

2006-07 ENGINE**Engine Electrical System - Repair Instructions - V8 (N62TU)****00 TROUBLESHOOTING****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

12 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.
- On vehicles with radio code: After disconnecting the battery, the radio code must be re-entered. Therefore obtain the radio code card from the customer beforehand. Note stored stations and restore them after connecting the battery.
- Stored settings of the on-board computer and clock will also be lost.
- All available central keys must be recoded for cars with first generation infrared transmitter locking systems.

- Do not disconnect battery leads and leads from alternator and starter motor while engine is running.
- Cars with IBS on battery negative terminal:

Do not under any circumstances pull/lever off pole shoes by force.

Do not under any circumstances release socket-head cap screw of IBS.

- Detach terminal of battery negative lead from car battery and second battery if fitted. Cover battery negative terminal(s) and secure.
- When work is carried out on the electrical system, faults may be caused in the fault memories of some control units when the battery is connected.
- When installing battery terminal: See tightening torque 61 21 1AZ in **61 21 BATTERY WITH TERMINAL** .

After connecting battery:

IMPORTANT: After a power supply interruption some equipment is disabled and must be reactivated.

Likewise, individual settings are lost and must be activated.

Example:

- **Vehicles with build date from 03/2007:**

Teach-in mid-position for power steering

- **If necessary, activate sliding sunroof**
- **If necessary, carry out adjustment of active front steering**
- **If necessary, activate power windows**
- **If necessary, activate mirror with compass**

Vehicles with a two-battery system

Starter and equipment batteries

A two-battery system has a starter battery circuit and an equipment battery circuit. A secondary control unit monitors both battery circuits. Depending on the situation, the battery circuits are connected to or isolated from the secondary control unit via an isolating relay.

Two AGM batteries, whose design and properties are described in AGM batteries, are used as a storage battery.

IMPORTANT: These batteries must not under any circumstances be charged with a voltage in excess of 14.8 V. Rapid programs must not be used either.

Receiving/giving starting assistance via jump start terminal

The engine can be jump-started with an external voltage supply via the jump start terminal on the right side of the engine compartment.

NOTE: **The starter battery is isolated from the alternators when the engine hood/bonnet is open.**

Giving starting assistance via the jump start terminal is thus limited by the capacity of the starter battery when the engine hood/bonnet is open.

Charging starter and equipment batteries via jump start terminal

The starter battery is charged as a matter of priority with a charger connected to the jump start terminal. The voltage at the starter battery is the decisive factor in determining whether the equipment battery is also included in the charging operation. The secondary control unit automatically detects a charging operation at a charging voltage at the starter battery of $>$ or $= 13.5$ V. The isolating relay is closed and thus the equipment battery is connected in parallel. Both batteries are now charged.

Prerequisite:

- Terminal 61 inactive
- Terminal 15 inactive

If terminal 15 becomes "active" during the charging operation, the isolating relay is opened immediately and again only the starter battery is charged.

NOTE: **When the engine hood is open, the isolating relay is also opened in normal operation when the engine is running.**

A special mode can be set by means of diagnosis for workshop/garage operation. The isolating relay is closed from terminal R in this operating mode. This mode is automatically reset once a distance of 5 km has been driven.

Trickle charging

The increased closed-circuit current consumption can be compensated for via the jump-start connection point with the aid of the "Acctiva easy" battery trickle charger.

IMPORTANT: **The cigarette lighter is isolated from the electrical system after terminal R "OFF" on a timed basis (60 mins.), thereby interrupting charging of the equipment battery via the cigarette lighter. This is prevented if the battery master switch (on the right side of the luggage compartment behind the panel) is turned on and off again twice within 2 seconds. (Cigarette light battery charging function).**

12 00 ... INSTRUCTIONS FOR REMOVING AND INSTALLING ELECTRONIC CONTROL UNITS**IMPORTANT:**

- **Disconnecting the vehicle battery will cancel the fault memories of control units. Consequently, before disconnecting the car's battery, always interrogate the fault memories. Investigate stored faults and, once any faults have been remedied, cancel the fault memory.**
- **Control unit plugs should only ever be connected and disconnected while the ignition is turned off.**
- **The removal and installation of components, relays, fuses etc. can cause faults to be stored in fault memories capable of self diagnosis. Always interrogate the fault memories after completing work on the electrical system.**
- **Investigate stored faults and, once any faults have been remedied, cancel the fault memory.**

Comply with the following when replacing the DME/DDE (Digital Motor Electronics/Digital Diesel Electronics):

- Always read out hardware/software version of the corresponding control unit with DIS tester.

Comply with the instructions of the DIS tester on the steps coding and programming.

On vehicles with electronic vehicle immobilization, comply with the instructions of the DIS tester.

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

12 13 NOTES ON CHECKING IGNITION SYSTEM**Troubleshooting**

- Fault in fuel injection system
- Spark plug faults

- Ignition coil faults
- Further fault patterns with evaluation
- Additional fault notes for troubleshooting

Oscillograms

- Normal oscillogram
- Oscillograms of ignition coils from different manufacturers

Check

- Secondary signal for stationary ignition distribution

12 REMOVING AND INSTALLING ENGINE COMPARTMENT SUPPRESSION LINES (GROUNDING CABLES) (N62/TU)

Necessary preliminary tasks:

- Read out fault memory of DME control unit; if necessary, work through test schedules
- Switch off ignition
- Disconnect battery negative lead
- If necessary, remove acoustic cover
- **REMOVE INTAKE HOSE**
- Remove intake filter housing

Release screw connection (1) of intake filter mounting.

Pull ignition coil covers (2) out of rubber grommets.

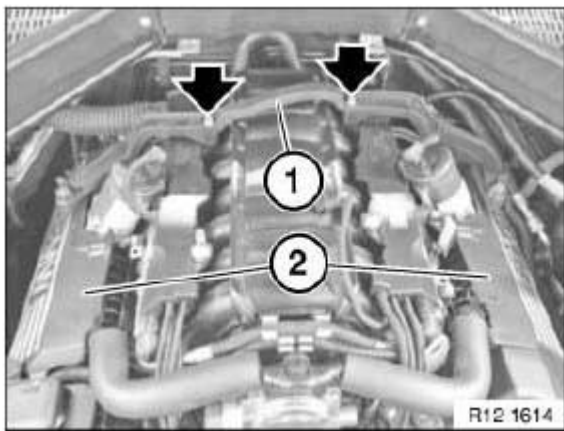


Fig. 1: Identifying Holder And Ignition Coil Covers
Courtesy of BMW OF NORTH AMERICA, INC.

Release front screw connection of fuel injector wiring harness, screw down grounding strap with crimp connection again in upward direction.

Release ignition coil ground screw connection and screw other end of grounding strap to ignition coil ground again.

Installation:

Tightening torque: 12 52 3AZ . See **CONNECTIONS, TERMINALS, LOOSE PARTS** for specs.

The picture shows the right cylinder bank, the procedure for the left cylinder bank is identical.

Add final details to vehicle, read out fault memory.

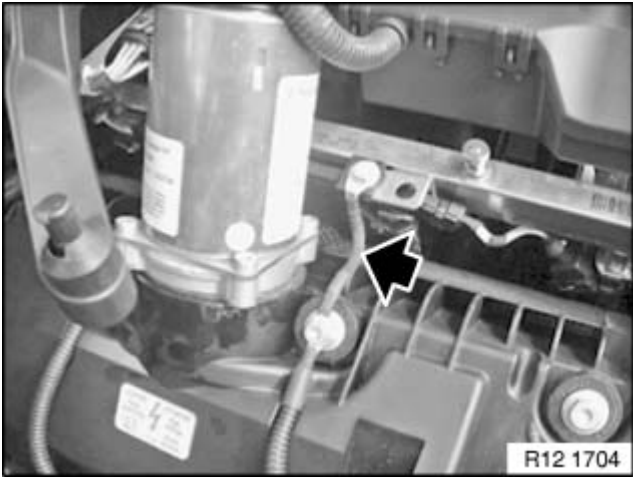


Fig. 2: Identifying Ignition Coil Ground Wire
Courtesy of BMW OF NORTH AMERICA, INC.

12 IGNITION WIRES, SPARK PLUGS

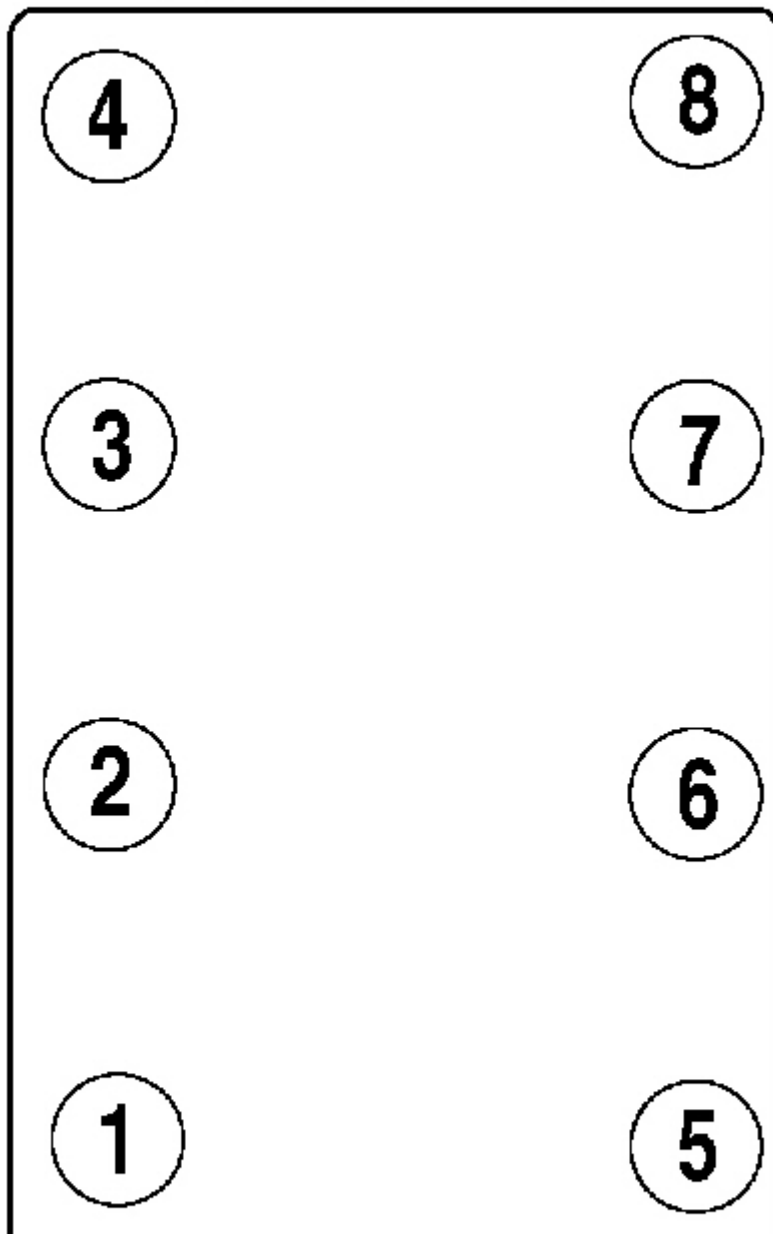
FIRING ORDER

FIRING ORDER

Application	Firing Order
V8	1 - 5 - 4 - 8 - 6 - 3 - 7 - 2

FIRING ORDER

1-5-4-8-6-3-7-2



FRONT OF VEHICLE ↓

Fig. 3: Firing Order (V8)

Courtesy of BMW OF NORTH AMERICA, INC.

12 12 011 REPLACING ALL SPARK PLUGS (N62, N62TU)**Special tools required:**

- 12 1 171
- 12 1 172

Necessary preliminary tasks:

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

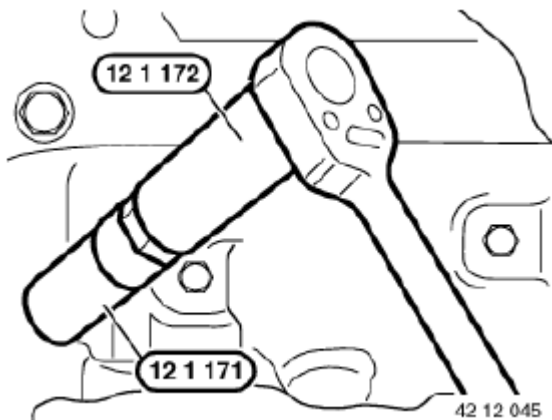
Unscrew spark plugs with special tool 12 1 171.

Installation:

Tighten down spark plugs with special tool 12 1 171 and special tool 12 1 172 (torque limiter).

Without special tool 12 1 172, observe tightening torque.

Tightening torque 12 12 1AZ. See **ENGINE ELECTRICAL SYSTEM - TIGHTENING TORQUES**.

**Fig. 4: Tightening Down Spark Plugs With Special Tool 12 1 171 And 12 1 172**

Courtesy of BMW OF NORTH AMERICA, INC.

13 IGNITION COIL**12 13 NOTES ON CHECKING IGNITION SYSTEM**

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

Oscillograms

- Normal oscillogram
- Oscillograms of ignition coils from different manufacturers

Check

- Secondary signal for stationary ignition distribution

12 13 ... ADDITIONAL FAULT NOTES FOR TROUBLESHOOTING

Necessary preliminary tasks:

- Connect diagnosis system



Fig. 5: Identifying Diagnosis Information System
Courtesy of BMW OF NORTH AMERICA, INC.

12 13 ... CHECKING SECONDARY SIGNAL FOR STATIONARY IGNITION DISTRIBUTION

Special tools required:

- 12 7 030

Remove ignition coil. Clip special tool 12 7 030 on the end of the ignition coil to be tested. Clip high tension clip around ignition lead.

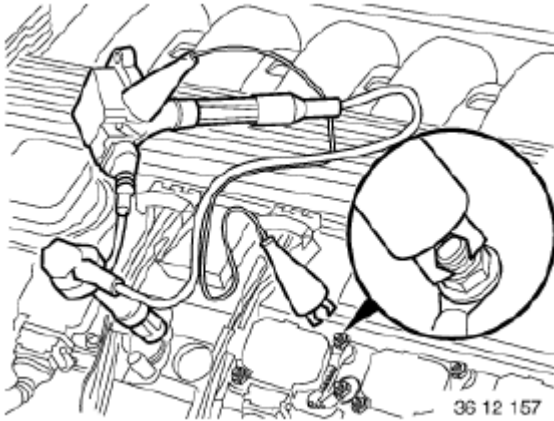


Fig. 6: Removing Ignition Coil

Courtesy of BMW OF NORTH AMERICA, INC.

Connect earth lead of adapter to vehicle earth and ignition coil. Connect up diagnosis connector.

If trigger signal is not present (terminal 1), connect black clip of universal adapter cable to pin 1 of primary adapter cable.

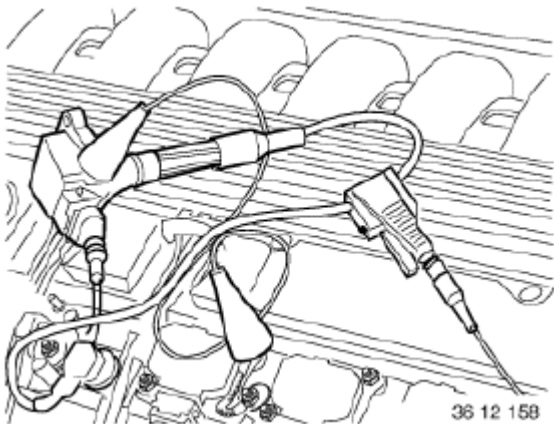


Fig. 7: Connecting Earth Lead Of Adapter To Vehicle Earth And Ignition Coil

Courtesy of BMW OF NORTH AMERICA, INC.

Produce a stationary signal by pressing key R on the tester.

NOTE: **Neighboring ignition leads could produce interference on the screen of the oscilloscope.**

Interrogate fault memory and its fault reports.

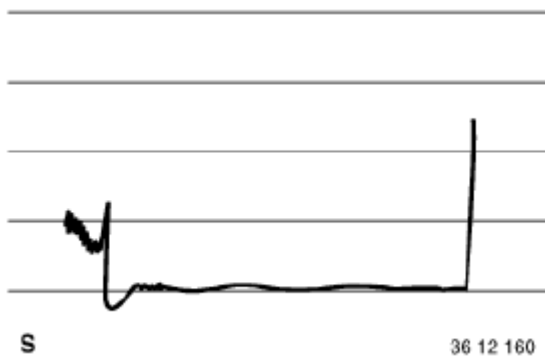


Fig. 8: Identifying Waveform

Courtesy of BMW OF NORTH AMERICA, INC.

12 13 ... FURTHER FAULT PATTERNS WITH EVALUATION

Necessary preliminary tasks:

- Connect diagnosis system



Fig. 9: Identifying Diagnosis And Information System

Courtesy of BMW OF NORTH AMERICA, INC.

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

Special tools required:

- 12 1 301
- 12 7 050

Necessary preliminary tasks:

- Read out fault memory in DME (Digital Engine Electronics)

- N40: Remove sound absorption hood
- N42: Remove sound absorption hood
- N43: Remove sound absorption hood
- N45: Remove sound absorption hood
- N46: Remove sound absorption hood
- N52: Remove sound absorption hood
- N62/N62TU: Remove sound absorption hood
- N62/N62TU: Remove ignition coil cover Open control unit box
- Remove M54/56 ignition coil cover

Unlock plug fastener (1) of ignition coil.

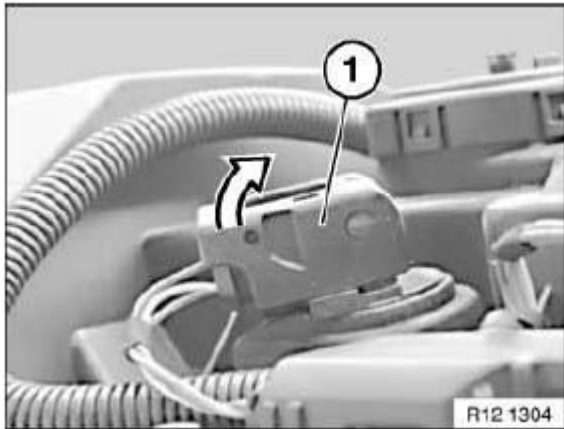


Fig. 10: Unlocking Plug Fastener Of Ignition Coil
Courtesy of BMW OF NORTH AMERICA, INC.

Detach plug (1) in direction of arrow.

Pull out ignition coil (2) towards top.

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

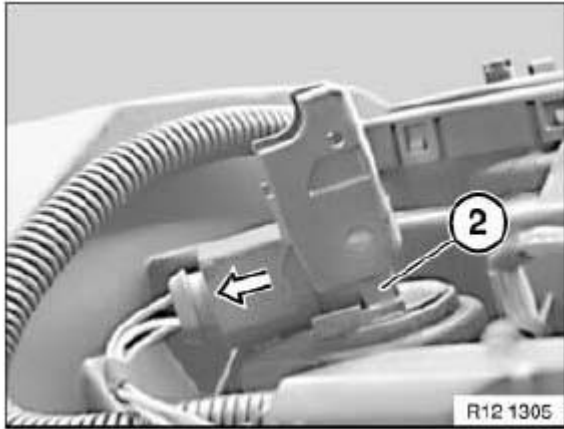


Fig. 11: Detaching Ignition Coil Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool 12 7 050.

Installation:

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

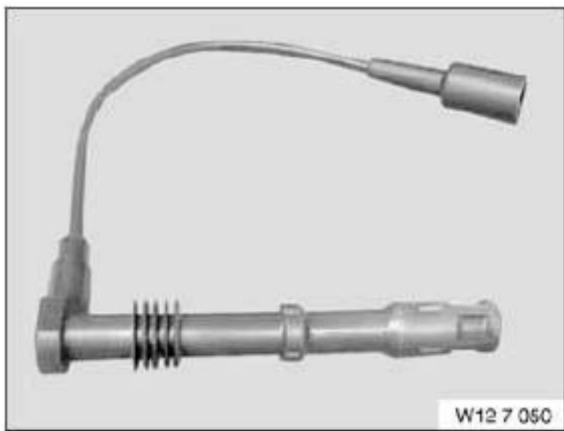


Fig. 12: Identifying Special Tool 12 7 050
Courtesy of BMW OF NORTH AMERICA, INC.

Secondary measurement:

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

Procedure on DIS Tester:

- Select < Measurement >.
- Select < Preset measurement >.

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

For subsequent procedure, follow DIS instructions.

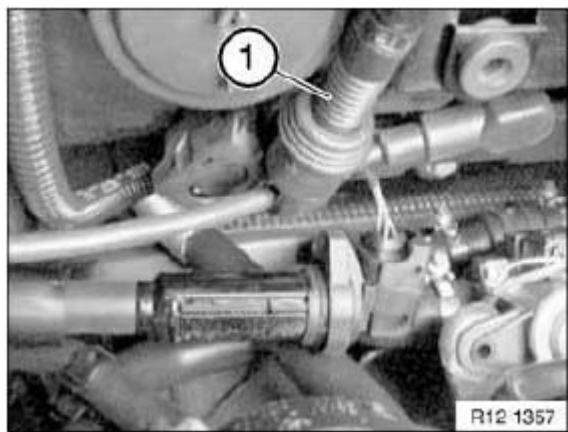


Fig. 13: Identifying KV Clip-On Probe

Courtesy of BMW OF NORTH AMERICA, INC.

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

Primary measurement:

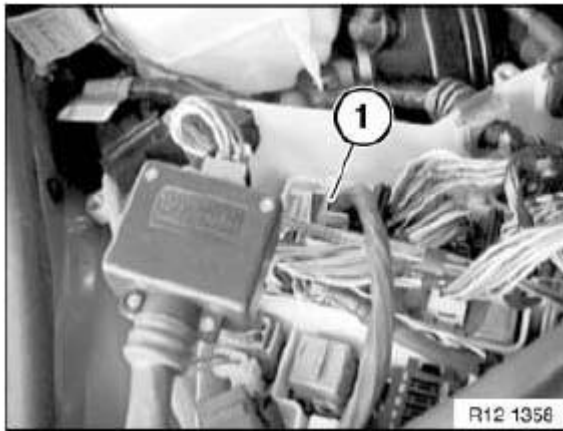
Connect 26-pin pin box with special tool 12 1 301 to connector (1) DME module 5.

Procedure on DIS Tester:

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

For subsequent procedure, follow DIS instructions.

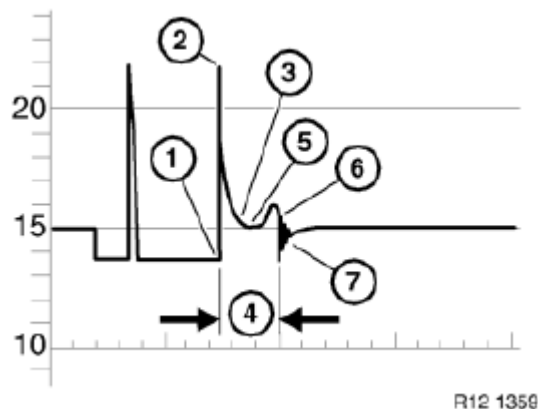
IMPORTANT: Ignition signal is a multiple spark ignition .

**Fig. 14: Identifying Connector**

Courtesy of BMW OF NORTH AMERICA, INC.

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. 15: Multiple Spark Ignition Graph**

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.

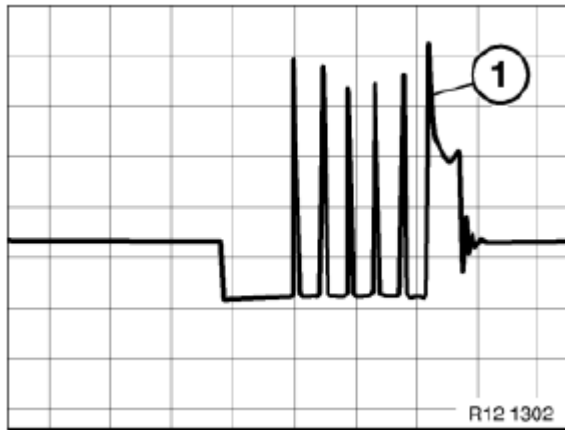


Fig. 16: Identifying Waveform Of Ignition Peak
Courtesy of BMW OF NORTH AMERICA, INC.

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 13 511 REPLACING IGNITION COIL (N62TU)

Necessary preliminary tasks:

- Switch off ignition
- Remove **INTAKE FILTER HOUSING**

Release screws and remove holder (1).

Pull ignition coil covers (2) out of rubber grommets.

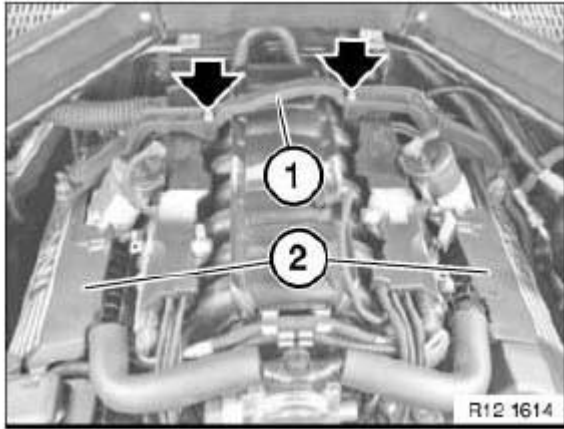


Fig. 17: Locating Holder And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug fastener (1) of ignition coil.

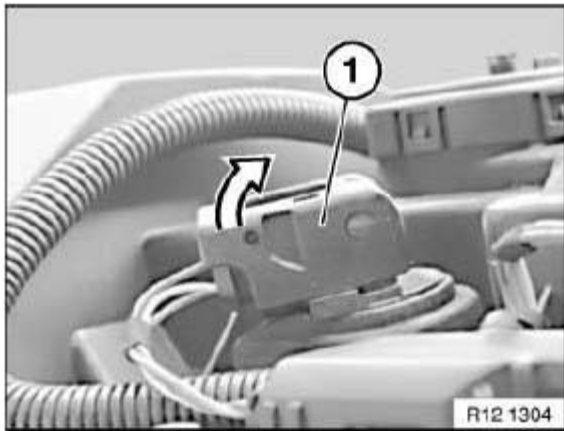


Fig. 18: Unlocking Plug Fastener Of Ignition Coil
Courtesy of BMW OF NORTH AMERICA, INC.

Detach ignition coil connector in direction of arrow.

Pull out ignition coil (2).

This procedure is applicable to all ignition coils.

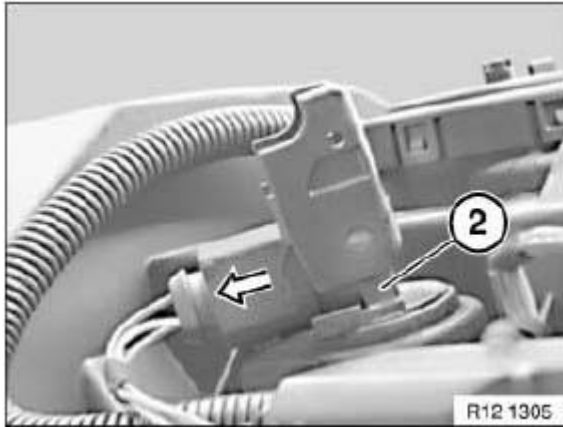


Fig. 19: Detaching Ignition Coil Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert rubber seal on ignition coils (2) between guides.

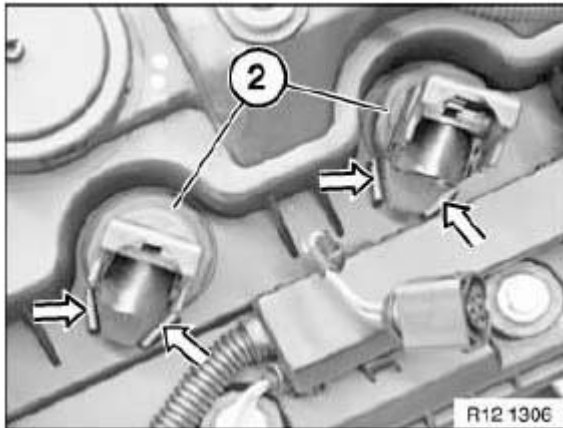


Fig. 20: Inserting Rubber Seal On Ignition Coils Between Guides
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

NOTE: Read out DME fault memory.

Check function of DME.

14 ELECTRONIC SWITCHING OR CONTROL UNIT

11 37 700 REPLACING CONTROL UNIT (VALVE ELECTRONIC)

Switch off ignition.

Follow instructions for disconnecting and connecting battery.

Disconnect battery.

CAUTION: Follow instructions for removing and installing electronic control units.
See INSTRUCTIONS FOR REMOVING AND INSTALLING ELECTRONIC CONTROL UNITS.

Observe following instructions before replacing control unit:

PROGRAM CONTROL UNIT.

Remove right fresh air duct.

Release screw and remove holder (1).

Release screws and remove cover (2) from control unit box.

NOTE: Release screws on seal (3) only when removing wiring harness.

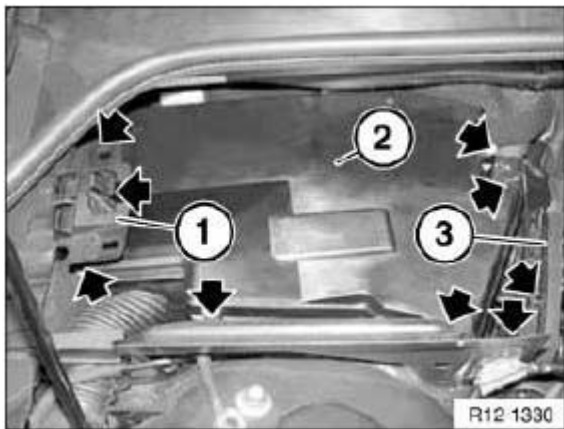


Fig. 21: Locating Holder And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert tabs (1) in openings (2) and close cover.

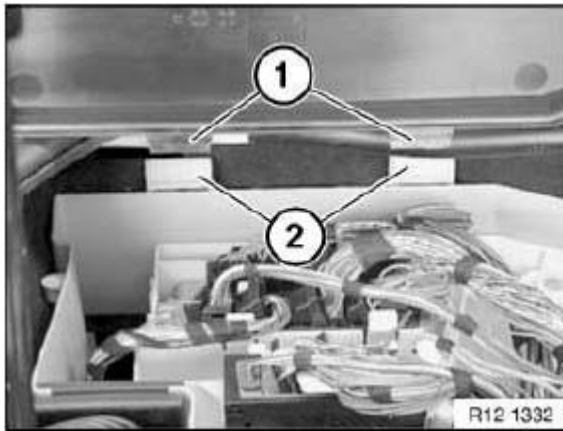


Fig. 22: Identifying Tabs And Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach plug connections on Valvetronic control unit (1).

Remove Valvetronic control unit (1).

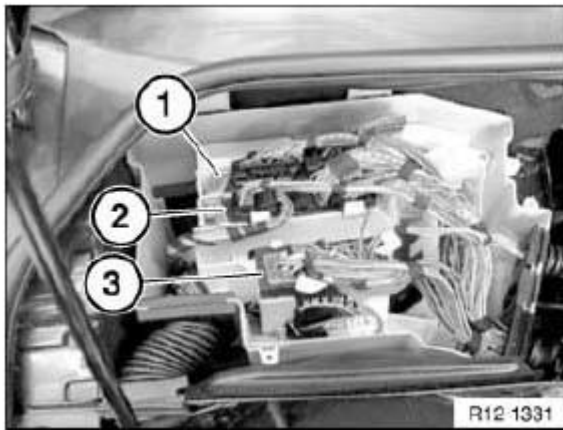


Fig. 23: Identifying Valvetronic Control Unit

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Interrogate fault memory of DME control unit.

Check stored fault messages.

Rectify faults.

Then clear fault memory.

(cylinder bank 5 to 8)

Necessary preliminary tasks:

- Read out fault memory of DME control unit; if necessary, work through test schedules
- Switch off ignition.
- Remove **ACOUSTIC COVER**
- Remove left ignition coil cover

Release plug connector (1) and pull off.

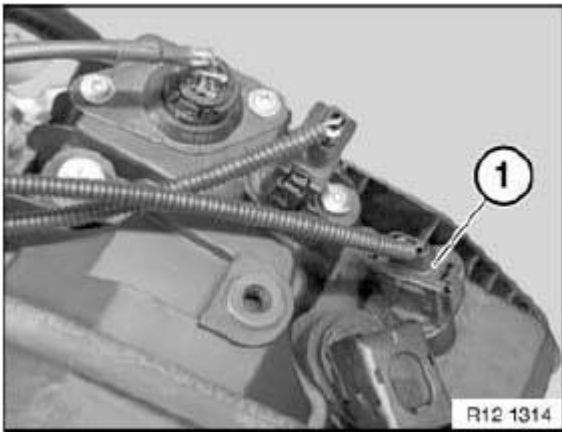


Fig. 24: Identifying Plug Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw.

Remove pulse generator (2).

Installation:

Replace sealing ring and coat with antiseize agent.

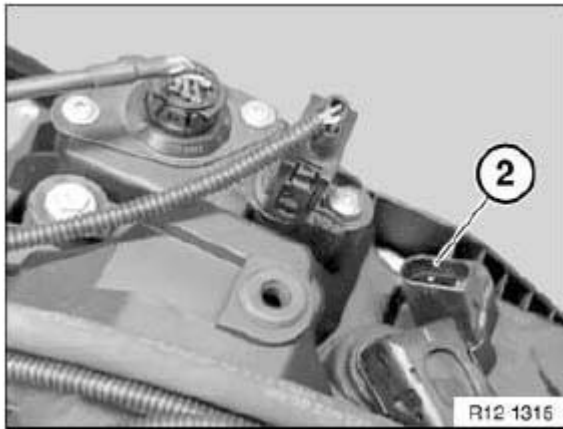


Fig. 25: Identifying Pulse Generator

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Now clear the fault memory.

12 14 513 REPLACING PULSE GENERATOR ON RIGHT EXHAUST CAMSHAFT (N62, N62TU)

(cylinder bank 1 to 4)

Necessary preliminary tasks:

- Read out fault memory of DME control unit; if necessary, work through test schedules
- Switch off ignition
- Remove ACOUSTIC COVER
- Remove right ignition coil cover

Release plug connector (1) and pull off.

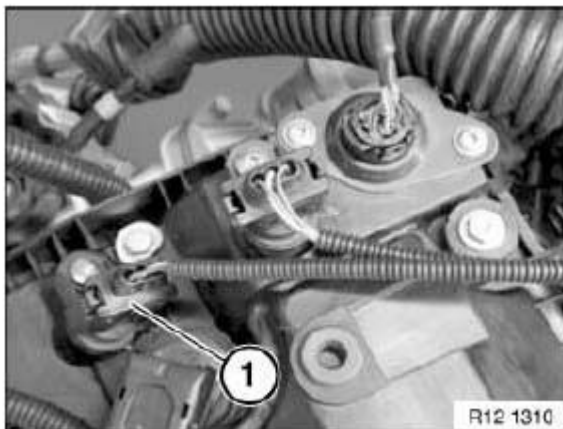


Fig. 26: Identifying Plug Connector

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw.

Remove pulse generator (2).

Installation:

Replace sealing ring and coat with antiseize agent.

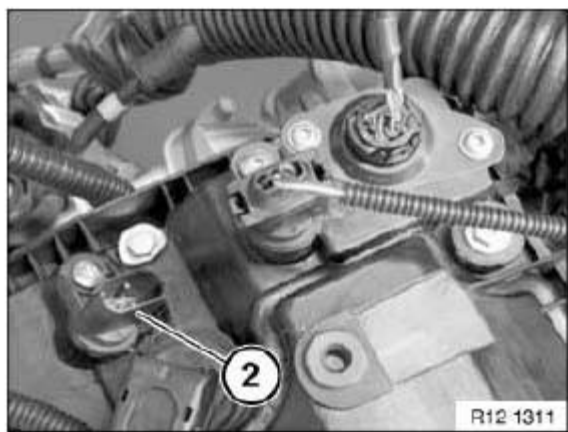


Fig. 27: Identifying Pulse Generator

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Now clear the fault memory.

12 14 521 REPLACING CRANKSHAFT PULSE GENERATOR (N62, N62TU)

Necessary preliminary tasks:

- Read out fault memory of DME control unit; if necessary, work through test schedules
- Switch off ignition
- If necessary, remove underbody protection.

Installation location:

On transmission housing at bottom right.

Unlock plug (1) and remove.

Release screw.

Withdraw pulse generator (2) from transmission housing.

Installation:

Replace sealing ring.

Replace screw.

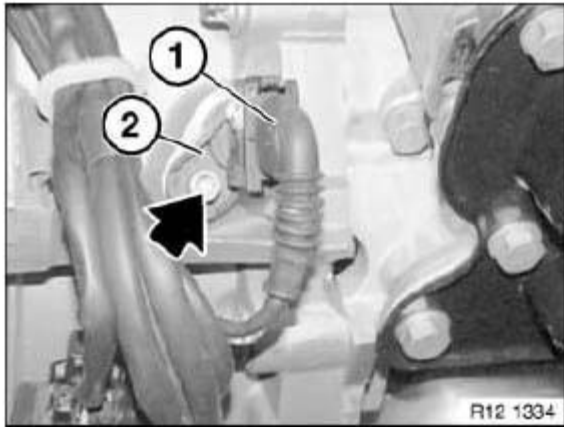


Fig. 28: Locating Pulse Generator

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Now clear the fault memory.

12 14 522 REPLACING PULSE GENERATOR ON LEFT INLET CAMSHAFT (N62, N62TU)

(cylinder bank 5 to 8)

Necessary preliminary tasks:

- Read out fault memory of DME control unit; if necessary, work through test schedules
- Switch off ignition
- Remove **ACOUSTIC COVER**
- Remove left ignition coil cover

Release plug connector (1) and pull off.

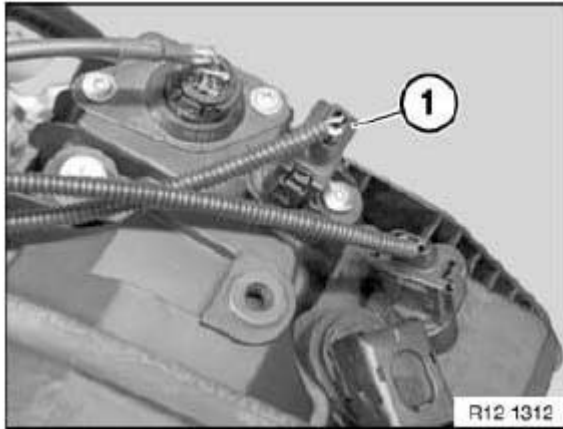


Fig. 29: Identifying Plug Connector

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw.

Remove pulse generator (2).

Installation:

Replace sealing ring and coat with antiseize agent.

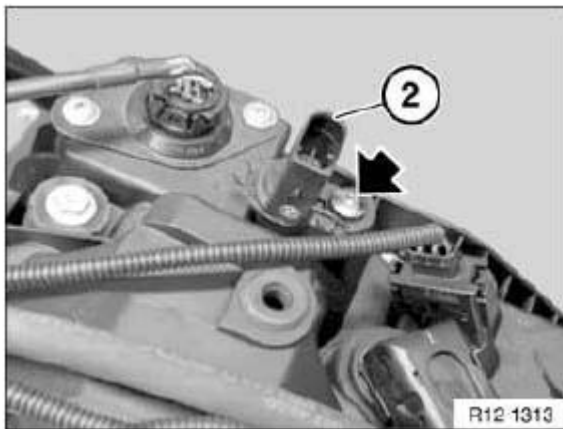


Fig. 30: Locating Pulse Generator

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Now clear the fault memory.

12 14 526 REPLACING PULSE GENERATOR ON RIGHT INLET CAMSHAFT (N62, N62TU)

(cylinder bank 1 to 4)

Necessary preliminary tasks:

- Read out fault memory of DME control unit; if necessary, work through test schedules
- Switch off ignition
- Remove **ACOUSTIC COVER**
- Remove right ignition coil cover

Release plug connector (1) and pull off.

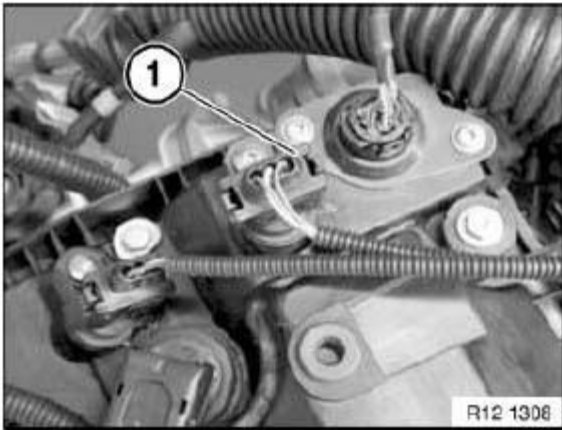


Fig. 31: Identifying Plug Connector

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw.

Remove pulse generator (2).

Installation:

Replace sealing ring and coat with antiseize agent.

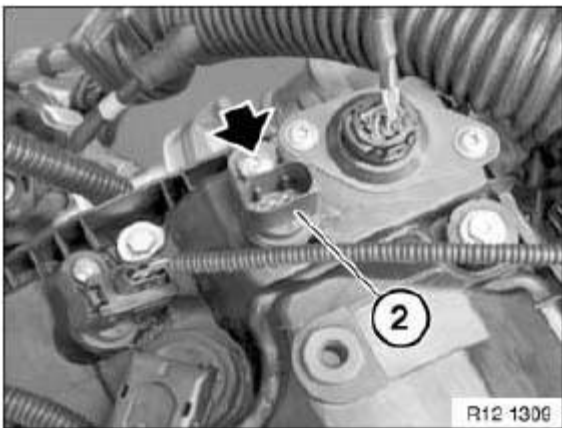


Fig. 32: Locating Pulse Generator

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Now clear the fault memory.

12 14 550 REPLACING CONTROL UNIT (DME) (N62, N62TU)

Necessary preliminary tasks:

- Read fault memory
- Switch off ignition
- Disconnect battery
- Remove **LOWER SECTION OF MICROFILTER HOUSING ON RIGHT** .

IMPORTANT: Follow instructions for removing and installing electronic control units. See **Instructions For Removing And Installing Electronic Control Units**.

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

Replacement:

- **PROGRAM CONTROL UNIT**
- **CODE CONTROL UNIT**

Unlock stopper (1) in direction of arrow.

Unfasten screws.

Lift out cover (2).

Security version:

Remove DME **ARMOUR PLATING**

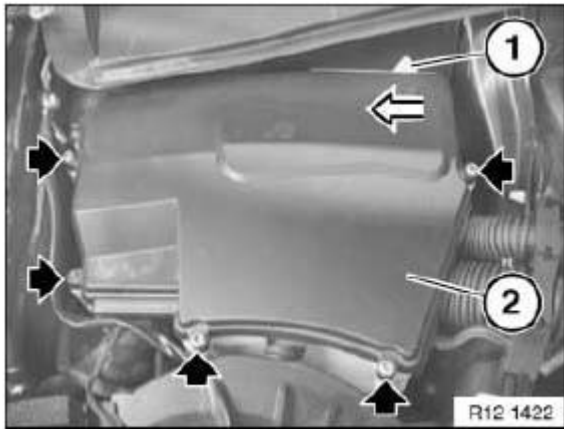


Fig. 33: Locating Screws And Stopper
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach all plug connections on DME control unit (1).

Unlock DME control unit (1) and remove towards top.



Fig. 34: Identifying DME Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

12 14 610 REPLACING RIGHT KNOCK SENSORS (N62, N62TU)

(cylinder bank 1 to 4)

Necessary preliminary tasks:

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

IMPORTANT: Mixing up the knock sensor plug connections will result in engine damage!

**Routing of wires and plug connections must conform to the original routing.
This eliminates the risk of confusion and mix-ups.**

Release bolts.

Tightening torque 12 14 1AZ. See **ENGINE - TIGHTENING TORQUES**.

Remove knock sensors (1).

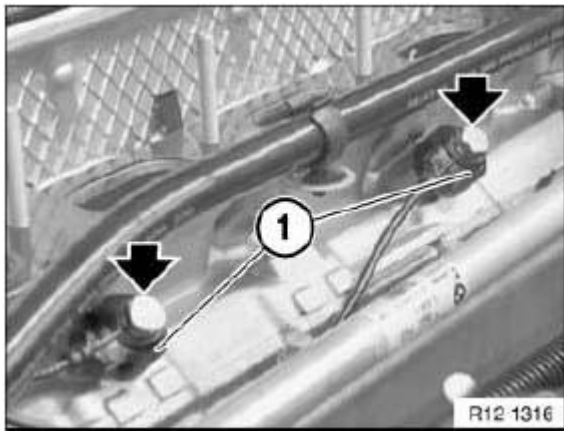


Fig. 35: Locating Knock Sensors

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Now clear the fault memory.

12 14 611 REPLACING LEFT KNOCK SENSORS (N62, N62TU)

(cylinder bank 5 to 8)

Necessary preliminary tasks:

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

IMPORTANT: Mixing up the knock sensor plug connections will result in engine damage!

**Routing of wires and plug connections must conform to the original routing.
This eliminates the risk of confusion and mix-ups.**

Release bolts.

Tightening torque 12 14 1AZ. See **ENGINE - TIGHTENING TORQUES** .

Remove knock sensors (1).

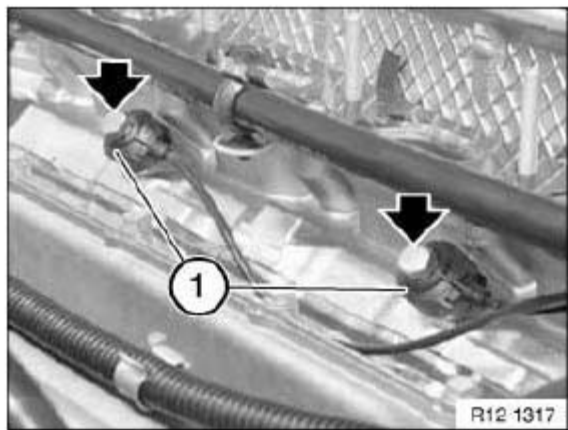


Fig. 36: Locating Knock Sensors

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Now clear the fault memory.

12 14 700 CODING CONTROL MODULE (DME / DDE)

Switch off ignition.

Connect MoDiC or DIS/GT1 Tester.

Switch on ignition.

Select "Coding" program.

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

Carry out adjustment of following control units:

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

12 14 705 PROGRAMMING CONTROL UNIT (DME / DDE)

Switch off ignition.

Connect MoDiC or DIS/GT1 Tester.

Switch on ignition.

Select "Programming".

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

Carry out adjustment of following control units:

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

31 ALTERNATOR WITH DRIVE AND MOUNT

12 31 ... REPLACING ALTERNATOR BELT PULLEY

Special tools required:

- 12 7 110

Remove and install alternator drive belt.

Depending on alternator type, grip shaft with:

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

Release nut with special tool 12 7 110.

Installation:

Tightening torque, 12 31 2AZ / 12 31 3AZ. See **ENGINE - TIGHTENING TORQUES** .

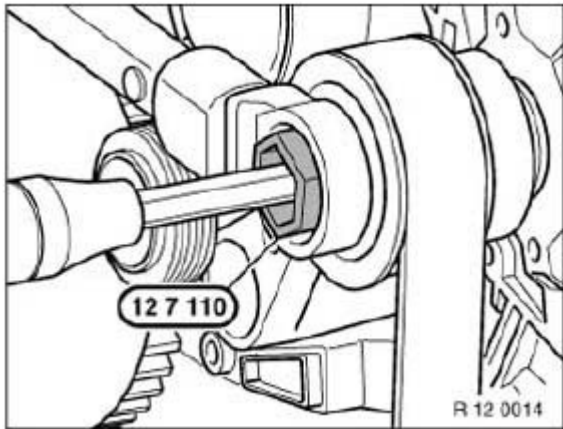


Fig. 37: Identifying Special Tool 12 7 110
 Courtesy of BMW OF NORTH AMERICA, INC.

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

Special tools required:

- 12 7 120

Remove and install alternator drive belt.

Grip alternator shaft with:

- internal serration

Release nut with special tools 12 7 120.

Installation:

Tightening torque: 12 31 3AZ. See **ENGINE - TIGHTENING TORQUES** .

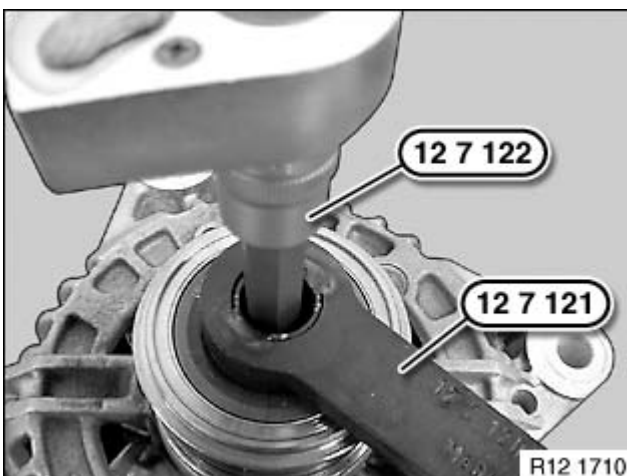


Fig. 38: Special Tools (12 7 122) And (12 7 121)
Courtesy of BMW OF NORTH AMERICA, INC.

12 31 009 CHECKING ALTERNATOR (BSD)

Necessary preliminary tasks:

- Correct connections on charged battery
- Correct connections on alternator and starter motor
- Good ground connection between engine and body
- Tensioned ribbed V-belt
- Read out DME/DDE fault memory.

NOTE: **The alternator with BSD interface can communicate with the engine control unit (DME/DDE).**

The alternator is not connected to the charge telltale light.

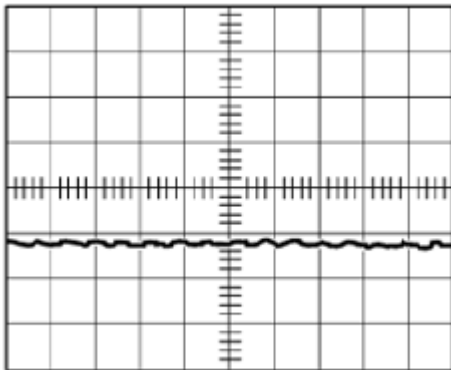
The alternator can identify various faults.

BSD alternator can be recognized by the plug connection on the alternator.

Connect diagnosis tester.

- Function selection
- Complete vehicle
- Drive
- Voltage and current regulation
- Voltage and current generation
- Alternator
- Follow instruction in diagnostic program

Oscillogram for a fault-free alternator:



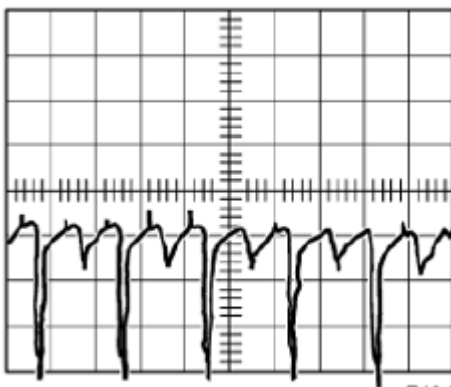
R12 0043

Fig. 39: Identifying Waveform - Fault-Free Alternator
Courtesy of BMW OF NORTH AMERICA, INC.

Oscillogram for a faulty alternator:

One phase interrupted.

Repair/exchange alternator.



R12 0044

Fig. 40: Identifying Waveform - Faulty Alternator (1 Of 6)
Courtesy of BMW OF NORTH AMERICA, INC.

Interturn fault.

Repair/exchange alternator.

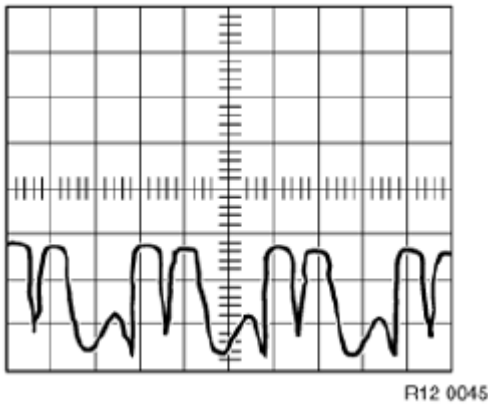


Fig. 41: Identifying Waveform - Faulty Alternator (2 Of 6)
Courtesy of BMW OF NORTH AMERICA, INC.

Open circuit in negative diode.

Repair/exchange alternator.

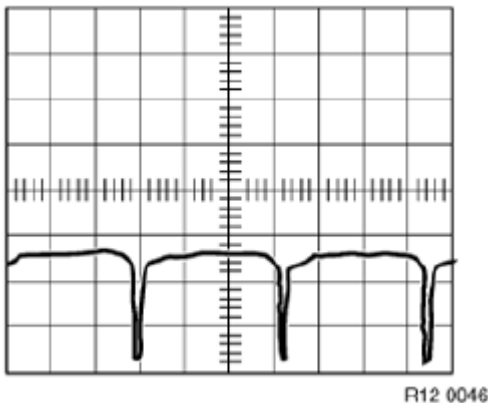


Fig. 42: Identifying Waveform - Faulty Alternator (3 Of 6)
Courtesy of BMW OF NORTH AMERICA, INC.

Short circuit in positive diode.

Repair/exchange alternator.

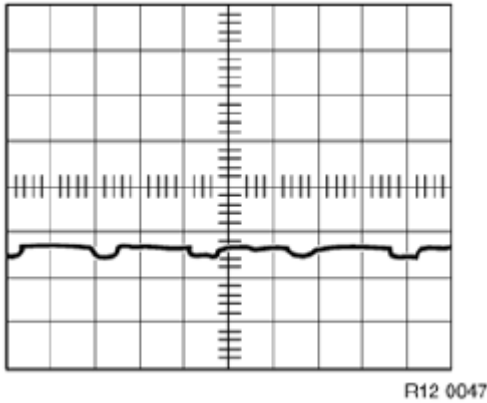


Fig. 43: Identifying Waveform - Faulty Alternator (4 Of 6)
 Courtesy of BMW OF NORTH AMERICA, INC.

Open circuit in positive diode.

Repair/exchange alternator.

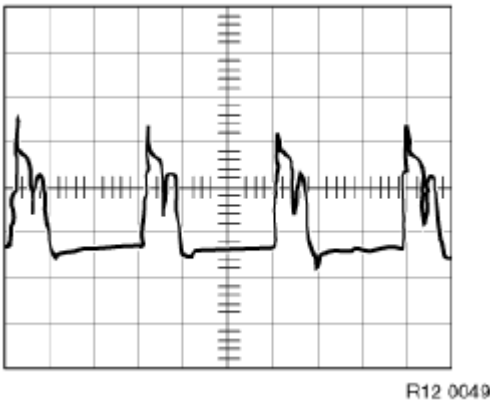


Fig. 44: Identifying Waveform - Faulty Alternator (5 Of 6)
 Courtesy of BMW OF NORTH AMERICA, INC.

Open circuit in exciter diode.

Repair/exchange alternator.

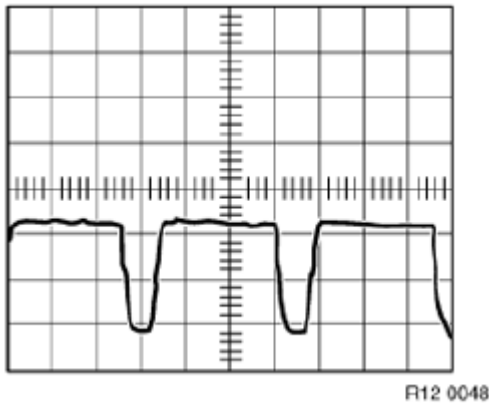


Fig. 45: Identifying Waveform - Faulty Alternator (6 Of 6)
 Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME/DDE.

12 31 020 REMOVING AND INSTALLING/REPLACING ALTERNATOR (N62)

Necessary preliminary tasks:

- Disconnect battery negative lead.
- Remove **SUCTION FILTER HOUSING** .
- Remove **ELECTRIC FAN** with cowl.
- Remove alternator **DRIVE BELT** .

Disconnect plug (3) from alternator.

Unscrew nut (1).

Lay B+ line (2) to one side.

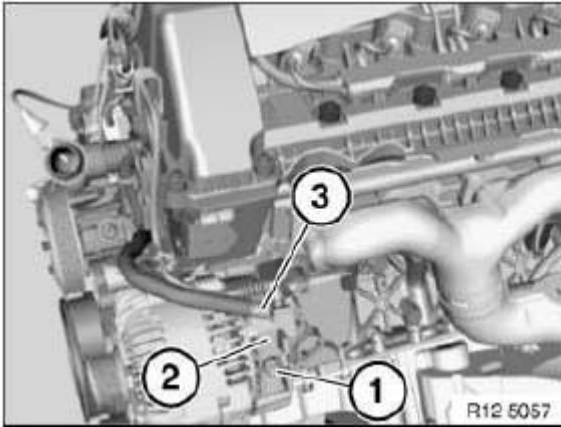


Fig. 46: Identifying Plug And Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Remove alternator (2).

Installation:

Modify guide pulley (3) to new alternator (replace if necessary).

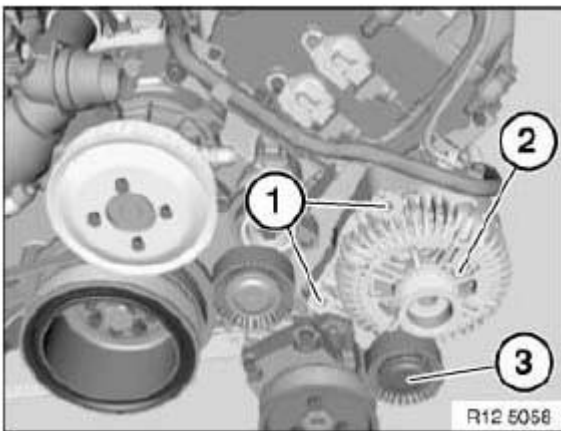


Fig. 47: Identifying Alternator, Guide Pulley And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Check DME (alternator) for correct operation.

32 REGULATOR

12 32 501 REPLACING CONTROLLER SWITCH FOR ALTERNATOR (N62, N62TU)

Necessary preliminary tasks:

- Disconnect battery negative lead
- Remove **ALTERNATOR**

Carefully insert a screwdriver between cover (1) and threaded pin.

Lever out cover (1) towards top.

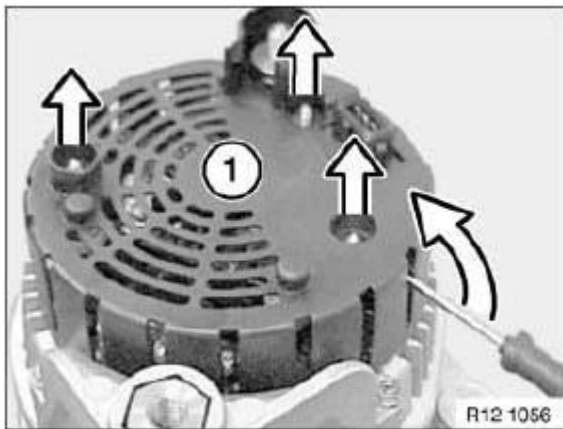


Fig. 48: Inserting Screwdriver Between Cover And Threaded Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Release contact screws (1).

Slacken nut (2).

Remove controller switch (3).

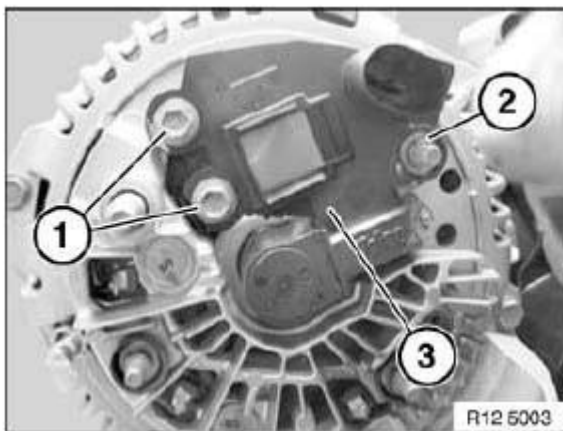


Fig. 49: Identifying Contact Screws, Nut And Controller Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Check contact surfaces (1) of slip rings for wear and recondition if necessary.

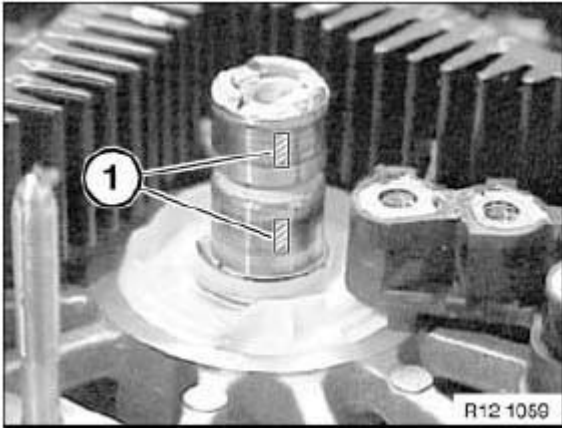


Fig. 50: Identifying Contact Surfaces

Courtesy of BMW OF NORTH AMERICA, INC.

Press in carbon brushes (1) of controller switch (2) in direction of arrow.

Install controller switch (2).

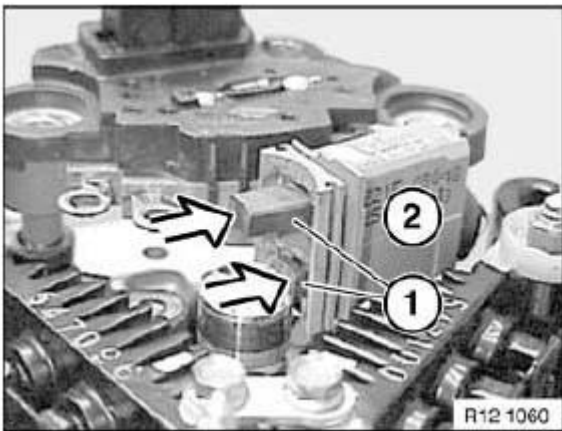


Fig. 51: Pressing Carbon Brushes Of Controller Switch

Courtesy of BMW OF NORTH AMERICA, INC.

Insert and tighten down contact screws (1).

Insert nut (2) and tighten down.

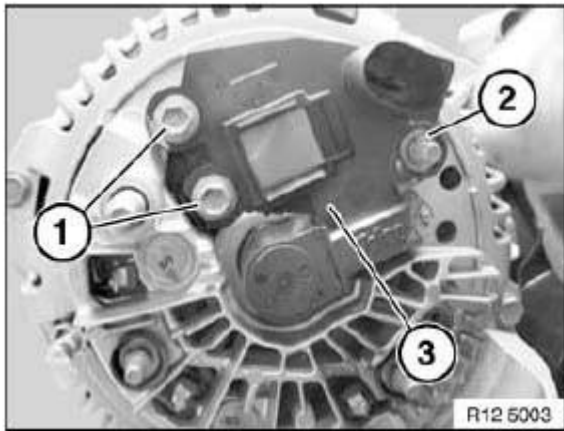


Fig. 52: Identifying Contact Screws And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble alternator.

Carry out alternator test with diagnostic system.

12 32 501 REPLACING VOLTAGE REGULATOR

Necessary preliminary tasks:

- Switch off ignition
- Disconnect battery negative lead
- Notes on removing and installing electronic control units
- Remove alternator

Bosch:

Release protective caps (1).

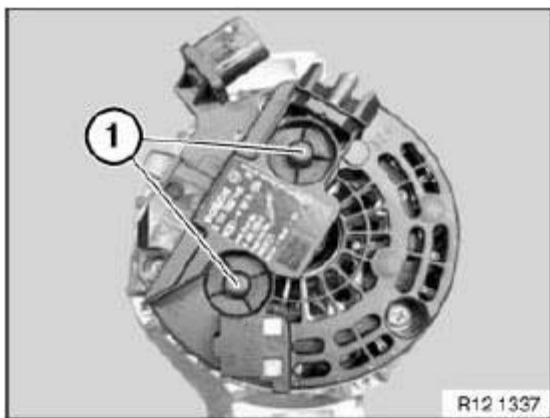
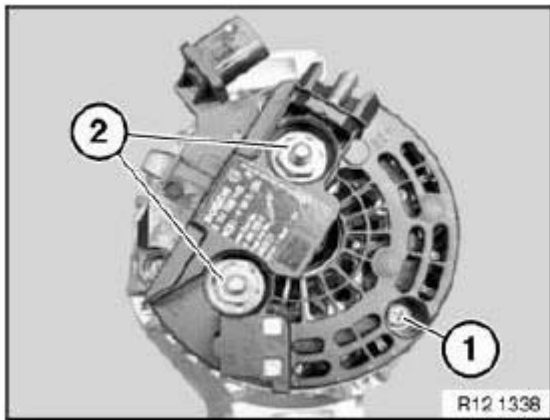


Fig. 53: Identifying Protective Caps

Courtesy of BMW OF NORTH AMERICA, INC.

Bosch:

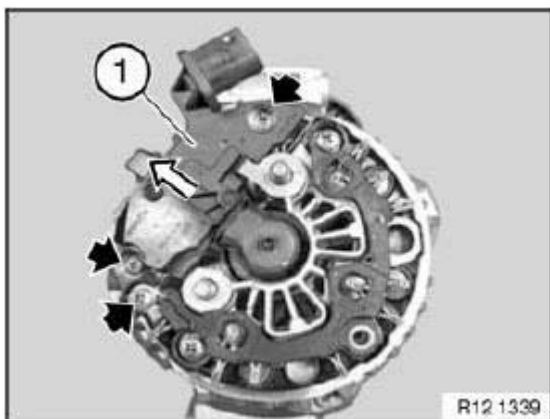
Release screw (1) and nuts (2), remove cover.

**Fig. 54: Identifying Cover Screw And Nuts**

Courtesy of BMW OF NORTH AMERICA, INC.

Bosch:

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

**Fig. 55: 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.

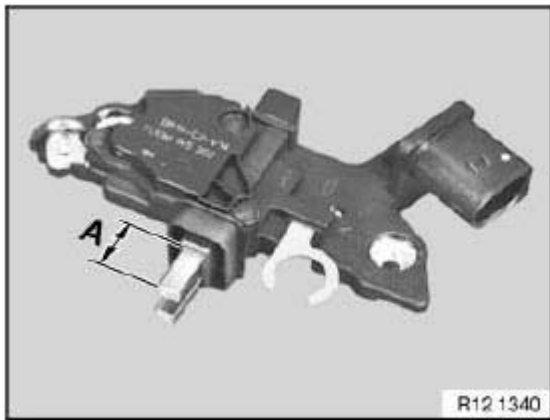


Fig. 56: Identifying Pretension Of Contact Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo:

Slacken nut (1).

Slacken nut (2).

Release screws (3).

Release cover (4).

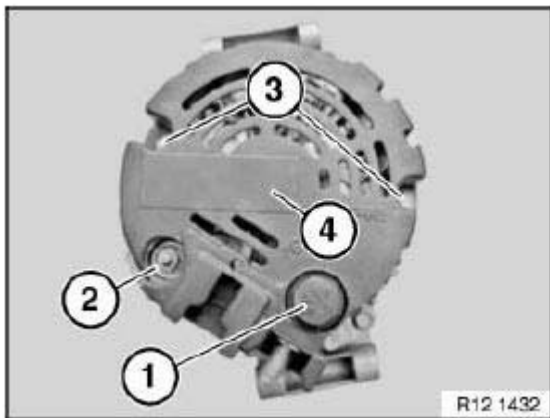


Fig. 57: Identifying Cover, Nuts And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo:

Release screws.

Remove regulator switch (1) towards top.

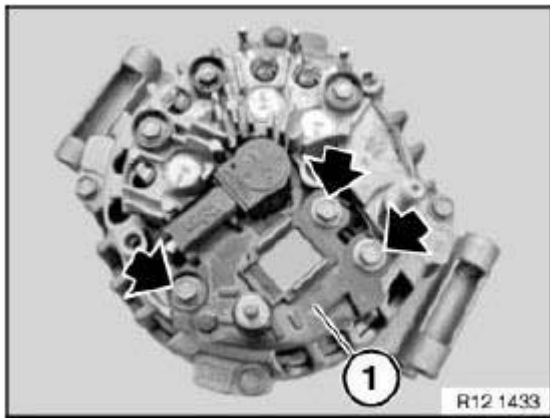


Fig. 58: Locating Regulator Switch Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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.

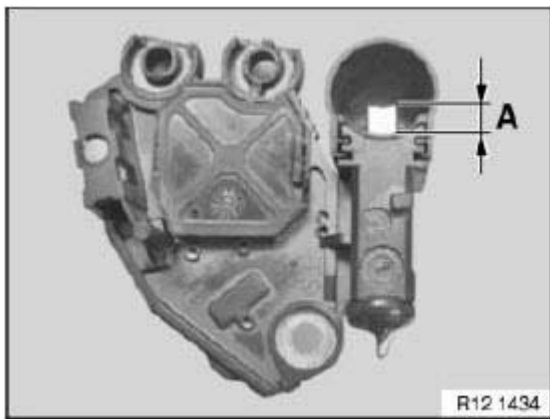


Fig. 59: Identifying Pretension Of Contact Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

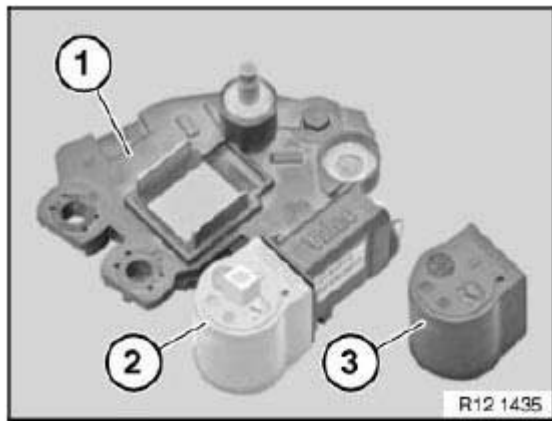


Fig. 60: Identifying Regulator, Mounting Sleeve And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

41 STARTER WITH MOUNTING

12 41 020 REMOVING AND INSTALLING/REPLACING STARTER MOTOR (N62)

Necessary preliminary tasks:

- Disconnect battery ground terminal.
- Remove right exhaust manifold.

Release screws and nut on heat shield (1) (see arrows).

Remove heat shield (1).

Installation:

Tightening torque: 12 41 6AZ. See ENGINE ELECTRICAL SYSTEM - TIGHTENING TORQUES .

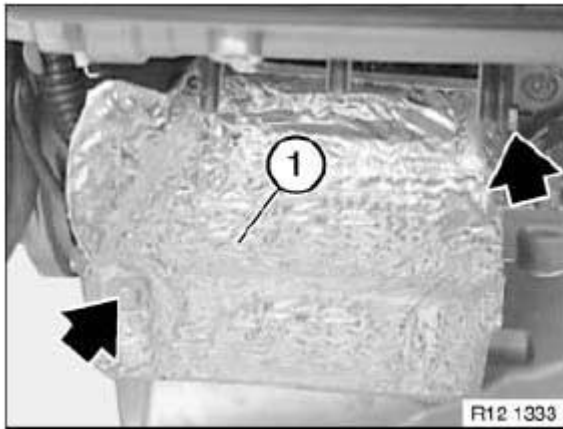


Fig. 61: Locating Heat Shield

Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) term.50.

Unscrew nut (2).

Installation:

Tightening torque 12 41 4AZ. See **ENGINE ELECTRICAL SYSTEM - TIGHTENING TORQUES** .

Remove starter cable (3) term.30.

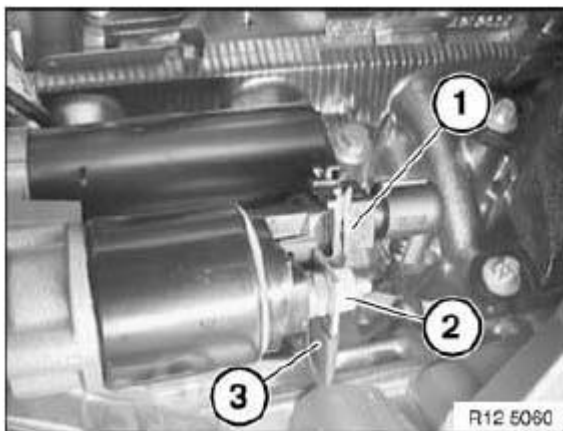


Fig. 62: Identifying Plug Connection, Nut And Starter Cable

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws on transmission (see arrows).

Installation:

Tightening torque 12 41 1AZ. See **ENGINE ELECTRICAL SYSTEM - TIGHTENING TORQUES** .

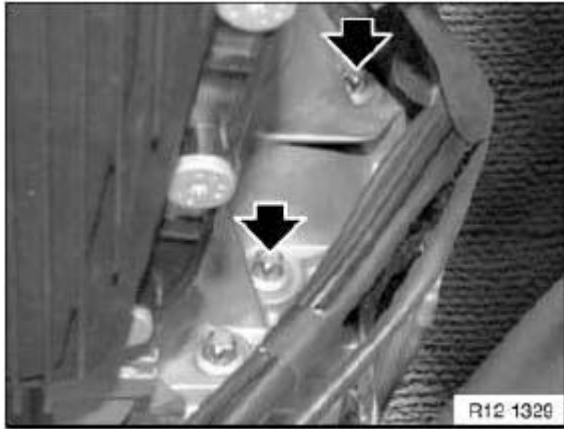


Fig. 63: Locating Screws On Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble vehicle.

12 41 020 REMOVING AND INSTALLING/REPLACING STARTER MOTOR (N62, N62TU)

Necessary preliminary tasks:

- Switch off ignition
- Follow instructions for disconnecting and connecting battery

Disconnect battery negative lead and cover

- Remove **REINFORCEMENT PLATE**
- **E60/E63/64/E65/E66 only:** Remove **RIGHT EXHAUST MANIFOLD**

Release screw and nut.

Remove heat shield (1).

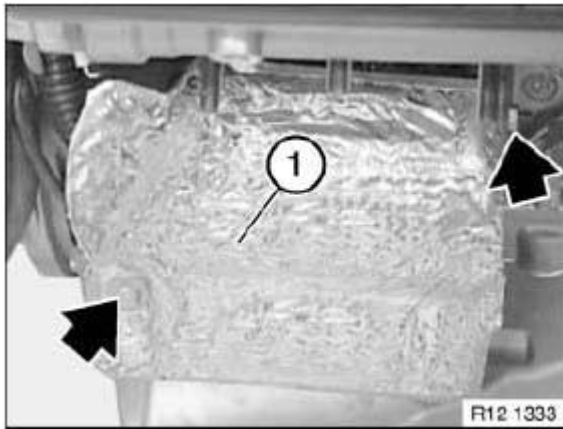


Fig. 64: Locating Heat Shield

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten nut.

Tightening torque 12 41 4AZ. See **ENGINE ELECTRICAL SYSTEM - TIGHTENING TORQUES** .

Unlock plug (1) and remove.

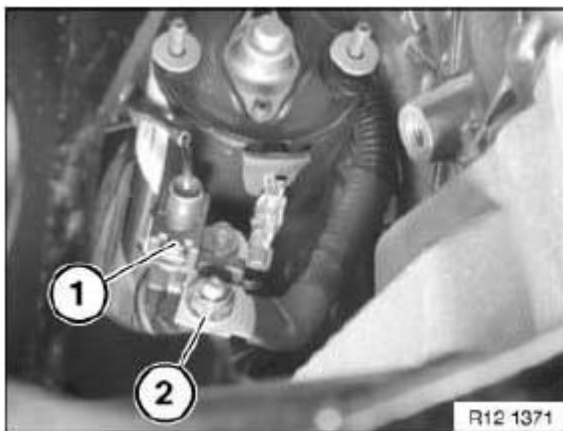


Fig. 65: Identifying Plug And Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws and pull starter motor out of transmission mounting and remove.

Tightening torque 12 41 1AZ. See **ENGINE ELECTRICAL SYSTEM - TIGHTENING TORQUES** .

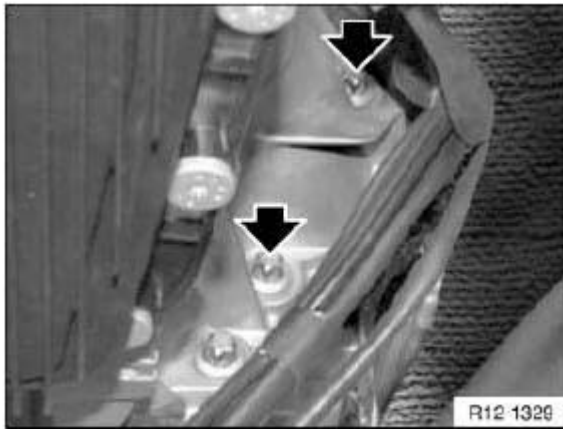


Fig. 66: Locating Screws On Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check starter pinion and ring gear for damage, replace damaged parts if necessary.

12 41 041 REPLACING SOLENOID SWITCH

Turn off ignition.

Remove starter motor.

Release nut (1).

Remove cable lug (2).

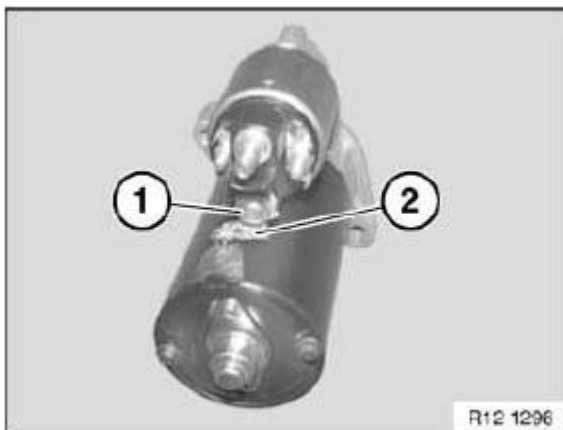


Fig. 67: Identifying Cable Lug And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not turn cable lug (2) while tightening down - risk of short circuit to starter motor housing.

Tightening torque, 12 41 4AZ. See ENGINE ELECTRICAL SYSTEM - TIGHTENING TORQUES .

Release screws (1).

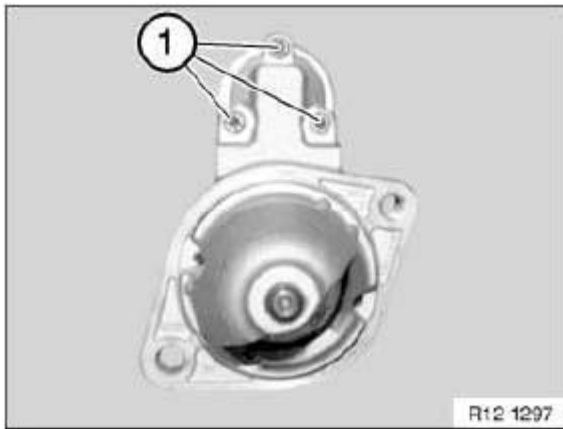


Fig. 68: Identifying Screws

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.

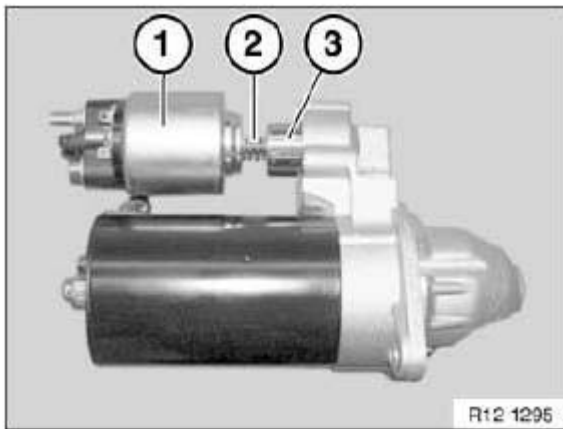


Fig. 69: Identifying Solenoid Switch, Spring And Pin

Courtesy of BMW OF NORTH AMERICA, INC.

42 STARTER LEAD

12 42 500 REMOVING AND INSTALLING OR REPLACING BATTERY POSITIVE LEAD (BETWEEN ALTERNATOR, STARTER MOTOR AND JUMP START CONNECTION POINT) (N62, N62TU)

REFERENCE CHART

Work step	Note:
Switch off ignition	
Disconnect battery negative lead	Follow instructions for disconnecting and connecting battery
Disconnect battery positive lead at jump start connection point	Tightening torque: 12 42 1AZ . See <u>WIRES TO STARTER</u> for specs.
Remove <u>INTAKE AIR MANIFOLD</u>	
Remove <u>FAN COWL</u>	
Detach battery positive lead from alternator	
Release expansion tank	
Secure engine in installation position with special tool	
Release both engine mounts from above	
Lower front axle	
Remove right exhaust manifold	
Remove <u>HEAT SHIELD FROM STARTER MOTOR</u>	
Detach battery positive lead from starter motor	Tightening torque: 12 41 4AZ . See <u>STARTER AND MOUNTING PARTS</u> for specs.
Remove battery positive lead	

12 42 500 REMOVING AND INSTALLING OR REPLACING BATTERY POSITIVE LEAD (BETWEEN ALTERNATOR, STARTER AND BATTERY POSITIVE TERMINAL) (N62)

REFERENCE CHART (N62)

Work step	Note:
Switch off ignition	
Disconnect battery negative lead	Follow instructions for disconnecting and connecting battery
Disconnect battery positive lead at jump start connection point	Tightening torque: 12 42 1AZ . See <u>WIRES TO STARTER</u> for specs.
<u>REMOVE SUCTION FILTER HOUSING .</u>	
<u>REMOVE RIGHT FRESH AIR DUCT .</u>	
Remove centre equipment compartment heater bulkhead.	1106 of 3160

Remove <u>INTAKE AIR MANIFOLD</u>	
<u>REMOVE A/C COMPRESSOR DRIVE BELT .</u>	
Detach battery positive lead from alternator	Tightening torque: 12 31 1AZ . See <u>ALTERNATOR WITH DRIVE AND MOUNTING PARTS</u> for specs.
<u>LIFT ENGINE HOOD INTO ASSEMBLY POSITION .</u>	
<u>SECURE ENGINE IN INSTALLATION POSITION WITH SPECIAL TOOL</u>	
Release grounding strap on engine support arm.	
<u>RELEASE A/C COMPRESSOR AND PLACE TO ONE SIDE .</u>	
Remove <u>EXHAUST SYSTEM</u>	
Remove right exhaust manifold	
Lower front axle	
Remove <u>STARTER MOTOR.</u>	Tightening torque: 12 41 4AZ . See <u>STARTER AND MOUNTING PARTS</u> for specs.
Detach battery positive lead from support point/terminal	Tightening torque: 12 42 1AZ . See <u>WIRES TO STARTER</u> for specs.

Unclip battery positive lead (2) from holders (1).

Installation:

Make sure battery positive lead is in correct installation position.

Danger of short circuits.

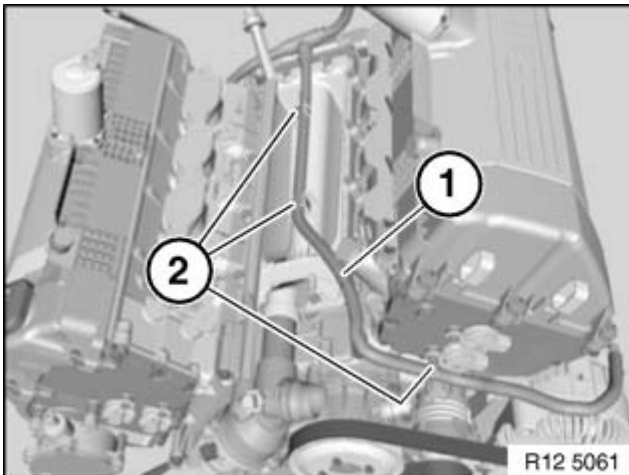


Fig. 70: Identifying Positive Battery Lead And Holders

Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle

Check function of DME.

51 ENGINE WIRING LOOM

12 51 001 REPLACING WIRING HARNESS SECTION FOR ENGINE (N62)

Necessary preliminary tasks:

- Read out DME fault memory
- Disconnect battery negative lead
- **ENGINE BONNET/HOOD** in assembly position
- Remove **FRESH AIR DUCT** on right and if necessary on left
- Remove center of **ASSEMBLY PARTITION WALL**
- Remove intake air manifold
- Remove underbody protection at front/rear
- Remove **REINFORCEMENT PLATE**
- Remove **ELECTRIC FAN** with fan cowl
- Remove right exhaust manifold
- Remove **STARTER MOTOR**
- Remove **ALTERNATOR**

Release screws (2).

Detach electronics box cover (1) from fixture (3) in direction of arrow towards right.

Installation:

Secure electronics box cover (1) in direction of arrow on left in fixture (3).

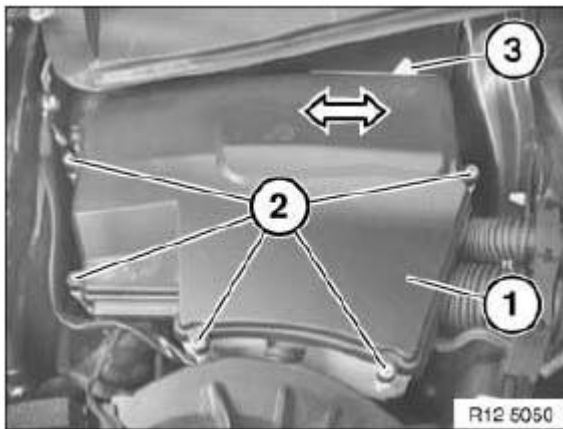
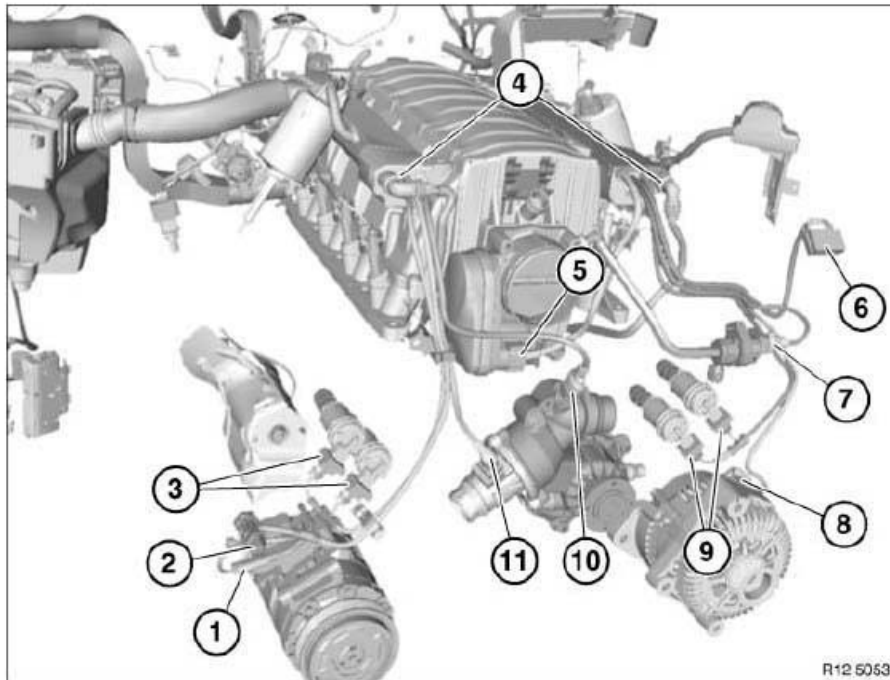


Fig. 71: Detaching Electronics Box Cover From Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

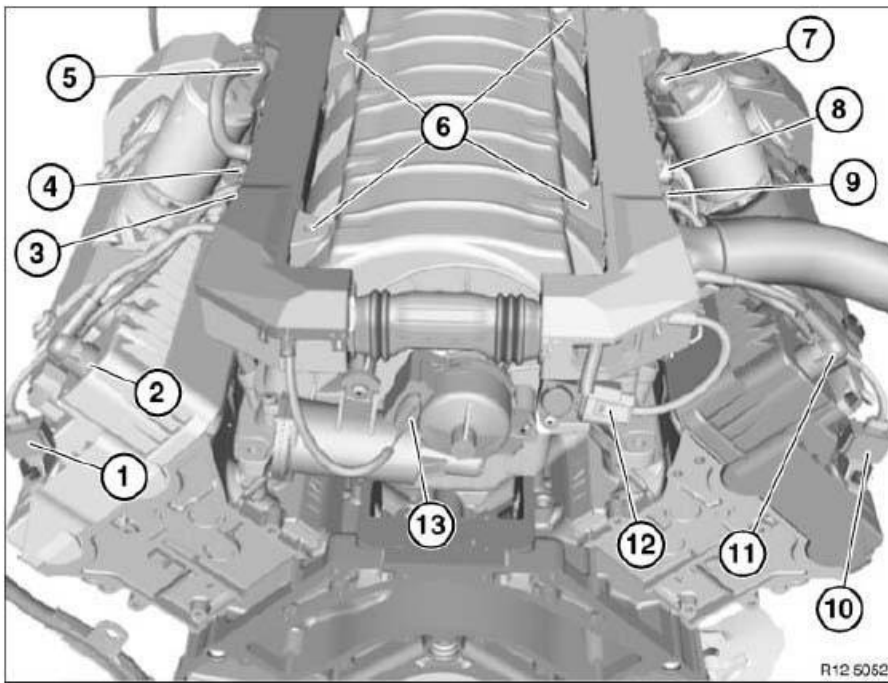
Unfasten following plug connections:



1	Air conditioner compressor	7	Tank venting valve
2	Oil-pressure switch	8	Plug connection BSD alternator
3	VANOS solenoid valves 1-4	9	VANOS solenoid valves 5-8
4	Knock sensor, right and left	10	Coolant temperature sensor
5	Throttle-valve actuator	11	Map thermostat
6	Air-mass sensor		

Fig. 72: Identifying Plug Connections (1 Of 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten following plug connections:

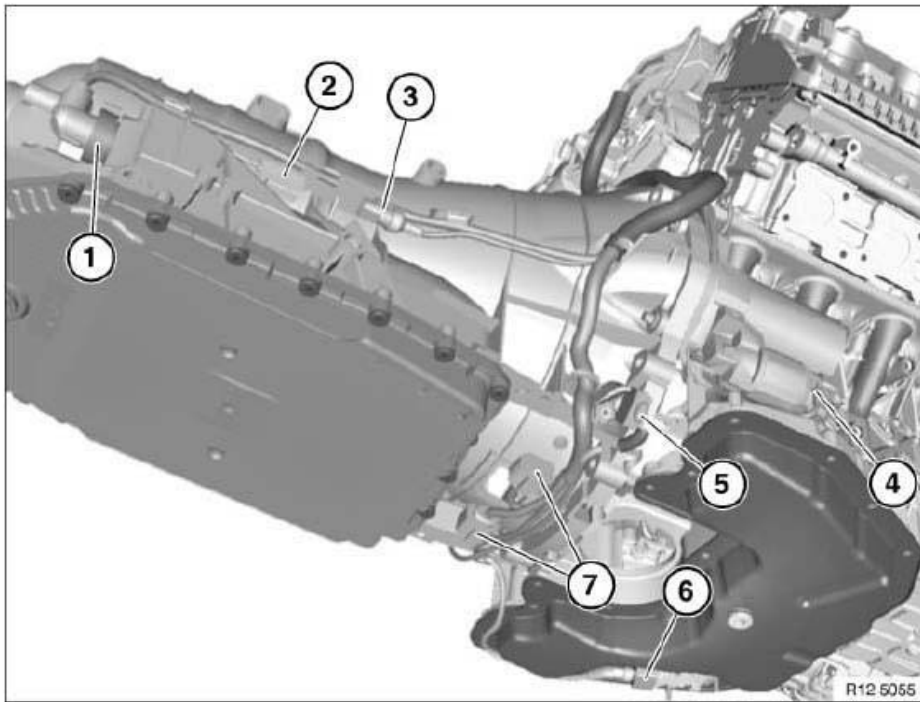


1	Exhaust camshaft sensor	8	Injection wiring harness (1 to 4)
2	VVT sensor (5 to 8)	9	Inlet camshaft sensor
3	Inlet camshaft sensor	10	Exhaust camshaft sensor
4	Injection wiring harness (5 to 8)	11	VVT sensor (1 to 4)
5	VVT servodrive (5 to 8)	12	Differential pressure sensor
6	Release screws	13	DISA gear
7	VVT servodrive (1 to 4)		

Fig. 73: Identifying Plug Connections (2 Of 4)

Courtesy of BMW OF NORTH AMERICA, INC.

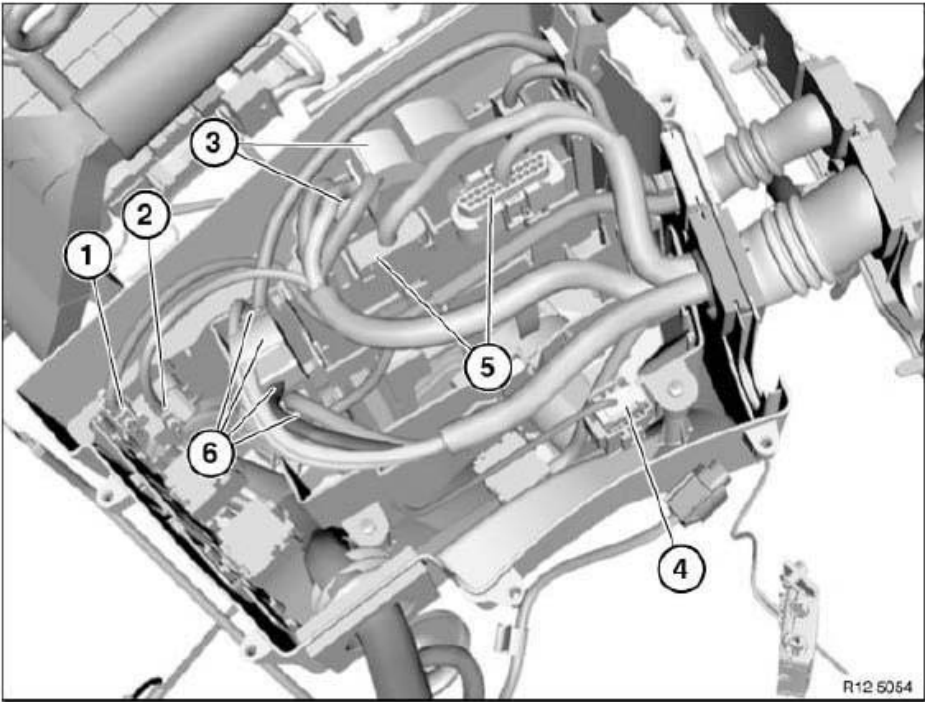
Unfasten following plug connections:



1	Automatic transmission	5	Crankshaft sensor
2	Not used	6	Oil level sensor
3	Monitor sensor, left and right	7	Control sensors (oxygen sensors)
4	Term. 50 starter motor		

Fig. 74: Identifying Plug Connections (3 Of 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten following plug connections:



1	Ground connection	5	
2	Ground connection	6	VVT control unit
3	DME module 1 and 2	7	IVM integrated supply module
4	Remove profile seal (4) in direction of arrow		

Fig. 75: Identifying Plug Connections (4 Of 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit profile seals correctly.

Check for water leaks.

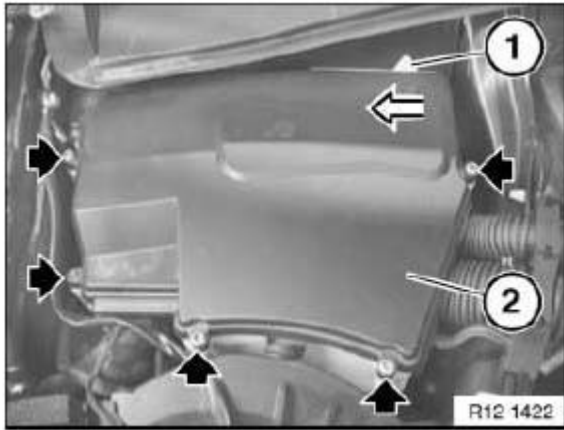
Assemble engine.

NOTE: Check function of DME.

Check electronics box cover and rubber grommets on equipment carrier for watertightness.

- Read out fault memory of DME control unit; if necessary, work through test schedules
- Switch off ignition
- Remove **RIGHT FRESH AIR DUCT**

Lift out cover (2).



REFERENCE CHART

Work step	Note:
Remove <u>ACOUSTIC COVER</u>	
Unlock and detach plug connections on DME control unit.	Only plug connections of wiring harness section for ignition coils
Remove ignition coil cover	This work step is described in the article " <u>REPLACING IGNITION COIL</u> ".
Detach grounding cable from cylinder head cover.	Pay attention to <u>INTERFERENCE SUPPRESSION LINE</u>
Unclip cable duct.	
Unlock plug connections on ignition coils and disconnect	Do not remove ignition coils This work step is described in the article " <u>REPLACING IGNITION COIL</u> ".

Remove engine vent hose	
Unclip and remove wiring harness.	

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

12 51 150 REMOVING AND INSTALLING/REPLACING WIRING HARNESS SECTION FOR FUEL INJECTORS ON LEFT OR RIGHT (N62, N62TU)

Necessary preliminary tasks:

- Disconnect battery negative lead
- Remove ACOUSTIC COVER
- Remove ignition coil cover

NOTE: **The procedure is identical for both sides.**

Unfasten screws.

Unlock plug (1) and remove.

Remove positioning motor for eccentric shaft. See REMOVING AND INSTALLING/REPLACING SERVOMOTOR FOR LEFT ECCENTRIC SHAFT (N62/N62TU) and REMOVING AND INSTALLING/REPLACING SERVOMOTOR FOR RIGHT ECCENTRIC SHAFT (N62/N62TU) .

Unlock plugs on fuel injectors and disconnect.

Remove wiring harness.

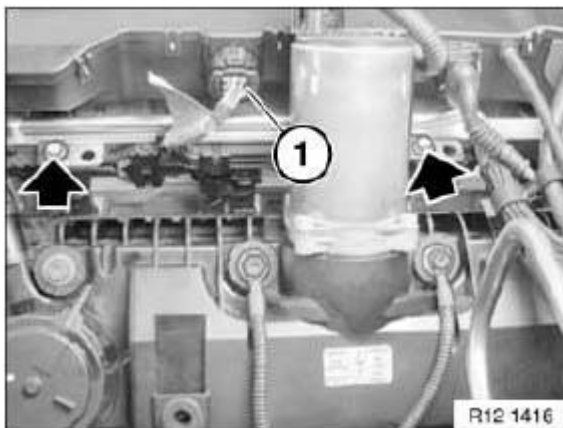


Fig. 77: Locating Plug And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

61 OIL PRESSURE/OIL TEMPERATURE GAUGE

12 61 280 REMOVING AND INSTALLING/REPLACING OIL PRESSURE SWITCH (N62, N62TU)

Necessary preliminary tasks:

- Switch off ignition
- **E65/E66 only:** Remove intake filter housing
- **E53 only:** Remove intake hood with air intake hose

WARNING: Scalding hazard!

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

Installation location:

Cylinder bank 1 to 4 on cylinder head, front right.

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

Release plug connector (1) and pull off.

Unscrew oil pressure switch (2).

Tightening torque: 12 61 1AZ . See **ENGINE - TIGHTENING TORQUES** .

Installation:

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

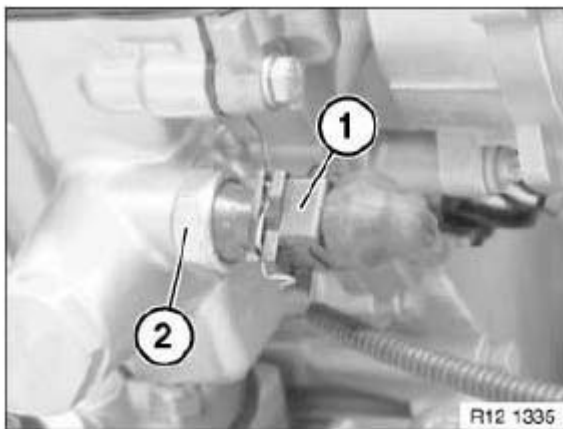


Fig. 78: Identifying Plug Connector And Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

12 61 285 REPLACING ENGINE OIL LEVEL SWITCH (N62, N62TU)

Necessary preliminary tasks:

- Switch off ignition
- Remove **REINFORCEMENT PLATE**
- **DRAIN OFF ENGINE OIL**

Illustration shows E65:

Release plug connector (1) and pull off.

Unscrew nuts.

Tightening torque: 12 61 2AZ . See **ENGINE - TIGHTENING TORQUES** .

Remove level switch (2).

Installation:

Clean sealing face on oil sump.

Replace seal on level switch.

An excessively low torque value will result in oil leakage, an excessively high torque value will result in damage to the level switch.

Top up engine oil.

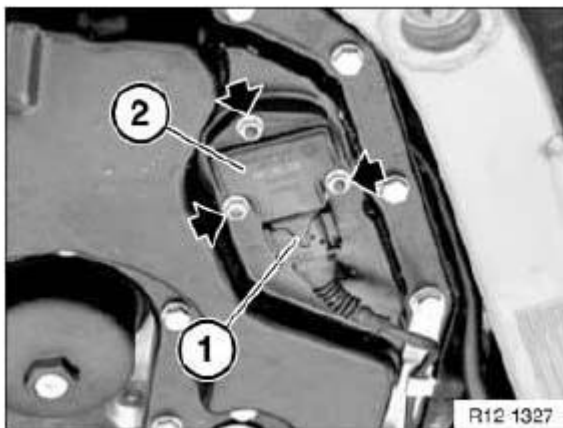


Fig. 79: Locating Plug Connector, Level Switch And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

12 90 ... REMOVING AND INSTALLING/REPLACING ELECTRONICS BOX

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

NOTE: Follow instructions for removing and installing electronic control units. See INSTRUCTIONS FOR REMOVING AND INSTALLING ELECTRONIC CONTROL UNITS.

Necessary preliminary tasks:

- Read fault memory.
- Disconnect negative battery cable
- Remove ELECTRONICS BOX FAN
- Remove DISTRIBUTION BOX (PASSENGER COMPARTMENT)
- Release control unit holder; if necessary, release CD changer

Release screws (arrows) behind sound insulation.

Disconnect wiring harness on engine compartment side on right.

Remove electronics box.



Fig. 80: Locating Electronics Box

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Make sure gasket (1) is correctly seated on electronics box.

Read fault memory.

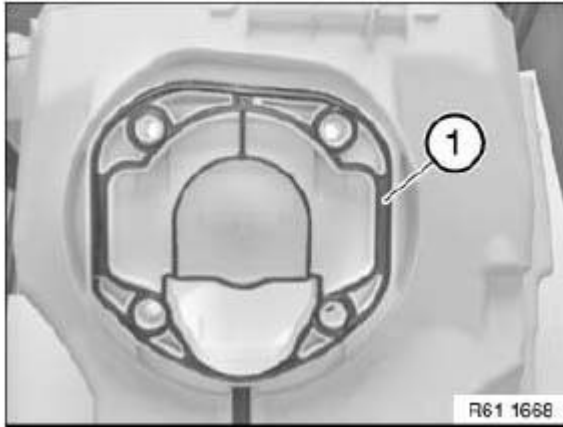


Fig. 81: Identifying Gasket

Courtesy of BMW OF NORTH AMERICA, INC.

12 90 100 REPLACING FAN FOR ELECTRONICS BOX (N62)

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

Necessary preliminary tasks:

- Switch off ignition.
- Follow instructions for disconnecting and connecting battery.
- Disconnect battery ground terminal.
- Remove right fresh air duct.

IMPORTANT: Follow instructions for removing and installing electronic control units. See INSTRUCTIONS FOR REMOVING AND INSTALLING ELECTRONIC CONTROL UNITS.

Release screw (2).

Remove cover (1) of equipment box in direction of arrow towards right.

Installation:

Push on cover (1) of equipment box in direction of arrow towards left into holder (3).

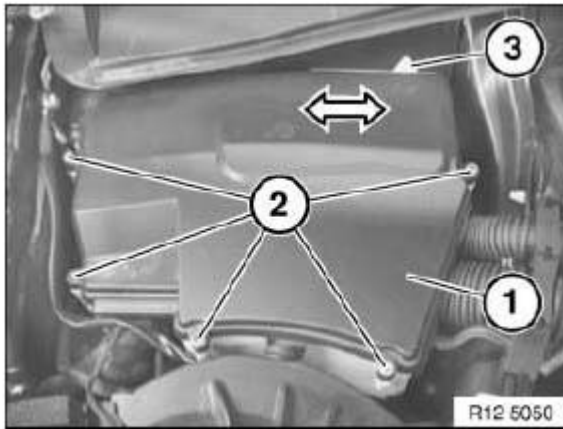


Fig. 82: Detaching Cover Of Equipment Box
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connections (1 to 6).

Remove Valvetronic control unit, DME and integrated supply module.

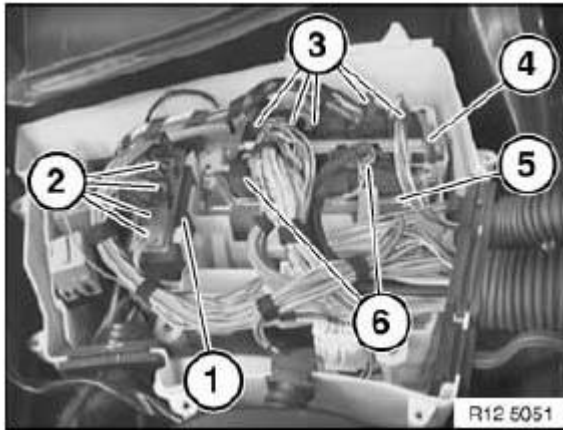


Fig. 83: Identifying Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug connection (3) on fan for electronics box and disconnect.

Release screws (1) on control unit carrier (2).

Remove control unit carrier (2) towards top.

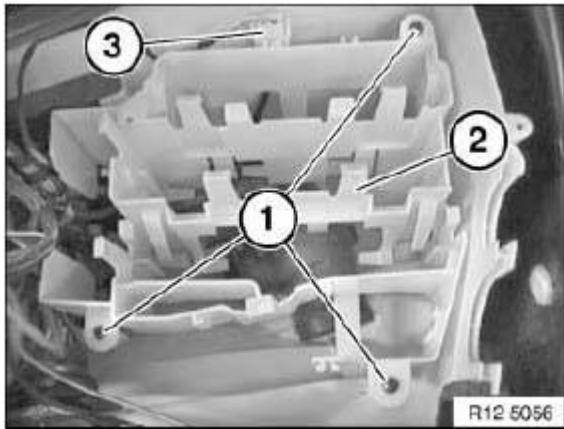


Fig. 84: Identifying Plug Connection And Control Unit Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Remove fan (2) in direction of arrow.

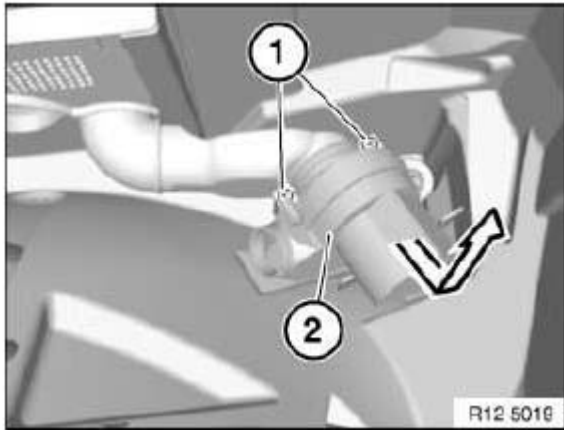


Fig. 85: Removing Fan And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Check function of DME.