

ENGINE

Engine Electrical System - Repair - Z4

1200 TROUBLESHOOTING

61 20 ... BATTERY REPLACEMENT INFORMATION

A vehicle battery is constructed for the installation location and the individual power requirements of the particular vehicle. These individual power requirements depend on the motorization and different types of optional equipment. The individually assigned vehicle battery is the ideal compromise between the power requirements of the vehicle electrical system and the weight and service life of the vehicle battery.

Vehicles with the automatic engine start-stop function or particular motorization and optional equipment are equipped with a special vehicle battery (AGM battery), since only this battery type can provide elevated power requirements over the extended service life. Installing a different vehicle battery can cause problems with vehicle electronics, can reduce functions or can cause leakage of battery acid.

In the event of an accident where the airbags are deployed in vehicles with a vehicle battery in the luggage compartment, the electrical connection between the vehicle battery and the trigger is automatically disconnected through pyrotechnics. This prevents a possible short circuit.

Proper operation of all of these safety and convenience functions requires a battery that conforms with specifications and that is properly registered in vehicles with energy management systems (IBS, power module).

Vehicles with energy management systems (IBS, power module): Register battery replacement

The vehicle electrical system is informed about the vehicle battery characteristic data, such as type, size, age and current power capacity. Therefore, only one work scope will be provided that is permitted by the current status of information.

When installing a new vehicle battery, the battery must be registered and thus must also be registered with the vehicle electrical system.

Diagnosis system:

Register battery replacement

- Service functions
- Body
- Voltage supply
- Register battery replacement
- Test plan

When retrofitting, a more powerful battery may be used. Standard batteries may always be replaced by AGM batteries with the same specifications.

When installing a battery of a different size or a different battery type, this change in vehicle data must be programmed into the vehicle data in accordance with specifications.

Programming system:

- Battery retrofitting

61 13 ... BUTT CONNECTOR FOR REPAIRING A PLUG CONNECTION

- IMPORTANT:**
1. Identify cause of damage (e.g. sharp-edged body parts, faulty electrical loads, jammed mechanisms, corrosion caused by ingress of water, etc.).
 2. Read out fault memory
 3. Eliminate cause of damage.
 4. Disconnect battery negative terminal
 5. Make sure that no safety-related system according to circuit diagram (e.g. antilock braking system, active rear-axe kinematics, airbags, etc.) are influenced. Otherwise replace faulty wiring harness or use repair cable (sourcing reference: BMW Parts Service)
 6. Carry out function test and read out fault memories again
 7. Eliminate new faults if applicable and clear fault memories

NOTE: The repair range IV for vehicle electrical system contained the required special tools and individual parts for retrofitting and repair work with the aid of fan connectors.
The case can no longer be ordered.

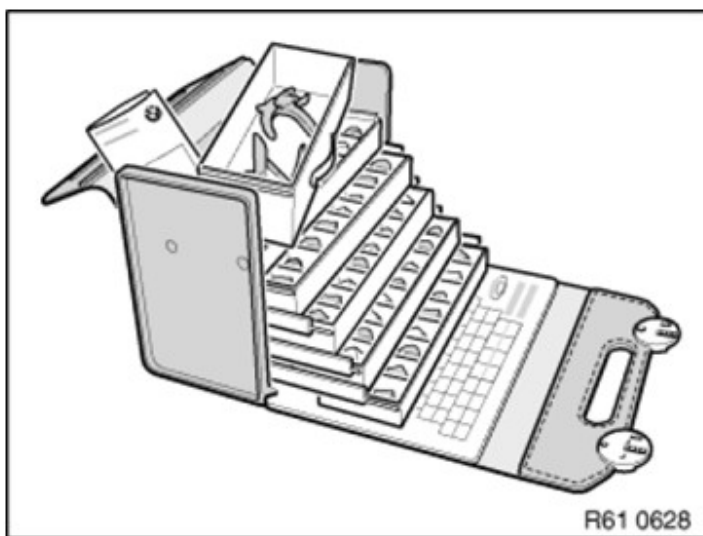
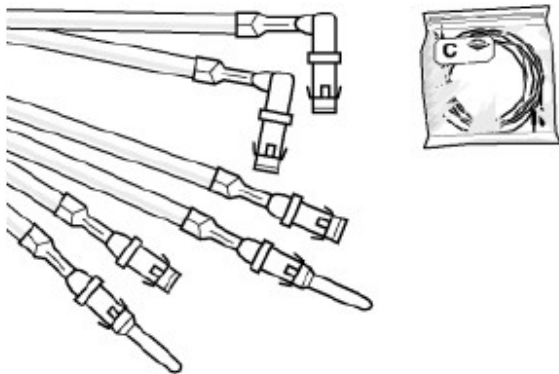


Fig. 1: Retrofitting Tool Box

Courtesy of BMW OF NORTH AMERICA, INC.

Choose repair kit.

Example: Repair kit, circular plug system D 2.5.

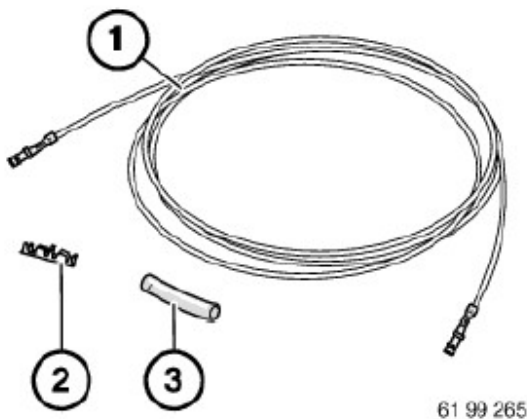


R61 99 257

Fig. 2: Identifying Circular Plug System D 2.5
Courtesy of BMW OF NORTH AMERICA, INC.

Remove following parts:

1. Pre-packaged end of cable with requisite wire cross-section
2. Crimp connector for selected wire cross-section
3. Shrink-fit hose



61 99 265

Fig. 3: Identifying Cable With Requisite Wire Cross-Section, Crimp Connector And Shrink-Fit Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Open secondary lock on housing.

Mark damaged contact (4) with socket number of housing and press it out of housing using appropriate special tool contained in special tool kit 61 0 300).

See repair instructions

INSTRUCTIONS FOR OPENING CONTACTS AND LOCKS of different plug contact systems.

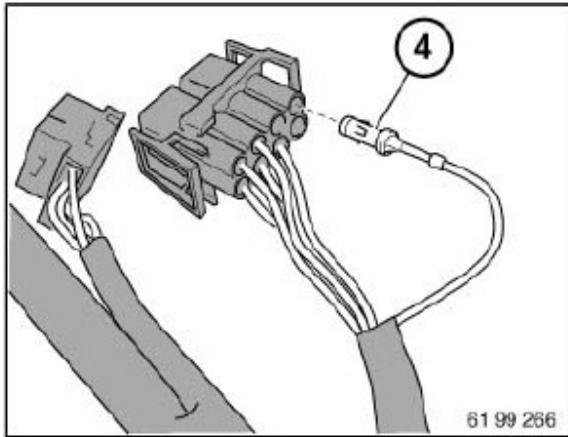


Fig. 4: Identifying Damaged Cable With Socket Number
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT:

- Check maximum length of repair cable
- If more than one wire is to be repaired, the individual interfaces must be offset so that the wiring harness is not too thick at the repaired point.

Adhere to following procedure:

- Cut off wire with faulty contact at point which is easily accessible
- Strip insulation from end of wire at wiring harness end
- Cut preassembled wire end to length and strip insulation

Refer also to repair instruction:

CUTTING TO LENGTH AND STRIPPING INSULATION FROM CABLES

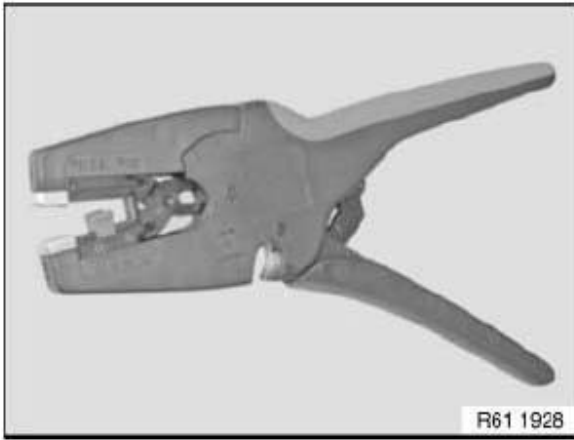


Fig. 5: Identifying Crimp Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Crimp butt connector on preassembled wire end.

Special tools:

- 61 4 328 (0.35 - 2.5 mm²)
- 61 0 240 (4.0 - 6.0 mm²)

See repair instructions

CRIMPING ON STOP PARTS



61 99 270

Fig. 6: Identifying Crimp Butt Connector On Preassembled Wire End
Courtesy of BMW OF NORTH AMERICA, INC.

Push shrink-fit hose (8) onto free wire end.

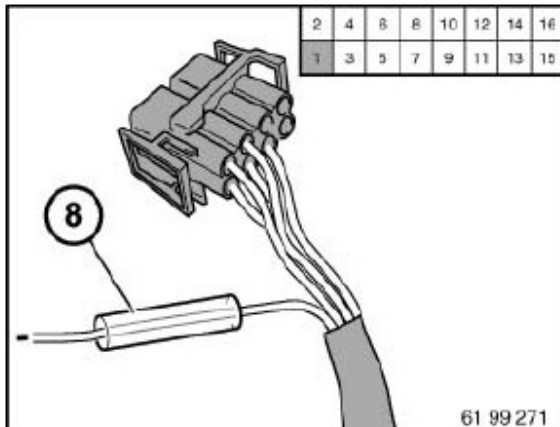


Fig. 7: Identifying Shrink-Fit Hose On Free Wire End
Courtesy of BMW OF NORTH AMERICA, INC.

Crimp unused wire end to butt connector.

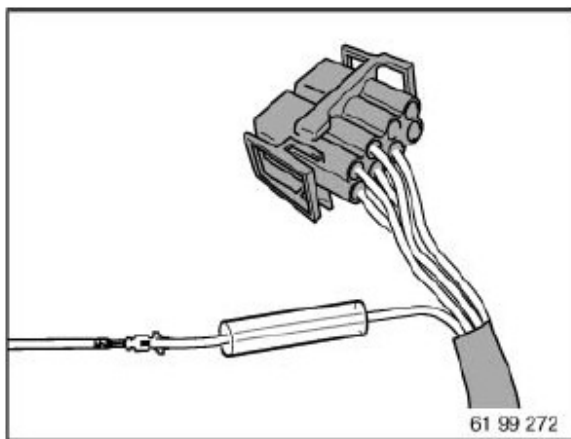


Fig. 8: Crimping Of Unused Wire End To Butt Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Pull shrink-on sleeve over butt connector.

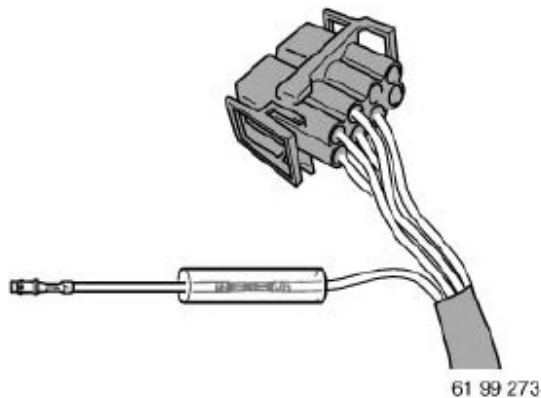


Fig. 9: Identifying Shrink-On Sleeve And Butt Connector
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not burn shrink-on sleeve.

With hot air blower, shrink the shrink-on sleeve on both sides (9) of shrink-fit hose until glue emerges uniformly all round.

Insert contact in housing.

Close secondary lock on housing.

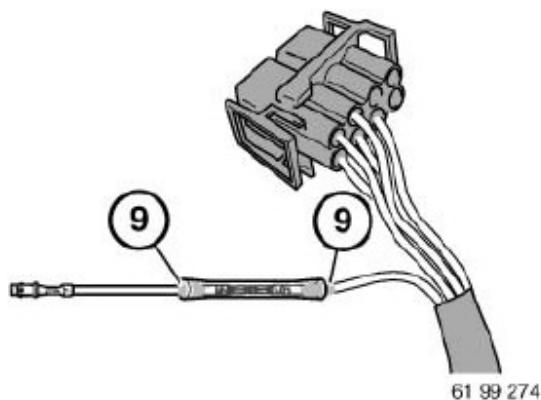


Fig. 10: Identifying Shrink On Shrink-On Sleeve Ends
 Courtesy of BMW OF NORTH AMERICA, INC.

12 00 CONTENTS OF ENGINE ELECTRICAL SYSTEM GENERAL

General Information

- **WORKING ON IGNITION SYSTEM**
- **REMOVING AND INSTALLING ELECTRONIC CONTROL UNITS**
- Welding work (overload protection of control units)

- **Disconnecting and connecting battery**
- Disconnecting and connecting test equipment
- Component inspection:
- **EXTERNAL JUMP-STARTING AID**
- Compression testing

61 00 ... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY

Observe **SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY** .

Before disconnecting battery

Turn off the ignition and other electrical loads/consumers to prevent sparking when reconnecting.

NOTE: If the ignition is not turned off when the battery is disconnected, fault memories may be set in some control units.

IMPORTANT:

- There is a danger of mixing up battery leads: If the battery positive and negative leads are the same color and you are in doubt, follow the polarity to the battery, then mark and cover the leads.
- The on-board computer and clock may lose your data.

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.

- Disconnect terminal of **BATTERY NEGATIVE LEAD** from vehicle battery. Cover battery negative terminal(s) and secure.
- When work is carried out on the electrical system, faults may be caused in the fault memories of some control units when the battery is connected.
- When installing battery terminal: Tightening torque **61 21 1AZ** .

After connecting battery

IMPORTANT: The scope of application of some systems may be restricted after a power supply interruption.
Likewise, individual settings may be lost.
Settings or activations must be carried out, depending on the equipment specification.

For example:

- If necessary, carry out adjustment of active steering
- If necessary, activate slide/tilt sunroof
- If necessary, activate POWER WINDOWS

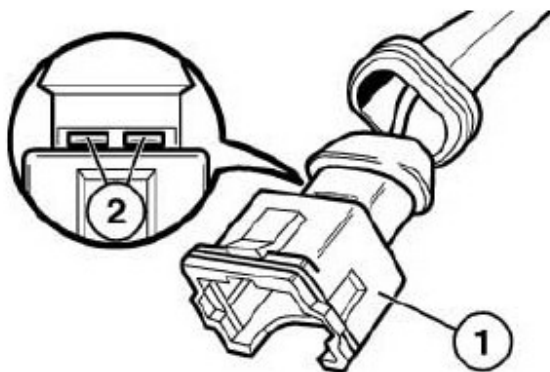
61 13 ... INSTRUCTIONS FOR OPENING CONTACTS AND LOCKS OF DIFFERENT PLUG CONTACT SYSTEMS

SPECIAL TOOL DESCRIPTION

Abbreviations of contacts and what they mean:	
ELA	Strand seal
D 1.5/2.5/3.5	Round contacts with 1.5 mm, 2.5 mm or 3.5 mm diameter
MDK	Miniature double flat spring contact
JPT	Junior Power timer
DFK	Double flat spring contacts
Elo	Electronic contacts
Elo Power	Electronic contacts for heavy load
MQS	Micro Quadlock system
MPQ	Micro Power Quadlock
MLK	Mini laminated contact
SLK	Sensor laminated contact
LSK	Load current contact
MLK	Mini laminated contact
Mcon	Multi contact

**IMPORTANT: The contacts can be changed on ultrasonically welded plugs (1).
Ultrasonically welded plugs (1) must be replaced completely.**

Ultrasonic-welded connectors (1) can be identified by the welds (2) on their longitudinal side.



36 61 126

Fig. 11: Identifying Ultrasonic-Welded Connectors And Weld Area
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 pressing-off tool 61 1 150 will be replaced on 09/2005 by 61 0 300 (BMW) and 61 0 400 (MINI)
- Release and pressing-off tool 61 1 100 (engine)

12 00 ... INSTRUCTIONS FOR WORKING ON THE IGNITION SYSTEM

CAUTION: Always switch off ignition before working on ignition system.
Use only test leads which have been approved and belong to these testing instruments (e.g. DIS Tester).
Comply with operating instructions of the respective testing instrument used.
Comply with the country-specific safety regulations.
Never touch components under current with engine running!
Comply with instructions of DIS tester.
Do not connect any suppression capacitors or inspection lamps to terminal 1 on the ignition coil.
Terminal 1 of ignition coil must not be connected to ground or battery positive lead.
If an alarm system is subsequently installed, lead of terminal 1 must not be used for start prevention.
When working on ignition system, always disconnect supply leads to ignition coils.
High tension! - High tension!

IMPORTANT: Hazardous voltages occur at:

- Ignition lead
- spark-plug connectors
- spark plugs
- Ignition coil (high voltage at terminal 4 is approx. 40 kV)
- Lead of terminal 1 from ignition coil to DME control unit (high voltage approx. 350 V)

12 13 NOTES ON CHECKING IGNITION SYSTEM

Troubleshooting

- Fault in fuel injection system
- Spark plug faults
- Ignition coil faults

- Further fault patterns with evaluation

Oscillograms

- Normal oscillogram
- Oscillograms of ignition coils from different manufacturers

Check

- Secondary signal for stationary ignition distribution

61 00 ... NOTES ON HANDLING WIRING HARNESSES AND CABLES

The following applies in general

To avoid damage, observe the following instructions:

- Avoid compressive and tensile loads
- Make sure cables are laid without kinks or abrasions
- Ensure non-contacting routing at sharp-edged body components; use edge protection if necessary
- Secure additionally laid cables/lines with cable straps

The following additionally applies

Shielded lines

Contact points in the shield can cause problems with regard to noise radiation and interference immunity. Consequently, distinctions have to be drawn between the following types:

Coaxial line

- Shielded RTK031 coaxial lines may only be repaired with special crimping tools .

CVBS lines

- CVBS lines may not be repaired.
- CVBS lines must be replaced in their entirety.

HSD lines

- HSD lines may not be repaired.
- HSD lines must be replaced in their entirety.

Optical fibre cable:

NOTE: **Optical fibre cables are colored differently as follows:**

- **Green = MOST (Media Oriented Systems Transport) optical fibre**
- **Yellow = ISIS (Intelligent Safety Integration System) optical fibre**
- **Orange = repair optical fibre cables**

IMPORTANT:

- **Optical fibre cables are permitted to show only one separation point (bridge), replace optical fibre cables if necessary**
- **Smallest permissible bending radius is 25 mm**
- **Avoid influence of heat > or = 85 °**

Treating cables and optical fibre cables

FlexRay:

It is possible to repair the FlexRay. In the event of damage, the cables can be joined with conventional butt connectors.

NOTE:

- **The line is a twisted cable. If possible, maintain twist in line after repair.**

Airbag lines:

Repairing airbag cables

Ribbon cables:

Repairing ribbon cables Z

61 00 ... NOTES ON HANDLING WIRING HARNESSES AND CABLES

The following applies in general

To avoid damage, observe the following instructions:

- Avoid compressive and tensile loads
- To ensure professional repairs, perform repair work only with BMW-approved or recommended special tools and spare parts
- Make sure cables are laid without kinks or abrasions
- Ensure non-contacting routing at sharp-edged body parts; use edge protection if necessary
- Secure additionally laid cables/leads with cable ties

The following additionally applies

Shielded lines (coaxial lines):

IMPORTANT: Shielded lines may not be repaired!

- This may lead to indifferences in noise radiation and interference immunity at contact points in the shield
- To satisfy the requirements of the type approval, it is essential to replace shielded cables completely

Fibre-optic cable:

NOTE: Fibre-optic cables are colored differently as follows:

- Green = MOST (M edia O riented S ystems T ransport) optical fibre
- Yellow = ISIS (I ntelligent S afety I ntegration S ystem) optical fibre
- Orange=repair fibre-optic cables

IMPORTANT:

- Optical fibres may only reveal one separation point (bridge); renew optical fibre if necessary
- Smallest permissible bending radius is 25 mm
- Avoid effects of heat > or = 85 °

Treating cables and fibre-optic cables See 6113... CUTTING OFF, STRIPPING INSULATION AND CUTTING OPTICAL FIBRES TO LENGTH or 6113... CRIMPING OPTICAL FIBRES

FlexRay:

It is possible to repair the FlexRay. In the event of damage, the cables can be joined with conventional BUTT CONNECTORS AND HEAT-SHRINK HOSES .

NOTE:

- FlexRay lines may only reveal one separation point (bride); renew complete line if necessary
- The cable is a twisted cable. If possible, maintain twisted cable after repair

Airbag lines:

REPAIRING AIRBAG CABLES

12 00 ... NOTES/INFORMATION ON REMOVING AND INSTALLING CONTROL UNITS

IMPORTANT:

- Disconnecting the vehicle battery will cancel the fault memories of control units. Consequently, before disconnecting the car's battery, always interrogate the fault memories. Investigate stored faults and, once any

faults have been remedied, cancel the fault memory.

- Control unit plugs should only ever be connected and disconnected while the ignition is turned off.
- The removal and installation of components, relays, fuses etc. can cause faults to be stored in fault memories capable of self diagnosis. Always interrogate the fault memories after completing work on the electrical system.
- Investigate stored faults and, once any faults have been remedied, cancel the fault memory.
- If necessary, initialize power window units

When replacing the DME/DDE control unit, observe the following:

- In each case read out the hardware/software status of the relevant control unit using the BMW diagnosis system.

Comply with the instructions of the DIS diagnosis system on the steps pertaining to coding and programming.

On vehicles with electronic vehicle immobilization, comply with the instructions of the BMW diagnosis system.

- Each control unit is programmed with certain basic values, which serve as mean values. The control unit receives different input values, depending on engine condition, which are compared with the stored values. The adaptive system compares the input values with the stored map values. The control commands are routed to the relevant actuators.
- If the DME control unit is without current for a long time (more than one hour), its adaptive system loses the stored values. When a cleared control unit is restarted or a new control unit is installed, the adaptive system must read in and store the input values of the associated engine as new basic values itself.
- This procedure could lead to erratic idling and disturbed overrunning of the engine after starting. Depending on the engine it could require some time before all values are adapted to the engine condition.
- Therefore observe the following procedure before replacing or reinstalling a DME/DDE control unit:
 1. If possible before exchanging control unit, run engine up to operating temperature.
 2. Exchange control units and run the vehicle at alternating engine speeds.

Do not start the engine with help of starting sprays.

Preparation

Conform with the following when starting the engine with a jump starting cable.

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

IMPORTANT: Never touch electrically live ignition system components: high voltage - danger of injury!

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

Operation

It is essential to conform to the procedures so as to avoid injury to persons or damage to parts.

- Automatic transmission: select drive position "P", apply parking brake.
- Manual transmission: move gear lever to neutral position, apply parking brake.
- Ensure that the jump leads cannot get caught in rotating parts, e.g. fan.
- First connect both positive poles of the batteries with one jump starting cable (red).
- Use the battery positive terminal in the engine compartment for vehicles with the battery in the luggage compartment.
- Then use the second jump starting cable (black) to connect the negative post of the current-supplying battery with the earth/ground point (not the negative pole or the body) of the vehicle to be started.

IMPORTANT: Do not connect the second jump starting cable (black) with the negative pole of the battery in the vehicle to be started. Produced gas could be ignited by sparks.

Risk of explosion!

After the engine of the vehicle to be started has fired, first disconnect the jump starting cable between the negative pole and the earth/ground point. Then remove the starting cable from the positive poles.

00 SAFETY INFORMATION FOR WORKING ON VEHICLES WITH AUTOMATIC ENGINE START-STOP FUNCTION (MSA)

WARNING: If the engine hood/bonnet contact is pulled upwards (workshop mode),

**the information "switch closed" is output. The automatic engine start-stop function is active.
An automatic engine start is possible.**

Observe safety precautions when working on MSA vehicles

Before carrying out practical work on the engine, always ensure that the MSA functionality is deactivated so as to prevent automatic engine starting while work is being carried out in the engine compartment.

MSA function is deactivated by

- Deactivate MSA by means of button (1) in passenger compartment
- Open seat belt buckle and driver's door

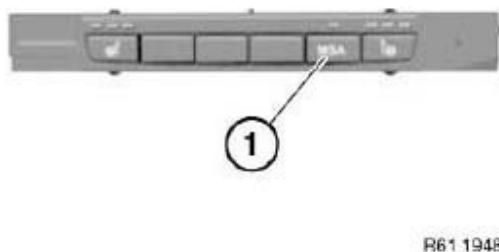


Fig. 12: Identifying Automatic Engine Start/Stop Button (MSA)
Courtesy of BMW OF NORTH AMERICA, INC.

- Open engine bonnet/hood and ensure that engine hood/bonnet contact is not in workshop mode
- Workshop mode

A = 10 mm

- Basic setting (engine hood/bonnet open)

B = 7 mm

To make sure that the engine hood/bonnet contact is at the basic setting, if necessary press the hood/bonnet contact up to the limit position before starting work and slowly release.

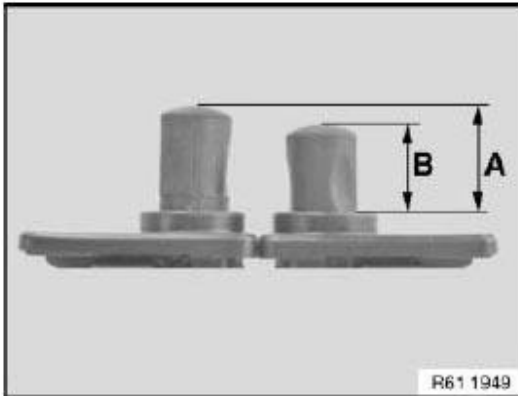


Fig. 13: Identifying Basic Setting For Engine Hood/Bonnet Basic
 Courtesy of BMW OF NORTH AMERICA, INC.

When working with diagnosis tools

- Observe instructions in diagnosis tool

1212 IGNITION WIRES, SPARK PLUGS

12 12 011 REPLACING ALL SPARK PLUGS (N52K)

Necessary preliminary work:

- Switch off ignition.
- Remove **IGNITION COILS** .

IMPORTANT: Wear safety goggles.
Oil and dirt particles may get into your eyes!

Clean spark connector slot with compressed air.

Unscrew spark plugs with special tool 12 1 171 and an extension with a joint.

Installation note:

First, hand-tighten the spark plugs with special tool 12 1 171 and with an extension with a joint into the engine.

Then tighten the spark plugs using a torque wrench, special tool 12 1 171 and an extension with a joint.

Observe tightening torque.

Tightening torque **12 12 2AZ** .

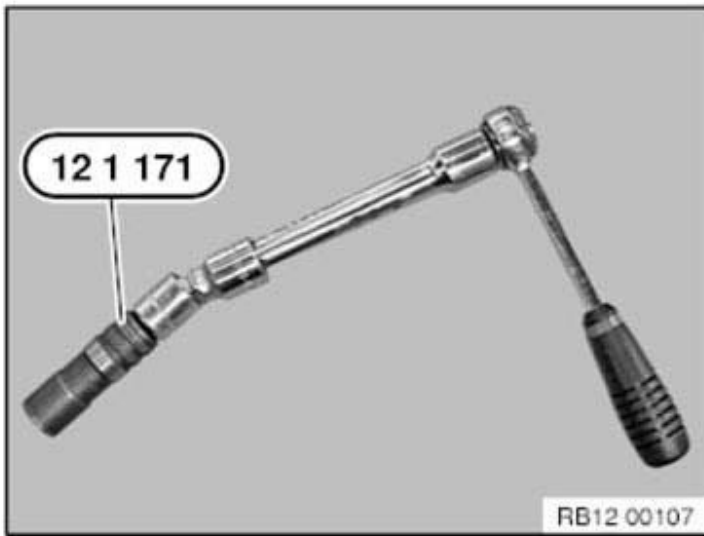


Fig. 14: Removing Spark Plug Using Special Tool (12 1 171)
 Courtesy of BMW OF NORTH AMERICA, INC.

1213 IGNITION COIL

12 13 009 CHECKING ROD-TYPE IGNITION COILS (M54, M56, N40, N42, N43, N45, N46, N52, N62, N62TU, N73)

Necessary preliminary tasks:

- Read out fault memory in DME (Digital Engine Electronics)
- N52: Remove sound absorption hood

Unlock plug fastener (1) of ignition coil.

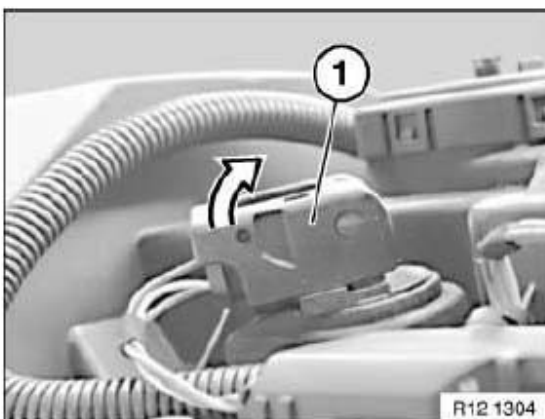


Fig. 15: Removing Ignition Coil Plug Fastener
 Courtesy of BMW OF NORTH AMERICA, INC.

Detach plug (1) in direction of arrow.

Pull out ignition coil (2) towards top.

NOTE: Procedure applies to all rod-type ignition coils.

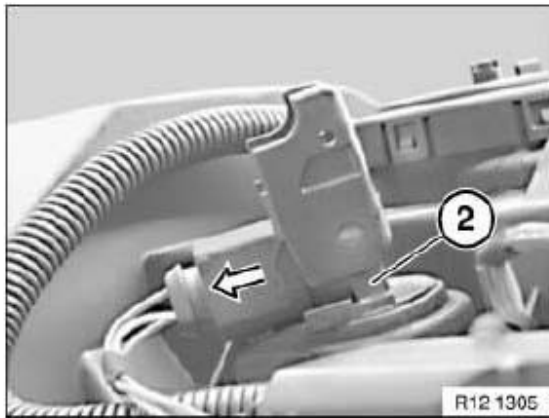


Fig. 16: Pulling Out Ignition Coil
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool 12 7 050 .

Installation:

Special tool 12 7 050 is attached between spark plug and rod-type ignition coil.

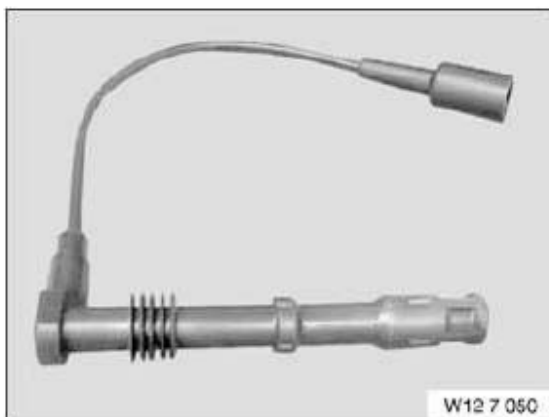


Fig. 17: Identifying Special Tool (12 7 050) Between Spark Plug And Rod-Type Ignition Coil
Courtesy of BMW OF NORTH AMERICA, INC.

Secondary measurement

Connect KV clip-on probe (1) of DIS Tester to special tool 12 7 050 .

Procedure on DIS Tester:

- Select <Measurement>.
- Select <Preset measurement>.
- Select <Secondary ignition signal>.
- Connect <TD cable to diagnostic head>.
- Select <static ignition distribution>.
- Select <Number of cylinders>.

For subsequent procedure, follow DIS instructions.

NOTE: Illustration shows: KV clip-on probe (1) US version.

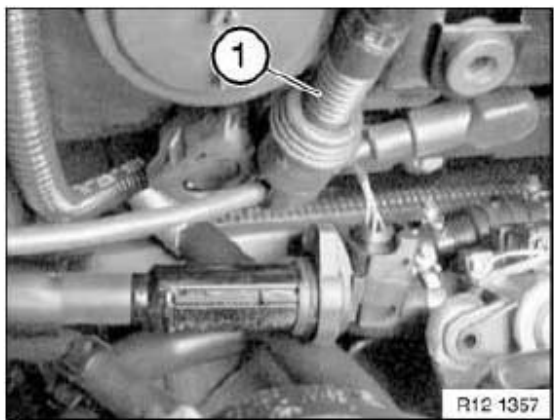


Fig. 18: Identifying KV Clip-On DIS Tester Probe
Courtesy of BMW OF NORTH AMERICA, INC.

Primary measurement

Connect 26-pin pin box with special tool 12 1 301 to connector (1) DME module 5.

Procedure on DIS Tester:

- Select <Measurement>.
- Select <Preset measurement>.
- Select <Ignition signal term.1>.

For subsequent procedure, follow DIS instructions.

NOTE: Pin assignment acc. to connection scheme.
Illustration shows N42.

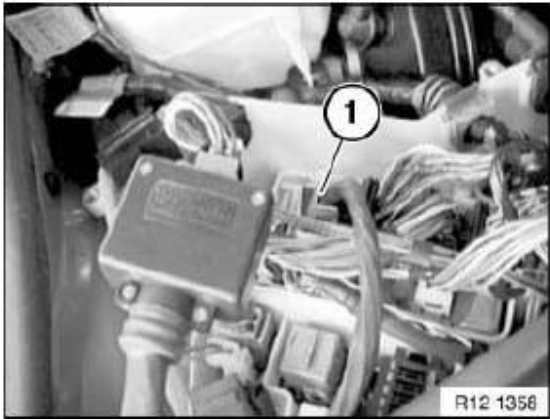


Fig. 19: Connecting 26-Pin Pin Box To Connector DME Module 5 Using Special Tool (12 1 301)
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Ignition signal is a multiple spark ignition.

Illustration of multiple spark ignition

1. Start of ignition peak.
2. Level of ignition voltage.
3. Level of sparking voltage.
4. Spark duration.
5. Sparking voltage curve.
6. Start of decay process.
7. Decay process.

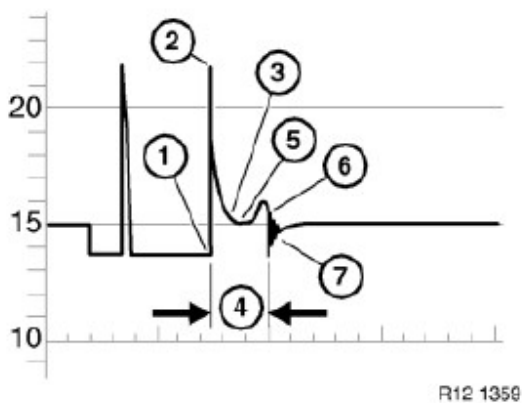


Fig. 20: Multiple Spark Ignition Illustration
 Courtesy of BMW OF NORTH AMERICA, INC.

M54/M56/N40/N42/N45/N46/N62/N73:

The following ignition oscillogram applies to engines with multiple spark ignition from a production date of April 2001:

Depending on **engine temperature** (approx. -20° to 100°) and **engine speed** (< 2000 RPM.), some ignition voltage peaks (approx. 1-5 ignition peaks) can occur before the typical ignition voltage characteristic.

The additional ignition peaks play **no** role in diagnosis.

The **last** ignition peak (1) on the oscillogram is decisive.

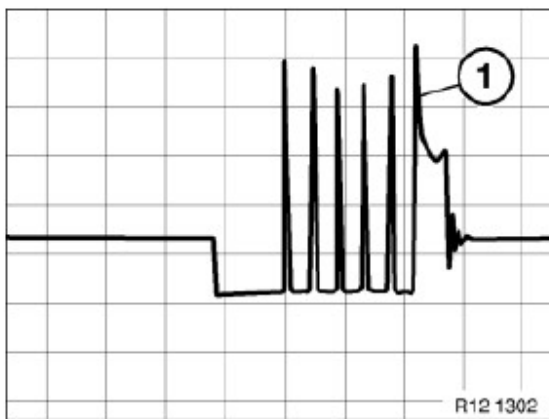


Fig. 21: Identifying Ignition Peaks Graph

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The display of the ignition voltage peak is approx. 20-25 % lower than the real value.
It is not the height of the ignition voltage peaks but rather the uniformity of all the cylinders that is important.
Differences of 3000 to 4000 volts are permitted.

12 13 NOTES ON CHECKING IGNITION SYSTEM

Troubleshooting

- Fault in fuel injection system
- Spark plug faults
- Ignition coil faults
- Further fault patterns with evaluation

Oscillograms

- Normal oscillogram
- Oscillograms of ignition coils from different manufacturers

Check

- Secondary signal for stationary ignition distribution

12 13 511 REPLACING IGNITION COILS (N52K)

Necessary preliminary tasks:

- Read out fault memory of DME control unit.
- Check stored fault messages
- Switch off ignition
- Remove **ACOUSTIC COVER**
- Remove right **TENSION STRUT**

Unlock plug fastener of ignition coil (1) and disconnect plug.

Pull ignition coil (1) up and out.

This procedure is applicable to all ignition coils.

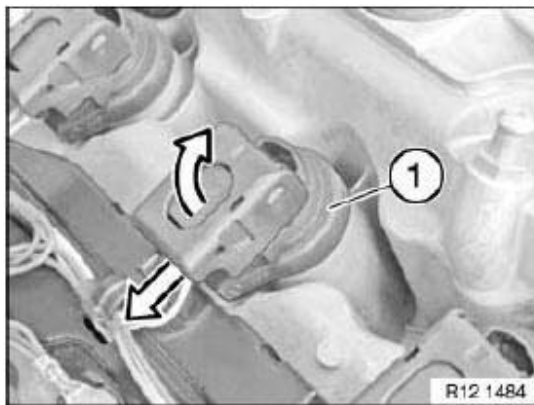


Fig. 22: Pulling Ignition Coil Up And Out
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check that rubber seal of ignition coil (1) is correctly seated.

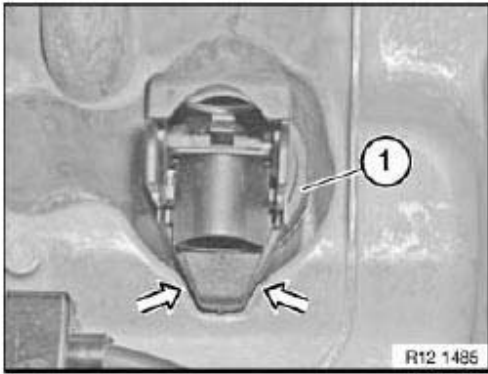


Fig. 23: Checking Ignition Coil Rubber Seal
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Push plug (1) with plug fastener (2) open onto ignition coil.

Carefully close plug fastener (2) in direction of arrow.

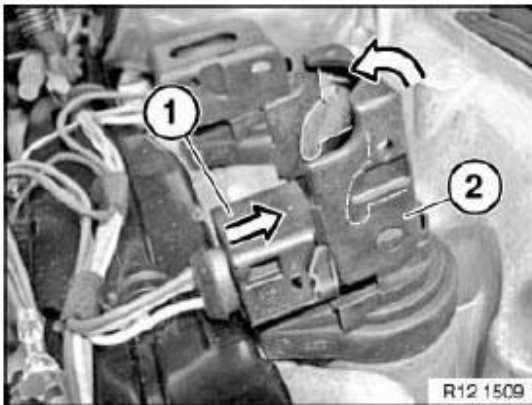


Fig. 24: Pushing Plug With Plug Retainer
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The plug fastener must snap into place without great effort.



Fig. 25: Identifying Plug Retainer

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Now clear the fault memory.**

1214 ELECTRONIC SWITCHING OR CONTROL UNITS

12 14 700 CODING CONTROL MODULE (DME/DDE)

Switch on ignition.

Connect MoDiC or DIS/GT1 Tester.

Select "Coding" program.

For subsequent procedure, follow instructions in MoDiC or DIS/GT1 Tester.

Carry out adjustment of following control units:

- EWS (electronic immobilizer)
- DME (Digital Motor Electronics) or
- DDE (Digital Diesel Electronics)

12 14 705 PROGRAMMING CONTROL UNIT (DME/DDE)

Switch on ignition.

Connect MoDiC or DIS/GT1 Tester.

Select "Programming".

For subsequent procedure, follow instructions in MoDiC or DIS/GT1 Tester.

Carry out adjustment of following control units:

- EWS (electronic immobilizer)
- DME (Digital Motor Electronics) or
- DDE (Digital Diesel Electronics)

12 14 600 REMOVING/REPLACING KNOCK SENSORS (N52K)

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are **released**.

Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:

Aluminum screws/bolts are **not magnetic**.

Jointing torque and angle of rotation must be observed without fail (**risk of damage**).

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- Remove **INTAKE AIR MANIFOLD**

Unlock plug (1) and remove.

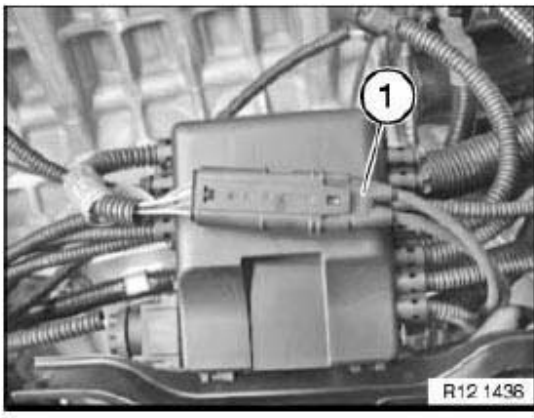


Fig. 26: Identifying Plug

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws on both knock sensors (1) and remove knock sensors (1).

Installation:

Replace aluminum screws.

Tightening torque 13 62 3AZ .

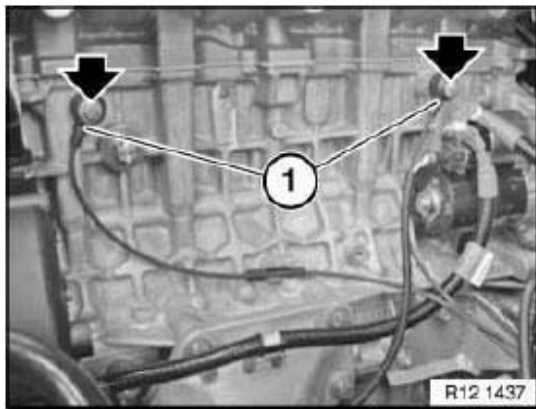


Fig. 27: Locating Knock Sensors

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean support face of knock sensors on engine block.

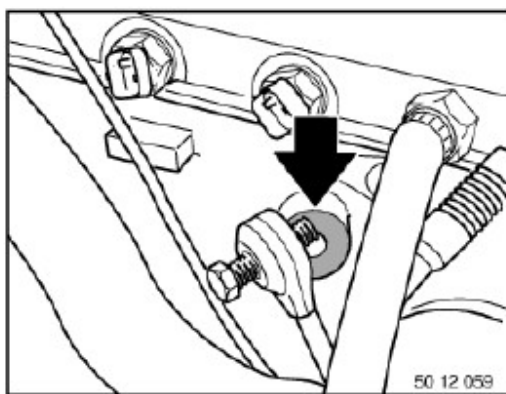


Fig. 28: Locating Knock Sensors Contact Surface On Engine Block

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Check stored fault messages.
Now clear the fault memory.**

12 14 550 REPLACING CONTROL UNIT (DME) (N52K)

IMPORTANT: Read and comply with notes on PROTECTION AGAINST ELECTROSTATIC DAMAGE (ESD PROTECTION)

Necessary preliminary tasks:

- Turn off ignition
- Disconnect **BATTERY NEGATIVE LEAD**

IMPORTANT: Follow instructions for REMOVING AND INSTALLING CONTROL UNITS

Replacement:

- Carry out programming/encoding

IMPORTANT: It is absolutely essential to read out the fault memory with the BMW diagnosis system and to create a fault memory printout.

Switch off ignition.

Release bolts along line (1).

Tightening torque **12 90 1AZ** .

Remove electronics box cover.

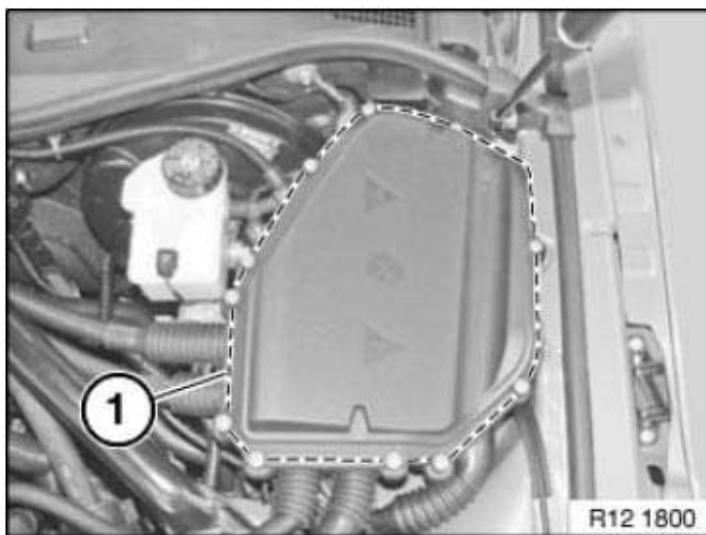


Fig. 29: Identifying Electronic Box Cover Mounting Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock battery positive lead (1), detach and lay to one side.

Release locks (2) in direction of arrow and pull control unit upwards slightly.

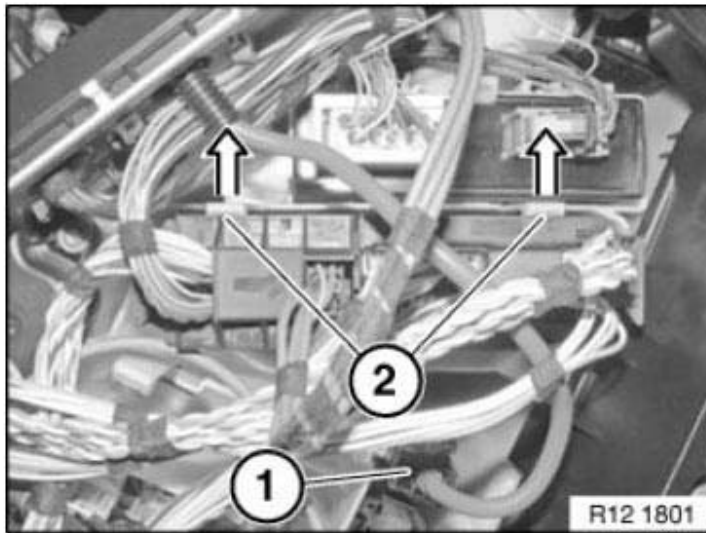


Fig. 30: Opening Control Unit Locks

Courtesy of BMW OF NORTH AMERICA, INC.

Pull control unit (1) upwards slightly until plug (2) can be released from control unit in direction of arrow.

Unlock plug (2) and detach from control unit (1).

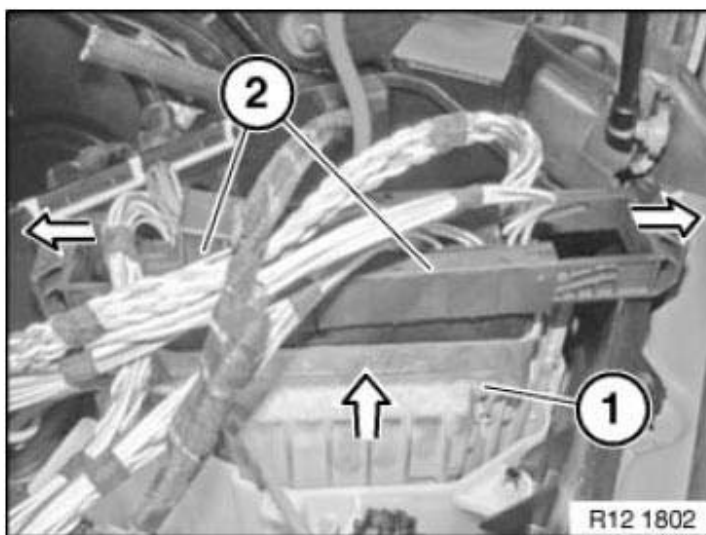


Fig. 31: Pulling Control Unit Upwards

Courtesy of BMW OF NORTH AMERICA, INC.

Lift out control unit (1).

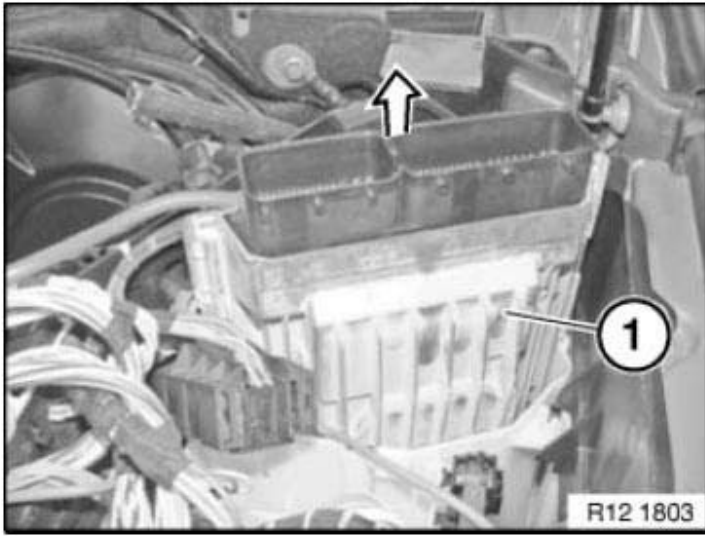


Fig. 32: Lifting Control Unit
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check stored fault messages.
 clear fault memory.

12 14 521 REPLACING CRANKSHAFT PULSE GENERATOR (N52K)

IMPORTANT: Read and comply with notes on PROTECTION AGAINST ELECTROSTATIC DAMAGE (ESD PROTECTION) .

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are **released**.

Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:

Aluminum screws/bolts are **not magnetic**.

Jointing torque and angle of rotation must be observed without fail (**risk of damage**).

Necessary preliminary tasks:

- Read out fault memory of DME control unit

- Switch off ignition

NOTE: Installation location of pulse generator for crankshaft is underneath starter motor.

Detach plug (1) from crankshaft pulse generator (2).

Release screw.

Installation:

Replace aluminum screws.

Tightening torque **13 62 2AZ** .

Withdraw pulse generator (2) from crankcase.

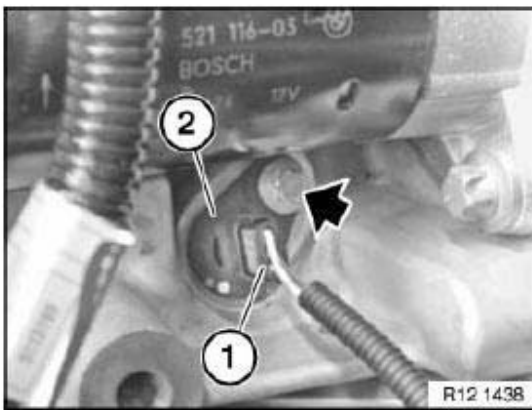


Fig. 33: Removing Plug From Crankshaft Pulse Generator
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring.

NOTE: Check stored fault messages.
Now clear the fault memory.

12 14 524 REPLACING PULSE GENERATOR ON EXHAUST CAMSHAFT (N52K)

IMPORTANT: Read and comply with notes on **PROTECTION AGAINST ELECTROSTATIC DAMAGE (ESD PROTECTION)** .

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition

Unlock plug (1) and remove.

Release screw.

Installation:

Replace screw.

Tightening torque **13 62 1AZ** .

Remove pulse generator (2).

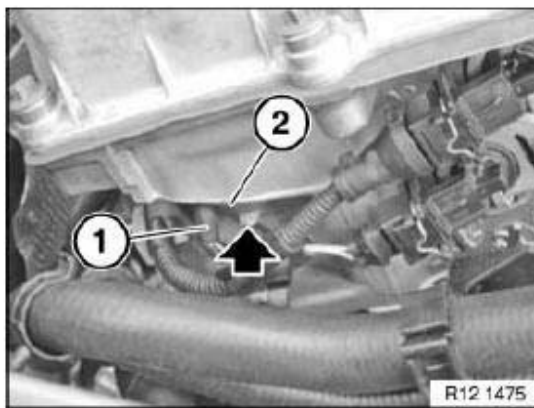


Fig. 34: Identifying Plug And Pulse Generator
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Check stored fault messages.**
 Now clear the fault memory.

12 14 523 REPLACING PULSE GENERATOR ON INLET CAMSHAFT (N52K)

IMPORTANT: Read and comply with notes on **PROTECTION AGAINST ELECTROSTATIC DAMAGE (ESD PROTECTION)** .

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition

Unlock plug (1) and remove.

Release screw.

Installation:

Replace screw.

Tightening torque **13 62 1AZ** .

Remove pulse generator (2).

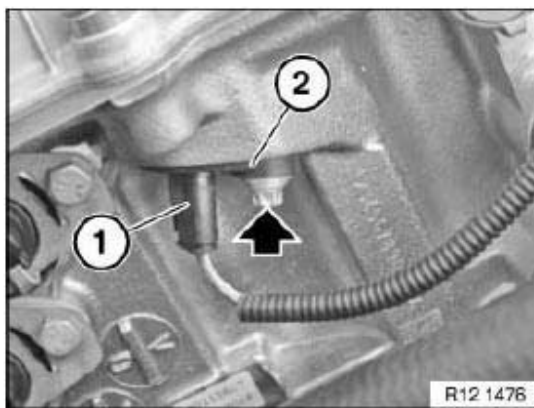


Fig. 35: Locating Pulse Generator With Plug
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Check stored fault messages.**
 Now clear the fault memory.

1231 ALTERNATOR WITH DRIVE AND MOUNTING

12 31 020 REMOVING AND INSTALLING OR REPLACING ALTERNATOR (N52K)

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are **released**.

Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:

Aluminum screws/bolts are **not magnetic**.

Jointing torque and angle of rotation must be observed without fail (**risk of damage**).

Necessary preliminary tasks:

- Turn off ignition
- Disconnect **BATTERY NEGATIVE LEAD**
- Remove **INTAKE FILTER HOUSING**
- Remove **ALTERNATOR DRIVE BELT**

Unlock plug (1) and remove.

Slacken nut (2).

Installation:

Tightening torque **12 31 1AZ** .

Disconnect battery positive lead from alternator.

Release screws (3) and remove alternator.

Installation:

Replace aluminum screws.

Tightening torque **12 31 2AZ** .

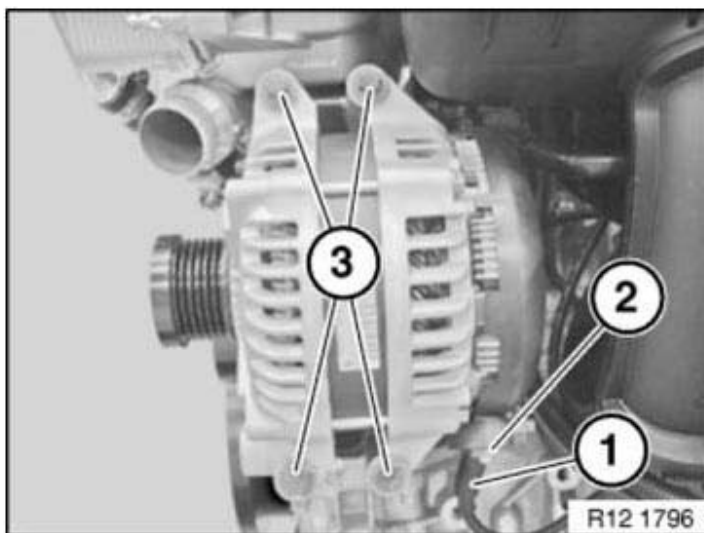


Fig. 36: Identifying Plug, Nut And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

12 31 ... REPLACING ALTERNATOR BELT PULLEY

Remove and install alternator drive belt.

Depending on alternator type, grip shaft with:

- hexagon socket
- multi-tooth socket or
- Torx socket wrench

Release nut with special tool 12 7 110 .

Installation:

TIGHTENING TORQUE, 12 31 2AZ/12 31 3AZ .

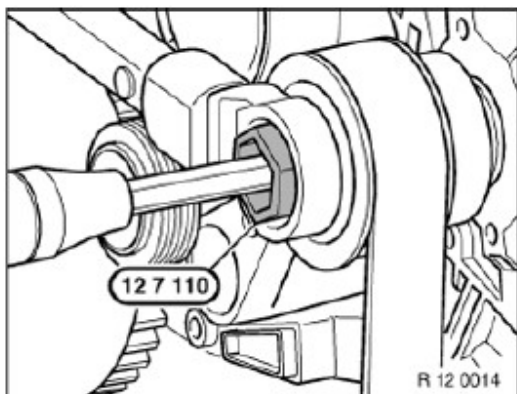


Fig. 37: Removing Nut Using Special Tool (12 7 110)
Courtesy of BMW OF NORTH AMERICA, INC.

12 31 ... REPLACING ALTERNATOR BELT PULLEY (WITH OVERRUNNING CLUTCH)

Special tools required

Remove and install alternator drive belt.

Grip alternator shaft with:

- internal serration

Release nut with special tools 12 7 120.

Installation:

Tightening torque 12 31 3AZ

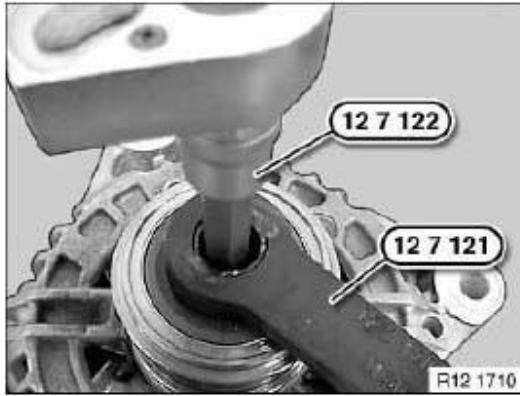


Fig. 38: Removing Nut Using Special Tool (12 7 120)
Courtesy of BMW OF NORTH AMERICA, INC.

1232 REGULATOR

12 32 501 REPLACING VOLTAGE REGULATOR

Necessary preliminary tasks:

- Switch off ignition
- Disconnect battery negative lead
- Remove alternator

Bosch

Release protective caps (1).

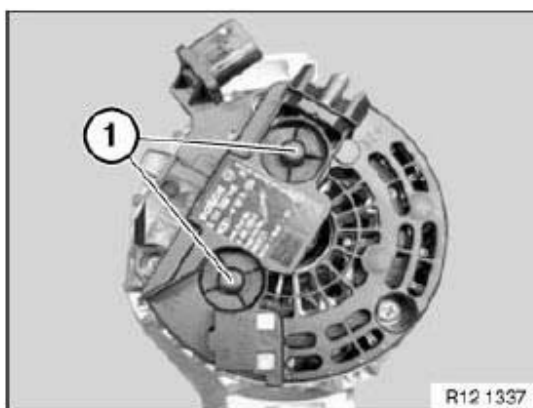


Fig. 39: Identifying Protective Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Bosch

Release screw (1) and nuts (2), remove cover.

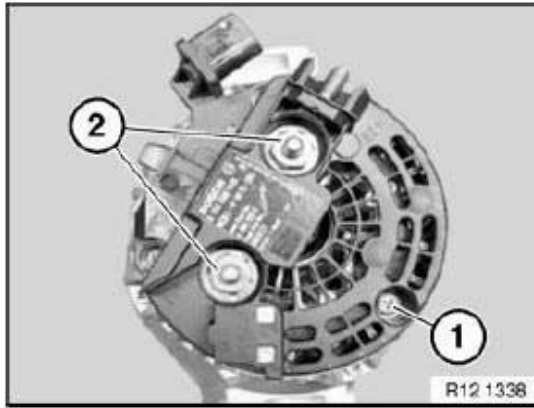


Fig. 40: Identifying Screw And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Bosch

Release screws and remove regulator switch (1) in direction of arrow.

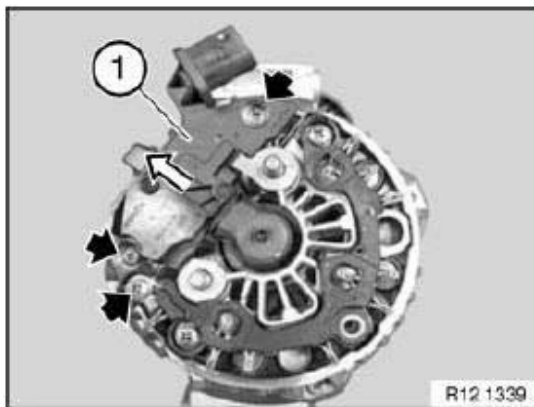


Fig. 41: Removing Regulator Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Bosch

Installation:

Clean contact surfaces and check pretension of contact spring, replace regulator switch if necessary.

Measurement A = min. 5 mm.

Check collector ring for wear and recondition if necessary.

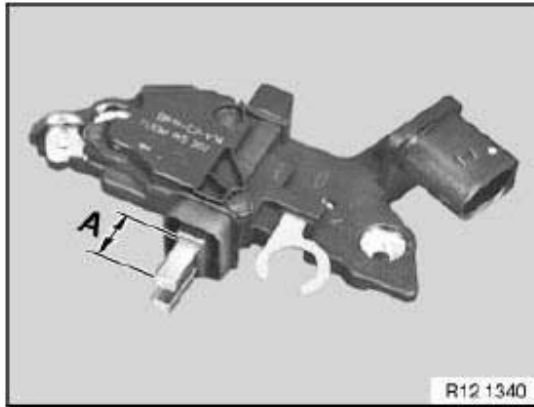


Fig. 42: Checking Contact Spring Pretension
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo

Slacken nut (1).

Slacken nut (2).

Release screws (3).

Release cover (4).

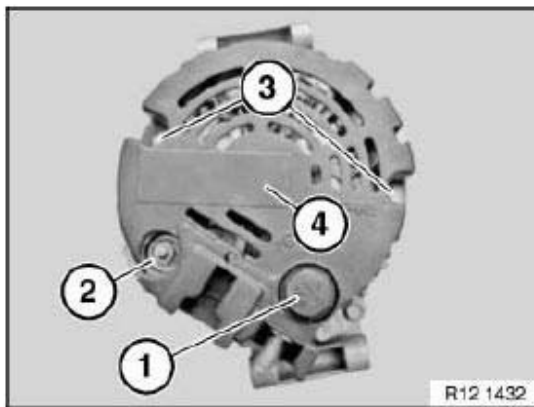


Fig. 43: Identifying Nut, Screw And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo

Release screws.

Remove regulator switch (1) towards top.

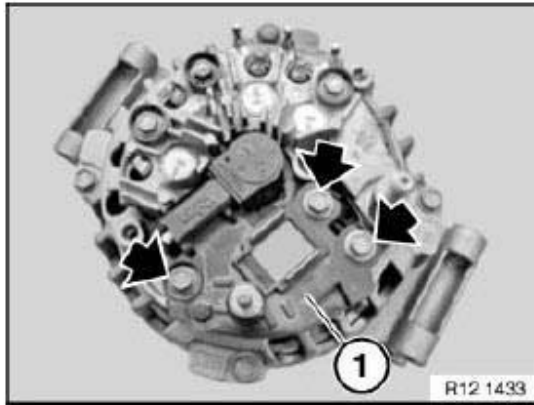


Fig. 44: Locating Regulator Switch Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo

Installation:

Clean contact surfaces and check pretension of contact spring, replace regulator switch if necessary.

Measurement A = min. 5 mm.

Check collector ring for wear and recondition if necessary.

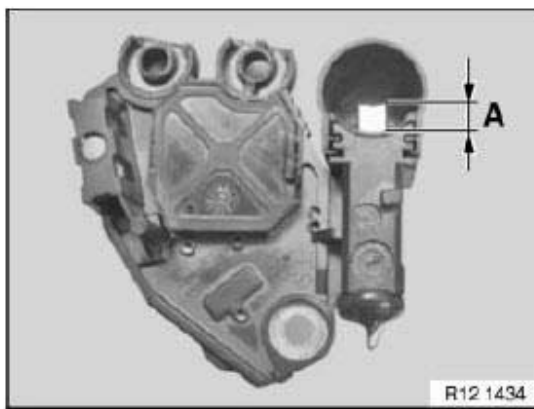


Fig. 45: Checking Regulator Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit new regulator (1) with attached mounting sleeve (2) or locked carbon brush.

Pull off mounting sleeve (2) and replace with cover (3).

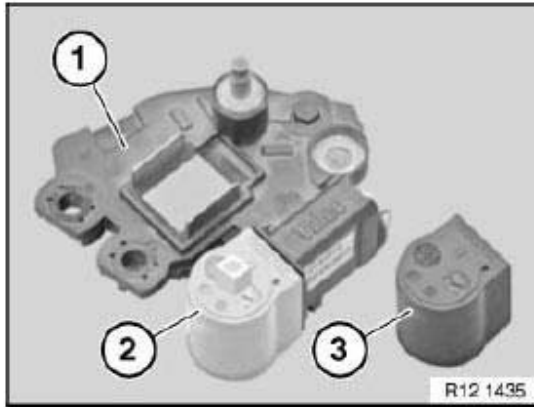


Fig. 46: Identifying Regulator, Mounting Sleeve And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

1241 STARTER WITH MOUNTING

12 41 020 REMOVING AND INSTALLING/REPLACING STARTER (N52K)

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are **released**.

Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:

Aluminum screws/bolts are **not magnetic**.

Jointing torque and angle of rotation must be observed without fail (**risk of damage**).

Necessary preliminary tasks

- Switch off ignition
- Clamp off **BATTERY NEGATIVE LEAD**
- Remove **INTAKE AIR MANIFOLD**

Unlock plug (1) and remove.

Unfasten nut.

Tightening torque **12 42 2AZ** .

Remove battery positive lead (2).

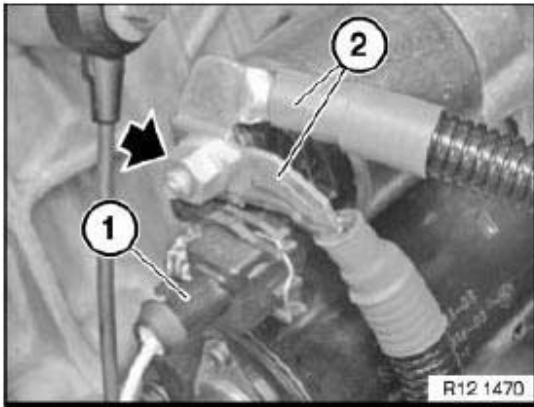


Fig. 47: Identifying Plug And Battery Positive Lead
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Installation:

Replace aluminum screws.

Tightening torque **12 41 1AZ** .

Unfasten screws (2).

Installation:

Replace aluminum screws.

Tightening torque **12 41 2AZ** .

Remove starter motor (3).

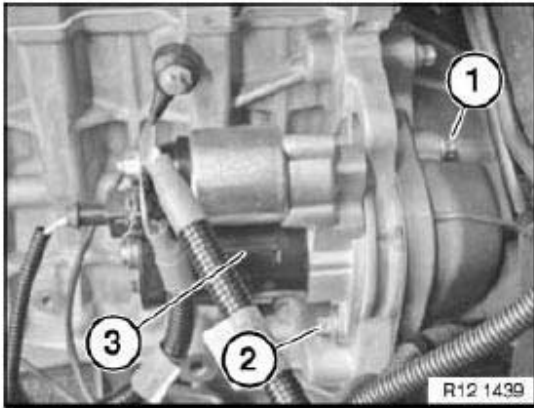


Fig. 48: Identifying Starter Motor And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check starter pinion and ring gear for damage. Replace starter if necessary.

Assemble engine.

12 41 041 REPLACING SOLENOID SWITCH

Turn off ignition.

Remove starter motor.

Release nut (1).

Remove cable lug (2).

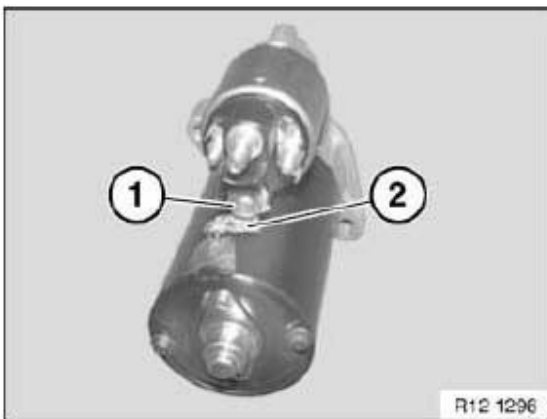


Fig. 49: Identifying Starter Motor Nut And Cable Lug
 Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not turn cable lug (2) while tightening down - risk of short circuit to starter motor housing.
Tightening torque, see 12 41 4AZ in 12 41 STARTER MOTOR WITH MOUNTING

Release screws (1).

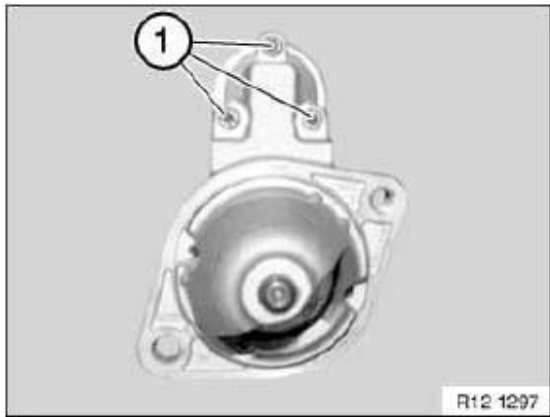


Fig. 50: Identifying Starter Motor Housing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove solenoid switch (1) and spring (2).

Unhook pin (3).

Installation:

Check pin (3) for wear and apply grease.

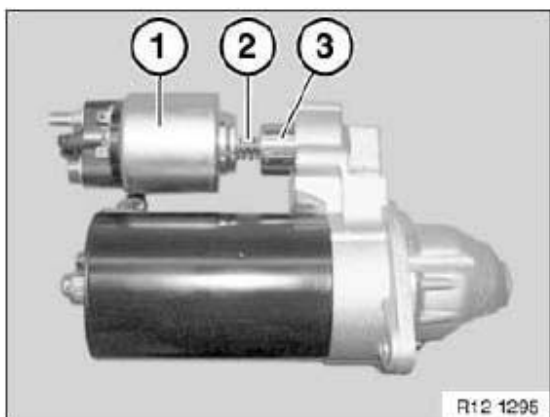


Fig. 51: Identifying Solenoid Switch, Spring And Pin
Courtesy of BMW OF NORTH AMERICA, INC.

1242 STARTER LEAD

12 42 500 REPLACING BATTERY POSITIVE LEAD BETWEEN STARTER, ALTERNATOR AND BATTERY POSITIVE TERMINAL (N52K)

Necessary preliminary tasks

- Read out fault memory of DME control unit
- Switch off ignition
- Disconnect **BATTERY NEGATIVE LEAD**
- Remove **INTAKE AIR MANIFOLD**

Open cover.

Slacken nut (1).

Tightening torque **12 42 3AZ** .

Remove battery positive lead (2) from battery positive terminal.

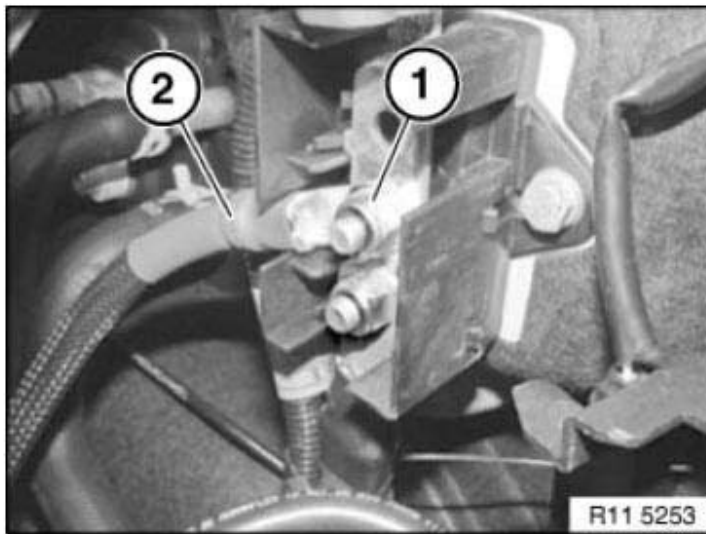


Fig. 52: Identifying Battery Cable And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1) on starter.

Tightening torque **12 42 2AZ** .

Disconnect battery positive lead from starter.

Release nut (2) on alternator.

Tightening torque **12 42 1AZ** .

Release battery positive lead from retainer (3), feed out and remove.

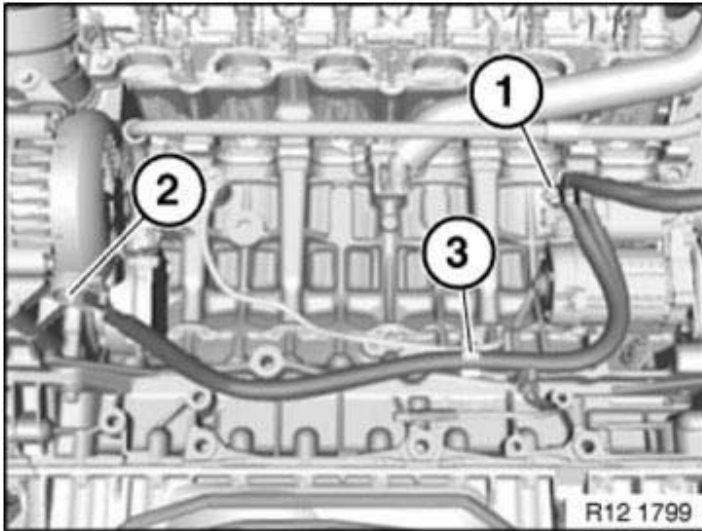


Fig. 53: Identifying Nut On Starter And Alternator
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check stored fault messages.
Now clear the fault memory.

12 42 540 REPLACING SAFETY BATTERY TERMINAL (SBK)

CAUTION: Observe safety regulations.
Investigate cause of triggering of safety battery terminal.
To do so, read out fault memory of airbag control unit. Note fault messages stored in memory. Rectify faults. Then clear fault memory.

Use of safety battery terminal:

- From model year 1998 in Series E38, E39, E46
- From 4/99 in E36/Z3
- in each of following new Series

The different models have different installation locations:

Battery in engine compartment

Safety battery terminal is replaced with cable up to battery positive support point.

Safety battery terminal is omitted as from 03/2002 from all E46 LHD models with 4-cylinder engines.

Battery in luggage compartment behind side trim panel

Remove side trim panel.

Follow instructions for disconnecting and connecting battery.

Disconnect and cover battery negative lead.

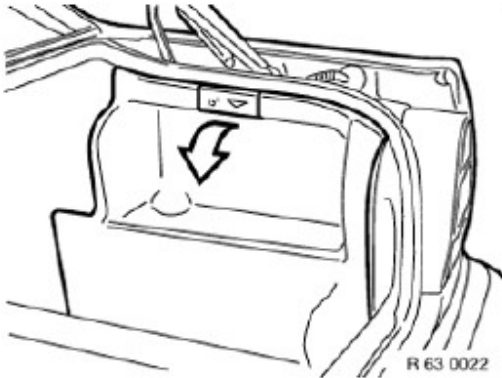


Fig. 54: Removing Luggage Compartment Battery
Courtesy of BMW OF NORTH AMERICA, INC.

Release front side trim panel partly and fold forward.



Fig. 55: Removing Front Side Trim Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Battery in luggage compartment under floor trim panel

Follow instructions for disconnecting and connecting battery.

Fold back floor trim panel (1).

Lift cover (2) on battery negative lead.

Disconnect and cover battery negative lead (3).

Release nuts (4).

Remove battery cover.

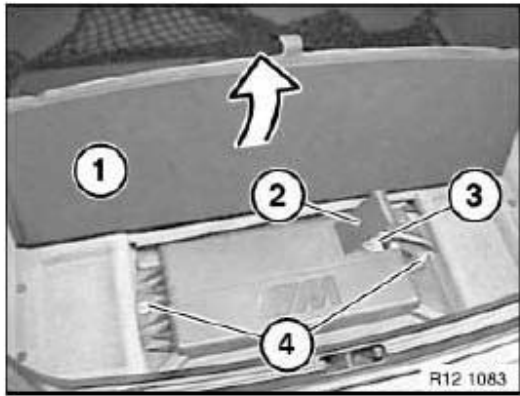


Fig. 56: Folding Back Floor Trim Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Battery in luggage compartment under spare wheel

Remove spare wheel.

Release screws.

CAUTION: Do not kink air pipes.

Set air supply system (1) to one side.

Follow instructions for disconnecting and connecting battery.

Disconnect battery negative lead.

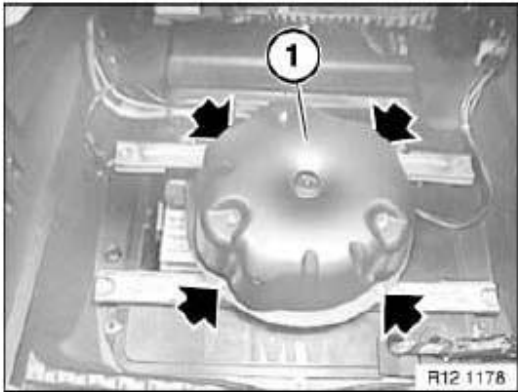


Fig. 57: Locating Air Supply System Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect supply cable (1) for vehicle electrical system.

Installation:

Remove faulty fuses and carry out troubleshooting.

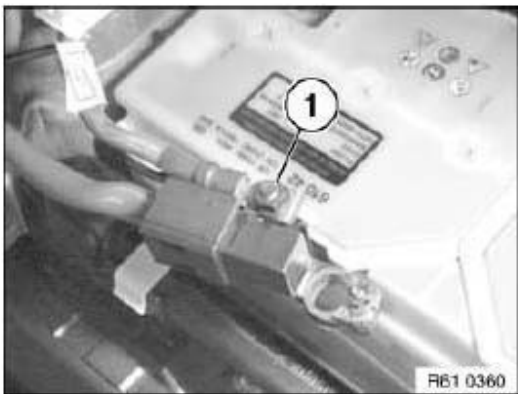


Fig. 58: Identifying Vehicle Electrical System Supply Cable
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Pay attention to interface.

The repair cable is always a standard length.

The heavy-current connector of the repair cable has a larger diameter than the battery positive lead.

In some Series (e.g. E46 touring), the heavy-current connector of the repair cable can lead to installation problems.

This is the case when the interface is in the area of the close-fitting trim panels.

Find matching interface (e.g. approx. 10 cm behind rear seat backrest in E46 touring).

Lay repair cable parallel to battery positive lead.

Mark interface of battery positive lead at end of repair cable.

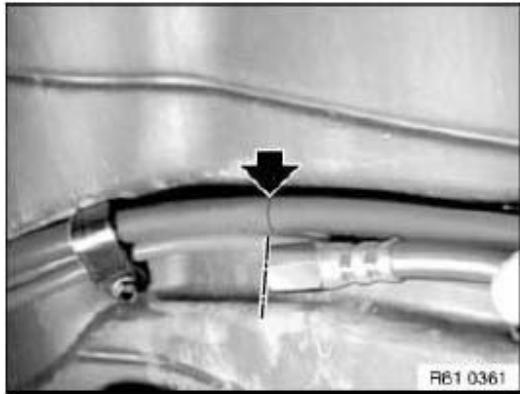


Fig. 59: Locating Interface Mark On Battery Positive Lead
Courtesy of BMW OF NORTH AMERICA, INC.

Release cable ties (1).

Disconnect plug connection (2).

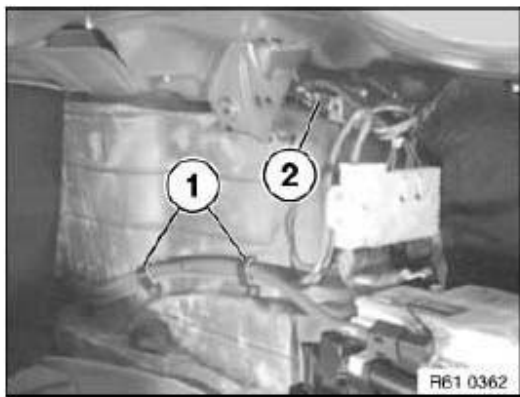


Fig. 60: Identifying Cable Ties And Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not use bolt cutters or similar tools to cut through the cable.
A cable end that has been squashed flat will no longer fit into the clamping sleeve.

Saw through battery positive cable at marked point with an iron saw.

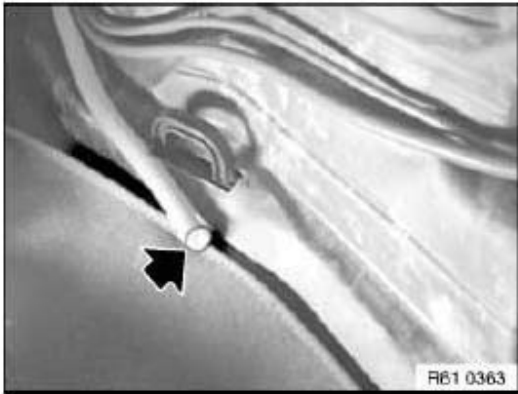


Fig. 61: Locating Cable End
Courtesy of BMW OF NORTH AMERICA, INC.

Strip insulation - length (A) - from cable end.

Distance (A) = 15 mm.

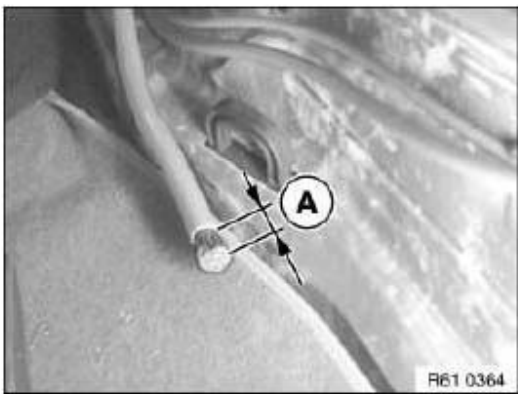


Fig. 62: Identifying Cable End Distance
Courtesy of BMW OF NORTH AMERICA, INC.

Push heavy-current connector (1) over stripped cable end and screw into position.

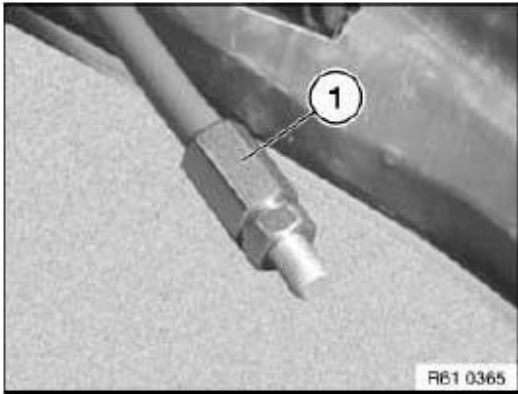


Fig. 63: Identifying Heavy-Current Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Push shrink-fit hose (3) over repair cable.

Screw threaded sleeve (1) of repair cable (2) to heavy-current connector.

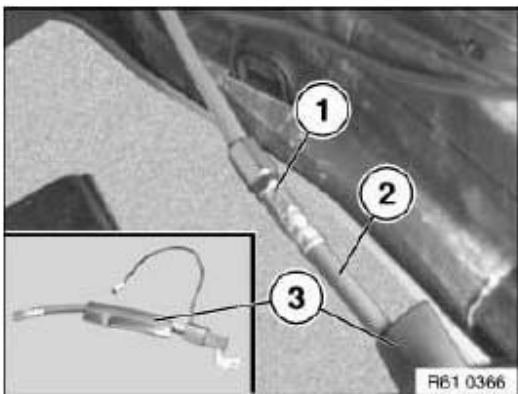


Fig. 64: Identifying Shrink-Fit Hose And Threaded Sleeve Of Repair Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Push shrink-fit hose (1) over connecting point and shrink on with a hot-air blower (2).

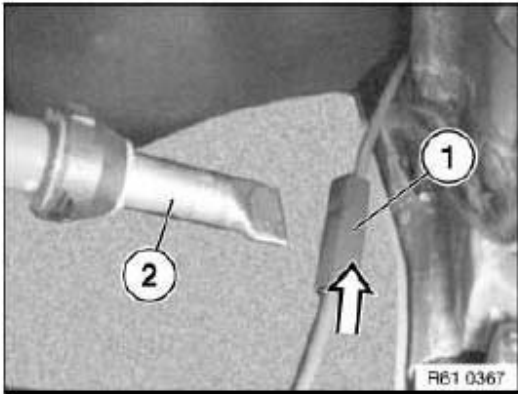


Fig. 65: Pushing Shrink-Fit Hose Over Connecting Point
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Heat up shrink-fit hose until it has settled completely around the connection point.

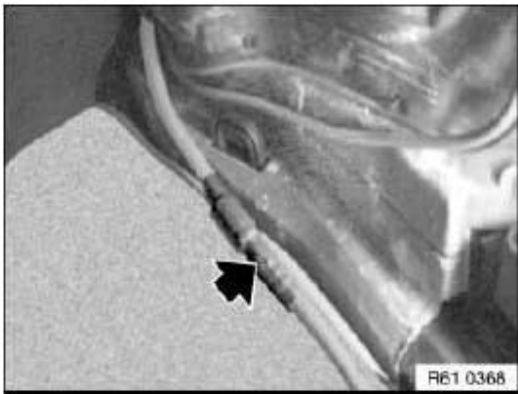


Fig. 66: Locating Shrink-Fit Hose
 Courtesy of BMW OF NORTH AMERICA, INC.

When laying the repaired battery positive cable, observe the following:

- The shrink-fit hose must not be scuffed during any movement.
- The repair cable must not cause any disturbing noises during driving operation.

NOTE: Offsetting cutting line by approx. 10 cm produces excess length of battery positive lead (1).
 Lay battery positive lead (1) without kinks or abrasions.
 (Shown on E46 touring.)

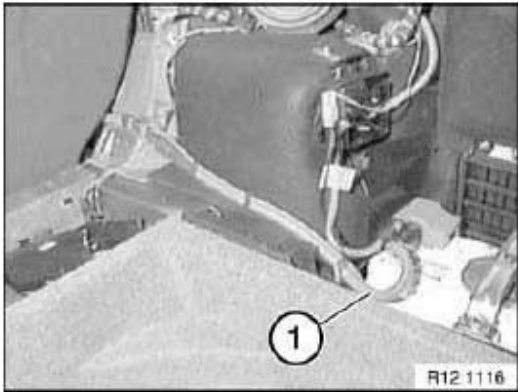


Fig. 67: Identifying Battery Positive Lead
Courtesy of BMW OF NORTH AMERICA, INC.

1251 ENGINE WIRING LOOM

12 51 001 REPLACING WIRING HARNESS SECTION FOR ENGINE (N52K)

IMPORTANT: Read and comply with notes on PROTECTION AGAINST ELECTROSTATIC DISCHARGE (ESD PROTECTION) .

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Turn off ignition
- Disconnect **BATTERY NEGATIVE LEAD**
- Remove front **UNDERBODY PROTECTION**
- Remove rear **UNDERBODY PROTECTION**
- Partially remove **WIRING HARNESS** for ignition coils
- Remove **INTAKE AIR MANIFOLD**

Release bolts along line (1).

Tightening torque **12 90 1AZ** .

Remove electronics box cover.

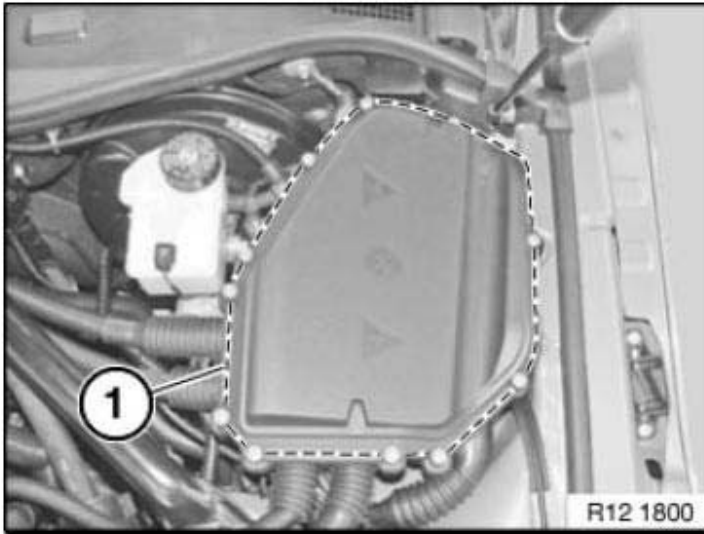


Fig. 68: Identifying Electronic Box Cover Mounting Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock battery positive lead (1), detach and lay to one side.

Release locks (2) in direction of arrows and pull control unit upwards slightly.

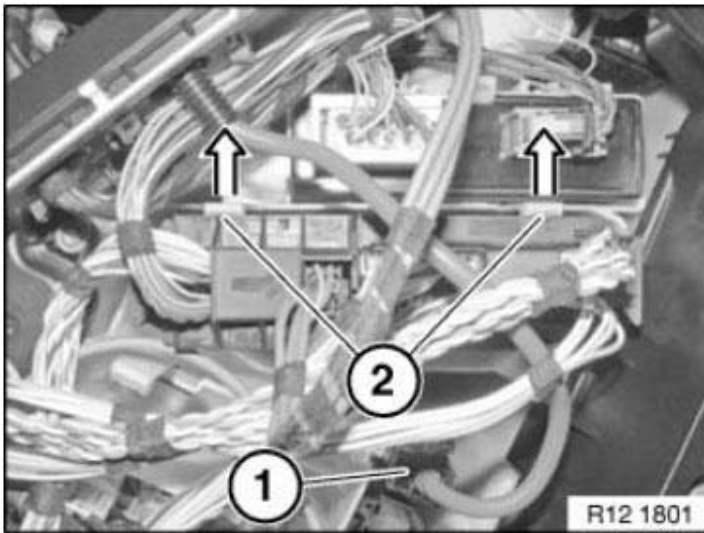


Fig. 69: Opening Control Unit Locks
 Courtesy of BMW OF NORTH AMERICA, INC.

Pull control unit (1) upwards slightly until plug (2) can be released from control unit in direction of arrow.

Unlock plug (2) and detach from control unit (1).

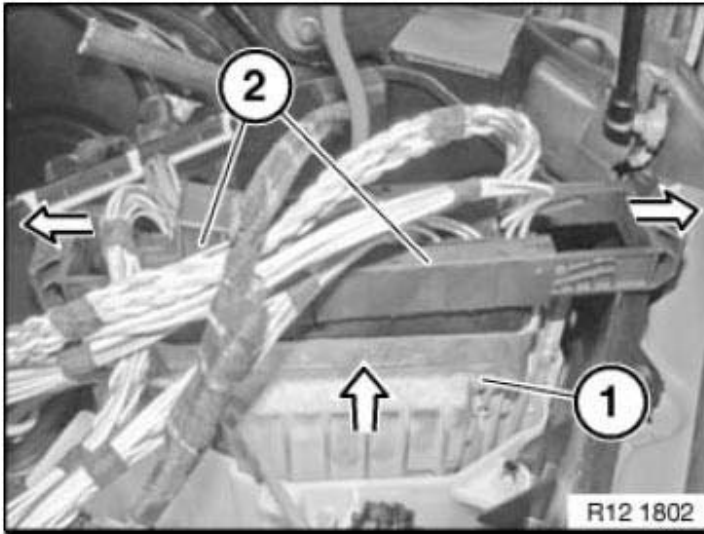


Fig. 70: Pulling Control Unit Upwards
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach all plugs from engine wiring harness in electronics box (1).

Unclip rubber grommet hold-down devices (2) and (3) and release engine wiring harness from electronics box.

Installation:

Make sure rubber grommets are correctly seated (watertightness).

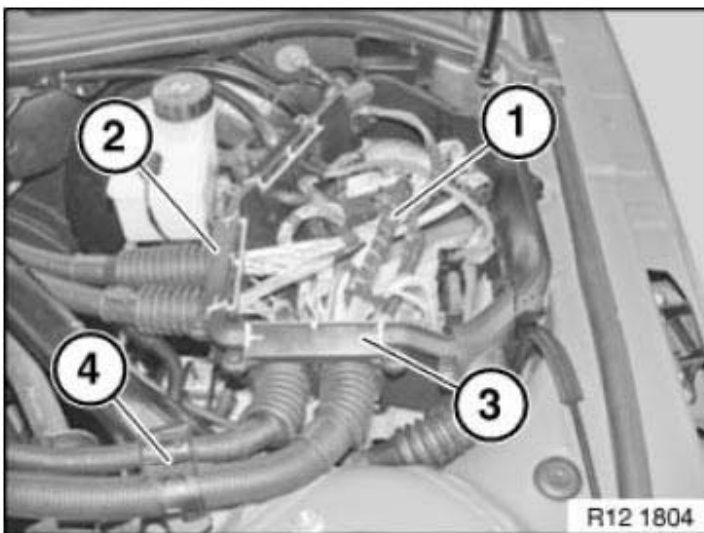


Fig. 71: Identifying Electronic Box With Rubber Grommet Hold Down Device And Plugs
 Courtesy of BMW OF NORTH AMERICA, INC.

Long plug:

Press in retaining lugs and withdraw lock (1) in direction of arrow from plug housing.

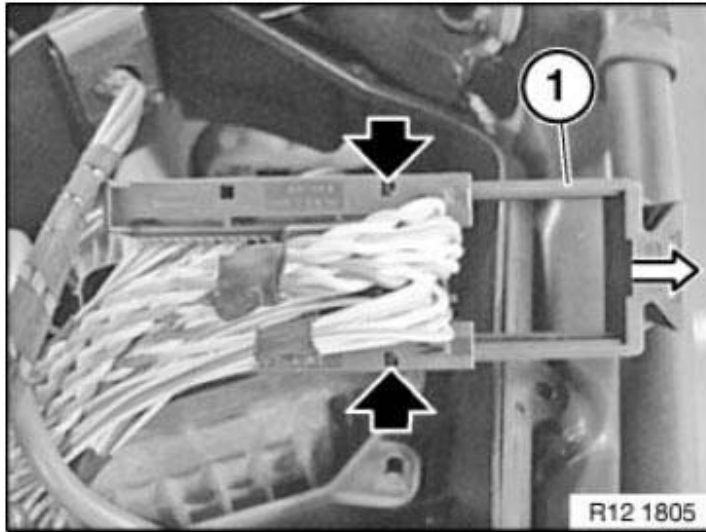


Fig. 72: Removing Locks By Pressing Retaining Tabs
Courtesy of BMW OF NORTH AMERICA, INC.

Press locking tabs (1) in direction of arrow and pull contact carrier (2) out of housing.

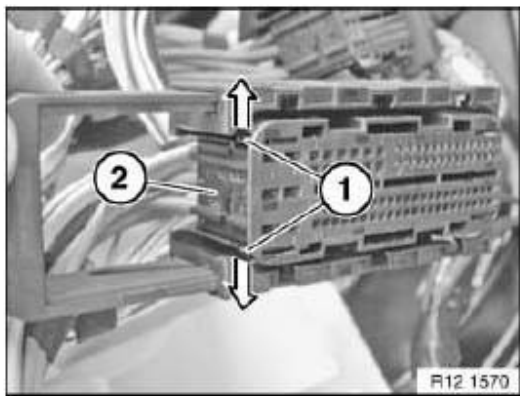


Fig. 73: Pressing Locking Tab
Courtesy of BMW OF NORTH AMERICA, INC.

Press locking tab (1) in direction of arrow and pull contact carrier (2) out of housing.

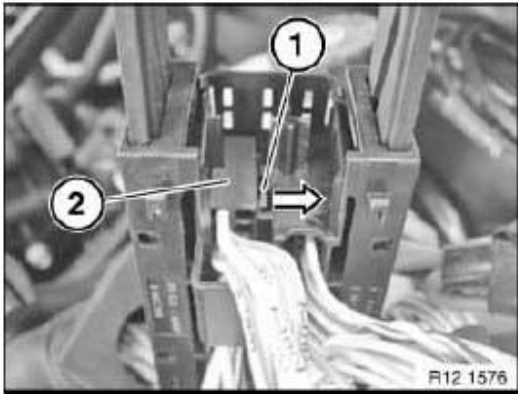


Fig. 74: Pressing Locking Tab
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock locking tabs (1) in direction of arrow and pull contact carrier (2) out of housing.

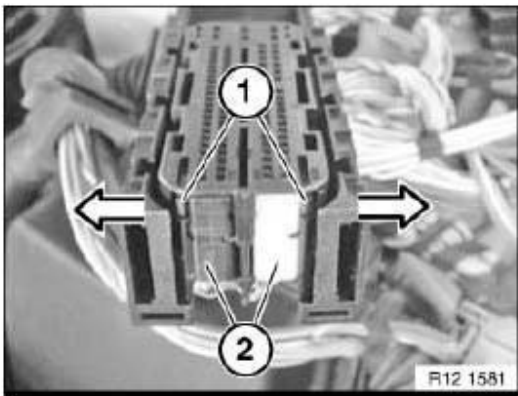


Fig. 75: Opening Locking Tabs
Courtesy of BMW OF NORTH AMERICA, INC.

Short plug:

Press in retaining lugs (1) and withdraw lock (2) in direction of arrow from plug housing.

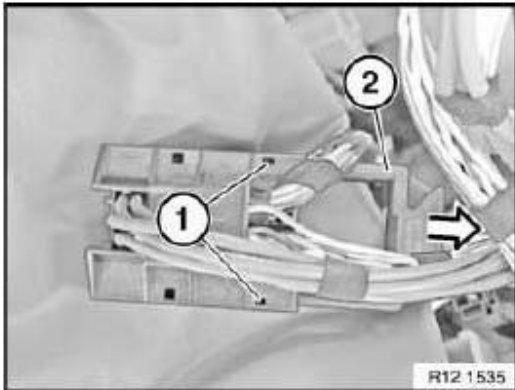


Fig. 76: Removing Locks From Plug Housing
 Courtesy of BMW OF NORTH AMERICA, INC.

Press locking tabs (1) in direction of arrow and pull contact carrier (2) out of housing.

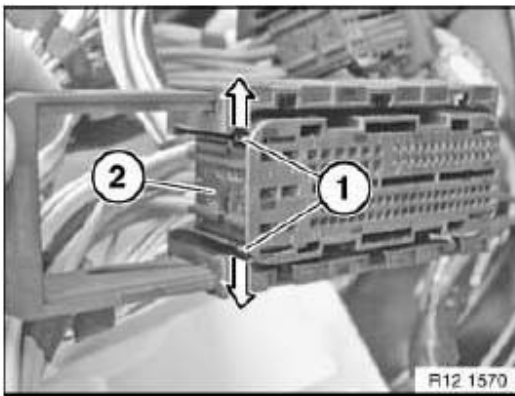


Fig. 77: Pressing Locking Tab
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock locking tabs (1) in direction of arrow and pull contact carrier (2) out of housing.

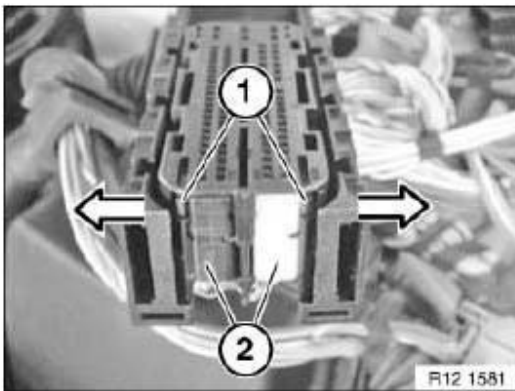


Fig. 78: Opening Locking Tabs

Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cable duct upper section (1) and expose wiring harnesses.

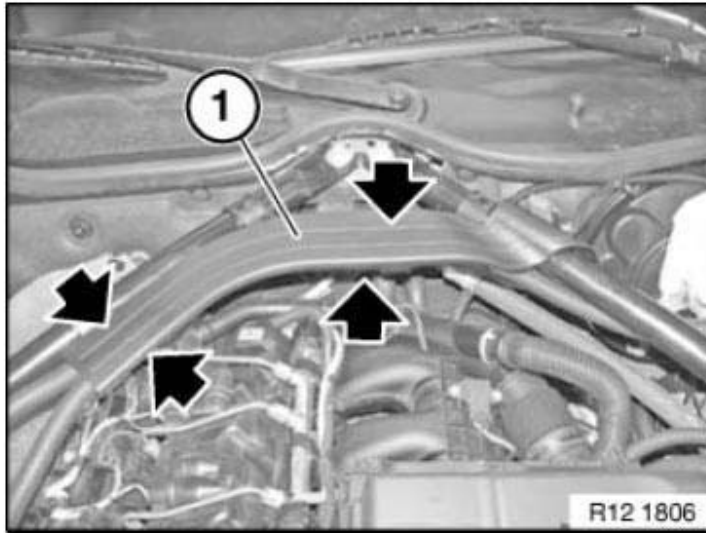


Fig. 79: Locating Wiring Harness In Cable Duct Upper Section

Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cable duct (1) and remove from cylinder head cover.

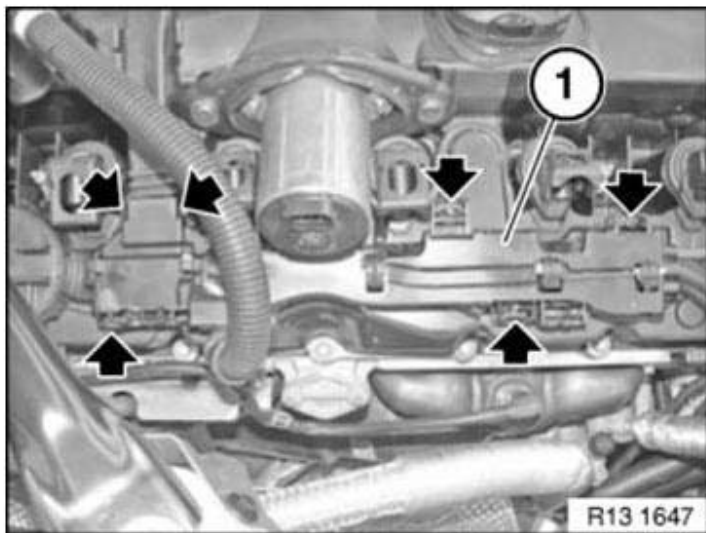


Fig. 80: Unclipping Cable Duct

Courtesy of BMW OF NORTH AMERICA, INC.

Unclip plug connection (1) from holder (2) and disconnect.

Unclip wiring harness from holder (2).

Unclip holder (2) from fuel rail and remove.

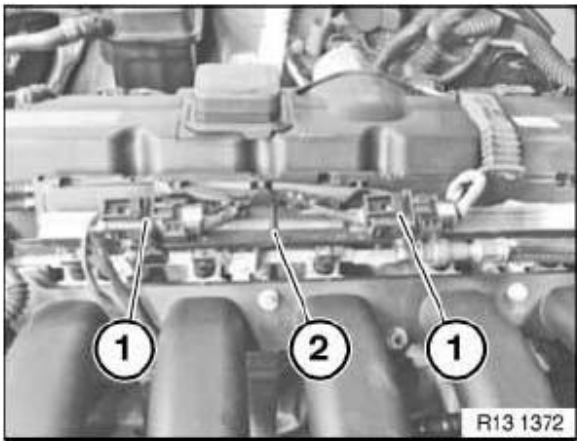


Fig. 81: Identifying Plug Connection And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Detach connector strip (2) in direction of arrow.

Do **not** remove fuel rail (3) and fuel line (1).

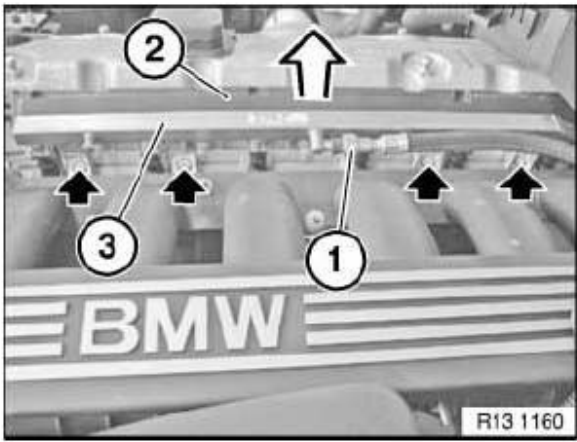


Fig. 82: Removing Connector Strip With Fuel Rail And Fuel Line
Courtesy of BMW OF NORTH AMERICA, INC.

WIRING HARNESS REPLACEMENT PROCEDURE

Work step	Note
Unlock plug connections on control sensors and disconnect	
Unlock plug on alternator and disconnect	
Unlock plug connection on knock sensors and disconnect	

Unlock plug on crankshaft sensor and disconnect	
Unlock plug on starter motor and disconnect	
Unlock plug on throttle valve assembly and disconnect	
Unlock plug connections on monitoring sensors and disconnect	
Unlock plug on oil condition sensor and disconnect	
Unlock plug on tank vent valve and remove	
Unlock plug on transmission and disconnect	
Unlock plug on air-mass meter and disconnect	
Unlock plug on differential-pressure sensor and disconnect	
Unlock plug on intake system servomotors and disconnect	
Unlock plug on eccentric shaft sensor and disconnect	
Unlock plug on solenoid valves and disconnect	
Unlock plug on coolant temperature sensor and disconnect	
Unlock plug on oil pressure sensor and disconnect	
Disconnect connector strip on fuel injectors	
Unlock plug on A/C compressor and disconnect	
Unlock plug on coolant thermostat and disconnect	
Unlock plug on hydraulic valve and disconnect	
Unlock plug on coolant pump and disconnect	
Release earth connection and remove	
Tightening torque 12 90 3AZ .	

Release wiring harness if necessary from clips and retainers

Feed out wiring harness and remove.

Installation:

Check wiring harness routing.

Check plug connections for correct seating.

NOTE: **Check stored fault messages.
clear fault memory.**

12 51 100 REPLACING WIRING HARNESS SECTION FOR IGNITION COILS (N52K)

IMPORTANT: Aluminium-magnesium materials.

No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are **released**.

Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:

Aluminum screws/bolts are **not magnetic**.

Jointing torque and angle of rotation must be observed without fail (**risk of damage**).

IMPORTANT: Read and comply with notes on PROTECTION AGAINST ELECTROSTATIC DISCHARGE (ESD PROTECTION) .

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Turn off ignition
- Disconnect **BATTERY NEGATIVE LEAD**
- Remove **IGNITION COIL COVER**

Release bolts along line (1).

Tightening torque **12 90 1AZ** .

Remove electronics box cover.

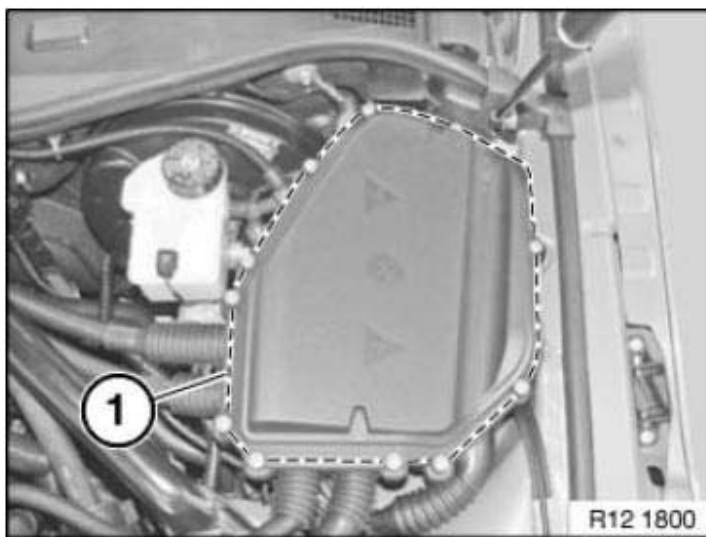


Fig. 83: Identifying Electronic Box Cover Mounting Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock battery positive lead (1), detach and lay to one side.

Release locks (2) in direction of arrows and pull control unit upwards slightly.

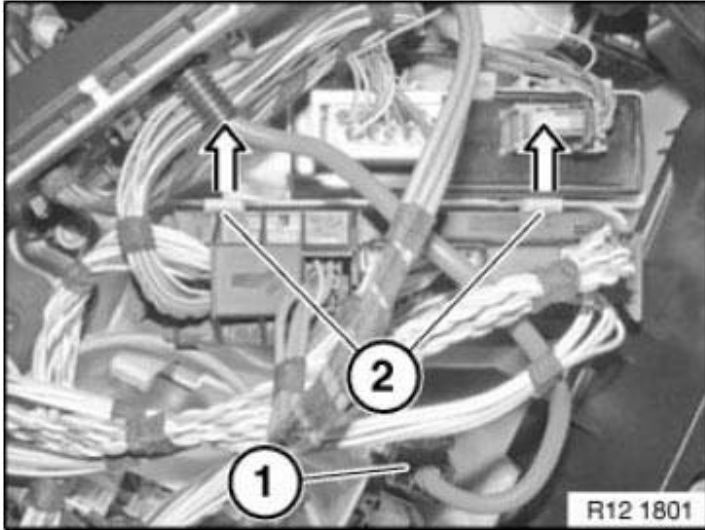


Fig. 84: Opening Control Unit Locks
Courtesy of BMW OF NORTH AMERICA, INC.

Pull control unit (1) upwards slightly until plug (2) can be released from control unit in direction of arrow.

Unlock plug (2) and detach from control unit (1).

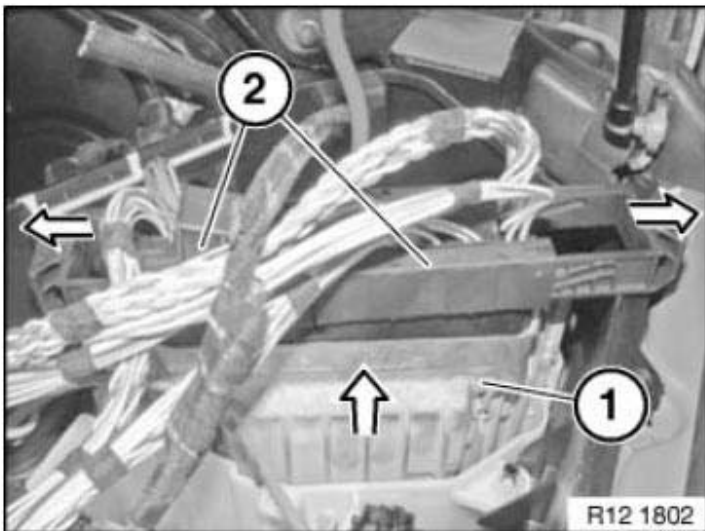


Fig. 85: Pulling Control Unit Upwards
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach all plugs (1) from ignition coil wiring harness in electronics box.

Unclip rubber grommet hold-down device (2) and release ignition coil wiring harness from electronics box.

Installation:

Make sure rubber grommets are correctly seated (watertightness).

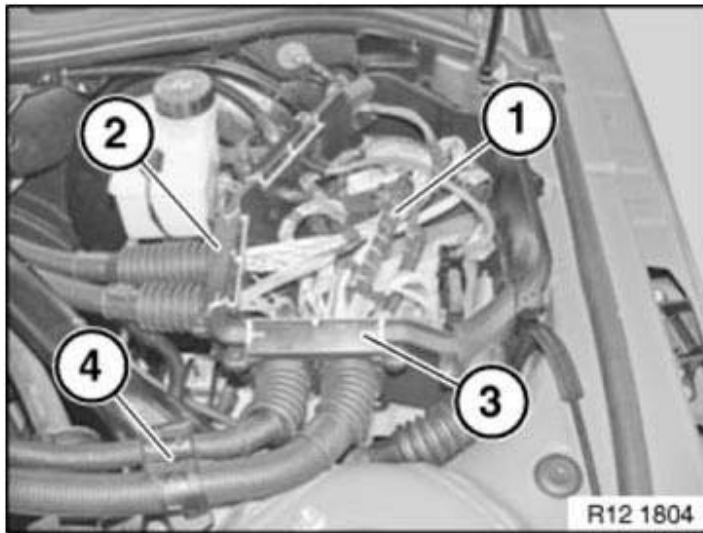


Fig. 86: Identifying Plugs And Rubber Grommet Hold Down Device
Courtesy of BMW OF NORTH AMERICA, INC.

Press in retaining lugs and withdraw lock (1) in direction of arrow from plug housing.

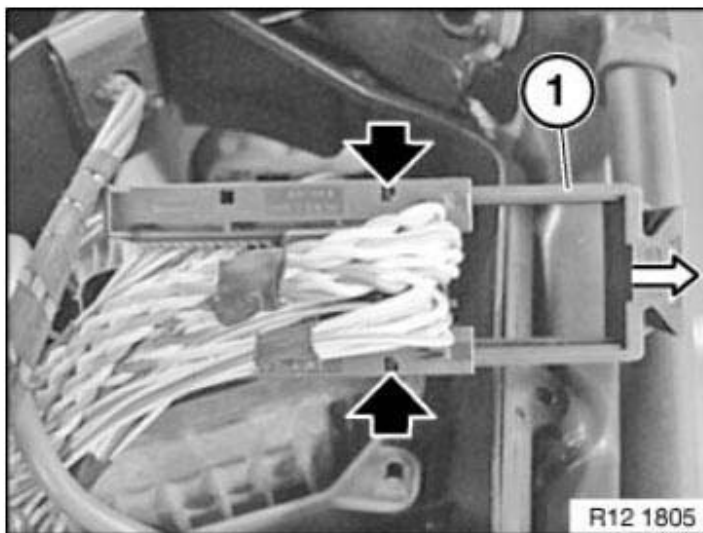


Fig. 87: Removing Locks By Pressing Retaining Tabs
Courtesy of BMW OF NORTH AMERICA, INC.

Press locking tabs (1) in direction of arrow and pull contact carrier (2) out of housing.

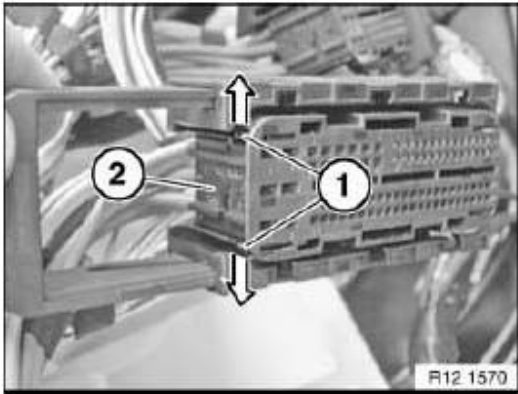


Fig. 88: Pressing Locking Tab
 Courtesy of BMW OF NORTH AMERICA, INC.

Press locking tab (1) in direction of arrow and pull contact carrier (2) out of housing.

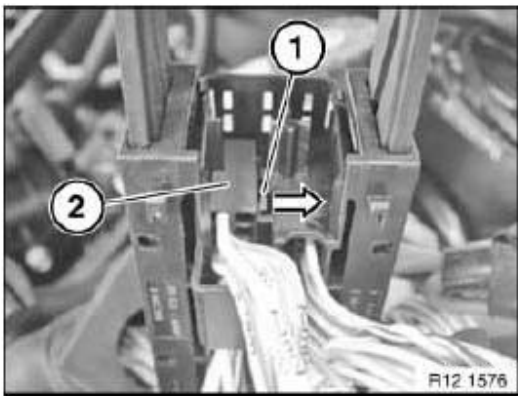


Fig. 89: Pressing Locking Tab
 Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cable duct upper section (1) and expose wiring harnesses.

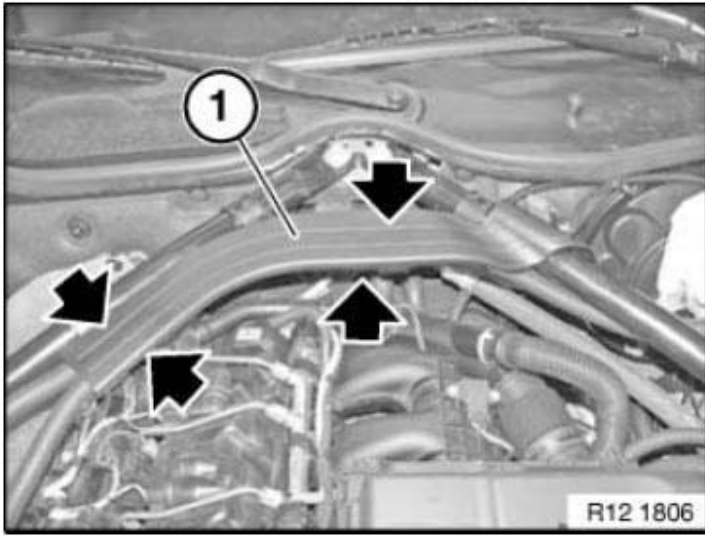


Fig. 90: Locating Wiring Harness In Cable Duct Upper Section
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and remove clip (1).

Unlock all plugs on ignition coils and disconnect.

Unlock plug (2) on Valvetronic servomotor and disconnect.

Release wiring harness from retainers and cable ties (3).

Replace defective cable ties.

Release nuts (4) and remove earth connections.

Tightening torque **12 90 2AZ** .

Feed out ignition coil wiring harness and remove.

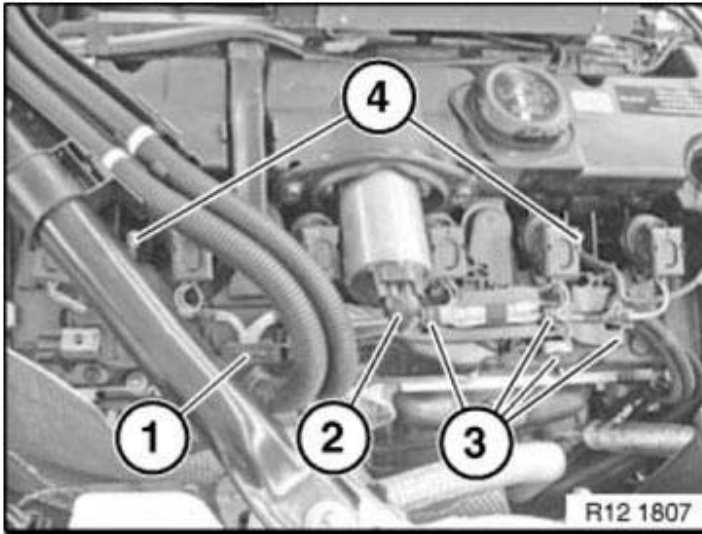


Fig. 91: Identifying Clip, Plug, Cable Ties And Nuts
 Courtesy of BMW OF NORTH AMERICA, INC.

Check wiring harness routing.

Check plug connections for correct seating.

Check stored fault messages.

clear fault memory.

1261 OIL PRESSURE/OIL TEMPERATURE/OIL GAUGE

12 61 285 REMOVING AND INSTALLING/RENEWING OIL LEVEL SENSOR FOR ENGINE OIL (N52K)

IMPORTANT: Read and comply with notes on PROTECTION AGAINST ELECTROSTATIC DISCHARGE (ESD PROTECTION) .

Necessary preliminary work

- Switch off ignition
- Remove front **UNDERBODY PROTECTION**
- Drain off **ENGINE OIL**

Release connector (1) and remove.

Unscrew nuts (2).

Tightening torque **12 61 2AZ** .

Remove oil level sensor.

Installation note:

Clean sealing surface on oil sump.

Replace gasket on oil level sensor.

An excessively low torque value will result in oil leaks.

An excessively high torque value will result in damage to the oil level sensor.

Top up engine oil.

Reinstall holder for ground cable.

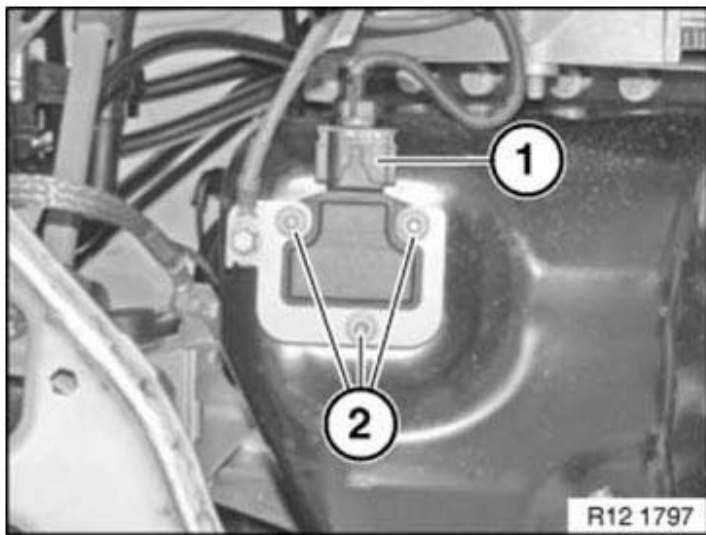


Fig. 92: Identifying Connector And Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check stored fault message.
Delete fault memory.

12 61 280 REMOVING AND INSTALLING/REPLACING OIL PRESSURE SENSOR (N52K)

WARNING: Scalding hazard!
Only perform this task on an engine that has cooled down.

Necessary preliminary tasks:

- Remove ACOUSTIC COVER

Installation location

Oil filter housing, front left.

Engine oil may emerge when oil pressure sensor is replaced; have a cleaning cloth ready.

Unlock plug (1) and remove.

Release oil pressure sensor (2).

Tightening torque **12 61 1AZ** .

Installation:

Check engine oil level, top up engine oil if necessary.

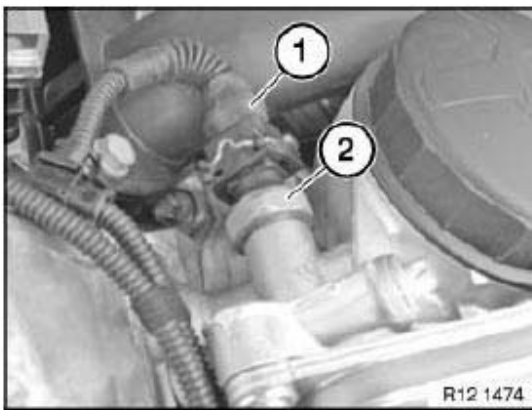


Fig. 93: Identifying Oil Pressure Sensor And Plug
Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE

Engine Electrical System - Repair - Z4

1200 TROUBLESHOOTING

61 20 ... BATTERY REPLACEMENT INFORMATION

A vehicle battery is constructed for the installation location and the individual power requirements of the particular vehicle. These individual power requirements depend on the motorization and different types of optional equipment. The individually assigned vehicle battery is the ideal compromise between the power requirements of the vehicle electrical system and the weight and service life of the vehicle battery.

Vehicles with the automatic engine start-stop function or particular motorization and optional equipment are equipped with a special vehicle battery (AGM battery), since only this battery type can provide elevated power requirements over the extended service life. Installing a different vehicle battery can cause problems with vehicle electronics, can reduce functions or can cause leakage of battery acid.

In the event of an accident where the airbags are deployed in vehicles with a vehicle battery in the luggage compartment, the electrical connection between the vehicle battery and the trigger is automatically disconnected through pyrotechnics. This prevents a possible short circuit.

Proper operation of all of these safety and convenience functions requires a battery that conforms with specifications and that is properly registered in vehicles with energy management systems (IBS, power module).

Vehicles with energy management systems (IBS, power module): Register battery replacement

The vehicle electrical system is informed about the vehicle battery characteristic data, such as type, size, age and current power capacity. Therefore, only one work scope will be provided that is permitted by the current status of information.

When installing a new vehicle battery, the battery must be registered and thus must also be registered with the vehicle electrical system.

Diagnosis system:

Register battery replacement

- Service functions
- Body
- Voltage supply
- Register battery replacement
- Test plan

When retrofitting, a more powerful battery may be used. Standard batteries may always be replaced by AGM batteries with the same specifications.

When installing a battery of a different size or a different battery type, this change in vehicle data must be programmed into the vehicle data in accordance with specifications.

Programming system:

- Battery retrofitting

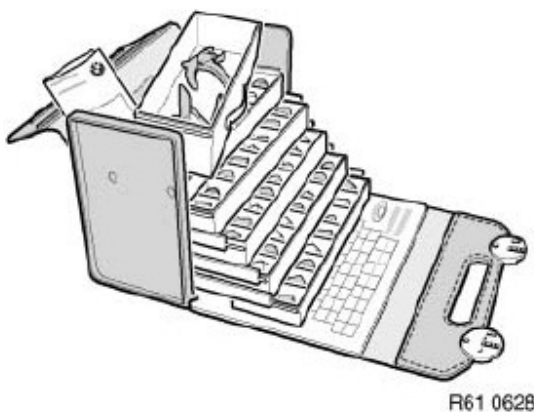
61 13 ... BUTT CONNECTOR FOR REPAIRING A PLUG CONNECTION

- IMPORTANT:**
1. Identify cause of damage (e.g. sharp-edged body parts, faulty electrical loads, jammed mechanisms, corrosion caused by ingress of water, etc.).
 2. Read out fault memory
 3. Eliminate cause of damage.
 4. Disconnect battery negative terminal
 5. Make sure that no safety-related system according to circuit diagram (e.g. antilock braking system, active rear-axle kinematics, airbags, etc.) are influenced.

Otherwise replace faulty wiring harness or use repair cable (sourcing reference: BMW Parts Service)

6. Carry out function test and read out fault memories again
7. Eliminate new faults if applicable and clear fault memories

NOTE: The repair range IV for vehicle electrical system contained the required special tools and individual parts for retrofitting and repair work with the aid of fan connectors.

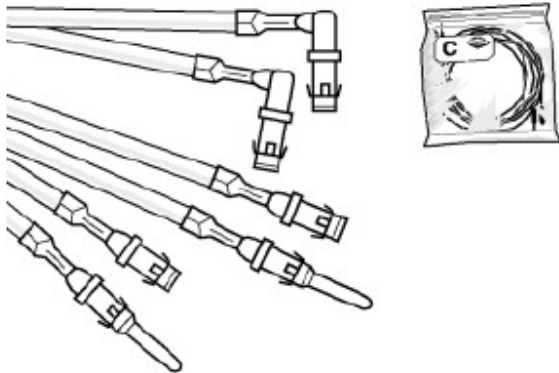


R61 0628

Fig. 1: Identifying Wiring Harness Repair Kit
Courtesy of BMW OF NORTH AMERICA, INC.

Choose repair kit.

Example: Repair kit, circular plug system D 2.5.

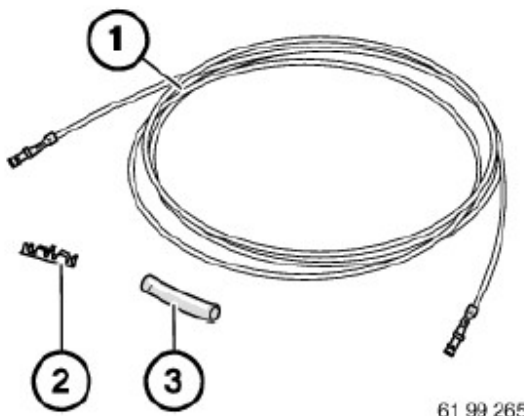


R61 99 257

Fig. 2: Identifying Repair Kit, Circular Plug System D 2.5
Courtesy of BMW OF NORTH AMERICA, INC.

Remove following parts

1. Pre-packaged end of cable with requisite wire cross-section
2. Crimp connector for selected wire cross-section
3. Shrink-fit hose



61 99 265

Fig. 3: Identifying Cable With Wire Cross-Section, Crimp Connector And Shrink-Fit Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Open secondary lock on housing.

Mark damaged contact (4) with socket number of housing and press it out of housing using appropriate special tool contained in special tool kit 61 0 300).

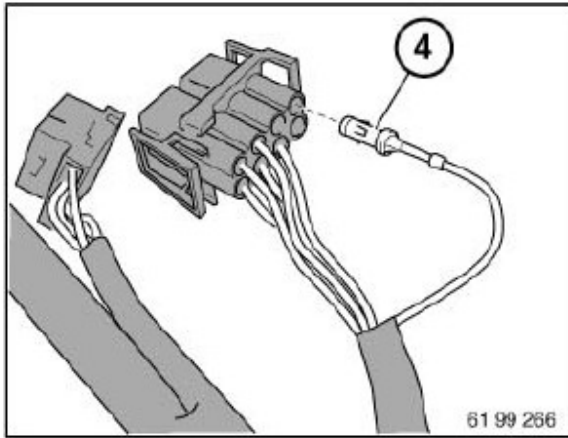


Fig. 4: Identifying Damaged Cable With Socket Number
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT:

- Check maximum length of repair cable
- If more than one wire is to be repaired, the individual interfaces must be offset so that the wiring harness is not too thick at the repaired point.

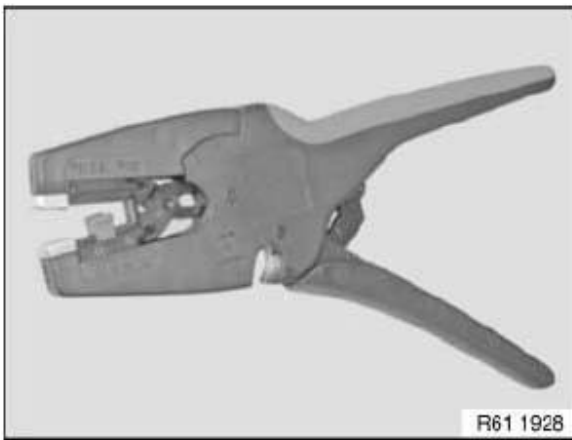


Fig. 5: Identifying Special Tool
 Courtesy of BMW OF NORTH AMERICA, INC.

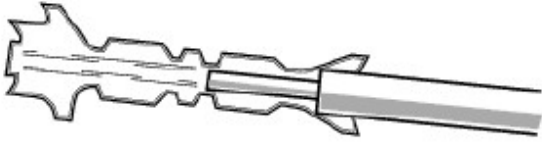
Adhere to following procedure

- Cut off wire with faulty contact at point which is easily accessible
- Strip insulation from end of wire at wiring harness end
- Cut preassembled wire end to length and strip insulation

Crimp butt connector on preassembled wire end.

Special tools:

- 61 4 328 (0.35 - 2.5 mm²)
- 61 0 240 (4.0 - 6.0 mm²)



61 99 270

Fig. 6: Identifying Crimp Butt Connector On Preassembled Wire End
 Courtesy of BMW OF NORTH AMERICA, INC.

Push shrink-fit hose (8) onto free wire end.

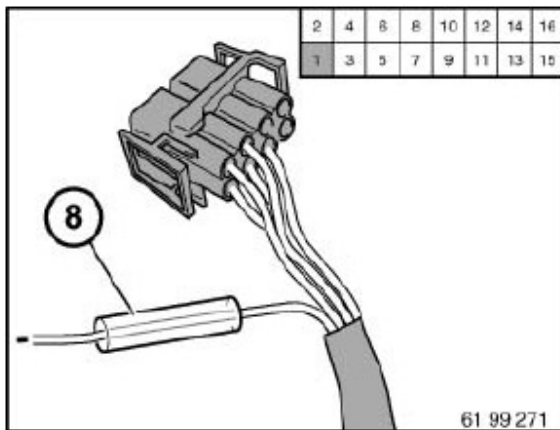


Fig. 7: Identifying Shrink-Fit Hose On Free Wire End
 Courtesy of BMW OF NORTH AMERICA, INC.

Crimp unused wire end to butt connector.

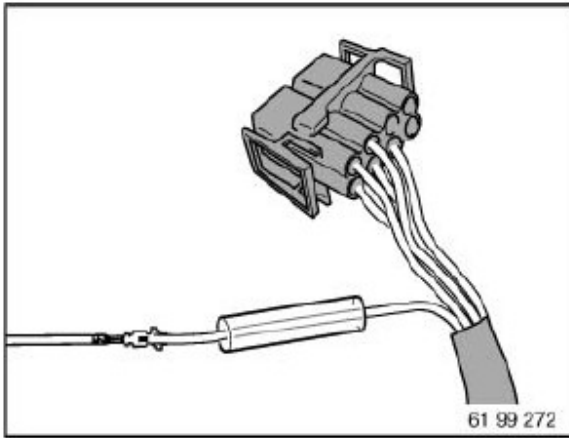


Fig. 8: Crimping Unused Wire End To Butt Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Pull shrink-on sleeve over butt connector.

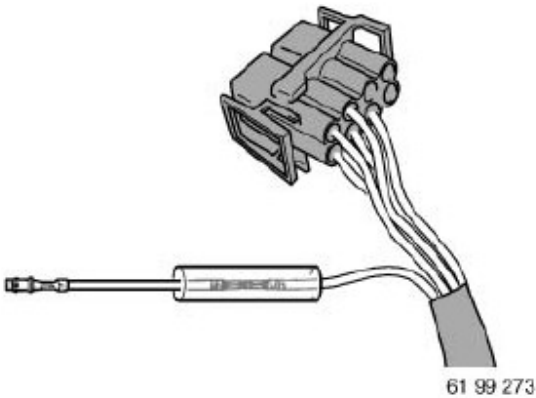


Fig. 9: Identifying Shrink-On Sleeve Over Butt Connector
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not burn shrink-on sleeve.

With hot air blower, shrink the shrink-on sleeve on both sides (9) of shrink-fit hose until glue emerges uniformly all round.

Insert contact in housing.

Close secondary lock on housing.

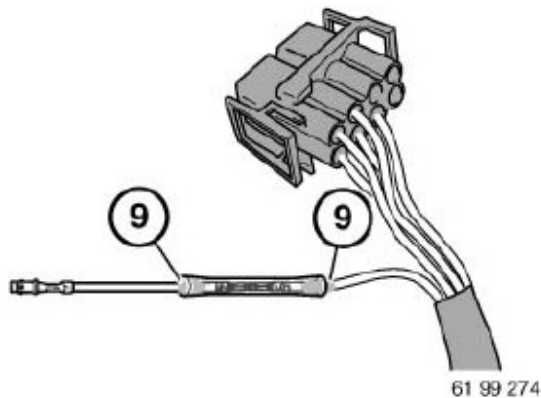


Fig. 10: Identifying Shrink-On Sleeve Ends
 Courtesy of BMW OF NORTH AMERICA, INC.

12 00 ... INSTRUCTIONS FOR WORKING ON THE IGNITION SYSTEM

CAUTION: Always switch off ignition before working on ignition system.
 Use only test leads which have been approved and belong to these testing instruments (e.g. DIS Tester).
 Comply with operating instructions of the respective testing instrument used.
 Comply with the country-specific safety regulations.
 Never touch components under current with engine running!
 Comply with instructions of DIS tester.
 Do not connect any suppression capacitors or inspection lamps to terminal 1 on the ignition coil.
 Terminal 1 of ignition coil must not be connected to ground or battery positive lead.
 If an alarm system is subsequently installed, lead of terminal 1 must not be used for start prevention.
 When working on ignition system, always disconnect supply leads to ignition coils.

High tension! - High tension!

IMPORTANT: Hazardous voltages occur at:

- Ignition lead
- spark-plug connectors
- spark plugs
- Ignition coil (high voltage at terminal 4 is approx. 40 kV)
- Lead of terminal 1 from ignition coil to DME control unit (high voltage approx. 350 V)

12 13 NOTES ON CHECKING IGNITION SYSTEM

Troubleshooting

- Fault in fuel injection system
- Spark plug faults
- Ignition coil faults
- Further fault patterns with evaluation
- Additional fault notes for troubleshooting

Oscillograms

- Normal oscillators
- Oscillograms of ignition coils from different manufacturers

Check

- Secondary signal for stationary ignition distribution

61 00 ... NOTES ON HANDLING WIRING HARNESSES AND CABLES

The following applies in general

To avoid damage, observe the following instructions:

- Avoid compressive and tensile loads
- Make sure cables are laid without kinks or abrasions
- Ensure non-contacting routing at sharp-edged body components; use edge protection if necessary
- Secure additionally laid cables/lines with cable straps

The following additionally applies

Shielded lines

Contact points in the shield can cause problems with regard to noise radiation and interference immunity. Consequently, distinctions have to be drawn between the following types:

Coaxial line

- Shielded RTK031 coaxial lines may only be repaired with special crimping tools .

CVBS lines

- CVBS lines may not be repaired.
- CVBS lines must be replaced in their entirety.

HSD lines

- HSD lines may not be repaired.
- HSD lines must be replaced in their entirety.

Optical fibre cable:

NOTE: **Optical fibre cables are colored differently as follows:**

- Green = **MOST** (**M**edia **O**riented **S**ystems **T**ransport) optical fibre
- Yellow = **ISIS** (**I**ntelligent **S**afety **I**ntegration **S**ystem) optical fibre
- Orange = repair optical fibre cables

IMPORTANT:

- **Optical fibre cables are permitted to show only one separation point (bridge), replace optical fibre cables if necessary**
- **Smallest permissible bending radius is 25 mm**
- **Avoid influence of heat = 85°**

Treating cables and optical fibre cables

FlexRay:

It is possible to repair the FlexRay. In the event of damage, the cables can be joined with conventional butt connectors.

NOTE:

- **The line is a twisted cable. If possible, maintain twist in line after repair.**

Airbag lines:

Repairing airbag cables

Ribbon cables:

Repairing ribbon cables Z

61 00 ... NOTES ON HANDLING WIRING HARNESSES AND CABLES

The following applies in general

To avoid damage, observe the following instructions:

- Avoid compressive and tensile loads
- To ensure professional repairs, perform repair work only with BMW-approved or recommended special tools and spare parts

- Make sure cables are laid without kinks or abrasions
- Ensure non-contacting routing at sharp-edged body parts; use edge protection if necessary
- Secure additionally laid cables/leads with cable ties

The following additionally applies

Shielded lines (coaxial lines):

IMPORTANT: Shielded lines may not be repaired!

- This may lead to indifferences in noise radiation and interference immunity at contact points in the shield
- To satisfy the requirements of the type approval, it is essential to replace shielded cables completely

Fibre-optic cable:

NOTE: Fibre-optic cables are colored differently as follows:

- Green = **MOST** (Media Oriented Systems Transport) optical fibre
- Yellow = **ISIS** (Intelligent Safety Integration System) optical fibre
- Orange=repair fibre-optic cables

IMPORTANT:

- Optical fibres may only reveal one separation point (bridge); renew optical fibre if necessary
- Smallest permissible bending radius is 25 mm
- Avoid effects of heat > or = 85°

FlexRay:

It is possible to repair the FlexRay. In the event of damage, the cables can be joined with conventional **BUTT CONNECTORS AND HEAT-SHRINK HOSES** .

NOTE:

- FlexRay lines may only reveal one separation point (bride); renew complete line if necessary
- The cable is a twisted cable. If possible, maintain twisted cable after repair

12 00 ... NOTES/INFORMATION ON REMOVING AND INSTALLING CONTROL UNITS

IMPORTANT:

- Disconnecting the vehicle battery will cancel the fault memories of control units. Consequently, before disconnecting the car's battery, always interrogate the fault memories. Investigate stored faults and, once any

faults have been remedied, cancel the fault memory.

- **Control unit plugs should only ever be connected and disconnected while the ignition is turned off.**
- **The removal and installation of components, relays, fuses etc. can cause faults to be stored in fault memories capable of self diagnosis. Always interrogate the fault memories after completing work on the electrical system.**
- **Investigate stored faults and, once any faults have been remedied, cancel the fault memory.**
- **If necessary, initialize power window units**

When replacing the DME/DDE control unit, observe the following:

- In each case read out the hardware/software status of the relevant control unit using the BMW diagnosis system.

Comply with the instructions of the DIS diagnosis system on the steps pertaining to coding and programming.

On vehicles with electronic vehicle immobilization, comply with the instructions of the BMW diagnosis system.

- Each control unit is programmed with certain basic values, which serve as mean values. The control unit receives different input values, depending on engine condition, which are compared with the stored values. The adaptive system compares the input values with the stored map values. The control commands are routed to the relevant actuators.
- If the DME control unit is without current for a long time (more than one hour), its adaptive system loses the stored values. When a cleared control unit is restarted or a new control unit is installed, the adaptive system must read in and store the input values of the associated engine as new basic values itself.
- This procedure could lead to erratic idling and disturbed overrunning of the engine after starting. Depending on the engine it could require some time before all values are adapted to the engine condition.
- Therefore observe the following procedure before replacing or reinstalling a DME/DDE control unit:
 1. If possible before exchanging control unit, run engine up to operating temperature.
 2. Exchange control units and run the vehicle at alternating engine speeds.

12 00 ... NOTES/INFORMATION ON START ASSISTANCE (JUMP STARTING)

Do not start the engine with help of starting sprays.

Preparation

Conform with the following when starting the engine with a jump starting cable.

- Ensure that the jump starting cable wires are of appropriate cross-section size.

- Only use fuse-protected jump starting cables.
- Check whether the current-supplying battery has 12 V voltage.
- If the engine is started from the battery of another vehicle, ensure that there is no contact between the bodies of both vehicles.

IMPORTANT: Never touch electrically live ignition system components: high voltage - danger of injury!

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

Operation

It is essential to conform to the procedures so as to avoid injury to persons or damage to parts.

- Automatic transmission: select drive position "P", apply parking brake.
- Manual transmission: move gear lever to neutral position, apply parking brake.
- Ensure that the jump leads cannot get caught in rotating parts, e.g. fan.
- First connect both positive poles of the batteries with one jump starting cable (red).
- Use the battery positive terminal in the engine compartment for vehicles with the battery in the luggage compartment.
- Then use the second jump starting cable (black) to connect the negative post of the current-supplying battery with the earth/ground point (not the negative pole or the body) of the vehicle to be started.

IMPORTANT: Do not connect the second jump starting cable (black) with the negative pole of the battery in the vehicle to be started. Produced gas could be ignited by sparks.

Risk of explosion!

After the engine of the vehicle to be started has fired, first disconnect the jump starting cable between the negative pole and the earth/ground point. Then remove the starting cable from the positive poles.

00 SAFETY INFORMATION FOR WORKING ON VEHICLES WITH AUTOMATIC ENGINE START-STOP FUNCTION (MSA)

WARNING: If the engine hood/bonnet contact is pulled upwards (workshop mode), the information "switch closed" is output. The automatic engine start-stop function is active.

An automatic engine start is possible.

Observe safety precautions when working on MSA vehicles

Before carrying out practical work on the engine, always ensure that the MSA functionality is deactivated so as to prevent automatic engine starting while work is being carried out in the engine compartment.

MSA function is deactivated by

- Deactivate MSA by means of button (1) in passenger compartment
- Open seat belt buckle and driver's door

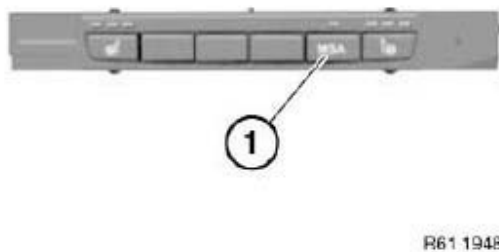


Fig. 11: Identifying MSA Switch In Passenger Compartment
Courtesy of BMW OF NORTH AMERICA, INC.

- Open engine bonnet/hood and ensure that engine hood/bonnet contact is not in workshop mode
 - Workshop mode

A = 10 mm

- Basic setting (engine hood/bonnet open)

B = 7 mm

To make sure that the engine hood/bonnet contact is at the basic setting, if necessary press the hood/bonnet contact up to the limit position before starting work and slowly release.

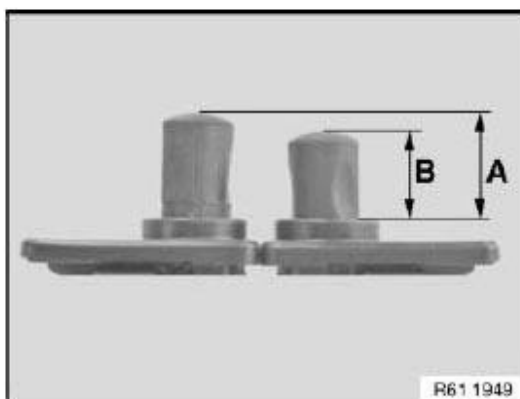


Fig. 12: Identifying Engine Hood/Bonnet Basic Setting And Workshop Mode
Courtesy of BMW OF NORTH AMERICA, INC.

When working with diagnosis tools

- Observe instructions in diagnosis tool

1212 IGNITION WIRES, SPARK PLUGS

12 12 011 REPLACING ALL SPARK PLUGS (N54)

Necessary preliminary work

- Switch off ignition.
- Remove IGNITION COILS .

IMPORTANT: Wear safety goggles.

Oil and dirt particles may get into your eyes!

Clean spark plug slot with compressed air.

Unscrew the spark plugs with special tool 12 1 220 and an extension with a minimum kink of 8°.

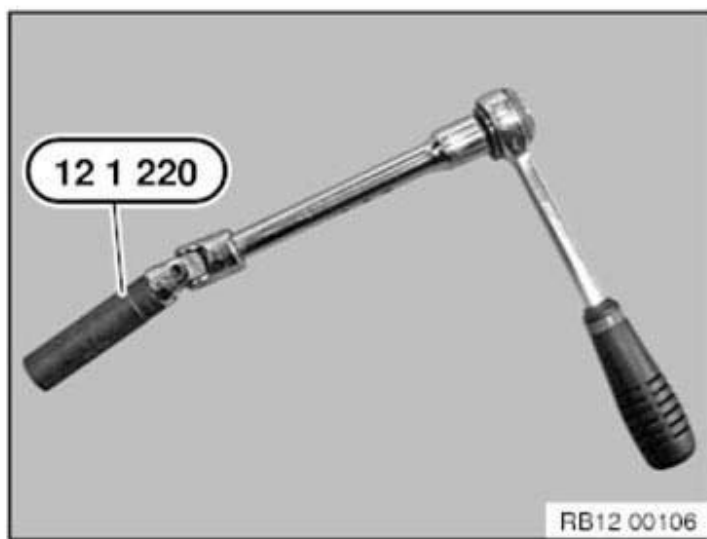


Fig. 13: Removing Spark Plugs Using Special Tool (12 1 220)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach new spark plug (1) 12 1 230 to special tool.

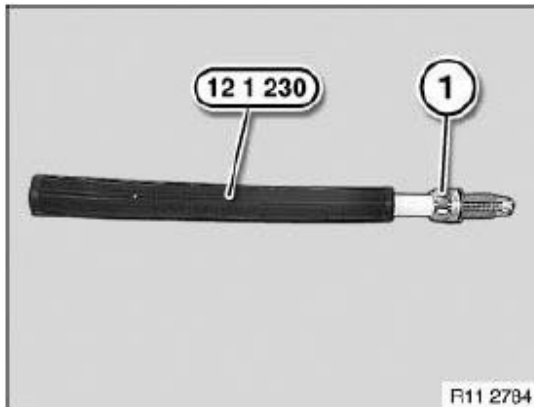


Fig. 14: Attaching Spark Plug To Special Tool (12 1 230)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw the spark plug hand-tight with special tool **12 1 230** into the cylinder head plug thread to the limit position.

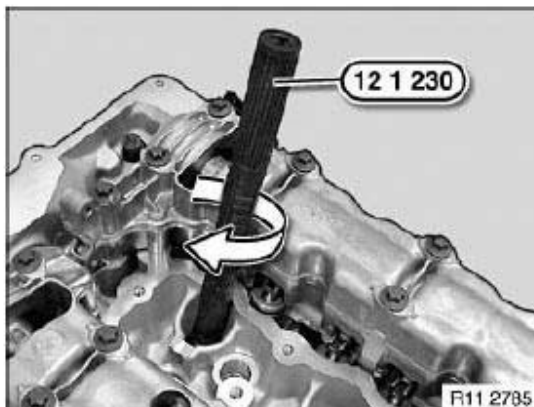


Fig. 15: Installing Spark Plug Using Special Tool (12 1 230)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Tighten the spark plugs with a torque wrench, special tool **12 1 220** and an extension with a minimum kink of 8°.

Observe tightening torque.

Tightening torque **12 12 2AZ** .

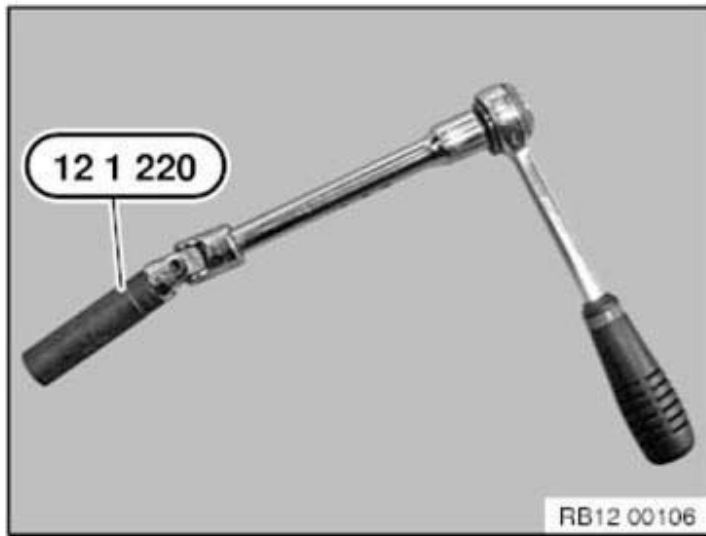


Fig. 16: Removing Spark Plugs Using Special Tool (12 1 220)
Courtesy of BMW OF NORTH AMERICA, INC.

1213 IGNITION COIL

12 13 CARRYING OUT ENGINE CLEANING (N54, N53, N43)

IMPORTANT: When cleaning the engine, it is absolutely essential to keep the ignition coil covers fitted in order to protect the injectors.

12 13 NOTES ON CHECKING IGNITION SYSTEM

Troubleshooting

- Fault in fuel injection system
- Spark plug faults
- Ignition coil faults
- Further fault patterns with evaluation
- Additional fault notes for troubleshooting

Oscillograms

- Normal oscillators
- Oscillograms of ignition coils from different manufacturers

Check

- Secondary signal for stationary ignition distribution

12 13 511 REPLACING IGNITION COILS (N54)

Necessary preliminary tasks

- Read out fault memory of DME control unit.
- Switch off ignition.
- Remove ACOUSTIC COVER
- Remove right TENSION STRUT

IMPORTANT: Ignition coils must not be fouled by fuel.

The resistance of the silicone material is reduced significantly by contact with fuel, which may cause the ignition coil to fail!

Unlock plug catch (1) of ignition coil (2) and disconnect plug.

Pull ignition coil (2) up and out.

This procedure is applicable to all ignition coils.

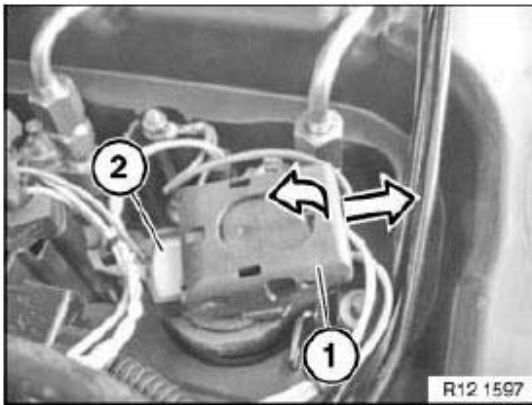


Fig. 17: Removing Ignition Coil

Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check that rubber seal of ignition coil (1) is correctly seated.

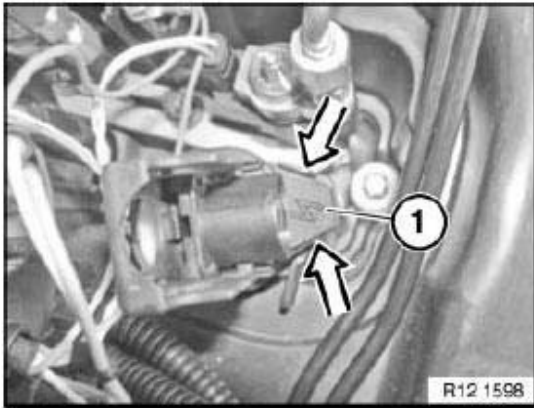


Fig. 18: Identifying Ignition Coil Rubber Seal
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Push plug (1) with plug catch (2) open onto ignition coil.

Carefully close plug catch (2) in direction of arrow.

The plug catch must snap into place without great effort.

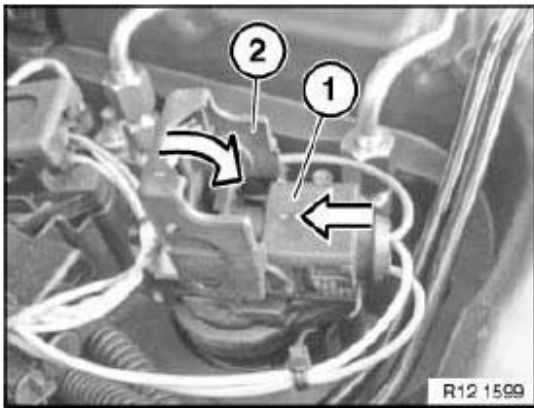


Fig. 19: Closing Plug Catch
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Now clear the fault memory.

1214 ELECTRONIC SWITCHING OR CONTROL UNITS

12 14 700 CODING CONTROL MODULE (DME/DDE)

Switch on ignition.

Connect MoDiC or DIS/GT1 Tester.

Select "Coding" program.

For subsequent procedure, follow

instructions in MoDiC or DIS/GT1 Tester. Carry out adjustment of following control units:

- EWS (electronic immobilizer)
- DME (Digital Motor Electronics)

or

- DDE (Digital Diesel Electronics)

Refer to "Diagnosis and Coding" service information bulletins on subject of coding.

12 14 705 PROGRAMMING CONTROL UNIT (DME/DDE)

Switch on ignition.

Connect MoDiC or DIS/GT1 Tester.

Select "Programming".

For subsequent procedure, follow instructions in MoDiC or DIS/GT1 Tester.

Carry out adjustment of following control units:

- EWS (electronic immobilizer)
- DME (Digital Motor Electronics)

or

- DDE (Digital Diesel Electronics)

Refer to "Diagnosis and Coding" service information bulletins on subject of programming.

12 14 600 REMOVING/REPLACING KNOCK SENSORS (N54)

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released.

Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:

Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks

- Read out fault memory of DME control unit.
- Switch off ignition.
- Remove **INTAKE AIR MANIFOLD** .

Unlock plug (1) and remove.

Feed out plug (1) behind feed line, remove **FEED LINE** if necessary.

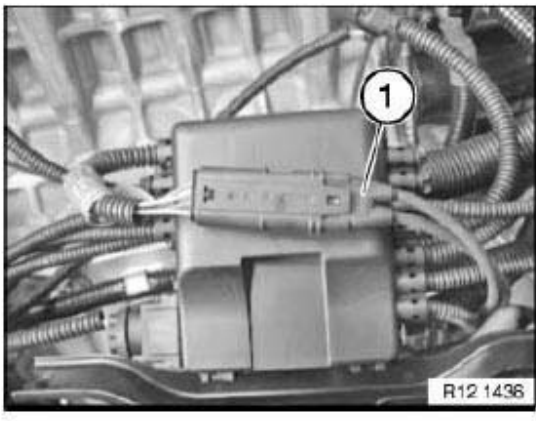


Fig. 20: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws on both knock sensors (1) and remove knock sensors (1).

Installation:

- Replace aluminum screws.
- Tightening torque **13 62 5AZ** .

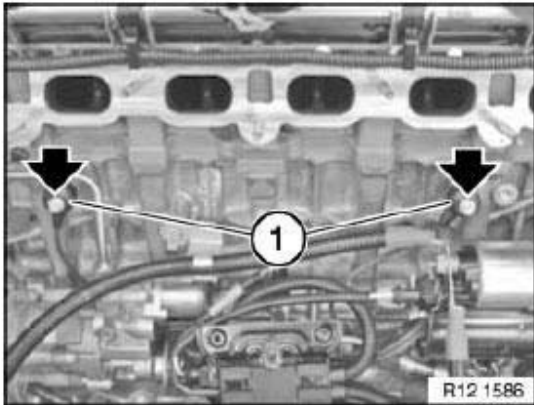


Fig. 21: Locating Knock Sensors
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Clean contact surface of knock sensors on engine block.

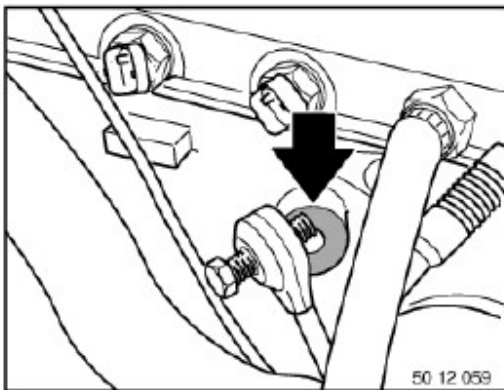


Fig. 22: Locating Contact Surface Of Knock Sensors On Engine Block
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Add final details to vehicle.

Check stored fault message.

Now clear the fault memory.

12 14 550 REPLACING CONTROL UNIT (DME) (N54)

IMPORTANT: Read and comply with notes on protection against electrostatic damage (**ESD PROTECTION (ELECTRO STATIC DISCHARGE))**)

Necessary preliminary tasks

- Turn off ignition
- Disconnect **BATTERY NEGATIVE LEAD**

IMPORTANT: Follow INSTRUCTIONS for removing and installing control units

Replacement

- Carry out programming/encoding
- If no data can be read out from the previous control unit, carry out injection quantity adjustment (description at end of instruction).

IMPORTANT: It is absolutely essential to read out the fault memory with the BMW diagnosis system and to create a fault memory printout.

Switch off ignition.

Release bolts along line (1).

Tightening torque **12 90 1AZ** .

Remove electronics box cover.

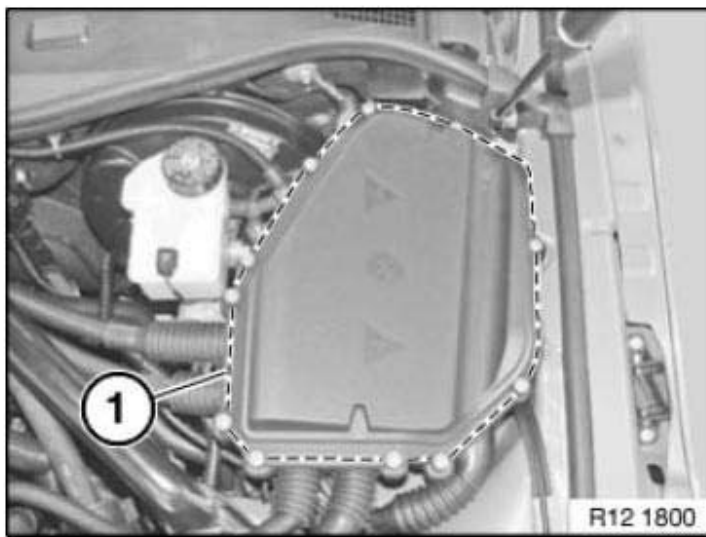


Fig. 23: Identifying Electronic Box Cover Mounting Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock battery positive lead (1), detach and lay to one side.

Release locks (2) in direction of arrow and pull control unit upwards slightly.

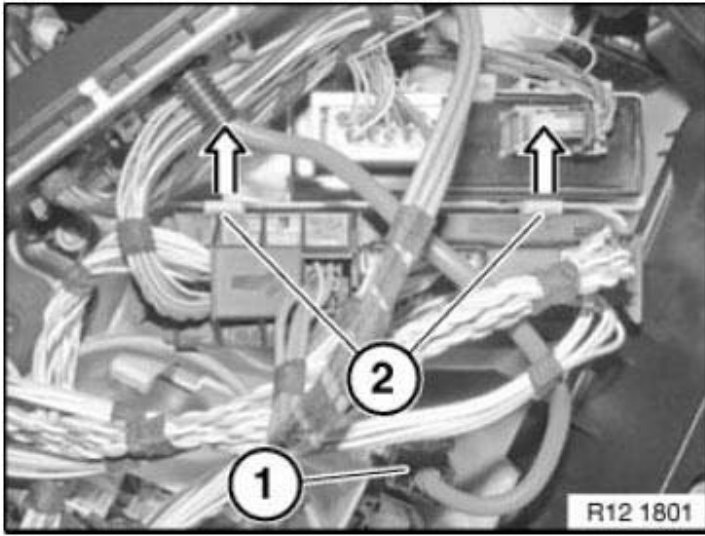


Fig. 24: Opening Control Unit Locks
 Courtesy of BMW OF NORTH AMERICA, INC.

Pull control unit (1) upwards slightly until plug (2) can be released from control unit in direction of arrow.

Unlock plug (2) and detach from control unit (1).

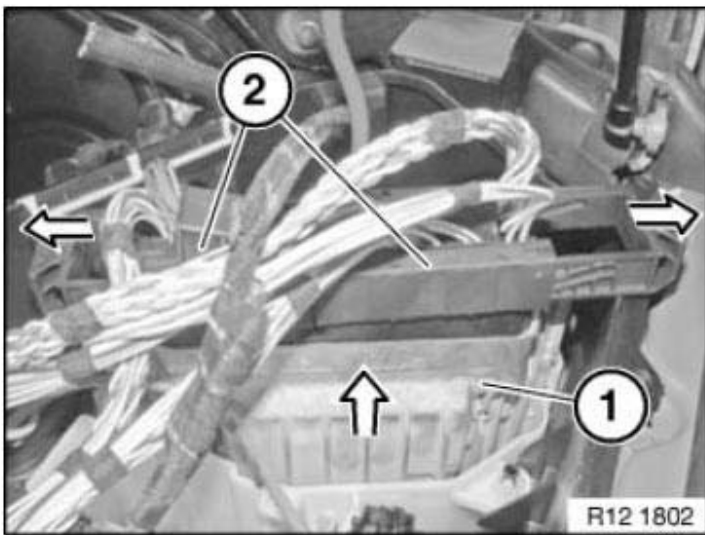


Fig. 25: Pulling Control Unit Upwards
 Courtesy of BMW OF NORTH AMERICA, INC.

Lift out control unit (1).

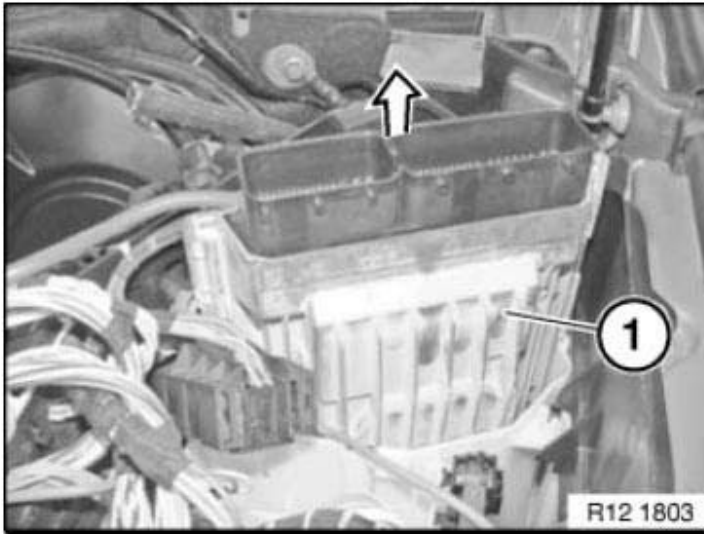


Fig. 26: Lifting Control Unit
 Courtesy of BMW OF NORTH AMERICA, INC.

Injector adjustment

If the DME control unit has been replaced, it will also be necessary to carry out adjustment of the injectors!

Injector adjustment is carried out with the aid of so-called adjustment values.

The adjustment values are printed in two blocks of three digits on each injector.

The adjustment values must be stored in the new control unit!

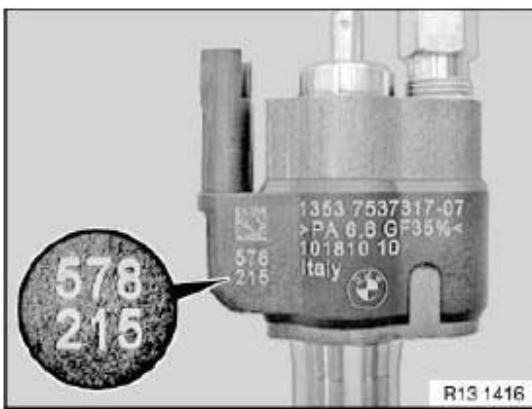


Fig. 27: Identifying Adjustment Value Printed In Blocks Of Digits On Injector
 Courtesy of BMW OF NORTH AMERICA, INC.

If injector adjustment is not carried out, the engine may run roughly or fail to start.

Read off the adjustment values and enter according to the installation location (cylinder) of the injectors:

- Connect DIS Tester
- Identify car
- Select "Function selection"
- Select "Service functions"
- Select "Engine electronics"
- Select "Adjustment programs"
- Select "Adjust injectors"
- Select "Test schedule"
- The adjustment value must be entered for each cylinder.



Fig. 28: Identifying Adjustment Value Printed In Blocks Of Digits On Injector
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check stored fault message.
clear fault memory.

12 14 521 REPLACING CRANKSHAFT PULSE GENERATOR (N54)

IMPORTANT: Read and comply with notes on ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released.

Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:

Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks

- Read out fault memory of DME control unit
- Switch off ignition

NOTE: **Installation location of pulse generator for crankshaft is underneath starter motor.**

Detach plug (1) from crankshaft pulse generator (2).

Release screw.

Installation:

Replace aluminum screws.

Tightening torque **13 62 4AZ** .

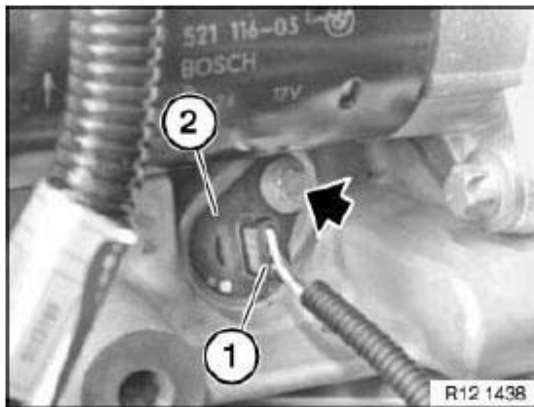


Fig. 29: Locating Crankshaft Pulse Generator With Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw pulse generator (2) from crankcase.

Installation:

Replace sealing ring.

NOTE: **Check stored fault messages.**
 Now clear the fault memory.

12 14 524 REPLACING PULSE GENERATOR ON EXHAUST CAMSHAFT (N54)

IMPORTANT: Read and comply with notes on **ESD PROTECTION (ELECTRO STATIC**

DISCHARGE) .

Necessary preliminary tasks

- Read out fault memory of DME control unit
- Switch off ignition
- Remove **FAN COWL**

Unlock plug (1) and remove.

Release screw.

Tightening torque **13 62 3AZ)** .

Remove pulse generator (2).

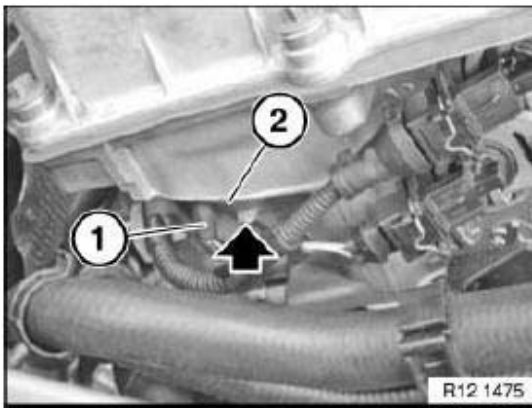


Fig. 30: Locating Plug And Pulse Generator
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Check stored fault messages.
Now clear the fault memory.**

12 14 523 REPLACING PULSE GENERATOR ON INLET CAMSHAFT (N54)

IMPORTANT: Read and comply with notes on **ESD PROTECTION (ELECTRO STATIC DISCHARGE)** .

Necessary preliminary tasks

- Read out fault memory of DME control unit
- Switch off ignition
- **REMOVE FAN COWL**

Unlock plug (1) and remove.

Release screw.

Tightening torque **13 62 3AZ** .

Remove pulse generator (2).

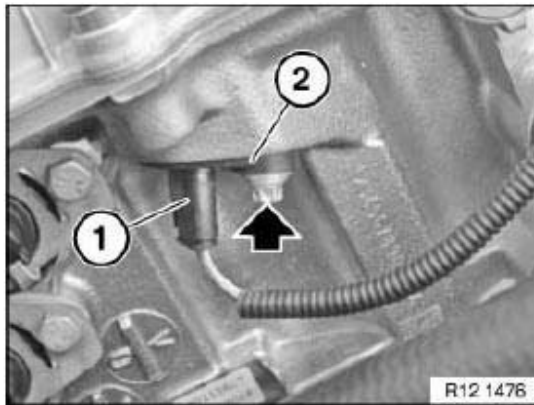


Fig. 31: Locating Pulse Generator With Plug
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Check stored fault messages.
Now clear the fault memory.**

12 14 651 REPLACING SUCTION PRESSURE SENSOR ON CHARGE-AIR DUCT (N54)

Necessary preliminary tasks

- Read out fault memory of DME control unit
- Switch off ignition
- Remove **INTAKE FILTER HOUSING**

NOTE: **The installation location of the suction pressure sensor is at the rear end of the charge-air duct.**

Unlock plug (1) and remove.

Release screws and pull suction pressure sensor (2) out of charge-air duct.

Tightening torque **13 62 2AZ** .

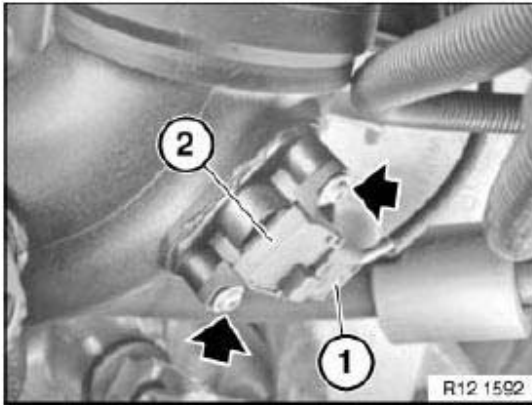


Fig. 32: Identifying Suction Pressure Sensor And Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check sealing ring for damage. Replace sealing ring if damaged.

When installing, coat sealing ring with suitable antiseize agent.



Fig. 33: Locating Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Add final details to vehicle.**
 Check stored fault messages.
 Now clear the fault memory.

12 14 650 REPLACING SUCTION PRESSURE SENSOR ON INTAKE AIR MANIFOLD (N54)

Necessary preliminary tasks

- Read out fault memory of DME control unit

- Switch off ignition

NOTE: The installation location of the suction pressure sensor is at the rear end of the intake air manifold.

Unlock plug (1) and remove.

Release screws and pull suction pressure sensor (2) out of intake air housing.

Tightening torque 13 62 2AZ .

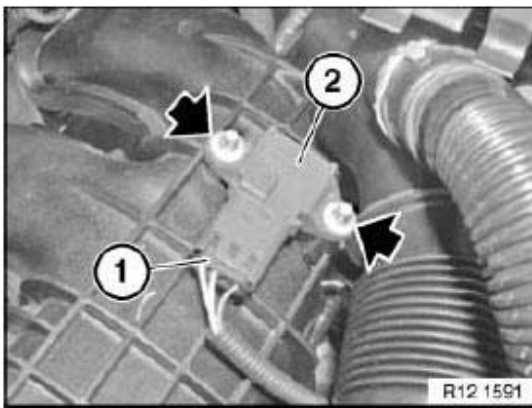


Fig. 34: Identifying Suction Pressure Sensor And Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check sealing ring for damage. Replace sealing ring if damaged.

When installing, coat sealing ring with suitable antiseize agent.

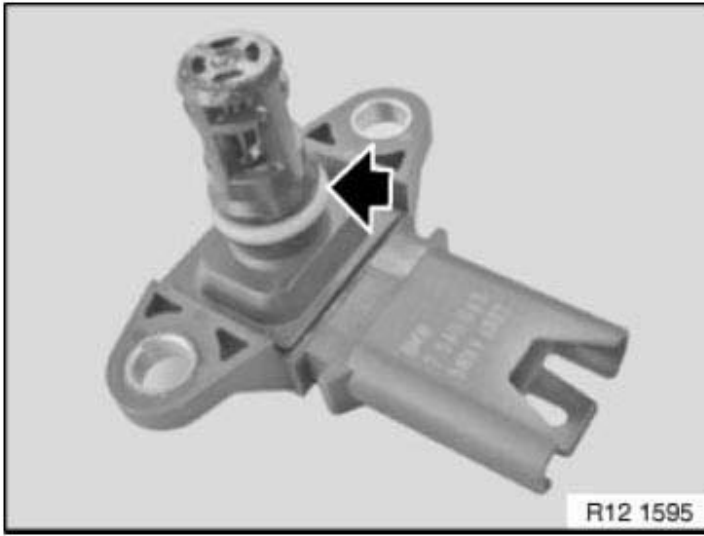


Fig. 35: Locating Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check stored fault messages.
Now clear the fault memory.

1231 ALTERNATOR WITH DRIVE AND MOUNTING

12 31 020 REMOVING AND INSTALLING OR REPLACING ALTERNATOR (N54)

Necessary preliminary tasks

- Turn off ignition
- Disconnect **BATTERY NEGATIVE LEAD** and cover
- Remove **INTAKE FILTER HOUSING**
- Release **CHARGE-AIR DUCT** at front, do not remove
- Remove alternator **DRIVE BELT**

NOTE: In order to remove the alternator, it is necessary to remove the air-conditioning compressor for the air conditioning system.
In so doing:

- Do not draw off A/C system refrigerant.
- Do not detach refrigerant lines from A/C compressor.
- Do not remove A/C compressor; instead, remove from bracket only and place to one side.

See **64 52 521 REPLACING AIR CONDITIONING COMPRESSOR (N54)** .

NOTE: For purposes of improved clarity, illustrations and description show A/C compressor removed.

Release bolts a few turns until bracket (1) is loose. Do **not** remove bracket (1).

Tightening torque, see 64 52 A/C COMPRESSOR .

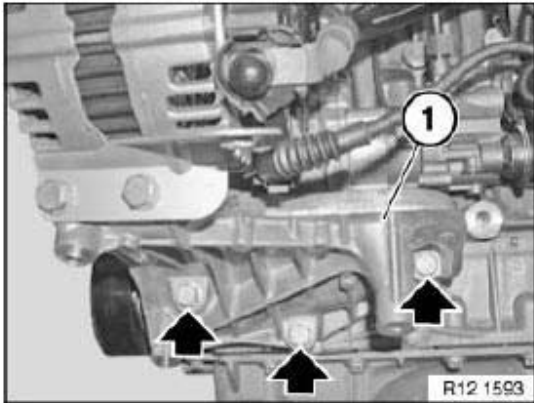


Fig. 36: Locating Bracket Mounting Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug (1) and remove.

Remove protective cap (2) and release nut underneath.

Tightening torque 12 42 1AZ .

Remove battery positive lead.

Release screws (3).

Tightening torque 12 31 1AZ .

Tightening torque 12 31 2AZ .

Remove alternator.

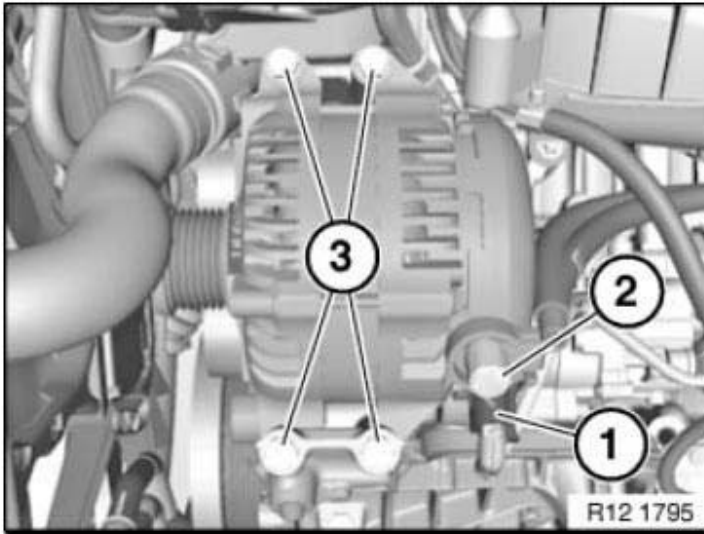


Fig. 37: Identifying Alternator Plug And Protective Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

12 31 ... REPLACING ALTERNATOR BELT PULLEY

Remove and install alternator drive belt.

Depending on alternator type, grip shaft with:

- hexagon socket
- multi-tooth socket or
- Torx socket wrench

Release nut with special tool 12 7 110.

Installation:

TIGHTENING TORQUE, 12 31 2AZ/12 31 3AZ .

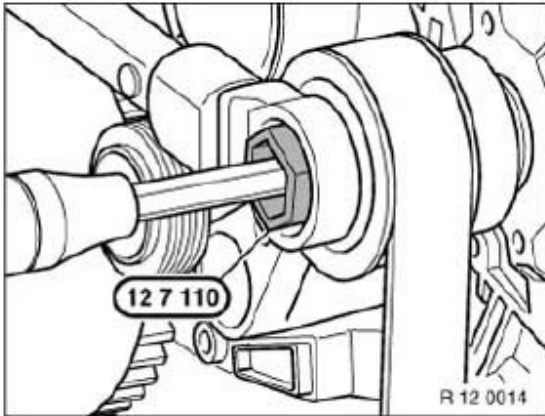


Fig. 38: Removing Belt Pulley Mounting Nut Using Special Tool (12 7 110)
 Courtesy of BMW OF NORTH AMERICA, INC.

12 31 ... REPLACING ALTERNATOR BELT PULLEY (WITH OVERRUNNING CLUTCH)

Remove and install alternator drive belt.

Grip alternator shaft with:

- internal serration

Release nut with special tools 12 7 120.

Installation:

Tightening torque, see 12 31 3AZ in **12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS** .

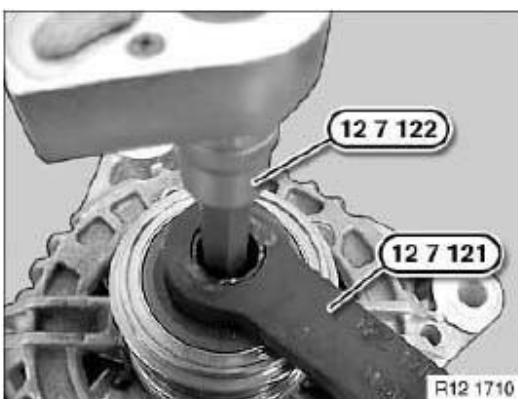


Fig. 39: Removing Nut Using Special Tools (12 7 120)
 Courtesy of BMW OF NORTH AMERICA, INC.

1232 REGULATOR

12 32 501 REPLACING VOLTAGE REGULATOR

Necessary preliminary tasks

- Switch off ignition
- Disconnect **BATTERY NEGATIVE LEAD**
- Remove alternator

Bosch

Release protective caps (1).

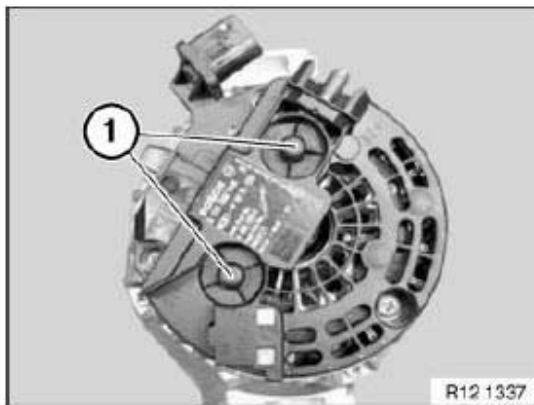


Fig. 40: Identifying Protective Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Bosch

Release screw (1) and nuts (2), remove cover.

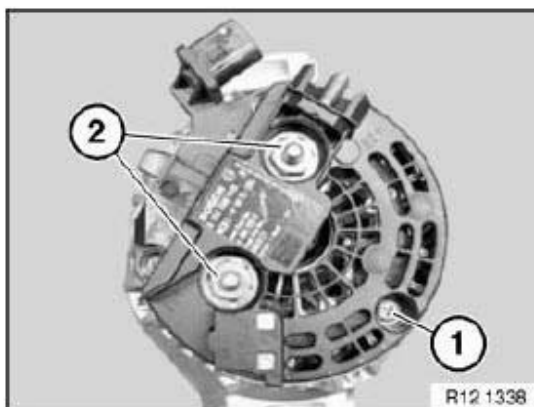


Fig. 41: Identifying Screw And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Bosch

Release screws and remove regulator switch (1) in direction of arrow.

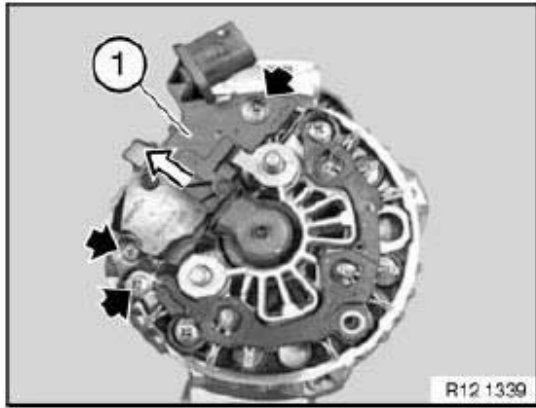


Fig. 42: Removing Regulator Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Bosch

Installation:

Clean contact surfaces and check pretension of contact spring, replace regulator switch if necessary.

Measurement A = min. 5 mm.

Check collector ring for wear and recondition if necessary.

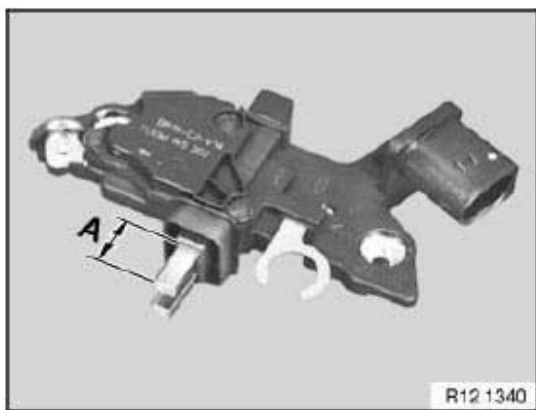


Fig. 43: Identifying Regulator Switch Dimensions
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo

Slacken nut (1).

Slacken nut (2).

Release screws (3).

Release cover (4).

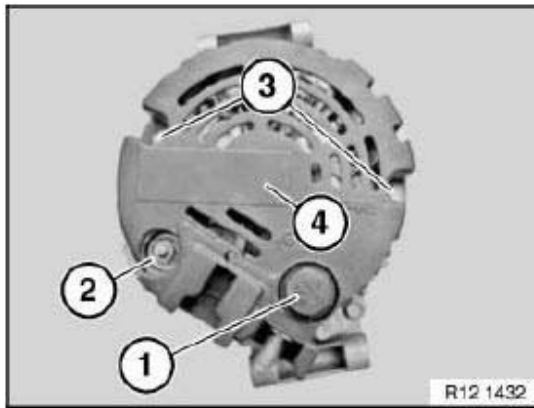


Fig. 44: Identifying Nut, Screw And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo

Release screws.

Remove regulator switch (1) towards top.

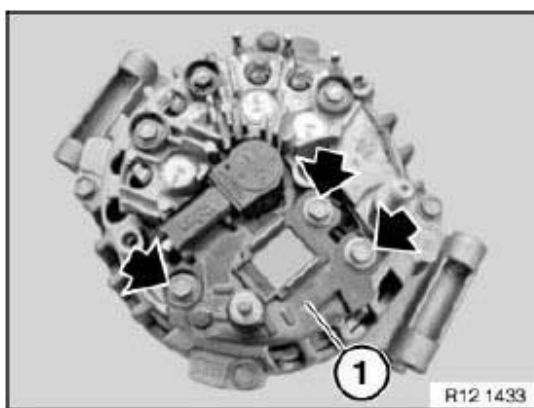


Fig. 45: Locating Regulator Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo

Installation:

Clean contact surfaces and check pretension of contact spring, replace regulator switch if necessary.

Measurement A = min. 5 mm.

Check collector ring for wear and recondition if necessary.

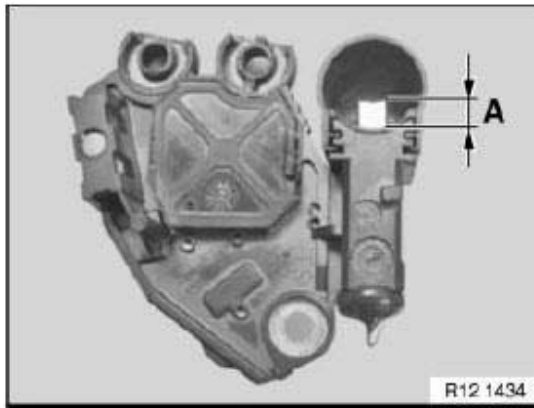


Fig. 46: Identifying Regulator Switch Dimension
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit new regulator (1) with attached mounting sleeve (2) or locked carbon brush.

Pull off mounting sleeve (2) and replace with cover (3).

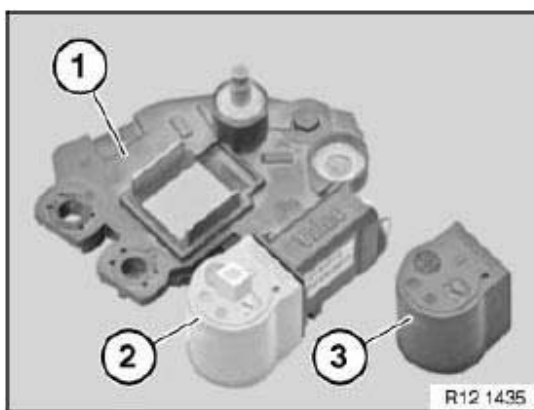


Fig. 47: Identifying Regulator, Mounting Sleeve And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

1241 STARTER WITH MOUNTING

12 41 020 REMOVING AND INSTALLING/REPLACING STARTER MOTOR (N54)

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released.

Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:

Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks

- Switch off ignition
- Disconnect **BATTERY NEGATIVE LEAD**
- Remove **INTAKE AIR MANIFOLD**

Unlock plug (1) and remove.

Release nuts (2) and disconnect battery positive leads.

Tightening torque **12 42 2AZ** .

Release screws (3).

Installation:

Replace aluminum screws.

Tightening torque **12 41 1AZ** .

Remove starter motor (4).

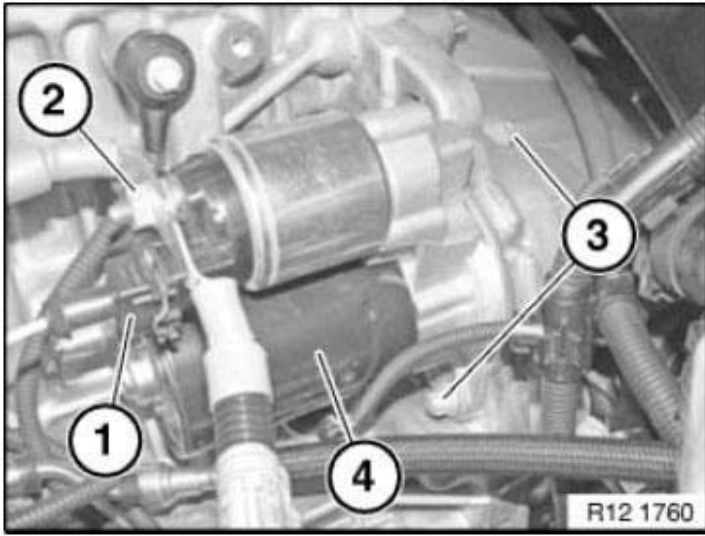


Fig. 48: Identifying Plug, Nuts And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check starter pinion and ring gear for damage. Replace starter if necessary.

Assemble engine.

12 41 041 REPLACING SOLENOID SWITCH

Turn off ignition.

Remove starter motor.

Release nut (1).

Remove cable lug (2).

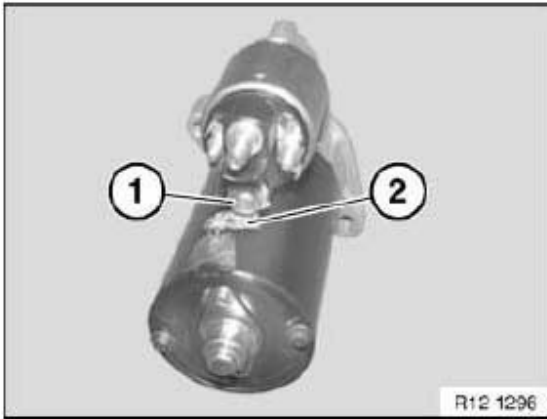


Fig. 49: Identifying Starter Motor Nut And Cable Lug
 Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not turn cable lug (2) while tightening down - risk of short circuit to starter motor housing.
 Tightening torque 12 41 4AZ

Release screws (1).

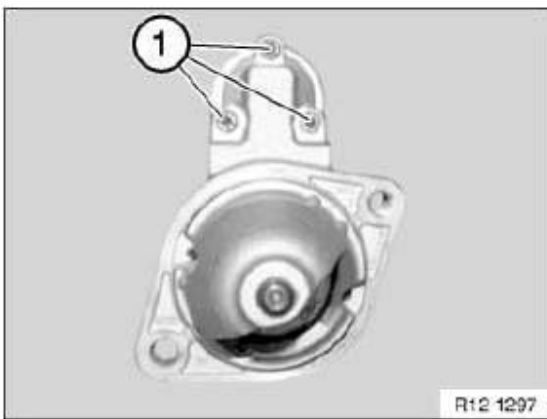


Fig. 50: Identifying Starter Motor Housing Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove solenoid switch (1) and spring (2).

Unhook pin (3).

Installation:

Check pin (3) for wear and apply grease.

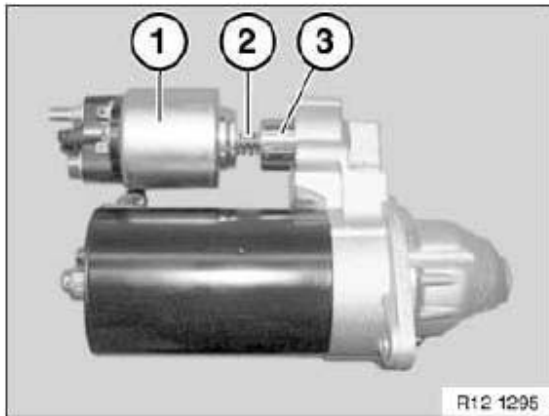


Fig. 51: Identifying Solenoid Switch, Spring And Pin
Courtesy of BMW OF NORTH AMERICA, INC.

1242 STARTER LEAD

12 42 500 REPLACING BATTERY POSITIVE LEAD BETWEEN STARTER, ALTERNATOR AND BATTERY POSITIVE TERMINAL (N54)

Necessary preliminary tasks

- Read out fault memory of DME control unit
- Switch off ignition
- Disconnect **BATTERY NEGATIVE LEAD**
- Remove **INTAKE AIR MANIFOLD**

Open cover.

Slacken nut (1).

Tightening torque **12 42 3AZ** .

Remove battery positive lead (2) from battery positive terminal.

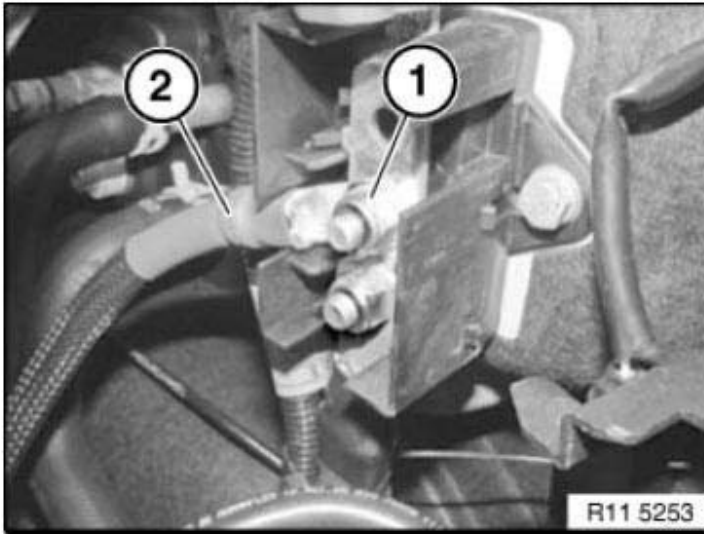


Fig. 52: Identifying Battery Positive Lead And Nuts
 Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1) on starter.

Tightening torque **12 42 2AZ** .

Disconnect battery positive lead from starter.

Release nut (2) on alternator.

Tightening torque **12 42 1AZ** .

Release battery positive lead from retainer (3), feed out and remove.

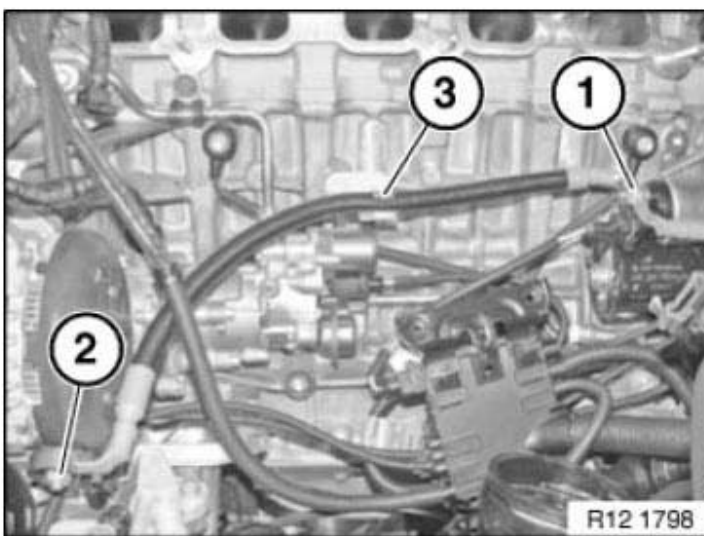


Fig. 53: Identifying Retainer And Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Add final details to vehicle.**
 Check stored fault messages.
 Now clear the fault memory.

12 42 540 REPLACING SAFETY BATTERY TERMINAL (SBK)

CAUTION: Observe safety regulations.
 Investigate cause of triggering of safety battery terminal.
 To do so, read out fault memory of airbag control unit. Note fault
 messages stored in memory. Rectify faults. Then clear fault memory.

Use of safety battery terminal:

- From model year 1998 in Series E38, E39, E46
- From 4/99 in E36/Z3
- in each of following new Series

The different models have different installation locations:

Battery in engine compartment

Safety battery terminal is replaced with cable up to battery positive support point.

Safety battery terminal is omitted as from 03/2002 from all E46 LHD models with 4-cylinder engines.

Battery in luggage compartment behind side trim panel

Remove side trim panel.

Follow instructions for disconnecting and connecting battery.

Disconnect and cover **BATTERY NEGATIVE LEAD** .

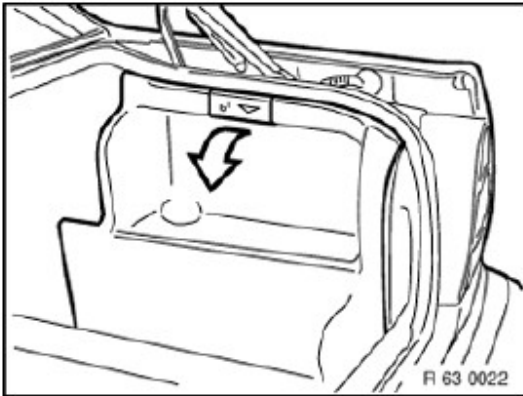


Fig. 54: Removing Side Trim Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Release front side trim panel partly and fold forward.



Fig. 55: Removing Front Side Trim Panel Partly
Courtesy of BMW OF NORTH AMERICA, INC.

Battery in luggage compartment under floor trim panel

Follow instructions for disconnecting and connecting battery.

Fold back floor trim panel (1).

Lift cover (2) on battery negative lead.

Disconnect and cover battery negative lead (3).

Release nuts (4).

Remove battery cover.

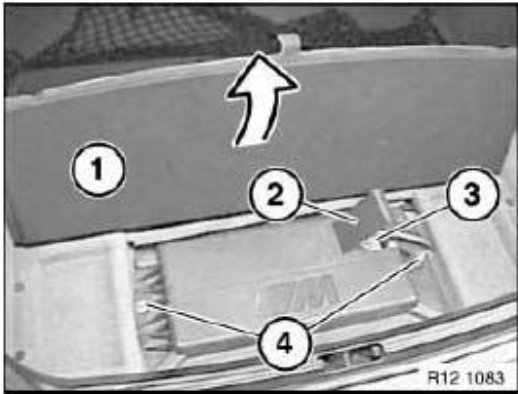


Fig. 56: Folding Back Floor Trim Panel
 Courtesy of BMW OF NORTH AMERICA, INC.

Battery in luggage compartment under spare wheel

Remove spare wheel.

Release screws.

CAUTION: Do not kink air pipes.

Set air supply system (1) to one side.

Follow instructions for disconnecting and connecting battery.

Disconnect **BATTERY NEGATIVE LEAD** .

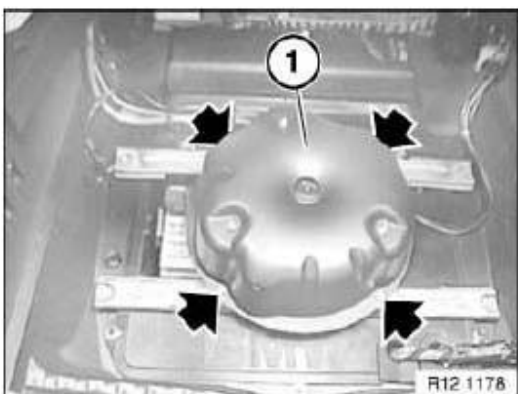


Fig. 57: Locating Air Supply System Mounting Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect supply cable (1) for vehicle electrical system.

Installation:

Remove faulty fuses and carry out troubleshooting.

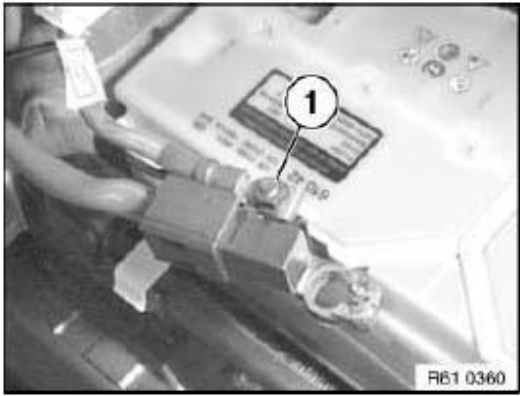


Fig. 58: Identifying Vehicle Electrical System Supply Cable
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Pay attention to interface.

The repair cable is always a standard length.

The heavy-current connector of the repair cable has a larger diameter than the battery positive lead.

In some Series (e.g. E46 touring), the heavy-current connector of the repair cable can lead to installation problems.

This is the case when the interface is in the area of the close-fitting trim panels.

Find matching interface (e.g. approx. 10 cm behind rear seat backrest in E46 touring).

Lay repair cable parallel to battery positive lead.

Mark interface of battery positive lead at end of repair cable.

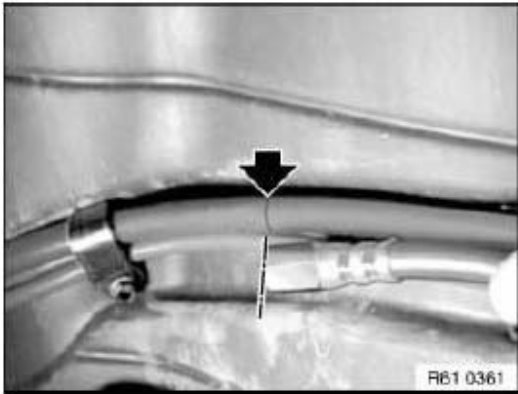


Fig. 59: Locating Interface Mark On Battery Positive Lead
Courtesy of BMW OF NORTH AMERICA, INC.

Release cable ties (1).

Disconnect plug connection (2).

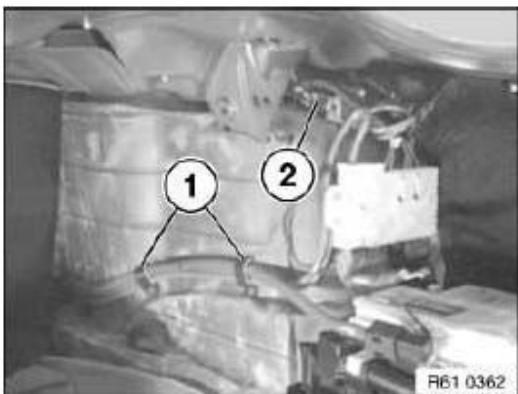


Fig. 60: Identifying Cable Ties And Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not use bolt cutters or similar tools to cut through the cable.
A cable end that has been squashed flat will no longer fit into the clamping sleeve.

Saw through battery positive cable at marked point with an iron saw.

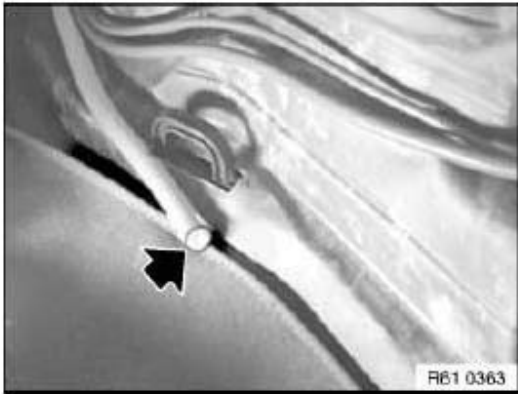


Fig. 61: Locating Cable End
Courtesy of BMW OF NORTH AMERICA, INC.

Strip insulation - length (A) - from cable end.

Distance (A) = 15 mm.

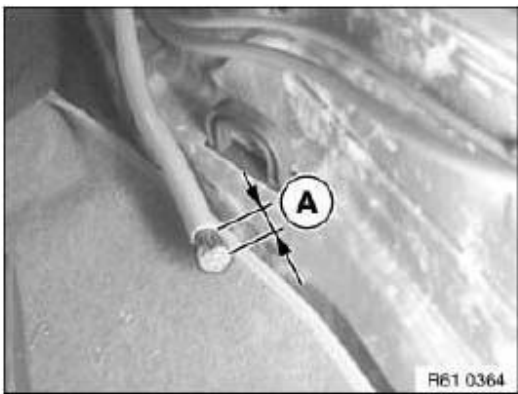


Fig. 62: Identifying Strip Insulation Length From Cable End
Courtesy of BMW OF NORTH AMERICA, INC.

Push heavy-current connector (1) over stripped cable end and screw into position.

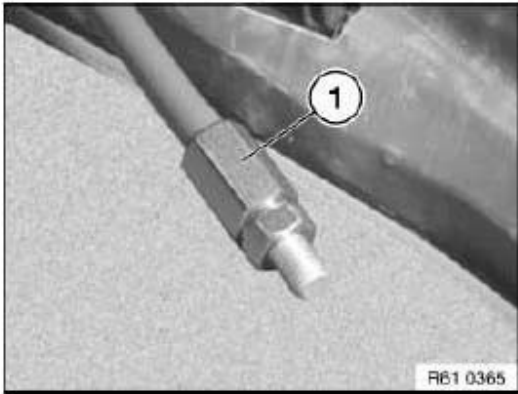


Fig. 63: Identifying Heavy-Current Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Push shrink-fit hose (3) over repair cable.

Screw threaded sleeve (1) of repair cable (2) to heavy-current connector.

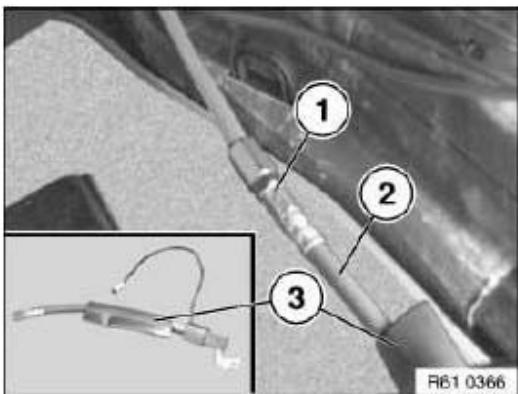


Fig. 64: Identifying Shrink-Fit Hose And Threaded Sleeve Of Repair Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Push shrink-fit hose (1) over connecting point and shrink on with a hot-air blower (2).

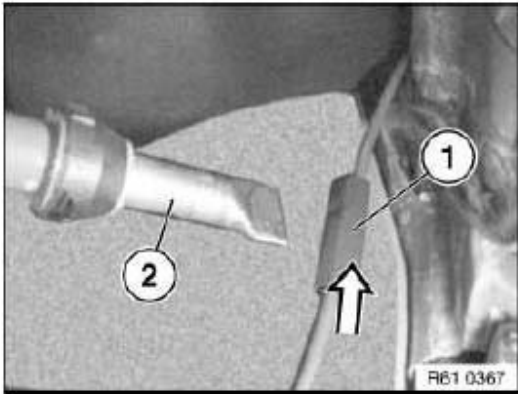


Fig. 65: Pushing Shrink-Fit Hose Over Connecting Point
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Heat up shrink-fit hose until it has settled completely around the connection point.

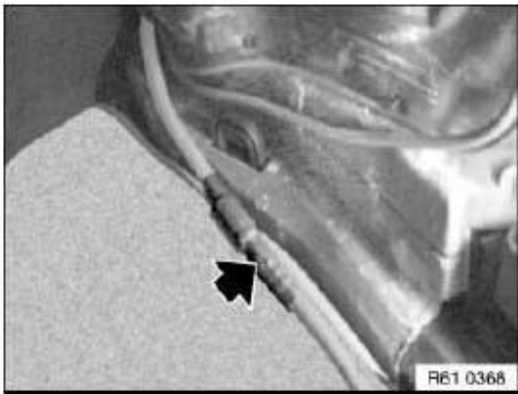


Fig. 66: Locating Shrink-Fit Hose
 Courtesy of BMW OF NORTH AMERICA, INC.

When laying the repaired battery positive cable, observe the following:

- The shrink-fit hose must not be scuffed during any movement.
- The repair cable must not cause any disturbing noises during driving operation.

NOTE: Offsetting cutting line by approx. 10 cm produces excess length of battery positive lead (1).
 Lay battery positive lead (1) without kinks or abrasions.
 (Shown on E46 touring.)

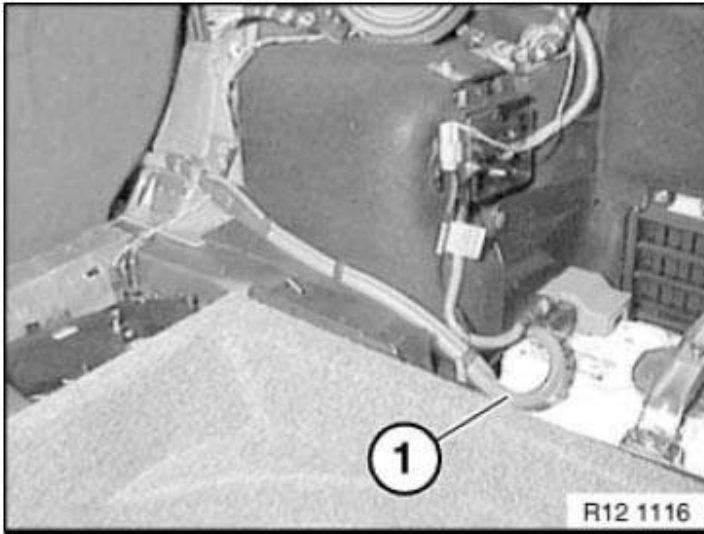


Fig. 67: Identifying Battery Positive Lead
Courtesy of BMW OF NORTH AMERICA, INC.

1251 ENGINE WIRING LOOM

12 51 001 REPLACING WIRING HARNESS SECTION FOR ENGINE (N54)

IMPORTANT: Read and comply with notes on **ESD PROTECTION (ELECTRO STATIC DISCHARGE)** .

Necessary preliminary tasks

- Read out fault memory of DME control unit
- Turn off ignition
- Disconnect **BATTERY NEGATIVE LEAD**
- Partially remove **WIRING HARNESS** for ignition coils and injectors
- Remove **INTAKE AIR MANIFOLD**
- Remove front **UNDERBODY PROTECTION**
- Remove rear underbody protection

Release bolts along line (1).

Tightening torque **12 90 1AZ** .

Remove electronics box cover.

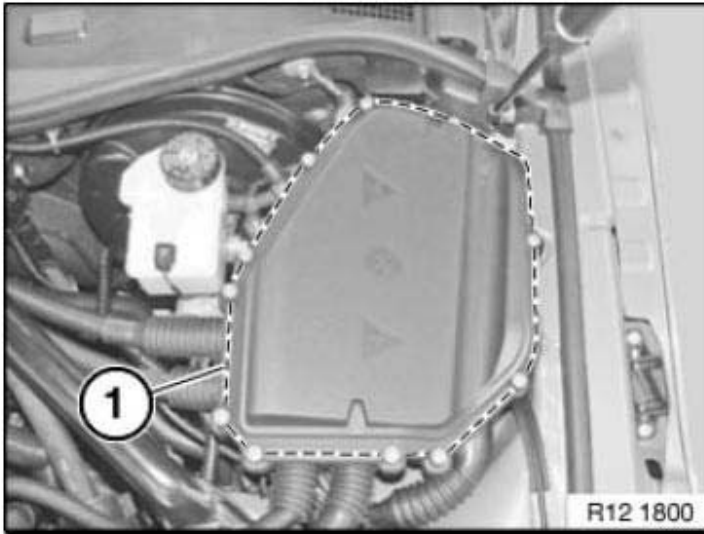


Fig. 68: Identifying Electronics Box Cover Mounting Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock battery positive lead (1), detach and lay to one side.

Release locks (2) in direction of arrows and pull control unit upwards slightly.

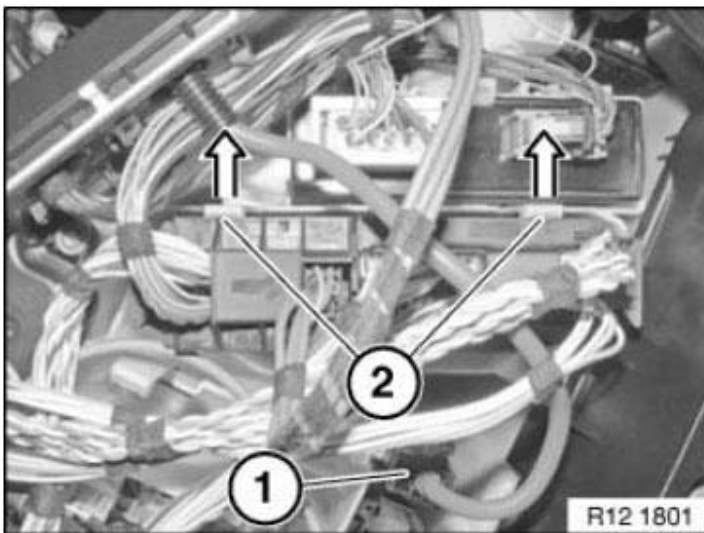


Fig. 69: Opening Control Unit Locks
 Courtesy of BMW OF NORTH AMERICA, INC.

Pull control unit (1) upwards slightly until plug (2) can be released from control unit in direction of arrow.

Unlock plug (2) and detach from control unit (1).

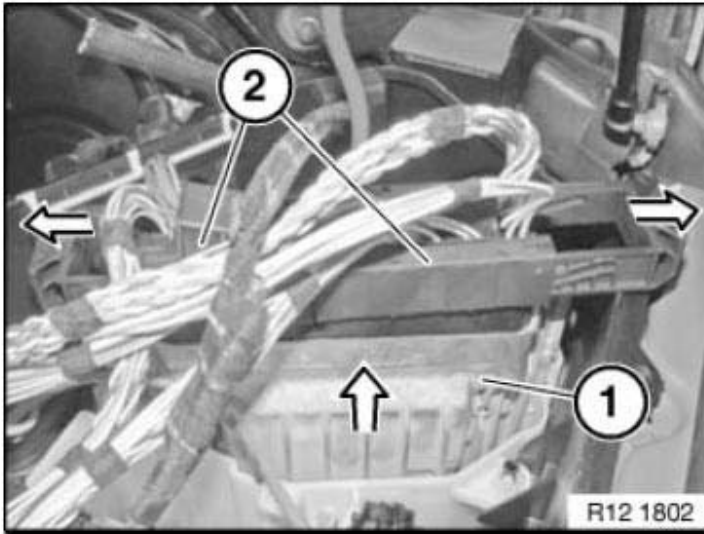


Fig. 70: Pulling Control Unit Upwards
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach all plugs from engine wiring harness in electronics box (1).

Unclip rubber grommet hold-down devices (2) and (3) and release engine wiring harness from electronics box.

Installation:

Make sure rubber grommets are correctly seated (watertightness).

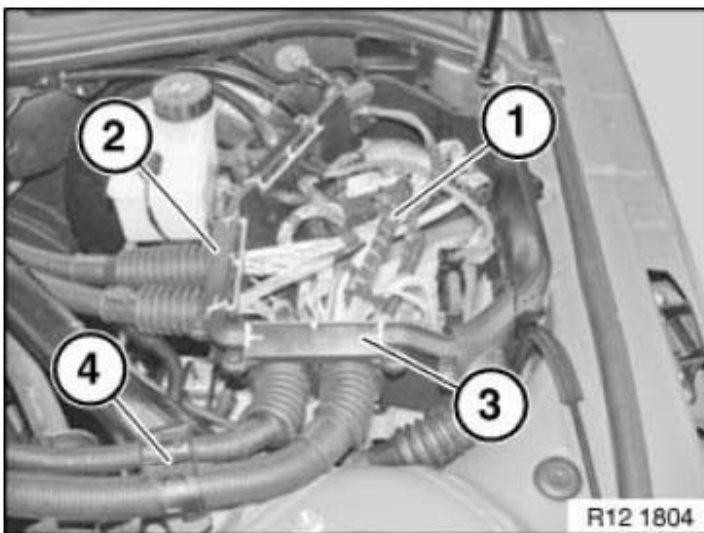


Fig. 71: Identifying Electronic Box With Rubber Grommet Hold Down Device
 Courtesy of BMW OF NORTH AMERICA, INC.

Long plug:

Press in retaining lugs and withdraw lock (1) in direction of arrow from plug housing.

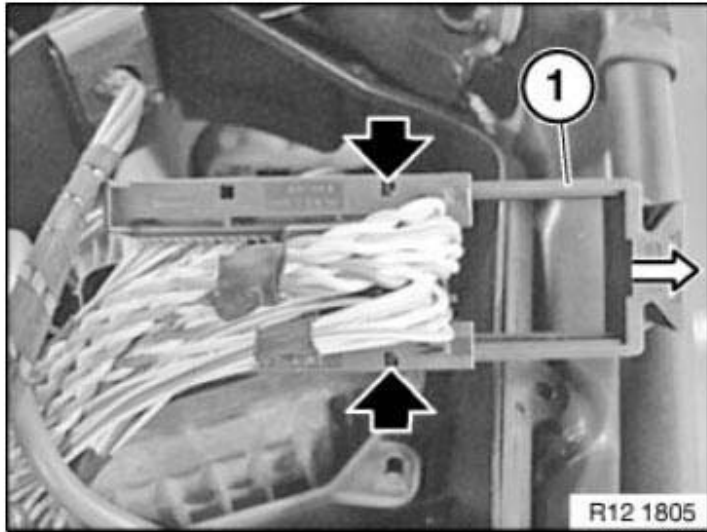


Fig. 72: Removing Locks From Plug Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Press locking tabs (1) in direction of arrow and pull contact carrier (2) out of housing.

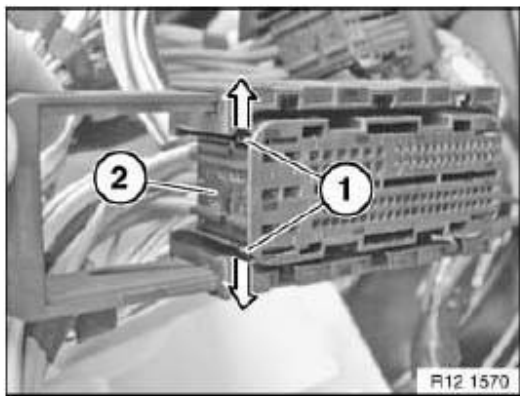


Fig. 73: Pressing Locking Tab
Courtesy of BMW OF NORTH AMERICA, INC.

Press locking tab (1) in direction of arrow and pull contact carrier (2) out of housing.

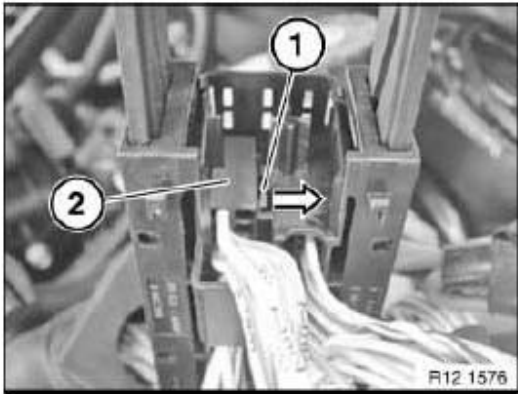


Fig. 74: Pressing Locking Tab
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock locking tabs (1) in direction of arrow and pull contact carrier (2) out of housing.

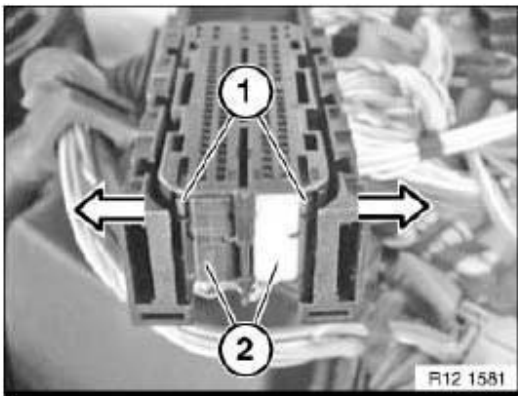


Fig. 75: Opening Locking Tabs
Courtesy of BMW OF NORTH AMERICA, INC.

Short plug

Press in retaining lugs (1) and withdraw lock (2) in direction of arrow from plug housing.

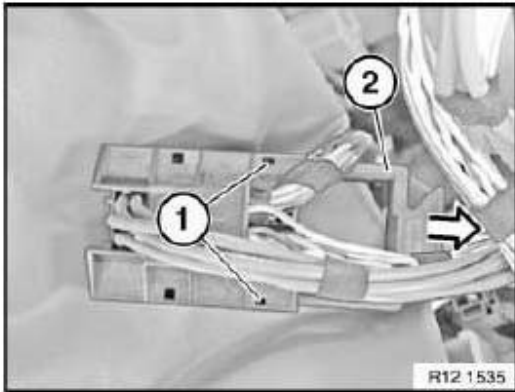


Fig. 76: Removing Locks From Plug Hosing
Courtesy of BMW OF NORTH AMERICA, INC.

Press locking tabs (1) in direction of arrow and pull contact carrier (2) out of housing.

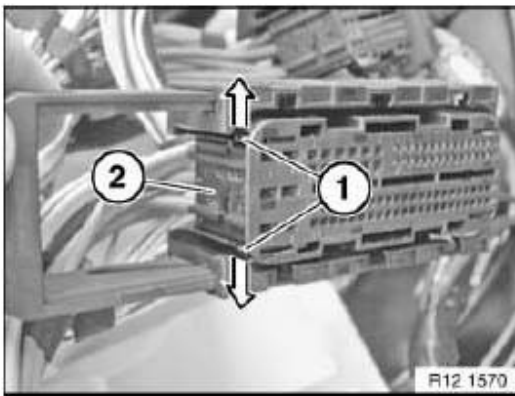


Fig. 77: Pressing Locking Tab
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock locking tabs (1) in direction of arrow and pull contact carrier (2) out of housing.

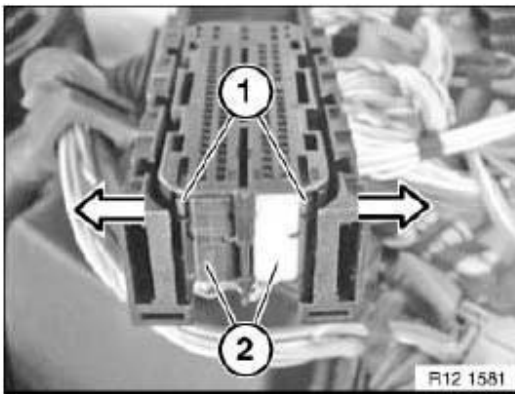


Fig. 78: Opening Locking Tabs

Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cable duct upper section (1) and expose wiring harnesses.

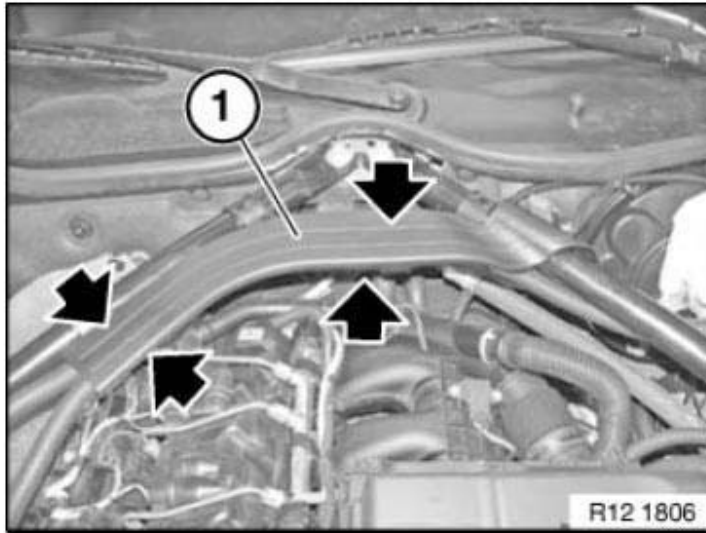


Fig. 79: Locating Wiring Harness In Cable Duct Upper Section

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew screws (1).

Tightening torque **12 90 4AZ** .

Remove cable duct (2).

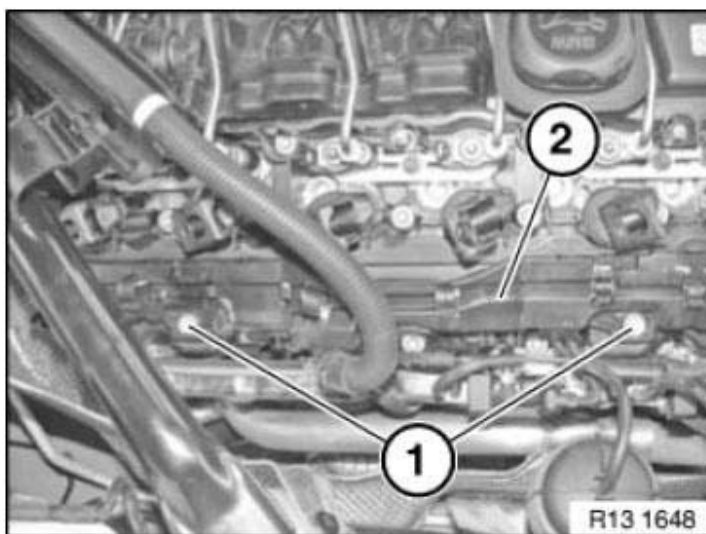


Fig. 80: Identifying Cable Duct And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE WIRING HARNESS REPLACEMENT PROCEDURE

Work step	Note
Unlock plug connections on control sensors and disconnect	
Unlock plug on heating element and disconnect	
Unlock plug on alternator and disconnect	
Unlock plug on intake pressure sensor and disconnect	
Unlock plug on throttle valve assembly and disconnect	
Unlock plug connection on knock sensors and disconnect	
Unlock plug on crankshaft sensor and disconnect	
Unlock plug on starter motor and disconnect	
Unlock plug on crankshaft pulse sensor and disconnect	
Unlock plug on high-pressure pump and disconnect	
Unlock plug on air-conditioning compressor and disconnect	
Unlock plug on transmission and disconnect	
Unlock plug on tank venting valve and disconnect	
Unlock plug connections on monitoring sensors and disconnect	
Unlock plug on oil condition sensor and disconnect	
Unlock plug on intake temperature sensor and disconnect	
Unlock plug on oil pressure sensor and disconnect	
Unlock plug on coolant temperature sensor and disconnect	
Unlock plug on intake camshaft pulse sensor and disconnect	
Unlock plug on Valvetronic valves and disconnect	
Unlock plug on exhaust camshaft pulse sensor and disconnect	
Unlock plug on both pressure converters and disconnect	
Unlock plug on coolant thermostat and disconnect	
Unlock plug on coolant pump and disconnect	
Release earth connection on crankcase lower section Tightening torque 12 90 3AZ .	

Release wiring harness from clips and retainers.

Feed out wiring harness and remove.

Installation:

Check wiring harness routing.

Check plug connections for correct seating.

NOTE: **Check stored fault messages.
clear fault memory.**

12 51 100 REPLACING WIRING HARNESS SECTION FOR IGNITION AND INJECTORS (N54)

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released .
Aluminum screws/bolts are permitted with and without color coding (blue).
For reliable identification:
Jointing torque and angle of rotation must be observed without fail (risk of damage) .

IMPORTANT: Read and comply with notes on **ESD PROTECTION (ELECTRO STATIC DISCHARGE)** .

Necessary preliminary tasks

- Read out fault memory of DME control unit
- Turn off ignition
- Disconnect **BATTERY NEGATIVE LEAD**
- Remove **ACOUSTIC COVER**

Release bolts along line (1).

Tightening torque **12 90 1AZ** .

Remove electronics box cover.

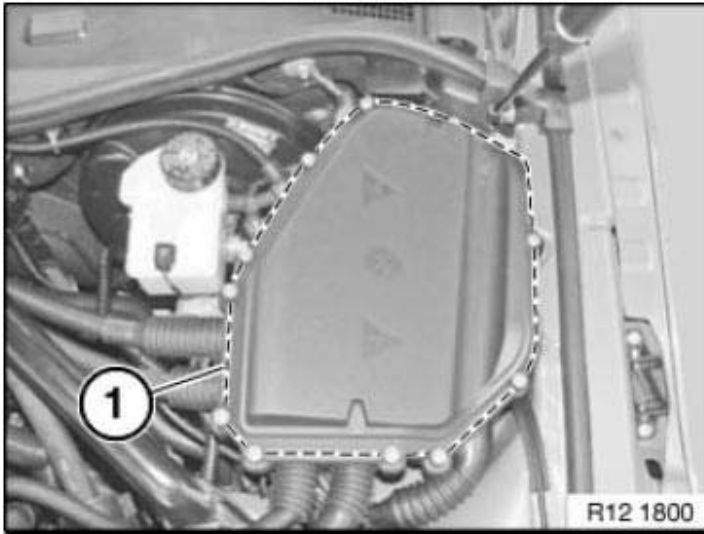


Fig. 81: Identifying Electronics Box Cover Mounting Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock battery positive lead (1), detach and lay to one side.

Release locks (2) in direction of arrows and pull control unit upwards slightly.

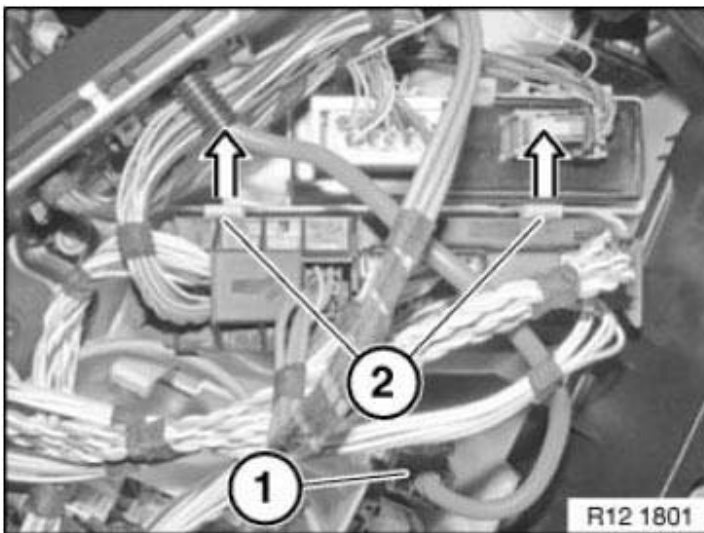


Fig. 82: Opening Locks
 Courtesy of BMW OF NORTH AMERICA, INC.

Pull control unit (1) upwards slightly until plug (2) can be released from control unit in direction of arrow.

Unlock plug (2) and detach from control unit (1).

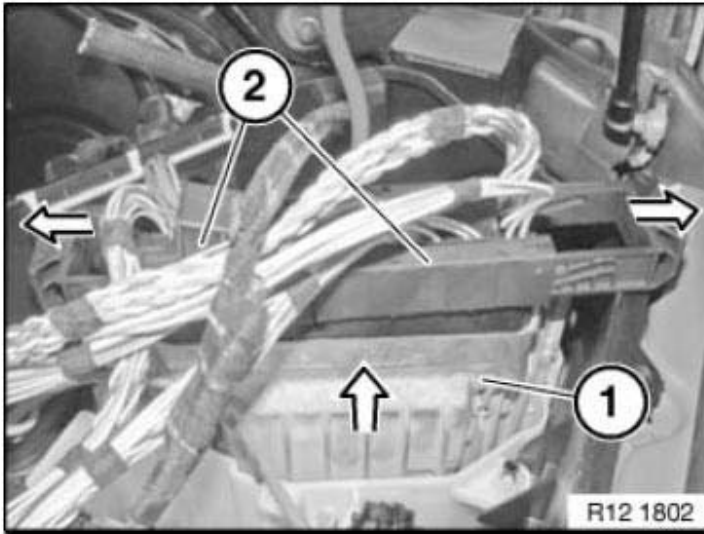


Fig. 83: Pulling Control Unit Upwards
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach all plugs (1) from ignition coil wiring harness in electronics box.

Unclip rubber grommet hold-down device (2) and release ignition coil wiring harness from electronics box.

Installation:

Make sure rubber grommets are correctly seated (watertightness).

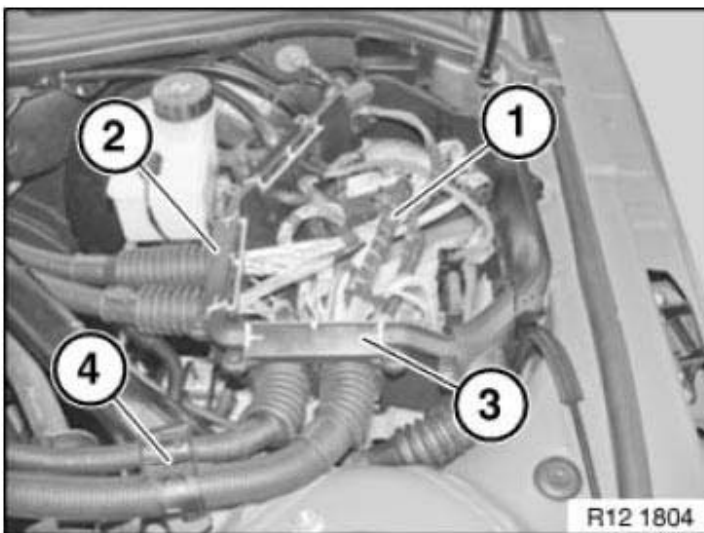


Fig. 84: Identifying Electronic Box With Rubber Grommet Hold Down Device And Plugs
 Courtesy of BMW OF NORTH AMERICA, INC.

Press in retaining lugs and withdraw lock (1) in direction of arrow from plug housing.

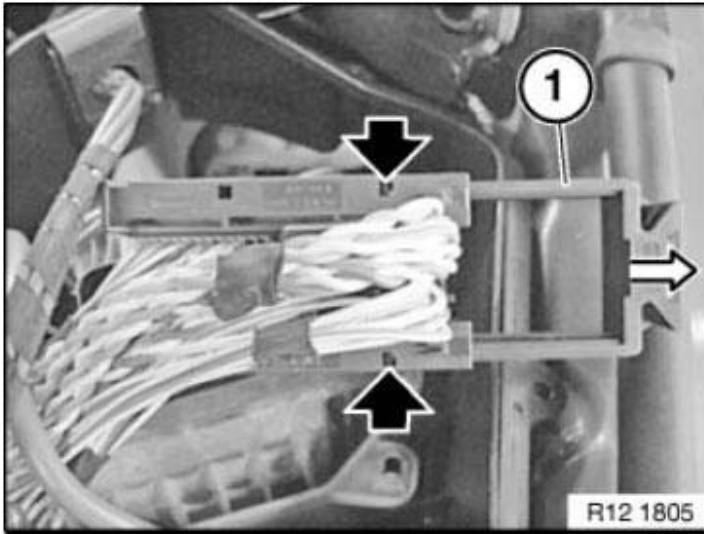


Fig. 85: Removing Locks By Pressing Retaining Tabs
 Courtesy of BMW OF NORTH AMERICA, INC.

Press locking tabs (1) in direction of arrow and pull contact carrier (2) out of housing.

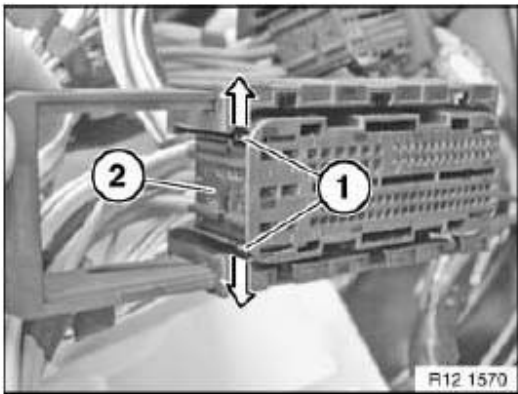


Fig. 86: Pressing Locking Tab
 Courtesy of BMW OF NORTH AMERICA, INC.

Press locking tab (1) in direction of arrow and pull contact carrier (2) out of housing.

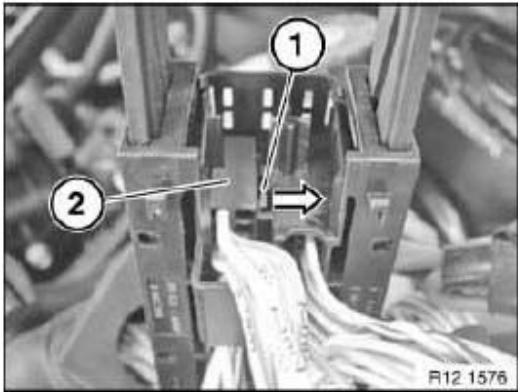


Fig. 87: Pressing Locking Tab
 Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cable duct upper section (1) and expose wiring harnesses.

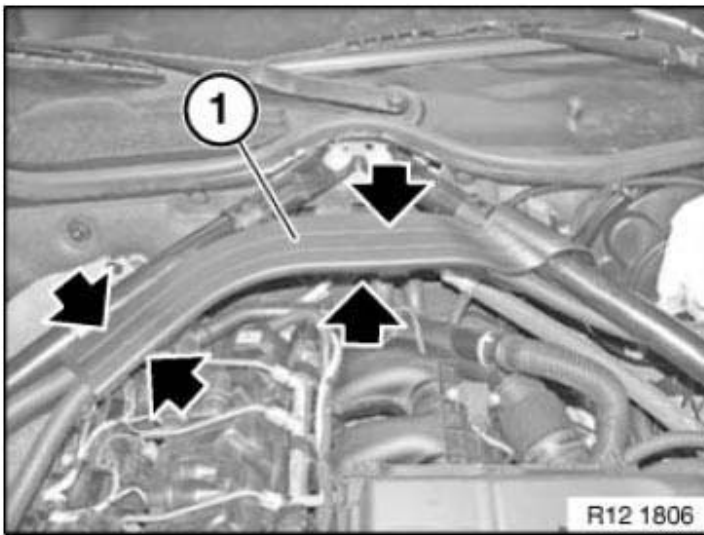


Fig. 88: Locating Wiring Harness In Cable Duct Upper Section
 Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and remove clip (1).

Release nuts (2) and remove earth connections.

Tightening torque **12 90 2AZ** .

Unlock all plugs on ignition coils and injectors and detach.

Release wiring harness (3) from retainers and cable ties, feed out and remove.

Replace defective cable ties.

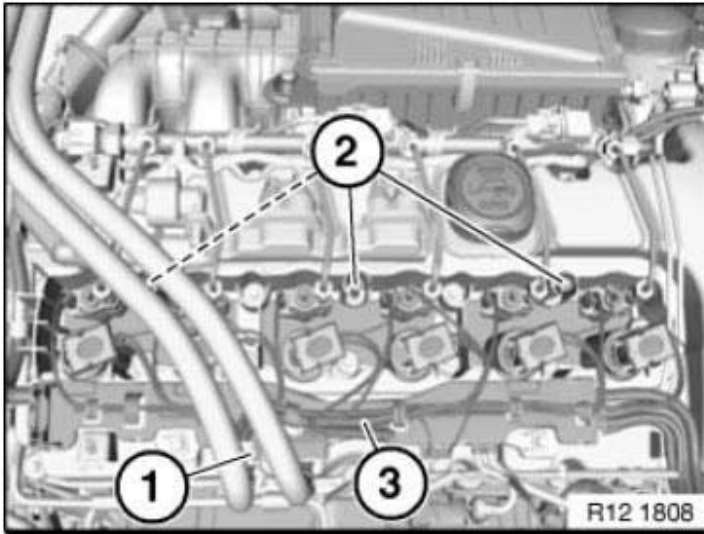


Fig. 89: Identifying Wiring Harness With Clips And Nuts
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check wiring harness routing.
 Check plug connections for correct seating.
 Check stored fault messages.
 clear fault memory.

1261 OIL PRESSURE OIL TEMPERATURE OIL GAUGE

12 61 285 REMOVING AND INSTALLING/REPLACING OIL LEVEL SENSOR FOR ENGINE OIL (N54)

IMPORTANT: Read and comply with notes on **ESD PROTECTION (ELECTRO STATIC DISCHARGE)** .

Necessary preliminary work

- Switch off ignition
- Remove front **UNDERBODY PROTECTION**
- Drain off **ENGINE OIL**

Release connector (1) and remove.

Unscrew nuts.

Tightening torque **12 61 2AZ** .

Remove oil level sensor (2).

Installation note:

Clean sealing surface on oil sump.

Replace gasket on oil level sensor.

An excessively low torque value will result in oil leaks.

An excessively high torque value will result in damage to the oil level sensor.

Top up engine oil.

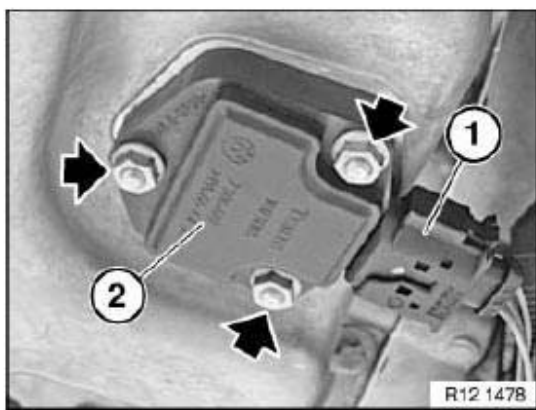


Fig. 90: Identifying Oil Level Sensor And Connector
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Check stored fault message.**
 Delete fault memory.

12 61 280 REMOVING AND INSTALLING/REPLACING OIL PRESSURE SENSOR (N54)

Necessary preliminary tasks

- Switch off ignition
- Remove **ACOUSTIC COVER**

WARNING: Scalding hazard!

Only perform this task on an engine that has cooled down.

Installation location

Oil filter housing, front left.

Engine oil may emerge when oil pressure sensor is replaced; have a cleaning cloth ready.

Unlock plug (1) and remove.

Release oil pressure sensor (2).

Tightening torque, **12 61 1AZ** .

Installation:

Check engine oil level, top up engine oil if necessary.

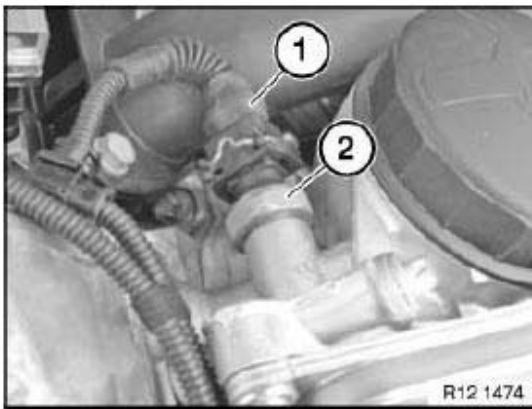


Fig. 91: Identifying Oil Pressure Sensor With Plug
Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE

Engine Electrical System - Special Tools - Z4

12 ENGINE ELECTRICAL SYSTEM

12-8010 ADAPTER

Adapter MW

NOTE: (plug adapter for CNG wiring harness) For reducing the gas pressure in the CNG system

Storage Location

W 2..

SI number

01 14 95 (014)

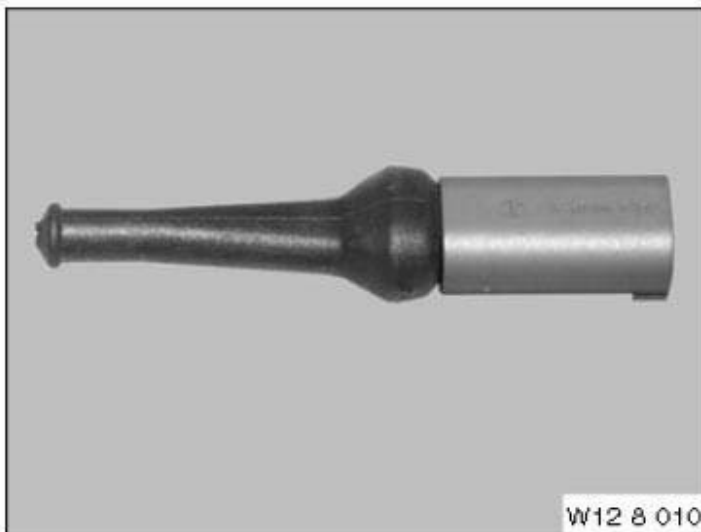
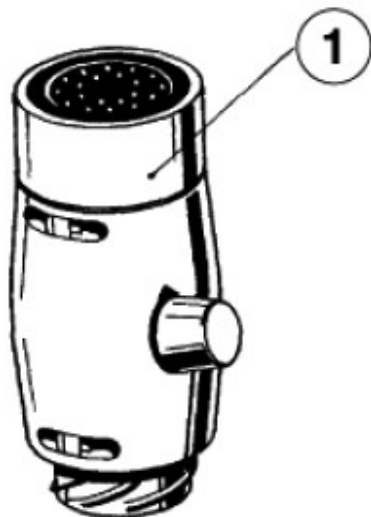
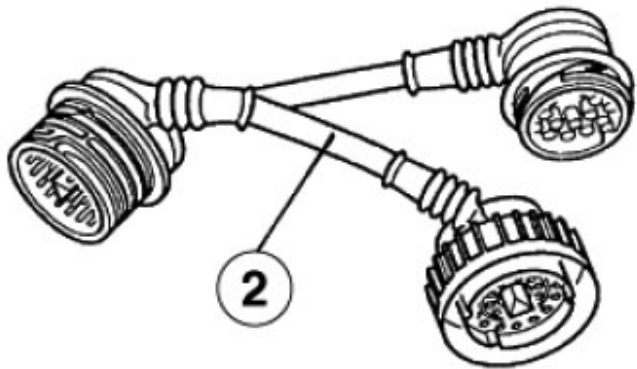
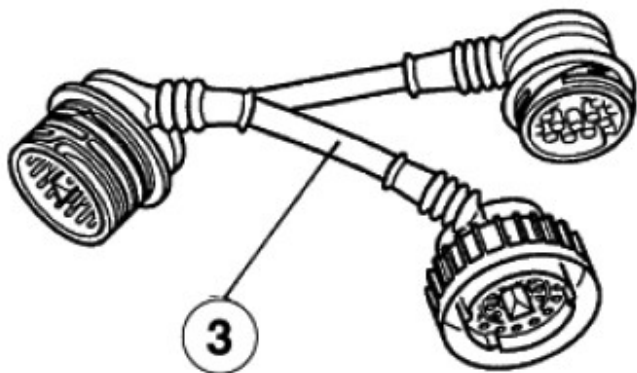


Fig. 1: Identifying Adapter (128010)
Courtesy of BMW OF NORTH AMERICA, INC.

12-7011 ADAPTER

Adapter MW

NOTE: (Electronic engine power control adapter) For checking of electronic engine power control safety circuit with 20-pin engine connector



W12 7 010

Fig. 2: Identifying Adapter (127011)
Courtesy of BMW OF NORTH AMERICA, INC.

12-8000 ADAPTER

Adapter MW

NOTE: (Test adapter, 56-pin) For checking the engine wiring harness on compressed natural gas vehicles

Storage Location

W 2..

SI number

01 14 95 (014)

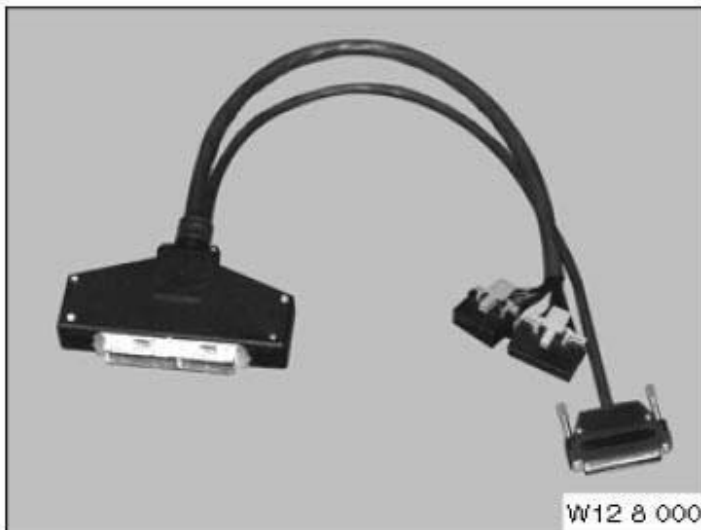


Fig. 3: Identifying Adapter (128000)
Courtesy of BMW OF NORTH AMERICA, INC.

12-1300 ADAPTER

Adapter MP

NOTE: (Adapter kit) For 134-pin module connector For diagnosis and troubleshooting in Digital Motor Electronics and transmission control unit - from model year 98

SI number

02 04 97 (248)

Consisting of:

2 = 0491135 Adapter cable

NOTE: (Adapter cable) 9-pin

2 = 0491136 Measuring module

NOTE: (Measuring module) 24-pin

2 = 0491137 Measuring module

NOTE: (Measuring module) 40-pin

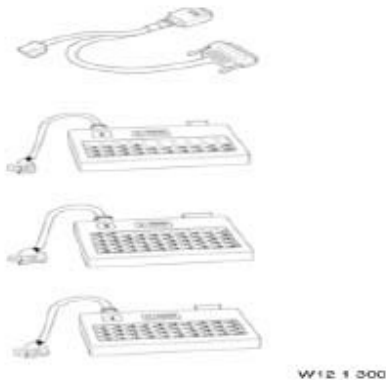


Fig. 4: Identifying Adapter (121300)

Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0491138 Measuring module

NOTE: (Measuring module) 52-pin Delivered from 08/2004 in combination with 12 1 305 (zero-encoded protective cap for new SGM control unit in E6x).

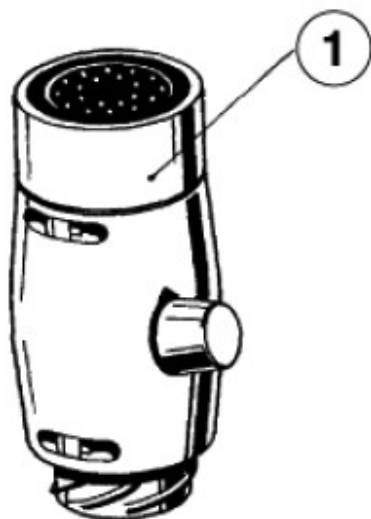
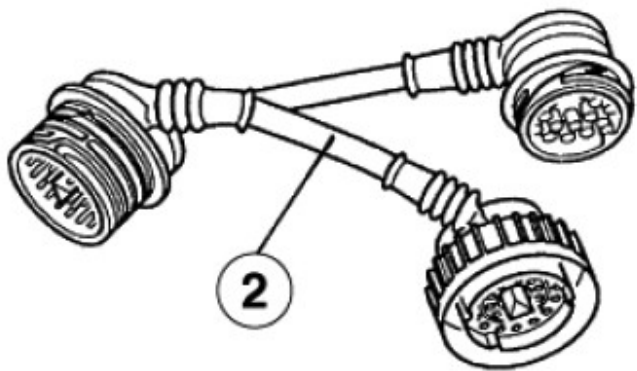
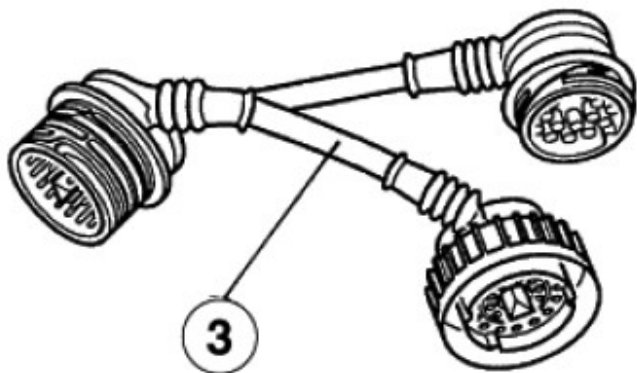
4 = 0495069 Cap

NOTE: (Zero-encoded protective cap for test box, 52-pin (12 1300/304)) New connector in E61/E61/E63 and E64 on SGM control unit protective cap 12 1 300/305 for diagnosis on wiring harness. From 08/2004 protective cap will be supplied with test box.

12-7012 ADAPTER CABLE

Adapter cable MW

NOTE: (Adapter cable, 25-pin) Encoding A



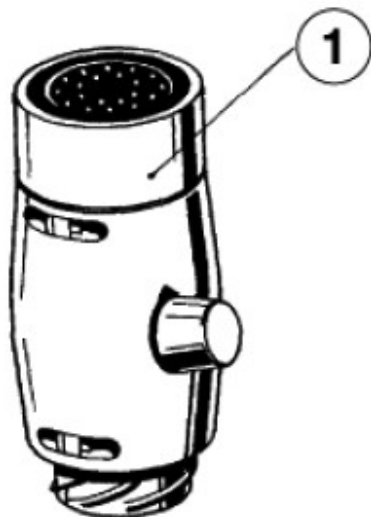
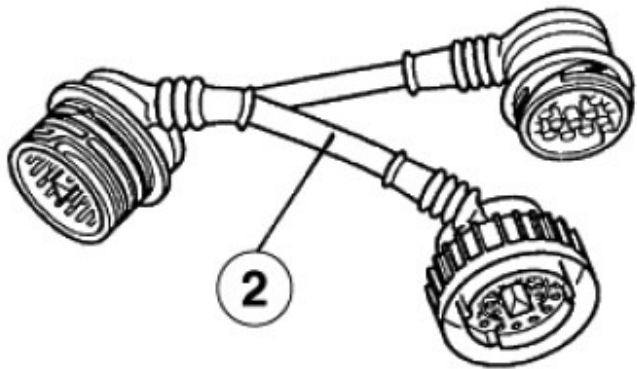
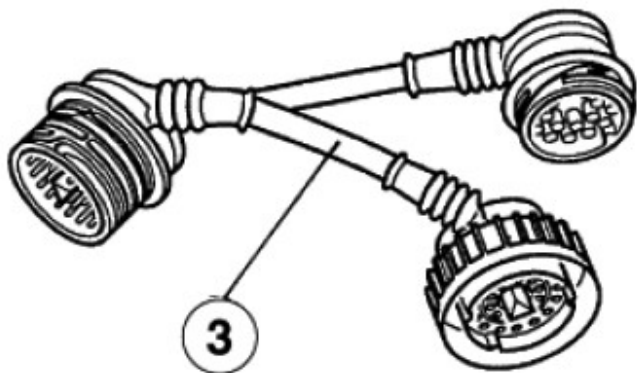
W12 7 010

Fig. 5: Identifying Adapter Cable (127012)
Courtesy of BMW OF NORTH AMERICA, INC.

12-7013 ADAPTER CABLE

Adapter cable MW

NOTE: (Adapter cable 25-pin) For checking/encoding B of electronic engine power control safety circuit - model series: E31/engine: M70



W12 7 010

Fig. 6: Identifying Adapter Cable (127013)
Courtesy of BMW OF NORTH AMERICA, INC.

12-7050 ADAPTER CABLE

Adapter cable Minimum set: Measuring and testing equipment MP

NOTE: For engines with rod-type ignition coils for measuring secondary voltage

Storage Location

F 104

SI number

02 01 01 (671)

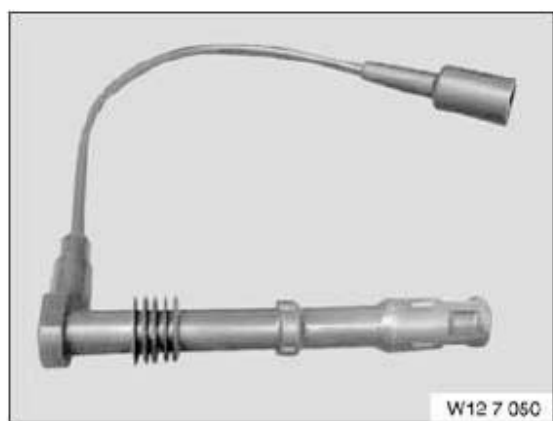


Fig. 7: Identifying Adapter Cable (127050)
Courtesy of BMW OF NORTH AMERICA, INC.

12-7420 ADAPTER CABLE

Adapter cable Minimum set: Measuring and testing equipment MP

NOTE: (V adapter cable set 58-pin) For diagnosis and troubleshooting at control unit DDE 5.0 04/04 Coding with special pliers (002250) removed - for N46, N52 and S85 engine. Set 12 7 420 consisting of 12 7 421 adapter cable and 12 7 422 cover plate 05/2004 set modification SI 2 03 04 (106)

Storage Location

Q204

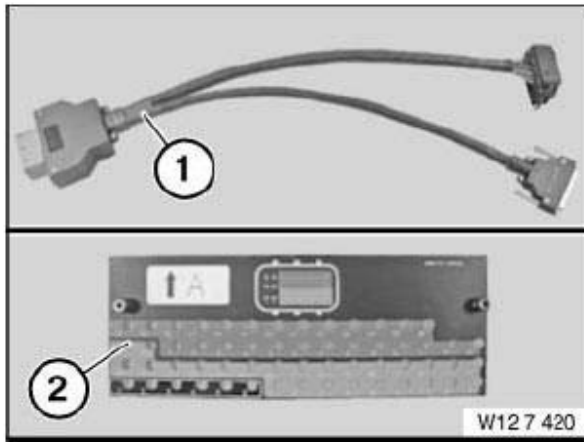


Fig. 8: Identifying Adapter Cable (127420)
Courtesy of BMW OF NORTH AMERICA, INC.

SI number

02 05 01 (479)

Consisting of:

1 = 0494963 Adapter cable

NOTE: (Adapter cable 58-pin)

2 = 0494964 Plate

NOTE: (Cover plate for test box) For pin allocation on 105-pin test box (61 4 380)

12-7060 ANTISTATIC MAT

Antistatic mat MW

NOTE: (Antistatic mat) ESD (Electronic Static Discharge) = electrostatic discharge For protection against ESD during repairs to electronic components. (Replaces the subnumber 12 7 192 from EPROM tool kit 12 7 190)

SI number

02 06 04 (128)

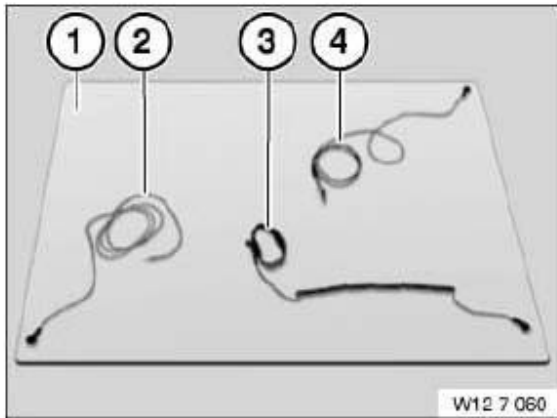


Fig. 9: Identifying Antistatic Mat (127060)
Courtesy of BMW OF NORTH AMERICA, INC.

12-7121 COUNTERHOLDER WRENCH

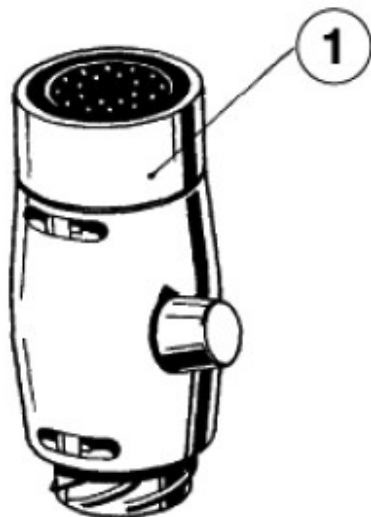
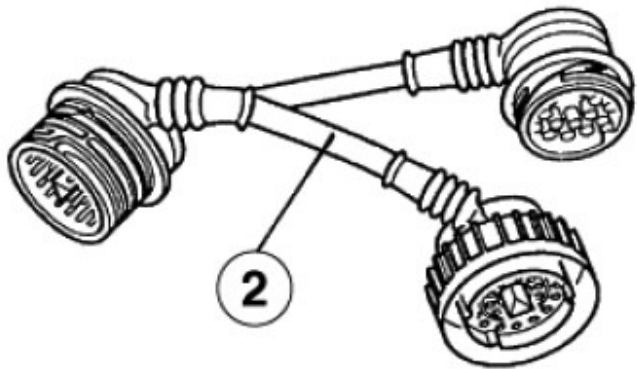
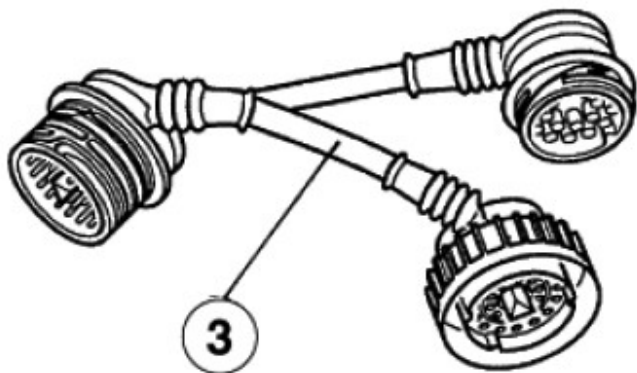
Counterholder wrench

In conjunction with: Socket

NOTE: Alternator N42 engine

12-7019 OPERATING INSTRUCTIONS

Operating instructions MW



W12 7 010

Fig. 10: Identifying Operating Instructions (127019)
Courtesy of BMW OF NORTH AMERICA, INC.

12-7122 SOCKET

Socket

In conjunction with: Counterholder wrench

NOTE: Hazet 8808 Ig10

SI number

1 28 03 (051)

12-7110 SOCKET WRENCH INSERT

Socket wrench insert Minimum set: Mechanical tools MW

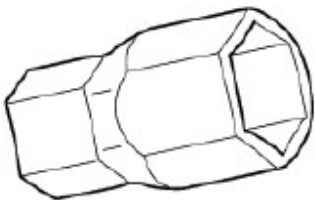
NOTE: (Socket wrench insert WAF 24) For removing and installing the belt pulley on the alternator

Storage Location

A12

SI number

01 12 93 (701)



W 12 7 110

Fig. 11: Identifying Socket Wrench Insert (127110)
Courtesy of BMW OF NORTH AMERICA, INC.

12-1200 TORQUE LIMITER

Torque limiter Minimum set: Mechanical tools MW

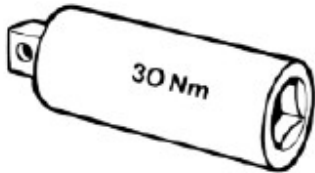
NOTE: (torque limiter) 30 Nm For tightening the spark plugs to a limited torque setting

Storage Location

A9

SI number

01 05 92 (507)



W 12 1 200

Fig. 12: Identifying Torque Limiter (121200)

Courtesy of BMW OF NORTH AMERICA, INC.

12-1305 ZERO-CODED COVER CAP FOR 52-PIN TEST BOX (12 1300/304)

Zero-coded cover cap for 52-pin test box (12 1300/304)

NOTE: New plugs in E61/E61/E63 and E64 on SGM control unit Cover cap 12 1 300/305 for diagnosis on wiring harness. From 08/2004 cover cap will be supplied with test box.

SI number

2 07 04 (138)

ENGINE

Engine Electrical System - Special Tools - Z4

12 ENGINE ELECTRICAL SYSTEM

12-8010 ADAPTER

Adapter MW

NOTE: (plug adapter for CNG wiring harness) For reducing the gas pressure in the CNG system

Storage Location

W 2..

SI number

01 14 95 (014)

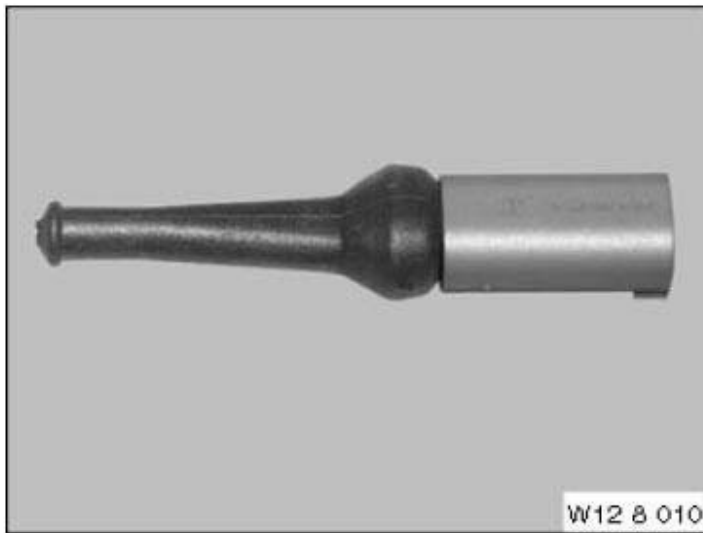


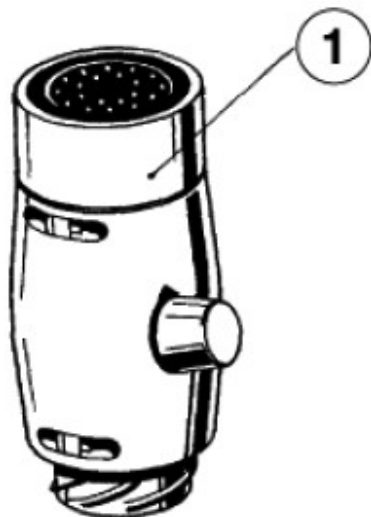
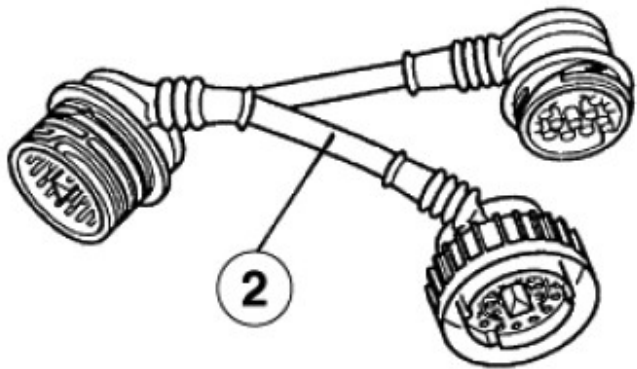
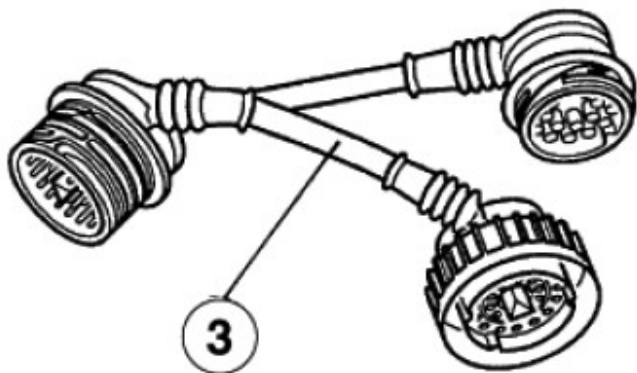
Fig. 1: Identifying Adapter (12-8010)

Courtesy of BMW OF NORTH AMERICA, INC.

12-7011 ADAPTER

Adapter MW

NOTE: (Electronic engine power control adapter) For checking of electronic engine power control safety circuit with 20-pin engine connector



W12 7 010

Fig. 2: Identifying Adapter (12-7011)
Courtesy of BMW OF NORTH AMERICA, INC.

12-8000 ADAPTER

Adapter MW

NOTE: (Test adapter, 56-pin) For checking the engine wiring harness on compressed natural gas vehicles

Storage Location

W 2..

SI number

01 14 95 (014)

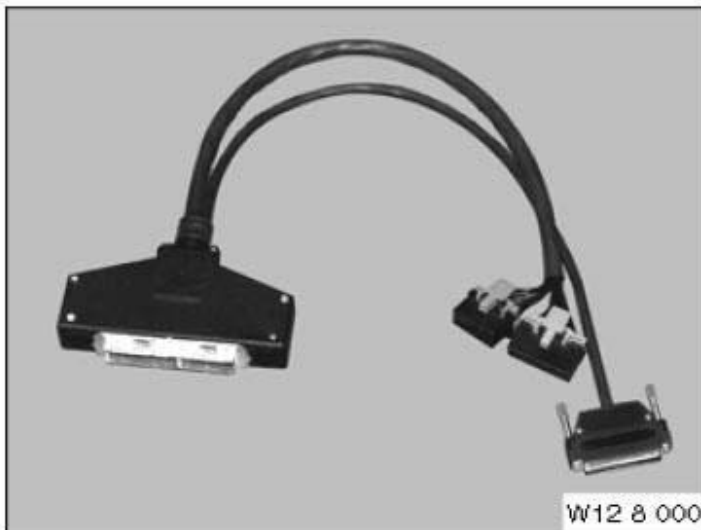


Fig. 3: Identifying Adapter (12-8000)

Courtesy of BMW OF NORTH AMERICA, INC.

12-1300 ADAPTER

Adapter MP

NOTE: (Adapter kit) For 134-pin module connector For diagnosis and troubleshooting in Digital Motor Electronics and transmission control unit - from model year 98

SI number

02 04 97 (248)

Consisting of:

2 = 0491135 Adapter cable

NOTE: (Adapter cable) 9-pin

2 = 0491136 Measuring module

NOTE: (Measuring module) 24-pin

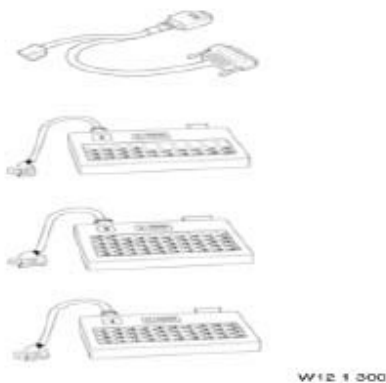


Fig. 4: Identifying Adapter (12-1300)

Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0491137 Measuring module

NOTE: (Measuring module) 40-pin

2 = 0491138 Measuring module

NOTE: (Measuring module) 52-pin Delivered from 08/2004 in combination with 12 1 305 (zero-encoded protective cap for new SGM control unit in E6x).

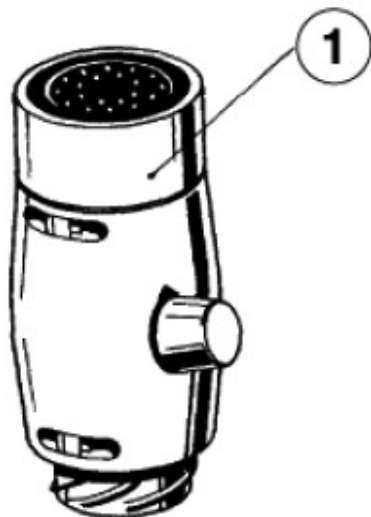
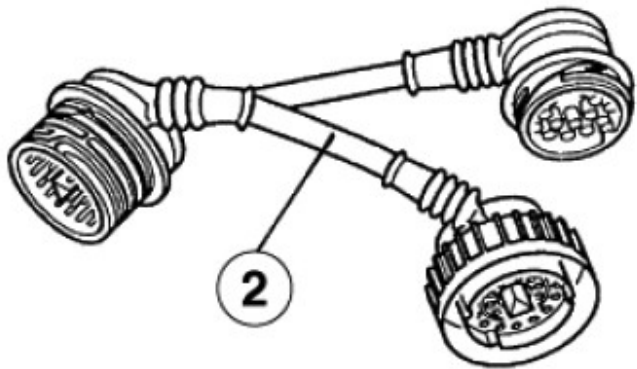
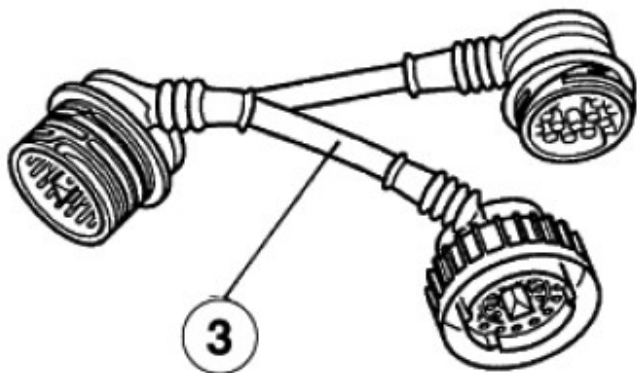
4 = 0495069 Cap

NOTE: (Zero-encoded protective cap for test box, 52-pin (12 1300/304)) New connector in E61/E61/E63 and E64 on SGM control unit protective cap 12 1 300/305 for diagnosis on wiring harness. From 08/2004 protective cap will be supplied with test box.

12-7012 ADAPTER CABLE

Adapter cable MW

NOTE: (Adapter cable, 25-pin) Encoding A



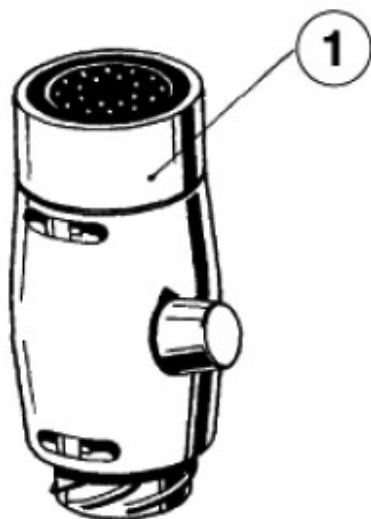
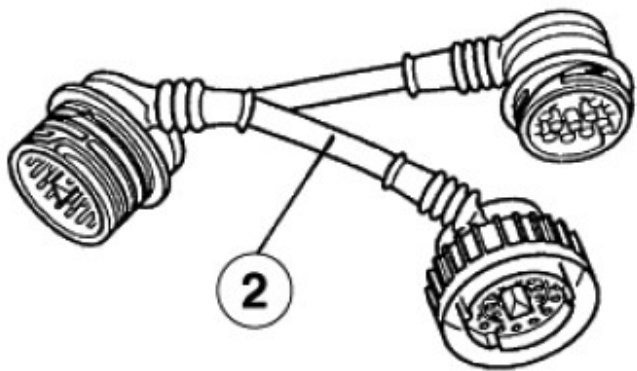
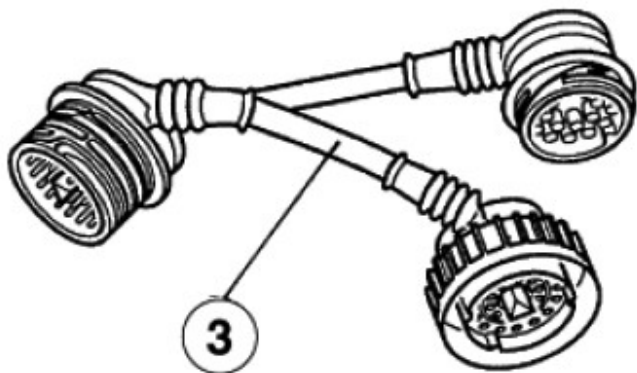
W12 7 010

Fig. 5: Identifying Adapter Cable (12-7012)
Courtesy of BMW OF NORTH AMERICA, INC.

12-7013 ADAPTER CABLE

Adapter cable MW

NOTE: (Adapter cable 25-pin) For checking/encoding B of electronic engine power control safety circuit - model series: E31/engine: M70



W12 7 010

Fig. 6: Identifying Adapter Cable (12-7013)
Courtesy of BMW OF NORTH AMERICA, INC.

12-7060 ANTISTATIC MAT

Antistatic mat MW

NOTE: (Antistatic mat) ESD (Electronic Static Discharge) = electrostatic discharge For protection against ESD during repairs to electronic components. (Replaces the subnumber 12 7 192 from Eprom tool kit 12 7 190)

SI number

02 06 04 (128)

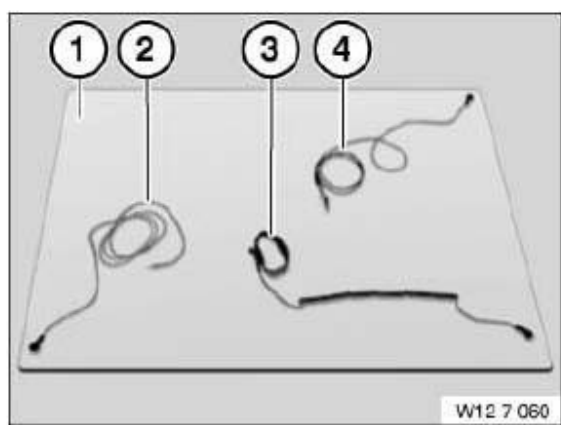


Fig. 7: Identifying Antistatic Mat (12-7060)
Courtesy of BMW OF NORTH AMERICA, INC.

12-7121 COUNTERHOLDER WRENCH

Counterholder wrench

In conjunction with: Socket

NOTE: Alternator N42 engine

12-1230 FITTING AID

Fitting aid MW

NOTE: Fitting aid for spark plug installation. Original BERU ZMH 001 rubber hose 0 890 00 001.

SI number

01 04 07 (352)

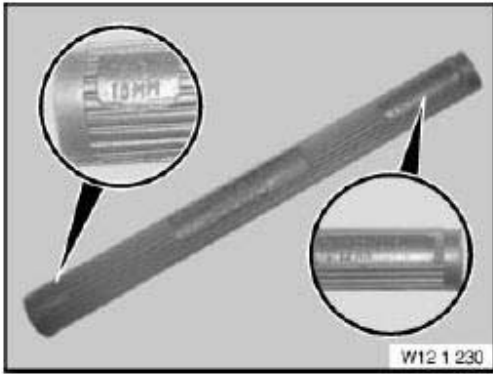
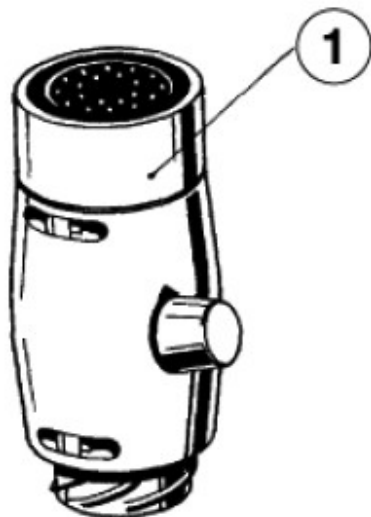
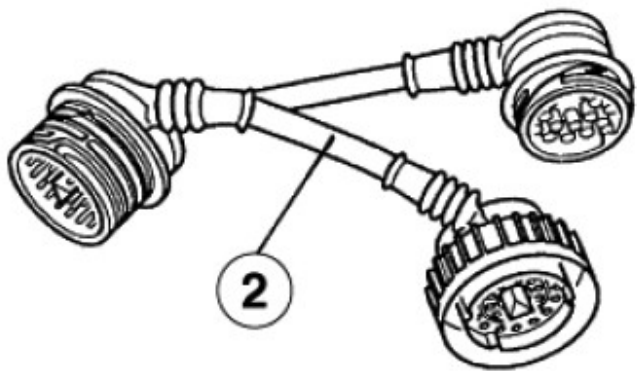
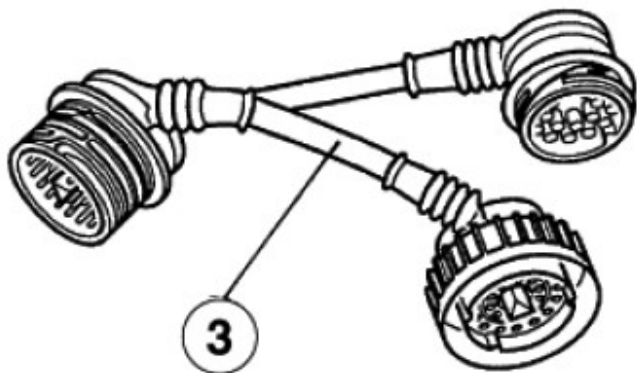


Fig. 8: Identifying Fitting Aid (12-1230)
Courtesy of BMW OF NORTH AMERICA, INC.

12-7019 OPERATING INSTRUCTIONS

Operating instructions MW



W12 7 010

Fig. 9: Identifying Operating Instructions (12-7019)
Courtesy of BMW OF NORTH AMERICA, INC.

12-1220 SOCKET

Socket Minimum set: Mechanical tools MW

NOTE: For removing and installing the spark plugs (WAF 14 bihexal).

SI number

01 04 06 (246)



Fig. 10: Identifying Socket (12-1220)

Courtesy of BMW OF NORTH AMERICA, INC.

12-7122 SOCKET

Socket

In conjunction with: Counterholder wrench

NOTE: Hazet 8808 lg 10

SI number

1 28 03 (051)

12-1305 ZERO-CODED COVER CAP FOR 52-PIN TEST BOX (12 1300/304)

Zero-coded cover cap for 52-pin test box (12 1300/304)

NOTE: New plugs in E61/E61/E63 and E64 on SGM control unit Cover cap 12 1 300/305 for diagnosis on wiring harness. From 08/2004 cover cap will be supplied with test box.

SI number

2 07 04 (138)

ENGINE

Engine Electrical System - Tightening Torques - Z4

ALTERNATOR LEAD

12 42 ALTERNATOR LEAD

TIGHTENING TORQUE SPECIFICATION - ALTERNATOR LEAD

		Type	Thread	Tightening specification	Measure
1AZ	Battery positive lead to alternator	N52K	M8		19 Nm
2AZ	Battery positive lead to starter	N52K	M8		13 Nm
3AZ	Battery positive lead to battery positive terminal	N52K	M8	Flange nut	15 Nm

ALTERNATOR WITH DRIVE AND MOUNTING PARTS

12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS

TIGHTENING TORQUE SPECIFICATION - ALTERNATOR WITH DRIVE AND MOUNTING PARTS

		Type	Thread	Tightening specification	Measure
1AZ	Wires to alternator				
Terminal D+		M10/M20			5 Nm
		All/others	M6		7 Nm
Terminal B+		S38/B38			8 Nm
		All/others	M8		13 Nm
2AZ	Pulley	All			45 Nm
3AZ	Pulley (ribbed drive belt)	Alternator with cooling jacket			80 Nm
		all others			70 Nm
		N42, N46 Valeo			75 Nm
		N42, N46 Bosch			65 Nm
4AZ	Rear holder	All			3.5 Nm
5AZ	Fillister head screw for wire holder	All			3.5 Nm
6AZ	Alternator on	M40/M42/M43/M44			43 Nm

	bearing block				
7AZ	Alternator to crankcase	N42, N46, N62	M8		21 Nm
8AZ	Belt pulley (ribbed V-belt) with freewheel (Ina) fitted to Bosch and Valeo alternators	N42, N43			80 Nm

ALTERNATOR WITH DRIVE AND MOUNTING PARTS

12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS

TIGHTENING TORQUE SPECIFICATION - ALTERNATOR WITH DRIVE AND MOUNTING PARTS

		Type	Thread	Tightening specification	Measure
1AZ	Battery positive lead to alternator	N52K	M8		19 Nm
2AZ	Alternator to crankcase	N52K	M8x82	Replace screws Jointing torque Torque angle	10 Nm 190 °

BRACKET FOR OIL LEVEL SENSOR EARTH STRAP

12 52 BRACKET FOR OIL LEVEL SENSOR EARTH STRAP

TIGHTENING TORQUE SPECIFICATION - BRACKET FOR OIL LEVEL SENSOR EARTH STRAP

		Type	Thread	Tightening specification	Measure
1AZ	Earth strap to bracket and cable bracket on transmission	N43/N45T/N51/N52/N52K/N53/N54	M6		8 Nm

CONTROL UNIT HOUSING

12 90 CONTROL UNIT HOUSING

TIGHTENING TORQUE SPECIFICATION - CONTROL UNIT HOUSING

		Type	Thread	Tightening specification	Measure
1AZ	Assembly of upper	E32/E34/E36			5 Nm

	and lower sections				
2AZ	Center section to body	E32/E34			3 Nm
3AZ	Control unit holder in E box	E36			5 Nm
4AZ	Control unit box cover	E38/E39/E52			4 Nm
		E46			6 Nm
		E53/E36/7/E54			3 Nm
5AZ	Electronics box to firewall	E65	Plastic screw		6 Nm

COOLANT TEMPERATURE

12 62 COOLANT TEMPERATURE

TIGHTENING TORQUE SPECIFICATION - COOLANT TEMPERATURE

		Type	Thread	Tightening specification	Measure
1AZ	Temperature sensor to water flange (glow time/coolant temperature gauge)	M21			18 Nm
		M51			13 Nm
2AZ	Temperature switch (5.5 °C/17 °C) to fuel filter/cylinder head	M21			18 Nm
3AZ	Coolant temperature sensor (2- pin plug-in connection)	S38/S50			13 Nm
		S85	M12/1.52		13.5 Nm
		All/others			20 Nm
4AZ	Remote thermometer sensor (2-pin plug-in connection)	All			20 Nm
Remote thermometer sensor (4-pin plug-in connection)		M62			16 Nm
		S62	M12 x 1.5		14 Nm
5AZ	Remote thermometer sensor on coolant	S50			18 Nm

	flange				
6AZ	Temperature sensor - air	S38/S50			13 Nm
7AZ	Temperature sensor - oil	S38/S50			13 Nm

ELECTRONICS BOX, WIRING HARNESS (N54, N52K)

12 90 ELECTRONICS BOX, WIRING HARNESS (N54, N52K)

TIGHTENING TORQUE SPECIFICATION - ELECTRONICS BOX, WIRING HARNESS (N54, N52K)

		Type	Thread	Tightening specification	Measure
1AZ	Electronics box lid to electronics box	N54/N52K			5 Nm
2AZ	Earth cable to cylinder head cover	N52K/N54	M5		5 Nm
3AZ	Earth cable to holder, electric coolant pump	N52K/N54	M8	Replace aluminium screw Jointing torque Torque angle	8 Nm 45 °
4AZ	Cable duct to cylinder head cover	N54	M6		8 Nm

ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY

12 61 ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY

TIGHTENING TORQUE SPECIFICATION - ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY

		Type	Thread	Tightening specification	Measure
1AZ	Engine oil pressure switch/engine oil temperature sensor	N52K/N54	M12x1.5	Jointing torque Torque angle	20 Nm 16 °
2AZ	Oil condition sensor for engine oil	N52K/N54	M6	Jointing torque 2 Nm	8.5 Nm

GOVERNOR

12 32 GOVERNOR

TIGHTENING TORQUE SPECIFICATION - GOVERNOR

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		Type	thread	tightening specification	Value
1AZ	Regulator switch	All	M4		2 Nm
		All	M5		4 Nm

OIL PRESSURE, OIL TEMPERATURE, OIL LEVEL DISPLAY

12 61 OIL PRESSURE, OIL TEMPERATURE, OIL LEVEL DISPLAY

TIGHTENING TORQUE SPECIFICATION - OIL PRESSURE, OIL TEMPERATURE, OIL LEVEL DISPLAY

		Type	Thread	Tightening specification	Measure
1AZ	Oil-pressure switch/oil-temperature switch	All	M12x1.5		27 Nm
2AZ	Level switch for engine oil	N62/N73/M67TU		Jointing torque 2 Nm	8.5 Nm
3AZ	Oil pressure switch	N46	M12 x 1.5		27 Nm
4AZ	Level sensor to oil sump	N46	M6		9 Nm

SENDERS FOR CONTROL UNIT

12 72 SENDERS FOR CONTROL UNIT

TIGHTENING TORQUE SPECIFICATION - SENDERS FOR CONTROL UNIT

		Type	Thread	Tightening specification	Measure
1AZ	Lever to pedal value sender	E32/E34/E31/E36			9 Nm
2AZ	Pedal value sender to pedal console	E32/E34/E31			5 Nm

SPARK PLUGS

12 12 SPARK PLUGS

TIGHTENING TORQUE SPECIFICATION - SPARK PLUGS

		Type	Thread	Tightening specification	Measure
1AZ	Spark plugs (ungreased)	All	M12x1.25		23 ± 3 Nm
		All	M14x1.25		30 ± 3 Nm

STARTER LINE

12 42 STARTER LINE

TIGHTENING TORQUE SPECIFICATION - STARTER LINE

		Type	Thread	Tightening specification	Measure
1AZ	Starter line to jump-start connection point	N52, N52K, N51, N53	M8		19 Nm
2AZ	Starter line to jump-start connection point	E70/N52K	M8		13 Nm

STARTER MOTOR WITH MOUNTING

12 41 STARTER MOTOR WITH MOUNTING

TIGHTENING TORQUE SPECIFICATION - STARTER MOTOR WITH MOUNTING

		Type	Thread	Tightening specification	Measure
1AZ	Starter motor mounting to crankcase	N52K	M10x85	Replace screw	
				Jointing torque	20 Nm
				Torque angle	180 °
2AZ	Starter motor mounting to crankcase	N52K	M10x30	Replace screw	
				Jointing torque	20 Nm
				Torque angle	90 °

WIRES TO STARTER

12 42 WIRES TO STARTER

TIGHTENING TORQUE SPECIFICATION - WIRES TO STARTER

		Type	Thread	Tightening specification	Measure
1AZ	Battery positive terminal in/on distribution box	E32/E34/E31/E36/E46/E87/E90/E85/E86/E81	M8		20 Nm
		E39/M57	M8		11 Nm
		E38/M67	M8		11 Nm
		E46/M47TU	M8		11 Nm
		E60/N62	M8		15 Nm
		E65/N62/N73	M8		15 Nm
2AZ	Wiring harness on distributor	E36/M41	M8		10 Nm

ENGINE

Engine Electrical System - Tightening Torques - Z4

ALTERNATOR LEAD

12 42 ALTERNATOR LEAD

TIGHTENING TORQUE SPECIFICATION - ALTERNATOR LEAD

	Type	Thread	Tightening specification	Measure
1AZ Battery positive lead to alternator	N54	M8		19 Nm
2AZ Battery positive lead to starter	N54	M8		13 Nm
3AZ Battery positive lead to battery positive terminal	N54	M8	Flange nut	15 Nm

ALTERNATOR WITH DRIVE AND MOUNTING PARTS

12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS

TIGHTENING TORQUE SPECIFICATION - ALTERNATOR WITH DRIVE AND MOUNTING PARTS

	Type	Thread	Tightening specification	Measure
1AZ Wires to alternator				
Terminal D+	M10/M20			5 Nm
	All/others	M6		7 Nm
Terminal B+	S38/B38			8 Nm
	All/others	M8		13 Nm
2AZ Pulley	All			45 Nm
3AZ Pulley (ribbed drive belt)	Alternator with cooling jacket			80 Nm
	all others			70 Nm
	N42, N46 Valeo			75 Nm
	N42, N46 Bosch			65 Nm
4AZ Rear holder	All			3.5 Nm
5AZ Fillister head screw for wire holder	All			3.5 Nm
6AZ Alternator on bearing block	M40/M42/M43/M44			43 Nm

7AZ Alternator to crankcase	N42, N46, N62	M8		21 Nm
8AZ Belt pulley (ribbed V-belt) with freewheel (Ina) fitted to Bosch and Valeo alternators	N42, N43			80 Nm

ALTERNATOR WITH DRIVE AND MOUNTING PARTS

12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS

TIGHTENING TORQUE SPECIFICATION - ALTERNATOR WITH DRIVE AND MOUNTING PARTS

	Type	Thread	Tightening specification	Measure
1AZ Alternator to crankcase, top	N54	M8 x 85		19 Nm
1AZ Alternator to crankcase with A/C compressor carrier	N54	M8x105		19 Nm

BRACKET FOR OIL LEVEL SENSOR EARTH STRAP

12 52 BRACKET FOR OIL LEVEL SENSOR EARTH STRAP

TIGHTENING TORQUE SPECIFICATION - BRACKET FOR OIL LEVEL SENSOR EARTH STRAP

	Type	Thread	Tightening specification	Measure
1AZ Earth strap to bracket and cable bracket on transmission	N43/N45T/N51/N52/N52K/N53/N54	M6		8 Nm

CONTROL UNIT HOUSING

12 90 CONTROL UNIT HOUSING

TIGHTENING TORQUE SPECIFICATION - CONTROL UNIT HOUSING

	Type	Thread	Tightening specification	Measure
1AZ Assembly of upper and lower sections	E32/E34/E36			5 Nm
2AZ Center section to body	E32/E34			3 Nm
3AZ Control unit holder in E box	E36			5 Nm
4AZ Control unit box cover	E38/E39/E52			4 Nm
	E46			6 Nm
	E53/E36/7/E54			3 Nm
5AZ Electronics box to firewall	E65	Plastic screw		6 Nm

COOLANT TEMPERATURE

12 62 COOLANT TEMPERATURE

TIGHTENING TORQUE SPECIFICATION - COOLANT TEMPERATURE

	Type	Thread	Tightening specification	Measure
1AZ Temperature sensor to water flange (glow time/coolant temperature gauge)	M21			18 Nm
	M51			13 Nm
2AZ Temperature switch (5.5°C/17°C) to fuel filter/cylinder head	M21			18 Nm
3AZ Coolant temperature sensor (2-pin plug-in connection)	S38/S50			13 Nm
	S85	M12/1.52		13.5 Nm
	All/others			20 Nm
4AZ Remote thermometer sensor (2-pin plug-in connection)	All			20 Nm
Remote thermometer sensor (4-pin plug-in connection)	M62			16 Nm
	S62	M12 x 1.5		14 Nm
5AZ Remote thermometer sensor on coolant flange	S50			18 Nm
6AZ Temperature sensor - air	S38/S50			13 Nm
7AZ Temperature sensor - oil	S38/S50			13 Nm

ELECTRONICS BOX, WIRING HARNESS (N54, N52K)

12 90 ELECTRONICS BOX, WIRING HARNESS (N54, N52K)

TIGHTENING TORQUE SPECIFICATION - ELECTRONICS BOX, WIRING HARNESS

	Type	Thread	Tightening specification	Measure
1AZ Electronics box lid to electronics box	N54/N52K			5 Nm
2AZ Earth cable to cylinder head cover	N52K/N54	M5		5 Nm
3AZ Earth cable to holder, electric coolant pump	N52K/N54	M8	Replace aluminium screw	
			Jointing torque	8 Nm
			Torque angle	45 °
4AZ Cable duct to cylinder head cover	N54	M6		8 Nm

ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY

12 61 ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY

TIGHTENING TORQUE SPECIFICATION - ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY

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	Type	Thread	Tightening specification	Measure
1AZ Engine oil pressure switch/engine oil temperature sensor	N52K/N54	M12x1.5	Jointing torque	20 Nm
			Torque angle	16 °
2AZ Oil condition sensor for engine oil	N52K/N54	M6	Jointing torque 2 Nm	8.5 Nm

ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY

12 61 ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY

TIGHTENING TORQUE SPECIFICATION - ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY

	Type	Thread	Tightening specification	Measure
1AZ Engine oil pressure switch	N54	M12x1.5	1. Tightening 2. Further angle of rotation	20 Nm 16°±2°
2AZ Oil condition sensor	N54	M6		8 Nm

GOVERNOR

12 32 GOVERNOR

TIGHTENING TORQUE SPECIFICATION - GOVERNOR

	Type	thread	tightening specification	Value
1AZ Regulator switch	All	M4		2 Nm
	All	M5		4 Nm

OIL PRESSURE, OIL TEMPERATURE, OIL LEVEL DISPLAY

12 61 OIL PRESSURE, OIL TEMPERATURE, OIL LEVEL DISPLAY

TIGHTENING TORQUE SPECIFICATION - OIL PRESSURE, OIL TEMPERATURE, OIL LEVEL DISPLAY

	Type	Thread	Tightening specification	Measure
1AZ Oil-pressure switch/oil-temperature switch	All	M12x1.5		27 Nm
2AZ Level switch for engine oil	N62/N73/M67TU		Jointing torque 2 Nm	8.5 Nm
3AZ Oil pressure switch	N46	M12 x 1.5		27 Nm
4AZ Level sensor to oil sump	N46	M6		9 Nm

SENDERS FOR CONTROL UNIT

12 72 SENDERS FOR CONTROL UNIT

TIGHTENING TORQUE SPECIFICATION - SENDERS FOR CONTROL UNIT

	Type	Thread	Tightening specification	Measure
1AZ Lever to pedal value sender	E32/E34/E31/E36			9 Nm
2AZ Pedal value sender to pedal console	E32/E34/E31			5 Nm

SPARK PLUGS

12 12 SPARK PLUGS

TIGHTENING TORQUE SPECIFICATION - SPARK PLUGS

	Type	Thread	Tightening specification	Measure
1AZ Spark plugs (ungreased)	All	M12x1.25		23 ± 3 Nm
	All	M14x1.25		30 ± 3 Nm

STARTER MOTOR WITH MOUNTING

12 41 STARTER MOTOR WITH MOUNTING

TIGHTENING TORQUE SPECIFICATION - STARTER MOTOR WITH MOUNTING

	Type	Thread	Tightening specification	Measure
1AZ Starter to crankcase	N54	M10x30		38 Nm
2AZ Starter to transmission housing	N54	M10x85		38 Nm

WIRES TO STARTER

12 42 WIRES TO STARTER

TIGHTENING TORQUE SPECIFICATION - WIRES TO STARTER

	Type	Thread	Tightening specification	Measure
1AZ Battery positive terminal in/on distribution box	E32/E34/E31/E36/E46/E87/E90/E85/E86/E81	M8		20 Nm
	E39/M57	M8		11 Nm
	E38/M67	M8		11 Nm
	E46/M47TU	M8		11 Nm
	E60/N62	M8		15 Nm
	E65/N62/N73	M8		15 Nm
2AZ Wiring harness on distributor	E36/M41	M8		10 Nm