ENGINE

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

ENGINE, GENERAL

ENGINE IDENTIFICATION

Drive in engine numbers at marked surface with impact tool.

M47 / M47TU / M47T2

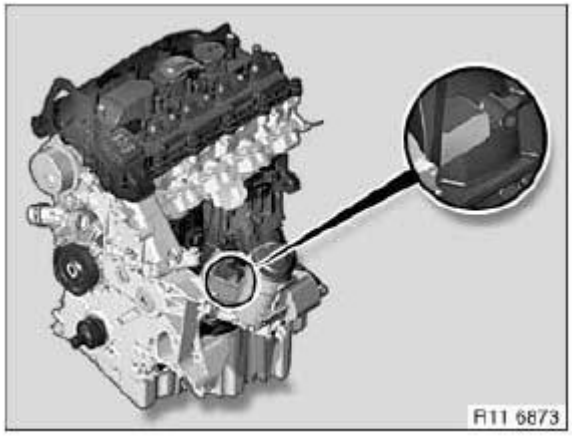


Fig. 1: M47 / M47TU / M47T2 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M57 / M57TU / M57T2

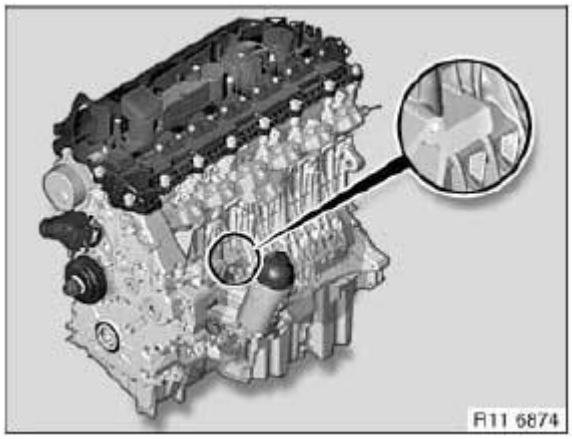


Fig. 2: M57 / M57TU / M57T2 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M67 / M67TU

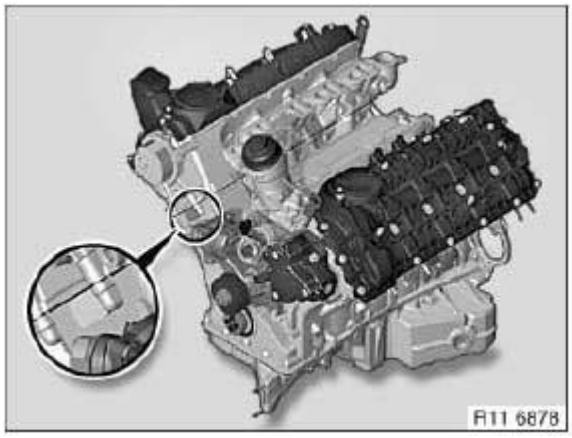


Fig. 3: M67 / M67TU Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N47

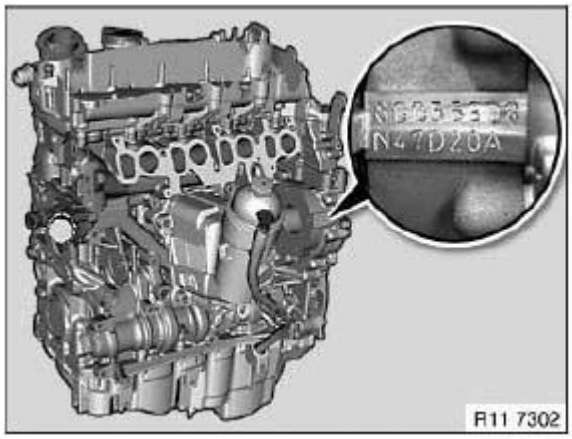


Fig. 4: N47 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M52 / M52TU

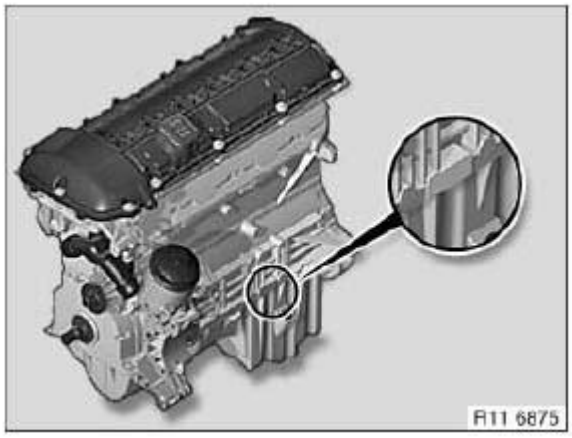


Fig. 5: M52 / M52TU Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M54

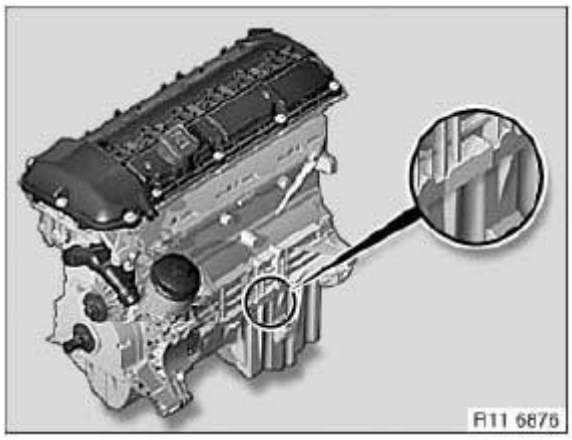


Fig. 6: M54 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

M56

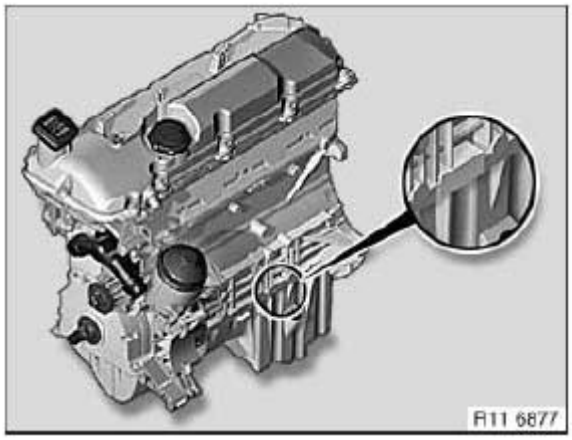


Fig. 7: M56 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N40 / N45

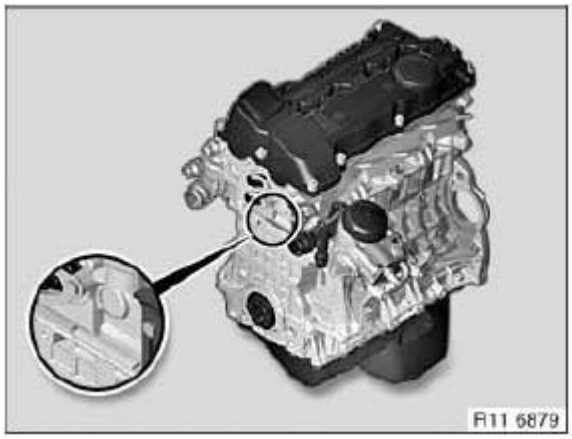


Fig. 8: N40 / N45 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N42 / N46 / N46T

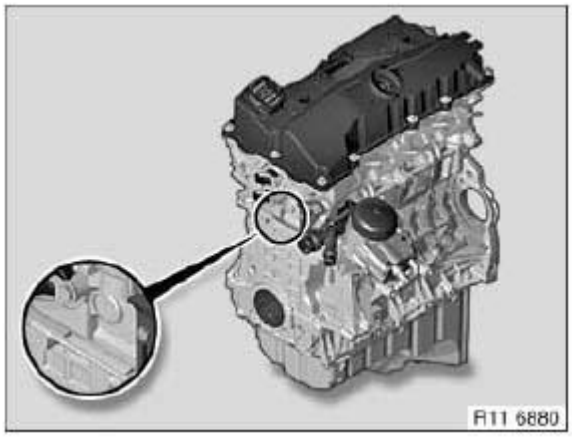


Fig. 9: N42 / N46 / N46T Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N51 / N52 / N52K / N53 / N54

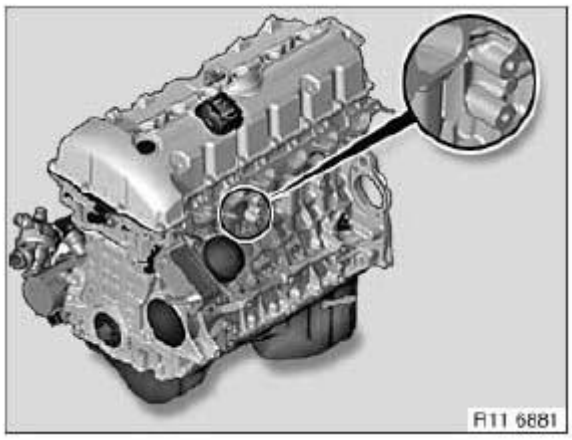


Fig. 10: N51 / N52 / N52K / N53 / N54 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N62

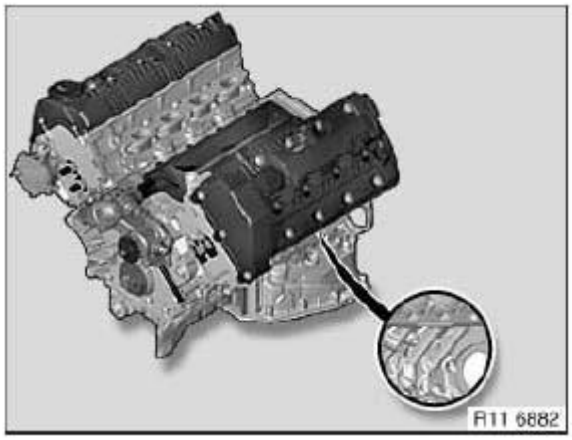


Fig. 11: N62 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

N73

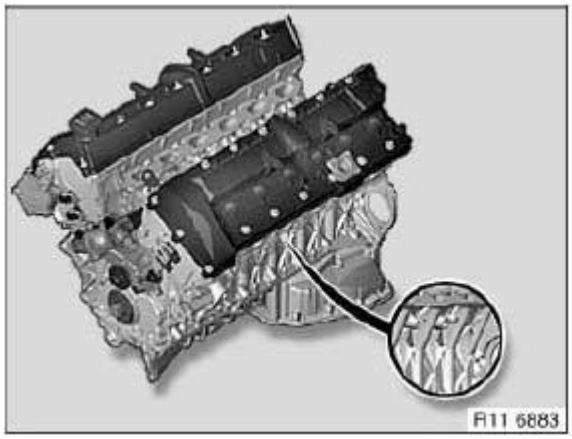


Fig. 12: N73 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

S54

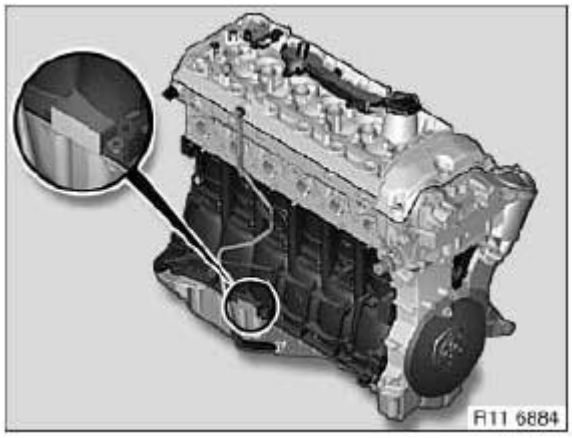


Fig. 13: S54 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

S85

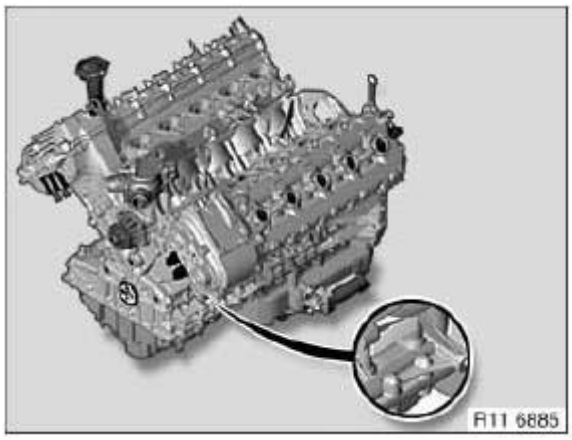


Fig. 14: S85 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

W10 / W11

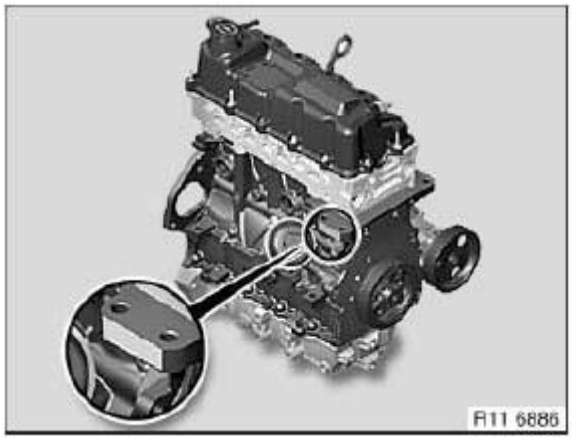


Fig. 15: W10 / W11 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

W17

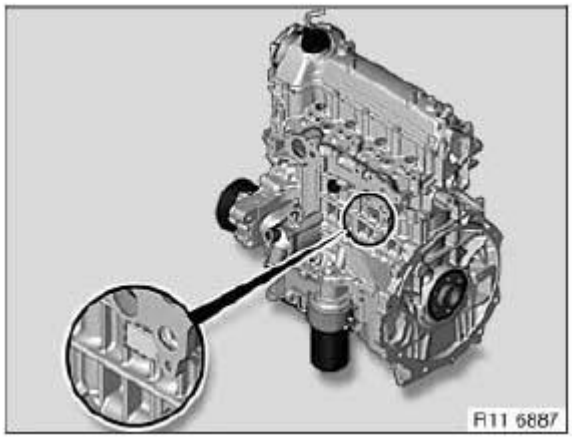


Fig. 16: W17 Engine Identification
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

MOUNTING ENGINE ON ASSEMBLY STAND (N52K)

Special tools required:

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

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

Necessary preliminary tasks:

- Remove engine

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

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

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

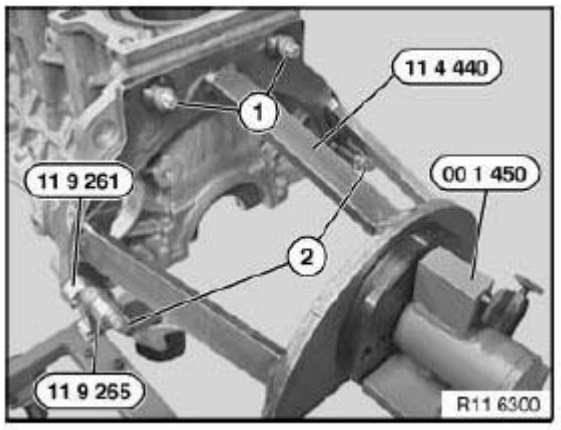


Fig. 17: Engine Block With Steel And Aluminum Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

Special tools required:

- 11 9 240

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

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

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

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

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

Checking and drip-off times must be observed.

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

The alternator must therefore be covered with suitable apparatus.

Recycling:

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

Observe country-specific waste-disposal regulations.

NOTE: Adhere to the following work steps in sequence:

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

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

Release oil filter cap with special tool 11 9 240 .

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

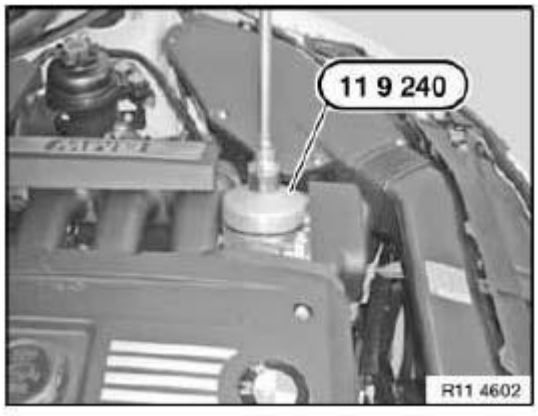


Fig. 18: Special Tool (11 9 240)

Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

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

Installation:

Moisten sealing rings (2) with engine oil.

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

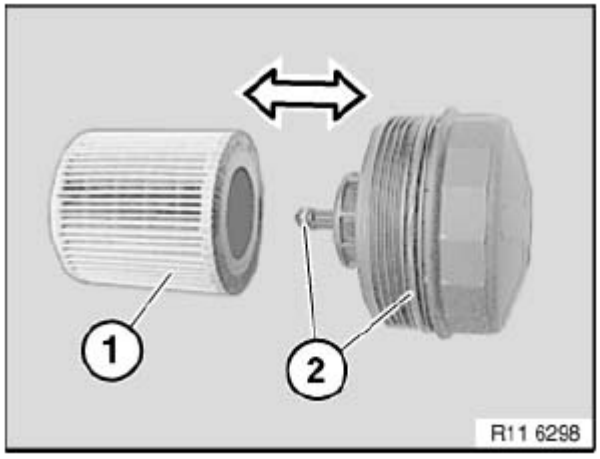


Fig. 19: Sealing Rings
Courtesy of BMW OF NORTH AMERICA, INC.

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

Unclip service opening on reinforcement plate.

Open screw plug (1) in oil sump.

Drain engine oil.

Installation:

Replace sealing ring.

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

Pour in engine oil.

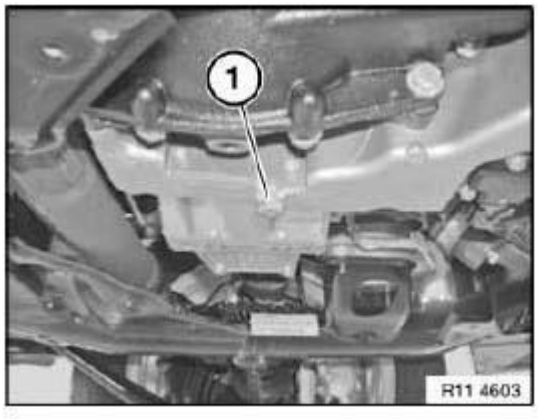


Fig. 20: Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

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

Turn off engine.

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

Assemble engine.

Checking engine oil level:

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

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

Release screws.

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

Remove ignition coil cover (1).

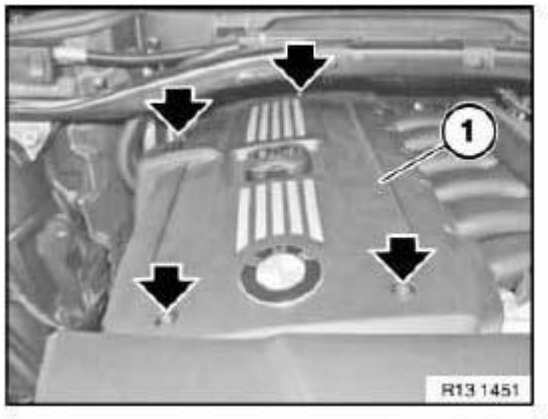


Fig. 21: Ignition Coil Cover
Courtesy of BMW OF NORTH AMERICA, INC.

11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52)

Special tools required:

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

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

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

Necessary preliminary tasks:

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

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

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

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

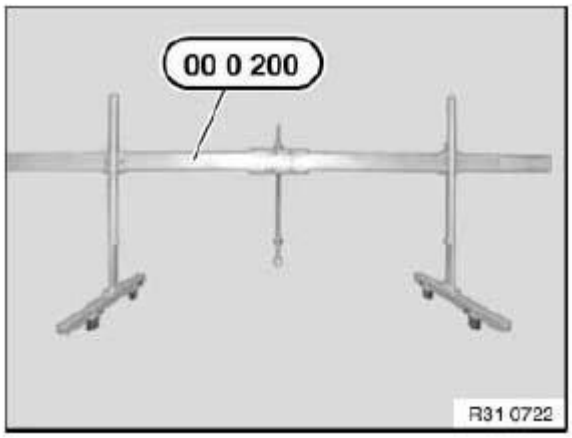


Fig. 22: Special Tool (00 0 200)
Courtesy of BMW OF NORTH AMERICA, INC.

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

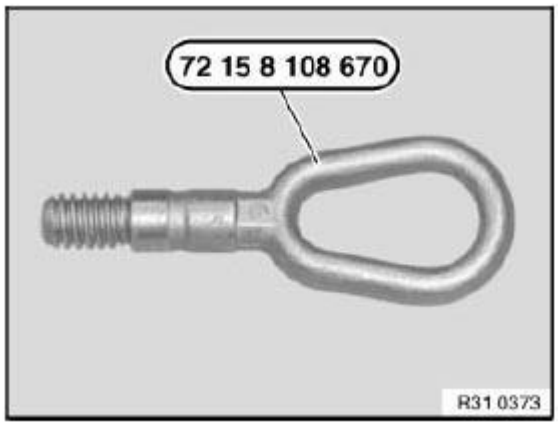


Fig. 23: Towing Hook (72 15 8 108 670)
Courtesy of BMW OF NORTH AMERICA, INC.

Cut open cable tie (2).

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

Installation:

Make sure the quick-release fastener is fitted correctly.

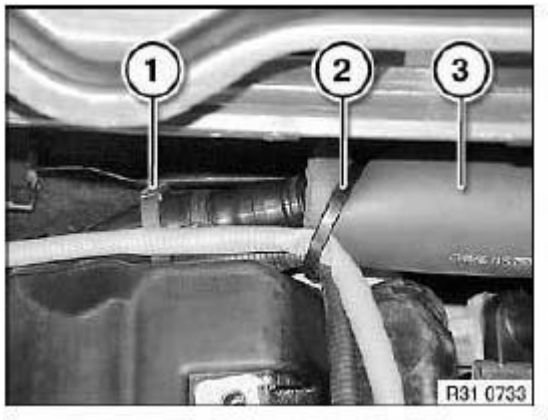


Fig. 24: Open Cable Tie, Quick-Release Fastener And Vent Line
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

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

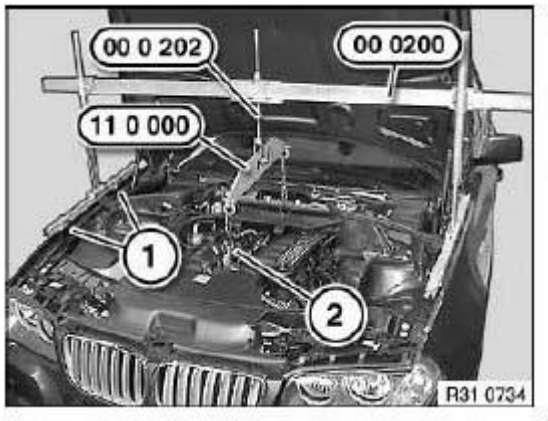


Fig. 25: Special Tools (00 0 202), (00 0 200) And (11 0 000)

Courtesy of BMW OF NORTH AMERICA, INC.

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

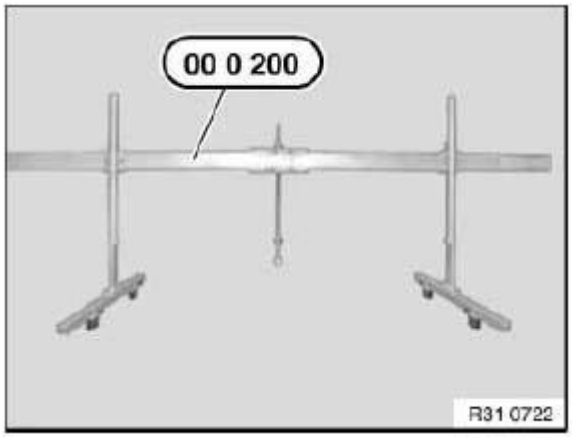


Fig. 26: Special Tool (00 0 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Raise engine approx. 10 mm with cross member.

Installation:

Replace self-locking nuts.

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

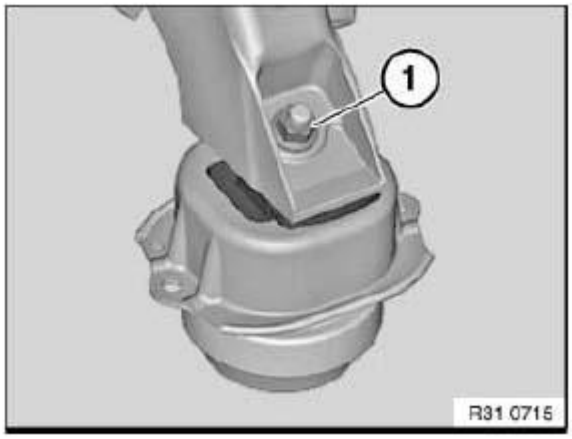


Fig. 27: Cross Member Nut
Courtesy of BMW OF NORTH AMERICA, INC.

CYLINDER HEAD WITH COVER

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

IMPORTANT: Aluminium-magnesium materials

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

Necessary preliminary tasks:

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

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

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

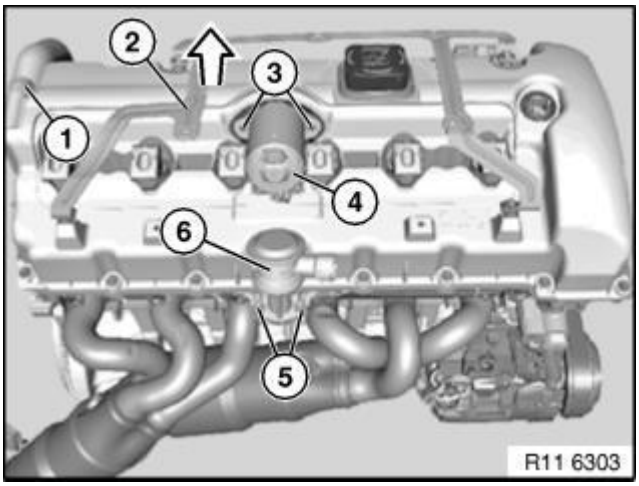


Fig. 28: Pull Off Metal Bracket (2) In Direction Of Arrow
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

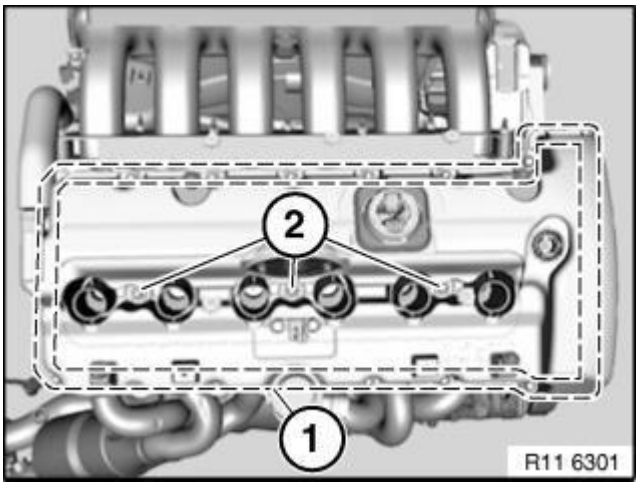


Fig. 29: Installation Location Of Screws (1 And 2) Is Specified By The Different Bushing Shapes
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

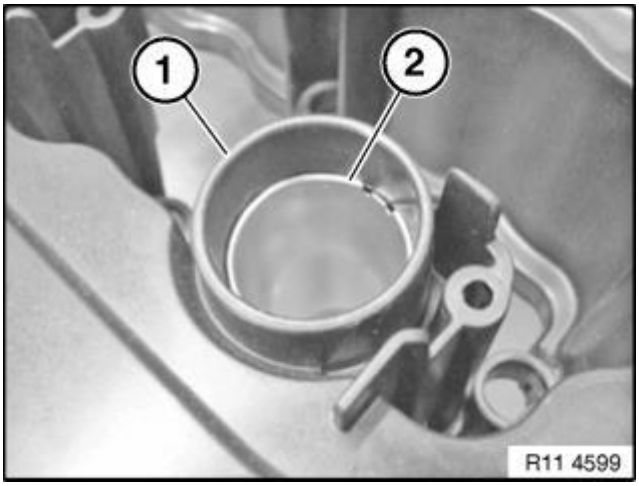


Fig. 30: Slotted Sleeves (2) For Guiding Ignition Coils In Cylinder Head Cover (1) Must Be Replaced

Courtesy of BMW OF NORTH AMERICA, INC.

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

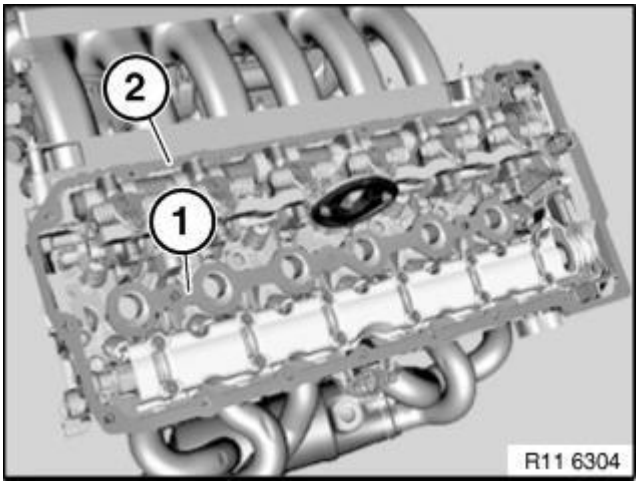


Fig. 31: Clean All Sealing Faces (1 And 2)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not use any metal-cutting tool

Installation: Replace gaskets (1 and 2).

Assemble engine.

11 12 100 REMOVING AND INSTALLING CYLINDER HEAD (N52K)

Special tools required:

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

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

damage).

Necessary preliminary tasks:

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

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

Risk of corrosion and cracking!

Release screws (1).

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

Set down timing chain.

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

Installation:

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

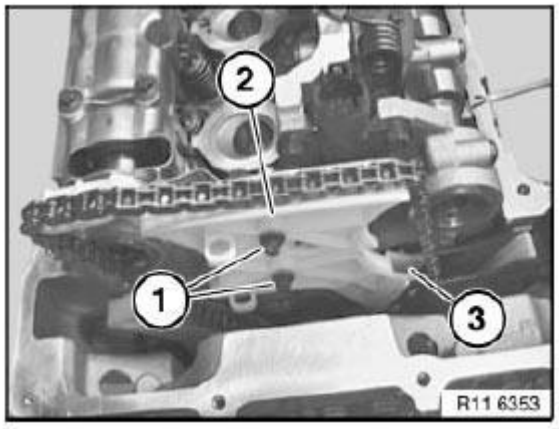


Fig. 32: Timing Chain Module, Junction And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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

Remove eccentric shaft sensor (1) towards front.

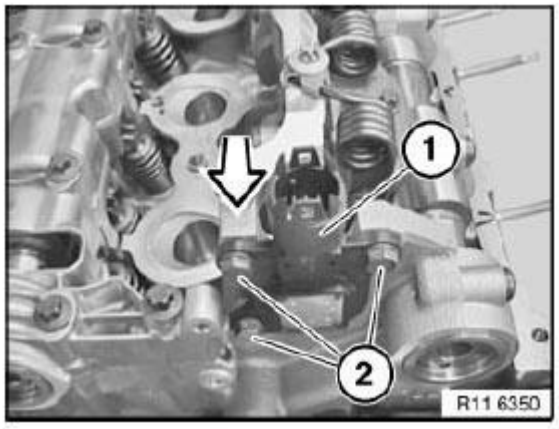


Fig. 33: Removing Eccentric Shaft Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

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

Release screw (1).

Remove magnet wheel (2) towards front.

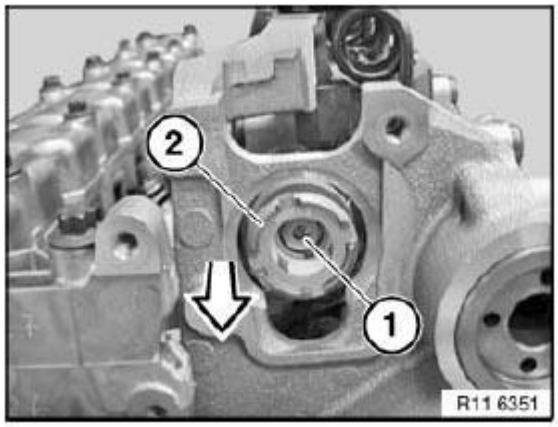


Fig. 34: Removing Magnet Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

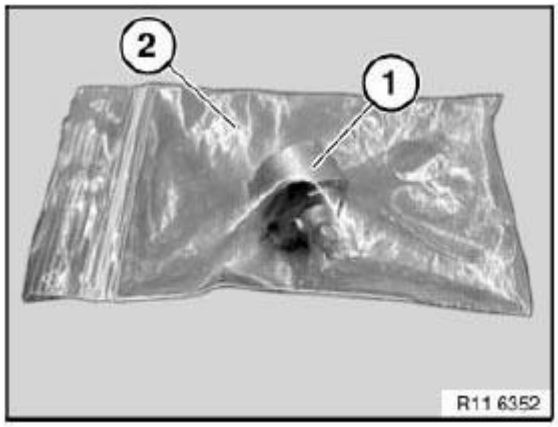


Fig. 35: Magnet Wheel And Plastic Bag
Courtesy of BMW OF NORTH AMERICA, INC.

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

Remove stop screw between 1st and 2nd cylinders.

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

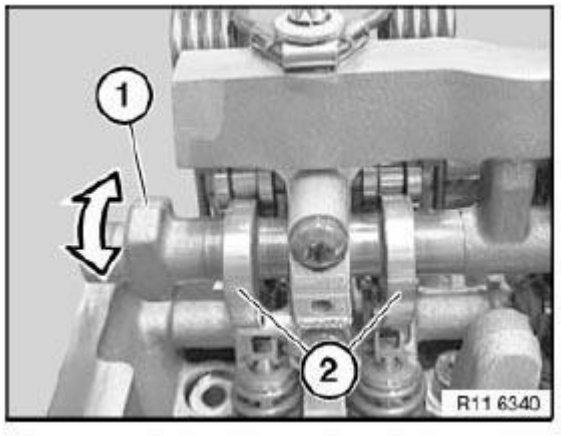


Fig. 36: Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Release screw (2).

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

Release screws (1).

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

Installation:

Replace aluminum screws.

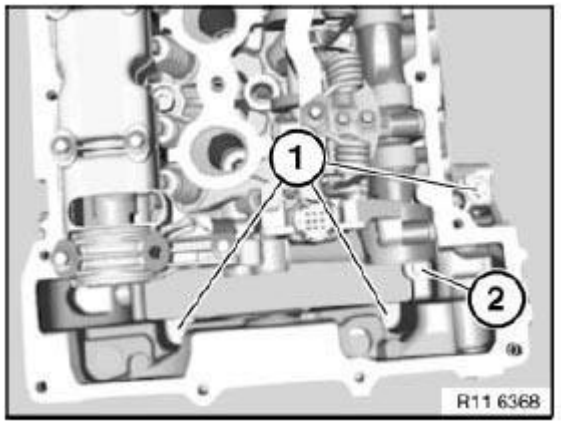


Fig. 37: Bolt

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe different bolt heads.

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

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

NOTE: Picture shows inlet and exhaust camshafts removed.

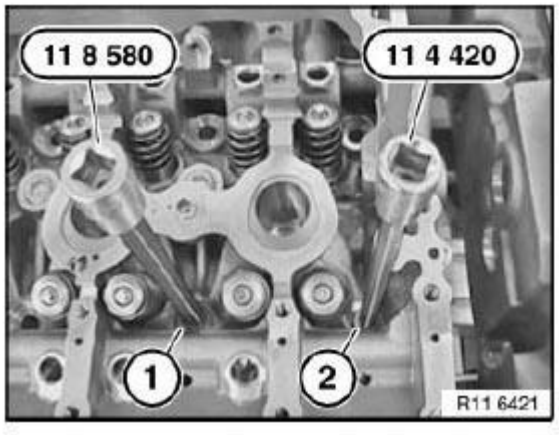


Fig. 38: Special Tools (11 8 580) And (11 4 420)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

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

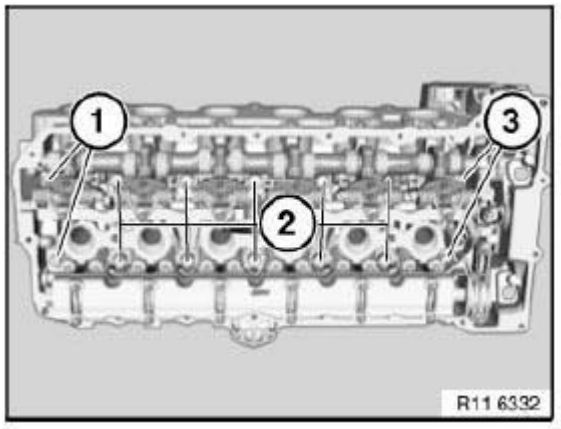


Fig. 39: Cylinder Head Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

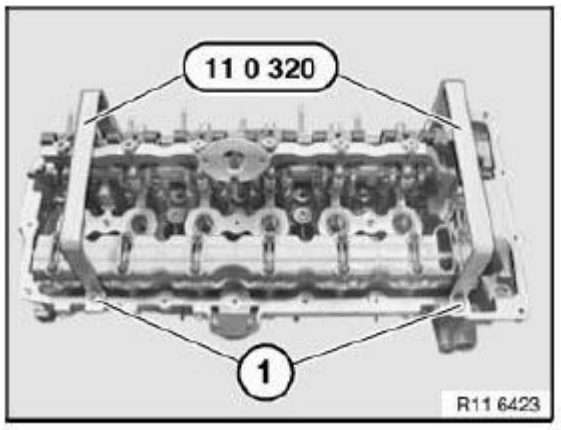


Fig. 40: Special Tool (11 0 320)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 4 430 into bores.

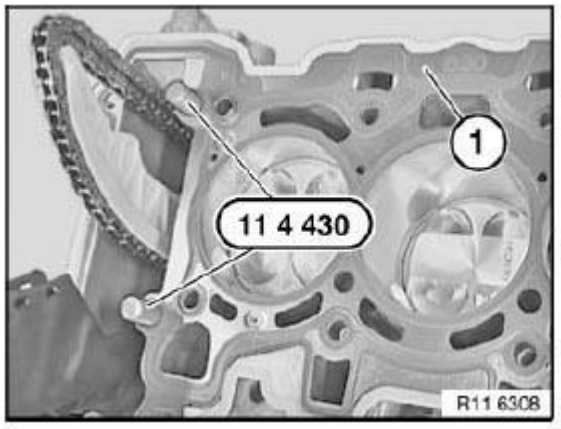


Fig. 41: Special Tool (11 4 430)
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Do not use any metal-cutting tools.

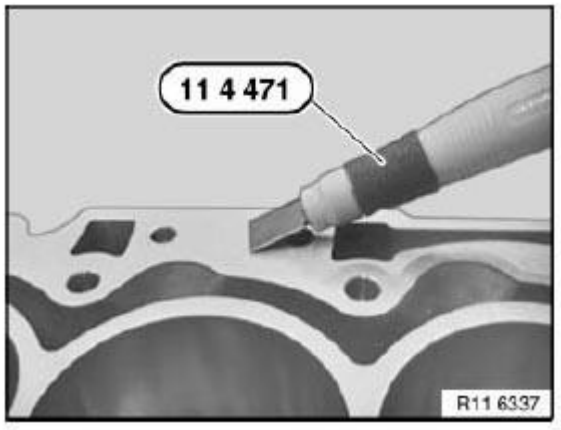


Fig. 42: Special Tool (11 4 471)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Risk of corrosion and cracking!

Clean all pocket holes.

Replace cylinder head gasket.

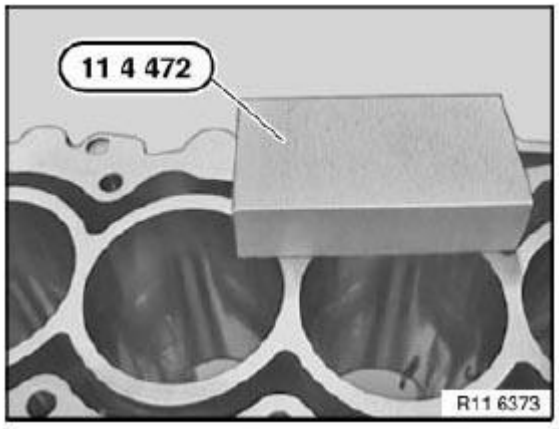


Fig. 43: Special Tool (11 4 472)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Fit new cylinder head screws.

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

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

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

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

NOTE: Picture shows inlet and exhaust camshafts removed.

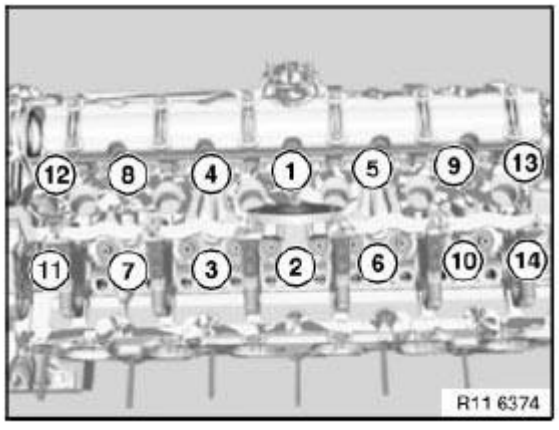


Fig. 44: Cylinder Head Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Observe sequence for tightening cylinder head bolts without fail.

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

Installation:

- Jointing torque:

  All cylinder head bolts 1 to 14 to 30 Nm

- 1st angle of rotation:

  All cylinder head bolts 1 to 14 to 90°

- 2nd angle of rotation:

  Only cylinder head bolts 1 to 10 to 90°

- 3rd angle of rotation:

All cylinder head bolts 1 to 14 to 45°

Insert bolts (1).

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

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

Insert bolt (2).

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

Installation:

Replace aluminum screws.

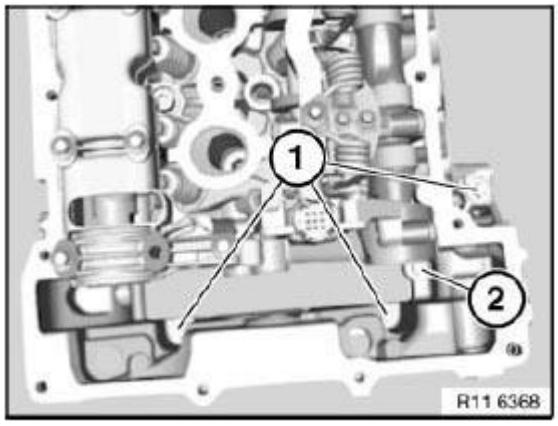


Fig. 45: Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 12 101 REPLACING CYLINDER HEAD GASKET (N52K)

Special tools required:

- 11 4 430
- 11 4 470

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

Necessary preliminary tasks:

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

Insert special tool 11 4 430 into bores.

Remove cylinder head seal.

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

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

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

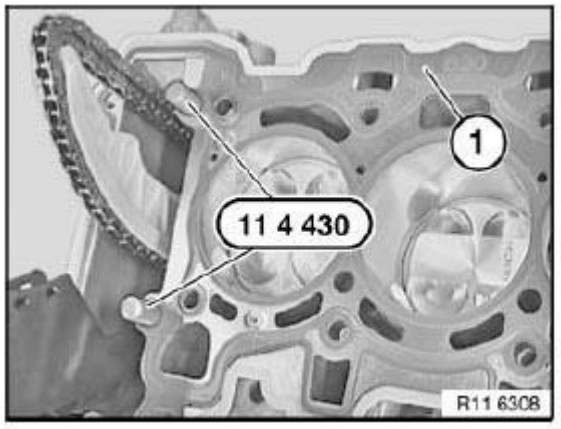


Fig. 46: Special Tool (11 4 430)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

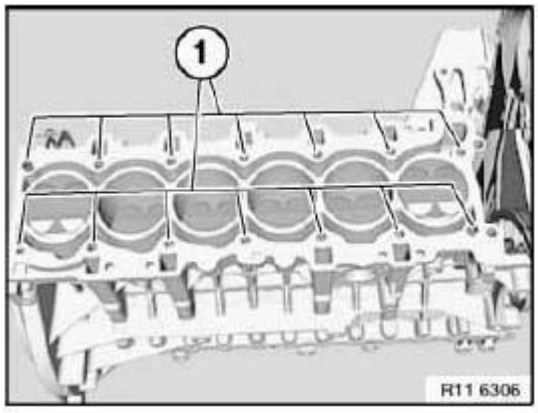


Fig. 47: Pocket Holes
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

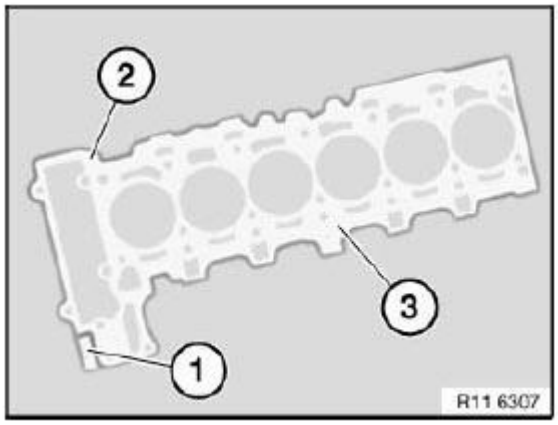


Fig. 48: Rubber Coating And Cylinder Head Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

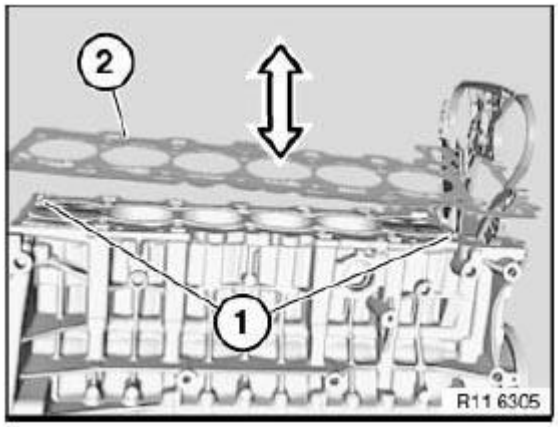


Fig. 49: Cylinder Head Gasket And Adapter Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

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

Assemble engine.

11 12 719 RESURFACING CYLINDER HEAD SEALING FACE (N52K)

Necessary preliminary tasks:

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

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

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

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

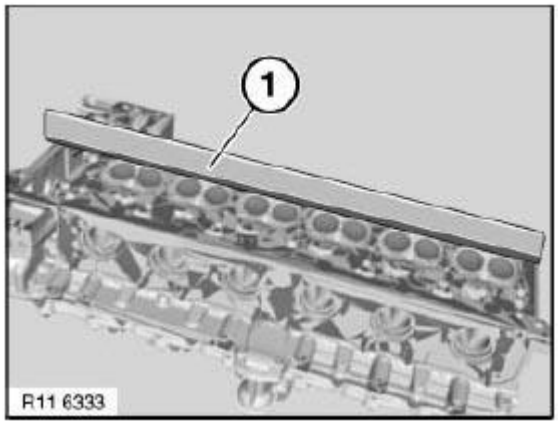


Fig. 50: Standard Straight-Edge On Cylinder Head Sealing Faces
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

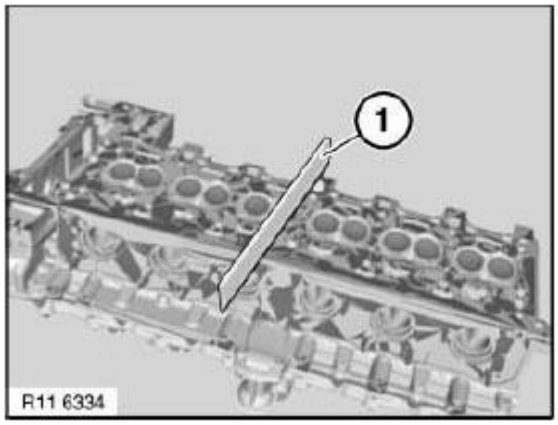


Fig. 51: Standard Straight-Edge On Cylinder Head Sealing Faces
Courtesy of BMW OF NORTH AMERICA, INC.

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

Assemble engine.

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

Special tools required:

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

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

Necessary preliminary tasks:

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

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

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

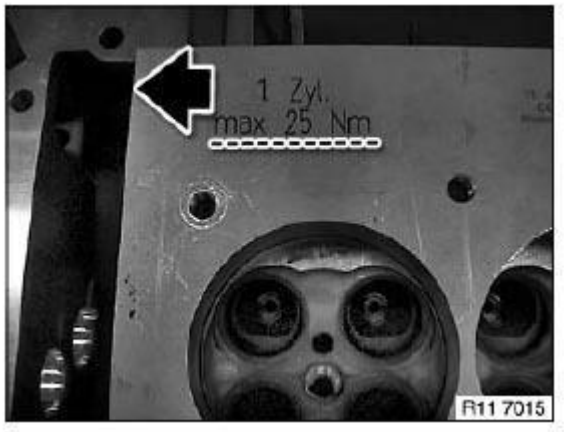


Fig. 52: Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

Cylinder no. 1 is marked.

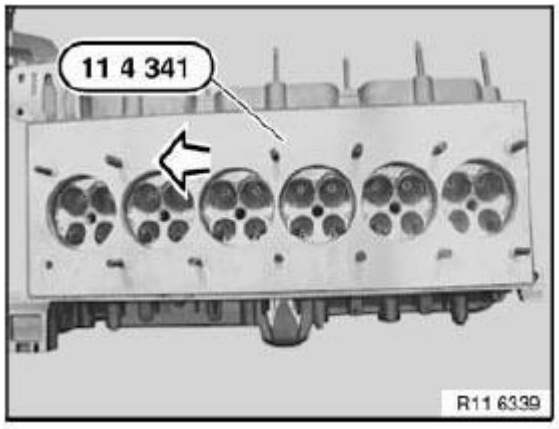


Fig. 53: Special Tool (11 4 341)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Sealing flange must rest flat.

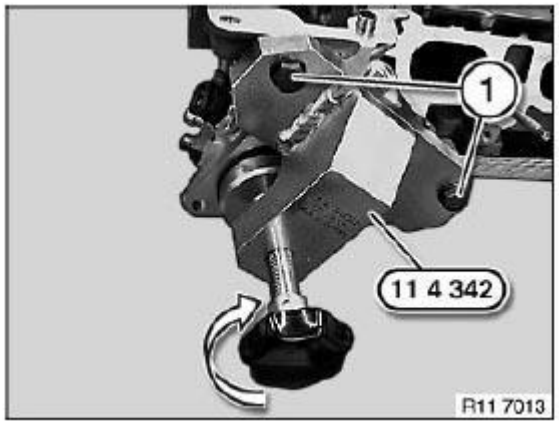


Fig. 54: Special Tool (11 4 342) With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

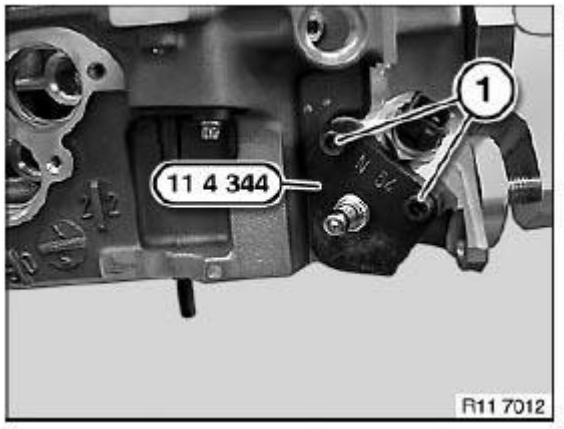


Fig. 55: Special Tool (11 4 344) With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

OIL SUMP

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

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

Necessary preliminary tasks:

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

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

Lay grounding cable (2) to one side.

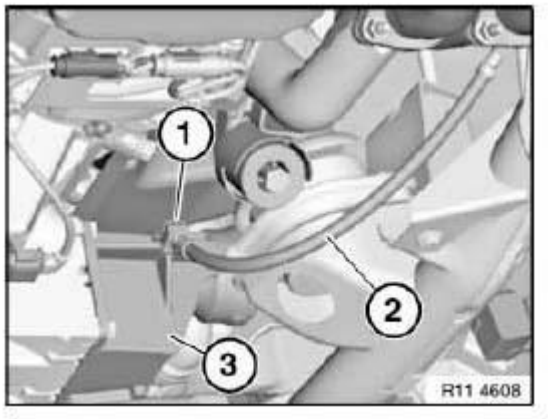


Fig. 56: Grounding Cable, Bearing Block And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

Release bolts (5) on transmission.

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

Disconnect plug connection (4) on oil level sensor.

Lay holder (3) to one side.

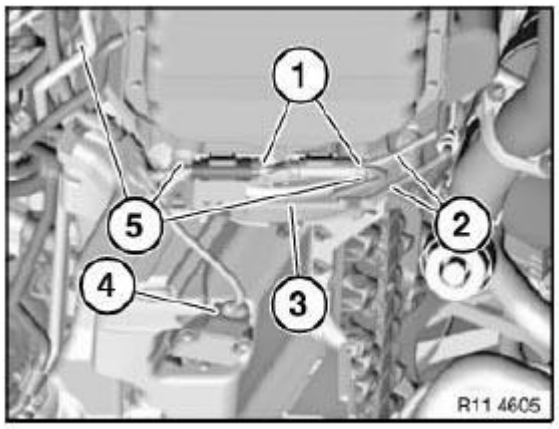


Fig. 57: Plug Connections, Holder, Electric Leads And Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles with optional extra SA205 (automatic transmission):

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

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

Unscrew nuts (1).

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

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

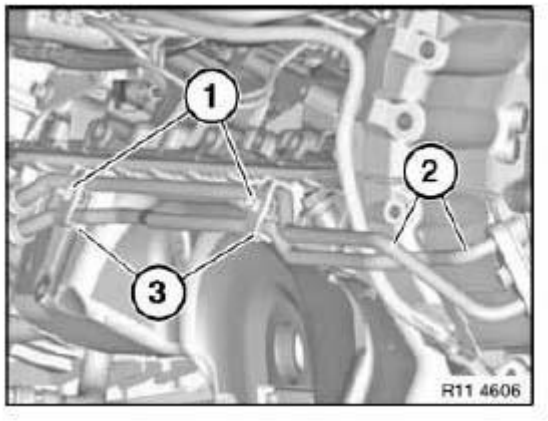


Fig. 58: Fluid Cooler Lines, Holders And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

For all vehicles:

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

Unscrew nut (3).

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

Release screw (2).

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

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

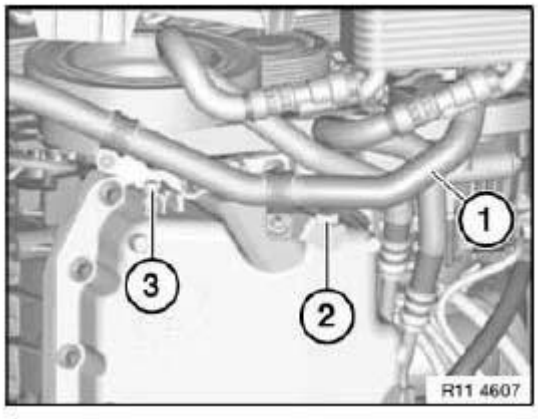


Fig. 59: Coolant Hose, Screw And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

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

Release bolts along line (1).

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

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

Installation:

Replace aluminum screws.

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

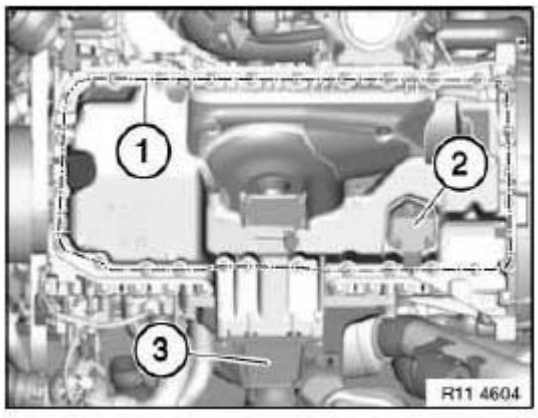


Fig. 60: Oil Level Sensor And Bearing Block
Courtesy of BMW OF NORTH AMERICA, INC.

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

Clean retaining threads.

Installation:

Replace all seals.

Assemble engine.

HOUSING COVER

11 14 005 REPLACING FRONT CRANKSHAFT RADIAL SEAL (N52K)

Special tools required:

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

Necessary preliminary tasks:

- Remove **VIBRATION DAMPER**

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

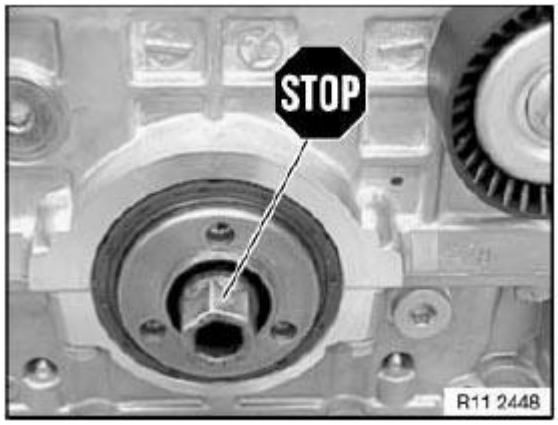


Fig. 61: Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Turn back special tool 11 9 222 .

Push special tool 11 9 221 onto crankshaft.

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

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

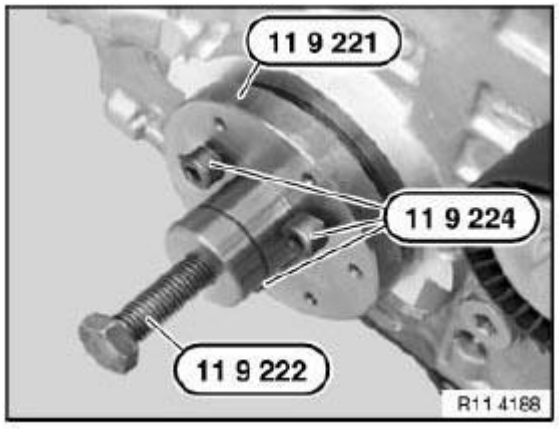


Fig. 62: Special Tools (11 9 221), (11 9 222) And (11 9 224)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

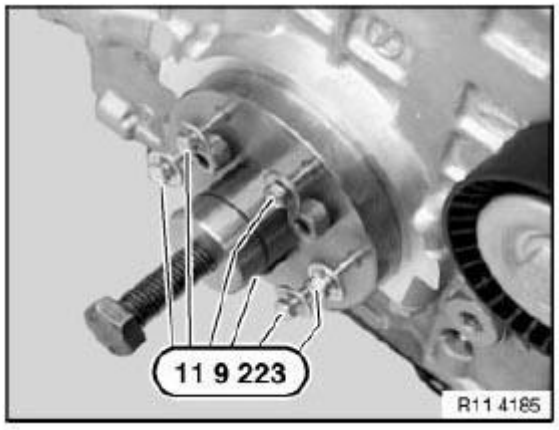


Fig. 63: Special Tool (11 9 223)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screws (special tool 11 9 224).

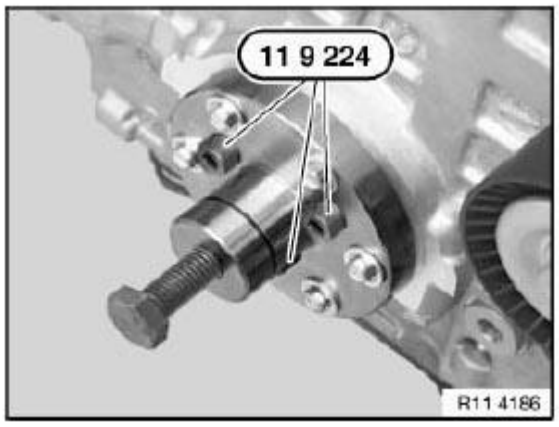


Fig. 64: Special Tool (11 9 224)
Courtesy of BMW OF NORTH AMERICA, INC.

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

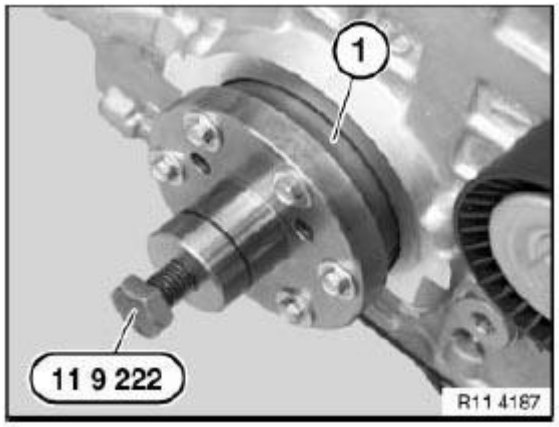


Fig. 65: Special Tool (11 9 222)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

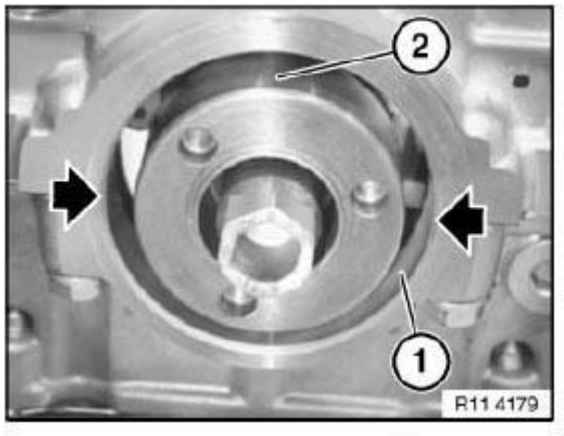


Fig. 66: Sealing And Running Surface
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

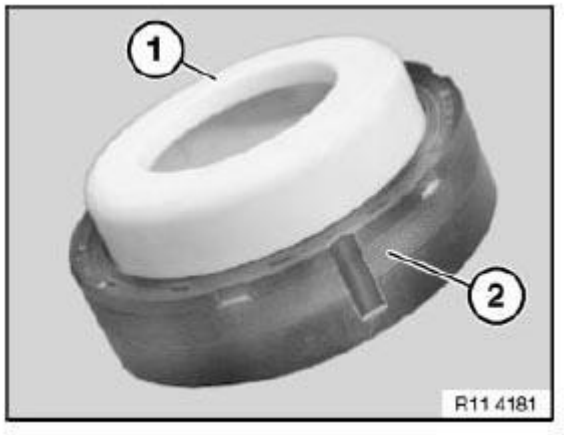


Fig. 67: Crankshaft Radial Seal And Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

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

Push on crankshaft radial seal (1) in direction of arrow.

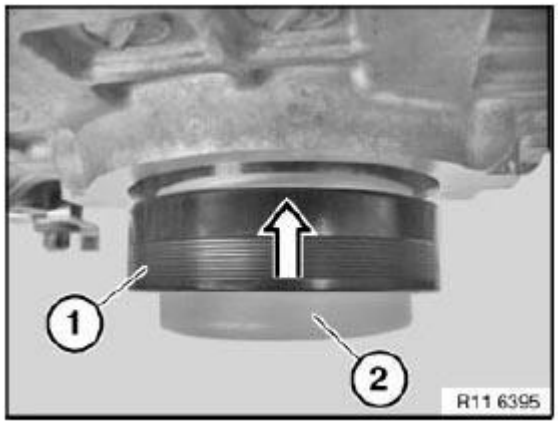


Fig. 68: Pushing Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Pay attention to opening on crankshaft radial seal (1) on left and right.

Remove support bushing (2).

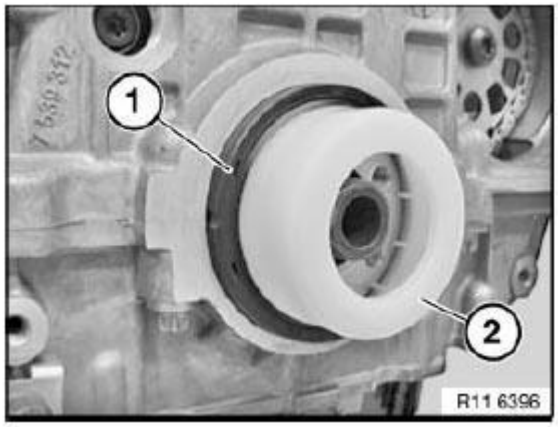


Fig. 69: Crankshaft Radial Seal And Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: The required parts are available from the BMW Parts Service (EPC).

Remove screw caps (1) from injector (2).

Screw on metering needle.

Insert piston for pressing out.

Injector (2) contains the sealing compound Loctite, manufacturer's number 128357.

Bottle (3) contains the primer Loctite, manufacturer's number 171000.

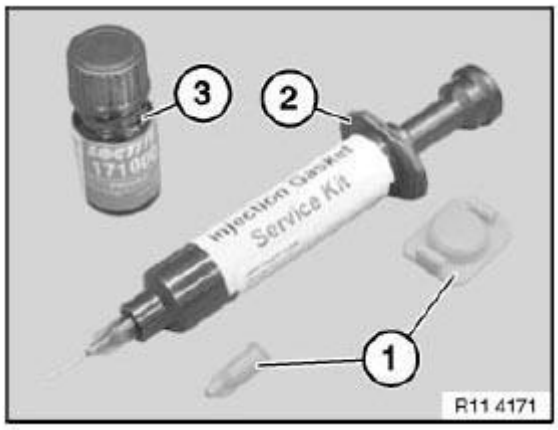


Fig. 70: Screw Caps, Injector And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 9 232 .

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

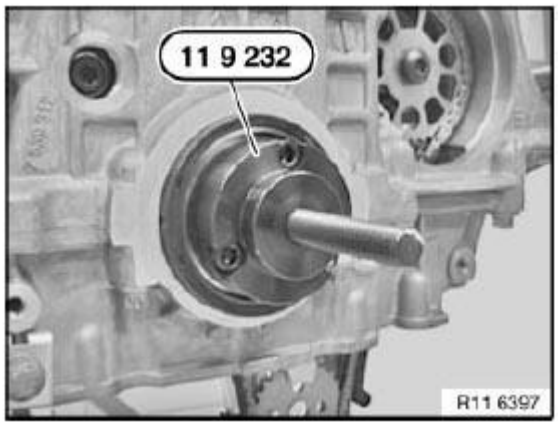


Fig. 71: Special Tool (11 9 232)
Courtesy of BMW OF NORTH AMERICA, INC.

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

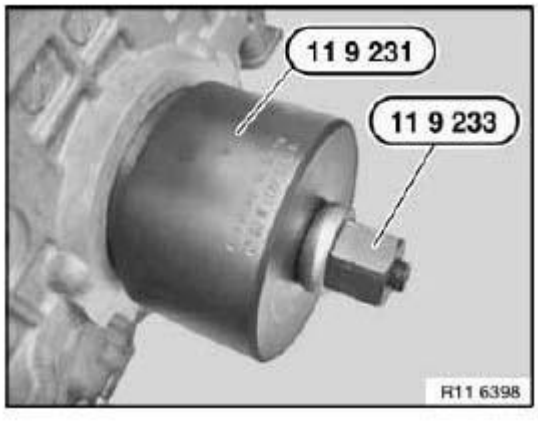


Fig. 72: Crankshaft Radial Seal And Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

Moisten brush with Loctite primer, manufacturer's number 171000. Insert brush as far as possible into grooves (1) on crankshaft radial seal in order to coat housing partition on engine block.

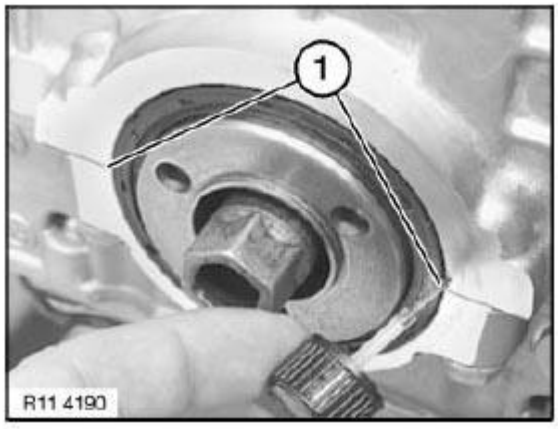


Fig. 73: Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

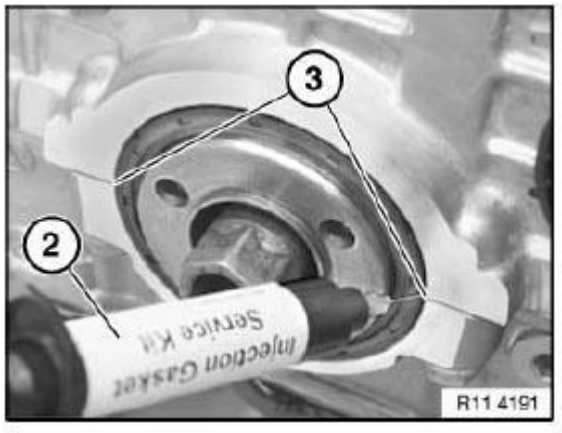


Fig. 74: Injector And Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Loctite primer, manufacturer's number 171000, binds the Loctite sealing compound, manufacturer's number 128357, and prevents leakage.

Coat surface of sealing compound in both grooves (1) with Loctite primer, manufacturer's number 171000.

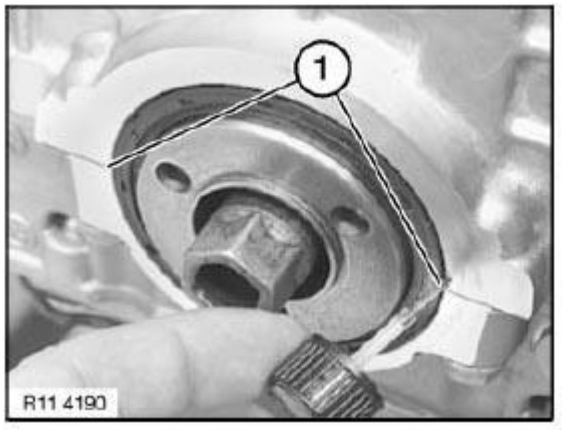


Fig. 75: Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

Special tools required:

- 11 4 361
- 11 4 362
- 11 4 363
- 11 4 364

- 11 9 200

Necessary preliminary tasks:

- Remove fan cowl with electric fan
- Remove alternator drive belt
- Remove drive belt tensioner

NOTE: The procedure is the same as for the crankshaft radial seal. Expose removal openings on sealing cover.

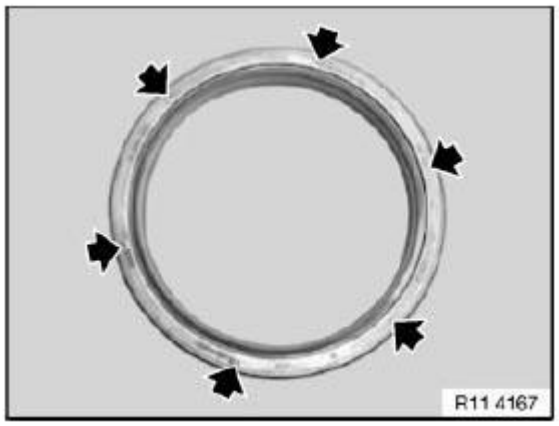


Fig. 76: Locating Openings On Sealing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Convert special tool 11 9 200 (see illustration).

Screw special tool 11 9 200 onto sealing cover.

NOTE: Insert screws until flush only with special tool 11 9 200 .

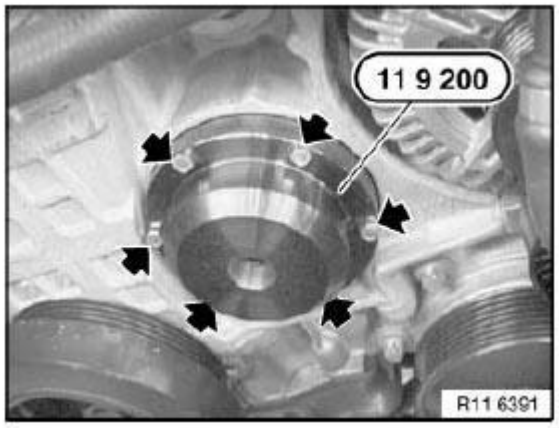


Fig. 77: Special Tool (11 9 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 11 4 362 .

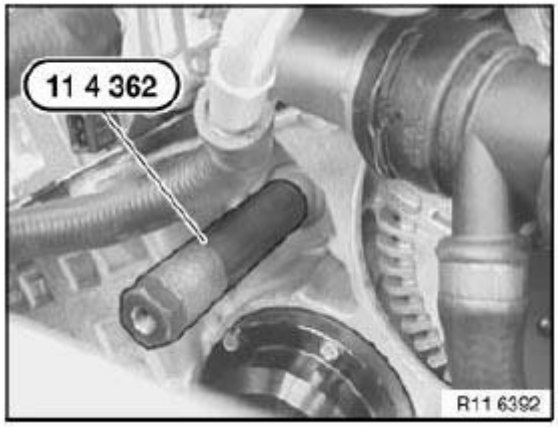


Fig. 78: Special Tool (11 4 362)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 4 361 to bedplate construction screw connection (see arrow).

Secure with knurled screw (1).

Screw special tool 11 4 364 into special tool 11 9 200 and screw out in direction of arrow.

NOTE: For purposes of clarity, the picture shows the alternator and power steering pump removed.

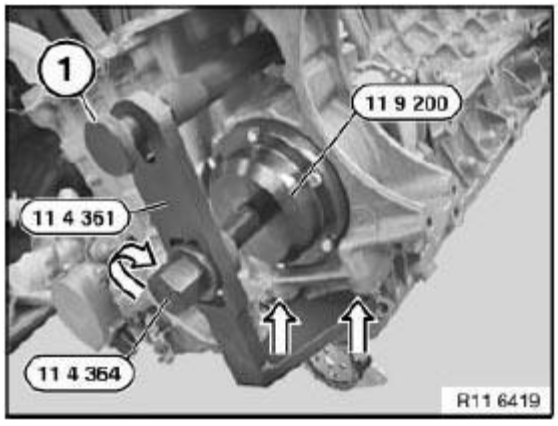


Fig. 79: Special Tools (11 4 361), (11 4 364) And (11 9 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Prepare new sealing cover (1) with special tool 11 9 200 **without** screws.

Screw in sealing cover with special tool 11 4 363 until it is flush.

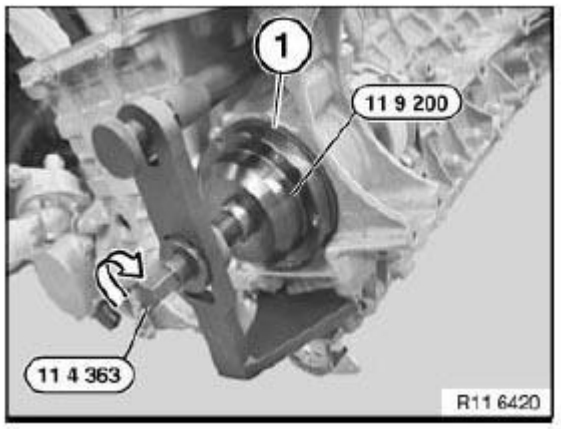


Fig. 80: Special Tools (11 9 200) And (11 4 363)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 151 REPLACING CRANKSHAFT RADIAL SEAL (TRANSMISSION SIDE) (N52K)

Special tools required:

- 11 9 181
- 11 9 182
- 11 9 183
- 11 9 184
- 11 9 200

Necessary preliminary tasks:

- Remove transmission
- Remove flywheel, see **11 22 500 Removing and installing/replacing flywheel (N52K)**

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

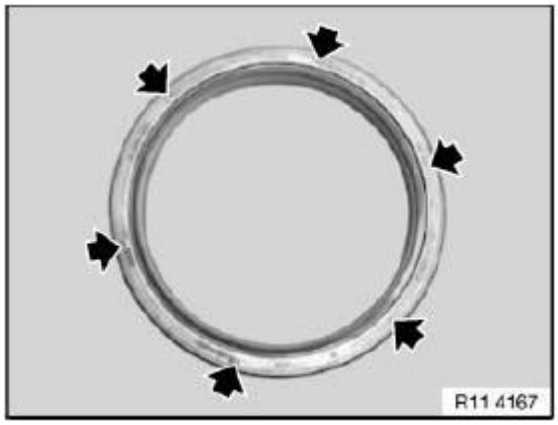


Fig. 81: Locating Openings On Sealing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

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

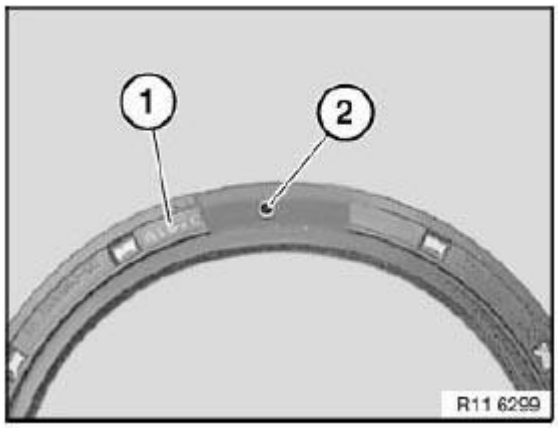


Fig. 82: Rubber Coating And Crankshaft Radial Seal Removal Opening
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

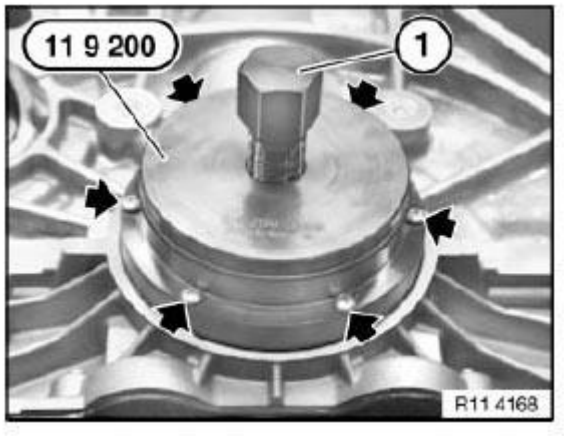


Fig. 83: Special Tool (11 9 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

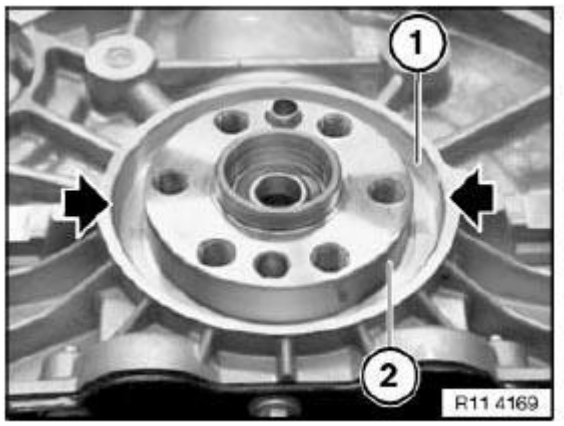


Fig. 84: Sealing And Running Surface Of Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Support bushing (4) is contained in scope of delivery of crankshaft radial seal (1).
When crankshaft radial seal (1) is installed, only support bushing (4) may be used as a slip bushing.
Crankshaft radial seal (1) has a groove (2) on both left and right sides.

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

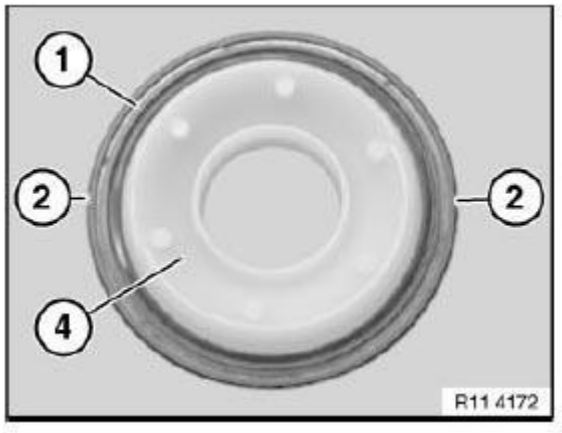


Fig. 85: Bushing, Crankshaft Radial Seal And Grooves
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: The required parts are available from the BMW Parts Service (ETK).
Remove screw caps (1) from injector (2).

Screw on metering needle.

Insert piston for pressing out.

Injector (2) contains the sealing compound Loctite, manufacturer's number 128357.

Bottle (3) contains the primer Loctite, manufacturer's number 171000.

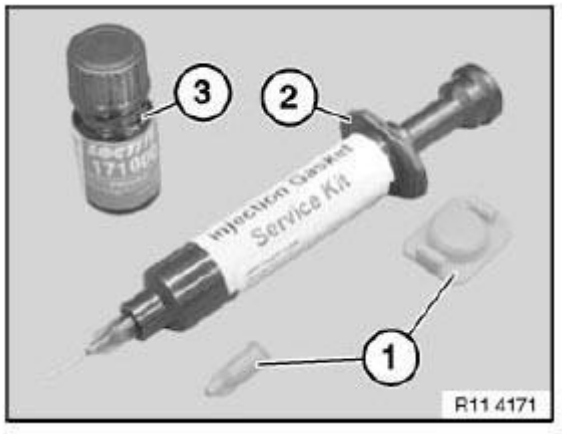


Fig. 86: Screw Caps, Injector And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

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

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

Carefully remove support sleeve (4).

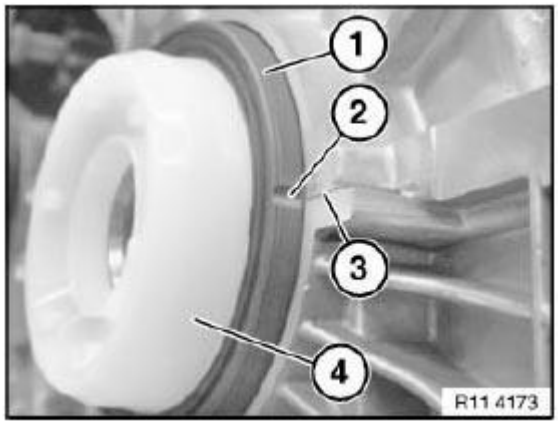


Fig. 87: Support Bushing, Crankshaft Radial Seal With Groove And Housing Partition
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Spacer ring (1) is supplied with radial shaft seal.

Screw special tool 11 9 182 with screws (special tool 11 9 184) to crankshaft.

Fit spacer ring (1) on preassembled radial shaft seal.

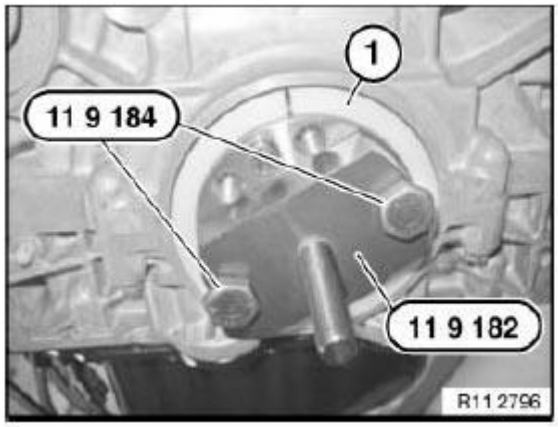


Fig. 88: Special Tools (11 9 184) And (11 9 182)
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in radial shaft seal and spacer ring with special tool 11 9 181 in conjunction with special tool 11 9 183 .

Then remove spacer ring again.

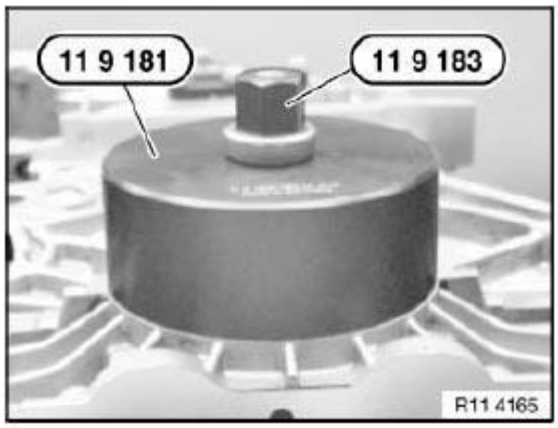


Fig. 89: Special Tools (11 9 181) And (11 9 183)
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

Moisten brush with Loctite primer, manufacturer's number 171000. Insert brush as far as possible into grooves (1) on crankshaft radial seal in order to coat housing partition on engine block.

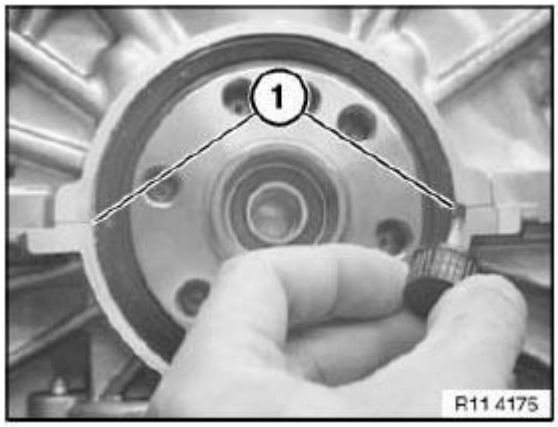


Fig. 90: Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

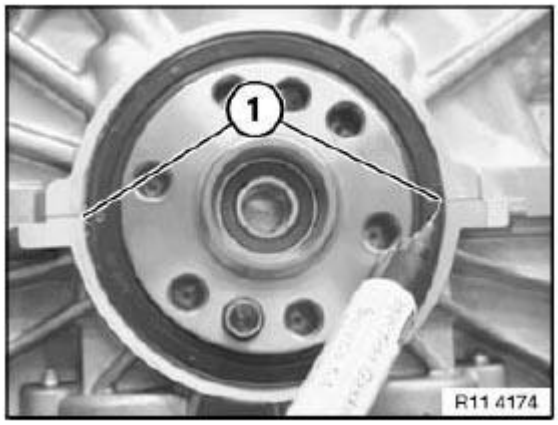


Fig. 91: Grooves With Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Loctite primer, manufacturer's number 171000, binds the Loctite sealing compound, manufacturer's number 128357, and prevents leakage. Coat surface of sealing compound in both grooves (1) with Loctite primer, manufacturer's number 171000.

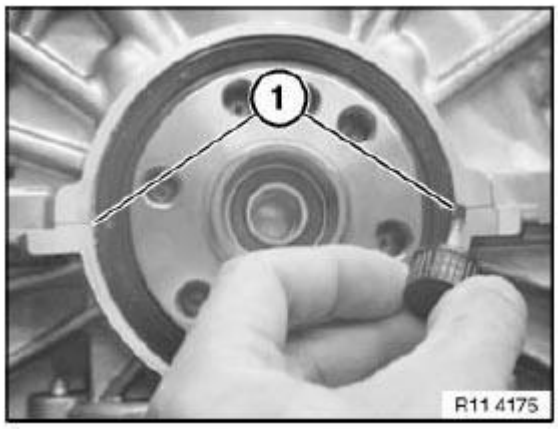


Fig. 92: Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CRANKSHAFT WITH BEARING

11 21 500 REPLACING CRANKSHAFT (N52K)

Special tools required:

- **00 2 510 DIAL GAUGE WITH FEELER**
- **00 9 120 TORQUE ANGLE MEASURING DIAL**

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

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

Necessary preliminary tasks:

- Remove engine
- Mount engine on assembly stand, see **Mounting engine on assembly stand (N52K)**.
- Remove **VIBRATION DAMPER**
- Remove oil sump
- Remove oil pump, see **11 41 000 Removing and installing/replacing oil pump (N52K)**
- Remove oil pump/vacuum pump chain module, see **11 41 010 Removing and installing/replacing chain module for oil pump/vacuum pump (N52K)**
- Remove timing chain module, see **11 31 051 Replacing timing chain (N52K)**
- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove flywheel, see **11 22 500 Removing and installing/replacing flywheel (N52K)**
- Removing all pistons, see **11 25 530 Removing and installing/replacing all pistons (N52K)**

Release screws (1).

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

Installation:

Replace aluminum screws.

Remove oil deflector (2).

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

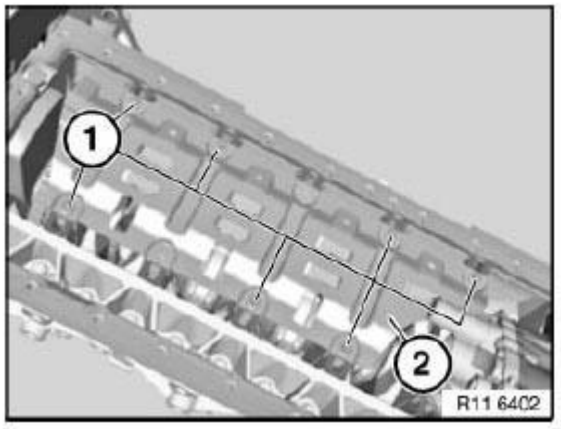


Fig. 93: Oil Deflector And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: 11 11 2AZ, see **11 11 CRANKCASE** .

Release screws (2).

Tightening torque: 11 11 3AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

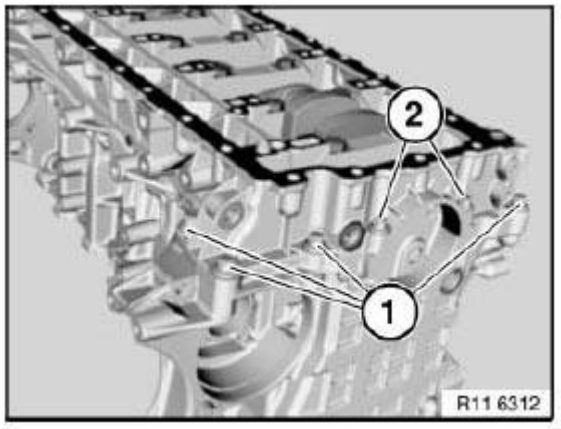


Fig. 94: Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: 11 11 4AZ, see **11 11 CRANKCASE** .

Release screws (2).

Tightening torque: 11 11 2AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

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

Tightening torque: 11 11 1AZ, see **11 11 CRANKCASE** .

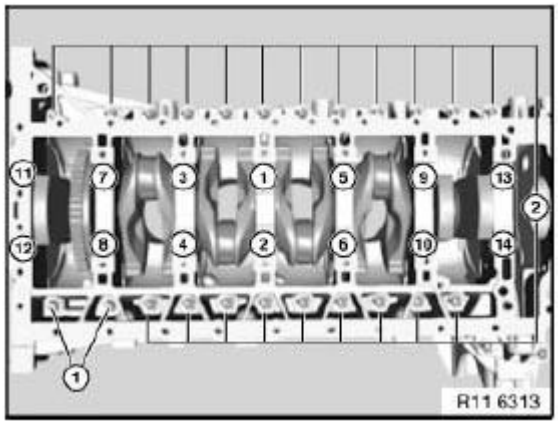


Fig. 95: Crankshaft Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: 11 11 3AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

Lift out bedplate.

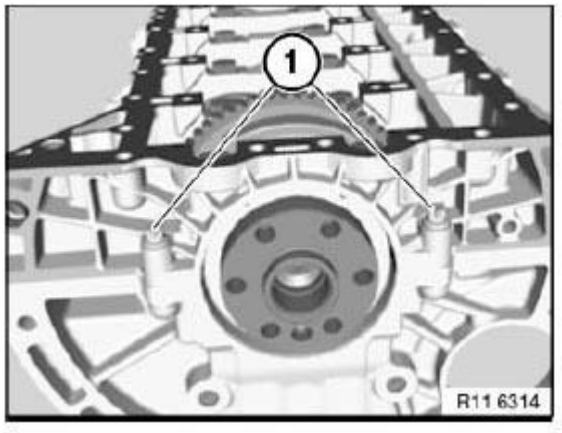


Fig. 96: Bedplate Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove crankshaft (1) in direction of arrow.

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

Remove bearing shells (2) and guide bearing shell (3), replace if necessary, see **11 21 531 Replacing all main crankshaft bearing shells (N52K)**.

Clean all sealing faces with special tool 11 4 470 .

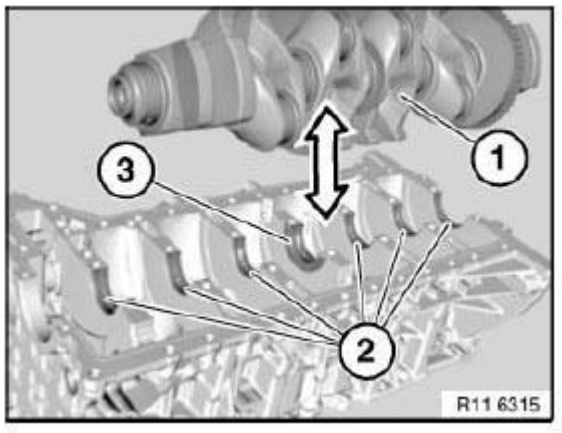


Fig. 97: Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

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

Install all bearing shells, see **11 21 531 Replacing all main crankshaft bearing shells (N52K)**.

Installation:

Lubricate all bearing points with engine oil.

NOTE: Picture shows N46.

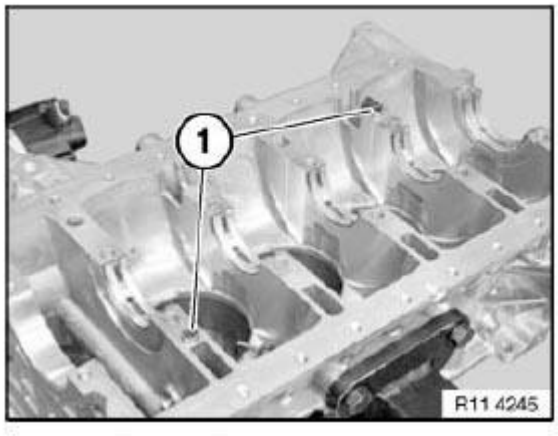


Fig. 98: Adapter Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Insert crankshaft (1).

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

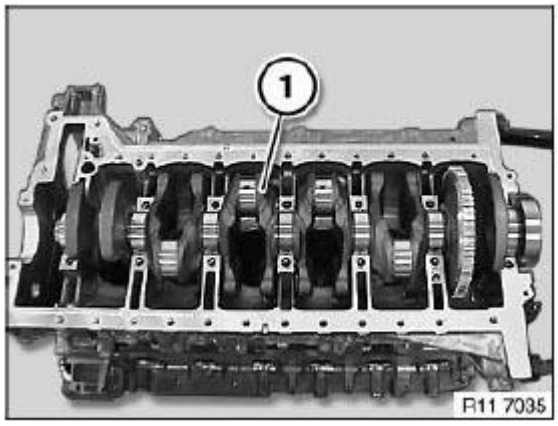


Fig. 99: Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque: 11 11 1AZ, see **11 11 CRANKCASE** .

Tighten screws (2) from inside outwards.

Tightening torque: 11 11 2AZ, see **11 11 CRANKCASE** .

Tighten screws (1).

Tightening torque: 11 11 4AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

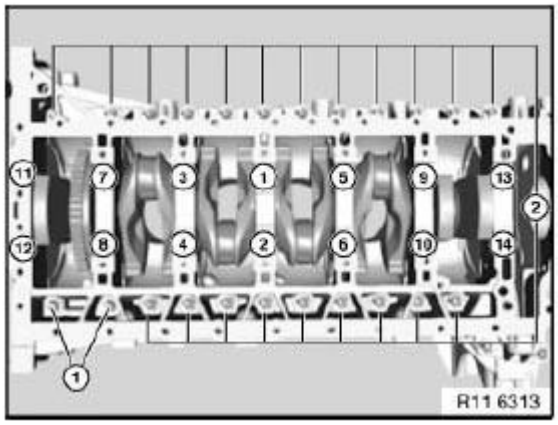


Fig. 100: Crankshaft Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten aluminum screws exclusively with special tool 00 9 120 .

IMPORTANT: In the case of aluminum screws, jointing torque and angle of rotation must be observed without fail.

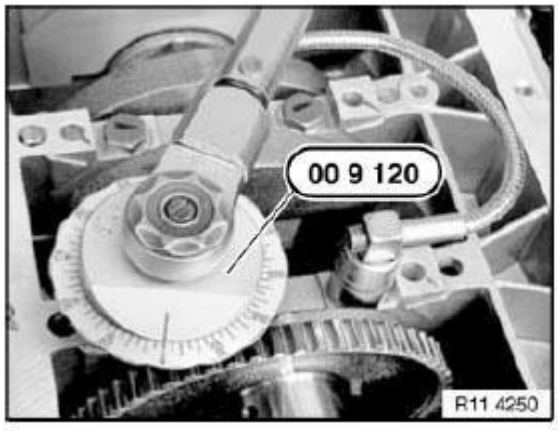


Fig. 101: Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Set up special tool 00 2 510 on stand.

Position special tool 00 2 510 on crankshaft.

Move crankshaft in direction of arrow.

Determine bearing play .

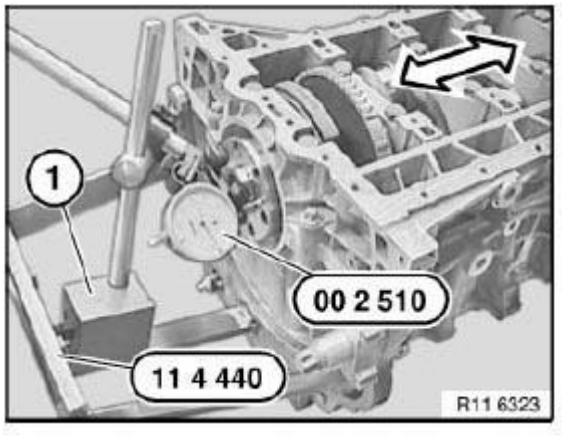


Fig. 102: Moving Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

Always replace nozzles (1).

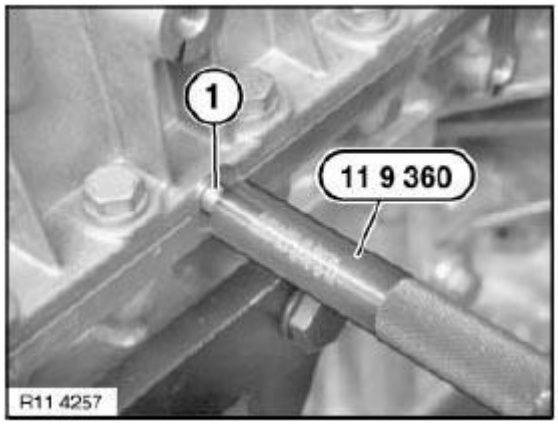


Fig. 103: Nozzles With Special Tool (11 9 360)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

Screw on nozzle (2) for injecting sealing compound.

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

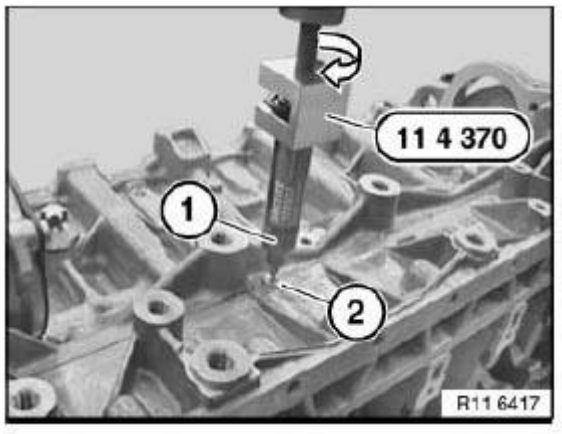


Fig. 104: Inserting Sealing Compound With Special Tool (11 4 370)
Courtesy of BMW OF NORTH AMERICA, INC.

Replace crankshaft radial seal at front, see **11 14 005 Replacing front crankshaft radial seal (N52K)**.

Replace crankshaft radial seal (transmission side), see **11 14 151 Replacing crankshaft radial seal (transmission side) (N52K)**.

Assemble engine.

11 21 505 SEALING THE CRANKCASE'S LOWER PART (N52K)

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

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

For reliable identification:

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

Risk of damage!

Joining torque and angle of rotation must be observed without fail.

IMPORTANT: Changed procedure.
It is not necessary to remove the cylinder head and the crankshaft.

Necessary preliminary tasks

- Remove ENGINE.
- .
- Remove CLUTCH (if fitted). See **21 21 500 REMOVING AND INSTALLING/REPLACING CLUTCH (SAC) (X3)**
- Remove left and right engine support arm
- Remove **OIL SUMP**.

Release screws (1).

Pull out oil pump intake pipe (2).

Tightening torque: 11 13

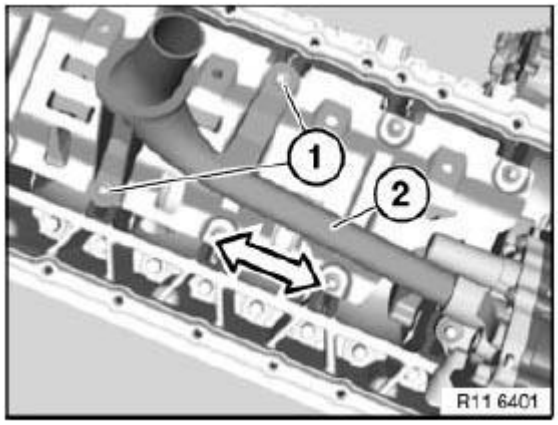


Fig. 105: Removing Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

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

Installation:

Replace aluminum screws

Remove oil deflector (2).

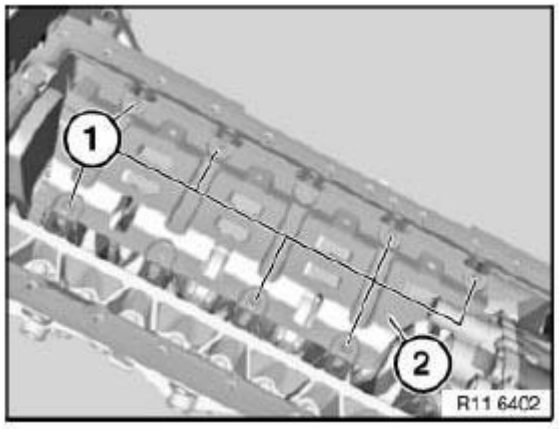


Fig. 106: Identifying Screws And Oil Deflector
Courtesy of BMW OF NORTH AMERICA, INC.

Secure oil pump sprocket with steel pin 6.0 mm (3) to oil pump.

IMPORTANT: Release central bolt (2) only together with steel pin 6.0 mm (3). Do not remove sprocket.

Release central bolt (2).

Tightening torque, see 11 41 6AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

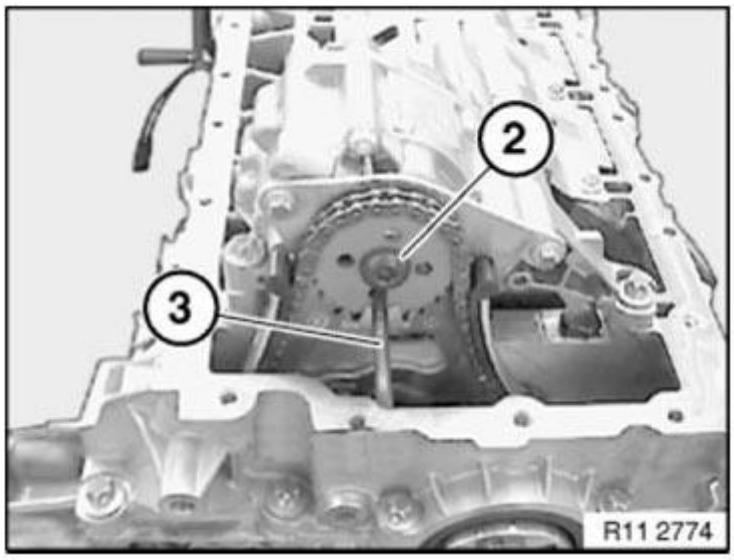


Fig. 107: Identifying Oil Deflector And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

Tightening torque: see 11 41 5AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws

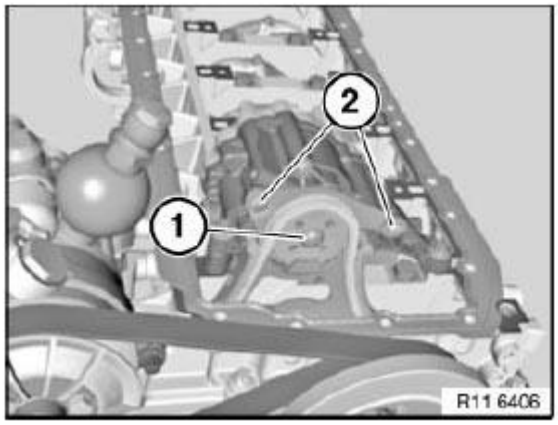


Fig. 108: Identifying Bolt And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw plug (1) from crankcase at front.

NOTE: Replace gasket.

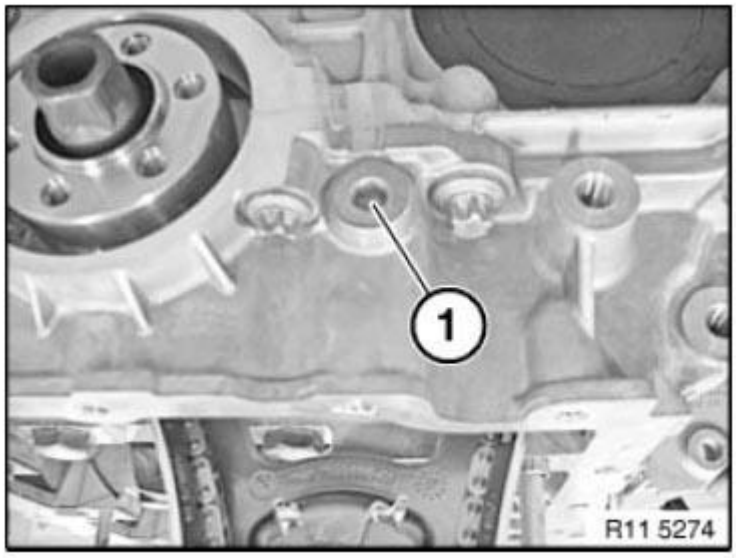


Fig. 109: Identifying Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) for oil pump triangular drive with special tool **11 8 640** .

NOTE: It is not necessary to remove the triangular drive.

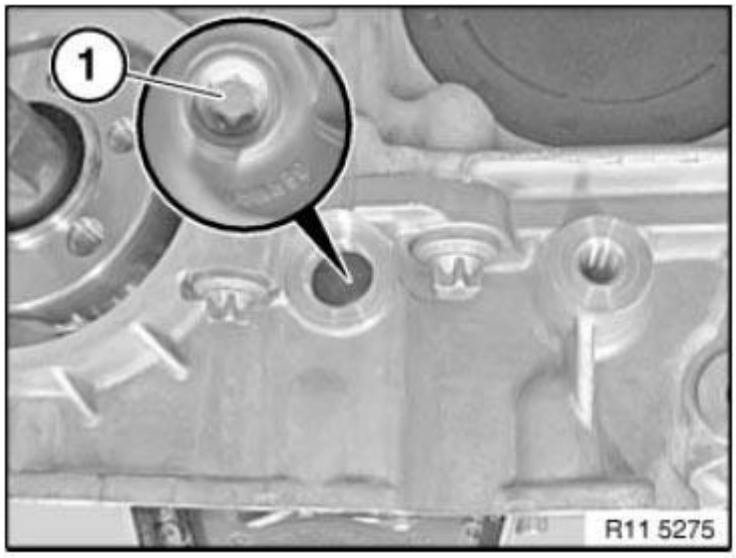


Fig. 110: Identifying Oil Pump Triangular Drive Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Version 1

IMPORTANT: Observe different screw lengths.

Release screws (1).

Tightening torque, see 11 41 2AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Tightening torque, see 11 41 3AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws

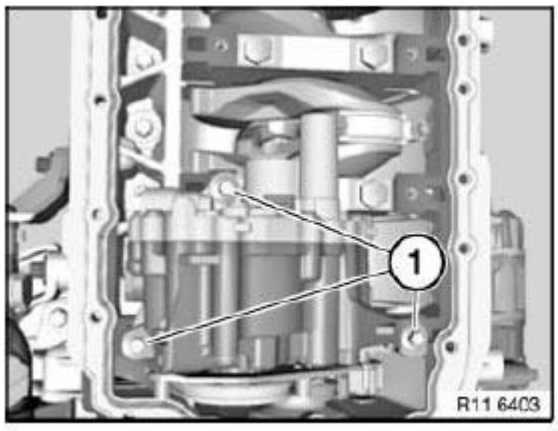


Fig. 111: Identifying Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

IMPORTANT: Observe different screw lengths.
Release oil pump screws (1).
Tightening torque, see 11 41 2AZ in 11 41 OIL PUMP WITH STRAINER AND DRIVE .
Installation:

Replace aluminum screws

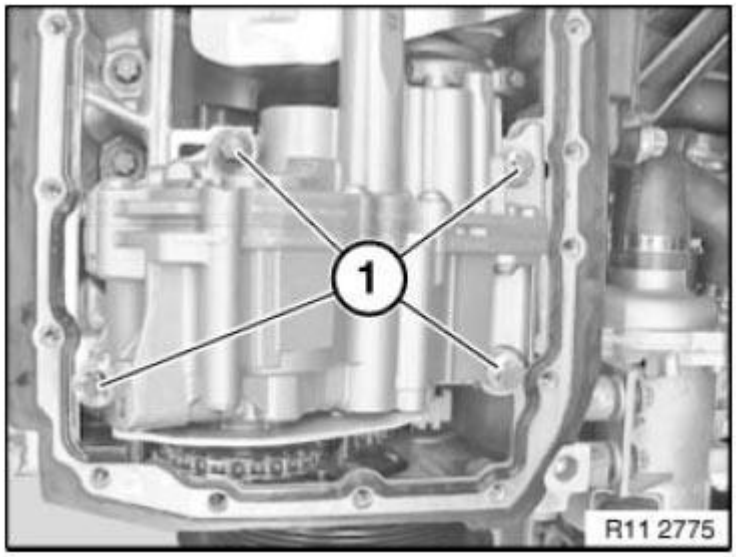


Fig. 112: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach sprocket (1) in direction of arrow.

NOTE: The chain tensioner pushes the timing chain (3) of the triangular drive upward.

Do **not** remove camshaft sprocket.

Remove oil pump (2) in direction of arrow.

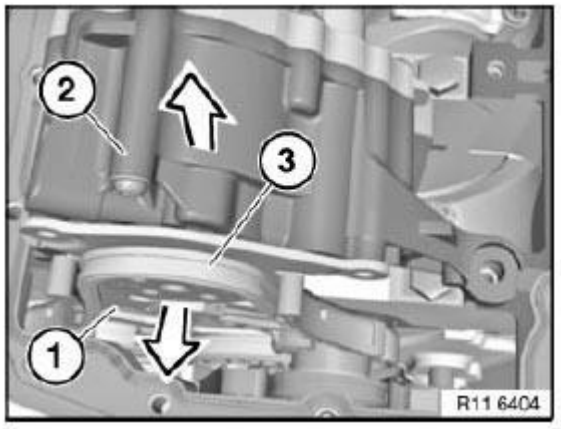


Fig. 113: Pulling Drive Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check spacer bushings (1) for secure seating and damage; replace if necessary.

Align twin surface (3) on oil pump (2) to sprocket wheel.

Install oil pump (2).

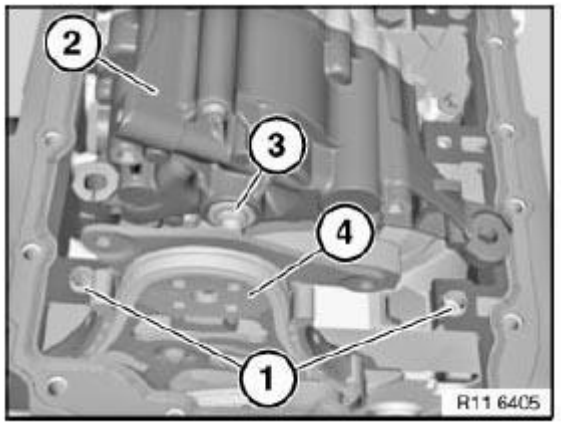


Fig. 114: Identifying Spacer Bushings And Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The special tool bore for the TDC position is located on the inlet side underneath the starter motor.

Rotate engine at central bolt and secure flywheel in position with special tool 11 0 300.

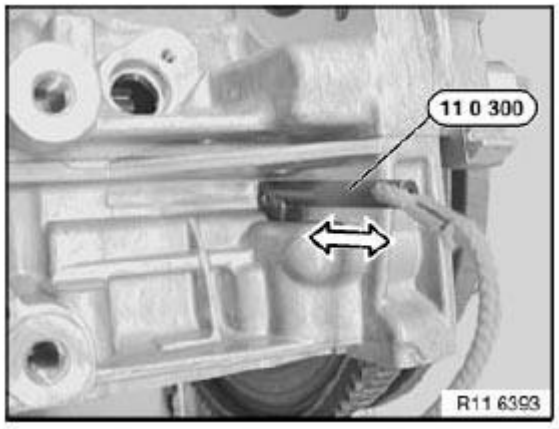


Fig. 115: Securing Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Secure flywheel with special tool (1)

11 9 260 and special tool (2) 11 9 266.

Tightening torque

NOTE: Make sure that the special tool (1) completely engages in the flywheel teeth (see arrow)

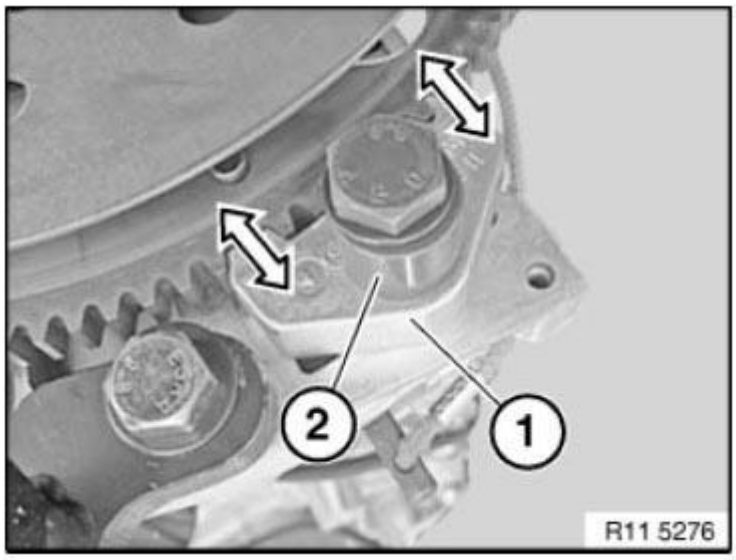


Fig. 116: Securing Flywheel Using Special Tool 11 9 260/11 9 266
Courtesy of BMW OF NORTH AMERICA, INC.

Automatic transmission

Release flywheel bolts (1).

Release special tool (2).

Remove flywheel (3).

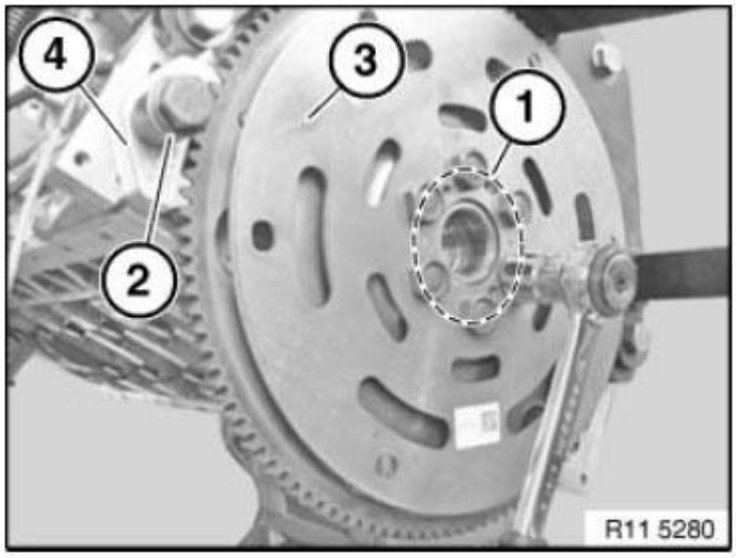


Fig. 117: Identifying Flywheel With Bolts And Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Manual gearbox

IMPORTANT: Position crankshaft at TDC.

Remove dual-mass flywheel.

Secure flywheel with special tool 11 9 260.

Remove VIBRATION DAMPER .

Release flywheel bolts with special tool 11 4 180.

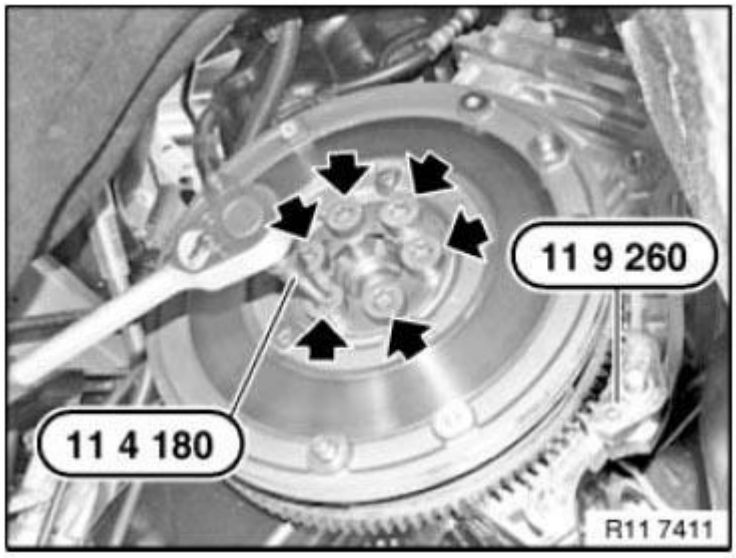


Fig. 118: Removing Flywheel Bolts Using Special Tool 11 4 180
Courtesy of BMW OF NORTH AMERICA, INC.

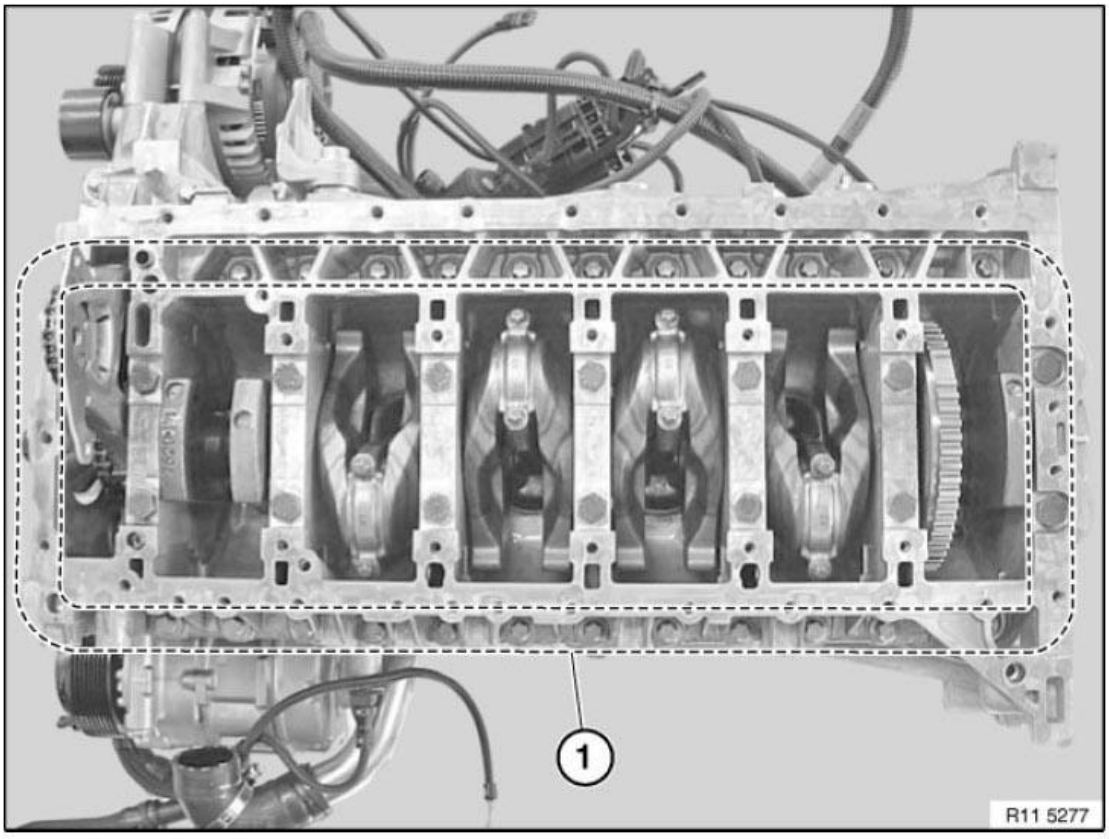


Fig. 119: Identifying Crankshaft Bolt Mounting Area
Courtesy of BMW OF NORTH AMERICA, INC.

Release all crankcase bolts (1) along line (2).

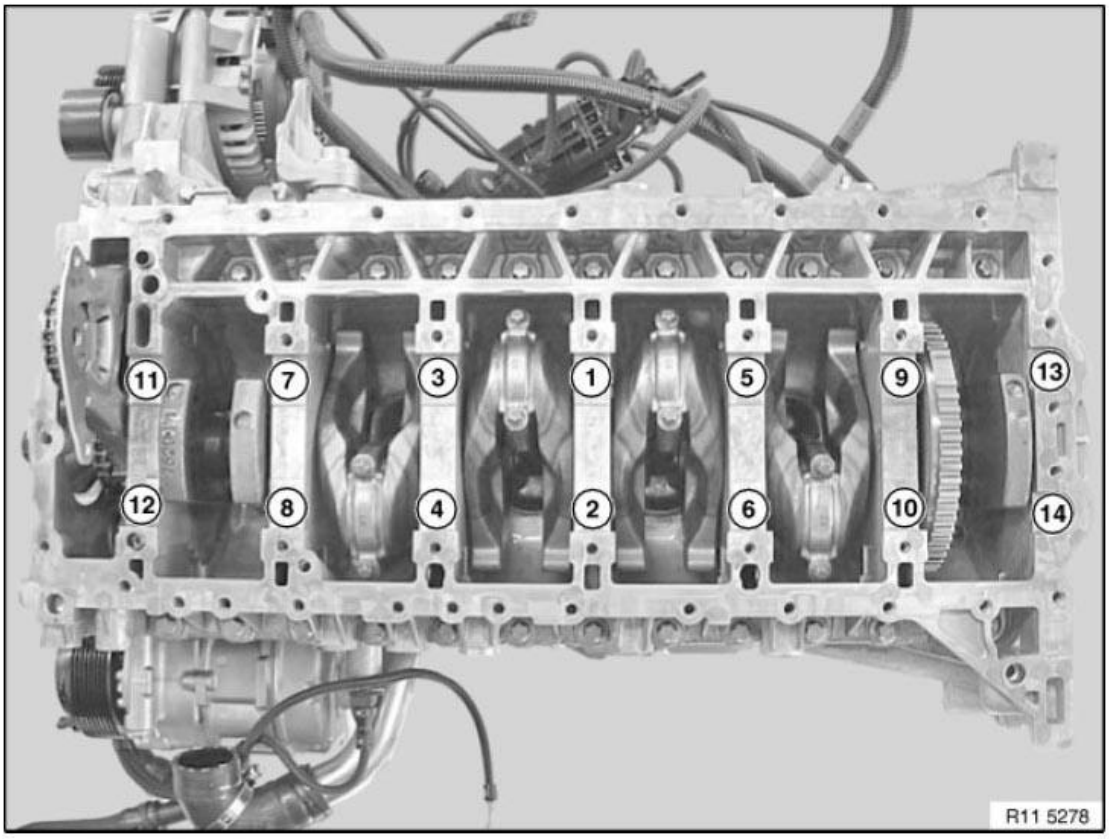


Fig. 120: Identifying Crankshaft Bolt Releasing Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Release crankcase bolts M10 in sequence 14 to 1.

Release crankcase lower section (1) from crankcase upper section (2) with suitable tool (3)

Remove crankcase lower section (1) upwards.

IMPORTANT: Do not rotate crankshaft without crankcase lower section (1) (risk of damage).

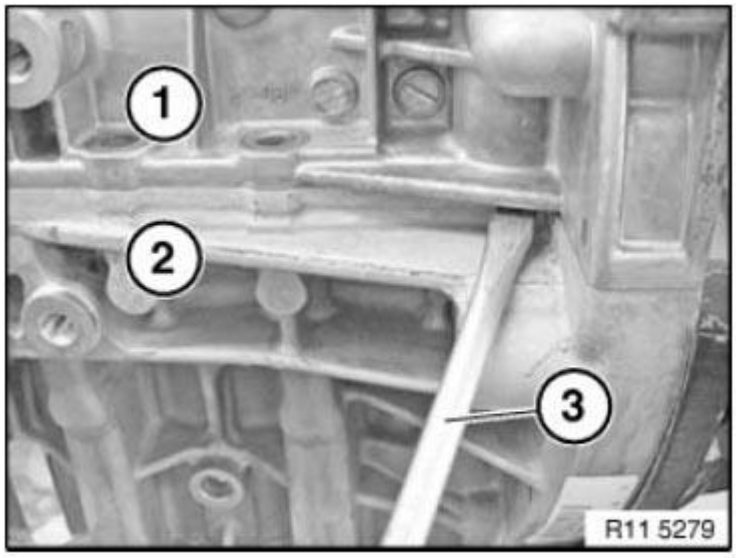


Fig. 121: Removing Crankshaft (Lower Section And Upper Section) Using Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Timing chain is pre-tensioned.
Do not raise crankshaft.

Carefully remove radial shaft seal (1).

Catch escaping engine oil with a cloth (2).

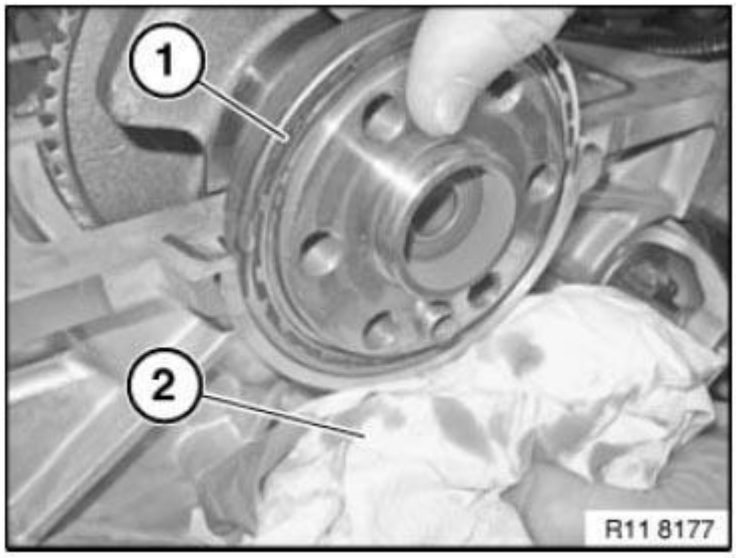


Fig. 122: Removing Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully remove radial shaft seal (1) towards front.

Catch escaping engine oil with a cloth (2).

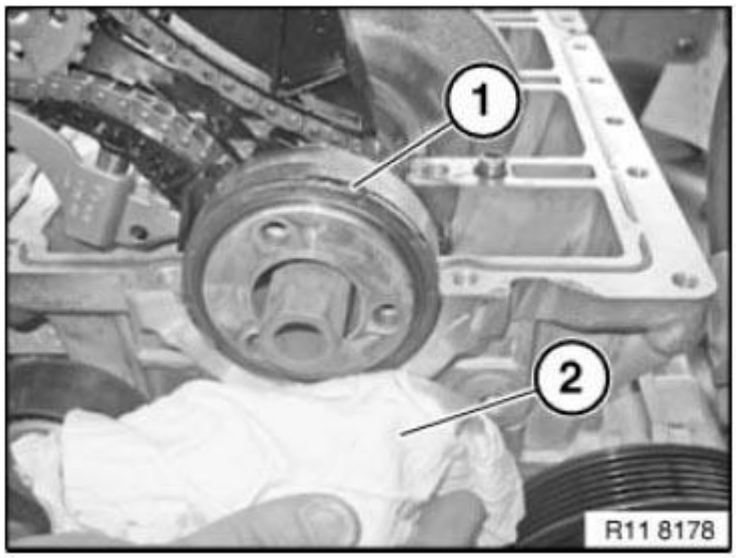


Fig. 123: Catching Escaping Engine Oil Using Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Protect crankcase against sealant residues with a cloth (1).

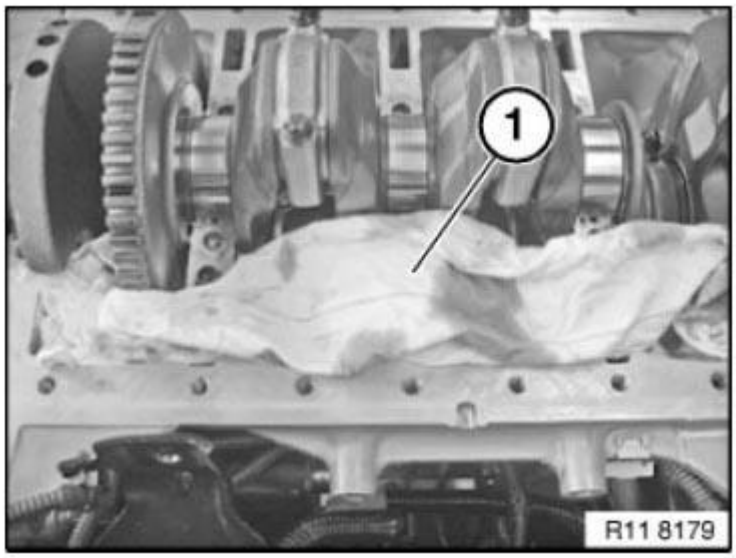


Fig. 124: Protecting Crankcase Against Sealant Residues Using Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sealant residues (1) with special tool 11 4 470.

Remove injector nozzles (2) for liquid sealing compound on left and right.

Installation:

Replace injector nozzles (2).

Clean all threads with compressed air.

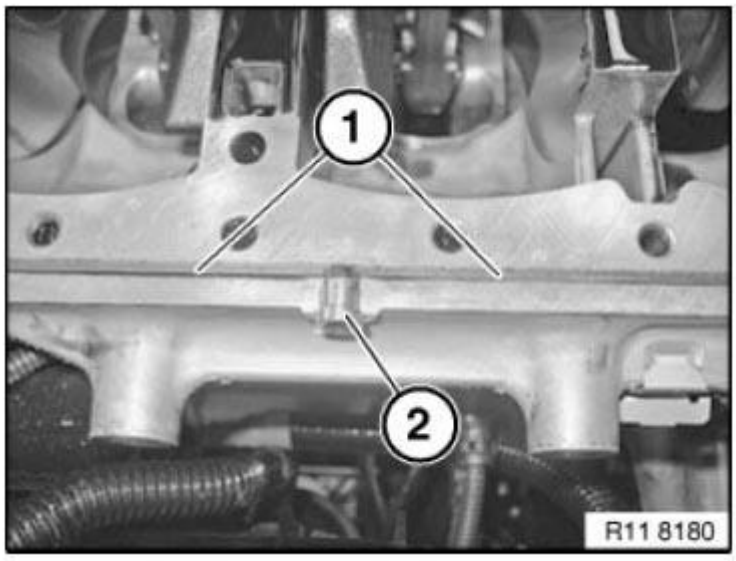


Fig. 125: Identifying Injector Nozzle And Sealant Residue
Courtesy of BMW OF NORTH AMERICA, INC.

Position crankcase lower section (1) on crankcase upper section.

Screw in all M10 crankcase bolts.

Joint all M10 crankcase bolts (1) to 20 Nm from inside outwards.

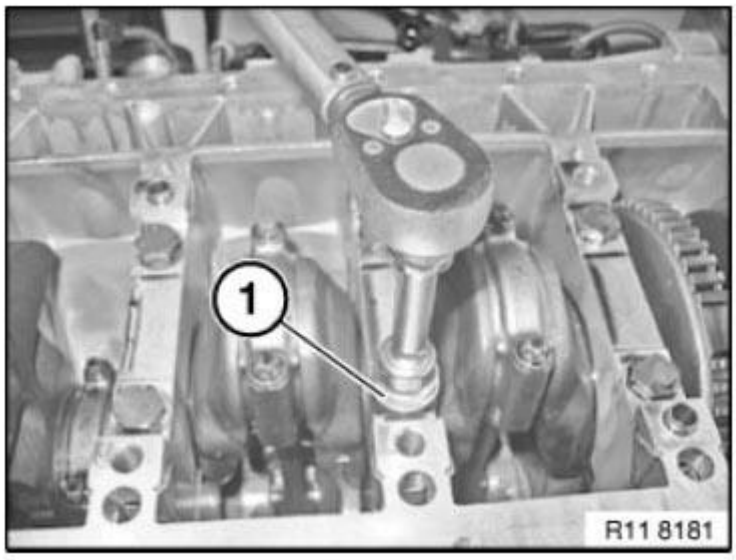


Fig. 126: Screwing In All M10 Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Identify all M10 crankcase bolts with a colored marking (1) for checking.

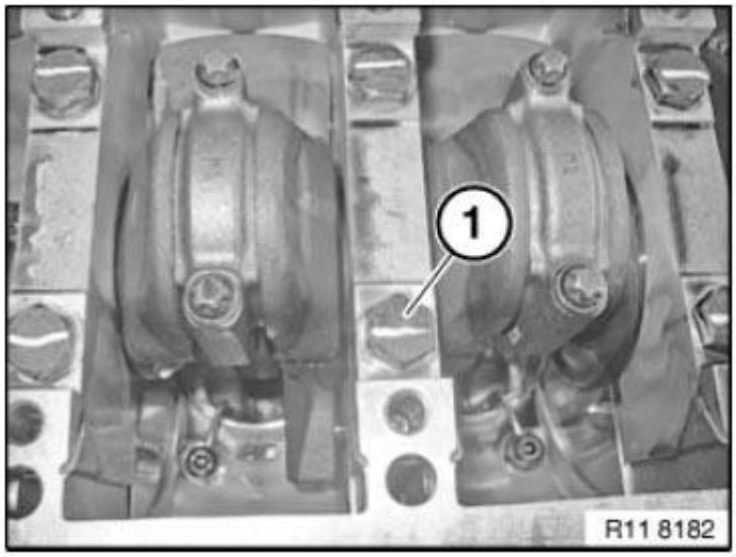


Fig. 127: Identify M10 Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

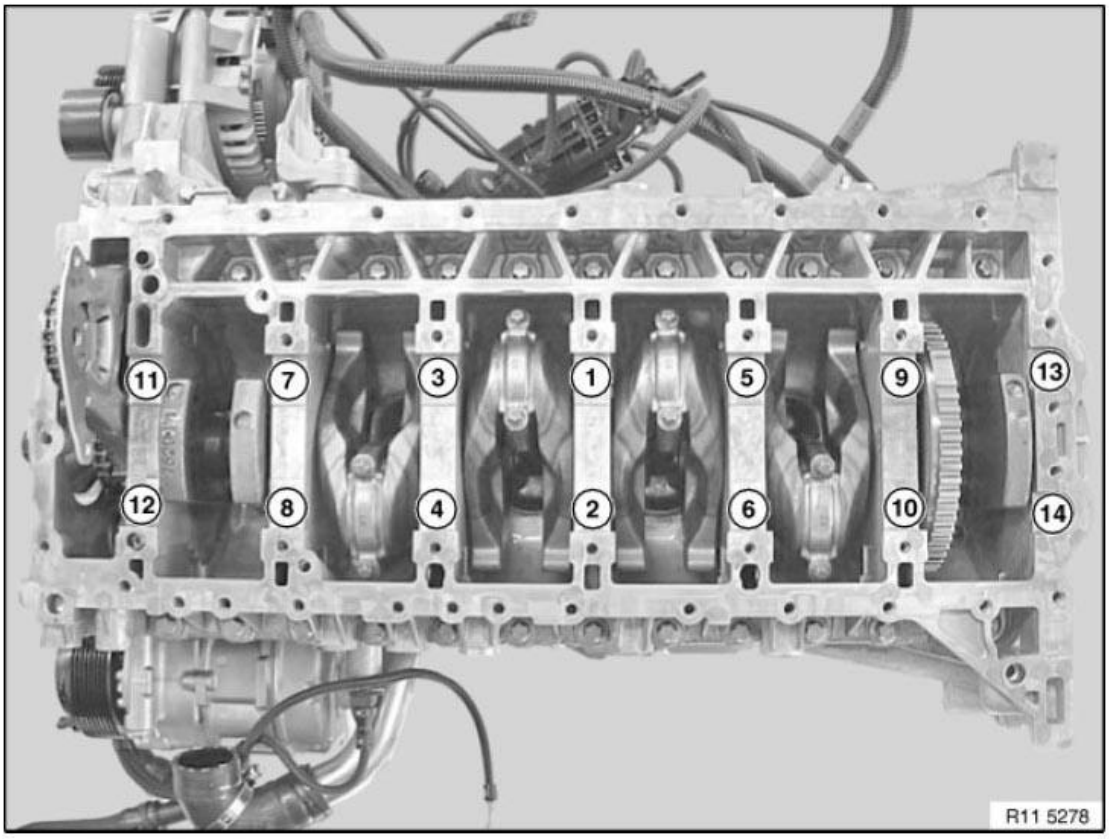


Fig. 128: Identifying Crankcase Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankcase bolts M10 in sequence 1 to 14 with special tool 00 9 120.

Tightening torque 11 11 1AZ, see **11 11 CRANKCASE**

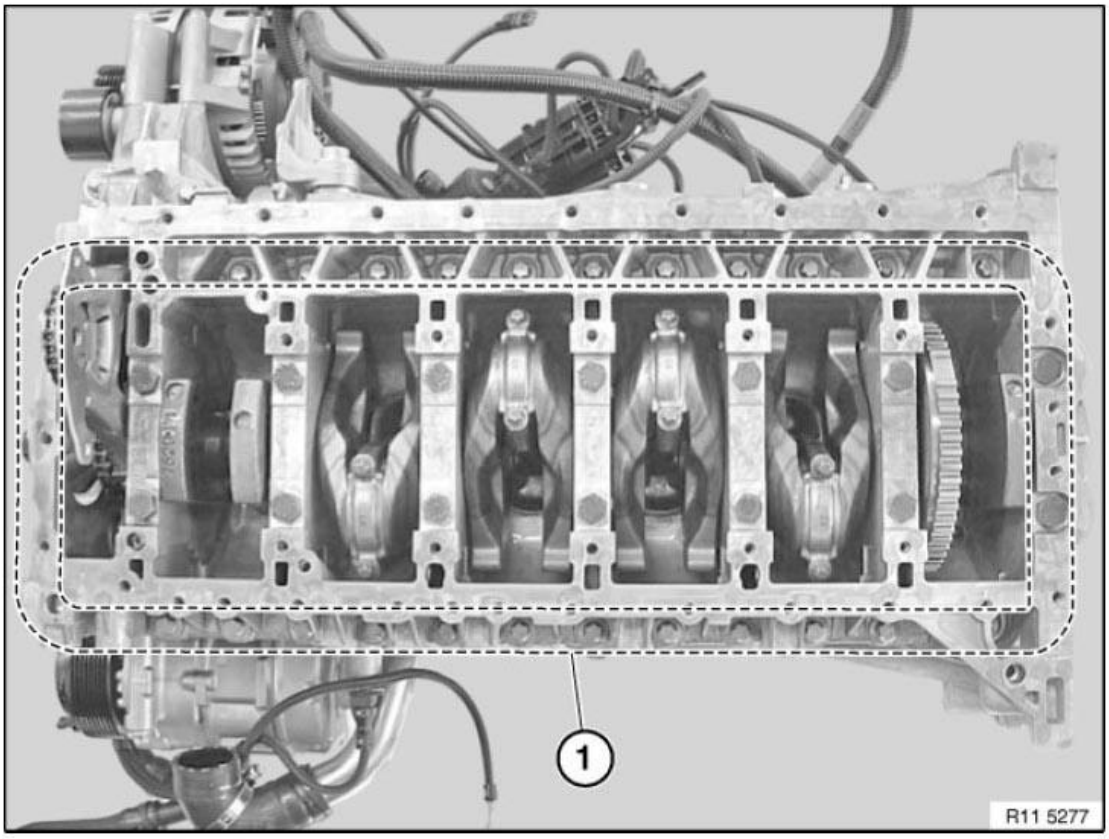


Fig. 129: Identifying Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Insert all crankcase bolts (1).

IMPORTANT: Observe different lengths and sizes of the bolts.

Tightening torque 11 11 2, 3 and 4AZ, see **11 11 CRANKCASE**

Tighten screw (1) for oil pump triangular drive with special tool **11 8 640** .

NOTE: Replace screw.

Tightening torque, see 11 41 4 AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

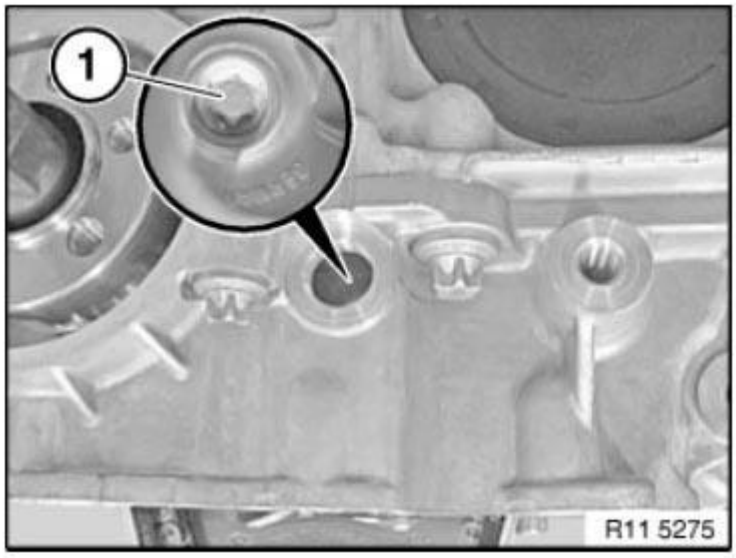


Fig. 130: Identifying Oil Pump Triangular Drive Mounting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten screw plug on front of crankcase.

Tightening torque, see 11 11 8 AZ in **11 11 CRANKCASE** .

Installation:

Replace sealing ring.

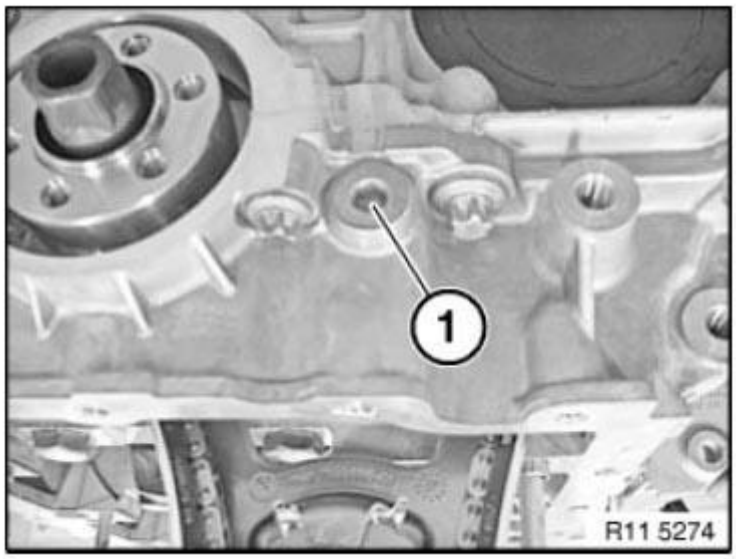


Fig. 131: Identifying Screw Plug On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

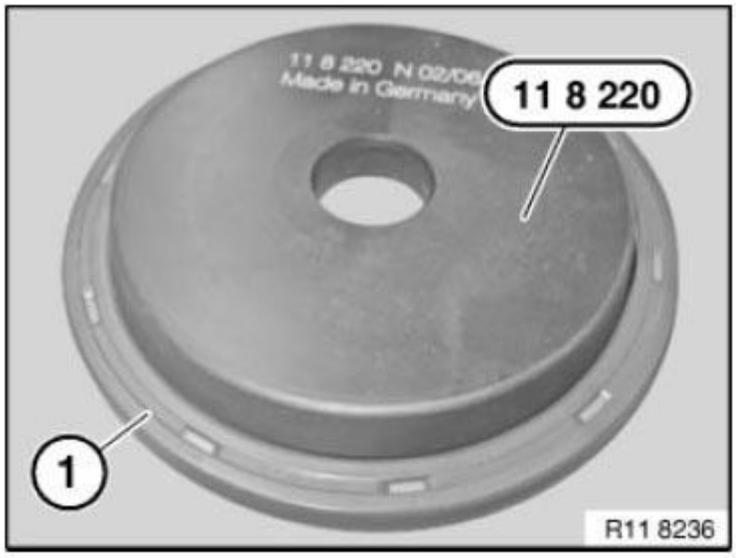


Fig. 132: Identifying Radial Shaft Seal On Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

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

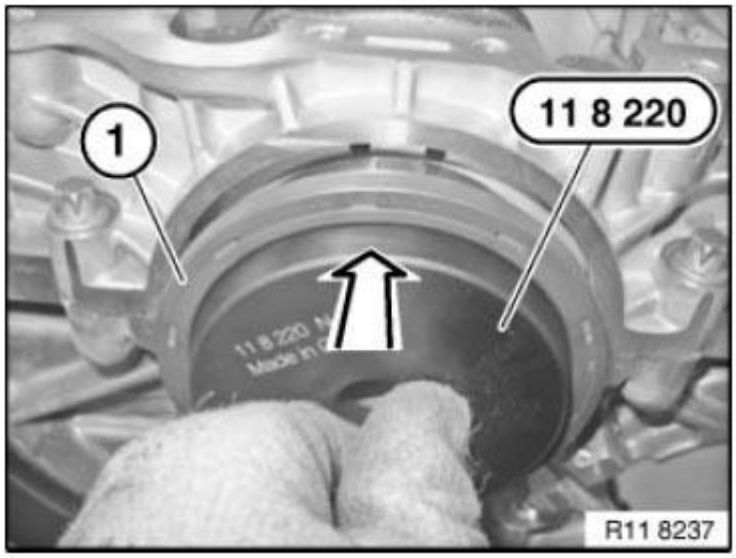


Fig. 133: Positioning Radial Shaft Seal Using Special Tool 11 8 220 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

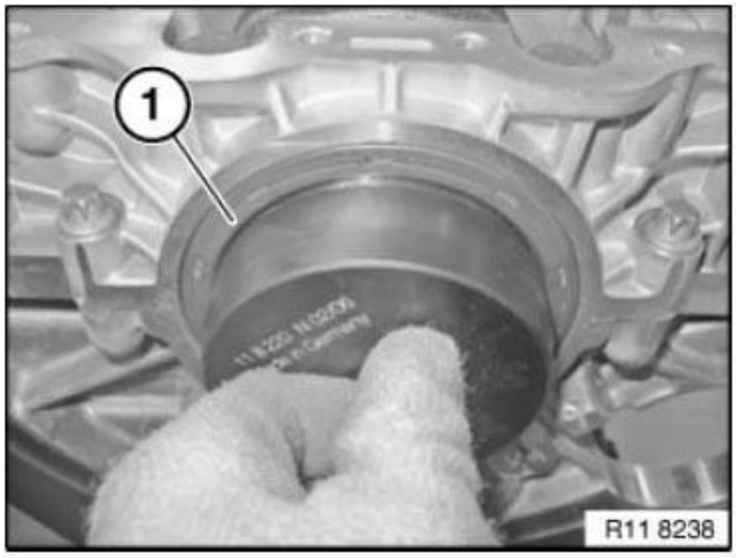


Fig. 134: Moving Radial Shaft Seal Parallel Up Against Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 11 9 182 with screws (special tool 11 9 184) to crankshaft.

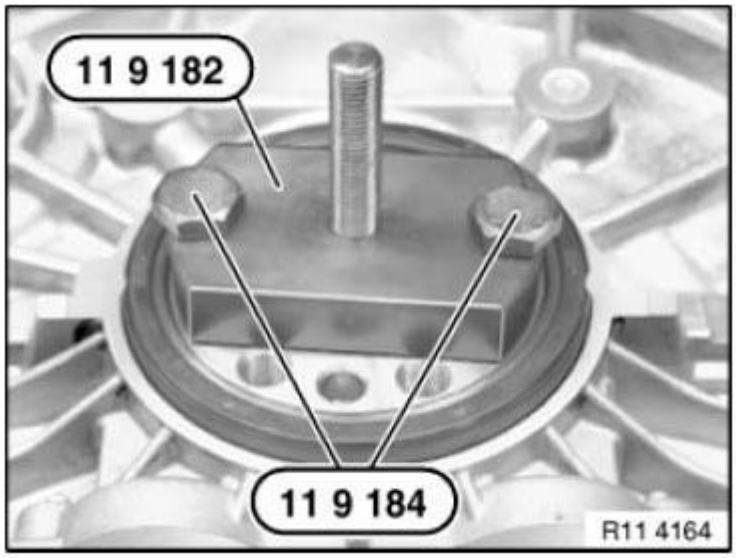


Fig. 135: Screwing Special Tool 11 9 182 With Screws (Special Tool 11 9 184) To Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Prepare special tool 11 9 181 for installation. Connect special tool 11 9 185 onto special tool 11 8 181.

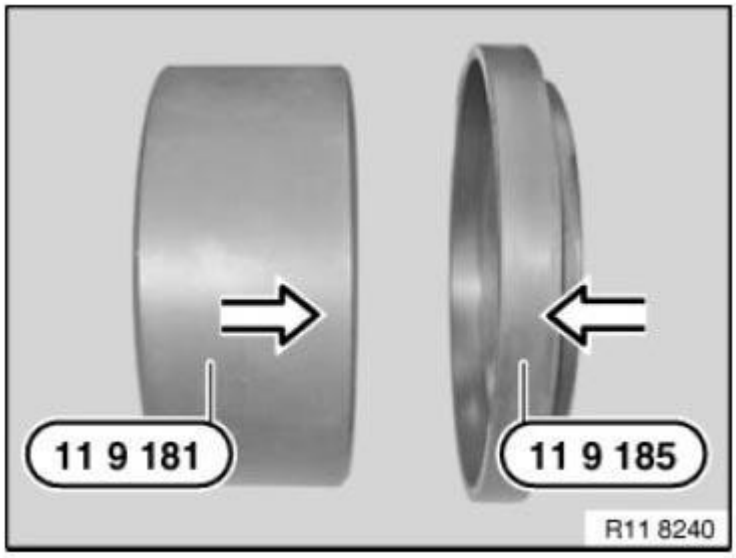


Fig. 136: Connecting Special Tool 11 9 185 Onto Special Tool 11 8 181
Courtesy of BMW OF NORTH AMERICA, INC.

Pull on radial shaft seal with special tool 11 9 181 and 11 9 185 in combination with special tool 11 9 183.

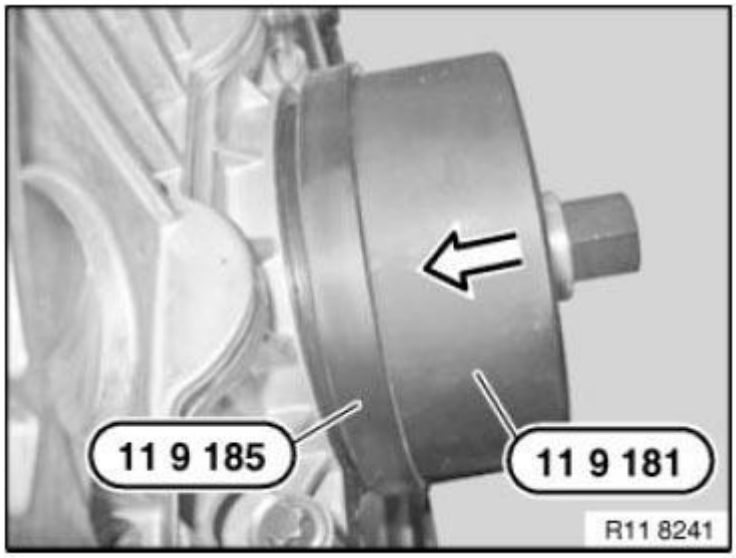


Fig. 137: Pulling Radial Shaft Seal Using Special Tool 11 9 181/11 9 185/11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

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

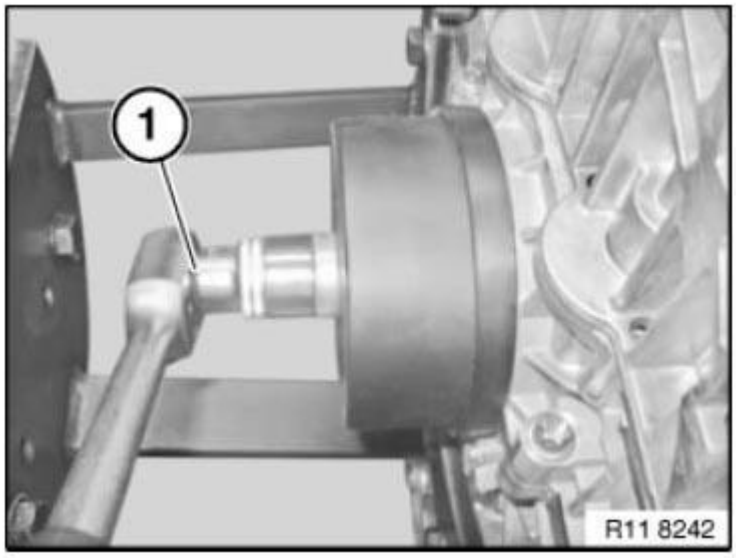


Fig. 138: Screwing On Radial Shaft Seal Using Special Tool 11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

NOTE: Graphic N42.

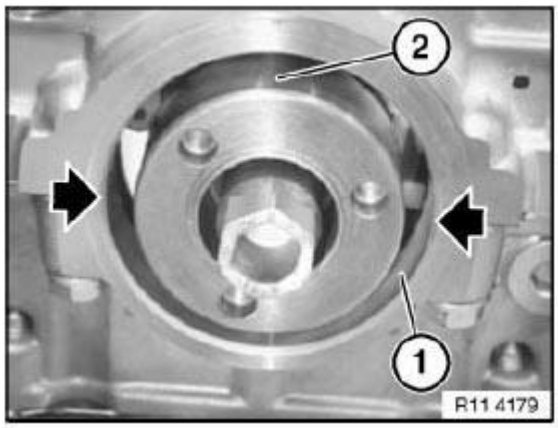


Fig. 139: Identifying Sealing Surface And Running Surface For Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Push radial shaft seal (1) 11 9 235carefully in direction of arrow on the special tool.

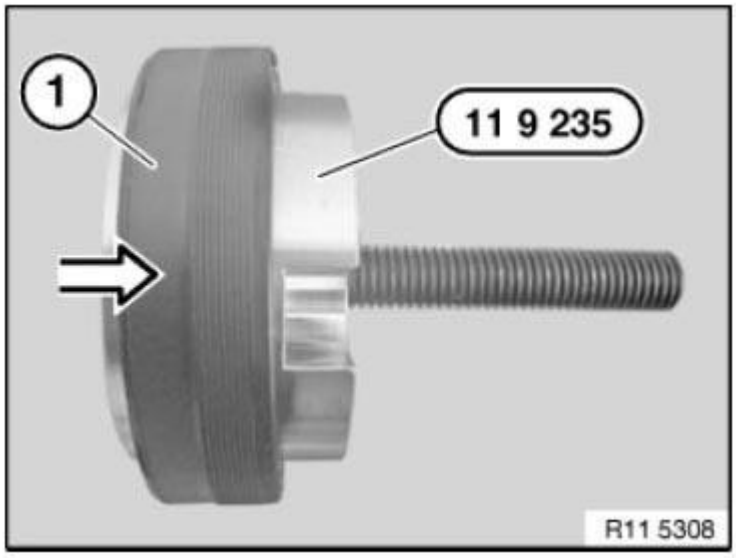


Fig. 140: Pushing Radial Shaft Seal (11 9 235) On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: 11 9 235Special tool can only be fastened with 2 opposite bolts.
Determine hole pattern on special tool.

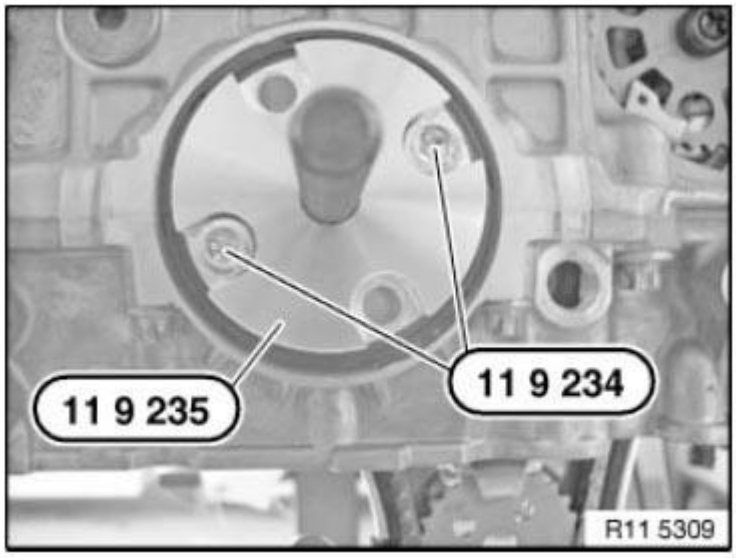


Fig. 141: Mounting Special Tool 11 9 235 With Special Tool 11 9 234 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 11 9 235 with special tool 11 9 234 on crankshaft.

Align groove (2) of radial shaft seal (1) centered to the housing partition (3.

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

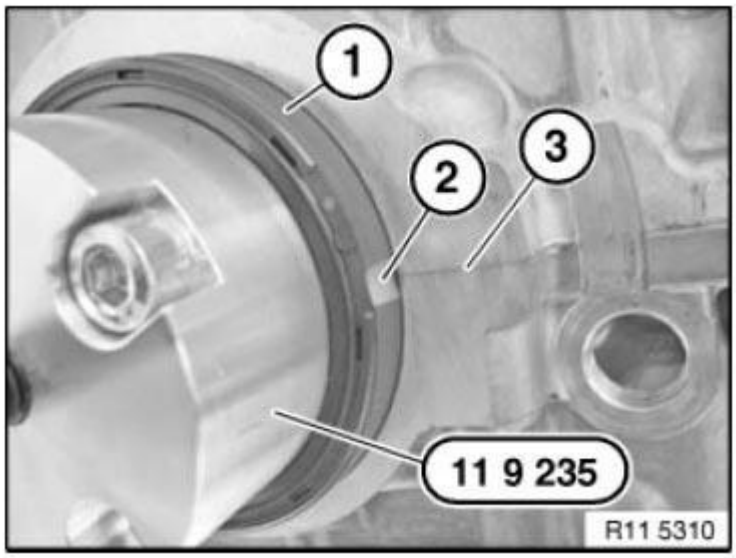


Fig. 142: Identifying Radial Shaft Seal , Housing Partition And Groove
Courtesy of BMW OF NORTH AMERICA, INC.

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

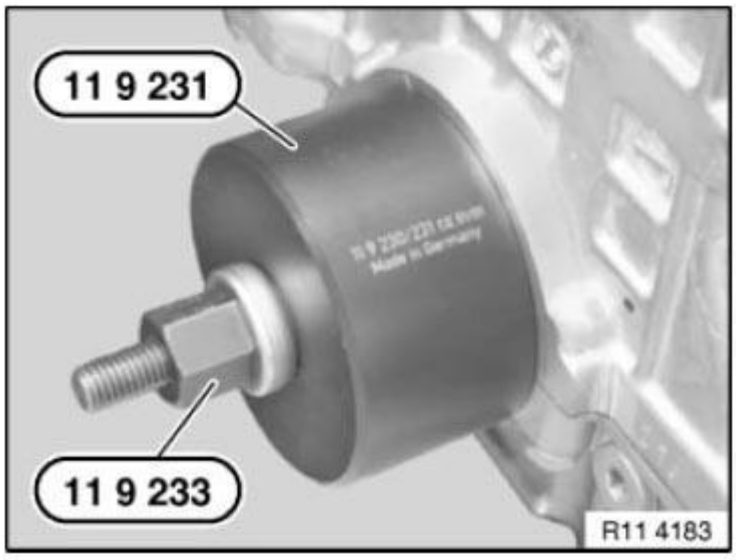


Fig. 143: Inserting Radial Seal With Special Tool 11 9 231 And 11 9 233
Courtesy of BMW OF NORTH AMERICA, INC.

Drive both injector nozzles (1) on left and right with special tool 11 9 360 into crankcase up to stop.

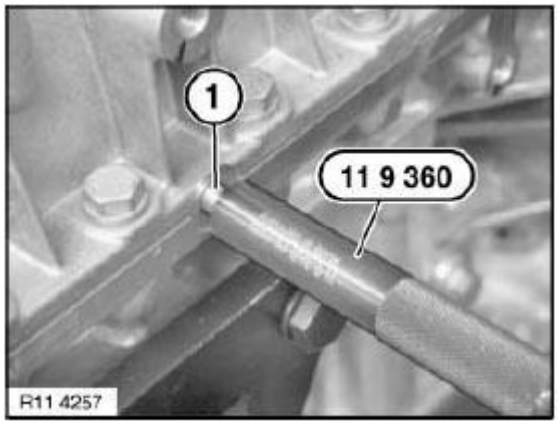


Fig. 144: Inserting Nozzles Using Special Tool 11 9 360
Courtesy of BMW OF NORTH AMERICA, INC.

After fitting both sealing rings, check both sealing ducts for clearance.

Blow compressed air (1) at max. 6 bar into injector nozzle (2).

Compressed air must emerge at both sealing rings on left and right from the outlet bores.

IMPORTANT: If the compressed air does not flow out of all ducts. the crankcase must again be taken apart and cleaned.

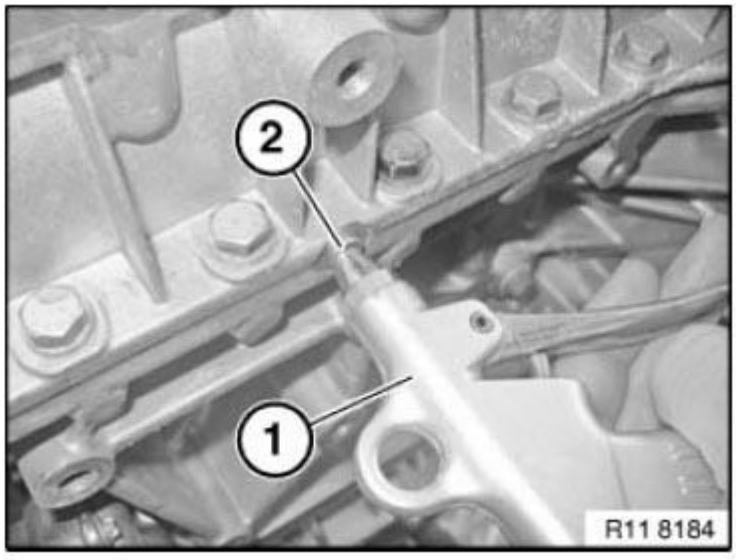


Fig. 145: Blowing Compressed Air Into Injector Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Use PRIMER 1.3 AND LIQUID SEAL 1.4.

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

Injector nozzles for injecting sealing compound are not required.

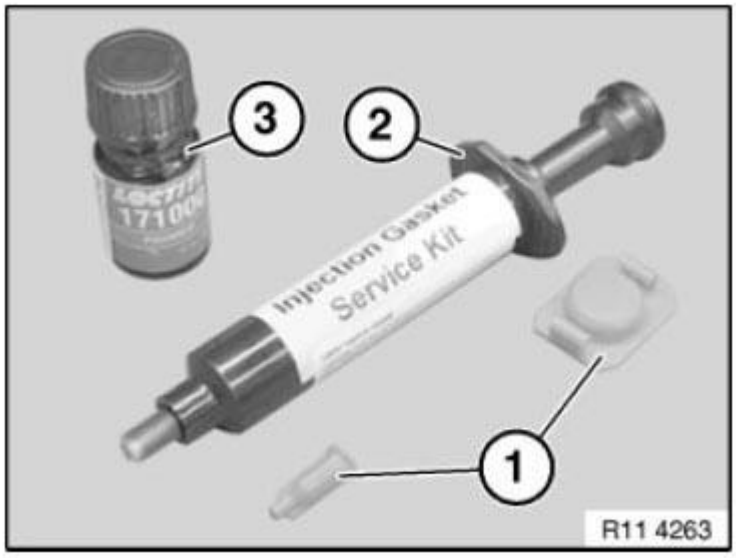


Fig. 146: Identifying Injector With Primer Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

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

Liquid sealing compound must emerge at radial shaft seals at front and rear.

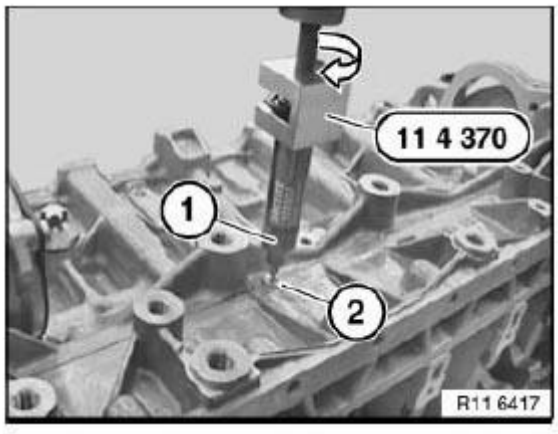


Fig. 147: Inserting Liquid Sealing Compound Using Special Tool 11 4 370
Courtesy of BMW OF NORTH AMERICA, INC.

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

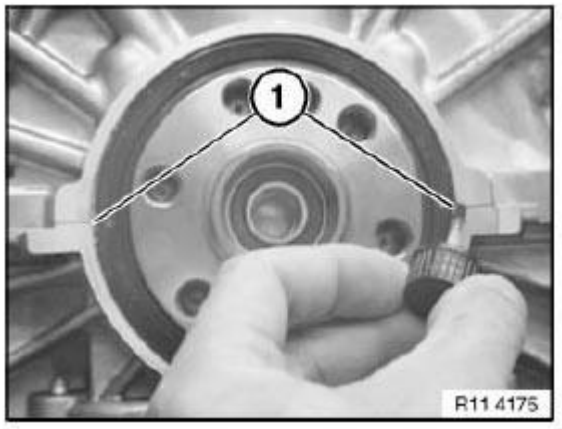


Fig. 148: Coating Surface Of Sealing Compound In Both Grooves Using Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

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

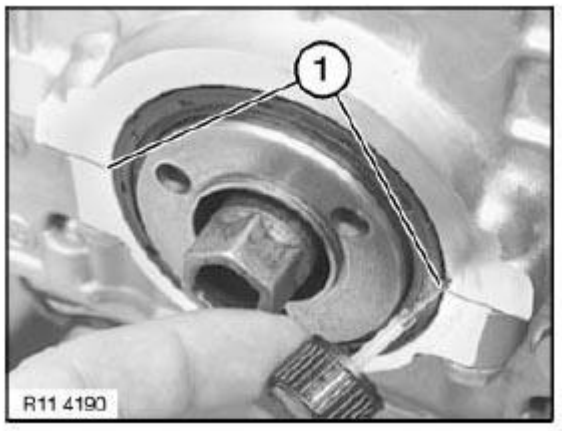


Fig. 149: Sealing Escaping Liquid Gasket With Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

Special tools required:

- **00 2 590 PLASTIGAGE (5)**
- 11 4 251
- 11 4 252
- 11 4 470

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical

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

Necessary preliminary tasks:

- Remove crankshaft, see **11 21 500 Replacing crankshaft (N52K)**

Checking position of oil spray nozzles:

Insert special tool 11 4 251 in screw connection of main bearing.

NOTE: Special tool 11 4 252 must be pre-installed at the seventh main bearing.

Check position of oil spray nozzle (2) according to position (1) on special tool 11 4 251 .

If necessary, adjust and secure oil spray nozzle (2).

Tightening torque: 11 11 5AZ, see **11 11 CRANKCASE** .

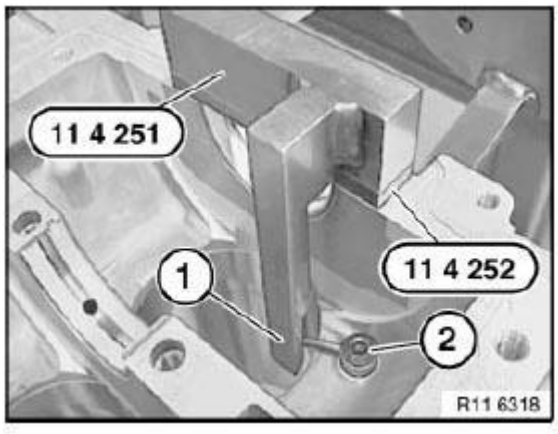


Fig. 150: Oil Spray Nozzle, Special Tools (11 4 251) And (11 4 252)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

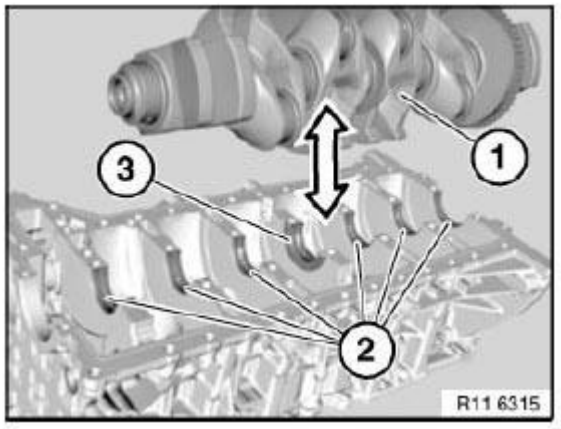


Fig. 151: Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

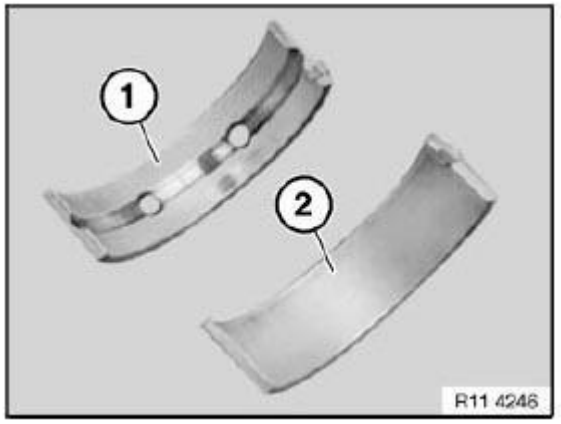


Fig. 152: Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: It is not possible to remachine the crankshaft.

Surface (1) for marking.

Seven-digit part number (2).

Bearing classification (3) on bedplate (see table: values of 1/2/3).

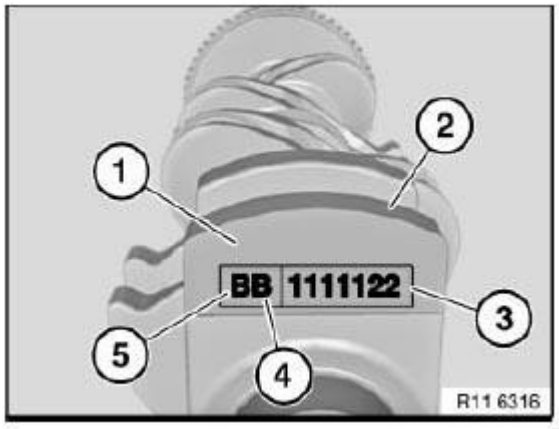


Fig. 153: Bearing Classification On Bedplate
Courtesy of BMW OF NORTH AMERICA, INC.

Bearing classification (1) on crankcase (see table: values of A/B/C).

Installation:

When all the letters and number code have been determined, the color of the bearing shells must be allocated (see table).

IMPORTANT: Excessively small bearing play will result in engine damage.
The color combination Yellow and Red must not be fitted.
Possible color combinations (see table).

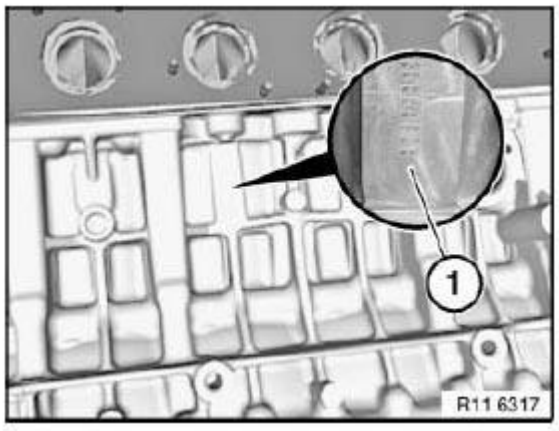


Fig. 154: Bearing Classification On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

BEARING SHELL COLOR COMBINATIONS SPECIFICATION

(A1) Bedplate / Yellow	**(B1)** Bedplate / Yellow	**(C1)** Bedplate / Green
(A1) Crankcase / Yellow	**(B1)** Crankcase / Green	**(C1)** Crankcase / Green
(A2) Bedplate / Green	**(B2)** Bedplate / Green	**(C2)** Bedplate / Green

(A2) Crankcase / Yellow	**(B2)** Crankcase / Green	**(C2)** Crankcase / Red
(A3) Bedplate / Green	**(B3)** Bedplate / Red	**(C3)** Bedplate / Red
(A3) Crankcase / Green	**(B3)** Crankcase / Green	**(C3)** Crankcase / Red

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

Installation:

Clean all sealing surfaces.

IMPORTANT: Do not use any metal-cutting tools.

Clean sealing faces with special tool 11 4 470 only.

Determine bearing play with special tool 00 2 590 .

Installation:

All measuring points must be clean and free from oil and grease. If necessary, clean all measuring points.

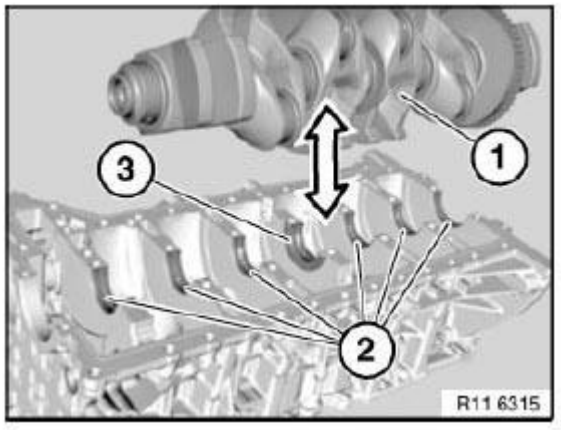


Fig. 155: Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Use the existing screws to determine the bearing play.

Set up bedplate with bearing shells, see **11 21 500 Replacing crankshaft (N52K)**.

Remove bedplate.

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

Installation:

Remove plastic thread.

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

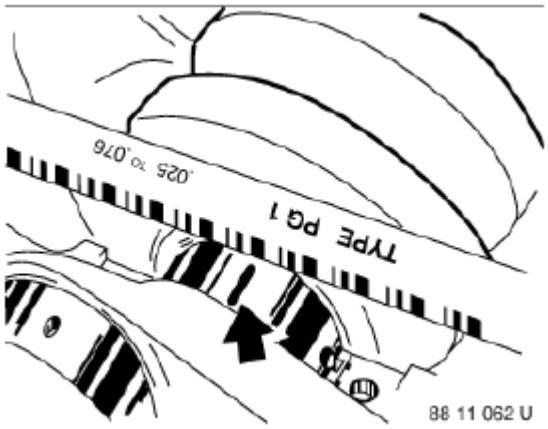


Fig. 156: Reading Bearing Play At Width Of Flattened Plastic Thread And Measurement Scale
Courtesy of BMW OF NORTH AMERICA, INC.

Install bedplate**11 21 500 Replacing crankshaft (N52K)**.

Assemble engine.

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

Necessary preliminary tasks

- Remove clutch.

Remove guide bearing with special tool 11 2 340.

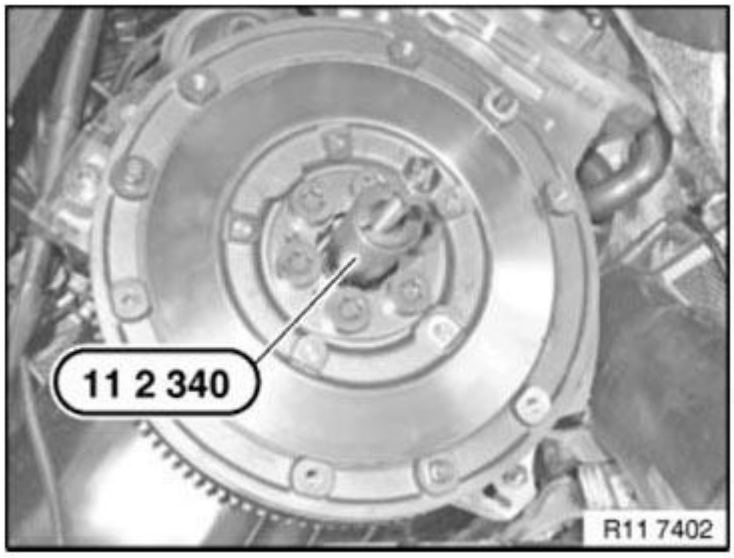


Fig. 157: Removing Guide Bearing Using Special Tool 11 2 340
Courtesy of BMW OF NORTH AMERICA, INC.

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

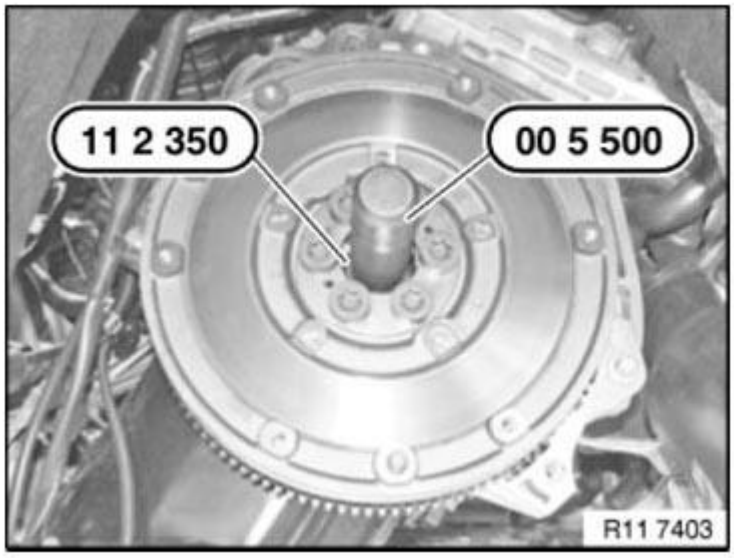


Fig. 158: Installing New Thrust Bearing Using Special Tool 11 2 350 And 00 5 500
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

FLYWHEEL

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

Special tools required:

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

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

Necessary preliminary tasks:

- Remove transmission
- Remove clutch, see **21 21 500 REMOVING AND INSTALLING/REPLACING CLUTCH (SAC) (X3)** or .

For vehicles with optional extra SA205 (automatic transmission):

Secure flywheel (1) with existing transmission bolt (2) and special tool 11 9 260 .

Installation:

Replace aluminum screws.

Unfasten flywheel screws.

Tightening torque: 11 22 1AZ, see **11 22 FLYWHEEL** .

Installation:

Flywheel (1) is secured with an alignment pin.

Fit new flywheel screws.

Clean all threads for flywheel screws in crankshaft.

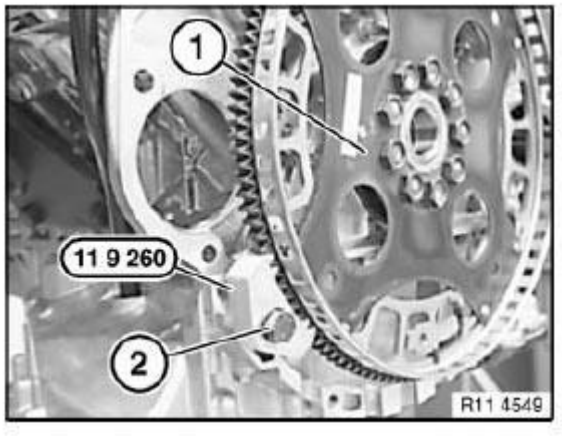


Fig. 159: Special Tool (11 9 260), Flywheel And Transmission Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles without optional extra SA205 (automatic transmission):

Secure flywheel with existing transmission bolt (1) and special tools 11 9 260 and 11 9 265 .

Installation:

Replace aluminum screws.

Release flywheel screws with special tool 11 4 180 .

Tightening torque: 11 22 2AZ, see **11 22 FLYWHEEL** .

Installation:

Flywheel is secured with a dowel pin.

Fit new flywheel screws.

Clean all threads for flywheel screws in crankshaft.

Assemble engine.

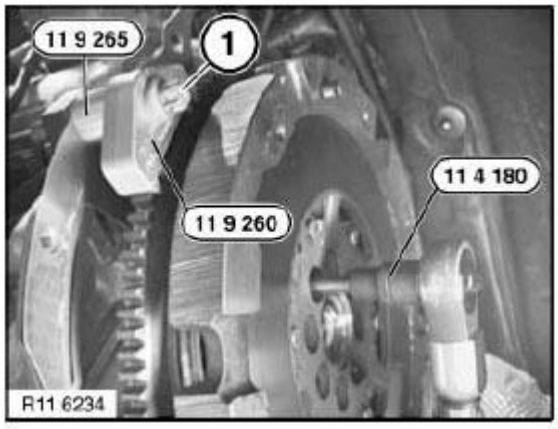


Fig. 160: Special Tools (11 9 260), (11 9 265) And (11 4 180)
Courtesy of BMW OF NORTH AMERICA, INC.

11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

Special tools required:

- 21 2 051
- 21 2 052

NOTE: Flywheel removed!

Using hydraulic press (1) and special tool 21 2 051 , press out dual-mass flywheel downwards on engine side.

IMPORTANT: Risk of damage:
Roller bearing must not be driven out.

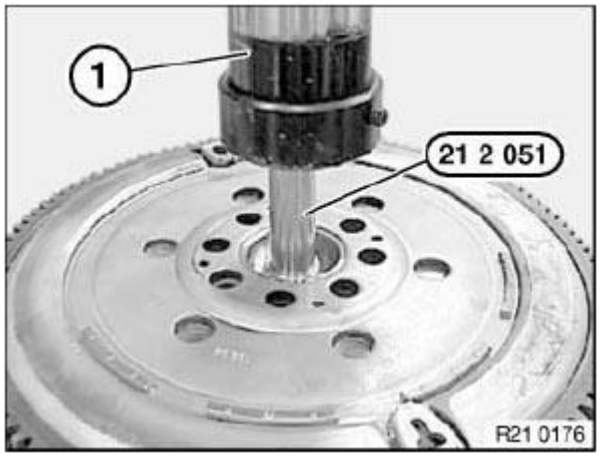


Fig. 161: Hydraulic Press And Special Tool (21 2 051)
Courtesy of BMW OF NORTH AMERICA, INC.

Push roller bearing (2) onto special tool 21 2 052 .

Using hydraulic press (1), press roller bearing into dual-mass flywheel as far as it will go on clutch side.

IMPORTANT: Risk of damage:
Observe press-in instruction:

- Roller bearing must not be driven in.
- Roller bearing mounting force/travel monitored:

Min. 2000N 1 mm before end of pressing in.

Max. 15000N during entire press-in procedure.

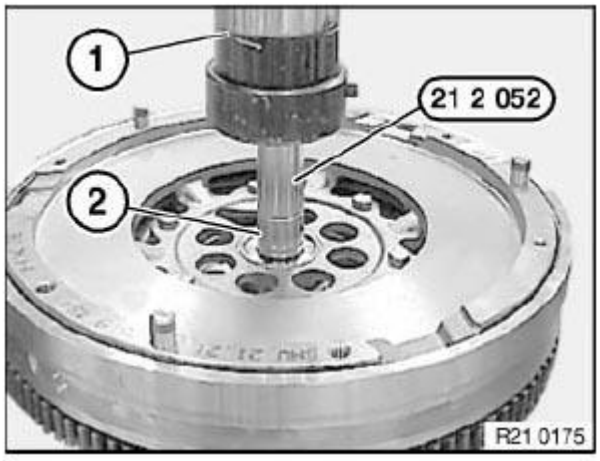


Fig. 162: Hydraulic Press, Roller Bearing And Special Tool (21 2 052)
Courtesy of BMW OF NORTH AMERICA, INC.

VIBRATION DAMPER

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

Necessary preliminary tasks

- Remove underbody protection **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION (X5)** or **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION (X3)** .
- Remove alternator drive belt.

Release screws (1).

Tightening torque, see **23 VIBRATION DAMPER** .

Remove vibration damper (2).

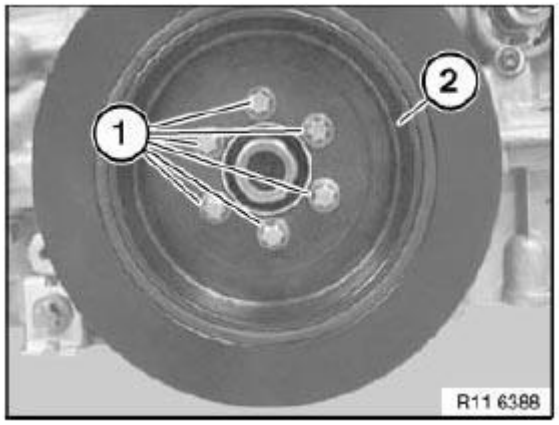


Fig. 163: Identifying Screws And Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CONNECTING ROD WITH BEARING

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

Special tools required:

- **00 2 590 PLASTIGAGE (5)**
- **00 9 120 TORQUE ANGLE MEASURING DIAL**

IMPORTANT: All crank pins are connected with the crankshaft.
Modified procedure: The colors of the connecting rod bearing shells are the same at the top and bottom.
The Blue / Red connecting rod bearing shell colors are no longer fitted in combination.

Necessary preliminary tasks:

- Remove oil sump

IMPORTANT: All crankshaft crank pins are classified.

Possible classifications per connecting rod at top and bottom:

r: Red

b: Blue

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

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

Example:

Possible classification: rbbrrb

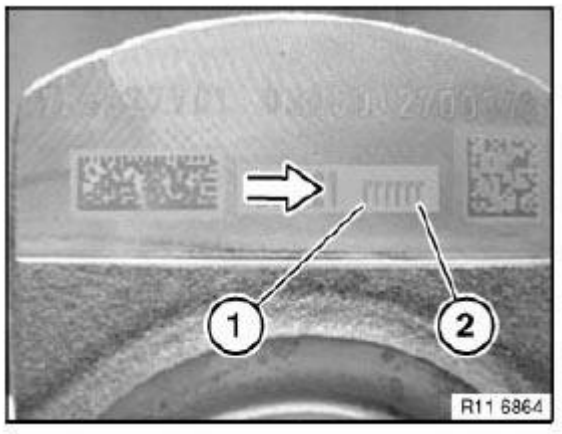


Fig. 164: Connecting Rod Classifications
Courtesy of BMW OF NORTH AMERICA, INC.

Cylinder Classification Red / Red

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

Release conrod bolts (1).

Remove connecting rod bearing cap (2).

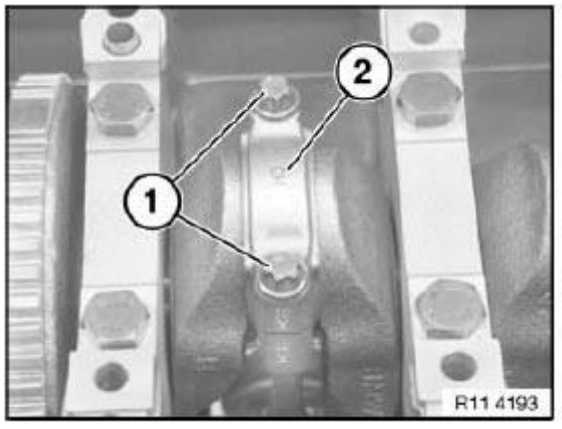


Fig. 165: Conrod Bolts And Connecting Rod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage to cylinder wall and to crankshaft.

Gently release connecting rod from crankshaft.

Remove connecting rod bearing shells (1 and 2).

Install new conrod bearing shells.

Installation:

Pay attention to guide lugs during installation.

IMPORTANT: All crankshaft crank pins are classified.

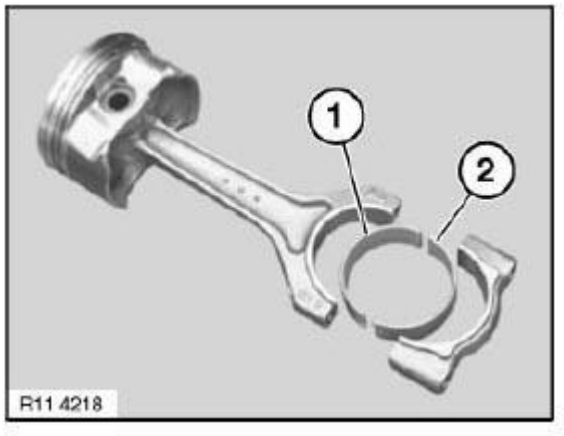


Fig. 166: Connecting Rod Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

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

Check conrod bearing clearance.

Piston in BDC position.

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

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

Fit conrod bearing cap so that pairing letters match up.

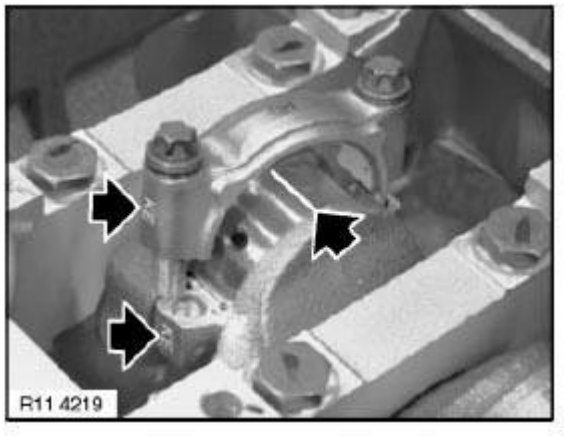


Fig. 167: Locating Conrod Bearing Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not distort conrods or crankshaft.

Use the old conrod bolts to check conrod clearance.

Tighten down conrod bolts with special tool 00 9 120 .

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

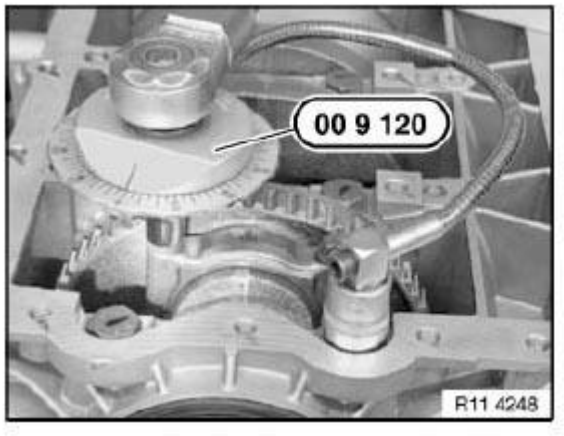


Fig. 168: Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Conrod bearing clearance, see **11 24 CONNECTING RODS AND BEARINGS N52K B25** .

- Remove Plastigage
- Coat crankshaft and connecting rod bearing shells with oil

- Install new conrod bolts and tighten down with special tool 00 9 120 .

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

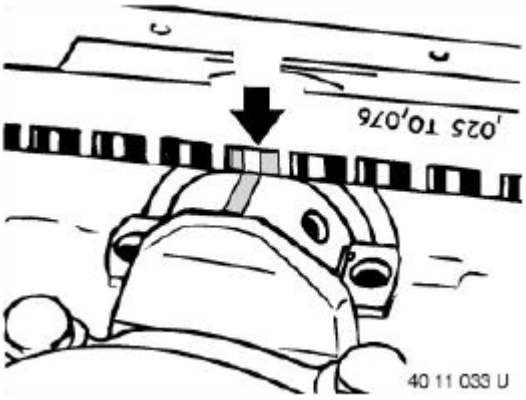


Fig. 169: Reading Conrod Bearing Play At Width Of Flattened Plastic Thread On Measurement Scale
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

PISTON WITH RINGS AND PIN

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

Special tools required:

- **00 9 120 TORQUE ANGLE MEASURING DIAL**
- 11 4 491
- 11 4 492
- 11 4 493
- 11 4 494
- 11 6 241
- 11 6 261
- 11 8 330

WARNING: Danger of injury!

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

IMPORTANT: If piston, connecting rod, big end bearing cap and connecting rod bearing shell are to be reused, they must be installed in the same position.
Individual replacement of a connecting rod is not permitted. Connecting rods

are classified by weight categories and are only available as a set for all cylinders.
Connecting rod and big end bearing cap are marked with identical pairing letters and must not be mixed up.

Danger of engine damage!

Piston and piston pins are paired and must not be fitted individually.

Necessary preliminary tasks:

- Remove engine
- Mount engine on assembly stand, see **Mounting engine on assembly stand (N52K)**.
- Remove intake air manifold
- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove oil sump
- Remove oil pump, see **11 41 000 Removing and installing/replacing oil pump (N52K)**

NOTE: Carefully remove heavy oil carbon residues from the cylinder wall (arrow).

IMPORTANT: Do not use any metal-cutting tools.

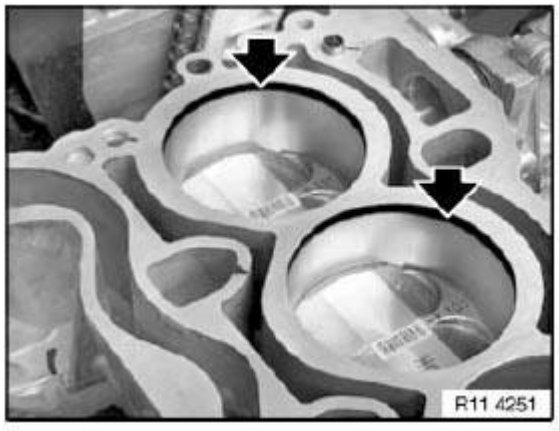


Fig. 170: Locating Cylinder Wall
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

If necessary, readjust oil spray nozzle (2), see **11 21 531 Replacing all main crankshaft bearing shells (N52K)**.

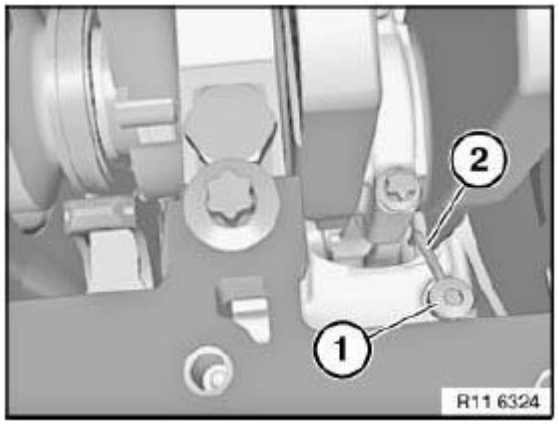


Fig. 171: Spray Nozzle And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release conrod bolts (1).

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

Installation:

Replace screws.

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

IMPORTANT: Connecting rod and big end bearing cap (2) are marked with identical pairing letters and must not be mixed up.

Danger of engine damage!

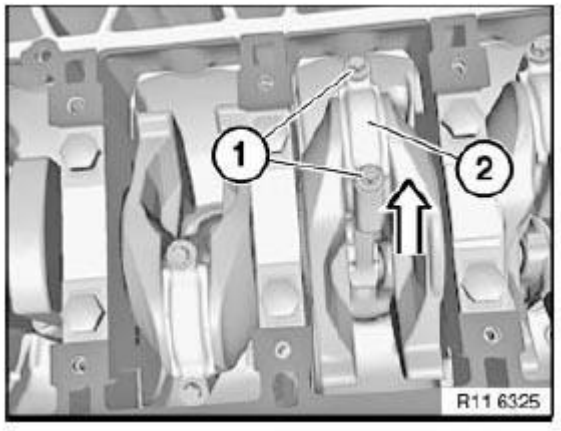


Fig. 172: Removing Conrod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 8 330 to connecting rod.

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

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

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

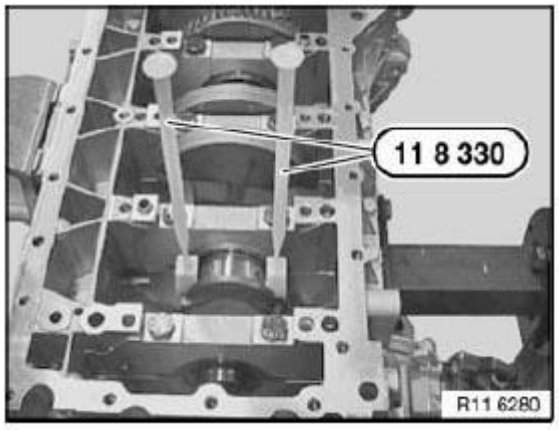


Fig. 173: Special Tool (11 8 330)
Courtesy of BMW OF NORTH AMERICA, INC.

Preliminary work:

Clamp special tool 11 4 491 in vice.

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

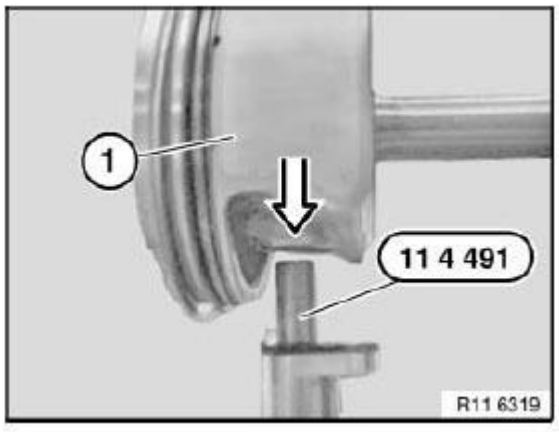


Fig. 174: Securing Piston With Connecting Rod To Special Tool (11 4 491)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

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

WARNING: Protective goggles must be worn.

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

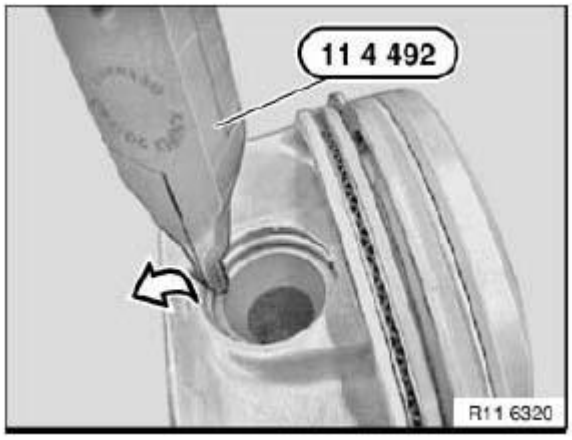


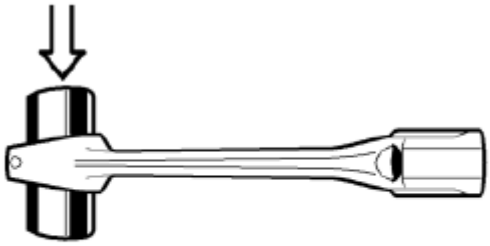
Fig. 175: Removing Piston Pin Circlip With Special Tool (11 4 492)
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, replace connecting rods.

IMPORTANT: Individual replacement of a connecting rod is not permitted. Connecting rods are classified by weight categories and are only available as a set for all cylinders.
Existing and new connecting rods must not be installed in mixed combinations.

Installation:

It must be possible for the piston pin to be pressed with minimal force by hand through the small end bushing. There must be no noticeable play.



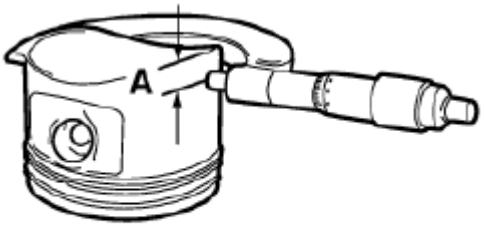
R11 4212

Fig. 176: Installing Piston Pin Into Small End Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

Measure piston installation clearance:

Measure piston diameter with micrometer at measuring point "A" from lower edge of piston and offset by 90° to piston pin axis.

Piston diameter at measuring point "A", see **11 25 PISTONS WITH RINGS AND PINS N52K B25** .



88 11 051 U

Fig. 177: Measuring Piston Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust micrometer to cylinder bore of crankcase. Set internal caliper on micrometer to "zero". Measure bottom, center and top of cylinder bore in direction of travel and direction of engine rotation.

Diameter of cylinder bore.

Piston installation clearance.

Total permissible wear tolerance, see **11 25 PISTONS WITH RINGS AND PINS N52K B25**

If necessary, replace piston.

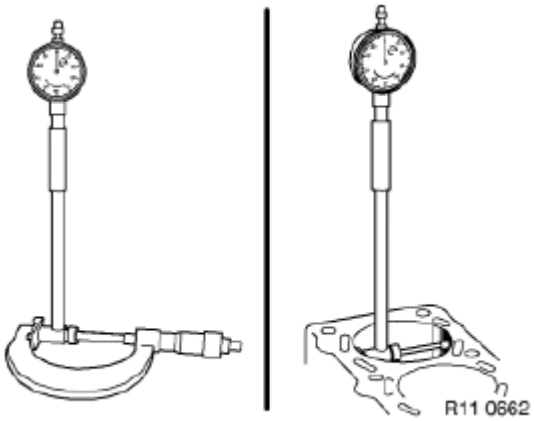


Fig. 178: Measuring Diameter Of Cylinder Bore
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Protective goggles must be worn.

Insert piston pin circlip (2) into groove (1) of special tool 11 4 493 .

Move piston pin circlip (2) into installation position.

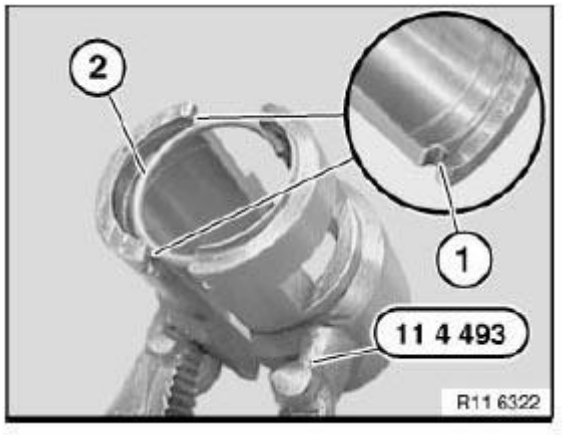


Fig. 179: Piston Pin Circlip And Groove
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Protective goggles must be worn.

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

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

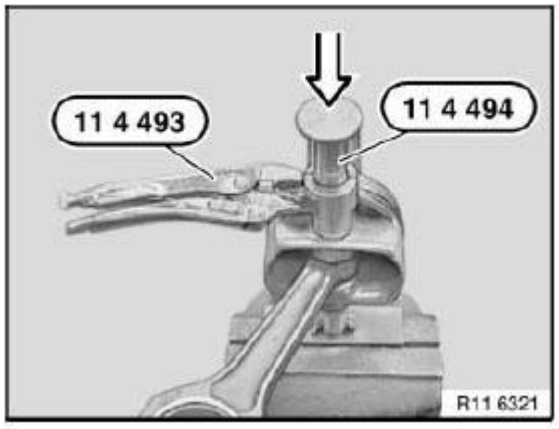


Fig. 180: Installing Piston Pin Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For vehicles with B30 engines.

Install all piston rings, see **11 25 671 Replacing piston rings on all pistons (N52K)**.

Install all connecting rod bearing shells, see **11 24 571 Replacing all connecting rod bearing shells (N52K)**.

Coat piston (2) and piston rings with oil.

Pre-install piston (2) in special tool 11 6 261 .

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

Installation:

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

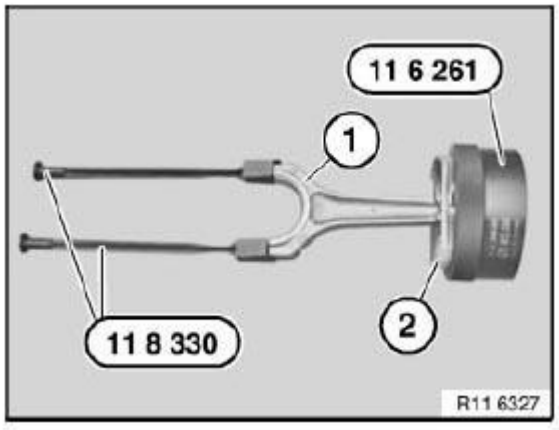


Fig. 181: Connecting Rod, Piston And Special Tools (11 8 330) And (11 6 261)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For vehicles with B25 engines.

Install all piston rings, see **11 25 671 Replacing piston rings on all pistons (N52K)**.

Install all connecting rod bearing shells, see **11 24 571 Replacing all connecting rod bearing shells (N52K)**.

Coat piston (2) and piston rings with oil.

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

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

Installation:

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

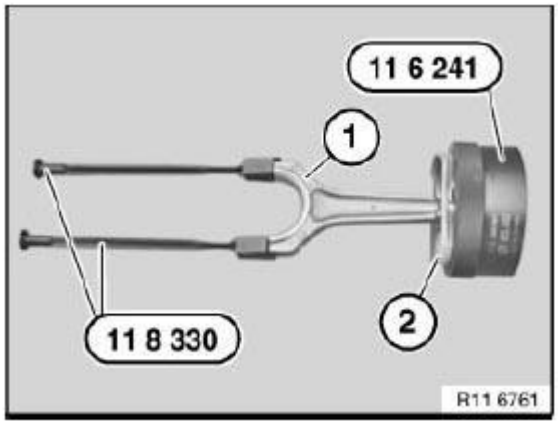


Fig. 182: Connecting Rod, Piston And Special Tools (11 8 330) And (11 6 241)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert piston (1) with connecting rod in cylinder.

IMPORTANT: Do not touch the oil spray nozzle when installing the components.
Risk of damage!
Danger of piston ring failure.

Press in piston (1) at marked points (see arrows) with finger pressure only, do not drive in.

Insert piston (1) so that arrow (2) on piston crown points to camshaft drive.

Press in piston (1) with special tools 11 6 261 / 11 6 241 .

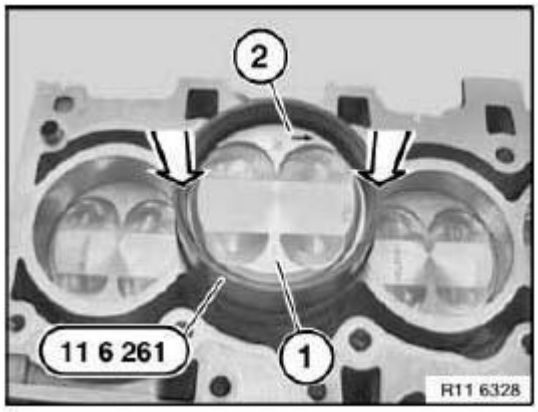


Fig. 183: Pressing Piston With Special Tools (11 6 261)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Connecting rod and big end bearing cap are marked with identical pairing letters (1) and must not be mixed up.
Mixing them up or incorrectly fitting the big end bearing cap on the connecting rod will result in engine damage .

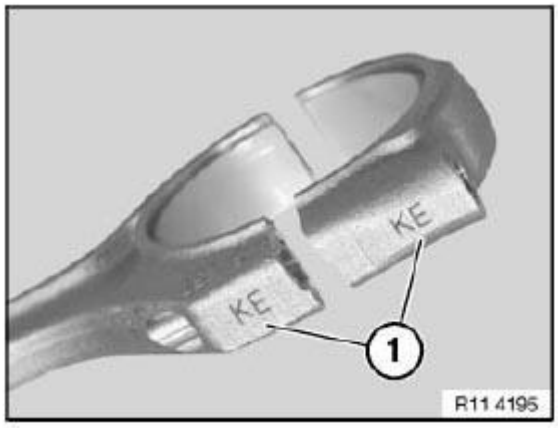


Fig. 184: Connecting Rod Identical Pairing Letters
Courtesy of BMW OF NORTH AMERICA, INC.

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

Detach special tool 11 8 330 .

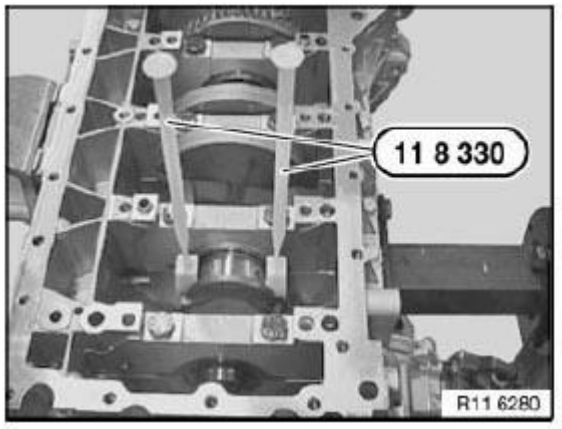


Fig. 185: Special Tool (11 8 330)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

Replace screws.

Install new conrod bolts (1).

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

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

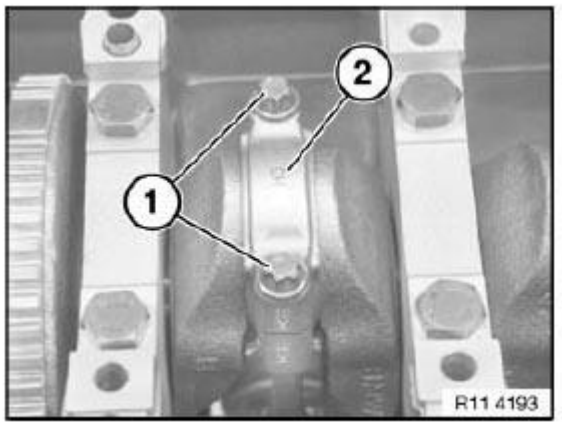


Fig. 186: Conrod Bolts And Connecting Rod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, tighten connecting rod bolts to torsion angle with special tool 00 9 120 .

Tightening torque: 11 24 1AZ, see **11 24 CONNECTING RODS AND BEARINGS** .

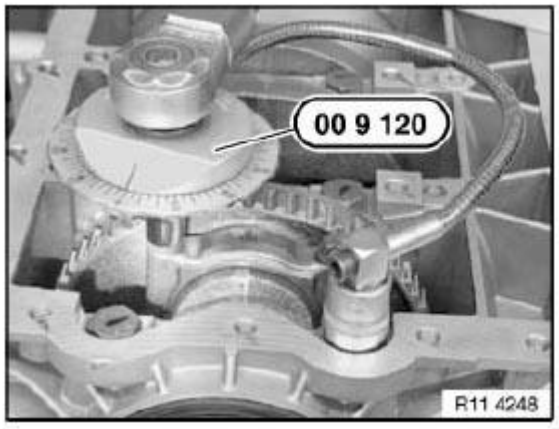


Fig. 187: Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

Necessary preliminary tasks:

- Removing all pistons, see **11 25 530 Removing and installing/replacing all pistons (N52K)**

Measuring axial clearance of piston rings in piston ring groove.

Technical Data.

NOTE: It is not possible to measure the axial clearance of the U-flex rings.

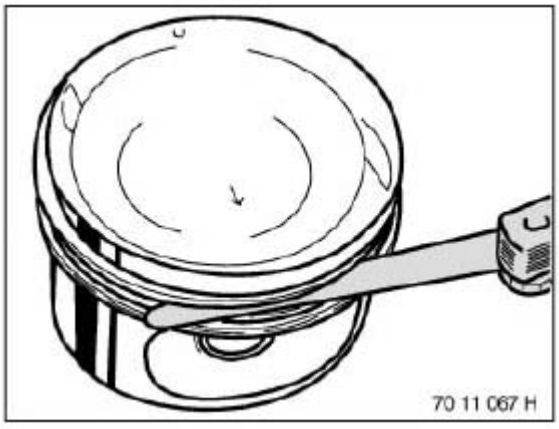


Fig. 188: Measuring Axial Clearance Of Piston Rings In Piston Ring Groove
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

**NOTE: The U-flex ring cannot be removed with piston ring pliers.
Put aside all piston rings in correct sequence and installation position.
It might not be possible to find the identification on used piston rings.**

Installation:

New pistons may only be installed together with new piston rings.

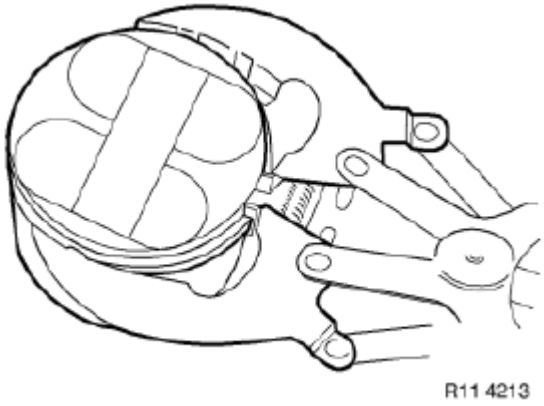


Fig. 189: Removing Plain Compression Ring And Stepped Ring With Piston Ring Pliers
Courtesy of BMW OF NORTH AMERICA, INC.

Determine end clearance with a feeler gauge, see **11 25 PISTONS WITH RINGS AND PINS N52K B25** .

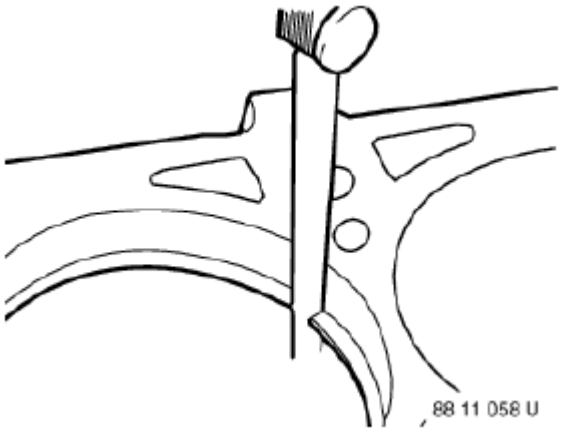


Fig. 190: Measuring Ring End Clearance With Feeler Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic diagram of piston rings.

Installation:

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

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

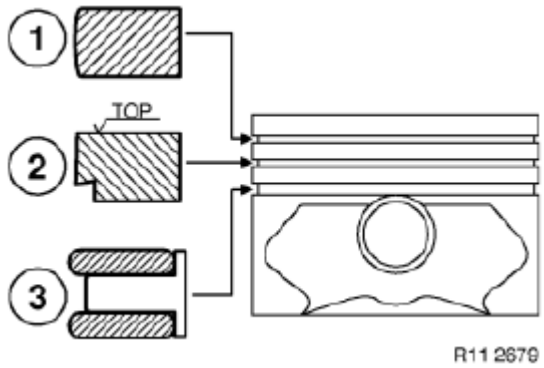


Fig. 191: Piston Rings Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The U-flex ring comprises two steel band rings (1) and a support spring (2).

Installation:

Insert support spring (2) into piston ring groove and then fit steel band rings (1) so that contact points are offset by approx. 120°.

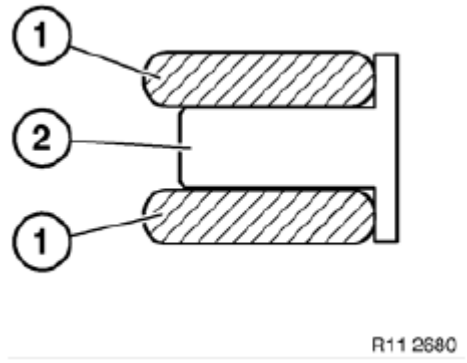


Fig. 192: Support Spring And Steel Band Rings
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: Picture shows N52.

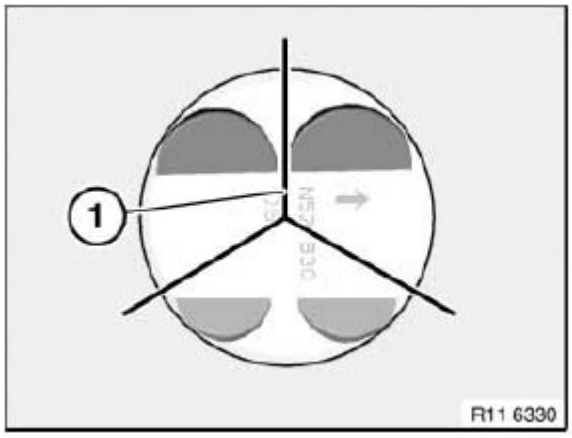


Fig. 193: Contact Points Of Piston Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

V-RIBBED BELT WITH TENSIONER / DEFLECT ELEMENT

11 28 010 REPLACING ALTERNATOR DRIVE BELT (N51)

Special tools required:

- 11 3 340

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

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

Necessary preliminary tasks:

- Remove Fan Cowl with electric fan.

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

Layout of drive belt.

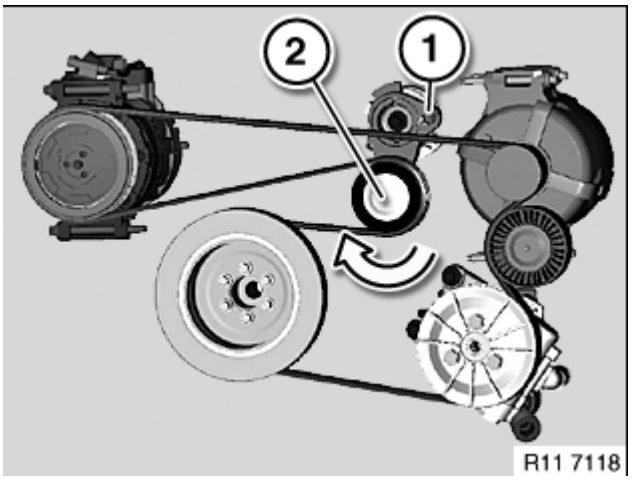


Fig. 194: Drive Belt Tensioner, Mounting Screw And Removal Direction
Courtesy of BMW OF NORTH AMERICA, INC.

Turn belt tensioner (4) in direction of arrow until bore (2) is flush on housing.

Hold belt tensioner (4) under tension.

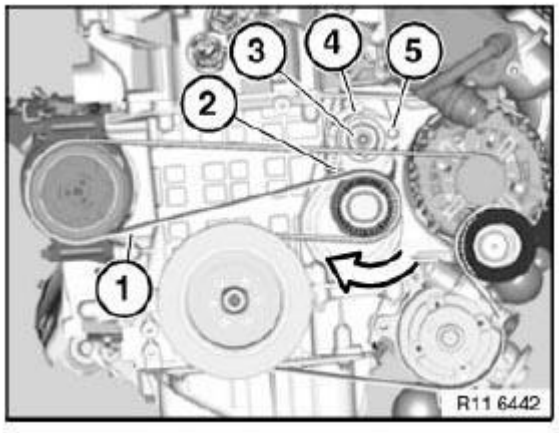


Fig. 195: Belt Tensioner And Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Secure belt tensioner with special tool 11 3 340.

NOTE: Illustration N42.

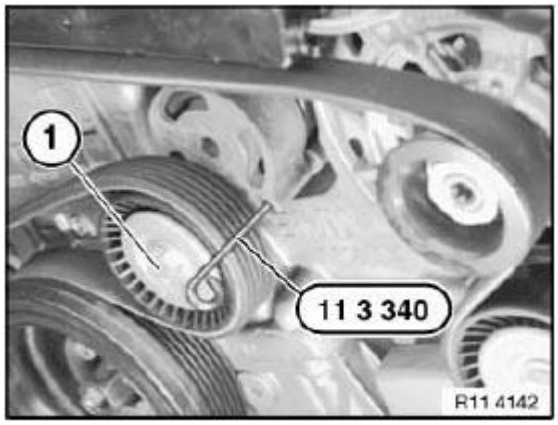


Fig. 196: Special Tool (11 3 340) And Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Remove drive belt (1) towards top.

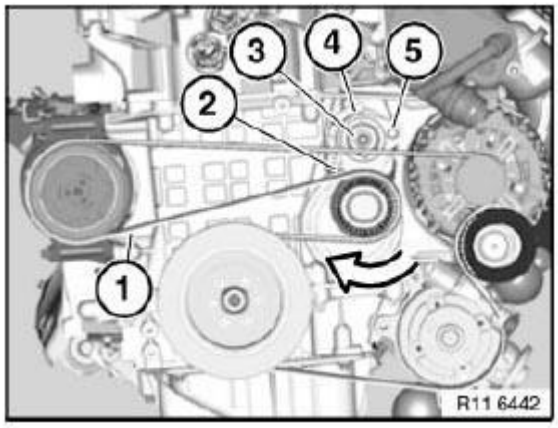


Fig. 197: Identifying Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Installation:

Check that drive belt for is in correct installation position - **risk of damage.**

11 28 010 REPLACING ALTERNATOR DRIVE BELT (N52K)

Special tools required:

- 11 3 340

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

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

Necessary preliminary tasks:

- Remove Fan Cowl with electric fan

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

Course of E9x drive belt:

Turn belt tensioner (4) in direction of arrow until bore (2) is flush on housing.

Hold belt tensioner (4) under tension.

Load is removed from tensioning pulley.

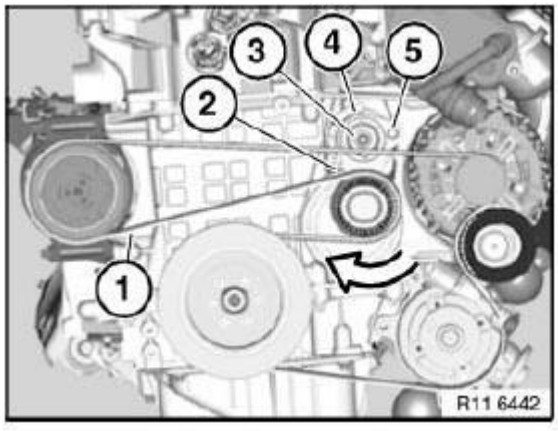


Fig. 198: Belt Tensioner And Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Course of E85 drive belt:

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

Hold belt tensioner (1) under tension.

Load is removed from tensioning pulley (2).

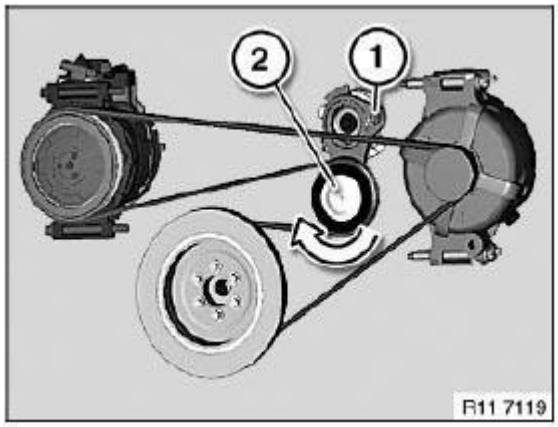


Fig. 199: Belt Tensioner And Tensioning Pulley
Courtesy of BMW OF NORTH AMERICA, INC.

All:

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

Remove drive belt upwards.

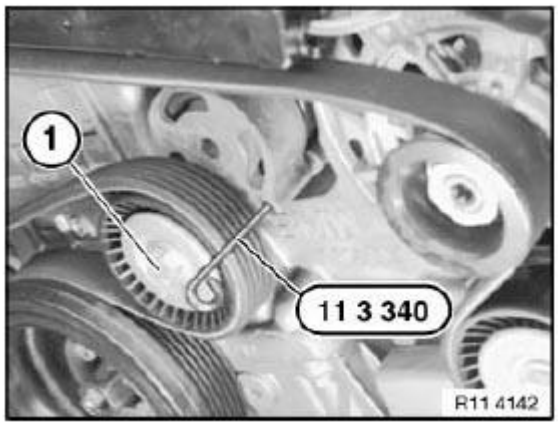


Fig. 200: Special Tool (11 3 340) And Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Installation:

Check that drive belt for is in correct installation position - **risk of damage.**

11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N51)

Special tools required:

- 11 3 340

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

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

Necessary preliminary tasks:

- Remove Drive Belt.

Remove special tool 11 3 340.

Release screw (3).

For tightening torque refer to 11 28 1AZ in **28 V-RIBBED BELT WITH TENSIONER** .

Installation:

Replace aluminum screws.

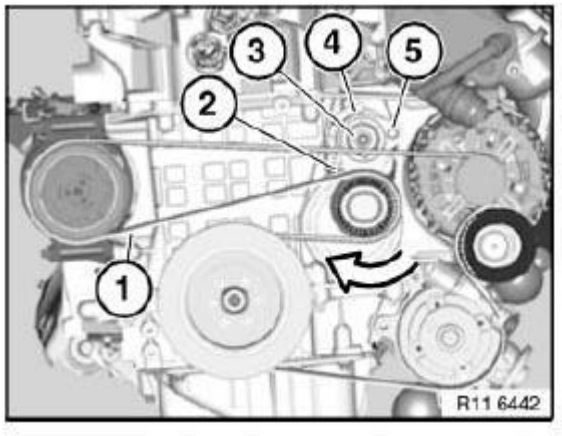


Fig. 201: Belt Tensioner And Belt Tensioner Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N52K)

Special tools required:

- 11 3 340

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.

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

Necessary preliminary tasks:

- Remove Drive Belt

E9x only:

Remove special tool 11 3 340.

Release screw (3) on belt tensioner (4).

For tightening torque refer to 11 28 1AZ in **28 V-RIBBED BELT WITH TENSIONER** .

Installation:

Replace aluminum screws.

Remove belt tensioner (4).

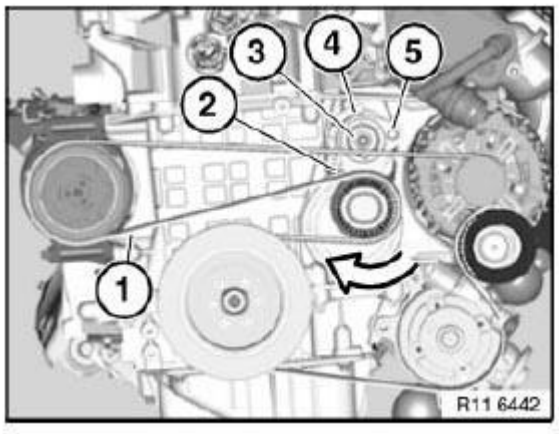


Fig. 202: Belt Tensioner And Belt Tensioner Screw
Courtesy of BMW OF NORTH AMERICA, INC.

E85 only:

Remove special tool 11 3 340.

Release screw on belt tensioner (1).

For tightening torque refer to 11 28 1AZ in **28 V-RIBBED BELT WITH TENSIONER** .

Installation:

Replace aluminum screws.

Remove belt tensioner (1).

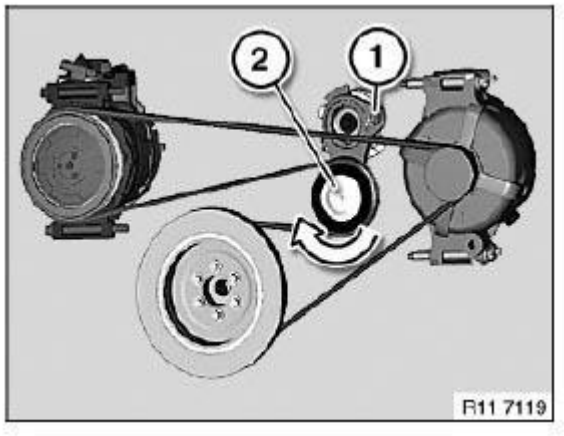


Fig. 203: Belt Tensioner And Drive Belt
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CAMSHAFT

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

Special tools required:

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

Necessary preliminary tasks:

- Remove **cylinder head cover**
- Remove underbody protection. See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION (X5)** or **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION (X3)**

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

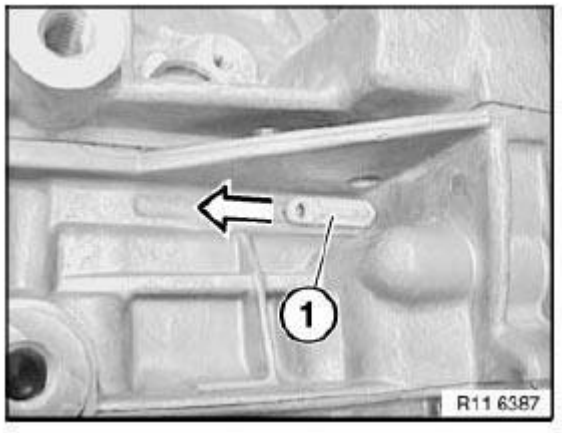


Fig. 204: Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

Slide special tool 11 0 300 in direction of arrow into special tool bore and secure crankshaft.

IMPORTANT: On vehicles with optional extra SA205 (automatic transmission), there is a large bore for the TDC position shortly before the special tool bore. This bore can be confused with the special tool bore.

If the flywheel is secured in the correct special tool bore with special tool 11 0 300 , the engine can no longer be moved at the central bolt.

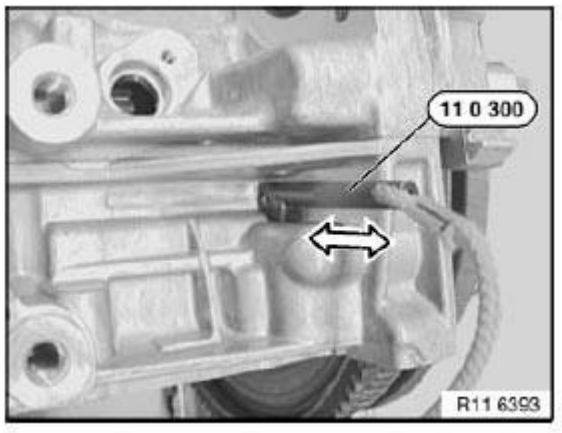


Fig. 205: Securing Crankshaft Using Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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

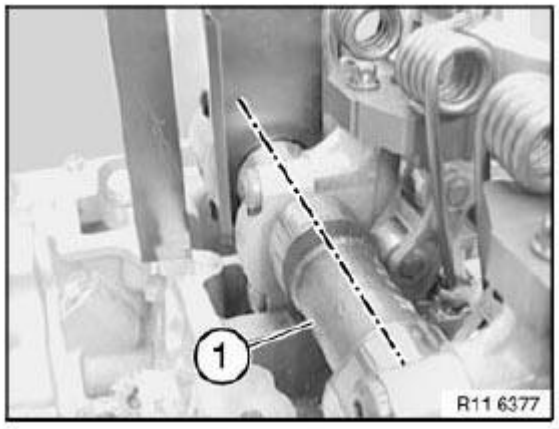


Fig. 206: Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

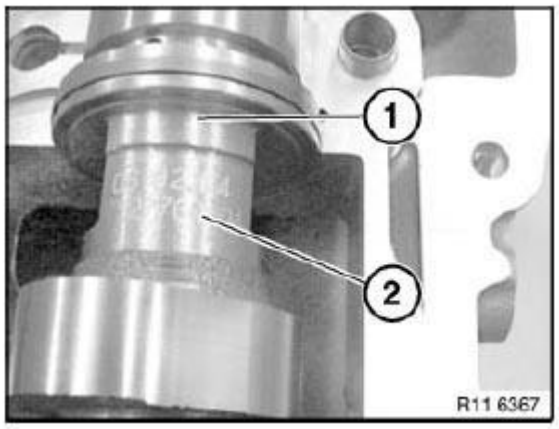


Fig. 207: Part Numbers On Inlet And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of exhaust camshaft (3) at 6th cylinder point downwards at an angle.

Cam follower (1) is not actuated.

NOTE: When the engine is installed, the position of the exhaust camshaft (3) for the timing can only be checked with a mirror.

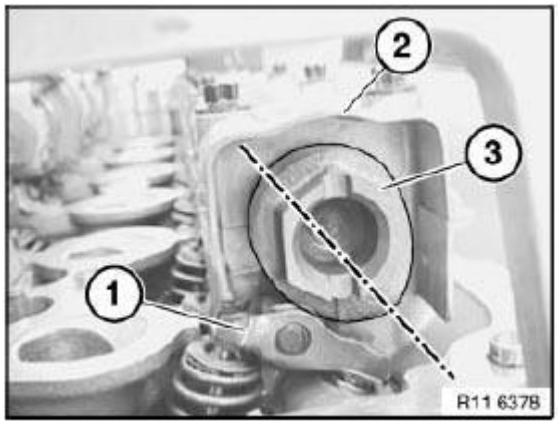


Fig. 208: Exhaust Camshaft And Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: Fit special tool 11 4 282 underneath on side of inlet camshaft. Mount special tool 11 4 281 on inlet and exhaust camshafts.

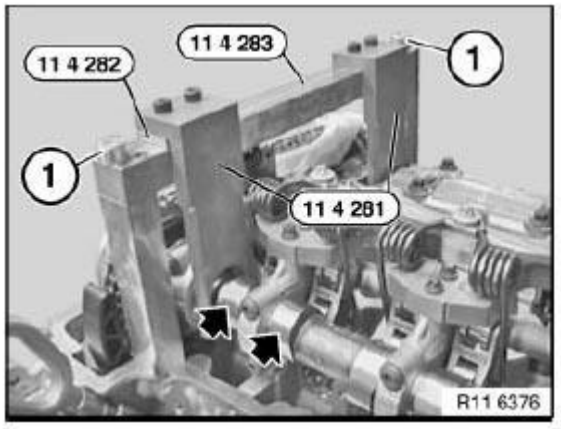


Fig. 209: Cylinder Head Bolts And Special Tools (11 4 282) And (11 4 281)
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, adjust valve timing, see **11 31 505 Adjusting timing of camshaft(s) (N52K)**.

Assemble engine.

11 31 025 REMOVING AND INSTALLING/REPLACING INLET CAMSHAFT (N52K)

Special tools required:

- 11 4 281
- 11 4 481

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

Necessary preliminary tasks:

- Remove **cylinder head cover**
- Remove inlet adjustment unit
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Adjust valve timing, see **11 31 505 Adjusting timing of camshaft(s) (N52K)**.

NOTE: All bearing caps (1 and 2) are marked with numbers from 1 to 6.

Bearing cap (1) is a thrust bearing.

Release screws on bearing caps 1 to 6 (1 and 2).

Tightening torque: 11 31 2AZ, see **11 31 CAMSHAFT** .

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

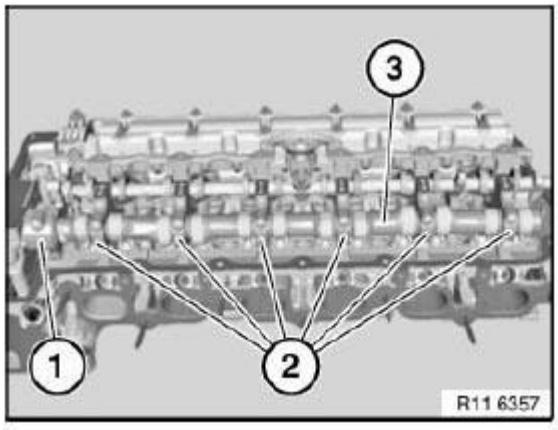


Fig. 210: Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Remove inlet camshaft (2) towards top.

Installation:

Clean all bearing points and lubricate with oil.

Check plain compression rings (1) for damage and replace if necessary.

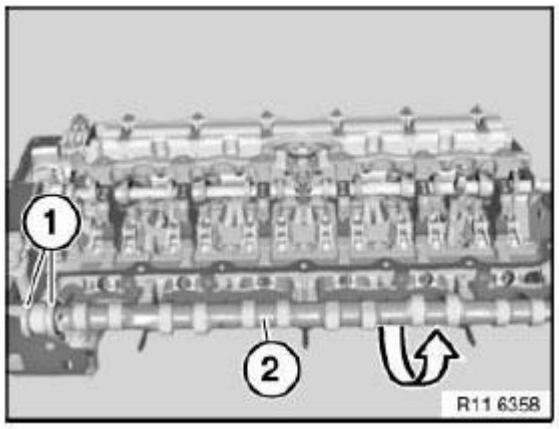


Fig. 211: Removing Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Plain compression rings (1) are engaged at joint.

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

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

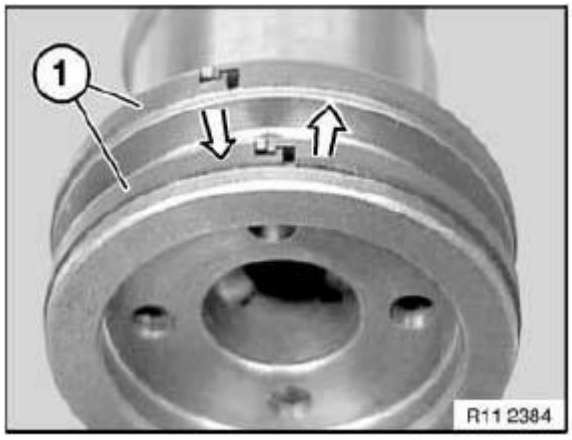
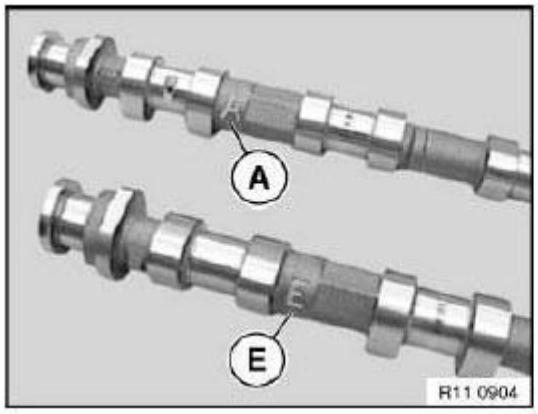


Fig. 212: Removing Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

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



A Exhaust camshaft.
E Inlet camshaft

Fig. 213: Markings Of Inlet And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Insert inlet camshaft (1) so that part number on twin surface points upwards.

Position inlet camshaft (1) so that cams point upwards at an angle.

Attach special tool 11 4 281 to twin surface.

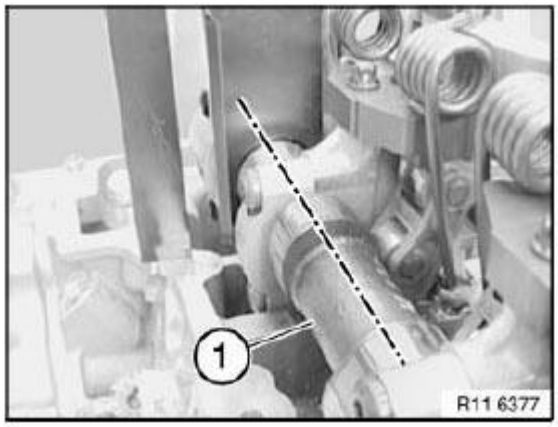


Fig. 214: Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

Special tools required:

- 00 9 120
- 11 4 350
- 11 4 461

- 11 4 462
- 11 4 463
- 11 9 000

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

Necessary preliminary tasks:

- Remove **cylinder head cover**
- Remove exhaust adjustment unit
- Adjust valve timing

The screw connection of the bearing banks must be released from the outside inwards.

Lift out upper and lower bearing banks (1) with exhaust camshaft.

Remove upper bearing bank (1).

Remove exhaust camshaft from lower bearing bank.

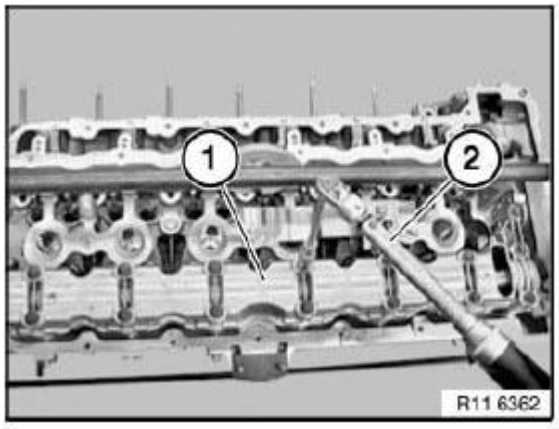


Fig. 215: Upper And Lower Bearing Banks
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Markings of inlet and exhaust camshafts are different.

Mixing up the inlet and exhaust camshaft will result in **engine damage** .

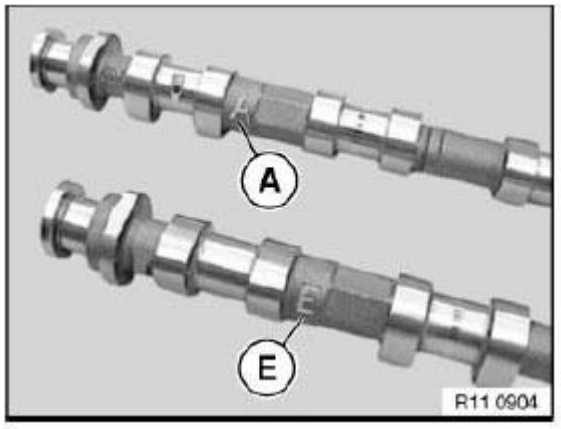


Fig. 216: Markings Of Inlet And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Check plain compression rings (1) for damage and replace if necessary.

Plain compression rings (1) are engaged at joint.

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

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

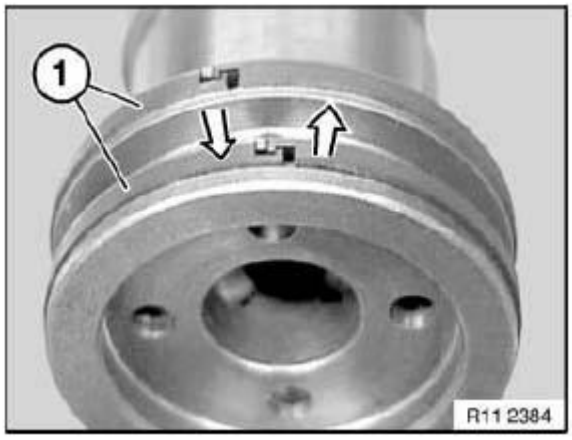


Fig. 217: Removing Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Removal on engine:
Set engine to firing TDC at 1st cylinder.
Removed cylinder head:
When using special tool 11 9 000, it will be necessary to remove the aluminum profile insert.

Mounting bearing bank:

Pre-install special tool 11 4 462 on cylinder no. 2.

Insert special tool 11 4 463 in screw connection of cylinder head cover.

IMPORTANT: Special tool 11 4 463 is a special screw.

Press down cam followers (3) on cylinder no. 2 with spindle nut (2) of special tool 11 4 462.

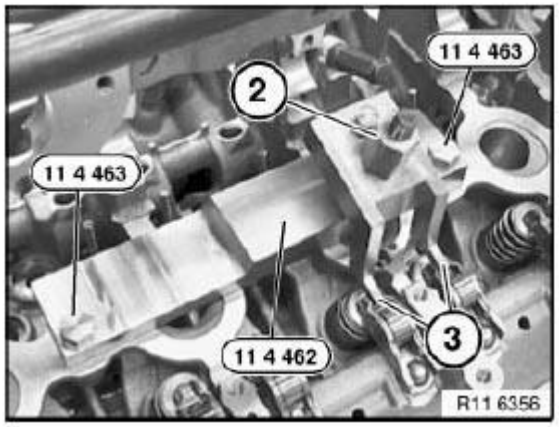


Fig. 218: Cam Followers, Spindle Nut And Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Before mounting the exhaust camshaft on the correct cam follower seat (1), pay attention to the hydraulic valve clearance adjustment element and the valve.

Refer to **REMOVING AND INSTALLING/REPLACING ALL CAM FOLLOWERS**.

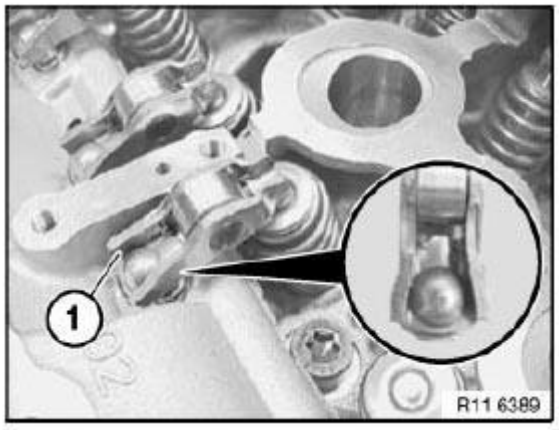


Fig. 219: Cam Follower Seat
Courtesy of BMW OF NORTH AMERICA, INC.

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

Align exhaust camshaft (2).

Cylinder nos. 2 and 4 are at valve overlap.

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

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

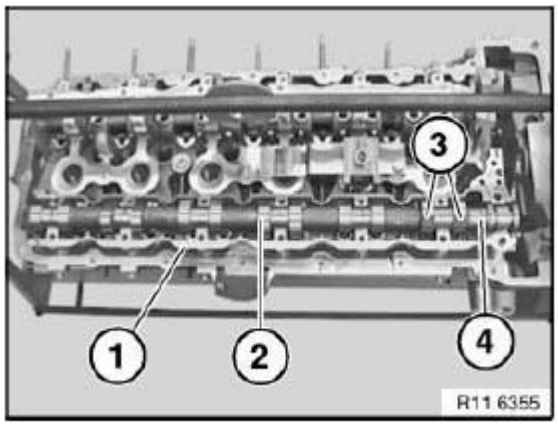


Fig. 220: Lower Bearing Bank, Exhaust Camshaft With Part Number And Cams
Courtesy of BMW OF NORTH AMERICA, INC.

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

Fit upper bearing bank (1).

Insert bolts dry.

Tension down upper bearing bank (1) with exhaust camshaft at bearing points 3 and 5 through a 1/2 bolt turn.

Join exhaust camshaft to upper and lower bearing banks (1) with torque wrench (2) from inside outwards to **8 Nm** .

Release all screws of upper bearing bank (1) from outside inwards by 90°.

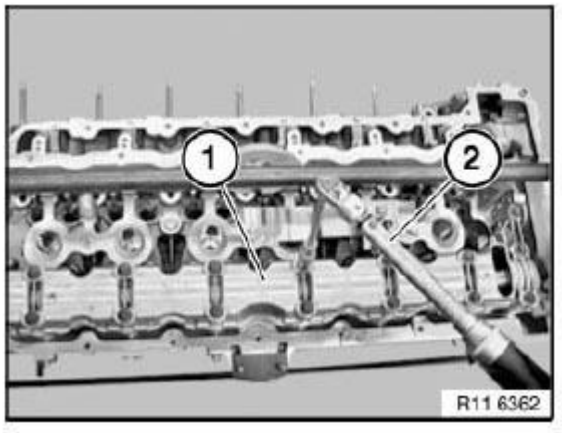


Fig. 221: Upper And Lower Bearing Banks
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Upper and lower bearing banks must be aligned to each other at ground surfaces (1 and 2).

Make sure that the thrust piece and the legs of special tools 11 4 461 rest on the milled surfaces.

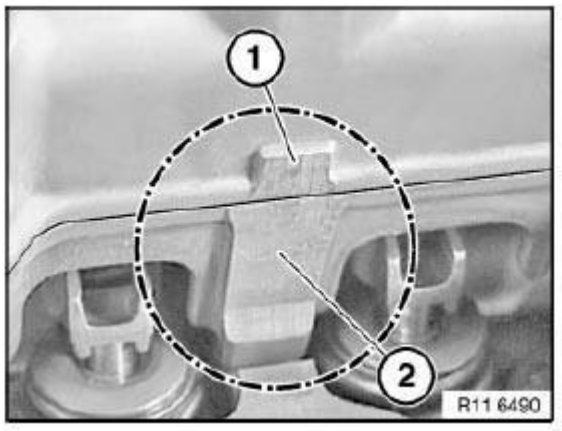


Fig. 222: Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic depiction of special tool 11 4 461 at upper bearing bank (1) and lower bearing bank (2).

Pretension all special tools 11 4 461 with special tool 11 4 350 only.

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

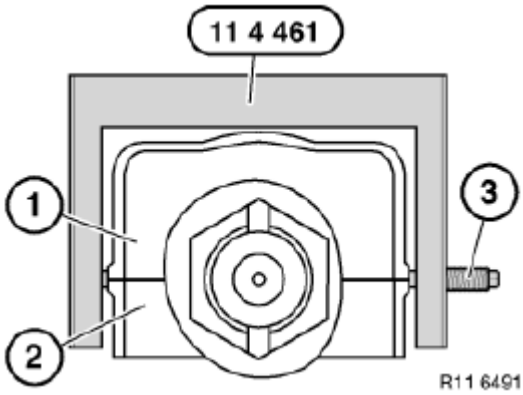


Fig. 223: Screw, Upper And Lower Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool 11 4 461 over screw connection of bearing banks.

Make sure that the legs rest exactly on the ground surfaces of the upper bearing bank (2) and lower bearing bank (1).

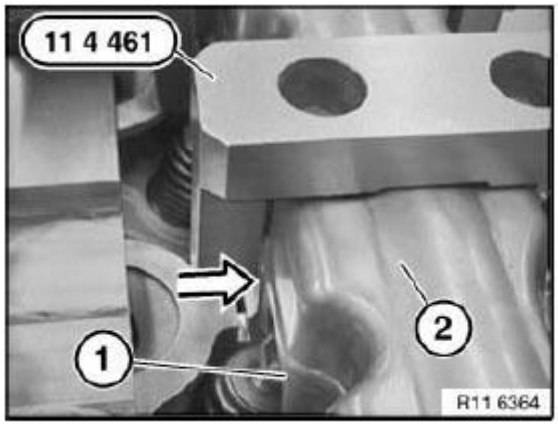


Fig. 224: Special Tool (11 4 461), Upper And Lower Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

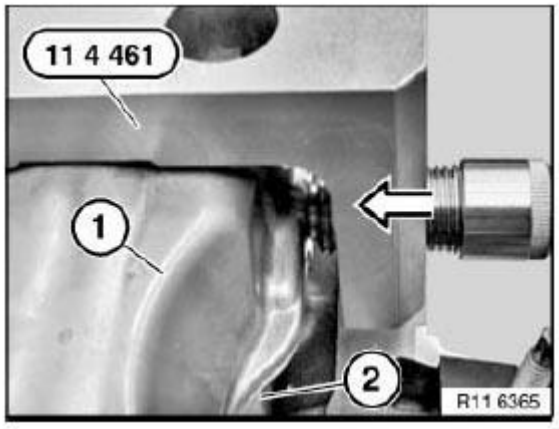


Fig. 225: Tightening Special Tool (11 4 461) Screw On Upper And Lower Bearing Bank Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

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

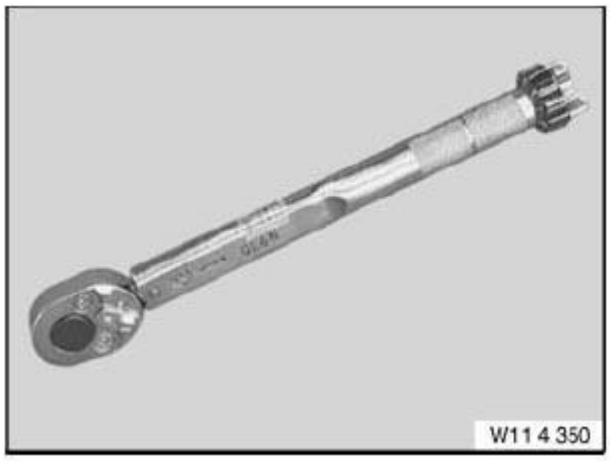


Fig. 226: Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

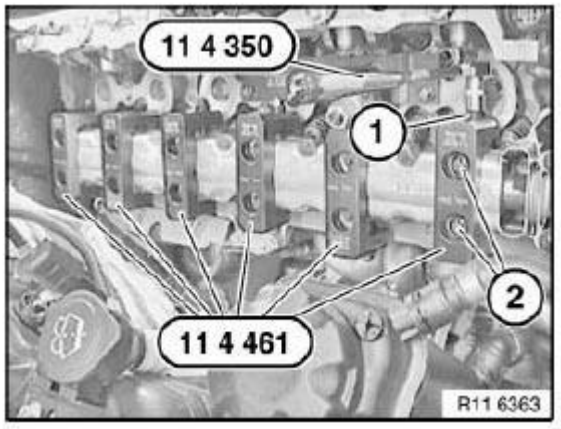


Fig. 227: Special Tools (11 4 461) And (11 4 350)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque: 11 31 1AZ, see **11 31 CAMSHAFT** .

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

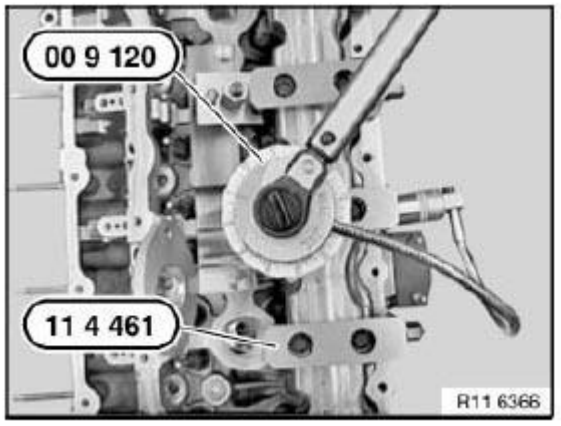


Fig. 228: Special Tools (11 4 461) And (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 051 REPLACING TIMING CHAIN (N52K)

Special tools required:

- 00 9 140
- 11 0 300

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

Necessary preliminary tasks:

- Remove **cylinder head cover**
- Remove all spark plugs
- Remove chain tensioner, see **11 31 090 Installing and removing/replacing chain tensioner piston (N52K)**
- Remove crankshaft radial seal at front, see **11 14 005 Replacing front crankshaft radial seal (N52K)**
- Remove drive belt tensioner
- Remove **VIBRATION DAMPER**

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

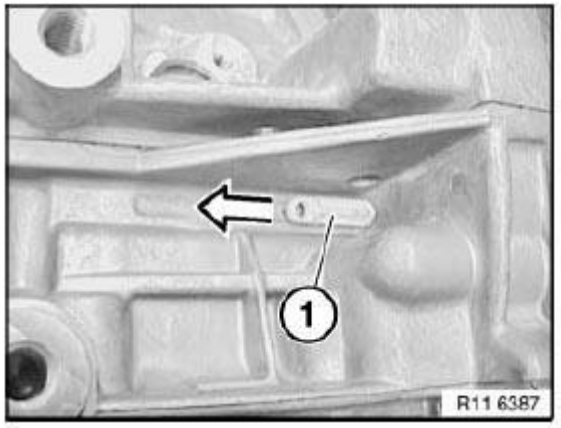


Fig. 229: Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

Slide special tool 11 0 300 in direction of arrow into special tool bore and secure crankshaft.

IMPORTANT: On vehicles with optional extra SA205 (automatic transmission), there is a large bore for the TDC position shortly before the special tool bore. This bore can be confused with the special tool bore.

If the flywheel is secured in the correct special tool bore with special tool 11 0 300 , the engine can no longer be moved at the central bolt.

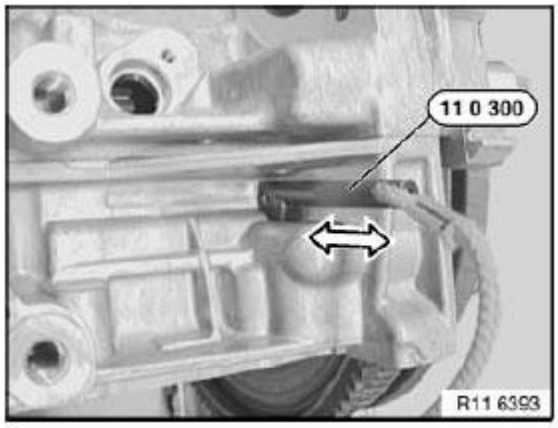


Fig. 230: Securing Crankshaft Using Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not remove special tool 11 0 300 to release central bolt (1). Employ a second person for gripping when releasing central bolt (1).

Screw special tool 11 9 280 onto hub of vibration damper.

Release central bolt (1).

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

Remove hub towards front.

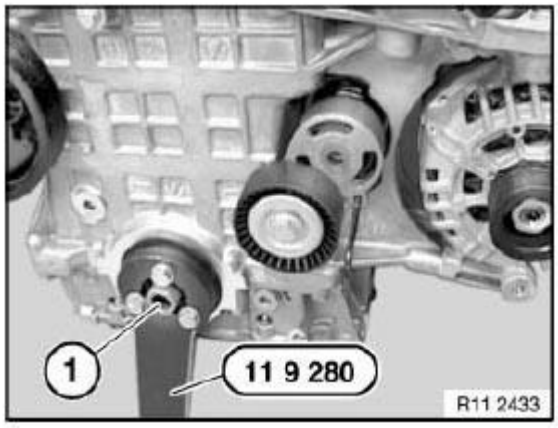


Fig. 231: Central Bolt With Special Tool (11 9 280)
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque: 11 31 7AZ, see **11 31 CAMSHAFT** .

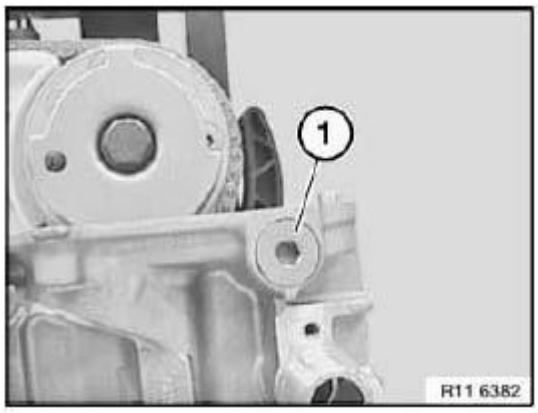


Fig. 232: Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque: 11 11 7AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

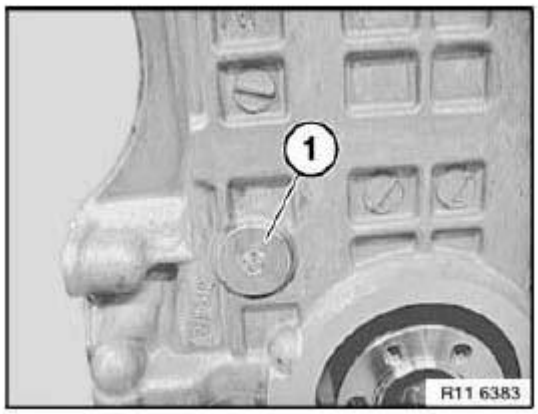


Fig. 233: Plug
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque: 11 31 5AZ, see **11 31 CAMSHAFT** .

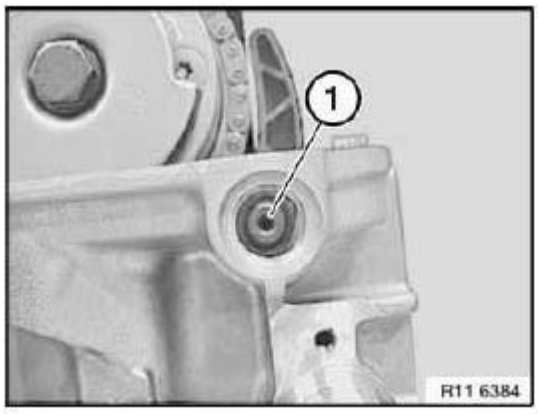


Fig. 234: Bearing Pin
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque: 11 31 4AZ, see **11 31 CAMSHAFT** .

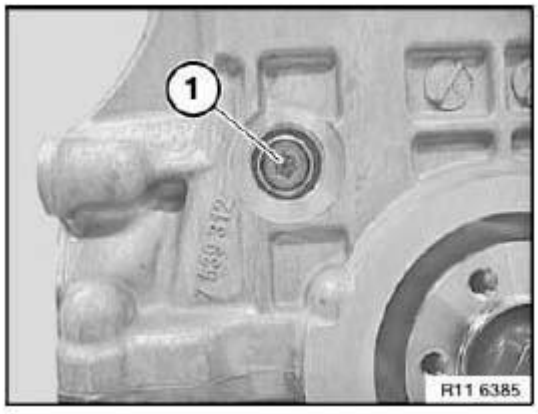


Fig. 235: Bearing Pin
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

Do not remove special tool 11 4 280 .

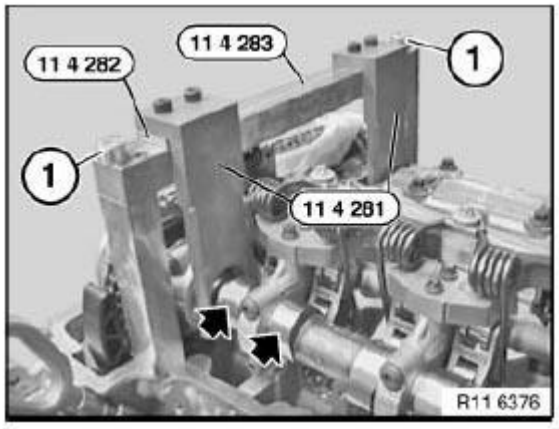


Fig. 236: Cylinder Head Bolts And Special Tools (11 4 282) And (11 4 281)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove inlet and exhaust adjustment unit.

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

Tightening torque: 11 31 3AZ, see **11 31 CAMSHAFT** .

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

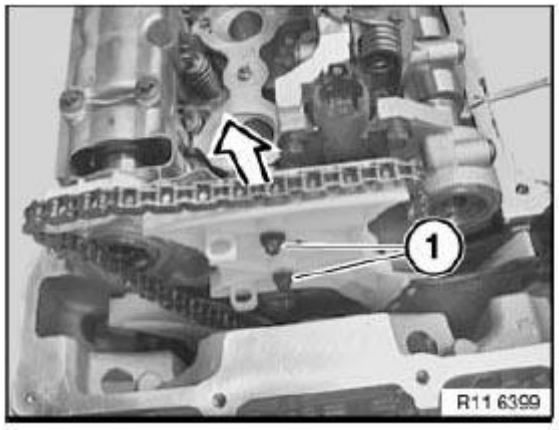


Fig. 237: Removing Timing Chain Module Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket wheel (2).
Collar (see arrow) on sprocket wheel (2) points to engine .
Incorrect assembly will result in engine damage .

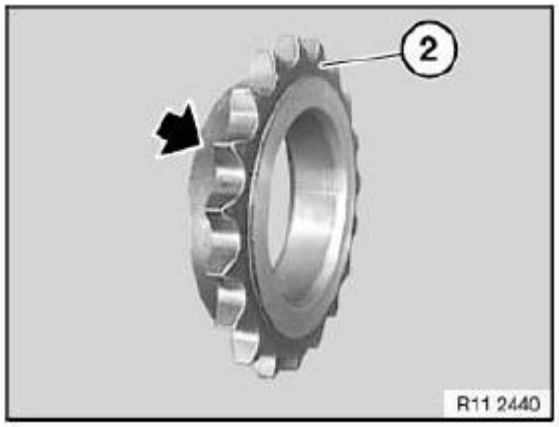


Fig. 238: Collar On Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Pull timing chain (1) upwards until sprocket wheel (2) engages chain guide (3).

Install timing chain (1) and sprocket wheel (2) in this position.

Installation:

Always hold timing chain (1) under tension. Timing chain (1) may jam on chain guide (3).

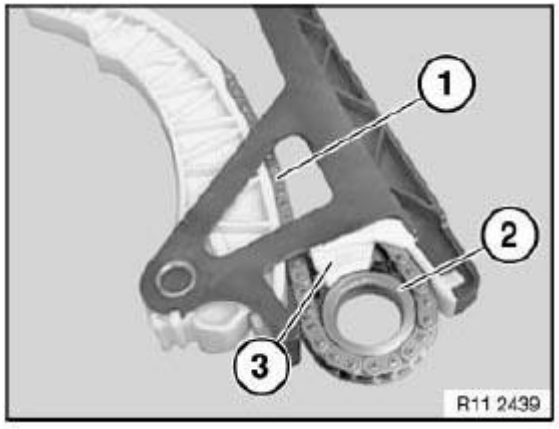


Fig. 239: Timing Chain, Sprocket Wheel And Chain Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Install hub with central bolt.

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

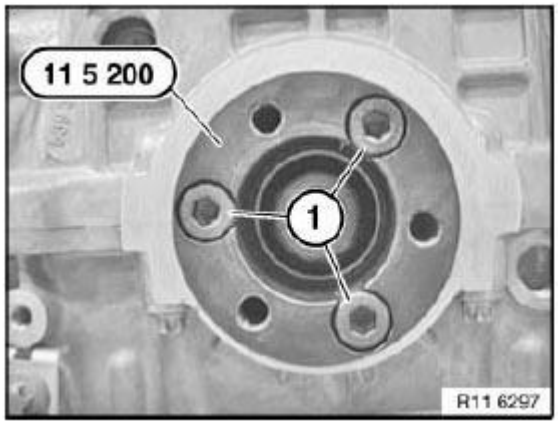


Fig. 240: Screws With Special Tool (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove tensioner for drive belt.

Screw in special tool 11 4 362 from special tool kit 11 4 360 .

Mount special tool 11 9 280 on 11 5 200 .

Support special tool 11 9 280 on special tool 11 4 362 .

Special tool 11 0 300 secures crankshaft.

Tighten central bolt to jointing torque.

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

Mark central bolt and hub with paint.

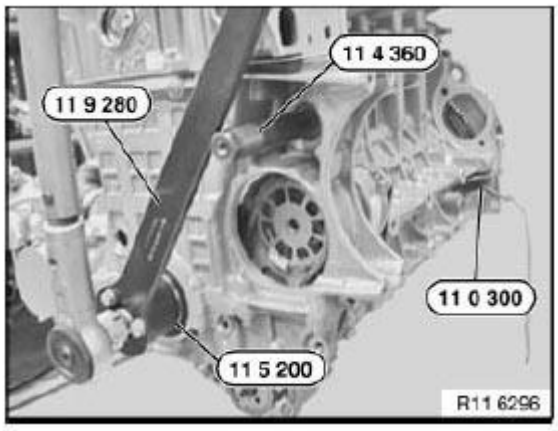


Fig. 241: Special Tools (11 9 280), (11 0 300), (11 4 360) And (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Mark special tools with colored line (1).

See picture.

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

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

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

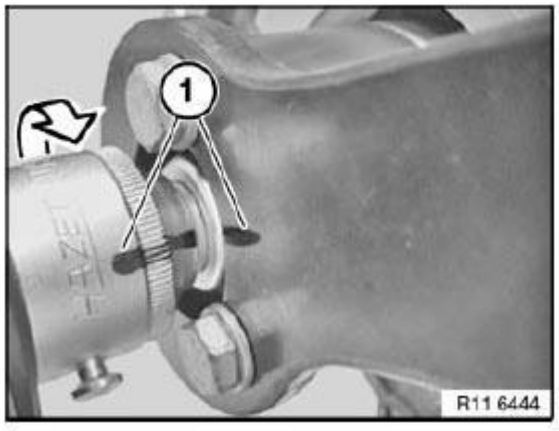


Fig. 242: Marking Special Tools With Colored Line
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten central bolt with a second person helping.

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

Install inlet and exhaust adjustment units.

Install chain tensioner, see **11 31 090 Installing and removing/replacing chain tensioner piston (N52K)**.

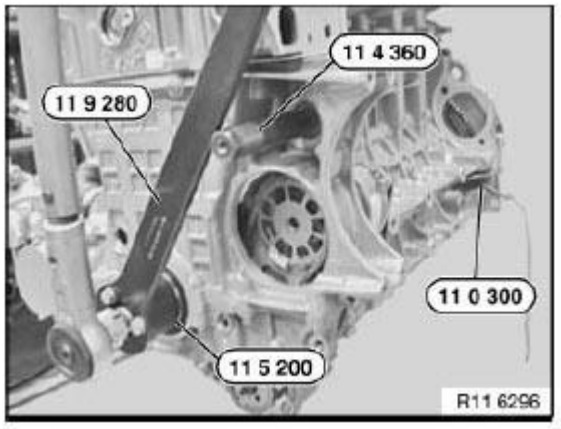


Fig. 243: Special Tools (11 9 280), (11 0 300), (11 4 360) And (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Crank engine twice.

Check timing, see **11 31 005 Checking timing of camshaft(s) (N52K)**.

If necessary, adjust valve timing, see **11 31 505 Adjusting timing of camshaft(s) (N52K)**.

Assemble engine.

11 31 090 INSTALLING AND REMOVING/REPLACING CHAIN TENSIONER PISTON (N52K)

Release chain tensioner (1).

Tightening torque: 11 31 6AZ, see **11 31 CAMSHAFT** .

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

Installation:

No sealing ring is fitted during series-production assembly.

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

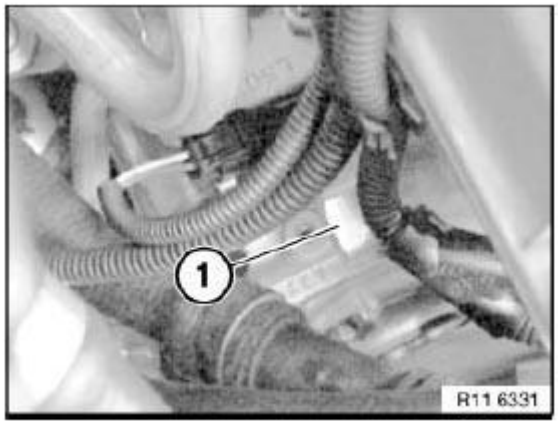


Fig. 244: Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

If the chain tensioner is reused, its oil chamber must be drained. Place chain tensioner on a level working surface and slowly compress.

Repeat procedure twice.

Fig. 245: Compressing Chain Tensioner On A Level Working Surface
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

Special tools required:

- **00 9 120 TORQUE ANGLE MEASURING DIAL**
- **00 9 250 TORSION ANGLE WRENCH WITH FLEXIBLE EXTENSION**
- 11 0 300
- 11 4 280

- 11 4 281
- 11 4 282
- 11 4 283
- 11 4 290
- 11 9 340

Necessary preliminary tasks:

- Remove **cylinder head cover**

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

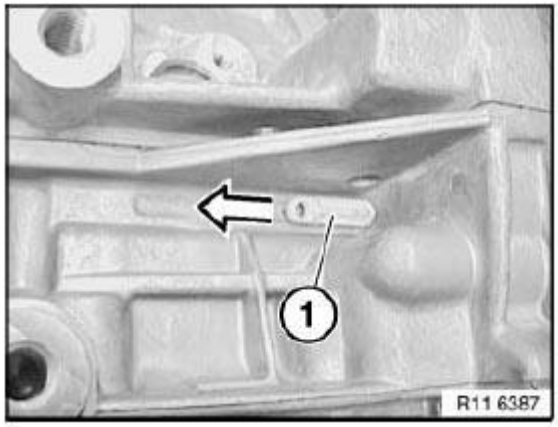


Fig. 246: Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

Slide special tool 11 0 300 in direction of arrow into special tool bore and secure crankshaft.

IMPORTANT: On vehicles with optional extra SA205 (automatic transmission), there is a large bore for the TDC position shortly before the special tool bore. This bore can be confused with the special tool bore.

If the flywheel is secured in the correct special tool bore with special tool 11 0 300 , the engine can no longer be moved at the central bolt.

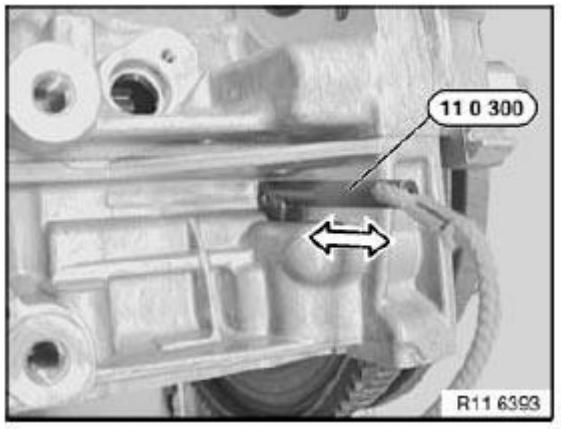


Fig. 247: Securing Crankshaft Using Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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

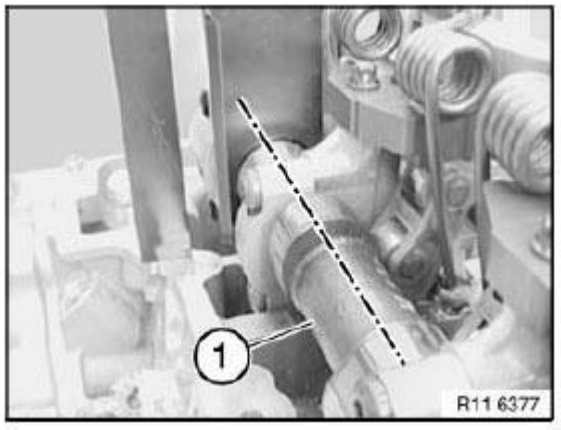


Fig. 248: Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

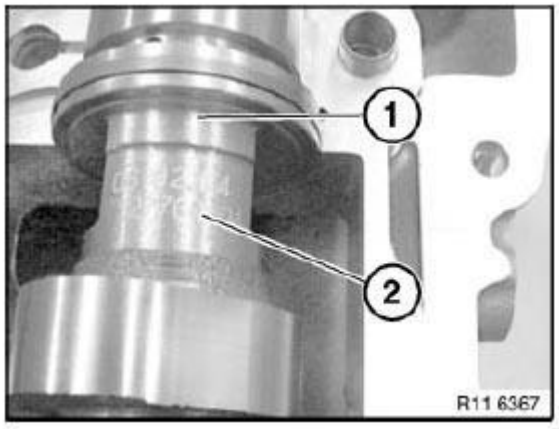


Fig. 249: Part Numbers On Inlet And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of exhaust camshaft (3) at 6th cylinder point downwards at an angle.

Cam follower (1) is not actuated.

NOTE: When the engine is installed, the position of the exhaust camshaft (3) for the timing can only be checked with a mirror.

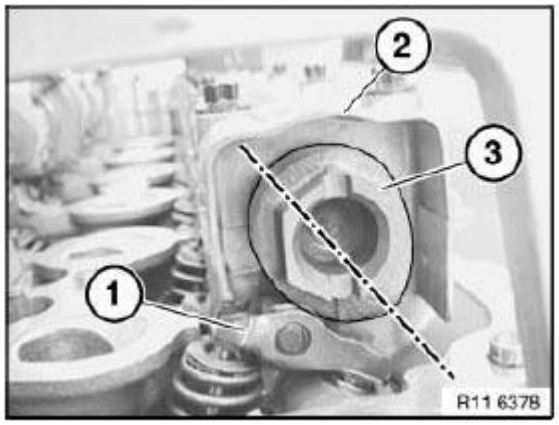


Fig. 250: Exhaust Camshaft And Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

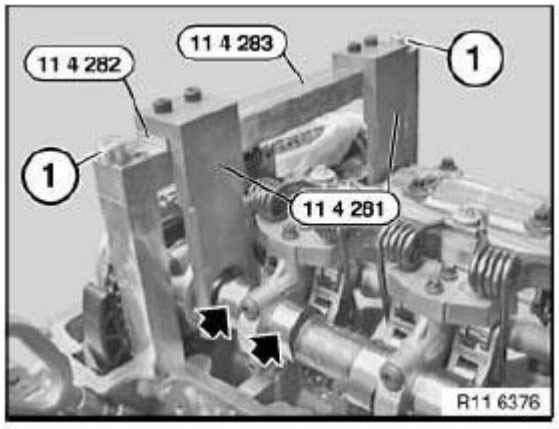


Fig. 251: Cylinder Head Bolts And Special Tools (11 4 282) And (11 4 281)
Courtesy of BMW OF NORTH AMERICA, INC.

Release central bolts (1).

Release central bolts (1) with special tool 11 4 280 only.

Release chain tensioner (2) (have a cleaning cloth ready).

NOTE: Picture in CAD and does not show special tools.

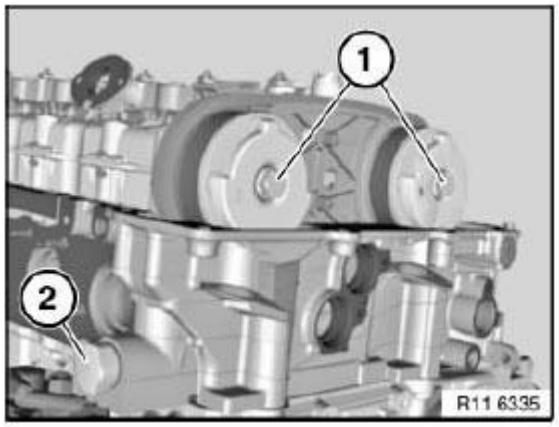


Fig. 252: Central Bolts And Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

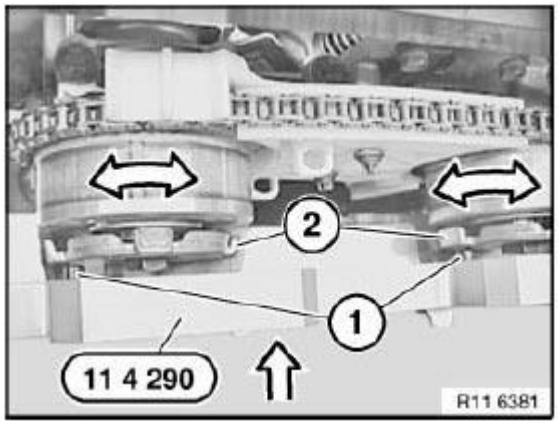


Fig. 253: Sensor Gears, Locating Pins And Special Tool (11 4 290)
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 290 with bolts (1).

Screw special tool 11 9 340 into cylinder head.

Pretension timing chain with special tool 00 9 250 to **0.6 Nm** .

Secure both central bolts of inlet and exhaust adjustment units with special tool 00 9 120 to inlet and exhaust camshafts.

Tightening torque: 11 36 1AZ, see **11 36 VARIABLE CAMSHAFT CONTROL VANOS** .

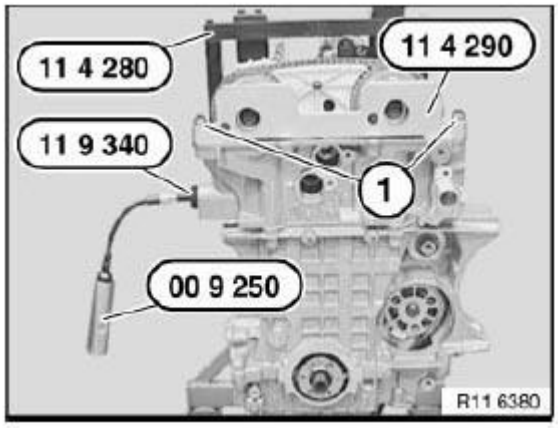


Fig. 254: Special Tools (00 9 250), (11 9 340) And (11 4 290)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

ROCKER ARM WITH BEARING MOUNT

11 33 050 REMOVING AND INSTALLING/REPLACING ALL CAM FOLLOWERS (N52K)

Special tools required:

- 11 4 480

Necessary preliminary tasks:

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

IMPORTANT: Rocker arms (1) are divided into bearing categories.
The tolerance classes are marked according to the picture in numbers from 1 to 5.
Already used rocker arms (1) may only be reused in the same position.

Detach cam followers (1) from HVCA element and remove.

Set down all cam followers (1) in neat order in special tool 11 4 480 .

Installation:

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

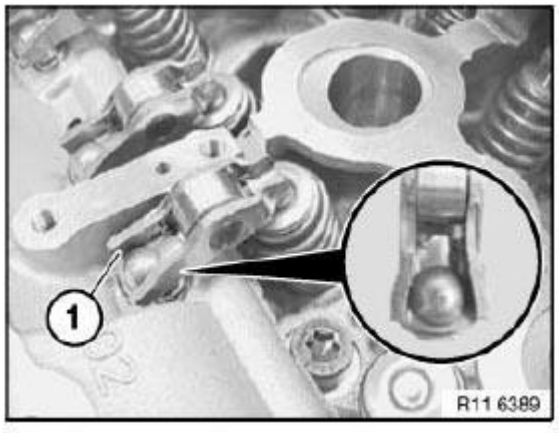


Fig. 255: Cam Follower Seat
Courtesy of BMW OF NORTH AMERICA, INC.

Remove HVCA element (1) in direction of arrow.

Installation:

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

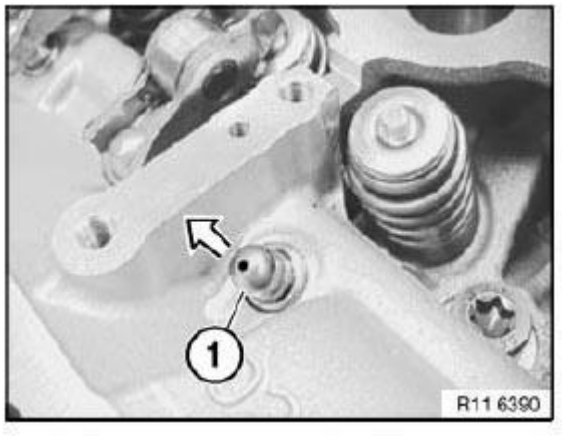


Fig. 256: Removing HVCA Element
Courtesy of BMW OF NORTH AMERICA, INC.

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:

- 11 4 480

Necessary preliminary tasks:

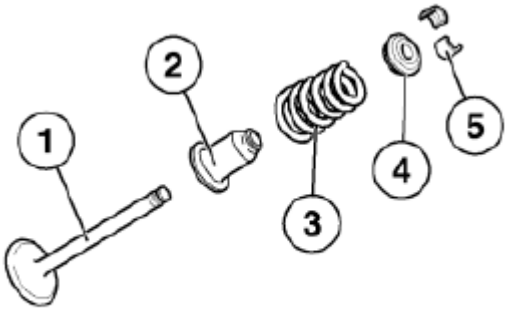
- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Remove eccentric shaft, see **11 37 005 Removing and installing/replacing eccentric shaft (N52K)**
- Remove inlet camshaft, see **11 31 025 Removing and installing/replacing inlet camshaft (N52K)**
- Remove exhaust camshaft, see **11 31 028 Removing and installing/replacing exhaust camshaft (N52K)**
- Remove cam followers, see **11 33 050 Removing and installing/replacing all cam followers (N52K)**
- Remove valve springs, see **11 34 715 Replacing all valve springs (N52K)**
- Remove valve stem seals, see **11 34 560 Replacing all valve stem seals (N52K)**

Arrangement:

1. Valve
2. Valve stem seal with lower spring plate

3. Valve spring
4. Upper spring plate
5. Valve tapers

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



R11 4170

Fig. 257: Upper Spring Plate, Valve Tapers And Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

11 34 560 REPLACING ALL VALVE STEM SEALS (N52K)

Special tools required:

- 11 1 480
- 11 6 380

Necessary preliminary tasks:

- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Remove eccentric shaft, see **11 37 005 Removing and installing/replacing eccentric shaft (N52K)**
- Remove inlet camshaft, see **11 31 025 Removing and installing/replacing inlet camshaft (N52K)**
- Remove exhaust camshaft, see **11 31 028 Removing and installing/replacing exhaust camshaft (N52K)**.
- Remove cam followers, see **11 33 050 Removing and installing/replacing all cam followers (N52K)**

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

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

Installation:

Insert all valves.

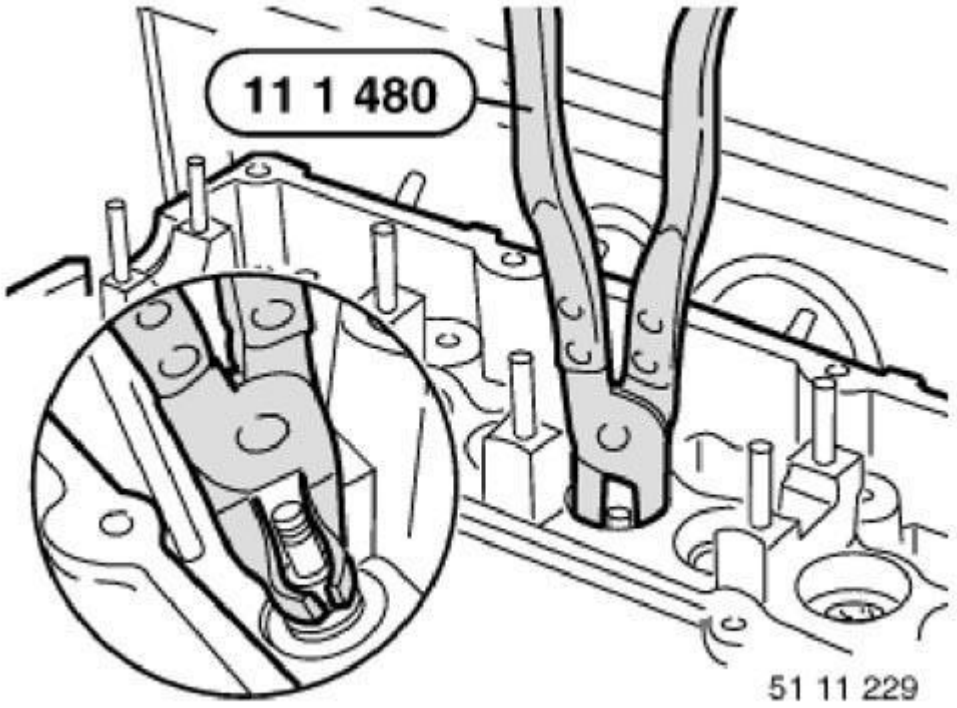


Fig. 258: Special Tool (11 1 480)
Courtesy of BMW OF NORTH AMERICA, INC.

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

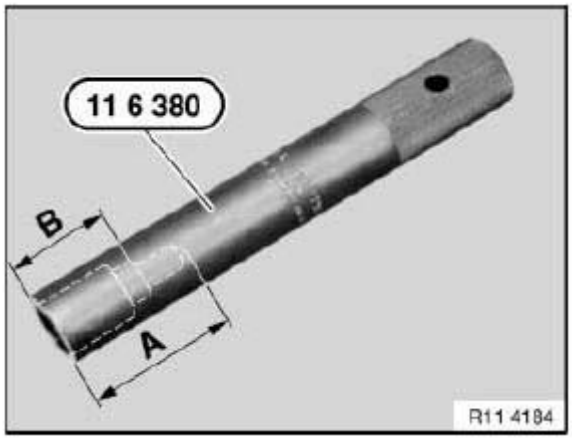


Fig. 259: Special Tool (11 6 380) With Dimensions
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Different diameters at valve stem.
All valve stem seals are color-coded.

For 5 mm dia. valves, the valve stem seal is marked red or brown.

For 6 mm dia. valves, the valve stem seal is marked green or light green.

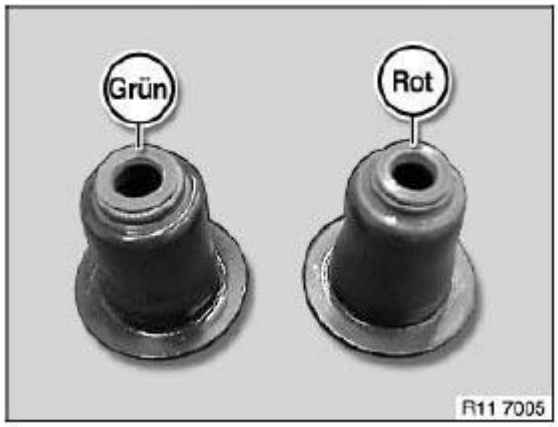


Fig. 260: Valve Stem Seals Color-Coded, Green (Grun), and Red (Rot)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

Lubricate mounting sleeve.

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

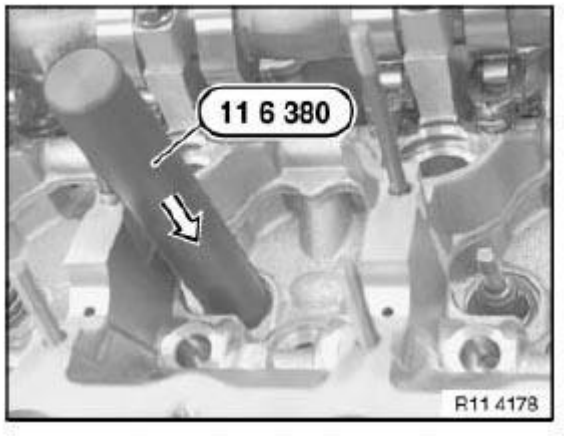


Fig. 261: Special Tool (11 6 380)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 34 715 REPLACING ALL VALVE SPRINGS (N52K)

Special tools required:

- 11 0 346
- 11 4 480
- 11 9 000
- 11 9 017

Necessary preliminary tasks:

- Remove cylinder head, see **11 12 100 Removing and installing cylinder head (N52K)**.
- Remove exhaust camshaft, see **11 31 028 Removing and installing/replacing exhaust camshaft (N52K)**.
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.
- Remove inlet camshaft, see **11 31 025 Removing and installing/replacing inlet camshaft (N52K)**
- Remove cam followers, see **11 33 050 Removing and installing/replacing all cam followers (N52K)**

Place cylinder head on special tool 11 9 000 .

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

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

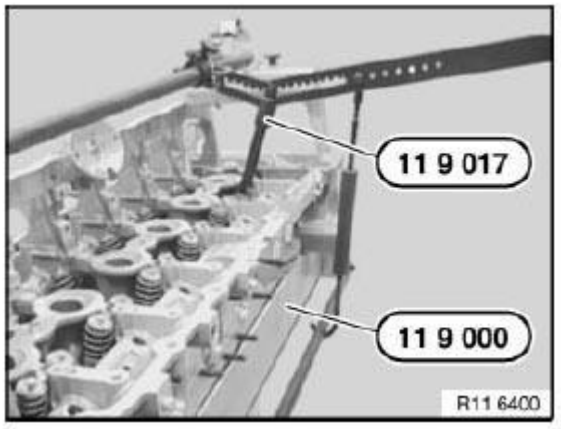


Fig. 262: Special Tool (11 9 017) And (11 9 000)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove valve cotters with a magnet.

Remove valve spring with spring plates.

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

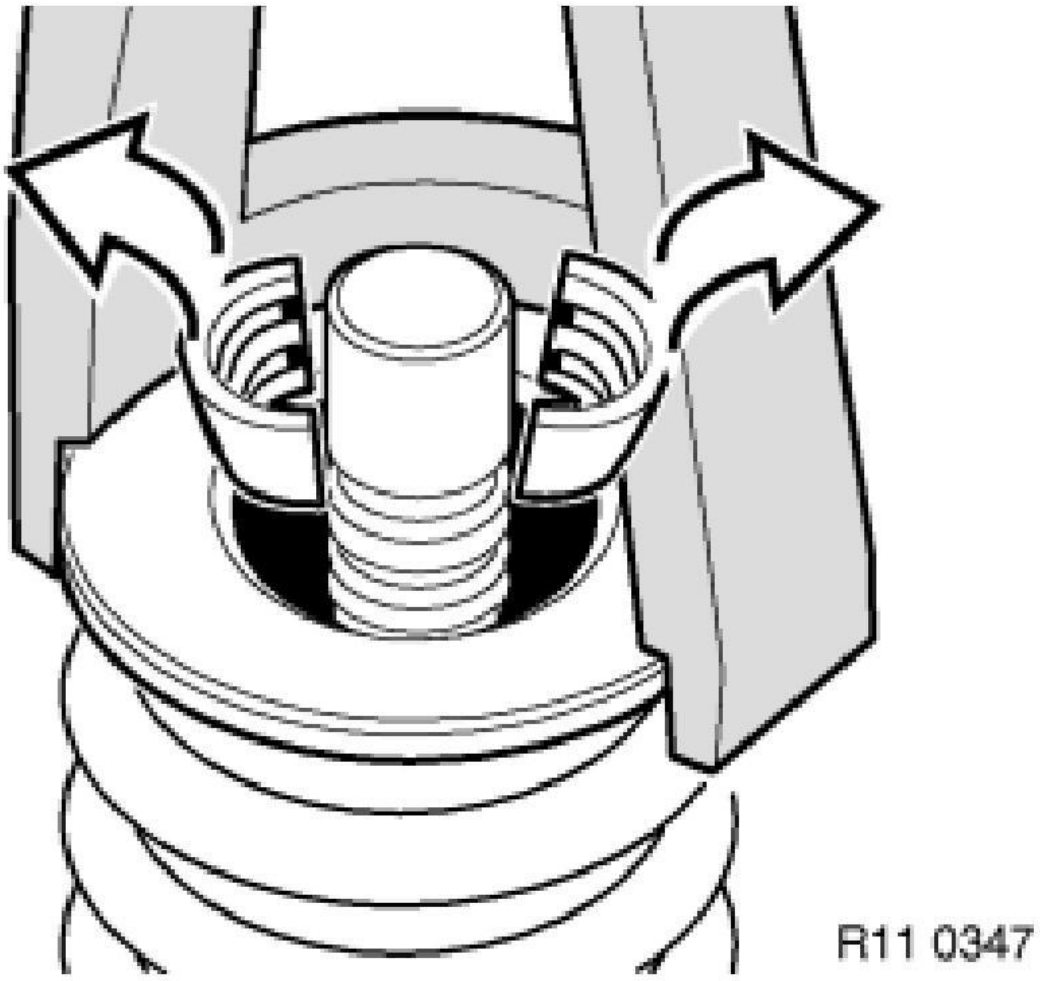


Fig. 263: Removing Valve Cotters With Magnet
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

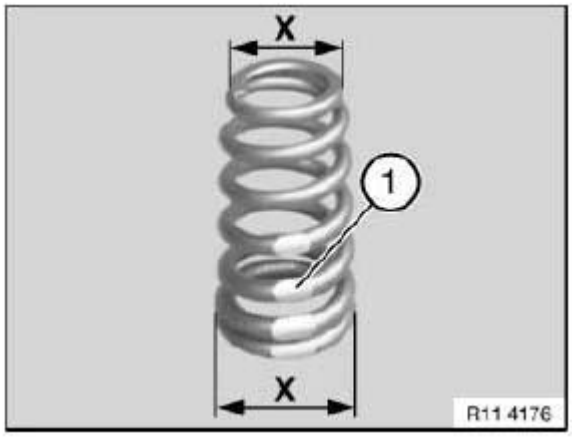


Fig. 264: Valve Spring Color-Coded
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement:

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

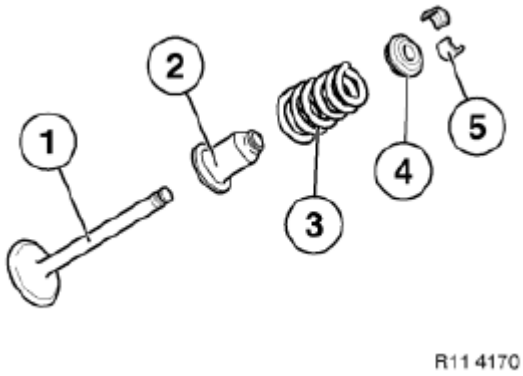


Fig. 265: Upper Spring Plate, Valve Tapers And Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

VARIABLE VALVE GEAR

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

Special tools required:

- 11 4 481

Necessary preliminary tasks:

- Remove **cylinder head cover**
- Remove intermediate lever, see **11 37 010 Removing and installing/replacing intermediate levers (N52K)**.

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

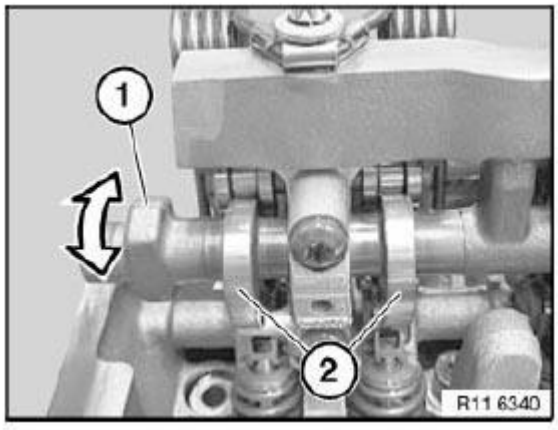


Fig. 266: Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: All bearing caps (1 and 2) of eccentric shaft are marked with numbers from 1 to 6 (1 for 1st cylinder to 6 for 6th cylinder).

Bearing cap 6 (1) is provided with a stop.

Release screws on bearing cap 6 (1).

Release screws on bearing caps 1 to 5 (2).

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

Remove eccentric shaft with gentle tilting and turning movements.

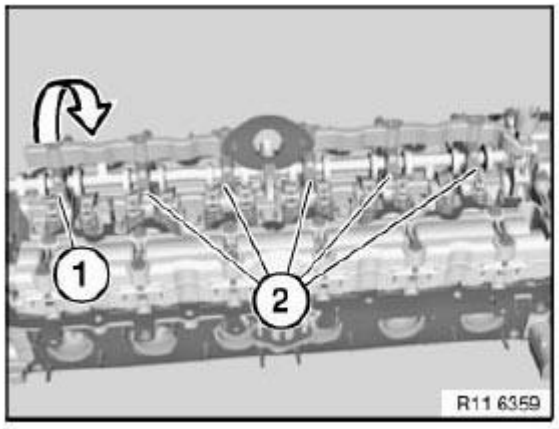


Fig. 267: Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

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

Release screw.

Remove magnet wheel (1).

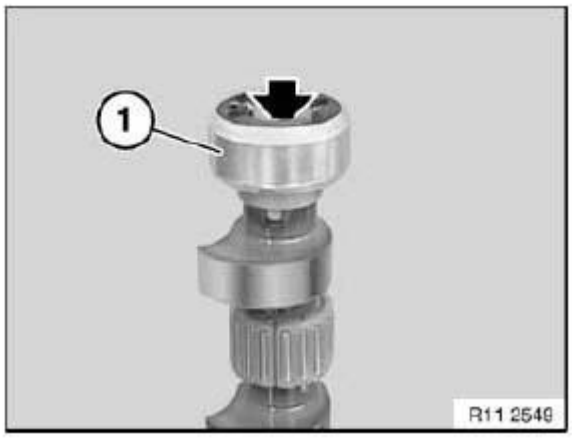


Fig. 268: Magnet Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

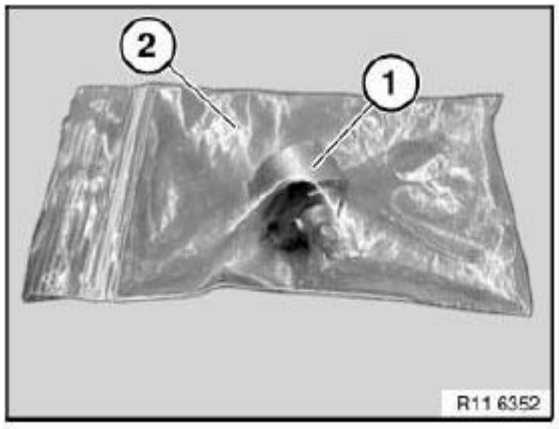


Fig. 269: Magnet Wheel And Plastic Bag
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Needle bearing (1) can break very easily.

Carefully pull needle bearing (1) apart at point of separation.

Remove all needle bearings (1) from eccentric shaft.

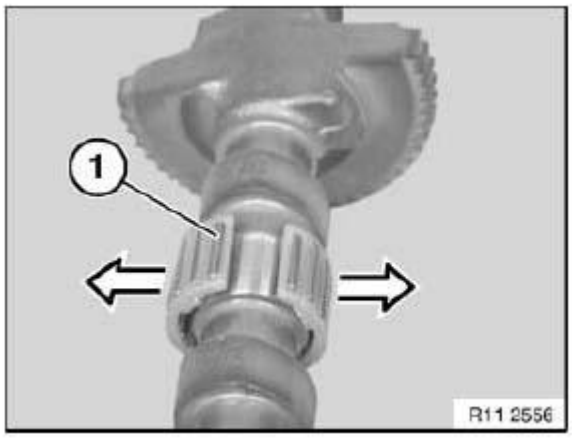


Fig. 270: Removing Needle Bearings From Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Install bearing shells (1) as pictured.

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

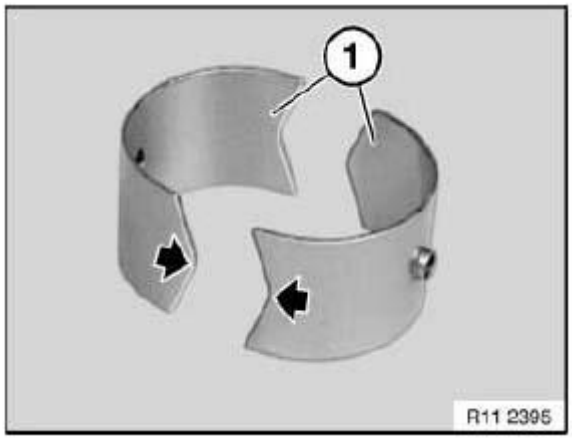


Fig. 271: Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

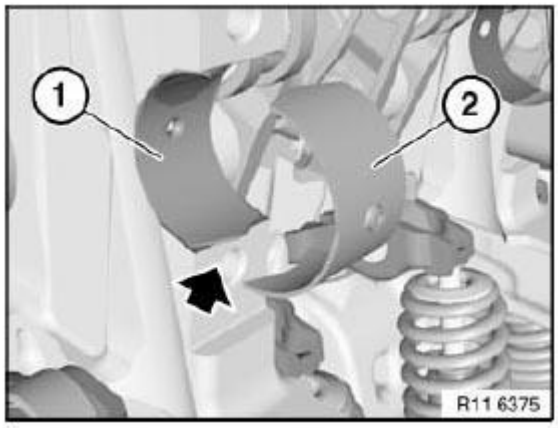


Fig. 272: Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: All bearing caps (1 and 2) of eccentric shaft are marked with numbers from 1 to 6 (1 for 1st cylinder to 6 for 6th cylinder).

Bearing cap 6 (1) is provided with a stop.

Insert eccentric shaft.

Adjust eccentric shaft on dihedron to minimum stroke.

Fit all bearing caps (1 and 2).

Insert all screws.

Tightening torque: 11 12 7AZ, see **11 12 CYLINDER HEAD WITH CYLINDER HEAD COVER** .

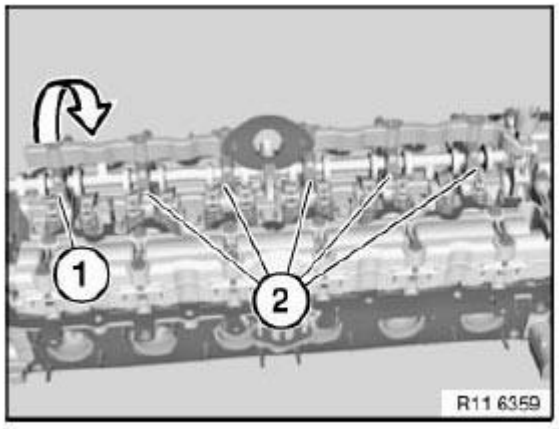


Fig. 273: Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

Special tools required:

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

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

Necessary preliminary tasks:

- Remove **cylinder head cover**

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

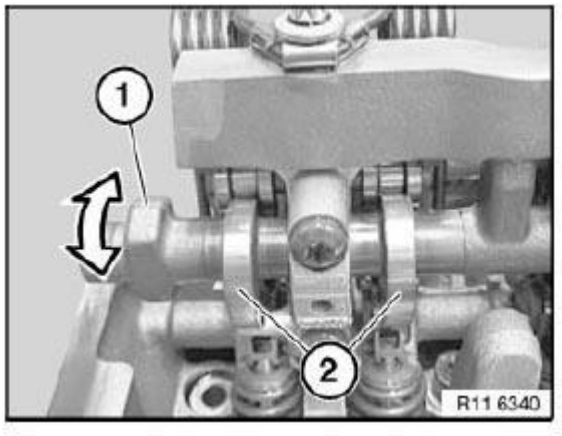


Fig. 274: Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

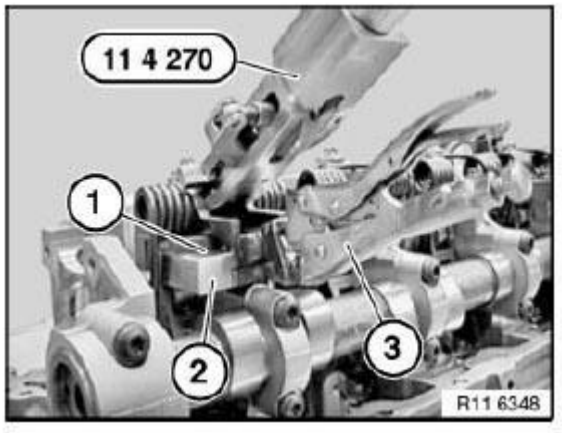


Fig. 275: Special Tool (11 4 270) - Gripping Pliers And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.

IMPORTANT: Improper handling. Risk of damage!

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

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

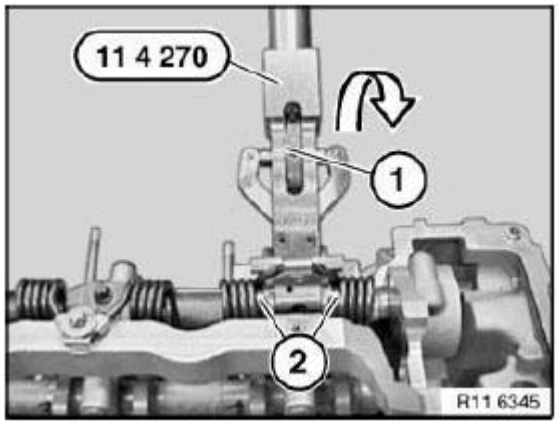


Fig. 276: Securing Bearing Pins In Torsion Springs With Knurled Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (2) of torsion spring.

Tightening torque: 11 37 2AZ, see **11 37 VARIABLE VALVE GEAR** .

To avoid jamming of screw (2) with torsion spring, it is necessary when releasing screw (2) to relieve the pretension on special tool 11 4 270 uniformly.

IMPORTANT: Thread on cylinder head. Risk of damage!

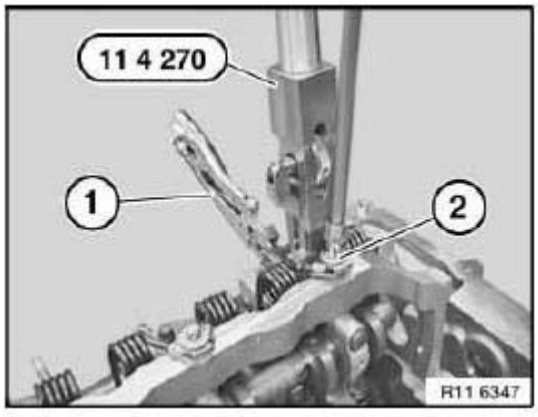


Fig. 277: Torsion Spring Screw And Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Installation:

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

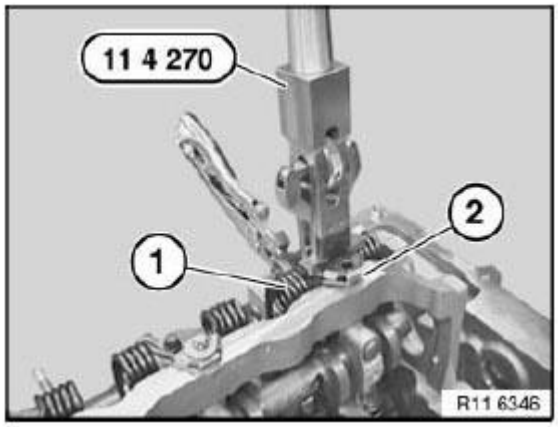


Fig. 278: Special Tool (11 4 270), Torsion Spring And Metal Lug
Courtesy of BMW OF NORTH AMERICA, INC.

Press torsion spring apart at positions (1).

Remove torsion spring towards top.

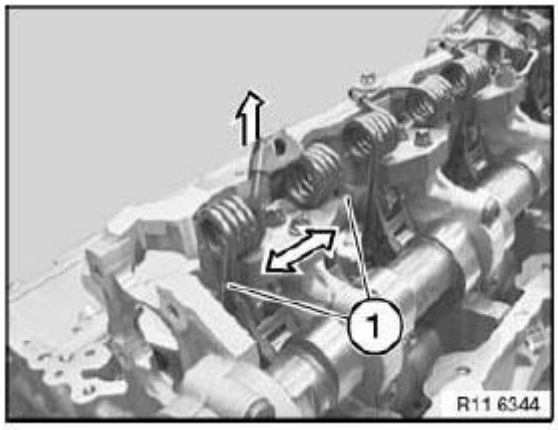


Fig. 279: Removing Torsion Spring
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

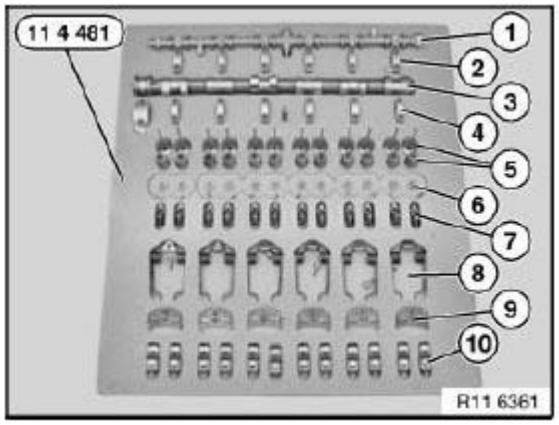


Fig. 280: Torsion Springs, Inlet Camshaft, Guide Blocks And Special Tools (11 4 481)
Courtesy of BMW OF NORTH AMERICA, INC.

1. Eccentric shaft with bearing
2. Bearing caps of eccentric shaft (set out in order)
3. Inlet camshaft
4. Bearing caps of inlet camshaft (set out in order)
5. Inlet valves with valve springs
6. Valve plates and valve cotters
7. Cam followers with HVCA elements (set out in order)
8. Torsion springs
9. Guide blocks (set out in order)
10. Intermediate levers (set out in order)

Release screws (1) on guide block (2).

Tightening torque: 11 37 1AZ, see **11 37 VARIABLE VALVE GEAR** .

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

Installation:

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

This will result in maladjustment of uniform distribution .

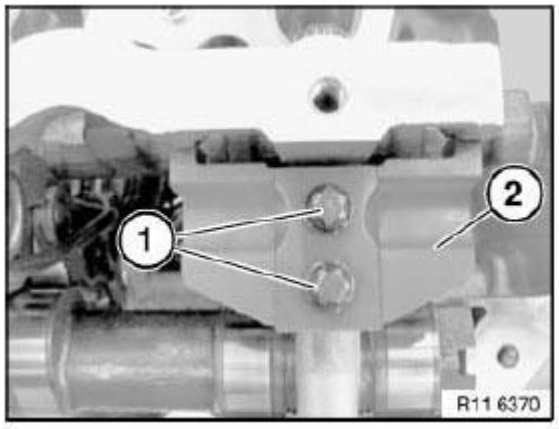


Fig. 281: Screws And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

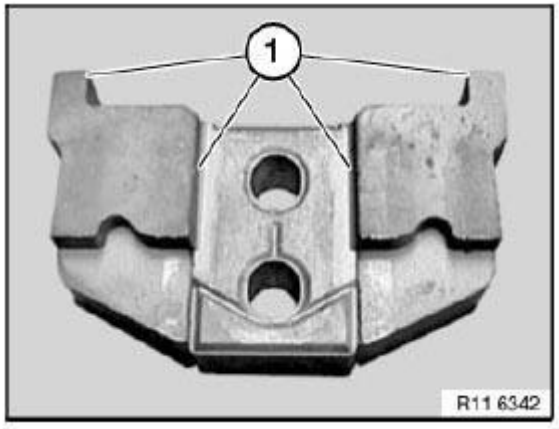


Fig. 282: Guide Block Contact Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out intermediate levers (2).

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

Installation:

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

Installation:

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

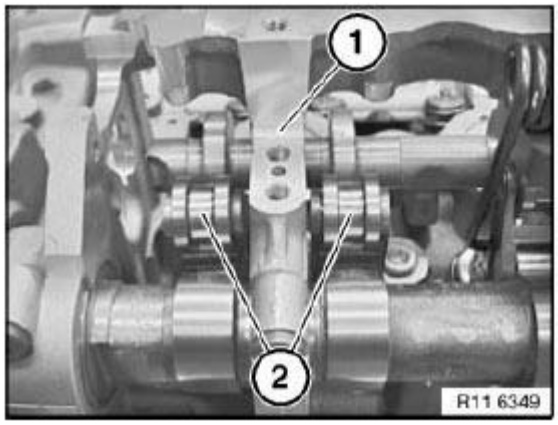


Fig. 283: Contact Surfaces And Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

All intermediate levers (1) are classified.

All intermediate levers (1) must be reinstalled in the same positions in an engine which has already been in use.

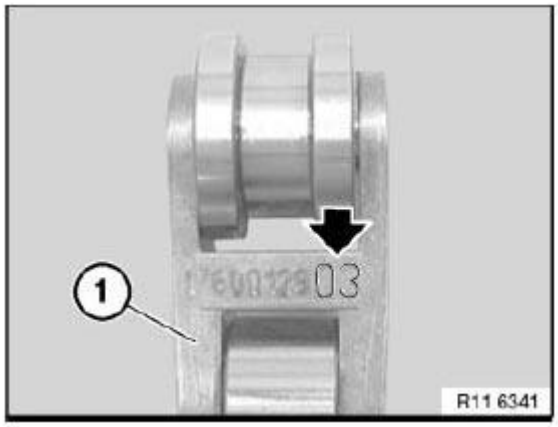


Fig. 284: Intermediate Lever Classification
Courtesy of BMW OF NORTH AMERICA, INC.

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

Install intermediate levers (2).

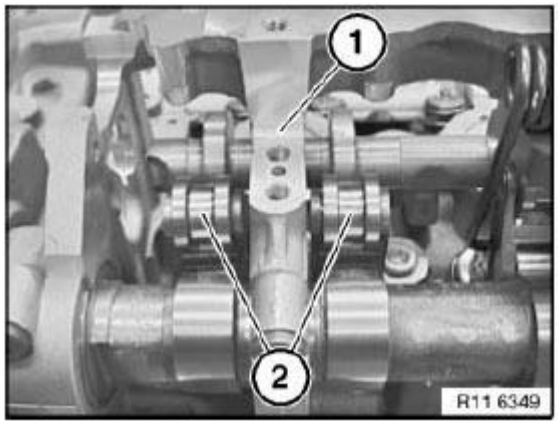


Fig. 285: Contact Surfaces And Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

Fit guide block (2) cleanly into opening.

Tighten screws (1) hand-tight.

Check that intermediate levers are in correct installation position.

Release screws (1) by a 1/4 turn.

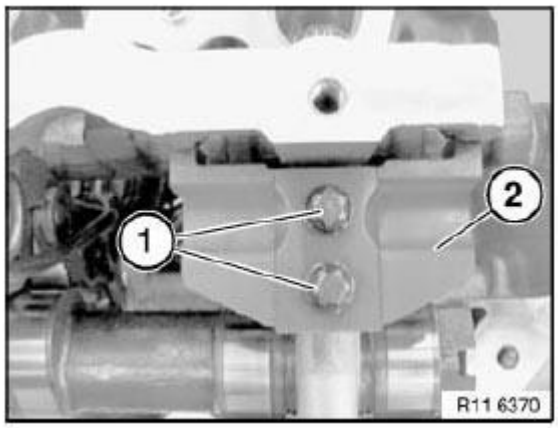


Fig. 286: Screws And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Guide block is now pretensioned.

Insert screws (2) of guide blocks.

Tightening torque: 11 37 1AZ, see **11 37 VARIABLE VALVE GEAR** .

Installation:

At cylinder no. 3, the guide block can be pre-installed with one screw (internal) only.

Oil spray nozzle is fitted only after torsion spring has been installed.

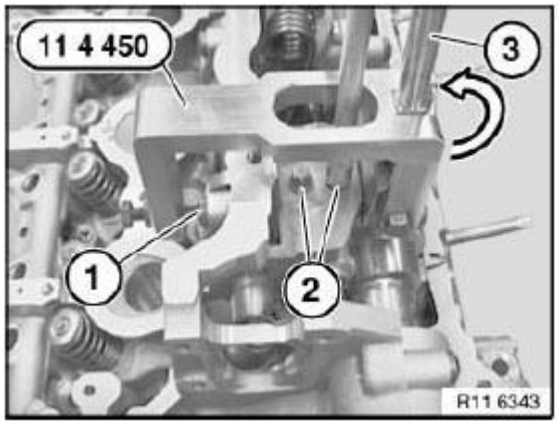


Fig. 287: Turning Eccentric Lever On Special Tool (11 4 450)
Courtesy of BMW OF NORTH AMERICA, INC.

Install torsion spring (2) on guide block.

Installation:

Insert torsion spring (2) in intermediate lever (1) (see arrow).

Check that cam follower (3) is in correct installation position.

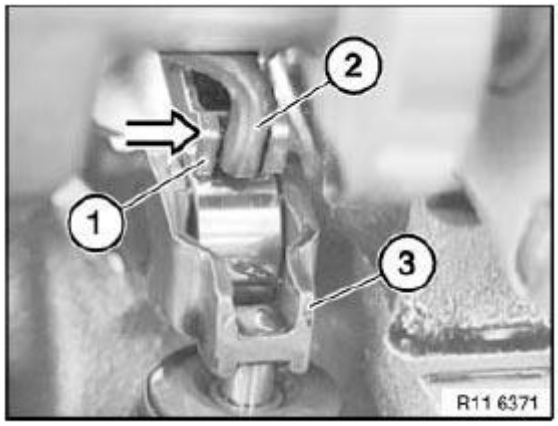


Fig. 288: Inserting Torsion Spring In Intermediate Lever
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

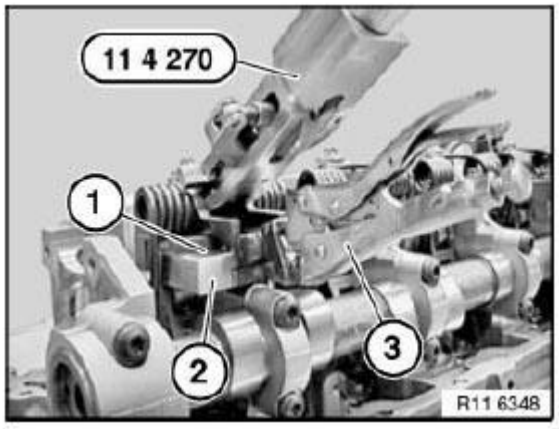


Fig. 289: Special Tool (11 4 270) - Gripping Pliers And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.

IMPORTANT: Improper handling. Risk of damage!

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

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

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

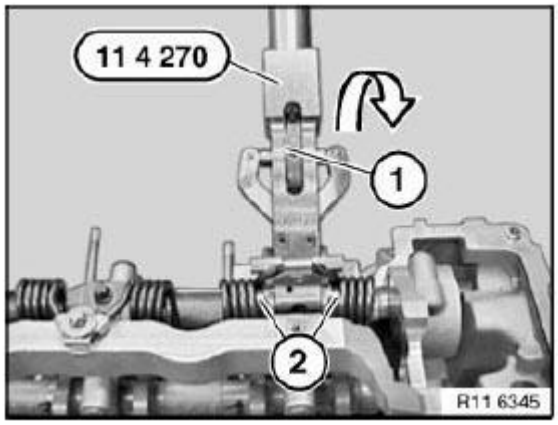


Fig. 290: Securing Bearing Pins In Torsion Springs With Knurled Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw (2) of torsion spring.

Tightening torque: 11 37 2AZ, see **11 37 VARIABLE VALVE GEAR** .

To avoid jamming of screw (2) with torsion spring, it is necessary when inserting screw (2) to increase pretension on special tool 11 4 270 uniformly.

IMPORTANT: Thread on cylinder head. Risk of damage!

Remove special tool 11 4 270 .

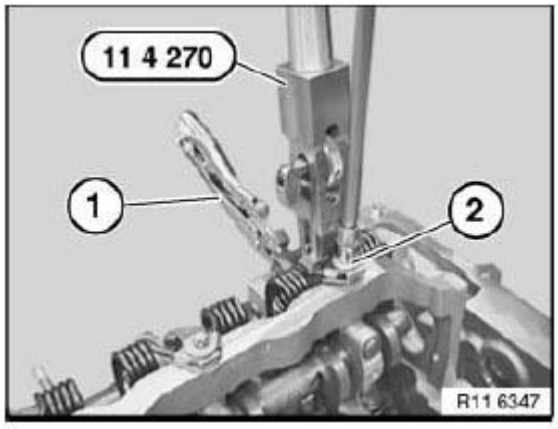


Fig. 291: Torsion Spring Screw And Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

At cylinder no. 3, adjust oil spray nozzle (2) so that oil spray points precisely towards spline teeth (3).

Insert screw (1) with oil spray nozzle (2) (external).

Tightening torque: 11 37 4AZ, see **11 37 VARIABLE VALVE GEAR** .

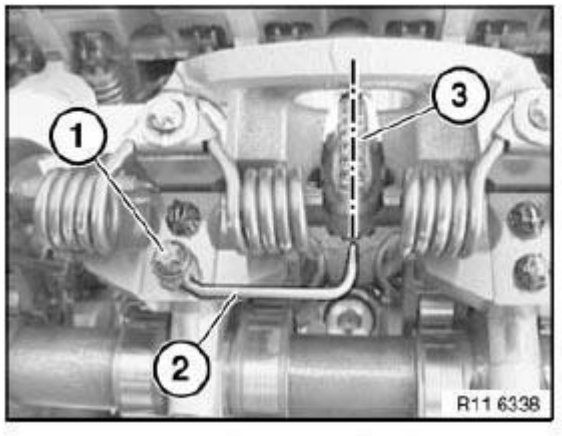


Fig. 292: Screw And Oil Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

OIL SUPPLY

11 40 000 CHECKING ENGINE OIL PRESSURE (N52, N52K)

IMPORTANT: The regulated oil pump can only be checked and measured with the diagnosis system.
Vehicles with a regulated oil pump have a HYDRAULIC VALVE fitted.

Necessary preliminary tasks

- Remove engine cover.
- Protect drive belt against dirt
- Have a cleaning cloth ready to catch escaping oil

Disconnect plug connection on oil pressure switch (3)

Remove oil pressure switch (3).

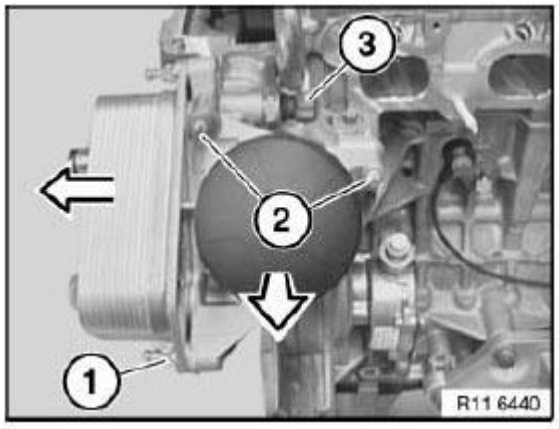


Fig. 293: Releasing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 11 4 050 with sealing ring. See **Fig. 294**.

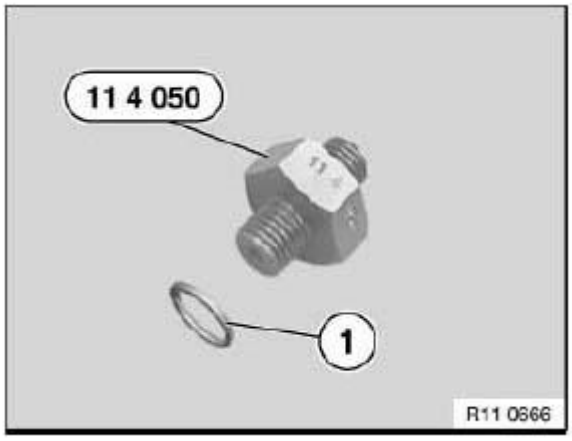


Fig. 294: Identifying Special Tool (11 4 050) And Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Check engine oil pressure with diagnosis system

Connect special tools 13 6 054 and 13 6 051.

Check engine oil pressure with pressure gauge

Connect special tools 13 3 063 and 13 3 061.

Start engine and check engine oil pressure.

See **41 OIL PUMP WITH FILTER AND DRIVE** .

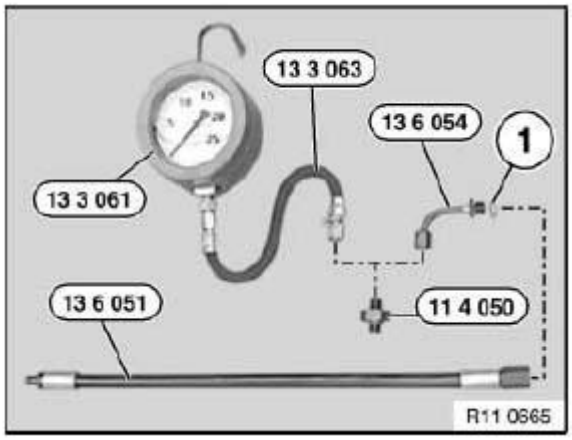


Fig. 295: Checking Engine Oil Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

OIL PUMP WITH FILTER AND DRIVE

11 41 000 REMOVING AND INSTALLING/REPLACING OIL PUMP (N52K)

Necessary preliminary tasks:

- Remove oil sump

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.

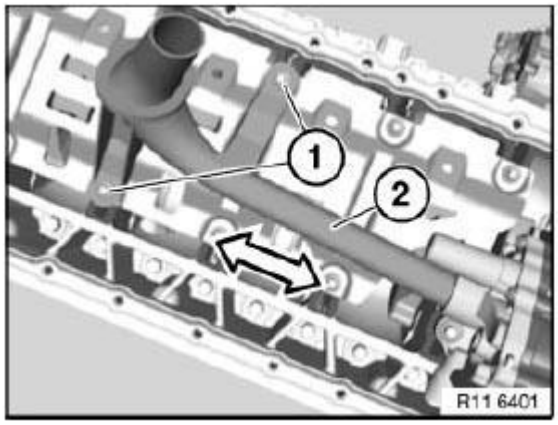


Fig. 296: Removing Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: To release bolt (1), insert a 6 mm drill bit between sprocket wheel and oil pump housing.

Release bolt (1).

Tightening torque: 11 41 6AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Release screws (2).

Tightening torque: 11 41 5AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

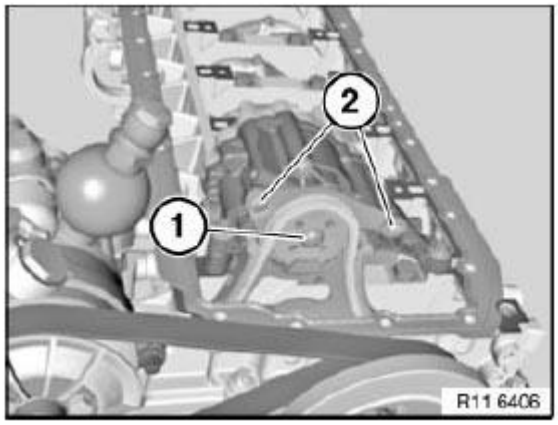


Fig. 297: Bolt And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe different screw lengths.

Release screws (1).

Tightening torque: 11 41 2AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Tightening torque: 11 41 3AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

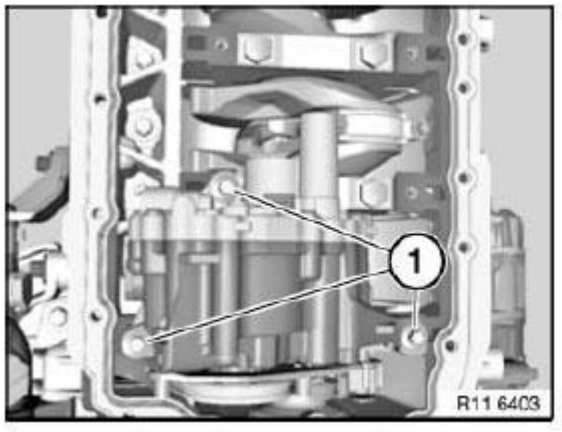


Fig. 298: Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach sprocket wheel (1) in direction of arrow.

NOTE: Chain tensioner presses timing chain (3) upwards. Do not remove sprocket wheel (1).

Remove oil pump (2) in direction of arrow.

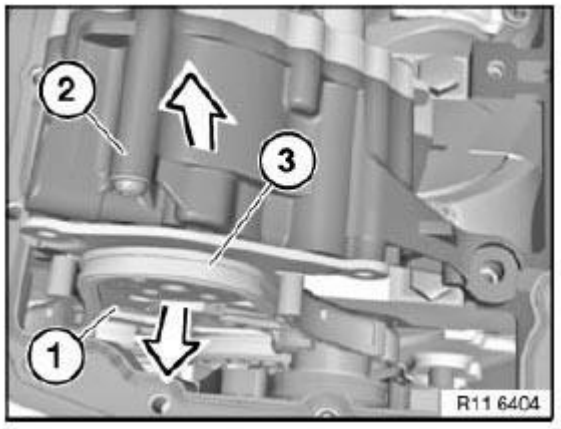


Fig. 299: Removing Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

Align twin surface (3) on oil pump (2) to sprocket wheel (4).

Install oil pump (2).

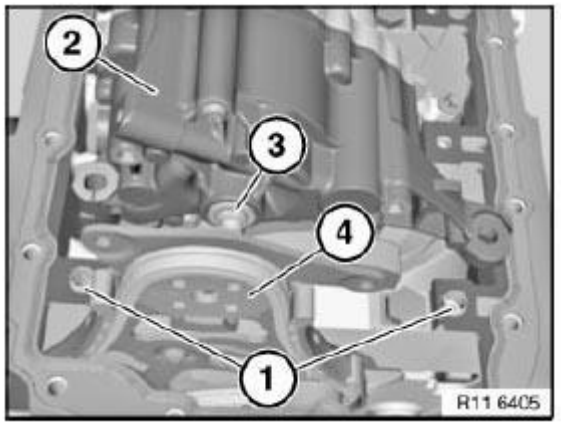


Fig. 300: Spacers, Oil Pump And Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 41 010 REMOVING AND INSTALLING/REPLACING CHAIN MODULE FOR OIL PUMP/VACUUM PUMP (N52K)

Special tools required:

- 00 9 140

- 11 0 290
- 11 0 300
- 11 4 120
- 11 4 280
- 11 4 360
- 11 4 362
- 11 4 440
- 11 5 200
- 11 9 280

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

Necessary preliminary tasks:

- Remove **cylinder head cover**
- Remove **oil sump**
- Remove drive belt
- Remove drive belt tensioner
- Remove **VIBRATION DAMPER**
- Remove sealing cover for vacuum pump

Procedure on installed engine:

Turn sprocket wheel (3) with central bolt at crankshaft into position until special tool 11 0 290 can be secured.

Simultaneously secure special tool 11 0 290 to sprocket wheel (3) and special tool 11 4 362 .

Release screw (2) for sprocket wheel (3).

Tightening torque: 11 66 2AZ, see **11 66 VACUUM PUMP** .

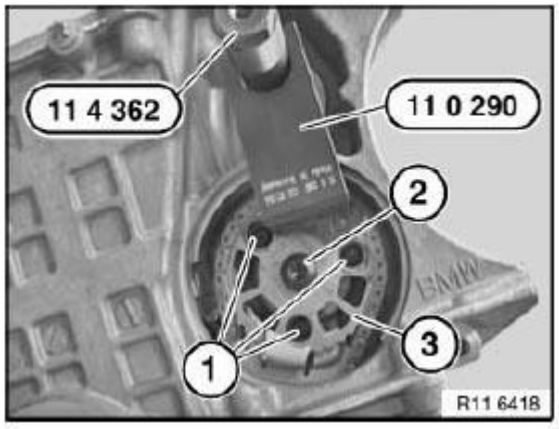


Fig. 301: Special Tool (11 4 362) And (11 0 290), Screw And Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Press timing chain with chain tensioner (1) in direction of arrow.

Disconnect timing chain with special tool 11 4 120 .

Feed out sprocket wheel (3) at hexagon head (4) of vacuum pump.

Installation:

If the chain module is replaced, a mounting bar (2) is already pre-installed.

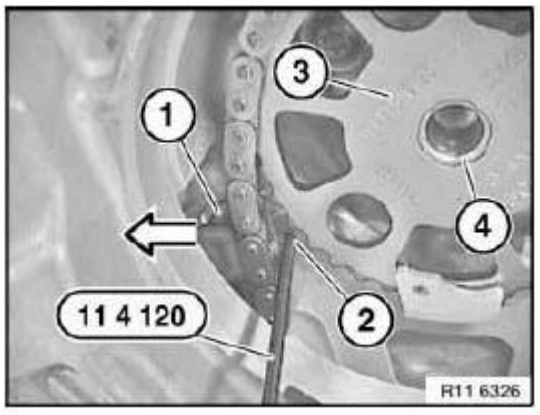


Fig. 302: Pressing Piston With Special Tools (11 6 261)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: To release bolt (1), insert a 6 mm drill bit between sprocket wheel and oil pump housing.

Release screw (1) for sprocket wheel.

Tightening torque: 11 41 6AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Release screws (2) for chain module.

Tightening torque: 11 41 5AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

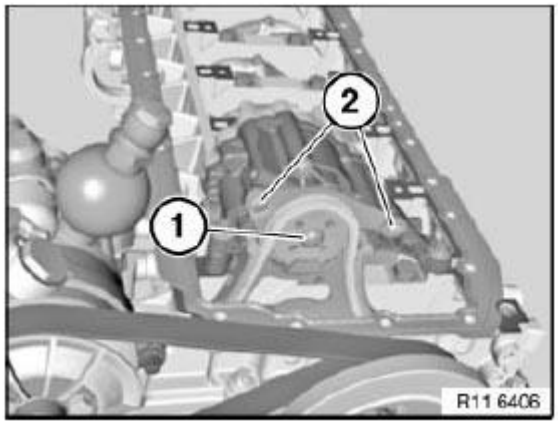


Fig. 303: Bolt And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft and camshaft with special tools 11 0 300 and 11 4 280

IMPORTANT: Do not remove special tools 11 0 300 and 11 4 280 to release central bolt (1). Employ a second person for gripping when releasing central bolt (1).

Screw special tool 11 9 280 onto hub of vibration damper.

Release central bolt (1).

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

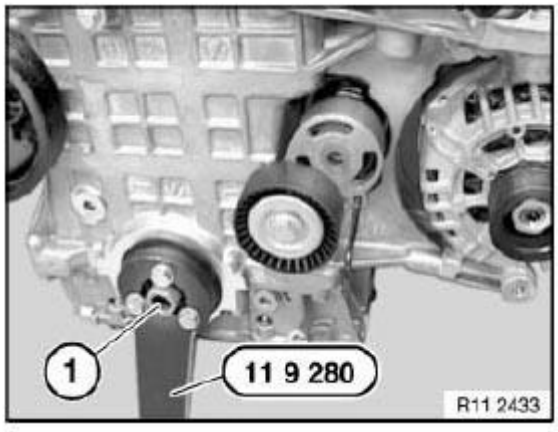


Fig. 304: Central Bolt With Special Tool (11 9 280)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace central bolt (1).

Remove hub (2) towards front.

Installation:

Replace crankshaft radial seal at front, see **11 14 005 Replacing front crankshaft radial seal (N52K)**.

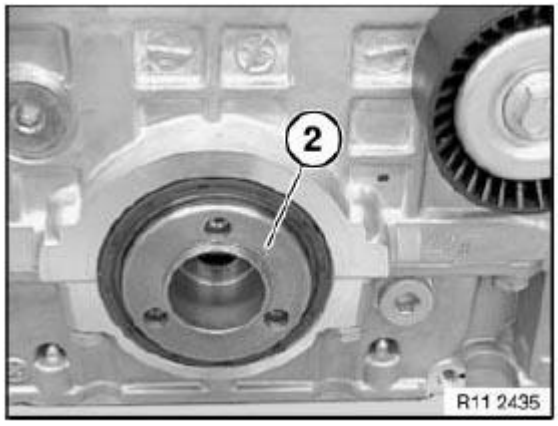


Fig. 305: Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Open screw plug on bedplate.

Tightening torque: 11 11 8AZ, see **11 11 CRANKCASE** .

Installation:

Replace aluminum screws.

Release screw for chain module (1).

Tightening torque: 11 41 4AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Installation:

Replace aluminum screws.

Remove chain module (1) in direction of arrow.

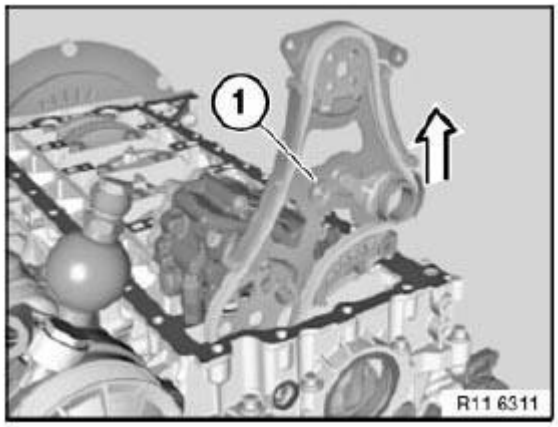


Fig. 306: Removing Chain Module
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket wheel (2).
Collar (see arrow) on sprocket wheel (2) points to engine .
Incorrect assembly will result in engine damage .

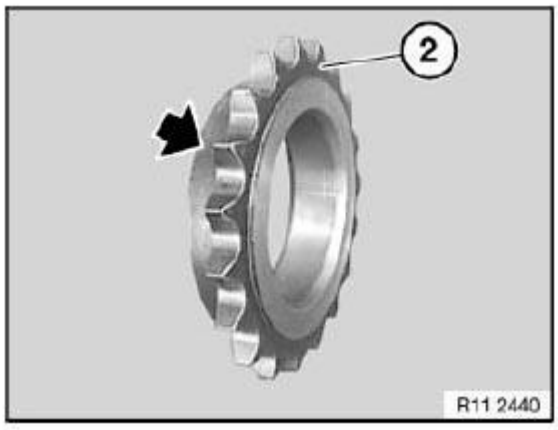


Fig. 307: Collar On Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Procedure on removed engine:

NOTE: Engine is mounted on special tool 11 4 440 .

Release screw (1) for sprocket wheel.

Tightening torque: 11 66 2AZ, see **11 66 VACUUM PUMP** .

Release screw (2) for sprocket wheel.

Tightening torque: 11 41 6AZ, see **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Release central bolt (3).

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

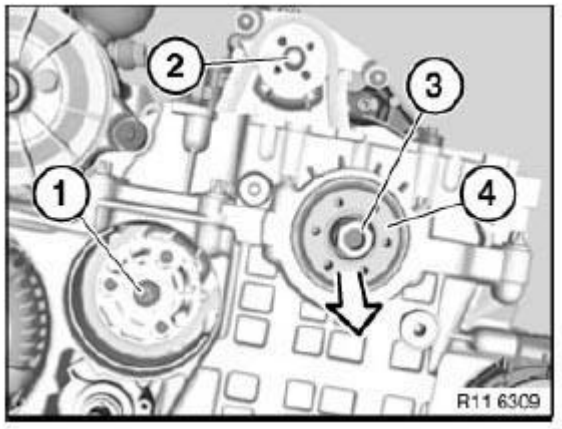


Fig. 308: Releasing Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Mark central bolt (3) with a colored dot.

Replace central bolt (3).

Remove hub (4) towards front.

All:

Install hub with new central bolt.

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

Do **not** remove special tools 11 0 300 and 11 4 280 .

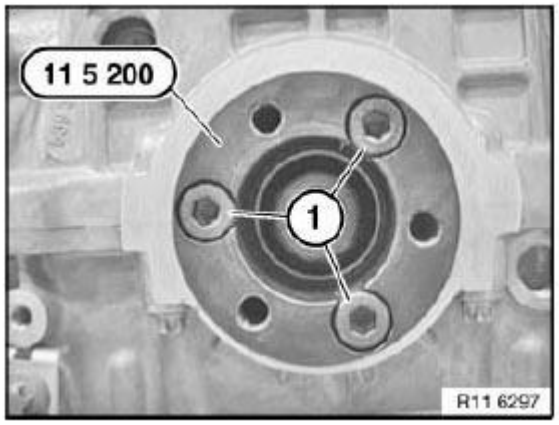


Fig. 309: Screws With Special Tool (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove tensioner for drive belt.

Screw in special tool 11 4 362 from special tool kit 11 4 360 .

Mount special tool 11 9 280 on 11 5 200 .

Support special tool 11 9 280 on special tool 11 4 362 .

Special tool 11 0 300 secures crankshaft.

Tighten central bolt to jointing torque.

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

Mark central bolt and hub with paint.

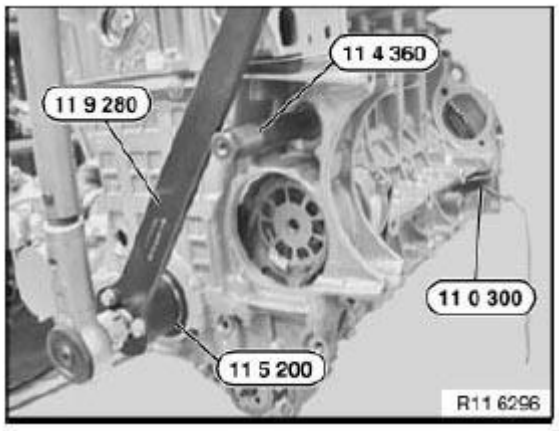


Fig. 310: Special Tools (11 9 280), (11 0 300), (11 4 360) And (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Mark special tools with colored line (1).

See picture.

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

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

Tightening torque: 11 21 1AZ, see **11 21 CRANKSHAFT AND BEARINGS** .

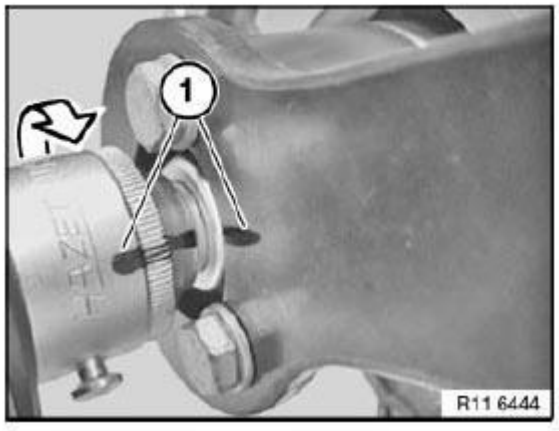


Fig. 311: Marking Special Tools With Colored Line
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace crankshaft radial seal at front, see **11 14 005 Replacing front crankshaft radial seal (N52K)**.

Assemble engine.

11 41 115 REMOVING AND INSTALLING/REPLACING HYDRAULIC VALVE (N52K)

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

Aluminum screws/bolts are permitted with and without

color coding (blue).

For reliable identification:

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

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

Necessary preliminary tasks

- Remove front underbody protection. See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION (X5)** or **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION (X3)**
- Have a cleaning cloth ready to catch escaping oil

Detach plug (1) from hydraulic valve (2).

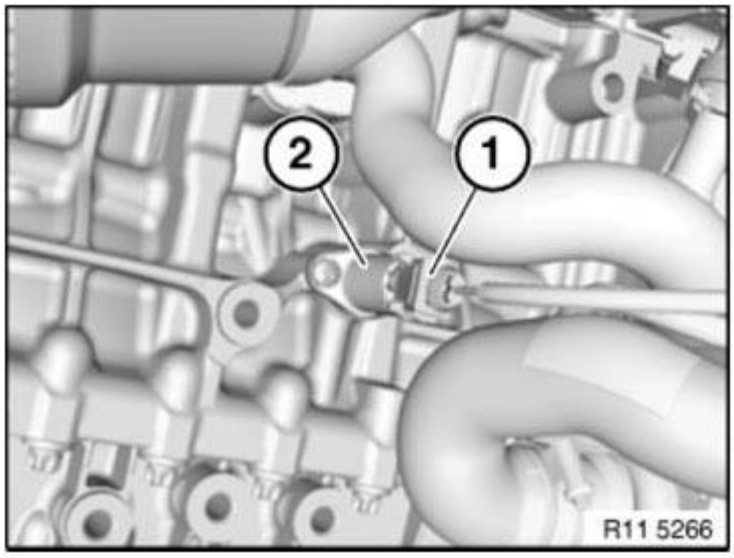


Fig. 312: Identifying Hydraulic Valve With Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) and remove hydraulic valve (2).

Tightening torque

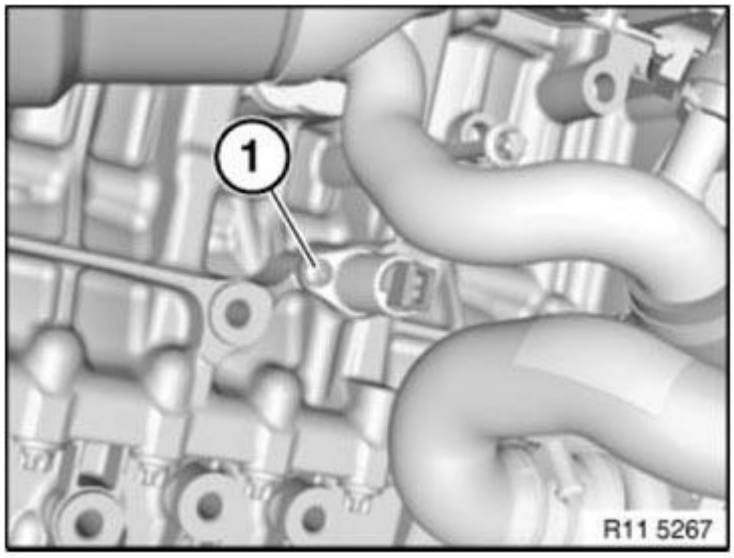


Fig. 313: Identifying Hydraulic Valve With Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Replace O-ring (1).

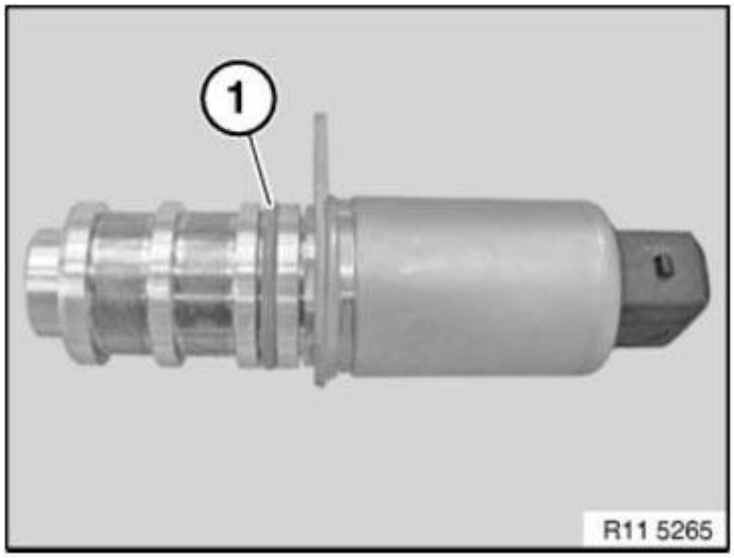


Fig. 314: Identifying O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

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 (N52K) (X3)** or **17 00 005 DRAINING AND ADDING COOLANT IN RADIATOR (N52K) (X5)** .
- Remove intake air **MANIFOLD** .
- Unfasten oil filter cover.
- Protect drive belt against dirt.

Release screw (1).

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

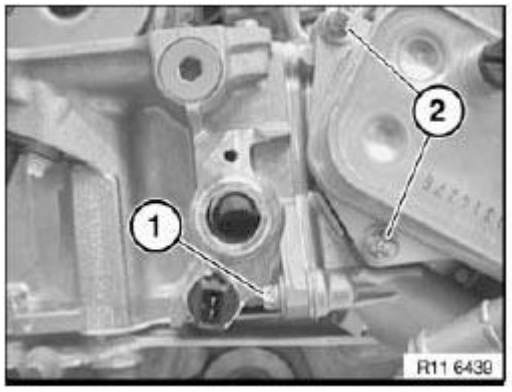


Fig. 315: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

NOTE: Have cleaning cloth ready to catch residual oil.

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

Installation:

Replace all seals.

If necessary, replace filter element.

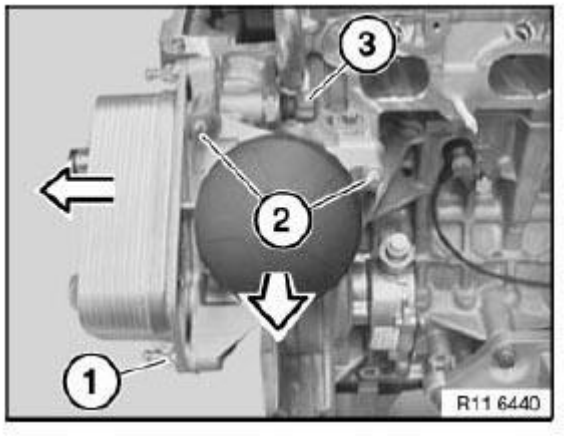


Fig. 316: Releasing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

NOTE: Protect drive belt against dirt.

Installation:

For VENTING INSTRUCTIONS see **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR LEAKS (X3)** or **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR WATER LEAKS (N52K) (X5)** .

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: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification

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

Necessary preliminary tasks:

- Remove coolant thermostat

Unfasten hose clip (1).

For tightening torque refer to 11 53 5AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant hose.

Unfasten hose clip (2).

For tightening torque refer to 11 53 3AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant hose.

Disconnect plug connection (3).

Release screws (4).

For tightening torque refer to 11 51 1AZ in **11 51 ELECTRIC WATER PUMP WITH DRIVE** .

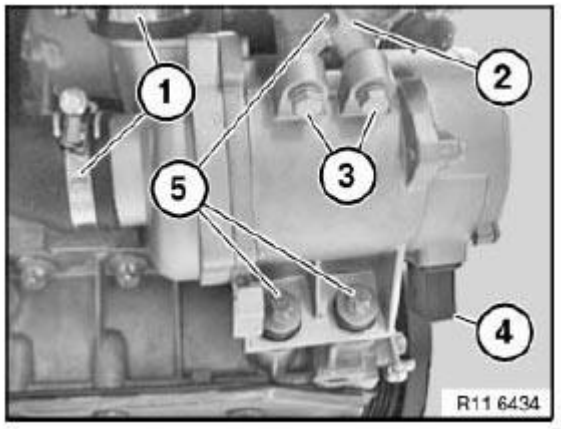


Fig. 317: Plug Connection, Screws And Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace aluminum screws.

Remove electric water pump (x) via x.

Installation:

If the electric water pump is reused, it must be rotated one turn due to the breakaway torque at the blade wheels.

Assemble engine.

Venting instructions must be observed without fail. . See **17 00 005 DRAINING AND ADDING COOLANT (N52K)** .

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

NOTE: For purposes of clarity, the picture and text refer to the component when removed.

Unfasten hose clip (1).

For tightening torque refer to 11 53 5AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant hose.

Unfasten hose clip (2).

For tightening torque refer to 11 53 6AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant hose.

Unlock and detach coolant hose (3).

Unlock and detach coolant hose (4).

Disconnect plug connection (5).

Release screws (6).

For tightening torque refer to 11 53 1AZ in **11 53 COOLANT THERMOSTAT WITH CONNECTIONS** .

Remove coolant thermostat (7).

Assemble engine.

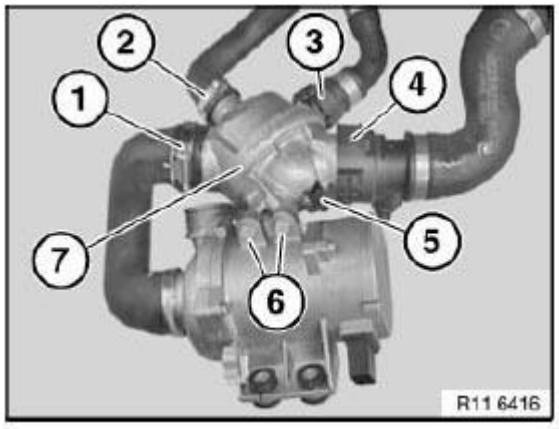


Fig. 318: Hose Clips, Hoses, Screws, Coolant Thermostat And Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

INTAKE MANIFOLD

11 61 050 REMOVING AND INSTALLING AIR INTAKE MANIFOLD (N52K)

Necessary preliminary tasks:

- Remove Tension Strut
- Remove Intake Filter Housing
- Remove Ignition Coil Cover

Open holder (2).

Disconnect plug connection (1) under of air intake manifold.

Release both crankcase breathers (3).

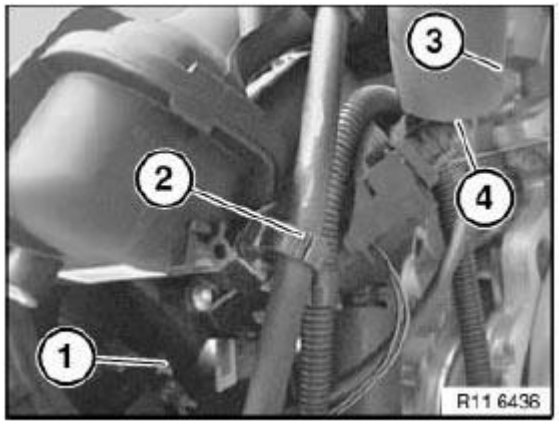


Fig. 319: Crankcase Breathers, Plug Connection And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Disconnect plug connection (3).

Release screws (4).

Detach engine wiring harness (2) from air intake manifold and lay to one side.

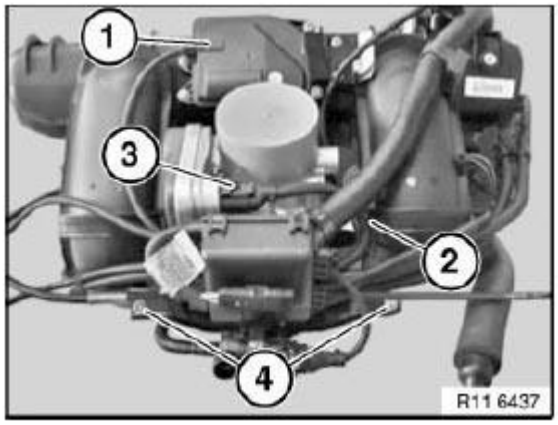


Fig. 320: Engine Wiring Harness, Screws And Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on oil pressure switch (2).

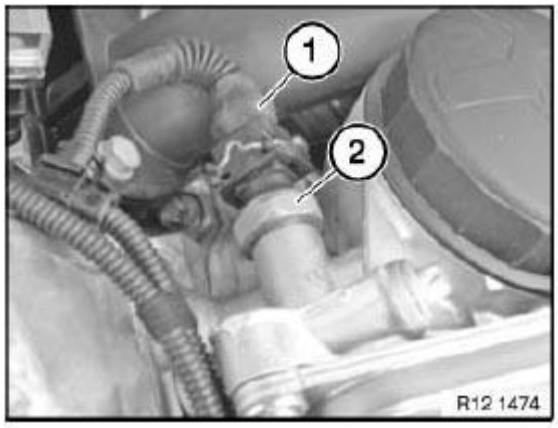


Fig. 321: Plug Connection And Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Release fuel rail (2) and lay to one side.

NOTE: Do not detach fuel line.

Release screws (1).

For tightening torque refer to 11 61 1AZ in **11 61 AIR INTAKE MANIFOLD** .

Unscrew nuts (3).

For tightening torque refer to 11 61 2AZ in **11 61 AIR INTAKE MANIFOLD** .

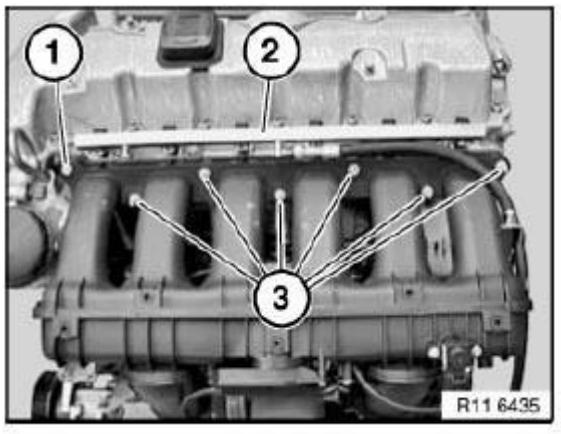


Fig. 322: Fuel Rail, Nuts And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Raise air intake manifold approx. 10 cm.

Disconnect plug connections (1) at bottom.

Release tank vent line behind throttle valve assembly.

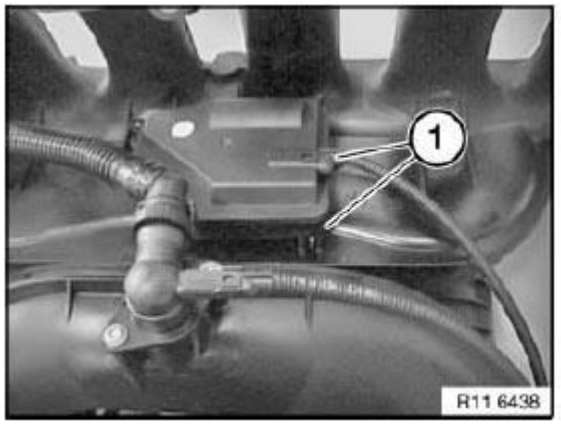


Fig. 323: Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace all seals.

Assemble engine.

EXHAUST MANIFOLD

18 40 050 REMOVING AND INSTALLING/REPLACING FRONT EXHAUST MANIFOLD (N52/ N52K/ N51)

Necessary preliminary tasks:

- Remove rear exhaust manifold

NOTE: The oxygen sensors are in danger of being damaged when the exhaust manifolds are removed and installed.

Remove control sensor from cylinders 1 to 3.

Remove monitor sensor from cylinders 1 to 3.

Tightening torque: 11 78 1AZ, see **11 78 EXHAUST GAS CONTROL, LAMBDA CONTROL SENSOR / LAMBDA MONITOR SENSOR** .

Unscrew nuts.

Remove exhaust manifold (1).

Installation:

Clean sealing faces and replace seals.

Replace nuts.

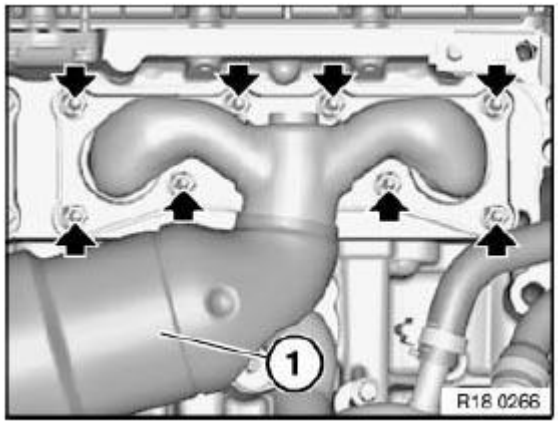


Fig. 324: Locating Exhaust Manifold Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

VACUUM PUMP

11 66 000 REMOVING AND INSTALLING OR REPLACING VACUUM/OIL PUMP (N47 D20 O1)

IMPORTANT: It is possible to remove and install the vacuum oil pump without removing the transmission.

Necessary preliminary work

- Removing **oil sump**.

Release screws (1).

Remove intake snorkel in direction of arrow.

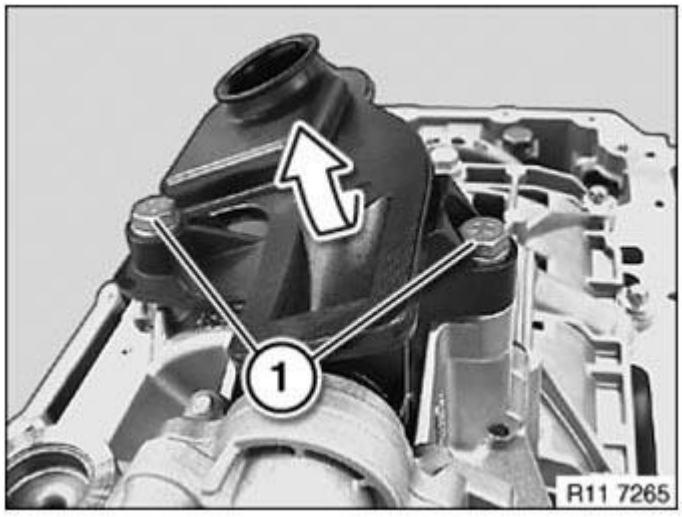


Fig. 325: Removing Intake Snorkel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

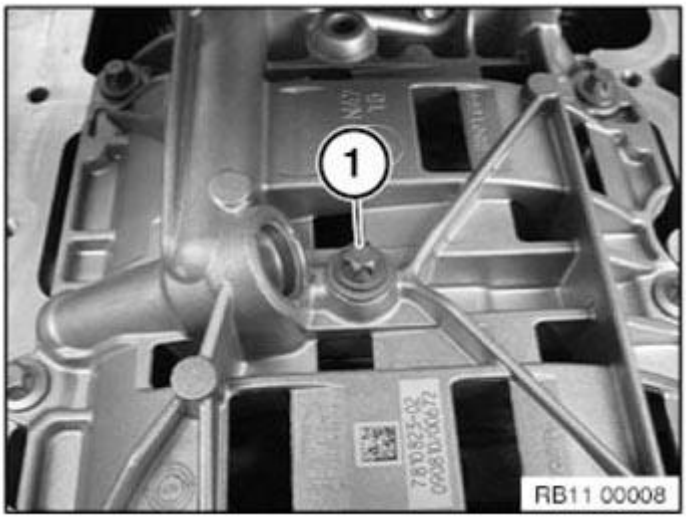


Fig. 326: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Installation note:

Clean and blow out thread

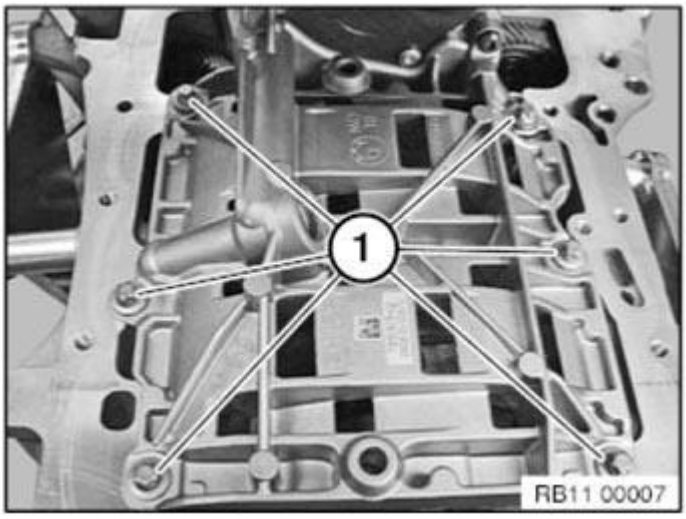


Fig. 327: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

When installed, the oil pump chain must be fed out from the sprocket wheel of the oil pump drive gear; the sprocket wheel cannot be removed.

NOTE: Illustration shows gear case cover removed.

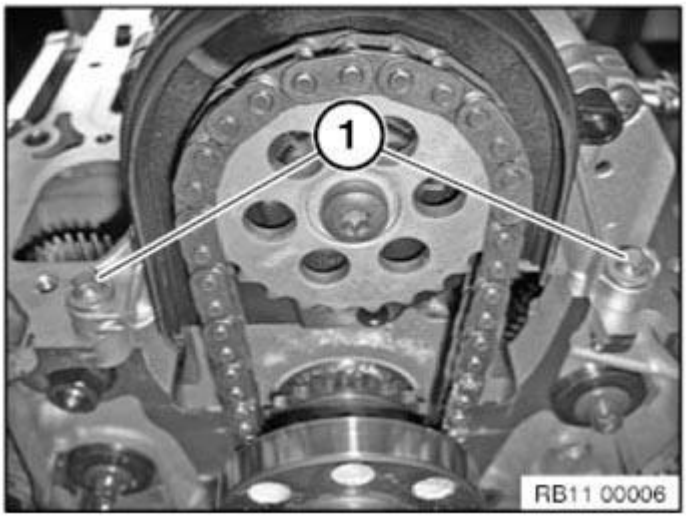


Fig. 328: Identifying Gear Case Cover Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Oil vacuum pump must be fed out at chain drive (1).

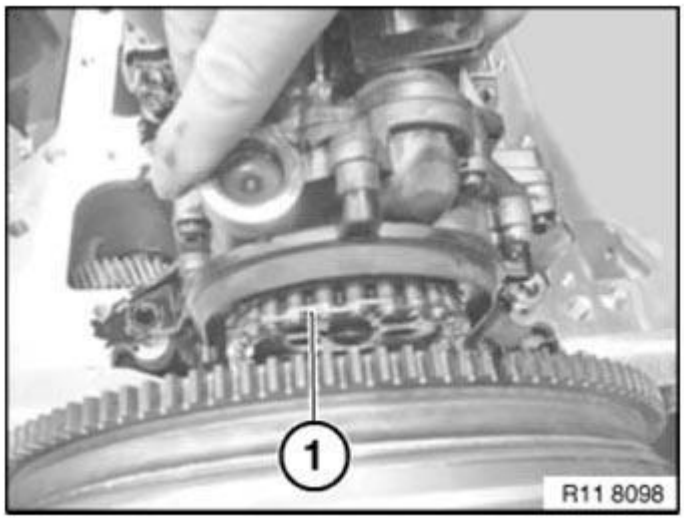


Fig. 329: Identifying Chain Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

Installation note:

Clean all sealing surfaces.

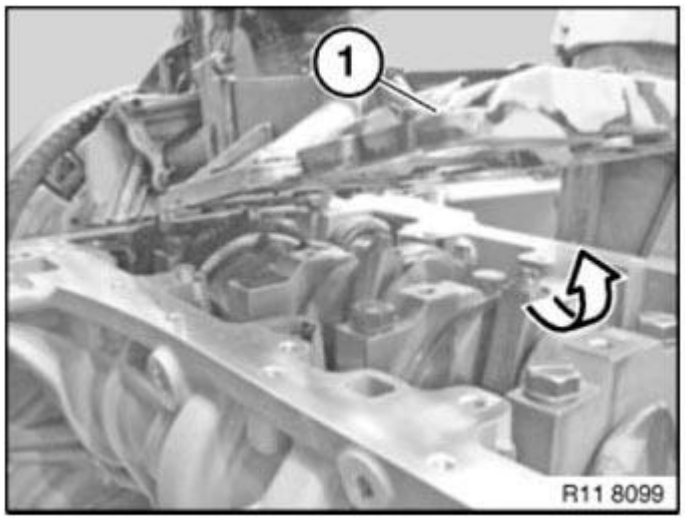


Fig. 330: Removing Oil Vacuum Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Install all screws (1) and tighten down.

Tightening torque, see 11 41 1AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE**

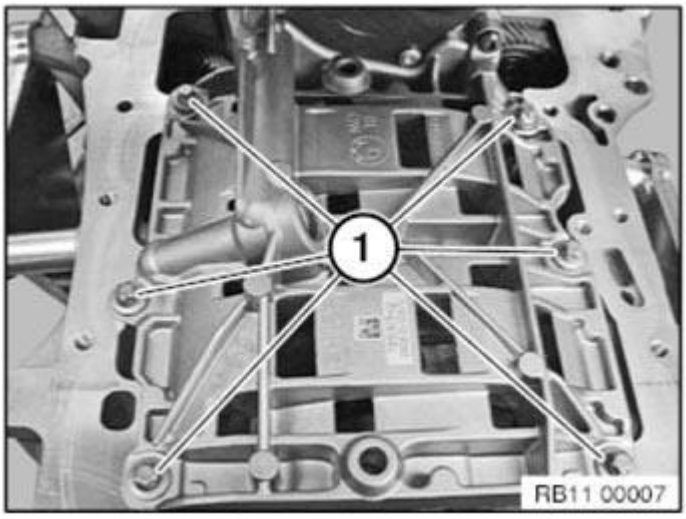


Fig. 331: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Install and tighten down screws (1).

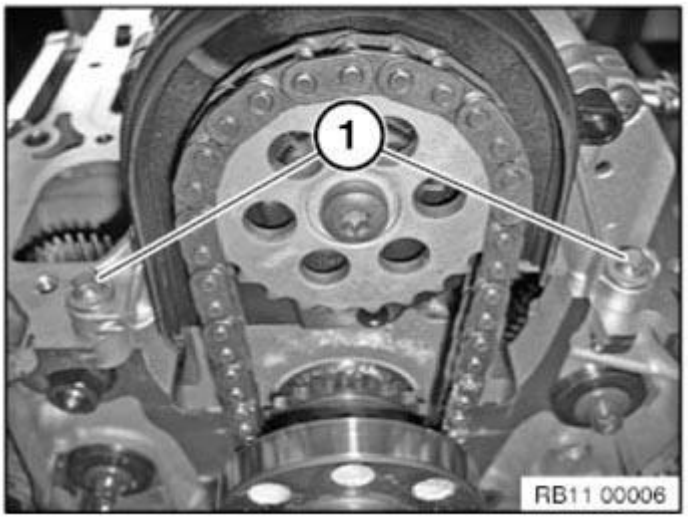


Fig. 332: Identifying Gear Case Cover Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Clean and blow out thread

Insert and secure screw (1).

Secure screw (1) with special tool 00 9 120 .

Tightening torque, see 11 41 2AZ in **11 41 OIL PUMP WITH STRAINER AND DRIVE**

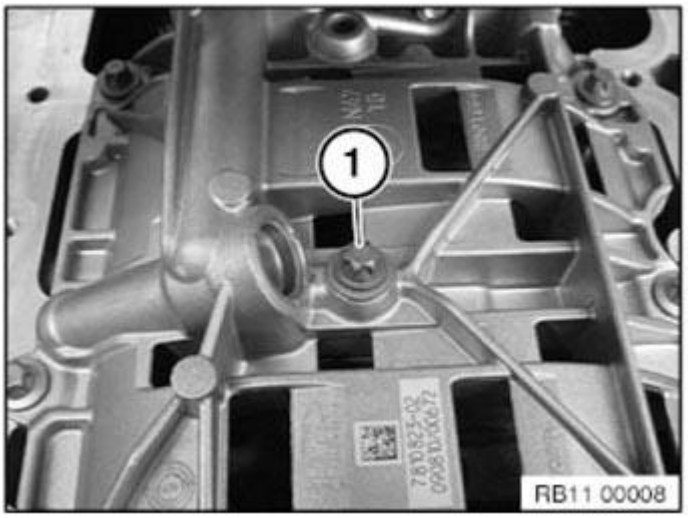


Fig. 333: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

EMISSION CONTROL, OXYGEN SENSOR

11 78 513 REPLACING BOTH LAMBDA OXYGEN CONTROL SENSORS (N52K)

WARNING: Risk of burning!

Work should only be carried out on an exhaust system that has cooled down.

Installation note:

The threads of new oxygen control sensors are already coated with Never Seez Compound.

If a oxygen control sensor is to be reused, apply a thin and even coating of Never Seez compound to the thread only.

The part of the lambda control sensor which projects into the exhaust system branch (sensor ceramics) must **not** be cleaned and **not** coated with lubricant.

Lambda control sensor, cylinder nos. 1 to 3

NOTE: The lambda control sensor on the exhaust manifold of cylinder nos. 1 to 3 is accessible from above. The exhaust system does not have to be removed.

Lambda control sensor, cylinder nos. 1 to 3

Necessary preliminary tasks:

- Remove complete exhaust system **EXHAUST SYSTEM (X3)** or **EXHAUST SYSTEM (X5)** .

Disconnect plug connection on oxygen control sensor (1).

Release lambda control sensor (1) on exhaust manifold of cylinder nos. 4 to 6 with special tool 11 4 260.

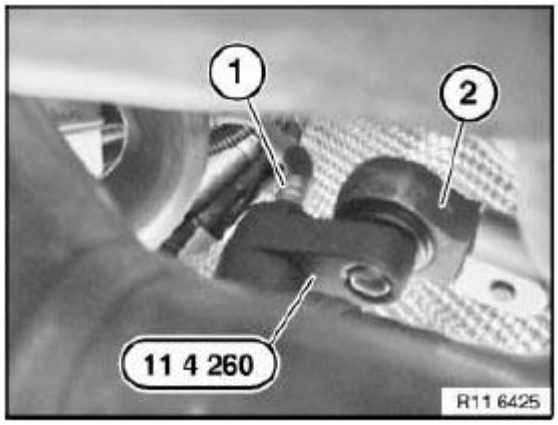


Fig. 334: Removing Lambda Oxygen Control Sensor Using Special Tool 11 4 260
Courtesy of BMW OF NORTH AMERICA, INC.

All:

Installation note:

Cable color of lambda control sensor, cylinders nos. 1 to 3 = black.

Cable color of lambda control sensor, cylinders nos. 4 to 6 = grey.

Tightening torque, see 11 78 1AZ in **78 EMISSION CONTROL, OXYGEN SENSOR** .

Assemble engine.

Check function of DME.

11 78 545 REPLACING BOTH LAMBDA OXYGEN MONITORING SENSORS (N52K)

WARNING: Risk of burning!

Work should only be carried out on an exhaust system that has cooled down.

Necessary preliminary tasks:

- Remove underbody protection. See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION (X5)** or **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION (X3)** .

Installation note:

The threads of new lambda monitoring sensors are already coated with Never Seez Compound (refer to BMW Parts Department).

If a lambda monitoring sensor is to be reused, apply a thin and even coating of Never Seez Compound to the thread only.

The part of the lambda monitoring sensor which projects into the exhaust system branch (sensor ceramics) must **not** be cleaned and **not** coated with lubricant.

Disconnect plug connection on lambda monitoring sensor (1).

Release lambda monitoring sensor (1) on exhaust manifold of cylinder nos. 1 to 3 with special tool 11 9 150.

Tightening torque, see 11 78 1AZ in **78 EMISSION CONTROL, OXYGEN SENSOR** .

Installation note:

Cable color of lambda monitoring sensor (1), cylinders nos. 1 to 3 = black.

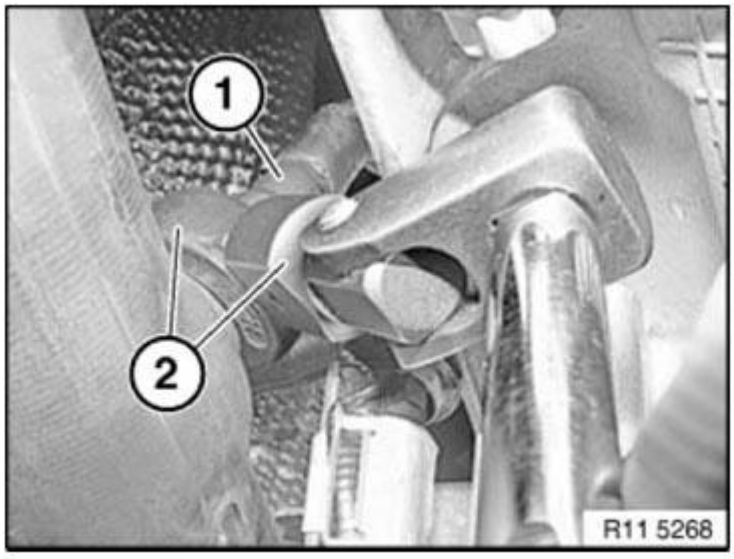


Fig. 335: Removing Lambda Monitoring Sensor Plug Connection Using Special Tool (11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection on lambda monitoring sensor (1).

Release lambda monitoring sensor (1) on exhaust manifold of cylinder nos. 4 to 6 with special tool 11 9 150.

Tightening torque, see 11 78 1AZ in **78 EMISSION CONTROL, OXYGEN SENSOR** .

Installation note:

Cable color of lambda monitoring sensor (1), cylinders nos. 4 to 6 = grey.

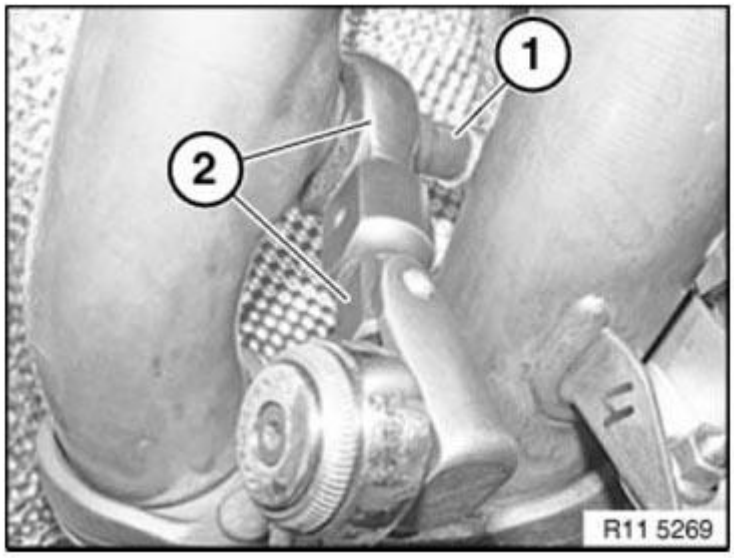


Fig. 336: Removing Lambda Monitoring Sensor Plug Connection Using Special Tool (11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

