ENGINE

Cooling System - Operating Fluids

1.0 GENERAL INFORMATION ON LONG-TERM ANTIFREEZE AND CORROSION INHIBITORS

The cooling system of BMW cars must only be filled with reputable brand name ethylene glycol long-term antifreeze having corrosion inhibitors that are compatible with aluminum radiators.

Coolants must fulfill four basic requirements.

- Guarantee sufficient cooling.
- Protect various metals (gray cast iron, steel, aluminum alloys, brass, copper and solder) against corrosion.
- Prevent excessive silicate gel precipitation, which may cause clogging of the cooling system.
- Guarantee operation of cooling system in winter (prevent freezing of coolant) and in summer by boosting the boiling point.

The quality or grade of a long-term antifreeze and corrosion inhibitor is very important to be able to protect metal (gray cast iron, steel, aluminum alloys, brass, copper and solder) in the cooling system against corrosion. It guarantees full operation of the cooling system in winter and also increases the boiling point at high outside temperatures and under heavy loads.

INITIAL FILLING IN FACTORY

The factory fills the cooling system for protection against freezing, for the U.S. and Canada, down to-34°F (-37° C). This means an antifreeze ratio of 50% antifreeze and 50% water. In severely cold areas, the antifreeze can be increased to 60% which provides freezing protection down to-62°F (-52°C). Do not exceed a 60% ratio of antifreeze. The specified antifreeze ratio is important, since an insufficient amount would impair antifreezing and corrosion inhibiting protection. An excessive amount would not improve freezing protection, but instead reduce freezing protection.

CHANGE INTERVALS

Regular checking of coolant concentration is part of Inspection I or II. for change intervals.

LIFETIME COOLANT

The BMW engine coolant has a lifetime rating, except when the cooling system requires repairs. Drained coolant is not to be re-used. Top up with new coolant.

REMARKS AND LIMITATIONS

Only tap water of drinking quality with the following properties may be used as coolant.

DRINKING QUALITY SPECIFICATION

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Appearance	-	colorless, clear
Residue	-	without suspended matter
pH value	-	6.5 - 8.0
Total hardness	-	max. 357 PPM Calcium Carbonate
Chloride content	-	max. 100 mg/l
Sulfate content	-	max. 100 mg/l

The antifreeze concentration in a cooling system should be checked before the beginning of winter. When determining the mixture concentration it is important to make sure that there is sufficient protection against freezing.

A hydrometer (radiator antifreeze tester) is required for correct determination of antifreeze concentration. The composition of long-term antifreezes and corrosion inhibitors differs between manufacturers.

BMW Anti-Freeze/Coolant contains no nitrites or phosphates and has been formulated to prevent excessive silicate drop out. Order the 1gallon container under BMW Part No. 82 14 1 467 704.

NOTE: Do not mix BMW Anti-Freeze/Coolant with different antifreezes which contain nitrites and/or phosphates and a high silicate formulation.

2.0 COOLANT ADDITIVES

No aftermarket coolant additives, including but not limited to those which provide additional corrosion inhibition or seal off minor leaks are approved by BMW.

Use of non-approved coolant additives may cause reduced heat transfer from the cylinder head to the coolant and the formation of hot spots. This can cause the burning through of cylinder head gaskets and/or cracking of the cylinder head.

BMW NA cannot accept the liability for the resulting effects and consequential damage caused by the use of coolant additives.

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ENGINE

Cooling System - Repair Instructions - X3

00 COOLANT, CHECKING COOLING SYSTEM

00 57 072 RETROFITTING SUPPLEMENTARY OIL COOLER (HIGH-SPEED SCOPE OPTION SA840) (N52K)

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- Remove underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- Replace front left wheel arch trim and replace dust lip
- Replace front left trim grille, see **51 11 185 REMOVING AND INSTALLING/REPLACING SIDE GRILLE IN BUMPER TRIM (FROM 09/2006)** .
- If necessary, replace left crashbox, see **51 11 770 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT DEFORMATION ELEMENT FOR FRONT BUMPER** .
- Remove air filter housing, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K)** .
- Release servo reservoir, see **32 41 250 REMOVING AND INSTALLING/REPLACING FLUID RESERVOIR FOR POWER STEERING (M54, N46, N52)** .
- Remove alternator, see **12 31 020 REMOVING AND INSTALLING OR REPLACING ALTERNATOR (N52, N52K, N51, N53)** .
- Remove heater bulkhead, see **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD** .
- Drain coolant, see **17 00 005 Draining and adding coolant (N52K)**.
- Remove oil pressure switch , remove oil filter housing

Mount full-flow oil filter and connection housing for oil lines.

Installation:

Tightening torque: 11 42 3AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

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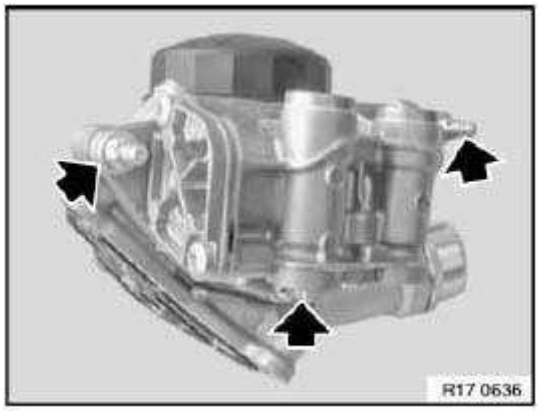


Fig. 1: Locating Mount Full-Flow Oil Filter And Connection Housing For Oil Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Mount oil filter housing on crankcase.

To facilitate mounting, remove coolant connection.

Installation:

Tightening torque: 11 42 2AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

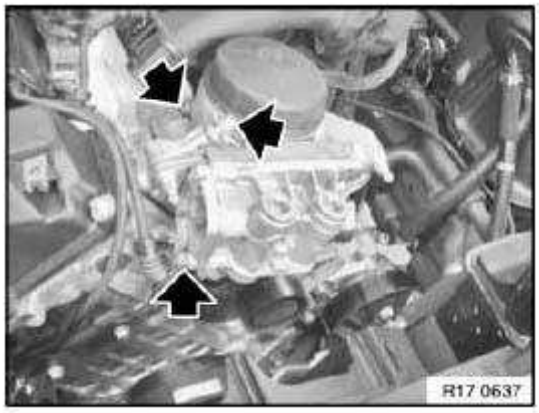


Fig. 2: Locating Mount Oil Filter Housing On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Mount oil pressure switch on new filter housing.

Installation:

Tightening torque 12 61 2AZ.

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Fig. 3: Locating Mount Oil Pressure Switch On Filter Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Mount sealing rings on oil supply and return lines.

Mount oil lines on filter housing (M8x28 screw).

Installation:

Lubricate sealing rings lightly with oil.

Tightening torque: 17 22 5AZ, see **17 22 OIL COOLER PIPES** .

Secure oil lines with pre-installed rubber grommet.

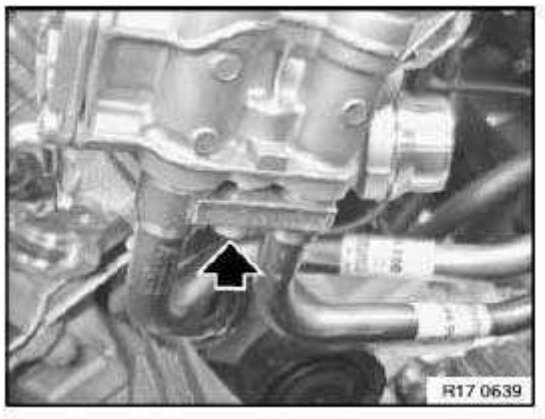


Fig. 4: Locating Mount Sealing Rings On Oil Supply And Return Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Remove underbody protection bracket.

Mount holding frame for engine oil cooler on crashbox.

There must be 2 press-in nuts for the radiator bracket on the crashbox, otherwise replace crashbox.

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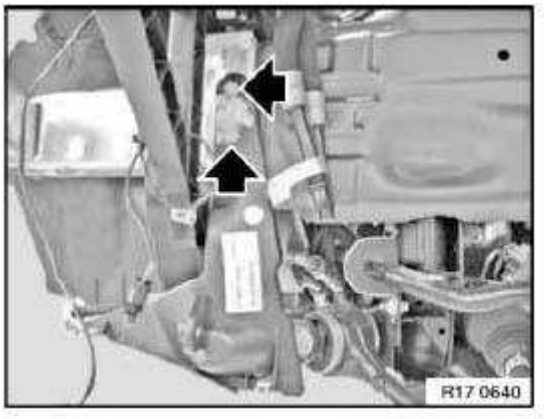


Fig. 5: Locating Underbody Protection Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Mount engine oil cooler on oil cooler bracket (M8x35 screw).

Installation:

Tightening torque: 17 21 2AZ, see **17 21 ENGINE OIL COOLER** .

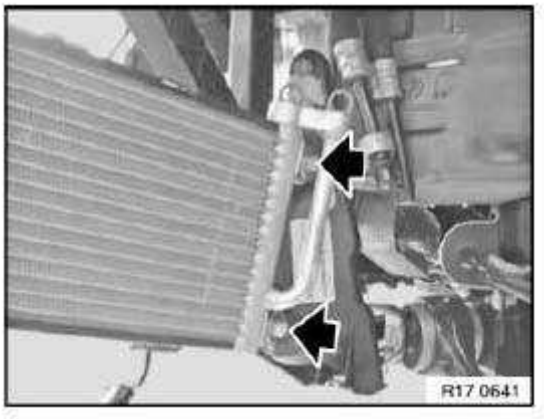


Fig. 6: Locating Mount Engine Oil Cooler On Oil Cooler Bracket (M8X35 Screw)
Courtesy of BMW OF NORTH AMERICA, INC.

Mount wheel arch cooler bracket with vibration damper (rubber element).

Installation:

Tightening torque: 17 21 3AZ, see **17 21 ENGINE OIL COOLER** .

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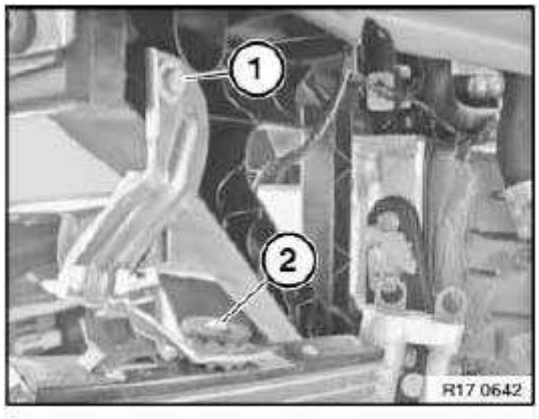


Fig. 7: Mount Wheel Arch Cooler Bracket With Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Mount sealing rings on oil supply and return lines.

Mount oil lines on engine oil cooler housing (M8x30 screw).

Installation:

Lubricate sealing rings lightly with oil.

Tightening torque: 17 22 5AZ, see **17 22 OIL COOLER PIPES** .

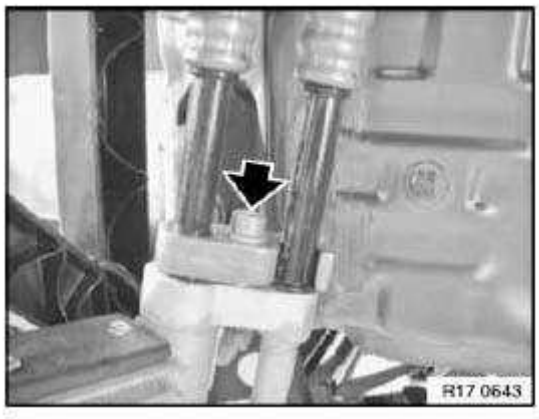


Fig. 8: Locating Mount Sealing Rings On Oil Supply And Return Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Mount wheel arch cover.

Mount dust lip.

Mount oil cooler protective grille in wheel arch cover.

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Fig. 9: Mount Wheel Arch Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Mount air duct on engine oil cooler.

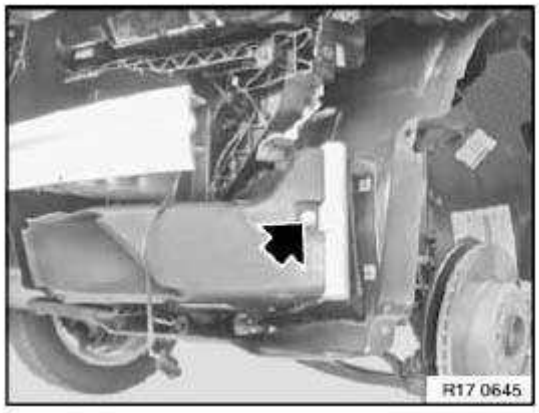
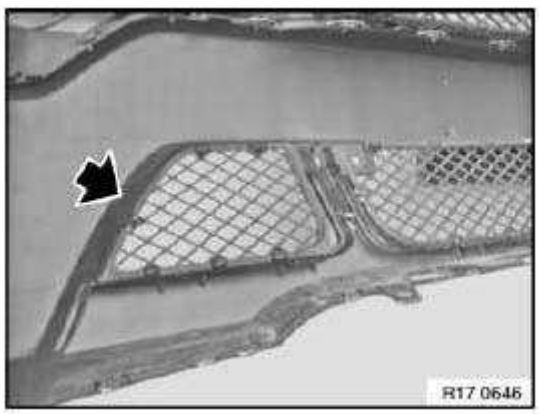


Fig. 10: Locating Mount Air Duct On Engine Oil Cooler
Courtesy of BMW OF NORTH AMERICA, INC.

Replace closed cover in left bumper trim with grille panel.



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Fig. 11: Locating Bumper Trim With Grille Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Remove coolant hose between coolant pump, coolant radiator and oil-water heat exchanger.

Install coolant hose between coolant pump and coolant radiator.

Push hose onto coolant pump up to mechanical stop.

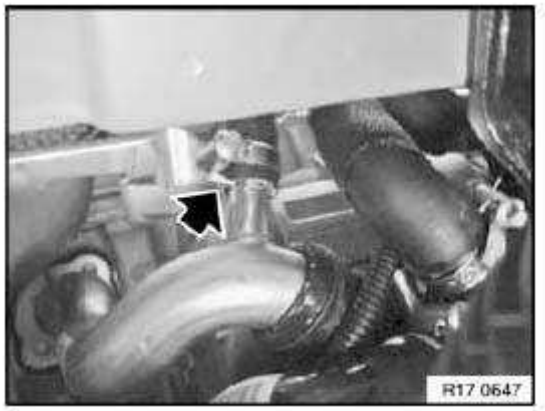


Fig. 12: Locating Coolant Hose Between Coolant Pump, Coolant Radiator And Oil-Water Heat Exchanger
Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle

Fill coolant and engine oil systems

The oil fill quantity is increased after installation of the supplementary cooler by 0.5 l.

NOTE: Now clear the fault memory.

17 00 ... INSTRUCTIONS FOR WORKING ON COOLING SYSTEM

WARNING: Danger of scalding! Work on the cooling system should only be carried out when the engine has cooled down.

IMPORTANT: Wear protective gloves and goggles.

IMPORTANT: Lifetime coolant filling:
Never reuse used coolant.
When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be drained and refilled.

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In the case of other removal work involving the draining of partial quantities of coolant, replace these quantities which have been drained with new coolant.

IMPORTANT: Open cooling system only when it has cooled down.
Opening the cooling system while hot can result in air entering the system
This can cause overheating with permanent damage to the engine.

IMPORTANT: When working on the oil, coolant or fuel circuit, protect the alternator against contamination.
Cover alternator with suitable materials.
Failure to comply with this procedure may result in an alternator malfunction.

IMPORTANT: Do not fill coolant expansion tank over MAX level as overfilling will cause the coolant to overflow. This may give rise to traces of residual coolant on the expansion tank or in the engine compartment and wrongly suggest possible leakages.

Recycling

Catch and dispose of drained coolant.

Observe country-specific waste-disposal regulations.

NOTE: Tightening torque, hose clamps: 17 00 1AZ, see 17 00 COOLANT .

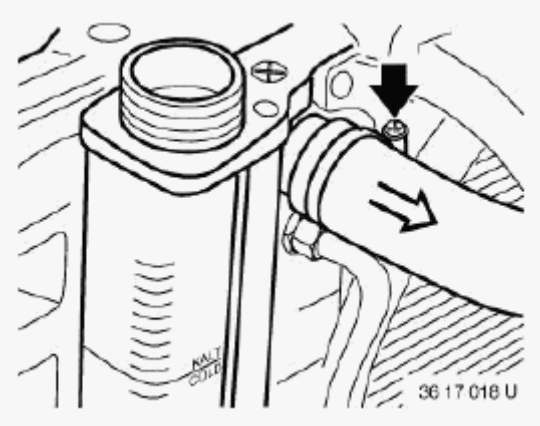


Fig. 13: Locating Hose Clamps
Courtesy of BMW OF NORTH AMERICA, INC.

Instructions for disassembly/assembly of coolant hose fast-release couplings

Disassembly of fast-release coupling

Withdraw lock (1/2), disconnect hose.

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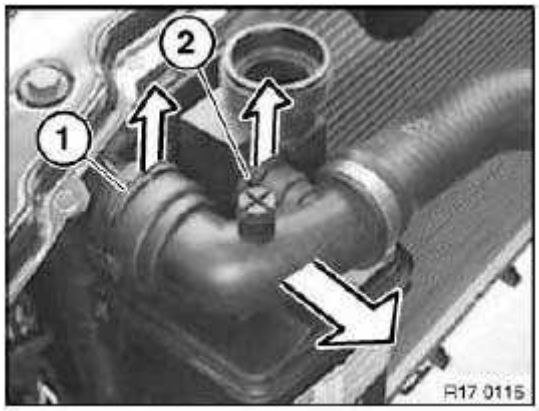


Fig. 14: Disconnecting Hose And Withdraw Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check O-rings (1).

Do not coat O-rings (1) with antiseize agent.

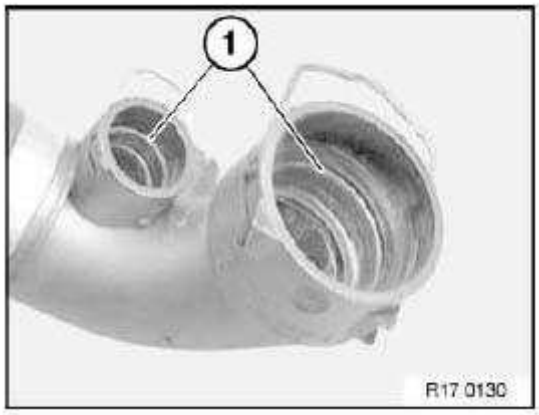


Fig. 15: O-rings
Courtesy of BMW OF NORTH AMERICA, INC.

Assembly of fast-release coupling

Press in lock (1) before installing fast-release coupling.

Push on hose.

Fast-release coupling must clearly snap audibly into place.

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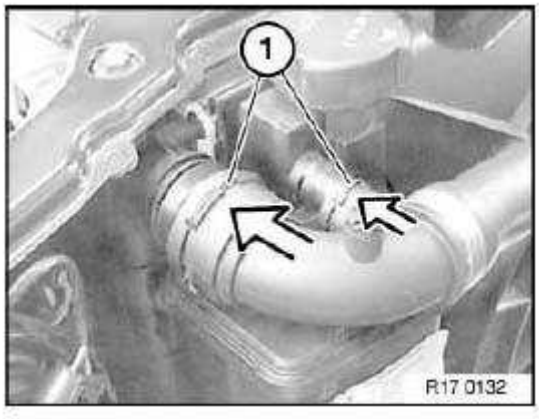


Fig. 16: Pushing Hose
Courtesy of BMW OF NORTH AMERICA, INC.

17 00 005 DRAINING AND ADDING COOLANT (N52K)

Necessary preliminary tasks:

- Remove underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .

WARNING: Danger of scalding!
Only carry out work on cooling system after engine has cooled down.

Recycling:

Catch and dispose of drained coolant.

Observe country-specific waste-disposal regulations.

Open cap (1) on coolant expansion tank.

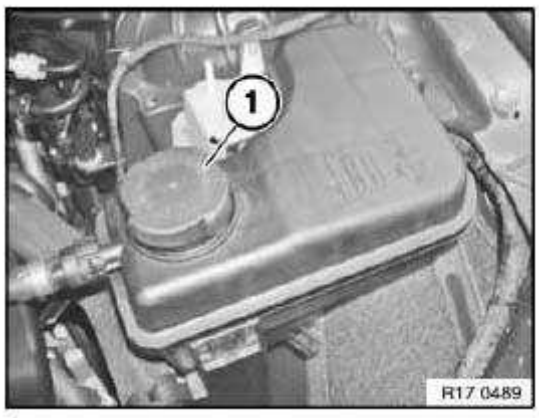


Fig. 17: Coolant Expansion Tank And Cap

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Courtesy of BMW OF NORTH AMERICA, INC.

E83:

Open drain plug (1) on radiator.

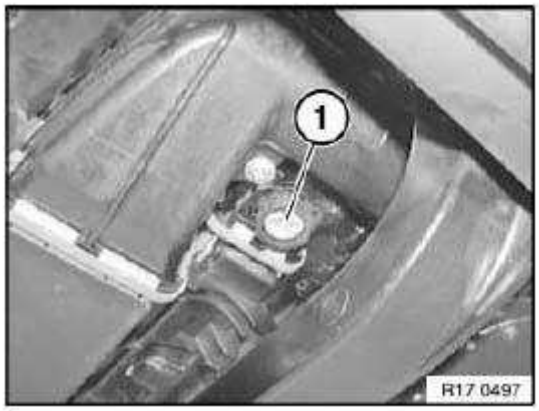


Fig. 18: Drain Plug On Radiator
Courtesy of BMW OF NORTH AMERICA, INC.

Open vent screw (1).

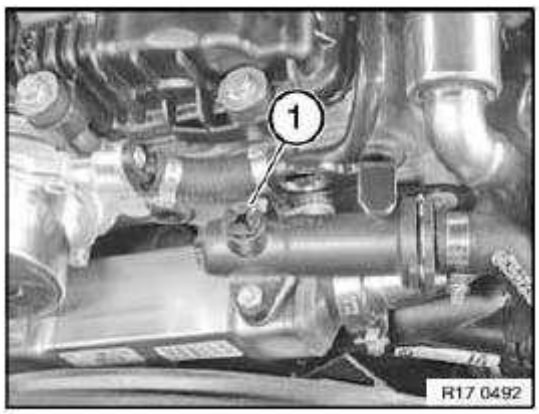


Fig. 19: Vent Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Use only recommended coolant.

Operating Fluids MG17.

NOTE: Adhere to the following work sequence when adding coolant.

- Switch ignition on
- Seat heating to maximum temperature and fan to low speed (heater valves are opened and auxiliary water

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pump starts up).
- Slowly fill expansion tank with coolant.
- Close vent screw after bubble-free coolant emerges or after filling up to max. cold fill level.

Vent cooling system.

17 00 009 CHECKING COOLING SYSTEM FOR LEAKS (M54, N46, N52)

Special tools required:

See **17 COOLING SYSTEM** .

- 17 0 101
- 17 0 105
- 17 0 106

WARNING: Danger of scalding!
Only perform this work after engine has cooled down.

NOTE: Illustrations feature the E85.

Checking pressure drop in cooling system:

Open cap on coolant expansion tank. Fit special tools 17 0 101 / 17 0 105.

Build up gauge pressure , wait approx. 2 minutes.

Cooling system is impervious to leaks if pressure drop is max. 0.1 bar.

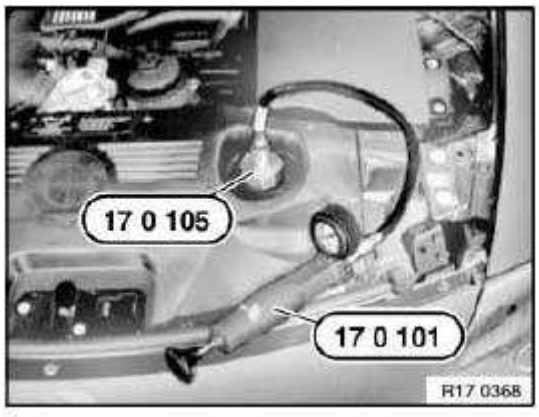


Fig. 20: Special Tool (17 0 105) And (17 0 101)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking pressure relief valve in cap:

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Screw cap (1) onto special tool 17 0 106.

Build up pressure with special tool (hand pump) 17 0 101; observe pressure gauge to ascertain when opening pressure is achieved.

Compare opening pressure of pressure relief valve.

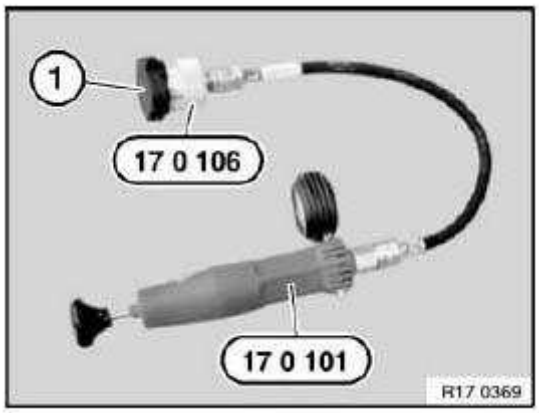


Fig. 21: Special Tool (17 0 106) And (17 0 101)
Courtesy of BMW OF NORTH AMERICA, INC.

17 00 009 CHECKING COOLING SYSTEM FOR WATER LEAKS

Special tools required:

See **17 COOLING SYSTEM** .

- 17 0 101
- 17 0 113
- 17 0 114

WARNING: Danger of scalding!
Only perform this work after engine has cooled down.

Checking pressure drop in cooling system:

Open cap on coolant expansion tank. Fit special tools 17 0 101 / 17 0 113.

Build up gauge pressure , wait approx. 2 minutes.

Cooling system is impervious to leaks if pressure drop is max. 0.1 bar.

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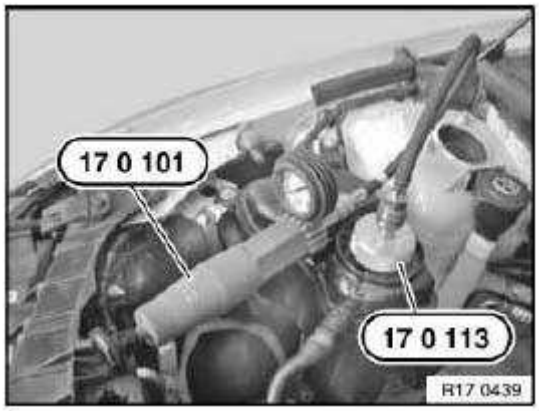


Fig. 22: Special Tool (17 0 101) And (17 0 113)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking pressure relief valve in cap:

NOTE: While the vehicle is driven at high outside temperatures, the design may cause the pressure relief valve in the cap to open slightly and air together with dissolved coolant to escape. This coolant vapor condenses on the surface of the expansion tank and leaves traces when the vehicle has cooled down. These traces do not indicate whether the cap is defective or not. When the vehicle has been parked up for an extended period of time, the residual escaping coolant can cause the pressure relief valve in the cap to stick; therefore check the cap again 2 to 3 times.

Replace the cap only after you have checked three times and there is an incorrect opening pressure.

Checking pressure relief valve in cap:

Screw cap (1) onto special tool 17 0 114.

Build up pressure with special tool (hand pump) 17 0 101; observe pressure gauge to ascertain when opening pressure is achieved.

Compare opening pressure of pressure relief valve.

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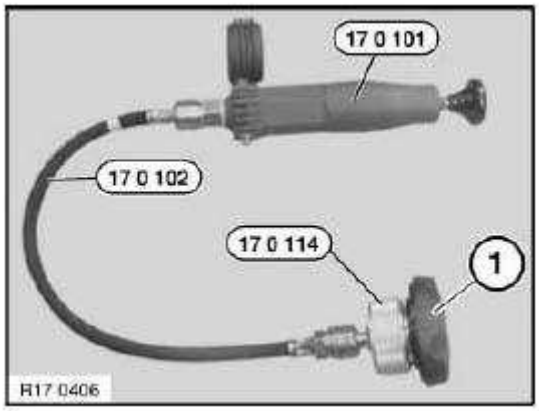


Fig. 23: Special Tool (17 0 101), (17 0 102) And (17 0 114)
Courtesy of BMW OF NORTH AMERICA, INC.

17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR LEAKS

WARNING: Danger of scalding!
Only perform these tasks on an engine that has cooled down.

Necessary preliminary tasks:

Draining coolant:

The procedure is described in the section Draining and adding coolant. See **17 00 005 Draining Off And Topping Up Coolant**.

NOTE: Use only recommended coolant.

IMPORTANT: Fill coolant expansion tank up to lower edge of filler neck with recommended coolant. Pour in coolant slowly. Close vent screw (2) when bubble-free coolant emerges Close cap on expansion tank. Do not open the coolant expansion tank cap during the venting procedure.

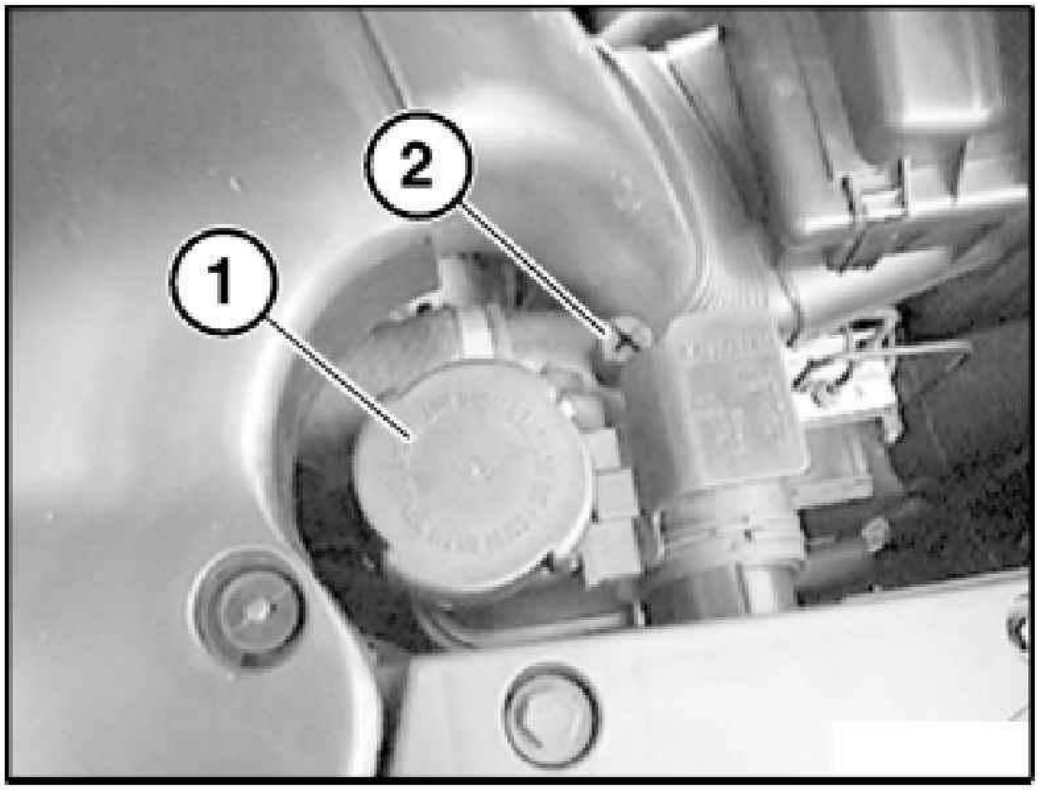
Adding coolant:

To ensure the cooling system is properly vented, it is absolutely essential to follow the steps below:

1. Open cap (1) on coolant expansion tank.
2. Open vent screw (2). Connect battery charger. Switch on ignition.
3. Set heater control to maximum temperature. Activate "Automatic" button, then reduce fan to lowest setting.
4. Press accelerator pedal for 10 seconds to floor. Engine must not be started.
5. The venting procedure is started when the accelerator pedal is pressed and takes approx. 12 minutes.

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6. Check cooling system for leaks.

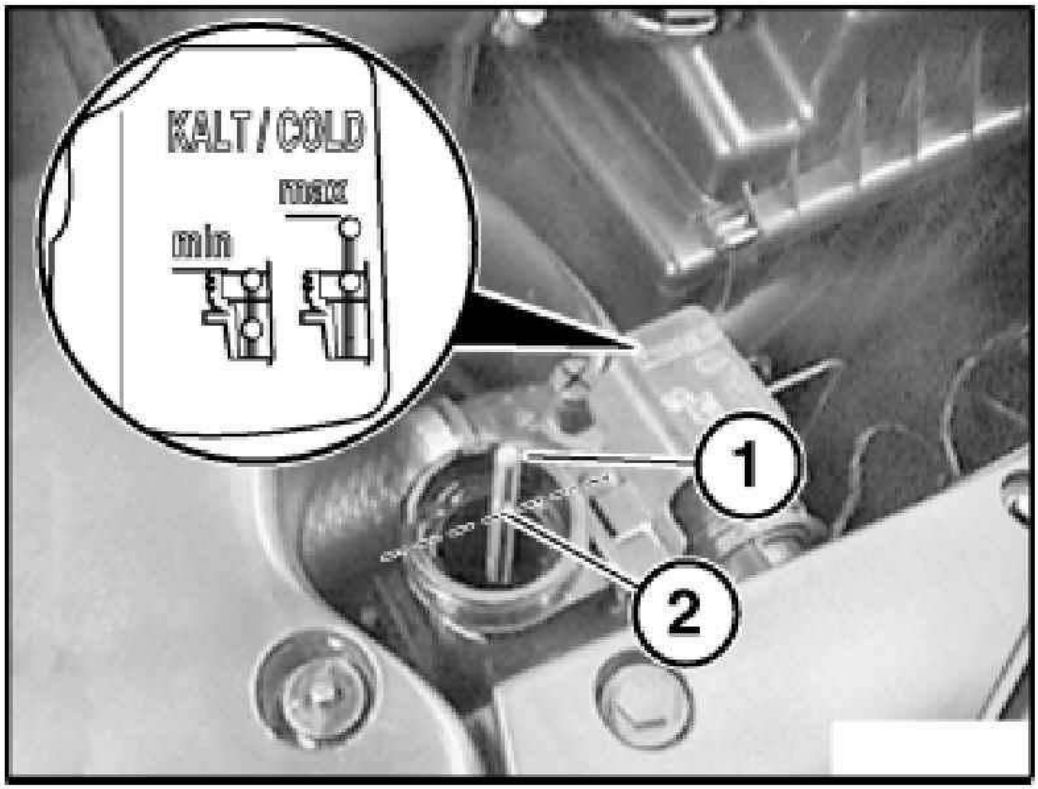


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Fig. 24: Opening Coolant Expansion Tank Cap
Courtesy of BMW OF NORTH AMERICA, INC.

7. If the venting procedure has to be carried out several times, allow DME to drop completely (ignition key removed for approx. 3 minutes), then repeat from step 3.

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Fig. 25: Locating Expansion Tank Coolant Filling Mark (E 65/E 66 Shown) (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking coolant level:

CAUTION: Check coolant level at a maximum coolant temperature of 30°C.

NOTE: If ambient temperature exceeds 30°C, allow engine to cool down at least to ambient temperature.

Open cap carefully.

Fluid level is O.K. when top edge of coolant expansion tank is between both markings (1 and 2) on float needle.

Minimum cold fill level:

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- Upper edge of coolant expansion tank is level with marking (1).

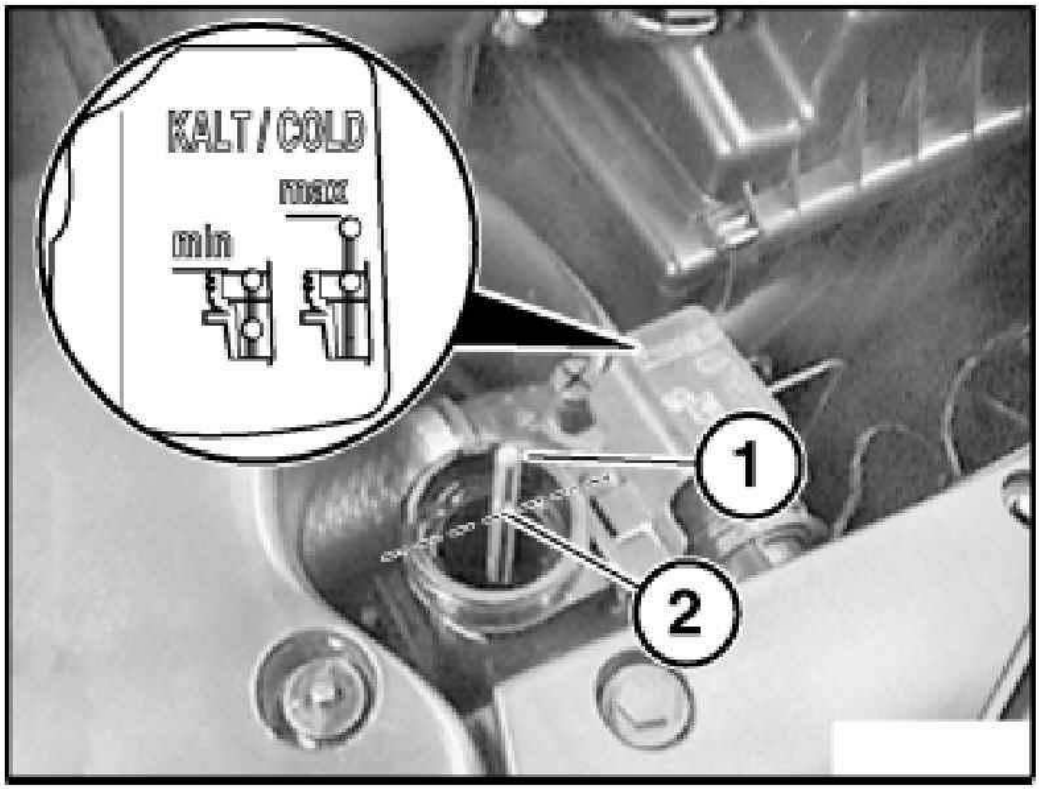
Maximum cold fill level:

- Upper edge of coolant expansion tank is level with marking (2).

If necessary, top up coolant.

NOTE: Tank mark indicates the fluid level at approx. 20°C.

Check cooling system for leaks. See **17 00 009 Checking Cooling System For Leaks (M54)**.



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Fig. 26: Locating Expansion Tank Coolant Filling Mark (E 65/E 66) (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

10 RADIATOR, EXPANSION TANK, PIPES

17 00 009 CHECKING COOLING SYSTEM FOR LEAKS (M54, N46, N52)

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Special tools required:

See **17 COOLING SYSTEM** .

- 17 0 101
- 17 0 105
- 17 0 106

WARNING: Danger of scalding!
Only perform this work after engine has cooled down.

NOTE: Illustrations feature the E85.

Checking pressure drop in cooling system:

Open cap on coolant expansion tank. Fit special tools 17 0 101 / 17 0 105.

Build up gauge pressure , wait approx. 2 minutes.

Cooling system is impervious to leaks if pressure drop is max. 0.1 bar.

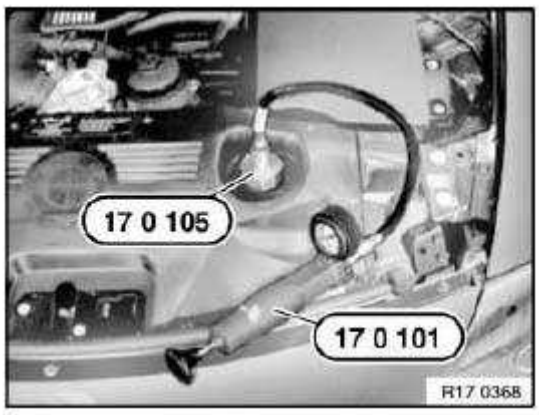


Fig. 27: Special Tool (17 0 105) And (17 0 101)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking pressure relief valve in cap:

Screw cap (1) onto special tool 17 0 106.

Build up pressure with special tool (hand pump) 17 0 101 ; observe pressure gauge to ascertain when opening pressure is achieved.

Compare opening pressure of pressure relief valve.

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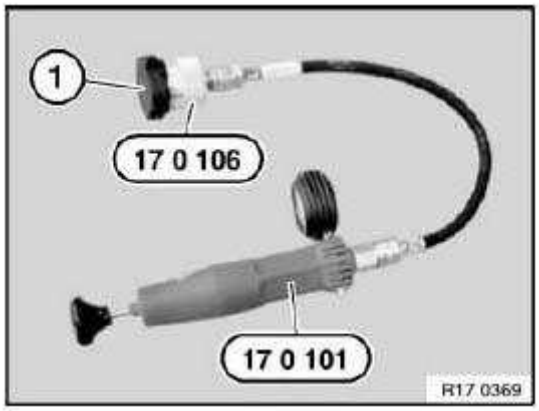


Fig. 28: Special Tool (17 0 106) And (17 0 101)
Courtesy of BMW OF NORTH AMERICA, INC.

17 00 009 CHECKING COOLING SYSTEM FOR WATER LEAKS

Special tools required:

See **17 COOLING SYSTEM** .

- 17 0 101
- 17 0 113
- 17 0 114

WARNING: **Danger of scalding!**
Only perform this work after engine has cooled down.

Checking pressure drop in cooling system:

Open cap on coolant expansion tank. Fit special tools 17 0 101 / 17 0 113.

Build up gauge pressure , wait approx. 2 minutes.

Cooling system is impervious to leaks if pressure drop is max. 0.1 bar.

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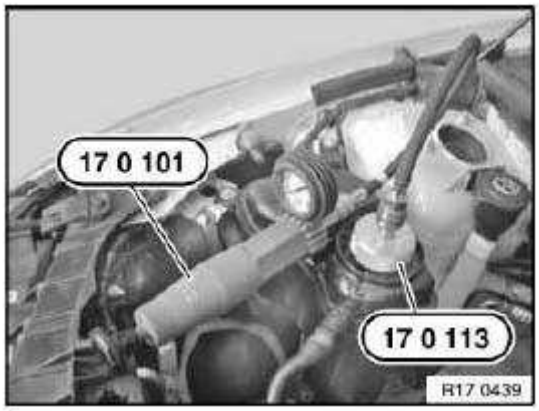


Fig. 29: Special Tool (17 0 101) And (17 0 113)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking pressure relief valve in cap:

NOTE: While the vehicle is driven at high outside temperatures, the design may cause the pressure relief valve in the cap to open slightly and air together with dissolved coolant to escape. This coolant vapor condenses on the surface of the expansion tank and leaves traces when the vehicle has cooled down. These traces do not indicate whether the cap is defective or not. When the vehicle has been parked up for an extended period of time, the residual escaping coolant can cause the pressure relief valve in the cap to stick; therefore check the cap again 2 to 3 times.

Replace the cap only after you have checked three times and there is an incorrect opening pressure.

Checking pressure relief valve in cap:

Screw cap (1) onto special tool 17 0 114.

Build up pressure with special tool (hand pump) 17 0 101 ; observe pressure gauge to ascertain when opening pressure is achieved.

Compare opening pressure of pressure relief valve.

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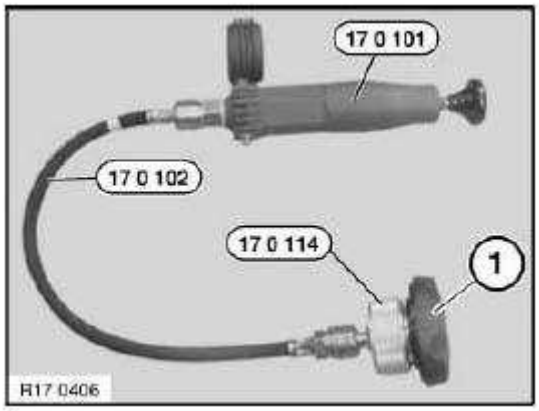


Fig. 30: Special Tool (17 0 101), (17 0 102) And (17 0 114)
Courtesy of BMW OF NORTH AMERICA, INC.

11 ENGINE RADIATOR WITH ATTACHMENT

00 57 072 RETROFITTING SUPPLEMENTARY OIL COOLER (HIGH-SPEED SCOPE OPTION SA840) (N52K)

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- Remove underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- Replace front left wheel arch trim and replace dust lip
- Replace front left trim grille, see **51 11 185 REMOVING AND INSTALLING/REPLACING SIDE GRILLE IN BUMPER TRIM (FROM 09/2006)** .
- If necessary, replace left crashbox, see **51 11 770 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT DEFORMATION ELEMENT FOR FRONT BUMPER** .
- Remove air filter housing, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K)** .
- Release servo reservoir, see **32 41 250 REMOVING AND INSTALLING/REPLACING FLUID RESERVOIR FOR POWER STEERING (M54, N46, N52)** .
- Remove alternator, see **12 31 020 REMOVING AND INSTALLING OR REPLACING ALTERNATOR (N52, N52K, N51, N53)** .
- Remove heater bulkhead, see **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD** .
- Drain coolant, see **17 00 005 Draining and adding coolant (N52K)**.
- Remove oil pressure switch , remove oil filter housing

Mount full-flow oil filter and connection housing for oil lines.

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Installation:

Tightening torque: 11 42 3AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

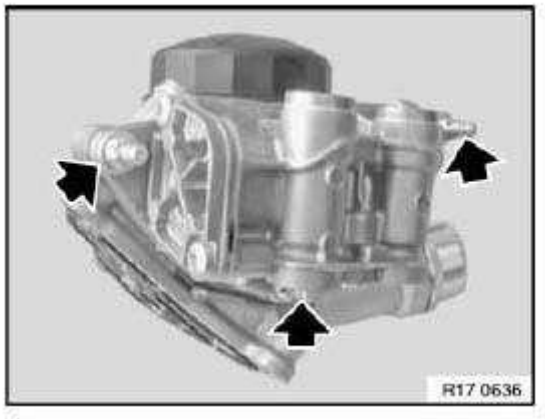


Fig. 31: Locating Mount Full-Flow Oil Filter And Connection Housing For Oil Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Mount oil filter housing on crankcase.

To facilitate mounting, remove coolant connection.

Installation:

Tightening torque: 11 42 2AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .



Fig. 32: Locating Mount Oil Filter Housing On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Mount oil pressure switch on new filter housing.

Installation:

Tightening torque 12 61 2AZ.

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Fig. 33: Locating Mount Oil Pressure Switch On Filter Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Mount sealing rings on oil supply and return lines.

Mount oil lines on filter housing (M8x28 screw).

Installation:

Lubricate sealing rings lightly with oil.

Tightening torque: 17 22 5AZ, see **17 22 OIL COOLER PIPES** .

Secure oil lines with pre-installed rubber grommet.

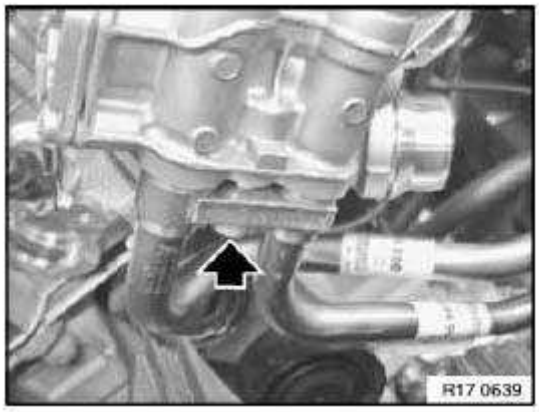


Fig. 34: Locating Mount Sealing Rings On Oil Supply And Return Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Remove underbody protection bracket.

Mount holding frame for engine oil cooler on crashbox.

There must be 2 press-in nuts for the radiator bracket on the crashbox, otherwise replace crashbox.

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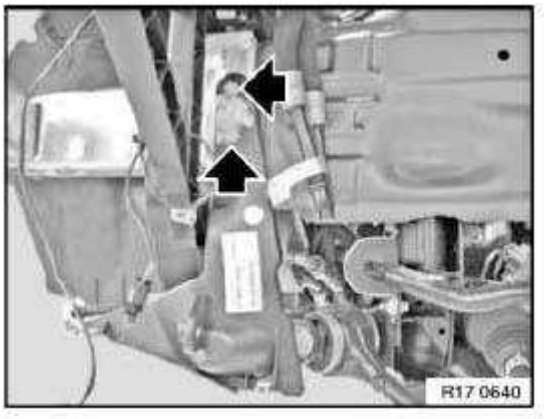


Fig. 35: Locating Underbody Protection Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Mount engine oil cooler on oil cooler bracket (M8x35 screw).

Installation:

Tightening torque: 17 21 2AZ, see **17 21 ENGINE OIL COOLER** .

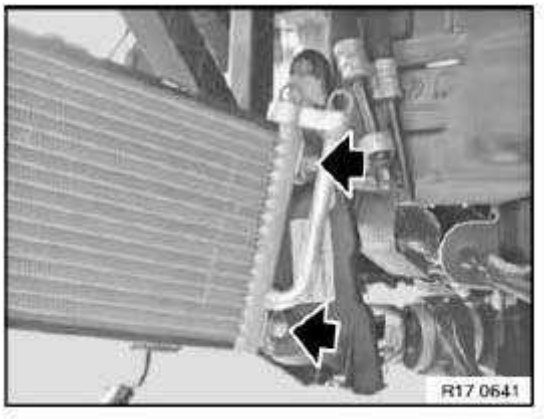


Fig. 36: Locating Mount Engine Oil Cooler On Oil Cooler Bracket (M8X35 Screw)
Courtesy of BMW OF NORTH AMERICA, INC.

Mount wheel arch cooler bracket with vibration damper (rubber element).

Installation:

Tightening torque: 17 21 3AZ, see **17 21 ENGINE OIL COOLER** .

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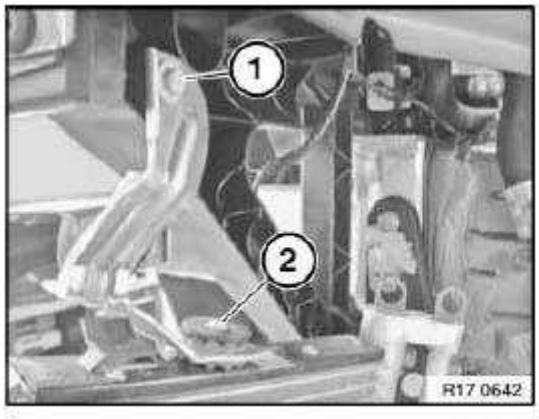


Fig. 37: Mount Wheel Arch Cooler Bracket With Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Mount sealing rings on oil supply and return lines.

Mount oil lines on engine oil cooler housing (M8x30 screw).

Installation:

Lubricate sealing rings lightly with oil.

Tightening torque: 17 22 5AZ, see **17 22 OIL COOLER PIPES** .

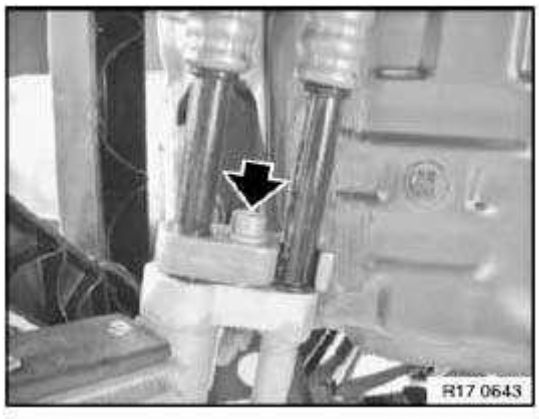


Fig. 38: Locating Mount Sealing Rings On Oil Supply And Return Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Mount wheel arch cover.

Mount dust lip.

Mount oil cooler protective grille in wheel arch cover.

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Fig. 39: Mount Wheel Arch Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Mount air duct on engine oil cooler.

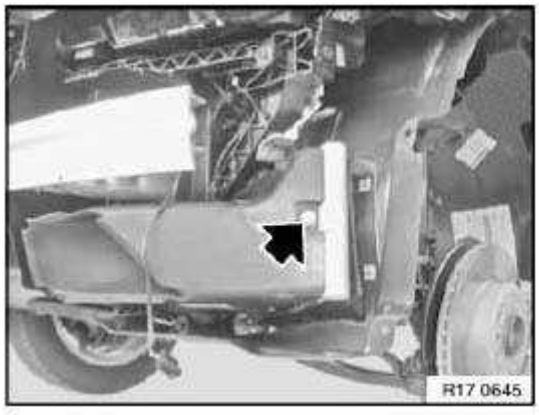
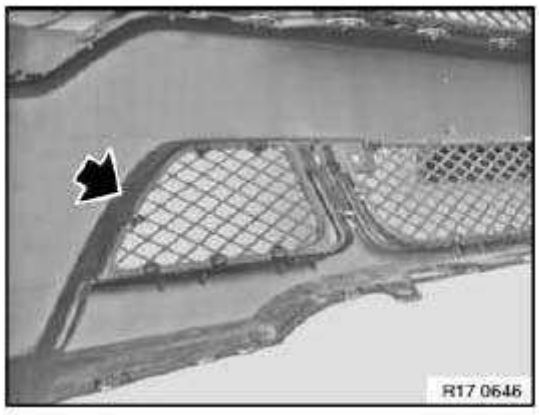


Fig. 40: Locating Mount Air Duct On Engine Oil Cooler
Courtesy of BMW OF NORTH AMERICA, INC.

Replace closed cover in left bumper trim with grille panel.



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Fig. 41: Locating Bumper Trim With Grille Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Remove coolant hose between coolant pump, coolant radiator and oil-water heat exchanger.

Install coolant hose between coolant pump and coolant radiator.

Push hose onto coolant pump up to mechanical stop.

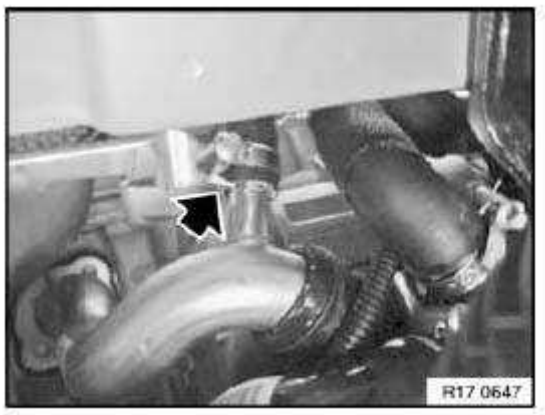


Fig. 42: Locating Coolant Hose Between Coolant Pump, Coolant Radiator And Oil-Water Heat Exchanger
Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle

Fill coolant and engine oil systems

Data oil fill quantity

The oil fill quantity is increased after installation of the supplementary cooler by 0.5 l.

Adapt DME data status

NOTE: Now clear the fault memory.

17 11 035 REPLACING FAN COWL WITH ELECTRIC FAN (N52K)

Necessary preliminary tasks:

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

Lever out expander rivet.

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Unlock plug (1) and remove.

Release screw (2).

Lift out fan cowl (3) with electric fan.

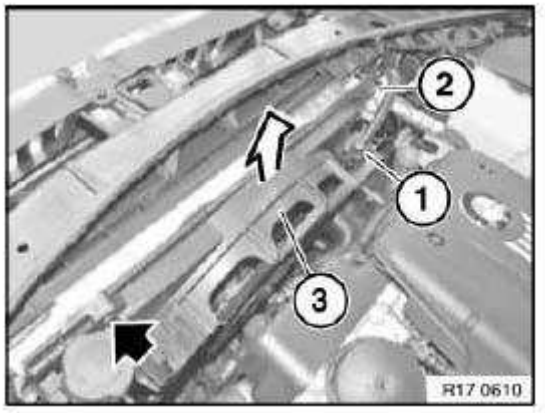


Fig. 43: Removing Electric Fan, Expander Rivet And Plug
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Now clear the fault memory.

17 11 046 REMOVING AND INSTALLING / REPLACING MODULE CARRIER

Necessary preliminary tasks:

- Remove **power steering cooling loop**
- If necessary, slacken A/C condenser and secure against damage and against falling down. Refer to Remove A/C condenser. See **64 53 550 REMOVING AND INSTALLING OR REPLACING CAPACITOR FOR THE HEATING AND AIR CONDITIONING SYSTEM** .

Release expander rivet and remove left module carrier (1). Installation: Rubber mounts fall out easily, ensure correct installation position.

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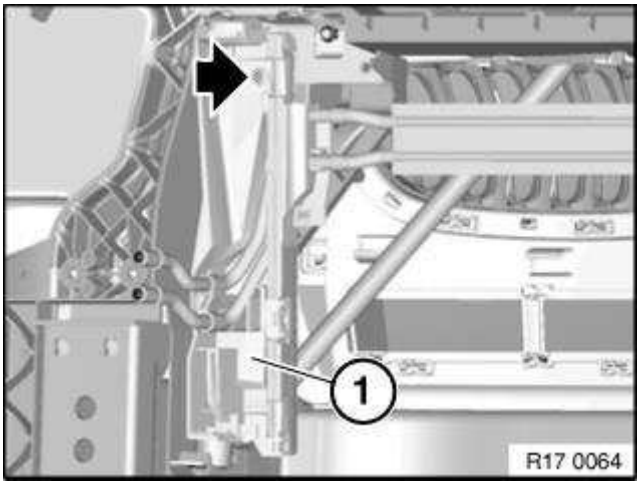


Fig. 44: Release Expander Rivet And Remove Left Module Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Remove right module carrier (1). Make sure rubber mount is in correct installation position.

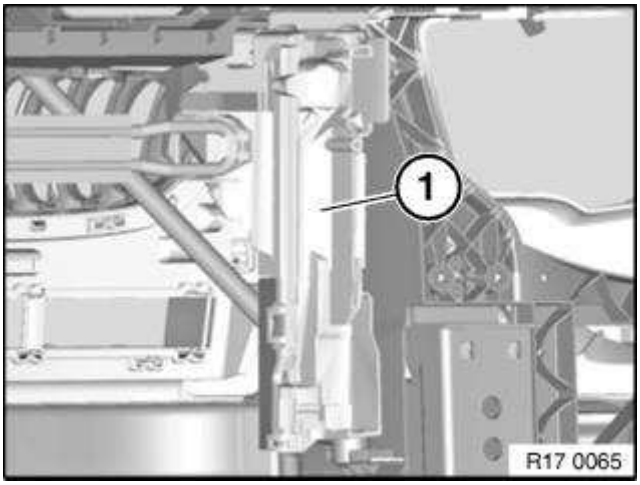


Fig. 45: Remove Right Module Carrier (1)
Courtesy of BMW OF NORTH AMERICA, INC.

When replacing module carrier: Convert **power steering cooling loop**.

17 11 100 REMOVING AND INSTALLING/REPLACING COOLANT EXPANSION TANK (M54, N46)

WARNING: Danger of scalding!
Only perform this work after engine has cooled down.

Necessary preliminary tasks:

- Follow instructions for working on cooling system, see **17 00 ... Instructions for working on cooling system**.
- E83: Remove intake duct

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- Remove fan cowl
- Drain coolant, see **17 00 005 Draining and adding coolant (N52K)**.

Unfasten plug connection (1) and disconnect.

Withdraw lock (2).

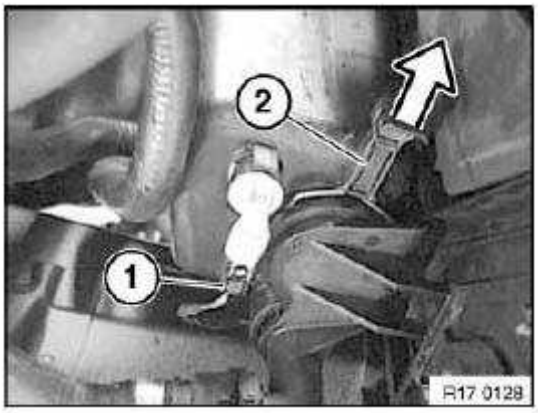


Fig. 46: Disconnecting Plug Connection And Withdraw Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Pull locks (1 and 2) upwards and detach coolant hose from radiator/coolant expansion tank.

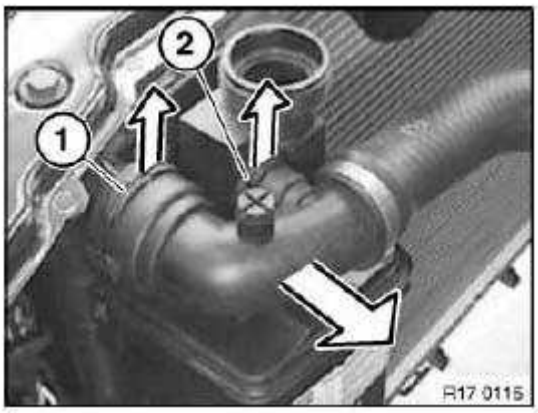


Fig. 47: Disconnecting Hose And Withdraw Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Pull lock (1) upwards and detach coolant hose from coolant expansion tank.

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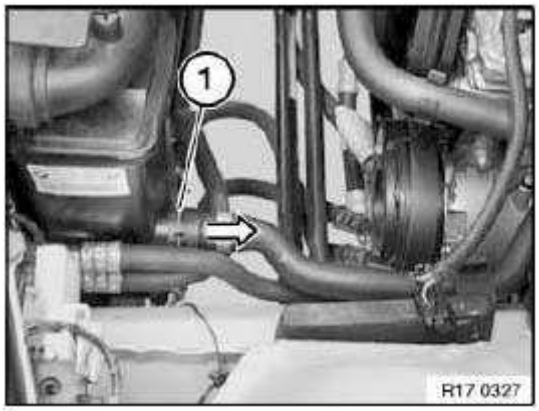


Fig. 48: Pulling Lock Coolant Hose From Coolant Expansion Tank
Courtesy of BMW OF NORTH AMERICA, INC.

Illustration with radiator removed.

Pull coolant expansion tank upwards slightly out of carrier plate and pull out lower connection piece. Then tilt expansion tank to rear and remove.

Installation:

Check sealing rings. Do not under any circumstances coat sealing rings with antiseize agent before installation.

Retaining lug must engage in opening on carrier plate.

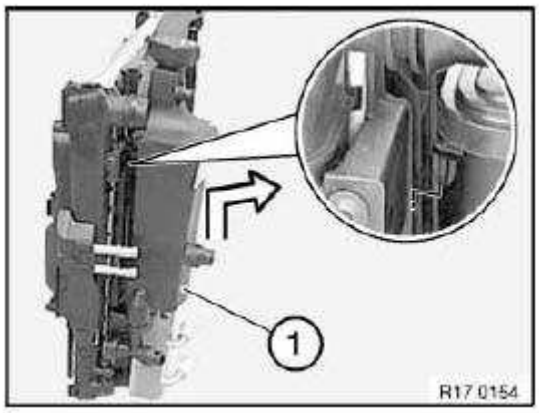


Fig. 49: Pulling Coolant Expansion Tank
Courtesy of BMW OF NORTH AMERICA, INC.

17 11 100 REMOVING AND INSTALLING/REPLACING COOLANT EXPANSION TANK (M57TU, M57T2, M47T2)

Necessary preliminary tasks:

- Drain coolant, see **17 00 005 Draining and adding coolant (N52K)**.

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Detach coolant hoses (1) and (3).

Unclip hose (2).

Disconnect connector (4).

Unfasten screws.

Remove expansion tank (5).

Installation:

Insert locating pin in rubber grommet.

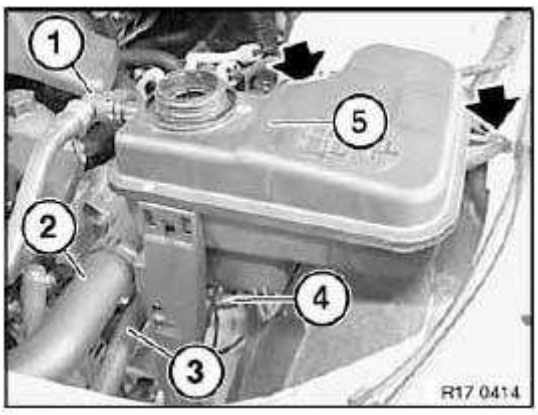


Fig. 50: Locating Coolant Hoses, Connector And Expansion Tank
Courtesy of BMW OF NORTH AMERICA, INC.

17 11 370 REMOVING AND INSTALLING/REPLACING COOLING LOOP FOR POWER STEERING

WARNING: Danger of scalding!
Only perform this work after engine has cooled down.

IMPORTANT: When working on the oil, coolant or fuel circuit, you must protect the alternator against contamination.

Cover alternator with suitable materials.

Failure to comply with this procedure may result in an alternator malfunction.

NOTE: After completing this operation, check fluid level in tank of power steering system, see 32 13 006 BLEEDING POWER STEERING UNIT .

Remove radiator.

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Lift out expansion rivet (1).

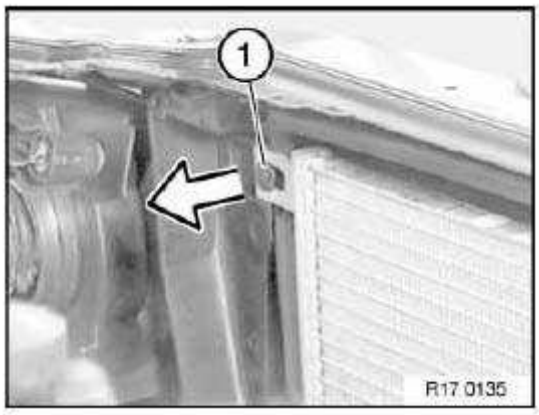


Fig. 51: Lifting Expansion Rivet
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew bolt (1).

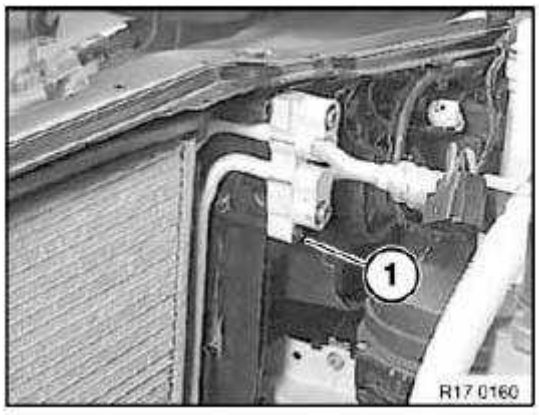


Fig. 52: Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Remove A/C condenser towards rear top from fixtures.

Tilt condenser towards engine, taking care not to damage condenser.

NOTE: Lines of A/C system remain connected to condenser.

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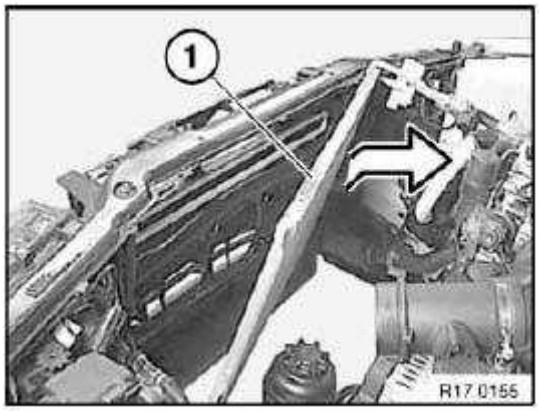


Fig. 53: Removing A/C Condenser Top From Fixtures
Courtesy of BMW OF NORTH AMERICA, INC.

Press lines (1) in direction of cooling loop, pull black locking ring towards rear. Keep locking ring pressed and detach lines (1) from cooling loop.

IMPORTANT: Catch and dispose of emerging fluid.

Press lock (2). Pull cooling loop (3) of power steering towards rear out of module carrier.

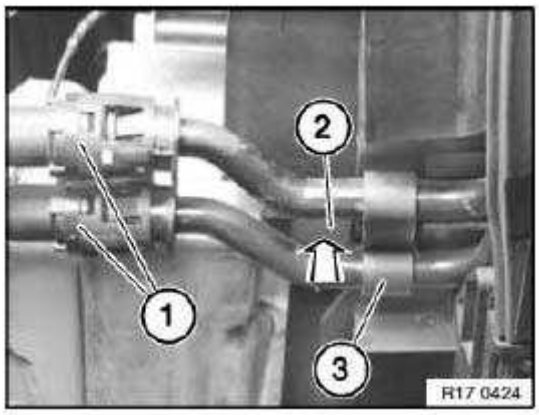


Fig. 54: Pulling Cooling Loop Of Power Steering
Courtesy of BMW OF NORTH AMERICA, INC.

21 OIL COOLER

17 21 500 FLUSHING OIL COOLER WITH LINES (AUTOMATIC TRANSMISSION)

Special tools required:

See **17 COOLING SYSTEM** .

- 17 2 018

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- 17 2 019

NOTE: Carry out the work steps listed when:
Fitting a new or replacement transmission
Flushing can only be carried out with the automatic transmission removed.

Procedure:

Automatic transmission removed.

Connect appropriate adapters (see description below) to oil lines exiting from automatic transmission.

Connect the connecting line 17 2 019 from the oil collection unit with the quick-release coupling.

Connect drain line 17 2 018 using quick-release coupling.

Feed open end of drain line into a suitable collection container.

Using oil collection unit, flush approx. 1 liter of transmission fluid through oil lines and oil cooler.

Reposition quick-release couplings.

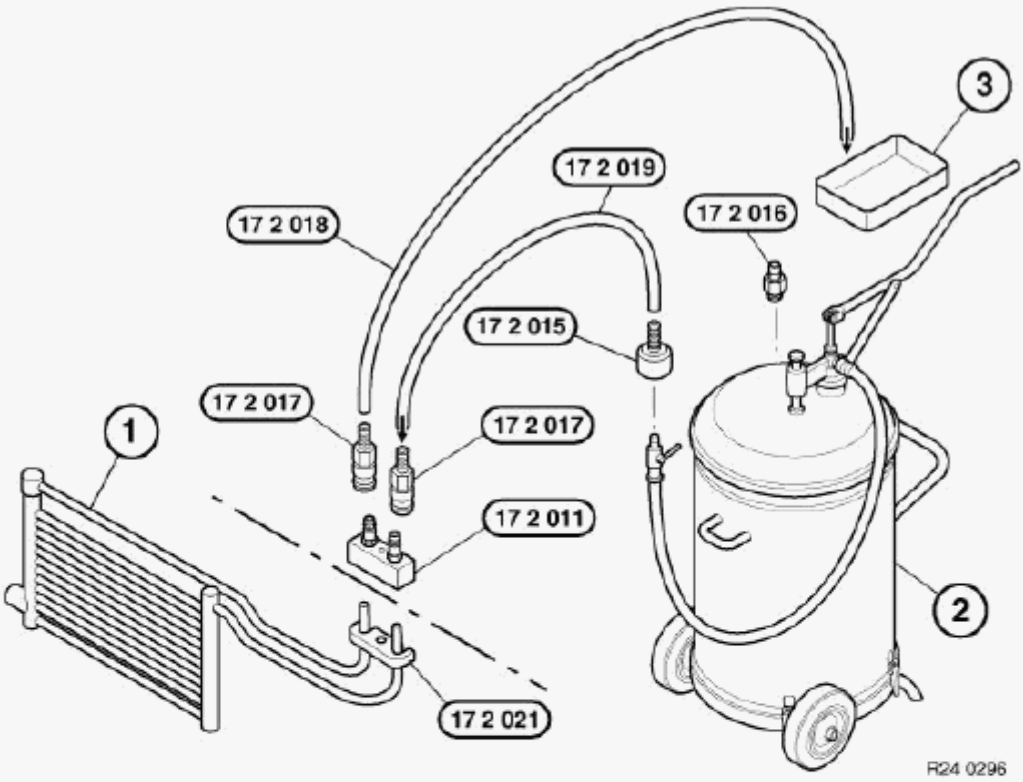
Flush oil lines/oil cooler in opposite direction with approx. 1 liter of transmission fluid.

Disconnect quick-release couplings, remove adapters.

NOTE: Dispose of flushing oil properly; do not under any circumstances reuse it.

Arrangement of flushing device for transmissions A5S 310Z, A5S 560Z, A5S 360R/390R, A4S 200R, A5S 325Z, GA6HP26Z

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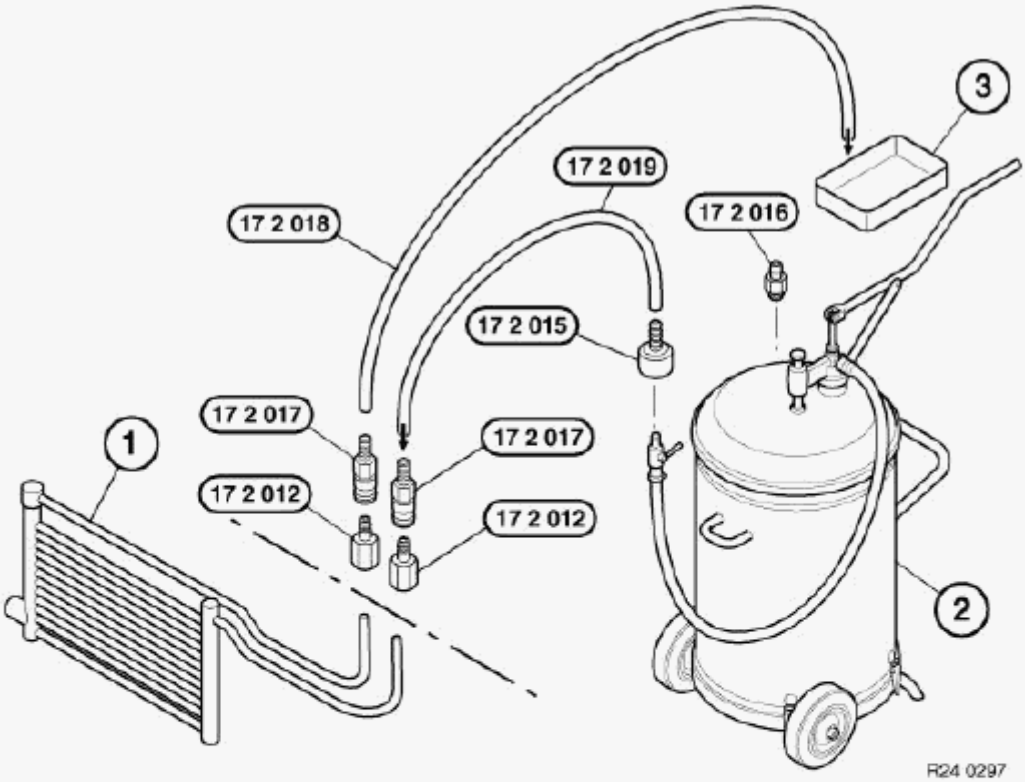


1) Transmission -oil cooler with lines
2) Oil collection unit
3) Oil drip tray
17 2 011 Adapter for connecting transmission -side oil cooler lines (1)
17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or
17 2 016 Connection for oil collection unit (2), manufacturer: Horn
17 2 017 Quick -release coupling (2 pieces)
17 2 018 Hose to oil drip tray (3)
17 2 019 Hose to oil collection unit (2)
17 2 021 Mounting plate for adapter 17 2 011 for transmissions A5S 325Z, GA6HP26Z

Fig. 55: Flushing Device For Transmissions
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of flushing device for transmission A4S 310R

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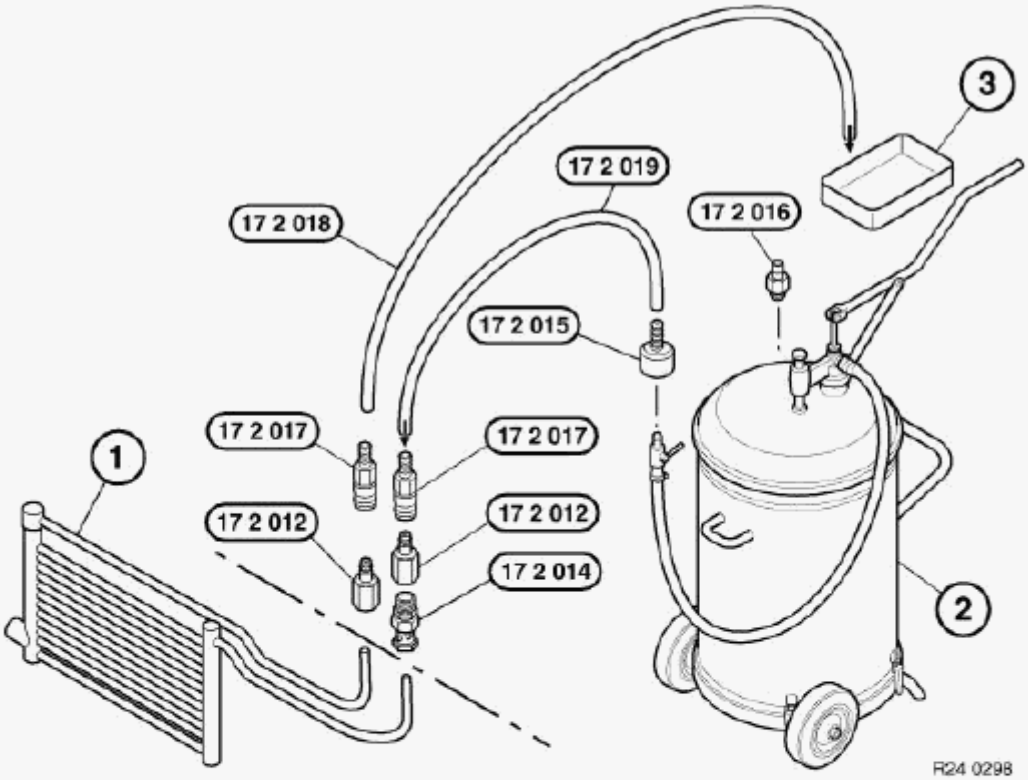


1) Transmission -oil cooler with lines
2) Oil collection unit
3) Oil drip tray
17 2 012 Adapters (2 x) for connecting transmission-side oil cooler lines (1)
17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or
17 2 016 Connection for oil collection unit (2), manufacturer: Horn
17 2 017 Quick -release coupling (2 pieces)
17 2 018 Hose to oil drip tray (3)
17 2 019 Hose to oil collection unit (2)

Fig. 56: Arrangement Of Flushing Device For Transmission (A4S 310R)
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of flushing device for transmission A4S 300J

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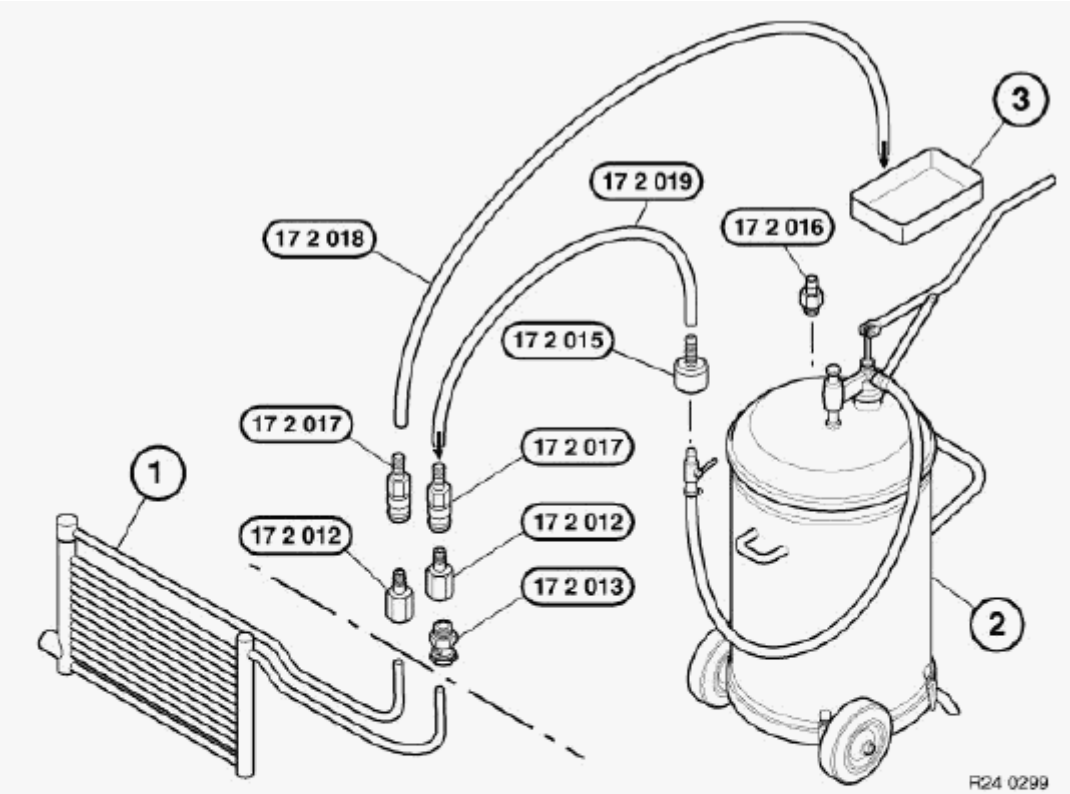


1) Transmission -oil cooler with lines
2) Oil collection unit
3) Oil drip tray
17 2 012 Adapters (2 x) for connecting transmission-side oil cooler lines (1)
17 2 014 Banjo bolt for connecting transmission -side oil cooler lines (1)
17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or
17 2 016 Connection for oil collection unit (2), manufacturer: Horn
17 2 017 Quick -release coupling (2 pieces)
17 2 018 Hose to oil drip tray (3)
17 2 019 Hose to oil collection unit (2)

Fig. 57: Arrangement Of Flushing Device For Transmission (A4S 300J)
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of flushing device for transmission A5S 440Z

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1) Transmission -oil cooler with lines
2) Oil collection unit
3) Oil drip tray
17 2 012 Adapters (2 x) for connecting transmission-side oil cooler lines (1)
17 2 013 Banjo bolt for connecting transmission -side oil cooler lines (1)
17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or
17 2 016 Connection for oil collection unit (2), manufacturer: Horn
17 2 017 Quick -release coupling (2 pieces)
17 2 018 Hose to oil drip tray (3)
17 2 019 Hose to oil collection unit (2)

Fig. 58: Arrangement Of Flushing Device For Transmission (A5S 440Z)
Courtesy of BMW OF NORTH AMERICA, INC.

22 OIL COOLER LINES

00 57 072 RETROFITTING SUPPLEMENTARY OIL COOLER (HIGH-SPEED SCOPE OPTION SA840) (N52K)

Necessary preliminary tasks:

- Read out fault memory of DME control unit

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- Switch off ignition
- Remove underbody protection, see **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- Replace front left wheel arch trim and replace dust lip
- Replace front left trim grille, see **51 11 185 REMOVING AND INSTALLING/REPLACING SIDE GRILLE IN BUMPER TRIM (FROM 09/2006)** .
- If necessary, replace left crashbox, see **51 11 770 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT DEFORMATION ELEMENT FOR FRONT BUMPER** .
- Remove air filter housing, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K)** .
- Release servo reservoir, see **32 41 250 REMOVING AND INSTALLING/REPLACING FLUID RESERVOIR FOR POWER STEERING (M54, N46, N52)** .
- Remove alternator, see **12 31 020 REMOVING AND INSTALLING OR REPLACING ALTERNATOR (N52, N52K, N51, N53)** .
- Remove heater bulkhead, see **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD** .
- Drain coolant, see **17 00 005 Draining and adding coolant (N52K)**.
- Remove oil pressure switch , remove oil filter housing

Mount full-flow oil filter and connection housing for oil lines.

Installation:

Tightening torque: 11 42 3AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

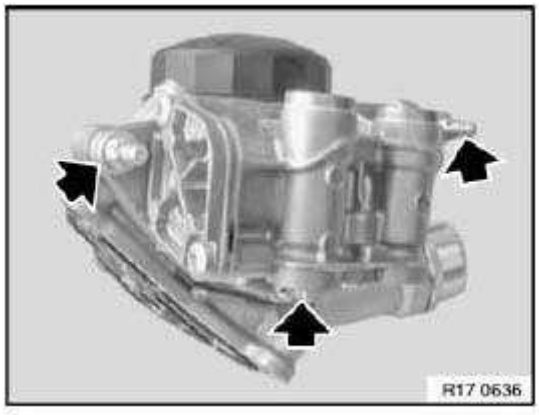


Fig. 59: Locating Mount Full-Flow Oil Filter And Connection Housing For Oil Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Mount oil filter housing on crankcase.

To facilitate mounting, remove coolant connection.

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Installation:

Tightening torque: 11 42 2AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

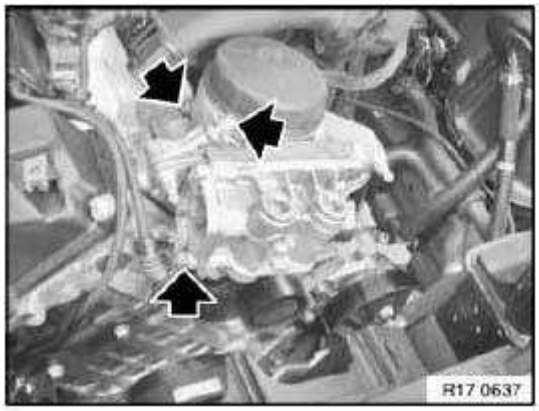


Fig. 60: Locating Mount Oil Filter Housing On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Mount oil pressure switch on new filter housing.

Installation:

Tightening torque 12 61 2AZ.



Fig. 61: Locating Mount Oil Pressure Switch On Filter Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Mount sealing rings on oil supply and return lines.

Mount oil lines on filter housing (M8x28 screw).

Installation:

Lubricate sealing rings lightly with oil.

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Tightening torque: 17 22 5AZ, see **17 22 OIL COOLER PIPES** .

Secure oil lines with pre-installed rubber grommet.

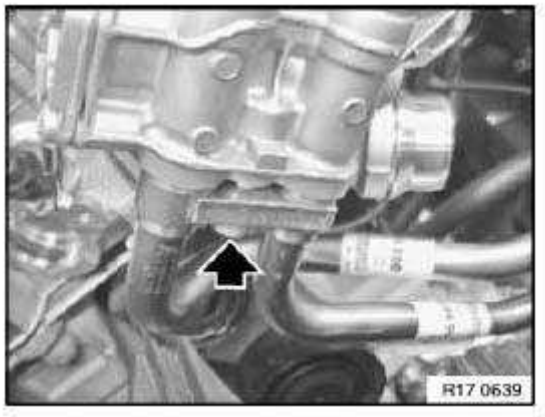


Fig. 62: Locating Mount Sealing Rings On Oil Supply And Return Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Remove underbody protection bracket.

Mount holding frame for engine oil cooler on crashbox.

There must be 2 press-in nuts for the radiator bracket on the crashbox, otherwise replace crashbox.

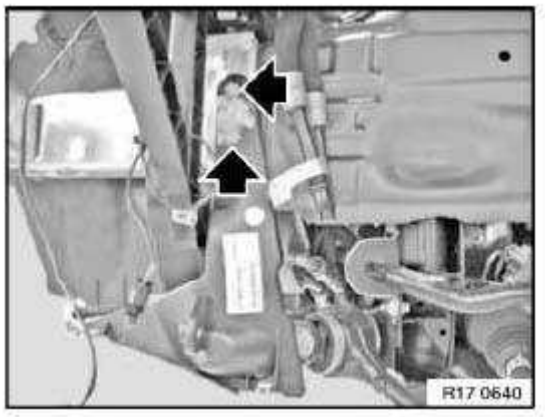


Fig. 63: Locating Underbody Protection Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Mount engine oil cooler on oil cooler bracket (M8x35 screw).

Installation:

Tightening torque: 17 21 2AZ, see **17 21 ENGINE OIL COOLER** .

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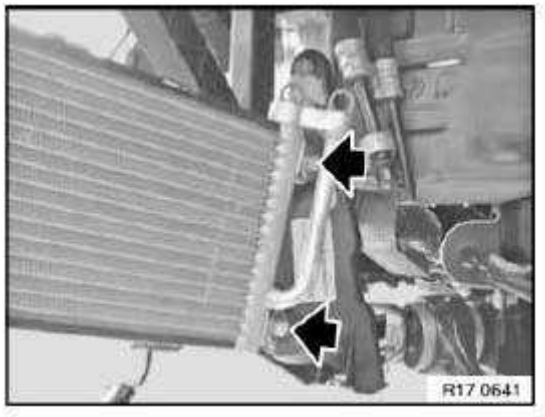


Fig. 64: Locating Mount Engine Oil Cooler On Oil Cooler Bracket (M8X35 Screw)
Courtesy of BMW OF NORTH AMERICA, INC.

Mount wheel arch cooler bracket with vibration damper (rubber element).

Installation:

Tightening torque: 17 21 3AZ, see **17 21 ENGINE OIL COOLER** .

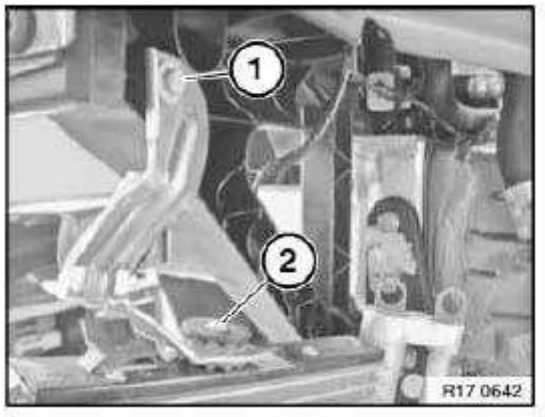


Fig. 65: Mount Wheel Arch Cooler Bracket With Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Mount sealing rings on oil supply and return lines.

Mount oil lines on engine oil cooler housing (M8x30 screw).

Installation:

Lubricate sealing rings lightly with oil.

Tightening torque: 17 22 5AZ, see **17 22 OIL COOLER PIPES** .

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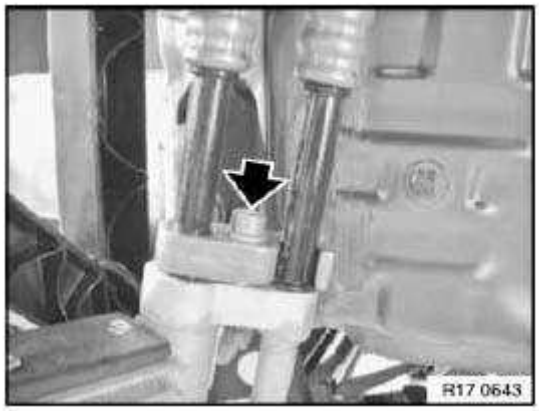


Fig. 66: Locating Mount Sealing Rings On Oil Supply And Return Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Mount wheel arch cover.

Mount dust lip.

Mount oil cooler protective grille in wheel arch cover.



Fig. 67: Mount Wheel Arch Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Mount air duct on engine oil cooler.

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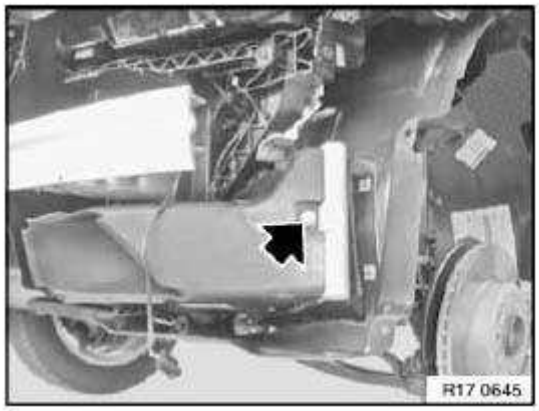


Fig. 68: Locating Mount Air Duct On Engine Oil Cooler
Courtesy of BMW OF NORTH AMERICA, INC.

Replace closed cover in left bumper trim with grille panel.

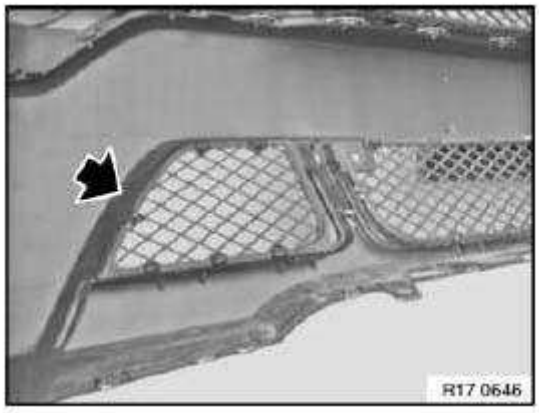


Fig. 69: Locating Bumper Trim With Grille Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Remove coolant hose between coolant pump, coolant radiator and oil-water heat exchanger.

Install coolant hose between coolant pump and coolant radiator.

Push hose onto coolant pump up to mechanical stop.

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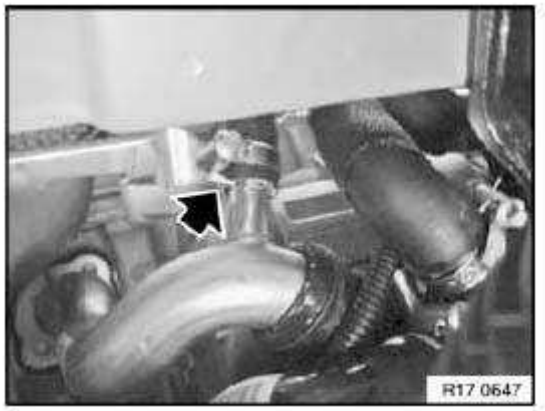


Fig. 70: Locating Coolant Hose Between Coolant Pump, Coolant Radiator And Oil-Water Heat Exchanger
Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle

Fill coolant and engine oil systems

Data oil fill quantity

The oil fill quantity is increased after installation of the supplementary cooler by 0.5 l.

Adapt DME data status

NOTE: Now clear the fault memory.

17 21 500 FLUSHING OIL COOLER WITH LINES (AUTOMATIC TRANSMISSION)

Special tools required:

See **17 COOLING SYSTEM** .

- 17 2 018
- 17 2 019

NOTE: Carry out the work steps listed when:
Fitting a new or replacement transmission
Flushing can only be carried out with the automatic transmission removed.

Procedure:

Automatic transmission removed.

Connect appropriate adapters (see description below) to oil lines exiting from automatic transmission.

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Connect the connecting line 17 2 019 from the oil collection unit with the quick-release coupling.

Connect drain line 17 2 018 using quick-release coupling.

Feed open end of drain line into a suitable collection container.

Using oil collection unit, flush approx. 1 liter of transmission fluid through oil lines and oil cooler.

Reposition quick-release couplings.

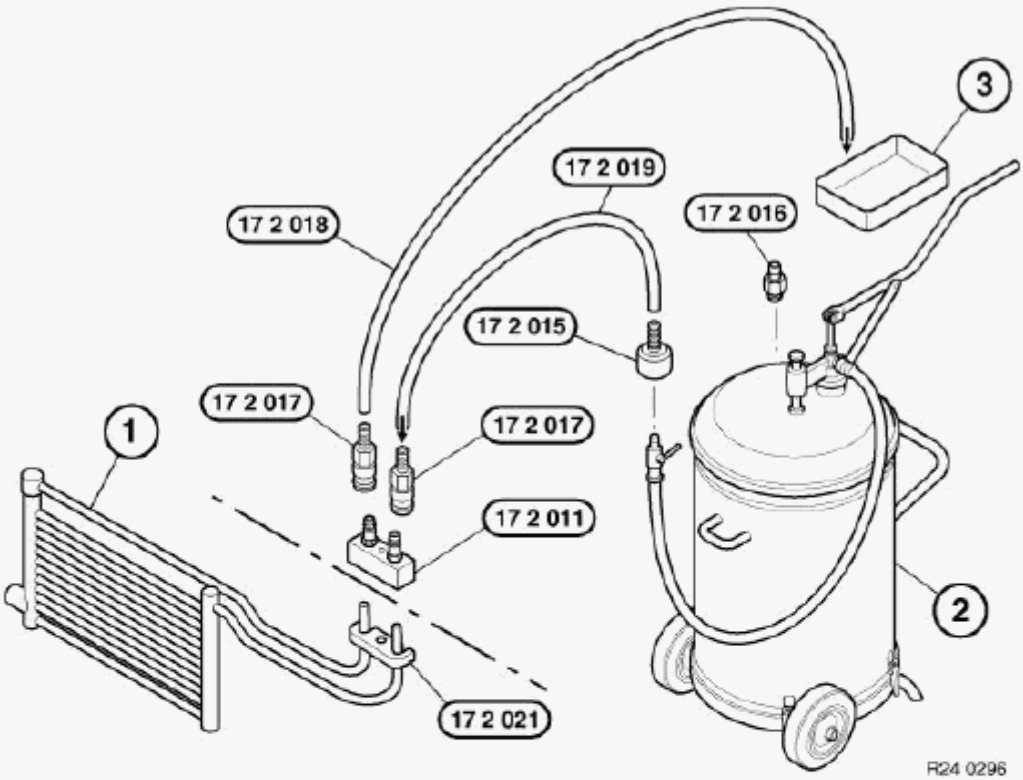
Flush oil lines/oil cooler in opposite direction with approx. 1 liter of transmission fluid.

Disconnect quick-release couplings, remove adapters.

NOTE: Dispose of flushing oil properly; do not under any circumstances reuse it.

Arrangement of flushing device for transmissions A5S 310Z, A5S 560Z, A5S 360R/390R, A4S 200R, A5S 325Z, GA6HP26Z

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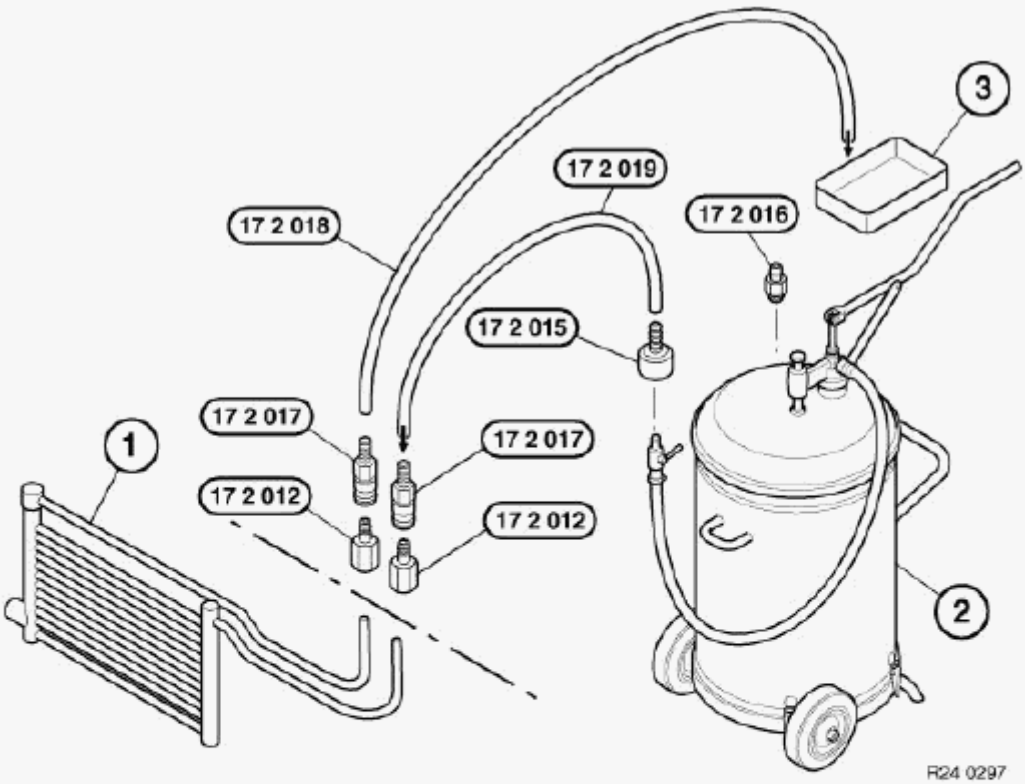


1) Transmission -oil cooler with lines
2) Oil collection unit
3) Oil drip tray
17 2 011 Adapter for connecting transmission -side oil cooler lines (1)
17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or
17 2 016 Connection for oil collection unit (2), manufacturer: Horn
17 2 017 Quick -release coupling (2 pieces)
17 2 018 Hose to oil drip tray (3)
17 2 019 Hose to oil collection unit (2)
17 2 021 Mounting plate for adapter 17 2 011 for transmissions A5S 325Z, GA6HP26Z

Fig. 71: Arrangement Of Flushing Device For Transmissions
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of flushing device for transmission A4S 310R

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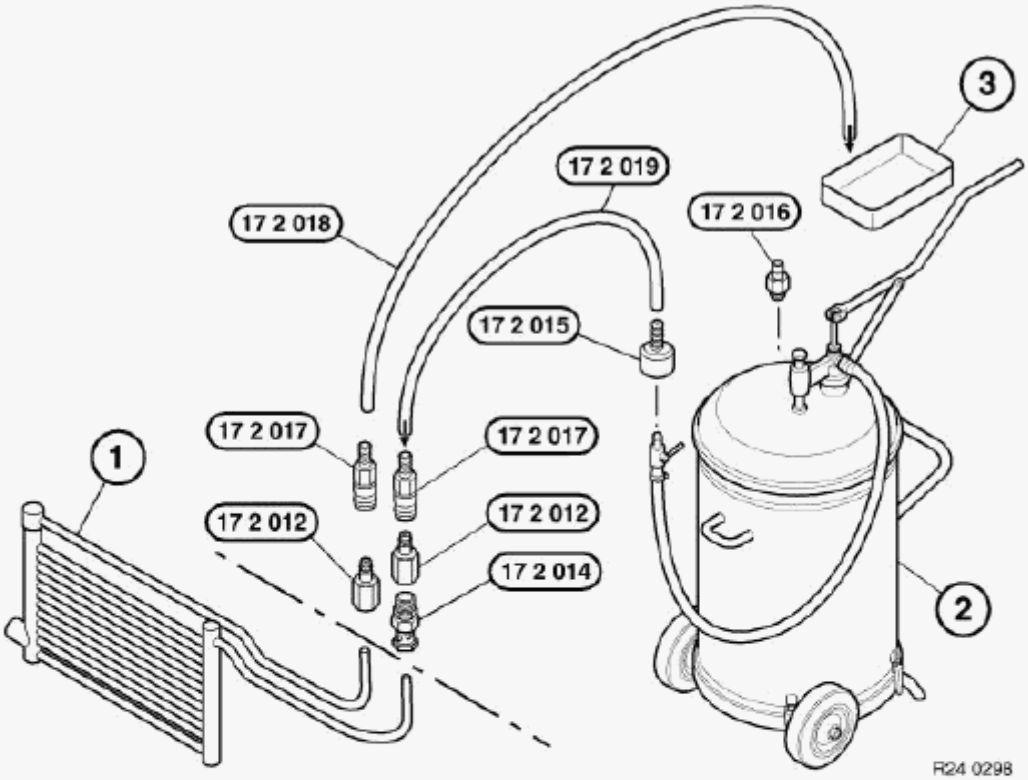


1) Transmission -oil cooler with lines
2) Oil collection unit
3) Oil drip tray
17 2 012 Adapters (2 x) for connecting transmission-side oil cooler lines (1)
17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or
17 2 016 Connection for oil collection unit (2), manufacturer: Horn
17 2 017 Quick -release coupling (2 pieces)
17 2 018 Hose to oil drip tray (3)
17 2 019 Hose to oil collection unit (2)

Fig. 72: Arrangement Of Flushing Device For Transmission (A4S 310R)
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of flushing device for transmission A4S 300J

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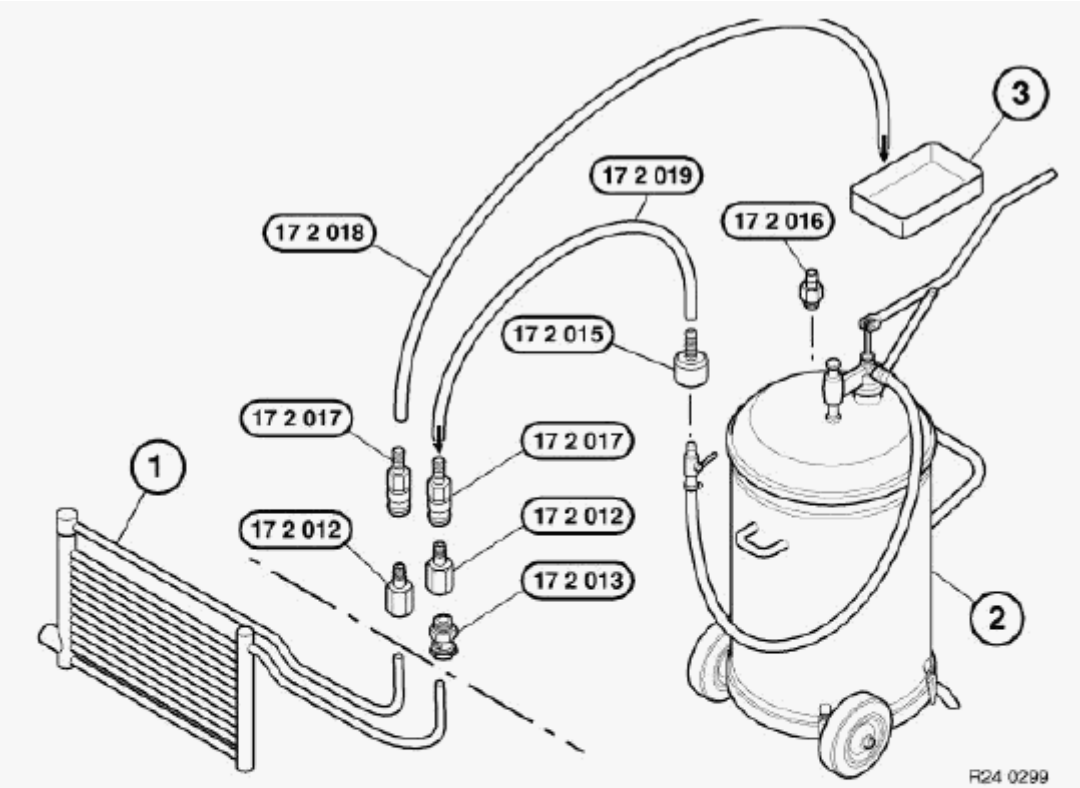


1) Transmission -oil cooler with lines
2) Oil collection unit
3) Oil drip tray
17 2 012 Adapters (2 x) for connecting transmission-side oil cooler lines (1)
17 2 014 Banjo bolt for connecting transmission -side oil cooler lines (1)
17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or
17 2 016 Connection for oil collection unit (2), manufacturer: Horn
17 2 017 Quick -release coupling (2 pieces)
17 2 018 Hose to oil drip tray (3)
17 2 019 Hose to oil collection unit (2)

Fig. 73: Arrangement Of Flushing Device For Transmission (A4S 300J)
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of flushing device for transmission A5S 440Z

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1) Transmission -oil cooler with lines
2) Oil collection unit
3) Oil drip tray

17 2 012 Adapters (2 x) for connecting transmission-side oil cooler lines (1)

17 2 013 Banjo bolt for connecting transmission -side oil cooler lines (1)

17 2 015 Connection for oil collection unit (2), manufacturer: Deutsche Tecalemit or

17 2 016 Connection for oil collection unit (2), manufacturer: Horn

17 2 017 Quick -release coupling (2 pieces)

17 2 018 Hose to oil drip tray (3)

17 2 019 Hose to oil collection unit (2)

Fig. 74: Arrangement Of Flushing Device For Transmission (A5S 440Z)
Courtesy of BMW OF NORTH AMERICA, INC.

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ENGINE

Cooling System - Special Tools - X3

17 COOLING SYSTEM

17 0 000 TESTER

Note: For checking cooling system for leaks and function of pressure relief valve in radiator cap. Replaced by 17 0 100

Storage location: A43, C17

Order number: 17 0 000

Tester

Consisting of:

1 = 17 0 001 Adapter

Note: For checking pressure relief valve in radiator cap / model series: all, except E28

2 = 17 0 002 Tester without adapter

Note: Pressure range 0...2.5 bar / model series: all, except E28

3 = 17 0 003 Screw neck

Note: For screw-on radiator caps (normal thread)/ model series: E28, E30, E31, E32 Engine: all, except M51

4 = 17 0 004 Adapter

Note: For screw-on radiator caps (normal thread) / model series: E28, E30, E32 / Engine: M51

5 = 17 0 005 Screw neck

Note: For screw-on radiator caps (buttress thread) / model series: E31, E32, E34, E36, E38, E39

7 = 17 0 007 Adapter

Note: For checking expansion tank cap / model series: E31, E32, E34, E36, E38, E39

8 = 17 0 008 Pressure hose

9 = 17 0 009 Adapter for radiator expansion tank

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Note: Model series: E36 / Model: M3 US Engine W10

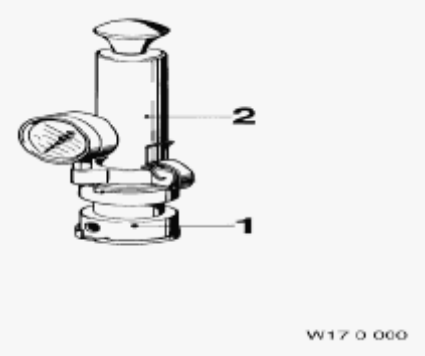


Fig. 1: Tester (17 0 000)
Courtesy of BMW OF NORTH AMERICA, INC.

17 0 030 PLIERS

Minimum set: Mechanical tools

Note: For releasing fasteners on transmission oil cooler

Series: E46, E53, E60, E61, E63, E64, E65, E66, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, RR1

Storage location: B46

SI number: 1 14 01 (766)

Order number: 17 0 030

Pliers

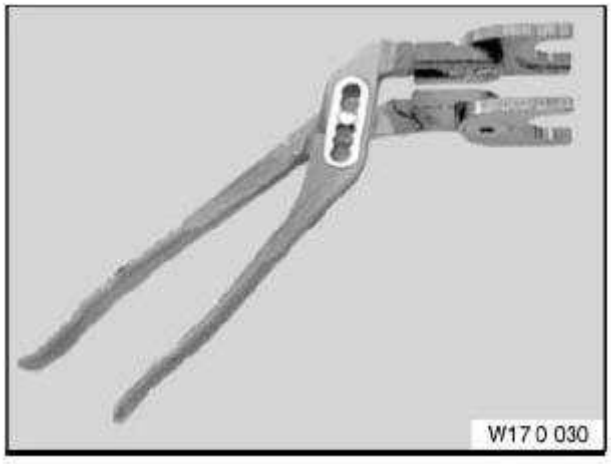


Fig. 2: Pliers (17 0 030)
Courtesy of BMW OF NORTH AMERICA, INC.

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17 0 100 TESTER

Minimum set: Mechanical tools

Note: For checking engine cooling system for water leaks. For checking radiator cap.

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E68, E70, E81, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

SI number: 01 07 02 (884)

Order number: 17 0 100

Tester

Consisting of:

1 = 17 0 101 Pump

2 = 17 0 102 Hose with quick-connect coupling

3 = 17 0 103 Adapter

Note: For radiator cap (normal thread)

4 = 17 0 104 Adapter

Note: For radiator cap (normal thread)

5 = 17 0 105 Adapter

Note: For radiator cap (sawtooth thread)

6 = 17 0 106 Adapter

Note: For radiator cap (sawtooth thread)

7 = 17 0 107 Adapter

Note: For radiator cap R50 / W10

8 = 17 0 108 Adapter

Note: For radiator cap R50 / W10

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9 = 17 0 109 Adapter

Note: For radiator connection R53/W11, R50/W17 Adapter corresponds to 17 0 051

10 = 17 0 111 Adapter

Note: For radiator cap R53/W11, R50/W17 Adapter corresponds to 17 0 052

11= 17 0 112 Case

12 = 17 0 113 Adapter

Note: For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)

13 = 17 0 114 Adapter

Note: For radiator cap Model series: E60, E61, E63, E64 SI no.: 1 08 03 (988)

14 = 17 0 115 Adapter

Note: For radiator cap Model series: N12, N14

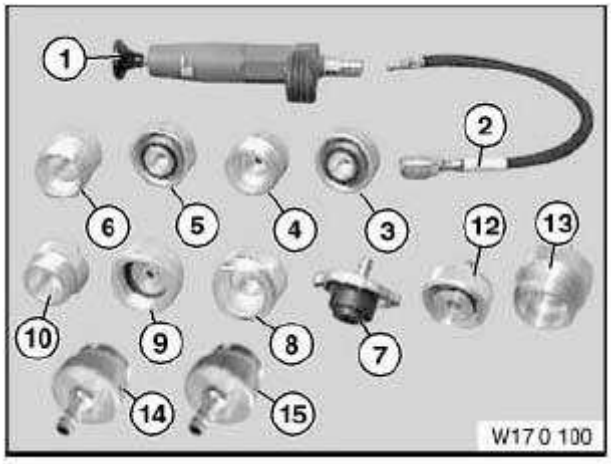


Fig. 3: Tester (17 0 100)
Courtesy of BMW OF NORTH AMERICA, INC.

17 0 130 SET OF ADAPTERS

In conjunction with: 17 0 101, 17 0 102

Note: For connecting adapters from 17 0 000 to pump 17 0 101 and hose 17 0 102.

SI number: 01 07 02 (884)

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Order number: 17 0 130

Set of adapters

Consisting of:

1 = 17 0 131 Adapter

Note: For connecting pump 17 0 101 and hose 17 0 102 to adapter from 17 0 000

2 = 17 0 132 Hose with coupling connection

Note: For connecting pump 17 0 101 to adapter 17 0 007

3 = 17 0 133 Hose clamp

Note: For hose 17 0 132

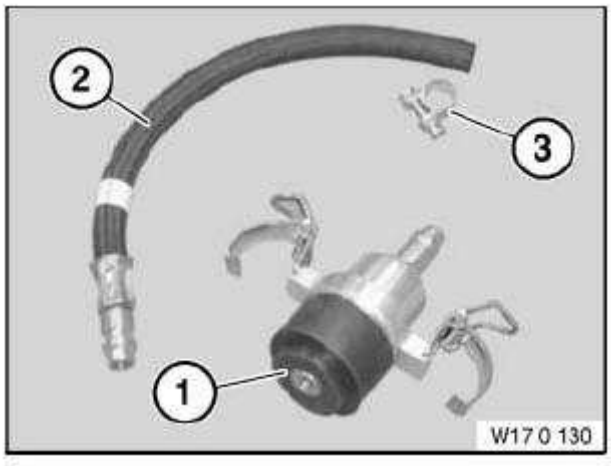


Fig. 4: Set Of Adapters (17 0 130)
Courtesy of BMW OF NORTH AMERICA, INC.

17 2 010 SET OF ADAPTERS

Note: For oil dispensers for flushing oil coolers of automatic transmissions

Transmission: A4S 310R, A5S 300J, A5S 310Z, A5S 325Z, A5S 360R, A5S 390G, A5S 440Z, A5S 560Z, GA6 HP19Z, GA6 HP26Z, GA6 HP32Z

SI number: 1 12 96(103)

Order number: 17 2 010

Set of adapters

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Consisting of:

1 = 17 2 011 Adapter

Note: For connecting oil cooler lines to oil dispensing unit - transmission: A5S 310Z, A5S 560Z, A5S 325Z

In conjunction with: 17 2 015, 17 2 016, 17 2 017, 17 2 018, 17 2 019

1 = 17 2 021 Retaining plate

Note: For Adapter 17 2 011 transmission: A5S 325Z

2 = 17 2 012 Adapter (2 x)

Note: For connecting oil cooler lines to oil dispensing unit - transmission: A4S 310R

In conjunction with: 17 2 015, 17 2 016, 17 2 017, 17 2 01, 17 2 018, 17 2 019

3 = 17 2 013 Banjo bolt (2 x)

Note: M18x1.5 thread with nut and seal for connecting oil cooler lines to oil dispensing unit-transmission: A5S 440Z

In conjunction with: 17 2 012, 17 2 015, 17 2 016, 17 2 017, 17 2 018, 17 2 019

4 = 17 2 014 Banjo bolt (2 x)

Note: M16x1.5 thread with nut, seal and threaded piece for connecting oil cooler lines to oil dispensing unit-transmission: A5S 300J

In conjunction with: 17 2 012, 17 2 015, 17 2 016, 17 2 017, 17 2 018, 17 2 019

5 = 17 2 015 Connecting piece

Note: For Tecalemit oil dispensing unit

6 = 17 2 016 Connecting piece

Note: For Horn oil dispensing unit

7 = 17 2 017 Coupling (2 x)

8 = 17 2 018 Hose, long

9 = 17 2 019 Hose, short

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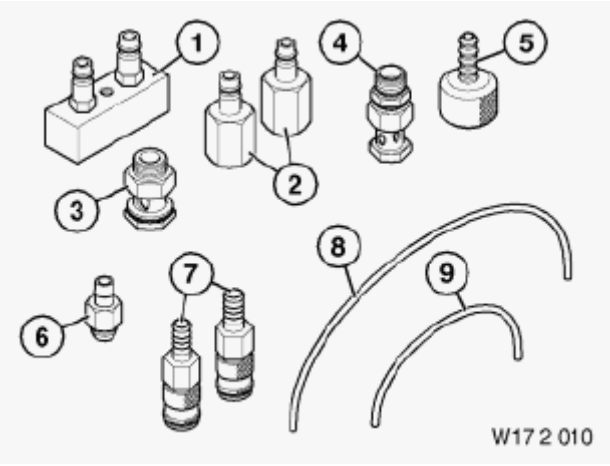


Fig. 5: Set Of Adapters (17 2 010)
Courtesy of BMW OF NORTH AMERICA, INC.

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ENGINE

Cooling System - Technical Data - X3

COOLING SYSTEM

Cooling System - Technical Data

Coolant Volume		
with integrated air conditioner MT	Litres	10.0
with integrated air conditioner AT	Litres	10.2
Test pressure for cooling system (gauge pressure)	bar	1.5

17 11 RADIATOR AND MOUNTING PARTS E65 / E70 / N62 / N62TU / N52 / N52K

Radiator and Mounting Parts - Technical Data

Cap for cooling system		
Pressure relief valve opens at overpressure to ambient pressure	pressure bar	2
Vacuum valve must open at latest at partial vacuum to ambient pressure	pressure bar	.1
Test pressure, coolant radiator (gauge pressure)	pressure bar	2

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ENGINE

Cooling System - Tightening Torques - X3

00 COOLANT, CHECKING COOLING SYSTEM

17 00 COOLANT

COOLANT - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hose clamps to coolant hoses 32 ... 48 mm dia.	All			2.5 Nm
2AZ Bleed screw (WAF 8) to thermostat housing	All, without E46			8 Nm
Plastic bleed screws to coolant lines	E46			2 -0.5/+ 1 Nm
3AZ Level switch (WAF 30) to coolant expansion tank	All			3 Nm
4AZ Bleed screw to water valve or auxiliary water pump	E90 / E91			3.5 Nm

11 ENGINE RADIATOR WITH ATTACHMENT

17 11 RADIATOR AND MOUNTING PARTS

RADIATOR AND MOUNTING PARTS TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Radiator to body				
self-tapping screw	All	B6.3		9 Nm
	All	M6		10 Nm
2AZ Drain plug to radiator	All			2.5 Nm
3AZ Temperature switch to radiator (91 °C / 99 °C) max.	All			15 Nm
4AZ Expansion tank to body	All			9 Nm
	M57TU / E65			4 Nm
5AZ Radiator on module carrier	E46			4 + 1 Nm
6AZ Retaining plate, expansion tank, to radiator	E46			4 + 1 Nm
7AZ Fan cowl on radiator	E46			4 + 1 Nm

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8AZ Plug in radiator (temperature switch omitted)	E36/7 / M54	M14 x 1.5		15 Nm
9AZ Mounting plate to radiator	M57TU / E65			4.5 Nm
10AZ Radiator bracket	All			2.5 Nm

21 OIL COOLER

17 21 ENGINE OIL COOLER

ENGINE OIL COOLER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Engine oil cooler to body	All			14 Nm
Oil cooler vapor extraction guide to trim panel	E36 / M3	B4.8		4 Nm

17 21 ENGINE OIL COOLER

ENGINE OIL COOLER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Transmission oil-water heat exchanger to front axle carrier	N52	M6x35		8 Nm
2AZ Engine oil cooler to holder	N52	M8x35		12 Nm
3AZ Engine oil cooler to holder	N52	Oval-head screw		3 Nm

22 OIL COOLER LINES

17 22 OIL COOLER PIPES

OIL COOLER PIPES - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
5AZ Cap nut on transmission oil cooler (on radiator) and on transmission	All	M18 x 1.5		20 Nm
	5HP30	M22 x 1.5		28 Nm
6AZ Oil lines on transmission				
Hollow bolt	All	M16 x 1.5		37 Nm
7AZ Oil lines on transmission oil cooler	A 5 S 300 J			28 Nm
Hollow bolt	All	M14 x 1.5		27 Nm
8AZ Screw-in fitting on transmission	All	M14 x 1.5 und M16 x 1.5		37 Nm

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9AZ Oil hose on oil pipe	E23			28 Nm
10AZ Oil pipe bracket on radiator	E23			2 Nm
11AZ Oil pipe bracket on body	E23			6.5 Nm
12AZ Oil cooler on transmission	5HP30			10 Nm
13AZ Transmission oil cooler line to transmission	N42	M8		21 Nm

17 22 OIL COOLER PIPES

OIL COOLER PIPES - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Transmission oil cooler line to transmission	N52K	M8x28		20 Nm
2AZ Transmission oil cooler line to oil sump	N52K	M6		10 Nm
3AZ Transmission oil cooler line to transmission sump	N52K	M6x35		8 Nm
4AZ Transmission oil cooler line to transmission oil-water heat exchanger	N52K	M6x35		8 Nm
5AZ Engine oil cooler lines to oil module/engine oil cooler	N52K	M8		20 Nm

40 AUXILIARY ELECTRICAL FAN

17 40 ADDITIONAL FAN (ELECTRIC)

ADDITIONAL FAN (ELECTRIC) TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Electric auxiliary fan on fan cowl	E46			6 Nm
2AZ Electronics for auxiliary fan on fan cowl	E46			6 Nm

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ENGINE

Engine - Operating Fluids

1.0 GENERAL INFORMATION

The specified engine oil is extremely important for the operation and service life of an engine.

Engine oil requirements will depend on the engine design, operating conditions, oil change intervals and, in the case of diesel engines, the fuel grade.

A modern engine oil provides more than just a lubrication function. The following qualities are required:

GOOD WEAR PROTECTION AND FRICTION REDUCTION

Frictional losses will lead to a reduction of engine power and efficiency. An approved engine oil will minimize frictional losses. Excessive wear will lead to a reduction in service life (e.g. wear of bearings, piston rings, cam lobes) or to mechanical failure.

LIMITED TENDENCY TO PRODUCE COMBUSTION RESIDUE

During engine operation, a limited amount of oil enters the combustion chamber, where it is burned. Combustion residues or deposits, which build up in the combustion chamber, lead to unwanted increases in compression and promote surface ignition ("pinging"). Any approved engine oil will help prevent such a condition.

FAVORABLE VISCOSITY TEMPERATURE BEHAVIOR

Viscosity is the tendency of oil to resist flowing. Engine oil, when cold, should be thin enough so that the engine can be cranked over. Hot oil should be thick enough to maintain proper lubrication.

ANTI-FOAMING

The oil is forcefully mixed with air during engine operation. Heavy foaming will lead to impaired lubrication and reduction in oil flow rate. To prevent foaming, antifoaming additives are mixed with the oil.

GOOD CORROSION INHIBITION

The engine oil must prevent corrosion on engine components under all circumstances. Corrosion and rust inhibitors are added to displace water and acids from metal surfaces so that oil coats them.

MIXING ABILITY/COMPATIBILITY

It must be possible to mix all engine oils with each other, even synthetic with mineral oils, without causing any incompatibility problems. A further requirement is the compatibility with all materials contacted by oil, in particular oil seals, hoses and paint.

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GOOD THERMAL CONDUCTIVITY/GOOD COOLING PROPERTY

Engine oil makes an important contribution to the cooling of an engine. It must transfer heat from friction surfaces, and combustion heat away from affected areas. The oil absorbed heat is carried back to the oil pan where it is transferred to the surrounding air.

GOOD DISPERSANT/DETERGENT QUALITIES

To limit or slow down the formation of combustion deposits and acidic components, together with abrasive particles and dirt from the intake air, good engine oils contain a detergent additive. Deposits of carbon and dirt are loosened and suspended in the oil, being drained away at the next oil change.

OXIDATION INHIBITORS AND AGING STABILITY

Oxidation can be described as the oxygen absorption of hydrocarbons formed in the oil. The results of oxidation have a negative impact on viscosity causing corrosion on certain metals and the formation of sludge. Inhibitors are added to prevent oxidation from occurring. A good engine oil must maintain its stability during the required oil change intervals.

Good Lubricating Oil Must:

1. Lubricate moving parts to minimize wear.
2. Lubricate moving parts to minimize loss from friction.
3. Remove heat from engine parts by acting as a cooling agent.
4. Absorb shocks between bearings and other engine parts, reducing engine noise and extending engine life.
5. Form a good seal between piston rings and cylinder walls.
6. Act as a cleaning agent.

2.0 GRADING OF OILS

VISCOSITY NUMBER

A method of classifying an oil by number, based on its resistance to flow at a high temperature.

These numbers are usually prefixed by SAE which is the abbreviation for the Society of Automotive Engineers. A lower SAE Number (i.e. SAE 5W) indicates a thinner oil with a higher flow rate, for use at lower temperatures. A higher SAE Number (i.e. SAE 30) indicates a thicker oil with a slower flow rate, for use at higher temperatures.

MULTIGRADE OILS

A multigrade, or multiviscosity oil has the qualities of a lower number oil at low temperatures and those of a higher number oil at high temperatures. Multigrade oils have numbers such as SAE 5W-30 and SAE 10W-40. For reliable engine performance in all temperature ranges mineral based engine oil viscosity must be matched to the temperature range at which the vehicle will be operated.

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SINGLE GRADE OILS

A single grade viscosity oil has a limited temperature/viscosity range compared with multigrade oils. Due to the limited temperature/viscosity range of these oils they are no longer used in BMW engines and thus no longer listed in the BMW Engine Oil Temperature/Viscosity Table.

OIL CLASSIFICATIONS

A method of classifying oil was jointly developed by the SAE, API (American Petroleum Institute), and ASTM (American Society for Testing and Materials). Engine oils are rated according to two engine use categories:

C = Compression Ignition (i.e. CC)

Compression Ignition (C) oils are those that are used for diesel engines. The current service ratings for diesel-engine lubricating oils are: CA, CB, CC, CD, CE, CF and CG. The oils differ in their properties and in the additives they contain.

S = Spark Ignition (i.e. SE)

Spark Ignition (S) oils are those that are used for gasoline engines. The current service ratings for gasoline-engine lubricating oils are: SA, SB, SC, SD, SE, SF, SG, SH and SJ. These oils differ in their properties and in the additives they contain.

Another method of classifying minimum performance standards for gasoline-fueled engine oils has been developed through ILSAC (International Lubrication Standardization Approval Committee). Oils that meet ILSAC GF-1 performance standards must have a "starburst" certification mark displayed on the print of the oil product packaging.

3.0 ENGINE OIL REQUIREMENTS AND SPECIFICATIONS

APPROVED ENGINE OILS

- For BMW gasoline engines with two valves per cylinder, all reputable multiple grade engine oils* which meet or exceed the API classification of SH. (Combination with diesel oil specifications CD or CE quality classifications are also permitted, e.g. SH/CE etc.)

  For BMW gasoline engines with four valves per cylinder, only reputable multiple grade engine oils* which meet or exceed the API classification of SH. (Combination with diesel oil specifications CD or CE quality classifications are also permitted, e.g. SH/CE etc.)

- For BMW turbocharged diesel engines, all reputable multiple grade engine oils* which meet or exceed the API classification CD/CE.

*Engine oil may be mineral or synthetic based.

Special Oils category has been replaced by BMW **High Performance Synthetic** Engine Oil (5W-30). It eliminates the need for seasonal oil changes since it covers all ambient temperature ranges.

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BMW of North America has introduced a line of exclusively formulated High Performance Engine Oils which exceed existing international quality specifications (SAE/CCMC) for motor oils. BMW part numbers are:

ENGINE OIL REQUIREMENTS AND SPECIFICATIONS

SAE 5W-30 (SJ/CF) BMW High Performance Synthetic Oil	1 quart	Part No. 07 51 0 017 866
SAE 15W-40 (SJ/CF) BMW High Performance Mineral Oil	1 quart	Part No. 07 51 0 017 868

Motorsport Engines

E46 M3 / S54E36 M roadster, M coupe / S54 from start of production

E39 M5 / S62 Up to 3/2000

E52 Z8 / S62 Up to 3/2000

E60 M5 / S85 From start of production

E63 M6 From start of production

E64 M6 From start of production

E85 Z4 M Coupe / Z4 M Roadster From start of production

BMW High Performance Synthetic Oil Castrol RS SAE 10W-60 also called Castrol TWS Motorsport SAE 10W-60 Synthetic Oil Part No. 07 51 0 009 420 (1quart)

E39 M5 / S62 From 3/2000

E52 Z8 / S62 From 3/2000

BMW High Performance Synthetic Oil SAE 5W-30 Part No. 07 51 0 017 866 Or BMW High Performance Synthetic Oil Castrol RS SAE 10W-60 also called Castrol TWS Motorsport SAE 10W-60 Synthetic Oil Part No. 07 51 0 009 420 (1quart)

BMW High Performance Synthetic Oil 5W-30 and 10W-60 offer several benefits over conventional mineral based oils.

SUPERIOR THERMAL STABILITY

The synthetic based oil resists thickening at very low ambient temperatures providing improved flow, lubrication and less internal engine resistance during cold starts.

Under high heat conditions, the oil resists thermal breakdown/shearing which causes a loss of lubrication quality compared with conventional oils.

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SUPERIOR LUBRICATION THROUGHOUT THE LIFE OF THE OIL

Compared to conventional engine oils, BMW High Performance Synthetic Oil is better able to keep engine combustion contaminants in suspension and is less susceptible to the harmful effects of oxidation.

The oil resists sludge buildup thus allowing extended oil change intervals. Synthetic based oils also have a lower volatility which makes them less susceptible to evaporation thereby reducing oil consumption.

This oil has been durability tested on BMW engines and supplies superior lubrication under all operating conditions and over the extended BMW oil change intervals.

4.0 ENGINE OIL CHANGE INTERVALS

With the introduction of the 1999 Model Year vehicles BMW has introduced an extended oil change interval of approximately 15,000 miles (depending on engine operating conditions) on most models.

To coincide with the increased oil change interval, BMW has also introduced "BMW High Performance Synthetic Oil" which must be used on all 1999 Model Year vehicles (except E36 318ti, 323is/iC, 328is/iC, M3, M Roadster and M Coupe models) whenever a service is necessary to avoid engine damage.

NOTE: Only if it is necessary to top up the engine oil between oil changes is it permissible to use synthetic low viscosity engine oils which conform to the API classification SJ or higher.

A label in the engine compartment states the oil specifications and refers to the BMW website (www.bmwusa.com) and toll free number (1-800-831-1117) for additional information.



Fig. 1: Identifying Label In Engine Compartment States
Courtesy of BMW OF NORTH AMERICA, INC.

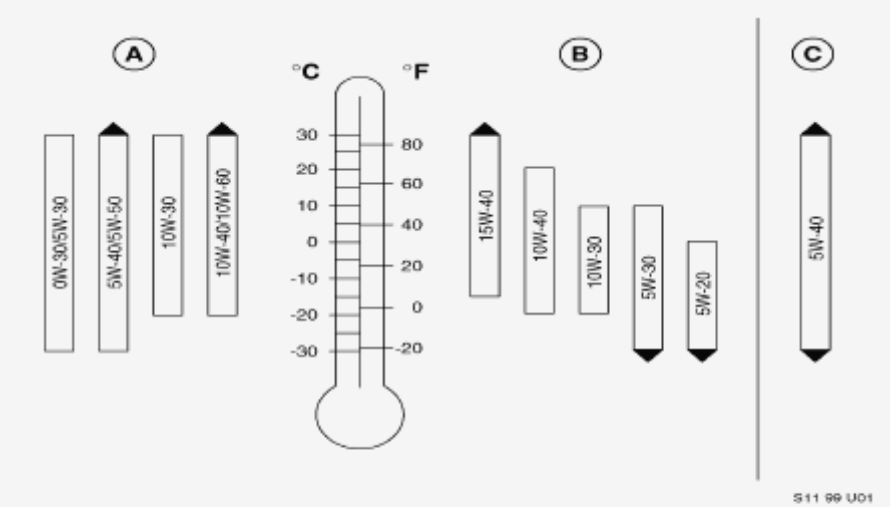
BMW High Performance Synthetic Engine Oil may also be used on Model Year 1999 E36 (3-Series and M models) as well has Model Year 1998 and earlier BMW models.

The oil change intervals should not be extended due to the greater durability of a fully synthetic engine oil. The engine oil and filter should always be changed as per the vehicle's Service Interval Indicator when the "Oil Service" or the "Inspection" display appears regardless of the type of oil being used.

BMW mineral-based High Performance engine oil is also offered for model year 1998 and earlier BMW

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models. However, for reliable engine performance in all temperature ranges mineral-based engine oil viscosity must be matched to the temperature range at which the vehicle will be operated. See Engine Oil Temperature/Viscosity Table below.



A/B: Brand name oils approved per API or ACEA (CCMC)

A = Diesel engines

B = Spark-ignition engines

C: BMW High Performance Synthetic Oil

C = Valid for spark-ignition and diesel engines

Fig. 2: Identifying BMW Engine Oil Temperature/Viscosity Table
Courtesy of BMW OF NORTH AMERICA, INC.

Other Oil Changes For Cars Without Service Indicator:

MODEL YEAR/MILLAGE REFERENCE

Model Year(s)	Mileage
1980 and later	7,500
1975 thru 1979	6,500
1974 or earlier	4,000

Including oil filter. However, at least twice annually, preferably before and after the winter season.

Under severe driving conditions it is recommended to increase the number of oil services.

5.0 CONDITION BASED SERVICE

Models: E90, 91, 92, E60, E61, E63, E64 E65, E66

Condition Based Service measures, monitors, and determines the required maintenance of several service items independent from each other. This technology prompts the customer to bring the vehicle for service whenever one of the CBS items requires maintenance or replacement. CBS strikes a compromise between too frequent

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maintenance and too rigid service intervals that call for the replacement of service items which may still have substantial remaining useful life. CBS also details the recommended, due, and overdue required maintenance during and after the BMW Vehicle Maintenance Program Agreement. Thus, CBS allows BMW customers to experience a technology that makes service more convenient, transparent and structured.

6.0 ENGINE OIL ADDITIVES

The use of engine oil additives is not recommended and not necessary on BMW engines. Instead, it is mandatory to use BMW High Performance Synthetic Oil in 1999 model year and later BMW models and recommended to use either BMW High Performance Synthetic Oil, BMW High Performance Mineral Oil or one of today's highly advanced brand name lubricating oils conforming to API classification SH or higher in 1998 and earlier BMW models.

7.0 BREAK-IN INSTRUCTIONS

During the break-in period of a new engine or parts of a reconditioned engine (new bearings, crankshaft, pistons, etc.) BMW engines do not require special break-in oils.

All of the multiple grade engine oils can be used, as long as they conform with BMW specifications.

8.0 N52, N52KP AND N54 FRONT AND REAR RADIAL SEAL SEALANT

When replacing the front or rear radial crankshaft seals on new generation 6 cylinder engines, a special Loctite® sealant must be applied to fill the seal grooves at the bedplate seam. Follow the appropriate repair instruction in TIS:

RA 11 14 005 - Front radial crankshaft seal replacement

RA 11 14 151 - Replacing crankshaft radial seal (rear)

All special tools required to perform these repairs have been sent out through the automatic tool shipment program and are listed in S.I. Bulletin 04 01 06.

Required Materials:

P/N 83 19 7 536 051 - Loctite® 128357 sealant compound\

P/N 83 19 7 515 683 - Loctite® 171000 primer

P/N 83 19 7 515 684 - Stamp

10.0 LUBRICANT FOR OXYGEN SENSOR

Apply Bostik NEVER-SEEZ® (Part No. NSBT-16) to threads of oxygen sensor.

11.0 OIL CONSUMPTION

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All engines normally consume a certain amount of oil. This is necessary in order to properly lubricate the cylinder walls, pistons, piston rings etc. In addition, engines with less than 6,000 miles will generally consume additional oil because the components are not fully seated. Therefore, oil consumption complaints received prior to 6,000 miles cannot be considered.

Once a new or rebuilt engine has accumulated 6,000 miles this procedure should be used if there is a drastic change in the oil consumption rate (i.e. the oil consumption rate triples) under similar driving conditions or if the oil consumption rate exceeds 1 qt. per 750 miles at any time..

All Motorsport Engines:

Due to their increased output and maximum engine speeds, these engines are allowed a maximum consumption of 2.5 quarts per 1,000 miles.

13.0 OPERATING FLUIDS TABLE AND ALTERNATE SUPPLIERS

OPERATING FLUIDS TABLE AND ALTERNATE SUPPLIERS

BMW Part Number	Description / Application	3M	Wurth	Loctite	CRC
11 12 1 262 571(1)	**Silicone Sealant**	8661		80050/PX66BR	
81 12 9 400 086(1)	**Hylogrip/Loctite 270 Thread Sealant** Secures and seals bolts, studs, nuts, threaded inserts, screw plugs against impact and vibration. Fastens ball, roller and sliding bearings onto shafts or in housings, with play up to 0.25mm. Quick setting.		8932700	21438	
	Oil filter flange bolt				
	-				
81 22 9 400 243(1)	**Sealer** Low viscosity, non-hardening, removeable. For sealing off against mineral oils, grease, gases, air and many chemicals. Application: from-40°C to approx. 200°			Permatex 3D Aviation Form a Gasket 80017	

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	C. Tacking cylinder gasket -					
81 22 9 400 339	**Hylomar SQ32M Sealant** Universal sealing compound, applicable by brush. For sealing interfaces between surfaces that require excellent temperature resistance and sealing elasticity. Material: Polyester-urethane mixture.					
81 22 9 407 394(1)	**Loctite 380 Epoxy Cement** Black cyanacrylate adhesive for joining metals, rubber, PVC.	8155	8934103	38050		
81 22 9 400 794(1)	**Copper Paste** Multi-purpose grease for all detachable joints at high temperatures and corrosive conditions, also after long operating periods. Able to withstand high pressures, protection against undesired weld contact, seizure and corrosion, active adhesion properties, effective as lubricant and separator up to 1100°C. Applications: parts subject to high temperatures, such as bolts and flanges on exhaust system, engine, disk brakes, etc.	8945				3046010

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81 22 9 407 439(1)	07 58 9 062 376(1)	**Silicone Sealer** A black colored silicone-based sealant for large areas. Resists temperatures up to 250°C. For engine or gearbox; particularly suitable for sealing the timing case on M70 engine, and eliminating oil seepage from E36 M42 cylinder head.	8670 8661	81157/PX16B 80050/PX66BR	
81 22 9 407 760(1)	Engine Cleaner Spray Fast acting cleaner for dirty engines and engine parts. Does not attack painted, rubber, or plastic parts.	8899	890923	80043	14045
N/A	**Lubro Moly Lecksucher** Intake and vacuum system leak detector.				
N/A	**J-B Weld** Repairs pitting in cylinder head sealing surfaces.				
N/A	**Bostik Never-Seez** Thread lubricant for oxygen sensors.				

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

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ENGINE

Engine - SI Techniques - X3, X5 (6-Cyl.)

11 ENGINE

VS-42 je

Bauruppe/Group: 11

welweit

Datum/Date: 02/2005

11 02 05 (130)

VACUUM SUPPLY

All models



Fig. 1: Vacuum Supply System
Courtesy of BMW OF NORTH AMERICA, INC.

INTRODUCTION

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Vacuum is principally used for the brake booster.

The vacuum in the inlet pipe depends on the varying engine load.

Diesel engines do not normally have any vacuum in the inlet pipe. Vacuum on diesel engines is provided by a pump that generates the required vacuum.

On spark-ignition engines with Valvetronic, the throttle valve is almost always open when driving. This means that there is a lower low air pressure in the intake manifold.

Spark-ignition engines with low vacuum in the inlet pipe also have a pump that generates additional vacuum.

BRIEF DESCRIPTION OF COMPONENTS

The following components are involved in the vacuum supply system:

- **Mechanical vacuum pump**

  A mechanic vacuum pump is fitted to diesel engines and spark-ignition engines with Valvetronic.

  The vacuum pump is mechanically driven by the engine, e.g. via the exhaust camshaft.

- **Suction-jet pump**

  As a rule, the suction-jet pump boosts the vacuum in the inlet pipe.

- **Electric vacuum pump**

On some engines, an electric vacuum pump is fitted for additional vacuum supply.

In certain temporary operating situations, the vacuum in the inlet pipe may be too low. In such cases, the inlet pipe vacuum cannot be adequately boosted by the suction-jet pump. In these situations, the electric vacuum pump ensures that sufficient vacuum is available.

Reason: After a cold start, an operating situation occurs in which there is very little inlet pipe vacuum due to the higher load. The electric vacuum pump is actuated for a certain time. This ensures that the brake is sufficiently boosted when maneuvering.

After a cold start, the DME will actuate the electric vacuum pump **once only** for max. 60 seconds.

The electric vacuum pump is actuated in the following situations:

- Engine-running signal from DME
- Coolant temperature below 60 °C

The electric vacuum pump is a vane-cell pump.

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- **Throttle valve**

  The throttle valve changes the cross-sectional area of the inlet pipe. This creates an inlet pipe vacuum behind the throttle valve, especially in overrun mode.

- **DME or DDE: Digital engine electronics or digital diesel electronics**

  The DME or DDE actuates the components needed for system functions (e.g. solenoid valves, electric switching valves, electropneumatic pressure converters).

SYSTEM FUNCTIONS

The system functions of the vacuum system are described using the following examples:

- Power assist for brakes
- Actuation of exhaust flaps
- Adjustment of variable turbine geometry
- Actuation of controlled damping mounts
- Exhaust gas recirculation
- Drawing off of blow-by gases from crankcase
- Blowing out activated charcoal filter

Power assist for brakes

The brake booster amplifies the force excerpted at the brake pedal. To do this, the brake booster stores part of the vacuum generated by the engine. The vacuum then amplifies the force generated by pressure on the brake pedal.

Actuation of exhaust flap

A controlled electropneumatic exhaust flap is fitted in the exhaust system. The exhaust flap enhances active sound-damping. The exhaust flap is closed by vacuum.

Adjustment of variable turbine geometry

The variable turbine geometry controls the boost pressure via adjustable guide vanes. The guide vanes are actuated by vacuum.

Actuation of controlled damping mounts

In the basic setting, there is no vacuum at the control component od the mount. The bypass in the mount is closed. Hydraulic fluid flows back and forth through a ring channel between the upper and lower chambers in the mount. The mount acts like a conventional hydraulic bearing. The mount has hard damping. If a vacuum is applied to the mount's control component, the bypass will open. The hydraulic fluid then flows back and forth between the chambers through a larger cross-sectional area. The mount has softer damping.

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Exhaust gas recirculation

With exhaust gas recirculation, part of the exhaust gas is take from behind the exhaust manifold. This is then fed back into the engine through the intake air duct. The exhaust gas recirculation pipe is located at the inlet to the intake manifold.

If a vacuum is applied to the exhaust gas recirculation valve, the exhaust gas recirculation pipe will open. The level of vacuum is determined by the opening in the exhaust gas recirculation valve.

Exhaust gases flow through a connecting pipe to the exhaust manifold and into the intake manifold.

Drawing off of blow-by gases from crankcase

The crankcase ventilation system uses vacuum to bleed the blow-by gases out of the engine block. Blow-by gases are the small portion of the cylinder fill that passes by the piston rings and into the crankcase during compression. If the blow-by gases are not bled from the engine block through the crankcase ventilation system, they will accumulate in the crankcase. The blow-by gases would then apply pressure on the pistons from below. This would have a negative effect on the downward movement of the pistons in the intake stroke and operating stroke.

Blowing out activated charcoal filter

The fuel tank vent hose is connected to an activated charcoal filter. Vapors from the fuel tank are collected in the activated charcoal filter. The activated charcoal filter is connected to the intake manifold by a pipe. A fuel evaporation control valve is fitted in this pipe. When the fuel evaporation control valve is opened, the vacuum in the manifold draws in fresh air. At the same time, the fresh air blows out the fuel vapors collected in the activated charcoal filter.

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ENGINE

Engine - Special Tools - X3

11 ENGINE

11 0 240 COUPLING

In conjunction with: 11 0 222, 11 0 226, 11 0 227, 11 0 225

Note: For adapting test probes to pressure gauge 11 0 162

Engine: All models

Order number: 11 0 240

Coupling

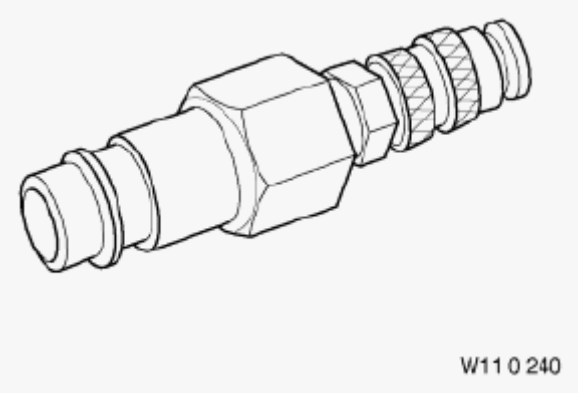


Fig. 1: Coupling (11 00 240)
Courtesy of BMW OF NORTH AMERICA, INC.

11 0 250 ENGINE SUPPORT

Minimum set: Mechanical tools

Note: For preventing inclination of engine (removing transmission, removing and installing engine mounts, etc.).

Series: E83

Storage location: C47, C48

SI number: 1 24 03 (040)

Order number: 11 0 250

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Engine support

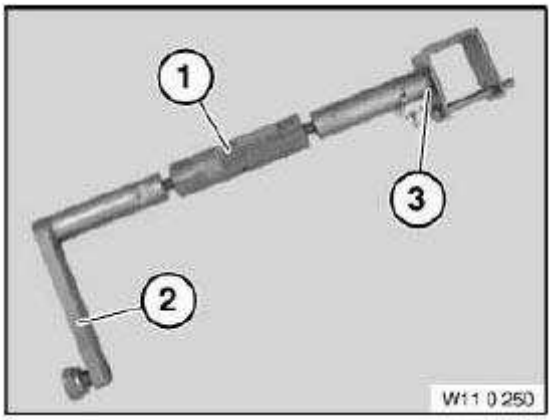


Fig. 2: Engine Support (11 0 250)
Courtesy of BMW OF NORTH AMERICA, INC.

11 4 190 1-4" EXTENSION PIECE

Minimum set: Mechanical tools

In conjunction with: 11 3 390, 00 2 050

Note: M73 For removing and installing pedal travel sensor M60 Pretensioning timing chain E53 Mounting airbag control unit

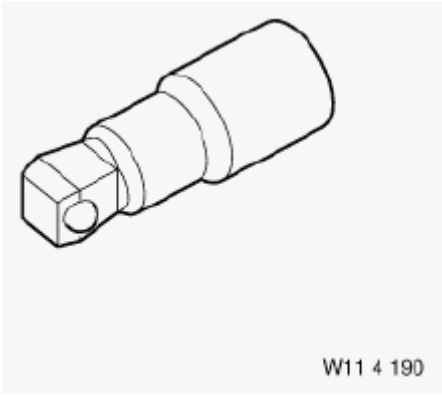
Series: All models

Storage location: B6

SI number: 1 06 94(801)

Order number: 11 4 190

1/4" extension piece



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Fig. 3: Extension Piece (11 4 190 1-4")
Courtesy of BMW OF NORTH AMERICA, INC.

11 5 461 INSTALLATION HOLDER

Order number: 11 5 461

Installation holder

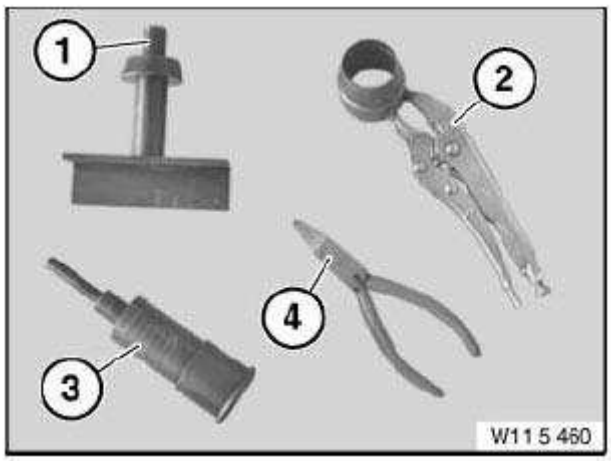


Fig. 4: Installation Holder (11 5 461)
Courtesy of BMW OF NORTH AMERICA, INC.

11 5 462 INSTALLATION PLIERS

Order number: 11 5 462

Installation pliers

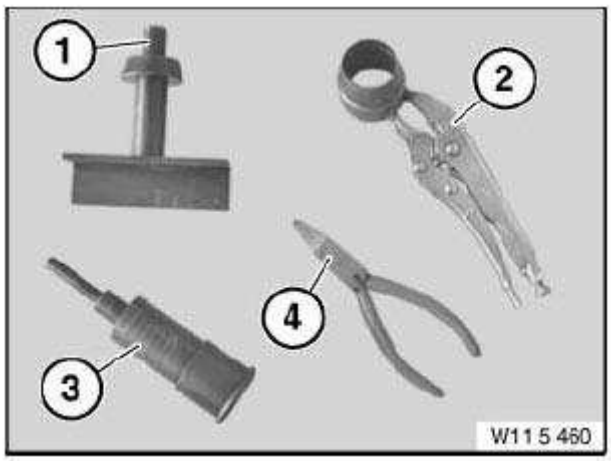


Fig. 5: Installation Holder (11 5 461)
Courtesy of BMW OF NORTH AMERICA, INC.

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11 5 463 INSTALLATION DRIFT

Order number: 11 5 463

Installation drift

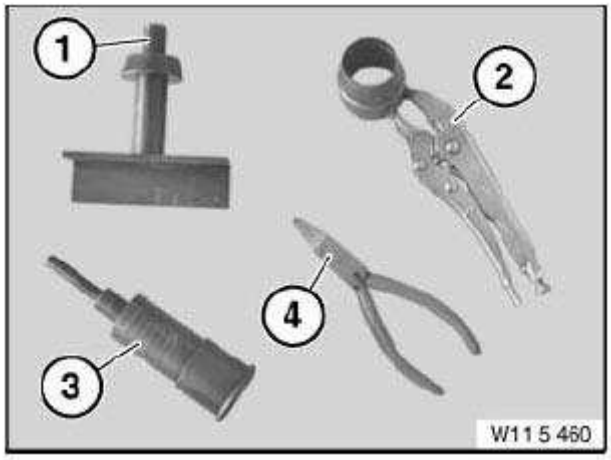


Fig. 6: Installation Holder (11 5 461)
Courtesy of BMW OF NORTH AMERICA, INC.

11 5 464 REMOVAL PLIERS

Order number: 11 5 464

Removal pliers

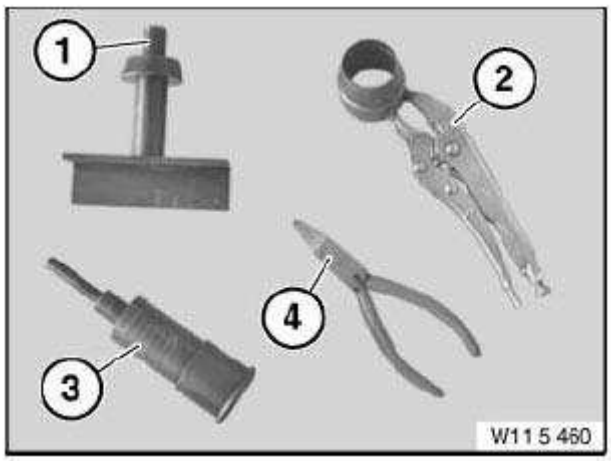


Fig. 7: Installation Holder (11 5 461)
Courtesy of BMW OF NORTH AMERICA, INC.

11 9 811 HOLDER

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Order number: 11 9 811

Holder

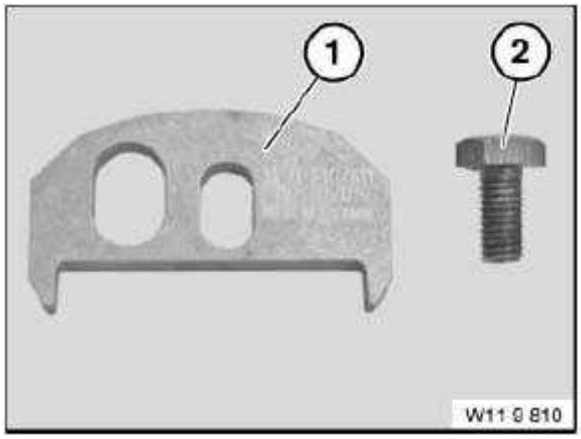


Fig. 8: Holder (11 9 811)
Courtesy of BMW OF NORTH AMERICA, INC.

11 9 812 SCREW

Order number: 11 9 812

Screw

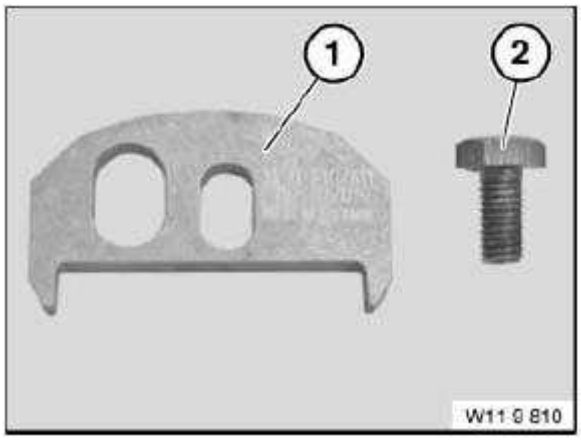


Fig. 9: Holder (11 9 811)
Courtesy of BMW OF NORTH AMERICA, INC.

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ENGINE

Engine - Technical Data - X3

00 ENGINE, GENERAL

11 00 ENGINE IN GENERAL N52K B25

TECHNICAL DATA - ENGINE GENERAL N52K B25

Cylinder		6
Bore O	mm	82
Stroke	mm	79
Effective displacement	cm^3	2497
Compression ratio	:1	11
Max. permissible engine speed	rpm	6500±50
Permissible constant speed	rpm	6300
Compression pressure: Minimum and maximum values depending on position of Valvetronic.		9 ... 18
Compression pressure: Maximum deviation of all cylinders to each other.	bar	2

11 00 ENGINE IN GENERAL N52K B30

TECHNICAL DATA - ENGINE GENERAL N52K B30

Cylinder		6
Bore O	mm	85
Stroke	mm	88
Effective displacement	cm^3	2996
Compression ratio	:1	10.7
Max. permissible engine speed	rpm	6550±50
Permissible constant speed	rpm	6300
Compression pressure: Minimum and maximum values depending on position of Valvetronic.		9 ... 18
Compression pressure: Maximum deviation of all cylinders to each other.	bar	2

11 00 ENGINE IN GENERAL N52K B30

TECHNICAL DATA - ENGINE GENERAL N52K B30

Cylinder		6
Bore O	mm	85
Stroke	mm	88
Effective displacement	cm^3	2996

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Compression ratio	:1	10.7
Max. permissible engine speed	rpm	6550±50
Permissible constant speed	rpm	6300
Compression pressure: Minimum and maximum values depending on position of Valvetronic.		9...18
Compression pressure: Maximum deviation of all cylinders to each other.	bar	2

11 ENGINE BLOCK

11 11 ENGINE BLOCK, CYLINDER CRANKCASE N52K B25

TECHNICAL DATA - ENGINE BLOCK, CYLINDER CRANKCASE N52K B25

Bore Z stage 0 (1)	mm	$82.000^{+0.014}$
Bore Z stage 00 (1)	mm	
Bore Z stage 1 (1)	mm	$82.250^{+0.014}$
Permitted out-of-round of cylinder bore (1)	mm	0.005
Permitted conicity of cylinder bore (1)	mm	0.010
Permissible total wear tolerance between piston and cylinder (engine operated)	mm	0.150
(1) new status or recondition		

11 11 ENGINE BLOCK, CYLINDER CRANKCASE N52K B30

TECHNICAL DATA - ENGINE BLOCK, CYLINDER CRANKCASE N52K B30

Bore Z stage 0 (1)	mm	$85.000^{+0.014}$
Bore Z stage 00 (1)	mm	
Bore Z stage 1 (1)	mm	$85.250^{+0.014}$
Permitted out-of-round of cylinder bore (1)	mm	0.005
Permitted conicity of cylinder bore (1)	mm	0.010
Permissible total wear tolerance between piston and cylinder (engine operated)	mm	0.150
(1) new status or recondition		

12 CYLINDER HEAD WITH COVER

11 12 CYLINDER HEAD WITH COVER N52K B25

TECHNICAL DATA - CYLINDER HEAD WITH COVER N52K B25

Cylinder head height: Original dimension	mm	112.000 ± 0.050
Machining limit	mm	111.700 ± 0.050
Valve guides are not available as replacement parts.		

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Inside diameter of installed valve guide		
Original inlet valve	mm	$5.000^{+0.012}$
Original exhaust valve	mm	$6.000^{+0.012}$
Tilt clearance, maximum (wear between valve and valve guide)	mm	0.500

11 12 CYLINDER HEAD WITH COVER N52K B30

TECHNICAL DATA - CYLINDER HEAD WITH COVER N52K B30

Cylinder head height: Original dimension	mm	112.000 ± 0.050
Machining limit	mm	111.700 ± 0.050
Valve guides are not available as replacement parts.		
Inside diameter of installed valve guide		
Original inlet valve	mm	$5.000^{+0.012}$
Original exhaust valve	mm	$6.000^{+0.012}$
Tilt clearance, maximum (wear between valve and valve guide)	mm	0.500

11 12 CYLINDER HEAD WITH VALVE SEAT COVER N52K B25

TECHNICAL DATA - CYLINDER HEAD WITH VALVE SEAT COVER N52K B25

Valve seat angle	°	45
Correction angle: outer	°	15
Correction angle: inner	°	60
Valve seat width: Inlet	mm	$1.0^{+0.1}$
Valve seat width: Exhaust	mm	$1.2^{+0.1}$
Z Valve seat		
Valve seat surface: Outside dia. inlet	mm	$27.7^{+0.1}$
Valve seat surface: Outside dia. exhaust	mm	$26.6^{+0.1}$

11 12 CYLINDER HEAD WITH VALVE SEAT COVER N52K B30

TECHNICAL DATA - CYLINDER HEAD WITH VALVE SEAT COVER N52K B30

Valve seat angle	°	45
Correction angle: outer	°	15
Correction angle: inner	°	60
Valve seat width: Inlet	mm	$1.0^{+0.1}$
Valve seat width: Exhaust	mm	$1.2^{+0.1}$
Z Valve seat		
Valve seat surface: Outside dia. inlet	mm	$27.7^{+0.1}$

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Valve seat surface: Outside dia. exhaust	mm	$26.6^{+0.1}$

21 CRANKSHAFT WITH BEARING

11 21 CRANKSHAFT AND BEARINGS N52K B25

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B25

Ground sizes of main bearing journals		main bearing journal
Original (designation S1)	mm	55.998 ... 55.993
Original (designation S2)	mm	55.992 ... 55.987
Original (designation S3)	mm	55.986 ... 55.981
Crankshaft bearing clearance, radial	mm	0.020 ... 0.046
Max. permitted runout at center crankshaft journal	mm	0.150

11 21 CRANKSHAFT AND BEARINGS N52K B25

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B25

Grinding stages, crankshaft guide bearing		
Standard	mm	24.0 F8
Crankshaft axial play	mm	0.060 ... 0.250

11 21 CRANKSHAFT AND BEARINGS N52K B25

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B25

Ground sizes of conrod bearing journals		
Standard	mm	$50.000\ ^{-0.007}_{-0.027}$
Radial conrod bearing play	mm	0.025 ... 0.070

11 21 CRANKSHAFT AND BEARINGS N52K B25

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B25

Ground sizes of main bearing journals		main bearing journal
Original (designation S1)	mm	55.998...55.993
Original (designation S2)	mm	55.992...55.987
Original (designation S3)	mm	55.986...55.981
Grinding stage 1 (designation B1)	mm	55.748...55.742
Grinding stage 1 (designation B2)	mm	55.742...55.737
Grinding stage 1 (designation B3)	mm	55.737...55.731
Grinding stage 2 (designation C1)	mm	55.498...55.492
Grinding stage 2 (designation C2)	mm	55.492...55.487
Grinding stage 2 (designation C3)	mm	55.487...55.481
Crankshaft bearing clearance, radial	mm	0.020...0.046

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Max. permitted runout at center crankshaft journal	mm	0.150

11 21 CRANKSHAFT AND BEARINGS N52K B30

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B30

Ground sizes of main bearing journals		Guide bearing journal
Original (designation S1)	mm	64.998 ... 64.993
Original (designation S2)	mm	64.992 ... 64.987
Original (designation S3)	mm	64.986 ... 64.981
Crankshaft bearing clearance, radial	mm	0.020 ... 0.046
Max. permitted runout at center crankshaft journal	mm	0.150

11 21 CRANKSHAFT AND BEARINGS N52K B30

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B30

Grinding stages, crankshaft guide bearing		
Standard	mm	24.0 F8
Crankshaft axial play	mm	0.060 ... 0.250

11 21 CRANKSHAFT AND BEARINGS N52K B30

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B30

Ground sizes of conrod bearing journals		
Standard	mm	$50.000\ ^{-0.007}_{-0.027}$
Radial conrod bearing play	mm	0.025 ... 0.070

11 21 CRANKSHAFT AND BEARINGS N52K B30

TECHNICAL DATA - CRANKSHAFT AND BEARINGS N52K B30

Ground sizes of main bearing journals		Guide bearing journal
Original (designation S1)	mm	64.998...64.993
Original (designation S2)	mm	64.992...64.987
Original (designation S3)	mm	64.986...64.981
Grinding stage 1 (designation B1)	mm	64.748...64.742
Grinding stage 1 (designation B2)	mm	64.742...64.737
Grinding stage 1 (designation B3)	mm	64.737...64.731
Grinding stage 2 (designation C1)	mm	64.498...64.492
Grinding stage 2 (designation C2)	mm	64.492...64.487
Grinding stage 2 (designation C3)	mm	64.487...64.481
Crankshaft bearing clearance, radial	mm	0.020...0.046
Max. permitted runout at center crankshaft journal	mm	0.150

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23 VIBRATION DAMPER

11 23 VIBRATION DAMPER N52K B25

TECHNICAL DATA - VIBRATION DAMPER N52K B25

Max. permitted radial runout	mm	0.100
Max. permitted axial runout	mm	0.100

11 23 VIBRATION DAMPER N52K B30

TECHNICAL DATA - VIBRATION DAMPER N52K B30

Max. permitted radial runout	mm	0.100
Max. permitted axial runout	mm	0.100

24 CONNECTING ROD WITH BEARING

11 24 CONNECTING RODS AND BEARINGS N52K B25

TECHNICAL DATA - CONNECTING RODS AND BEARINGS N52K B25

Z Large connecting rod eye (without bearing)	mm	53.600 $^{+0.016}$
Conrod bushing: Inside diameter	mm	20.000 $^{+0.013}$ $_{+0.004}$
Permissible total deviation of connecting rods in one engine (without bearing shells)	g	± 5

11 24 CONNECTING RODS AND BEARINGS N52K B30

TECHNICAL DATA - CONNECTING RODS AND BEARINGS N52K B30

Z Large connecting rod eye (without bearing)	mm	53.600 $^{+0.016}$
Conrod bushing: Inside diameter	mm	20.000 $^{+0.013}$ $_{+0.004}$
Permissible total deviation of connecting rods in one engine (without bearing shells)	g	± 5

25 PISTON WITH RINGS AND PIN

11 25 PISTONS WITH RINGS AND PINS N52K B25

TECHNICAL DATA - PISTONS WITH RINGS AND PINS N52K B25

Piston and pin are paired to each other - replace together only.		
Measuring point "A" (position)	mm	10
Piston diameter at measuring point "A"		

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Original (new dimension)	mm	$81.985^{\pm 0.014}$
Repair stage (new dimension)	mm	%
Oversize (new dimension)	mm	$82.235^{\pm 0.014}$
Piston installation clearance (piston new)	mm	0.000...0.043
Piston installation clearance (piston worn)	mm	0.020...0.047
Permissible total wear tolerance between piston and cylinder (engine operated)	mm	0.150

11 25 PISTONS WITH RINGS AND PINS N52K B25

TECHNICAL DATA - PISTONS WITH RINGS AND PINS N52K B25

1st groove		
End clearance	mm	0.180 ... 0.330
Axial play	mm	0.020 ... 0.060
2nd groove		
End clearance	mm	0.300 ... 0.500
Axial play	mm	0.020 ... 0.060
3rd groove		
End clearance	mm	cannot be measured
Axial play	mm	cannot be measured

11 25 PISTONS WITH RINGS AND PINS N52K B30

TECHNICAL DATA - PISTONS WITH RINGS AND PINS N52K B30

Piston and pin are paired to each other - replace together only.		
Measuring point "A" (position)	mm	14
Piston diameter at measuring point "A"		
Original (new dimension)	mm	$84.990^{\pm 0.010}$
Repair stage (new dimension)	mm	%
Oversize (new dimension)	mm	$85.240^{\pm 0.010}$
Piston installation clearance (piston new)	mm	0.000...0.034
Piston installation clearance (piston worn)	mm	0.020...0.047
Permissible total wear tolerance between piston and cylinder (engine operated)	mm	0.150

11 25 PISTONS WITH RINGS AND PINS N52K B30

TECHNICAL DATA - PISTONS WITH RINGS AND PINS N52K B30

1st groove		
End clearance	mm	0.150 ... 0.300
Axial play	mm	0.020 ... 0.070
2nd groove		
End clearance	mm	0.300 ... 0.500

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Axial play	mm	0.020 ... 0.060
3rd groove		
End clearance	mm	cannot be measured
Axial play	mm	cannot be measured

31 CAMSHAFT

11 31 CAMSHAFT N52K B25

TECHNICAL DATA - CAMSHAFT N52K B25

Guide bearing (width)	mm	20.000+0.052
Radial play	mm	0.054...0.099
Axial play	mm	0.020...0.162

11 31 CAMSHAFT N52K B30

TECHNICAL DATA - CAMSHAFT N52K B30

Guide bearing (width)	mm	$20.000^{+0.052}$
Radial play	mm	0.054...0.099
Axial play	mm	0.020...0.162

34 VALVES WITH SPRINGS

11 34 VALVES WITH SPRINGS N52K B25

TECHNICAL DATA - VALVES WITH SPRINGS N52K B25

Plate dia.		
Inlet	mm	$32.2^{\pm 0.05}$
Exhaust	mm	$27.0^{\pm 0.1}$
Stem Z		
Inlet	mm	$5.0\ ^{-0.1}_{-0.06}$
Exhaust	mm	$6.0\ ^{-0.1}_{-0.06}$

11 34 VALVES WITH SPRINGS N52K B30

TECHNICAL DATA - VALVES WITH SPRINGS N52K B30

Plate dia.		
Inlet	mm	$34.2^{\pm 0.05}$
Exhaust	mm	$29.0^{\pm 0.1}$
Stem Z		

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Inlet	mm	$5.0^{-0.1}_{-0.06}$
Exhaust	mm	$6.0^{-0.1}_{-0.06}$

40 OIL SUPPLY

11 40 OIL SUPPLY N52K B25

TECHNICAL DATA - OIL SUPPLY N52K B25

Oil change volume with oil filter	ltr.	6.5
Oil change volume with oil filter for auxiliary engine oil cooler	ltr.	7.0

11 40 OIL SUPPLY N52K B30

TECHNICAL DATA - OIL SUPPLY N52K B30

Oil change volume with oil filter	ltr.	6.5
Oil change volume with oil filter for auxiliary engine oil cooler	ltr.	7.0

41 OIL PUMP WITH FILTER AND DRIVE

11 41 OIL PUMP WITH STRAINER AND DRIVE N52K B25

TECHNICAL DATA - OIL PUMP WITH STRAINER AND DRIVE N52K B25

Oil pressure at idle (engine at normal operating temperature)	min	bar 1.5
Control pressure (engine at normal operating temperature)	bar	4.0 ... 6.0

11 41 OIL PUMP WITH STRAINER AND DRIVE N52K B30

TECHNICAL DATA - OIL PUMP WITH STRAINER AND DRIVE N52K B30

Oil pressure at idle (engine at normal operating temperature)	min bar	1.5
Control pressure (engine at normal operating temperature)	bar	4.0 ... 6.0

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ENGINE

Engine - Tightening Torques - X3, X5 (6-Cyl.)

11 ENGINE BLOCK

11 11 CRANKCASE

CRANKCASE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon screws (14 x) Bedplate to crankcase.	N52K	M10 x 100	Replace screws. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	20 Nm
			Torque angle	70 °
2AZ ASA screws (25 x) Bedplate to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M10 x 27	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	15 Nm
			Torque angle	90 °
3AZ ASA screws (4x) Bedplate to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M8 x 37	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	8 Nm
			Torque angle	90 °
4AZ ASA screws (2x) Bedplate to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M10 x 41	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	15 Nm
			Torque angle	90 °
5AZ Oil spray nozzles (6 x) Oil spray nozzles in crankcase.	N52K	M8 x 1		12 Nm
6AZ Plug (1 x) Coolant drain to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M14 x 1.5	Replace screw and sealing ring. Thread repairs are not permitted!	50 Nm
7AZ Plug				

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(1 x) Assembly opening to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M22 x 1.5	Replace screw. Thread repairs are not permitted!	50 Nm
8AZ Plug (1 x) Assembly opening to bedplate. The end faces of the aluminium screw heads are painted blue.	N52K	M16 x 1.5	Replace screw. Thread repairs are not permitted!	27 Nm

12 CYLINDER HEAD WITH COVER

11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER

CYLINDER HEAD WITH CYLINDER HEAD COVER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ISA screws (cylinder head bolts) (10 x) Cylinder head to crankcase.	N52K	M10 x 125	Replace screws. Tighten screws from inside outwards. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	30 Nm
			1st angle of rotation	90 °
			2. Angle of rotation	90 °
			3. Angle of rotation	45 °
2AZ ISA screws (cylinder head bolts) (1 x M9 x 95) (3 x M9 x 125) Cylinder head to crankcase.	N52K	M9	Replace screws. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	30 Nm
			1st angle of rotation	90 °
			2. Angle of rotation	omitted
			3. Angle of rotation	45 °
3AZ Al screw (1 x) Cylinder head to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M9 x 30	Replace screw. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	10 Nm
			Torque angle	90 °
4AZ ASA screws (3 x) Cylinder head to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M9 x 70	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	

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			Jointing torque	10 Nm
			Torque angle	135 °
5AZ ASA screws (15 x M7 x 33.5 round) (1 x M7 x 33.5 oval) (1 x M7 x 35) (2 x M7 x 36) Hexagon screw (1 x M7 x 46) Studs (2 x M7 x 75) Cylinder head cover to cylinder head.	N52K	M7		9 Nm
6AZ Fillister head screws (4 x) Ignition coil cover to cylinder head cover.	N52K	M6 x 20		4 Nm
7AZ ISA screws (12 x) Bearing cap of eccentric shaft to cylinder head.	N52K	M6 x 30.5		9 Nm
8AZ Seal plugs (3 x) Seal, oil channel, in cylinder head.	N52K	M16 x 1.5	Thread must be oiled.	40 Nm
9AZ Towing eye (1 x) Towing eye to cylinder head.	N52K	M16	Use towing eye exclusively with M16 thread. Use towing eye for engine transportation only.	30 Nm

11 12 CYLINDER HEAD WITH COVER

CYLINDER HEAD WITH COVER - TIGHTENING TORQUES

	Type	thread	tightening specification	Measure
11AZ Cylinder head cover	All	M6		10 Nm
	All	M7		15 Nm
	M21	M8		15 Nm
12AZ Oil trap to cylinder head cover	M21	M8		17 Nm
13AZ Timing case to cylinder head	All	M7		15 Nm
	All	M8		20 Nm
14AZ Plug for oil channel (microencapsulated)	M47/M57	M12 x 1.5		20 Nm
15AZ Vent plugs to cylinder head (coolant)	M67			2 Nm

13 OIL SUMP

11 13 OIL PAN

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OIL PAN - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
Optional extra designation: SA205 = Automatic transmission				
1AZ Plug (1 x) Oil drain to oil sump.	N52K	M12 x 1.5	Replace sealing ring.	25 Nm
2AZ ASA screws (20 x) Oil sump (aluminium) to bedplate. The end faces of the aluminium screw heads are painted blue.	N52K	M8 x 26	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	8 Nm
			Torque angle	90 °
3AZ ASA screws (5 x M8 x 112) (3 x M8 x 92) Oil sump (aluminium) to bedplate. The end faces of the aluminium screw heads are painted blue.	N52K	M8	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	8 Nm
			Torque angle	180 °
4AZ ASA screws (7 x) Oil deflector to bedplate. The end faces of the aluminium screw heads are painted blue.	N52K	M6 x 20	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	4 Nm
			Torque angle	90 °
5AZ ASA screws (3 x) Transmission to oil sump.	N52K	M8 x 50		19 Nm
6AZ Hexagon nuts (2 x) Holder, transmission oil cooler line, to oil sump for vehicles with optional extra SA205.	N52K	BM6		8 Nm
7AZ Hexagon nut (1 x) Holder, coolant hose, to oil sump.	N52K	M6		9 Nm
8AZ Hexagon screw (1 x) Holder, coolant hose, to oil sump.	N52K	M10 x 18		21 Nm

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11 14 TRANSMISSION CLOSING PLATE

TRANSMISSION CLOSING PLATE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screws (4 x) Transmission cover plate to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M6 x 16	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	4 Nm
			Torque angle	45 °

21 CRANKSHAFT WITH BEARING

11 21 CRANKSHAFT AND BEARINGS

CRANKSHAFT AND BEARINGS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Increment wheel on crankshaft	S54	M5 10.9	Replace screws	
			Jointing torque	5.0 Nm
			Torque angle	45 °
Increment wheel on crankshaft		M5 10.9	Replace screws	13 Nm
Increment wheel on crankshaft		M5 8.8	Replace screws	5.5 Nm

11 21 CRANKSHAFT AND BEARINGS

CRANKSHAFT AND BEARINGS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon screw (central screw) (1 x) Hub of vibration damper to crankshaft.	N52K	M16 x 80	Replace screw. Screw and thread are lightly oiled. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	100 Nm
			Torque angle	360 °

22 FLYWHEEL

11 22 FLYWHEEL

FLYWHEEL - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon screws				

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(6 x) Flywheel to crankshaft for vehicles with SA205 (automatic transmission).	N52K	M12 x 25.5	Replace screws. Jointing torque and final tightening must be observed without fail.	
			1. Jointing torque	30 Nm
			2. Final tightening	125 Nm
2AZ ISA screws (6 x) Flywheel to crankshaft for vehicles without SA205 (automatic transmission).	N52K	M12 x 25	Replace screws.	120 Nm

23 VIBRATION DAMPER

11 23 VIBRATION DAMPER

VIBRATION DAMPER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
3AZ Belt pulley/vibration damper to hub	S38 / B36	M8 10.9		34 Nm
	N40 / N42 / N45 / N46 / S38 / B38	M8 10.9		34 Nm
	All / others	M8		22 Nm
4AZ Belt pulley to vibration damper	S38 / B35	M8 8.8		22 Nm
	S50	M8 8.8		22 Nm
5AZ Sprocket with hub or hub to crankshaft	M40	M16 x 1.5	Replace screw	310 Nm
	M42 / M43 / M43TU / M44	M16 x 1.5	Replace screw	330 Nm
6AZ Hub to crankshaft	N40 / N42 / N45 / N46	M16 x 1.5	Replace screw	300 Nm

11 23 VIBRATION DAMPER

VIBRATION DAMPER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screws (6 x) Vibration damper to hub.	N52K	M8 x 16		35 Nm

24 CONNECTING ROD WITH BEARING

11 24 CONNECTING RODS AND BEARINGS

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CONNECTING RODS AND BEARINGS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screws (connecting rod bolts) (12 x) Connecting rod bearing cap to connecting rod.	N52K	M8 x 47	Replace screws. Screws washed and oiled. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	20 Nm
			Torque angle	70 °

28 V-RIBBED BELT WITH TENSIONER

11 28 RIBBED V-BELT WITH TENSION AND DEFLECTION SYSTEM

RIBBED V-BELT WITH TENSION AND DEFLECTION SYSTEM - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screw (1 x) Belt tensioner to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K / Not for E70 N52K B30	M11 x 65	Replace screw. Thread repairs are not permitted! Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	25 Nm
			Torque angle	90 °
2AZ ASA screw (1 x) Belt tensioner with deflection pulley to crankcase. The end faces of the aluminium screw heads are painted blue.	E70 N52K B30	M11 x 99	Replace screw. Thread repairs are not permitted! Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	25 Nm
			Torque angle	90 °
3AZ Hexagon screw (1 x) Deflection pulley to alternator.	N52K	M10 x 45		40 Nm

31 CAMSHAFT

11 31 CAMSHAFT

CAMSHAFT - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screws (15 x) Upper and lower bearing banks of exhaust camshaft to cylinder head.	N52K	M7 x 70	Insert screws dry. Tighten screws from inside outwards. Jointing torque and angle of rotation must be observed without fail.	

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			Jointing torque	8 Nm
			Torque angle	60 °
2AZ ISA screws (14 x) Bearing cap of inlet camshaft to cylinder head.	N52K	M6 x 30.5		9 Nm
3AZ ASA screws (2 x) Timing chain module to cylinder head.	N52K	M6 x 35		9 Nm
4AZ Bearing pin (1 x) Timing chain module to crankcase.	N52K	M8		20 Nm
5AZ Bearing pin (1 x) Timing chain module to cylinder head.	N52K	M7		14 Nm
6AZ Chain tensioner (1 x) Chain tensioner to cylinder head.	N52K	M22 x 1.5	Replace sealing ring.	55 Nm
7AZ Plug (1 x) Assembly opening to cylinder head.	N52K	M18 x 1.5		25 Nm

36 VARIABLE CAMSHAFT TIMING

11 36 VARIABLE CAMSHAFT CONTROL VANOS

VARIABLE CAMSHAFT CONTROL VANOS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon screws (central bolts) (2 x) VANOS with sensor gear to inlet and exhaust camshafts.	N52K	M10 x 94	Replace screws. Grip inlet and exhaust camshafts at dihedron when tightening. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	20 Nm
			Torque angle	180 °
2AZ Non-return valve (2 x) Non-return valve for VANOS to cylinder head	N52K	M14 x 1.5	Replace sealing ring.	13 Nm
3AZ Hexagon screws (2 x) Inlet and exhaust solenoid valve with holder to cylinder head.	N52K	M6 x 12	Replace support and sealing rings.	9 Nm

37 VARIABLE VALVE GEAR

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11 37 VARIABLE VALVE GEAR

VARIABLE VALVE GEAR - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screws (11 x) Guide block to timing case.	N52K	M6 x 23	Only one screw (inside) plus the oil spray nozzle are fitted on cylinder no. 3.	10 Nm
2AZ ASA screws (6 x) Torsion spring to cylinder head.	N52K	M6 x 20		10 Nm
3AZ ASA screws (2 x on cylinder head) (1 x on cylinder head cover) Electric servomotor to cylinder head and to cylinder head cover.	N52K	M6 x 16	1. Join screws hand-tight to cylinder head. 2. Join screw hand-tight to cylinder head cover. 3. Jointing torque on cylinder head. 4. Jointing torque on cylinder head cover.	10 Nm
4AZ ASA screw (1 x) Oil spray nozzle to guide block.	N52K	M6 x 30	Oil spray nozzle is fitted on cylinder no. 3 (outside).	10 Nm
5AZ Stop screw (1 x) Stop screw of eccentric shaft to cylinder head.	N52K	M6		10 Nm

41 OIL PUMP WITH FILTER

11 41 OIL PUMP WITH STRAINER AND DRIVE

OIL PUMP WITH STRAINER AND DRIVE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
Optional extra designation: SA203 = All-wheel drive				
1AZ ASA screws (2 x with optional extra SA203) (3 x without optional extra SA203) Suction pipe to bedplate. The end faces of the aluminium screw heads are painted blue.	N52K	M6 x 30	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	4 Nm
			Torque angle	100 °
2AZ ASA screw (1 x) Oil pump to bedplate.	N52K	M8 x 123	Replace screw. Thread repairs exclusively with aluminium Helicoil threaded insert.	

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The end faces of the aluminium screw heads are painted blue.			Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	10 Nm
			Torque angle	180 °
3AZ ASA screws (2 x) Oil pump to bedplate. The end faces of the aluminium screw heads are painted blue.	N52K	M8 x 31	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	10 Nm
			Torque angle	90 °
4AZ ASA screw (1 x) Chain module to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M6 x 16	Replace screw. Thread repairs are not permitted! Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	4 Nm
			Torque angle	45 °
5AZ ASA screws (2 x) Chain module to oil pump. The end faces of the aluminium screw heads are painted blue.	N52K	M6 x 16	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	4 Nm
			Torque angle	45 °
6AZ Fillister head bolt (1 x) Sprocket wheel to oil pump.	N52K	M8 x 20	Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	20 Nm
			Torque angle	45 °

42 OIL FILTER AND LINES

11 42 OIL FILTER ELEMENT WITH CONNECTIONS

OIL FILTER ELEMENT WITH CONNECTIONS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Oil filter cap (1 x) Oil filter cap to oil-filter housing.	N52K		Replace sealing ring.	25 Nm
2AZ ASA screws (1 x M8 x 28) (1 x M8 x 43) (1 x M8 x 78)	N52K	M8	Replace seal.	22 Nm

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Oil filter housing to cylinder head.				
3AZ Tapping screws (3 x) Oil/water heat exchanger to oil filter housing.	N52K	M8 x 20	Replace seal.	16 Nm

51 WATER PUMP WITH DRIVE

11 51 ELECTRIC WATER PUMP WITH DRIVE

ELECTRIC WATER PUMP WITH DRIVE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ASA screws (3 x) Electric water pump to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K / Not for E70 N52K B30	M8 x 32	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	10 Nm
			Torque angle	90 °
2AZ ASA screws (3 x) Electric water pump to crankcase. The end faces of the aluminium screw heads are painted blue.	E70 N52K B30	M8 x 28	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	10 Nm
			Torque angle	90 °

53 THERMOSTAT AND CONNECTIONS

11 53 COOLANT THERMOSTAT WITH CONNECTIONS

COOLANT THERMOSTAT WITH CONNECTIONS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon screws (2 x) Coolant thermostat to electric water pump.	N52K	M6 x 25		9 Nm
2AZ ASA screws (2 x) Feed line (from electric water pump) to crankcase.	N52K	M6 x 16	Replace sealing ring and seal.	9 Nm
3AZ Hose clamp (1 x) Feed line (from crankcase) to electric	N52K	L42-48		3 Nm

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water pump.				
4AZ Hose clamps (2 x) Coolant hose between oil-water heat exchanger and feed line.	N52K	L18-24		3 Nm
5AZ Hose clamps (2 x) Coolant hose between coolant thermostat and electric water pump.	N52K	L42-48		3 Nm
6AZ Hose clamp (1 x) Coolant hose (from cylinder head) to coolant thermostat.	N52K	L23-35		3 Nm
7AZ Hexagon screws (2 x) Coolant hose (from coolant thermostat) to cylinder head.	N52K	M6 x 25		9 Nm
8AZ ASA screw (1 x) Spacer to cylinder head.	N52K	M6 x 12		8 Nm
9AZ ASA screws (2 x) Dual bracket to crankcase. The end faces of the aluminium screw heads are painted blue.	N52K	M6 x 16	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	
			Jointing torque	4 Nm
			Torque angle	45 °

61 INTAKE MANIFOLD

11 61 INTAKE MANIFOLD

INTAKE MANIFOLD - TIGHTENING TORQUES

	Type	thread	tightening specification	Measure
1AZ Intake manifold on cylinder head	All	M8		22 Nm
	All	M7		15 Nm
	All	M6		10 Nm
2AZ Soundproofing hood to holder	M60/1 / M60/2 / M62	M6		8 Nm

11 61 AIR INTAKE MANIFOLD

AIR INTAKE MANIFOLD - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon screws (4 x)	N52K	M7 x 50		15 Nm

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Air intake manifold to cylinder head.				
2AZ Hexagon nuts (3 x) Air intake manifold to cylinder head.	N52K	AM7 (to DIN 439)		15 Nm

62 EXHAUST MANIFOLD

11 62 EXHAUST MANIFOLD

EXHAUST MANIFOLD - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Exhaust manifold to cylinder head Coat screw connections with CRC copper paste	All	M6	Replace nuts	10 Nm
	M50 / M52 / M52TU / M54 / M56 / S52 / S50 US	M7	Replace nuts	20 Nm
	All / others	M7	Replace nuts	15 Nm
	M10	M8	Upper row of staybolts installed with bolt cement	
				23 Nm
	M21	M8		12 Nm
			Replace nuts Retighten after 2000 km Slacken nuts by a 1/4 turn	
				12 Nm
	M41 / M47 / M47TU / M51 / M57 / M57TU	M8	Replace nuts	20 Nm
	All / others	M8	Replace nuts	23 Nm

66 VACUUM PUMP

11 66 VACUUM PUMP

VACUUM PUMP - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ ISA flat mushroom head screws 10.9 (3 x) Vacuum pump to crankcase.	N52K	M6 x 40		10 Nm
2AZ ISA screw (1 x)	N52K	M10 x 30		66 Nm

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Sprocket wheel to vacuum pump.				

72 AIR PUMP, LINES AND CONTROL VALVE

11 72 AIR PUMP, LINES AND CONTROL VALVES

AIR PUMP, LINES AND CONTROL VALVES - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Secondary air valve to cylinder head	N52K	M6		8 Nm
2AZ Secondary air pump to mounting bracket/pump carrier	N52K	M6		8 Nm
3AZ Intake hose / intake line to body	N52K	M6		8 Nm

78 EMISSION CONTROL, OXYGEN SENSOR

11 78 EXHAUST GAS CONTROL, LAMBDA CONTROL SENSOR / LAMBDA MONITOR SENSOR

EXHAUST GAS CONTROL, LAMBDA CONTROL SENSOR / LAMBDA MONITOR SENSOR - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Lambda control sensor LSU 4.9 Lambda monitor sensor LSF 4.2	N52K	M18 x 1.5		50 Nm
2AZ ASA screws (2 x) Bracket, lambda control sensors, to cylinder head.	N52K	M6 x 12		8 Nm
3AZ Hexagon screw (1 x) Bracket, lambda monitor sensors, side, to transmission.	N52K / Not for E6x and E85	M8 x 16		19 Nm
4AZ Bracket, plug connection, lambda monitor sensors, bottom, to transmission.	N52K			

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ENGINE

Engine And Gearbox - Repair Instructions - X3

11 ENGINE SUSPENSION

22 11 001 REPLACING RIGHT ENGINE MOUNT (N52K)

Necessary preliminary tasks:

- Remove right engine support arm, see **22 11 100 Replacing right engine support arm (N52K)**.

Release screws (1) and remove engine mount (2).

Tightening torque, see 1AZ in **22 11 ENGINE SUSPENSION** .

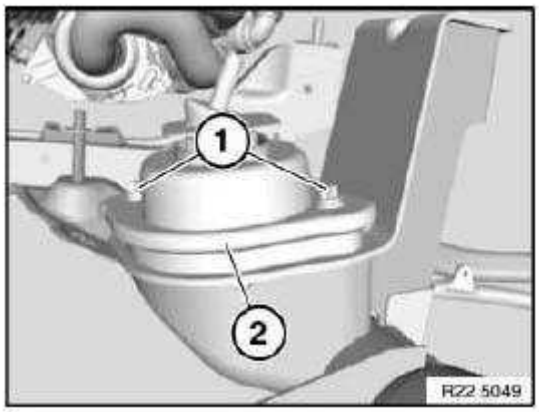


Fig. 1: Engine Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Ensure lug (1) is correctly located.

Engine mount designations:

Right engine mount

- Even component number

Left engine mount

- Odd component number

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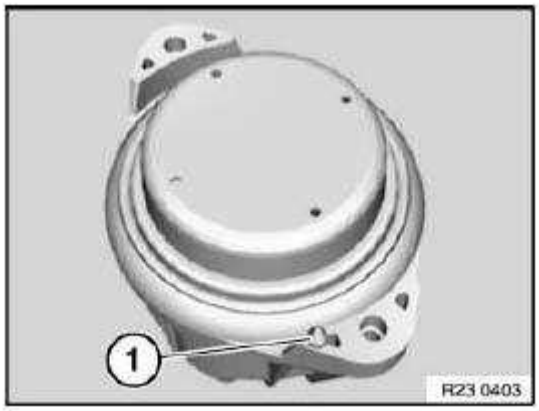


Fig. 2: Lug
Courtesy of BMW OF NORTH AMERICA, INC.

22 11 011 REPLACING LEFT ENGINE MOUNT (N52K)

Necessary preliminary tasks:

- Remove left engine support arm, see **22 11 110 Replacing left engine support arm (N52K)**.

Release screws (1) and remove engine mount (2).

Tightening torque, see 1AZ in **22 11 ENGINE SUSPENSION** .

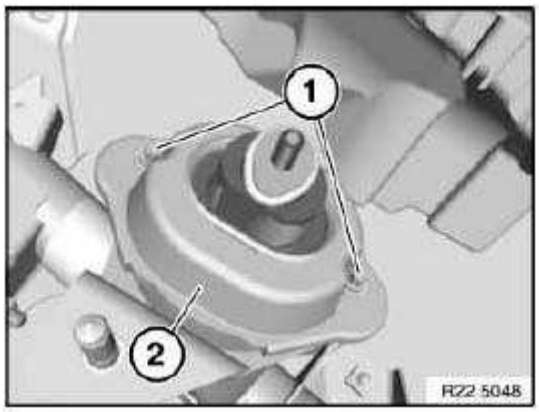


Fig. 3: Engine Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Note installation position.

Threaded pin (1) must point outwards.

Engine mount designations:

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Right engine mount

- Even component number

Left engine mount

- Odd component number

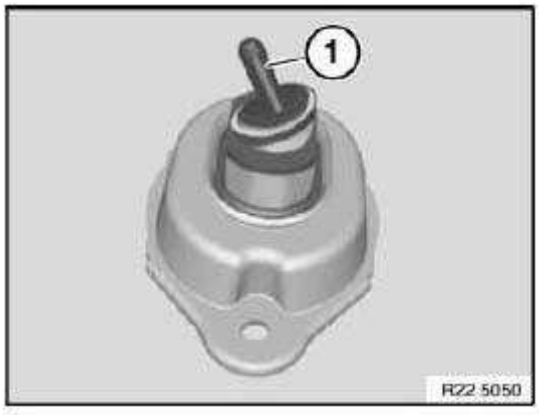


Fig. 4: Threaded Pin
Courtesy of BMW OF NORTH AMERICA, INC.

22 11 100 REPLACING RIGHT ENGINE SUPPORT ARM (N52K)

Necessary preliminary tasks:

- Secure engine in installation position, see **11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52)** .
- Remove the reinforcement plate, see **31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE** .

Release screws.

Remove engine support arm (1).

Tightening torque 3AZ, see **22 11 ENGINE SUSPENSION** .

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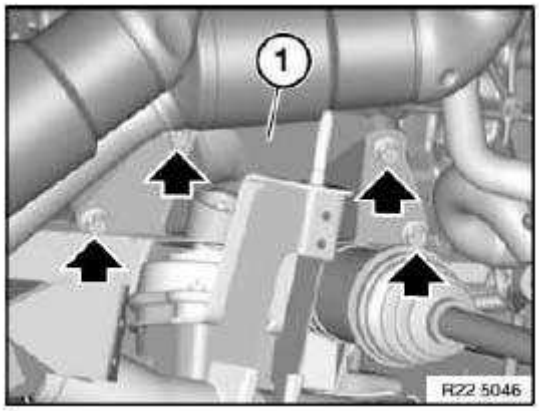


Fig. 5: Engine Support Arm
Courtesy of BMW OF NORTH AMERICA, INC.

22 11 110 REPLACING LEFT ENGINE SUPPORT ARM (N52K)

Necessary preliminary tasks:

- Secure engine in installation position, see **11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52)** .
- Remove the reinforcement plate, see **31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE** .

Disconnect connector (1).

Detach oil line (2) from engine support arm.

Release screws and remove engine support arm (3).

Tightening torque, see 3AZ in **22 11 ENGINE SUSPENSION** .

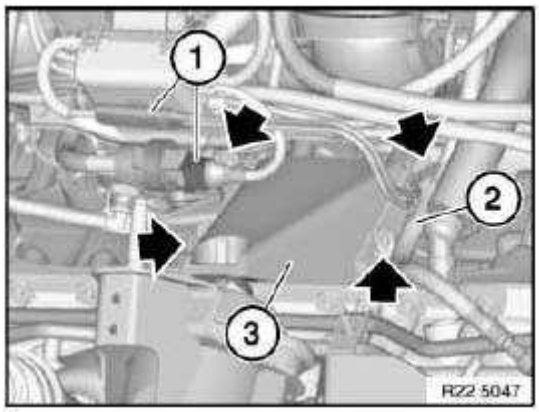


Fig. 6: Connector, Oil Line And Engine Support Arm
Courtesy of BMW OF NORTH AMERICA, INC.

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31 TRANSMISSION SUSPENSION, MANUAL TRANSMISSION

22 31 001 REPLACING RUBBER MOUNT FOR TRANSMISSION MOUNTING

Special tools required:

See **22 1 010 SET OF TOOLS** .

- 22 1 011
- 22 1 014
- 22 1 016
- 22 1 021
- 33 3 144

Necessary preliminary tasks:

- Remove complete exhaust system, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54)** .
- Remove heat shield
- Support transmission with hydraulic lifter.

Unfasten screws and remove transmission cross-member.

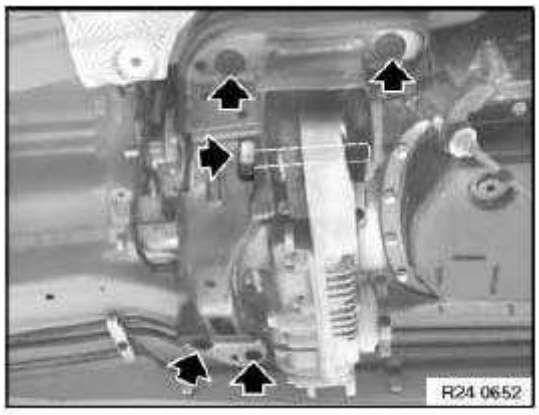


Fig. 7: Transmission Cross-Member Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool 22 1 016 on opening (2) and twist in screw (3) hand-tight against housing.

Pull out rubber mount with special tools 22 1 011 / 33 3 144 and nut (1).

Nut (1) = M 12x1.5 nut

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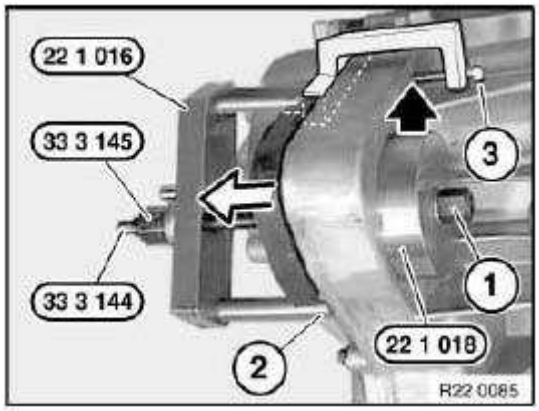


Fig. 8: Pulling Out Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Arrow on rubber mount must point to arrow on housing.

Coat housing bore and rubber mount with Circolight.

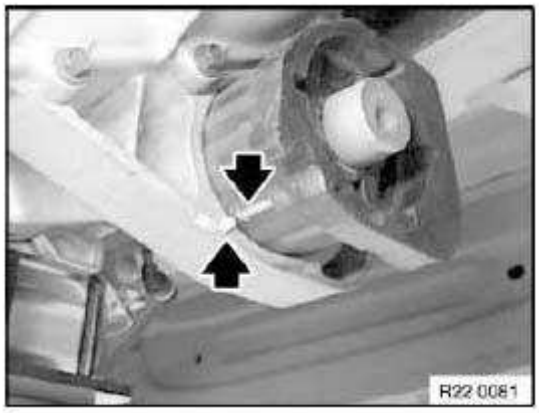


Fig. 9: Arrow On Rubber Mount And Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 22 1 014 with pins into openings of rubber mount.

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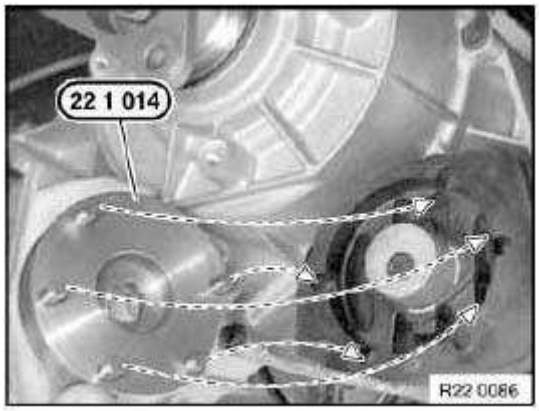


Fig. 10: Special Tool 22 1 014
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in rubber mount with special tools 22 1 014 / 22 1 021 / 33 3 144 and nut (1).

Nut (1) = M12x1.5

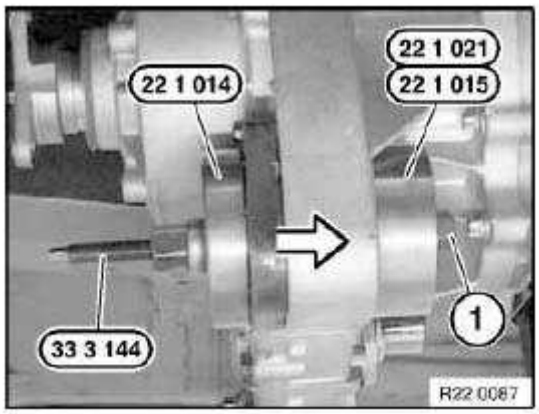


Fig. 11: Installing Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

22 31 050 REPLACING CROSS-MEMBER FOR TRANSMISSION MOUNTING

Operation is identical to **22 31 001 Replacing rubber mount for transmission mounting**.

22 31 050 REPLACING CROSS-MEMBER FOR TRANSMISSION MOUNTING

Operation is identical to **22 31 001 Replacing rubber mount for transmission mounting**.

32 TRANSMISSION SUSPENSION, AUTOMATIC TRANSMISSION

22 31 001 REPLACING RUBBER MOUNT FOR TRANSMISSION MOUNTING

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Special tools required:

See **22 1 010 SET OF TOOLS** .

- 22 1 011
- 22 1 014
- 22 1 016
- 22 1 021
- 33 3 144

Necessary preliminary tasks:

- Remove complete exhaust system, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54)** .
- Remove heat shield
- Support transmission with hydraulic lifter.

Unfasten screws and remove transmission cross-member.

Tightening torque 10AZ, see **27 00 TRANSFER BOX IN GENERAL** .

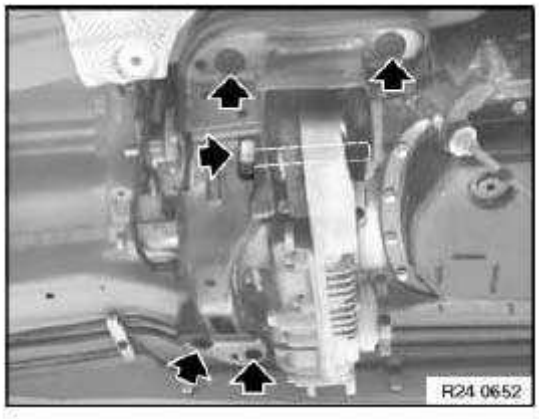


Fig. 12: Transmission Cross-Member Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool 22 1 016 on opening (2) and twist in screw (3) hand-tight against housing.

Pull out rubber mount with special tools 22 1 011 / 33 3 144 and nut (1).

Nut (1) = M 12x1.5 nut

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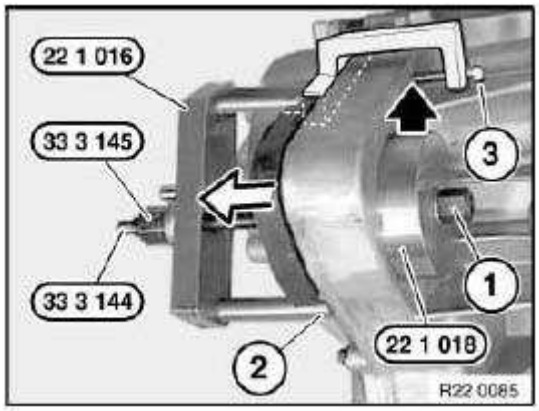


Fig. 13: Pulling Out Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Arrow on rubber mount must point to arrow on housing.

Coat housing bore and rubber mount with Circolight.

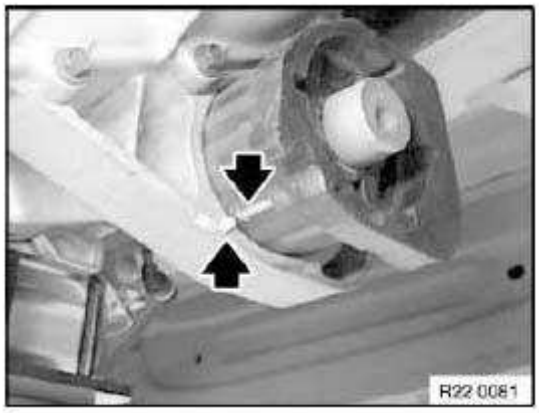


Fig. 14: Arrow On Rubber Mount And Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 22 1 014 with pins into openings of rubber mount.

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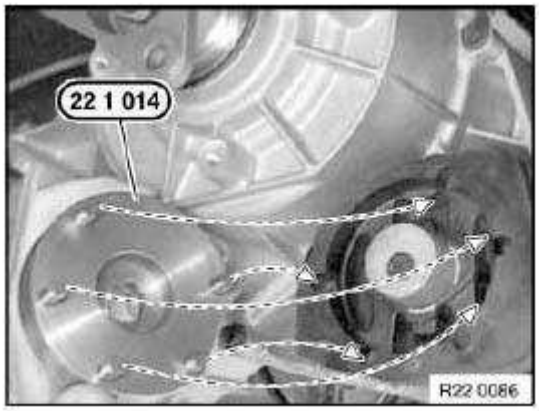


Fig. 15: Special Tool 22 1 014
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in rubber mount with special tools 22 1 014 / 22 1 021 / 33 3 144 and nut (1).

Nut (1) = M12x1.5

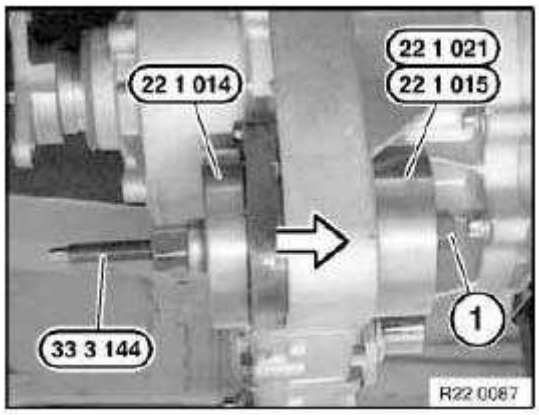


Fig. 16: Installing Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

22 32 001 REPLACING RUBBER MOUNT FOR TRANSMISSION MOUNTING

Special tools required:

See **22 1 010 SET OF TOOLS** .

- 22 1 011
- 22 1 014
- 22 1 016
- 22 1 021
- 33 3 144

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Necessary preliminary tasks:

- Remove complete exhaust system, see **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM**
- Remove heat shield
- Support transmission with hydraulic lifter.
- Remove transfer case, see **27 10 010 REMOVING AND INSTALLING TRANSFER CASE (ATC 400 X-DRIVE)** .

Position special tool 22 1 016 on opening (2) and twist in screw (3) hand-tight against housing.

Pull out rubber mount with special tools 22 1 011 / 33 3 144 and nut (1).

Nut (1) = M 12x1.5 nut

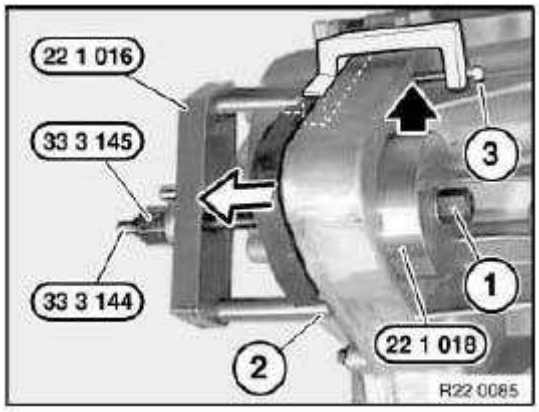


Fig. 17: Pulling Out Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Arrow on rubber mount must point to arrow on housing.

Coat housing bore and rubber mount with Circolight.

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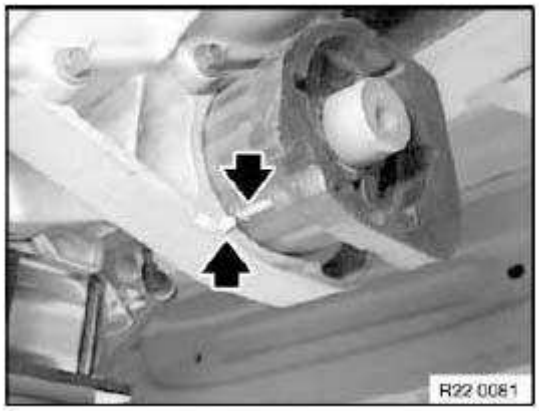


Fig. 18: Arrow On Rubber Mount And Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 22 1 014 with pins into openings of rubber mount.

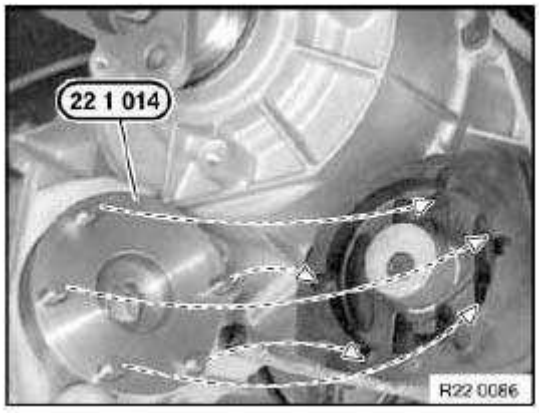


Fig. 19: Special Tool 22 1 014
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in rubber mount with special tools 22 1 014 / 22 1 021 / 33 3 144 and nut (1).

Nut (1) = M12x1.5

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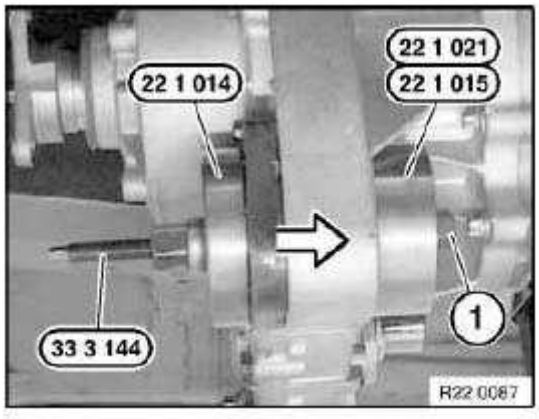


Fig. 20: Installing Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

22 32 050 REPLACING CROSS-MEMBER FOR TRANSMISSION MOUNTING

Operation is identical to **Replacing rubber mount for transmission mounting**.

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ENGINE

Engine and Gearbox Suspension - Special Tools - X3

22 ENGINE AND GEARBOX SUSPENSION

22 1 010 SET OF TOOLS

Minimum set: Mechanical tools

In conjunction with: 33 3 144

Note: For removing and installing transfer box rubber mount 22 1 018 for E67 and RR

Series: E46/16, E53, E60, E61, E67, E70, E83, E90, E91, E92, RR1

Storage location: B41, C34, C35, C47

SI number: 1 15 99 (483)

Order number: 22 1 010

Set of tools

Consisting of:

3 = 22 1 013 Thrust piece

Note: For installing transfer case rubber mount - model series: E53

4 = 22 1 014 Thrust piece

Note: For installing transfer box rubber mount - model series: E46/16, E83

5 = 22 1 015 Washer

Note: Model series: E46/16

6 = 22 1 016 Bridge

Note: For removing transfer box rubber mount. Model series: E46/16, E83

7 = 22 1 017 Nut

Note: For installing and removing transfer box rubber mount - model series: E46/16

8 = 22 1 018 Sleeve

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Note: For removing transfer box rubber mount - model series: E53, E83, E90

9 = 22 1 019 Washer

Note: For installing transfer box rubber mount - Model series: E53

10 = 22 1 021 Washer

Note: For installing rubber mount in transfer box: ATC400 Model series: E83

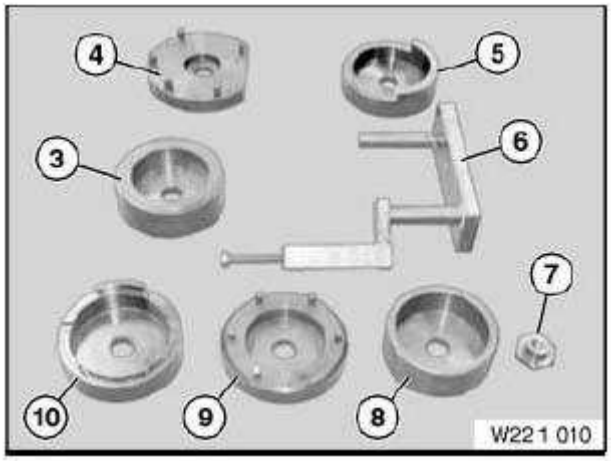


Fig. 1: Identifying Set Of Tools (22 1 010)
Courtesy of BMW OF NORTH AMERICA, INC.

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ENGINE

Engine and Gearbox Suspension - Tightening Torques - X3

11 ENGINE SUSPENSION

22 11 ENGINE SUSPENSION

ENGINE SUSPENSION - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Engine mount to front axle support	E52 / E85 / E86			42 Nm
	E60 / E61 / E63 / E64 / E65 / E66 / E67 / E92	M8-8		19 Nm
	E60/N54, E60/ N53, N52, E61 / N53, N52, N54	M8-8		21 Nm
	E53	M8-10.9		30 Nm
	E87 / E90 / E91 / E92 / E93 / E70 / E83 / E81	M8 10.9		28 Nm
	E70 / E83	M10		38 Nm
2AZ Engine mount to engine support arm	E60 / E61 / E63 / E64 / E65 / E66 / E67 / E53 / E83 / E87 / E90 / E91/ E92 / E93 / E70 / E81	M10 10.9		56 Nm
	E65 / E66 / E67	M12 10.9		100 Nm
	E70 / E83	M12		68 Nm
	E85 / E86 / E52			42 Nm
	E92	M10		38 Nm
3AZ Engine support arm to engine	E60 / E61 / E63 / E64 / E65 / E66 / E67 / E83 / E87 / E90 / E91 / E70 / E81 / E92 / E93	M10 8.8		38 Nm
	E60 / 61 N52 / E63 / 64 N52 / E83 / 85 N52 / E86 N52 / E87 / 90 N52 / E91 N52 / E65 N52 / E92 N51 / N52 / E70 N52	M12	Aluminium screws marked blue must be replaced	
			1. Jointing torque	34 Nm
			2. Angle of rotation	90 °
			3. Angle of rotation	20 °
	E60 / E61 / E65 / E66 / E67	M8 8.8		19 Nm
	E85 / E83	M8 8.8		21 Nm
	E53 (N62 / M54)			38 Nm
	E53 (M57)			65 Nm

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	E92 / E90 (N54)	M12		66 Nm
	E60(N53) / E61 (N53) / E87 (N52K) / E81 (N52K)		1. Jointing torque	34 Nm
			2. Angle of rotation	100 °
			marked blue must be replaced	
	E60 (N54)	M12		66 Nm
4AZ Engine mount to mounting bracket	E65 / E60 / E61 / E63 / E64	M8 8.8		21 Nm
5AZ Mounting bracket to front axle carrier	E65 / E60 / E61 / E63 / E64	M8-8		21 Nm
6AZ Vibration damper to engine carrier	E70			19 Nm
7AZ Reinforcement plate to front axle carrier	E90 / E91 / E92	M8		19 Nm
8AZ Support angle to engine mount or front axle carrier	E90 / E91 / E92	M8		19 Nm

32 TRANSMISSION MOUNTS

22 32 TRANSMISSION MOUNTS

TRANSMISSION MOUNTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Bolt to transmission cross-member	E60 / E65 / E66 / E67			30 Nm
2AZ Transmission support block to transmission	E60 / E61 / E65 / E66 / E67 / E85 / E86 / E63 / E64 / E87 / E90 / E91 / E92 / E93 / E81	M10x35 M10x32.5	ASA screw Isa flat-head screw	38Nm 48 Nm
3AZ Transmission mount to transmission / transmission cross-member	E60 / E61 / E63 / E64 / E67 / E85 / E86 / E87 / E90 / E91 / E92 / E93 / E81	M8		19 Nm
4AZ Transmission cross-member to body	E85 / E86 / E46 / E83	M8 8.8		21 Nm
	E60 / E61 / E63 / E64 / E67 / E87 / E90 / E91 / E92 / E93 / E81			19 Nm
	E53	M10		41 Nm
	E70	M10		38 Nm
5AZ Transmission cross member to rubber mounts	E46 / E53 / E83	M12		74 Nm
	E70	M12		68 Nm

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6AZ Vibration damper to transmission cross-member	E60, E61	M10		38 Nm

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ELECTRICAL

Engine Electrical System - Special Tools - X3

12 ENGINE ELECTRICAL SYSTEM

12 1 305 ZERO-CODED COVER CAP FOR 52-PIN TEST BOX (12 1300/304)

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

SI number: 2 07 04 (138)

Order number: 12 1 305

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

12 7 060 ANTISTATIC MAT (ESD)

Note: ESD (Electro Static Discharge) For protection against ESD during repairs to electronic components. (Replaces the sub-number 12 7 192 from Eprom tool kit 12 7 190)

Series: E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E81, E82, E83, E85, E87, E90, E91, R50, R52, R53, R55, R56, RR1

SI number: 2 06 04 (128)

Order number: 12 7 060

Antistatic mat (ESD)

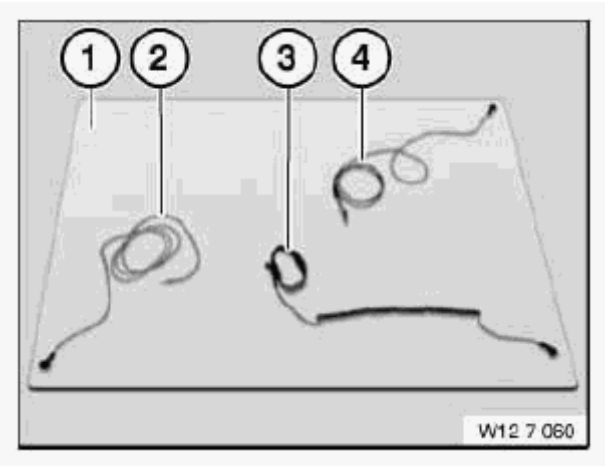


Fig. 1: Antistatic Mat (ESD) (12 7 060)
Courtesy of BMW OF NORTH AMERICA, INC.

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12 7 121 COUNTERHOLDER WRENCH

In conjunction with: Socket

Note: Alternator N42 engine

Order number: 12 7 121

Counterholder wrench

12 7 122 SOCKET

In conjunction with: Counterholder wrench

Note: Hazet 8808 lg10

SI number: 1 28 03 (051)

Order number: 12 7 122

Socket

12 7 190 EPROM TOOLS / ID MARKING

Note: Set no longer available. Antistatic mat can be ordered using number 12 7 060.

Storage location: J 101

Order number: 12 7 190

Eprom tools / ID marking

Consisting of:

1 = 12 7 191 Eprom puller pliers

Note: No longer available. Antistatic mat can be ordered using special tool number 12 7 060.

2 = 12 7 192 Antistatic mat

Note: Is replaced by main number 12 7 060.

12 7 200 SET OF TOOLS

Note: For opening & closing control unit box

Storage location: J 106

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Order number: 12 7 200

Set of tools

Consisting of:

1 = 12 7 201 Pliers

Note: For bending open tab washers

2 = 12 7 202 Lever

Note: For bending tab washers

3 = 12 7 203 Pliers

Note: For closing tab washers

4 = 12 7 204 Torx socket T20

5 = 12 7 205 Torx socket T10

6 = 12 7 206 Fine pen

Note: Black, waterproof

8 = 12 7 208 Slotted screwdriver 2 mm

9 = 12 7 209 Straightening tool

Note: For Eprom connections

12 7 210 CONTROL UNIT SEAL

Storage location: J 106

Order number: 12 7 210

Control unit seal

Consisting of:

1 = 12 7 211 Seal marks

2 = 12 7 212 Hole punch

Note: For seal mark dating

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ENGINE

Engine Electrical System - Tightening Torques - X3

12 IGNITION WIRES, SPARK PLUGS

12 12 SPARK PLUGS

SPARK PLUGS - TIGHTENING TORQUES

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

14 ELECTRONIC SWITCHING OR CONTROL UNIT

12 14 ELECTRONIC SHIFT UNITS OR CONTROL UNITS

ELECTRONIC SHIFT UNITS OR CONTROL UNITS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Knock sensor	N52, N52K, N51, N53	M8x31	Replace screws	
			Jointing torque	10 Nm
			Torque angle	90 °
2AZ Pulse generator for crankshaft	N52, N52K, N51, N53	M6x16	Replace screws	
			Jointing torque	3 Nm
			Torque angle	45 °
3AZ Pulse generator for inlet camshaft	N52, N52K, N51, N53	M6x16		9 Nm
4AZ Pulse generator for exhaust camshaft	N52, N52K, N51, N53	M6x16		9 Nm

31 ALTERNATOR WITH DRIVE AND MOUNT

12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS

ALTERNATOR WITH DRIVE AND MOUNTING PARTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Wires to alternator				
Terminal D+	M10/M20			5 Nm
	All / others	M6		7 Nm
Terminal B+	S38 / B38			8 Nm

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	All / others	M8		13 Nm
2AZ Pulley	All			45 Nm
3AZ Pulley (ribbed drive belt)	Alternator with cooling jacket			80 Nm
	all others			70 Nm
	N42, N46 Valeo			75 Nm
	N42, N46 Bosch			65 Nm
4AZ Rear holder	All			3.5 Nm
5AZ Fillister head screw for wire holder	All			3.5 Nm
6AZ Alternator on bearing block	M40/M42 / M43 / M44			43 Nm
7AZ Alternator to crankcase	N42, N46, N62	M8		21 Nm
8AZ Belt pulley (ribbed V-belt) with freewheel (Ina) fitted to Bosch and Valeo alternators	N42, N43			80 Nm

12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS

ALTERNATOR WITH DRIVE AND MOUNTING PARTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
2AZ Alternator to crankcase	N52, N52K, N51, N53	M8x82	Replace screws	
			Jointing torque	10 Nm
			Torque angle	180 °

32 REGULATOR

12 32 REGULATOR

GOVERNOR - TIGHTENING TORQUES

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

41 STARTER WITH MOUNTING

12 41 STARTER MOTOR WITH MOUNTING

STARTER MOTOR WITH MOUNTING - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Starter motor mounting to crankcase	N52, N52K, N51, N53	M10x85	Replace screw	

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			Jointing torque	20 Nm
			Torque angle	180 °
2AZ Starter motor mounting to crankcase	N52, N52K, N51, N53	M10x30	Replace screw	
			Jointing torque	20 Nm
			Torque angle	90 °
3AZ Battery positive lead to starter	N52, N52K, N51, N53	M8		13 Nm

42 STARTER LEAD

12 42 STARTER LINE

STARTER LINE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Battery positive terminal in/on distribution box	E63 / E65 / E90 / E91 / E87 / E83	M8		21 Nm
	E60 / E61	M8		14 Nm

12 42 STARTER LINE

STARTER LINE - TIGHTENING TORQUES

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

12 42 WIRES TO STARTER

WIRES TO STARTER - TIGHTENING TORQUES

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

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52 CONNECTORS PLUGS, LOOM

12 52 PLUG CONNECTIONS, TERMINALS, LOOSE PARTS

PLUG CONNECTIONS, TERMINALS, LOOSE PARTS - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Wiring harness to cylinder head	N52	M6		8 Nm
2AZ Cable duct to cylinder head cover	N52, N54, N53	M6	Replace screws	
			Jointing torque	4 Nm
			Torque angle	90 °
3AZ Ground cable to crankcase (electr. coolant pump)	N52, N54, N52K, N51,N53	M8	Replace screws	
			Jointing torque	8 Nm
			Torque angle	45 °

61 OIL PRESSURE/OIL TEMPERATURE GAUGE

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

ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Engine oil pressure switch/engine oil temperature sensor	N52, N52K, N51, N54, N53	M12x1.5		
			Jointing torque	20 Nm
			Torque angle	16 °
2AZ Oil condition sensor for engine oil	N52, N52K, N51, N54, N53	M6	Jointing torque 2 Nm	8.5 Nm

12 61 OIL PRESSURE, OIL TEMPERATURE, OIL LEVEL DISPLAY

OIL PRESSURE, OIL TEMPERATURE, OIL LEVEL DISPLAY - TIGHTENING TORQUES

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

62 COOLANT TEMPERATURE

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12 62 COOLANT TEMPERATURE

COOLANT TEMPERATURE - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Temperature sensor to water flange (glow time/coolant temperature gauge)	M21			18 Nm
	M51			13 Nm
2AZ Temperature switch (5.5 °C/17 °C) to fuel filter/cylinder head	M21			18 Nm
3AZ Coolant temperature sensor (2-pin plug-in connection)	S38 / S50			13 Nm
	S85	M12/1.52		13.5 Nm
	All / others			20 Nm
4AZ Remote thermometer sensor (2-pin plug-in connection)	All			20 Nm
Remote thermometer sensor (4-pin plug-in connection)	M62			16 Nm
	S62	M12x1.5		14 Nm
5AZ Remote thermometer sensor on coolant flange	S50			18 Nm
6AZ Temperature sensor - air	S38 / S50			13 Nm
7AZ Temperature sensor - oil	S38 / S50			13 Nm

72 SENSOR FOR CONTROL UNIT

12 72 SENDERS FOR CONTROL UNIT

SENDERS FOR CONTROL UNIT - TIGHTENING TORQUES

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

90 CONTROL UNIT BOX

12 90 CONTROL UNIT HOUSING

CONTROL UNIT HOUSING - TIGHTENING TORQUES

			Tightening	

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

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ENGINE

Engine Mechanical - Repair Instructions - X3, X5 (6-Cylinder)

00 ENGINE, GENERAL

ENGINE IDENTIFICATION

Drive in engine numbers at marked surface with impact tool.

M47 / M47TU / M47T2

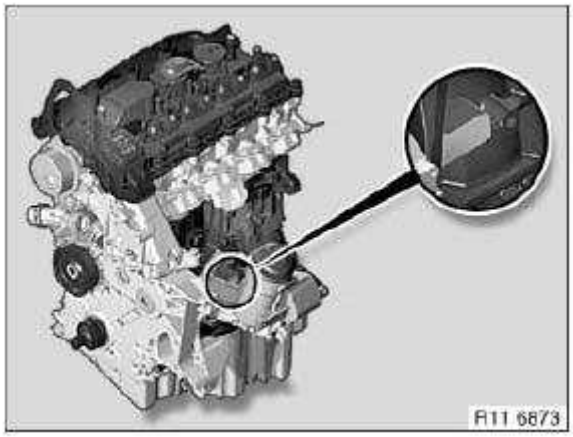


Fig. 1: M47 / M47TU / M47T2 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M57 / M57TU / M57T2

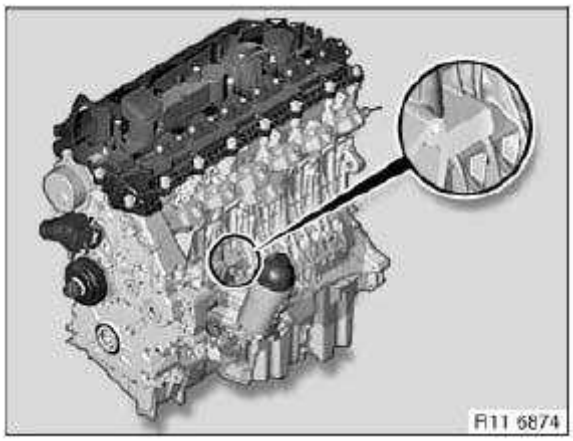


Fig. 2: M57 / M57TU / M57T2 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M67 / M67TU

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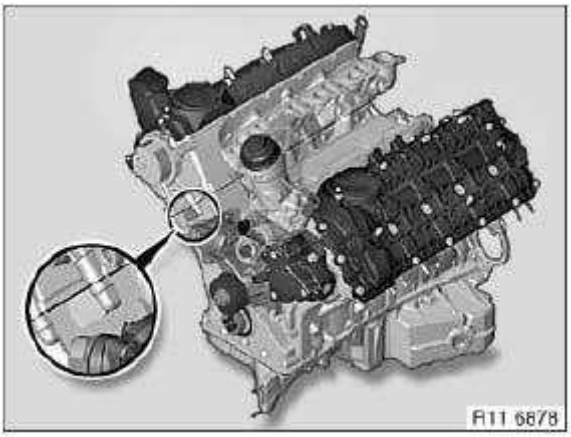


Fig. 3: M67 / M67TU Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N47

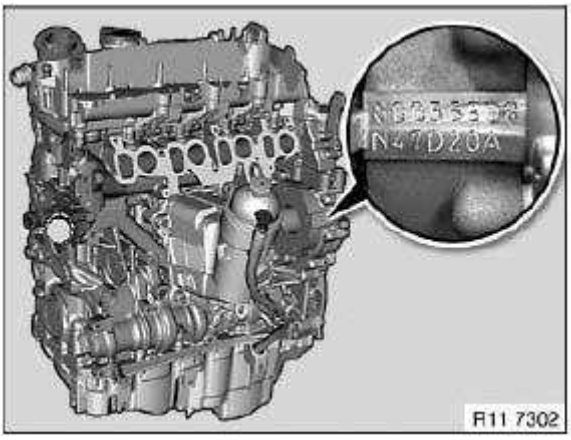


Fig. 4: N47 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M52 / M52TU

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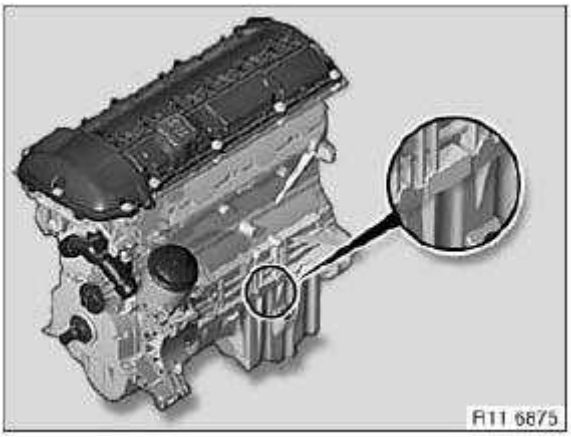


Fig. 5: M52 / M52TU Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M54

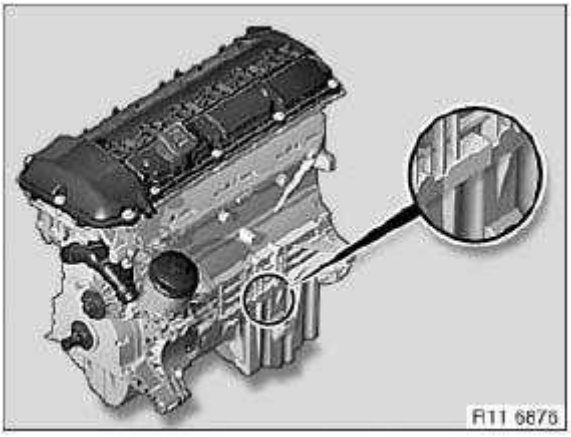


Fig. 6: M54 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M56

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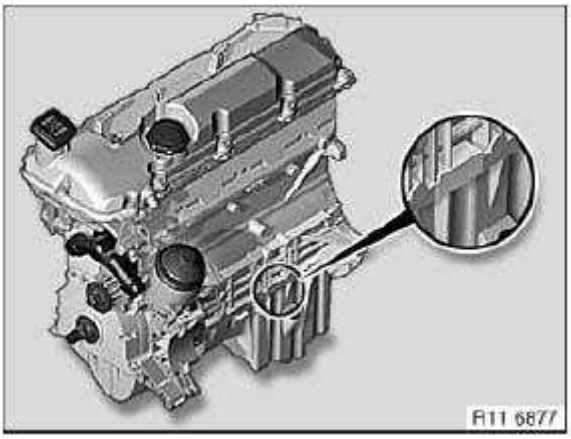


Fig. 7: M56 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N40 / N45

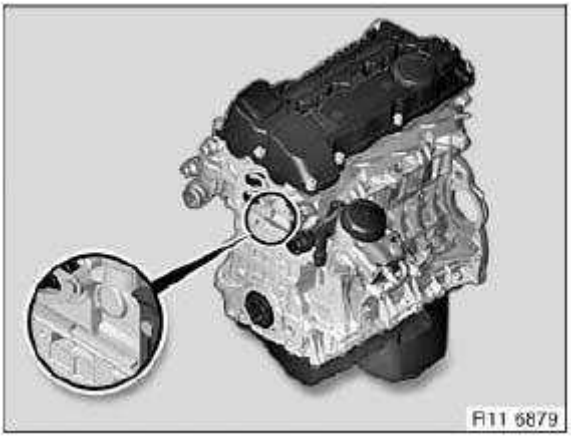


Fig. 8: N40 / N45 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N42 / N46 / N46T

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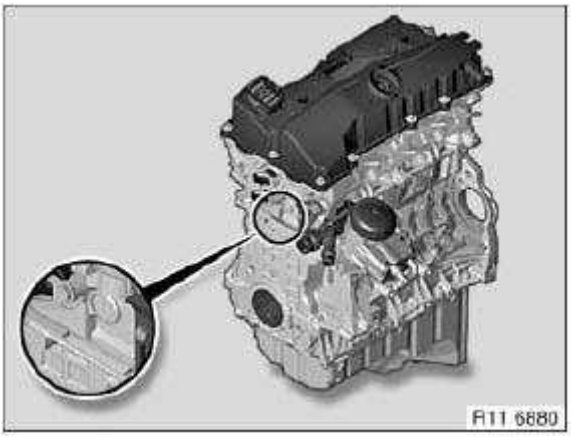


Fig. 9: N42 / N46 / N46T Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N51 / N52 / N52K / N53 / N54

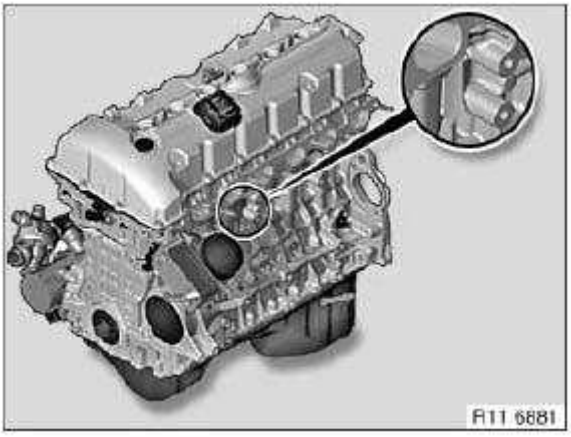


Fig. 10: N51 / N52 / N52K / N53 / N54 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N62

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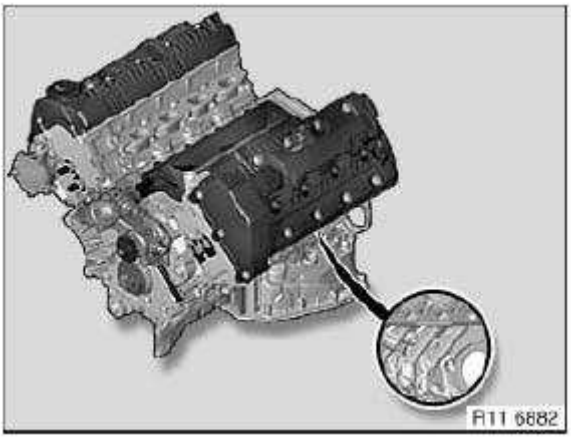


Fig. 11: N62 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N73

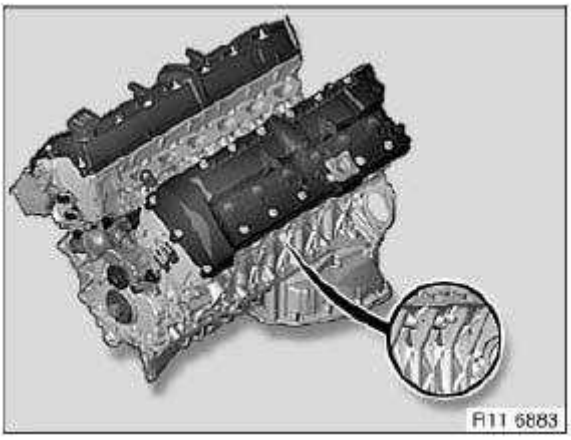


Fig. 12: N73 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

S54

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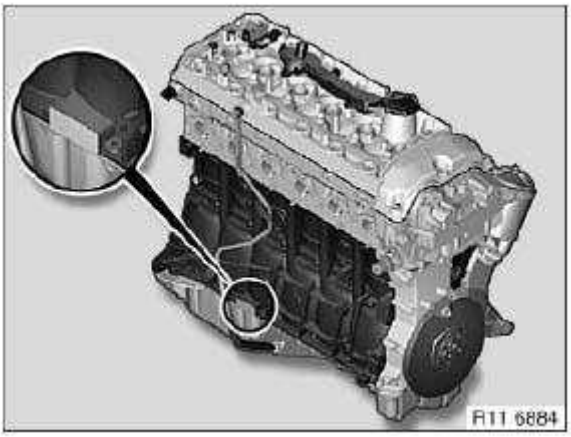


Fig. 13: S54 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

S85

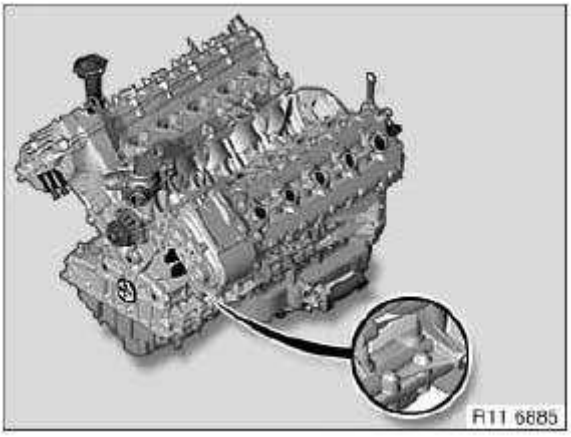


Fig. 14: S85 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

W10 / W11

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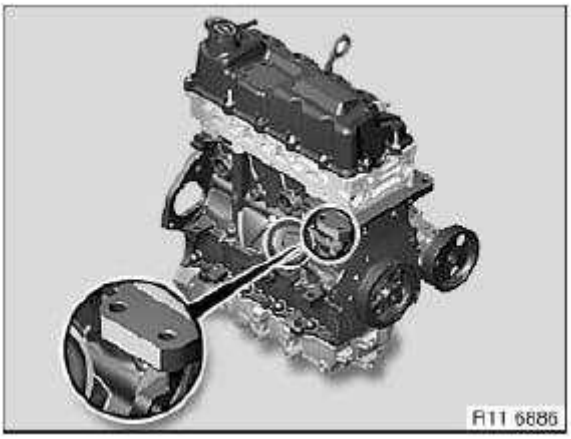


Fig. 15: W10 / W11 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

W17

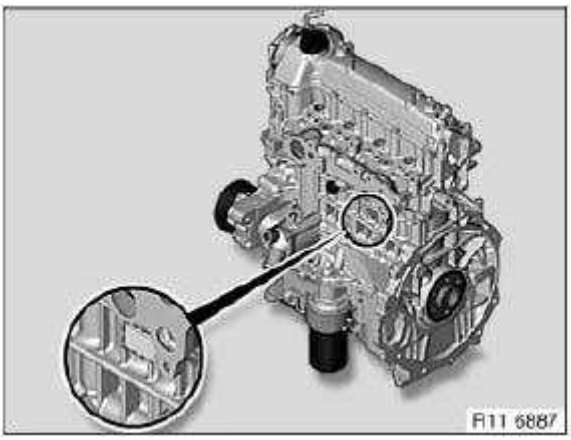


Fig. 16: W17 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

MOUNTING ENGINE ON ASSEMBLY STAND (N52K)

Special tools required:

- **00 1 450 ASSEMBLY STAND**
- 11 3 370
- 11 4 440
- 11 9 261
- 11 9 265

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IMPORTANT: Aluminum screws/bolts must be replaced each time they are released.
The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove engine

Bolt engine or engine block with steel bolts (1) and aluminum bolts (2) to special tool 11 4 440 .

To release central bolt, bolt on special tools 11 9 261 and 11 9 265 as well.

Mount engine with special tool 11 3 370 to special tool 00 1 450 .

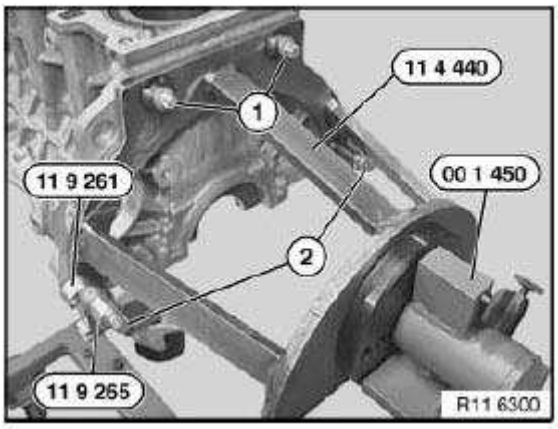


Fig. 17: Engine Block With Steel And Aluminum Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

00 00 250 BMW ENGINE OIL SERVICE INCLUDING SUPPLEMENTARY SERVICE (N52K)

Special tools required:

- 11 9 240

Only the engine oil service will be described in these repair instructions.

The supplementary service is made up of the following operations which must be taken from the relevant repair instructions:

- Reset service interval indicator according to factory specification, see **00 00 ... RESETTING SERVICE INTERVAL INDICATOR ACCORDING TO FACTORY SPECIFICATIONS** .
- Replace microfilter for interior ventilation
- Check brake lining thickness, see **34 00 010 CHECKING THICKNESS OF BRAKE PAD** .

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- Adjust handbrake/parking brake, see **34 10 014 ADJUSTING HANDBRAKE** .
- Parking brake function check

IMPORTANT: Adhere to exact filling quantities.
Overfilling the engine with engine oil will result in engine damage.

Checking and drip-off times must be observed.

IMPORTANT: When working on the engine oil, coolant or fuel circuit, you must always protect the alternator against contamination.
Risk of damage!

The alternator must therefore be covered with suitable apparatus.

Recycling:

Catch and dispose of drained engine oil in a suitable container.

Observe country-specific waste-disposal regulations.

NOTE: Adhere to the following work steps in sequence:

1. **Open oil filter cap.**
2. **Release screw plug in oil sump.**

NOTE: Picture shows the E93 by way of example. Other model series may differ in certain details.

Release oil filter cap with special tool 11 9 240 .

Engine oil flows out of the oil filter housing and back into the oil sump.



Fig. 18: Special Tool (11 9 240)

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Courtesy of BMW OF NORTH AMERICA, INC.

Remove and insert oil filter element (1) in direction of arrow.

Installation:

Replace oil filter element (1) and sealing rings (2).

Installation:

Moisten sealing rings (2) with engine oil.

Tightening torque: 11 42 1AZ, see **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

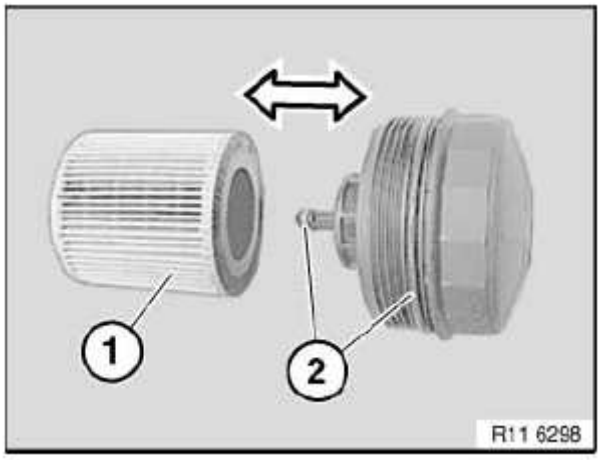


Fig. 19: Sealing Rings
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, the picture shows the assembly underside protection and reinforcement plate removed.

Unclip service opening on reinforcement plate.

Open screw plug (1) in oil sump.

Drain engine oil.

Installation:

Replace sealing ring.

Tightening torque: 11 13 1AZ, see **11 13 OIL PAN** .

Pour in engine oil.

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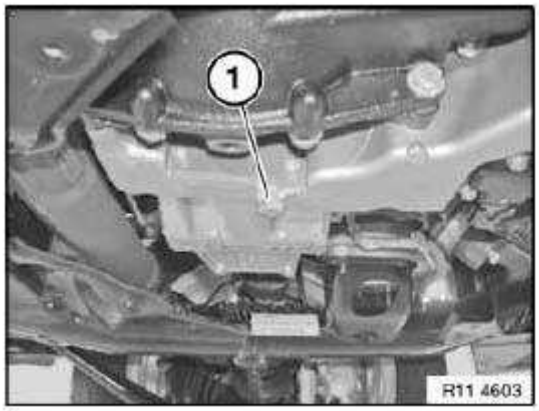


Fig. 20: Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Start engine and run at idle until oil pressure warning lamp goes out.

Turn off engine.

Check oil filter cap and screw plug (1) on oil sump for leaks.

Assemble engine.

Checking engine oil level:

- Park vehicle on a horizontal surface
- Allow engine at normal operating temperature to run for three minutes with increased revs (approx. 1100 RPM)
- Read off engine oil level in instrument cluster or on Control Display
- Top up engine oil if necessary

11 00 REMOVING AND INSTALLING/REPLACING IGNITION COIL COVER (N52K)

Release screws.

Tightening torque: 11 12 6AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

Remove ignition coil cover (1).

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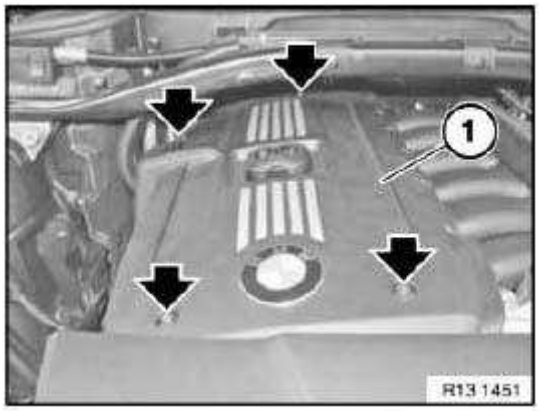


Fig. 21: Ignition Coil Cover
Courtesy of BMW OF NORTH AMERICA, INC.

11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52)

Special tools required:

- **00 0 200 CROSS MEMBER**
- 00 0 202
- 00 0 204
- 00 0 208
- 11 0 000

WARNING: Danger of injury!
Observe following instructions relating to special tool:

1. **Prior to each use, check the special tools for defects, modifications and operational reliability.**
2. **Damaged/modified special tools must not be used!**
3. **No changes or modifications may be made to the special tools!**
4. **Keep special tools dry, clean and free of grease.**

Necessary preliminary tasks:

- Secure engine bonnet/hood in service position, see **51 00 ... SERVICE POSITION OF ENGINE HOOD/BONNET (X3)** or **51 00 ... SERVICE POSITION OF ENGINE HOOD/BONNET 9X5)** .
- Remove cover for windscreen cowl panel, see **51 13 115 REMOVING AND INSTALLING/REPLACING COWL PANEL COVER (X3)** or **51 13 116 REMOVING AND INSTALLING/REPLACING COWL PANEL COVER (X5)** .
- Remove microfilter housing
- Remove tension strut on spring strut dome, see **51 71 373 REMOVING AND INSTALLING/REPLACING TENSION STRUT ON SPRING STRUT DOME (X3)** or **51 71 372**

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REMOVING AND INSTALLING/REPLACING BOTH TENSION STRUTS ON SPRING STRUT DOMES (X5) .

- Remove acoustic cover
- Remove intake filter housing with rubber gaiter, see **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K) (X3)** or **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52K) (X5)** .

Assemble cross member 00 0 200 with special tools 00 0 202 , 00 0 204 , 00 0 208 .

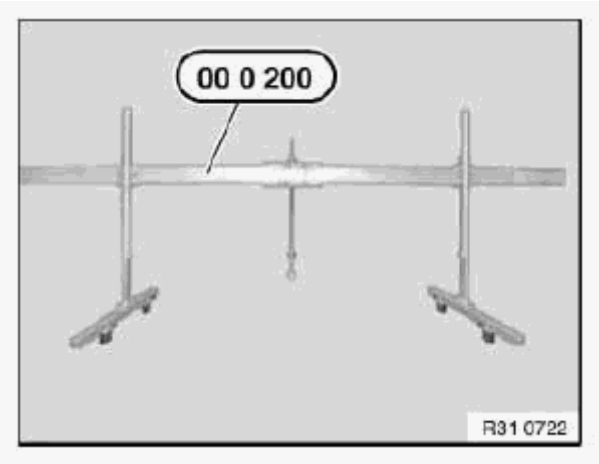


Fig. 22: Special Tool (00 0 200)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Use towing hook (72 15 8 108 670).

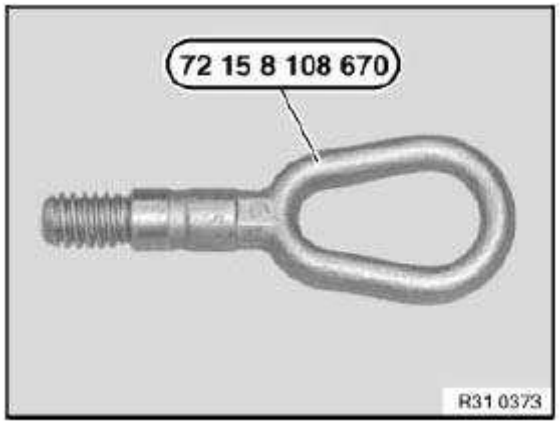


Fig. 23: Towing Hook (72 15 8 108 670)
Courtesy of BMW OF NORTH AMERICA, INC.

Cut open cable tie (2).

Detach quick-release fastener (1) and place vent line (3) to one side.

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Installation:

Make sure the quick-release fastener is fitted correctly.

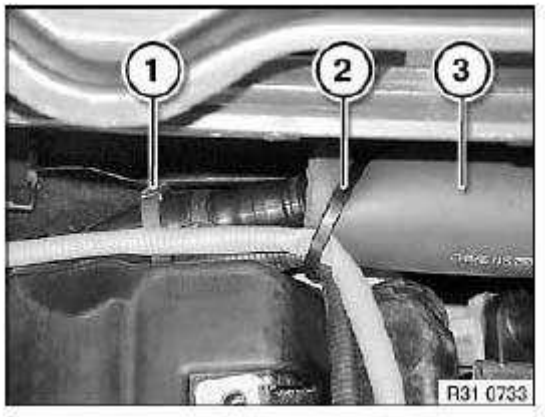


Fig. 24: Open Cable Tie, Quick-Release Fastener And Vent Line
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Avoid a change of engine position in the transverse or longitudinal direction. Always make sure there is sufficient clearance between the engine (or its attachment parts) and the body.

IMPORTANT: Risk of damage!
With the aid of an assistant and the supports (1), place cross member 00 0 200 on the screw connections of the side panels.

Screw in towing hook (2) and tighten down to approx. 30 Nm.

Secure special tool 11 0 000 to spindle 00 0 202 .

Fit suitable chains to special tool 11 0 000 and attach to towing hook (2) or engine lifting eye.

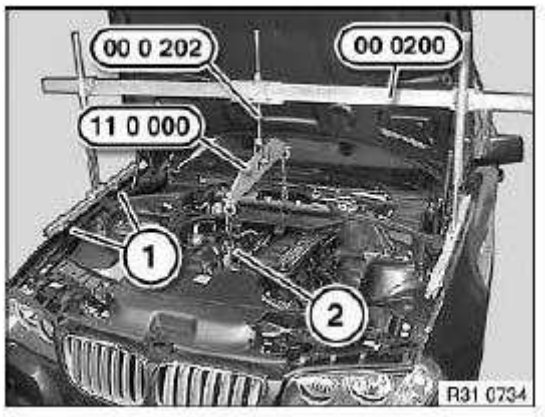


Fig. 25: Special Tools (00 0 202), (00 0 200) And (11 0 000)

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Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!
Tighten down all adjusting screws and nuts on cross member 00 0 200 .

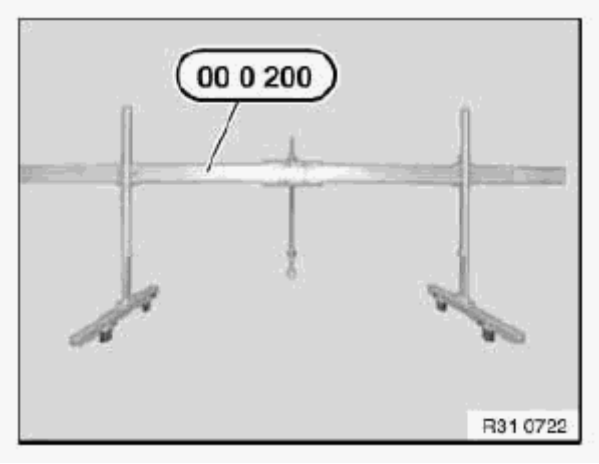


Fig. 26: Special Tool (00 0 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Raise engine approx. 10 mm with cross member.

Installation:

Replace self-locking nuts.

Tightening torque: 22 11 2AZ, see **22 11 ENGINE SUSPENSION** .

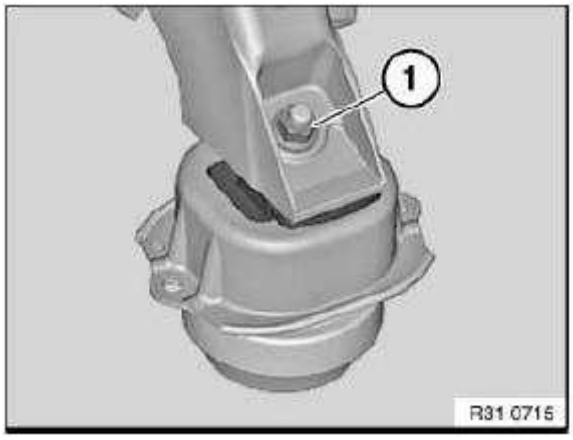


Fig. 27: Cross Member Nut
Courtesy of BMW OF NORTH AMERICA, INC.

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12 CYLINDER HEAD WITH COVER

11 12 000 REMOVING AND INSTALLING/SEALING CYLINDER HEAD COVER (N52K)

IMPORTANT: Aluminium-magnesium materials

- **No steel screws/bolts may be used due to the threat of electrochemical corrosion.**
- **A magnesium crankcase requires aluminum screws/bolts exclusively.**
- **Aluminum screws/bolts must be replaced each time they are released.**
- **Aluminum screws/bolts are permitted with and without color coding (blue).**
- **For reliable identification: Aluminum screws/bolts are not magnetic.**
- **Jointing torque and angle of rotation must be observed without fail (risk of damage).**

Necessary preliminary tasks:

- Remove ignition coils. See **12 13 511 REPLACING IGNITION COIL (N52, N52K, N51)** .
- Release ignition wiring harness in cylinder head cover area. See **12 51 100 REPLACING WIRING HARNESS SECTION FOR IGNITION COIL (N52K)** .
- Remove tension strut.

Unlock and detach vent hose (1). If necessary, pull off metal bracket (2) in direction of arrow. Release screws (3) on electric servomotor. Tightening torque, see 11 37 3AZ in **37 VARIABLE VALVE GEAR** .

NOTE: A further screw, which cannot be seen in the picture, must be released under the electric servomotor (4).

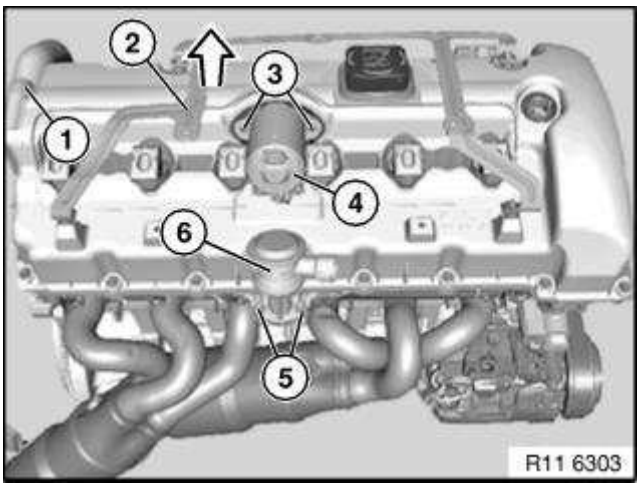


Fig. 28: Pull Off Metal Bracket (2) In Direction Of Arrow
Courtesy of BMW OF NORTH AMERICA, INC.

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Release screw on electric servomotor. Tightening torque, see 11 37 3AZ in **37 VARIABLE VALVE GEAR** . Remove servomotor (4) in direction of arrow. If necessary, release nuts (5). Tightening torque, see 11 72 1AZ in **72 AIR PUMP, LINES AND CONTROL VALVE** . If necessary, remove secondary air valve (6).

IMPORTANT: Observe different screw lengths. Installation location of screws (1 and 2) is specified by the different bushing shapes.

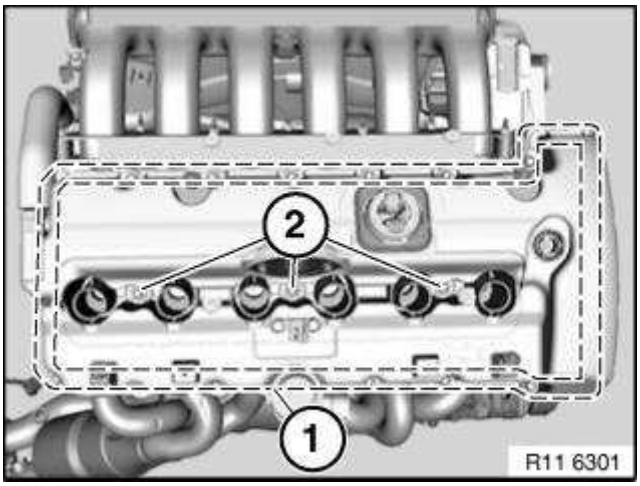


Fig. 29: Installation Location Of Screws (1 And 2) Is Specified By The Different Bushing Shapes
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws in area (1). Tightening torque, see 11 12 5AZ in **12 CYLINDER HEAD WITH COVER** . Installation: Replace aluminum screws.

Release threaded pin (2). Tightening torque, see 11 12 5AZ in **12 CYLINDER HEAD WITH COVER** . Installation: Replace aluminum screws.

Installation: Slotted sleeves (2) for guiding ignition coils in cylinder head cover (1) must be replaced. Remove slotted sleeves (2).

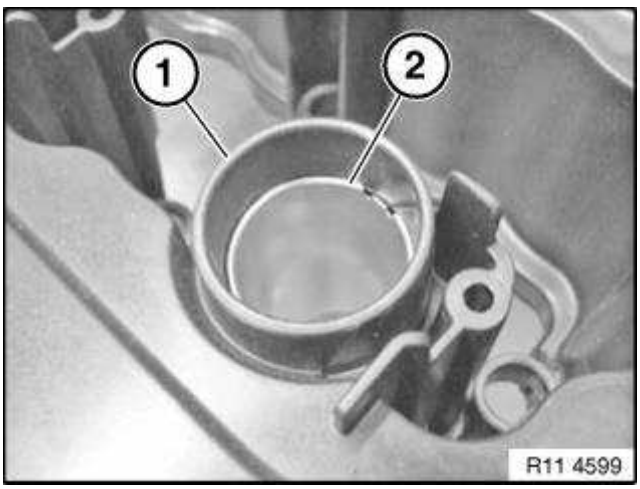


Fig. 30: Slotted Sleeves (2) For Guiding Ignition Coils In Cylinder Head Cover (1) Must Be Replaced

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Courtesy of BMW OF NORTH AMERICA, INC.

Installation: Clean all sealing faces (1 and 2).

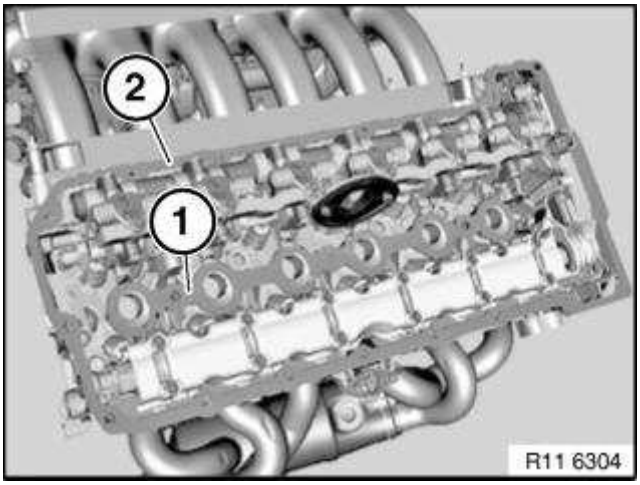


Fig. 31: Clean All Sealing Faces (1 And 2)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not use any metal-cutting tool

Installation: Replace gaskets (1 and 2).

Assemble engine.

11 12 100 REMOVING AND INSTALLING CYLINDER HEAD (N52K)

Special tools required:

- 11 0 320
- 11 4 420
- 11 4 430
- 11 4 471
- 11 4 472
- 11 8 580

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical corrosion.
A magnesium crankcase requires aluminum screws/bolts exclusively.
Aluminum screws/bolts must be replaced each time they are released.
The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of

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damage).

Necessary preliminary tasks:

- Remove exhaust system, see **EXHAUST SYSTEM COMPLETE** .
- Drain coolant, see **17 00 005 DRAINING AND ADDING COOLANT IN RADIATOR (N52K) (X5)** or **17 00 005 DRAINING AND ADDING COOLANT (N52K) (X3)** .
- Drain off engine oil
- Remove both exhaust manifolds
- Remove intake air manifold
- Detach coolant hoses from cylinder head
- Remove inlet and exhaust adjustment unit

IMPORTANT: Fit new cylinder head screws.
Do not wash off bolt coating.
There must be no coolant, water or engine oil in the pocket holes.

Risk of corrosion and cracking!

Release screws (1).

Unclip timing chain module (2) at junction (3) and remove towards top.

Set down timing chain.

IMPORTANT: If the timing chain is stowed in the gearcase, the crankshaft must no longer be rotated.
This would cause the timing chain on the crankshaft sprocket wheel to jam or jump.

Installation:

The timing chain is lifted out with a hook only during assembly.

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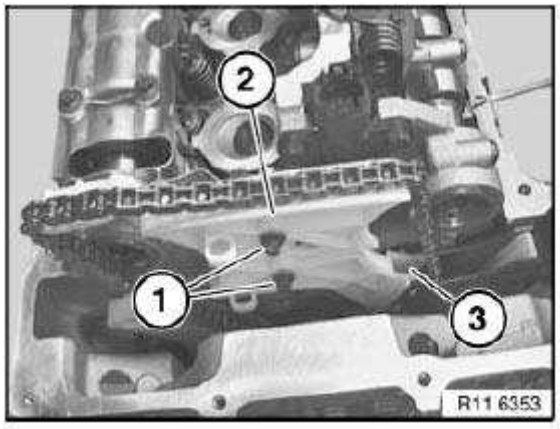


Fig. 32: Timing Chain Module, Junction And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (2) for eccentric shaft sensor (1).

Remove eccentric shaft sensor (1) towards front.

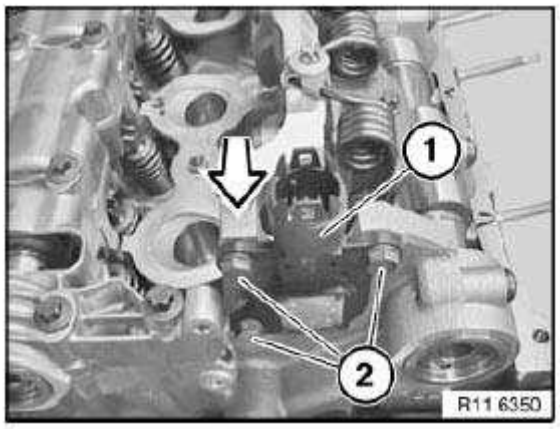


Fig. 33: Removing Eccentric Shaft Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Screw (1) is not magnetic and must be secured against falling down.

Release screw (1).

Remove magnet wheel (2) towards front.

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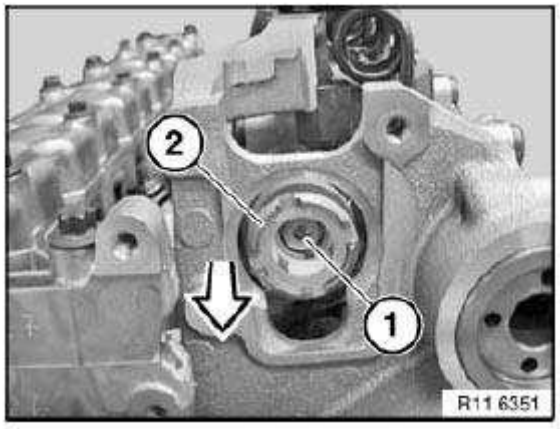


Fig. 34: Removing Magnet Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Magnet wheel (1) is highly magnetic and must be protected against metal filings/borings.

After removing, place magnet wheel (1) in a plastic bag (2) with a seal.

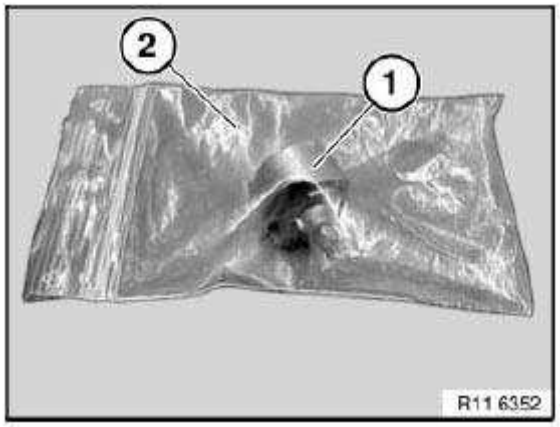


Fig. 35: Magnet Wheel And Plastic Bag
Courtesy of BMW OF NORTH AMERICA, INC.

Pretension eccentric shaft (1) upwards in direction of arrow.

Remove stop screw between 1st and 2nd cylinders.

Tightening torque: 11 37 5AZ, see **11 37 VARIABLE VALVE GEAR** .

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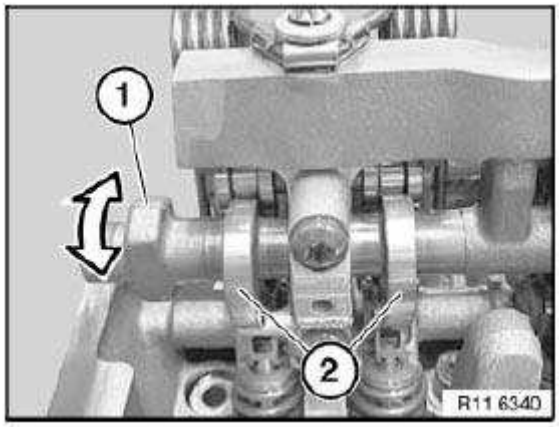


Fig. 36: Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Bolt (2) can only be released when the timing chain module is pressed forward slightly.

IMPORTANT: Secure bolt (2) with a gripper against falling down.

Release screw (2).

Tightening torque: 11 12 3AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

Release screws (1).

Tightening torque: 11 12 4AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

Installation:

Replace aluminum screws.

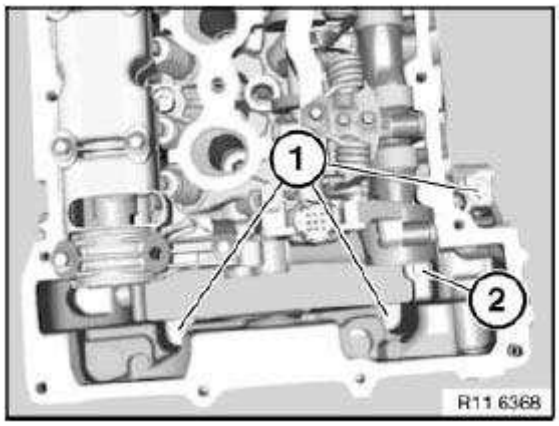


Fig. 37: Bolt

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Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe different bolt heads.

Release M10 cylinder head bolts (1) with special tool 11 8 580 .

Release M9 cylinder head bolts (2) with special tool 11 4 420 .

NOTE: Picture shows inlet and exhaust camshafts removed.

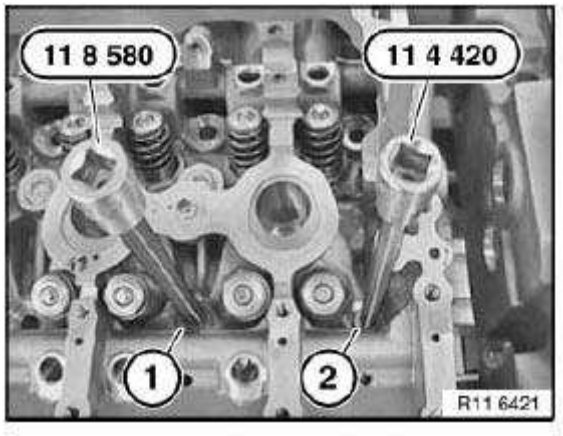


Fig. 38: Special Tools (11 8 580) And (11 4 420)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe different M9 bolt lengths (1 and 3).

Release M9 cylinder head bolts (1 and 3) with special tool 11 4 420 .

Tightening torque: 11 12 2AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

Release M10 cylinder head bolts (2) with special tool 11 8 580 from outside inwards.

Tightening torque: 11 12 1AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

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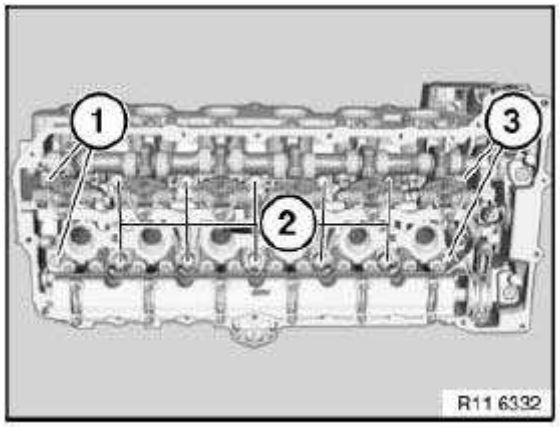


Fig. 39: Cylinder Head Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: All cylinder head bolts (1, 2 and 3) must be replaced.
Jointing torque and angle of rotation must be observed without fail.
Risk of damage!

Secure special tool 11 0 320 with existing cylinder head cover bolts (1).

Tightening torque: 11 12 5AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

IMPORTANT: Removing and install cylinder head with a second person helping.
Weight of cylinder head with add-on parts is approx. 40 kg.
Do not rest cylinder head on sealing surface. Risk of damage to valves!

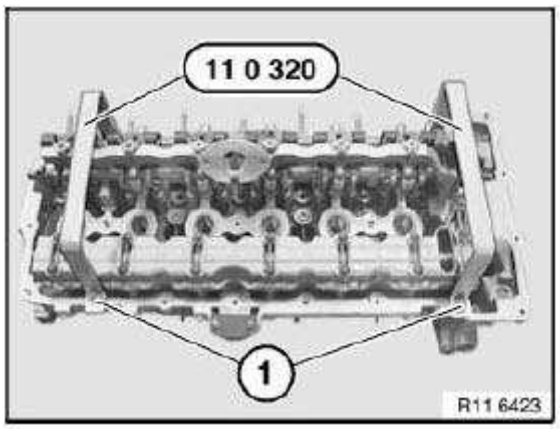


Fig. 40: Special Tool (11 0 320)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 4 430 into bores.

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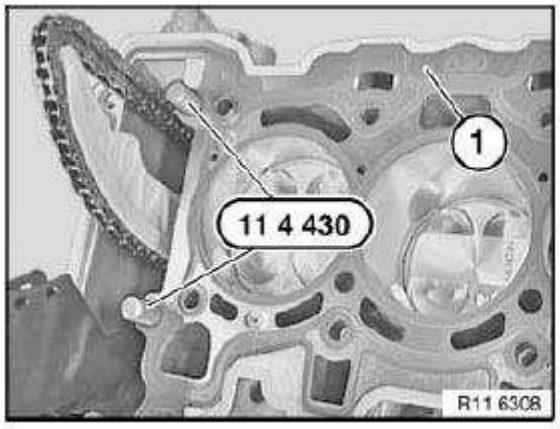


Fig. 41: Special Tool (11 4 430)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove coarse residues on sealing faces with special tool 11 4 471 from cylinder head and crankcase.

IMPORTANT: Do not use any metal-cutting tools.

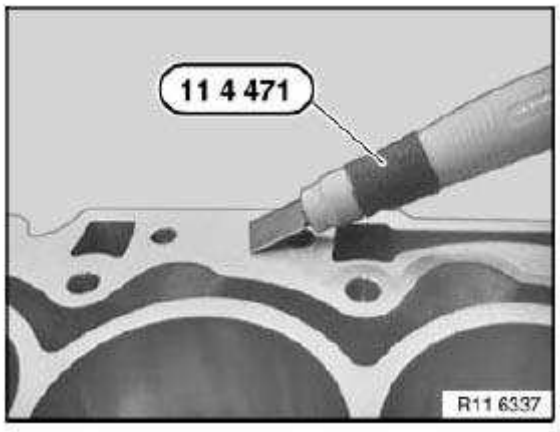


Fig. 42: Special Tool (11 4 471)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove fine residues on sealing faces with special tool 11 4 472 from cylinder head and crankcase.

IMPORTANT: Do not use any metal-cutting tools.
There must be no coolant, water or engine oil in the pocket holes.

Risk of corrosion and cracking!

Clean all pocket holes.

Replace cylinder head gasket.

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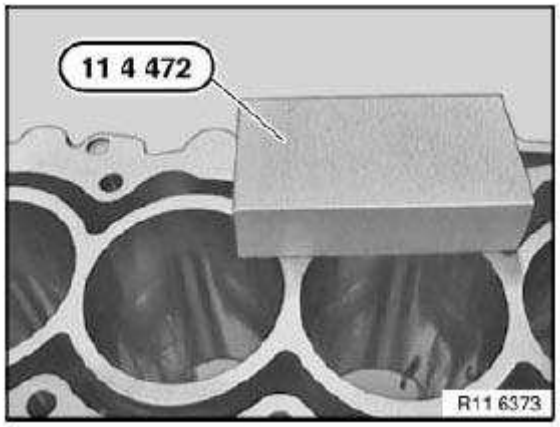


Fig. 43: Special Tool (11 4 472)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe sequence for tightening cylinder head bolts without fail.

Fit new cylinder head screws.

Insert cylinder head bolts (1 to 10) with special tool 11 8 580 .

Tightening torque: 11 12 1AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

Insert cylinder head bolts (11 to 14) with special tool 11 4 420 .

Tightening torque: 11 12 2AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

NOTE: Picture shows inlet and exhaust camshafts removed.

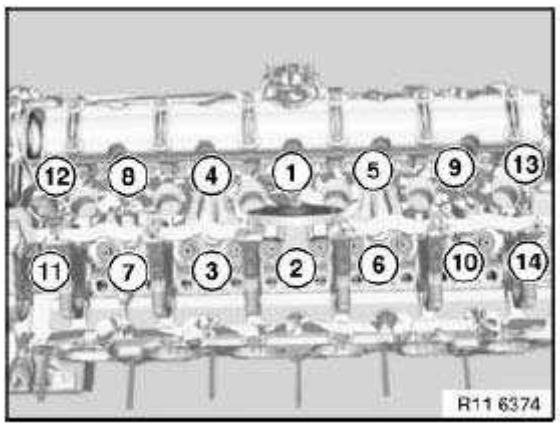


Fig. 44: Cylinder Head Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Observe sequence for tightening cylinder head bolts without fail.

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IMPORTANT: The 2nd torsion angle relates only to cylinder head bolts 1 to 10.

Installation:

- Jointing torque:

  All cylinder head bolts 1 to 14 to 30 Nm

- 1st angle of rotation:

  All cylinder head bolts 1 to 14 to 90°

- 2nd angle of rotation:

  Only cylinder head bolts 1 to 10 to 90°

- 3rd angle of rotation:

All cylinder head bolts 1 to 14 to 45°

Insert bolts (1).

Tightening torque: 11 12 4AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

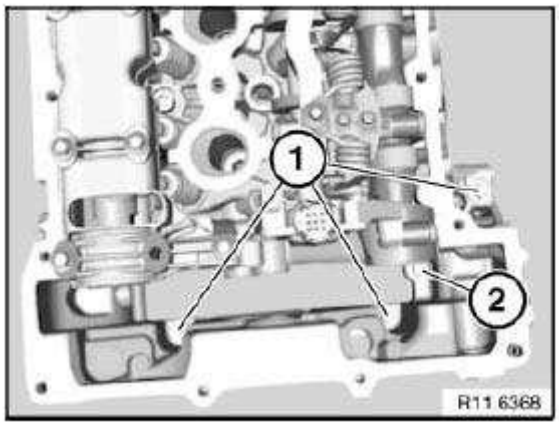
IMPORTANT: Secure bolt (2) with a gripper against falling down.

Insert bolt (2).

Tightening torque: 11 12 3AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

Installation:

Replace aluminum screws.



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Fig. 45: Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 12 101 REPLACING CYLINDER HEAD GASKET (N52K)

Special tools required:

- 11 4 430
- 11 4 470

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical corrosion.
A magnesium crankcase requires aluminum screws/bolts exclusively.
Aluminum screws/bolts must be replaced each time they are released .
The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.

Insert special tool 11 4 430 into bores.

Remove cylinder head seal.

IMPORTANT: Check marking (1) on cylinder head gasket (B25 or B30).

- **B = petrol/gasoline engine**
- **30= displacement (3 liters)**

Do not mix them up as this will cause engine damage .

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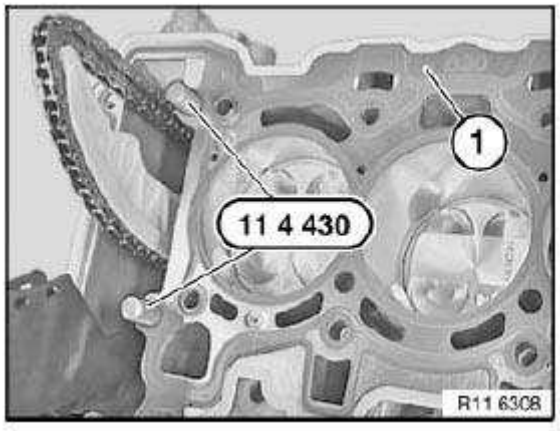


Fig. 46: Special Tool (11 4 430)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove remnants of oil and dirt from pocket holes (1).

IMPORTANT: Work on sealing face on engine block and on cylinder head with special tool 11 4 470 only.
Do not use any metal-cutting tools.

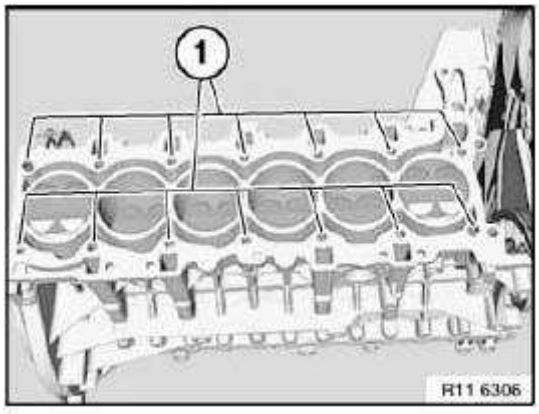


Fig. 47: Pocket Holes
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Rubber coating (2) on cylinder head gasket (3) must not under any circumstances be damaged (electrochemical corrosion).

Cylinder head gasket (3) is a sheet-metal gasket.

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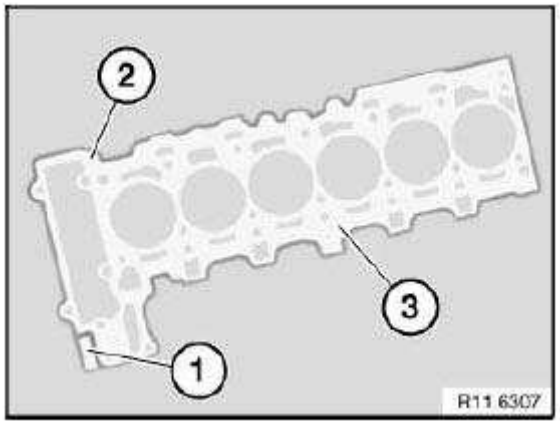


Fig. 48: Rubber Coating And Cylinder Head Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

Check adapter sleeves (1) for damage and firm seating.

Place cylinder head gasket (2) in direction of arrow on engine block.

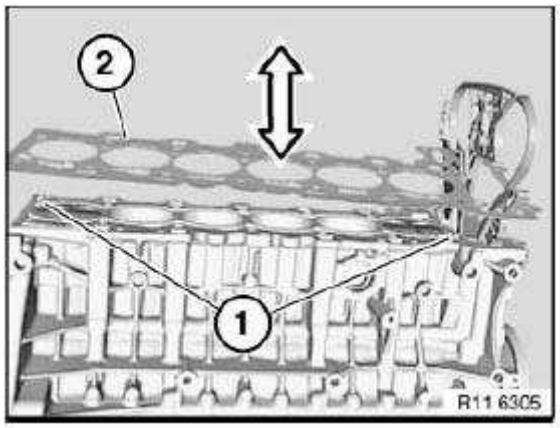


Fig. 49: Cylinder Head Gasket And Adapter Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check cylinder head for deviation from flatness, see 11 12 719 Resurfacing cylinder head sealing face (N52K).
Check cylinder head for water leaks, see 11 12 729 Checking cylinder head for water leaks (N52K).

Assemble engine.

11 12 719 RESURFACING CYLINDER HEAD SEALING FACE (N52K)

Necessary preliminary tasks:

- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.

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- Remove exhaust camshaft, see **11 31 028 Removing and installing/replacing exhaust camshaft (N52K)**.
- Remove intermediate lever on inlet side, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.

Check evenness of cylinder head sealing faces with a standard straight-edge (1).

NOTE: Max. deviation from level (longitudinal) 0.10 mm

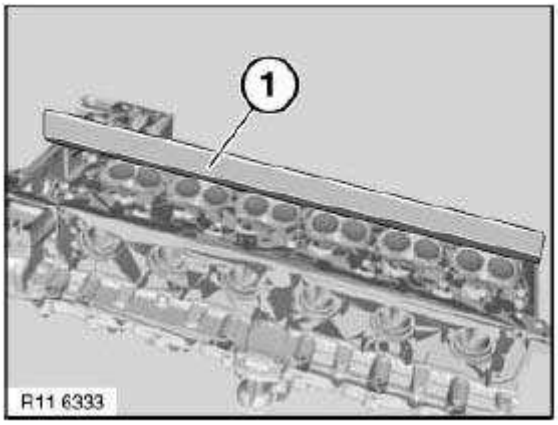


Fig. 50: Standard Straight-Edge On Cylinder Head Sealing Faces
Courtesy of BMW OF NORTH AMERICA, INC.

Check evenness of cylinder head sealing faces with a standard straight-edge (1).

NOTE: Max. deviation from level (transversal) 0.05 mm

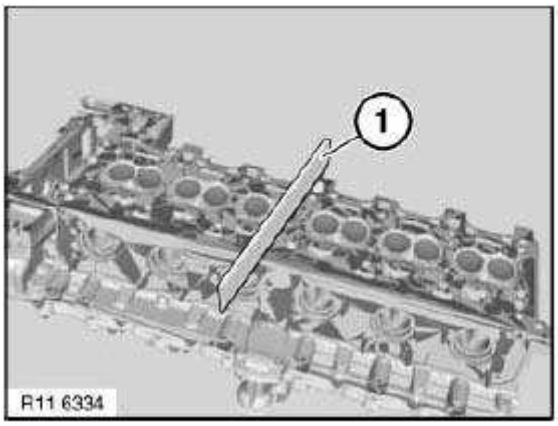


Fig. 51: Standard Straight-Edge On Cylinder Head Sealing Faces
Courtesy of BMW OF NORTH AMERICA, INC.

Check cylinder head for water leaks, see **11 12 729 Checking cylinder head for water leaks (N52K)**.

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Assemble engine.

11 12 729 CHECKING CYLINDER HEAD FOR WATER LEAKS (N52K)

Special tools required:

- 11 4 341
- 11 4 342
- 11 4 344
- 11 4 345

IMPORTANT: Pressure-test cylinder head to max. 3 bar.
Heat cylinder head to 60°.
Check for bubble formation in a water bath.

Necessary preliminary tasks:

- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Disassemble cylinder head, see **11 34 560 Replacing all valve stem seals (N52K)**.

NOTE: Observe mounting of special tool 11 4 341 on cylinder.

Secure special tool 11 4 341 with bolts 11 4 345 to 25 Nm.

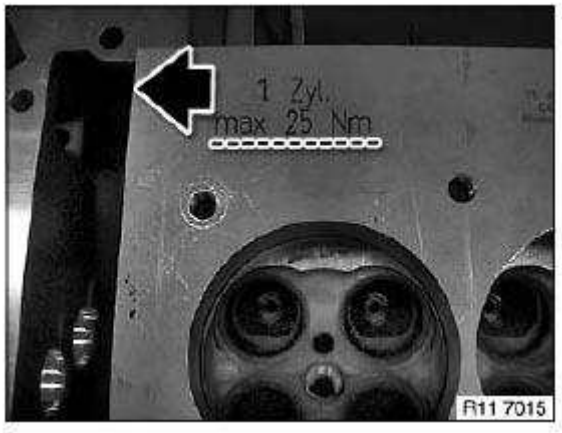


Fig. 52: Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool 11 4 341 with special tool 11 4 345 .

Installation:

Cylinder no. 1 is marked.

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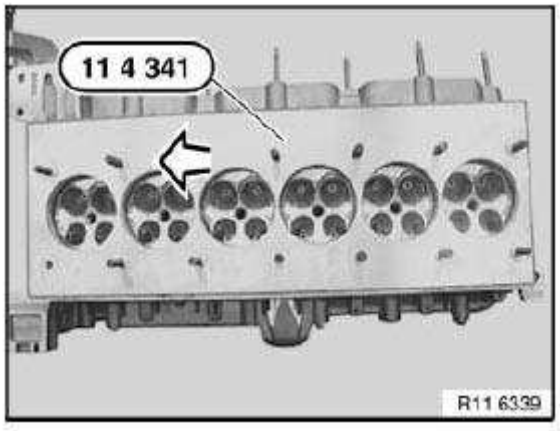


Fig. 53: Special Tool (11 4 341)
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 4 342 with bolts (1). Screw in knurled screw in direction of arrow.

Sealing flange must rest flat.

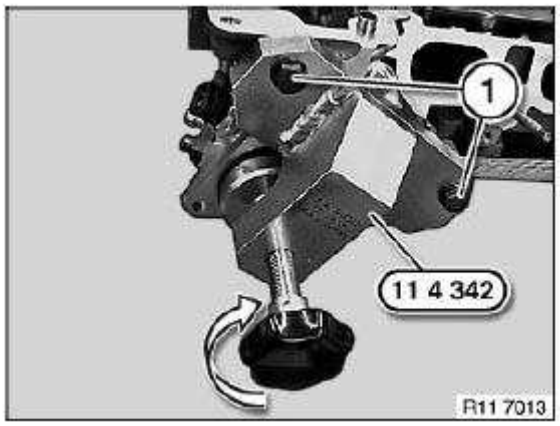


Fig. 54: Special Tool (11 4 342) With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 344 with bolts (1).

NOTE: Compressed air at valve max. 3 bar.
Heat cylinder head to 60°.
Check for bubble formation in a water bath.

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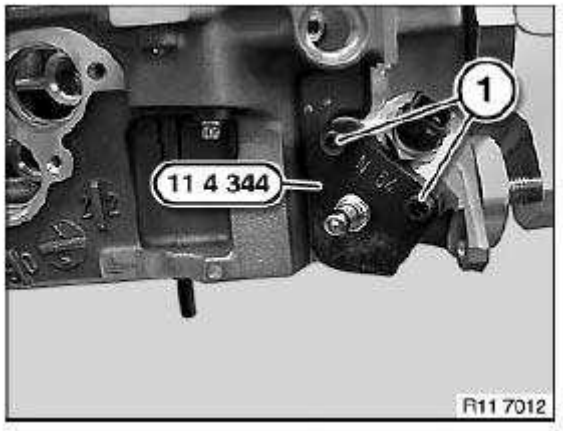


Fig. 55: Special Tool (11 4 344) With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

13 OIL SUMP

11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (N52K)

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical corrosion.
A magnesium crankcase requires aluminum screws/bolts exclusively.
Aluminum screws/bolts must be replaced each time they are released.
The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail.
Risk of damage!

Necessary preliminary tasks:

- Lower front axle, see **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (X3)** or **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (UNIVERSAL LIFTER) (X5)**
- Remove front differential, see **31 50 001 REMOVING AND INSTALLING/REPLACING FRONT DIFFERENTIAL (X3)** or **31 50 001 REMOVING AND INSTALLING/REPLACING FRONT DIFFERENTIAL (X5)** .

Release screw (1) from grounding cable (2) on right bearing block (3).

Lay grounding cable (2) to one side.

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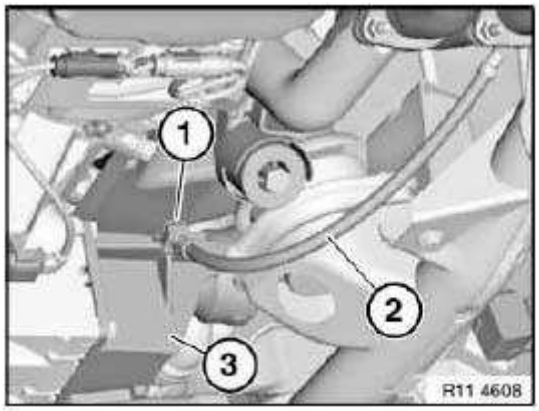


Fig. 56: Grounding Cable, Bearing Block And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Picture shows an E92 by way of example. Other model series may differ in certain details.

Unclip electric leads (2) of oxygen monitor sensors from holder (3).

Disconnect plug connections (1) of oxygen monitor sensors and lay to one side.

Release bolts (5) on transmission.

Tightening torque: 11 13 5AZ, see **11 13 OIL PAN** .

Disconnect plug connection (4) on oil level sensor.

Lay holder (3) to one side.

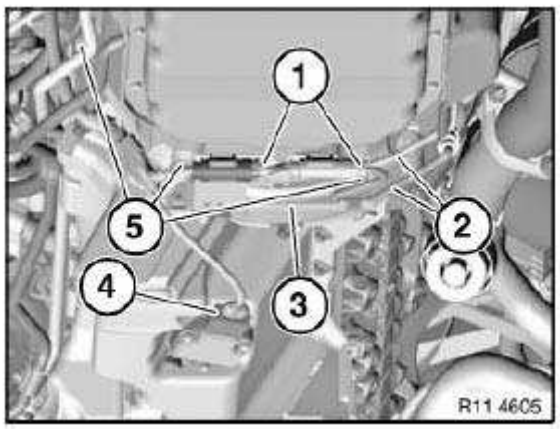


Fig. 57: Plug Connections, Holder, Electric Leads And Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles with optional extra SA205 (automatic transmission):

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NOTE: Transmission fluid cooler lines (2) (supply and return) are secured to the oil sump with two holders (3).

If necessary, release oil pump and lay to one side.

Unscrew nuts (1).

Tightening torque: 11 13 6AZ, see **11 13 OIL PAN** .

Release holders (3) with transmission fluid cooler lines (2) from oil sump guides.

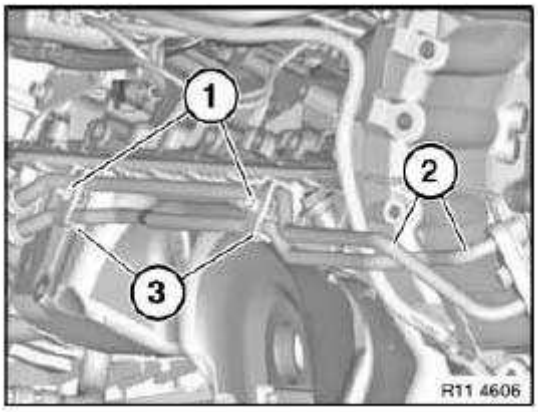


Fig. 58: Fluid Cooler Lines, Holders And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

For all vehicles:

NOTE: For purposes of clarity, the picture shows the front axle carrier and stabilizer bar removed.

Unscrew nut (3).

Tightening torque: 11 13 7AZ, see **11 13 OIL PAN** .

Release screw (2).

Tightening torque: 11 13 8AZ, see **11 13 OIL PAN** .

Release both holders with coolant hose (1) from oil sump guide.

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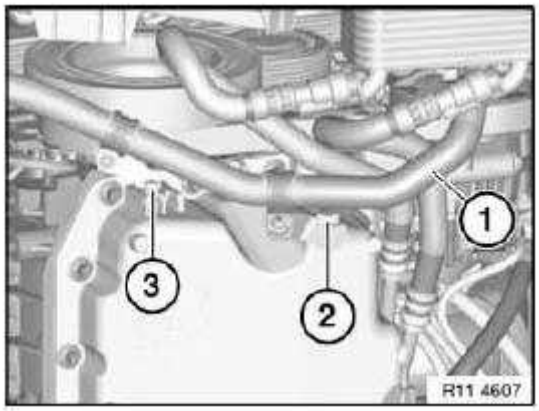


Fig. 59: Coolant Hose, Screw And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Bolts of oil sump have different lengths. Observe different tightening torques.

Release bolts along line (1).

Tightening torque: 11 13 2AZ, see **11 13 OIL PAN** .

Tightening torque: 11 13 3AZ, see **11 13 OIL PAN** .

Installation:

Replace aluminum screws.

If necessary, remove oil level sensor (2) and right bearing block (3).

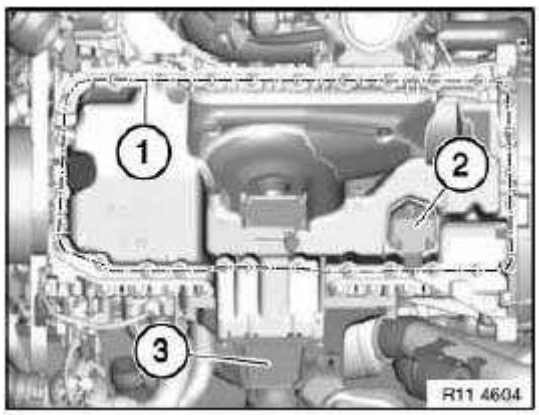


Fig. 60: Oil Level Sensor And Bearing Block
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: There must be no adhesive residues in the bedplate retaining threads.

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Clean retaining threads.

Installation:

Replace all seals.

Assemble engine.

14 HOUSING COVER

11 14 005 REPLACING FRONT CRANKSHAFT RADIAL SEAL (N52K)

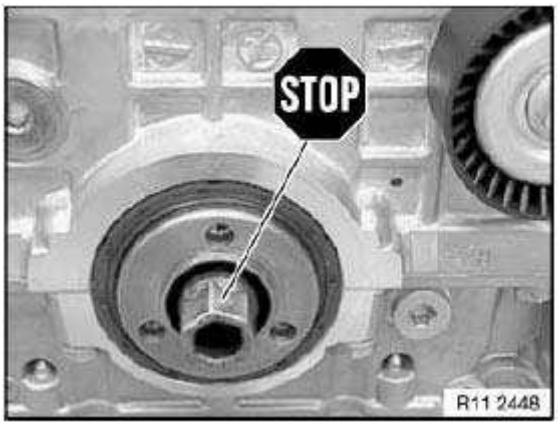
Special tools required:

- 11 9 221
- 11 9 222
- 11 9 223
- 11 9 224
- 11 9 231
- 11 9 232
- 11 9 233

Necessary preliminary tasks:

- Remove **VIBRATION DAMPER**

IMPORTANT: Do not release central bolt.
If the central bolt is released, the sprocket wheels of the timing chain and the oil pump will no longer be non - positively connected to the crankshaft. Inlet and exhaust camshafts can turn in relation to crankshaft.
Risk of damage!



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Fig. 61: Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Turn back special tool 11 9 222 .

Push special tool 11 9 221 onto crankshaft.

IMPORTANT: When screws are tightened down (special tool 11 9 224) , crankshaft radial seal is pressed inwards approx. 1 mm and thus slackened for subsequent removal.

Insert screws (special tool 11 9 224) and tighten down to approx. 20 Nm.

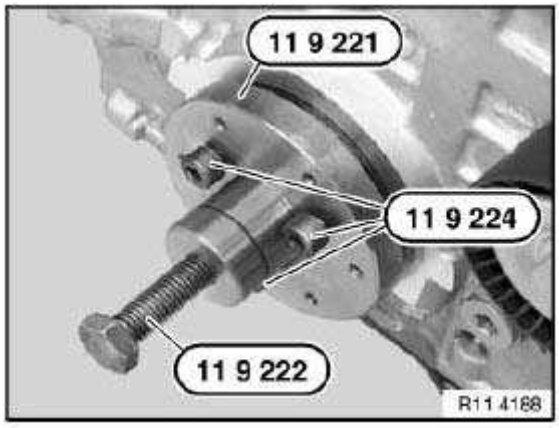


Fig. 62: Special Tools (11 9 221), (11 9 222) And (11 9 224)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screws (special tool 11 9 223) and screw in until they make contact without play.

IMPORTANT: Do not overload special tool 11 9 223 (metal screws).

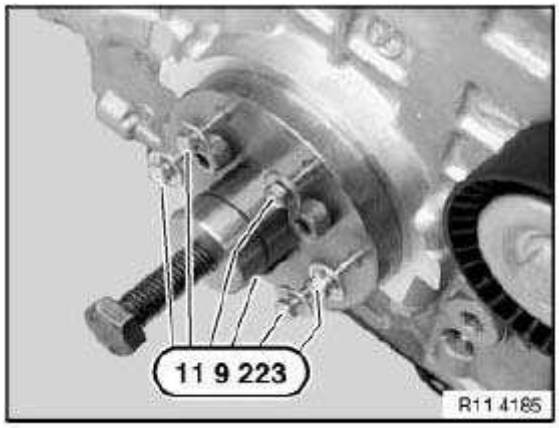


Fig. 63: Special Tool (11 9 223)
Courtesy of BMW OF NORTH AMERICA, INC.

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Remove screws (special tool 11 9 224).

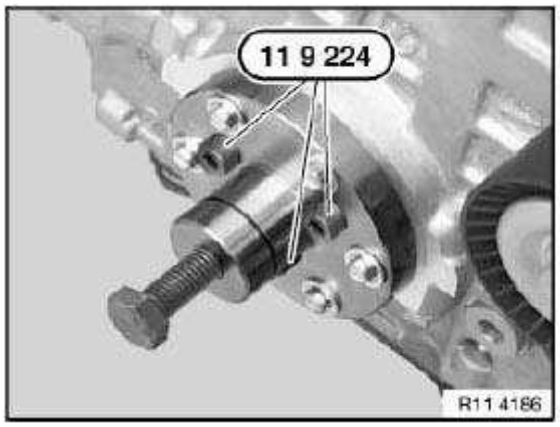


Fig. 64: Special Tool (11 9 224)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw (special tool 11 9 222) carefully and slowly withdraw crankshaft radial seal (1).

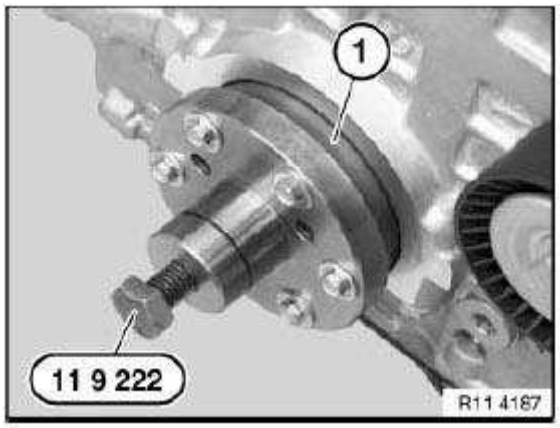


Fig. 65: Special Tool (11 9 222)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean sealing surface (1) and degrease thoroughly in area of housing partition.

Apply a light coat of oil to running surface (2) of crankshaft radial seal.

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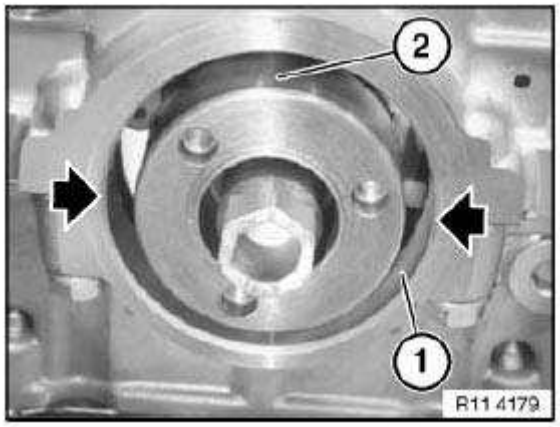


Fig. 66: Sealing And Running Surface
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Support bushing (1) is contained in scope of delivery of crankshaft radial seal (2).
When crankshaft radial seal (2) is installed, only support bushing (1) may be used as a slip bushing.

Crankshaft radial seal (2) has a groove on both left and right sides.

IMPORTANT: After installation, the grooves must be filled with sealing compound.

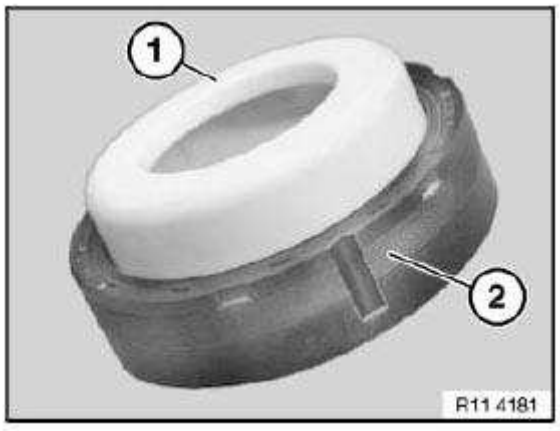


Fig. 67: Crankshaft Radial Seal And Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

Attach support bushing (2) with crankshaft radial seal (1).

Push on crankshaft radial seal (1) in direction of arrow.

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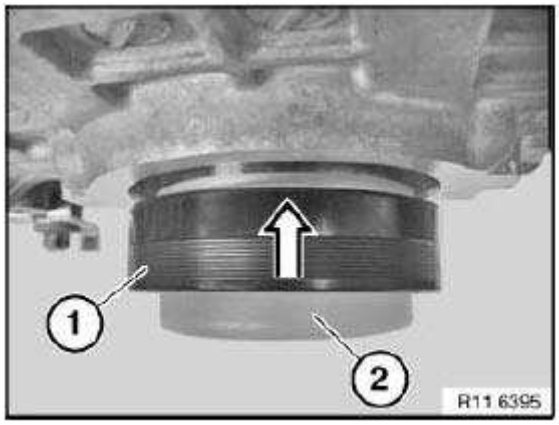


Fig. 68: Pushing Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Pay attention to opening on crankshaft radial seal (1) on left and right.

Remove support bushing (2).

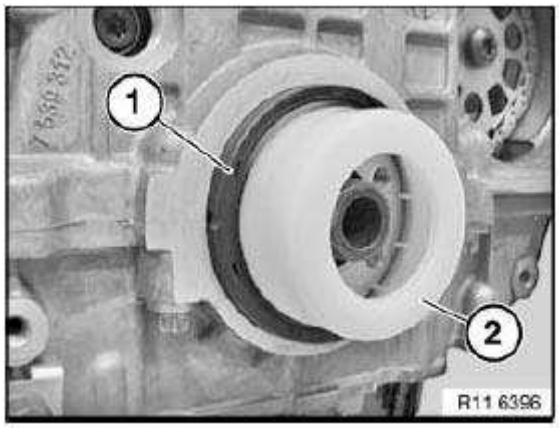


Fig. 69: Crankshaft Radial Seal And Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The following text describes installation and sealing between the engine block and crankshaft radial seal.
The engine block will not be leakproof at the outside of the crankshaft radial seal if you fail to comply with the individual work steps and the work sequence.

NOTE: The required parts are available from the BMW Parts Service (EPC).

Remove screw caps (1) from injector (2).

Screw on metering needle.

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Insert piston for pressing out.

Injector (2) contains the sealing compound Loctite, manufacturer's number 128357.

Bottle (3) contains the primer Loctite, manufacturer's number 171000.

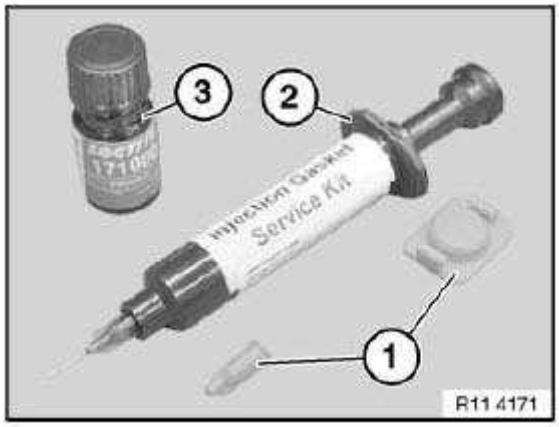


Fig. 70: Screw Caps, Injector And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 9 232 .

Coat both grooves on crankshaft radial shaft seal with Loctite primer, manufacturer's number 171000, and expose to air for approx. one minute.

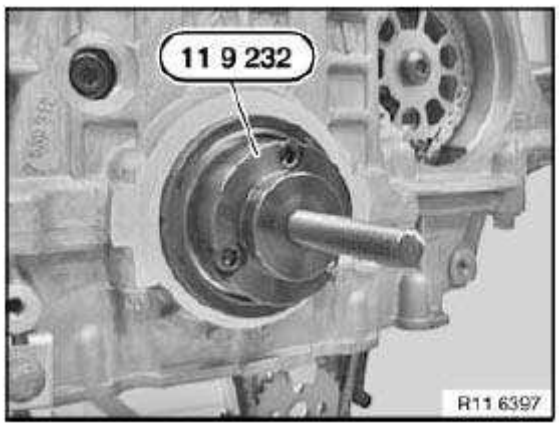


Fig. 71: Special Tool (11 9 232)
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in crankshaft radial seal with special tool 11 9 231 in conjunction with special tool 11 9 233 until flush.

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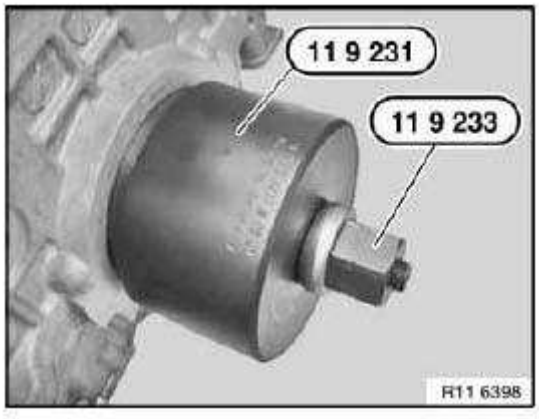


Fig. 72: Crankshaft Radial Seal And Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

Moisten brush with Loctite primer, manufacturer's number 171000. Insert brush as far as possible into grooves (1) on crankshaft radial seal in order to coat housing partition on engine block.

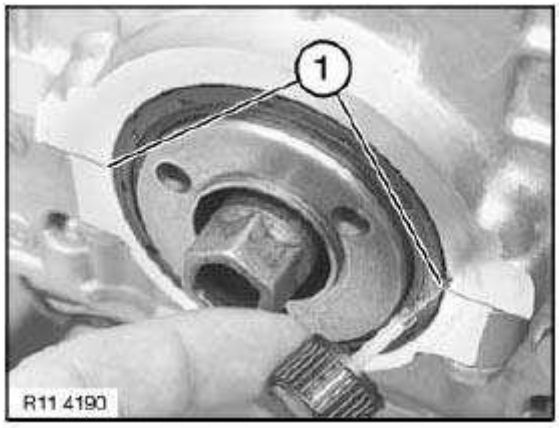


Fig. 73: Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Using injector (2), fill both grooves (3) flush with Loctite sealing compound, manufacturer's number 128357.

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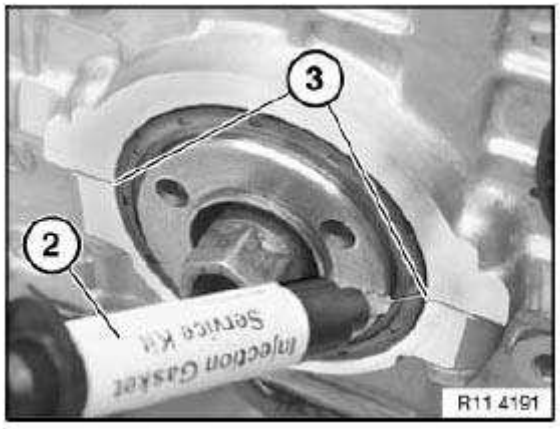


Fig. 74: Injector And Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Loctite primer, manufacturer's number 171000, binds the Loctite sealing compound, manufacturer's number 128357, and prevents leakage.

Coat surface of sealing compound in both grooves (1) with Loctite primer, manufacturer's number 171000.

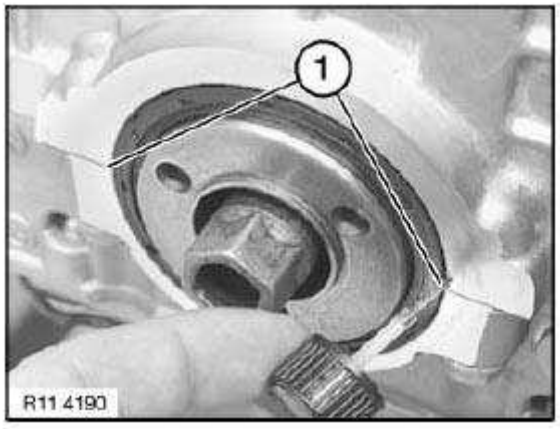


Fig. 75: Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 010 REPLACING SEALING COVER FOR VACUUM PUMP (N52K)

Special tools required:

- 11 4 361
- 11 4 362
- 11 4 363
- 11 4 364

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- 11 9 200

Necessary preliminary tasks:

- Remove fan cowl with electric fan
- Remove alternator drive belt
- Remove drive belt tensioner

NOTE: The procedure is the same as for the crankshaft radial seal. Expose removal openings on sealing cover.

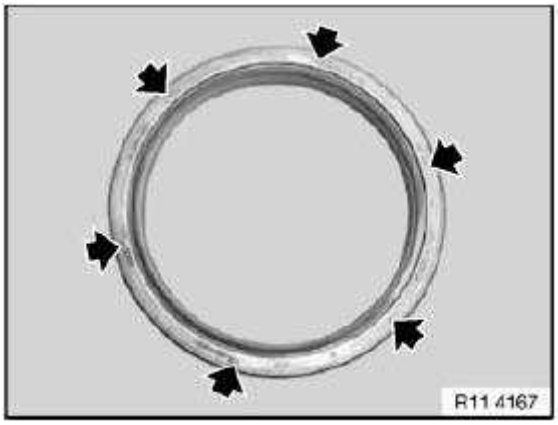
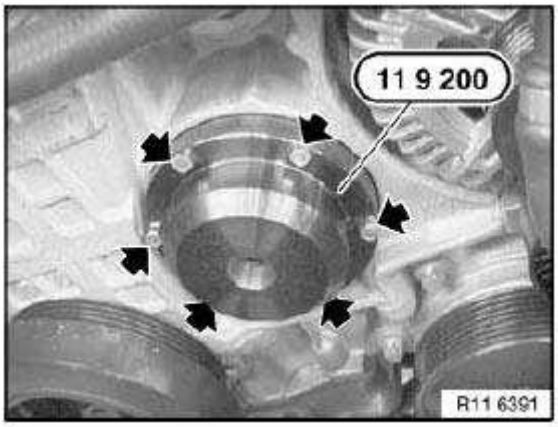


Fig. 76: Locating Openings On Sealing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Convert special tool 11 9 200 (see illustration).

Screw special tool 11 9 200 onto sealing cover.

NOTE: Insert screws until flush only with special tool 11 9 200 .



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Fig. 77: Special Tool (11 9 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 11 4 362 .

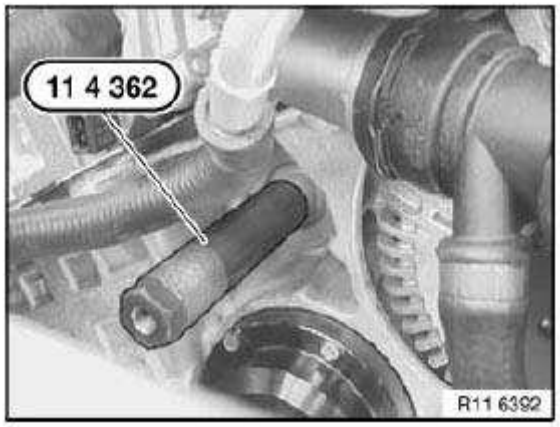


Fig. 78: Special Tool (11 4 362)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 4 361 to bedplate construction screw connection (see arrow).

Secure with knurled screw (1).

Screw special tool 11 4 364 into special tool 11 9 200 and screw out in direction of arrow.

NOTE: For purposes of clarity, the picture shows the alternator and power steering pump removed.

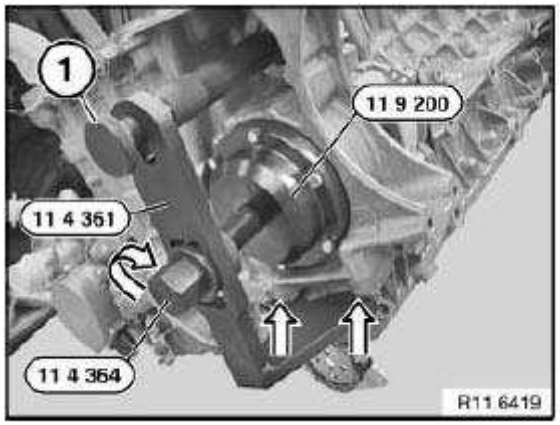


Fig. 79: Special Tools (11 4 361), (11 4 364) And (11 9 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Prepare new sealing cover (1) with special tool 11 9 200 **without** screws.

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Screw in sealing cover with special tool 11 4 363 until it is flush.

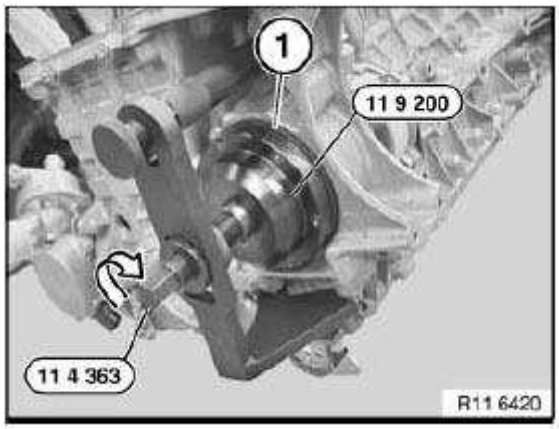


Fig. 80: Special Tools (11 9 200) And (11 4 363)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 151 REPLACING CRANKSHAFT RADIAL SEAL (TRANSMISSION SIDE) (N52K)

Special tools required:

- 11 9 181
- 11 9 182
- 11 9 183
- 11 9 184
- 11 9 200

Necessary preliminary tasks:

- Remove transmission
- Remove flywheel, see **11 22 500 Removing and installing/replacing flywheel (N52K)**

NOTE: Crankshaft radial seal has six removal openings for removal with special tool 11 9 200 .

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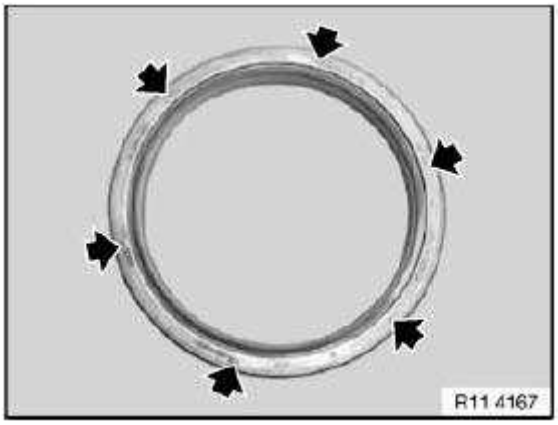


Fig. 81: Locating Openings On Sealing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If necessary, remove rubber coating (1) on top side of crankshaft radial seal and expose a removal opening (2) (see illustration).

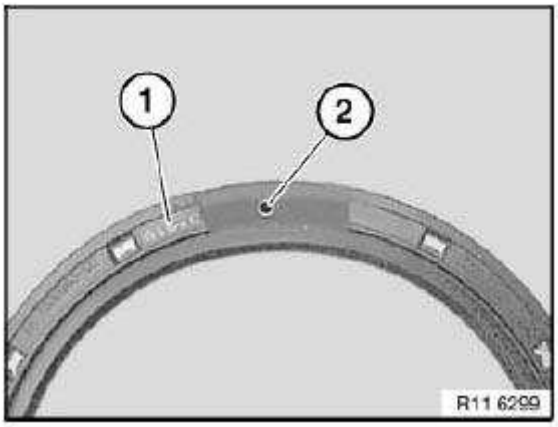


Fig. 82: Rubber Coating And Crankshaft Radial Seal Removal Opening
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 9 200 . Insert sheet metal screws into removal opening of crankshaft radial seal and fasten without play (do **not** overtighten sheet metal screws).

Screw in spindle (1) slowly and carefully and detach crankshaft radial seal.

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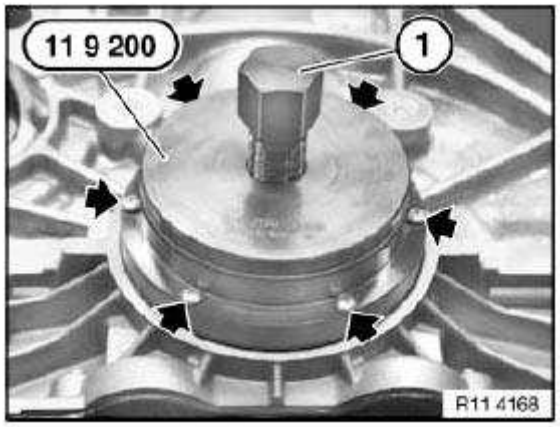


Fig. 83: Special Tool (11 9 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean sealing surface (1) and degrease thoroughly in area of housing partition.

Apply a light coat of oil to running surface (2) of crankshaft radial seal.

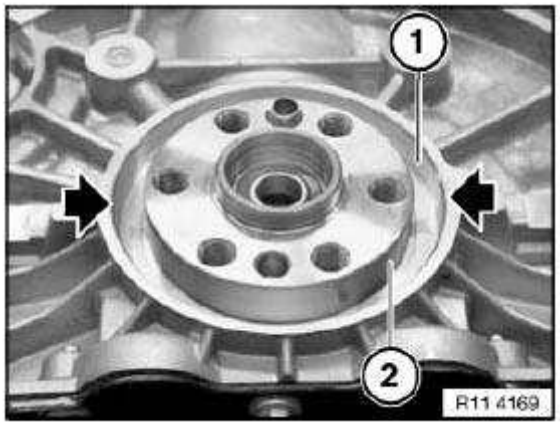


Fig. 84: Sealing And Running Surface Of Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Support bushing (4) is contained in scope of delivery of crankshaft radial seal (1).
When crankshaft radial seal (1) is installed, only support bushing (4) may be used as a slip bushing.
Crankshaft radial seal (1) has a groove (2) on both left and right sides.

IMPORTANT: After installation, grooves (2) must be filled with sealing compound.

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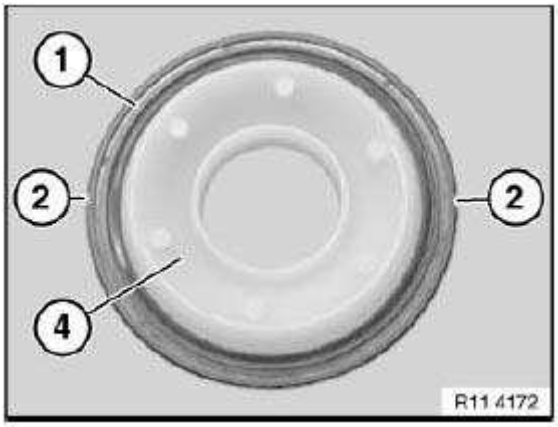


Fig. 85: Bushing, Crankshaft Radial Seal And Grooves
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The following text describes installation and sealing between the engine block and crankshaft radial seal.
The engine block will not be leakproof at the outside of the crankshaft radial seal if you fail to comply with the individual work steps and the work sequence.

NOTE: The required parts are available from the BMW Parts Service (ETK).
Remove screw caps (1) from injector (2).

Screw on metering needle.

Insert piston for pressing out.

Injector (2) contains the sealing compound Loctite, manufacturer's number 128357.

Bottle (3) contains the primer Loctite, manufacturer's number 171000.

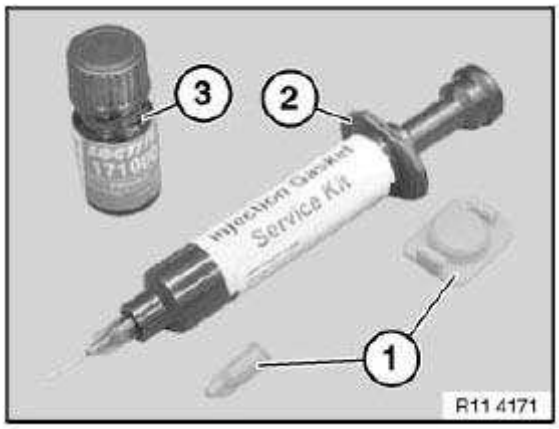


Fig. 86: Screw Caps, Injector And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

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Installation:

Fit support bushing (4) with crankshaft radial seal (1) on crankshaft.

Align groove (2) centrally to housing partition (3).

Coat both grooves (2) on crankshaft radial seal (1) with Loctite primer, manufacturer's number 171000, and expose to air for approx. one minute.

Push crankshaft radial seal (1) by hand as far as possible onto running surface.

Carefully remove support sleeve (4).

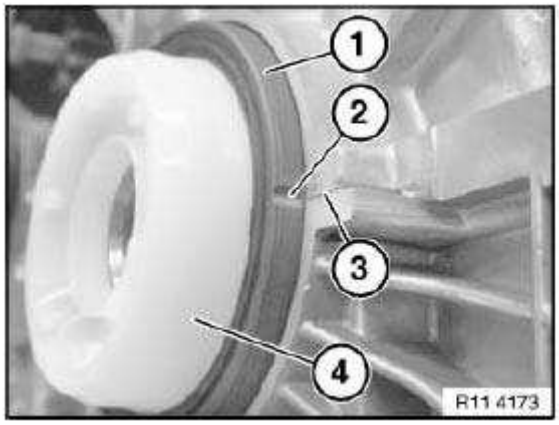
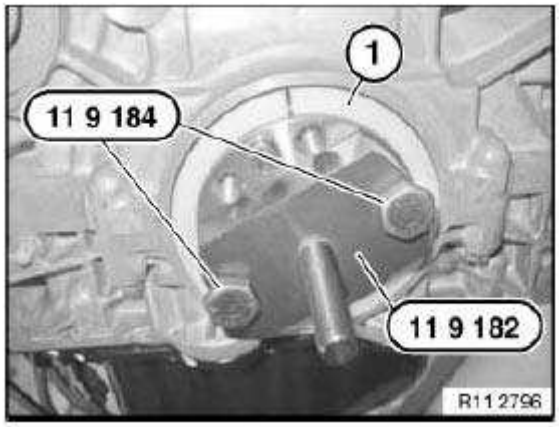


Fig. 87: Support Bushing, Crankshaft Radial Seal With Groove And Housing Partition
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Spacer ring (1) is supplied with radial shaft seal.

Screw special tool 11 9 182 with screws (special tool 11 9 184) to crankshaft.

Fit spacer ring (1) on preassembled radial shaft seal.



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Fig. 88: Special Tools (11 9 184) And (11 9 182)
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in radial shaft seal and spacer ring with special tool 11 9 181 in conjunction with special tool 11 9 183 .

Then remove spacer ring again.

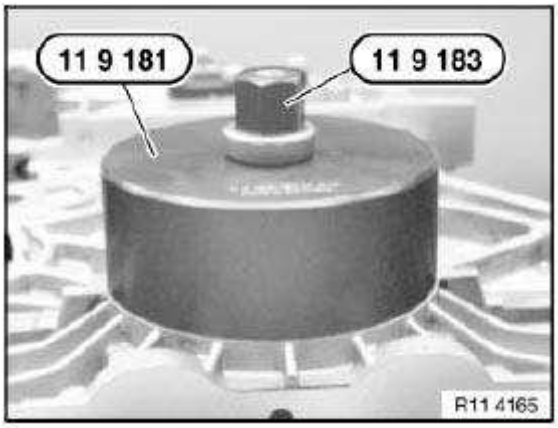


Fig. 89: Special Tools (11 9 181) And (11 9 183)
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

Moisten brush with Loctite primer, manufacturer's number 171000. Insert brush as far as possible into grooves (1) on crankshaft radial seal in order to coat housing partition on engine block.

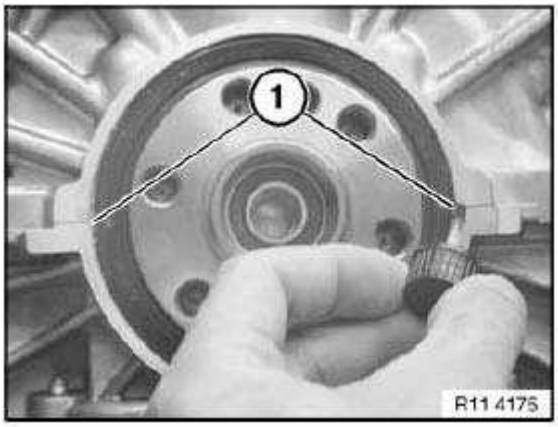


Fig. 90: Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Using injector, fill both grooves (1) flush with Loctite sealing compound, manufacturer's number 128357.

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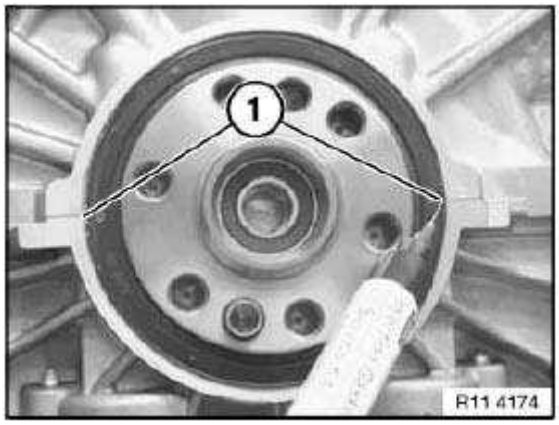


Fig. 91: Grooves With Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Loctite primer, manufacturer's number 171000, binds the Loctite sealing compound, manufacturer's number 128357, and prevents leakage. Coat surface of sealing compound in both grooves (1) with Loctite primer, manufacturer's number 171000.

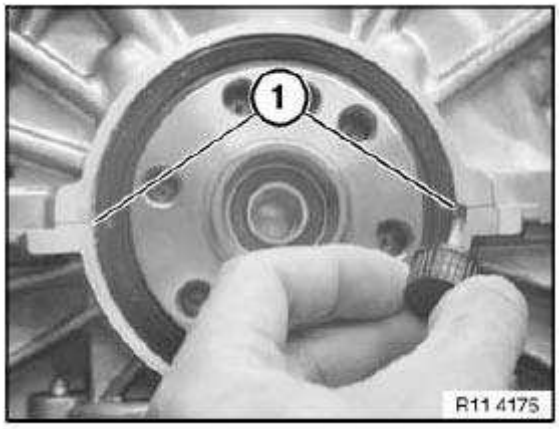


Fig. 92: Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

21 CRANKSHAFT WITH BEARING

11 21 500 REPLACING CRANKSHAFT (N52K)

Special tools required:

- **00 2 510 DIAL GAUGE WITH FEELER**
- **00 9 120 TORQUE ANGLE MEASURING DIAL**

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- 11 4 370
- 11 4 440
- 11 4 470
- 11 9 360

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical corrosion.
A magnesium crankcase requires aluminum screws/bolts exclusively.
Aluminum screws/bolts must be replaced each time they are released.
The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove engine
- Mount engine on assembly stand, see **Mounting engine on assembly stand (N52K)**.
- Remove **VIBRATION DAMPER**
- Remove oil sump
- Remove oil pump, see **11 41 000 Removing and installing/replacing oil pump (N52K)**
- Remove oil pump/vacuum pump chain module, see **11 41 010 Removing and installing/replacing chain module for oil pump/vacuum pump (N52K)**
- Remove timing chain module, see **11 31 051 Replacing timing chain (N52K)**
- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove flywheel, see **11 22 500 Removing and installing/replacing flywheel (N52K)**
- Removing all pistons, see **11 25 530 Removing and installing/replacing all pistons (N52K)**

Release screws (1).

Tightening torque: 11 13 6AZ, see **11 13 OIL PAN** .

Installation:

Replace aluminum screws.

Remove oil deflector (2).

NOTE: Picture shows the screw connection of the oil deflector (2) for vehicles with optional extra SA203 (all-wheel drive).

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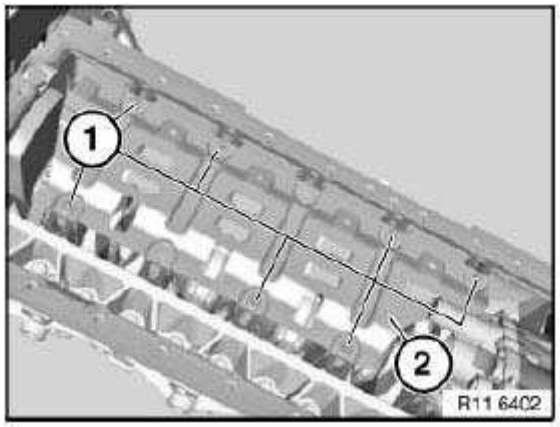


Fig. 93: Oil Deflector And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: 11 11 2AZ, see **11 11 CRANKCASE** .

Release screws (2).

Tightening torque: 11 11 3AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

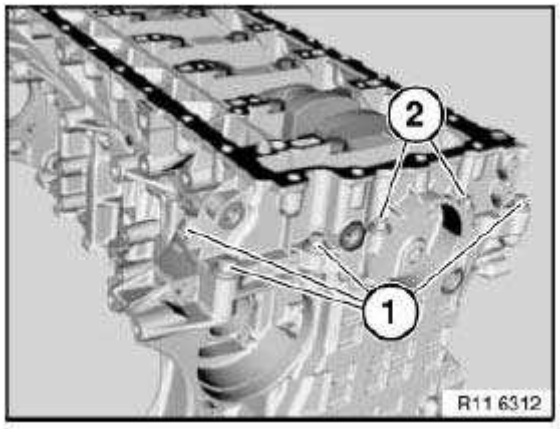


Fig. 94: Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: 11 11 4AZ, see **11 11 CRANKCASE** .

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Release screws (2).

Tightening torque: 11 11 2AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

Release steel screws (1 to 14) from outside inwards.

Tightening torque: 11 11 1AZ, see **11 11 CRANKCASE** .

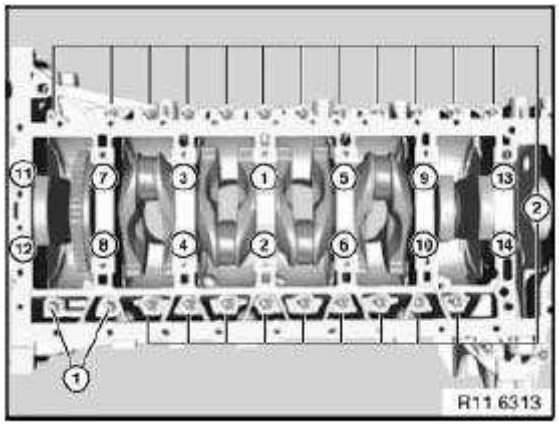


Fig. 95: Crankshaft Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: 11 11 3AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

Lift out bedplate.

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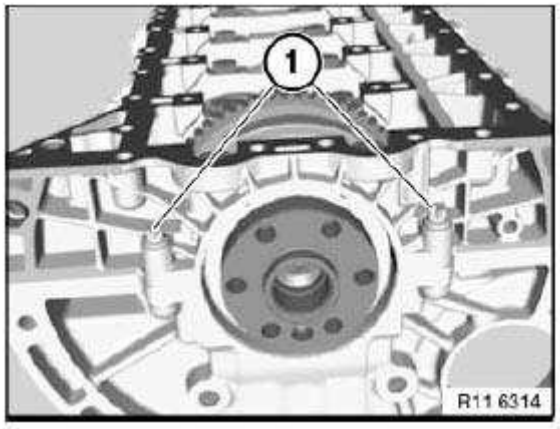


Fig. 96: Bedplate Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove crankshaft (1) in direction of arrow.

IMPORTANT: Remove crankshaft with aid of a second person.
Weight of crankshaft approx. 25 kg.

Remove bearing shells (2) and guide bearing shell (3), replace if necessary, see **11 21 531 Replacing all main crankshaft bearing shells (N52K)**.

Clean all sealing faces with special tool 11 4 470 .

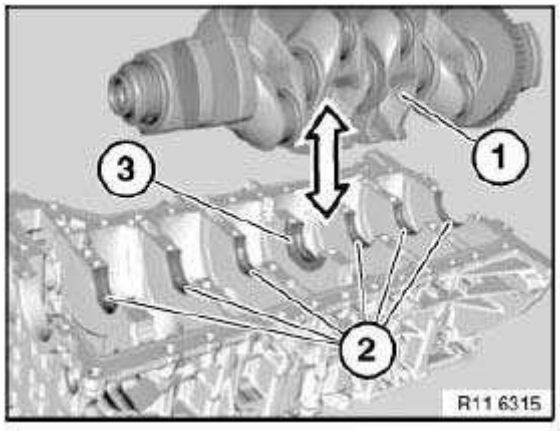


Fig. 97: Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Check adapter sleeves (1) for damage and secure seating; replace if necessary.

Install all bearing shells, see **11 21 531 Replacing all main crankshaft bearing shells (N52K)**.

Installation:

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Lubricate all bearing points with engine oil.

NOTE: Picture shows N46.

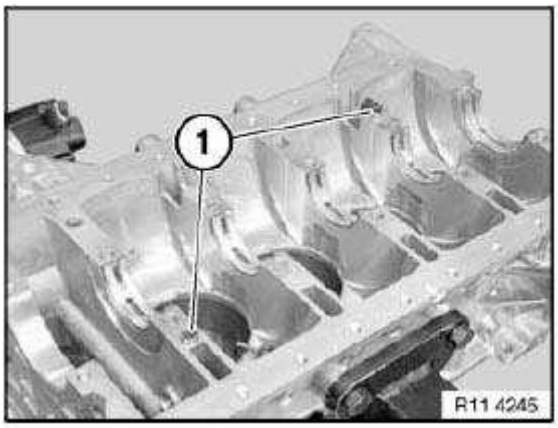


Fig. 98: Adapter Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Insert crankshaft (1).

IMPORTANT: Install crankshaft with aid of a second person.
Weight of crankshaft approx. 25 kg.

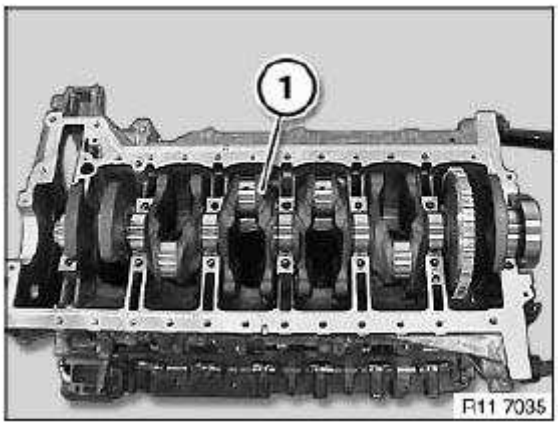


Fig. 99: Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten steel screws (1 to 14) from inside outwards.

Tightening torque: 11 11 1AZ, see **11 11 CRANKCASE** .

Tighten screws (2) from inside outwards.

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Tightening torque: 11 11 2AZ, see **11 11 CRANKCASE** .

Tighten screws (1).

Tightening torque: 11 11 4AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

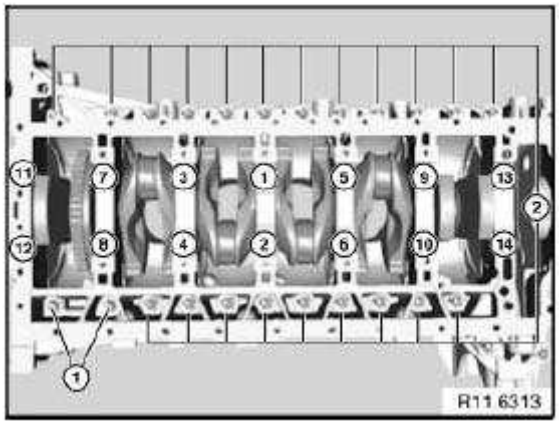


Fig. 100: Crankshaft Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten aluminum screws exclusively with special tool 00 9 120 .

IMPORTANT: In the case of aluminum screws, jointing torque and angle of rotation must be observed without fail.

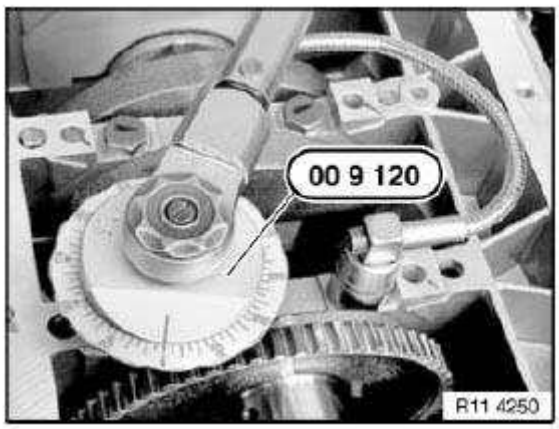


Fig. 101: Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Set up stand with magnetic foot (1) on special tool 11 4 440 .

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Set up special tool 00 2 510 on stand.

Position special tool 00 2 510 on crankshaft.

Move crankshaft in direction of arrow.

Determine bearing play .

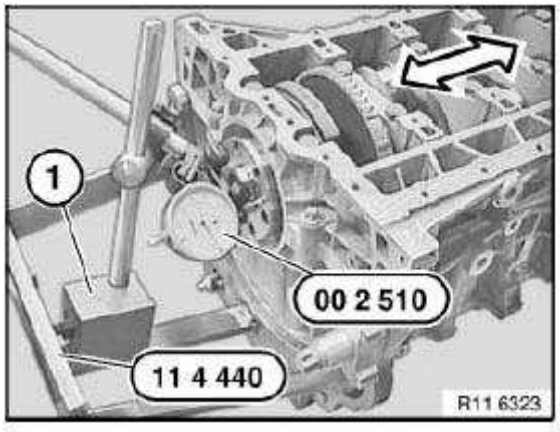


Fig. 102: Moving Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Drive in both nozzles (1) with special tool 11 9 360 on left and right into crankcase.

Installation:

Always replace nozzles (1).

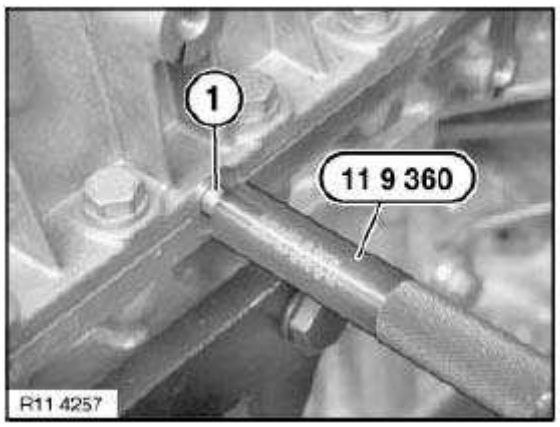


Fig. 103: Nozzles With Special Tool (11 9 360)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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Prepare sealing compound (1) in special tool 11 4 370 .

Screw on nozzle (2) for injecting sealing compound.

Slowly insert sealing compound (1) with special tool 11 4 370 in direction of arrow.

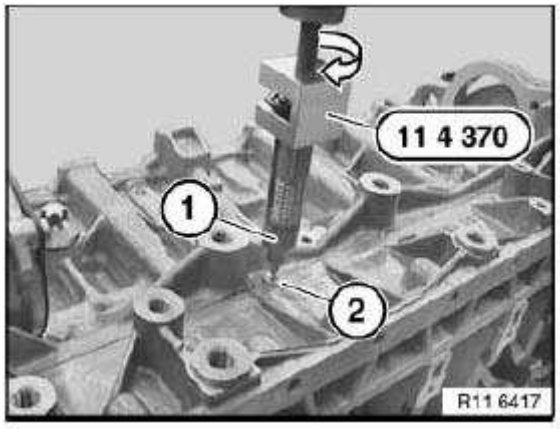


Fig. 104: Inserting Sealing Compound With Special Tool (11 4 370)
Courtesy of BMW OF NORTH AMERICA, INC.

Replace crankshaft radial seal at front, see **11 14 005 Replacing front crankshaft radial seal (N52K)**.

Replace crankshaft radial seal (transmission side), see **11 14 151 Replacing crankshaft radial seal (transmission side) (N52K)**.

Assemble engine.

11 21 505 SEALING THE CRANKCASE'S LOWER PART (N52K)

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

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

For reliable identification:

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

Risk of damage!

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Joining torque and angle of rotation must be observed without fail.

IMPORTANT: Changed procedure.
It is not necessary to remove the cylinder head and the crankshaft.

Necessary preliminary tasks

- Remove ENGINE.
- .
- Remove CLUTCH (if fitted). See **21 21 500 REMOVING AND INSTALLING/REPLACING CLUTCH (SAC) (X3)**
- Remove left and right engine support arm
- Remove **OIL SUMP**.

Release screws (1).

Pull out oil pump intake pipe (2).

Tightening torque: 11 13

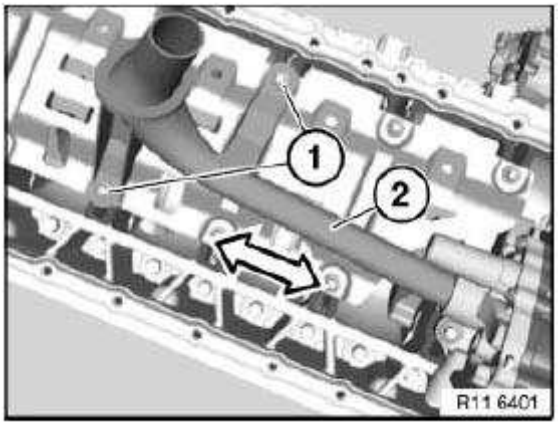


Fig. 105: Removing Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque, see 11 13 6AZ in **11 13 OIL PAN** .

Installation:

Replace aluminum screws

Remove oil deflector (2).

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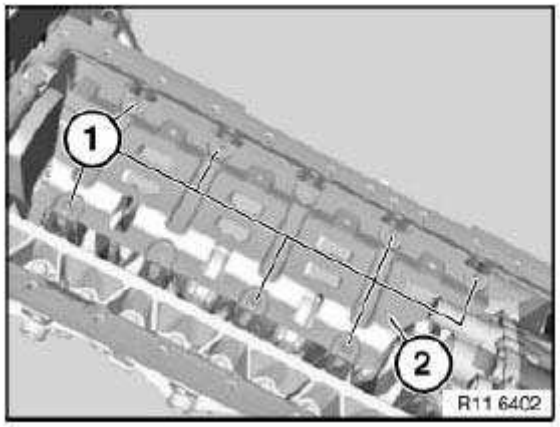


Fig. 106: Identifying Screws And Oil Deflector
Courtesy of BMW OF NORTH AMERICA, INC.

Secure oil pump sprocket with steel pin 6.0 mm (3) to oil pump.

IMPORTANT: Release central bolt (2) only together with steel pin 6.0 mm (3). Do not remove sprocket.

Release central bolt (2).

Tightening torque, see 11 41 6AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

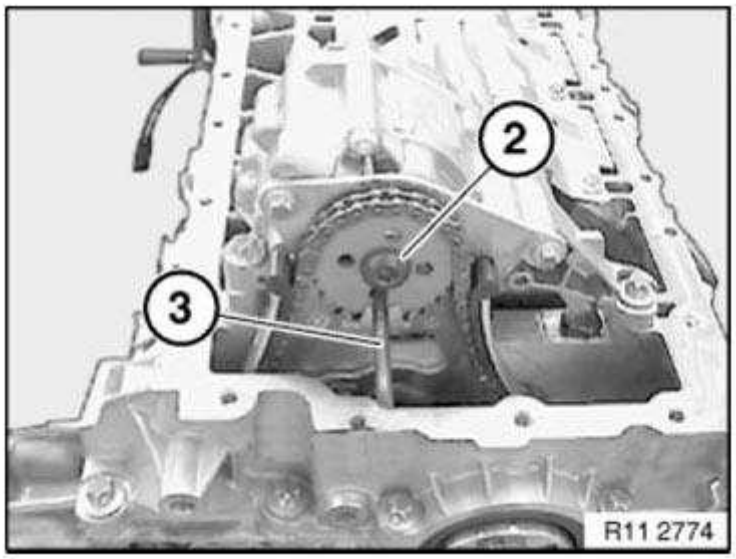


Fig. 107: Identifying Oil Deflector And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

Tightening torque: see 11 41 5AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

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Installation:

Replace aluminum screws

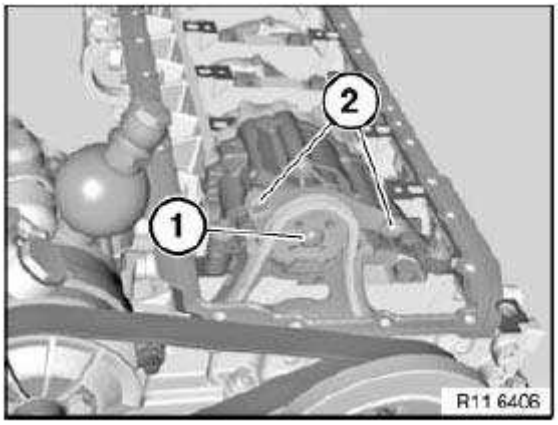


Fig. 108: Identifying Bolt And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw plug (1) from crankcase at front.

NOTE: Replace gasket.

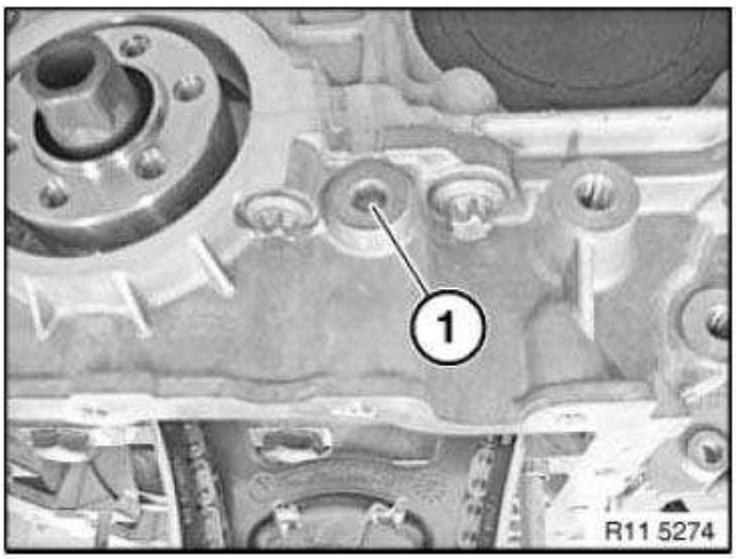


Fig. 109: Identifying Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) for oil pump triangular drive with special tool **11 8 640** .

NOTE: It is not necessary to remove the triangular drive.

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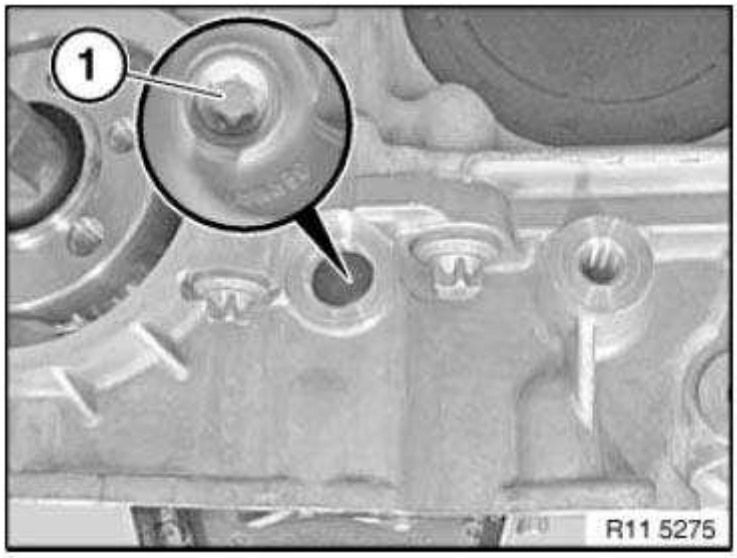


Fig. 110: Identifying Oil Pump Triangular Drive Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Version 1

IMPORTANT: Observe different screw lengths.

Release screws (1).

Tightening torque, see 11 41 2AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Tightening torque, see 11 41 3AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws

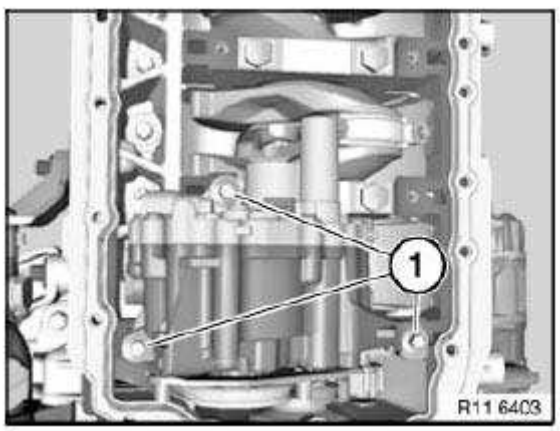


Fig. 111: Identifying Screws

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Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

IMPORTANT: Observe different screw lengths.
Release oil pump screws (1).
Tightening torque, see 11 41 2AZ in 11 41 OIL PUMP WITH STRAINER AND DRIVE .
Installation:

Replace aluminum screws

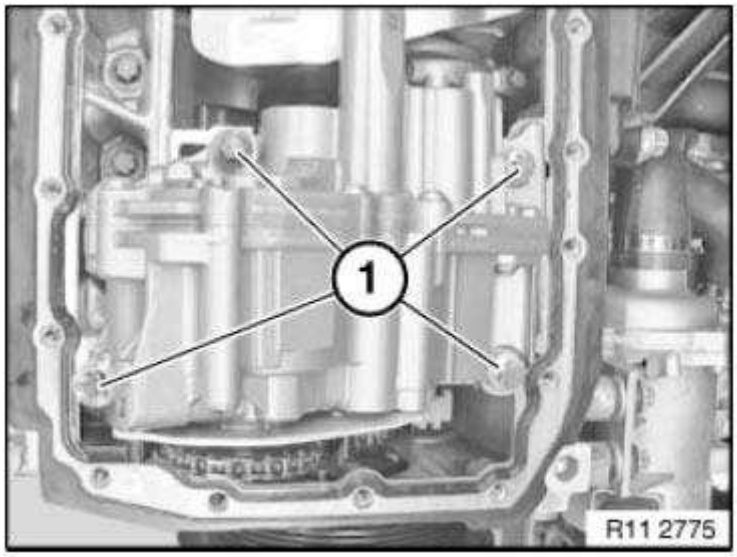


Fig. 112: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach sprocket (1) in direction of arrow.

NOTE: The chain tensioner pushes the timing chain (3) of the triangular drive upward.

Do **not** remove camshaft sprocket.

Remove oil pump (2) in direction of arrow.

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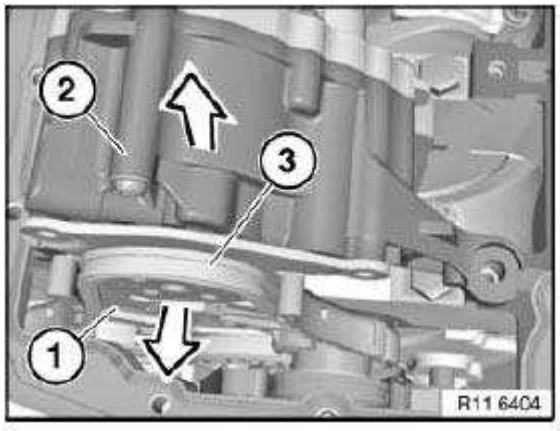


Fig. 113: Pulling Drive Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check spacer bushings (1) for secure seating and damage; replace if necessary.

Align twin surface (3) on oil pump (2) to sprocket wheel.

Install oil pump (2).

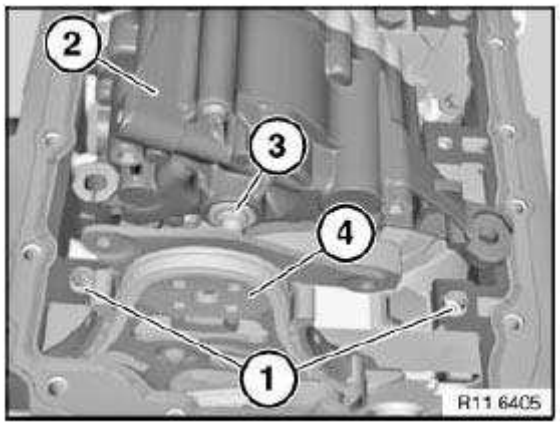


Fig. 114: Identifying Spacer Bushings And Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The special tool bore for the TDC position is located on the inlet side underneath the starter motor.

Rotate engine at central bolt and secure flywheel in position with special tool 11 0 300.

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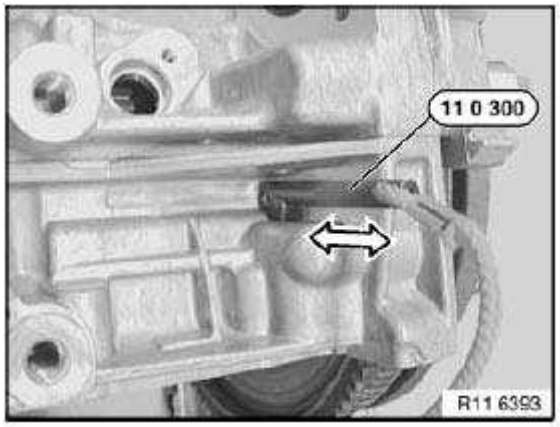


Fig. 115: Securing Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Secure flywheel with special tool (1)

11 9 260 and special tool (2) 11 9 266.

Tightening torque

NOTE: Make sure that the special tool (1) completely engages in the flywheel teeth (see arrow)

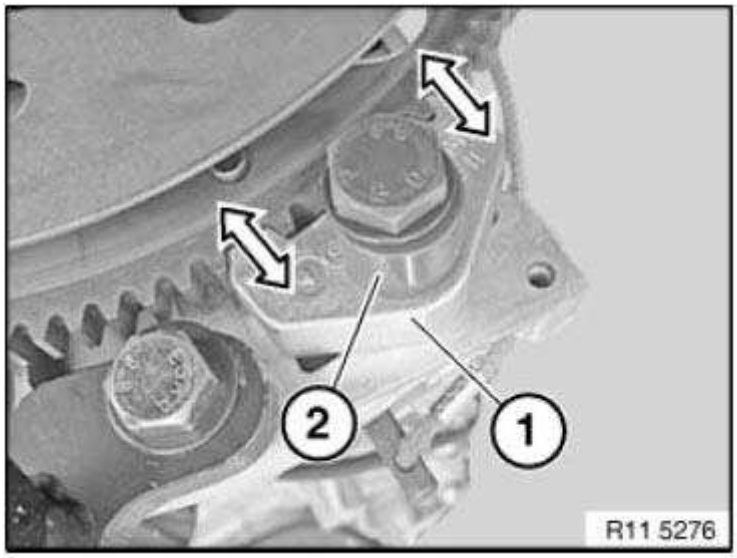


Fig. 116: Securing Flywheel Using Special Tool 11 9 260/11 9 266
Courtesy of BMW OF NORTH AMERICA, INC.

Automatic transmission

Release flywheel bolts (1).

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Release special tool (2).

Remove flywheel (3).

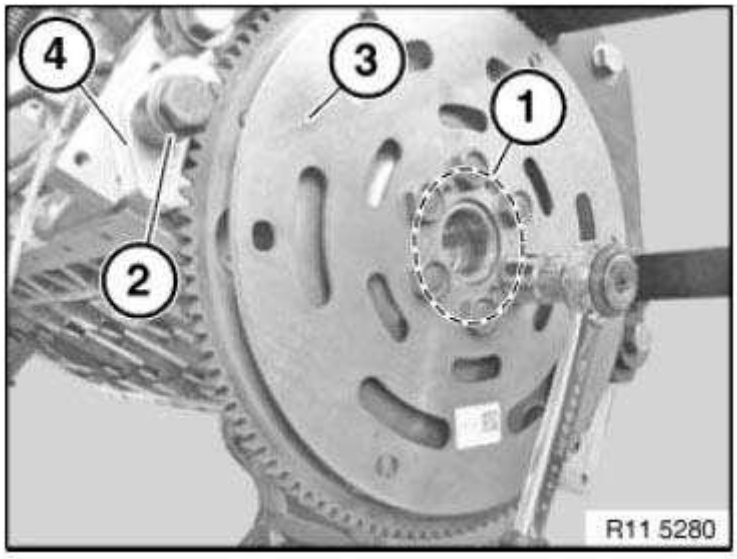


Fig. 117: Identifying Flywheel With Bolts And Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Manual gearbox

IMPORTANT: Position crankshaft at TDC.

Remove dual-mass flywheel.

Secure flywheel with special tool 11 9 260.

Remove VIBRATION DAMPER .

Release flywheel bolts with special tool 11 4 180.

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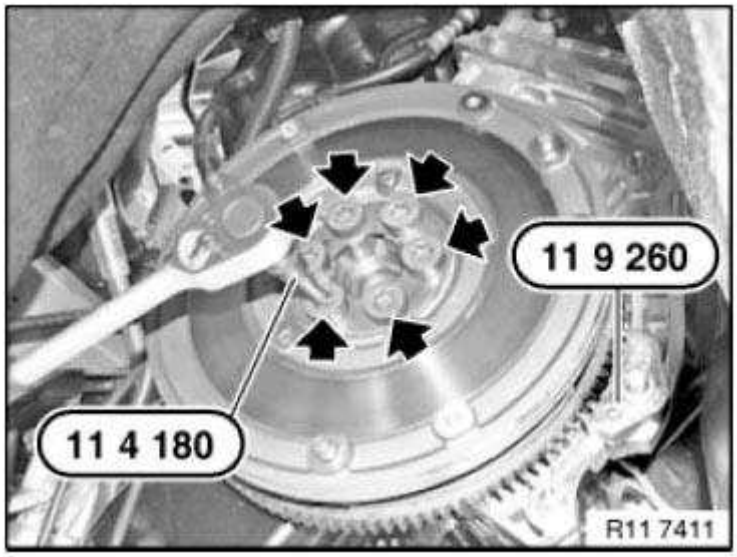


Fig. 118: Removing Flywheel Bolts Using Special Tool 11 4 180
Courtesy of BMW OF NORTH AMERICA, INC.

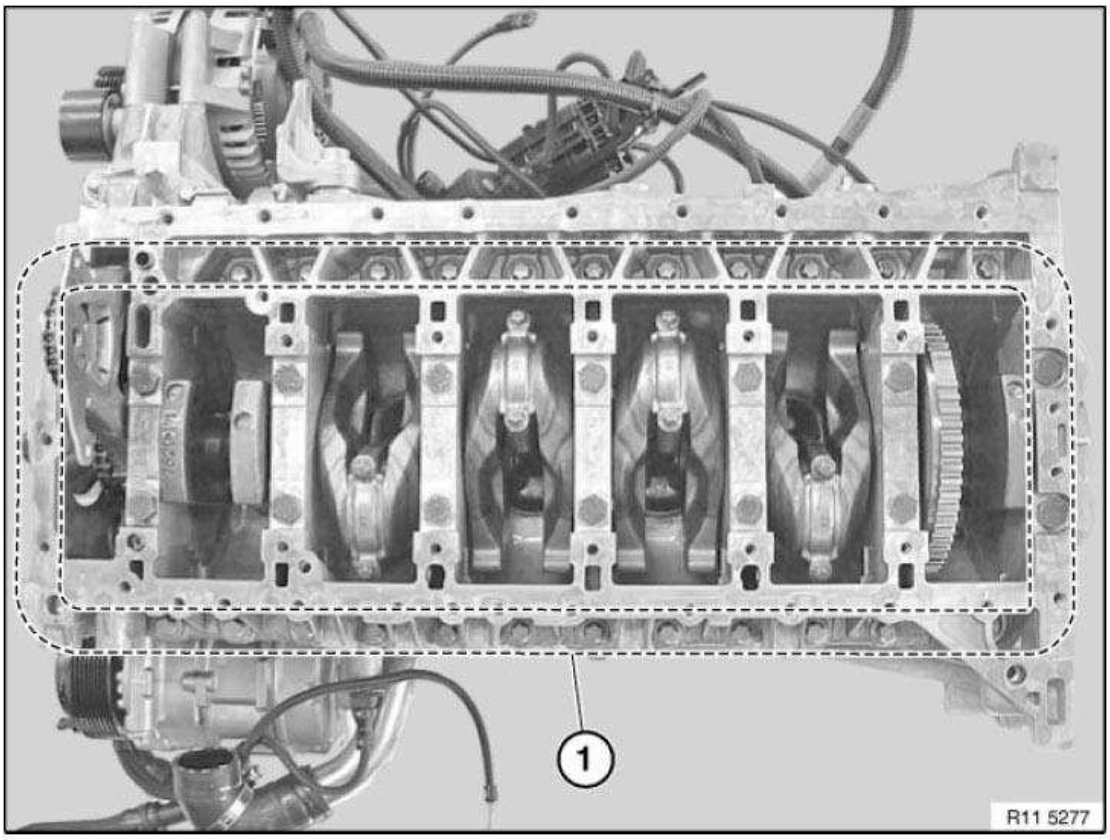


Fig. 119: Identifying Crankshaft Bolt Mounting Area
Courtesy of BMW OF NORTH AMERICA, INC.

Release all crankcase bolts (1) along line (2).

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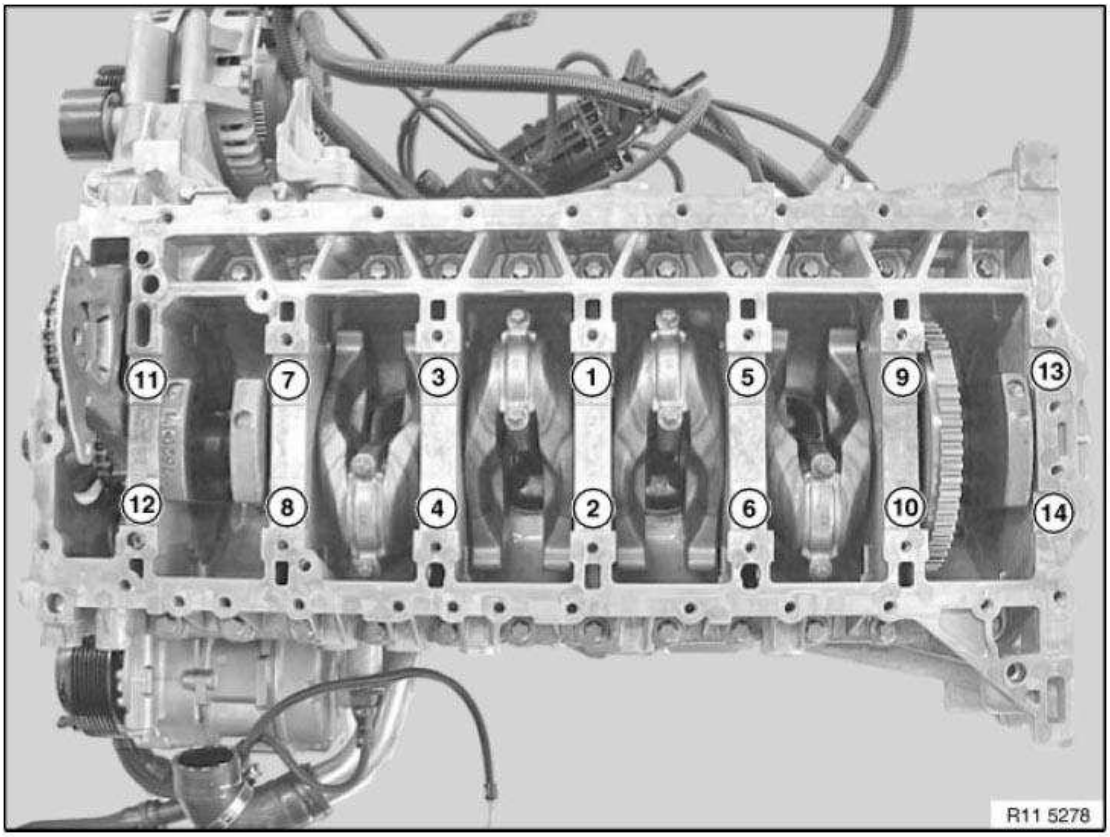


Fig. 120: Identifying Crankshaft Bolt Releasing Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Release crankcase bolts M10 in sequence 14 to 1.

Release crankcase lower section (1) from crankcase upper section (2) with suitable tool (3)

Remove crankcase lower section (1) upwards.

IMPORTANT: Do not rotate crankshaft without crankcase lower section (1) (risk of damage).

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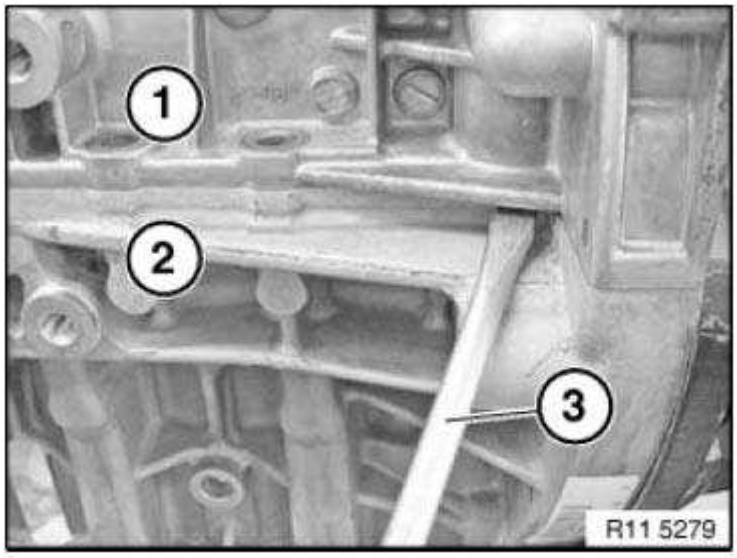


Fig. 121: Removing Crankshaft (Lower Section And Upper Section) Using Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Timing chain is pre-tensioned.
Do not raise crankshaft.

Carefully remove radial shaft seal (1).

Catch escaping engine oil with a cloth (2).

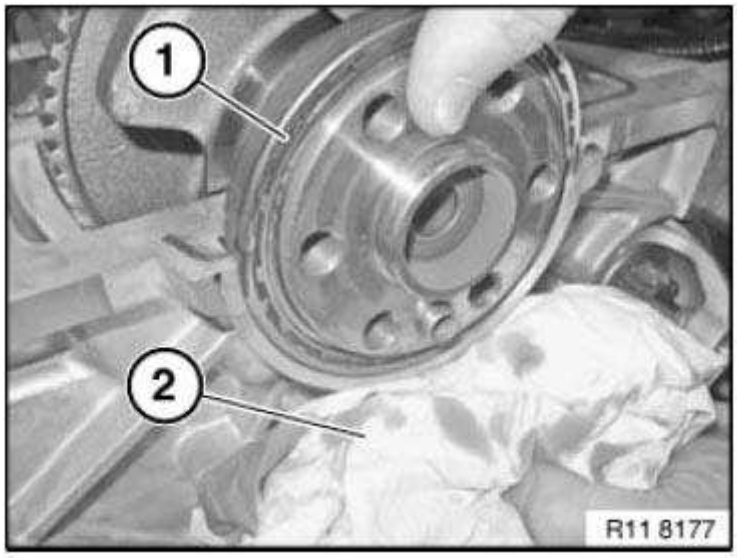


Fig. 122: Removing Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully remove radial shaft seal (1) towards front.

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Catch escaping engine oil with a cloth (2).

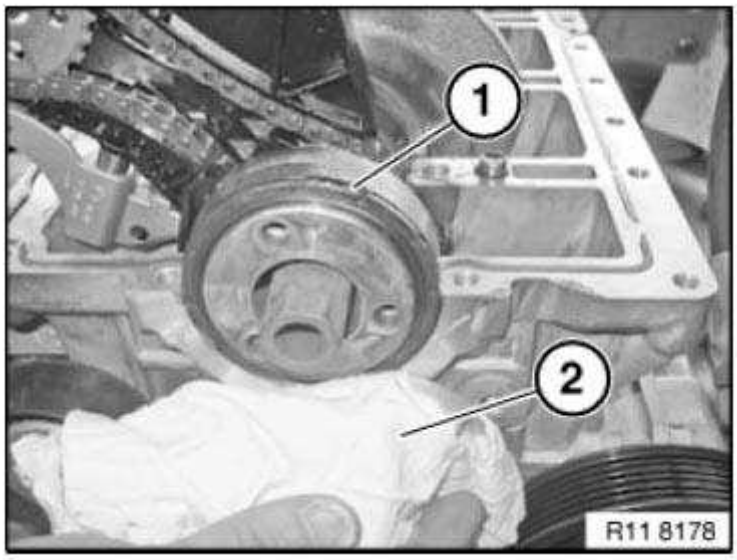


Fig. 123: Catching Escaping Engine Oil Using Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Protect crankcase against sealant residues with a cloth (1).

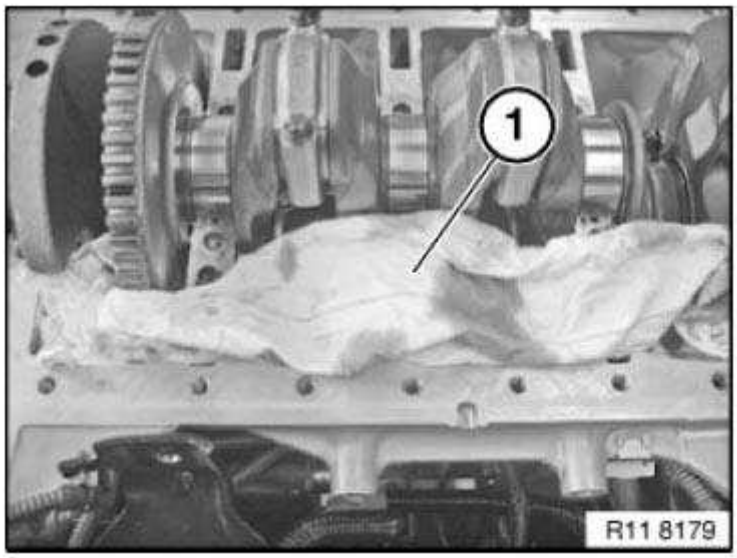


Fig. 124: Protecting Crankcase Against Sealant Residues Using Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sealant residues (1) with special tool 11 4 470.

Remove injector nozzles (2) for liquid sealing compound on left and right.

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Installation:

Replace injector nozzles (2).

Clean all threads with compressed air.

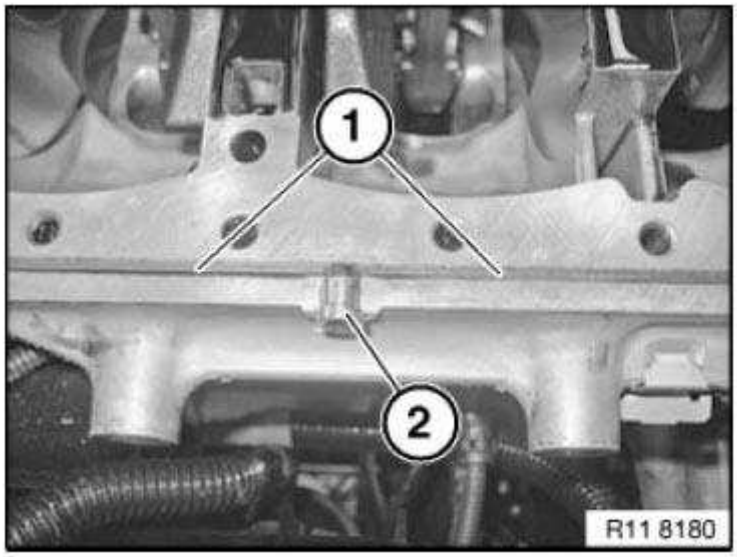
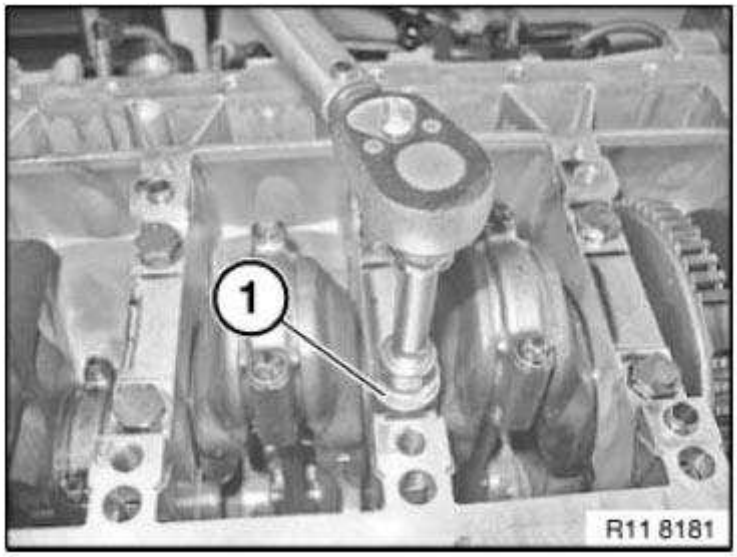


Fig. 125: Identifying Injector Nozzle And Sealant Residue
Courtesy of BMW OF NORTH AMERICA, INC.

Position crankcase lower section (1) on crankcase upper section.

Screw in all M10 crankcase bolts.

Joint all M10 crankcase bolts (1) to 20 Nm from inside outwards.



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Fig. 126: Screwing In All M10 Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Identify all M10 crankcase bolts with a colored marking (1) for checking.

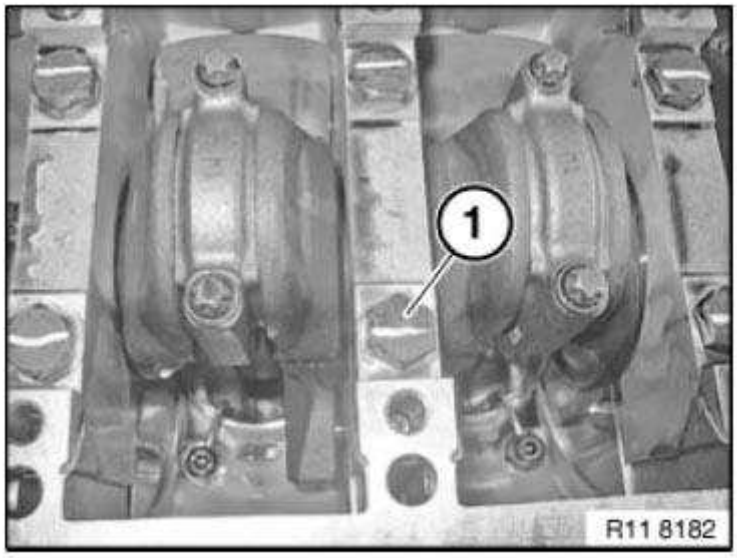


Fig. 127: Identify M10 Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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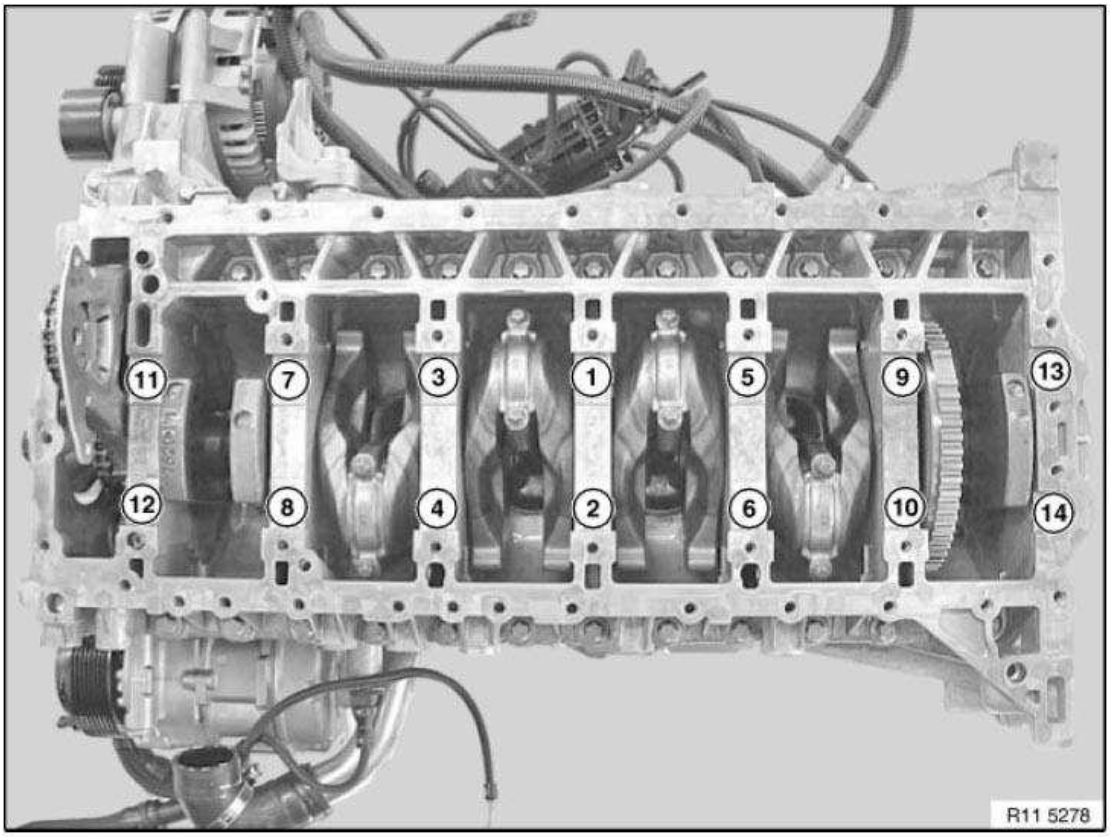


Fig. 128: Identifying Crankcase Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankcase bolts M10 in sequence 1 to 14 with special tool 00 9 120.

Tightening torque 11 11 1AZ, see **11 11 CRANKCASE**

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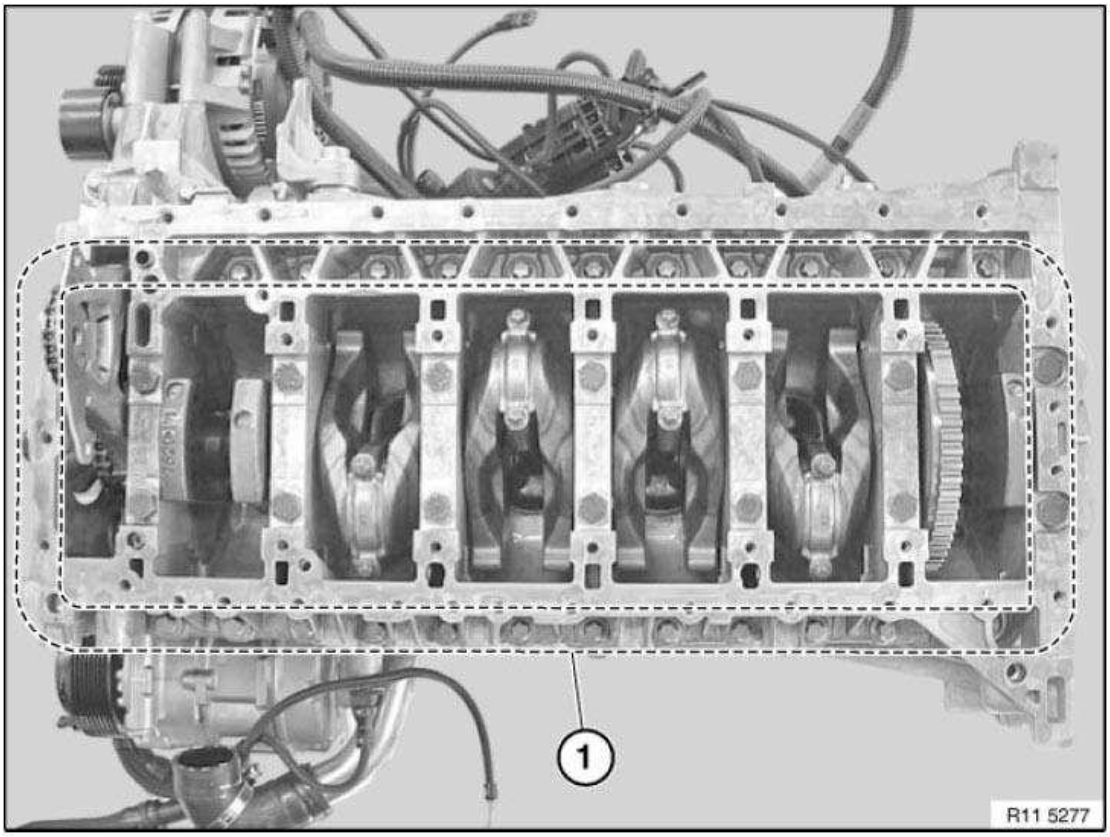


Fig. 129: Identifying Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Insert all crankcase bolts (1).

IMPORTANT: Observe different lengths and sizes of the bolts.

Tightening torque 11 11 2, 3 and 4AZ, see **11 11 CRANKCASE**

Tighten screw (1) for oil pump triangular drive with special tool **11 8 640** .

NOTE: Replace screw.

Tightening torque, see 11 41 4 AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

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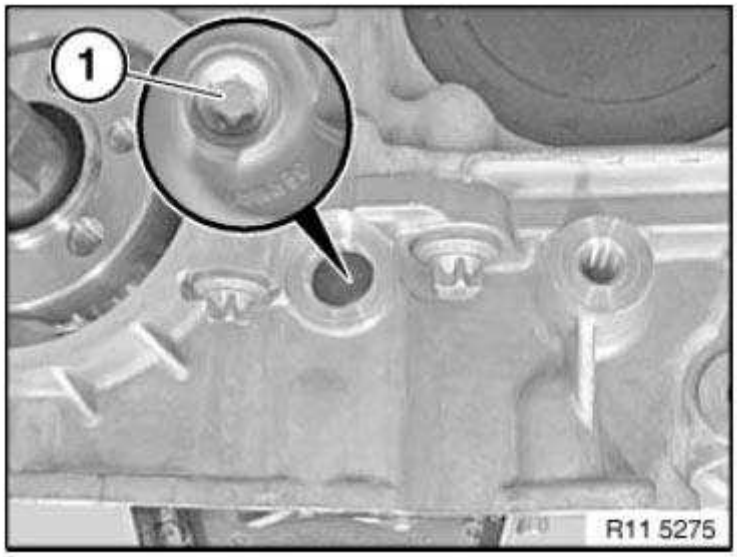


Fig. 130: Identifying Oil Pump Triangular Drive Mounting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten screw plug on front of crankcase.

Tightening torque, see 11 11 8 AZ in **11 11 CRANKCASE** .

Installation:

Replace sealing ring.

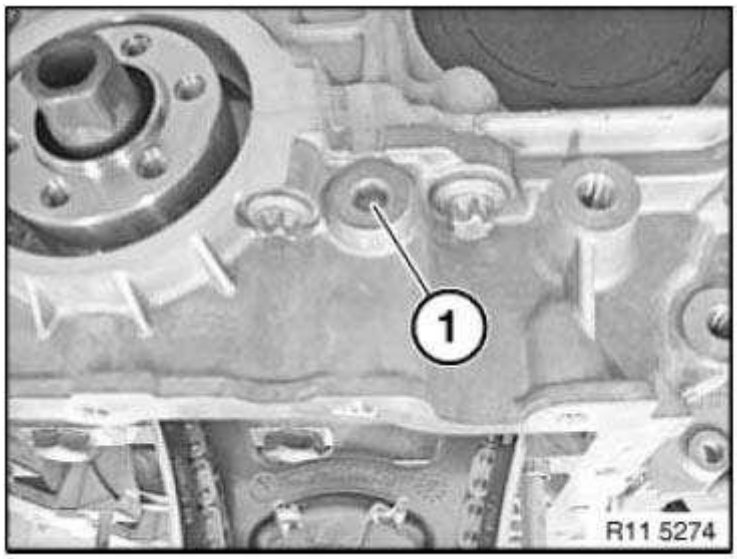


Fig. 131: Identifying Screw Plug On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Prepare radial shaft seal (1) on special tool 11 8 220.

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Fig. 132: Identifying Radial Shaft Seal On Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

Position radial shaft seal (1) with special tool 11 8 220 on the crankshaft.

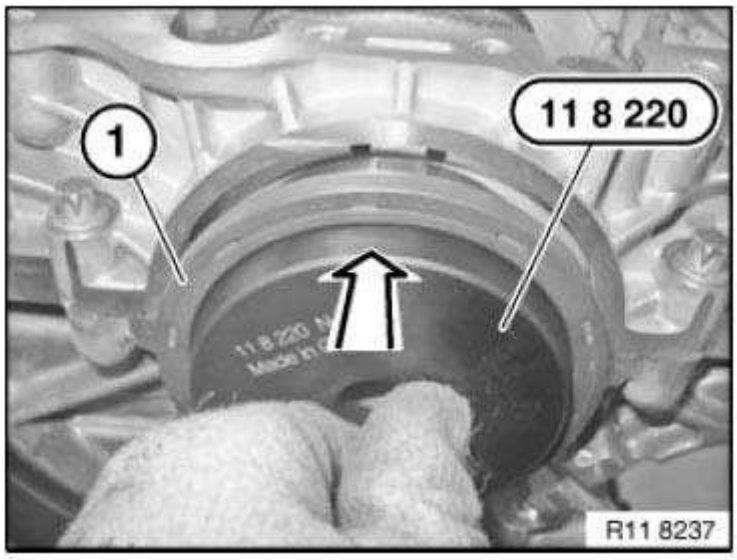


Fig. 133: Positioning Radial Shaft Seal Using Special Tool 11 8 220 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Brush radial shaft seal (1) over the special tool 11 8 220.

Move radial shaft seal (1) parallel up against the crankcase.

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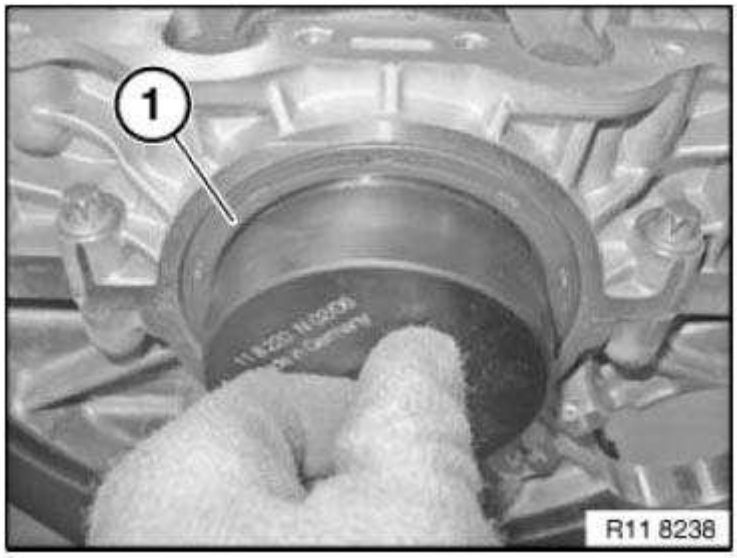


Fig. 134: Moving Radial Shaft Seal Parallel Up Against Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 11 9 182 with screws (special tool 11 9 184) to crankshaft.

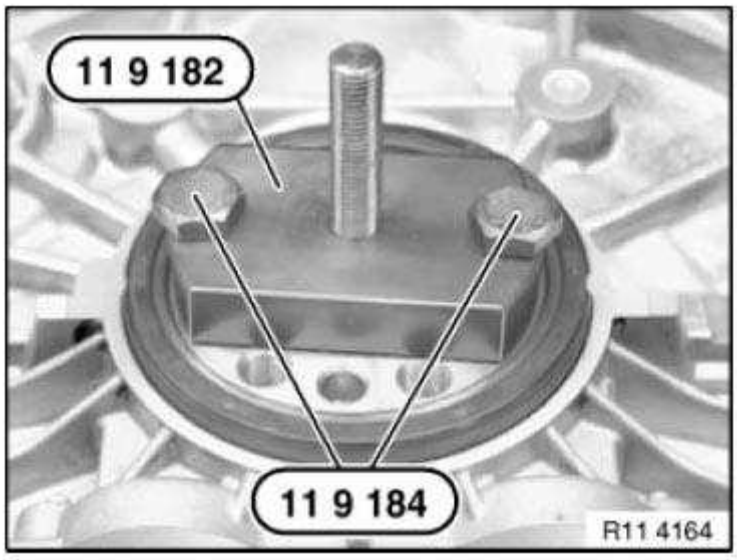


Fig. 135: Screwing Special Tool 11 9 182 With Screws (Special Tool 11 9 184) To Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Prepare special tool 11 9 181 for installation. Connect special tool 11 9 185 onto special tool 11 8 181.

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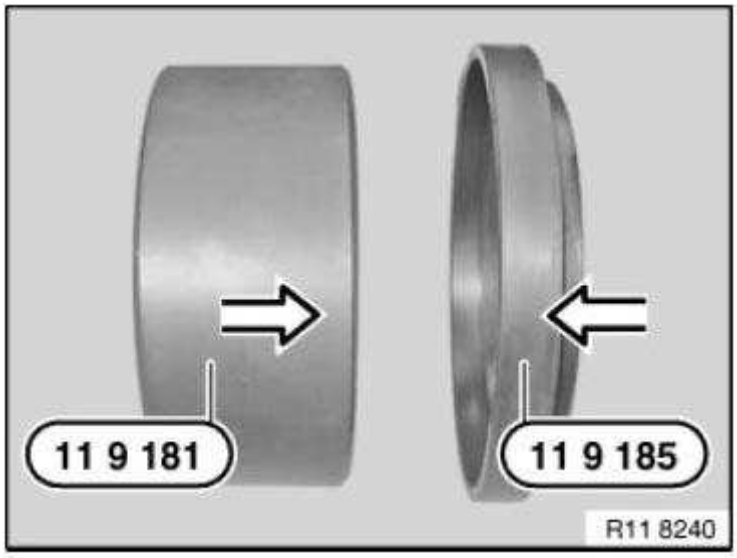


Fig. 136: Connecting Special Tool 11 9 185 Onto Special Tool 11 8 181
Courtesy of BMW OF NORTH AMERICA, INC.

Pull on radial shaft seal with special tool 11 9 181 and 11 9 185 in combination with special tool 11 9 183.

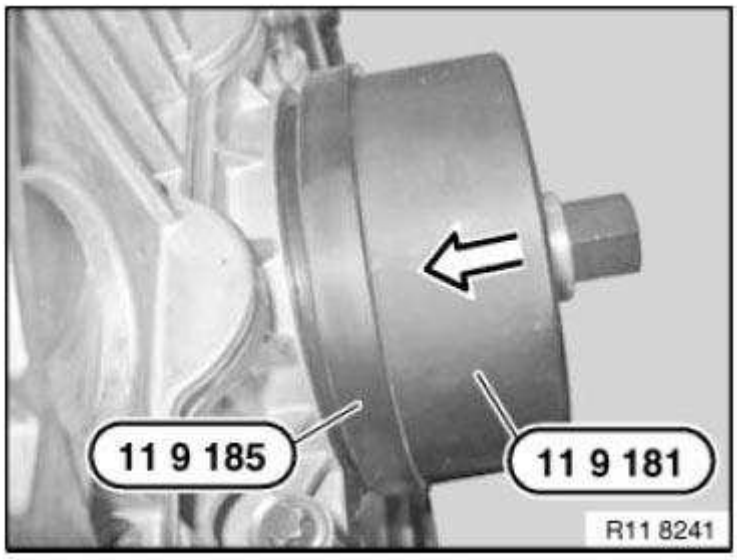


Fig. 137: Pulling Radial Shaft Seal Using Special Tool 11 9 181/11 9 185/11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

Screw on radial shaft seal with special tool 11 9 183 to limit position.

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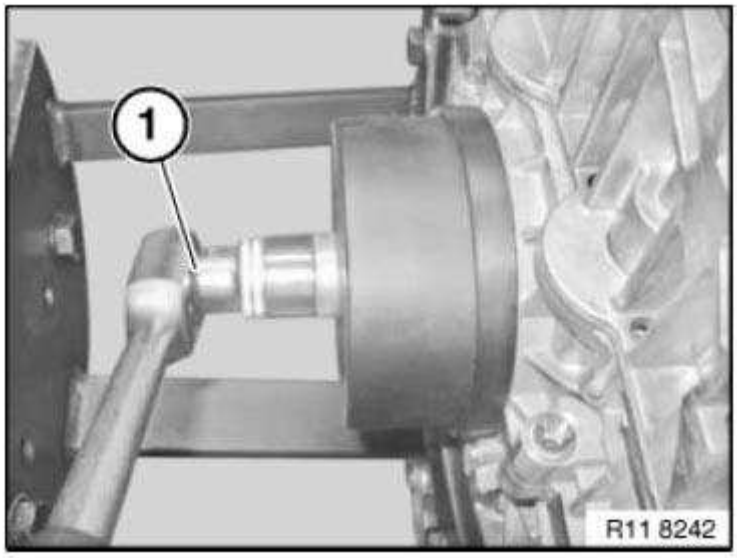


Fig. 138: Screwing On Radial Shaft Seal Using Special Tool 11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean sealing surface (1) and degrease thoroughly in area of housing partition.

Apply a light coat of oil to running surface (2) of radial seal.

NOTE: Graphic N42.

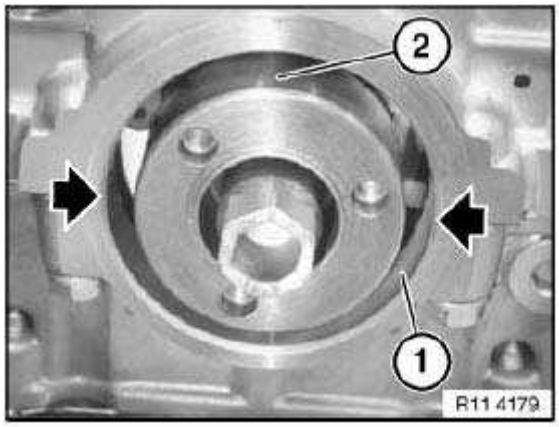


Fig. 139: Identifying Sealing Surface And Running Surface For Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Push radial shaft seal (1) 11 9 235carefully in direction of arrow on the special tool.

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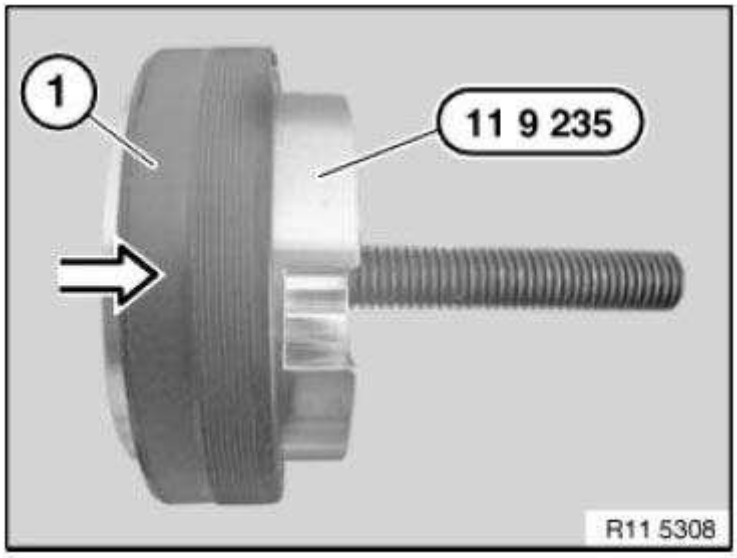


Fig. 140: Pushing Radial Shaft Seal (11 9 235) On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: 11 9 235Special tool can only be fastened with 2 opposite bolts.
Determine hole pattern on special tool.

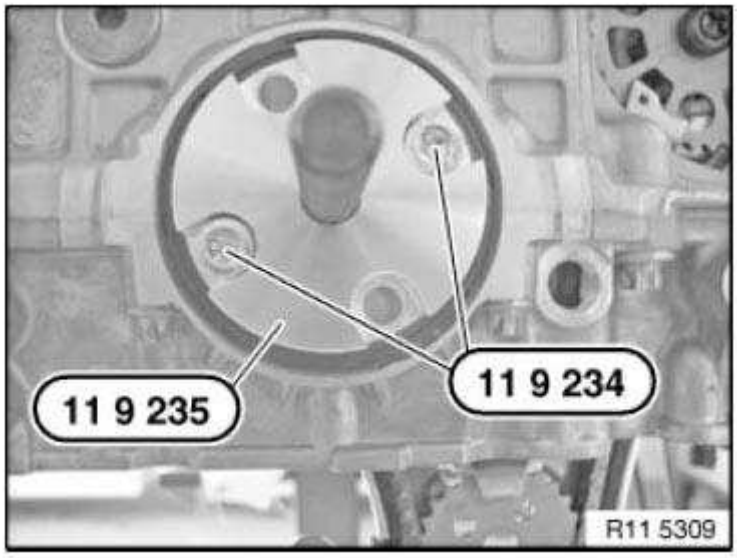


Fig. 141: Mounting Special Tool 11 9 235 With Special Tool 11 9 234 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 11 9 235 with special tool 11 9 234 on crankshaft.

Align groove (2) of radial shaft seal (1) centered to the housing partition (3.

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IMPORTANT: After installation, the grooves must be filled with sealing compound.

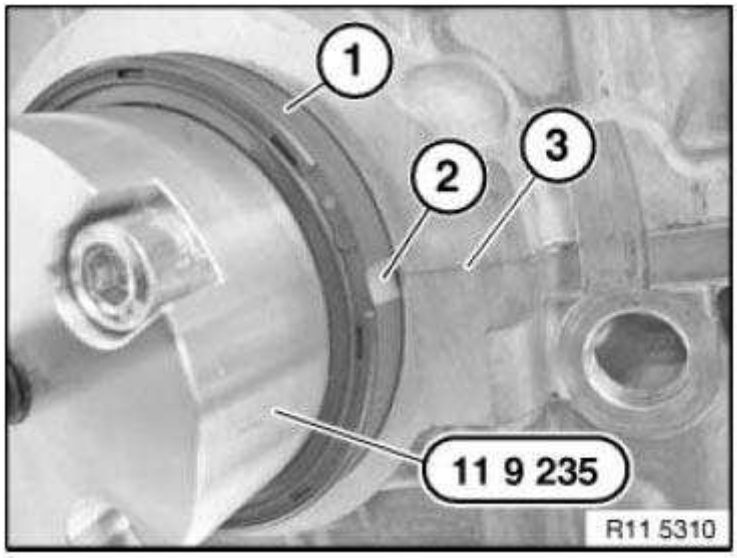


Fig. 142: Identifying Radial Shaft Seal , Housing Partition And Groove
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in radial seal with special tool 11 9 231 in conjunction with special tool 11 9 233 until flush.

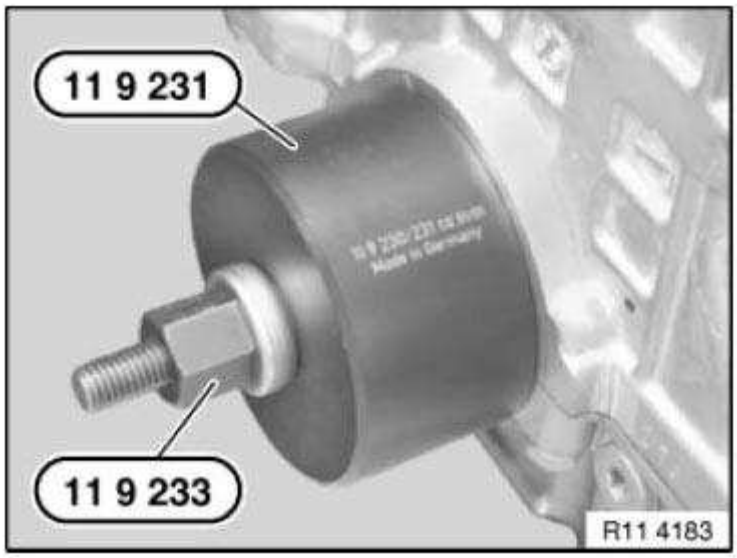


Fig. 143: Inserting Radial Seal With Special Tool 11 9 231 And 11 9 233
Courtesy of BMW OF NORTH AMERICA, INC.

Drive both injector nozzles (1) on left and right with special tool 11 9 360 into crankcase up to stop.

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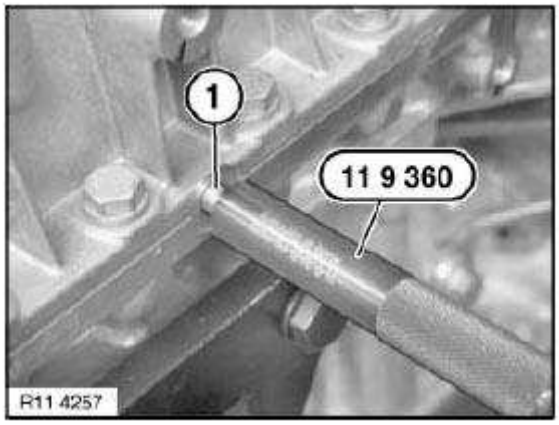


Fig. 144: Inserting Nozzles Using Special Tool 11 9 360
Courtesy of BMW OF NORTH AMERICA, INC.

After fitting both sealing rings, check both sealing ducts for clearance.

Blow compressed air (1) at max. 6 bar into injector nozzle (2).

Compressed air must emerge at both sealing rings on left and right from the outlet bores.

IMPORTANT: If the compressed air does not flow out of all ducts. the crankcase must again be taken apart and cleaned.

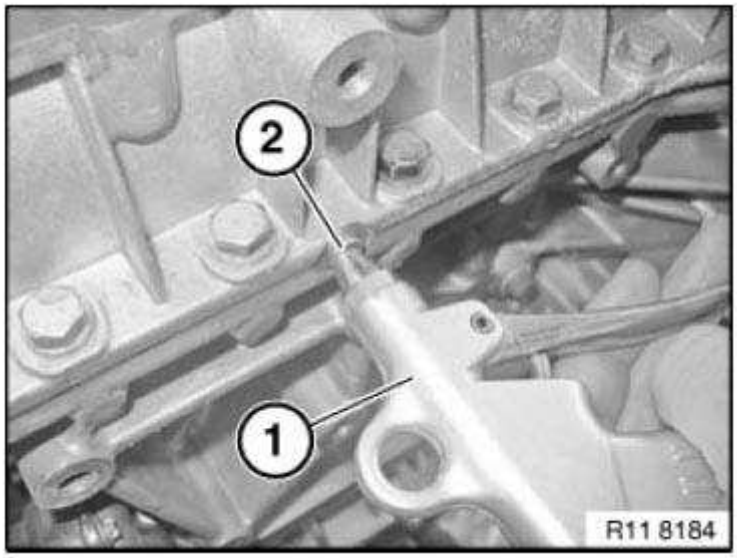


Fig. 145: Blowing Compressed Air Into Injector Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Use PRIMER 1.3 AND LIQUID SEAL 1.4.

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Prepare liquid sealing compound (1) in special tool 11 4 370.

Injector nozzles for injecting sealing compound are not required.

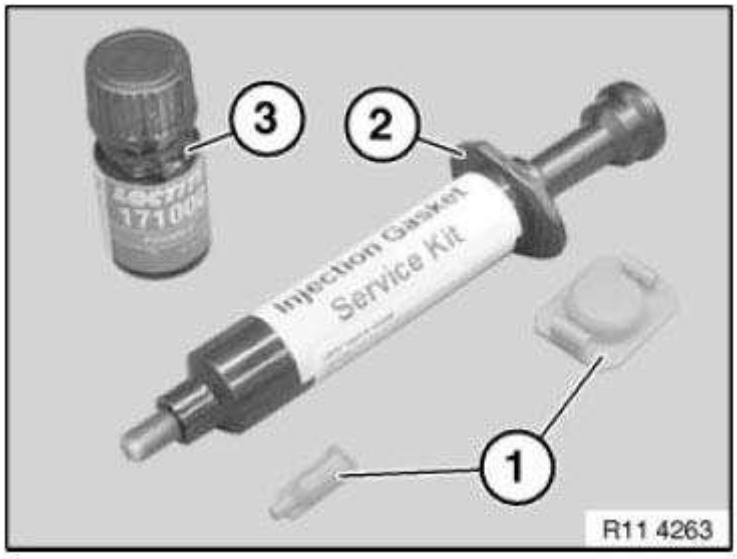


Fig. 146: Identifying Injector With Primer Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

Slowly insert liquid sealing compound (1) with special tool 11 4 370 in direction of arrow.

Liquid sealing compound must emerge at radial shaft seals at front and rear.

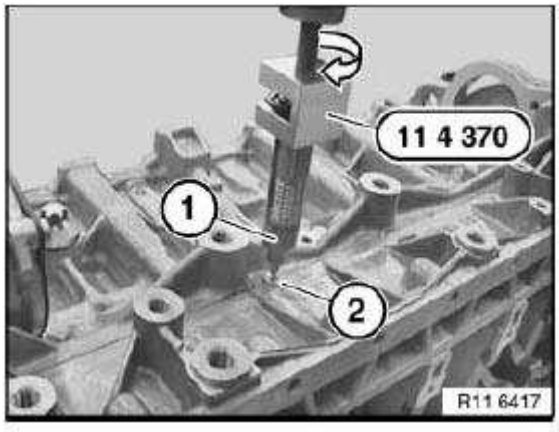


Fig. 147: Inserting Liquid Sealing Compound Using Special Tool 11 4 370
Courtesy of BMW OF NORTH AMERICA, INC.

Stop (seal off) escaping liquid gasket with primer 1.3.

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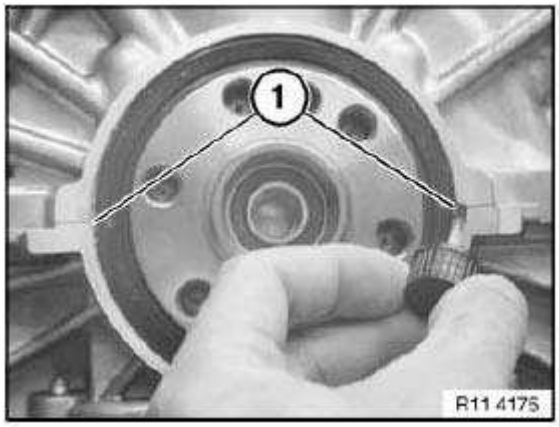


Fig. 148: Coating Surface Of Sealing Compound In Both Grooves Using Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Stop (seal off) escaping liquid gasket with primer 1.3.

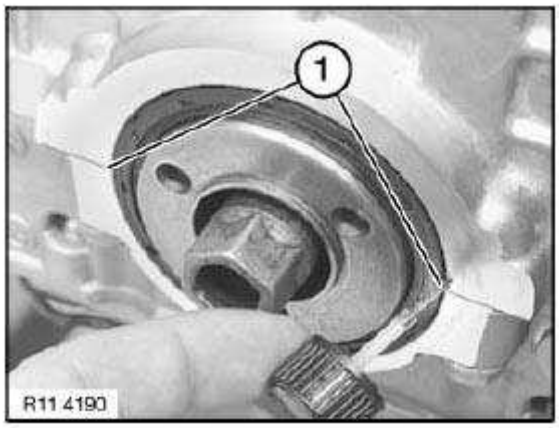


Fig. 149: Sealing Escaping Liquid Gasket With Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 21 531 REPLACING ALL MAIN CRANKSHAFT BEARING SHELLS (N52K)

Special tools required:

- **00 2 590 PLASTIGAGE (5)**
- 11 4 251
- 11 4 252
- 11 4 470

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical

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corrosion.
A magnesium crankcase requires aluminum screws/bolts exclusively.
Aluminum screws/bolts must be replaced each time they are released .
The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove crankshaft, see **11 21 500 Replacing crankshaft (N52K)**

Checking position of oil spray nozzles:

Insert special tool 11 4 251 in screw connection of main bearing.

NOTE: Special tool 11 4 252 must be pre-installed at the seventh main bearing.

Check position of oil spray nozzle (2) according to position (1) on special tool 11 4 251 .

If necessary, adjust and secure oil spray nozzle (2).

Tightening torque: 11 11 5AZ, see **11 11 CRANKCASE** .

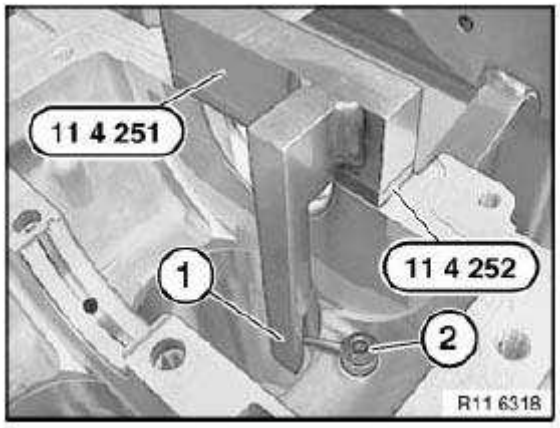


Fig. 150: Oil Spray Nozzle, Special Tools (11 4 251) And (11 4 252)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove bearing shells (2) and guide bearing shell (3).

NOTE: Guide bearing shell (3) is a thrust bearing.
Observe bearing classification.

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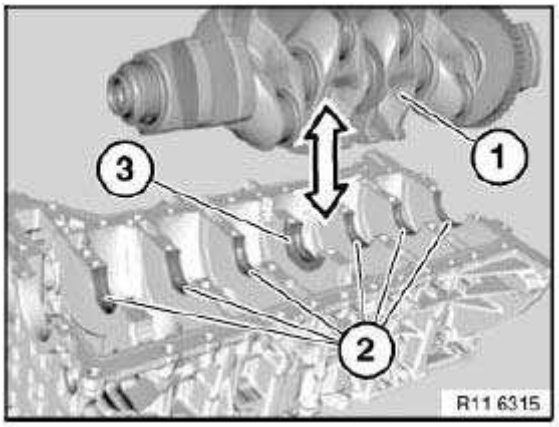


Fig. 151: Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Bearing shell (1) with lubricant groove must be fitted in crankcase.

Bearing shell (2) without lubricant groove must be fitted in bedplate.

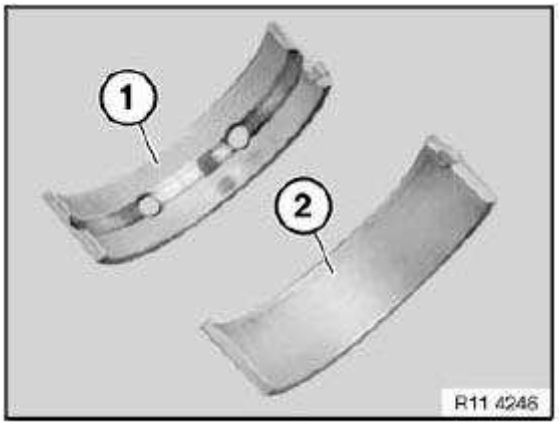


Fig. 152: Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: It is not possible to remachine the crankshaft.

Surface (1) for marking.

Seven-digit part number (2).

Bearing classification (3) on bedplate (see table: values of 1/2/3).

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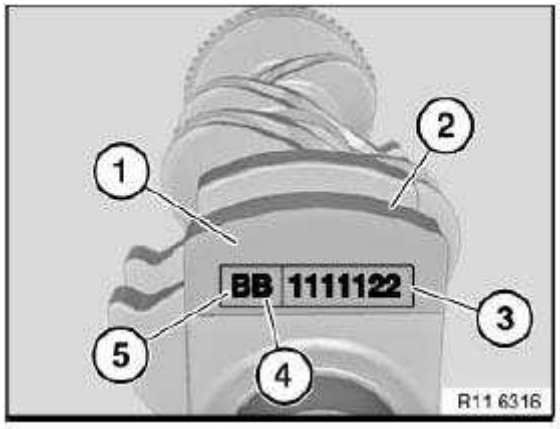


Fig. 153: Bearing Classification On Bedplate
Courtesy of BMW OF NORTH AMERICA, INC.

Bearing classification (1) on crankcase (see table: values of A/B/C).

Installation:

When all the letters and number code have been determined, the color of the bearing shells must be allocated (see table).

IMPORTANT: Excessively small bearing play will result in engine damage.
The color combination Yellow and Red must not be fitted.
Possible color combinations (see table).

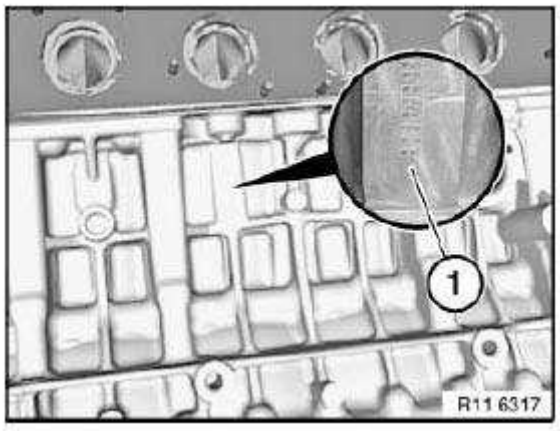


Fig. 154: Bearing Classification On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

BEARING SHELL COLOR COMBINATIONS SPECIFICATION

(A1) Bedplate / Yellow	**(B1)** Bedplate / Yellow	**(C1)** Bedplate / Green
(A1) Crankcase / Yellow	**(B1)** Crankcase / Green	**(C1)** Crankcase / Green
(A2) Bedplate / Green	**(B2)** Bedplate / Green	**(C2)** Bedplate / Green

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(A2) Crankcase / Yellow	**(B2)** Crankcase / Green	**(C2)** Crankcase / Red
(A3) Bedplate / Green	**(B3)** Bedplate / Red	**(C3)** Bedplate / Red
(A3) Crankcase / Green	**(B3)** Crankcase / Green	**(C3)** Crankcase / Red

Install bearing shells (2) and guide bearing shell (3).

Installation:

Clean all sealing surfaces.

IMPORTANT: Do not use any metal-cutting tools.

Clean sealing faces with special tool 11 4 470 only.

Determine bearing play with special tool 00 2 590 .

Installation:

All measuring points must be clean and free from oil and grease. If necessary, clean all measuring points.

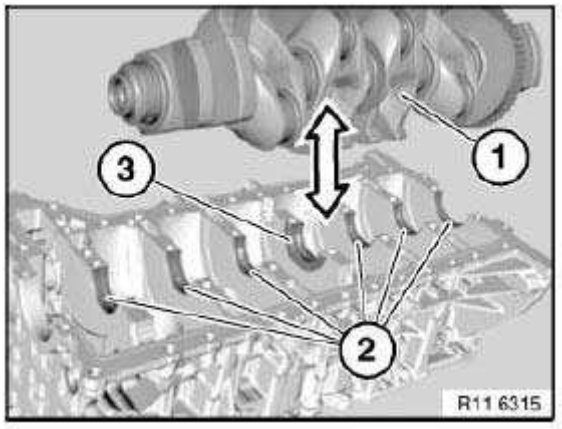


Fig. 155: Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Use the existing screws to determine the bearing play.

Set up bedplate with bearing shells, see **11 21 500 Replacing crankshaft (N52K)**.

Remove bedplate.

Read off bearing play at width of flattened plastic thread and measurement scale.

Installation:

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Remove plastic thread.

Apply a light coat of oil to bearing shells and crankshaft.

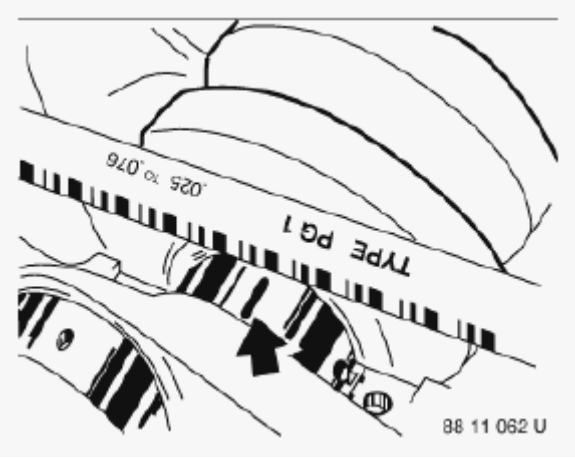


Fig. 156: Reading Bearing Play At Width Of Flattened Plastic Thread And Measurement Scale
Courtesy of BMW OF NORTH AMERICA, INC.

Install bedplate**11 21 500 Replacing crankshaft (N52K)**.

Assemble engine.

11 21 571 REPLACING ROLLER BALL BEARING IN CRANKSHAFT (N52K)

Necessary preliminary tasks

- Remove clutch.

Remove guide bearing with special tool 11 2 340.

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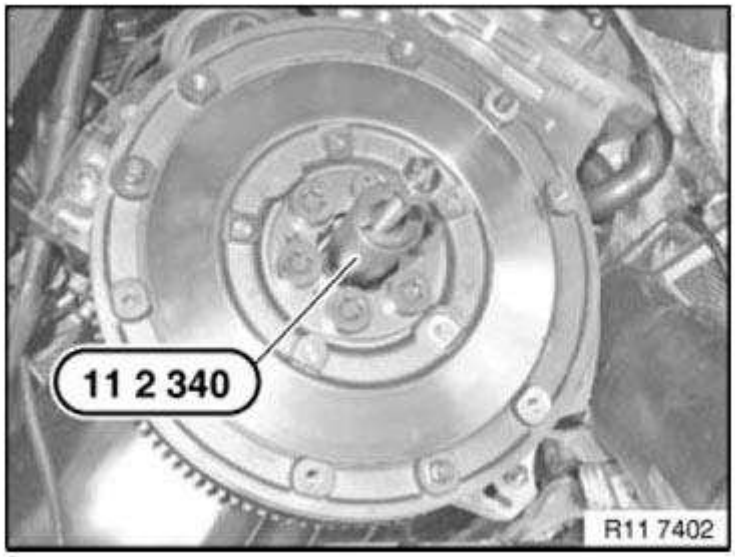


Fig. 157: Removing Guide Bearing Using Special Tool 11 2 340
Courtesy of BMW OF NORTH AMERICA, INC.

Install new thrust bearing and drive firmly home with special tool 11 2 350 in conjunction with special tool 00 5 500.

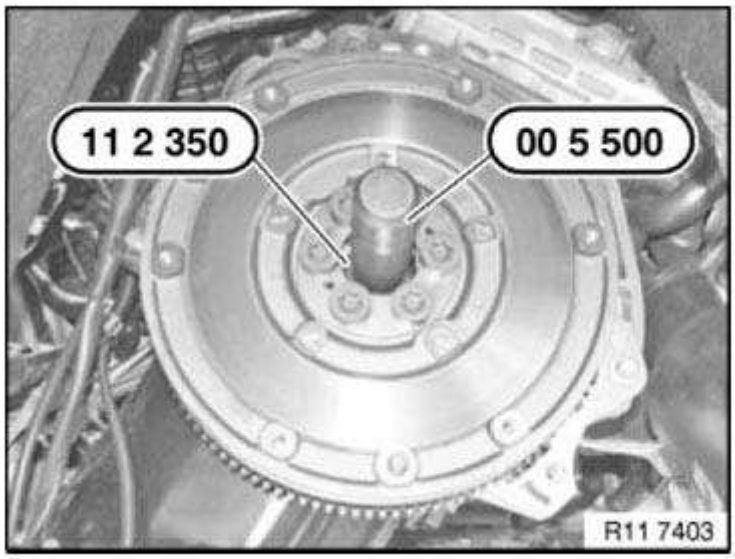


Fig. 158: Installing New Thrust Bearing Using Special Tool 11 2 350 And 00 5 500
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

22 FLYWHEEL

11 22 500 REMOVING AND INSTALLING/REPLACING FLYWHEEL (N52K)

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Special tools required:

- 11 4 180
- 11 9 260
- 11 9 265

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released .
The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove transmission
- Remove clutch, see **21 21 500 REMOVING AND INSTALLING/REPLACING CLUTCH (SAC) (X3)** or .

For vehicles with optional extra SA205 (automatic transmission):

Secure flywheel (1) with existing transmission bolt (2) and special tool 11 9 260 .

Installation:

Replace aluminum screws.

Unfasten flywheel screws.

Tightening torque: 11 22 1AZ, see **11 22 FLYWHEEL** .

Installation:

Flywheel (1) is secured with an alignment pin.

Fit new flywheel screws.

Clean all threads for flywheel screws in crankshaft.

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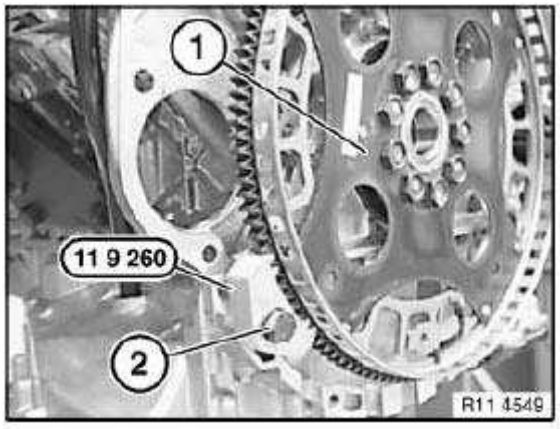


Fig. 159: Special Tool (11 9 260), Flywheel And Transmission Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles without optional extra SA205 (automatic transmission):

Secure flywheel with existing transmission bolt (1) and special tools 11 9 260 and 11 9 265 .

Installation:

Replace aluminum screws.

Release flywheel screws with special tool 11 4 180 .

Tightening torque: 11 22 2AZ, see **11 22 FLYWHEEL** .

Installation:

Flywheel is secured with a dowel pin.

Fit new flywheel screws.

Clean all threads for flywheel screws in crankshaft.

Assemble engine.

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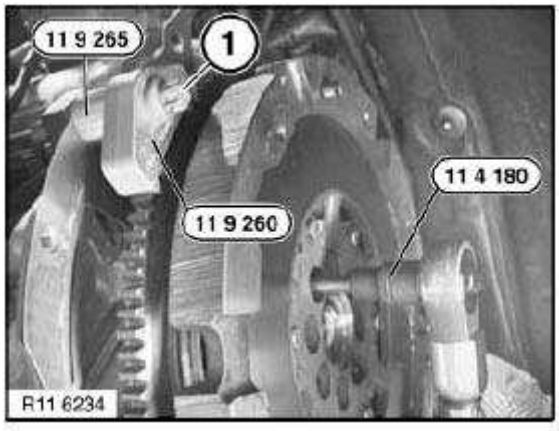


Fig. 160: Special Tools (11 9 260), (11 9 265) And (11 4 180)
Courtesy of BMW OF NORTH AMERICA, INC.

11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

Special tools required:

- 21 2 051
- 21 2 052

NOTE: Flywheel removed!

Using hydraulic press (1) and special tool 21 2 051 , press out dual-mass flywheel downwards on engine side.

IMPORTANT: Risk of damage:
Roller bearing must not be driven out.

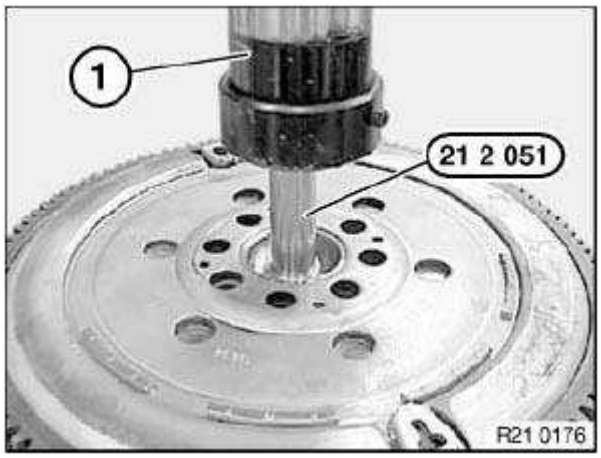


Fig. 161: Hydraulic Press And Special Tool (21 2 051)
Courtesy of BMW OF NORTH AMERICA, INC.

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Push roller bearing (2) onto special tool 21 2 052 .

Using hydraulic press (1), press roller bearing into dual-mass flywheel as far as it will go on clutch side.

IMPORTANT: Risk of damage:
Observe press-in instruction:

- Roller bearing must not be driven in.
- Roller bearing mounting force/travel monitored:

Min. 2000N 1 mm before end of pressing in.

Max. 15000N during entire press-in procedure.

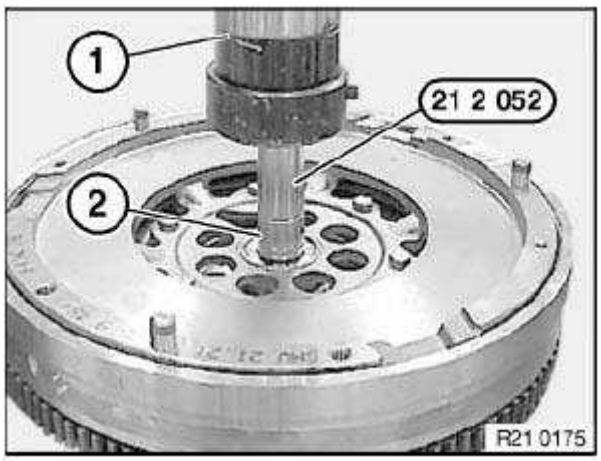


Fig. 162: Hydraulic Press, Roller Bearing And Special Tool (21 2 052)
Courtesy of BMW OF NORTH AMERICA, INC.

1123 VIBRATION DAMPER

11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (N52K)

Necessary preliminary tasks

- Remove underbody protection **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION (X5)** or **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION (X3)** .
- Remove alternator drive belt.

Release screws (1).

Tightening torque, see **23 VIBRATION DAMPER** .

Remove vibration damper (2).

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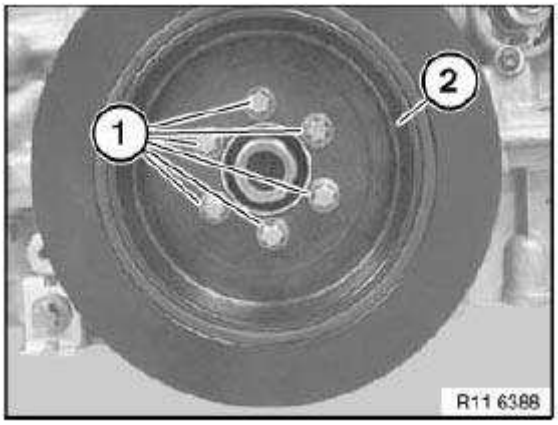


Fig. 163: Identifying Screws And Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

24 CONNECTING ROD WITH BEARING

11 24 571 REPLACING ALL CONNECTING ROD BEARING SHELLS (N52K)

Special tools required:

- **00 2 590 PLASTIGAGE (5)**
- **00 9 120 TORQUE ANGLE MEASURING DIAL**

IMPORTANT: All crank pins are connected with the crankshaft.
Modified procedure: The colors of the connecting rod bearing shells are the same at the top and bottom.
The Blue / Red connecting rod bearing shell colors are no longer fitted in combination.

Necessary preliminary tasks:

- Remove oil sump

IMPORTANT: All crankshaft crank pins are classified.

Possible classifications per connecting rod at top and bottom:

r: Red

b: Blue

Only **one** color may be fitted per big end bearing cap and connecting rod.

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In direction of arrow from (1 to 2) crank pin (1 to 6).

Example:

Possible classification: rbbrrb

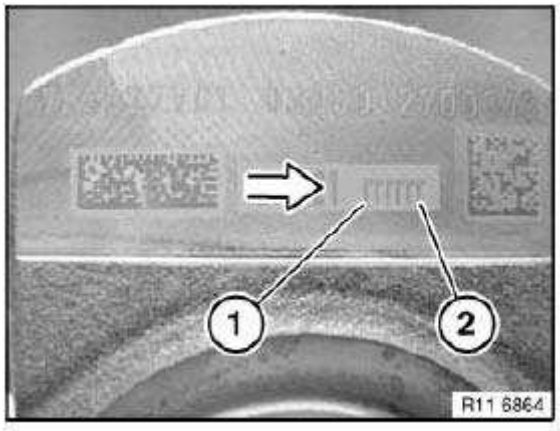


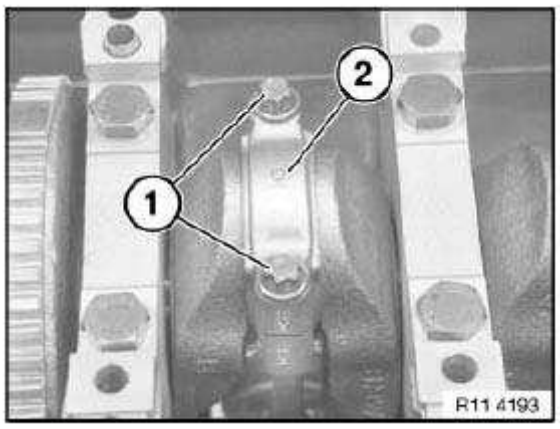
Fig. 164: Connecting Rod Classifications
Courtesy of BMW OF NORTH AMERICA, INC.

Cylinder Classification Red / Red

1. Cylinder Classification Blue / Blue
2. Cylinder Classification Blue / Blue
3. Cylinder Classification Red / Red
4. Cylinder Classification Red / Red
5. Cylinder Classification Blue / Blue

Release conrod bolts (1).

Remove connecting rod bearing cap (2).



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Fig. 165: Conrod Bolts And Connecting Rod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage to cylinder wall and to crankshaft.

Gently release connecting rod from crankshaft.

Remove connecting rod bearing shells (1 and 2).

Install new conrod bearing shells.

Installation:

Pay attention to guide lugs during installation.

IMPORTANT: All crankshaft crank pins are classified.

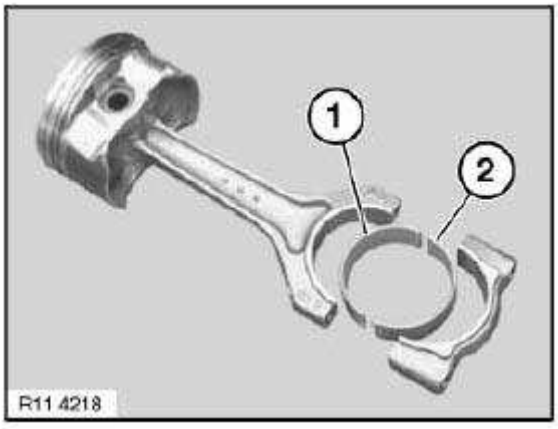


Fig. 166: Connecting Rod Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

In each case insert only one color of connecting rod bearing shell (1 and 2) for each connecting rod.

Check conrod bearing clearance.

Piston in BDC position.

To determine the connecting rod bearing play, make sure that the bearing points are clean and free from oil and grease.

Fit special tool 00 2 590 (Plastigage Type PG 1) to the oil-free crankshaft.

Fit conrod bearing cap so that pairing letters match up.

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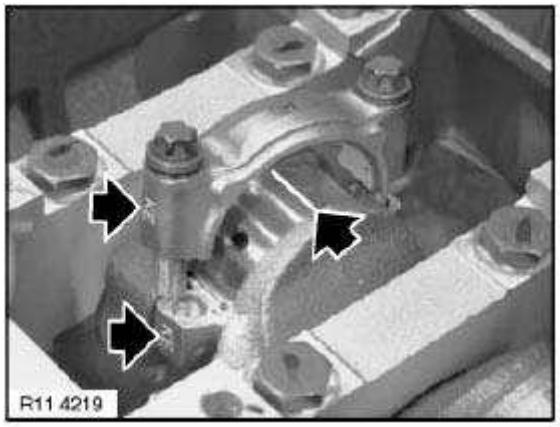


Fig. 167: Locating Conrod Bearing Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not distort conrods or crankshaft.

Use the old conrod bolts to check conrod clearance.

Tighten down conrod bolts with special tool 00 9 120 .

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

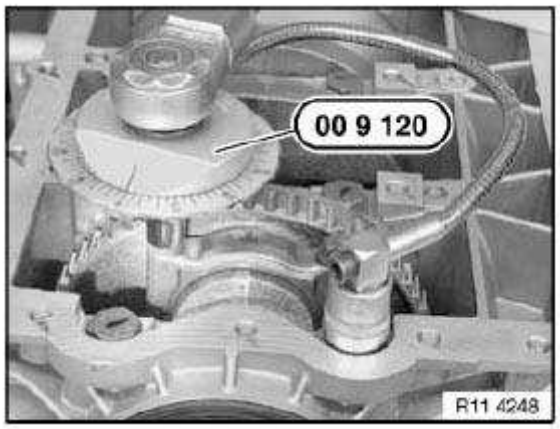


Fig. 168: Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew conrod bearing cover. Read off conrod bearing play at width of flattened plastic thread on measurement scale.

Conrod bearing clearance, see **11 24 CONNECTING RODS AND BEARINGS N52K B25** .

- Remove Plastigage
- Coat crankshaft and connecting rod bearing shells with oil

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- Install new conrod bolts and tighten down with special tool 00 9 120 .

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

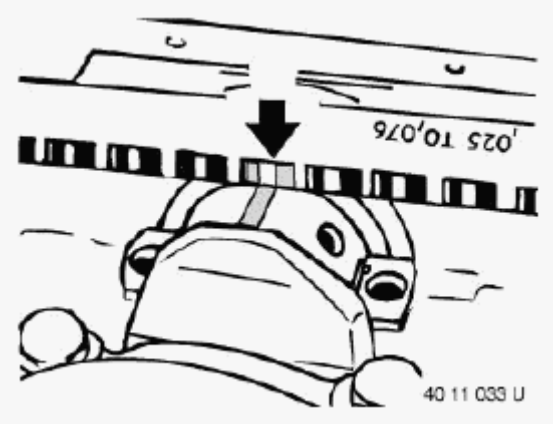


Fig. 169: Reading Conrod Bearing Play At Width Of Flattened Plastic Thread On Measurement Scale
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

25 PISTON WITH RINGS AND PIN

11 25 530 REMOVING AND INSTALLING/REPLACING ALL PISTONS (N52K)

Special tools required:

- **00 9 120 TORQUE ANGLE MEASURING DIAL**
- 11 4 491
- 11 4 492
- 11 4 493
- 11 4 494
- 11 6 241
- 11 6 261
- 11 8 330

WARNING: Danger of injury!

Carry out work on piston pin circlip wearing protective goggles only.

IMPORTANT: If piston, connecting rod, big end bearing cap and connecting rod bearing shell are to be reused, they must be installed in the same position.
Individual replacement of a connecting rod is not permitted. Connecting rods

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are classified by weight categories and are only available as a set for all cylinders.
Connecting rod and big end bearing cap are marked with identical pairing letters and must not be mixed up.

Danger of engine damage!

Piston and piston pins are paired and must not be fitted individually.

Necessary preliminary tasks:

- Remove engine
- Mount engine on assembly stand, see **Mounting engine on assembly stand (N52K)**.
- Remove intake air manifold
- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove oil sump
- Remove oil pump, see **11 41 000 Removing and installing/replacing oil pump (N52K)**

NOTE: Carefully remove heavy oil carbon residues from the cylinder wall (arrow).

IMPORTANT: Do not use any metal-cutting tools.

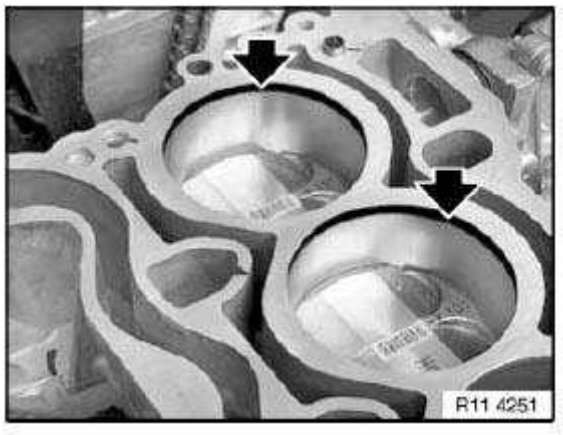


Fig. 170: Locating Cylinder Wall
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Oil spray nozzle (2) must not be maladjusted or bent.
Risk of damage!

Do **not** release screw (1) of oil spray nozzle (2).

If necessary, readjust oil spray nozzle (2), see **11 21 531 Replacing all main crankshaft bearing shells (N52K)**.

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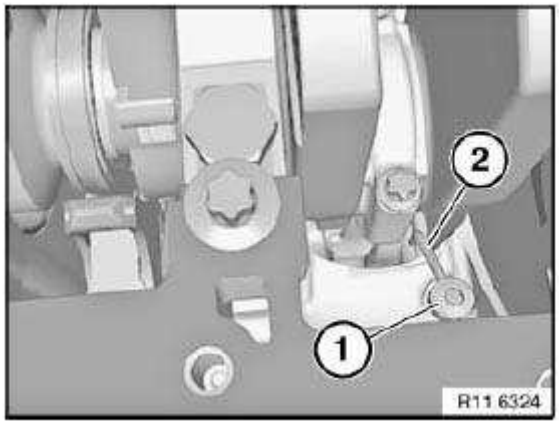


Fig. 171: Spray Nozzle And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release conrod bolts (1).

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

Installation:

Replace screws.

Remove conrod bearing cap (2) in direction of arrow.

IMPORTANT: Connecting rod and big end bearing cap (2) are marked with identical pairing letters and must not be mixed up.

Danger of engine damage!

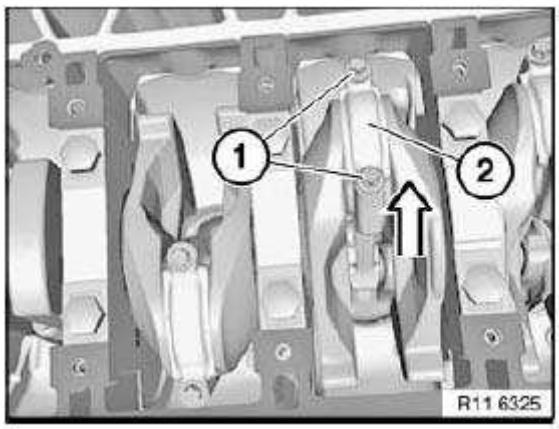


Fig. 172: Removing Conrod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 8 330 to connecting rod.

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Press out connecting rod and piston with special tool 11 8 330 to cylinder head side.

NOTE: Special tool 11 8 330 simultaneously serves to prevent connecting rod and piston from falling down.

IMPORTANT: Do not touch the oil spray nozzle when removing the components. Risk of damage!

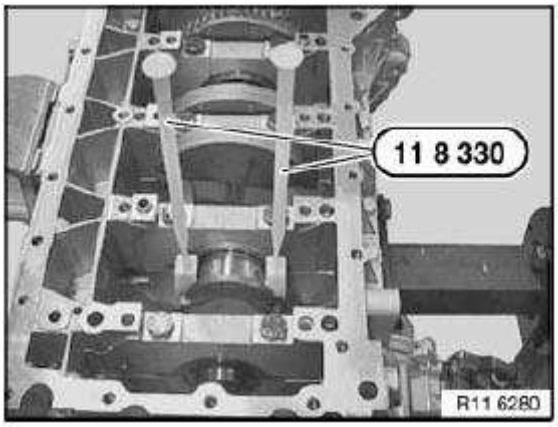


Fig. 173: Special Tool (11 8 330)
Courtesy of BMW OF NORTH AMERICA, INC.

Preliminary work:

Clamp special tool 11 4 491 in vice.

Secure piston (1) with connecting rod to special tool 11 4 491 .

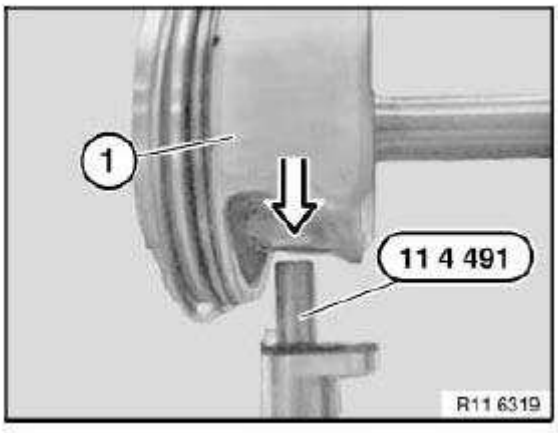


Fig. 174: Securing Piston With Connecting Rod To Special Tool (11 4 491)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

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Carry out work on piston pin circlip wearing protective goggles only.

WARNING: Protective goggles must be worn.

Lever out piston pin circlip with special tool 11 4 492 in direction of arrow.

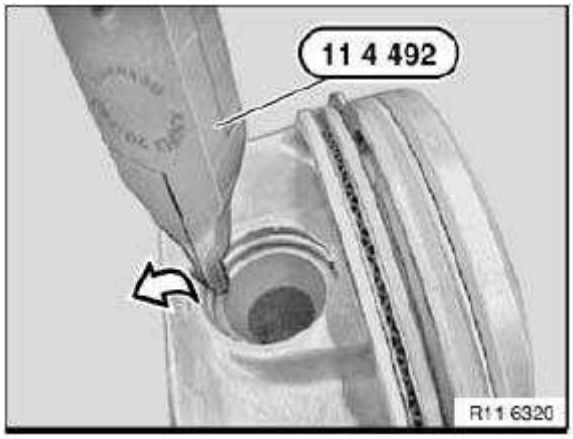


Fig. 175: Removing Piston Pin Circlip With Special Tool (11 4 492)
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, replace connecting rods.

IMPORTANT: Individual replacement of a connecting rod is not permitted. Connecting rods are classified by weight categories and are only available as a set for all cylinders.
Existing and new connecting rods must not be installed in mixed combinations.

Installation:

It must be possible for the piston pin to be pressed with minimal force by hand through the small end bushing. There must be no noticeable play.

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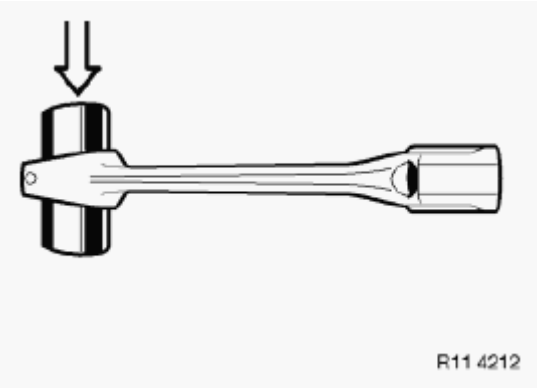


Fig. 176: Installing Piston Pin Into Small End Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

Measure piston installation clearance:

Measure piston diameter with micrometer at measuring point "A" from lower edge of piston and offset by 90° to piston pin axis.

Piston diameter at measuring point "A", see **11 25 PISTONS WITH RINGS AND PINS N52K B25** .

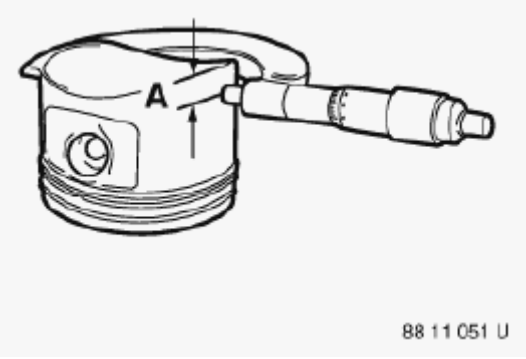


Fig. 177: Measuring Piston Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust micrometer to cylinder bore of crankcase. Set internal caliper on micrometer to "zero". Measure bottom, center and top of cylinder bore in direction of travel and direction of engine rotation.

Diameter of cylinder bore.

Piston installation clearance.

Total permissible wear tolerance, see **11 25 PISTONS WITH RINGS AND PINS N52K B25**

If necessary, replace piston.

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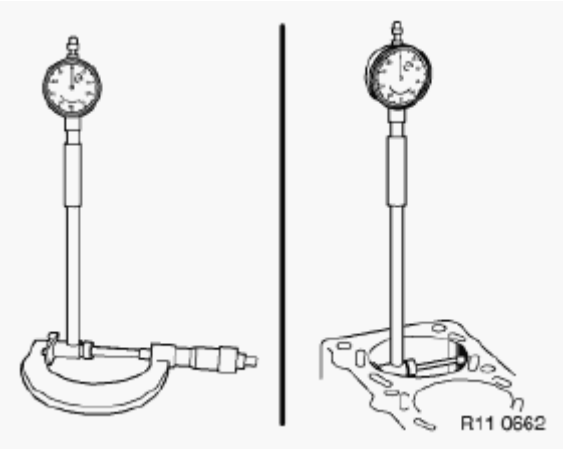


Fig. 178: Measuring Diameter Of Cylinder Bore
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Protective goggles must be worn.

Insert piston pin circlip (2) into groove (1) of special tool 11 4 493 .

Move piston pin circlip (2) into installation position.

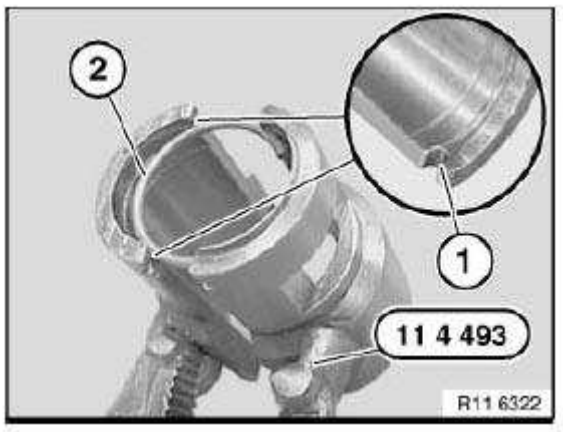


Fig. 179: Piston Pin Circlip And Groove
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Protective goggles must be worn.

Guide lug and cutout on special tool 11 4 493 must point to piston crown. Only then can special tool 11 4 494 be correctly fitted.

When special tools 11 4 493 and 11 4 494 are correctly positioned, the piston pin circlip must be driven in with a plastic hammer in the direction of the arrow.

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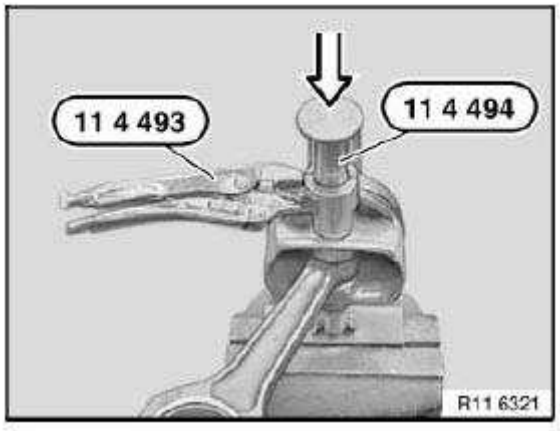


Fig. 180: Installing Piston Pin Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For vehicles with B30 engines.

Install all piston rings, see **11 25 671 Replacing piston rings on all pistons (N52K)**.

Install all connecting rod bearing shells, see **11 24 571 Replacing all connecting rod bearing shells (N52K)**.

Coat piston (2) and piston rings with oil.

Pre-install piston (2) in special tool 11 6 261 .

Attach special tool 11 8 330 to connecting rod (1).

Installation:

Check protective lugs on special tool 11 8 330 for correct position and damage.

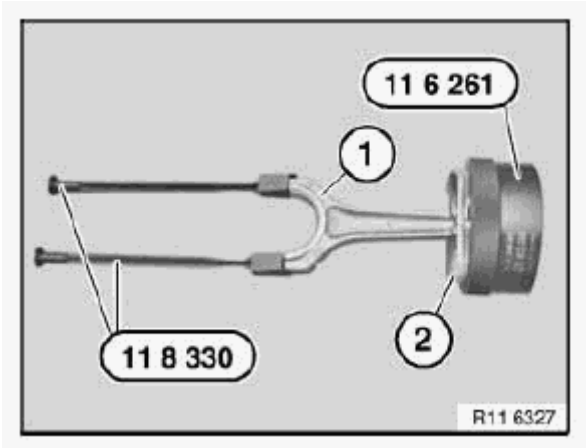


Fig. 181: Connecting Rod, Piston And Special Tools (11 8 330) And (11 6 261)
Courtesy of BMW OF NORTH AMERICA, INC.

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NOTE: For vehicles with B25 engines.

Install all piston rings, see **11 25 671 Replacing piston rings on all pistons (N52K)**.

Install all connecting rod bearing shells, see **11 24 571 Replacing all connecting rod bearing shells (N52K)**.

Coat piston (2) and piston rings with oil.

Pre-install piston (2) in special tool 11 6 241 .

Attach special tool 11 8 330 to connecting rod (1).

Installation:

Check protective lugs on special tool 11 8 330 for correct position and damage.

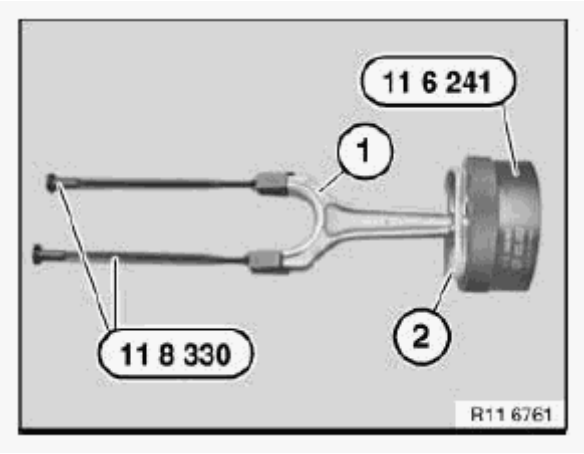


Fig. 182: Connecting Rod, Piston And Special Tools (11 8 330) And (11 6 241)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert piston (1) with connecting rod in cylinder.

IMPORTANT: Do not touch the oil spray nozzle when installing the components.
Risk of damage!
Danger of piston ring failure.

Press in piston (1) at marked points (see arrows) with finger pressure only, do not drive in.

Insert piston (1) so that arrow (2) on piston crown points to camshaft drive.

Press in piston (1) with special tools 11 6 261 / 11 6 241 .

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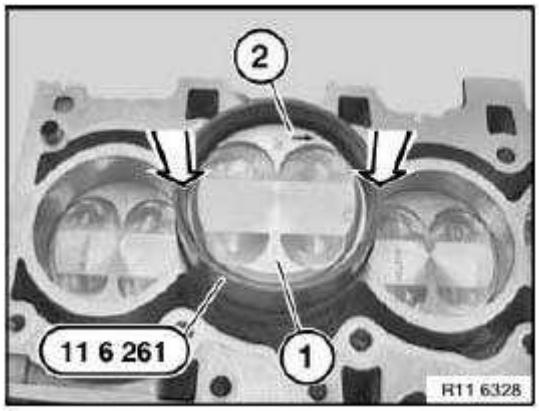


Fig. 183: Pressing Piston With Special Tools (11 6 261)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Connecting rod and big end bearing cap are marked with identical pairing letters (1) and must not be mixed up.
Mixing them up or incorrectly fitting the big end bearing cap on the connecting rod will result in engine damage .

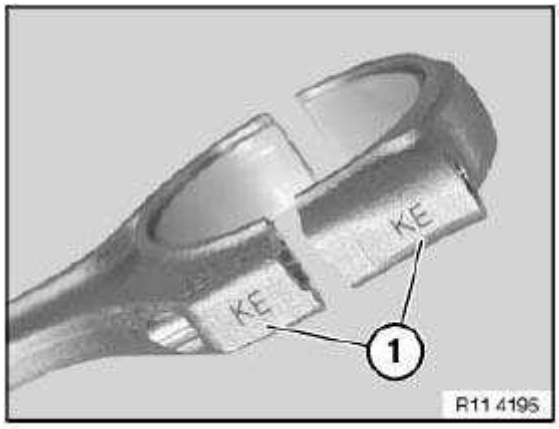


Fig. 184: Connecting Rod Identical Pairing Letters
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a light coat of oil to connecting rod bearing journal. Join connecting rod and connecting rod bearing journal.

Detach special tool 11 8 330 .

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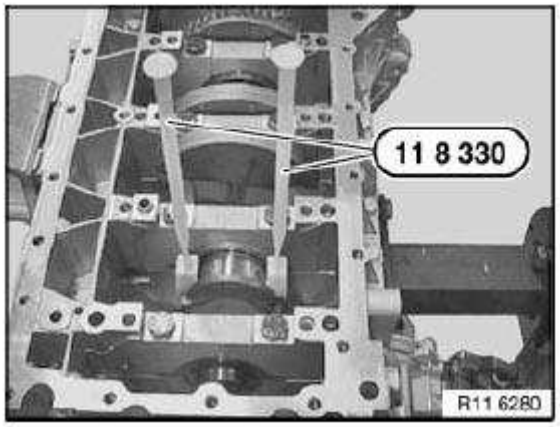


Fig. 185: Special Tool (11 8 330)
Courtesy of BMW OF NORTH AMERICA, INC.

Fit conrod bearing caps (2) so that pairing letters match up.

Installation:

Replace screws.

Install new conrod bolts (1).

IMPORTANT: Jointing torque and angle of rotation must be observed without fail. Risk of damage!

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

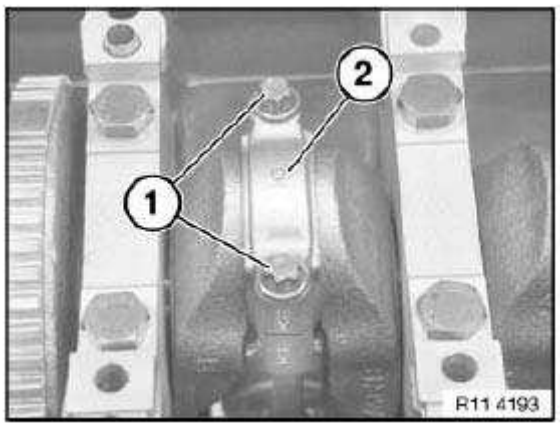


Fig. 186: Conrod Bolts And Connecting Rod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, tighten connecting rod bolts to torsion angle with special tool 00 9 120 .

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

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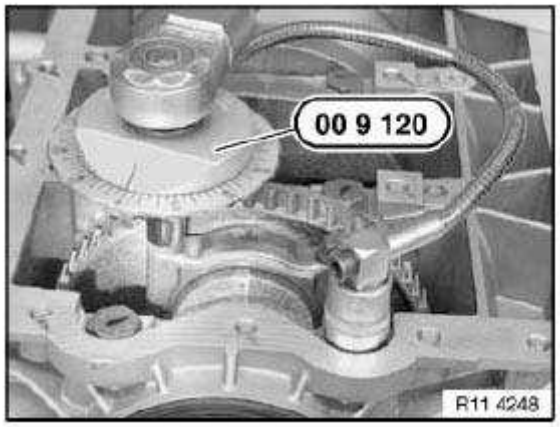


Fig. 187: Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 25 671 REPLACING PISTON RINGS ON ALL PISTONS (N52K)

Necessary preliminary tasks:

- Removing all pistons, see **11 25 530 Removing and installing/replacing all pistons (N52K)**

Measuring axial clearance of piston rings in piston ring groove.

Technical Data.

NOTE: It is not possible to measure the axial clearance of the U-flex rings.

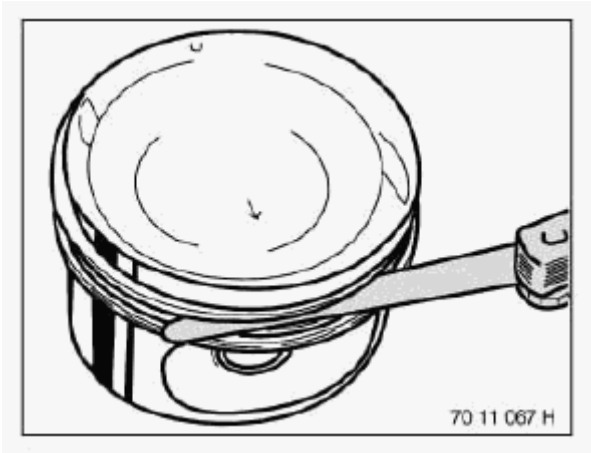


Fig. 188: Measuring Axial Clearance Of Piston Rings In Piston Ring Groove
Courtesy of BMW OF NORTH AMERICA, INC.

Remove plain compression ring and stepped ring upwards with piston ring pliers.

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The U-flex ring comprises two steel band rings and a support spring.

**NOTE: The U-flex ring cannot be removed with piston ring pliers.
Put aside all piston rings in correct sequence and installation position.
It might not be possible to find the identification on used piston rings.**

Installation:

New pistons may only be installed together with new piston rings.

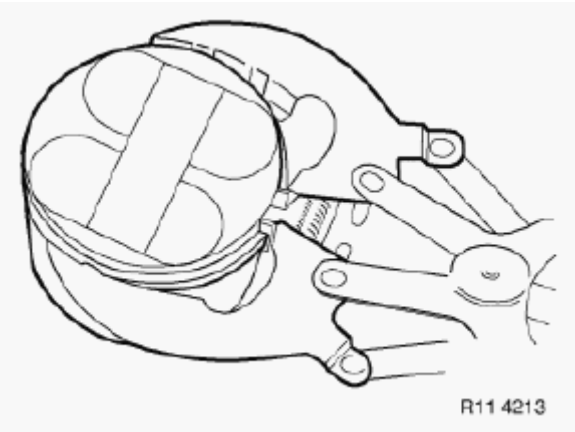


Fig. 189: Removing Plain Compression Ring And Stepped Ring With Piston Ring Pliers
Courtesy of BMW OF NORTH AMERICA, INC.

Determine end clearance with a feeler gauge, see **11 25 PISTONS WITH RINGS AND PINS N52K B25** .

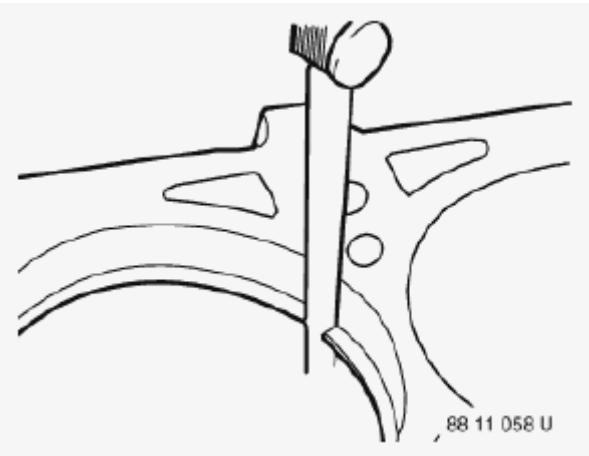


Fig. 190: Measuring Ring End Clearance With Feeler Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic diagram of piston rings.

Installation:

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Piston rings with "TOP" identification must point to piston crown.

1. Plain compression ring
2. Stepped ring "TOP"
3. U-flex ring

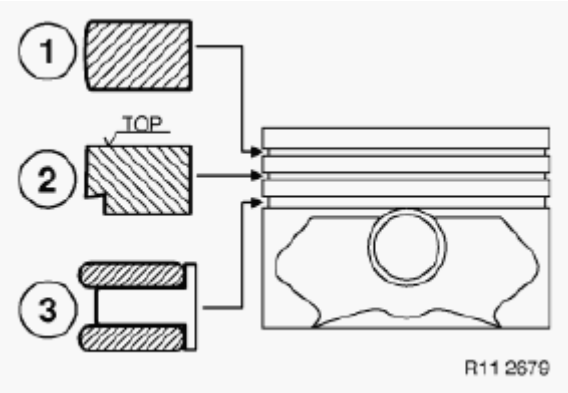


Fig. 191: Piston Rings Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The U-flex ring comprises two steel band rings (1) and a support spring (2).

Installation:

Insert support spring (2) into piston ring groove and then fit steel band rings (1) so that contact points are offset by approx. 120°.

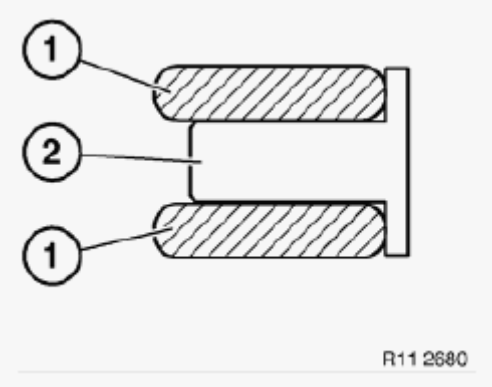


Fig. 192: Support Spring And Steel Band Rings
Courtesy of BMW OF NORTH AMERICA, INC.

The contact points (1) of the piston rings must be arranged offset by approx. 120°. However, the contact points (1) must not be arranged over the piston pin boss.

NOTE: Picture shows N52.

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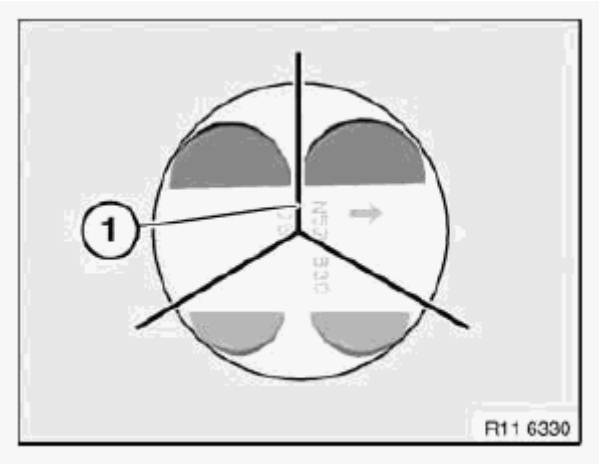


Fig. 193: Contact Points Of Piston Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

28 V-RIBBED BELT WITH TENSIONER / DEFLECT ELEMENT

11 28 010 REPLACING ALTERNATOR DRIVE BELT (N51)

Special tools required:

- 11 3 340

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

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

Necessary preliminary tasks:

- Remove Fan Cowl with electric fan.

NOTE: Mark the direction of rotation of the drive belt if it is to be reused.

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Layout of drive belt.

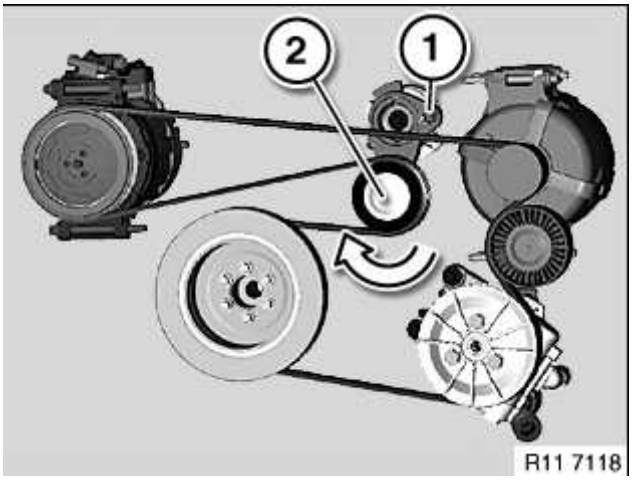


Fig. 194: Drive Belt Tensioner, Mounting Screw And Removal Direction
Courtesy of BMW OF NORTH AMERICA, INC.

Turn belt tensioner (4) in direction of arrow until bore (2) is flush on housing.

Hold belt tensioner (4) under tension.

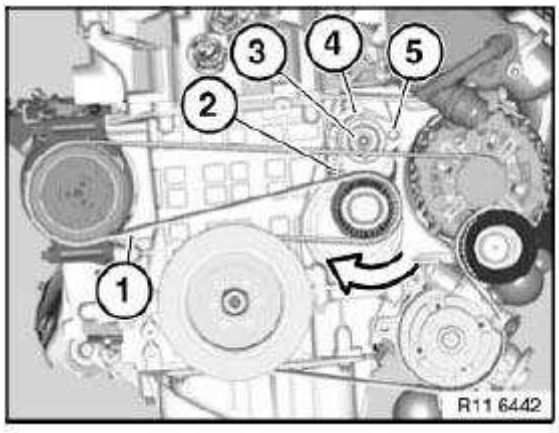


Fig. 195: Belt Tensioner And Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Secure belt tensioner with special tool 11 3 340.

NOTE: Illustration N42.

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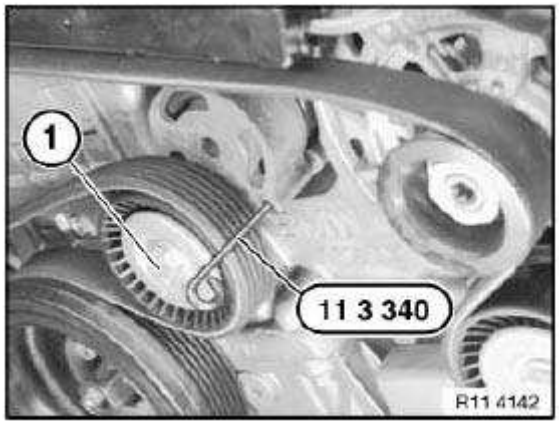


Fig. 196: Special Tool (11 3 340) And Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Remove drive belt (1) towards top.

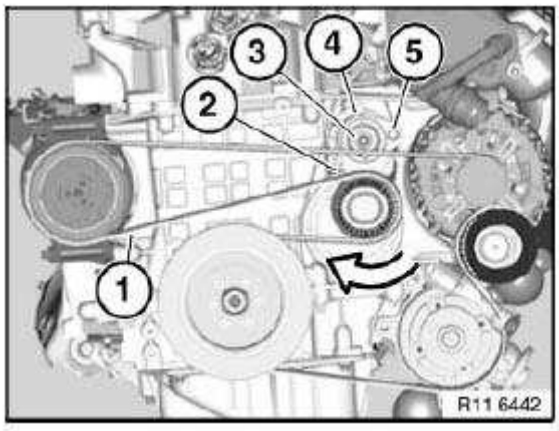


Fig. 197: Identifying Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Installation:

Check that drive belt for is in correct installation position - **risk of damage.**

11 28 010 REPLACING ALTERNATOR DRIVE BELT (N52K)

Special tools required:

- 11 3 340

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

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

Necessary preliminary tasks:

- Remove Fan Cowl with electric fan

NOTE: Mark the direction of rotation of the drive belt if it is to be reused.

Course of E9x drive belt:

Turn belt tensioner (4) in direction of arrow until bore (2) is flush on housing.

Hold belt tensioner (4) under tension.

Load is removed from tensioning pulley.

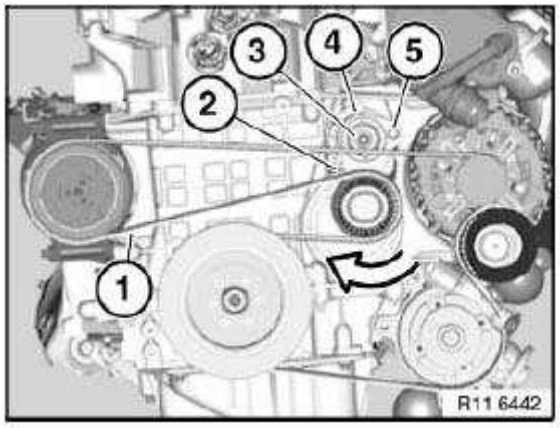


Fig. 198: Belt Tensioner And Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Course of E85 drive belt:

Turn belt tensioner (1) in direction of arrow until bore is flush on housing.

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Hold belt tensioner (1) under tension.

Load is removed from tensioning pulley (2).

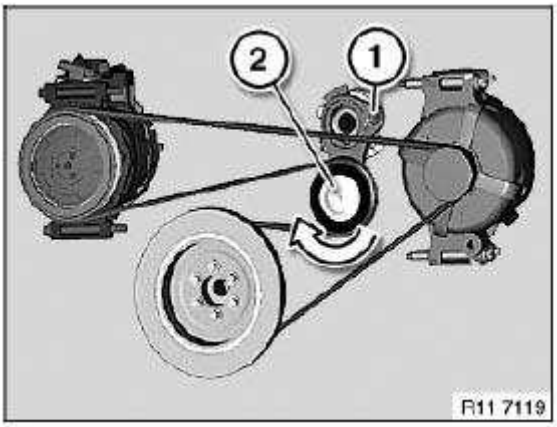


Fig. 199: Belt Tensioner And Tensioning Pulley
Courtesy of BMW OF NORTH AMERICA, INC.

All:

Secure belt tensioner (1) with special tool 11 3 340.

Remove drive belt upwards.

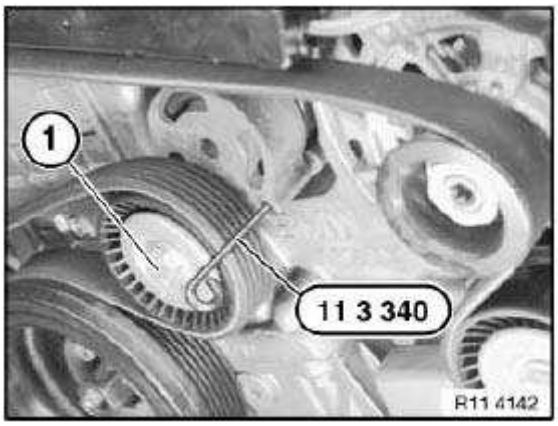


Fig. 200: Special Tool (11 3 340) And Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Installation:

Check that drive belt for is in correct installation position - **risk of damage.**

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11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N51)

Special tools required:

- 11 3 340

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

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

Necessary preliminary tasks:

- Remove Drive Belt.

Remove special tool 11 3 340.

Release screw (3).

For tightening torque refer to 11 28 1AZ in **28 V-RIBBED BELT WITH TENSIONER** .

Installation:

Replace aluminum screws.

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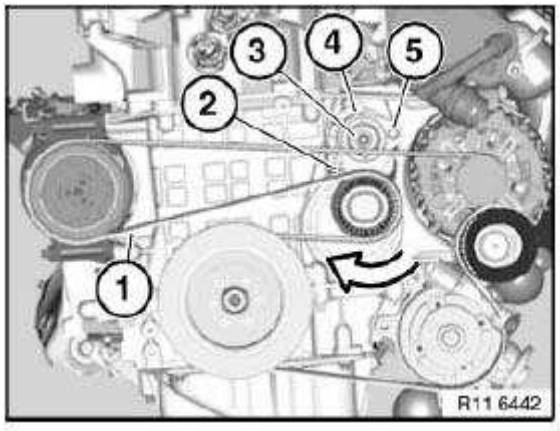


Fig. 201: Belt Tensioner And Belt Tensioner Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N52K)

Special tools required:

- 11 3 340

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

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

Necessary preliminary tasks:

- Remove Drive Belt

E9x only:

Remove special tool 11 3 340.

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Release screw (3) on belt tensioner (4).

For tightening torque refer to 11 28 1AZ in **28 V-RIBBED BELT WITH TENSIONER** .

Installation:

Replace aluminum screws.

Remove belt tensioner (4).

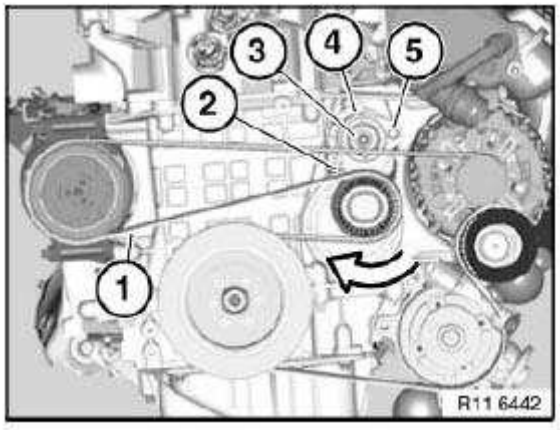


Fig. 202: Belt Tensioner And Belt Tensioner Screw
Courtesy of BMW OF NORTH AMERICA, INC.

E85 only:

Remove special tool 11 3 340.

Release screw on belt tensioner (1).

For tightening torque refer to 11 28 1AZ in **28 V-RIBBED BELT WITH TENSIONER** .

Installation:

Replace aluminum screws.

Remove belt tensioner (1).

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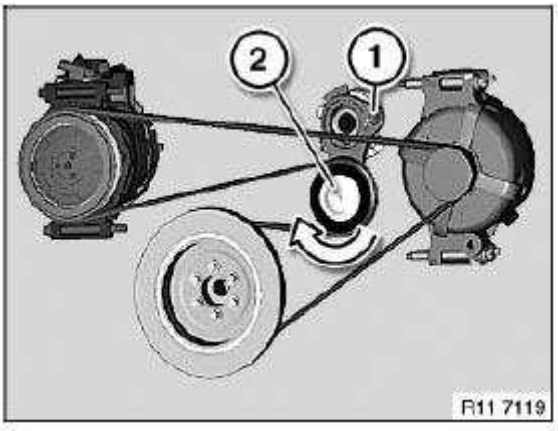


Fig. 203: Belt Tensioner And Drive Belt
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

31 CAMSHAFT

11 31 005 CHECKING TIMING OF CAMSHAFT(S) (N52K)

Special tools required:

- 11 0 300
- 11 4 281
- 11 4 282
- 11 4 283

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove underbody protection. See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION (X5)** or **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION (X3)**

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

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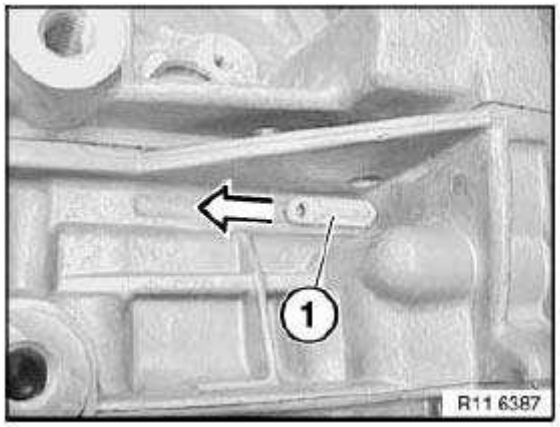


Fig. 204: Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

Slide special tool 11 0 300 in direction of arrow into special tool bore and secure crankshaft.

IMPORTANT: On vehicles with optional extra SA205 (automatic transmission), there is a large bore for the TDC position shortly before the special tool bore. This bore can be confused with the special tool bore.

If the flywheel is secured in the correct special tool bore with special tool 11 0 300 , the engine can no longer be moved at the central bolt.

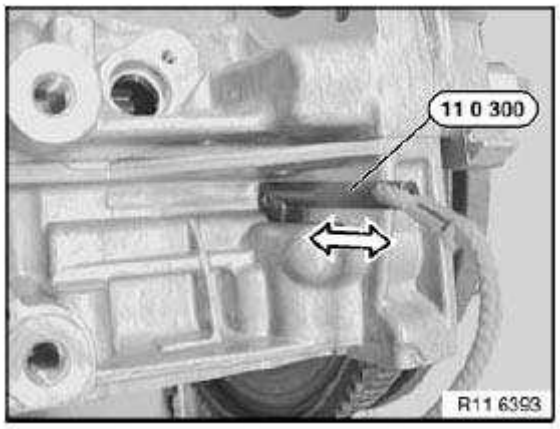


Fig. 205: Securing Crankshaft Using Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of inlet camshaft (1) at 1st cylinder point upwards at an angle.

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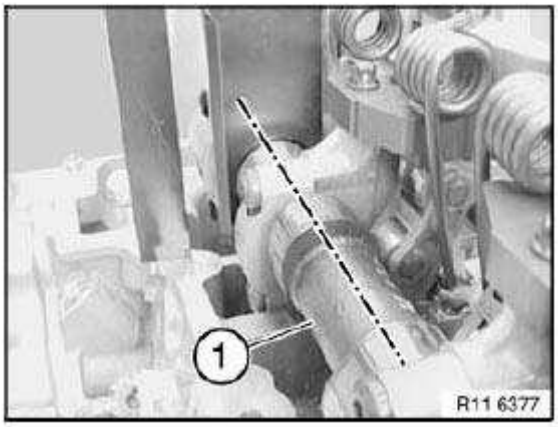


Fig. 206: Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

The timings are correct when the part numbers (2) on the inlet and exhaust camshafts (1) point upwards.

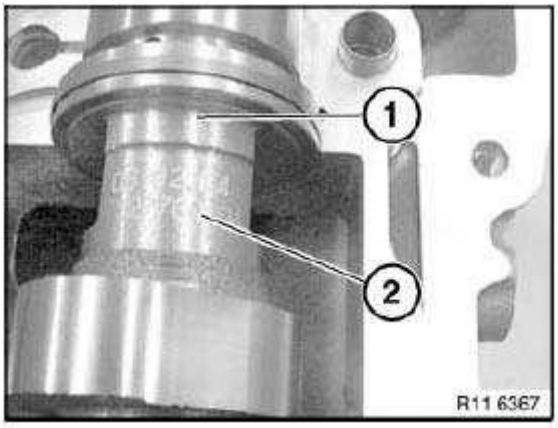


Fig. 207: Part Numbers On Inlet And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of exhaust camshaft (3) at 6th cylinder point downwards at an angle.

Cam follower (1) is not actuated.

NOTE: When the engine is installed, the position of the exhaust camshaft (3) for the timing can only be checked with a mirror.

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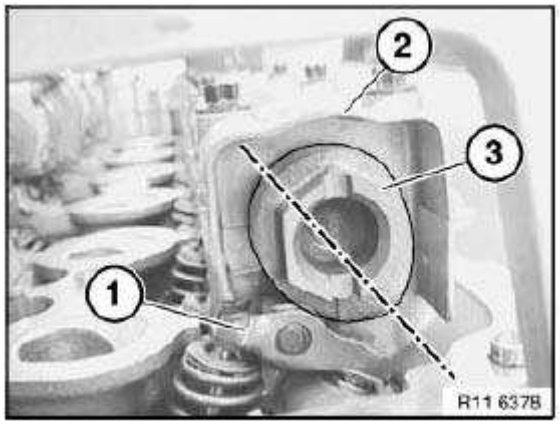


Fig. 208: Exhaust Camshaft And Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 283 to cylinder head with bolts (1).

NOTE: Fit special tool 11 4 282 underneath on side of inlet camshaft. Mount special tool 11 4 281 on inlet and exhaust camshafts.

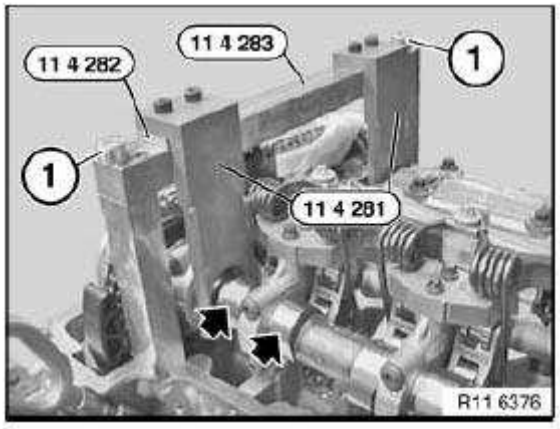


Fig. 209: Cylinder Head Bolts And Special Tools (11 4 282) And (11 4 281)
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, adjust valve timing, see **11 31 505 Adjusting timing of camshaft(s) (N52K)**.

Assemble engine.

11 31 025 REMOVING AND INSTALLING/REPLACING INLET CAMSHAFT (N52K)

Special tools required:

- 11 4 281
- 11 4 481

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IMPORTANT: Aluminum screws/bolts must be replaced each time they are released . The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification. Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove inlet adjustment unit
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Adjust valve timing, see **11 31 505 Adjusting timing of camshaft(s) (N52K)**.

NOTE: All bearing caps (1 and 2) are marked with numbers from 1 to 6.

Bearing cap (1) is a thrust bearing.

Release screws on bearing caps 1 to 6 (1 and 2).

Tightening torque: 11 31 2AZ, see **11 31 CAMSHAFT** .

Set all bearing caps down in special tool 11 4 481 in a tidy and orderly fashion.

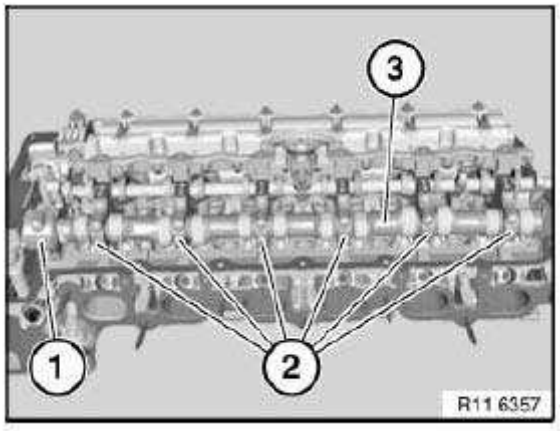


Fig. 210: Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Remove inlet camshaft (2) towards top.

Installation:

Clean all bearing points and lubricate with oil.

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Check plain compression rings (1) for damage and replace if necessary.

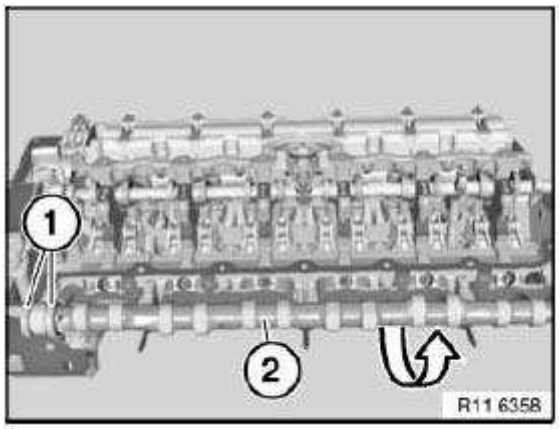


Fig. 211: Removing Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Plain compression rings (1) are engaged at joint.

Press plain compression rings (1) apart upwards and downwards and removed towards front.

IMPORTANT: Plain compression rings (1) can easily break.

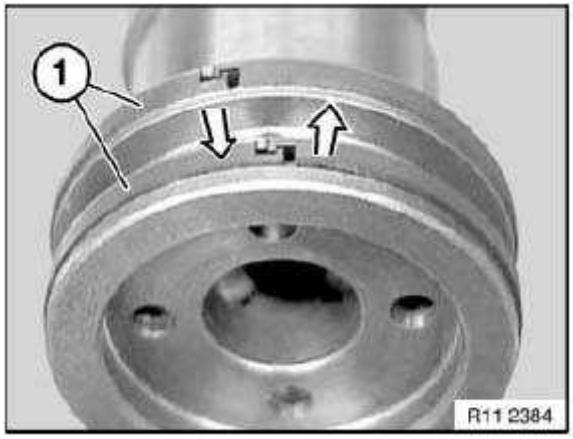
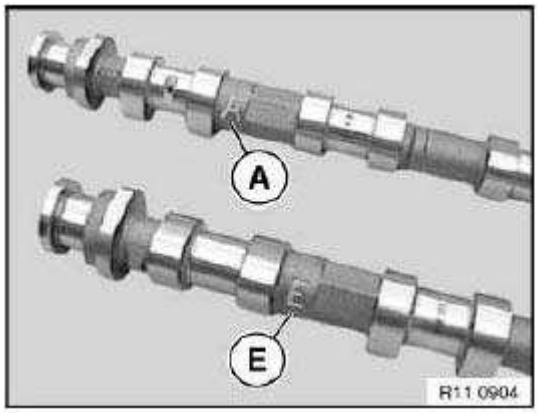


Fig. 212: Removing Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Markings of inlet and exhaust camshafts are different.
Mixing up the inlet and exhaust camshaft will result in engine damage .

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A Exhaust camshaft.
E Inlet camshaft

Fig. 213: Markings Of Inlet And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Insert inlet camshaft (1) so that part number on twin surface points upwards.

Position inlet camshaft (1) so that cams point upwards at an angle.

Attach special tool 11 4 281 to twin surface.

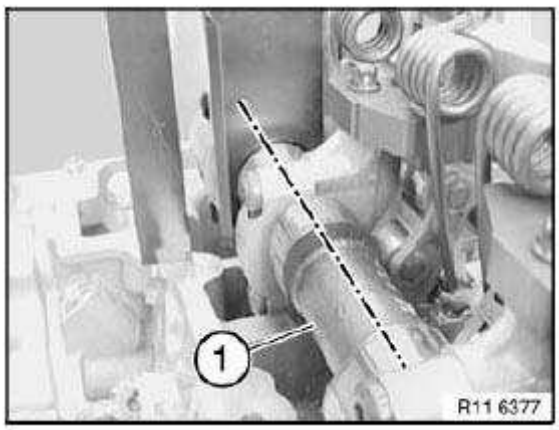


Fig. 214: Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 028 REMOVING AND INSTALLING/REPLACING EXHAUST CAMSHAFT (N52K)

Special tools required:

- 00 9 120
- 11 4 350
- 11 4 461

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- 11 4 462
- 11 4 463
- 11 9 000

IMPORTANT: It is absolutely essential to follow an exact procedure for removing and installing the exhaust camshaft.
Risk of damage!
The upper and lower bearing banks must be tensioned with a total of six special tools 11 4 461.

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove exhaust adjustment unit
- Adjust valve timing

The screw connection of the bearing banks must be released from the outside inwards.

Lift out upper and lower bearing banks (1) with exhaust camshaft.

Remove upper bearing bank (1).

Remove exhaust camshaft from lower bearing bank.

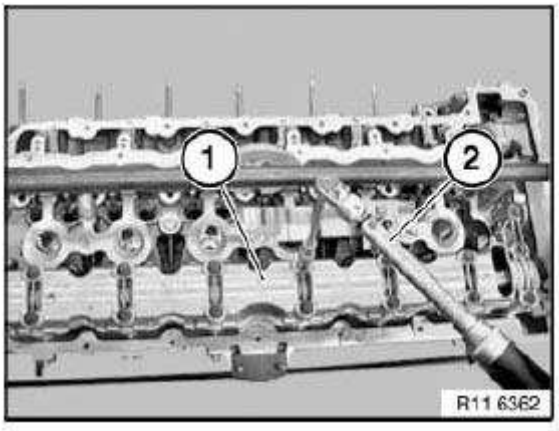


Fig. 215: Upper And Lower Bearing Banks
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Markings of inlet and exhaust camshafts are different.

Mixing up the inlet and exhaust camshaft will result in **engine damage** .

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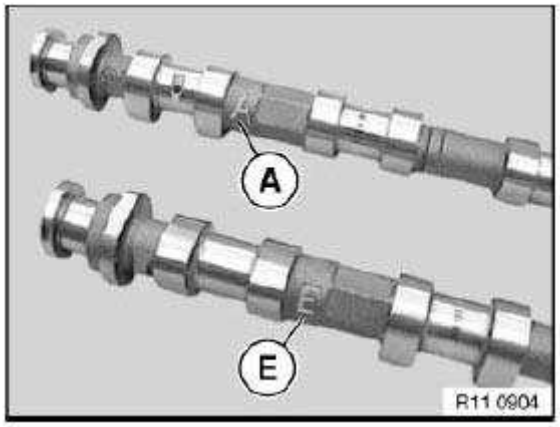


Fig. 216: Markings Of Inlet And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Check plain compression rings (1) for damage and replace if necessary.

Plain compression rings (1) are engaged at joint.

Press plain compression rings (1) apart upwards and downwards and removed towards front.

IMPORTANT: Plain compression rings (1) can easily break.

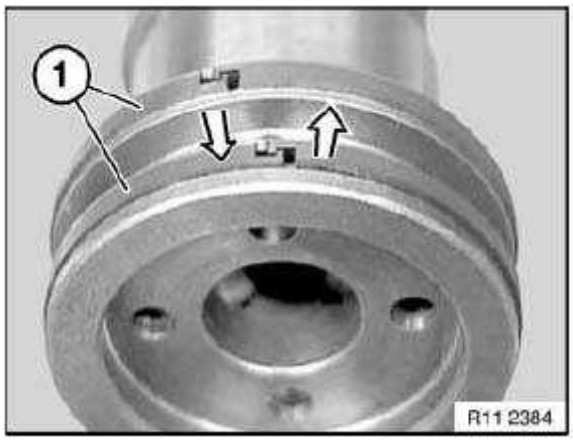


Fig. 217: Removing Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Removal on engine:
Set engine to firing TDC at 1st cylinder.
Removed cylinder head:
When using special tool 11 9 000, it will be necessary to remove the aluminum profile insert.

Mounting bearing bank:

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Pre-install special tool 11 4 462 on cylinder no. 2.

Insert special tool 11 4 463 in screw connection of cylinder head cover.

IMPORTANT: Special tool 11 4 463 is a special screw.

Press down cam followers (3) on cylinder no. 2 with spindle nut (2) of special tool 11 4 462.

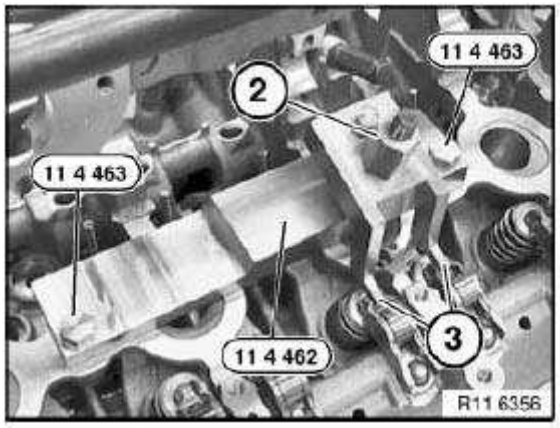


Fig. 218: Cam Followers, Spindle Nut And Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Before mounting the exhaust camshaft on the correct cam follower seat (1), pay attention to the hydraulic valve clearance adjustment element and the valve.

Refer to **REMOVING AND INSTALLING/REPLACING ALL CAM FOLLOWERS**.

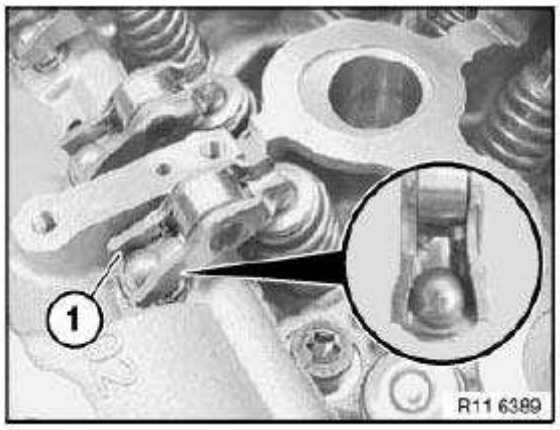


Fig. 219: Cam Follower Seat
Courtesy of BMW OF NORTH AMERICA, INC.

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Position lower bearing bank (1) with exhaust camshaft (2) cam followers.

Align exhaust camshaft (2).

Cylinder nos. 2 and 4 are at valve overlap.

Cams (3) on cylinder no. 1 point upwards at an angle.

Part number (4) on twin surface of exhaust camshaft (2) points upwards.

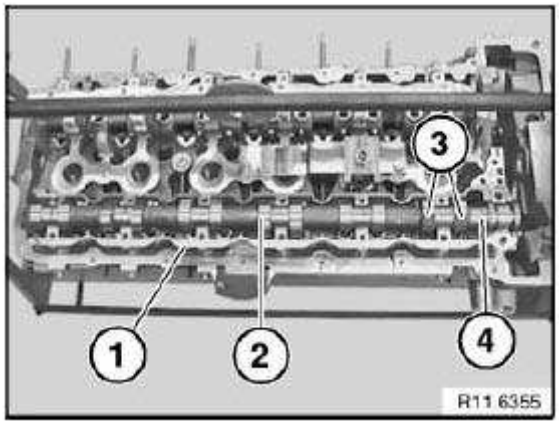


Fig. 220: Lower Bearing Bank, Exhaust Camshaft With Part Number And Cams
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: There must be no adhesive residues in the cylinder head tapped holes. Clean tapped holes.

Fit upper bearing bank (1).

Insert bolts dry.

Tension down upper bearing bank (1) with exhaust camshaft at bearing points 3 and 5 through a 1/2 bolt turn.

Join exhaust camshaft to upper and lower bearing banks (1) with torque wrench (2) from inside outwards to **8 Nm** .

Release all screws of upper bearing bank (1) from outside inwards by 90°.

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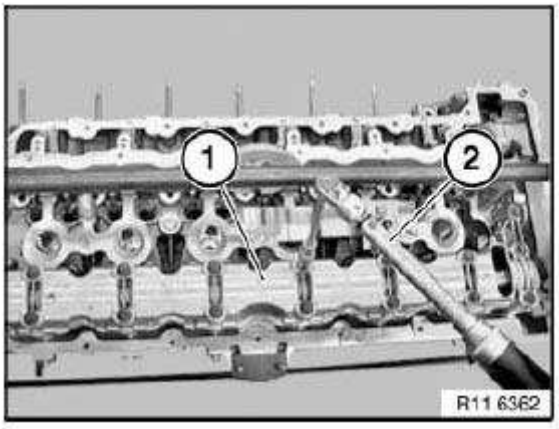


Fig. 221: Upper And Lower Bearing Banks
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Upper and lower bearing banks must be aligned to each other at ground surfaces (1 and 2).

Make sure that the thrust piece and the legs of special tools 11 4 461 rest on the milled surfaces.

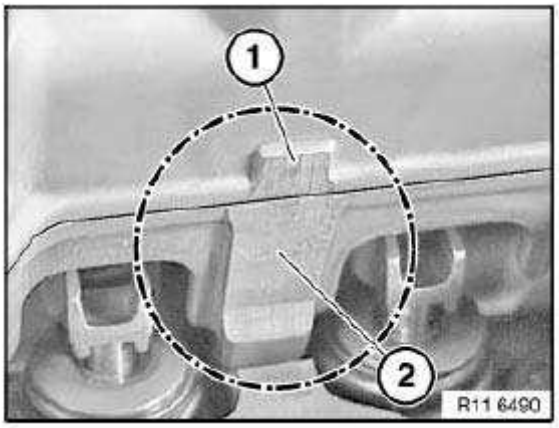


Fig. 222: Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic depiction of special tool 11 4 461 at upper bearing bank (1) and lower bearing bank (2).

Pretension all special tools 11 4 461 with special tool 11 4 350 only.

IMPORTANT: Tighten screw (3) on thrust piece to 2 Nm. Risk of damage!

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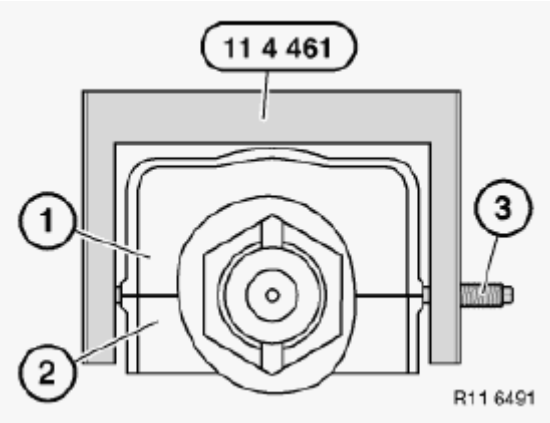


Fig. 223: Screw, Upper And Lower Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool 11 4 461 over screw connection of bearing banks.

Make sure that the legs rest exactly on the ground surfaces of the upper bearing bank (2) and lower bearing bank (1).

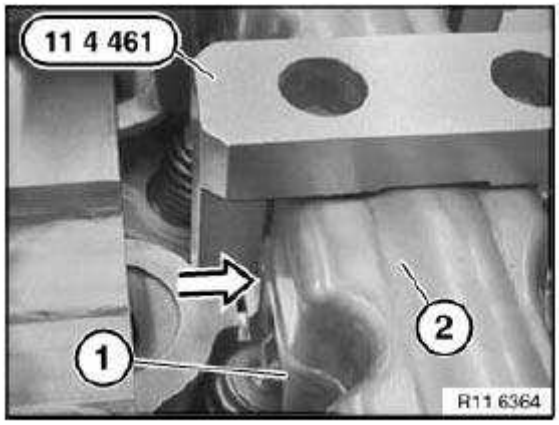


Fig. 224: Special Tool (11 4 461), Upper And Lower Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten screw of special tool 11 4 461 to ground surfaces of upper bearing bank (1) and lower bearing bank (2).

IMPORTANT: Tighten screws on thrust piece to 2 Nm. Risk of damage!

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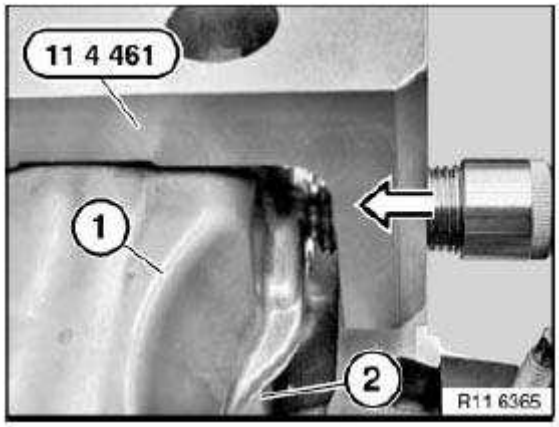


Fig. 225: Tightening Special Tool (11 4 461) Screw On Upper And Lower Bearing Bank Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Set special tool 11 4 350 to 2 Nm.
Pretension all special tools 11 4 461 with special tool 11 4 350 only.

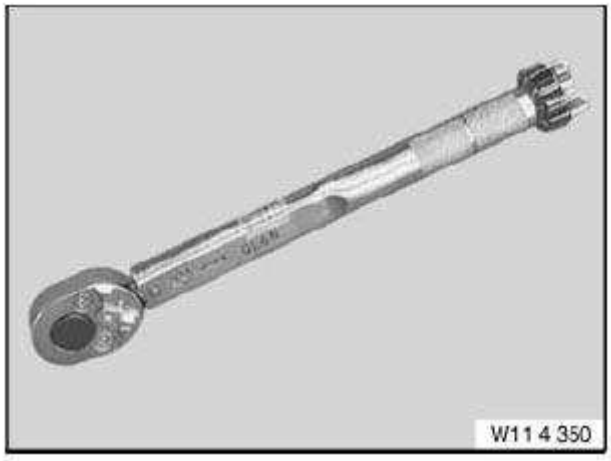


Fig. 226: Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tools 11 4 461 with screw (1) to inside of cylinder head.

Mount special tool 11 4 461 with screw facing outwards on cylinder no. 2.

Position special tools 11 4 461 so that screw connections (2) of bearing bank are easily accessible.

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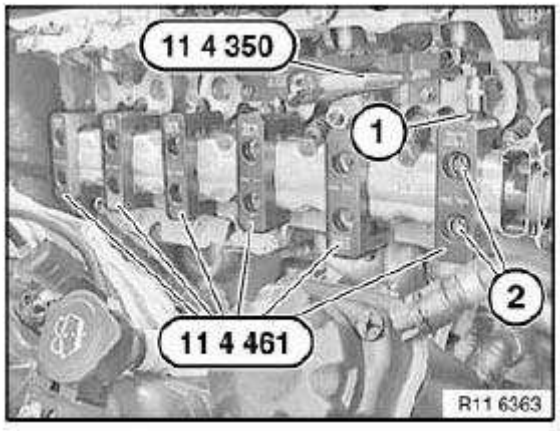


Fig. 227: Special Tools (11 4 461) And (11 4 350)
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten upper and lower bearing banks with special tool 00 9 120.

Tightening torque: 11 31 1AZ, see **11 31 CAMSHAFT** .

IMPORTANT: Remove special tool 11 4 461 only when exhaust camshaft screw connection is completed .

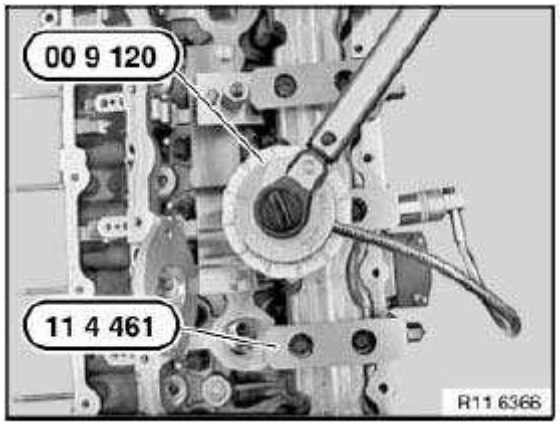


Fig. 228: Special Tools (11 4 461) And (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 051 REPLACING TIMING CHAIN (N52K)

Special tools required:

- 00 9 140
- 11 0 300

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- 11 4 280
- 11 4 281
- 11 4 282
- 11 4 283
- 11 4 360
- 11 4 362
- 11 5 200
- 11 9 280

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove all spark plugs
- Remove chain tensioner, see **11 31 090 Installing and removing/replacing chain tensioner piston (N52K)**
- Remove crankshaft radial seal at front, see **11 14 005 Replacing front crankshaft radial seal (N52K)**
- Remove drive belt tensioner
- Remove **VIBRATION DAMPER**

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

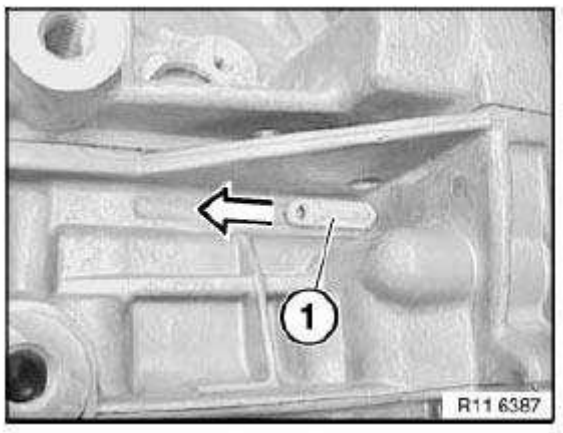


Fig. 229: Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

Slide special tool 11 0 300 in direction of arrow into special tool bore and secure crankshaft.

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IMPORTANT: On vehicles with optional extra SA205 (automatic transmission), there is a large bore for the TDC position shortly before the special tool bore. This bore can be confused with the special tool bore.

If the flywheel is secured in the correct special tool bore with special tool 11 0 300 , the engine can no longer be moved at the central bolt.

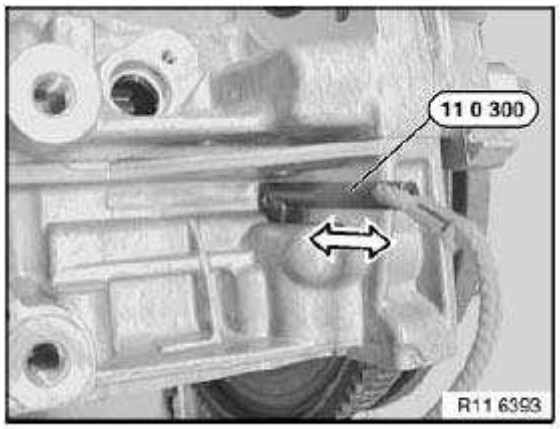


Fig. 230: Securing Crankshaft Using Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

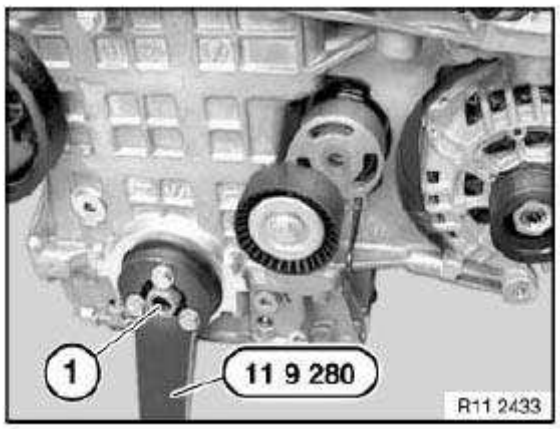
IMPORTANT: Do not remove special tool 11 0 300 to release central bolt (1). Employ a second person for gripping when releasing central bolt (1).

Screw special tool 11 9 280 onto hub of vibration damper.

Release central bolt (1).

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

Remove hub towards front.



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Fig. 231: Central Bolt With Special Tool (11 9 280)
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque: 11 31 7AZ, see **11 31 CAMSHAFT** .

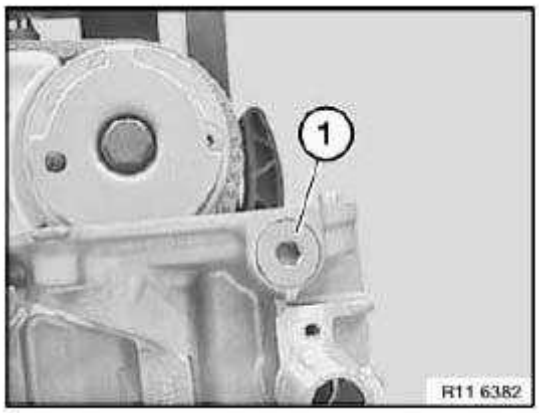


Fig. 232: Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque: 11 11 7AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

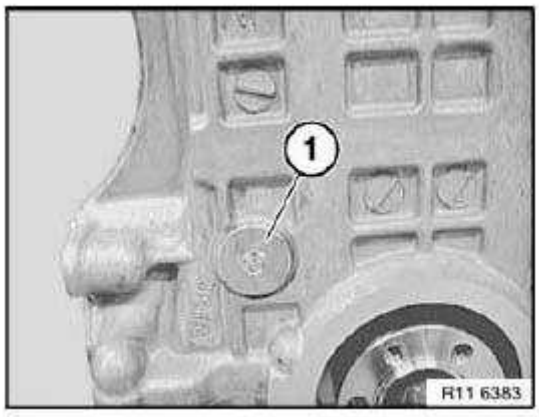


Fig. 233: Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release bearing pin (1) from timing chain module on cylinder head.

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Tightening torque: 11 31 5AZ, see **11 31 CAMSHAFT** .

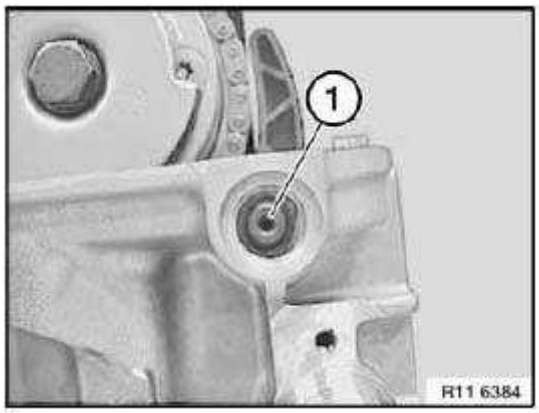


Fig. 234: Bearing Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Release bearing pin (1) from timing chain module on crankcase.

Tightening torque: 11 31 4AZ, see **11 31 CAMSHAFT** .

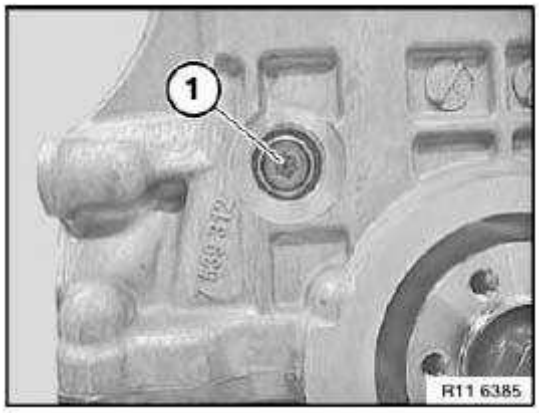


Fig. 235: Bearing Pin
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Install special tool 11 4 280 to release the central bolts on the inlet and exhaust adjustment units.

Secure special tool 11 4 283 to cylinder head with bolts (1).

NOTE: Fit special tool 11 4 282 underneath on side of inlet camshaft.

Mount special tool 11 4 281 on inlet and exhaust camshafts.

Do not remove special tool 11 4 280 .

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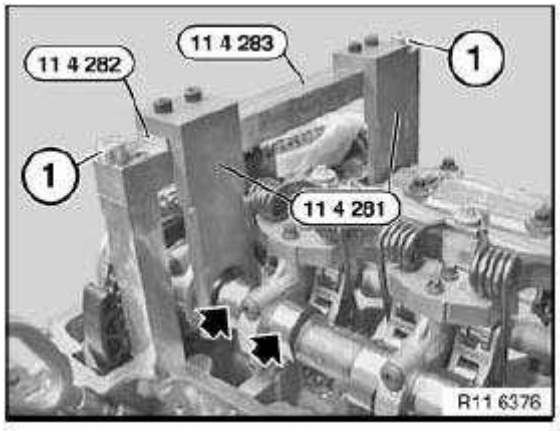


Fig. 236: Cylinder Head Bolts And Special Tools (11 4 282) And (11 4 281)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove inlet and exhaust adjustment unit.

Release bolts (1) from timing chain module on cylinder head.

Tightening torque: 11 31 3AZ, see **11 31 CAMSHAFT** .

Remove chain module with timing chain and sprocket wheel upwards in direction of arrow.

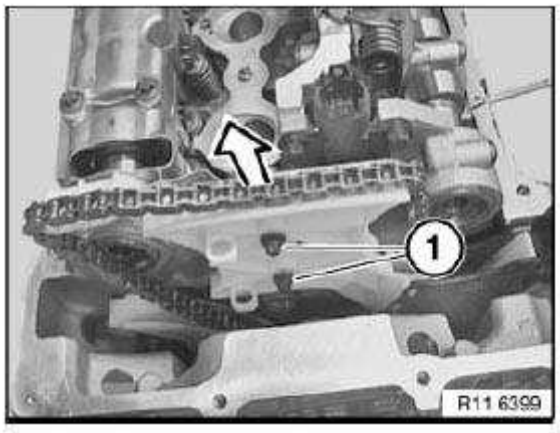


Fig. 237: Removing Timing Chain Module Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket wheel (2).
Collar (see arrow) on sprocket wheel (2) points to engine .
Incorrect assembly will result in engine damage .

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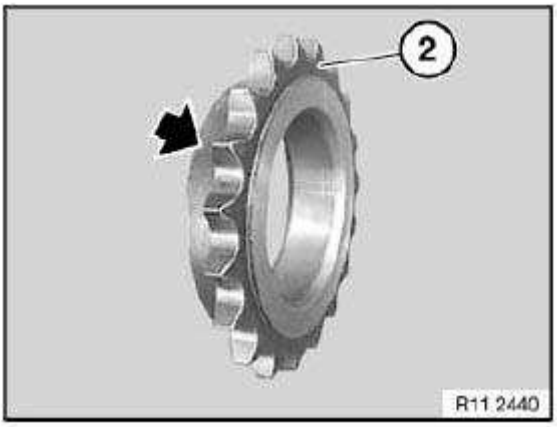


Fig. 238: Collar On Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Pull timing chain (1) upwards until sprocket wheel (2) engages chain guide (3).

Install timing chain (1) and sprocket wheel (2) in this position.

Installation:

Always hold timing chain (1) under tension. Timing chain (1) may jam on chain guide (3).

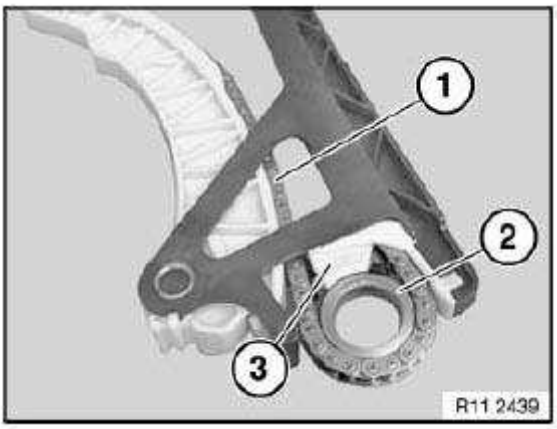


Fig. 239: Timing Chain, Sprocket Wheel And Chain Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Install hub with central bolt.

Tighten down special tool 11 5 200 with screws (1) to hub.

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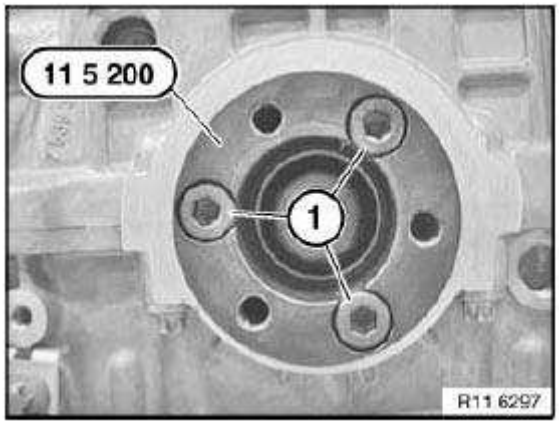


Fig. 240: Screws With Special Tool (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove tensioner for drive belt.

Screw in special tool 11 4 362 from special tool kit 11 4 360 .

Mount special tool 11 9 280 on 11 5 200 .

Support special tool 11 9 280 on special tool 11 4 362 .

Special tool 11 0 300 secures crankshaft.

Tighten central bolt to jointing torque.

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

Mark central bolt and hub with paint.

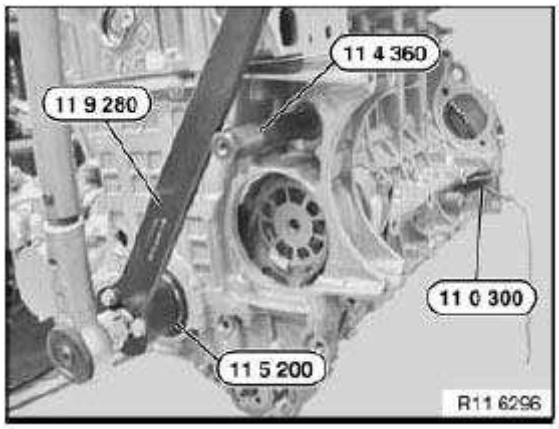


Fig. 241: Special Tools (11 9 280), (11 0 300), (11 4 360) And (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

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Mark special tools with colored line (1).

See picture.

**IMPORTANT: Do not remove the special tool while tightening the central bolt to torsion angle.
Risk of damage!**

If necessary, tighten central bolt to torsion angle with special tool 00 9 140 .

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

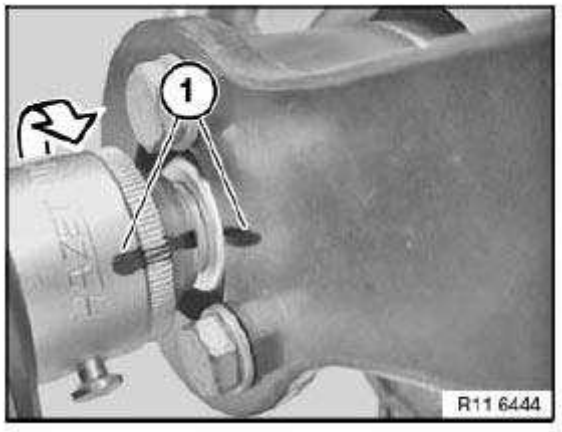


Fig. 242: Marking Special Tools With Colored Line
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten central bolt with a second person helping.

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

Install inlet and exhaust adjustment units.

Install chain tensioner, see **11 31 090 Installing and removing/replacing chain tensioner piston (N52K)**.

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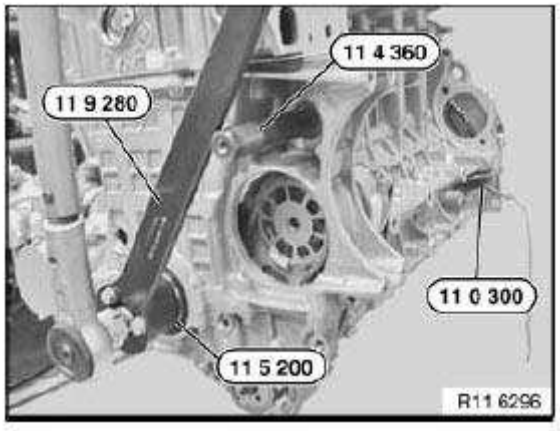


Fig. 243: Special Tools (11 9 280), (11 0 300), (11 4 360) And (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Crank engine twice.

Check timing, see **11 31 005 Checking timing of camshaft(s) (N52K)**.

If necessary, adjust valve timing, see **11 31 505 Adjusting timing of camshaft(s) (N52K)**.

Assemble engine.

11 31 090 INSTALLING AND REMOVING/REPLACING CHAIN TENSIONER PISTON (N52K)

Release chain tensioner (1).

Tightening torque: 11 31 6AZ, see **11 31 CAMSHAFT** .

IMPORTANT: Have a cleaning cloth ready. A small quantity of engine oil will emerge after the screw connection has been released.
Make sure no engine oil runs onto belt drive.

Installation:

No sealing ring is fitted during series-production assembly.

A sealing ring must be fitted by service personnel when the chain tensioner is fitted.

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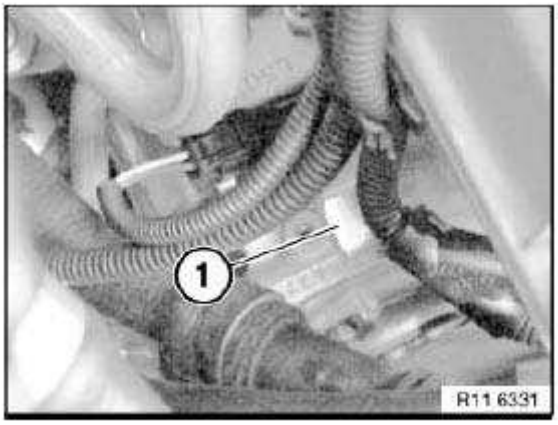


Fig. 244: Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

If the chain tensioner is reused, its oil chamber must be drained. Place chain tensioner on a level working surface and slowly compress.

Repeat procedure twice.



Fig. 245: Compressing Chain Tensioner On A Level Working Surface
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 505 ADJUSTING TIMING OF CAMSHAFT(S) (N52K)

Special tools required:

- **00 9 120 TORQUE ANGLE MEASURING DIAL**
- **00 9 250 TORSION ANGLE WRENCH WITH FLEXIBLE EXTENSION**
- 11 0 300
- 11 4 280

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- 11 4 281
- 11 4 282
- 11 4 283
- 11 4 290
- 11 9 340

Necessary preliminary tasks:

- Remove cylinder head cover

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

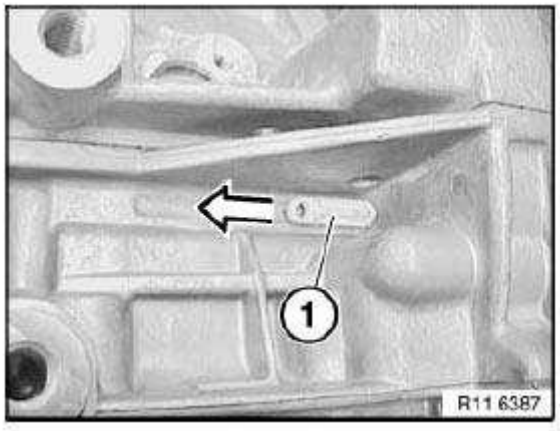


Fig. 246: Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

Slide special tool 11 0 300 in direction of arrow into special tool bore and secure crankshaft.

IMPORTANT: On vehicles with optional extra SA205 (automatic transmission), there is a large bore for the TDC position shortly before the special tool bore. This bore can be confused with the special tool bore.

If the flywheel is secured in the correct special tool bore with special tool 11 0 300 , the engine can no longer be moved at the central bolt.

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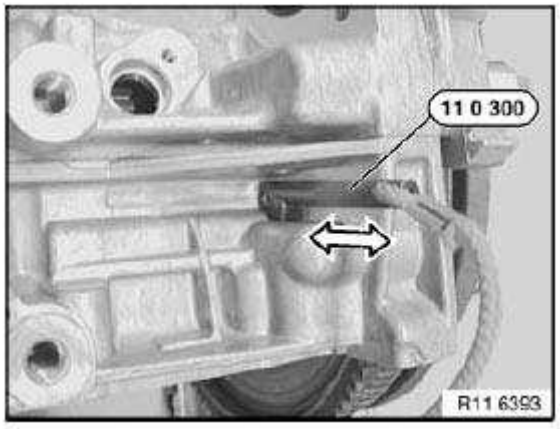


Fig. 247: Securing Crankshaft Using Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of inlet camshaft (1) at 1st cylinder point upwards at an angle.

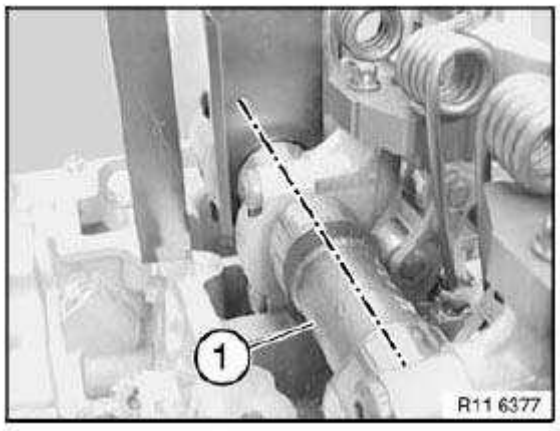


Fig. 248: Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Part numbers (2) on inlet and exhaust camshafts (1) point upwards.

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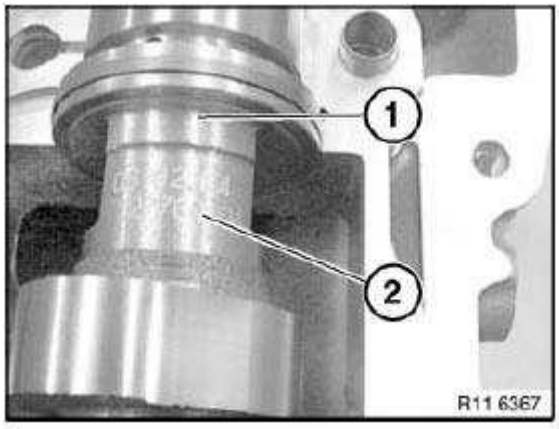


Fig. 249: Part Numbers On Inlet And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of exhaust camshaft (3) at 6th cylinder point downwards at an angle.

Cam follower (1) is not actuated.

NOTE: When the engine is installed, the position of the exhaust camshaft (3) for the timing can only be checked with a mirror.

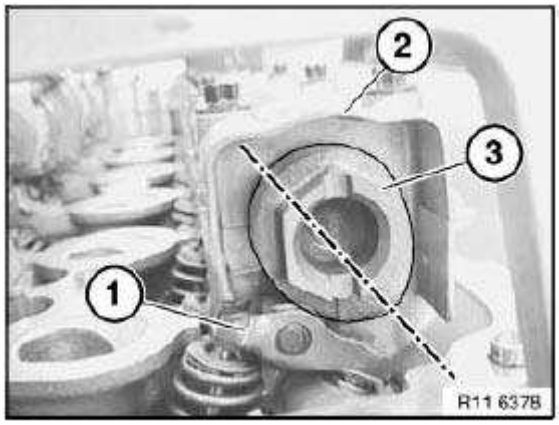


Fig. 250: Exhaust Camshaft And Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 283 to cylinder head with bolts (1).

NOTE: Fit special tool 11 4 282 underneath on side of inlet camshaft.

Mount special tool 11 4 281 on inlet and exhaust camshafts.

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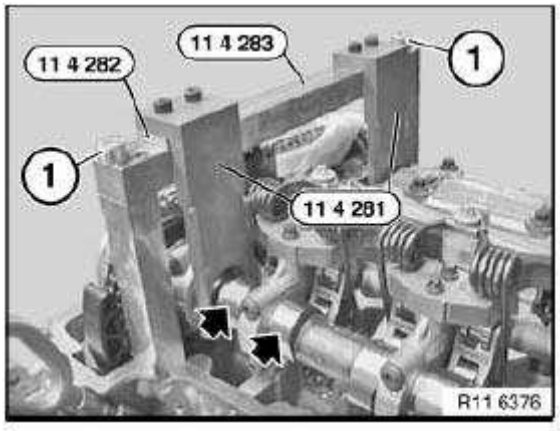


Fig. 251: Cylinder Head Bolts And Special Tools (11 4 282) And (11 4 281)
Courtesy of BMW OF NORTH AMERICA, INC.

Release central bolts (1).

Release central bolts (1) with special tool 11 4 280 only.

Release chain tensioner (2) (have a cleaning cloth ready).

NOTE: Picture in CAD and does not show special tools.

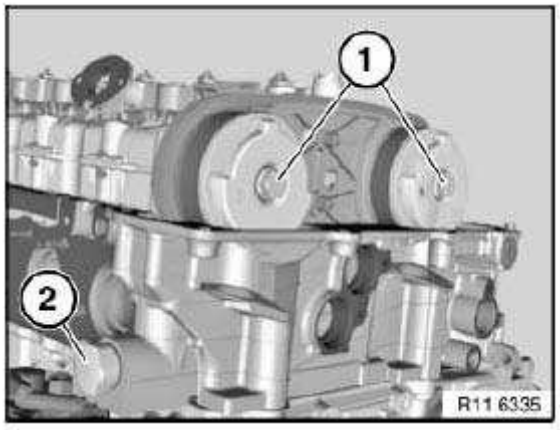


Fig. 252: Central Bolts And Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Turn sensor gears (2) in direction of arrow until locating pins (1) on special tool 11 4 290 match up.

Slide on special tool 11 4 290 in direction of arrow.

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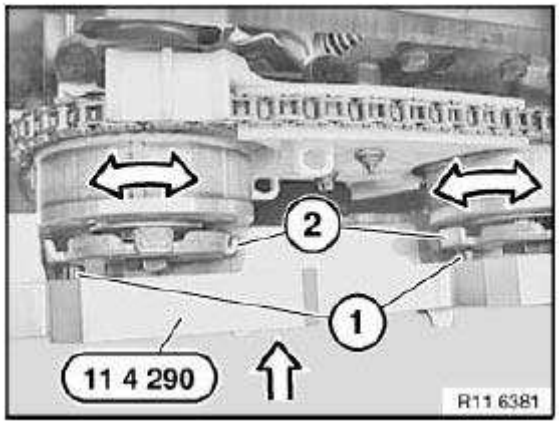


Fig. 253: Sensor Gears, Locating Pins And Special Tool (11 4 290)
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 290 with bolts (1).

Screw special tool 11 9 340 into cylinder head.

Pretension timing chain with special tool 00 9 250 to **0.6 Nm** .

Secure both central bolts of inlet and exhaust adjustment units with special tool 00 9 120 to inlet and exhaust camshafts.

Tightening torque: 11 36 1AZ, see **11 36 VARIABLE CAMSHAFT CONTROL VANOS** .

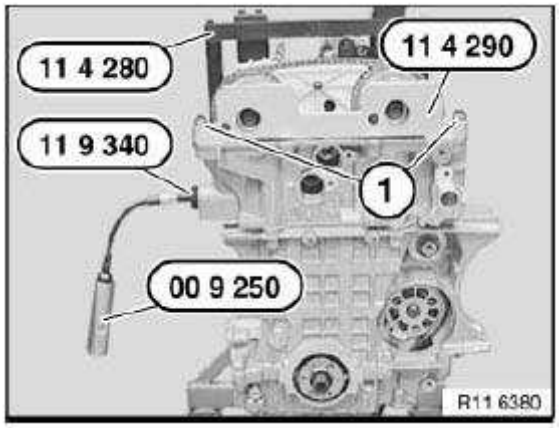


Fig. 254: Special Tools (00 9 250), (11 9 340) And (11 4 290)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

33 ROCKER ARM WITH BEARING MOUNT

11 33 050 REMOVING AND INSTALLING/REPLACING ALL CAM FOLLOWERS (N52K)

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Special tools required:

- 11 4 480

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Remove exhaust camshaft, see **11 31 028 Removing and installing/replacing exhaust camshaft (N52K)**.

IMPORTANT: Rocker arms (1) are divided into bearing categories.
The tolerance classes are marked according to the picture in numbers from 1 to 5.
Already used rocker arms (1) may only be reused in the same position.

Detach cam followers (1) from HVCA element and remove.

Set down all cam followers (1) in neat order in special tool 11 4 480 .

Installation:

Before installing exhaust camshaft or intermediate levers, make sure cam followers (1) are correctly seated.

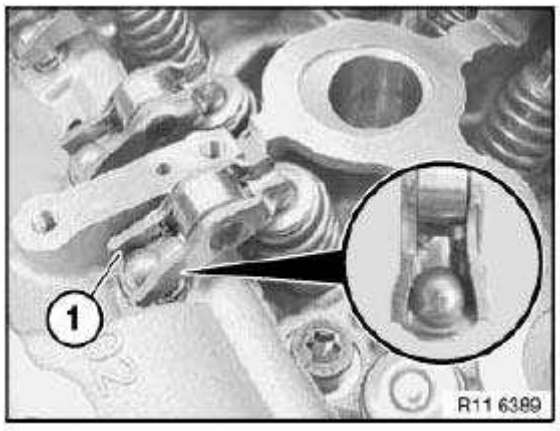


Fig. 255: Cam Follower Seat
Courtesy of BMW OF NORTH AMERICA, INC.

Remove HVCA element (1) in direction of arrow.

Installation:

If the HVCA elements (1) are reused, they must be placed together with the cam followers in neat order in special tool 11 4 480 .

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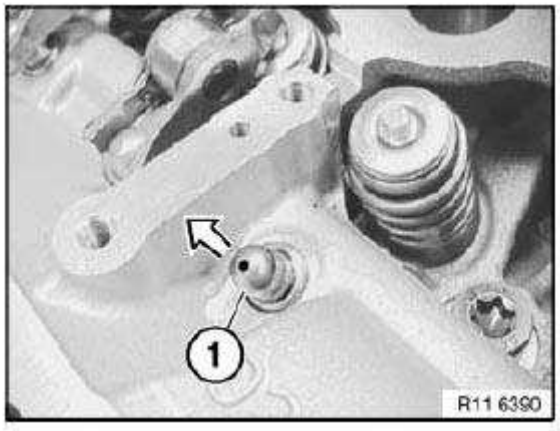


Fig. 256: Removing HVCA Element
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME; if necessary, readjust uniform mixture distribution.

34 VALVES WITH SPRINGS

11 34 552 REMOVING AND INSTALLING/REPLACING ALL VALVES (N52K)

Special tools required:

- 11 4 480

Necessary preliminary tasks:

- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Remove eccentric shaft, see **11 37 005 Removing and installing/replacing eccentric shaft (N52K)**
- Remove inlet camshaft, see **11 31 025 Removing and installing/replacing inlet camshaft (N52K)**
- Remove exhaust camshaft, see **11 31 028 Removing and installing/replacing exhaust camshaft (N52K)**
- Remove cam followers, see **11 33 050 Removing and installing/replacing all cam followers (N52K)**
- Remove valve springs, see **11 34 715 Replacing all valve springs (N52K)**
- Remove valve stem seals, see **11 34 560 Replacing all valve stem seals (N52K)**

Arrangement:

1. Valve
2. Valve stem seal with lower spring plate

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3. Valve spring
4. Upper spring plate
5. Valve tapers

If the valves are to be reused, they must be placed in neat order in special tool 11 4 480 .

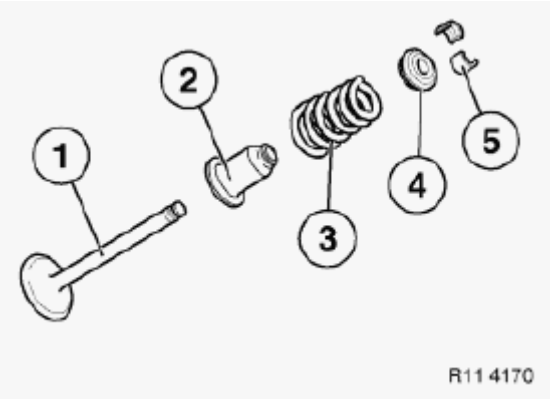


Fig. 257: Upper Spring Plate, Valve Tapers And Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME; if necessary, readjust uniform mixture distribution.

11 34 560 REPLACING ALL VALVE STEM SEALS (N52K)

Special tools required:

- 11 1 480
- 11 6 380

Necessary preliminary tasks:

- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Remove eccentric shaft, see **11 37 005 Removing and installing/replacing eccentric shaft (N52K)**
- Remove inlet camshaft, see **11 31 025 Removing and installing/replacing inlet camshaft (N52K)**
- Remove exhaust camshaft, see **11 31 028 Removing and installing/replacing exhaust camshaft (N52K)**.
- Remove cam followers, see **11 33 050 Removing and installing/replacing all cam followers (N52K)**

Firmly press special tool 11 1 480 onto old valve stem seals.

Detach valve stem seal from valve stem by turning and simultaneously pulling special tool 11 1 480 .

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Installation:

Insert all valves.

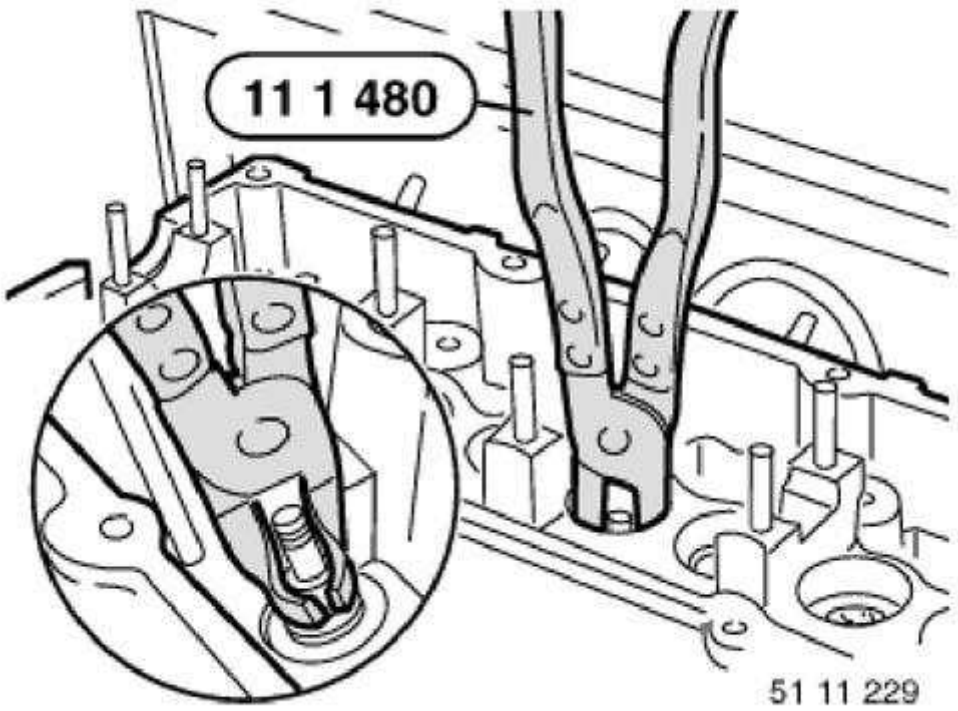


Fig. 258: Special Tool (11 1 480)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For use on the N52K engine, special tool 11 6 380 must be remachined according to the picture with a 10 mm dia. drill bit to a depth of B = approx. 23 mm.
This modification has already been taken into account for reordering.

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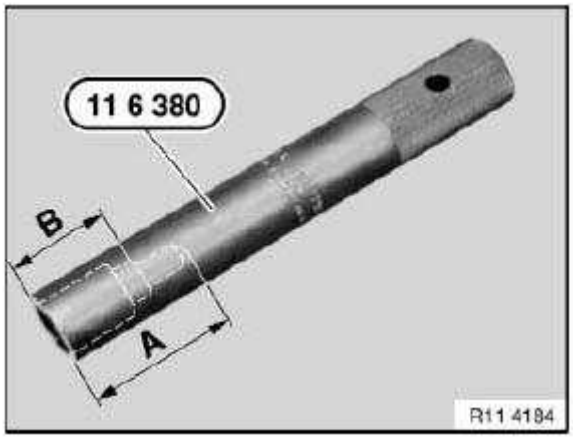


Fig. 259: Special Tool (11 6 380) With Dimensions
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Different diameters at valve stem.
All valve stem seals are color-coded.

For 5 mm dia. valves, the valve stem seal is marked red or brown.

For 6 mm dia. valves, the valve stem seal is marked green or light green.

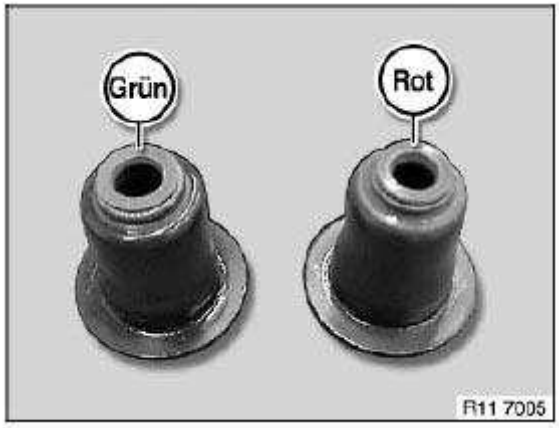


Fig. 260: Valve Stem Seals Color-Coded, Green (Grun), and Red (Rot)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit the mounting sleeves (plastic sleeves) contained in the delivery specification on the valve stem end.

Lubricate mounting sleeve.

Press on valve stem seal by hand with special tool 11 6 380 as far as it will go.

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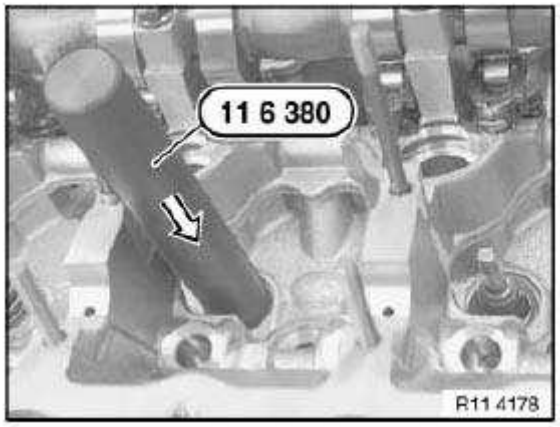


Fig. 261: Special Tool (11 6 380)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 34 715 REPLACING ALL VALVE SPRINGS (N52K)

Special tools required:

- 11 0 346
- 11 4 480
- 11 9 000
- 11 9 017

Necessary preliminary tasks:

- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove exhaust camshaft, see **11 31 028 Removing and installing/replacing exhaust camshaft (N52K)**.
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Remove inlet camshaft, see **11 31 025 Removing and installing/replacing inlet camshaft (N52K)**
- Remove cam followers, see **11 33 050 Removing and installing/replacing all cam followers (N52K)**

Place cylinder head on special tool 11 9 000 .

Press down **inlet valves** with special tool 11 9 017 .

Press down **exhaust valves** with special tool 11 0 346 .

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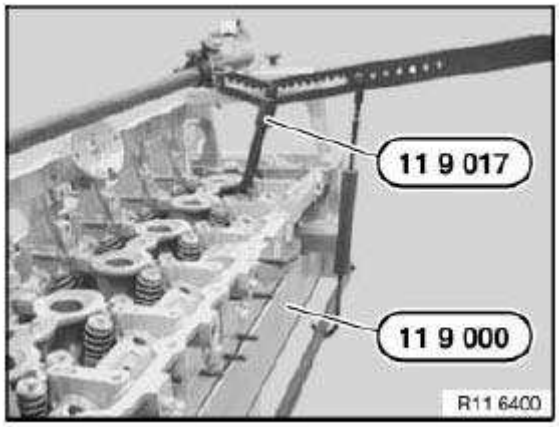


Fig. 262: Special Tool (11 9 017) And (11 9 000)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove valve cotters with a magnet.

Remove valve spring with spring plates.

If the individual components are to be reused, they must be placed in neat order in special tool 11 4 480 .

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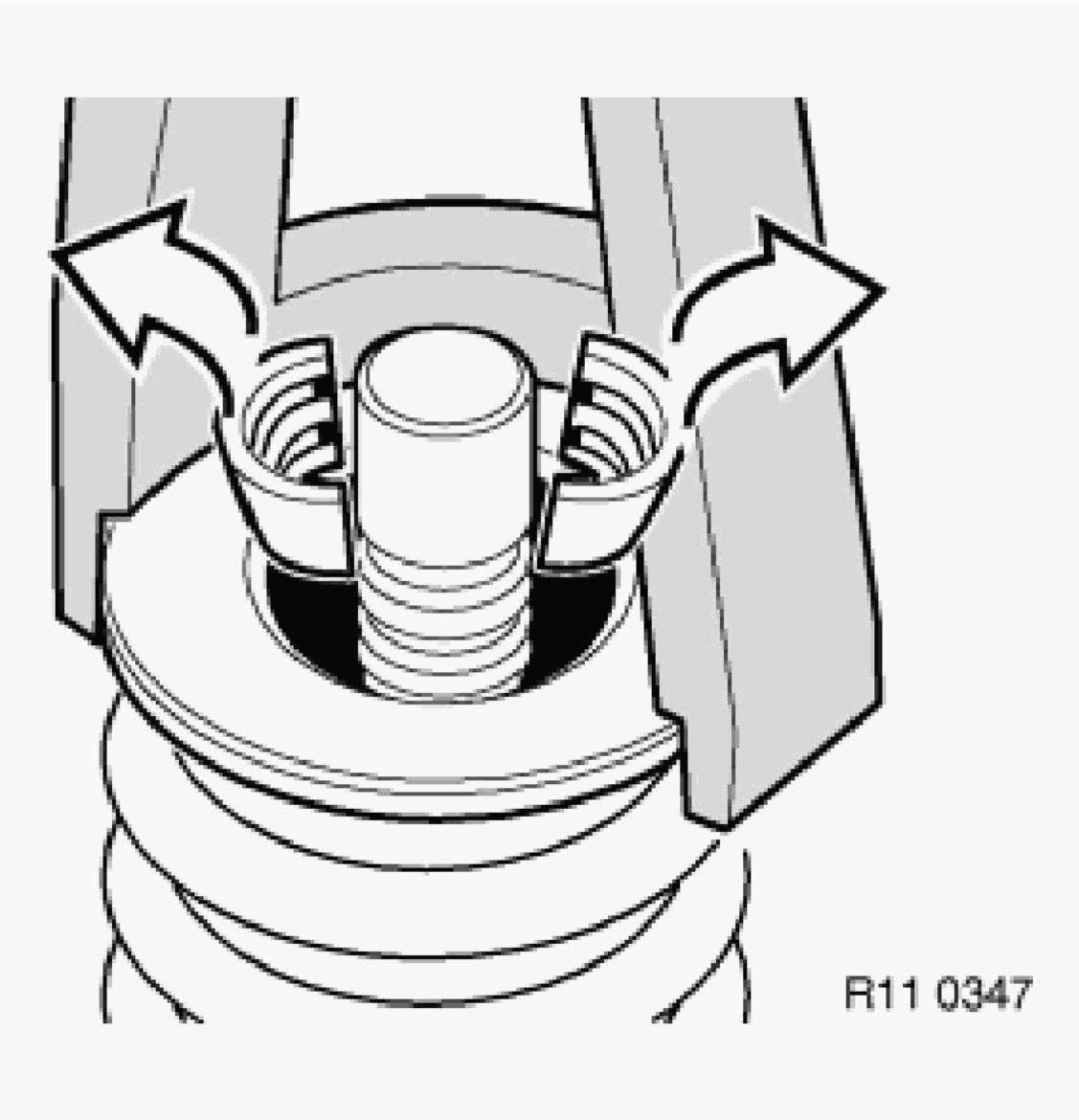


Fig. 263: Removing Valve Cotters With Magnet
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Incorrect installation possible.
Incorrect installation will result in valve spring breakage.
Risk of mixing up the valve springs for the inlet and exhaust valves.

The valve spring is color-coded (1) at the lower end.

Install the valve spring so that the larger diameter points to the lower spring plate.

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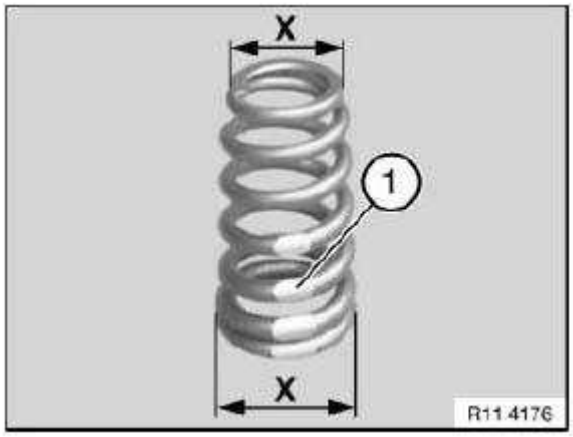


Fig. 264: Valve Spring Color-Coded
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement:

1. Valve
2. Valve stem seal with lower spring plate
3. Valve spring
4. Upper spring plate
5. Valve tapers

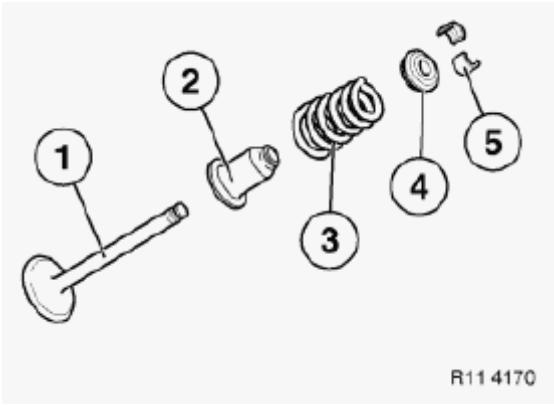


Fig. 265: Upper Spring Plate, Valve Tapers And Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME; if necessary, readjust uniform mixture distribution.

37 VARIABLE VALVE GEAR

11 37 005 REMOVING AND INSTALLING/REPLACING ECCENTRIC SHAFT (N52K)

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Special tools required:

- 11 4 481

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.

If necessary, move eccentric shaft (1) on twin surface to minimum lift (2).

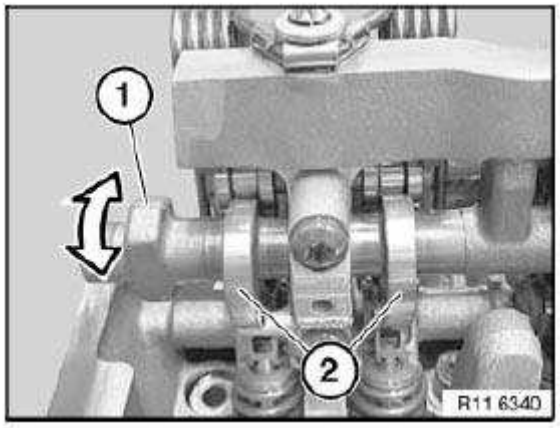


Fig. 266: Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: All bearing caps (1 and 2) of eccentric shaft are marked with numbers from 1 to 6 (1 for 1st cylinder to 6 for 6th cylinder).

Bearing cap 6 (1) is provided with a stop.

Release screws on bearing cap 6 (1).

Release screws on bearing caps 1 to 5 (2).

Set all bearing caps down in special tool 11 4 481 in a tidy and orderly fashion.

Remove eccentric shaft with gentle tilting and turning movements.

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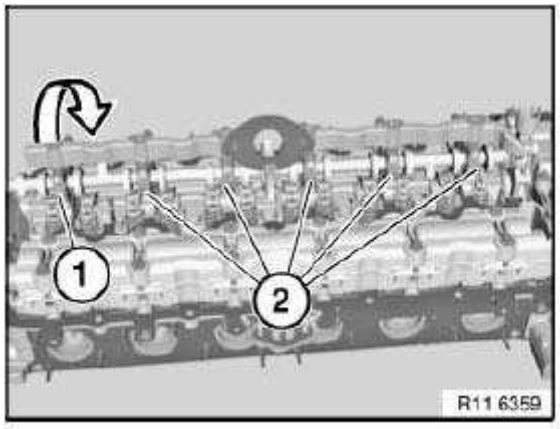


Fig. 267: Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Screw is not magnetic and must be secured against falling down.

Release screw.

Remove magnet wheel (1).

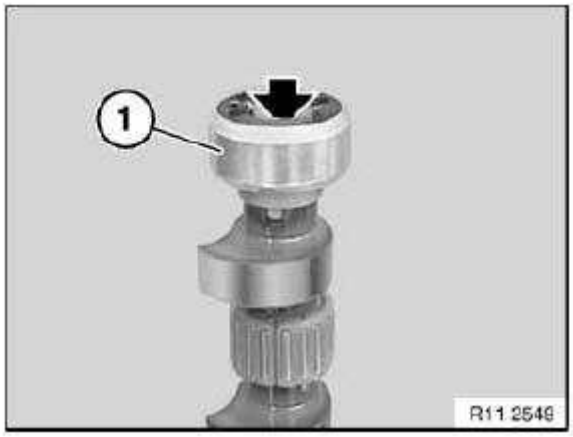


Fig. 268: Magnet Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Magnet wheel (1) is highly magnetic and must be protected against metal filings/borings.

After removing, place magnet wheel (1) in a plastic bag (2) with a seal.

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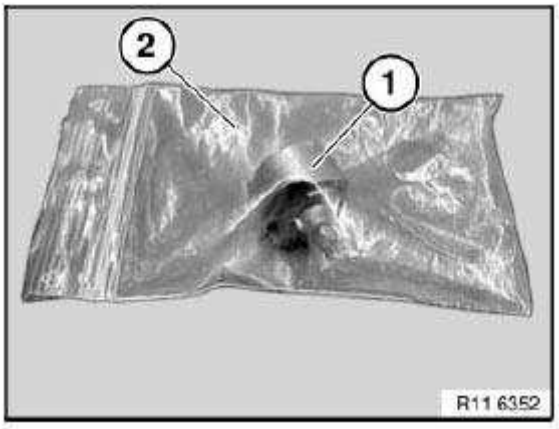


Fig. 269: Magnet Wheel And Plastic Bag
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Needle bearing (1) can break very easily.

Carefully pull needle bearing (1) apart at point of separation.

Remove all needle bearings (1) from eccentric shaft.

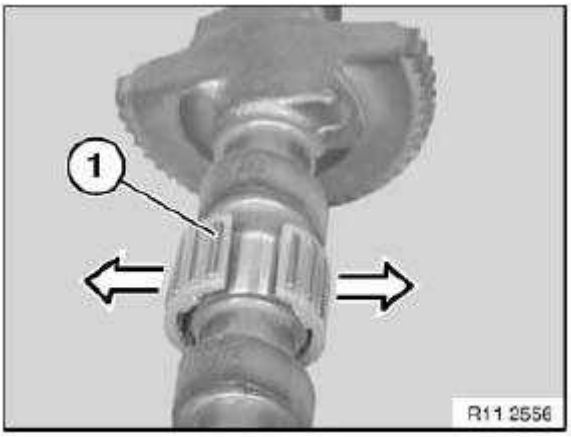


Fig. 270: Removing Needle Bearings From Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Install bearing shells (1) as pictured.

NOTE: Always replace bearing shells (1) and needle bearings together.

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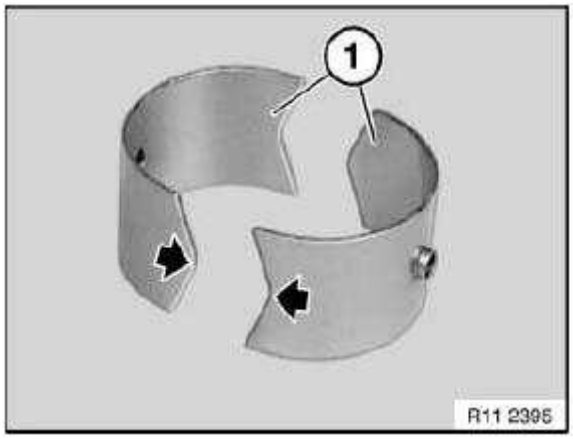


Fig. 271: Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Install bearing shell (1) with tip facing down (see arrow) in cylinder head.

Install bearing shell (2) with tip facing up in bearing cap.

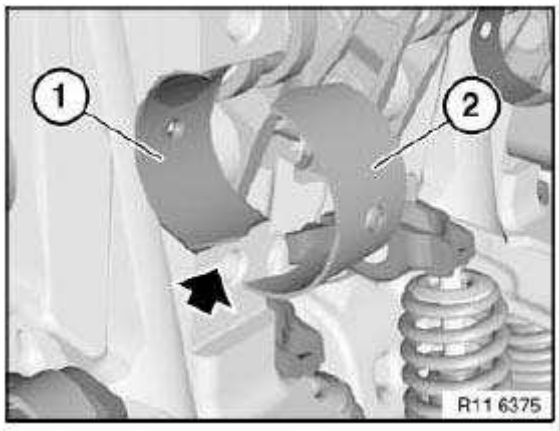


Fig. 272: Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: All bearing caps (1 and 2) of eccentric shaft are marked with numbers from 1 to 6 (1 for 1st cylinder to 6 for 6th cylinder).

Bearing cap 6 (1) is provided with a stop.

Insert eccentric shaft.

Adjust eccentric shaft on dihedron to minimum stroke.

Fit all bearing caps (1 and 2).

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Insert all screws.

Tightening torque: 11 12 7AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

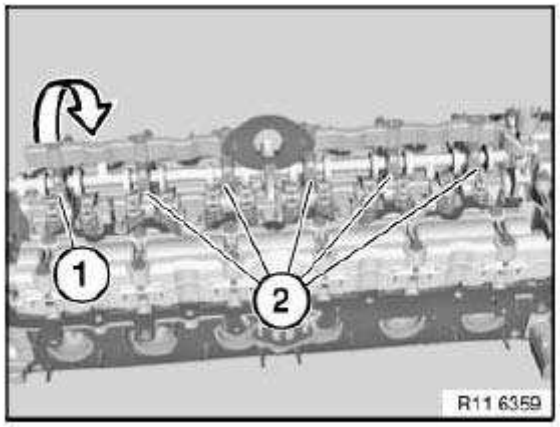


Fig. 273: Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 37 010 REMOVING AND INSTALLING/REPLACING INTERMEDIATE LEVERS (N52K)

Special tools required:

- 11 4 270
- 11 4 450
- 11 4 481

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released .
The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove cylinder head cover

If necessary, move eccentric shaft (1) on twin surface to minimum lift (2).

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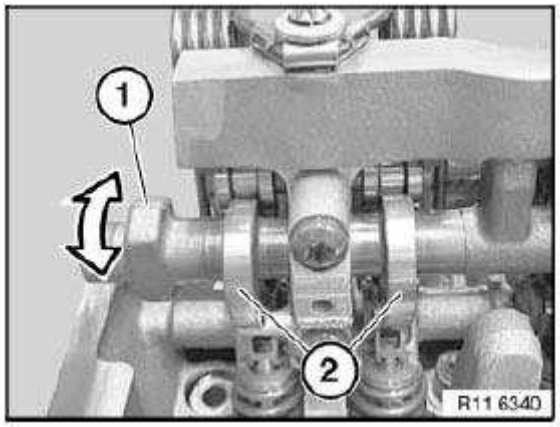


Fig. 274: Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Oil spray nozzle must be removed from 3rd cylinder (make a note of installation position of oil spray nozzle).

Secure special tool 11 4 270 with gripping pliers (3) to guide block (2).

IMPORTANT: Special tool 11 4 270 is only secured to guide block (2). Adjusting the gripping pliers (3) on special tool 11 4 270 is not permitted. Risk of damage!

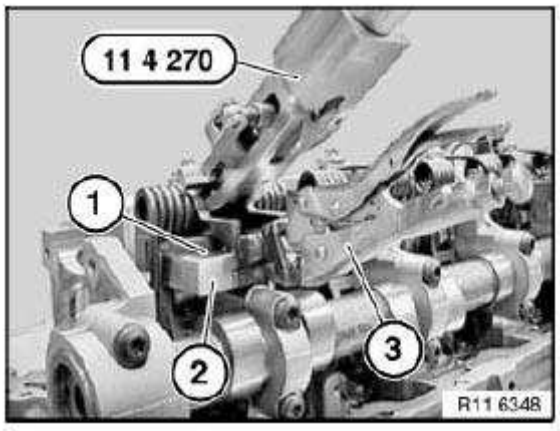


Fig. 275: Special Tool (11 4 270) - Gripping Pliers And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.

IMPORTANT: Improper handling. Risk of damage!

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Secure both bearing pins (2) in torsion springs with knurled screw (1) of special tool 11 4 270 .

Press special tool 11 4 270 in direction of arrow as far as it will go.

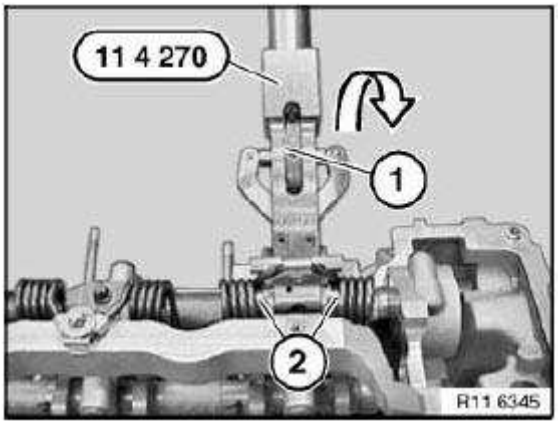


Fig. 276: Securing Bearing Pins In Torsion Springs With Knurled Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (2) of torsion spring.

Tightening torque: 11 37 2AZ, see **11 37 VARIABLE VALVE GEAR** .

To avoid jamming of screw (2) with torsion spring, it is necessary when releasing screw (2) to relieve the pretension on special tool 11 4 270 uniformly.

IMPORTANT: Thread on cylinder head. Risk of damage!

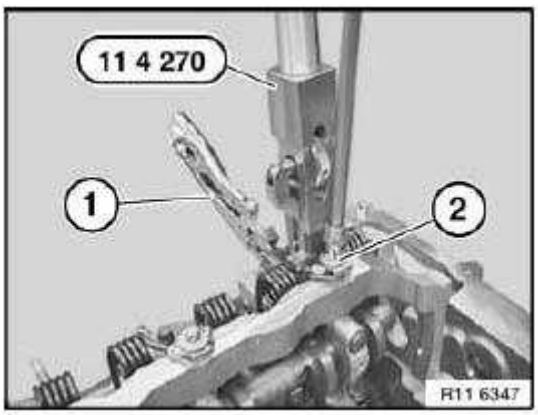


Fig. 277: Torsion Spring Screw And Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on torsion spring (1) with special tool 11 4 270 .

NOTE: Metal lug (2) cannot be disassembled and must not be removed.

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Installation:

Replace torsion spring (1) if metal lug (2) is faulty.

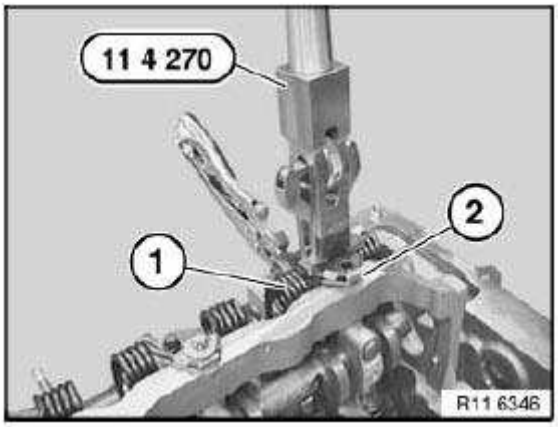


Fig. 278: Special Tool (11 4 270), Torsion Spring And Metal Lug
Courtesy of BMW OF NORTH AMERICA, INC.

Press torsion spring apart at positions (1).

Remove torsion spring towards top.

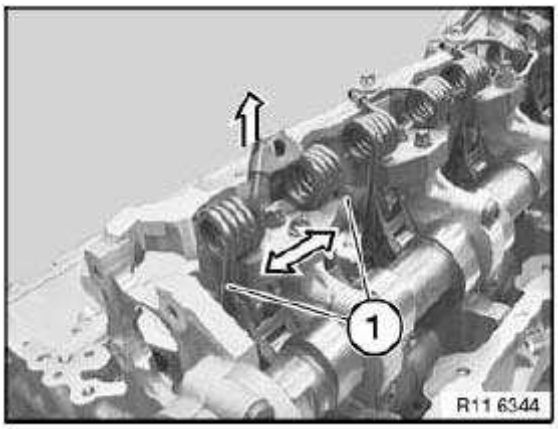


Fig. 279: Removing Torsion Spring
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Uniform distribution must not be changed.
Place all components in clean and neat order in special tool 11 4 481.

All components must be reinstalled in the same positions in an engine which has already been in use.

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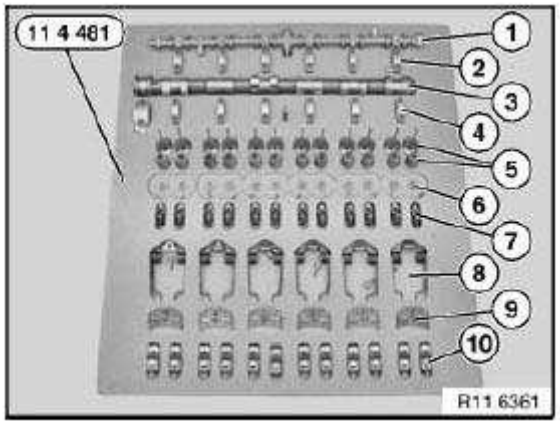


Fig. 280: Torsion Springs, Inlet Camshaft, Guide Blocks And Special Tools (11 4 481)
Courtesy of BMW OF NORTH AMERICA, INC.

1. Eccentric shaft with bearing
2. Bearing caps of eccentric shaft (set out in order)
3. Inlet camshaft
4. Bearing caps of inlet camshaft (set out in order)
5. Inlet valves with valve springs
6. Valve plates and valve cotters
7. Cam followers with HVCA elements (set out in order)
8. Torsion springs
9. Guide blocks (set out in order)
10. Intermediate levers (set out in order)

Release screws (1) on guide block (2).

Tightening torque: 11 37 1AZ, see **11 37 VARIABLE VALVE GEAR** .

Place all guide blocks (2) in neat order in special tool 11 4 481 .

Installation:

Mixing up the guide blocks (2) will cause the engine to suffer idle-speed fluctuations.

This will result in maladjustment of uniform distribution .

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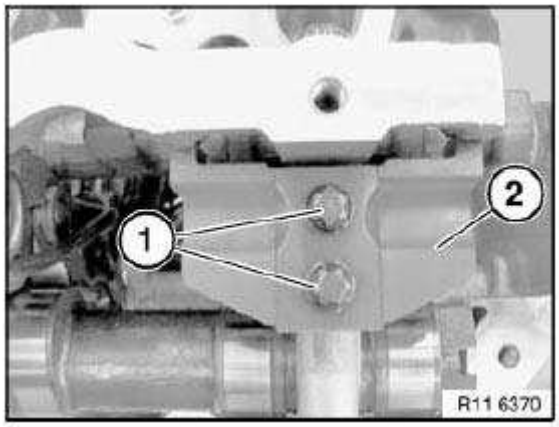


Fig. 281: Screws And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

All contact surfaces (1) of guide block must be clean and free from oil and grease. If necessary, clean contact surfaces (1).

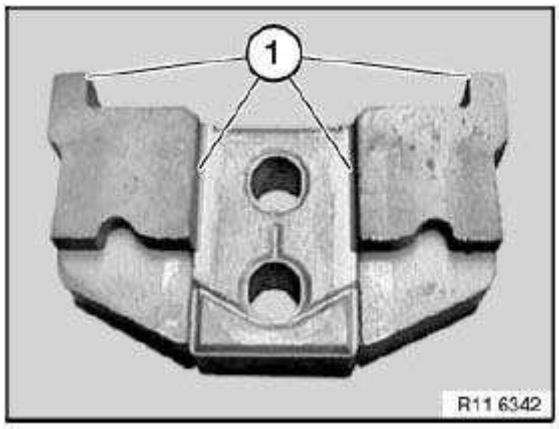


Fig. 282: Guide Block Contact Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out intermediate levers (2).

Place all intermediate levers (2) in neat order in special tool 11 4 481 .

Installation:

Mixing up the intermediate levers (2) will cause the engine to suffer idle-speed fluctuations.

Installation:

All contact surfaces (1) must be clean and free from oil and grease. If necessary, clean contact surfaces (1).

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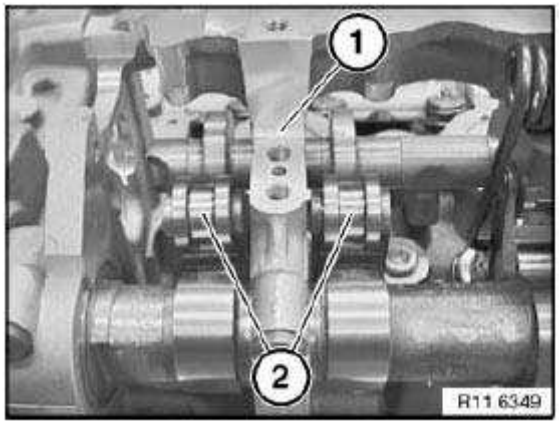


Fig. 283: Contact Surfaces And Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

All intermediate levers (1) are classified.

All intermediate levers (1) must be reinstalled in the same positions in an engine which has already been in use.

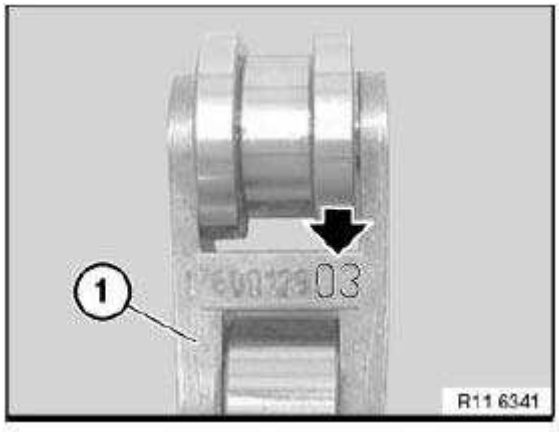


Fig. 284: Intermediate Lever Classification
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Before installing intermediate levers (2), make sure cam followers are correctly positioned.
Risk of damage!

Install intermediate levers (2).

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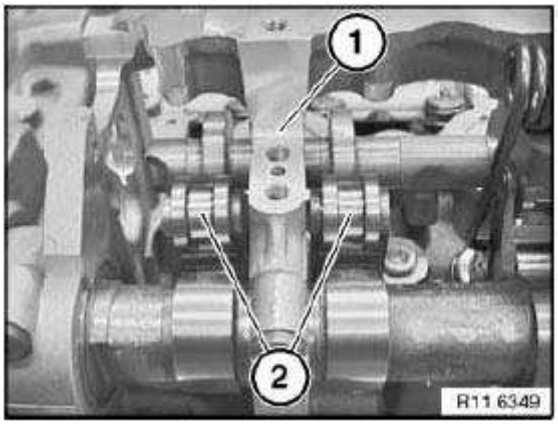


Fig. 285: Contact Surfaces And Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

Fit guide block (2) cleanly into opening.

Tighten screws (1) hand-tight.

Check that intermediate levers are in correct installation position.

Release screws (1) by a 1/4 turn.

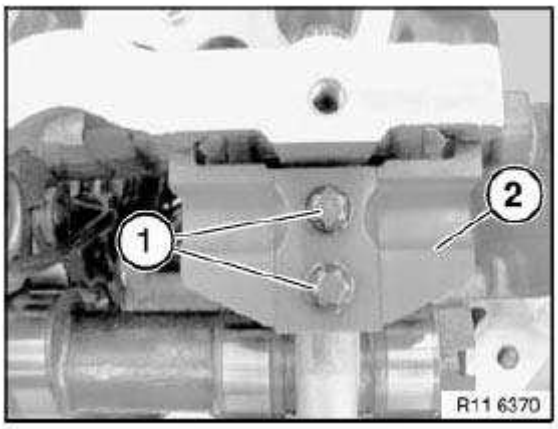


Fig. 286: Screws And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 450 to bolt connection (1) of eccentric shaft.

Turn eccentric lever (3) on special tool 11 4 450 in direction of arrow.

Guide block is now pretensioned.

Insert screws (2) of guide blocks.

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Tightening torque: 11 37 1AZ, see **11 37 VARIABLE VALVE GEAR** .

Installation:

At cylinder no. 3, the guide block can be pre-installed with one screw (internal) only.

Oil spray nozzle is fitted only after torsion spring has been installed.

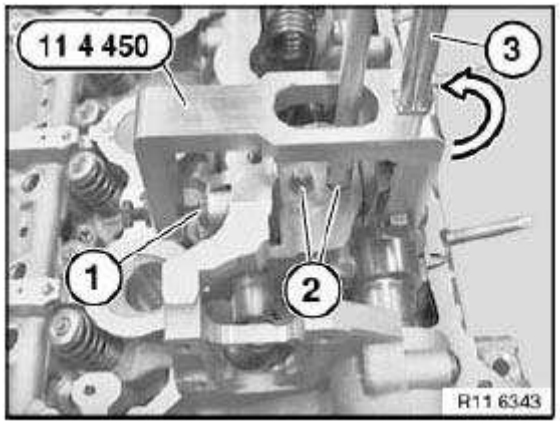


Fig. 287: Turning Eccentric Lever On Special Tool (11 4 450)
Courtesy of BMW OF NORTH AMERICA, INC.

Install torsion spring (2) on guide block.

Installation:

Insert torsion spring (2) in intermediate lever (1) (see arrow).

Check that cam follower (3) is in correct installation position.

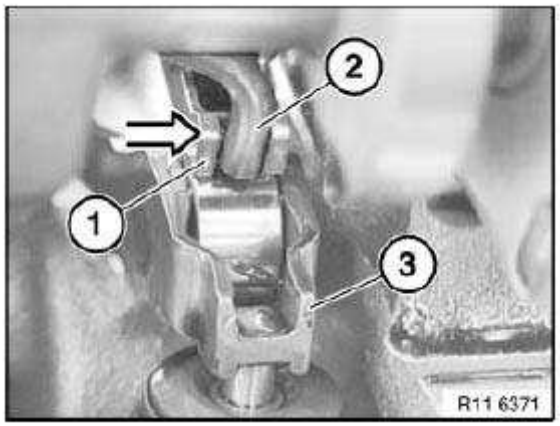


Fig. 288: Inserting Torsion Spring In Intermediate Lever
Courtesy of BMW OF NORTH AMERICA, INC.

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Secure special tool 11 4 270 with gripping pliers (3) to guide block (2).

IMPORTANT: Special tool 11 4 270 is only secured to guide block (2). Adjusting the gripping pliers (3) on special tool 11 4 270 is not permitted. Risk of damage!

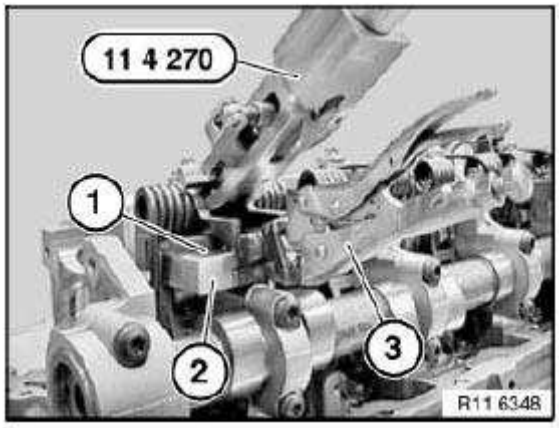


Fig. 289: Special Tool (11 4 270) - Gripping Pliers And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.

IMPORTANT: Improper handling. Risk of damage!

Secure both bearing pins (2) in torsion springs with knurled screw (1) of special tool 11 4 270 .

IMPORTANT: Check torsion spring on intermediate lever to ensure correct installation position.

Press special tool 11 4 270 in direction of arrow as far as it will go.

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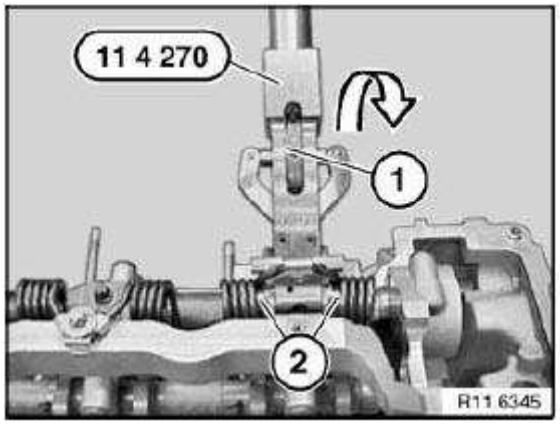


Fig. 290: Securing Bearing Pins In Torsion Springs With Knurled Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw (2) of torsion spring.

Tightening torque: 11 37 2AZ, see **11 37 VARIABLE VALVE GEAR** .

To avoid jamming of screw (2) with torsion spring, it is necessary when inserting screw (2) to increase pretension on special tool 11 4 270 uniformly.

IMPORTANT: Thread on cylinder head. Risk of damage!

Remove special tool 11 4 270 .

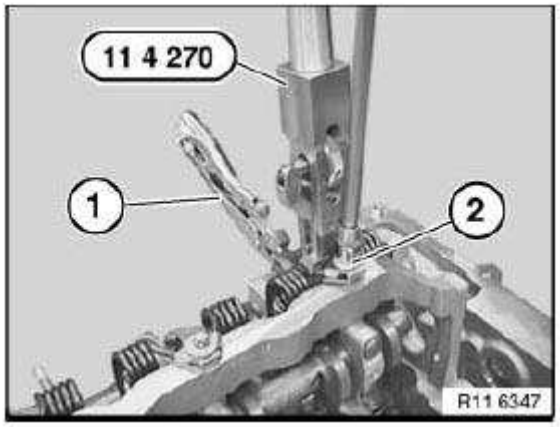


Fig. 291: Torsion Spring Screw And Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

At cylinder no. 3, adjust oil spray nozzle (2) so that oil spray points precisely towards spline teeth (3).

Insert screw (1) with oil spray nozzle (2) (external).

Tightening torque: 11 37 4AZ, see **11 37 VARIABLE VALVE GEAR** .

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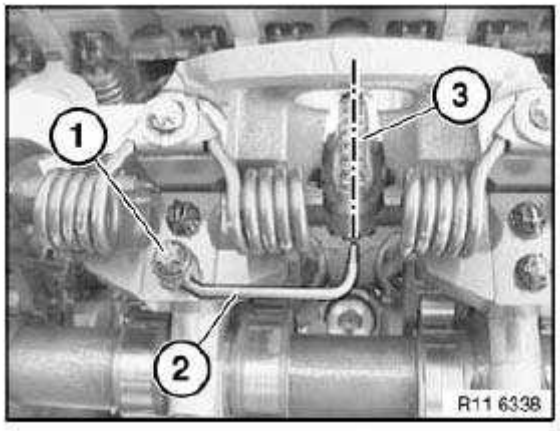


Fig. 292: Screw And Oil Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

40 OIL SUPPLY

11 40 000 CHECKING ENGINE OIL PRESSURE (N52, N52K)

IMPORTANT: The regulated oil pump can only be checked and measured with the diagnosis system.
Vehicles with a regulated oil pump have a HYDRAULIC VALVE fitted.

Necessary preliminary tasks

- Remove engine cover.
- Protect drive belt against dirt
- Have a cleaning cloth ready to catch escaping oil

Disconnect plug connection on oil pressure switch (3)

Remove oil pressure switch (3).

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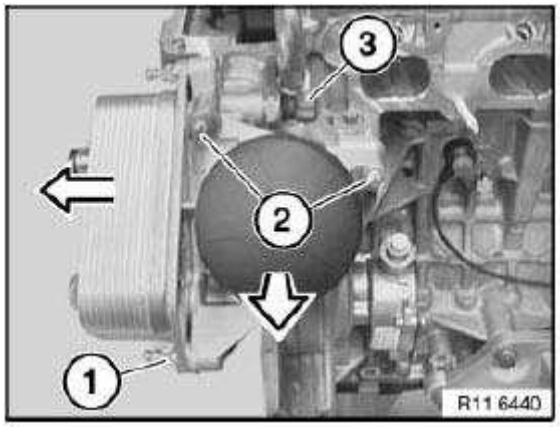


Fig. 293: Releasing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 11 4 050 with sealing ring. See **Fig. 294**.

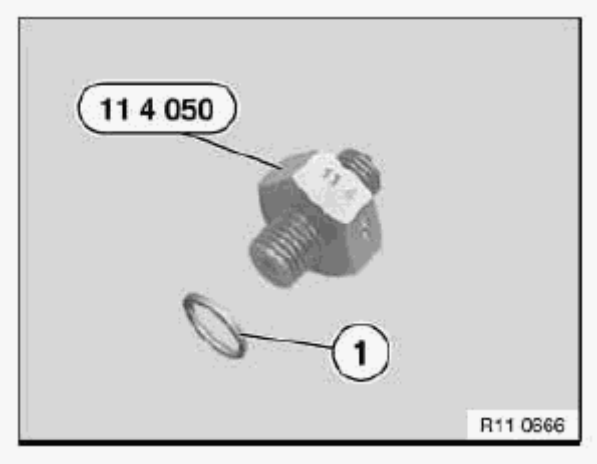


Fig. 294: Identifying Special Tool (11 4 050) And Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Check engine oil pressure with diagnosis system

Connect special tools 13 6 054 and 13 6 051.

Check engine oil pressure with pressure gauge

Connect special tools 13 3 063 and 13 3 061.

Start engine and check engine oil pressure.

See **41 OIL PUMP WITH FILTER AND DRIVE** .

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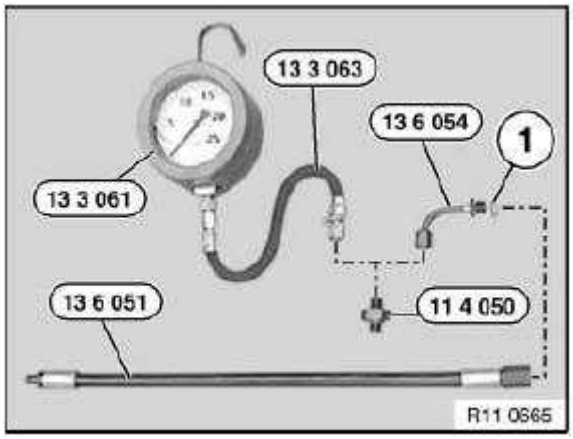


Fig. 295: Checking Engine Oil Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

41 OIL PUMP WITH FILTER AND DRIVE

11 41 000 REMOVING AND INSTALLING/REPLACING OIL PUMP (N52K)

Necessary preliminary tasks:

- Remove oil sump

Release screws (1).

Tightening torque, see 11 41 1AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

Remove intake pipe (2) in direction of arrow.

Installation:

Replace sealing ring.

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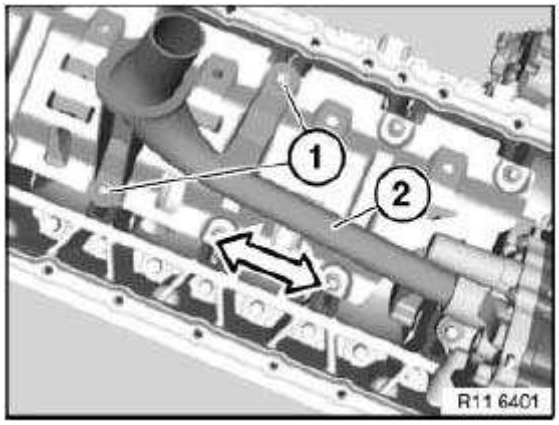


Fig. 296: Removing Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: To release bolt (1), insert a 6 mm drill bit between sprocket wheel and oil pump housing.

Release bolt (1).

Tightening torque: 11 41 6AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Release screws (2).

Tightening torque: 11 41 5AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

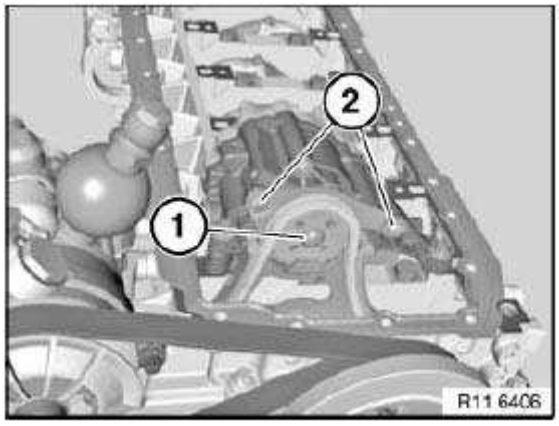


Fig. 297: Bolt And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

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IMPORTANT: Observe different screw lengths.

Release screws (1).

Tightening torque: 11 41 2AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Tightening torque: 11 41 3AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

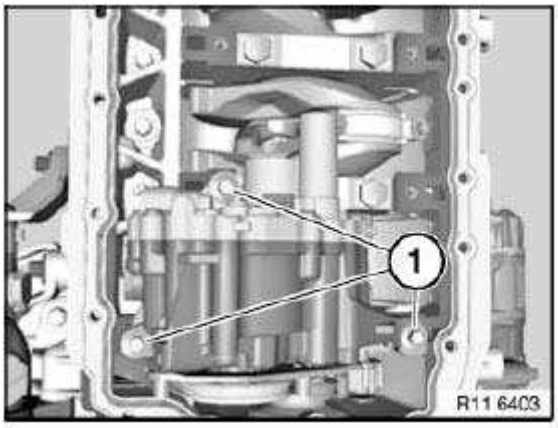


Fig. 298: Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach sprocket wheel (1) in direction of arrow.

NOTE: Chain tensioner presses timing chain (3) upwards. Do not remove sprocket wheel (1).

Remove oil pump (2) in direction of arrow.

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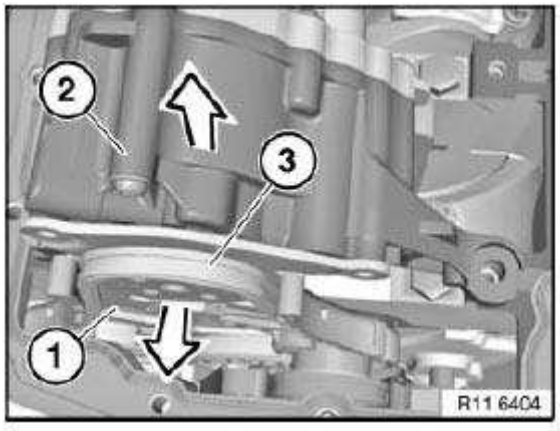


Fig. 299: Removing Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check spacers (1) for secure seating and damage; replace if necessary.

Align twin surface (3) on oil pump (2) to sprocket wheel (4).

Install oil pump (2).

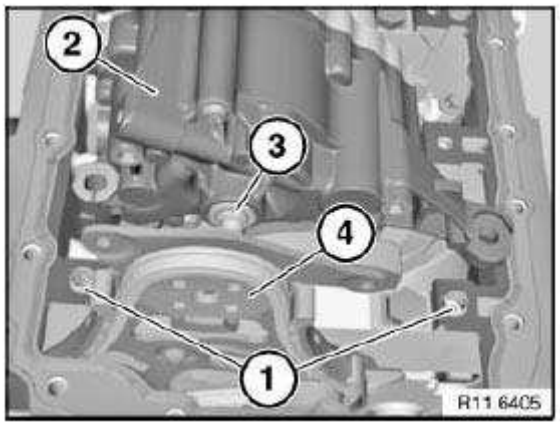


Fig. 300: Spacers, Oil Pump And Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 41 010 REMOVING AND INSTALLING/REPLACING CHAIN MODULE FOR OIL PUMP/VACUUM PUMP (N52K)

Special tools required:

- 00 9 140

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- 11 0 290
- 11 0 300
- 11 4 120
- 11 4 280
- 11 4 360
- 11 4 362
- 11 4 440
- 11 5 200
- 11 9 280

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical corrosion.
A magnesium crankcase requires aluminum screws/bolts exclusively.
Aluminum screws/bolts must be replaced each time they are released .
The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove oil sump
- Remove drive belt
- Remove drive belt tensioner
- Remove **VIBRATION DAMPER**
- Remove sealing cover for vacuum pump

Procedure on installed engine:

Turn sprocket wheel (3) with central bolt at crankshaft into position until special tool 11 0 290 can be secured.

Simultaneously secure special tool 11 0 290 to sprocket wheel (3) and special tool 11 4 362 .

Release screw (2) for sprocket wheel (3).

Tightening torque: 11 66 2AZ, see **11 66 VACUUM PUMP** .

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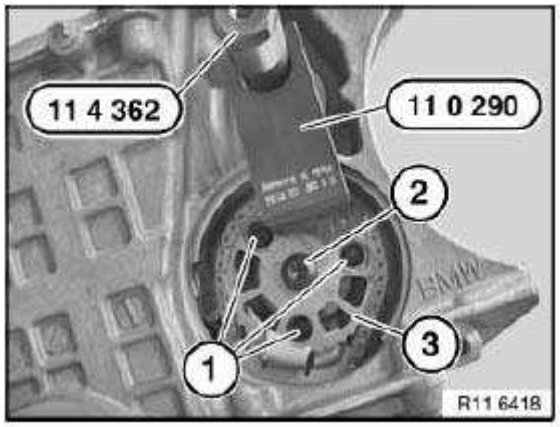


Fig. 301: Special Tool (11 4 362) And (11 0 290), Screw And Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Press timing chain with chain tensioner (1) in direction of arrow.

Disconnect timing chain with special tool 11 4 120 .

Feed out sprocket wheel (3) at hexagon head (4) of vacuum pump.

Installation:

If the chain module is replaced, a mounting bar (2) is already pre-installed.

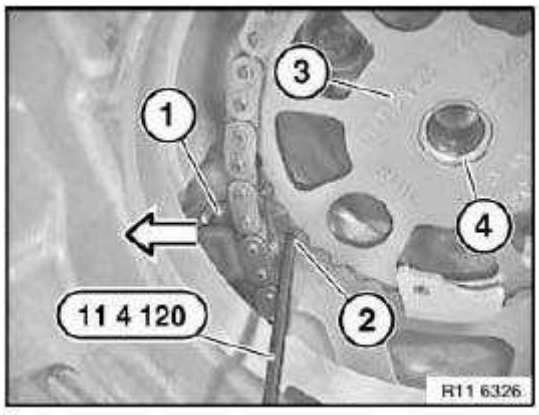


Fig. 302: Pressing Piston With Special Tools (11 6 261)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: To release bolt (1), insert a 6 mm drill bit between sprocket wheel and oil pump housing.

Release screw (1) for sprocket wheel.

Tightening torque: 11 41 6AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

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Release screws (2) for chain module.

Tightening torque: 11 41 5AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

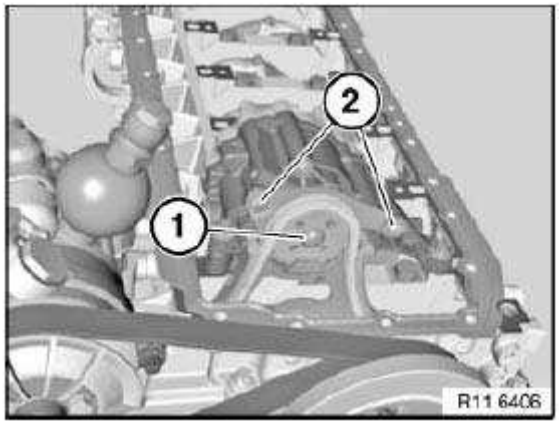


Fig. 303: Bolt And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

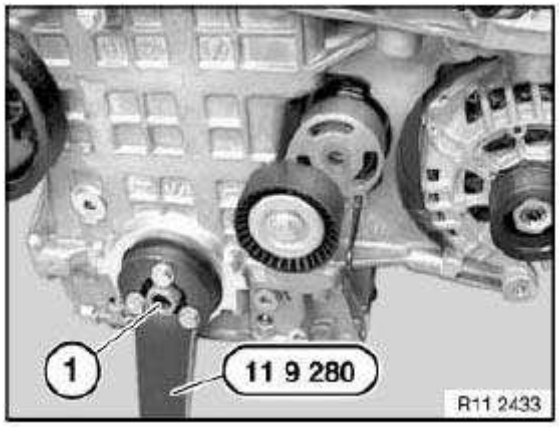
Secure crankshaft and camshaft with special tools 11 0 300 and 11 4 280

IMPORTANT: Do not remove special tools 11 0 300 and 11 4 280 to release central bolt (1). Employ a second person for gripping when releasing central bolt (1).

Screw special tool 11 9 280 onto hub of vibration damper.

Release central bolt (1).

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .



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Fig. 304: Central Bolt With Special Tool (11 9 280)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace central bolt (1).

Remove hub (2) towards front.

Installation:

Replace crankshaft radial seal at front, see **11 14 005 Replacing front crankshaft radial seal (N52K)**.

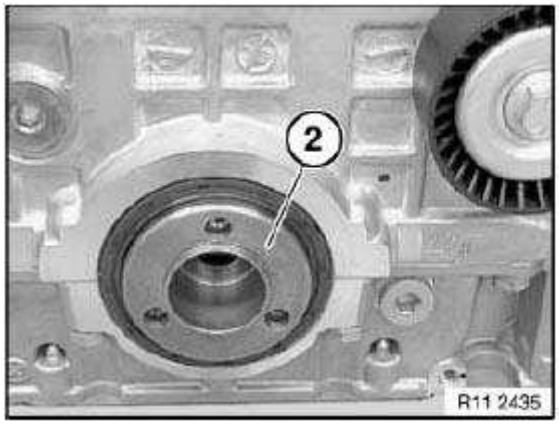


Fig. 305: Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Open screw plug on bedplate.

Tightening torque: 11 11 8AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

Release screw for chain module (1).

Tightening torque: 11 41 4AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

Remove chain module (1) in direction of arrow.

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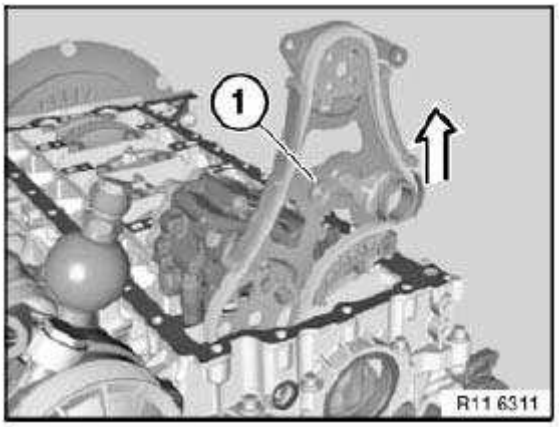


Fig. 306: Removing Chain Module
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket wheel (2).
Collar (see arrow) on sprocket wheel (2) points to engine .
Incorrect assembly will result in engine damage .

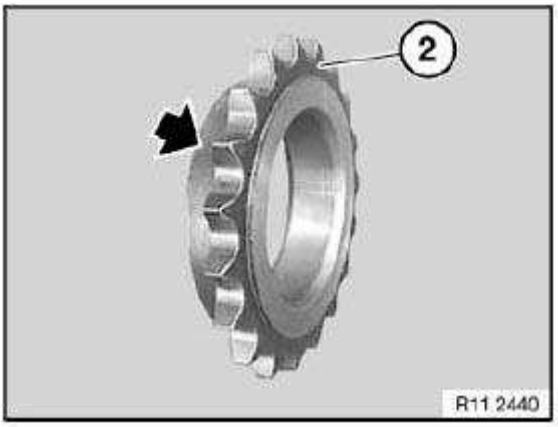


Fig. 307: Collar On Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Procedure on removed engine:

NOTE: Engine is mounted on special tool 11 4 440 .

Release screw (1) for sprocket wheel.

Tightening torque: 11 66 2AZ, see **11 66 VACUUM PUMP** .

Release screw (2) for sprocket wheel.

Tightening torque: 11 41 6AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

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Release central bolt (3).

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

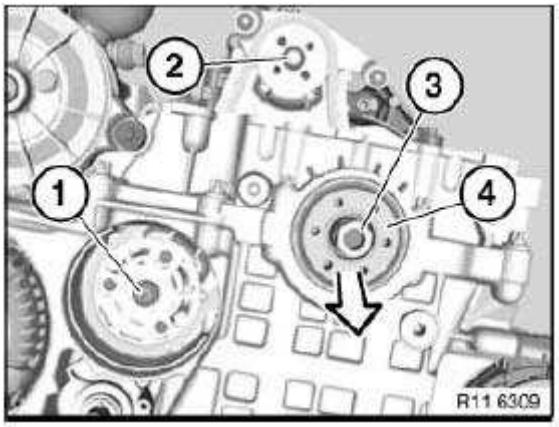


Fig. 308: Releasing Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Mark central bolt (3) with a colored dot.

Replace central bolt (3).

Remove hub (4) towards front.

All:

Install hub with new central bolt.

Tighten down special tool 11 5 200 with screws (1) to hub.

Do **not** remove special tools 11 0 300 and 11 4 280 .

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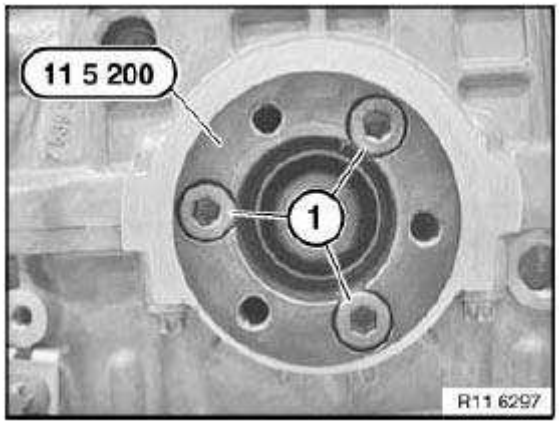


Fig. 309: Screws With Special Tool (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove tensioner for drive belt.

Screw in special tool 11 4 362 from special tool kit 11 4 360 .

Mount special tool 11 9 280 on 11 5 200 .

Support special tool 11 9 280 on special tool 11 4 362 .

Special tool 11 0 300 secures crankshaft.

Tighten central bolt to jointing torque.

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

Mark central bolt and hub with paint.

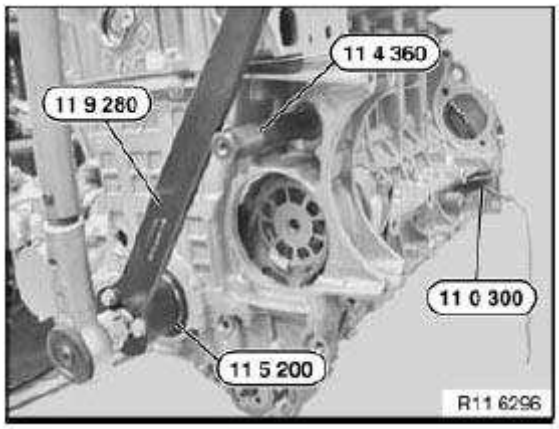


Fig. 310: Special Tools (11 9 280), (11 0 300), (11 4 360) And (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

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Mark special tools with colored line (1).

See picture.

**IMPORTANT: Do not remove the special tool while tightening the central bolt to torsion angle.
Risk of damage!**

If necessary, tighten central bolt to torsion angle with special tool 00 9 140 .

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

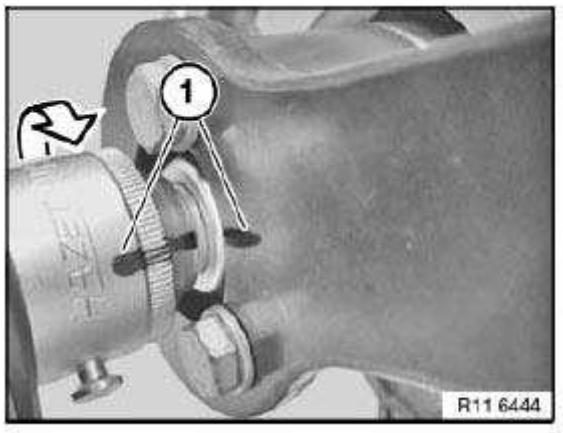


Fig. 311: Marking Special Tools With Colored Line
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace crankshaft radial seal at front, see **11 14 005 Replacing front crankshaft radial seal (N52K)**.

Assemble engine.

11 41 115 REMOVING AND INSTALLING/REPLACING HYDRAULIC VALVE (N52K)

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

Aluminum screws/bolts are permitted with and without

color coding (blue).

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For reliable identification:

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

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

Necessary preliminary tasks

- Remove front underbody protection. See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION (X5)** or **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION (X3)**
- Have a cleaning cloth ready to catch escaping oil

Detach plug (1) from hydraulic valve (2).

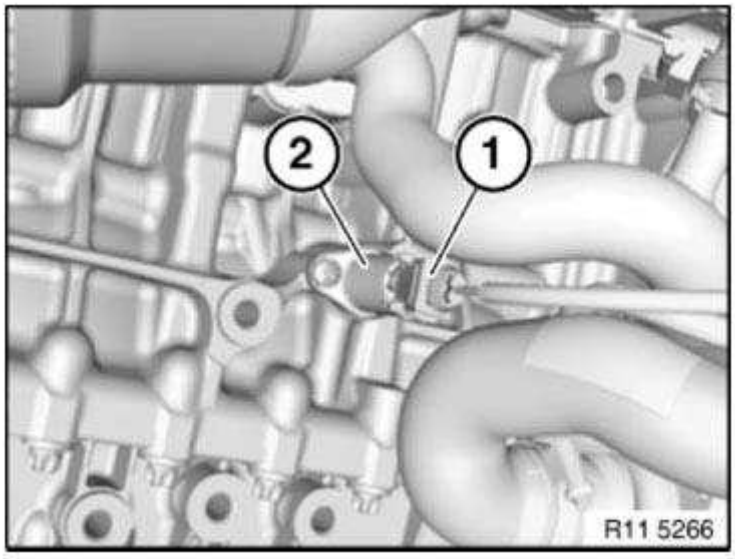


Fig. 312: Identifying Hydraulic Valve With Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) and remove hydraulic valve (2).

Tightening torque

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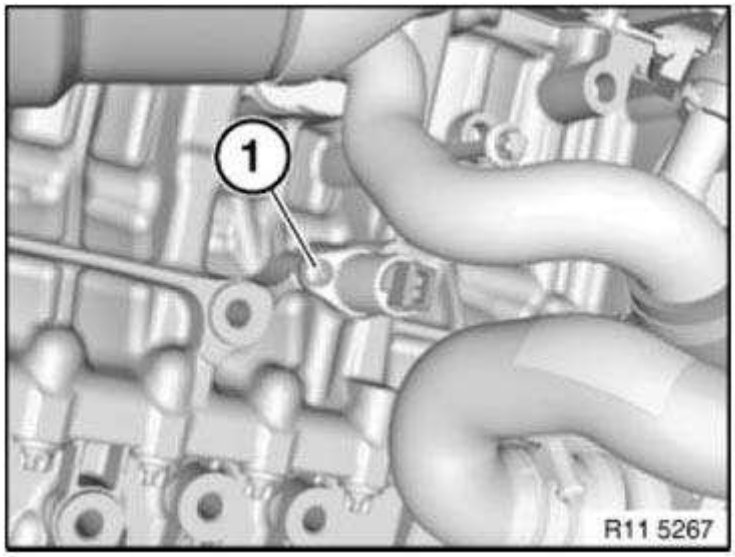


Fig. 313: Identifying Hydraulic Valve With Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Replace O-ring (1).

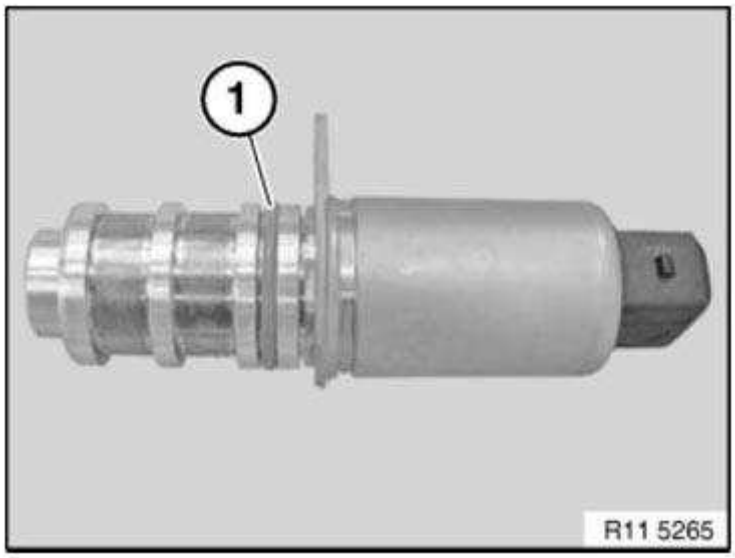


Fig. 314: Identifying O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

1142 OIL FILTER AND LINES

11 42 020 REMOVING AND INSTALLING/REPLACING FULLFLOW OIL FILTER (N52)

WARNING: Danger of scalding!

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Only perform these tasks on an engine that has cooled down.

Recycling

Catch and dispose of drained coolant.

Observe country-specific waste-disposal regulations.

Necessary preliminary tasks

- Drain COOLANT. See **17 00 005 DRAINING AND ADDING COOLANT (N52K) (X3)** or **17 00 005 DRAINING AND ADDING COOLANT IN RADIATOR (N52K) (X5)** .
- Remove intake air **MANIFOLD** .
- Unfasten oil filter cover.
- Protect drive belt against dirt.

Release screw (1).

Tightening torque, see 11 42 2AZ in **11 42 OIL FILTER ELEMENT WITH CONNECTIONS**

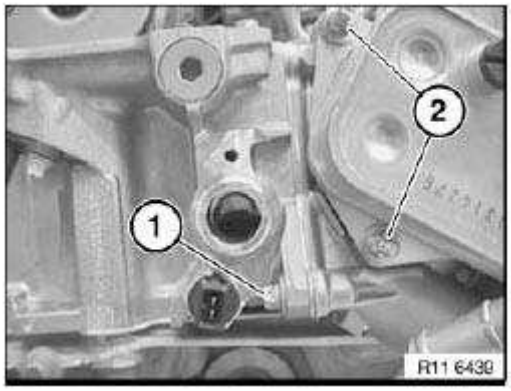


Fig. 315: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

NOTE: Have cleaning cloth ready to catch residual oil.

Tightening torque: see 11 42 2AZ in **11 42 OIL FILTER ELEMENT WITH CONNECTIONS**

Installation:

Replace all seals.

If necessary, replace filter element.

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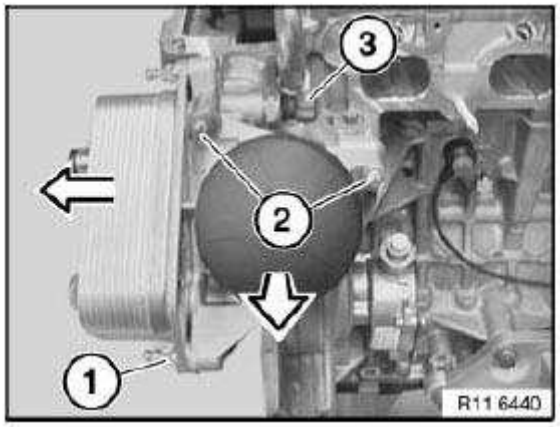


Fig. 316: Releasing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

NOTE: Protect drive belt against dirt.

Installation:

For VENTING INSTRUCTIONS see **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR LEAKS (X3)** or **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR WATER LEAKS (N52K) (X5)** .

51 WATER PUMP WITH DRIVE

11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP (N52K)

WARNING: Danger of scalding!

Only perform this work after engine has cooled down.

Recycling:

Catch and dispose of drained coolant in a suitable container.

Observe country-specific waste-disposal regulations.

IMPORTANT: If a water pump that has already been operated is reused, it must be filled with coolant immediately after removal.

Mixture ratio, water : coolant = 1 : 1

Protect plug connections against coolant and contamination.

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Cover plug connections with suitable materials.

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification

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

Necessary preliminary tasks:

- Remove coolant thermostat

Unfasten hose clip (1).

For tightening torque refer to 11 53 5AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant hose.

Unfasten hose clip (2).

For tightening torque refer to 11 53 3AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant hose.

Disconnect plug connection (3).

Release screws (4).

For tightening torque refer to 11 51 1AZ in **11 51 ELECTRIC WATER PUMP WITH DRIVE** .

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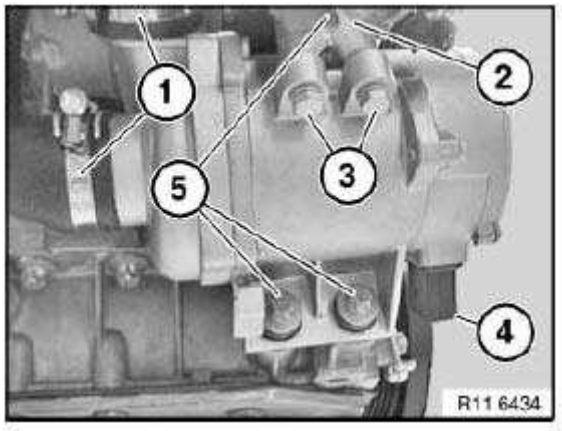


Fig. 317: Plug Connection, Screws And Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace aluminum screws.

Remove electric water pump (x) via x.

Installation:

If the electric water pump is reused, it must be rotated one turn due to the breakaway torque at the blade wheels.

Assemble engine.

Venting instructions must be observed without fail. . See **17 00 005 DRAINING AND ADDING COOLANT (N52K)** .

53 THERMOSTAT AND CONNECTIONS

11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N52K)

WARNING: Danger of scalding!

Only perform this work after engine has cooled down.

Recycling

Catch and dispose of drained coolant in a suitable container.

Observe country-specific waste-disposal regulations.

IMPORTANT: Protect plug connections against coolant and contamination.

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Cover plug connections with suitable materials.

Necessary preliminary tasks:

- Drain Coolant

NOTE: For purposes of clarity, the picture and text refer to the component when removed.

Unfasten hose clip (1).

For tightening torque refer to 11 53 5AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant hose.

Unfasten hose clip (2).

For tightening torque refer to 11 53 6AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant hose.

Unlock and detach coolant hose (3).

Unlock and detach coolant hose (4).

Disconnect plug connection (5).

Release screws (6).

For tightening torque refer to 11 53 1AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant thermostat (7).

Assemble engine.

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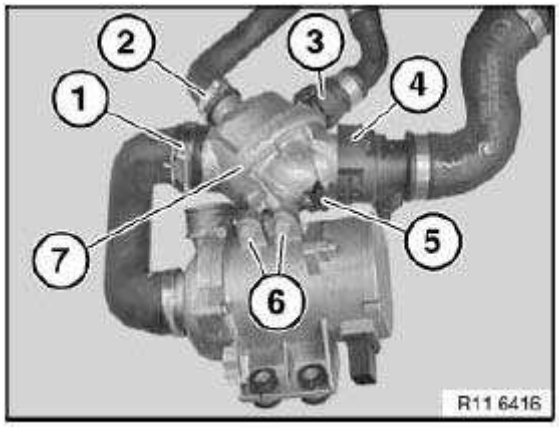


Fig. 318: Hose Clips, Hoses, Screws, Coolant Thermostat And Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

61 INTAKE MANIFOLD

11 61 050 REMOVING AND INSTALLING AIR INTAKE MANIFOLD (N52K)

Necessary preliminary tasks:

- Remove Tension Strut
- Remove Intake Filter Housing
- Remove Ignition Coil Cover

Open holder (2).

Disconnect plug connection (1) under of air intake manifold.

Release both crankcase breathers (3).

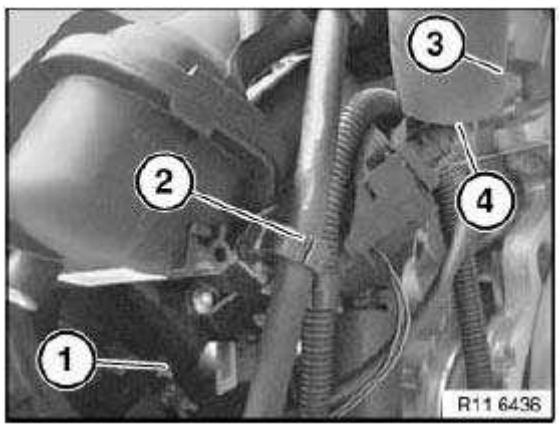


Fig. 319: Crankcase Breathers, Plug Connection And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

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Disconnect plug connection (1).

Disconnect plug connection (3).

Release screws (4).

Detach engine wiring harness (2) from air intake manifold and lay to one side.

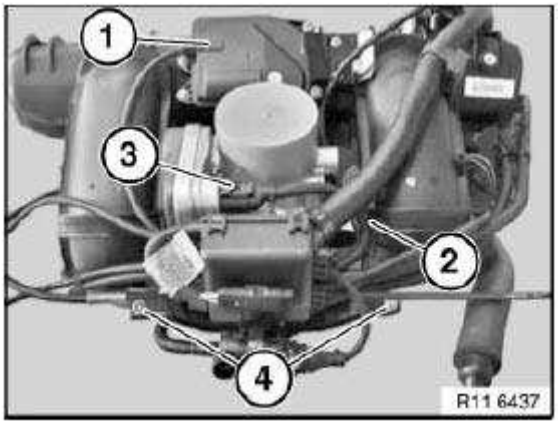


Fig. 320: Engine Wiring Harness, Screws And Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on oil pressure switch (2).

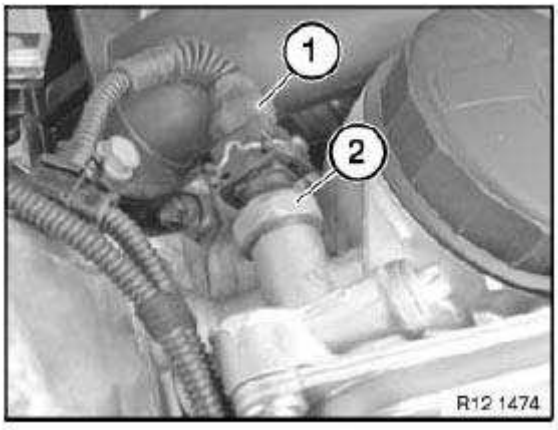


Fig. 321: Plug Connection And Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Release fuel rail (2) and lay to one side.

NOTE: Do not detach fuel line.

Release screws (1).

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For tightening torque refer to 11 61 1AZ in **11 61 AIR INTAKE MANIFOLD** .

Unscrew nuts (3).

For tightening torque refer to 11 61 2AZ in **11 61 AIR INTAKE MANIFOLD** .

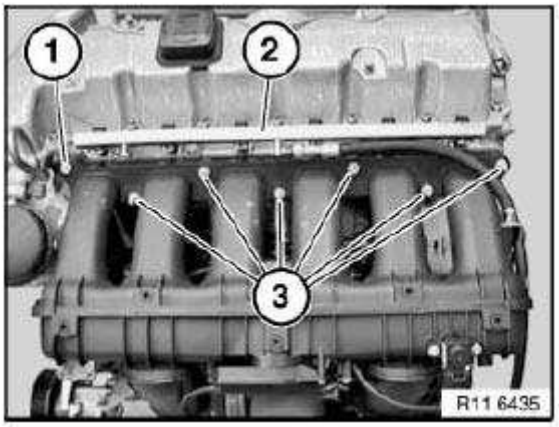


Fig. 322: Fuel Rail, Nuts And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Raise air intake manifold approx. 10 cm.

Disconnect plug connections (1) at bottom.

Release tank vent line behind throttle valve assembly.

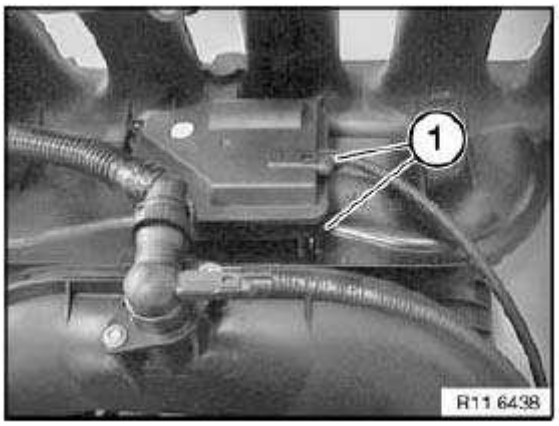


Fig. 323: Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace all seals.

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Assemble engine.

62 EXHAUST MANIFOLD

18 40 050 REMOVING AND INSTALLING/REPLACING FRONT EXHAUST MANIFOLD (N52/ N52K/ N51)

Necessary preliminary tasks:

- Remove rear exhaust manifold

NOTE: The oxygen sensors are in danger of being damaged when the exhaust manifolds are removed and installed.

Remove control sensor from cylinders 1 to 3.

Remove monitor sensor from cylinders 1 to 3.

Tightening torque: 11 78 1AZ, see **11 78 EXHAUST GAS CONTROL, LAMBDA CONTROL SENSOR / LAMBDA MONITOR SENSOR** .

Unscrew nuts.

Remove exhaust manifold (1).

Installation:

Clean sealing faces and replace seals.

Replace nuts.

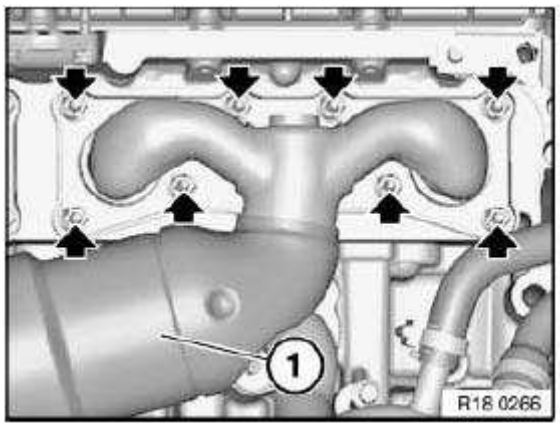


Fig. 324: Locating Exhaust Manifold Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

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1166 VACUUM PUMP

11 66 000 REMOVING AND INSTALLING OR REPLACING VACUUM/OIL PUMP (N47 D20 O1)

IMPORTANT: It is possible to remove and install the vacuum oil pump without removing the transmission.

Necessary preliminary work

- Removing oil sump.

Release screws (1).

Remove intake snorkel in direction of arrow.

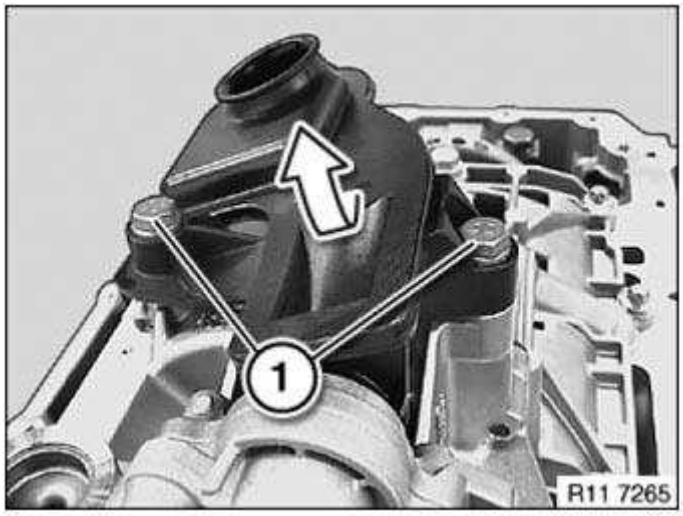


Fig. 325: Removing Intake Snorkel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

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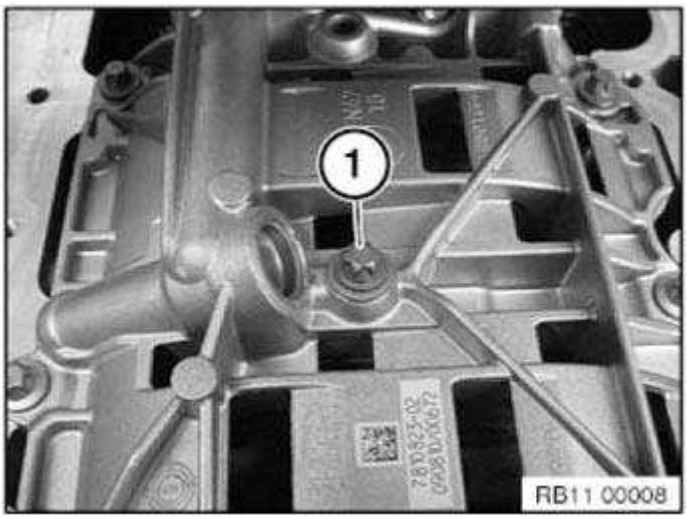


Fig. 326: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Installation note:

Clean and blow out thread

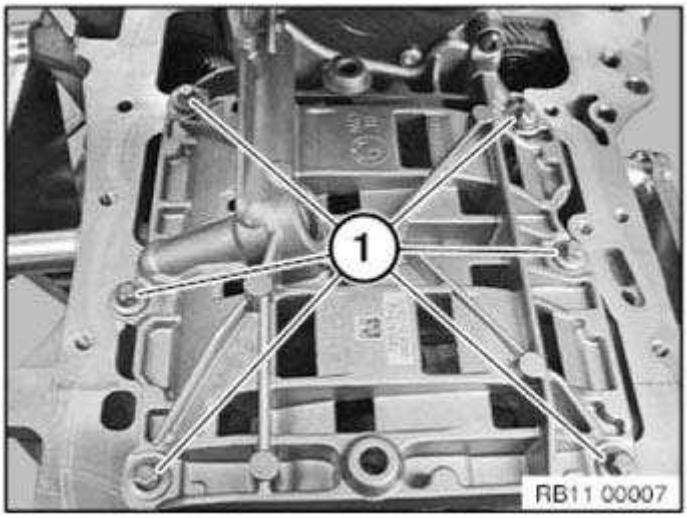


Fig. 327: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

When installed, the oil pump chain must be fed out from the sprocket wheel of the oil pump drive gear; the sprocket wheel cannot be removed.

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NOTE: Illustration shows gear case cover removed.

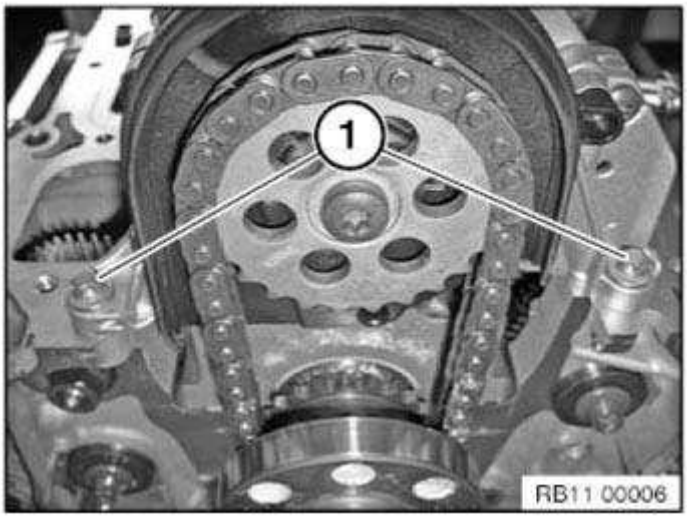


Fig. 328: Identifying Gear Case Cover Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Oil vacuum pump must be fed out at chain drive (1).

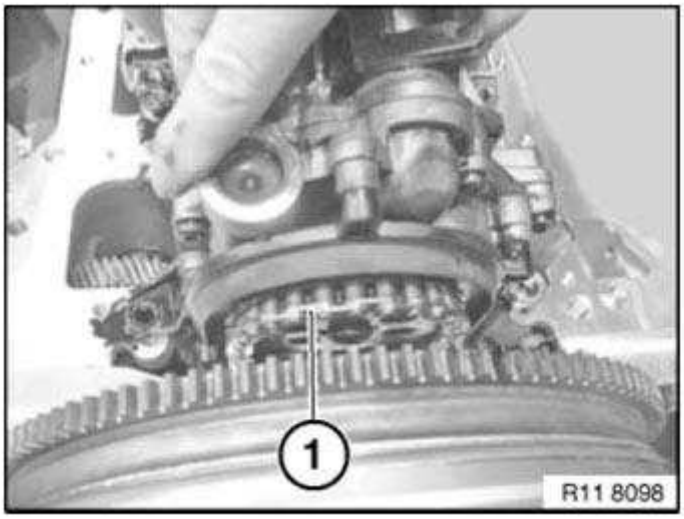


Fig. 329: Identifying Chain Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

Installation note:

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Clean all sealing surfaces.

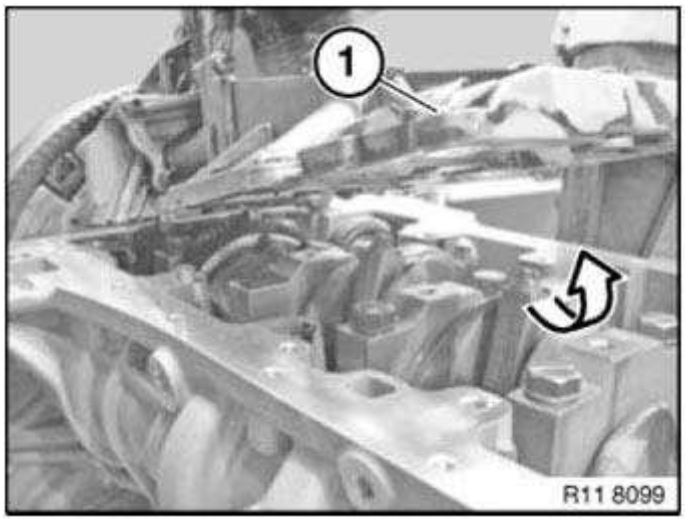


Fig. 330: Removing Oil Vacuum Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Install all screws (1) and tighten down.

Tightening torque, see 11 41 1AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE**

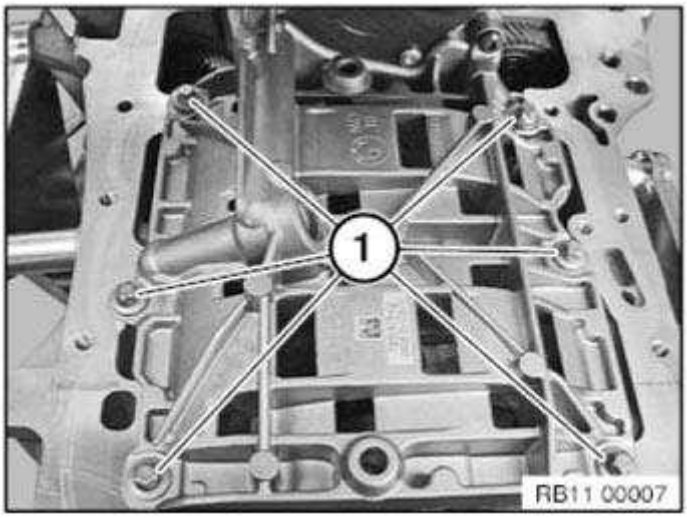


Fig. 331: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Install and tighten down screws (1).

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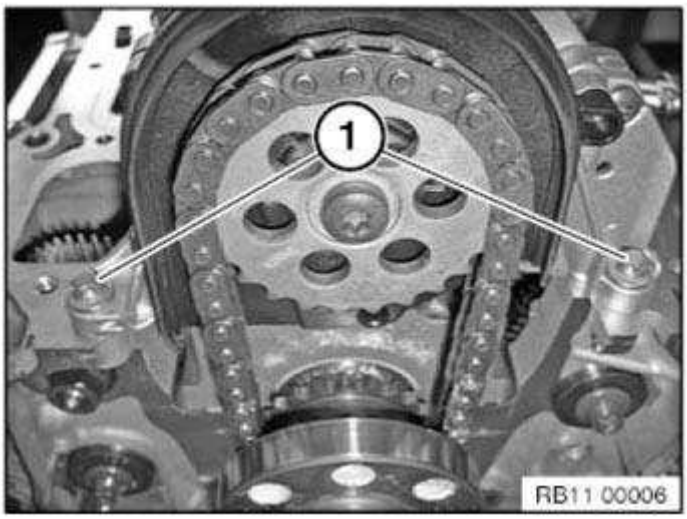


Fig. 332: Identifying Gear Case Cover Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Clean and blow out thread

Insert and secure screw (1).

Secure screw (1) with special tool 00 9 120 .

Tightening torque, see 11 41 2AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE**

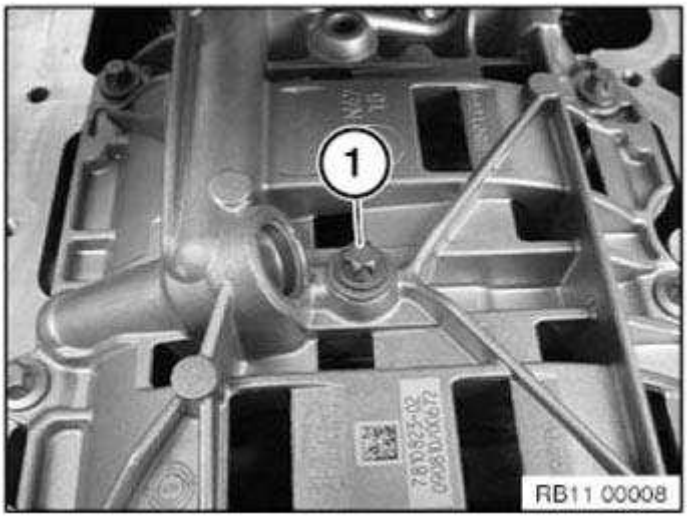


Fig. 333: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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1178 EMISSION CONTROL, OXYGEN SENSOR

11 78 513 REPLACING BOTH LAMBDA OXYGEN CONTROL SENSORS (N52K)

WARNING: Risk of burning!

Work should only be carried out on an exhaust system that has cooled down.

Installation note:

The threads of new oxygen control sensors are already coated with Never Seez Compound.

If a oxygen control sensor is to be reused, apply a thin and even coating of Never Seez compound to the thread only.

The part of the lambda control sensor which projects into the exhaust system branch (sensor ceramics) must **not** be cleaned and **not** coated with lubricant.

Lambda control sensor, cylinder nos. 1 to 3

NOTE: The lambda control sensor on the exhaust manifold of cylinder nos. 1 to 3 is accessible from above. The exhaust system does not have to be removed.

Lambda control sensor, cylinder nos. 1 to 3

Necessary preliminary tasks:

- Remove complete exhaust system **EXHAUST SYSTEM (X3)** or **EXHAUST SYSTEM (X5)** .

Disconnect plug connection on oxygen control sensor (1).

Release lambda control sensor (1) on exhaust manifold of cylinder nos. 4 to 6 with special tool 11 4 260.

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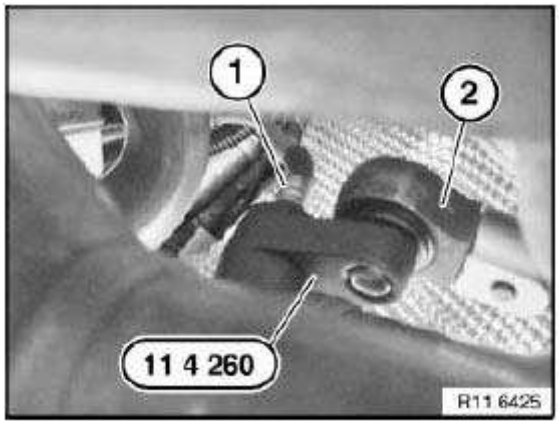


Fig. 334: Removing Lambda Oxygen Control Sensor Using Special Tool 11 4 260
Courtesy of BMW OF NORTH AMERICA, INC.

All:

Installation note:

Cable color of lambda control sensor, cylinders nos. 1 to 3 = black.

Cable color of lambda control sensor, cylinders nos. 4 to 6 = grey.

Tightening torque, see 11 78 1AZ in **78 EMISSION CONTROL, OXYGEN SENSOR** .

Assemble engine.

Check function of DME.

11 78 545 REPLACING BOTH LAMBDA OXYGEN MONITORING SENSORS (N52K)

WARNING: Risk of burning!

Work should only be carried out on an exhaust system that has cooled down.

Necessary preliminary tasks:

- Remove underbody protection. See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION (X5)** or **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION (X3)** .

Installation note:

The threads of new lambda monitoring sensors are already coated with Never Seez Compound (refer to BMW Parts Department).

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If a lambda monitoring sensor is to be reused, apply a thin and even coating of Never Seez Compound to the thread only.

The part of the lambda monitoring sensor which projects into the exhaust system branch (sensor ceramics) must **not** be cleaned and **not** coated with lubricant.

Disconnect plug connection on lambda monitoring sensor (1).

Release lambda monitoring sensor (1) on exhaust manifold of cylinder nos. 1 to 3 with special tool 11 9 150.

Tightening torque, see 11 78 1AZ in **78 EMISSION CONTROL, OXYGEN SENSOR** .

Installation note:

Cable color of lambda monitoring sensor (1), cylinders nos. 1 to 3 = black.

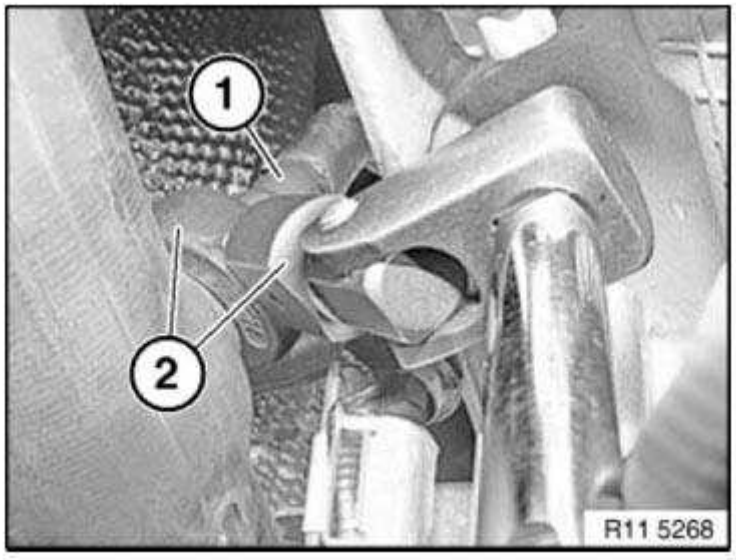


Fig. 335: Removing Lambda Monitoring Sensor Plug Connection Using Special Tool (11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection on lambda monitoring sensor (1).

Release lambda monitoring sensor (1) on exhaust manifold of cylinder nos. 4 to 6 with special tool 11 9 150.

Tightening torque, see 11 78 1AZ in **78 EMISSION CONTROL, OXYGEN SENSOR** .

Installation note:

Cable color of lambda monitoring sensor (1), cylinders nos. 4 to 6 = grey.

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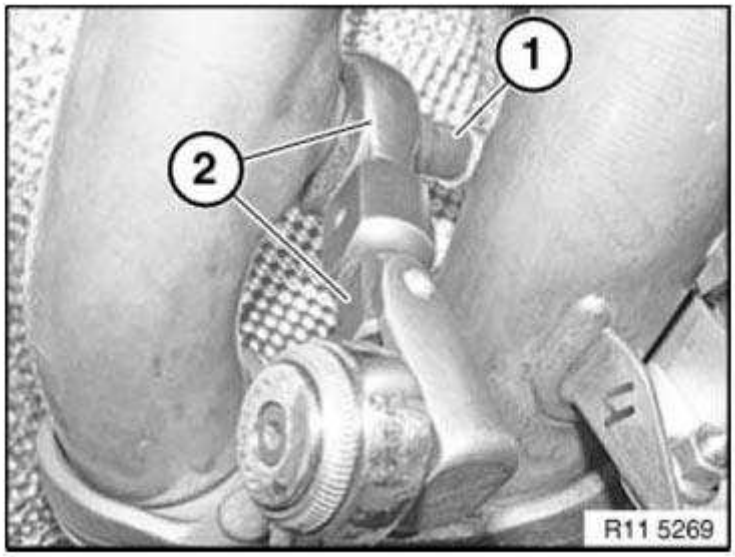


Fig. 336: Removing Lambda Monitoring Sensor Plug Connection Using Special Tool (11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

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ENGINE

Exhaust System - Operating Fluids

1.0 GENERAL INFORMATION

Detachable joints such as exhaust manifold bolts and exhaust system flange connections can be treated with a grease able to withstand high temperatures and corrosive conditions.

Use Copper Paste (former BMW Part No. 81 22 9 400 794).

BMW PART NUMBER SPECIFICATION

3M	Part No. 8945
CRC	Part No. 3046010

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ENGINE

Exhaust System - Tightening Torques - X3

00 EXHAUST SYSTEM, COMPLETE

18 00 EXHAUST ASSEMBLY

EXHAUST ASSEMBLY - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Primary catalytic converter to turbocharger/or jacket pipe to catalytic converter	M57 / M57TU	M10		42 Nm
	M67			15 Nm
	M30 / M70		Tighten down compression spring with nut uniformly to full extent, then slacken by 1.5 turns	10 Nm
	M51		Preload compression springs with nut to 27 ± 1 mm	
	S50	M10		30 Nm
	S54 / ECE	M10		27 Nm
	S54 / US	M10		24 Nm
2AZ Exhaust pipe to flow section	E23			25 Nm
3AZ Clamp for final muffler	All	M8		15 Nm
4AZ Catalytic converter on silencer	E36 / M42 / M43 / M44		Version with compression spring: Evenly preload compression springs with nuts to 30 mm	
5AZ Connection of positive and negative leads to E catalytic converter	M73			5 Nm
6AZ Rear muffler to intermediate muffler	E53	M8		30 Nm
7AZ Vacuum tank to retaining plate	E46 / M54	M8		10 Nm
8AZ Exhaust system to exhaust manifold	M40 / M42 / M43 / M44	M10		45 Nm
9AZ Primary cat. to exhaust system	M57TU / E65			55 Nm

18 00 REAR MUFFLER

REAR MUFFLER - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Chrome panel to rear muffler	E8x,E9x		Screw securing, Powerlok	9.5 Nm

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20 EXHAUST SYSTEM

18 20 EXHAUST SYSTEM SUSPENSION

EXHAUST SYSTEM SUSPENSION - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Exhaust system to manifold	N52 / N52K / N51	M10nut		45 Nm
2AZ Preliminary pipe bracket to transmission	N52 / N52K / N51	M8		21 Nm
3AZ Bracket to rear differential	N52 / N46 / M47T2 / M57T2	M12 nut		30 Nm
4AZ Bracket, rear muffler, to support plate	N52 / N52K / N51	M8 nut		21 Nm
5AZ Rear muffler to body	N52 / N52K / N51	M8nut		21 Nm
6AZ Exhaust system to transmission	M47T2	ASAM8 bolt		21 Nm
7AZ Exhaust system to body	N52 / N52K / N51	M8		21 Nm
8AZ Clamp	N52 / N52K / N51			45 Nm

18 20 EXHAUST SYSTEM SUSPENSION

EXHAUST SYSTEM SUSPENSION - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Rear muffler to body	N52K	M8		19 Nm
2AZ Transmission bracket to transfer case	N52K	M8x35		19 Nm
3AZ Transmission bracket to transfer case	N52K	M8		19 Nm

30 EXHAUST PIPE

18 30 EXHAUST PIPE / CATALYTIC CONVERTER, EXHAUST SYSTEM

EXHAUST PIPE / CATALYTIC CONVERTER, EXHAUST SYSTEM - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Hexagon nut to welding stud	N52K		Plastic nut	4 Nm
2AZ Grounding strap, exhaust system	N52K	BM6		9 Nm

40 EXHAUST MANIFOLD

18 40 EXHAUST MANIFOLD

EXHAUST MANIFOLD - TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure

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1AZ Pipe elbow to cylinder head	N52K	M7		20 Nm

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ENGINE

Exhaust Systems - Repair Instructions - X3 & X5

EXHAUST SYSTEM COMPLETE

18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (M54/N52)

Special tools required:

- 31 2 220

WARNING: Scalding hazard!
Only perform these tasks after exhaust system has cooled down.

Support exhaust system with jack and special tool 31 2 220 and secure against falling out.

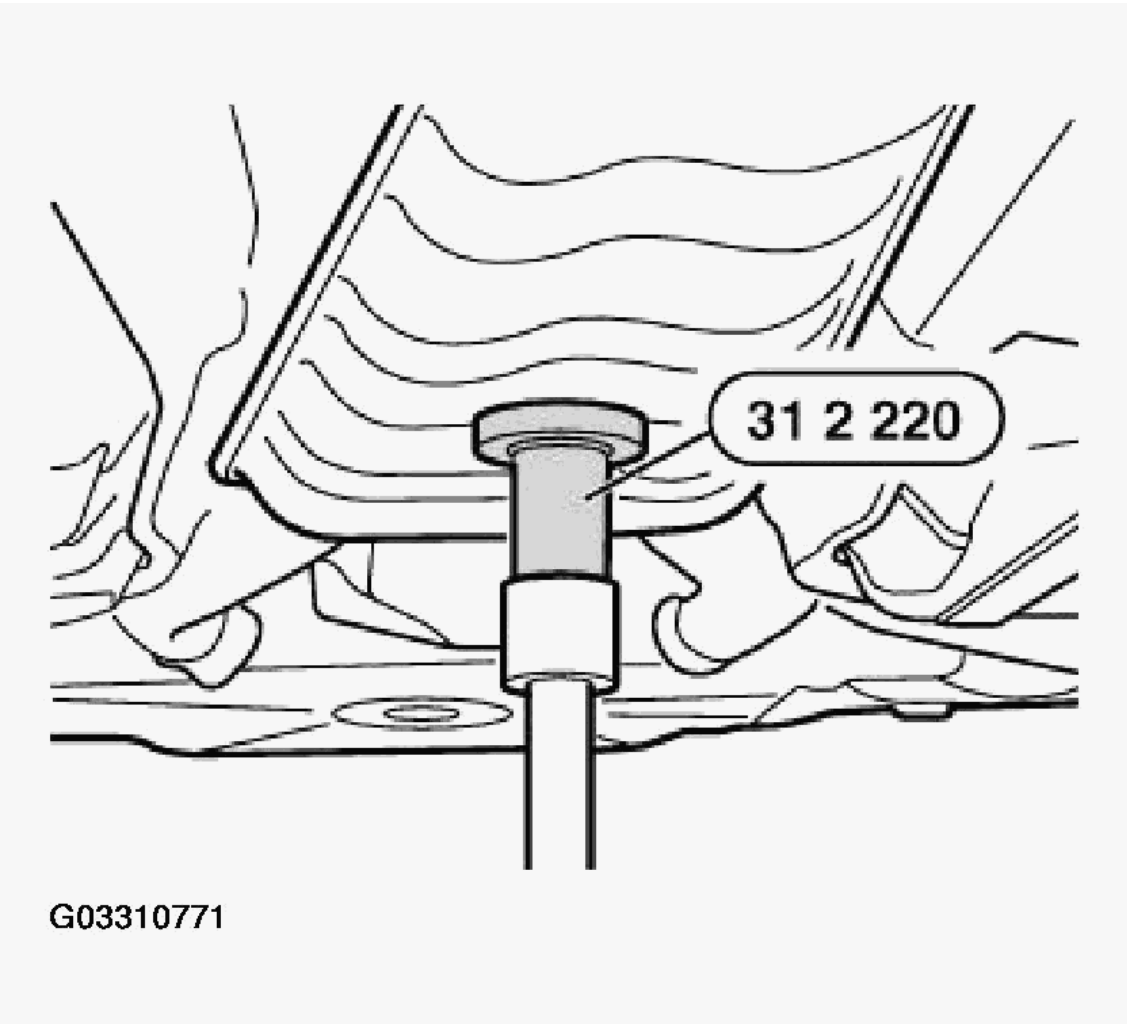


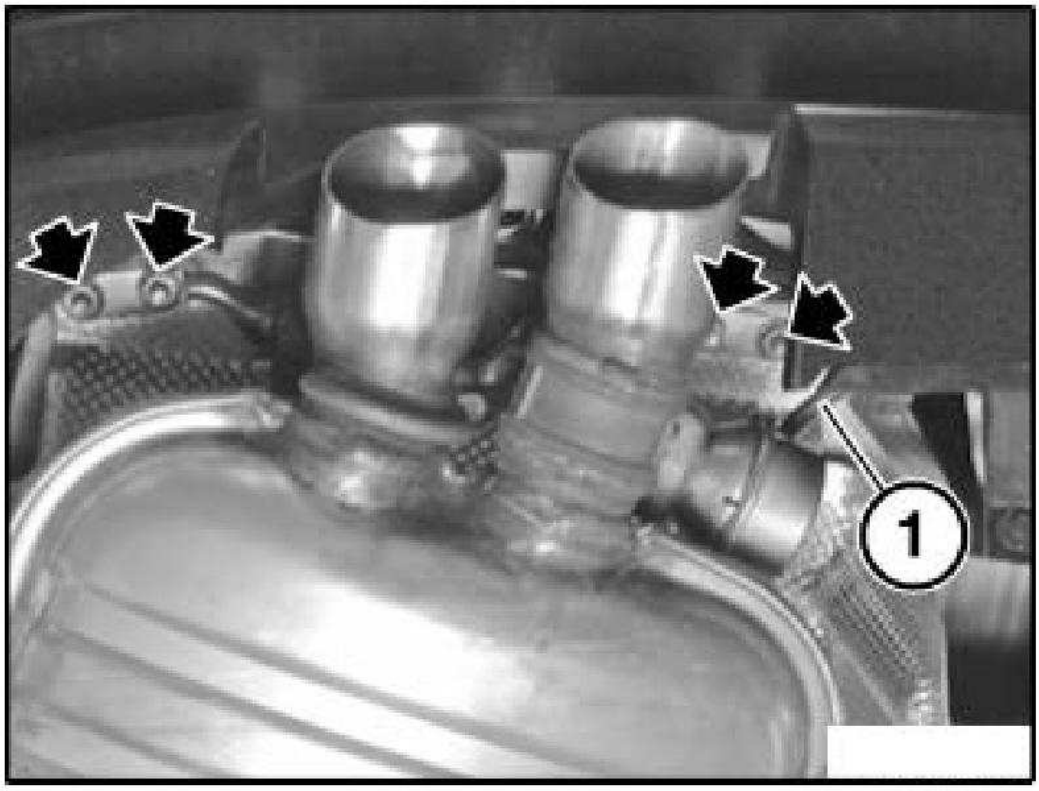
Fig. 1: Supporting Exhaust System

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Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Removal of the exhaust system must be carried out with the assistance of a second person.

Pull off vacuum hose (1).



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Fig. 2: Locating Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts.

Unfasten screws.

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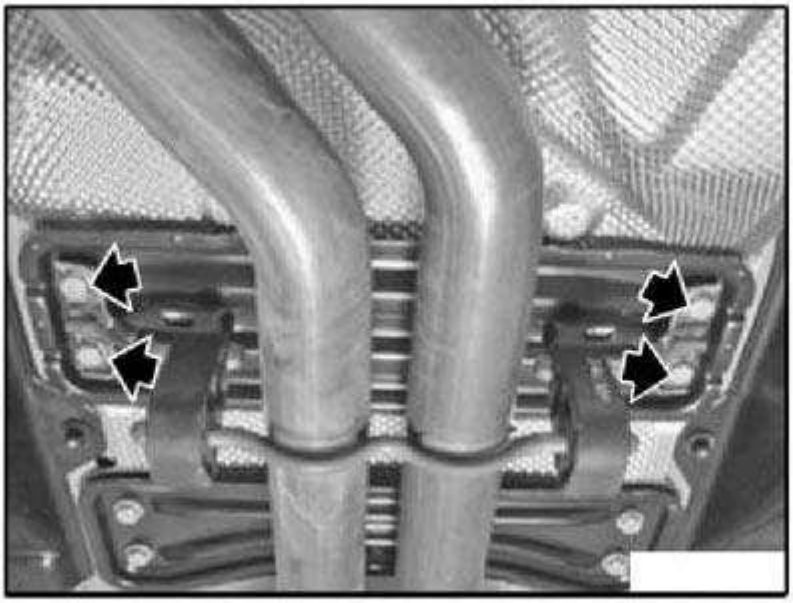
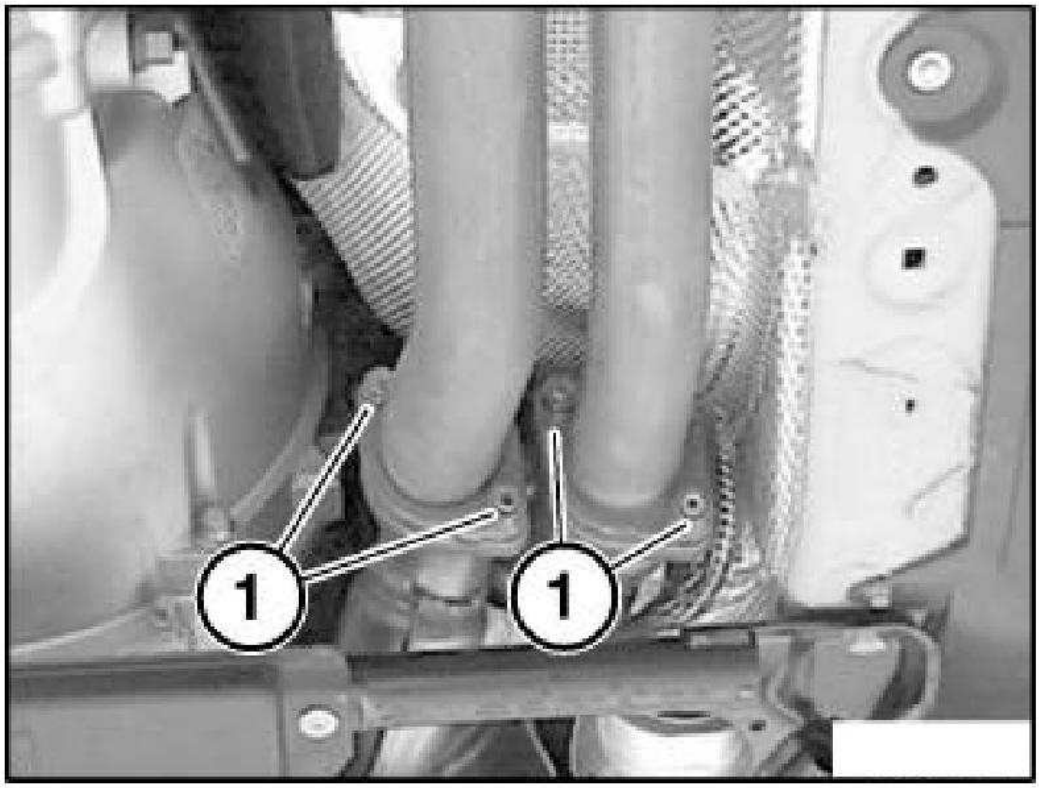


Fig. 3: Removing Muffler Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (1) and remove complete exhaust system.

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Fig. 4: Removing Complete Exhaust System
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace nuts.

MUFFLERS, PETROL

18 12 030 REPLACING REAR MUFFLER (M54/N52)

Special tools required:

- 00 2 210

WARNING: Scalding hazard!
Only perform these tasks after exhaust system has cooled down.

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Cutting line (4) between center muffler (3) and rear muffler (5).

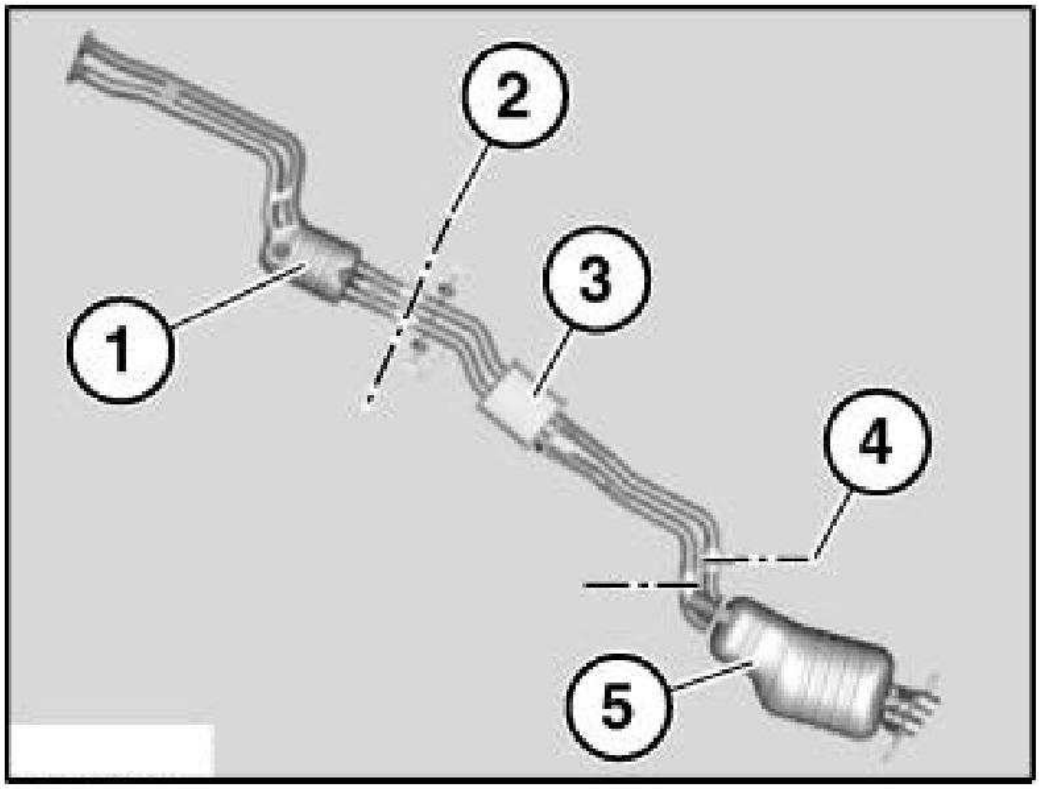


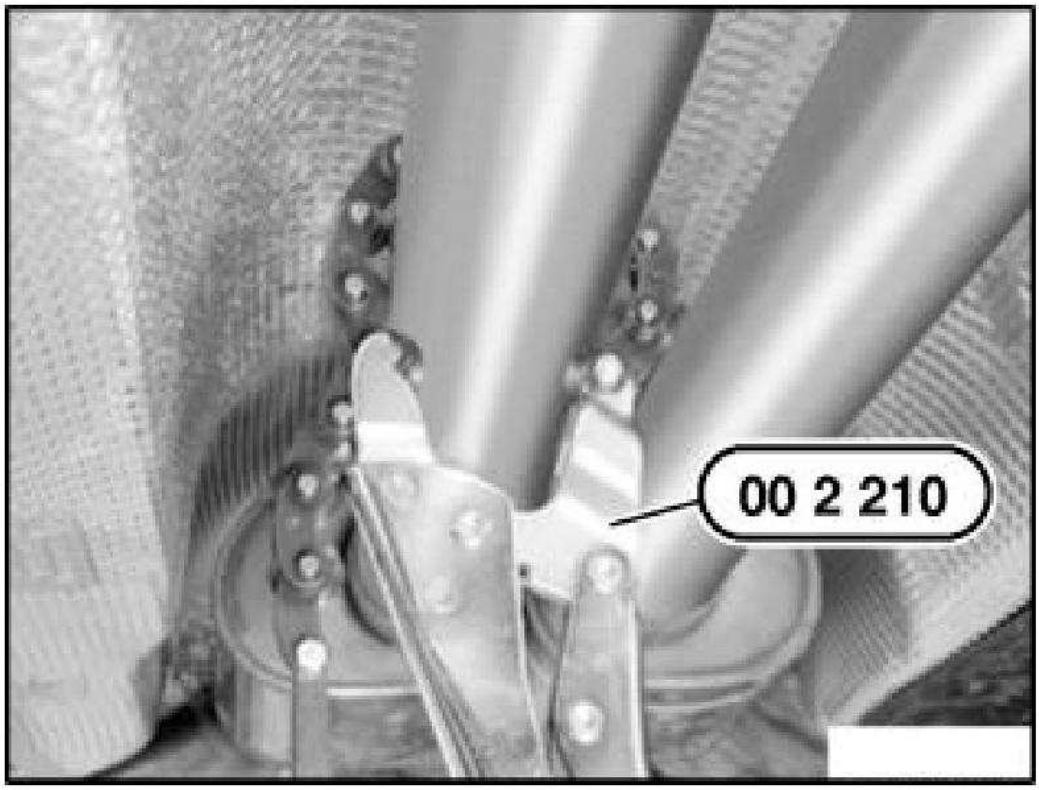
Fig. 5: Locating Cutting Line Between Center Muffler And Rear Muffler
Courtesy of BMW OF NORTH AMERICA, INC.

Determine pipe length on new rear muffler (5).

Carry over dimensions to faulty rear muffler (5) and mark cutting line.

Cut exhaust pipe with special tool 00 2 210 at marked points and deburr.

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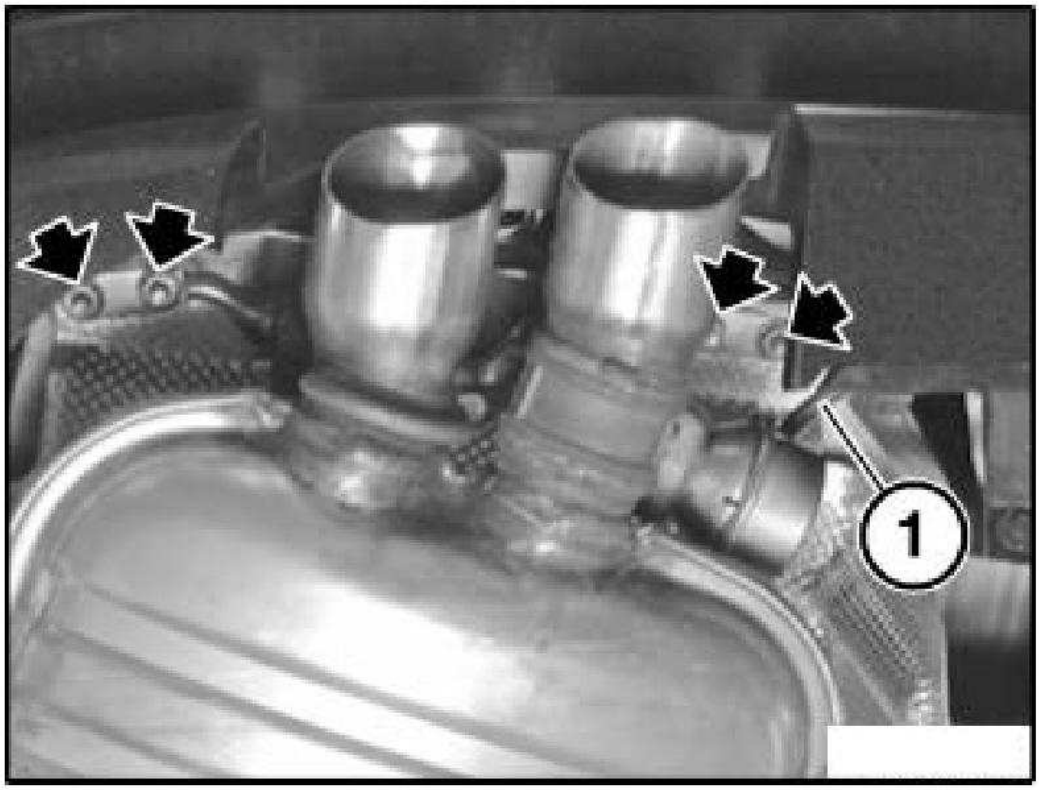


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Fig. 6: Cutting Exhaust Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off vacuum hose (1).

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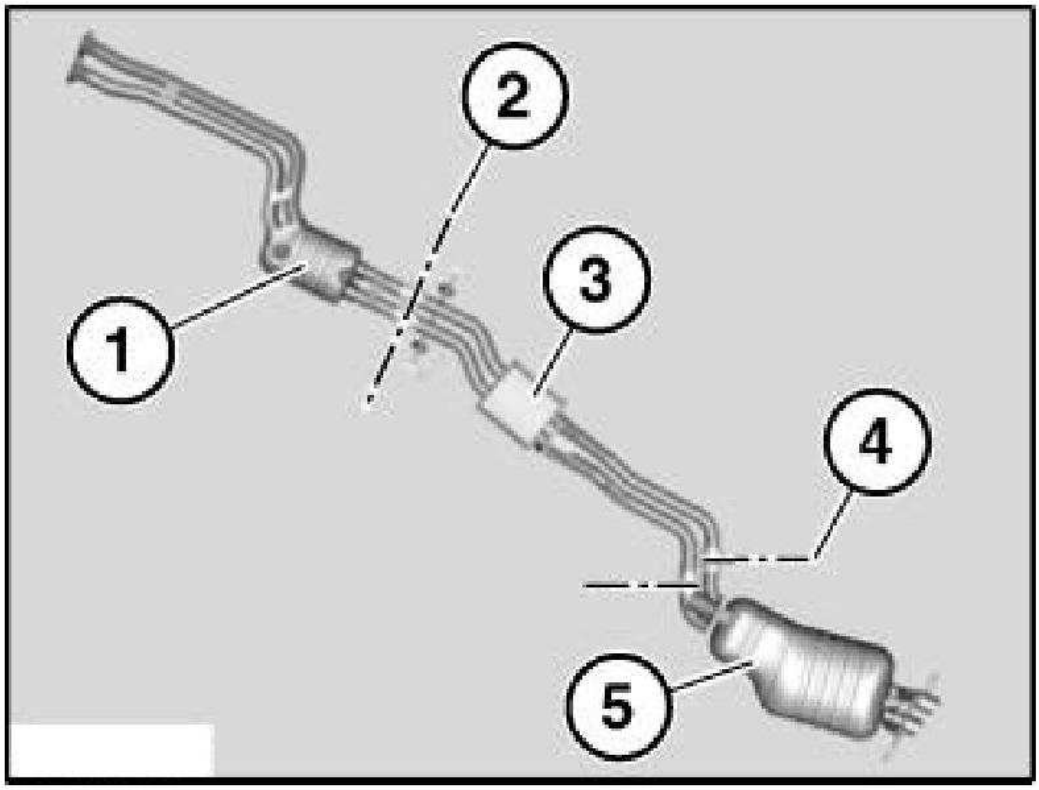
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Fig. 7: Locating Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts and remove rear muffler.

Connect rear muffler (5) using clamping sleeve.

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Fig. 8: Connecting Rear Muffler
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Align clamping sleeve so that:

- Nuts point downwards.
- Cutting line is in middle of clamping sleeve.
- There is sufficient spacing to adjoining components.

18 12 040 REMOVING AND INSTALLING/REPLACING FRONT MUFFLER (M54/N52)

Special tools required:

- 00 2 210

WARNING: Scalding hazard!

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These tasks should only be carried out on an exhaust system that has cooled down!

Cutting line (2) between front muffler (1) and center muffler (3).

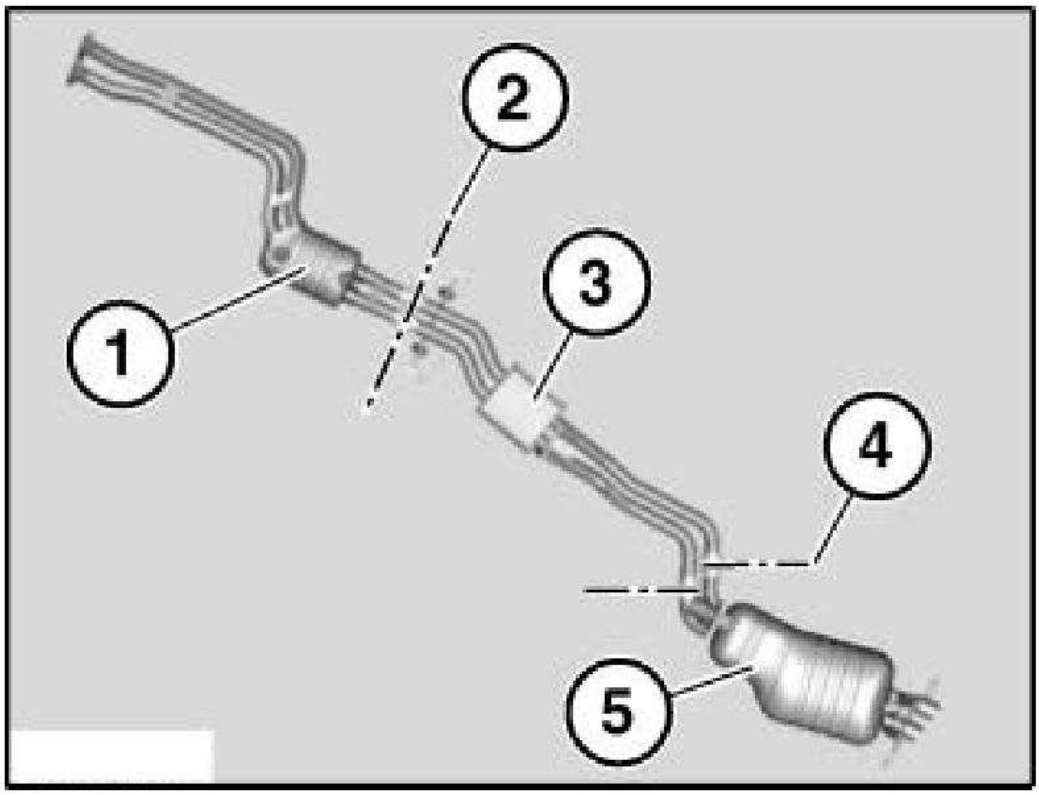


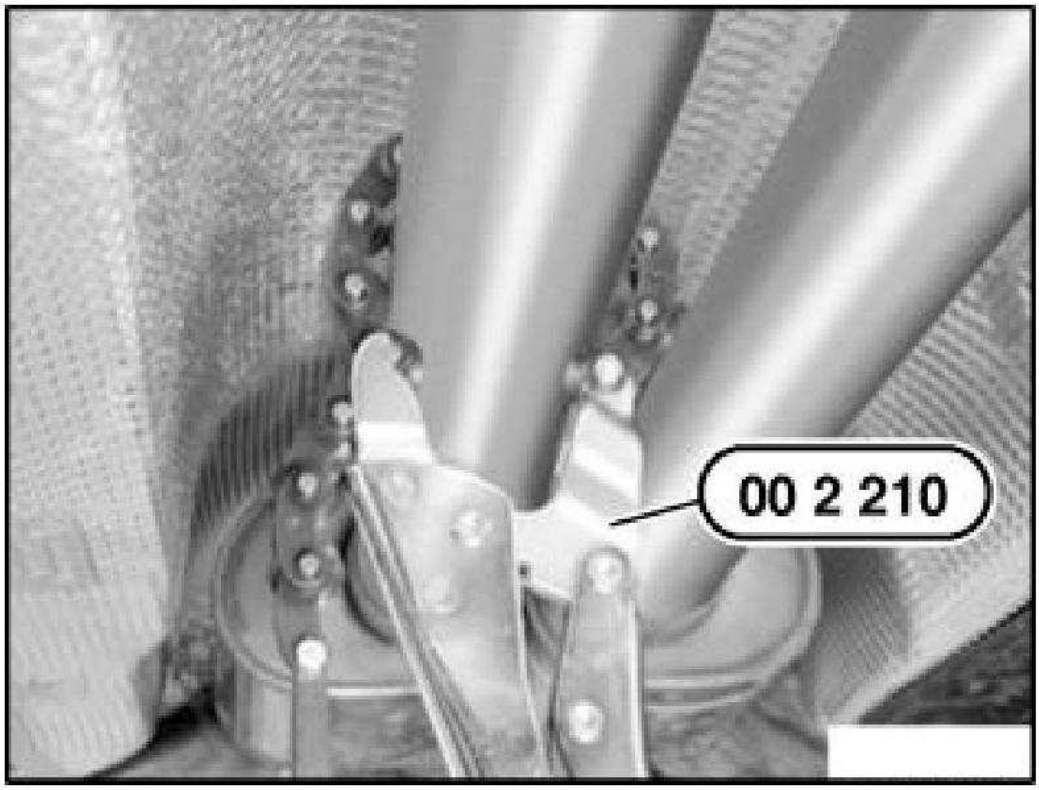
Fig. 9: Locating Cutting Line Between Front Muffler And Center Muffler
Courtesy of BMW OF NORTH AMERICA, INC.

Determine pipe length on new front muffler (1).

Carry over dimension to faulty front muffler (1) and mark cutting line.

Cut exhaust pipes with special tool 00 2 210 at marked points and deburr.

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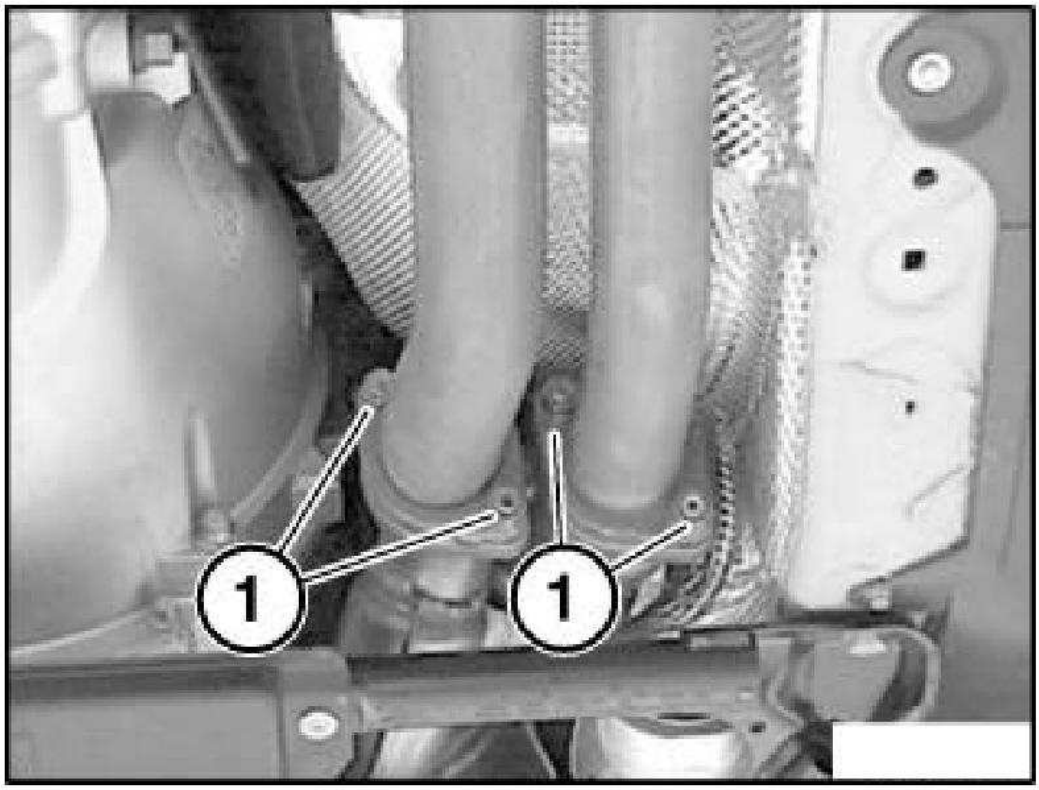


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Fig. 10: Cutting Exhaust Pipes
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

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Fig. 11: Removing Muffler Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

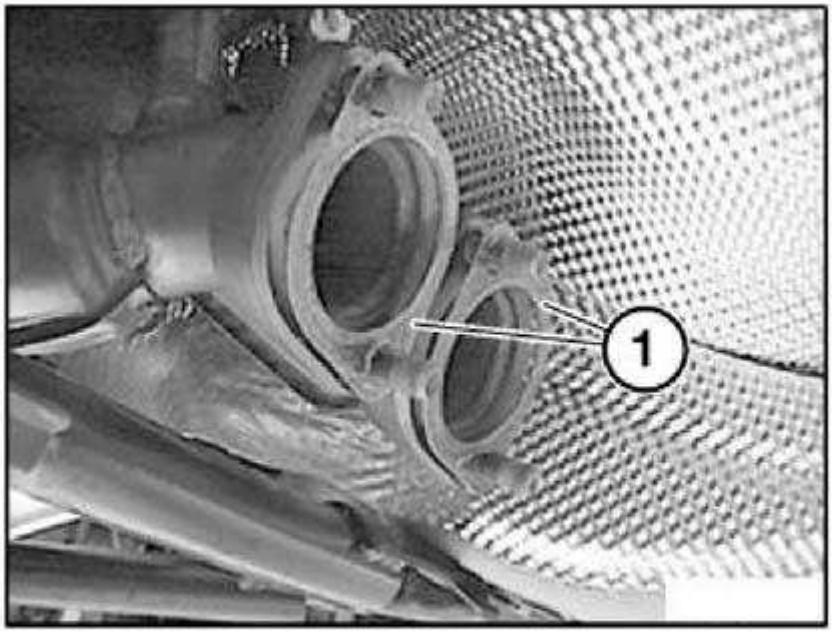
Installation:

Replace self-locking nuts.

Installation:

Replace both seals (1).

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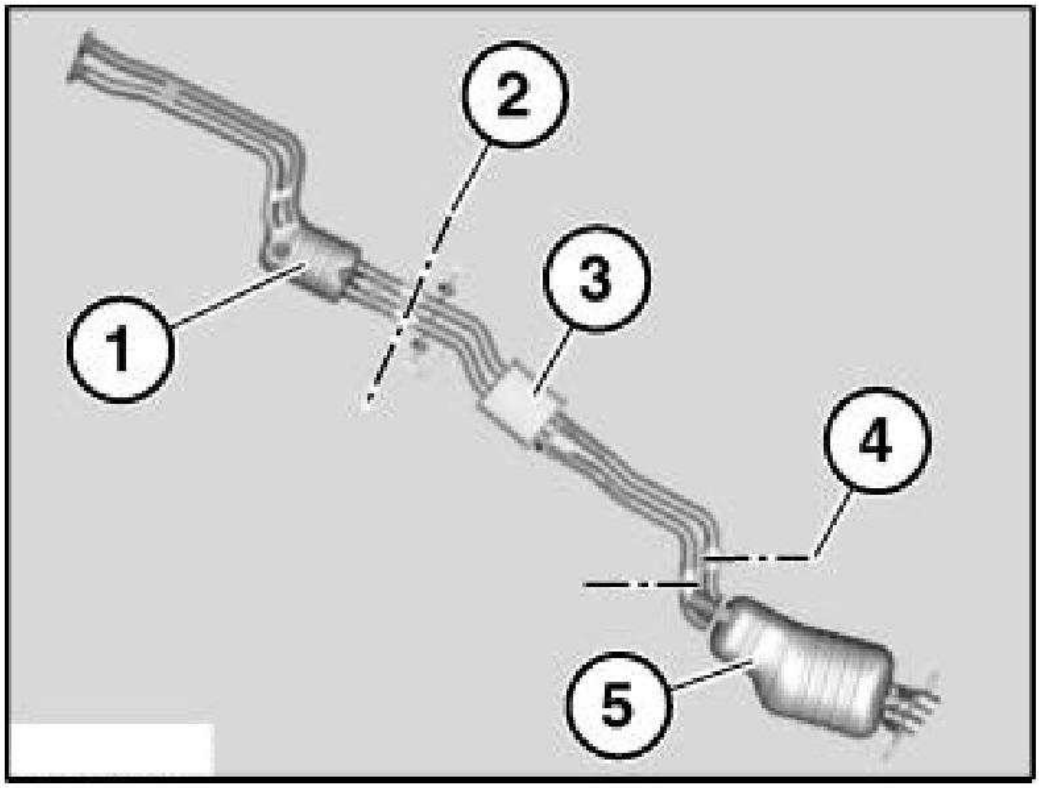


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Fig. 12: Replacing Seals
Courtesy of BMW OF NORTH AMERICA, INC.

Connect front muffler (1) to center muffler (3).

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Fig. 13: Connecting Front Muffler To Center Muffler
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Align clamping sleeves so that:

- Nuts point downwards.
- Cutting line is in middle of clamping sleeve.
- There is sufficient spacing to adjoining components.

18 12 045 REPLACING CENTER MUFFLER (M54/N52)

Special tools required:

- 00 2 210
- 31 2 220

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WARNING: Scalding hazard!
Only perform these tasks after exhaust system has cooled down.

Support exhaust system with jack and special tool 31 2 220 and secure against falling out.

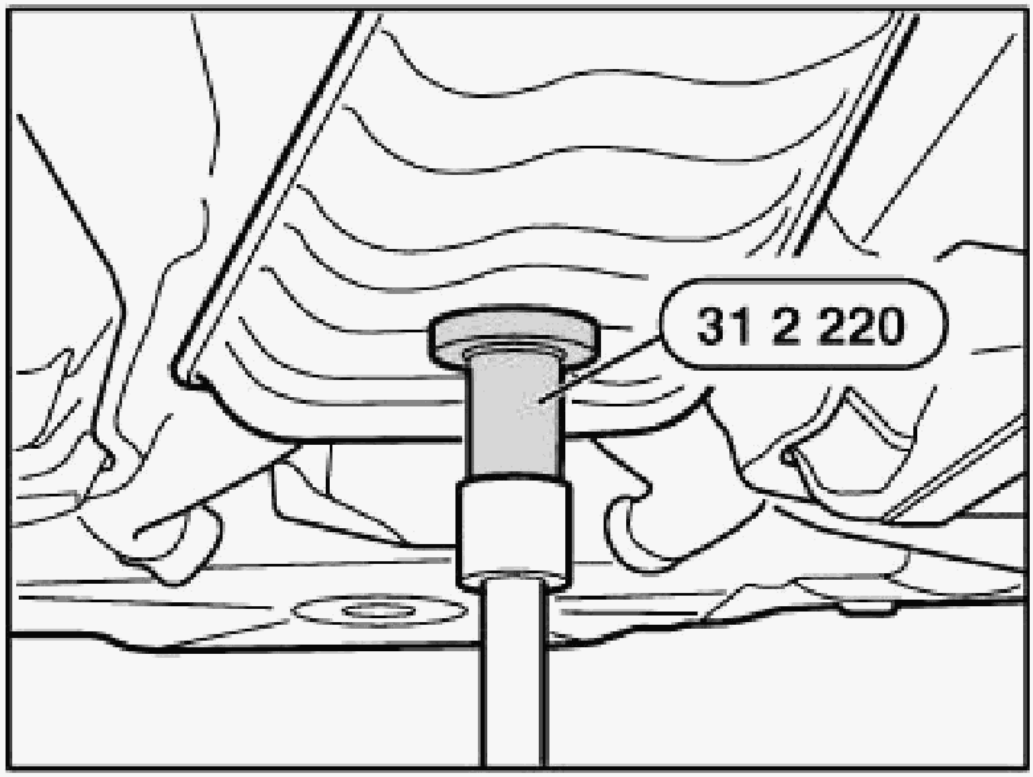


Fig. 14: Supporting Exhaust System
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws.

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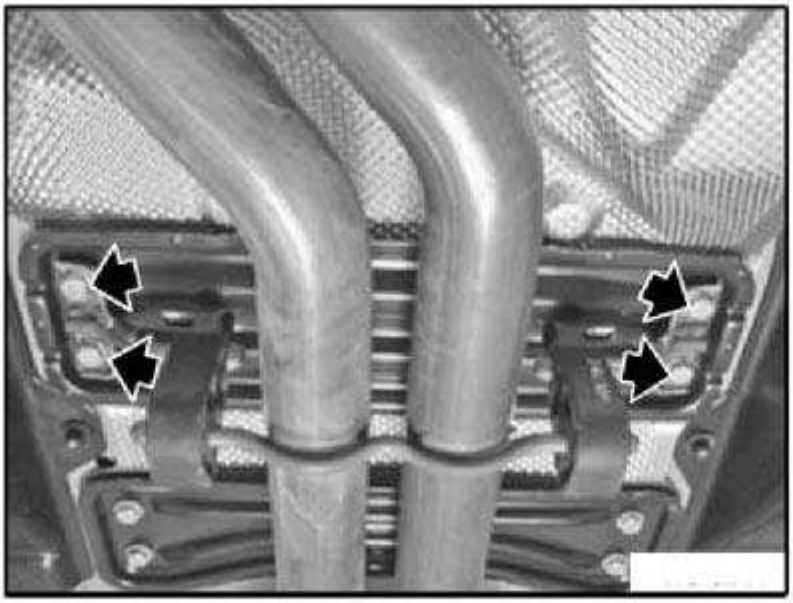
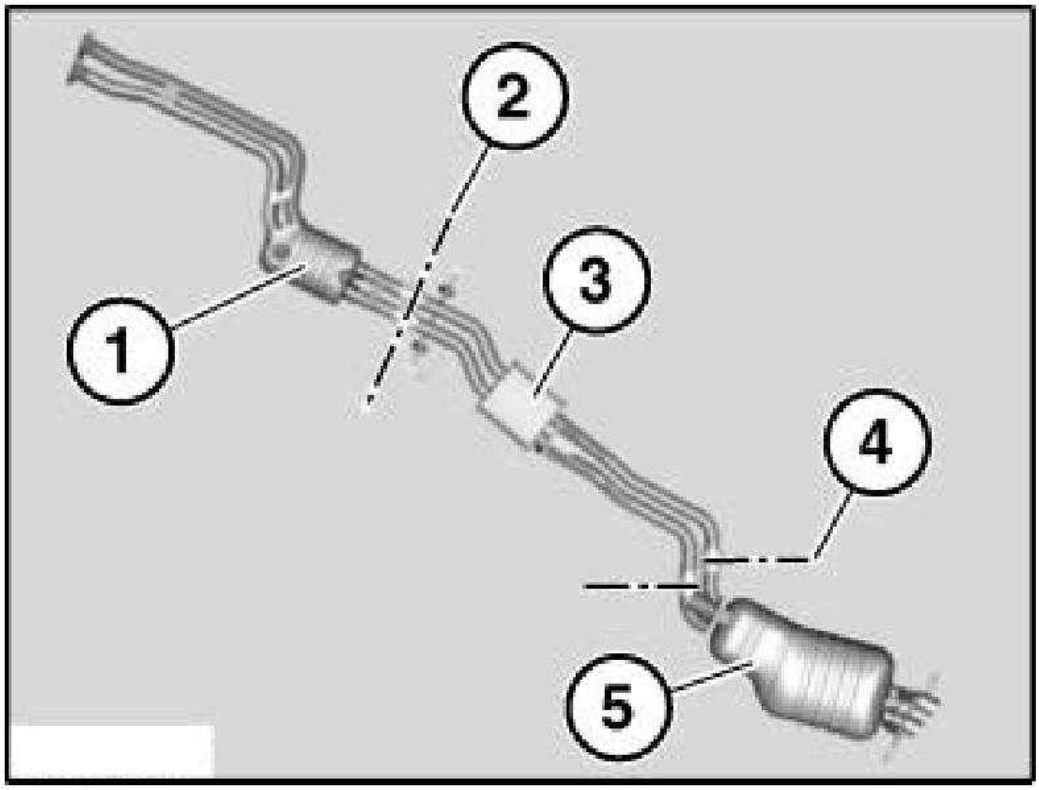


Fig. 15: Removing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Cutting line (2) and (4) between front muffler (1) and rear muffler (5).

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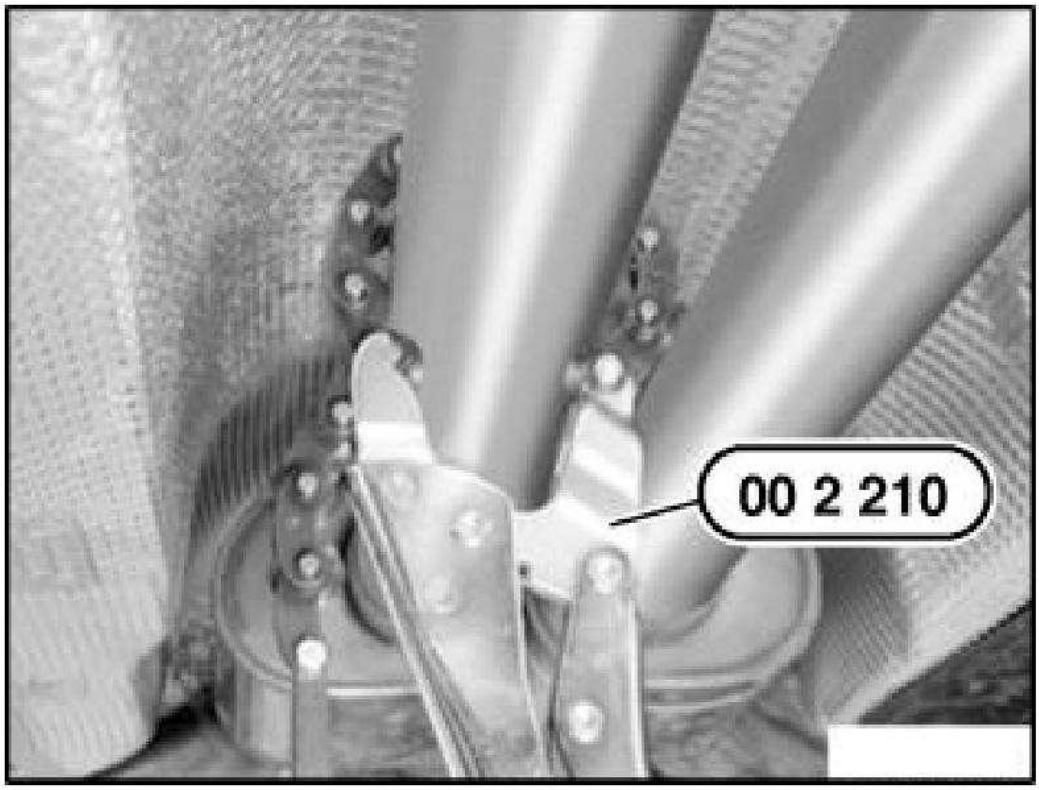
Fig. 16: Locating Cutting Line And Between Front Muffler And Rear Muffler
Courtesy of BMW OF NORTH AMERICA, INC.

Determine pipe length on new center muffler (3).

Carry over measurement to faulty center muffler (3) and mark cutting lines.

Cut exhaust pipes with special tool 00 2 210 at marked points and deburr.

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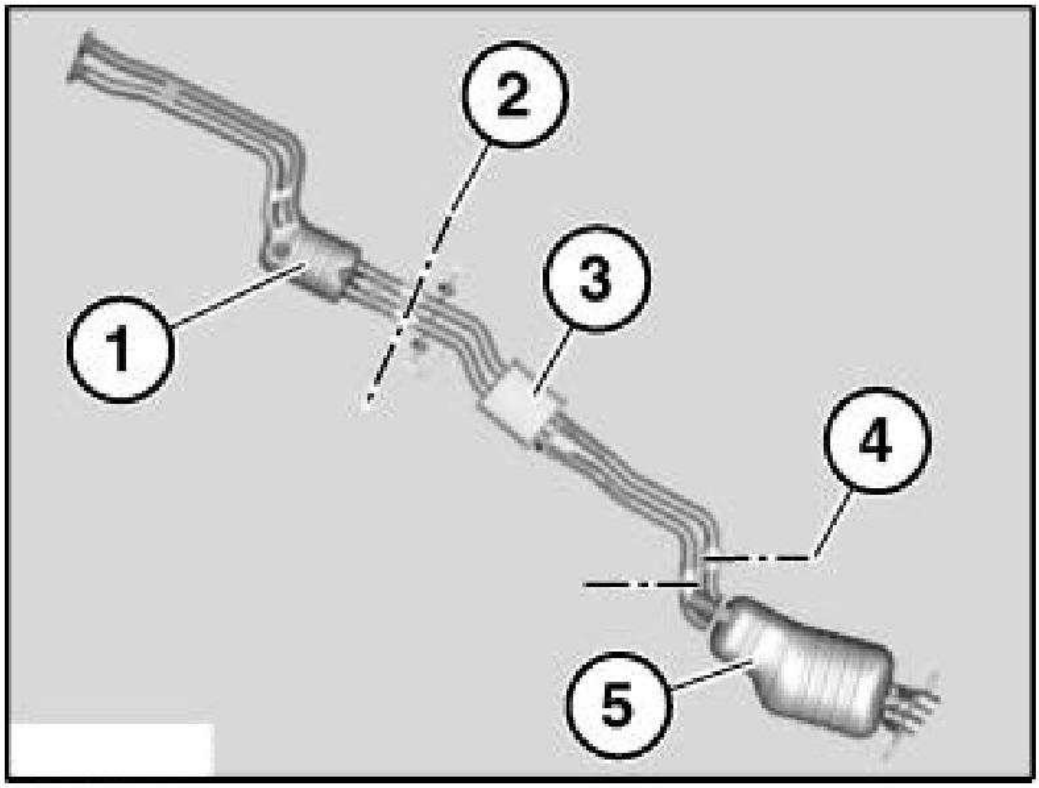


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Fig. 17: Cutting Exhaust Pipes
Courtesy of BMW OF NORTH AMERICA, INC.

Connect center muffler (3) to front muffler (1) and rear muffler (5).

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Fig. 18: Connecting Center Muffler To Front Muffler And Rear Muffler
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Align clamping sleeves so that:

- Nuts point downwards.
- Cutting line is in middle of clamping sleeve.
- There is sufficient spacing to adjoining components.

EXHAUST MANIFOLD WITH INTEGRATED CATALYTIC CONVERTER

18 40 050 REMOVING AND INSTALLING/REPLACING FRONT EXHAUST MANIFOLD (M54/N52)

Necessary preliminary tasks:

- Secure engine in installation position.

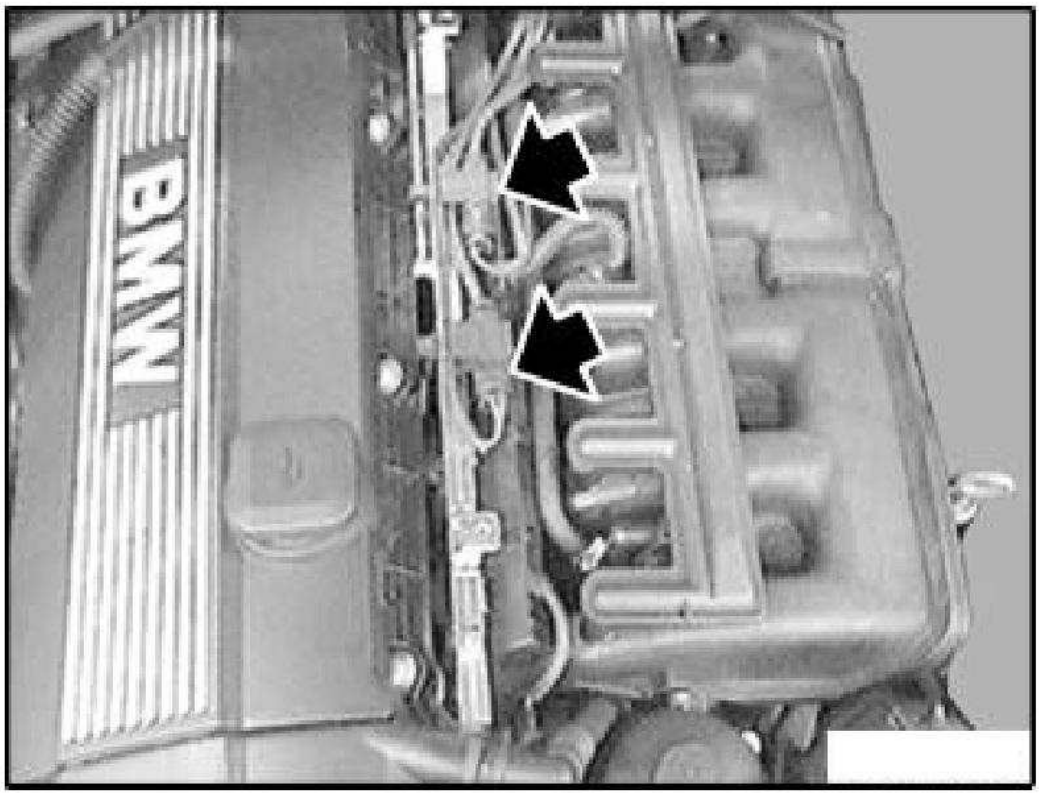
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- Remove reinforcement plate
- Remove complete exhaust system, refer to **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM**
- Detach grounding cable from body.
- Remove right engine support arm with engine mount
- M54: Remove air pump

NOTE: The oxygen sensors are in danger of being damaged when the exhaust manifolds are removed and installed.

Remove front control sensor. Refer to **11 78 511 REPLACING OXYGEN CONTROL SENSOR (CYLINDERS 1-3)** .

Remove cover from fuel injectors.



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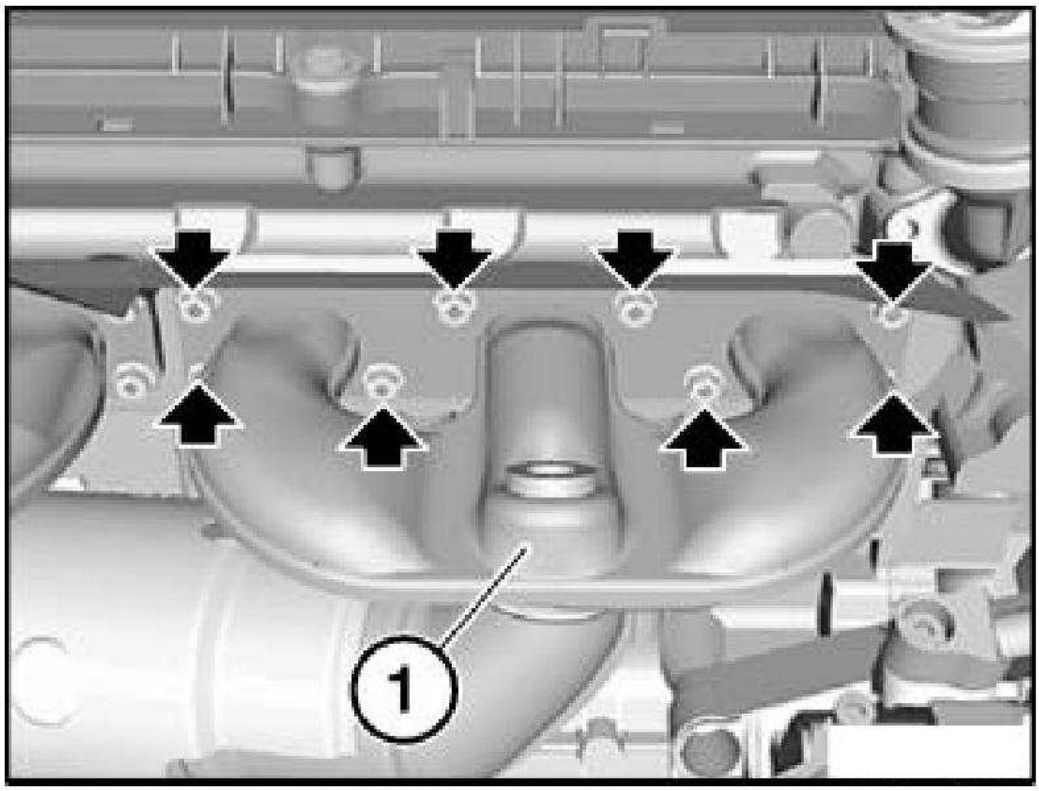
Fig. 19: Removing Cover From Fuel Injectors
Courtesy of BMW OF NORTH AMERICA, INC.

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NOTE: **Do not mix up monitor sensors for cylinders 1 to 3 and 4 to 6 at plug connection to wiring harness.**
Mark plug connections.
Unclip cable from holder. Disconnect plug connection. Unclip cable on rear side of engine from cable guide.

Remove monitor sensor from cylinders 1 to 3. Refer to **11 78 611 REPLACING OXYGEN MONITOR SENSOR (CYLINDERS 1-3)** .

Unscrew nuts.



G03310790

Fig. 20: Removing Exhaust Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

Remove exhaust manifold (1).

Installation:

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Clean sealing faces, replace gaskets.

Replace nuts.

Tightening torque 11 62 1AZ. Refer to **ENGINE - TIGHTENING TORQUES** .

18 40 060 REMOVING AND INSTALLING/REPLACING REAR EXHAUST MANIFOLD (M54/N52)

Necessary preliminary tasks:

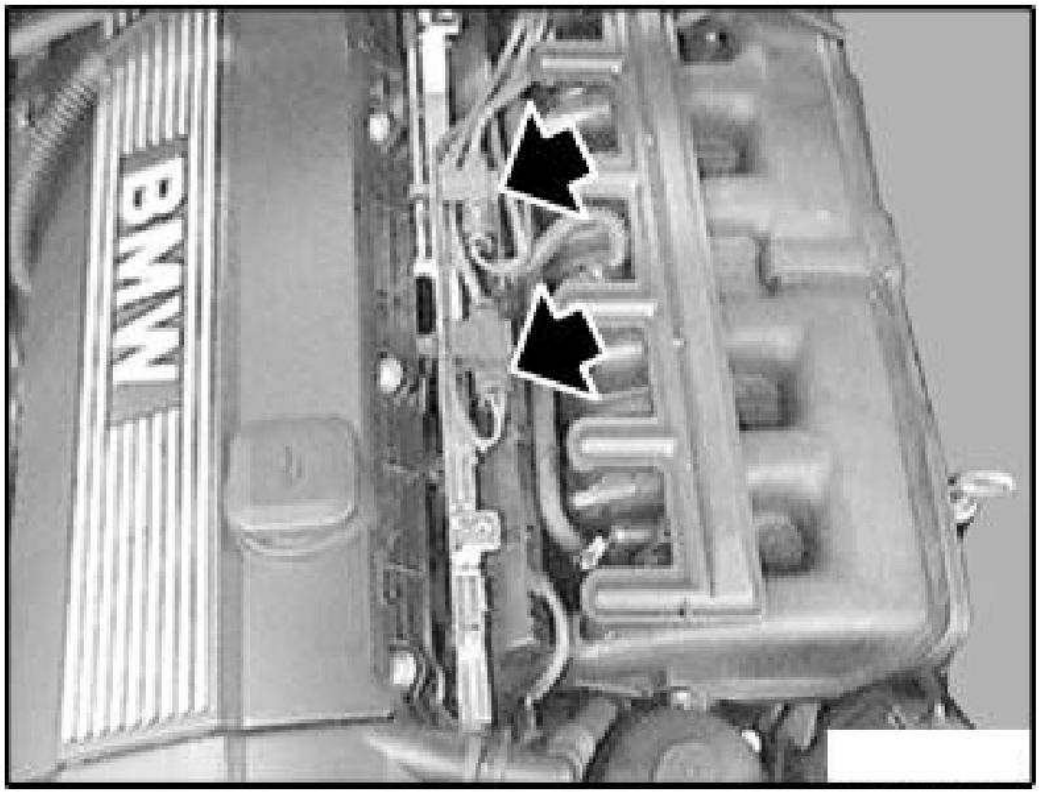
- Remove reinforcement plate
- Remove complete exhaust system, refer to **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM**
- M54: Remove air pump

NOTE: The oxygen sensors are in danger of being damaged when the exhaust manifolds are removed and installed.

Remove rear control sensor. Refer to **11 78 512 REPLACING OXYGEN CONTROL SENSOR (CYLINDERS 4-6)** .

Remove cover from fuel injectors.

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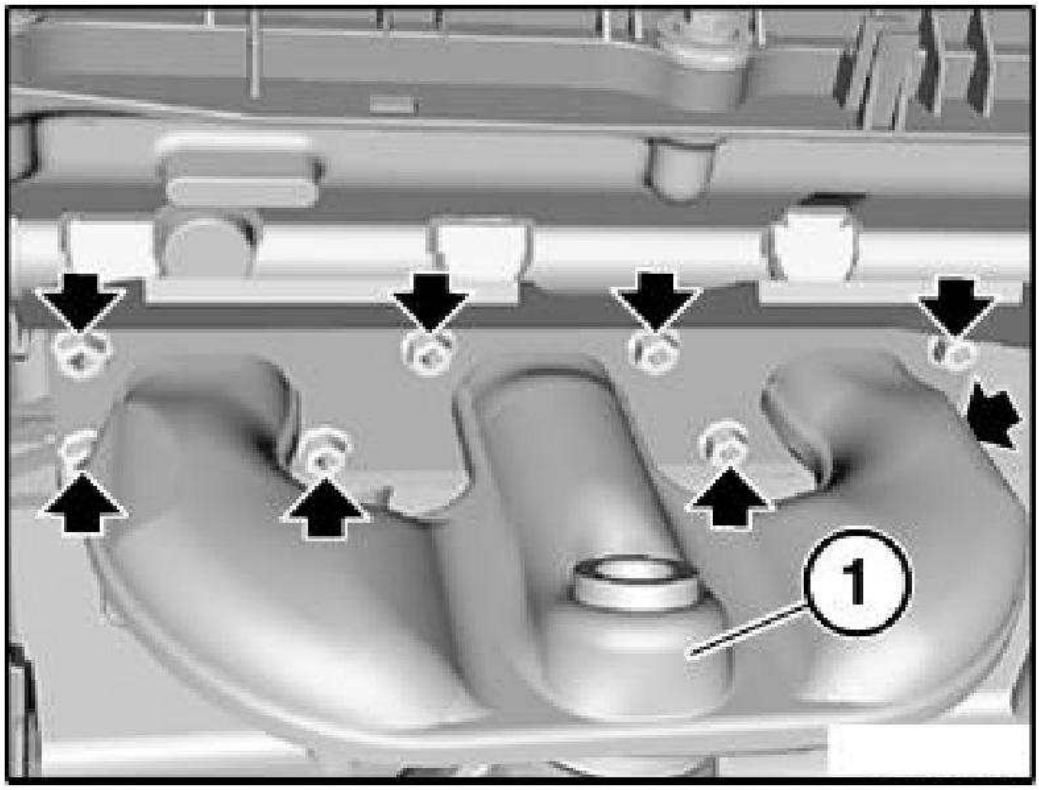
Fig. 21: Removing Cover From Fuel Injectors
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Do not mix up monitor sensors for cylinders 1 to 3 and 4 to 6 at plug connection to wiring harness.**
Mark plug connections.
Unclip cable from holder. Disconnect plug connection. Unclip cable on rear side of engine from cable guide.

Remove monitor sensor from cylinders 4 to 6. Refer to **11 78 612 REPLACING OXYGEN MONITOR SENSOR (CYLINDERS (4-6)** .

Unscrew nuts.

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G03310792

Fig. 22: Removing Exhaust Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

Remove exhaust manifold (1).

Installation:

Clean sealing faces, replace gaskets.

Replace nuts.

Tightening torque, see 11 62 1AZ in **ENGINE - TIGHTENING TORQUES** .

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ENGINE

Fuel Supply System - Special Tools - X3

16 FUEL SUPPLY SYSTEM

16 1 020 PIN WRENCH

Minimum set: Mechanical tools

Note: For removing and installing fuel level sensor in fuel tank

Series: E31, E34, E34tou, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56, RR1, RR2

Storage location: C21

SI number: 1 04 99 (425)

Order number: 16 1 020

Pin wrench

Consisting of:

1 = 16 1 021 Basic wrench

2 = 16 1 022 Attachment (2 x)

Note: Model series: E46, E38, E39, R50, R53

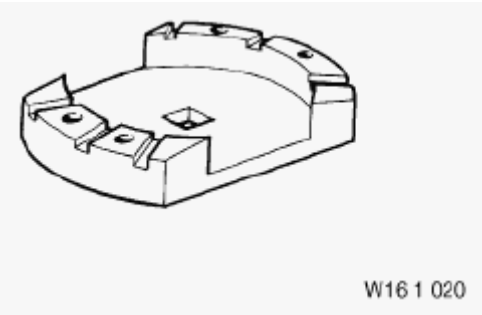


Fig. 1: Pin Wrench (16 1 020)
Courtesy of BMW OF NORTH AMERICA, INC.

16 1 080 HOSE GUIDE

Minimum set: Mechanical tools

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Note: For unlocking new fuel tank flap systems with safety lock (incorrect fuelling, diesel/petrol/gasoline)

Series: E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53, R56

SI number: 01 16 06 282

Order number: 16 1 080

Hose guide



Fig. 2: Hose Guide (16 1 080)
Courtesy of BMW OF NORTH AMERICA, INC.

16 1 170 TESTER WITH TEST ADAPTER

Note: Leak-testing tank and fuel tank catch

Series: E46, E46/16, E46/2, E46/3, E46/5, E46/C, E60, E61, E63, E64, E65, E66, E67, E70, E83, E85, E86, E87, E90, E91, E92, E93, R50, R52, R53

SI number: 1 10 00 (593)

Order number: 16 1 170

Tester with test adapter

Consisting of:

1 = 16 1 171 Tester

2 = 16 1 172 Test adapter for tank cap

3 = 16 1 173 Test adapter for tank cap

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4 = 16 1 174 Test adapter for tank

5 = 16 1 175 Connection hose

6 = 16 1 176 Sealing plug

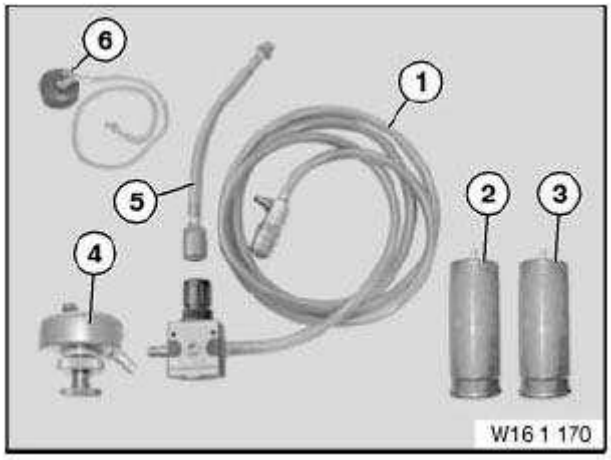


Fig. 3: Tester With Test Adapter (16 1 170)
Courtesy of BMW OF NORTH AMERICA, INC.

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ENGINE

Fuel Supply System - Technical Data - X3

11 FUEL TANK WITH MOUNTING

16 11 FUEL TANK AND MOUNTING PARTS E83

TECHNICAL DATA - FUEL TANK AND MOUNTING PARTS E83

Tank volume/reserve	ltr.	67 / 8
Venting: via integrated compensation volume in tank, by carbon canister to intake tract.		

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ENGINE

Fuel Supply System - Tightening Torques - X3

11 FUEL TANK WITH MOUNTING

16 11 FUEL TANK AND MOUNTING PARTS

FUEL TANK AND MOUNTING PARTS TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Fuel tank to body (hexagon nut)	E46 / E83	M8	Replace self-locking nuts	19 Nm
	E24	M8		45 Nm
	E30	M8		25 Nm
Tension strap to body (hexagon screw)	E53 / E46 / E85 / E86 / E83	M8		19 Nm
	E24	M8		8 Nm
	E38 / E65 / E66 / E67/E60/E61/ E63 / E64	M8		20 Nm
2AZ Connecting pipe to fuel tank	E30			25 Nm
3AZ Heat shield to fuel tank	E30			8,5 Nm
	E24			1,0 Nm
	E31			3 Nm
4AZ Drain plug to fuel tank	E28 / E30			25 Nm
5AZ Trunk separating wall/retaining bracket to trunk floor	E52	M6		7,8 Nm
6AZ Wheel arch cover to body	E52	M6		3 Nm

12 FUEL TRANSFER, SENSOR FOR GAUGE

16 12 FUEL DELIVERY

FUEL DELIVERY TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Pump assembly to metal-bonded mount	E28 / E30			6,5 Nm
2AZ Holder to fuel pump or fuel reservoir	E28 / E30			6,5 Nm
3AZ Electric connections on fuel pump	E28 / E30			2 Nm
4AZ Electric connections on fuel pump	E28 / E30	M4		1,2 Nm
5AZ Electric connections on fuel pump	E28 / E30	M5		1,6 Nm
6AZ Plastic nut on cover for fuel pipes	E30			2 Nm
7AZ Hose clamps 10-16 mm dia.	E28 / E30			2 Nm

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	E65 / E66			1,5 Nm
8AZ Hose clamps 18 mm dia.	E28 / E30			3 Nm
9AZ Hose clamps 37 - 43 mm dia.	E28 / E30			4 Nm
	E52			3 Nm
10AZ Hose clamps 42 - 48 mm dia.	E65 / E66			2 Nm
	E83			4 Nm
11 AZ Fuel filler pipe to body	E46 / E65 / E66 / E67 / E83			4 Nm
	E60 / E61 / E63 / E64	M6		9 Nm
	E85 / E86	M6 8.8		9 Nm
12AZ Feed line to fuel tank	E46 / M56	M14		26±3 Nm
13AZ Vent line from carbon canister to fuel tank	E46 / M56	M24		26±3 Nm
14AZ Fuel tank vent line to fuel filler pipe / purge air line to carbon canister	E46 / M56	M14		26±3 Nm
16AZ Grounding strap, fuel filler pipe to body	E85 / E86	M6 8.8		9 Nm
	E83			8 Nm

13 FUEL VENTILATION

16 13 TANK VENTILATION

TANK VENTILATION TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Fuel vapor venting tank to body	E24			3 Nm
	E30			4,5 Nm
	E39			4,0 Nm
	E38			5,5 Nm
	E53			3,5 Nm
	E65 / E66 / E67			9,0 Nm
2AZ Carbon canister to body	E85 / E86	M8		9 Nm
	E46/E60/E61/ E63 / E64 / E83	M6		9 Nm
3AZ DMTL to holder / carbon canister	E83 / E85 / E86 / E60 / E46 / M56			2 Nm
4AZ Dust filter to holder / carbon canister	E60 / E83 / E46 / M56			2 Nm
	E85 / E86			2 Nm

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14 FUEL PUMP

16 14 FUEL PUMP

FUEL PUMP TIGHTENING TORQUES

	Type	Thread	Tightening specification	Measure
1AZ Fuel level sensor to suction device	E32			8 Nm
2AZ Sealing ring for fuel tank (service aperture, fuel level sensor, pump unit)				
Plastic sealing ring 26.5 mm high	E34 / E31			40 Nm
Plastic sealing ring 31.5 mm high (new)	E36/E34/E31		First tighten sealing ring by hand 2 turns	55 Nm
Locking ring (metal)	E39 / E52 / E53			35 Nm
	E60 / E61 / E63 / E64 / E65 / E66 / E67			45 ±5 Nm
	E85 / E86,			50 ±10 Nm
	E83			55±5 Nm
3AZ In-tank pump with fill level sensor to tank	E38	M6	Tighten nuts diagonally and evenly.	6,5 Nm
4AZ El. fuel pump control unit to body / holder	E60 / E61 / E63 / E64 / E85 / E86	M6		8 Nm

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ENGINE

Fuel System - Operating Fluids

1.0 FUELS FOR GASOLINE ENGINES

Use only unleaded gasoline in vehicles equipped with a catalytic converter.

Fuels containing up to and including 10% of ethanol or other oxygenates with up to 2.8% oxygen by weight, that is, 15% MTBE (methyl tertiary butyl ether) or 3% methanol plus an equivalent amount of co-solvent, will not void the applicable warranties with respect to defects in materials or workmanship.

Although, usage of such alcohol fuel blends may result in driveability, starting, and stalling problems due to reduced volatility and lower energy content of the fuel. Those driveability problems may be especially evident under certain environmental conditions, such as: high or low ambient temperatures and high altitude.

Only specially adapted vehicles (FFV-Flexible Fuel Vehicles) can run on high alcohol fuel blends. BMW, for the various technical and environmental reasons explained below, does not offer FFV models.

Usage of E85, or any other high alcohol content blend (e.g. E30) in BMW vehicles, will cause various driveability complaints (cold start problems, stalling, reduced performance, poor fuel economy, etc.), may cause excessive emissions, and may cause irreversible damage to engine, emission control and fuel delivery systems due to incompatibility of materials with alcohols.

General Notes Regarding E85 Fuel.

E85 fuel contains 85% (by volume) of ethanol and 15% of gasoline. Ethanol can be produced chemically from ethylene or biologically from grains, agricultural wastes, or any organic material containing starch or sugar. In the US, ethanol is mainly produced from corn and is classified as a renewable fuel.

Similar to gasoline, ethanol contains hydrogen and carbon; with additional oxygen molecules build into its chemical chain. This chemical structure makes ethanol's burning process slightly cleaner compared to the gasoline (lower tailpipe emissions).

On the other hand, due to lower carbon content, ethanol provides 27% less energy (for identical volume) then gasoline, resulting in the reduced fuel economy of E85 vehicles (approximately 22% higher consumption). Increased fuel consumption requires the appropriately enlarged fuel tank capacities (usually 30% increase), and the specific DME calibrations for the E85 lower Stoichiometric air/fuel ratio (10 compared to 14.7 for gasoline engines).

E85 fuel volatility is typically lower then gasoline (RVP 6-10 psi, compared to 8-15 psi for gasoline). Lower fuel volatility will reduce vehicle evaporative emissions, but it may cause cold starting problems especially with lower ambient temperatures.

Under certain environmental conditions, mainly lower ambient temperatures, ethanol separates from gasoline/alcohol mixture and absorbs water. The ethanol absorbed water molecules are heavier then gasoline or ethanol, they remain at the bottom of fuel tank and when introduced into combustion process they tend to form

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an extremely lean mixture resulting in misfire, rough idle and cold starting problems.

Certain materials, commonly used with gasoline are totally incompatible with alcohols. When these materials come in contact with ethanol, they may dissolve in the fuel, which may damage engine components and may result in poor vehicle driveability.

Some metals (e.g. zinc, brass, lead, aluminum) become degraded by long exposure to ethanol fuel blends. Also, some nonmetallic materials used in automotive industry such as: natural rubber, polyurethane, cork gasket material, leather, polyvinyl chloride (PVC), polyamides, methyl-methacrylate plastics, and certain thermo & thermoset plastics degrade when in contact with fuel ethanol.

In order to safely and effectively operate a motor vehicle running on E85, the vehicle must be compatible with alcohol use. Some manufacturers have developed vehicles called FFV (Flexible Fuel Vehicle) that can operate on any blend of ethanol and gasoline (from 0% ethanol and 100% gasoline, up to 85% ethanol and 15% gasoline). Ethanol FFVs are similar to gasoline vehicles, with main differences in materials used in fuel management and delivery systems, and DME control module calibrations. In some cases, also E85 vehicles require special lubricating oils.

Aftermarket conversions of gasoline-powered vehicles to ethanol-fueled vehicles, although possible, are not recommended due to internal materials and DME software incompatibility, as well, as the high costs of conversion.

TOP TIER DETERGENT GASOLINE

Deposit-control additives have been required by the EPA in all gasoline from 1995, however, since the introduction of the lowest additive concentration (LAC) most gasoline manufacturers have actually reduced the concentration level of detergent additives by up to 50%.

Low content of cleaning additives results in an excessive accumulation of deposits on fuel injectors, the intake valves, the exhaust manifold or inside the combustion chamber. Due to deposits build-up, customers may experience various driveability problems (e.g. cold start problems, rough idle), increased emissions with Service Engine Soon light illumination, reduced engine performance and poor fuel economy.

In order to increase the level of detergent additives in gasoline, the TOP TIER Detergent Gasoline requirements were approved by four automotive companies (BMW, GM, Honda and Toyota).

Usage of the TOP TIER Gasoline will help keep engines cleaner, and will reduce deposits-related concerns.

A number of gasoline retailers have already met the TOP TIER Detergent Gasoline requirements and are offering this product in all octane grades in all of their respective marketing areas. The current TOP TIER Gasoline retailers are: QuickTrip®, ChevronTexaco®; ConocoPhillips®; 76®; Shell®; Entec Stations®; MFA Oil Company®; Kwik Trip®/Kwik Star®; The Somerset Refinery, Inc.®; Aloha Petroleum®; Jiffy Mart®; Mahalo®; Trip-Par Oil Company®. All gasoline outlets carrying the brand of the approved retailer must conform to TOP TIER requirements on products advertised as such.

BMW recommends using TOP TIER Detergent Gasoline of minimum octane rating of AKI 91 and with alcohol content of less then 10% by volume (or any other oxygenates with up to 2.8% of oxygen by weight). Only the exclusive usage of TOP TIER Gasoline provides the full benefit of reducing deposits build-up.

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ALCOHOL DETECTION PROCEDURE

Fuel Blends containing a high percentage (10% and above) of alcohol, mainly ethanol, are becoming more commercially available. Usage of E85, or any other high alcohol content blend (e.g. E30) in BMW vehicles, will cause various driveability complaints (cold start problems, stalling, reduced performance, poor fuel economy, etc.), may cause excessive emissions, and may cause irreversible damage to engine, emission control and fuel delivery systems due to incompatibility of materials with alcohols.

In order to correctly diagnose various driveability complaints caused by fuel blends with a high level of ethanol content, BMW is providing you with an alcohol detection test tool.

Distribution of the following tool will be through the Automatic Tool Shipment Program. Additional tools may be purchased through your PDC. All prices on this bulletin are introductory prices and are only valid during the Automatic Tool Shipment.

Procedure

Safety Precautions:

Gasoline is highly flammable; observe normal precautions for working with flammable liquids. Perform all tests away from any source of ignition. A class B fire extinguisher must be available. Wear protective eye protection with side shields and Nitrile rubber gloves for handling syringe. Please adhere to any applicable OSHA regulations when handling Gasoline. Dispose of the mixture according to local, state and federal regulations.

Fill a clean container with gasoline drawn from the fuel system of the affected vehicle then fill another container with water. Only a small amount of fuel is needed to perform the test (5 ounces of each fluid).

Slowly draw 3cc of water into the syringe. Note: To remove air, draw at least 5cc to 6cc of water, invert the syringe and squirt the water out until the top rim of the rubber plunger is at the 3cc mark.

Slowly draw gasoline into the syringe until the fluid reaches the 12cc mark. Place your finger over the tip of the syringe, vigorously shake the syringe for one minute. Relieve built-up pressure by occasionally removing your finger.

Place the syringe on a flat surface with the nozzle pointing up, allow the syringe to stand for one minute.

If alcohol is present in the fuel, it will separate from the gasoline and dissolve in the water.

Empty the syringe and rinse thoroughly with water, allow drying and apply a silicone lubricant to the rubber plunger before storing.

ALCOHOL PERCENTAGE REFERENCE

Boundary Line	% Alcohol	Boundary Line	% Alcohol
9.0cc	0%	5.0cc	45%
8.6cc	5%	4.5cc	55%
8.1cc	10%	4.1cc	60%
7.7cc	15%	3.6cc	65%

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7.2cc	20%	3.2cc	70%
6.8cc	25%	2.7cc	75%
6.3cc	30%	2.3cc	80%
5.9cc	35%	1.8cc	85%
5.4cc	40%	1.4cc	90%

WARRANTY INFORMATION

Components damage/malfunctions, or any driveability problems caused by use of fuels containing more then 10% ethanol (or other oxygenates with more then 2.8% oxygen by weight) will not be covered under BMW warranties with respect to defects in materials or workmanship. Please document the results found on the vehicle repair order whenever performing this test

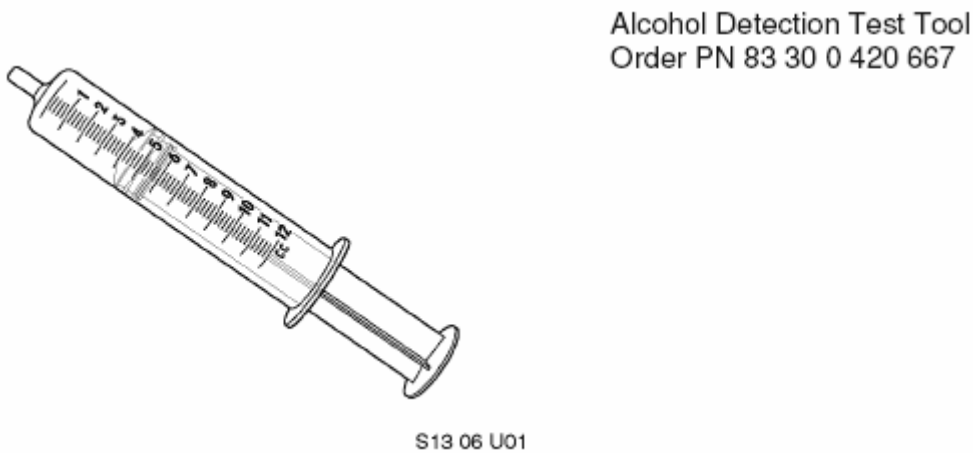


Fig. 1: Identifying Alcohol Detection Test Tool
Courtesy of BMW OF NORTH AMERICA, INC.

ANTI-KNOCK PROPERTIES

The anti-knock value is the quality rating for gasoline and is a requirement for controlled combustion. Anti-knock value is expressed with an octane number. A higher number indicates better anti-knock properties of a gasoline. Internationally approved methods are used to determine the Research Octane Number (RON) and the Motor Octane Number (MON). In the United States the Anti-Knock Index (AKI) is displayed at the gas pumps.

$$AKI = \frac{RON + MON}{2}$$

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

BOILING RANGE AND VAPOR PRESSURE

Gasolines must be highly volatile. The boiling range and vapor pressure values are used for evaluation. Gasolines do not have a boiling "point", but rather a boiling "line", since they are produced from a mixture of various hydrocarbon components.

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The boiling line (boiling range) and therefore vapor pressure have influence on, for example,

- vapor lock
- starting behavior
- evaporation loss
- transition and driving behavior
- engine oil dilution
- perfect combustion

The boiling range is different for summer and winter gasolines. The vapor pressure test is another means of determining the behavior of a gasoline.

SPECIFIC GRAVITY

The specific gravity is determined by gasoline components. The volume changes with the temperature. Due to the different compositions there are different values for premium grade and regular grade gasolines.

CALORIFIC VALUE

The calorific value expresses the power content of a gasoline. The calorific value of a combustible fuel/air mixture is of prime importance for the power output of engines.

PURITY, COMBUSTION DEPOSITS

Gasolines must be free of contamination. Pumps, jets, injectors, valves and lines must not be clogged or plugged up. Residue and deposits in the intake system and combustion chamber will impair engine operation. The solid residue from evaporation of gasoline provides information on the degree of contamination.

SULFUR CONTENT

The sulfur content of all gasolines should be as low as possible. In this manner there will be less sulfuric acids or sulfur acids in the combustion residue, which would lead to corrosion and sulfuric emissions on an engine running without reaching operating temperature.

1.1 MINIMUM OCTANE AND AKI RATINGS FOR GASOLINE ENGINES

Up to 2005 model year

MINIMUM OCTANE AND AKI RATINGS FOR GASOLINE ENGINES

	Leaded Gasoline	
	Premium Grade	**Regular Grade**
RON (Research Octane No.)		at least 91.0
MON (Motor Octane No.)		at least 82.7

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AKI*		at least 93.0	at least 87.0
		Unleaded Gasoline	
	Premium Grade	**Mid-Range**	**Grade Regular Grade**
RON	at least 98.0	at least 95.0	at least 91.0
MON	at least 88.0	at least 85.0	at least 82.5
AKI*	at least 93.0	at least 90.0	at least 87.0

*Anti-Knock Index $AKI = \frac{RON + MON}{2}$

Fig. 3: Identifying Formula
Courtesy of BMW OF NORTH AMERICA, INC.

1.2 SUMMARY OF FUEL GRADE REQUIREMENTS

SUMMARY OF FUEL GRADE REQUIREMENTS

				Unleaded Gasoline	
Engine	**Vehicle**	**Model**	**Model Year**	**Regular** (AKI at least 87.0)	**Premium** (AKI at least 93.0)
M10	E30	318i	'84-'85	X	
M20	E30	25e/es	'85-'88	X	
	E30	325i/iX	thru '91	X	
	E30	325iC	thru '93	X	
	E28	528e	thru '88	X	
	E34	525i	'89-'90	X	
M30	E28	535i	'85-'88	X	
	E34	535i	thru '93	X	
	E24	635CSi, L6	thru '89	X	
	E23	735i/iL, L7	thru '87	X	
	E32	735i/iL	thru '92	X	
M42	E30	318i/is/iC	'91-'92		X
	E36	318i/is/iC/ti	thru '95		X
M44	E36	318i, Z3	'96-'98		X
	E36	318is/iC	'96-'97		X
	E36	318ti	'96-'99		X
M50	E36	325i/is	'92		X
	E34	525i/iT	'91-'92		X
M50TU	E36	325i/is	'93-'95		X
	E36	325iC	'94-'95		X
	E34	525i/iT	'93-'95		X
M52	E36	323is/iC	'98-'99		X
	E36	328i	'96-'98		X
	E36	328is/iC	'96-'99		X

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	E36	Z3	'97-'98	X
	E39	528i	'97-'98	X
M52TU	E46	323i, 328i	'99-'00	X
	E46	323Ci, 328Ci	'00	X
	E36	Z3 2.3/2.8	'99-'00	X
	E39	528i/iT	'99-'00	X
N52	E60	525i, 530i	'05-present	X
	E61	525xiT, 530xiT	'05-present	X
	E90	325i, 330i	'05-present	X
M54	E36	Z3	'01-'03	X
	E46	325i/Ci/CiCiT	'01-present	X
	E46	325xi/xiT	'01-present	X
	E46	330i/Ci/CiC	'01-present	X
	E46	330xi	'01-present	X
	E39	525i/iT	'01-present	X
	E39	530i	'01-present	X
	E53	X5 3.0i	'01-present	X
	E60	525i, 530i	'03-present	X
	E83	X3	'04-present	X
	E85	Z4	'03-present	X
M60	E34	530i/iT, 540i	'94-'95	X
	E32	740i/iL	'93-'94	X
	E38	740i/iL	'95	X
	E31	840Ci	'94-'95	X
M62	E39	540i	'97-'03	X
	E39	540iT	'99-'03	X
	E38	740i/iL	'96-'01	X
	E31	840Ci	'96-'97	X
	E53	X5	'00-'03	X
N62	E53	X5	'04-'05	X
	E60	545i	'03-'05	X
	E63	645Ci	'04-'05	X
	E64	645CiC	'04-'05	X
	E65	745i	'02-'05	X
	E66	745Li	'02-'05	X
N62TU	E53	X5	'05-present	X
	E60	550i	'03-present	X
	E63	650Ci	'04-present	X
	E65	750i	'05-present	X
	E66	750Li	'05-present	X
M70	E32	750iL	'88-'94	X
	E31	850i/Ci	'91-'94	X
M73	E38	750iL	'95-'01	X

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	E31	850Ci	'95-'97	X
N73	E66	760Li	'04-present	X
S14	E30	M3	'88-'91	X
S38	E24	M6	'87-'88	X
	E28	M5	'88	X
	E34	M5	'91-'93	X
S50	E36	M3	'95	X
S52	E36	M3	'96-'99	X
	E36	MZ3	'98-'00	X
S54	E36	MZ3	'01-'02	X
	E46	M3	'01-'02	X
S62	E39	M5	'00-'03	X
	E52	Z8	'00-present	X
S70	E31	850CSi	'94-'95	X

2.0 FUEL SYSTEM CLEANER PLUS

Recent field experiences have shown a significant increase in various driveability complaints due to excessive carbon deposits in engine's combustion chambers, on the intake valves and fuel injectors.

The overall rise in carbon deposits accumulation is generally attributed to poor gasoline quality, namely, low level of cleaning additives and fuel contamination.

TECHNICAL BACKGROUND

Combustion chamber deposit formation is a by-product of the gasoline burning process. Fuel injector and intake valve deposits may become less troublesome with the recently introduced Top Tier Detergent Gasoline deposit control standards, which are exceeding the detergent requirements imposed by the EPA since 1995.

However, vehicles that do not exclusively use a Top Tier Detergent Gasoline, or are regularly driven in severe service conditions, such as stop-and-go traffic, high ambient temperatures, and high altitude can experience performance problems caused by intake system and combustion chamber deposits.

The most common customer complaints may include:

FUEL INJECTORS

Deposits at the injector's tip can impact fuel flow, upsetting the air/fuel mixture ratio.

Symptoms: Hesitation or stumble during acceleration, even loss of power. Poor fuel efficiency. Increased emissions of HC and CO. "Service Engine Soon" light illumination due to intermittent misfire faults, or lean mixture adaptation values

INTAKE VALVES:

Deposits at the valves and on the intake manifold ports can absorb fuel during the warm-up phase, leaning out

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the air/fuel mixture ratio. Carbon build-up may disturb mixture flow at low throttle conditions/idle speeds.

Symptoms: Poor driveability, loss of power, unstable/rough idle, increased emissions of HC, CO and NOx. "Service Engine Soon" light illumination due to intermittent misfire faults.

COMBUSTION CHAMBER:

Combustion Chamber Deposit Interference, or CCDI, occurs when there is a contact between carbon deposits on the piston crown and cylinder head. The noise can be confused or misdiagnosed as ping, knock or other noises that could indicate a mechanical failure. CCDI occurs first as a cold start noise that can fade as the engine warms to operating temperature. The noise will reoccur at the next cold start. As deposits build, there is an increase in compression temperature that may cause pre-ignition detonations.

Symptoms: Knocking, pinging, run-on, poor acceleration, octane requirement increase, increased emissions of NOx, engine idle speed surges.

Depending on the manufacturer, fuels may contain various additives such as: oxidation and corrosion inhibitors, metal deactivators, emulsifiers, anti-icing agents & dyes, plus they are required to include some form of an intake system deposit control package. Unfortunately, not all fuels are created equal, and some additive packages are not effective enough to maintain integrity of the intake systems in high performance engines, or engines operating in severe environmental conditions. Even worse, the intake system deposit control additives in some fuels may actually contribute to the combustion chamber deposits accumulation, and to the problems associated with those deposits: knock, run-on and increased emissions of oxides of nitrogen.

RECOMMENDATION

BMW recommends using TOP TIER Detergent Gasoline of minimum octane rating of AKI 91 and with alcohol content of less then 10% by volume (or any other oxygenates with up to 2.8% of oxygen by weight). Only the exclusive usage of TOP TIER Detergent Gasoline provides the full benefit of reducing deposits formation.

If the TOP TIER Detergent Gasoline is unavailable, we recommend BMW Group Fuel System Cleaner Plus (PN 82 14 0 413 341) be added to the gas tank. For optimum cleaning and deposits control, add a 20 fl. oz. bottle every 3,000 miles when refueling.

Regular use of BMW Group Fuel System Cleaner Plus can help address carbon deposits related symptoms listed above. By removing these deposits, an engine may experience restored power, performance and fuel efficiency, a smoother idle running, lower emissions, and reduced octane requirement.

BMW Group Fuel System Cleaner Plus uses polyether amine TECHRON® based technology developed and patented by Chevron. BMW Group Fuel System Cleaner Plus has proven to clean up deposits in fuel injectors, ports & intake valves and reduces the harmful effects of combustion chamber deposits. It helps restore performance lost due to deposit buildup.

Chevron and BMW have run an extensive "no harm" tests with polyether amine technology. When used as directed, it will not harm catalytic converters, oxygen sensors, or any other mechanical components of the engine, or fuel delivery system.

The effectiveness of the additive depends on its presence in the gasoline in large concentrations for short

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periods of time. One treatment is usually sufficient, but a second treatment (one 20 oz bottle per each, consecutive full tank of gas) may give additional benefits. To keep your fuel intake system clean, we recommend usage at every 3000 miles.

Additionally, vehicle's fuel sending units equipped with silver plated resistor card/contacts are especially vulnerable to attacks by elemental sulfur and/or hydrogen sulfide found in fuels. Adding BMW Group Fuel System Cleaner Plus immediately upon noticing erratic fuel gauge behavior may, in many cases, restore proper performance due to the additive's ability to remove the harmful sulfur compounds from the sending unit's contact surface. Additionally, BMW Group Fuel System Cleaner Plus can help protect the fuel gauge from future malfunctioning by coating all metal surfaces of the fuel system.

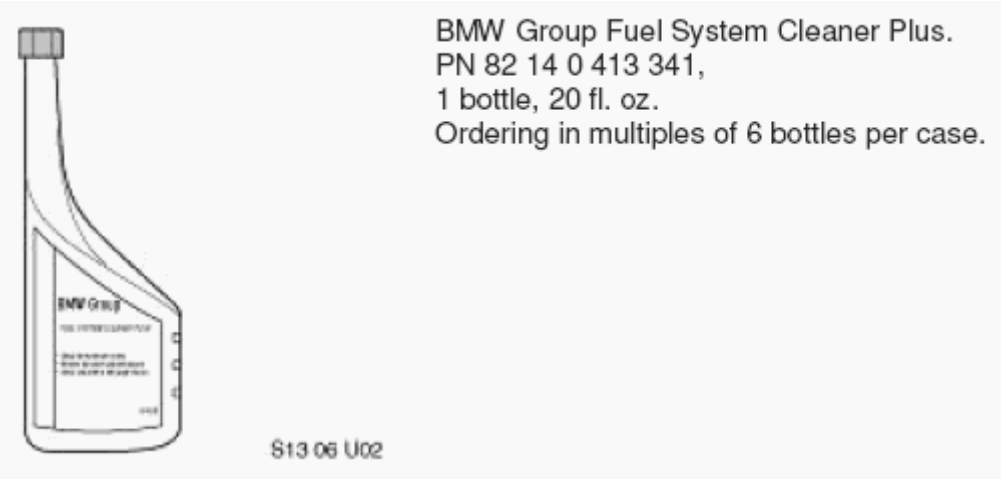


Fig. 4: Identifying BMW Group Fuel System Cleaner Plus
Courtesy of BMW OF NORTH AMERICA, INC.

WARRANTY INFORMATION

Because carbon deposit build-up is related to fuel quality, it cannot be considered as a defect in vehicle's materials or workmanship. Consequently, usage of BMW Group Fuel System Cleaner Plus is not covered under the terms of the BMW New Vehicle Limited Warranty or maintenance plan.

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ENGINE

Fuel System - Repair Instructions - X3

00 FUEL PICK-UP, CLEANING SYSTEM

16 00 GENERAL FUNCTION DESCRIPTION FOR FUEL SUPPLY SYSTEMS

Fuel supply systems, spark-ignition engines

Fuel system

The electric fuel pump in the fuel tank generates the pressure in the fuel system which is set by the pressure regulator to a specific level.

Tank venting system

The tank venting system is an enclosed system which is vented via a carbon canister. The carbon is incorporated in the carbon canister as granulate. The large surface of the carbon stores the fuel vapors which occur in the fuel tank. The carbon canister must be regenerated on a regular basis so as to be able to continue storing fuel vapors. Regeneration is performed by way of purging with fresh air via the intake manifold. This process is controlled by the engine control unit.

Fuel supply systems, diesel engines

Fuel system

The electric fuel pump in the fuel tank supplies the engine with fuel. Two types of high-pressure pump are used for cylinder injection.

1. The distributor injection pump supplies each cylinder directly with fuel via the corresponding injection nozzle.
2. The high-pressure pump for the common rail systems generates in the fuel rail the necessary pressure for all the injection nozzles.

In common rail systems, a further pump (inline pump, M57/gear pump, M67) is connected between the high-pressure pump and the electric fuel pump. This pump supports the fuel pump in the fuel tank in the event of a high fuel demand.

Tank venting system

Diesel fuel is non-volatile and therefore a carbon canister is not required. The fuel tank is vented directly to atmosphere.

16 00 ... FUEL SUPPLY SYSTEM (PETROL/GASOLINE)

1. **General**

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General function description of fuel system, see **16 00 General function description for fuel supply systems**.

2. **Component designation Schematic drawings of fuel supply systems**

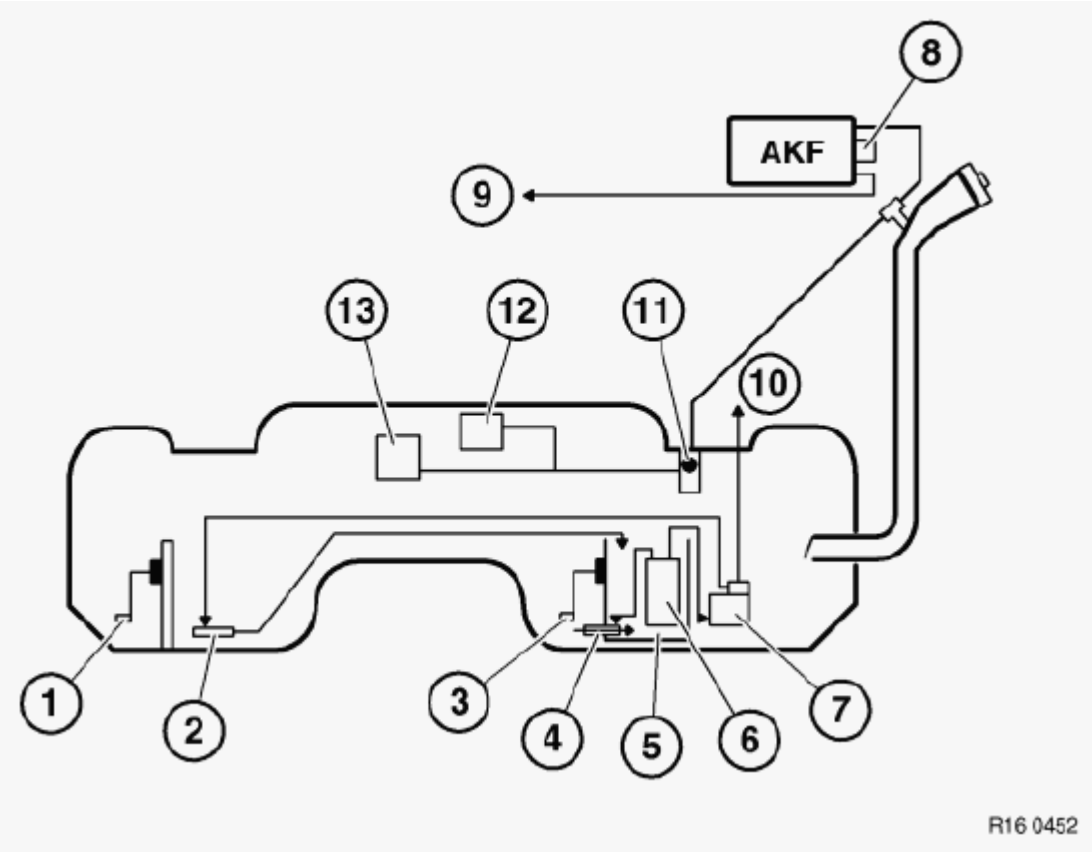
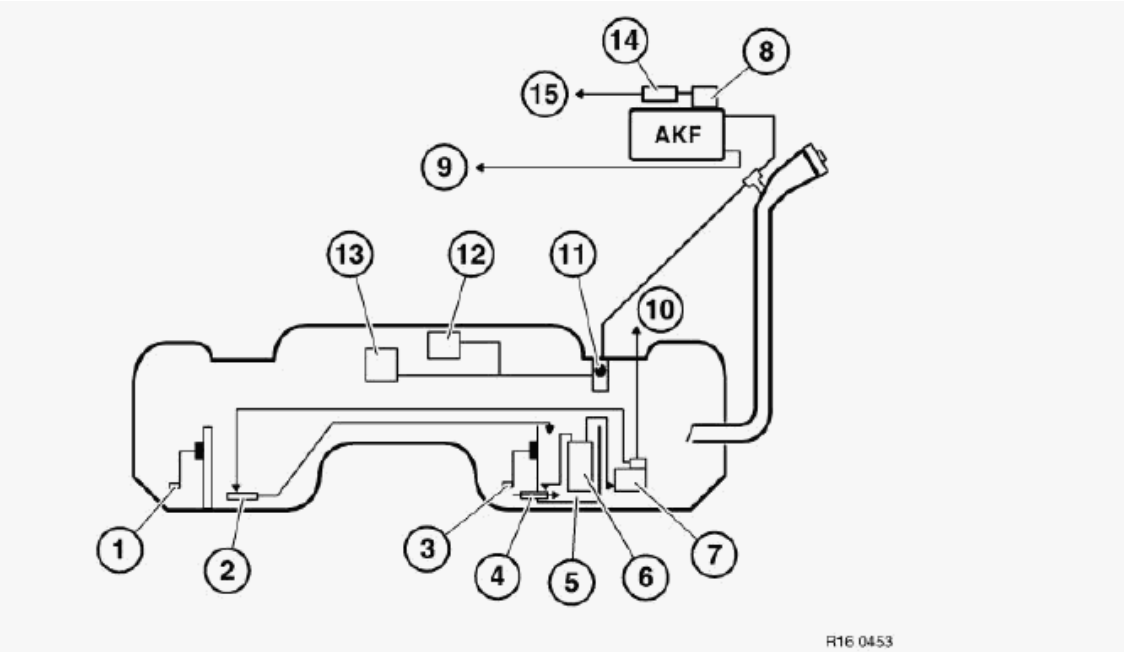


Fig. 1: Fuel Supply System Components (ECE/Japan)
Courtesy of BMW OF NORTH AMERICA, INC.

Fuel supply system (ECE/Japan)

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Fuel supply system (US version)

1. Fuel level sensor, left	9. Purge air line to tank venting valve
2. Suction jet pump, left	10. Fuel line to engine
3. Fuel level sensor, right	11. Rollover valve
4. Suction jet pump, right	12. Service vent valve
5. Surge chamber	13. Filler vent valve
6. Electric fuel pump	14. Dust filter
7. Fuel filter with pressure regulator	15. To atmosphere
8. Tank leak diagnosis module (see drawing 5.2) 8. Evaporator strainer (see drawing 5.1)	

Fig. 2: Identifying Fuel Supply System Components (US Version)
Courtesy of BMW OF NORTH AMERICA, INC.

3. **Function description (see also drawing)**

Fuel system

The saddle-shaped fuel tank contains the surge chamber with integrated electric fuel pump on its right side.

The surge chamber ensures that the fuel pump is properly supplied in all vehicle operating states.

The fuel is pumped from the right side of the fuel tank into the surge chamber via the suction jet pump integrated in the surge chamber.

The suction jet pump in the left fuel tank half pumps the fuel through the tank expansion line to the right side of the fuel tank.

The suction jet pump is operated via the fuel feed line.

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Return line, pressure regulator and fuel filter are located in the tank.

Fuel supply to engine:

The fuel is routed from the electric fuel pump via the fuel feed line and the fuel filter/pressure regulator unit to the fuel rail.

Pressure regulator and fuel filter are incorporated in a single unit in the tank. There is thus no need for a fuel return line.

The fuel passes through the pressure regulator into the left side of the fuel tank and thereby drives a suction jet pump. This pump repumps the fuel from the left side of the tank to the right side.

The fuel rail is return-free.

Tank venting system (US version):

The fuel tank is vented during refuelling via the refuelling vent line.

Because of its large cross-section, the refuelling vent line directs the displaced volume (fuel vapors) at high speed through the expansion volume to the carbon canister.

The activated carbon retains the fuel contained in the fuel vapors. The cleaned air is discharged to atmosphere via the evaporation line, the tank leak diagnosis module and the dust filter.

During driving, the system tank is vented in the same way via the vent line.

The condensed constituents of the fuel vapors remain in the tank because the tank has an integrated compensating volume.

The refuelling shutoff valve in the fuel tank is closed by the rising fuel if the fuel tank is overfilled. The ventilation function is maintained by a second float valve.

Al three valves are designed as rollover valves. This prevents fuel from escaping from the fuel tank in extreme vehicle positions (overturning, inclined position).

The carbon canister is regenerated by purging with fresh air.

The DME control unit opens the tank vent valve. Thus the vacuum pressure of the engine intake manifold is applied at the purge air line. The carbon canister is purged in this way. The fresh air needed for this purpose is supplied via the tank leak diagnosis module and the dust filter. The fuel constituents bound by the activated carbon are flushed out by the supplied air and directed via the purge line to the engine for combustion.

This operation is only possible while the engine is running.

Tank venting system (worldwide):

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Refer to Tank venting system (US version) with following differences:

1. Carbon canister has a smaller capacity.
2. No tank leak diagnosis module or dust filter.

Leak diagnosis for tank venting system (US version):

The tank leak diagnosis module (see drawing 5.2) serves to diagnose leakages for the tank venting system within the on - board diagnosis laid down by legislation.

The tank venting system is pressurized and the pressure loss is detected in the event of a leak.

The tank leak diagnosis module is activated by the DME control unit and detects the pressure loss by way of the power consumption of the integrated pump. The air required for this purpose is supplied via the dust filter.

The pressure test line establishes the connection between fuel tank and fuel filler neck. This enables a leak to be detected in the fuel filler pipe - fuel tank cap area.

Determining fill level in fuel tank:

The fuel level is measured by means of lever-type sensors on both sides of the fuel tank. The combination of the determined ohm values from the right and left lever-type sensors produces the actual level in the fuel tank.

4. Service data, fuel system

Fuel pump operating pressure.

16 00 005 DRAINING AND FILLING FUEL TANK

Special tools required:

- 16 1 020
- 16 1 080

IMPORTANT: Observe country-specific safety regulations.
Ensure adequate ventilation in the place of work!
Connect the exhaust and extraction systems to the exhaust tailpipe.
The electric fuel pump must not operate without fuel! After completing repairs but before starting the engine for the first time, fill the fuel tank with min. 5 l fuel through the fuel filler pipe.
Do not damage non-return flap when pulling out extraction hose.

Diesel vehicles:

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Before starting the engine for the first time, if the tank has been run dry or drawn off, fill with diesel fuel and turn on ignition for approx. 1 minute. The fuel circuit is thus filled and vented, which results in the engine firing more quickly.

Drawing off fuel:

Start engine and allow to run.

The electric fuel pump runs.

In this way, the fuel is repumped through the suction jet pump from the left to the right side of the fuel tank.

NOTE: Fuel can be drawn out of left and right sides of tank through filler neck, leaving only a small residue. The residual quantity is drawn off through the service opening (on right/left).

Insert special tool 16 1 080 into filler neck.

Special tool 16 1 080 has two different diameters for petrol/gasoline and diesel vehicles!

Slide extraction hose of extractor unit through special tool 16 1 080 into the fuel filler pipe, turning in the process if necessary.

Insertion length of extraction hose: 120-130 cm.

Draw off fuel as much as possible with extractor unit.

Follow drawing off of fuel on fuel gauge in instrument cluster.

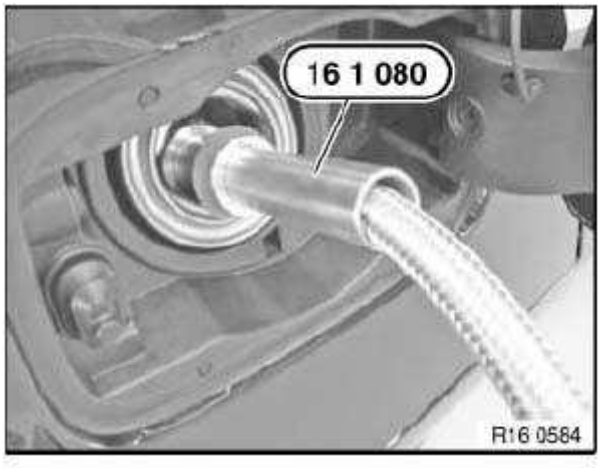


Fig. 3: Special Tool 16 1 080
Courtesy of BMW OF NORTH AMERICA, INC.

Drawing off residual fuel quantity:

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IMPORTANT: Ensure car interior is adequately ventilated.
Catch dripping fuel in a suitable container.
Release sealing ring with special tool 16 1 020 and remove cap for service opening (left/right).
Tightening torque: 16 14 2AZ, see 16 14 FUEL PUMP .

Draw off residual fuel quantity through service openings.

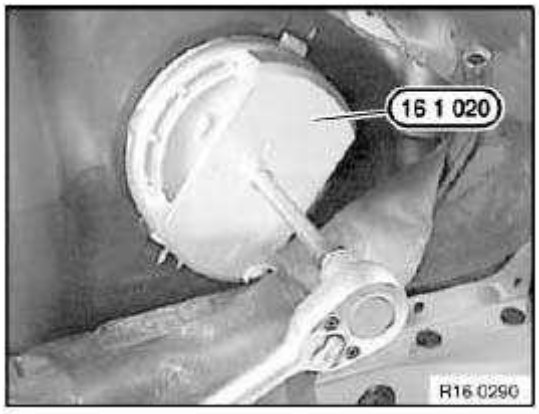


Fig. 4: Special Tool 16 1 020
Courtesy of BMW OF NORTH AMERICA, INC.

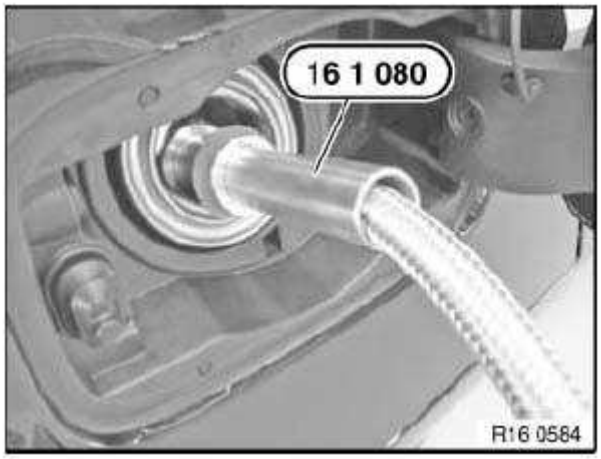
Fuel filling:

Insert special tool 16 1 080 into filler neck.

Special tool 16 1 080 has two different diameters for petrol/gasoline and diesel vehicles!

Slide extraction hose of extractor unit approx. 40 cm into fuel filler pipe.

Fill fuel from suction extractor unit.



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Fig. 5: Special Tool 16 1 080
Courtesy of BMW OF NORTH AMERICA, INC.

Drawing off after fault in suction jet pump:

Draw off right half of tank completely through fuel filler pipe.

Remove cap from left service opening.

Insert extraction hose through service opening in tank, fuel (also residual quantity) can be drawn off.

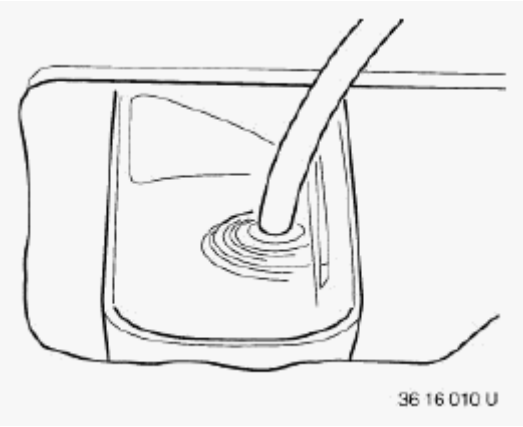


Fig. 6: Extraction Hose
Courtesy of BMW OF NORTH AMERICA, INC.

16 00 510 CONDUCTING LEAK TEST ON FUEL TANK AND TANK VENTING SYSTEM

NOTE: The following procedure is only applicable to vehicles with the tank leak diagnosis module (DMTL).
For vehicles without tank leak diagnosis module:
Pressurize fuel tank and tank venting system.
During the leak test with a leak detector, be sure to follow the operating instructions of the equipment manufacturer.

NOTE: Select "Tank leak diagnosis module (DMTL)" on Diagnosis and Information System (DIS).

- The leak diagnosis pump pressurizes the fuel tank and tank ventilation system for 30 sec.
- If pressure is needed for longer than 30 sec., press "Activate" button again after 30 sec.

IMPORTANT: On vehicles with tank leak diagnosis modules (DMTL), do not work with external pressurization as the tank ventilation system will leak under this condition.
On account of emerging fuel vapors, carry out all work in well ventilated rooms. Or use a suitable extractor system.

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Observe country-specific accident prevention and occupational safety regulations.

The leak test can be carried out with a leak detector. Possible causes may be:

- Tank cap leaking check tank cap pressure relief valve, see **16 11 130 Checking filler cap pressure relief valve**.
- Tank venting lines leaking (fuel tank - carbon canister - tank venting valve).
- Tank vent line leaking (engine compartment).
- Fuel level sensor flange on tank leaking.



Fig. 7: Leak Detector
Courtesy of BMW OF NORTH AMERICA, INC.

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11 FUEL TANK WITH MOUNTING

16 11 030 REMOVING AND INSTALLING/REPLACING FUEL TANK

Special tools required:

See .

- 13 5 281
- 13 5 282

IMPORTANT: After installation of fuel tank/prior to first engine start-up:

- **Check ground connection at fuel filler neck to body for continuity. If necessary, clean contact surface between body and fuel filler pipe screw connection.**
- **Fill fuel tank with min. 5 l fuel.**

Necessary preliminary tasks:

- Draw off fuel from fuel tank, see **16 00 005 Draining and filling fuel tank**
- Remove rear seat bench, see **52 26 005 REMOVING AND INSTALLING/REPLACING REAR SEAT (THROUGH-LOADING SYSTEM)** .
- Remove underbody panelling, see **51 47 ... REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT UNDERBODY PANELLING** .
- Remove handbrake Bowden cables, see **34 41 120 REMOVING AND INSTALLING/REPLACING BOTH HANDBRAKE BOWDEN CABLES** .
- Remove complete propeller shaft, see **26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (CARDAN UNIVERSAL JOINT) COMPLETELY** .

Release screws (1) and remove cover (2) from right side of fuel tank.

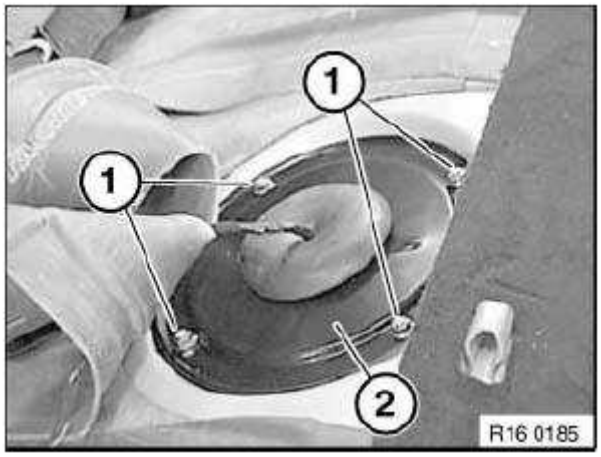
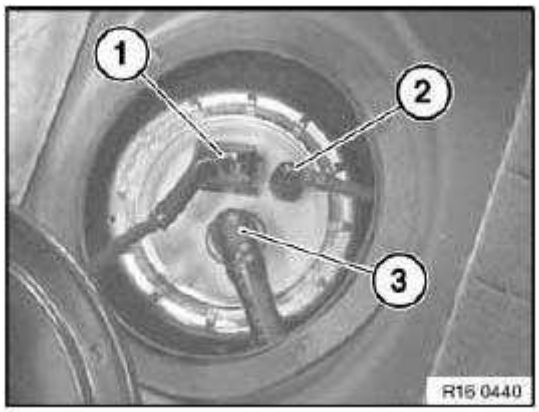


Fig. 8: Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Right side:

Disconnect plug (1) and service vent line (3) from delivery unit.



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Fig. 9: Plug And Service Vent Line
Courtesy of BMW OF NORTH AMERICA, INC.

Left side (diesel only):

Unlock quick-release fastener (1) and detach vent line.

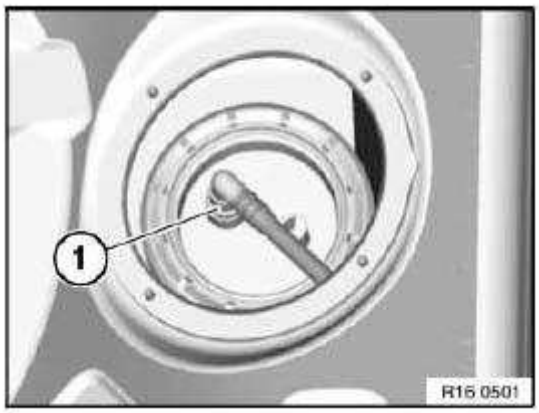


Fig. 10: Quick-Release Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Release hose clamp (1) and detach fuel filler hose (2).

Installation:

Tightening torque: 16 12 10AZ, see **16 12 FUEL DELIVERY** .

Unclip line (3) from holders.

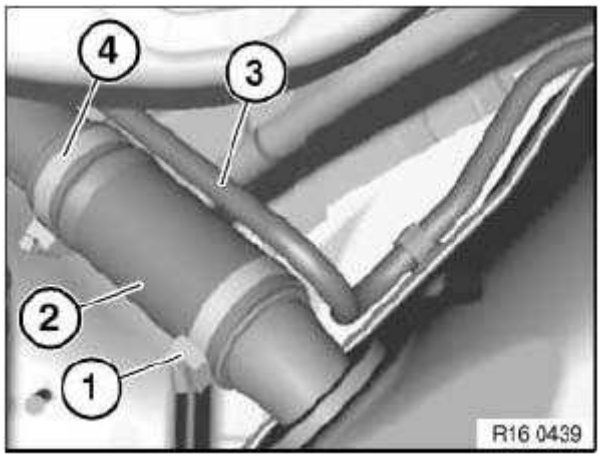


Fig. 11: Hose Clamp And Fuel Filler Hose
Courtesy of BMW OF NORTH AMERICA, INC.

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Unlock and disconnect fuel feed line (1).

Unlock and disconnect fuel return line (2).

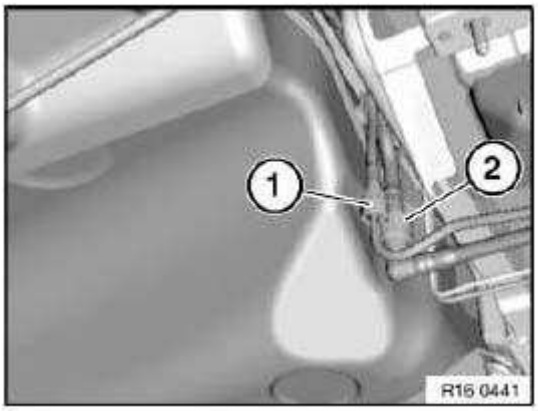


Fig. 12: Fuel Feed Line And Fuel Return Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw and unclip lines (1) from holder.

IMPORTANT: Risk of damage: Do not kink lines.

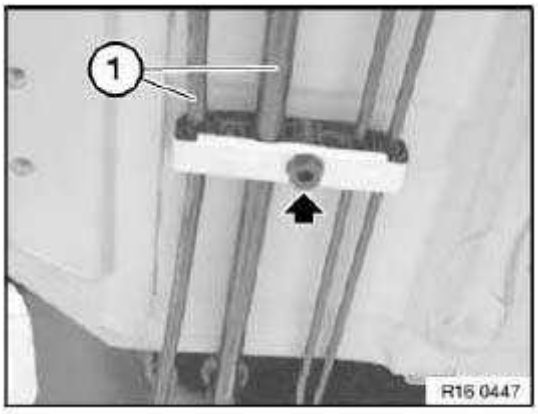


Fig. 13: Fuel Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Seal fuel feed line with special tools 13 5 281 and 13 5 282 .

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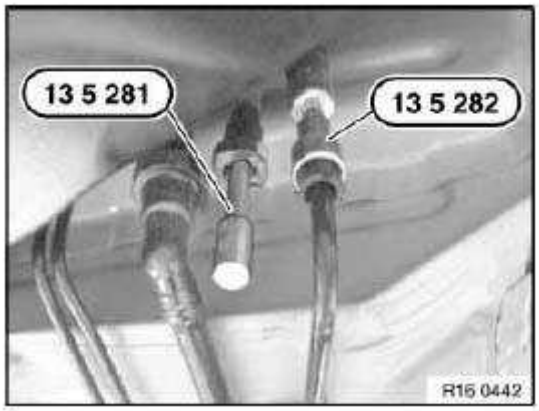


Fig. 14: Special Tools 13 5 281 And 13 5 282
Courtesy of BMW OF NORTH AMERICA, INC.

Heavily support the fuel tank.

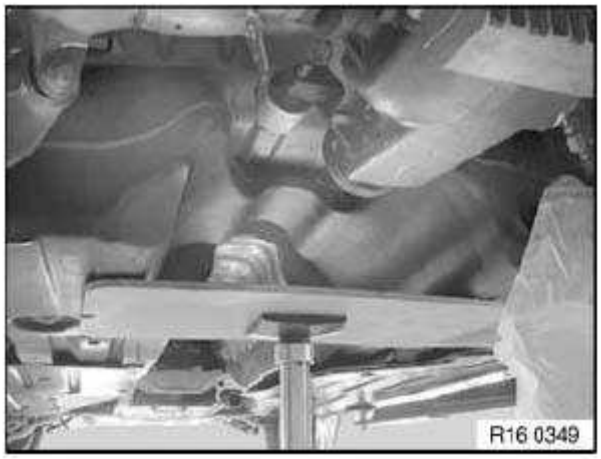


Fig. 15: Supporting Fuel Tank
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw.

Installation:

Tightening torque: 16 11 1AZ, see **16 11 FUEL TANK AND MOUNTING PARTS** .

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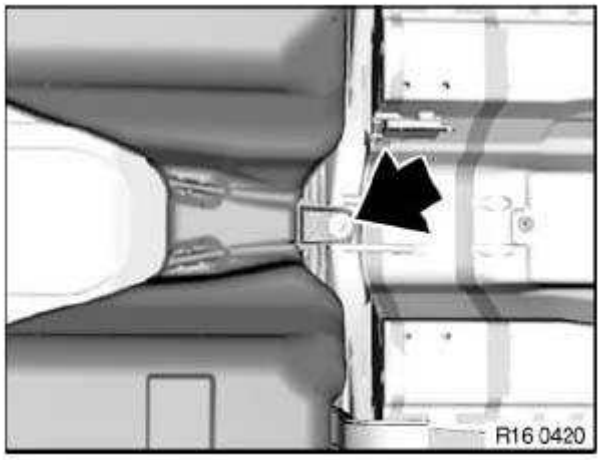


Fig. 16: Locating Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws for tightening straps on left and right and remove tightening straps.

Installation:

Tightening torque: 16 11 1AZ, see **16 11 FUEL TANK AND MOUNTING PARTS** .

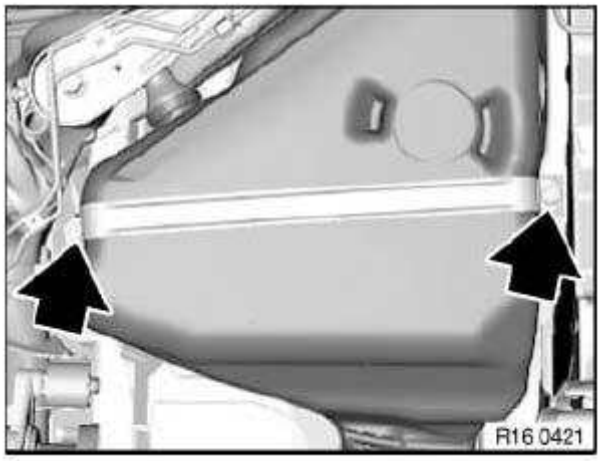


Fig. 17: Locating Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Note rubber mount with spacer bush.

Wide collar on spacer bush points to screw head.

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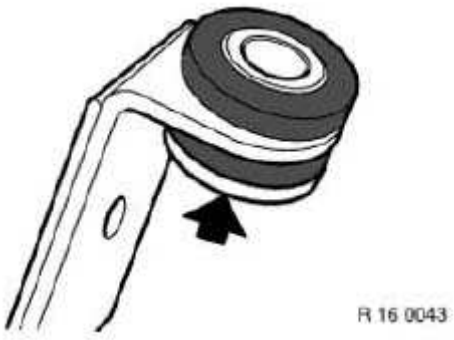


Fig. 18: Locating Rubber Mount Spacer Bush
Courtesy of BMW OF NORTH AMERICA, INC.

Lower tank until line (1) is accessible.

Unclip line (1) from holders.

Remove fuel tank downwards.

IMPORTANT: Risk of damage: Feed out fuel line (2). Do not kink fuel line.

NOTE: Illustration shows: tank removed.

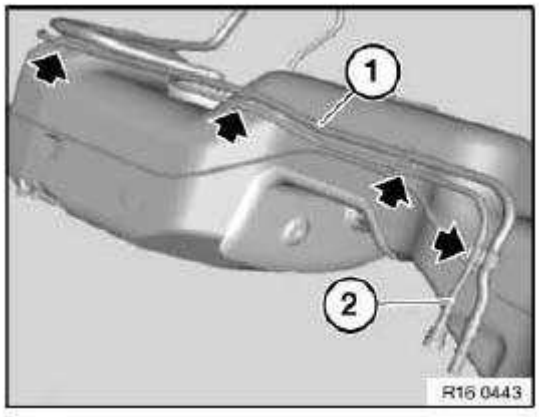


Fig. 19: Fuel Lines
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The following components must be modified when the fuel tank is replaced:

- Left sensor unit
- Right sensor unit
- Fuel lines on tank

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16 11 060 REMOVING AND INSTALLING OR REPLACING FUEL FILLER PIPE

Necessary preliminary tasks:

- Remove rear right wheel arch trim, see **51 71 041 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT WHEEL ARCH COVER** .
- Draw off fuel from fuel tank, see **16 00 005 Draining and filling fuel tank**.

Unhook retaining strap (1) from tank flap.

Open cap and set to one side.

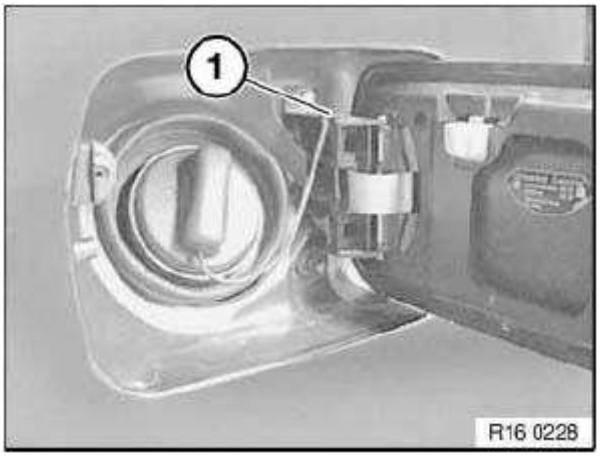


Fig. 20: Retaining Strap
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten hose clip (4).

Installation:

Replace hose clip.

Tightening torque: 16 12 10AZ, see **16 12 FUEL DELIVERY** .

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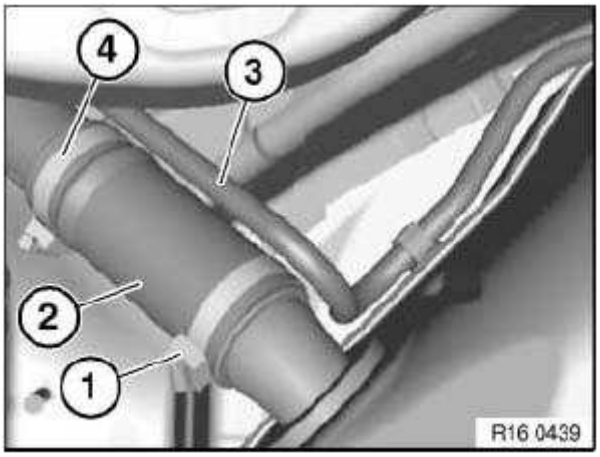


Fig. 21: Hose Clamp And Fuel Filler Hose
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: With petrol/gasoline engine only!

Detach vent line (1) and (2) from fuel filler pipe.

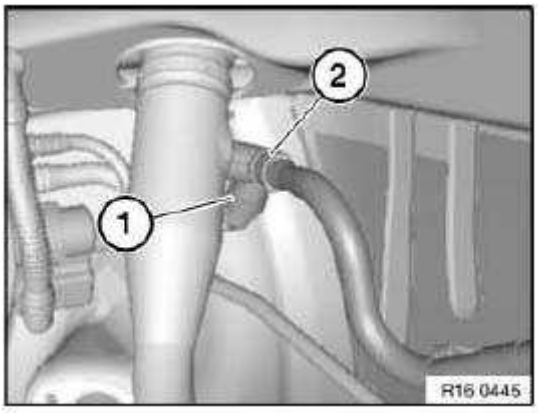


Fig. 22: Vent Lines
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: With diesel engine only!

Unclip vent line (1) from holder on fuel filler pipe (2).

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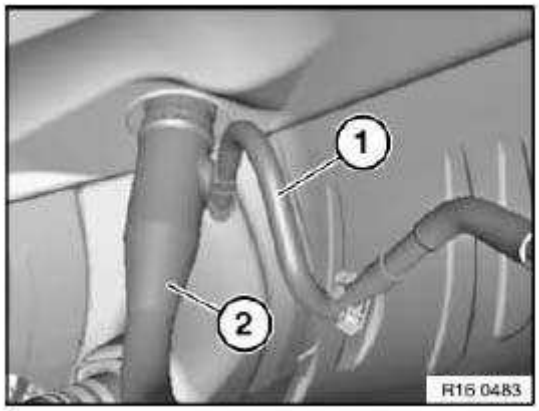


Fig. 23: Vent Line And Fuel Filler Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts.

Tightening torque: 16 12 11AZ, see **16 12 FUEL DELIVERY** .

Unclip vent line (2) from holder on fuel filler pipe (1).

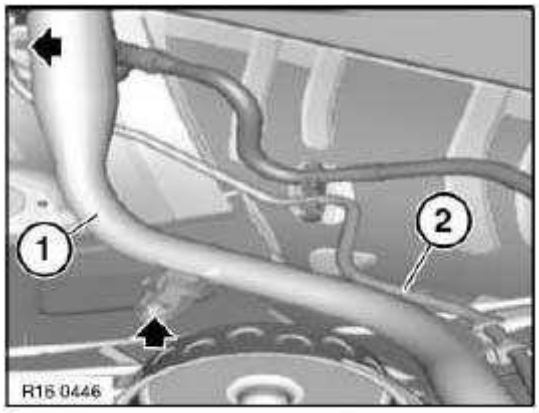


Fig. 24: Vent Line And Fuel Filler Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nut (1).

Tightening torque: 16 12 16AZ, see **16 12 FUEL DELIVERY** .

Withdraw fuel filler pipe (2) completely out of rubber gaiter at wheel arch.

Installation:

Make sure rubber gaiter is correctly seated.

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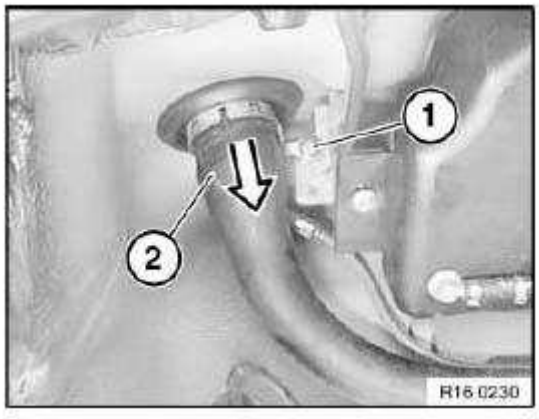


Fig. 25: Removing Fuel Filler Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean **contact surface** on body and grounding lead on fuel filler pipe.

Ground connection must be guaranteed.

16 11 130 CHECKING FILLER CAP PRESSURE RELIEF VALVE

Special tools required:

See , **16 FUEL SUPPLY SYSTEM** .

- 13 3 010
- 16 1 171
- 16 1 172

Set pressure regulator on special tool 16 1 171 fully in " -" direction.

Connect special tool 16 1 171 via compressed air line (1) to workshop/garage compressed air system (8 ... 10 bar).

Connect pressure sensor (2) from Diagnosis and Information System.

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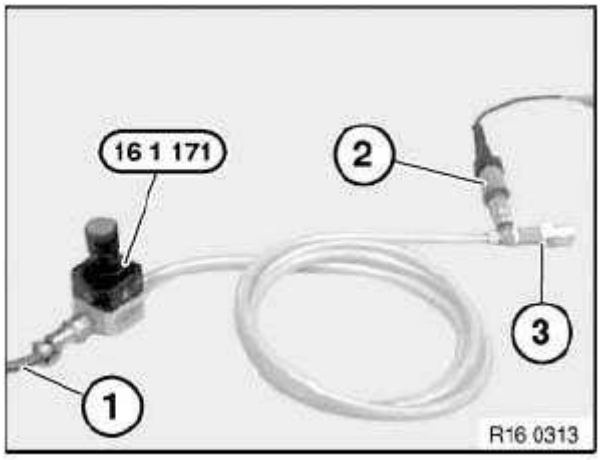


Fig. 26: Special Tool 16 1 171 And Pressure Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Connect special tool 16 1 172 to fast-release coupling of special tool 16 1 171 .

Install fuel tank cap on special tool 16 1 172 (3).



Fig. 27: Special Tool 16 1 172
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Only the absolute pressure is indicated in the display of the Diagnosis and Information System (DIS). The current ambient air pressure is already displayed without additional pressurization.

Check testing equipment for leaks!

Select "Measurement/ Pressure" function on Diagnosis and Information System (DIS).

Increase pressure by 0.2 bar with pressure regulator on special tool 16 1 171 .

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Using special tool 13 3 010 , disconnect supply line from special tool 16 1 171 .

Read off and note down pressure.

Wait 60 secs.

Read off pressure again and compare with starting pressure value.

Measurement evaluation:

FILLER CAP PRESSURE RELIEF VALVE MEASUREMENT EVALUATION

Pressure drop > 0.012 bar	Testing equipment leaking. Check connection points for leaks.

Check filler cap pressure relief!

Select "Measurement/ Pressure" function on Diagnosis and Information System (DIS).

Increase pressure by 0.3 bar with pressure regulator on special tool 16 1 171 .

Using special tool 13 3 010 , disconnect supply line from special tool 16 1 171 .

Read off and note down pressure.

Wait 60 secs.

Read off pressure value again and compare with starting pressure value.

Measurement evaluation:

FILLER CAP PRESSURE RELIEF VALVE MEASUREMENT EVALUATION

Pressure drop > 0.012 bar	Filler cap pressure relief valve faulty. Replace fuel tank cap.

16 11 350 REPLACING CLAMPING BANDS FOR FUEL TANK

Necessary preliminary tasks:

- Remove **UNDERBODY PANELLING**

IMPORTANT: Secure fuel tank against slipping and falling out.

Heavily support the fuel tank.

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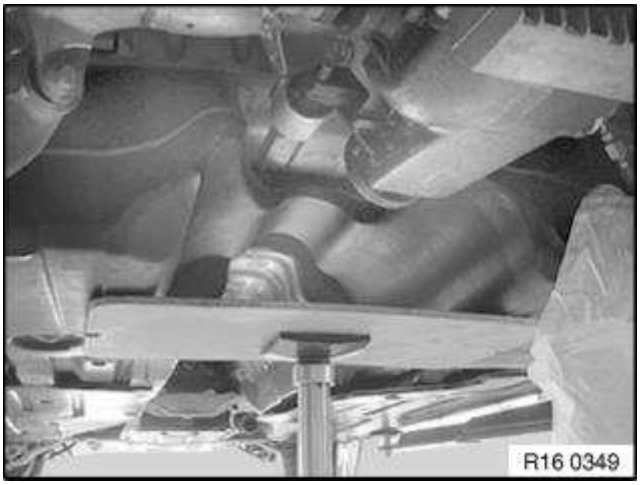


Fig. 28: Heavily Support The Fuel Tank
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove clamping band. Installation: tightening torque, 16 11 1AZ, see **16 11 FUEL TANK AND MOUNTING PARTS** .

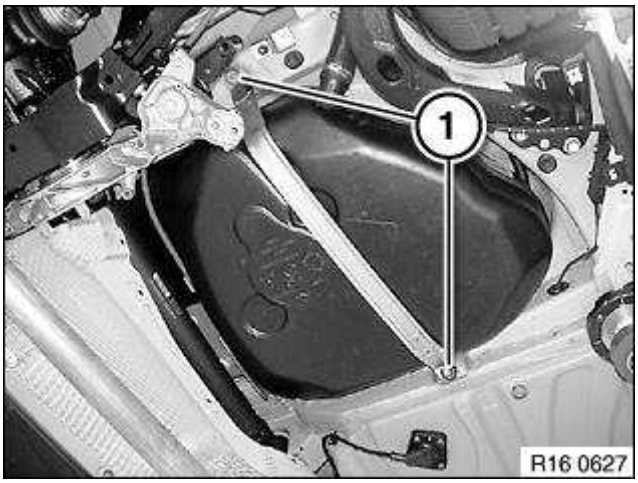


Fig. 29: Release Screws (1) And Remove Clamping Band
Courtesy of BMW OF NORTH AMERICA, INC.

16 11 071 REPLACING RUBBER SLEEVE BETWEEN FUEL FILLER PIPE AND FUEL TANK

Recycling

- Fuel escapes when fuel lines are detached. Have a suitable collecting container ready.
- Catch and dispose of escaping fuel.
- Observe country-specific waste-disposal regulations.

Important

- Ensure adequate ventilation in the place of work!

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- Avoid skin contact (wear gloves)!
- Before starting the engine for the first time: Fill fuel tank with at least 5 litres of fuel.

Necessary preliminary tasks:

- Draw off **fuel from fuel tank**
- Remove right underbody panelling. See **51 47 ... REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT UNDERBODY PANELLING** .

Loosen hose clamps (1). Detach rubber sleeve (2) first from fuel filler pipe and then from fuel tank. Installation: Tightening torque 16 12 10AZ, see **16 12 FUEL DELIVERY** .

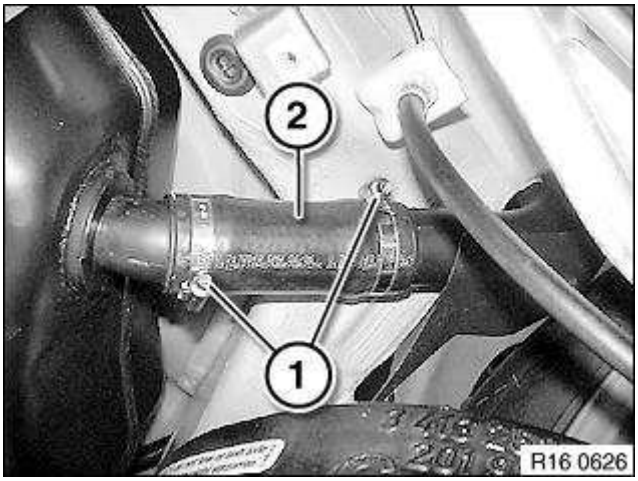


Fig. 30: Detaching Rubber Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

12 FUEL DELIVERY, SENSOR FOR DISPLAY

16 12 ... CHECKING REPUMPING FUNCTION OF SUCTION - JET PUMP WITH BMW DIAGNOSIS SYSTEM

IMPORTANT: Ensure adequate ventilation in the place of work!
Ensure absolute cleanliness when working on the open fuel tank.
Contaminants in the fuel tank can impair driving operation or may even result in vehicle breakdown!
Catch escaping fuel in a suitable container.

Necessary preliminary tasks:

- Fill level must be less than or equal to 28 l
  - Draw off fuel from fuel tank, see **16 00 005 Draining and filling fuel tank**.
- Pour two to three litres of fuel into the left tank chamber via the flange opening
- Connect diagnosis system

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- Path:
  - Brief test KOMBI Instrument cluster
  - Diagnosis control unit functions
  - Diagnosis requests
  - Tank sensor 1, tank sensor 2

NOTE: **Tank sensor 1 = right tank sensor**
Tank sensor 2 = left tank sensor

Start engine.

Compare display for left and right tank chambers.

Repumping function OK

If fill level of tank sensor 2 (left chamber) is falling (approx. one litre per minute).

Repumping function not OK

If fill level of tank sensor 2 (left chamber) is stable or rising.

16 12 000 REMOVING AND INSTALLING/REPLACING FUEL GAUGE SENSOR (PETROL/GASOLINE, RIGHT, N52)

Special tools required:

See **16 FUEL SUPPLY SYSTEM** , **61 GENERAL ELECTRICAL SYSTEM** .

- 16 1 020
- 61 0 300
- 61 0 307

IMPORTANT: **Ensure adequate ventilation in the place of work!**
Ensure absolute cleanliness when working on the open fuel tank.
Contaminants in the fuel tank can impair driving operation or may even result in vehicle breakdown!

NOTE:
- **Removed lever-type sensor with cable length of 400 mm must no longer be fitted.**
- **Only lever-type sensor with cable length of 335 mm may be refitted.**

Necessary preliminary tasks:

- Draw off fuel from fuel tank, see **16 00 005 Draining and filling fuel tank**.

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- Remove rear seat bench, see **52 26 005 REMOVING AND INSTALLING/REPLACING REAR SEAT (THROUGH-LOADING SYSTEM)** .

Release screws (1) and remove cover (2) from right side of fuel tank.

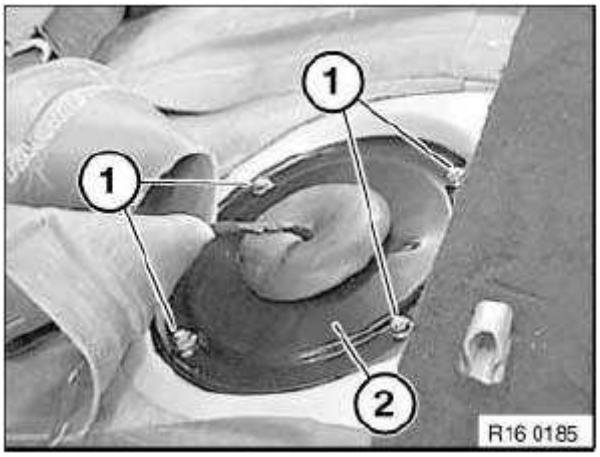


Fig. 31: Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten plug connection (1) and disconnect.

Unlock and disconnect fuel feed line (2).

IMPORTANT:

- **Press the blue button to unlock the quick-release fastener. Then carefully detach fuel feed line vertically upwards.**
- **Do not use any mechanical tools or means to detach the quick-release fastener.**
- **Quick-release fastener must be attached vertically without mechanical tools/means. It must snap audibly into place.**
- **Then carry out a leak test with engine running.**
- **Damaged or leaking quick-release fasteners must be replaced.**

Unlock and detach vent line (3).

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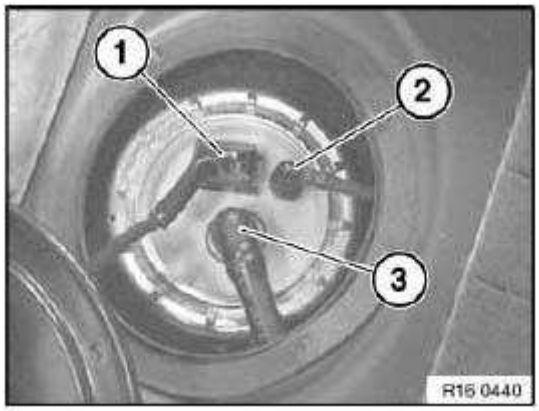


Fig. 32: Plug And Service Vent Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw cap with special tool 16 1 020 and remove.

Installation:

Tightening torque: 16 14 2AZ, see **16 14 FUEL PUMP** .

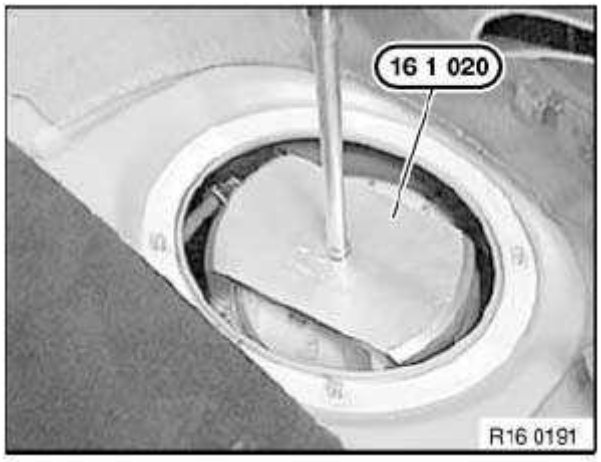


Fig. 33: Special Tool 16 1 020
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Service cap can only be installed in one position.

When installing, make sure lug (1) of service cap engages in corresponding opening (2) on fuel tank.

During torque tightening, notch (3) on screw cap can be clearly heard and felt to engage toothed segment (4) on fuel tank.

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Replace rubber gasket.

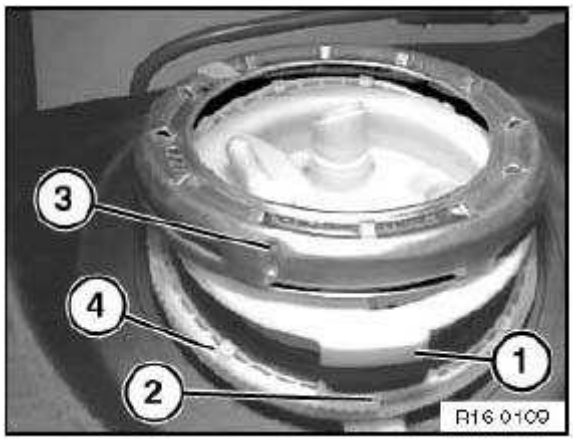


Fig. 34: Service Cap Lug And Notch
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Make sure that tab (1) of adapter ring lies completely in recess (2).

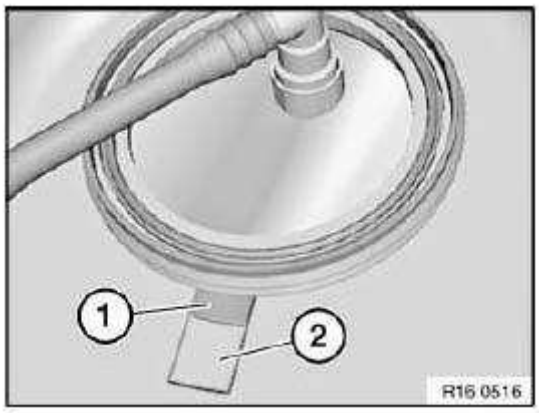


Fig. 35: Tab Of Adapter Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully raise service cap (4).

Unlock and detach fuel line (2).

Unlock and detach vent line (3).

Disconnect connector (1).

IMPORTANT: Carefully release quick-release fasteners and detach.
Make sure quick-release fasteners are correctly engaged.
Test the quick-release fasteners by pulling on them.

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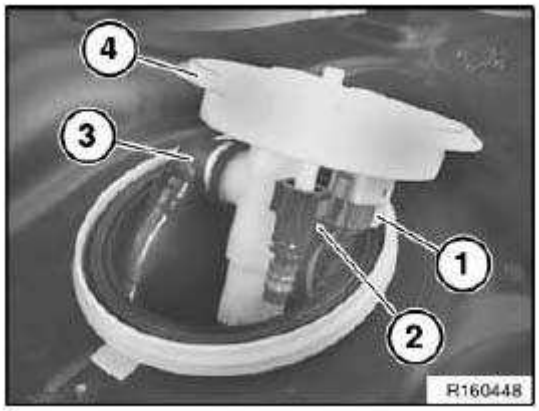


Fig. 36: Service Cap, Fuel Line, Vent Line And Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Cable (1) must be laid in a loop around the corrugated tube (2).

Cable must not restrict freedom of movement of lever-type sensor!

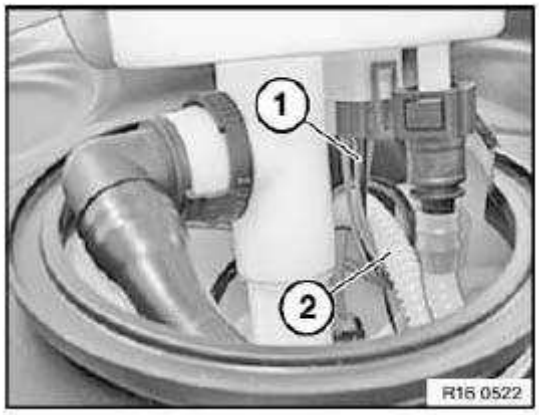


Fig. 37: Cable And Tube
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and disconnect plug connection (1) using a screwdriver (2).

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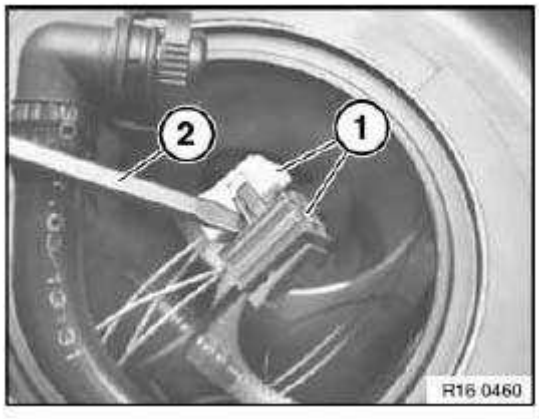


Fig. 38: Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Unpin cables (1) issuing from lever-type sensor on blue plug using special tool 61 0 307 from special tool kit 61 0 300 .

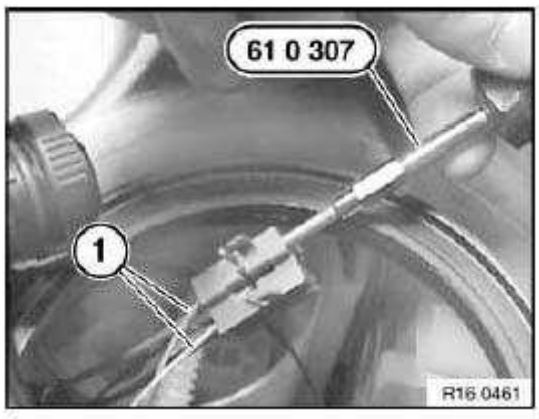


Fig. 39: Cables And Special Tool 61 0 307
Courtesy of BMW OF NORTH AMERICA, INC.

Removing fuel level sensor:

- Disengage cable from guides (3 and 4).
- Carefully pull tab (1) in direction of arrow; at the same time, press tab (2) in direction of arrow and press out fuel level sensor downwards.

IMPORTANT: Risk of damage:
Carefully feed cable out of cable guides (3 and 4). Do not kink cable.

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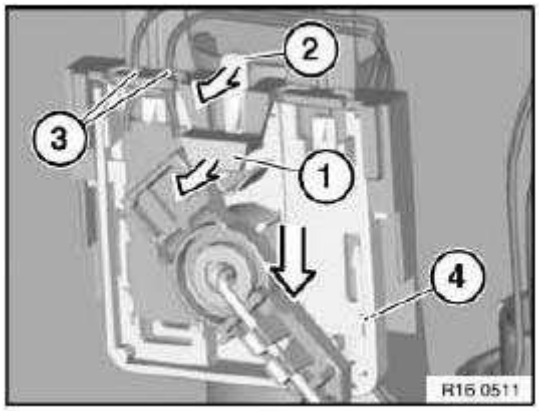


Fig. 40: Pulling Tab
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Observe the following procedure when installing the fuel level sensor.

1. Carefully push fuel level sensor (1) in direction of arrow onto sensor holder (2).
2. Fuel level sensor must snap audibly into place!
3. Carefully feed cable into cable guides (3).

   Do not kink cable.

Make sure fuel level sensor is correctly positioned in both guides (see arrows).

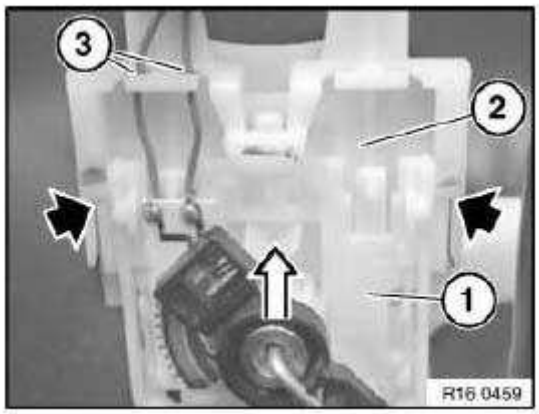


Fig. 41: Pushing Fuel Level Sensor Onto Sensor Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Lay cable (1) through upper loop of tank support (2).

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Illustration shows cutaway model:

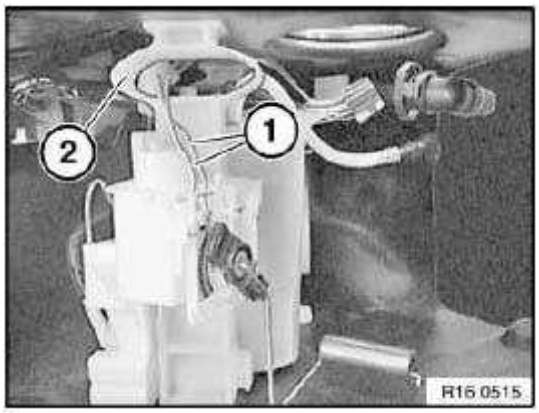


Fig. 42: Cable And Tank Support
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Cable (1) must be laid under line (2) and engaged in cable holder (3).

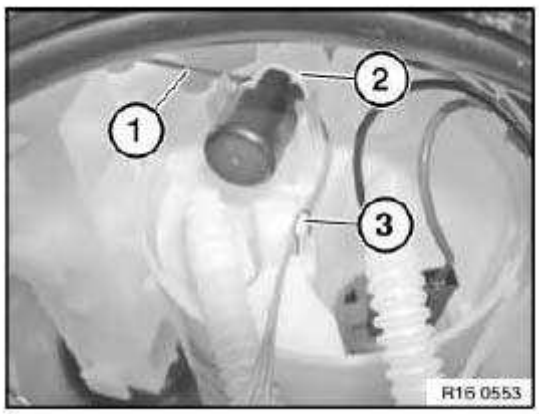


Fig. 43: Cable And Cable Holder
Courtesy of BMW OF NORTH AMERICA, INC.

16 12 001 REMOVING AND INSTALLING/REPLACING FUEL GAUGE SENSOR (PETROL/GASOLINE, LEFT)

Special tools required:

- **16 1 020 PIN WRENCH** .

IMPORTANT: Ensure adequate ventilation in the place of work!
Ensure absolute cleanliness when working on the open fuel tank.
Contaminants in the fuel tank can impair driving operation or may even result

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in vehicle breakdown!

Necessary preliminary tasks:

- Draw off fuel from fuel tank, see **16 00 005 Draining and filling fuel tank**.
- Remove rear seat bench, see **52 26 005 REMOVING AND INSTALLING/REPLACING REAR SEAT (THROUGH-LOADING SYSTEM)** .

Release screws (1) and remove cover (2) from left side of fuel tank.

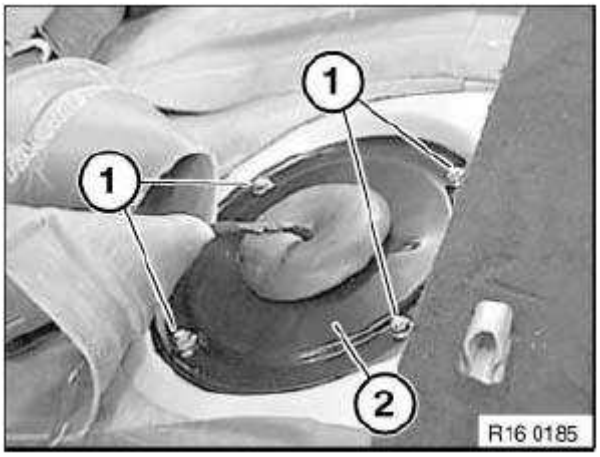
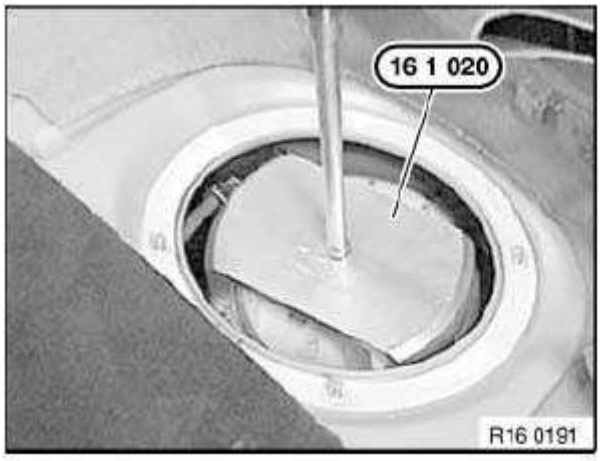


Fig. 44: Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw cap with special tool 16 1 020 and remove.

Installation:

Tightening torque: 16 14 2AZ, see **16 14 FUEL PUMP** .



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Fig. 45: Special Tool 16 1 020
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Service cap can only be installed in one position.

When installing, make sure lug (1) of service cap engages in corresponding opening on fuel tank.

During torque tightening, notch (3) on screw cap can be clearly heard and felt to engage toothed segment (4) on fuel tank.

Replace rubber gasket.

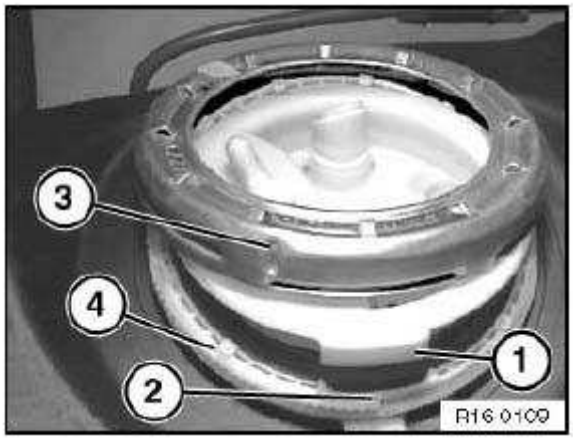


Fig. 46: Service Cap Lug And Notch
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Make sure that tab (1) of adapter ring lies completely in recess (2).

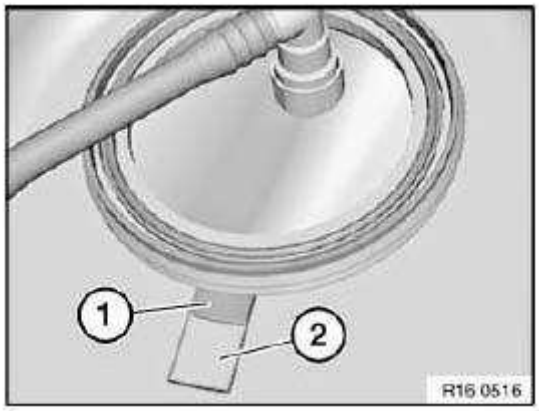


Fig. 47: Tab Of Adapter Ring
Courtesy of BMW OF NORTH AMERICA, INC.

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Disconnect plug (1) from fuel level sensor.

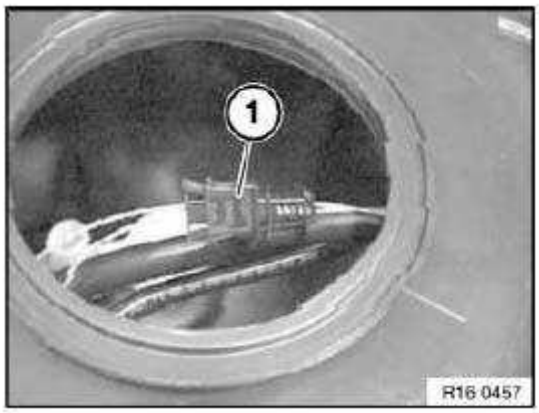


Fig. 48: Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Removing fuel level sensor:

- Disengage cable from guides (3 and 4).
- Carefully pull tab (1) in direction of arrow; at the same time, press tab (2) in direction of arrow and press out fuel level sensor downwards.

IMPORTANT: Risk of damage:
Carefully feed cable out of cable guides (3 and 4). Do not kink cable.

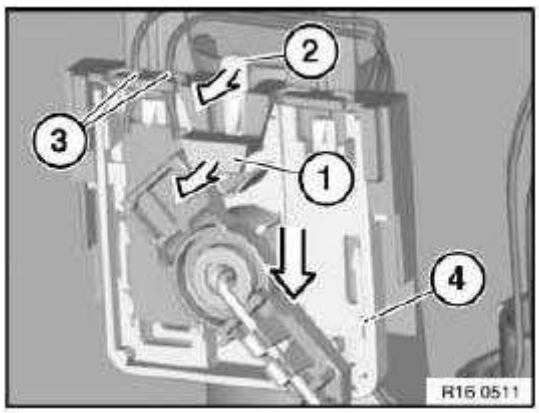


Fig. 49: Pulling Tab
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Observe the following procedure when installing the fuel level sensor.

1. Carefully push fuel level sensor (1) in direction of arrow onto sensor holder (2).

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2. Push on fuel level sensor up to end stop. Fuel level sensor must snap audibly into place!
3. Carefully feed cable into cable guide (3). Do not kink cable.

Make sure fuel level sensor is correctly positioned in both guides (see arrow).

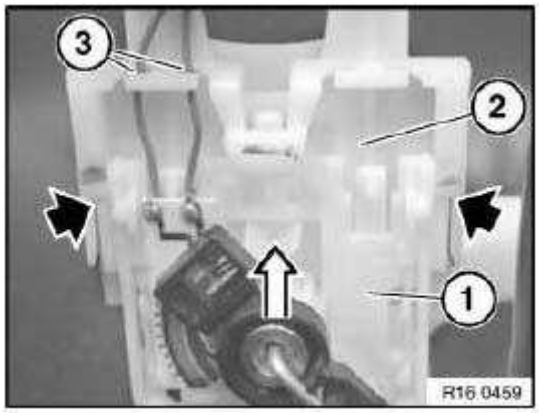


Fig. 50: Pushing Fuel Level Sensor Onto Sensor Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Engage cable (1) in cable guide (2) and lay behind lines (3).

Cable must not restrict freedom of movement of lever-type sensor!

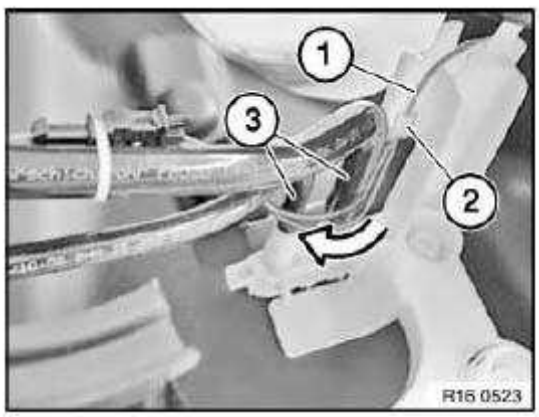


Fig. 51: Engaging Cable In Cable Guide
Courtesy of BMW OF NORTH AMERICA, INC.

16 12 010 REMOVING AND INSTALLING OR REPLACING CARBON CANISTER

Necessary preliminary tasks:

- Remove rear right wheel. **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL**

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- Remove rear right wheel arch trim. See **51 71 041 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT WHEEL ARCH COVER** .

Disconnect vent line (1) and (2) from carbon canister (3). Unfasten nut. Tightening torque, see 16 13 2AZ in **16 13 TANK VENTILATION** . Remove carbon canister (3).

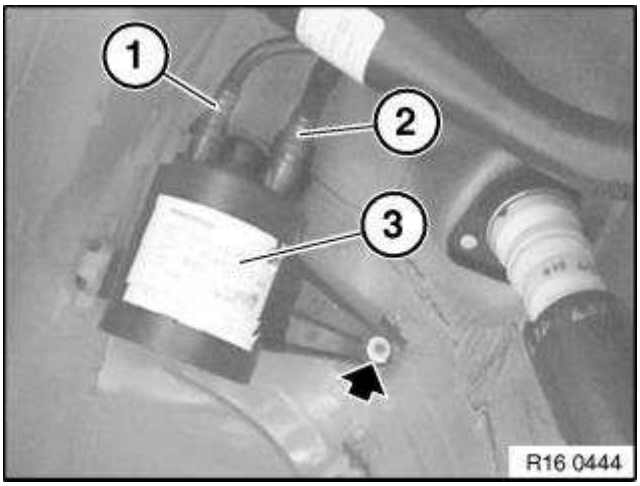


Fig. 52: Disconnect Vent Line (1) And (2) From Carbon Canister (3)
Courtesy of BMW OF NORTH AMERICA, INC.

16 12 010 REMOVING AND INSTALLING/REPLACING CARBON CANISTER WITH DM-TL (DIAGNOSIS MODULE FOR TANK LEAKAGE)

- Remove rear right wheel. **36 10 300 REMOVING OR INSTALLING FRONT OR REAR WHEEL**
- Remove rear right wheel arch trim. See **51 71 041 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT WHEEL ARCH COVER** .

Unlock lines (1), (2) and plug (3) and detach:

- Scavenging air line
- Vent line to tank

Release screws (5) and remove carbon canister with DM-TL towards bottom. Tightening torque 16 13 2AZ, see **16 13 TANK VENTILATION** .

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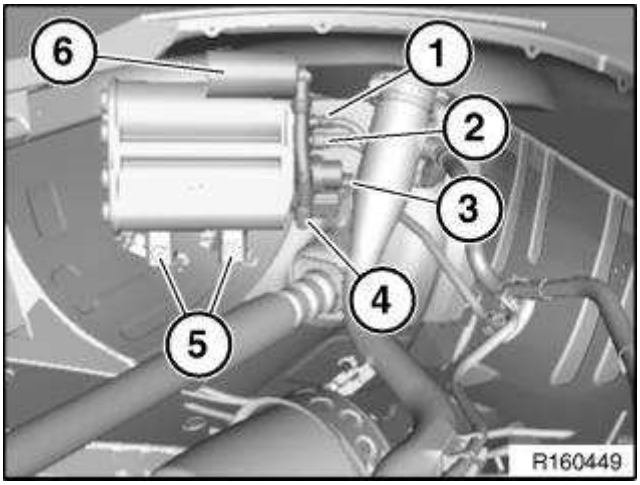


Fig. 53: Removing/Installing Carbon Canister With DM-TL
Courtesy of BMW OF NORTH AMERICA, INC.

13 FUEL VENTILATION/DEAERATION

16 13 015 REMOVING AND INSTALLING/REPLACING TANK LEAK DIAGNOSIS MODULE

Necessary preliminary tasks:

- Remove carbon canister with DMTL.

Unlock and disconnect line (1) from tank leakage diagnosis module.

Release screws (2).

Tightening torque: 16 13 3AZ, see **16 13 TANK VENTILATION** .

Detach DMTL from carbon canister.

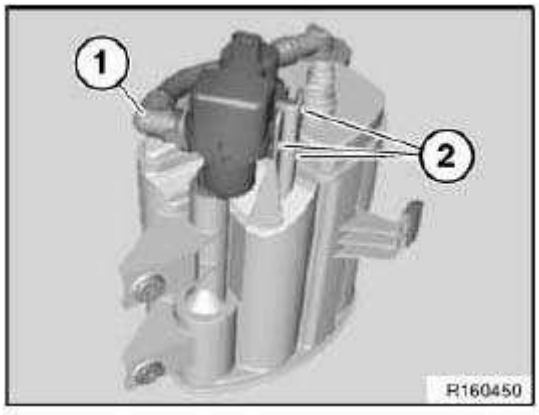


Fig. 54: Fuel Line
Courtesy of BMW OF NORTH AMERICA, INC.

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14 FUEL PUMP

16 14 010 REMOVING AND INSTALLING/REPLACING FUEL PUMP (PETROL/GASOLINE, N52)

Special tools required:

See **16 FUEL SUPPLY SYSTEM** , **61 GENERAL ELECTRICAL SYSTEM** .

- 16 1 020
- 61 0 300
- 61 0 307

IMPORTANT: Ensure adequate ventilation in the place of work!
Ensure absolute cleanliness when working on the open fuel tank.
Contaminants in the fuel tank can impair driving operation or may even result in vehicle breakdown!

Necessary preliminary tasks:

- Draw off fuel from fuel tank, see **16 00 005 Draining and filling fuel tank**.
- Remove rear seat bench, see **52 26 005 REMOVING AND INSTALLING/REPLACING REAR SEAT (THROUGH-LOADING SYSTEM)** .

Release screws (1) and remove cover (2) from right side of fuel tank.

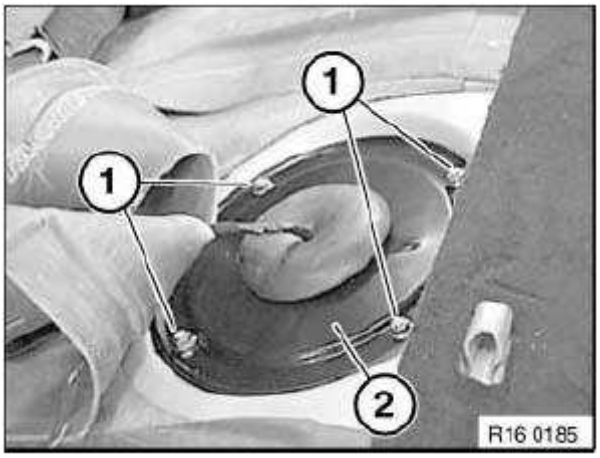


Fig. 55: Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach plug (1), fuel feed line (2) and service vent line (3).

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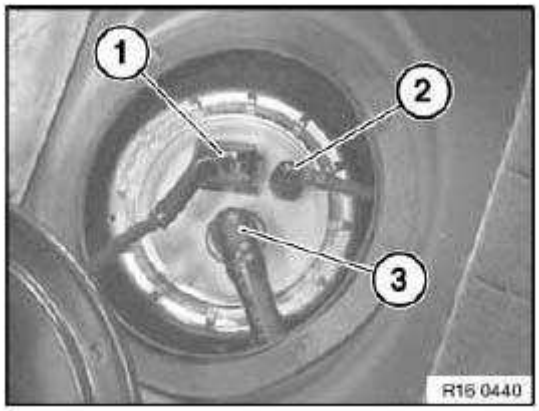


Fig. 56: Plug And Service Vent Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw cap with special tool 16 1 020 and remove service cap.

Installation:

Tightening torque: 16 14 2AZ, see **16 14 FUEL PUMP** .

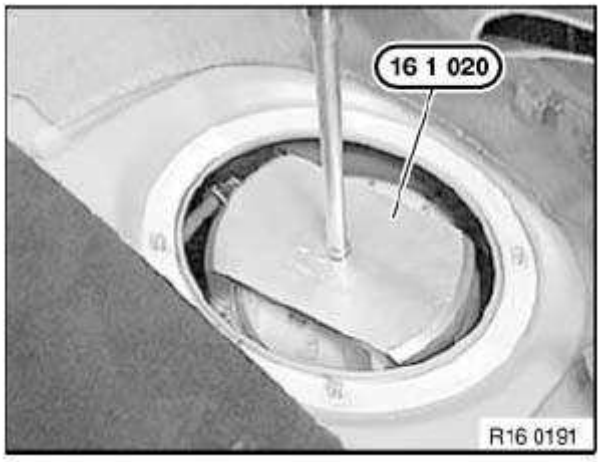


Fig. 57: Special Tool 16 1 020
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Service cap can only be installed in one position.

When installing, make sure lug (1) of service cap engages in corresponding opening (2) on fuel tank.

During torque tightening, notch (3) on screw cap can be clearly heard and felt to engage toothed segment (4) on fuel tank.

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Replace rubber gasket.

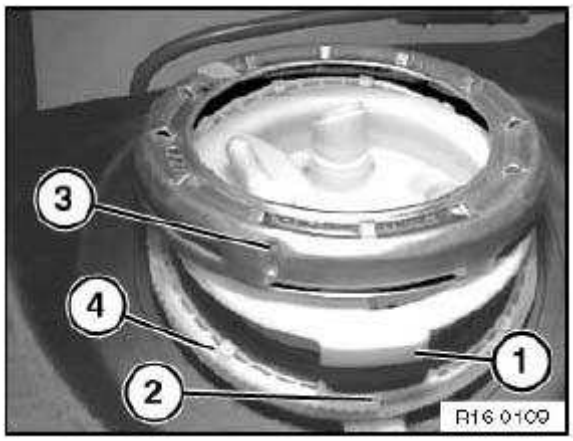


Fig. 58: Service Cap Lug And Notch
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Make sure that tab (1) of adapter ring lies completely in recess (2).

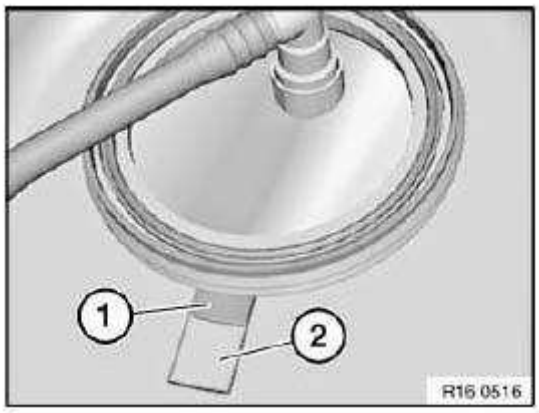


Fig. 59: Tab Of Adapter Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully raise service cap (4) on right.

Unlock and detach fuel line (2).

Detach vent line (3).

Disconnect connector (1).

IMPORTANT: Carefully release quick-release fasteners and detach.
Make sure quick-release fasteners are correctly engaged.
Test the quick-release fasteners by pulling on them.

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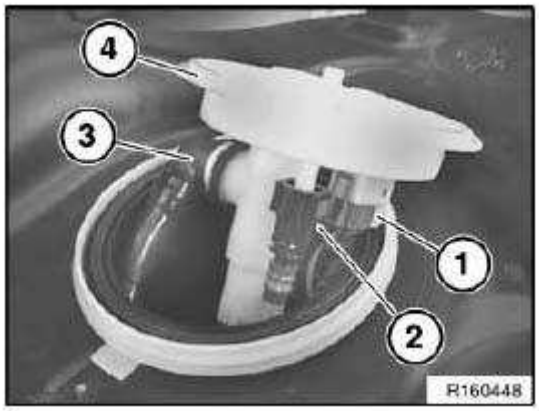


Fig. 60: Service Cap, Fuel Line, Vent Line And Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Cable (1) must be laid in a loop around the corrugated tube (2).

Cable must not restrict freedom of movement of lever-type sensor!

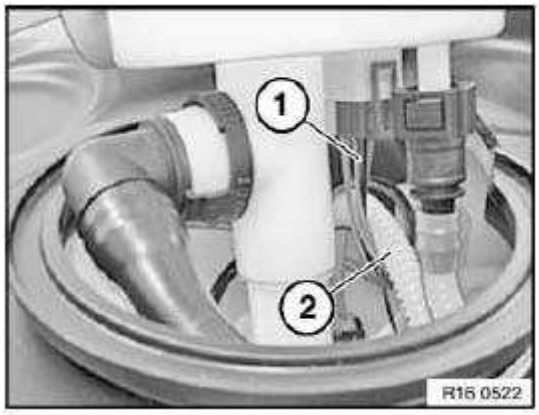


Fig. 61: Cable And Tube
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and disconnect plug housing (1) using a screwdriver (2).

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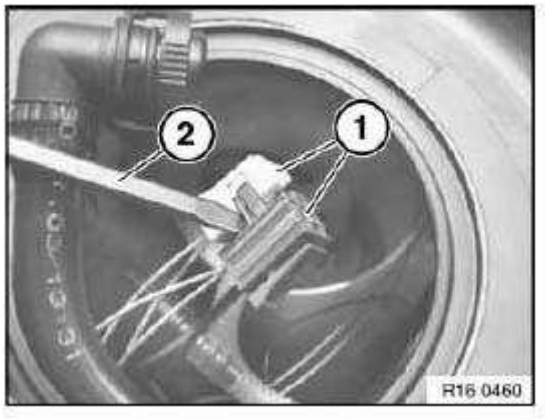


Fig. 62: Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Unpin cables (1) issuing from lever-type sensor on blue plug using special tool 61 0 307 from special tool kit 61 0 300 .

NOTE: Plug connection on fuel pump must not be disconnected!
When the fuel pump is replaced, the cables and the blue plug are included in the delivery specification.

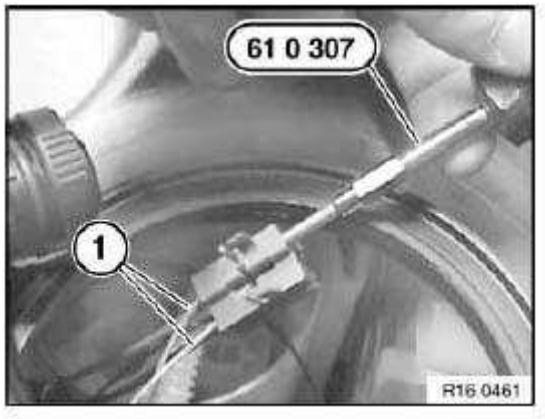


Fig. 63: Cables And Special Tool 61 0 307
Courtesy of BMW OF NORTH AMERICA, INC.

Press retaining lug (2) together simultaneously in direction of arrow and detach fuel line (1) from pressure regulator.

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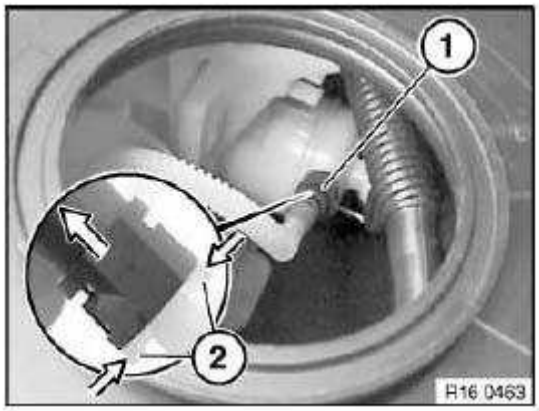


Fig. 64: Pressing Retaining Lug
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock quick-release fastener (1) by pressing both white surfaces and detach.

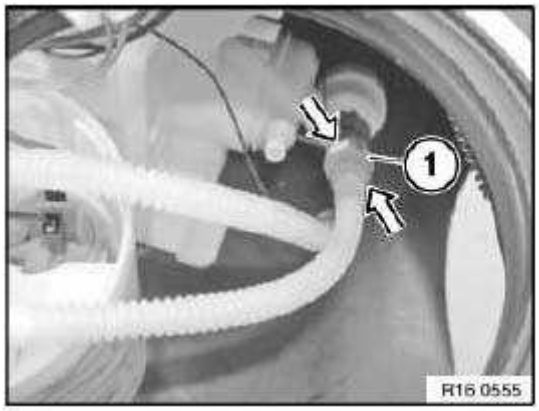


Fig. 65: Unlocking Quick-Release Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Press retaining lug (1) in direction of arrow towards rear and lift out fuel pump with surge chamber (2).

Installation:

Fuel pump can only be installed in one position.

Make sure lug (4) of mounting engages opening in fuel pump.

Make sure fuel pump (2) is correctly positioned in guides (3).

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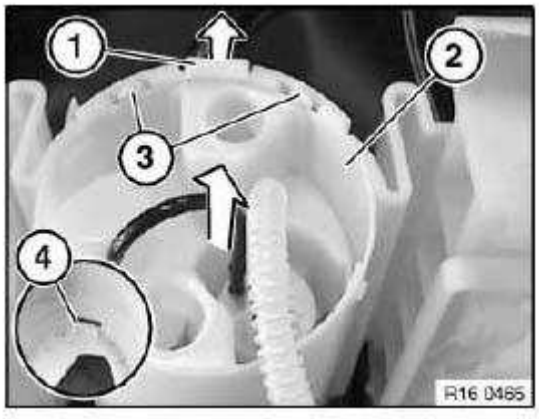


Fig. 66: Pressing Retaining Lug
Courtesy of BMW OF NORTH AMERICA, INC.

16 14 060 REMOVING AND INSTALLING/REPLACING DUST FILTER FOR TANK LEAKAGE DIAGNOSIS MODULE (DM-TL)

Necessary preliminary tasks:

- Remove rear right wheel arch trim. See **51 71 041 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT WHEEL ARCH COVER** .
- Remove carbon canister.

Disconnect line (2) from DM-TL. Release screw. Tightening torque, see 16 13 4AZ in **16 13 TANK VENTILATION** . Remove dust filter (1) with line (2).

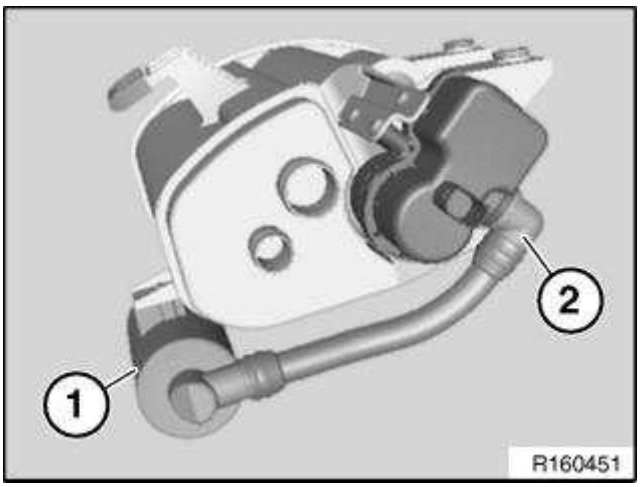


Fig. 67: Disconnect Line (2) From DM-Tl
Courtesy of BMW OF NORTH AMERICA, INC.

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ENGINE

Ignition System - Repair Instructions - X3

00 TROUBLESHOOTING

12 00 ... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY

Observe safety instructions for handling vehicle battery, see **61 00 ... SAFETY INSTRUCTIONS FOR HANDLING VEHICLE BATTERY** .

Before disconnecting battery:

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

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

IMPORTANT:

- **There is a danger of mixing up battery leads: If the battery positive and negative leads are the same color and you are in doubt, follow the polarity to the battery, then mark and cover the leads.**
- **On vehicles with radio code: After disconnecting the battery, the radio code must be re-entered. Therefore obtain the radio code card from the customer beforehand. Note stored stations and restore them after connecting the battery.**
- **Stored settings of the on-board computer and clock will also be lost.**
- **All available central keys must be recoded for cars with first generation infrared transmitter locking systems.**

General notes on disconnecting battery:

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

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

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

- Detach negative lead from car battery and second battery if fitted. Cover battery negative terminal(s) and secure, see **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD** .
- When work is carried out on the electrical system, faults may be caused in the fault memories of some control units when the battery is connected.
- When installing battery terminal: Tightening torque: 61 21 1AZ, see **61 21 BATTERY WITH TERMINAL** .

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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

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voltage at the starter battery of greater than or equal to 13.5 V. The isolating relay is closed and thus the equipment battery is connected in parallel. Both batteries are now charged.

Prerequisite:

- Terminal 61 inactive
- Terminal 15 inactive

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

NOTE: When the engine hood is open, the isolating relay is also opened in normal operation when the engine is running.
A special mode can be set by means of diagnosis for workshop/garage operation. The isolating relay is closed from terminal R in this operating mode. This mode is automatically reset once a distance of 5 km has been driven.

Trickle charging

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

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

12 00... INSTRUCTIONS FOR REMOVING AND INSTALLING ELECTRONIC CONTROL UNITS

IMPORTANT:

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

Comply with the following when replacing the DME/DDE (Digital Motor

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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

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Check -> Secondary signal for stationary ignition distribution

12 IGNITION WIRES, SPARK PLUGS

FIRING ORDER

FIRING ORDER

Application	Firing Order
6-Cylinder	1 - 5 - 3 - 6 - 2 - 4

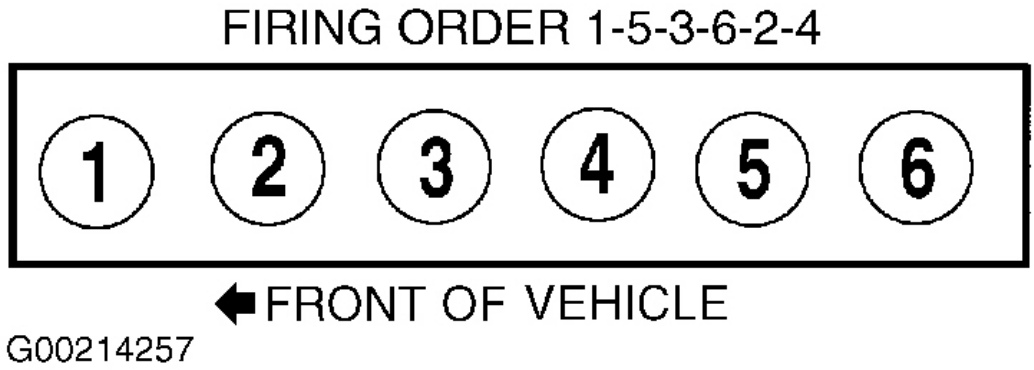


Fig. 1: Firing Order (6-Cylinder)
Courtesy of BMW OF NORTH AMERICA, INC.

12 12 011 REPLACING ALL SPARK PLUGS (N42, N40, N46, N45, N52, N52K, N51)

Special tools required:

See **12 ENGINE ELECTRICAL SYSTEM** .

- 12 1 171
- 12 1 200

Necessary preliminary tasks:

- Switch off ignition
- Remove ignition coils, see **12 13 511 Replacing ignition coils (N52, N52K, N51)**.

Unscrew spark plugs with special tool 12 1 171.

Installation:

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Tighten down spark plugs with special tool 12 1 171 and special tool 12 1 200 (torque limiter).

Without special tool 12 1 200 , observe tightening torque.

Tightening torque: 12 12 1AZ, see **12 12 SPARK PLUGS** .

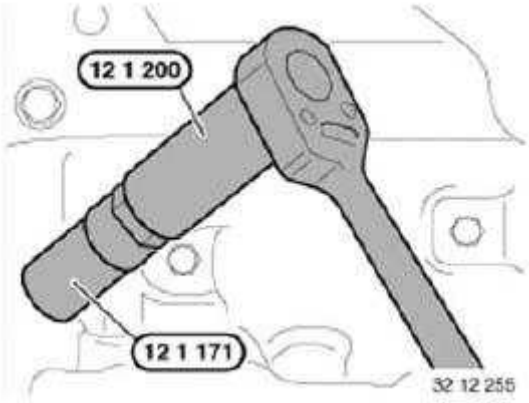


Fig. 2: Special Tool 12 1 171 And 12 1 200
Courtesy of BMW OF NORTH AMERICA, INC.

13 IGNITION COIL

12 13 NOTES ON CHECKING IGNITION SYSTEM

Troubleshooting -> Fault in fuel injection system

-> Spark plug faults

-> Ignition coil faults

-> Further fault patterns with evaluation

-> Additional fault notes for troubleshooting

Oscillograms -> Normal oscillogram

-> Oscillograms of ignition coils from different manufacturers

Check -> Secondary signal for stationary ignition distribution

12 13 511 REPLACING IGNITION COILS (N52, N52K, N51)

Necessary preliminary tasks:

- Read out fault memory of DME control unit.
- Check stored fault messages

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- Switch off ignition
- Remove ignition coil cover

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

Pull ignition coil (1) up and out.

This procedure is applicable to all ignition coils.

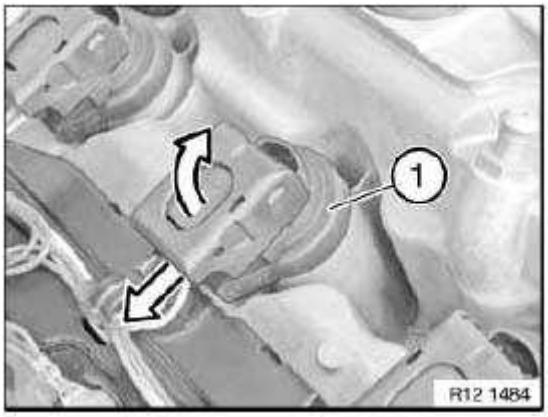


Fig. 3: Pulling Out Ignition Coil
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

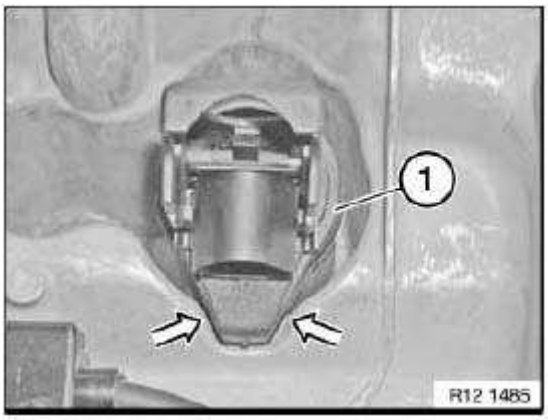


Fig. 4: Rubber Seal Of Ignition Coil
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

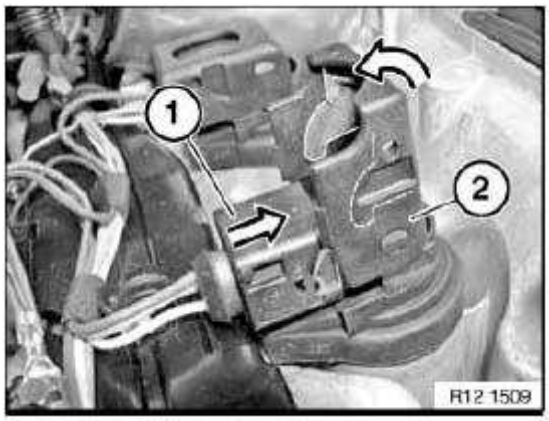


Fig. 5: Closing Plug Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The plug retainer must snap into place without great effort.

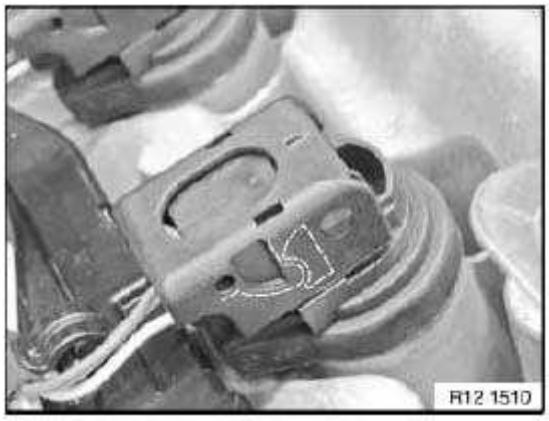


Fig. 6: Plug Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Now clear the fault memory.

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

Special Tools Required

- **12 1 301**
- **12 7 050 (ADAPTER LEAD)**

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Necessary preliminary tasks:

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

Unlock plug fastener (1) of ignition coil.

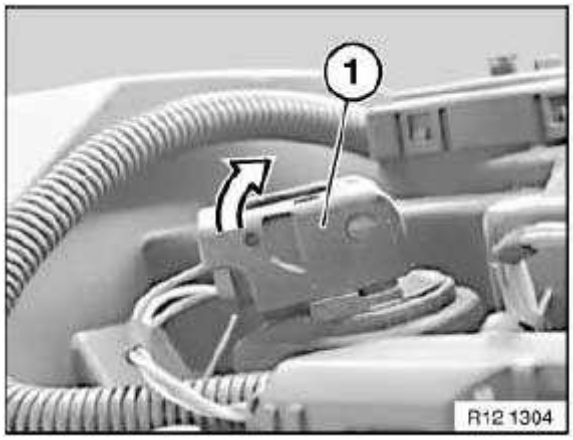


Fig. 7: Identifying Plug Fastener Of Ignition Coil
Courtesy of BMW OF NORTH AMERICA, INC.

Detach plug (1) in direction of arrow.

Pull out ignition coil (2) towards top.

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

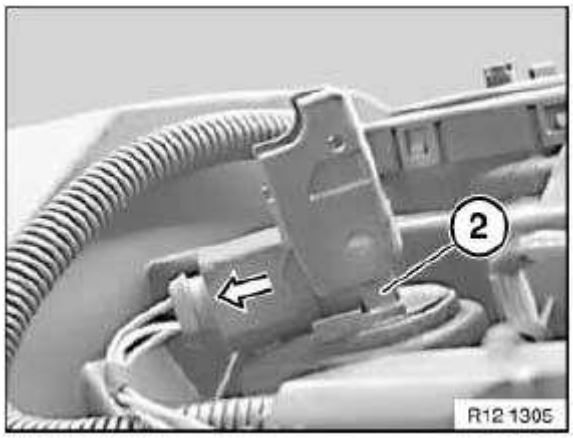


Fig. 8: Pulling Out Ignition Coil & Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool **12 7 050** .

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Installation:

Special tool **12 7 050** is attached between spark plug and rodtype ignition coil.

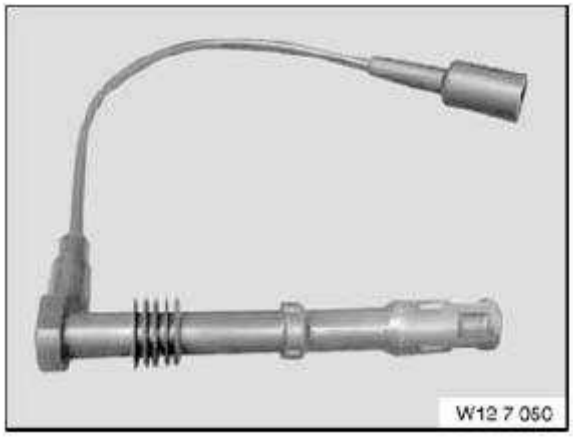


Fig. 9: Identifying Special Tool (12 7 050)
Courtesy of BMW OF NORTH AMERICA, INC.

Secondary measurement:

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

Procedure on DIS Tester:

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

For subsequent procedure, follow DIS instructions.

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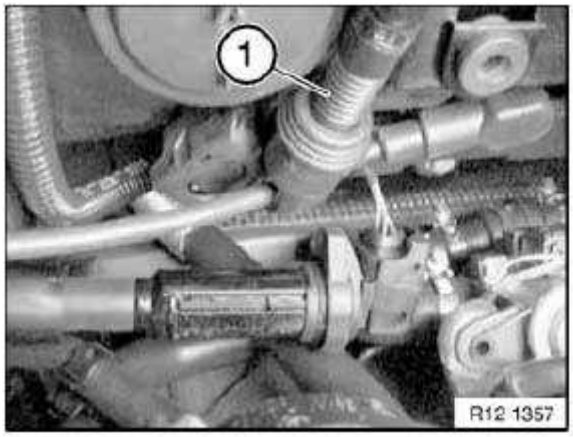


Fig. 10: Identifying KV Clip-On Probe Of DIS Tester
Courtesy of BMW OF NORTH AMERICA, INC.

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

Primary measurement:

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

Procedure on DIS Tester:

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

For subsequent procedure, follow DIS instructions.

NOTE: Pin assignment acc. to connection scheme.

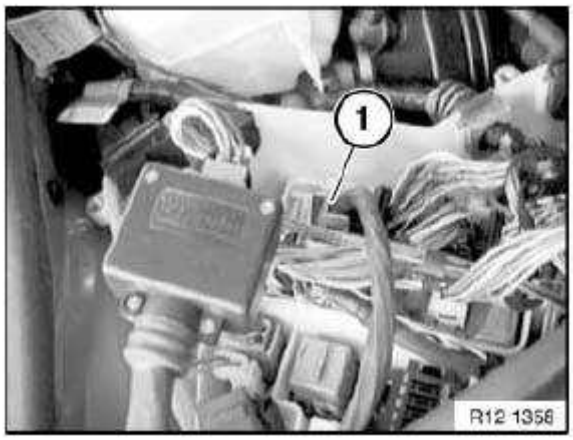


Fig. 11: Identifying DME Module 5 Connector

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Courtesy of BMW OF NORTH AMERICA, INC.

Illustration N42.

IMPORTANT: Ignition signal is a multiple spark ignition.

Illustration of multiple spark ignition

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

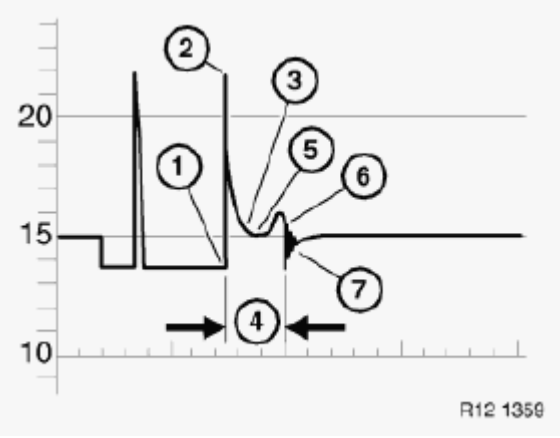


Fig. 12: Illustration Of Multiple Spark Ignition
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

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

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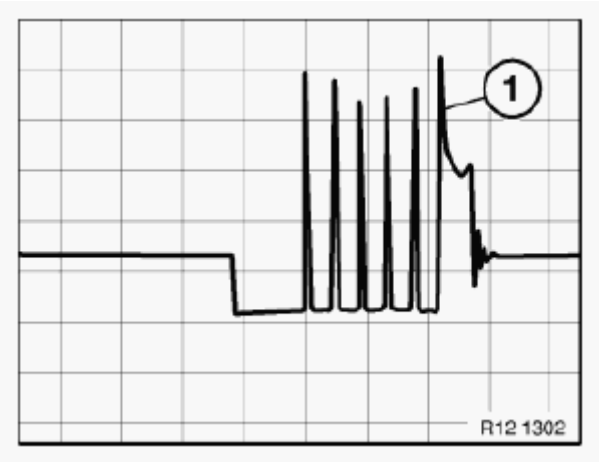


Fig. 13: Ignition Voltage Characteristic Graph
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The display of the ignition voltage peak is approx. 20-25% lower than the real value.

It is not the height of the ignition voltage peaks but rather the uniformity of all the cylinders that is important.

Differences of 3000 to 4000 volts are permitted.

14 ELECTRONIC SWITCHING OR CONTROL UNIT

12 14 523 REPLACING INLET CAMSHAFT PULSE GENERATOR (N52, N52K, N51, N53)

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- If necessary, remove radiator cover

Unlock plug (1) and remove.

Release bolt.

Installation:

Replace screw.

Tightening torque: 12 14 3AZ, see **12 14 ELECTRONIC SHIFT UNITS OR CONTROL UNITS** .

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Remove pulse generator (2).

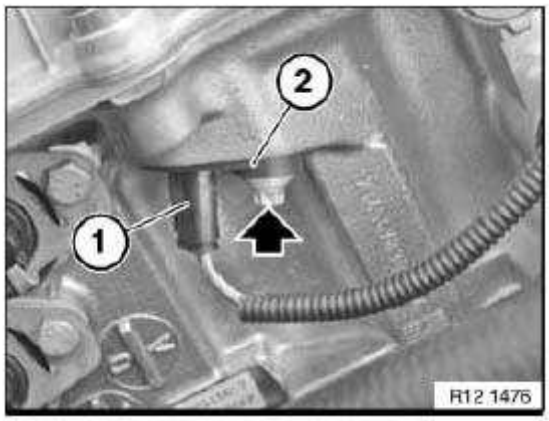


Fig. 14: Plug And Pulse Generator
Courtesy of BMW OF NORTH AMERICA, INC.

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

12 14 524 REPLACING EXHAUST CAMSHAFT PULSE GENERATOR (N52, N52K, N51, N53)

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- If necessary, remove radiator cover

Unlock plug (1) and remove.

Release bolt.

Installation:

Replace screw.

Tightening torque: 12 14 4AZ, see **12 14 ELECTRONIC SHIFT UNITS OR CONTROL UNITS** .

Remove pulse generator (2).

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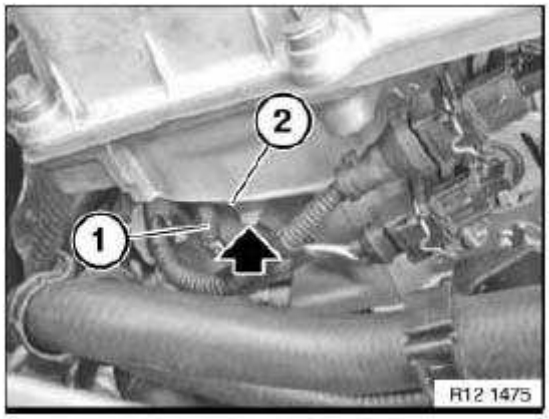


Fig. 15: Plug And Pulse Generator
Courtesy of BMW OF NORTH AMERICA, INC.

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

12 14 600 REMOVING/REPLACING KNOCK SENSORS (N52, N52K, N51)

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical corrosion.
A magnesium crankcase requires aluminium screws/bolts exclusively.
Aluminium screws/bolts must be replaced each time they are released.
The end faces of aluminium screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Switch off ignition
- Disconnect battery negative lead **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD**
- Remove intake air manifold

Unlock plug (1) and remove.

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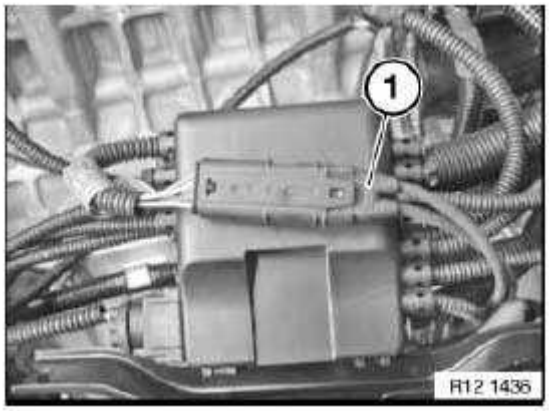


Fig. 16: Plug
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

Replace aluminium screws.

Tightening torque: 12 14 1AZ, see **12 14 ELECTRONIC SHIFT UNITS OR CONTROL UNITS** .

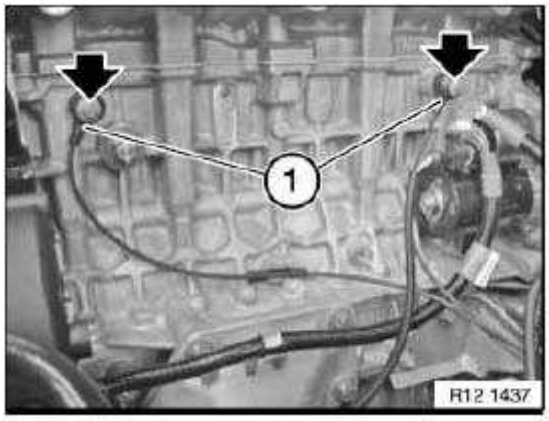


Fig. 17: Knock Sensors
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean support face of knock sensors on engine block.

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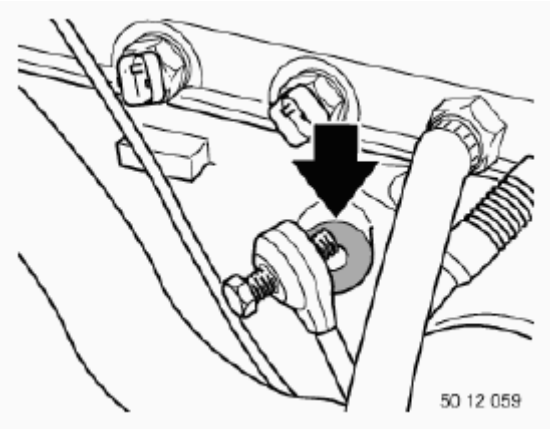


Fig. 18: Support Face Of Knock Sensors
Courtesy of BMW OF NORTH AMERICA, INC.

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

12 14 700 CODING CONTROL MODULE (DME / DDE)

Switch off ignition.

Connect MoDiC or DIS/GT1 Tester.

Switch on ignition.

Select "Coding" program.

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

Carry out adjustment of following control units:

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

12 14 705 PROGRAMMING CONTROL UNIT (DME / DDE)

Switch off ignition.

Connect MoDiC or DIS/GT1 Tester.

Switch on ignition.

Select "Programming".

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

Carry out adjustment of following control units:

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

31 ALTERNATOR WITH DRIVE AND MOUNTING

12 31... REPLACING ALTERNATOR BELT PULLEY

Special tools required:

See **12 ENGINE ELECTRICAL SYSTEM**

- 12 7 110

Remove and install alternator drive belt.

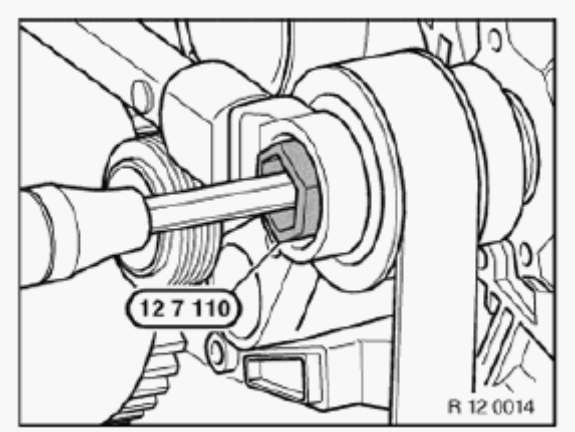
Depending on alternator type, grip shaft with:

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

Release nut with special tool 12 7 110.

Installation:

Tightening torque: 12 31 2AZ / 12 31 3AZ, see **12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS** .



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Fig. 19: Special Tool 12 7 110
Courtesy of BMW OF NORTH AMERICA, INC.

12 31... REPLACING ALTERNATOR BELT PULLEY

Special tools required:

See **12 ENGINE ELECTRICAL SYSTEM**

- 12 7 121
- 12 7 122

Illustrations show N42:

If fitted, remove cover cap from belt pulley.

Depending on alternator type, slacken screw with:

- Torx socket wrench
- Slacken multi-tooth socket wrench (special tool 12 7 122).

Grip freewheel with special tool 12 7 121.

Installation:

Tightening torque: 12 31 8AZ, see **12 31 ALTERNATOR WITH DRIVE AND MOUNTING PARTS** .

Remove alternator drive belt.

Release screw and if necessary remove freewheel.

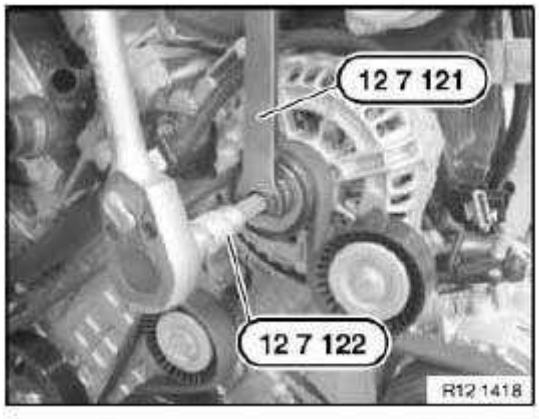


Fig. 20: Special Tool 12 7 121 And 12 7 122
Courtesy of BMW OF NORTH AMERICA, INC.

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

Special tools required:

See **12 ENGINE ELECTRICAL SYSTEM**

- 12 7 120

Remove and install alternator drive belt. Grip alternator shaft with: - internal serration. Release nut with special tools 12 7 120.

Installation: Tightening torque, see 12 31 3AZ in **31 ALTERNATOR WITH DRIVE AND MOUNT** .

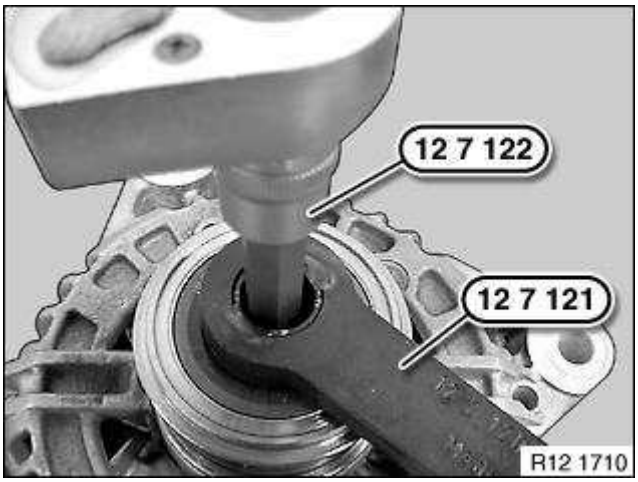


Fig. 21: Release Nut With Special Tools 12 7 120
Courtesy of BMW OF NORTH AMERICA, INC.

12 31 009 CHECKING ALTERNATOR (BSD)

Necessary preliminary tasks:

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

NOTE: The alternator with BSD interface can communicate with the engine control unit (DME/DDE).
The alternator is not connected to the charge telltale light.
The alternator can identify various faults.

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

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Connect diagnosis tester.

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

Oscillogram for a fault-free alternator:

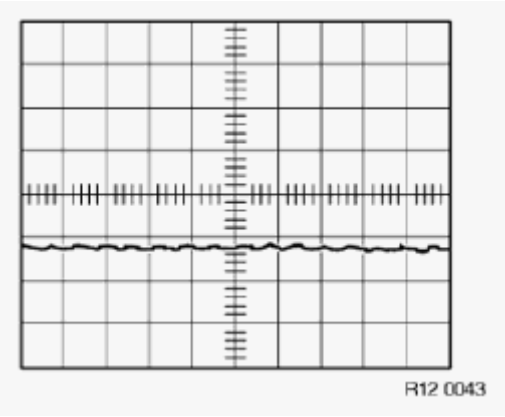


Fig. 22: Oscillogram Graph - Fault-Free Alternator
Courtesy of BMW OF NORTH AMERICA, INC.

Oscillogram for a faulty alternator:

One phase interrupted.

Repair/exchange alternator.

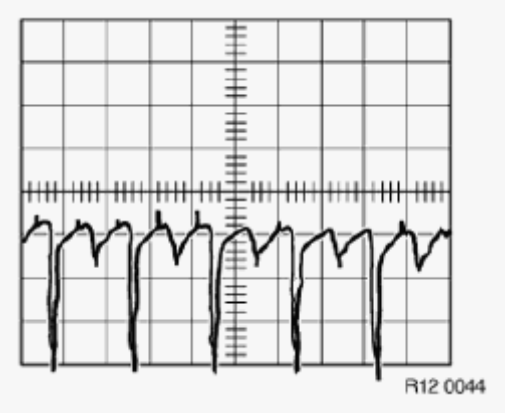


Fig. 23: Oscillogram Graph - One Phase Interrupted

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Courtesy of BMW OF NORTH AMERICA, INC.

Interturn fault.

Repair/exchange alternator.

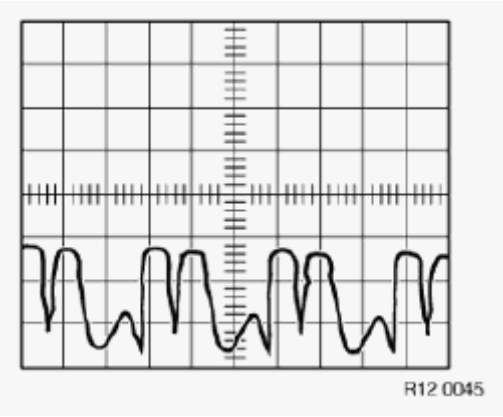


Fig. 24: Oscillogram Graph - Interturn Fault
Courtesy of BMW OF NORTH AMERICA, INC.

Open circuit in negative diode.

Repair/exchange alternator.

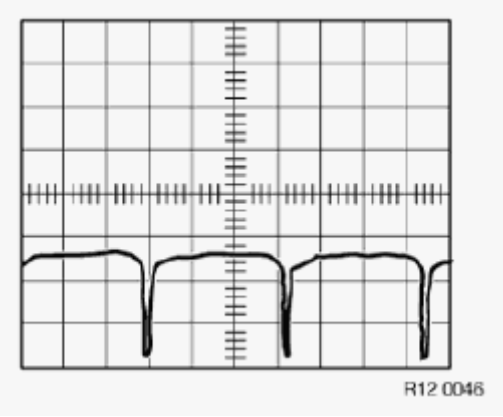


Fig. 25: Oscillogram Graph - Open Circuit In Negative Diode
Courtesy of BMW OF NORTH AMERICA, INC.

Short circuit in positive diode.

Repair/exchange alternator.

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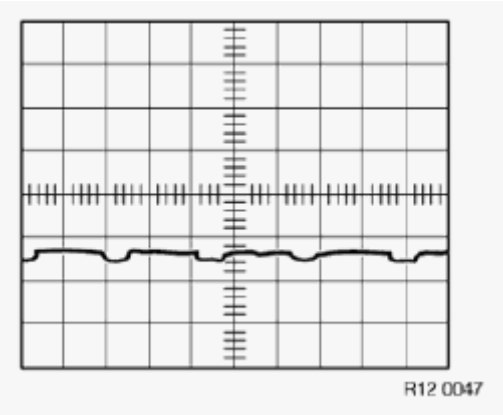


Fig. 26: Oscillogram Graph - Short Circuit In Positive Diode
Courtesy of BMW OF NORTH AMERICA, INC.

Open circuit in positive diode.

Repair/exchange alternator.

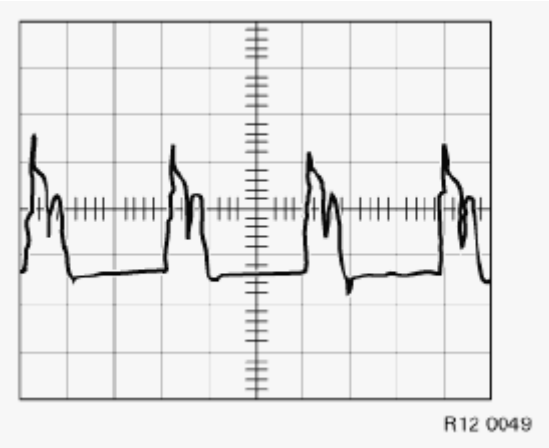


Fig. 27: Oscillogram Graph - Open Circuit In Positive Diode
Courtesy of BMW OF NORTH AMERICA, INC.

Open circuit in exciter diode.

Repair/exchange alternator.

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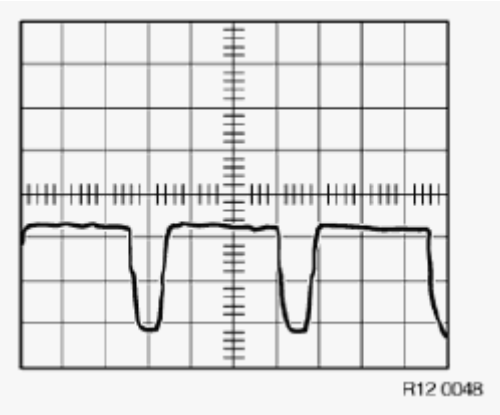


Fig. 28: Oscillogram Graph - Open Circuit In Exciter Diode
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME/DDE.

12 31 020 REMOVING AND INSTALLING OR REPLACING ALTERNATOR (N52, N52K, N51, N53)

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical corrosion.
A magnesium crankcase requires aluminium screws/bolts exclusively.
Aluminium screws/bolts must be replaced each time they are released.
The end faces of aluminium screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Switch off ignition
- Disconnect battery negative lead **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD**
- Remove intake filter housing
- Remove alternator drive belt

Unlock plug (1) and remove.

Slacken nut (2).

Installation:

Tightening torque 12 31 1AZ.

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Release screws and remove alternator (3).

Installation:

Replace aluminium screws.

Tightening torque 12 31 2AZ.

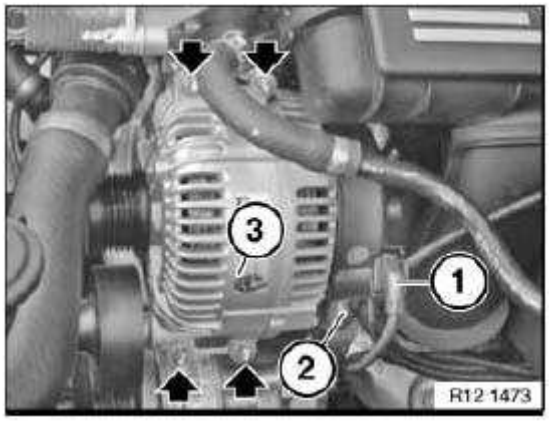


Fig. 29: Plug And Alternator
Courtesy of BMW OF NORTH AMERICA, INC.

32 REGULATOR

12 32 501 REPLACING VOLTAGE REGULATOR

Necessary preliminary tasks:

- Switch off ignition
- Disconnect battery negative lead **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD**
- Notes on removing and installing electronic control units
- Remove alternator

Bosch:

Release protective caps (1).

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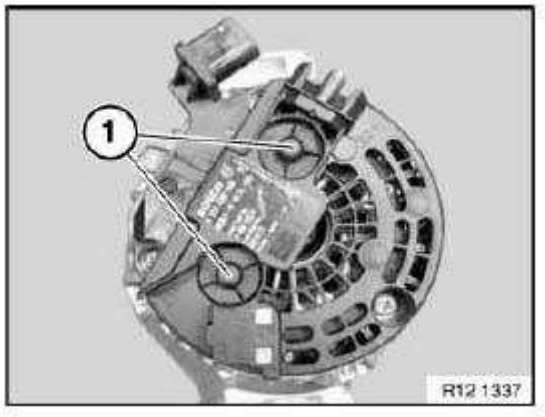


Fig. 30: Protective Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Bosch:

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

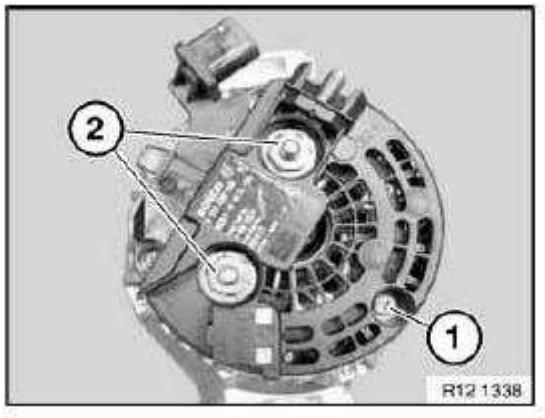


Fig. 31: Cover Screw And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Bosch:

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

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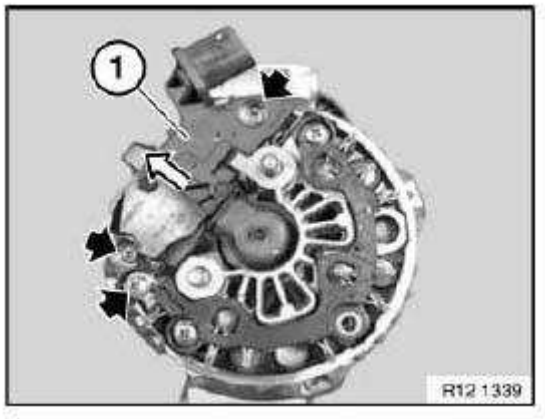


Fig. 32: Removing Regulator Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Bosch:

Installation:

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

Measurement A = min. 5 mm.

Check collector ring for wear and recondition if necessary.

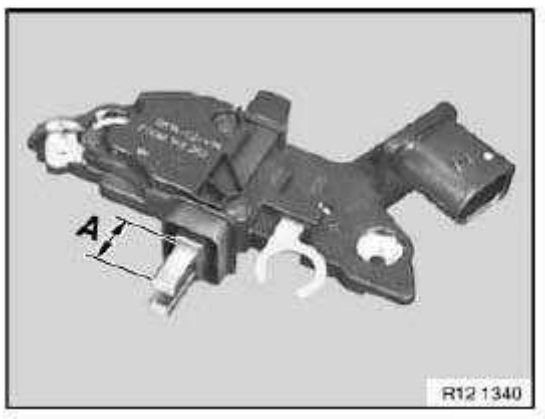


Fig. 33: Pretension Of Contact Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo:

Unscrew nut (1).

Slacken nut (2).

Release screws (3).

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Release cover (4).

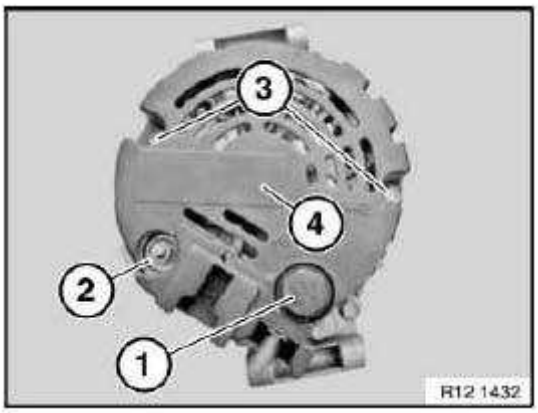


Fig. 34: Cover Nuts And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo:

Release screws.

Remove regulator switch (1) towards top.

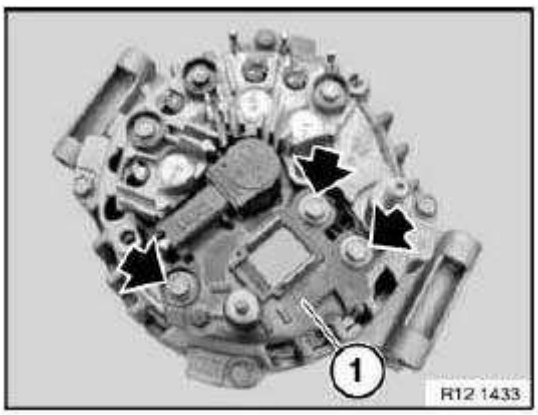


Fig. 35: Regulator Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Valeo:

Installation:

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

Measurement A = min. 5 mm.

Check collector ring for wear and recondition if necessary.

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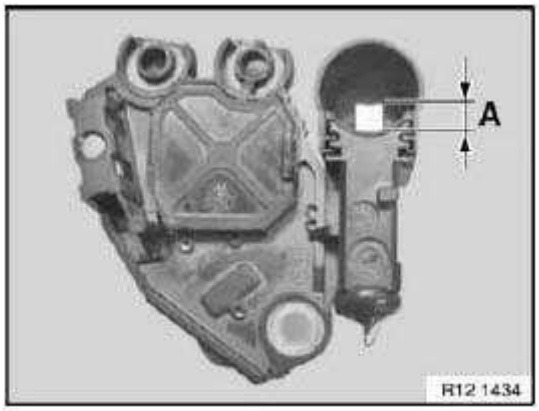


Fig. 36: Pretension Of Contact Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

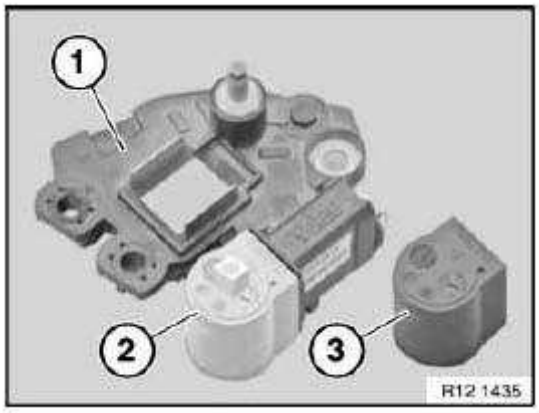


Fig. 37: Regulator With Mounting Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

41 STARTER WITH MOUNTING

12 41 020 REMOVING AND INSTALLING/REPLACING STARTER (N52, N52K, N51, N53, N54)

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical corrosion.
A magnesium crankcase requires aluminium screws/bolts exclusively.
Aluminium screws/bolts must be replaced each time they are released.
The end faces of aluminium screws/bolts are painted blue for the purposes of

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

Necessary preliminary tasks:

- Switch off ignition
- Disconnect battery negative lead **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD**
- Remove intake air manifold

Unlock plug (1) and remove.

Unfasten nut.

Tightening torque: 12 41 3AZ, see **12 41 STARTER MOTOR WITH MOUNTING**

Remove battery positive lead (2).

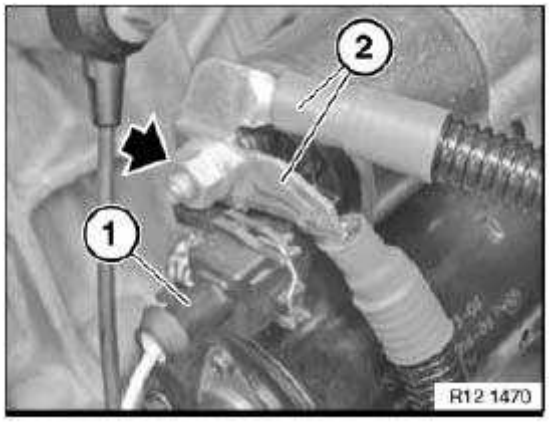


Fig. 38: Plug And Battery Positive Lead
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolt (1).

Installation:

Replace aluminium screws.

Tightening torque: 12 41 1AZ, see **12 41 STARTER MOTOR WITH MOUNTING** .

Release screws (2).

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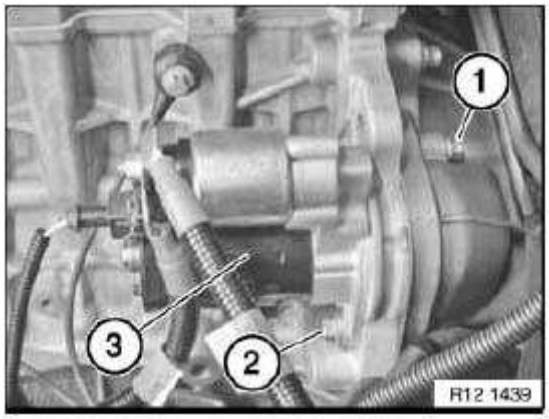


Fig. 39: Starter Motor
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace aluminium screws.

Tightening torque: 12 41 2AZ, see **12 41 STARTER MOTOR WITH MOUNTING**

Remove starter motor (3).

Installation:

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

12 41 041 REPLACING SOLENOID SWITCH

Turn off ignition.

Remove starter motor.

Release nut (1).

Remove cable lug (2).

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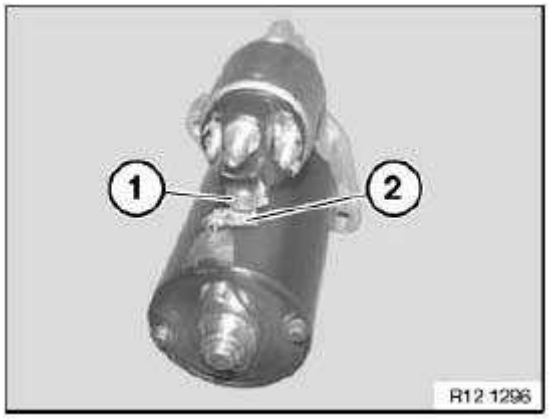


Fig. 40: Cable Lug
Courtesy of BMW OF NORTH AMERICA, INC.

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

Release screws (1).

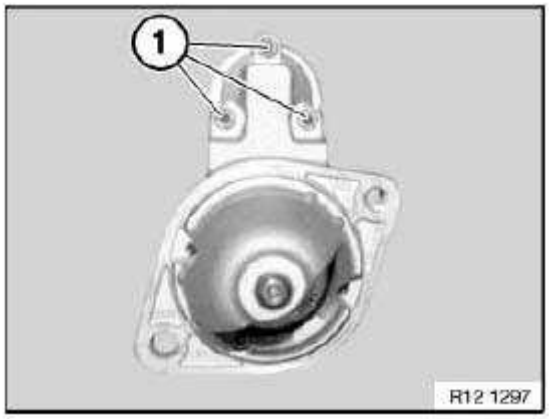


Fig. 41: Starter Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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

Unhook pin (3).

Installation:

Check pin (3) for wear and apply grease.

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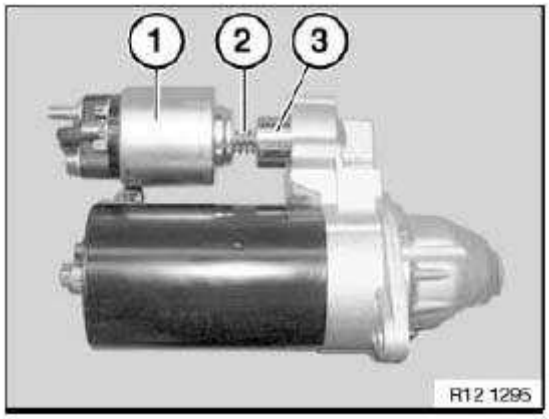


Fig. 42: Solenoid Switch, Pin And Spring
Courtesy of BMW OF NORTH AMERICA, INC.

61 OIL PRESSURE-OIL TEMPERATURE GAUGE

12 61 280 REMOVING AND INSTALLING/REPLACING OIL PRESSURE SENSOR (N52, N52K, N51, N54, N53)

Necessary preliminary tasks:

- Switch off ignition
- **N52, N52K, N51, N53 only:**
  - Remove ignition coil cover
- **N54 only:**
  - Remove intake filter housing

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

Installation location:

Oil filter housing, front left.

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

Unlock plug (1) and remove.

Release oil pressure sensor (2).

Tightening torque: 12 61 1AZ, see **12 61 ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY** .

Installation:

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

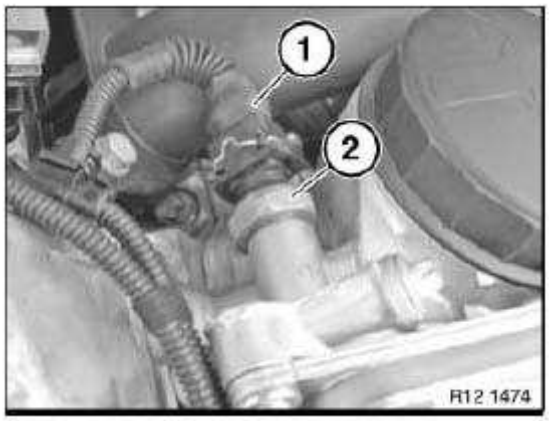


Fig. 43: Plug And Oil Pressure Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

12 61 285 REPLACING ENGINE OIL LEVEL SENSOR (N52, N52K, N51, N46, N54, N53)

IMPORTANT: Read and comply with 61 35 ... NOTES ON ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks:

- Switch off ignition
- E60 / E63 / E64 / E83 / E85 / E86 / E70 only: Remove reinforcement plate, see **31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE** .
- E81 / E87 / E90 / E91 / E92 / E93 only: Remove underbody protection
- Drain off engine oil

Unlock plug (1) and remove.

Unscrew nuts.

Tightening torque: 12 61 2AZ, see **12 61 ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY** .

Remove oil level sensor (2).

Installation:

Clean sealing face on oil sump.

Replace seal on oil level sensor.

An excessively low torque value will result in oil leaks.

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

Top up engine oil.

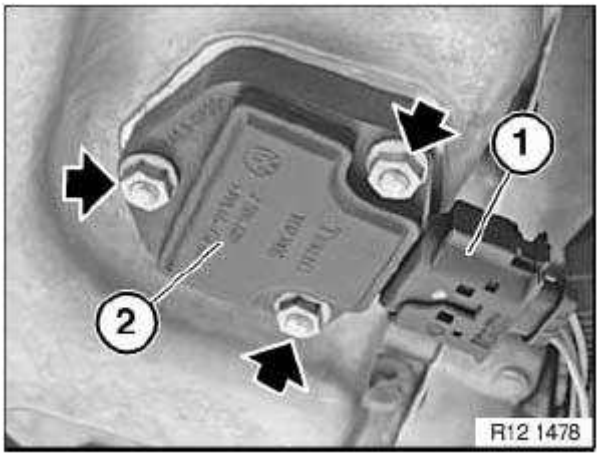


Fig. 44: Oil Level Sensor And Plug
Courtesy of BMW OF NORTH AMERICA, INC.

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