ENGINE

Engine - Repair Instructions - 128i

ENGINE GENERAL

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct:

- Pour oil only into appropriately marked containers
- Do **not** pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures:

- Do not induce vomiting.

  If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

  If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct:

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations

First aid measures:

- **Eye contact** : Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- **Skin contact:** Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

WARNING: DANGER OF POISONING if oil is ingested/absorbed through the skin! RISK OF INJURY if oil comes into contact with eyes and skin!

Recycling:

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released:

- **Personal precautionary measures:** Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- **Environmental protection measures:** Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- **Limiting spread:** Use oil blocks to prevent the surface spread of oil.
- **Cleaning procedure:** Bind and dispose of escaped oil with nonflammable absorbents.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

11 00 REMOVING AND INSTALLING/REPLACING ACOUSTIC COVER (N52/N52K)

IMPORTANT: Aluminum-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) .

Unfasten screws (1 and 3).

If necessary, release oil cap (2) in direction of arrow.

Lift off acoustic cover (4)

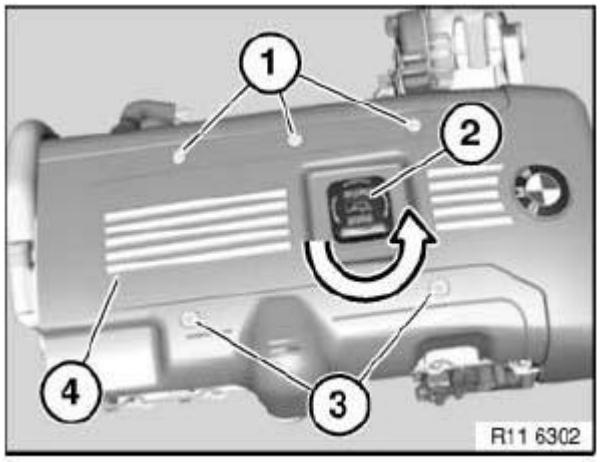

Fig. 1: Releasing Oil Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

- Remove microfilter housing. See **64 31 092 REMOVING AND INSTALLING/REPLACING MICROFILTER HOUSING (LOWER SECTION)** .
- Remove tension strut.

Release screws.

Tightening torque. See 11 12 7AZ in **CYLINDER HEAD WITH COVER** .

Remove acoustic cover.

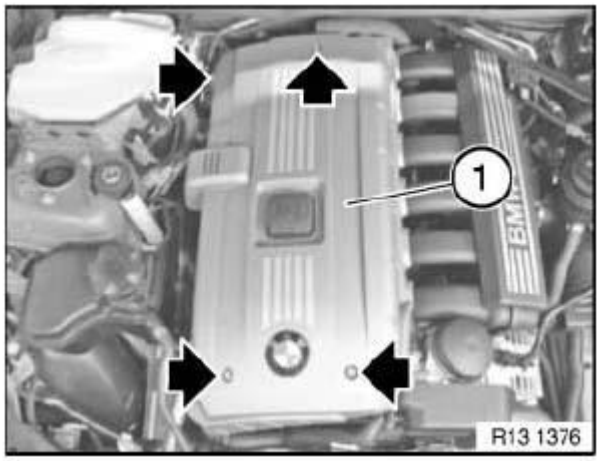

Fig. 2: Locating Acoustic Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of improved clarity, illustration and descriptions shows wiring harness and tension strut removed.

11 00... ENGINE OIL SERVICE (N52K)

Special tools required:

- **11 9 040** . See **Fig. 3**.

WARNING: Danger of scalding!

Carry out work on the vehicle only when wearing oil- and heat-resistant protective gloves incl. forearm protection, face guard and protective apron.

IMPORTANT: Carry out the engine oil service only when the engine is at normal operating temperature.

Observe the exact engine oil filling capacity.

Overfilling the engine with engine oil will result in engine damage.

Checking and drop-off times (at least 10 minutes) must be observed.

IMPORTANT: Risk of damage!

Protect belt drive against dirt.

Cover with suitable materials.

Recycling:

Catch and dispose of drained engine oil in a suitable container. Observe country-specific waste-disposal regulations.

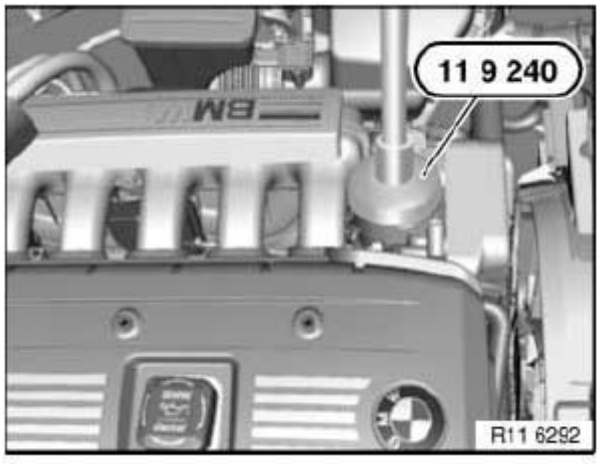

Fig. 3: Special Tool (11 9 240) And Engine Oil Filter Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Release oil filter cap with special tool **11 9 240** .

Tightening torque. See 11 42 1AZ in **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

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

NOTE: Presentation: without underbody protection.

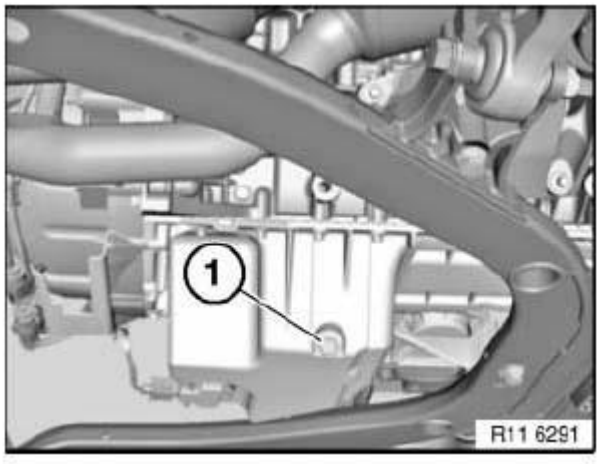

Fig. 4: Identifying Engine Oil Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip service opening on underbody protection.

Remove screw plug (1) from oil sump and drain engine oil.

Tightening torque. See 11 13 1AZ in **OIL SUMP** .

Installation:

Replace sealing ring.

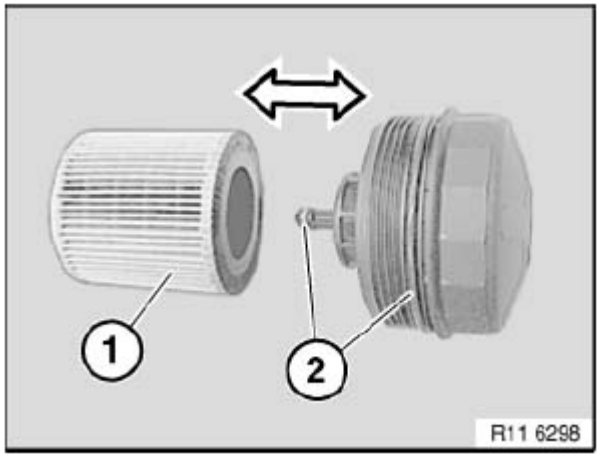

Fig. 5: Identifying Oil Filter Element And Sealing Rings
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

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

NOTE: Moisten sealing rings (2) with engine oil.

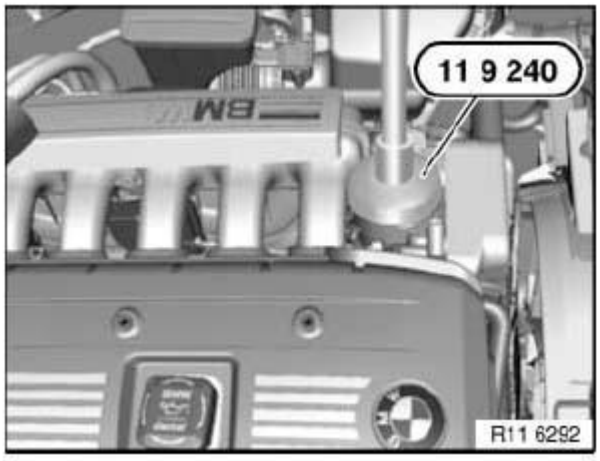

Fig. 6: Identifying Special Tool (11 9 240)
Courtesy of BMW OF NORTH AMERICA, INC.

Secure oil filter cap with special tool 11 9 240.

Tightening torque. See 11 42 1AZ in **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

Pour in engine oil.

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

Turn off engine.

Check oil filter cap and screw plug 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 00 050 REMOVING AND INSTALLING ENGINE (N52K)

Special tools required:

- **11 0 020** . See **00 0 020 SPECIAL TOOL BOARD II COMPLETE** .

IMPORTANT: Aluminum-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:

- Lift engine hood into **assembly position** . See **51 00... SERVICE POSITION OF ENGINE HOOD/BONNET** .
- Remove exhaust system. See **18 00 020 REMOVING AND INSTALLING/REPLACING COMPLETE EXHAUST SYSTEM (N52/N52K/N51)** .
- Remove transmission. See **23 00 017 REMOVING AND INSTALLING TRANSMISSION (GS6-17BZ) N51/N52/N52K/N53** or **24 00 032 REMOVING AND INSTALLING AUTOMATIC TRANSMISSION (GA6L45R)** .
- Drain engine oil. See **11 00... ENGINE OIL SERVICE (N52K)**.
- Clamp off battery negative lead. See **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD** .
- Remove intake filter housing. See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52/N52K/N53)** .
- Remove fan cowl with electric fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N52/ N52K/ N53)** .
- Remove radiator. See **17 11 000 REMOVING AND INSTALLING RADIATOR (N43, N45, N46, N52, N52K, N53)** .
- Remove **water pump** . See **11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP (N52K)**.
- Remove coolant thermostat. See **11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N52K)**.
- Detach all coolant hoses from engine.
- Remove left and right **fresh air duct** . See **51 13 115 REMOVING AND INSTALLING/REPLACING COWL PANEL COVER** .
- Remove microfilter housing. See **64 31 092 REMOVING AND INSTALLING/REPLACING MICROFILTER HOUSING (LOWER SECTION)** .
- Remove intake air manifold. See **11 61 050 REMOVING AND INSTALLING AIR INTAKE MANIFOLD (N52K)**.
- Detach vacuum line from brake booster. See **34 33 071 REPLACING VACUUM HOSE FOR BRAKE BOOSTER (N52 ON BRAKE BOOSTER)** .
- Unfasten ignition wiring harness and lay to one side. See **12 51 100 REPLACING WIRING HARNESS SECTION FOR IGNITION COIL (N52K, N51)** .
- Unfasten engine wiring harness and lay to one side. See **12 51 001 REPLACING WIRING HARNESS SECTION FOR ENGINE (N52K, N51)** .
- Remove fuel injector rail and place to one side. See **13 53 240 REPLACING COMPLETE**

INJECTION PIPE (N52/N52K) .

Release air-conditioning compressor (1) and set down on front axle carrier. See **Fig. 7**.

NOTE: E60/E61 only.

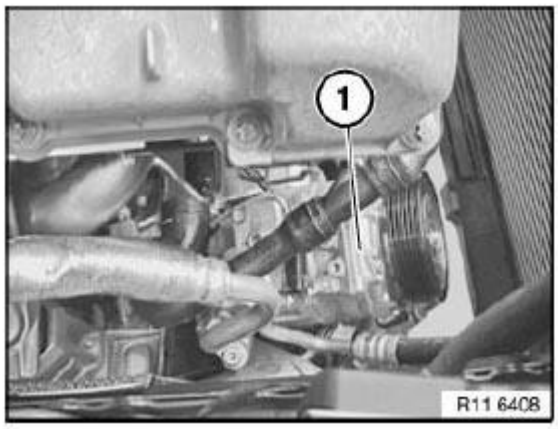

Fig. 7: Identifying Air Conditioning Compressor
Courtesy of BMW OF NORTH AMERICA, INC.

Release power steering pump (1) and set down on front axle carrier. See **Fig. 8**.

NOTE: Do not disconnect hydraulic lines.

NOTE: For vehicles with optional equipment SA229 (Dynamic Drive), bracket must be released.

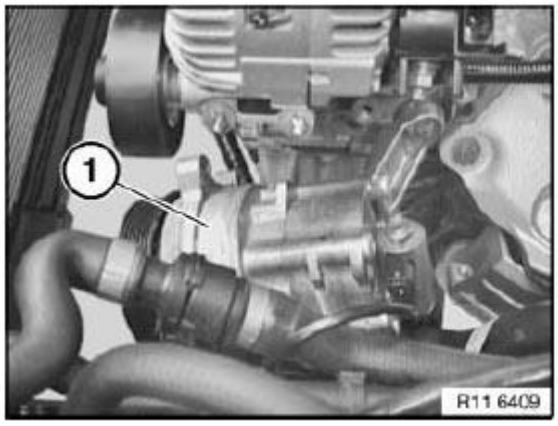

Fig. 8: Identifying Power Steering Pump
Courtesy of BMW OF NORTH AMERICA, INC.

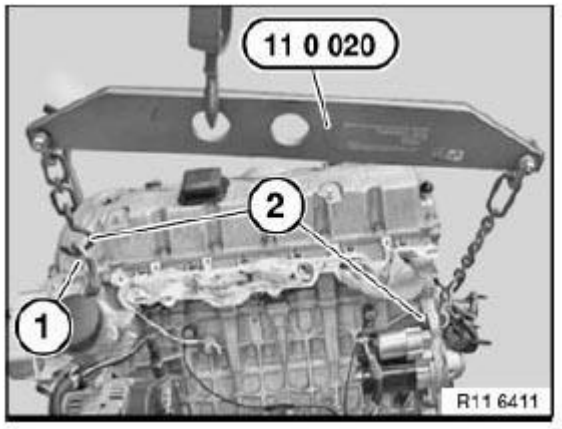

Fig. 9: Identifying Special Tool 11 0 020
Courtesy of BMW OF NORTH AMERICA, INC.

Screw towing eye (1) into cylinder head.

Tightening torque. See 11 12 9AZ in **CYLINDER HEAD WITH COVER** .

Suspend special tool **11 0 020** from engine crane.

Suspend special tool **11 0 020** from the designated mounting eyelets (2) only.

Lift engine out with engine crane.

NOTE: For vehicles with optional equipment SA205 (automatic transmission), engine must be raised approx. 10 cm.

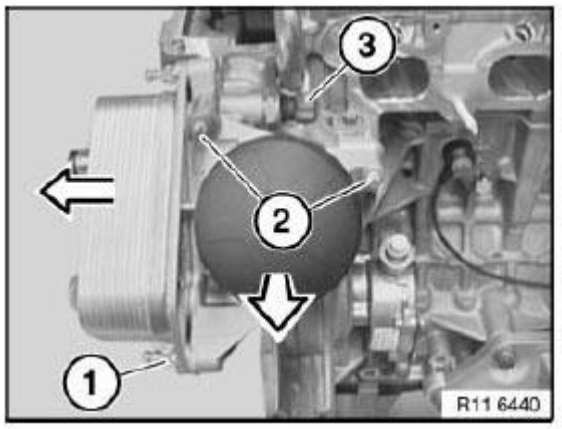

Fig. 10: Releasing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1).

Remove lines (2) with oil-water heat exchanger in direction of arrow.

Assemble engine.

Check function of DME.

11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52)

Special tools required:

For the following special tools, refer to **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS -- 128I** .

- **00 0 200**
- **00 0 202**
- **00 0 204**
- **00 0 208**

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 0 000**

WARNING: Risk 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** .
- Remove **cowl panel cover** . See **51 13 115 REMOVING AND INSTALLING/REPLACING COWL PANEL COVER** .
- Remove **intake filter housing** . See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52/N52K/N53)** .
- Remove both **tension struts from spring strut dome** . See **51 71 371 REMOVING AND INSTALLING/REPLACING TENSION STRUT ON LEFT OR RIGHT SPRING STRUT DOME** .
- Remove acoustic cover
- Remove hose for crankshaft ventilation.

Release screws (1, 2).

Remove bulkhead (3).

Installation:

Make sure bulkhead is correctly seated.

M6x20 screw must be fitted in middle.

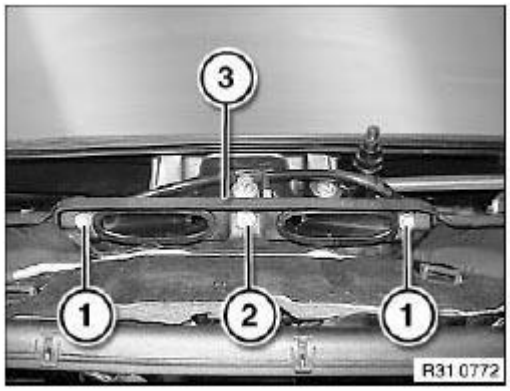

Fig. 11: Identifying Bulkhead Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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

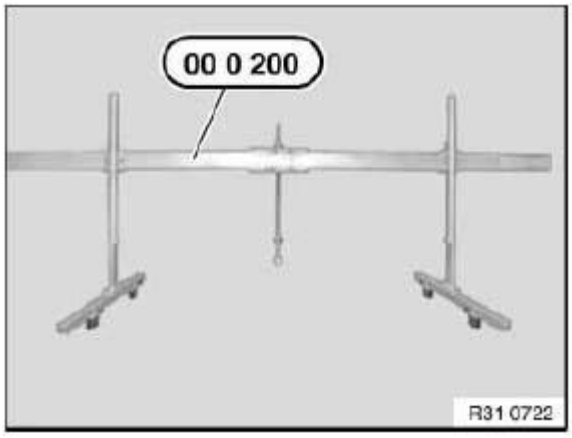

Fig. 12: Identifying Special Tool (00 0 200)
Courtesy of BMW OF NORTH AMERICA, INC.

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

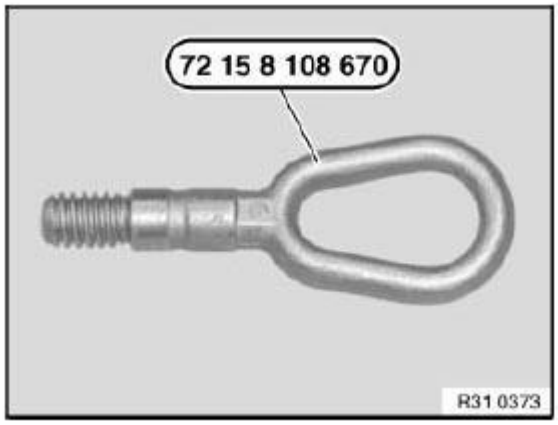

Fig. 13: Identifying Special Tool (72 15 8 108 670)
Courtesy of BMW OF NORTH AMERICA, INC.

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 (2), place cross member 00 0 200 on the screw connections of the side panels.

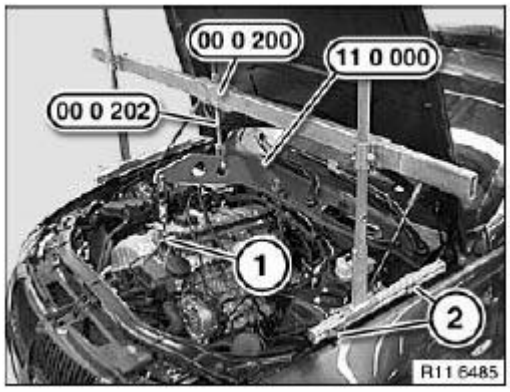

Fig. 14: Identifying Special Tool (00 0 202, 00 0 200 And 11 0 000)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in towing hook (1) 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 (1) or engine lifting eye.

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

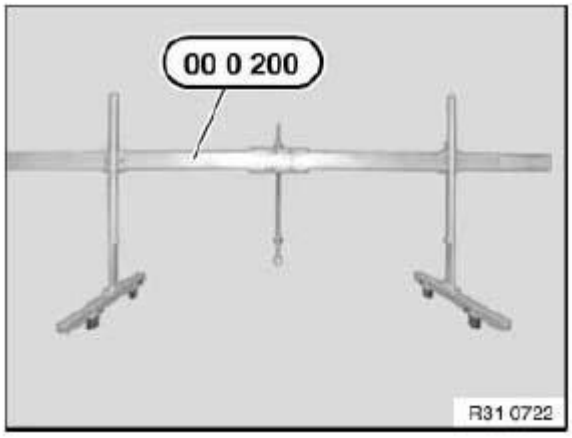

Fig. 15: Identifying Special Tool (00 0 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Raise engine approx. 10 mm with crossmember.

Installation:

Replace self-locking nuts.

Tightening torque. See 22 11 2AZ in **22 11 ENGINE SUSPENSION** .

Check vacuum lines of engine mounts for correct position and connection.

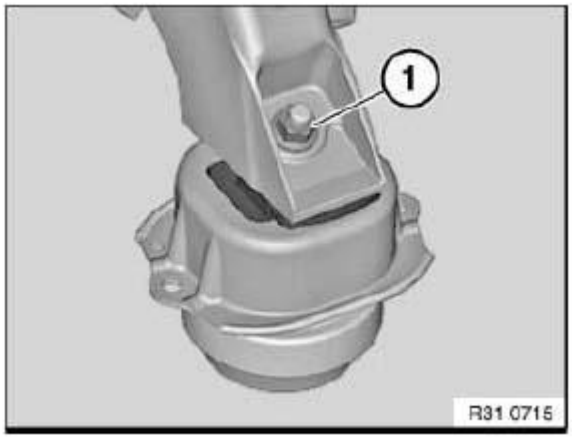

Fig. 16: Identifying Crossmember Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE IDENTIFICATION

Drive in engine numbers at marked surface with impact tool.

M47 / M47TU / M47T2

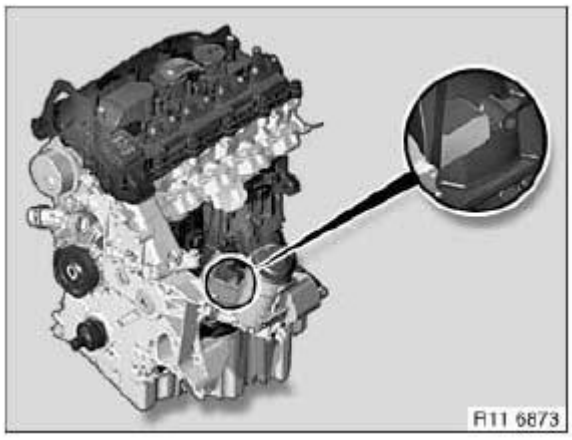

Fig. 17: Identifying Engine Identification Numbers Location (M47/M47TU/M47T2)
Courtesy of BMW OF NORTH AMERICA, INC.

M57 / M57TU / M57T2

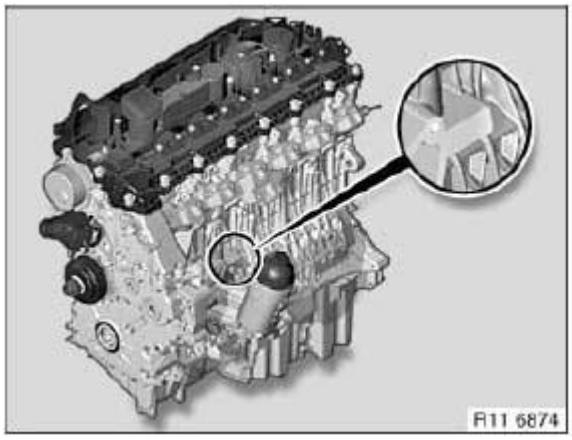

Fig. 18: Identifying Engine Identification Numbers Location (M57 / M57TU / M57T2)
Courtesy of BMW OF NORTH AMERICA, INC.

M67 / M67TU

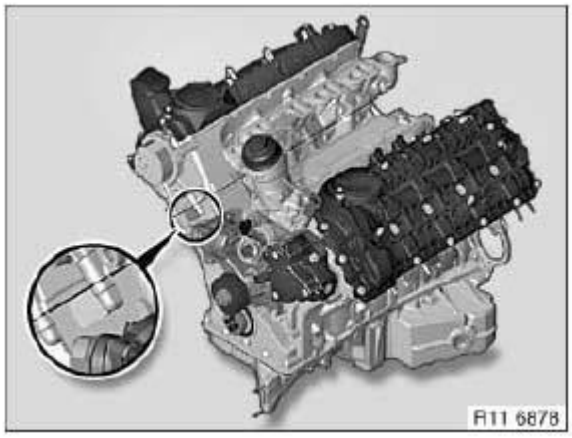

Fig. 19: Identifying Engine Identification Numbers Location (M67 / M67TU)
Courtesy of BMW OF NORTH AMERICA, INC.

N47 / N47S

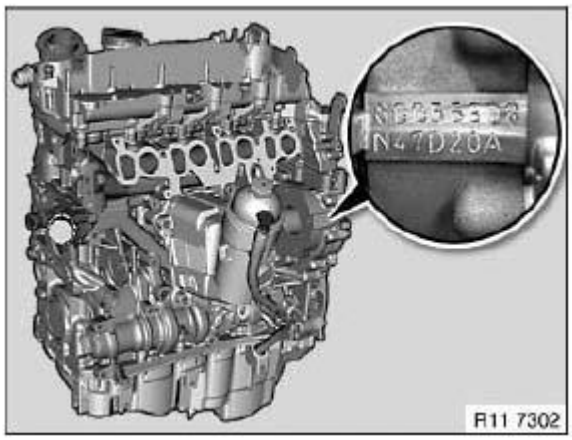

Fig. 20: Identifying Engine Identification Numbers Location (N47 / N47S)
Courtesy of BMW OF NORTH AMERICA, INC.

M52 / M52TU

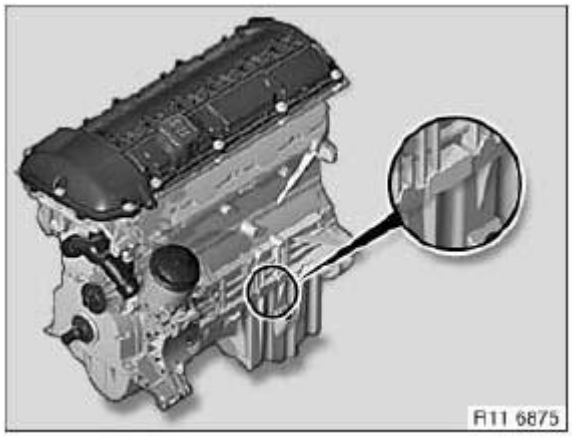

Fig. 21: Identifying Engine Identification Numbers Location (M52 / M52TU)
Courtesy of BMW OF NORTH AMERICA, INC.

M54

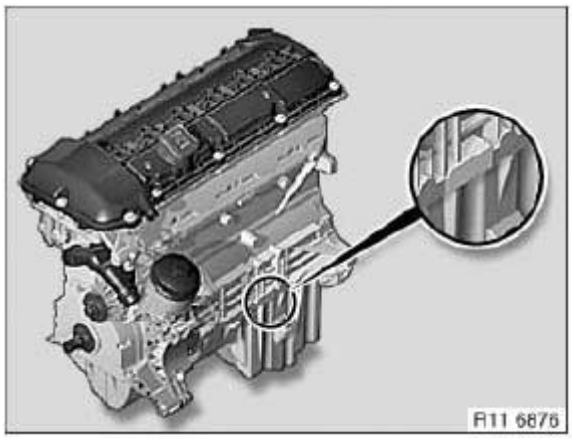

Fig. 22: Identifying Engine Identification Numbers Location (M54)
Courtesy of BMW OF NORTH AMERICA, INC.

M56

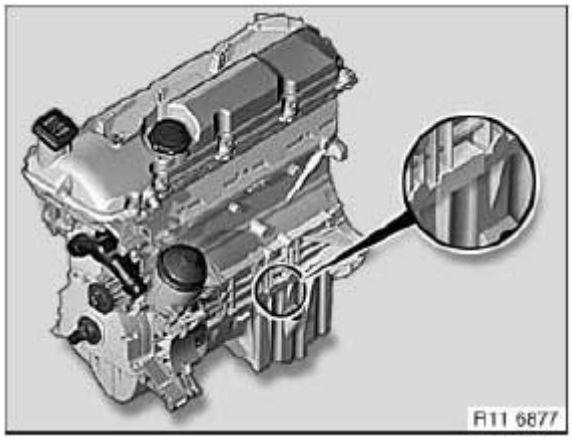

Fig. 23: Identifying Engine Identification Numbers Location (M56)
Courtesy of BMW OF NORTH AMERICA, INC.

N40 / N45 / N45T / N43

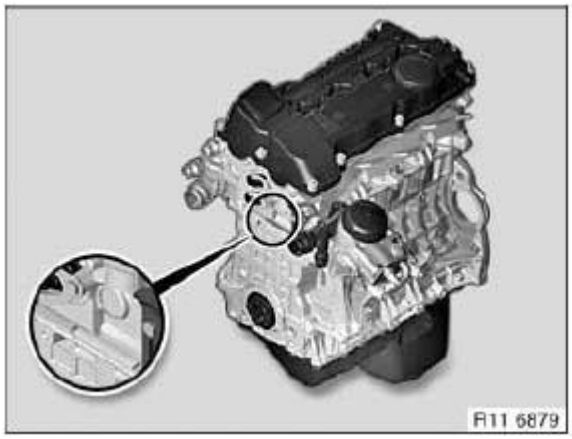

Fig. 24: Identifying Engine Identification Numbers Location (N42 / N46 / N46T)
Courtesy of BMW OF NORTH AMERICA, INC.

N42 / N46 / N46T

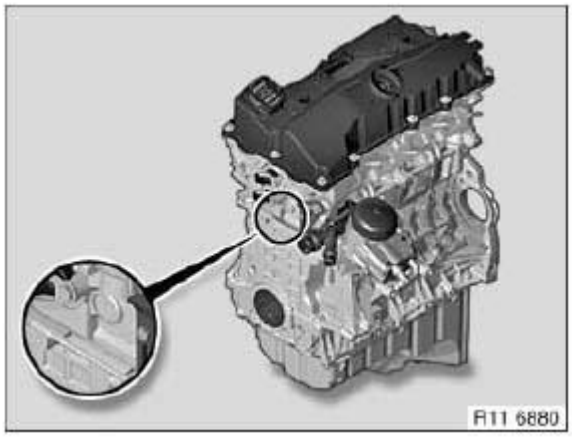

Fig. 25: Identifying Engine Identification Numbers Location (N42 / N46 / N46T)
Courtesy of BMW OF NORTH AMERICA, INC.

N51 / N52 / N52K / N53 / N54

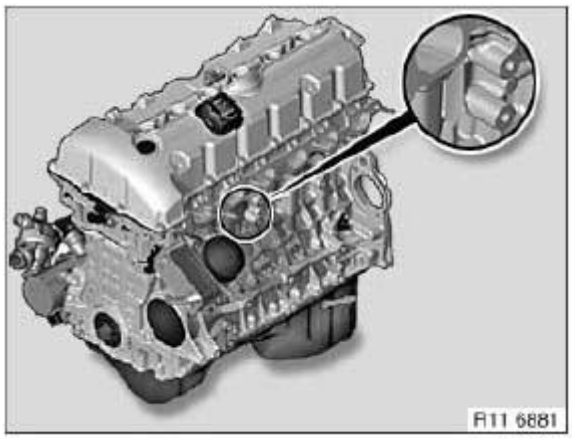

Fig. 26: Identifying Engine Identification Numbers Location (N51 / N52 / N52K / N53 / N54)
Courtesy of BMW OF NORTH AMERICA, INC.

N62

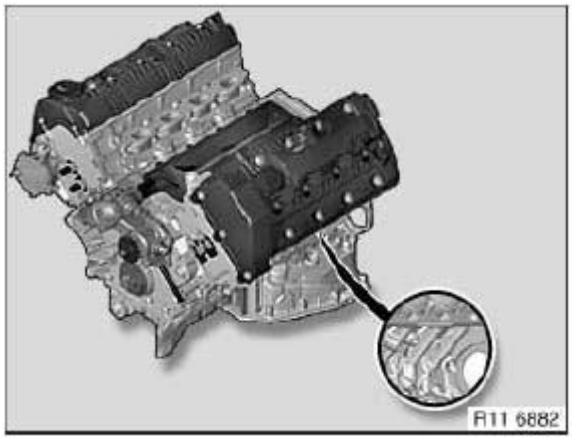

Fig. 27: Identifying Engine Identification Numbers Location (N62)
Courtesy of BMW OF NORTH AMERICA, INC.

N73

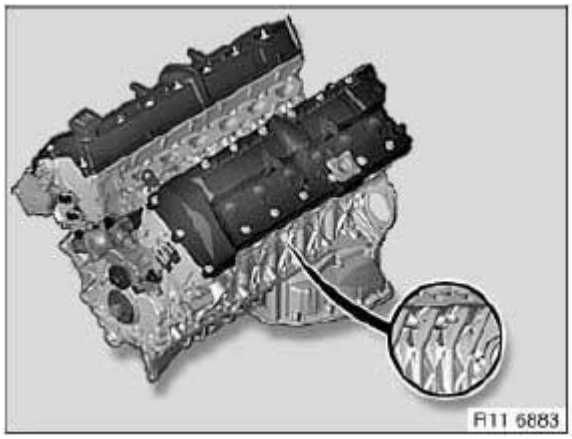

Fig. 28: Identifying Engine Identification Numbers Location (N73)
Courtesy of BMW OF NORTH AMERICA, INC.

S54

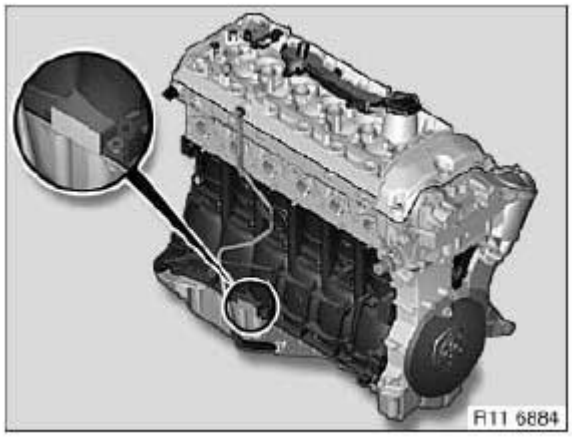

Fig. 29: Identifying Engine Identification Numbers Location (S54)
Courtesy of BMW OF NORTH AMERICA, INC.

S85 / S65

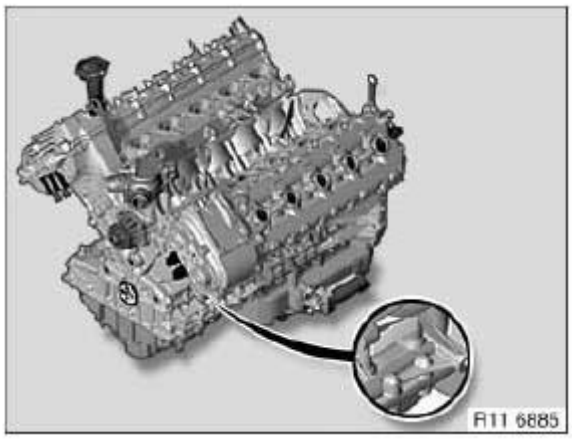

Fig. 30: Identifying Engine Identification Numbers Location (S85 / S65)
Courtesy of BMW OF NORTH AMERICA, INC.

W10 / W11

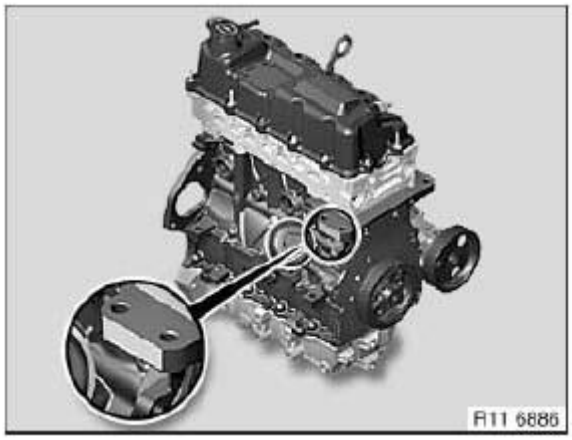

Fig. 31: Identifying Engine Identification Numbers Location (W10 / W11)
Courtesy of BMW OF NORTH AMERICA, INC.

W17

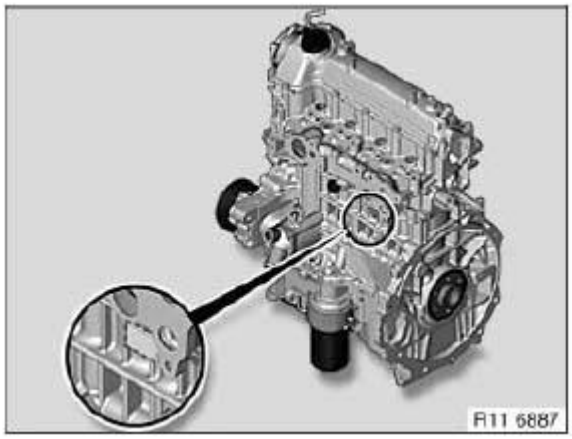

Fig. 32: Identifying Engine Identification Numbers Location (W17)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

MOUNTING ENGINE ON ASSEMBLY STAND (N52K)

Special tools required:

For the following special tools, refer to **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS -- 128I** .

- **00 1 450**

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 3 370**
- **11 4 440**
- **11 9 261**
- **11 9 265**

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

Necessary preliminary tasks:

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

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

CYLINDER HEAD WITH COVER

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

IMPORTANT: Aluminum-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 **tension strut** . See **51 71 371 REMOVING AND INSTALLING/REPLACING TENSION STRUT ON LEFT OR RIGHT SPRING STRUT DOME** .
- Clamp off battery
- Release coolant expansion tank and place to one side
- Remove **acoustic cover**

NOTE: Illustrations feature the E91.

Detach sealing (1) from cowl panel.

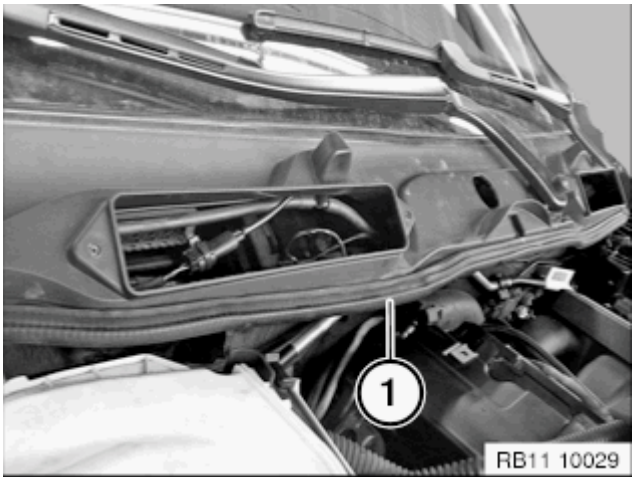

Fig. 33: Detach Sealing From Cowl Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1). Remove cover (2).

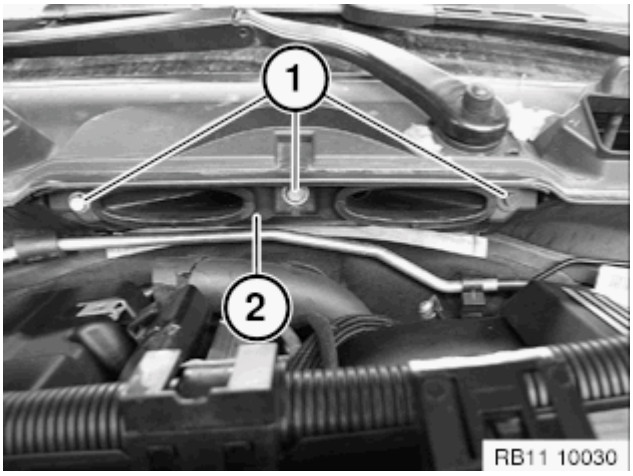

Fig. 34: Release Screws And Remove Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen nut (1).

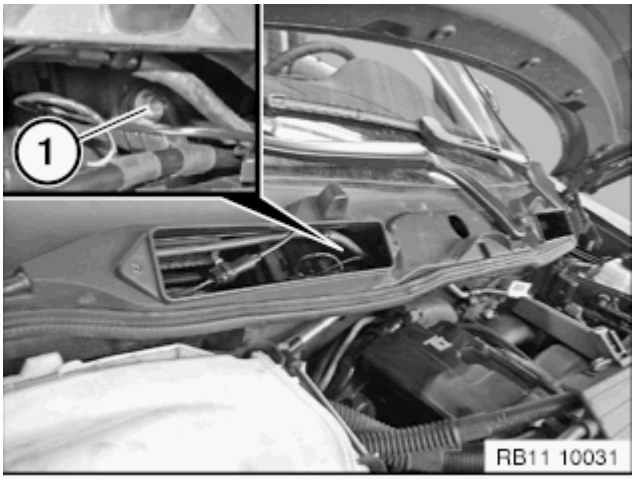

Fig. 35: Loosen Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Tape off engine compartment lid (1) with adhesive tape. Lift cover (2) in direction of arrow. Support cover with cloth (3). Release screw (4) of right cover.

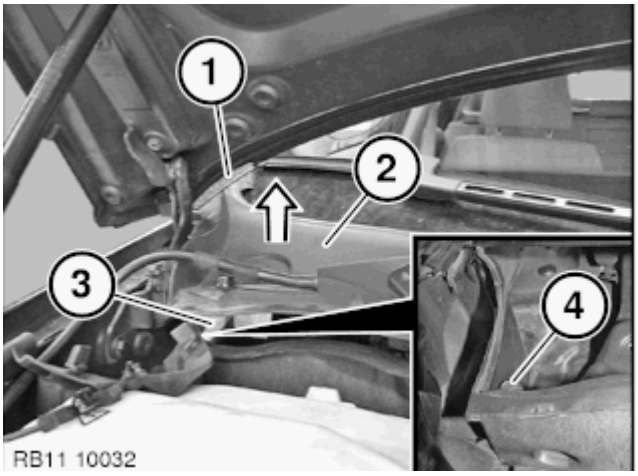

Fig. 36: Removing Right Cover Components
Courtesy of BMW OF NORTH AMERICA, INC.

Remove right cover (1). Remove electronics box cover. Release rubber gaskets (2) on wiring harness from electronics box. Tie up wiring harness (3) on engine compartment lid.

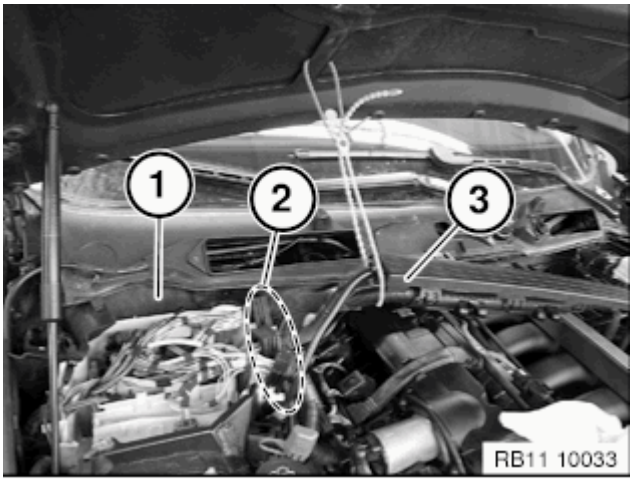

Fig. 37: Removing Right Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock connector (1) from coolant thermostat and detach. Unlock connector (2) on oil pressure switch and detach. Unlock connector (3) on coolant temperature sensor (3) and detach. Detach connector strip (4) from fuel injection pipe. Unclip oxygen sensor cable (5).

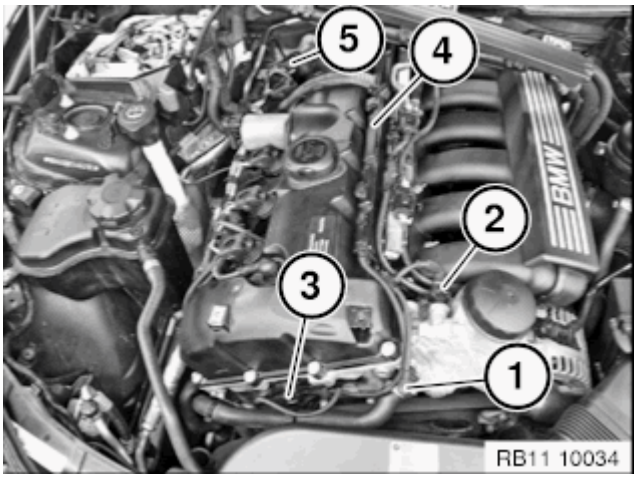

Fig. 38: Disconnecting Sensor Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Detach plug connection of VVT sensor (1). Release ground connections (2) on engine. Unlock connector (3) of eccentric shaft servomotor and detach.

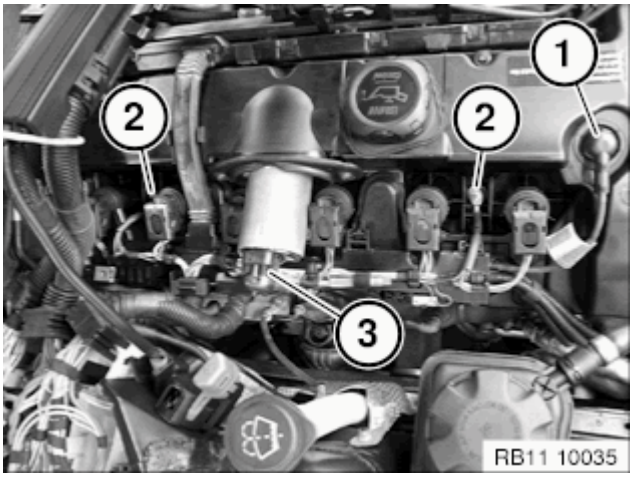

Fig. 39: Unlock Connector Of Eccentric Shaft Servomotor And Detach
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug connections (1) of ignition coils and detach. Unlock cable channel (2) of cylinder head cover and detach. Remove ignition coils.

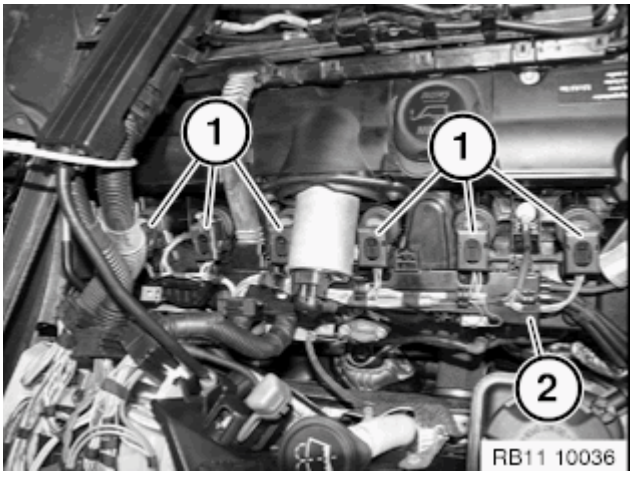

Fig. 40: Unlock Cable Channel Of Cylinder Head Cover And Detach
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach engine vent hose (1).

If necessary, pull off metal bracket (2) in direction of arrow.

Release screws (3) on electric servomotor. Remove servomotor (4).

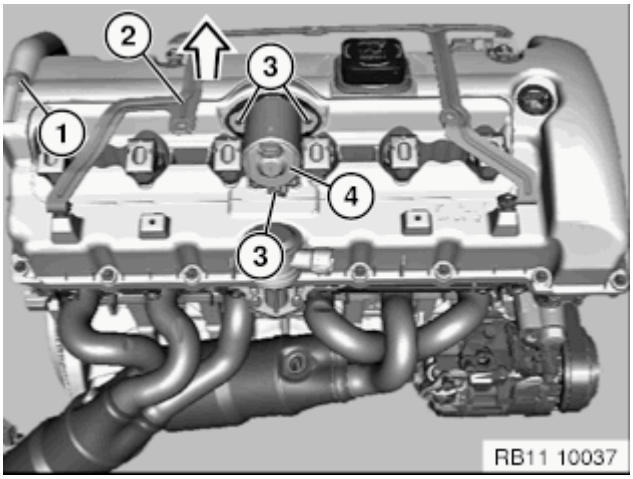

Fig. 41: Pulling Off Metal Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque. See 11 37 3AZ in **11 37 VARIABLE VALVE GEAR** .

IMPORTANT: Observe different screw lengths.

Unfasten screws (1) and threaded bolts (2).

Tightening torque. See 11 12 5AZ in **CYLINDER HEAD WITH COVER** .

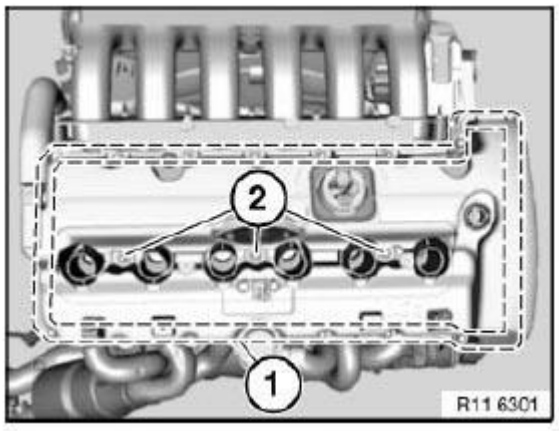

Fig. 42: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

Remove slotted sleeves (2).

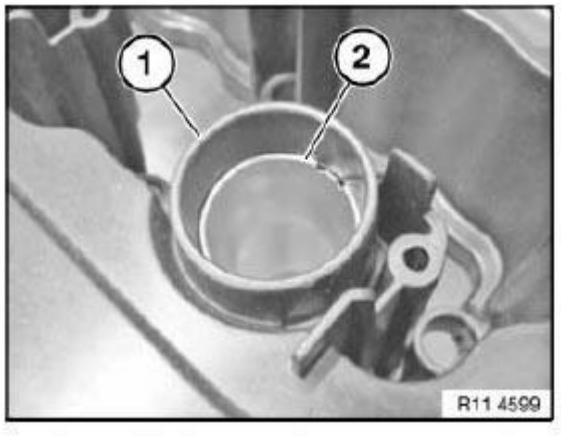

Fig. 43: Identifying Cylinder Head Cover And Slotted Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque. See 11 12 5AZ in **CYLINDER HEAD WITH COVER** .

Installation:

Clean all sealing faces (1 and 2).

IMPORTANT: Do not use any metal-cutting tools.

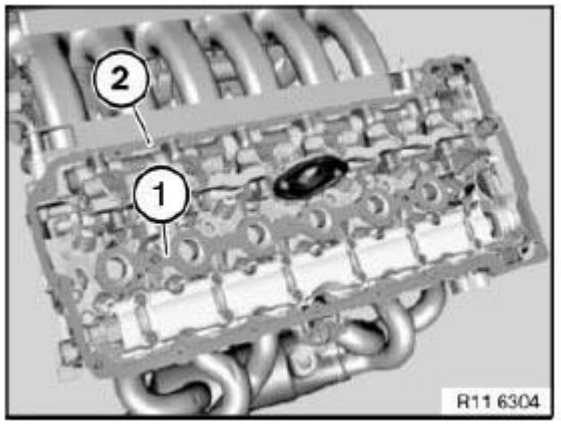

Fig. 44: Identifying Seal And Sealing Faces
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace gaskets (1 and 2).

Assemble engine.

11 12 100 REMOVING AND INSTALLING CYLINDER HEAD (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

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

IMPORTANT: Aluminum-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 **exhaust system** . See **EXHAUST SYSTEM COMPLETE** .
- Drain **coolant** . See **17 00 005 DRAINING AND ADDING COOLANT (N52, N52K, N51, N53)** .
- Drain off engine oil. See **11 00... ENGINE OIL SERVICE (N52K)**.
- Remove both **exhaust manifolds** . See **EXHAUST MANIFOLD WITH** .
- Remove **intake air manifold** . See **11 61 050 REMOVING AND INSTALLING AIR INTAKE MANIFOLD (N52K)**.
- Detach coolant hoses from cylinder head
- Remove **inlet and exhaust adjustment unit** . See **11 36 046 REMOVING AND INSTALLING/REPLACING INLET AND EXHAUST ADJUSTMENT UNITS (N52)**.

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 gear case, the crankshaft must no longer be rotated.
This would cause the timing chain on the crankshaft sprocket wheel to jam or jump.

Installation:

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

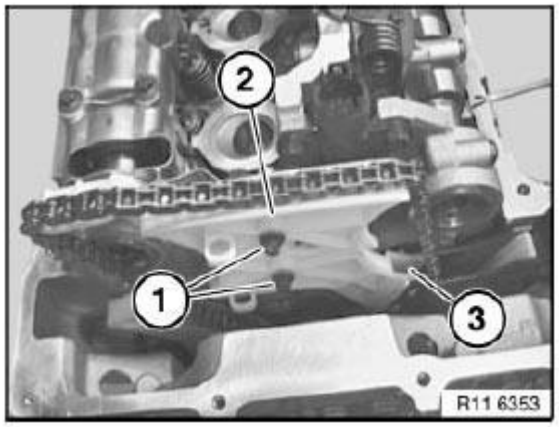

Fig. 45: Identifying Timing Chain Module At Junction With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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

Remove eccentric shaft sensor (1) towards front.

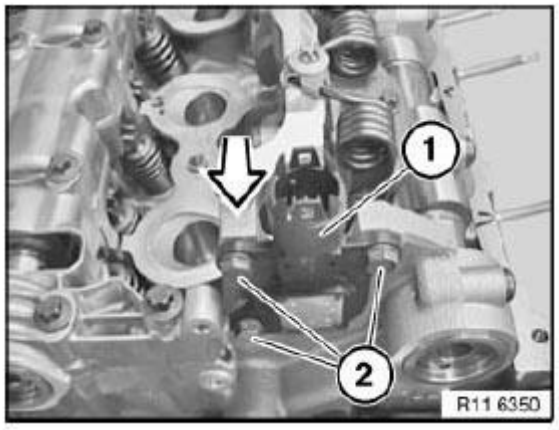

Fig. 46: Identifying Eccentric Shaft Sensor And Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

Release screw (1).

Remove magnet wheel (2) towards front.

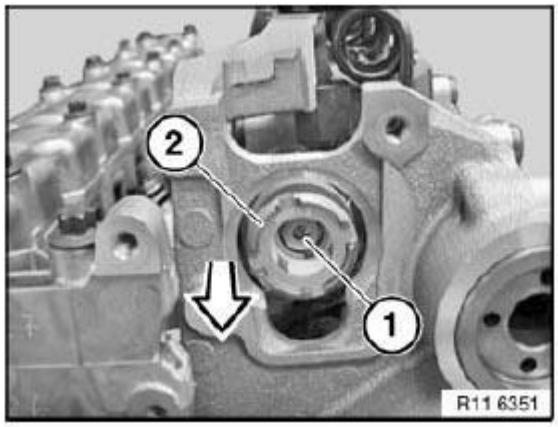

Fig. 47: Identifying Magnet Wheel And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

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.

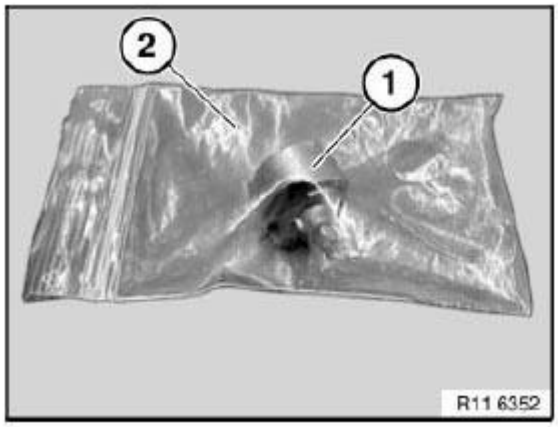

Fig. 48: Identifying Magnet Wheel In Plastic Bag
Courtesy of BMW OF NORTH AMERICA, INC.

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

Remove stop screw between 1st and 2nd cylinders.

Tightening torque. See 11 37 5AZ in **11 37 VARIABLE VALVE GEAR** .

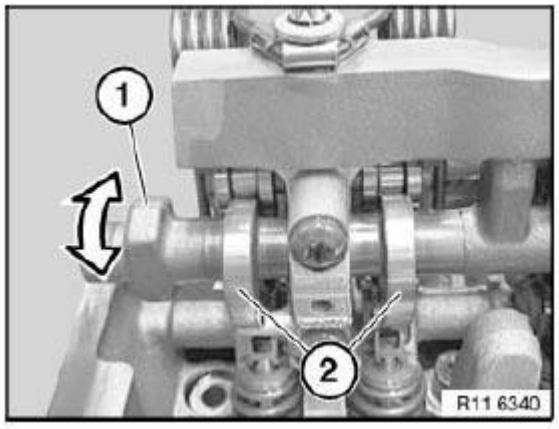

Fig. 49: Pretensioning Eccentric Shaft Upwards
Courtesy of BMW OF NORTH AMERICA, INC.

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.

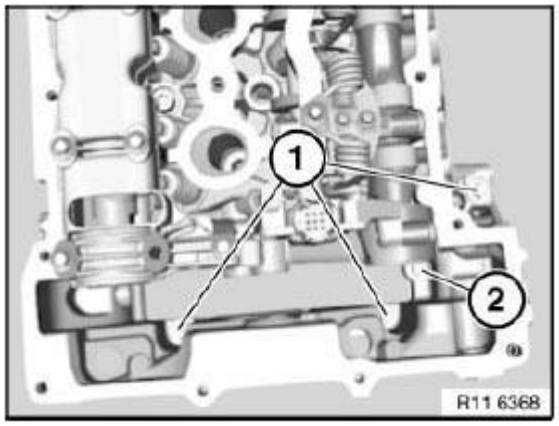

Fig. 50: [Identifying Timing Chain Module Bolt And Screw]
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (2).

Tightening torque. See 11 12 3AZ in **CYLINDER HEAD WITH COVER** .

Release screws (1).

Tightening torque. See 11 12 4AZ in **CYLINDER HEAD WITH COVER** .

Installation:

Replace aluminum screws.

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.

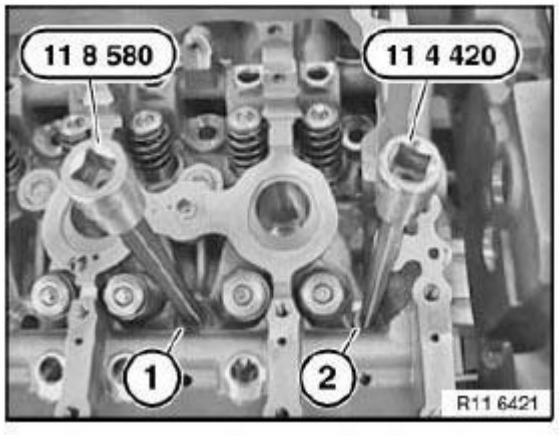

Fig. 51: Identifying Special Tool (11 8 580 And 11 4 420)
Courtesy of BMW OF NORTH AMERICA, INC.

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. See 11 12 2AZ in **CYLINDER HEAD WITH COVER** .

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

Tightening torque. See 11 12 1AZ in **CYLINDER HEAD WITH COVER** .

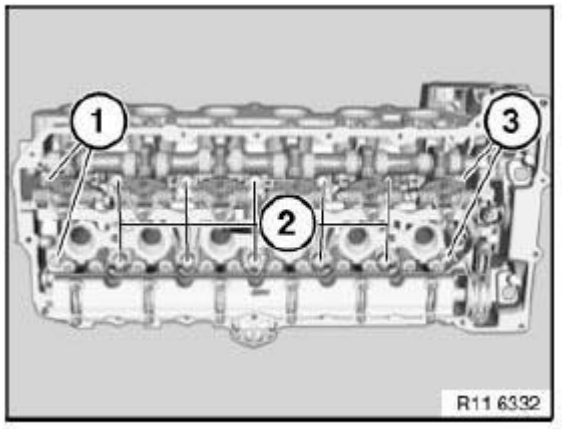

Fig. 52: Identifying M9 Cylinder Head Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: All cylinder head bolts (1, 2 and 3) must be replaced. Joining 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. See 11 12 5AZ in **CYLINDER HEAD WITH 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!

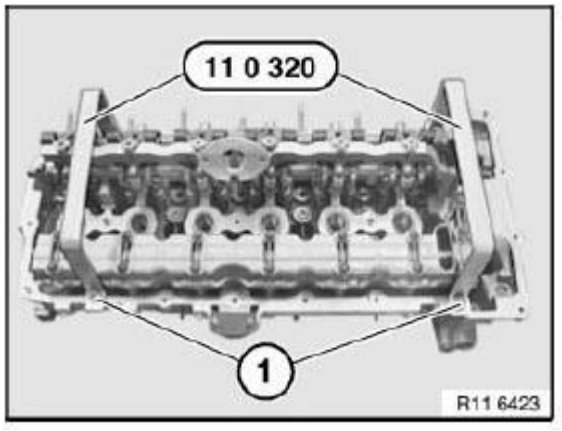

Fig. 53: Identifying Special Tool (11 0 320)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool **11 4 430** into bores.

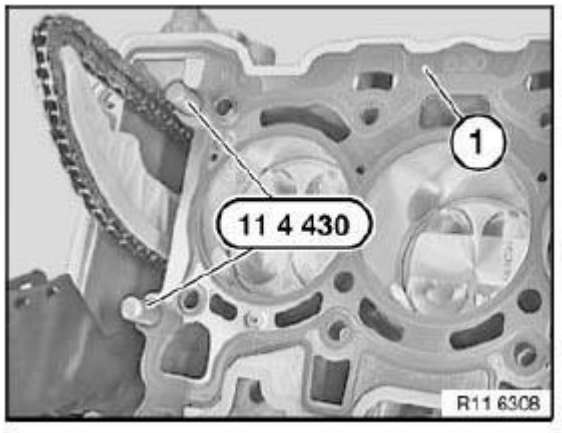

Fig. 54: Identifying Special Tool (11 4 430)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

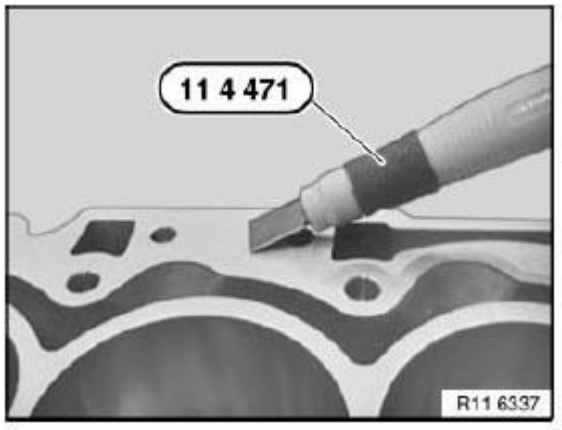

Fig. 55: Identifying Special Tool (11 4 471)
Courtesy of BMW OF NORTH AMERICA, INC.

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!

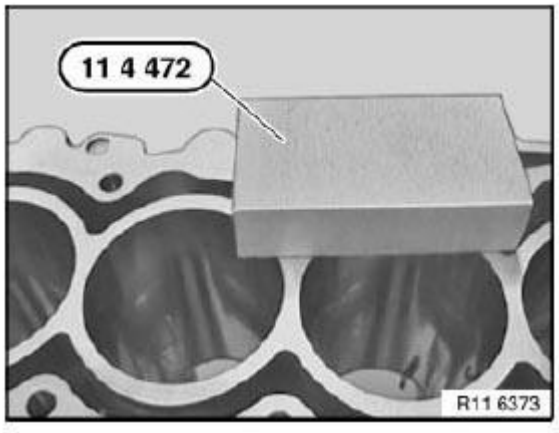

Fig. 56: Identifying Special Tool (11 4 472)
Courtesy of BMW OF NORTH AMERICA, INC.

There must be no fluids or contaminants in any of the threaded holes (1) for the cylinder head bolt connections. **Risk of cracking and corrosion!** - Clean all threaded holes.

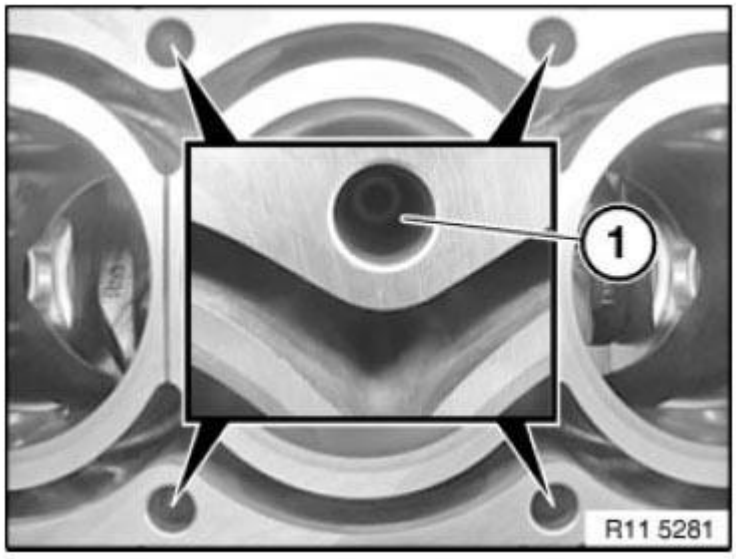

Fig. 57: Identifying Threaded Hole
Courtesy of BMW OF NORTH AMERICA, INC.

Replace **cylinder head gasket.** See **11 12 101 REPLACING CYLINDER HEAD GASKET (N52K)**.

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. See 11 12 1AZ in **CYLINDER HEAD WITH COVER** .

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

Tightening torque. See 11 12 2AZ in **CYLINDER HEAD WITH COVER** .

NOTE: Picture shows inlet and exhaust camshafts removed.

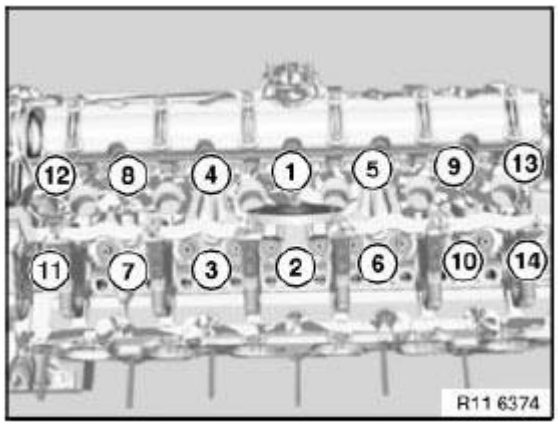

Fig. 58: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Observe sequence for tightening cylinder head bolts without fail.

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

Installation:

- **Tightening 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. See 11 12 4AZ in **CYLINDER HEAD WITH COVER** .

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

Insert bolt (2).

Tightening torque. See 11 12 3AZ in **CYLINDER HEAD WITH COVER** .

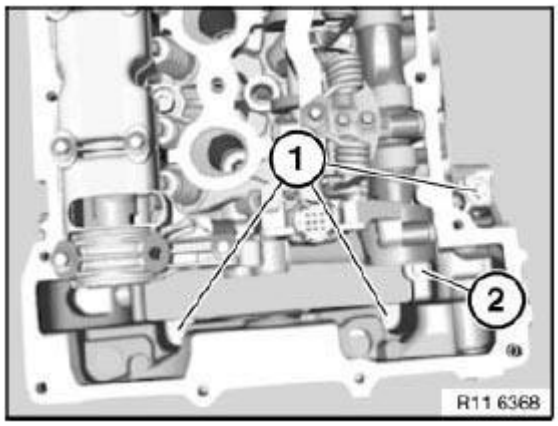

Fig. 59: Identifying Timing Chain Module Bolt And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace aluminum screws.

Assemble engine.

11 12 101 REPLACING CYLINDER HEAD GASKET (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 4 430**
- **11 4 470**

IMPORTANT: Aluminum-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 **cylinder head.** See **11 12 100 REMOVING AND INSTALLING CYLINDER HEAD (N52K)**.

Insert special tool **11 4 430** into bores.

Remove cylinder head seal.

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

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

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

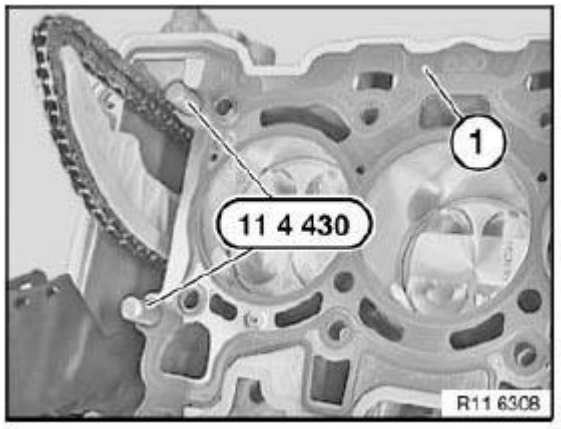

Fig. 60: Identifying Special Tool (11 4 430)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

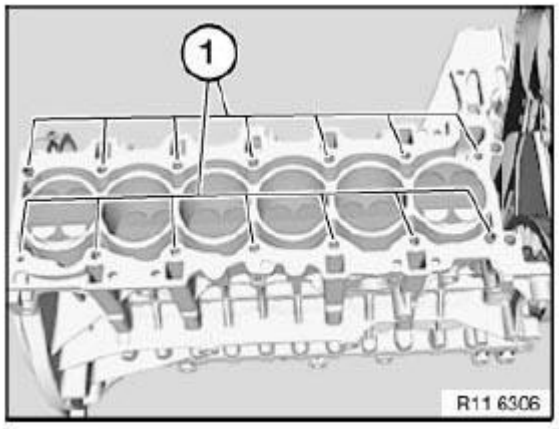

Fig. 61: Identifying Pocket Holes
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

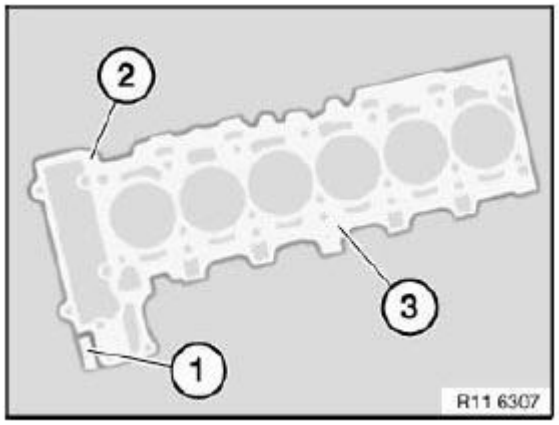

Fig. 62: Identifying Rubber Coating On Cylinder Head Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

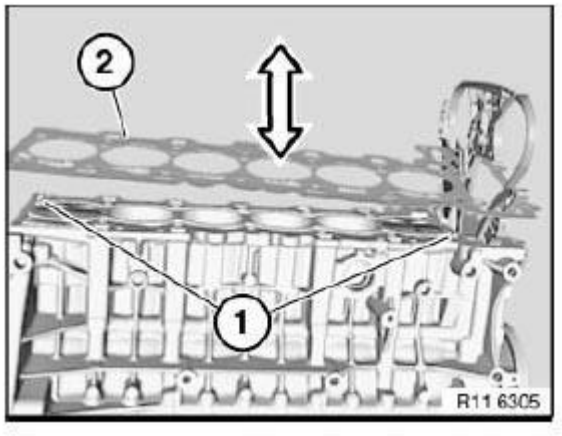

Fig. 63: Placing Cylinder Head Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check cylinder head for deviation from flatness. See 11 12 719 RESURFACING CYLINDER HEAD SEALING FACE (N52K). Check cylinder head for water leaks. See 11 12 729 CHECKING CYLINDER HEAD FOR WATER LEAKS (N52K).

Assemble engine.

11 12 719 RESURFACING CYLINDER HEAD SEALING FACE (N52K)

Necessary preliminary tasks:

- Remove **cylinder head** . See **11 12 100 REMOVING AND INSTALLING CYLINDER HEAD (N52K)**.
- Remove **exhaust camshaft.** See **11 31 028 REMOVING AND INSTALLING/REPLACING EXHAUST CAMSHAFT (N52K)**.
- Remove **intermediate lever** on inlet side. See **11 37 010 REMOVING AND INSTALLING/REPLACING INTERMEDIATE LEVERS (N52K)**.

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

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

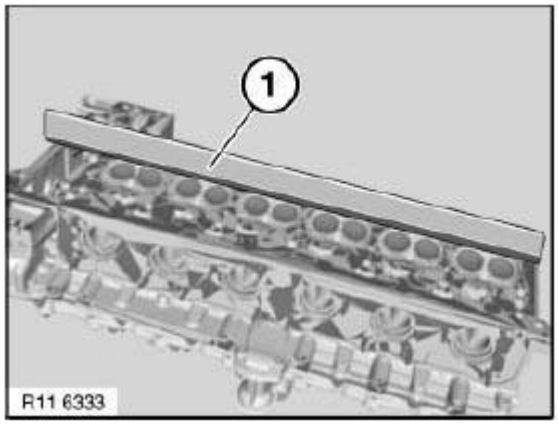

Fig. 64: Checking Evenness Of Cylinder Head Sealing Faces
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

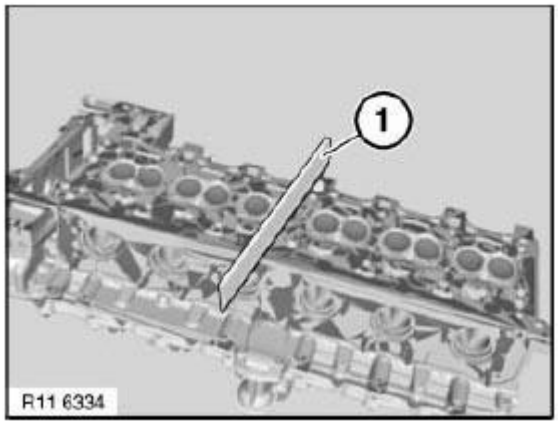

Fig. 65: Checking Evenness Of Cylinder Head Sealing Faces
Courtesy of BMW OF NORTH AMERICA, INC.

Check cylinder head for **water leaks.** See **11 12 729 CHECKING CYLINDER HEAD FOR WATER LEAKS (N52K)**.

Assemble engine.

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

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **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.

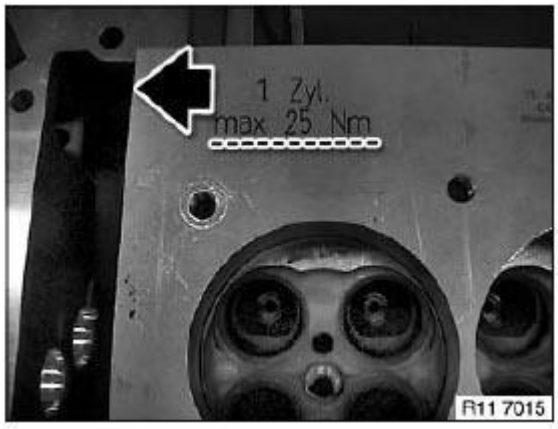

Fig. 66: Identifying Special Tool Securing Position
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

Cylinder no. 1 is marked.

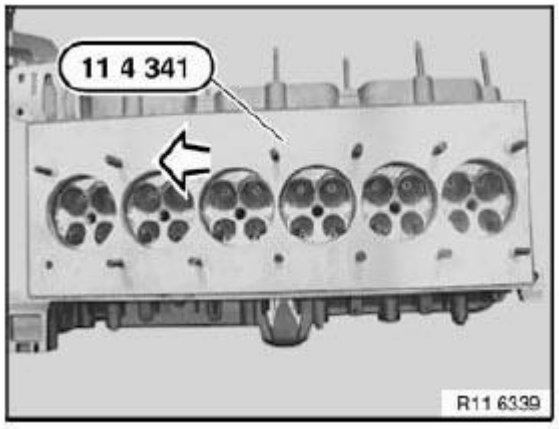

Fig. 67: Identifying Special Tool (11 4 341)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Sealing flange must rest flat.

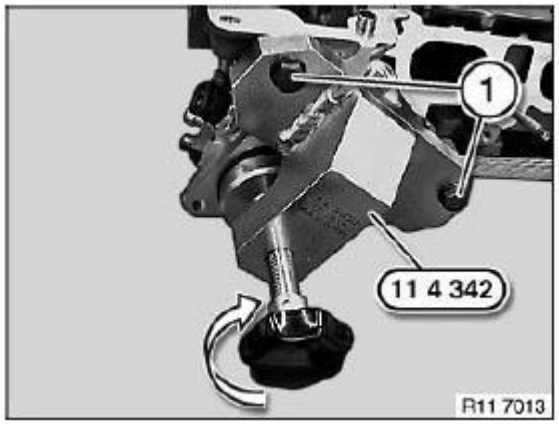

Fig. 68: Identifying Special Tool (11 4 342)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

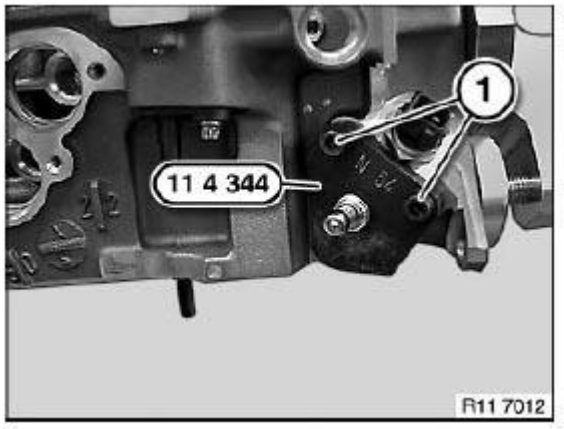

Fig. 69: Identifying Special Tool (11 4 344)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

OIL SUMP

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

IMPORTANT: Aluminum-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:

- Lower **front axle** . See **FRONT SUB FRAME** .
- Drain and add engine oil. See **11 00... ENGINE OIL SERVICE (N52K)**.

NOTE: The lines must be detached from the oil sump on vehicles with optional extra SA205 (automatic transmission); if necessary, detach oil pump and place to one side.

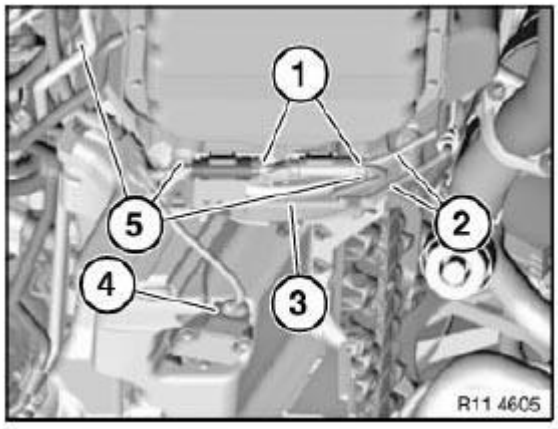

Fig. 70: Plug Connections, Holder, Electric Leads And Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Release bolts (5) on transmission.

Tightening torque. See 11 13 7AZ in **OIL SUMP** .

Lay holder (3) to one side.

Disconnect plug connection (4) on oil level sensor.

Detach return hose (2).

IMPORTANT: For vehicles with optional extra SA205 (automatic transmission), bolts of different lengths are installed for mounting the oil sump. Observe different tightening torques.

Release bolts along line (1).

For vehicles with optional extra SA205 (automatic transmission): Tightening torque. See 11 13 2 and 3AZ in **OIL SUMP** .

For vehicles without optional extra SA205 (automatic transmission): Tightening torque. See 11 13 5AZ in **OIL SUMP** .

Installation:

Replace aluminum screws .

If necessary, release bolts (4), remove oil level sensor.

Tightening torque. See 11 13 11AZ in **OIL SUMP** .

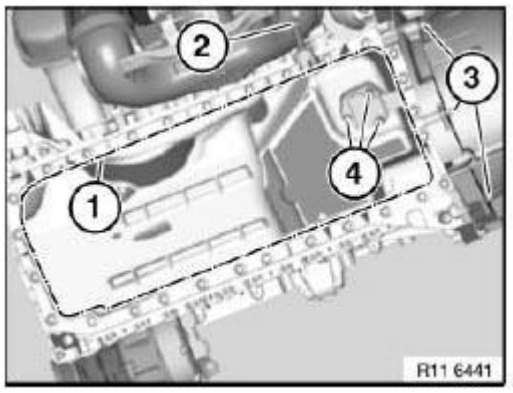

Fig. 71: Identifying Bolts On Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring.

IMPORTANT: There must be no adhesive residues in the lower crankcase retaining threads. Clean retaining threads and sealing faces.

Installation:

Replace all seals.

Assemble engine.

HOUSING COVER

11 14 005 REPLACING FRONT CRANKSHAFT SEAL (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 0 371**
- **11 0 372**
- **11 9 221**
- **11 9 222**
- **11 9 224**
- **11 9 231**
- **11 9 232**

- **11 9 233**
- **11 9 234**

Necessary preliminary tasks:

- Remove **vibration damper** . See **11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (N52K)**.

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

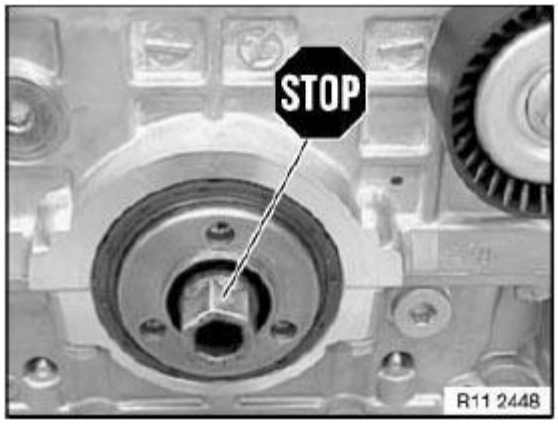

Fig. 72: Caution For - Do Not Release Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

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 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.

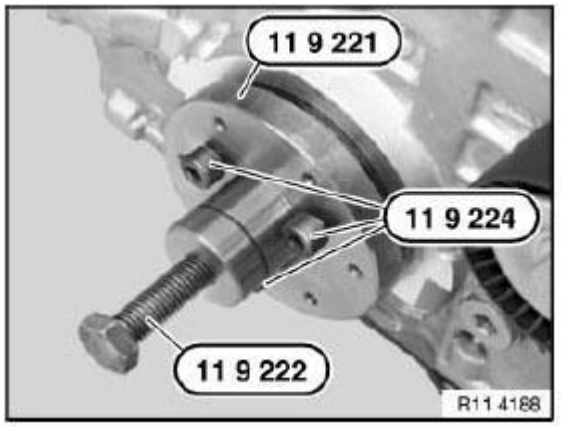

Fig. 73: Identifying Special Tool (11 9 221, 11 9 224 And 11 9 222)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool **11 0 371** to 80 Nm into crankshaft seal.

Screw in spindle **11 0 372.**

Release crankshaft seal from housing.

Repeat the operation several times if necessary.

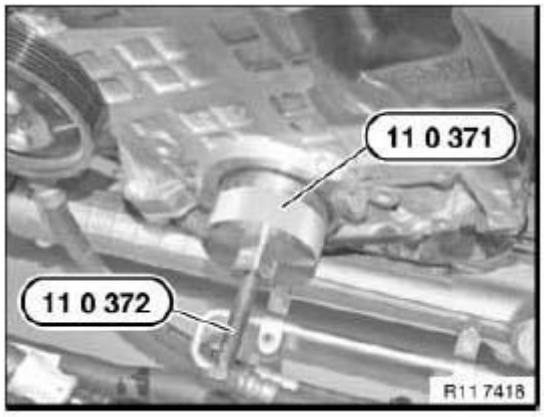

Fig. 74: Identifying Special Tool (11 0 372 And 11 0 371)
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully saw open crankshaft seal (1) at cutting line (2).

Remove crankshaft seal (1) from special tool **11 0 371.**

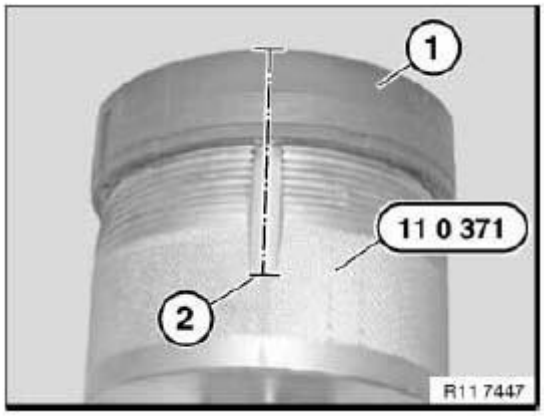

Fig. 75: Identifying Special Tool (11 0 371)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The following text describes installation and sealing between the engine block and crankshaft seal.
The engine block will not be leakproof at the outside of the crankshaft seal if you fail to comply with the individual work steps and the work sequence.

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 seal. Illustration N42.

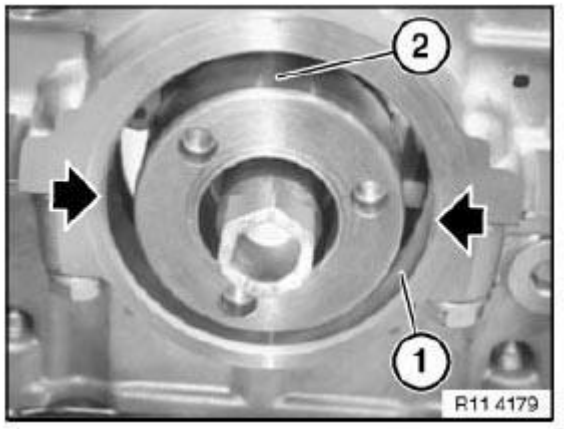

Fig. 76: Identifying Sealing Surface & Running Surface
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool **11 9 232** with screws (special tool **11 9 234**) to crankshaft.

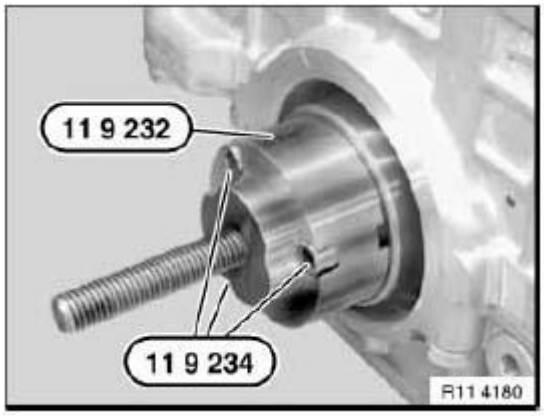

Fig. 77: Identifying Special Tool (11 9 232 And 11 9 234)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Support sleeve (1) is supplied with crankshaft seal (2).
When crankshaft seal (2) is installed, only support sleeve (1) may be used as a slip sleeve.
Crankshaft seal (2) has a groove on both left and right sides.

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

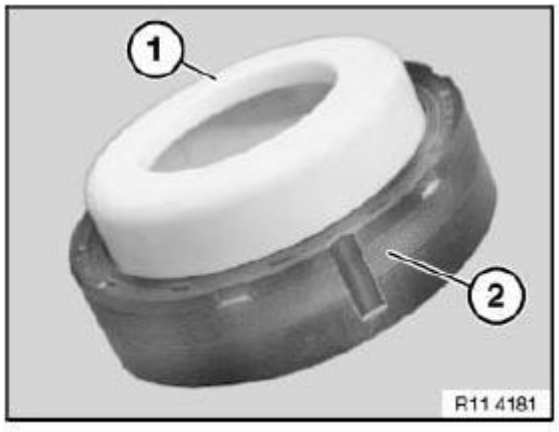

Fig. 78: Identifying Sleeve And Crankshaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The required parts are available from the BMW Parts Service (Electronic Parts Catalogue 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.

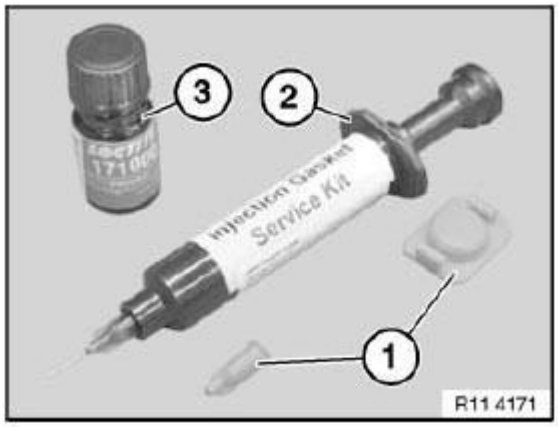

Fig. 79: Identifying Screw Cap, Injector And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

Push support sleeve (1) with crankshaft seal (2) onto special tool **11 9 232.**

IMPORTANT: Support sleeve (1) remains on special tool 11 9 232 , until crankshaft seal is drawn in.

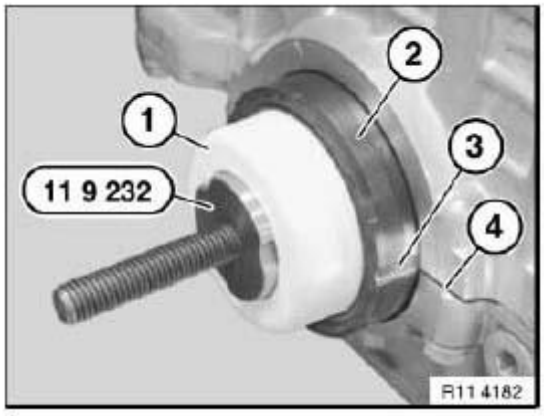

Fig. 80: Identifying Sleeve, Crankshaft Seal, Groove And Housing Partition With Special Tool (11 9 232)
Courtesy of BMW OF NORTH AMERICA, INC.

Align groove (3) centrally to housing partition (4).

Coat both grooves (3) on crankshaft seal (2) with Loctite primer, manufacturer's number 171000, and expose to air for approx. one minute.

Draw in crankshaft seal with special tool **11 9 231** in conjunction with special tool **11 9 233** until flush.

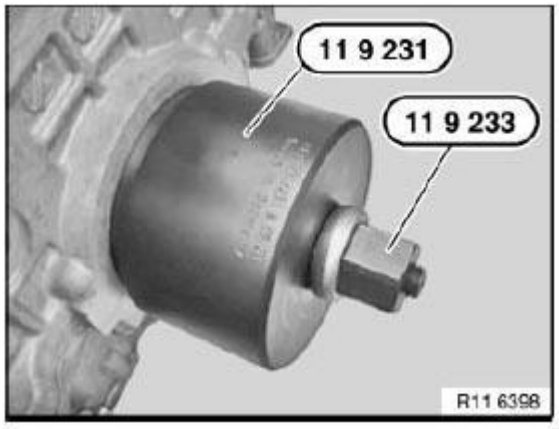

Fig. 81: Identifying Special Tool (11 9 231 And 11 9 233)
Courtesy of BMW OF NORTH AMERICA, INC.

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 seal in order to coat housing partition on engine block.

Illustration N42.

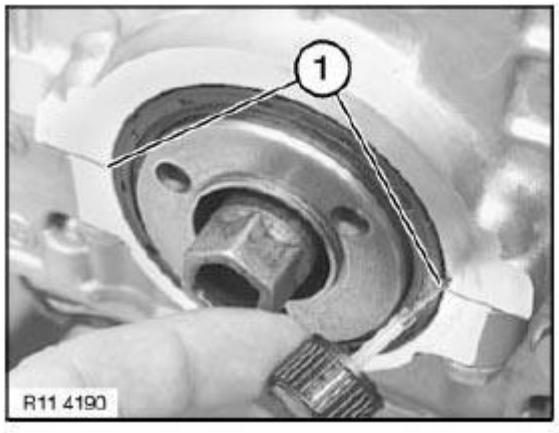

Fig. 82: Inserting Brush Into Grooves On Crankshaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Using injector (2), fill both grooves (3) flush with Loctite sealing compound, manufacturer's number 128357.

Illustration N42.

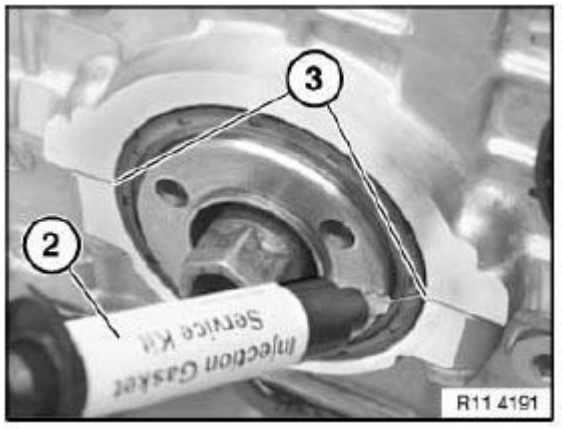

Fig. 83: Inserting Injector Into Grooves
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Illustration N42.

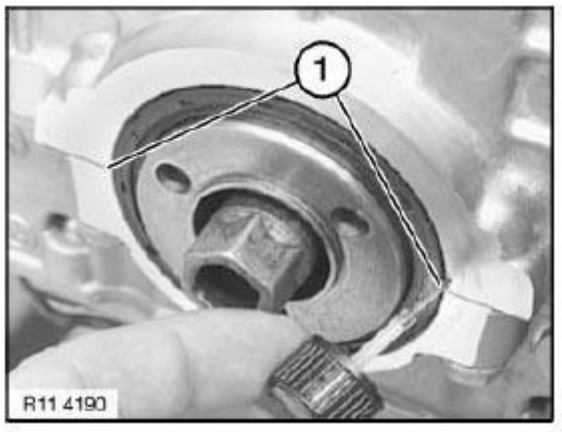

Fig. 84: Inserting Brush Into Grooves On Crankshaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 010 REPLACING SEALING COVER FOR VACUUM PUMP (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 4 361**
- **11 4 362**
- **11 4 363**
- **11 4 364**
- **11 9 200**

Necessary preliminary tasks:

- Remove **fan cowl** with electric fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N52/ N52K/ N53)** .
- Remove alternator **drive belt** . See **11 28 010 REPLACING ALTERNATOR DRIVE BELT (N52K)**.
- Remove **drive belt tensioner** . See **11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N52)**.

NOTE: For purposes of clarity, graphics show alternator and power steering pump removed.

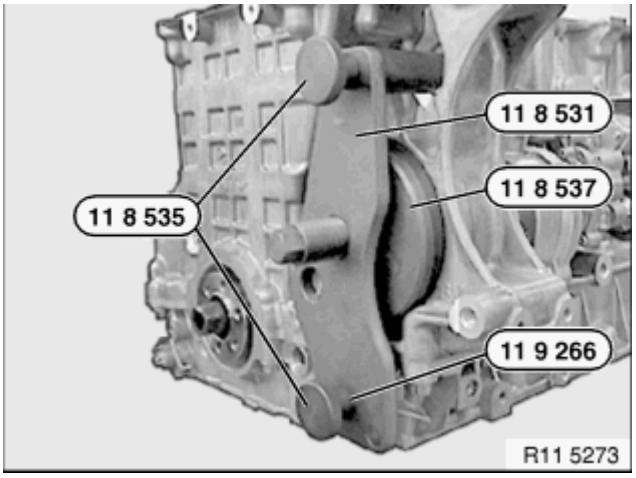

Fig. 85: Secure special tools 11 8 535, 11 8 531, 11 8 537 and special tool 11 9 266
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tools 11 8 535, 11 8 531, 11 8 537 and special tool 11 9 266.

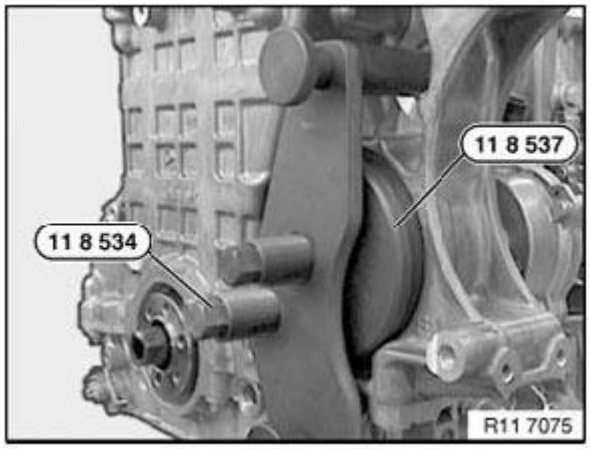

Fig. 86: Identifying Special Tools (11 8 537, 11 8 534)
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool 11 8 537 by hand on sealing cap. Screw in special tool 11 8 534.

NOTE: The sealing cap is pressed out diagonally during this work step.

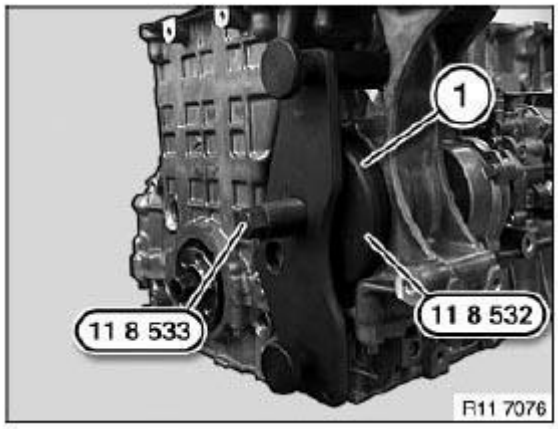

Fig. 87: Identifying Special Tool (11 8 533) And (11 8 532)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in new sealing cap (1) with special tools **11 8 532 and 11 8 533** until flush with crankcase upper part.

Assemble engine.

11 14 151 REPLACING CRANKSHAFT (TO 12/31/08)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 9 181**

- **11 9 182**
- **11 9 183**
- **11 9 184**
- **11 9 200**

Necessary preliminary tasks:

- Remove **transmission** . See **23 00 017 REMOVING AND INSTALLING TRANSMISSION (GS6-17BZ) N51/N52/N52K/N53** or **24 00 032 REMOVING AND INSTALLING AUTOMATIC TRANSMISSION (GA6L45R)** .
- Remove **flywheel** . See **11 22 500 REMOVING AND INSTALLING/REPLACING FLYWHEEL (N52K)**.

NOTE: Crankshaft radial seal has six removal openings for removal with special tool 11 9 200.

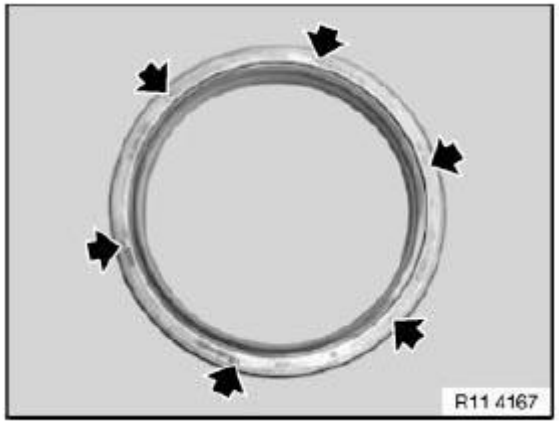

Fig. 88: Locating Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If necessary, remove rubber coating (1) on top side of crankshaft radial seal and expose a removal opening (2) (see Fig. 89).

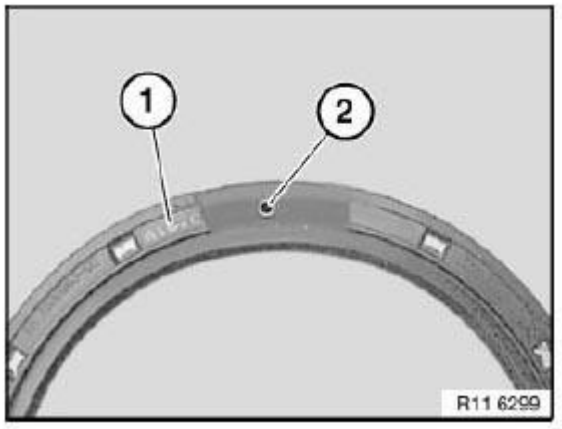

Fig. 89: Identifying Rubber Coating On Top Side Of Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool **11 9 200** . Insert sheet metal screws into removal opening of crankshaft radial seal and fasten without play (do **not** overtighten sheet metal screws).

Screw in spindle (1) slowly and carefully and detach crankshaft radial seal.

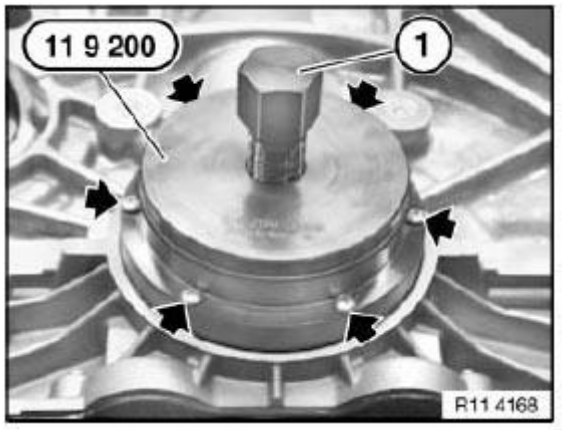

Fig. 90: Locating Screws With Special Tool (11 9 200)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

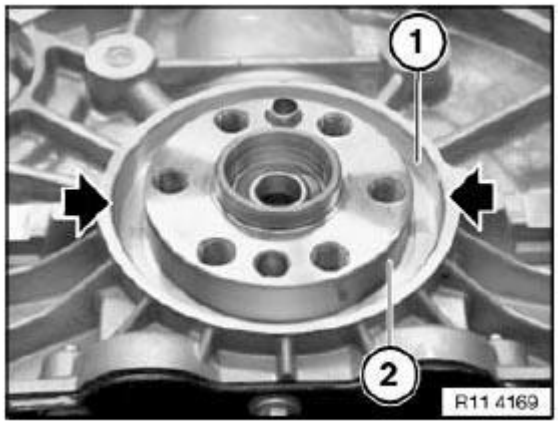

Fig. 91: Identifying Sealing Surface And Running Surface Of Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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.

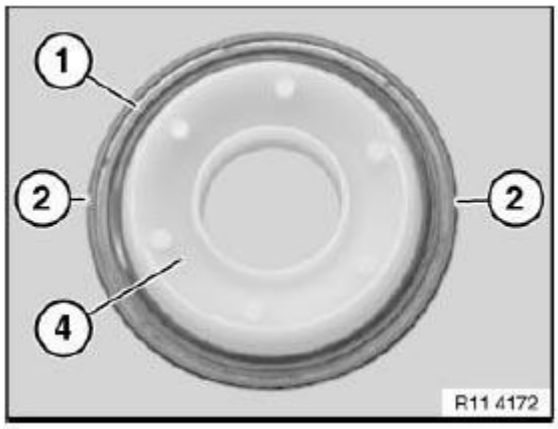

Fig. 92: Identifying Crankshaft Radial Seal, Grooves And Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: After installation, grooves (2) must be filled with sealing compound.

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.

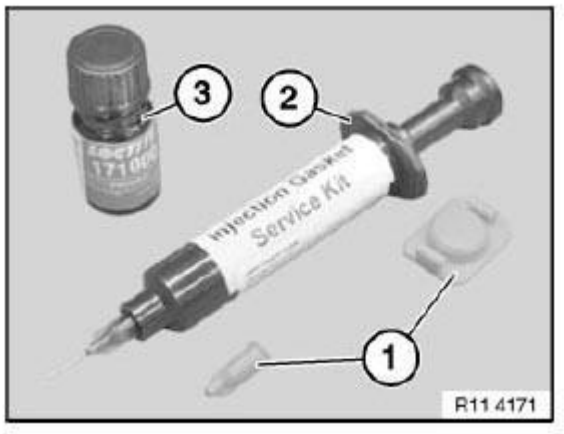

Fig. 93: Identifying Screw Cap, Injector And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit support bushing (4) with crankshaft radial seal (1) on crankshaft.

Align groove (2) centrally to housing partition (3).

Coat both grooves (2) on crankshaft radial seal (1) with Loctite primer, manufacturer's number 171000, and expose to air for approx. one minute.

Push crankshaft radial seal (1) by hand as far as possible onto running surface.

Carefully remove support sleeve (4).

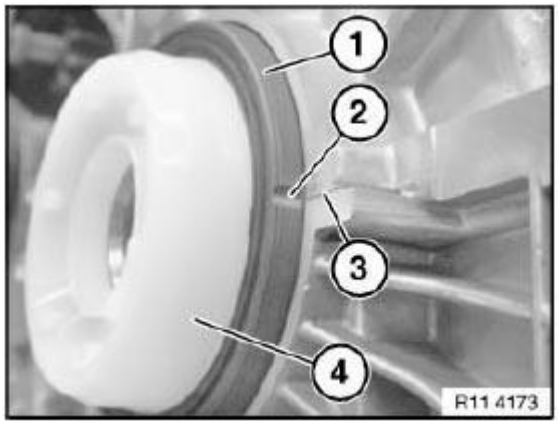

Fig. 94: Identifying Bushing, Grooves, Housing Partition And Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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 pre-assembled radial shaft seal.

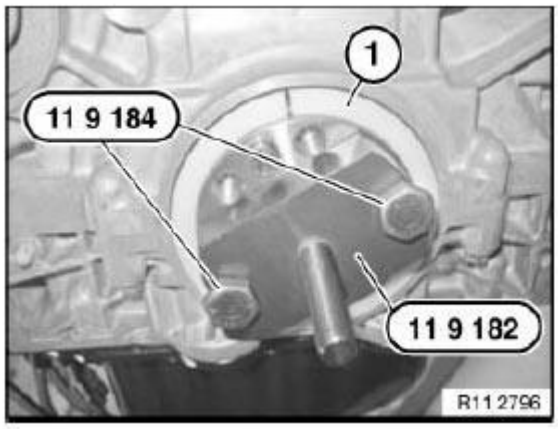

Fig. 95: Identifying Spacer Ring With Special Tool (11 9 182 And 11 9 183)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

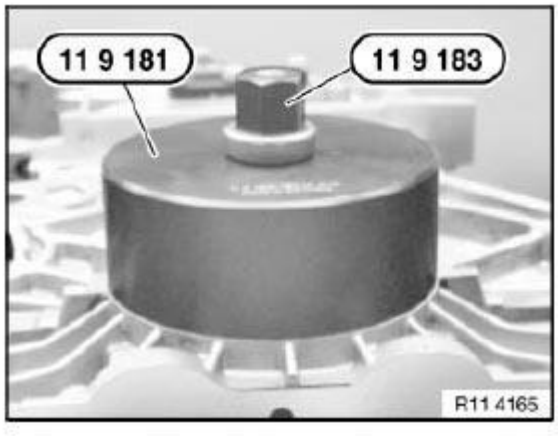

Fig. 96: Identifying Special Tool (11 9 181 And 11 9 183)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

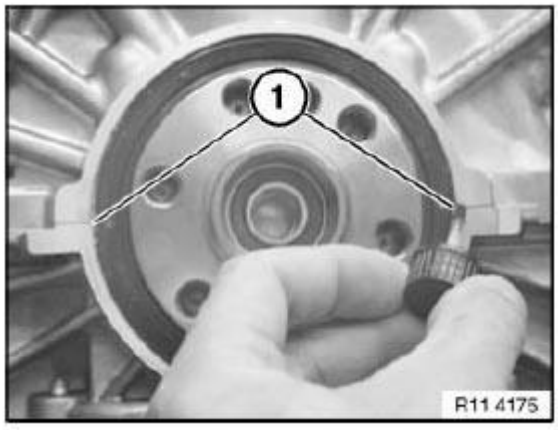

Fig. 97: Inserting Brush Into Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Using injector, fill both grooves (1) flush with Loctite sealing compound, manufacturer's number 128357.

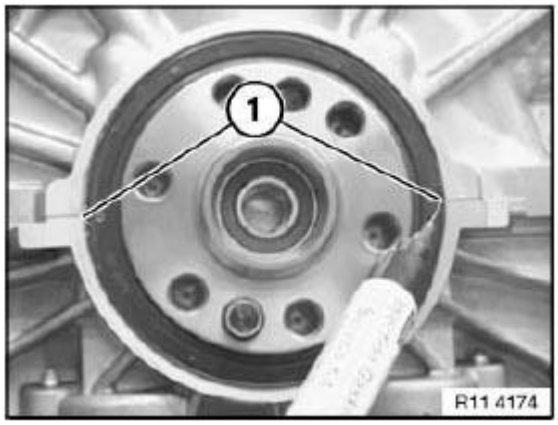

Fig. 98: Inserting Injector Into Grooves
Courtesy of BMW OF NORTH AMERICA, INC.

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.

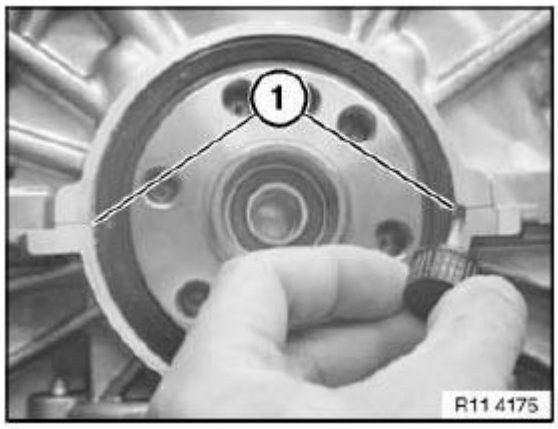

Fig. 99: Inserting Brush Into Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 151 REPLACING CRANKSHAFT SEAL (FROM 1/1/2009)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 9 181**
- **11 9 182**

- **11 9 183**
- **11 9 184**
- **11 9 185**
- **23 0 490**

Necessary preliminary tasks:

- Remove **flywheel** . See **11 22 500 REMOVING AND INSTALLING/REPLACING FLYWHEEL (N52K)**.

IMPORTANT: Magnet wheel (1) is magnetic.

Keep magnet wheel (1) in a plastic bag away from metallic debris.

Remove magnet wheel (1) from crankshaft.

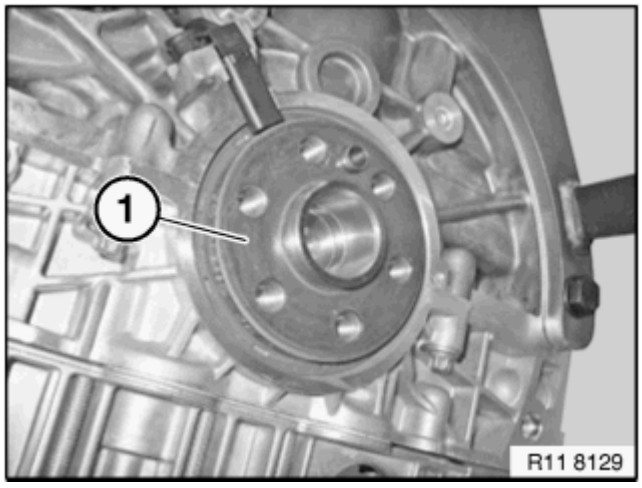

Fig. 100: Identifying Magnet Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw on pulse sensor (1).

Slide pulse sensor (2) upwards.

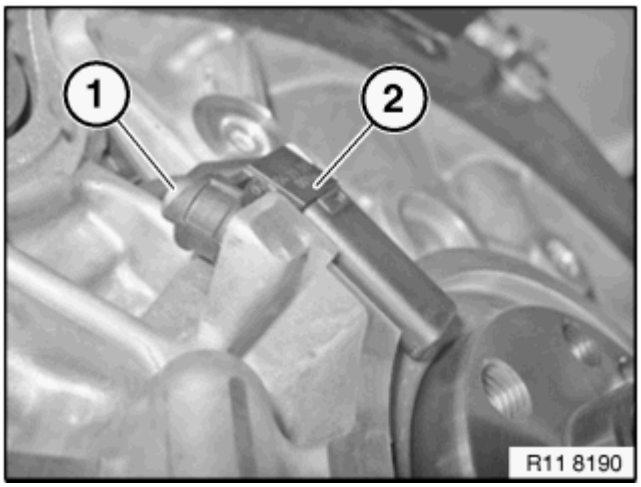

Fig. 101: Identifying Pulse Sensor And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Drill size maximum 2.5 millimeters.

Remove shavings immediately.

Drill a hole with a drill (1) in the radial shaft seal (see arrow).

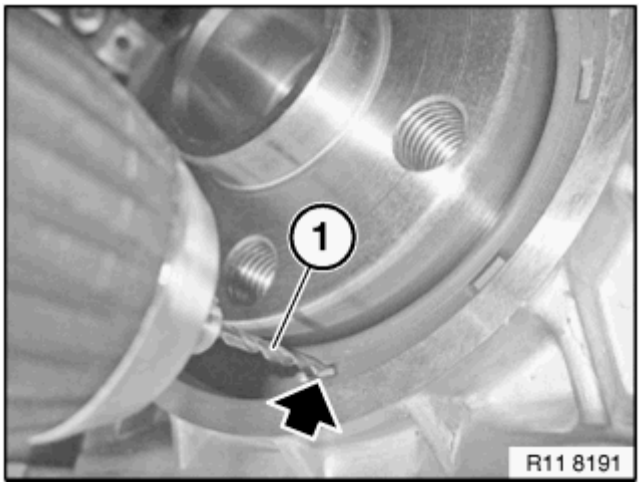

Fig. 102: Drilling Hole In Radial Shaft Seal Using Drill
Courtesy of BMW OF NORTH AMERICA, INC.

Immediately carefully remove shavings on the radial shaft seal (1).

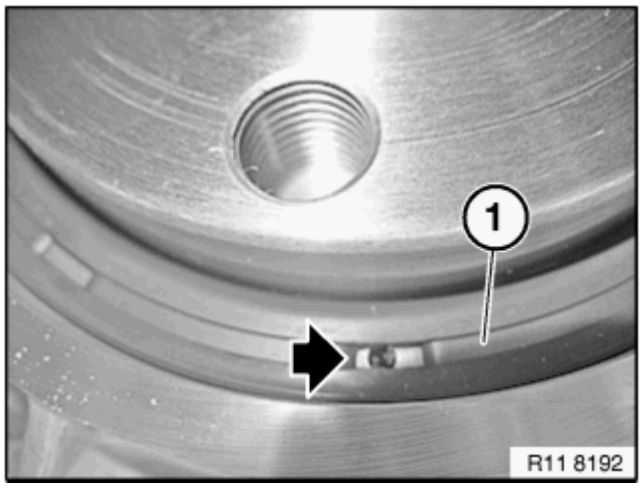

Fig. 103: Identifying Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool **23 0 490** in direction of arrow.

Drive out radial shaft seal with impact weight in direction of arrow.

IMPORTANT: Immediately carefully remove residual shavings.

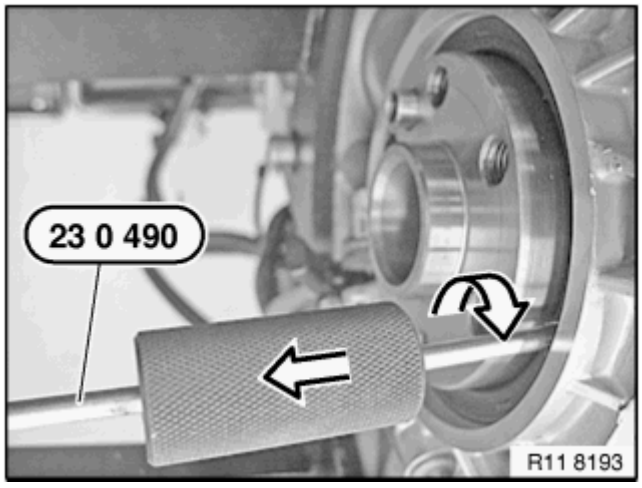

Fig. 104: Screwing In Special Tool 23 0 490 In Clockwise Direction
Courtesy of BMW OF NORTH AMERICA, INC.

Prepare radial shaft seal (1) on special tool 11 8 220.

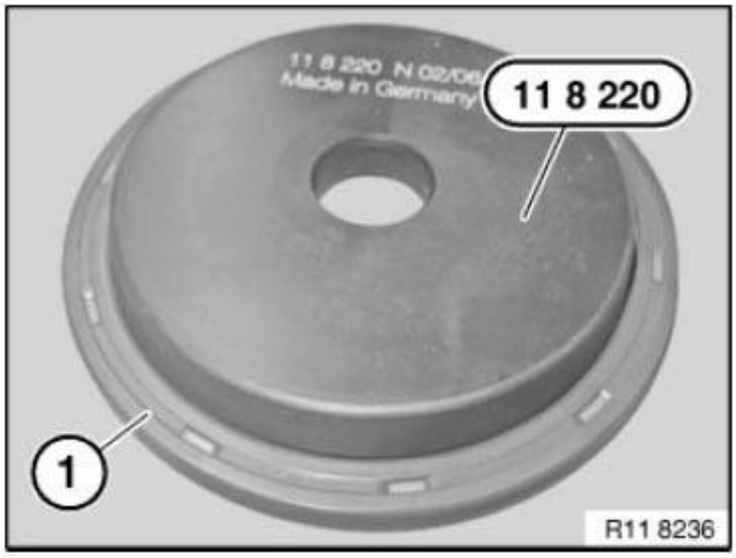

Fig. 105: Identifying Radial Shaft Seal On Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

Position the radial shaft seal (1) with special tool 11 8 220 on the crankshaft.

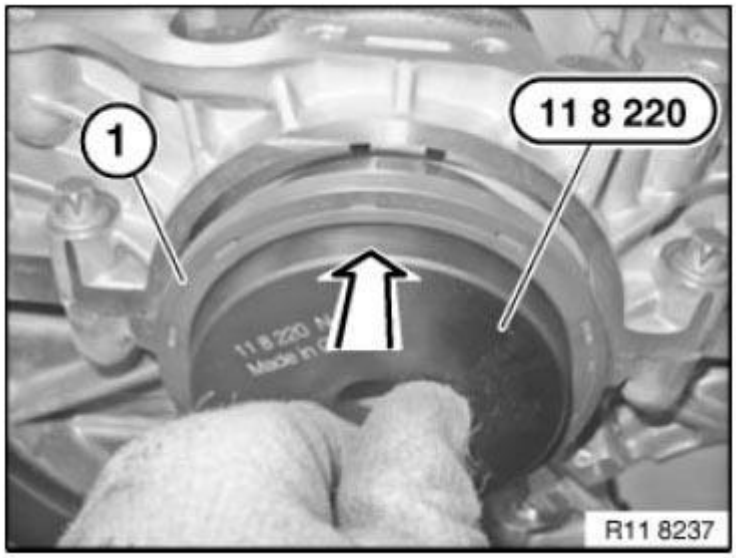

Fig. 106: Positioning Radial Shaft Seal Using Special Tool 11 8 220 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Brush radial shaft seal (1) over the special tool 11 8 220.

Move radial shaft seal (1) parallel up against the crankcase.

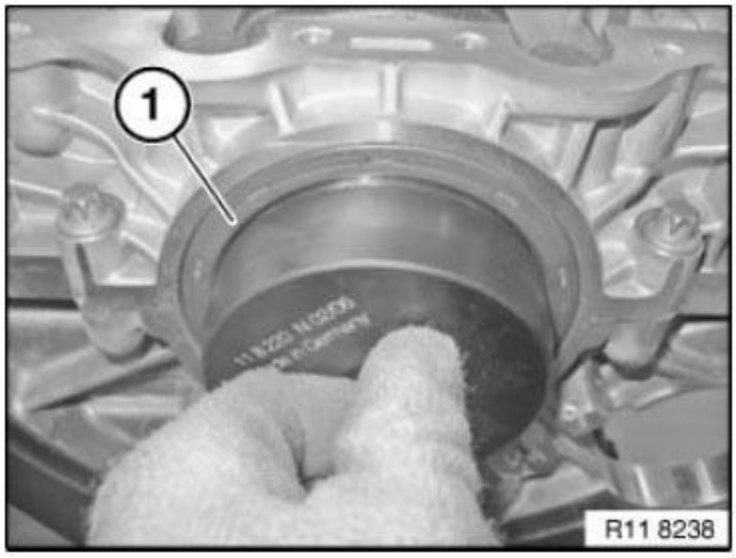

Fig. 107: Moving Radial Shaft Seal Parallel Up Against Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Fasten special tool 11 9 182 (synchronizing key) with special tool 11 9 184 (screw) on the crankshaft.

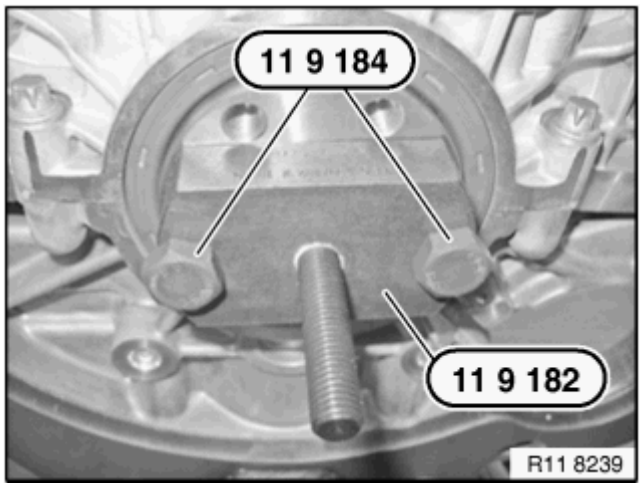

Fig. 108: Fastening Special Tool 11 9 182 With Special Tool 11 9 184 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Prepare special tool 11 9 181 (bush) for installation.

Connect special tool 11 9 185 (ring) onto special tool 11 9 181 (bush).

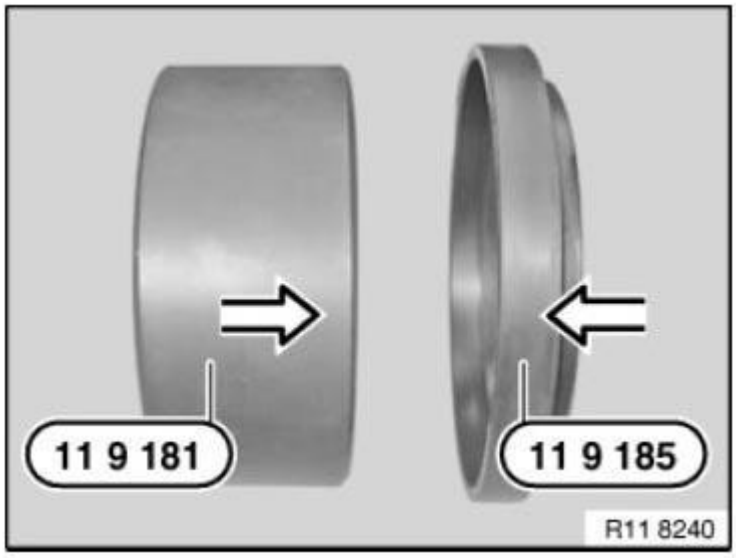

Fig. 109: Connecting Special Tool 11 9 185 Onto Special Tool 11 8 181
Courtesy of BMW OF NORTH AMERICA, INC.

Pull on radial shaft seal with special tools 11 9 181 (bush) and 11 9 185 (ring) in combination with special tool 11 9 183 (nut).

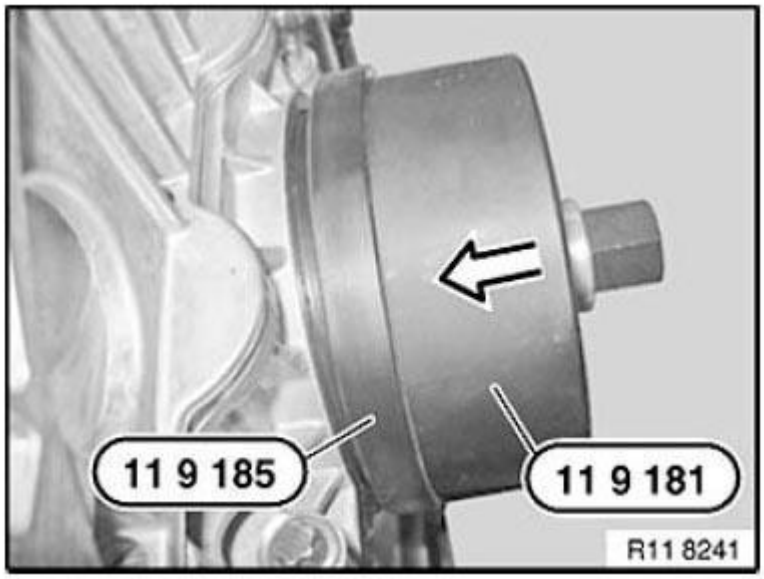

Fig. 110: Installing Rear Crankshaft Seal Using Tool 119 180/181
Courtesy of BMW OF NORTH AMERICA, INC.

Screw on radial shaft seal with special tool 11 9 183 (nut) to limit position.

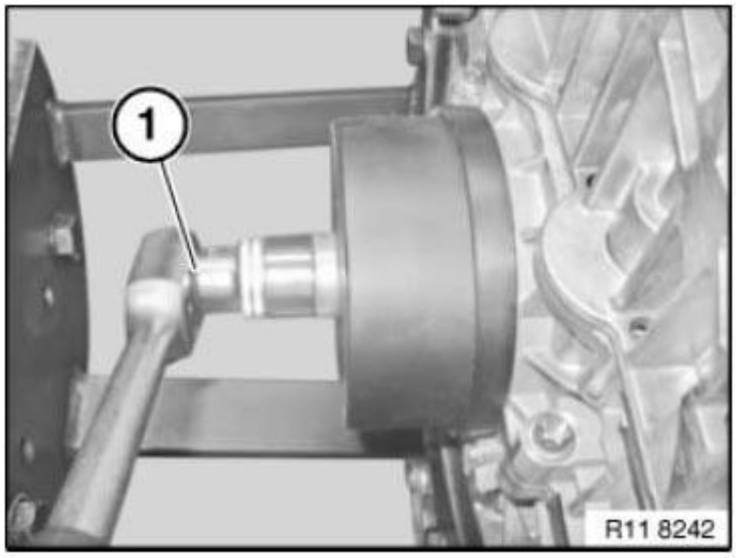

Fig. 111: Screwing On Radial Shaft Seal Using Special Tool 11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

CRANKSHAFT WITH BEARING

11 21 500 REPLACING CRANKSHAFT (N52K)

Special tools required:

For the following special tools, refer to **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS -- 128I** .

- **00 2 510**
- **00 9 120**

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 4 370**
- **11 4 440**
- **11 4 470**
- **11 9 360**

IMPORTANT: Aluminum-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 **engine** . See **11 00 050 REMOVING AND INSTALLING ENGINE (N52K)**.
- Mount engine on **assembly stand** . See **MOUNTING ENGINE ON ASSEMBLY STAND (N52K)**.
- Remove **vibration damper** . See **11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (N52K)**.
- Remove **oil sump** . See **11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (N52K)**.
- 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. See 11 13 6AZ in **OIL SUMP** .

Installation:

Replace aluminum screws.

Remove oil deflector (2).

NOTE: Graphic shows the screw connection of the oil deflector (2) for vehicles with optional extra SA203 (all-wheel drive).

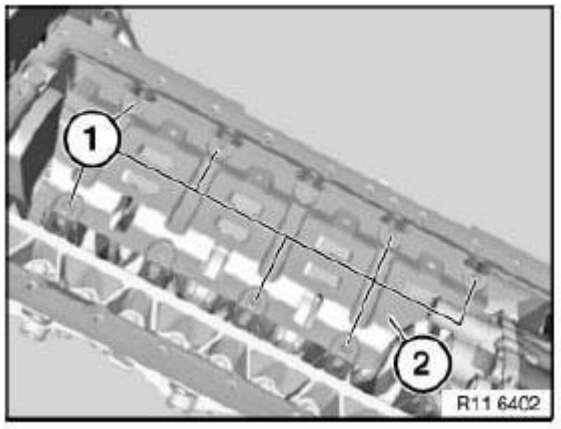

Fig. 112: Identifying Screws And Oil Deflector
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque. See 11 11 2AZ in **11 11 CRANKCASE** .

Release screws (2).

Tightening torque. See 11 11 3AZ in **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

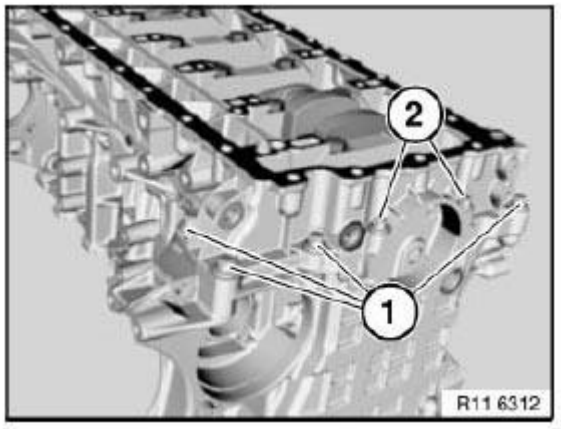

Fig. 113: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque. See 11 11 3AZ in **11 11 CRANKCASE** .

Release screws (2).

Tightening torque. See 11 11 2AZ in **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

Release steel screws (1 to 14) from outside inwards.

Tightening torque. See 11 11 1AZ in **11 11 CRANKCASE** .

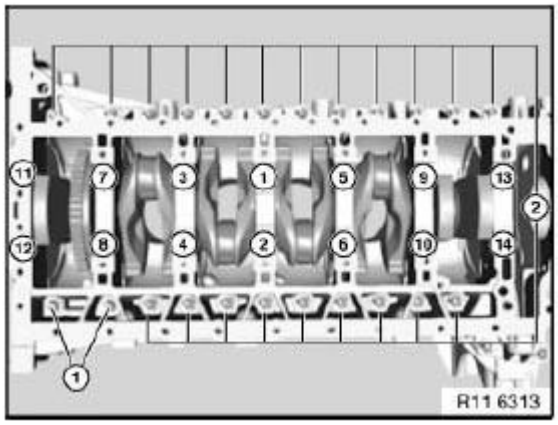

Fig. 114: Identifying Steel Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque. See 11 11 3AZ in **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

Lift out bedplate.

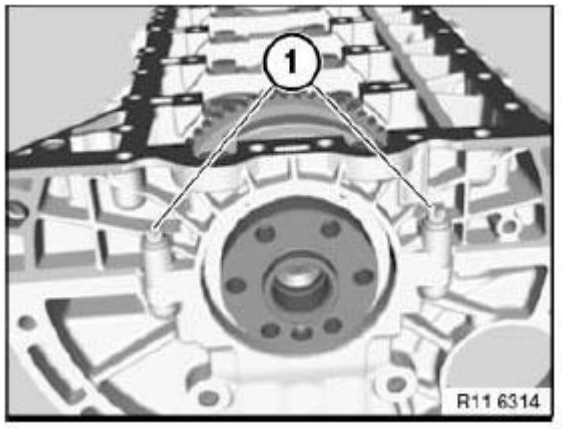

Fig. 115: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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.**

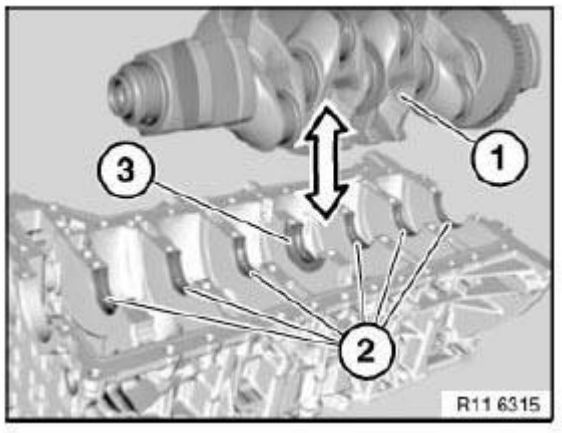

Fig. 116: Removing Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Check adapter sleeves (1) for damage and secure seating; replace if necessary.

Install all **bearing shells.** See **11 21 531 REPLACING ALL MAIN CRANKSHAFT BEARING SHELLS (N52K)**.

Installation:

Lubricate all bearing points with engine oil.

NOTE: Graphic shows N46.

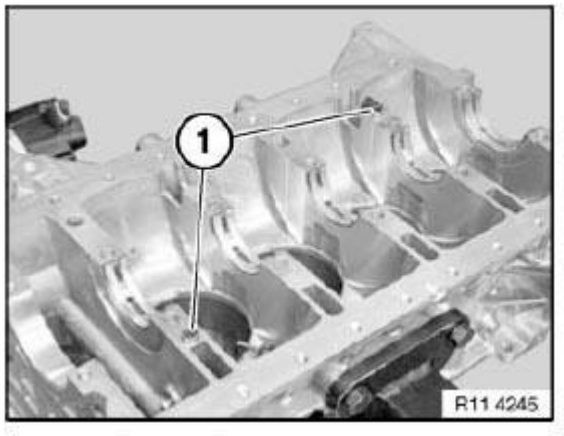

Fig. 117: Identifying Adapter Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Insert crankshaft (1).

IMPORTANT: Install crankshaft with aid of a second person. Weight of crankshaft approx. 25 kg.

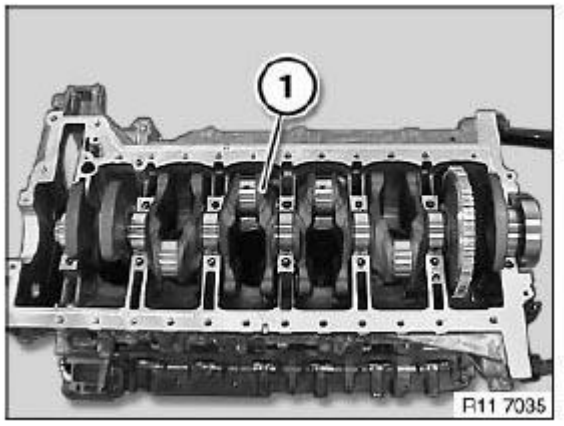

Fig. 118: Identifying Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten steel screws (1 to 14) from inside outwards.

Tightening torque. See 11 11 1AZ in **11 11 CRANKCASE** .

Tighten screws (2) from inside outwards.

Tightening torque. See 11 11 2AZ in **11 11 CRANKCASE** .

Tighten screws (1).

Tightening torque. See 11 11 4AZ in **11 11 CRANKCASE** .

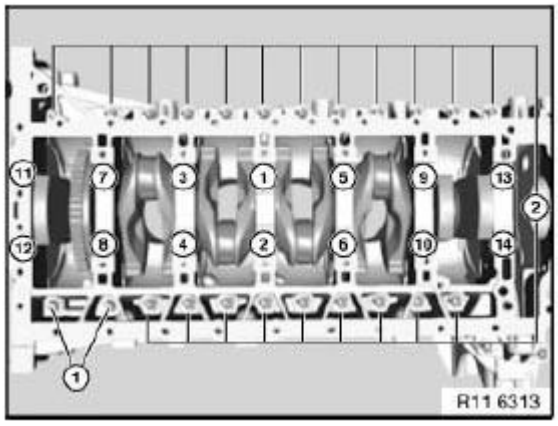

Fig. 119: Identifying Steel Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace aluminum screws.

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.

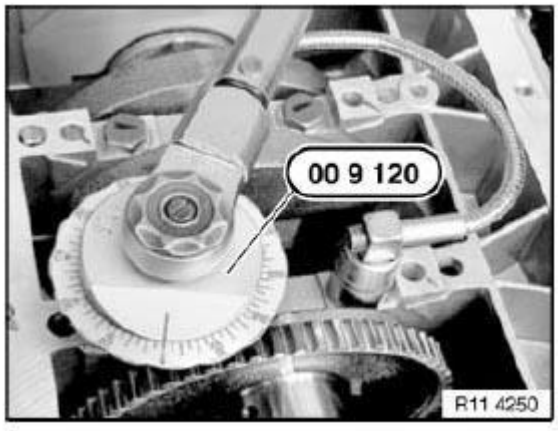

Fig. 120: Identifying Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Set up stand with magnetic foot (1) on special tool **11 4 440.**

Set up special tool **00 2 510** on stand.

Position special tool **00 2 510** on crankshaft.

Move crankshaft in direction of arrow.

Determine **bearing play.** See **ENGINE - TECHNICAL DATA (N52K)** .

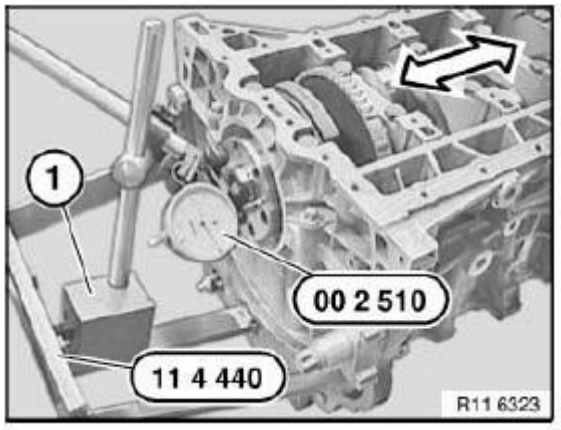

Fig. 121: Moving Crankshaft With Special Tools (11 4 440 And 00 2 510)
Courtesy of BMW OF NORTH AMERICA, INC.

Drive in both nozzles (1) with special tool **11 9 360** on left and right into crankcase.

Installation:

Always replace nozzles (1).

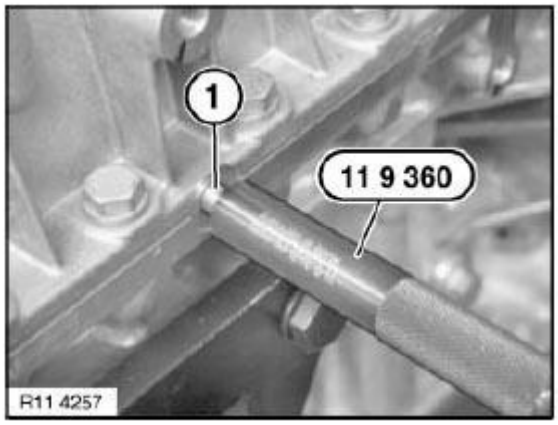

Fig. 122: Identifying Nozzles With Special Tool (11 9 360)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Prepare sealing compound (1) in special tool **11 4 370.**

Screw on nozzle (2) for injecting sealing compound.

Slowly insert sealing compound (1) with special tool **11 4 370** in direction of arrow.

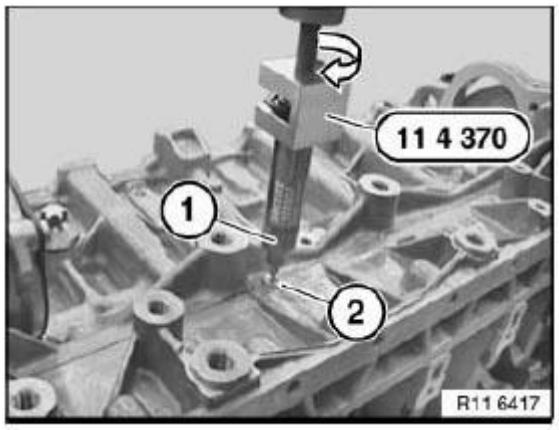

Fig. 123: Inserting Sealing Compound With Special Tool (11 4 370)
Courtesy of BMW OF NORTH AMERICA, INC.

Stop (seal off) escaping liquid gasket with primer 1.3. (Picture shows N40).

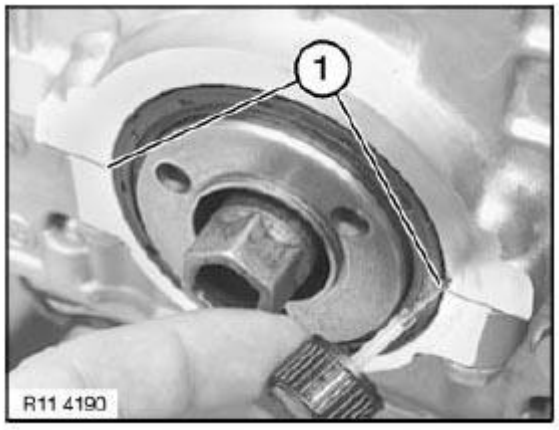

Fig. 124: Sealing Escaping Liquid Gasket With Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 21 531 REPLACING ALL MAIN CRANKSHAFT BEARING SHELLS (N52K)

Special tools required:

For the following special tools, refer to **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS -- 128I** .

- **00 2 590**

  For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 4 251**
- **11 4 252**
- **11 4 470**

IMPORTANT: Aluminum-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 **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.

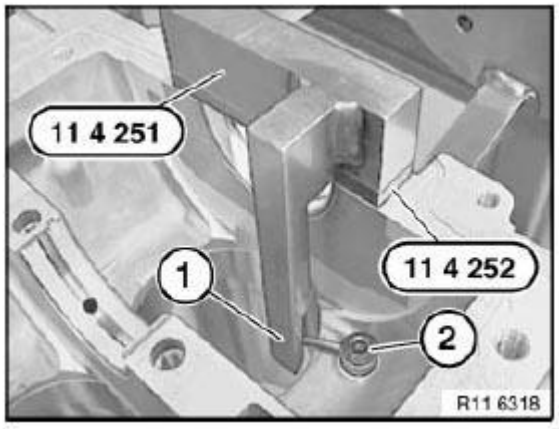

Fig. 125: Identifying Oil Spray Nozzle With Special Tools (11 4 251 And 11 4 252)
Courtesy of BMW OF NORTH AMERICA, INC.

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. See 11 11 5AZ in **11 11 CRANKCASE** .

Remove bearing shells (2) and guide bearing shell (3).

NOTE: Guide bearing shell (3) is a thrust bearing. Observe bearing classification.

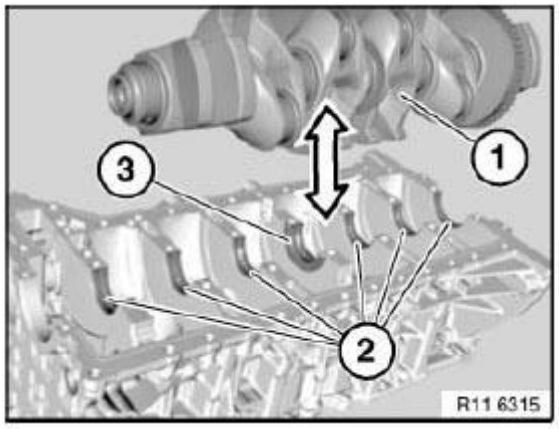

Fig. 126: Removing Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Bearing shell (1) with lubricant groove must be fitted in crankcase.

Bearing shell (2) without lubricant groove must be fitted in bedplate.

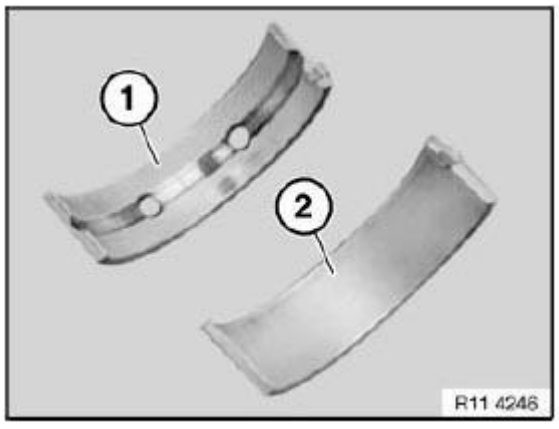

Fig. 127: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: It is not possible to remachine the crankshaft.

Surface (1) for marking.

Seven-digit part number (2).

Bearing classification (3).

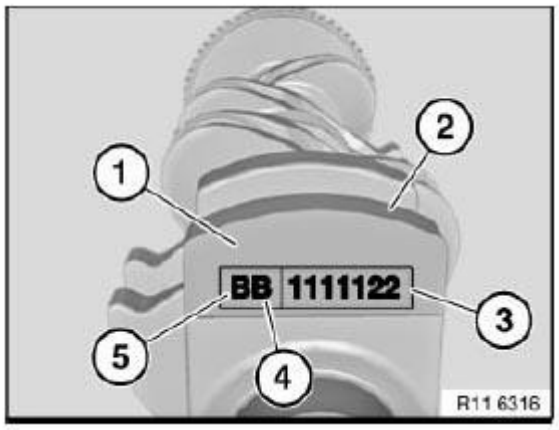

Fig. 128: Identifying Seven-Digit Part Number
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The letter / number combination produces a bearing shell pairing. Identification by different colours.

IMPORTANT: Excessively small bearing play will result in engine damage.

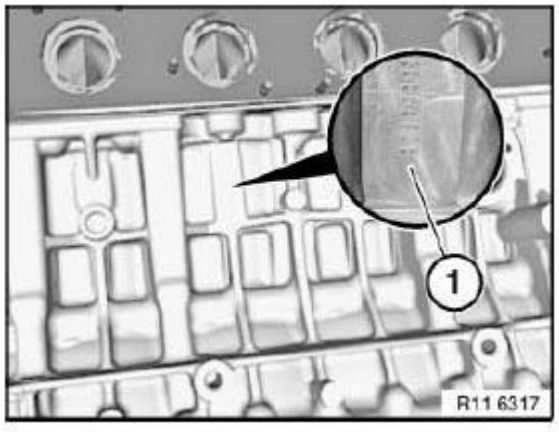

Fig. 129: Identifying Bearing Classification On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

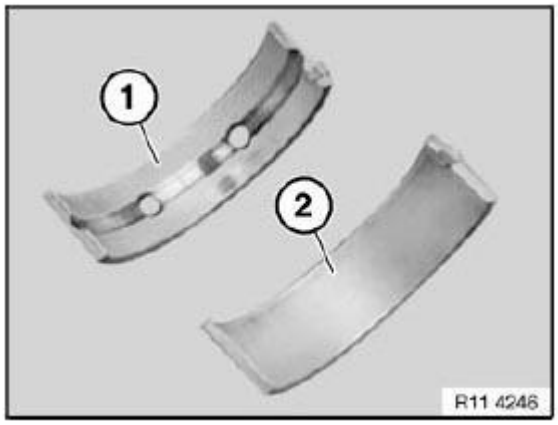

Fig. 130: Identifying Bearing Shell With/Without Lubricant Groove
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: First bearing point is on the timing drive. The colour combination Yellow and Red must not be fitted. Engine damage will result if excessively small bearing play is determined.

Code letters on crankcase:

Code letter A = bearing shell (1) colour Yellow.

Code letter B = bearing shell (1) colour Green.

Code letter C = bearing shell (1) colour Red.

Code numbers on crankshaft:

Code number 1 = bearing shell (2) Yellow.

Code number 2 = bearing shell (2) Green.

Code number 3 = bearing shell (2) Red.

IMPORTANT: The colour combination Yellow and Red must not be fitted; the bearing colours Green / Green must be selected for this colour combination

Installation example:

For bearing 1 with code letter A on the crankcase and code number 1 on the crankshaft bearing shell (1) with the colour Yellow is required for the crankcase and bearing shell (2) with the colour Yellow for the crankcase lower half (bedplate).

Bearing 2: A and 2 colours Yellow and Green.

Bearing 3: B and 2 colours Green and Green.

Bearing 4: C and 2 colours Red and Green.

Bearing 5: B and 1 colours Green and Yellow.

Bearing 6: C and 3 colours Red and Red.

Bearing 7: C and 1 colours Green and Green.

The colour combination Yellow and Red must not be fitted.

Possible color combinations (see **COLOR COMBINATIONS FOR MOUNTING CRANKSHAFT**).

COLOR COMBINATIONS FOR MOUNTING CRANKSHAFT

(A 1) Crankcase/**Yellow**	**(B 1)** Crankcase/**Green**	**(C 1)** Crankcase/**Green**
(A 1) Crankcase lower half/**Yellow**	**(B 1)** Crankcase lower half/**Yellow**	**(C 1)** Crankcase lower half/**Green**
(A 2) Crankcase/**Yellow**	**(B 2)** Crankcase/**Green**	**(C 2)** Crankcase/**Red**
(A 2) Crankcase lower half/**Green**	**(B 2)** Crankcase lower half/**Green**	**(C 2)** Crankcase lower half/**Green**
(A 3) Crankcase/**Green**	**(B 3)** Crankcase/**Green**	**(C 3)** Crankcase/**Red**
(A 3) Crankcase lower half/**Green**	**(B 3)** Crankcase lower half/**Red**	**(C 3)** Crankcase lower half/**Red**

Install bearing shells (2) and guide bearing shell (3).

Installation:

Clean all sealing surfaces.

IMPORTANT: Do not use any metal-cutting tools.

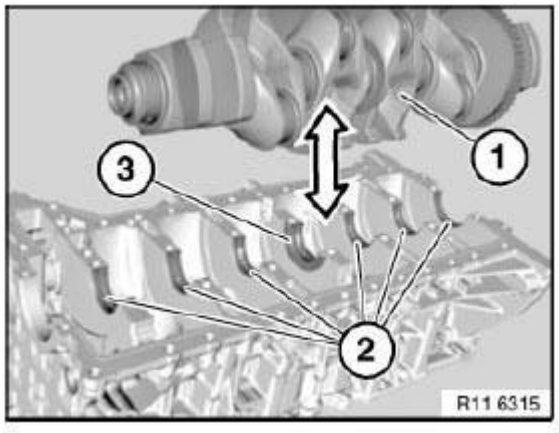

Fig. 131: Installing Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Use the existing screws to determine the bearing play.

Set up **bedplate** with bearing shells.

Remove bedplate.

Read off bearing play at width of flattened plastic thread and measurement scale.

Installation:

Remove plastic thread.

Apply a light coat of oil to bearing shells and crankshaft.

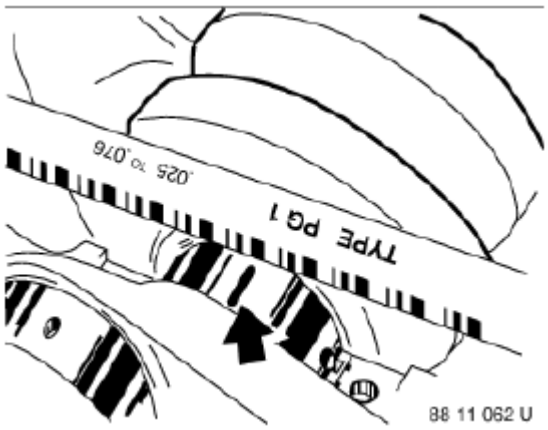

Fig. 132: Measuring Bearing Play Width
Courtesy of BMW OF NORTH AMERICA, INC.

Install **bedplate.**

Assemble engine.

11 21 571 REPLACING ROLLER BALL BEARING IN CRANKSHAFT (N52K)

Special tools required:

- **00 5 500**

- **11 2 340**
- **11 2 350**

Necessary preliminary tasks: Remove clutch.

Remove guide bearing with special tool 11 2 340.

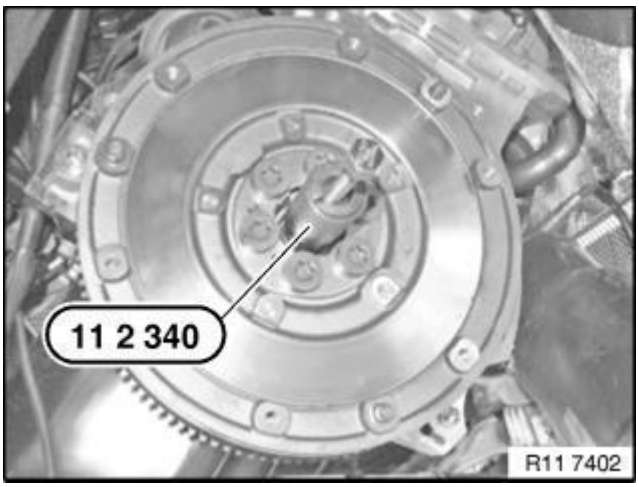

Fig. 133: Removing Guide Bearing With Special Tool 11 2 34
Courtesy of BMW OF NORTH AMERICA, INC.

Install new thrust bearing and drive firmly home with special tool 11 2 350 in conjunction with special tool 00 5 500.

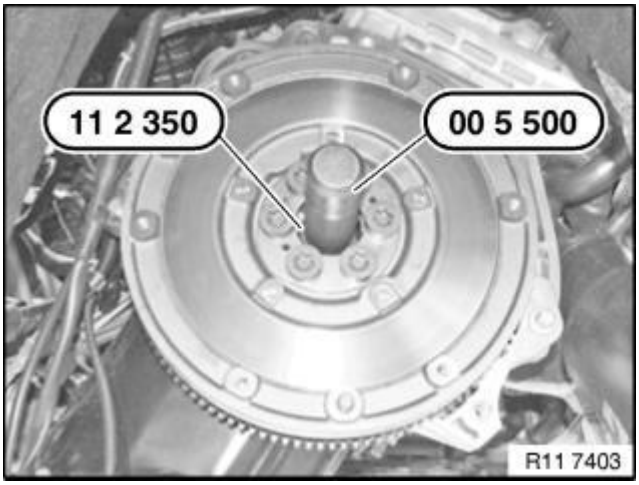

Fig. 134: Installing New Thrust Bearing And Drive Firmly Home With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

FLYWHEEL

11 22 500 REMOVING AND INSTALLING/REPLACING FLYWHEEL (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 4 180**
- **11 9 260**
- **11 9 265**

IMPORTANT: Aluminum-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 **transmission** . See **23 00 017 REMOVING AND INSTALLING TRANSMISSION (GS6-17BZ) N51/N52/N52K/N53** or **24 00 032 REMOVING AND INSTALLING AUTOMATIC TRANSMISSION (GA6L45R)** .
- Remove **clutch** . See **21 21 500 REMOVING AND INSTALLING OR REPLACING CLUTCH (SAC 228)** .

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.

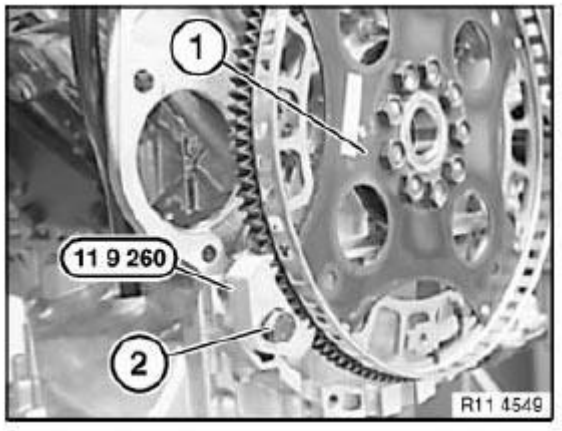

Fig. 135: Identifying Flywheel And Existing Transmission Bolt With Special Tool (11 9 260)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten flywheel screws.

Tightening torque. See 11 22 1AZ in **11 22 FLYWHEEL** .

Installation:

Flywheel (1) is secured with an alignment pin.

Fit new flywheel screws.

Clean all threads for flywheel screws in crankshaft.

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.

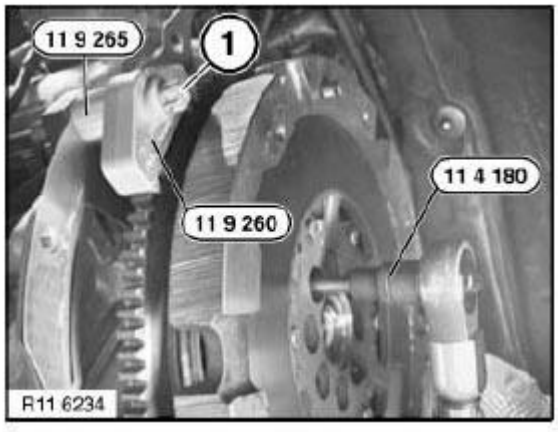

Fig. 136: Identifying Existing Transmission Bolt With Special Tools (11 9 255, 11 9 260 And 11 4 180)
Courtesy of BMW OF NORTH AMERICA, INC.

Release flywheel screws with special tool **11 4 180.**

Tightening torque. See 11 22 2AZ in **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.

VIBRATION DAMPER

11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (N52K)

Necessary preliminary tasks:

- Remove **underbody protection.** See **51 47 490 REMOVING AND INSTALLING/REPLACING FRONT UNDERBODY PROTECTION** .
- Remove **drive belt** . See **11 28 010 REPLACING ALTERNATOR DRIVE BELT (N52K)**.

Release screws (1).

Tightening torque. See in **VIBRATION DAMPER** .

Remove vibration damper (2).

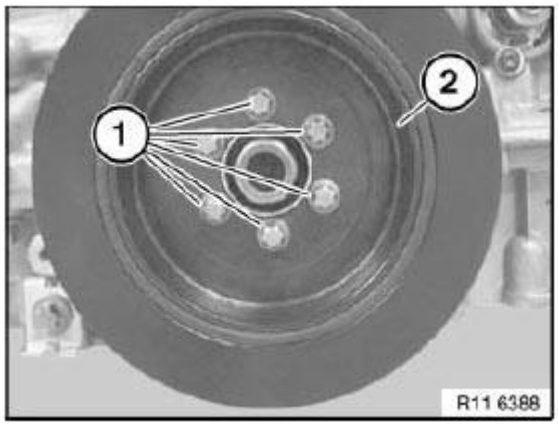

Fig. 137: Identifying Screws And Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CONNECTING ROD WITH BEARING

11 24 571 REPLACING ALL CONNECTING ROD BEARING SHELLS (N52K)

Special tools required:

For the following special tools, refer to **MAINTENANCE AND GENERAL INFORMATION -**

SPECIAL TOOLS -- 128I .

- **00 2 590**
- **00 9 120**

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

IMPORTANT: All crankshaft crank pins are classified.

Possible classifications per connecting rod at top and bottom:

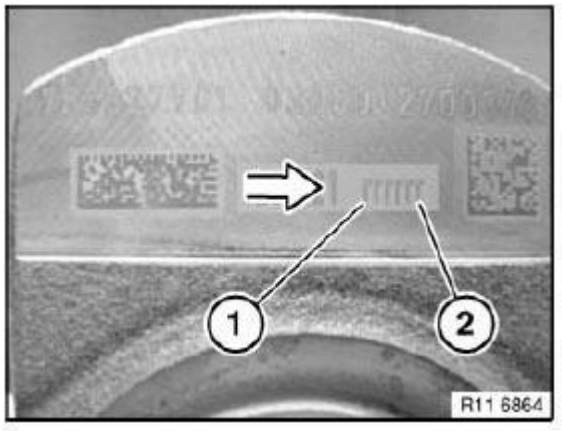

Fig. 138: Identifying Crank Pin
Courtesy of BMW OF NORTH AMERICA, INC.

r: Red

b: Blue

Only **one** color may be fitted per big end bearing cap and connecting rod.

In direction of arrow from (1 to 2) crank pin (1 to 6).

Example:

Possible classification:

1. Cylinder Classification Red / Red
2. Cylinder Classification Blue / Blue
3. Cylinder Classification Blue / Blue
4. Cylinder Classification Red / Red
5. Cylinder Classification Red / Red
6. Cylinder Classification Blue / Blue

Release conrod bolts (1).

Remove connecting rod bearing cap (2).

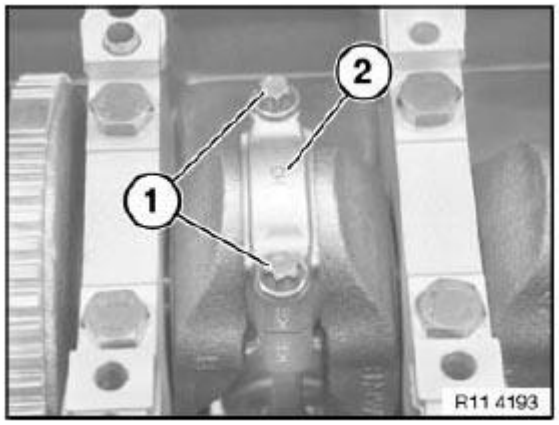

Fig. 139: Identifying Conrod Bolts And Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

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.

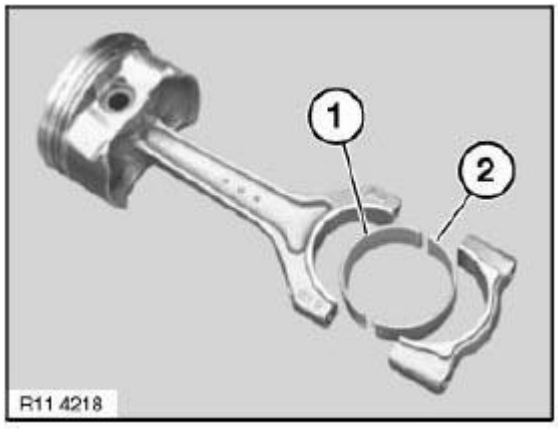

Fig. 140: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: All crankshaft crank pins are classified.

In each case insert only one color of connecting rod bearing shell (1 and 2) for each connecting rod.

Check conrod bearing clearance.

Piston in BDC position.

To determine the connecting rod bearing play, make sure that the bearing points are clean and free from oil and grease.

Fit special tool **00 2 590** (Plastigage Type PG 1) to the oil-free crankshaft.

Fit conrod bearing cap so that pairing letters match up.

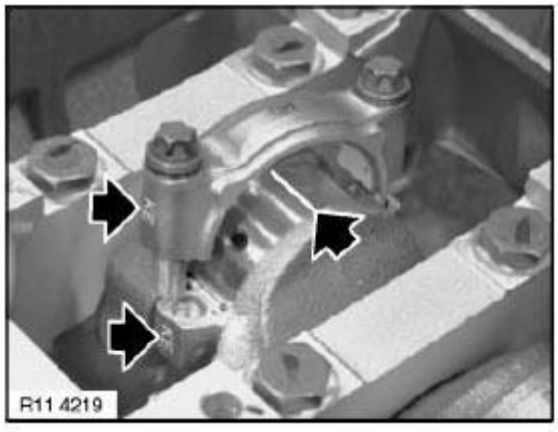

Fig. 141: Locating Conrod Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

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. See 11 24 1AZ in **11 24 CONNECTING RODS AND BEARINGS** .

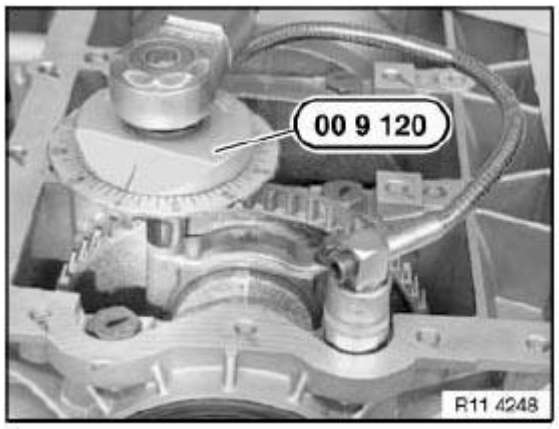

Fig. 142: Identifying Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew conrod bearing cover. Read off conrod bearing play at width of flattened plastic thread on measurement scale.

Conrod bearing clearance. See **ENGINE - TECHNICAL DATA (N52K)** .

- Remove Plastigage
- Coat crankshaft and connecting rod bearing shells with oil
- Install new conrod bolts and tighten down with special tool **00 9 120.**

Tightening torque. See 11 24 1AZ in **11 24 CONNECTING RODS AND BEARINGS** .

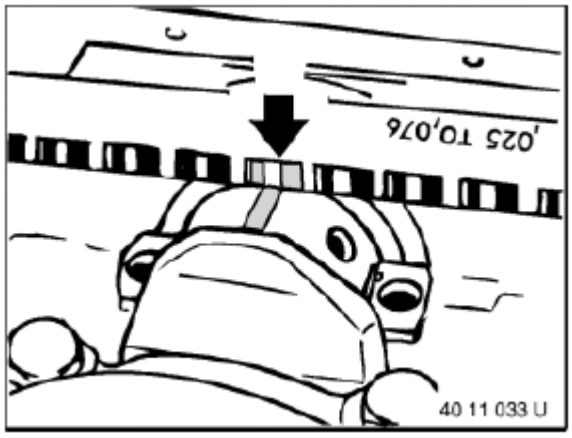

Fig. 143: Measuring Conrod Bearing Play Width Flattened Plastic Thread

Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

PISTON WITH RINGS AND PIN

11 25 530 REMOVING AND INSTALLING/REPLACING ALL PISTONS (N52K)

Special tools required:

For the following special tools, refer to **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS -- 128I** .

- **00 9 120**

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 4 491**
- **11 4 492**
- **11 4 493**
- **11 4 494**
- **11 6 241**
- **11 6 261**
- **11 8 330**

WARNING: Danger of injury!
Carry out work on piston pin circlip wearing protective goggles only.

IMPORTANT: If piston, connecting rod, big end bearing cap and connecting rod bearing shell are to be reused, they must be installed in the same position.
Individual replacement of a connecting rod is not permitted. Connecting rods are classified by weight categories and are only available as a set for all cylinders.
Connecting rod and big end bearing cap are marked with identical pairing letters and must not be mixed up.
Danger of engine damage!
Piston and piston pins are paired and must not be fitted individually.

Necessary preliminary tasks:

- Remove **engine** . See **11 00 050 REMOVING AND INSTALLING ENGINE (N52K)**.
- Mount engine on **assembly stand** . See **MOUNTING ENGINE ON ASSEMBLY STAND (N52K)**.
- Remove intake air **manifold** . See **11 61 050 REMOVING AND INSTALLING AIR INTAKE MANIFOLD (N52K)**.

- Remove **cylinder head.** See **11 12 100 REMOVING AND INSTALLING CYLINDER HEAD (N52K)**.
- Remove **oil sump** . See **11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (N52K)**.
- 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.

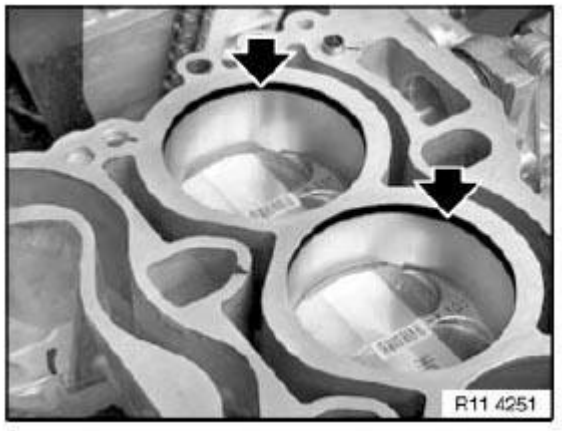

Fig. 144: Locating Cylinder Wall
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Oil spray nozzle (2) must not be maladjusted or bent.
Risk of damage!

Do **not** release screw (1) of oil spray nozzle (2).

If necessary, readjust **oil spray nozzle** (2). See **11 21 531 REPLACING ALL MAIN CRANKSHAFT BEARING SHELLS (N52K)**.

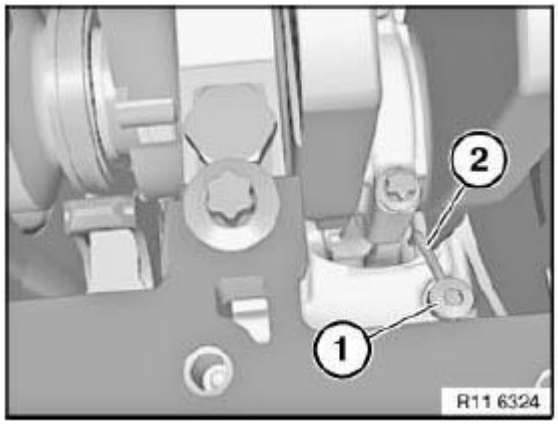

Fig. 145: Identifying Spray Nozzle And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release conrod bolts (1).

Tightening torque. See 11 24 1AZ in **11 24 CONNECTING RODS AND BEARINGS** .

Installation:

Replace screws.

Remove conrod bearing cap (2) in direction of arrow.

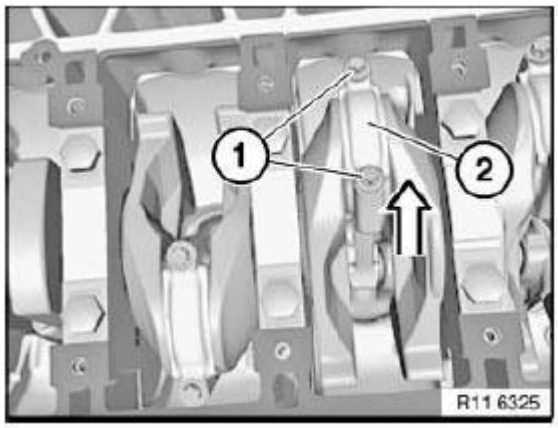

Fig. 146: Removing Conrod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

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!

Attach special tool **11 8 330** to connecting rod.

Press out connecting rod and piston with special tool **11 8 330** to cylinder head side.

NOTE: Special tool 11 8 330 simultaneously serves to prevent connecting rod and piston from falling down.

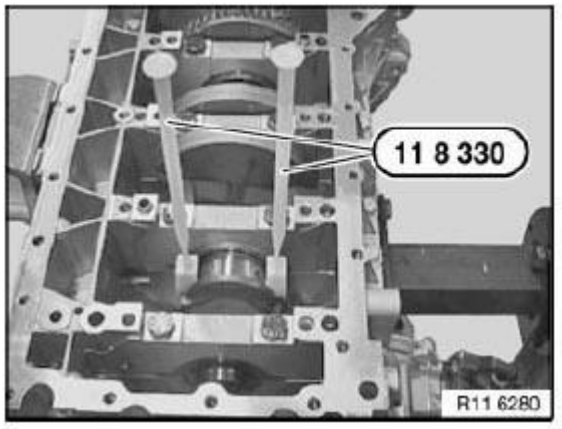

Fig. 147: Identifying Special Tool (11 8 330)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not touch the oil spray nozzle when removing the components. Risk of damage!

Preliminary work:

Clamp special tool **11 4 491** in vice.

Secure piston (1) with connecting rod to special tool **11 4 491.**

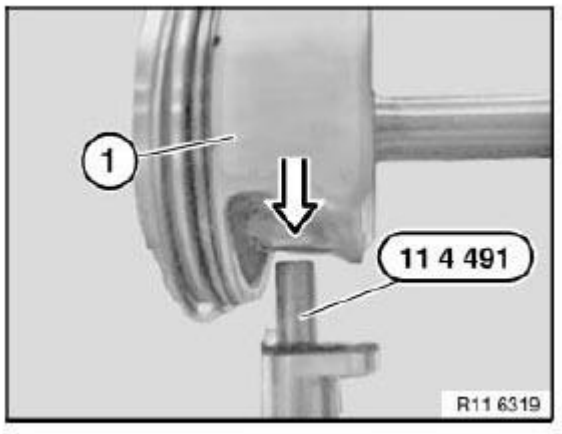

Fig. 148: Identifying Piston With Special Tool (11 4 491)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

Carry out work on piston pin circlip wearing protective goggles only.

WARNING: Protective goggles must be worn.

Lever out piston pin circlip with special tool **11 4 492** in direction of arrow.

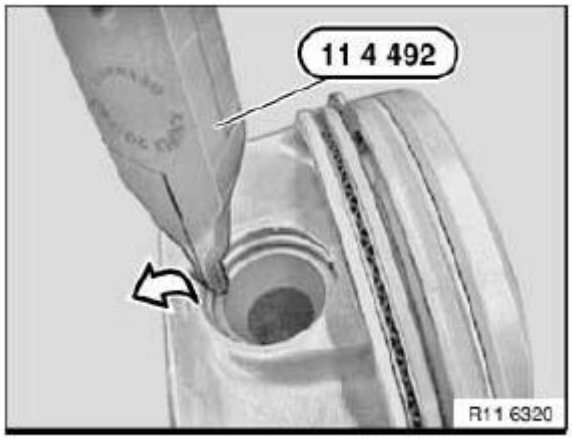

Fig. 149: Removing Piston Pin Circlip With Special Tool (11 4 492)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

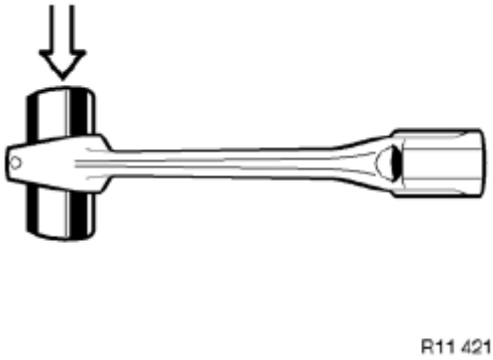

Fig. 150: Identifying Piston Pin
Courtesy of BMW OF NORTH AMERICA, INC.

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.

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".

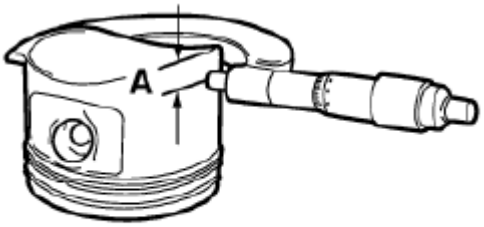

Fig. 151: Measuring Outer Piston Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

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.

If necessary, replace piston.

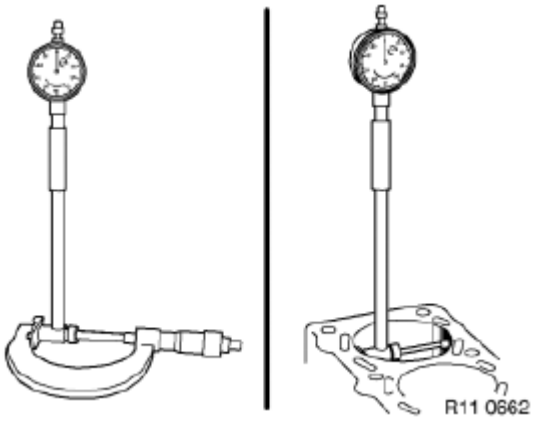

Fig. 152: Measuring Diameter Of Cylinder Bore

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.

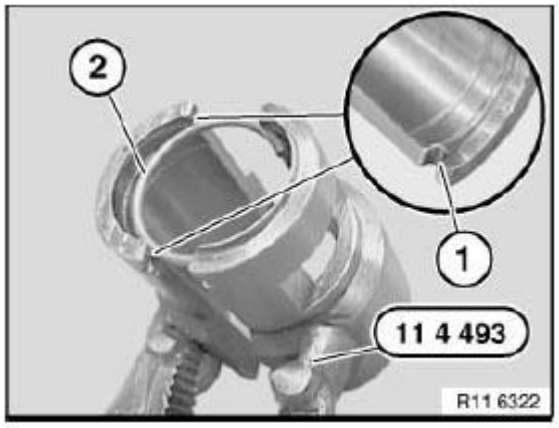

Fig. 153: Inserting Piston Pin Circlip Into Groove With Special Tool (11 4 493)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Protective goggles must be worn.

Guide lug and cutout on special tool **11 4 493** must point to piston crown. Only then can special tool **11 4 494** be correctly fitted.

When special tools **11 4 493** and **11 4 494** are correctly positioned, the piston pin circlip must be driven in with a plastic hammer in the direction of the arrow.

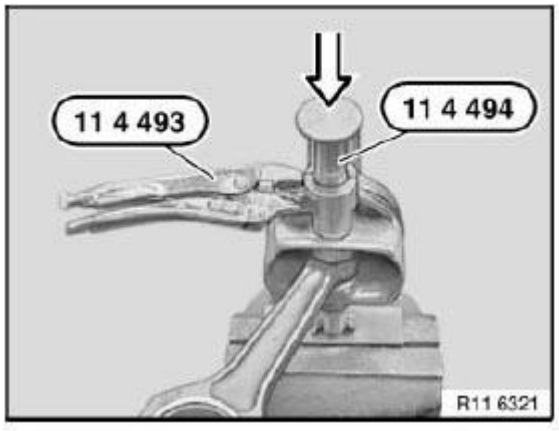

Fig. 154: Identifying Special Tool (11 4 493 And 11 4 494)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

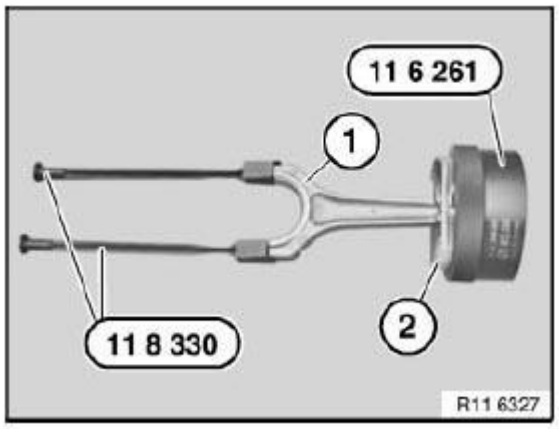

Fig. 155: Identifying Piston And Connecting Rod With Special Tools (11 8 330 And 11 6 261)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For vehicles with B25 engines.

Install all **piston rings.** See **11 25 671 REPLACING PISTON RINGS ON ALL PISTONS (N52K)**.

Install all **connecting rod bearing shells.** See **11 24 571 REPLACING ALL CONNECTING ROD BEARING SHELLS (N52K)**.

Coat piston (2) and piston rings with oil.

Pre-install piston (2) in special tool **11 6 241.**

Attach special tool **11 8 330** to connecting rod (1).

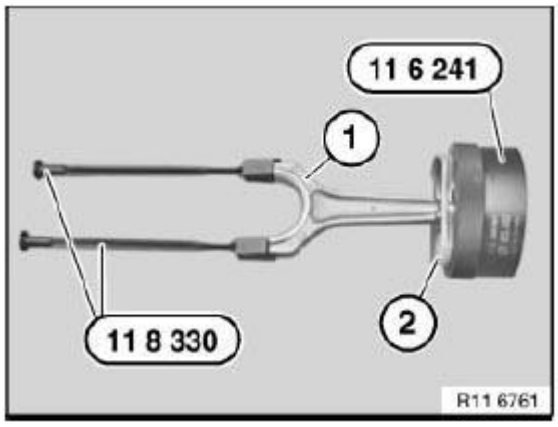

Fig. 156: Identifying Piston And Connecting Rod With Special Tools (11 8 330 And 11 6 241)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check protective lugs on special tool **11 8 330** for correct position and damage.

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.

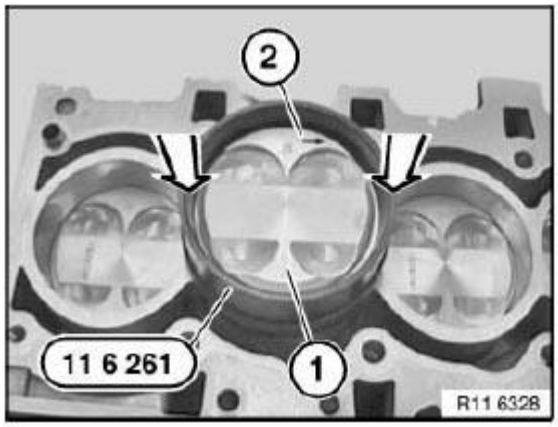

Fig. 157: Pressing In Piston With Special Tool (11 6 261)
Courtesy of BMW OF NORTH AMERICA, INC.

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.**

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.

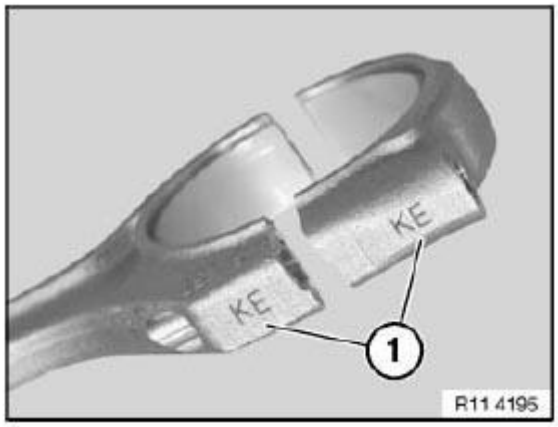

Fig. 158: Identifying Identical Pairing Letters
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a light coat of oil to connecting rod bearing journal.

Join connecting rod and connecting rod bearing journal.

Detach special tool **11 8 330.**

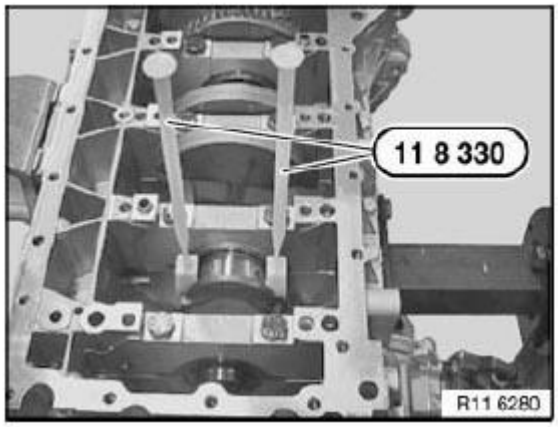

Fig. 159: Identifying Special Tool (11 8 330)
Courtesy of BMW OF NORTH AMERICA, INC.

Fit big end bearing caps (2) so that pairing letters match up.

Installation: Replace screws.

Install new connecting rod bolts (1).

IMPORTANT: Joining torque and angle of rotation must be observed without fail. Risk of damage!

Tightening torque **11 24 1AZ.**

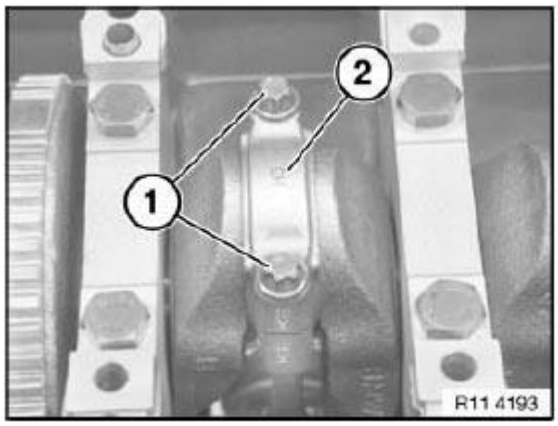

Fig. 160: Identifying Conrod Bolts And Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, tighten connecting rod bolts to torsion angle with special tool 00 9 120. Tightening torque **11 24 1AZ.**

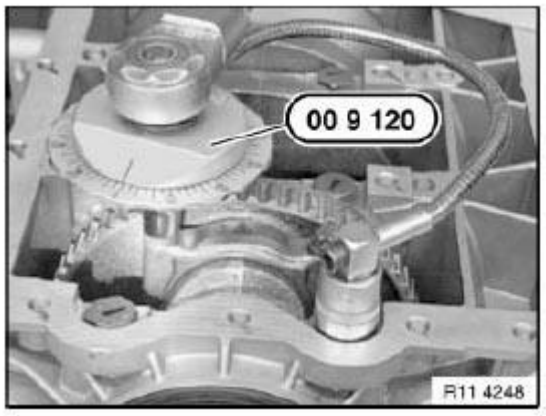

Fig. 161: Tightening Connecting Rod Bolts To Torsion Angle With Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 25 671 REPLACING PISTON RINGS ON ALL PISTONS (N52K)

Necessary preliminary tasks:

- Remove **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.

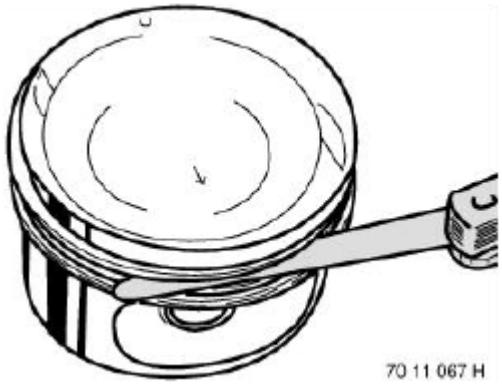

Fig. 162: Measuring Axial Clearance Of Piston Rings In Piston Ring Groove
Courtesy of BMW OF NORTH AMERICA, INC.

Remove plain compression ring and stepped ring upwards with piston ring pliers.

The U-flex ring comprises two steel band rings and a support spring.

NOTE: The U-flex ring cannot be removed with piston ring pliers.
Put aside all piston rings in correct sequence and installation position.

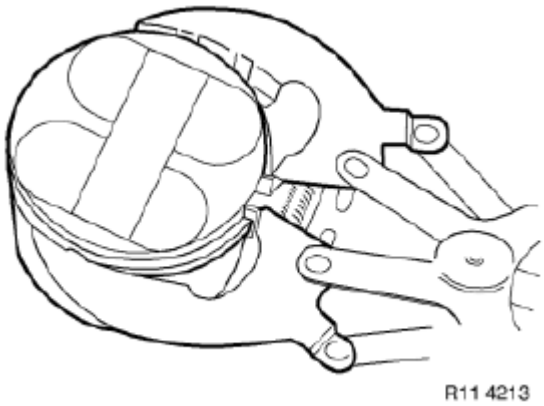

Fig. 163: Removing Plain Compression Ring And Stepped Ring
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Determine **end clearance** with a feeler gauge.

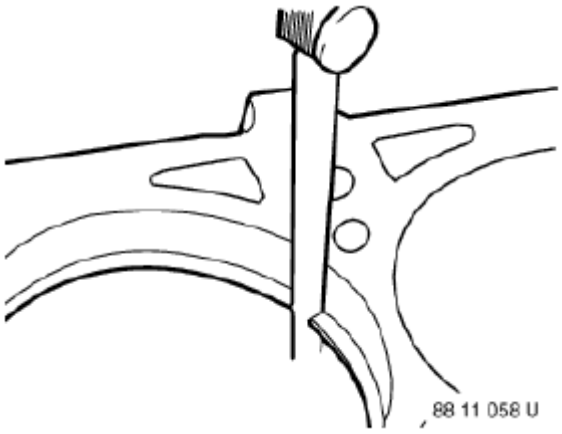

Fig. 164: Checking Piston Rings Gap
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic diagram of piston rings.

Installation:

Piston rings with "TOP" identification must point to piston crown.

1. Plain compression ring
2. Stepped ring "TOP"
3. U-flex ring

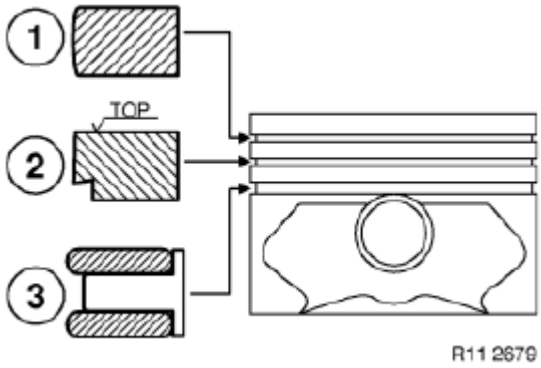

Fig. 165: Identifying Plain Compression Ring, Stepped Ring "Top" And U-Flex Ring
Courtesy of BMW OF NORTH AMERICA, INC.

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°.

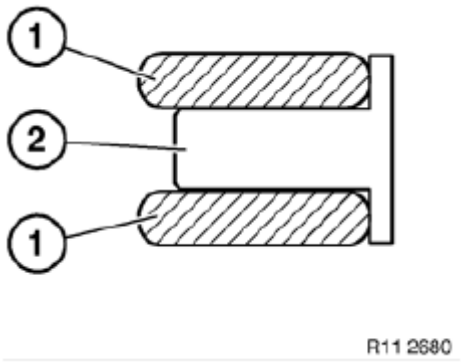

Fig. 166: Identifying Steel Band Rings And Support Springs
Courtesy of BMW OF NORTH AMERICA, INC.

The contact points (1) of the piston rings must be arranged offset by approx. 120°. However, the contact points (1) must not be arranged over the piston pin boss.

NOTE: Picture shows N52.

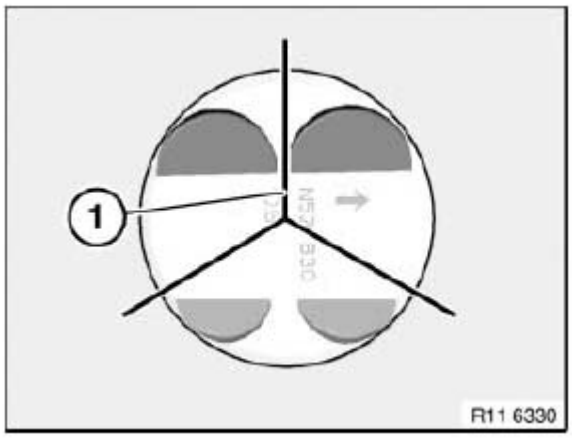

Fig. 167: Identifying Contact Points
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

V-RIBBED BELT WITH TENSIONER DEFLECTION ELEMENT

11 28 010 REPLACING ALTERNATOR DRIVE BELT (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 3 340**

IMPORTANT: Aluminum-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 **fan cowl** with electric fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N52/ N52K/ N53)** .

Drive belt routing E90, E91, E92, E93, E81, E82, E88

NOTE: Mark the direction of rotation of the drive belt if it is to be reused.

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.

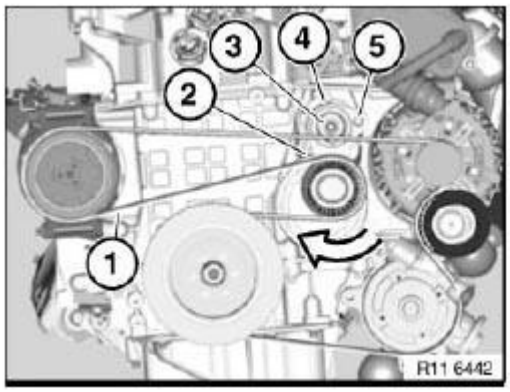

Fig. 168: Turning Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Course of E85 drive belt:

Turn belt tensioner (1) in direction of arrow until bore is flush on housing.

Hold belt tensioner (1) under tension.

Load is removed from tensioning pulley (2).

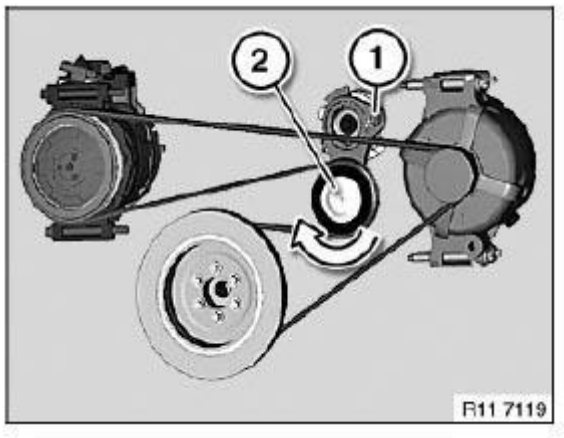

Fig. 169: Turning Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

All:

Secure belt tensioner (1) with special tool **11 3 340.**

Remove drive belt upwards.

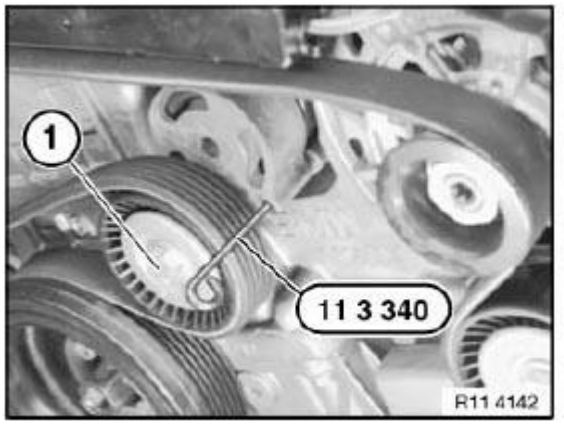

Fig. 170: Identifying Belt Tensioner With Special Tool (11 3 340)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Installation:

Check drive belt for correct installation position and, if reusing, observe direction of rotation. **Risk of damage.**

11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N52)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 3 340**

IMPORTANT: Aluminum-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 **drive belt** . See **11 28 010 REPLACING ALTERNATOR DRIVE BELT (N52K)**.

Remove special tool **11 3 340** .

Unscrew bolt (3).

Tightening torque. See 11 28 1AZ in **11 28 RIBBED V-BELT WITH TENSION AND DEFLECTION SYSTEM** .

Installation:

Replace aluminum screws .

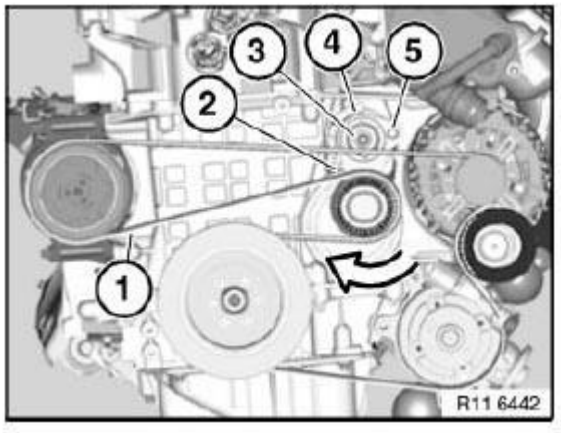

Fig. 171: Belt Tensioner And Belt Tensioner Screw (E9x Only)

Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CAMSHAFT

11 31 005 CHECKING TIMING OF CAMSHAFT(S) (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 0 300**
- **11 4 281**
- **11 4 282**
- **11 4 283**

IMPORTANT: When the engine is shut down, the intake and exhaust camshaft adjusters are normally locked in their initial setting. In order to avoid incorrect timing adjustment, it is essential to check the locking of the camshaft adjuster and if necessary perform locking by rotating the camshafts.

Necessary preliminary tasks:

- Remove **cylinder head cover** . See **11 12 000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER (N52K)**.
- Remove **underbody protection.** See **51 47 490 REMOVING AND INSTALLING/REPLACING FRONT UNDERBODY PROTECTION** .

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

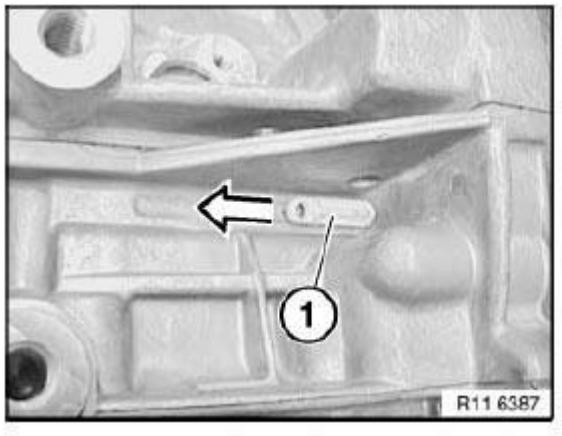

Fig. 172: Removing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

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.

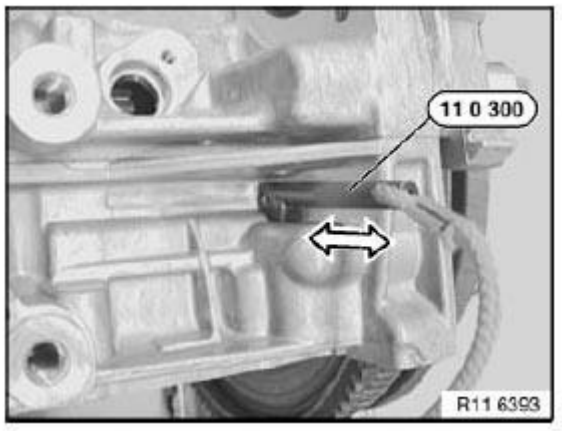

Fig. 173: Sliding Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

With 1st cylinder in firing TDC position, cams of inlet camshaft (1) at 1st cylinder point upwards at an angle.

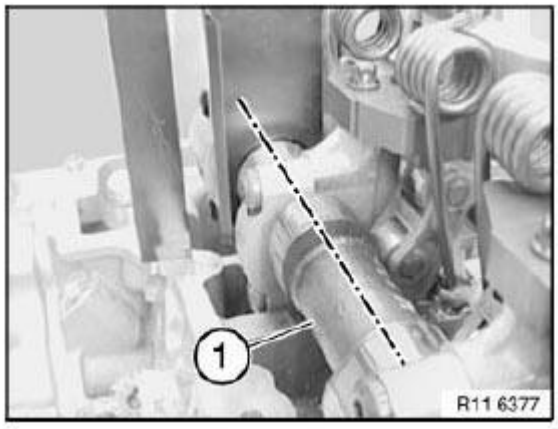

Fig. 174: Identifying Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

The timings are correct when the part numbers (2) on the inlet and exhaust camshafts (1) point upwards.

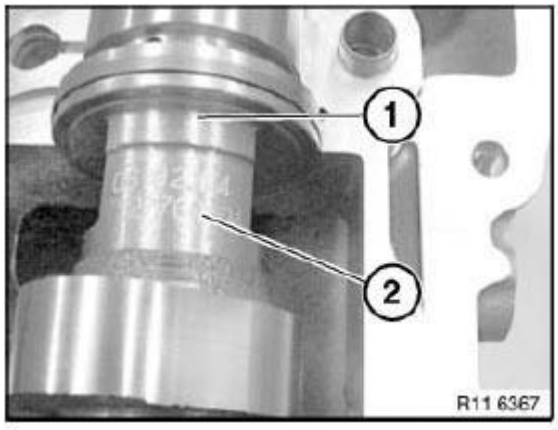

Fig. 175: Identifying Part Numbers And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

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.

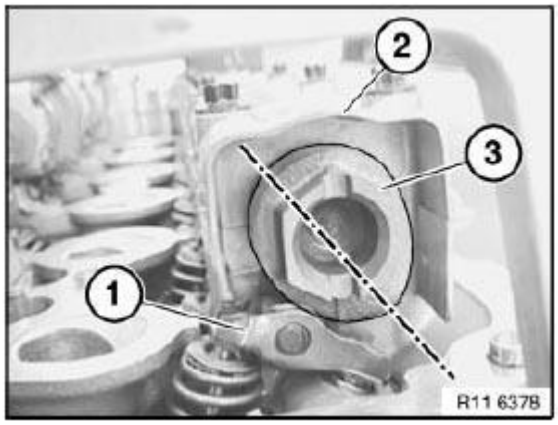

Fig. 176: Identifying Exhaust Camshaft And Angle Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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.

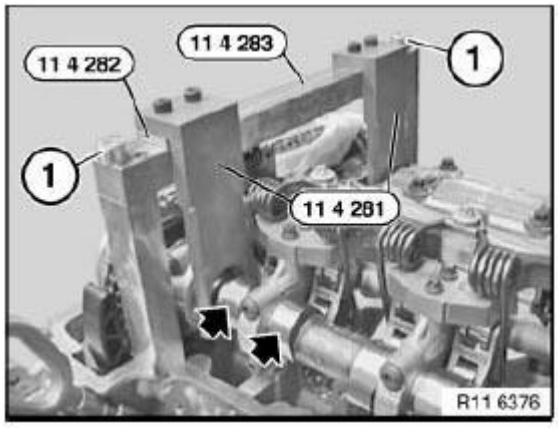

Fig. 177: Identifying Cylinder Head Bolts With Special Tools (11 4 282, 11 4 283 And 11 4 281)
Courtesy of BMW OF NORTH AMERICA, INC.

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:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 4 281**
- **11 4 481**

IMPORTANT: Aluminum-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 **cylinder head cover** . See **11 12 000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER (N52K)**.
- Remove **inlet adjustment unit** . See **11 36 046 REMOVING AND INSTALLING/REPLACING INLET AND EXHAUST ADJUSTMENT UNITS (N52)**.
- 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. See 11 31 2AZ in **11 31 CAMSHAFT** .

Set all bearing caps down in special tool **11 4 481** in a tidy and orderly fashion.

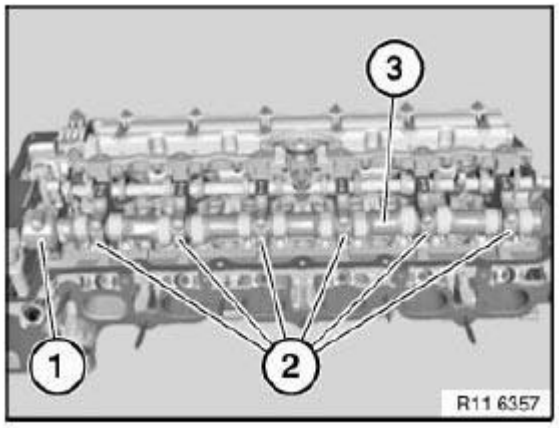

Fig. 178: Identifying Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Remove inlet camshaft (2) towards top.

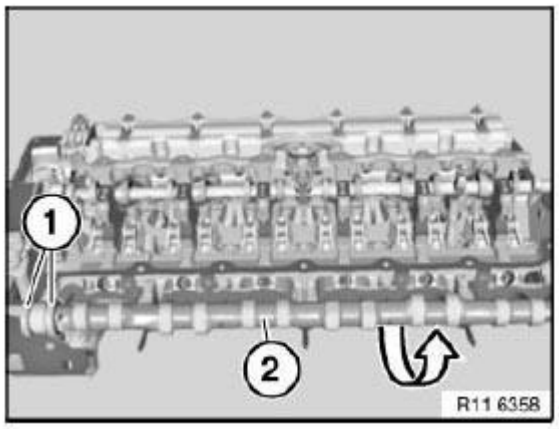

Fig. 179: Removing Inlet Camshaft Towards Top
Courtesy of BMW OF NORTH AMERICA, INC.

Metal plain rectangular compression ring:

IMPORTANT: Plain compression rings (1) can easily break.

Only replace plain rectangular compression rings (1) when they are broken.

The plain rectangular compression rings have catches at the joint.

Press plain rectangular compression rings (1) apart upwards and downwards and removed towards front.

Make sure plain rectangular compression rings (1) can move freely.

Installation note

When intake camshafts are inserted, no joint must point to a separating joint.

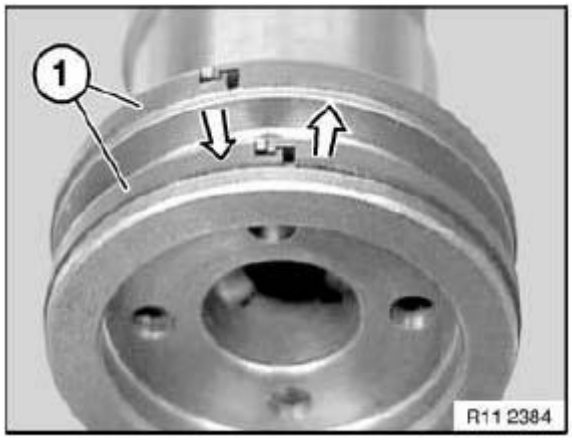

Fig. 180: Identifying Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Plastic plain rectangular compression ring:

Installation note

The plastic plain rectangular compression ring is maintenance free and does not have to be replaced.

Insert plastic rectangular compression ring (1) into groove of exhaust camshaft (2) (see arrow). Lightly oil plastic rectangular compression ring (1) and rotate in direction of arrow until compression ring (1) is positioned on the exhaust camshaft.

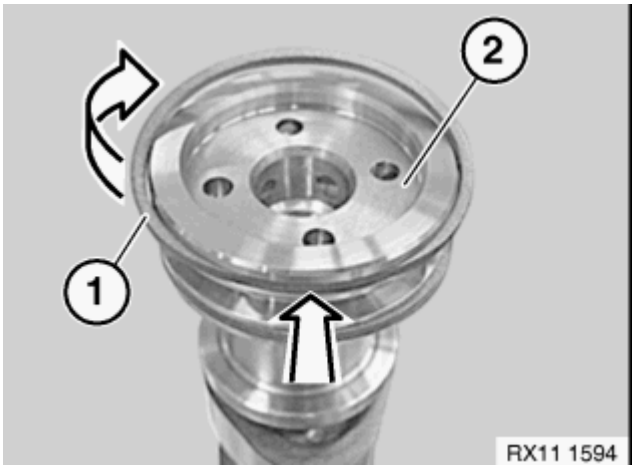

Fig. 181: Installing Plastic Plain Rectangular Compression Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Check plastic plain rectangular compression ring (1 and 2) for freedom of movement.

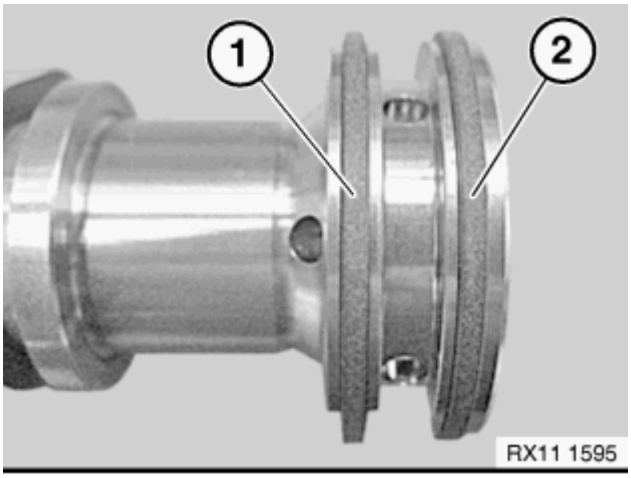

Fig. 182: Checking Ring For Freedom Of Movement
Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Markings of inlet and exhaust camshafts are different.
Mixing up the inlet and exhaust camshaft will result in engine damage.**

**A - Exhaust camshaft.
E - Inlet camshaft**

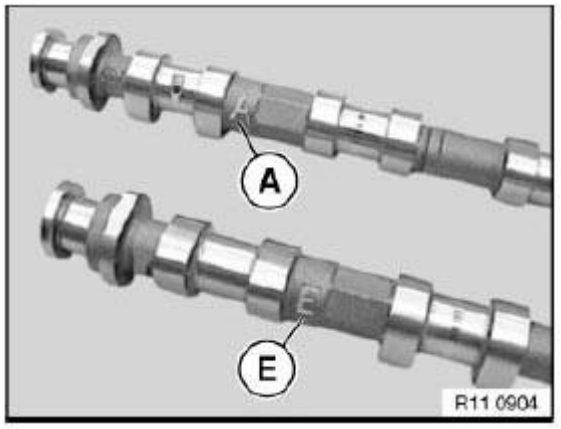

Fig. 183: Identifying Exhaust Camshaft And Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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.

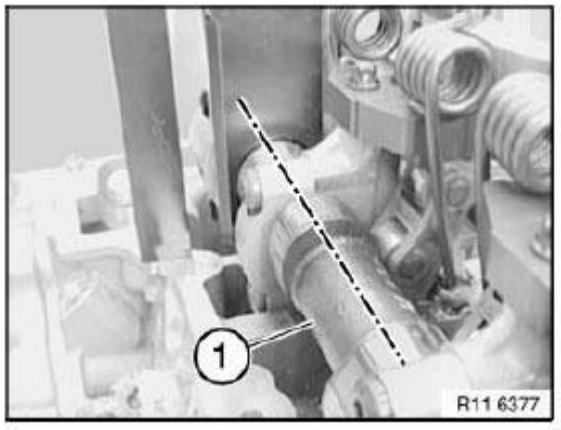

Fig. 184: Identifying Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 028 REMOVING AND INSTALLING/REPLACING EXHAUST CAMSHAFT (N52K)

Special tools required:

For the following special tools, refer to **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS -- 128I** .

- **00 9 120**

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 4 350**
- **11 4 461**
- **11 4 462**
- **11 4 463**
- **11 9 000**

IMPORTANT: It is absolutely essential to follow an exact procedure for removing and installing the exhaust camshaft.
Risk of damage!
The upper and lower bearing banks must be tensioned with a total of six special tools 11 4 461.

Necessary preliminary tasks:

- Remove **cylinder head cover** . See **11 12 000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER (N52K)**.
- Remove **exhaust adjustment unit** . See **11 36 046 REMOVING AND INSTALLING/REPLACING INLET AND EXHAUST ADJUSTMENT UNITS (N52)**.
- Adjust **valve timing** . See **11 31 505 ADJUSTING TIMING OF CAMSHAFT(S) (N52K)**.

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.

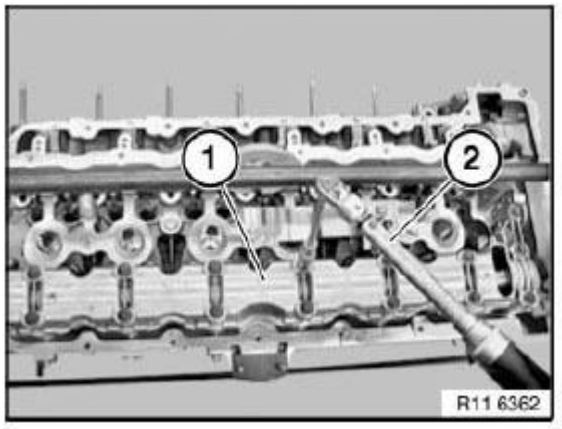

Fig. 185: Removing Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Markings of inlet and exhaust camshafts are different. Mixing up the inlet and exhaust camshaft will result in engine damage.
A Exhaust camshaft.
E Inlet camshaft

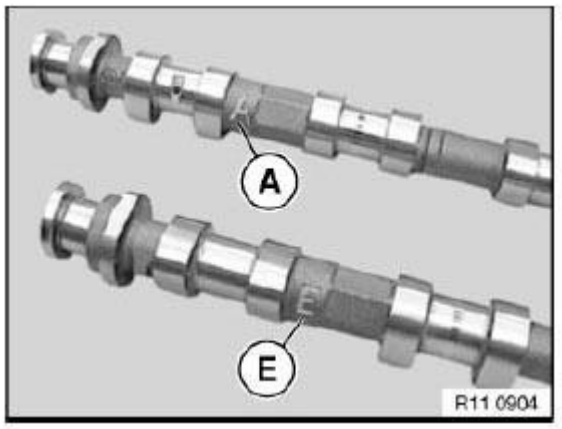

Fig. 186: Identifying Exhaust Camshaft And Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Metal plain rectangular compression ring:

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.

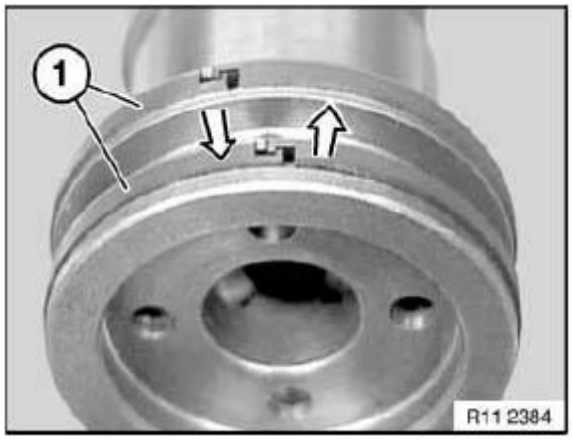

Fig. 187: Identifying Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Plain compression rings (1) can easily break.

Plastic plain rectangular compression ring:

Installation note

The plastic plain rectangular compression ring is maintenance free and does not have to be replaced.

Insert plastic rectangular compression ring (1) into groove of exhaust camshaft (2) (see arrow). Lightly oil plastic rectangular compression ring (1) and rotate in direction of arrow until compression ring (1) is positioned on the exhaust camshaft.

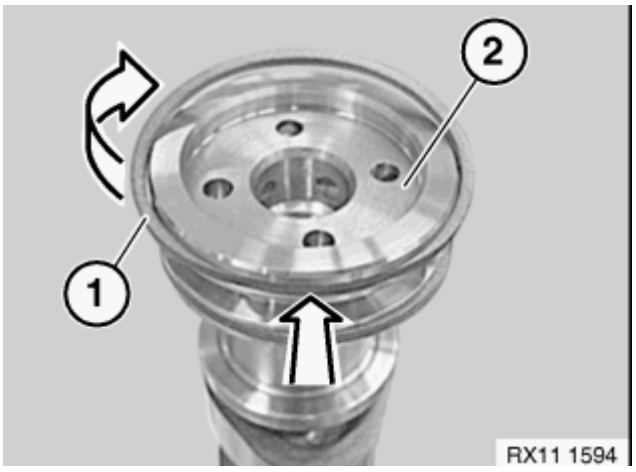

Fig. 188: Installing Plastic Plain Rectangular Compression Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Check plastic plain rectangular compression ring (1 and 2) for freedom of movement.

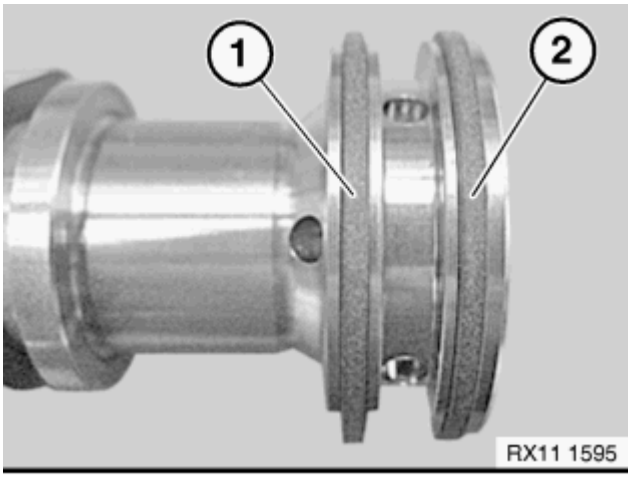

Fig. 189: Checking Ring For Freedom Of Movement
Courtesy of BMW OF NORTH AMERICA, INC.

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 strip:

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.

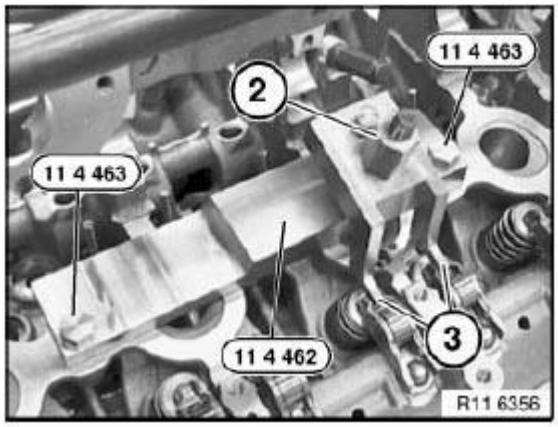

Fig. 190: Identifying Cam Followers And Spindle Nut With Special Tools (11 4 463 And 11 4 462)
Courtesy of BMW OF NORTH AMERICA, INC.

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 **11 33 050 REMOVING AND INSTALLING/REPLACING ALL ROCKER ARMS (N52K)**.

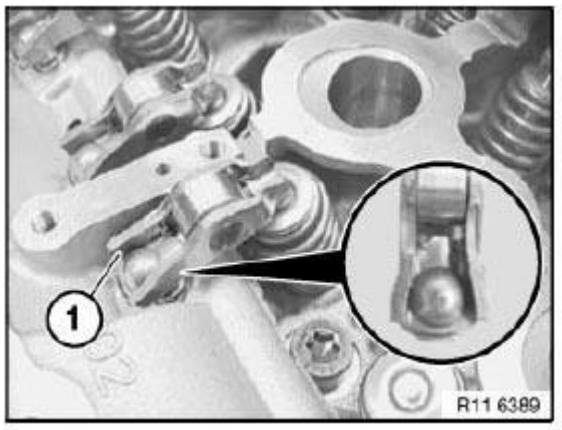

Fig. 191: Identifying Cam Follower Seat
Courtesy of BMW OF NORTH AMERICA, INC.

Position lower bearing bank (1) with exhaust camshaft (2) cam followers.

Align exhaust camshaft (2).

Cylinder nos. 2 and 4 are at valve overlap.

Cams (3) on cylinder no. 1 point upwards at an angle.

Part number (4) on twin surface of exhaust camshaft (2) points upwards.

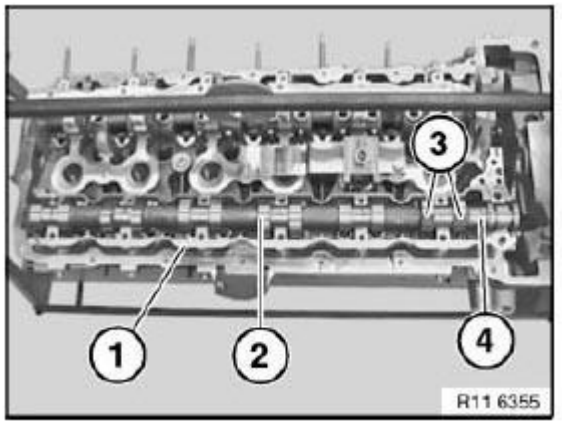

Fig. 192: Identifying Lower Bearing Bank, Exhaust Camshaft And Cam
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: There must be no adhesive residues in the cylinder head tapped holes.
Clean tapped holes.

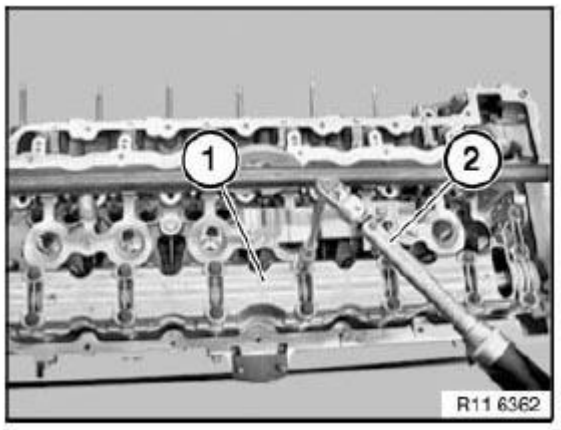

Fig. 193: Removing Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

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°.

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.

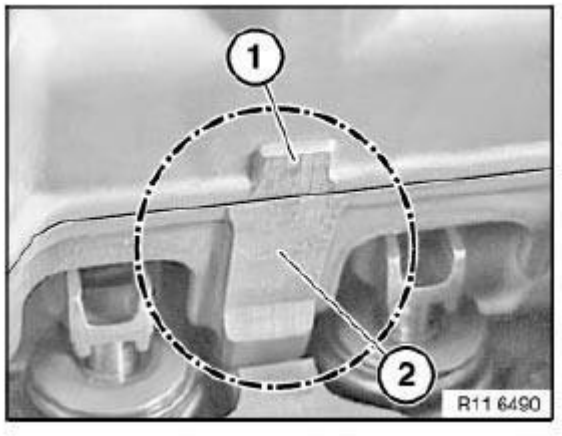

Fig. 194: Identifying Bearing Banks
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic depiction of special tool 11 4 461 at upper bearing bank (1) and lower bearing bank (2).
Pretension all special tools 11 4 461 with special tool 11 4 350 only.

IMPORTANT: Tighten screw (3) on thrust piece to 2 Nm. Risk of damage!

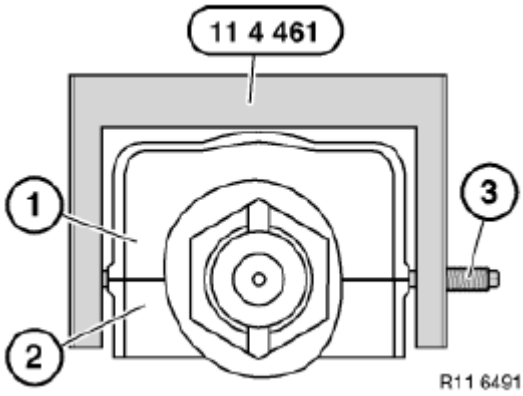

Fig. 195: Identifying Screw, Upper And Lower Bearing Bank With Special Tool (11 4 461)
Courtesy of BMW OF NORTH AMERICA, INC.

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).

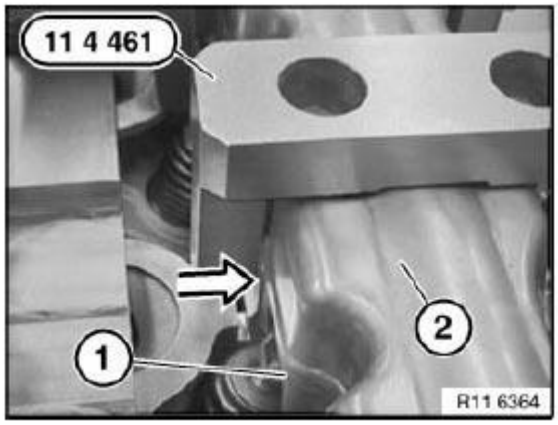

Fig. 196: Identifying Upper And Lower Bearing Bank With Special Tool (11 4 461)
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten screw of special tool 11 4 461 to ground surfaces of upper bearing bank (1) and lower bearing bank (2).

IMPORTANT: Tighten screws on thrust piece to 2 *Nm. Risk of damage!*

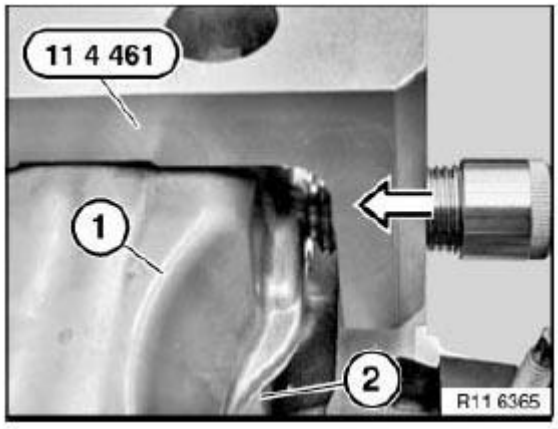

Fig. 197: Tightening Screw Of Special Tool 11 4 461 To Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: *Set special tool 11 4 350 to 2 Nm.*
Pretension all special tools 11 4 461 with special tool 11 4 350 only.

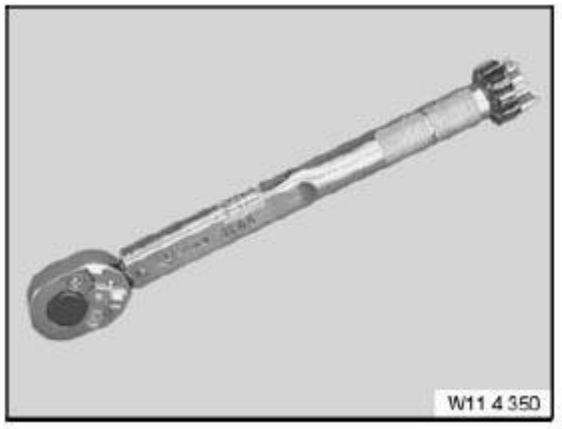

Fig. 198: Identifying Special Tools 11 4 461
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tools 11 4 461 with screw (1) to inside of cylinder head.

Mount special tool 11 4 461 with screw facing outwards on cylinder no. 2.

Position special tools 11 4 461 so that screw connections (2) of bearing bank are easily accessible.

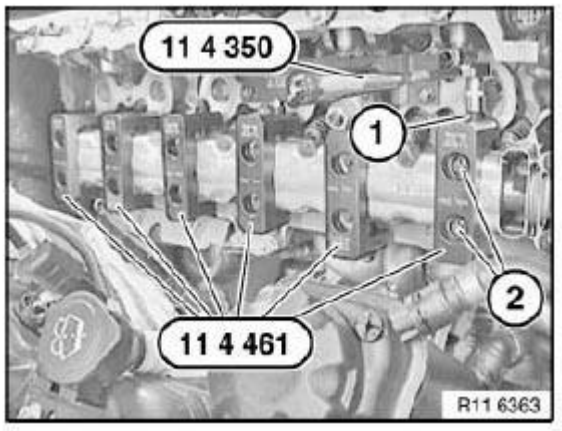

Fig. 199: Identifying Screws With Special Tools (11 4 350 And 11 4 461)
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten upper and lower bearing banks with special tool 00 9 120.

Tightening torque. See 11 31 1AZ in **11 31 CAMSHAFT** .

IMPORTANT: Remove special tool 11 4 461 only when exhaust camshaft screw connection is completed.

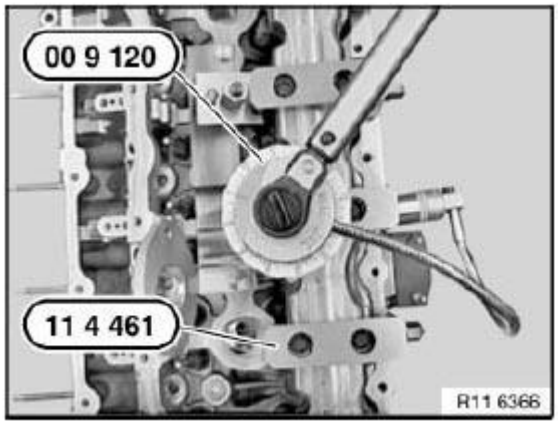

Fig. 200: Identifying Special Tools (00 9 120 And 11 4 461)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 051 REPLACING TIMING CHAIN (N52K)

Special tools required:

For the following special tools, refer to **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS -- 128I** .

- **00 9 140**

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 0 300**
- **11 4 280**
- **11 4 281**
- **11 4 282**
- **11 4 283**
- **11 4 360**
- **11 4 362**
- **11 5 200**
- **11 9 280**

Necessary preliminary tasks:

- Remove **cylinder head cover** . See **11 12 000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER (N52K)**.
- Remove all **spark plugs** . See **12 12 011 REPLACING ALL SPARK PLUGS (N42, N40, N46, N45, N52, N52K, N51)** .

- 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 SEAL (N52K)**.
- Remove drive belt **tensioner** . See **11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N52)**.
- Remove **vibration damper** . See **11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (N52K)**.

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

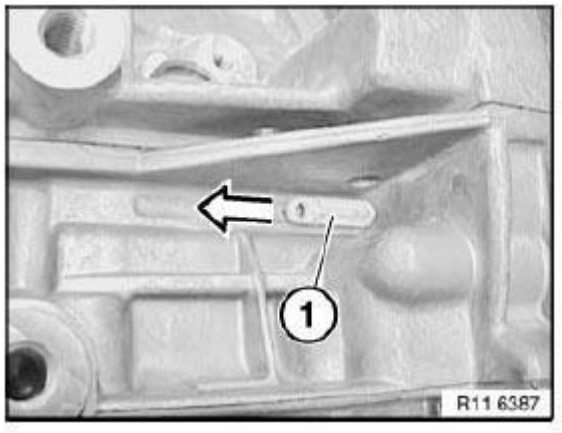

Fig. 201: Removing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

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.

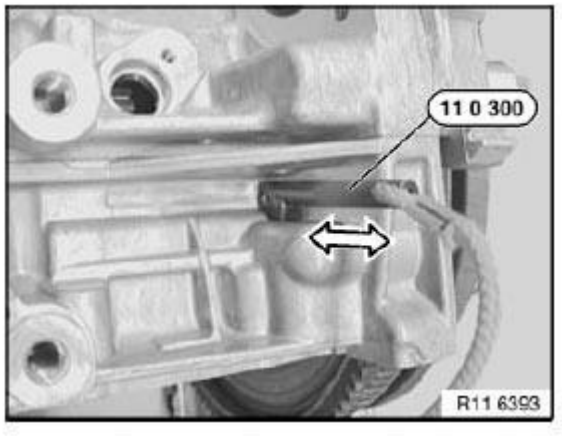

Fig. 202: Sliding Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

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. See 11 21 1AZ in **11 21 CRANKSHAFT AND BEARINGS** or **11 21 CRANKSHAFT AND BEARINGS** .

Remove hub towards front.

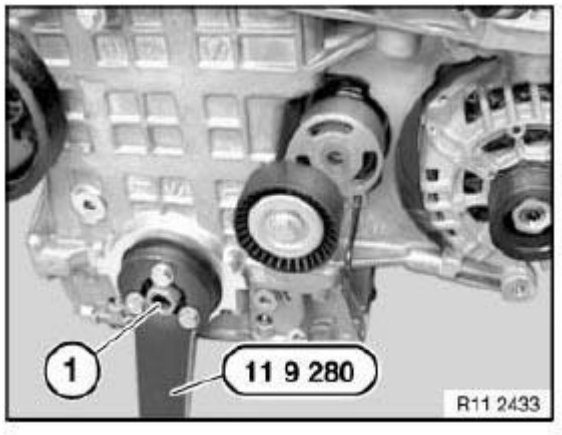

Fig. 203: Identifying Central Bolt With Special Tool (11 9 280)
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque. See 11 31 7AZ in **11 31 CAMSHAFT** .

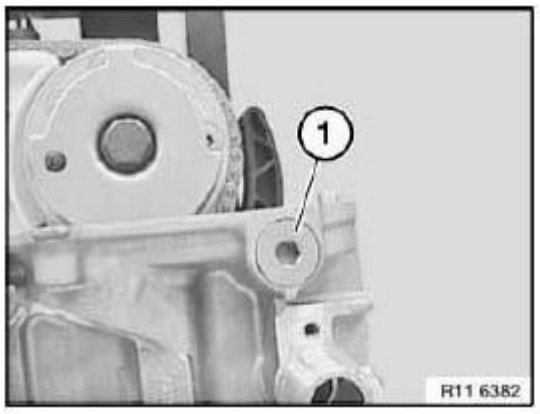

Fig. 204: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque. See 11 11 7AZ in **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

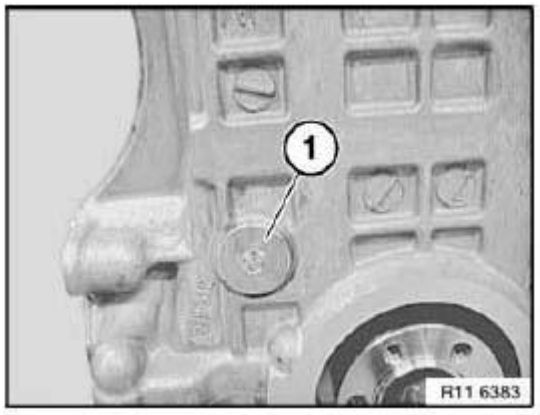

Fig. 205: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release bearing pin (1) from timing chain module on cylinder head.

Tightening torque. See 11 31 5AZ in **11 31 CAMSHAFT** .

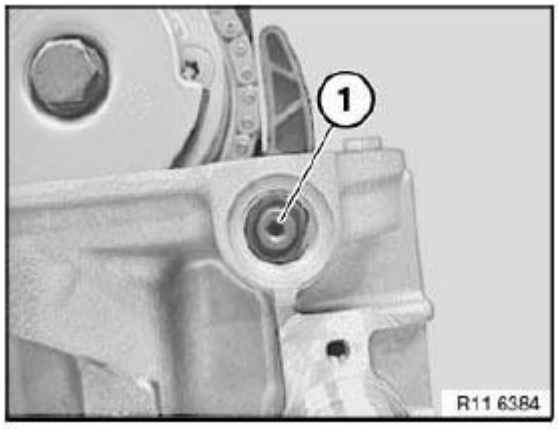

Fig. 206: Identifying Bearing Pin From Timing Chain Module On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Release bearing pin (1) from timing chain module on crankcase.

Tightening torque. See 11 31 4AZ in **11 31 CAMSHAFT** .

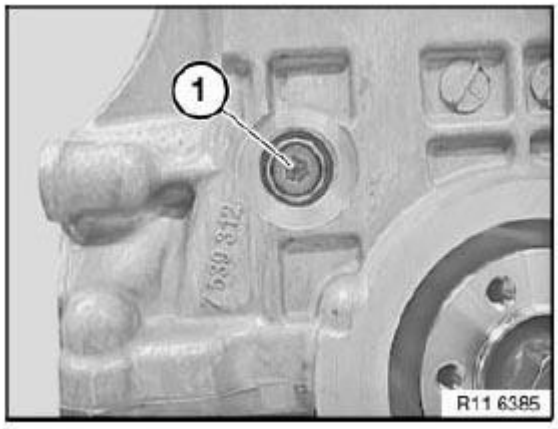

Fig. 207: Identifying Bearing Pin From Timing Chain Module On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Install special tool 11 4 280 to release the central bolts on the inlet and exhaust adjustment units.

Secure special tool **11 4 283** to cylinder head with bolts (1).

NOTE: Fit special tool 11 4 282 underneath on side of inlet camshaft.

Mount special tool **11 4 281** on inlet and exhaust camshafts.

Do not remove special tool **11 4 280.**

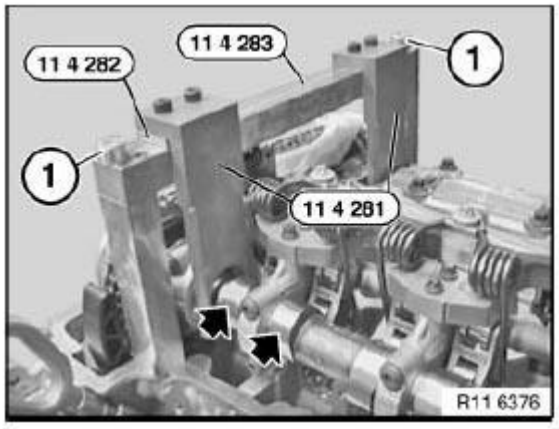

Fig. 208: Identifying Cylinder Head Bolts With Special Tools (11 4 282, 11 4 283 And 11 4 281)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **inlet and exhaust adjustment unit.** See **11 36 046 REMOVING AND INSTALLING/REPLACING INLET AND EXHAUST ADJUSTMENT UNITS (N52)**.

Release bolts (1) from timing chain module on cylinder head.

Tightening torque. See 11 31 3AZ in **11 31 CAMSHAFT** .

Remove chain module with timing chain and sprocket wheel upwards in direction of arrow.

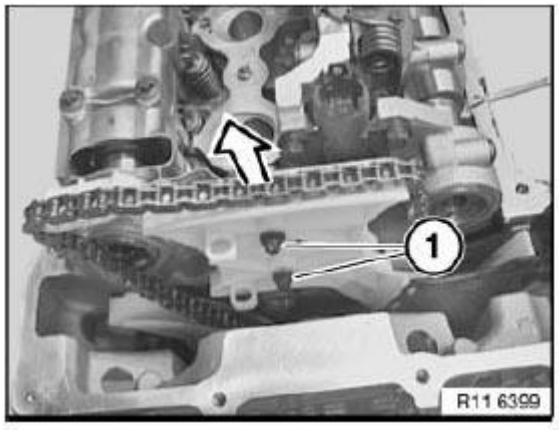

Fig. 209: Removing Chain Module With Timing Chain And Sprocket Wheel Upwards
Courtesy of BMW OF NORTH AMERICA, INC.

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.

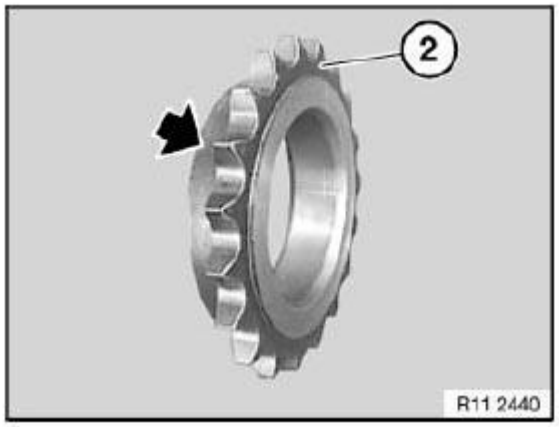

Fig. 210: Identifying Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

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).

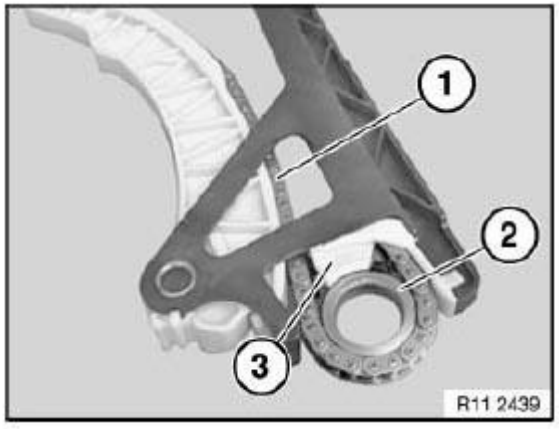

Fig. 211: Identifying Timing Chain, Sprocket Wheel And Chain Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Install hub with central bolt.

Tighten down special tool **11 5 200** with screws (1) to hub.

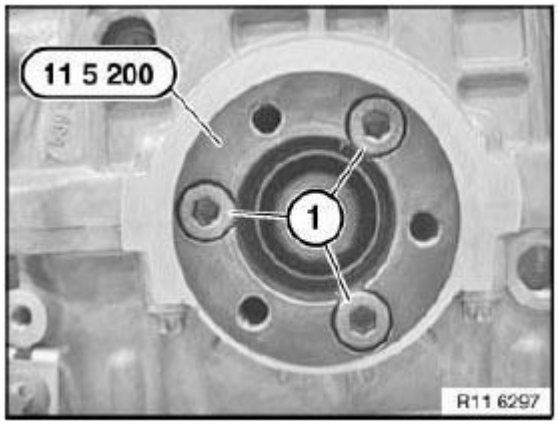

Fig. 212: Identifying Screws With Special Tool (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **tensioner** for drive belt. See **11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N52)**.

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. See in **11 21 CRANKSHAFT AND BEARINGS** or **11 21 CRANKSHAFT AND BEARINGS** .

Mark central bolt and hub with paint.

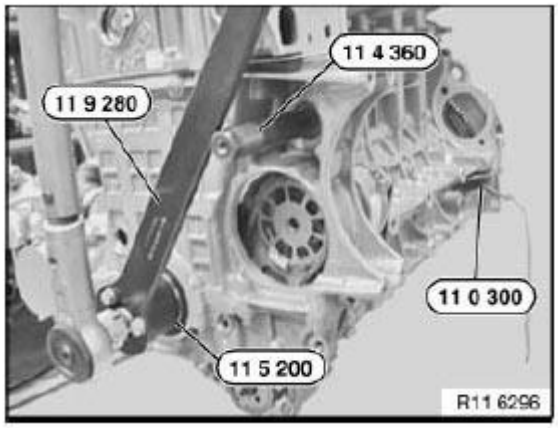

Fig. 213: Identifying Special Tool (11 9 280, 11 4 360, 11 5 200 And 11 0 300)

Courtesy of BMW OF NORTH AMERICA, INC.

Mark special tools with colored line (1).

See **Fig. 214**.

IMPORTANT: Do *not* remove the special tool while tightening the central bolt to torsion angle.
Risk of damage!

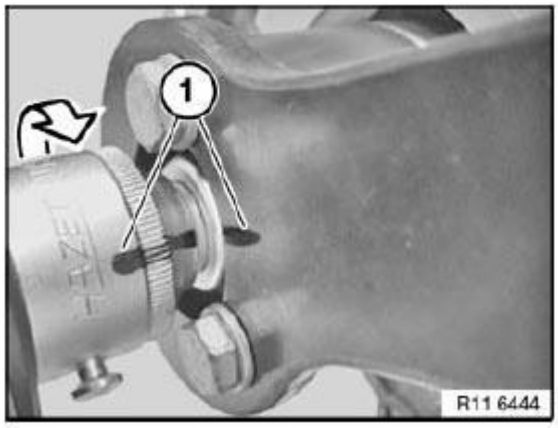

Fig. 214: Identifying Colored Line
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, tighten central bolt to torsion angle with special tool **00 9 140.**

Tightening torque. See 11 21 1AZ in **11 21 CRANKSHAFT AND BEARINGS** or **11 21 CRANKSHAFT AND BEARINGS** .

Tighten central bolt with a second person helping.

Tightening torque. See 11 21 1AZ in **11 21 CRANKSHAFT AND BEARINGS** or **11 21 CRANKSHAFT AND BEARINGS** .

Install **inlet and exhaust adjustment units.** See **11 36 046 REMOVING AND INSTALLING/REPLACING INLET AND EXHAUST ADJUSTMENT UNITS (N52)**.

Install **chain tensioner.** See **11 31 090 INSTALLING AND REMOVING/REPLACING CHAIN TENSIONER PISTON (N52K)**.

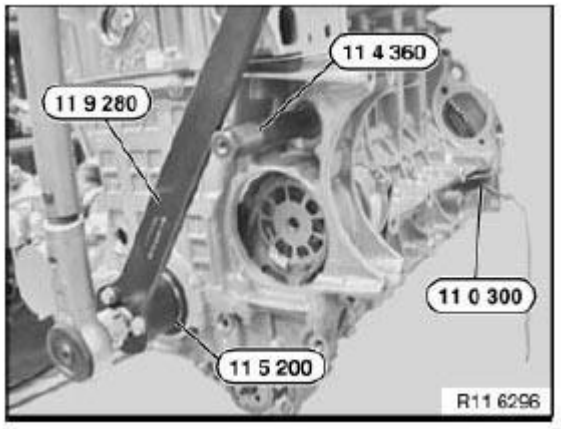

Fig. 215: Identifying Special Tool (11 9 280, 11 4 360, 11 5 200 And 11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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. See 11 31 6AZ in **11 31 CAMSHAFT** .

IMPORTANT: Have a cleaning cloth ready. A small quantity of engine oil will emerge after the screw connection has been released.
Make sure no engine oil runs onto belt drive.

Installation:

No sealing ring is fitted during series-production assembly.

A sealing ring must be fitted by service personnel when the chain tensioner is fitted.

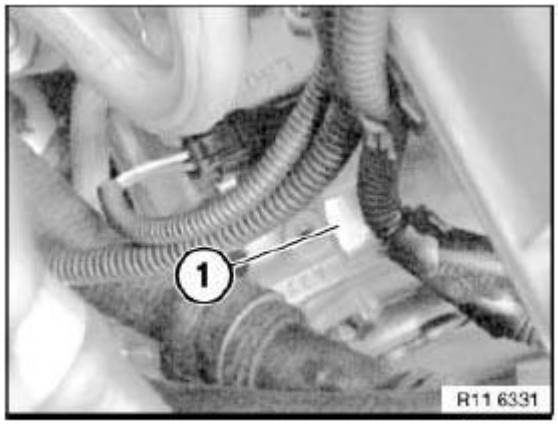

Fig. 216: Identifying Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

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. 217: Compressing Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 505 ADJUSTING TIMING OF CAMSHAFT(S) (N52K)

Special tools required:

For the following special tools, refer to **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS -- 128I** .

- **00 9 120**
- **00 9 250**

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 0 300**
- **11 4 280**
- **11 4 281**
- **11 4 282**
- **11 4 283**
- **11 4 290**
- **11 9 340**

Necessary preliminary tasks:

- Remove **cylinder head cover** . See **11 12 000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER (N52K)**.

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

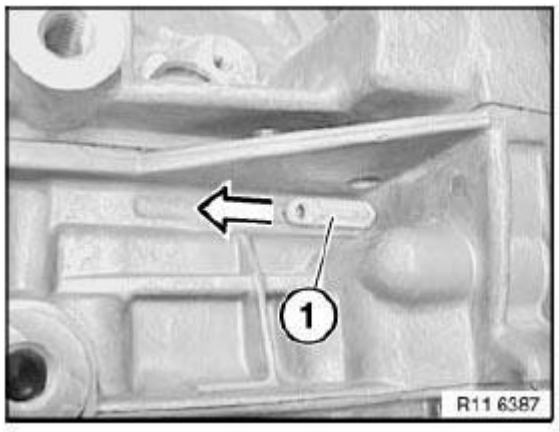

Fig. 218: Removing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

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.

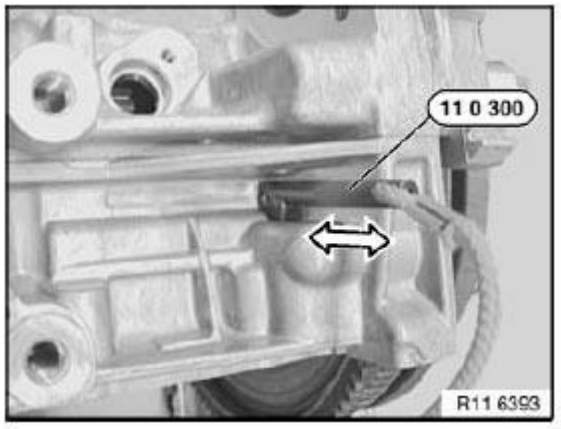

Fig. 219: Sliding Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

With 1st cylinder in firing TDC position, cams of inlet camshaft (1) at 1st cylinder point upwards at an angle.

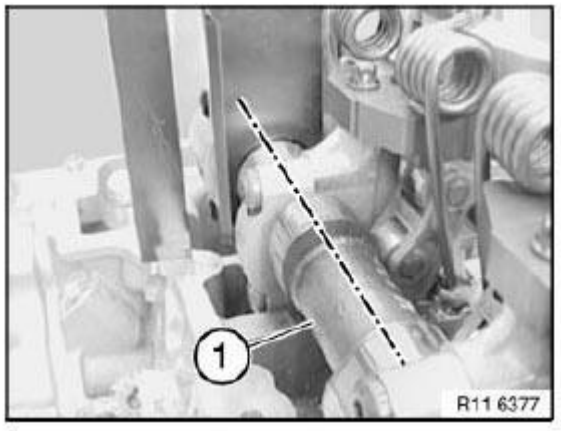

Fig. 220: Identifying Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Part numbers (2) on inlet and exhaust camshafts (1) point upwards.

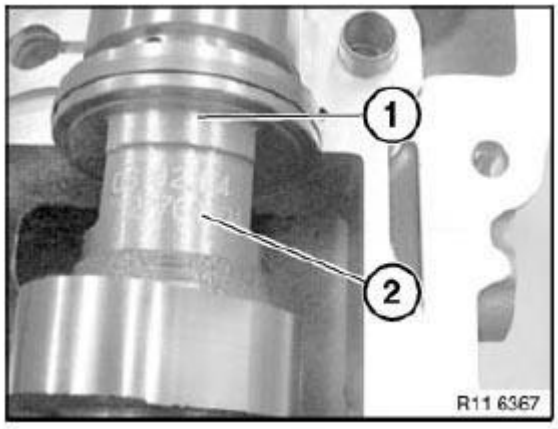

Fig. 221: Identifying Part Numbers And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

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.

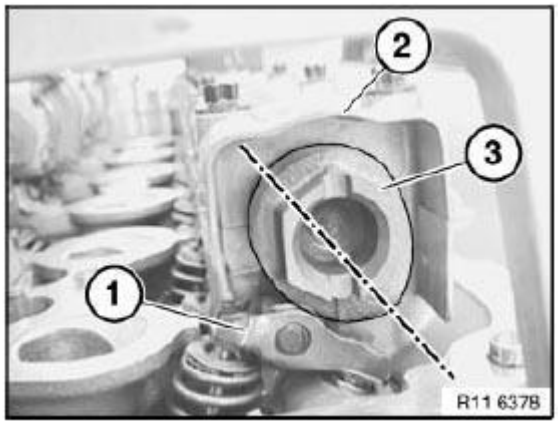

Fig. 222: Identifying Exhaust Camshaft And Angle Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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.

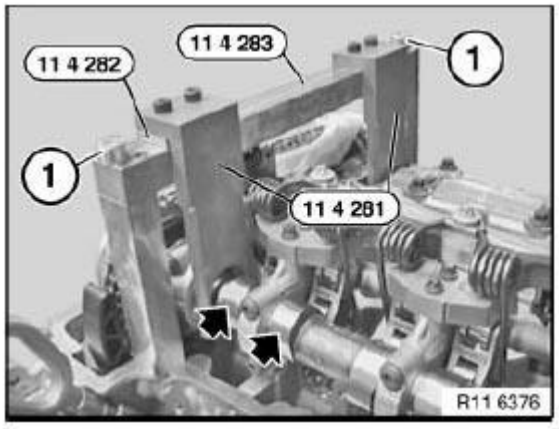

Fig. 223: Identifying Cylinder Head Bolts With Special Tools (11 4 282, 11 4 283 And 11 4 281)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

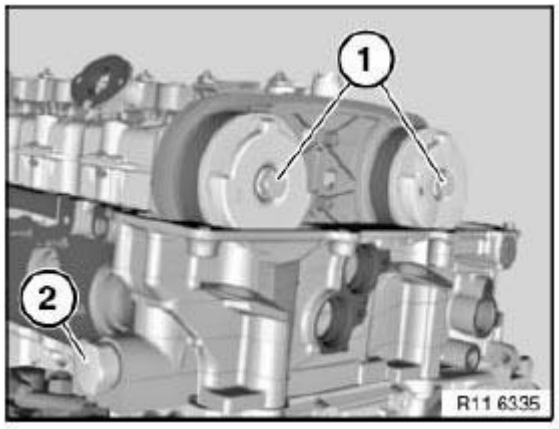

Fig. 224: Identifying Central Bolts And Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Turn sensor gears (2) in direction of arrow until locating pins (1) on special tool **11 4 290** match up.

Slide on special tool **11 4 290** in direction of arrow.

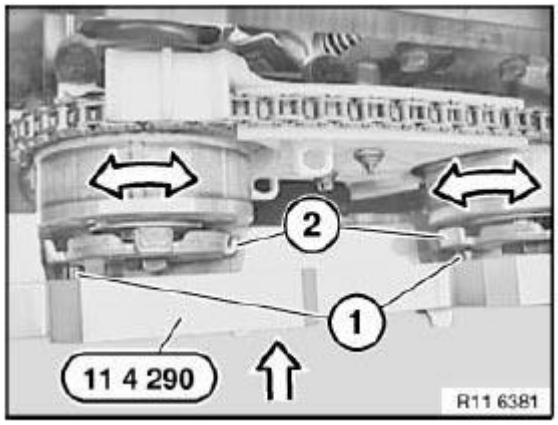

Fig. 225: Turning Sensor Gears
Courtesy of BMW OF NORTH AMERICA, INC.

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. See 11 36 1AZ in **11 36 VARIABLE CAMSHAFT CONTROL VANOS** .

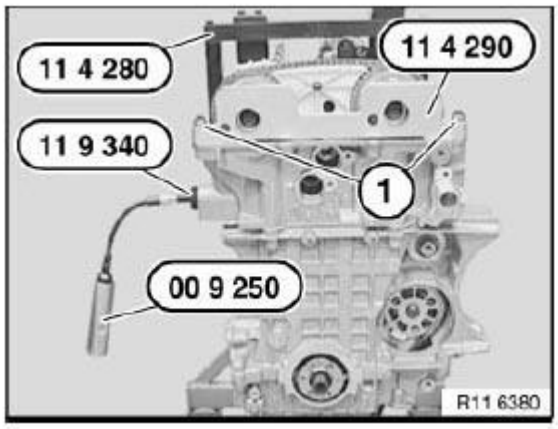

Fig. 226: Identifying Bolts With Special Tools (11 4 280, 11 4 290, 11 9 340 And 00 9 250)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

ROCKER ARM WITH BEARING MOUNT

11 33 050 REMOVING AND INSTALLING/REPLACING ALL ROCKER ARMS (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 4 480**

Necessary preliminary tasks:

- Remove **cylinder head cover** . See **11 12 000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER (N52K)**.
- 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.**

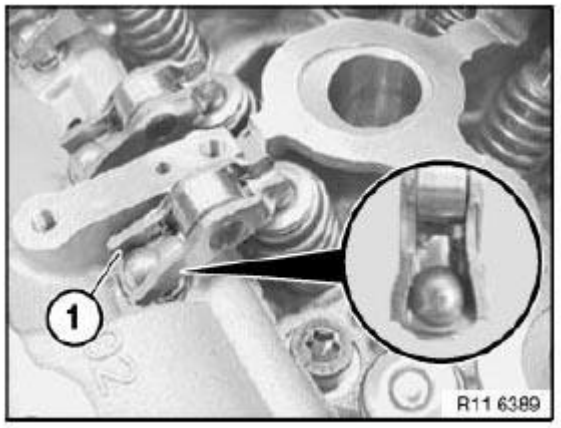

Fig. 227: Identifying Rocker Arms
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Before installing exhaust camshaft or intermediate levers, make sure cam followers (1) are correctly seated.

Remove HVCA element (1) in direction of arrow.

Installation:

If the HVCA elements (1) are reused, they must be placed together with the cam followers in neat order in special tool **11 4 480.**

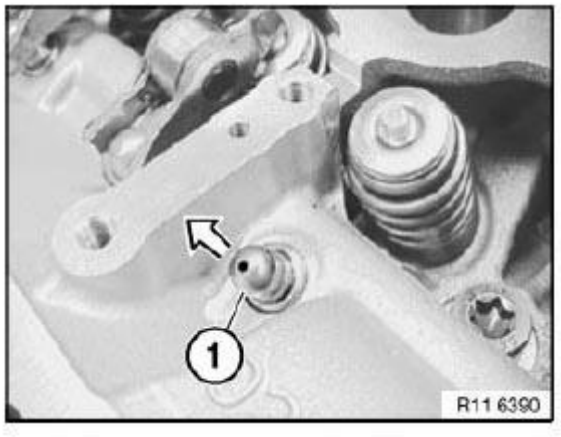

Fig. 228: Removing HVCA Element
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME; if necessary, readjust uniform mixture distribution.

VALVES WITH SPRINGS

11 34 552 REMOVING AND INSTALLING/REPLACING ALL VALVES (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **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**

ROCKER ARMS (N52K).

- Remove **valve springs** . See **11 34 715 REPLACING ALL VALVE SPRINGS (N52K)**.
- Remove **valve stem seals** . See **11 34 560 REPLACING ALL VALVE STEM SEALS (N52K)**.

Arrangement:

1. Valve
2. Valve stem seal with lower spring plate
3. Valve spring
4. Upper spring plate
5. Valve tapers

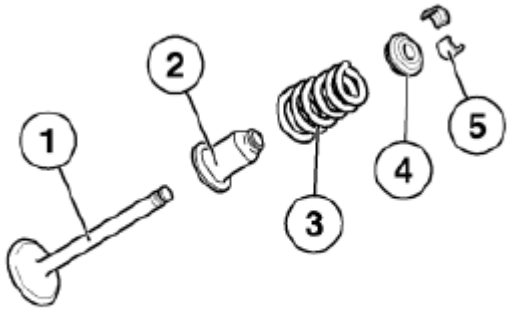

Fig. 229: Identifying Valve, Valve Stem Seal With Lower Spring Plate, Valve Spring And Valve Tapers
Courtesy of BMW OF NORTH AMERICA, INC.

If the valves are to be reused, they must be placed in neat order in special tool **11 4 480** .

Assemble engine.

Check function of DME; if necessary, readjust uniform mixture distribution.

11 34 560 REPLACING ALL VALVE STEM SEALS (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **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 ROCKER ARMS (N52K)**.

Firmly press special tool **11 1 480** onto old valve stem seals.

Detach valve stem seal from valve stem by turning and simultaneously pulling special tool **11 1 480.**

Installation:

Insert all valves.

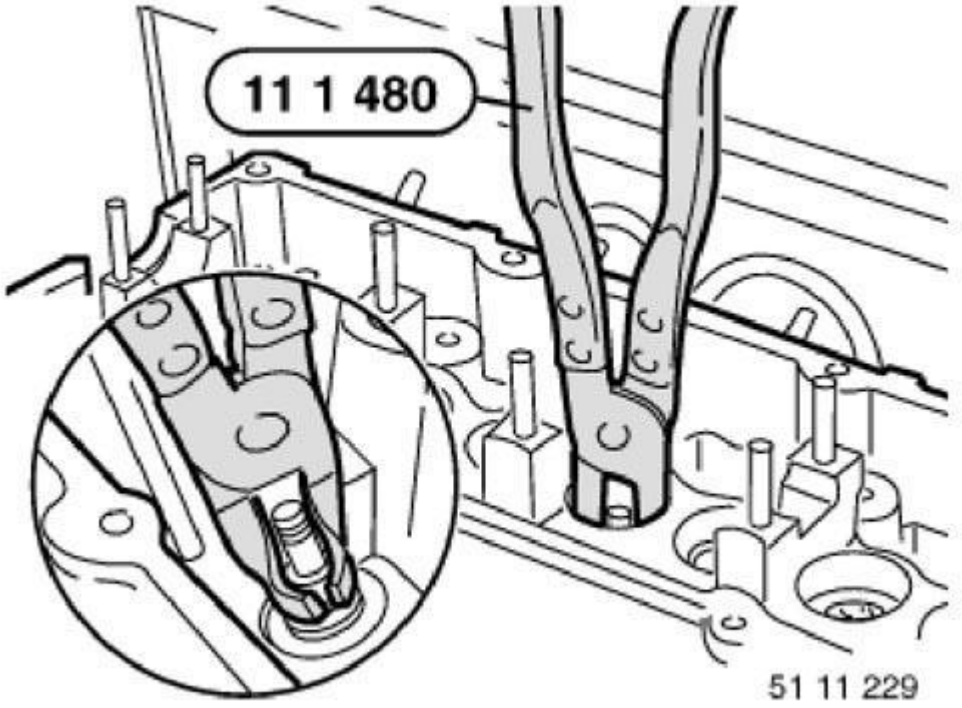

Fig. 230: Identifying Special Tool 11 1 480 Onto Old Valve Stem Seals
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For use on the N52K engine, special tool 11 6 380 must be remachined according to the picture with a 10 mm dia. drill bit to a depth of B = approx. 23 mm.
This modification has already been taken into account for reordering.

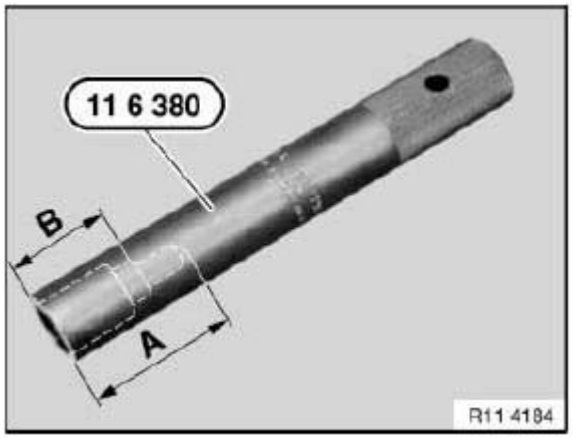

Fig. 231: Identifying Special Tool (11 6 380)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

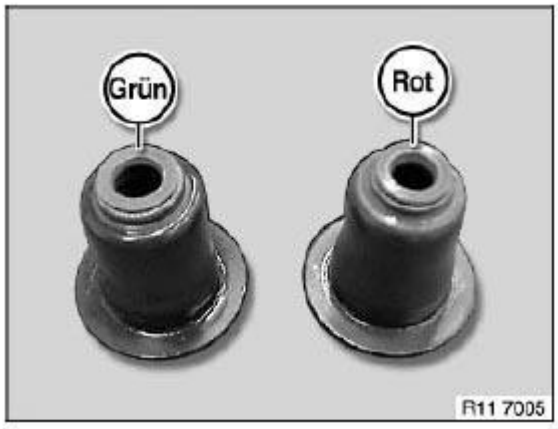

Fig. 232: Identifying Valve Stem Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit the mounting sleeves (plastic sleeves) contained in the delivery specification on the valve stem end.

Lubricate mounting sleeve.

Press on valve stem seal by hand with special tool **11 6 380** as far as it will go.

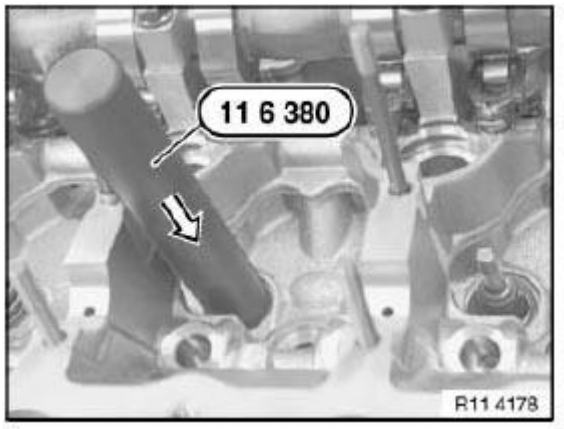

Fig. 233: Identifying Special Tools (11 6 380)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 34 715 REPLACING ALL VALVE SPRINGS (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **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 ROCKER ARMS (N52K)**.

Place cylinder head on special tool **11 9 000.**

Press down **inlet valves** with special tool **11 9 017.**

Press down **exhaust valves** with special tool **11 0 346.**

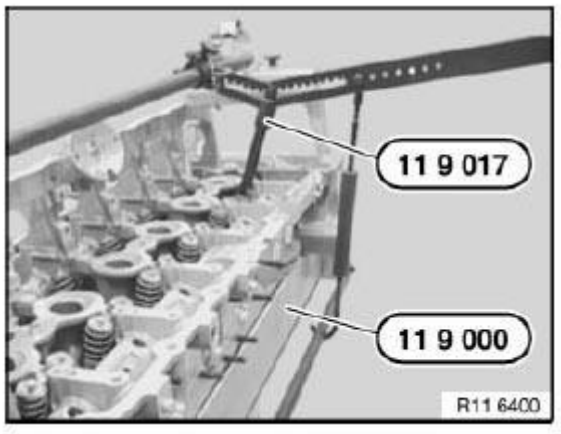

Fig. 234: Identifying Special Tools (11 9 000 And 11 9 017)
Courtesy of BMW OF NORTH AMERICA, INC.

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.**

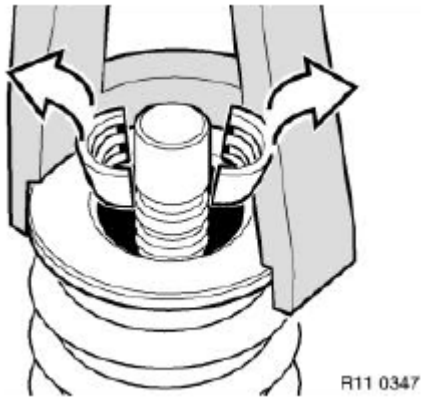

Fig. 235: Removing Valve Cotters With Magnet
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Incorrect installation possible.
Incorrect installation will result in valve spring breakage. Risk of mixing up the valve springs for the inlet and exhaust valves.

The valve spring is color-coded (1) at the lower end.

Install the valve spring so that the larger diameter points to the lower spring plate.

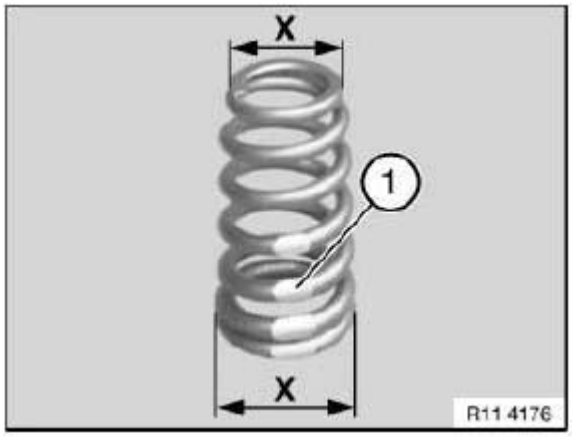

Fig. 236: Identifying Valve Spring Color Coded
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement:

1. Valve
2. Valve stem seal with lower spring plate
3. Valve spring
4. Upper spring plate
5. Valve tapers

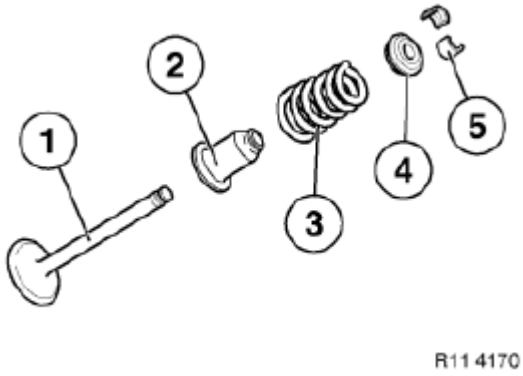

Fig. 237: Identifying Valve, Valve Stem Seal With Lower Spring Plate, Valve Spring And Valve Tapers
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME; if necessary, readjust uniform mixture distribution.

VARIABLE CAMSHAFT TIMING

11 36 046 REMOVING AND INSTALLING/REPLACING INLET AND EXHAUST ADJUSTMENT UNITS (N52)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 4 280**
- **11 4 281**
- **11 4 28**
- **11 4 283**

Necessary preliminary tasks:

- Remove **cylinder head cover** . See **11 12 000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER (N52K)**.
- For E81, E82, E87, E88, E90, E91, E92, E93: Remove **COWL PANEL COVER** .
- Check **timing** . See **11 31 505 ADJUSTING TIMING OF CAMSHAFT(S) (N52K)**.

IMPORTANT: To secure the central bolts on the intake and exhaust camshaft adjusters and camshafts, fit special tool 11 4 280. See Fig. 238.

Fit special tool 11 4 283 with screws (1).

Fit special tool 11 4 281 on special tool 11 4 283. See **Fig. 238**.

IMPORTANT: Special tool 11 4 282 must be fitted underneath on inlet camshaft.

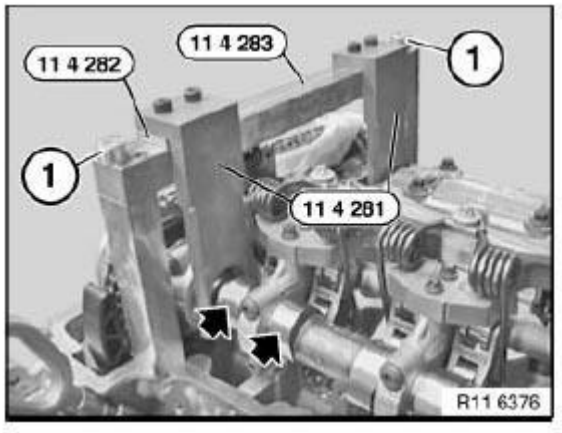

Fig. 238: Identifying Central Bolts On Adjustment Units And Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Release chain tensioner (2).

Tightening torque. See 11 31 6AZ in **11 31 CAMSHAFT** .

Release central bolt on inlet/exhaust adjustment units (1).

Tightening torque. See 11 36 1AZ in **11 36 VARIABLE CAMSHAFT CONTROL VANOS** .

IMPORTANT: Installation note: Replace central bolts.

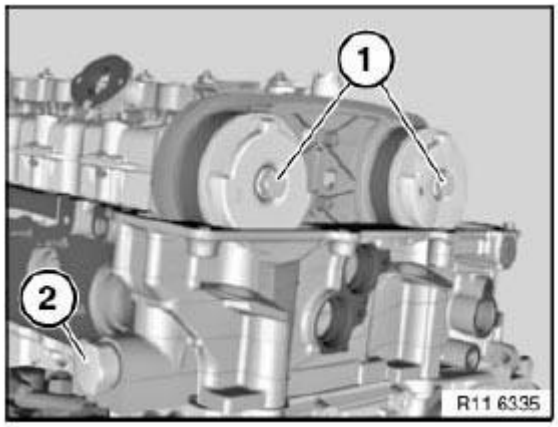

Fig. 239: Identifying Chain Tensioner And Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Detach exhaust adjustment unit (1) from exhaust camshaft.

Detach inlet adjustment unit (2) from inlet camshaft.

Installation:

To facilitate removal and installation of adjustment units, turn sensor gears at cutout downwards.

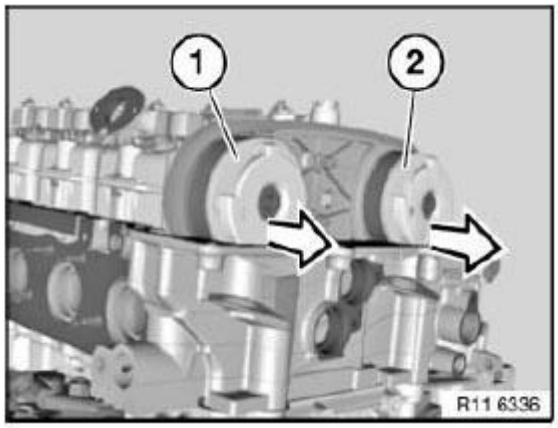

Fig. 240: Identifying Inlet/Exhaust Adjustment Unit
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT:

- **Danger of mixing up adjustment units! .**
- **Mixing up the adjustment units will result in engine damage.**

The inlet and exhaust adjustment units are different.

VANOS is marked with AUS and EX for the exhaust camshaft.

VANOS is marked with EIN and IN for the inlet camshaft.

Sensor gears can be fitted alternatively.

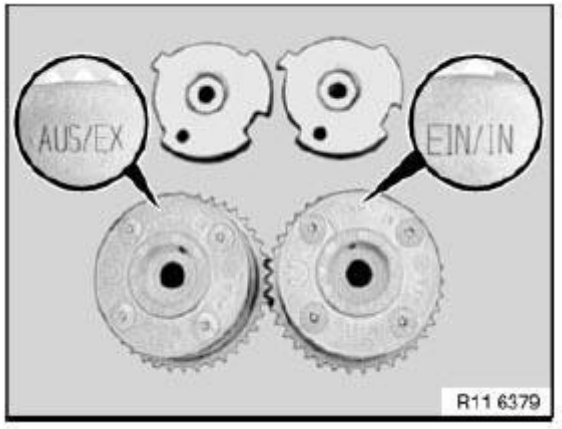

Fig. 241: Identifying AUS And EX Marks For Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Fit both adjustment units on camshafts.

The installation position of the adjustment units can be freely selected.

Insert central bolts (1).

Installation note: Replace central bolts.

Tightening torque. See 11 36 1AZ in **11 36 VARIABLE CAMSHAFT CONTROL VANOS** .

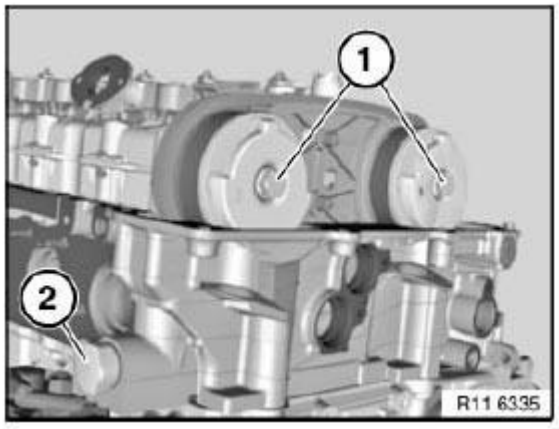

Fig. 242: Identifying Central Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: To secure central bolts on adjustment units and camshafts. Fit special tool 11 4 280.

IMPORTANT: Incorrect installation possible.

Press clamping rail (1) by hand against timing chain and make sure timing chain is guided in clamping rail (1).

NOTE: Schematic representation on removed chain drive.

Adjust **valve timing** . See **11 31 505 ADJUSTING TIMING OF CAMSHAFT(S) (N52K)**.

Fit **chain tensioner** . See **11 31 090 INSTALLING AND REMOVING/REPLACING CHAIN TENSIONER PISTON (N52K)**.

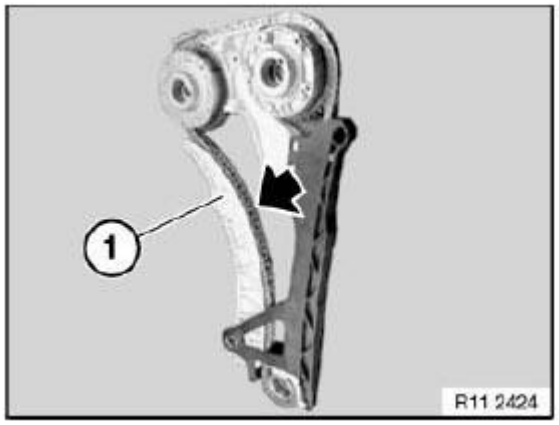

Fig. 243: Securing Timing Chain Guided In Clamping Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 36 655 REMOVING AND INSTALLING/REPLACING BOTH SOLENOID VALVES (N52K)

IMPORTANT: It is essential to observe conditions of absolute cleanliness when removing and installing the inlet and exhaust solenoid valves.

Possible malfunction if valves are contaminated:

- Rough running
- OBD fault entry
- Exhaust emission characteristics
- Low engine power

Necessary preliminary tasks:

- Remove ignition coil cover as necessary. See **11 00 REMOVING AND INSTALLING/REPLACING ACOUSTIC COVER (N52/N52K)**.

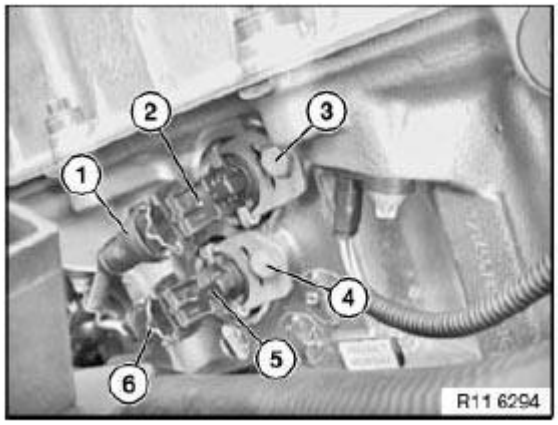

Fig. 244: Locating Inlet Solenoid Valve & Connectors
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on inlet solenoid valve (2). Release screw (3).

NOTE: Secure support and sealing ring against falling down.

Remove inlet solenoid valve (2) with bracket towards front.

Disconnect plug connection (6) on exhaust solenoid valve (5).

Release screw (4).

NOTE: Secure support and sealing ring against falling down.

Remove exhaust solenoid valve (5) with bracket towards front.

Tightening torque. See 11 36 3AZ in **11 36 VARIABLE CAMSHAFT CONTROL VANOS** .

IMPORTANT: Risk of mixing up plug connections (1 and 6).

Installation:

Replace support and sealing rings.

Assemble engine.

Check function of DME.

VARIABLE VALVE GEAR

11 37 005 REMOVING AND INSTALLING/REPLACING ECCENTRIC SHAFT (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 4 481**

Necessary preliminary tasks:

- Remove **cylinder head cover** . See **11 12 000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER (N52K)**.
- 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).

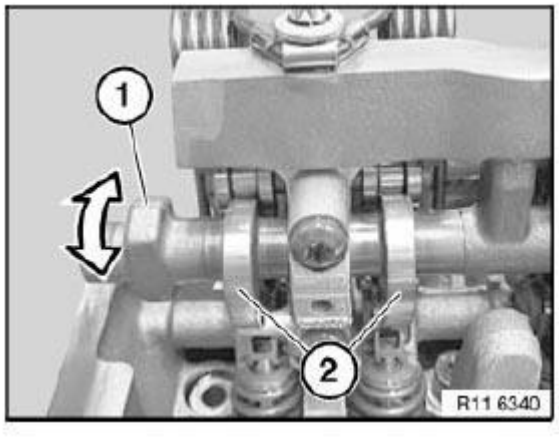

Fig. 245: Pretensioning Eccentric Shaft Upwards
Courtesy of BMW OF NORTH AMERICA, INC.

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.

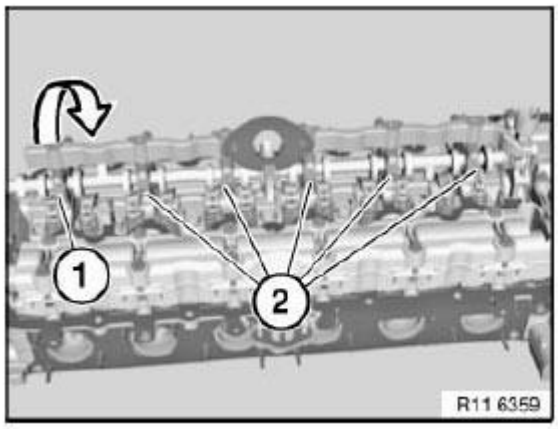

Fig. 246: Identifying Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

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.

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

Release screw.

Remove magnet wheel (1).

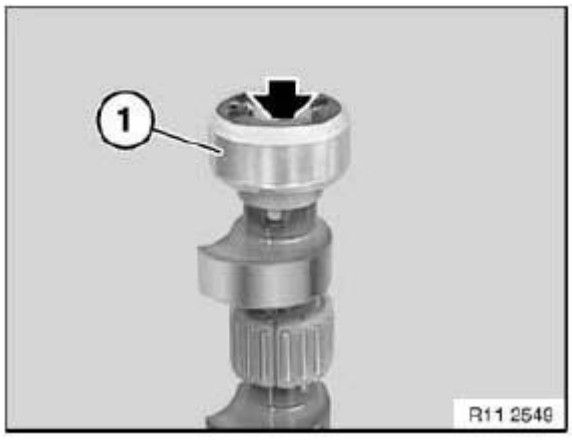

Fig. 247: Locating Magnet Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

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.

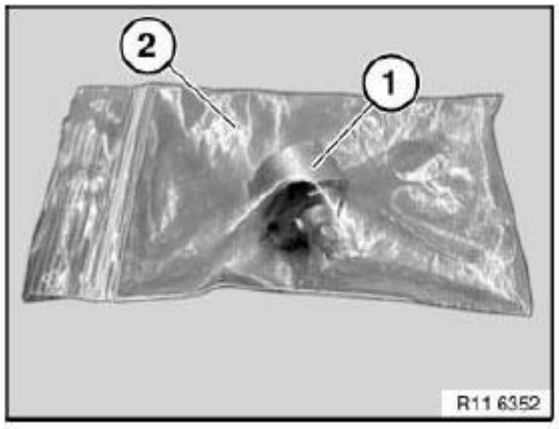

Fig. 248: Identifying Magnet Wheel In Plastic Bag
Courtesy of BMW OF NORTH AMERICA, INC.

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.

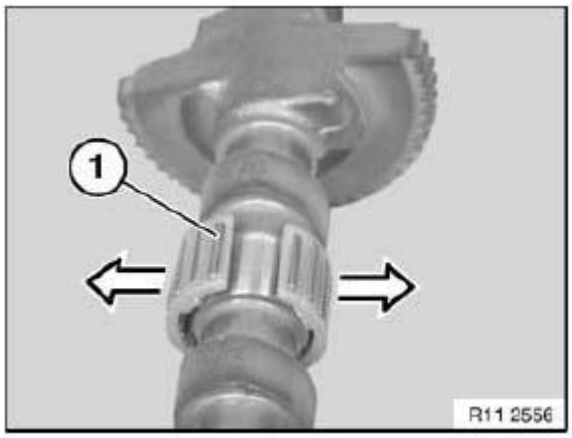

Fig. 249: Identifying Needle Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Install bearing shells (1) as pictured.

NOTE: Always replace bearing shells (1) and needle bearings together.

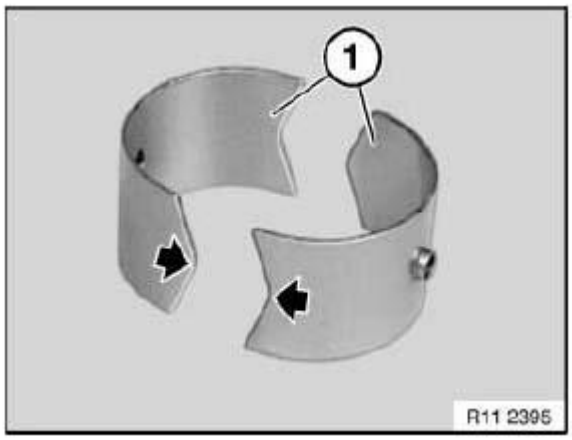

Fig. 250: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Install bearing shell (1) with tip facing down (see arrow) in cylinder head.

Install bearing shell (2) with tip facing up in bearing cap.

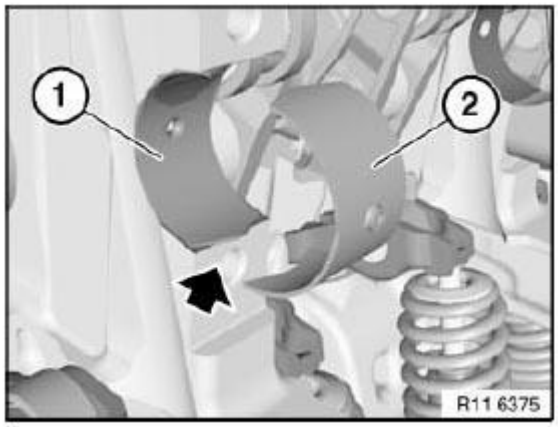

Fig. 251: Identifying Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

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.

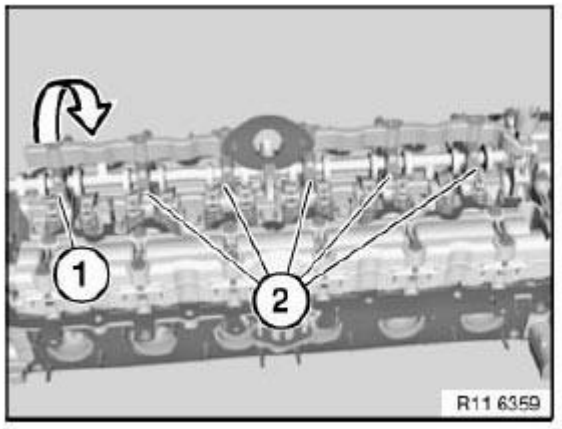

Fig. 252: Identifying Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Insert eccentric shaft.

Adjust eccentric shaft on dihedron to minimum stroke.

Fit all bearing caps (1 and 2).

Insert all screws.

Tightening torque. See 11 12 7AZ in **CYLINDER HEAD WITH COVER** .

Assemble engine.

11 37 010 REMOVING AND INSTALLING/REPLACING INTERMEDIATE LEVERS (N52K)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 4 270**
- **11 4 450**
- **11 4 481**

IMPORTANT: Aluminum-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) .

NOTE: There are 2 different versions of the guide block

IMPORTANT: Establish size of guide blocks.
Version 1
Size 55.2 mm
Version 2
Size 58 mm
The description of version 2 starts on page 8.

Version 1

Size (1) 55.2 mm

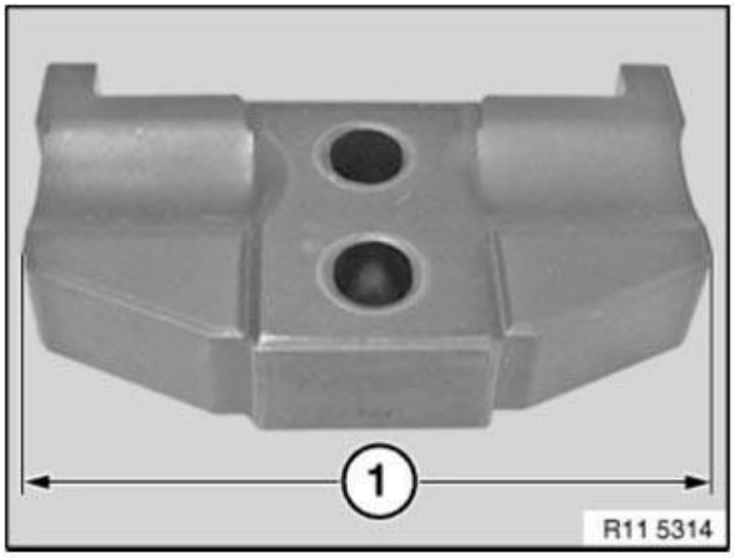

Fig. 253: Identifying Guide Block Dimension
Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

- Remove **cylinder head cover** . See **11 12 000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER (N52K)**.
- For E81, E82, E87, E88, E90, E91, E92, E93: Remove **COWL PANEL COVER** .

If necessary, move eccentric shaft (1) on twin surface to minimum lift (2).

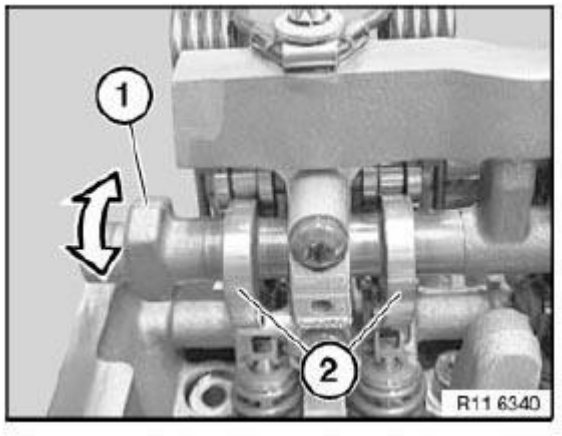

Fig. 254: Pretensioning Eccentric Shaft Upwards
Courtesy of BMW OF NORTH AMERICA, INC.

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!

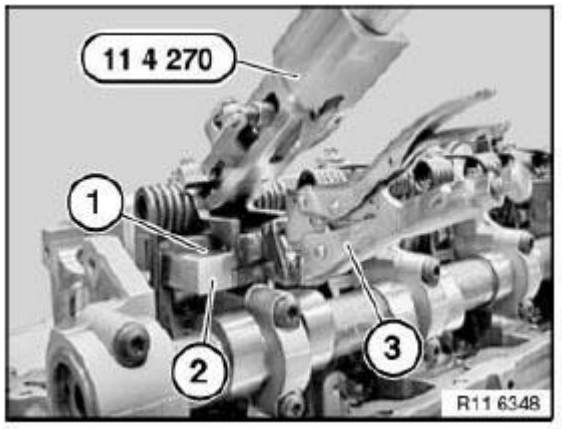

Fig. 255: Identifying Gripping Pliers And Guide Block With Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.

IMPORTANT: Improper handling. Risk of damage!

Secure both bearing pins (2) in torsion springs with knurled screw (1) of special tool **11 4 270.**

Press special tool **11 4 270** in direction of arrow as far as it will go.

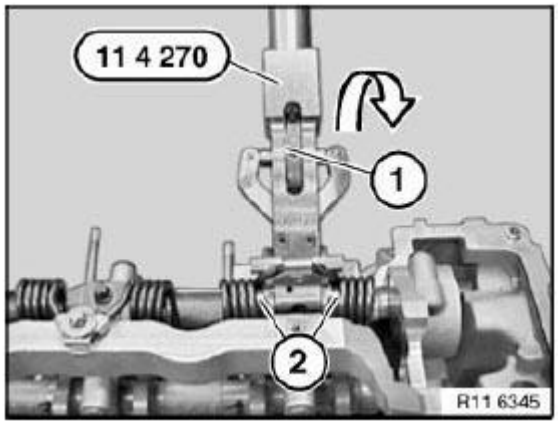

Fig. 256: Identifying Bearing Pins And Knurled Screw With Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (2) of torsion spring.

Tightening torque. See 11 37 2AZ in **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!

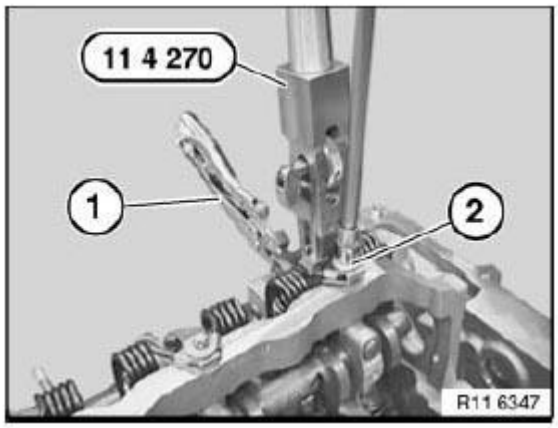

Fig. 257: Identifying Torsion Spring Screw With Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on torsion spring (1) with special tool **11 4 270.**

NOTE: Metal lug (2) cannot be disassembled and must not be removed.

Installation:

Replace torsion spring (1) if metal lug (2) is faulty.

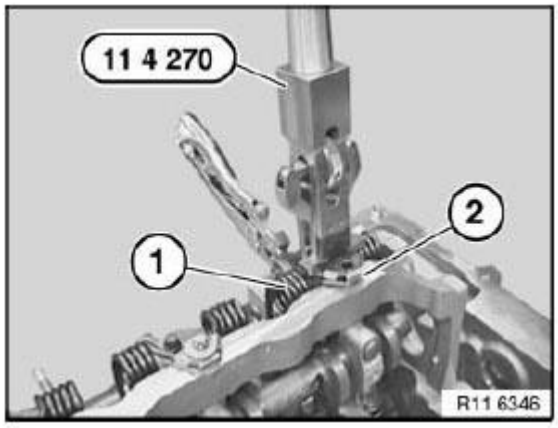

Fig. 258: Identifying Torsion Spring And Lug With Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

Press torsion spring apart at positions (1).

Remove torsion spring towards top.

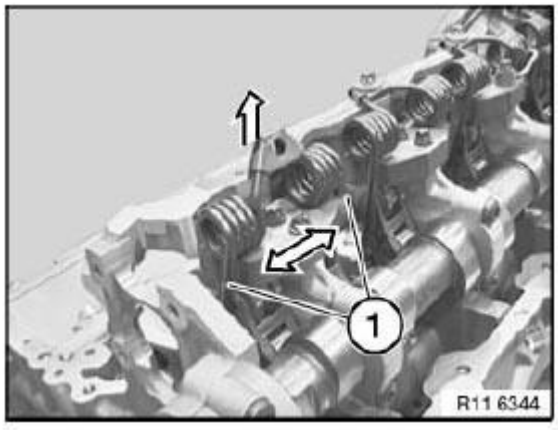

Fig. 259: Pressing Torsion Spring Apart Positions
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Uniform distribution must *not* be changed.
Place all components in clean and neat order in special tool 11 4 481.

All components must be reinstalled in the same positions in an engine which has already been in use.

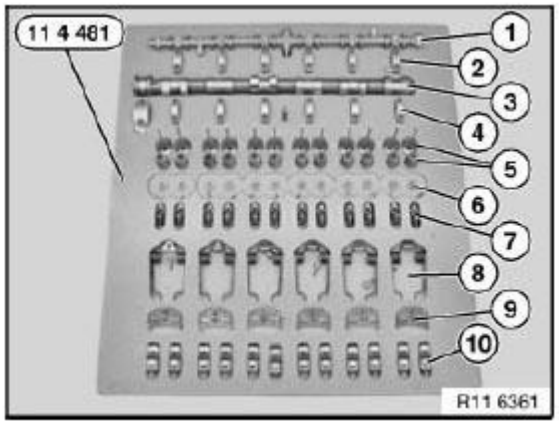

Fig. 260: Identifying Components With Special Tool (11 4 481)
Courtesy of BMW OF NORTH AMERICA, INC.

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. Intake 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. See 11 37 1AZ in **11 37 VARIABLE VALVE GEAR** .

Place all guide blocks (2) in neat order in special tool **11 4 481.**

Installation:

Mixing up the guide blocks (2) will cause the engine to suffer idle-speed fluctuations.

This will result in maladjustment of uniform distribution.

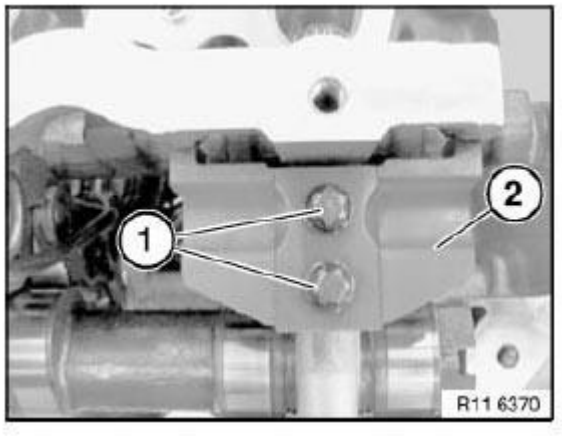

Fig. 261: Identifying Screws And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

All contact surfaces (1) of guide block must be clean and free from oil and grease. If necessary, clean contact surfaces (1).

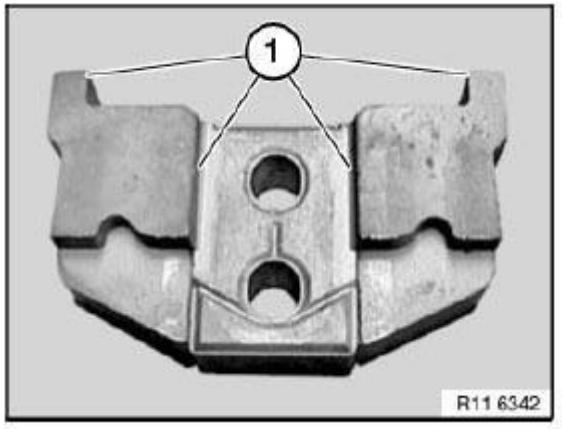

Fig. 262: Identifying Contact Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out intermediate levers (2).

Place all intermediate levers (2) in neat order in special tool **11 4 481.**

Installation:

Mixing up the intermediate levers (2) will cause the engine to suffer idle-speed fluctuations.

Installation:

All contact surfaces (1) must be clean and free from oil and grease. If necessary, clean contact surfaces (1).

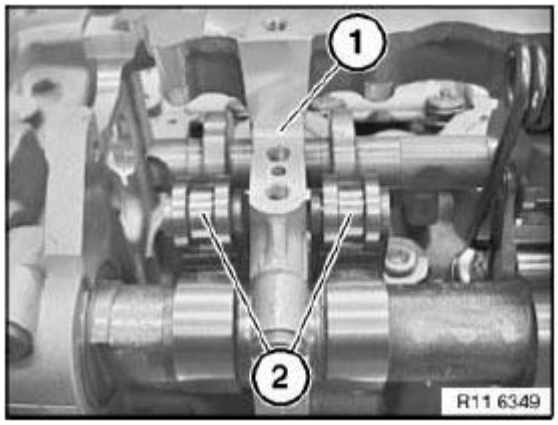

Fig. 263: Identifying Contact Surfaces And Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

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.

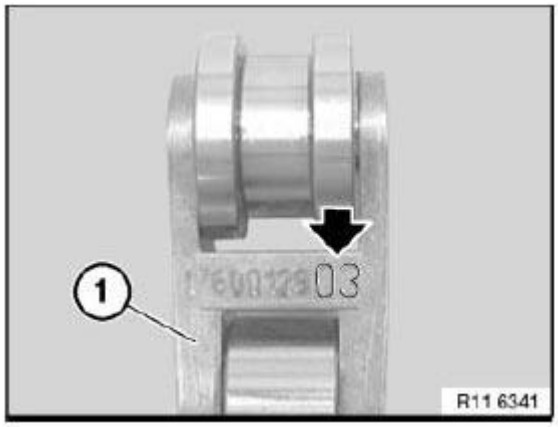

Fig. 264: Identifying Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Before installing intermediate levers (2), make sure cam followers are correctly positioned.
Risk of damage!

Install intermediate levers (2).

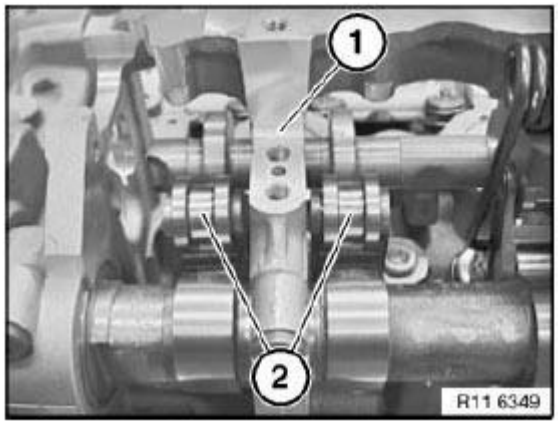

Fig. 265: Identifying Contact Surfaces And Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

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.

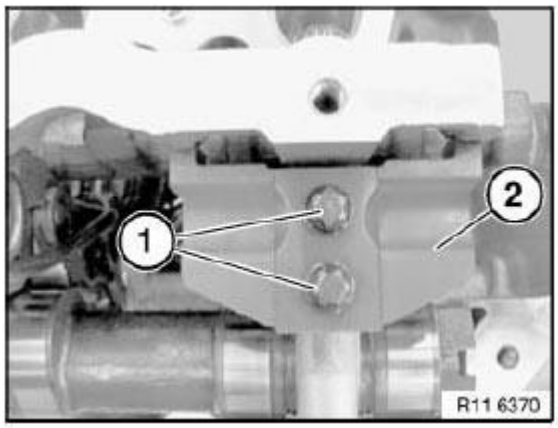

Fig. 266: Identifying Screws And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool **11 4 450** to bolt connection (1) of eccentric shaft.

Turn eccentric lever (3) on special tool **11 4 450** in direction of arrow.

Guide block is now pretensioned.

Insert screws (2) of guide blocks.

Tightening torque. See in 11 37 1AZ **11 37 VARIABLE VALVE GEAR** .

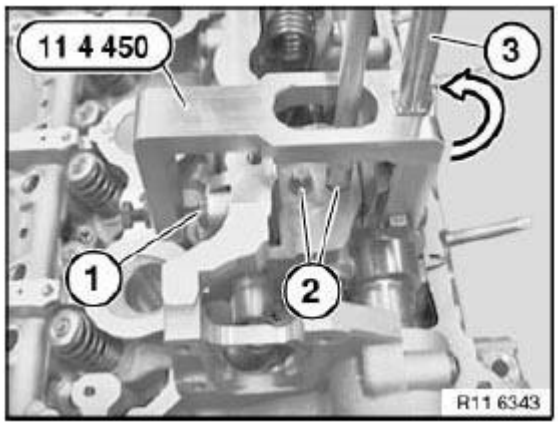

Fig. 267: Turning Eccentric Lever
Courtesy of BMW OF NORTH AMERICA, INC.

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.

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.

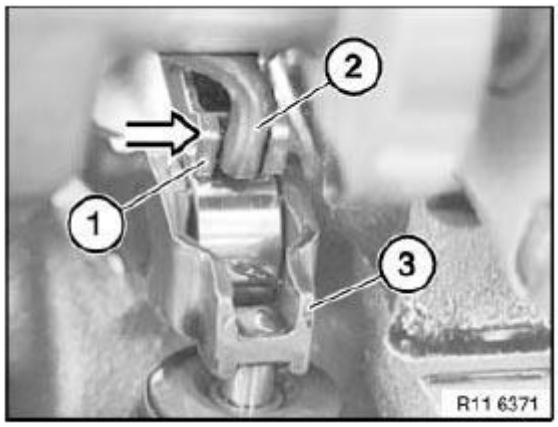

Fig. 268: Inserting Torsion Spring In Intermediate Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool **11 4 270** with gripping pliers (3) to guide block (2).

IMPORTANT: Special tool 11 4 270 is only secured to guide block (2). Adjusting the gripping pliers (3) on special tool 11 4 270 is not permitted. Risk of damage!

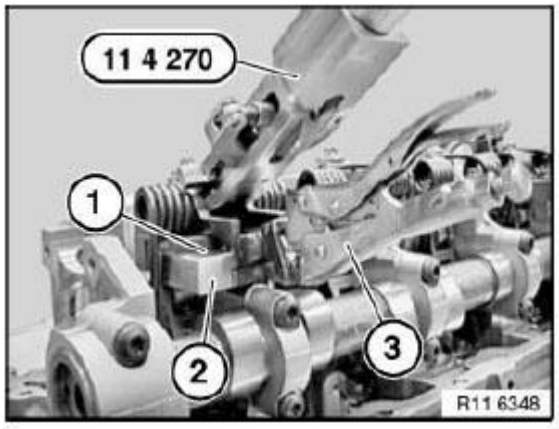

Fig. 269: Identifying Gripping Pliers And Guide Block With Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.

IMPORTANT: Improper handling. Risk of damage!

Secure both bearing pins (2) in torsion springs with knurled screw (1) of special tool **11 4 270.**

IMPORTANT: Check torsion spring on intermediate lever to ensure correct installation position.

Press special tool **11 4 270** in direction of arrow as far as it will go.

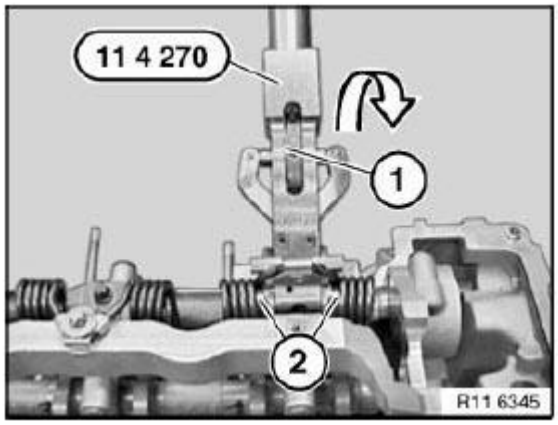

Fig. 270: Identifying Bearing Pins And Knurled Screw With Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw (2) of torsion spring.

Tightening torque. See 11 37 2AZ in **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.**

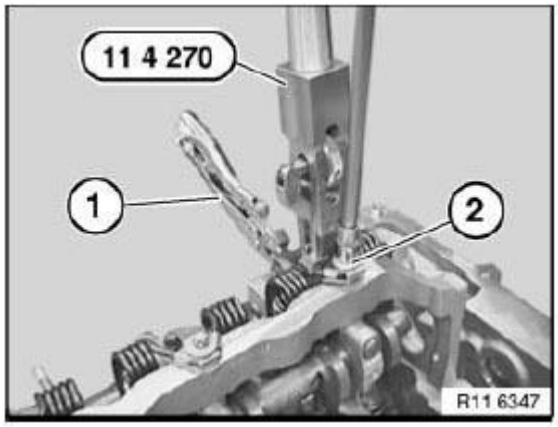

Fig. 271: Identifying Torsion Spring Screw With Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

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. See 11 37 4AZ in **11 37 VARIABLE VALVE GEAR** .

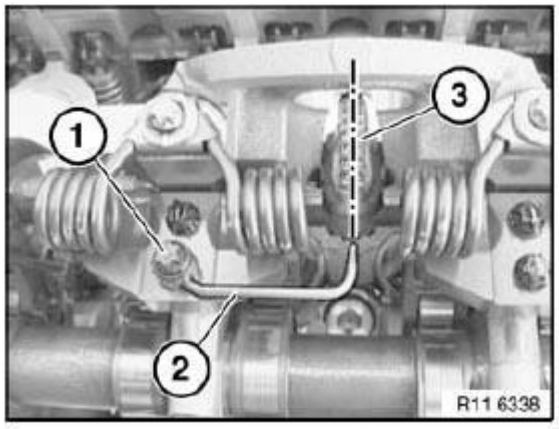

Fig. 272: Identifying Oil Spray Nozzle, Spline Teeth And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Version 2

Size (1) 58 mm

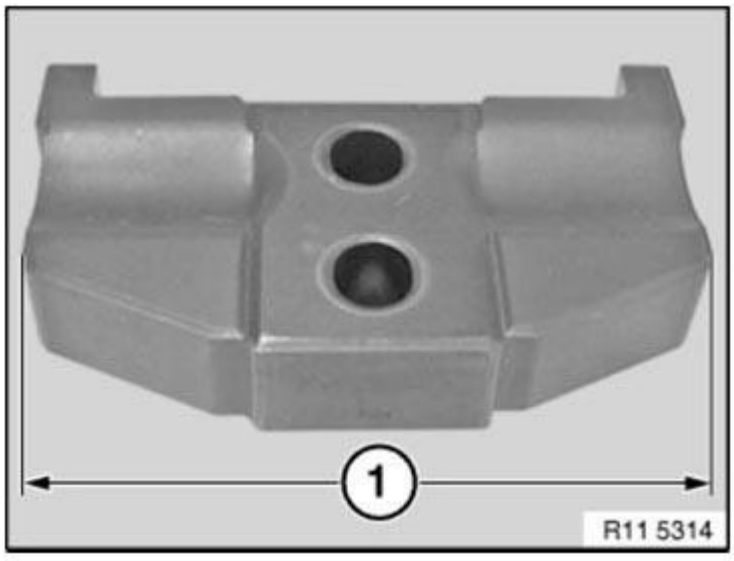

Fig. 273: Identifying Guide Block Dimension
Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER**
- For E81, E82, E87, E88, E90, E91, E92, E93: Remove **COWL PANEL COVER** .

If necessary, move eccentric shaft (1) on twin surface to minimum lift (2).

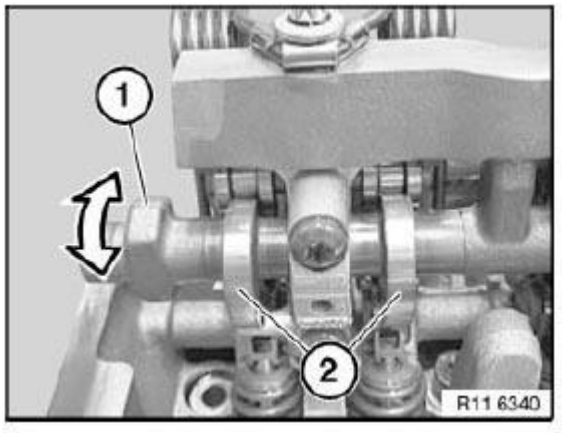

Fig. 274: Moving Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Oil spray nozzle must be removed from 3rd cylinder (make a note of installation position of oil spray nozzle).

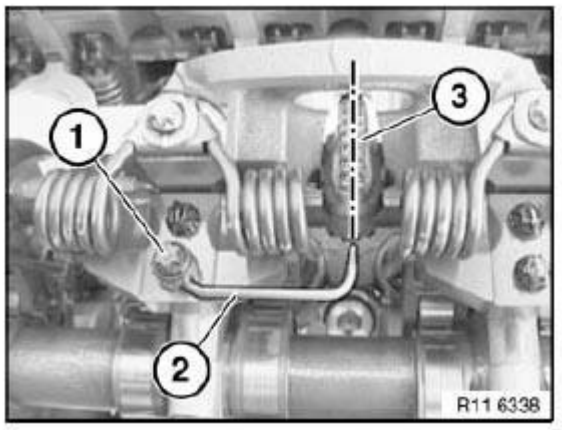

Fig. 275: Identifying Oil Spray Nozzle With Spray
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool **11 7 110** on return spring (1) (see arrows).

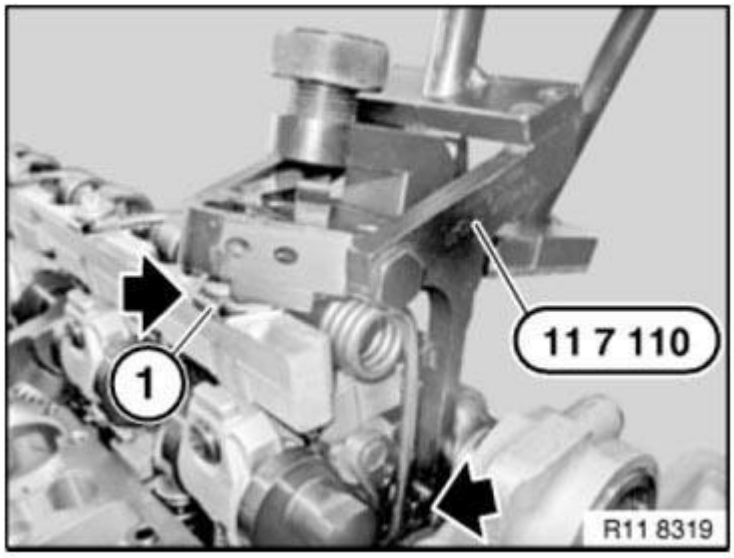

Fig. 276: Positioning Special Tool (11 7 110) On Return Spring
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.

IMPORTANT: Improper handling. Risk of damage!

Place special tool **11 7 110** flat on cylinder head.

Turn knurled screw (1) in direction of arrow until both clamping levers secure return spring in guide block.

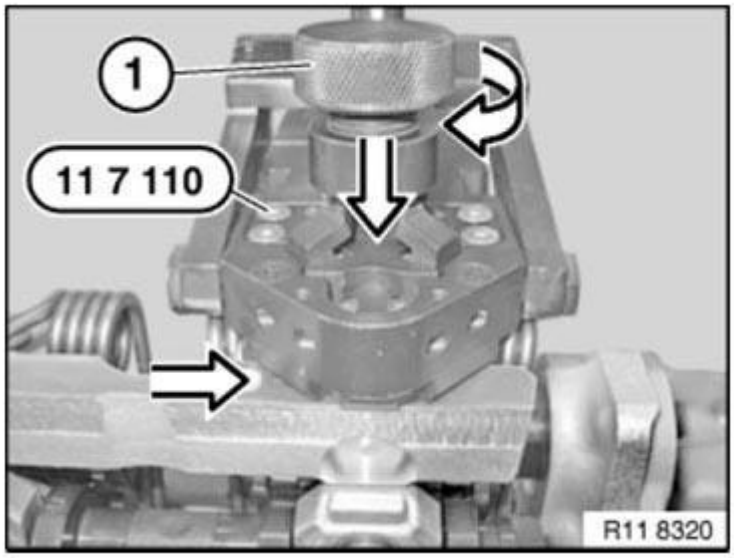

Fig. 277: Turning Knurled Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Return spring is correctly preloaded when both clamping levers are parallel to guide block.

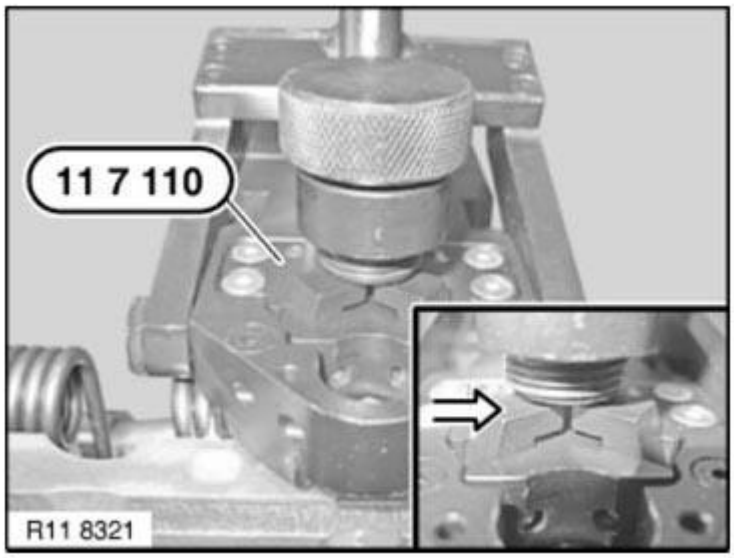

Fig. 278: Identifying Special Tool (11 7 110)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Left and right return springs (1) must be positioned in lateral guide of special tool **11 7 110** .

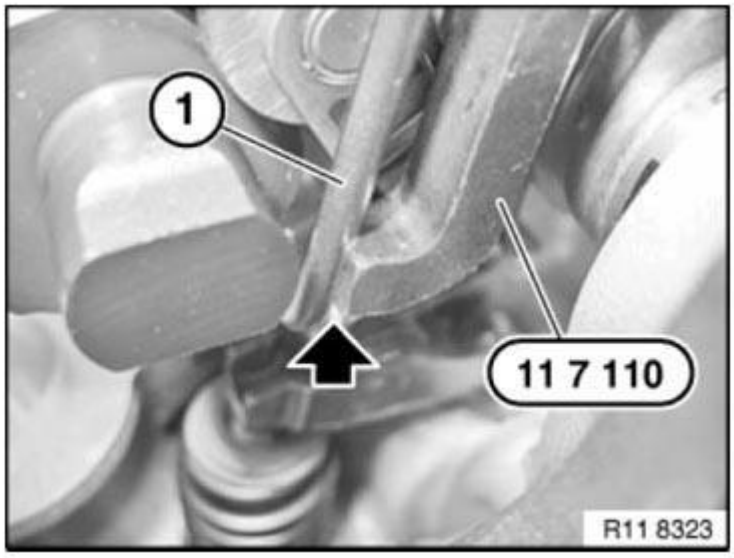

Fig. 279: Positioning Return Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Preload return spring with lever (1) on special tool **11 7 110** in direction of arrow.

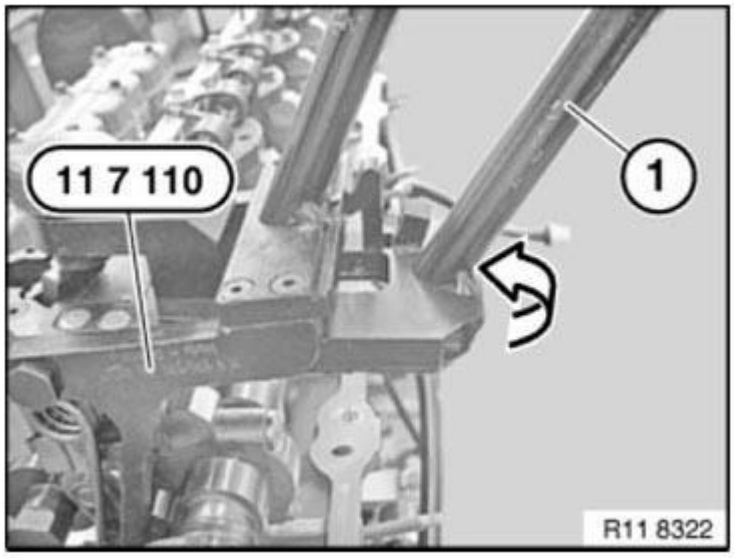

Fig. 280: Preloading Return Spring On Special Tool (11 7 110)
Courtesy of BMW OF NORTH AMERICA, INC.

Lock special tool **11 7 110** with catch on lever (1).

IMPORTANT: Screw fixing on return spring can only be released with special tool 11 7 110 secured.

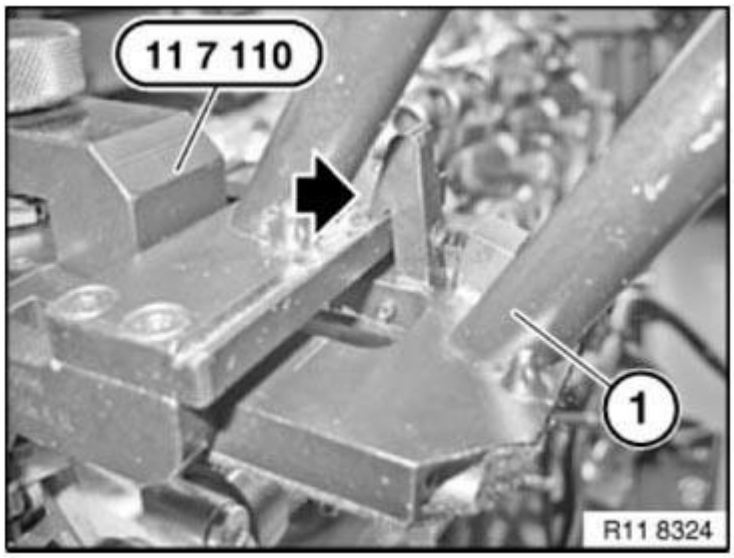

Fig. 281: Locking Special Tool (11 7 110) On Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

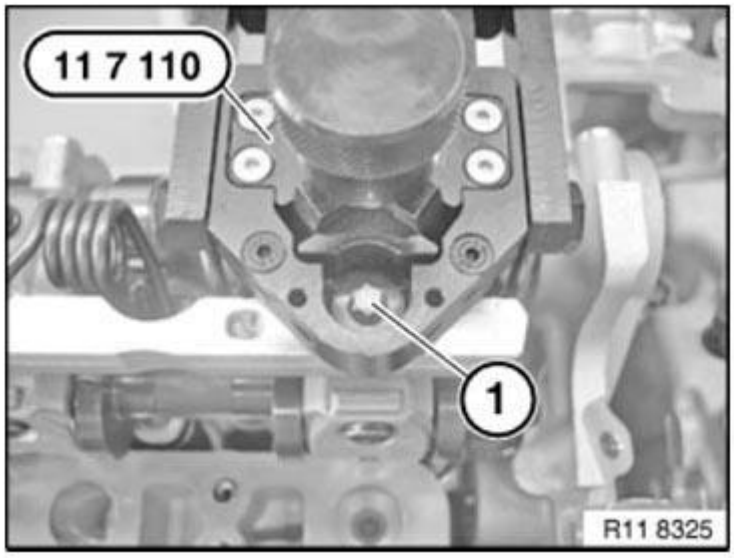

Fig. 282: Releasing Screw
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.
Lever (1) is under pre-tension.

IMPORTANT: Improper handling.
Risk of damage!

Secure lever (1)

Press back latching hook (2).

Return spring tension can now be released.

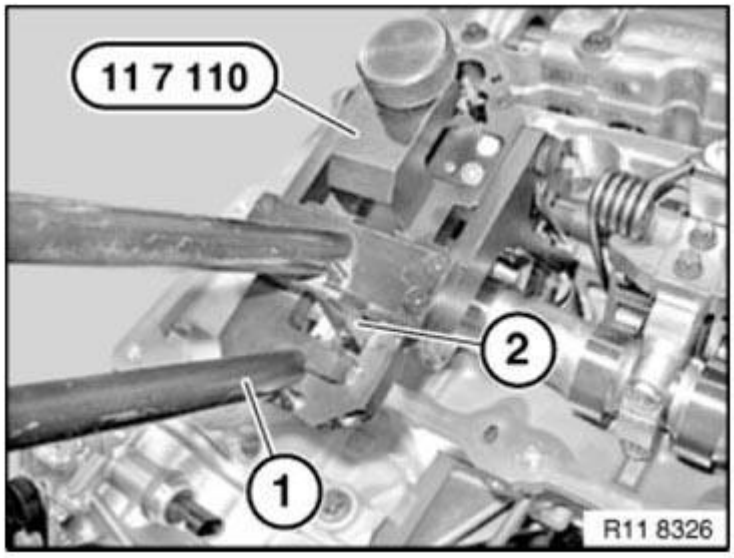

Fig. 283: Pressing Latching Hook
Courtesy of BMW OF NORTH AMERICA, INC.

Release knurled screw (1) on special tool **11 7 110** in direction of arrow.

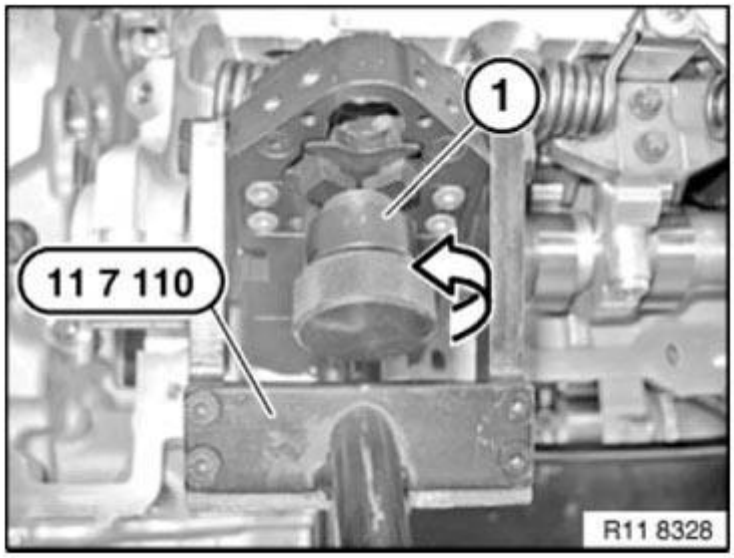

Fig. 284: Releasing Knurled Screw On Special Tool (11 7 110)
Courtesy of BMW OF NORTH AMERICA, INC.

Release special tool **11 7 110** in direction of arrow from return spring (1).

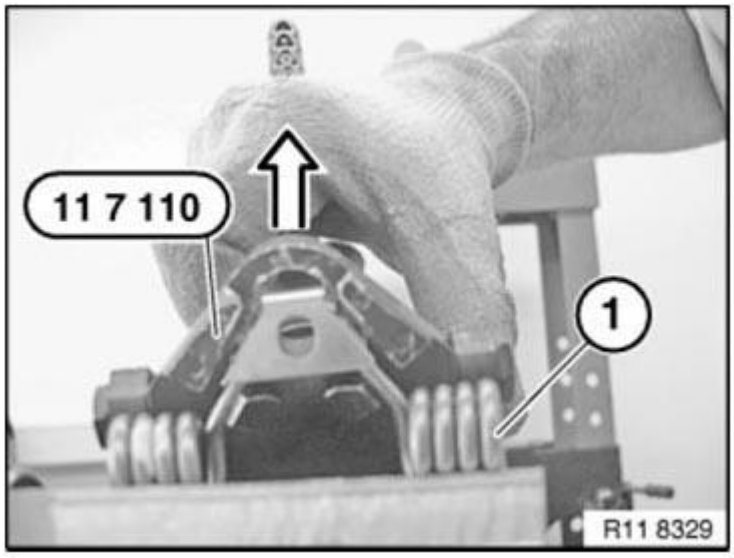

Fig. 285: Releasing Special Tool (11 7 110)
Courtesy of BMW OF NORTH AMERICA, INC.

Press torsion spring apart at positions (1).

Remove torsion spring towards top.

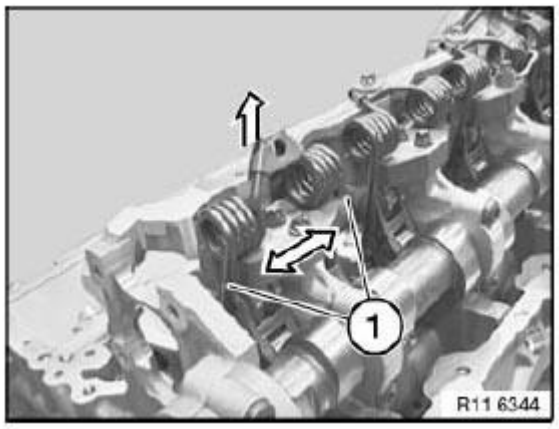

Fig. 286: Removing Torsion Spring
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Uniform distribution must not be changed.
Place all components in clean and orderly condition in special tool 11 4 481.

All components must be reinstalled in the same positions in an engine which has already been in use.

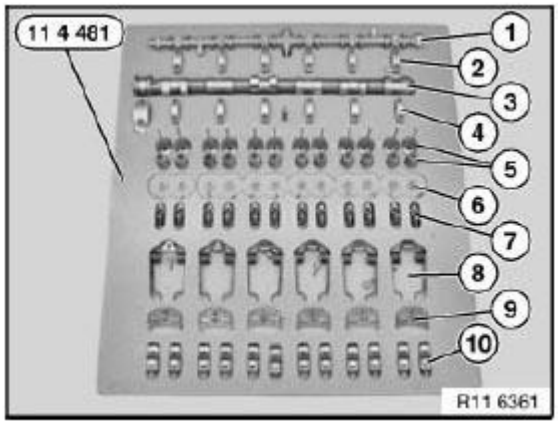

Fig. 287: Identifying Intermediate Lever Components On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

1. Eccentric shaft with bearing
2. Bearing caps of eccentric shaft (set out in order)
3. Intake camshaft
4. Bearing caps of inlet camshaft (set out in order)
5. Intake 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** .

Place all guide blocks (2) in neat order in special tool 11 4 481.

Installation:

Mixing up the guide blocks (2) will cause the engine to suffer idle-speed fluctuations.

This will result in maladjustment of **uniform distribution** .

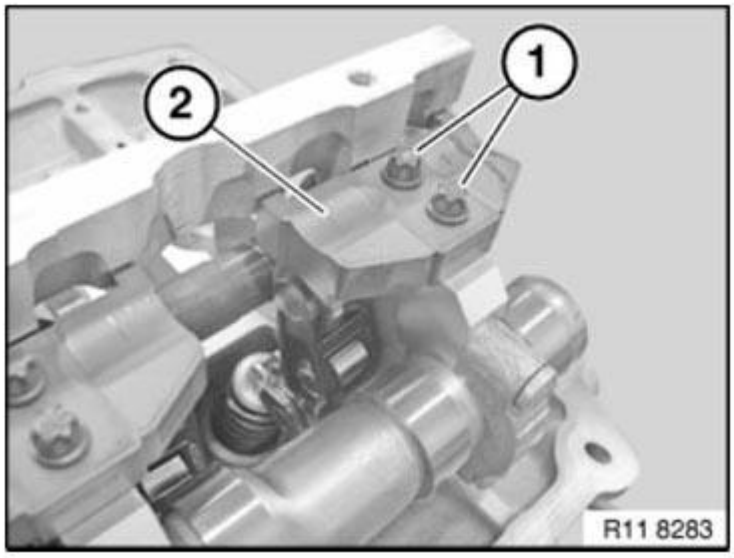

Fig. 288: Identifying Screws On Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

All contact surfaces (1) of guide block must be clean and free from oil and grease. If necessary, clean contact surfaces (1).

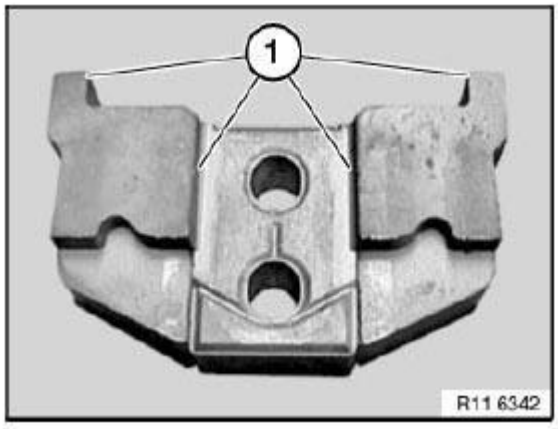

Fig. 289: Identifying Contact Surface Of Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out intermediate levers (2).

Place all intermediate levers (2) in neat order in special tool 11 4 481.

Installation:

Mixing up the intermediate levers (2) will cause the engine to suffer idle-speed fluctuations.

Installation:

All contact surfaces (1) must be clean and free from oil and grease. If necessary, clean contact surfaces (1).

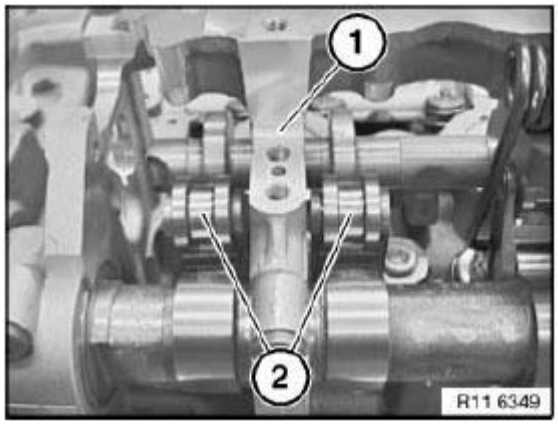

Fig. 290: Identifying Contact Surface Of Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

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.

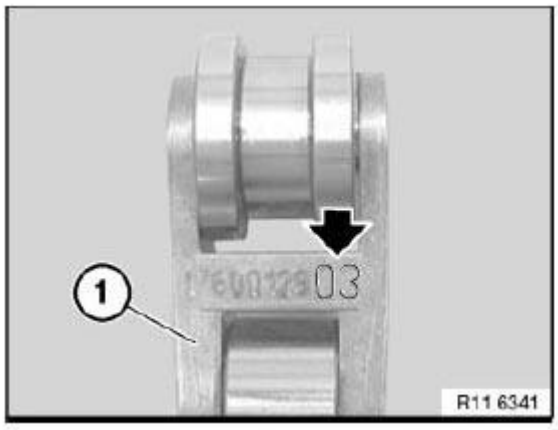

Fig. 291: Locating Marking On Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Before installing intermediate levers (2), make sure cam followers are correctly positioned.
Risk of damage!

Install intermediate levers (2).

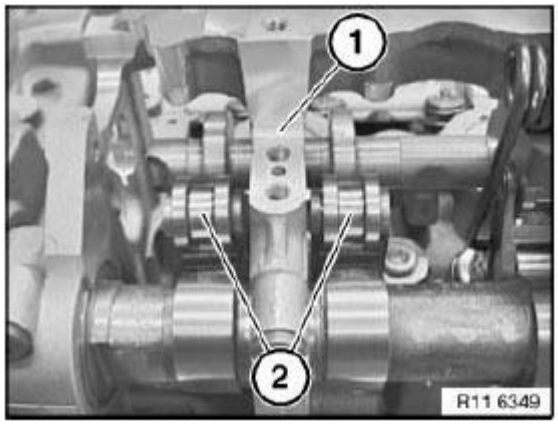

Fig. 292: Identifying Contact Surface Of Guide Block And Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

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.

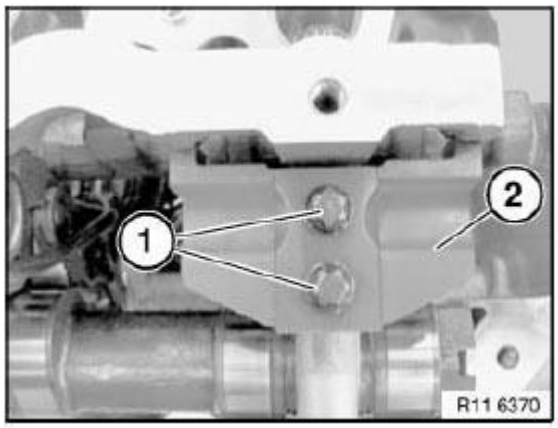

Fig. 293: Identifying Guide Block And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool **11 4 450** to screw fixing (1) of eccentric shaft.

Move eccentric lever (3) on special tool **11 4 450** in direction of arrow.

Guide block is now pretensioned.

Insert screws (2) of guide blocks.

Tightening torque **11 37 1AZ** .

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.

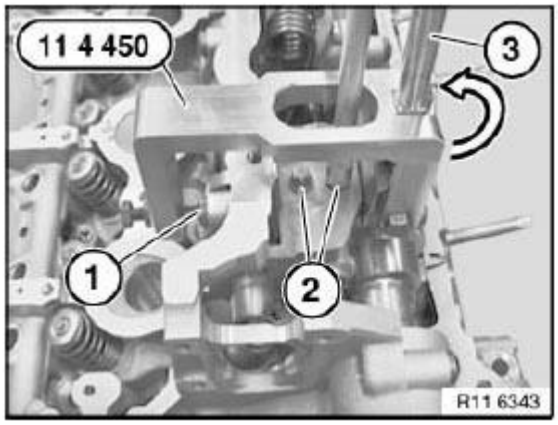

Fig. 294: Moving Eccentric Lever On Special Tool (11 4 450)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

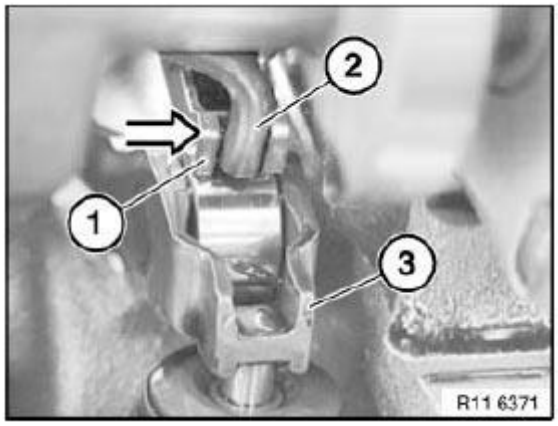

Fig. 295: Inserting Torsion Spring On Intermediate Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool **11 7 110** on return spring.

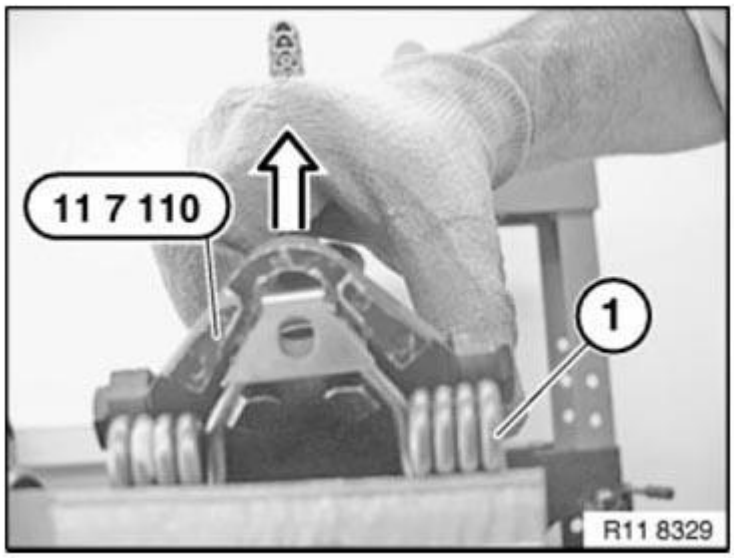

Fig. 296: Positioning Special Tool (11 7 110) On Return Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Clamp return spring with knurled screw (1) in direction of arrow.

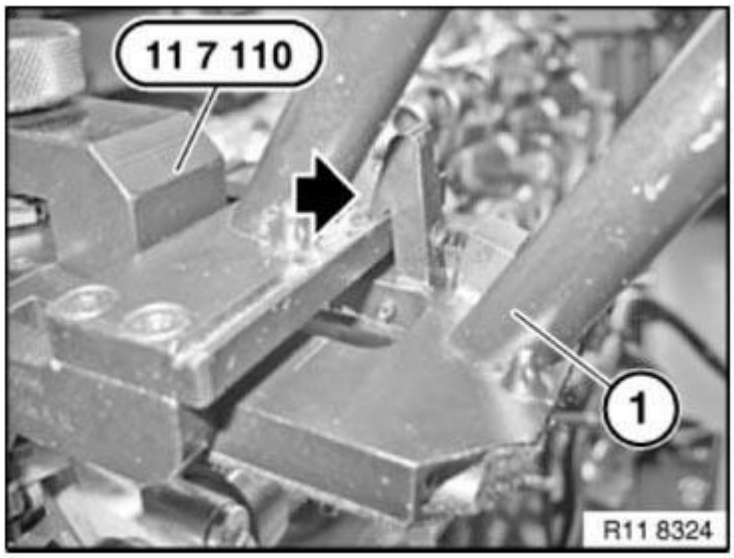

Fig. 297: Compressing Return Spring With Knurled Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Return spring (1) is positioned correctly when catches (see arrows) are surrounding return spring (1).

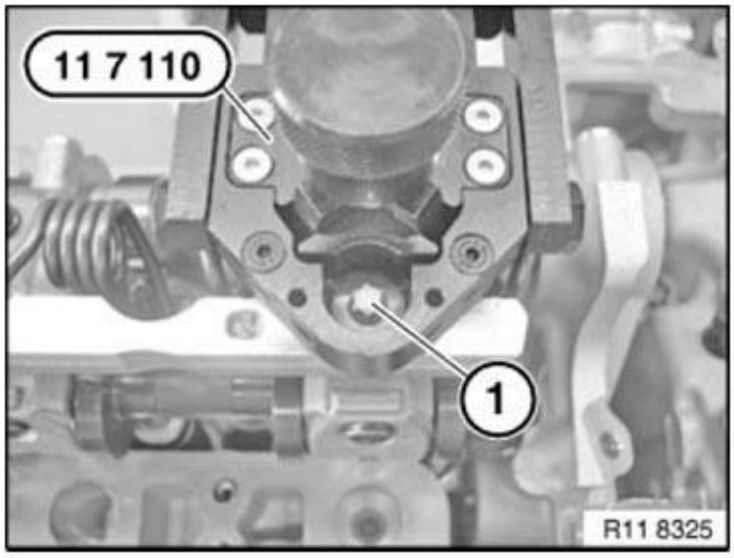

Fig. 298: Positioning Return Spring
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.

IMPORTANT: Improper handling.
Risk of damage!
Check return spring on intermediate lever to ensure correct installation position.

Press special tool **11 7 110** to stop in direction of arrow.

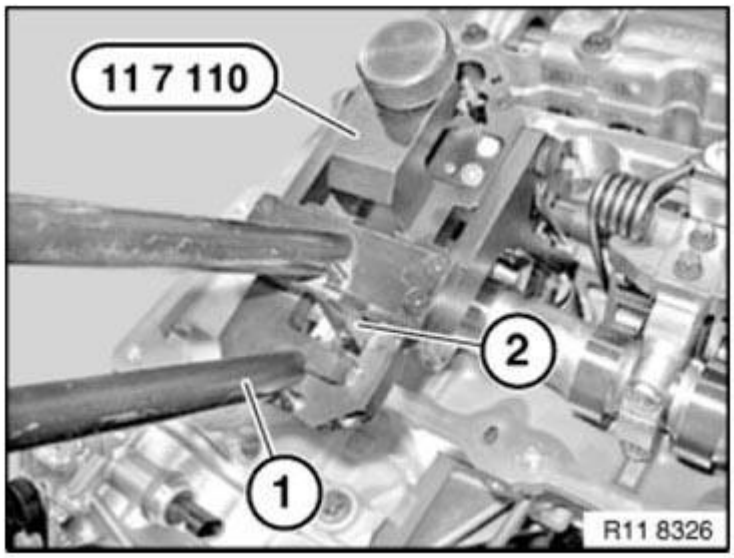

Fig. 299: Pressing Special Tool (11 7 110)

Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Pay attention to thread on cylinder head.
Risk of damage!**

Tighten bolt (1).

Tightening torque **11 37 2AZ** .

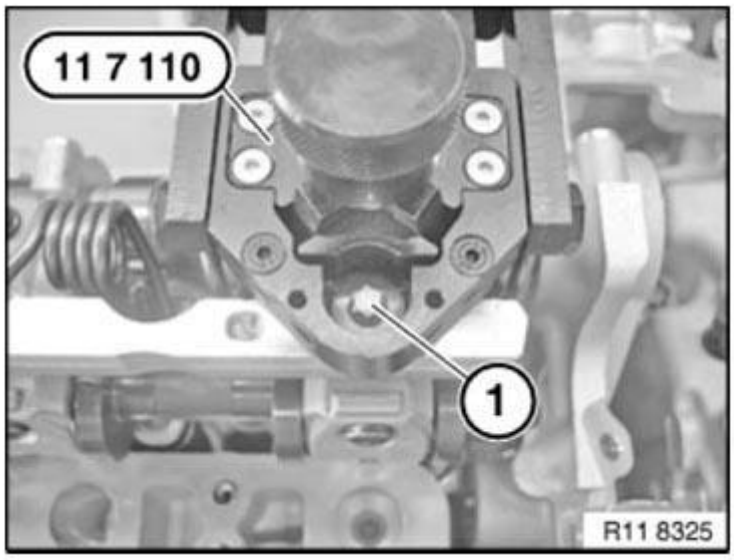

Fig. 300: Tightening Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

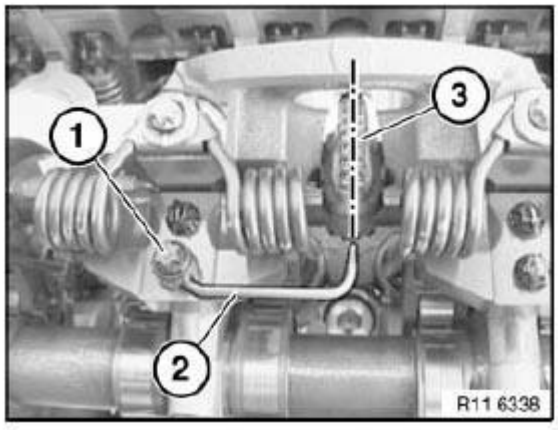

Fig. 301: Identifying Oil Spray Nozzle With Spray
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

OIL SUPPLY

11 40 000 CHECKING ENGINE OIL PRESSURE (WITH HYDRAULIC VALVE)

Special tools required:

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **11 6 410**
- **11 9 240**
- **11 9 250**
- **13 6 051**

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.

Diagnosis path:

- DME Motor Electronics
- Complete vehicle
- Drive
- Engine electronics
- Engine oil
- Oil-pressure control

Necessary preliminary tasks:

- Connect BMW diagnosis system to vehicle.
- Observe diagnosis instructions.
- Protect drive belt against dirt.
- Have a cleaning cloth ready to catch escaping oil.

Special tool 11 9 250 must be converted for the N52k and N53.

Secure special tool **11 9 250** at hexagon head in a vice.

Release insert (2) using a screwdriver (1) in direction of arrow.

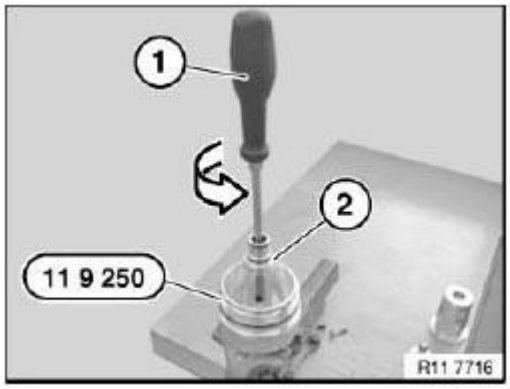

Fig. 302: Identifying Screwdriver With Special Tool (11 9 250)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw piece (1) on special tool **11 6 410.**

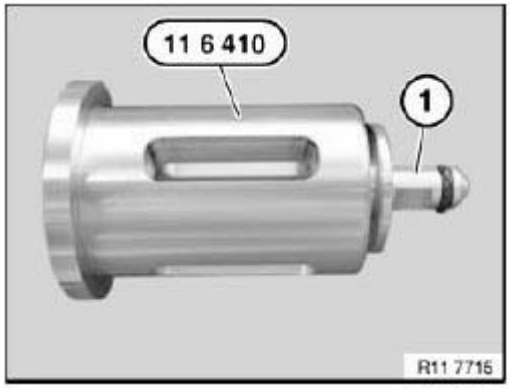

Fig. 303: Identifying Screw Piece With Special Tool (11 6 410)
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool **11 6 410** in special tool **11 9 250.**

Insert central screw with a screwdriver (1) hand-tight.

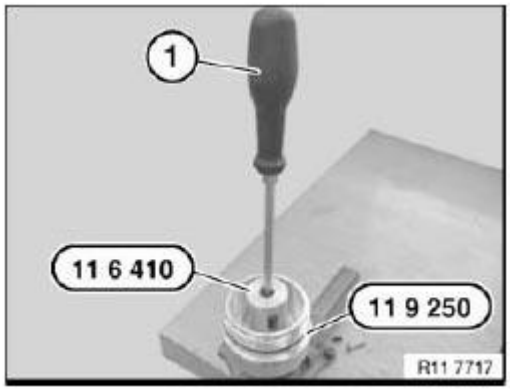

Fig. 304: Identifying Screwdriver With Special Tools (11 6 410 And 11 9 250)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw piece (1) hand-tight in direction of arrow on special tool **11 6 410.**

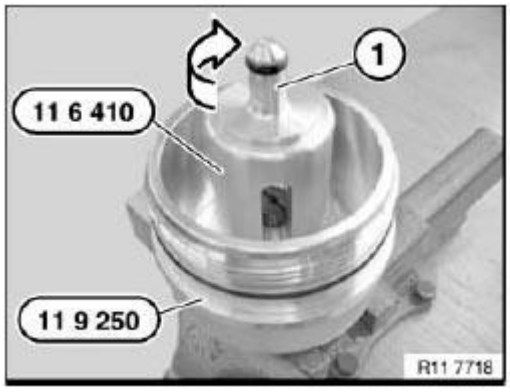

Fig. 305: Identifying Screw Piece With Special Tools (11 6 410 And 11 9 250)
Courtesy of BMW OF NORTH AMERICA, INC.

Release oil filter cap with special tool 11 9 240.

Tightening torque. See 11 42 1AZ in **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

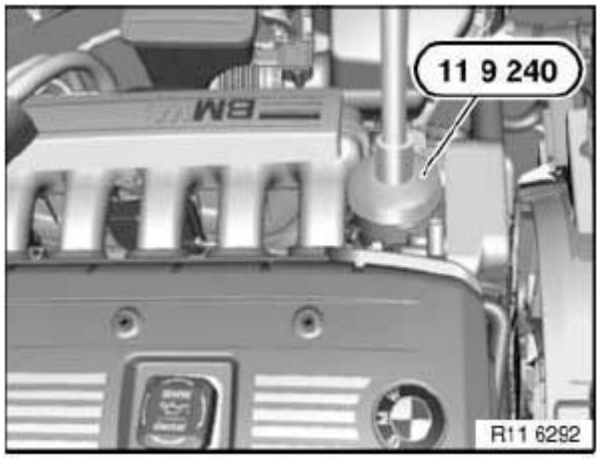

Fig. 306: Identifying Special Tool (11 9 240)
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully detach filter element.

Installation:

Check all O-rings for damage, replace if necessary.

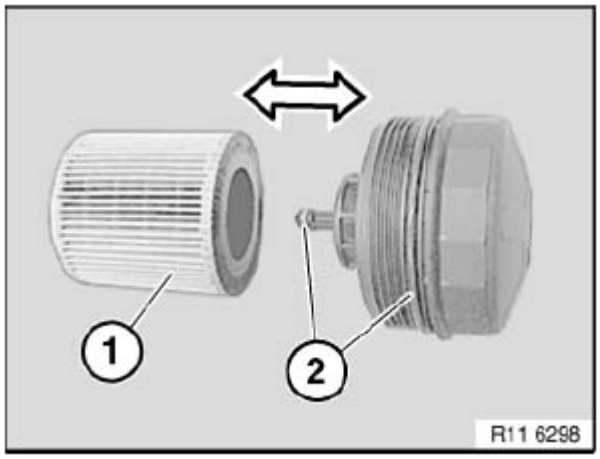

Fig. 307: Identifying Filter Element
Courtesy of BMW OF NORTH AMERICA, INC.

Install filter element (1) in special tool 11 9 250.

Installation:

Coat O-ring with engine oil.

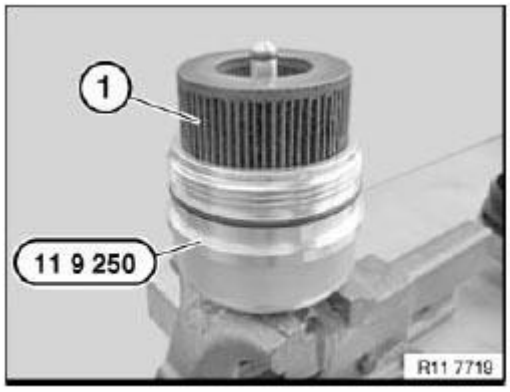

Fig. 308: Identifying Filter Element With Special Tool (11 9 250)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Engine oil pressure measurement is only possible with the diagnosis system.

Screw in special tool **11 9 250** with a filter element.

Secure special tool **13 6 051** with a sealing ring to special tool.

Start engine and check engine oil pressure.

Specified values.

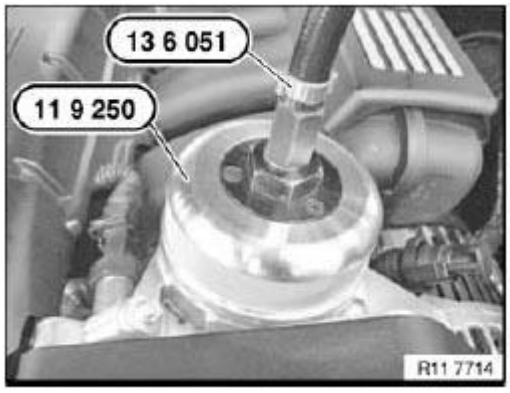

Fig. 309: Identifying Special Tool (13 6 051 And 11 9 250)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 40 000 CHECKING ENGINE OIL PRESSURE (WITHOUT HYDRAULIC VALVE)

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.
If a hydraulic valve is fitted, proceed in accordance with CHECKING ENGINE OIL PRESSURE (WITH HYDRAULIC VALVE).

Necessary preliminary tasks

- Remove **ACOUSTIC COVER**
- Protect drive belt against dirt
- Have a cleaning cloth ready to catch escaping oil

Disconnect plug connection on oil pressure switch (3)

Remove oil pressure switch (3).

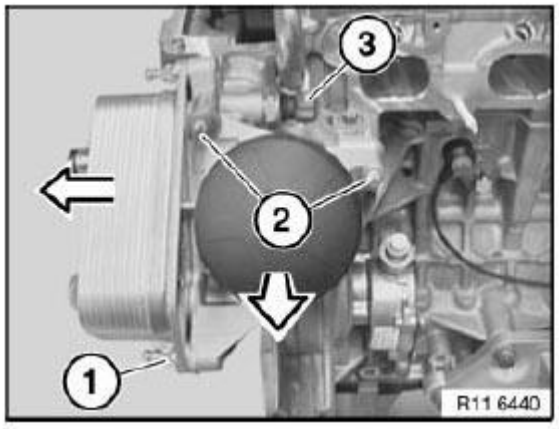

Fig. 310: Disconnecting Plug Connection Of Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool **11 4 050** with sealing ring.

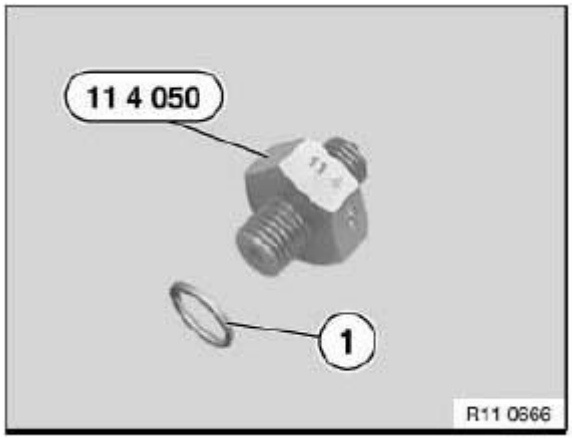

Fig. 311: Identifying Sealing Ring And Special Tool (11 4 050)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Specified values See **TED-TED-TDMUC1141-N52K-01B1S2 OIL PUMP WITH STRAINER AND DRIVE N52K/B30** or **TED-TED-TDMUC1141-N52K-01B1S1 OIL PUMP WITH STRAINER AND DRIVE N52K/B25** .

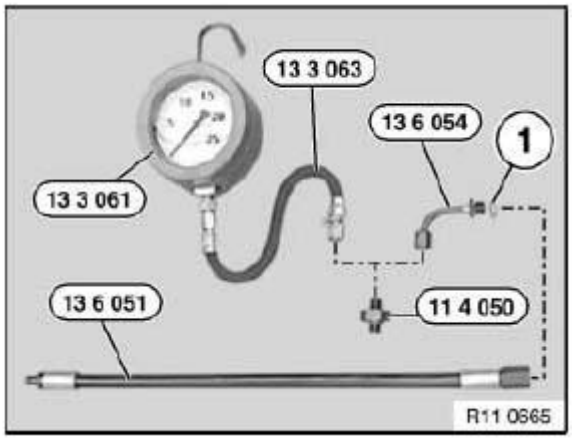

Fig. 312: Checking Engine Oil Pressure Using Pressure Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

OIL PUMP WITH FILTER AND DRIVE

11 41 000 REMOVING AND INSTALLING/REPLACING OIL PUMP (N52K)

Necessary preliminary tasks:

- Remove **oil sump** . See **11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (N52K)**.

Release screws (1).

Tightening torque. See 11 41 1AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

Remove intake pipe (2) in direction of arrow.

Installation:

Replace sealing ring.

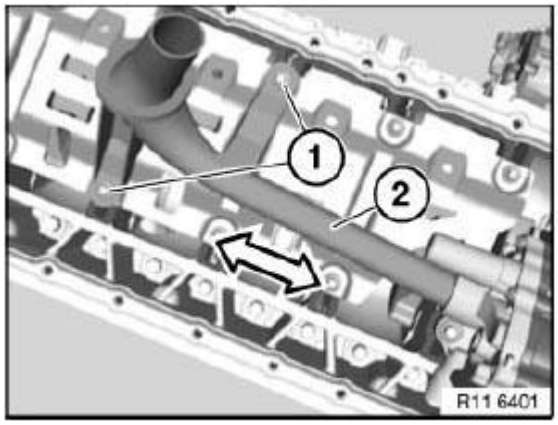

Fig. 313: Removing Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: To release bolt (1), insert a 6 mm drill bit between sprocket wheel and oil pump housing.

Release bolt (1).

Tightening torque. See 11 41 6AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Release screws (2).

Tightening torque. See 11 41 5AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

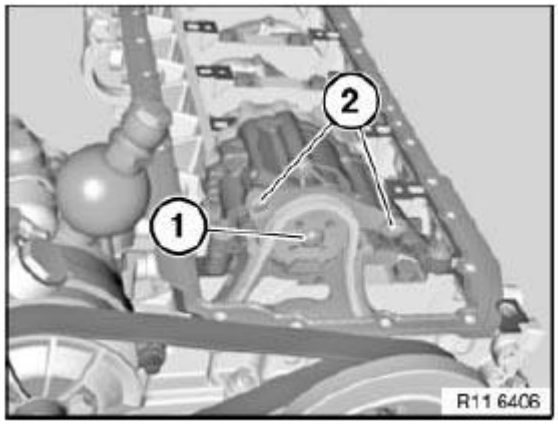

Fig. 314: Identifying Oil Pump Housing Bolt And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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.

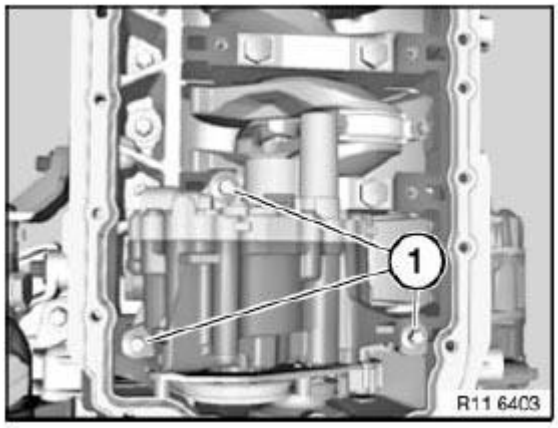

Fig. 315: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach sprocket wheel (1) in direction of arrow.

NOTE: Chain tensioner presses timing chain (3) upwards.

Do not remove sprocket wheel (1).

Remove oil pump (2) in direction of arrow.

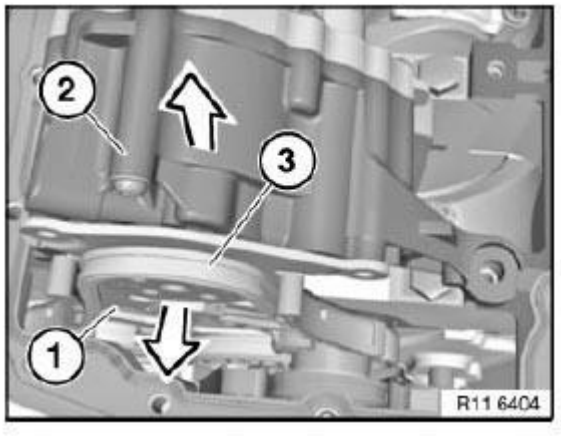

Fig. 316: Removing Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

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).

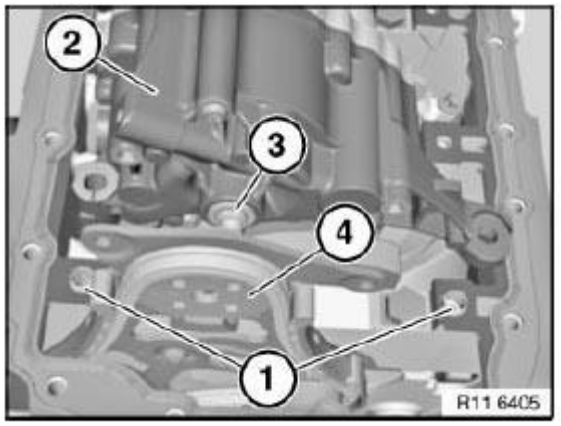

Fig. 317: Identifying Spacers, Twin Surface, Oil Pump And Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 41 010 REMOVING AND INSTALLING/REPLACING CHAIN MODULE FOR OIL PUMP/VACUUM PUMP (N52K)

Special tools required:

For the following special tools, refer to **MAINTENANCE AND GENERAL INFORMATION -**

SPECIAL TOOLS -- 128I .

- **00 9 140**

For the following special tools, refer to **ENGINE- SPECIAL TOOLS (N52K)** .

- **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: Aluminum-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 **cylinder head cover** . See **11 12 000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER (N52K)**.
- Remove **COWL PANEL COVER**
- Remove **oil sump** . See **11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (N52K)**.
- Remove **drive belt** . See **11 28 010 REPLACING ALTERNATOR DRIVE BELT (N52K)**.
- Remove drive belt **tensioner** . See **11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N52)**.
- Remove **vibration damper** . See **11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (N52K)**.
- Remove **sealing cover** for vacuum pump. See **11 41 000 REMOVING AND INSTALLING/REPLACING OIL PUMP (N52K)**.

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. See 11 66 2AZ in **11 66 VACUUM PUMP** .

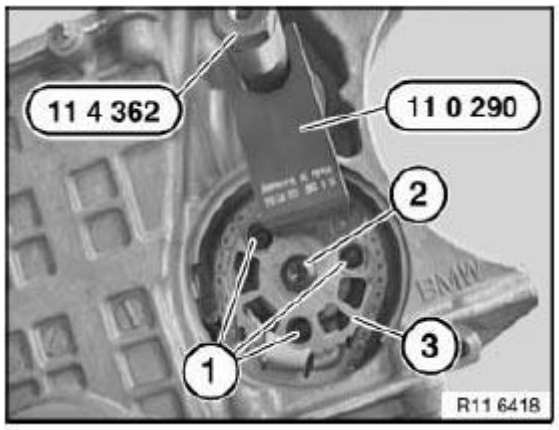

Fig. 318: Identifying Sprocket Wheel And Screw With Special Tool (11 4 362 And 11 0 290)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

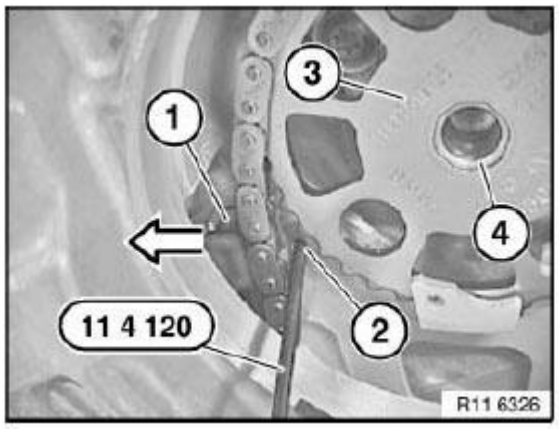

Fig. 319: Pressing Timing Chain With Chain Tensioner With Special Tool (11 4 120)
Courtesy of BMW OF NORTH AMERICA, INC.

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. See 11 41 6AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Release screws (2) for chain module.

Tightening torque. See 11 41 5AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

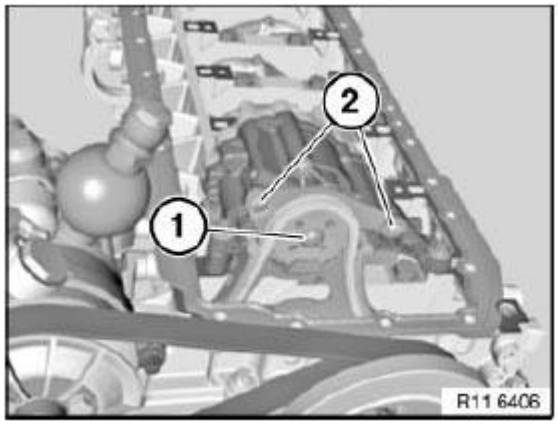

Fig. 320: Identifying Oil Pump Housing Bolt And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft and camshaft with special tools **11 0 300** and **11 4 280** (refer to **CHECKING TIMING**).

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).

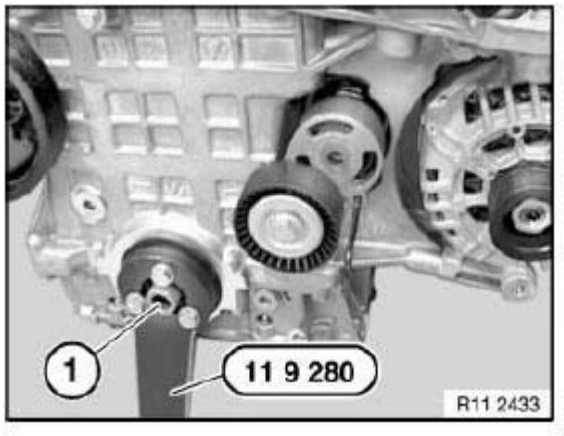

Fig. 321: Identifying Central Bolt With Special Tool (11 9 280)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool **11 9 280** onto hub of vibration damper.

Release central bolt (1).

Tightening torque. See 11 21 1AZ in **11 21 CRANKSHAFT AND BEARINGS** or **11 21 CRANKSHAFT AND BEARINGS** .

Installation:

Replace central bolt (1).

Remove hub (2) towards front.

Installation:

Replace **crankshaft radial seal** at front. See **11 14 005 REPLACING FRONT CRANKSHAFT SEAL (N52K)**.

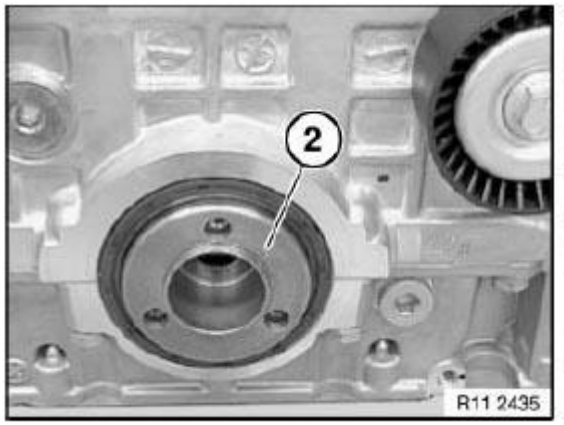

Fig. 322: Identifying Front Hub

Courtesy of BMW OF NORTH AMERICA, INC.

Open screw plug on bedplate.

Tightening torque. See 11 11 8AZ in **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

Release screw for chain module (1).

Tightening torque. See 11 41 4AZ in **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

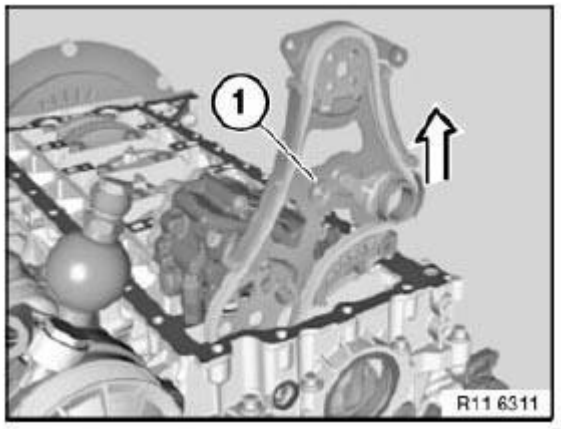

Fig. 323: Removing Chain Module
Courtesy of BMW OF NORTH AMERICA, INC.

Remove chain module (1) in direction of arrow.

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.

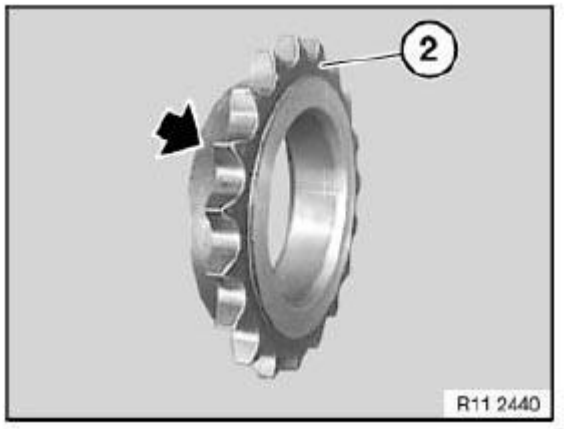

Fig. 324: Identifying Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Procedure on removed engine:

NOTE: Engine is mounted on special tool 11 4 440.

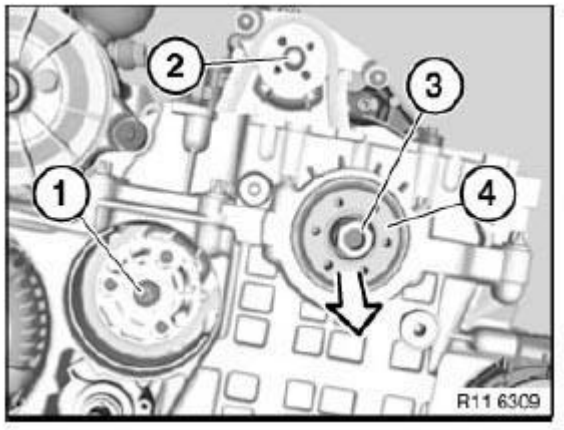

Fig. 325: Identifying Sprocket Wheel Screws, Central Bolt And Front Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) for sprocket wheel.

Tightening torque. See 11 66 2AZ in **11 66 VACUUM PUMP** .

Release screw (2) for sprocket wheel.

Tightening torque. See 11 41 6AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Release central bolt (3).

Tightening torque. See 11 21 1AZ in **11 21 CRANKSHAFT AND BEARINGS** or **11 21 CRANKSHAFT**

AND BEARINGS .

Installation:

Mark central bolt (3) with a colored dot.

Replace central bolt (3).

Remove hub (4) towards front.

All:

Install hub with new central bolt.

Tighten down special tool **11 5 200** with screws (1) to hub.

Do **not** remove special tools **11 0 300** and **11 4 280.**

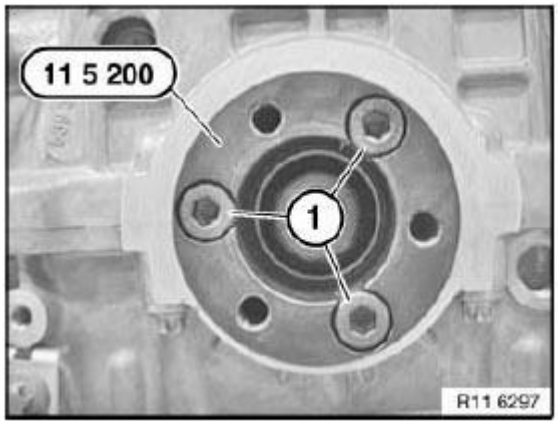

Fig. 326: Identifying Screws With Special Tool (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **tensioner** for drive belt. See **11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N52)**.

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. See 11 21 1AZ in **11 21 CRANKSHAFT AND BEARINGS** or **11 21 CRANKSHAFT AND BEARINGS** .

Mark central bolt and hub with paint.

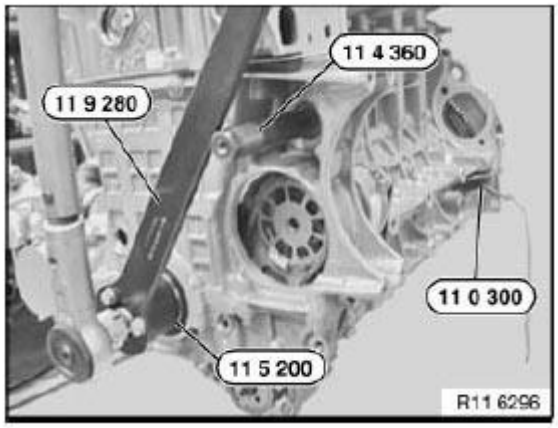

Fig. 327: Identifying Special Tool (11 9 280, 11 4 360, 11 5 200 And 11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

Mark special tools with colored line (1).

See **Fig. 328**.

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. See 11 21 1AZ in **11 21 CRANKSHAFT AND BEARINGS** or **11 21 CRANKSHAFT AND BEARINGS** .

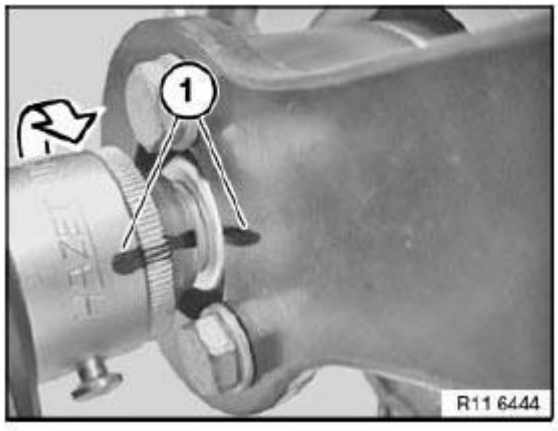

Fig. 328: Identifying Colored Line

Courtesy of BMW OF NORTH AMERICA, INC.

11 41 115 REMOVING AND INSTALLING/REPLACING HYDRAULIC VALVE (N52K)

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

Necessary preliminary tasks

- Remove front **UNDERBODY PROTECTION**
- Have a cleaning cloth ready to catch escaping oil

Detach plug (1) from hydraulic valve (2).

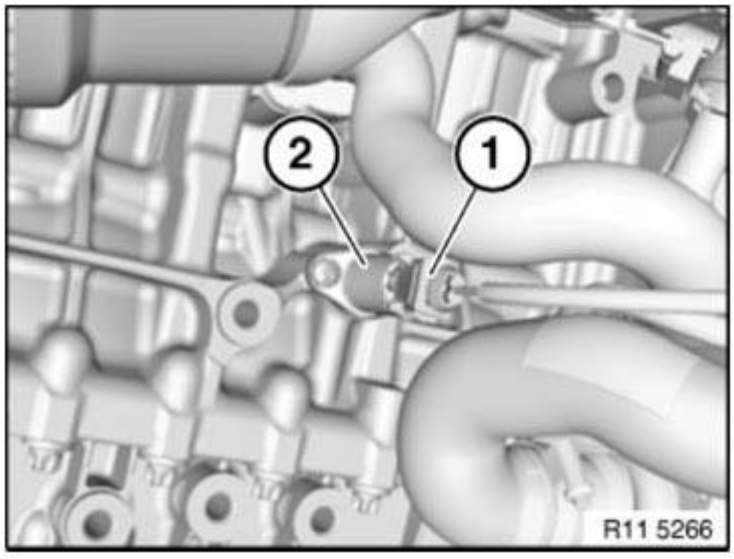

Fig. 329: Identifying Hydraulic Valve And Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) and remove hydraulic valve (2).

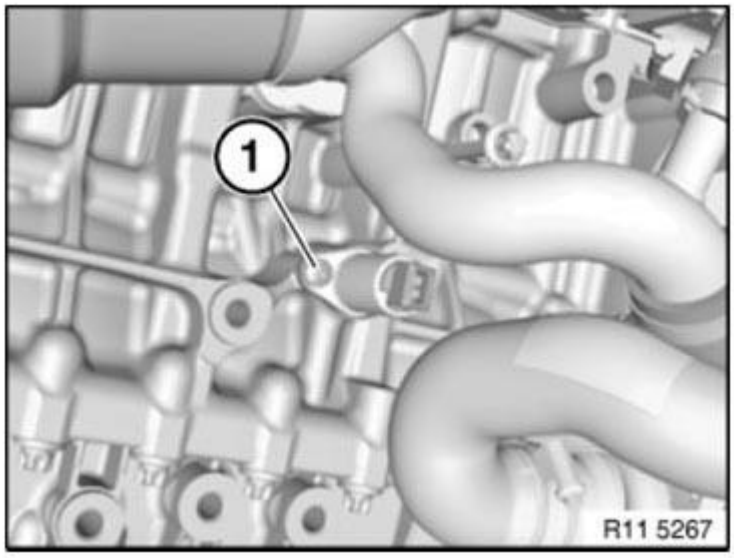

Fig. 330: Identifying Hydraulic Valve Mounting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Replace O-ring (1).

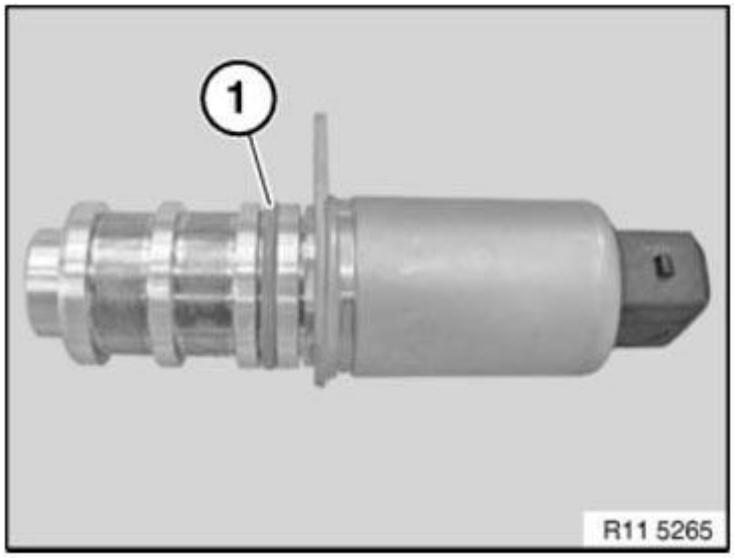

Fig. 331: Identifying O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

OIL FILTER AND LINES

11 42 020 REMOVING AND INSTALLING/REPLACING FULLFLOW OIL FILTER (N52)

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

Recycling:

Catch and dispose of drained coolant.

Observe country-specific waste-disposal regulations.

Necessary preliminary tasks:

- Drain **coolant.** See **17 00 005 DRAINING AND ADDING COOLANT (N52, N52K, N51, N53)** .
- Remove intake air **manifold.** See **11 61 050 REMOVING AND INSTALLING AIR INTAKE MANIFOLD (N52K)**.
- 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** .

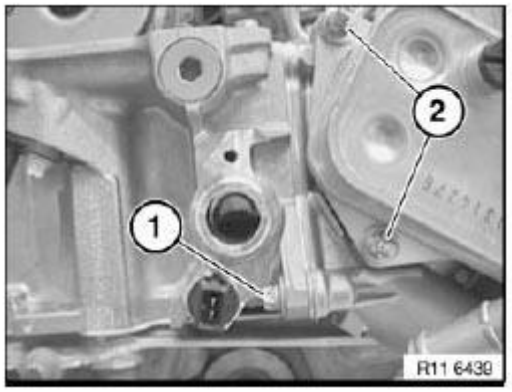

Fig. 332: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (2).

NOTE: Have cleaning cloth ready to catch residual oil.

Tightening torque. See 11 42 2AZ in **11 42 OIL FILTER ELEMENT WITH CONNECTIONS** .

Installation:

Replace all seals.

If necessary, replace filter element.

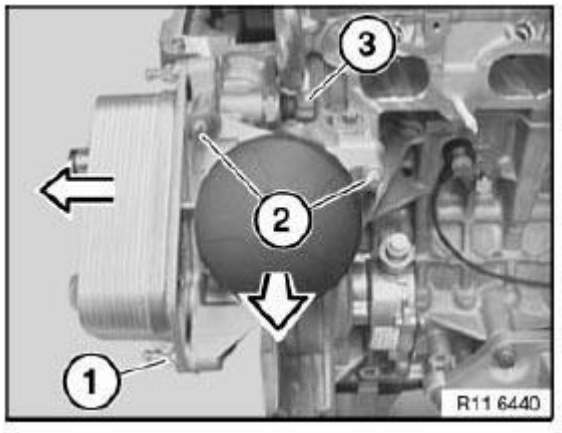

Fig. 333: Releasing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

NOTE: Protect drive belt against dirt.

Installation:

Venting instructions must be observed without fail.

WATER PUMP WITH DRIVE

11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP (N52K)

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

Recycling:

Catch and dispose of drained coolant in a suitable container.

Observe country-specific waste-disposal regulations.

IMPORTANT: If a water pump that has already been operated is reused, it must be filled with coolant immediately after removal.
Mixture ratio, water: coolant = 1 : 1
Protect plug connections against coolant and contamination.
Cover plug connections with suitable materials.

IMPORTANT: Aluminum-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 coolant thermostat. See **11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N52K)**.

Unfasten hose clip (1).

Tightening torque. See 11 53 5AZ in **THERMOSTAT AND CONNECT** .

Remove coolant hose.

Unfasten hose clip (2).

Tightening torque. See 11 53 3AZ in **THERMOSTAT AND CONNECT** .

Remove coolant hose.

Disconnect plug connection (3).

Release screws (4).

Tightening torque. See 11 51 1AZ in **11 51 ELECTRIC WATER PUMP WITH DRIVE** .

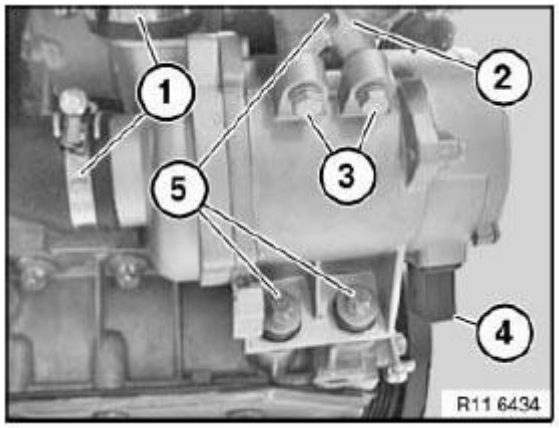

Fig. 334: Identifying Hose Clip, Plug Connection And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace aluminum screws.

Remove electric water pump (x). See **11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP (N52K)**.

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 00 039 VENTING COOLING SYSTEM AND CHECKING FOR WATER LEAKS (N52/ N52K/ N51/ N53)** .

THERMOSTAT AND CONNECTIONS

11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N52K)

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

Recycling

Catch and dispose of drained coolant in a suitable container.

Observe country-specific waste-disposal regulations.

IMPORTANT: Protect plug connections against coolant and contamination.
Cover plug connections with suitable materials.

Necessary preliminary tasks:

- Drain **coolant** . See **17 00 005 DRAINING AND ADDING COOLANT (N52, N52K, N51, N53)** .

NOTE: For purposes of clarity, the picture and text refer to the component when removed.

Unfasten hose clip (1).

Tightening torque. See 11 53 5AZ in **THERMOSTAT AND CONNECT** .

Remove coolant hose.

Unfasten hose clip (2).

Tightening torque. See 11 53 6AZ in **THERMOSTAT AND CONNECT** .

Remove coolant hose.

Unlock and detach coolant hose (3).

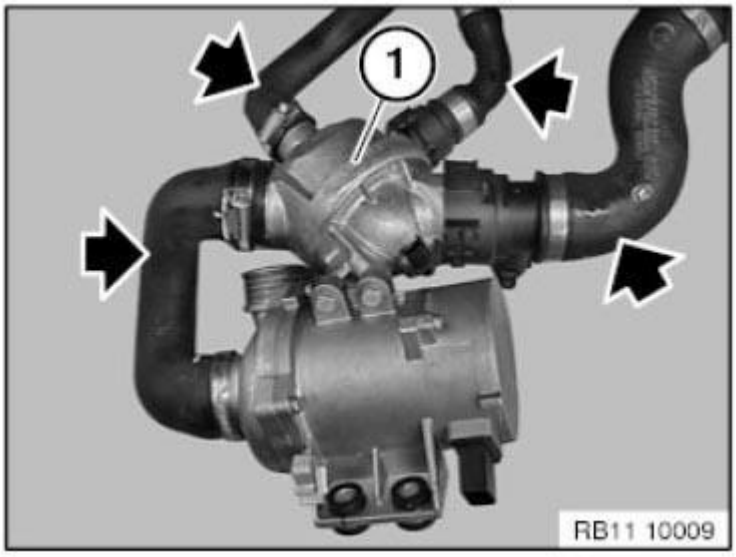

Fig. 335: Locating Thermostat
Courtesy of BMW OF NORTH AMERICA, INC.

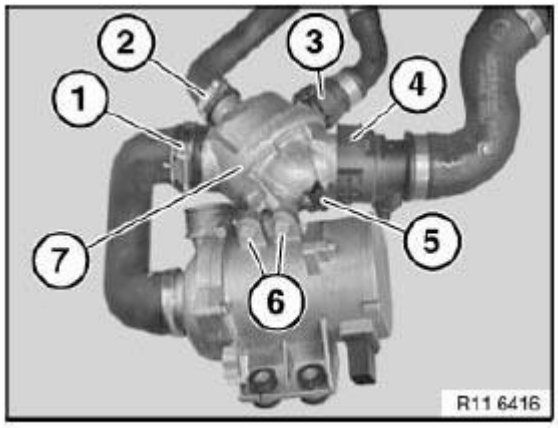

Fig. 336: Identifying Hose Clip, Coolant Hose, Plug Connection And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach coolant hose (4).

Disconnect plug connection (5).

Release screws (6).

Tightening torque. See 11 53 1AZ in **THERMOSTAT AND CONNECT** .

Remove coolant thermostat (7). See **11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N52K)**.

Assemble engine.

INTAKE MANIFOLD

11 61 050 REMOVING AND INSTALLING AIR INTAKE MANIFOLD (N52K)

Necessary preliminary tasks:

- Remove **tension strut** . See **51 71 371 REMOVING AND INSTALLING/REPLACING TENSION STRUT ON LEFT OR RIGHT SPRING STRUT DOME** .
- Remove **intake filter housing** . See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N52/N52K/N53)** .
- Remove **ignition coil cover** . See **11 00 REMOVING AND INSTALLING/REPLACING ACOUSTIC COVER (N52/N52K)**.

Release vacuum line (5) from line holder (4).

Disconnect vacuum hose (1) from vacuum line (5).

Release connections (2 and 3) of vacuum line (5).

Lay vacuum line (5) to one side.

Installation:

Connections (2 and 3) must snap audibly into place!

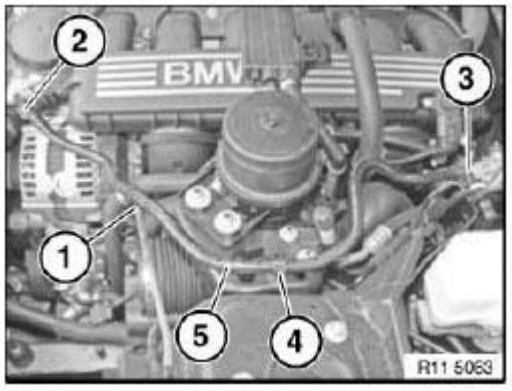

Fig. 337: Identifying Vacuum Line, Line Holder, Vacuum Hose And Vacuum Line
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Tightening torque. See 32 41 2AZ in **32 41 PUMP AND OIL SUPPLY** .

Installation:

Replace self-locking nut (1).

Place oil reservoir (2) in direction of arrow to one side.

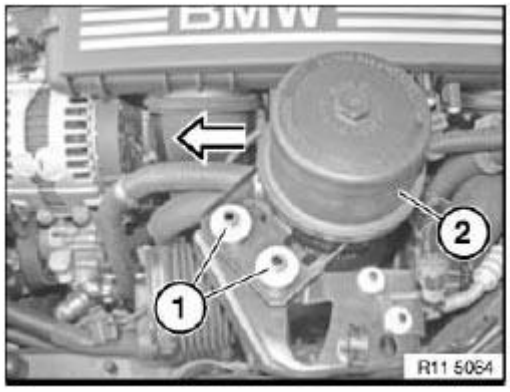

Fig. 338: Placing Oil Reservoir
Courtesy of BMW OF NORTH AMERICA, INC.

Release rubber holders (1 and 2) from guide.

Disconnect plug connection (3).

Installation:

Plug connection (3) must snap audibly into place!

Unclip line (4) from line holder.

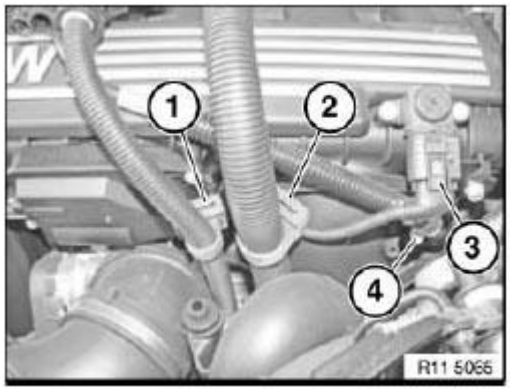

Fig. 339: Identifying Rubber Holders, Plug Connection And Unclip Line
Courtesy of BMW OF NORTH AMERICA, INC.

Open cable duct (4).

Expose lines (1 and 3).

Lay cable duct (4) (upper and lower sections) to one side.

NOTE: The lines (1 to 3) do not have to be detached in order to remove the air intake manifold!

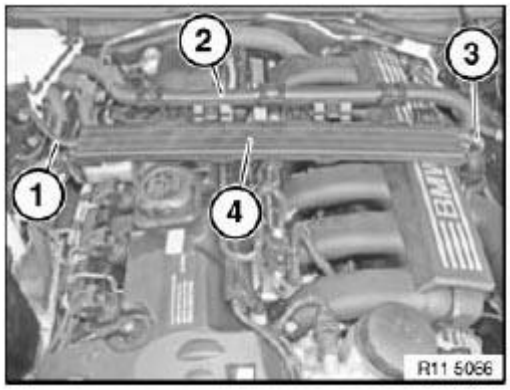

Fig. 340: Identifying Cable Duct And Expose Line
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten hose clip (1).

Tightening torque. See 11 61 3AZ in **INTAKE MANIFOLD** .

Detach clean-air gaiter (3) at position (2) in direction of arrow and remove.

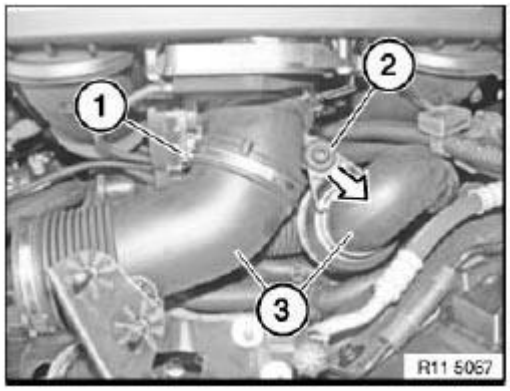

Fig. 341: Identifying Hose Clip And Clean-Air Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Installation:

Plug connections (1) must snap audibly into place!

IMPORTANT: Cover fitting (2) with suitable apparatus to prevent objects getting into it.

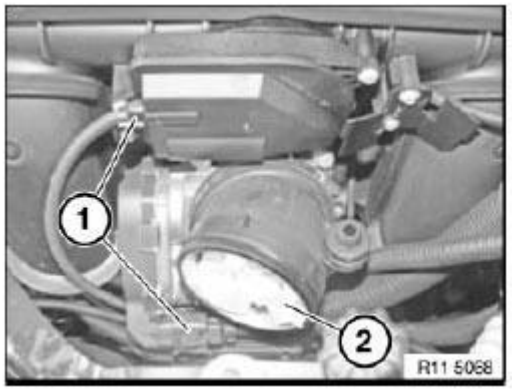

Fig. 342: Identifying Plug Connection And Cover Fitting
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (2).

Tightening torque. See 11 61 4AZ in **INTAKE MANIFOLD** .

Unclip fuel line (1) at position (3) from holder (not shown).

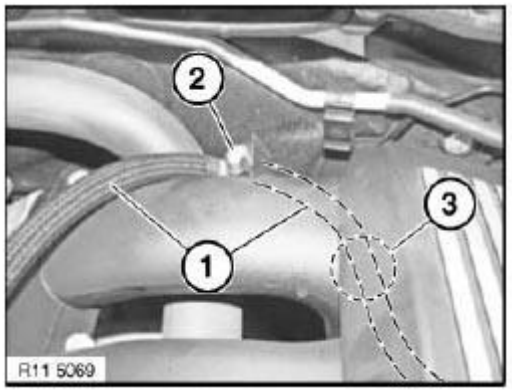

Fig. 343: Identifying Screw And Fuel Line
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) and lay to one side.

Unclip lines at positions (4).

Remove plug connections (2 and 3).

Installation:

Plug connections (1 to 3) must snap audibly into place!

Lay both lines (5) between intake ducts (direction of arrow) downwards.

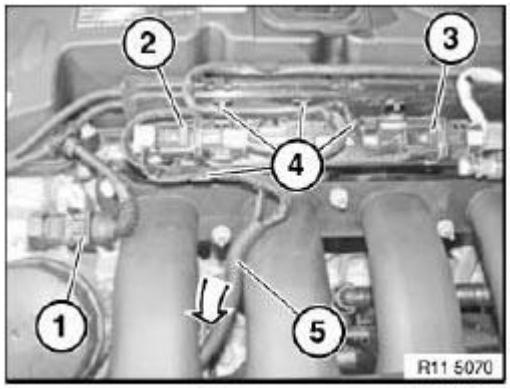

Fig. 344: Identifying Plug Connection And Unclip Line
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, the graphic shows the engine wiring harness removed.

Release screws (1).

Tightening torque. See 11 61 5AZ in **INTAKE MANIFOLD** .

Lay cable duct (2) with bracket (3) and engine wiring harness to one side.

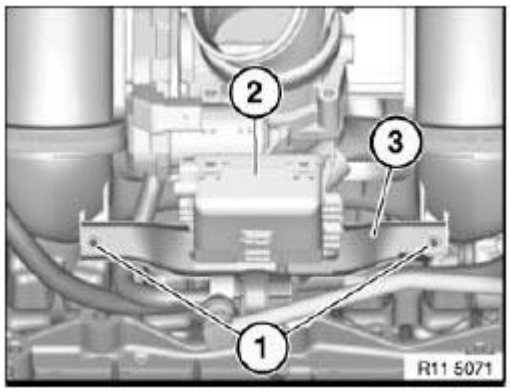

Fig. 345: Identifying Screws And Cable Duct With Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1 and 3).

Tightening torque. See 11 61 1AZ in **INTAKE MANIFOLD** .

Unscrew nuts (2).

Tightening torque. See 11 61 1AZ in **INTAKE MANIFOLD** .

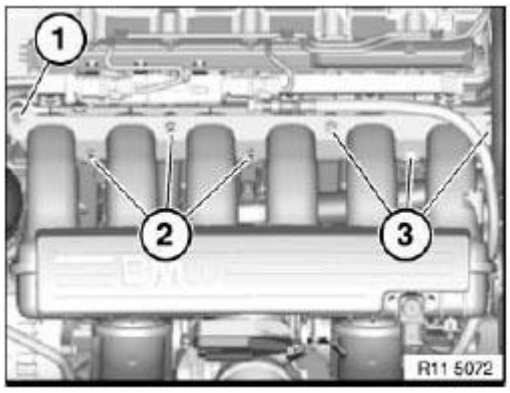

Fig. 346: Identifying Screws And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Expose air intake manifold (3) in following work steps:

1. Raise air intake manifold (3) approx. 5 - 10 cm (see arrow 1).
2. Turn air intake manifold (3) at front through 45° (see arrow 2).

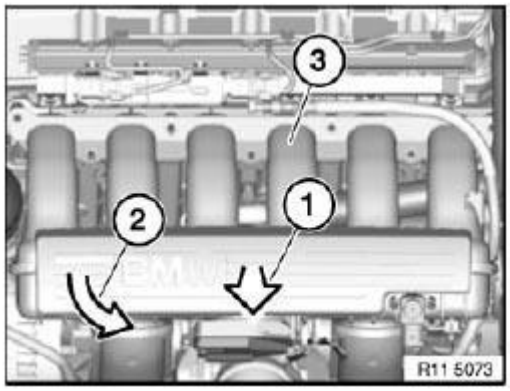

Fig. 347: Turning Air Intake Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The following plug connections and connections are located below the intake ducts.

Disconnect plug connections (2).

Release engine ventilation connections (1).

Installation:

Engine ventilation connections (1) and plug connections (2) must snap audibly into place!

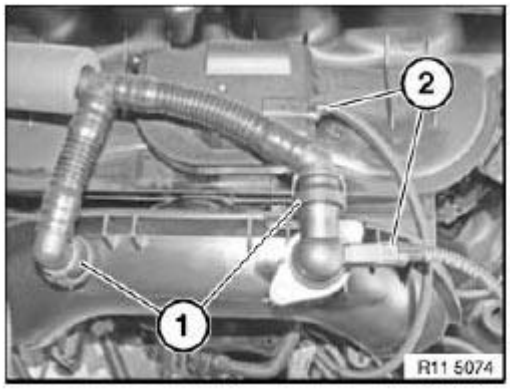

Fig. 348: Identifying Ventilation Connections And Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Release tank venting connection (2).

Installation:

Tank venting connection (2) must snap audibly into place!

Disconnect air intake manifold (1) in upward direction.

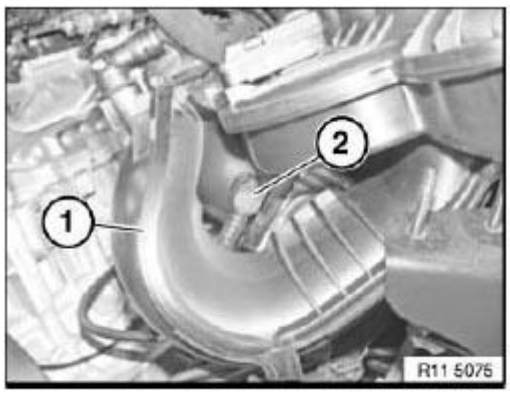

Fig. 349: Identifying Tank Venting Connection And Air Intake Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Cover intake entries (1) with suitable apparatus to prevent objects getting into them.

Installation:

Sealing faces must be free from oil and grease.

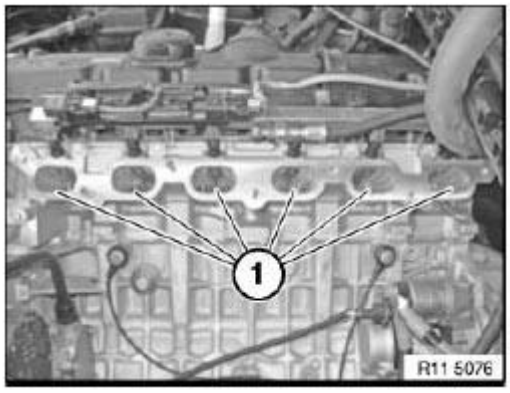

Fig. 350: Identifying Intake Entries
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace gaskets (1).

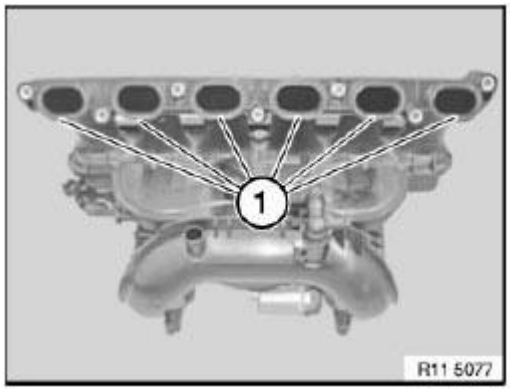

Fig. 351: Identifying Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check air intake system for leaks.

EXHAUST MANIFOLD

18 40 050 REMOVING AND INSTALLING/REPLACING FRONT EXHAUST MANIFOLD (N52, N52K)

Necessary preliminary tasks:

- Remove **rear exhaust manifold** . See **EXHAUST MANIFOLD WITH** .

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.

Unscrew nuts.

Remove exhaust manifold (1).

Installation:

Clean sealing faces and replace seals.

Replace nuts.

Tightening torque. See 18 40 1AZ in **18 40 EXHAUST MANIFOLD** .

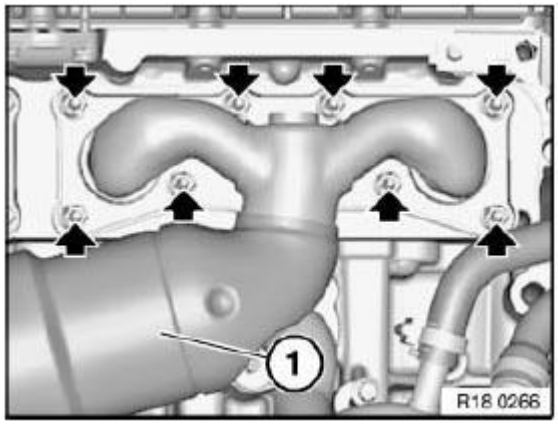

Fig. 352: Identifying Exhaust Manifold With Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Add final details to vehicle.

Check exhaust system for leaks.

18 40 050 REMOVING AND INSTALLING/REPLACING FRONT EXHAUST MANIFOLD (N53/N52/N52K/N51)

Necessary preliminary tasks:

- Remove **rear exhaust manifold** . See **EXHAUST MANIFOLD WITH**

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. See 11 78 1AZ in **EMISSION CONTROL OXYGEN SENSOR** .

Unscrew nuts.

Remove exhaust manifold (1).

Installation:

Clean sealing faces and replace seals.

Replace nuts.

Tightening torque. See 18 40 1AZ in **18 40 EXHAUST MANIFOLD** .

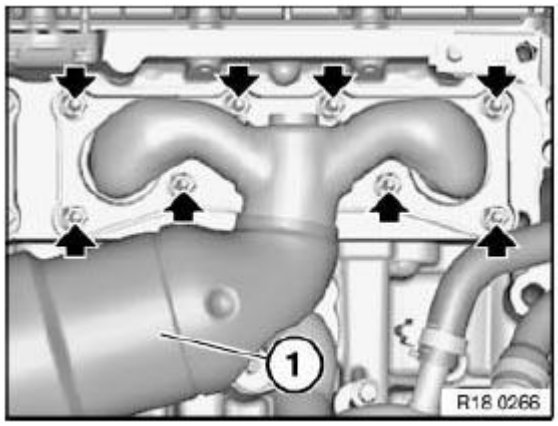

Fig. 353: Identifying Exhaust Manifold With Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

18 40 060 REMOVING AND INSTALLING/REPLACING REAR EXHAUST MANIFOLD (N52, N52K)

Necessary preliminary tasks:

- Remove **acoustic cover** . See **11 00 REMOVING AND INSTALLING/REPLACING ACOUSTIC COVER (N52/N52K)**.
- Remove **coolant expansion tank** . See **17 11 100 REMOVING AND INSTALLING/REPLACING COOLANT EXPANSION TANK (N46, N45, N52, N52K, N51, N53)** .
- Remove **underbody protection** . See **51 47 490 REMOVING AND INSTALLING/REPLACING FRONT UNDERBODY PROTECTION** .

- Remove **complete exhaust system** . See **EXHAUST SYSTEM COMPLETE** .

NOTE: The oxygen sensors are in danger of being damaged when the exhaust manifolds are removed and installed.

Remove **control sensor** from cylinders 4 to 6.

Remove **monitor sensor** from cylinders 4 to 6.

Unscrew nuts.

Remove exhaust manifold (1).

Installation:

Clean sealing faces and replace seals.

Replace nuts.

Tightening torque. See 18 40 1AZ in **18 40 EXHAUST MANIFOLD** .

Add final details to vehicle.

Check exhaust system for leaks.

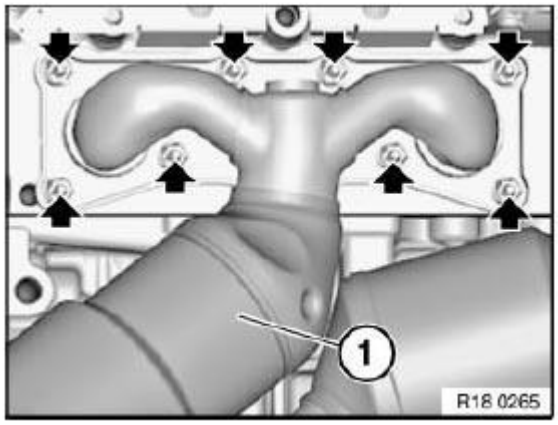

Fig. 354: Identifying Exhaust Manifold With Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

18 40 060 REMOVING AND INSTALLING/REPLACING REAR EXHAUST MANIFOLD (N53/N52/N52K/N51)

NOTE: See 18 40 060 Removing And Installing/Replacing Rear Exhaust Manifold (N52, N52K).

VACUUM PUMP

11 66 000 REMOVING AND INSTALLING OR REPLACING VACUUM PUMP (N52)

Necessary preliminary work

- Remove **DRIVE BELT**.
- Remove **DRIVE BELT TENSIONER** for drive belt.
- Remove **SEALING CAP** for vacuum pump.
- Remove intake **PLENUM**.

Rotate crankshaft at central bolt.

Rotate camshaft sprocket (3) until drilled holes and screws (1) match up.

Screw in special tool 11 4 362 (adapter).

Secure special tool **11 0 290** in sprocket (3) and on special tool 11 4 362 (adapter).

Release screw (2).

Tightening torque: **11 66 2AZ** .

Release screws (1) and secure against falling out.

Tightening torque: **11 66 1AZ** .

Remove vacuum pump towards rear.

Installation note:

Replace gasket.

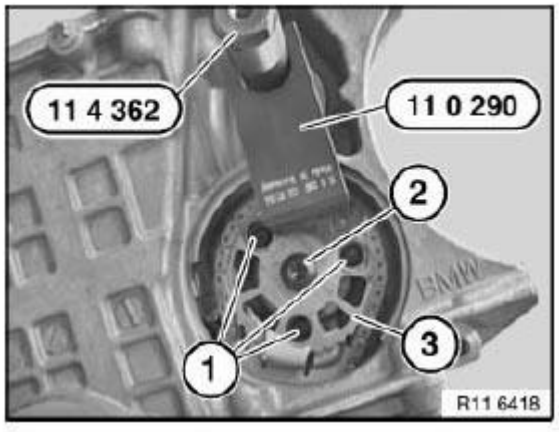

Fig. 355: Identifying Special Tool (11 0 290) And (11 4 362)

Courtesy of BMW OF NORTH AMERICA, INC.

Press chain tensioner with chain (1) in direction of arrow.

Insert special tool **11 4 120** .

Remove special tool **11 0 290** .

Remove camshaft sprocket (2) in direction of arrow.

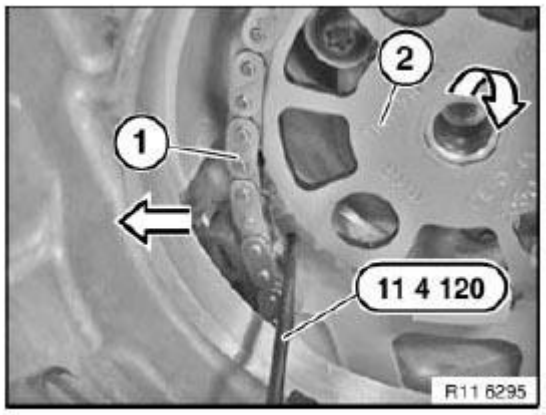

Fig. 356: Removing Camshaft Sprocket
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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 (refer to BMW Parts Department).

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

Disconnect plug connection on oxygen control sensor (1).

Release lambda control sensor (1) on exhaust manifold of cylinder nos. 4 to 6 with special tool **11 4 260** .

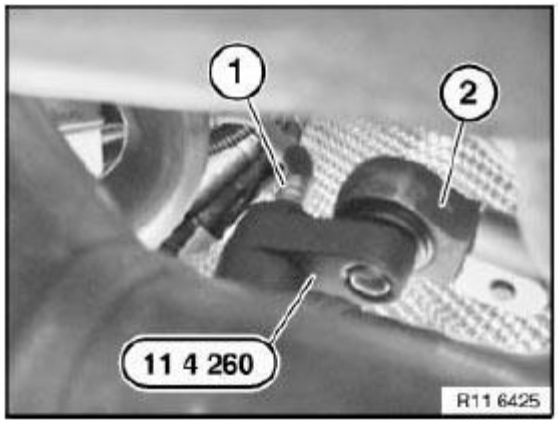

Fig. 357: Releasing Lambda Control Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

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 **11 78 1AZ** .

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** .

Installation note:

The threads of new lambda monitoring sensors are already coated with Never Seez Compound (refer to BMW Parts Department).

If a lambda monitoring sensor is to be reused, apply a thin and even coating of Never Seez Compound to the thread only.

The part of the lambda monitoring sensor which projects into the exhaust system branch (sensor ceramics) must **not** be cleaned and **not** coated with lubricant.

Disconnect plug connection on lambda monitoring sensor (1).

Release lambda monitoring sensor (1) on exhaust manifold of cylinder nos. 1 to 3 with special tool **11 9 150** .

Tightening torque **11 78 1AZ** .

Installation note:

Cable color of lambda monitoring sensor (1), cylinders nos. 1 to 3 = black.

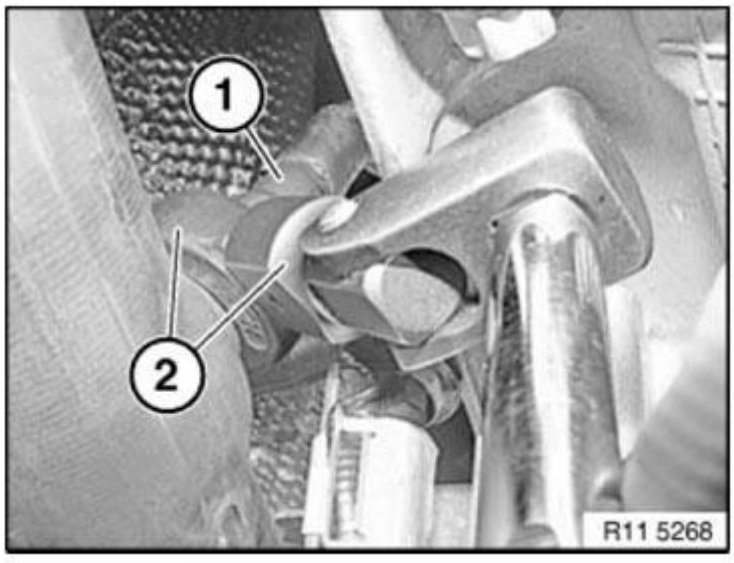

Fig. 358: Identifying Lambda Monitoring Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

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 **11 78 1AZ** .

Installation note:

Cable color of lambda monitoring sensor (1), cylinders nos. 4 to 6 = grey.

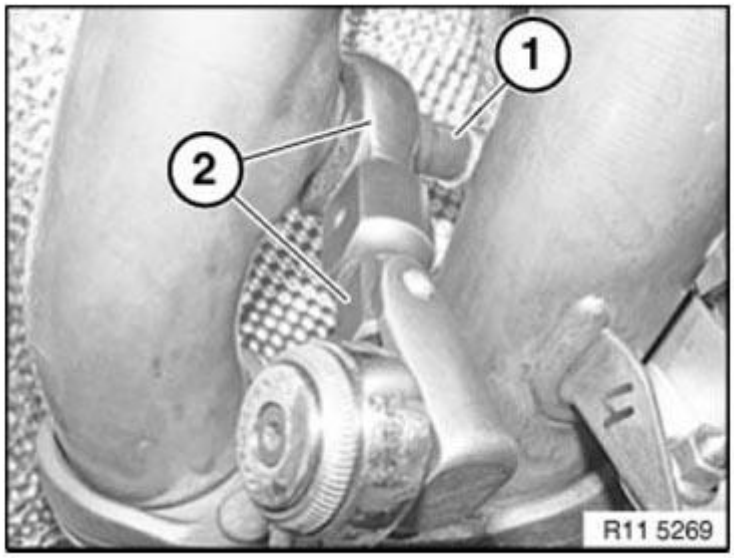

Fig. 359: Identifying Lambda Monitoring Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

