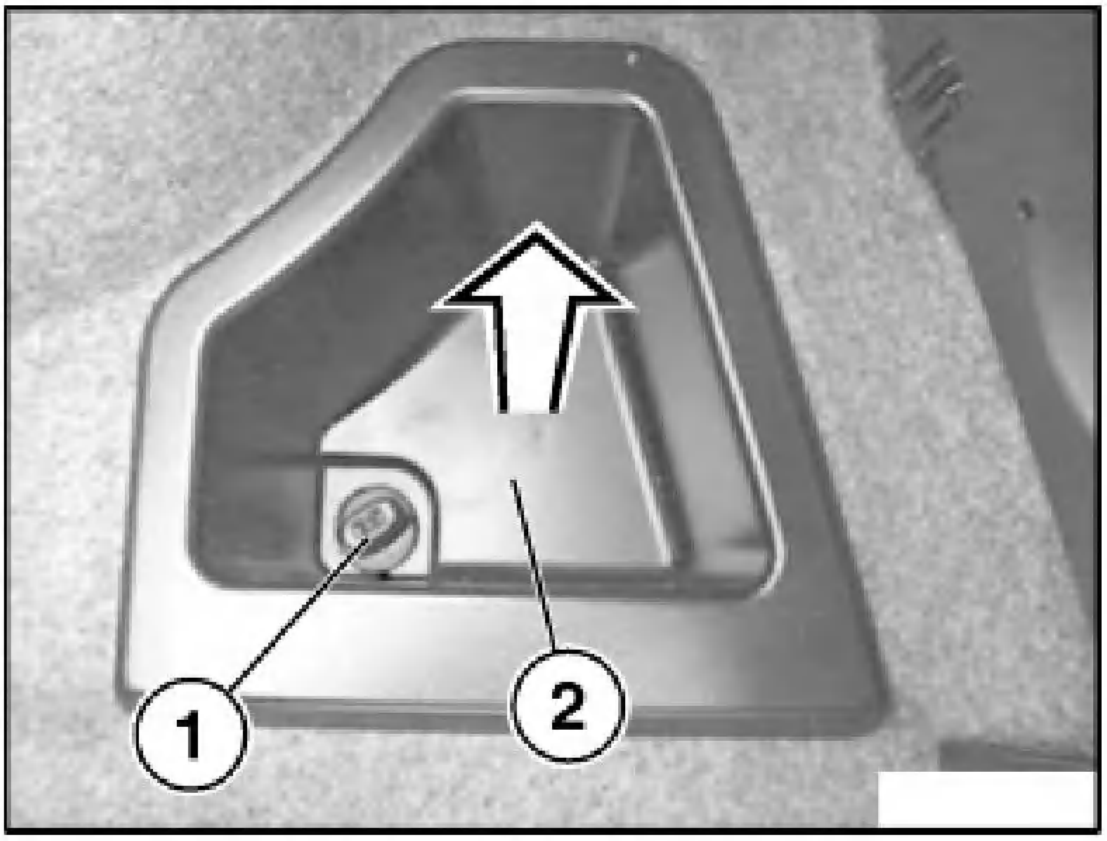


Fig. 255: Removing Tray
Courtesy of BMW OF NORTH AMERICA, INC.

Version with battery in luggage compartment:

Unfasten clips (1) and remove trunk wheel housing trim (2).

Installation:

Guide trunk wheel housing trim (2) into the rear apron trim (3) at the bottom.

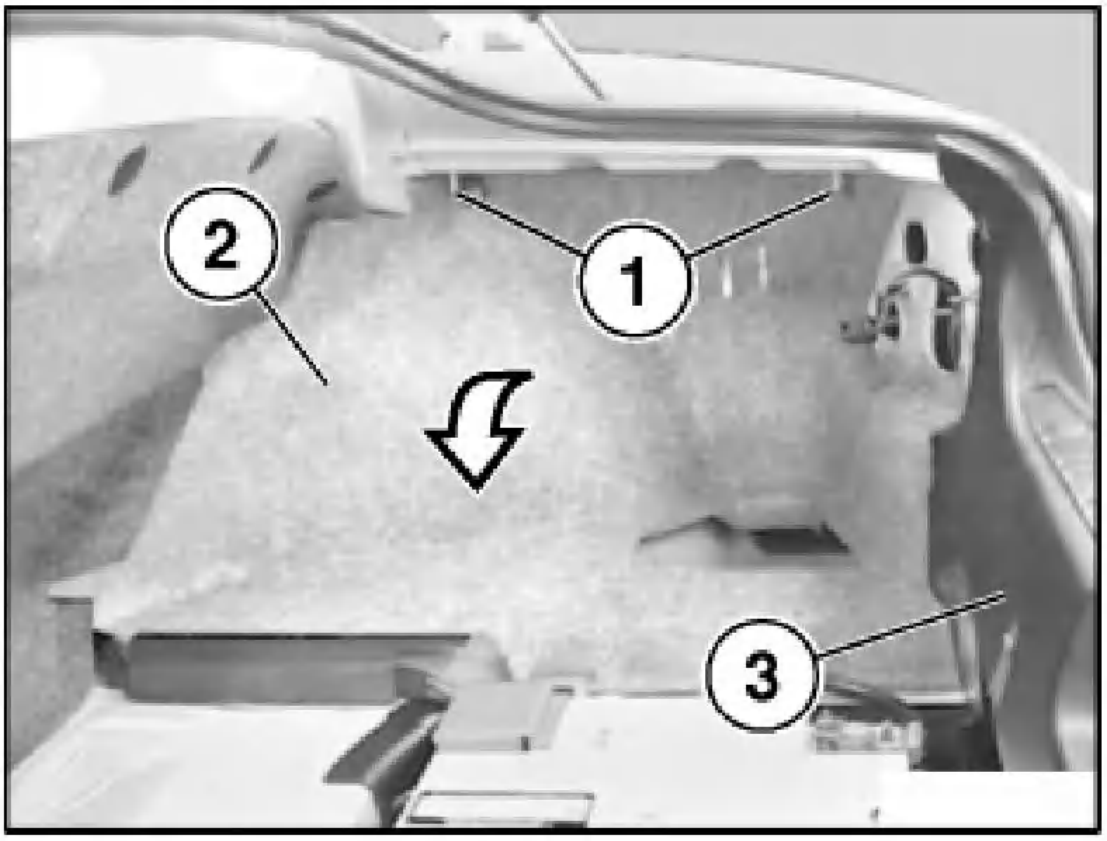


Fig. 256: Guiding Trunk Wheel Housing Trim
Courtesy of BMW OF NORTH AMERICA, INC.

LOOSE BODY PARTS

51 71 041 REMOVING AND INSTALLING/REPLACING WHEEL ARCH COVER, REAR LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Remove rear wheel, refer to 36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL .

Unfasten screws (1) and nuts (2).

Lever out and remove wheel arch trim (3).

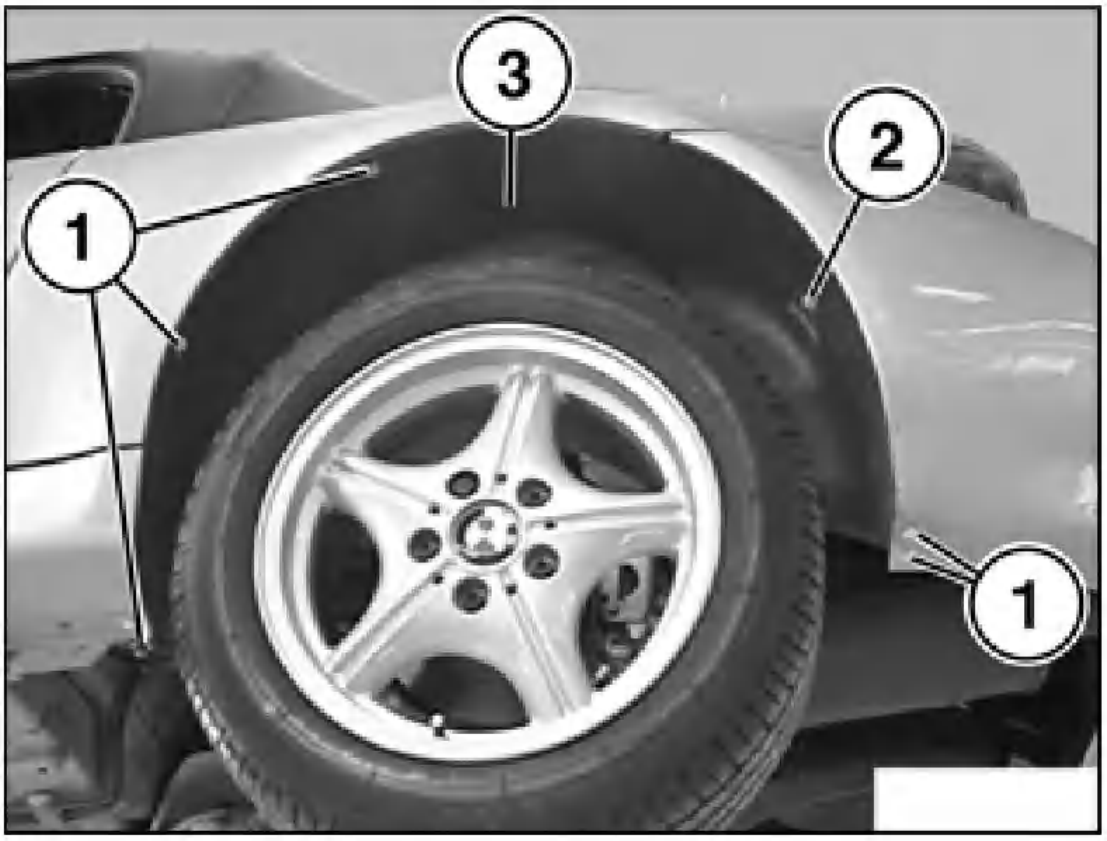


Fig. 257: Removing Wheel Arch Trim
Courtesy of BMW OF NORTH AMERICA, INC.

51 71 380 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (Z3 ROADSTER, M ROADSTER)

Remove rear bumper, refer to 51 12 000 REMOVING AND INSTALLING COMPLETE REAR BUMPER (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Loosen nut (1) and pull vibration damper (2) backwards to remove.

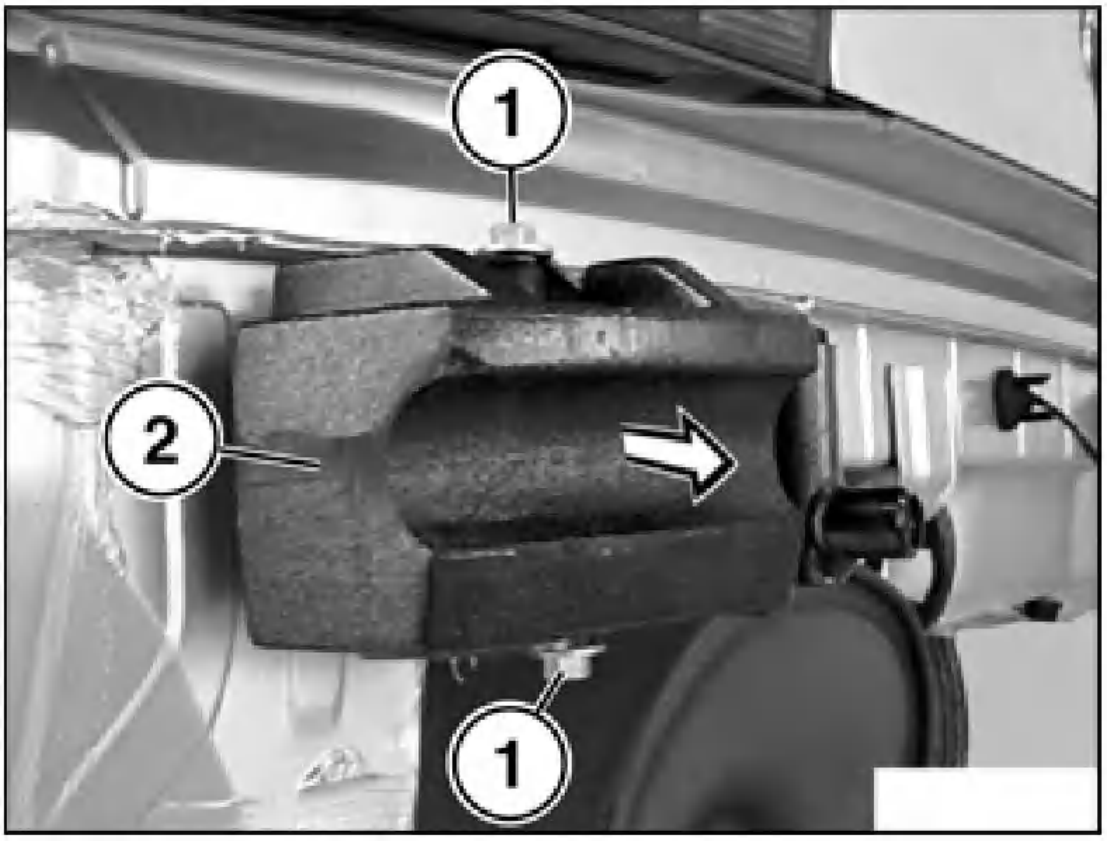


Fig. 258: Removing Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00202363

BATTERY

61 20 BATTERY E36

BATTERY E36 TECHNICAL SPECIFICATION

Rated voltage	V	12
Capacity (cold testing current in A)	Ah (A)	46 / (250)
.....	.....	50 / (265)
.....	.....	65 / (300)
.....	.....	75 / (380)
.....	.....	85/(410)

SWITCH

61 31 SWITCHES E36

SWITCHES E36 TECHNICAL SPECIFICATION

Oil pressure switch Switching-on pressure (high pressure	bar	0.2 ...0.5
Temperature switch for additional fan Optionally double temperature switch or single switches	.....	.....
Double temperature switch	.....	.....
Switching-on temp. - stage I/II	Â°C	93 +/- 3/103 +/- 3
Switching-off temp. - stage I/II	Â°C	89 +/- 3/98 +/- 3
Temperature switch 91Â° C Switching-on temp./switching-off temp.	Â°C	91 +/- 2 /84+/-2
Temperature switch 99Â°C Switching-on temp./switching-off temp.	Â°C	99 +/- 2 / 92 +/- 2

61 31 SWITCHES E36

SWITCHES E36 TECHNICAL SPECIFICATION

Door lock heating control unit Outside temperature in Â°C/heating time in sec.	.....	Controlled by central locking module
Heat ring for door locking Current consumption	approx. A	7
Brake pad sensor Warning position for remaining pad thickness	Â	.....
.....	at least mm	1.5
.....	max. mm	3.5

WINDSCREEN WIPERS

61 61 WINDSCREEN WIPER SYSTEM E36

WINDSCREEN WIPER SYSTEM E36 TECHNICAL SPECIFICATION

Delivery pressure	bar (psi)	1.5

WINDSCREEN WASHER SYSTEM

61 66 WINDSCREEN WASHER SYSTEM E36

WINDSCREEN WASHER SYSTEM E36 TECHNICAL SPECIFICATION

Delivery pressure	bar (psi)	1.5

HEADLIGHT WASHER SYSTEM

61 67 HEADLAMP WASHING SYSTEM E36

HEADLAMP WASHING SYSTEM E36 TECHNICAL SPECIFICATION

Foglamp/headlamp pump	bar (psi)	$2.5^{+0.5}$
Dual-mode pump, anticlockwise/clockwise	bar (psi)	$2.5^{+0.5}$

Article GUID: A00202380

SEATS

52 0 050 PLIERS

PLIERS GENERAL SPECIFICATION

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, E83, E85, E87, E90, E91, R50, R52, R53, RR1
Storage location:	A25, B25
SI number:	52 06 87(808)
Order number:	52 0 050
Â	Pliers

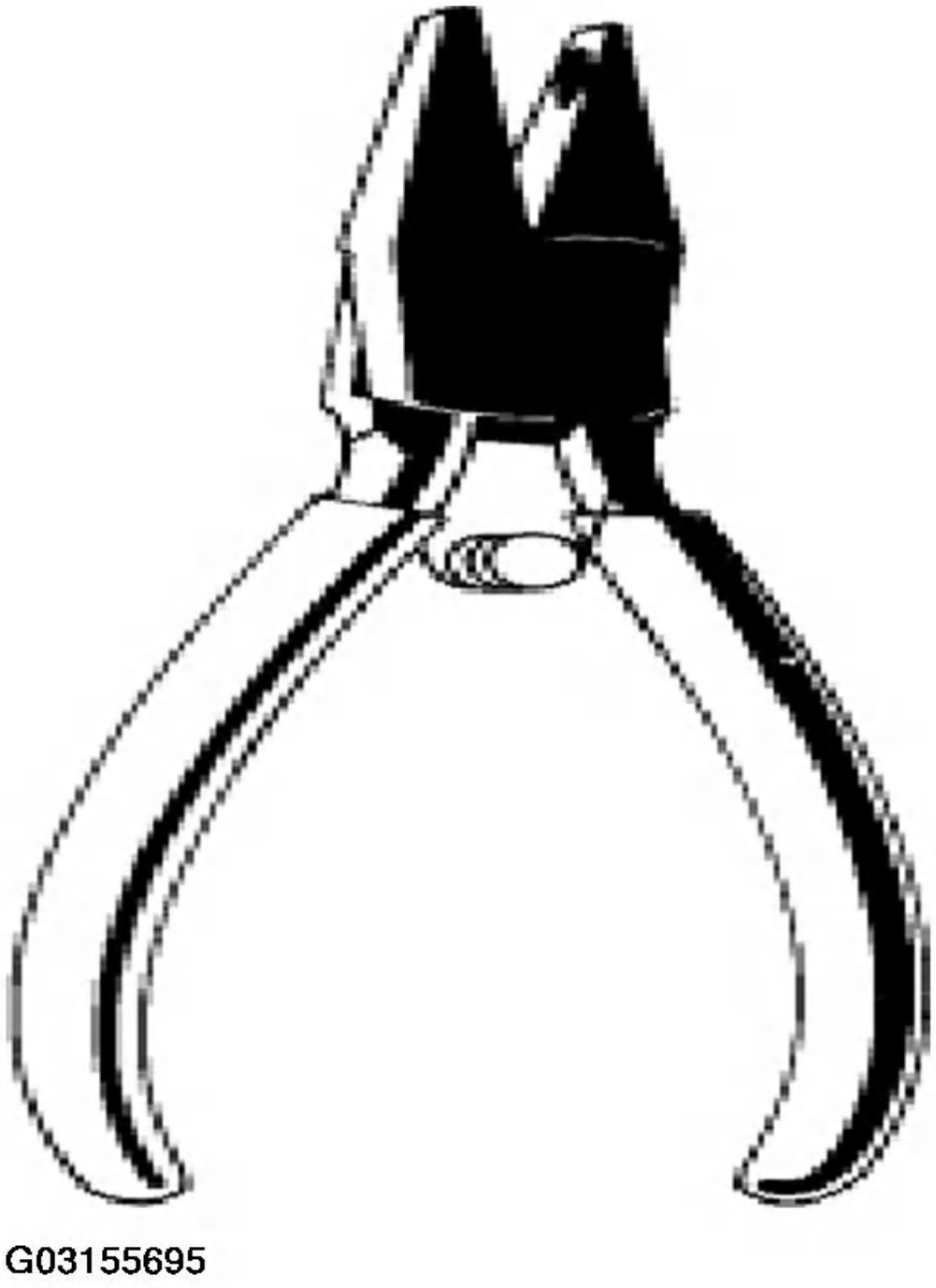


Fig. 1: Identifying Pliers
Courtesy of BMW OF NORTH AMERICA, INC.

52 1 000 PIN WRENCH FOR ARM REST

PIN WRENCH FOR ARM REST GENERAL SPECIFICATION

Series:	E12, E21, E23, E24, E28, E30, E31, E32,E34, E36, E38, E39
Storage location:	A15
Order number:	52 1 000
Â	Pin wrench for arm rest

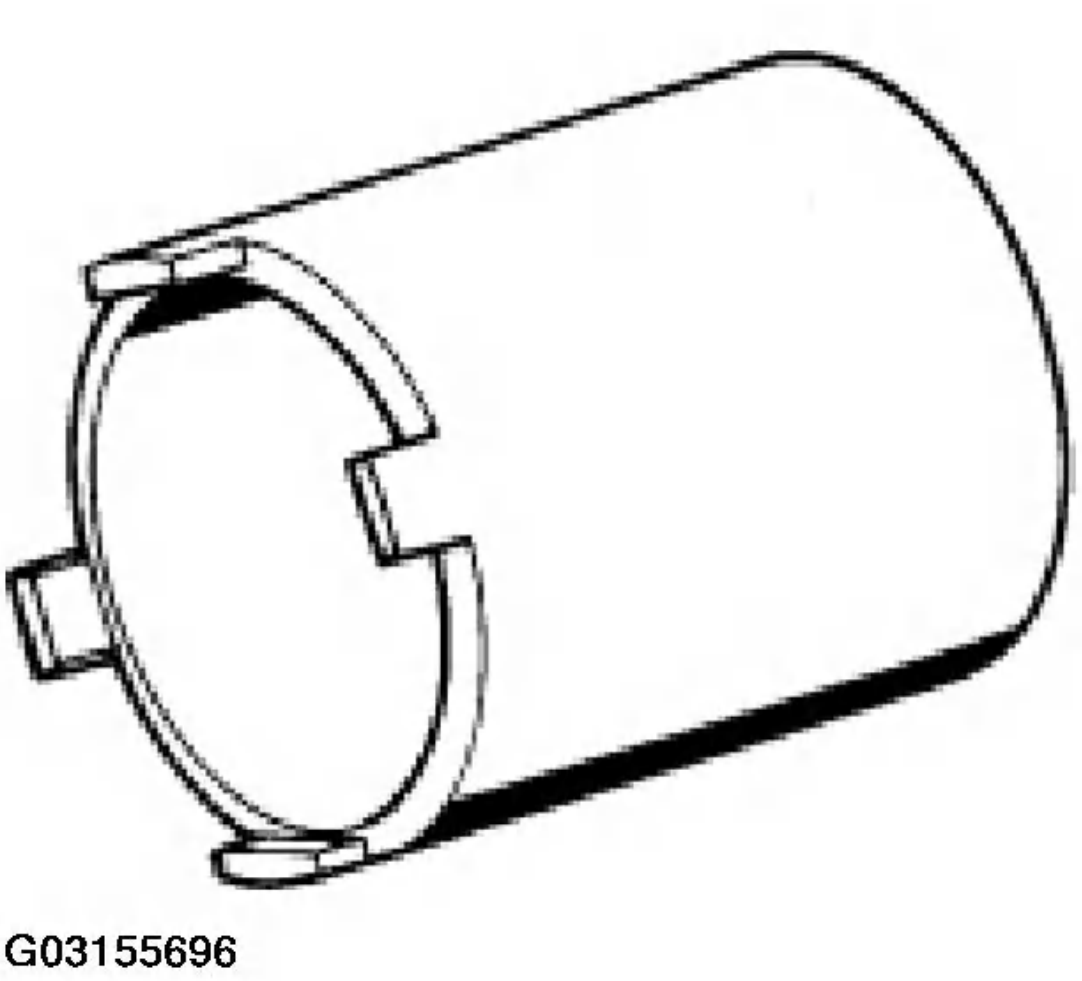


Fig. 2: Identifying Pin Wrench For Arm Rest
Courtesy of BMW OF NORTH AMERICA, INC.

52 1 200 FIXTURE

FIXTURE GENERAL SPECIFICATION

Note:	For securing seat height adjustment
Series:	E36
Storage location:	B21
SI number:	1 11 91(458)
Order number:	52 1 200
Â	Fixture
Consisting of:	Â
1 = 52 1 201	Guide shaft with crimp arm
2 = 52 1 202	Guide bush with crimp arm
3 = 52 1 203	Thrust pieces with socket head cap screws (2)
4 = 52 1 204	Deep groove ball bearing
5 = 52 1 205	Nut
52 1 206	Isoflex grease

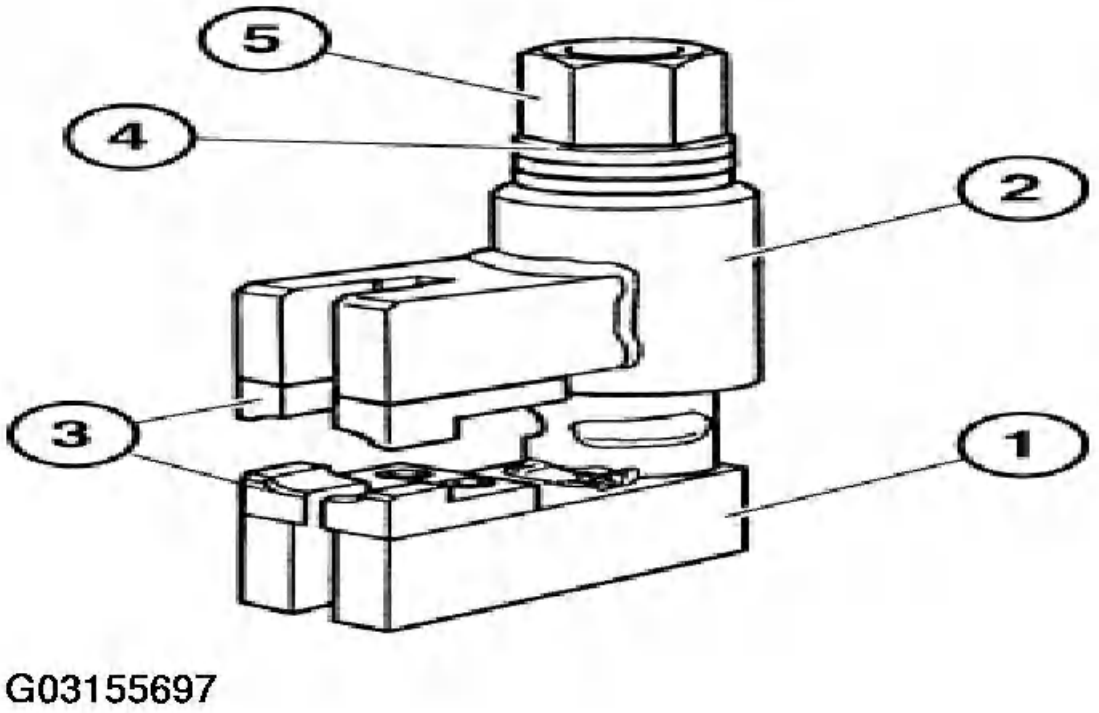


Fig. 3: Identifying Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00202810

FRONT SEATS

52 10 000 REMOVING AND INSTALLING FRONT SEAT (NORMAL/ELECTRIC), LEFT OR RIGHT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

NOTE: Removal in event of faulty gear for longitudinal seat adjustment, refer to 52 10 899 ADDITIONAL WORK (NORMAL/ELECTRIC) IN EVENT OF FAULTY DRIVE FOR LONGITUDINAL ADJUSTMENT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Unfasten seatbelt screw (1).

Installation:

Tightening Torque, refer to 72 11 1AZ 52 10 FRONT SEATS .

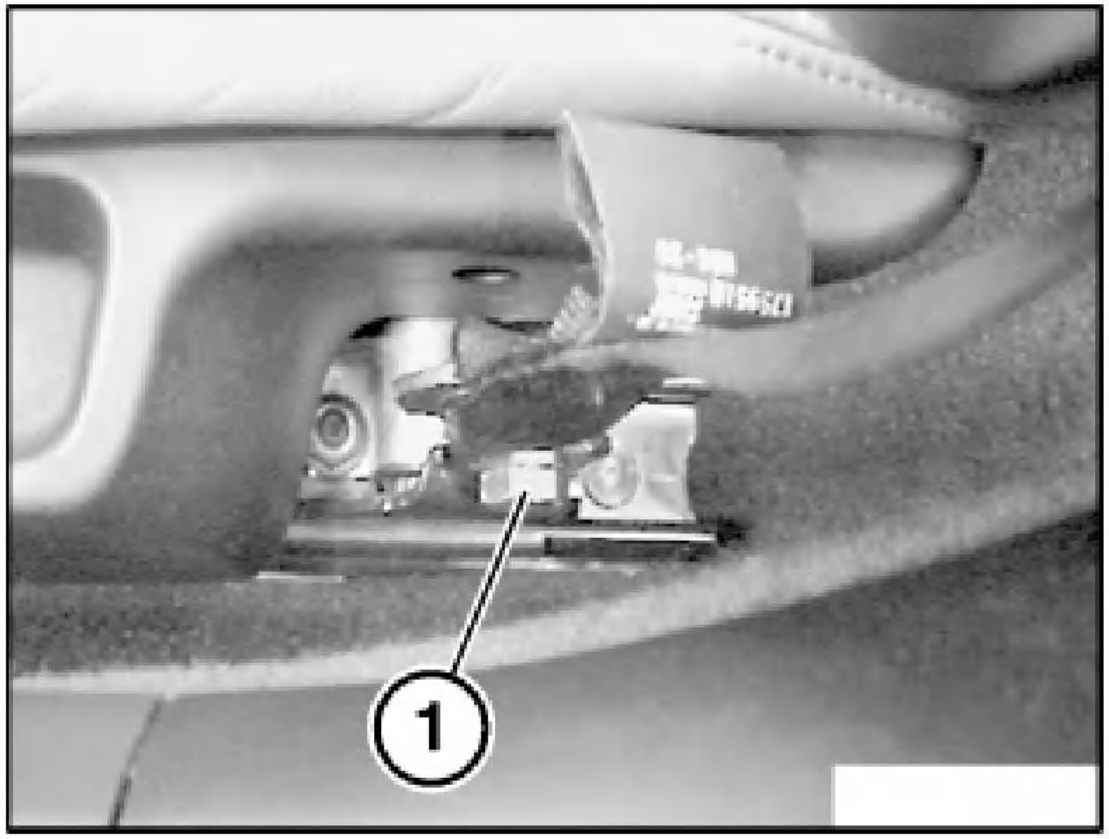


Fig. 1: Removing Seatbelt Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw seatbelt strap (1) from seatbelt guide (2).

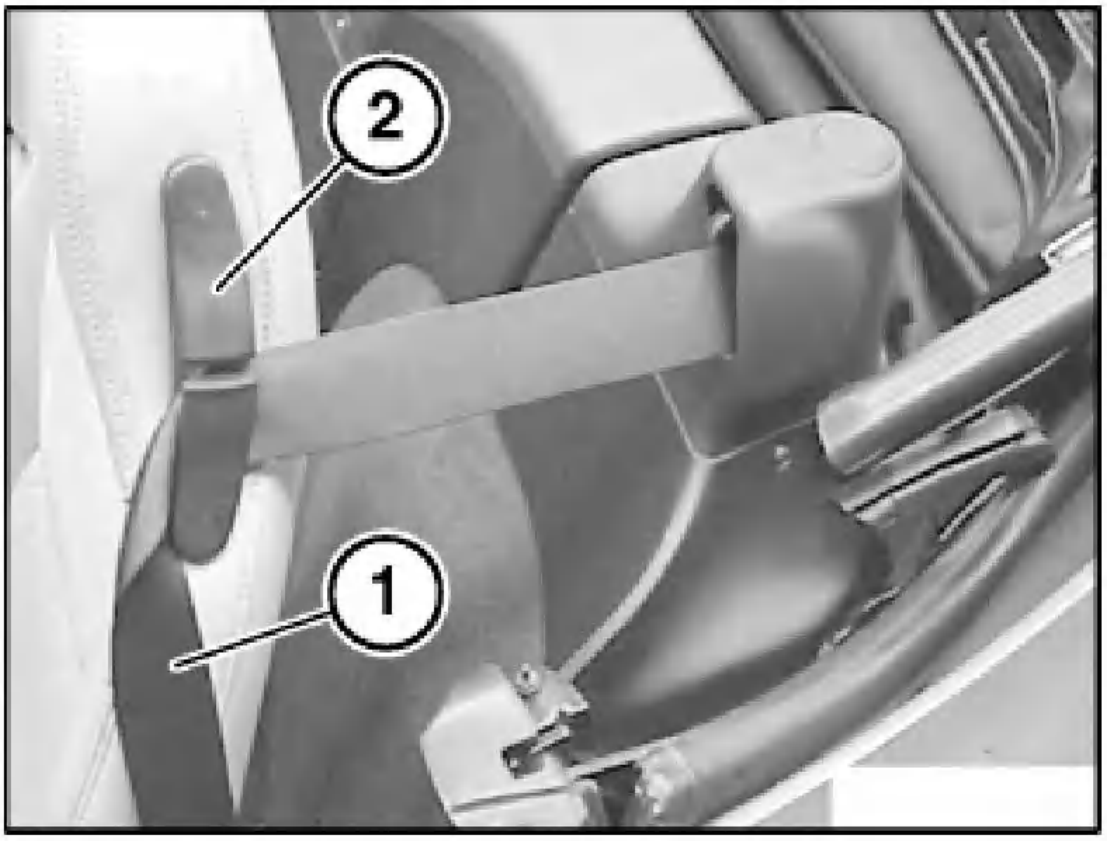


Fig. 2: Removing Seatbelt Strap From Seatbelt Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) at front.

Installation:

Tightening Torque, refer to 52 10 1AZ 52 10 FRONT SEATS .

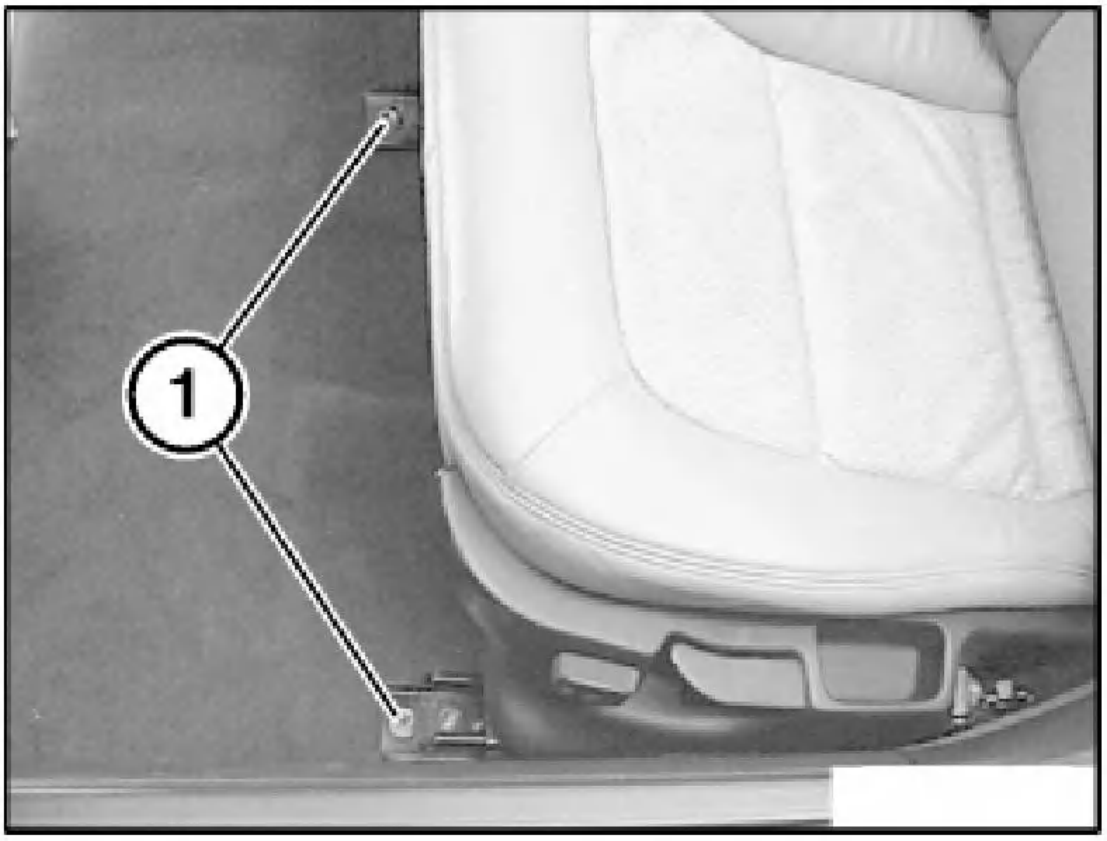


Fig. 3: Releasing Screws At Front
Courtesy of BMW OF NORTH AMERICA, INC.

Move front seat as far back as possible.

Release screws (1) at rear.

Installation:

Tightening Torque, refer to 52 10 1AZ 52 10 FRONT SEATS .

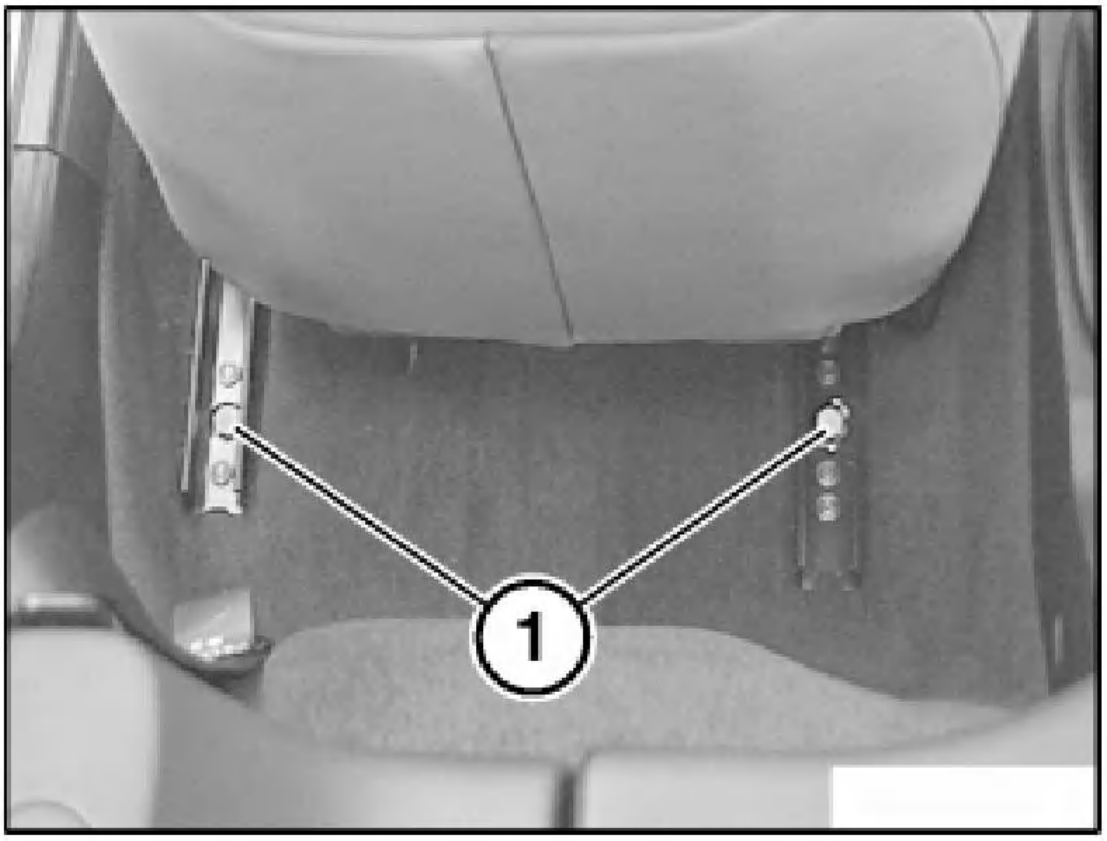


Fig. 4: Releasing Screws At Rear
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Disarm seatbelt lock tensioner before removal:

Turn slotted head screw until green mark in sight glass changes to red.

Installation:

Arm seatbelt lock tensioner:

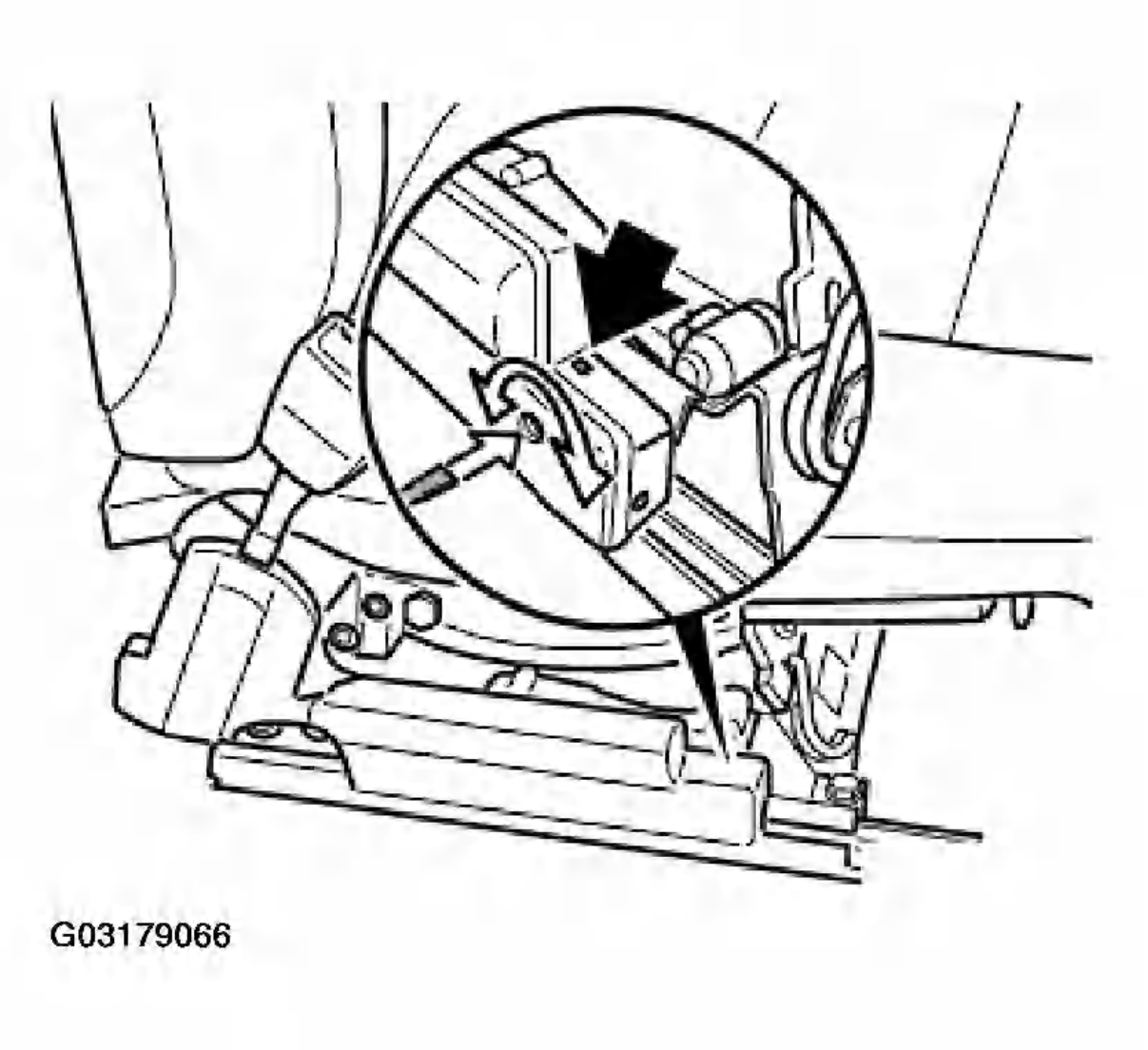


Fig. 5: Locating Seatbelt Lock Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Turn mark to green.

Seatbelt lock tensioner is not functional when marker is red.

(danger to life).

WARNING: When removing and/or connecting up airbag control unit (passenger side), ensure that terminal "R" is switched off and/or that battery is disconnected.

Disconnect plugs (1 and 2).

Version with seat heating:

Disconnect plugs (3) and (4).

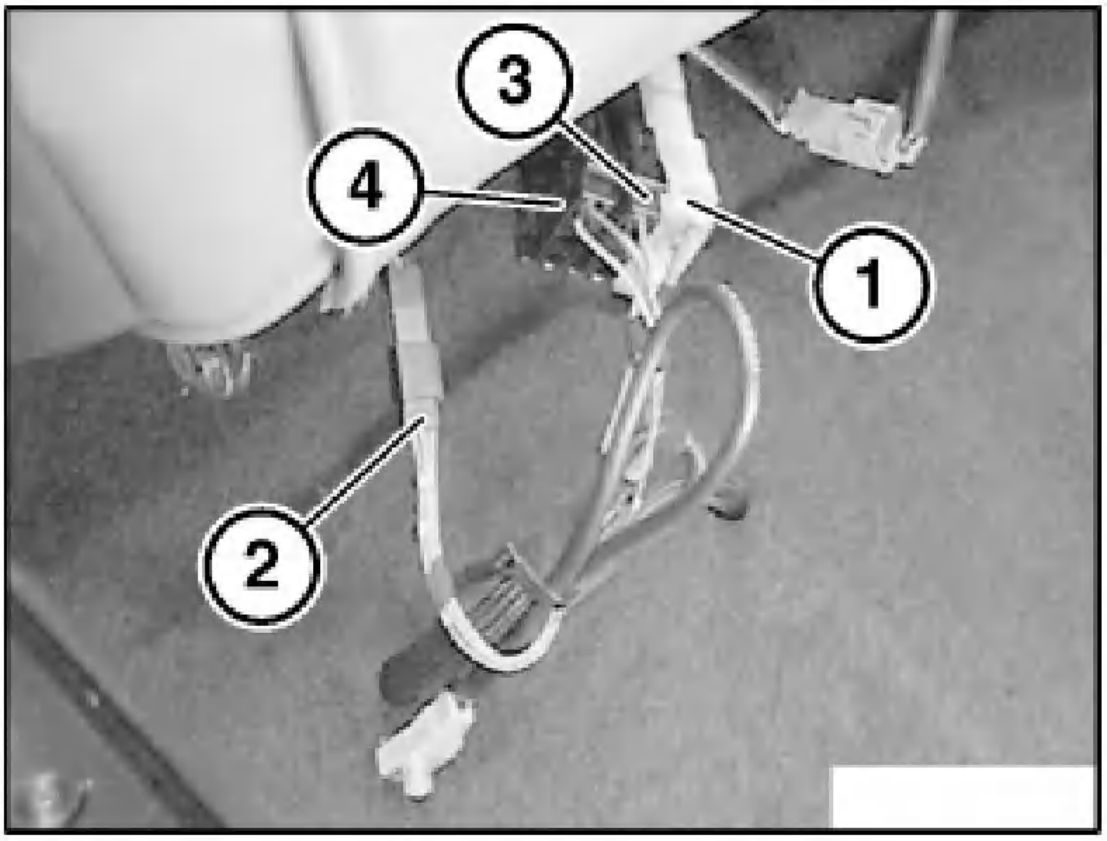


Fig. 6: Disconnecting Plugs
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out front seat.

Installation:

Floor carpet must not enter area between seat rails and floor panel beside screw points (grating noises).

Tightening sequence:

Tightening Torque, refer to 52 10 1AZ 52 10 FRONT SEATS .

Front inner, outer; then rear inner, outer.

52 10 899 ADDITIONAL WORK (NORMAL/ELECTRIC) IN EVENT OF FAULTY DRIVE FOR LONGITUDINAL ADJUSTMENT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE)

Move seat tilt adjustment upwards.

Unfasten screws on actuator drive (1) for longitudinal seat adjustment and remove actuator drive.

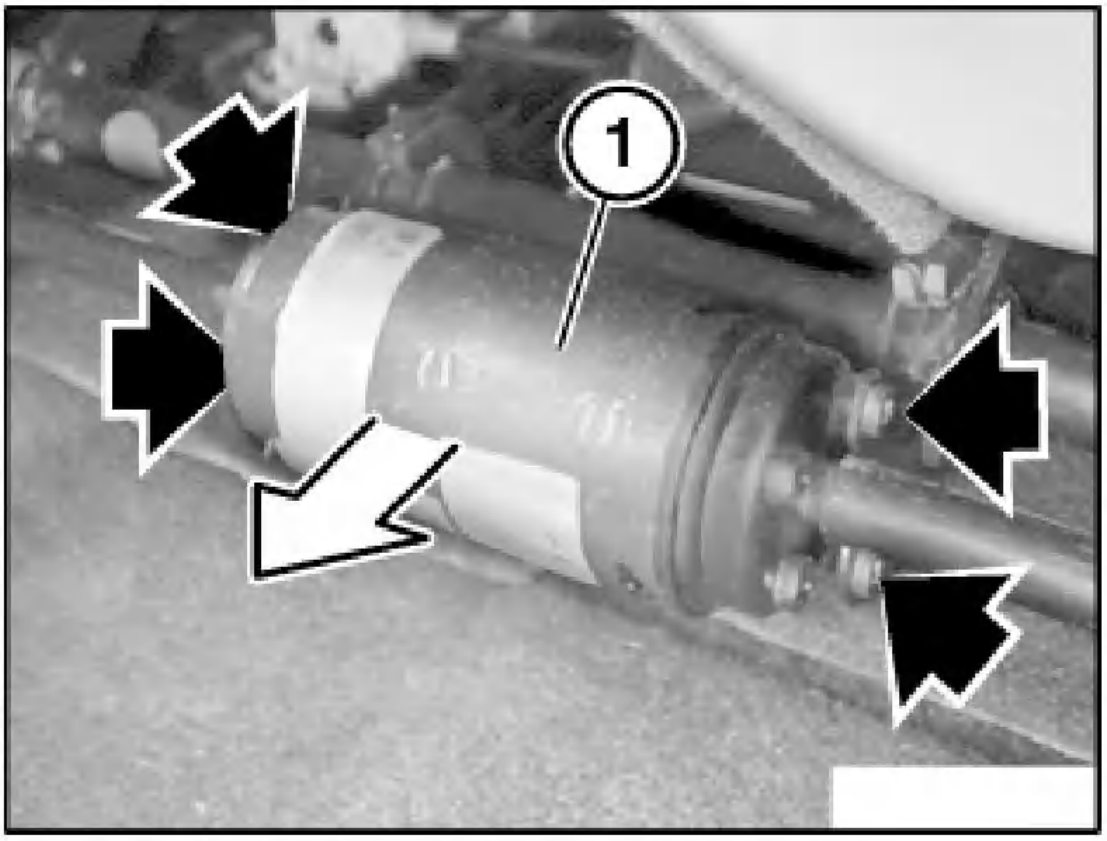


Fig. 7: Locating Screws Actuator Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Pull input shafts (2) out of left/right transmissions.

Activate the operating switch for the seat position adjustment:

A. No function:

   Disconnect plug connection (1) and connect new actuator drive.

   Check function, if O.K. install actuator drive (transmission O.K.)

B. Actuator drive running:

   Transmission for longitudinal seat adjustment defective!

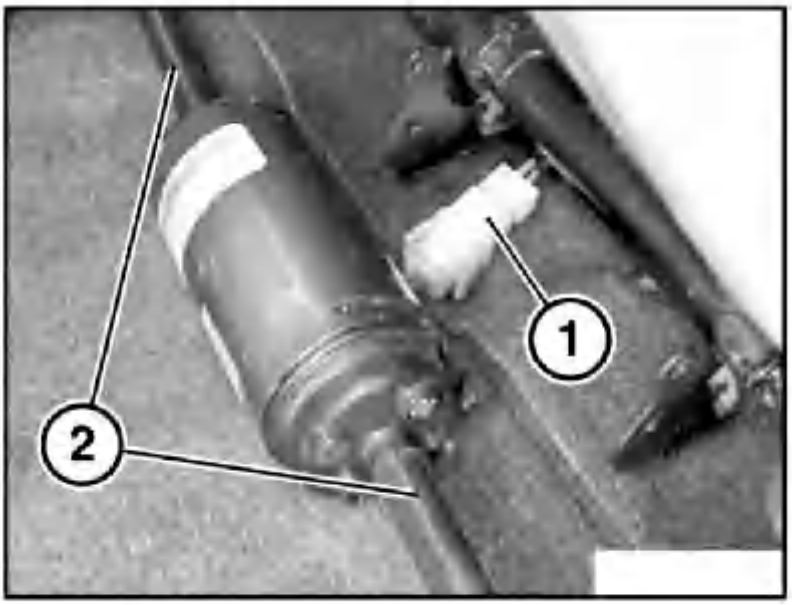


Fig. 8: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Only with defective transmissions:

Insert input shaft (1) at one end into gear (2),

engage actuator drive (3) and thus locate faulty gear(s).

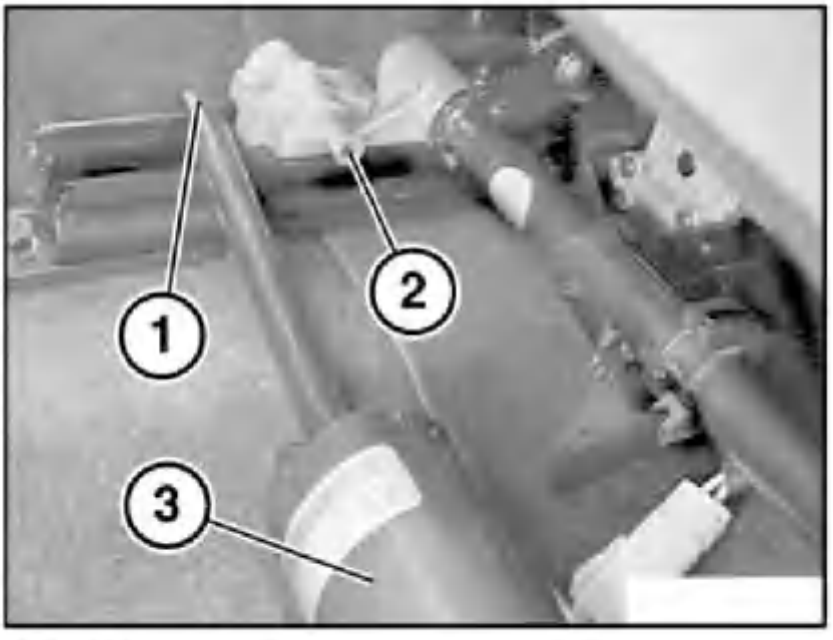


Fig. 9: Inserting Input Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection of longitudinal seat adjustment and remove actuator drive (3) from car.

Remove the defective gear unit (2) with hammer and cold chisel (1):

Place cold chisel (1) between gear (2) and upper seat runner (3),

first place at one end and lever out gear (2).

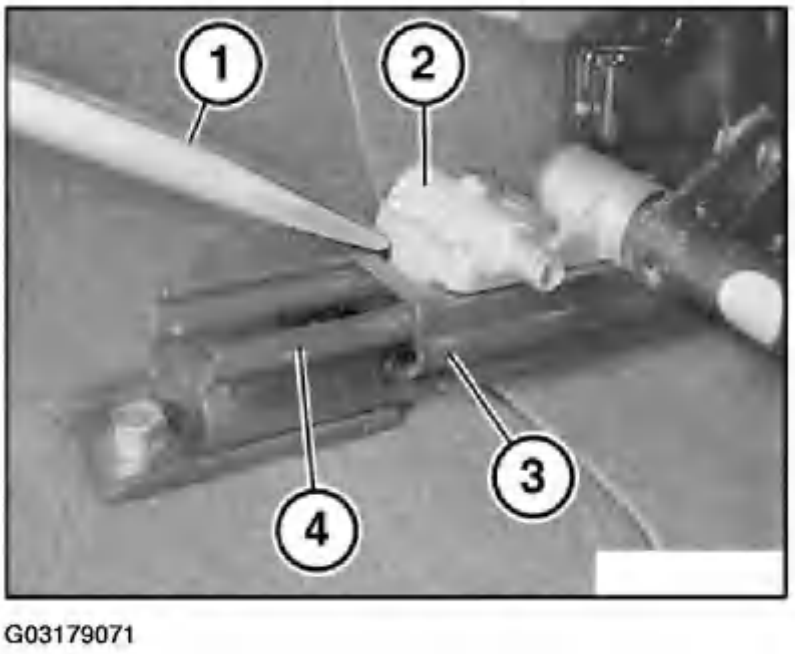


Fig. 10: Removing Defective Gear Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Then lever out other end of gear (2) until it detaches itself from seat runner (3).

If necessary, remove second gear in this manner.

- Remove gear cables from guide screws.
- Insert screwdriver into end of guide screw.

  Twist guide screws alternately on both sides until the screws and nuts on both sides can be removed.

- Remove front seat and adjuster from car.
- Adjustment mechanism must be replaced.

Article GUID: A00202364

AIRBAG TRIGGERING UNIT

65 77 AIRBAG TRIGGERING CONTROL

AIRBAG TRIGGERING CONTROL - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Tightening Specification	Measure
1AZ Airbag control unit	E36 / E38 / E39 / E46 / E52 / E53	Â	8.8 Nm
Â	E85	Â	4.6 Nm
E83 / E87 / E90 / E91	Â	Â	8.0 Nm
2AZ Impact sensor for side airbag	E36 / E38 / E39 / E46 / E52 / E53	Â	5.5 Nm
3AZ Sensor, front	E83 / E85	Â	8.0 Nm
4AZ Sensor, A-pillar	E65 / E66	Â	4.5 Nm
5AZ Sensor, B-pillar	E60 / E61 / E63 / E64 / E65 / E66 / E85	Â	4.6 Nm
Â	E83 / E87 / E90 / E91	Â	8.0 Nm
6AZ Sensor, vehicle center	E65 / E66	Â	5.5 Nm
Â	E60 / E61 / E63 / E64	Â	8.0 Nm
7AZ Sensor, front door	E65 / E66	Â	8.2 Nm
Â	E85	Â	5.6 Nm
Â	E83	Â	4.6 Nm
8AZ Sensor, rear seat	E65 / E66	Â	8.0 Nm
9AZ Acceleration sensor, front	E90 / E91	Replace screws	8.0 Nm

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Article GUID: A00202663

FRONT BUMPER

51 11 FRONT BUMPER

FRONT BUMPER - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Thread	Tightening Specification	Measure
1AZ Bumper to bracket	E32	M6	Â	9 Nm
Â	E36	M8	Â	22 Nm
Â	E34	M10	Â	43 Nm
2AZ Bumper and bracket to impact absorber	E31	M10	Install bolts with bolt cement.	22 Nm
Â	E38 / E39 / E46	M10	Â	41 Nm
Â	E36	M10	Install bolts with bolt cement.	55 Nm
Â	E32 / E34 / E30 / Mod. 88	M12	Â	48 Nm
3AZ Impact absorber/bracket to body	E30 / E24	Â	Â	23 Nm
Â	E31 / E32 / E34 / E36 / E38 / E39	M6	Â	9 Nm
Â	E32 / E34	M10	Â	48 Nm
Â	E46	M8	Â	20 Nm
4AZ Carrier to body	E46 / E65 / E66 / E67	M8	Â	18 Nm
Â	E87 / E90 / E91	M8	Â	20 Nm
Â	E60 / E61 / E63 / E64	M8	Â	21.4 Nm
5AZ Carrier to deformation element	E85	M10	Â	38 Nm
Â	E83	M8	Â	28 Nm
6AZ Deformation element to body	E85	M8	Â	19 Nm
Â	E83	M8	Â	21.4 Nm
7AZ License plate to bumper	E60 / E63 / E64	Â	1 Nm	Â
8AZ License plate to bumper (thread repair)	E60 / E63 / E64	M5	Â	4.5 Nm

REAR BUMPER

51 12 REAR BUMPER

REAR BUMPER - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Thread	Tightening Specification	Measure
1AZ Bumper to	E31	M10	Â	40 Nm

carrier				
Â	E32 / E34 / E36	M8	Â	22 Nm
Â	E34	M10	Â	42 Nm
2AZ Bumper / carrier to impact absorber	E36	M10	Install bolts with bolt cement.	42 Nm
Â	E38	M12	Â	45 Nm
Â	E39	M10	Â	45 Nm
Â	E46	M10	Â	41 Nm
Â	E31 / E32 / E34 / E30 / Mod. 88	M12	Â	48 Nm
Â	E53	M12	Â	55 Nm
Â	E85 US	Â	Â	19 Nm
Â	E60 / E61 / E63 / E64	M10	Â	36 Nm
3AZ Impact absorber / carrier to body	E30 / E24	Â	Â	23 Nm
Â	E31 / E32 / E34	M6	Â	9 Nm
Â	E36 / E46	M8	Â	22 Nm
Â	E39	M8	Â	20 Nm
Â	E53	M8	Â	24 Nm
Â	E65 / E66 / E67	Â	Â	38 Nm
Â	E85	Â	Â	19 Nm
Â	E60 / E61 / E63 / E64	M10	36 Nm	Â
Â	E83	M12	Â	71 Nm
Â	E87 / E90 / E91	M12	Â	66 Nm
4AZ Bumper to side panel	E30	Â	Â	7 Nm
5AZ Bracket to side panel	E36 / E46	Â	Â	3 Nm
Â	E39	Â	Â	6 Nm
6AZ Holder, bottom, to body	E36	Â	Â	8.5 Nm
7AZ Screw for lower panel	E36	Â	Â	2.5 Nm
8AZ Bumper on rear apron	E60	M6	Replace screw with sealing washer	2.5 Nm
9AZ Guide to side panel	E83	Â	Â	2 Nm
Â	E61 / E87	Â	Â	3 Nm
10AZ Guide to rear trim panel	E83 / E87	Â	Â	2.8 Nm
Â	E61	Â	Â	4.5 Nm

TRIM, COVERS, HANDLE

51 13 TRIM PARTS, COVERS, HANDLE TRIM

TRIM PARTS, COVERS, HANDLE TRIM - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Thread	Tightening Specification	Measure
1AZ Bracket, roof luggage rack on body	Z3 and M-Coupe / E39 / E46	M10	Â	20 Nm
2AZ Water drain to body (plastic nut)	E46	Â	Â	1 Nm
Water drain to body (metal nut or rivet nut)	E46	Â	Â	1.8 Nm
3AZ Roof railing to body	E39	Â	Center, front, rear	24 Nm
Â	E61	M8	Â	16 Nm
Â	Â	Â	settling time	15 min
Â	Â	Â	Check	16 Nm
Â	E83	M8	Front	Â
Â	Â	Â	Jointing torque	20.5 Nm
Â	Â	Â	Release nut after settling time	15 min
Â	Â	Â	Jointing torque	20.5 Nm
Â	Â	Â	Torque angle	120 +/- 10Â°
Â	E83	M8	Centre, rear	20.5 Nm
Â	Â	Â	settling time	15 min
Â	Â	Â	Check	20.5 Nm
4AZ Handle strip to rear lid	E39 / Touring	Â	Â	3 Nm
Â	E46 / E53	Â	Â	2.5 Nm
Â	E83	Â	Â	1.8 Nm
5AZ Cowl panel cover to body	E60 / E61 / E63 / E64	Â	Â	2.5 Nm
6AZ Centre trim to rear lid	E65 / E66 / E67	M8	Â	2.5 Nm
7AZ Trim to hood/bonnet	E90 / E91	Â	Â	2 +/- 0.4 Nm

MIRRORS, COVERS, ASHTRAY

51 16 MIRRORS, FINISHERS, ASHTRAYS, CONSOLES

MIRRORS, FINISHERS, ASHTRAYS, CONSOLES - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Measure
1AZ Mirror to front door	E31 / E36 / Z3 / E38 / E39 / E46 / E52 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E67 / E83 / E85 / E87 / E90 / E91	6 Nm
Only for new rearview mirror (replacement) for initial screw connection (shaping of threadcutting screws)	E46 / E53 / E60 / E61 / E63 / E64 / E65 / E66 / E67 / E83 / E85 / E87 / E90 / E91	8 Nm
2AZ Center console (plastic nut)	E30	5 Nm
3AZ Wooden finisher on carrier	E38	0.6 Nm
4AZ Wooden finisher on carrier	E38	0.8 Nm
5AZ Wooden finisher on carrier	E38	0.7 Nm

6AZ Cup holder, front, on function carrier	E38	1.3 Nm
7AZ Wooden finisher on cup holder, front	E38	0.5 Nm
8AZ Screw-in pin to wooden finisher of instrument panel and door panel	E46	0.3 Nm
9AZ Housing for rearview mirror to carrier	E46 M3 Coupe	1.3 Nm
Â	E60 M5 / E63 M6	0.7 Nm
Â	E85	1.1 Nm
10AZ Brush cable unit to function carrier	E65 / E66 / E67	0.5 +/- 0.1 Nm
11AZ Roller sun blind to function carrier	E65 / E66 / E67	0.5 +/- 0.1 Nm
12AZ Roller sun blind to brush cable unit	E65 / E66 / E67	1.2 +/- 0.2 Nm
13AZ Flap to storage box	E85	0.5 Nm
14AZ Rearview mirror retaining ring on reinforcement plate	E60 M5 / E63 M6	1.1 Nm
15AZ Notch adapter to mirror base	E60 M5 / E63 M6	3.0 Nm

FRONT DOOR LOCKS HANDLE

51 21 FRONT DOOR LOCKS

FRONT DOOR LOCKS - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Tightening Specification	Measure
1AZ Door lock to front door	E31 / E36	Install bolt with bolt cement.	9 Nm
Â	E46 / E53 / E87 / E90 / E91	Â	9 Nm
Â	E60 / E61 / E63 / E64 / E65 / E66 / E67 / E85	Â	8 Nm
Â	E83	Â	10 Nm
2AZ Outside handle to front door	E31 / E36	Â	10 Nm
3AZ Door striker to body	E24 / E30	Â	24 Nm
Â	E31 / E32 / E34	Â	28 Nm
Â	E60 / E61 / E63 / E64 / E65 / E66 / E67 / E83 / E85 / E87 / E90 / E91	Â	19 Nm
4AZ Adjustment screw to door lock	E46	Â	3^{+2} Nm
5AZ Outside handle to lock actuator	E53	Â	3.2 Nm
Â	E46 / E60 / E61 / E63 / E64 / E83	Â	2 Nm
6AZ Inside door opener to front door	E46 / Saloon / Touring	Â	4 Nm
Â	E46 / Compact	Â	2.7 Nm
Â	E65 / E66 / E85	Â	3 Nm

Â	E67	Â	4 Nm
7AZ Lock actuator/front cover to front door	E60 / E61 / E63 / E64	Â	2.5 Nm
8AZ Lock actuator/rear cover to front door	E60 / E61 / E63 / E64	Â	3.3 Nm
9AZ Door retainer to A-pillar	E87 / E90 / E91	Â	22 Nm
10AZ Door retainer to door	E87 / E90 / E91	Â	11.6 Nm

REAR DOOR LOCKS HANDLE

51 22 REAR DOOR LOCKS

REAR DOOR LOCKS - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Tightening Specification	Measure
1AZ Door lock to rear door	E36	Install bolt with bolt cement.	9 Nm
Â	E46 / E53 / E87 / E90 / E91	Â	9 Nm
Â	E60 / E61 / E63 / E64 / E65 / E66 / E67 / E85	Â	10 Nm
2AZ Outside handle to rear door E36	Â	Â	10 Nm
3AZ Door striker to body	E32 / E34	Â	24 Nm
Â	E60 / E61 / E63 / E64 / E65 / E66 / E67 / E85 / E87 / E90 / E91	Â	19 Nm
4AZ Adjustment screw to door lock	E46	Â	3^{+2} Nm
5AZ Outside handle to lock actuator	E53	Â	3.2 Nm
Â	E46 / E60 / E61 / E63 / E64 / E83	Â	2 Nm
6AZ Inside door opener to rear door	E46 / E67	Â	4 Nm
Â	E65 / E66	Â	3 Nm
Â	E87	Â	7.5 Nm
7AZ Lock actuator/front cover to rear door	E60 / E61 / E63 / E64	Â	2.5 Nm
8AZ Lock actuator/rear cover to rear door	E60 / E61 / E63 / E64	Â	3.3 Nm
9AZ Side impact protection to rear door, top	E61	Â	18.5 Nm
10AZ Door retainer to B-pillar	E87 / E90 / E91	Â	22 Nm
11AZ Door retainer to door	E87 / E90 / E91	Â	11.6 Nm

CENTRAL LOCKING SYSTEM

51 26 CENTRAL FASTENER

CENTRAL FASTENER - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Measure
1AZ Central fastener to lock	E30 / E31 / E32 / E34 / E36	2 Nm

FRONT MANUALLY, OPERATE

51 32 FRONT DOOR WINDOWS

FRONT DOOR WINDOWS - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Measure
1AZ Door window glass holder to roller guide	E31 / E36 / Coupe/Convertible	9 Nm
2AZ Door window glass to holder	E31 / E36 / Coupe/Convertible	6 Nm
Â	E38 / E39 / E46 / E60 / E61	8 Nm
Â	E85	9 Nm
Â	E63 / E64 / E65 / E66	10 Nm
3AZ Main stop to window regulator	E31 / E36	9 Nm
4AZ Window guide to body	E36	10 Nm
5AZ Window winder	E36	6 Nm

FRONT ELECTRICALLY OPERATE

51 33 POWER WINDOWS, FRONT

POWER WINDOWS, FRONT - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Tightening Specification	Measure
1AZ Motor to window regulator	E31 / E36 / E65 / E66	Â	5 Nm
Â	E46 / E85	Â	4.5 +/- 0.5 Nm
Â	E83	Â	3 Nm
Â	E60 / E61 / E87 / E90	Â	6 Nm
Â	E63 / E64	Â	6 +/- 0.6 Nm
2AZ Window regulator to door	E38 / E39 / E60 / E61 / E65 / E66 / E83 / E85 / E87 / E90	Â	8 Nm
Â	E46	Replace nut (self-locking)	9.5 Nm
Â	E63 / E64	Â	9.5 Nm
3AZ Window regulator to door	E36	Â	9 Nm

Article GUID: A00202659

DRIVE WINDOW REGULATOR

67 62 DRIVES, POWER WINDOWS

DRIVES, POWER WINDOWS - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Thread	Tightening Specification	Measure
1AZ Motor to window regulator	E46 / E85	Â	Â	4.5 +/- 0.5 Nm
Â	E31 / E36 / E65 / E66	Â	Â	5 Nm
Â	E83	v	Â	3 Nm
Â	E60 / E61 / E87 / E90 / E91	Â	Â	3.5 +/- 0.5 Nm
Â	E63 / E64	Â	Â	6 +/- 0.6 Nm

Article GUID: A00202664

BATTERY

61 21 BATTERY WITH TERMINAL

BATTERY WITH TERMINAL - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Thread	Measure
1AZ Positive battery lead, negative battery lead, safety battery terminal, IBS (screw connection from above)	All	M6	5 +/- 1 Nm
2AZ Distribution box	E87	M8	15 +/- 15 % Nm

SWITCH

61 31 SWITCH

SWITCH - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Measure
1AZ Temperature switch		
99Â°C	All	14 Nm
99Â°C	All	14 Nm
2AZ Oil pressure switch Note: Oil and screw in	M10, M40, M42, M21, M51, M20, M30, M50, M60/1, M60/2, M70, S70	40 Nm
Â	S14, S50, S38, M43	20 Nm
3AZ Reversing light switch	All	20 Nm
4AZ Light switch on instrument panel	E36, E38	2 Nm
5AZ Transmission switch on shift block	All	4.5 Nm

ECUS MODULES

61 35 CONTROL UNITS, MODULES

CONTROL UNITS, MODULES - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Measure
1AZ Power window module to drive	E36	1 + 0.5 Nm
2AZ Screws on E-box	E38	4 Nm

WINDSCREEN WIPERS

61 61 WINDSHIELD WIPERS

WINDSHIELD WIPERS - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Thread	Measure
1AZ Wiper motor mounting to wiper console	E31 LHD / E38	M6	7.5 Nm
Â	E31 RL / E36	Â	10 Nm
Â	E39	Â	12 Nm

2AZ Stop for park position to wiper console	Â	Â	E31 15 Nm
3AZ Wiper contact pressure motor to wiper console	E31 / E32 / E34 / E38 to 04/98	Â	6.5 Nm
4AZ Motor crank to wiper motor	E38	M8	21 Nm
Â	E36 / E39	M8	27 Nm
5AZ Wiper shaft nut to body	E31 / E36 / E32 / E34	Â	12 Nm
Â	E46 / E83	Â	10 Nm
6AZ Holder to firewall	E31 / E46 / E83	M6	10 Nm
Wiper bracket to firewall	E36 Coupe/ E38 / E39	Â	10 Nm
7AZ Upper cowl panel support	E31	M4	5 Nm
8AZ Wiper support bracket to firewall	E36	Â	10 Nm
9AZ Wiper support bracket to wiper console	E36	Â	10 Nm
10AZ Wiper arms			
Driver's side	E31/E39	Â	40 Nm
Â	E38 from 04/98	Â	25 Nm
Â	E46 / E83	Â	30 Nm
Driver's side without ADV (contact pressure adjustment)	E32 / E34 E36 / E38 to 04/98	Â	25 Nm
Driver's side with ADV (contact pressure adjustment)	E32 / E34	Â	21 Nm
Â	E38 to 04/98	Â	40 Nm
Passenger's side	E31 / E32 / E34 / E36 / E38 / E39	Â	25 Nm
Â	E46 / E83	Â	30 Nm

HEADLIGHT WASHER SYSTEM

61 67 HEADLIGHT CLEANERS

HEADLIGHT CLEANERS - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Measure
1AZ Telescope to bracket	E36	3 Nm
2AZ Bracket to body	E36	15 Nm

Article GUID: A00202662

INSTRUMENTS CLUSTER

62 10 ... BRIEF DESCRIPTION OF THE TEST FUNCTIONS:

Test-function display:

TEST 01 ROLL MODE WITH SYSTEM TEST (SEQUENCE AS BEFORE ON E36/4). .

Test function 01 enables the workshop to conduct a short test of the instrument cluster. Once the function has been started, at display intervals of 3 seconds, the following information is displayed in the LCD:

Display and point allocation in trip-distance and mileometers (GWSZ/TWSZ).

POINT ALLOCATION IN TRIP-DISTANCE AND MILEOMETERS (GWSZ/TWSZ)

MW scope of delivery	6 digits	1
Code No. of data set	5 digits	2
k-number	4 digits	3
------	6 digits	4
Software version	2 digits	5
Amendment index	2 digits	6

Next, the microprocessor moves the pointer (speedo, tachometer, tank, coolant temperature) uniformly to limit position and back. All LCD segments are activated for this period of time. The test procedure then terminates automatically. Premature termination occurs when the trip-distance-counter button is pressed with terminal R OFF or continued selection after terminal 15 and also when travel impulses arise. In the latter case, the prevailing km reading is displayed once again.

Test 02 Engine Data:

Display of engine factor stored in EEPROM for speed signal evaluation; e.g. "3" engine factor 3.

Test 03 Elapsed And Evaluated SI Mileage In km:

The type of the next service due (lubrication or inspection) is indicated by selecting the relevant letters displayed in the service-interval indicator (SIA).

E.g. GWSZ - - 8750 = SIA OILSERVICE - INSPECTION,

or GWSZ - 22450 = SIA OILSERVICE - INSPECTION.

Basic value not assessed:

Petrol-driven engines: oil service at 12000 km, inspection at 24000 km.

Diesel engines: first oil service at 10000 km, second oil service at 20000 km, inspection at 30000 km.

Test 04 Elapsed SI Days With Piloting Of Clock Symbol:

Maximum 716 days based on 2 years.

Test 05 SI Assessment Factors fn And ft (0 Or 1):

Currently dependent on engine speed and coolant temperature;

Presentation: n0 or n1...t0 or t1, where n is the speed factor and t is the temperature factor.

Shaft speed threshold.

Petrol-driven engines 4512 min^{-1} .

Diesel 3808 min^{-1} .

Test 06 Tank Fill Quantity And Coolant Temperature:

Display of values for tank contents and coolant temperature unfiltered.

VALUES FOR TANK CONTENTS AND COOLANT TEMPERATURE UNFILTERED

Presentation:	XX	XX
-	Tank	Temp.

Presentation in hexadecimal numbers (refer to illustration and table which follows test functions).

Test 07 Engine Speed:

Display of prevailing engine speed in rpm.

Test 08 Roadspeed:

Display of current vehicle road speed always in km/h (not in mph).

Test 09 Status Mileage In km:

Information and matching of any difference occurring between the km reading in the encoding connector and the redundant value soldered in the EEPROM.

E.g. display GWSZ-------signifies identical readings from EEPROM "E" and EEPROM "I".

(E = external EEPROM in encoding connector).

(I = internal EEPROM in instrument cluster).

E.g. display on GWSZ 012654 I.

There is a difference in the km readings stored in memory. The value displayed (e.g. 012654 I) is always the lower reading.

The supplement "I" indicates that this is in the internal, i.e. the soldered EEPROM. An "E" signifies the external EEPROM (encoding connector).

In addition, if counter readings differ, the manipulation point lights up.

After replacement of cluster or encoding connector, the higher km reading in the EEPROM can be matched to the lower reading by holding down the reset button when selecting the test function 09 for > 4 secs. At this point, the SIA data is also transmitted. After successful matching, the manipulation point disappears.

CAUTION: Replacement part must always have a smaller km reading otherwise the vehicle-specific km reading is overwritten.

Test 10 Statusbits (Input Modes):

Display binary in GWSZ (mileometer).

0 = input low,

1 = input high.

Test 11 Statusbit (Output Modes):

Display binary in GWSZ (mileometer).

0 = Output inactive,

1 = Output active.

Test 12 Free:

Test 13 Display Of Current National Codes:

ECE.

US.

Golf.

The code cannot be altered in the workshop.

Test 14 Perform Software Reset:

(watchdog test) or complete reset acts like a power interrupt. When executing the function, a RESET is initiated, the diagnosis level is quit and lock ON is activated.

If implausible faults occur, the test should be conducted before any components are replaced.

The test mode is quit automatically.

Test 15 Lock Off/Lock On:

This function is preset to Lock ON when the test function is switched on. To change over, button must be held down while selecting.

The display then switches every 3 seconds from L ON to L OFF.

Once desired status is reached, release the button.

Test 00 Termination of cluster diagnosis (test function) and return to normal operation.

FUEL-GAUGE SETTING

Fuel-gauge setting	Hex value
1st Dash A	0d
End of spare	37
2. Dash B	54
3. Dash C	90
4. Dash D	c4
5. Dash E (full)	f0

TEMP.-POINTER SETTING

Temp.-pointer setting	Hex value
1st Dash A	ce
2. Dash B	6d
3. Dash C	5c
4. Dash D (centre)	4f-23
5. Dash E	1e

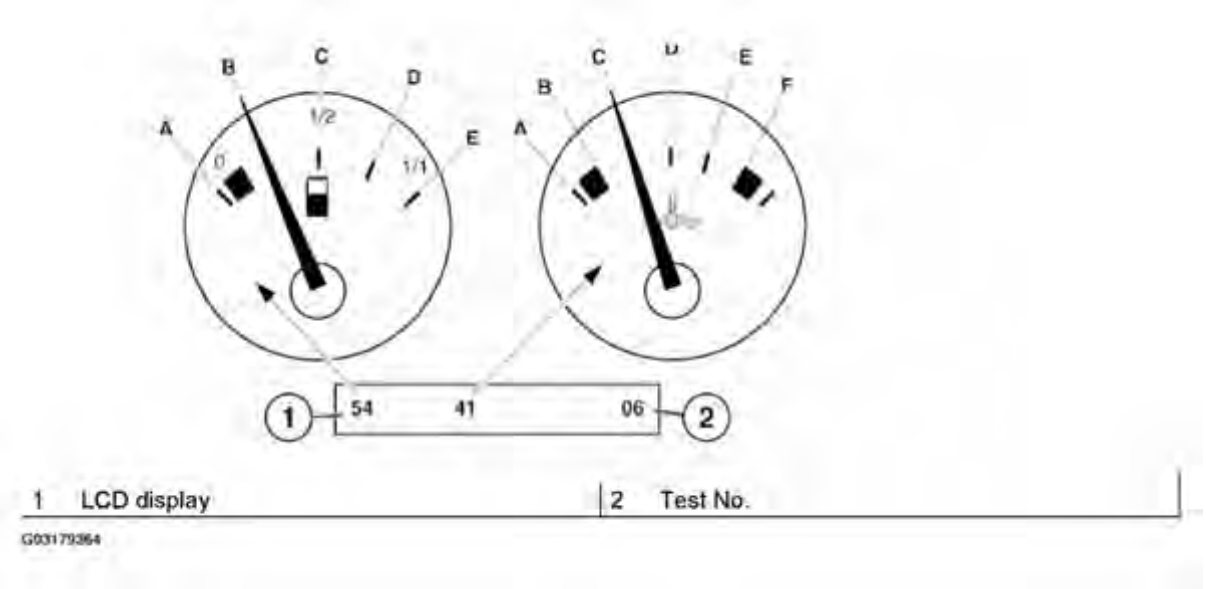


Fig. 1: Identifying Fuel And Temp. Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

62 10 000 CHECK FUNCTION OF INSTRUMENT CLUSTER

Since the E36/5 instrument cluster does not feature an on-board diagnosis interface, the following test functions are implemented in the functional scope. Some of them are comparable to familiar on-board computer test functions.

Test functions/overview

With the test functions 0 to 15, cluster reading and adjacent signal modes can be checked. Activation occurs with depressed reset button on trip-distance counter (TWSZ) when vehicle terminal R is selected at the same time.

The lettering "tESt" appears in the mileometer display (GWSZ), followed by the two-digit number "01" in the odometer display panel.

With each subsequent press of the button, the next higher test is selected. If the button is not actuated for longer than 1 second, the corresponding test is carried out.

This causes the letters "tESt" to disappear from the mileometer (GWSZ). The test number continues to be displayed in the odometer (TWSZ). When the button is pressed again, the prevailing test function is interrupted. Lettering "tESt" reappears and the number continues to rise incrementally. Once the last digit has been reached, the system restarts from the beginning.

Test functions 05 to 14 are only executed if test 15 is switched to "lock off". Test 15 is selected when test function is activated to "lock on".

In "lock on" mode, from test number 05, only dashes are displayed in the mileometer (e.g. -----07).

Functions 01 to 04 are also executed with "lock on".

Termination criterion for test functions 01 to 15: term. R OFF, or selection of test function "00". Apart from test function 01, which terminates automatically after the indicator test, test functions 02 to 14 can also be selected when vehicle is in motion.

62 11 ... CONFIGURATION OF INSTRUMENT CLUSTER

Shown from left to right:

Floor panel.

Display system.

Instrument panel.

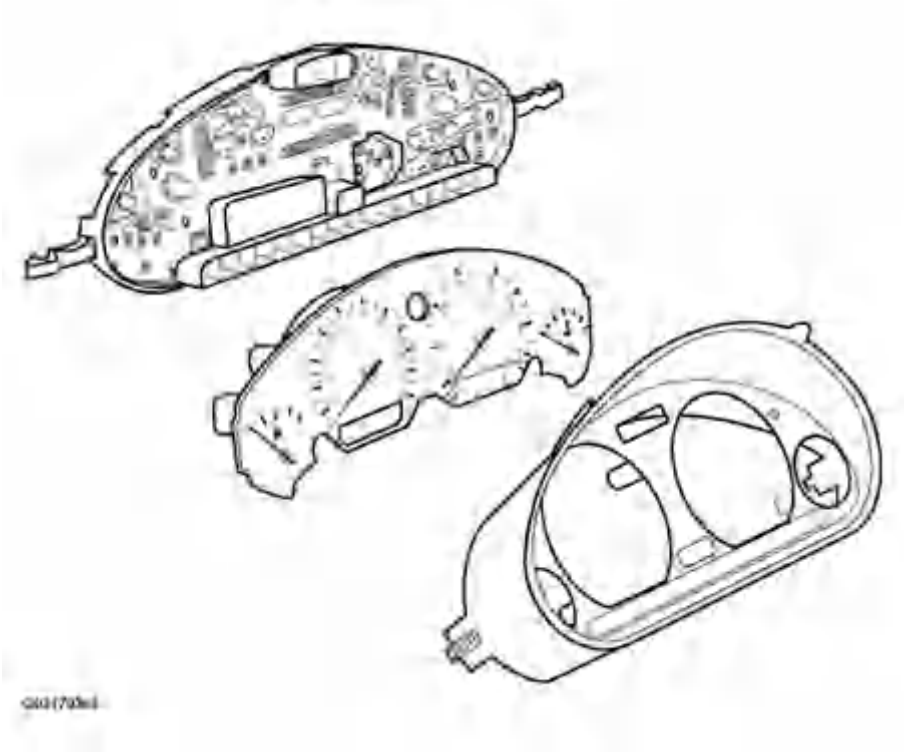


Fig. 2: Identifying Configuration Of Instrument Cluster
Courtesy of BMW OF NORTH AMERICA, INC.

62 11 070 REPLACE ENCODING CONNECTOR

Compact.

Removing instrument cluster.

Break open retaining frame with screwdriver and remove encoding connector.

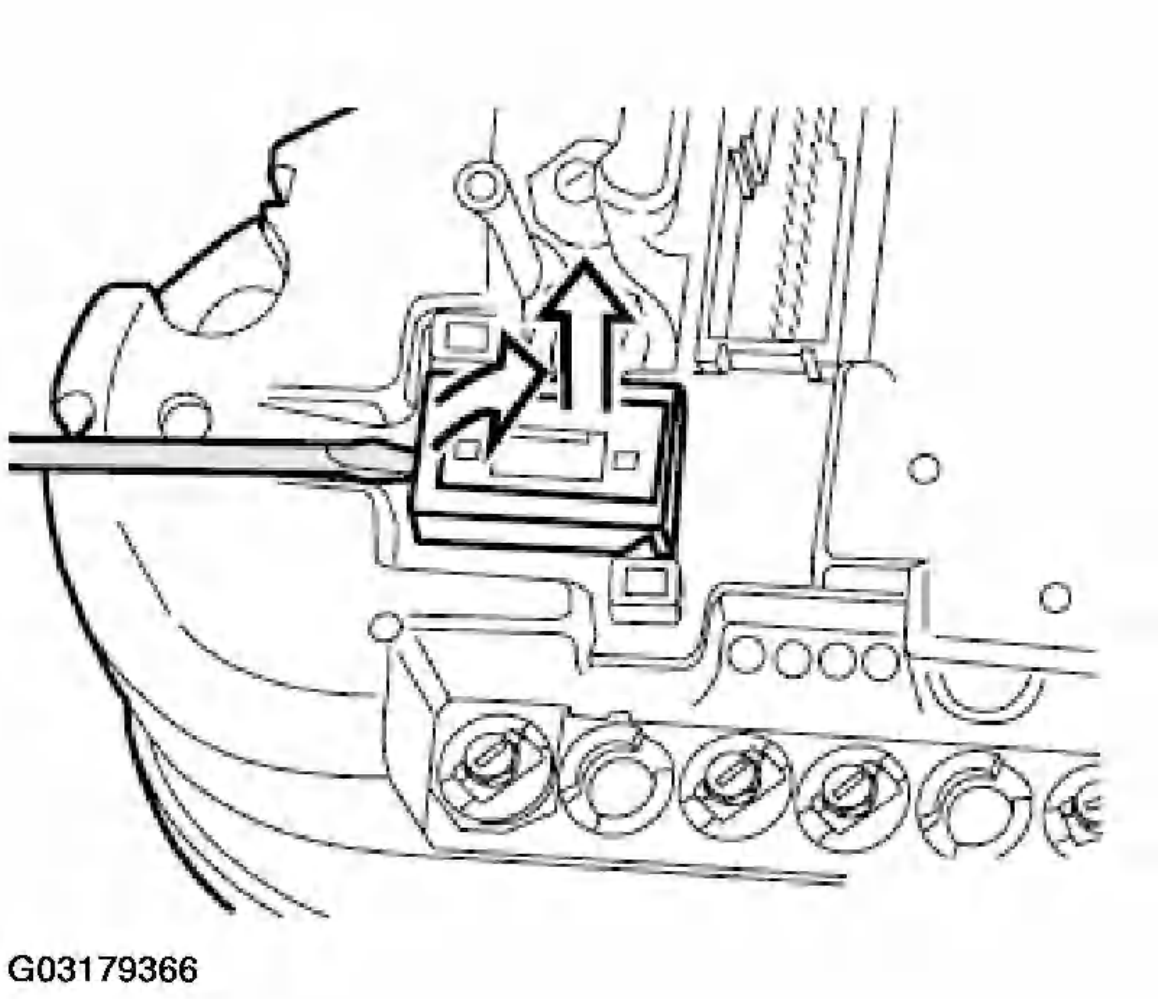


Fig. 3: Removing Instrument Cluster
Courtesy of BMW OF NORTH AMERICA, INC.

Insert encoding connector and clip in new retaining frame.

CAUTION: The new encoding connector must be checked against the instrument cluster, refer to 62 10 000 CHECK FUNCTION OF INSTRUMENT CLUSTER , Tests 15 and 09.

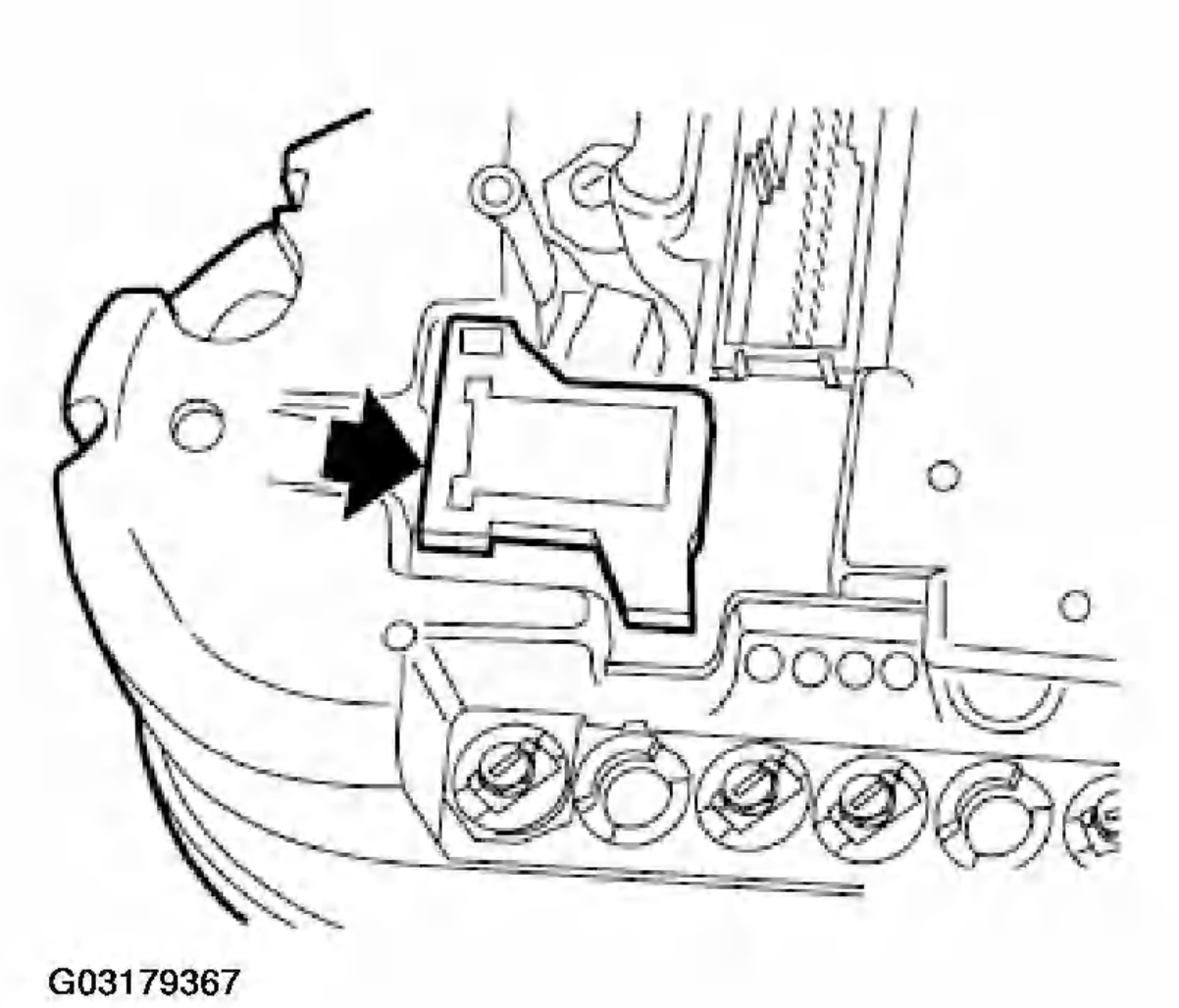


Fig. 4: Inserting Encoding Connector And Clip In New Retaining Frame
Courtesy of BMW OF NORTH AMERICA, INC.

REVOLUTION COUNTER, CL...

62 13 050 REMOVING AND INSTALLING/REPLACING CLOCK

Z3 Roadster From 04/99:

Remove oddments tray, refer to 51 16 200 REMOVING AND INSTALLING ODDMENTS TRAY (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Release screws (1). Remove clock.

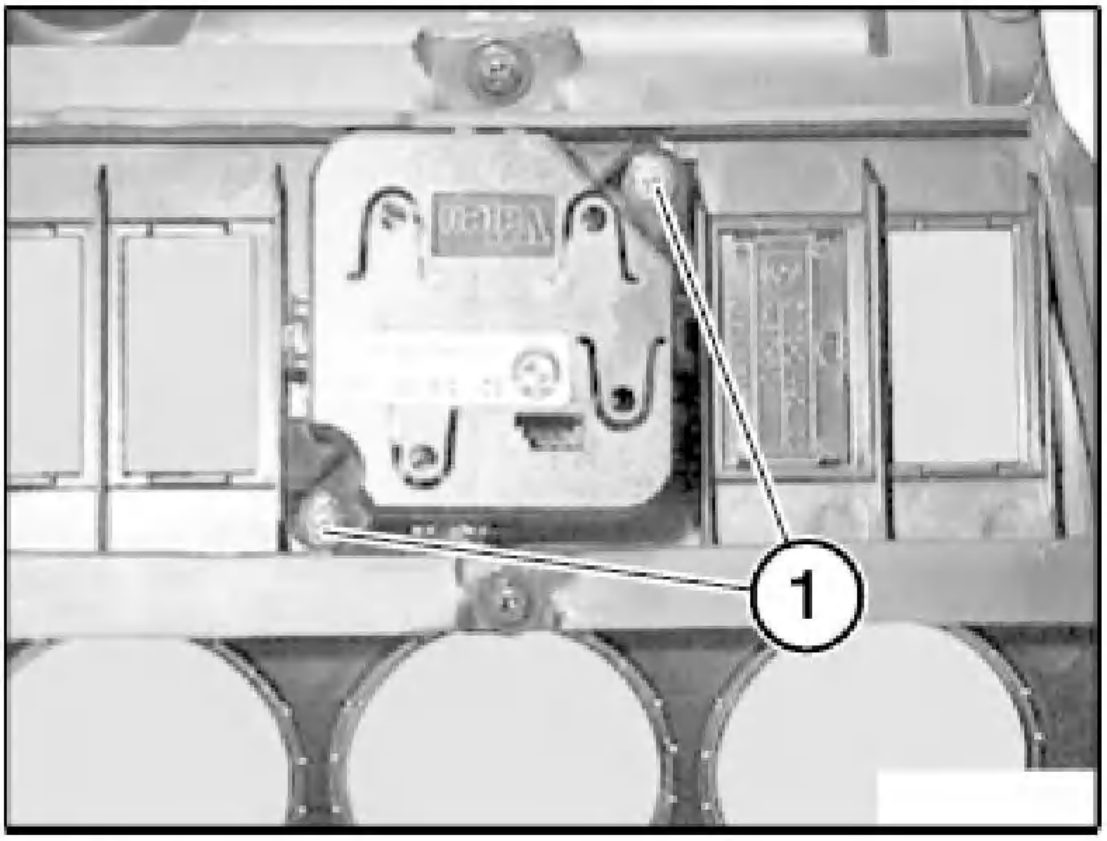


Fig. 5: Removing Oddments Tray
Courtesy of BMW OF NORTH AMERICA, INC.

Z3 Coupe:

Pull out radio cover and if necessary radio (do not disconnect plug connection), refer to 65 11 030 RADIO (BAVARIA C II OR C REVERSE II) , or REMOVING AND INSTALLING OR REPLACING RADIO (BAVARIA CIII OR C REVERS III RDS) or 65 11 030 REMOVING AND INSTALLING/REPLACING RADIO (BUSINESS) .

Through radio aperture, press clips together on sides of clock. Press out clock towards front. Disconnect plug connection.

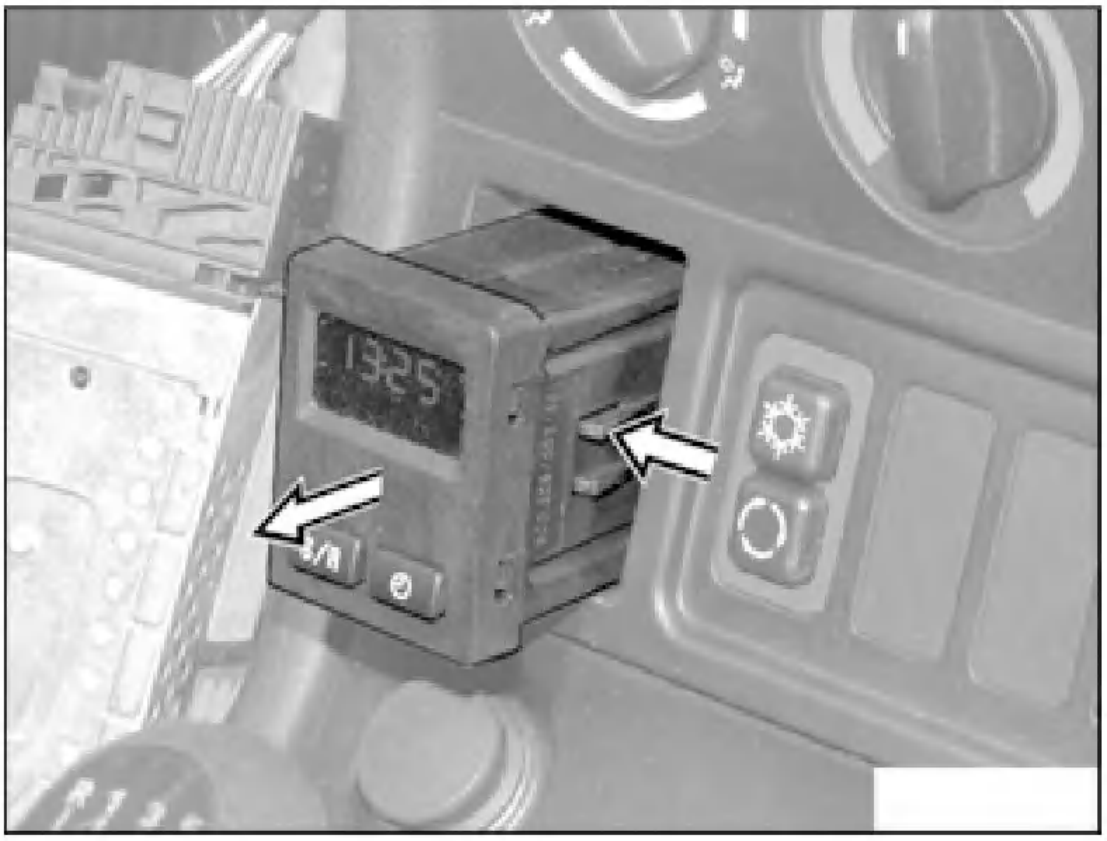


Fig. 6: Pulling Out Radio Cover
Courtesy of BMW OF NORTH AMERICA, INC.

SENSOR FOR VEHICLE ELE...

62 16 071 REMOVING AND INSTALLING OR SPEEDOMETER-DISPLAY SENSOR

Disconnect plug-in connection at rear axle.

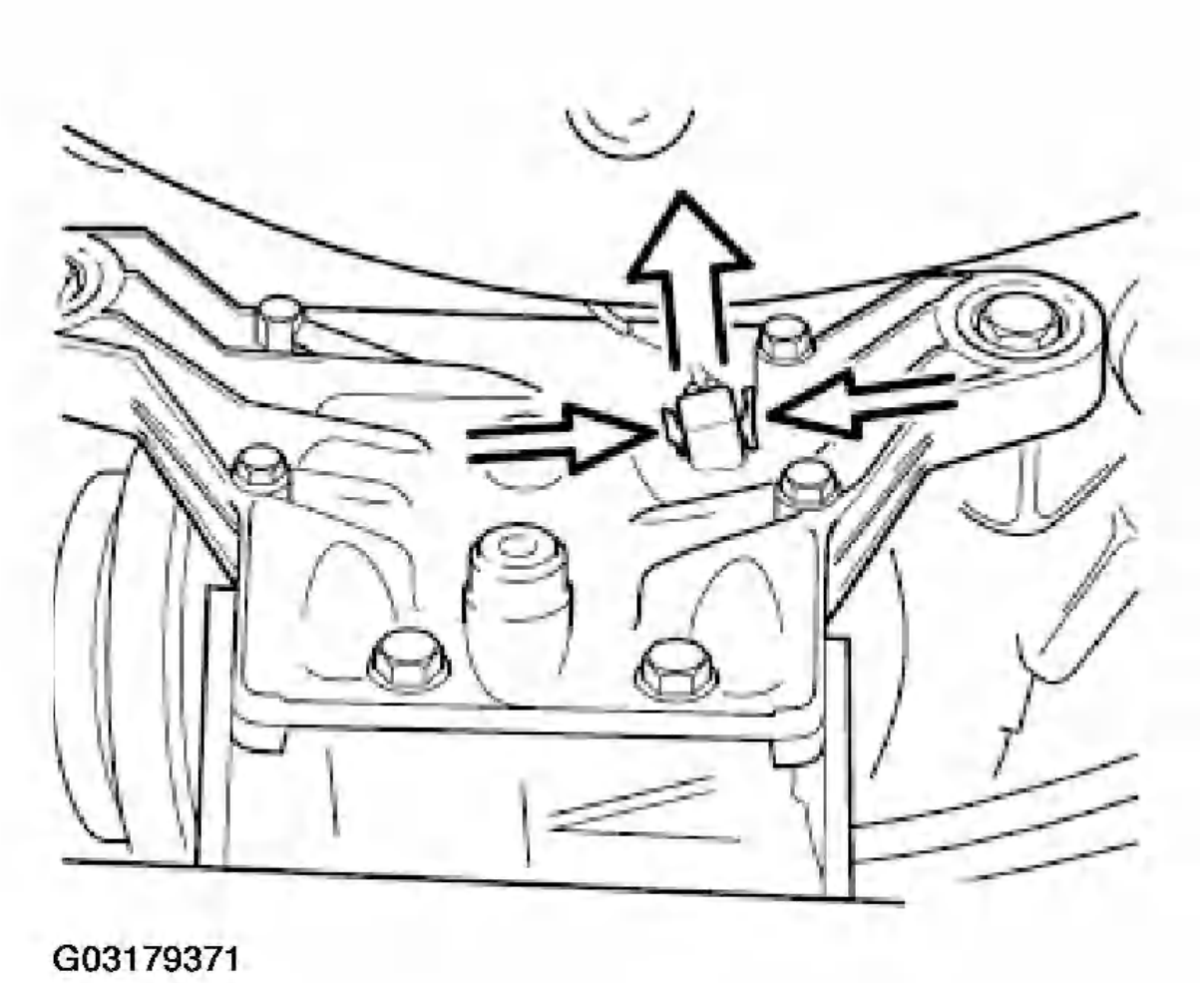


Fig. 7: Disconnecting Plug-In Connection At Rear Axle
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1) and remove speedometer-display sensor.

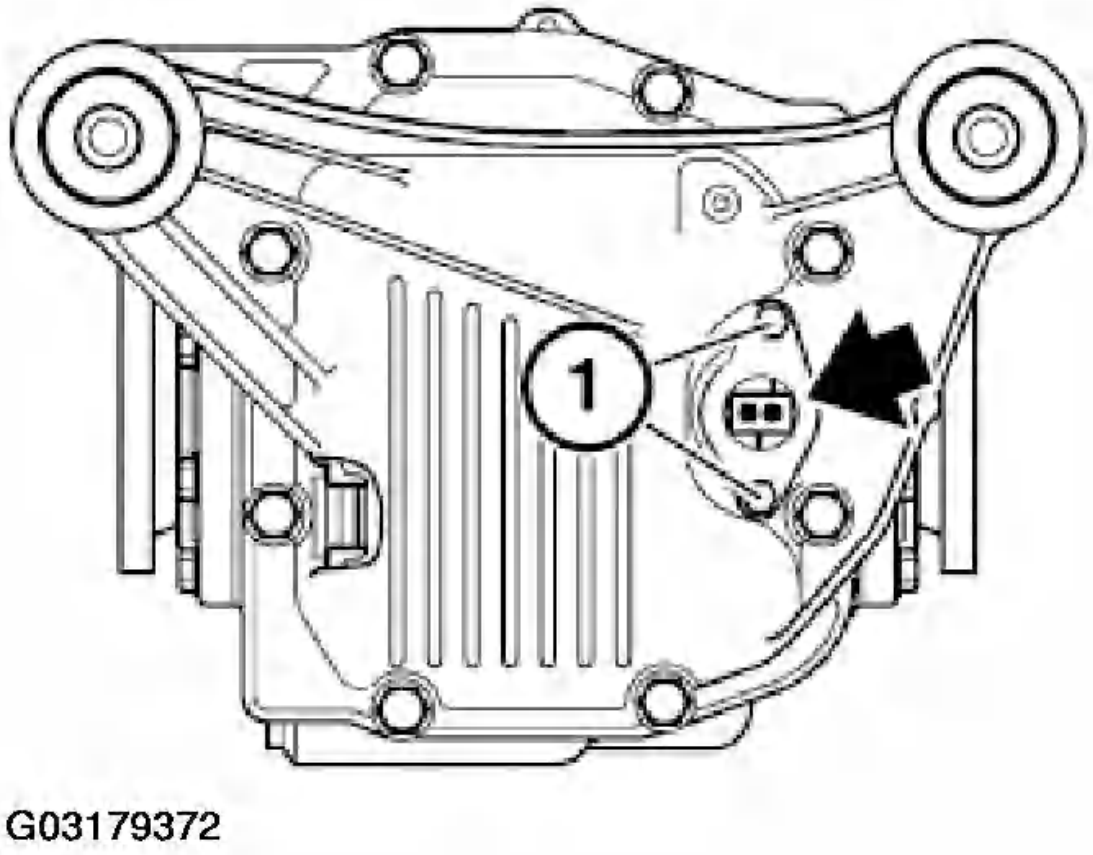


Fig. 8: Removing Speedometer-Display Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Installation Note:

Replace O-ring and coat with HLS-90 oil. Slide O-ring onto speedometer-sensor shaft as far as slip phase (A).

Install sensor with O-ring in rear axle and tighten both screws uniformly.

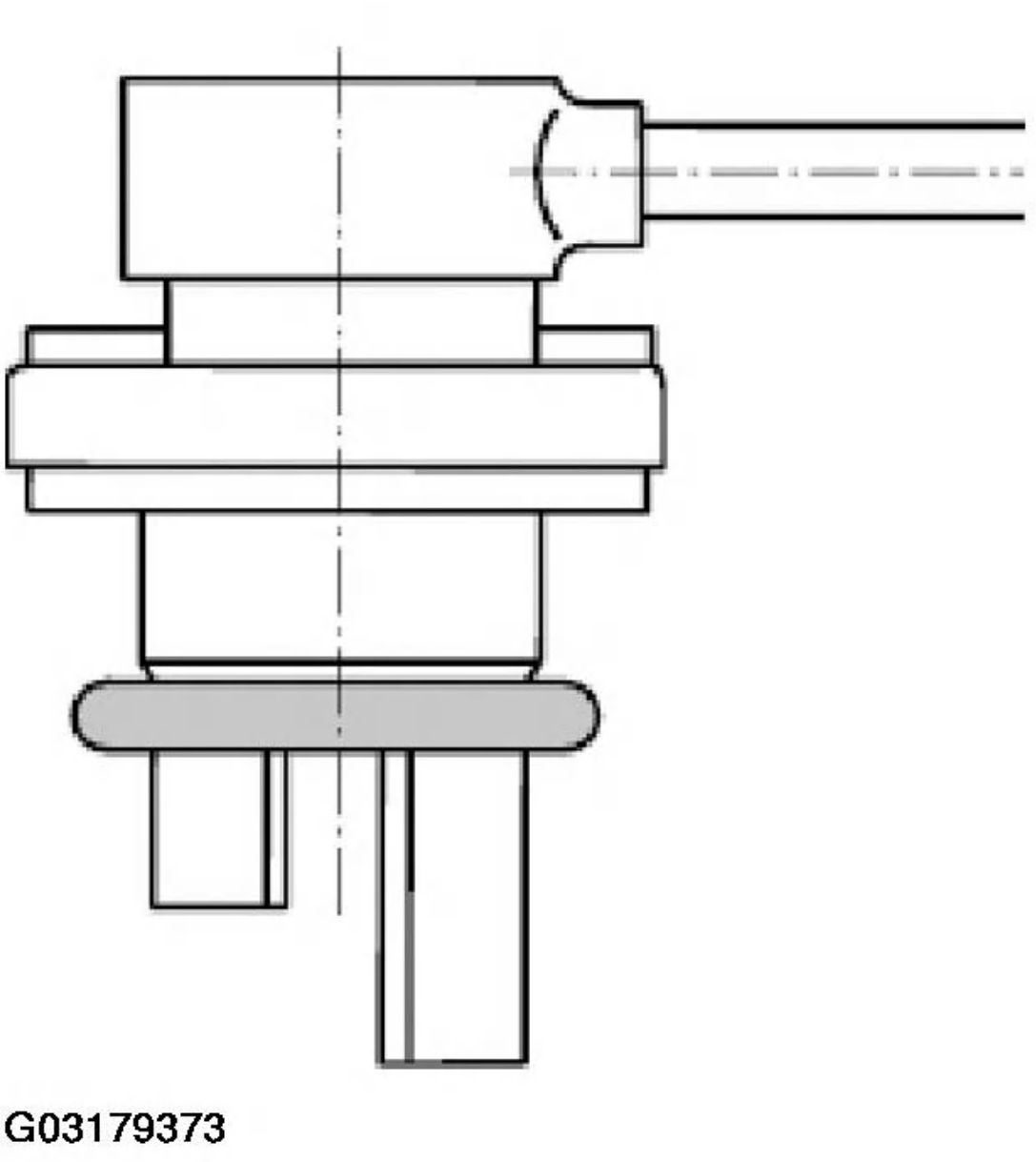


Fig. 9: Installing Sensor With O-Ring In Rear Axle And Tightening Both Screws Uniformly
Courtesy of BMW OF NORTH AMERICA, INC.

INSTRUMENT CARRIER

62 21 000 REMOVING AND INSTALLING ENTIRE INSTRUMENT CARRIER (Z3 ROADSTER, Z3 COUPE)

Remove steering wheel, refer to STEERING WHEEL .

Remove paneling for instrument panel at bottom, refer to 51 45 180 REMOVING AND INSTALLING/REPLACING TRIM FOR INSTRUMENT PANEL, BOTTOM LEFT (Z3 ROADSTER, M ROADSTER, Z3 COUPE, M COUPE) .

Unfasten screws, then slide instrument cluster straight out of trim and fold over.

CAUTION: Place cleaning rags on steering column to avoid scratches in glass of instrument carrier.

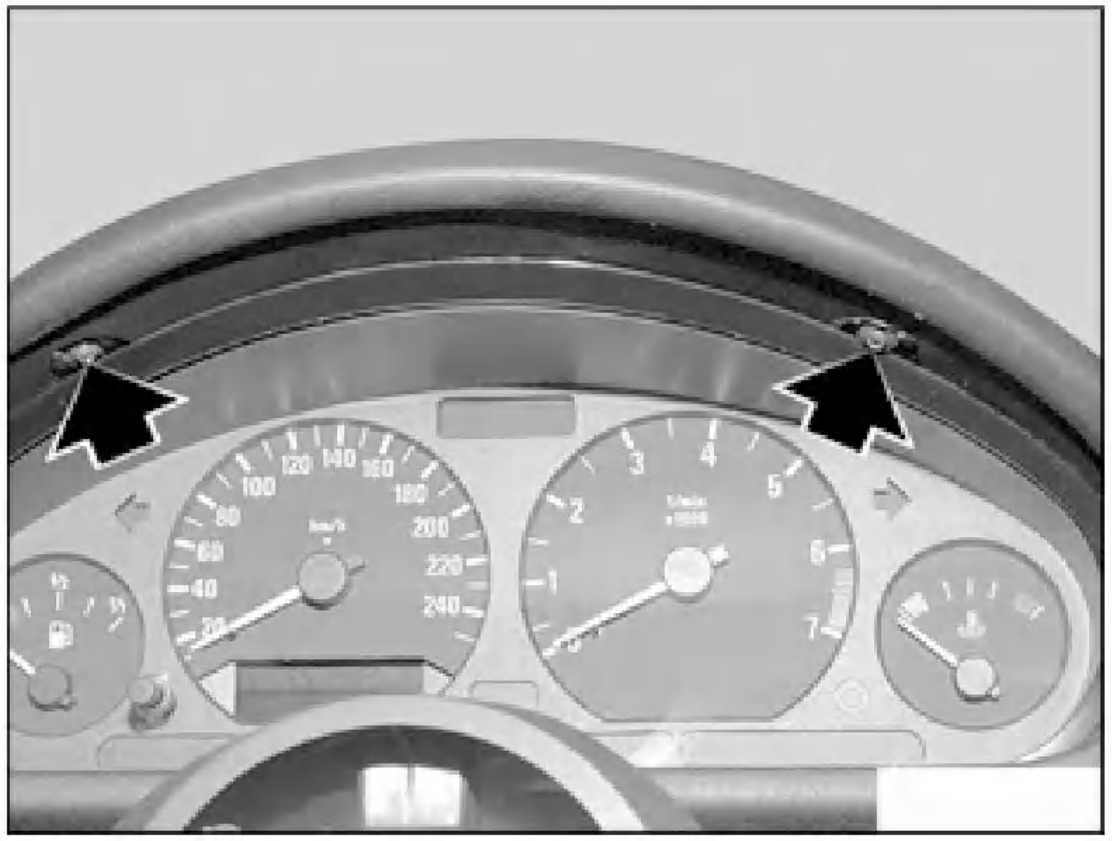


Fig. 10: Placing Cleaning Rags On Steering Column To Avoid Scratches In Glass Of Instrument Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Push levers on connectors forward and take out connectors.



Fig. 11: Pushing Levers On Connectors Forward And Taking Out Connectors
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

When inserting a connector, lever must be in forward position.

Recode instrument carrier after replacing. Refer to IDC 003/92-14.

Installation:

Convert and reset encoding connector when replacing instrument carrier, refer to 62 10 000 CHECK FUNCTION OF INSTRUMENT CLUSTER , Tests 15 and 09.

62 99 090 REPLACING BULBS IN INSTRUMENT CARRIER

Remove complete instrument carrier, refer to 62 21 000 REMOVING AND INSTALLING ENTIRE INSTRUMENT CARRIER (Z3 ROADSTER, Z3 COUPE) .

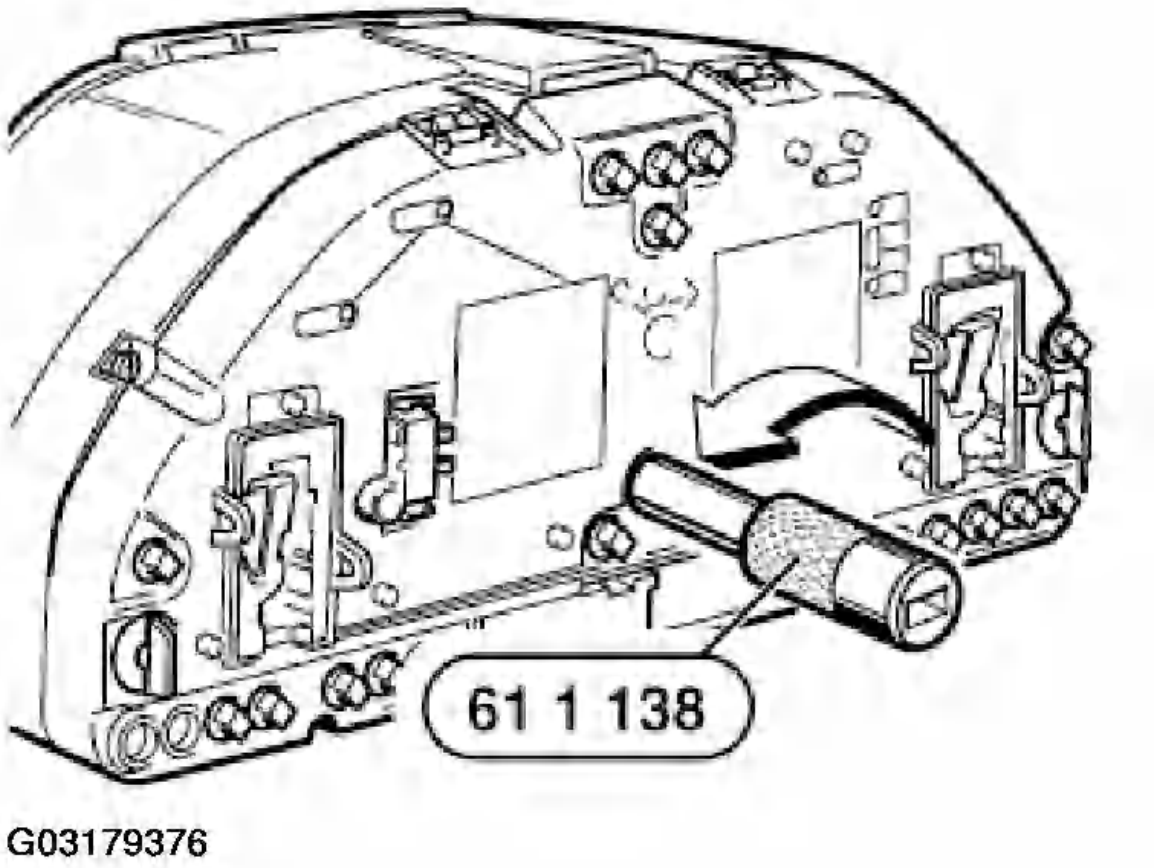
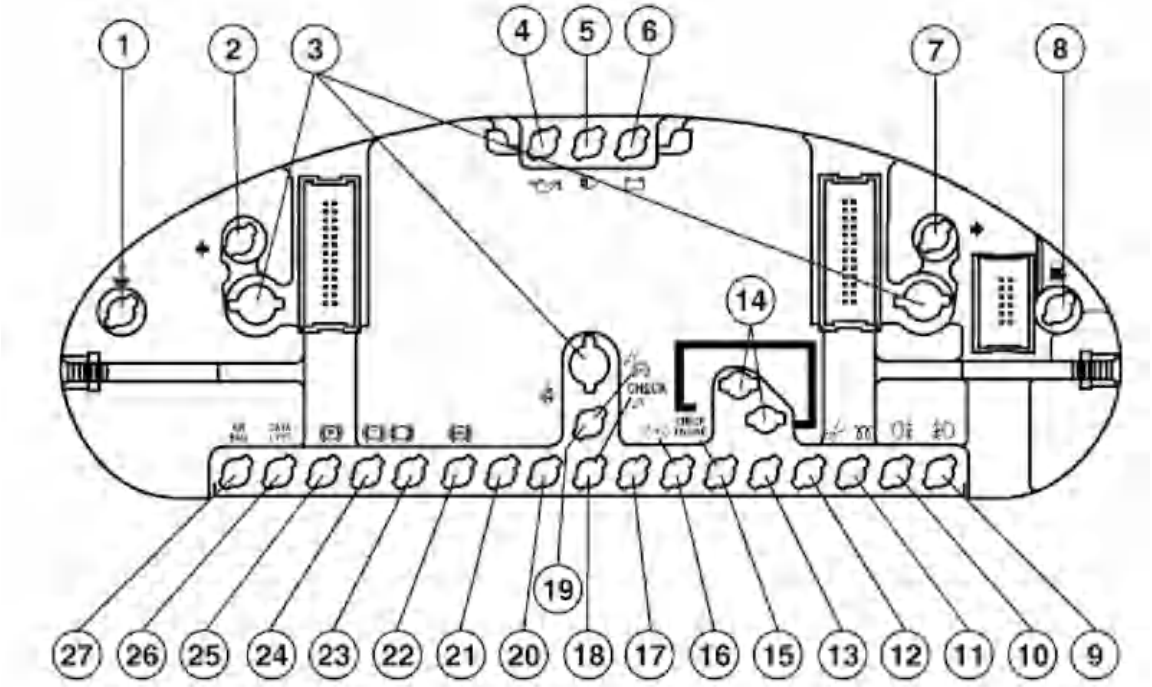


Fig. 12: Removing Complete Instrument Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Turn bulb holder of faulty instrument lighting with special tool 61 1 138 in direction of arrow and remove. Pull bulb out of holder.



1	Excess temperature warning lamp	15	Engine control
2	Right turn signal	16	Trailer turn indicator
3	Lighting for instruments	17	EGS failure
4	Oil pressure	18	Check
5	High beam	19	Wheel-Slip Control (ASC)
6	Charge control	20	Seat belt
7	Left turn signal	21	Not used
8	Fuel reserve	22	ABS control
9	Front fog lamp	23	Brake-pad wear indicator
10	Rear fog lights	24	Brake fluid
11	Diesel preheating	25	Handbrake
12	Diesel diagnosis	26	Catalytic-converter overtemperature
13	Not used	27	Airbag
14	Light for LCD display		

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Fig. 13: Identifying Instrument Carrier Bulb Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure bulb brightness is correct.

Bulb chamber could melt in event of excessive bulb power.

LAMPS FOR INSTRUMENTS

62 99 090 REPLACING BULBS IN INSTRUMENT CARRIER

Remove complete instrument carrier, refer to 62 21 000 REMOVING AND INSTALLING ENTIRE INSTRUMENT CARRIER (Z3 ROADSTER, Z3 COUPE) .

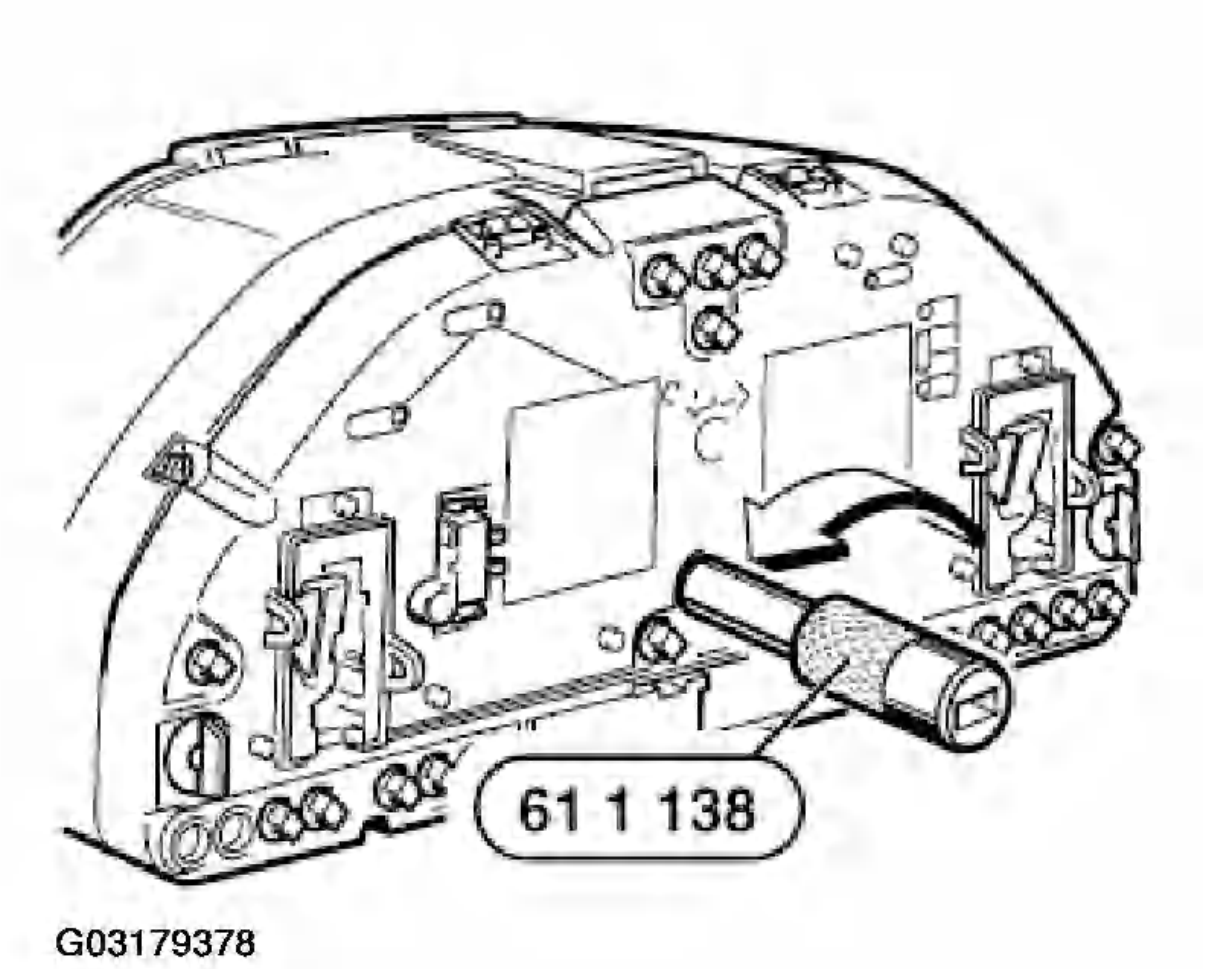
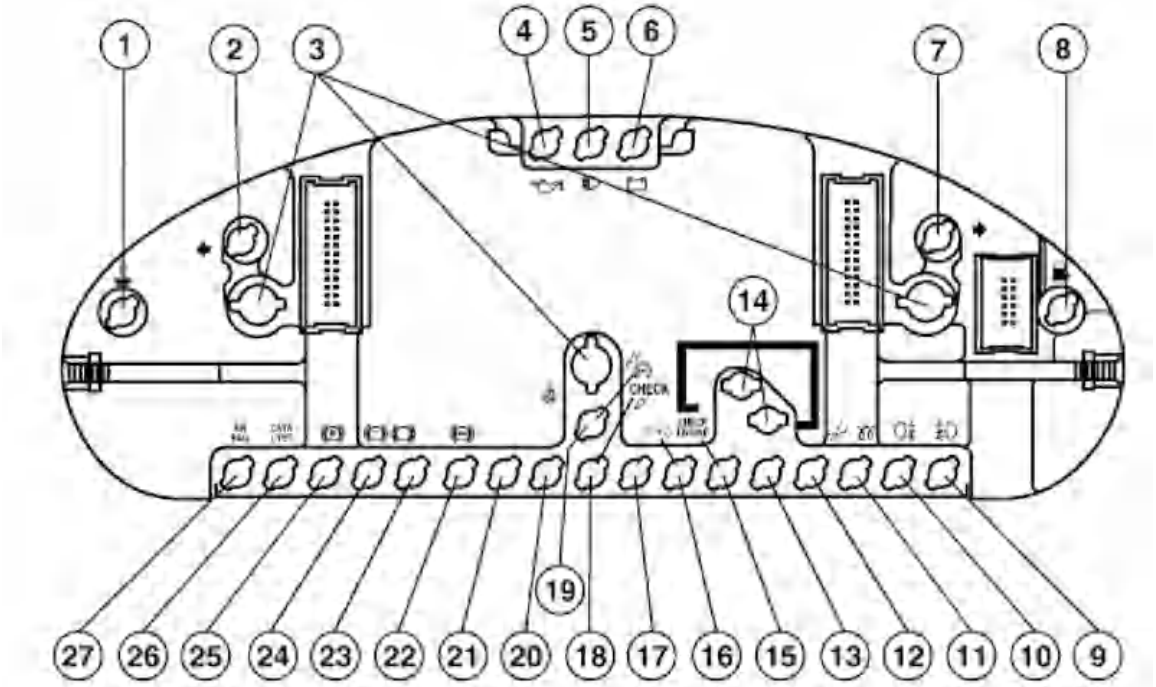


Fig. 14: Removing Complete Instrument Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Turn bulb holder of faulty instrument lighting with special tool 61 1 138 in direction of arrow and remove. Pull bulb out of holder.



1	Excess temperature warning lamp	15	Engine control
2	Right turn signal	16	Trailer turn indicator
3	Lighting for instruments	17	EGS failure
4	Oil pressure	18	Check
5	High beam	19	Wheel-Slip Control (ASC)
6	Charge control	20	Seat belt
7	Left turn signal	21	Not used
8	Fuel reserve	22	ABS control
9	Front fog lamp	23	Brake-pad wear indicator
10	Rear fog lights	24	Brake fluid
11	Diesel preheating	25	Handbrake
12	Diesel diagnosis	26	Catalytic-converter overtemperature
13	Not used	27	Airbag
14	Light for LCD display		

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Fig. 15: Identifying Instrument Carrier Bulb Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure bulb brightness is correct.

Bulb chamber could melt in event of excessive bulb power.

Article GUID: A00202367

FRONT SEATS

52 10 FRONT SEATS

FRONT SEATS - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Thread	Tightening Specification	Measure
1AZ Seat to floor plate E31 / E32 / E34 / E36	M10	Â	Â	44 Nm
Â	E36 / Z3 front	M8	Â	22 Nm
Â	E36 / Z3 rear	M10	Â	43 Nm
Â	E38 / E39	M10	Â	42 Nm
Â	E46 / E52 / E53 / E85 / E83 / E63 / E64	M10	Â	45 Nm
Â	Â	Â	Torque angle	90 Â°
Â	E65 / E66 / E67 / E60 / E61 / E87	M10 (trilobular)	Replace Powerlok screw	44 Nm
2AZ Backrest-frame on seat frame	E36	Â	Â	60 Nm
Â	E63 / E64 / E83 / E85	Â	Â	32 Nm
Â	E87	(trilobular)	Replace Powerlok screw	32 Nm
Â	E46 all except Convertible	Â	Replace screws	32 Nm
Â	E46 / Convertible	Â	Replace screws	24 +4 Nm
Â	E65 / E66 / E67 / E60 / E61	M10 (trilobular)	Replace Powerlok screw	33 Nm
Â	E53	Â	Â	45 Nm
3AZ Support (backrest shell) to headrest rail	E31	Â	Â	6.5 Nm
4AZ Headrest rail on seat-backrest-frame	E31	Â	Â	25 Nm
5AZ Finisher on seat rail	E38 / E39	M4	Â	4 Nm
6AZ Seat frame to seat runner	E38 / E39	M6	Â	15 Nm
Â	E60 / E61 / E65 / E66	M8	27 +/- 3 Nm	Â
7AZ Actuating unit to seat frame	E46 / E85	Â	Â	10+/-2 Nm
8AZ Adjusting screw for eccentric disk	E46 / E85	Â	Â	1.4 Nm
9AZ Seat pan to seat frame	E46 / E85	Â	Â	10+/-2 Nm
10AZ Microswitch	E46	Â	Â	2+/-1 Nm

to front seat				
11AZ Seat backrest frame to seat rail	E31	Â	Â	25 Nm
12AZ Trims to seat mechanism	E63 / E64	Â	Â	3 Nm
13AZ Trim to seat cushion shell	E63 / E64	Â	Â	4.4 Nm
14AZ Bracket, control unit, to seat mechanism	E87	Â	Â	2 Nm
15AZ Seat depth adjustment to seat mechanism	E87	Â	Â	1.1 Nm
16AZ Seat tilt adjuster to seat mechanism	E46, E53, E83, E85	M6x10 (trilobular)	Replace Taptite screw	$9^{+/-1}$ Nm
17AZ Seat tilt adjuster to seat pan	E46, E53, E83, E85	Â	Â	$9^{+/-1.8}$ Nm

REAR SEAT (NORMAL)/MANUAL

52 24 REAR SEAT (NORMAL), MANUAL

REAR SEAT (NORMAL), MANUAL - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Thread	Tightening Specification	Measure
1AZ Backrest on body	E38	M6	Â	5 Nm
Â	E60	M8	Â	18.5 Nm
Â	E90	M8	Â	31 Nm
2AZ Head restraint support to backrest	E60	M6	Screws, top	5.6 Nm
Â	Â	Â	Screws, bottom	8 Nm
3AZ Armrest lock to backrest	E60	M6	Â	8 Nm
4AZ Backrest lock to backrest	E60	M6	Â	19 Nm
5AZ Center armrest to backrest frame	E60	M6	Â	19 Nm
6AZ Storage compartment casing to body	E63 / E64	Â	Â	7.5 Nm
7AZ Ski bag casing to body (hexagon screw) E63 / E64	M8	Â	24 Nm	Â
8AZ Lock to body	E90	Â	Â	18.5 Nm
9AZ Top Tether eyelet	E60 / E65 / E66 / E90	Â	Â	22 +/- 4 Nm

REAR SEAT (NORMAL)/ELECTRIC

52 26 REAR SEATS (THROUGH-LOADING SYSTEM)

REAR SEATS (THROUGH-LOADING SYSTEM) - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Thread	Tightening Specification	Measure
1AZ Outer mount	E60	Â	Â	12.5 Nm

(backrest) to body				
Â	E87	Â	Â	31 Nm
2AZ Center mount (backrest) to body	E60	Â	Â	12.5 Nm
Â	E87 / E90 / E91	Â	Â	18.5 Nm
3AZ Backrest lock to seat back	E60	Â	Â	12.5 Nm
4AZ Center armrest to seat back	E60	M6	Â	6 Nm
Â	E87 / E90 / E91	Â	Â	5 +/-0.35 Nm
5AZ Outer mount to seat back	E60	Â	Â	38 Nm
Â	E87	Â	Â	36 Nm
6AZ Skibag cover to skibag frame	E60	Â	Â	6 Nm
7AZ Striker to body	E87 / E90 / E91	Â	Â	18.5 Nm
8AZ Lashing eye to backrest	E87	Â	Â	15 Nm
9AZ Lock to backrest	E61 / E87 / E91	Â	Â	20 +5 Nm
10AZ Lock to body	E90	Â	Â	18.5 Nm

52 25 REAR SEAT (NORMAL), ELECTRIC

REAR SEAT (NORMAL), ELECTRIC - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Thread	Tightening Specification	Measure
1AZ Backrest on body	E38	Â	Â	5 Nm
Â	E65 / E66 / E67	Â	Install nuts with Loctite	20 Nm
2AZ Seat to floor plate	E65 / E66 / E67	Â	Â	20 Nm
Â	E65 / E66 / E67	Â	Plastic nut	12 Nm
3AZ Backrest frame to seat frame	E65 / E66 / E67	Â	Â	18 Nm
4AZ Center armrest to body	E65 / E66 / E67	Â	Â	19 Nm

REAR SEATS (THROUGH - LOADING SYSTEM)

52 26 REAR SEATS (THROUGH-LOADING SYSTEM)

REAR SEATS (THROUGH-LOADING SYSTEM) - TIGHTENING TORQUE SPECIFICATIONS

Application	Type	Thread	Measure
1AZ Outer mount (backrest) to body	E60	Â	12.5 Nm
Â	E87	Â	31 Nm
2AZ Center mount (backrest) to body	E60	Â	12.5 Nm
Â	E87 / E90 / E91	Â	18.5 Nm
3AZ Backrest lock to seat back	E60	Â	12.5 Nm
4AZ Center armrest to seat back	E60	M6	6 Nm

Â	E87 / E90 / E91	Â	5 +/-0.35 Nm
5AZ Outer mount to seat back	E60	Â	38 Nm
Â	E87	Â	36 Nm
6AZ Skibag cover to skibag frame	E60	Â	6 Nm
7AZ Striker to body	E87 / E90 / E91	Â	18.5 Nm
8AZ Lashing eye to backrest	E87	Â	15 Nm
9AZ Lock to backrest	E61 / E87 / E91	Â	20 +5 Nm
10AZ Lock to body	E90	Â	18.5 Nm

Article GUID: A00202660

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).

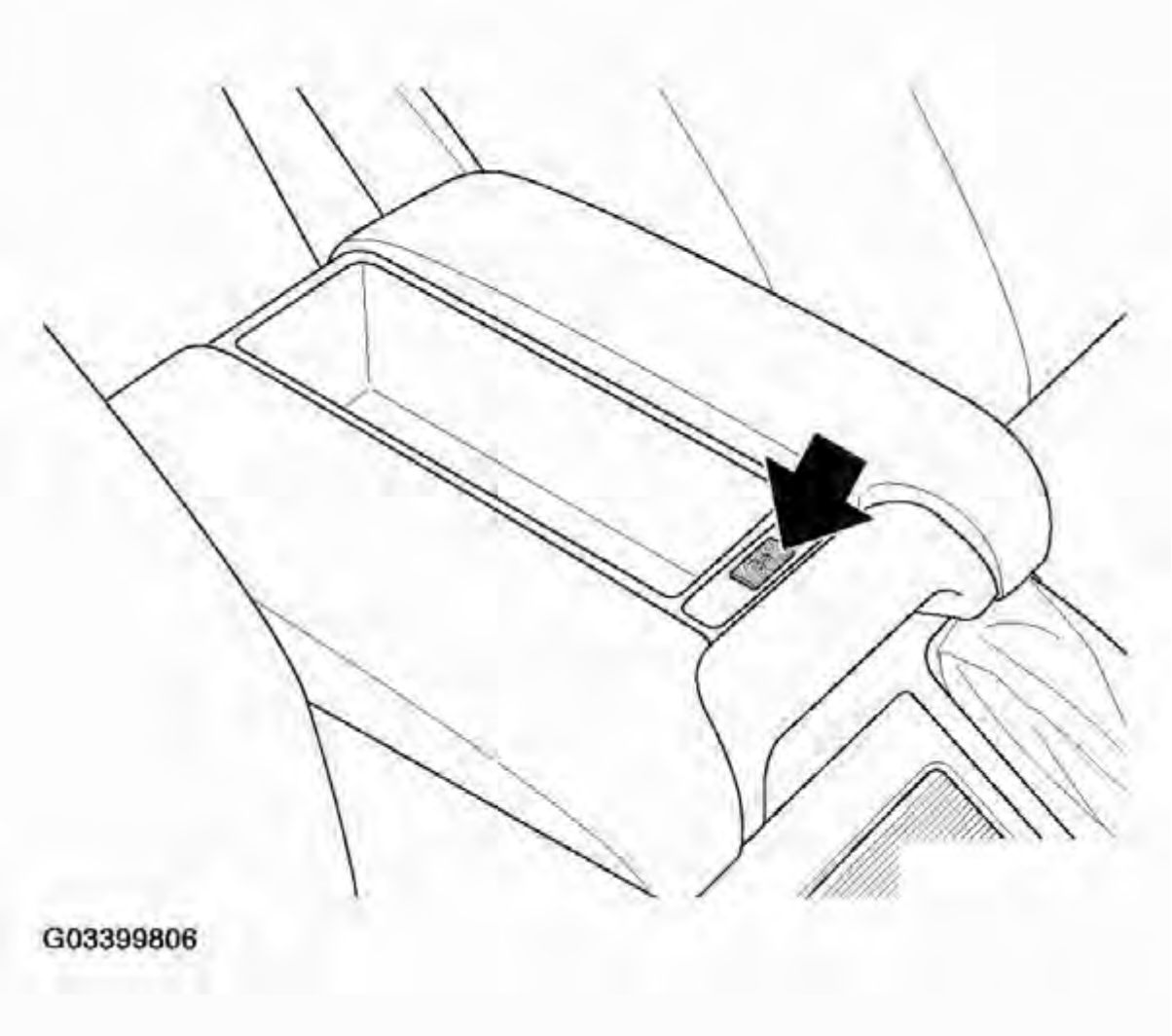


Fig. 1: Identifying Oddment Tray Button
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Communication/Security

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.

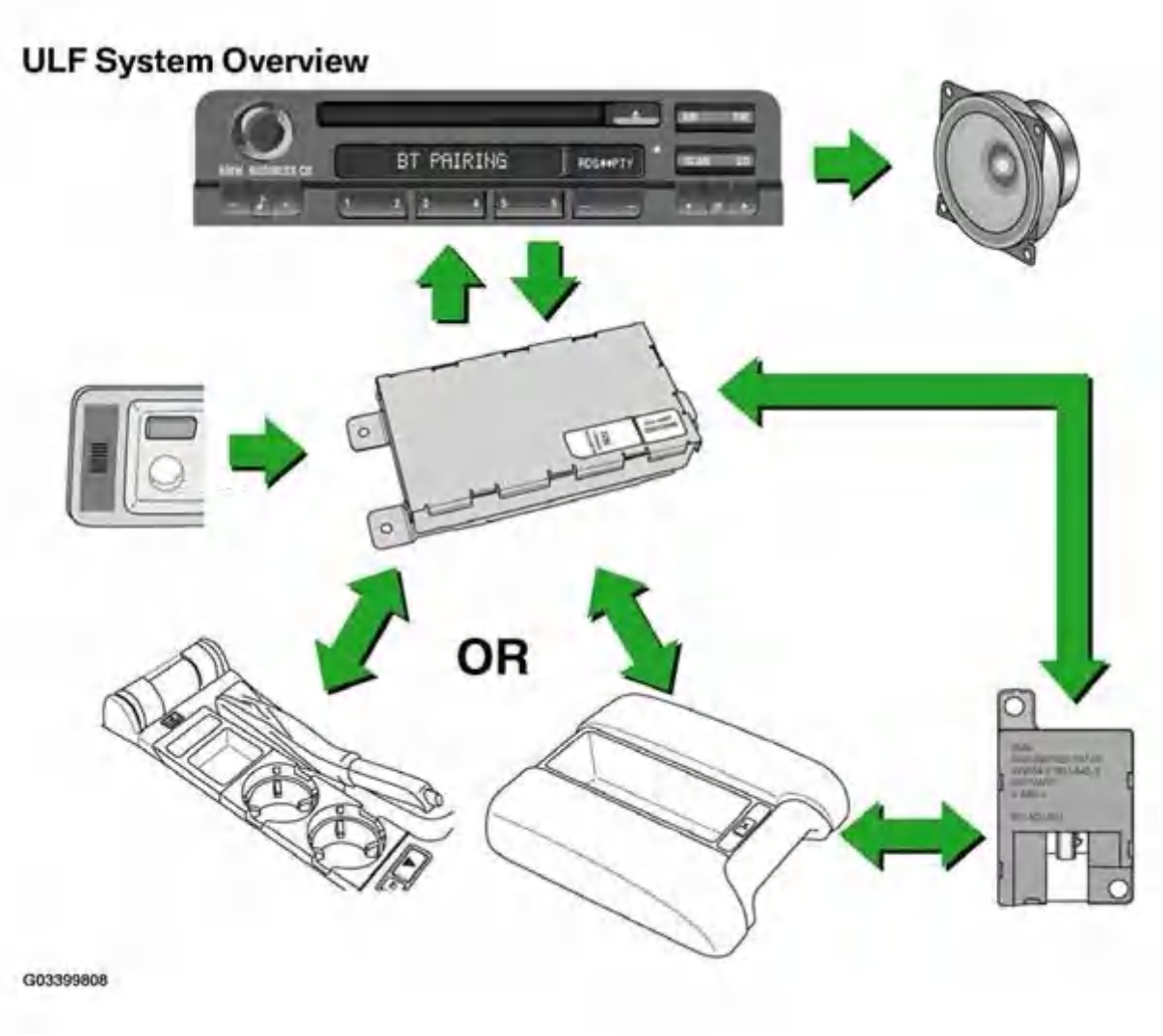


Fig. 3: ULF Control Module System Components
Courtesy of BMW OF NORTH AMERICA, INC.

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.

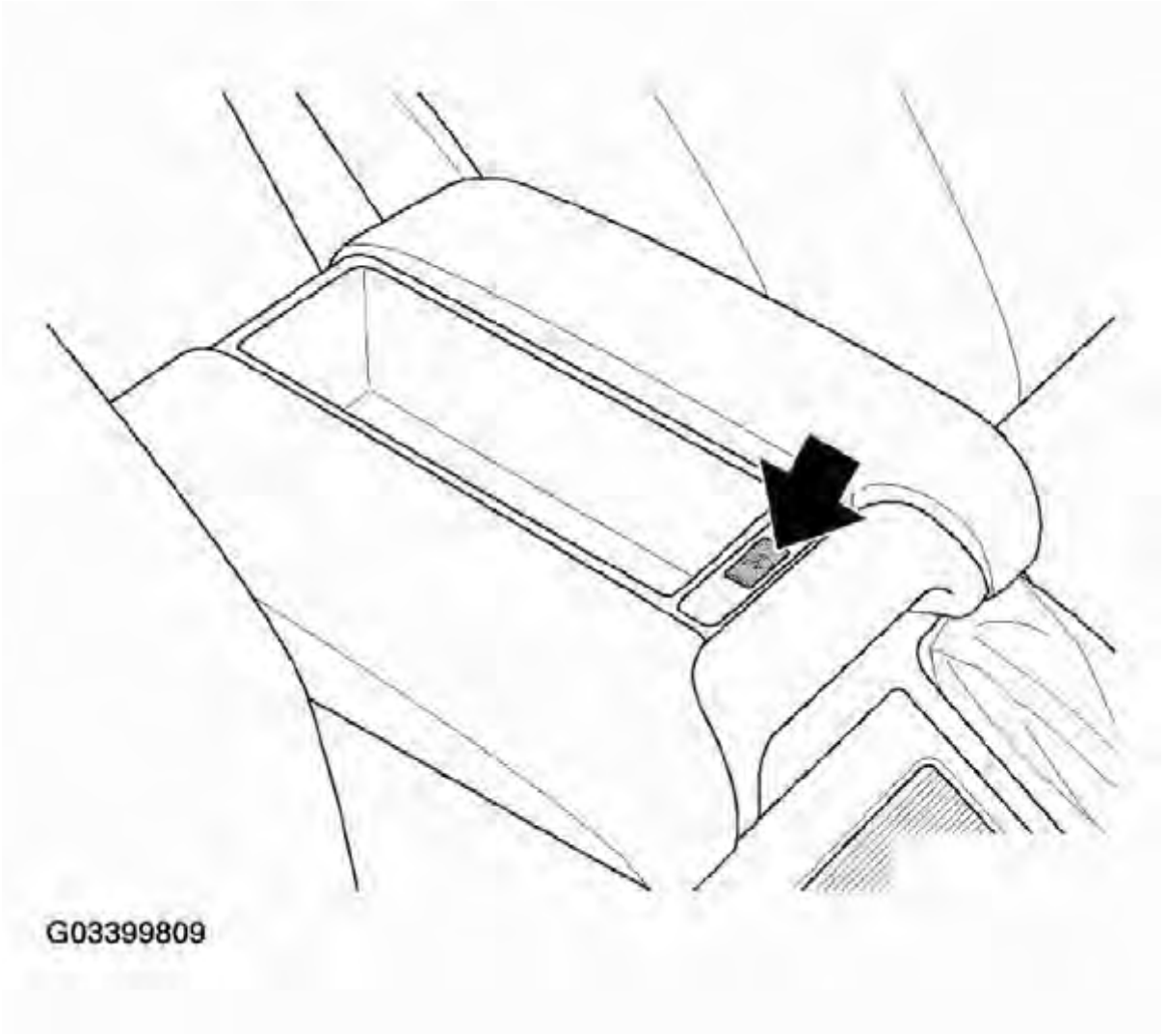


Fig. 4: Identifying Oddment Tray Button
Courtesy of BMW OF NORTH AMERICA, INC.

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.

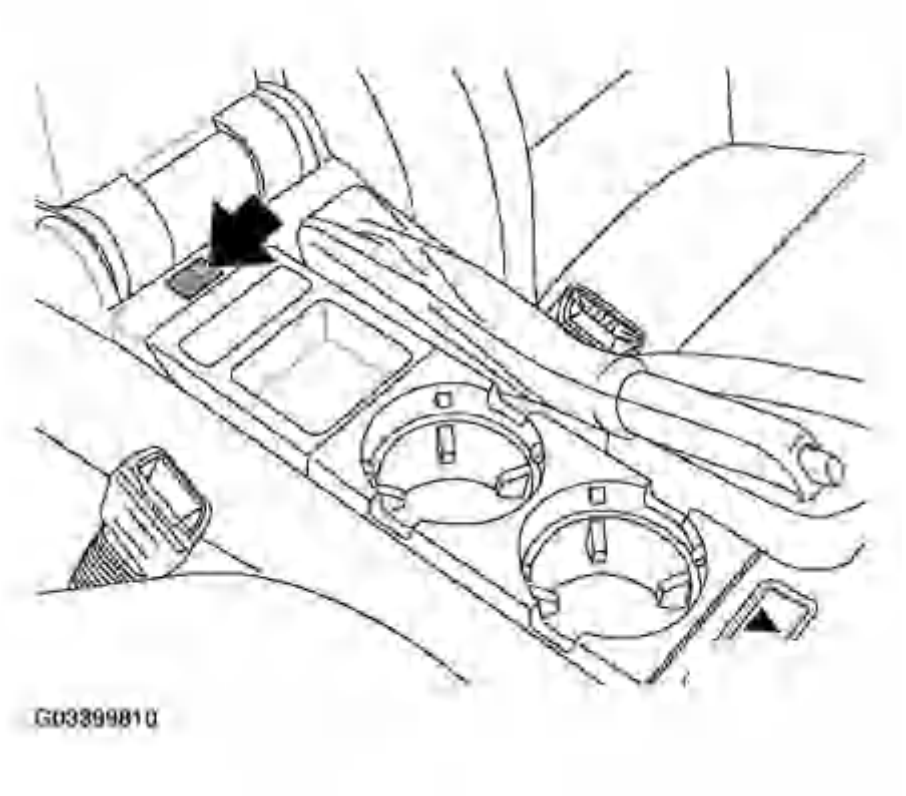


Fig. 5: Identifying Pairing Button
Courtesy of BMW OF NORTH AMERICA, INC.

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 form 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.

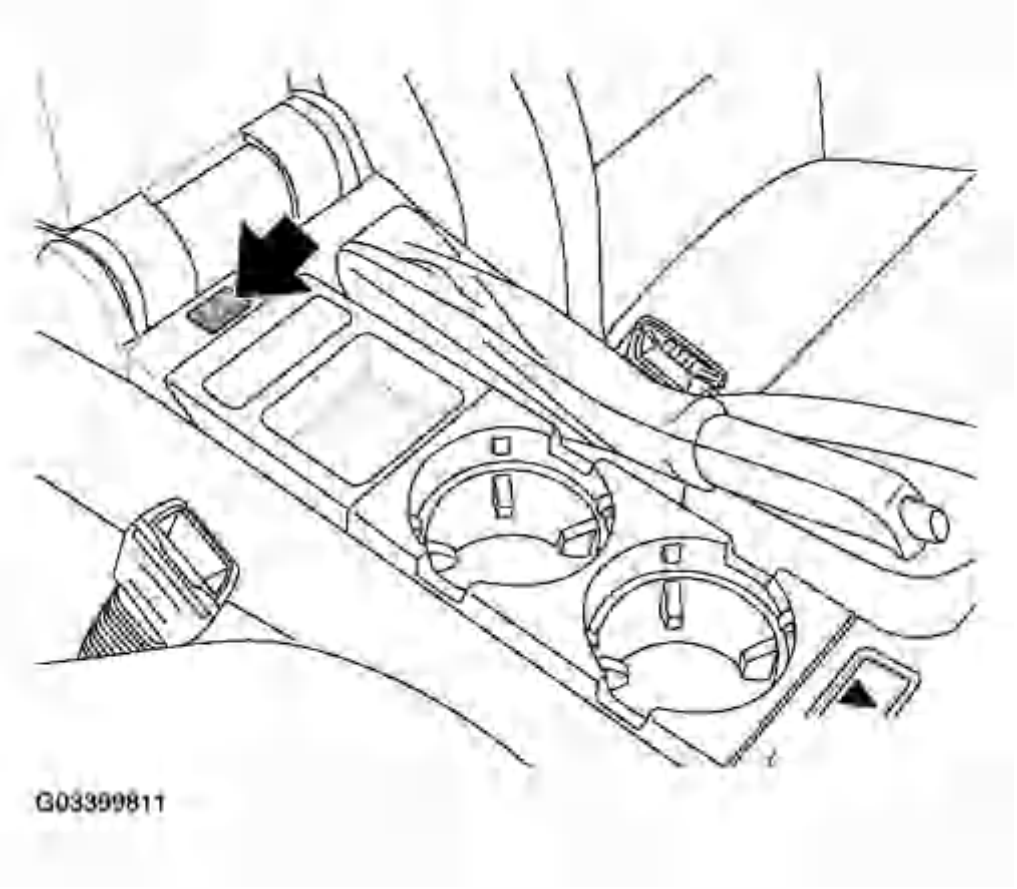


Fig. 6: Identifying Send /Receive (Pairing) Button Location (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

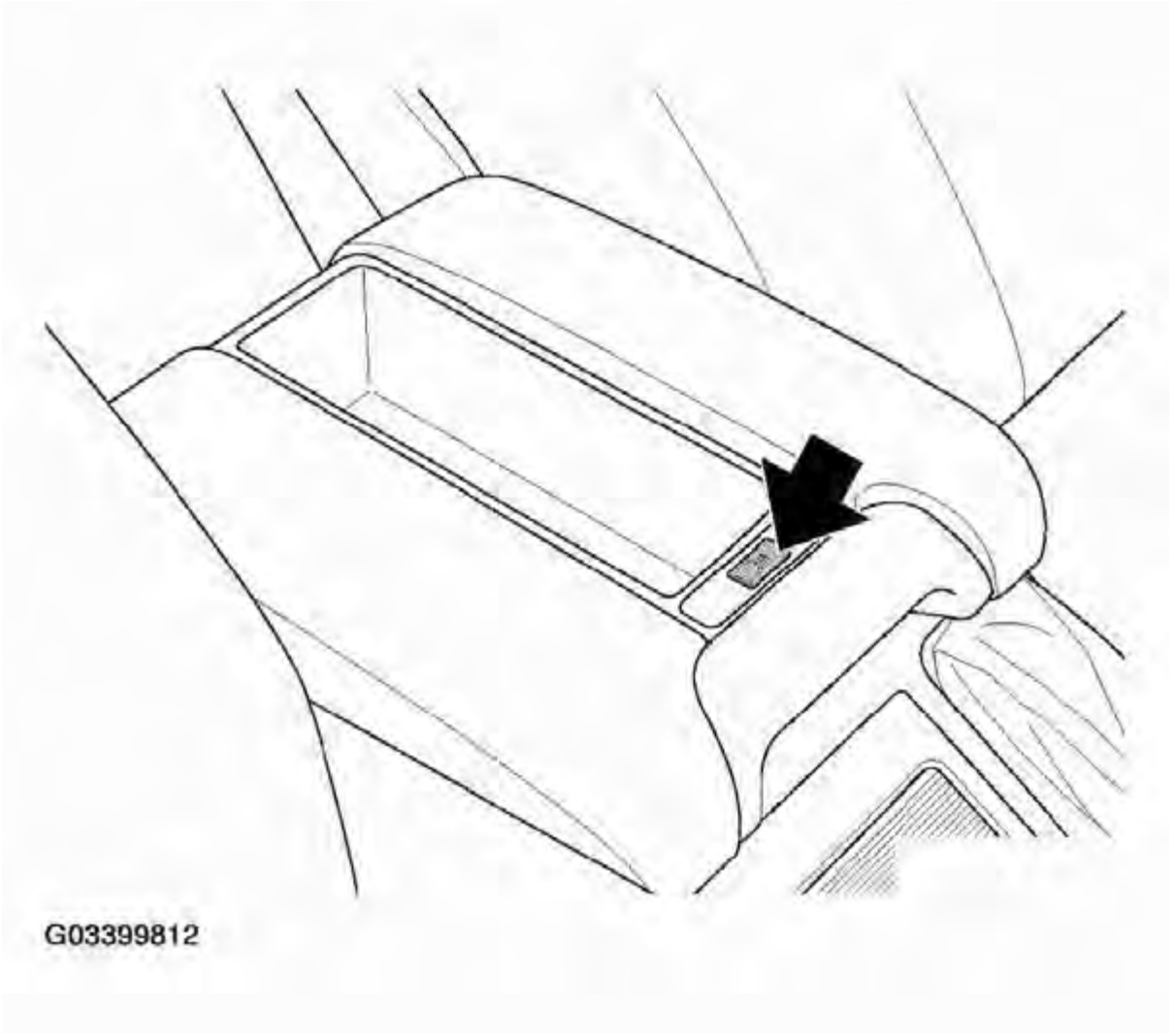


Fig. 7: Identifying Send /Receive (Pairing) Button Location (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

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.



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.

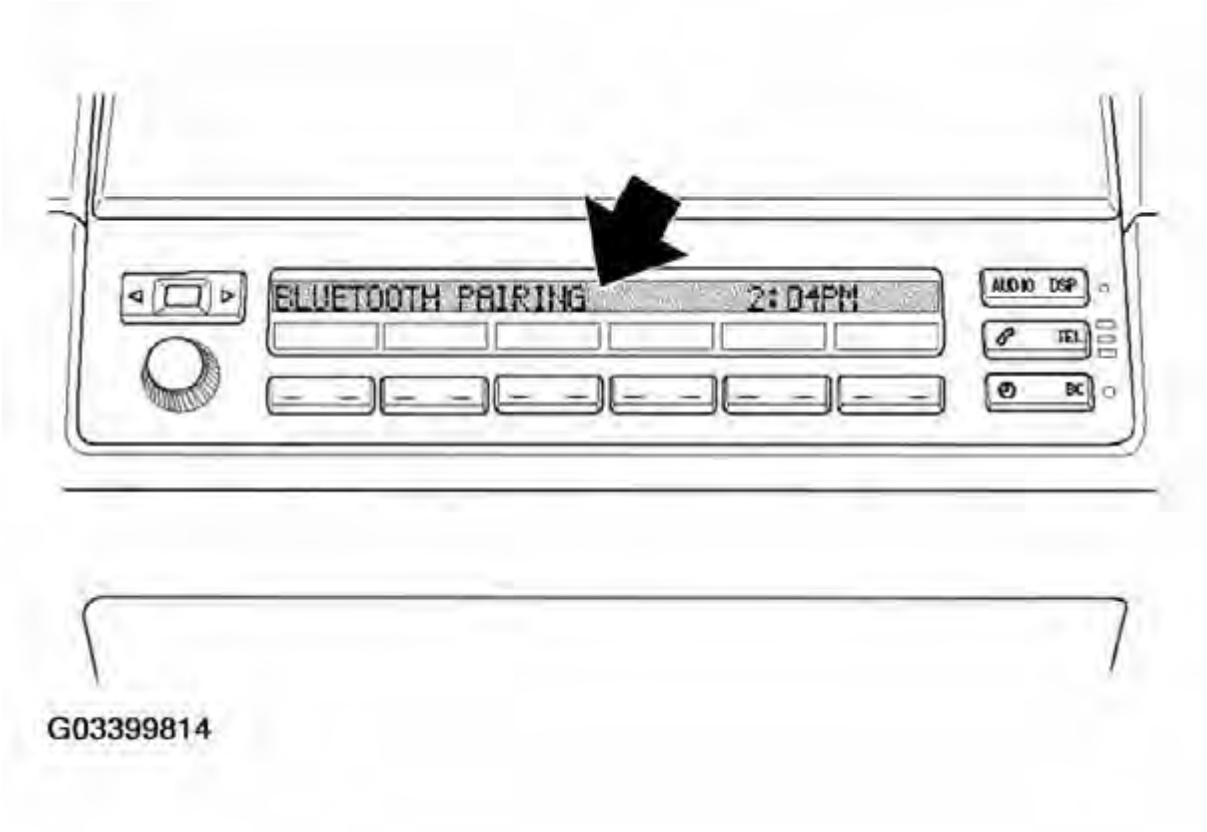


Fig. 9: Bluetooth Pairing Display
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

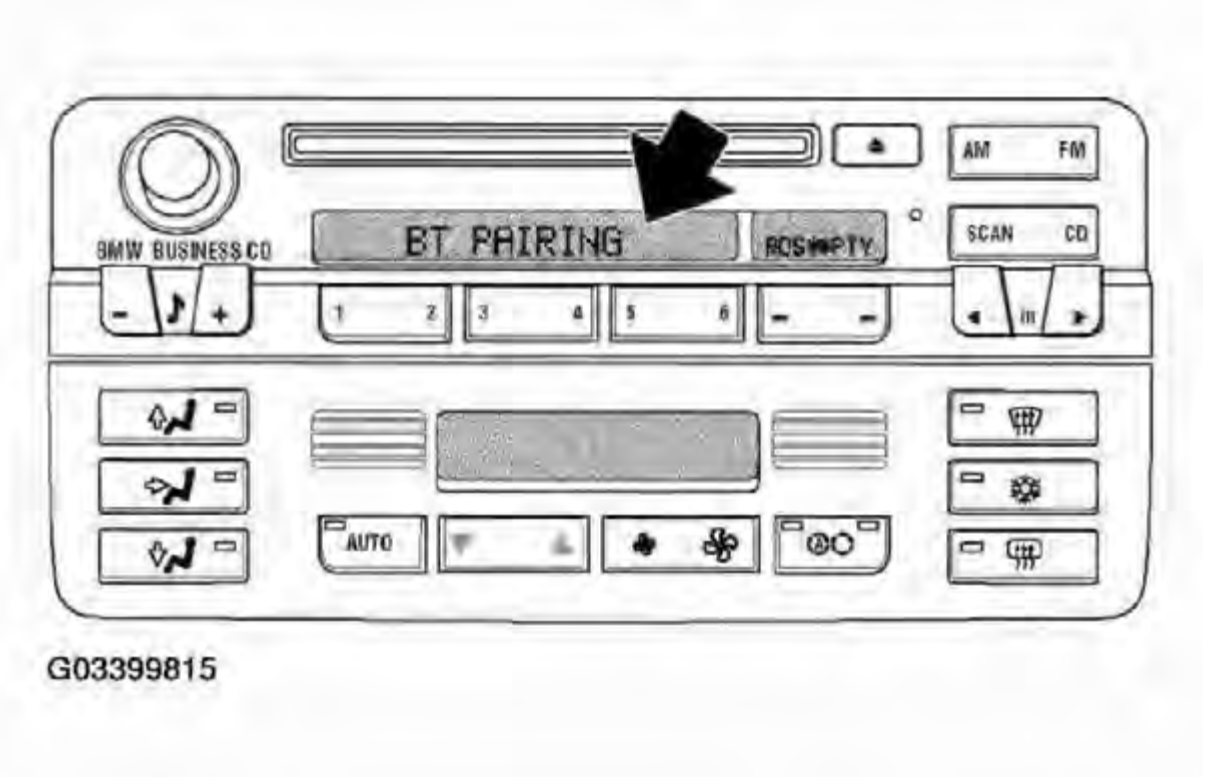


Fig. 10: BT Pairing Display
Courtesy of BMW OF NORTH AMERICA, INC.

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.

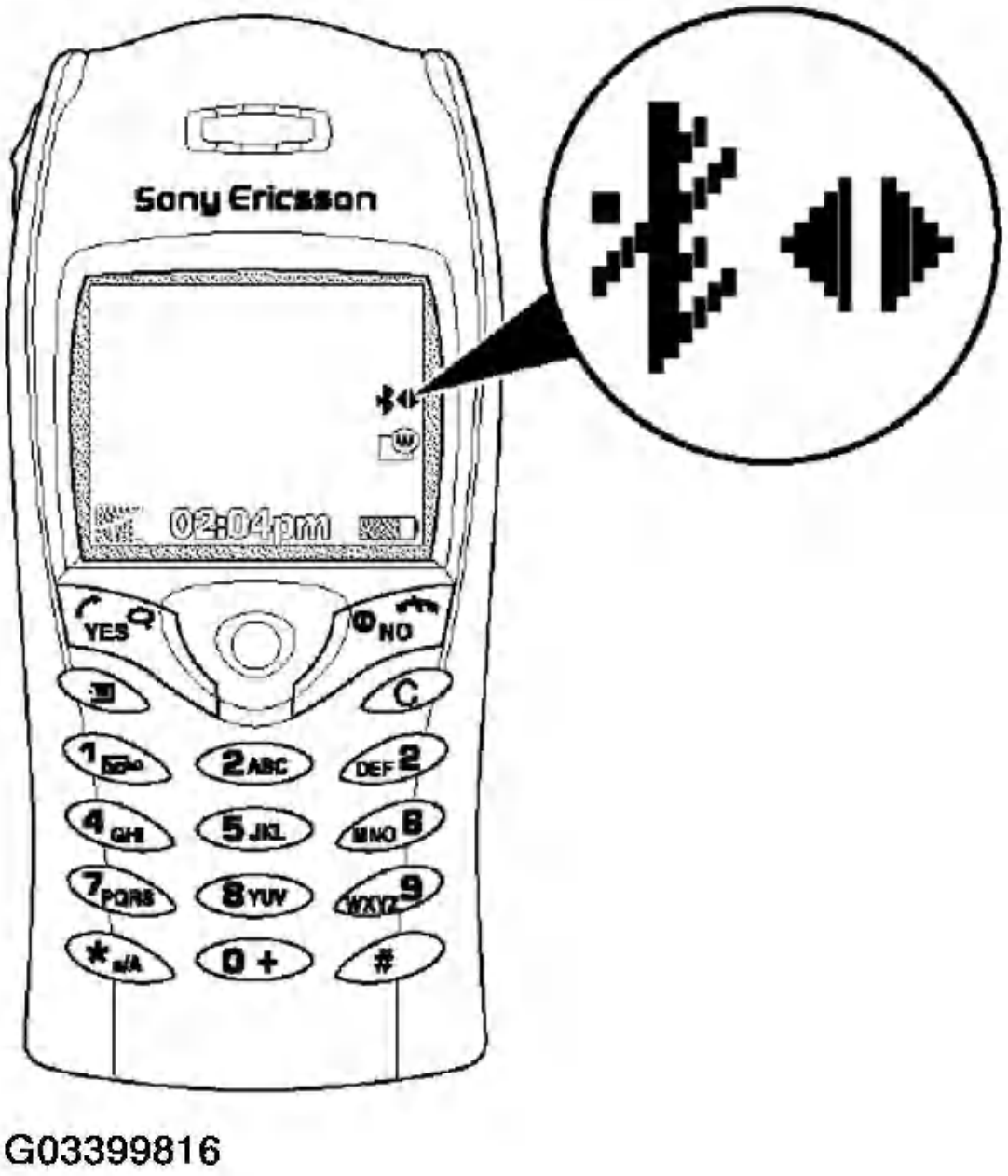


Fig. 11: Locating Connection/Settings Menu On Phone
Courtesy of BMW OF NORTH AMERICA, INC.

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:

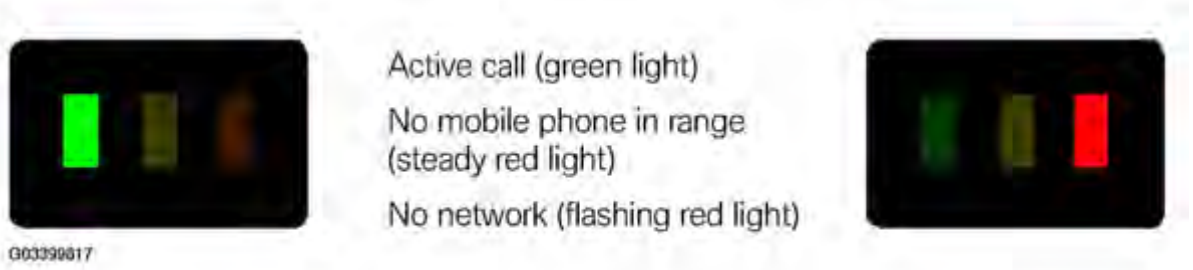


Fig. 12: Identifying Indicator Lamps
Courtesy of BMW OF NORTH AMERICA, INC.

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 ™ or ™ 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 ™ button on the steering wheel or center console to place the call.
3. Depressing the ™ 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

dis play screen or radio; plus it will always be displayed on the mobile phone after a call is placed.

4. Briefly depressing the ™ 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 Bluetooth™ mobile phone is audible when an incoming call signal is received. At the same time, the signal is sent via the Bluetooth™ interface in the mobile phone to the Bluetooth™ antenna in the vehicle. The ULF receives the incoming ring/call signal via the Bluetooth™ 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 ™ button on MFL (Steering Wheel).
- Press send/receive ™ button in the center console.
- Press send/receive key on mobile phone.

5 Series and X5 SAV without Display Screen:

- Press send/receive ™ button on MFL (Steering Wheel).
- Press send/receive key on radio.
- Press send/receive ™ 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.

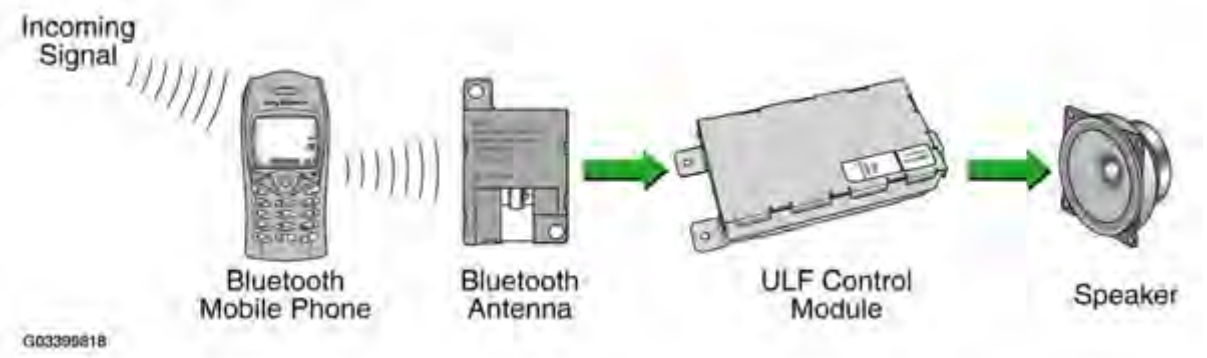


Fig. 13: Identifying Call Components (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

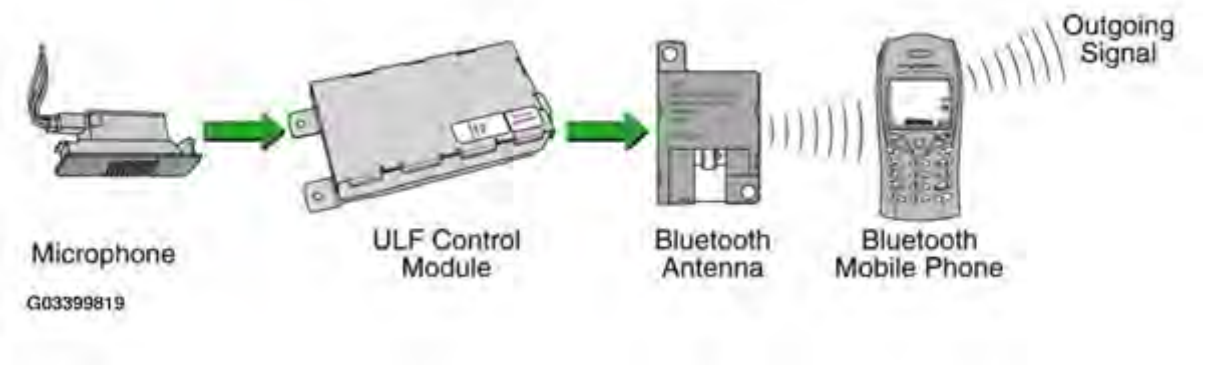


Fig. 14: Identifying Call Components (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Ending a Call

The following options are available for ending a call:

3 Series without Display Screen:

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

5 Series and X5 SAV without Display Screen:

- Press send/receive ™ button on MFL (Steering Wheel).
- Press send/receive key on radio.
- Press send/receive ™ 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.

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 Bluetooth™ 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

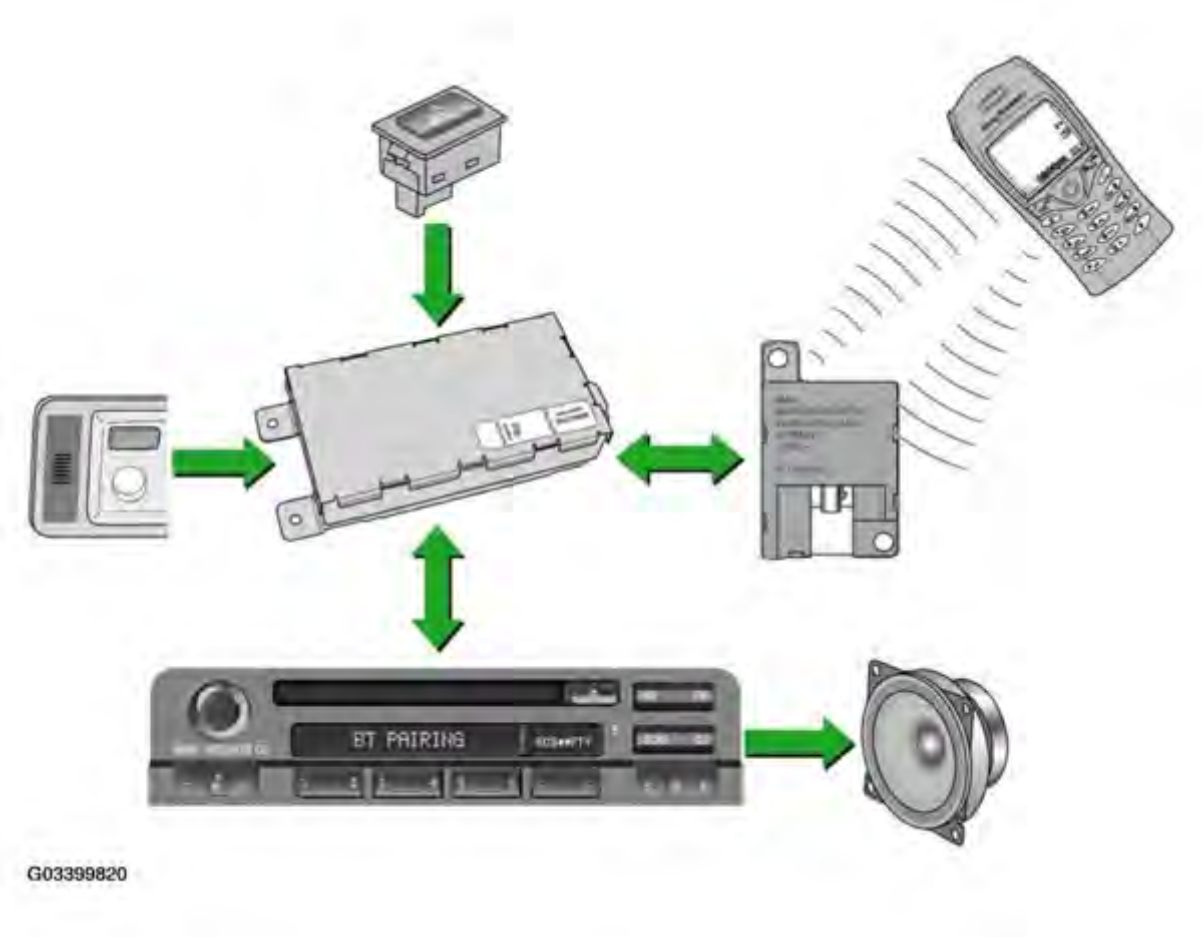


Fig. 15: Identifying Power Module System Components
Courtesy of BMW OF NORTH AMERICA, INC.

Voice Recognition

The voice recognition for the 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 to 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 GT1and 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 CODING ULF CONTROL MODULE TO VEHICLE).
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

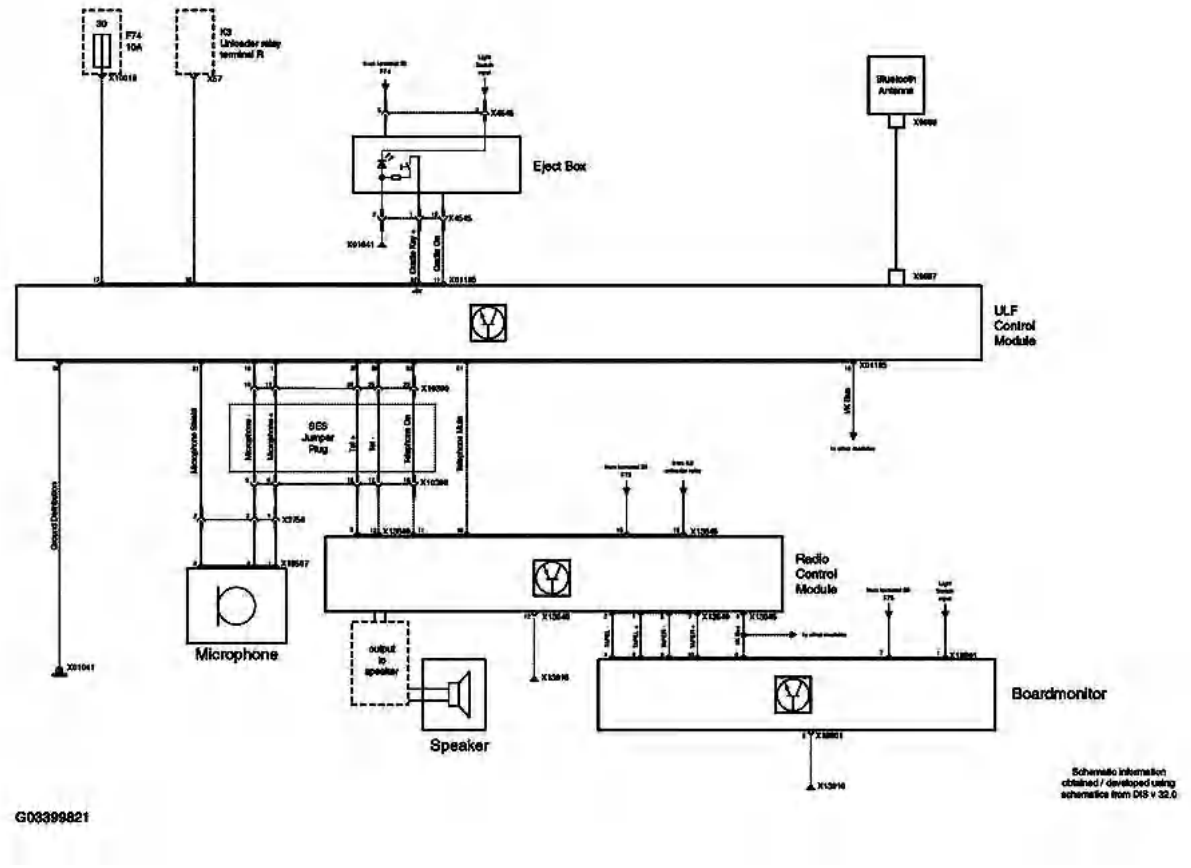


Fig. 16: ULF Wiring Schematic For E53 With Boardmonitor
Courtesy of BMW OF NORTH AMERICA, INC.

ULF Wiring Schematic for the E53 with Multi Information Display

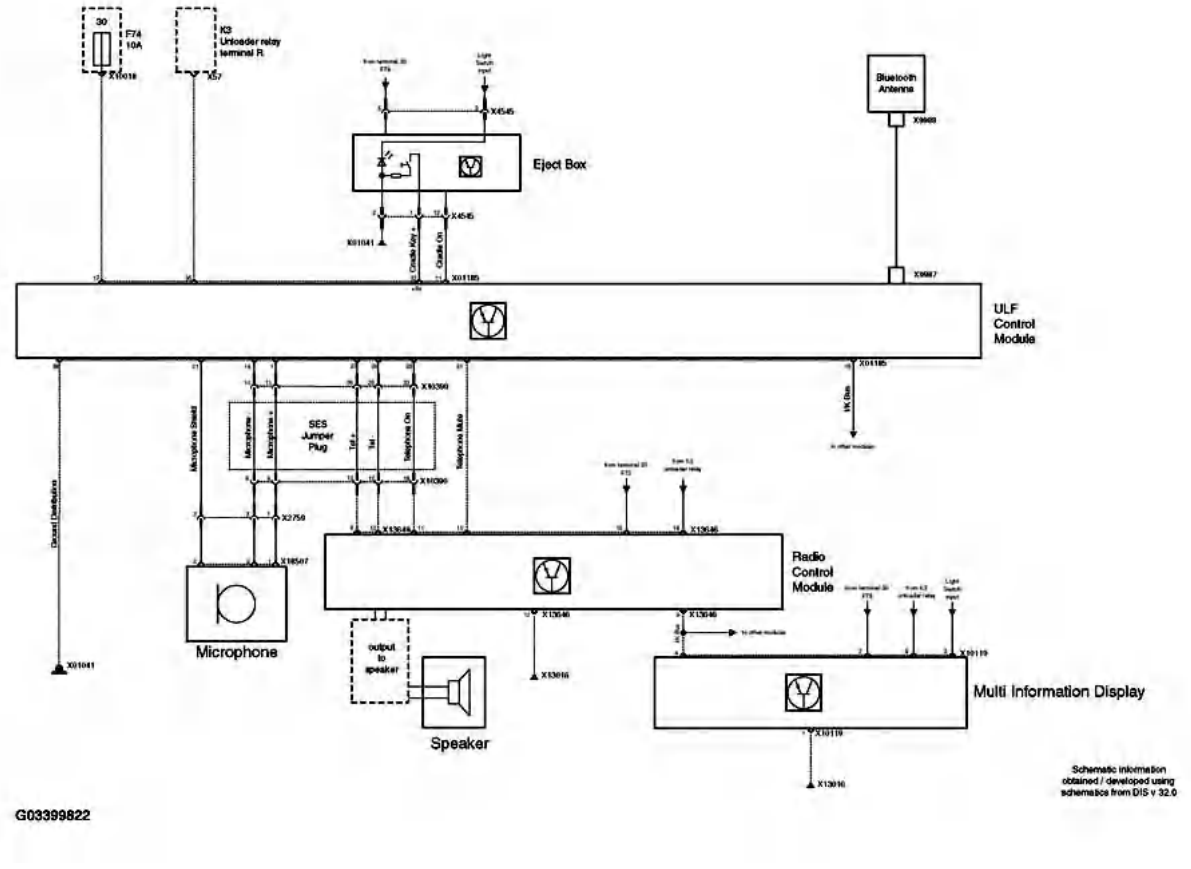


Fig. 17: ULF Wiring Schematic For E53 With MULTI Information Display

Courtesy of BMW OF NORTH AMERICA, INC.

ULF Wiring Schematic for the E39 with Boardmonitor

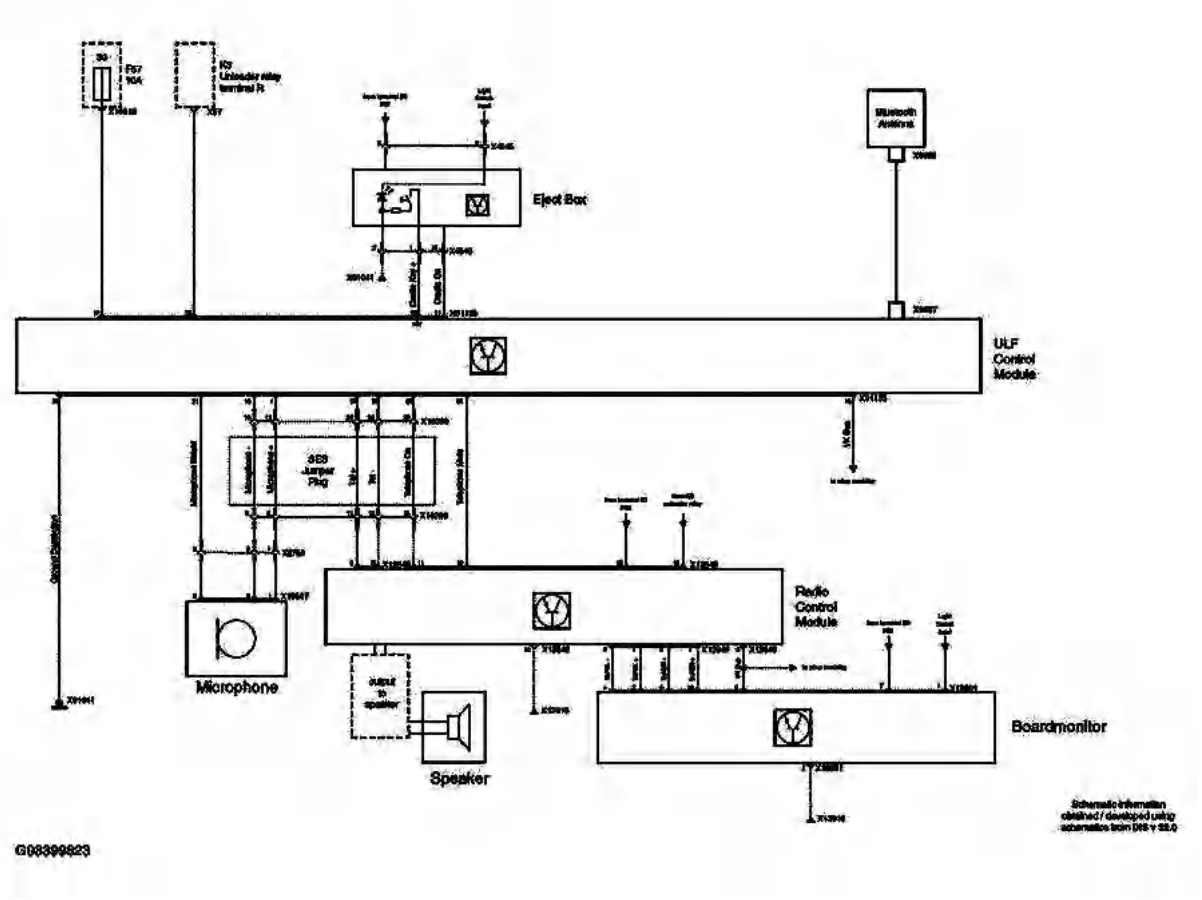


Fig. 18: ULF Wiring Schematic For E39 With Boardmonitor
Courtesy of BMW OF NORTH AMERICA, INC.

ULF Wiring Schematic for the E39 with Multi Information Display

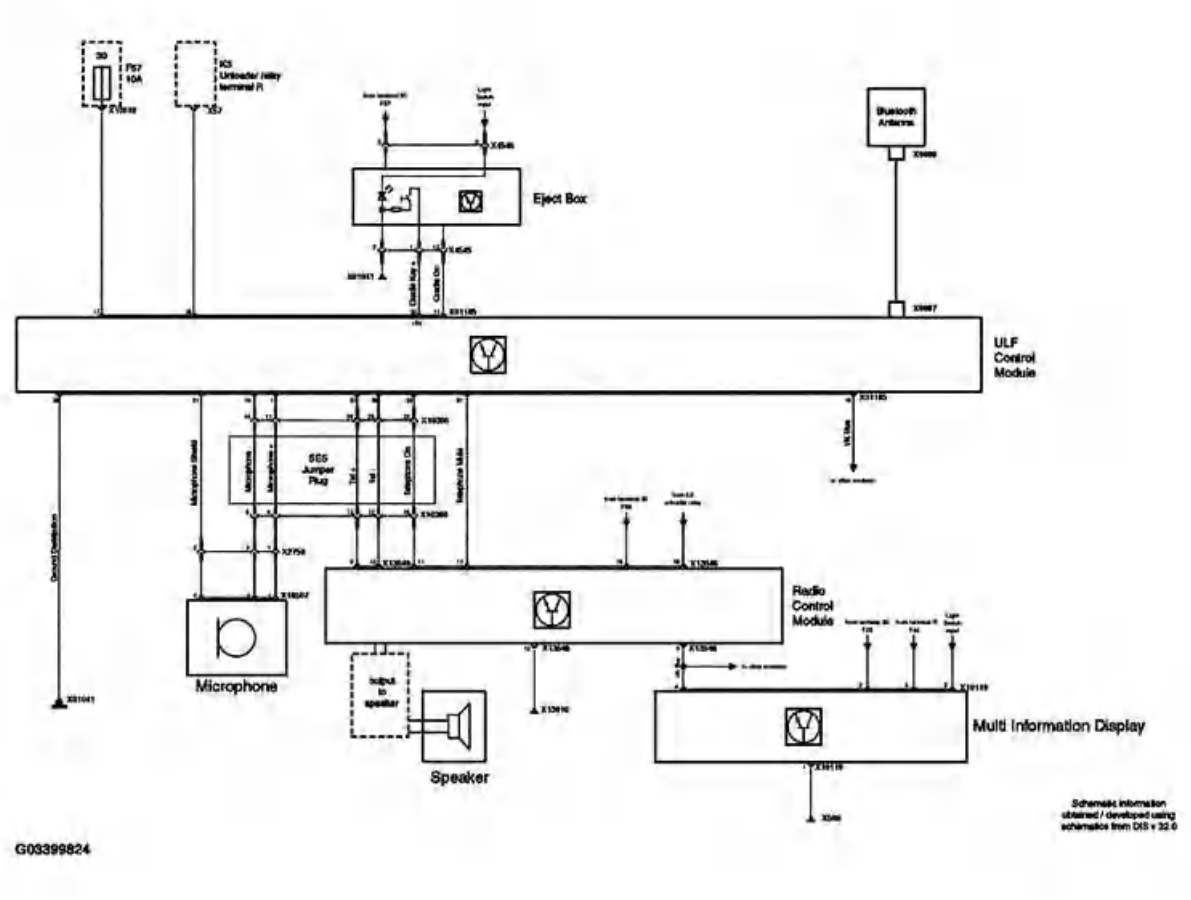


Fig. 19: ULF Wiring Schematic For E39 With Multi Information Display
Courtesy of BMW OF NORTH AMERICA, INC.

ULF Wiring Schematic for the E46 with Boardmonitor

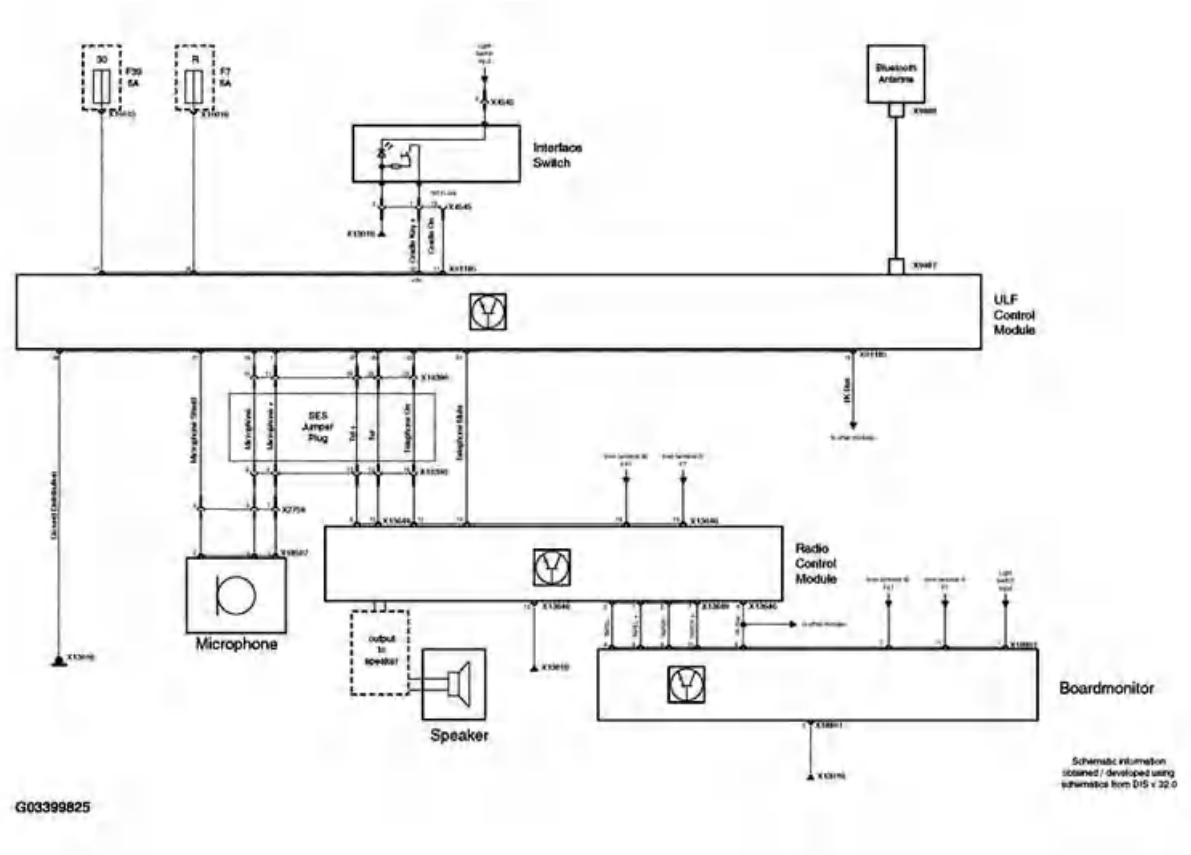


Fig. 20: ULF Wiring Schematic For E46 With Boardmonitor
Courtesy of BMW OF NORTH AMERICA, INC.

ULF Wiring Schematic for the E46 without the Boardmonitor

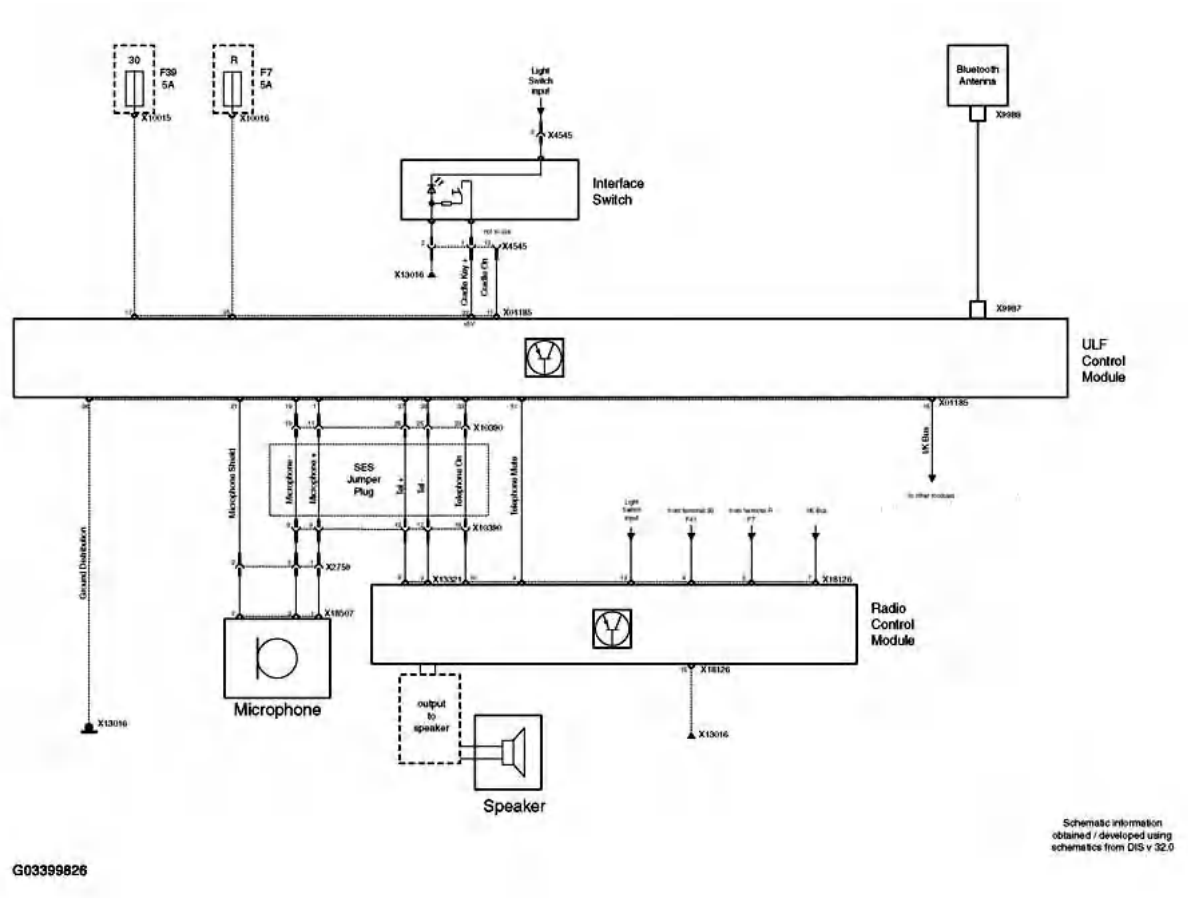


Fig. 21: ULF Wiring Schematic For E46 Without Boardmonitor
Courtesy of BMW OF NORTH AMERICA, INC.

Article GUID: A00232177

DRIVER INFORMATION PART 1

E36 DRIVER INFORMATION SYSTEMS

Model: E36, E36/5, E36/7

Production Date: From Production Start

Introduction

The driver information systems found on the E36 and Z3 models consists of the following components/systems:

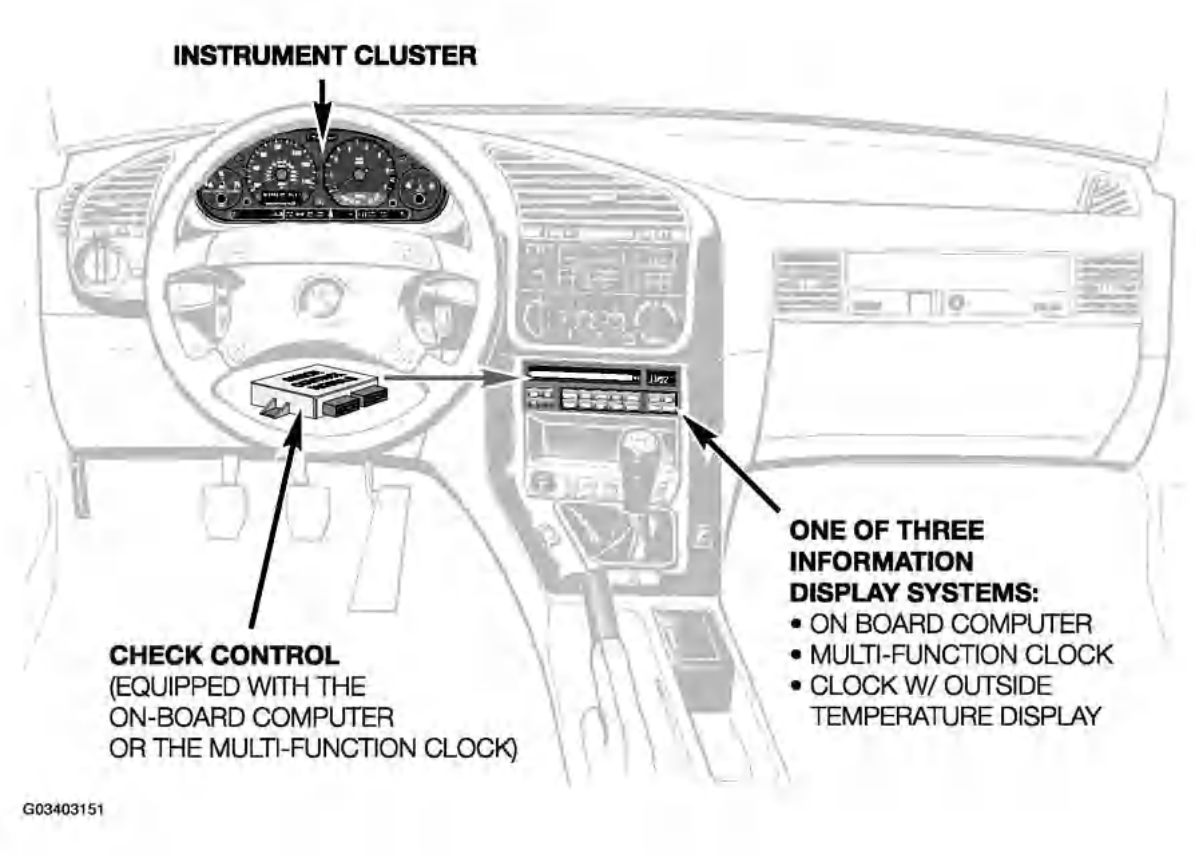


Fig. 1: Identifying Driver Information Systems Components
Courtesy of BMW OF NORTH AMERICA, INC.

Different systems are found on the E36s depending on the Model Year, standard/optional equipment and/or specific vehicle.

There are two different instrument clusters used on the E36 and Z3 depending on the Model. Although they look the same and function generally the same there are differences between the models and over the model years.

One cluster is connected to the diagnostic link for troubleshooting purposes and the other incorporates self contained test functions. The latest models have both features.



Fig. 2: Identifying Instrument Cluster
Courtesy of BMW OF NORTH AMERICA, INC.

The higher line models incorporate a check control warning system for various lamp failures and low fluid levels. The majority of system failure warnings are through the instrument cluster warning lamps positioned on the face of the cluster.

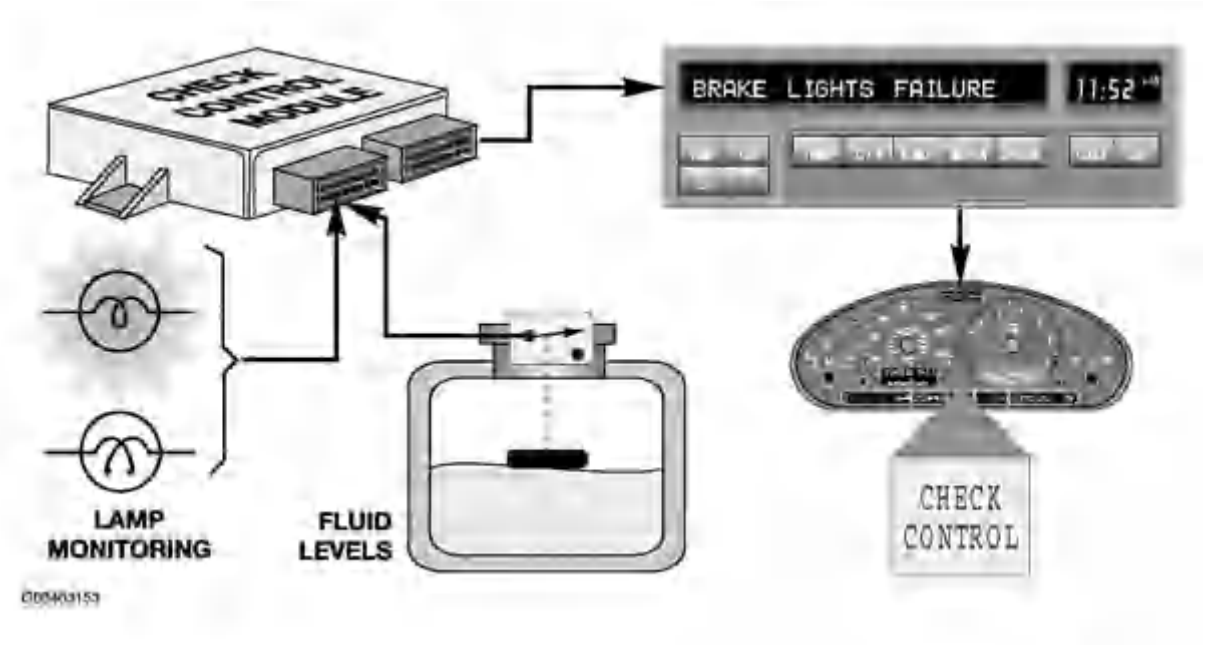


Fig. 3: View Of Checking Control Warning System
Courtesy of BMW OF NORTH AMERICA, INC.

The high line models also have the option of the full touring On-board Computer system.

This system incorporates the display matrix for the check control system.

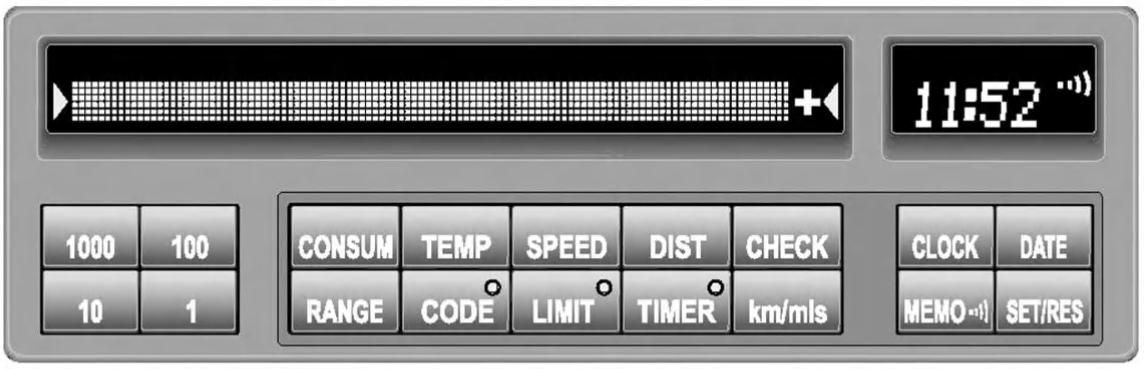


Fig. 4: Identifying Computer System Display
Courtesy of BMW OF NORTH AMERICA, INC.

The Multifunction Clock incorporates the Check Control system and a digital clock.

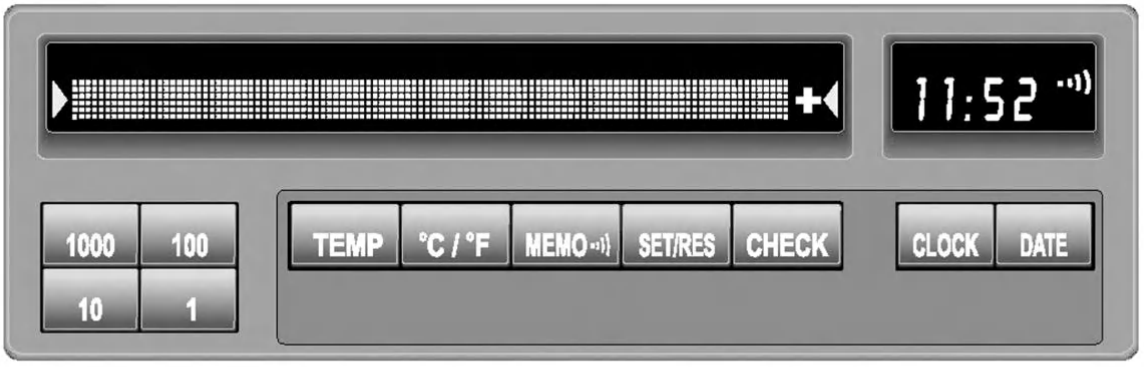


Fig. 5: View Of Multifunction Clock Display
Courtesy of BMW OF NORTH AMERICA, INC.

Standard equipment is the digital clock which contains an outside temperature display.

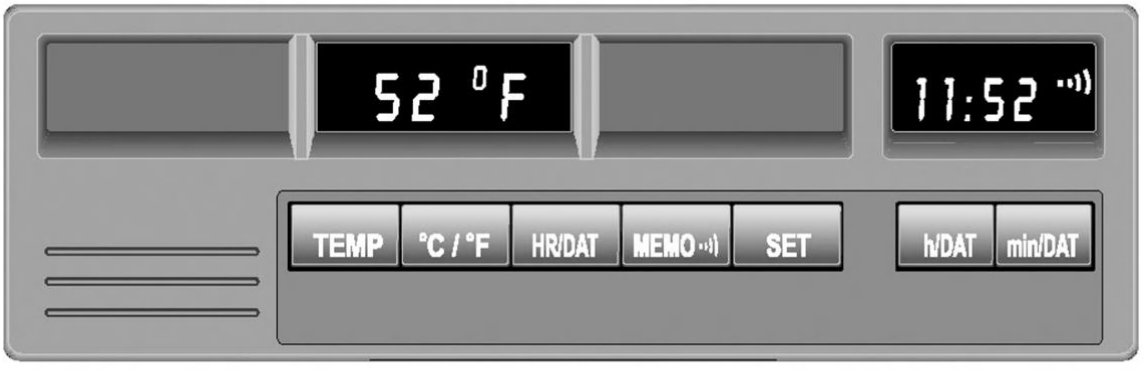


Fig. 6: Identifying Temperature Display

Courtesy of BMW OF NORTH AMERICA, INC.

A limited function Board Computer is offered as an option for the E36ti and Z3 models.



Fig. 7: Identifying Board Computer
Courtesy of BMW OF NORTH AMERICA, INC.

Instrument Cluster

Overview

The instrument cluster in the E36/Z3 consists of the main circuit board with the microprocessor, driver electronics, LCD display block and the instrument mount with the analog gauges.

There are several different variations of the cluster depending on the model and year.

The general breakdown of cluster variations is as follows:

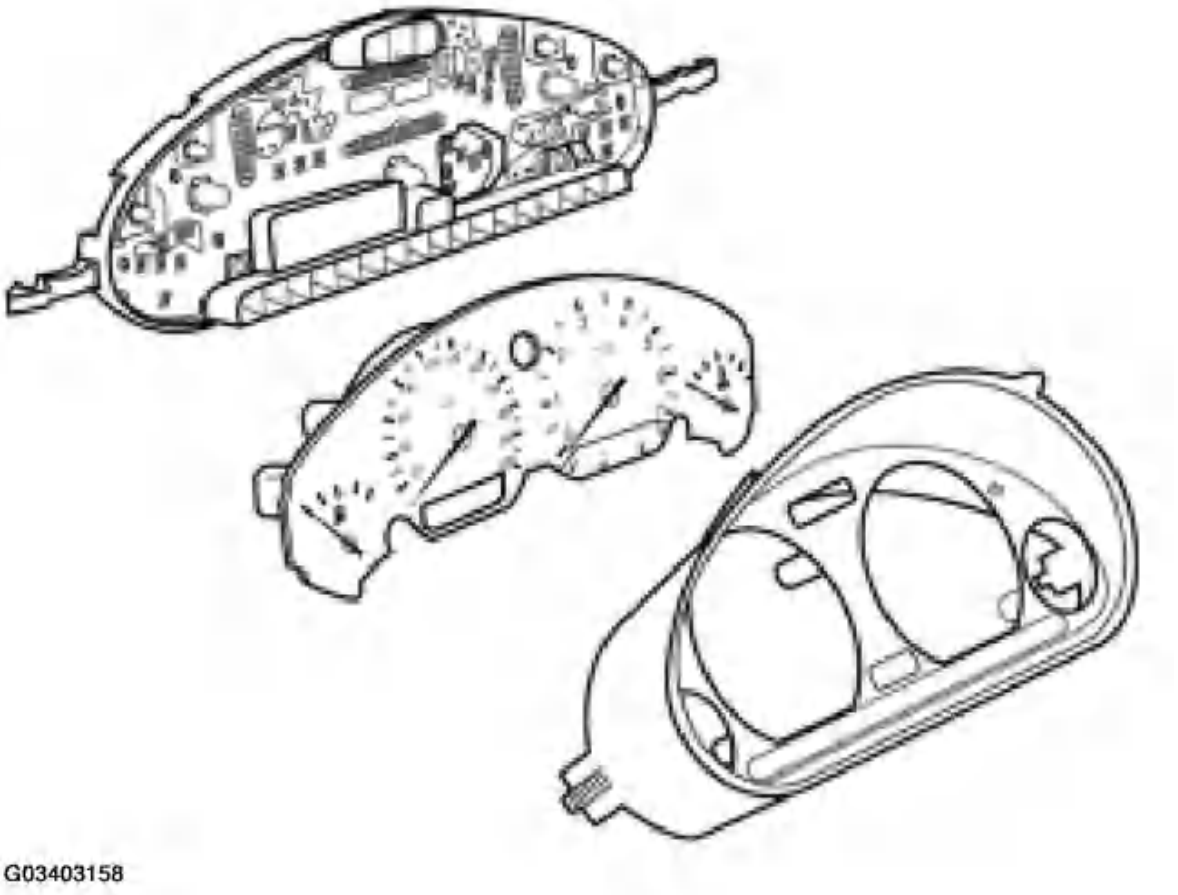


Fig. 8: Identifying Instrument Cluster
Courtesy of BMW OF NORTH AMERICA, INC.

E36 4 door/Coupe/Convertible/M3: from 1992 to 1996 model year.

- Cluster is on the diagnostic link. The cluster communicates with the DIS for diagnosis and coding functions. This variation uses the central coding key (ZCS) for model specific coding. This cluster also stores the ZCS for replacement control modules in need of coding.

E36/5 (318ti): from 1995 to 1998 model year, E36/7 (Z3): from 1996 to 1998 model year

- Cluster is not on the diagnostic link. This variation uses a separate coding plug for model specific coding, mileage and service interval information transfer into a replacement component.

E36 4 door/coupe/Convertible/M3: from 1997 model year to production end.

- Cluster is on the diagnostic link. The cluster communicates with the DIS for diagnosis and coding functions. This variation also utilizes the separate coding plug for mileage and service interval information transfer to the replacement component.

E36/5: Model year 1999, E36/7: from 1999 model year to production end.

- Cluster is on the diagnostic link. The cluster communicates with the DIS for diagnosis and coding functions. This variation uses a separate coding plug for mileage and SIA data transfer to the replacement component. This cluster is also connected to the CAN bus.

Though the instrument cluster assembly is the sum of many parts, it is only available as a complete replacement unit with only the indicator lamps and backlighting bulbs being serviceable. The rear of the cluster has pictograms of the indicator symbols for easy identification as shown in example below.

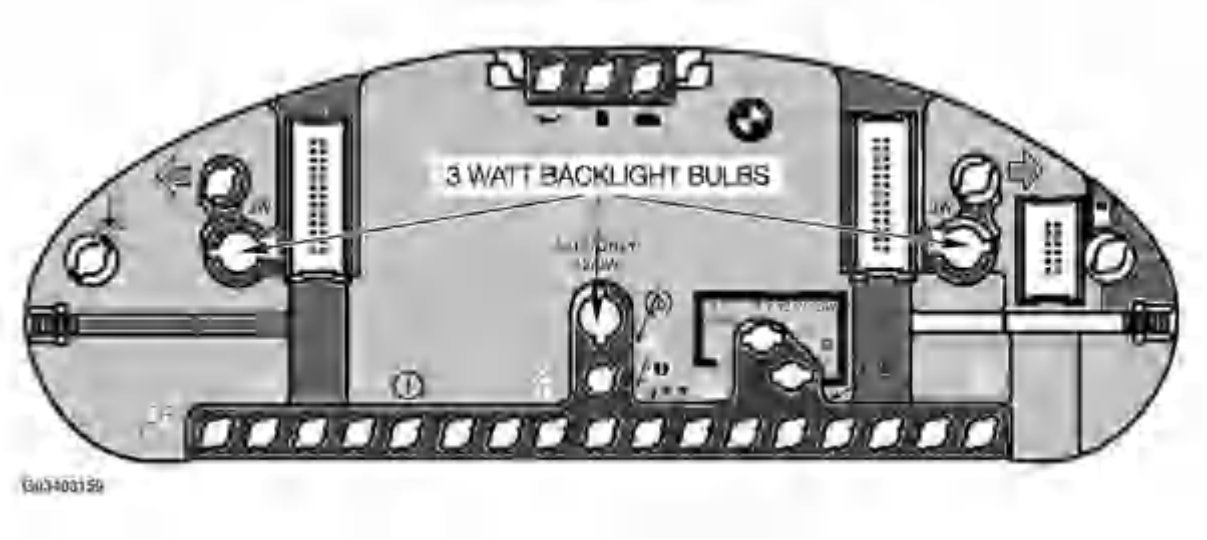


Fig. 9: Identifying Backlight Bulbs
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement instrument clusters that are connected to the diagnostic link require coding with the DIS tester or MoDiC using the central coding key (ZCS).

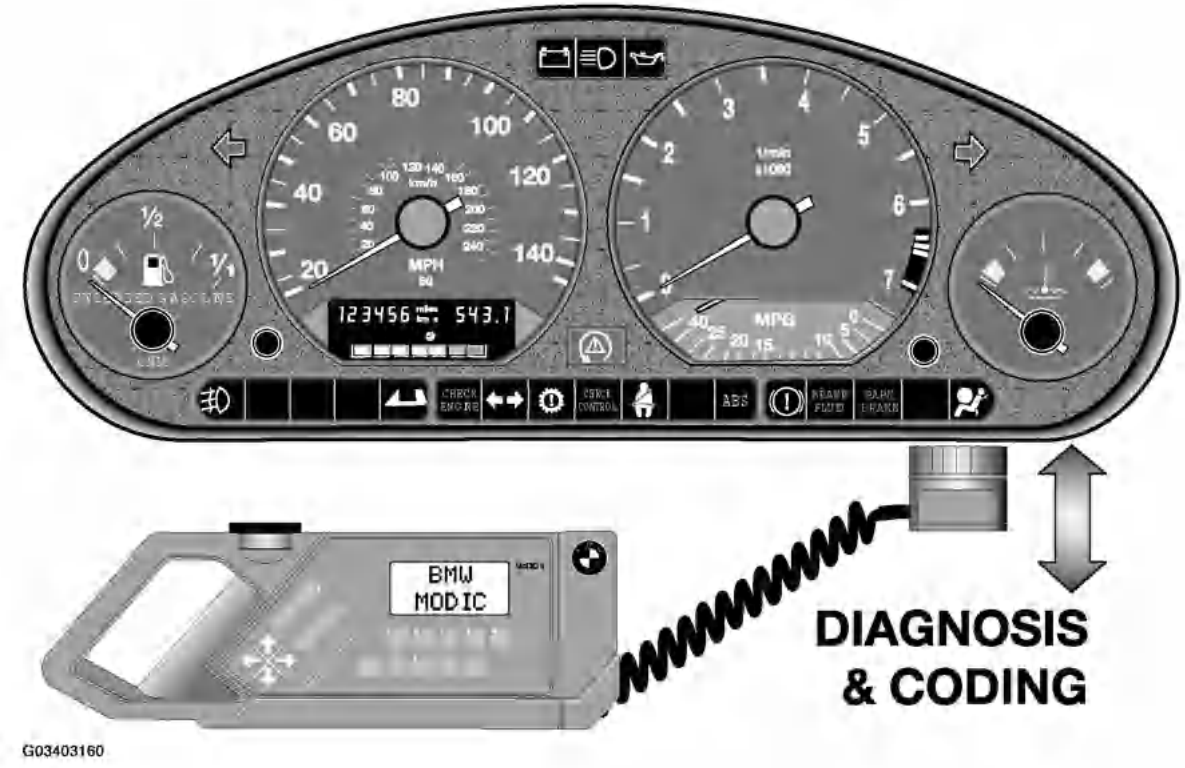


Fig. 10: View Of Programming Unite Connected To Instrument Cluster
Courtesy of BMW OF NORTH AMERICA, INC.

The software and hardware of the cluster are being continuously updated and revised. This requires careful attention to the latest appropriate articles for the latest information and data on cluster compatibility from one version to the next.

Instrument Cluster Display Functions

All the gauges on the cluster are electronically driven analog needle displays. The inputs to the cluster are processed by the main circuit board as follows:

Road Speed - The signal from the rear axle reed contact is processed by the cluster for display. The processed signal is also transmitted as an output of the cluster as "Speed Signal A" to other control modules that require road speed as an input.

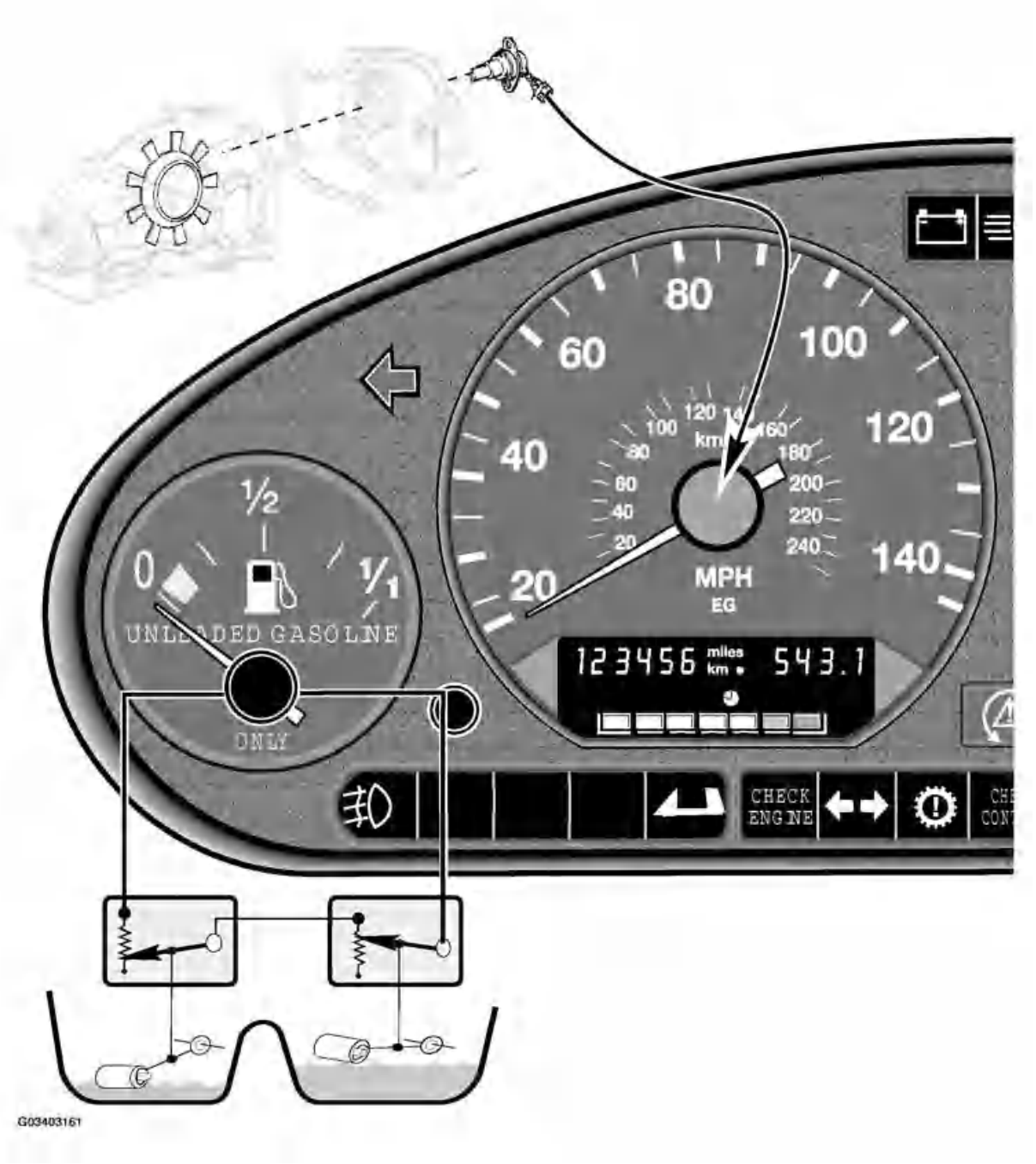


Fig. 11: Identifying Instrument Cluster Display
Courtesy of BMW OF NORTH AMERICA, INC.

Fuel Gauge - Two lever type floats wired in series provide the input for the fuel gauge display.

When the fuel reserve threshold is reached, the low fuel warning LED is illuminated.

Engine Speed - The "TD" signal is a processed output of the engine control module that the cluster uses for the tachometer display. This signal is provided by the CAN bus from 1999 for the Z3.

Economy Display - The cluster uses the "Ti" and road speed input signals to determine the instantaneous fuel consumption for display on the gauge.

This gauge is not equipped on 318ti and roadster instrument clusters.

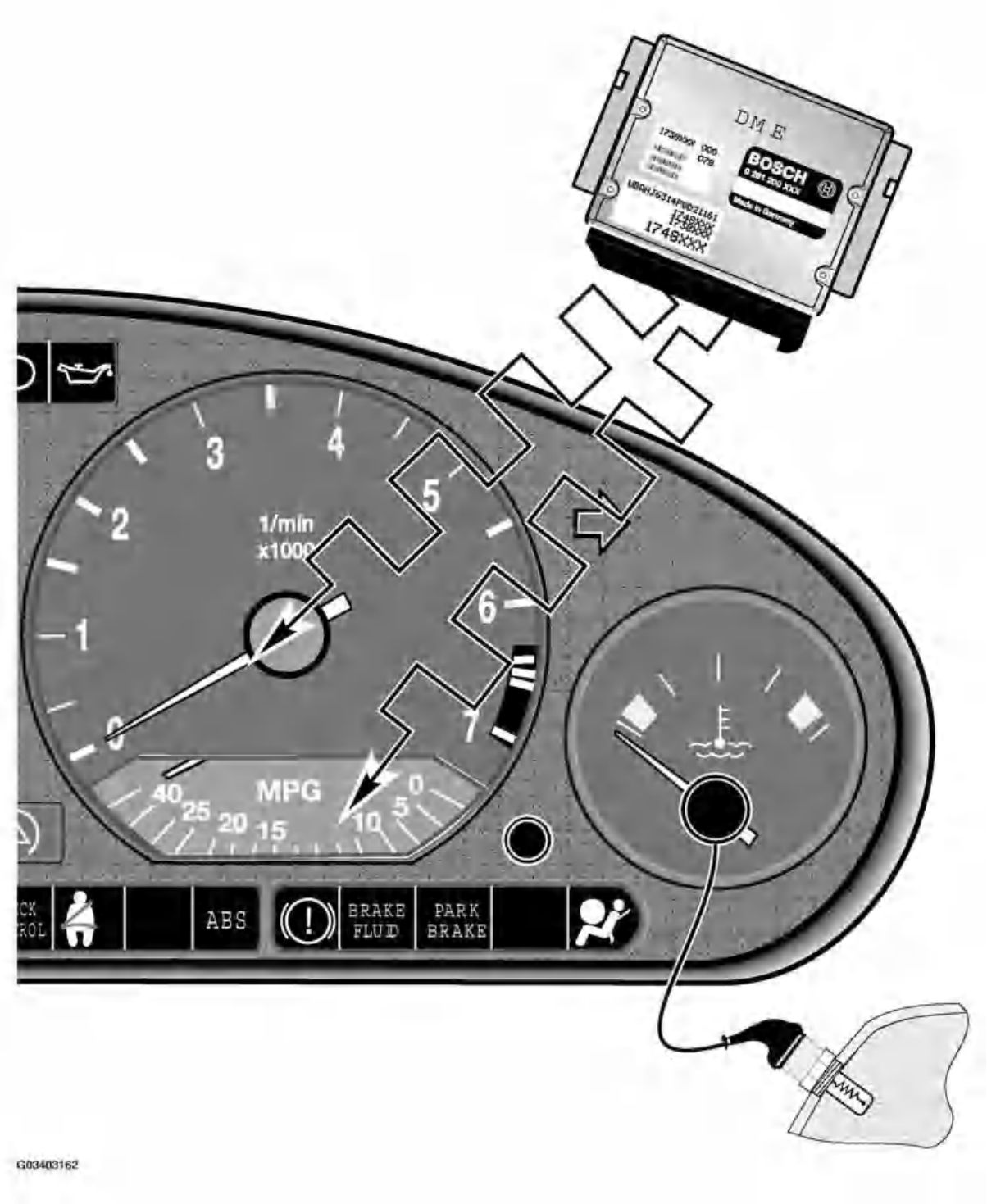


Fig. 12: View Of Economy Display
Courtesy of BMW OF NORTH AMERICA, INC.

Coolant Temperature Gauge - The input signal from the engine coolant temperature sensor is processed for display on the temp gauge.

The overheat warning LED is illuminated if the coolant temperature exceeds approximately 125Â° C (240Â° F).

Total Mileage/Trip Odometer - The signal from the rear axle reed contact is also processed for accumulated mileage display.

The processed signal is displayed in the LCD block below the speedometer. Depending on model and year, the total mileage reading is stored electronically as follows:

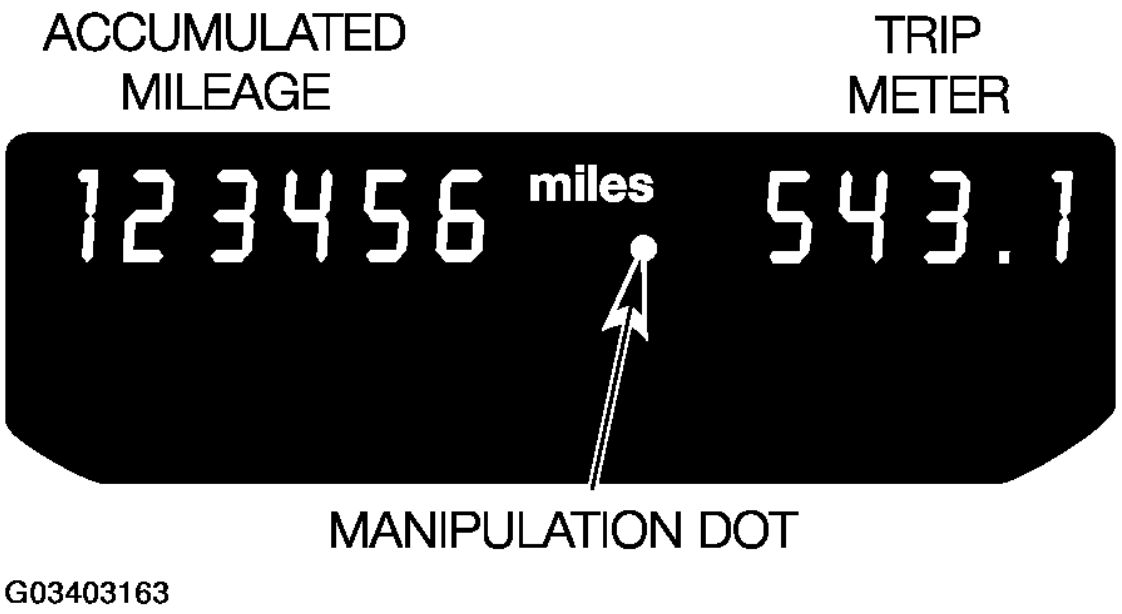


Fig. 13: Identifying Total Mileage/Trip Odometer
Courtesy of BMW OF NORTH AMERICA, INC.

- 1992-1996 E36 4 door/coupe/convertible/M3 in an EEPROM on the main circuit board.
- 1995-1999 318ti in an EEPROM on the main circuit board and in the instrument cluster coding plug.
- 1996-2002 Z3 in an EEPROM on the main circuit board and in the instrument cluster coding plug
- 1997-1998 E36 4 door/coupe/convertible/M3 in an EEPROM on the main circuit board and in the instrument cluster coding plug.

Service Interval Indicator - SI information is also displayed in the LCD block with the mileage - when the ignition is switched on. All models use SI II processing for "Oil Service "and "Inspection" intervals.

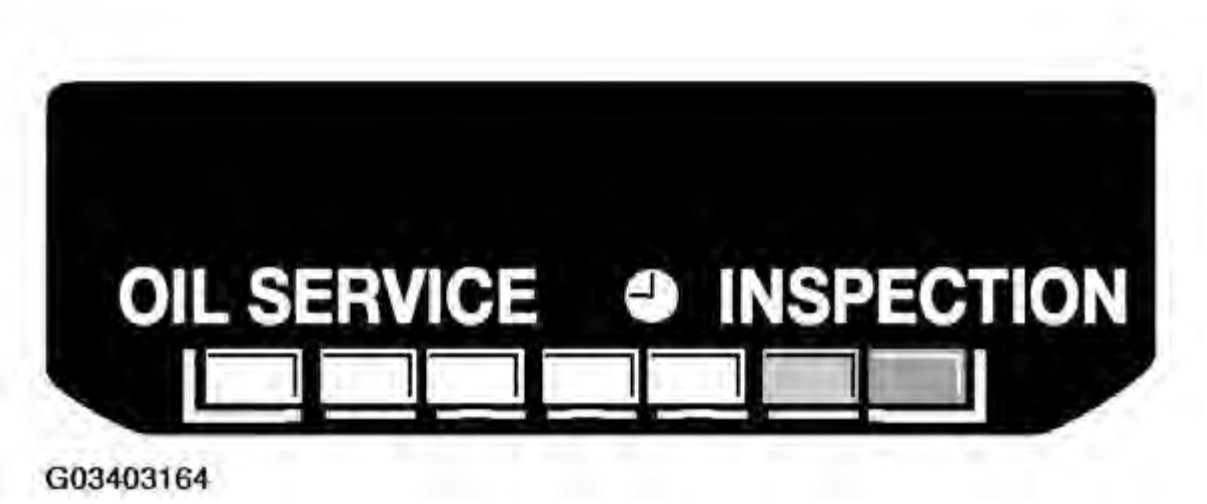


Fig. 14: View Of Service Interval Indicator
Courtesy of BMW OF NORTH AMERICA, INC.

Indicator and Warning Lamps - The various lamps are positioned at the top center and along the bottom of the cluster display. They are controlled internally by the cluster or externally by other sensors and modules

where required by legislation.

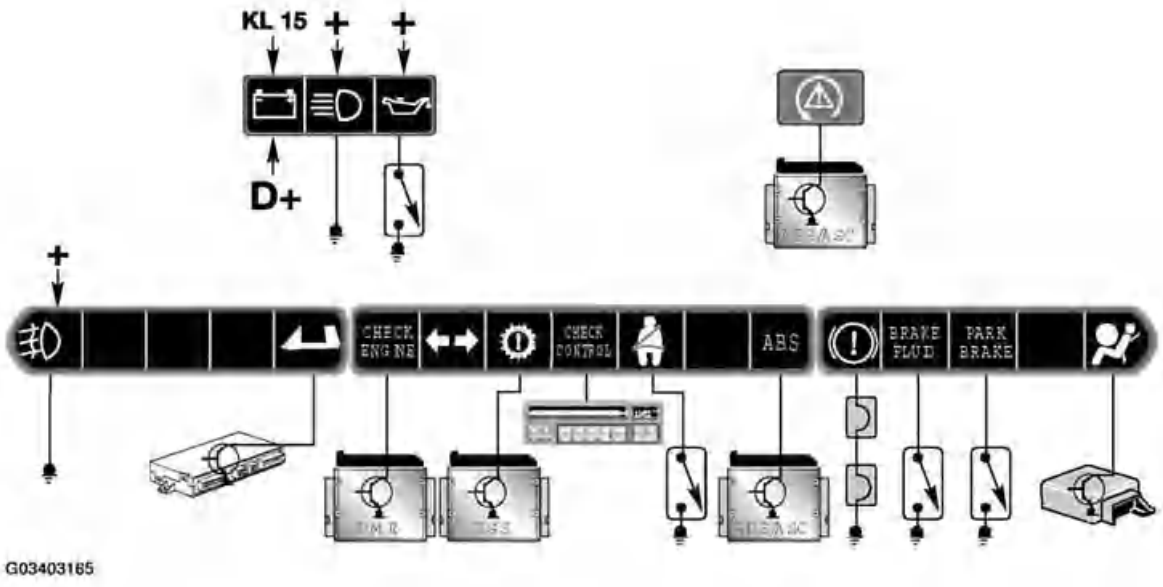


Fig. 15: Identifying Indicator And Warning Lamps
Courtesy of BMW OF NORTH AMERICA, INC.

Cluster Display Changes

Minor changes have occurred to the face of the cluster as follows:

- 1995 model year: The maximum mileage display for the speedometer was changed from 160 MPH to 155 MPH.



Fig. 16: View Of Updated Speedometer
Courtesy of BMW OF NORTH AMERICA, INC.

- 1997 model year: The temperature gauge display was changed - the middle bar on the face of the gauge was deleted.

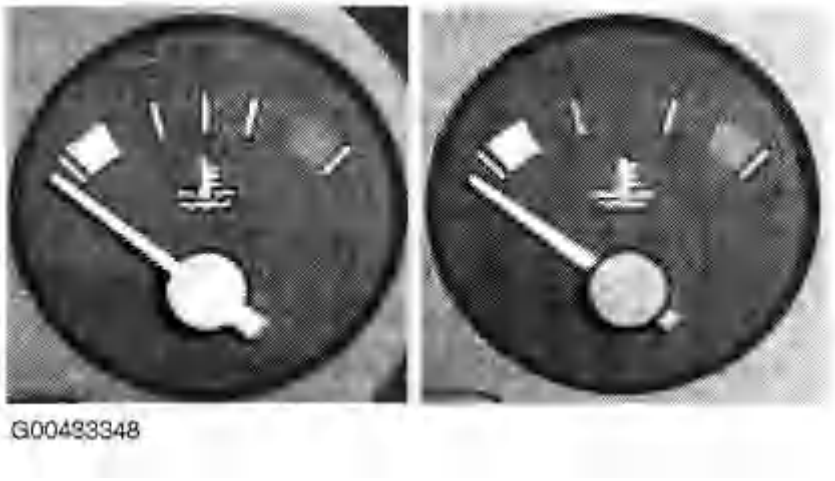


Fig. 17: Identifying Updated Temperature Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

Instrument Cluster Testing

1992 - 1996 E36 - 4 door/Coupe/Convertible/M3

The instrument cluster is connected to the diagnostic link. The majority of the diagnosis and troubleshooting will be carried out using the DIS tester and diagnostic procedures.

There is a self test that can be carried out on the cluster by pressing the trip odometer reset button and switching the ignition to KL R. All gauges move from the zero position to the maximum display and back again. The warning lamps are illuminated as a bulb check.

In addition, vehicle specific data is displayed in the LCD matrix as follows:



Fig. 18: Identifying Instrument Cluster LCD Matrix
Courtesy of BMW OF NORTH AMERICA, INC.

- BMW PART NUMBER (6 digits)
- CODE NUMBER (5 digits)
- K NUMBER (4 digits)
- CHASSIS NUMBER (5 digits)

- SOFTWARE VERSION (3 digits)
- REVISION INDEX (2 digits)

The self test is canceled by switching the ignition off or to KL 15.

1995 - 1998 E36/5 (318ti)

1996 - 1998 E36/7 (Z3 roadster)

1997 - 1998 E36 4 door/Coupe/Convertible/M3

The 318ti and Z3 clusters prior to 9/98 are not connected to the diagnostic link for troubleshooting. However they do incorporate several built in test values that can be accessed through the LCD matrix display.

Starting with the 1997 model year production, the balance of the E36 line also has these test functions in addition to the diagnostic link for troubleshooting purposes, there are 15 different test functions that can be used to check various outputs of the cluster and the status of various input signals.

- Test functions 1-4 are unlocked tests and can be called up at any time for display.
- Test functions 5-14 are locked and require unlocking the test mode before they can be displayed.
- Test functions 2-14 can be selected at any time when the cluster is unlocked, even when the vehicle is moving.
- Test function 15 is the lock/unlock function.

TEST FUNCTION SUMMARY

TEST NO. 15

LOCK/UNLOCK - Press and hold the mileage reset button while switching "ON" KL R. "tESt" appears in the digital display.

Pressing the reset button will scroll through the test functions until "tESt 15 L ON" is displayed.

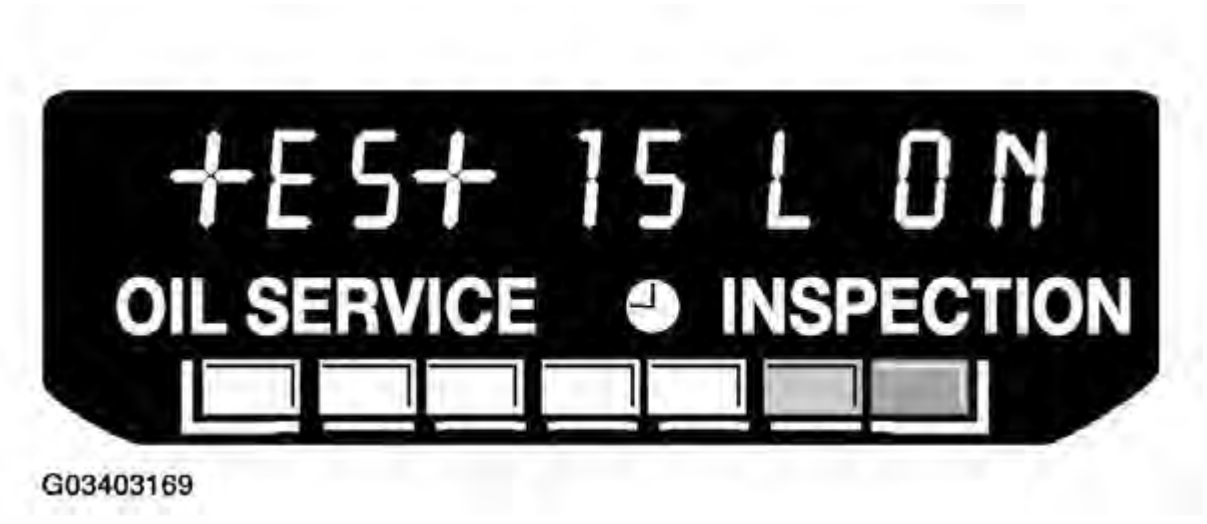


Fig. 19: View Of Test 15 In Digital Display
Courtesy of BMW OF NORTH AMERICA, INC.

Pressing and holding the reset button for three seconds will cause the display to cycle back and forth between ON/OFF. With "tESt L OFF" displayed any test function can now be accessed.

TEST NO. 01:

INSTRUMENT CLUSTER SELF TEST - All of the gauges are activated and the warming lamps are

illuminated as an output test as described on the previous page. At the end of the test, the cluster exits the test mode.

TEST NO. 02

ENGINE DATA - This display is an "engine factor" value that is stored in the coding plug. The instrument cluster processor uses this factor in addition to the "TD" signal from the DME control module to process and display tachometer RPM based on the engine installed. For example:

- ENGINE FACTOR 2 = 4 CYLINDER
- ENGINE FACTOR 3 = 6 CYLINDER
- ENGINE FACTOR 4 = 8 CYLINDER

TEST NO. 03

SI ELAPSED DISTANCE - The total mileage in kilometers since the last reset. Which service is due at the next inspection (OIL SERVICE or INSPECTION).

TEST NO. 04

SI ELAPSED DAYS - No value for U S vehicles. Relates to Euro annual inspections.

TEST NO. 05

SI EVALUATION FACTORS - For engine speed and temperature thresholds being passed.

Display: n = 0 or 1. engine speed

t = 0 or 1. engine temperature

TEST NO. 06

FUEL LEVEL AND COOLANT TEMPERATURE - Display of hexadecimal codes in relation to gauge position.

FUEL LEVEL AND COOLANT TEMPERATURE

FUEL GAUGE	Â	HEX VALUE
"A" (empty)	---------->	0d
End of reserve	---------->	37
"B"	---------->	54
"C"	---------->	90
"D"	---------->	c4
"E" (full)	---------->	f0
ENGINE TEMP GAUGE	Â	HEX VALUE
"A"	---------->	ce
"B"	---------->	6d
"C"	---------->	5c
"D" (center)	---------->	4f-23
"E"	---------->	1e

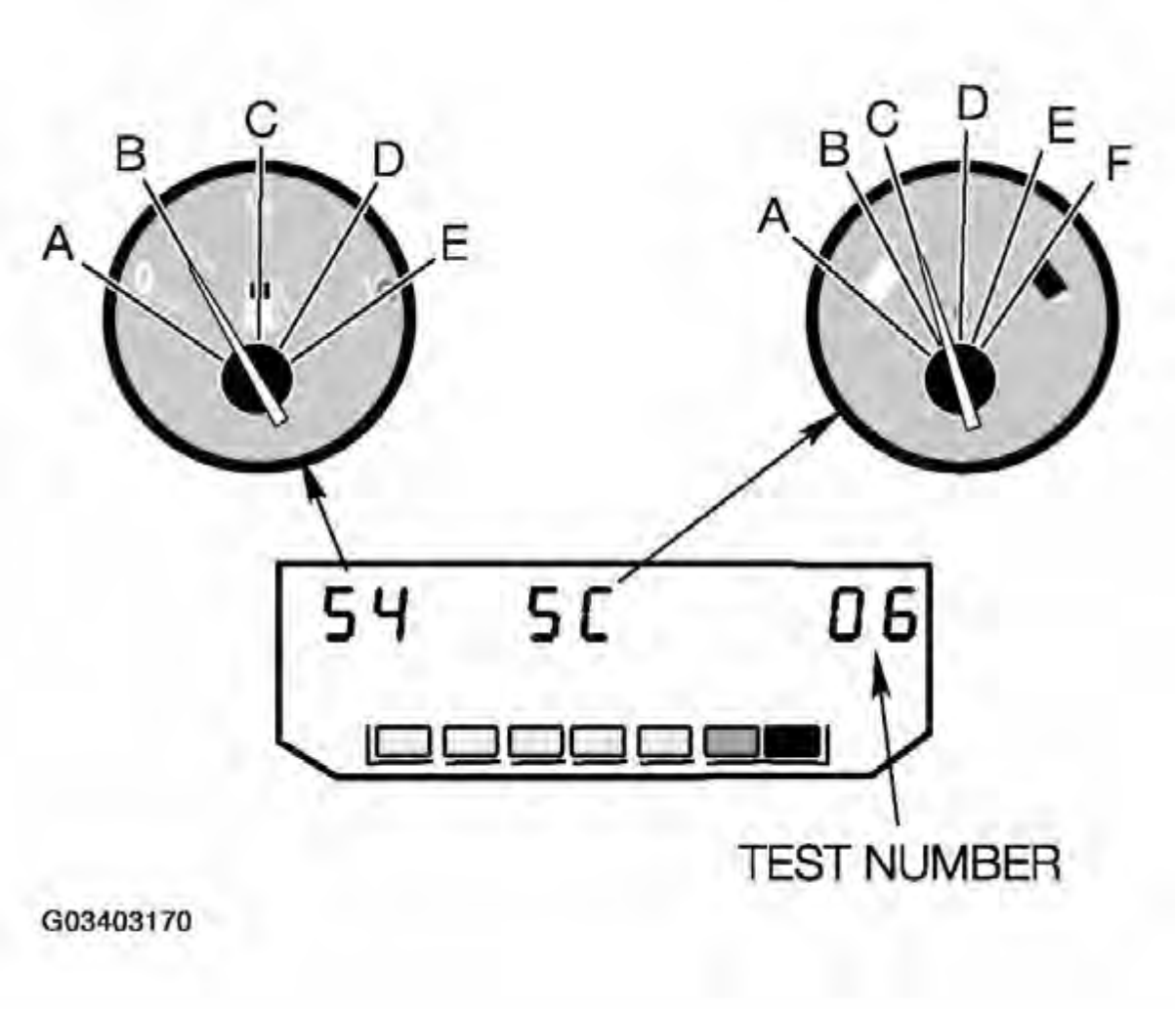


Fig. 20: View Of Test NO. 06 Display Screen
Courtesy of BMW OF NORTH AMERICA, INC.

TEST NO. 07

ENGINE SPEED - Display of current engine speed.

TEST NO. 08

ROAD SPEED - Display of current road speed in km/h.

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. This test step will be used if the manipulation dot is illuminated in the cluster display. The display will show the component with the lower mileage for example:

Display of: 012654 I indicates that the mileage in the internal EEPROM is lower than the mileage stored in the coding plug.

Display of: 000325 E indicates that 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.

TEST NO. 10

STATUS BITS (INPUT SIGNALS) - The status of digital inputs to the cluster are displayed as 0 or 1 .

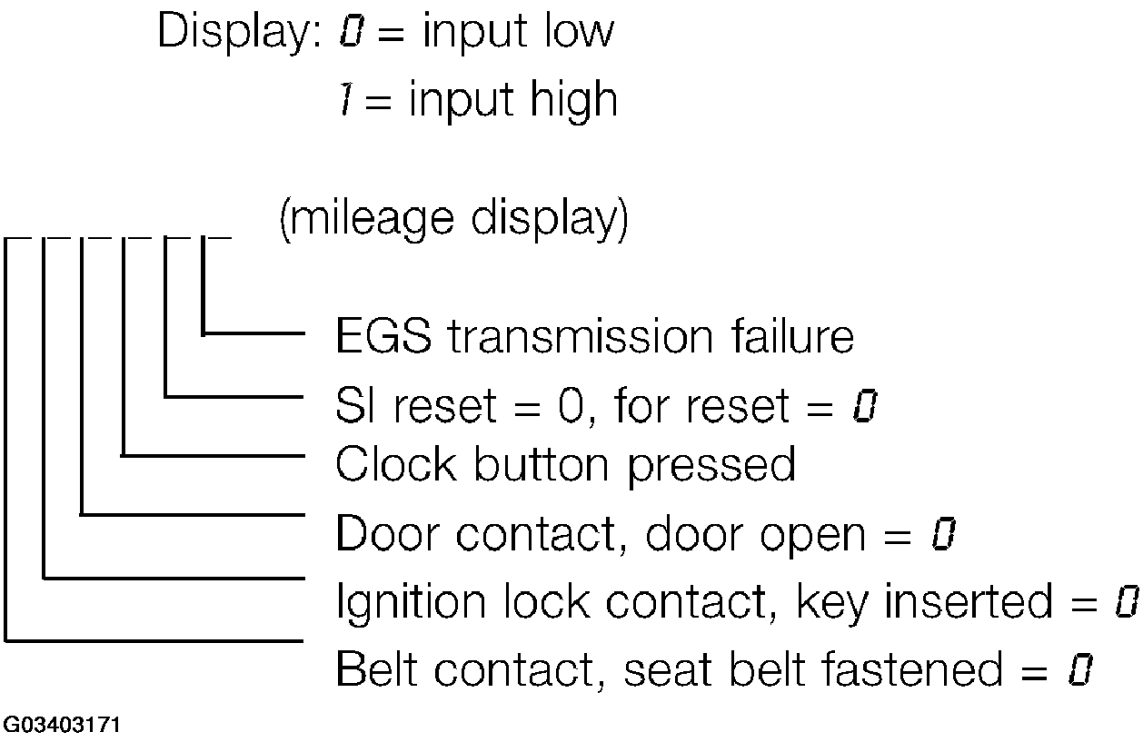


Fig. 21: Identifying Status Bits Graph (Input Signals)
Courtesy of BMW OF NORTH AMERICA, INC.

TEST NO. 11

STATUS BITS (OUTPUT SIGNALS) - The status of digital outputs is displayed.

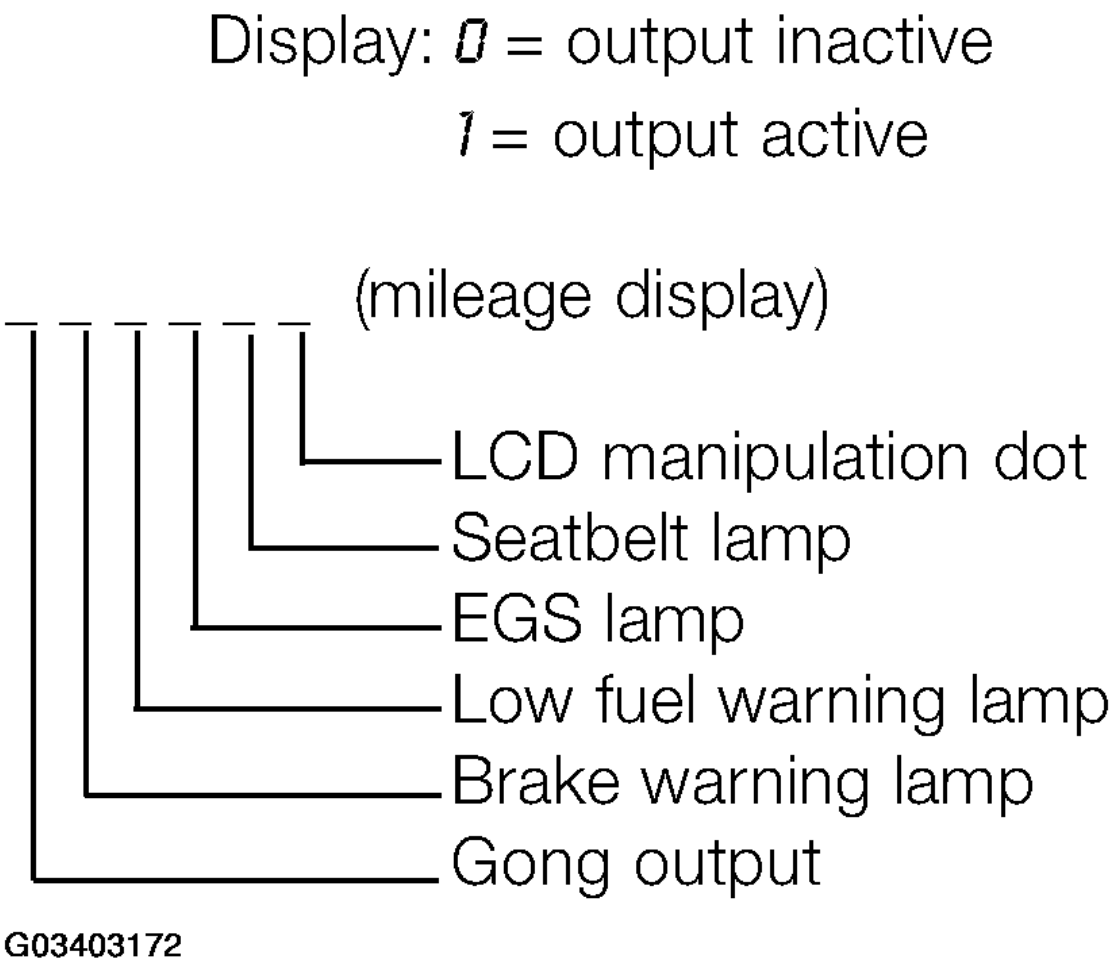


Fig. 22: View Of Status Bits Graph (Output Signals)
Courtesy of BMW OF NORTH AMERICA, INC.

TEST NO. 12- NOT USED

TEST - 13

COUNTRY CODE OF CLUSTER - The display indicates the country version of the cluster. This cannot be changed in the workshop.

Display: USA 02

TEST NO. 14

SOFTWARE RESET - The reset must be carried out if any faults are present that are not plausible before any components are replaced. After the reset, the system will exit the TEST mode and the lock will be reactivated.

1999 E36/5 (318ti)

1999 - 2002 E36/7 (Z3 coupe and roadster)

For model year 1999 the 318ti and the Z3 received an updated instrument cluster. In addition to the fault memory and diagnostic link the instrument cluster also contains 21 test functions similar to the base cluster of the E39/E53.

- Test functions 1 & 2 are always unlocked.

- Tests 3 through 21 are only accessible after unlocking the test function. Test 19 is the unlock function.

Test Function Summary

TEST 01. - Vehicle specific data including:

SubTests:

12345 1.0 = VIN

4663 1.1 = K-value

414061 5_1.2 = Part number of cluster

029000 1.3 = Coding/Diagnosis/Bus index

_2197 1.4 = Manufacturing date (calendar week/year)

01_700 1.5 = Hardware/software # of cluster (HW:01, SW:7.00)

FFF_04 2_1.6 = Injection status, number of cylinders, engine factor

_02_00 _1.7 = Can Index

TEST 02. Cluster System Test - activates the gauge drivers, indicators and LEDs to con firm function.

TEST 03. SIA data

Sub Tests:

1500 3.0 = Z3 - Consumption in liters since last SI reset.

318ti -Distance in miles since last reset.

0 3.1 = Periodic inspection days (not applicable for US).

TEST 04. - Momentary Consumption

Sub Tests:

0267 4.0 = 26.7 liters/1000km

0073 4.1 = 7.3 liters per hour

TEST 05. - Not used

TEST 06. - Fuel level sensor inputs in liters

Sub Tests:

237415 6.0 = Fuel level averaged

- LH sensor input = 23.7 liters
- RH sensor Input = 41.5 liters

0652 6.1 = Total tank level averaged = 65.2 liters

0667 1_6.2 = Indicated value and tank phase

- 1 = both sensors OK

- 2 = one sensor fault
- 3 = implausible input

NOTE: Z3 only shows one sensor reading.

TEST 07. - Temperature and Speed

Sub Tests:

032 7.0 = Coolant temp input 32Â°C

___ 7.1 = Not used

5283 7.2 = Engine speed 5,283 RPM

058 7.3 = Vehicle speed 58km/H

TEST 08. - Input values in HEX form

Sub Tests:

XXX 8.0 -- 8.3 = Hex code, Instrument cluster inputs

TEST 09. - Battery voltage

Sub Test:

125 9.0 = KL30 12.5 volts

TEST 10. - Country Coding

Sub Test:

02 10.0 = USA

TEST 11. - Cluster code

Sub Test:

FFFF08 11.0 = Cluster code

TEST 12. - Not used

TEST 13. - GONG test

Sub Test:

9on9 13.0 = Activate gong by pressing button (gong response is delayed).

TEST 14. - Fault memory Hex code (not for diagnosis)

TEST 15. - Not Used

TEST 16. - Transfer of total stored mileage data

This step is used if the total mileage is to be transferred between the coding plug and the internal EEPROM of the cluster. This step extinguish the red manipulation dot after components have been replaced and restore normal data exchange between the two components.

Sub Test:

123459 I_16.0 = Memory location with lower stored mileage

I = internal EEPROM, E = external coding plug

COPY _16.1 = Copy from higher to lower memory location.

NOTE: 2 miles must accumulate on cluster before disconnecting battery, otherwise step 16 will have to be repeated to extinguish the manipulation dot.

TEST 17. - Time of day

Test 18. - Not Used

TEST 19. - LOCK/UNLOCK

Sub-Tests

L-ON...

L-OFF 19.0 =

Display changes from "L-ON" to "L-OFF" every second. To unlock test functions, press the cluster button immediately when it changes to "L-OFF".

Tests are automatically locked when exiting test functions.

TEST 20. - Average fuel consumption - correction factor

The factor follows previous systems, with adjustment range of 750 to 1250. The adjustment method is new for the base cluster. If adjustment is necessary, enter into test 20 using the cluster button.

The correction factor number is changed by using the sub-tests for the "ones, tenths and hundreds of the factor number. The digits will automatically scroll through 0-9 within each group (ones, tenths, hundreds).

Sub-Tests:

20.0 = Press the button to reset display to 1000

XXX9 20.1 = Press the button when the correct "ones" position is attained.

XX5X 20.2 = Press the button when the correct "tenths" position is attained.

12XX 20.3 = Press the button when the correct "hundreds" position is attained.

TEST 21. - Software reset

Sub-Test:

reset 21.0 = Reset software

Check Control

1992 - 1998 E36 4 door/Coupe/Convertible/M3

The Check Control is an active warning system that displays various lighting circuit failures and low fluid level warnings. It is only available on the listed models if they are equipped with the Multi-Function Clock or On-board Computer. Failure warnings are displayed in the matrix of the LCD panel on these units.

The complete system consists of the following components:

- Check Control Module - located below the left side of the instrument panel. The module processes the

inputs from the monitored components.

- Check Control display - located in the matrix of the BC or Multi-function clock.
- Check waring lamp - located in the instrument cluster.
- Monitored lamps and fluid reservoirs.

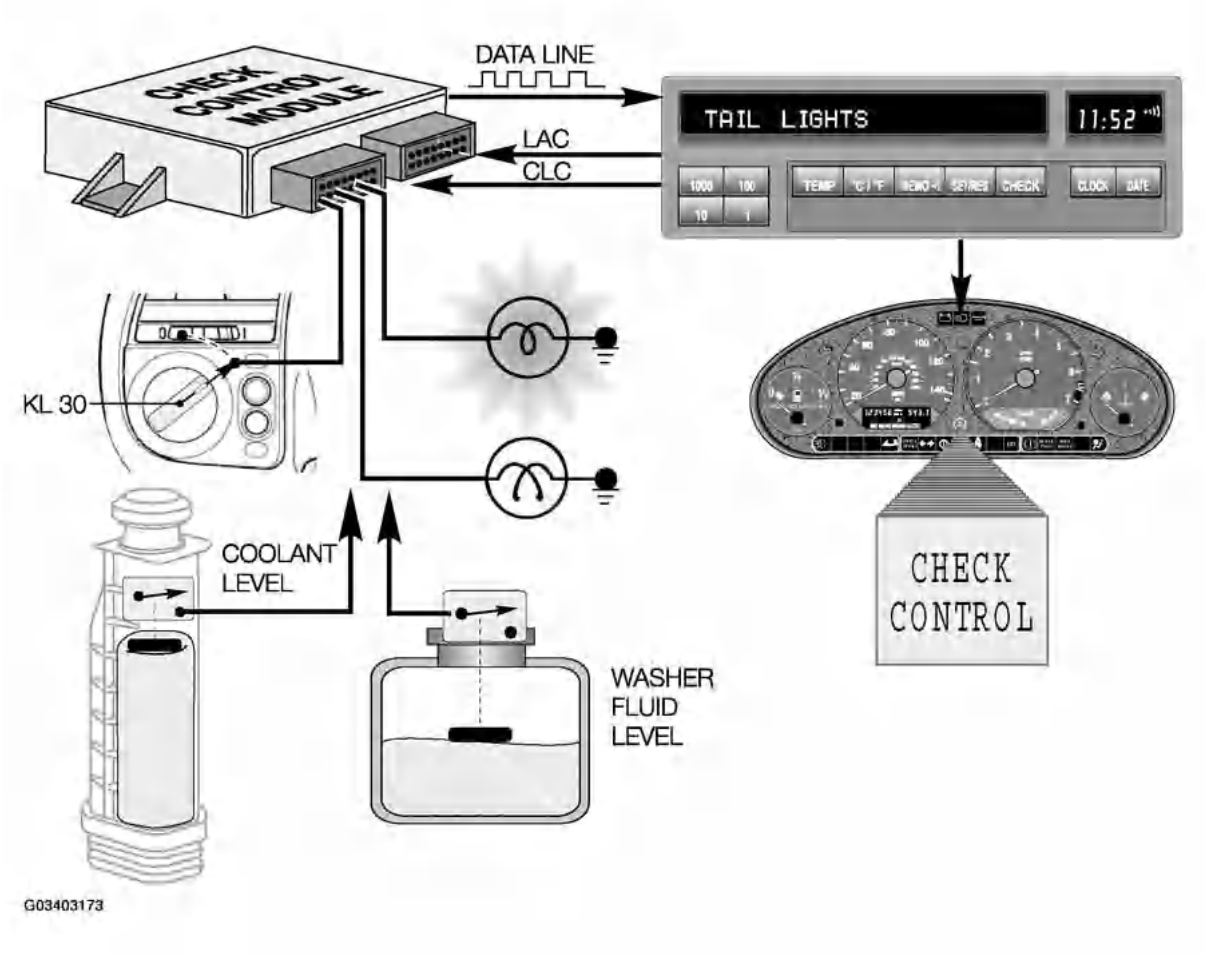


Fig. 23: Checking Control Module
Courtesy of BMW OF NORTH AMERICA, INC.

The following circuits are monitored by the check control system:

- Windshield washer fluid.
- Low beam headlights.
- Brake light circuit - including brake light switch.
- Coolant level.
- Tail lights.
- License plate lights.

The lighting circuits are warm monitored only - a fault will only be detected when the circuit is on. If a fault occurs in one of the monitored circuits, the check control will post the warning in the 20 digit matrix display and the check warning lamp will illuminate in the cluster depending on the priority of the failure.

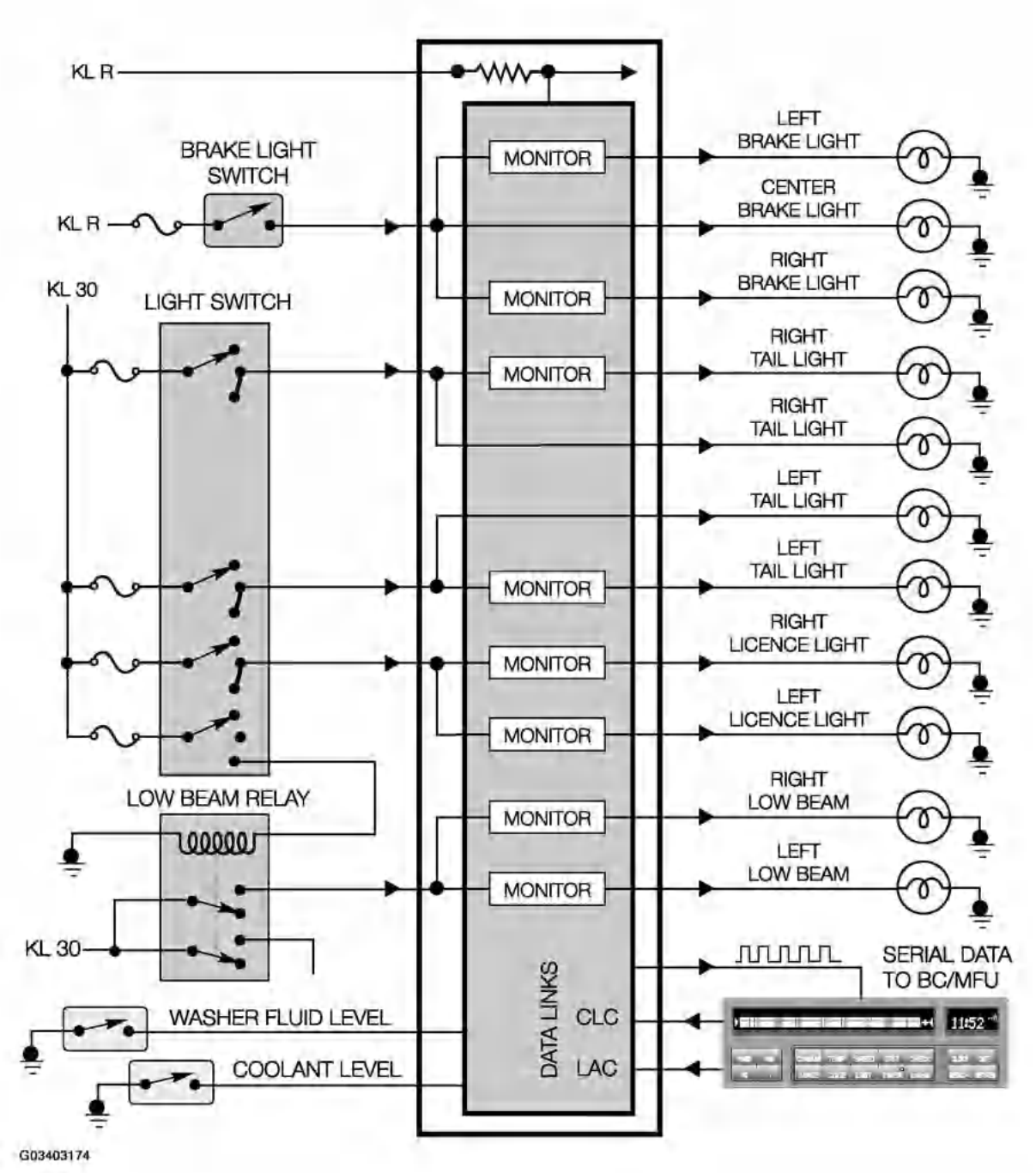


Fig. 24: Identifying Break Light Switch Fuse
Courtesy of BMW OF NORTH AMERICA, INC.

CHECK CONTROL MESSAGE PRIORITIES

There are three priority fault displays in the check control system

PRIORITY 1: The brake light circuit is the only priority 1 fault display.

A failure of the brake light circuit (with the exception of one bulb) will be posted in the matrix display when stepping one the brake pedal.



Fig. 25: View Of Priority 1 Fault Display
Courtesy of BMW OF NORTH AMERICA, INC.

The warning triangles in the display will flash and the check warning lamp in the cluster will also flash for 20 seconds, then remain on steady, pressing the check button on the matrix panel will cancel the display for 5 seconds and then it will reappear in the display.

PRIORITY 2: These failures will appear in the display as soon as they occur. The warning triangles will illuminate steady and the check lamp in the cluster will also illuminate.

Priority 2 failures are only posted for 20 seconds and then are canceled. The warning triangles remain illuminated and the failure message can be recalled by pressing the check button.

The following circuits are priority 2 displays:

- One brake light bulb.
- Low beam headlights.
- Tail lights.
- License plate lights.
- Washer fluid.



Fig. 26: Identifying Priority 2 Fault Display
Courtesy of BMW OF NORTH AMERICA, INC.

PRIORITY 3: Low Coolant Level is the only priority three display. This condition will not be displayed while driving.

A low coolant level condition is held in memory and posted when the ignition is switched off.



Fig. 27: View Of Priority 3 Fault Display
Courtesy of BMW OF NORTH AMERICA, INC.

The warning is also posted for 20 seconds when the ignition is switched on, however the condition is held in memory until the problem is corrected. The low coolant level display can also be recalled at any time by pressing the check control button.

On-Board Computers / Clock Displays

There are several variations of the On-Board Computer/ digital clock display systems found on the E36 and Z3 roadster depending on model and year of production.

1992 - 1998 E36 - 325/328/M3 - ON-BOARD COMPUTER V (BC V)

The optionally equipped On-Board Computer V is the highest level display system available for the E36.

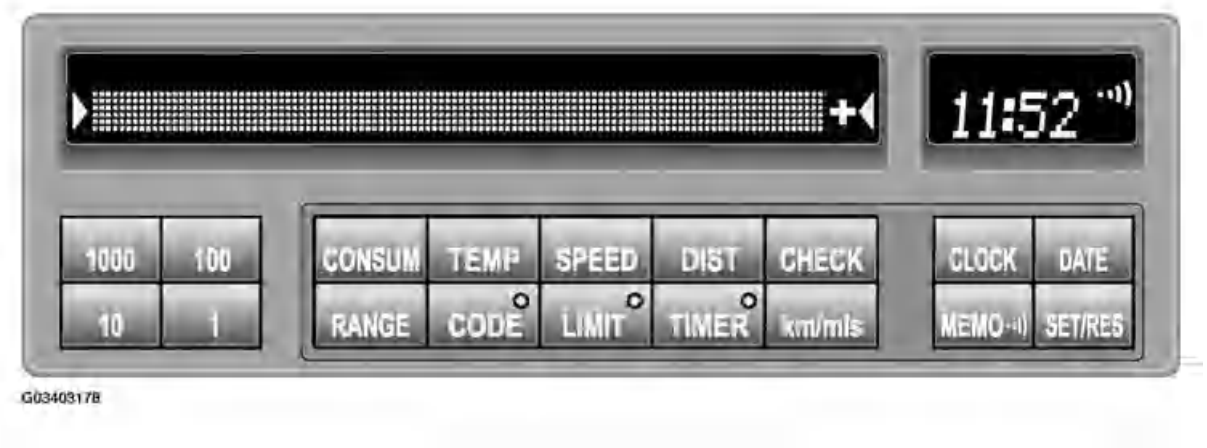


Fig. 28: Identifying On-Board Computer V
Courtesy of BMW OF NORTH AMERICA, INC.

In addition to serving as the check control display block, the BC V offers the following functions:

- Clock/Date with Memo warning (separate display block).
- Fuel Consumption calculation (CONSUM).
- Outside Temperature display (TEMP).
- Average miles per hour calculation (SPEED).
- Distance and arrival time to destination (DIST).
- Estimate driving range on remaining fuel (RANGE).
- Anti-theft code function (CODE).
- Maximum speed limit warning (LIMIT).
- Stop watch function (TIMER).

BC V Operation

Fuel consumption - Two average fuel consumption values can be monitored. Pressing the [CONSUM] button once will display the first value and pressing it a second time will call up the second value. The BC calculates the average fuel consumption based on the "ti" and road speed (signal A) inputs.

Pressing [SERIES] clears the displayed value allowing the BC to start a new calculation.

Outside temperature - Pressing the [TEMP] button will display the current outside temperature. The temperature sensor is located in the front air dam. The sensor's input is dampened when the vehicle is stopped so that engine heat will not influence the temperature display.

The BC includes an ice warning that will sound the gong and display the outside temperature when it drops below 37Â°F. The temperature reading will flash anytime it is displayed when the temperature is below this value.

Average miles per hour - Pressing the [SPEED] button will display the average miles per hour. The BC calculates this value based on the road speed signal input and the time. Pressing the [SERIES] button will start a new calculation.

Distance/Arrival time - The feature allows you to program a distance to a destination with the input keys. Press the [DIST] button, an area for the total distance in miles to be entered will display. Using the numerical buttons, enter the mileage. Press the [SERIES] button and the BC will calculate the estimated arrival time based on mileage remaining, average miles per hour the vehicle is traveling and existing clock time.

Driving range on fuel in tank - The estimated driving range on the remaining fuel in the tank is calculated by the BC from the "ti" signal and current road speed input signal. A "+" sign along with the mileage indicates a full tank.

Maximum miles per hour - A speed limit warning can be programmed into the BC with the input number keys. Once set, the warning gong will sound and the set speed will flash in the display block of the BC.

The current driving speed can be set as the warning by selecting [LIMITÂ°] and pressing the [SERIES] button while driving.

Timer Function - The timer operates as a stop watch. Pressing the [SERIES] button with the function called up on the display will start/stop the watch. Pressing the [TIMERÂ°] button with the watch running will give a lap time. Pressing the [TIMERÂ°] button with the watch stopped will reset the timer to zero.

Code Function - A four digit anti-theft code can be entered into the BC after pressing the [CODEÂ°] button when the ignition is switched to KL R. After entering the code and pressing [SERIES], the code function is accepted. Switching KL R off arms the function.

The code function is disarmed by entering the code when the ignition is switched on and then pressing the [SERIES] button.

When active the code function disables the engine management system.

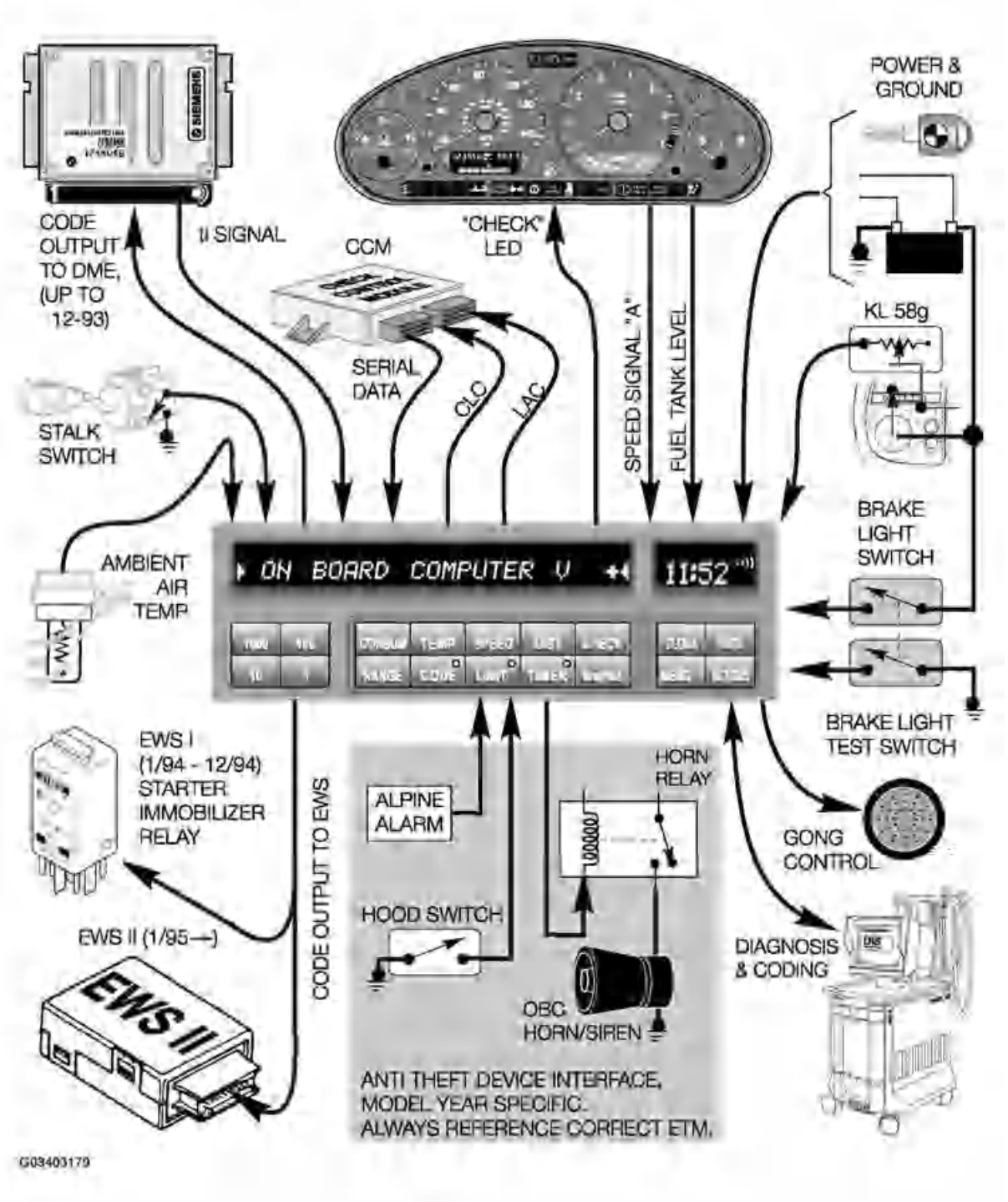


Fig. 29: Identifying On Board Computer V System
Courtesy of BMW OF NORTH AMERICA, INC.

Steering Column Stalk Switch

The BC display functions can be called up using the turn signal lever. Pressing the lever in will cause the BC functions to be displayed in the matrix. The functions are displayed in a rolling manner each time the lever is pressed.

The remote operation can be programmed to display the number and sequence of BC functions as follows

- Press and hold the turn signal lever - P1 is displayed
- Press the desired functions and sequence of displays
- Press "SET/RES" to activate the program

To return the BC to its original display functions, press and hold the lever until "P1 "is displayed - then press the "SET/RES.

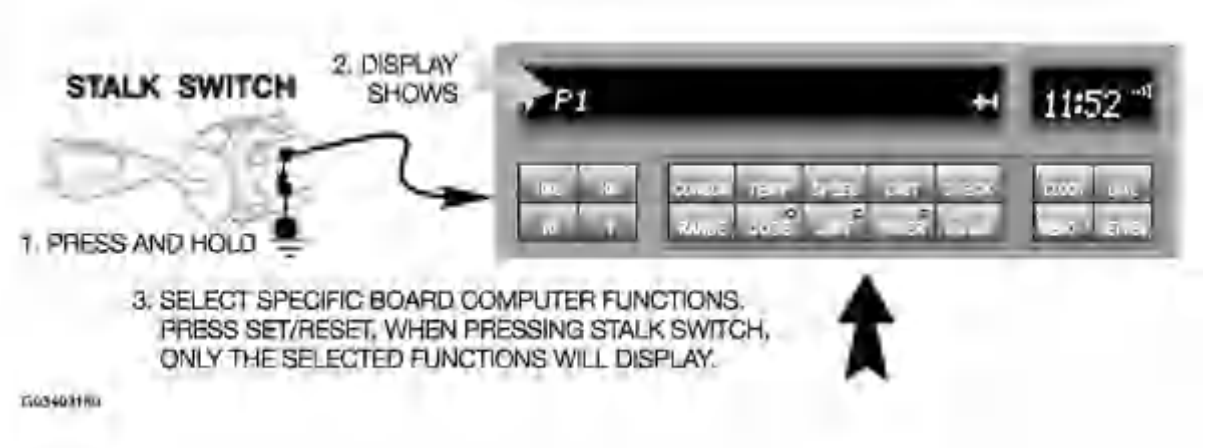


Fig. 30: Identifying Steering Column Stalk Switch
Courtesy of BMW OF NORTH AMERICA, INC.

BC V Test Functions

The BC contains test data values that can be accessed for troubleshooting purposes. The following is a list of the test functions and numbers that are stored in the BC:

1. Display test - test all of the LCD segments in the display matrix
2. Momentary consumption (L/100Km) - based on the current "ti" signal and road speed
3. Momentary consumption (L/h) - based on current "ti" signal only
4. Range consumption -
5. Momentary range (Km) - range left on fuel in tank when reserve light is on
6. Not used
7. Fuel level from the instrument cluster - average value
8. Momentary speed (Km) - current speed averaged over 2 seconds
9. Operating voltage - available to BC from KL R
10. Language for display -
11. Units readout - for display of mileage/gallons - etc.
12. Average speed for arrival time function
13. Momentary arrival computed
14. ROM - date
15. Readout of fault memory - vendor use only
16. I/O port status - vendor use only
17. Encoding of vehicle specific data - vendor use only
18. Alarm mode - for BC code function - pulse or continuous tone
19. Lock/Unlock function
20. Fuel consumption correction factor
21. Software reset function

The test functions are accessed by pressing the "1000" and "10" buttons simultaneously. Test functions #1, #10, #14, #19 and #21 are unlocked and can be called up by entering the number and pressing SET/RES.

The other test functions are locked out and test #19 must be used to release the test functions for display. The unlock procedure is as follows:

- Call up test #19 - "LOCK ON" is displayed in the matrix display.
- Use the number input buttons to enter the sum of the day and month displayed on the clock.
- Press SET/RES and the computer is now unlocked for display of all test functions

To relock the test functions when through with the testing, call up test #19 and press SET/RES twice.

Multi-Function Clock

1992 - 1998 E36 - 325/323/328/M3

The Multi-Function Clock is standard equipment on the listed models. It is similar in appearance to the BC V, however its functions are limited to:

- Digital clock and date display.
- Outside temperature display with freeze warning.
- Display of check control warning messages.

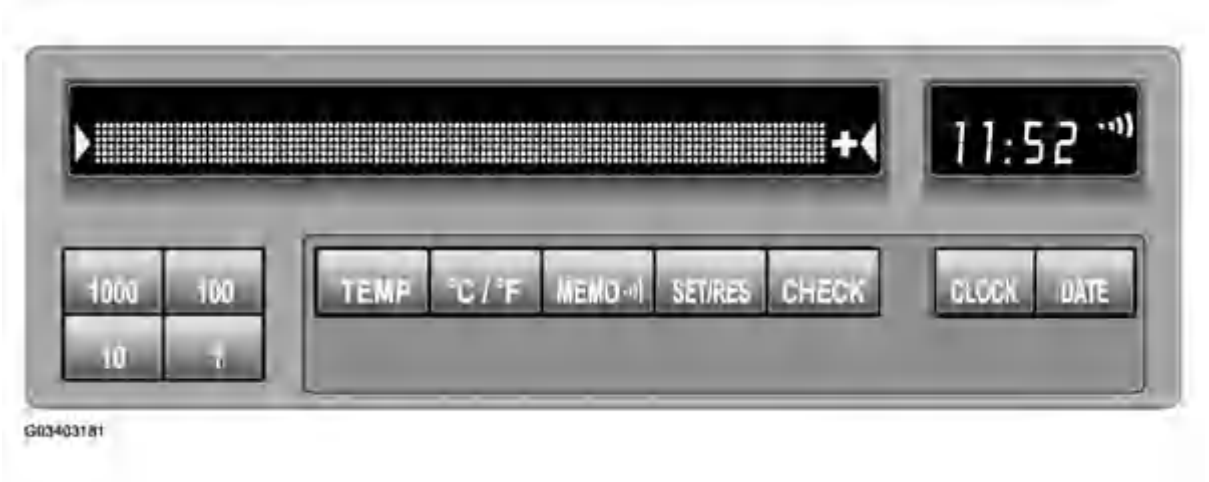


Fig. 31: View Of Multifunction Clock
Courtesy of BMW OF NORTH AMERICA, INC.

The time and date are set the same as the BC V and the temperature and warning also function the same as the BC. There is a change over button on the panel for switching the temperature display between Â°F and Â°C.

The check control functions are identical to those of the BC V.

Multi-Function Clock - Test Functions

Several internal test functions can be called up and displayed on the matrix of the multifunction clock. The test functions are not locked and can be accessed at any time.

To call up the test functions the "1000" and "10" input buttons must be pressed simultaneously, the desired test number is then entered followed by the SET/RES button. The following is a listing of the test functions available with the Multi-function clock:

0 Display test - same function as the BC

1. Language change - Six languages are stored in the clock for the check control display test including: English UK, French, Italian, Spanish, English US and German. The languages are selected by scrolling with the "1" button, followed by the SET/RES to select the desired language.
2. Time Mode - the clock display can be switched from a 12 hour to a 24 hour mode with this test function. Scroll with the "1" button followed by SET/RES to select.
3. Date mode - the date can be switched from a month/day to a day/month display with this test function. Scroll with the "1" button followed by the SET/RES button.
4. Temperature Mode - the display of the temperature can be switched from F to C with the test function. Scroll with the "1" button followed by the SET/RES.
5. Compensation factor - information only
6. Display status (HEX) information only

41. Road speed display (Km)

53. Display of "K" number - correction factor for speedometer

The test function will cancel after several seconds or it can be canceled by pressing the clock button.

Digital Clock / Outside Temperature Display

1992 - 1998 E36 - 318i - 4 door and coupe models

The digital clock with outside temperature display is standard equipment on the 318 models. The basic difference is that the check control has been deleted from these models.

The temperature display still includes an ice warning when the temperature drops below 37Â°F and the display can be changed from FÂ° to CÂ°.

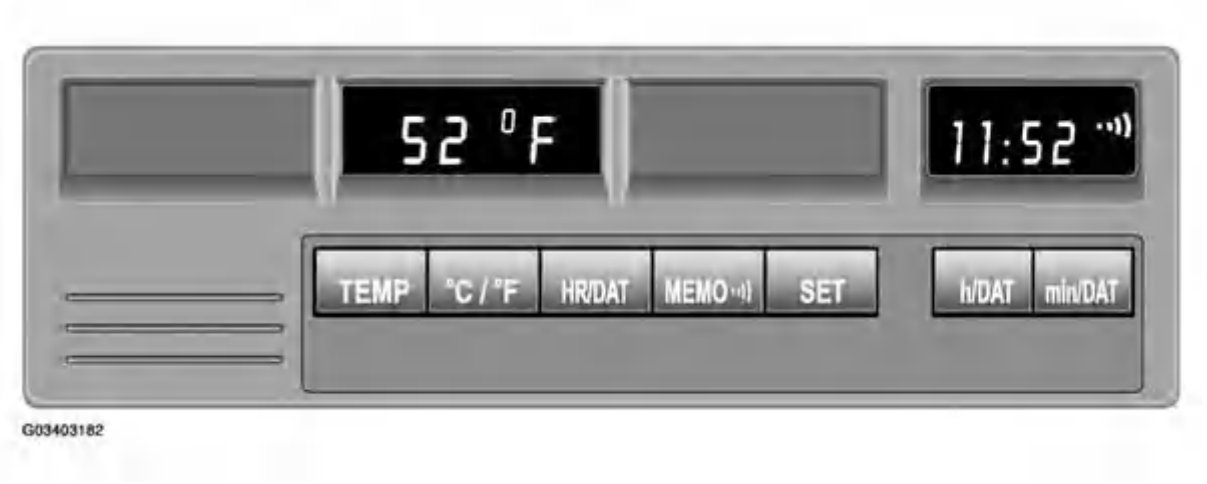


Fig. 32: Identifying Digital Clock With Outside Temperature Display
Courtesy of BMW OF NORTH AMERICA, INC.

TEST FUNCTIONS

The digital clock has an audible test function for activation of the gong. This test function was omitted from later production (approximately 9-96 production).

To activate the gong output stage press the "Â°C/Â°F" and "MEMO" buttons simultaneously.

Z3/318ti Digital Clock / On-Board Computer

1995 - 1999 318ti

1996 - 2002 Z3

DIGITAL CLOCK

The digital clock is standard equipment on the ti and Z3 models. The time can be displayed in either the 12 or 24 hour modes, the modes is selected by pressing the "H" and "M" buttons simultaneously.

To set the clock - press the "H" button until the correct hour is displayed. The minutes are set by pressing and holding the "M" button until the correct minute is displayed.



Fig. 33: Identifying Digital Clock / On-Board Computer
Courtesy of BMW OF NORTH AMERICA, INC.

ON-BOARD COMPUTER

The Z3 and 318ti offer an On-Board Computer with limited functions as optional equipment. The digital clock function of the BC is as follows:

- The time can be displayed for up to 8 seconds with the key switched off. When the key is switched on, the clock is always displayed unless a BC function is called up.
- The time is set using the clock and S/R buttons. Pressing and holding the clock button will put the clock into the time setting mode (the colon will flash). Set the hour first by pressing the clock button until the correct hour is displayed, press S/R, then set the minutes in the same fashion. Finally, press S/R to activate the clock with the new time.



Fig. 34: View Of On-Board Computer Clock / S/R Buttons
Courtesy of BMW OF NORTH AMERICA, INC.

On-Board Computer Functions

- The BC is coded on the assembly line for the specific country version.
- It can be changed in the dealership using the DIS tester or MoDiC.
- All vehicle specific data for the BC's operation is stored in the NVRAM of the BC.
- The BC functions are called up by pressing the turn signal lever.

In addition to the clock it offers the following functions:

OUTSIDE TEMPERATURE - the temperature display is dampened, as with other displays to prevent underhood temperatures from influencing the sensor when the vehicle is stopped.

The warning gong will sound when the outside temperature drops below 37Â°F as with other BC displays.

AVERAGE FUEL CONSUMPTION - the average fuel consumption is displayed in MPG. As with other BCs it is calculated from the "ti" and road speed signals.



Fig. 35: View Of On-Board Computer
Courtesy of BMW OF NORTH AMERICA, INC.

Pressing S/R with the MPG displayed, will start a new calculation.

RANGE - the estimated distance on the remaining fuel is displayed. The range value is determined from the "ti" and road speed signals as with other BCs.

AVERAGE ROAD SPEED - The average road speed corresponds to other BCs, pressing the S/R button will start a new calculation.

On-Board Computer Test Functions

There are four test functions available for the Z3/318ti board computer. Press and hold the clock and S/R buttons simultaneously to enter the test functions. Scroll through the test steps by pressing the stalk switch.

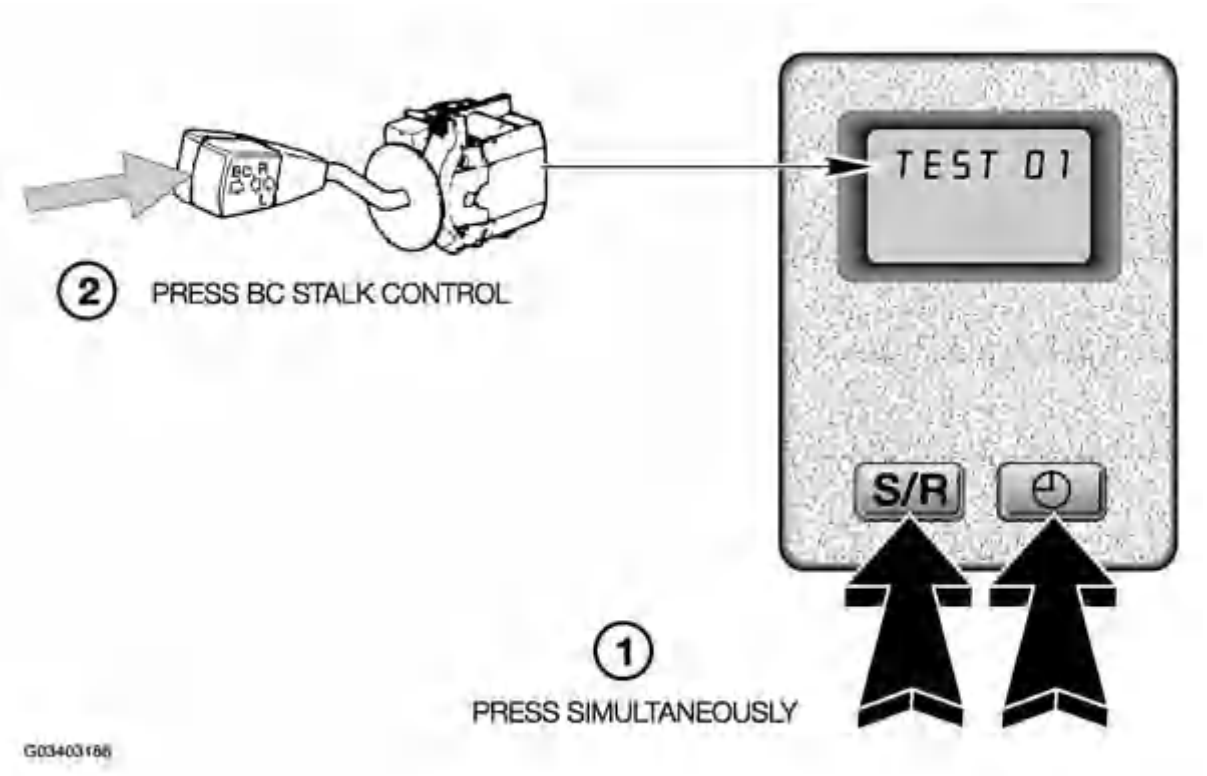


Fig. 36: View Of On-Board Computer Test Function Procedure
Courtesy of BMW OF NORTH AMERICA, INC.

TEST 1. - 12/24 hour clock mode. Press the clock button to switch between 12/24 hour display.

TEST 2. - Display test. Pressing the S/R button will illuminate all of the LCD segments of the display, the BC will then return to the test mode.

TEST 3. - Correction factor for the MPG display. The correction factor corresponds to other BC factors. The value can be corrected from 750 to 1250 by scrolling with the clock button. When the new value is reached it is stored by pressing the S/R button.

TEST 4. - Acoustic test. Pressing the S/R button will test the temperature warning gong.

INSTRUMENT CLUSTER MODULE (IKE)

Model: E38, E39, E53

Production Date: All from start of production.

Introduction

The instrument cluster is the main Driver Information display unit. The instrument cluster is made up of the IKE and a display unit. This type of cluster is known as a "High version".

As introduced, the IKE control module was mounted on the back of the instrument cluster and was connected to the cluster with a 46 pin ribbon connector. The two additional connectors contained the D, I and K Busses and the input and output leads to the IKE.

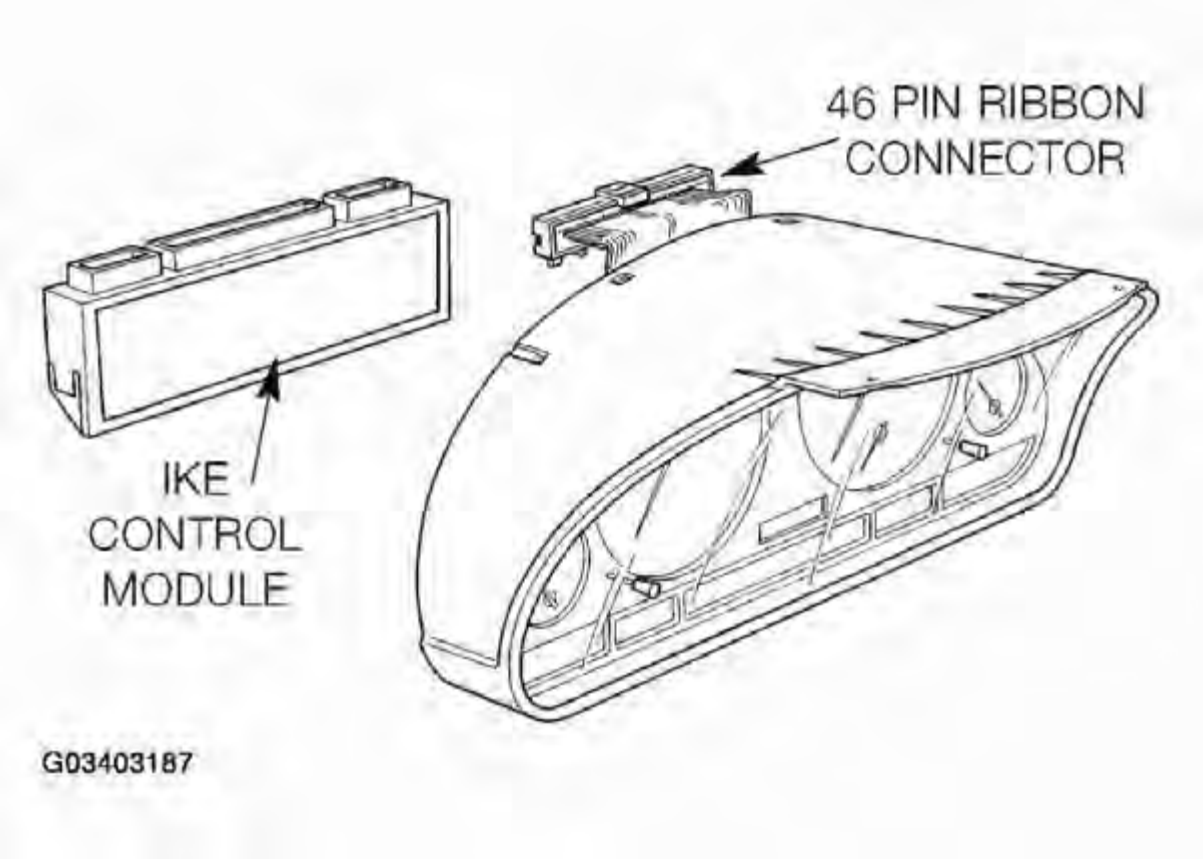


Fig. 37: View Of IKE Control Module And Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Since 9/97 the external IKE control module was integrated into the display unit creating an integrated component. The CAN bus was also linked to the instrument cluster starting model year 98.

The IKE contains all of the processing electronics for the Instrument Cluster and On-Board Computer.

The Instrument Cluster is merely a display unit and performs no processing. On Board Computer data can be displayed in the MID/BMBT or the matrix display in the cluster.

Signals that are intended for a component that is on the I/K-BUS must be passed on by the IKE. Also, diagnostic data must be passed through the IKE to the "I" and "K" busses as communication between DIS and control modules takes place.

The IKE incorporates an EEPROM for storing the Central Coding Key (ZCS).

Instrument Cluster

The instrument cluster incorporates the five familiar analog gauges along with indicator/warning lights and Liquid Crystal Displays.



Fig. 38: Identifying Instrument Cluster
Courtesy of BMW OF NORTH AMERICA, INC.

All the indicator/warning lights are LEDs and are not replaceable. Critical warning indicators use two LEDs for safety. There are five conventional bulbs for the back lighting of the LCD which can be replaced if necessary.

The LCD provides:

- 6 digit total mileage.
- 4 digit trip mileage.
- Manipulation DOT.
- Outside temperature display.
- 20 digit read-out with reminder arrows.
- Service Interval Indicator.
- Automatic transmission selector position.
- Automatic transmission driving program.



Fig. 39: Identifying LCD Display
Courtesy of BMW OF NORTH AMERICA, INC.

When KLR is switched on, mileage and temperature are displayed. All displays are illuminated from KL15.

The back lighting intensity of the LCD's is dependent on available light and is controlled by a photo-transistor in the lower left corner of the cluster. When the parking lights are switched on, the dash mounted dimmer wheel controls the intensity of the back lighting.

Service Interval Indicator (SIA)

The Service Interval Indicator of the E38 up to M.Y. 96' operates using SIA II. SIA III is used after M.Y. 96' to present vehicles.

The reset of Service Indicator is carried out with the reset tool, DIS, or cluster reset mode (reset mode after 9/00 only).



Fig. 40: Identifying Service Interval Indicator (SIA)
Courtesy of BMW OF NORTH AMERICA, INC.

Total Mileage/Trip Mileage

Mileage can be displayed with the key off for 25 seconds if the trip meter button is pressed.

Total mileage is stored in non-volatile memories of the IKE and LCM to protect against loss.

Automatic Transmission Selector Position/Driving Program

As introduced, the selector lever position and driving program were signaled to the IKE from the AGS control module over a single wire circuit. These signals are passed along by the CAN after the CAN bus was connected to the integrated IKE.

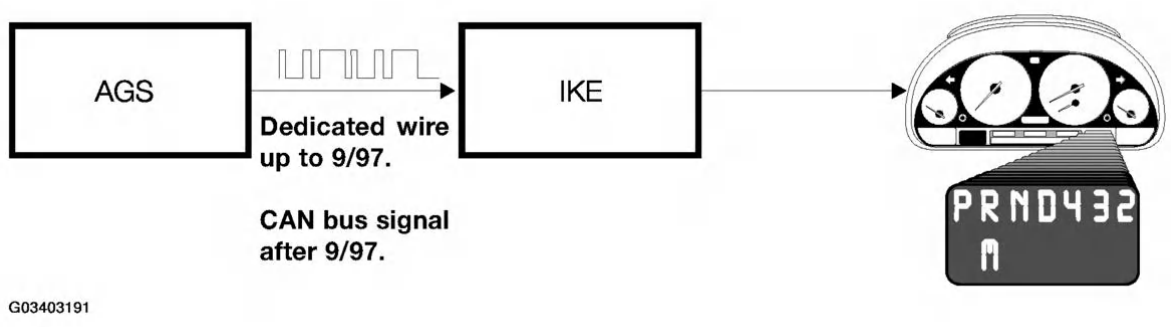


Fig. 41: Identifying Automatic Transmission Selector Position/Driving Program

Courtesy of BMW OF NORTH AMERICA, INC.

Analog Instruments

Analog instruments are controlled by the IKE from signals it receives over separate inputs or the CAN bus.

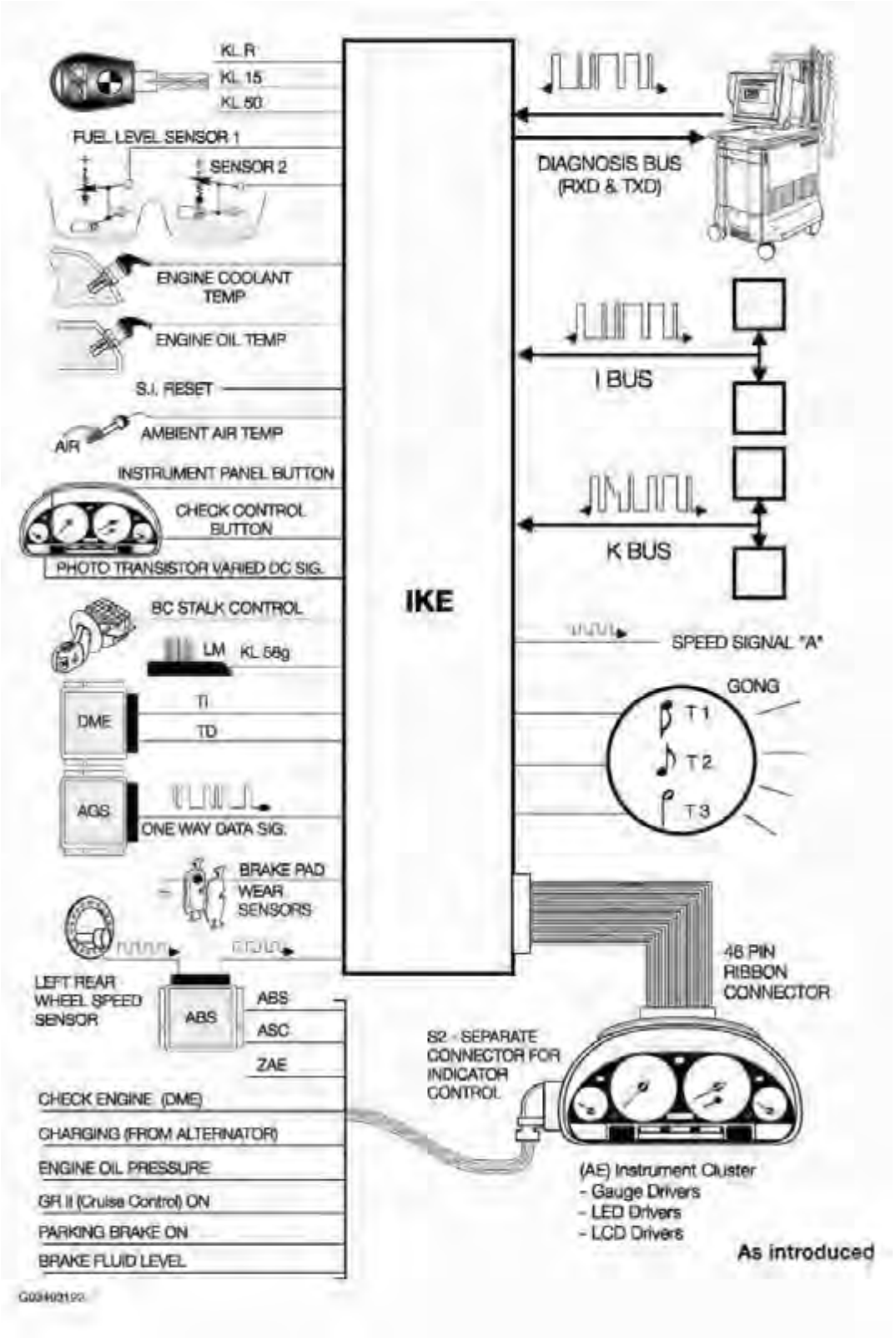


Fig. 42: Identifying Instrument Cluster System (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

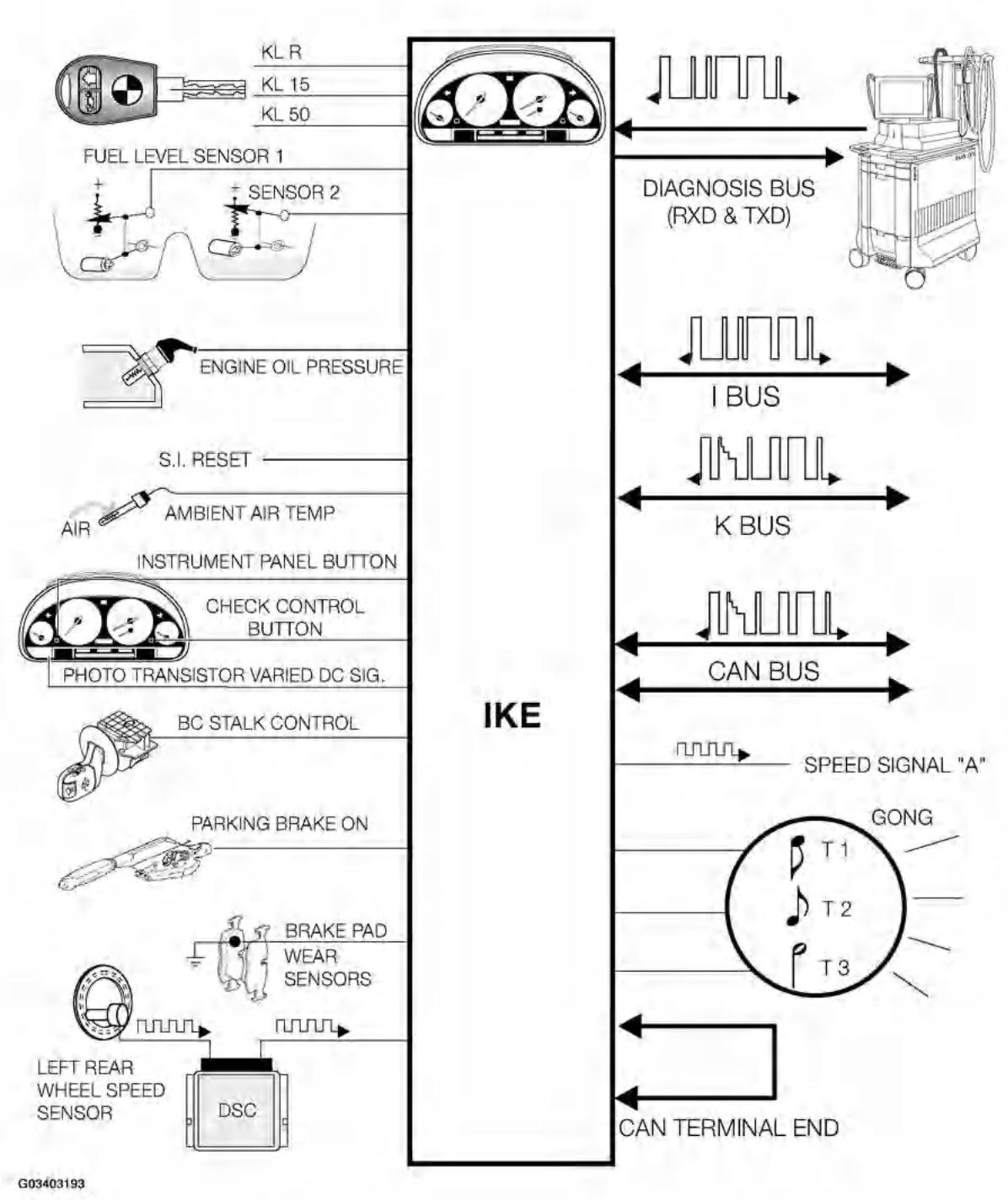


Fig. 43: Identifying Instrument Cluster System (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Integrated IKE as of 9/97.

Dynamic Digital Inputs

Distance signal - This information is supplied to the IKE by the ASC/DSC control module with a square-wave signal. Pulses from the left-rear wheel speed hall sensor are used to produce signal. The IKE processes this for the cluster display and provides a speed signal output on the I / K busses.

Engine speed signal - The TD signal is produced by the DME and sent to the IKE. This is a CAN bus signal on vehicles produced after 9/97. Engine speed is re-transmitted over the I/K buses by the IKE.

NOTE: The wiring continues to exist as in the earlier systems but the cluster is coded to only accept the information from the CAN.

Injection Signal - The DME supplies the signal to the IKE for fuel consumption evaluation. This signal is also transmitted via the CAN on later vehicles.

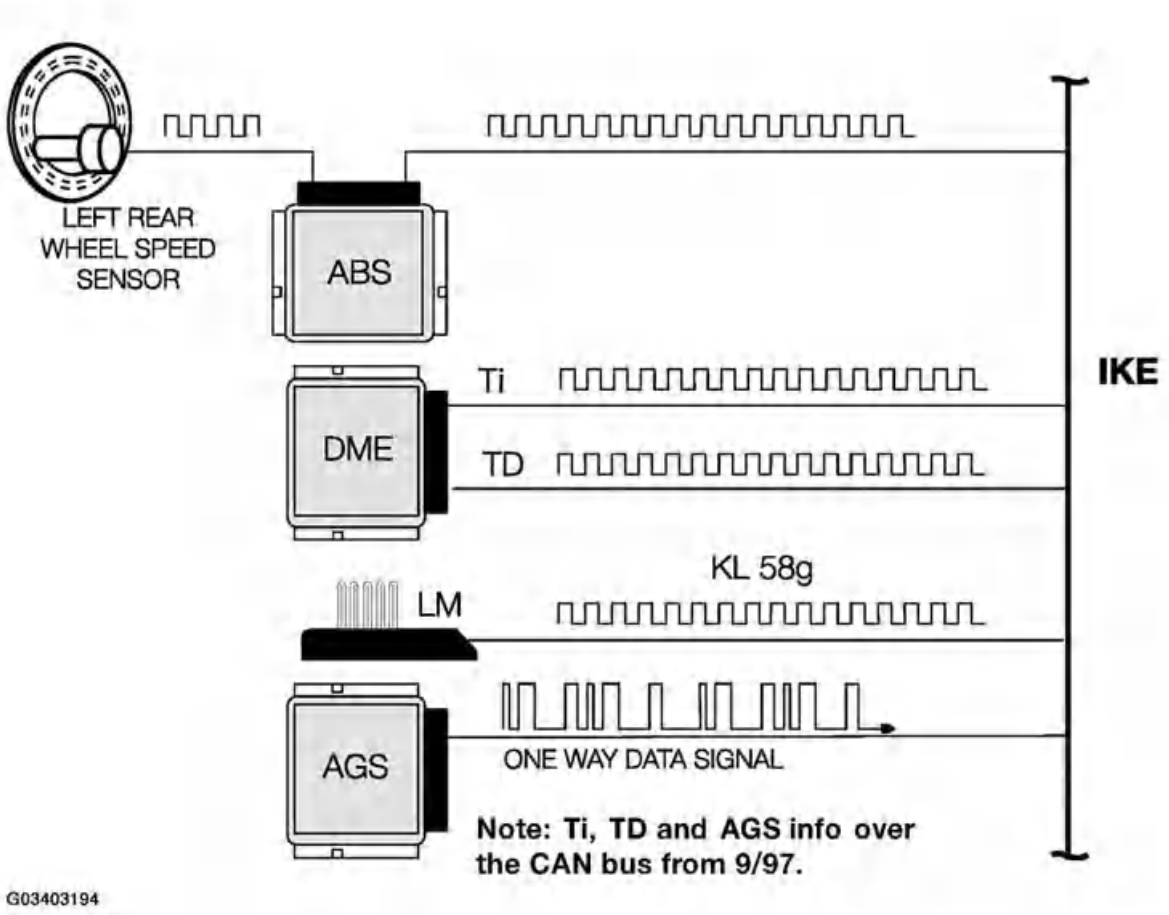


Fig. 44: Identifying Dynamic Digital Inputs
Courtesy of BMW OF NORTH AMERICA, INC.

Dimmer signal - This is a pulse-width modulated signal from terminal 58, of the Lamp Control Module. It is used to control back lighting of instruments and the LCD and is also transmitted through the I/K buses.

Transmission Interface - This single-wire is a serial one-way interface that provides the IKE with selector lever position, driving program and the fault message. This information is provided over the CAN on vehicles from 9/97.

Analog Input Signals

Battery Voltage - The system voltage is monitored by the IKE and sets a fault if it exceeds 16 volts.

Fuel tank level - Two lever action sensors are wired in parallel to the IKE. The two variable resistor inputs are processed by the IKE and used to operate the fuel gauge. The reserve light is controlled by the IKE from the sensor inputs.

Photo transistor - A variable voltage signal, that is dependent on ambient light, is used for LCD back lighting.

Coolant Temperature - A NTC sensor is used by the IKE to measure coolant temperature. This is a CAN bus signal from the DME on vehicles produced from 9/97.

NOTE: The dual sensor and wiring continue to exist as in the earlier systems but the cluster is coded to only accept the information from the CAN.

Outside Temperature - A NTC sensor is used by the IKE to measure outside temperature for display in the cluster. Other systems that require outside temperature receive this information on the I/K Buses.

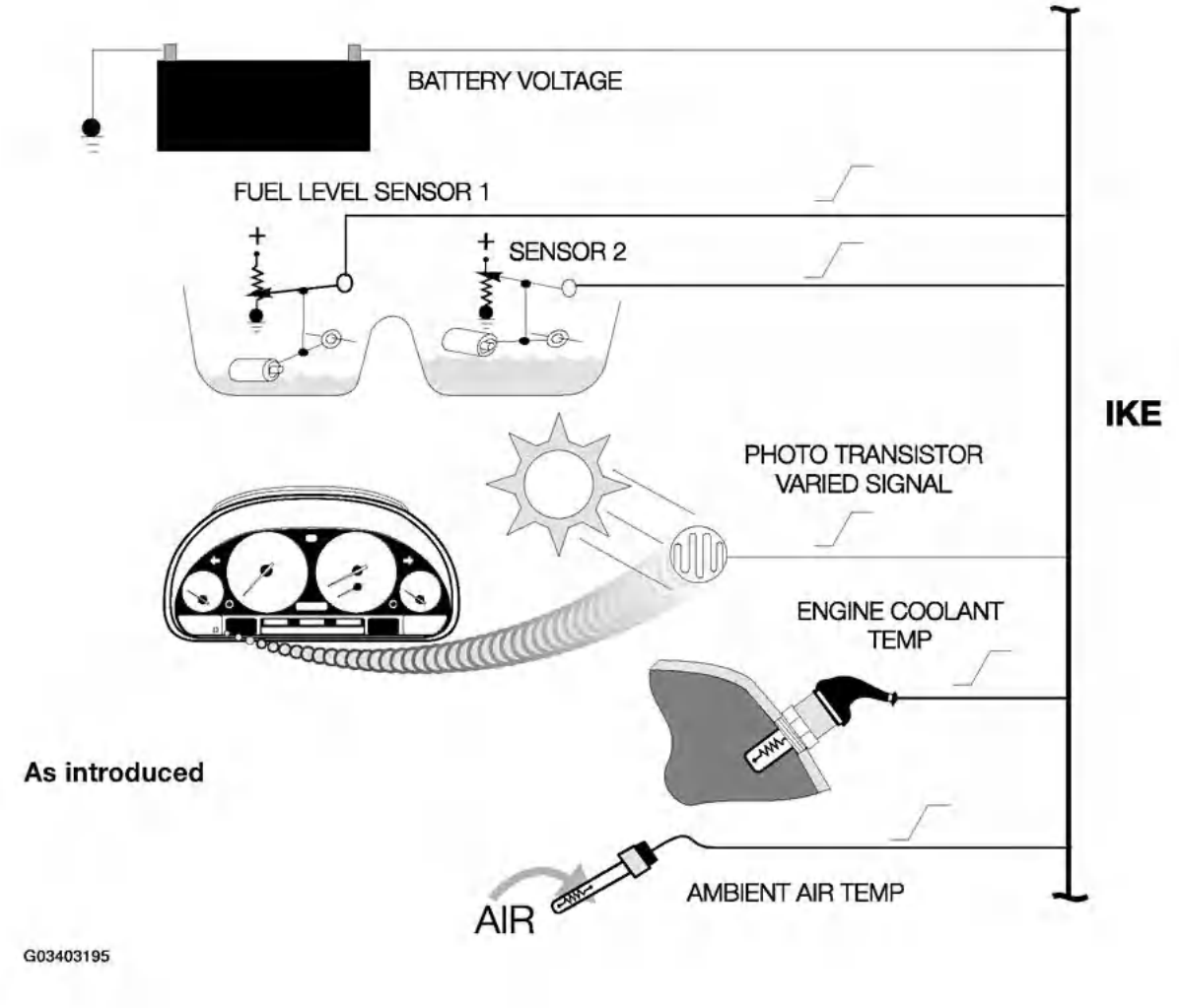


Fig. 45: Identifying Analog Input Signals
Courtesy of BMW OF NORTH AMERICA, INC.

Digital Input Signals

The normal power-up and KL 50 inputs to the IKE processor:

- Terminal R.
- Terminal 15.
- Terminal 50.

Various functions are dependent on the ignition switch positions.

Steering column switch - This switch is used to call up BC functions into the cluster matrix.

Oil Pressure Switch - This status is transmitted to the LCM over the I-BUS. The LCM compares the switch status with engine speed to evaluate oil pressure. IKE can store faults with the oil pressure switch and circuit.

Parking Brake Switch - Switch status is transmitted to the LCM for evaluation.

Trip Odometer Reset - The left button on the cluster is used to reset the trip mileage if the key is on and display mileage if the key is off.

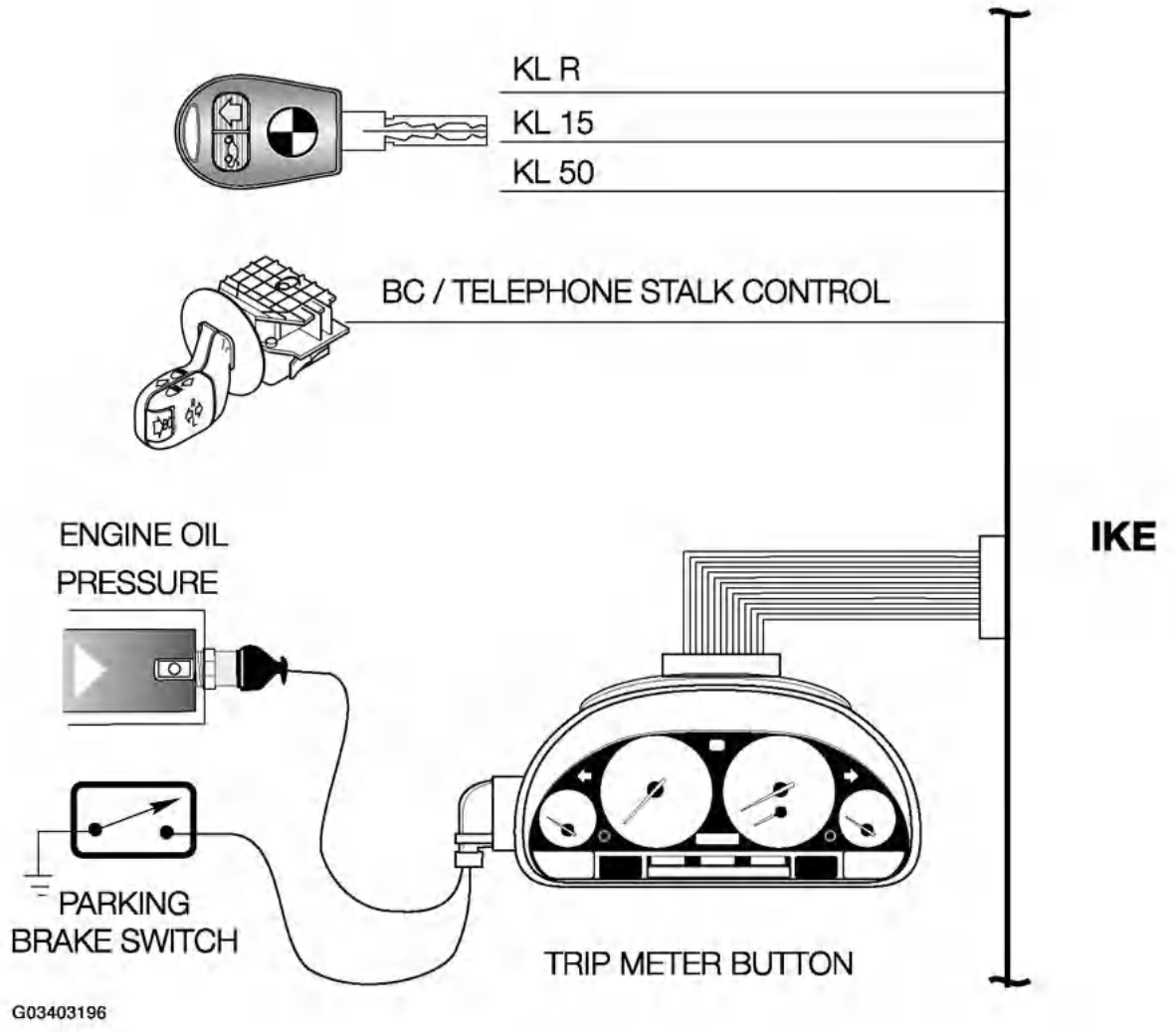


Fig. 46: Identifying Digital Input Signals
Courtesy of BMW OF NORTH AMERICA, INC.

Output Signals

Speed Signal "A" - The vehicle speed is made available to control modules that require a precise speed value. The ASC/DSC wheel speed input is reduced by a factor of 5:1 to produce a speed signal "A" that these control modules can process as an input.

Gong Outputs T_1 , T_2 , T_3

- T_1 - Activates memo (hourly reminder).
- T_2 - Activates the tone for the freeze warning.
- T_3 - Activates the tone for check control functions.
- T_1 -T_2 - Activated simultaneously produces the tone for code and limit functions.

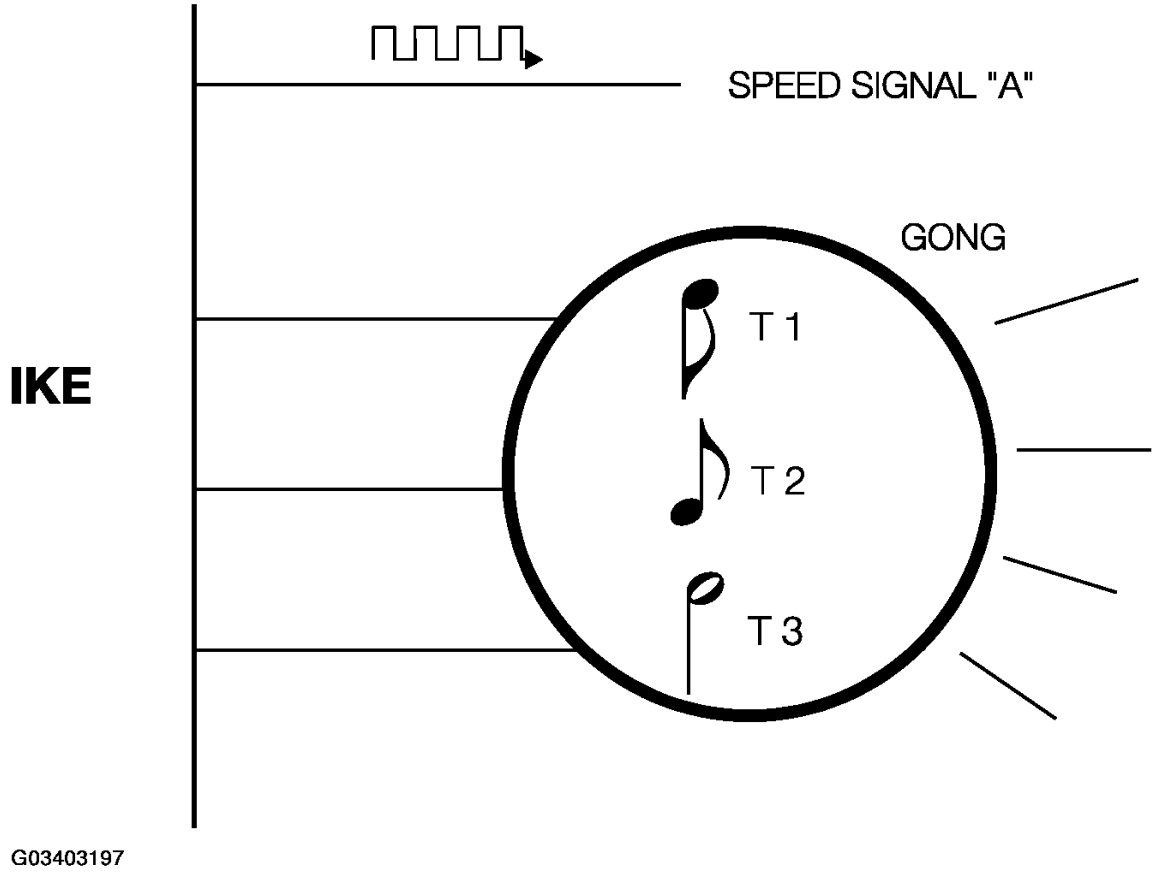


Fig. 47: Identifying Output Signals
Courtesy of BMW OF NORTH AMERICA, INC.

Buses - The I/K, D and CAN buses are used by the IKE to transfer data to other control modules as output signals.

Redundant Data Storage

This specific information is:

- Vehicle ID number.
- Total mileage.
- Service Interval information.

To guard against the loss of specific vehicle information, it is stored in both the IKE and the lamp module (LCM).

This data is compared each time KL15 is switched on. If the data check reveals a mismatch, the manipulation DOT is illuminated.

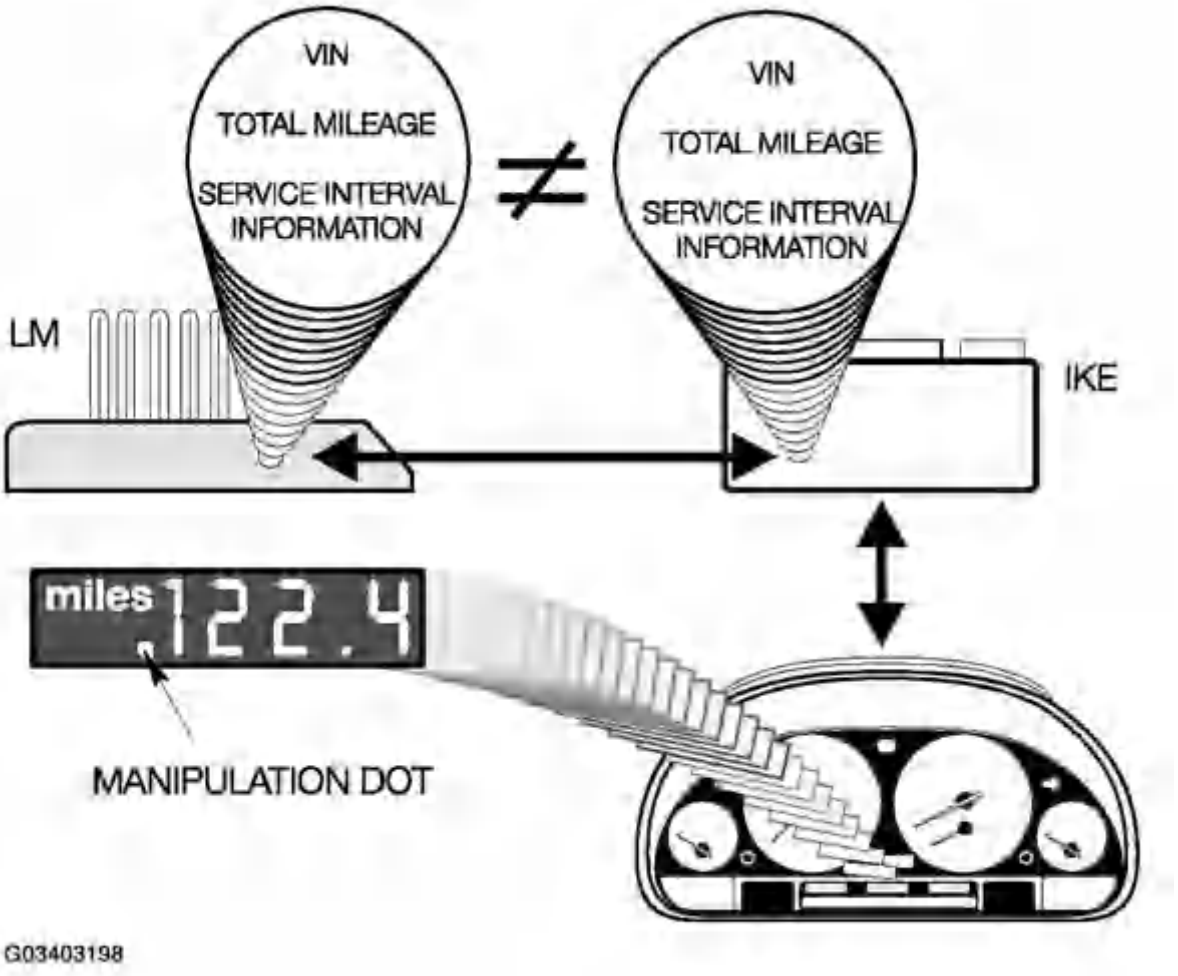


Fig. 48: Identifying Redundant Data Storage Locations
Courtesy of BMW OF NORTH AMERICA, INC.

Because of this redundant storage feature, the following points must be noted:

1. If the vehicle ID number is not the same in both modules, the manipulation DOT is activated and there is no data exchange between the IKE and LCM. All functions of both modules will continue to work (car can be test driven).
2. Data is only accepted from the LCM by the IKE if the ID number is the same and the IKE is at 0 miles.
3. The vehicle ID number is input into a module by way of the DIS tester and only accepted if the mileage recorder in the module is at 0 miles.
4. The LCM mileage data can only be over written with a higher mileage and is updated every 60 miles (100 km).
5. If the distance differs by more than 120 miles (200 km) and the ID numbers are the same, the IKE stores a data transfer fault.
6. If the I-Bus link to the LCM faults, the IKE stores this fault and continues to record the mileage driven.

The condition that controls the redundant date exchange and allows only new components to be used as replacement.

If the IKE from another car is used for testing purposes, test driving the car should be avoided if possible. If the vehicle is test driven, the IKE will record mileage and this mileage ill be added to total mileage of the original car.

E38 BC Test Functions

The BC test functions are used to check inputs, outputs and functions of the IKE. There are 21 possible test steps. With the exception of Test #1,, #2, and #19, all other tests are locked but can be released through test #19.

The test functions are displayed in the instrument cluster. Test #01 is called up by pressing the CC button for 10 sec. The same activation can be initiated by pressing and holding the CC button while switching on the ignition.

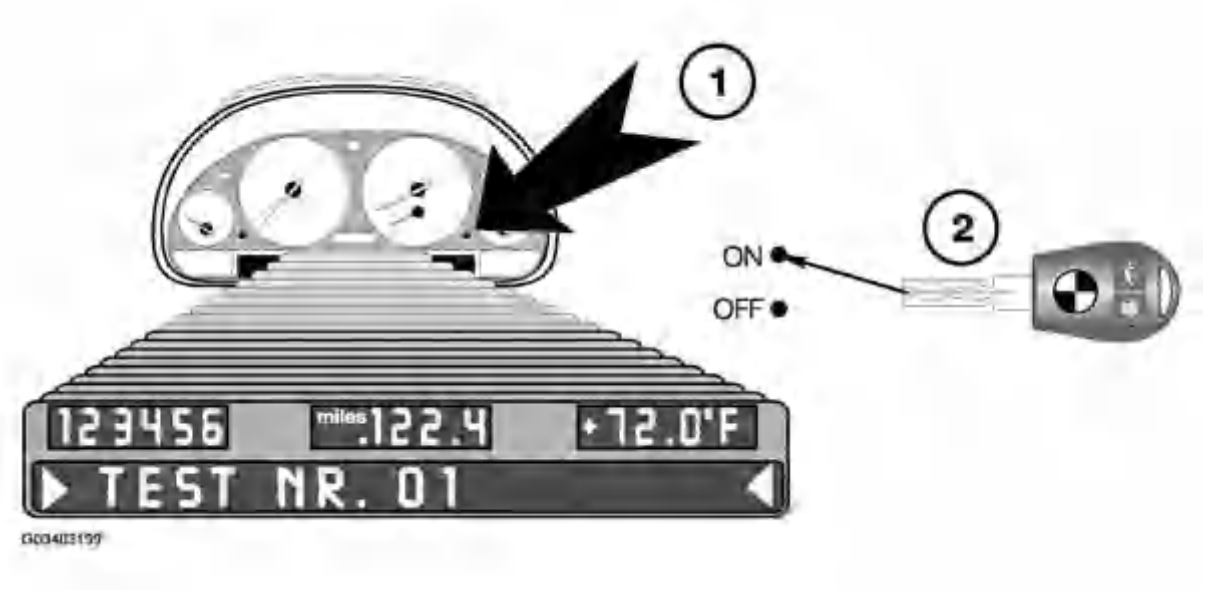


Fig. 49: View Of E38 BC Test Function Display
Courtesy of BMW OF NORTH AMERICA, INC.

Each time the CC button is pressed, the next test number is displayed.

After selecting a test number, the information from the test is posted by pressing the trip odometer reset button. Several tests have sub-functions which are called up by pressing the reset button while in the test.

Unnlocking test functions:

- Call up test #19 - This is automatically done if attempting to enter a locked test
- Using the trip meter reset button enter by pressing the sum of the last 5 digits of the chassis number, example : VIN GB11111, -1+1+1+1+1=5, press the reset button 5 times.
- Confirm entry by pressing the CC button.

The test function can be cancelled by switching the ignition off or pressing the CC button for approximately 2 sec.

TEST NO. 01

The IKE supplies the following data, which appears on the 20 digit cluster matrix display:

- Vehicle Identification number = FGSTNR: GB11111 .
- K value = K: 4739 .
- BMW part number: BMWTNR. 13809873
- Encoding, diagnosis and bus index: CI: 01 DI: 01 BI:01 .
- IKE production date: DRT: 52/94 .
- HW/SW number: HW: 405W:80 .
- Motor: ZYL:8

  M:6 S:400 .

- ROM Date: ROM: 23.08.96 .

TEST NO. 02

The following displays and instruments are activated (system test):

- Speedometer, tachometer, coolant temp gauge, fuel gauge.
- LC displays (segment test).
- Indicators and Warning Lights.

This test can only be called up with the vehicle at a standstill, engine turned off, with KL R or 15 switched on.

TEST NO. 03

The following SI data can be displayed:

- SI km since last reset: SI KM: 1250 .
- SI automatic transmission kilometers: SI-GETR - KM 23300 .

TEST NO. 04

Momentary Fuel Consumption is displayed:

- VBR: 0.0 L100KM .

  VBR: 0.0 L/H.

TEST NO .05

This function shows the range calculation data:

- Range at measured fuel consumption: RW-VBR: 19.5 L/100 KM .

TEST NO .06

In this function, the fuel tank volume for the right and left half of the fuel tank and the current total tank volume are shown in the Instrument Cluster matrix display.

This enables the function of the float level sensors to be checked.

Display: TNK 29.5/34.2/63.7L .

TNKANZ 60.2L PHASE 1 .

The first numerical value in line 1 shows the contents of the left half of the fuel tank, the second, the volume of the right half of the tank. The third value is the current total value. If a level sensor is defective, it's value reverts to 0.

Line 2 shows the current average value (displayed value) for the contents of the fuel tank. The numerical value after the word phase refers to the valid computed number.

Phase 1: Regular computing method by way of sensors (both sensors OK).

Phase 2: Calculation in progress from TKVA signal (sensor faulted)

Phase 3: Fuel tank contents cannot be computed, fuel gauge reads 0 (at least one sensor is faulted).

TEST NO. 07

Momentary coolant temperature. KTMP: 076Â°C .

Momentary engine speed: N:5238 U/MIN .

TEST NO. 08

Momentary Road Speed V: 085 KM/H .

TEST NO. 09

Battery voltage (terminal 30) UB: 12.5 V .

TEST NO. 10

Preset national market codes list. The number is encoded in the IKE with the central code key

Display: USA 02 .

TEST NO. 11

The unit code is entered in the EEPROM by the DIS after IKE has been installed and can be read out by means of test function 11.

TEST NO. 12

This test function shows the data for computing the vehicle's estimated time of arrival.

- Average speed for calculating arrival time: VANK: 029.7 KM/H .
- Current arrival time: ANK: 13.04 .

TEST NO. 13

This test function enables the gong to be tested, Display: GONG? .

- After confirming by pressing the trip odometer reset button, the four audible warning signals are triggered off once in succession.
- Gong T1 (Memo signal) 2.0s.
- Gong T2 (Outside temperature) 1.5 s.
- Gongs T1 and T2 (LIMIT/CODE warning) 1.5 s.
- Gong T3 (Check Control Gong).

TEST NO. 14

This function shows the contents of the fault memory in a hexidecimal code.

Display: DIRG: 07 81 033 .

TEST NO. 15

Not assigned to any test function.

TEST NO. 19

Procedure for unlocking the BC test functions. See ON-BOARD COMPUTER .

TEST NO. 20

BC consumption value correction factor. This test adjusts the correction factor for the consumption value displayed in the MID. The production line installed value is 1000. The value ranges from 750 to 1250.

To adjust the correction factor press the trip meter reset button once for a reduction of 1. For each press of the reset button the value decreases by 1 until it reaches 750. After 750 the number will reset to 1250 and begin to count down again.

To accept the set correction factor press the CC button.

The consumption correction factor (VK) is calculated from the actual amount of consumed fuel (VBR 1ST) and the displayed value (VBR ANZ):

VK = (Actual MPG / Displayed MPG) X 1000.

TEST NO. 21:

This function resets the software at the IKE. This reset is necessary after replacing for example one of the fuel tank level sensors. Otherwise the damping function in the software will prevent the actual value from being shown only after a long time duration.

Display: RESET?

If the test is terminated without a software reset, the ignition switch must be turned back to "0" or the CC button pressed.

CHECK CONTROL MODULE

Model: E38

Production Date: E38: From start of production to 9/95.

Check Control Module (E38 start of production up to 9/95)

The Check Control System in early E38 models utilizes a self-contained Check Control Module (CCM).

The CCM is located in the electrical carrier in | front of the glove box.

This module collects and evaluates all check control data, including messages from the Lamp Control Module (LM).

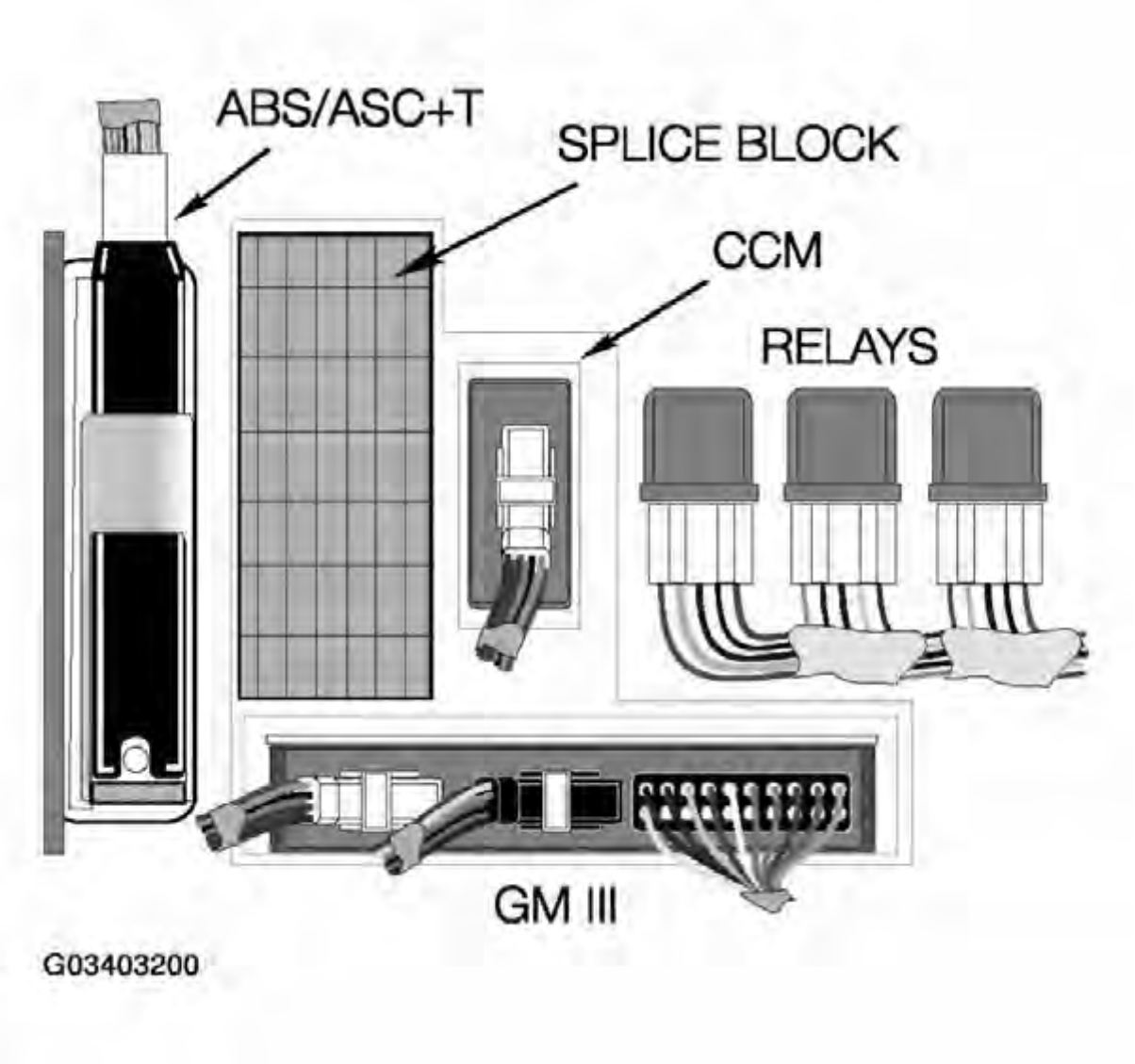


Fig. 50: Locating Control Module (E38 Start Of Production Up To 9/95)
Courtesy of BMW OF NORTH AMERICA, INC.

When the driver needs to be informed of a problem, the CCM signals the IKE over the I-BUS. The IKE will then post the message in the instrument cluster matrix display.

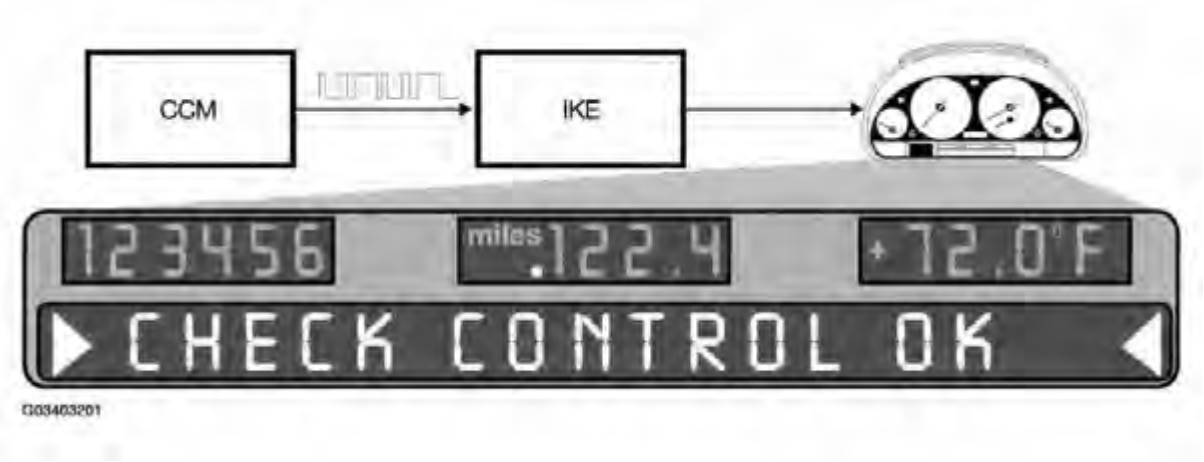


Fig. 51: View Of Instrument Cluster Matrix Display
Courtesy of BMW OF NORTH AMERICA, INC.

The text and operation of the E38 check control was changed to improve message interpretation and reliability, for example:

- GONG. Pre E38: Gong with every new display.

  E38: Only activated for first display in group.

  Advantage: Reduces driver's irritation.

- DISPLAY: Pre E38: "Owner's Handbook" used repeatedly

  E38: "Owner's Handbook" phrase deleted. Actual text for situation with recommended action.

  Advantage: Driver can asses situation without reading the Owner's Manual.

All the warning messages fall into one of four priority groups.

Priority Group P1 - Faults that directly affect the safety or operation of the car and the drive should be addressed immediately. The text is displayed with a flashing arrow on the right and left sides.



Fig. 52: Identifying Priority 1 Fault Display
Courtesy of BMW OF NORTH AMERICA, INC.

Priority Group P2 - Faults that do not affect vehicle's safety or operation directly and the driver need not respond to immediately. These messages are displayed only once when the fault occurs and have to be called up again with the CC button.



Fig. 53: View Of Priority 2 Fault Display
Courtesy of BMW OF NORTH AMERICA, INC.

Priority Group P3 - These faults are shown when the key is turned on before a trip. The faults in P3 are mainly fluid levels which are not assigned to P2. The lights on reminder is a Priority 3 item. With the key in position 0 with the light switch On initiates this reminder.



Fig. 54: Identifying Priority 3 Fault Display

Courtesy of BMW OF NORTH AMERICA, INC.

Special warnings - These are top priority messages and won't be overridden when displayed. Seat belt/ignition key in lock with door open are some of these messages.



Fig. 55: View Of Special Warning Display
Courtesy of BMW OF NORTH AMERICA, INC.

When the key is switched off, all registered check control faults are displayed.

The language of the check control messages is set with the central coding key.

CC DISPLAY PROCEDURES

Special Displays - These messages will overwrite all other displays. If more than one special display request is received by the CCM, the one with the highest priority will be delivered.

P1 Group - P1 displays remain posted as long as the fault is present. If several P1 warnings have been received by the CCM, they are displayed one after another in 3 second intervals.

P2 and P3 Groups - The messages in both groups are displayed when KL15 is switched on for a maximum of twenty three (23) seconds and P3 messages are not displayed after the trip is started. P2 and P3 warning that have been registered by the CCM can be recalled during the trip by pressing the CC button.

Reminder Symbol "> --> <" - The "+" symbol is no longer used. If more than one P1 check control message is present, the reminder symbol "> --> <" is illuminated permanently. If a P2 or P3 message is extinguished, the reminder symbol informs the driver that a CC message has been posted. The symbol will flash when a new P1 warning is recognized.

CC Button - Check control messages can be recalled, for up to 3 minutes, after the ignition is switched off using the CC button.

The highest priority message is displayed first with following messages in a priority descending order. After the lowest message has been displayed, pressing the CC button will clear the matrix.

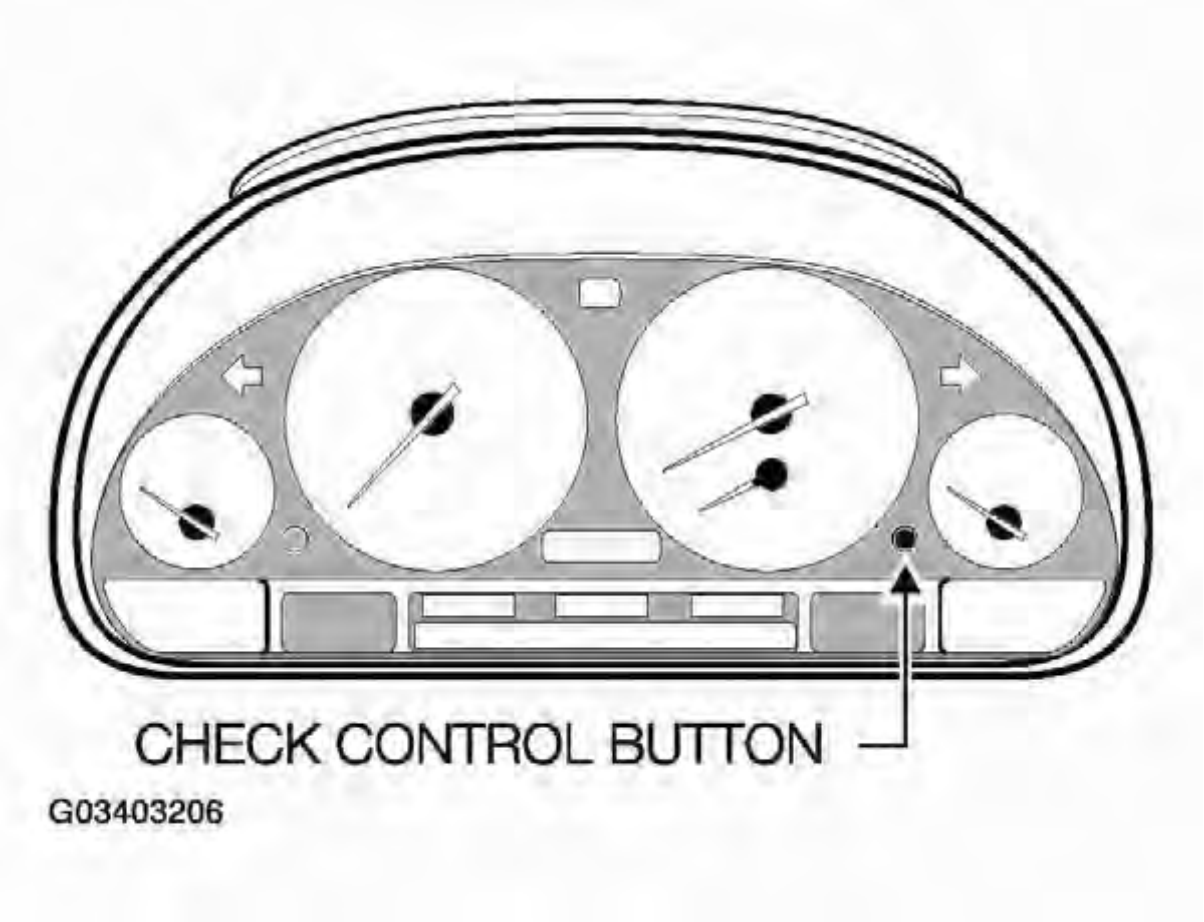


Fig. 56: Locating Check Control Button
Courtesy of BMW OF NORTH AMERICA, INC.

"Check Control OK" is posted when the CC button is pressed and there are no warning message present.

Steering column switch (LSS) - Pressing the steering column switch will clear the matrix display if low priority messages are being posted. This will allow the display to be utilized for other information.

Gong - The warning gong is activated by the IKE when the CCM sends the proper data over the I Bus. The gong is activated only when higher priority warnings are posted.

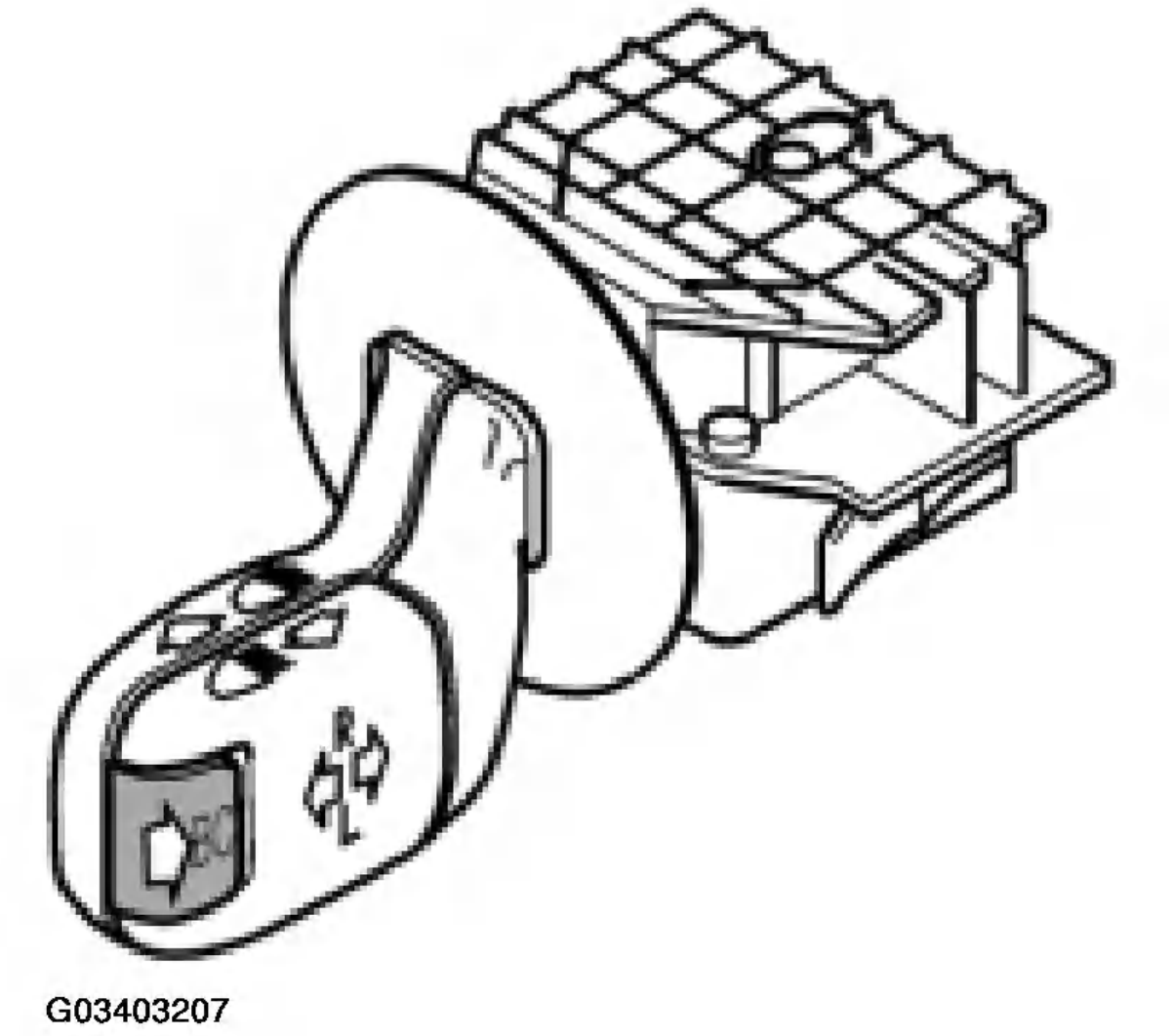


Fig. 57: Identifying Steering Column Switch
Courtesy of BMW OF NORTH AMERICA, INC.

CCM DISPLAY	GONG	PRTY	SCOPE OF MONITOR
OPERATING CONDITIONS			
Release Parking Brake	G	P1	Warning displayed above 3 MPH
Door open with ignition key in position KL 15		P2	Warning displayed when a door is open or opened above 3 MPH.
Trunk Open	G	P2	Warning displayed above 3 MPH when trunk opens or was left open prior to pulling away. Displayed once only.
Stop! Engine oil pressure	G	P1	Warning displayed oil pressure has fallen below safe level.
Coolant Temperature	G	P1	Warning displayed when coolant rises above maximum temperature
Check Brake Lights Check low-beam headlights Check high-beam headlights Check parking lights Check front fog lights Check license plate lights	G	P2	The LM monitors certain vehicle lights and circuits. When a fault is detected the CCM is notified to post a display.
Check brake pads		P2	Warning issued when brake pad wear limit is reached.
Lights on?	G	P3	Warning displayed when key is in position 0 if driver's door is opened with light switch on.
Ignition key in lock	G	S	Warning is displayed when key is left in ignition switch in position R or 0.
Please Fasten Seatbelt	G	S	Warning is displayed for a 6 second period after "Ignition on" with seatbelt fastened or not. If seatbelt is fastened the intermittant gong is switched off.
Remote Battery		S	When remote key battery voltage drops below 4,5 volts
FLUID LEVELS			
Check Brake Fluid	G	P1	Warning is displayed when brake fluid is too low.
Check engine oil level		P2	Warning is displayed when the engine oil level is too low. The E38 is equipped with a new electronic oil level sensor. (see E38 Complete Vehicle for function and operational description).
Check coolant level		P2	Warning is displayed when coolant level is too low. The warning is only posted when the ignition key is first turned on.
Add washer fluid	G	P2	Warning is displayed when washer fluid level is low. This warning is displayed at any time the level becomes low to provide an early warning
NOTE: The fluid level warnings are monitored in 25 second intervals. This time interval prevents false displays from occuring due to bumpy roads, fluid sloshing, etc.			
CONTROL SYSTEM FAULT DISPLAYS			
Emergency transmission operating program	G	P2	If a fault occurs in the AGS control system Check control displays the message. The message is orriginated from the AGS CM to IKE over a one way serial data line. From there IKE notifies the CCM over the I Bus.
EEPROM IKE		S	When IKE and LM data differ (for testing purposes).

G03403208

Fig. 58: Identifying Check Control Messages
Courtesy of BMW OF NORTH AMERICA, INC.

Electronic Engine Oil level Sensor

The E38 began production utilizing the electronic oil level sensor, it was later phased into production on other models and engines.

The electronic level sensor is located in the engine sump mounted to the engine oil pan.

The oil level sensor contains an integral microprocessor and two sensing elements. The sensing elements are inside of a plastic shield and are immersed in the oil.

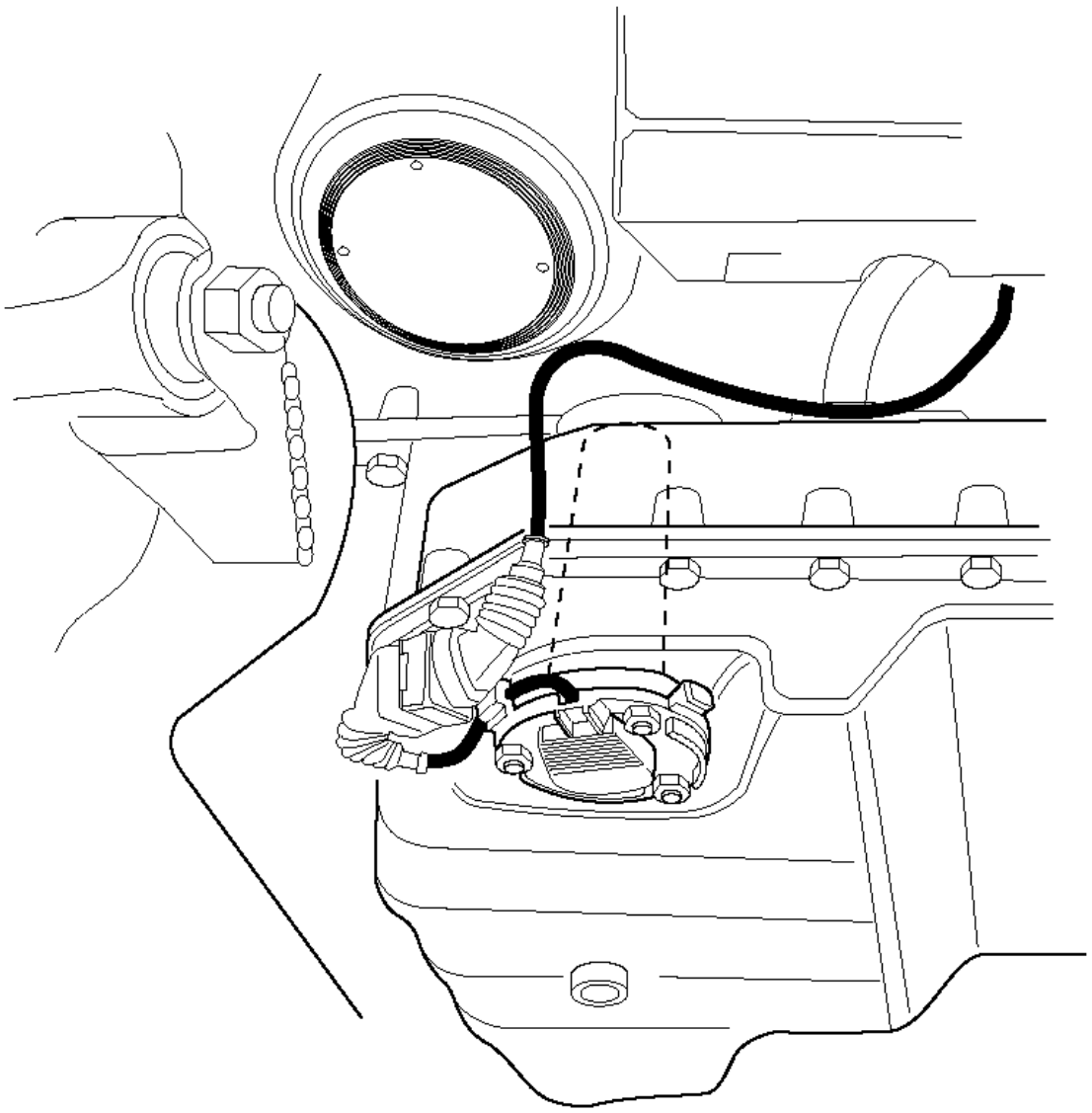


Fig. 59: Locating Electronic Engine Oil Level Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

- One element measures the oil temperature.
- The second is heated to 10Â°C above the temperature of the oil and then switched off to cool.

The length of time it takes to cool the heated element is how the sensor determines the engine oil level. When the oil level is high it covers a larger portion of the probe submersed in the oil sump. The engine oil around the probe cools the heated element faster than if the level is low.

The micro-processor in the base of the sensor supplies a signal to the CCM/LCM with a varying pulse width and frequency.

The "high" or "on" time of the signal is dependent on oil temperature, this means the hotter the oil is, the longer the sensing element has to be heated to reach 10Â°C above.

The "low" or "off" time of the signal is dependent on the oil level. The lower the oil level is, the longer the "off" time of the signal is.

Cool down times are averaged over a minimum of 350 measurements to take account of slosh in the oil pan while driving. If the average is over the warning limit the low oil warning is set.

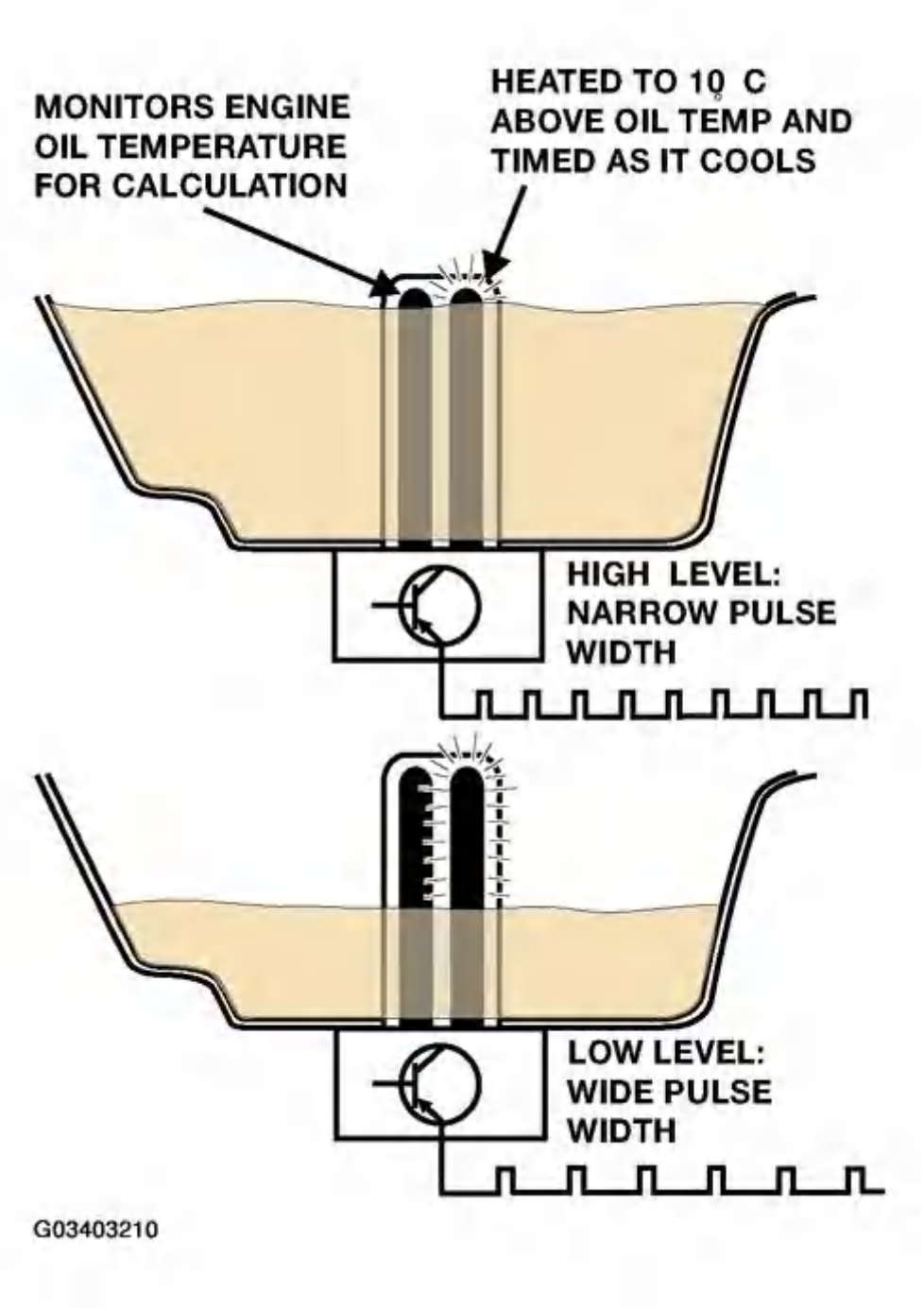


Fig. 60: Identifying High Level Oil
Courtesy of BMW OF NORTH AMERICA, INC.

Please refer to appropriate article for a table of the warning levels of individual vehicles.

BASE INSTRUMENT CLUSTER (KOMBI)

Model: E39, E53

Production Date: From start of production

Base Instrument Cluster

The base instrument cluster consists of five analog gauges. The processing electronics and drivers for the gauges are contained in the cluster. The five gauges include:

- Fuel Gauge.
- Speedometer.
- Tachometer.
- Fuel Economy Gauge.
- Coolant Temperature.



Fig. 61: Identifying Base Instrument Cluster
Courtesy of BMW OF NORTH AMERICA, INC.

Three Liquid Crystal Display blocks are provided for the:

- Check Control Display - pictogram.
- Mileage, Outside Temperature and BC Display.
- Transmission Range and SI Display.

Warning lamps and indicators are positioned to the left and right of the display blocks. The number of warning lamps is greater on the base cluster for the display of several check control warnings. All of the warning lamps and indicators are LEDs and not replaceable. Critical warning lamps use two LEDs for a safety margin.

There are replaceable lamps for the back lighting on the liquid crystal display units.

The LEFT DISPLAY BLOCK contains a pictogram for various check control warnings. LEDs within the display will illuminate for:

- Lighting failures for headlight (low beam), taillight and brake lights.
- Open doors or trunk.
- Low washer fluid.

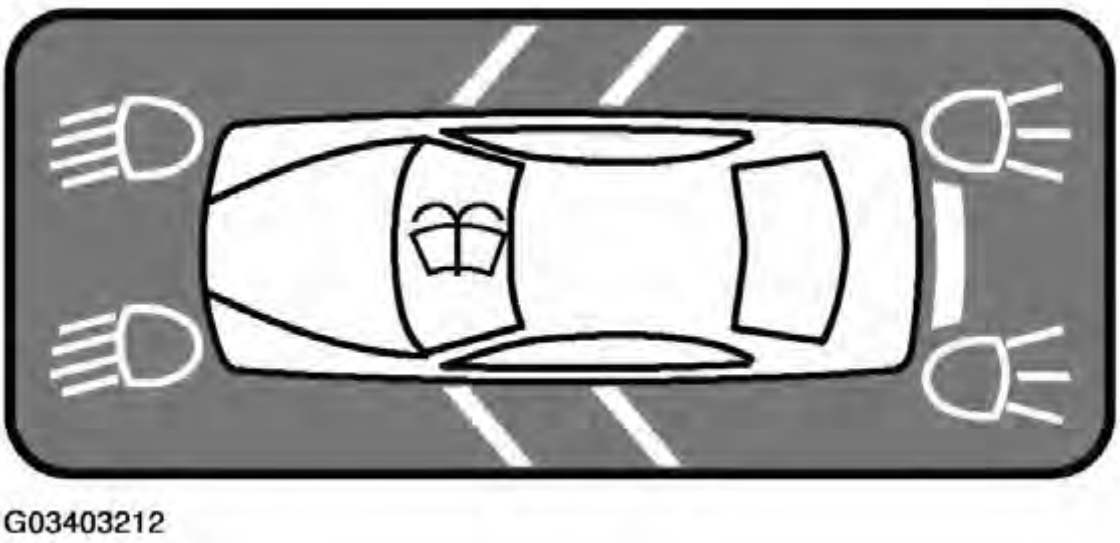


Fig. 62: Identifying Left Display Block Pictogram
Courtesy of BMW OF NORTH AMERICA, INC.

Additional circuits monitored by check control include the engine oil level and transmission emergency program. These warnings are indicated by lamps positioned in both indicator display areas on the left and right sides on the bottom of the instrument cluster.

Due to the ability to illuminate multiple warning LEDs, there is no priority displays for the pictogram check control. If multiple faults exist, each corresponding LED will illuminate.

The LED will remain illuminated as long as the fault exists. The only exception is the washer fluid which will go out 60 seconds after KL 15 is switched ON.

All check control and lamp control circuits are monitored by the Light Check Module (LCM). When failures or faults exist, the messages are passed to the cluster for display over the K-Bus.

The MIDDLE BLOCK contains the displays for the Total Mileage, Trip Mileage and Board Computer.

The total mileage is stored in non-volatile memories in the cluster EEPROM and the LCM.

The mileage can be displayed with the key off for 25 seconds if the mileage reset button is pressed.



Fig. 63: Identifying Middle Block Display
Courtesy of BMW OF NORTH AMERICA, INC.

Board Computer information can be displayed by pressing the turn signal lever.

The RIGHT BLOCK contains the displays for the automatic transmission driving range and the Service Interval Indicator III.

The display of the Service Indicator on the E39 is the same as the "High" clusters. The processor for the intervals is located in the cluster electronics. The processing method for determining interval times uses the Service Interval III system. Interval times are based on fuel consumption instead of mileage and starts. This system was introduced on the 1996 E38 - 750iL.



Fig. 64: Identifying Right Block Display
Courtesy of BMW OF NORTH AMERICA, INC.

Using fuel consumption offers several advantages over the SIA II method for determining oil service.

- First, the processing electronics are less involved in that only one value is needed for the processing.
- Second, the use of fuel consumption is a more accurate method of determining engine load and the need for service.
- Third, resetting of the indicator before the scheduled time will not effect the time to the next service.

A set volume of fuel (in liters) is stored in the EEPROM of the SI. The volume of fuel is dependent on the vehicle and engine size. The processor receives the "ti" signal as the vehicle is used. As 20% of the stored volume is consumed, one of the green LEDs will go out. Each successive 20% of fuel consumption will cause the next LED to go out until 100% of the stored volume has been consumed. At this point the yellow LED will come on indicating the service is due. At 108% of the volume, the RED LED will illuminate indicating an over due service.

With each reset (oil service ore inspection), the total volume of fuel is restored in the EEPROM and the calculation starts over again.

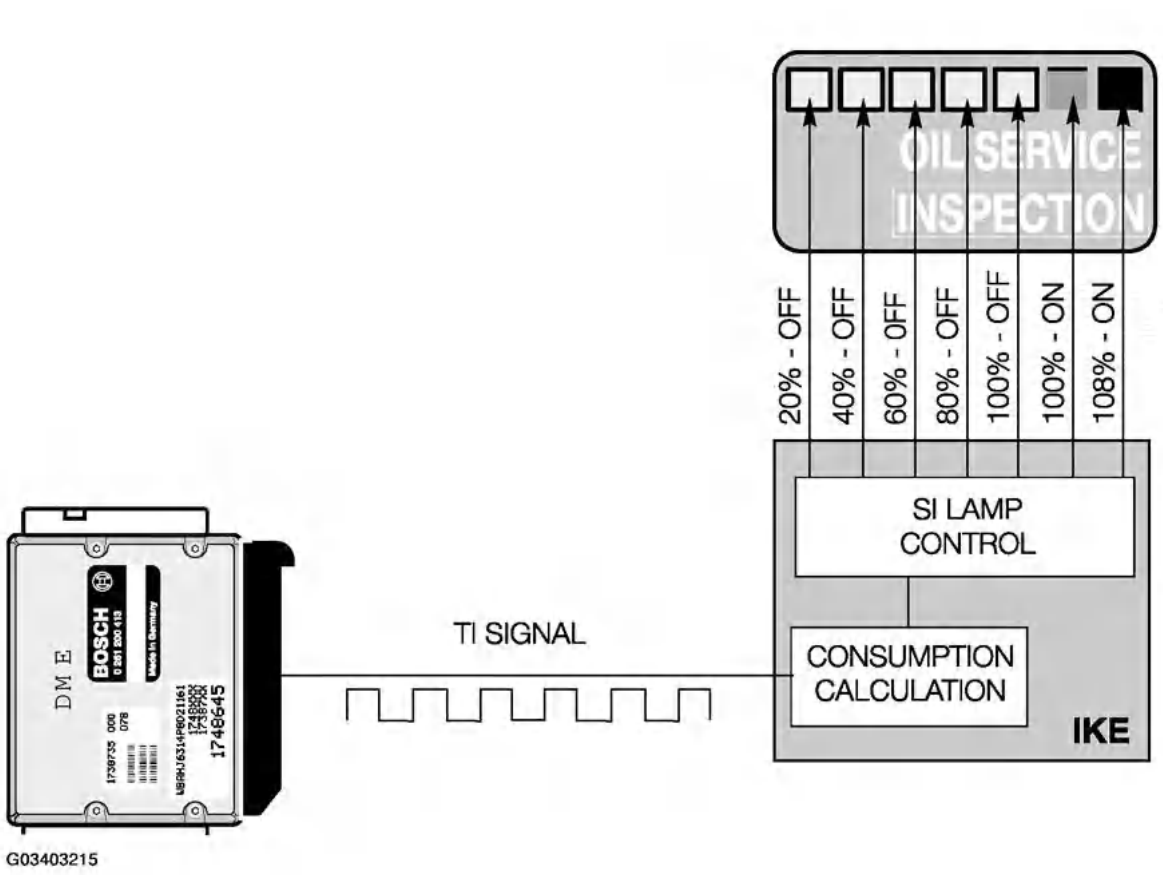


Fig. 65: Identifying Sl Lamp Control
Courtesy of BMW OF NORTH AMERICA, INC.

Dynamic Digital Inputs

Distance Signal- This input is supplied to the cluster by the ASC/DSC control module as a square wave signal. Pulses from the left rear wheel speed sensor are processed by the DSC module to produce this signal. The cluster electronics process the input for the cluster display and pass the signal along on the K bus as speed signal "A" for other control modules requiring the vehicle speed signal.

Engine Control Module Signals - The "Ti" & "TD" signals are produced by the Engine control module and sent to the cluster. As first introduced on the E39, these signals were delivered to the cluster via hard wire. On models produced after 9/98 these signals are delivered by the CAN Bus.

The cluster processes the signals for the tachometer and fuel economy indicator displays. The Ti signal is used by the cluster for the SI indicator. The cluster also passes the TD signal out over the K Bus.

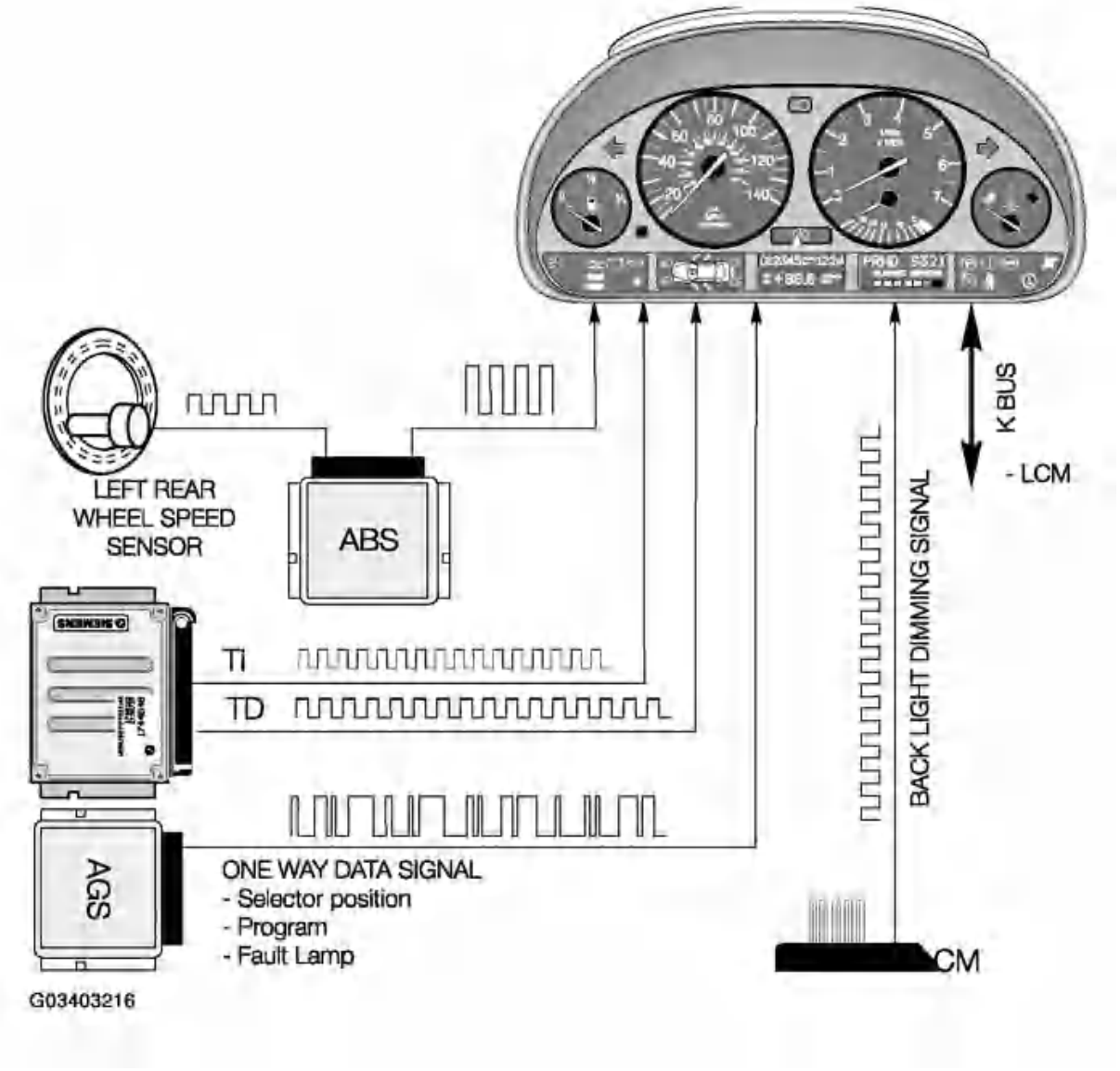


Fig. 66: Identifying Dynamic Digital Inputs
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Diagram represents vehicles produced before 9/98.

Transmission One Way Data Signal- The AGS control module provides a one way data signal to the instrument cluster for signalling of the range selector position, driving program and for fault lamp activation. This signal is provided over the CAN Bus on vehicles produced after 9/98.

DIMMER SIGNAL - This is a pulse-width modulated signal from the LCM. It is used to control the intensity of the back lighting of the instruments and the LCDs when the lights are switched ON. This signal is also output over the K-Bus.

K-BUS Signalling - The Cluster receives signals for the Check Control Pictogram over the K-Bus.

Analog Input Signals

Battery Voltage - Battery voltage is monitored by the cluster and a fault is stored if the voltage exceeds 16 volts.

Fuel Tank Level - Two lever action sensors are wired in parallel to the cluster. The two varying voltage signals are processed by the cluster for fuel gauge and low fuel warning display.

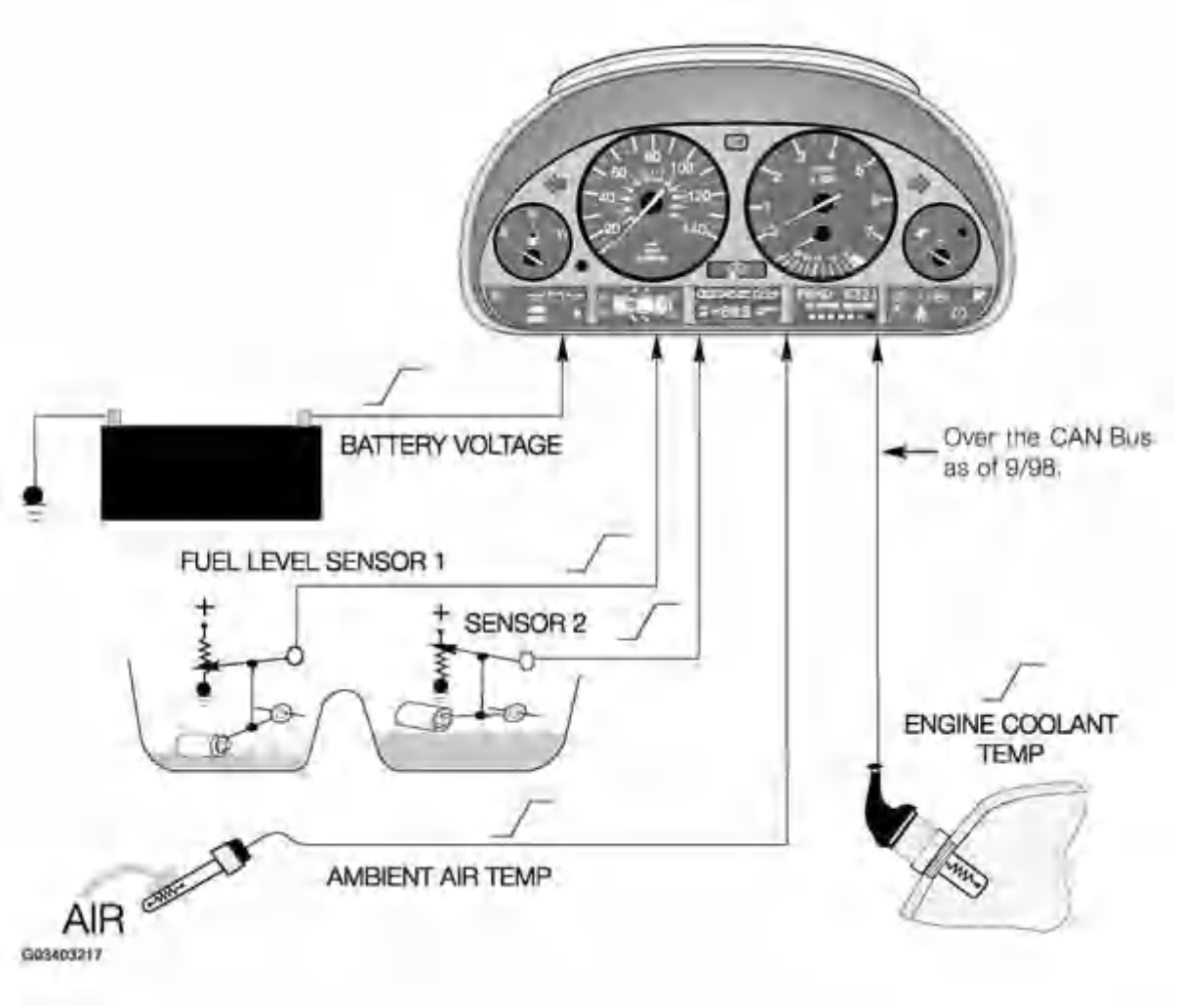


Fig. 67: Identifying Analog Input Signals
Courtesy of BMW OF NORTH AMERICA, INC.

Coolant Temperature - A NTC sensor is used to measure coolant temperature, the cluster uses this input for temperature gauge display. This is also a CAN bus signal on vehicles which have the CAN bus link to the cluster

Outside Temperature - A NTC sensor is used to measure the ambient temperature. The signal is processed by the cluster and passed out over the K Bus to modules requiring this input for processing.

Digital Input Signals

The normal ignition switch terminals (KLR, KL15 & KL50) are input to the cluster. Various functions are dependent on ignition switch position.

Steering Column Switch - The turn signal stalk provides a momentary ground signal that is used to call up BC functions.

Brake Pad wear Sensor - The pad sensor inputs are used to illuminate the brake pad warning indicator.

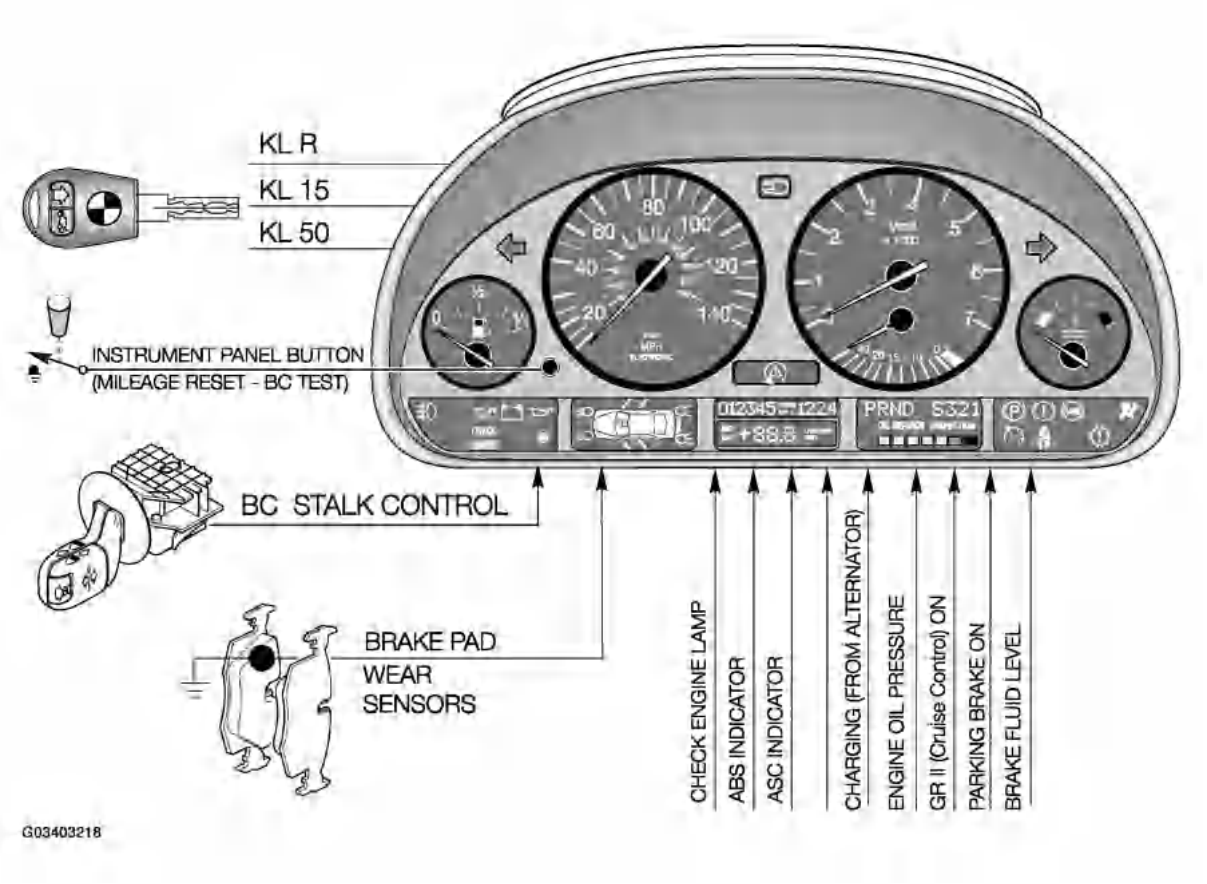


Fig. 68: Identifying Digital Input Signals
Courtesy of BMW OF NORTH AMERICA, INC.

Instrument Panel Button - The reset button is used to reset the trip - odometer as in the past. It will also display the mileage, if pressed with the key switched OFF. This button is also used for the Base BC/instrument cluster test functions.

Inputs for Warning Lamps - Various switches are used to signal the cluster for warning and indicator lamp illumination. Many of these inputs are provided over the CAN or K-bus.

Output Signals

Speed Signal "A" - The vehicle speed signal is available as an output for control modules that require precise vehicle speed information.

K-Bus Interface - The K Bus is used to transfer data between the cluster and other modules on the link. The diagnostic interface also passes over the K Bus for troubleshooting with the DIS.

Low Fuel - Based on the processing for the low fuel indicator lamp, this output is also sent to the Engine control module. The signal is stored along with a mis-fire detection fault for troubleshooting purposes.

Gong Output - T3, The T3 tone is used for check control warnings.

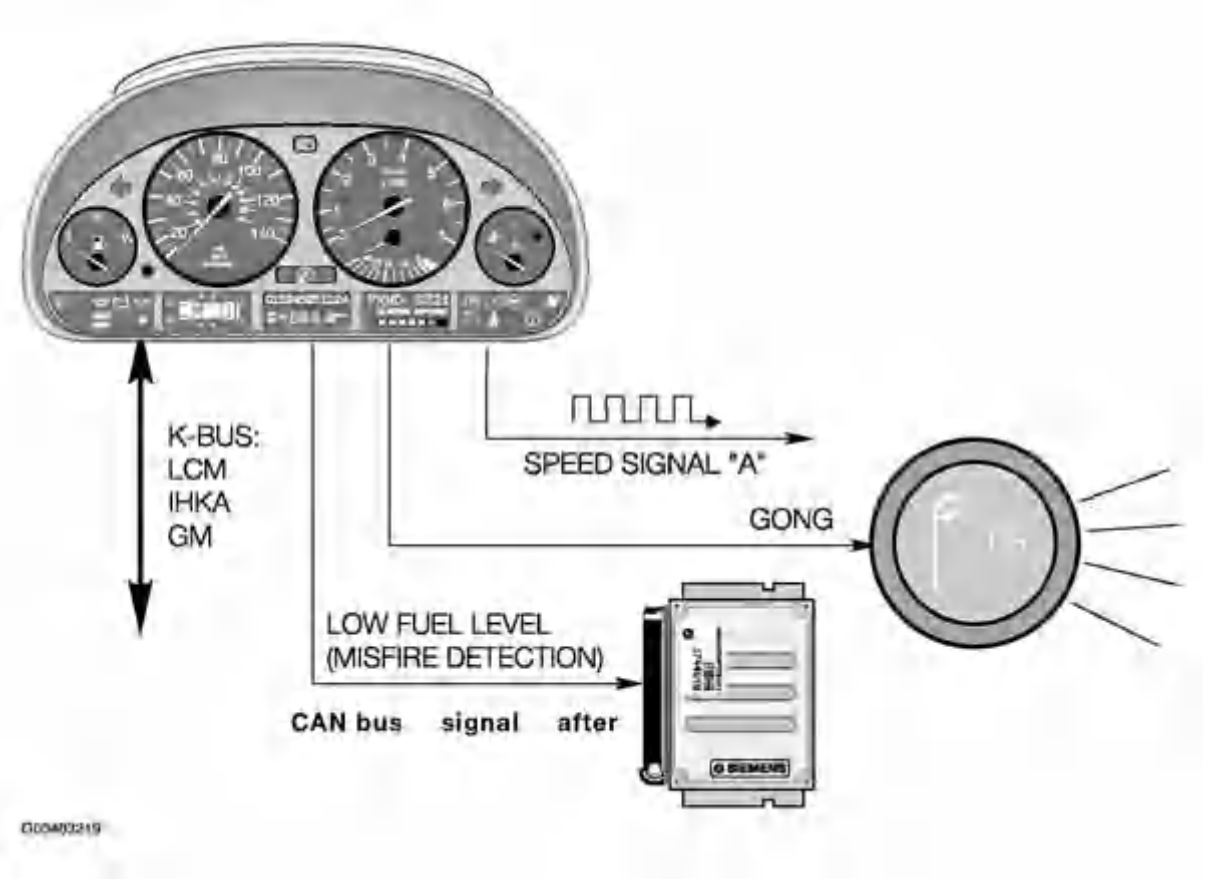


Fig. 69: Identifying Output Signals (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

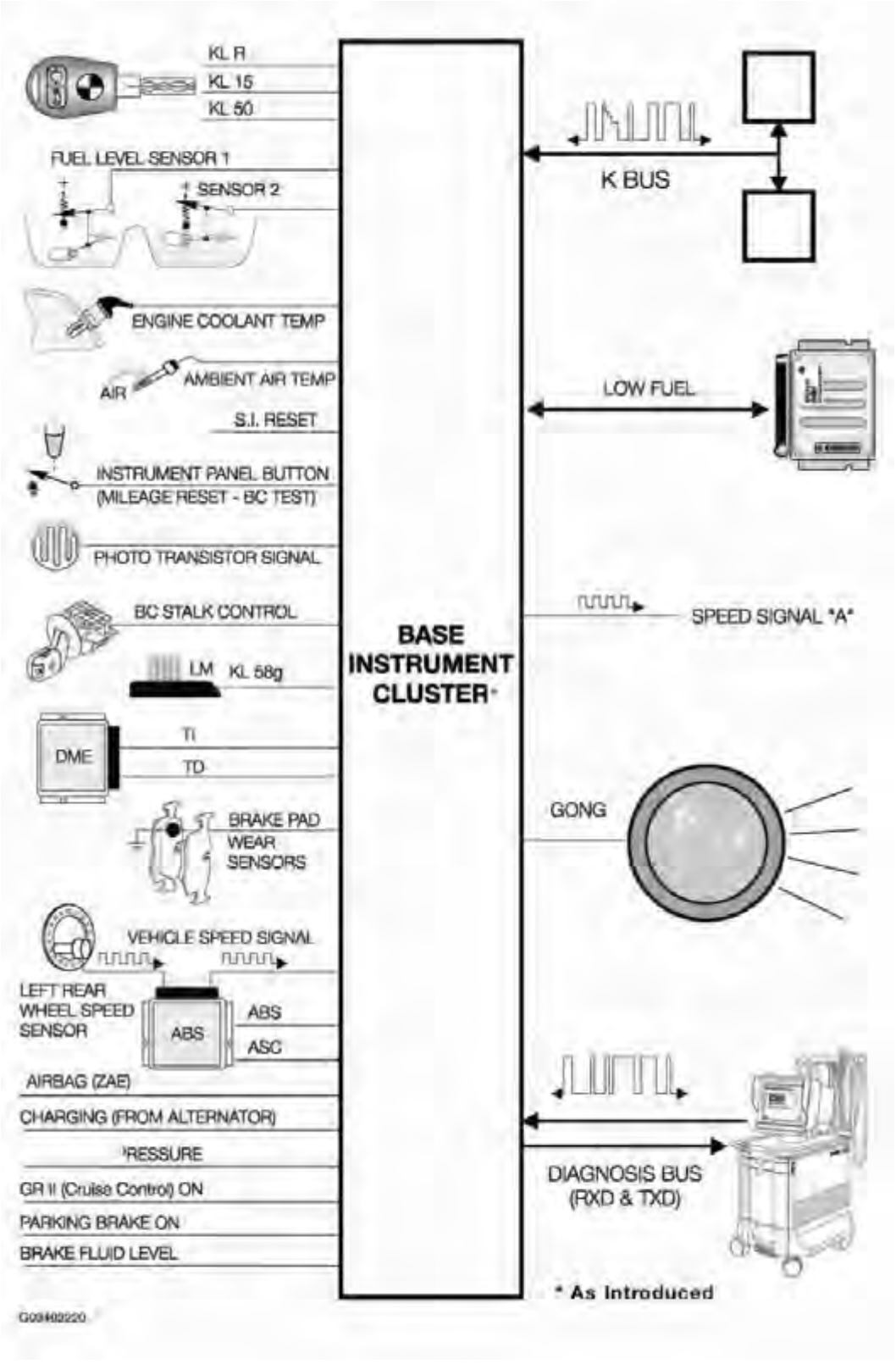


Fig. 70: Identifying Output Signals (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Redundant Data Storage

The specific information stored redundantly includes:

- Vehicle ID number.
- Total mileage.
- Service Interval data.

The data is stored in the cluster and in the Light Check Module (LCM). The storage of this data follows the

redundant storage of the IKE. It prevents the loss of total mileage or SI data in the event of a cluster processor failure.

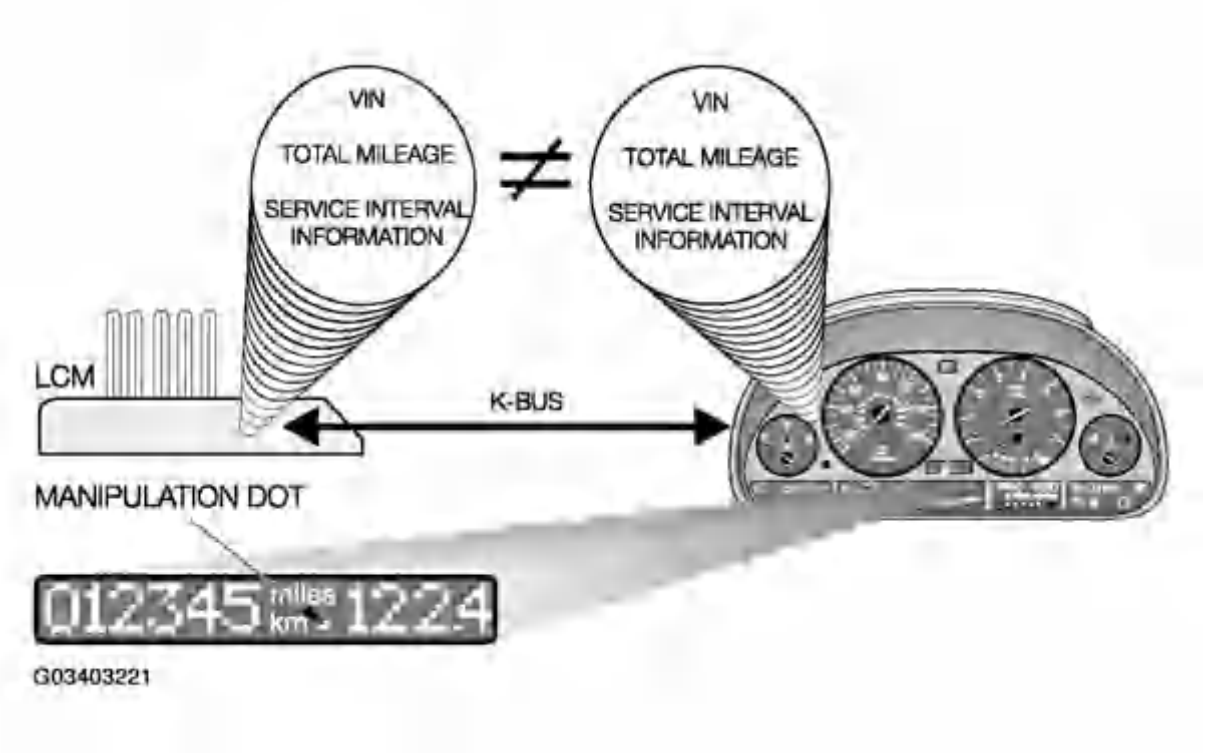


Fig. 71: Identifying Redundant Data Storage Locations
Courtesy of BMW OF NORTH AMERICA, INC.

The data is compared each time KL 15 is switched ON. If the data does not match, the manipulation DOT in the mileage display is illuminated.

Because of this redundant storage feature, the following points must be noted:

1. If the vehicle ID number is not the same in both modules, the manipulation DOT is illuminated and no data transfer takes place. All functions of both modules will continue to operate.
2. Data will only be accepted by the cluster from the LCM if the ID numbers match and the cluster mileage is zero.
3. The vehicle ID number is input into the cluster through coding and will only be accepted when the cluster is at zero mileage.
4. The LCM stored mileage can only be overwritten with a higher mileage and is updated every 60 miles.
5. If the mileage differs by more than 120, and the ID numbers are the same, the cluster will continue recording the mileage and set a fault for data transfer.
6. If the K Bus link to the LCM fails, the cluster will continue to record mileage and store a fault for the data link.

These conditions will only allow new components to be installed for replacement purposes. However, a used component can be installed for testing purposes. If a cluster from another vehicle is used for testing purposes, road testing of the vehicle should be avoided, because the cluster will accumulate mileage.

Base version On-Board Computer

The On Board computer information on the base variant cluster can only be displayed in the center matrix. The following information can be displayed:

- OUTSIDE TEMPERATURE



Fig. 72: Identifying Outside Temperature Display
Courtesy of BMW OF NORTH AMERICA, INC.

- FUEL CONSUMPTION



Fig. 73: View Of Fuel Consumption Display
Courtesy of BMW OF NORTH AMERICA, INC.

- AVERAGE SPEED



Fig. 74: Identifying Average Speed Display
Courtesy of BMW OF NORTH AMERICA, INC.

- ESTIMATED DRIVING RANGE ON REMAINING FUEL



Fig. 75: View Of Estimated Driving Range Display
Courtesy of BMW OF NORTH AMERICA, INC.

On 97 M.Y. vehicles, when KL R is switched ON, the outside temperature will be displayed. To call up any other function, the turn signal lever must be pressed and released. The other functions are than displayed one after the other. A blank field is provided after the average speed display to allow the driver to switch off the display. Vehicles produced from M.Y. 98 the display last called up will be remembered and displayed when KLR is switched back on.

A freeze warning is incorporated in the BC. If the temperature drops below 37Â° F, the gong will sound and the temperature display will flash in the BC. Pressing the turn signal lever will cancel the display.

Two of the displays "Average Fuel Consumption" and "Average Speed" can be reset to start new calculations. To reset the displays, press and hold the turn signal lever, for longer than one second, when the function is called up. The BC will than start to compute a new average value.

Base BC/Instrument Cluster Test Functions

In addition to the fault memory and diagnostic link, the base instrument cluster contains a series of test functions that can be accessed to check various functions and values. The test functions are displayed in the mileage LCD block. There are a total of 21 test functions. The test functions are similar to those of previous Board computers and contain similar tests.

- Tests 1 & 2 are always unlocked.
- Tests 3 -21 are only accessible after unlocking the test function. Test 19 is the unlock function for accessing the displays.

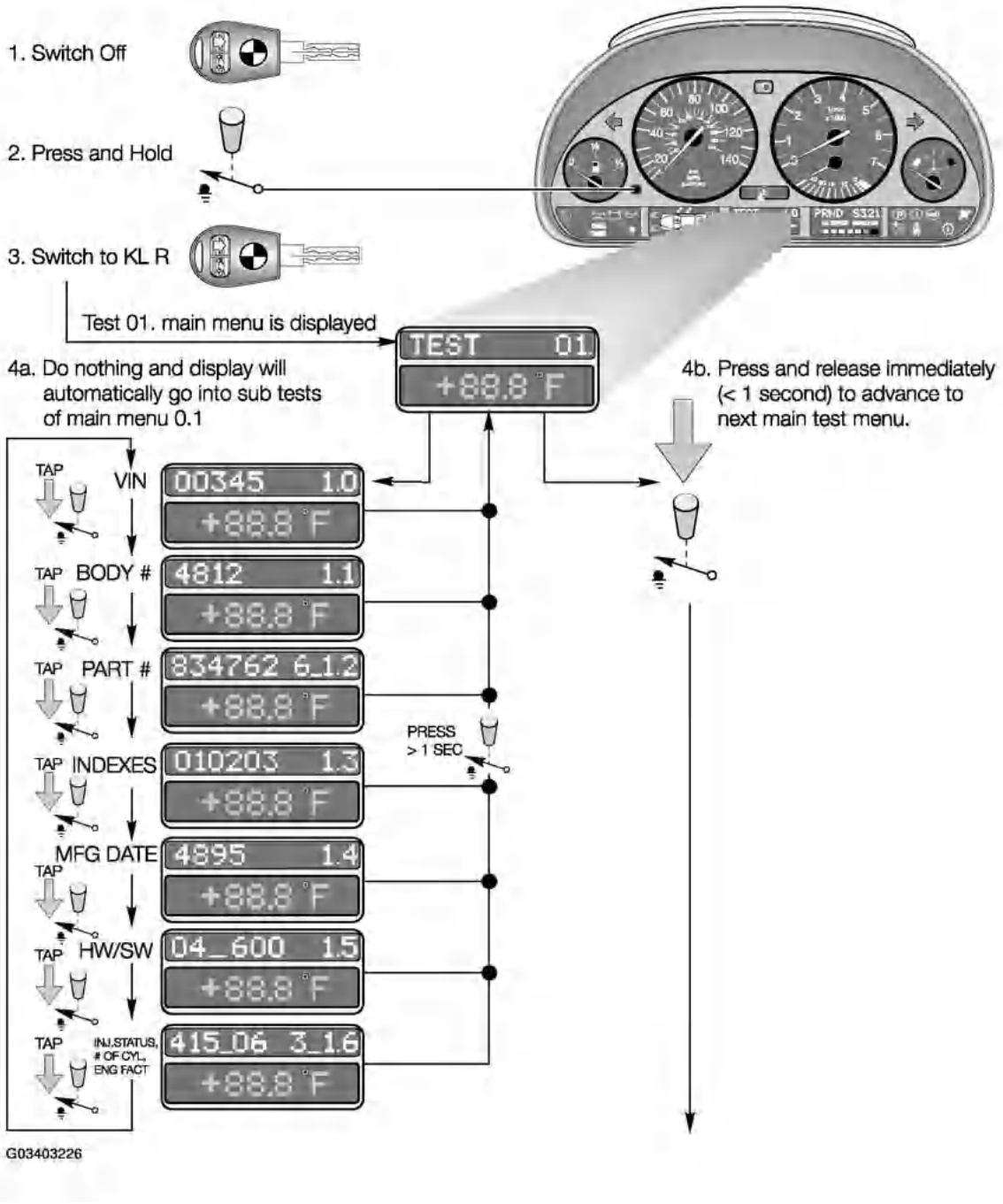


Fig. 76: Identifying Base BC/Instrument Cluster Test Functions
Courtesy of BMW OF NORTH AMERICA, INC.

Scrolling through the numbered test functions is achieved by pressing the instrument cluster button when the test number is displayed.

- (press button) = test #2.
- 1.0 (press button) = sub-test #1.

This signals the BC to display the sub-tests of the displayed main test menu or continue on to the next main test menu.

TEST 01. - Vehicle specific data including:

SubTests:

12345 1.0 = VIN.

4812 1.1 = K-value.

834762 6_1.2 = Part number of cluster.

010203 1.3 = Coding/Diagnosis/Bus index.

3495 1.4 = Manufacturing date (calendar week/year).

04_600 1.5 = Hardware/software # of cluster (HW:04, SW:6.00).

415_06 3_1.6 = Injection status, number of cylinders, engine factor.

TEST 02. - Cluster System Test - activates the gauge drivers, indicators and LEDs to confirm function.

TEST 03. - SI data.

Sub Tests:

1500 3.0 = Liters

0 3.1 = Periodic inspection days (not applicable for US).

TEST 04. - Momentary Consumption.

Sub Tests:

0267 4.0 = 26.7 liters/1000km.

0073 4.1 = 7.3 liters per hour.

TEST 05. - Distance Gone Consumption.

Sub Tests:

0195 5.0 = 19.5 liters/100 km.

226 5.1 = momentary distance to go (226km).

TEST 06. - Fuel level sensor inputs in liters.

Sub Tests:

237415 6.0 = Fuel level averaged.

- LH sensor input = 23.7 liters.

- RH sensor Input = 41.5 liters.

0652 6.1 = Total tank level averaged = 65.2 liters.

0667 1_6.2 = Indicated value and tank phase.

- 1 = both sensors OK.
- 2 = one sensor fault.
- 3 = implausible input.

TEST 07. - Temperature and Speed

Sub Tests:

032 7.0 = Coolant temp input 32Â°C.

245 7.1 = Outside temp input 24.5Â°C.

5283 7.2 = Engine speed 5,283 RPM.

058 7.3 = Vehicle speed 58km/H.

TEST 08. - Input values in HEX form.

Sub Tests:

XXX 8.0 -- 8.3 = Hex code, Instrument cluster inputs.

TEST 09. - Battery voltage.

Sub Test:

125 9.0 = 12.5 volts.

TEST 10. - Country Coding.

Sub Test:

02 10.0 = US 02.

TEST 11. - Cluster code.

Sub Test:

000003 11.0 = Cluster code.

TEST 12. - Not used.

TEST 13. - GONG test.

Sub Test:

Gong 13.0 = Activate gong by pressing button (gong response is delayed).

TEST 14. - Fault memory (not for diagnosis).

TEST 15 to 18 - Not used.

TEST 19. - LOCK/UNLOCK.

Sub-Tests

L-ON...

L-OFF 19.0 =

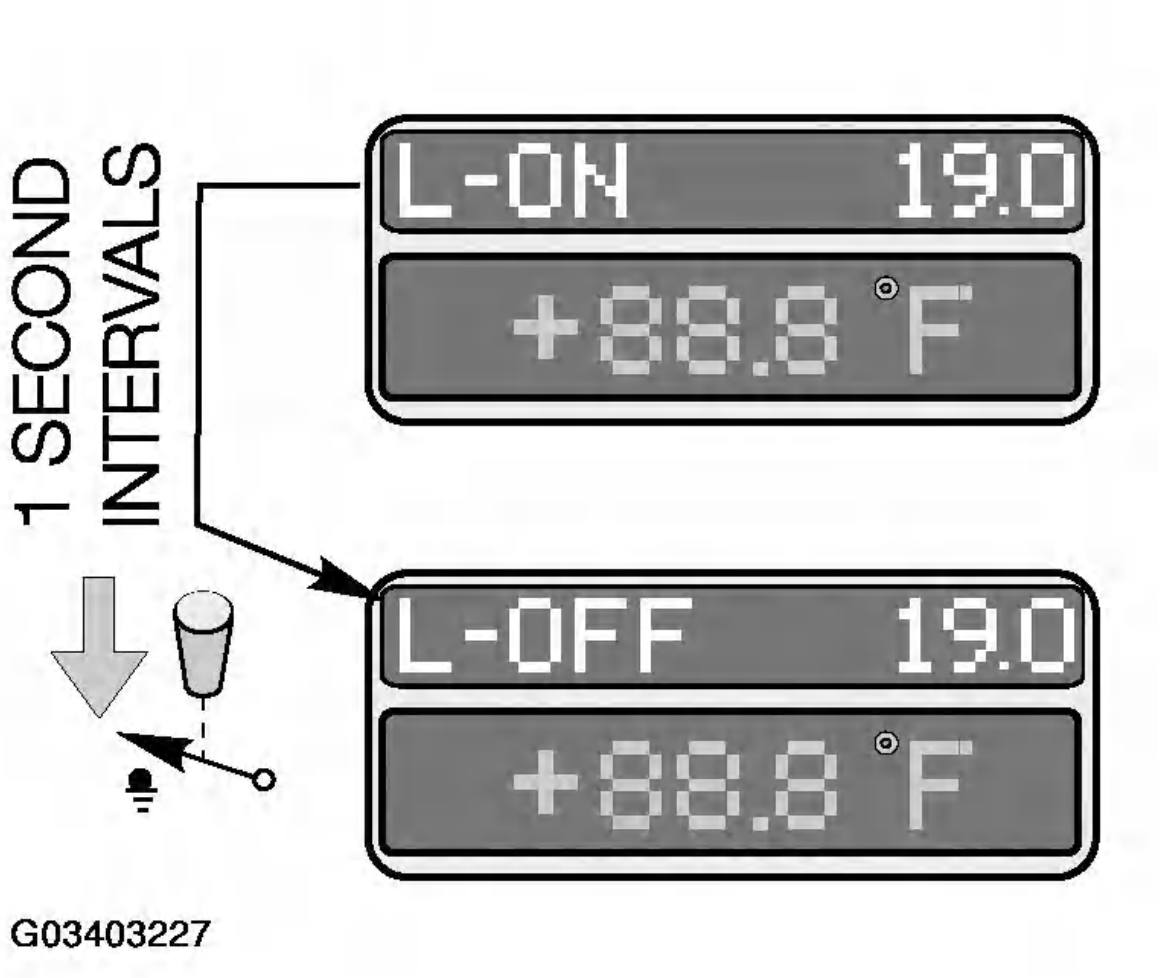


Fig. 77: Identifying Lock/Unlock Display
Courtesy of BMW OF NORTH AMERICA, INC.

Display changes from "L-ON" to "L-OFF" every second. To unlock test functions, press the cluster button immediately when it changes to "L-OFF". Tests are automatically locked when exiting test functions.

TEST 20. - Average fuel consumption - correction factor

The factor follows previous systems, with adjustment range of 750 to 1250. The adjustment method is new for the base cluster. If adjustment is necessary, enter into test 20 using the cluster button.

The correction factor number is changed by using the sub-tests for the "ones, tenths and hundreds of the factor number. The digits will automatically scroll through 0-9 within each group (ones, tenths, hundreds).

Sub-Tests:

20.0 = Press the button to reset display to 1000

XXX9 20.1 = Press the button when the correct "ones" position is attained.

XX5X 20.2 = Press the button when the correct "tenths" position is attained.

12XX 20.3 = Press the button when the correct "hundreds" position is attained.

TEST 21. - Software reset

Sub-Test:

reset 21.0 = Reset software

Article GUID: A00232777

EWS

Drive Away Protection System (EWS)

Model: EWS I/EWS II/EWS III/EWS III D E31/E34/E36/E38/E39/E46/E52/E53

Production Date: All since 1/94

DRIVE AWAY PROTECTION

The first version of Drive Away Protection was installed on production vehicles 9/93 through 12/93.

Purpose of The System

The purpose of the Drive Away Protection system was to reduce vehicle theft as mandated by the European Insurance Commission to combat the high theft rate in European Countries.

This first version of the Drive Away Protection System added a circuit from the General Module to the DME. The added circuit was spliced into the existing code function from the Board Computer (BC) to the DME.

The components of the Drive Away Protection System are:

- Door Lock Switch.
- General Module.
- Board Computer.
- DME.

System Components

Door Lock Switch

The door lock switch provides a 12V (High) signal to the GM when the vehicle is locked from the outside. The switch also provides a Low signal to the GM when the vehicle is unlocked.

General Module

The GM receives the lock and unlock signals from the door lock switch and signals the DME with a 12V High signal when the vehicle is double locked or with a Low signal when this vehicle is unlocked.

Board Computer

The Board Computer (BC) through its' code function provides a High signal to the DME to disallow vehicle operation or a Low signal to allow vehicle operation.

DME

The DME looks for a High/Low signal from the BC or GM and dependent on the signal, it will either allow or prevent vehicle operation.

Principle of Operation

When the vehicle is locked from the outside, a High signal is sent to the GM from the door lock switch. The GM receives this High signal and outputs a High signal to the DME. The circuit from the GM is spliced into an existing circuit from the BC to the DME.

A High signal from the GM (or BC) causes the DME to cancel the fuel and spark functions to the engine

resulting in a no-start condition. The vehicle must be unlocked with the key or the code function of the BC cancelled for the DME to allow engine operation.

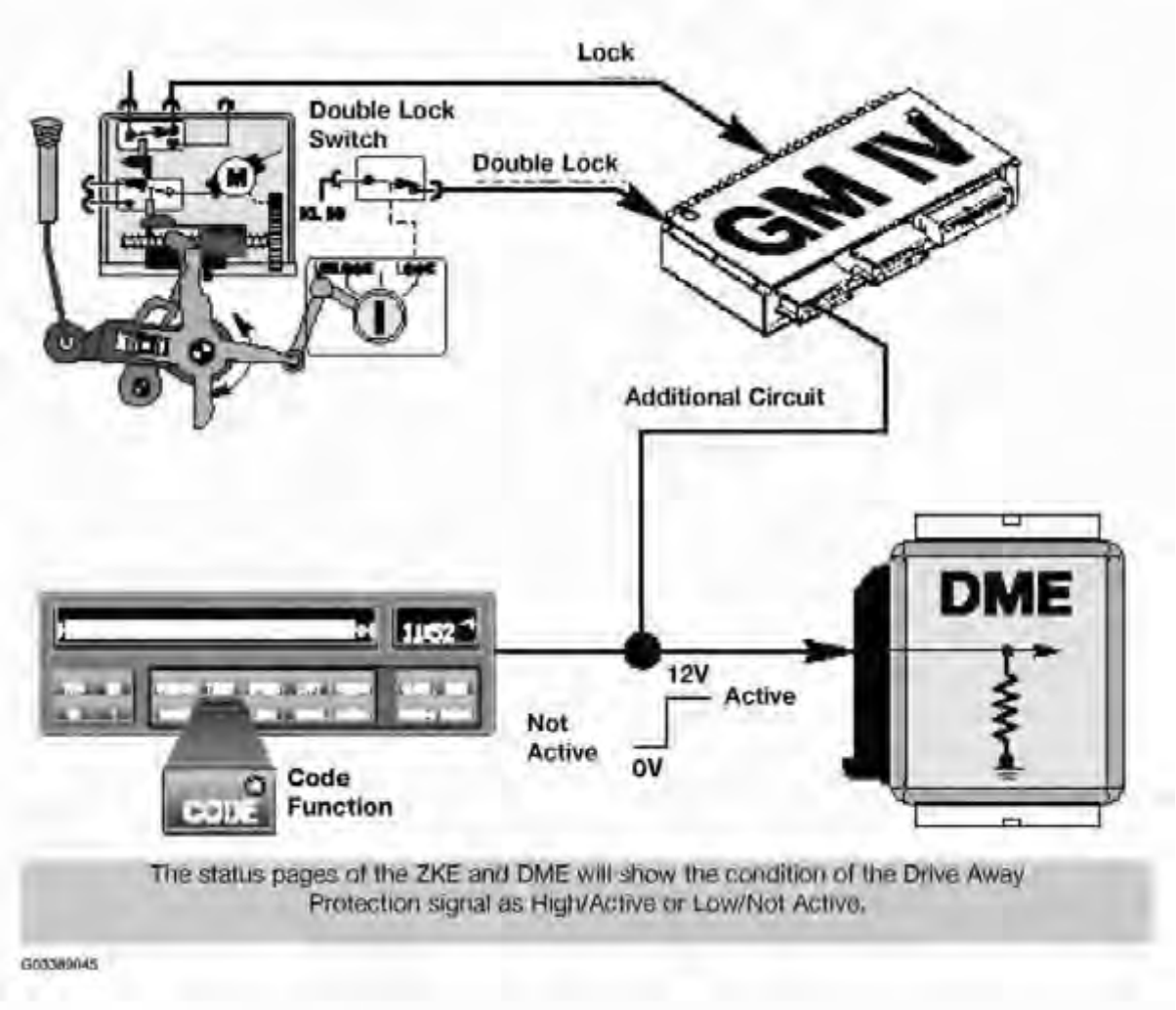


Fig. 1: DME Look Operation
Courtesy of BMW OF NORTH AMERICA, INC.

The status pages of the ZKE and DME will show the condition of the Drive Away Protection signal as High/Active or Low/Not Active.

EWS I

EWS I was installed on vehicles beginning production 1/94, replacing the original Drive Away Protection System.

Purpose of the System

The next level of compliancy with the European Insurance Commission required additional changes from the previous system. An additional component was added called the Starter Immobilization Relay. This relay module provides added theft prevention and safety features.

At the time of introduction the system was referred to as Electronic Drive Away Protection which in German is E lectronische Wegfahrsperre or EWS.

The EWS I system consisted of the following components:

- Starter Immobilization Relay.
- Door Lock Cylinders and Switch.
- General Module.

- Board Computer (if equipped).
- Transmission Range Switch.
- DME Engine Speed Signal (Beginning 6/94 Production).
- DWA (E31).

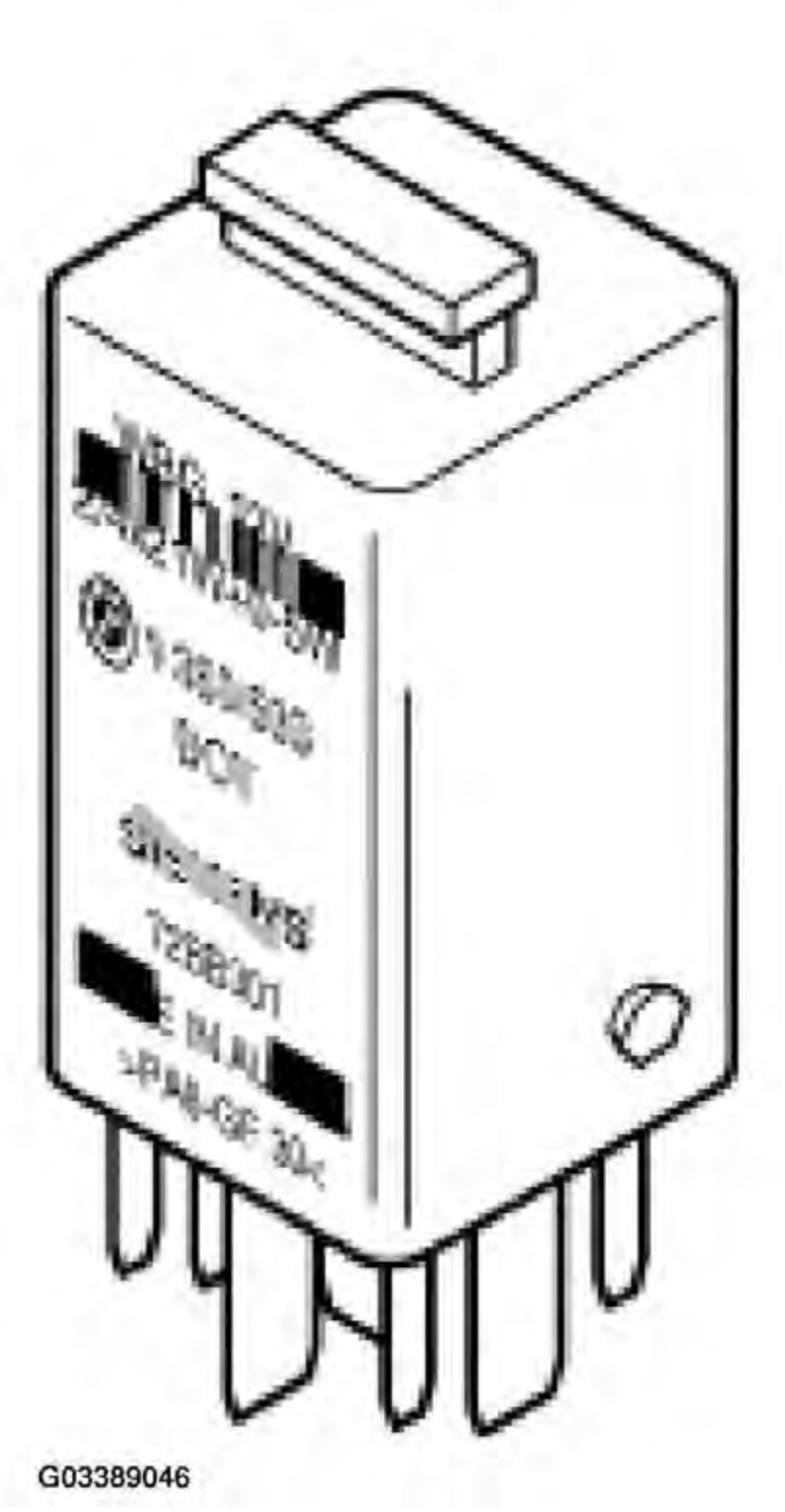


Fig. 2: Identifying Starter Immobilization Relay
Courtesy of BMW OF NORTH AMERICA, INC.

System Components

Starter Immobilization Relay

The Starter Immobilization Relay was installed on E31, E34 and E36 vehicles. It was in the following location:

E36 - In the relay carrier to the left of the steering column.

E31/E34 - In the "A" pillar above the footwell kick panel speaker.

The Starter Immobilization Relay functions as a "Smart Relay", a relay which receives inputs from various sources looking at the proper combination of input signals before activating a component, in this case the starter.

The Starter Immobilization Relay receives input from:

- Ignition Switch.
- Trans Range Switch.
- General Module.
- DME (>6/94).
- Board Computer.

And processes output to:

- Starter.
- DME.

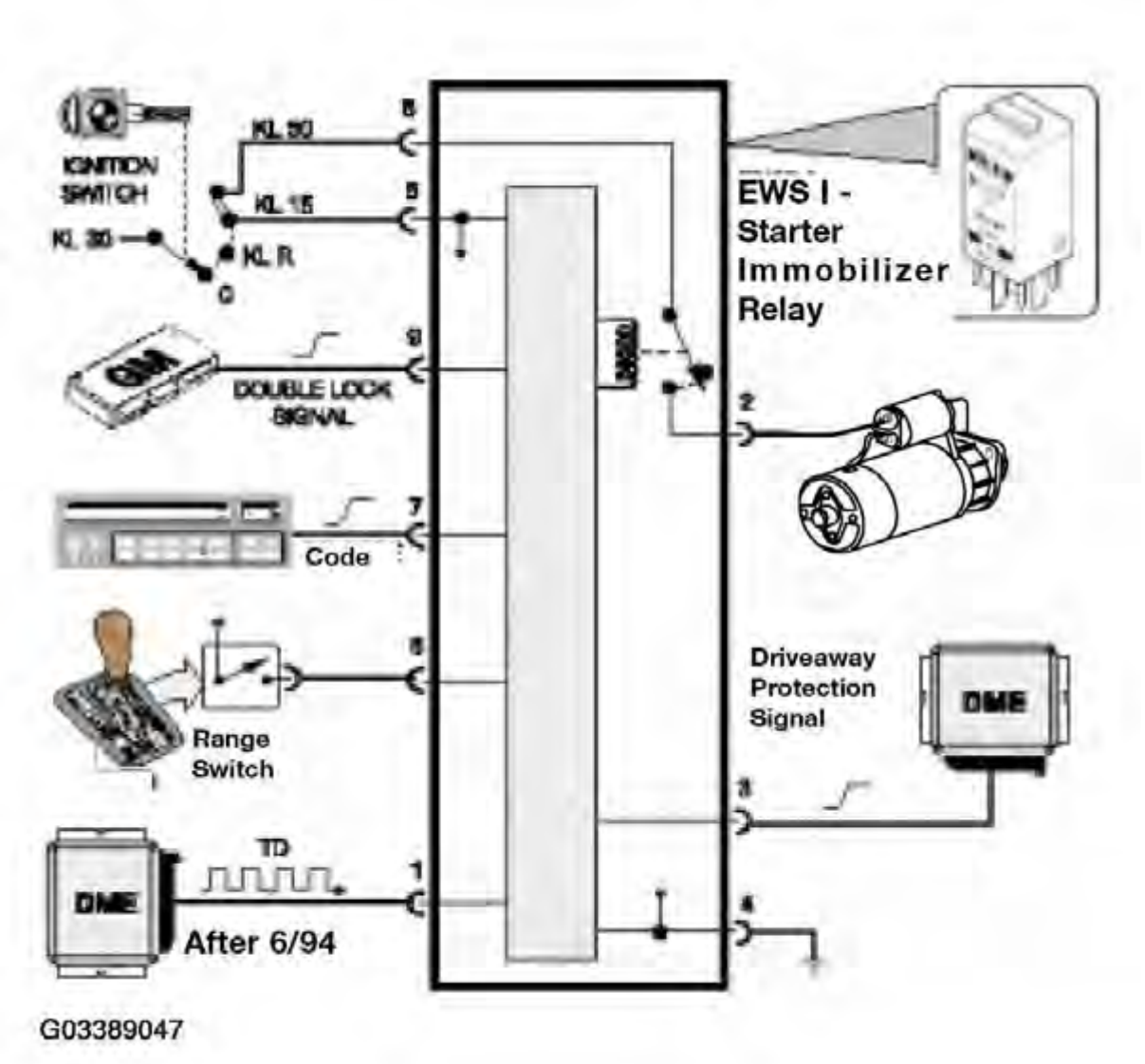


Fig. 3: Identifying Starter Immobilization Relay Functions
Courtesy of BMW OF NORTH AMERICA, INC.

Door Lock Cylinders and Switch

The door lock cylinders and switch input a High/Low signal into the GM informing the GM of lock status. The signal is High when the system is in Double Lock.

General Module

The GM receives the High/Low signal from the door lock switch and outputs a High/Low signal to the Starter Immobilization Relay. A High signal indicates the vehicle is in Double Lock.

Board Computer

The Board Computer outputs a High/Low signal to the Starter Immobilization Relay. A High signal indicates the Code function is active.

Transmission Range Switch

The Transmission Range Switch input with automatic transmission equipped vehicles allows the Starter Immobilization Relay to provide a Neutral safety switch function. A High signal from the Trans range switch indicates the transmission is in Park or Neutral. A Low signal indicates the transmission is in a drive gear and will prevent starter operation.

DME

The DME is both an input device (after 6/94) and an output device of the Starter Immobilization Relay.

Input

Starting with production 6/94, the DME "TD" (engine speed) signal was added to the inputs of the Starter Immobilization Relay. This additional input allows the relay to provide a starter protection feature. The internal relay contact (starter operation) opens if the TD signal exceeds 60 Hz which equals the following engine speeds:

- 4 cylinder = 1800 RPM.
- 6 or 12 cylinder = 1200 RPM.
- 8 cylinder = 900 RPM.

The relay contacts will close when the exceeded Hz value drops to 5Hz below the maximum value. This is intended as a safety feature to prevent starter motor activation when the engine is running above these speeds.

Output

The DME receives a High/Low signal from the Starter Immobilization Relay. When the signal is High, the DME does not activate injector or ignition operation.

DWA (E31)

The DWA outputs a High/Low signal to the Starter Immobilization Relay indicating the condition of the alarm system. A High signal indicates the alarm is armed, preventing vehicle starting.

Principle of Operation

The EWS Starter Immobilization Relay receives it's inputs from the Ignition switch, GM (or DWA), BC, Trans Range Switch and the DME (after 6/94). The relay will prevent engine starting if:

- The vehicle is locked from the outside. The GM receives the High signal from the door lock switch and sends a High signal to the EWS.

- The BC Code function is set.
- A DWA High signal is received. (E31 only).
- A Low signal is received from the Trans Range Switch.
- The engine speed signal from the DME exceeds 60Hz. (after 6/94).

The Ignition and injection functions of the DME are disabled and the KL50 start signal to the starter is opened to prevent starter operation.

Workshop Hints:

Starter Immobilization Relays are different for manual and automatic vehicles, check to ensure correct relay is installed.

The Starter Immobilization Relay is not on the Diagnostic Link. Conventional troubleshooting techniques using the DISplus, a DVOM and the correct ETM are necessary.

Loss of input from the GM or BC will allow the engine to start.

Loss of input from the Trans Range Switch will NOT allow the engine to start.

EWS II

Starting with 1/95 production, all vehicles were equipped with a new EWS system, EWS II. This change was once again brought about to meet the next level of compliancy with the European Insurance Commission regulations.

Purpose of The System

Changes to the European Insurance Commission regulations made it necessary to introduce a new theft protection system with greater capabilities and a higher level of security. The EWS II system operates independent of the mechanical key. The mechanical key only makes a request of the vehicle starting system. Verification of the key electronically is required before the starting procedure is initiated.

The system features wireless communication between a programmed EEPROM housed in the ignition key and the EWS II control module. A key which is properly coded to the EWS II control module is required before starting operation continues. The EWS II and the DME control modules are synchronized through an Individual Serial Number (ISN).

The ISN, stored in the EWS II, must match that of the DME every time the ignition is switched "ON" before engine operation is allowed.

EWS II was installed on E31, E34, E36, E38 and E39 vehicles.

Major components of the EWS II system are:

- Key with Transponder.
- Ring Antenna.
- Transmitter/Receiver Module.
- EWS II Control Module.
- DME Control Module.

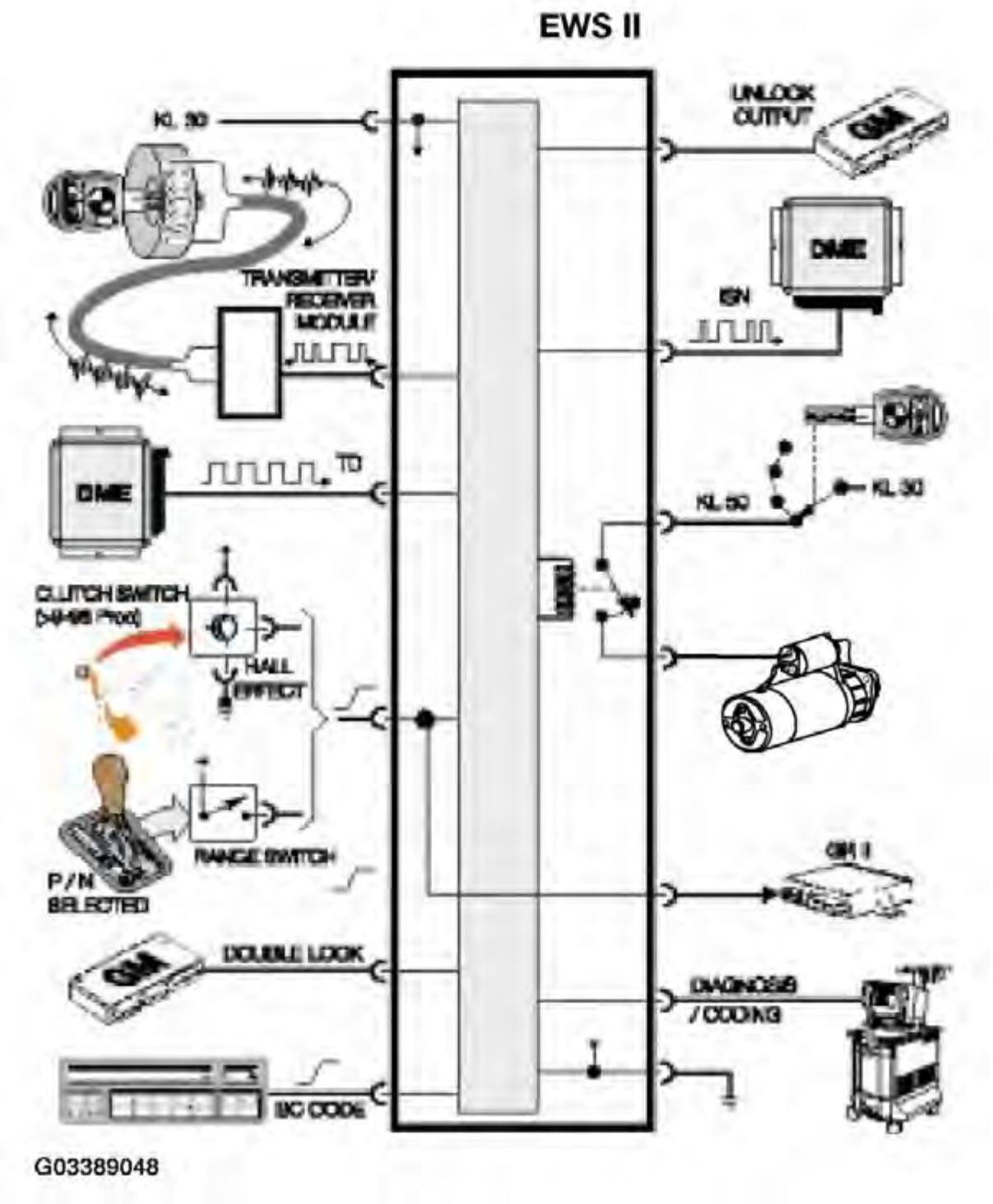


Fig. 4: Identifying Major Components Of EWS II System
Courtesy of BMW OF NORTH AMERICA, INC.

System Components

Key with Transponder

Four keys are initially supplied with each vehicle. Each key contains a wireless electronic chip (transponder chip). The function of the transponder is to receive and transmit data to the EWS II control module. The transponder contains a wireless read/write EEPROM in addition to a small capacitor and coil for self power capabilities.

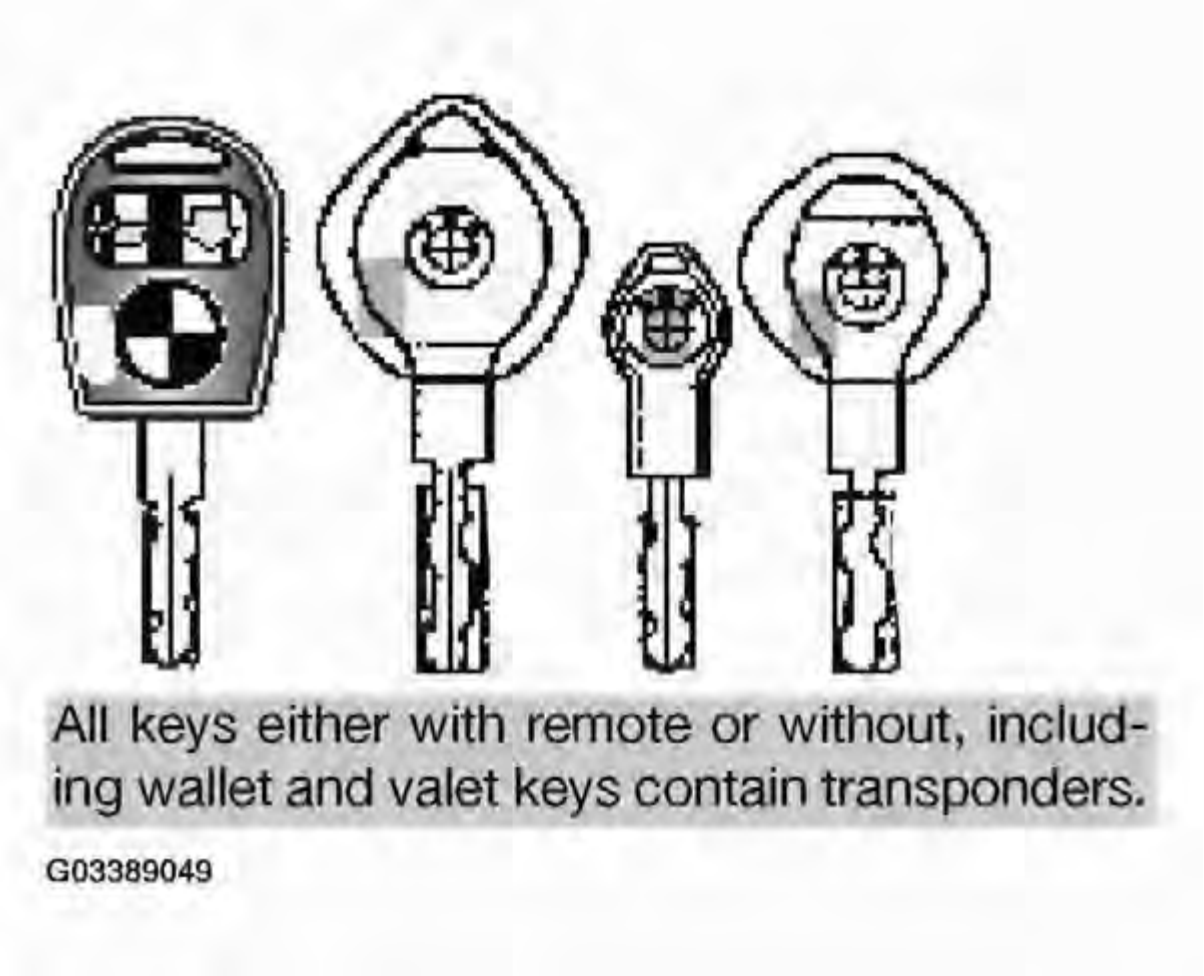


Fig. 5: Identifying Key With Transponder
Courtesy of BMW OF NORTH AMERICA, INC.

The functions of the EEPROM are:

- Store codes for key identification, password and changing codes.
- Receive and respond to coded messages from the EWS II control module.

Power for the transponder is produced through the inductive coil and stored in the capacitor. Each time the key is inserted into the ignition AC voltage in the antenna ring induces voltage in the inductive coil.

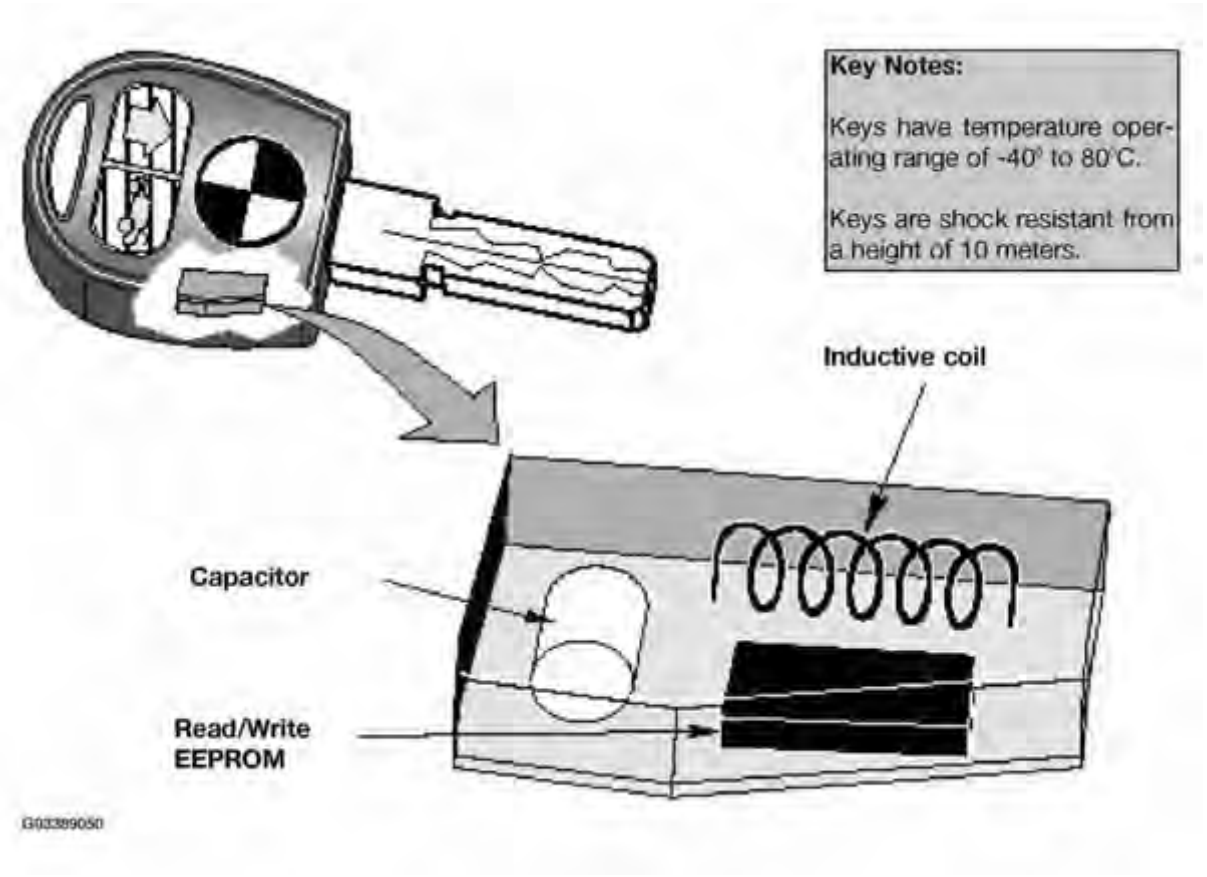


Fig. 6: Identifying Inductive Coil In Key
Courtesy of BMW OF NORTH AMERICA, INC.

Ring Antenna

The Ring Antenna is an inductive coil installed around the lock cylinder which provides power for the transponder in the key and the communication link (antenna) between the key and the transmit/receive module.

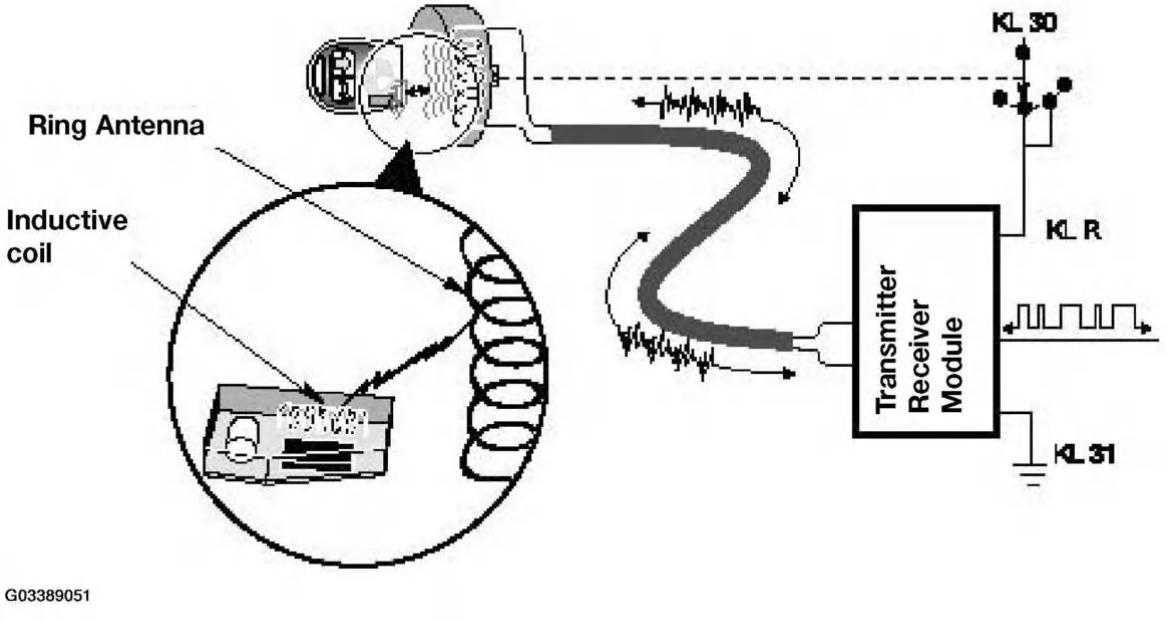


Fig. 7: Identifying Ring Antenna
Courtesy of BMW OF NORTH AMERICA, INC.

Transmitter/Receiver Module

The Transmitter/Receiver module supplies power to the transponder through the ring antenna and controls the flow of data between the transponder and the EWS II control module.

Data transmission between the transmitter/receiver module and the transponder takes place over a radio frequency of 125 KHz amplitude modulated AM signal.

The transmitter/receiver module converts the analog data received through the AM signal to digital data and transfers it to the EWS II control module over a single wire bi-directional data interface.

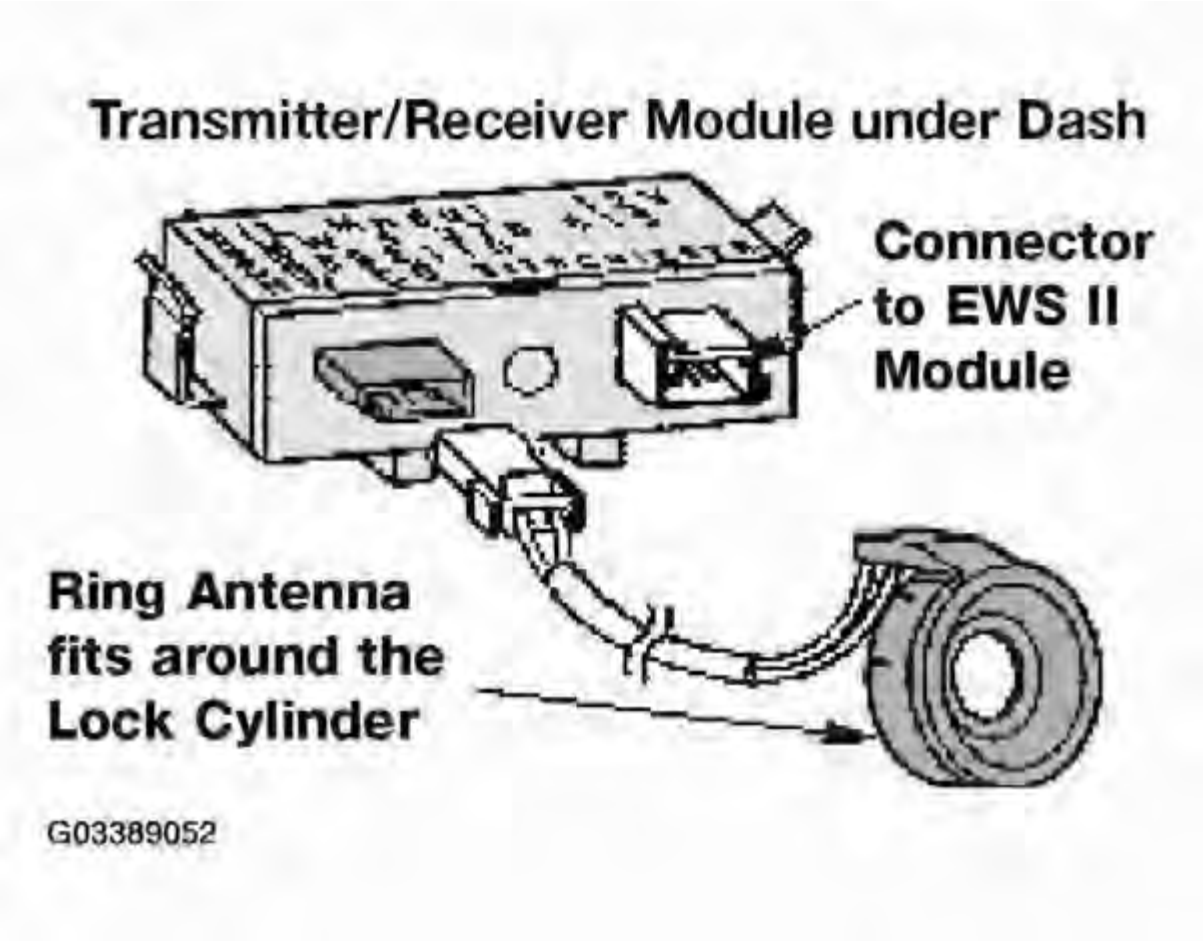


Fig. 8: Identifying Transmitter/Receiver Module
Courtesy of BMW OF NORTH AMERICA, INC.

Workshop Hint:

On E34 and E36 models the transmitter/receiver module is located under the dash near the steering column.

On E 31, E38 and E39 models the transmitter/receiver module is located in the steering column cover on the right hand side of the column.

EWS II Control Module

The EWS II Control Module is linked to the BC, GM, DME, Trans Range switch and the starter for drive away protection operation. The module incorporates an integral starter relay and stores data and codes for communication with the transponder chip.

The function of the EWS II module is to provide improved drive away protection for the vehicle and it incorporates many features of previous systems:

- Lock out of the starter when the code function of the BC is set.
- Disable injection and ignition through the DME.
- Prevent starter engagement with engine running.

- Recognition of Park/Neutral position with automatic transmission.

New features that have been added:

- Disable injection, ignition and starter operation until a correct key is recognized.
- EWS and DME synchronization through the use of the ISN.
- Release of double lock when a correctly coded key is switched on.

The EWS II control module stores the following data for the key transponder inter-link:

- Key identification code- up to 10 keys.
- Key password.
- Changing code- up to 10 keys.

Workshop Hint:

On E31, E36, E38 and E39 models the EWS II control module is located behind the glove box in the electrical carrier.

On E34 models the module is located on the drivers side of the vehicle behind the knee bolster.

Typical component locations:

E36 shown

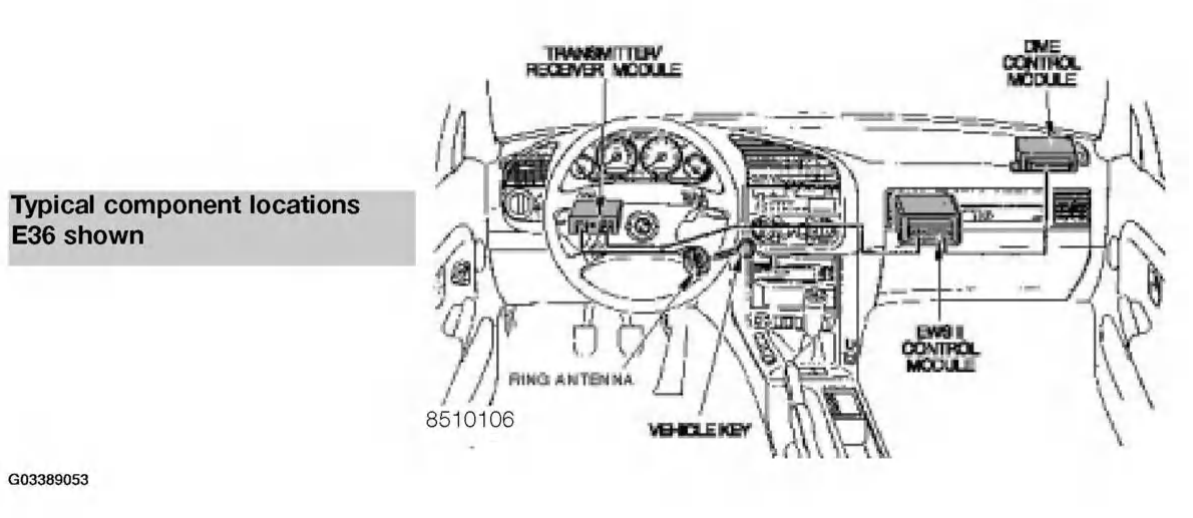


Fig. 9: Identifying EWS II Control Module
Courtesy of BMW OF NORTH AMERICA, INC.

DME

The DME is redesigned to incorporate the new ISN code. As of production 1/95 all DME control modules will contain the unique ISN number and will not interchange with previous DME's. The following new features are added to the DME:

- Unique ISN assigned to DME during manufacture, it can not be changed, altered or overwritten.
- The BC code input to the DME is eliminated.
- The DME and EWS II control module must be synchronized. The DME sends the ISN to the EWS II module which stores the number for replay to the DME.
- The ISN received from the EWS II module during start-up is compared to the internal ISN of the DME. The numbers must match before the start operation is allowed to continue.
- The ISN is sent to the DME continuously by the EWS II module with the key on.

- The DME will ignore loss of the ISN after the engine is running.
- The DME retains the ISN information from the EWS II module for 10 seconds after the ignition is switched off.

Restarting or switching the ignition on within the 10 seconds cancels the key identification process.

Workshop Hints:

The DME is located in the E-Box.

Remember the EWS-DME link stays active for 10 seconds while testing keys for proper operation.

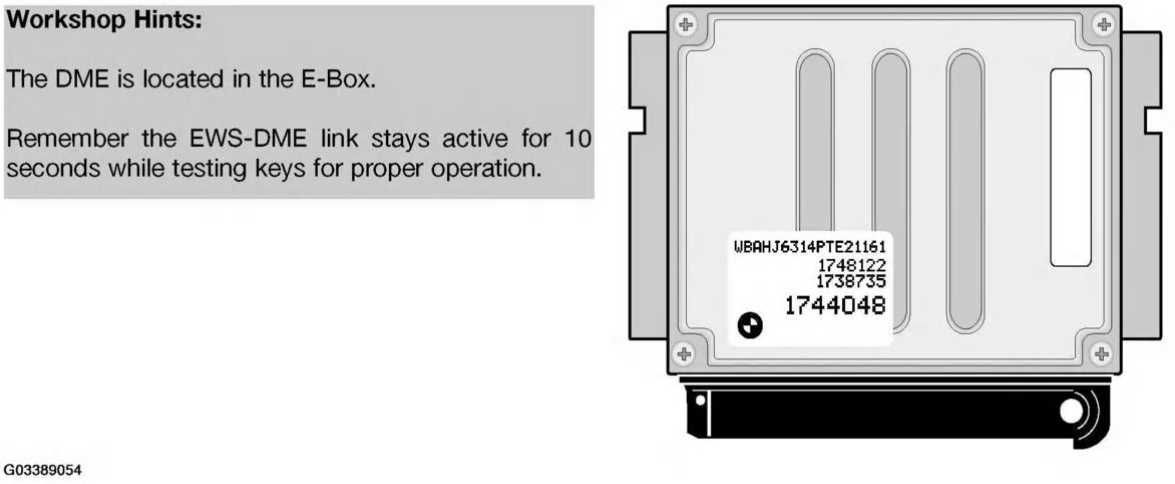


Fig. 10: Identifying DME
Courtesy of BMW OF NORTH AMERICA, INC.

Principle of Operation

The starting sequence involves communication between all the components of the system. Any break-down in the communication process will result in a no start condition. The sequence of events for vehicle starting is as follows:

- The key is inserted into the lock cylinder and switched "ON". The transmitter/receiver module is powered through KL R. The transmitter/receiver module sends a 125kHz. AM signal to the ring antenna. The AM signal induces voltage in the key coil and powers up the transponder.
- Powered up, the key transponder sends the key identification code to the transmitter/receiver module via the 125kHz AM signal (1). The transmitter/receiver module converts the AM signal to a digital signal and sends it to the EWS II control module (2).
- The EWS II control module verifies the key identification code and checks to see if the key is enabled (3).

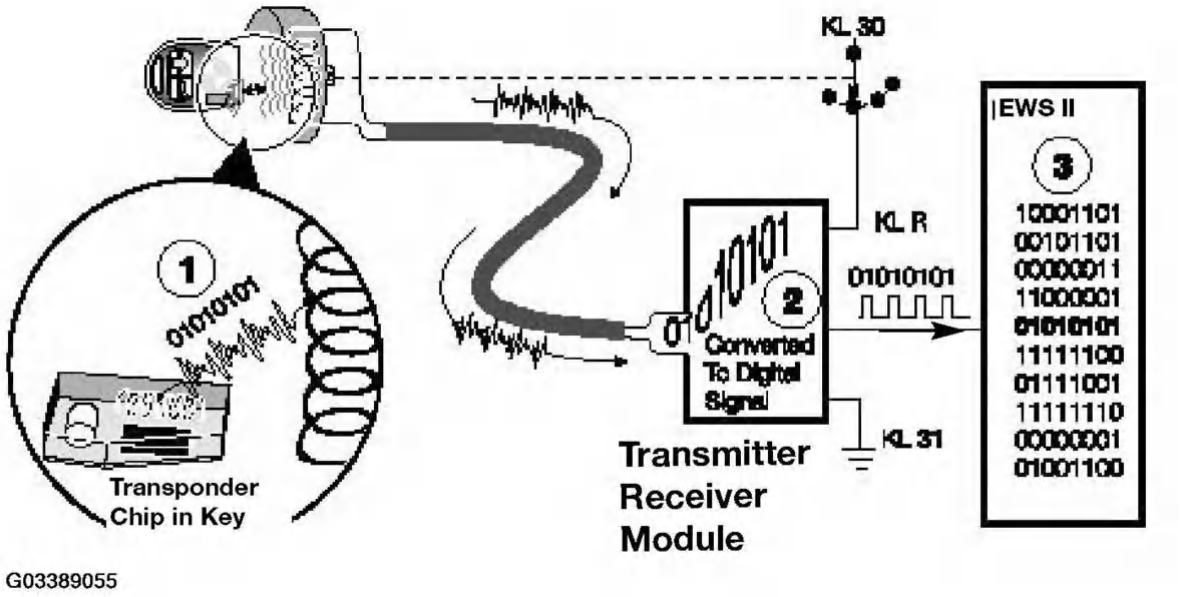


Fig. 11: Checking Key Identification Code
Courtesy of BMW OF NORTH AMERICA, INC.

- Upon accepting the key as valid and enabled the EWS II control module sends a digital password (4) to the transmitter/receiver module, which converts the data to an AM signal (5) and sends it to the transponder via the ring antenna (6).

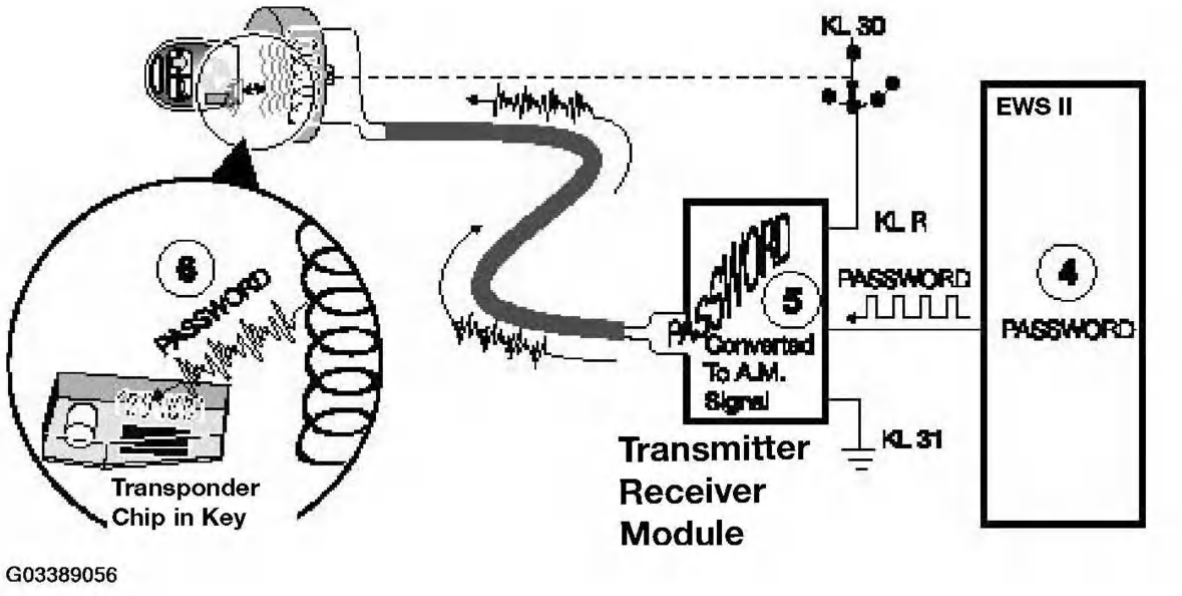


Fig. 12: Identifying Digital Password
Courtesy of BMW OF NORTH AMERICA, INC.

- If the transponder accepts the password as correct the transponder releases the changing code (7) to the transmitter/receiver module which converts this AM signal to digital (8) and sends it to the EWS II module (9).
- If the changing code received by the EWS II module is correct, the status of the BC, transmission range switch and TD is examined. With correct input status the internal starter relay is energized and the starter motor begins to operate (10). At the same time the EWS II module sends the ISN to the DME via the single wire communication link (11).

- If the ISN code stored in the EWS II module matches that of the DME, the drive away protection is cancelled and injection and ignition is enabled.
- During the process of sending the ISN to the DME, the EWS II module sends a new changing code to the transponder through the transmitter/receiver and ring antenna.

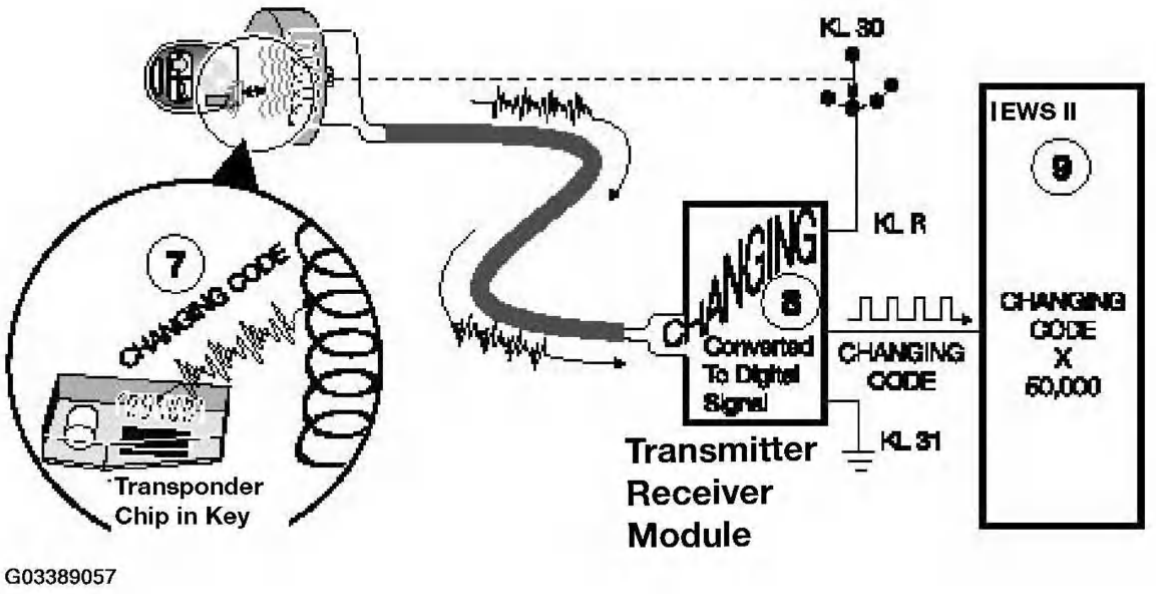


Fig. 13: Identifying Changing Code
Courtesy of BMW OF NORTH AMERICA, INC.

The transponder stores the changing code until the next starting sequence.

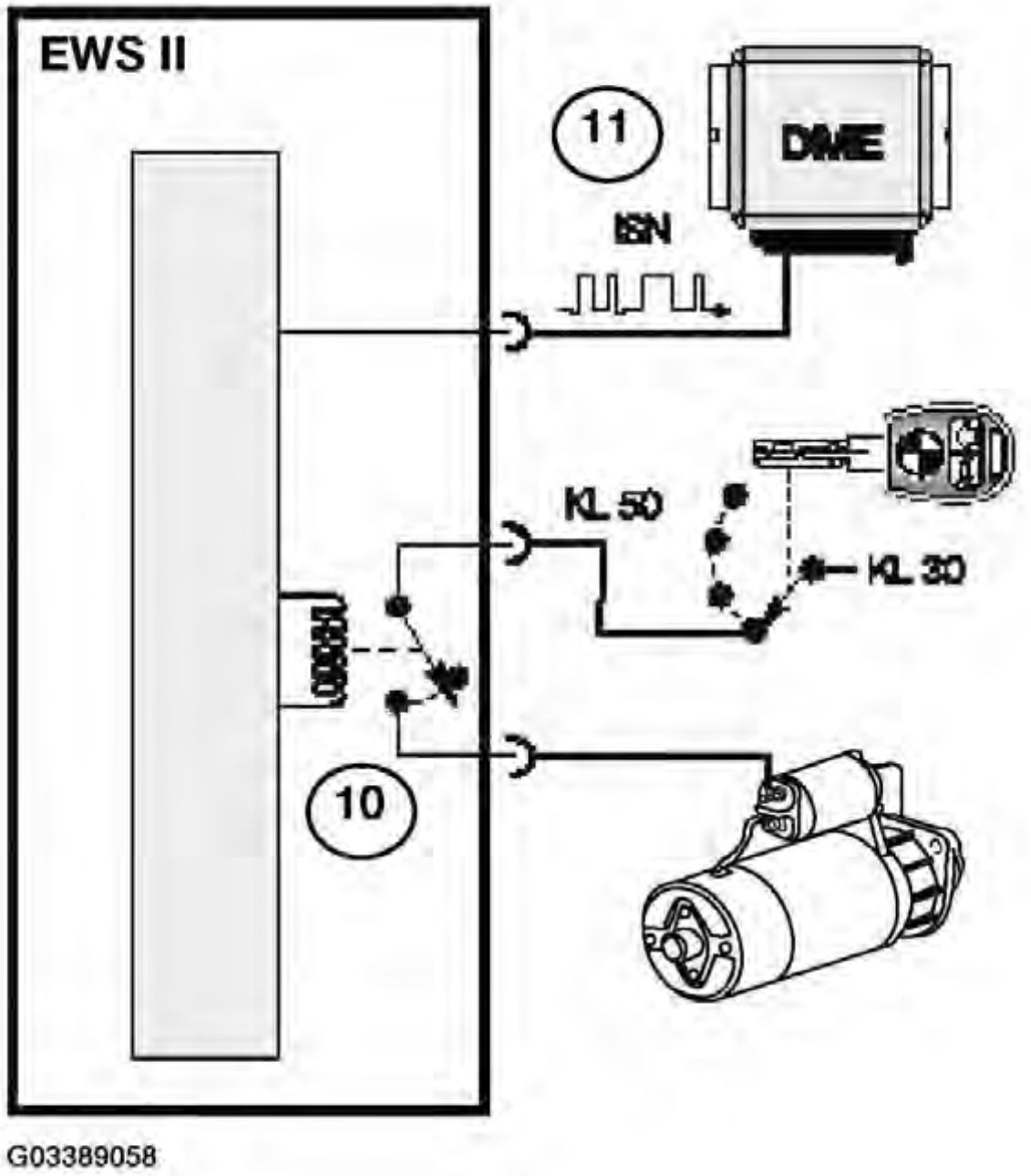


Fig. 14: Identifying Transponder Stores Changing Code
Courtesy of BMW OF NORTH AMERICA, INC.

Workshop Hints:

The entire process takes place in under 750ms.

If the starter operates, the key has been recognized as OK and the key requires no further diagnosis. Check status of ISN in DISplus or MoDic.

Recognition of a valid key by the EWS II module causes it to send an unlock signal to the GM if the vehicle is in double lock.

Replacement Procedures

Keys

Up to 6 additional keys may be ordered as replacement keys. The EWS II control module is codeable for only 10 keys (4 delivered with vehicle and 6 replacement).

EWS II Control Module

Replacement EWS II Control Modules must be ordered VIN specific. EWS II modules contain the VIN and coding from the factory to recognize the key codes. Modules from other vehicles will not recognize keys as being valid and not start the engine.

EWS II Control Modules store the Central Coding Key (ZCS) and the VIN. If the EWS II control module is replaced the system must be ZCS coded.

The EWS II module must be synchronized with the DME (aligned). There is no limit to the number of times the ISN may be changed in the EWS II module.

DME Control Module

The DME Control Module is not ordered VIN specific and must be programmed during replacement. The ISN from the new DME must be transferred to the EWS II module using the DISplus or MoDic.

Key Activation

Keys that are lost or stolen may be deactivated or made to not operate the starter functions. The SERVICE FUNCTIONS of the DISplus or MoDic for EWS II contains a "Bar/Release Code" function that activates and deactivates keys of the EWS II. Any key may be "Barred" except the key in the ignition at the time of deactivation. The lost or stolen key can be identified by the identification of the remaining keys.

There is no limit to the number of times a key can be activated/deactivated.

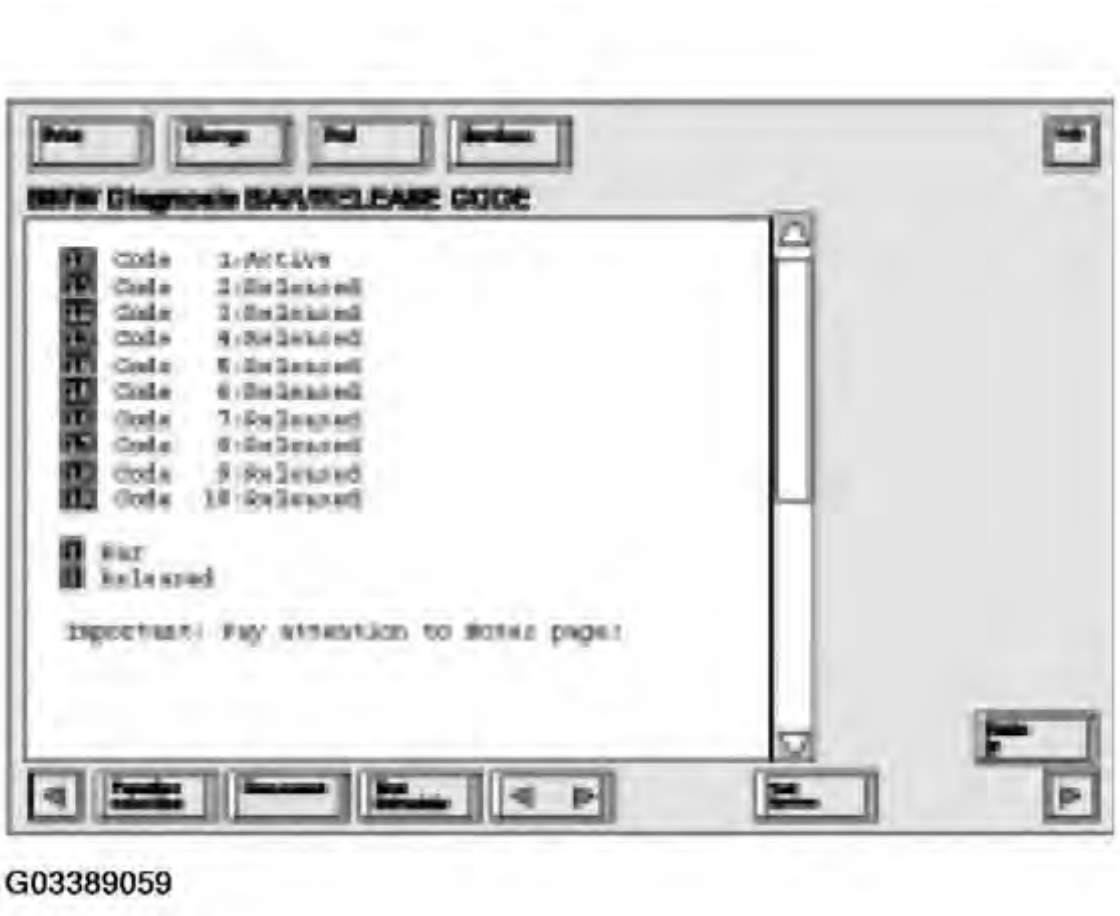


Fig. 15: Identifying Key Activation
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: A "Barred" key will not start the engine, it will still unlock the vehicle.

EWS II Update

Beginning MY 1997 E31 and E36 vehicles with manual transmissions were updated to include a clutch pedal position switch. The clutch switch signal is provided by a hall-effect sensor providing a high signal when the clutch is depressed.

EWS III (3.2)

The 1997 Model Year E38 is equipped with EWS III (3.2) drive away protection. E39 vehicles produced 3/97 and later are also equipped with EWS III (3.2).

Purpose of the System

The major changes of the EWS III (3.2) system over the EWS II are a modified control module, revised wiring and the addition of the clutch switch input.

Output functions, starter control and ISN signal, remain the same for EWS III (3.2). Component changes are:

- EWS III (3.2) Control Module.
- Input From The K-Bus.
- Clutch Switch.
- Transmitter/Receiver Module Eliminated.

System Components

EWS III (3.2) Control Module

The EWS III (3.2) Control Module has a 13 pin connector. The transmitter/receiver module is no longer a separate module of the system with the electronic functions for the data transfer between the key transponder and the EWS control module being handled directly by the EWS III (3.2) control module. The vehicle wiring harness has been changed to reflect this modification and to route the wiring from the ring antenna directly to the EWS III (3.2) control module.

Input From The K-Bus

Reduction in wiring has also been accomplished with the use of the K-Bus for data communication between the GM, Door Module, IKE and the EWS III (3.2) control module. This data link provides the following signals to be communicated on one wire:

- Engine Speed.
- Lock and Unlock Requests.
- Code Function.
- Range Selector Position (Redundant Signal).

Engine Speed

The DME outputs the engine speed "TD" signal over the CAN Bus to the IKE. The IKE uses the TD information as needed and passes it on to the EWS III (3.2) via the K-Bus.

Lock and Unlock Requests

The lock and unlock information arrives at the GM over the P-Bus from the door module and is sent via the K-Bus to the EWS III (3.2) control module. This information informs the EWS control module the lock status of the vehicle (lock/double lock). The EWS III (3.2) control module signals the GM over the K-Bus that an authorized key has been recognized and requests the doors be removed from the double lock position.

Code Function

The code function status arrives at the EWS control module over the K-Bus. This information allows/disallows vehicle operation based on code status. If a code has been set and entered correctly during the start-up, the vehicle will operate normally based on the other inputs. Entering the code incorrectly will prevent vehicle operation.

Range Selector Position

Range selector position is still provided directly to the EWS III (3.2) control module from the Transmission Range Selector Switch. Redundant information is provided over the K-Bus in case of loss of signal from the range switch.

Workshop Hint:

If the starter engages the following inputs are functioning normally:

- Key.
- Code Function
- Trans Range (Clutch Switch).
- Engine Speed.

Don't waste time diagnosing these inputs.

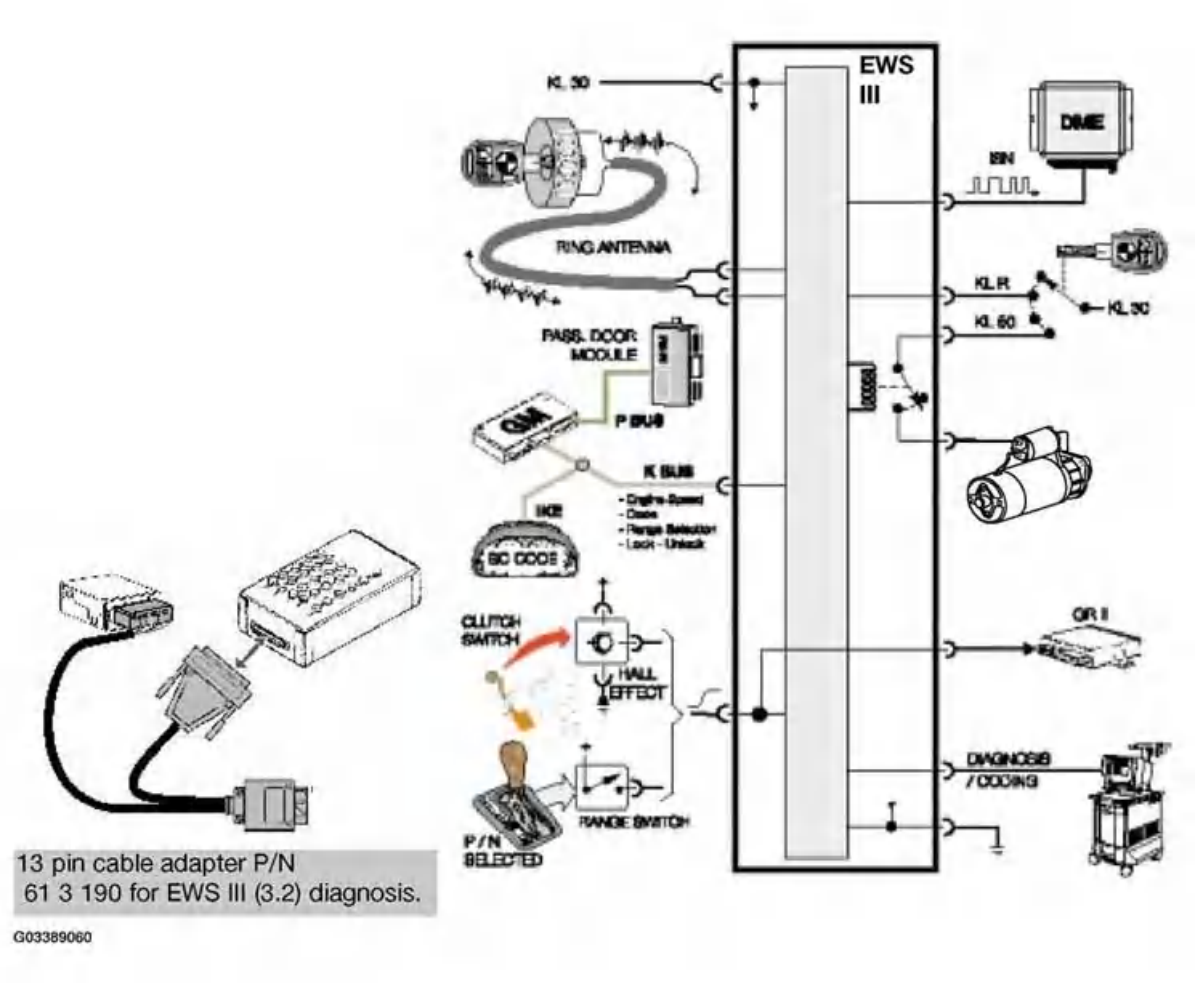


Fig. 16: Identifying Range Selector Position Functions
Courtesy of BMW OF NORTH AMERICA, INC.

13 pin cable adapter P/N

61 3 190 for EWS III (3.2) diagnosis.

Clutch Switch

A Hall-Effect Switch is added to the clutch system to inform the EWS III (3.2) control module of clutch status. Input from the switch replaces the signal from the Trans Range Selector Switch on manual transmission equipped vehicles. High signal status indicates the clutch is depressed and vehicle starting is allowed.

Principle of Operation

The starting sequence for the EWS III (3.2) is as follows:

- The key is inserted into the lock cylinder and switched "ON". The EWS III control module is powered through KL R and sends a 125kHz AM signal to the ring antenna. The AM signal induces voltage in the key coil and powers up the transponder.
- Powered up, the key transponder sends the key identification code to the EWS III module. The EWS III module verifies the key identification code and checks to see if the key is enabled. If the key is correct and enabled, a password is sent to the transponder over the 125kHz AM signal through the ring antenna.
- When the transponders accepts the password, it releases the changing code, which it received from the EWS III module during the last start-up operation, to the EWS III module via the ring antenna.
- The EWS III module compares the changing code received from the transponder with the code stored in its memory and if they match the process is allowed to continue. The EWS III module looks at the other inputs for correct status (e.g. Code function not active, Transmission in P or N or clutch depressed, engine speed below specified RPM) and energizes the internal relay to begin starter operation.
- As the starter begins to operate, the EWS III module sends the ISN to the DME and if verified as correct by the DME, drive away protection is cancelled and injection and ignition is enabled. The EWS III module also sends a new changing code to the key transponder through the ring antenna.

Replacement Procedures

Keys

Up to 6 additional keys may be ordered as replacement keys. The EWS III (3.2) module is codeable for only 10 keys (4 delivered with vehicle and 6 replacement). The keys are mechanically matched to the vehicle with the lock tumblers and electronically matched to the EWS III (3.2) through unalterable coding.

EWS III (3.2) Control Module

Replacement EWS III (3.2) Control Modules must be ordered VIN specific. The EWS III modules contain the VIN and coding from the factory to recognize the key codes. Use of EWS III modules from other vehicles will result in the keys not being recognized.

The EWS III (3.2) control module stores the ZCS coding and must be coded at time of installation. The module must be aligned with the DME so that it stores the correct ISN. There is no limit to the number of times the ISN may be changed in the EWS III module.

DME Control Module

DME Control Modules are "off the shelf" parts requiring programming during installation. The ISN of the DME is not changeable and must be transferred to the EWS III (3.2) module.

Key Activation

Keys that are lost or stolen may be deactivated or made to not operate the starter functions. The SERVICE FUNCTIONS of the DISplus or MoDic for EWS III (3.2) contains a "Bar/Release Code" function that activates and deactivates keys of the EWS III (3.2). Any key may be "Barred" except the key in the ignition at the time of deactivation. The lost or stolen key can be identified by the identification of the remaining keys.

There is no limit to the number of times a key can be activated/deactivated.

EWS III (3.3)

EWS III (3.3) is installed in the 1998 E38 from 5/97 production, in the 1998 E39 from 9/97 production, in the

E46 beginning of production, in the E52 and E53 beginning of production.

Purpose of the System

The purpose of the EWS III (3.3) system is to add greater theft protection by providing a higher level of sophistication than previous systems. The new "Rolling Code" provides an additional theft deterrent through a changing of the ISN everytime the vehicle enters the start sequence.

Components changed in the EWS III (3.3) system include:

- EWS III (3.3) Control Module.
- DME Control Module.
- Transmission Range Selection Input.

System Components

Workshop Hint:

While it is possible to initialize a key to another vehicle to check for remote operation, use caution. All keys for Both vehicles must be available. The initializing process, causes loss of operation of keys previously initialized.

All keys must be initialized at the same time.

EWS III (3.3) Control Module

The EWS III (3.3) Control Module uses the same 13 pin connector as EWS III (3.2) but functions differently. The EWS III (3.3) module has a Rolling Code" ISN assigned to it during manufacture. The "Rolling Code" is burned into the module and cannot be overwritten by ZCS Coding or DME alignment procedures.

The "Rolling Code" is a one way signal from the EWS III (3.3) control module to the DME and is similar in operation to the data exchange between the EWS control module and the key transponder.

The "Rolling Code" will be different each time the start operation is begun. The "Codes" are taken from the "Rolling Code Table" which is assigned at the factory to the EWS III (3.3) control module and the DME.

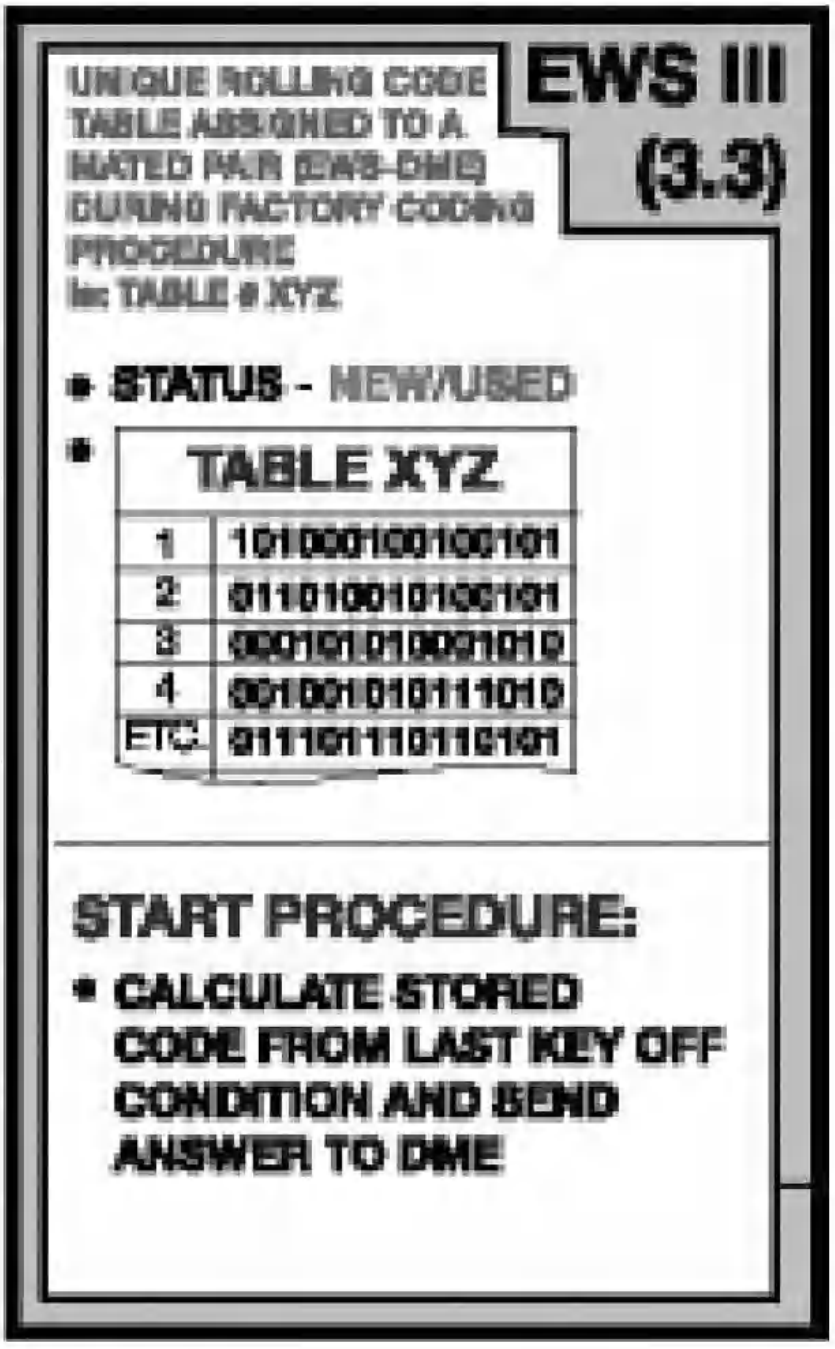


Fig. 17: Identifying EWS III (3.3) Control Module
Courtesy of BMW OF NORTH AMERICA, INC.

DME Control Module

The DME Control Module has changed in that it is not the source of the ISN but now only stores the "Rolling Code". It compares the "Codes" to those sent to it by the EWS III (3.3) control module. The "Rolling Code Table" assigned to the DME must match the table in the EWS III (3.3) module. The "Rolling Code Table is "burned" into the DME during the programming of the DME and cannot be change once "burned".

Transmission Range Selection Input

With the introduction of the SKE type connectors on Transmission Control Modules the direct input from the

Transmission Range Selector Switch is eliminated. The input for range selection is now received from the AGS Control Module.

On manual transmission vehicles clutch status is input directly into the DME.

Principle of Operation

The starting sequence of the EWS III (3.3) is as follows:

(Same as EWS III (3.2)

- The key is inserted into the lock cylinder and switched "ON". The EWS III (3.3) control module is powered through KL R and sends a 125kHz AM signal to the ring antenna. The AM signal induces voltage in the key coil and powers up the transponder.
- Powered up, the key transponder sends the key identification code to the EWS III (3.3) module. The EWS III (3.3) module verifies the key identification code and checks to see if the key is enabled. If the key is correct and enabled, a password is sent to the transponder over the 125kHz AM signal through the ring antenna.
- When the transponders accepts the password, it releases the changing code which it received from the EWS III (3.3) module during the last start-up operation to the EWS III (3.3) module via the ring antenna.
- The EWS III (3.3) module compares the changing code received from the transponder with the code stored in its memory and if they match the process is allowed to continue. The EWS III (3.3) module looks at the other inputs for correct status (e.g. Code function not active, Transmission in P or N or clutch depressed, engine speed below specified RPM) and energizes the internal relay to begin starter operation.

New to EWS III (3.3)

- While energizing the internal starter relay, the EWS III (3.3) module calculates a stored code from the "Rolling Code Table" and sends the calculated results to the DME.
- On receipt of the "Rolling Code" from the EWS III (3.3) the DME calculates it's own stored code and compares its results with the code it received from the EWS III (3.3)

  If the "Codes" match the drive away protection is released and injection and ignition are enabled and the engine starts.

  If the "Codes" do NOT match, the DME "rolls forward" to the next code according to the "Rolling Code Table" and makes the same calculations. The DME continues this "forward roll" up to a maximum of 200 times or until a match is found. Failure to find a match will result in the engine cranking but not starting.

- When the ignition is switched off and no engine RPM is present in both the DME and the EWS III (3.3) control module each module will automatically "roll forward" to the next predetermined code based on the "Rolling Code Table". This new code is used for the next starting sequence.

Workshop Hint:

If during diagnosis the key is switched on while the DME or EWS modules are "Disconnected", the alignment procedure will need to be carried out.

The "Alignment" procedure may be carried out an unlimited number of times.

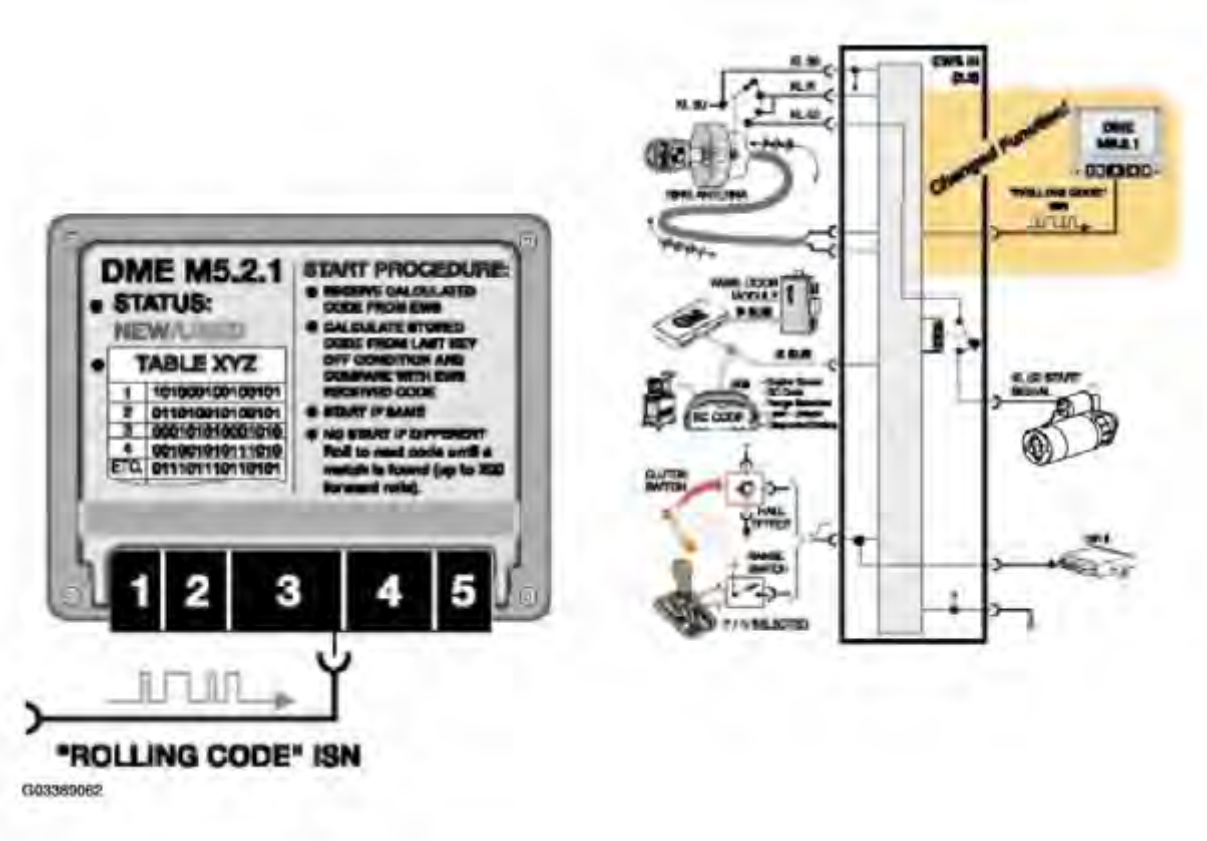


Fig. 18: Identifying Alignment Procedure
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement Procedures

Keys

Up to 6 additional keys may be ordered as replacement keys. The EWS II control module is codeable for only 10 keys (4 delivered with vehicle and 6 replacement).

EWS III (3.3) Control Module

Replacement EWS III (3.3) Control Modules are ordered VIN specific. The module is received with the same "Rolling Code Table" as the original module. Once ZCS coded, the DISplus software "resets" the current rolling code in the DME back to "Rolling Code" #1, providing synchronization of both modules.

DME Control Modules

Replacement DME Control Modules are "off the shelf" and must be programmed for the specific vehicle. After programming the DISplus software informs the EWS III (3.3) control module that a new DME has been installed. The next time the ignition is switched on, the EWS III (3.3) module will send the entire "Rolling Code Table" to the DME and reset it to "Rolling Code" #1.

The DME will automatically burn the "Rolling Code Table" into its memory. Once the table has been burned into the DME memory it can NOT be changed. For this reason once a DME is "Married" to the vehicle it will not work in any other vehicle.

Under certain condition "Alignment" of the DME and EWS III (3.3) modules may still be necessary. The alignment procedure only resets the code table to code #1 it does not change the "Rolling Code Table".

Key Activation

Keys that are lost or stolen may be deactivated or made to not operate the starter functions. The SERVICE FUNCTIONS of the DISplus or MoDic for EWS III (3.3) contains a "bar/release code" function that activates and deactivates keys of the EWS III (3.3). Any key may be "Barred" except the key in the ignition at the time of

deactivation. The lost or stolen key can be identified by the identification of the remaining keys.

There is no limit to the number of times a key can be activated/deactivated.

Workshop Hint:

While checking key operation, don't forget to wait 10 seconds before inserting the next key.

You can not BAR the key in the ignition.

Workshop Hint:

A dead key battery does not affect vehicle starting.

Keys without replaceable batteries are not charged if the ignition is in the KLO (Off) position.

EWS III D

EWS III D is installed on E36/7 beginning of production 99 Model Year. The system does not have a K-Bus input.

Purpose of the System

The purpose of the EWS III D system is to provide the highest level of drive away protection available to vehicles without a K-Bus. The input side of the control module functions the same as an EWS II (no bus inputs) system with the exception of an integrated EWS module and transmitter/receiver module. The output side functions similar to an EWS III (3.3) system with "Rolling codes". The EWS III D control module is on the D-Bus for diagnostics.

Individual component inputs and system operation is the same as the mentioned previous systems.

Replacement Procedures

Keys

Up to 6 additional keys may be ordered as replacement keys. The EWS III D control module is codeable for only 10 keys (4 delivered with vehicle and 6 replacement).

EWS III D Control Module

Replacement EWS III D Control Modules are ordered VIN specific. The module is received with the same "Rolling Code Table" as the original module. Once ZCS codes, the DISplus software "resets" the current rolling code in the DME back to "Rolling Code" #1, providing synchronization of both modules.

DME Control Modules

Replacement DME Control Modules are "off the shelf" and must be programmed for the specific vehicle. After programming the DISplus software informs the EWS III D control module that a new DME has been installed. The next time the ignition is switched on, the EWS III D module will send the entire "Rolling Code Table" to the DME and reset it to "Rolling Code" #1.

The DME will automatically burn the "Rolling Code Table" into its memory. Once the table has been burned into the DME memory it can NOT be changed. For this reason once a DME is "Married" to the vehicle it will not work in any other vehicle.

Under certain condition "Alignment" of the DME and EWS III D modules may still be necessary. The alignment procedure only resets the code table to code #1 it does not change the "Rolling Code Table".

Key Activation

Keys that are lost or stolen may be deactivated or made to not operate the starter functions. The SERVICE

FUNCTIONS of the DISplus or MoDic for EWS III D contains a "bar/release code" function that activates and deactivates keys of the EWS III D. Any key may be "Barred" except the key in the ignition at the time of deactivation. The lost or stolen key can be identified by the identification of the remaining keys.

There is no limit to the number of times a key can be activated/deactivated.

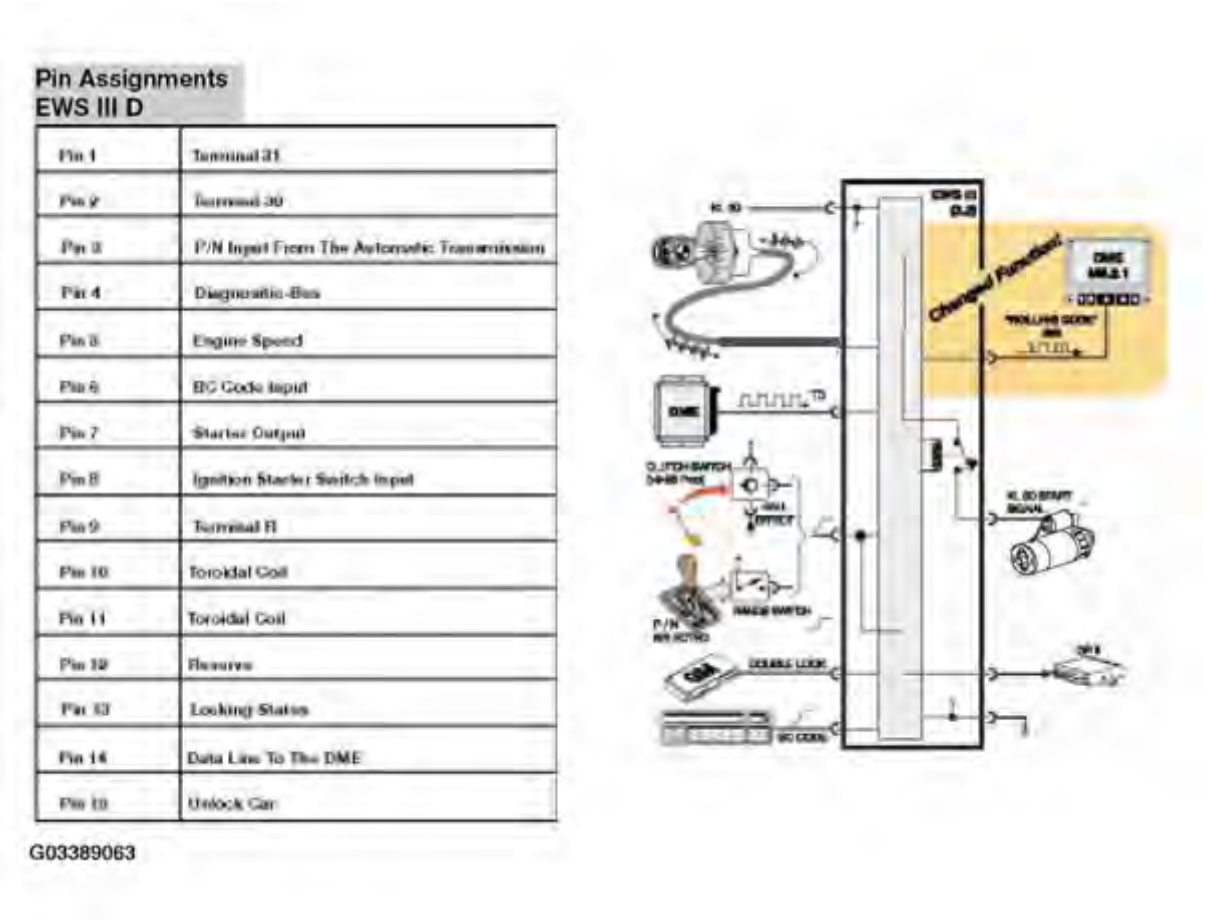


Fig. 19: Identifying Starter Functions
Courtesy of BMW OF NORTH AMERICA, INC.

Workshop Hint:

With E46 Style diagnostics, check the following status' in Diagnosis, Control Unit Functions, EWS:

- Starter Status:

  Park/Neutral, BC Code active, Engine Speed, Double lock status, Starter Enabled.

- Key Status:

  Transmits, Changing code, Key I.D., Key number, Key Password, Key disabled

- DME Wire Status.
- Selector lever/Clutch Status.
- Central Locking Status.
- Input Power.
- BC Code via K-Bus.

EWS SPECIFICATIONS

System	Introduced	Model	Features	One Touch Starting
Drive Away	9/93 - 12/93	All	Injection/Ignition	No

Protection			Disabled if car In Double lock	
EWS I	1/94 - 1/95	All	Starter Immobilizer Injection/Ignition Disable	No
EWS II	1/95	E-36 To End of Production E36/7 To MY 1998 E-34 To End of Production E-38 To M.Y 1997 E-38 To 3/97 Production	Transponder Key Starter Interlock DME - EWS ISN Code	E38 Late MY 1997
EWS III 3.2	9/96	E 38 MY 97 E39 From 9/97 Production	Transponder Key Starter Interlock IDME-EWS ISN Code K-Bus	Yes V-12 and V-8 Only
EWS III 3.3	5/97	E38 MY 1998 From 5/97 Production E39 From 3/97 Production	Transponder Key Starter Interlock K-Bus DME-EWS Rolling Code	Yes V-12 and V-8 Only
EWS III D	MY 1999	Z3 Only	Transponder Key Starter Interlock DME-EWS Rolling Code	No 85101103aa

Article GUID: A00232598

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 high-end 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 iDENÂ®.

    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. Lead 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 telamatics 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.

FLEXÂ® 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.

iDENÂ® 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.

InFLEXionÂ®

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 IntelligentTransportation 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 IntelligentTransportation 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.

ReFLEXÂ®

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.

Article GUID: A00232175

ZKE 4

CENTRAL BODY ELECTRONICS (ZKE IV)

Models: E36 and Z3

Production Date: E36 1994 MY (including 318ti) to End of Production Z3 Coupe, Roadster (including M) 1997 MY to Present

Manufacturer: Hella

Pin Connectors: 6 - Black 18 pin, Black 15 pin, Yellow 26 pin, Green 26 pin, Natural 26 pin, White 15 pin

Purpose of the System

The Central Body Electronics (ZKE IV) system manages the following functions:

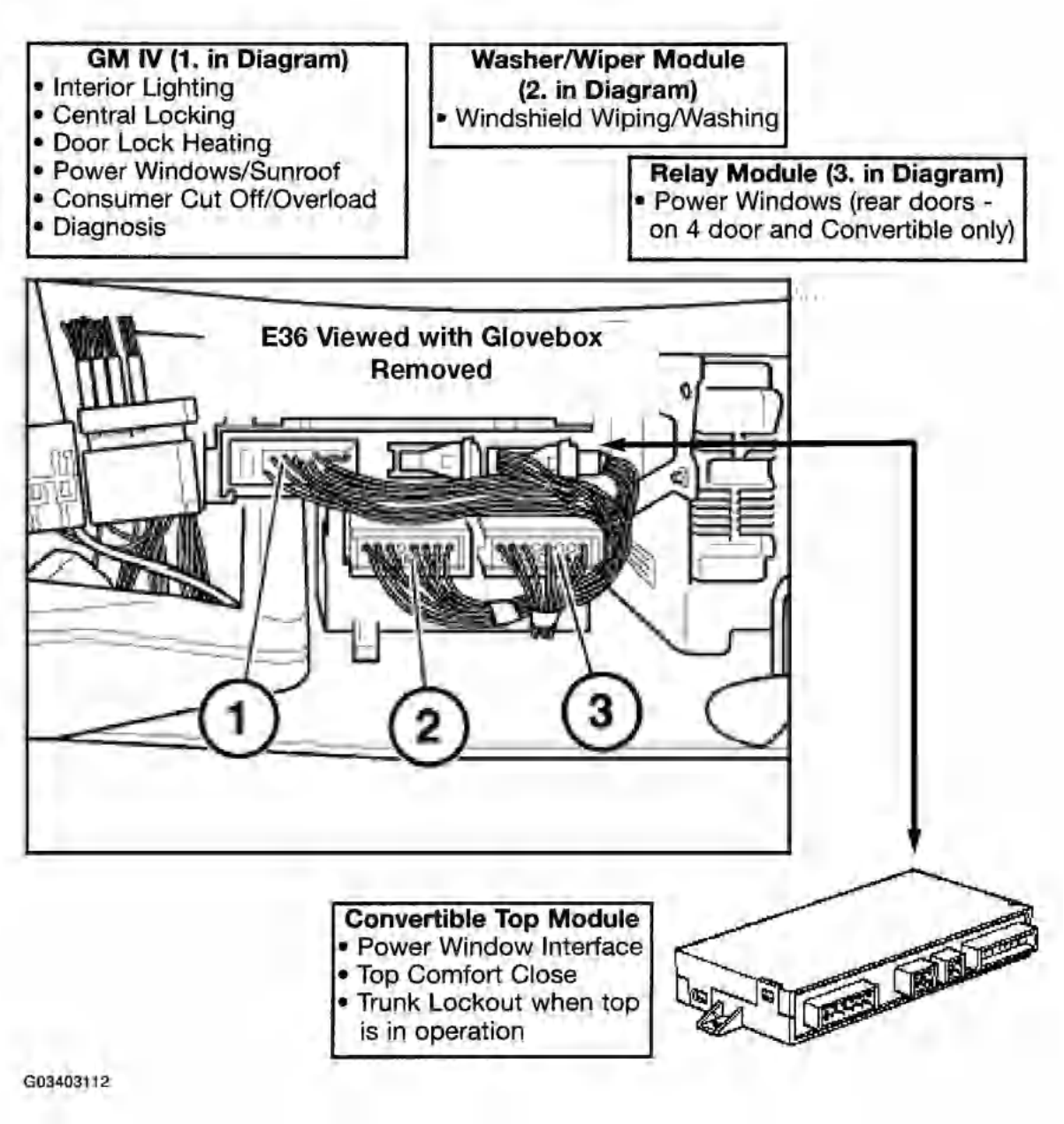


Fig. 1: Identifying Central Body Electronics (ZKE IV) System Chart

Courtesy of BMW OF NORTH AMERICA, INC.

The ZKE IV system was introduced on the E36 Convertible and is also used in the Z3. Most of the functions operate the same on these vehicles with minor changes and added features to the system. ZKE IV is the fourth generation of central body control systems.

The GM IV is responsible for controlling most of the Body Electronic Functions from one central module.

System Components

General Module (GM IV): The GM is a microcomputer that is the central component (heart) of the Central Body Electronics. The GM is located behind the glove box.

The main objectives for using the GM are:

- Increase Overall Reliability.
- Centralize Electronic Systems.
- Decrease Assembly and Service Repairs.
- Centralized Diagnosis of all ZKE Components.
- Individualization of Features (Coding).

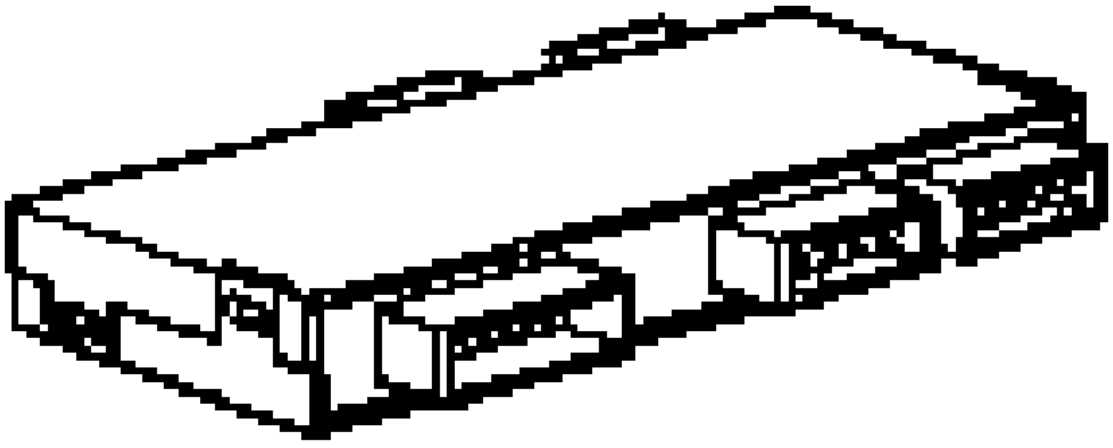


Fig. 2: Identifying General Module (GM IV)
Courtesy of BMW OF NORTH AMERICA, INC.

The GM requires input data to perform Central Body Electronics functions. The inputs are supplied by digital switched signals such as:

- Driver's Door Lock Microswitch: supplies voltage (KL 30) to the GM when switched. A path to ground is provided by the GM (internally). The GM monitors the input voltage.
- Central Lock Button (E36 from 96 MY): supplies a ground circuit to the GM when switched. The GM supplies and monitors a reference voltage (5v) that is "pulled" low when the switched ground path is provided.

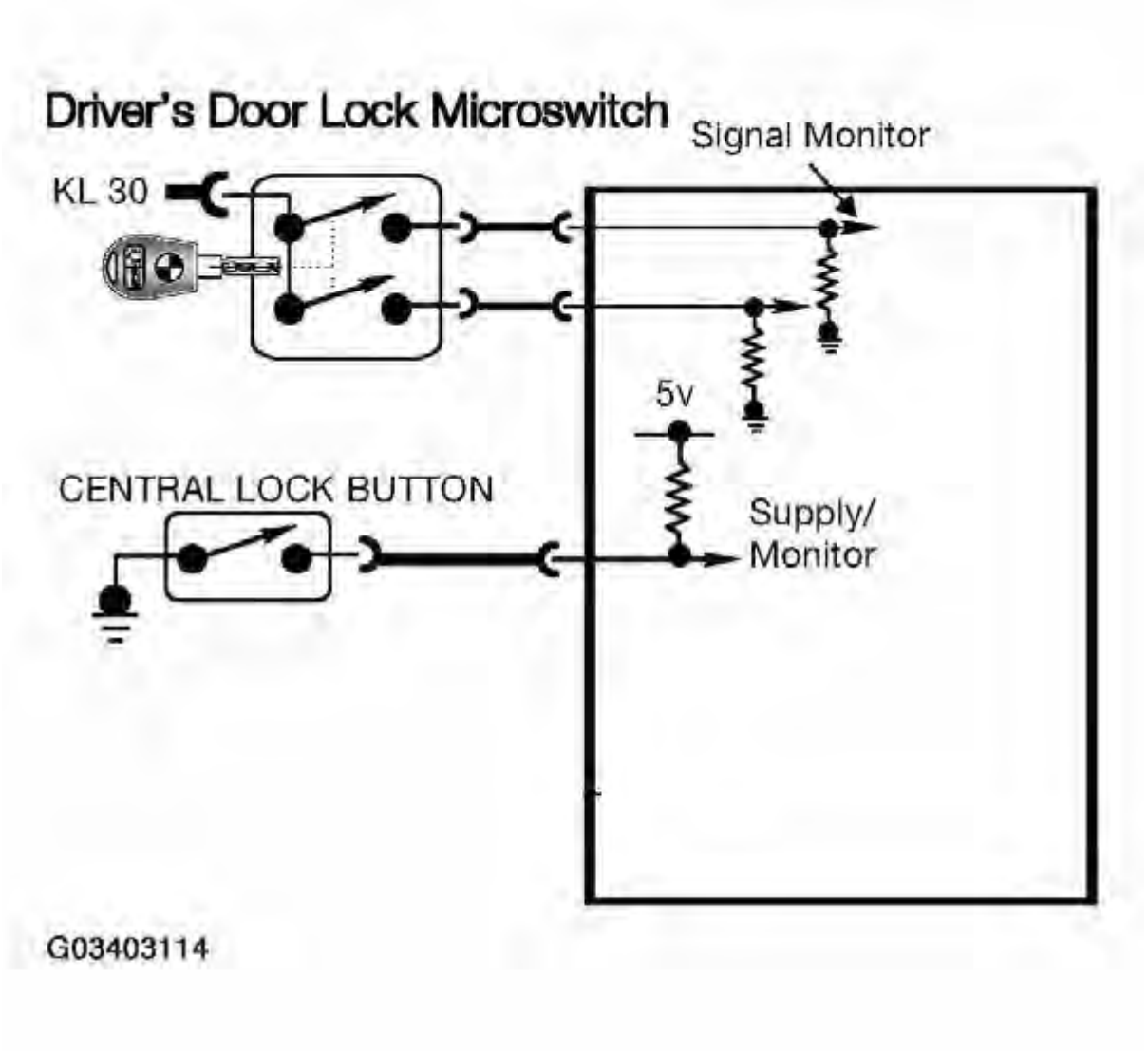


Fig. 3: View Of Driver's Door Lock Microswitch Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

The GM processes the input information and contains "coded" instructions that allow a specific output control of functions.

The GM will produce output controls using internal transistors to switch relays allowing current flow (providing voltage or ground) through circuits and actuators. Actuators (such as relays and motors) are used by the GM to operate or control various output functions.

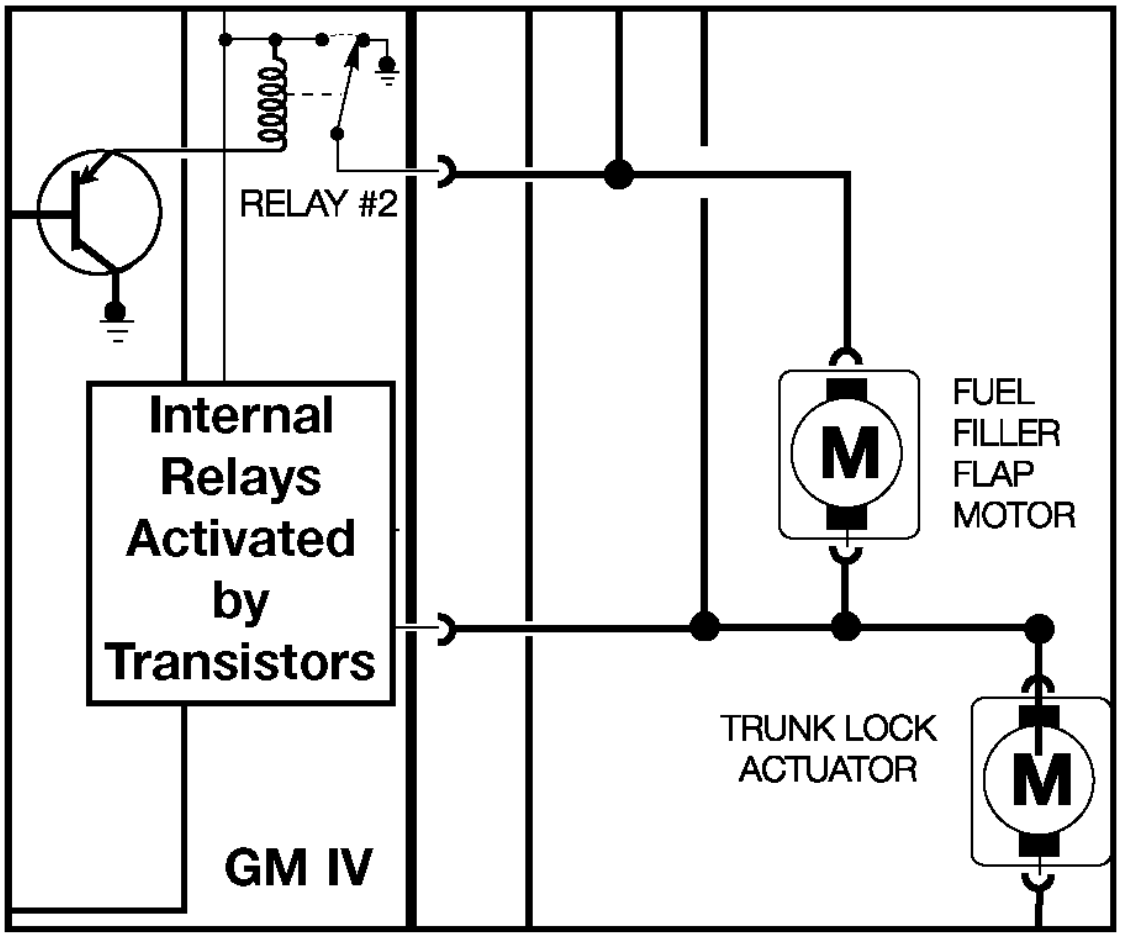


Fig. 4: Identifying Fuel Filter Flap Motor Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Power Distribution

The power distribution box which [includes the fuses for the E36 and Z3 is located in the engine compartment.

A fuse designation label is also located on the inside lid of the fusebox. The label notes:

- Fuse rating in amps.
- Location.
- Circuit listing by fuse.

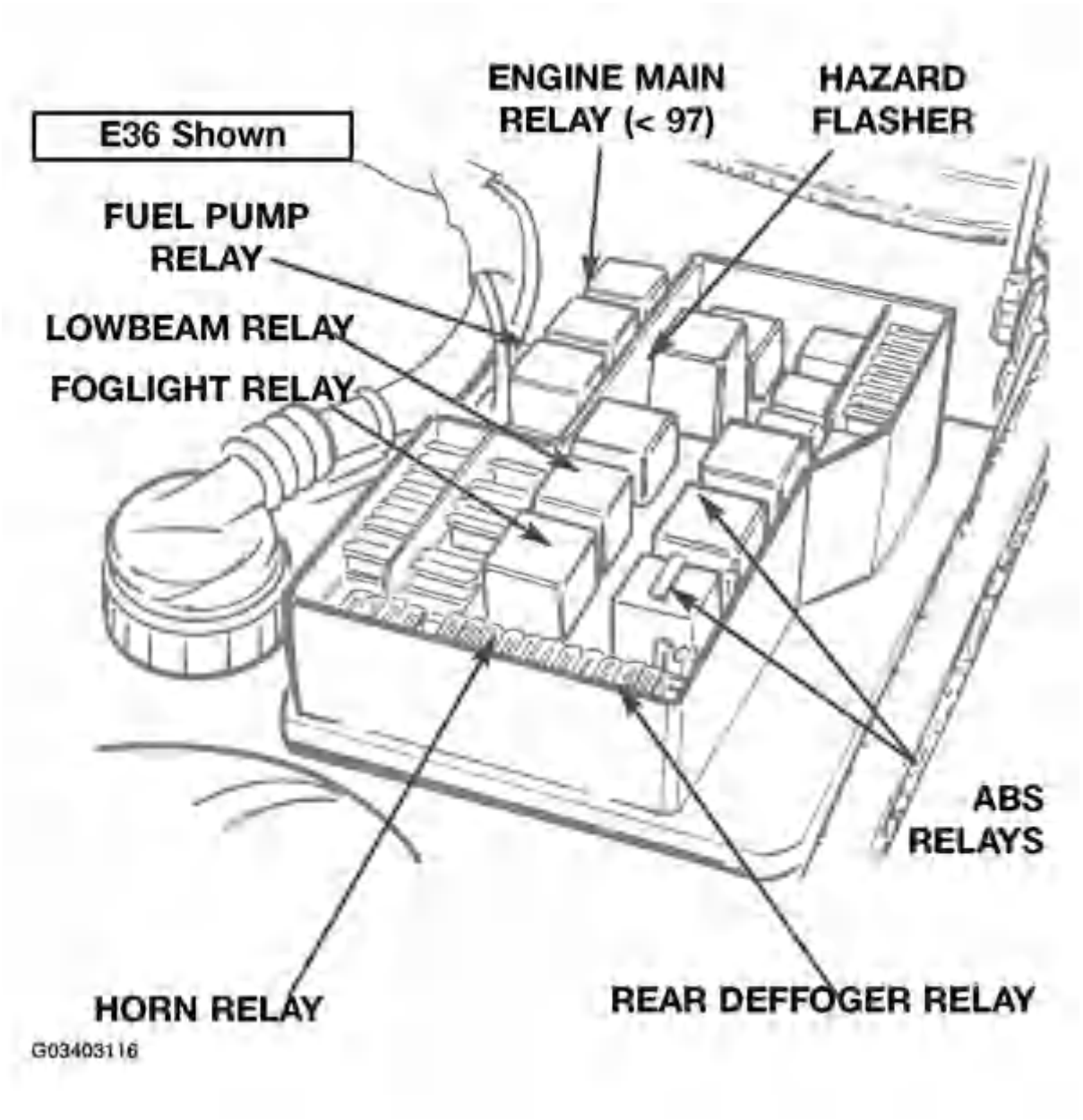


Fig. 5: Identifying Power Distribution Box
Courtesy of BMW OF NORTH AMERICA, INC.

Located under and to the left of the steering column is:

- Check Control Module.
- Common connector plates (splice box).
- Window/Sunroof Relay.
- Crash Alarm Relay.

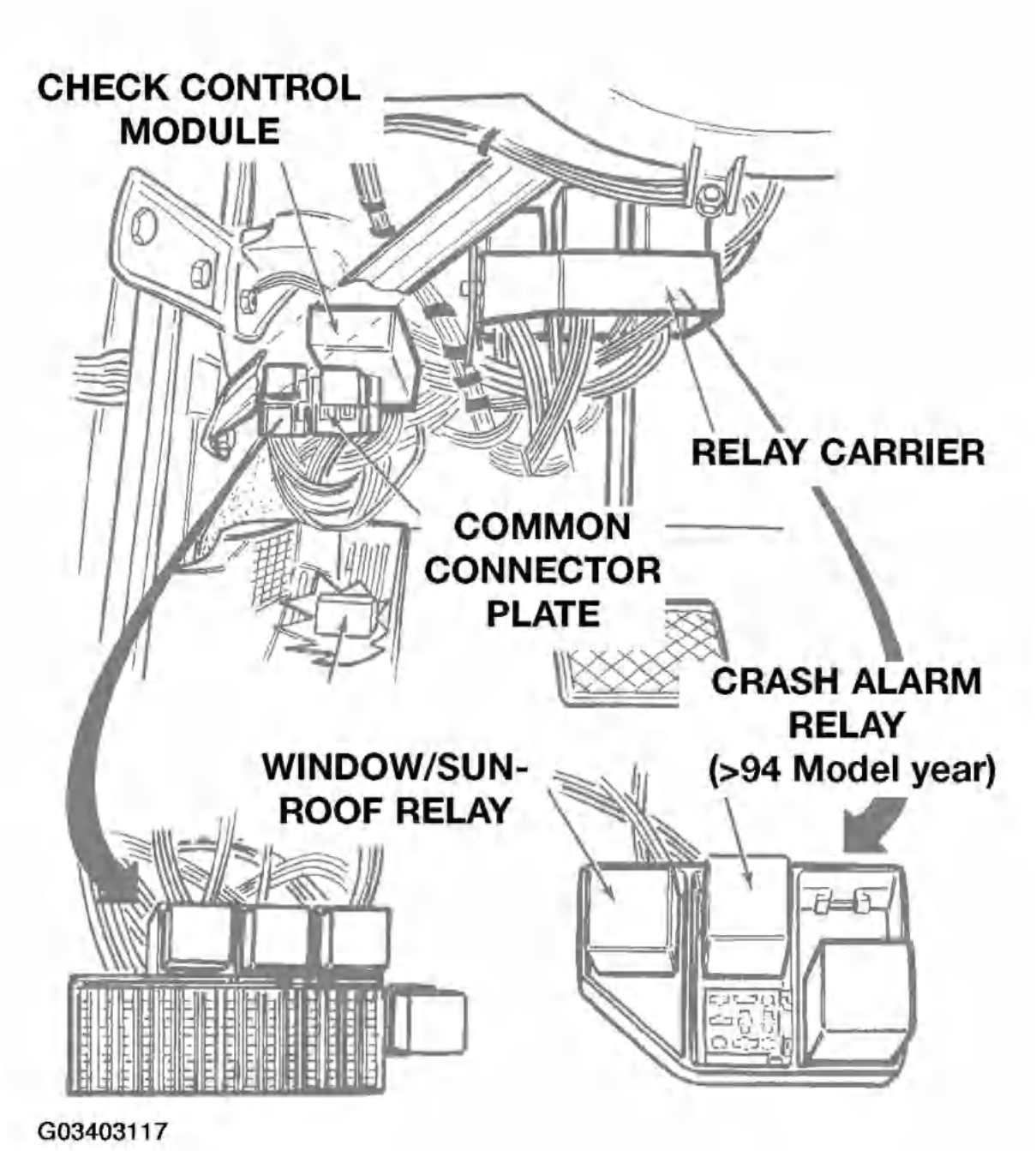


Fig. 6: Identifying Steering Column Power Distribution Box
Courtesy of BMW OF NORTH AMERICA, INC.

WINDSHIELD WIPING/WASHING

Purpose of the System

The windshield wiping/washing functions are controlled by a separate wiper module (WWM). The system has never been directly controlled by the ZKE, even though it is a body electrical system.

The system has four wiping stages including one interval wiping speed when the ignition is in position KL R or KL15. The wiper motor output control is by the WWM located behind the glovebox.

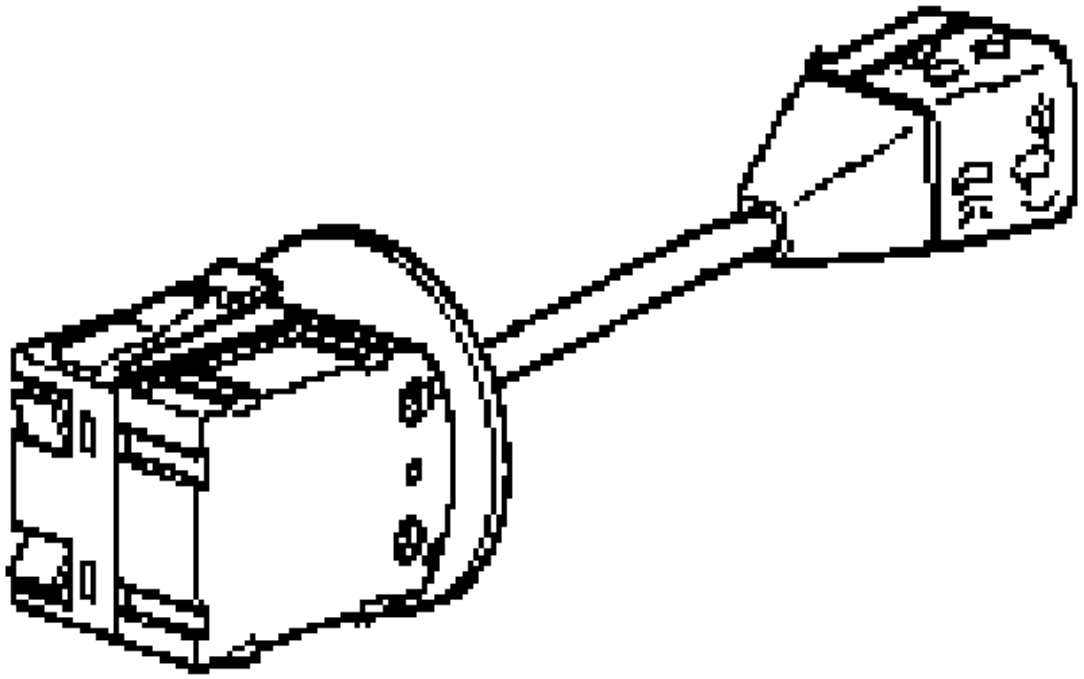


Fig. 7: Identifying E36 Wiper Stalk
Courtesy of BMW OF NORTH AMERICA, INC.

System Components - with Principle of Operation

Wiper Stalk Switch Input

The wiping stage inputs are through a coded combination switch that supplies a ground signal to the WWM. The wiping stages include:

Single (S): Momentarily holding the wiper switch down in the single position provides a momentary ground signal to activate a single sweep in slow speed.

Slow (I) and Fast (II): The stage I and stage II wiping speeds are road speed dependent. Stage I switches to intermittent when the vehicle is stopped and stage II switches to stage I when stopped.

Windshield Washing: The wash request provides a switched ground input to the WWM by pulling the stalk rearward. The WWM activates the windshield washer pump directly. When the washing function is activated, the pump runs as long as the switch is held. The wipers switch on and will continue to for 3 wiping cycles after the switch is released.

Intermittent: The interval time of the wipers is vehicle speed dependent. As the vehicle speed increases, wiping interval times decrease. This timed interval is set in the control module and is not programmable. The programmed intermittent cycles are as follows:

INTERVAL TIME OF WIPERS (PROGRAMMED INTERMITTENT CYCLES)

0-10 mph	10-25 mph	25-50 mph	50-69 mph	69-93 mph	>93 mph
14 sec's	8 sec's	7 sec's	6 sec's	5 sec's	4 sec's

Blocking Protection

The wiper module receives a feedback signal from the wiper motor when the wipers are switched on. If this feedback signal is missing for several seconds after the wipers are switched on, the module will switch the motor off.

The wiper switch must be moved to the off position before another attempt can be made to turn the wipers on. If this blocking protection has activated several times, the ignition must be cycled before the wipers can be switched on again.

The wiper module is not connected to the diagnostic link for troubleshooting purposes. Standard troubleshooting procedures using an ETM and DISplus multimeter must be employed to diagnose the wiper/washer.

System Components: Inputs - Processing - Outputs

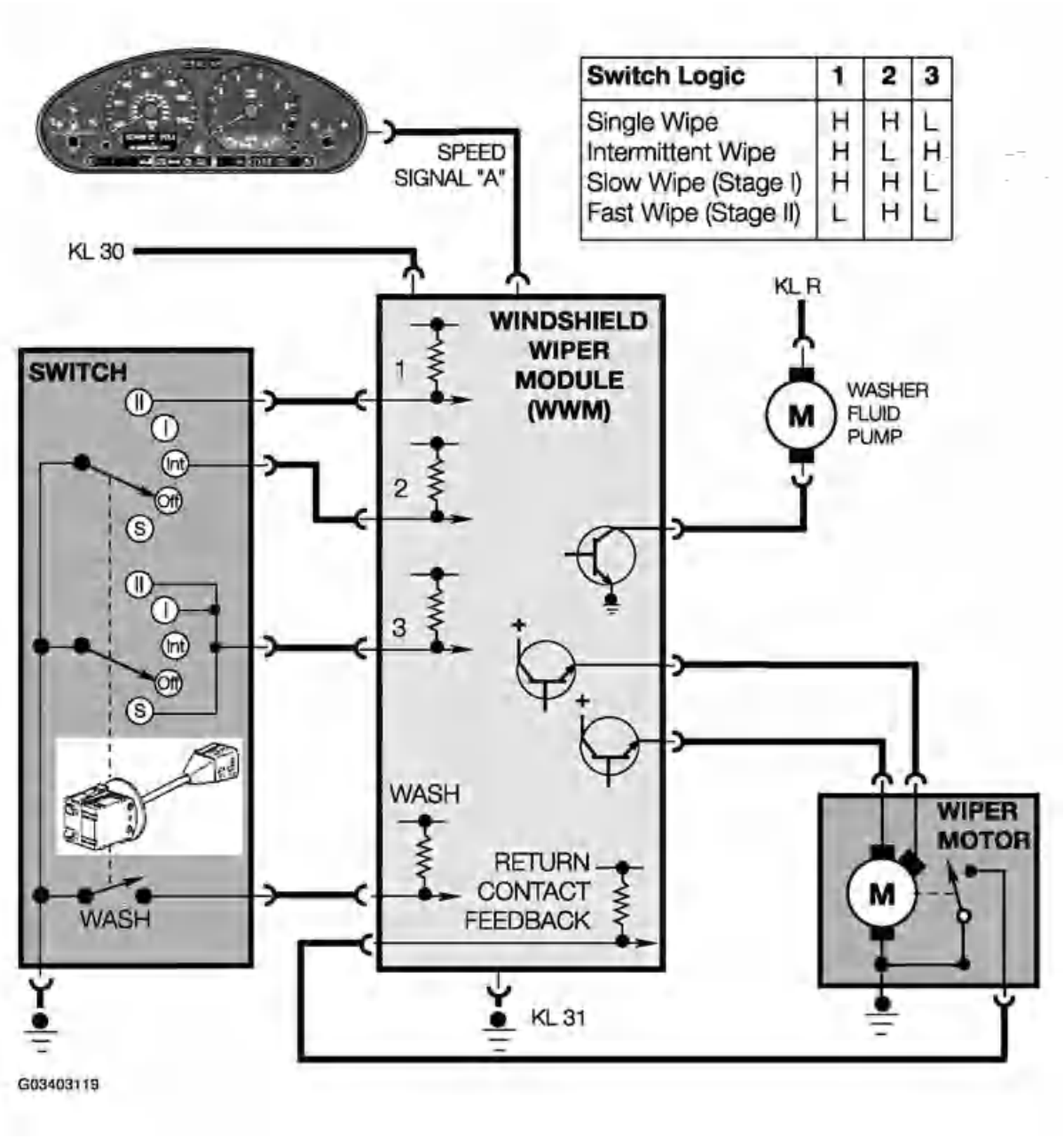


Fig. 8: View Of Wiper Module Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

318ti Rear Window Wiper/Washer

The rear glass of the 318ti has a wiper/washer. This system has an additional set of contacts in the wiper stalk switch that operates the rear window system as well as front window wiper/washer system. Operation is as follows:

- Intermittent Wiping: Push the wiper switch away from the steering wheel briefly to activate intermittent wipe. Pressing a second time will switch the wiping off.
- Wash/Wipe: Push the lever away from the steering wheel and hold, this will activate the washer pump and the wiper as long as the switch is held.

System Components: Inputs - Processing - Outputs

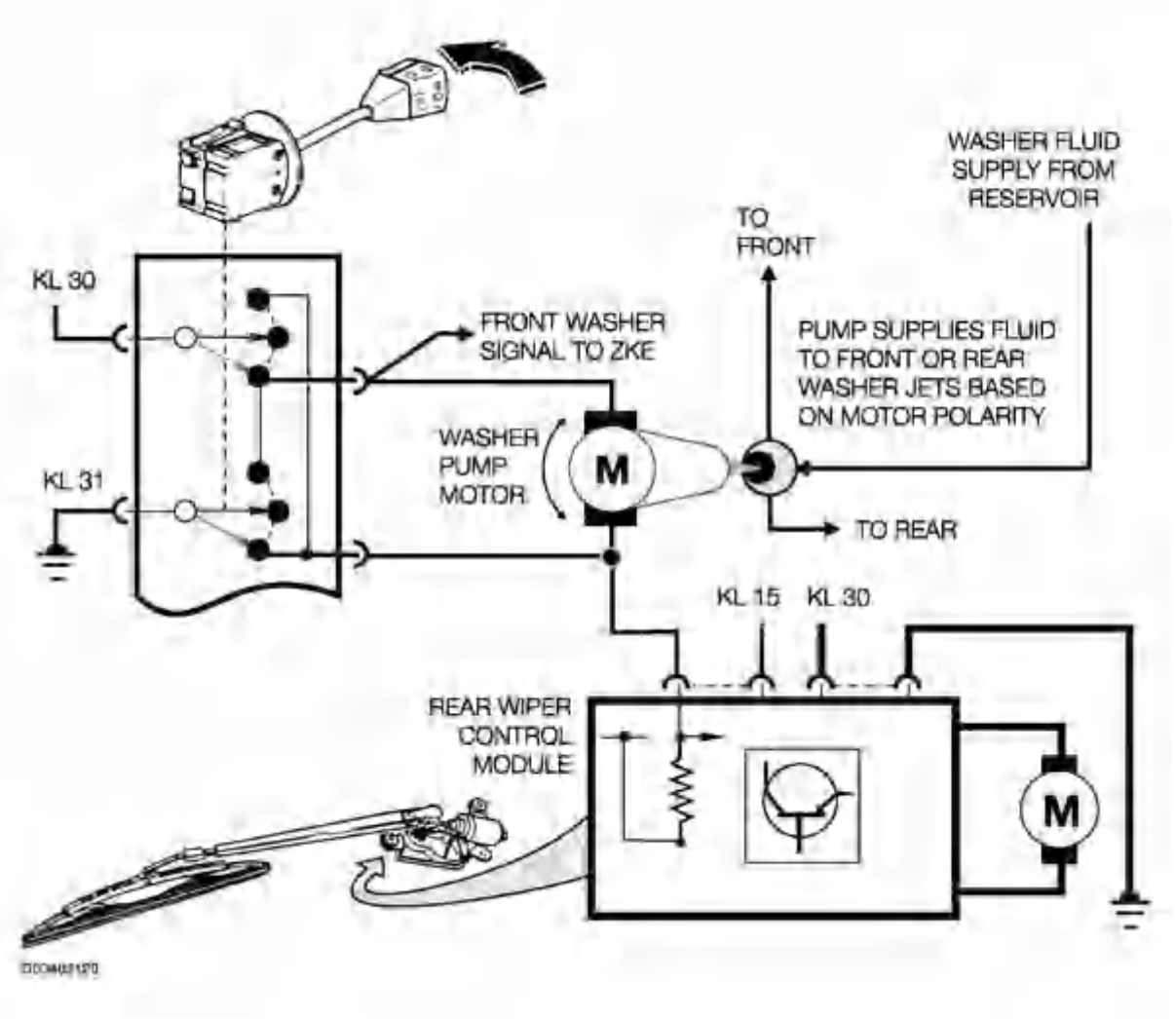


Fig. 9: Identifying Rear Wiper Control Module Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

CENTRAL LOCKING

Purpose of the System

The Central Locking System provides locking/ unlocking of the entire vehicle from one central exterior point.

From the driver's door, passenger's door or luggage compartment (>96 MY), a lock/unlock request will lock/unlock all exterior doors, luggage compartment and the fuel filler flap (and glove box E36iC only).



Fig. 10: Identifying Central Locking Locations
Courtesy of BMW OF NORTH AMERICA, INC.

Locking from the luggage compartment lock cylinder and leaving the lock cylinder in the horizontal position will manually lock the luggage compartment in the "valet" position.

From inside, the vehicle can be locked using one of the front door lock knobs or a central locking button (>96 MY E36 which also unlocks the vehicle) located in the center console. The doors can be unlocked by puling twice on the interior door handle.

Locking the vehicle from the central switch or door lock knob will "single lock" all doors, luggage compartment and not lock the fuel filer flap (or glovebox on the E36iC).

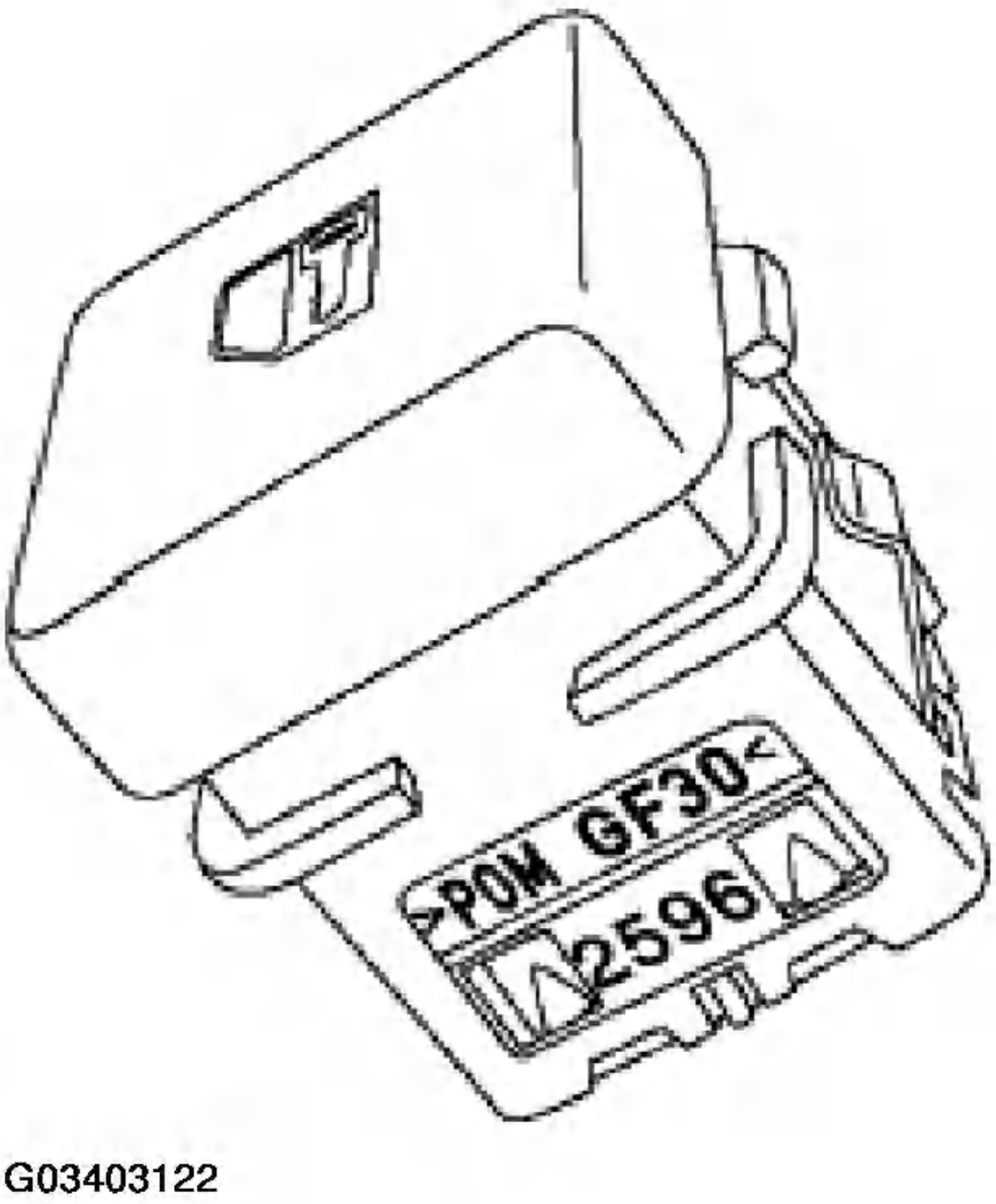


Fig. 11: Identifying Central Switch
Courtesy of BMW OF NORTH AMERICA, INC.

The Central Locking System utilizes the GM IV to carry out all of the locking/unlocking features:

- When locked from the outside, the vehicle will double lock and arm the alarm system (only if equipped with DWA, not the accessory Alpine Alarm). The ignition must be switched off and the driver's door must be opened and closed.
- The EWS II is interfaced for double lock monitoring and unlock function(>1/95 Production Date). With the presence of an accepted EWS II key and switching the ignition "on", the GM IV will unlock the vehicle.
- In the event of an accident (ignition must be switched on), the GM IV will be signalled to unlock all of the doors.

- Anti-theft drive away protection feature with double lock (>1/95 Production Date when locking the vehicle from the exterior).
- Comfort closing of the windows is posible from both front door locks if held in the lock position.
- 1996 E36 - Sunroof added to comfort closing feature.
- E36iC - The trunk is locked out when the convertible top is in operation. Fully automatic convertible top added to comfort closing feature (97 MY and later vehicles).

Hardware Features

- The door lock buttons are mechanically uncoupled from the lock actuators when locked. The door lock buttons also "mechanically" lock the individual doors. This provides manual locking in the event of a central locking malfunction.

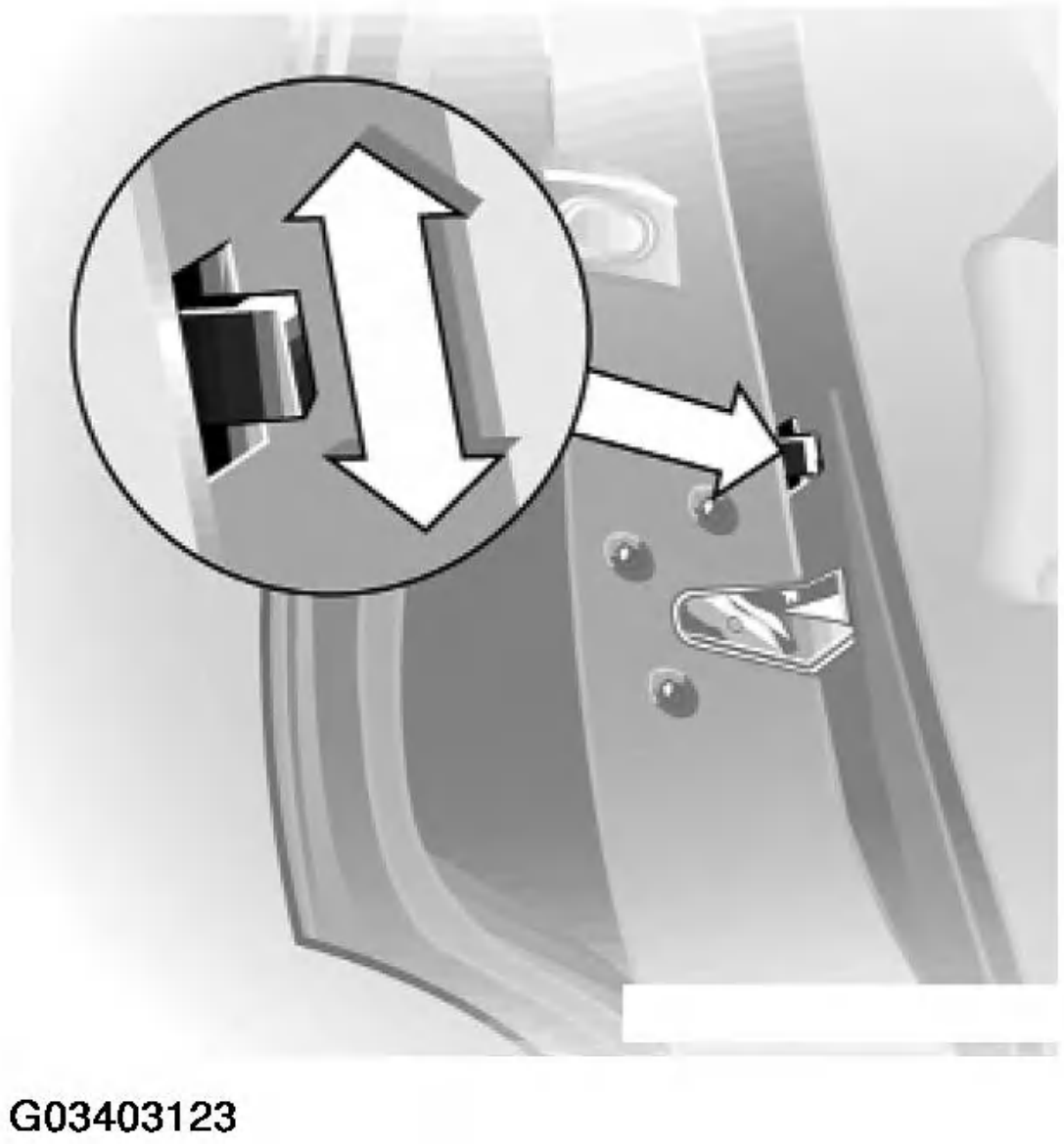


Fig. 12: Identifying Door Lock Buttons
Courtesy of BMW OF NORTH AMERICA, INC.

- Child safety locks (located in the rear doors on a four door vehicle) are actuated by sliding a lever. The

door can now only be opened from outside.

- The luggage compartment can be manually locked with a "Master Key" and leaving the lock cylinder in the horizontal position which prevents opening by any other method (secured for valet).

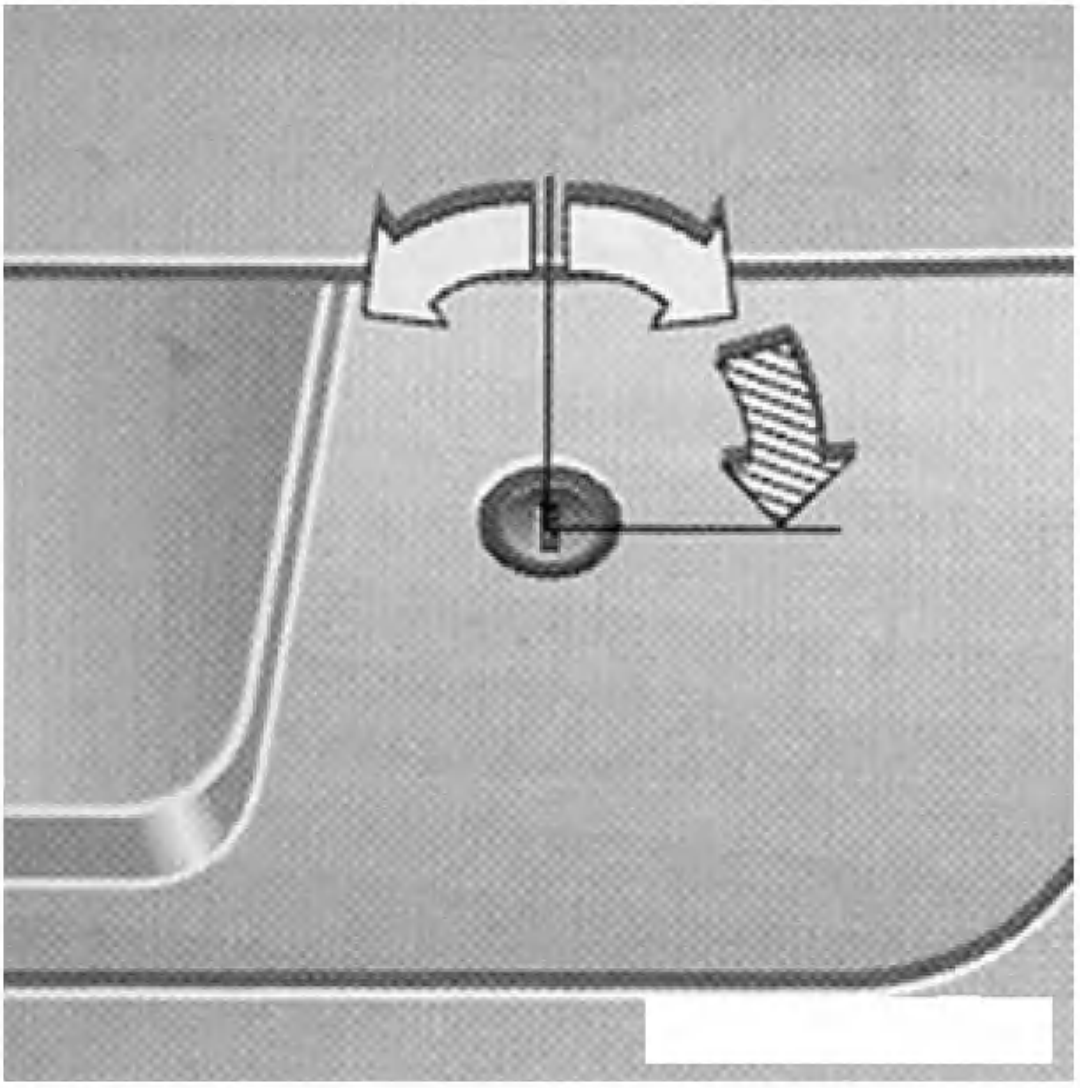


Fig. 13: Identifying Luggage Compartments Lock
Courtesy of BMW OF NORTH AMERICA, INC.

- The Fuel Filler Flap mechanical release is found in the right side of the luggage compartment.
- The glove box has a lock cylinder to secure the contents by manual locking with a "Master Key" and leaving the lock cylinder in the horizontal position which prevents opening by any other method (secured for valet).

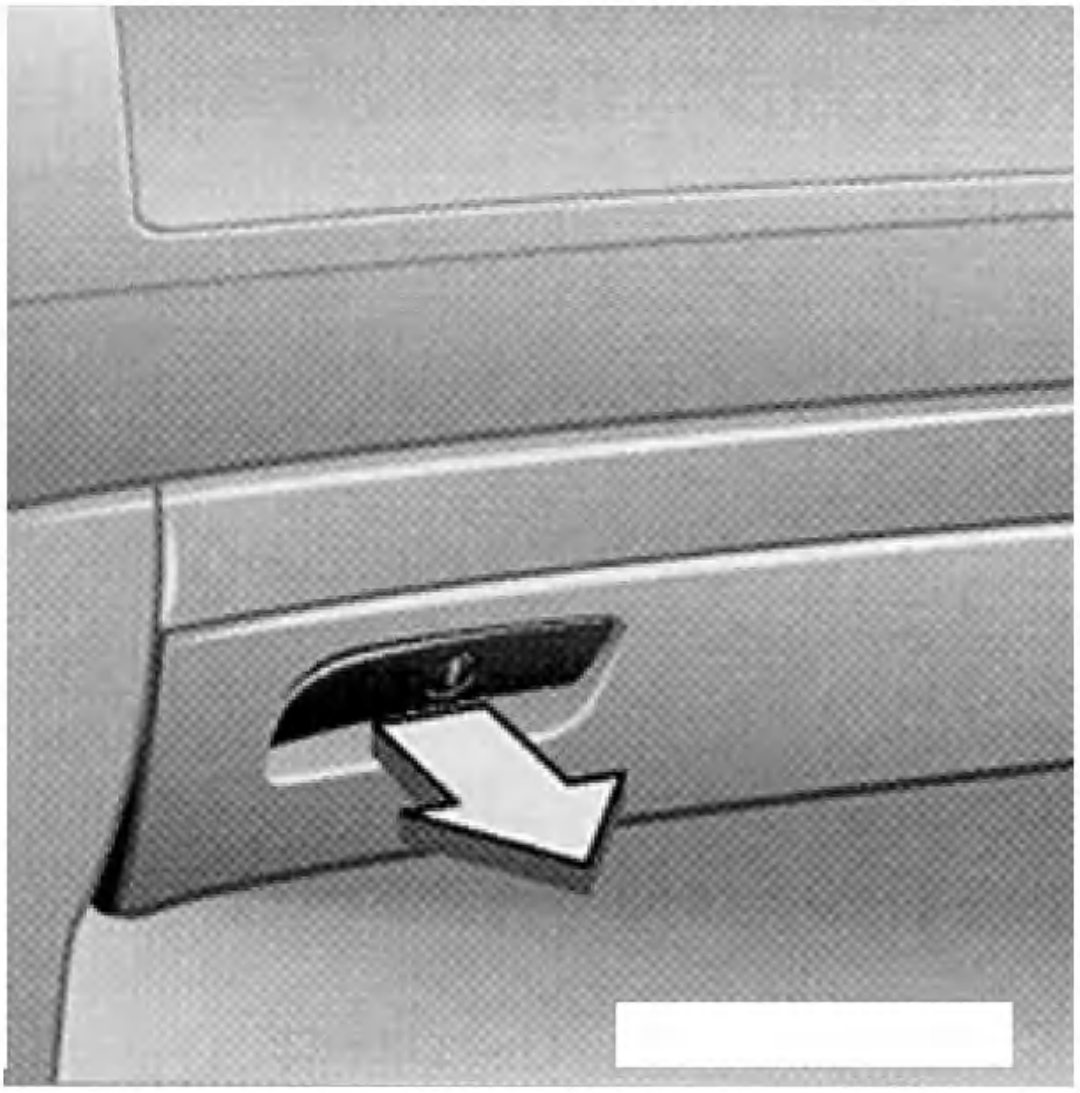


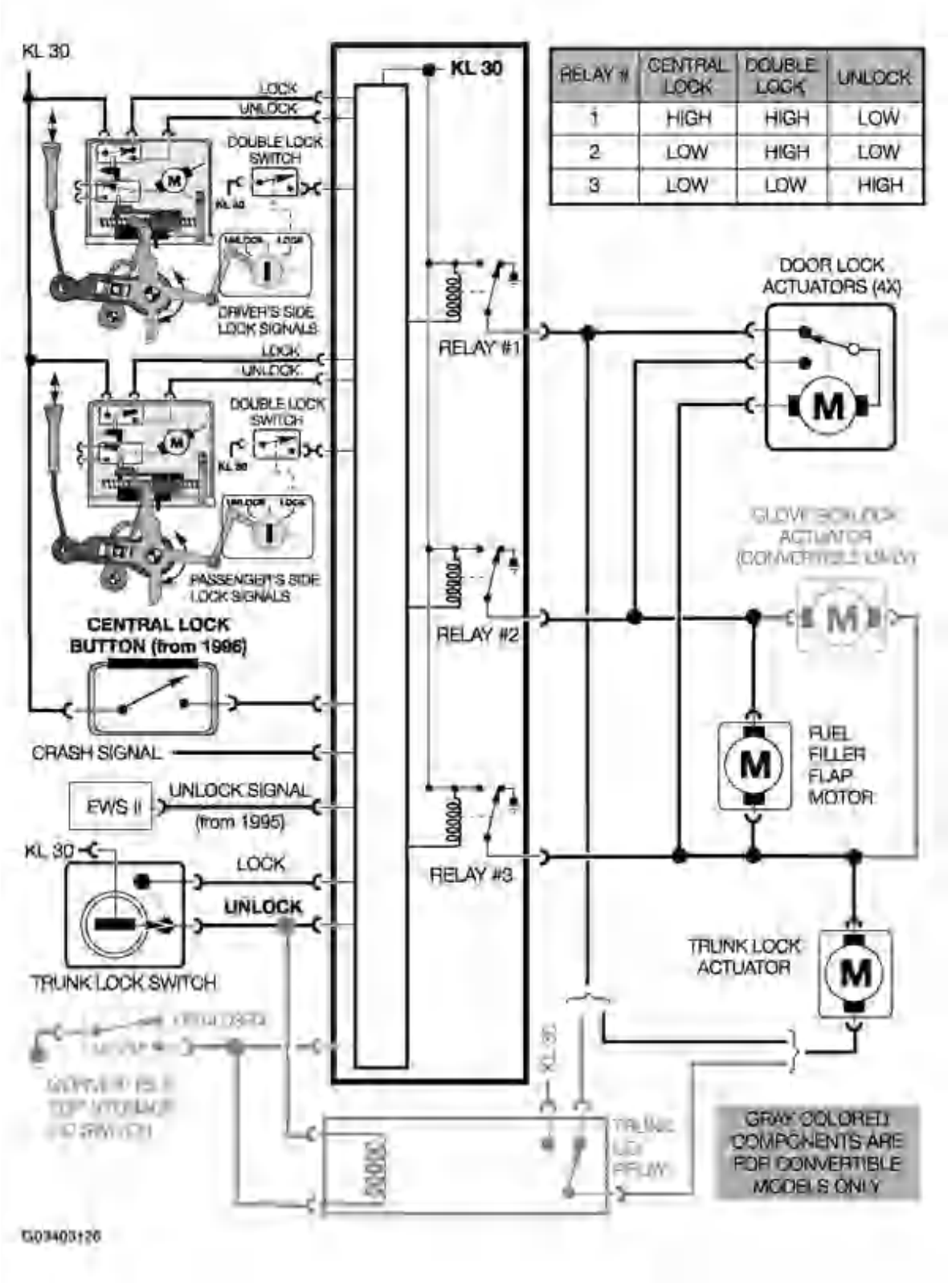
Fig. 14: Identifying Glove Box
Courtesy of BMW OF NORTH AMERICA, INC.

The valet key is not mechanically capable of entering either of these lock cylinders.

Central Locking - ZKE IV

The locking and unlocking of the lock actuators is controlled from three relays in the GM. The door lock actuator "Pin Contacts" and lock micro-switches provide the inputs to the GM for locking/double locking and unlocking of the doors, trunk, fuel filler flap (and glove box on the E36iC only). The relays in the GM provide both power and ground depending on the direction of actuator movement (lock/unlock).

System Components: Inputs - Processing - Outputs



RELAY #	CENTRAL LOCK	DOUBLE LOCK	UNLOCK
1	HIGH	HIGH	LOW
2	LOW	HIGH	LOW
3	LOW	LOW	HIGH

Fig. 15: Identifying Lock Actuators Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Lock Actuator Operation

The lock actuators contain the electrical motor drive, the lock/ unlock switch contacts and the integral single/double lock limiting switch.

The actuators control the mechanical locking/unlocking function of the doors by sliding two protruding levers. The precise positioning of the levers provides the unlock, single lock and double lock positions of the latch mechanism.

The electro-mechanical operation of all the lock positions are provided in the appropriate articles

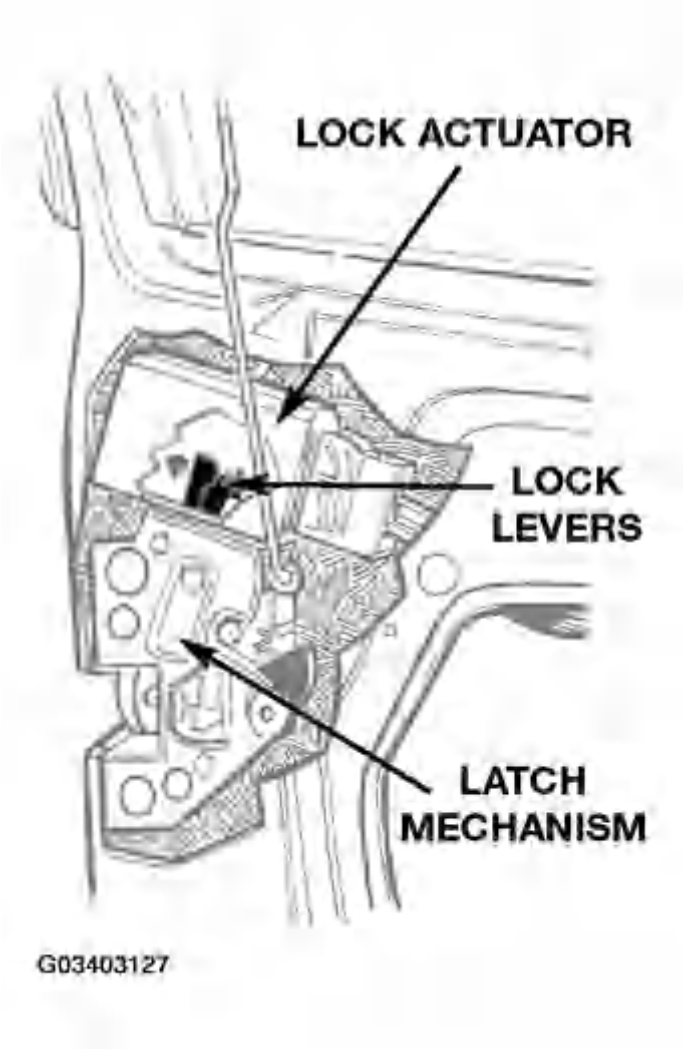


Fig. 16: Identifying Lock Actuator, Lever And Latch Mechanism
Courtesy of BMW OF NORTH AMERICA, INC.

UNLOCKED - NEUTRAL POSITION

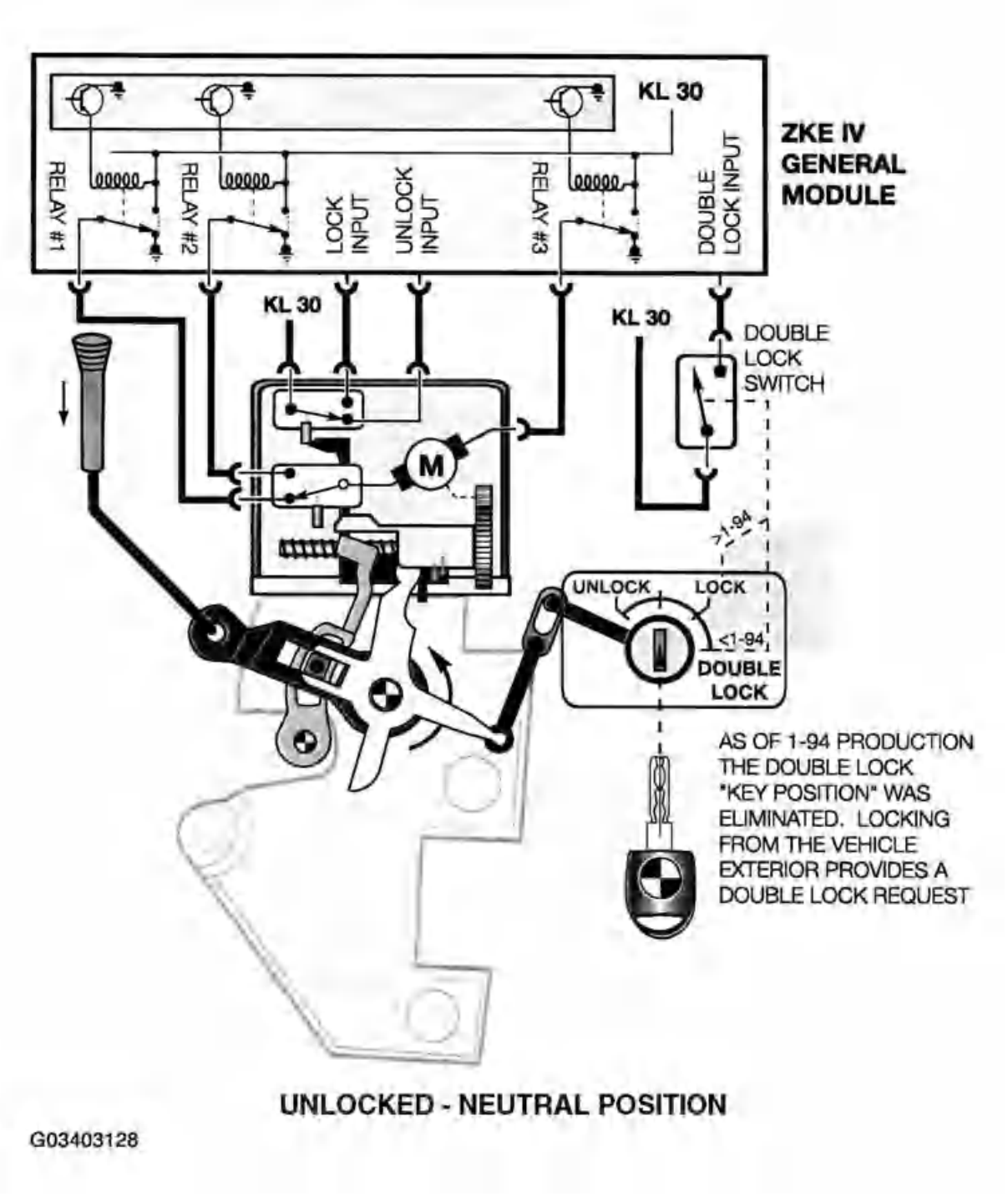


Fig. 17: Identifying Unlocked-Neutral Position Of Lock Actuator
Courtesy of BMW OF NORTH AMERICA, INC.

- All switch contacts are in their rest positions.
- The lock actuator/latch mechanisms are in the unlocked position.
- Raising the door handle or pulling the interior door latch will mechanically open the door.

Central Locking System Terminology

"Single lock", "Central lock": Vehicle is locked via the lock knob, or the console mounted central lock button (>12-95 prod).

"Double lock", "Central arrest": Vehicle has been locked from the exterior with the key at the driver's door, passenger's door or trunk.

SINGLE LOCK - Phase 1, Mechanical Lock At Door And Lock Signal Generation

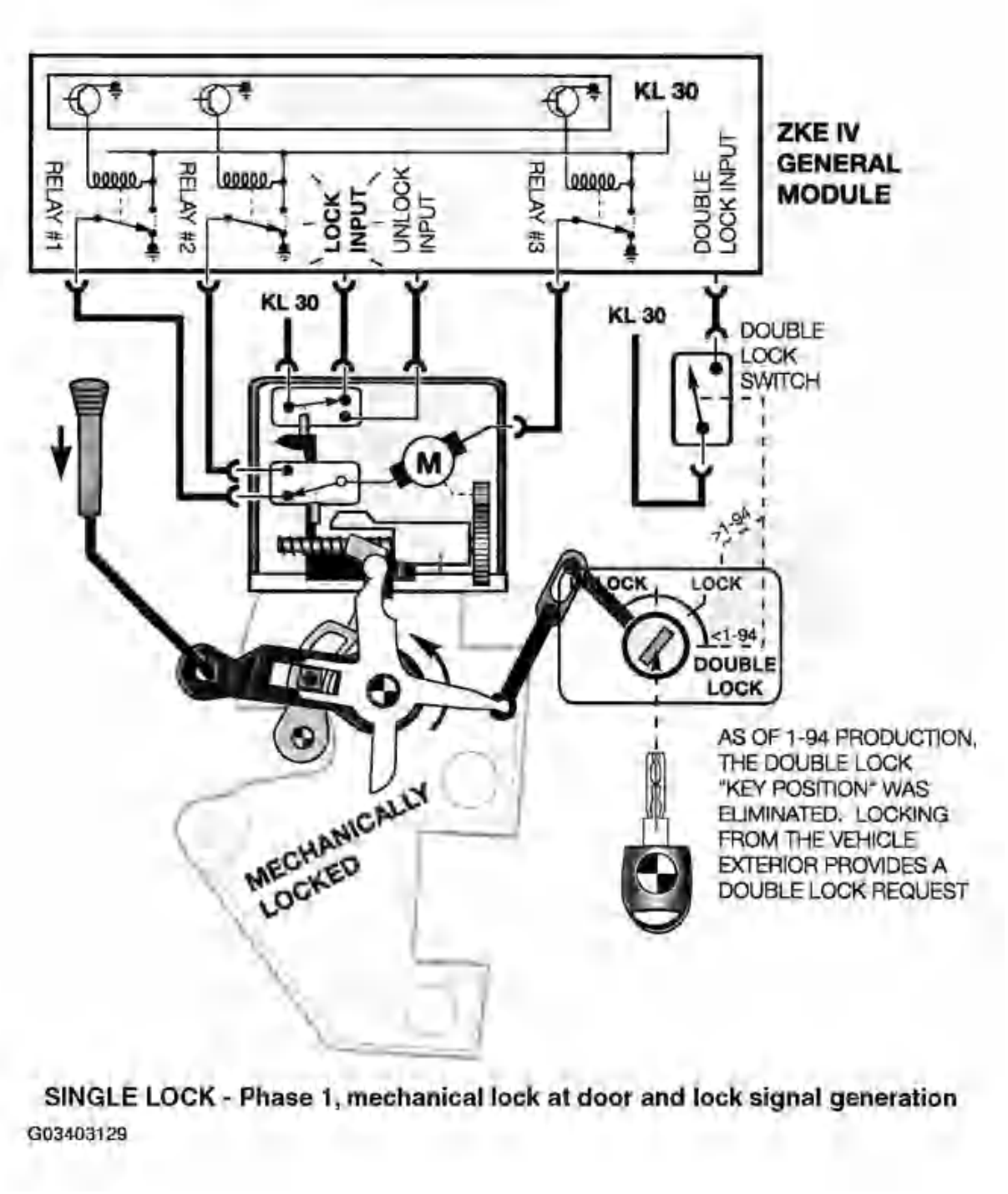


Fig. 18: Identifying Single Lock Actuation (Phase 1)
Courtesy of BMW OF NORTH AMERICA, INC.

- The lock button and key mechanically rotate the lock lever which decouples the exterior door handle from the latch.
- When rotated, the lock lever also slides an internal switch ramp to the left closing the lock microswitch.
- This provides the lock signal to the GM.

SINGLE LOCK - Phase 2, activation of actuators at all door locks

When the GM receives the lock signal it activates internal relay #1, providing power through the closed single lock contact to the actuator motor. Ground is provided through the module's closed contact of relay #3.

All of the vehicle's actuator motors are energized until the single lock circuit is opened by the gear driven slider. The actuators stop at the single locked position.

At this point, the external door handles are decoupled from the latch mechanism preventing entry from outside

of the vehicle.

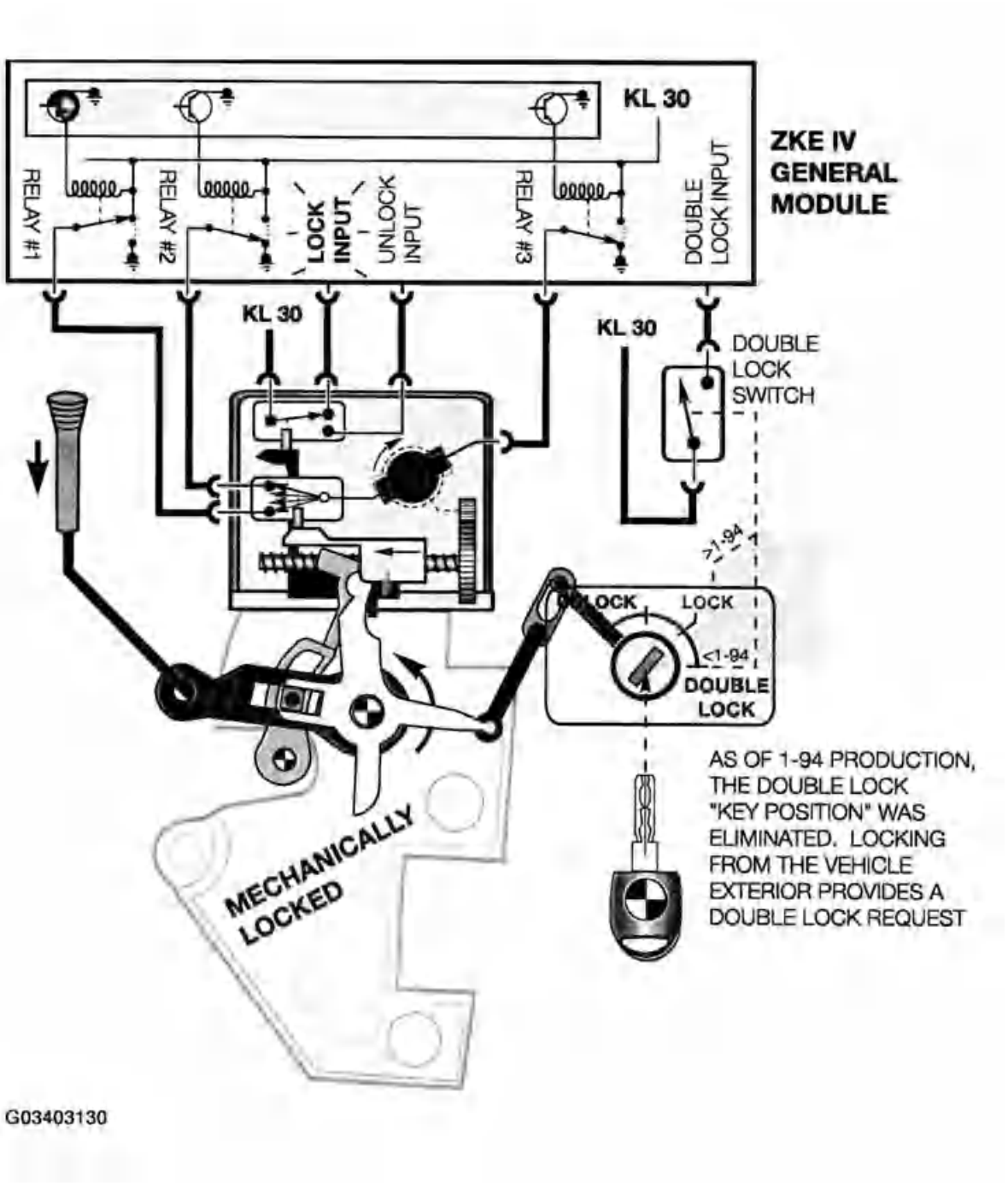


Fig. 19: Identifying Single Lock Actuation (Phase Two)
Courtesy of BMW OF NORTH AMERICA, INC.

If the internal door handle, the lock buttons or the central lock button on the center console are operated, the door returns to unlock mechanically and can be opened.

DOUBLE LOCK - Electrical Activation

Turning the key from any outside lock cylinder causes the external double lock micro-switch to close. The GM recognizes this high signal as a double lock request.

The GM activates internal relay #2, providing continued motor operating power through the closed contacts of the internal double lock circuit. Ground is provided through the GM's internal relay # 3. The actuator motors are energized until the internal double lock circuit is switched back to the single lock circuit by the gear driven slider.

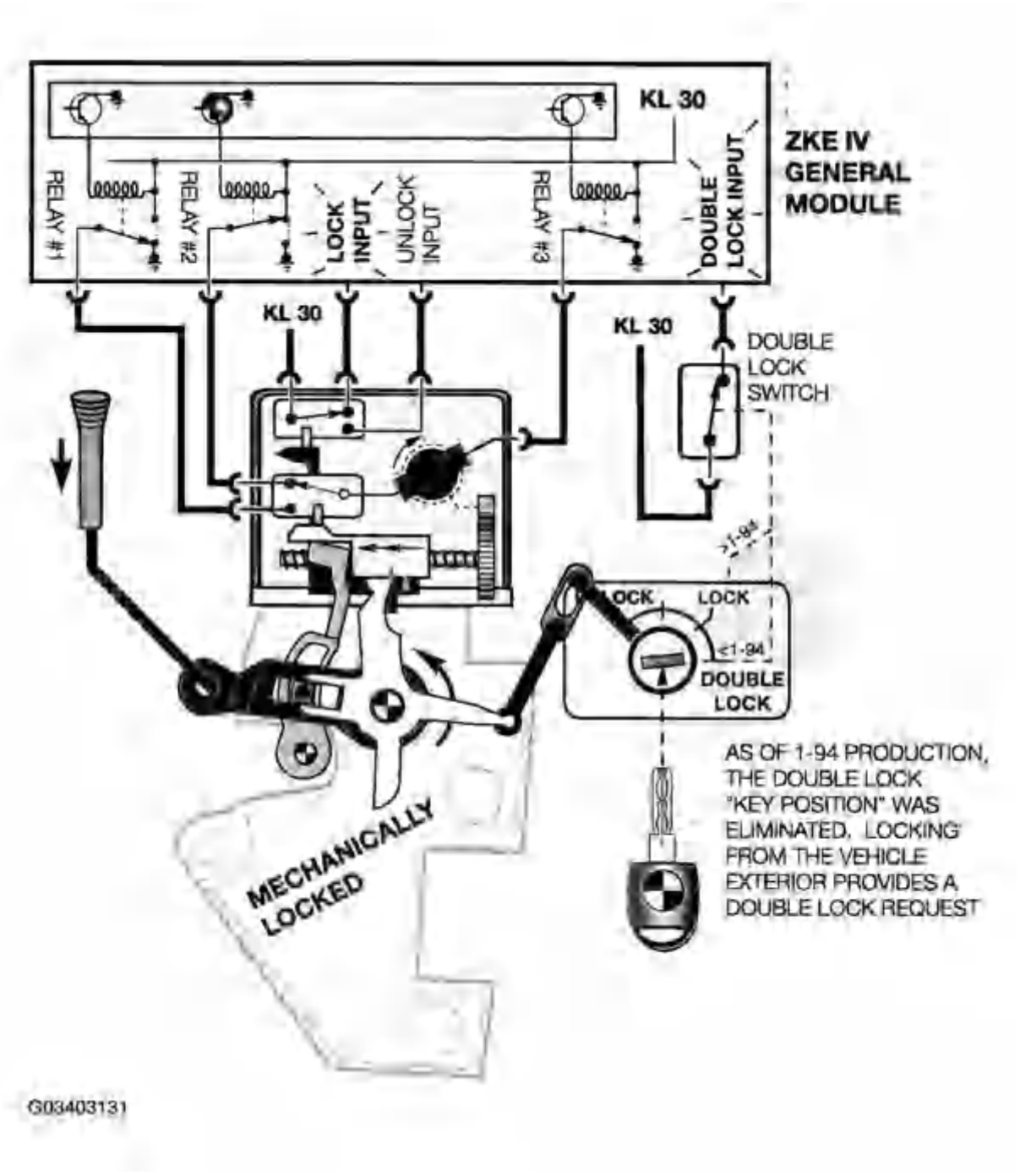


Fig. 20: Identifying Double Locked Actuator
Courtesy of BMW OF NORTH AMERICA, INC.

DOUBLE LOCK - Mechanically Decoupled

When the slider switches the circuit back to single lock it also pushes the double lock lever to the left until it stops. In this position, the double lock lever decouples the lock button from the latch mechanism. The lock button can be pulled but will not unlock the door since it is not coupled to the mechanism. Spring pressure pulls the button back down when released.

At this point, unlock is only possible when a key is turned to the unlock position from an outside door lock or if the GM receives the unlock signal from the EWS II control module.

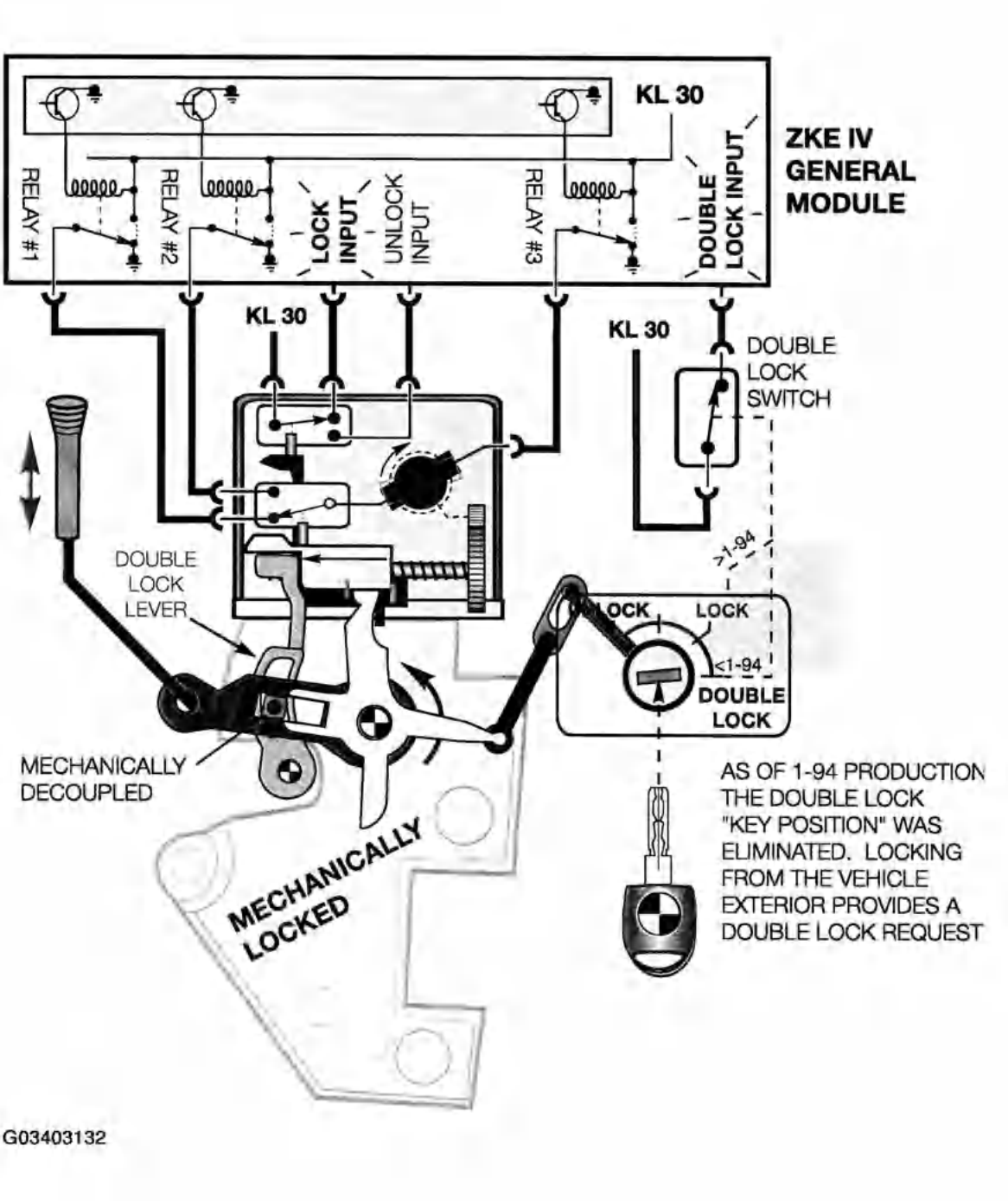


Fig. 21: View Of Double Locked Actuator (Mechanically Decoupled)
Courtesy of BMW OF NORTH AMERICA, INC.

UNLOCK FROM DOUBLE LOCK

When the GM receives the unlock request from a key location it activates internal relay #3 providing operating power to the actuator motor in the opposite direction.

The single and double lock circuits (internal relays 1 & 2) are not activated at all during the unlock function providing ground for the motor to bring the actuator back to the fully unlocked position.

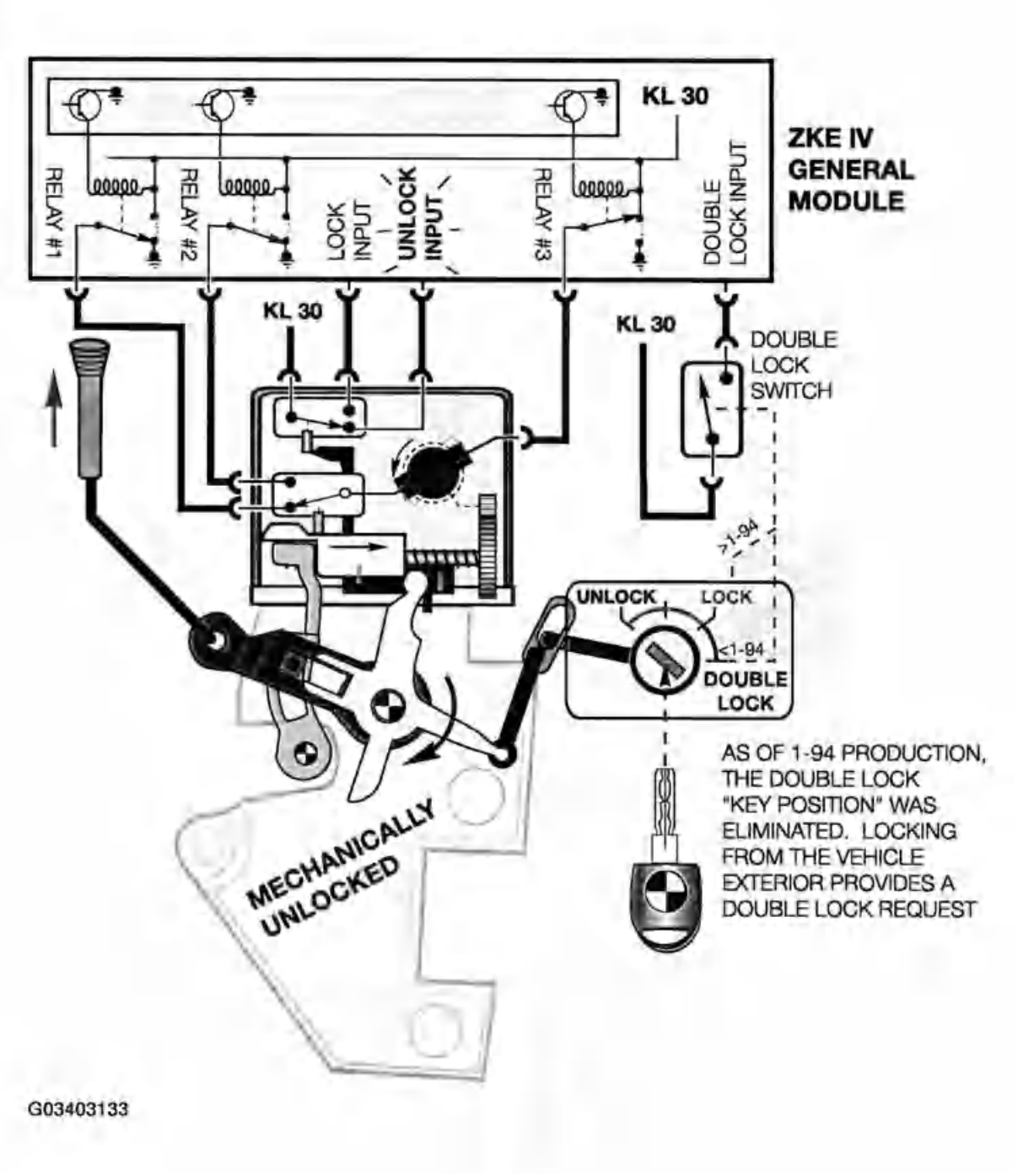


Fig. 22: Unlocking Door Lock Actuator
Courtesy of BMW OF NORTH AMERICA, INC.

Locking Protection

Power protection for the door locking circuit is provided by a "time monitored" activation of the door lock actuators by the GM. The door lock actuators are provided power for the duration of time needed to run the actuator to the desired position.

- The maximum on time for the actuators is 0.7 seconds.

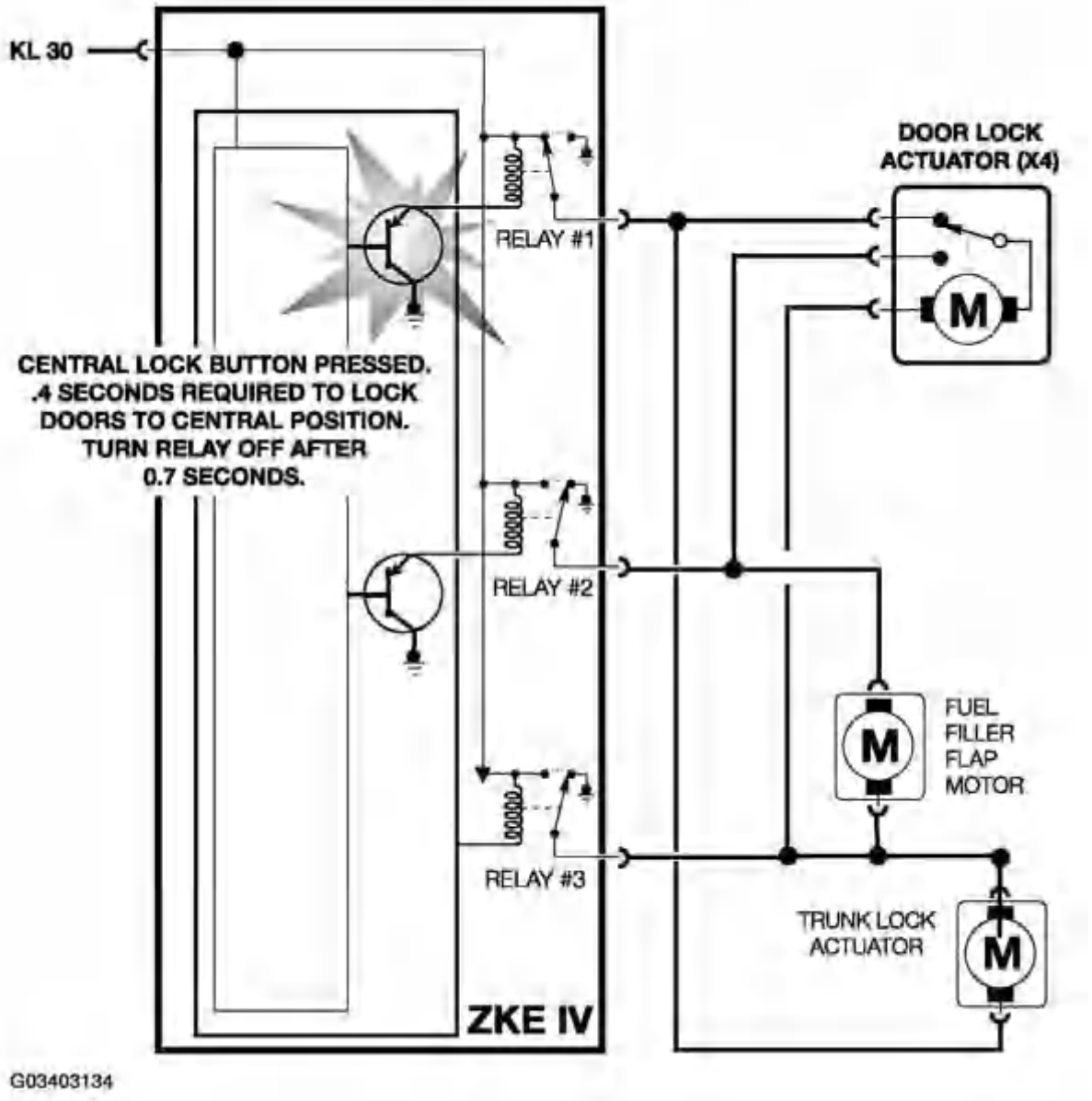


Fig. 23: View Of Locking Protection Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Crash Signalling

The Supplemental Restraint System control module provides a switched signal to the GM in the event of an accident. This signal was previously provided by the Crash Alarm located in the left front kick panel on earlier models (< 97 MY).

The signal is an output function of the control module and becomes active when the impact threshold has been exceeded. The GM unlocks the vehicle, switches on the interior lights and signals the Crash Alarm Relay to flash the exterior lights when this signal is active.

Door Lock Heating (optional)

Purpose of the System

The Driver's door lock cylinder is surrounded by a heating coil to warm the lock cylinder if in case it is frozen due to moisture and below freezing temperatures.

Principle of Operation

The GM controls the lock heater by providing voltage through a final stage transistor. The heater is switched on by raising the driver's door handle. Prerequisites for heater operation include:

- Vehicle locked.
- Door handle raised for approximately 3 seconds.

Power is applied to the heater for a maximum of 32 seconds. A timed arrest of 16 minutes is activated after 3 heating attempts. The door lock heater is switched off immediately after unlocking the door.

System Components: Inputs - Processing - Outputs

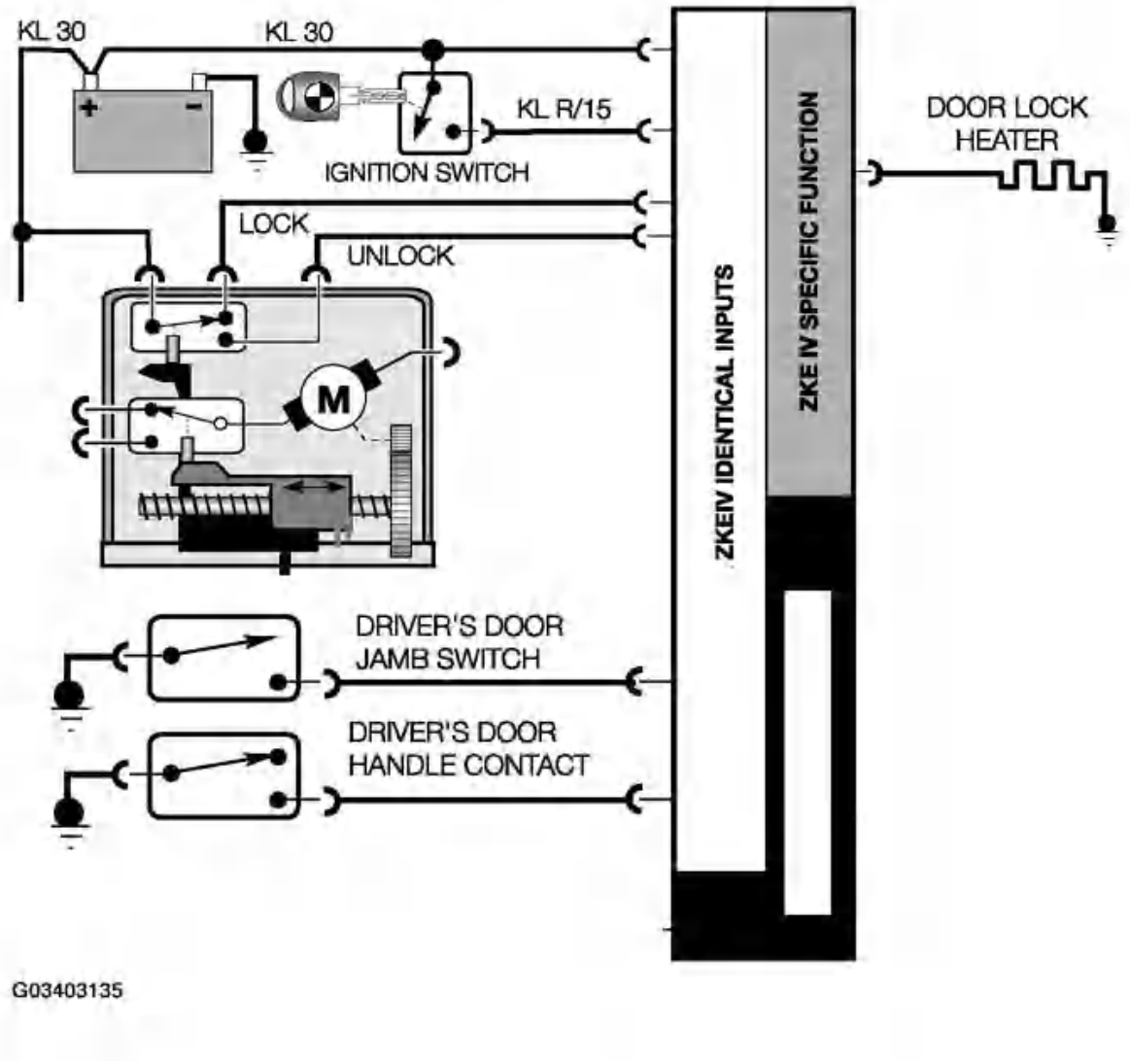


Fig. 24: Identifying Door Lock Heating Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

POWER WINDOWS/SUNROOF

Purpose of the System

The features of the power windows and sunroof system include:

- One-touch operation in both directions (up/ down) on the front windows, down only on the rear windows.
- Anti-trap detection is on the front windows only (initialization required for one touch operation).
- The control of the rear windows is carried out through a Relay Module (RM IV).
- The switches in the center console controls all four windows and the rear window lock out feature.

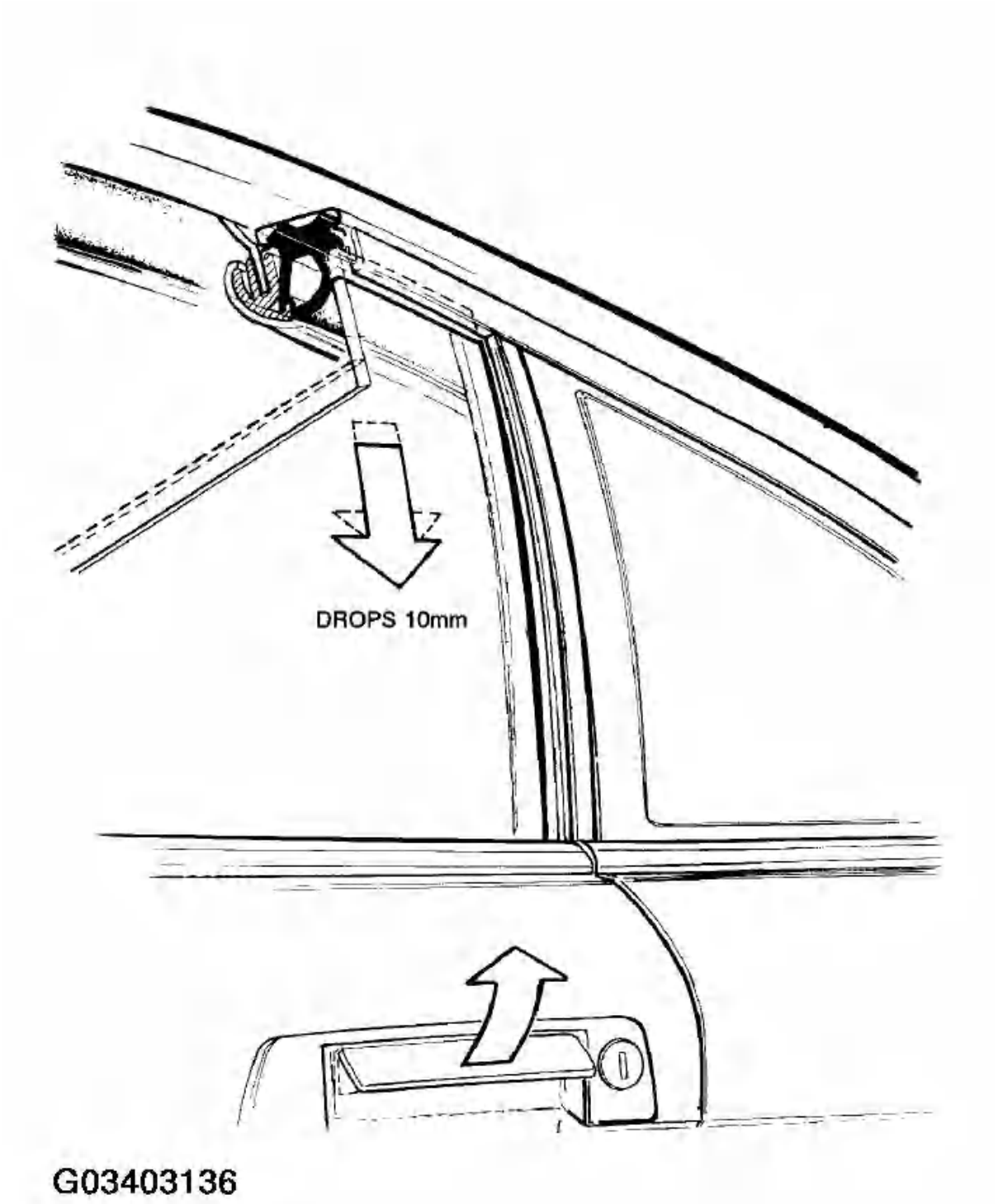


Fig. 25: View Of Power Window
Courtesy of BMW OF NORTH AMERICA, INC.

Principle of Operation

All window operation request signals are digital inputs to the GM.

- Comfort Closing of the windows from the driver's or passenger's lock cylinder when held in the locking position.
- When the ignition key is in accessory or "ON" press the switch to open or close the windows. Window operation is possible with the ignition switched off until a front door is opened or 16 minutes (maximum) has elapsed.
- Power protection against a jammed or seized motor is monitored by the hall sensors in the window

motors. The GM will interrupt the power to a jammed motor. Rear windows utilize current sensing for shut off.

- The one-touch function is activated by momentarily pressing the window switch to the second detent. Window travel will cease when the full up or down position has been reached. One-touch can be canceled by pressing the window switch a second time. Anti-trap is provided by the GM monitoring the door glass movement from the hall sensor. If the door glass encounters resistance in the closing direction (>100N.m) the motor will stop and reverse direction for 50 mm of travel.

Window Operation specific to the E36 Convertible:

- Central Window Switch: Located in the center console, the switch will raise or lower all four windows at the same time. The window lowering has the one-touch feature.
- Convertible top operation: Prior to lowering the top, the top control module signals the GM to lower all four windows half way.
  - If the top switch is held after the top is fully lowered, the windows will close fully.
  - If the top switch is held after the top is fully closed the GM will close the windows.
- With the introduction of the fully automatic convertible top, the comfort close feature of the convertible was also added.



Fig. 26: Identifying Central Window Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Window Operation specific to the Coupe, Convertible and Z3 Coupe:

The design of the E36 Coupe, Convertible and Z3 Coupe required changes in the window operation.

- When opening the door, the door glass is automatically lowered by approximately 10mm. When the door latch opens (switch closes), the window will drop. It remains down until the door contact switch opens when the door is closed. The window will then raise back into the door seal.
- When the door is closed, the glass is raised back into the seal.

This allows the glass to drop out of the door seal when opening the door and provides a tighter seal when

the door and glass are closed.

- The window motor contains a Hall sensor for this feature that is monitored by the GM.

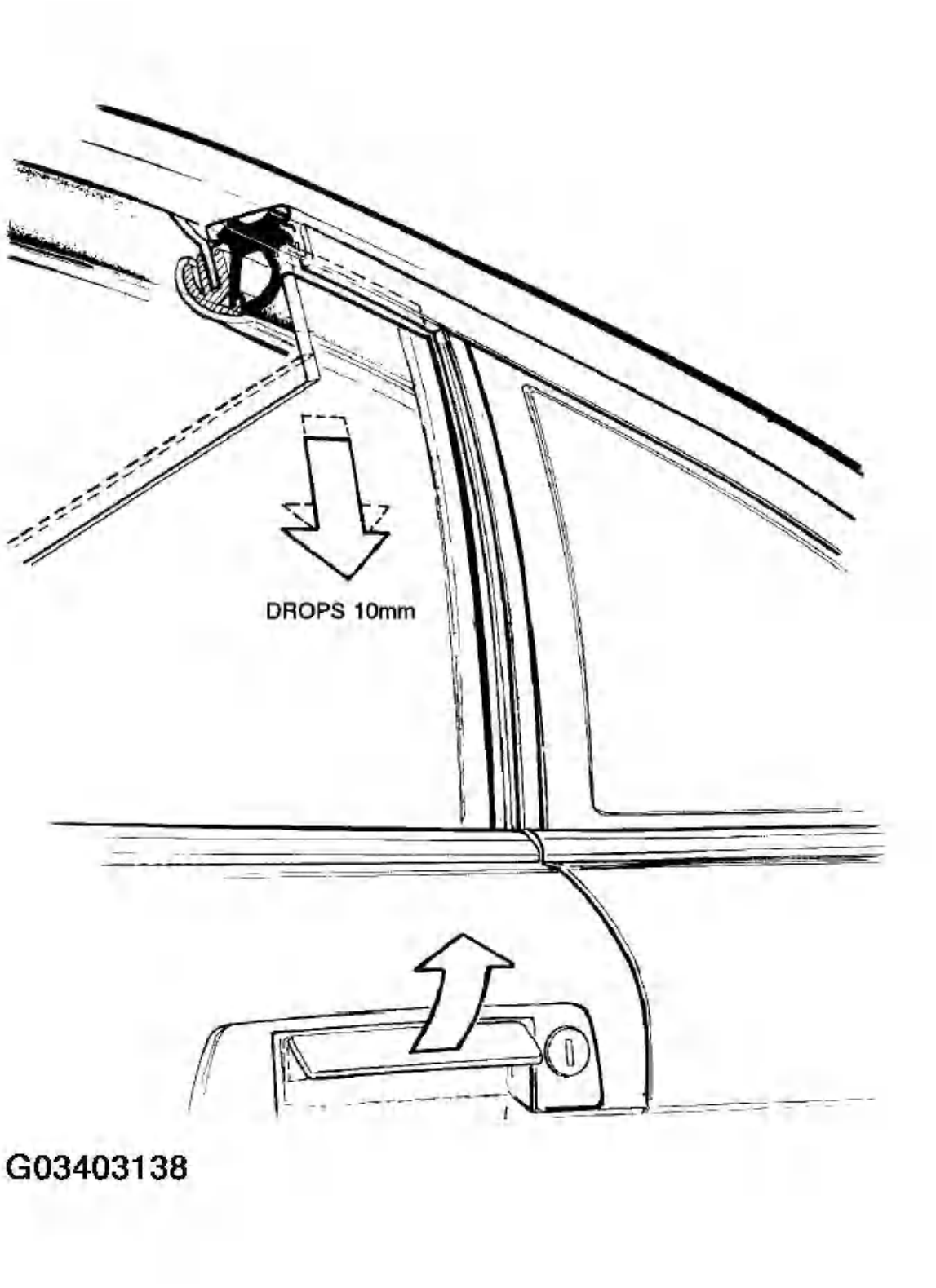


Fig. 27: View Of Power Window (Glass Lowered)
Courtesy of BMW OF NORTH AMERICA, INC.

System Components

Window Switches: The signals from the window switches are monitored by the GM.

The power window switches have a second detent position for the purpose of signalling the one touch feature.

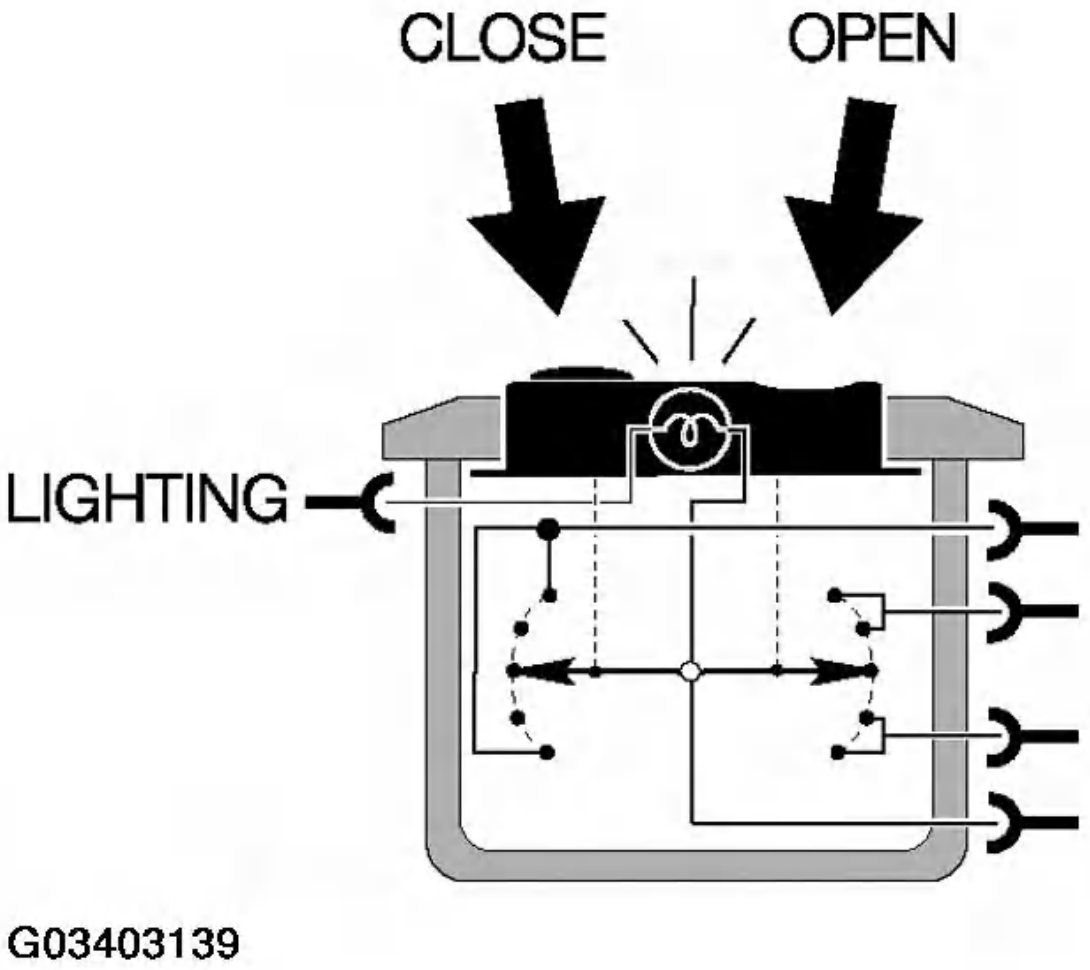


Fig. 28: View Of Power Window Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Relay Module: The RM IV was added for rear window operation in the 4 door and convertible models only.

Similar to the front window relays in the GM, the Relay Module contains the relays for the rear window motors on these vehicles.

The RM IV is located behind the glove box in the electrical carrier next to the GM.

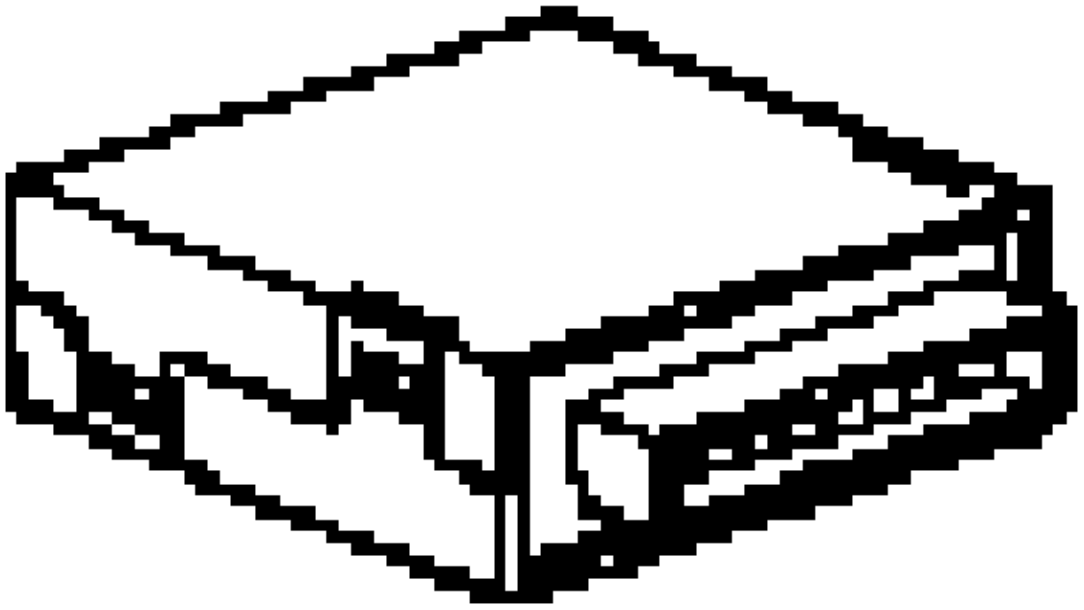


Fig. 29: Identifying Relay Module
Courtesy of BMW OF NORTH AMERICA, INC.

System Components: Inputs - Processing - Outputs

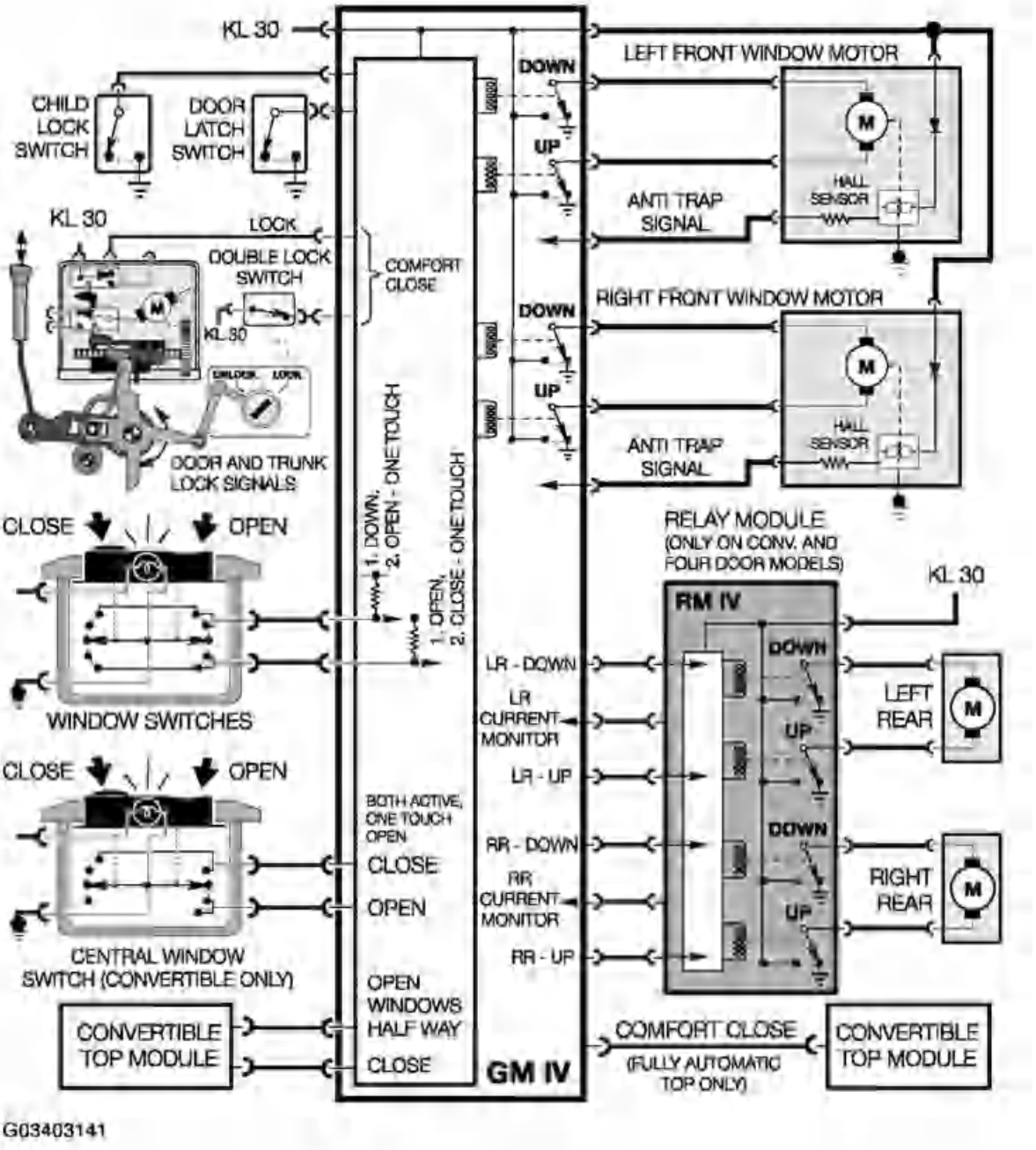


Fig. 30: Identifying Power Window Switch Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Initialization of Window Circuits

Initialization of the window circuits is required for the one-touch and anti-trap features to function. Closing the window and holding the switch for an additional two seconds will initialize the system. However the window drive motor switches off automatically after the motor ceases rotation for approximately 0.3 seconds.

Sunroof

Purpose of the System

When the ignition key is in the accessory or "on" position press the switch to lift (1), close the sunroof (2) or open the sunroof (3).

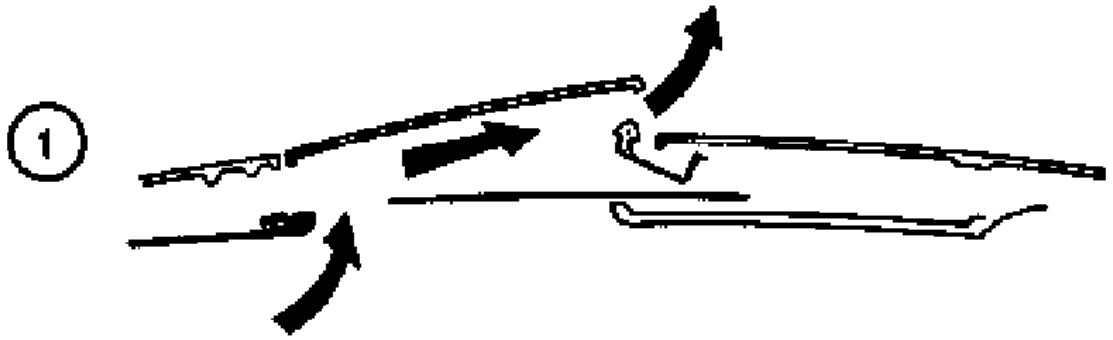


Fig. 31: Identifying Sunroof Operation (1 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

When lifting, the headliner retracts several inches. The sunroof can continue to operate after the ignition has been switched off (up to 16 minutes) as long as one of the front doors has not been opened.

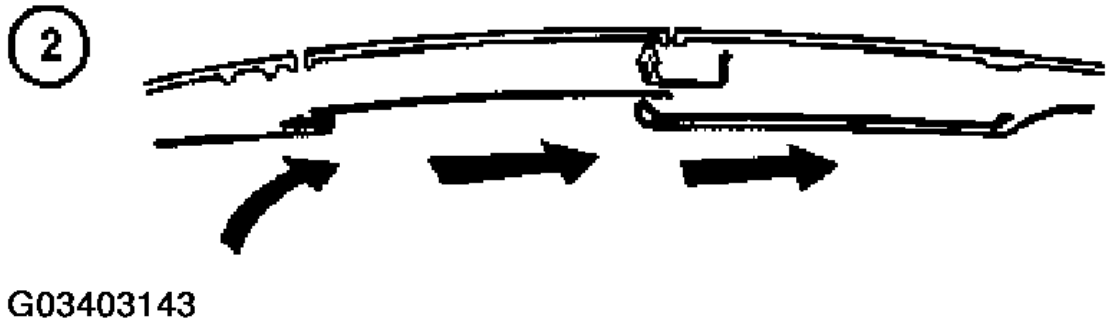


Fig. 32: Identifying Sunroof Operation (2 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

E36 vehicles are equipped with the steel roof while the Z3 Coupe is equipped with the glass (moon) roof. Mechanically, the sunroofs are similar in design.



Fig. 33: Identifying Sunroof Operation (3 Of 3)

Courtesy of BMW OF NORTH AMERICA, INC.

Principle of Operation

The motor incorporates a sunroof module (>96 MY) which receives inputs from the sunroof switch (1) for operation. This sunroof system has the one touch open function.

The sunroof module is linked to the GM for two purposes:

- The comfort closing feature when the key is held in the lock position in one of the door lock cylinders.
- Unloader signal. This signal (30h) informs the sunroof motor module to stop running the sunroof motor when the GM receives a start signal (KL 50).

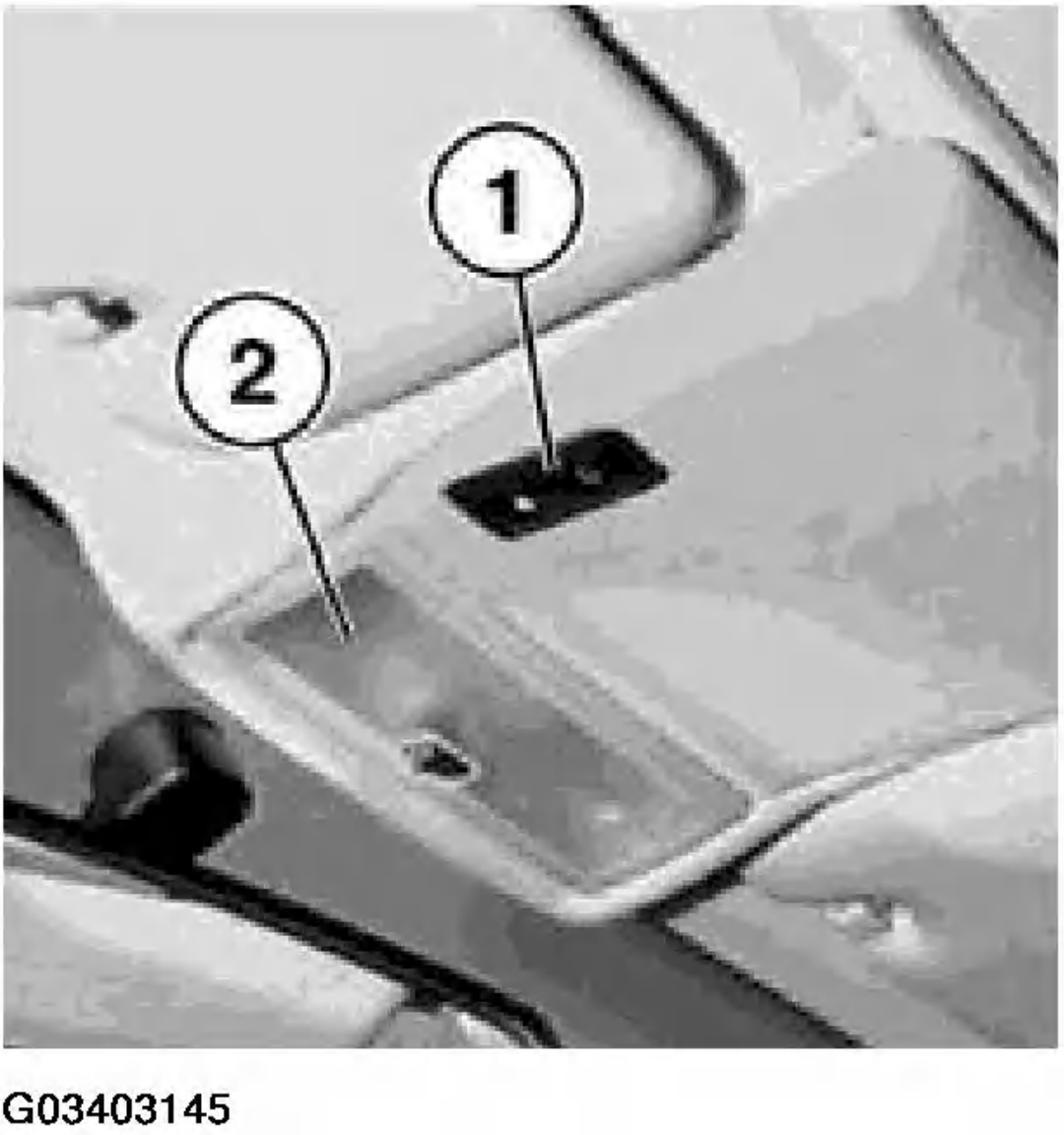


Fig. 34: Identifying Sunroof Switch
Courtesy of BMW OF NORTH AMERICA, INC.

System Components: Inputs - Processing - Outputs

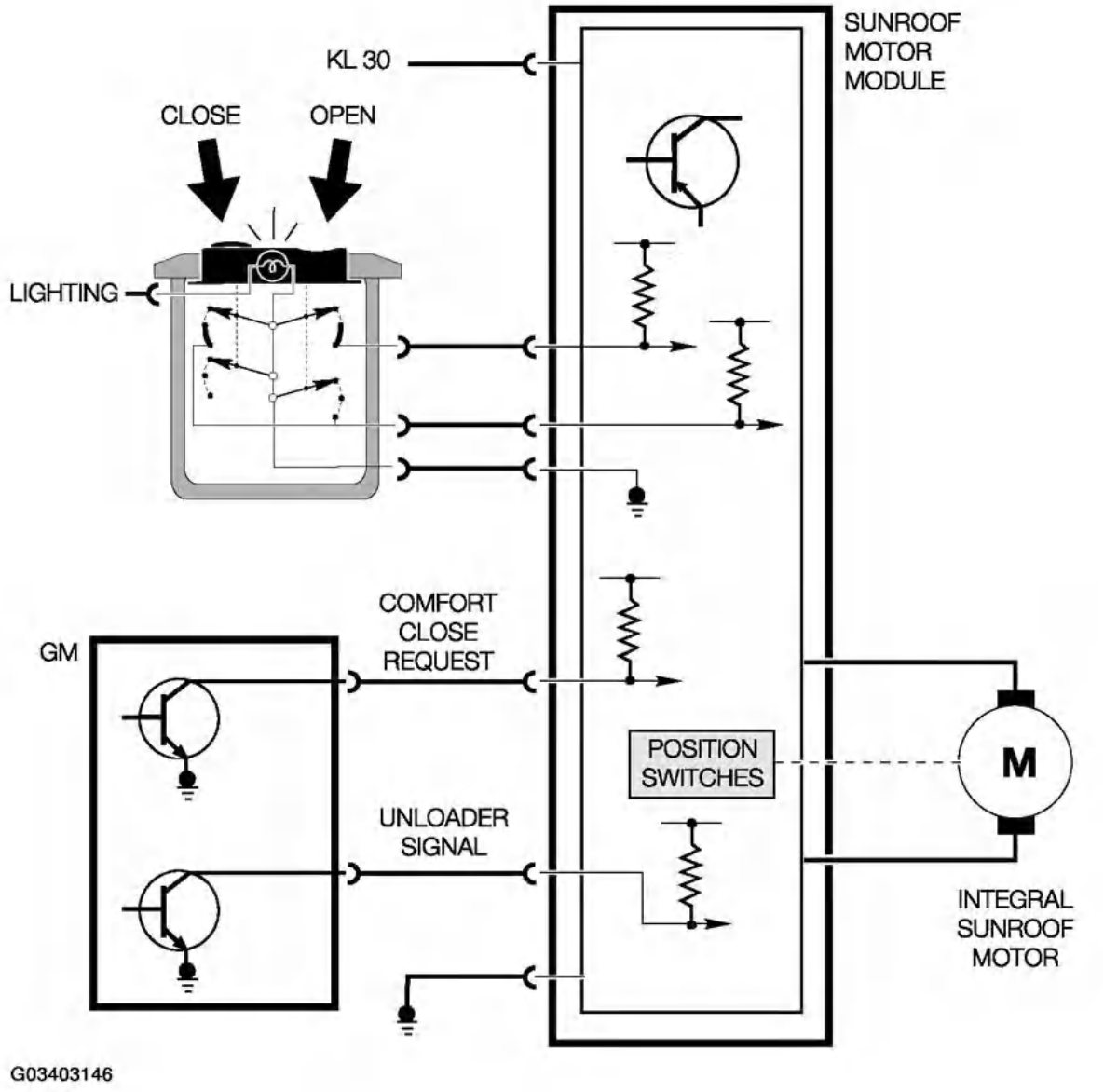


Fig. 35: View Of Sunroof System Components Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

INTERIOR LIGHTING

Purpose of the System

The GM controls the interior lighting automatically with the status change of several monitored inputs.

The lighting can also be manually controlled using the interior light switch (2).

In addition to the various time controls, the interior lights are also subject to the 16 minute shut down of the GM (consumer protection).

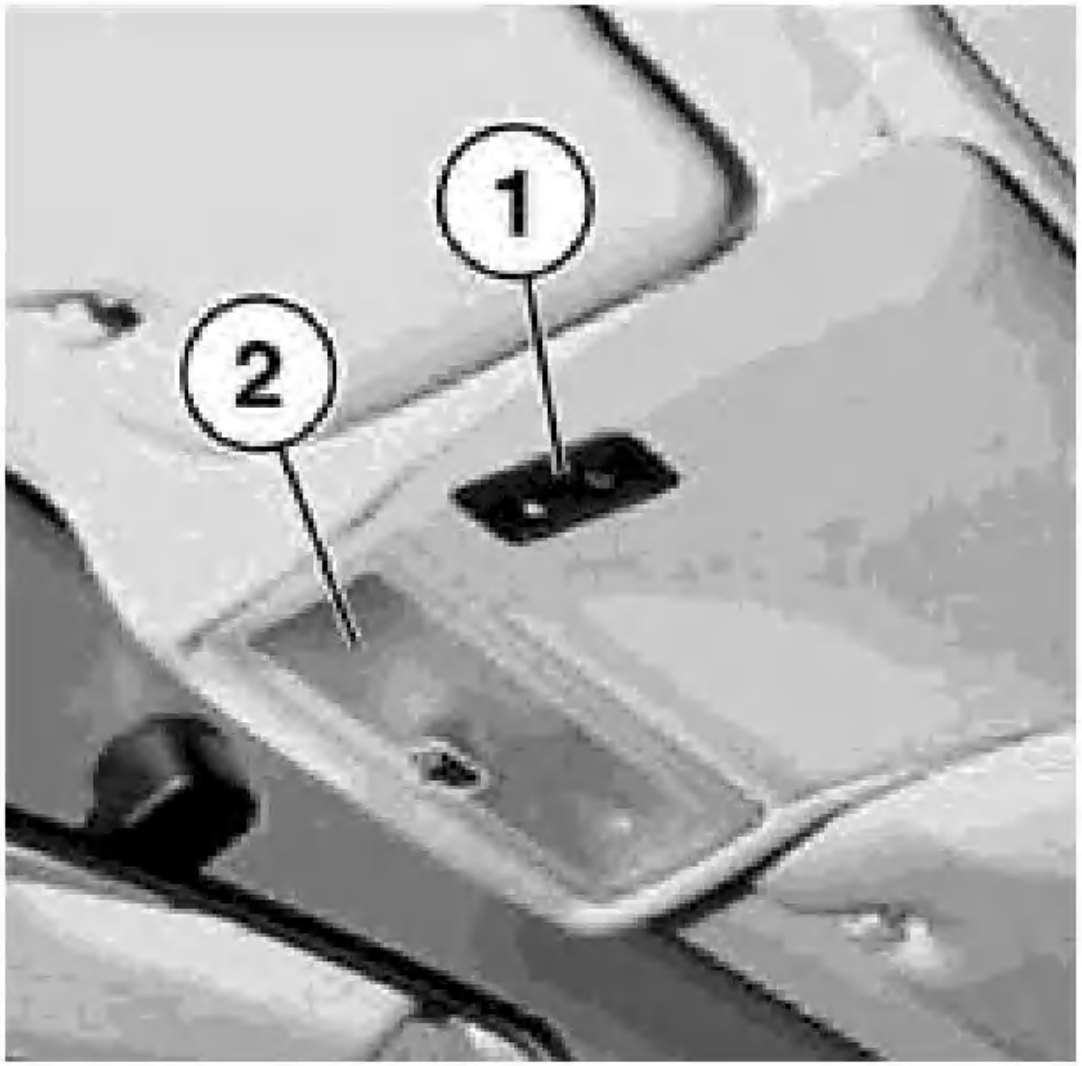


Fig. 36: Identifying Interior Light Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Principle of Operation

The interior light switch is a rocker switch that will activate the interior lights "On or Off" (left/right positions). When the light switch is in the center position (automatic):

- If the interior lights are switched "ON" by the button with the ignition switched ON , the interior lights will remain on until they are switched off by the button.
- If the interior lights are switched "ON" when the ignition is switched OFF , the lights will remain on for 16 minutes (consumer cutout).
- Locking the vehicle from the outside will immediately switch off the interior lights.

The ON/OFF conditions for the interior lights in the automatic mode are as follows:

ON Conditions:

- Door Open.
- Switching off ignition after exterior lights have been switched off.
- Crash Alarm/MRS input.

OFF Conditions:

- All doors closed with ignition on.
- All doors closed with ignition off after 20 seconds.
- 20 seconds after switching off ignition with lights off.
- 8 seconds after switching the ignition off.
- 16 minutes with door(s) open.
- When doors are locked.

System Components: Inputs - Processing - Outputs

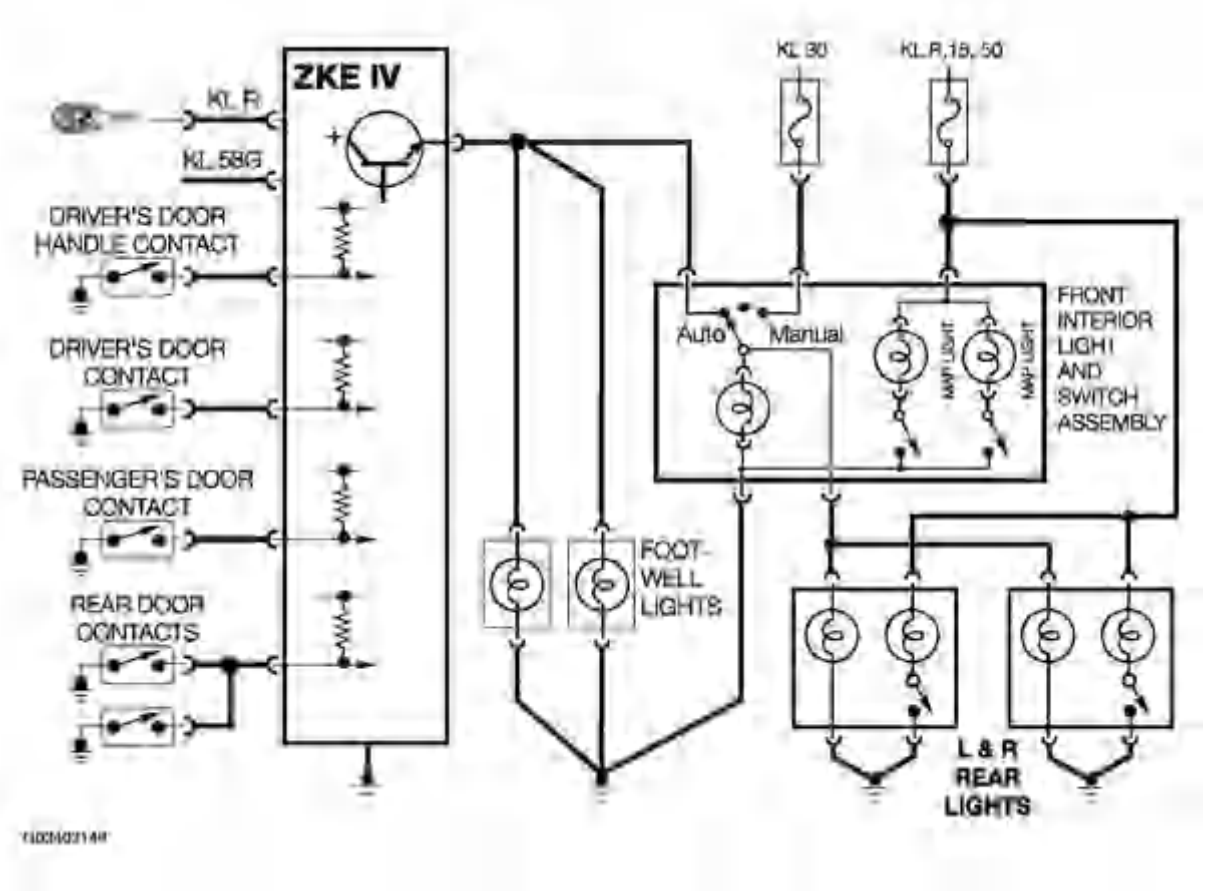


Fig. 37: View Of Front Interior Light Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

- The GM in 3 Series convertibles provide power to the manual circuit of the interior lights.
- Through the production range there are minor changes in the lighting fixtures.

  For example: the additional map light switch on rear seat interior lights on 1997 models. Always refer to the specific appropriate article for the vehicle being serviced.

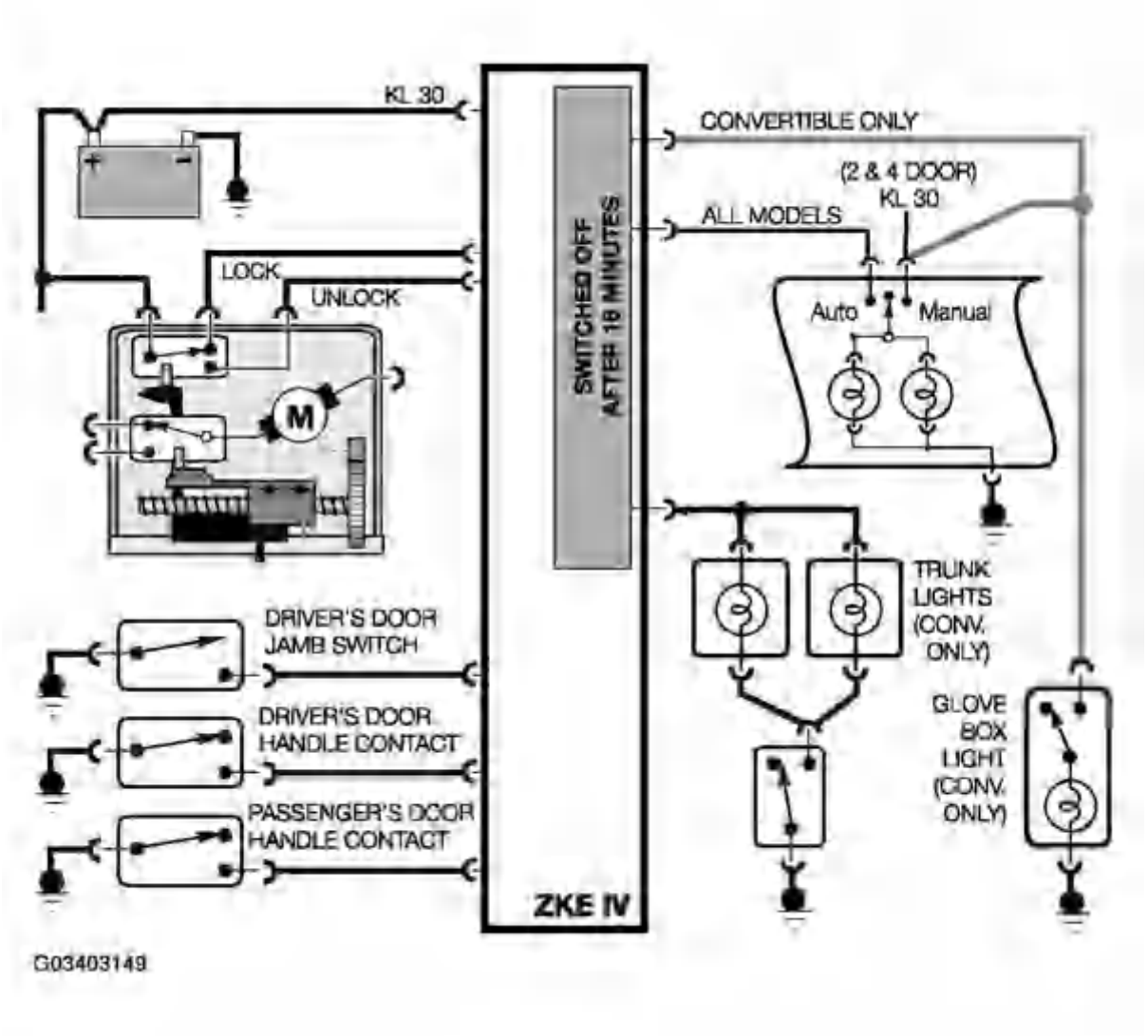


Fig. 38: View Of Interior Lights System Components Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

GENERAL FUNCTIONS

Consumer Cut Off

The Consumer Cut Off function interrupts battery voltage to circuits preventing inadvertent battery drain if one of the consumers were to remain activated. The GM will deactivate the interior lights after 16 minutes if one of the doors is left open. Convertibles also have the following lighting circuits controlled by this feature:

- Glove Box Light.
- Trunk Light.

The circuit will switch back on when any monitored wake up trigger such as the door contacts or the lock/unlock signals become active.

Overload Protection

The Central Locking circuit of the GM is protected against overloads and short circuits by the electronic Overload Protection which is an integral part of the GM.

- Power protection for the door locking circuit is provided by a "time monitored" activation of the door lock actuators by the GM. The door lock actuators are provided power for the duration of time needed to run the actuator to the desired position. The maximum on time for the actuators is 0.7 seconds.

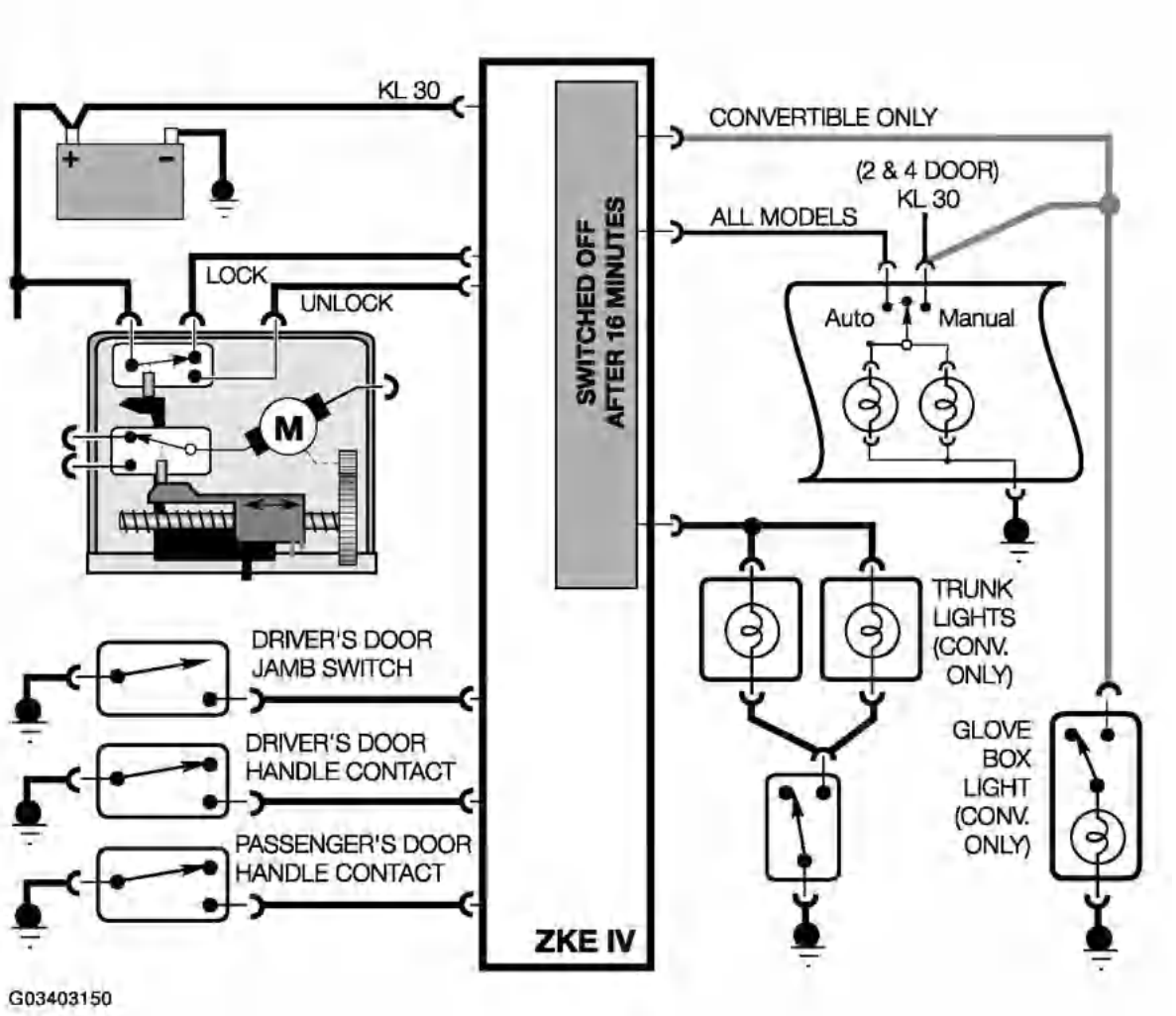


Fig. 39: Identifying Overload Protection Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

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