

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

2001-2003 ENGINE

Engine Mechanical - Repair Instructions - X5 (3.0i) M54

ENGINE, GENERAL

00 00 250 BMW ENGINE OIL SERVICE INCL. SUPPLEMENTARY SERVICE (M54 / M56)

NOTE: This article comprises the engine oil and supplementary services. Only the engine oil service will be described in these repair instructions. For the supplementary service work steps, refer to the vehicle-specific inspection sheet.

Engine Oil Service:

Release and tighten down main flow oil filter cap with a socket only.

When the main flow oil filter cap is opened, engine oil flows from the oil filter housing back into the oil sump.

Release main flow oil filter cap and remove towards top.

Installation:

Tightening torque, refer to 11 42 2AZ in **ENGINE - TIGHTENING TORQUES** .

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

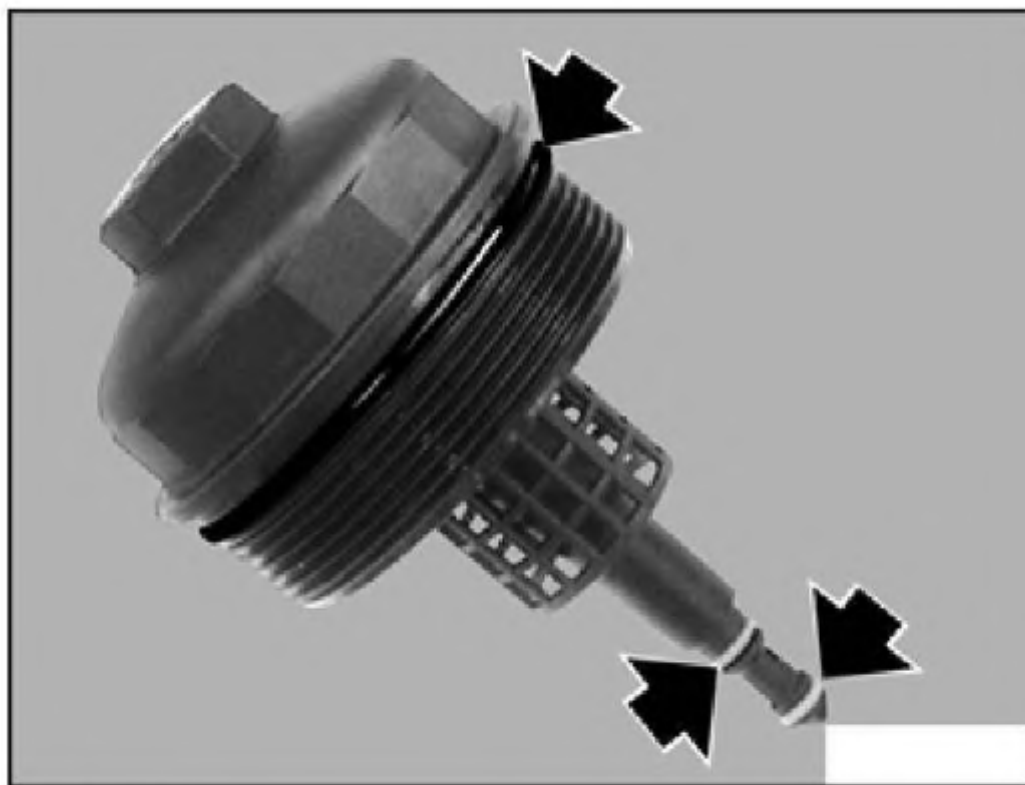


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Fig. 1: Locating Mail Flow Oil Filter Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace and oil O-ring.



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Fig. 2: Identifying O-Rings On Oil Filter Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Drain or draw off engine oil.

When engine oil is drained, open cap in engine underguard.

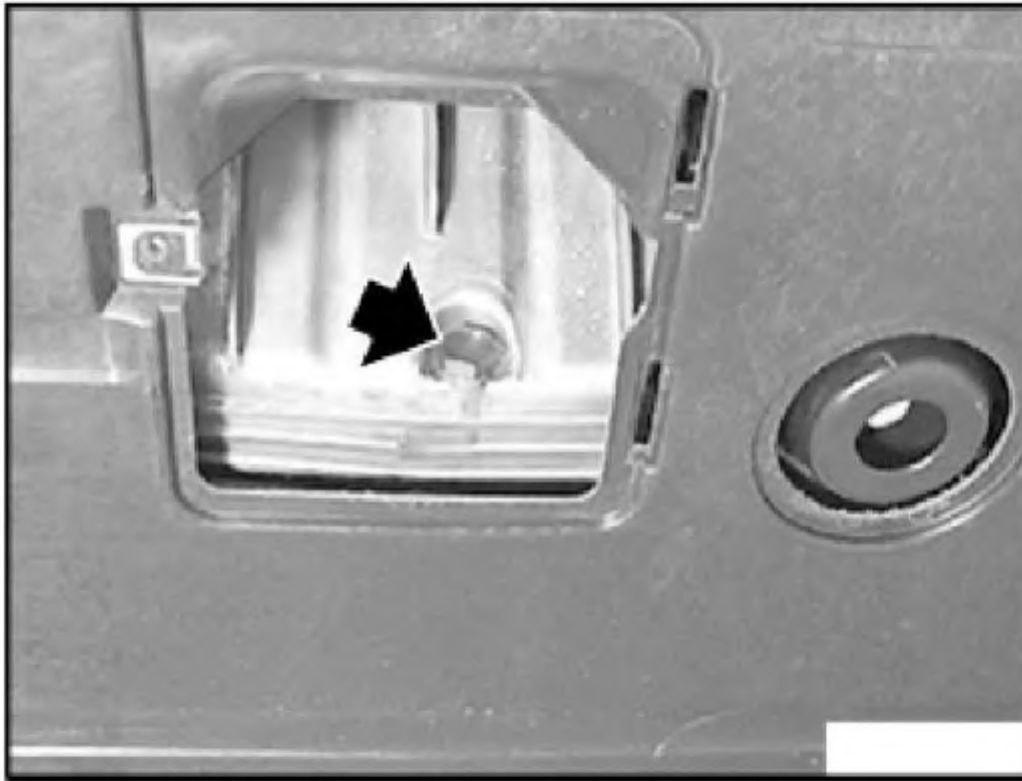
Open oil drain plug and drain off engine oil.

Installation:

Replace sealing ring.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



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Fig. 3: Locating Oil Drain Plug In Engine Underguard
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque, refer to 11 13 1AZ in **ENGINE - TIGHTENING TORQUES** .

Complete vehicle and set in horizontal position.

Top up engine oil.

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

Switch off engine, wait approx. 5 minutes and then check engine oil level.

Top up engine oil if necessary.

Supplementary Service:

Refer to vehicle-specific inspection sheet.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

11 00 039 CHECKING COMPRESSION OF ALL CYLINDERS (M60 / M62 / M73 / S62 / M54)

NOTE: For Special Tool identification, see SPECIAL TOOLS - X5 (3.0i) .

Special Tools Required:

- 110 224.
- 110 226

IMPORTANT: High tension - mortal danger! Cut off power supply to ignition coils (disconnect plug connection at DME control unit).

Necessary Preliminary Tasks:

- Connect charger or a second battery.
- Read out fault memory of DME control unit
- Pull fuel pump relay or fuel pump fuse.
- Start engine and allow residual fuel to drain out (pressure reduction). Remove all spark plugs.

IMPORTANT: Check Schrader valve on special tool 11 0 226 for tight fit.

Screw special tool 11 0 226 by hand into spark plug thread and connect special tool 11 0 224.

NOTE: Check that sealing ring is in perfect condition.

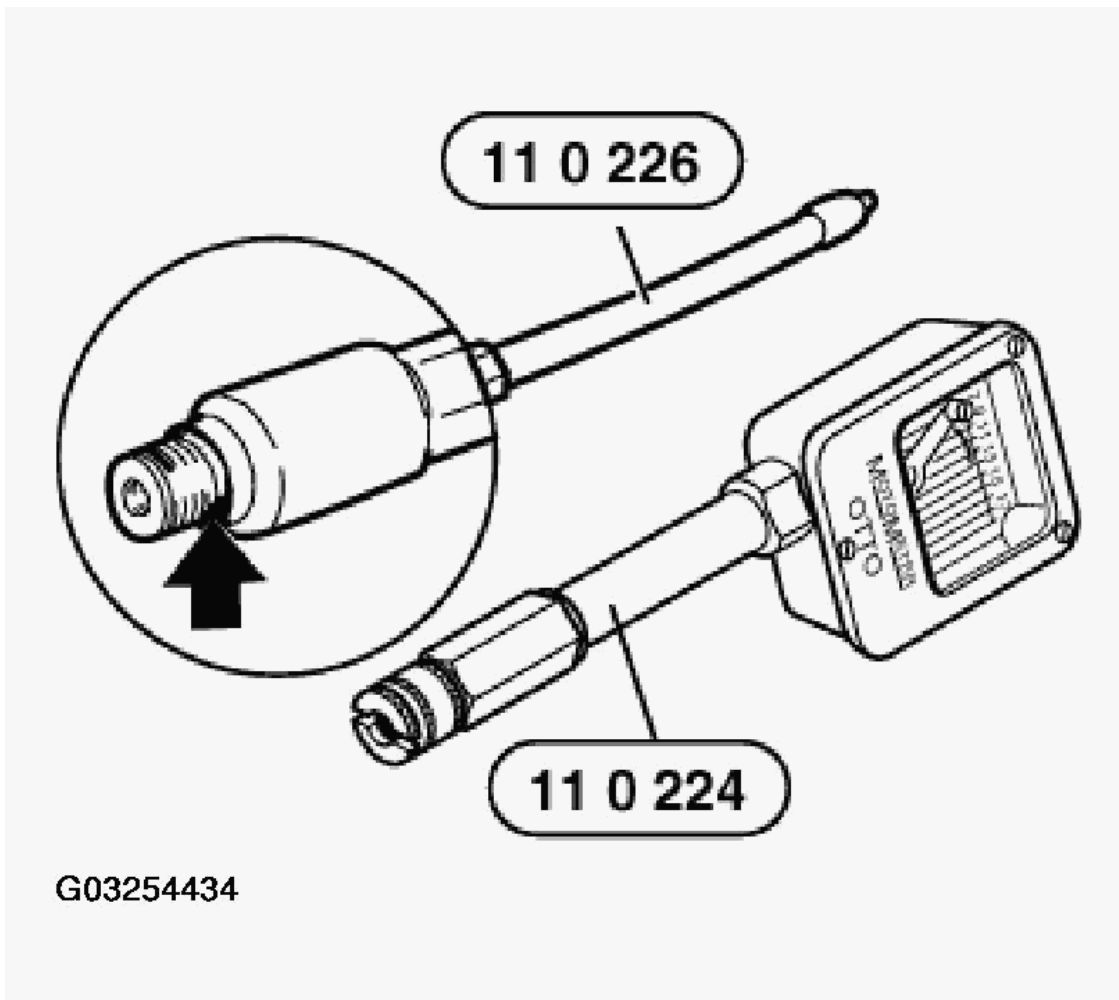


Fig. 4: Checking Schrader Valve On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Depress accelerator and actuate starter until compression stops rising.

Compression pressure, refer to **ENGINE IN GENERAL** .

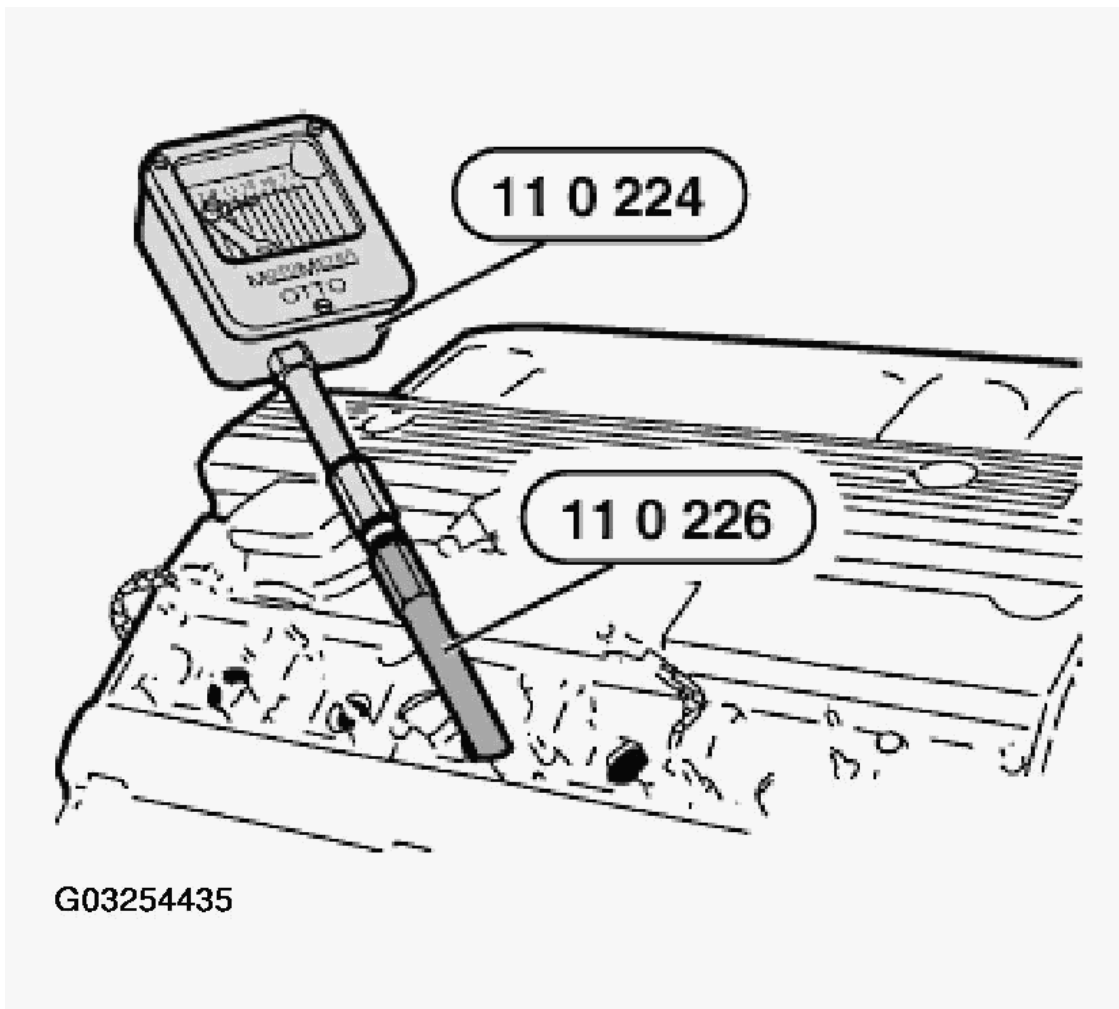


Fig. 5: Identifying Special Tools 11 0 224 And 11 0 226
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Now clear the fault memory.

11 00 045 CHECKING ABSOLUTE COMPRESSION OF ALL CYLINDERS

With BMW Diagnosis Information System (DIS).

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



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Fig. 6: View Of BMW Diagnosis Information System (DIS)
Courtesy of BMW OF NORTH AMERICA, INC.

- Connect DIS tester.

- BMW measuring technology Preset measurements.
- Absolute compression.
 - The further procedure is described in:
 - Help.
 - Help on preset measurements.
 - Adaptation of "Absolute compression".
- Clear fault memory.

11 00 050 REMOVING AND INSTALLING ENGINE (M54)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 11 0 000
- 51 2 170

Instructions for disconnecting and connecting battery, refer to **12 00... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY** .

Disconnect negative battery lead.

Remove heater bulkhead.

Remove engine cover.

Remove both oxygen monitor sensors, refer to **11 78 613 REPLACING BOTH OXYGEN MONITOR SENSORS (M52TU / M54 / M56)** .

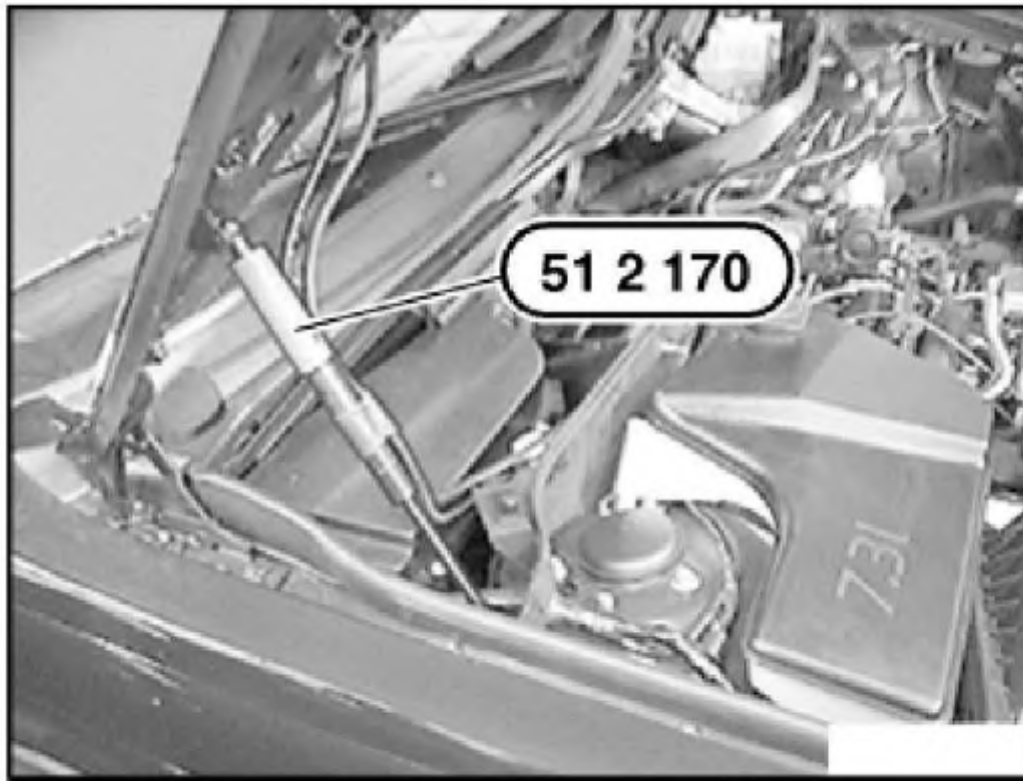
Move engine hood to assembly position:

NOTE: The following work must be carried out with a second person assisting. Work instruction applies to left and right sides.

Gently raise retaining clip and simultaneously push upwards.

Hold engine hood, unhook damper on hood.

Open engine hood fully and reattach damper with special tool 51 2 170 to hood.



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Fig. 7: Identifying Hood/Bonnet Stay
Courtesy of BMW OF NORTH AMERICA, INC.

Remove front splash guard.

Remove reinforcement plate, refer to **FRONT AXLE SUPPORT** .

CAUTION: The article "Removing and installing reinforcement plate" contains important installation instructions.

Remove transmission.

Remove A/C compressor drive belt, refer to **11 28 050 REPLACING A/C COMPRESSOR DRIVE BELT (M52 / S52 / M52TU / M54 / M56)** .

Remove A/C compressor from bearing block and tie back to one side.

NOTE: Lines remain connected.

Drain and dispose of coolant.

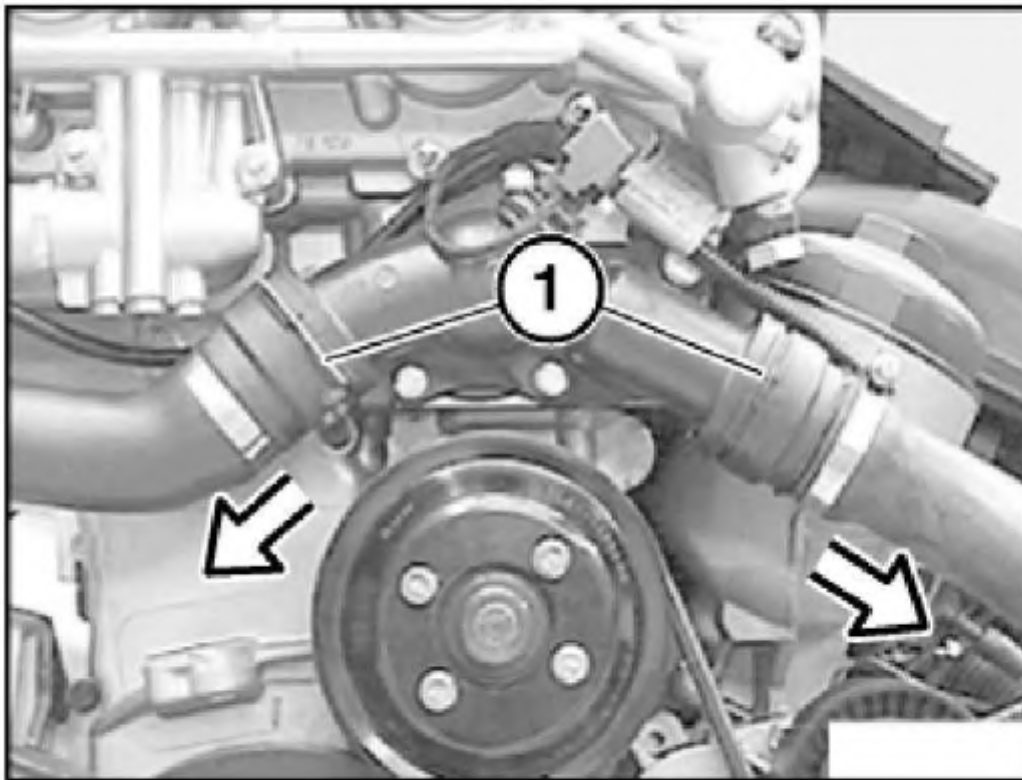
NOTE: The water drain plug is located on the exhaust side on cylinder 2 in the engine block.

Installation:

Replace sealing ring of water drain plug.

Tightening torque, (25 N.m.).

Pull locks (1) and disconnect water hoses.



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Fig. 8: Pulling Locks And Disconnecting Water Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

Installation:

Refer to general instructions for work on cooling system, refer to **17 00 ... INSTRUCTIONS FOR WORKING ON COOLING SYSTEM** .

Remove radiator, refer to **17 11 000 REMOVING AND INSTALLING RADIATOR (M62, M54 AND M57)** .

Remove intake air manifold, refer to **11 61 050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (M54)** .

Disconnect water hoses from water pipe and from heating valve.

Release wiring harness section for engine and lay to one side.

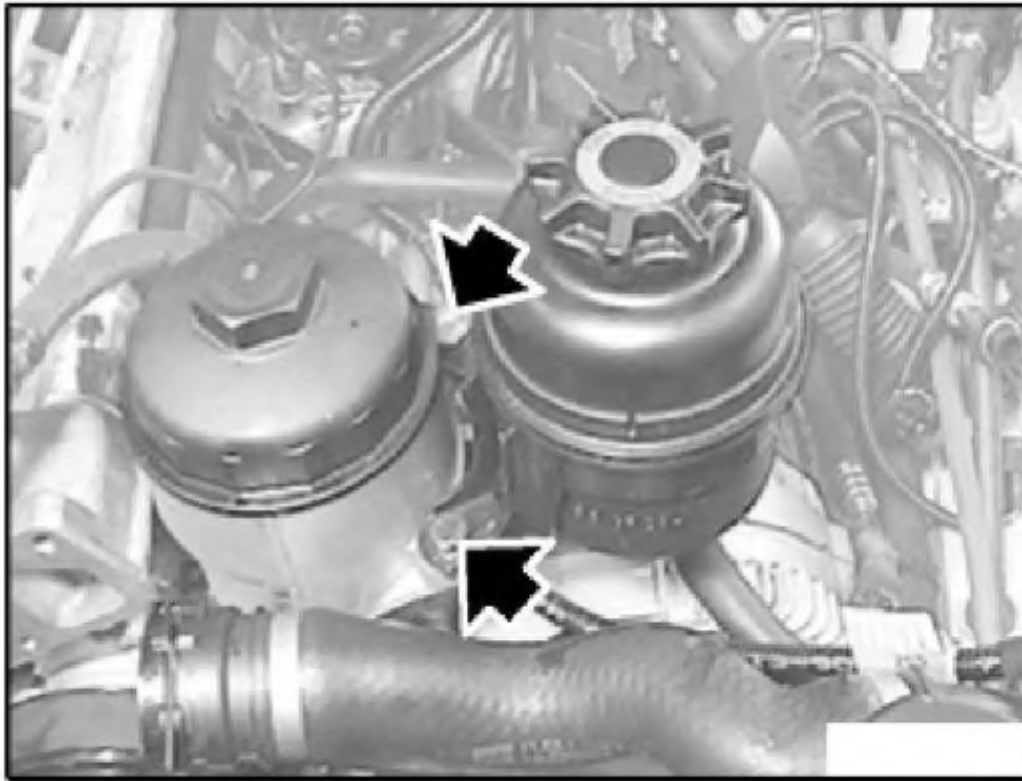
Draw off hydraulic fluid from supply tank for power steering pump.

Dispose of hydraulic fluid.

Observe country-specific waste-disposal regulations.

Unfasten reservoir for power steering unit and tie up to one side.

NOTE: **Lines remain connected.**



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Fig. 9: Locating Retaining Screws For Power Steering Unit
Courtesy of BMW OF NORTH AMERICA, INC.

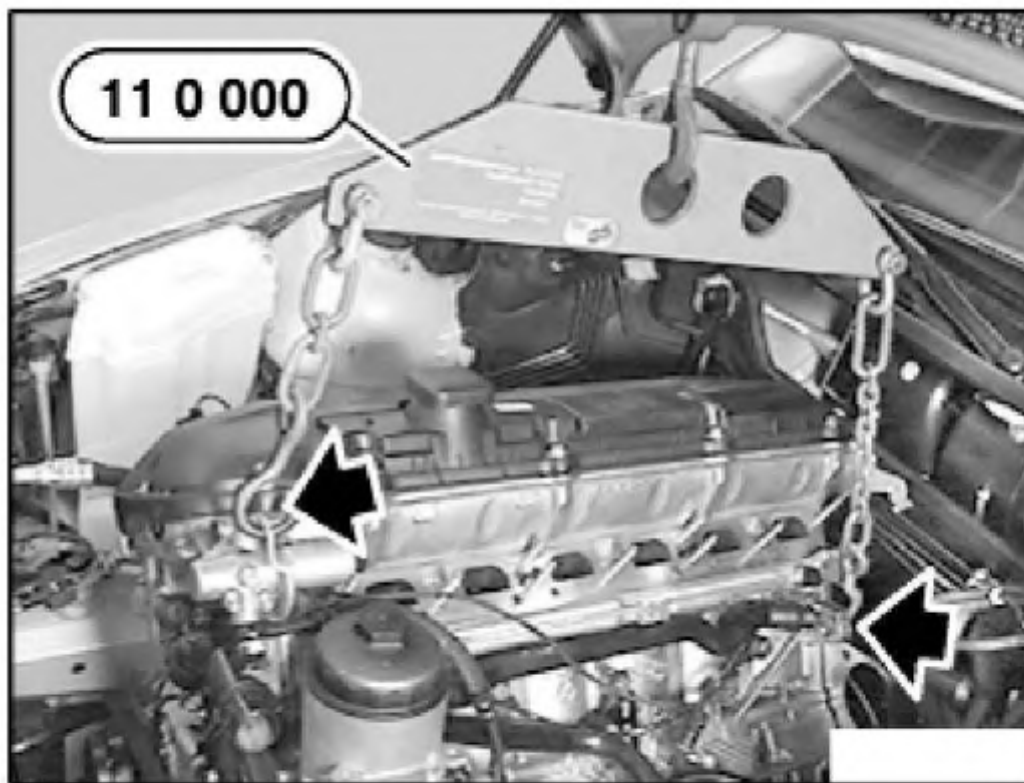
Remove fan clutch with fan impeller from water pump, refer to **11 52 020 REMOVING AND INSTALLING/REPLACING FAN CLUTCH (S52 / S54 / M52 / M52TU / M54 / M56)** .

Remove alternator drive belt, refer to **11 28 010 REPLACING ALTERNATOR DRIVE BELT (M52 / S52 / M52TU / M54 / M56)** .

Remove vane pump for power steering and tie back to one side.

NOTE: **Lines remain connected.**

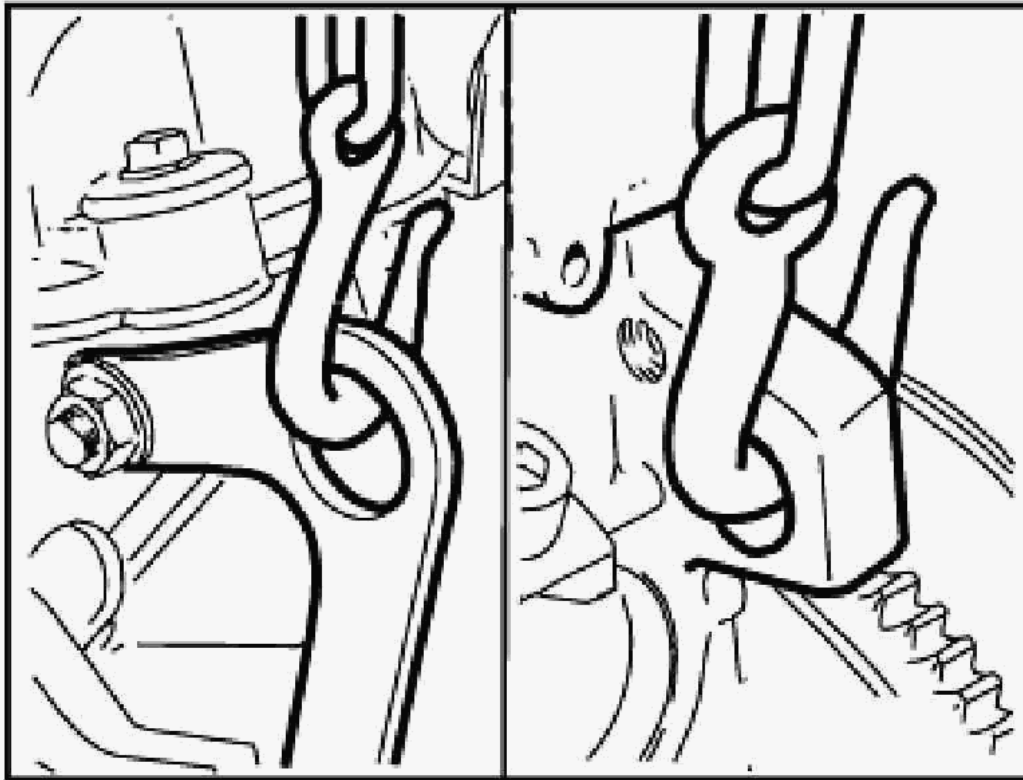
Suspend engine from special tool 11 0 000.



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Fig. 10: Suspending Engine Using Special Tool 11 0 000
Courtesy of BMW OF NORTH AMERICA, INC.

Front and rear suspension arrangement.



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Fig. 11: View Of Front/Rear Suspension Arrangement
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten right ground wire.

Unscrew left and right engine mounts.

Carefully lift out engine.

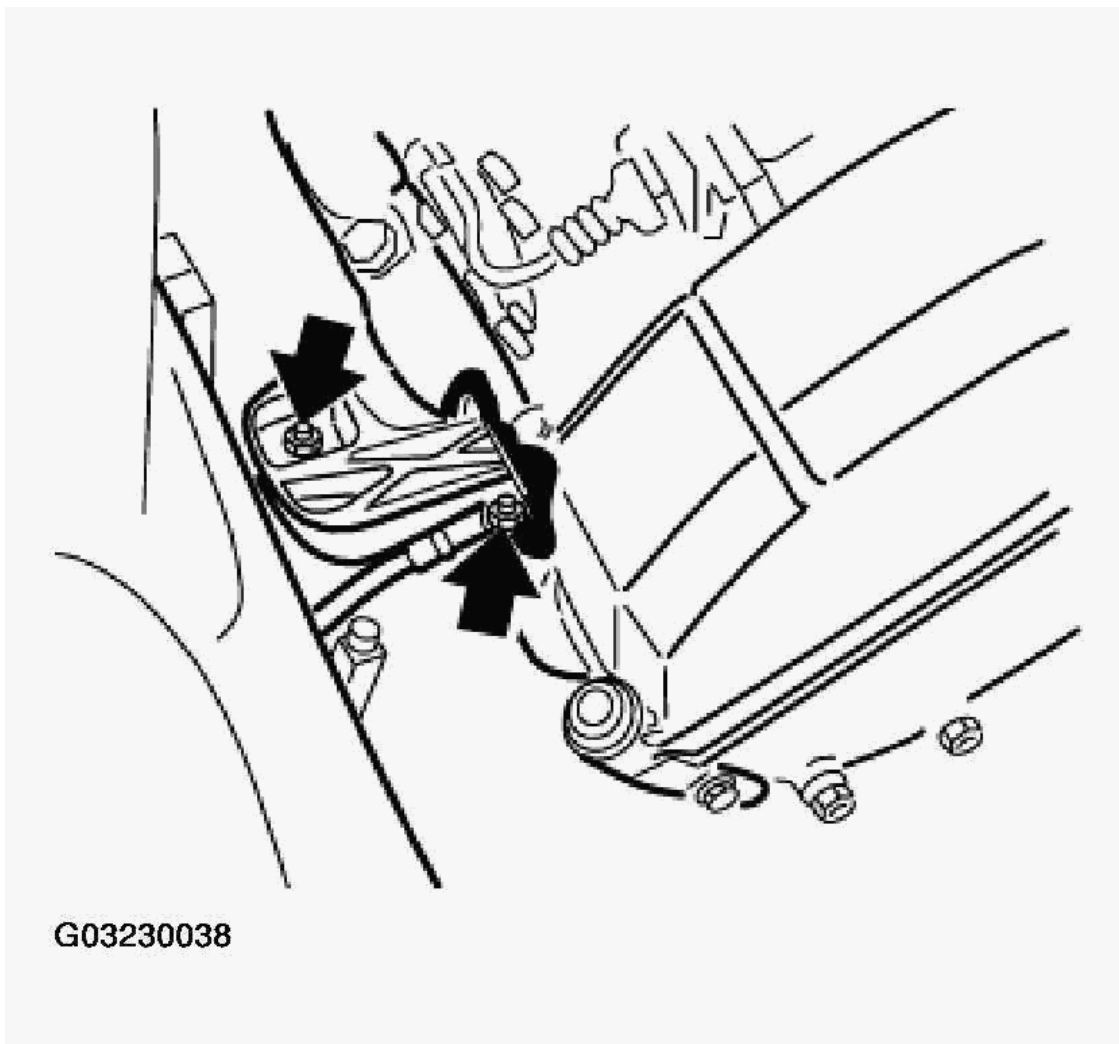


Fig. 12: Locating Right Engine Mount And Ground Wire
Courtesy of BMW OF NORTH AMERICA, INC.

CYLINDER HEAD WITH COVER

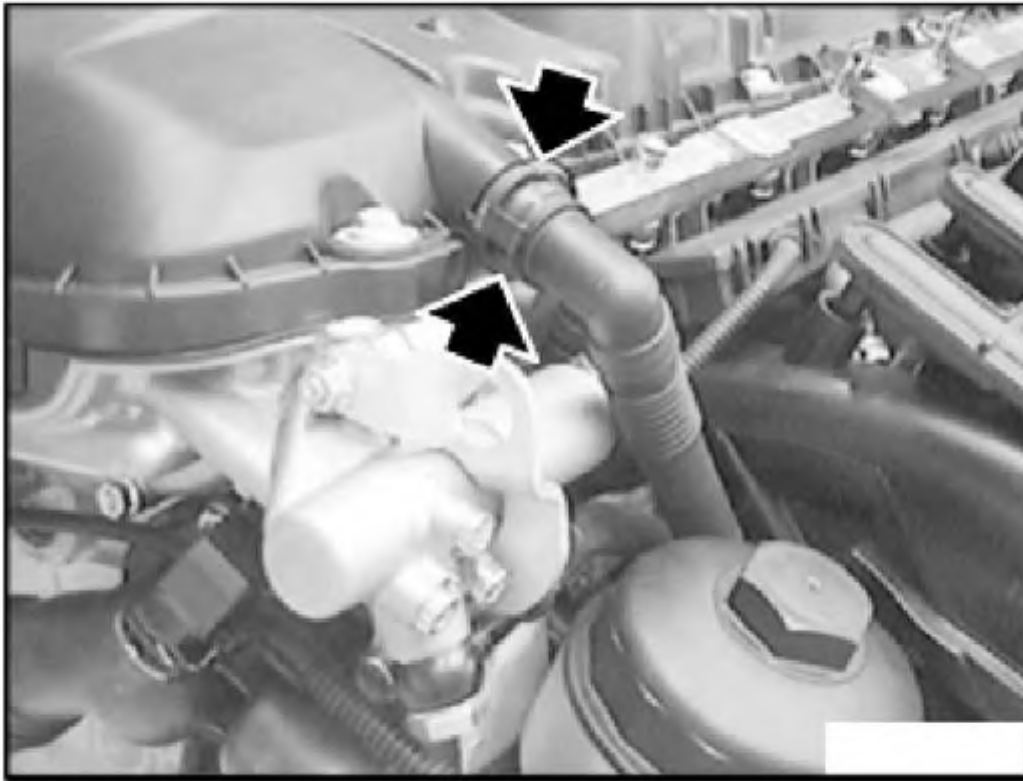
11 12 000 REMOVING AND INSTALLING, SEALING CYLINDER HEAD COVER (M52TU / M54 / M56)

Remove engine cover.

Remove ignition coils, refer to **12 13 511 REPLACING IGNITION COIL (M52, M52TU, M54)** .

Remove wiring harness of ignition coils from cylinder head cover and place to one side.

NOTE: Illustration on M54 engine. Press lock. Pull off the hose for the engine breather.



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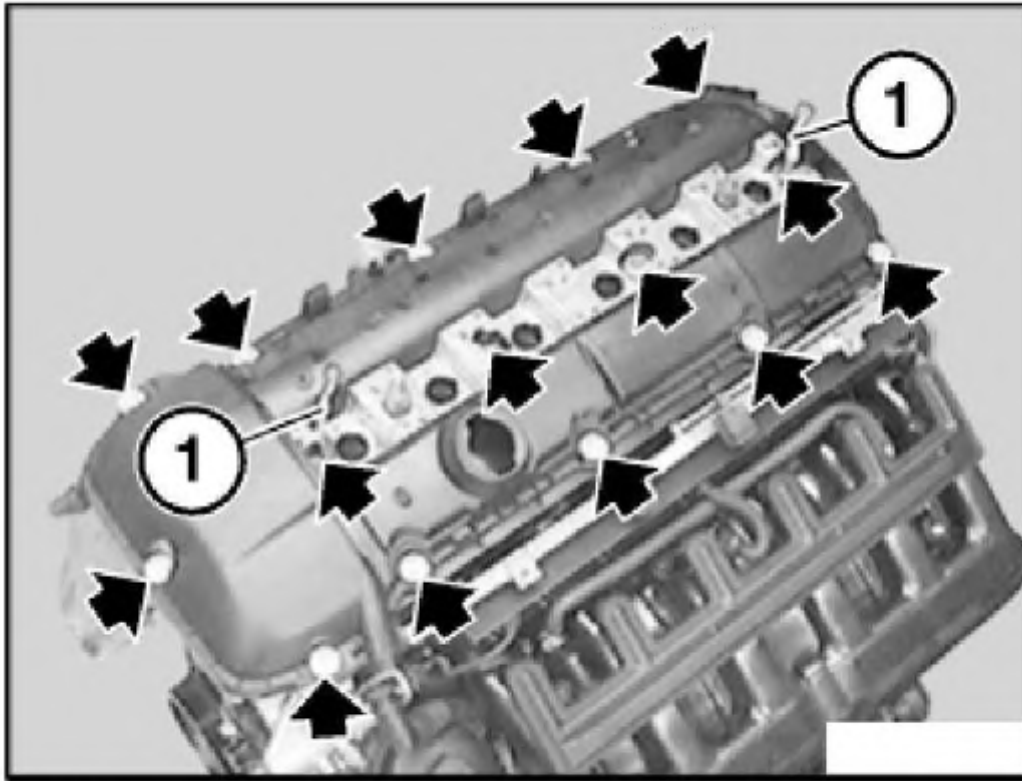
Fig. 13: Removing Hose For Engine Breather
Courtesy of BMW OF NORTH AMERICA, INC.

Remove grounding straps (1).

Remove cylinder head cover, refer to **11 12 000 REMOVING AND INSTALLING, SEALING CYLINDER HEAD COVER (M52TU / M54 / M56)** .

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



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Fig. 14: Removing Grounding Straps

Courtesy of BMW OF NORTH AMERICA, INC.

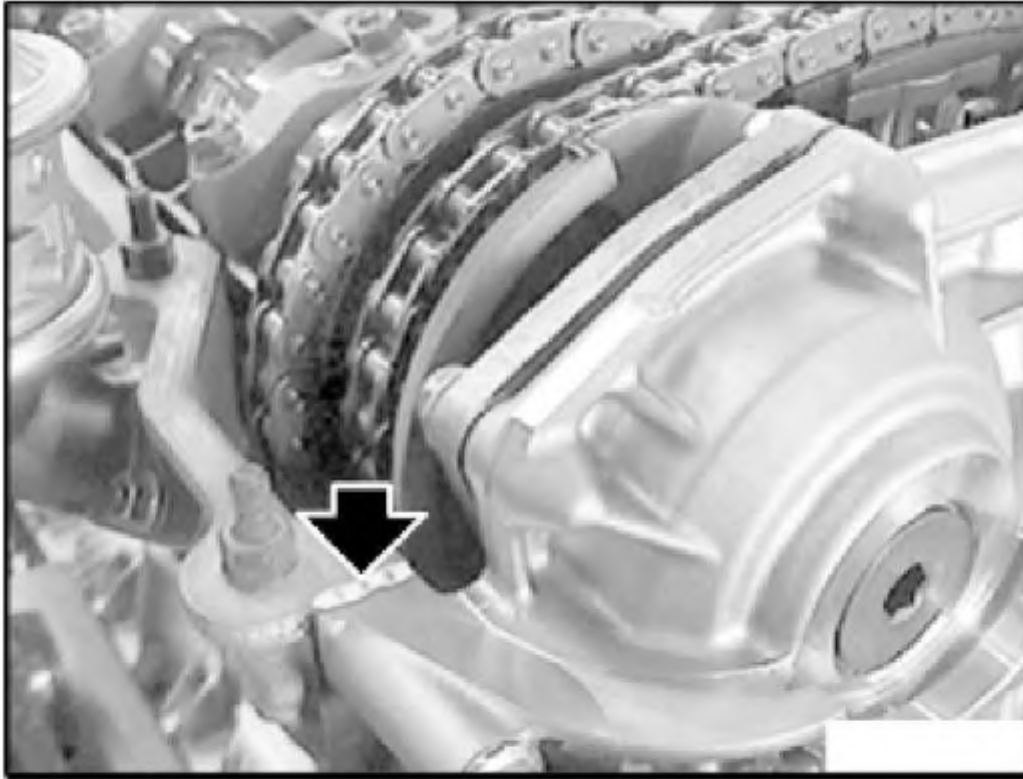
Installation:

Remove sealing debris from sealing faces of cylinder head and cylinder head cover.

Apply a sealing bead of Drei Bond 1209 on left and right sides at transition between cylinder head and VANOS adjustment unit.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

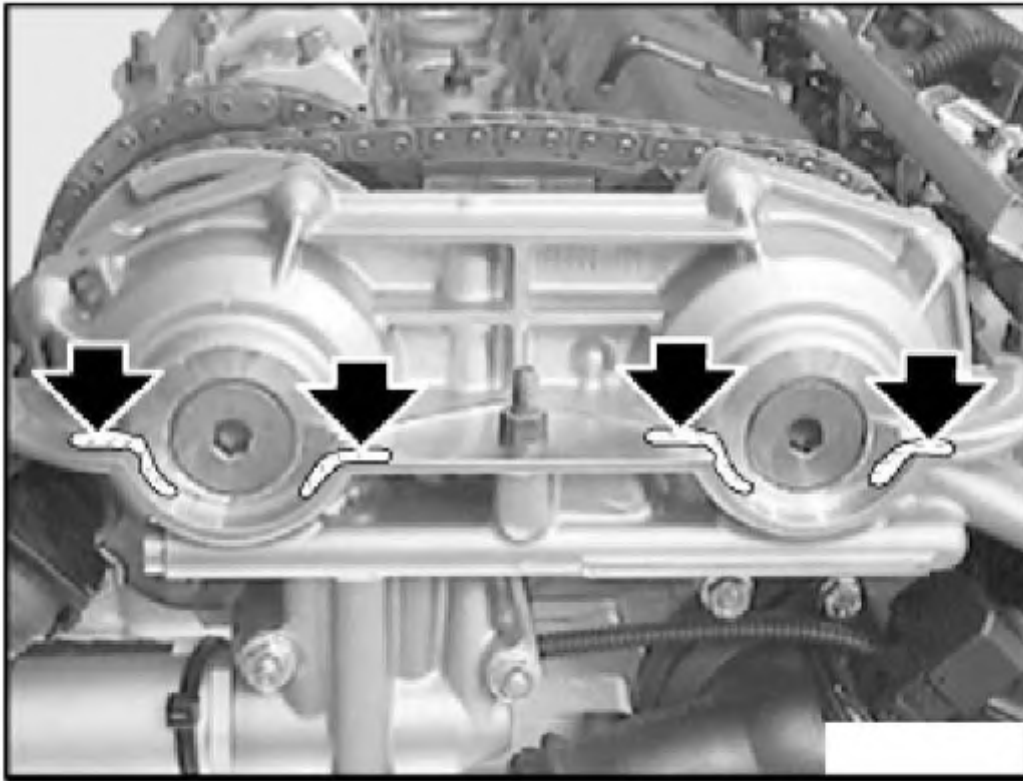


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Fig. 15: Applying Sealant Between Cylinder Head And VANOS Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Apply a thin and even sealing bead of Drei Bond 1209 at transition to half-moon sections at VANOS adjustment unit.



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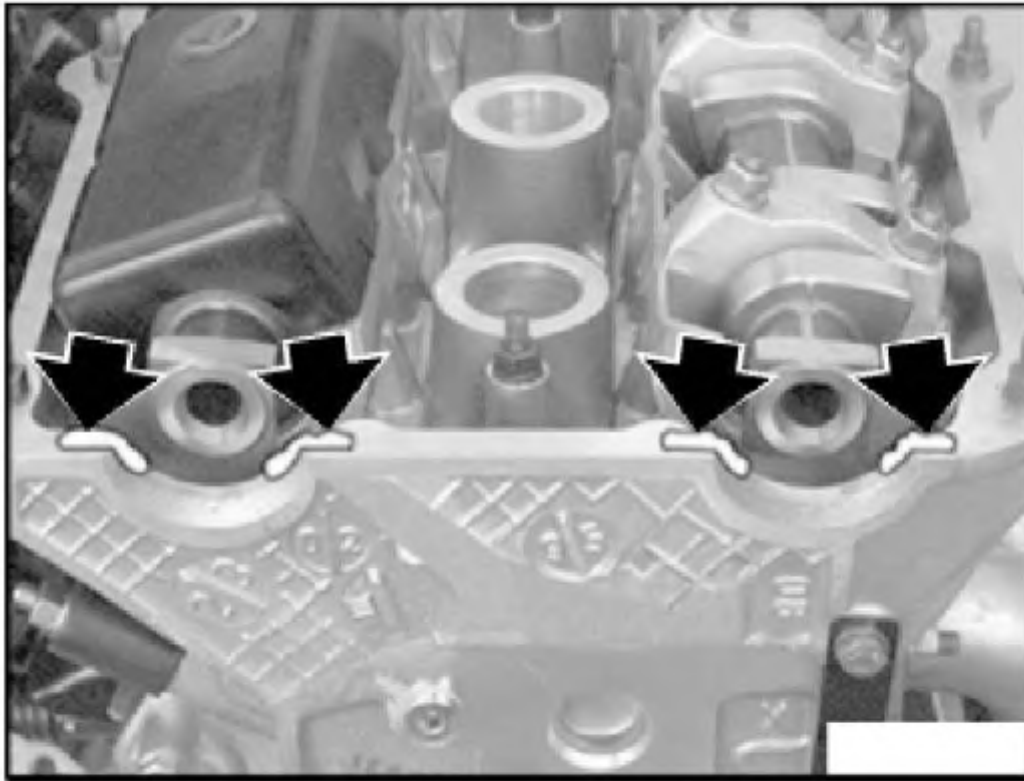
Fig. 16: Applying Sealant To VANOS Adjustment Unit
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Illustration with engine removed.

Installation:

Apply a thin and even sealing bead of Drei Bond 1209 at transition to half-moon sections at rear of cylinder head.

Check seals and replace if necessary.



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Fig. 17: Applying Sealant To VANOS Adjustment Unit (Rear)
Courtesy of BMW OF NORTH AMERICA, INC.

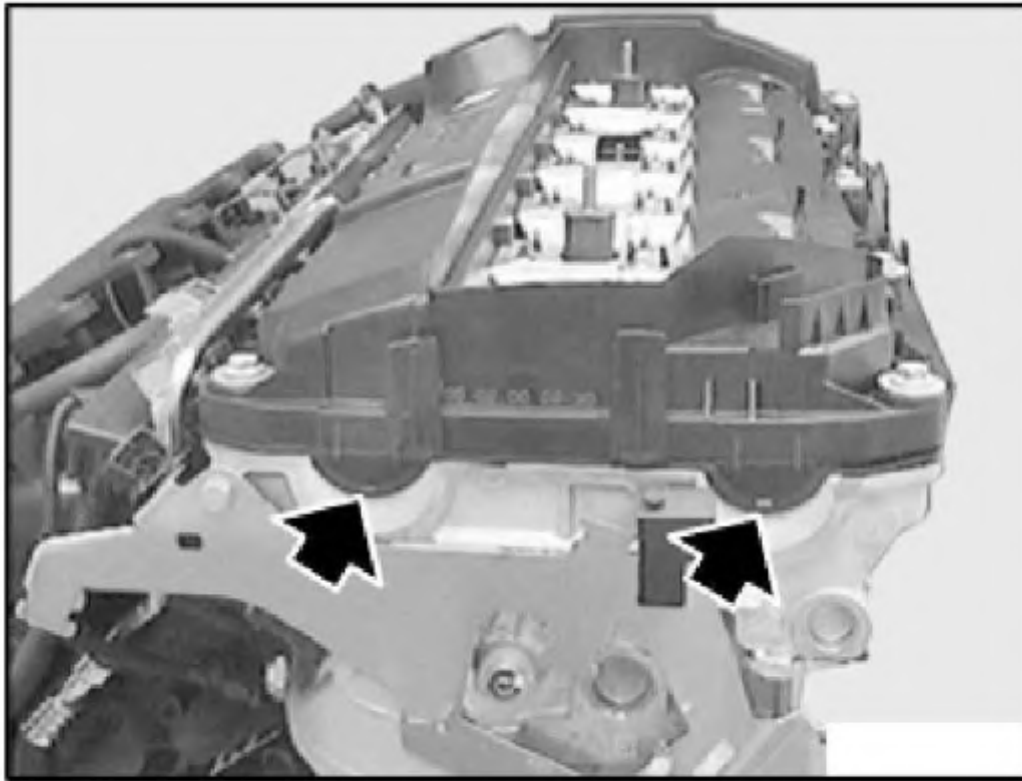
NOTE: Illustration with engine removed.

Installation:

Make sure gasket is correctly seated on rear and front ends of cylinder head.

Install cover bolts and align cylinder head cover.

Hand-tighten all cover bolts without preload. Tighten cap nuts crosswise from inside to outside.



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Fig. 18: Locating Half-Moon Gaskets On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 100 REMOVING AND INSTALLING/SEALING CYLINDER HEAD (M54)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required :

- 00 9 120

Remove both exhaust manifolds, refer to **11 62 140 REMOVING AND INSTALLING, SEALING OR REPLACING BOTH EXHAUST MANIFOLDS WITH CATALYTIC CONVERTER (M54)** .

Remove intake filter housing with air-mass flow sensor.

Remove cylinder head cover, refer to **11 12 000 REMOVING AND INSTALLING, SEALING CYLINDER HEAD COVER (M52TU / M54 / M56)** .

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

Remove all spark plugs.

Remove intake air manifold, refer to **11 61 050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (M54)** .

Open coolant drain plug on engine block. Drain and dispose of coolant.

Installation:

Replace sealing ring on drain plug.

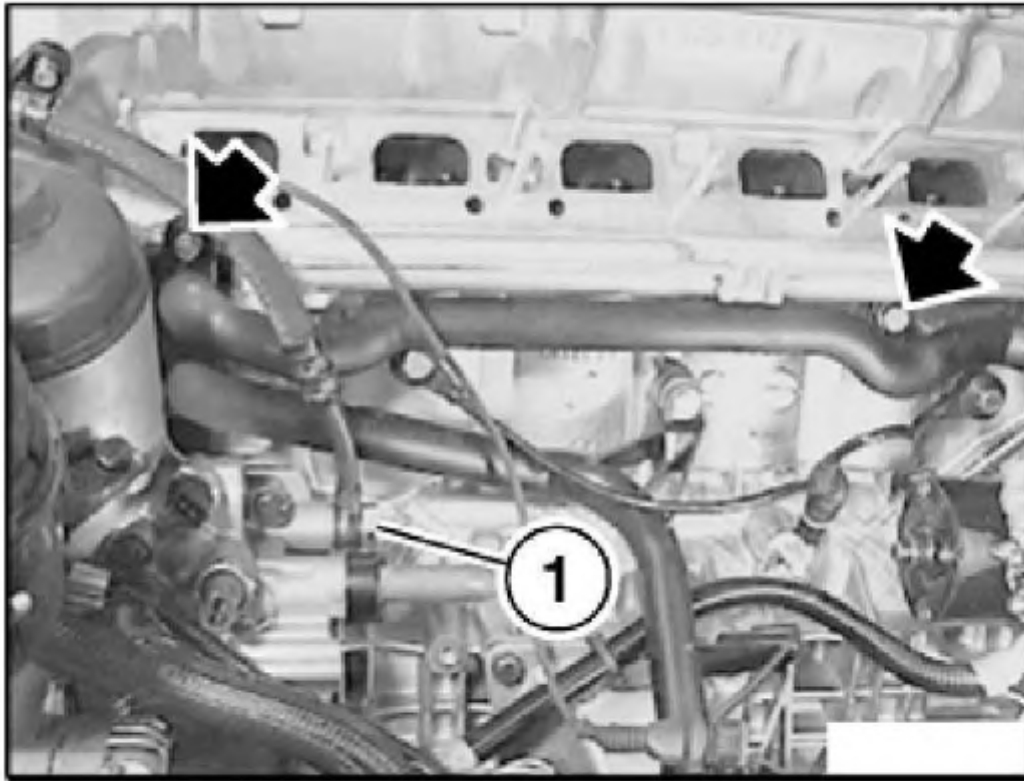
Tightening torque, (25 N.m.).

Vent cooling system and check for leaks, refer to **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR LEAKS (M54 / M56)** .

Remove coolant thermostat housing, refer to **11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (M52TU / M54 / M56)** .

Remove coolant pipe.

NOTE: If the coolant pipe cannot be fed out: Release banjo bolt (1) and disconnect oil pressure line for VANOS adjustment unit.



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Fig. 19: Removing Banjo Bolt

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace O-ring on coolant pipe.

If necessary, replace sealing rings on banjo bolt (1).

Tightening torque of banjo bolt, (32 N.m.).

Removal:

Removal of cylinder head is described separately from installation.

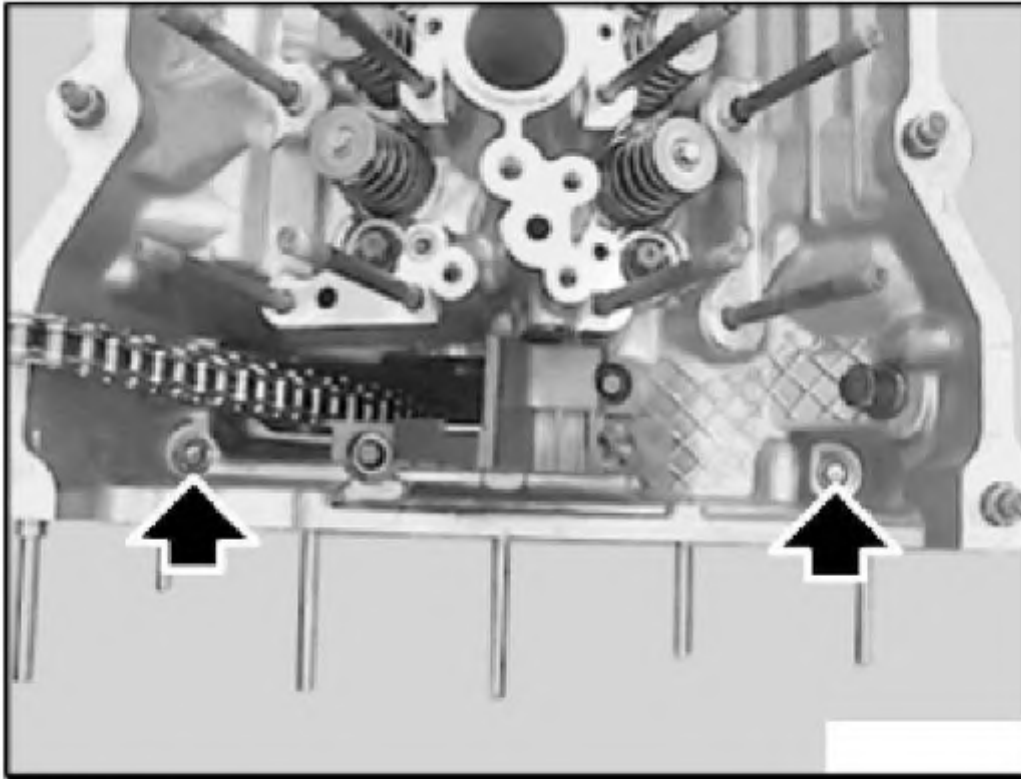
Remove double VANOS adjustment unit, refer to **11 36 010 REMOVING AND INSTALLING OR REPLACING DOUBLE VANOS ADJUSTMENT UNIT (M52TU / M54 / M56)** .

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

Remove camshafts with bearing strips, refer to **11 31 001 REPLACING CAMSHAFT (M52TU / M54 / M56)** .

Release screw connection between timing case cover and cylinder head.



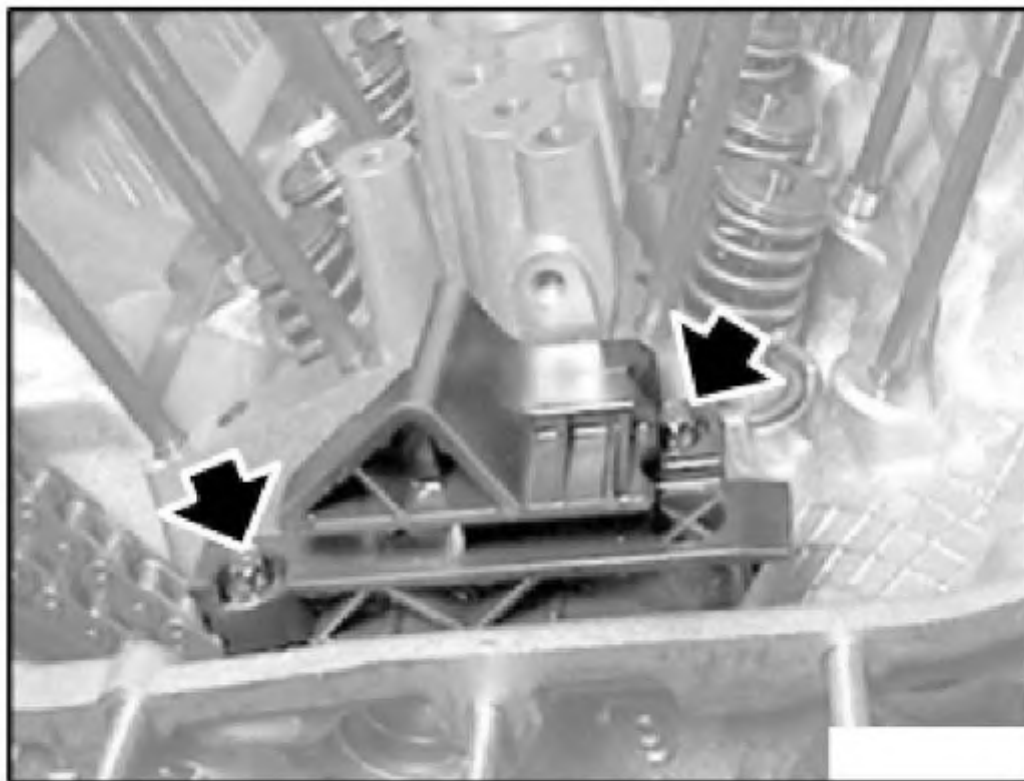
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Fig. 20: Locating Screw Connection Between Cover And Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws, remove chain guide.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

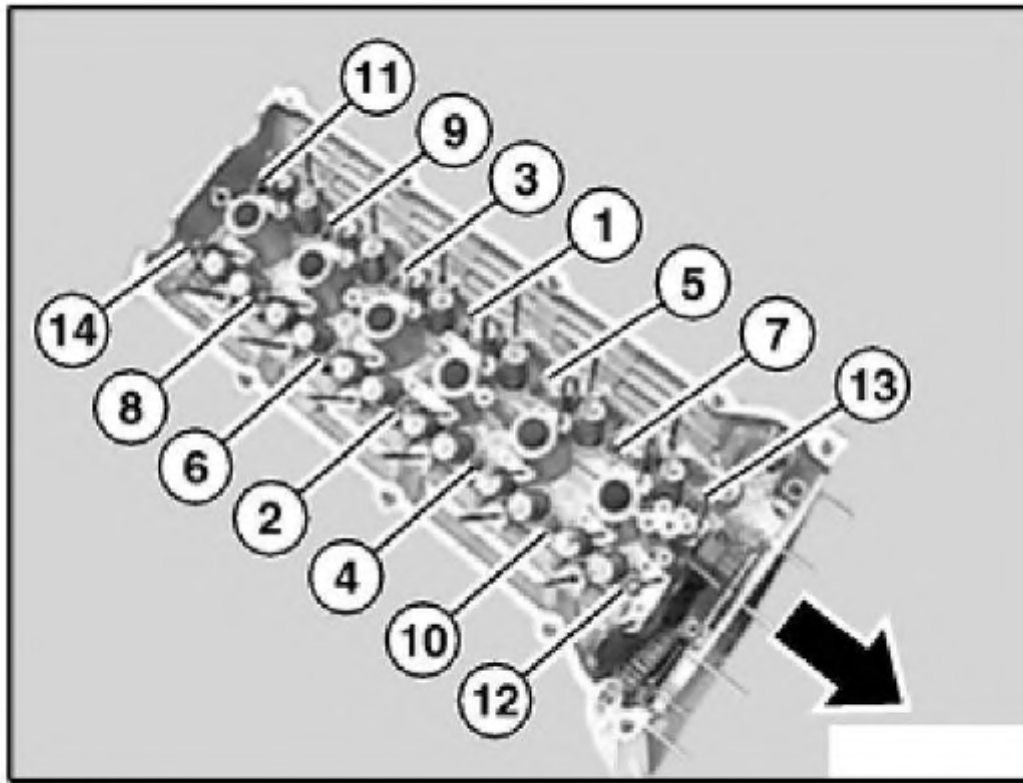


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Fig. 21: Identifying Chain Guide Retaining Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release cylinder head bolts from outside to inside in sequence 14 to 1.

Lift off cylinder head.



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Fig. 22: Cylinder Head Bolt Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Installation of cylinder head is described separately from removal.

Clean sealing faces of cylinder head and engine block; if necessary, remove traces of sealing compound with hardwood spatula. Make sure no gasket remnants drop into oil and cooling channels.

There must be no oil in the tapped holes of the engine block and the timing case cover.

Danger of cracking and distorted tightening values.

Check dowel sleeves for damage and correct installation position.

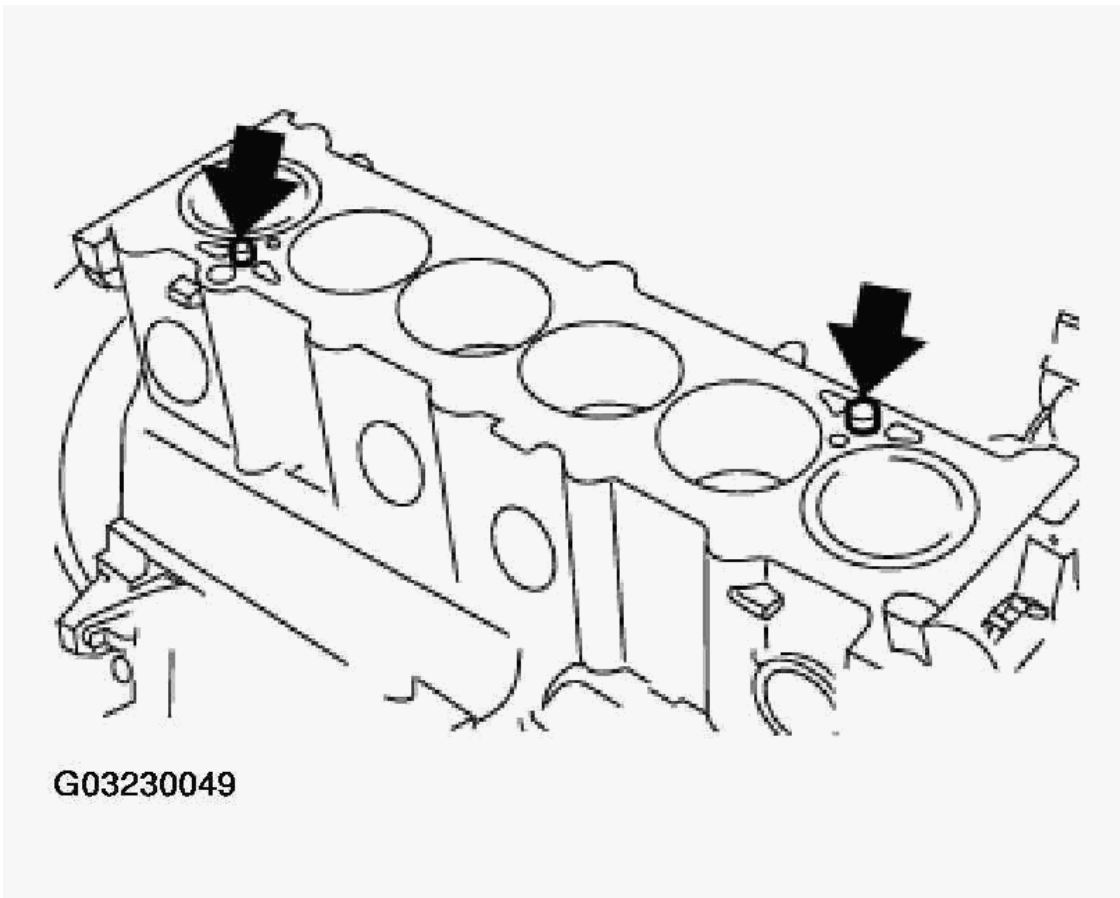


Fig. 23: Locating Dowel Sleeves For Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Apply permanently elastic sealing compound Drei Bond 1209 to joints to timing case cover.

Replace cylinder head gasket.

NOTE: **A 0.3 mm thick cylinder head gasket is available for cylinder heads remachined at the cylinder head gasket surface.**

Put the cylinder head on.

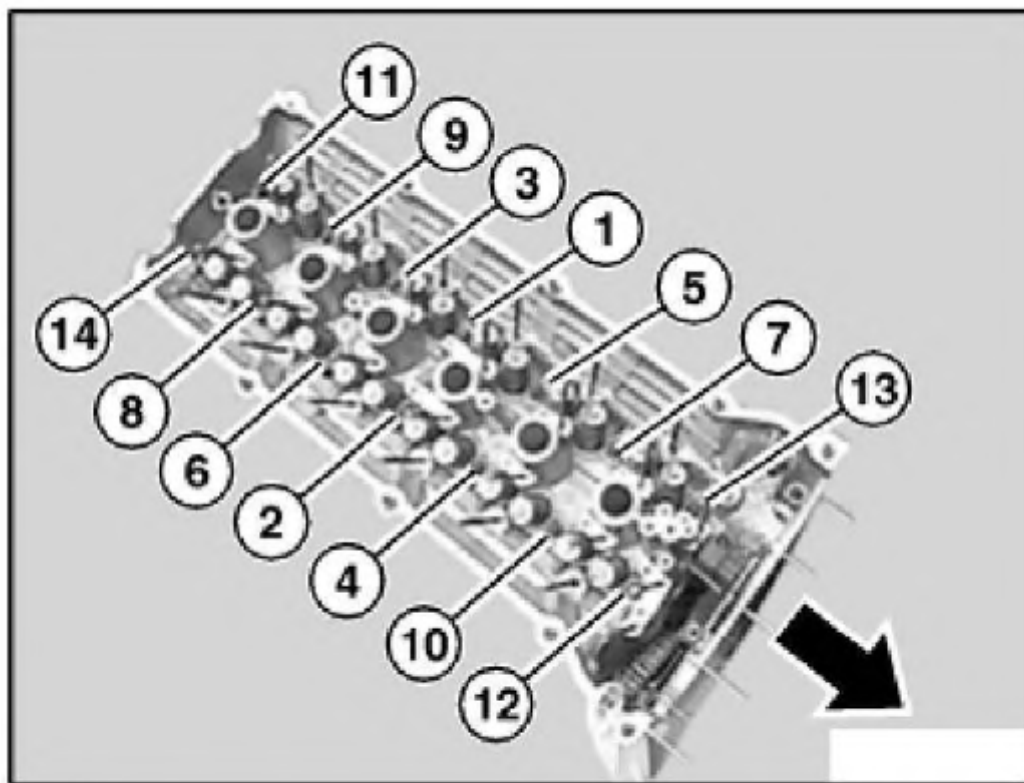
Install new cylinder head bolts.

Apply a light coat of oil to washer contact area and thread of new cylinder head bolts.

Tighten down cylinder head bolts in sequence 1 to 14.

Tightening torque, refer to 11 12 6AZ in **ENGINE - TIGHTENING TORQUES** .

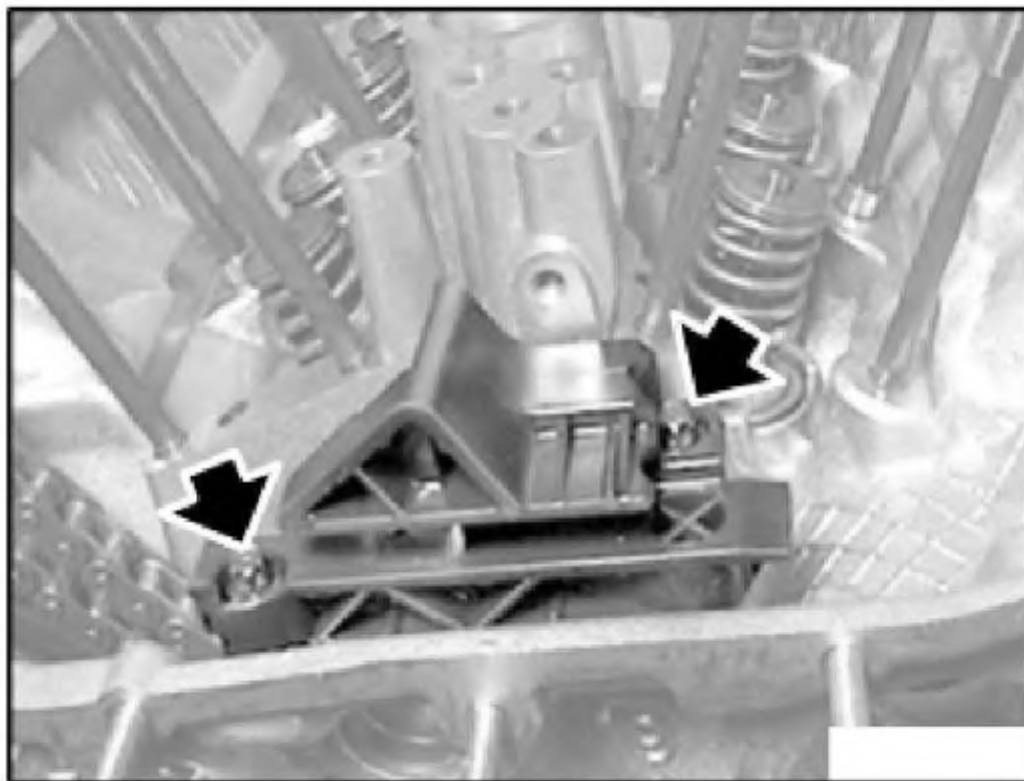
NOTE: **Use special tool 00 9 120 for torsion angle tightening.**



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Fig. 24: Cylinder Head Bolt Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Install chain guide.

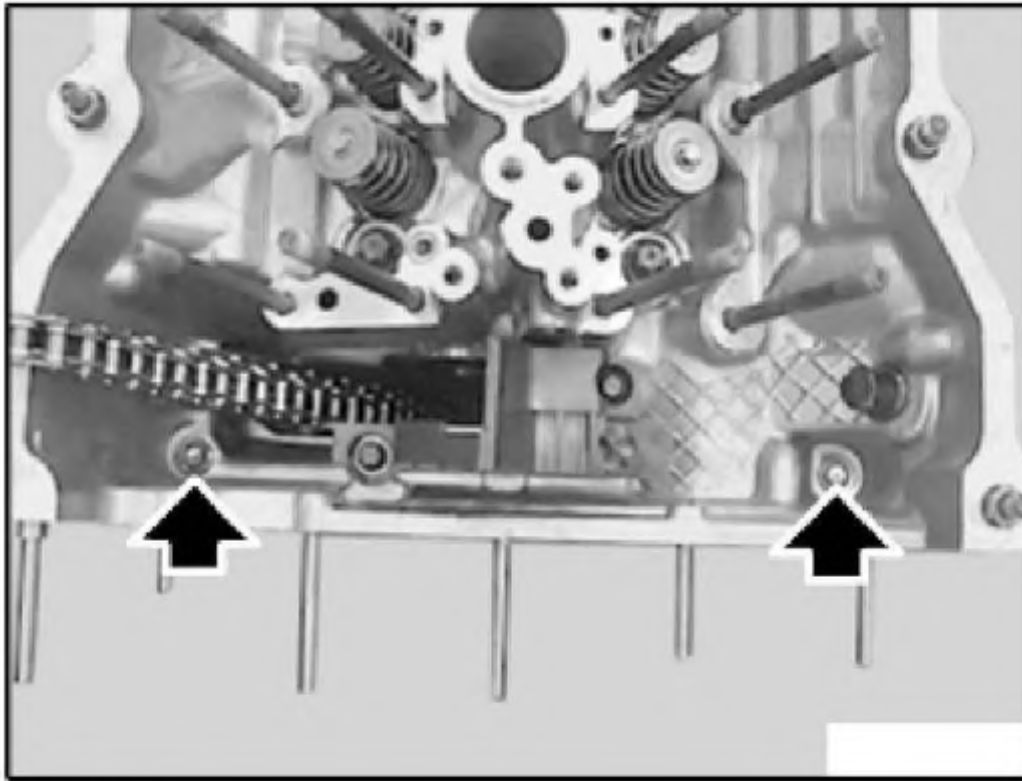


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Fig. 25: Installing Chain Guide

Courtesy of BMW OF NORTH AMERICA, INC.

Insert screws and tighten down screw connection between timing case cover and cylinder head.



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Fig. 26: Locating Screw Connection Between Cover And Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Install camshafts, refer to **11 31 001 REPLACING CAMSHAFT (M52TU / M54 / M56)** .

Install double VANOS adjustment unit, refer to **11 36 010 REMOVING AND INSTALLING OR REPLACING DOUBLE VANOS ADJUSTMENT UNIT (M52TU / M54 / M56)** .

Assemble engine.

11 12 101 REPLACING CYLINDER HEAD GASKET (M52 / S52 / M52TU / M54 / M56)

Tasks are identical to removing and installing cylinder head, refer to **11 12 503 DISASSEMBLING AND ASSEMBLING CYLINDER HEAD (M52 / S52 / M52TU / M54 / M56)** .

11 12 503 DISASSEMBLING AND ASSEMBLING CYLINDER HEAD (M52 / S52 / M52TU / M54 / M56)

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

NOTE: For Special Tool identification, see SPECIAL TOOLS - X5 (3.0i) .

Special Tools Required:

- 00 1 490
- 11 0 192
- 11 0 342
- 11 0 343
- 11 0 345
- 11 1 045
- 11 1 065
- 11 1 067
- 11 1 071
- 11 1 441
- 11 1 442

(Cylinder head removed.)

If necessary, remove coolant thermostat.

Screw on special tool 11 1 442 .

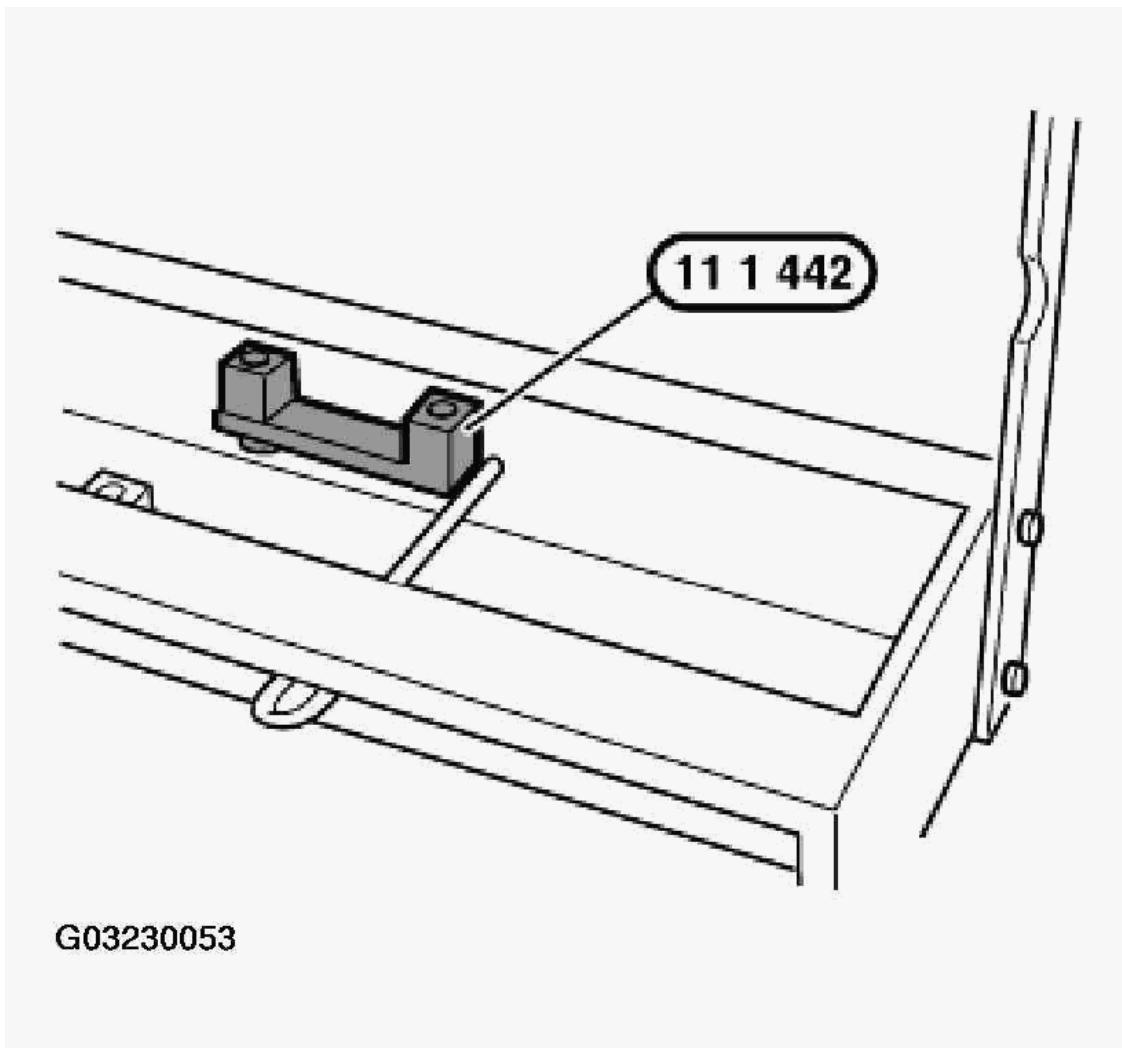


Fig. 27: Installing Special Tool 11 1 442
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 11 1 065 onto special tool 00 1 490 .

Provide special tools for disassembling cylinder head:

- Special tool 11 1 071 .
- Special tool 11 1 067 .
- Special tool 11 0 192 .

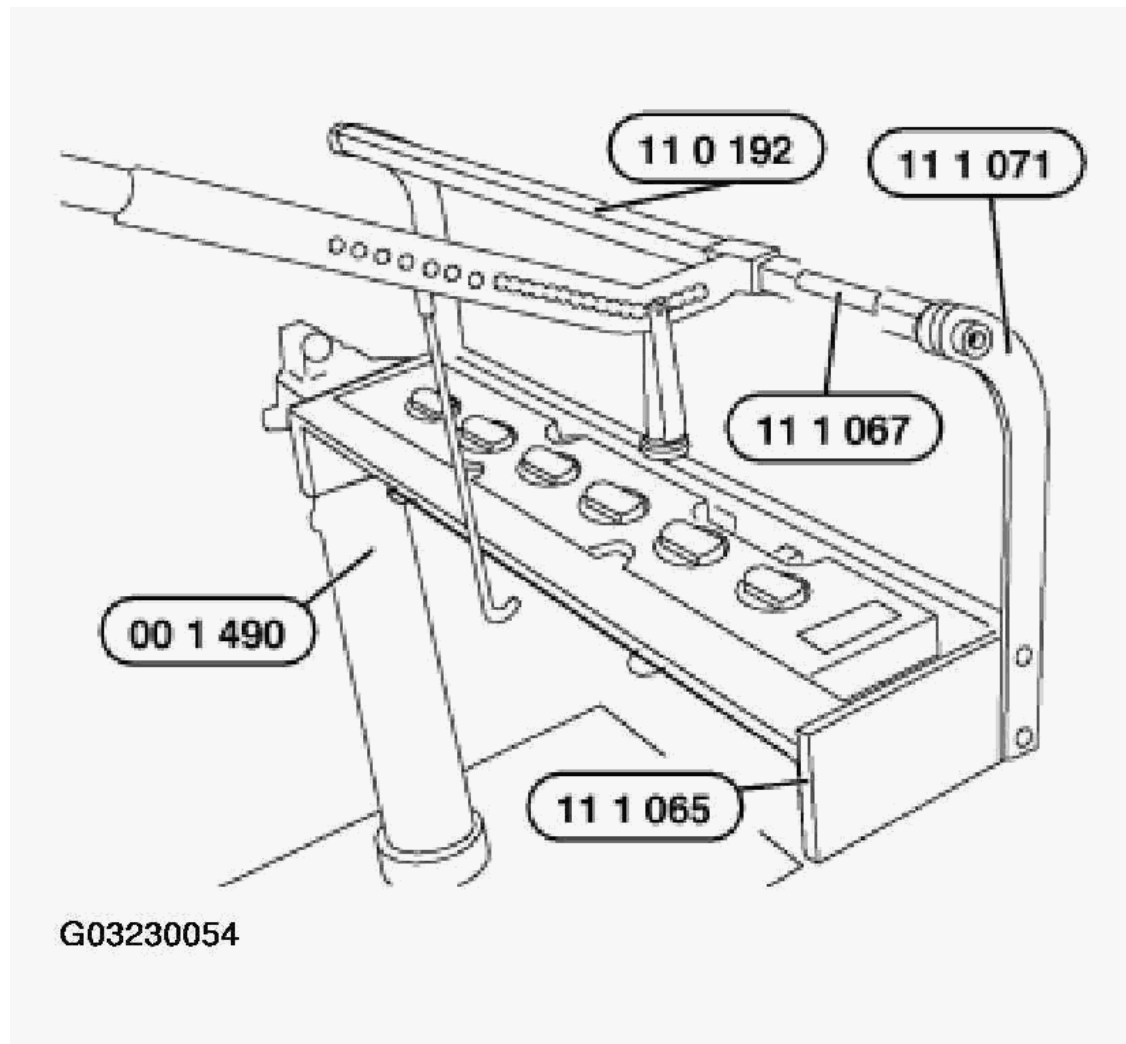


Fig. 28: View Of Engine Hoist

Courtesy of BMW OF NORTH AMERICA, INC.

- Special tool 11 1 045
- Special tool 11 0 342
- Special tool 11 0 343
- Special tool 11 0 345
- Special tool 11 1 441 .

Assemble special tools.

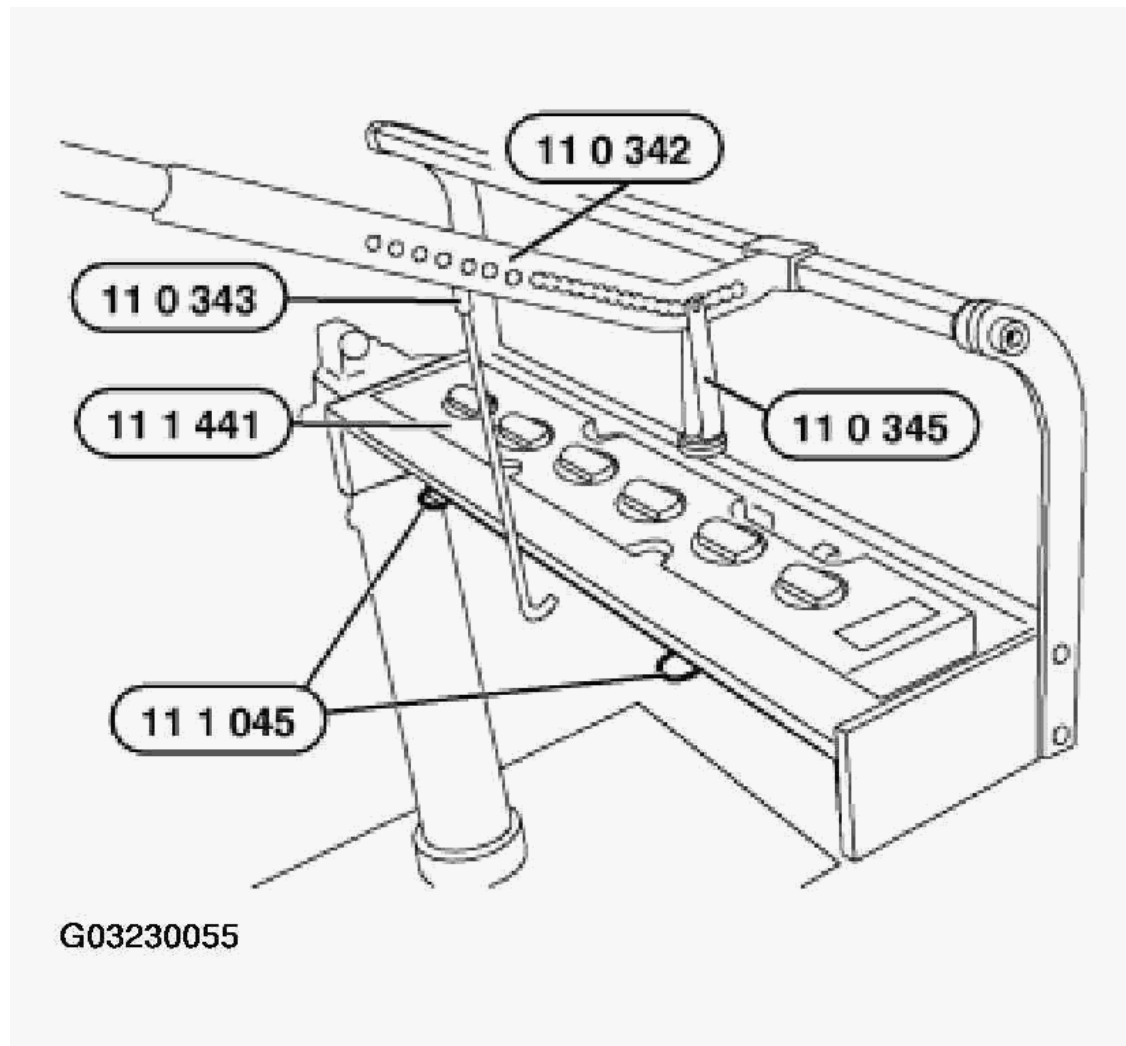


Fig. 29: Identifying Special Tools 11 0 340 Accessories

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Do not install special tool 11 1 441 (locating board) in special tool 11 1 065 at this stage.

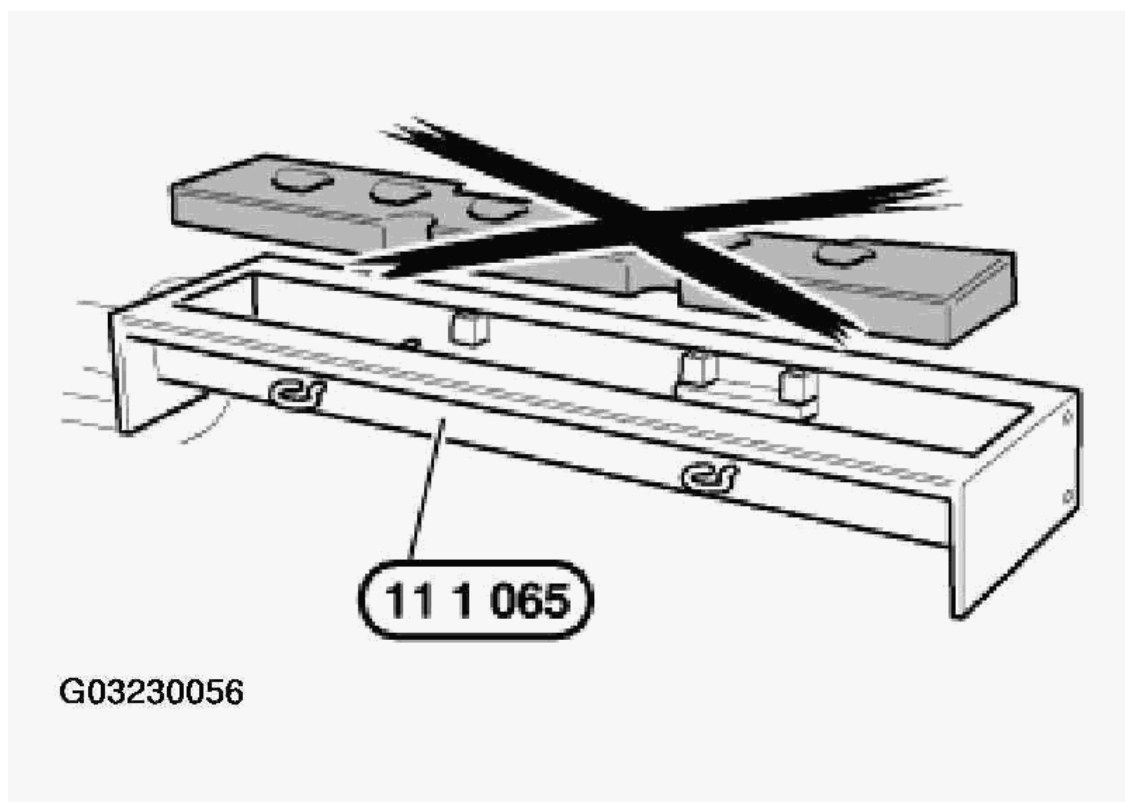
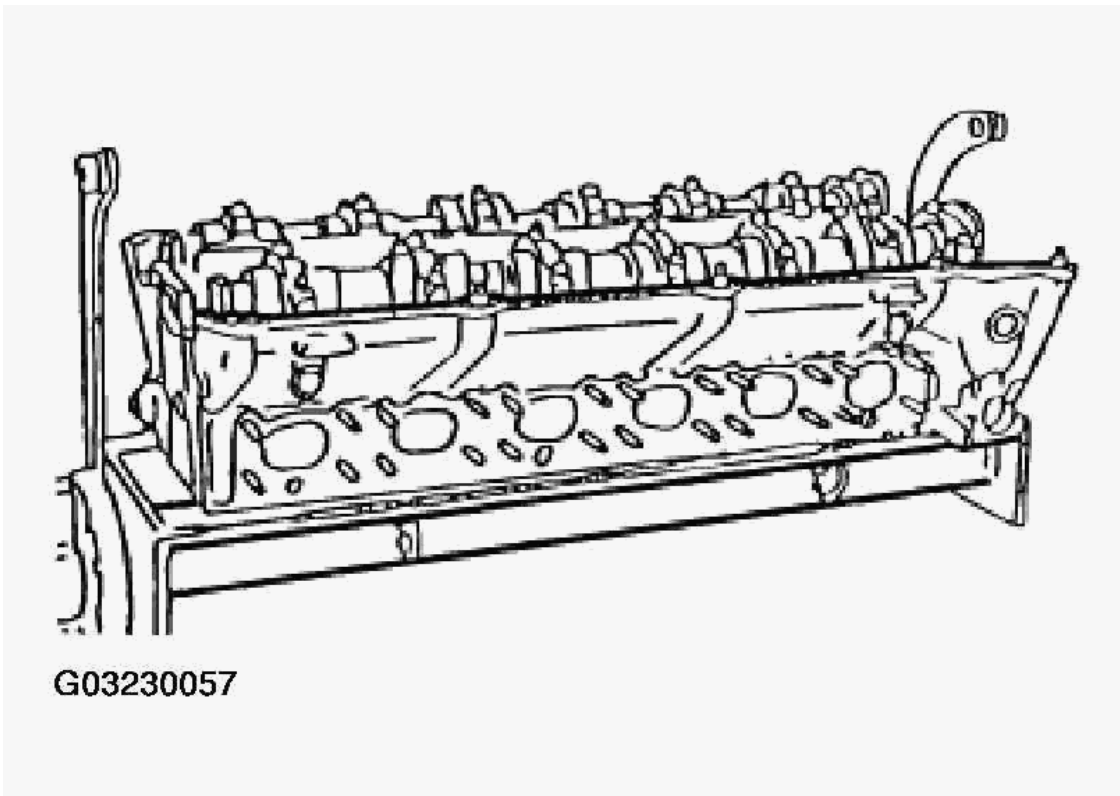


Fig. 30: Identifying Locating Board

Courtesy of BMW OF NORTH AMERICA, INC.

Place cylinder head on special tool 11 1 065 and screw on with two screws.



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Fig. 31: Placing Cylinder Head On Locating Board

Courtesy of BMW OF NORTH AMERICA, INC.

Remove all valve springs, refer to **11 34 715 REPLACING ALL VALVE SPRINGS (M52 / S52 / M52TU / M54 / M56)** .

Remove all valve stem seals, refer to **11 34 560 REPLACING ALL VALVE STEM SEALS (M52 / S52 / M52TU / M54 / M56)** .

Remove all valves, refer to **11 34 552 REMOVING AND INSTALLING OR REPLACING ALL VALVES (M52 / S52 / M52TU / M54 / M56)** .

11 12 527 REMACHINING A VALVE SEAT (M52 / S52 / M52TU / M54 / M56)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 00 3 520
- 00 3 580

(Cylinder head dismantled.).

Machine valve seat surface with special tool 00 3 520 or with special tool 00 3 580 in accordance with

manufacturer's instructions.

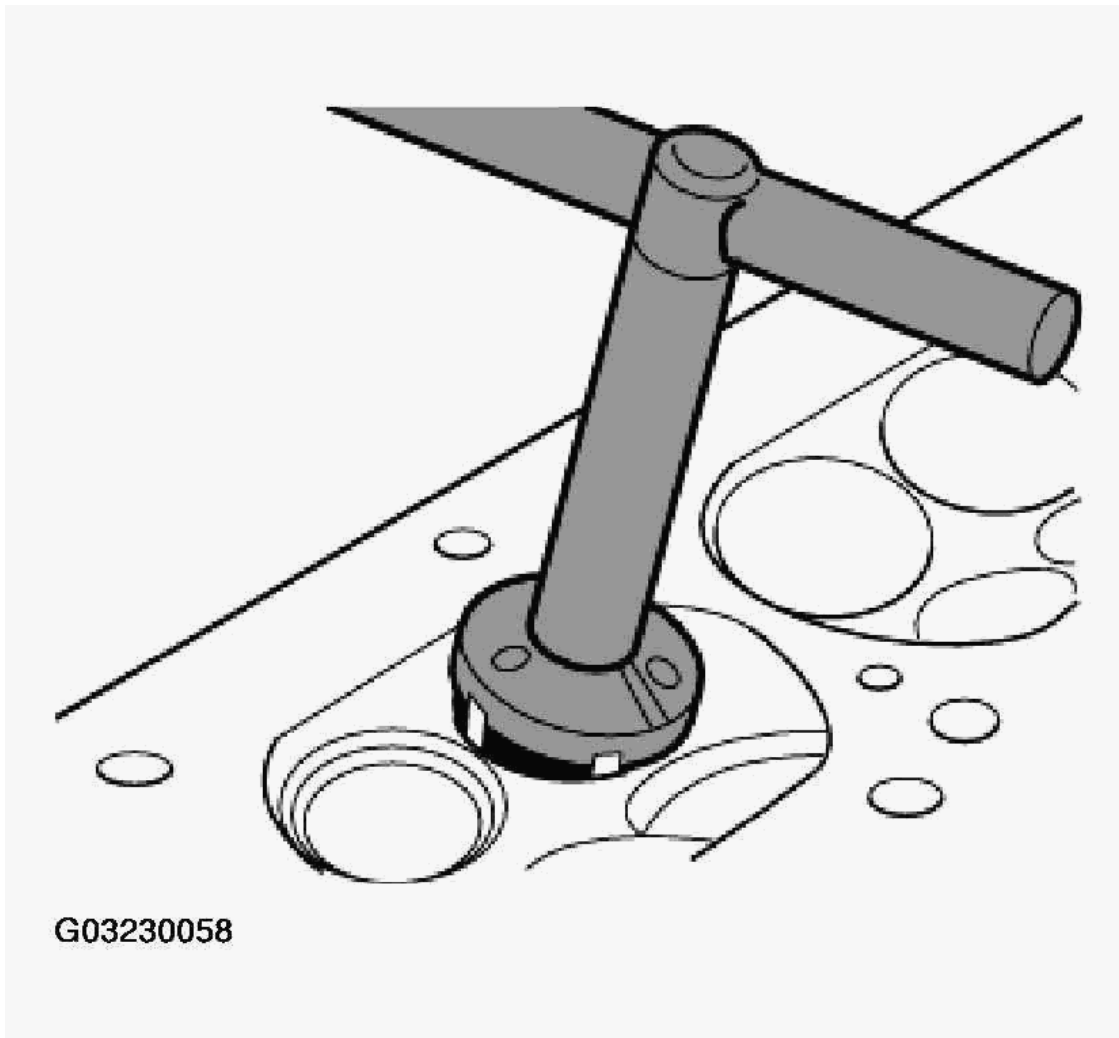


Fig. 32: Identifying Valve Seal Milling Cutters
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: After machining the valve seat surface, remachine the outside and inside diameters with a correction milling tool to the prespecified diameter to produce valve seat width (5).

1. Valve-seat angle.
2. Correction angle, outside.
3. Correction angle, inside.
4. Outside diameter seat face.
5. Valve-seat width.

Specified values (1 to 5), refer to **ENGINE - TECHNICAL DATA** .

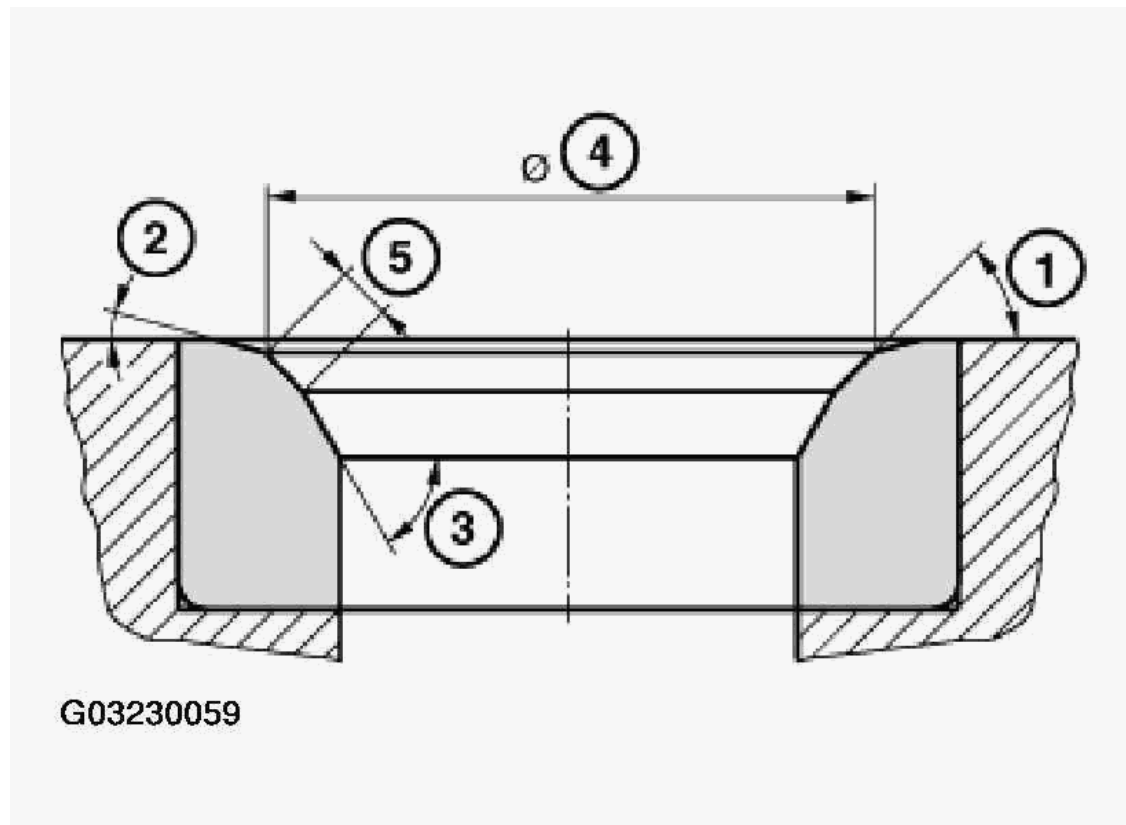


Fig. 33: Valve Seat Diameters

Courtesy of BMW OF NORTH AMERICA, INC.

11 12 595 CHECKING A VALVE GUIDE FOR WEAR (M52 / S52 / M52TU / M54 / M56)

(Valve removed.)

To measure tilt clearance, install a new valve so that end of valve stem is flush with valve guide.

Attach dial gauge and measure tilt clearance.

NOTE: Max. permissible tilt clearance, refer to ENGINE - TECHNICAL DATA .

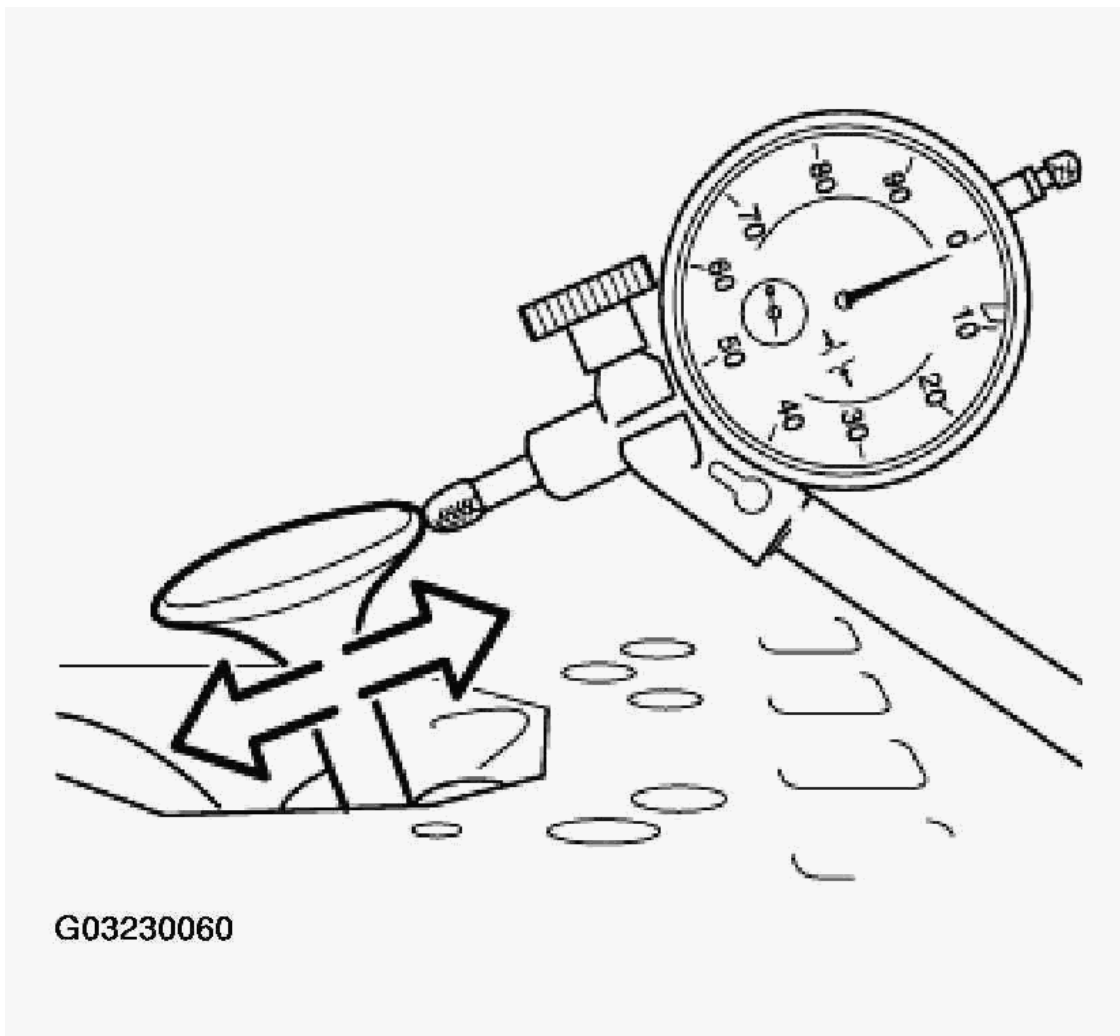


Fig. 34: Measuring Tilt Clearance With Dial Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If tilt clearance is excessive, valve guide is reamed out and a repair valve with a larger shaft diameter is installed.

If necessary, ream valve guide, refer to 11 12 600 REAMING A VALVE GUIDE (M52 / S52 / M52TU / M54 / M56) .

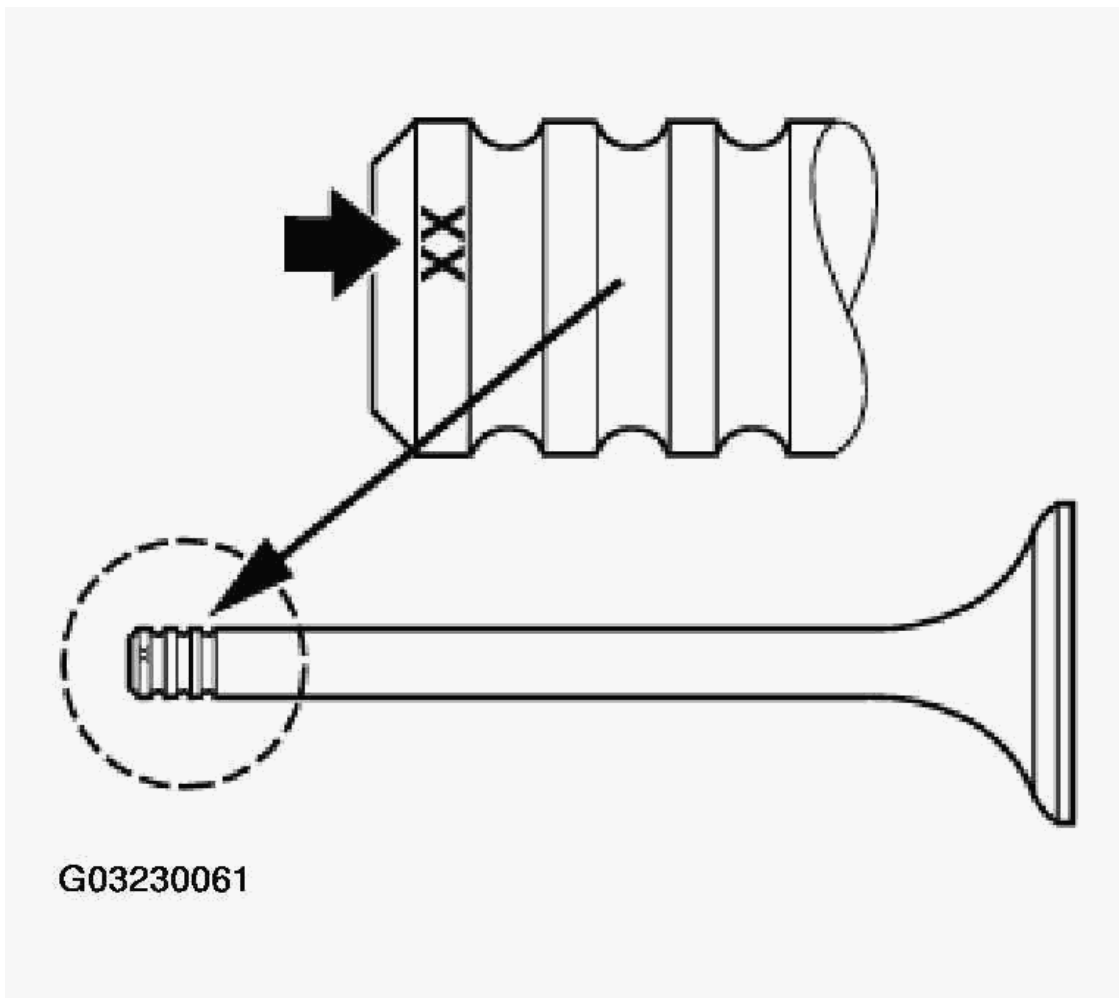


Fig. 35: Identifying Repair Valve With Larger Shaft Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 600 REAMING A VALVE GUIDE (M52 / S52 / M52TU / M54 / M56)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 00 4 210

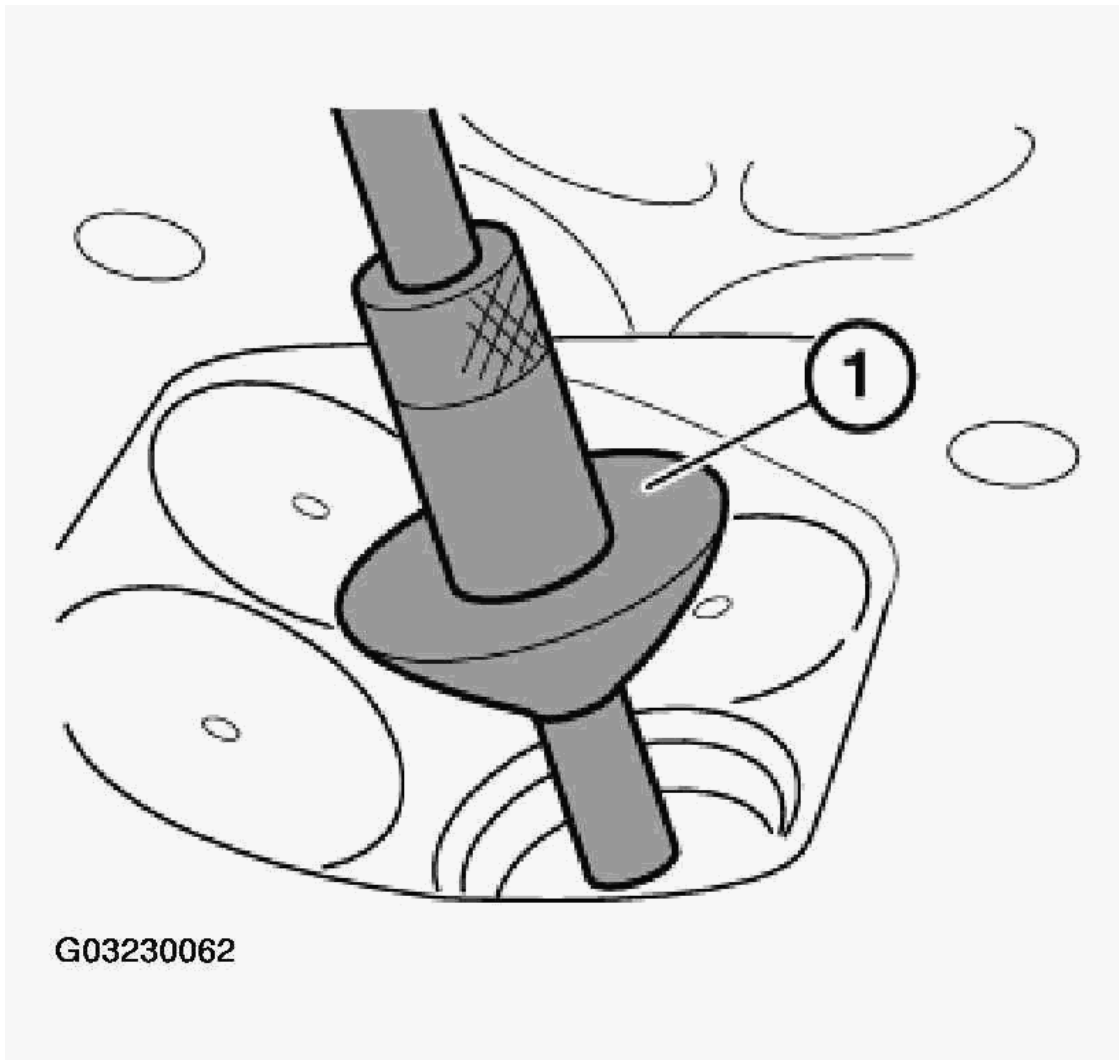
(Valve removed.)

NOTE: In event of excessive clearance between valve stem and valve guide: Valve guide is reamed and a repair valve with a larger stem diameter is installed.

Assemble reaming tool and guide taper (1) from special tool kit 00 4 210 depending on stem diameter. Press guide taper (1) onto valve seat. Starting from combustion chamber side, ream valve guide dry. Rotate reaming

tool once in downwards direction.

NOTE: Remachine valve seat after reaming. Refer to 11 12 527 REMACHINING A VALVE SEAT (M52 / S52 / M52TU / M54 / M56) .



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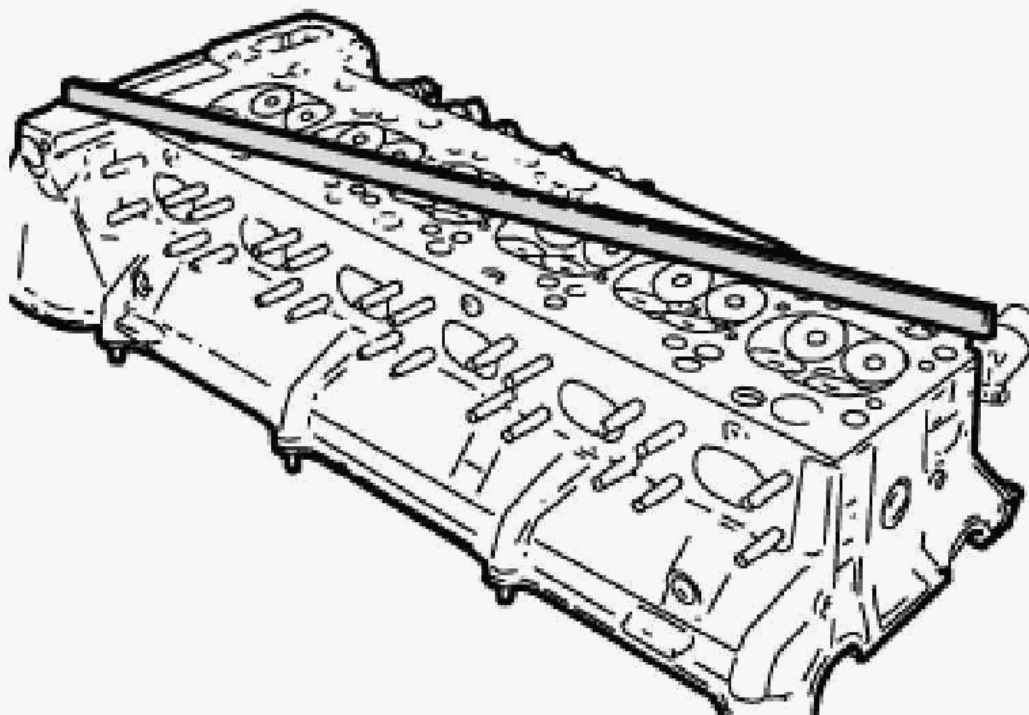
Fig. 36: View of Reaming Tool And Guide Taper
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 719 RESURFACING CYLINDER HEAD SEALING SURFACE (M52 / M52TU / M54 / M56)

(Cylinder head dismantled.)

Check flatness of cylinder head sealing surface with a commercially available straightedge.

Deviation from flatness max. 0.05 mm.



G03230063

Fig. 37: Using Straightedge To Check Cylinder Head Flatness
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Machining limit, refer to ENGINE - TECHNICAL DATA .

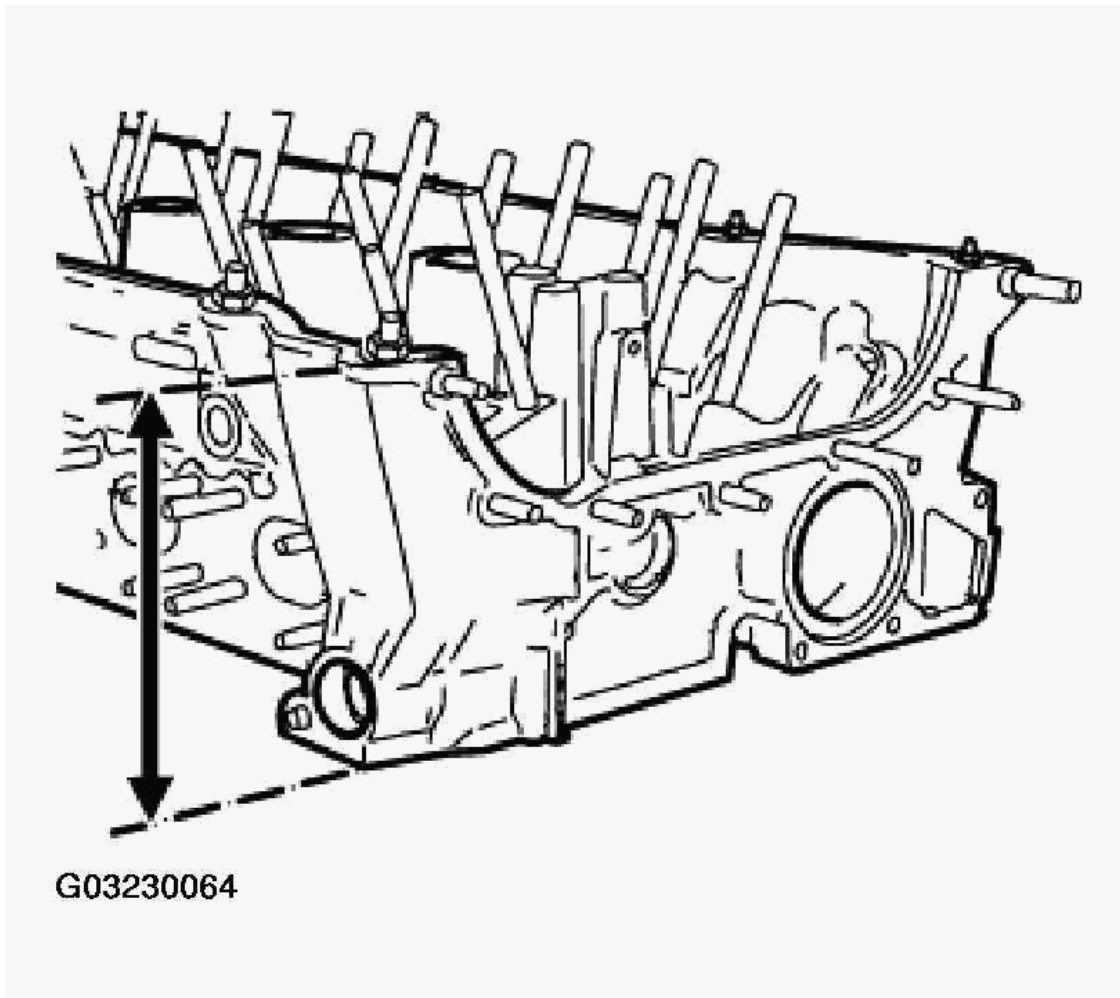


Fig. 38: Identifying Machining Limit
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For compression comparison check, a repair cylinder head seal is provided.



Fig. 39: Locating Repair Cylinder Head Seal
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 729 CHECKING CYLINDER HEAD FOR WATERTIGHTNESS (M52TU / M54 / M56)

NOTE: For Special Tool identification, see SPECIAL TOOLS - X5 (3.0i) .

Special Tools Required:

- 11 7 390
- 11 7 391
- 11 7 392
- 11 7 393
- 11 7 394
- 11 7 395

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

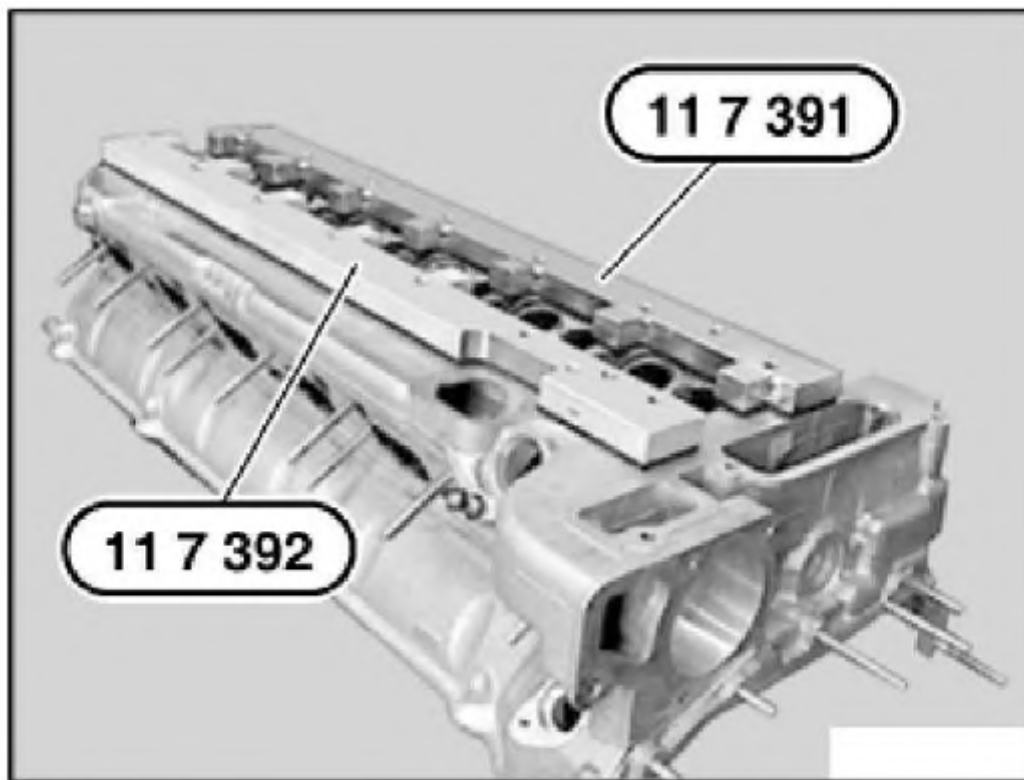
- 11 7 396
- 11 7 397
- 11 7 398

(Cylinder head dismantled.)

Prepare special tool kit 11 7 390 .

NOTE: Special tool kit 11 7 390 consists of special tools 11 7 391 / 11 7 392 / 11 7 393 / 11 7 394 / 11 7 395 / 11 7 396 / 11 7 397 / 11 7 398 .

Place special tools 11 7 391 / 11 7 392 on cylinder head sealing surface and screw down with cylinder head bolts.



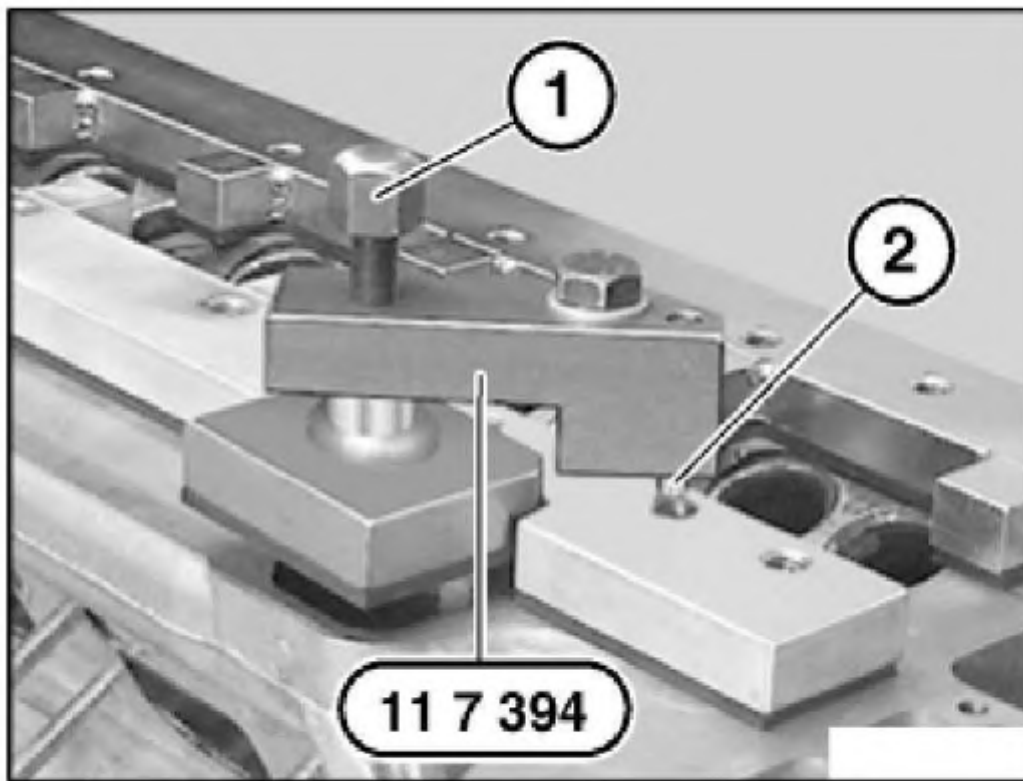
G03230066

Fig. 40: View Of Pressure Testing Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Turn back screw (1).

NOTE: Special tool 11 7 394 is secured with a pin (2).

Fit special tool 11 7 394 .

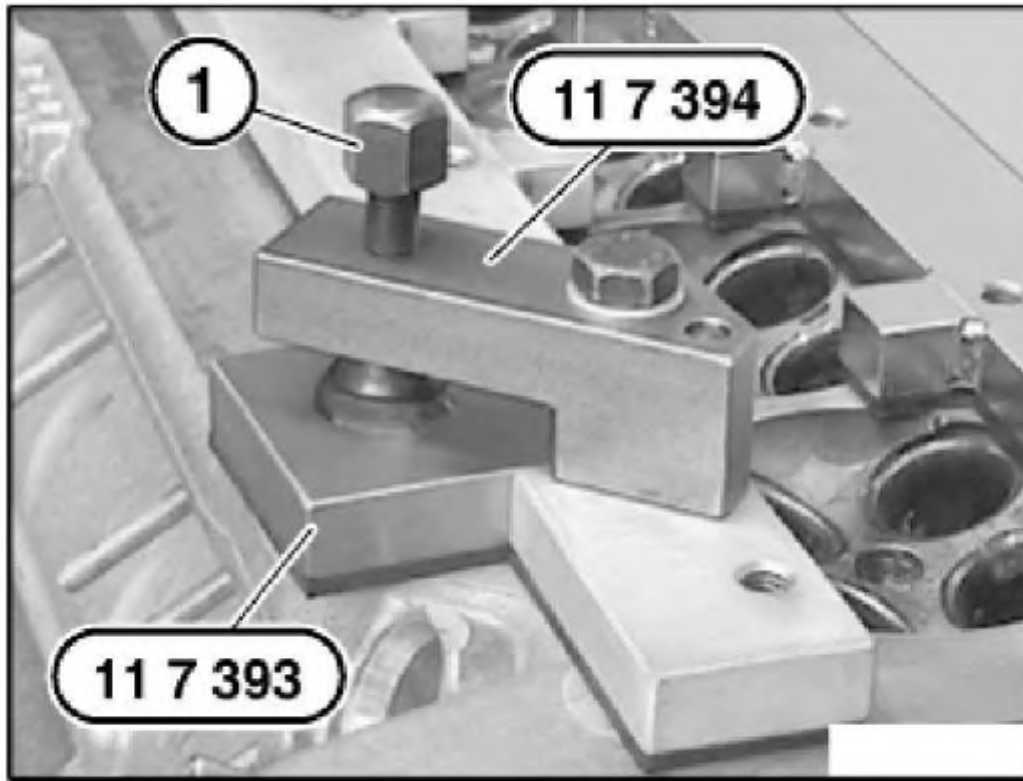


G03230067

Fig. 41: Identifying Support Bracket For Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw (1) by hand until special tool 11 7 393 rests on sealing surface.

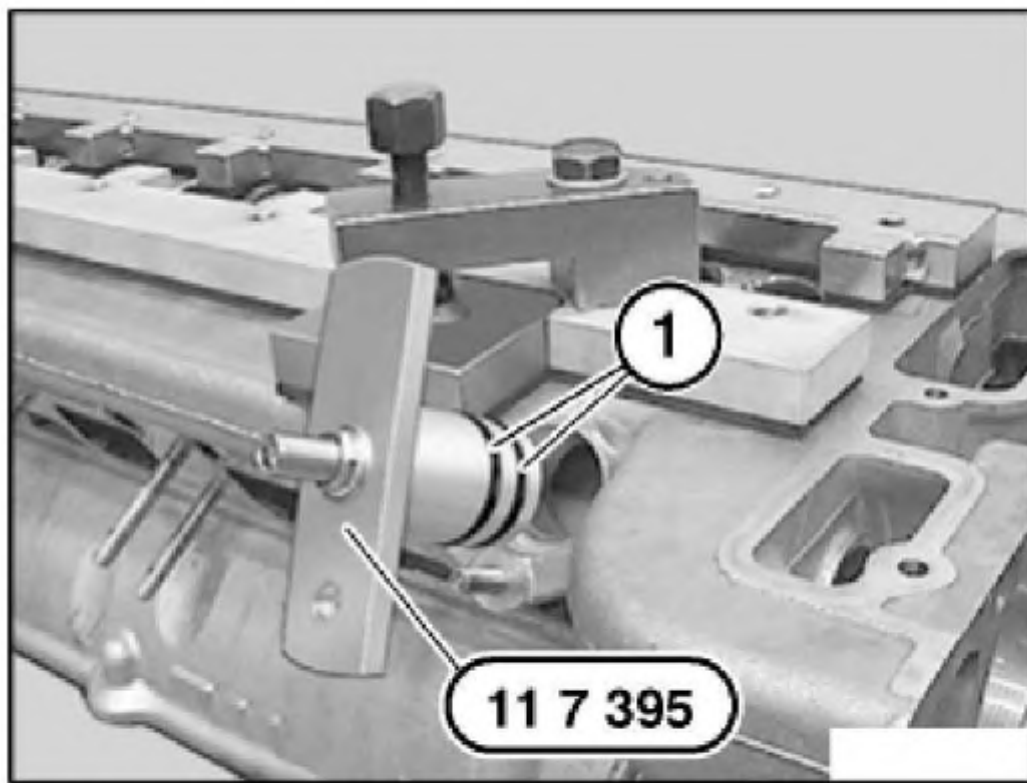
Tighten down screw (1) by approx. a half to one turn.



G03230068

Fig. 42: Aligning Cover Plate On Sealing Surface
Courtesy of BMW OF NORTH AMERICA, INC.

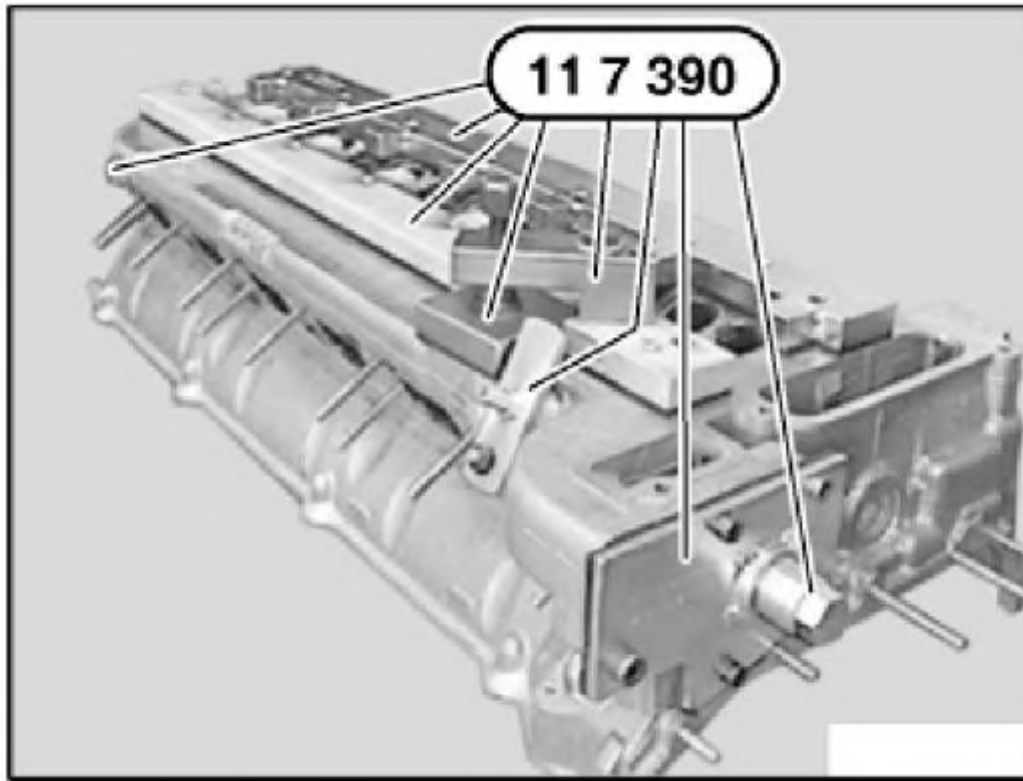
Check sealing rings (1) and coat with water as anti-friction coating. Insert special tool 11 7 395 and tighten down.



G03230069

Fig. 43: Installing Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Seal coolant apertures with special tool kit 11 7 390 .



G03230070

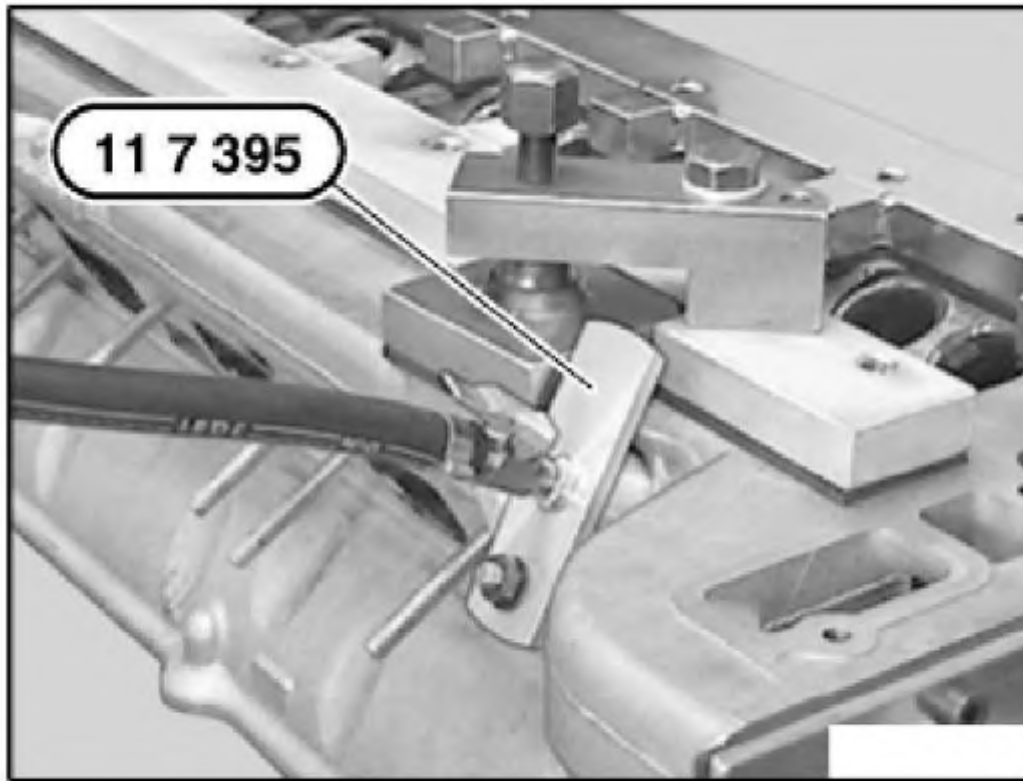
Fig. 44: Locating Sealing Coolant Apertures
Courtesy of BMW OF NORTH AMERICA, INC.

Connect compressed air to special tool 11 7 395 .

Immerse cylinder head in a water bath. Inspection pressure 4.5 bar.

Check cylinder head for escaping air (cracks).

NOTE: If necessary, soften the bath water with a cleaning agent.



G03230071

Fig. 45: Connecting Compressed Air To Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

OIL SUMP

11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (M52TU / M54 / M56)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 00 0 200
- 00 0 201
- 00 0 202
- 00 0 204

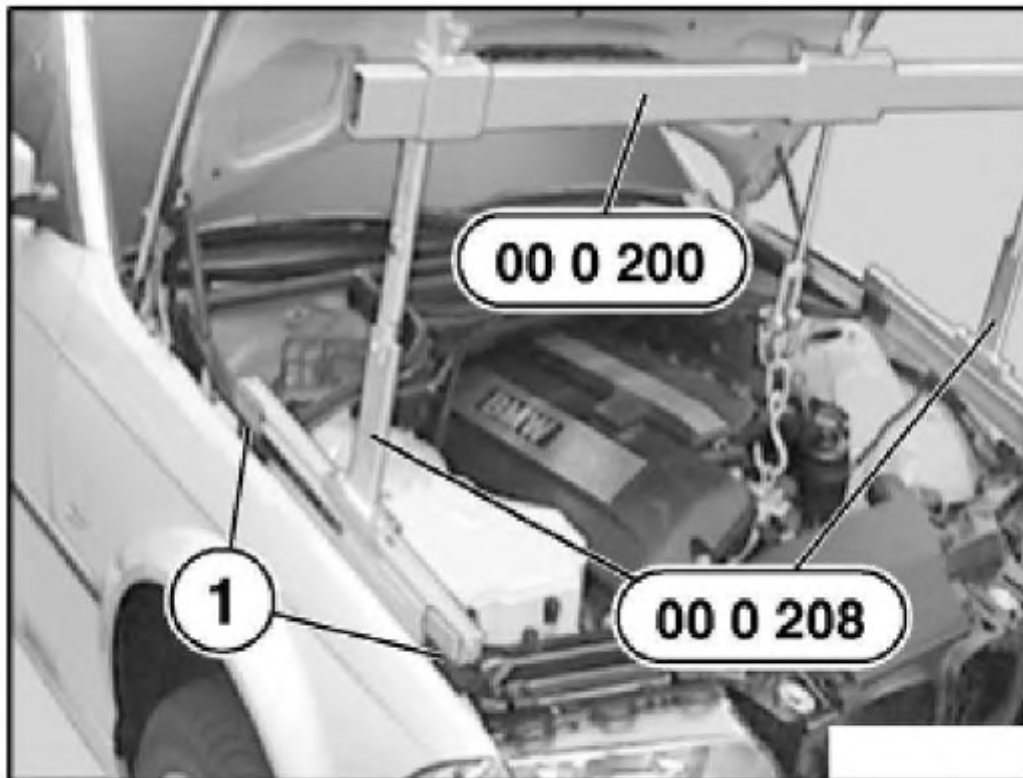
- 00 0 208

NOTE: To remove the oil sump, you must lower the front axle support. There is no need to perform a front axle alignment check.

Assemble special tool 00 0 200 with special tools 00 0 201 / 00 0 202 / 00 0 204 / 00 0 208 and fit.

Secure special tool 00 0 200 to front suspension eye on engine.

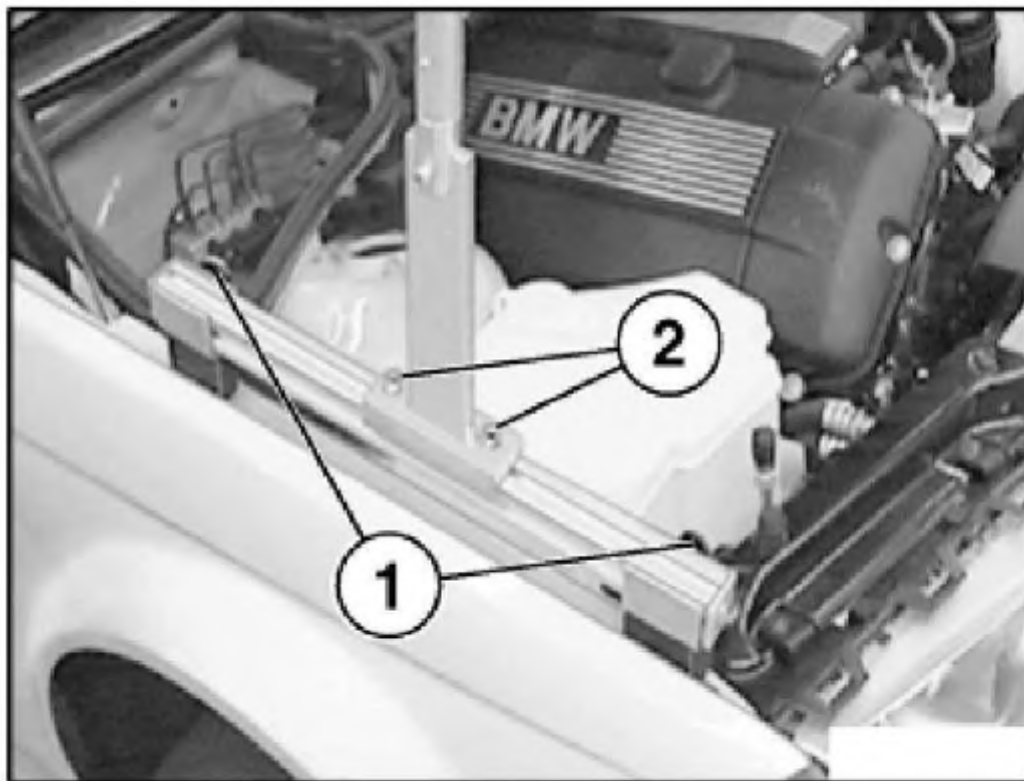
NOTE: The supports (1) of special tool 00 0 208 must rest on the bolt connection of both side walls.



G03230072

Fig. 46: View Of Cross Member Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten the screws (1 and 2).



G03230073

Fig. 47: Locating Screws On Cross Member Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Raise engine with special tool 00 0 200 approx. 5 mm.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230074

Fig. 48: Raising Engine Using Cross Member
Courtesy of BMW OF NORTH AMERICA, INC.

Remove suction filter housing.

Remove engine splash guard.

Drain engine oil, refer to **00 00 250 BMW ENGINE OIL SERVICE INCL. SUPPLEMENTARY SERVICE (M54 / M56)** .

On vehicles with automatic transmission:

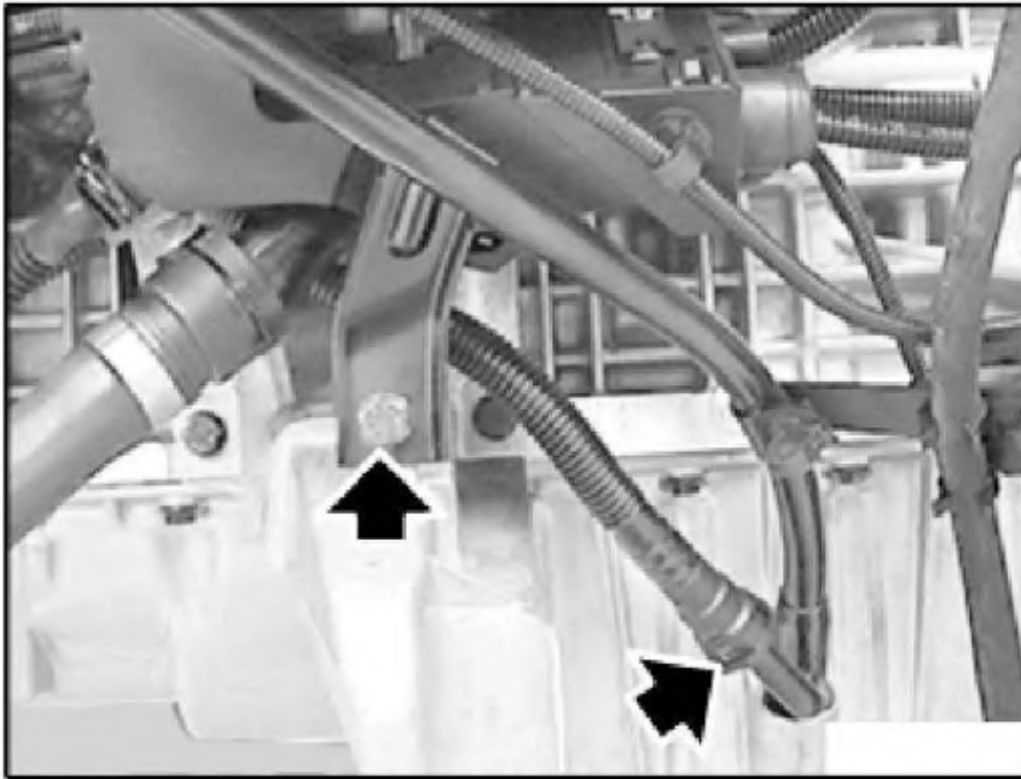
Disconnect oil lines from automatic transmission and from oil pan.

Release guide tube for dipstick.

NOTE: **M52 TU and M54 only.**

Detach return hose from cyclone oil separator on oil dipstick guide tube.

Remove oil dipstick guide tube upwards.



G03230075

Fig. 49: View Of Oil Dipstick Guide Tube
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace O-ring.

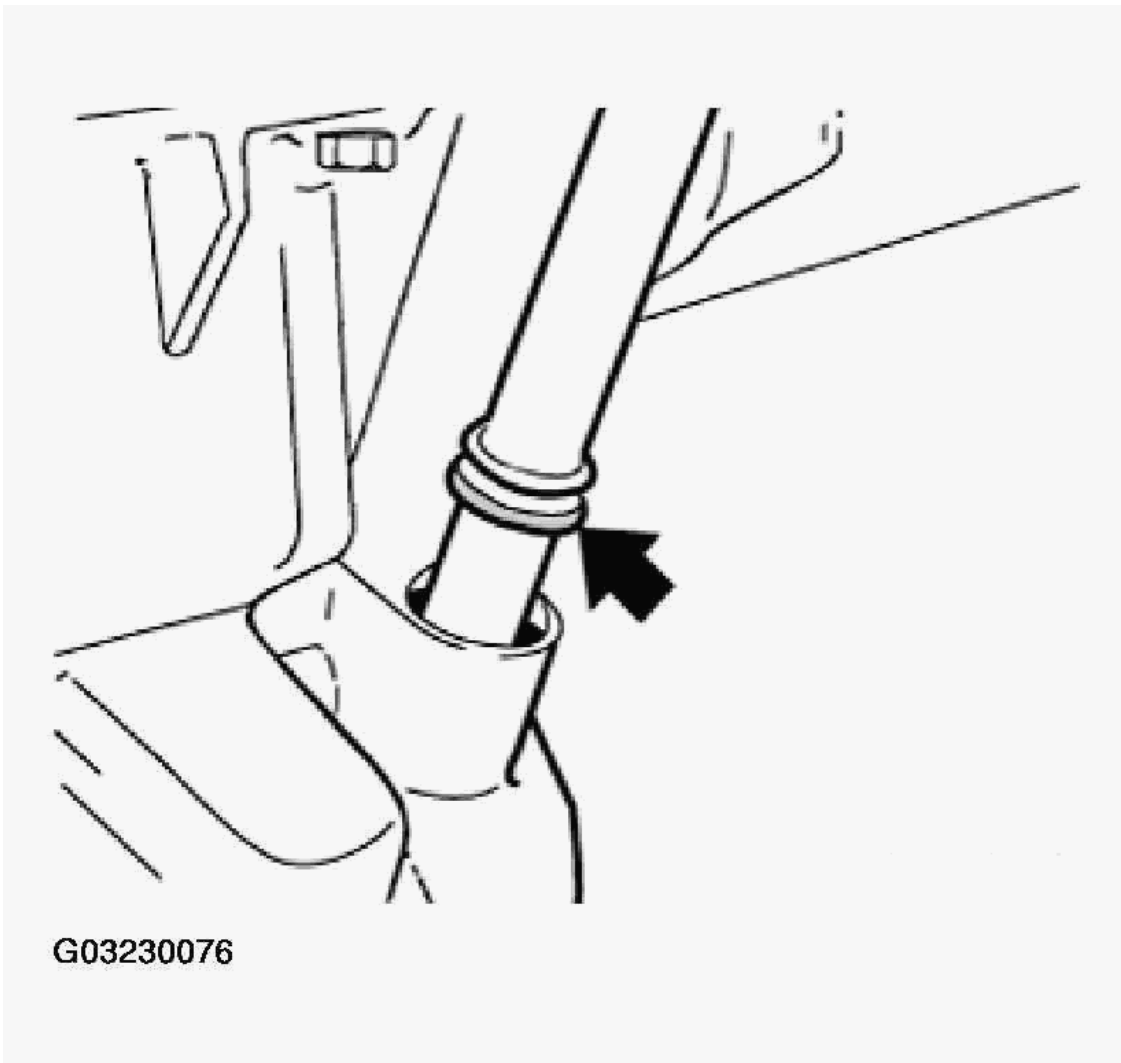


Fig. 50: Locating O-Ring On Oil Dipstick Guide Tube
Courtesy of BMW OF NORTH AMERICA, INC.

Remove front end reinforcement.

Remove vane pump for power steering unit (lines remain connected).

Disconnect plug connection to oil level sensor.

Loosen top and unfasten bottom of left and right engine mounts.



Fig. 51: Locating Top/Bottom Of Left/Right Engine Mounts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

1. Replace gasket.
2. Install oil sump.
3. Insert all oil sump screws.
4. Insert screws in transmission end without preload at this stage.
5. Tighten down screws in engine end.
6. Tighten down screws in transmission end.

11 13 000 REMOVING AND INSTALLING/REPLACING OIL SUMP (M54)

NOTE: For Special Tool identification, see SPECIAL TOOLS - X5 (3.0i) .

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

Special Tools Required:

- 00 0 200
- 00 0 201
- 00 0 202
- 00 0 204
- 00 0 208
- 00 2 030
- 11 0 020
- 31 2 220
- 51 2 170

NOTE: To remove the oil sump, you must lower the front axle support. There is no need to perform a front axle alignment check.

Remove heater bulkhead, refer to **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD** .

Lift engine hood into assembly position.

NOTE: The following work must be carried out with a second person assisting. Work instruction applies to left and right sides.

Gently raise retaining clip and simultaneously push upwards.

Hold engine hood, unhook damper on hood. Open engine hood fully and reattach damper with special tool 51 2 170 to hood.



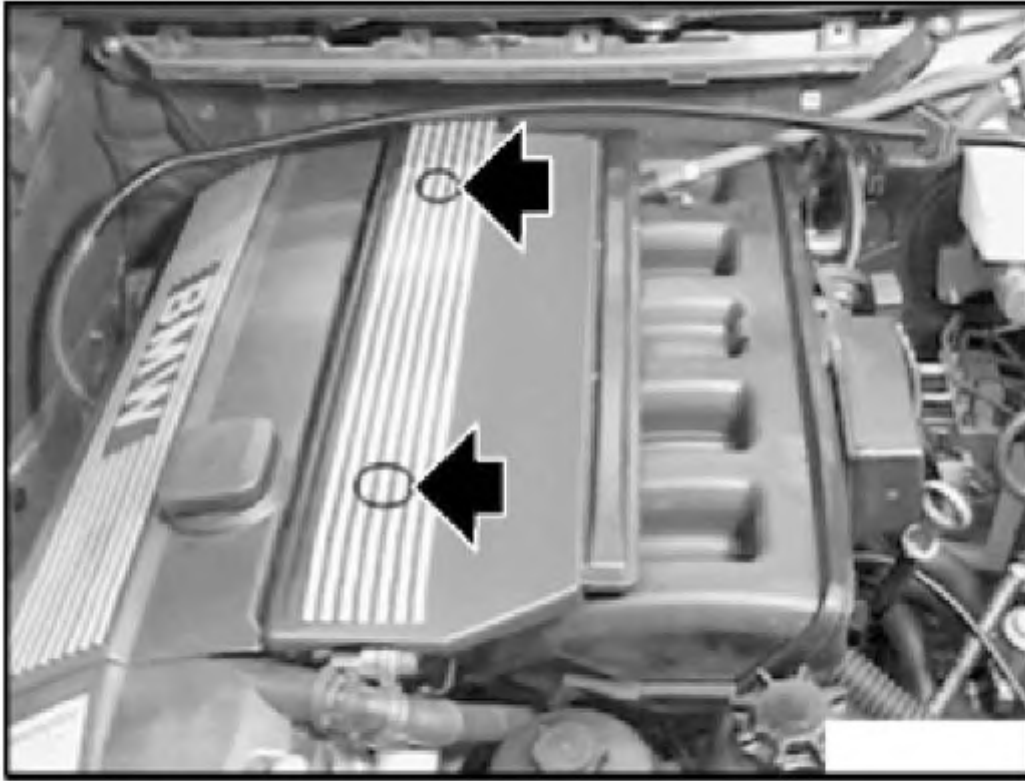
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Fig. 52: View Of Hood/Bonnet Stay
Courtesy of BMW OF NORTH AMERICA, INC.

Remove cover for fuel injectors.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230081

Fig. 53: Removing Cover For Fuel Injectors
Courtesy of BMW OF NORTH AMERICA, INC.

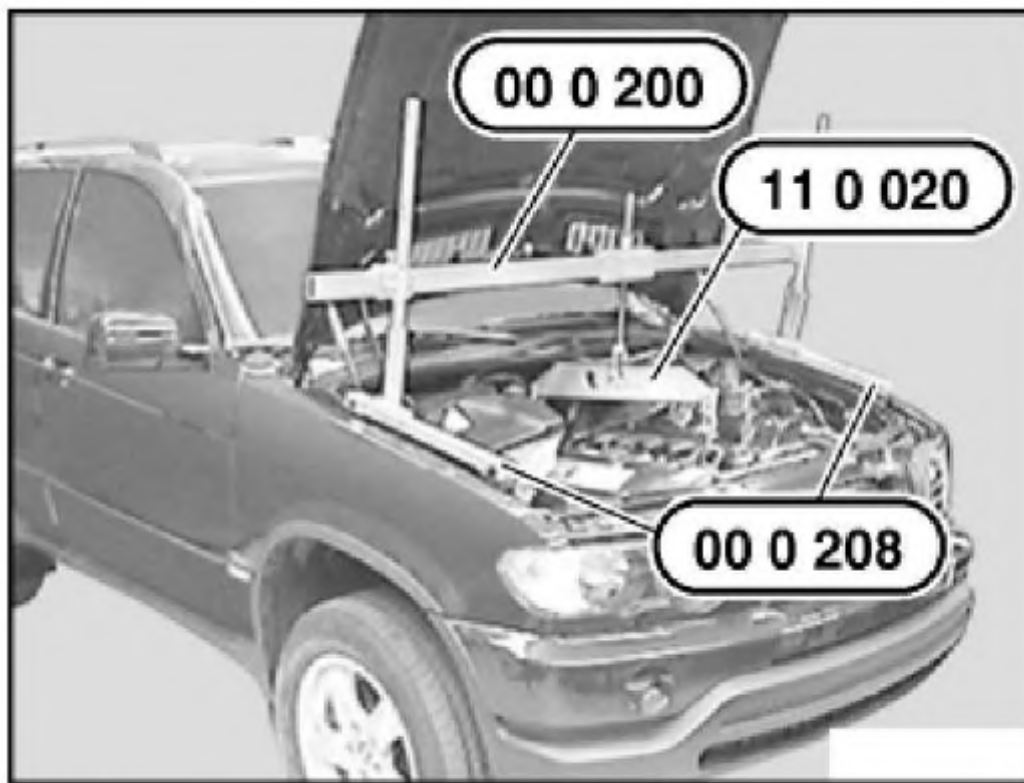
Remove upper section of suction filter housing with mass air flow sensor.

Fit special tool 00 0 200 to special tool 00 0 201 / 00 0 202 / 00 0 204 / 00 0 208 and attach.

Attach special tool 11 0 020 as shown in illustration to special tool 00 0 200 .

2002 BMW X5

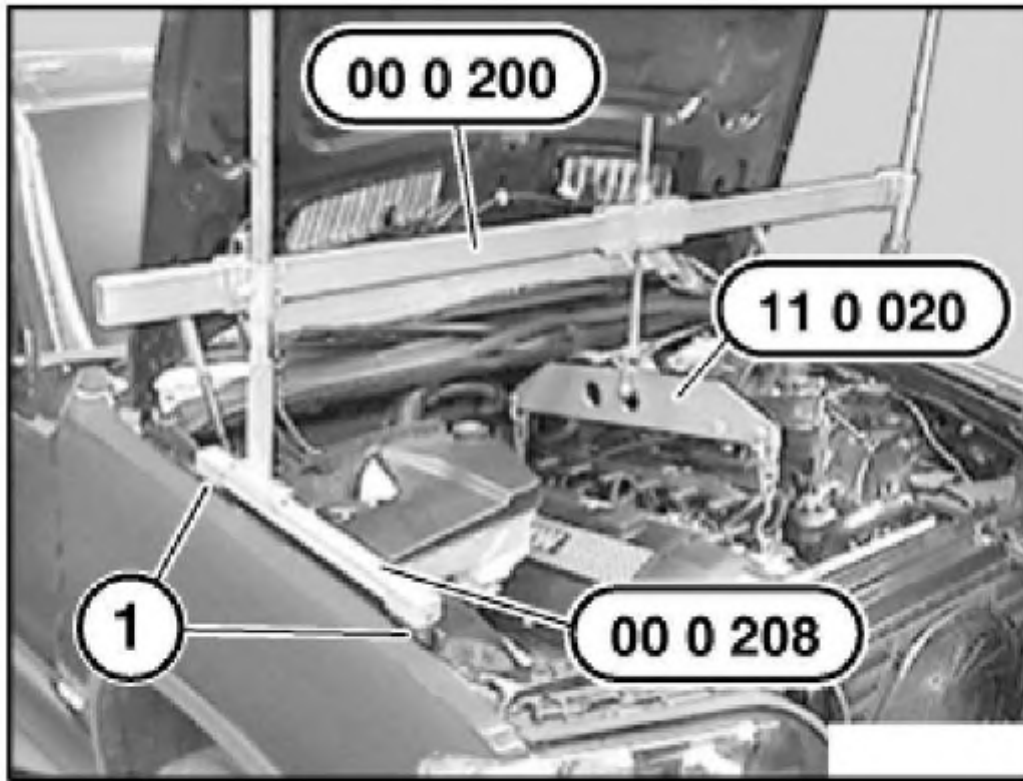
2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230082

Fig. 54: Attaching Engine Hoist To Cross Member
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 0 020 to front and rear engine suspension eyes.



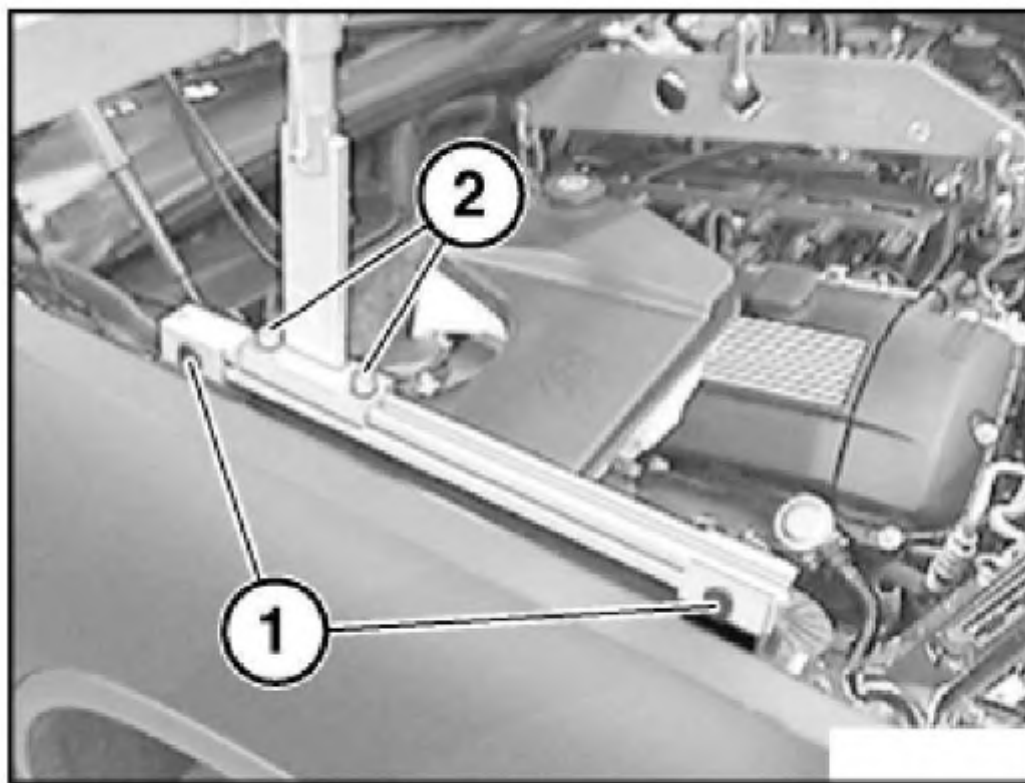
G03230083

Fig. 55: Securing Cross Member To Suspension Eyes
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Make sure no lines or cables on rear side of engine are damaged by chain.

The supports (1) of special tool 00 0 208 must make contact with the screws on the side walls.

Tighten the screws (1 and 2).



G03230084

Fig. 56: Locating Cross Member Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten top left and right nuts on engine mount.

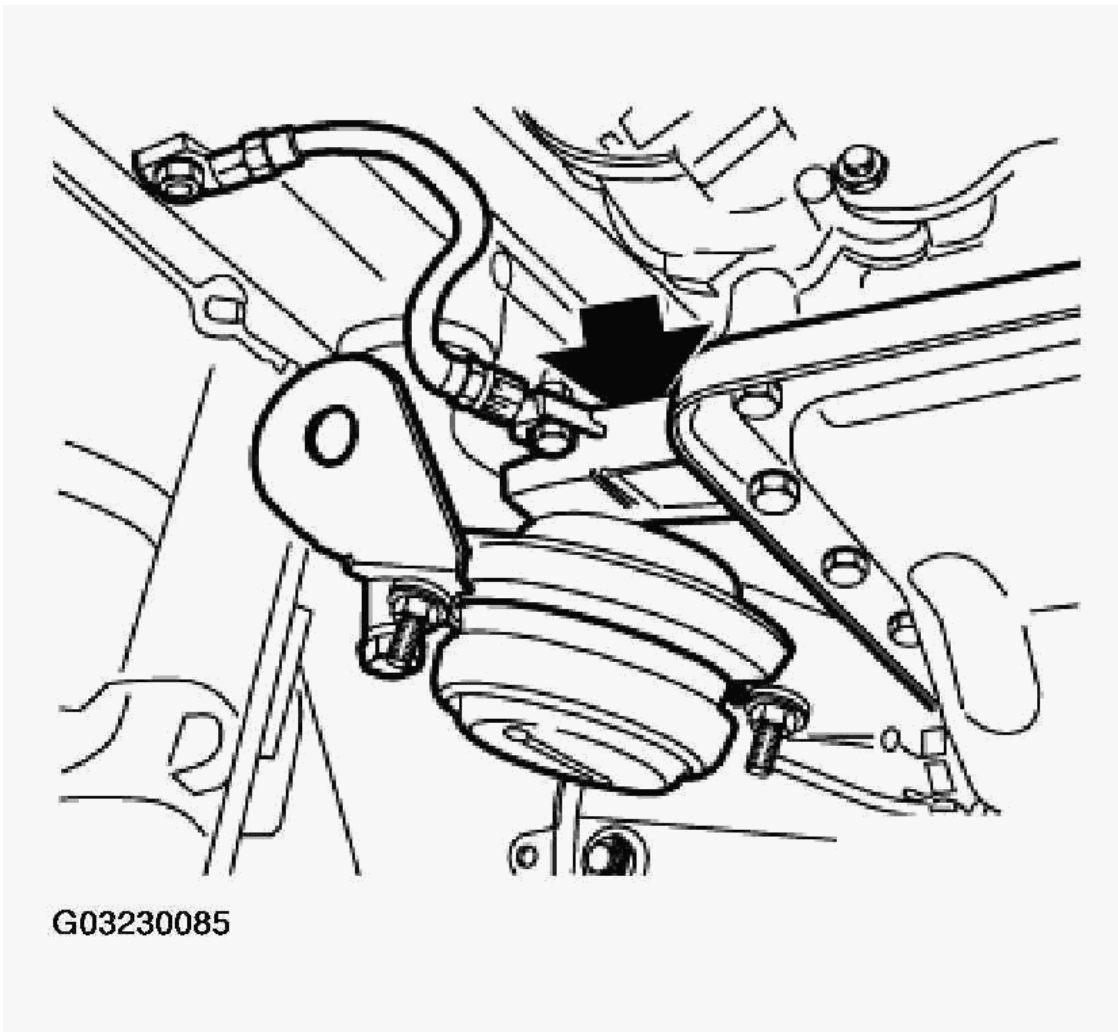


Fig. 57: View Of Top Left/Right Engine Mount Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Raise engine with special tool 00 0 200 approx. 5 mm.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230086

Fig. 58: Raising Engine With Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Remove front splash guard.

Remove reinforcement plate, refer to **FRONT AXLE SUPPORT** .

CAUTION: The article "Front Axle Support" contains important installation instructions.

Remove left and right swivel bearings, refer to **SWIVEL BEARING** .

Remove output shafts.

Remove propeller shaft at front, refer to **26 20 000 REMOVING AND INSTALLING FRONT PROPELLER SHAFT** .

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

Remove alternator drive belt from belt pulley for vane pump.

Remove vane pump for power steering.

NOTE: **Lines remain connected. Tie vane pump to one side.**

Open oil drain plug and drain off engine oil.

Disconnect return hose from oil separator.

Remove guide pipe for dipstick.

Installation:

Replace O-ring.

Unfasten steering spindle from steering gear. This operation is described in the article removing and installing steering gear, refer to **POWER STEERING GEAR** .

Provisionally reinstall left and right swivel bearings and connect with a screw to spring strut.

Provisionally connect tension strut, control arm and tie rod to swivel bearing.

As shown in illustration, support front axle support with special tool 00 2 030 in conjunction with special tool 31 2 220 and a block of wood.



G03230087

Fig. 59: Supporting Front Axle Using Universal Hydrolifter

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Steering gear remains bolted to front axle support. Return hose of steering gear must not be overstretched when front axle support is lowered.**

Detach front axle support from engine carrier and carefully lower by approx. 90 to 100 mm.

Tightening torque and installation instructions for front axle support **FRONT AXLE SUPPORT** .

Remove front axle differential, refer to **DIFFERENTIAL ASSEMBLY** .

Release screws on oil sump.

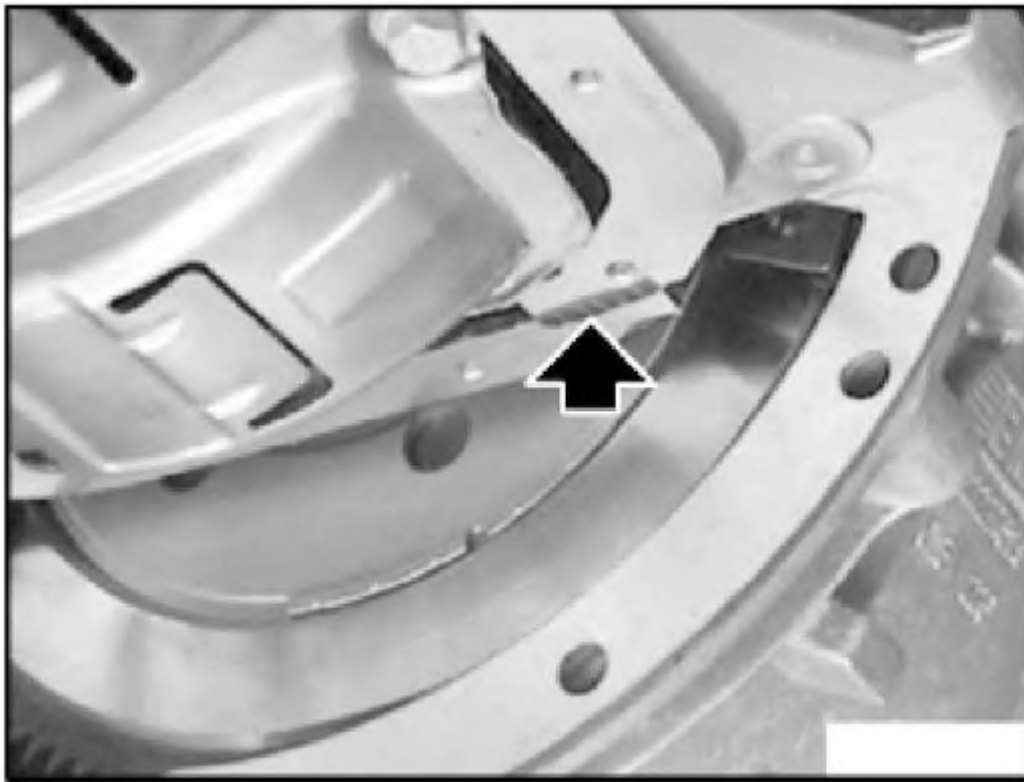
Move oil sump backwards.

Installation:

Sealing faces clean and free of seal debris.

In area of joints on end and timing case covers:

Apply Drei Bond 1209 sealing compound approx. 3 mm wide and 2 mm high.



G03230088

Fig. 60: Applying Sealant To End And Timing Case Covers
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

1. Replace gasket.
2. Install oil sump.
3. Insert all oil sump screws.
4. Insert screws in transmission end without preload at this stage.
5. Tighten down screws in engine end.
6. Tighten down screws in transmission end.

HOUSING COVER

11 14 110 REMOVING AND INSTALLING LOWER TIMING CASE COVER (M52 / S52 / M52TU / M54)

Remove VANOS adjustment unit, refer to **11 36 010 REMOVING AND INSTALLING OR REPLACING DOUBLE VANOS ADJUSTMENT UNIT (M52TU / M54 / M56)** .

Remove coolant thermostat, refer to **11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (M52TU / M54 / M56)** .

Remove alternator drive belt and drive belt tensioner.

Brace pulley for water pump with drive belt and unfasten screws.

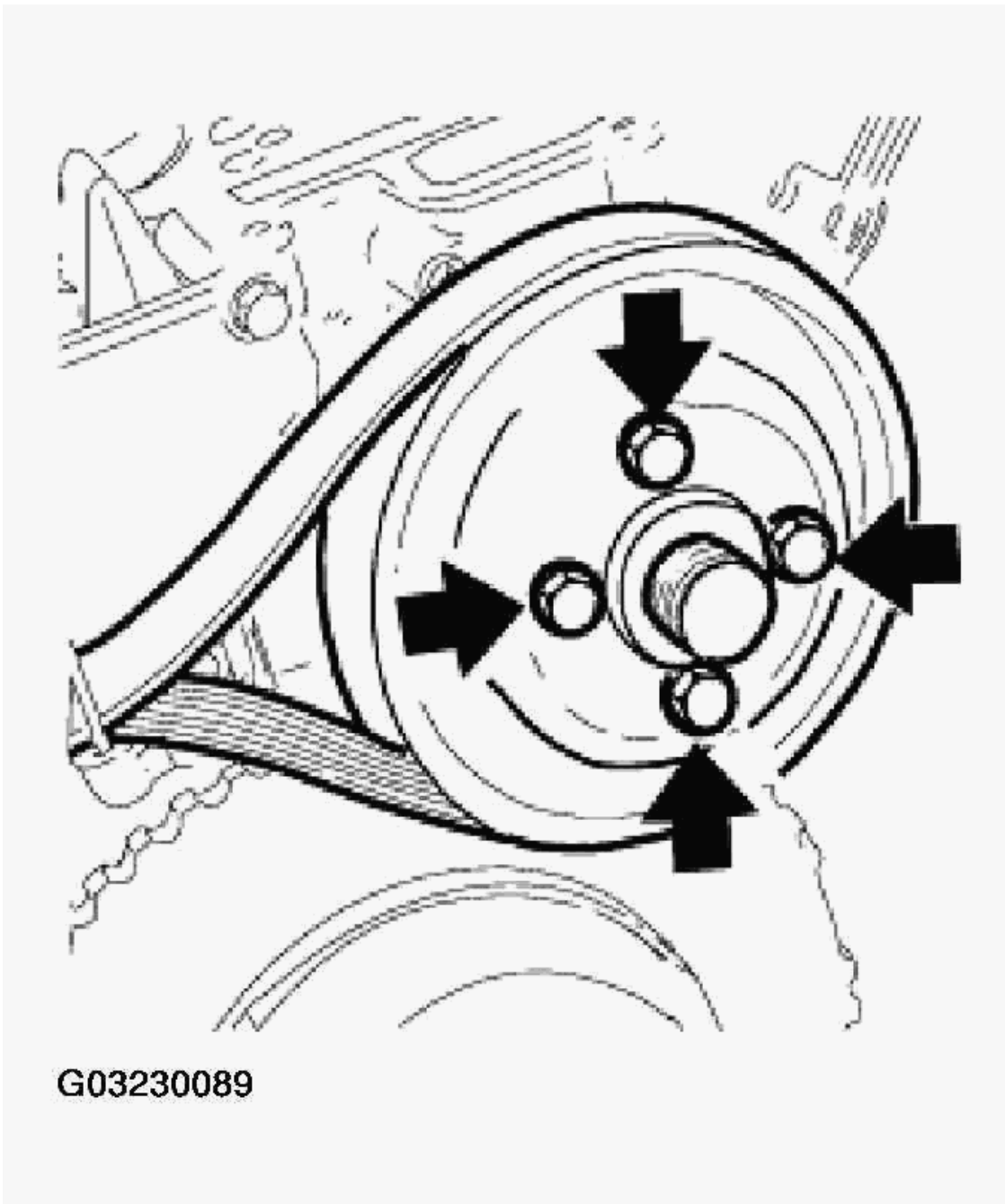


Fig. 61: Locating Retaining Screws For Water Pump Pulley
Courtesy of BMW OF NORTH AMERICA, INC.

11 14 141 REPLACING RADIAL SEAL IN LOWER TIMING CASE COVER

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 11 2 380
- 11 2 383
- 11 2 385
- 11 3 280

NOTE: This repair instruction is valid for the following engines:

- M50 / M52 / M52TU / M54 / M56

Remove vibration damper, refer to **11 23 010 REMOVING AND INSTALLING OR REPLACING VIBRATION DAMPER (M52TU / M54 / M56)** .

Fit special tool 11 2 383 to crankshaft.

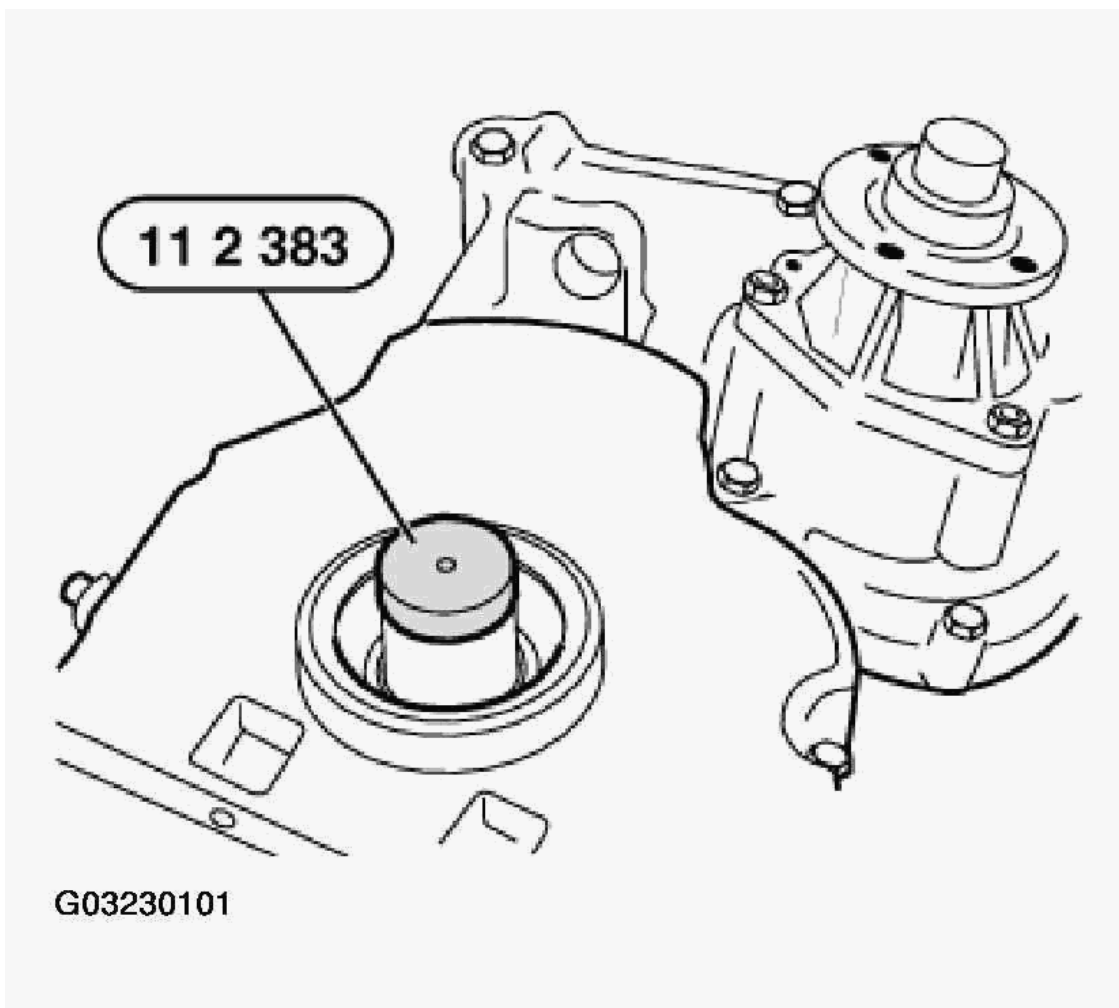


Fig. 62: Installing Puller To Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 2 385 to crankshaft.

Align groove of special tool 11 2 385 to featherkey of crankshaft.

NOTE: Special tool 11 2 385 centers special tool 11 2 380 .

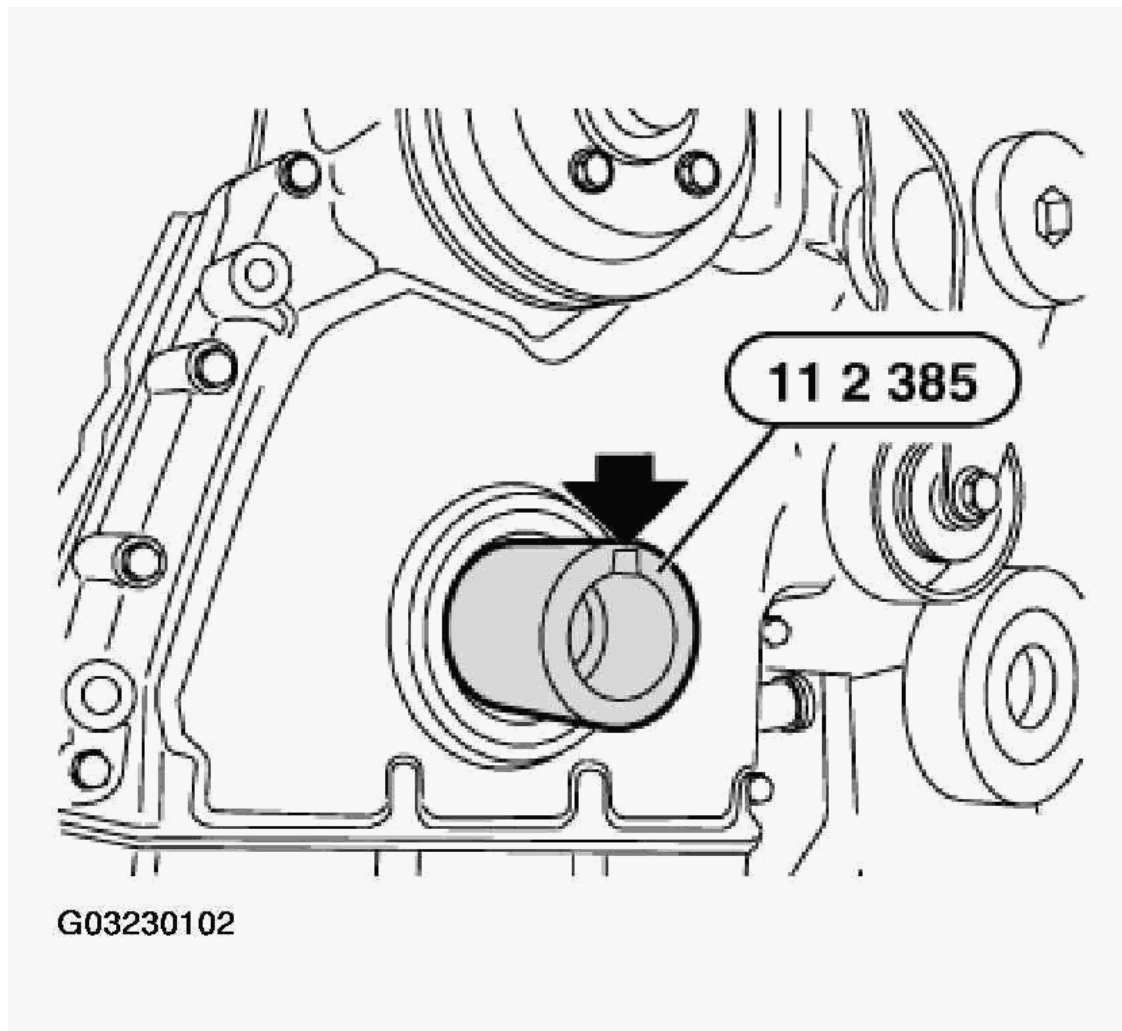


Fig. 63: Aligning Groove In Puller To Featherkey Of Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 11 2 380 until it has made firm contact with radial seal.

Remove radial seal by tightening screw on special tool.

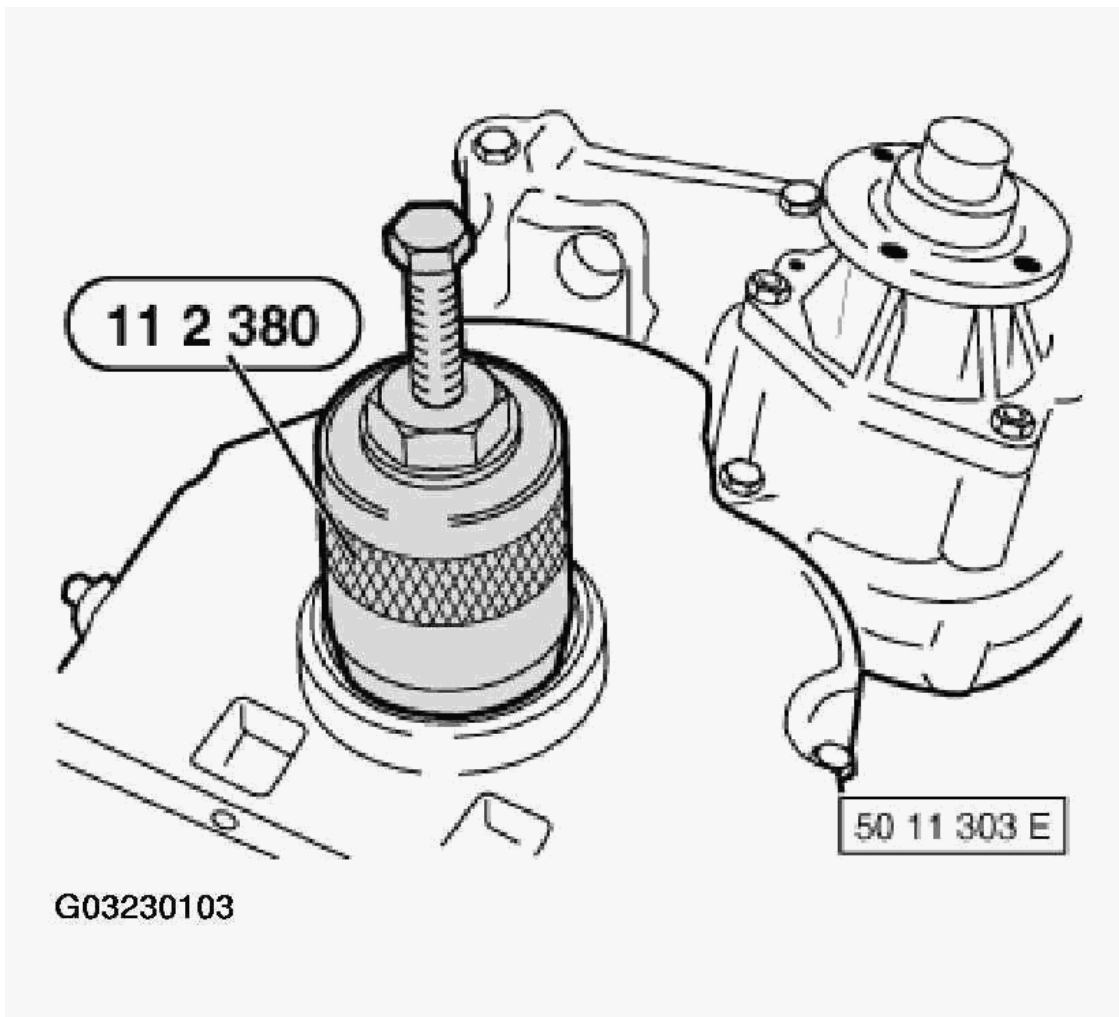


Fig. 64: Removing Radial Seal With Puller
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Coat sealing lips of new radial sealing ring with oil.

Using special tool 11 3 280 and centering screw, install new radial seal flush with timing case cover.

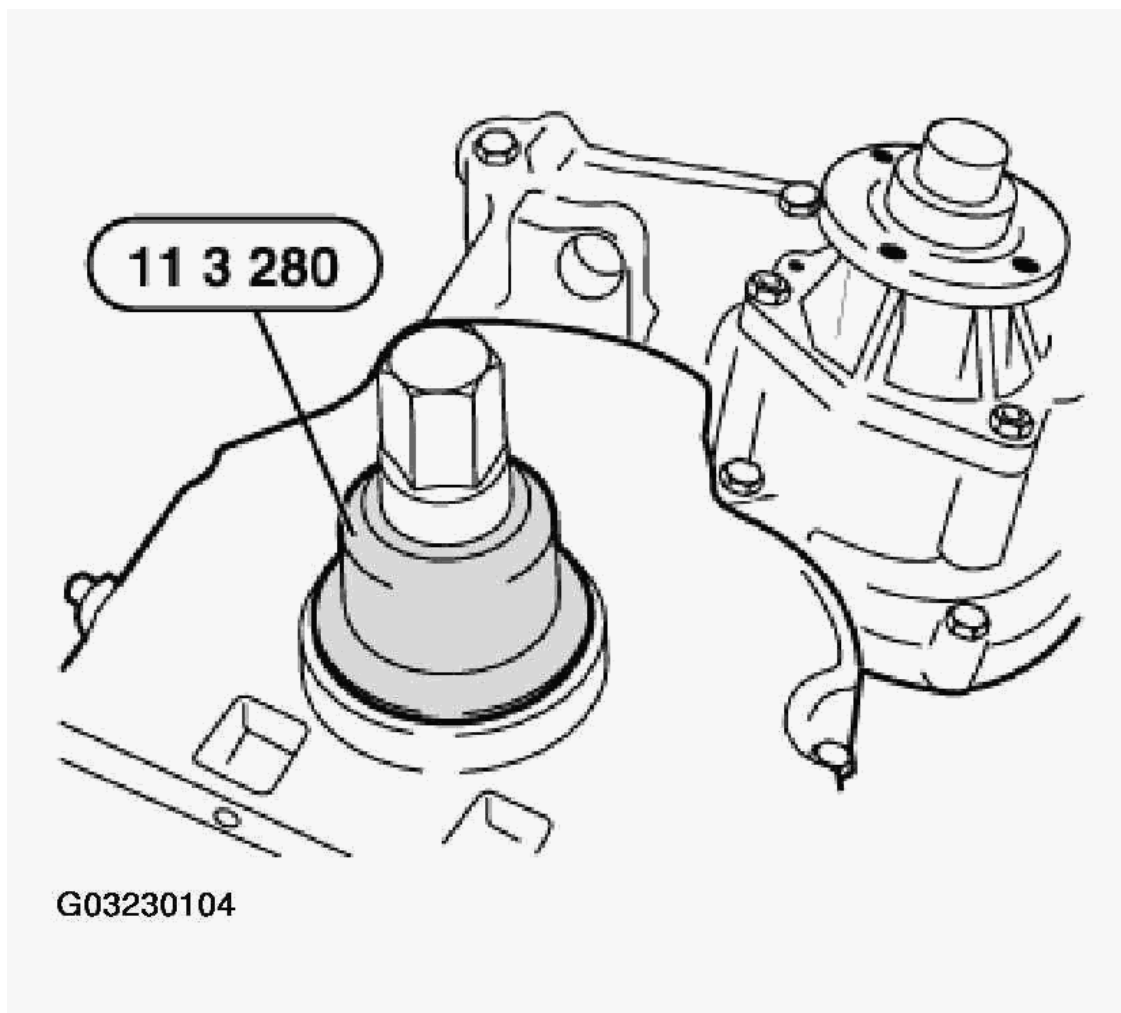


Fig. 65: Installing Radial Seal Using Puller
Courtesy of BMW OF NORTH AMERICA, INC.

11 14 151 REPLACING CRANKSHAFT RADIAL SEAL (TRANSMISSION SIDE)

NOTE: This repair instruction is valid for the following engines:

- M50 / M52 / M52TU / M54 / M56.

Necessary Preliminary Tasks:

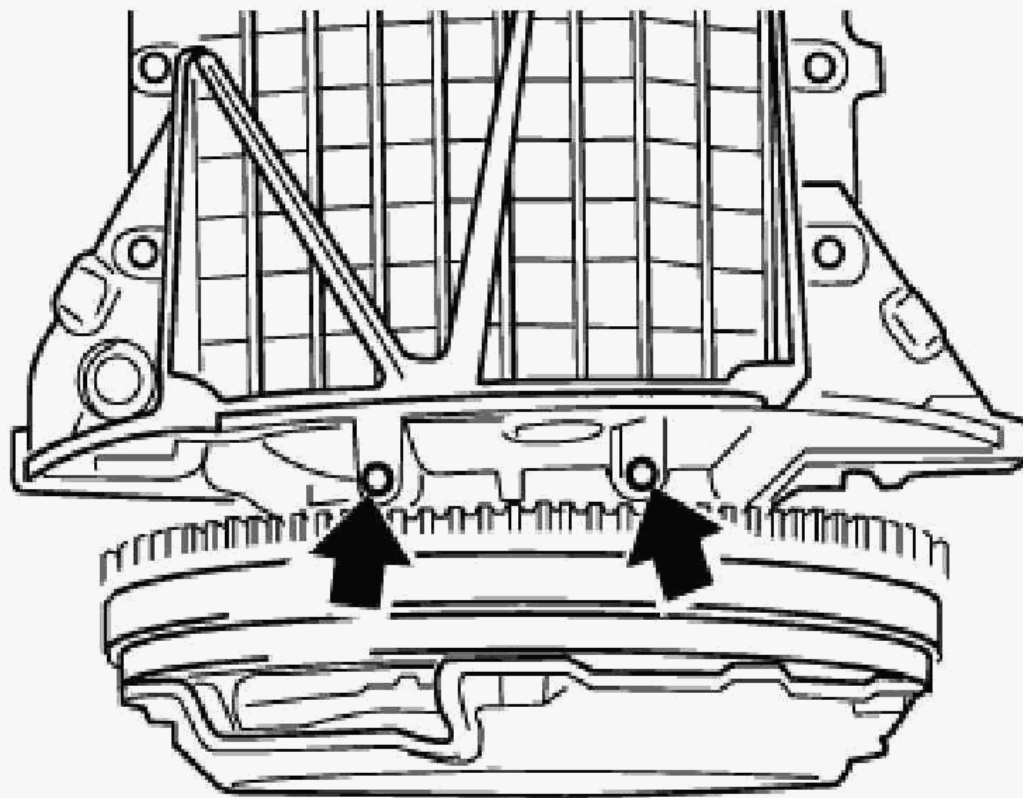
- Remove gearbox.
- Drain off engine oil.
- Remove flywheel.

Unfasten oil sump screws on transmission end.

Loosen oil pan.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



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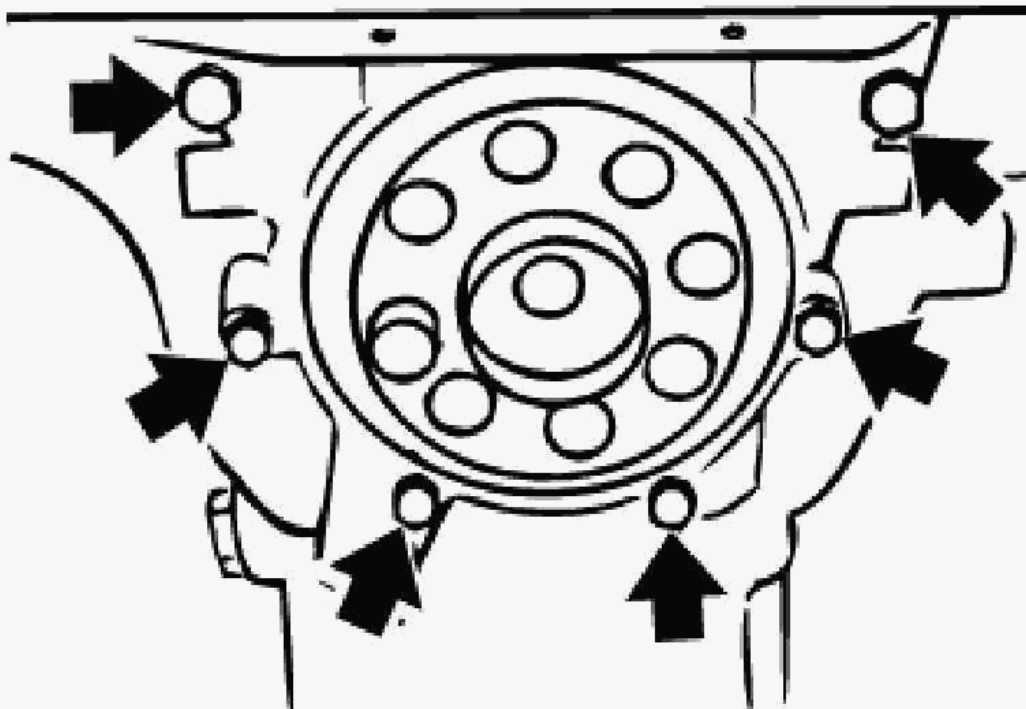
Fig. 66: Locating Oil Sump Screws On Transmission End

Courtesy of BMW OF NORTH AMERICA, INC.

Release screws in end cover at rear.

Carefully detach oil sump gasket from end cover, remove end cover.

NOTE: After removing end cover: check oil sump gasket for damage. If necessary, remove oil sump and replace oil sump gasket.

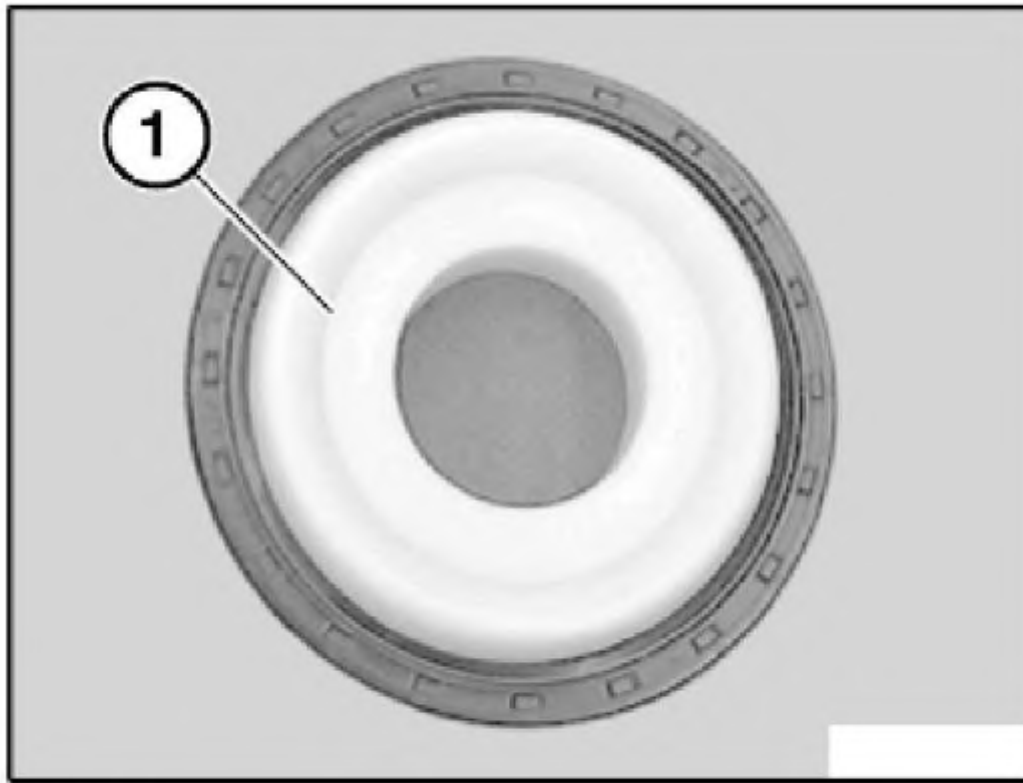


G03230106

Fig. 67: Identifying Screws In End Cover

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: As from 4/98, a new type of radial seal is used in the Series and as a replacement. This radial seal may only be supported with a "support bushing". If the radial seal is supported without the support bushing (1) for more than six months, operational reliability will no longer be assured and the radial seal must not be used any further.



G03230107

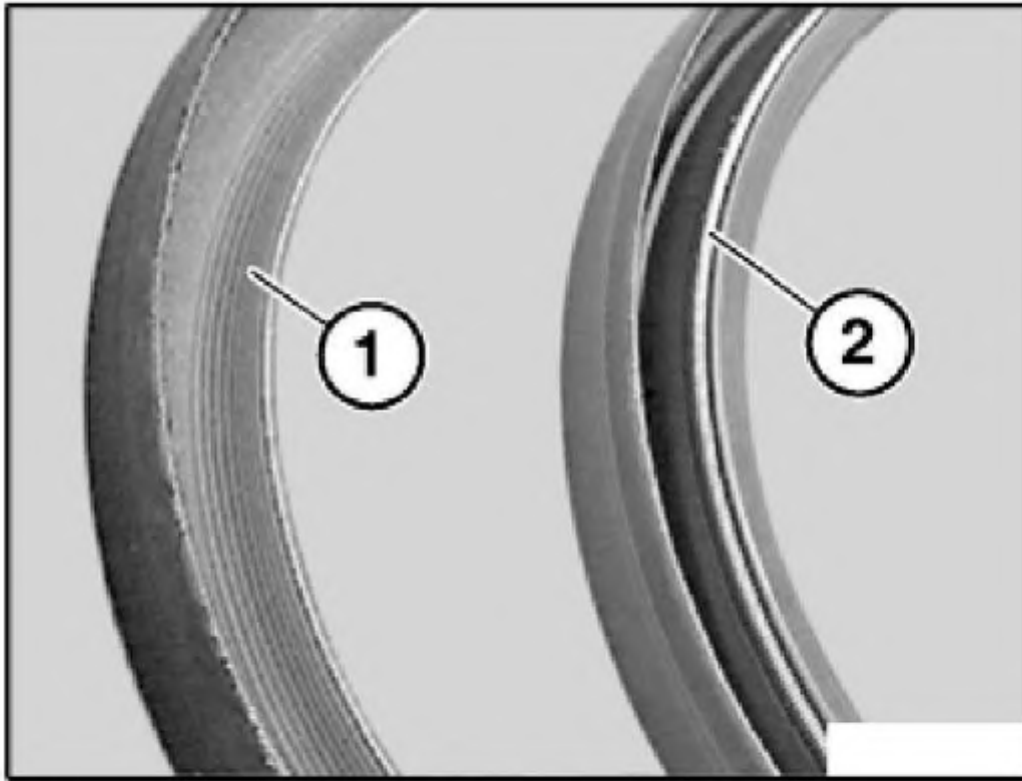
Fig. 68: View Of Radial Seal Without Hose Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Distinguishing feature:

- New version "without hose spring".
- Old version "with hose spring".

Important!

The sealing lip of the new version (1) is very sensitive and must not be kinked under any circumstances. Do not touch the sealing lip with your fingers.



G03230108

Fig. 69: Identifying Different Types Of Radial Seals

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The end cover is offered in the kit with a radial seal. If necessary, lift out the radial sealing ring and drive in new sealing ring using special tool 11 1 260 in conjunction with special tool 00 5 500 .

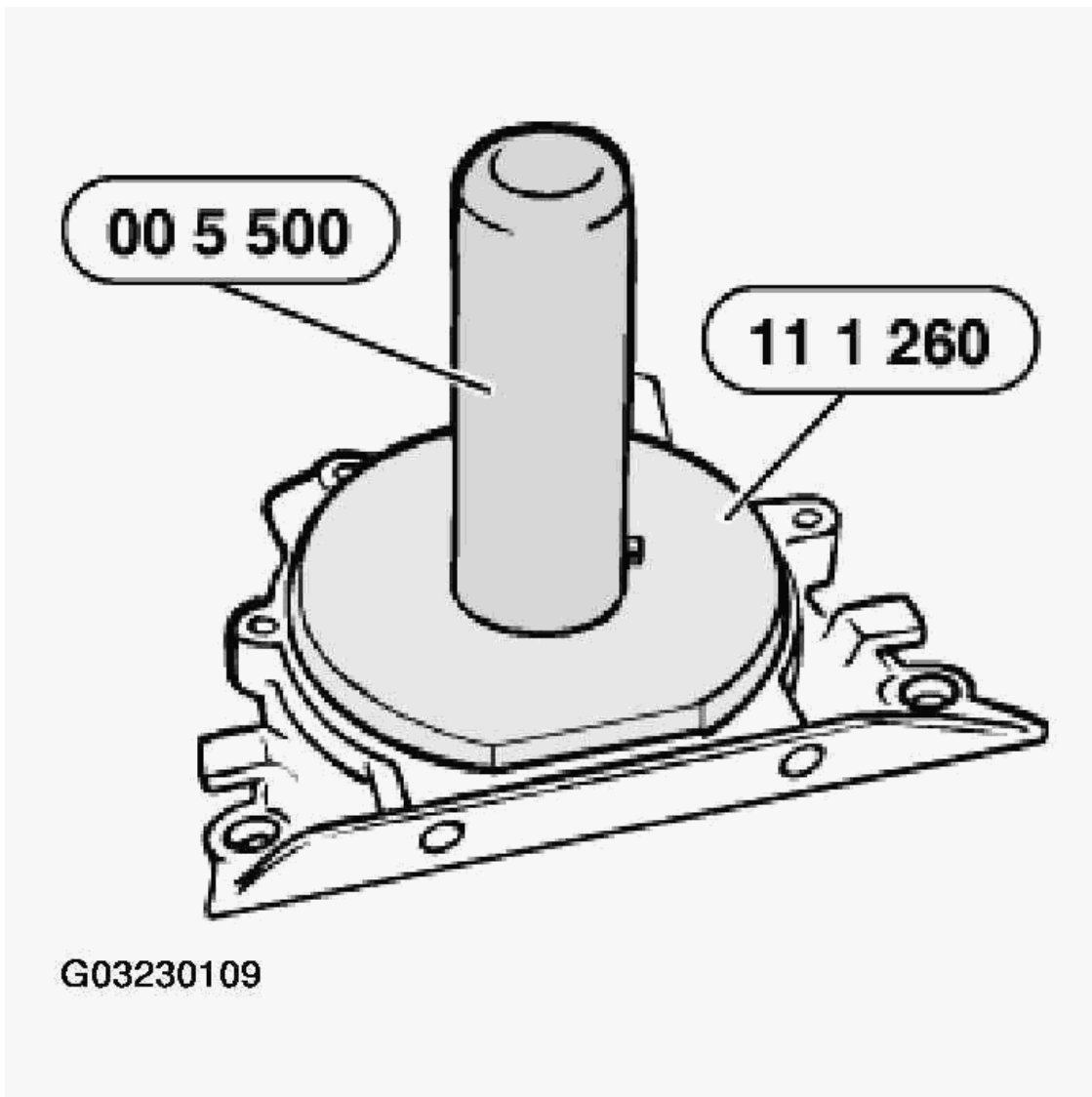
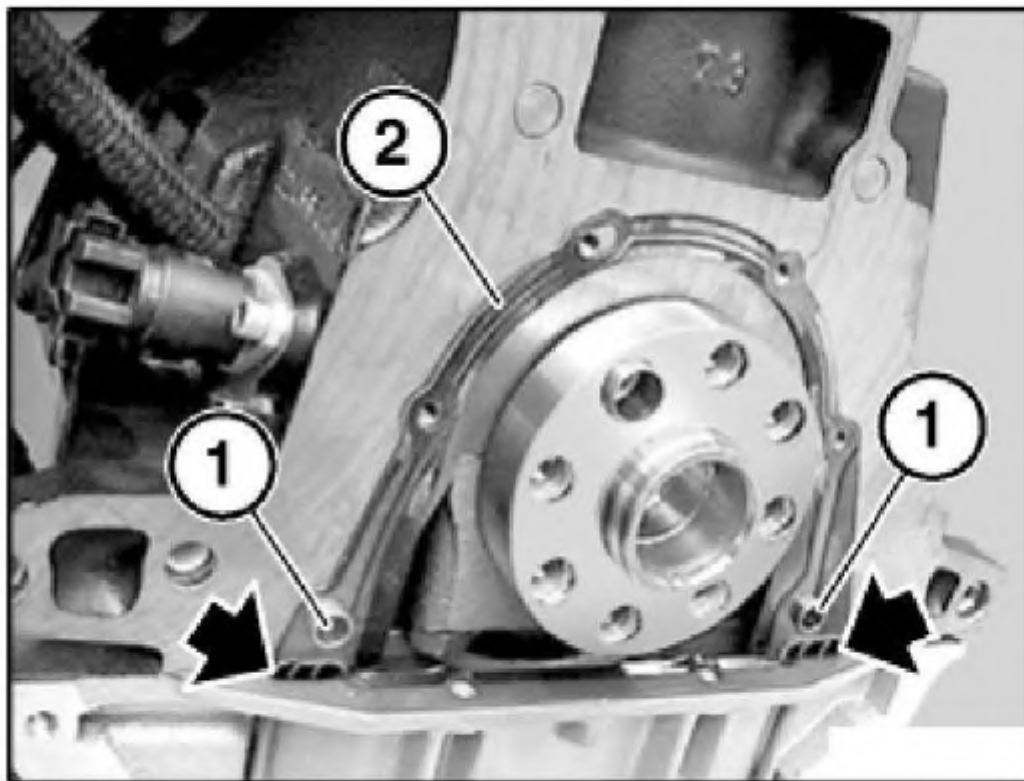


Fig. 70: Installing Sealing Ring Using Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Check dowel sleeves (1) for damage and correct installation position.

Replace seal (2).

Apply thin, uniform coat of Drei Bond 1209 sealing compound to edges of joint on oil pan.



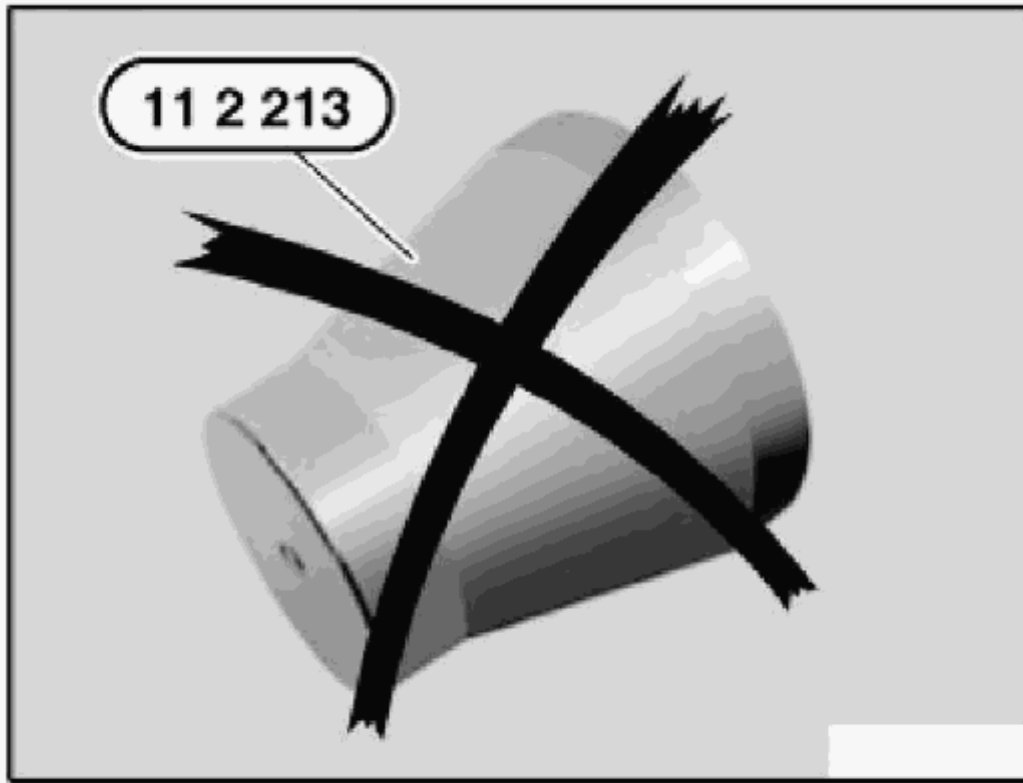
G03230110

Fig. 71: Locating Dowel Sleeves

Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Do not use special tool 11 2 213 for the new radial seal version.



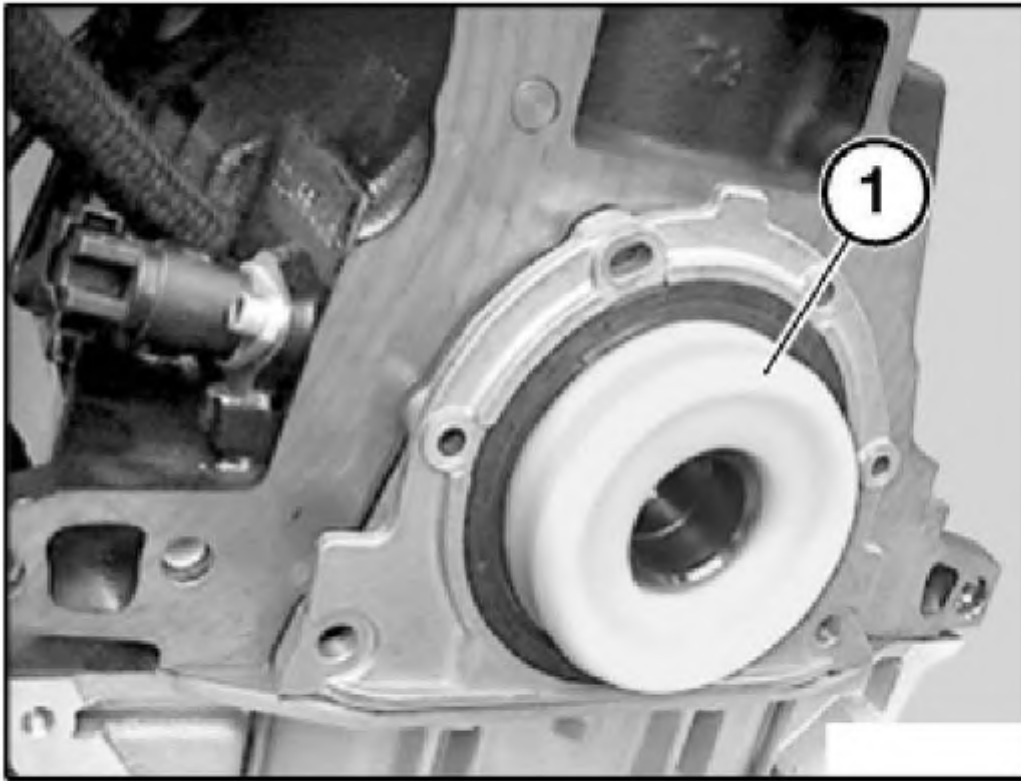
G03230111

Fig. 72: Identifying Incorrect Special Tool For Seal Installation

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: When fitting the end cover with radial seal on the crankshaft, it is only permitted to use the "support bushing (1)" as an installation tool.

Lubricate contact face of crankshaft.



G03230112

Fig. 73: View Of Support Bushing

Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Push on end cover with support bushing (1) straight and without tilting sideways.

NOTE: **Screw threads (1) are coated with sealing compound.**

Replace screws (1).

Insert all screws and tighten down end cover.

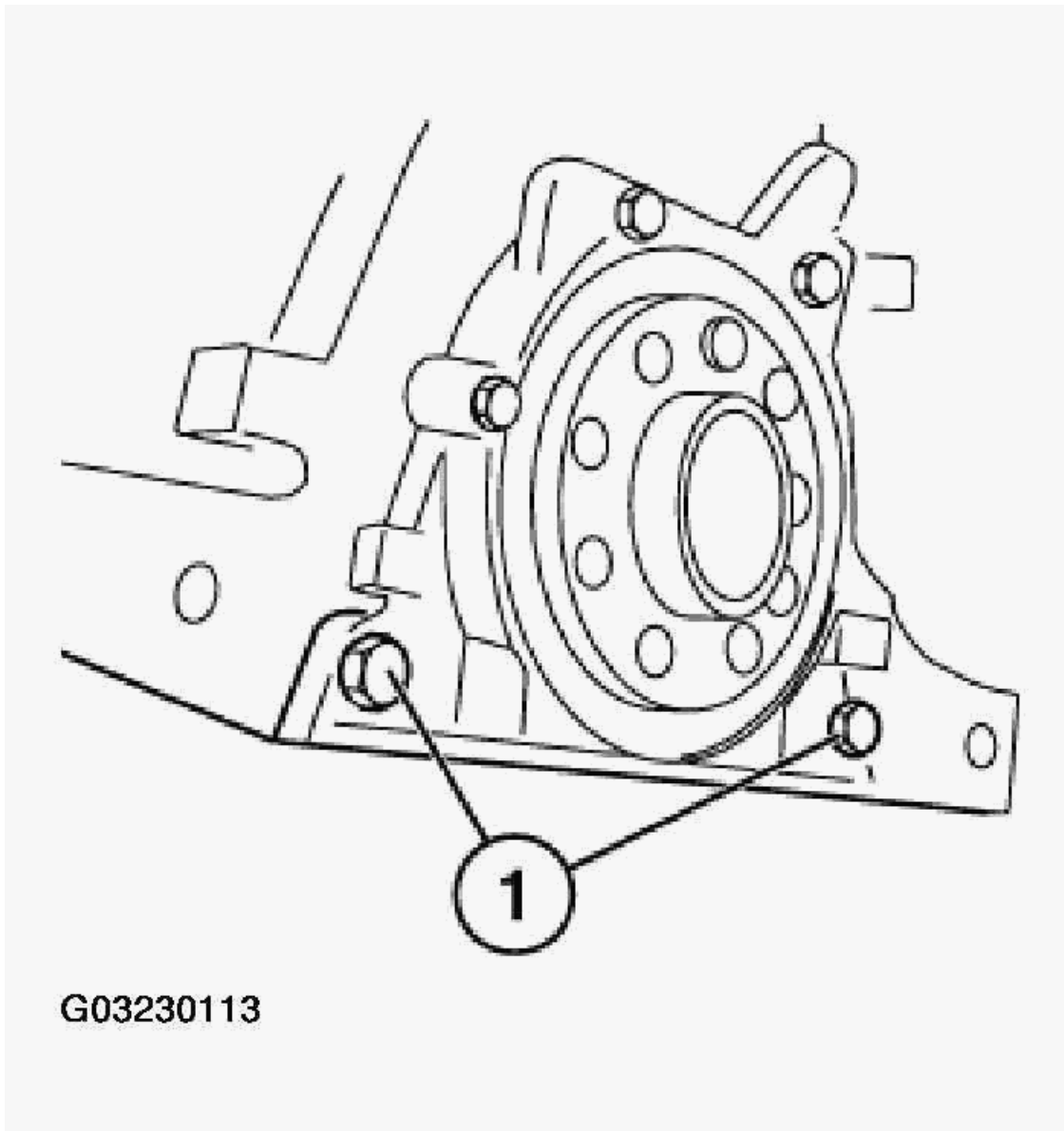
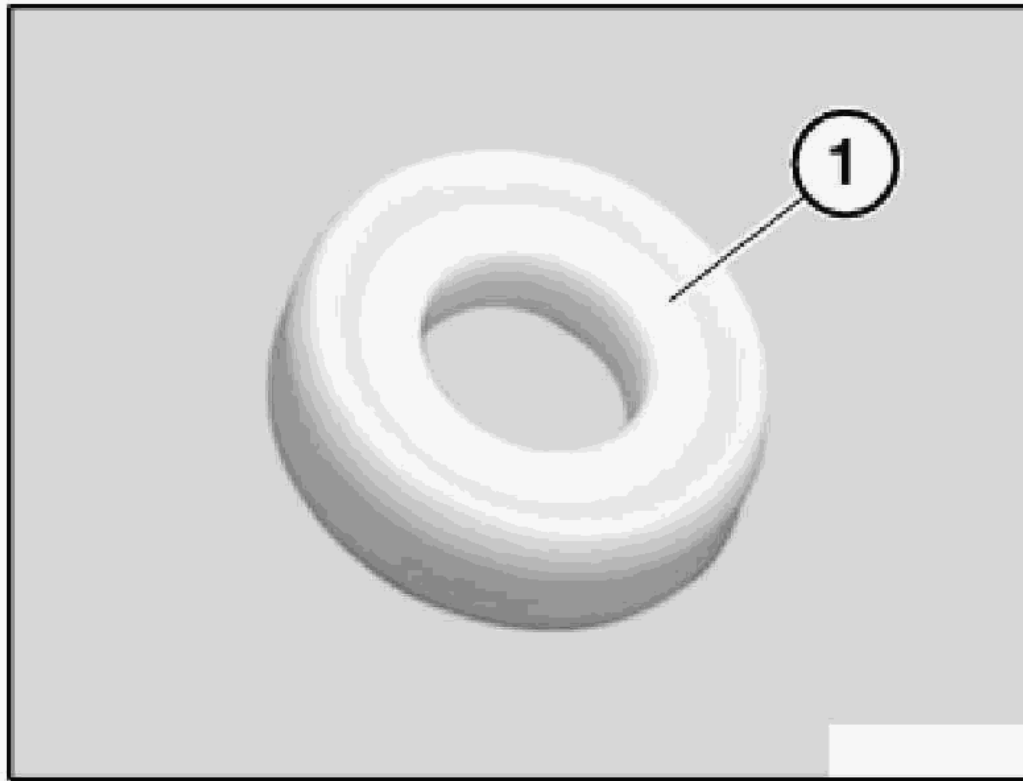


Fig. 74: Locating End Cover Screws

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Keep the support bushing (1) of the new radial seal version as a "special tool", then render the special tool 11 2 213 unusable and dispose of it.

The old and new radial seal versions can be installed with the support bushing (1).



G03230114

Fig. 75: View Of Support Bushing

Courtesy of BMW OF NORTH AMERICA, INC.

CRANKSHAFT WITH BEARING

11 21 500 REPLACING CRANKSHAFT (M52 / S52 / M52TU / M54 / M56)

(Engine removed.)

Necessary Preliminary Tasks:

- Removing cylinder head.
- Removing lower timing case cover.
- Removing all pistons, refer to **11 25 530 REMOVING AND INSTALLING OR REPLACING ALL PISTONS (M52 / S52 / M52TU / M54 / M56)** .
- Remove end cover at rear; this operation is described in **11 14 151 REPLACING CRANKSHAFT RADIAL SEAL (TRANSMISSION SIDE)** .

Checking axial clearance:

If permitted end float is exceeded, check crankshaft, guide bearing shells and engine block, replacing if necessary, end float.

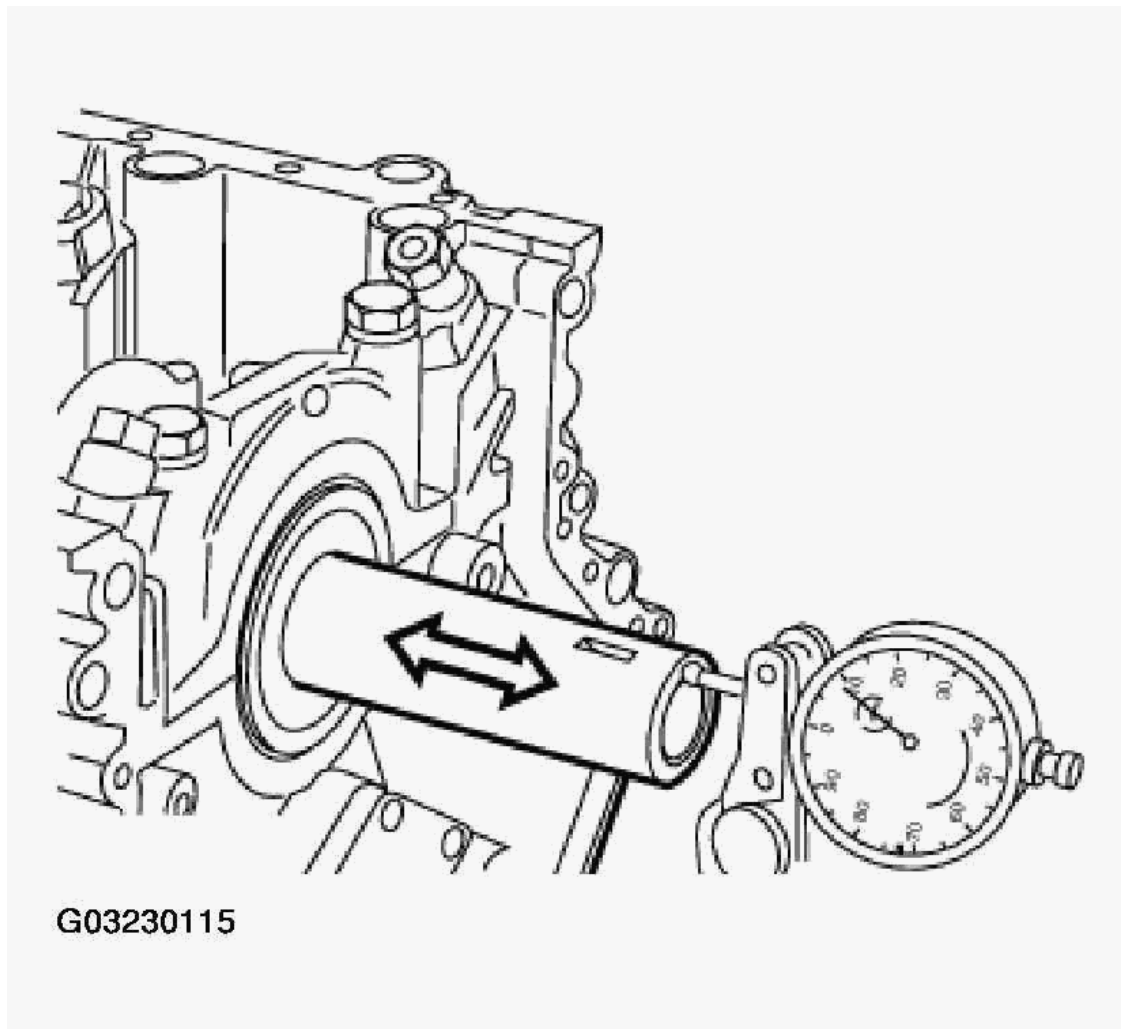
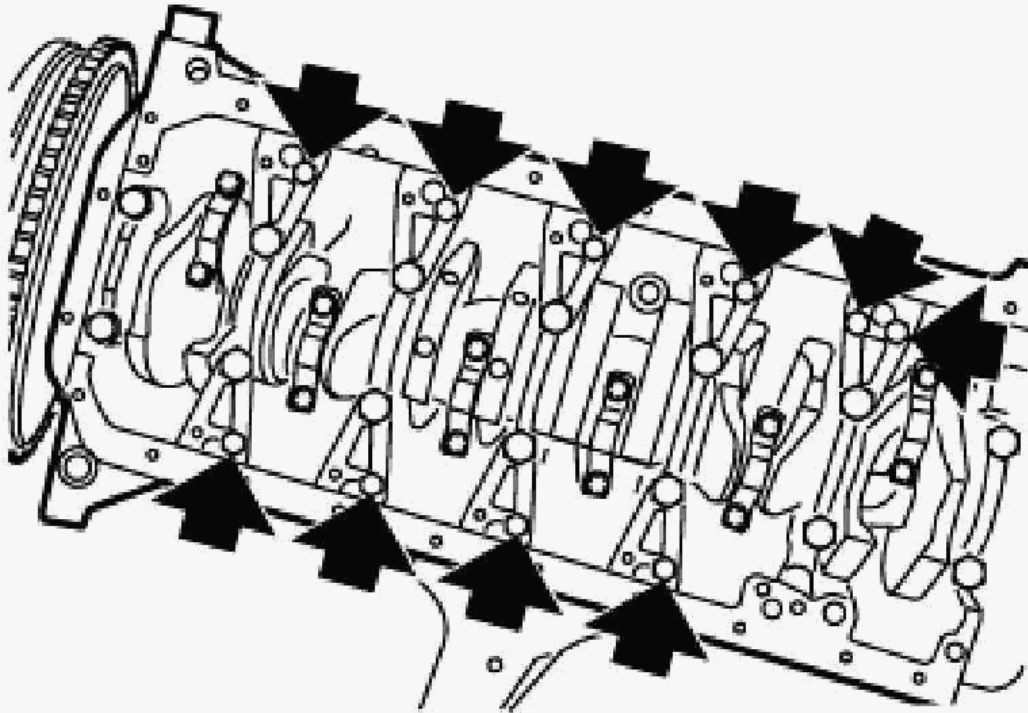


Fig. 76: Checking Axial Clearance

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screw connection on reinforcement plates.

NOTE: The reinforcement plates are not fitted on engines with gray cast iron engine blocks or on engines with oil pumps integrated in oil scrapers.



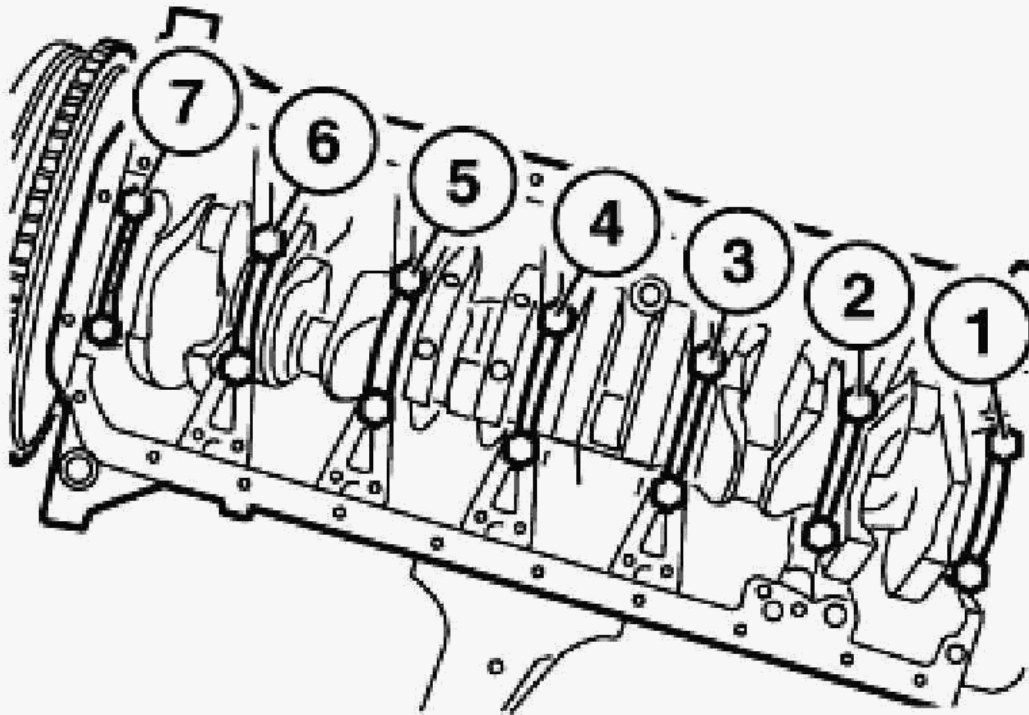
G03230116

Fig. 77: Removing Reinforcement Plate Retaining Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screw connection on main bearing.

Remove main bearing caps (1 to 7).

Lever out crankshaft.



G03230117

Fig. 78: Removing Main Bearing Caps

Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, release incremental gear.

Installation:

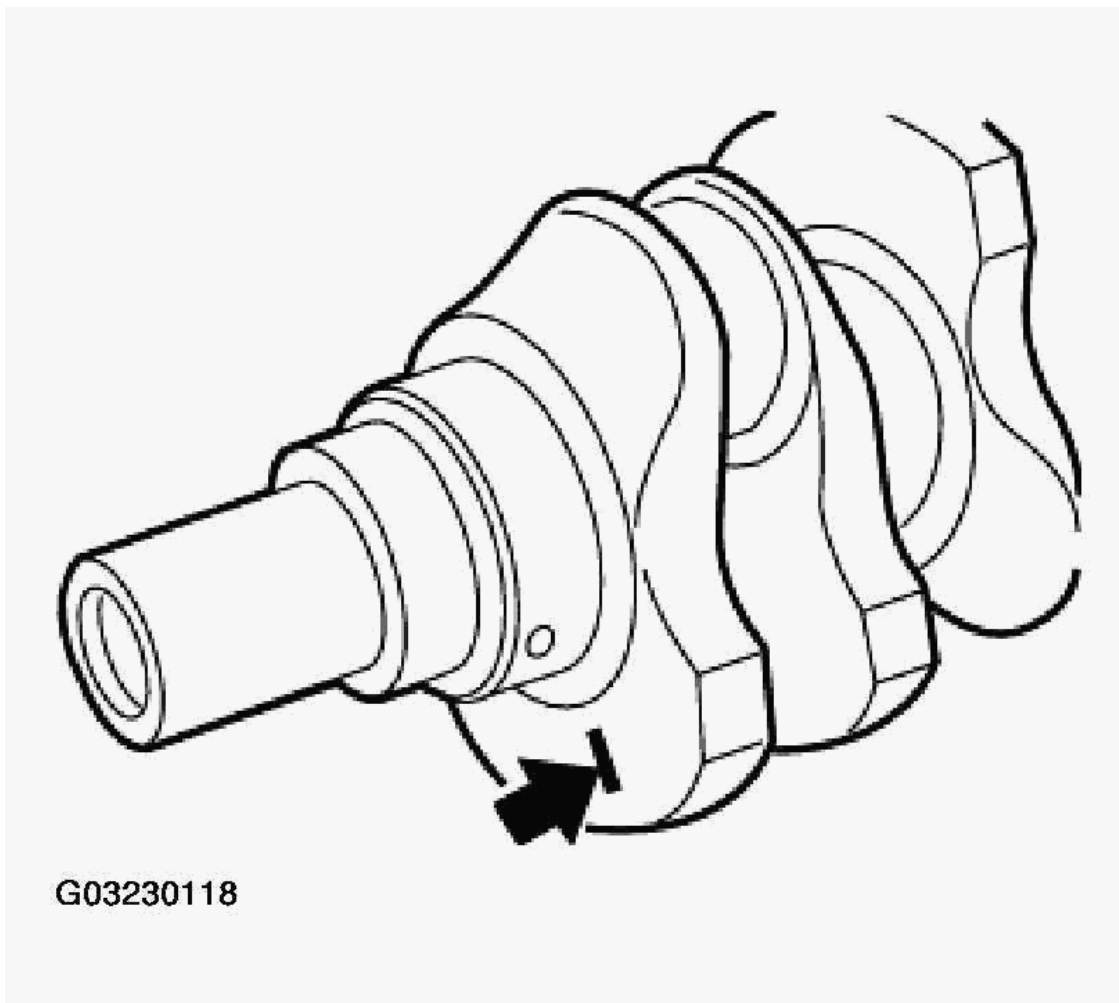
Replace screws.

Install screws and tighten down in two passes.

Tightening torque, refer to 11 21 1AZ in **ENGINE - TIGHTENING TORQUES** .

Important!

Check grinding stage of crankshaft, refer to **ENGINE - TECHNICAL DATA** .



G03230118

Fig. 79: Checking Crankshaft

Courtesy of BMW OF NORTH AMERICA, INC.

Replace main crankshaft bearing shells, refer to **11 21 531 REPLACING ALL MAIN CRANKSHAFT BEARING SHELLS (M52 / S52 / M52TU / M54 / M56)** .

Replace conrod bearing shells, refer to **11 24 571 REPLACING ALL CONNECTING ROD BEARINGS (M52 / S52 / M52TU / M54 / M56)** .

Replace grooved ball bearings in crankshaft, refer to **11 21 571 REPLACING GROOVED BALL BEARING IN CRANKSHAFT (M52 / S52 / M52TU / M54 / S50 / S54)** .

11 21 531 REPLACING ALL MAIN CRANKSHAFT BEARING SHELLS (M52 / S52 / M52TU / M54 / M56)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 00 2 590
- 00 9 120
- 11 2 110

(Engine dismantled.)

M52 B20 / M52TU B20 M54 M22

NOTE: Injection nozzles for cooling the pistons are installed in the bores of bearing seats 2 to 7.

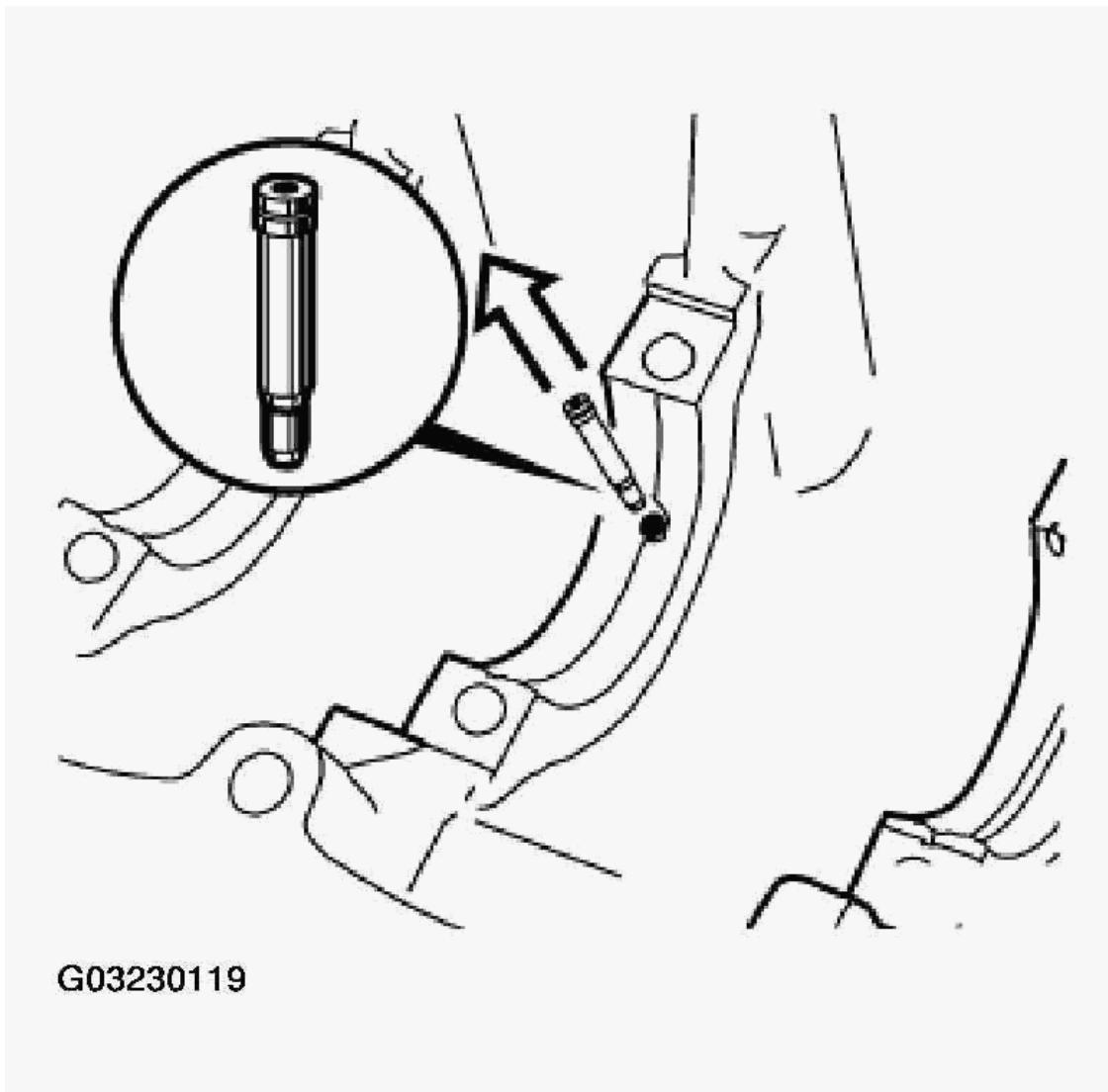


Fig. 80: Locating Injection Nozzles

Courtesy of BMW OF NORTH AMERICA, INC.

M54 B25 / B30

NOTE: Injection nozzles for cooling the pistons are installed on the underside of the cylinder between the bearing seats.

Installation:

Screw threads are coated with screw securing adhesive (Loctite).

Replace screws.

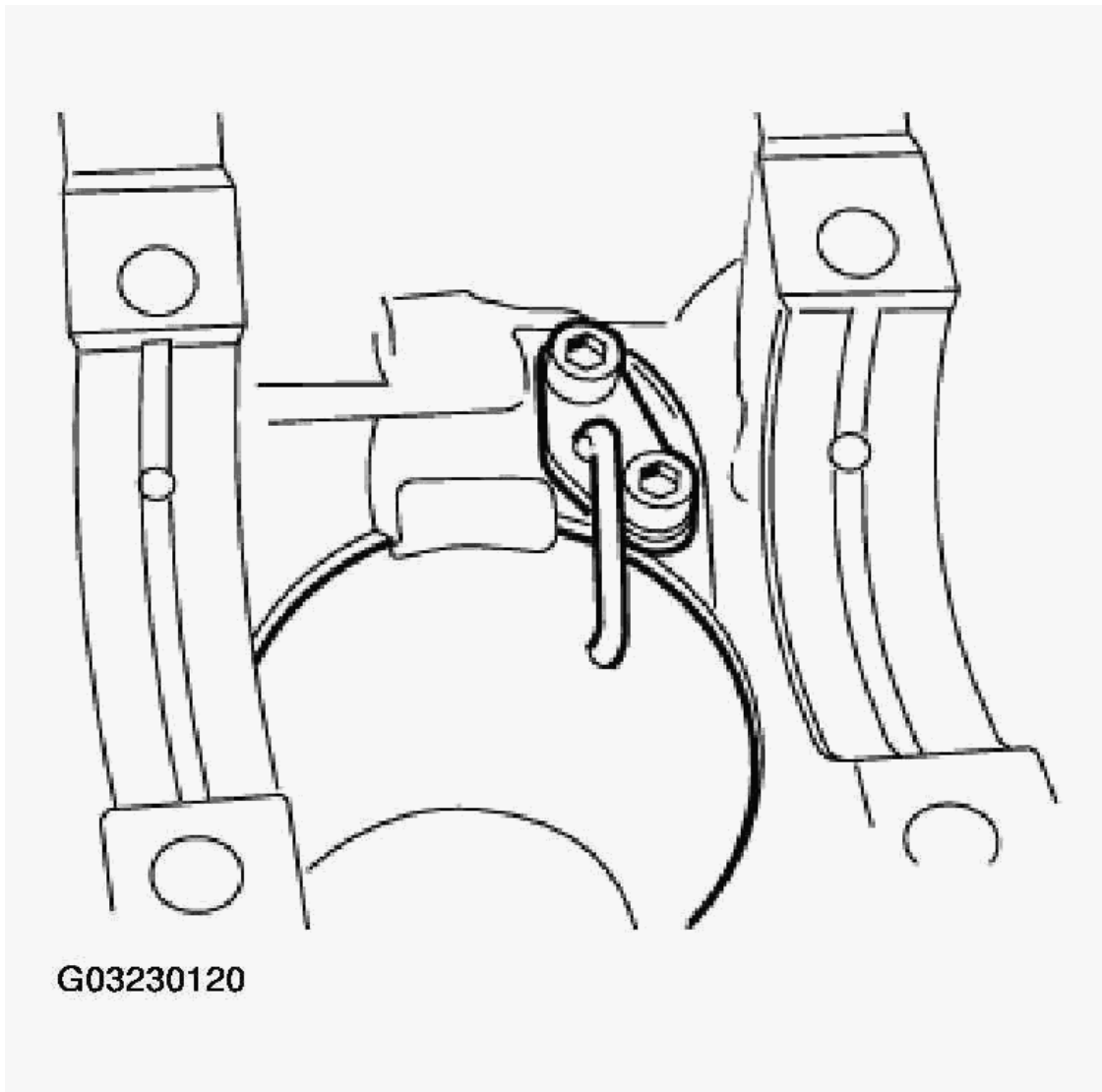


Fig. 81: View Of Injection Nozzles

Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Observe grinding stage of crankshaft, refer to **ENGINE - TECHNICAL DATA** .

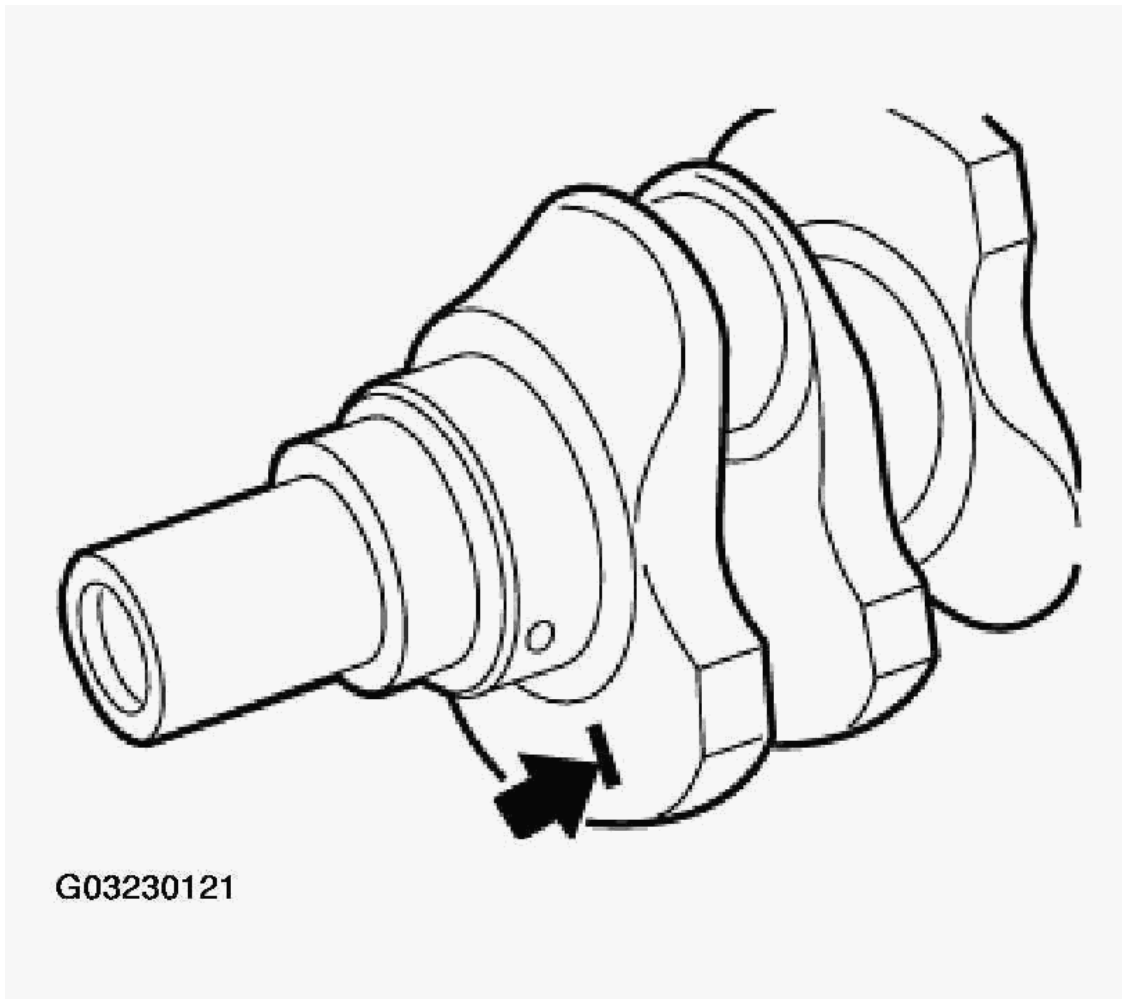


Fig. 82: Identifying Crankshaft

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

When replacing the bearing shells (also for replacement crankshaft), classification for bearing shell arrangement in engine block is waived.

Insert bearing shells with yellow color coding in engine block.

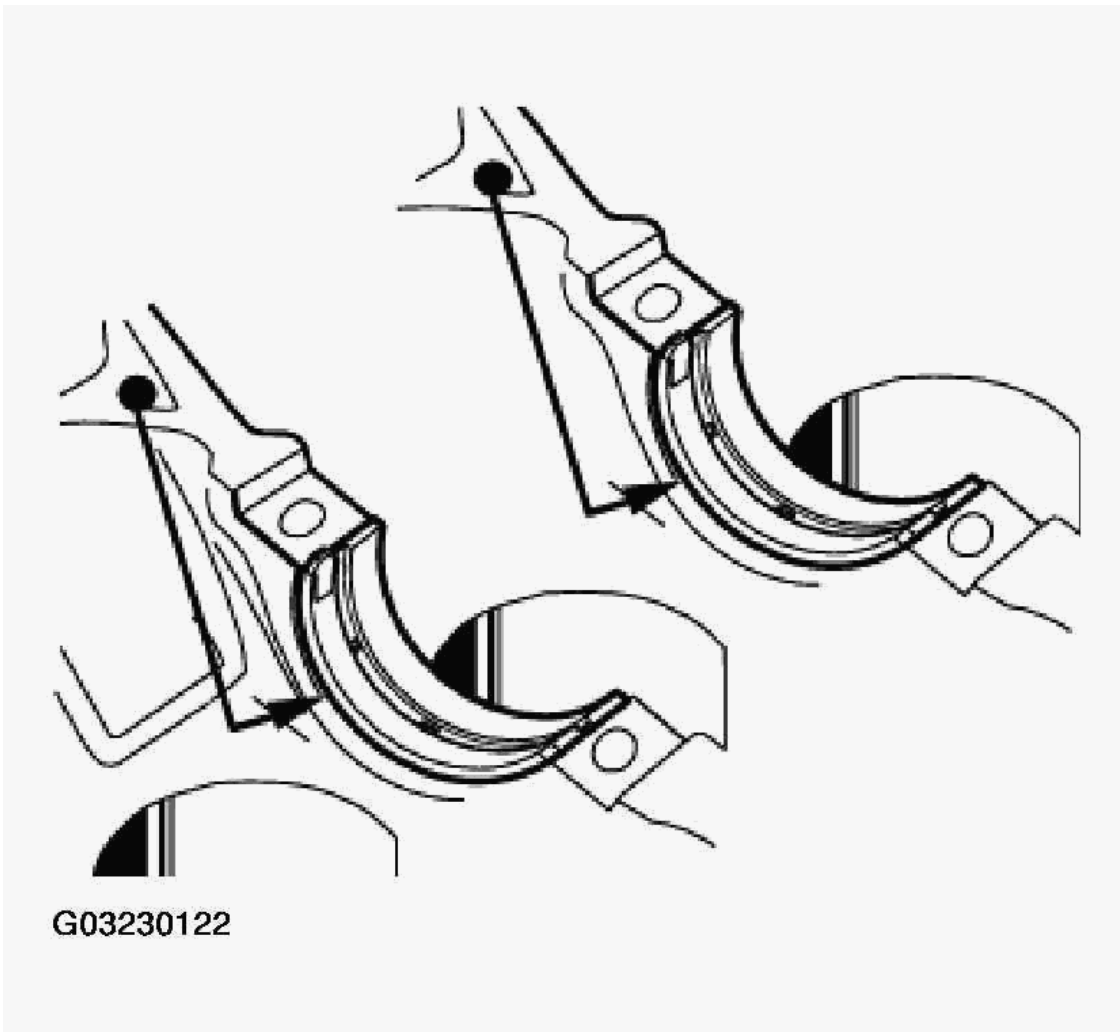


Fig. 83: Locating Color Coding In Engine Block
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE:

1. Install bearing shells with continuous lubricant groove and one retaining lug in engine block.
2. Fit bearing shells without continuous lubricant groove and two retaining lugs in bearing cover.

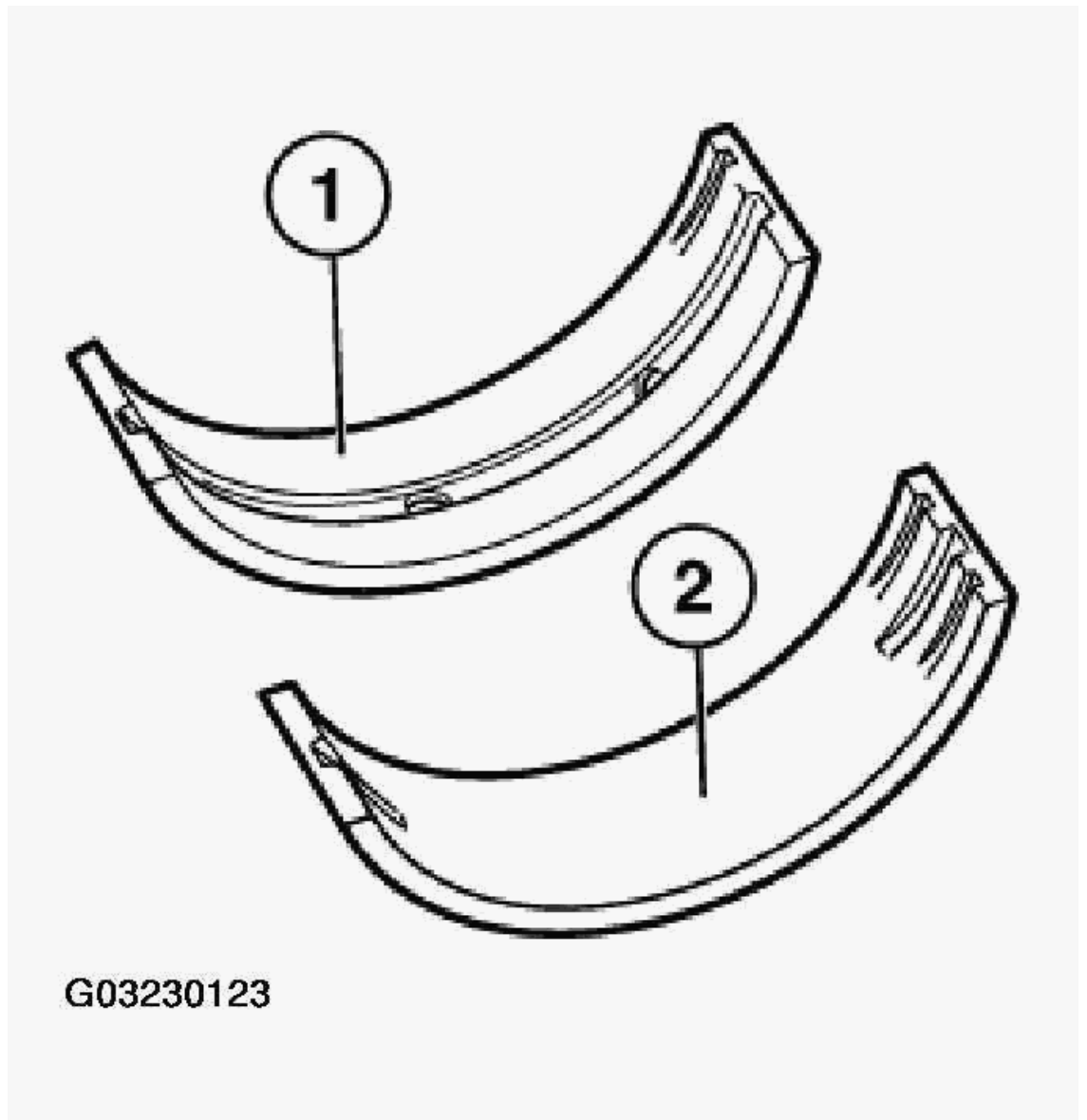


Fig. 84: Types Of Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The axial guide on the crankshaft is fitted to bearing point 6. Insert pilot bearing shell in the engine block.

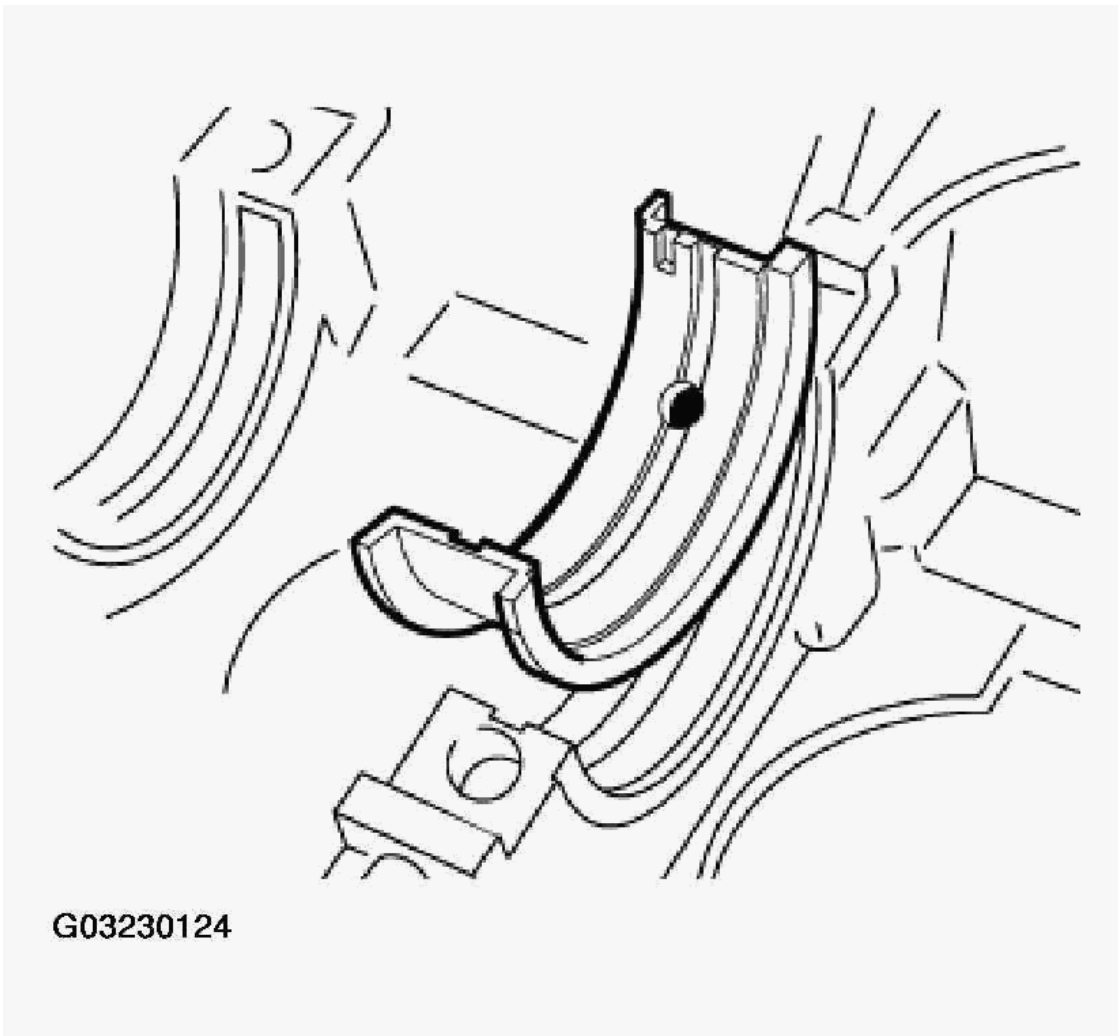


Fig. 85: Identifying Pilot Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

Install crankshaft.

NOTE: The crankshaft is marked with yellow, green or white paint according to the tolerance of the main journal.

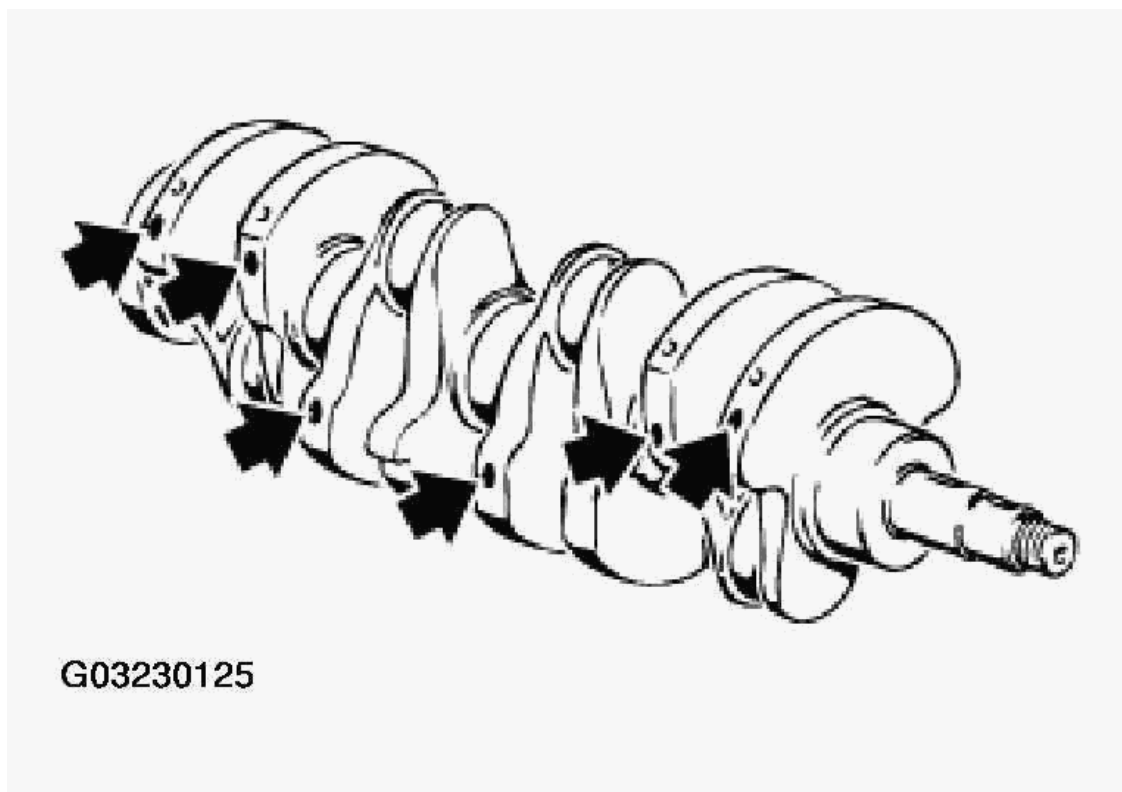


Fig. 86: Locating Color Codes On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The bearing shell classification for the bearing cover is marked on the crankshaft in yellow, green or white paint.

Insert main bearing shells with same crankshaft color coding in main bearing caps.

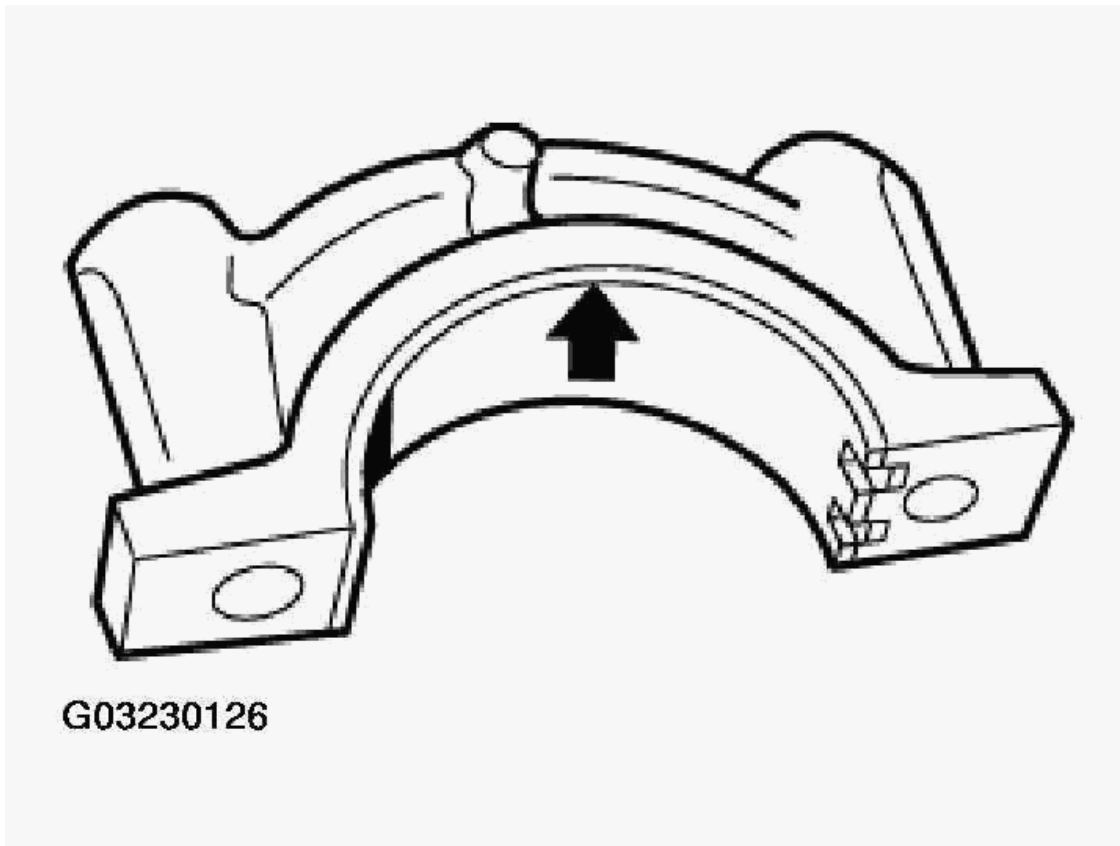


Fig. 87: View Of Bearing Shell Classification
Courtesy of BMW OF NORTH AMERICA, INC.

The bearing shells are marked with yellow, green or white paint.

1. Bearing shell.
2. Guide bearing.

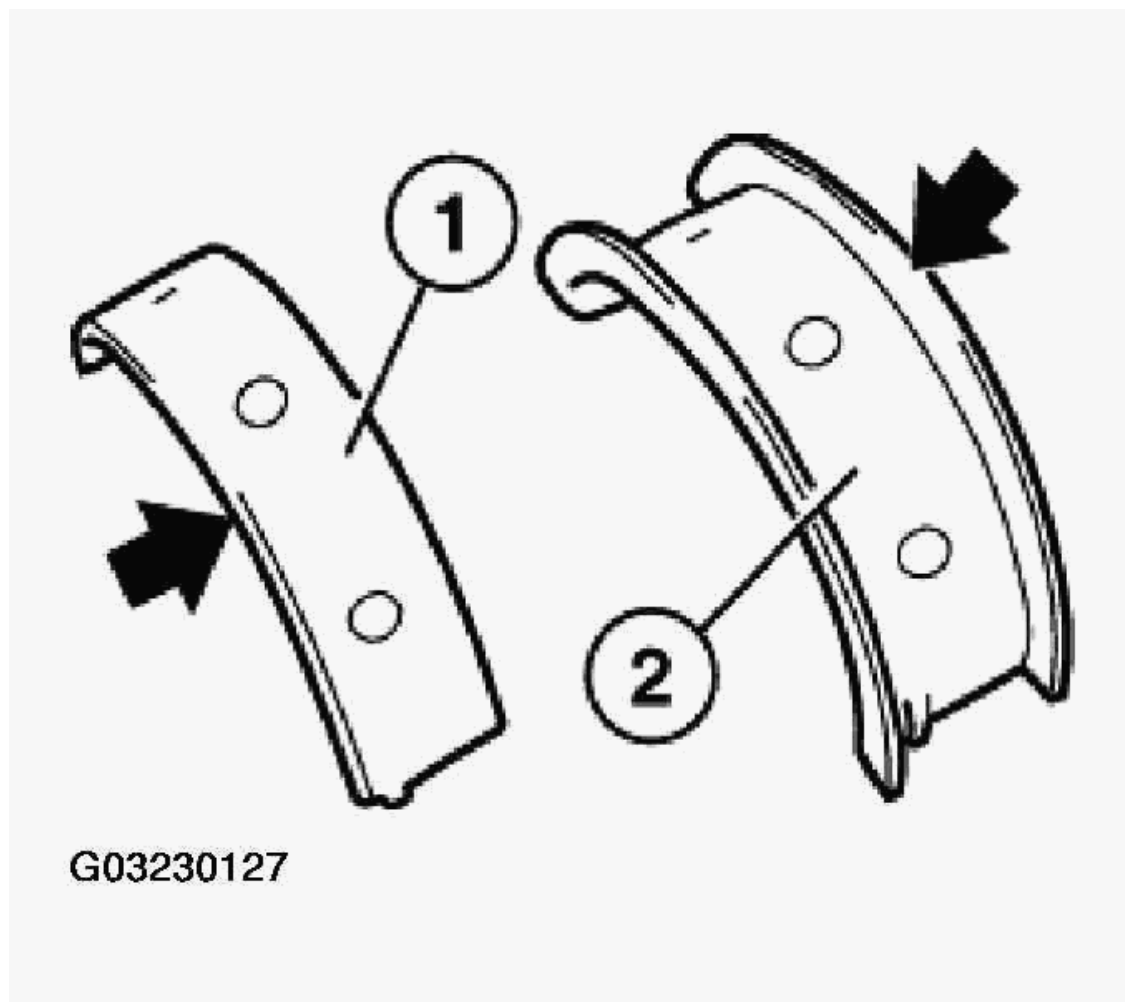


Fig. 88: Locating Markings On Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Observe grinding stage of main bearing journals, refer to **ENGINE - TECHNICAL DATA** .

NOTE: Bearing caps 1 to 5 are marked on exhaust side. Bearing caps 6 and 7 are not designated. Bearing cap 6 is a thrust bearing.

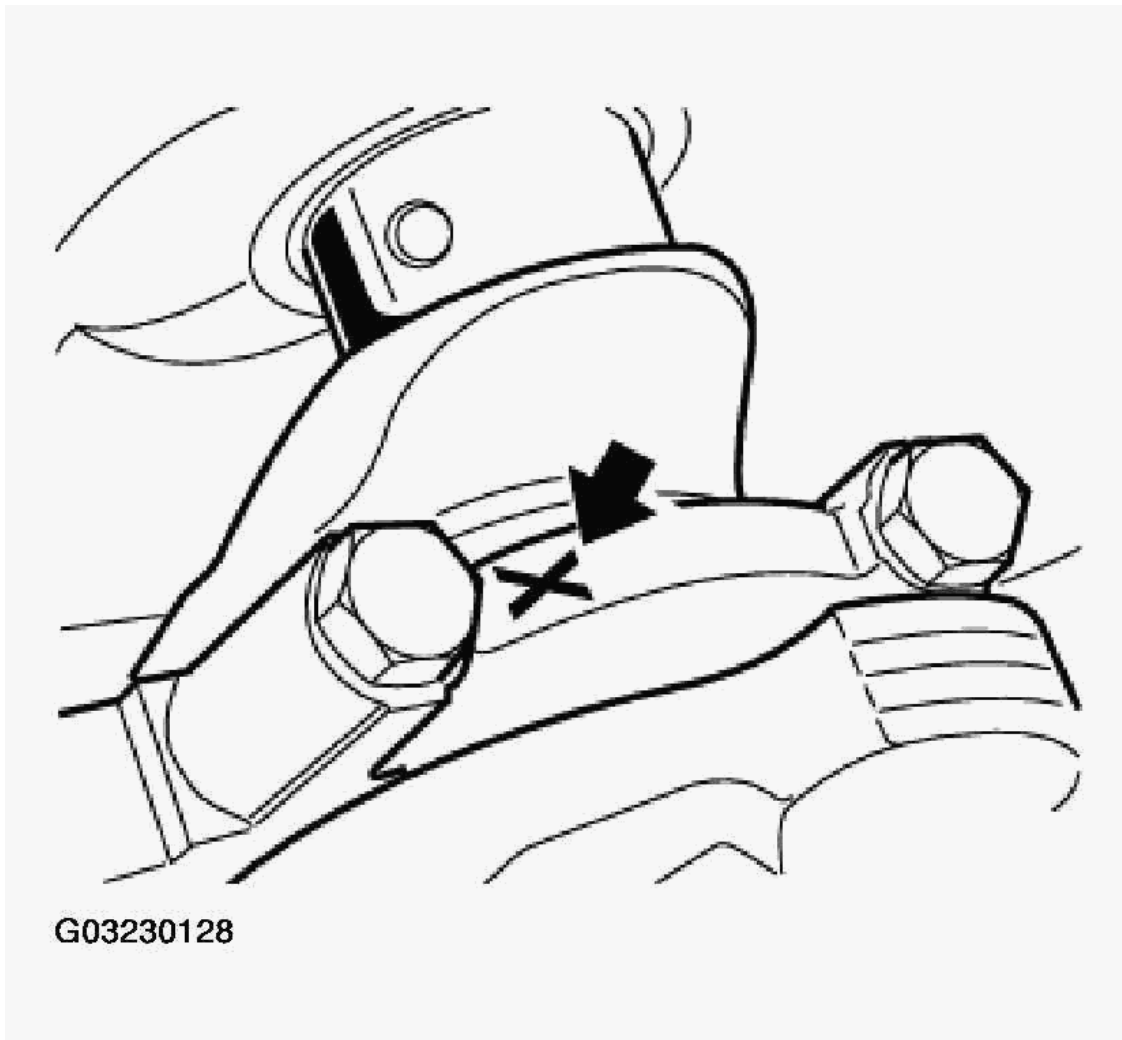


Fig. 89: Identifying Bearing Marks On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Check clearance on main crankshaft bearing.

Install crankshaft and place special tool 00 2 590 (Plastigage Type PG1) on oil-free crankshaft.

Do not twist crankshaft.

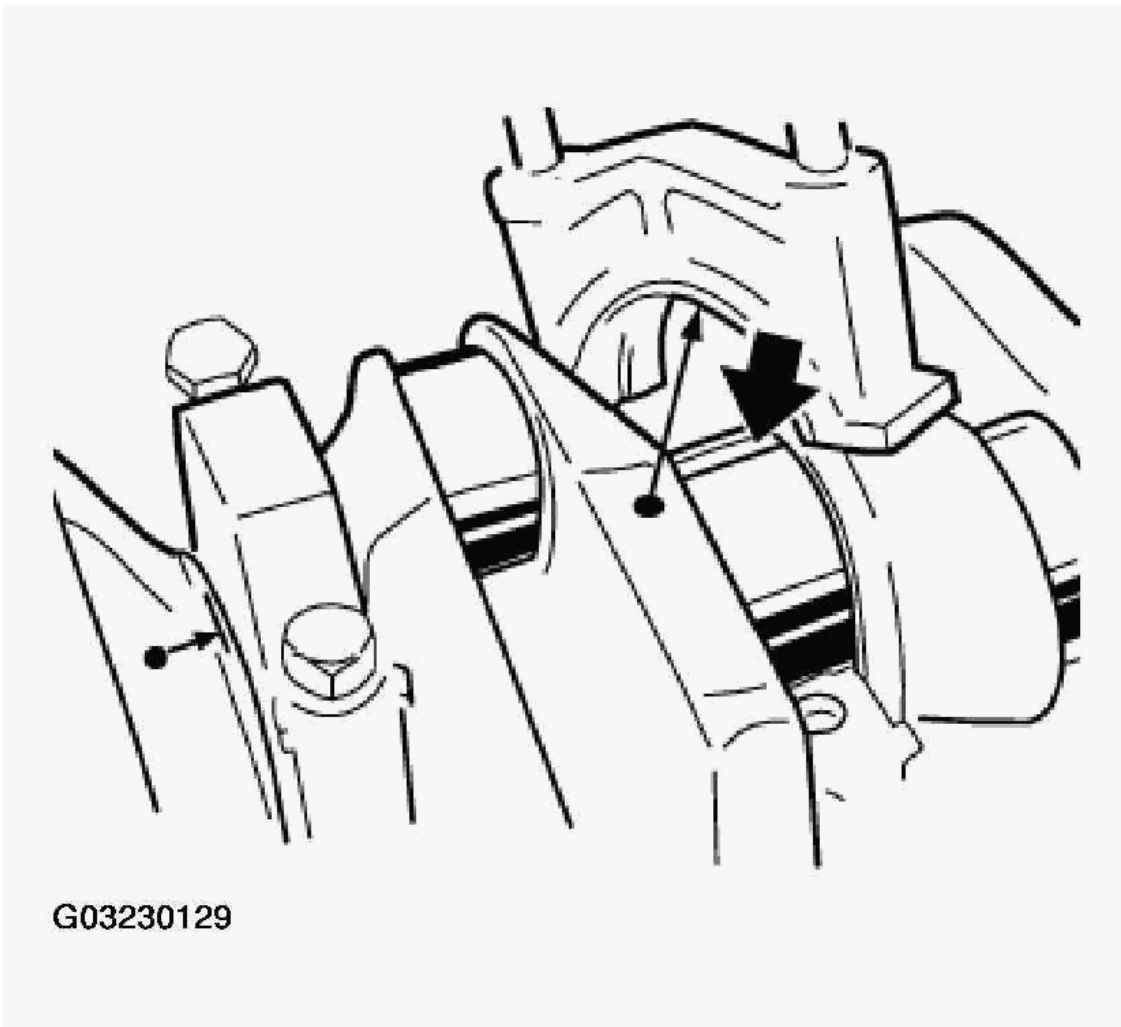


Fig. 90: Aligning Crankshaft

Courtesy of BMW OF NORTH AMERICA, INC.

Install main bearing cap so that grooves in main bearing shell guide are one side.

Align main bearing cap flush with side of bearing seat.

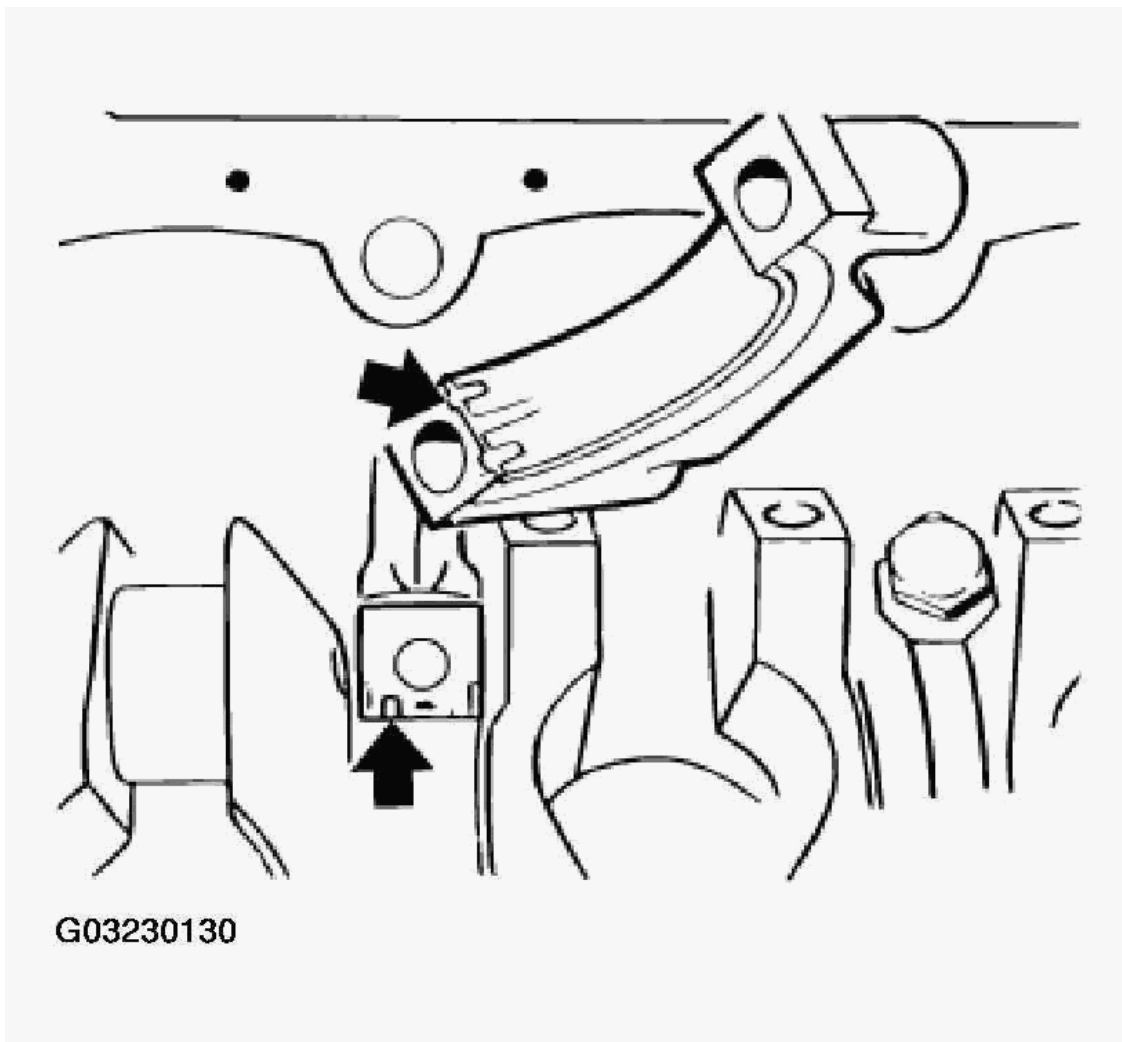


Fig. 91: Positioning Main Bearing Cap Grooves
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

To check main bearing clearance, use the old main bearing screws.

There must be no oil in the blind holes (risk of cracking).

1. Tighten down main bearing screws with jointing torque.
2. Tighten down main bearing bolts with special tool 00 9 120 to angle of rotation.

Tightening torque, refer to 11 11 1AZ in **ENGINE - TIGHTENING TORQUES** .

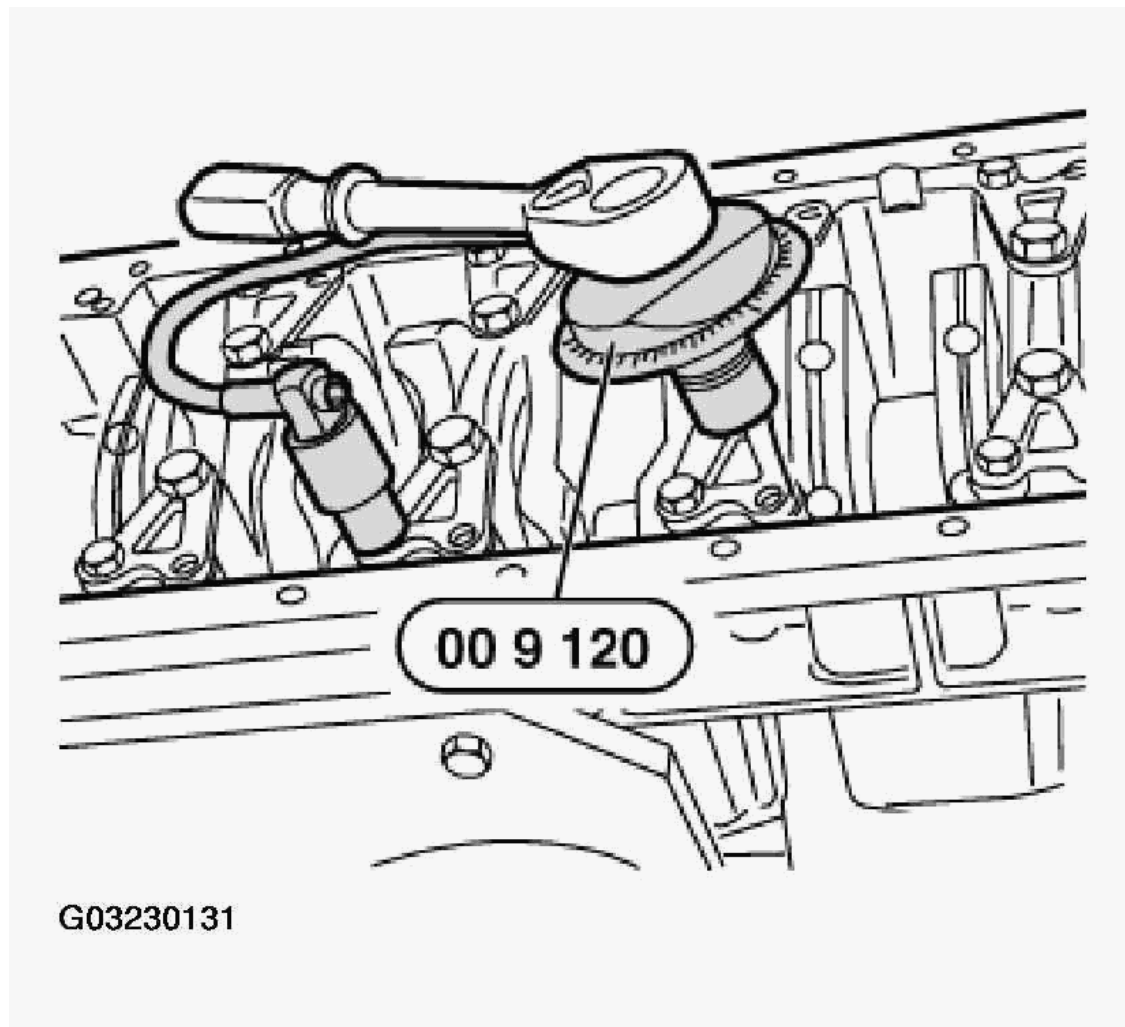


Fig. 92: Identifying Torque Angle Measuring Dial
Courtesy of BMW OF NORTH AMERICA, INC.

Remove main bearing cap and read off bearing clearance at width of pinched plastic thread on measuring scale.

Radial crankshaft bearing clearance, refer to **ENGINE - TECHNICAL DATA** .

If necessary, to correct bearing clearance, fit new bearing shells with a different color coding.

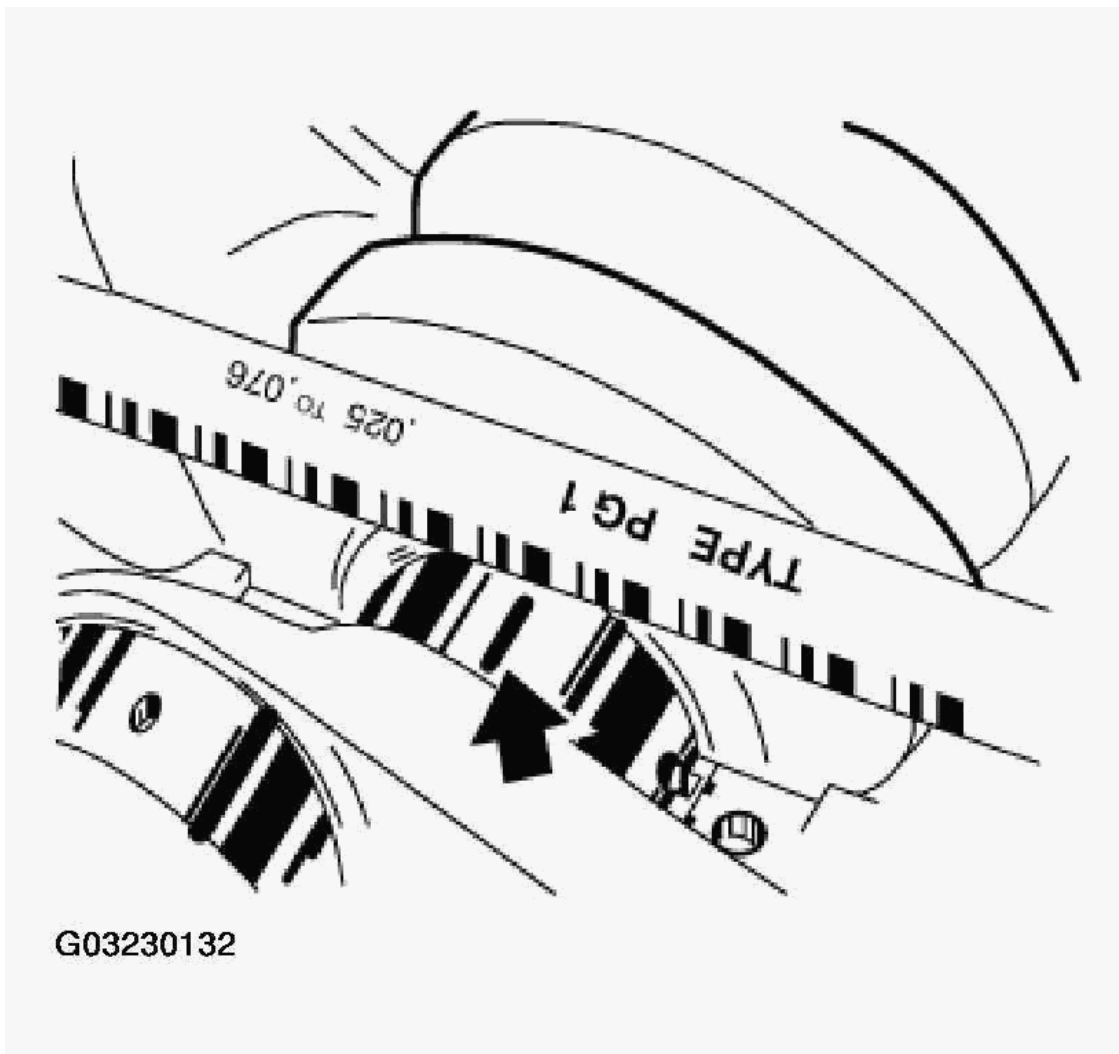


Fig. 93: Using Measuring Scale To Read Bearing Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

Remove plastic thread.

Coat main bearing shells and crankshaft with engine oil.

Install main bearing cap so that grooves in main bearing shell guide are one side.

Align main bearing cap flush with side of bearing seat.

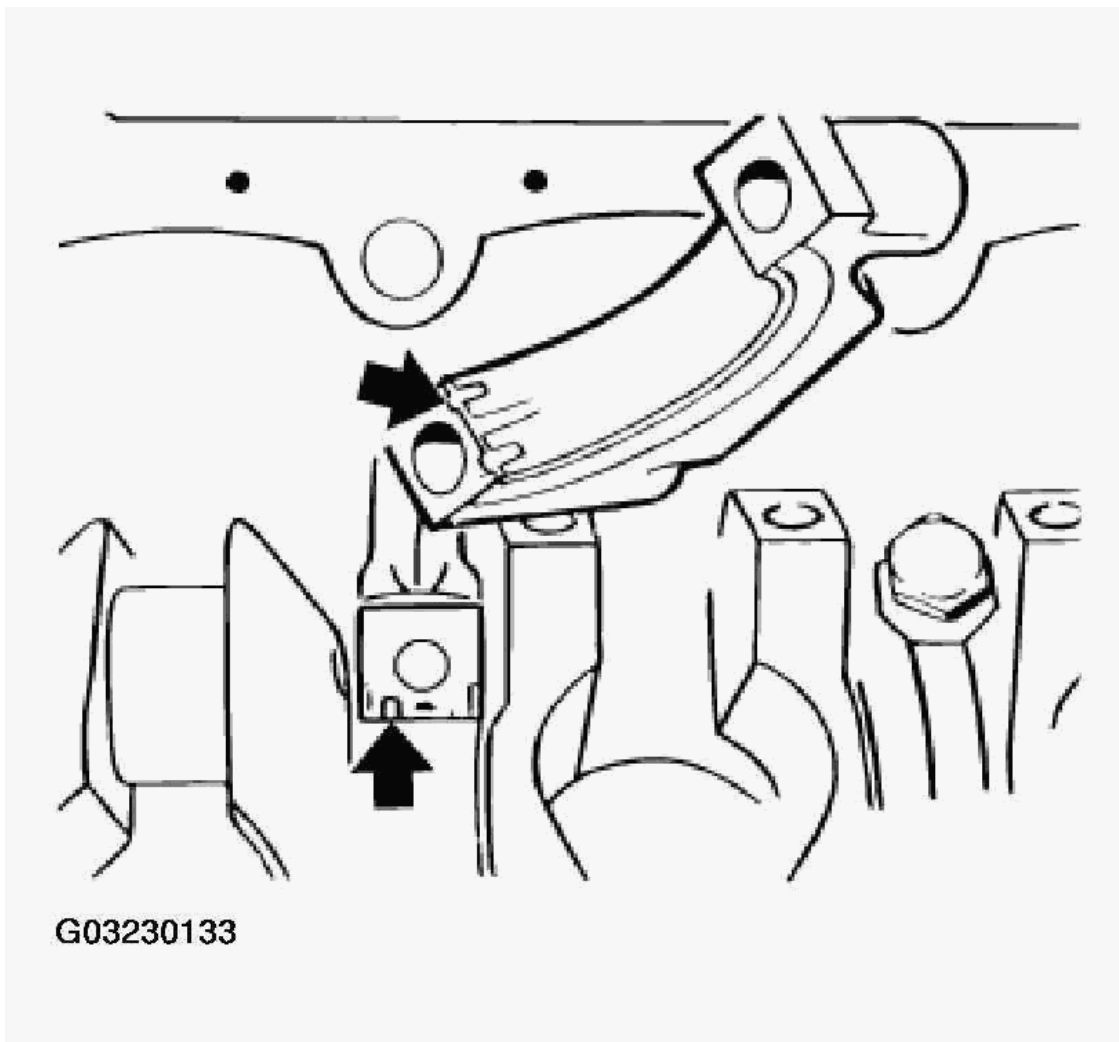


Fig. 94: Aligning Main Bearing Cap Grooves
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Always replace bolts of main bearing cap with new bolts.

There must be no oil in the blind holes (risk of cracking).

NOTE: **The reinforcement plates are not fitted on engines with gray cast iron engine blocks or on engines with oil pumps integrated in oil scrapers.**

Installation:

Install reinforcement plates and fit screws with zero backlash.

Install main bearing shells and abut firmly.

Tighten down screw connection on reinforcement plates.

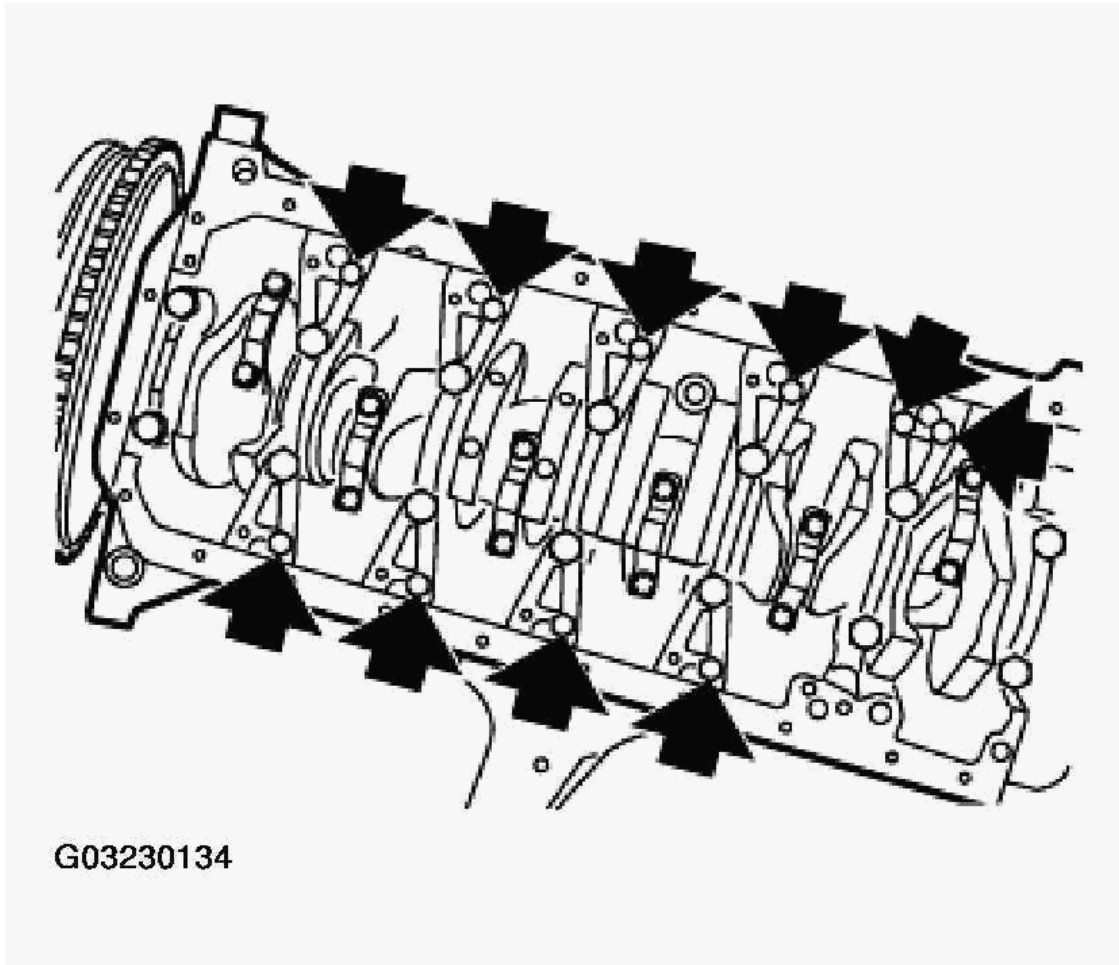


Fig. 95: Installing Reinforcement Plates
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening specifications for main bearing:

1. Tighten all screws on main bearing cover with jointing torque.
2. Unfasten screws on main bearing cover 6.
3. Strike back and front of crankshaft with plastic hammer to center thrust bearing (do not damage crankshaft).
4. Tighten screws of main bearing cover 6 with jointing torque.
5. Tighten down all screws of main bearing caps with special tool 11 2 110 or with special tool 00 9 120 to torsion angle.

Tightening torque, refer to 11 11 1AZ in **ENGINE - TIGHTENING TORQUES** .

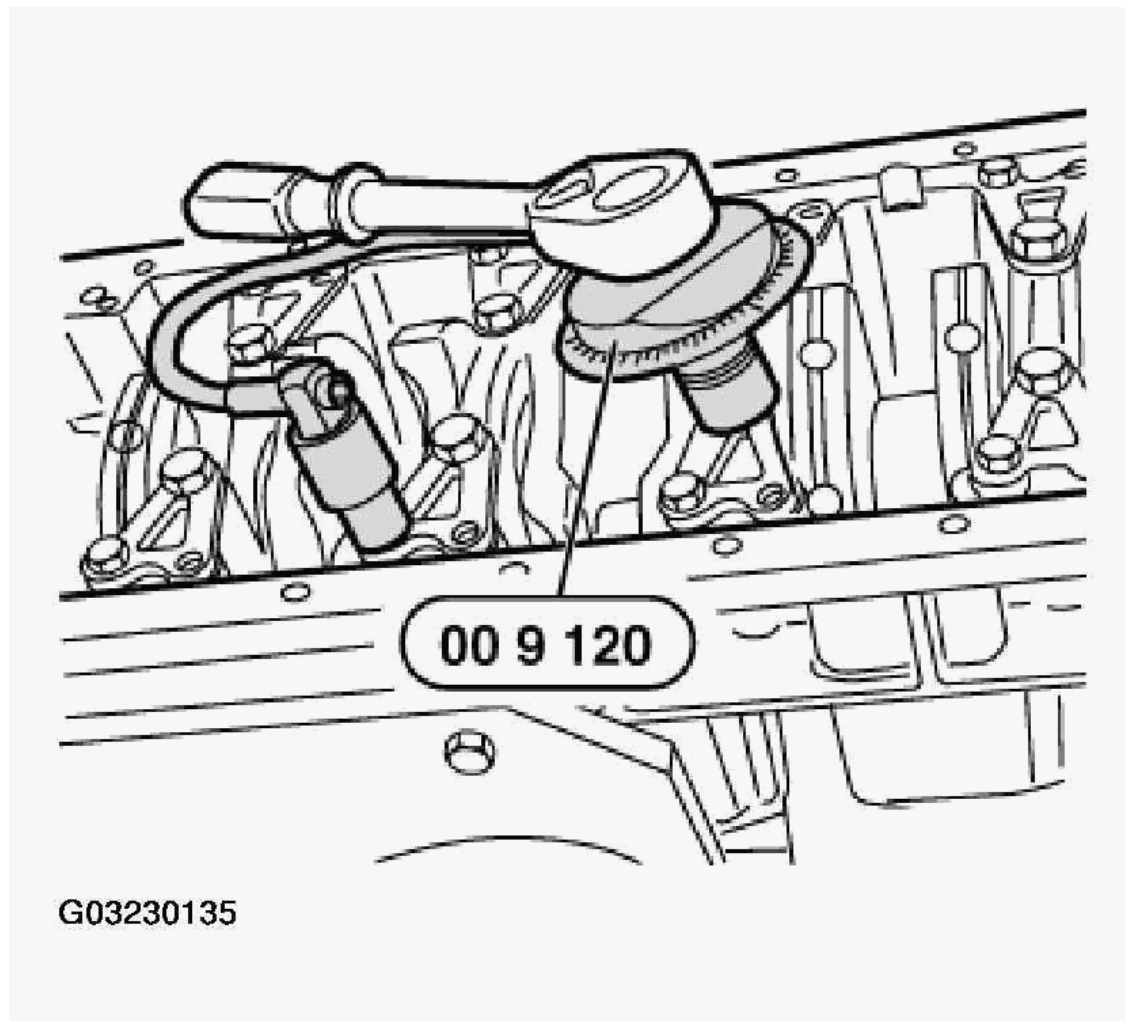


Fig. 96: Checking Torque Using Torque Angle Measuring Dial
Courtesy of BMW OF NORTH AMERICA, INC.

Check axial play.

If permitted end float is exceeded, check crankshaft, guide bearing shells and engine block, replacing if necessary, refer to **ENGINE - TECHNICAL DATA** .

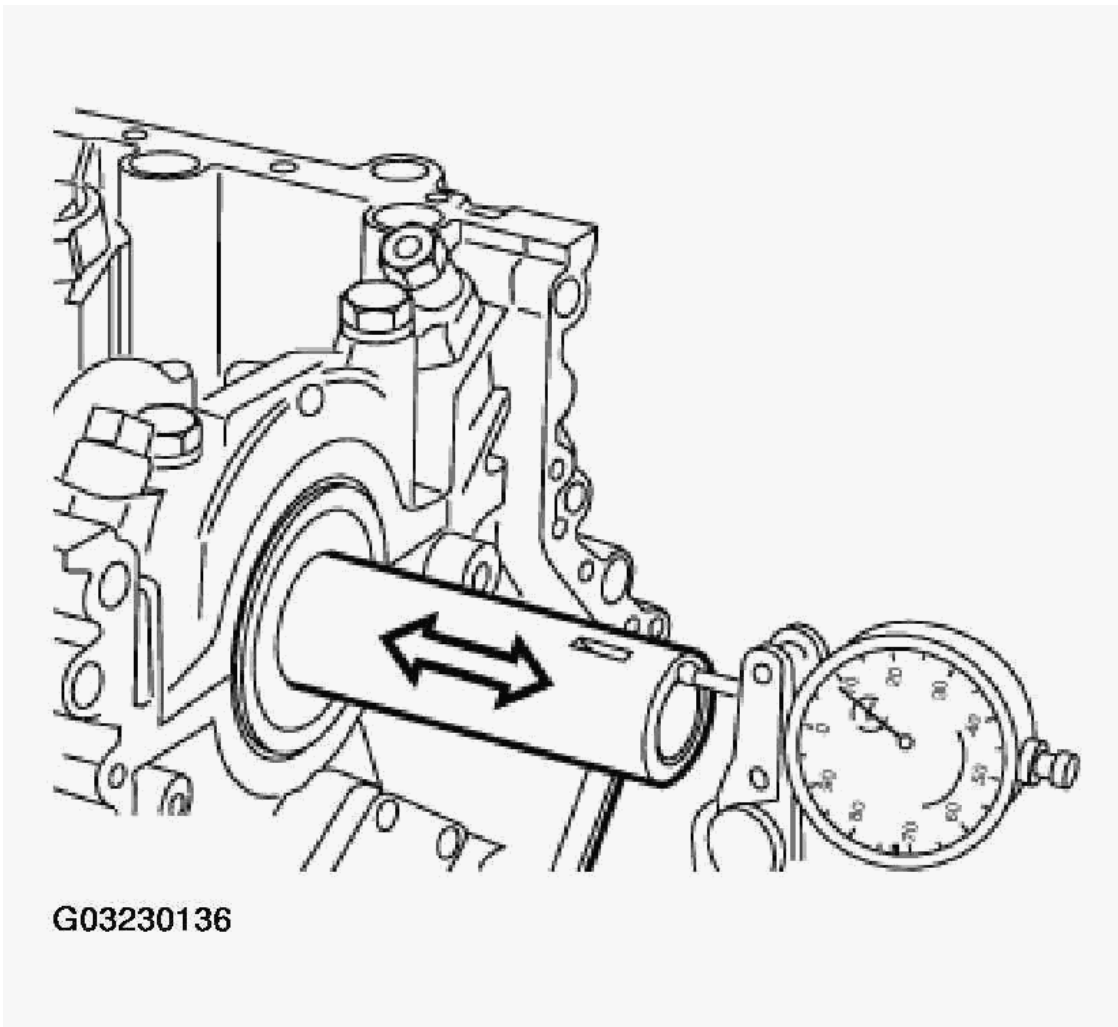


Fig. 97: Checking Axial Play

Courtesy of BMW OF NORTH AMERICA, INC.

11 21 571 REPLACING GROOVED BALL BEARING IN CRANKSHAFT (M52 / S52 / M52TU / M54 / S50 / S54)

NOTE: For Special Tool identification, see SPECIAL TOOLS - X5 (3.0i) .

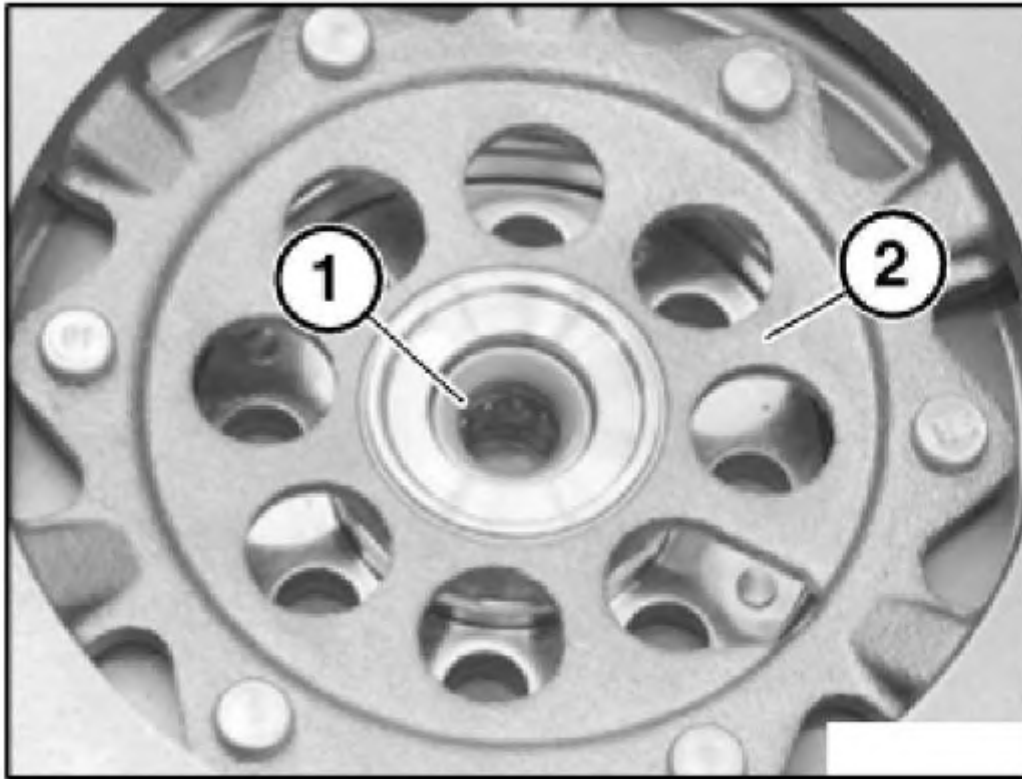
Special Tools Required:

- 00 5 500
- 11 2 340
- 11 2 350

(Clutch removed.)

Important!

In version with needle bearing (1) in dual-mass flywheel (2), **no** grooved ball bearing may be fitted in the crankshaft.



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Fig. 98: Identifying Dual-Mass Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

Version With Grooved Ball Bearing:

Remove guide bearing with special tool 11 2 340 .

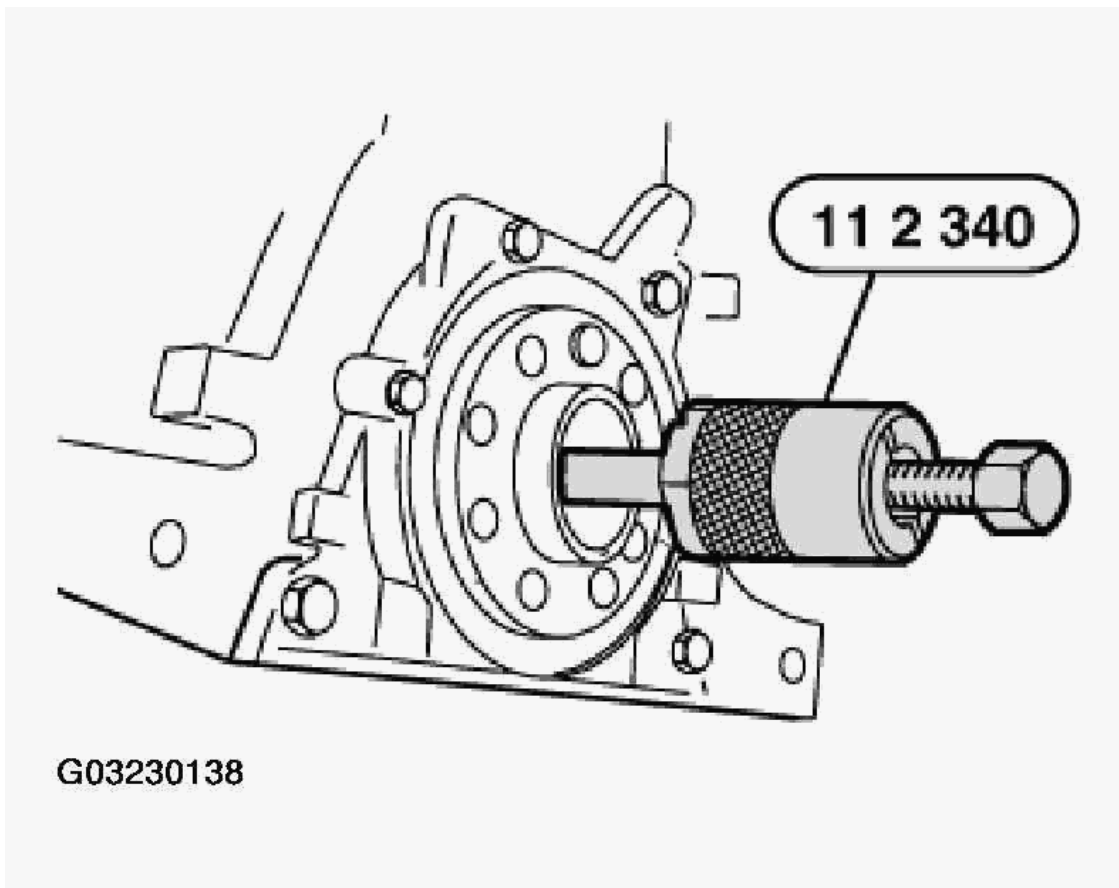


Fig. 99: Removing Guide Bearing With Puller
Courtesy of BMW OF NORTH AMERICA, INC.

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

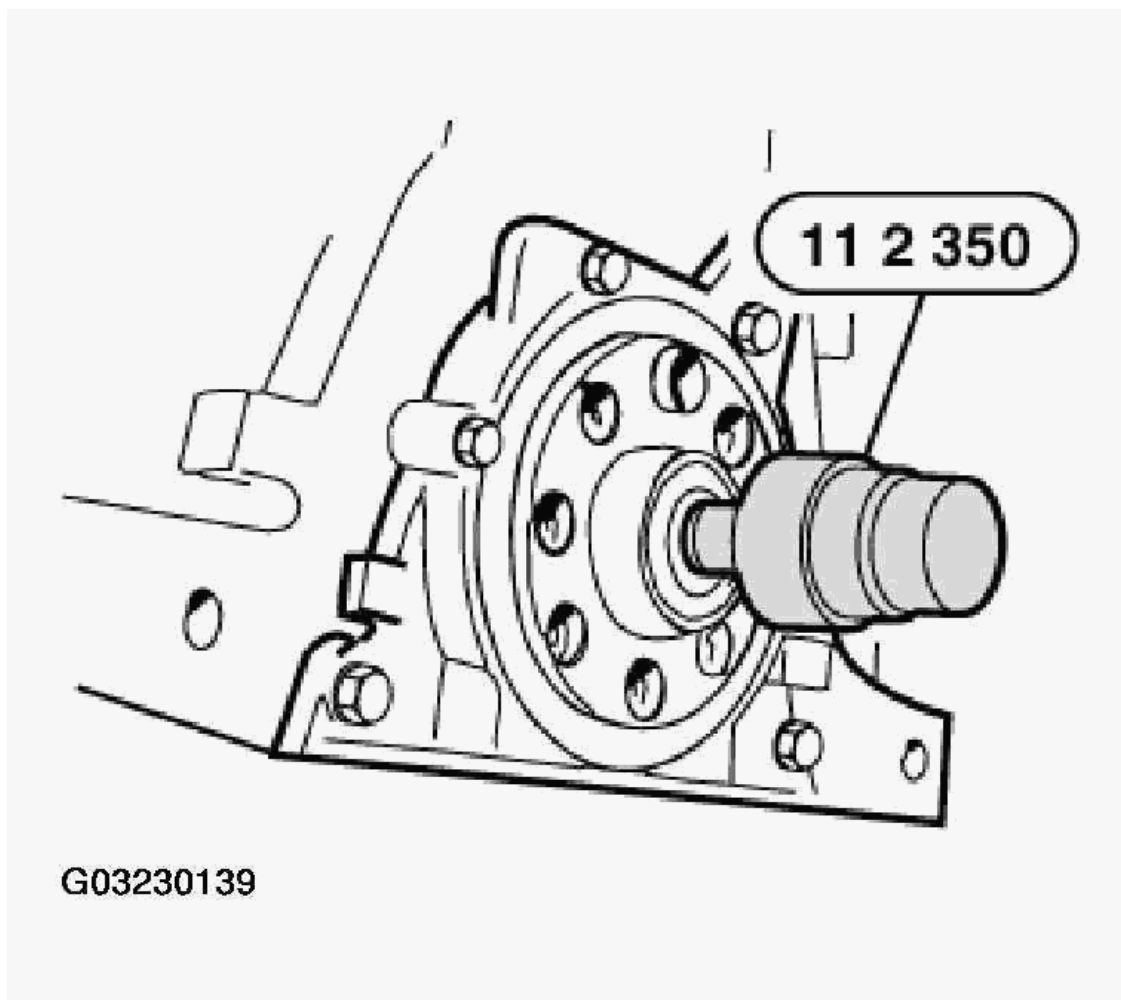


Fig. 100: Installing Thrust Bearing With Drift
Courtesy of BMW OF NORTH AMERICA, INC.

FLYWHEEL

11 22 500 REMOVING AND INSTALLING OR REPLACING FLYWHEEL (M52 / S52 / M52TU / M54 / S54)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 11 2 170

(Clutch removed.)

Lock flywheel with special tool 11 2 170 .

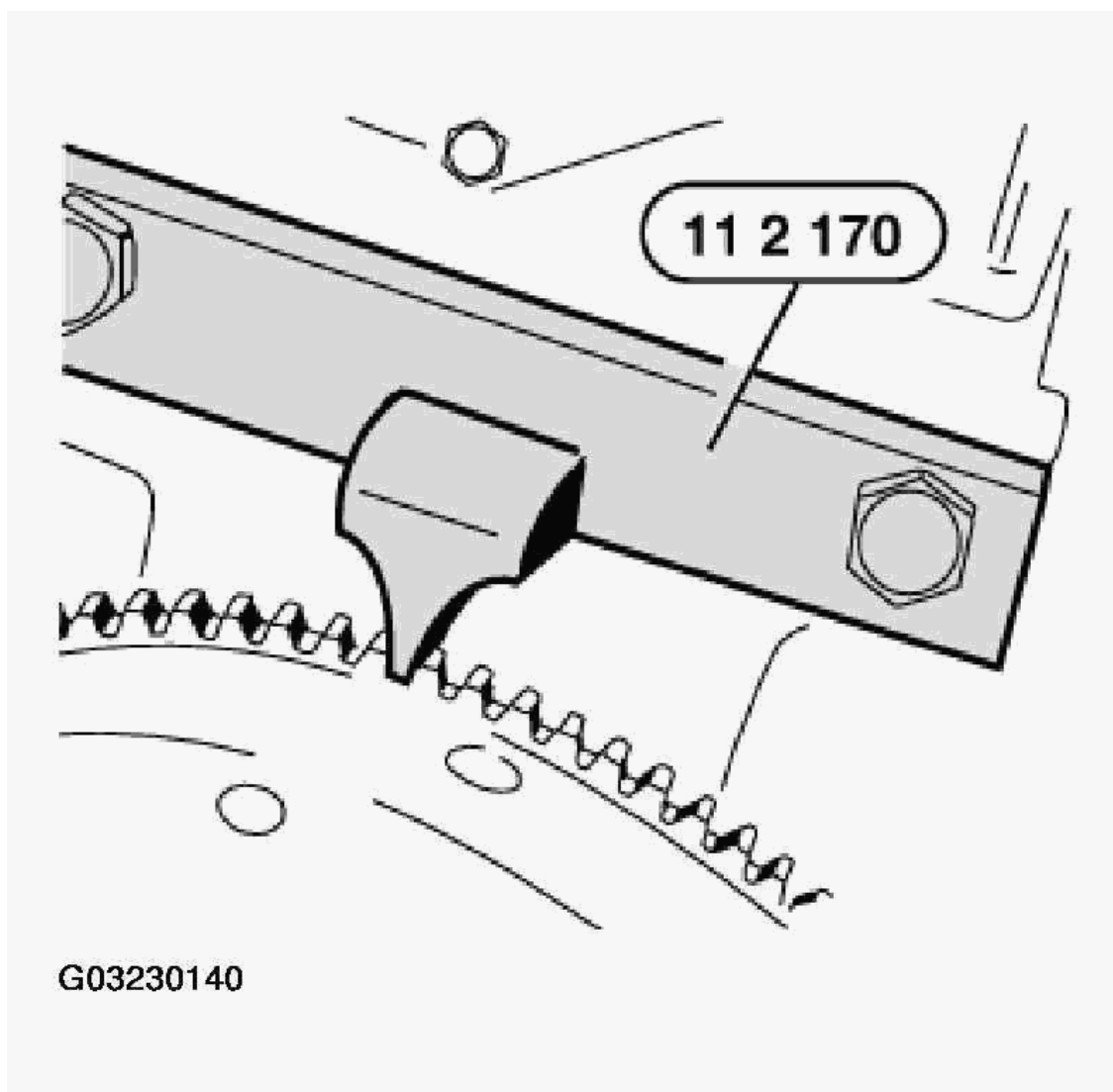
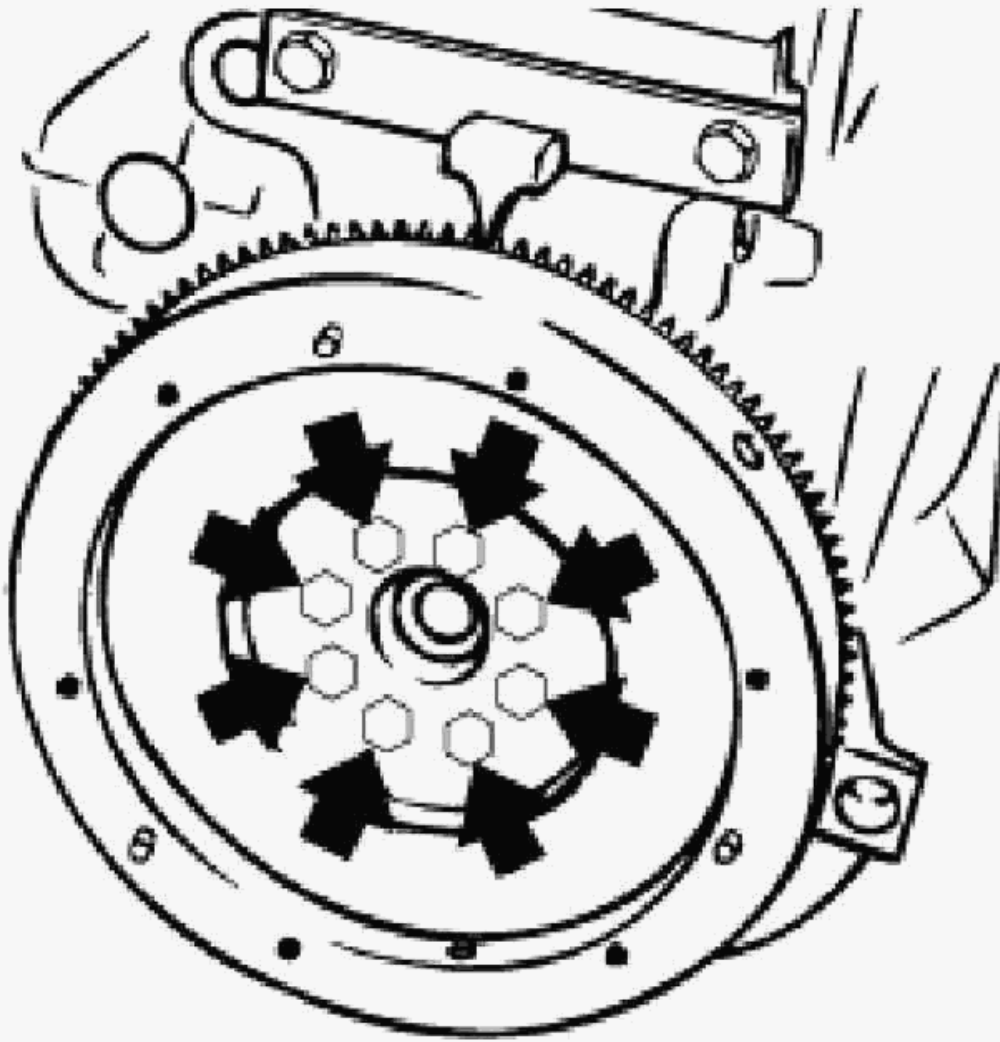


Fig. 101: Securing Flywheel Using Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws and remove flywheel.



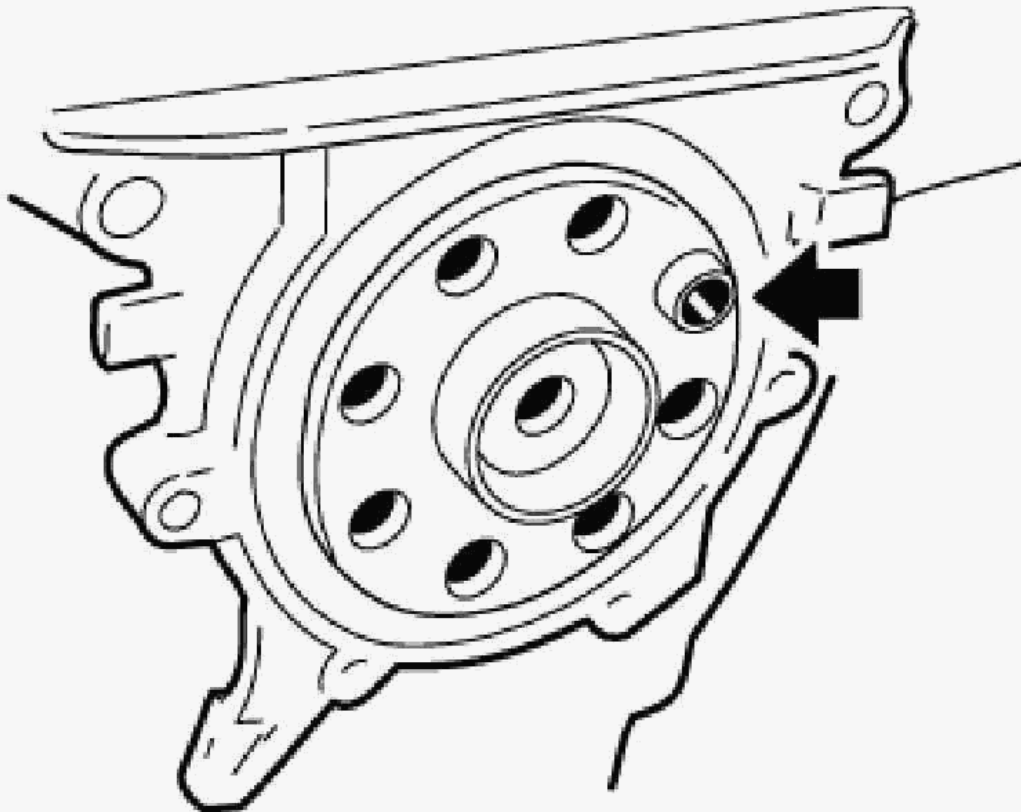
G03230141

Fig. 102: Removing Flywheel

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check dowel sleeve for damage and correct installation position.



G03230142

Fig. 103: Checking Dowel Sleeves

Courtesy of BMW OF NORTH AMERICA, INC.

Position of dowel sleeve (1) in dual-mass flywheel is identified by two notches next to associated bolt hole.

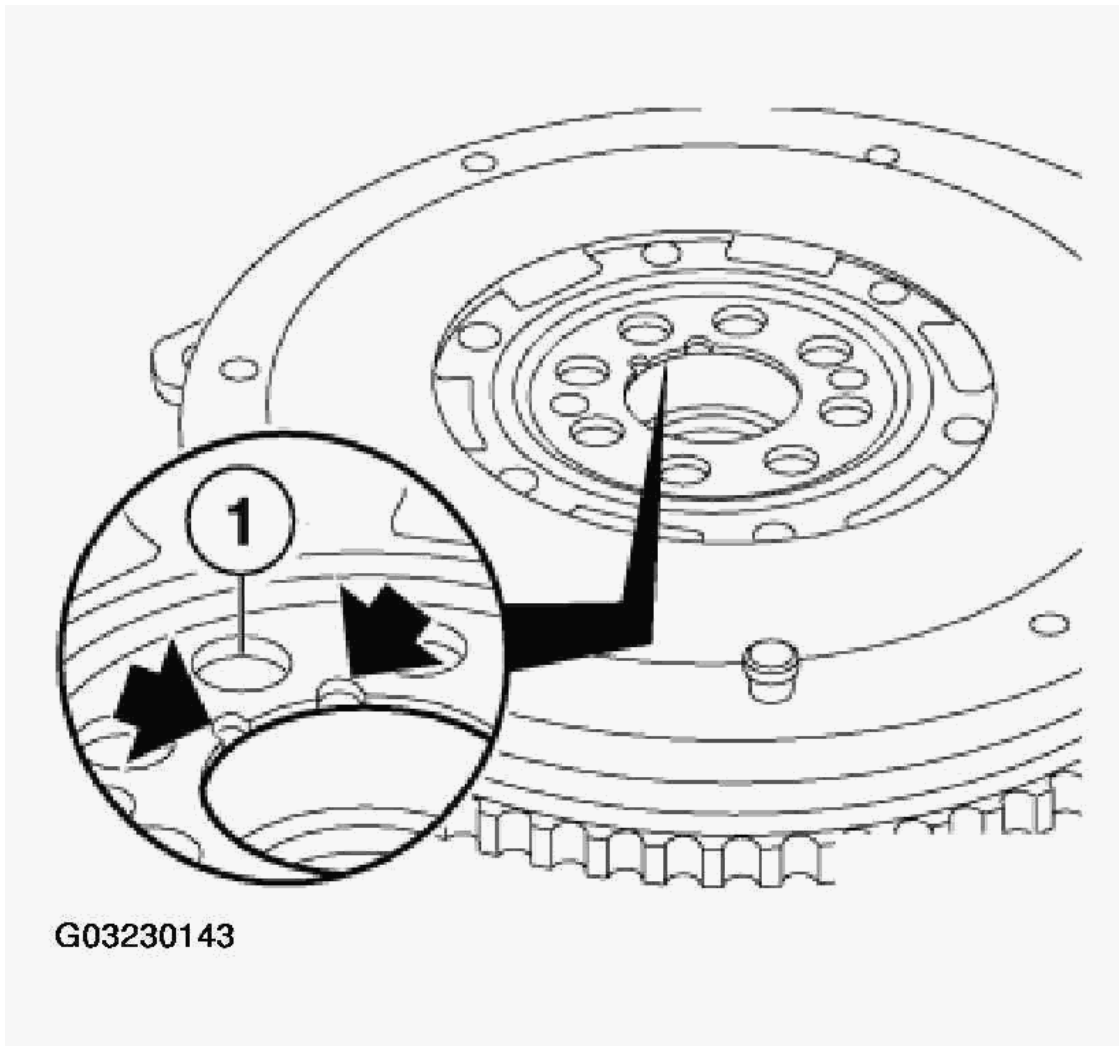


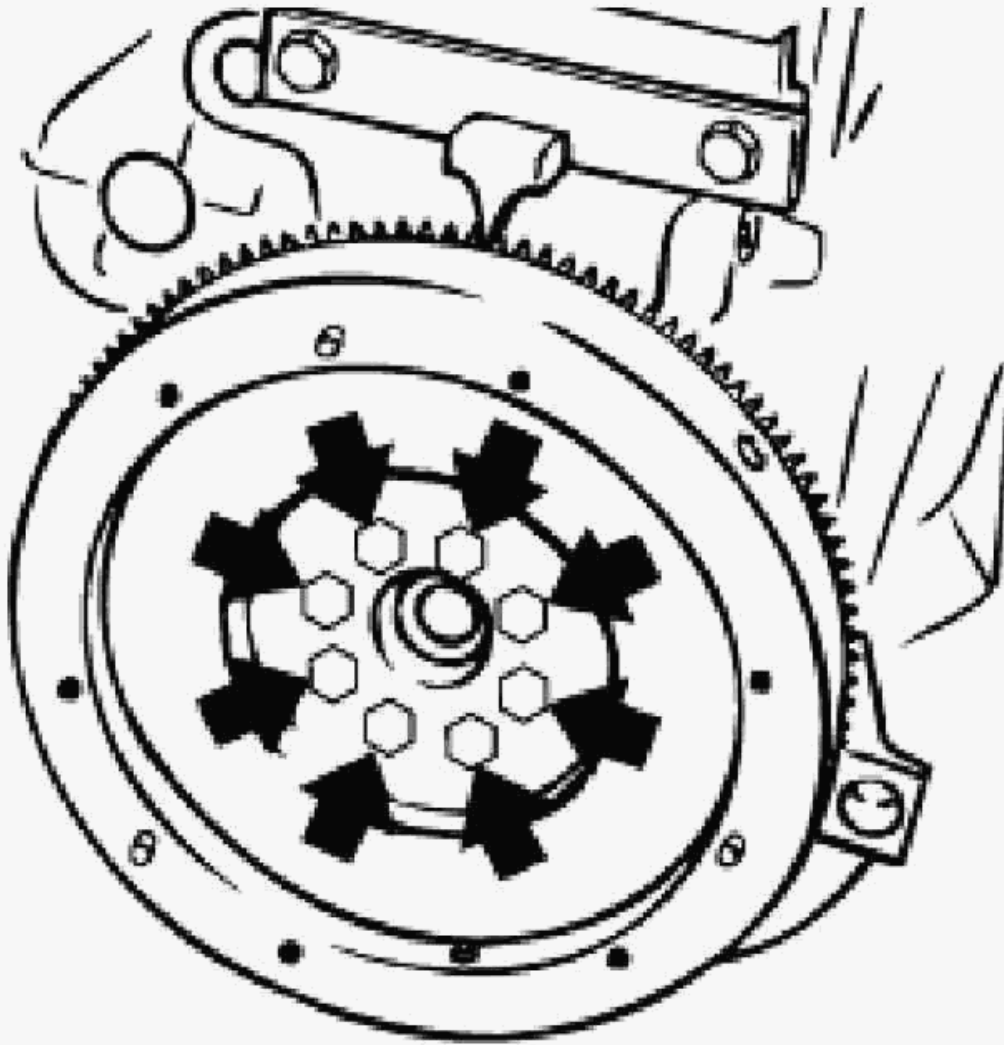
Fig. 104: Identifying Notches In Dual-Mass Flywheel

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean thread and install new micro-encapsulated screws.

Tightening torque, refer to 11 22 1AZ in **ENGINE - TIGHTENING TORQUES** .



G03230144

Fig. 105: Installing Micro-Encapsulated Screws
Courtesy of BMW OF NORTH AMERICA, INC.

11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

NOTE: For Special Tool identification, see SPECIAL TOOLS - X5 (3.0i) .

Special Tools Required:

- 21 2 051
- 21 2 052

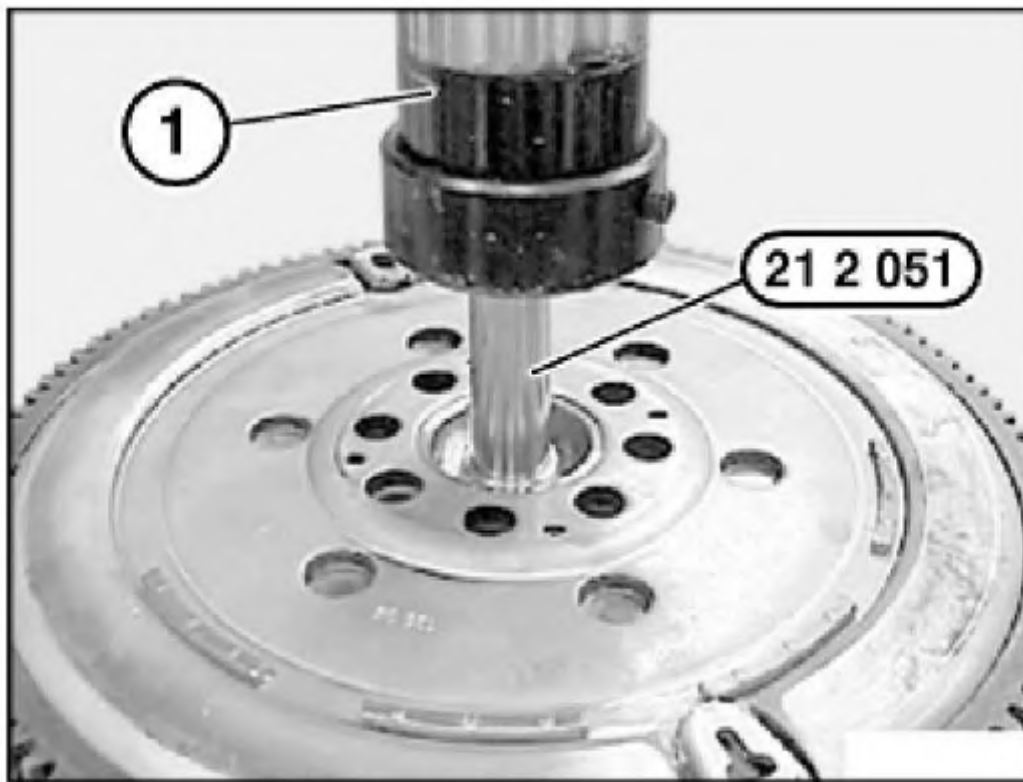
NOTE: Flywheel removed!

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.

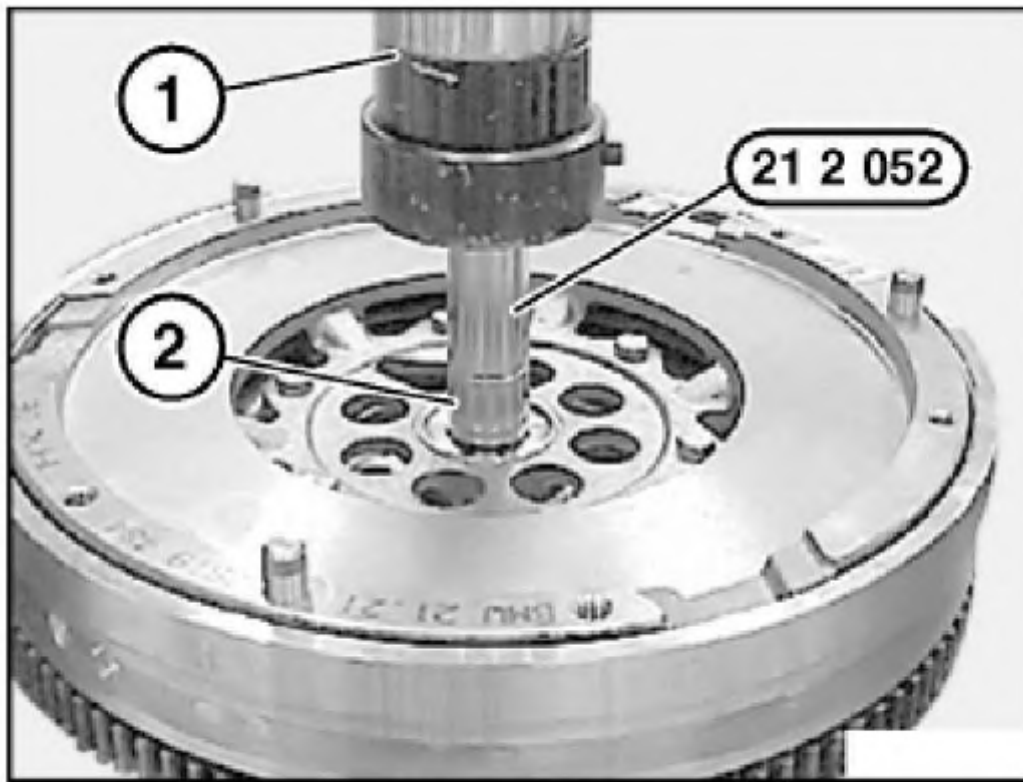


G03230145

Fig. 106: Pressing Out Dual-Mass Flywheel Using Mandrel
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.



G03230146

Fig. 107: Installing Roller Bearing Into Dual-Mass Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

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.

VIBRATION DAMPER

11 23 010 REMOVING AND INSTALLING OR REPLACING VIBRATION DAMPER (M52TU / M54 / M56)

NOTE: For Special Tool identification, see SPECIAL TOOLS - X5 (3.0i) .

Special Tools Required:

- 11 8 190
- 11 8 200
- 11 8 210

Necessary Preliminary Tasks:

- Unscrew and remove splash guard.
- Remove fan impeller with fan clutch and fan cowl, refer to **11 52 020 REMOVING AND INSTALLING/REPLACING FAN CLUTCH (S52 / S54 / M52 / M52TU / M54 / M56)** .
- Remove A/C compressor drive belt, refer to **11 28 050 REPLACING A/C COMPRESSOR DRIVE BELT (M52 / S52 / M52TU / M54 / M56)** .
- Remove alternator drive belt, refer to **11 28 010 REPLACING ALTERNATOR DRIVE BELT (M52 / S52 / M52TU / M54 / M56)** .

Important!

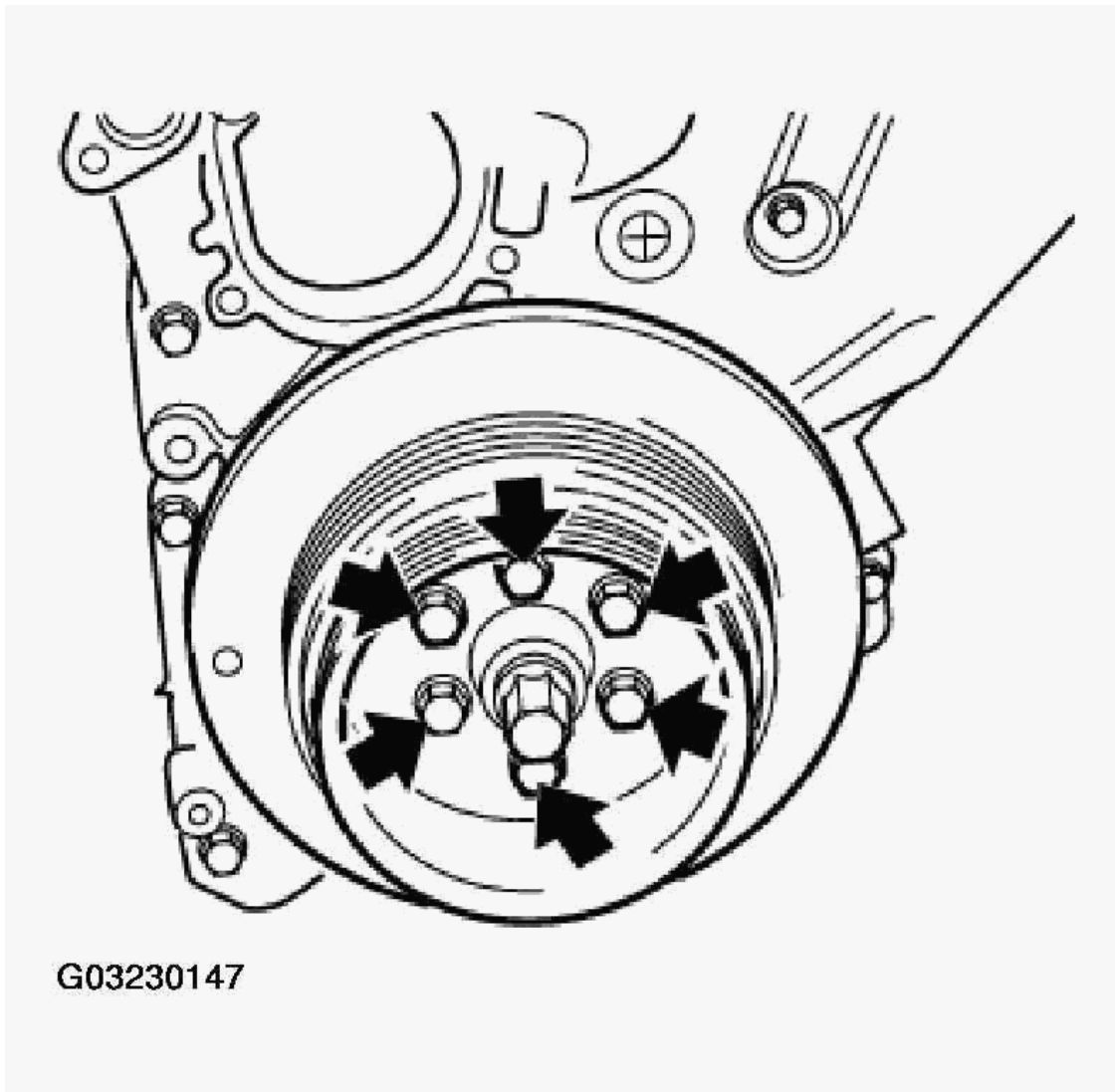
Risk of damage.

Protect cooler against damage.

Version 1:

Vibration damper and hub for vibration damper are two parts:

Unscrew vibration damper bolts and take off vibration damper.



G03230147

Fig. 108: Removing Vibration Damper Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Version 1:

Vibration damper and hub for vibration damper are two parts:

Installation:

Align locating bore in vibration damper to dowel pin.

Install and tighten down screws.

Tightening torque, (22 N.m.).

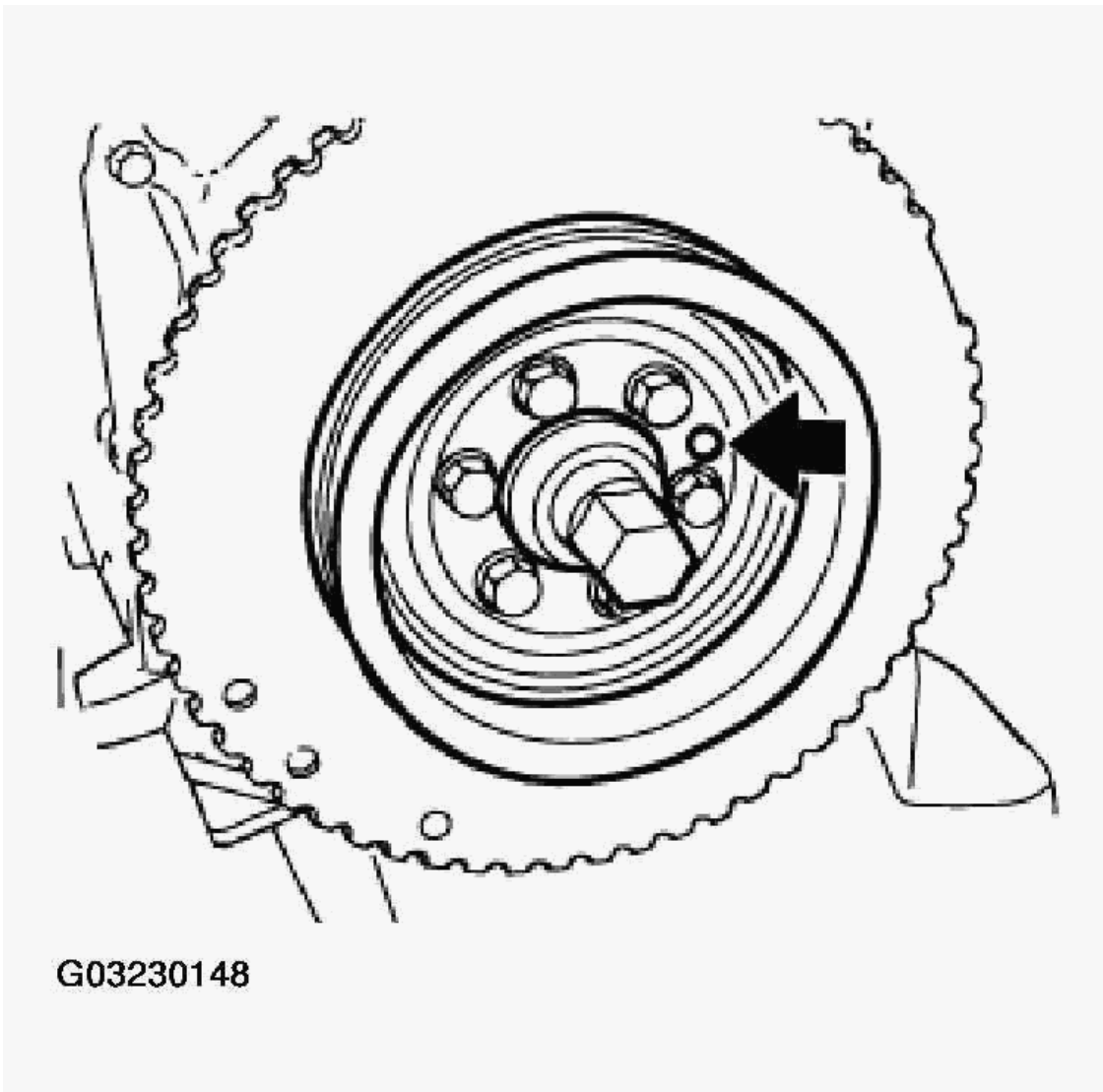
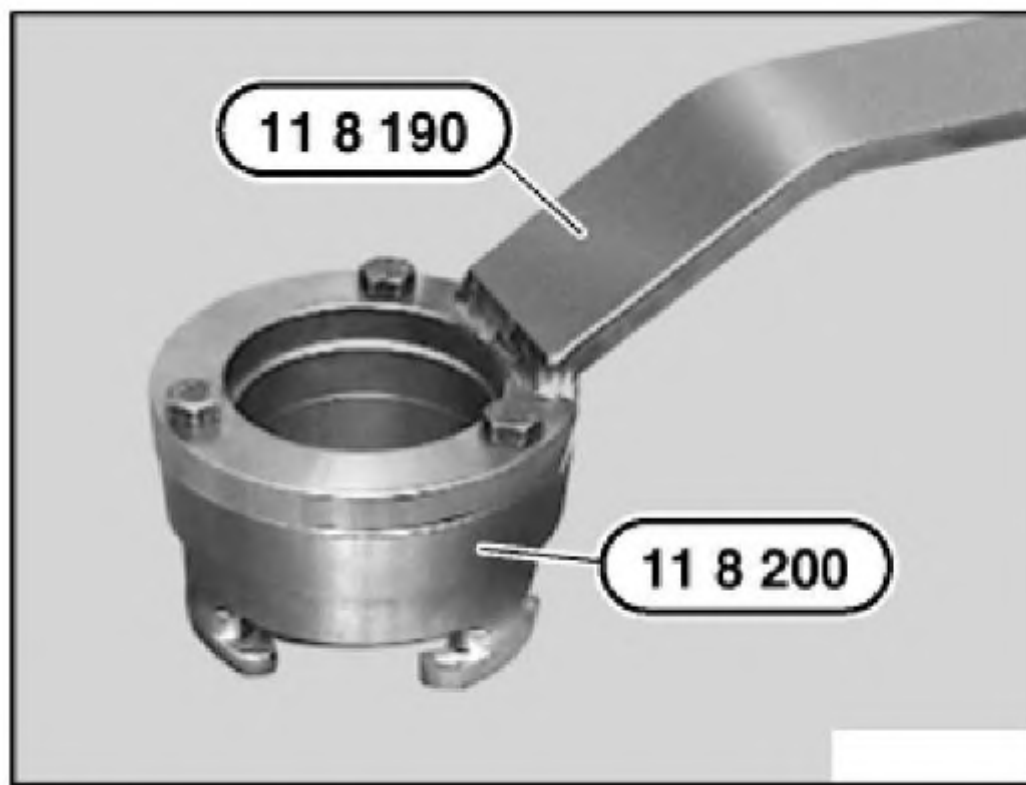


Fig. 109: Aligning Locating Bore In Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

Vibration damper and hub for vibration damper are one part:

Screw special tool 11 8 190 to special tool 11 8 200 .



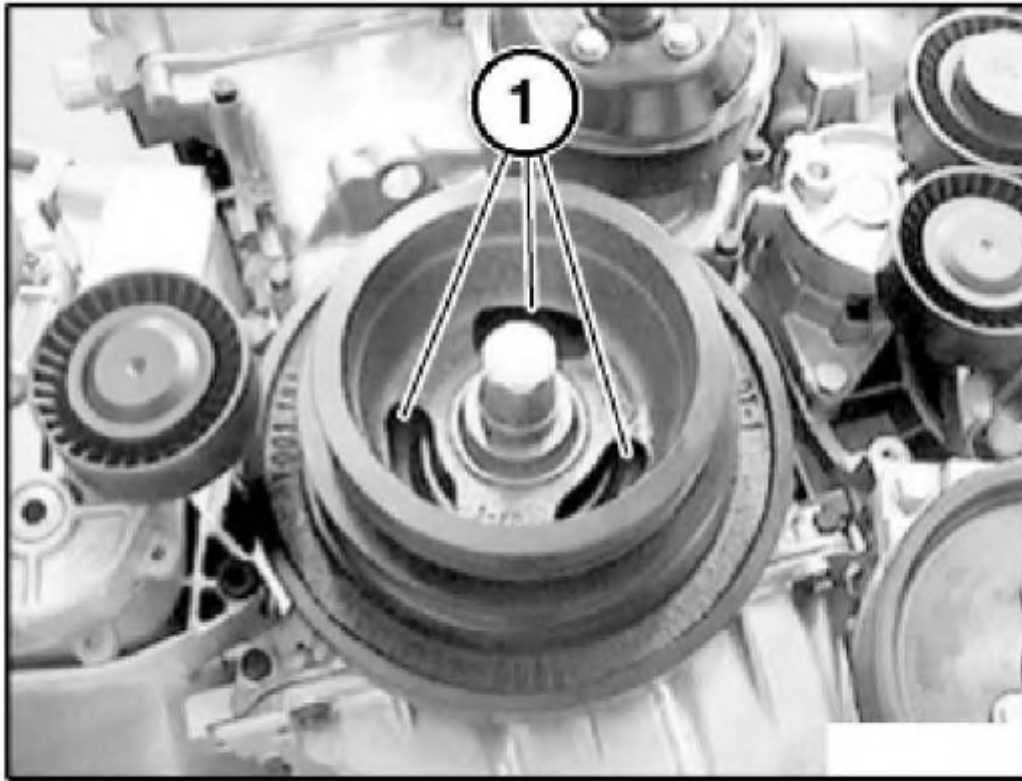
G03230149

Fig. 110: Assembling Brace

Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

NOTE: Special tool 11 8 200 must snap into place in openings (1).



G03230150

Fig. 111: Identifying Openings In Damper
Courtesy of BMW OF NORTH AMERICA, INC.

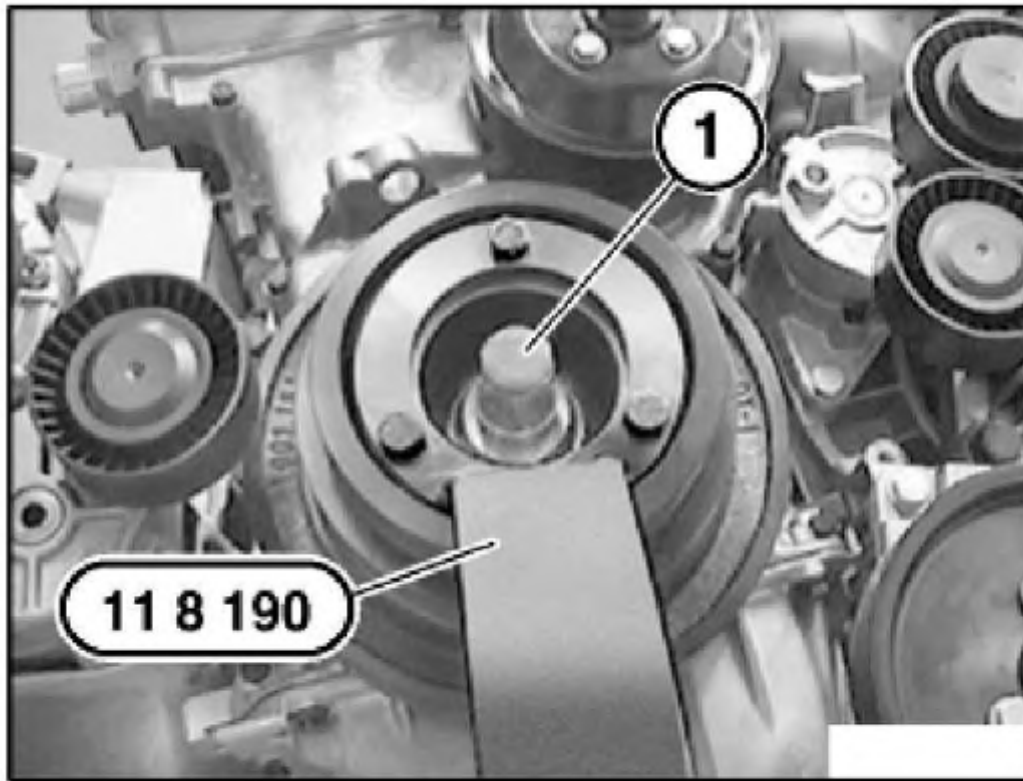
Version 2:

When releasing and tightening down central bolt, grip special tool 11 8 190 with assistance of a second person.

Version 2:

Insert special tool 11 8 200 in openings on vibration damper and turn counterclockwise so that counter-supports snap into place on vibration damper.

Release central screw (1).



G03230151

Fig. 112: Locating Central Screw

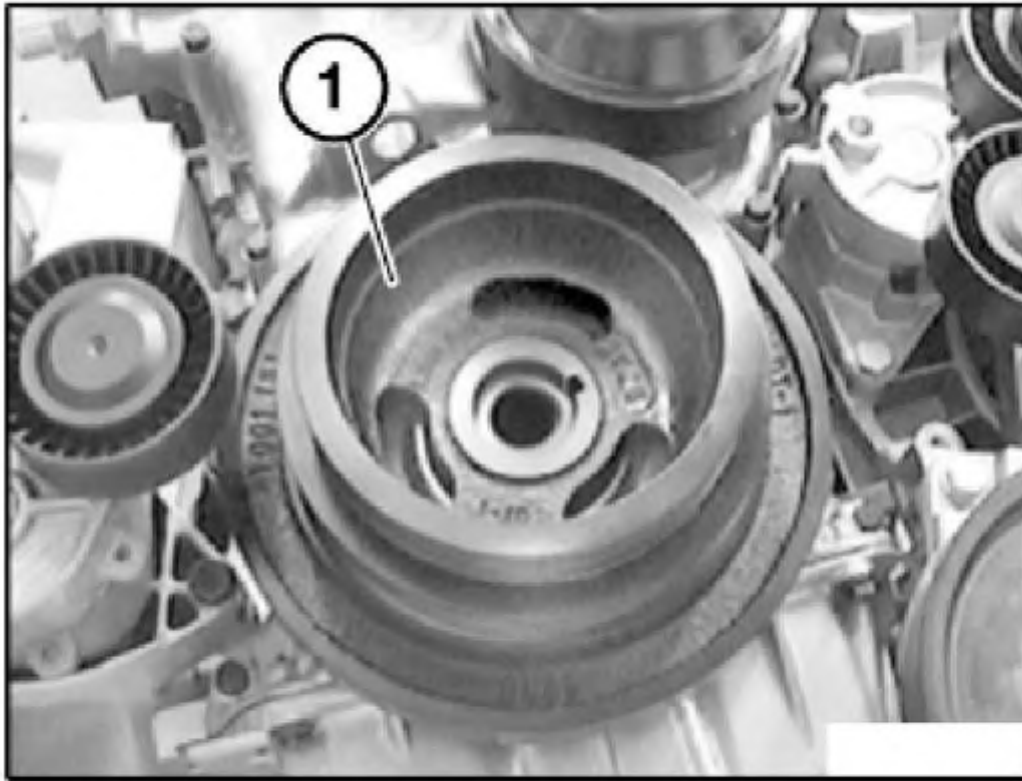
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

Feed out special tools 11 8 190 / 11 8 200 .

Remove central screw and washer.

Carefully detach vibration damper (1) by hand.



G03230152

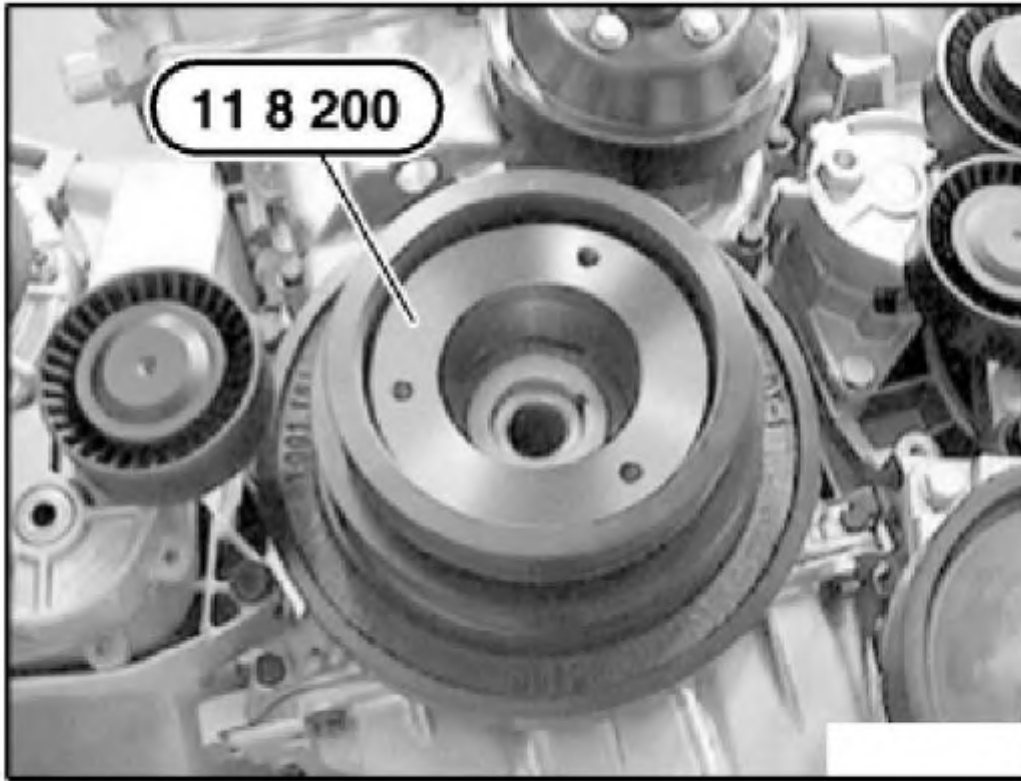
Fig. 113: View Of Vibration Damper

Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

NOTE: If vibration damper cannot be detached by hand:

Insert special tool 11 8 200 in openings on vibration damper and turn clockwise so that counter-supports snap into place on vibration damper.



G03230153

Fig. 114: Identifying Brace (11 8 200)

Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

Screw out spindle on special tool 11 8 210 as far as possible.

Version 2:

Important!

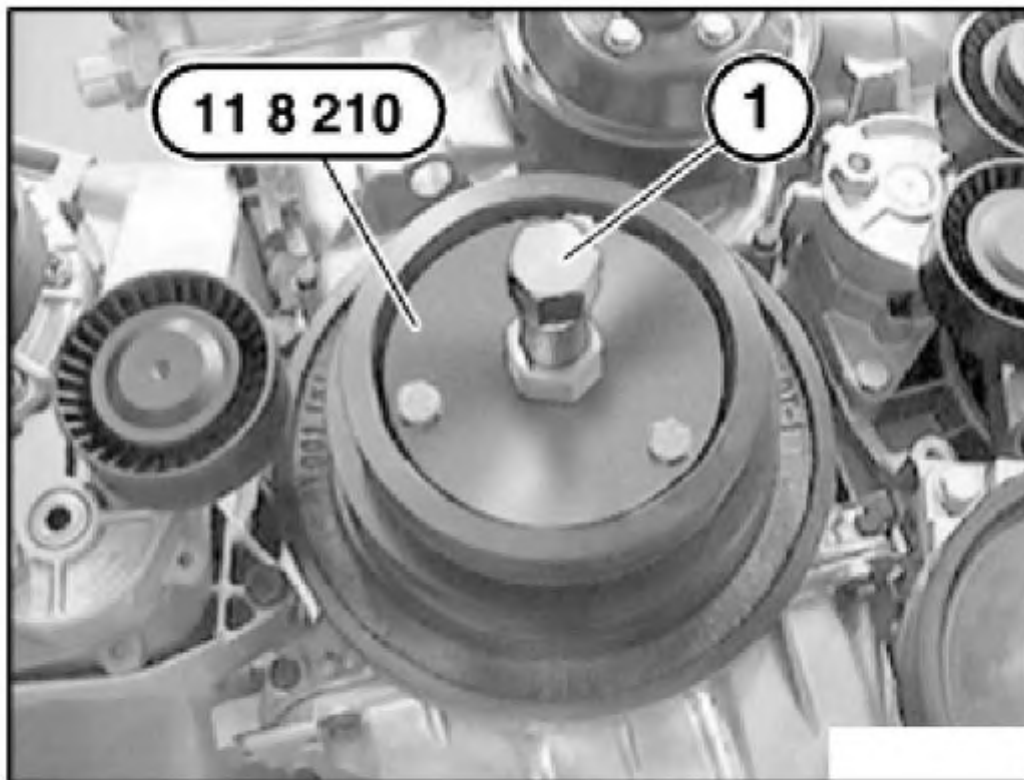
Risk of damage.

Protect cooler against damage.

Carefully install special tool 11 8 210 .

Screw special tool 11 8 210 to special tool 11 8 200 .

Detach vibration damper by turning spindle (1) on special tool 11 8 210 .



G03230155

Fig. 115: Locating Spindle

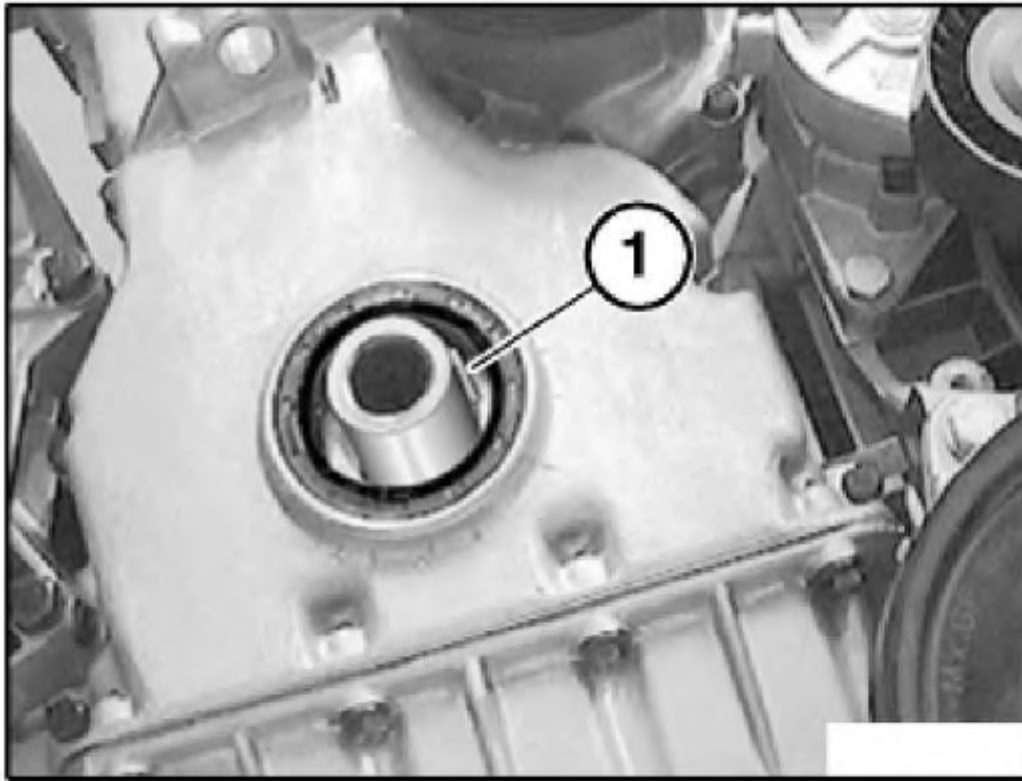
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

Installation:

Check featherkey (1) for damage and correct installation position.

Replace radial seal in lower timing case cover, refer to **11 14 141 REPLACING RADIAL SEAL IN LOWER TIMING CASE COVER** .



G03230156

Fig. 116: View Of Featherkey

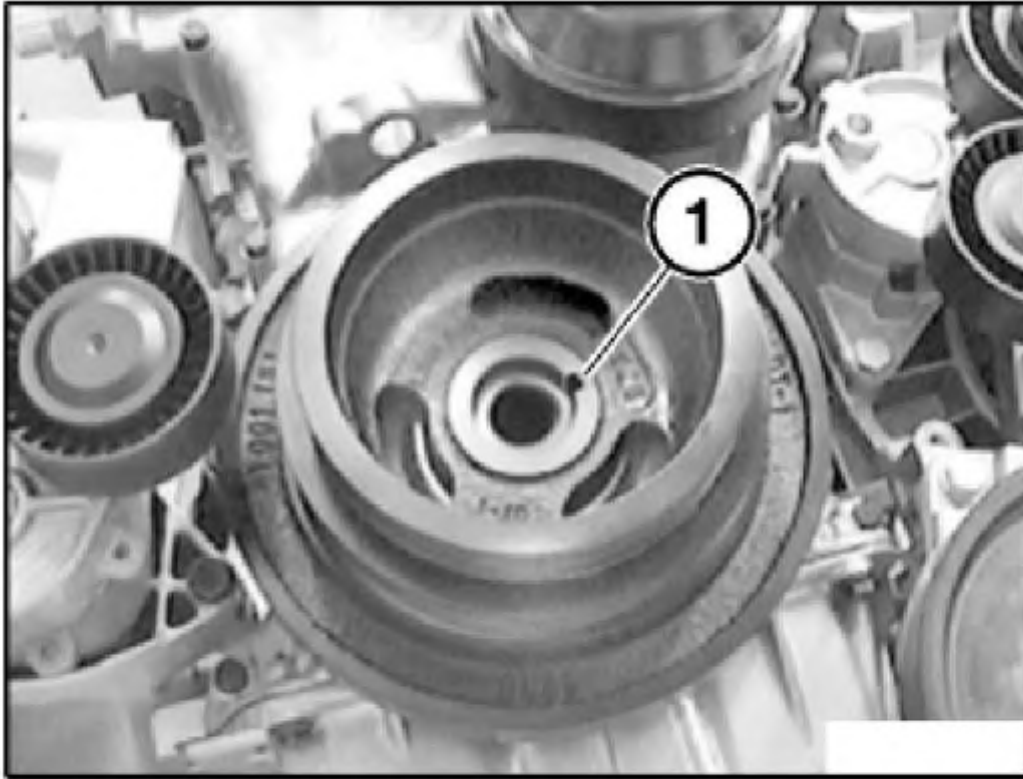
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

Installation:

Align groove (1) in vibration damper to featherkey.

Fit vibration damper.



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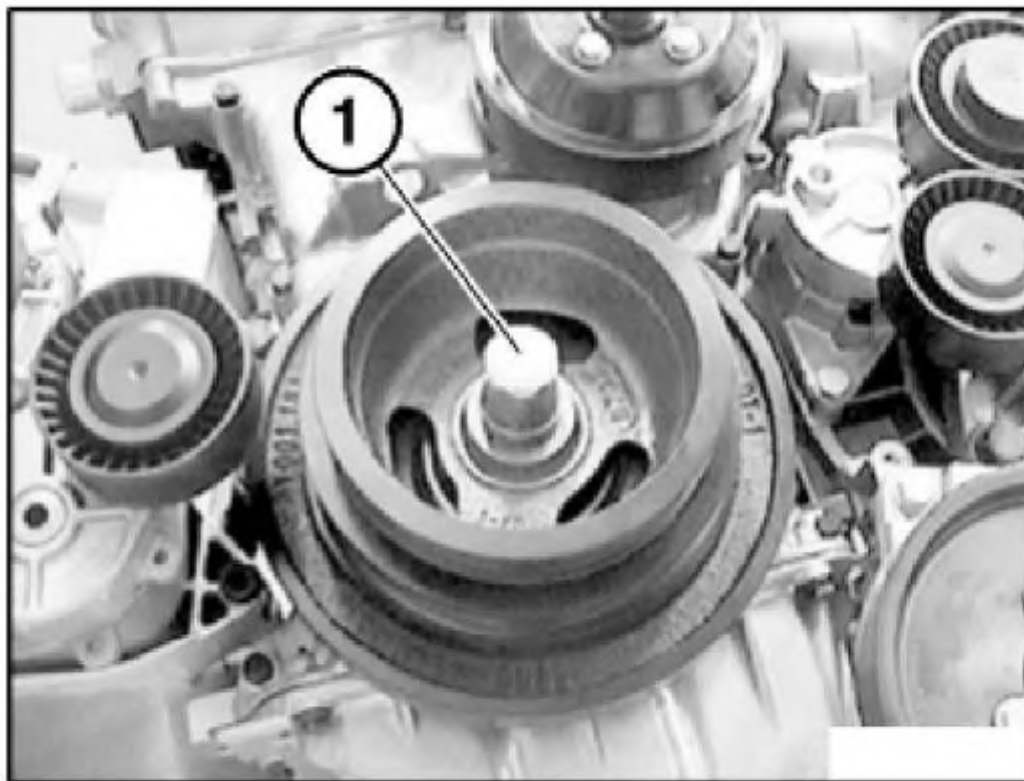
Fig. 117: Identifying Groove In Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

Installation:

Replace central screw (1).

Install central screw and washer.



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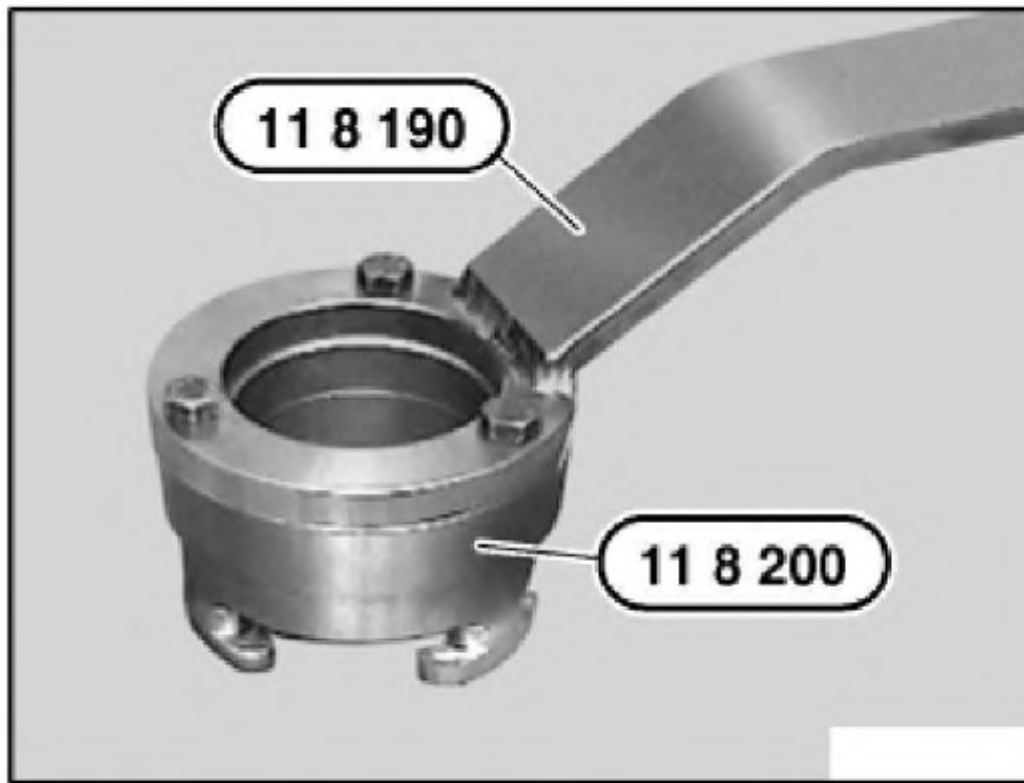
Fig. 118: Locating Central Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

Installation:

Screw special tool 11 8 190 to special tool 11 8 200 .



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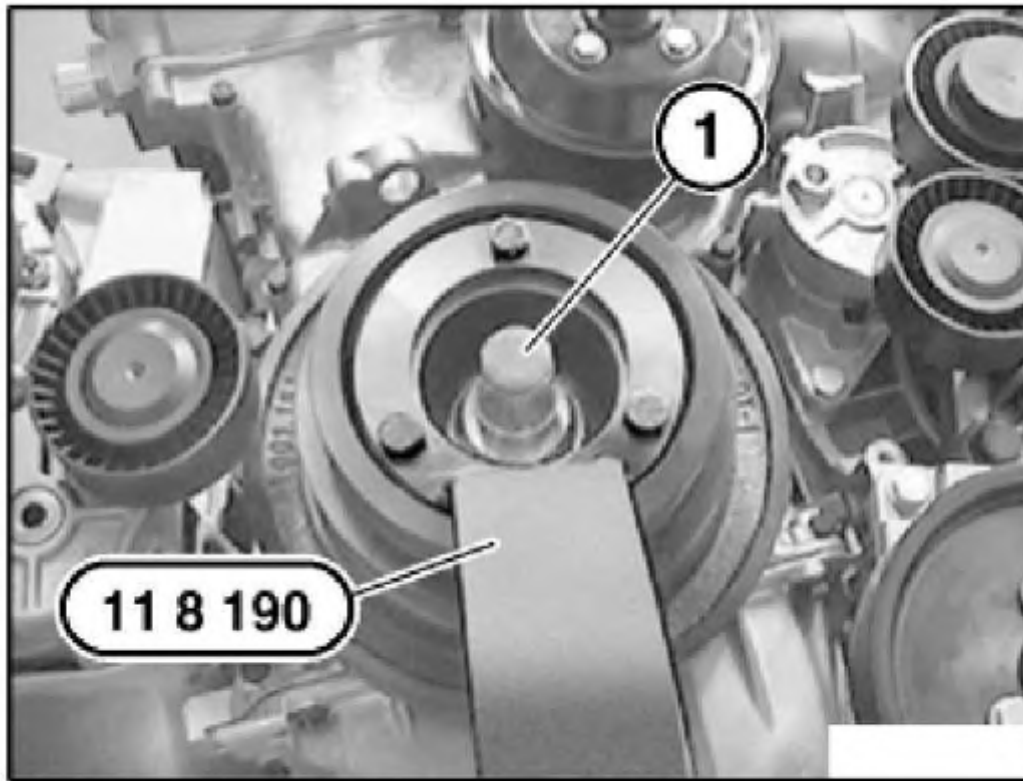
Fig. 119: Identifying Braces 11 8 200 And 11 8 190
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

Insert special tool 11 8 200 in openings on vibration damper and turn clockwise so that counter-supports snap into place on vibration damper.

Tighten down central screw (1).

Tightening torque, refer to 11 23 2AZ in **ENGINE - TIGHTENING TORQUES** .



G03230160

Fig. 120: View Of Central Screw

Courtesy of BMW OF NORTH AMERICA, INC.

CONNECTING ROD WITH BEARING

11 24 571 REPLACING ALL CONNECTING ROD BEARINGS (M52 / S52 / M52TU / M54 / M56)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 00 2 590
- 00 9 120
- 11 2 110

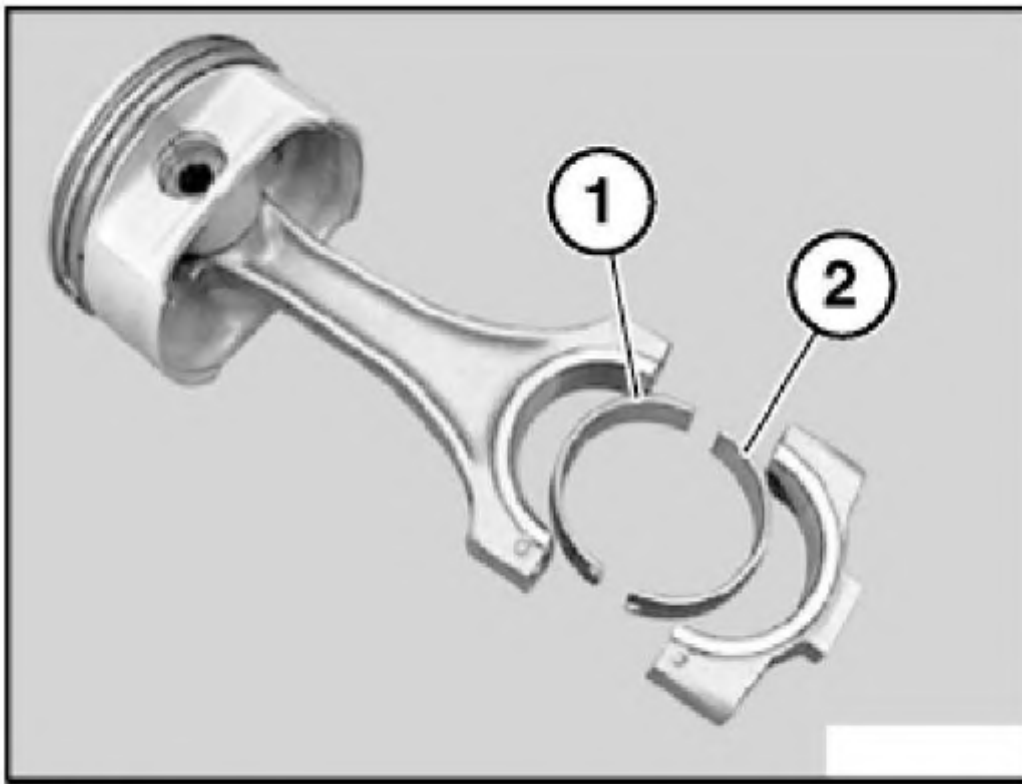
(Piston removed.)

Important!

Note grinding stages on crankshaft, refer to **ENGINE - TECHNICAL DATA** .

Install new conrod bearing shells.

Insert one blue (1) and one red (2) bearing shell (irrespective of the color coding on the conrod shaft).



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Fig. 121: Identifying Blue And Red Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Install piston, refer to **11 25 530 REMOVING AND INSTALLING OR REPLACING ALL PISTONS (M52 / S52 / M52TU / M54 / M56)** .

Check conrod bearing clearance.

Piston in BDC position.

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

Fit bearing caps so that pair numbers match up.

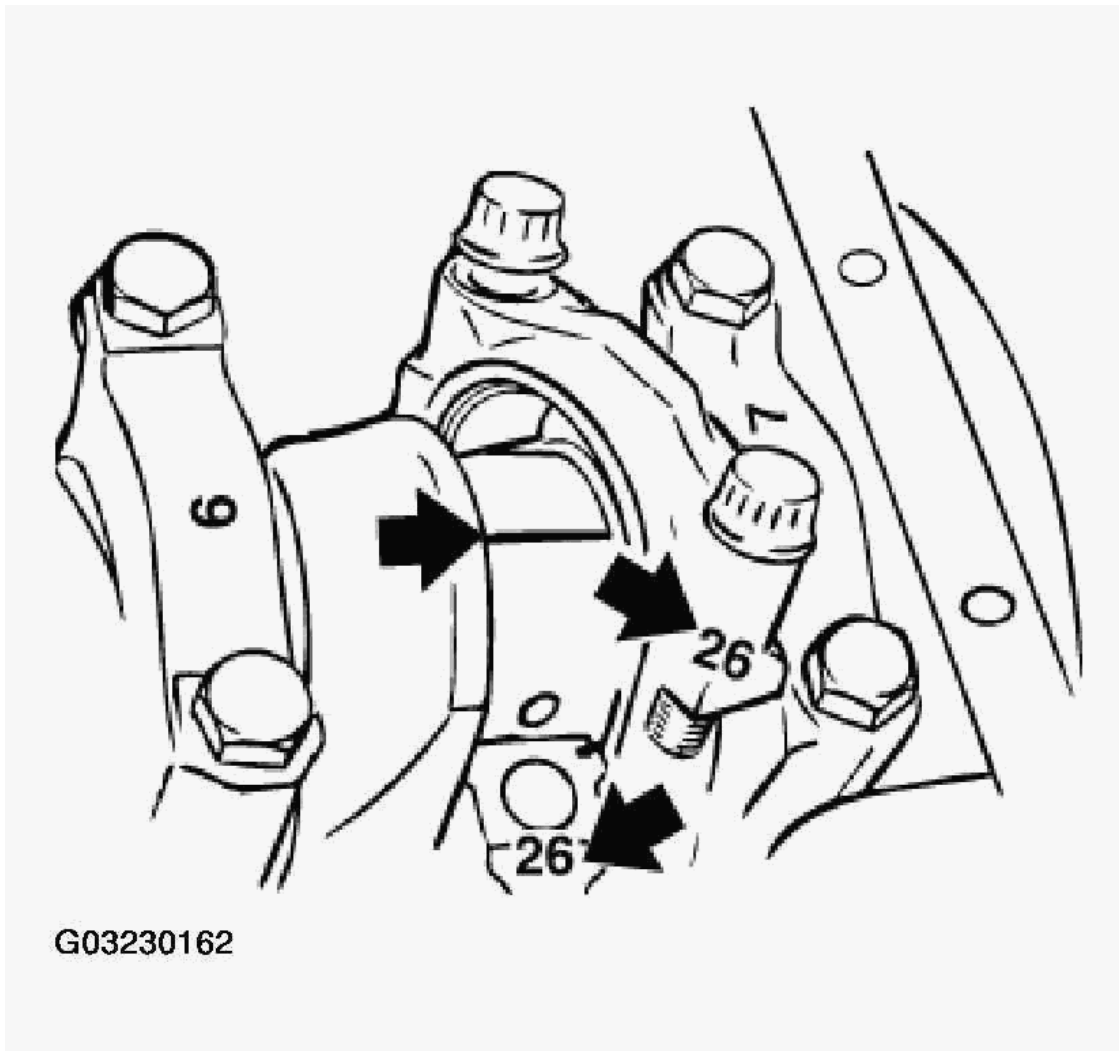


Fig. 122: Aligning Pair Numbers In Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

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 or with special tool 11 2 110 .

Tightening torque, refer to 11 24 1AZ in **ENGINE - TIGHTENING TORQUES** .

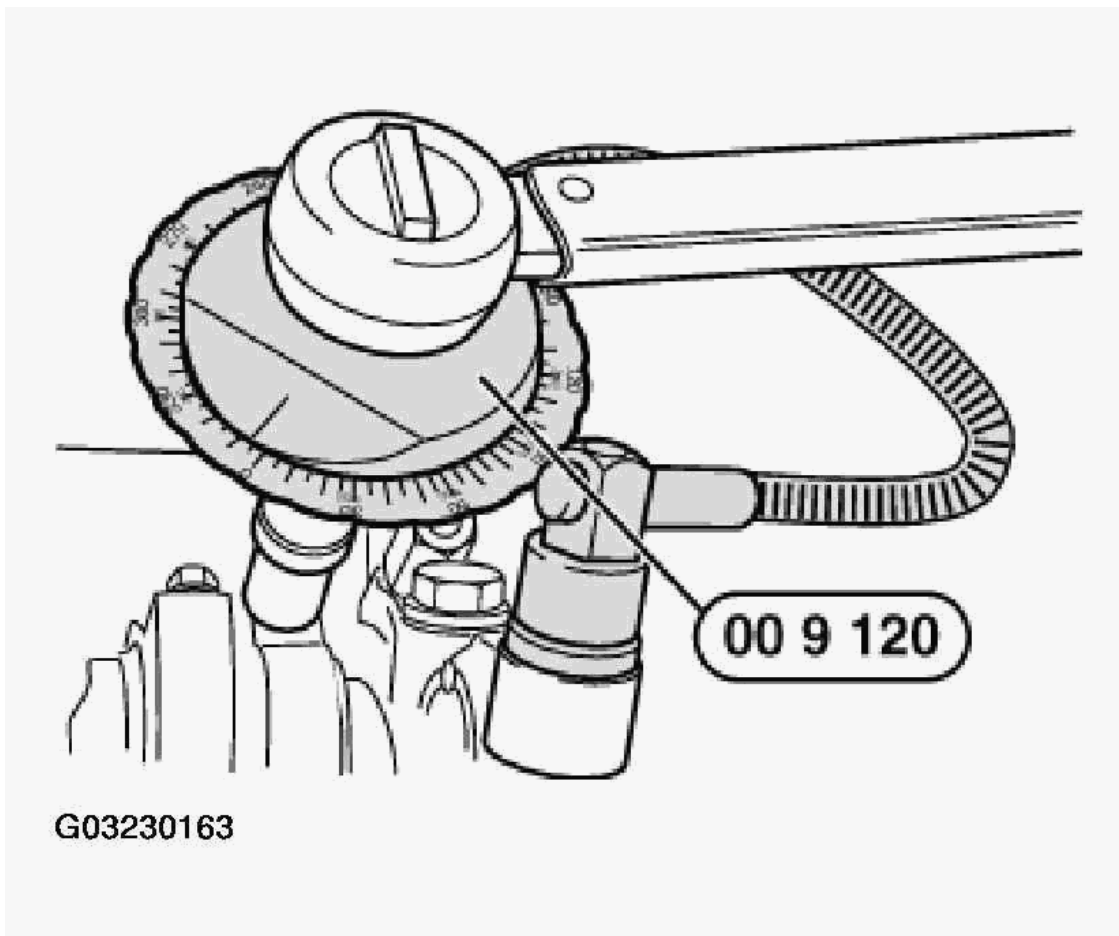


Fig. 123: Identifying Torque Angle Measuring Dial
Courtesy of BMW OF NORTH AMERICA, INC.

Remove bearing cap and read off bearing play at width of flattened plastic thread with assistance of measurement scale.

Conrod bearing clearance, refer to **ENGINE - TECHNICAL DATA** .

- Remove plastic thread.
- Coat crankshaft and bearing shells with oil.
- Install new conrod bolts and tighten down.

Tightening torque, refer to 11 24 1AZ in **ENGINE - TIGHTENING TORQUES** .

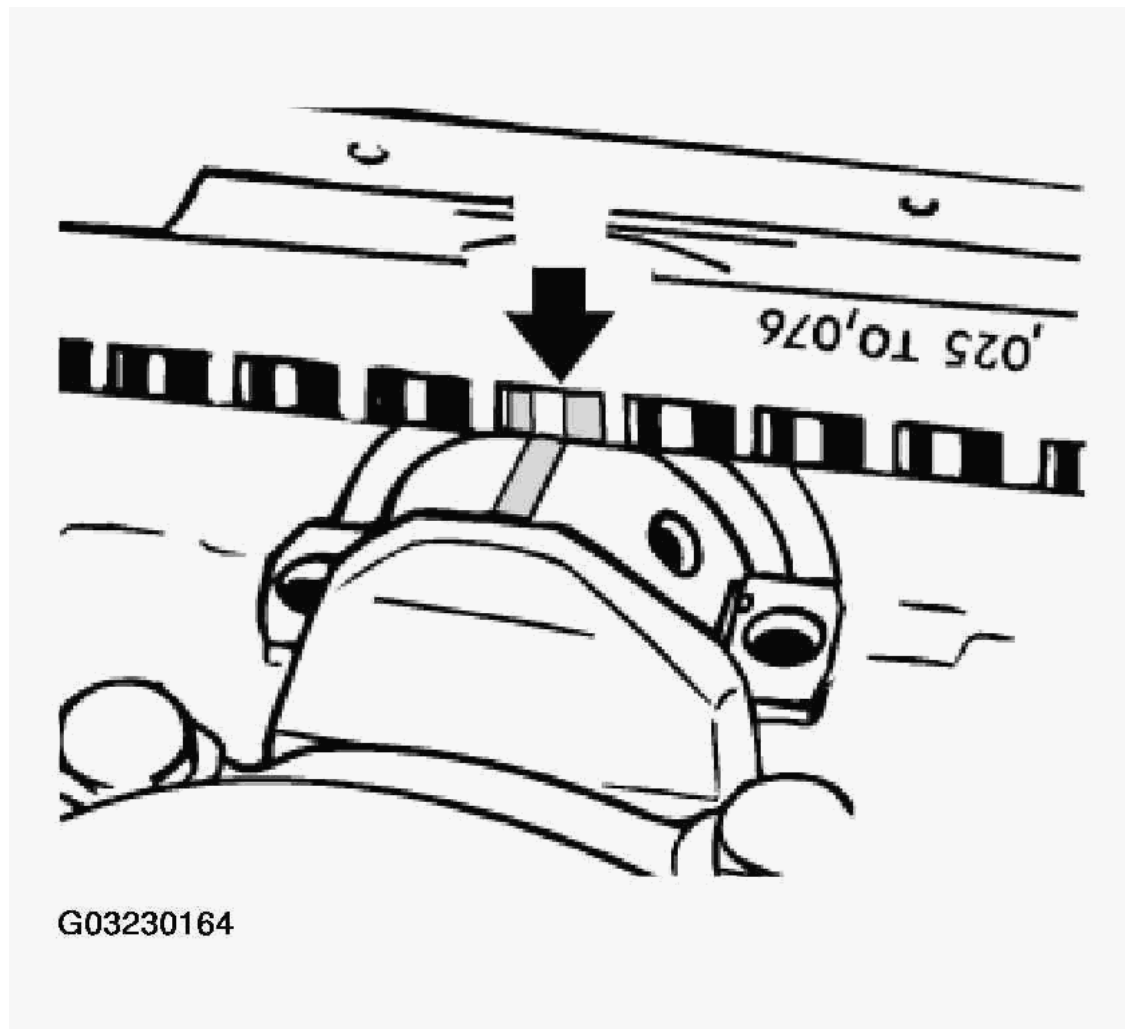


Fig. 124: Reading Bearing Play Using Measurement Scale
Courtesy of BMW OF NORTH AMERICA, INC.

PISTON WITH RINGS AND PIN

11 25 530 REMOVING AND INSTALLING OR REPLACING ALL PISTONS (M52 / S52 / M52TU / M54 / M56)

NOTE: For Special Tool identification, see SPECIAL TOOLS - X5 (3.0i) .

Special Tools Required:

- 00 9 120
- 11 2 110
- 11 2 260
- 11 2 470

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

- 11 3 480
- 11 8 141

(Engine removed.)

Remove cylinder head.

Removal:

Removal of pistons is described separately from installation.

Assembly sequence for removal and installation is different.

Important!

Re-install piston, connecting rod and bearing shells back in the same position and in the same installation location.

Connecting rods and bearing covers are designated with the same pair number: do not mix them.

Remove oil pump, refer to **11 41 000 REMOVING AND INSTALLING/REPLACING OIL PUMP (M52TU / M54 / M56)** .

If oil pump and oil scraper are two parts:

Remove oil scraper.

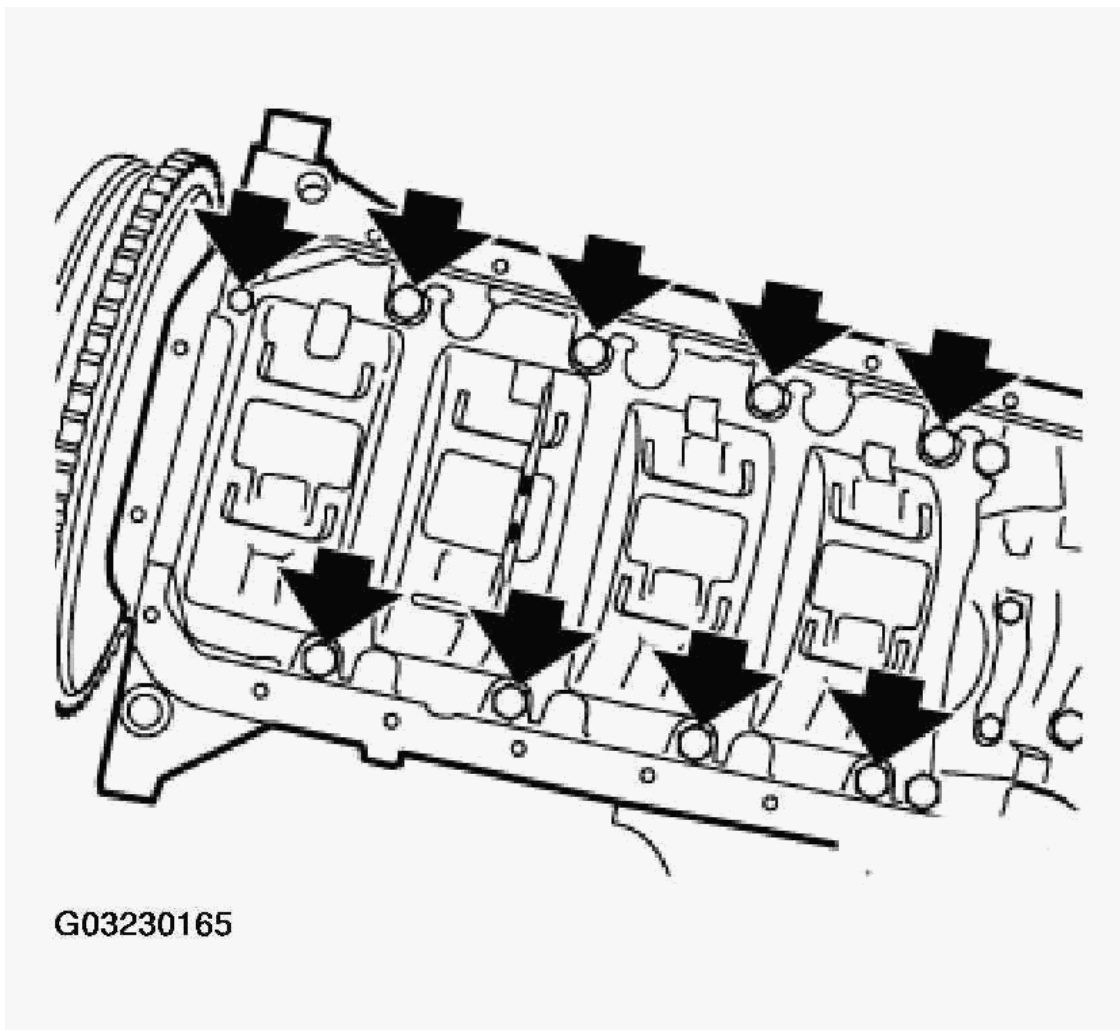


Fig. 125: Removing Oil Scraper

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Figure shows crankshaft removed.

On engines with spray nozzles for piston cooling on cylinder underside:

Important!

When removing and installing pistons, make sure the piston cooling spray nozzles are not damaged.

Installation:

Screw threads are coated with screw securing adhesive (Loctite). Replace screws.

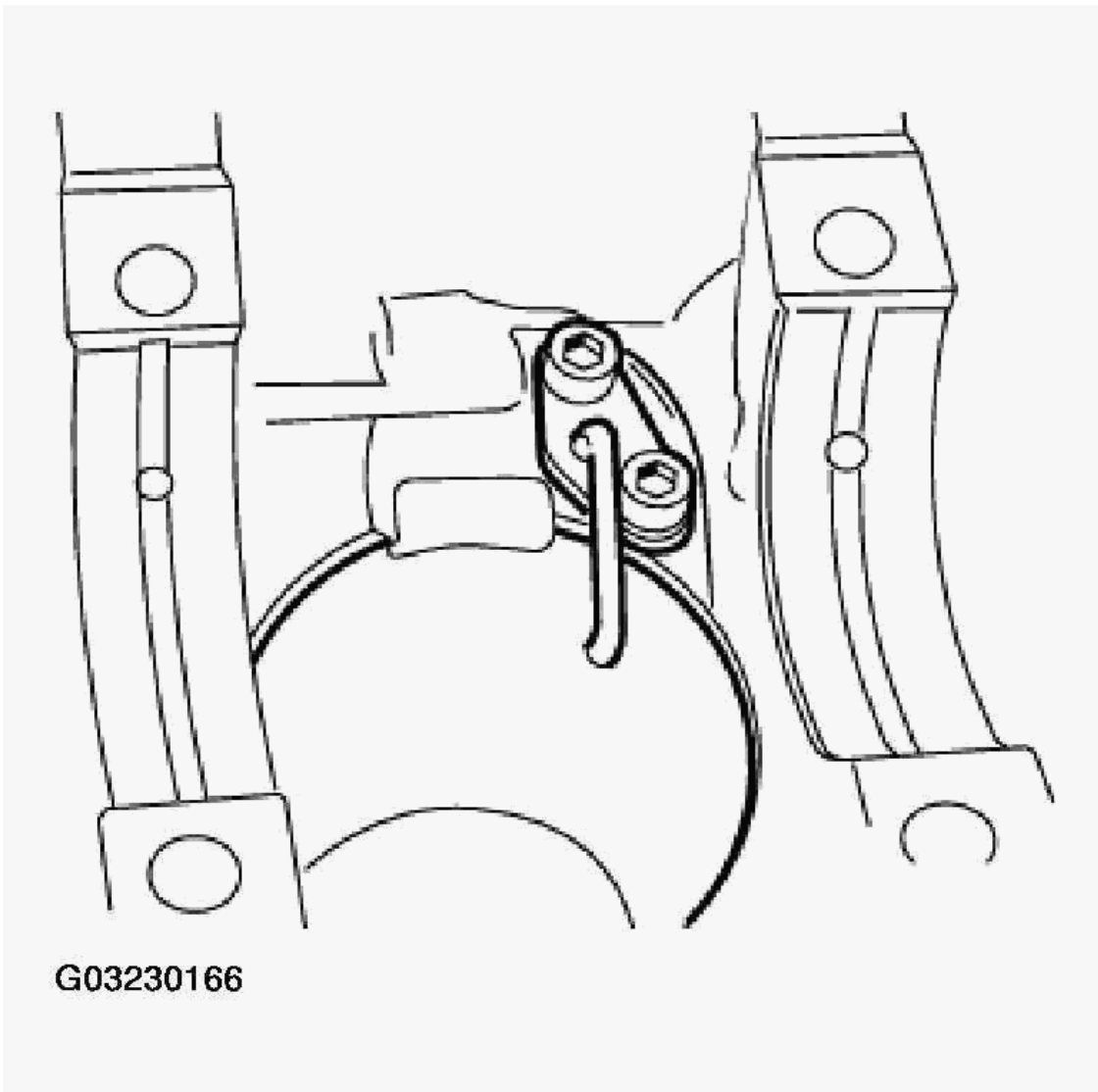
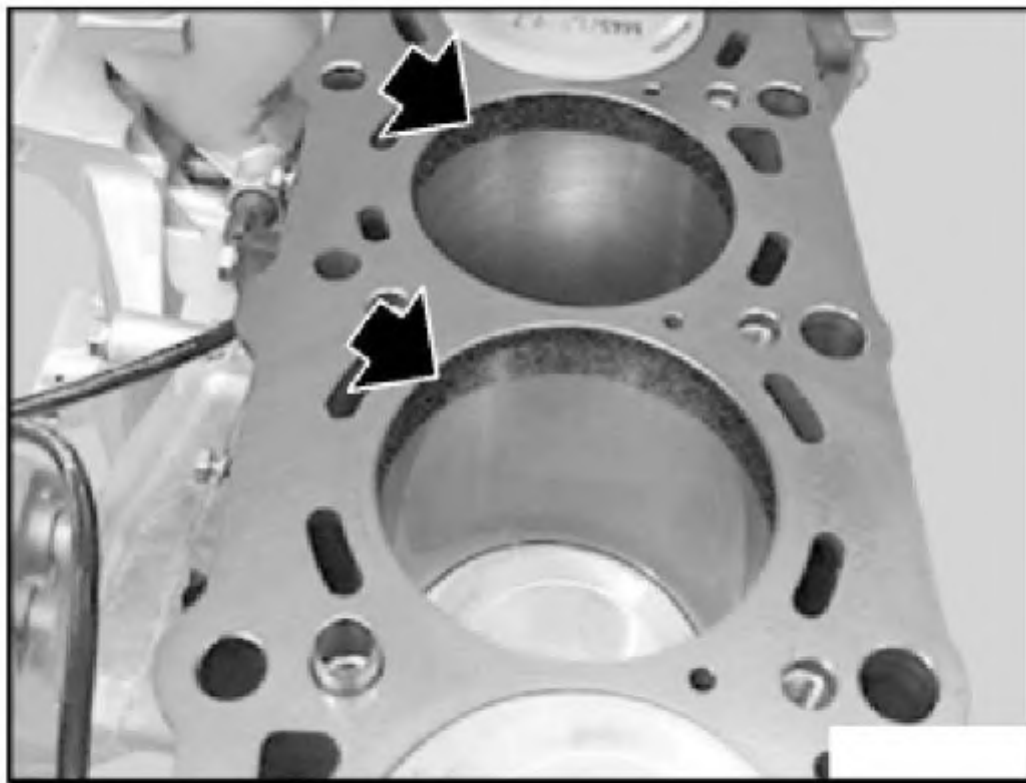


Fig. 126: Identifying Piston Cooling Spray Nozzles
Courtesy of BMW OF NORTH AMERICA, INC.

In event of heavy oil carbon residue:

Carefully remove oil carbon residue from cylinder wall.



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Fig. 127: View Of Heavy Oil Carbon Residue
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew conrod bearing cover.

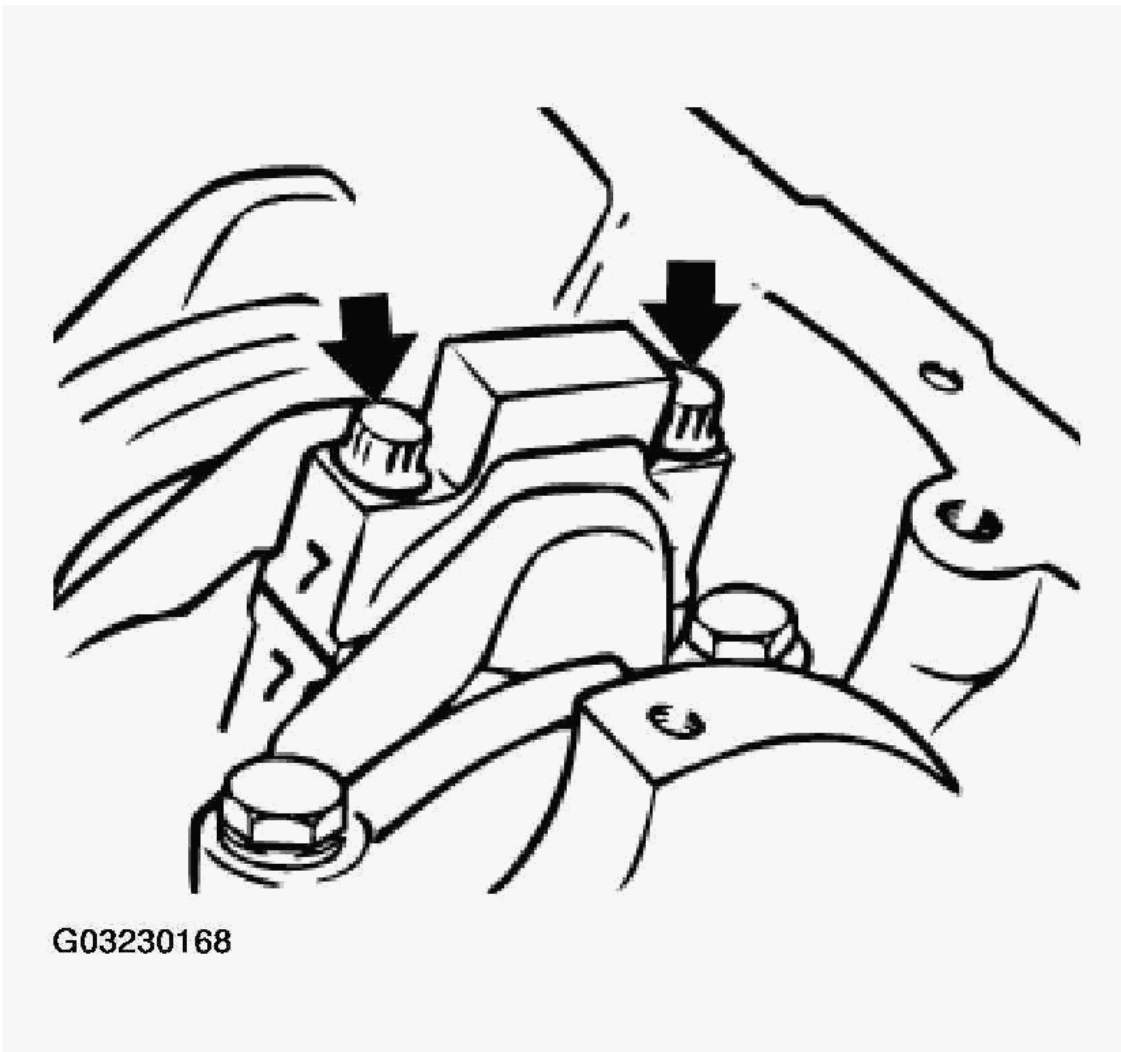


Fig. 128: Locating Conrod Bearing Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 3 480 in conrod.

Remove conrod with piston from cylinder head side.

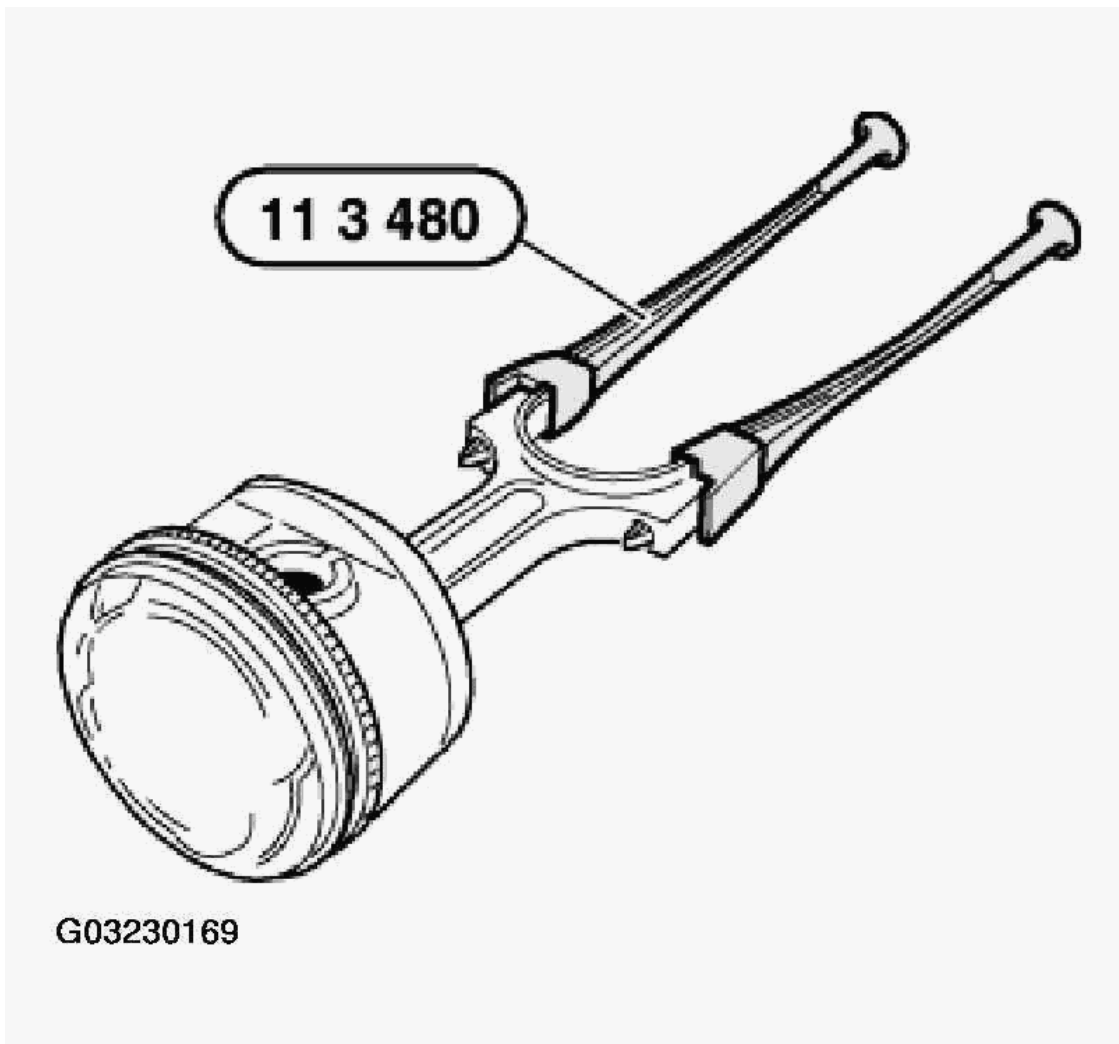


Fig. 129: Identifying Conrod With Piston
Courtesy of BMW OF NORTH AMERICA, INC.

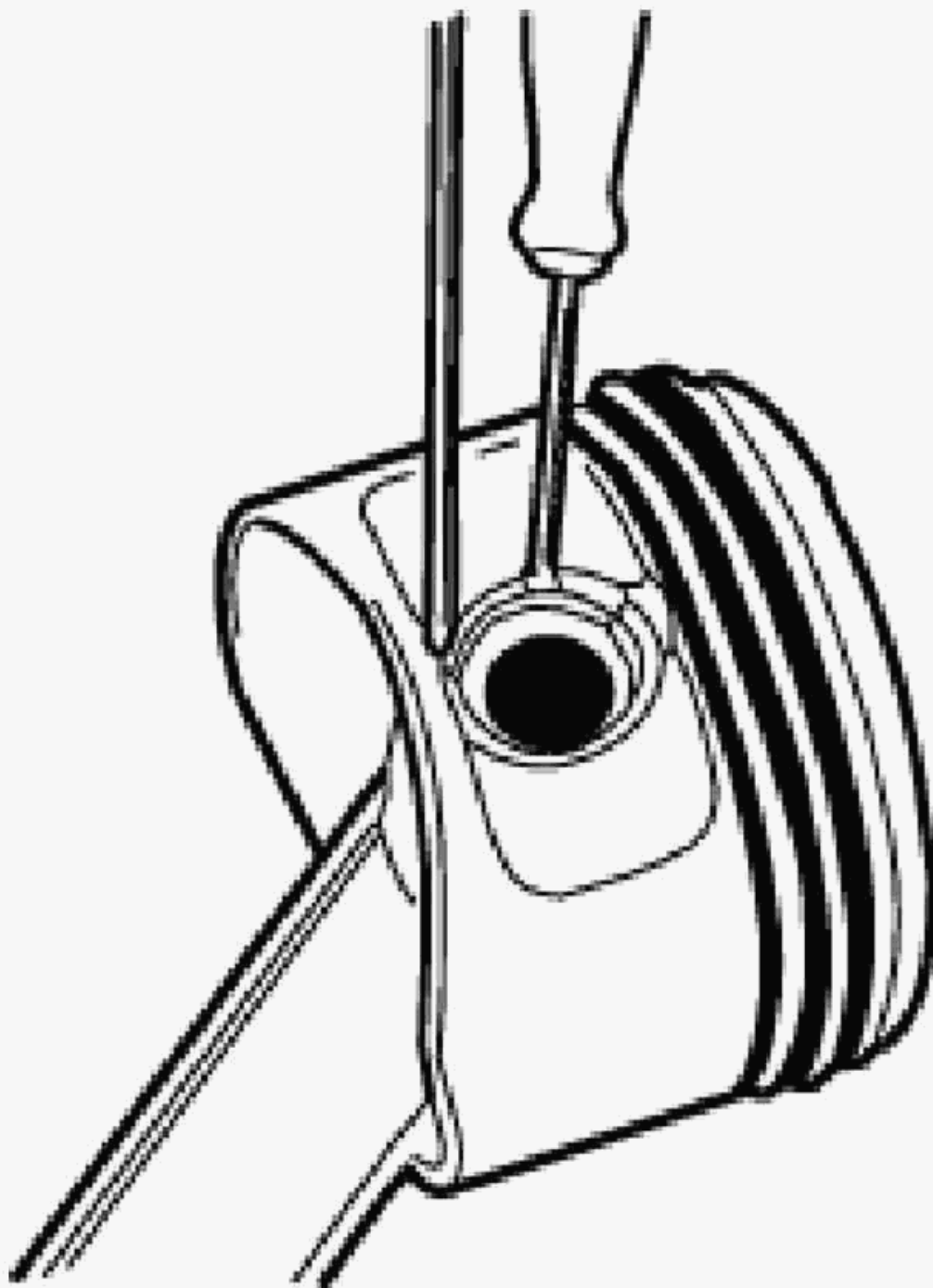
Lift out retaining ring and press out piston pin.

Important!

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

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



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Fig. 130: Removing Piston Pin Retaining Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Installation of pistons is described separately from removal. The assembly sequence differs between removal and installation.

The piston pin must be able to be pressed through the liner by hand with little force and must not display any significant play.

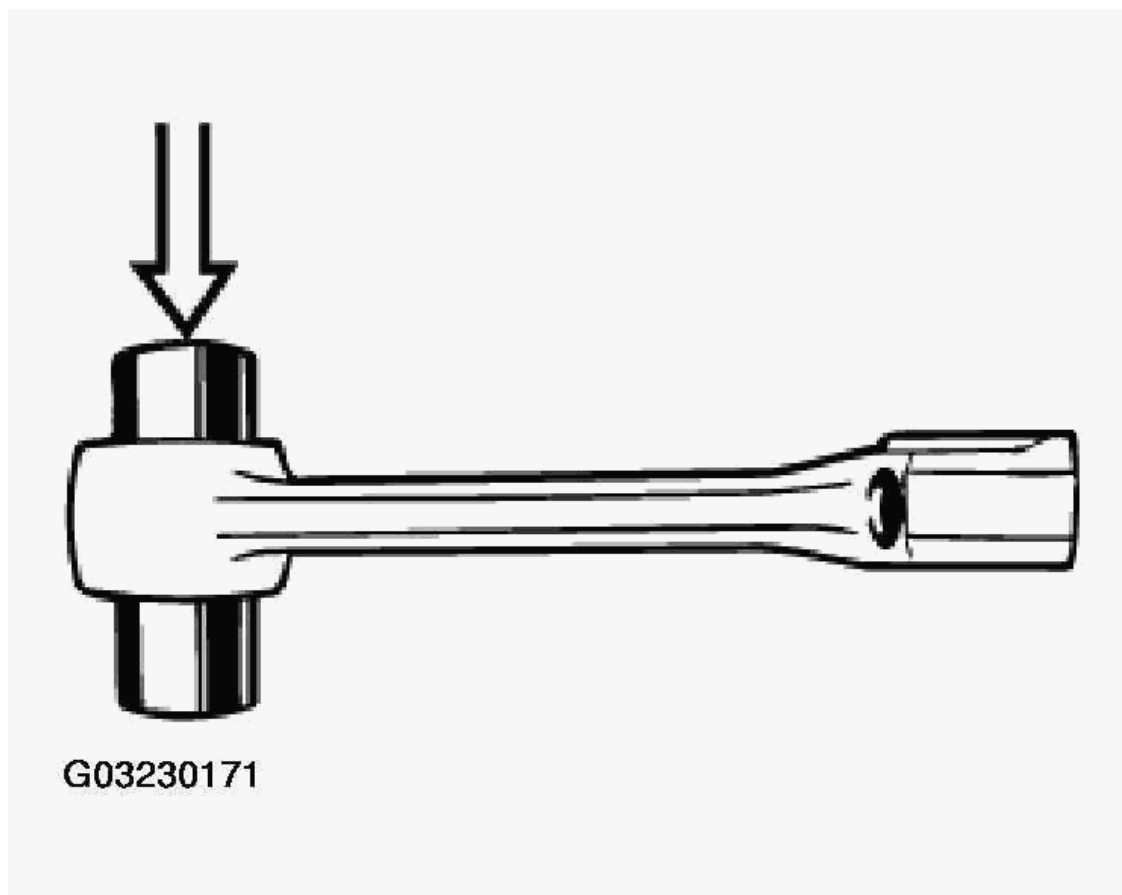


Fig. 131: Removing Piston Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Measure piston installation clearance:

Measure piston diameter with micrometer at distance A from the underside of the piston and at offset angle of 90° to piston pin axis.

Measurement A, refer to **ENGINE - TECHNICAL DATA** .

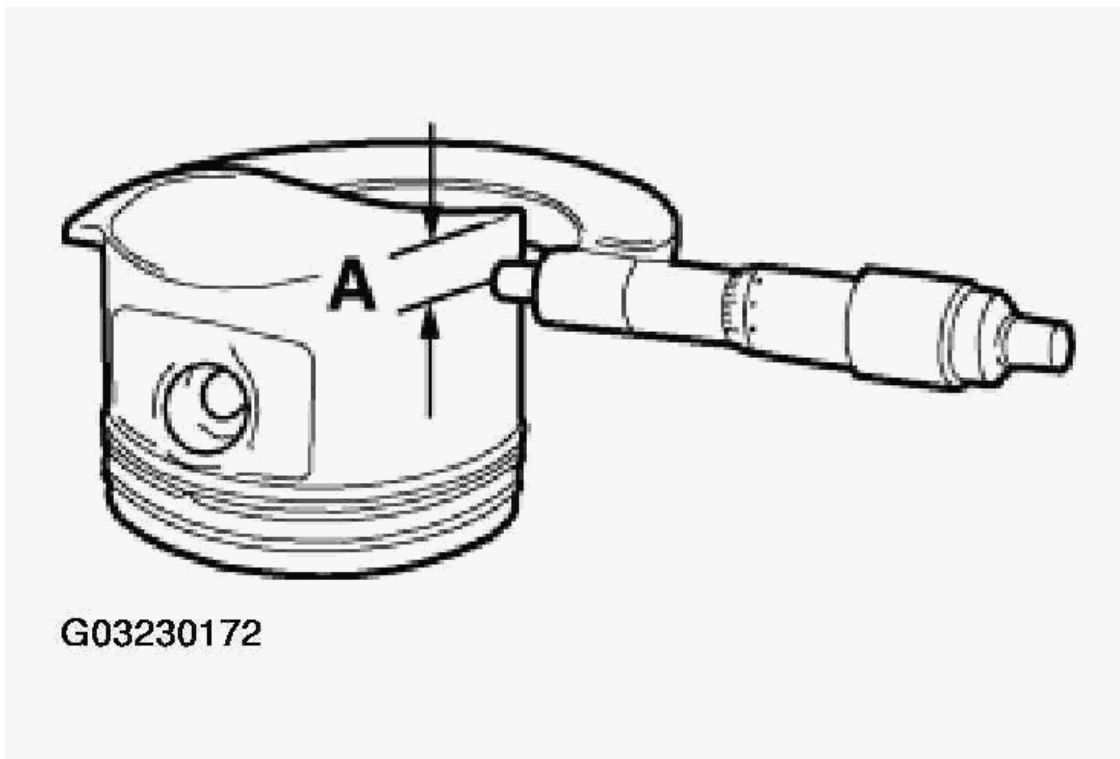


Fig. 132: Identifying Measurement A

Courtesy of BMW OF NORTH AMERICA, INC.

Adjust micrometer to cylinder bore of engine block, 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, refer to **ENGINE - TECHNICAL DATA** .

Piston installation clearance, refer to **ENGINE - TECHNICAL DATA** .

Total permissible wear tolerance, refer to **ENGINE - TECHNICAL DATA** .

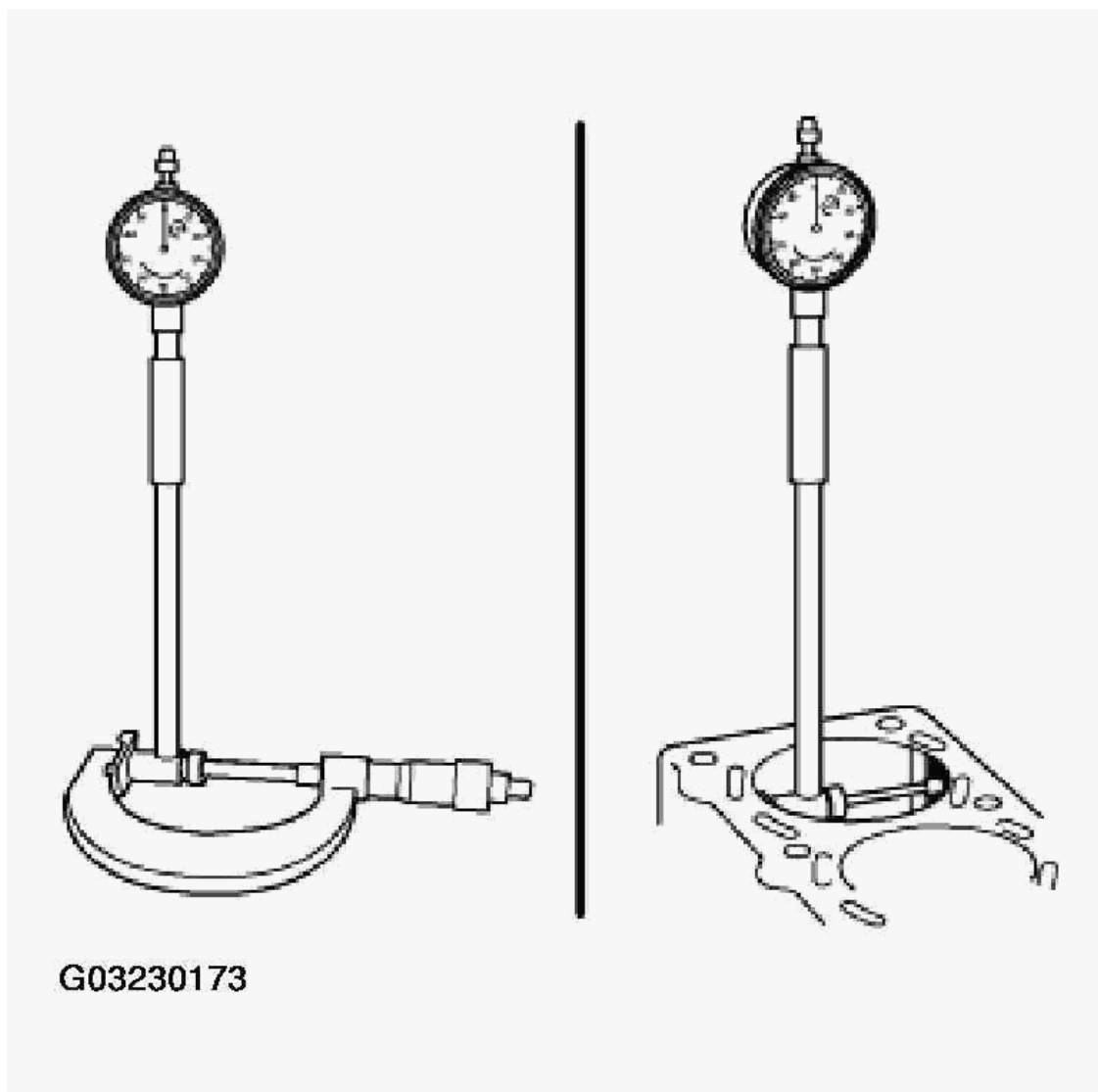


Fig. 133: Measuring Cylinder Bore

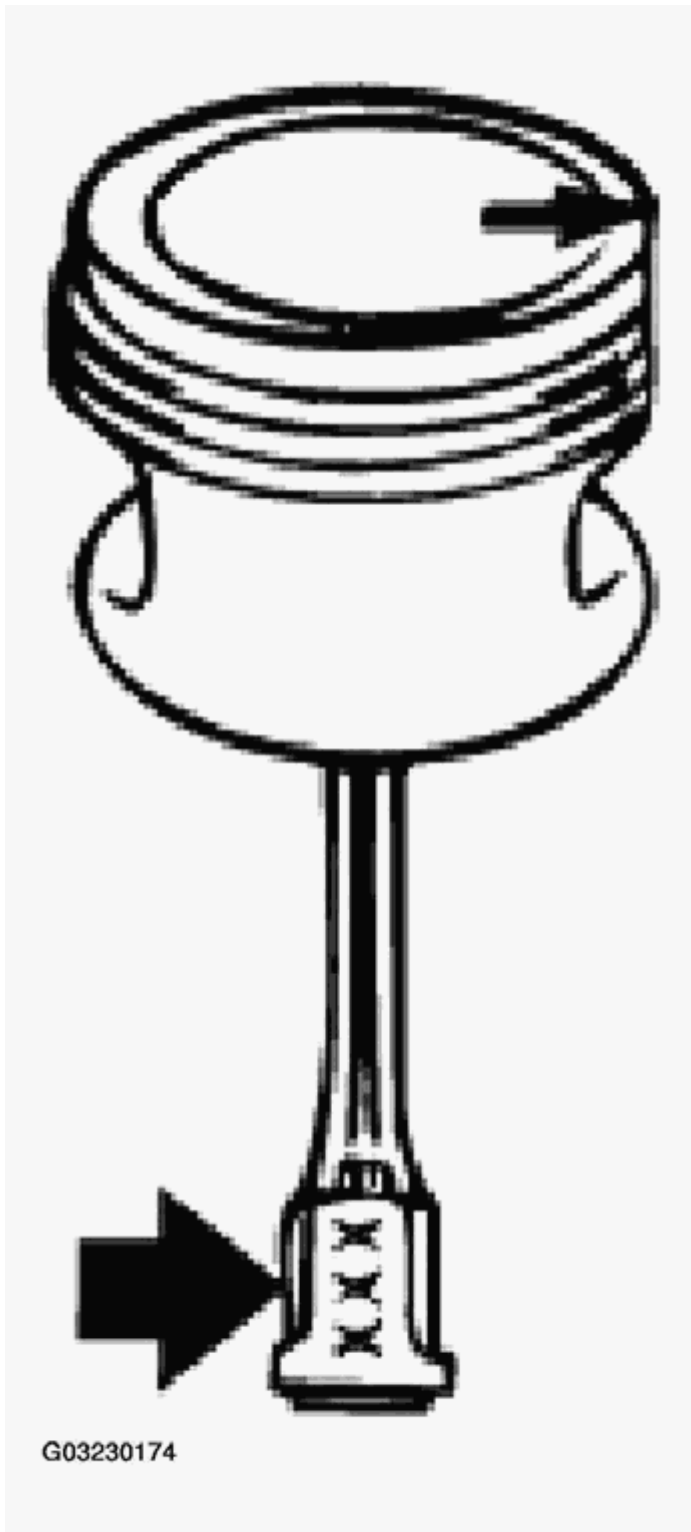
Courtesy of BMW OF NORTH AMERICA, INC.

Replace conrod bearing shells, refer to **11 24 571 REPLACING ALL CONNECTING ROD BEARINGS (M52 / S52 / M52TU / M54 / M56)** .

Important!

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

Fit conrod with piston pin to piston in such a way that both of the visible pair numbers on the installation direction arrow on the piston point to the right.



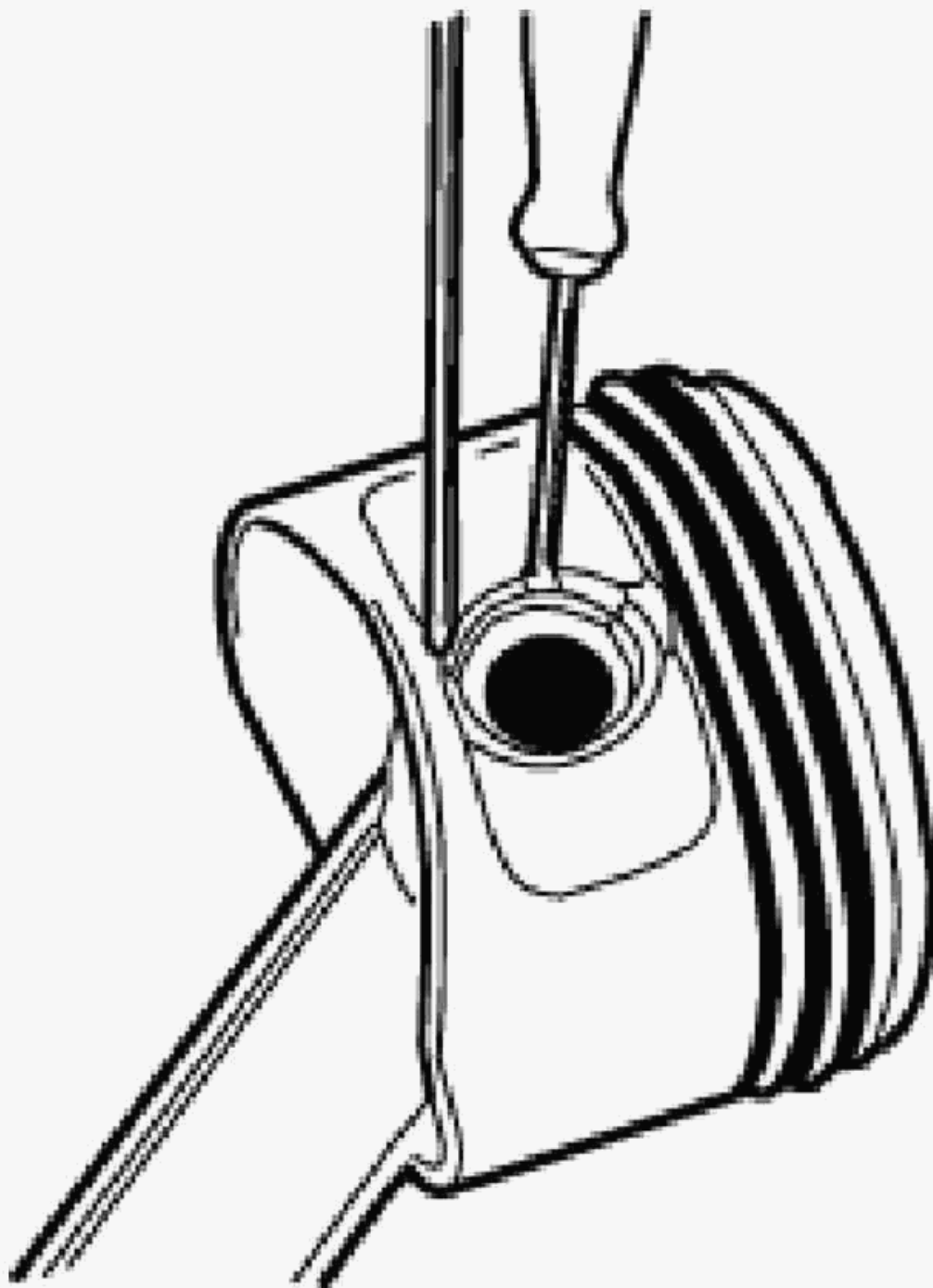
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Fig. 134: Identifying Installation Direction Arrow On Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Install snap ring so that opening is opposite recess.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

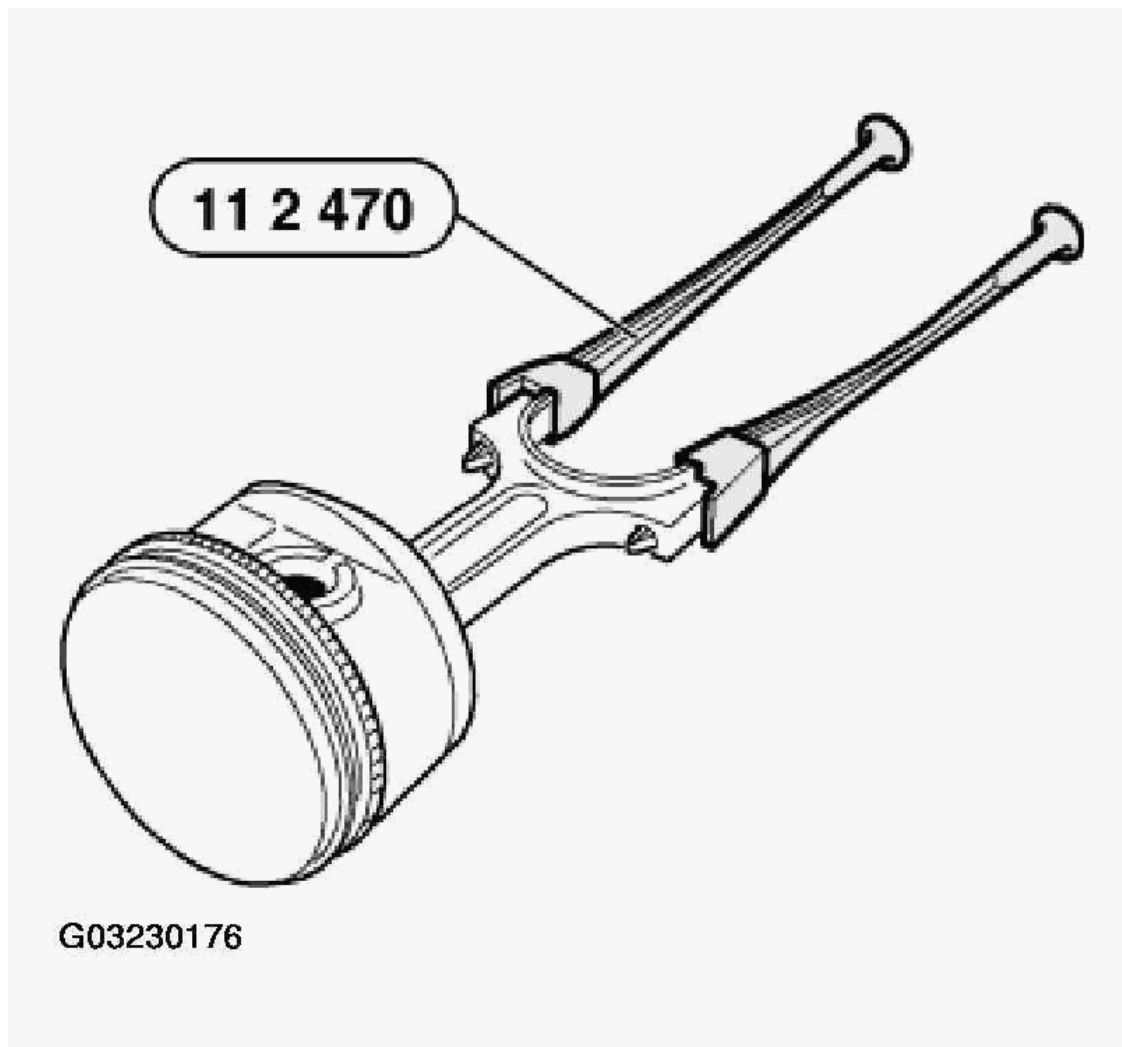


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Fig. 135: Installing Snap Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 2 470 in conrod.

**Fig. 136: Installing Guide Mandrel In Conrod**

Courtesy of BMW OF NORTH AMERICA, INC.

Lightly coat pistons and piston rings with oil.

Align contact points on piston rings (offset at approx. 120°, but do not arrange over piston pin lug).

NOTE: Piston diameter 84 mm: Use special tool 11 8 141 . Press together piston rings with special tool 11 2 260 . Piston diameter 80 mm: Press together piston rings with special tool 11 2 260 .

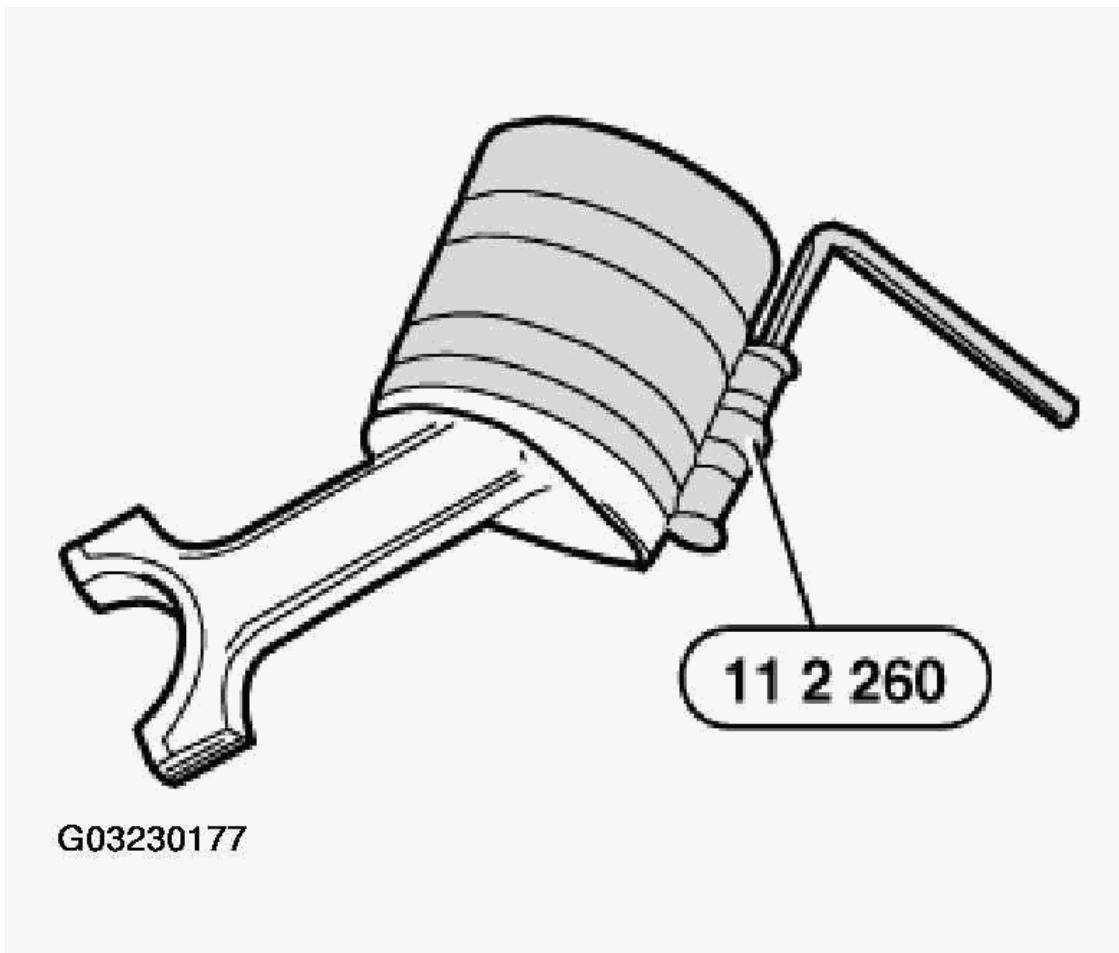


Fig. 137: Compressing Piston Rings With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Install piston so that arrow points to camshaft drive.

Entire circumference of tightening strap must rest firmly on engine block.

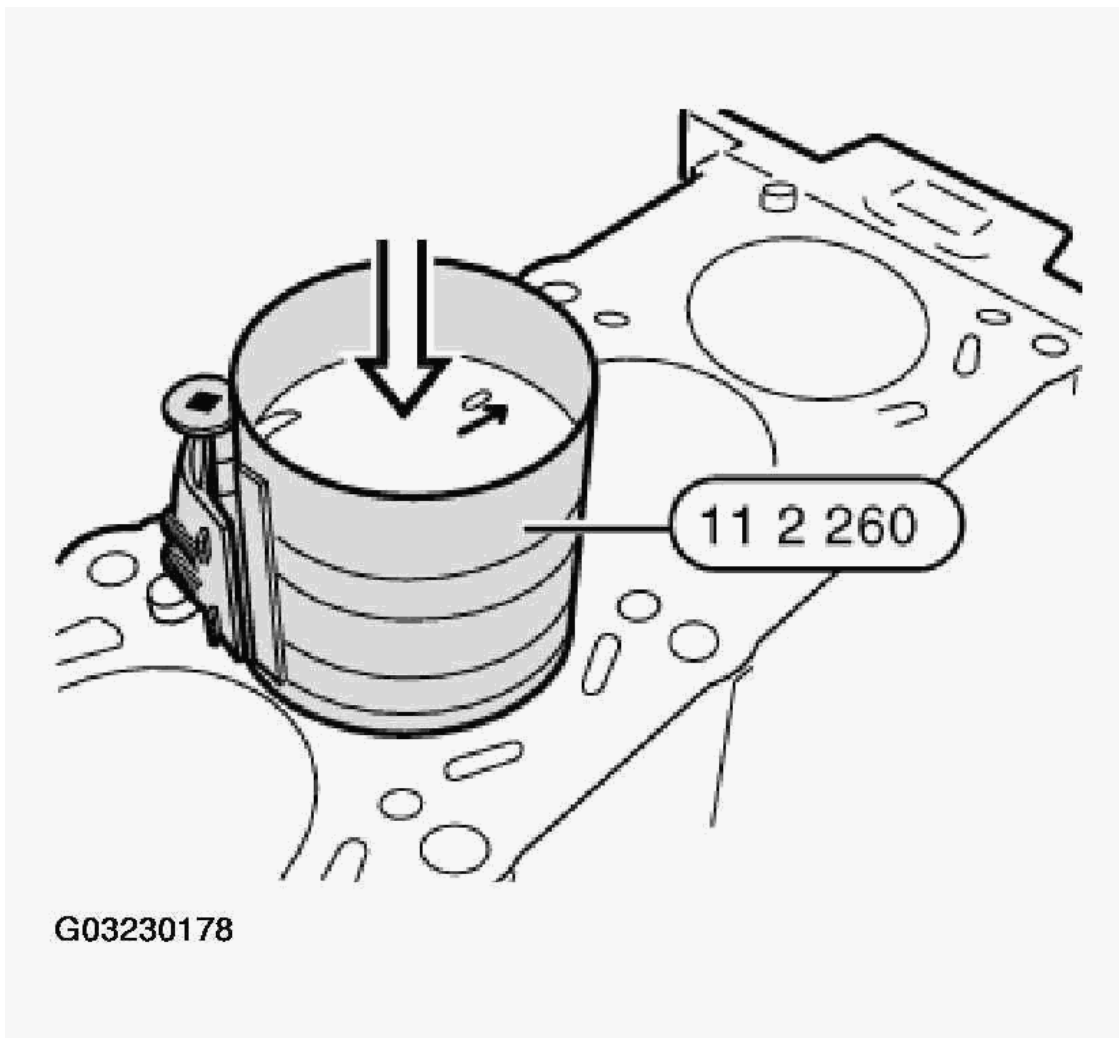


Fig. 138: Aligning Piston Directional Arrow Towards Camshaft Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Danger of piston ring failure.

Press in piston only with finger force (do not knock in!).

Attach crankpin to connecting rod.

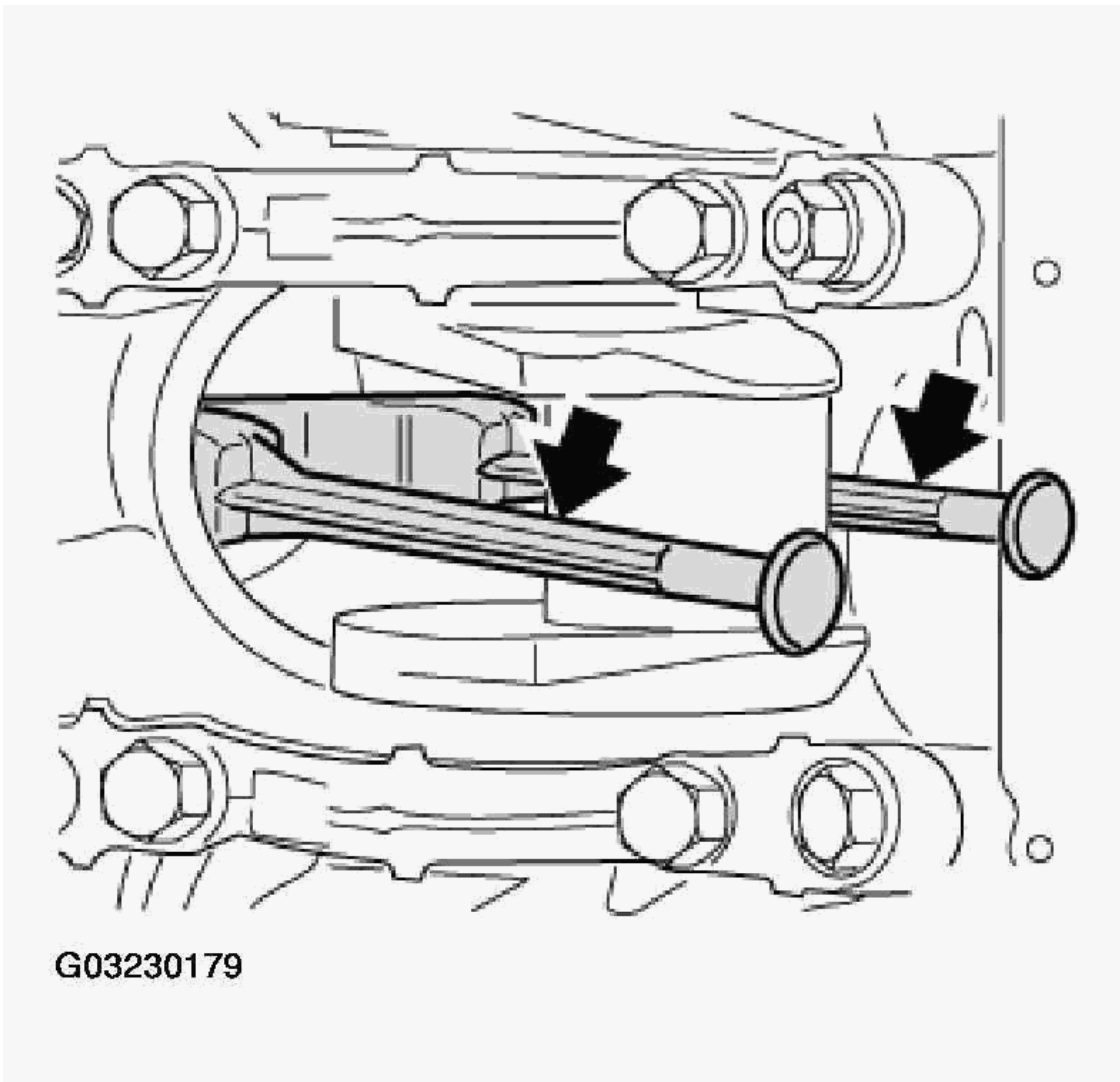


Fig. 139: Attaching Crankpin To Connecting Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Apply light coat of oil to connecting-rod bearing shells.

Fit bearing caps so that pair numbers match up.

Install new conrod bolts.

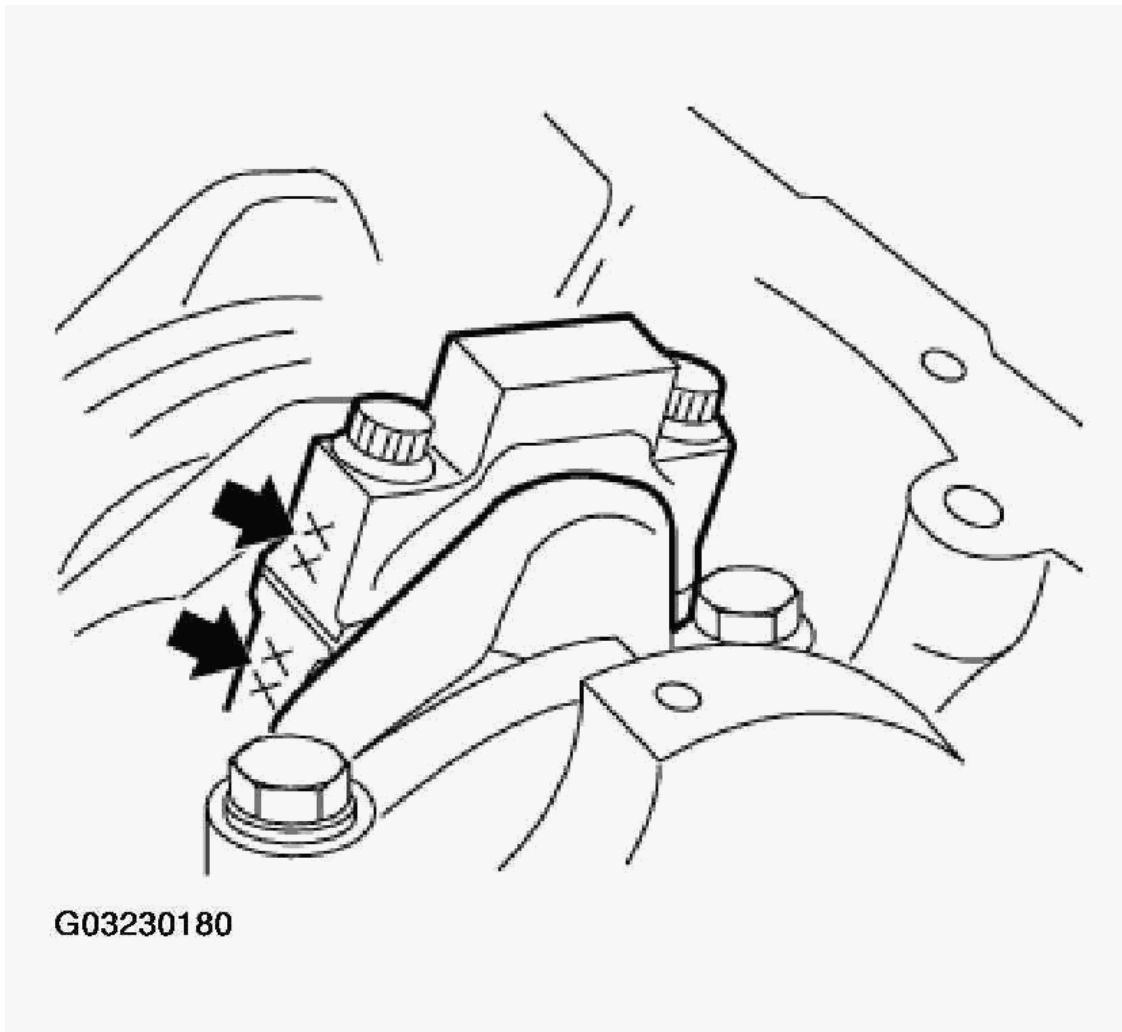


Fig. 140: Aligning Pair Numbers On Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down conrod bolts with special tool 00 9 120 or special tool 11 2 110 .

Tightening torque, refer to 11 24 1AZ in **ENGINE - TIGHTENING TORQUES** .

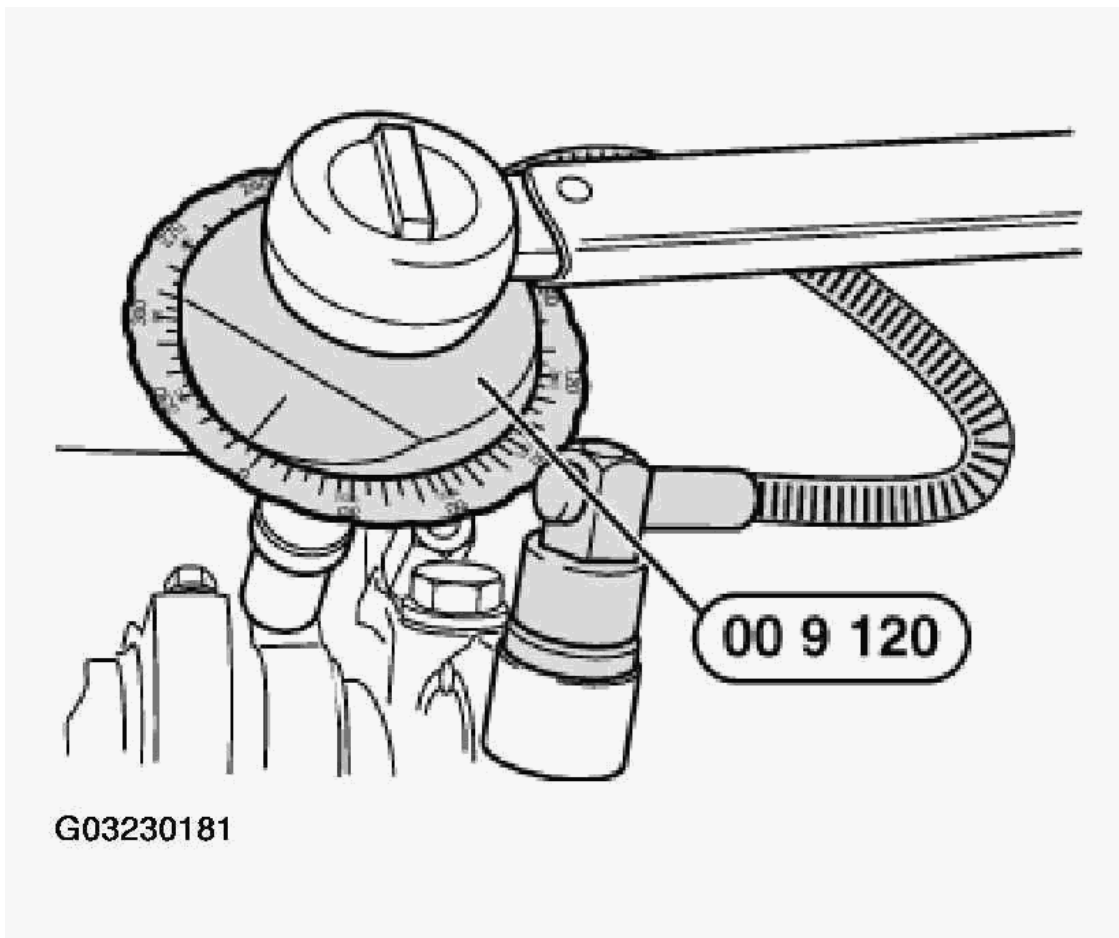


Fig. 141: View Of Torque Angle Measuring Dial
Courtesy of BMW OF NORTH AMERICA, INC.

Install oil pump, refer to **11 41 000 REMOVING AND INSTALLING/REPLACING OIL PUMP (M52TU / M54 / M56)** .

If oil pump and oil scraper are two parts:

Fit oil scraper.

Assemble engine.

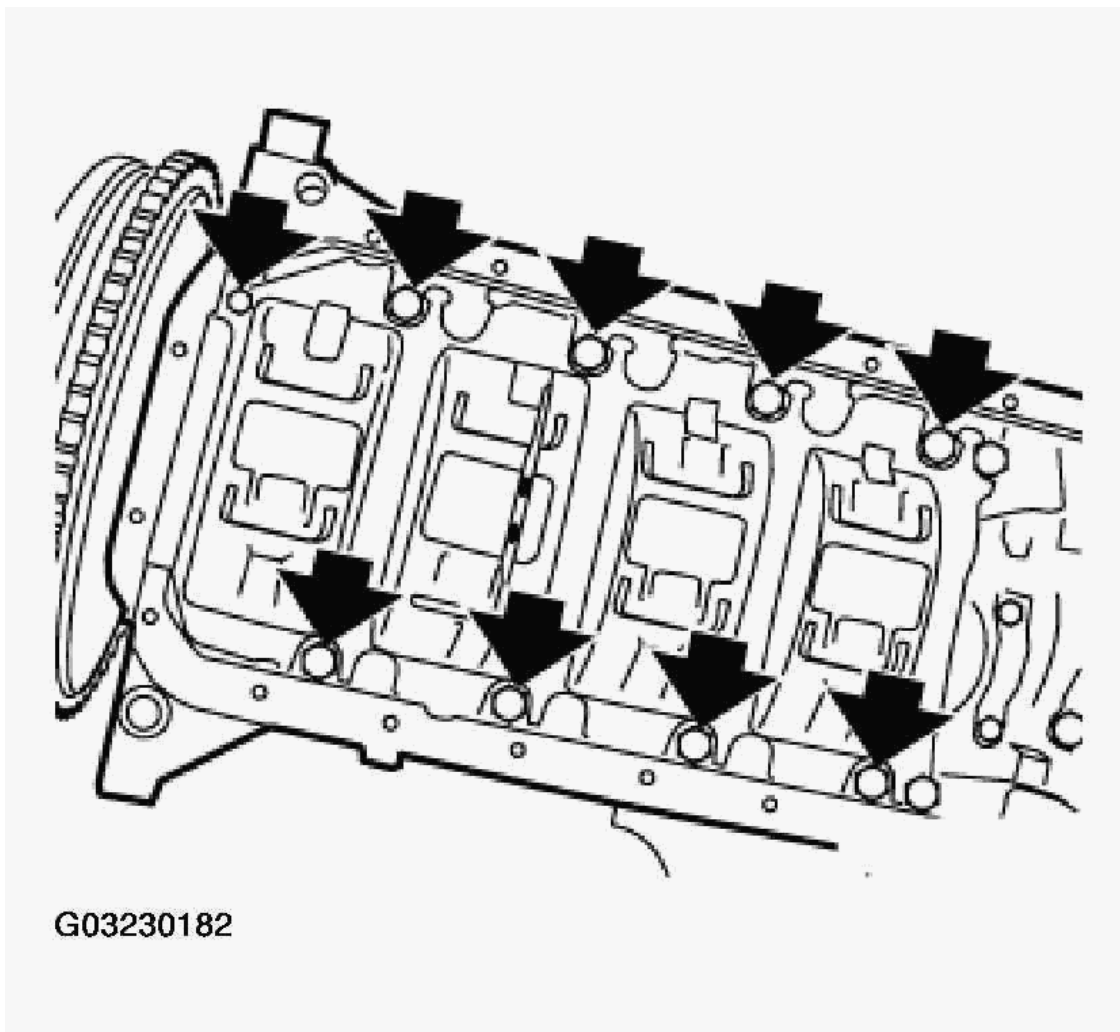


Fig. 142: Installing Oil Scraper

Courtesy of BMW OF NORTH AMERICA, INC.

11 25 671 REPLACING PISTON RINGS ON ALL PISTONS (M52 / S52 / M52TU / M54 / M56)

(Piston removed.)

Remove piston rings with a piston-ring compressing pliers.

NOTE: It might not be possible to find the identification on used piston rings. Only install new pistons in conjunction with new piston rings. Put aside piston rings in correct sequence and installation position. Only install new pistons in conjunction with new piston rings.

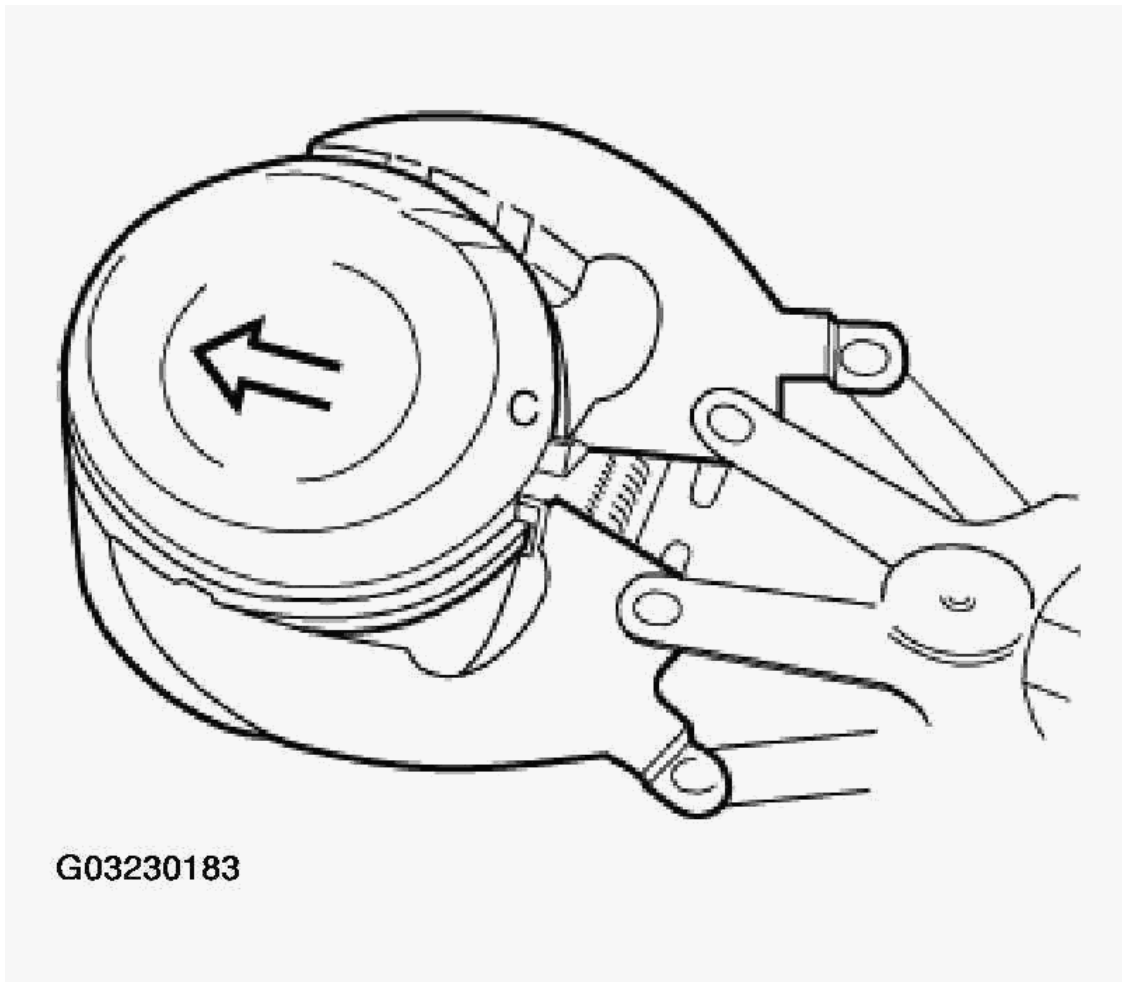


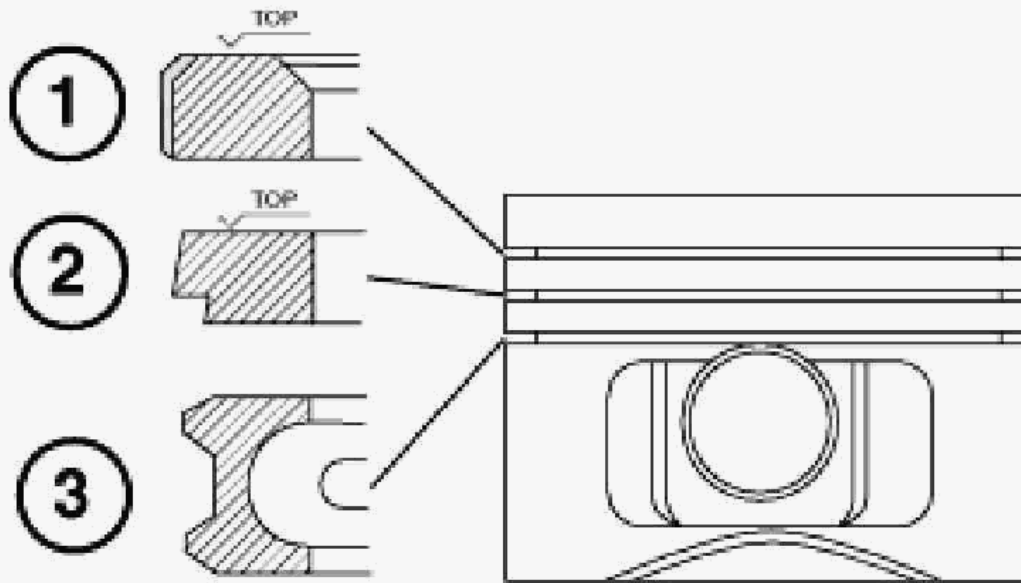
Fig. 143: Removing Piston Rings

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install piston rings with "TOP" to piston top.

1. Plain compression ring.
2. Stepped compression ring "Top".
3. Slotted oil ring with hose spring clip.



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Fig. 144: Identifying Piston Ring Types

Courtesy of BMW OF NORTH AMERICA, INC.

Measure axial play, refer to **ENGINE - TECHNICAL DATA** .

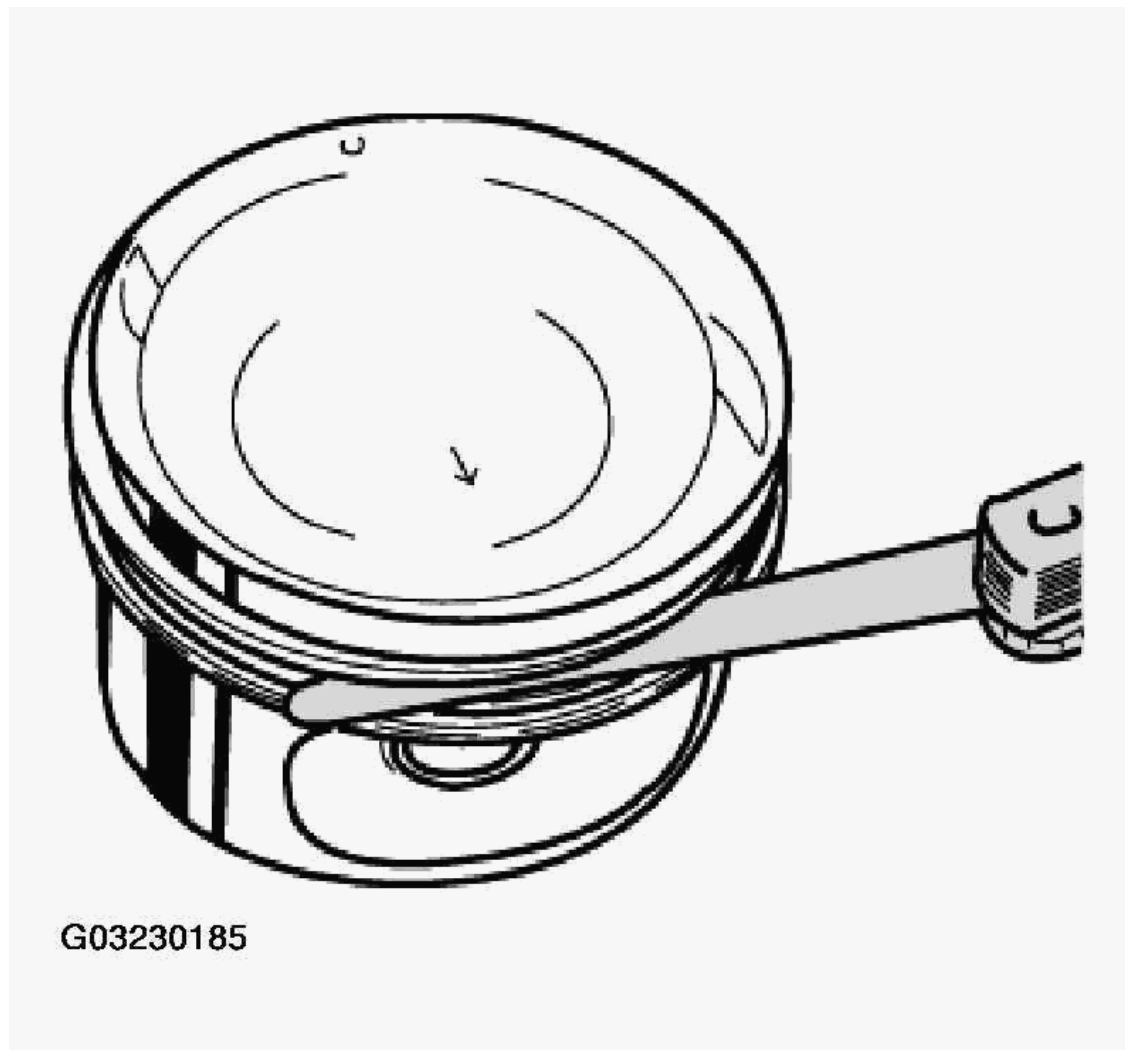


Fig. 145: Measuring Axial Play

Courtesy of BMW OF NORTH AMERICA, INC.

Measure end clearance, refer to **ENGINE - TECHNICAL DATA** .

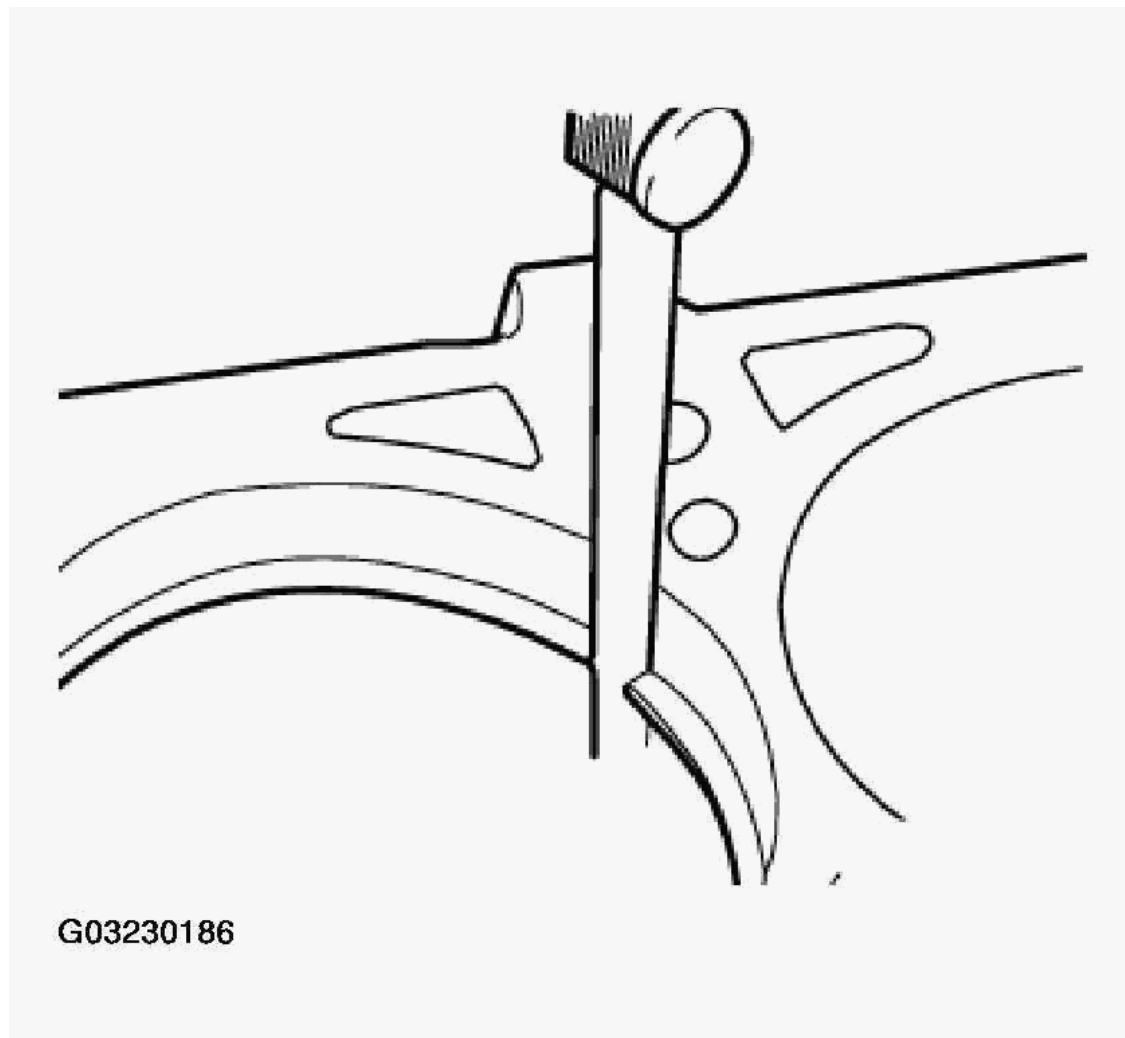


Fig. 146: Measure End Clearance

Courtesy of BMW OF NORTH AMERICA, INC.

V-RIBBED BELT W/TENS. DEFLECT ELEMENT

11 28 010 REPLACING ALTERNATOR DRIVE BELT (M52 / S52 / M52TU / M54 / M56)

NOTE: If the drive belt is to be subsequently reused: Mark direction of travel and reinstall drive belt in same direction of travel.

Necessary Preliminary Tasks:

- Remove fan clutch with fan impeller, refer to **11 52 020 REMOVING AND INSTALLING/REPLACING FAN CLUTCH (S52 / S54 / M52 / M52TU / M54 / M56)** .
- Remove A/C compressor drive belt, refer to **11 28 050 REPLACING A/C COMPRESSOR DRIVE BELT (M52 / S52 / M52TU / M54 / M56)** .

Remove cap from tensioning roller.

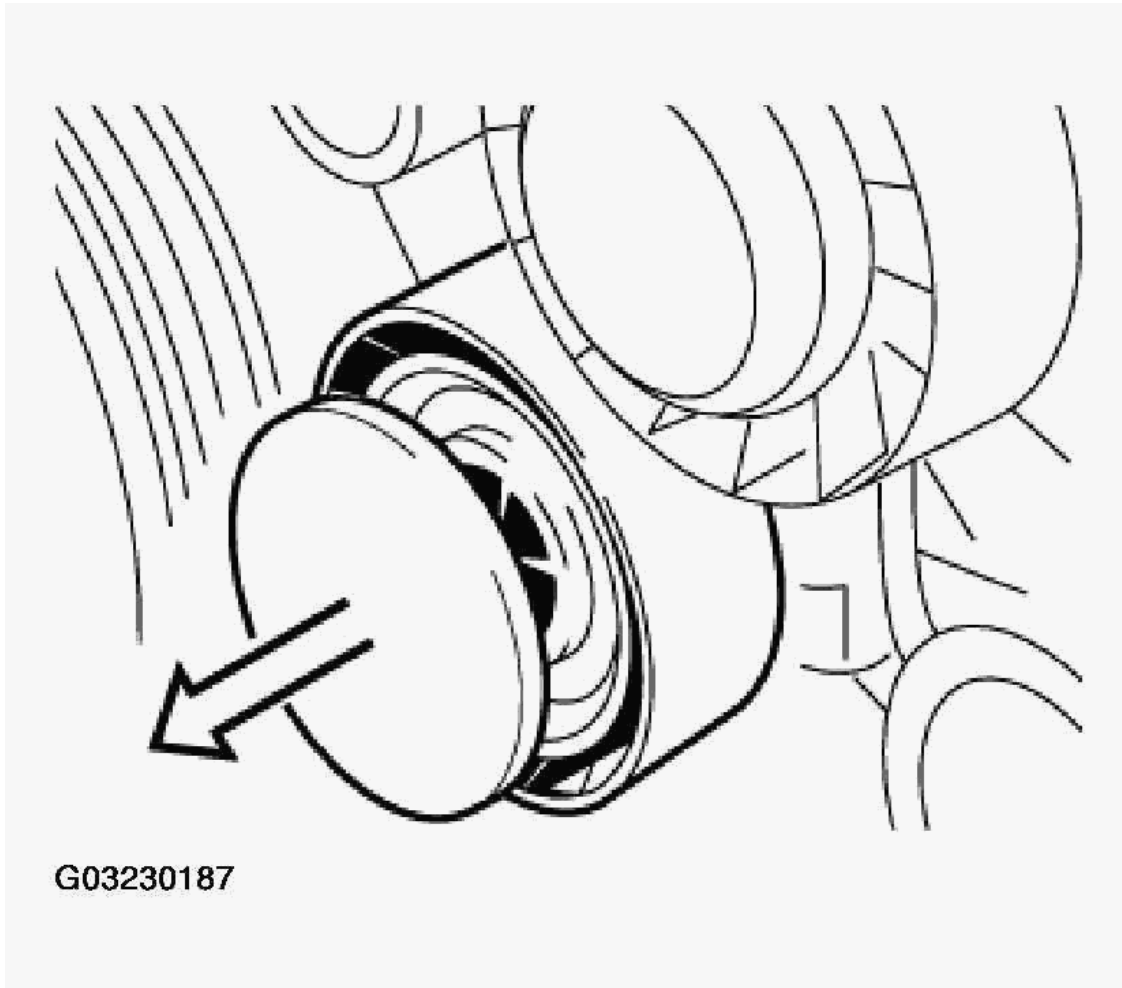


Fig. 147: Removing Cap From Tensioning Roller
Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on belt drive.

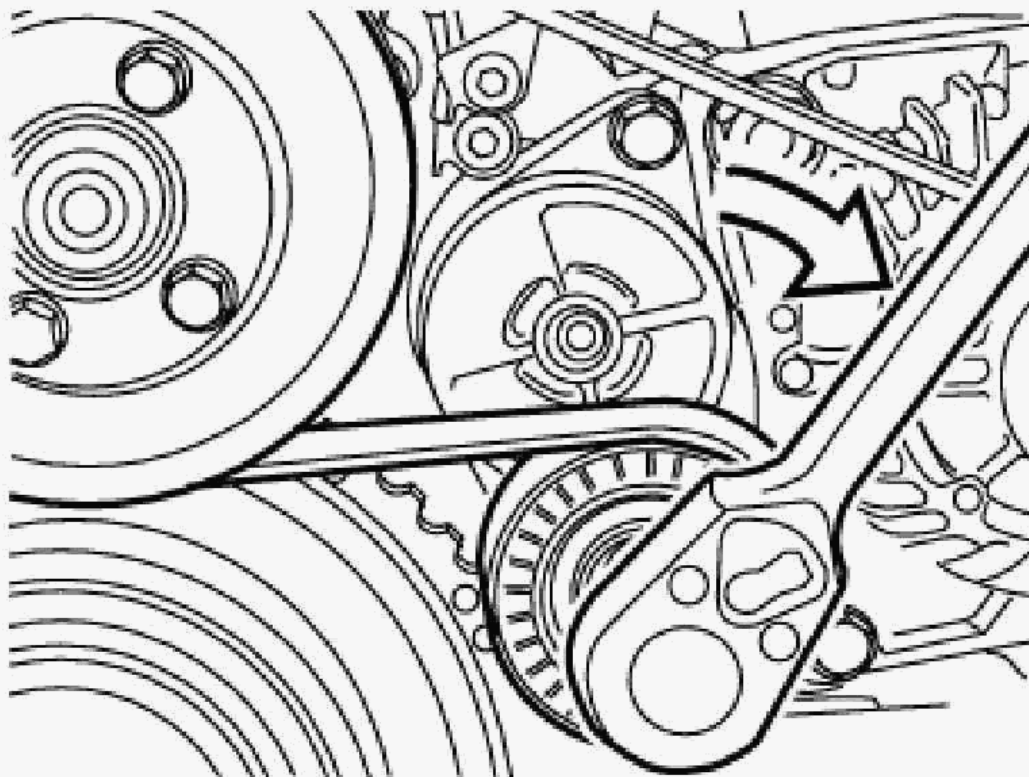
Remove drive belt.

Important!

Drive belt must be replaced if fouled with hydraulic fluid.

Installation:

Check drive belt for coolant and oil residues, replace if necessary.



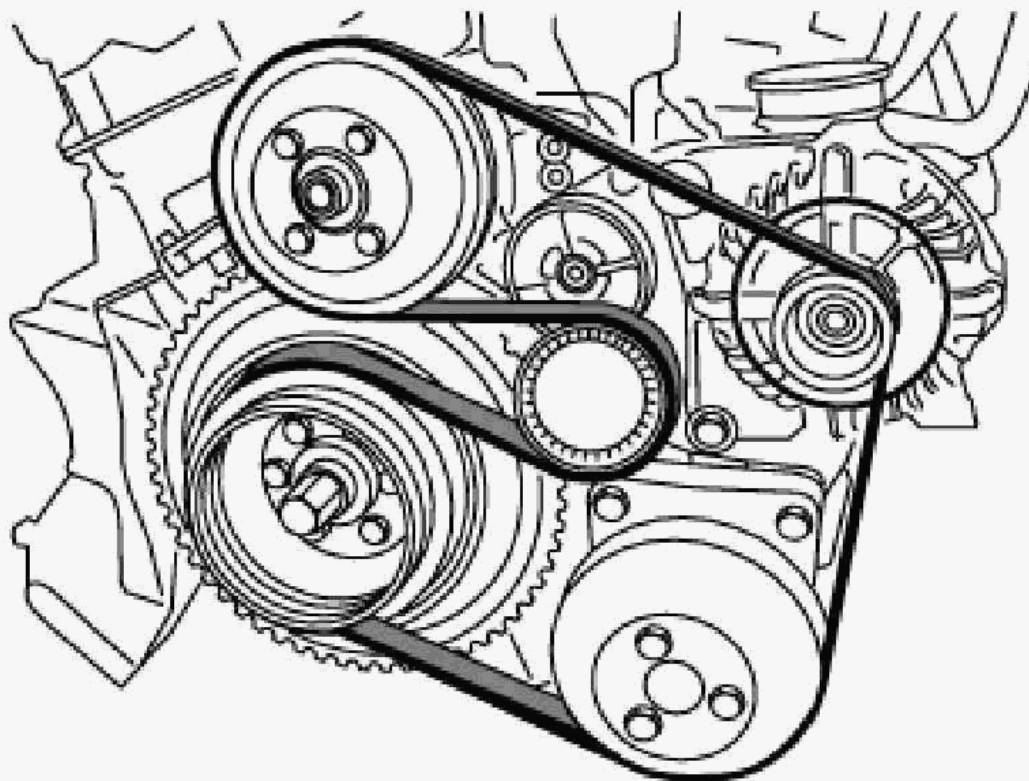
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Fig. 148: Removing Drive Belt

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check that belt is correctly positioned on belt pulleys.



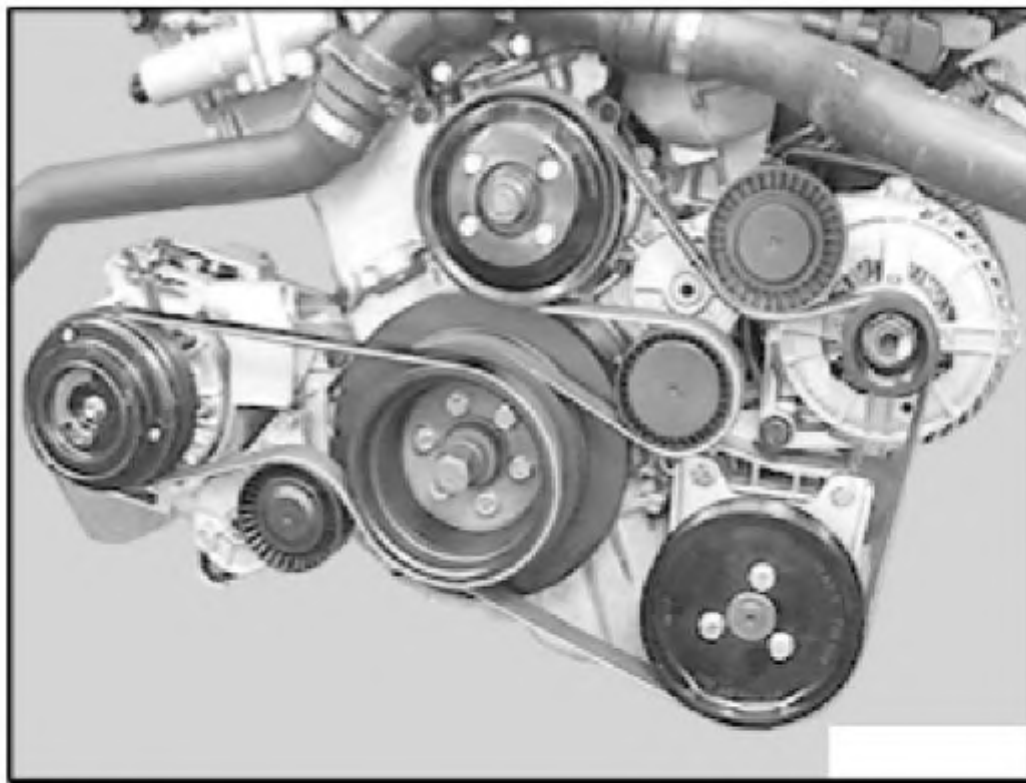
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Fig. 149: Aligning Drive Belt On Belt Pulleys
Courtesy of BMW OF NORTH AMERICA, INC.

Version with auxiliary tensioning roller.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



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Fig. 150: Aligning Drive Belt (With Auxiliary Tensioning Roller)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Locking device of auxiliary tensioning roller must snap into groove on alternator.



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Fig. 151: Locating Groove On Alternator
Courtesy of BMW OF NORTH AMERICA, INC.

11 28 050 REPLACING A/C COMPRESSOR DRIVE BELT (M52 / S52 / M52TU / M54 / M56)

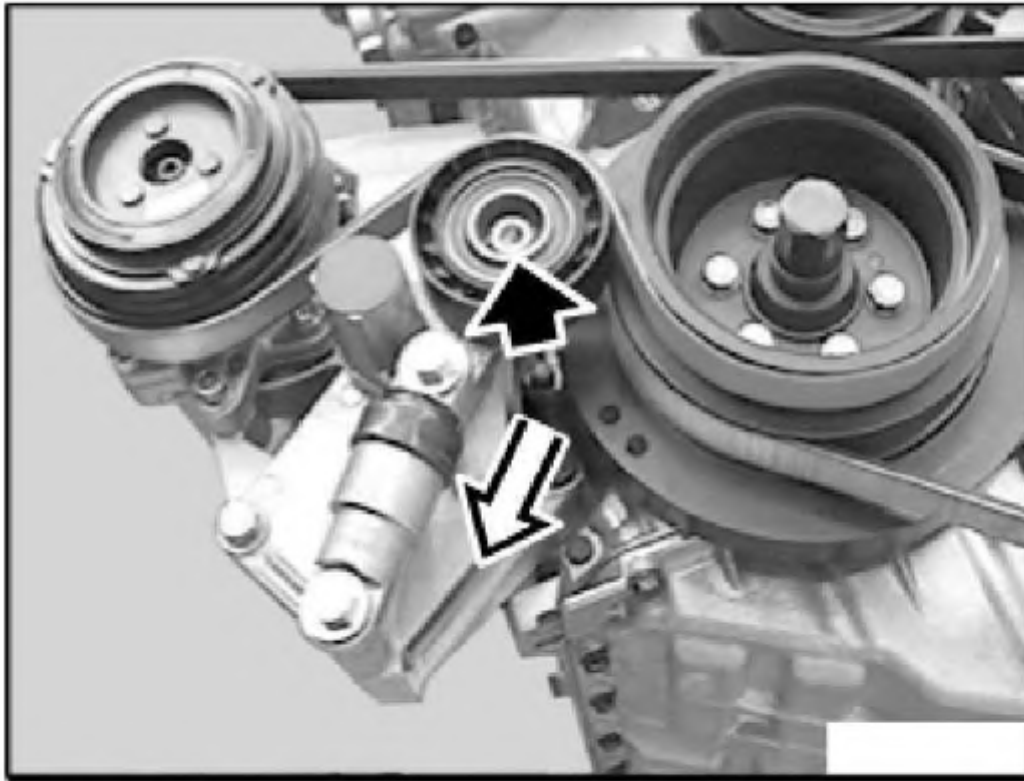
NOTE: If the drive belt is to be subsequently reused: Mark direction of travel and reinstall drive belt in same direction of travel.

Necessary Preliminary Tasks:

- If necessary, remove splash guard.

Model With Hydraulic Drive Belt And Tension Jack:

Remove the dust cap. Push back belt tensioner at bolt connection of guide pulley and remove drive belt.



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Fig. 152: Identifying Belt Tensioner

Courtesy of BMW OF NORTH AMERICA, INC.

Model With Mechanical Drive Belt And Tension Jack:

Press back drive belt tensioner at hexagon head or Torx socket and remove drive belt.

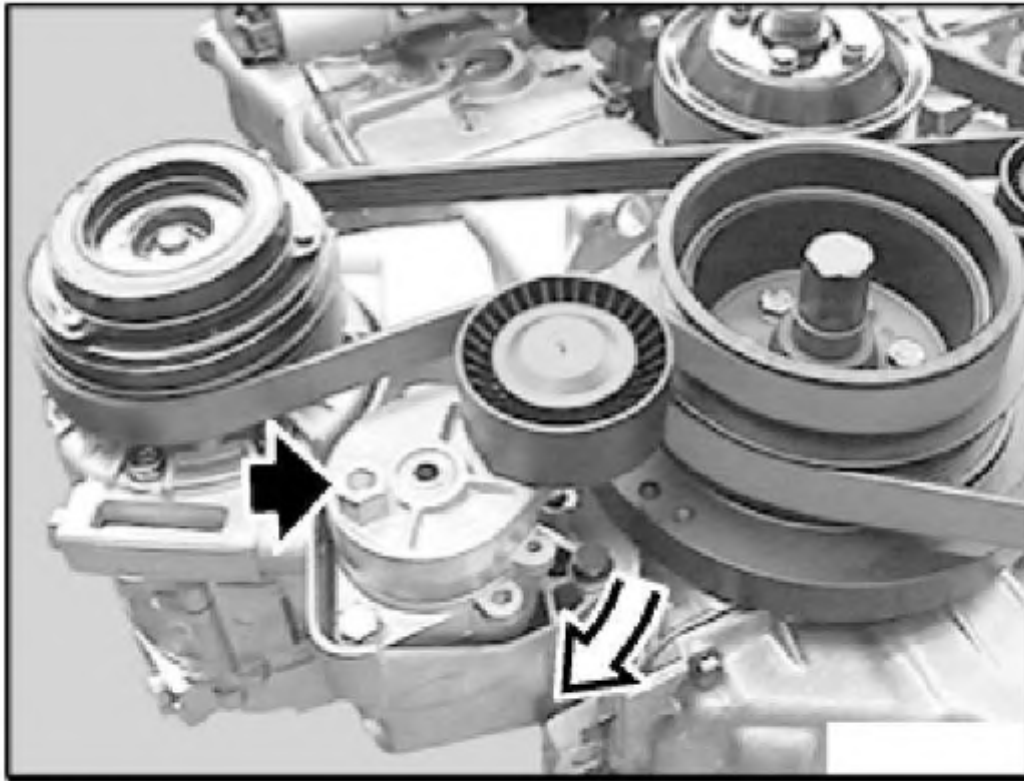
Important!

Drive belt must be replaced if fouled with hydraulic fluid.

Installation:

Check drive belt for coolant and oil residues, replace if necessary.

Install drive belt, make sure it is correctly positioned on belt pulleys.



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Fig. 153: View Of Drive Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

CAMSHAFT

11 31 001 REPLACING CAMSHAFT (M52TU / M54 / M56)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 00 9 250
- 11 2 300
- 11 3 240
- 11 3 244
- 11 3 250

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

- 11 3 260
- 11 3 292
- 11 4 220
- 11 6 150
- 11 6 180

(If necessary inlet or exhaust side.)

The inlet or exhaust camshaft can be replaced in the vehicle.

Important!

Incorrect assembly/removal without special tools exposes the camshaft to the risk of preliminary damage or breakage. The valves may also be bent by contact with the piston crown. Comply without fail with the job instructions, recommended special tools and work sequence.

Removal:

Removal of camshafts is described separately from installation.

The assembly sequence for removal and installation is different.

Remove VANOS adjustment unit, refer to **11 36 010 REMOVING AND INSTALLING OR REPLACING DOUBLE VANOS ADJUSTMENT UNIT (M52TU / M54 / M56)** .

Important!

Cylinder for chain tensioning piston is under spring pressure.

Unfasten cylinder for chain tensioning piston.

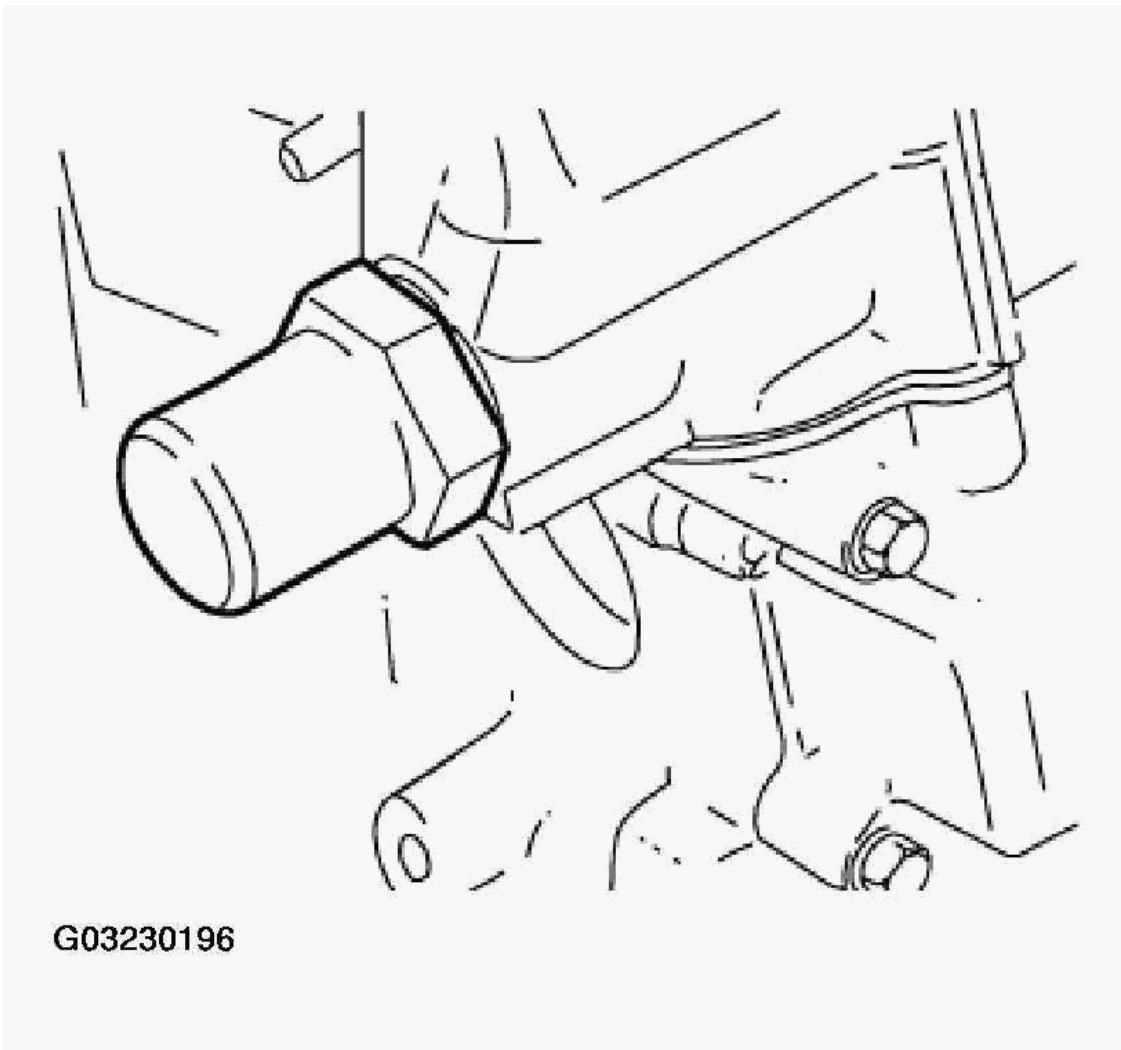


Fig. 154: Locating Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Press down secondary chain tensioner at top and lock with special tool 11 3 292 .

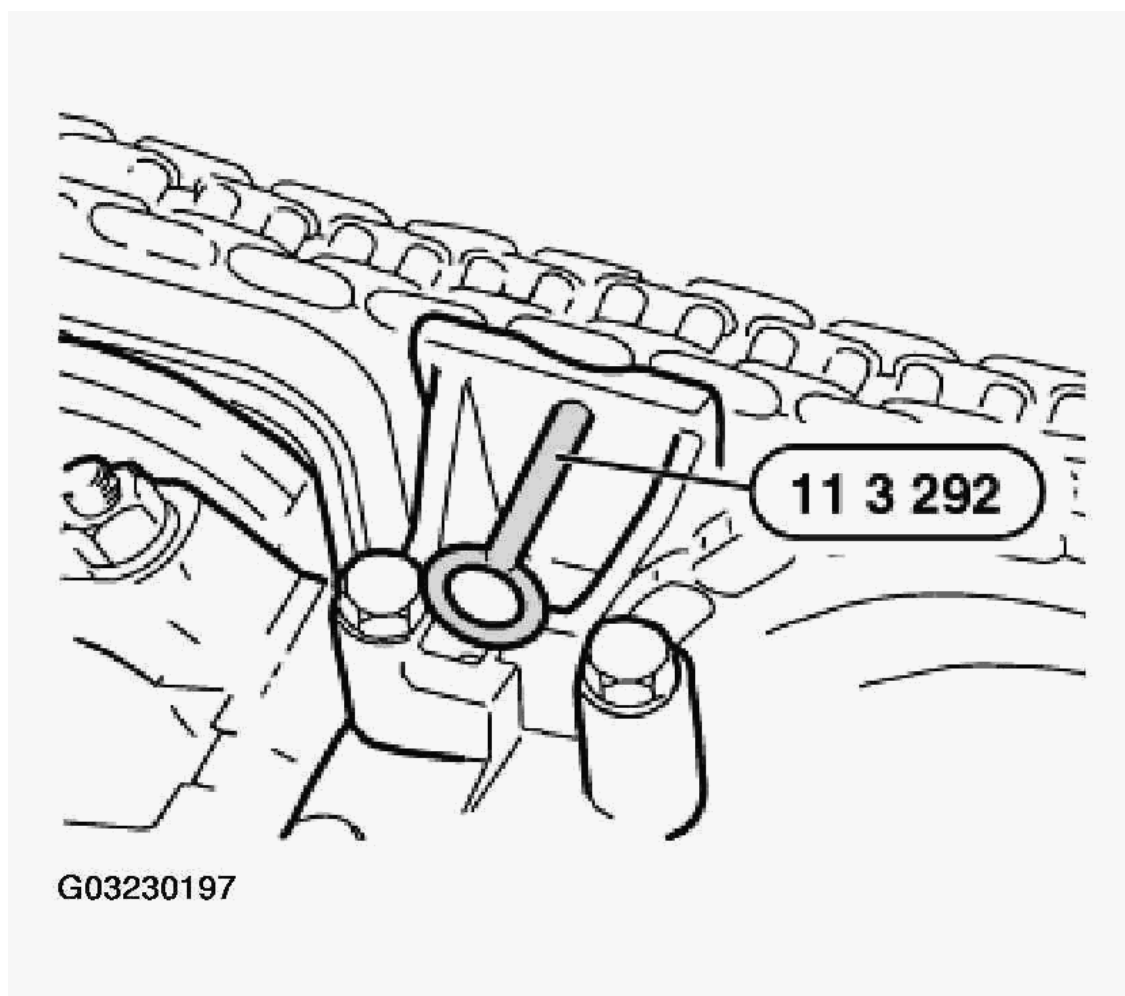
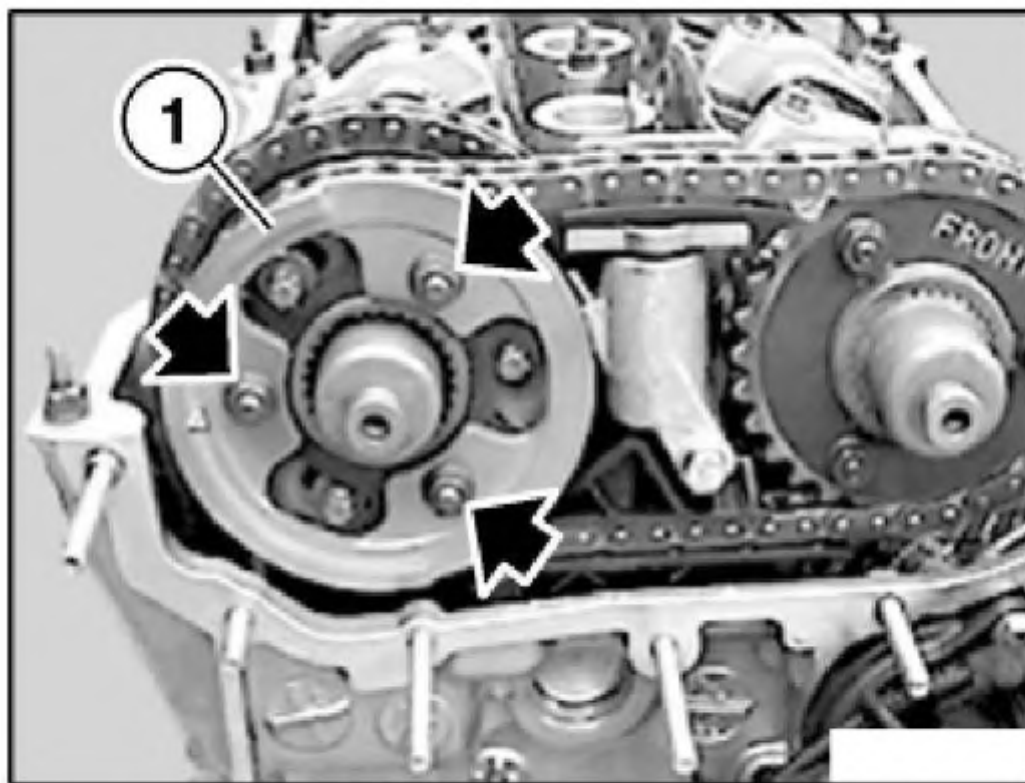


Fig. 155: Locking Secondary Chain Tensioner With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts, remove sensor gear (1).

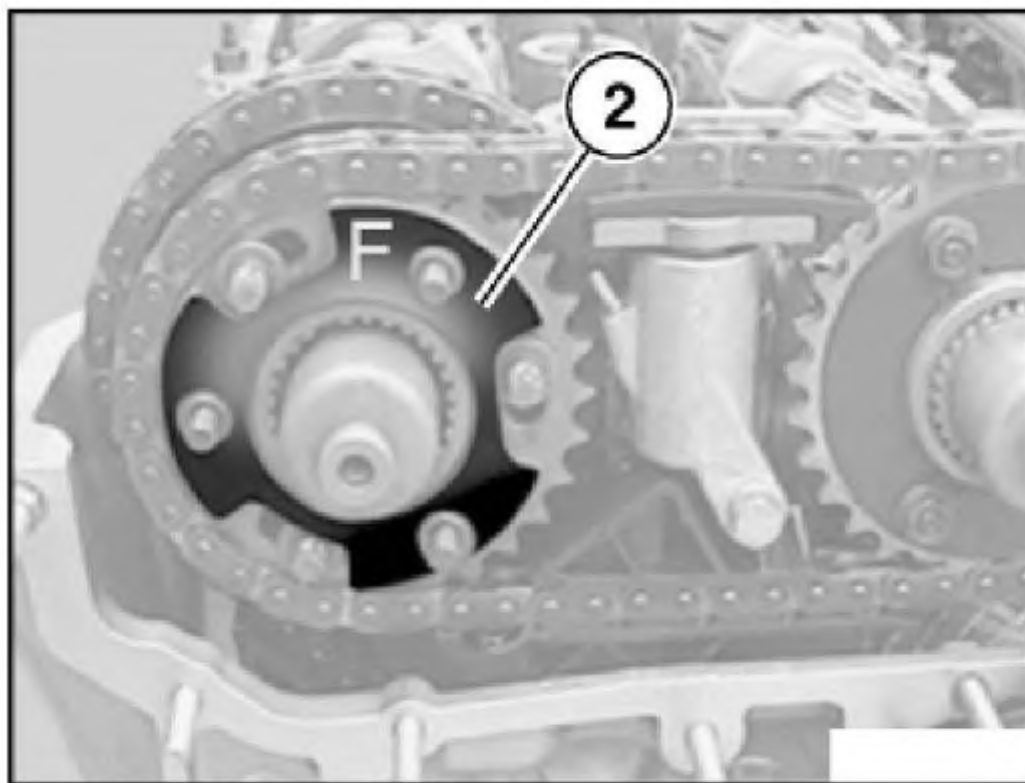


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Fig. 156: Removing Sensor Gear

Courtesy of BMW OF NORTH AMERICA, INC.

Remove plate spring (2).

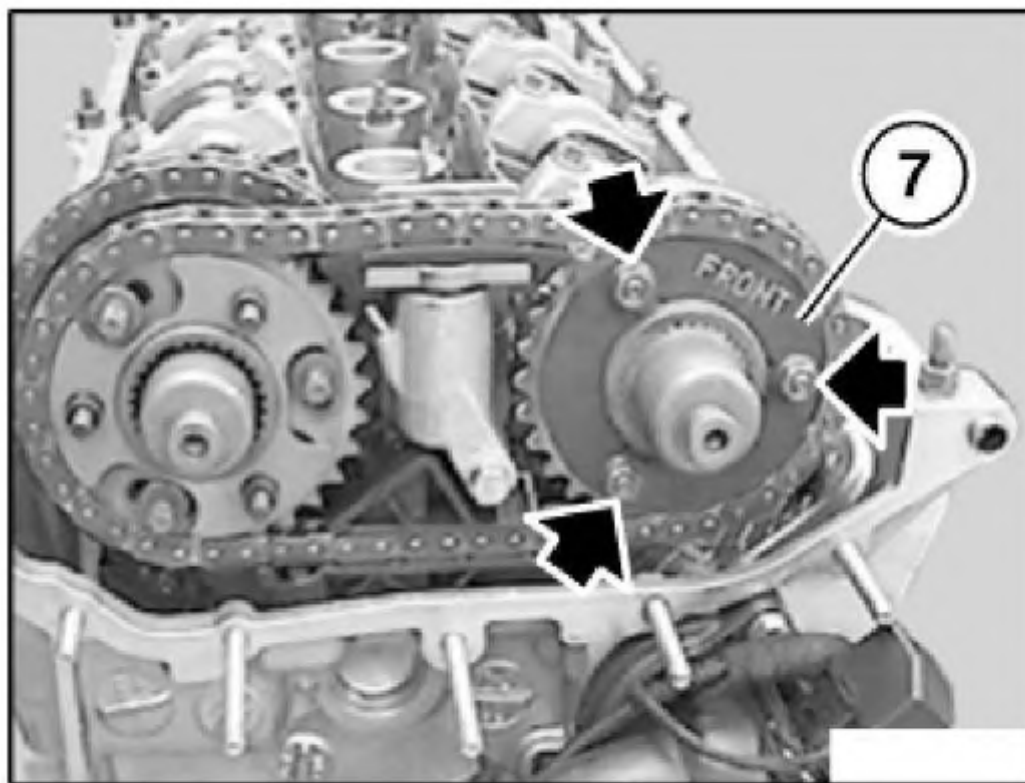


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Fig. 157: Removing Plate Spring

Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts on inlet side and remove corrugated washer (7).



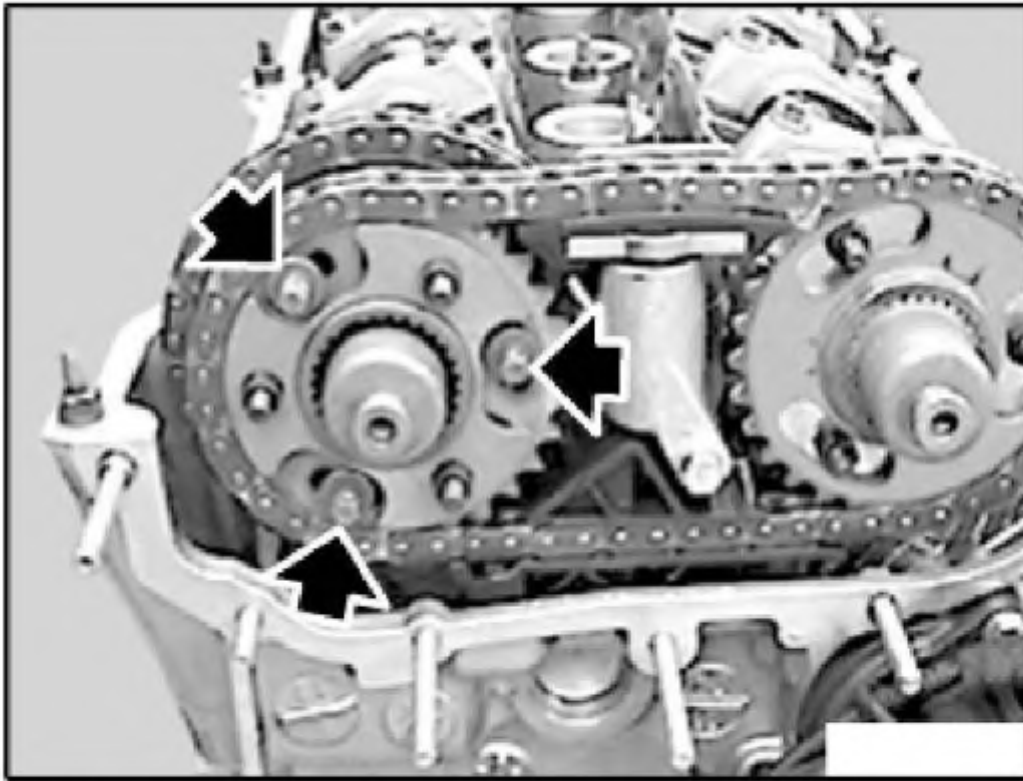
G03230200

Fig. 158: Locating Corrugated Washer Retaining Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

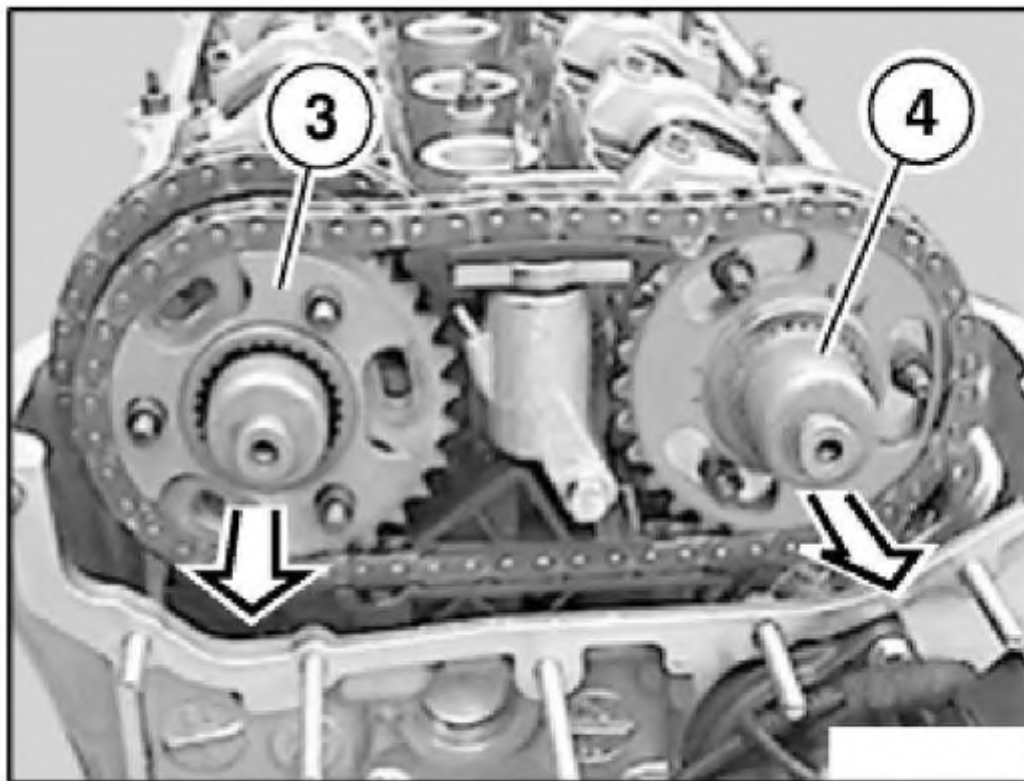


G03230201

Fig. 159: Removing Chain Wheel Retaining Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Lift off exhaust and inlet chain wheels together with chain, friction washer (3) and toothed shaft (4).

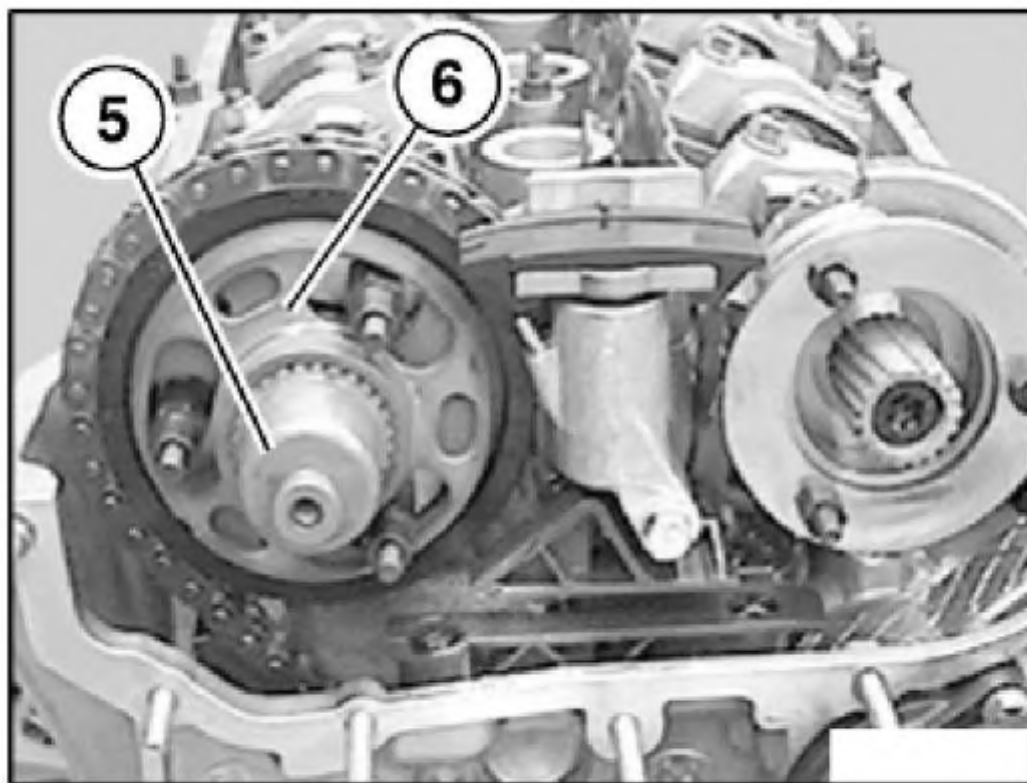
NOTE: **Toothed shaft (4) is an identical part for exhaust and inlet sides. Store used toothed shafts in order and reinstall on the same side only.**



G03230202

Fig. 160: Removing Exhaust/Inlet Chain Wheels
Courtesy of BMW OF NORTH AMERICA, INC.

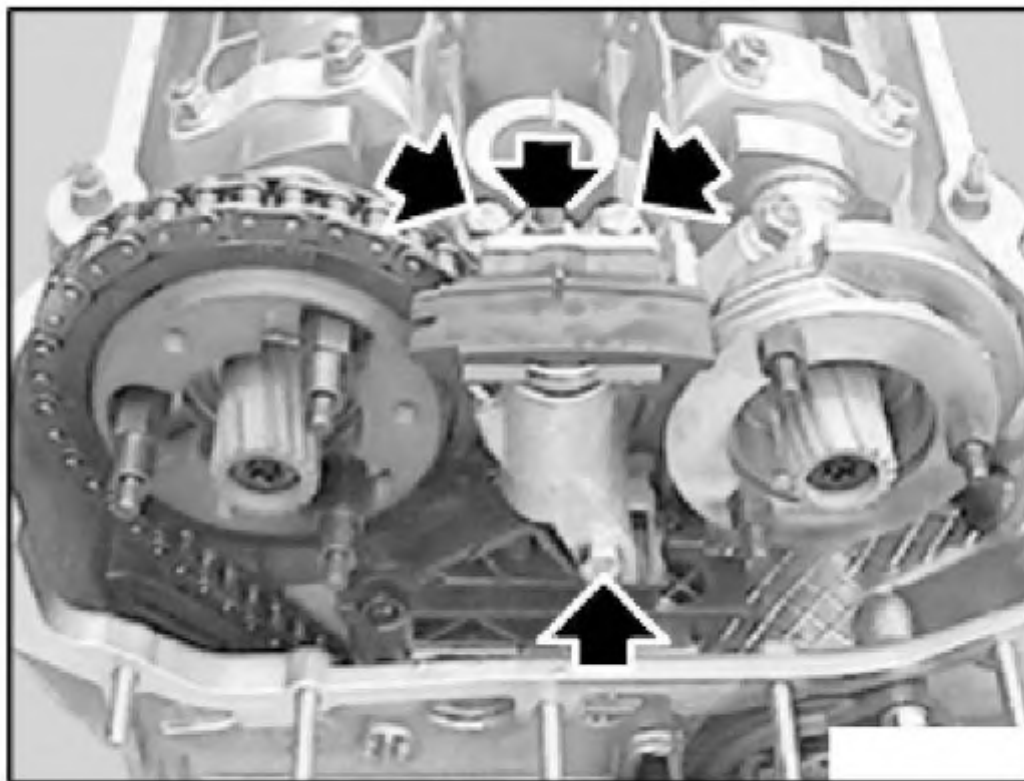
Remove toothed shaft (5) with toothed sleeve (6).



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Fig. 161: View Of Toothed Shaft And Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

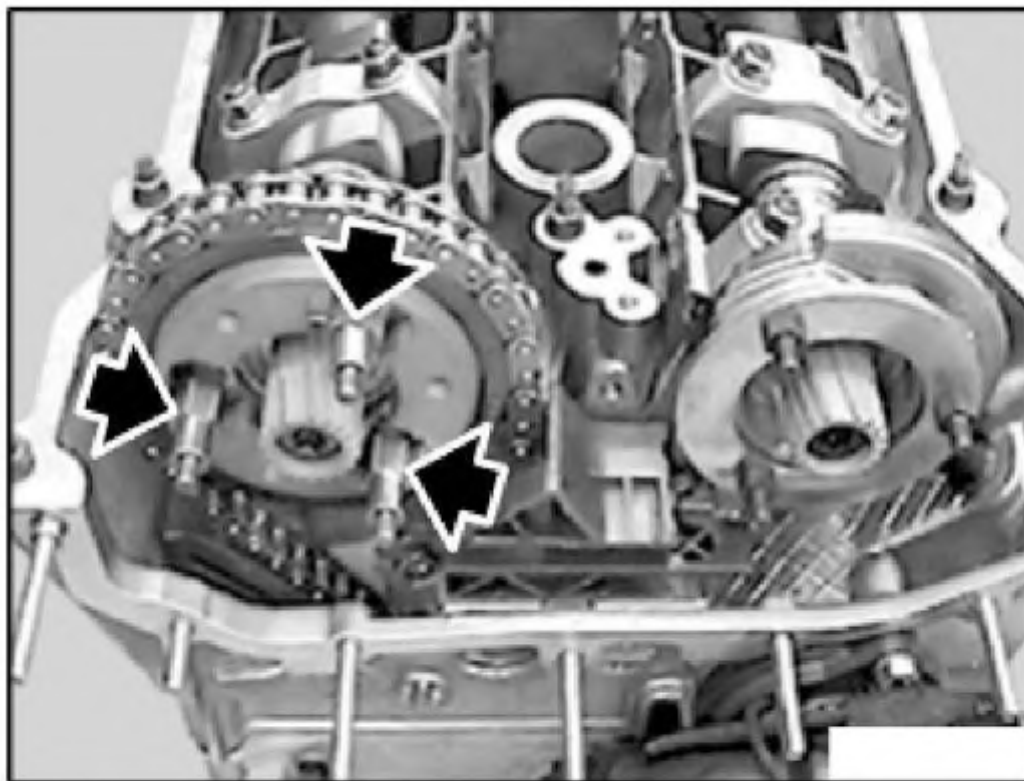
Unfasten screws. Remove secondary chain tensioner.



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Fig. 162: Locating Secondary Chain Tensioner Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw-in pin.

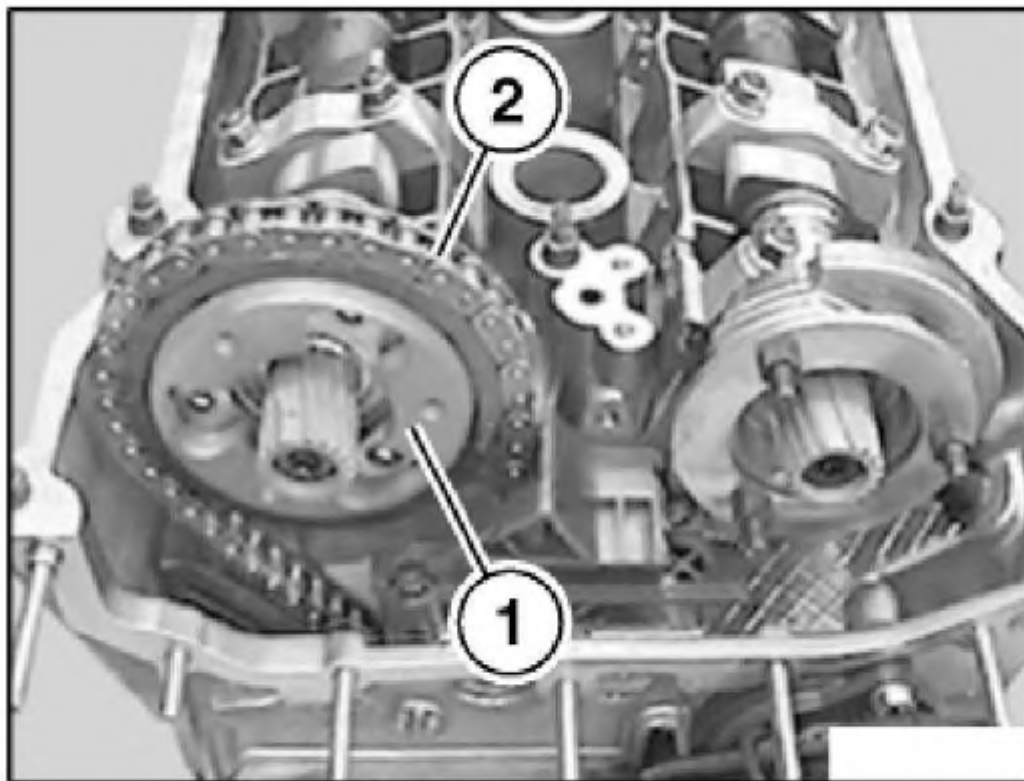


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Fig. 163: Removing Screw-In Pin

Courtesy of BMW OF NORTH AMERICA, INC.

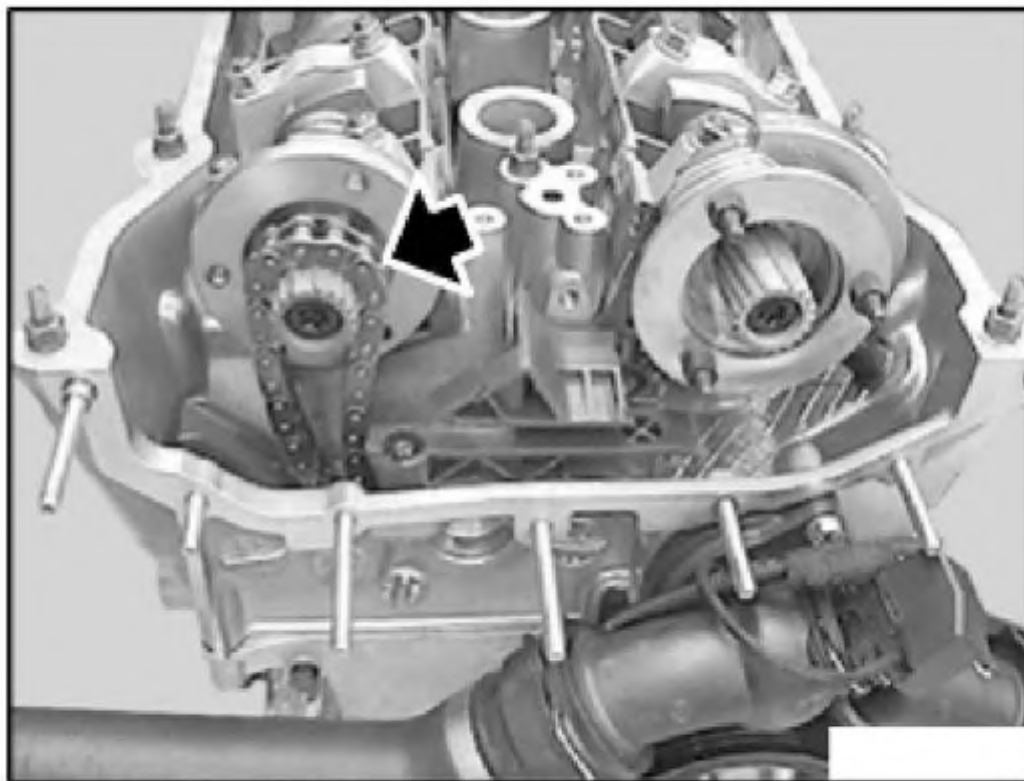
Feed chain wheel (1) towards front out of timing chain (2).



G03230206

Fig. 164: Positioning Chain Wheel Towards Front Of Chain
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Timing chain remains positioned over exhaust camshaft.

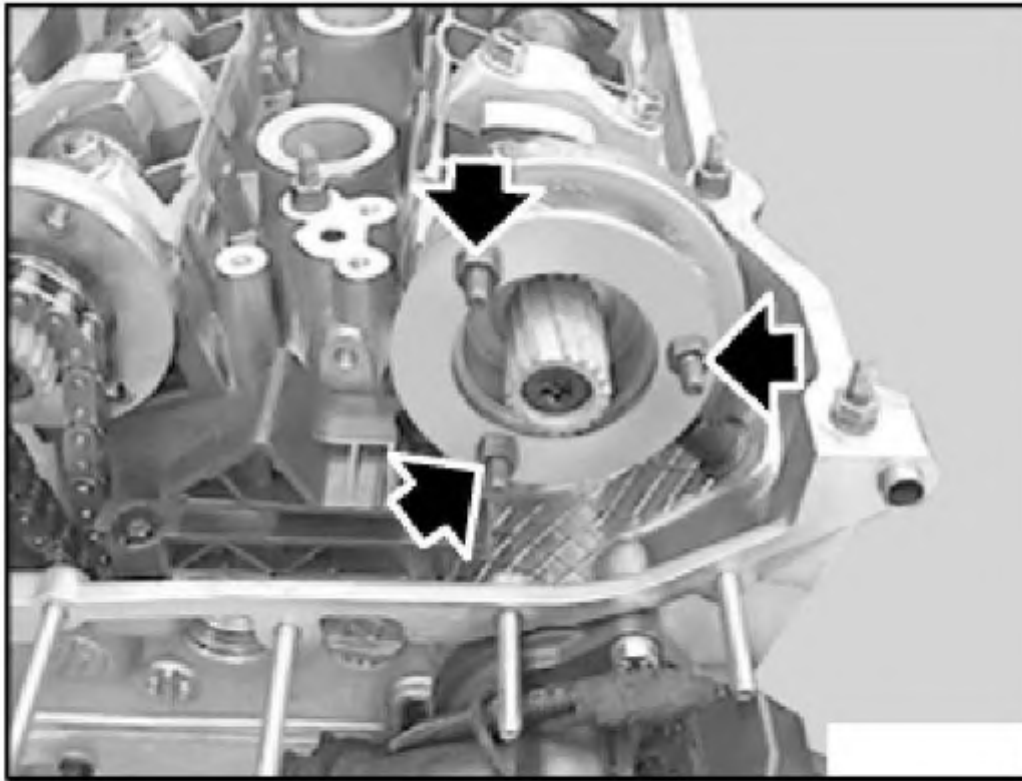


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Fig. 165: View Of Timing Chain Over Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, release screw-in pin on inlet side.

Remove thrust washer.



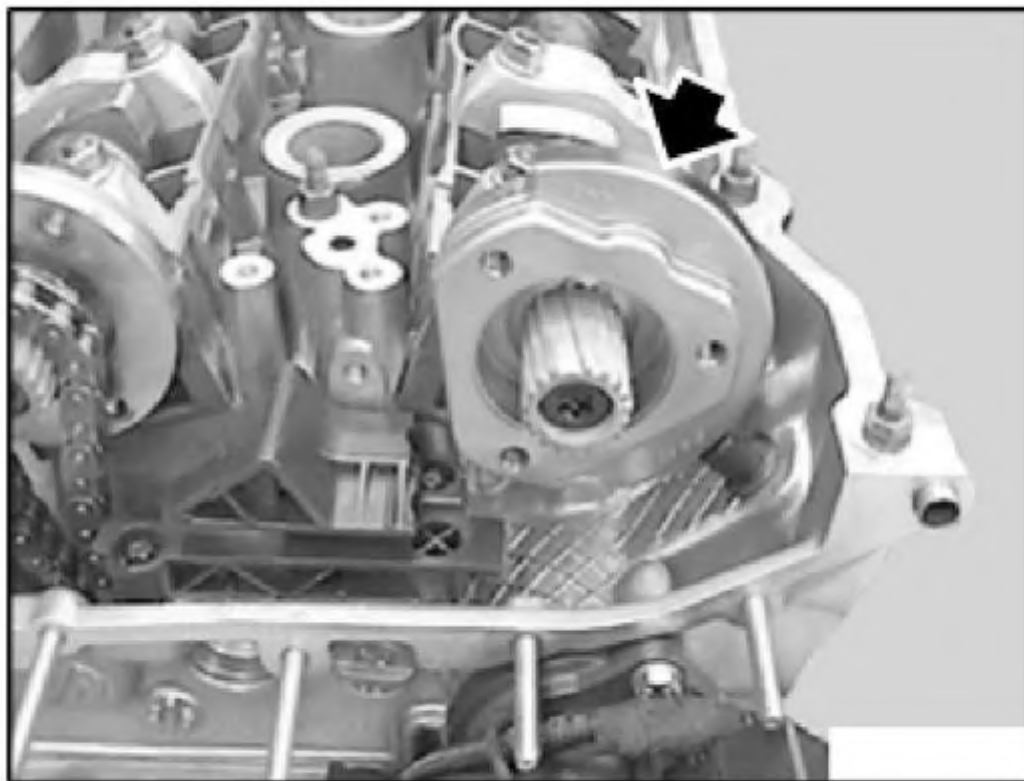
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Fig. 166: Removing Thrust Washer
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sensor gear.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



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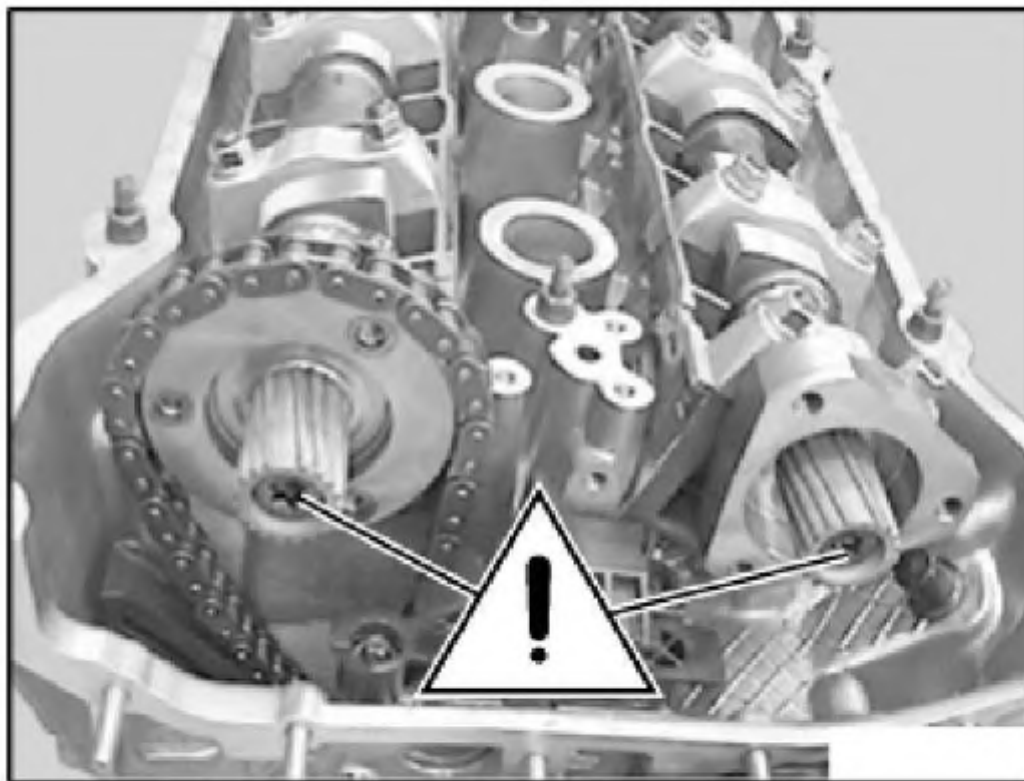
Fig. 167: View Of Sensor Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Do "not" release these screws.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



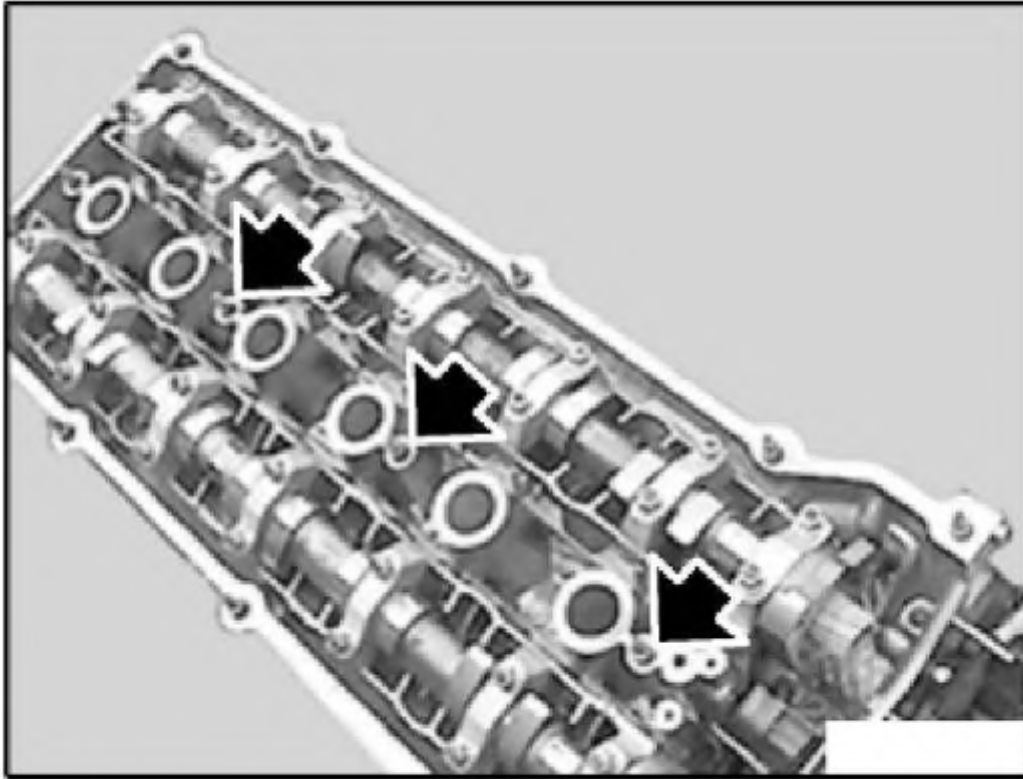
G03230210

Fig. 168: Identifying Screws That Remain Secured
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew studs.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230211

Fig. 169: Locating Studs

Courtesy of BMW OF NORTH AMERICA, INC.

Pull special tool 11 2 300 back until flywheel is no longer secured in position.

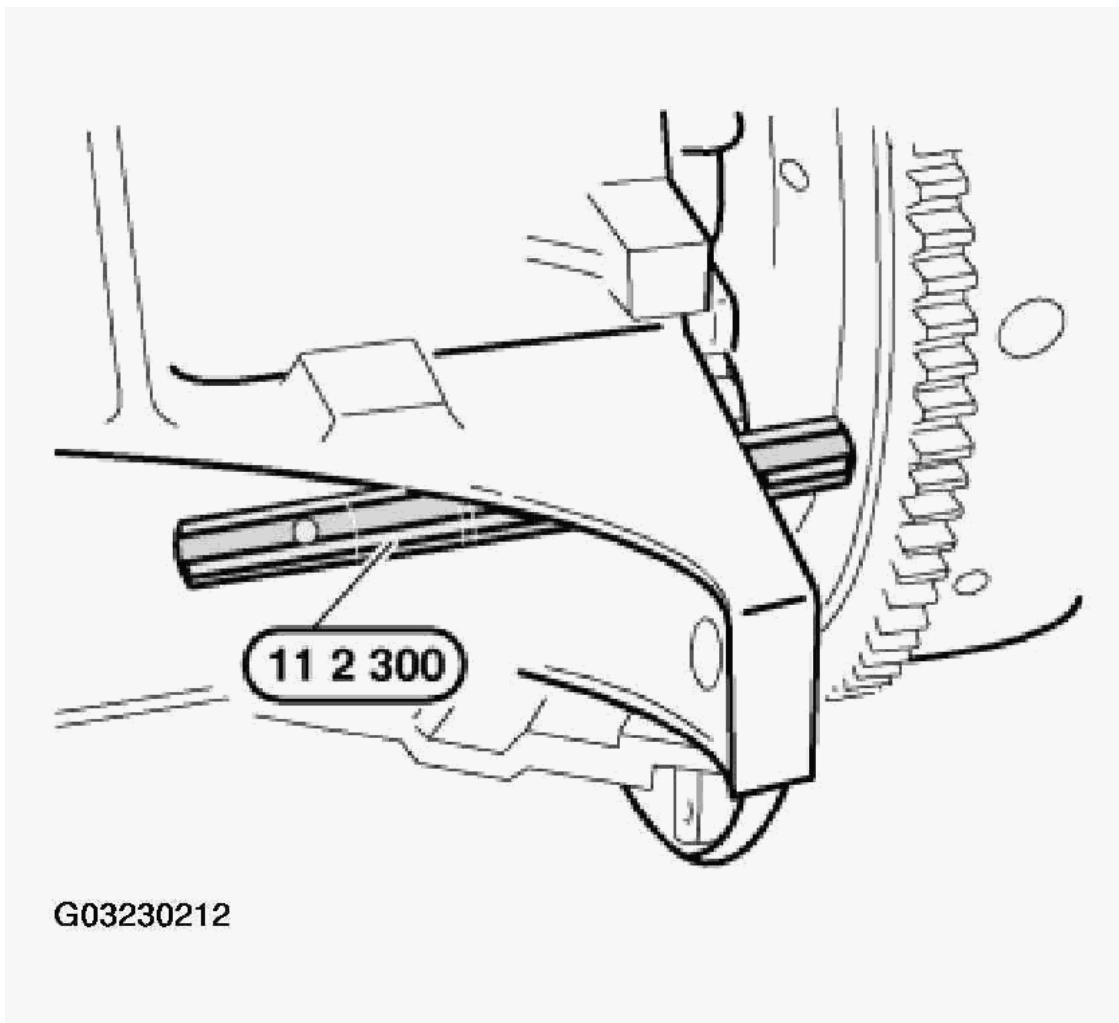


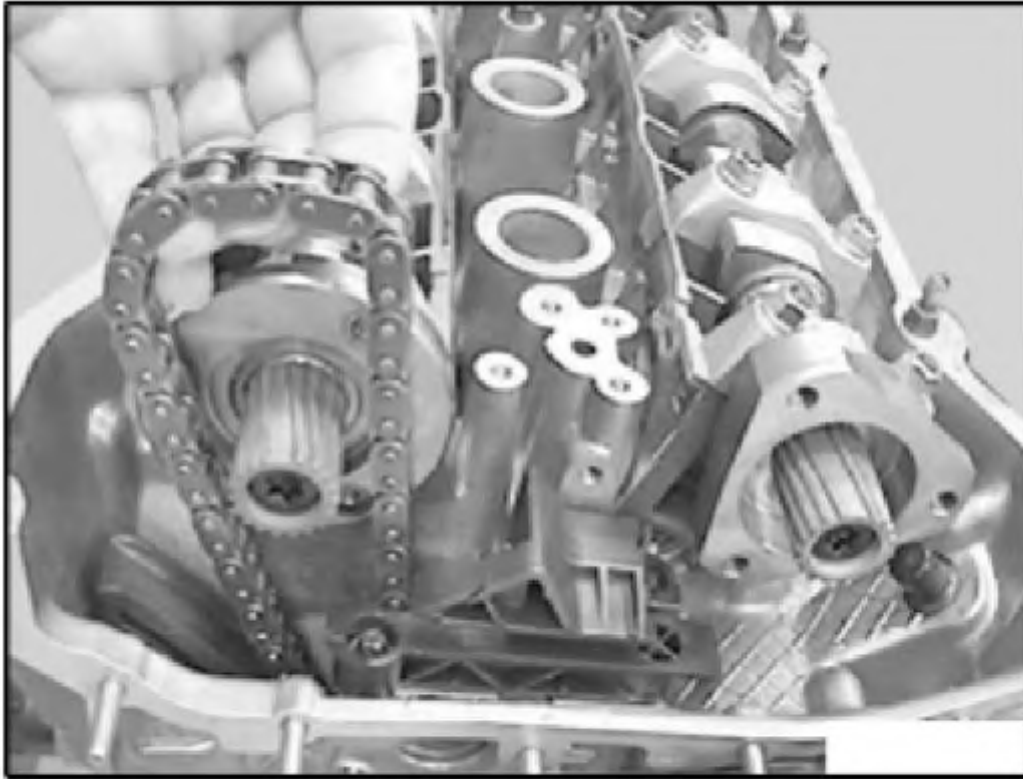
Fig. 170: Securing Flywheel With Plug Mandrel
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

To prevent damaging valves when fitting the camshafts, no pistons should be in TDC position.

Lift timing chain and hold under tension.

Rotate engine against direction of engine rotation approx. 30° using the central bolt.



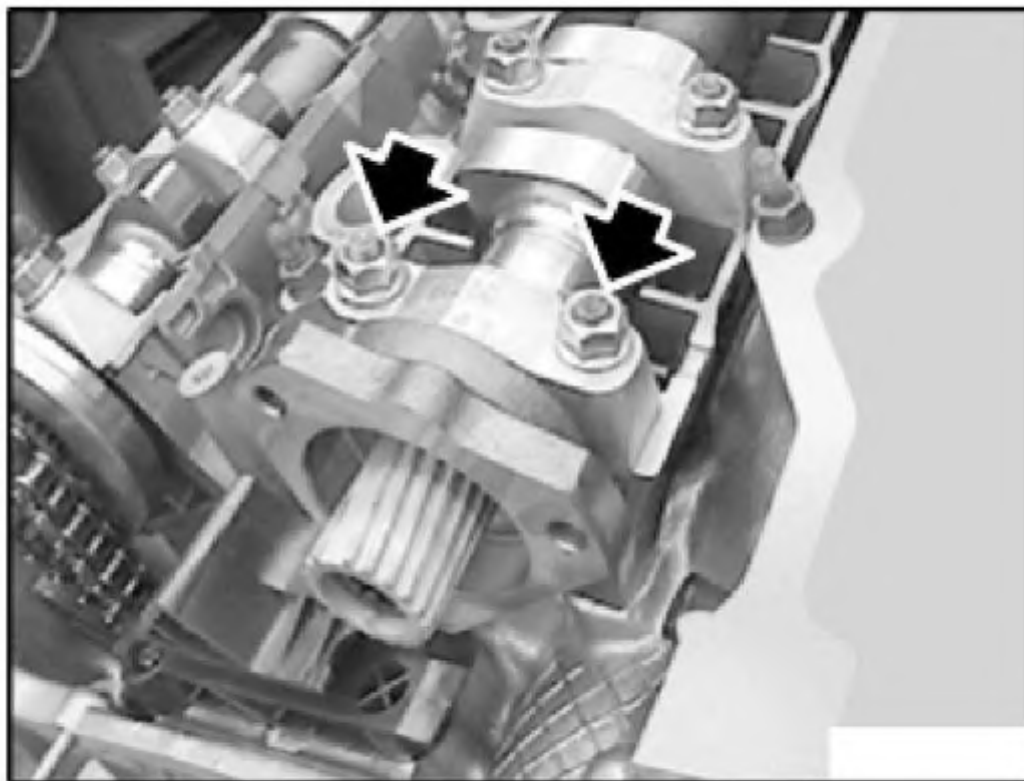
G03230213

Fig. 171: Apply Tension To Lifted Timing Chain
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Bearing cap 1 of inlet camshaft is centered with adapter sleeves.

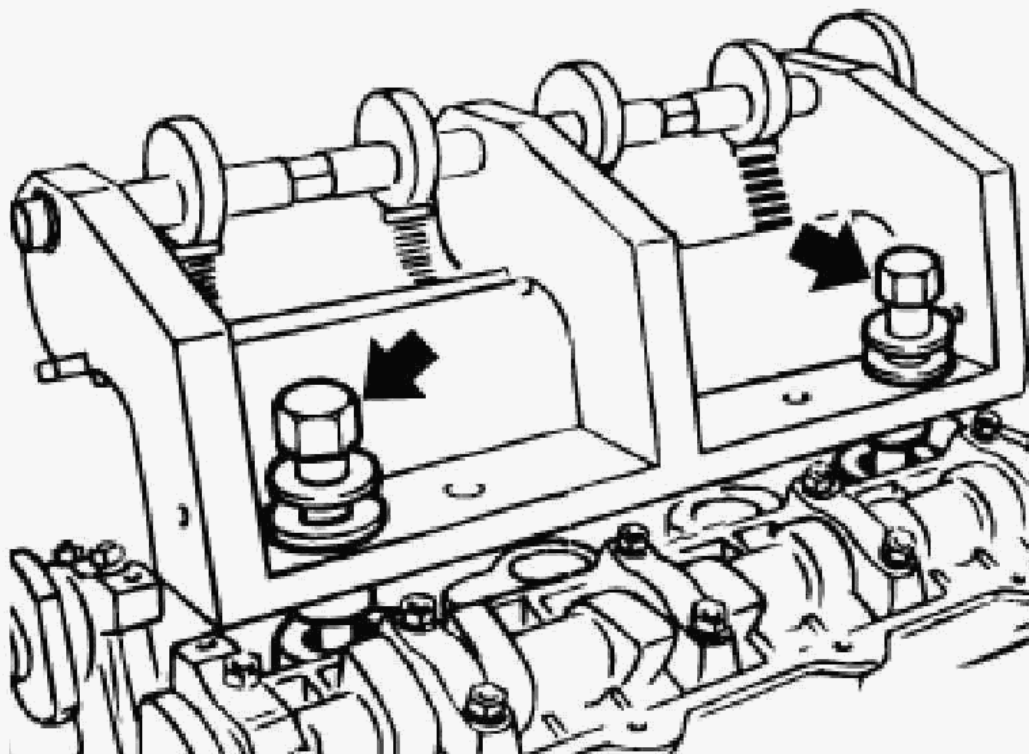
To prevent inlet camshaft from tilting in bearing strip, release nuts and remove bearing cap 1.



G03230214

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

Fit special tool 11 3 260 to cylinder head and screw into spark plug threads in cylinders 1 and 4.

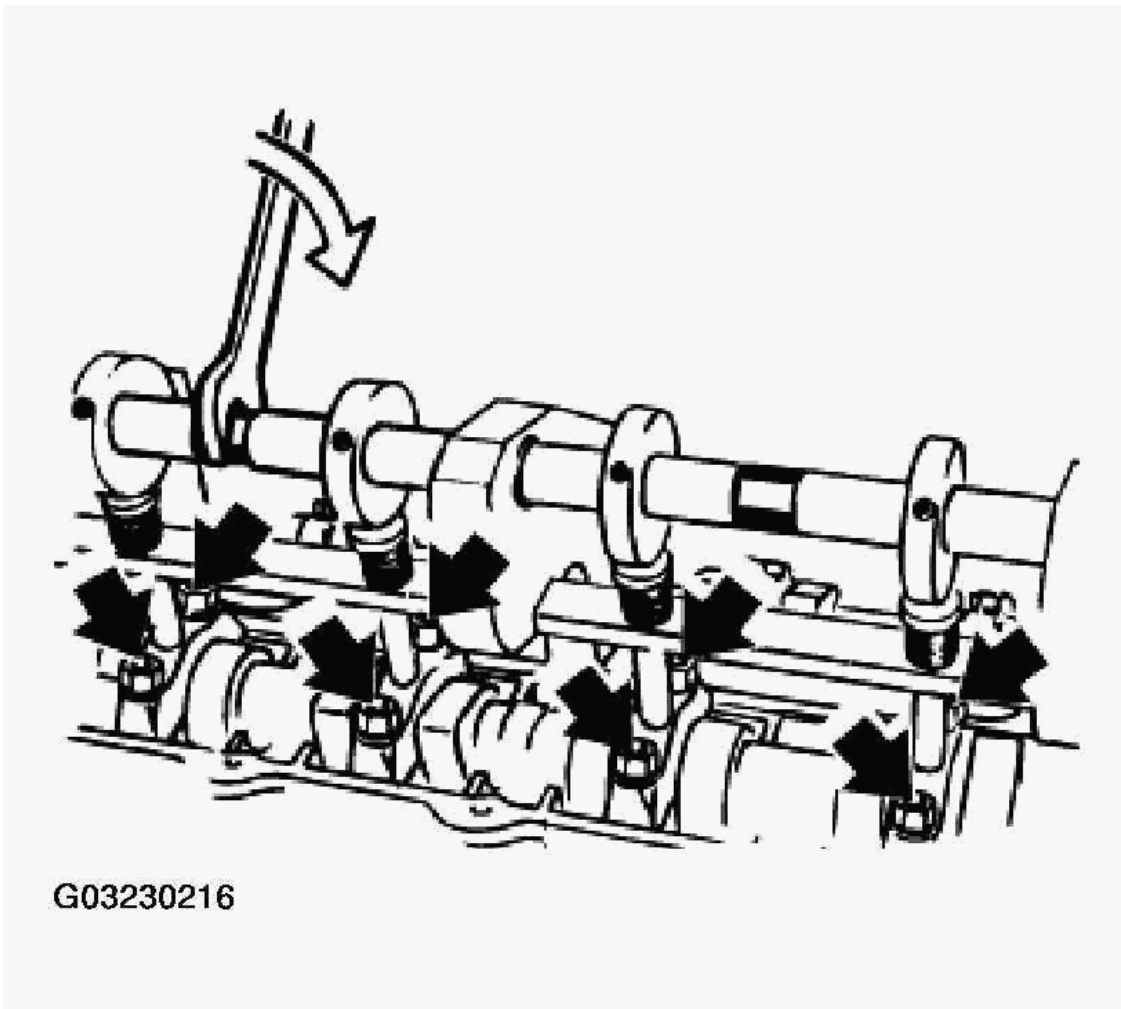


G03230215

Fig. 173: View Of Fixture In Spark Plug Threads
Courtesy of BMW OF NORTH AMERICA, INC.

Turn the eccentric shaft to tension the bearing caps.

Unfasten nuts on bearing cover.



G03230216

Fig. 174: `Locating Nuts On Bearing Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on eccentric shaft and remove special tool 11 3 260 .

Remove bearing covers and place to one side in orderly fashion. Remove camshaft.

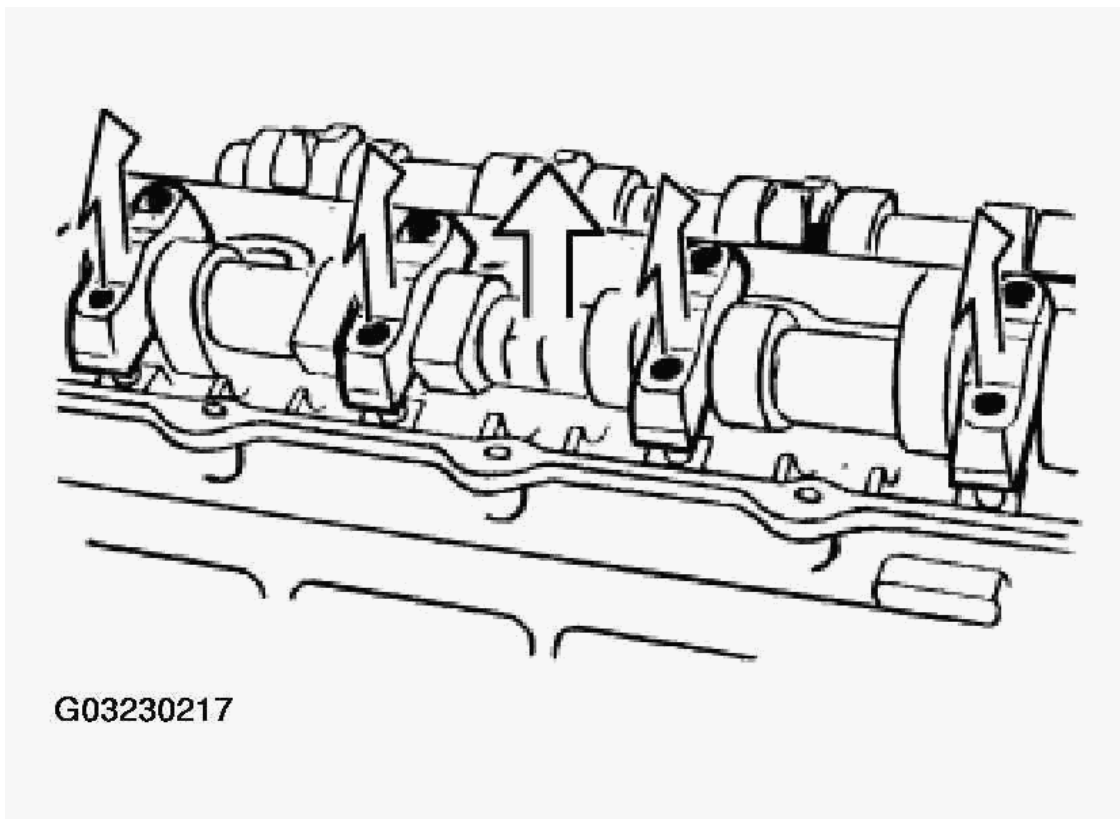


Fig. 175: Removing Camshaft

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If the cylinder head is then to be removed, remove complete bearing strip with bucket tappets.

Locate bucket tappets in bearing strip with special tool 11 3 250 .

Lift out complete bearing strip with bucket tappet.

NOTE: Only re-use used bucket tappets in the same tappet bore.

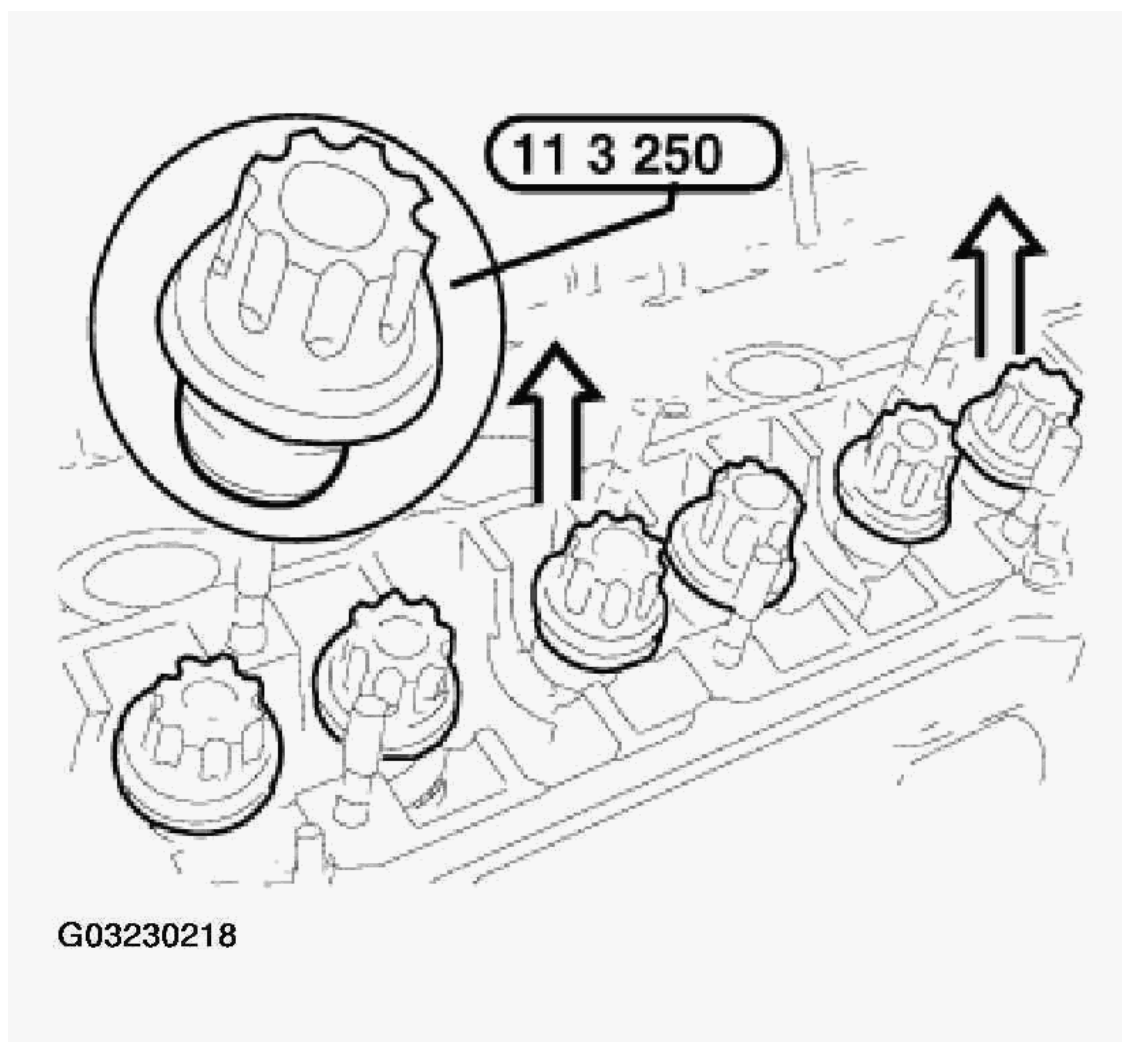


Fig. 176: Removing Bearing Strip With Bucket Tappet
Courtesy of BMW OF NORTH AMERICA, INC.

Check bearing points on bucket tappets for signs of wear (scoring).

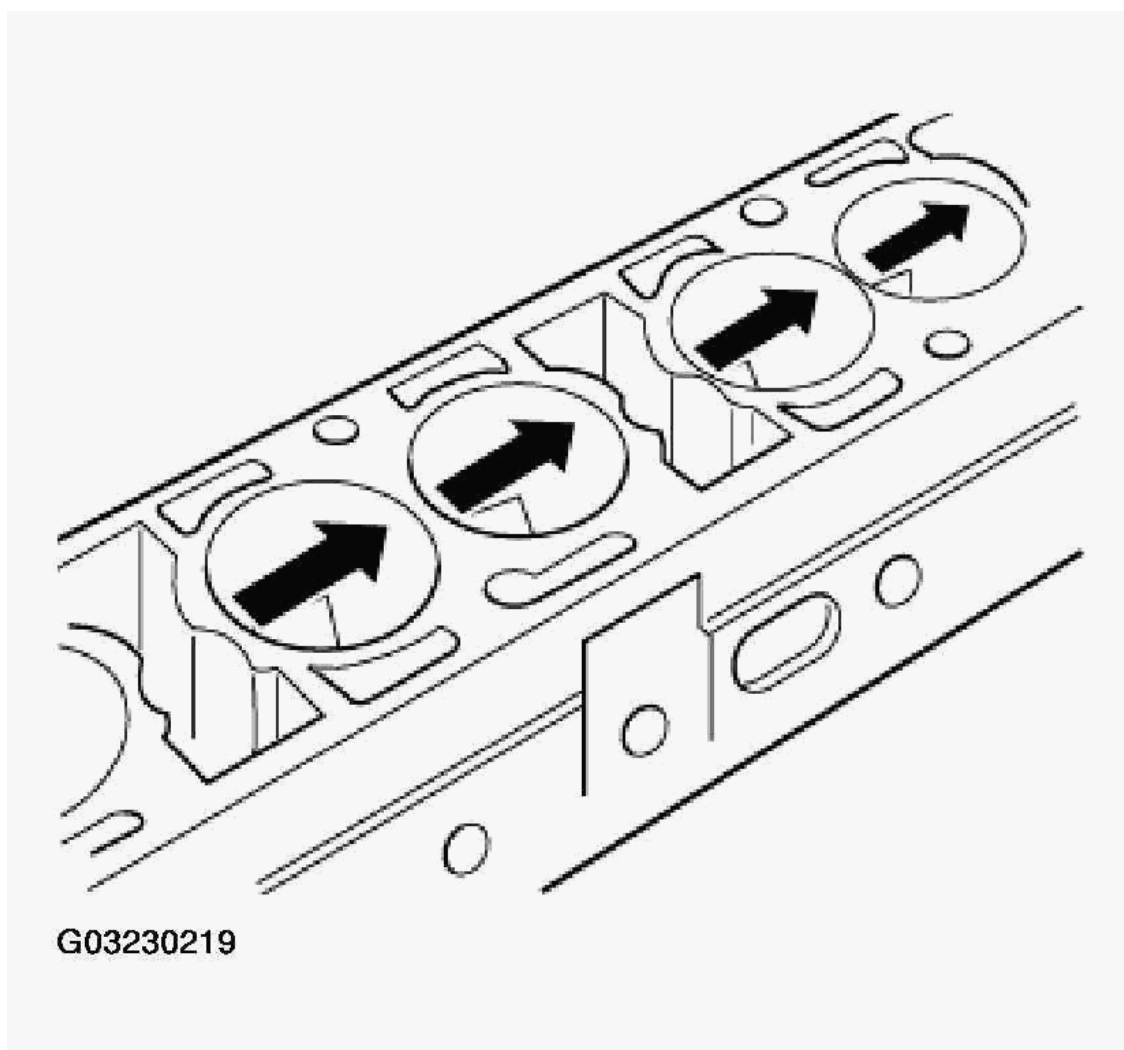
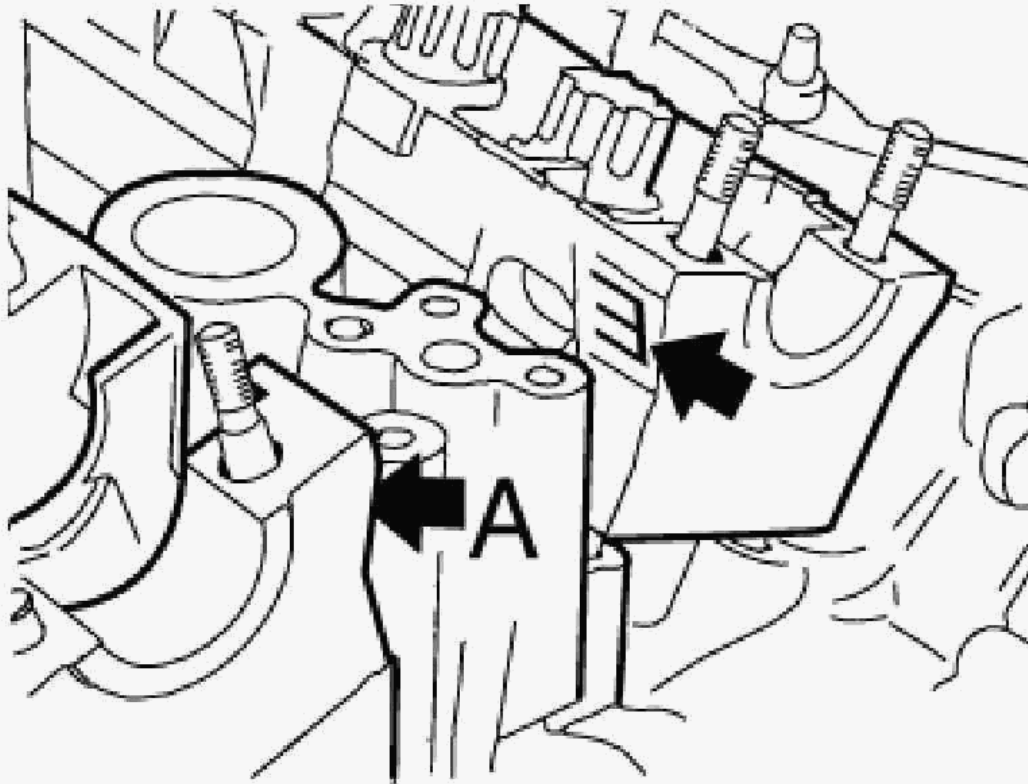


Fig. 177: Checking Bearing Points For Scoring
Courtesy of BMW OF NORTH AMERICA, INC.

Bearing strips are marked "A" for exhaust side and "E" for inlet side.



G03230220

Fig. 178: Locating Bearing Strip Identifying Marks

Courtesy of BMW OF NORTH AMERICA, INC.

Note centering dowels on retaining pins at bearing points 2 and 7.

Install bearing strips.

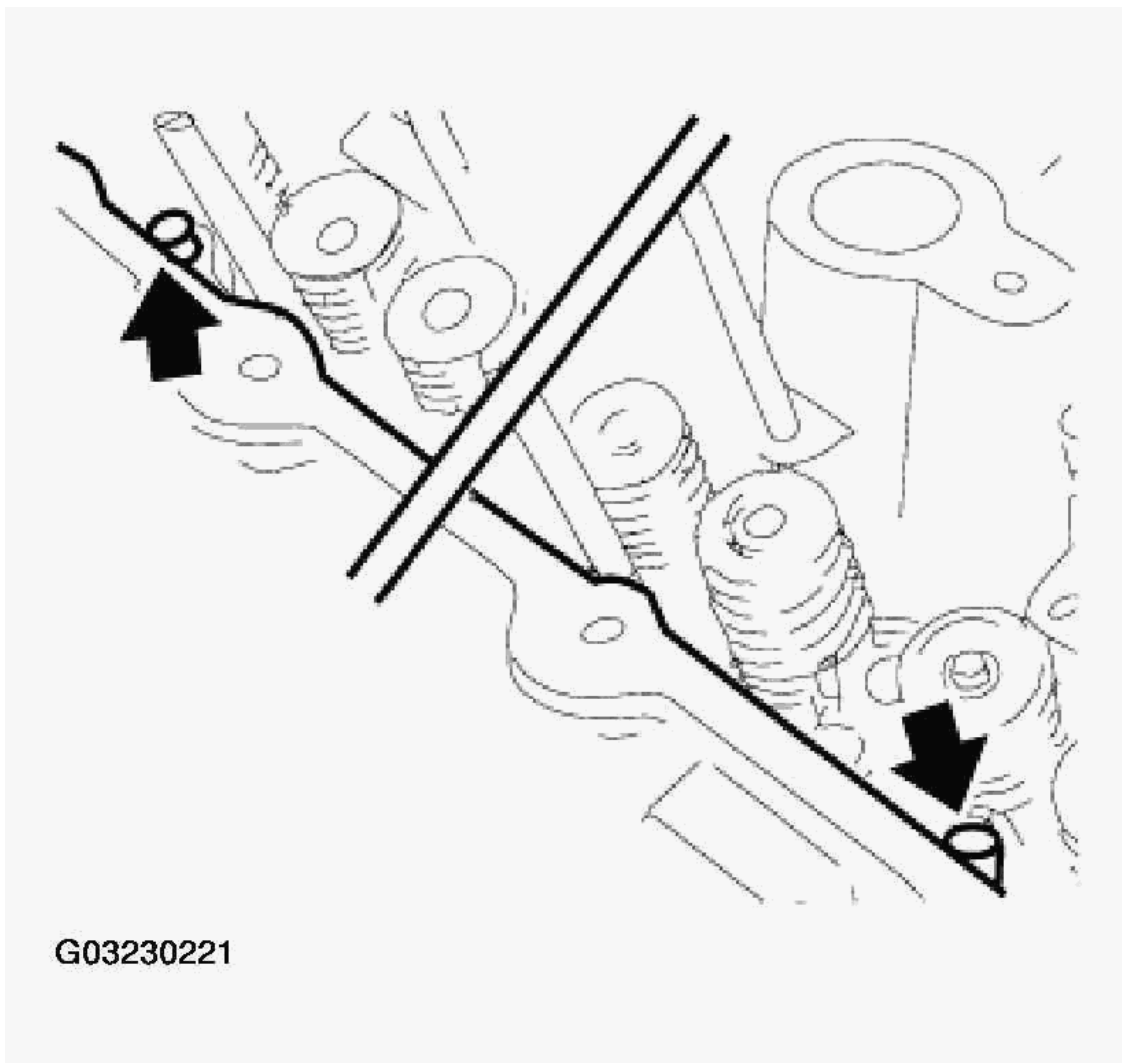


Fig. 179: Installing Bearing Strips

Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Installation of camshafts is described separately from removal.

The assembly sequence for removal and installation is different.

NOTE: Camshafts, bearings and bearing caps, friction washers, all splines on toothed shafts and spline hubs must be oiled before installation.

Important!

The bucket tappets expand when not subjected to load by the camshaft and therefore require some time before they can be pushed back down. During a rapid assembly sequence, the "closed" valves may still be open and be in contact with the piston.

2002 BMW X5

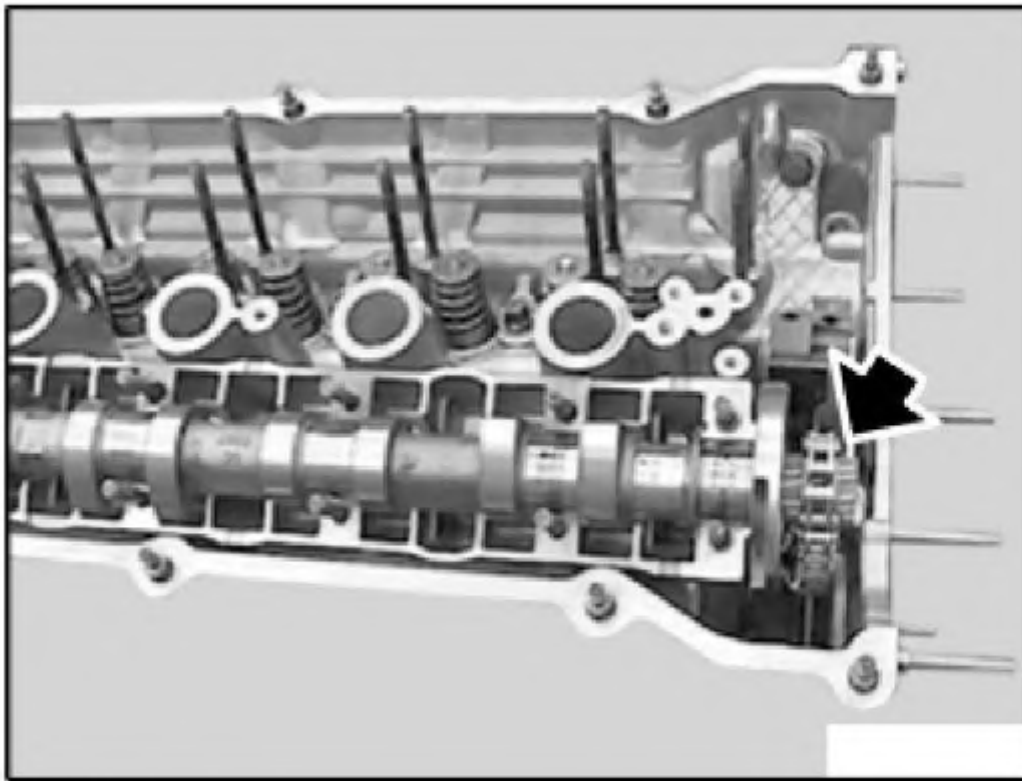
2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

Comply with following waiting periods after installing camshaft and before cranking engine back to TDC position.

- Room temperature (20° C) 4 mins.
- 10° C - 20° C 11 mins.
- 0° C - 10° C 30 mins.

Pull up timing chain and feed in exhaust camshaft.

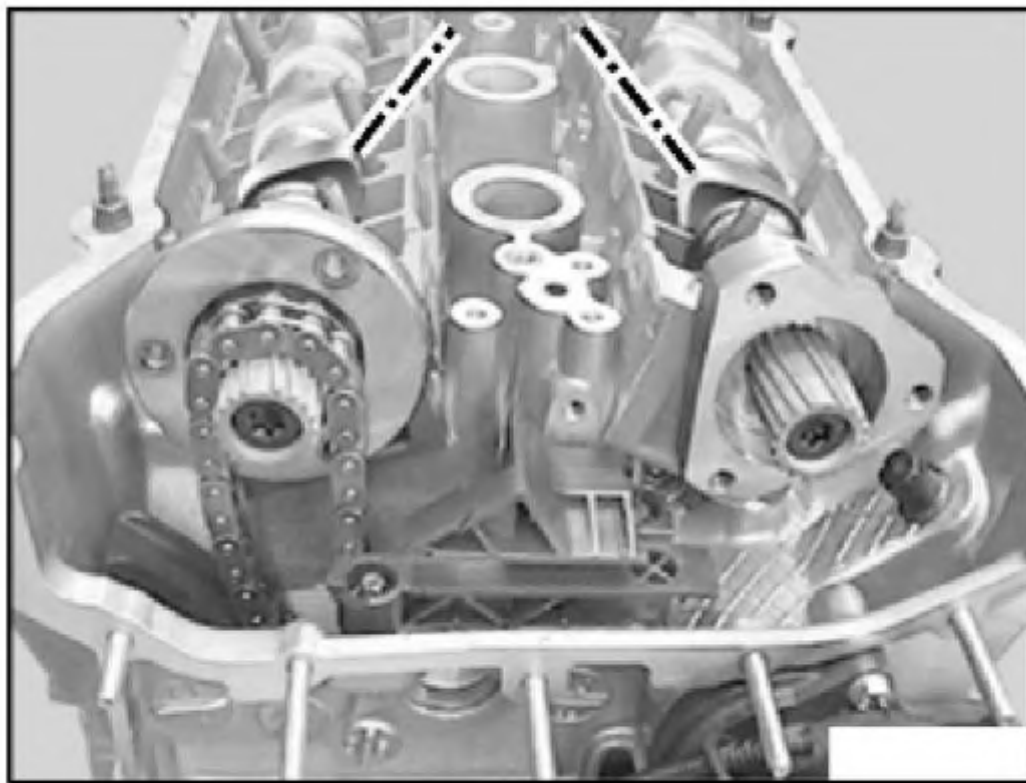
Position timing chain on exhaust camshaft.



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Fig. 180: Positioning Timing Chain On Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Install camshafts so that cam tips on inlet and exhaust valves on 1st cylinder face one another.



G03230223

Fig. 181: Aligning Camshaft Tips

Courtesy of BMW OF NORTH AMERICA, INC.

Fit bearing cover.

NOTE: Bearing caps are marked from exhaust side:

A1 - A7 for exhaust side.

E1 - E7 for inlet side.

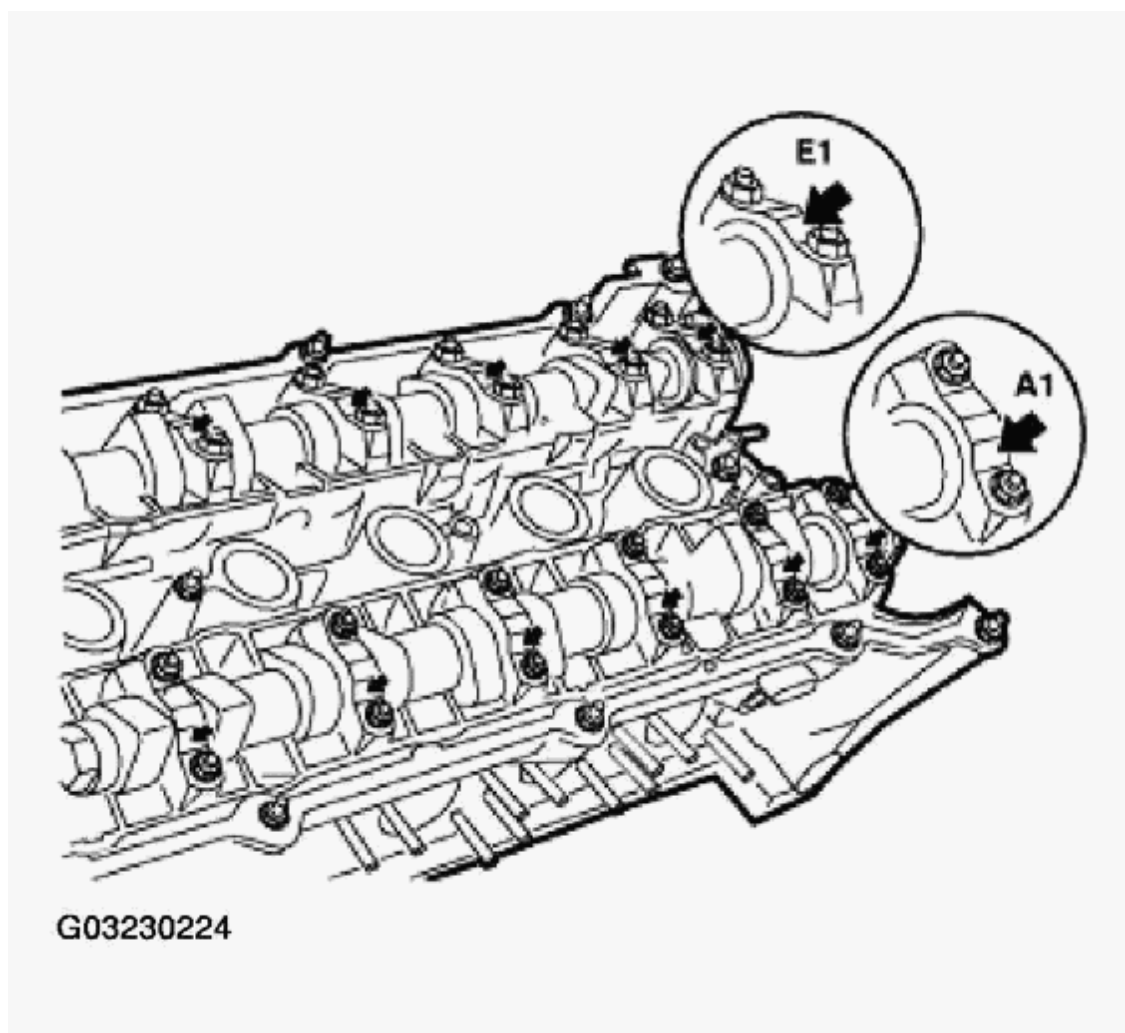


Fig. 182: View Of Bearing Cap Marks

Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 3 260 to cylinder head and screw into spark plug threads in cylinders 1 and 4.

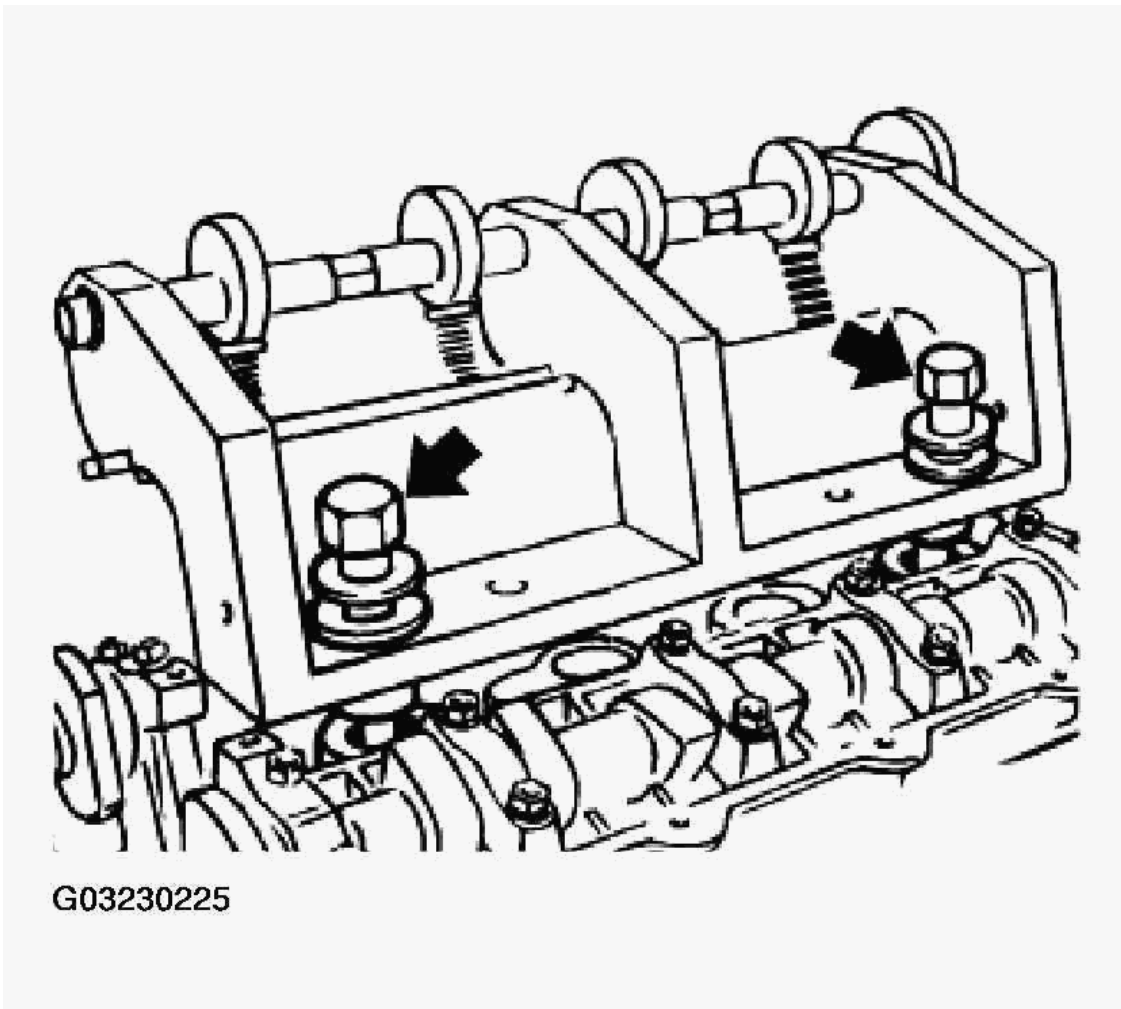


Fig. 183: Identifying Special Tool In Spark Plug Threads
Courtesy of BMW OF NORTH AMERICA, INC.

Turn the eccentric shaft to tension the bearing caps.

Tighten down bearing cover.

Tightening torque, refer to 11 31 1AZ in **ENGINE - TIGHTENING TORQUES** .

Remove special tool 11 3 260 .

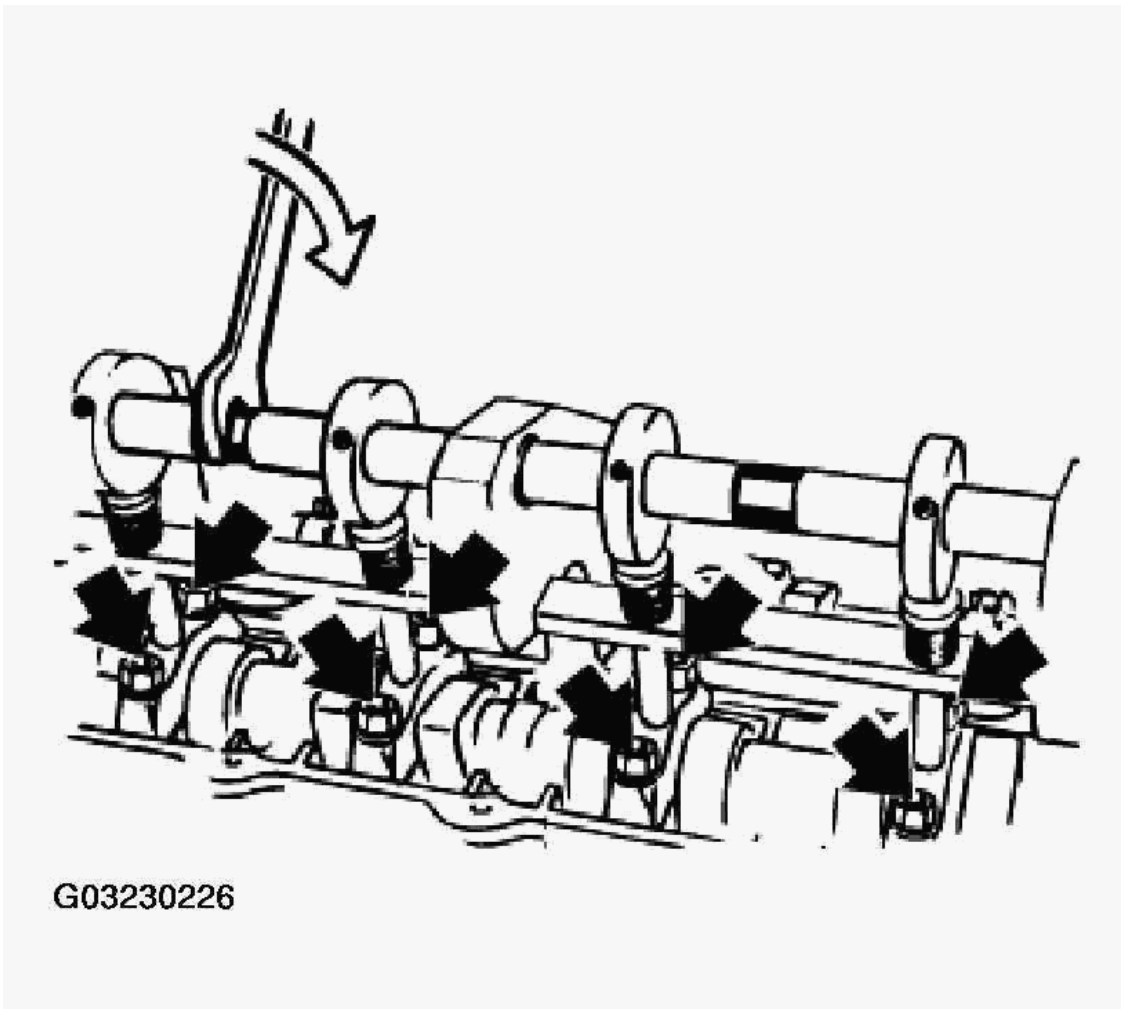


Fig. 184: Installing Bearing Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

Align camshafts with open-end wrench.

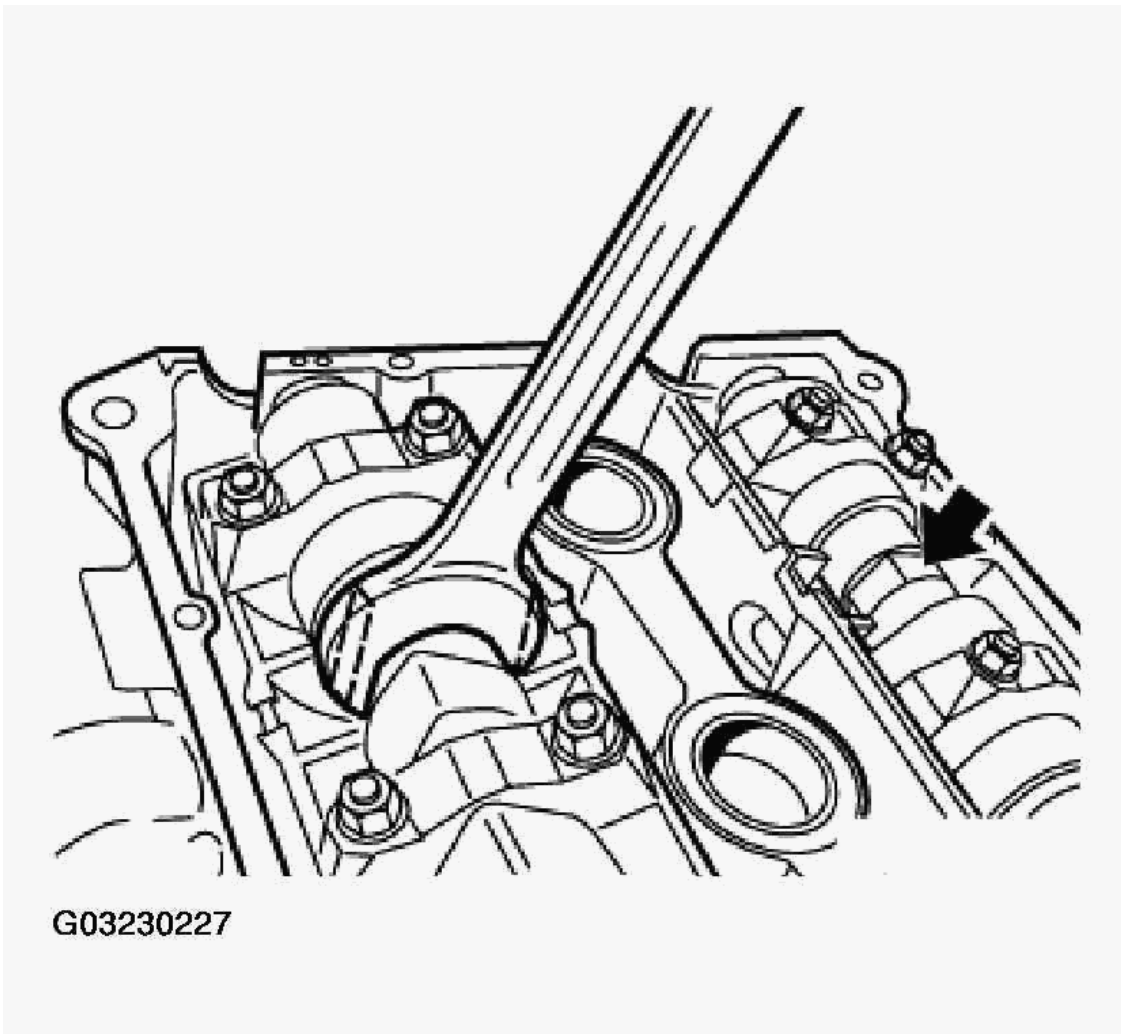
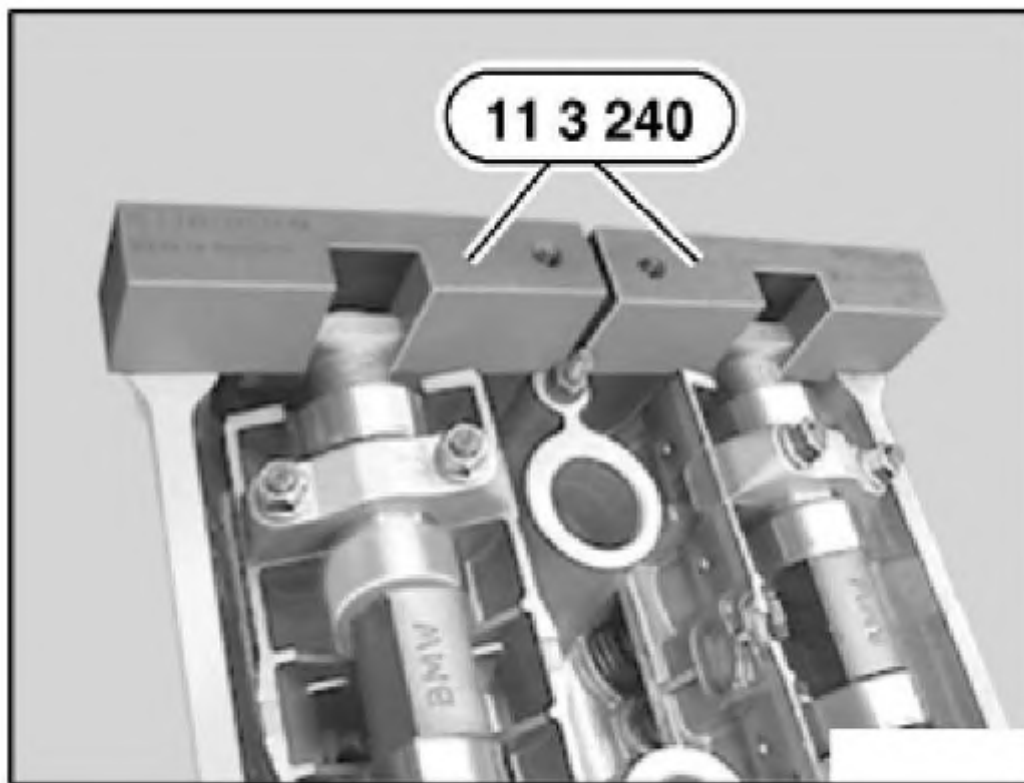


Fig. 185: Aligning Camshafts Using Open-End Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

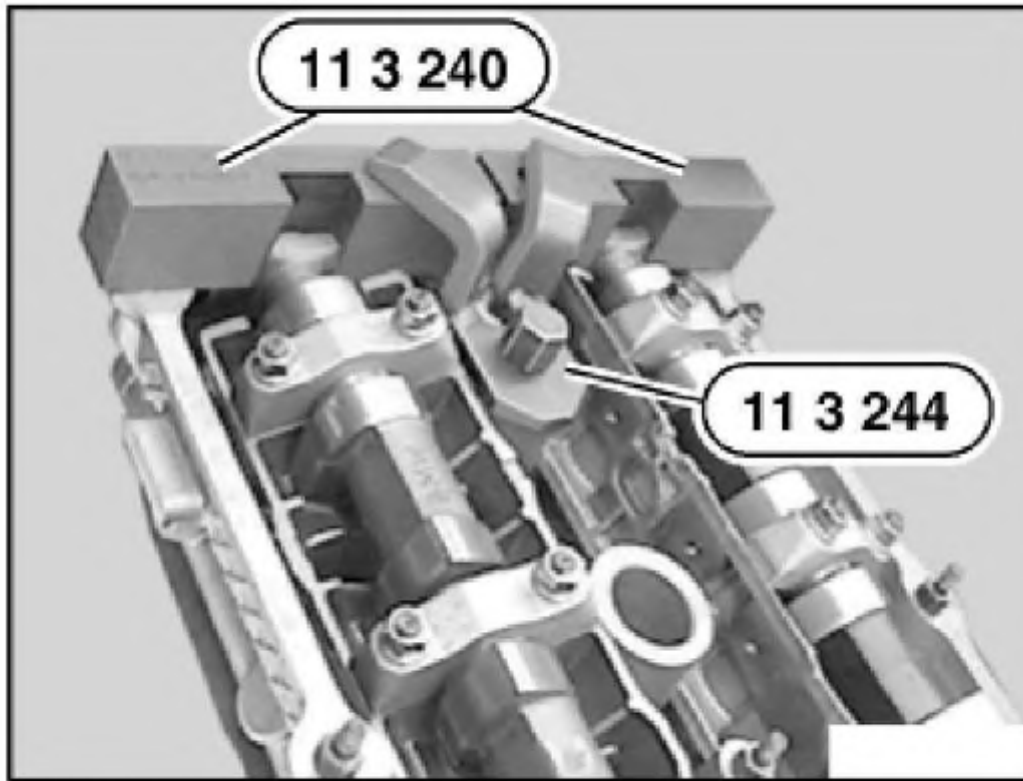
Fit special tool 11 3 240 to camshafts on cylinder 6. Align camshafts so that special tool 11 3 240 rests without gaps on cylinder head.



G03230228

Fig. 186: Securing Camshafts With Locking Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 3 244 to special tool 11 3 240 and locate by way of spark plug thread.



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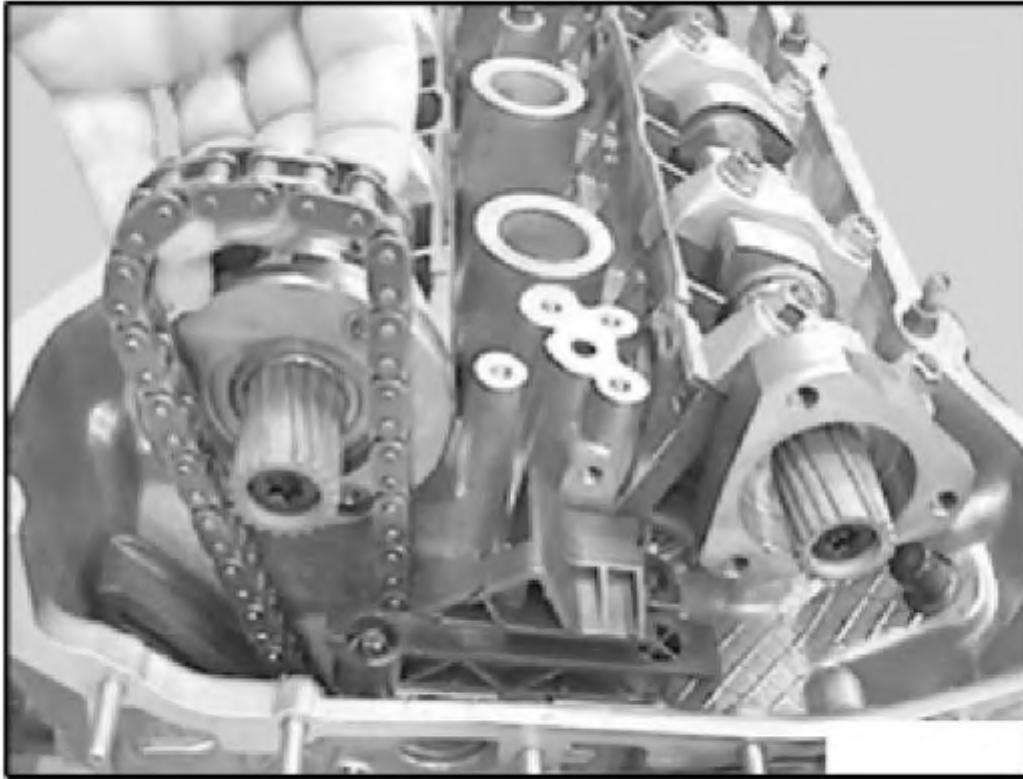
Fig. 187: Locking Camshafts Using Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Lift timing chain and hold under tension.

Turn engine from 30° before TDC position in direction of rotation as far as TDC position.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230230

Fig. 188: Lifting Camchain And Applying Tension
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft in firing TDC position with special tool 11 2 300 .

Important!

Remove special tool 11 2 300 before starting engine.

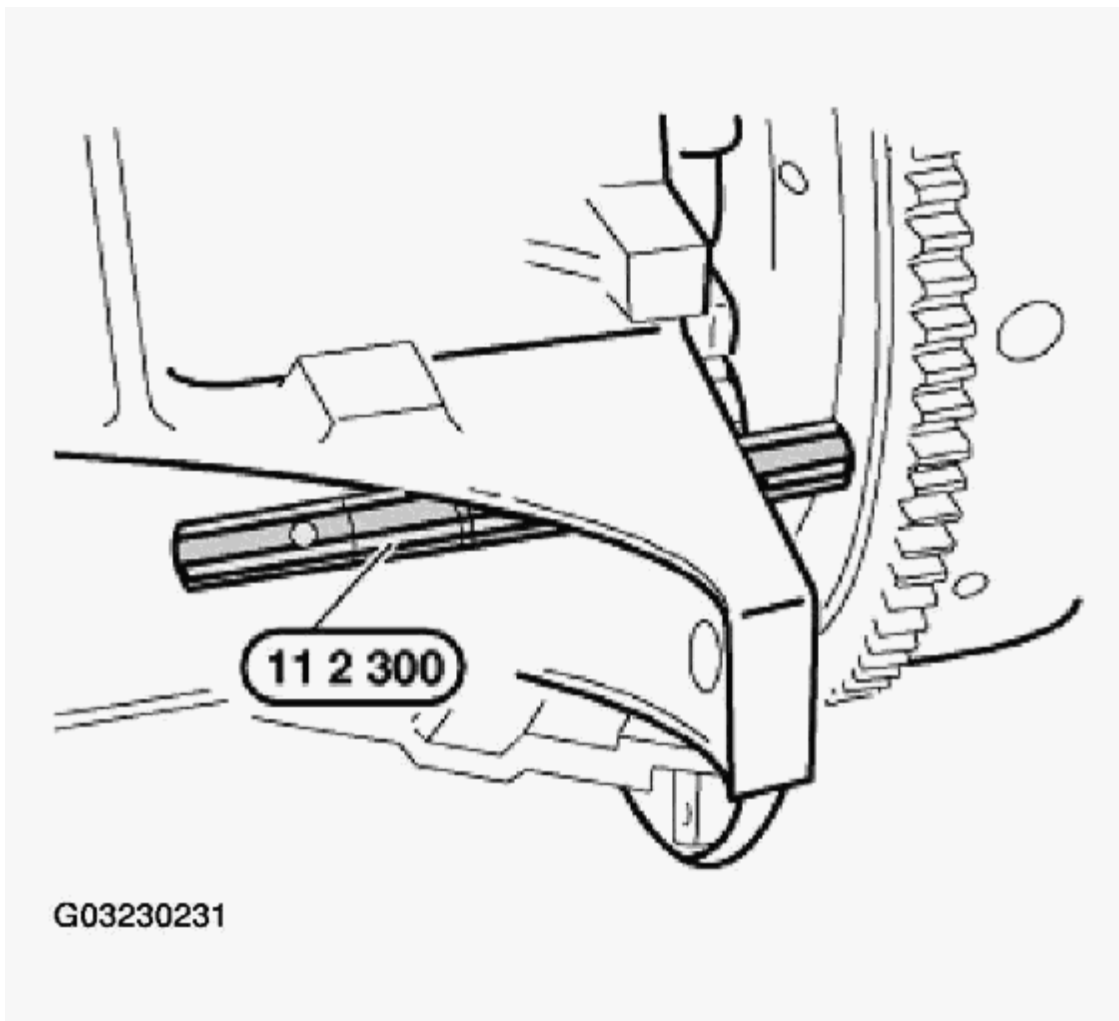


Fig. 189: Removing Plug Mandrel From Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

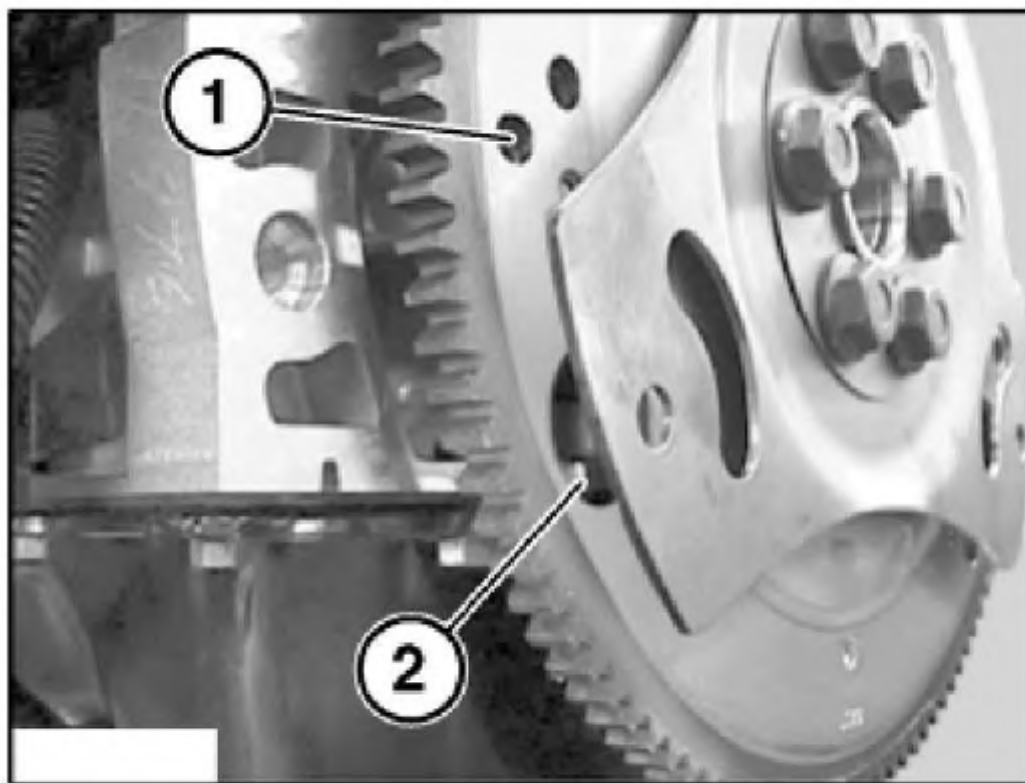
Automatic Transmissions Only:

Illustration does not show automatic transmission.

Important!

On engines with automatic transmissions, there is shortly before the special tool bore (1) a large bore (2) which can be confused with the special tool bore.

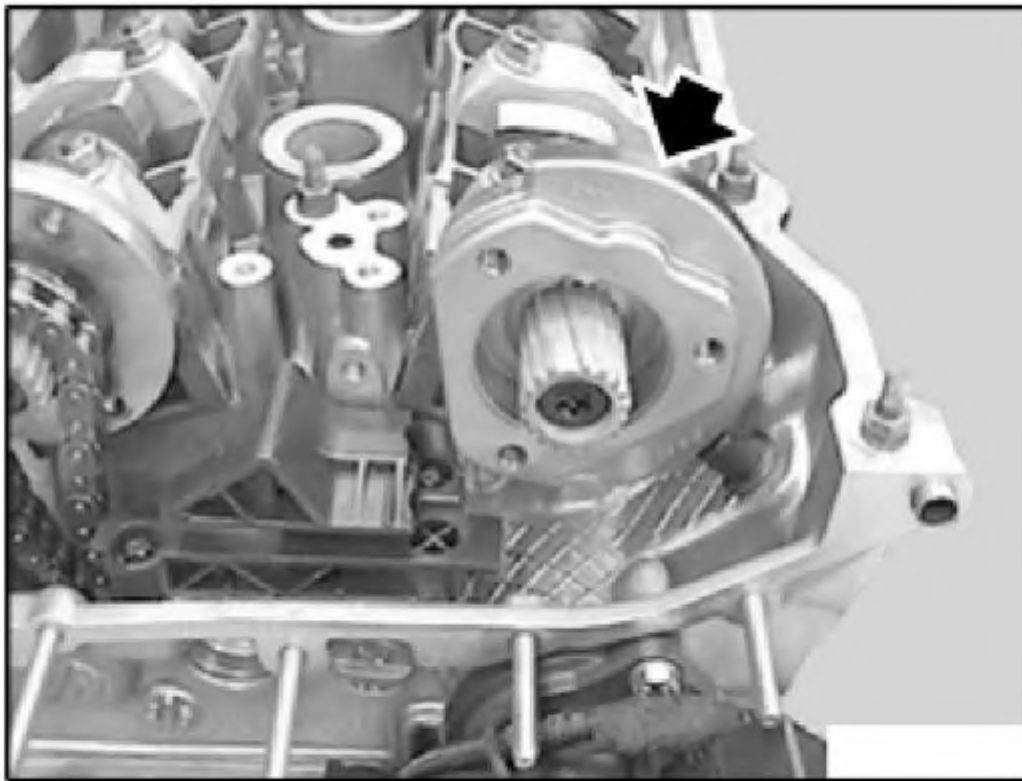
If special tool 11 2 300 is secured in the correct bore (1), the engine can no longer be cranked at the central bolt.



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Fig. 190: Identifying Large Bore And Special Tool Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Position sensor gear on inlet camshaft.



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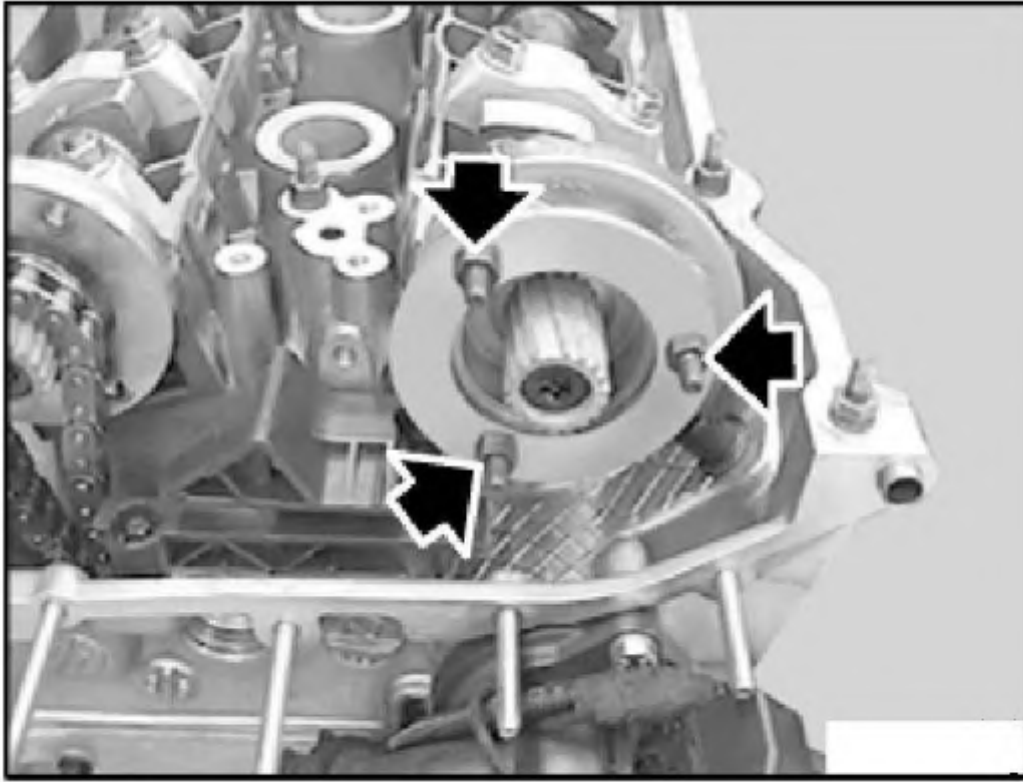
Fig. 191: Positioning Sensor Gear On Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Fit thrust washer and tighten down with dowels.

Tightening torque, refer to 11 31 11AZ in **ENGINE - TIGHTENING TORQUES** .

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230234

Fig. 192: Installing Thrust Washer

Courtesy of BMW OF NORTH AMERICA, INC.

Feed chain wheel onto timing chain so that arrow on chain wheel faces separating face of upper side of cylinder head.

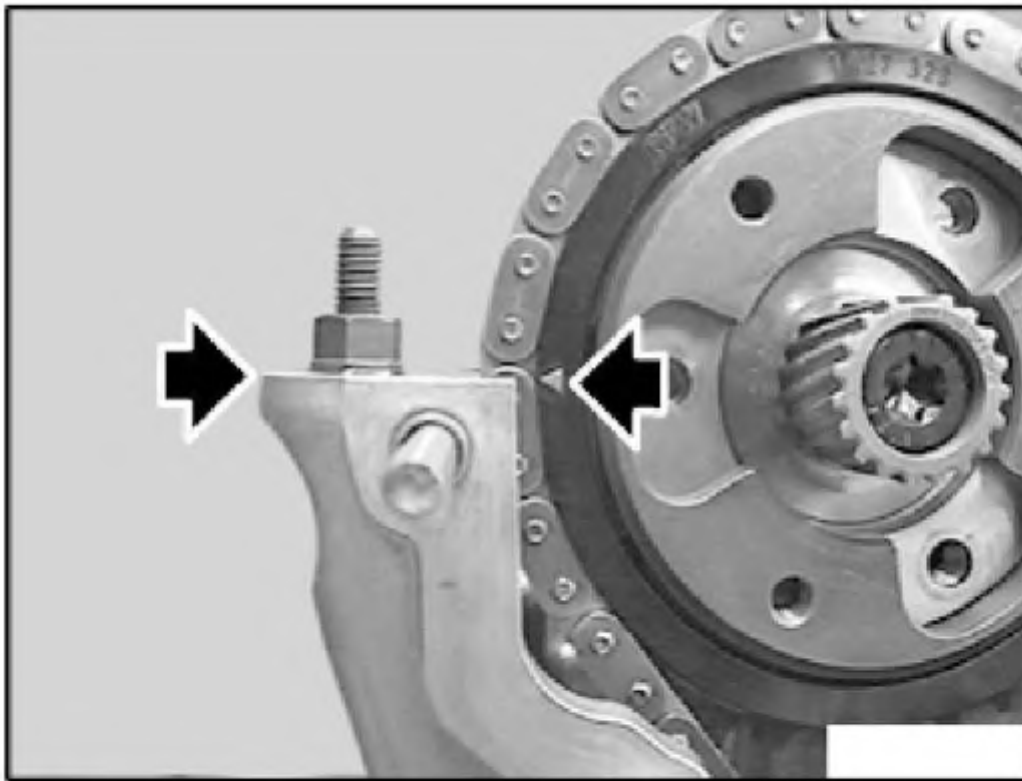
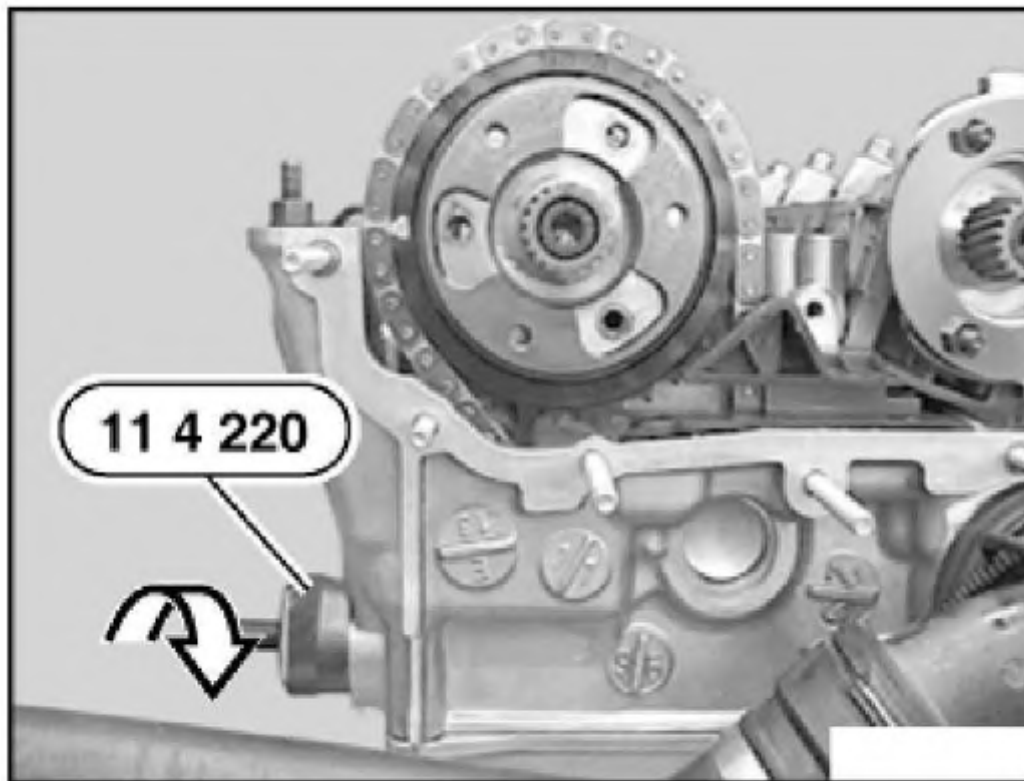
**G03230235**

Fig. 193: Aligning Arrow On Chain Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 4 220 in cylinder head and bring adjustment screw into contact with tensioning rail, but do not pretension timing chain yet.

Check arrow on chain wheel to separating face of upper side of cylinder head, reposition chain wheel if necessary.

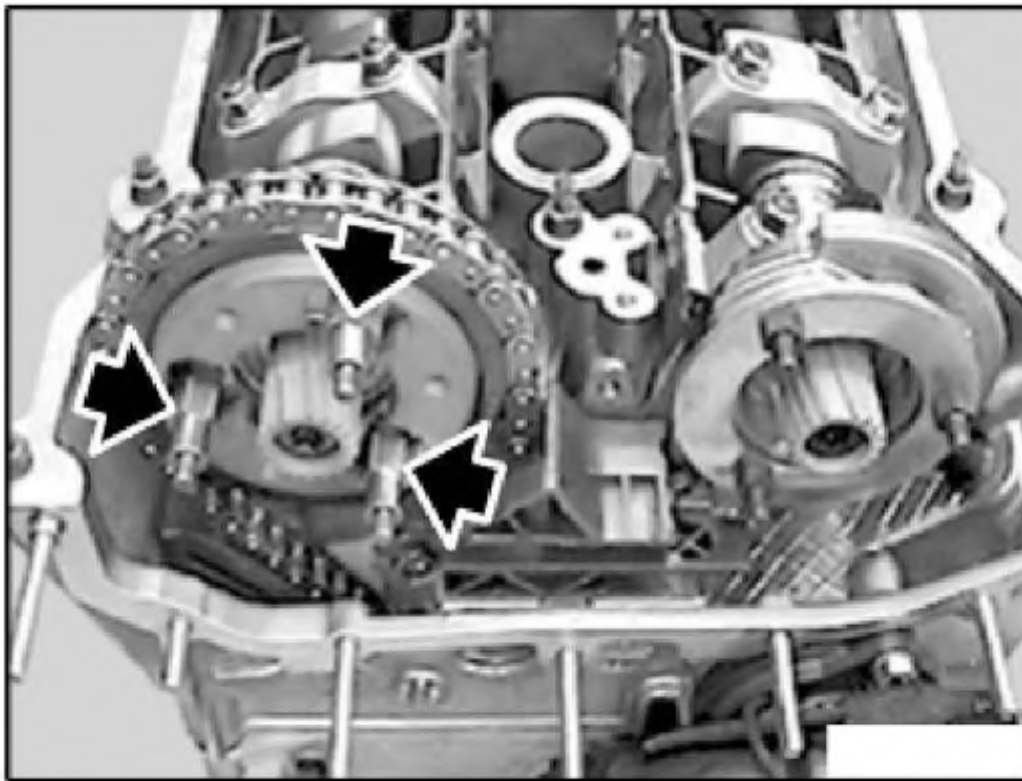


G03230236

Fig. 194: Installing Special Tool In Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Insert and tighten down screw-in pin.

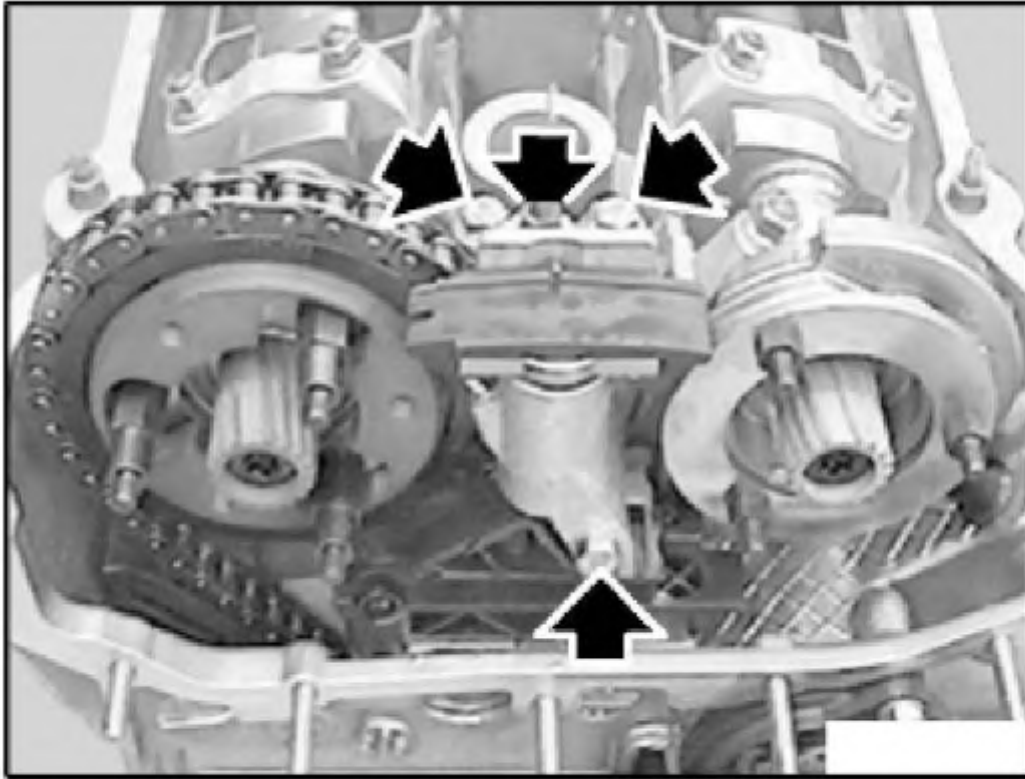
Tightening torque, refer to 11 31 11AZ in **ENGINE - TIGHTENING TORQUES** .



G03230237

Fig. 195: Installing Screw-In Pin
Courtesy of BMW OF NORTH AMERICA, INC.

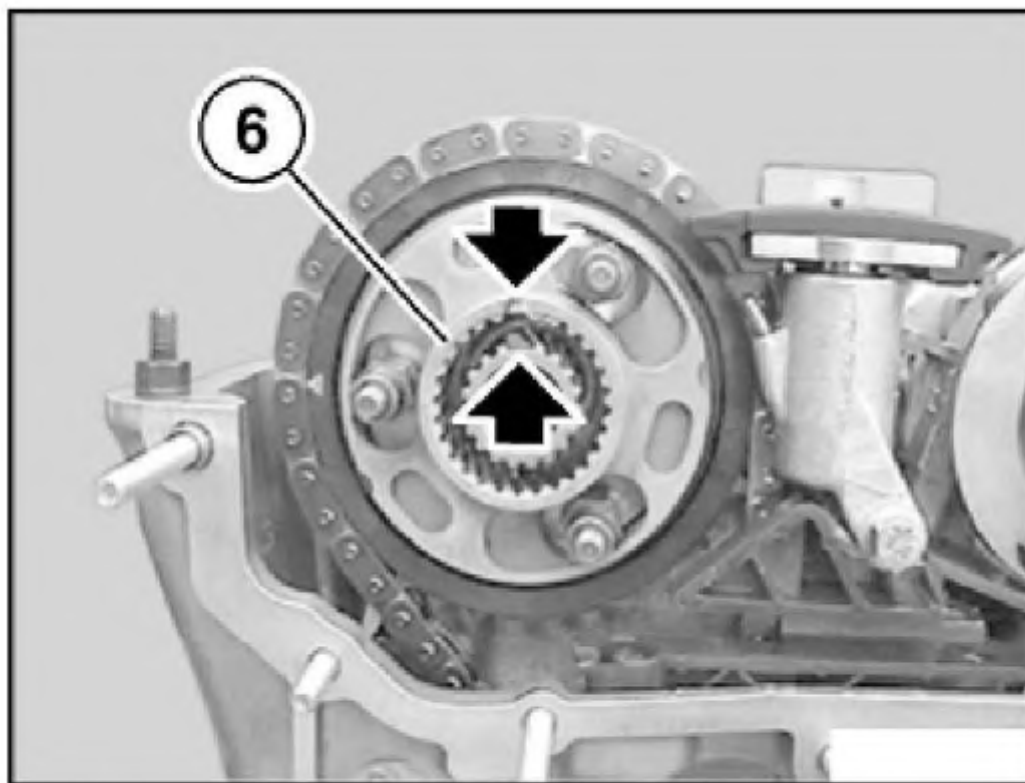
Install secondary chain tensioner.



G03230238

Fig. 196: Installing Secondary Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Fit toothed sleeve (6) and align to toothed shaft in camshaft so that tooth gaps are opposed.

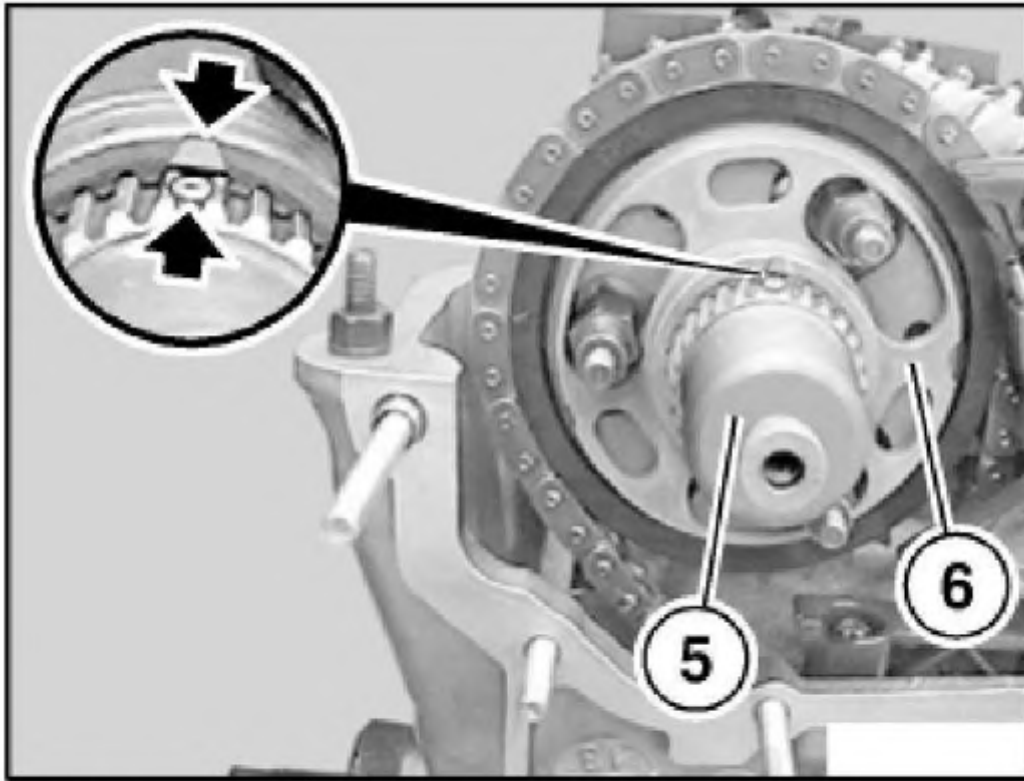


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Fig. 197: Aligning Toothed Sleeve To Toothed Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Secure toothed shaft (5).

Insert pin of toothed shaft (5) into tooth gaps of splines on camshaft and toothed sleeve (6).



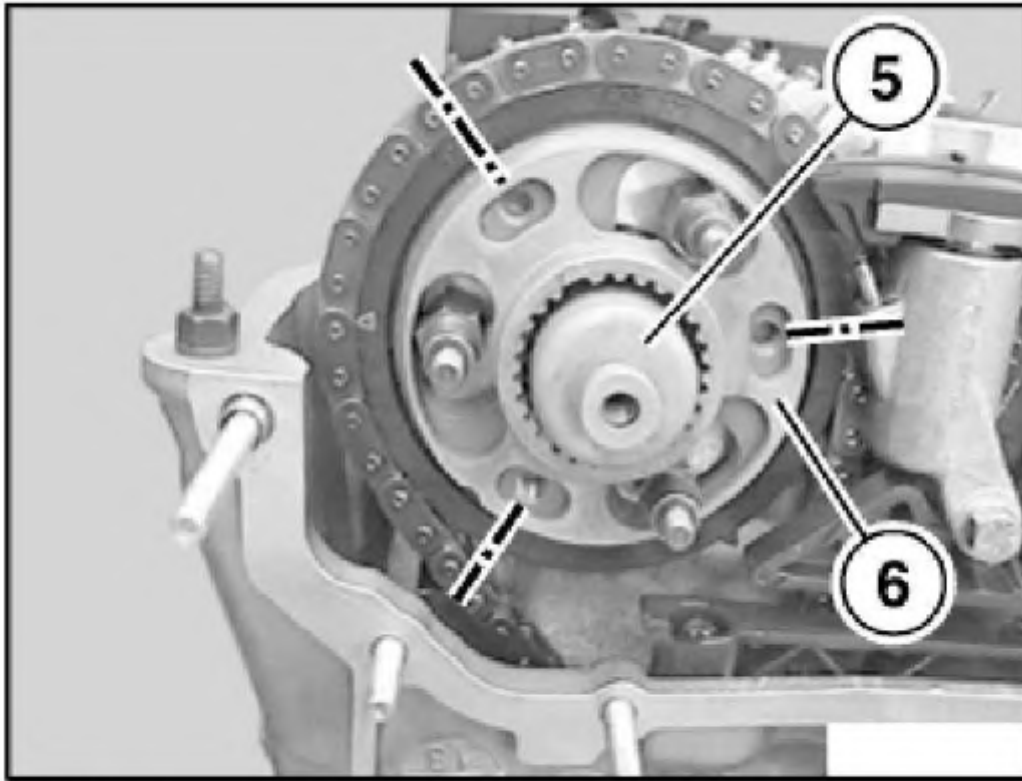
G03230240

Fig. 198: Inserting Pin Of Toothed Shaft Into Tooth Gaps Of Splines
Courtesy of BMW OF NORTH AMERICA, INC.

Push in toothed shaft (5) until the longitudinal holes in the toothed sleeve (6) are positioned centrally with respect to the thread.

2002 BMW X5

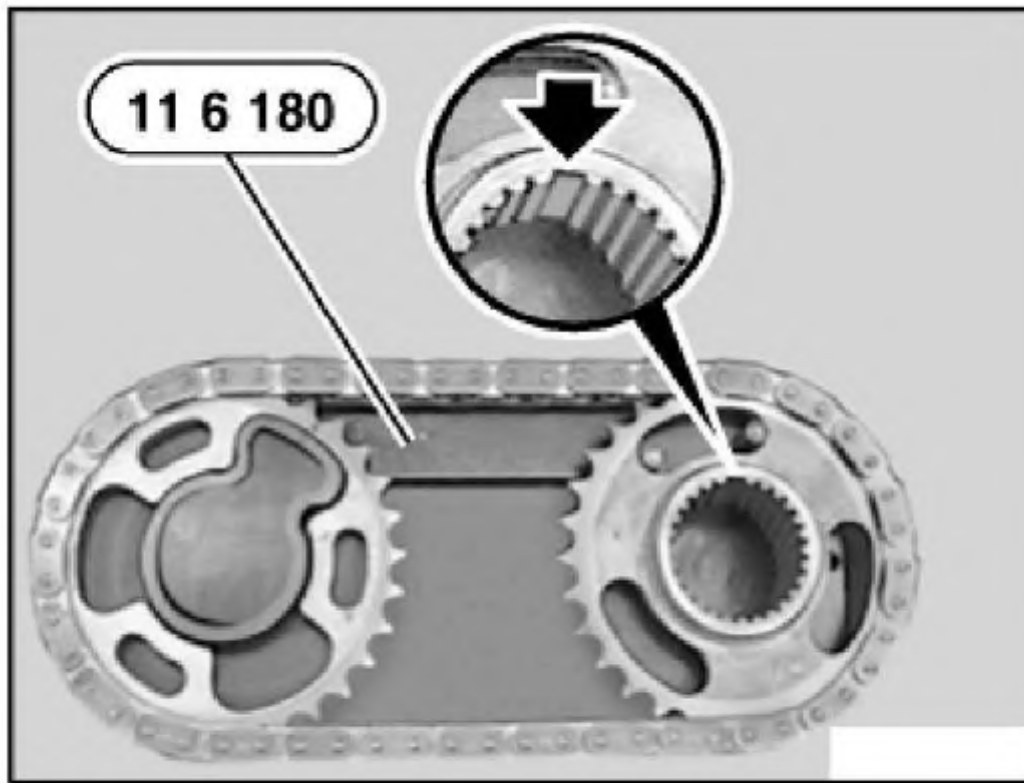
2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230241

Fig. 199: Positioning Toothed Shaft With Holes In Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Place chain wheels in special tool 11 6 180 , position tooth gap on inlet chain wheel as shown in illustration and feed on chain.



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Fig. 200: Aligning Tooth Gap On Inlet Chain Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

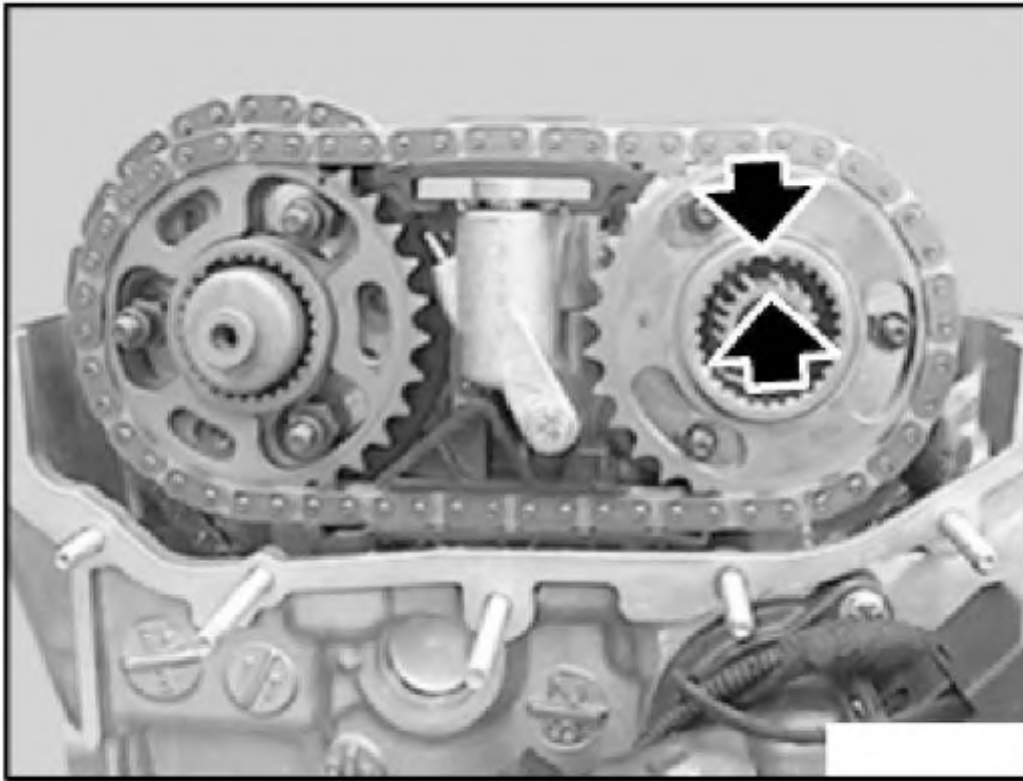
Important!

Do not alter position of chain wheels with respect to chain when removing from special tool 11 6 180 .

Remove chain with sprocket wheels positioned from special tool 11 6 180 and so that tooth spaces oppose each other on inlet side.

2002 BMW X5

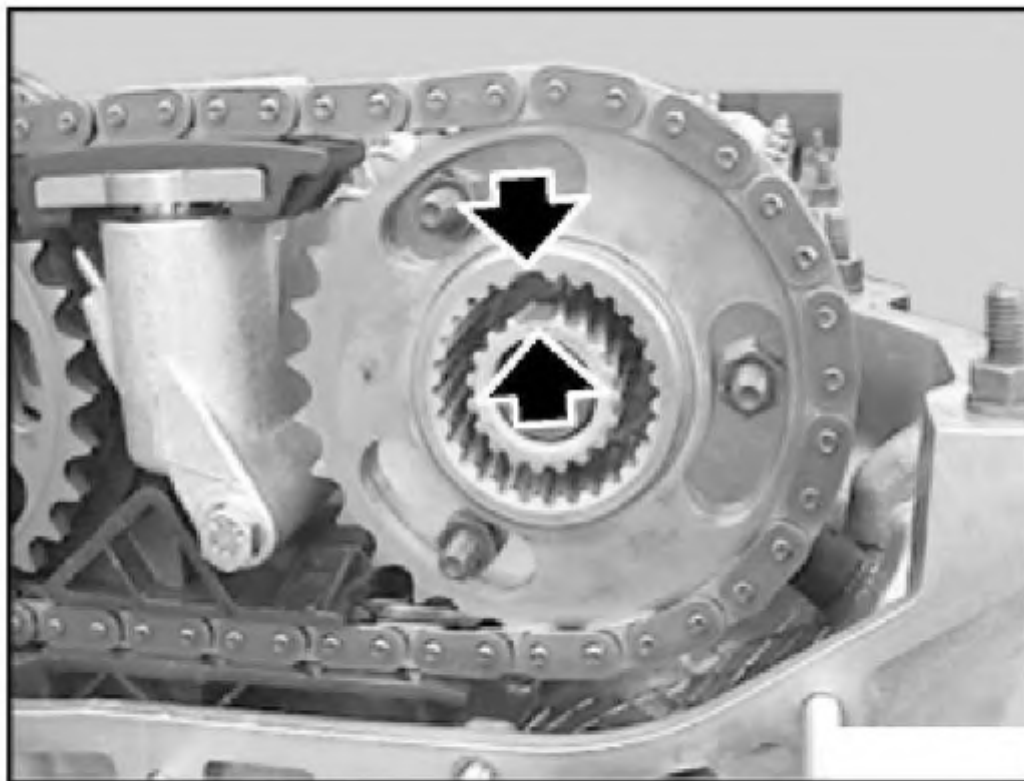
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G03230243

Fig. 201: Identifying Chain Wheels With Tooth Spaces Positioned Opposite Each Other
Courtesy of BMW OF NORTH AMERICA, INC.

Align chain with sprocket wheels so that tooth spaces are positioned exactly over each other on inlet side.

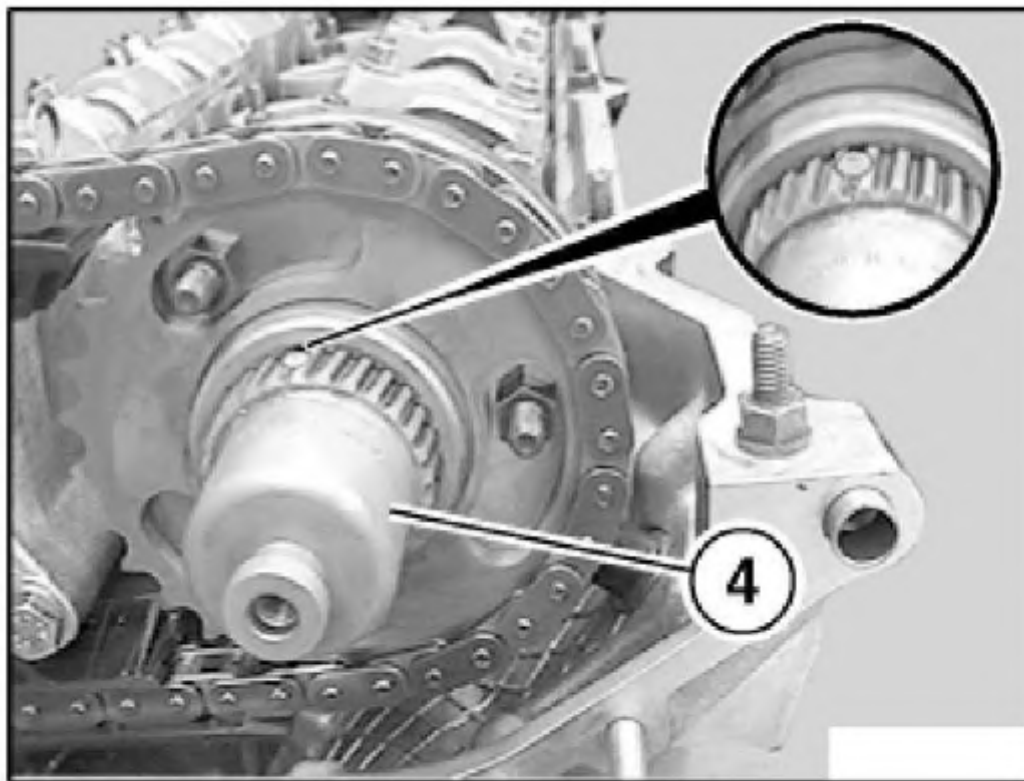


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Fig. 202: Alignment Of Tooth Spaces On Chain With Sprocket Wheels
Courtesy of BMW OF NORTH AMERICA, INC.

Secure toothed shaft (4).

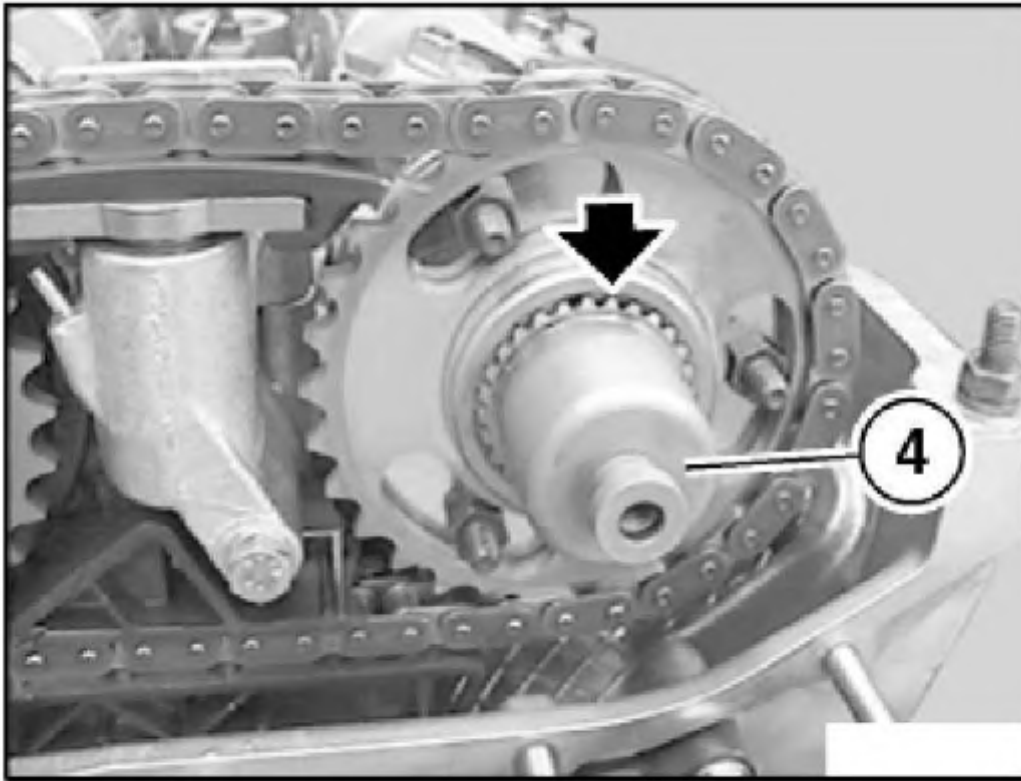
Insert pin of toothed shaft (4) into tooth gaps of splines on camshaft and chain wheel.



G03230245

Fig. 203: Locating Pin Of Toothed Shaft In Tooth Gaps Of Splines
Courtesy of BMW OF NORTH AMERICA, INC.

Push in toothed shaft (4) until approx. 1 mm of splines can still be seen.

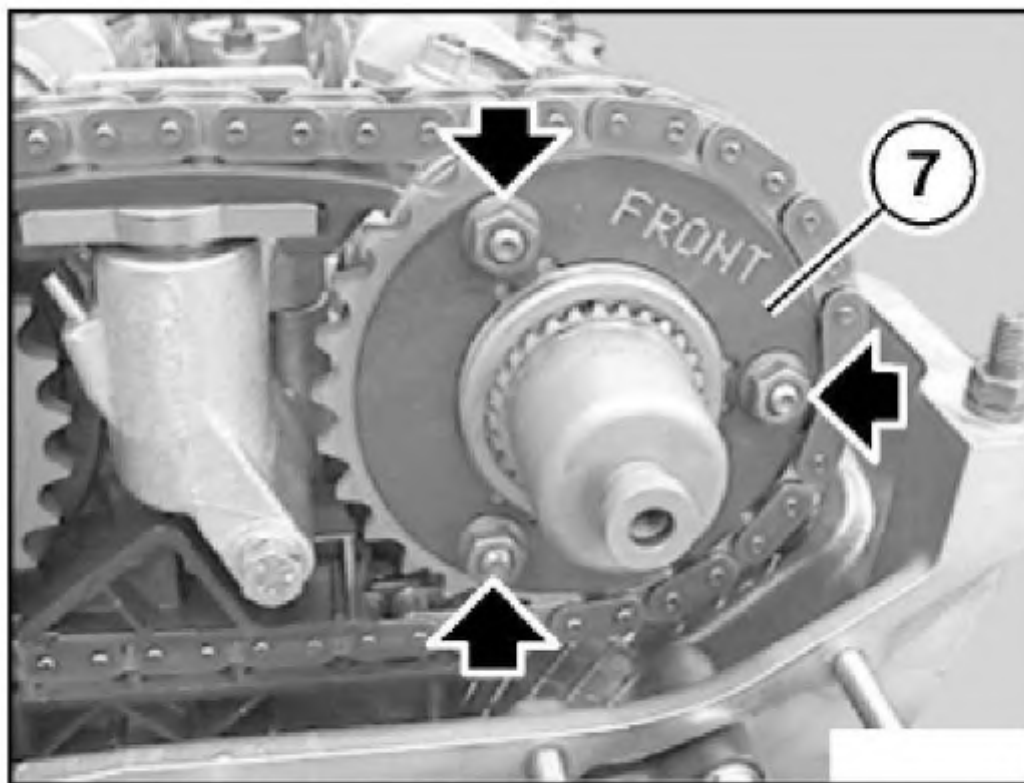


G03230246

Fig. 204: Aligning Toothed Shaft Splines
Courtesy of BMW OF NORTH AMERICA, INC.

Note installation direction of corrugated washer (7), "FRONT" lettering must be visible.

Install corrugated washer, tighten nuts by hand but do not tighten down fully yet.



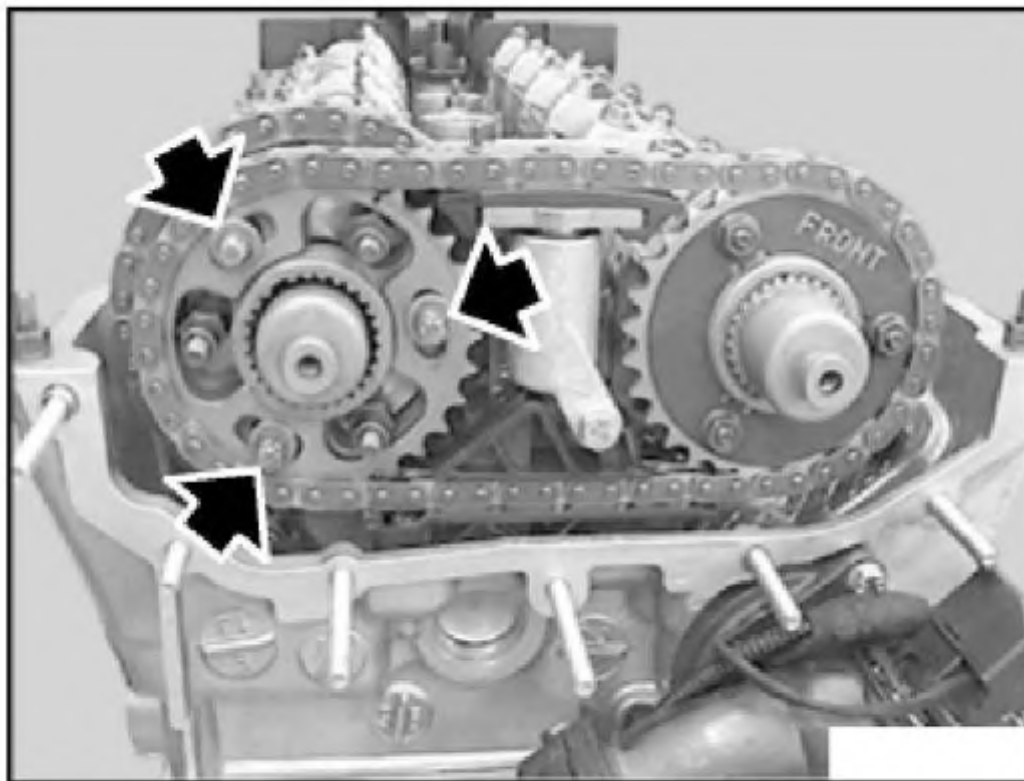
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Fig. 205: Installing Corrugated Washer
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screws on exhaust side, initially tighten to approx. 5 N.m and then slacken off again half a turn.

2002 BMW X5

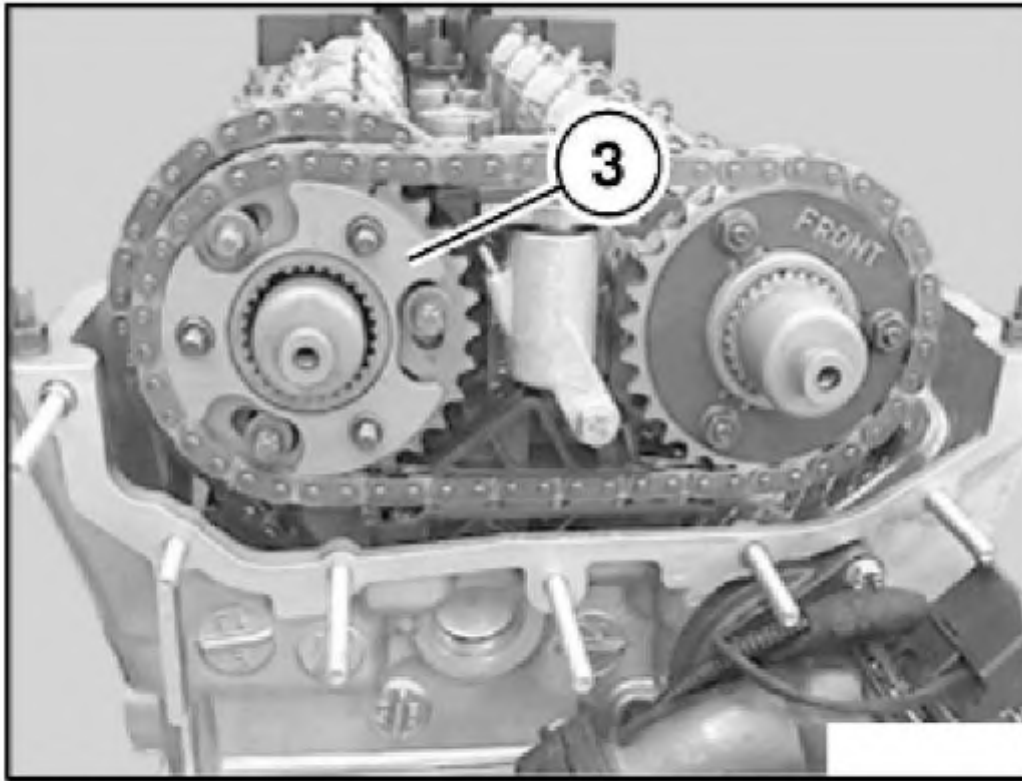
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Fig. 206: Installing Screws On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Fit thrust washer (3).



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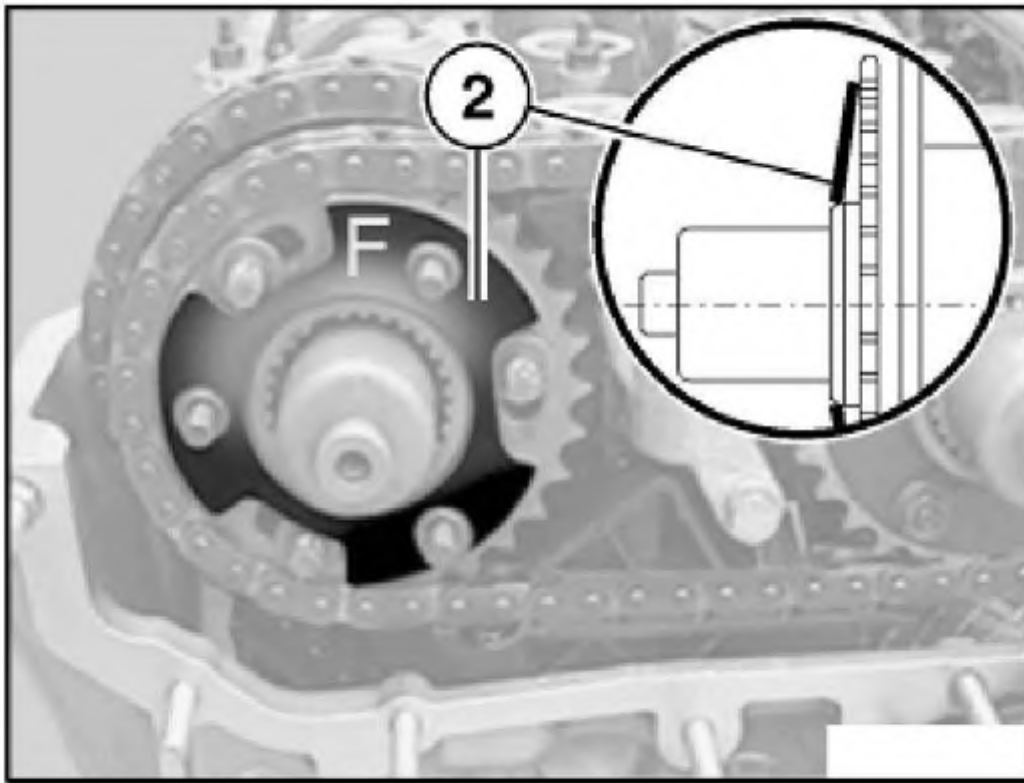
Fig. 207: Fitting Thrust Washer On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Note installation direction of cup spring (2), "F" lettering must be visible.

NOTE: If "F" lettering is no longer visible on an engine that has been run:

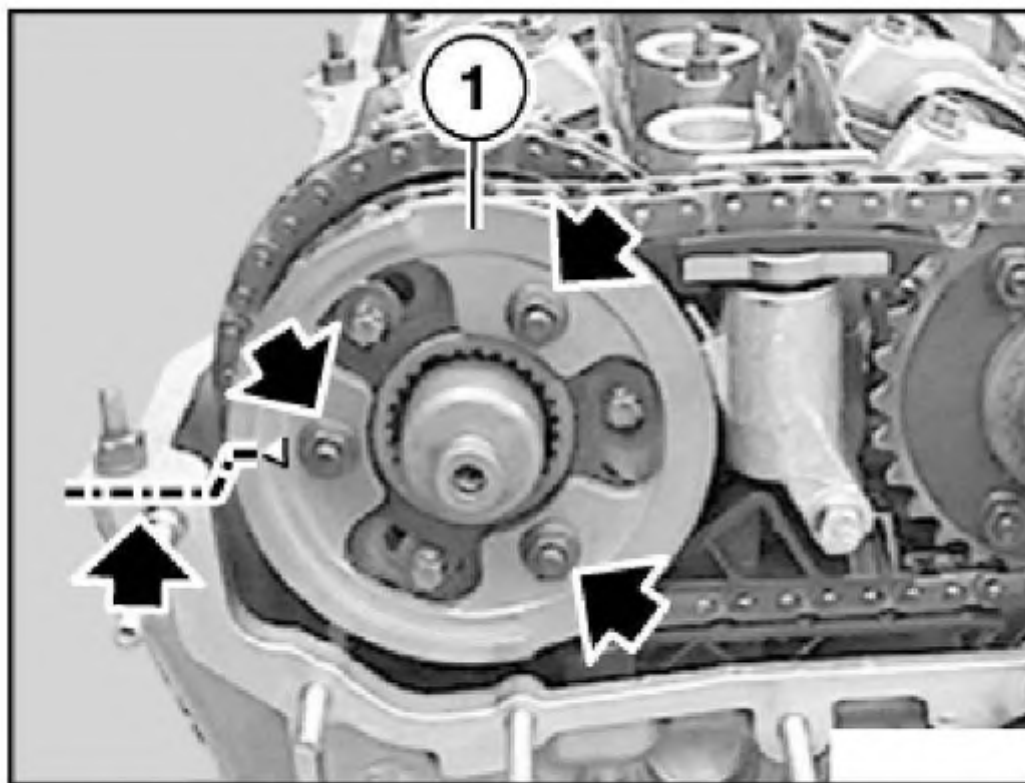
Install cup spring (2) so that small locating diameter of spring (2) points to sensor gear.

Fit cup spring (2) in position.

**G03230250****Fig. 208: Installing Cup Spring****Courtesy of BMW OF NORTH AMERICA, INC.**

Position sensor gear (1) so that arrow on sensor gear faces separating face of upper side of cylinder head.

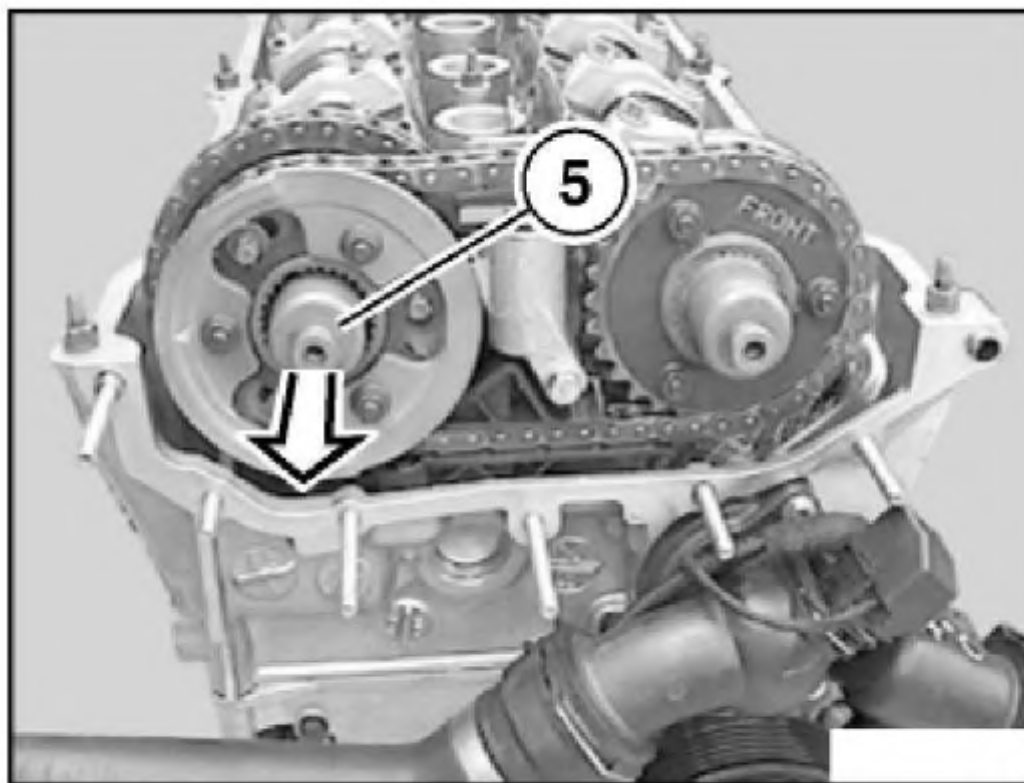
Install nuts and tighten by hand but do not tighten down fully yet.



G03230251

Fig. 209: Aligning Arrow On Sensor Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw toothed shaft (5) up to stop.



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Fig. 210: Positioning Toothed Shaft To Stop
Courtesy of BMW OF NORTH AMERICA, INC.

Press down secondary chain tensioner at top and remove special tool 11 3 292 .

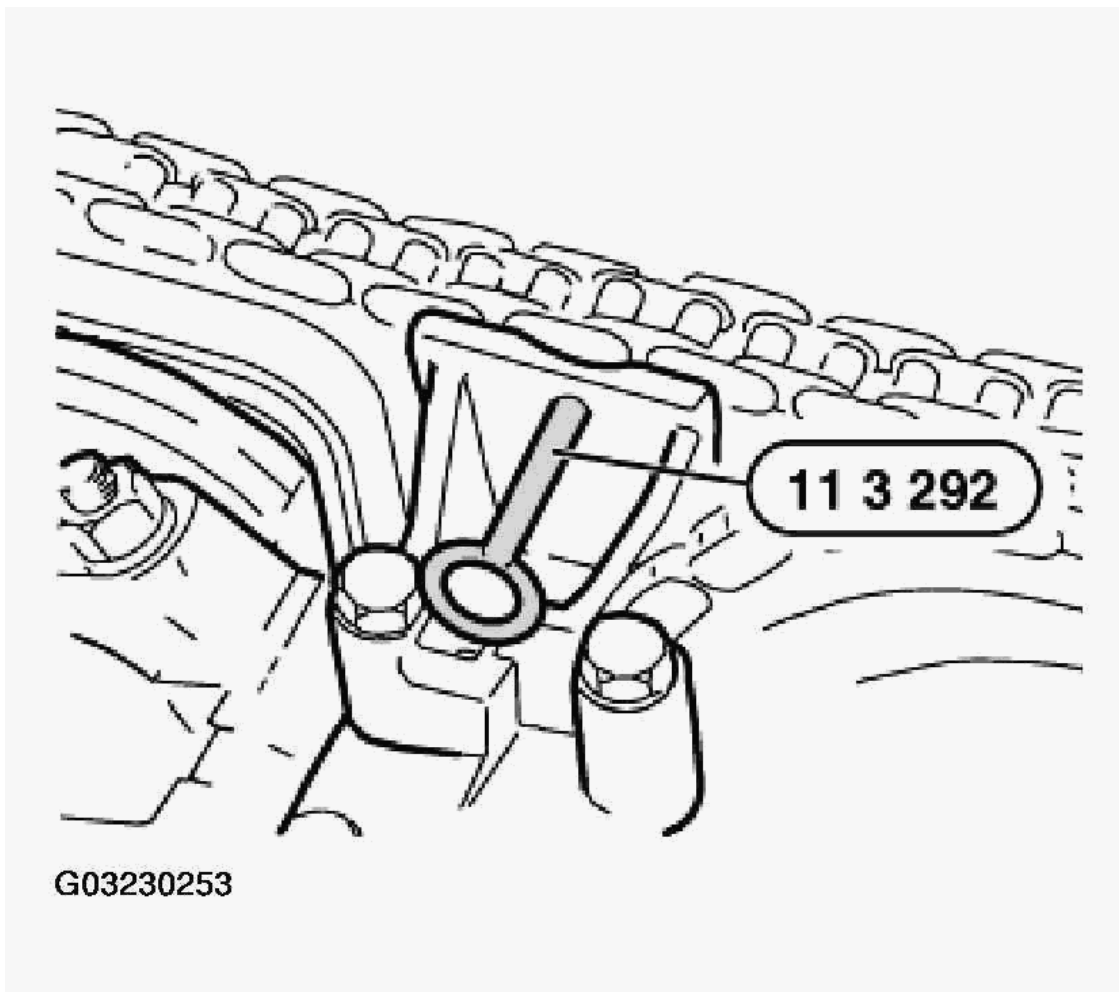
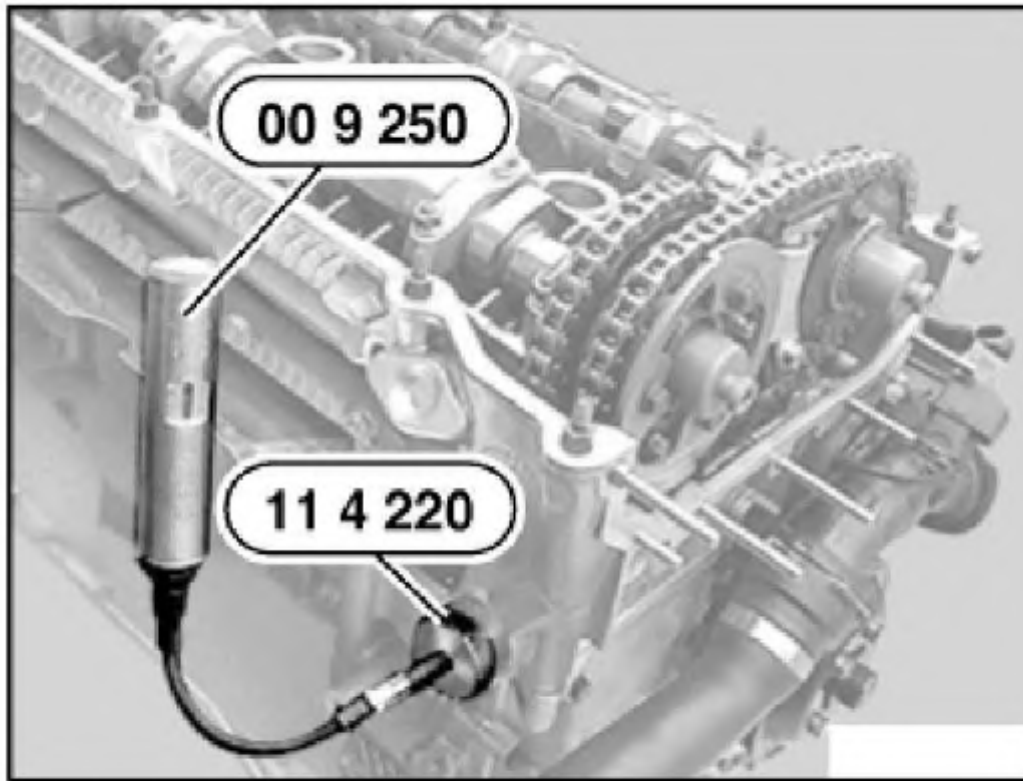


Fig. 211: Identifying Special Tool 11 3 292

Courtesy of BMW OF NORTH AMERICA, INC.

Preload tensioning rail with special tool 11 4 220 by rotating adjusting screw with special tool 00 9 250 or standard torque wrench to 0.7 N.m.



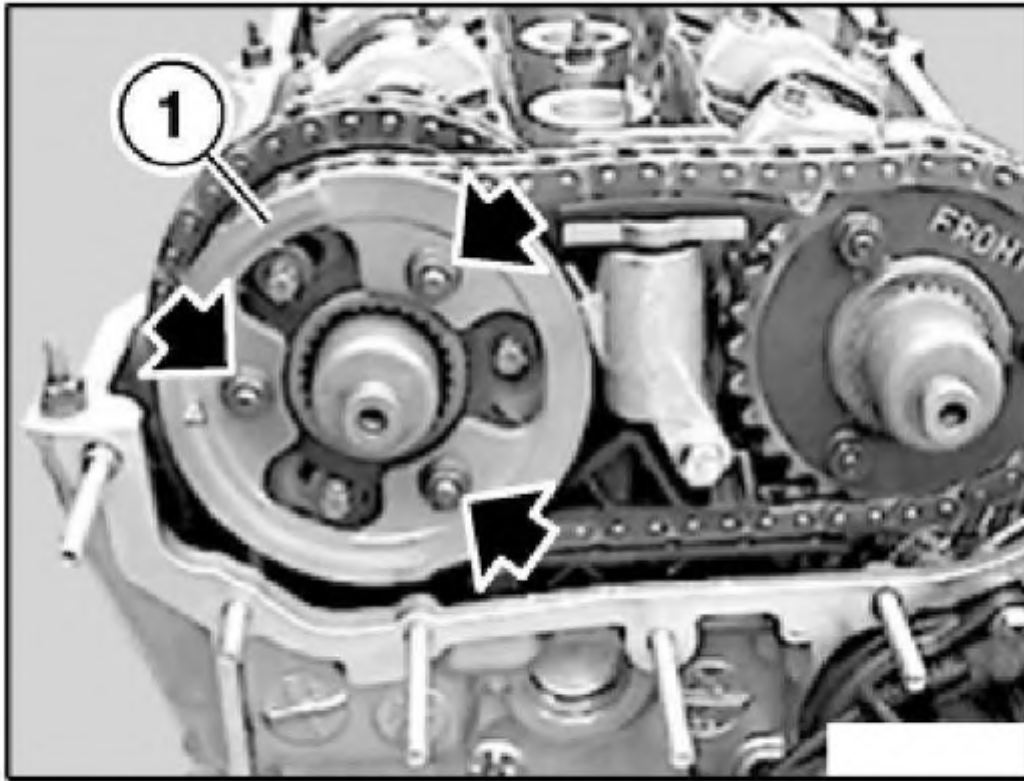
G03230254

Fig. 212: Preload Tensioning Rail Using Special Tool 11 4 220
Courtesy of BMW OF NORTH AMERICA, INC.

Preload cup spring slightly by pressing on sensor gear (1) and tighten nuts by hand.

Important!

Do not tighten down nuts fully.



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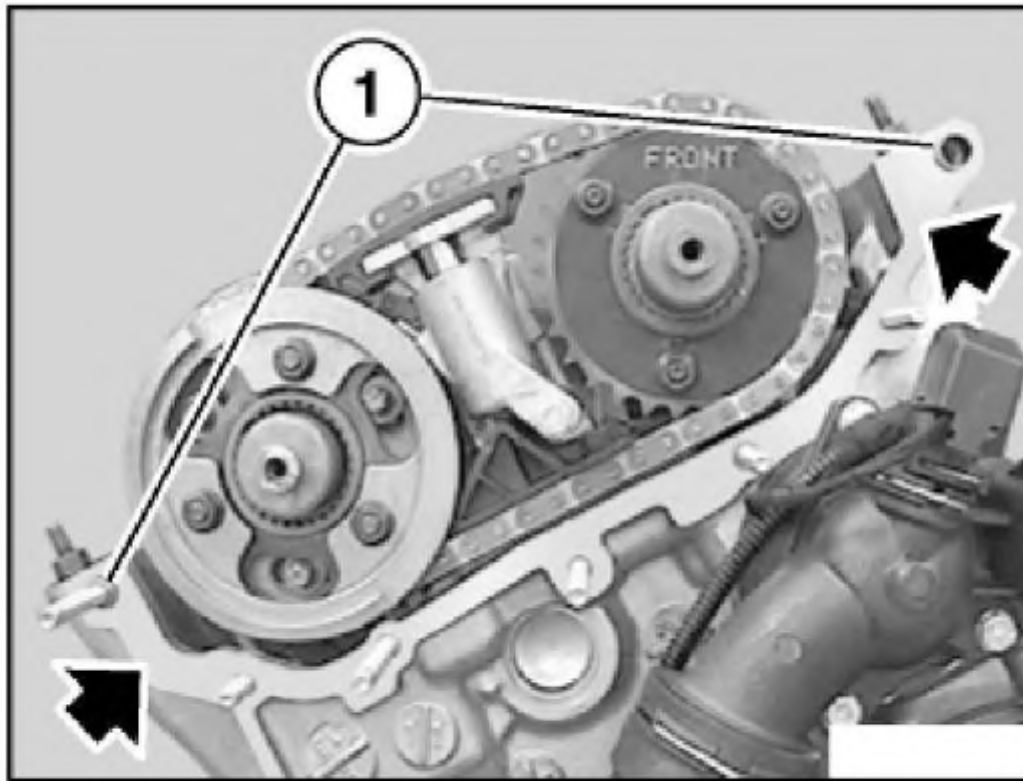
Fig. 213: Preloading Cup Spring

Courtesy of BMW OF NORTH AMERICA, INC.

Remove gasket.

Check dowel sleeves (1) for damage and correct installation position.

Keep sealing face clean and free of oil.



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Fig. 214: Locating Dowel Sleeves

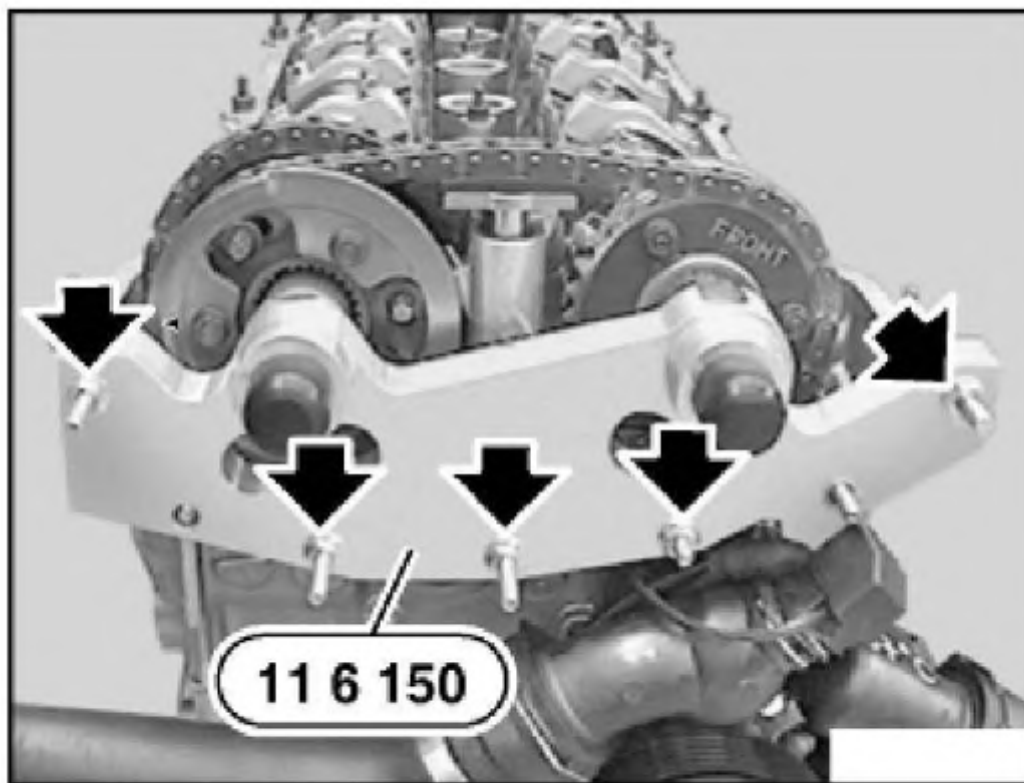
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Fit special tool 11 6 150 "without gasket" only.

If gasket remains underneath special tool 11 6 150 , camshaft timing will be "incorrectly" set.

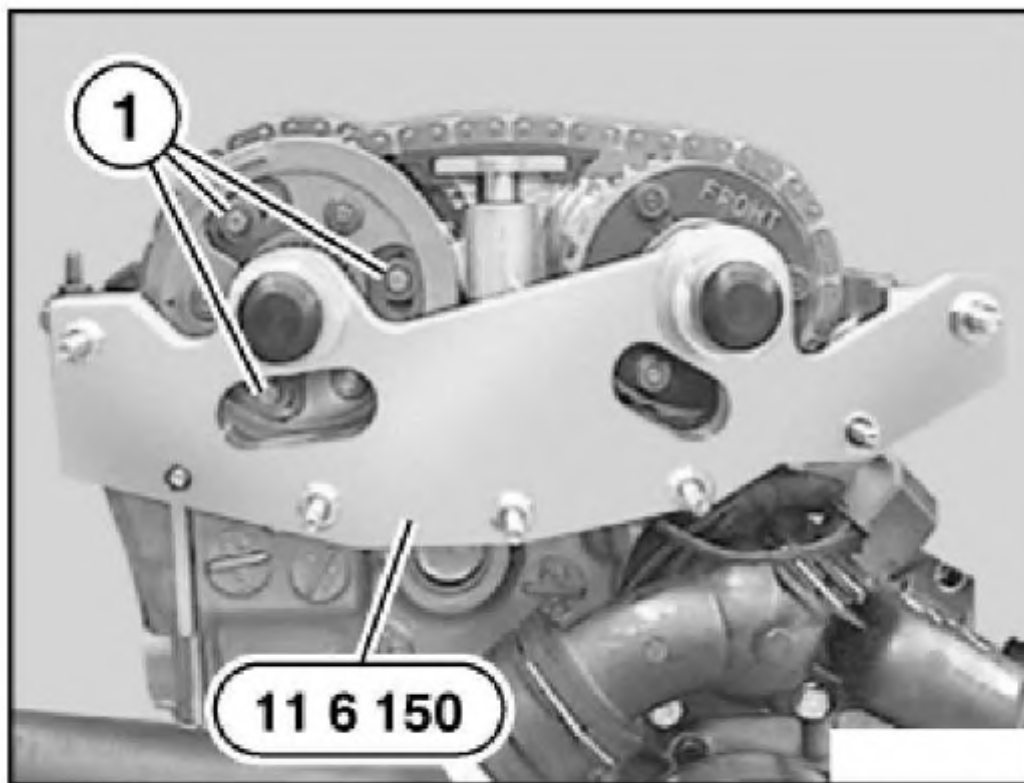
Attach special tool 11 6 150 "without gasket", tighten nuts by hand and then tighten down uniformly until special tool 11 6 150 is in full contact with cylinder head.



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Fig. 215: Installing Adjusting Plate On Cylinder Head Without Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

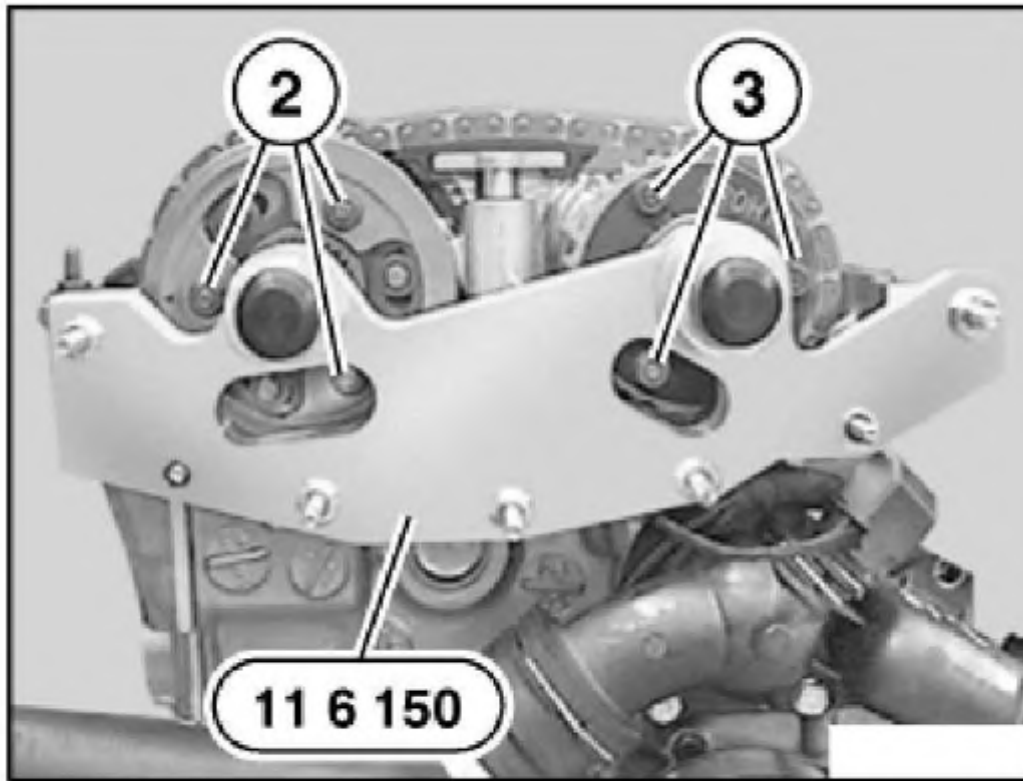
Insert screws (1) on exhaust side and initially tighten to approx. 5 N.m.



G03230258

Fig. 216: Installing Screws On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten nuts (2) on exhaust side and nuts (3) on inlet side to approx. 5 N.m.

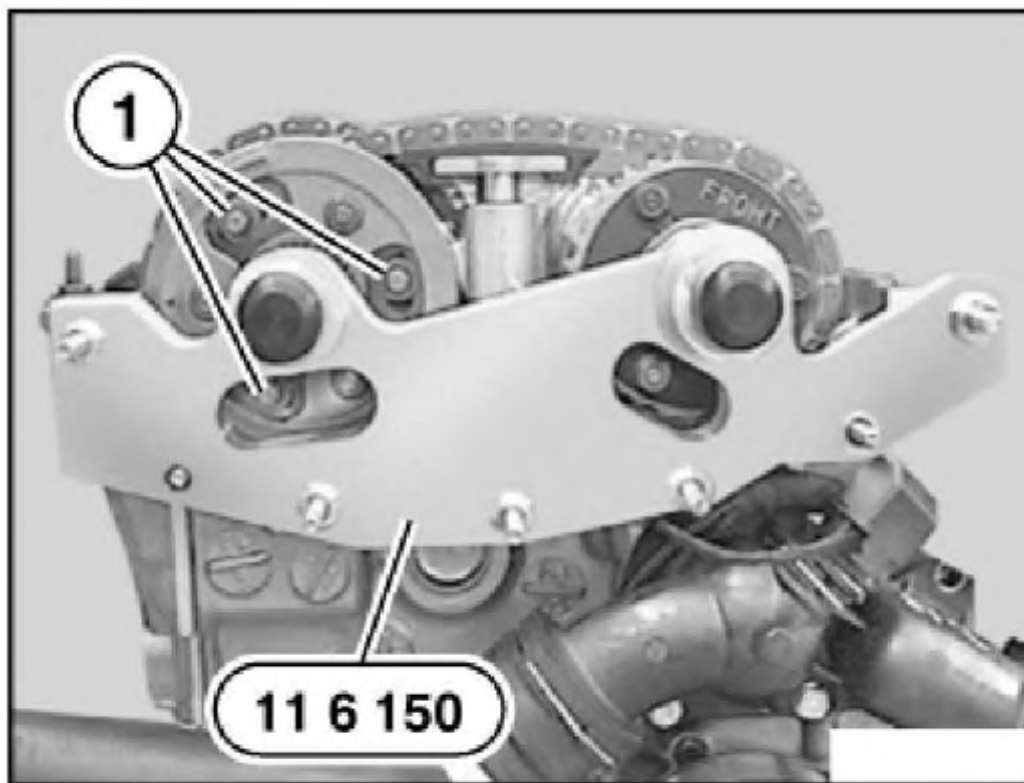


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Fig. 217: Tightening Nuts On Inlet And Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down screws (1) on exhaust side.

Tightening torque, refer to 11 31 3AZ in **ENGINE - TIGHTENING TORQUES** .

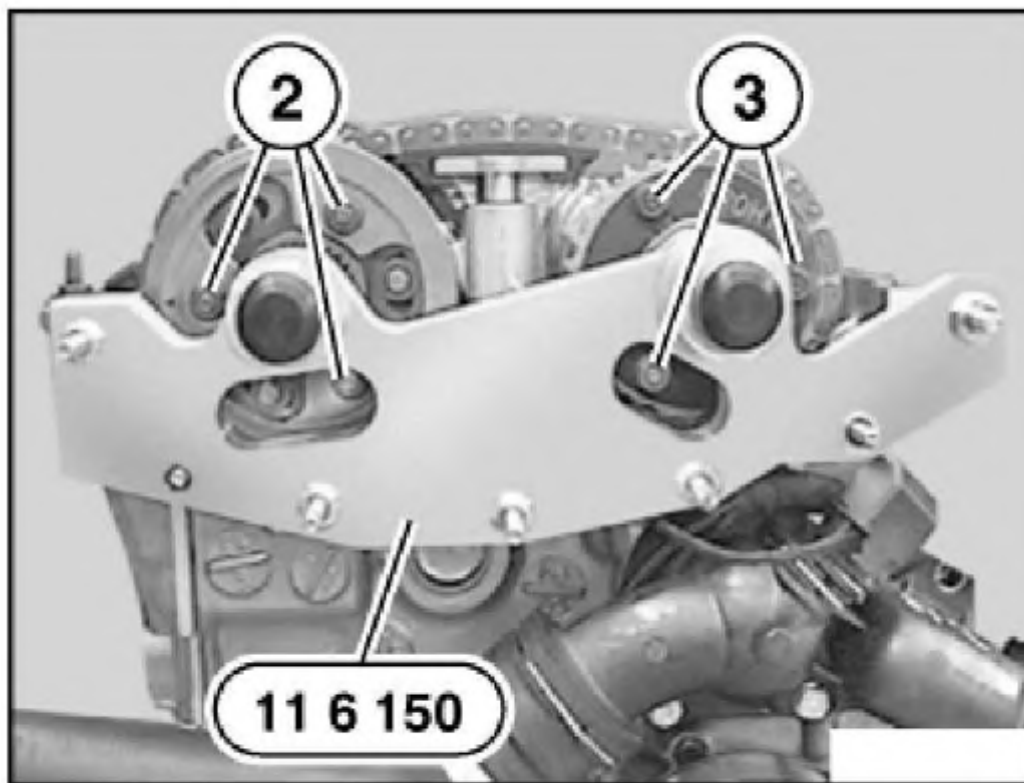


G03230260

Fig. 218: Tightening Nuts On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down nuts (2) on exhaust side and nuts (3) on inlet side.

Tightening torque, refer to 11 31 11AZ in **ENGINE - TIGHTENING TORQUES** .



G03230261

Fig. 219: Tightening Nuts On Inlet And Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Pull special tool 11 2 300 back until flywheel is no longer secured in position.

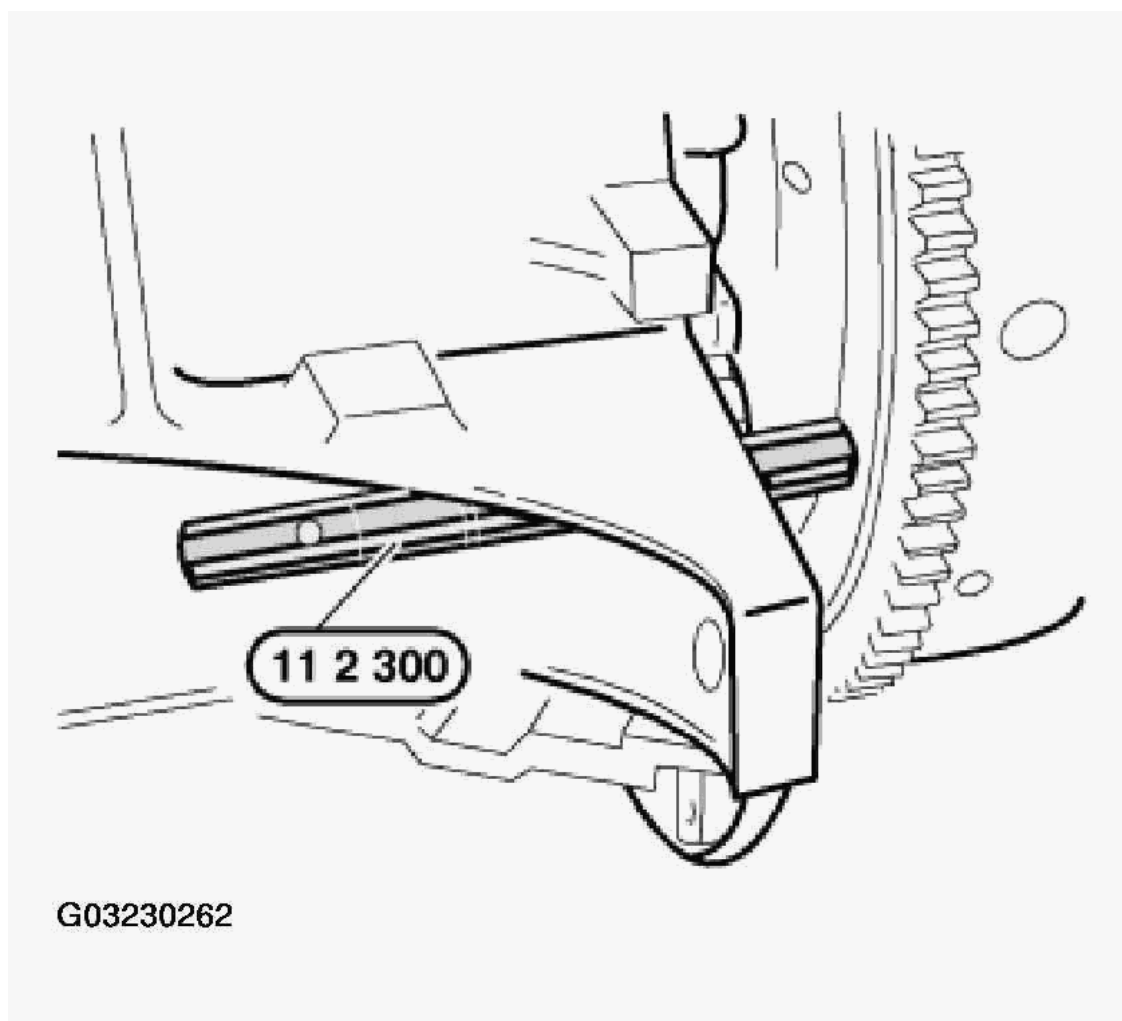
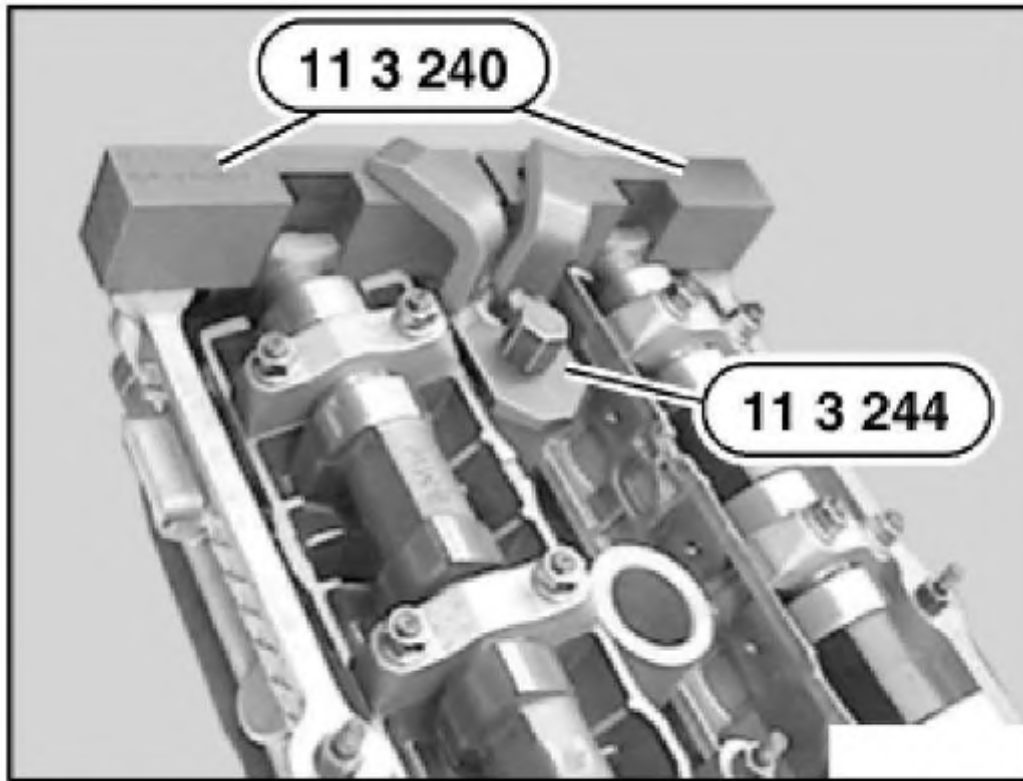


Fig. 220: Releasing Flywheel From Plug Mandrel
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 3 244 and special tool 11 3 240 .



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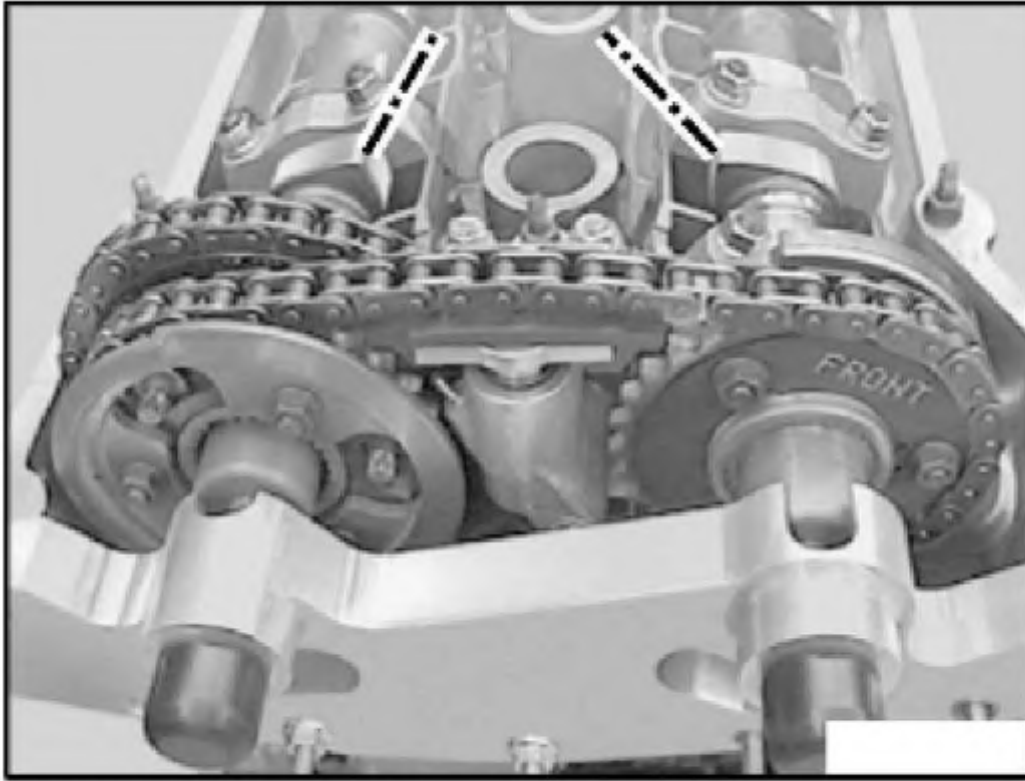
Fig. 221: Removing Locking Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

Crank engine twice in direction of rotation until cam tips on inlet and exhaust camshafts on 1st cylinder face one another.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230264

Fig. 222: Aligning Cam Tips

Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft in firing TDC position with special tool 11 2 300 .

Important!

Do not turn the engine back.

Remove special tool 11 2 300 before switching on the engine.

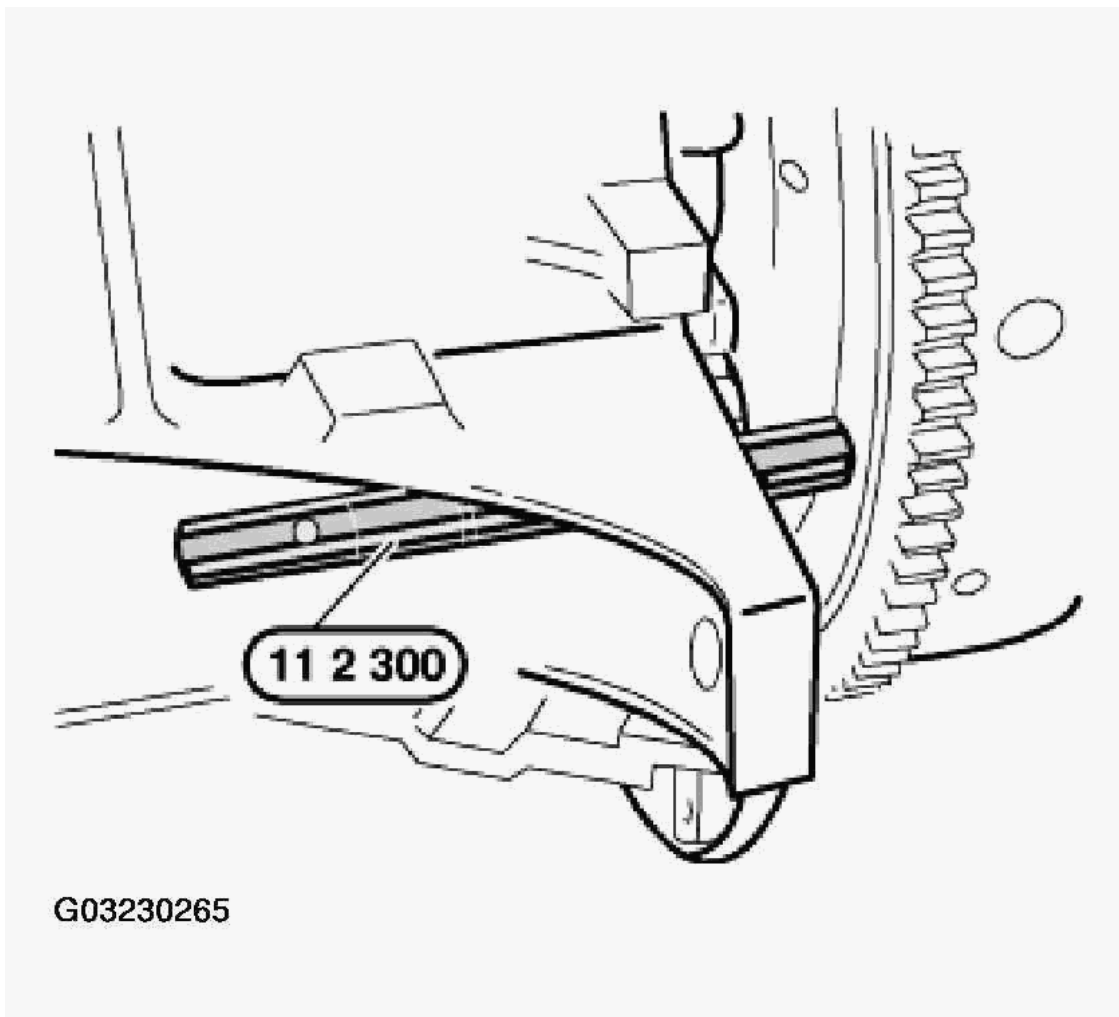
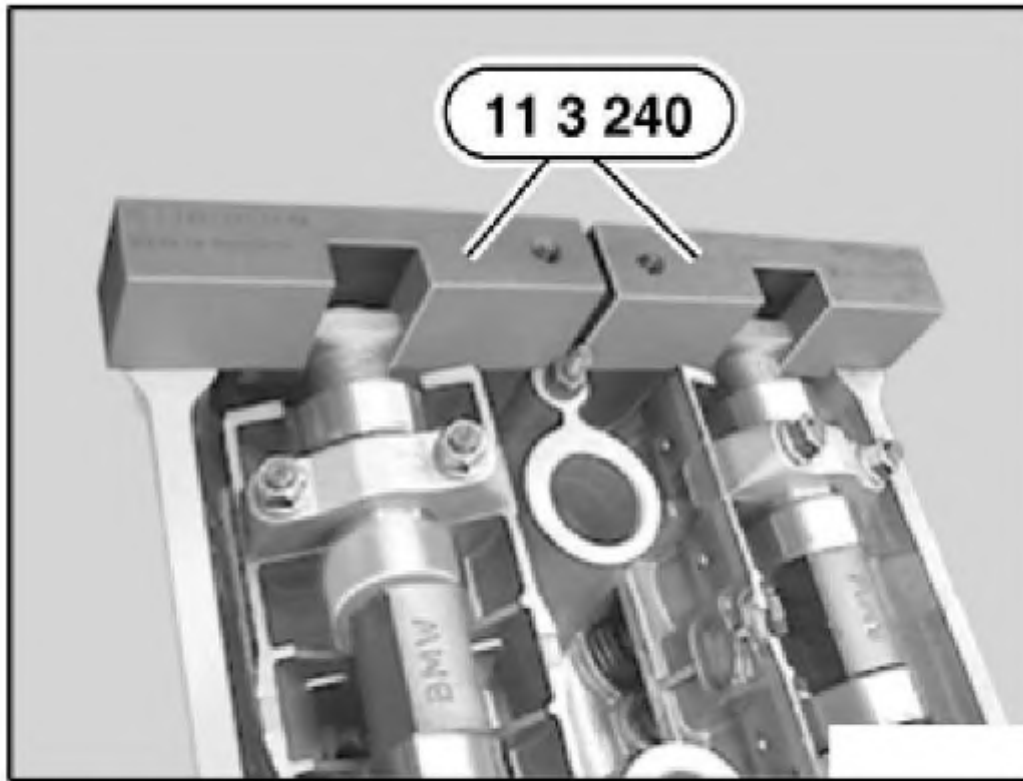


Fig. 223: Removing Plug Mandrel From Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 3 240 to camshafts.

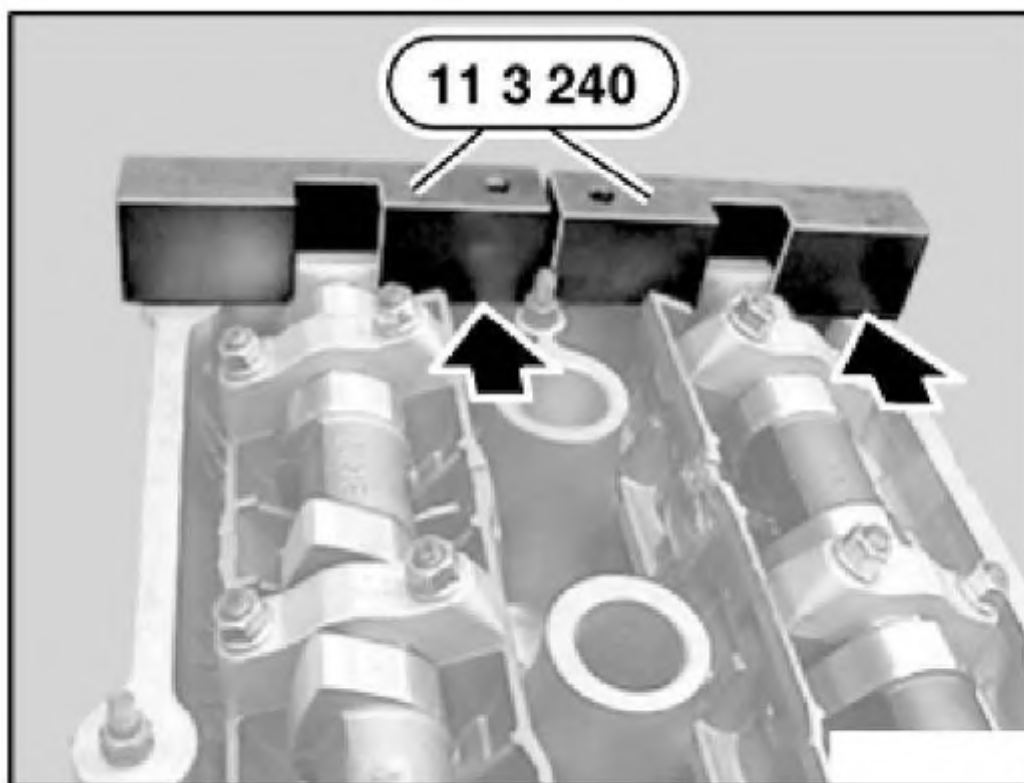


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Fig. 224: Installing Locking Fixture On Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The timing is correctly set if the special tool 11 3 240 rests without a gap on the cylinder head or protrudes up to 1 mm to the inlet side.

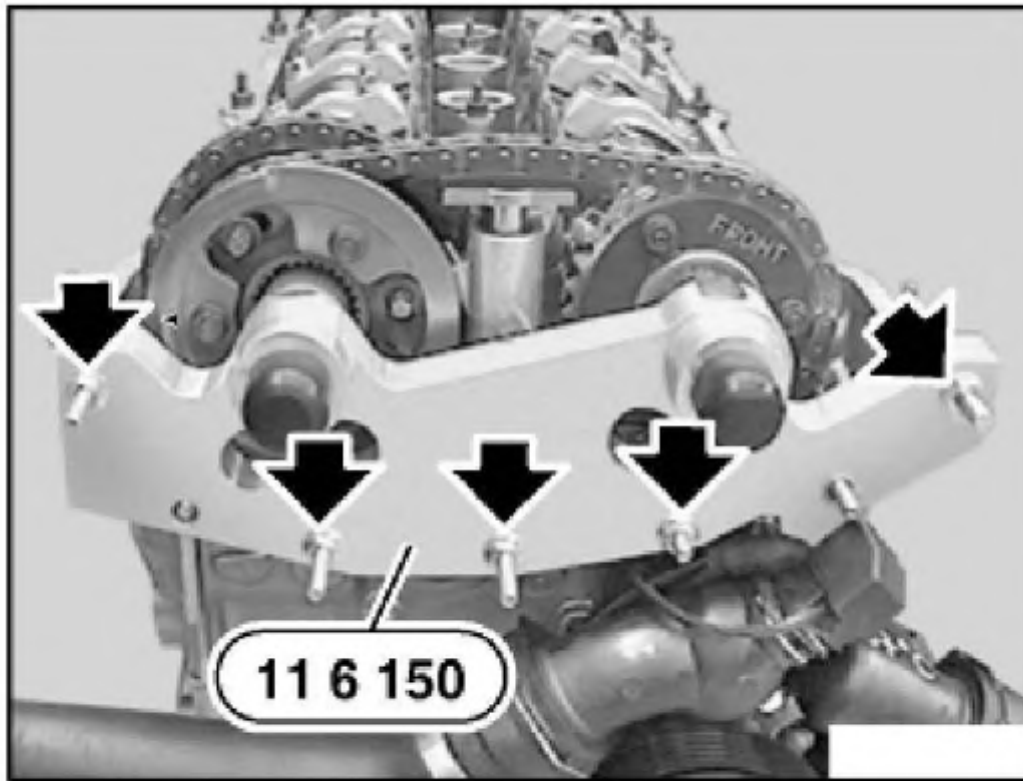
The timing must be reset if the special tool 11 3 240 protrudes to the exhaust side.



G03230267

Fig. 225: Checking Locking Fixture Alignment On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 6 150 .



G03230268

Fig. 226: Removing Locking Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

Install VANOS adjustment unit, refer to **11 36 010 REMOVING AND INSTALLING OR REPLACING DOUBLE VANOS ADJUSTMENT UNIT (M52TU / M54 / M56)** .

Assemble engine.

11 31 005 CHECKING CAMSHAFT TIMING (M52TU / M54 / M56)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

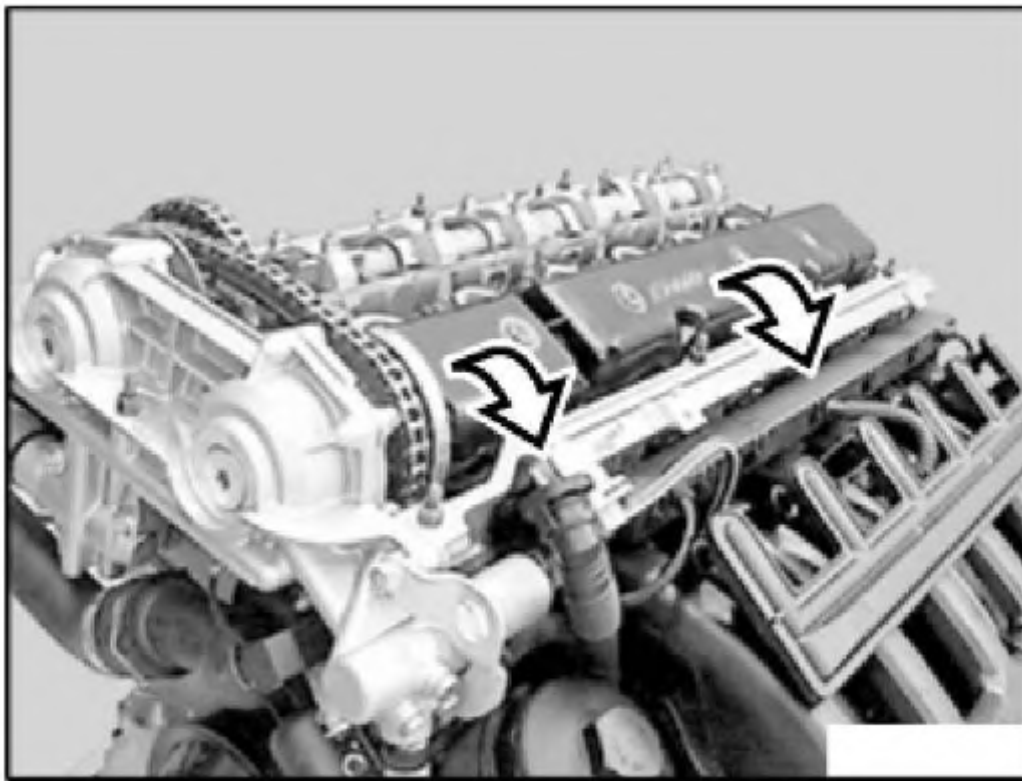
- 00 9 250
- 11 2 300
- 11 3 240

- 11 3 450
- 11 4 220

Necessary Preliminary Tasks:

- Remove fan impeller with fan clutch, refer to **11 52 020 REMOVING AND INSTALLING/REPLACING FAN CLUTCH (S52 / S54 / M52 / M52TU / M54 / M56)** .
- Remove cylinder head cover, refer to **11 12 000 REMOVING AND INSTALLING, SEALING CYLINDER HEAD COVER (M52TU / M54 / M56)** .
- Remove all spark plugs. Refer to **12 12 011 REPLACING ALL SPARK PLUGS** .

Detach cover for inlet camshaft.



G03230269

Fig. 227: Removing Cover For Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Cylinder for chain tensioning piston is under spring pressure.

Remove cylinder for chain tensioning piston.



Fig. 228: Removing Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool 11 4 220 .

Fit adjusting screw to bow cover.

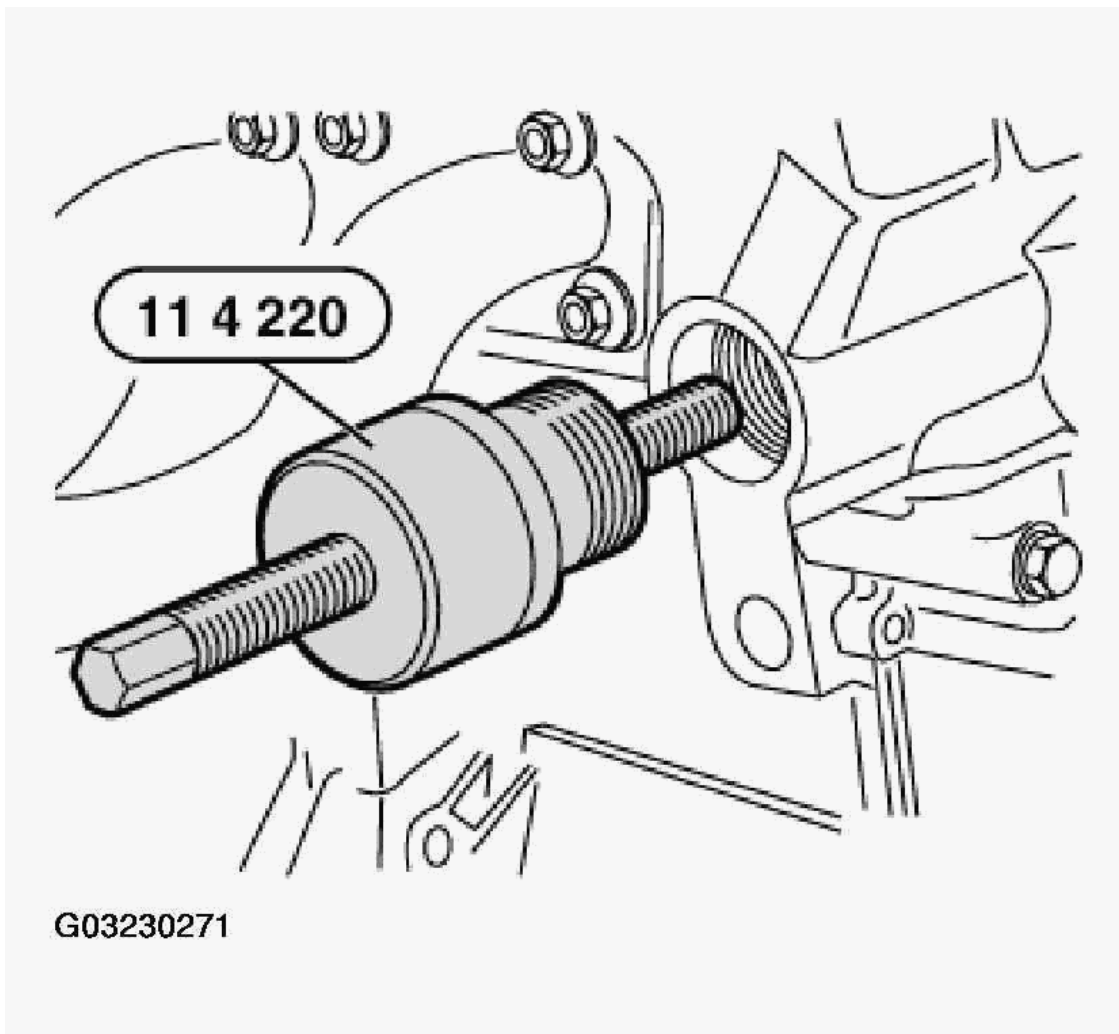
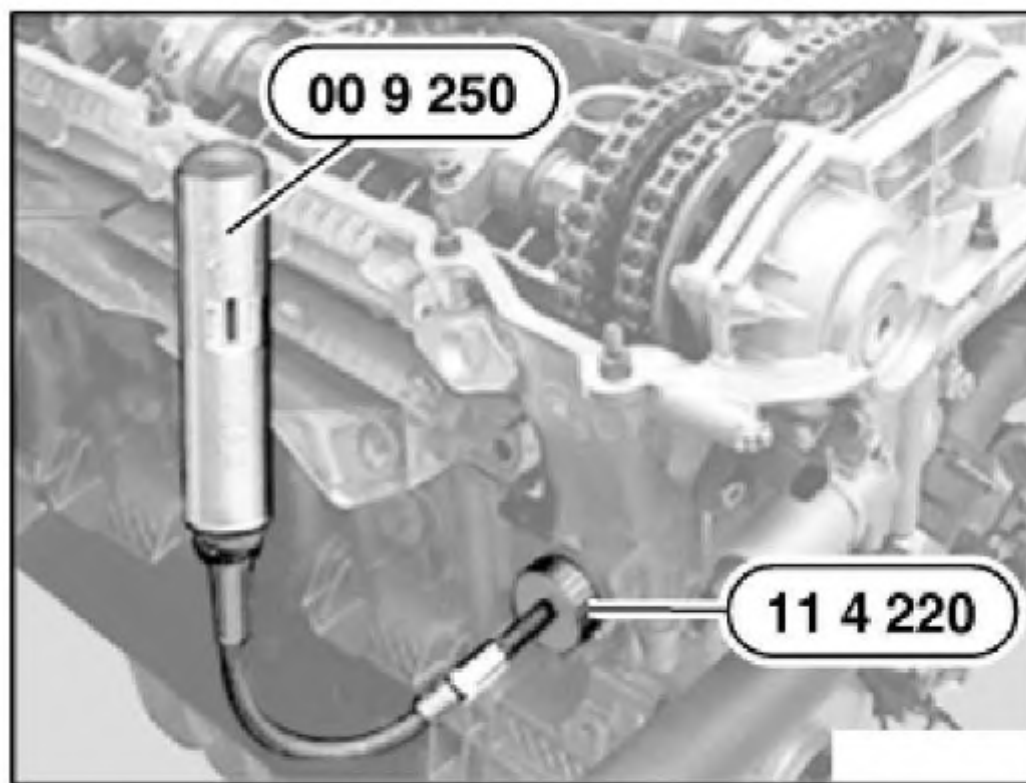


Fig. 229: Installing Chain Tensioner

Courtesy of BMW OF NORTH AMERICA, INC.

Preload tensioning rail with special tool 11 4 220 by rotating adjusting screw with special tool 00 9 250 or standard torque wrench to 0.7 N.m.



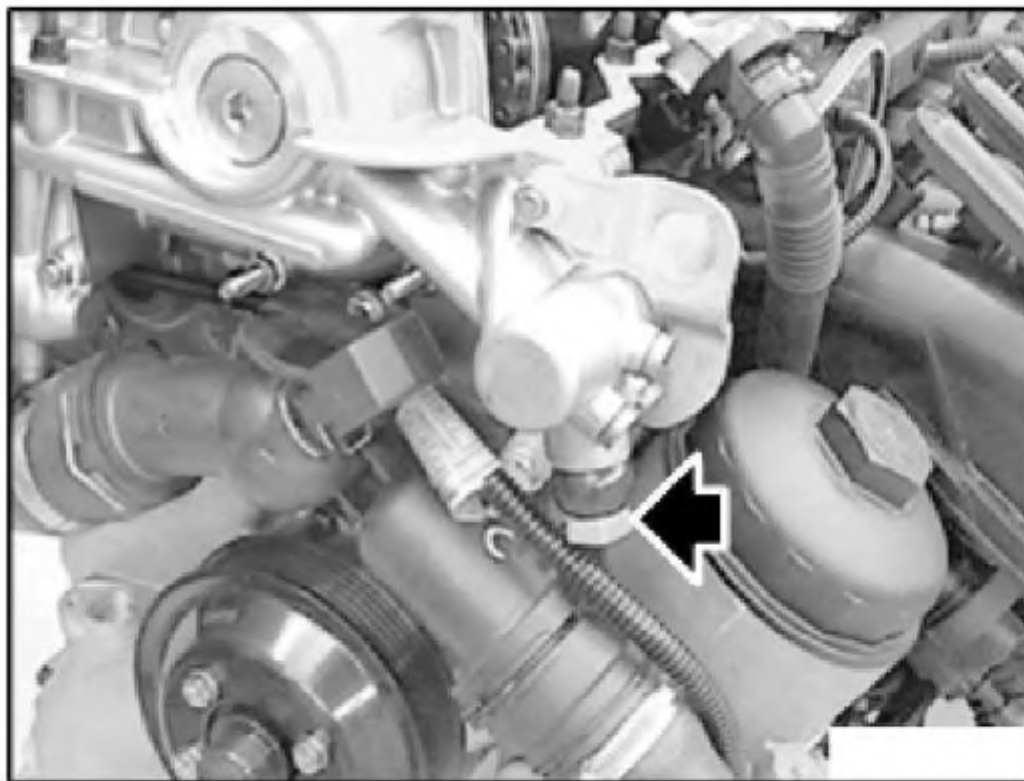
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Fig. 230: Preloading Tensioning Rail With 11 4 220
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew oil pressure pipe.

2002 BMW X5

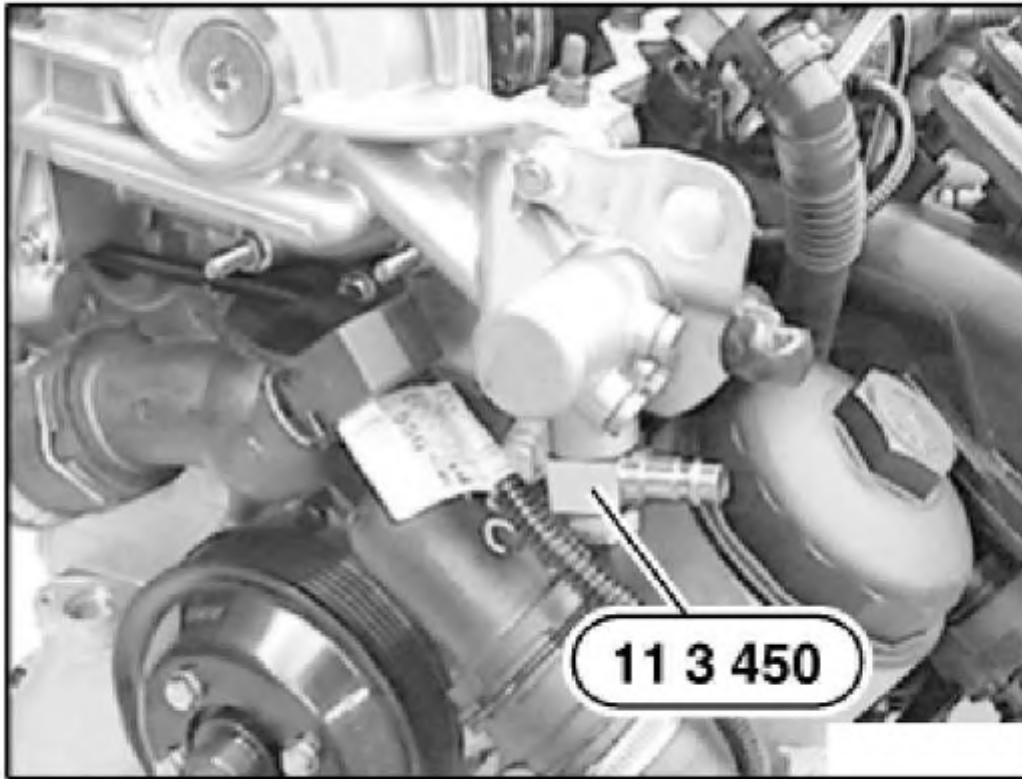
2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



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Fig. 231: Releasing Oil Pressure Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tool 11 3 450 with banjo bolt of oil pressure line.



G03230274

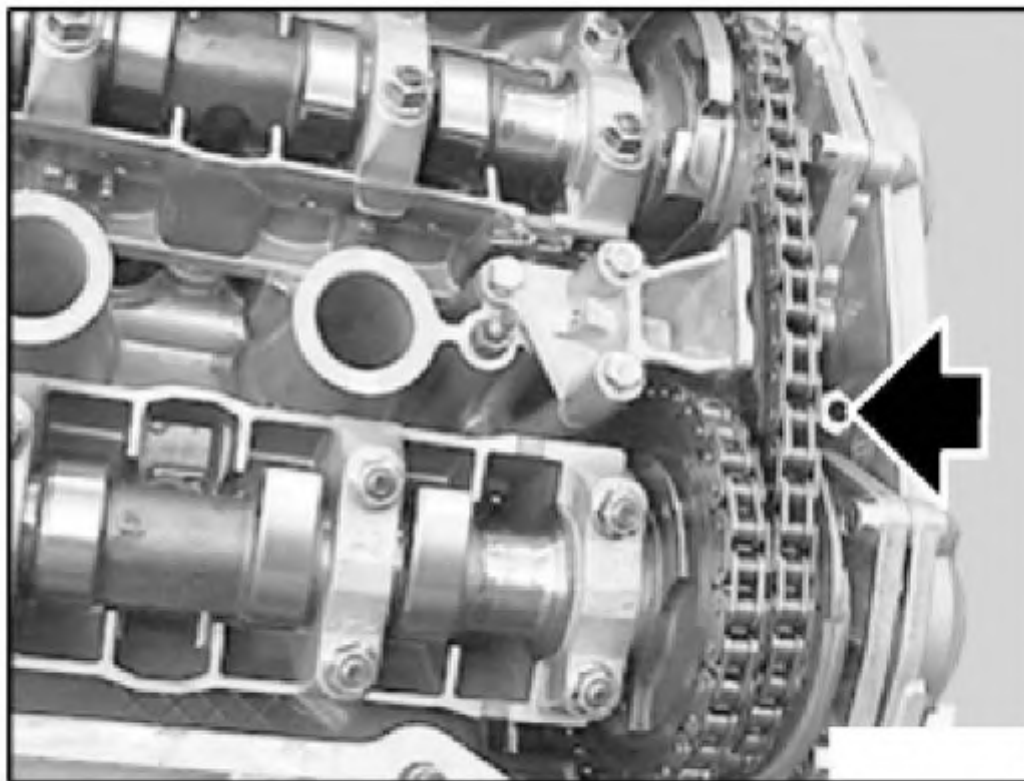
Fig. 232: Installing Compressed Air Fitting To Banjo Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Cover double VANOS adjustment unit; when the compressed air supply is connected, several drops of oil are sprayed out of the bore.

2002 BMW X5

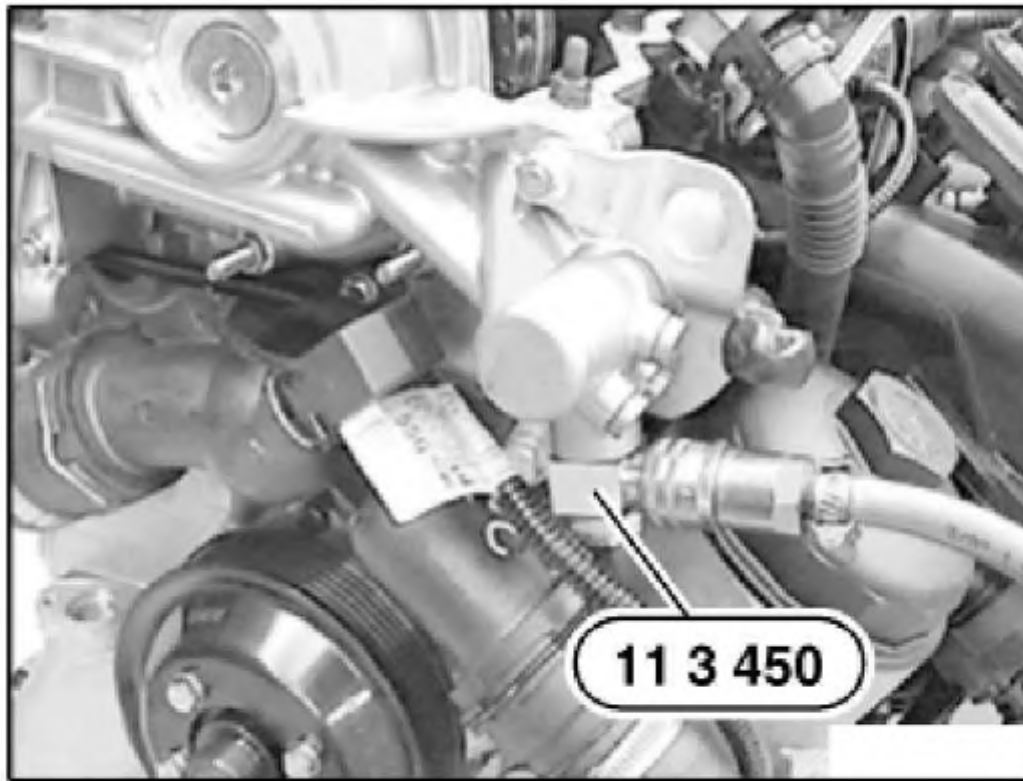
2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230275

Fig. 233: Locating Bore In VANOS Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Connect compressed air (2 to 8 bar).



G03230276

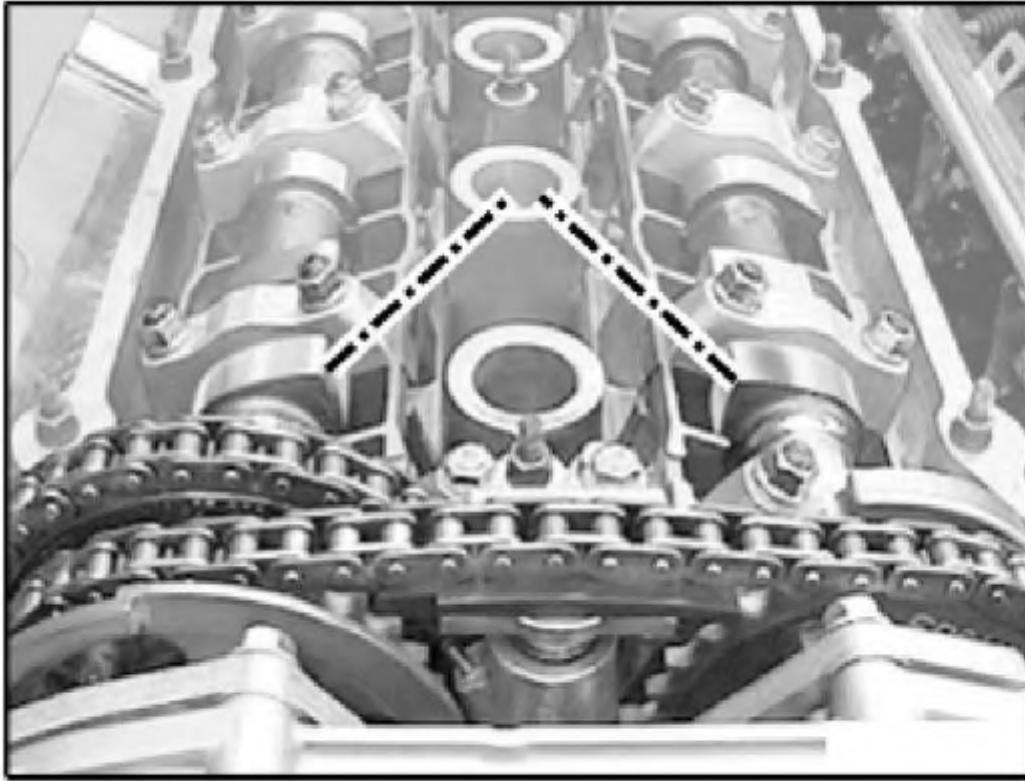
Fig. 234: Connecting Compressed Air To Oil Pressure Line
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: When the engine is switched off, it is possible that the camshafts are not in their initial positions. With the compressed air supply connected, rotate the engine to return the camshafts to their initial positions.

With compressed air supply connected, crank engine at least two revolutions in direction of rotation until cam tips on inlet and exhaust camshafts on 1st cylinder face each other.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230277

Fig. 235: Aligning Cam Tips
Courtesy of BMW OF NORTH AMERICA, INC.

Pull dust guard out of the special tool bore.

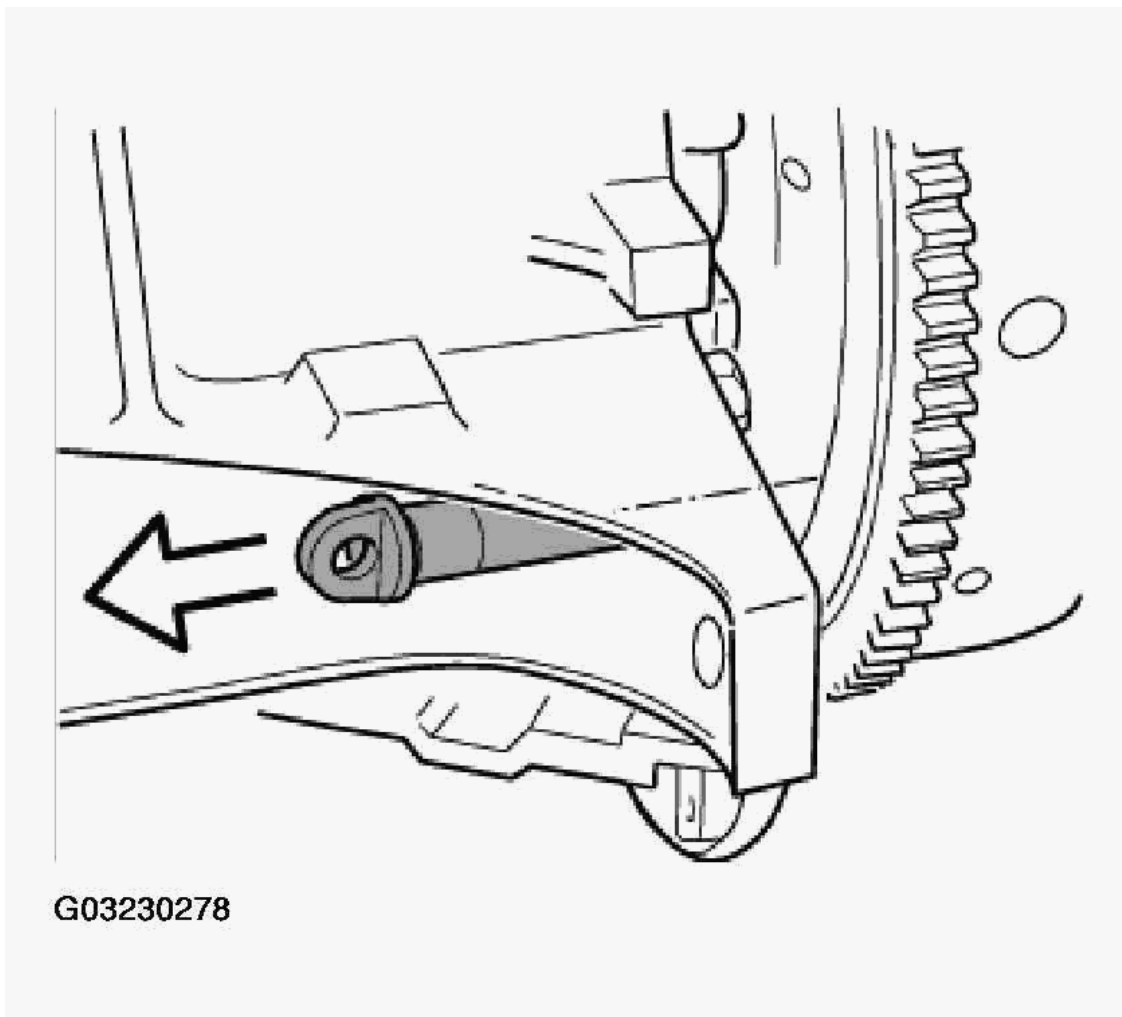


Fig. 236: Removing Dust Guard

Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft with special tool 11 2 300 in TDC firing position of 1st cylinder.

Important!

Do not turn the engine back.

Remove special tool 11 2 300 before starting engine.

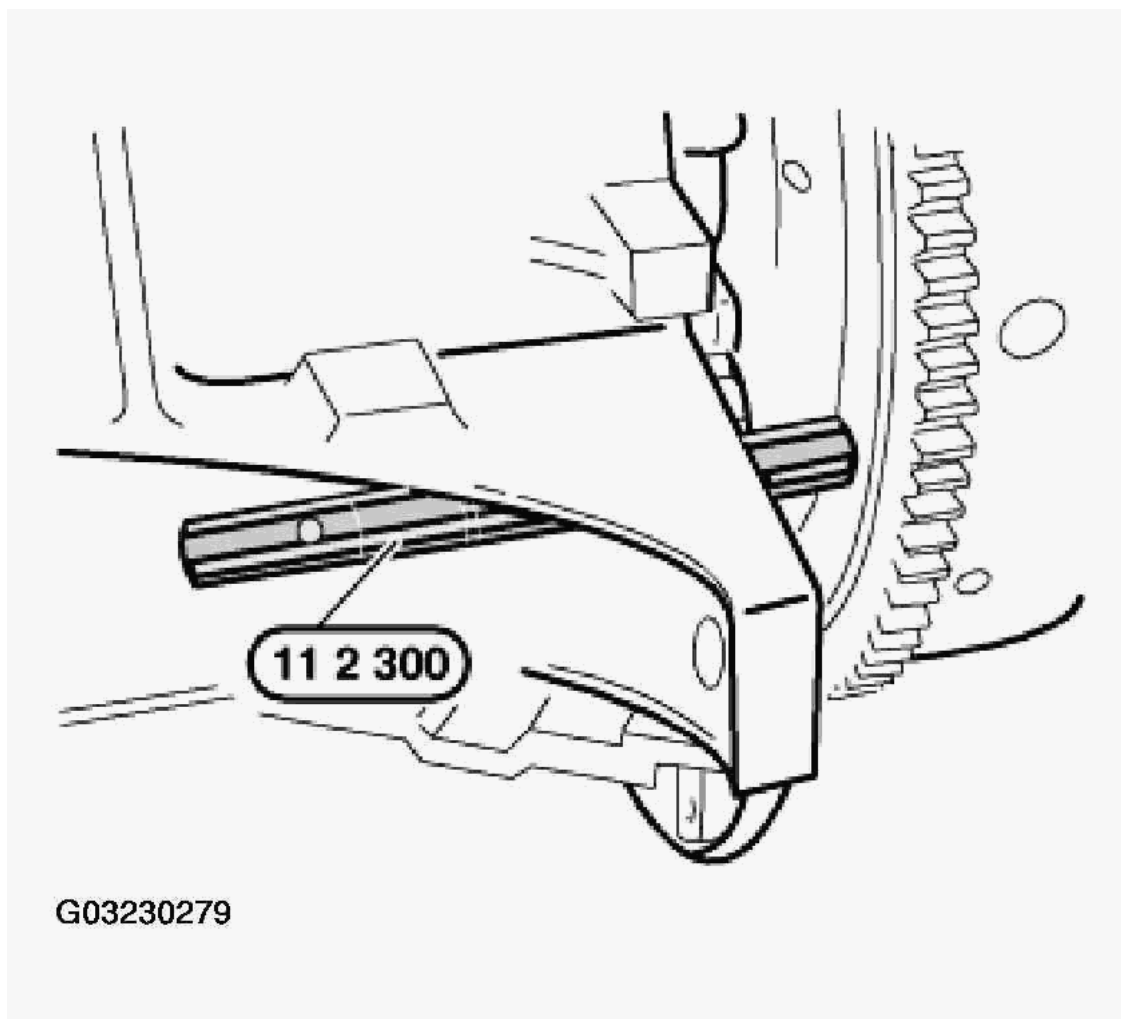


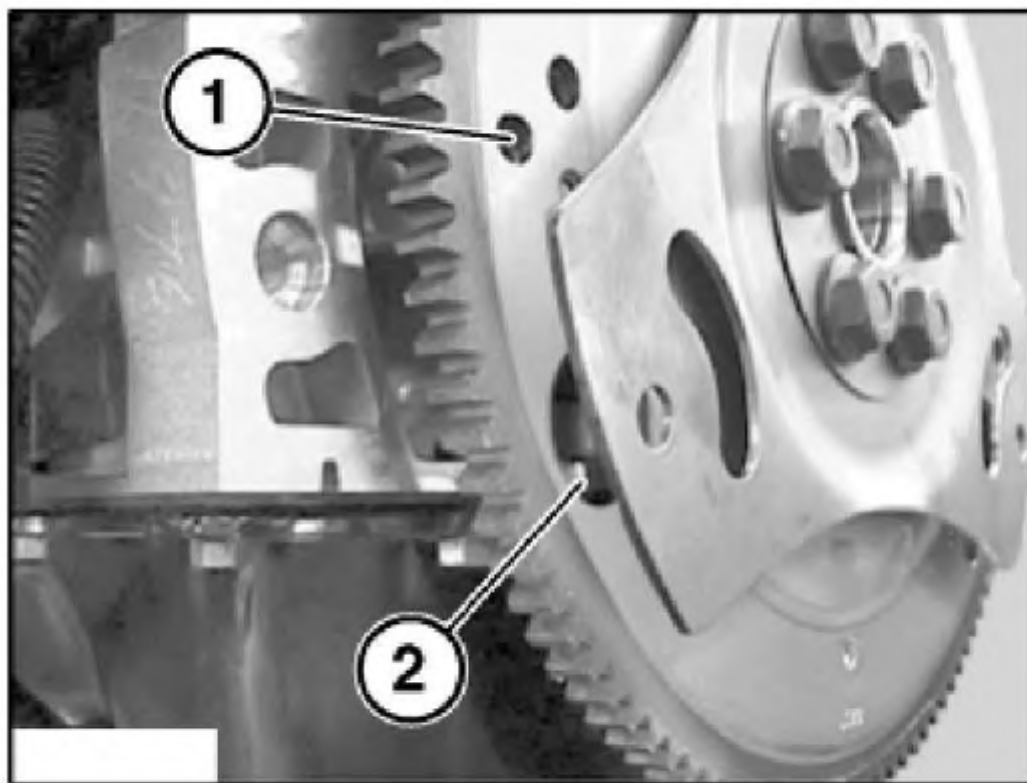
Fig. 237: Removing Plug Mandrel From Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

Automatic Transmissions Only:

Illustration does not show automatic transmission.

Important!

On engines with automatic transmissions, there is shortly before the special tool bore (1) a large bore (2) which can be confused with the special tool bore (1). If special tool 11 2 300 is secured in the correct bore (1), the engine can no longer be cranked at the central bolt.



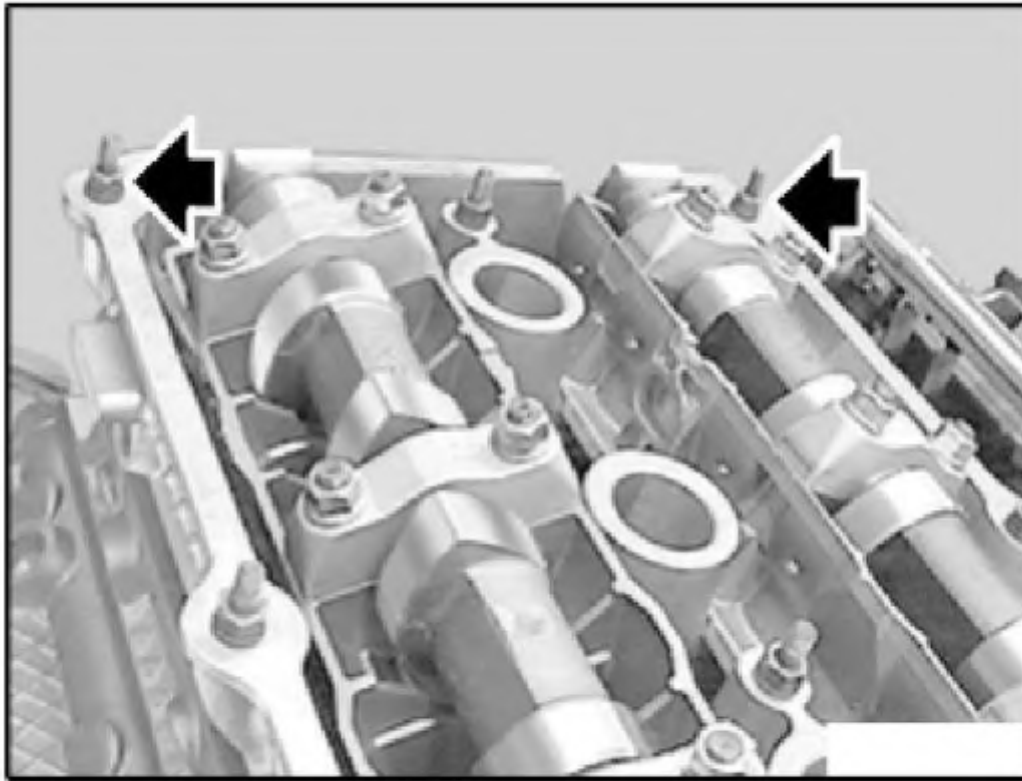
G03230280

Fig. 238: Locating Large Bore And Special Tool Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew studs.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

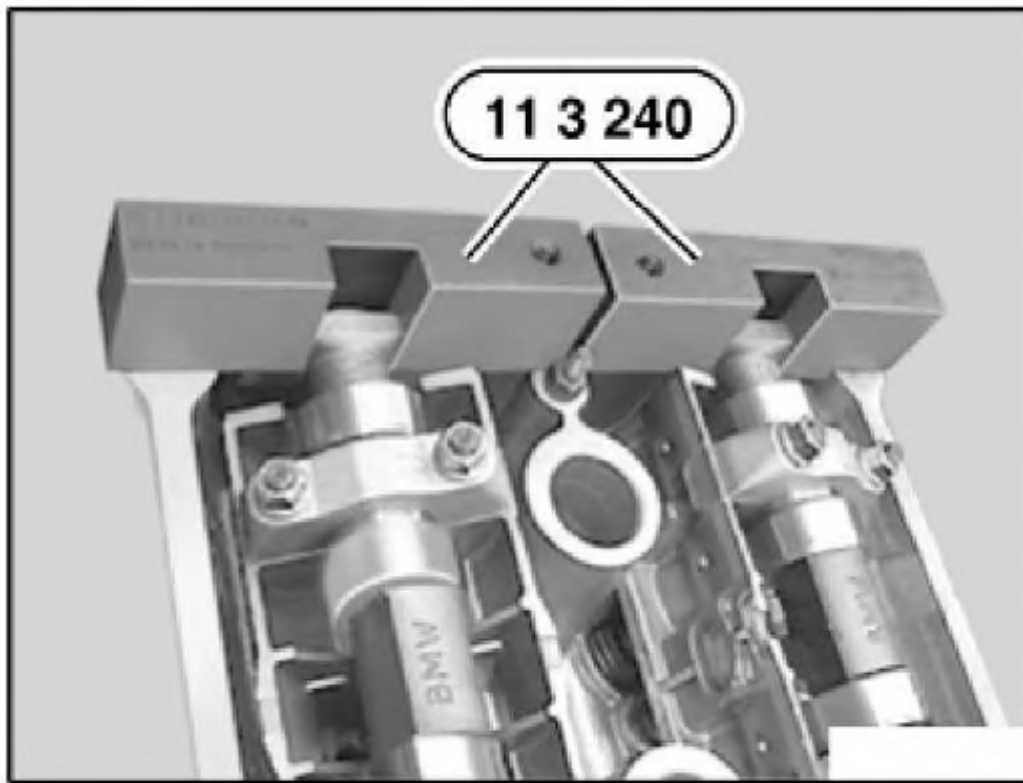


G03230281

Fig. 239: Unscrewing Studs

Courtesy of BMW OF NORTH AMERICA, INC.

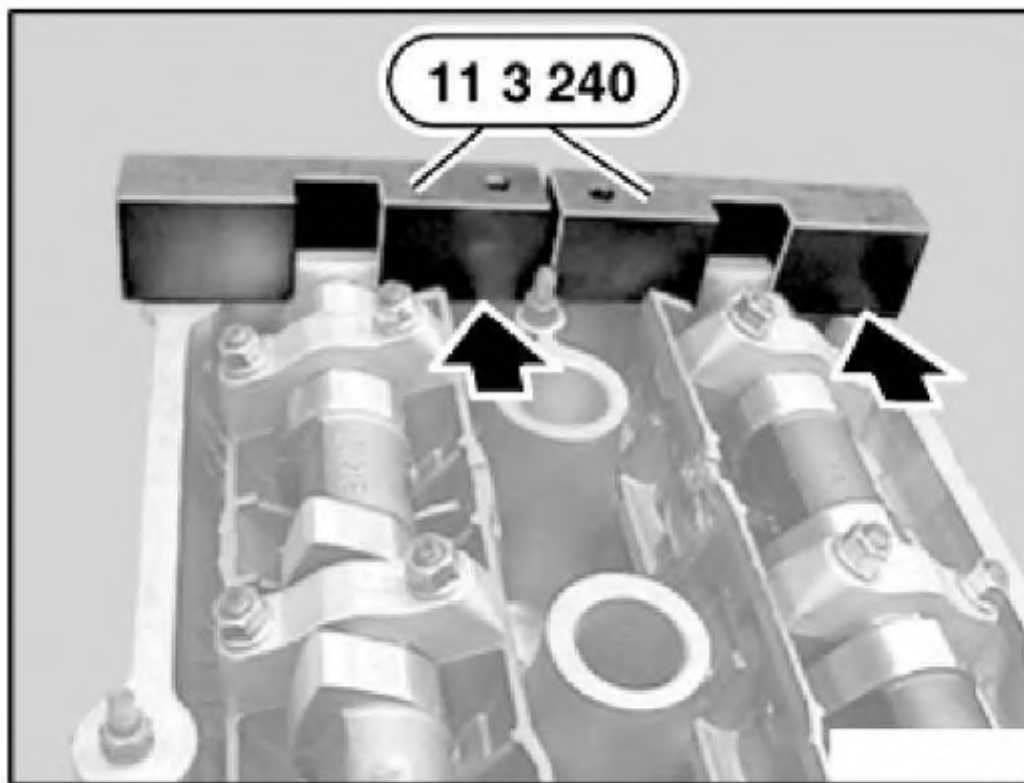
Place special tool 11 3 240 on camshafts.



G03230282

Fig. 240: Placing Locking Fixture On Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The timing is correctly set if the special tool 11 3 240 rests without a gap on the cylinder head or protrudes up to 1 mm to the inlet side. The timing must be reset if the special tool 11 3 240 protrudes to the exhaust side. If necessary, adjust camshaft timing. Refer to 11 31 505 ADJUSTING CAMSHAFT TIMING (M52TU / M54 / M56) .

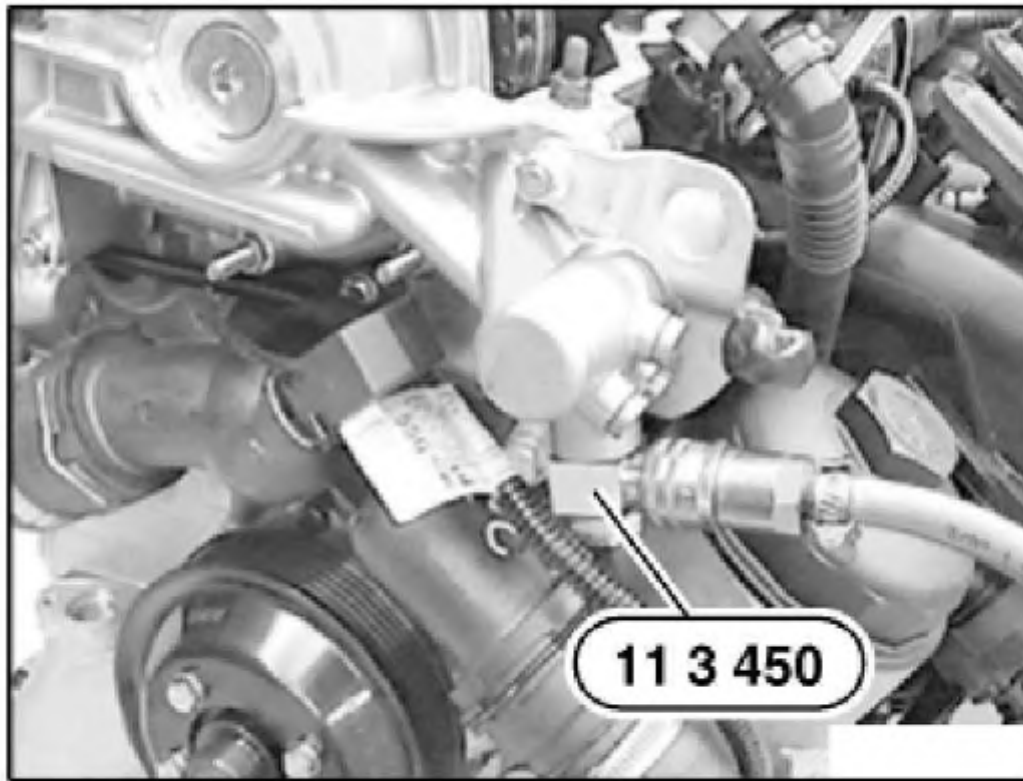


G03230283

Fig. 241: Checking Alignment Of Locking Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Detach compressed air connection.

Remove special tool 11 3 450 .



G03230284

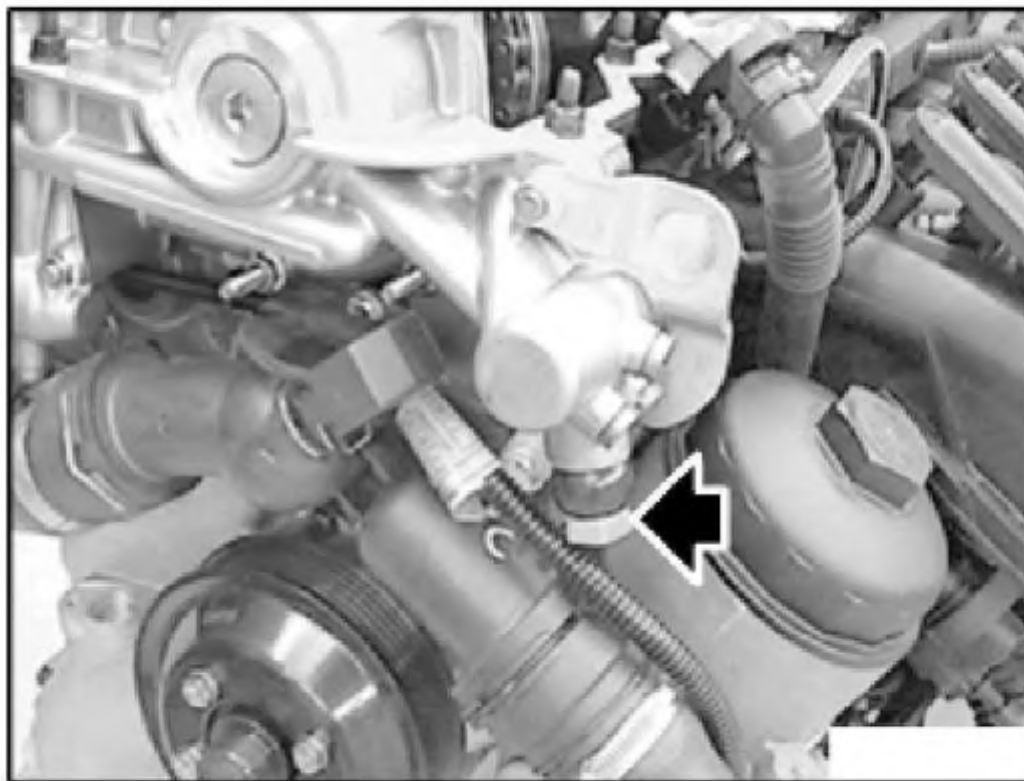
Fig. 242: Detaching Compressed Air Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Fit oil pressure line with new seals.

Tightening torque of banjo bolt, (32 N.m.).

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

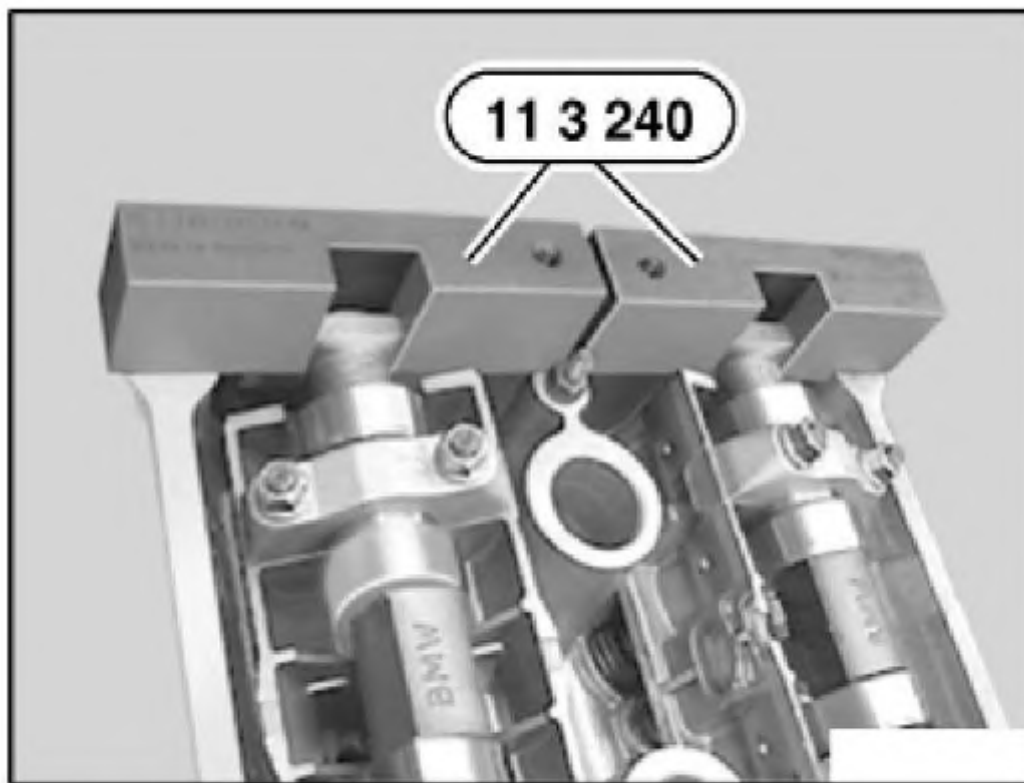


G03230285

Fig. 243: Locating Oil Pressure Line

Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 3 240 .

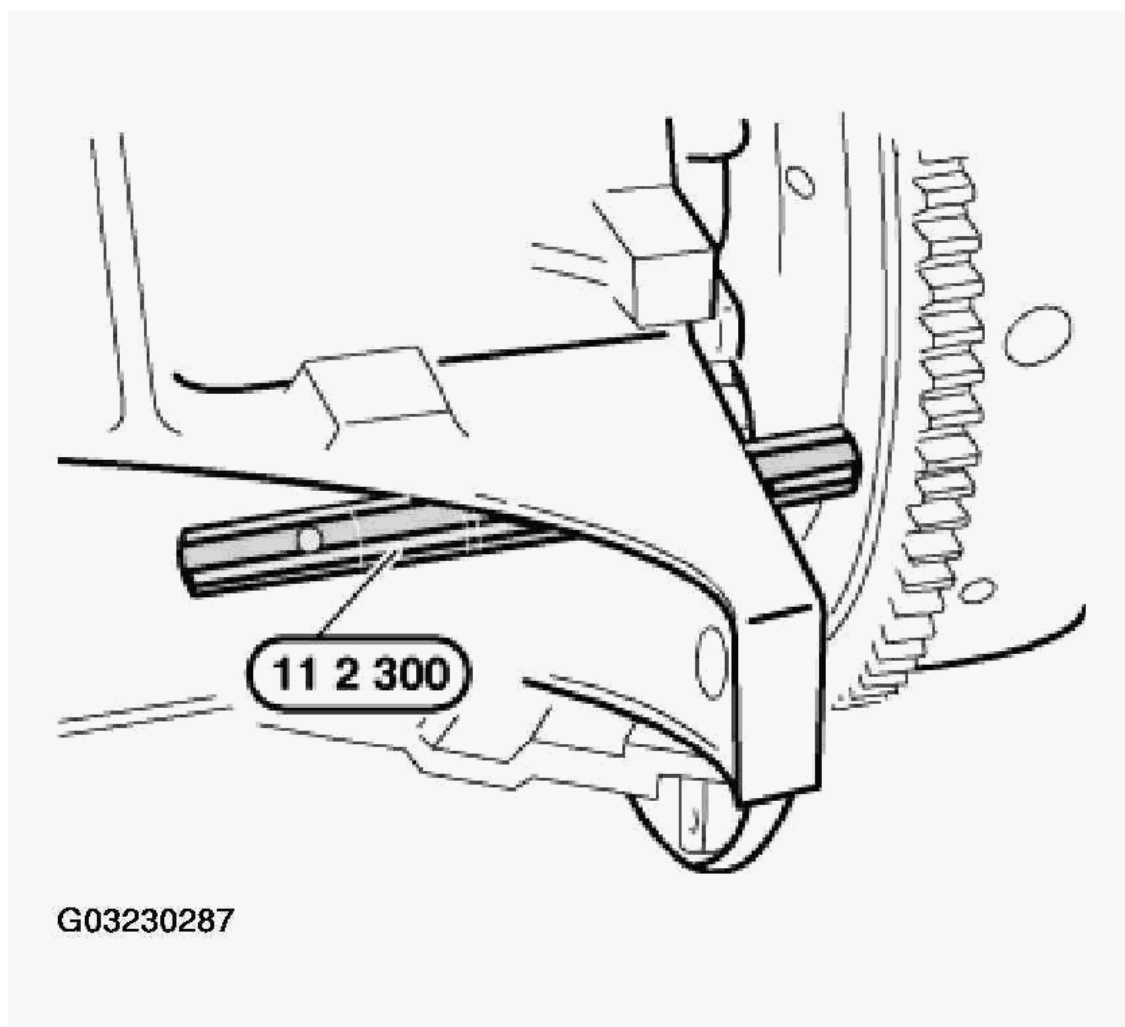


G03230286

Fig. 244: Removing Locking Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 2 300 .

Install dust guard from inspection bore.



G03230287

Fig. 245: Removing Plug Mandrel

Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten and remove special tool 11 4 220 .

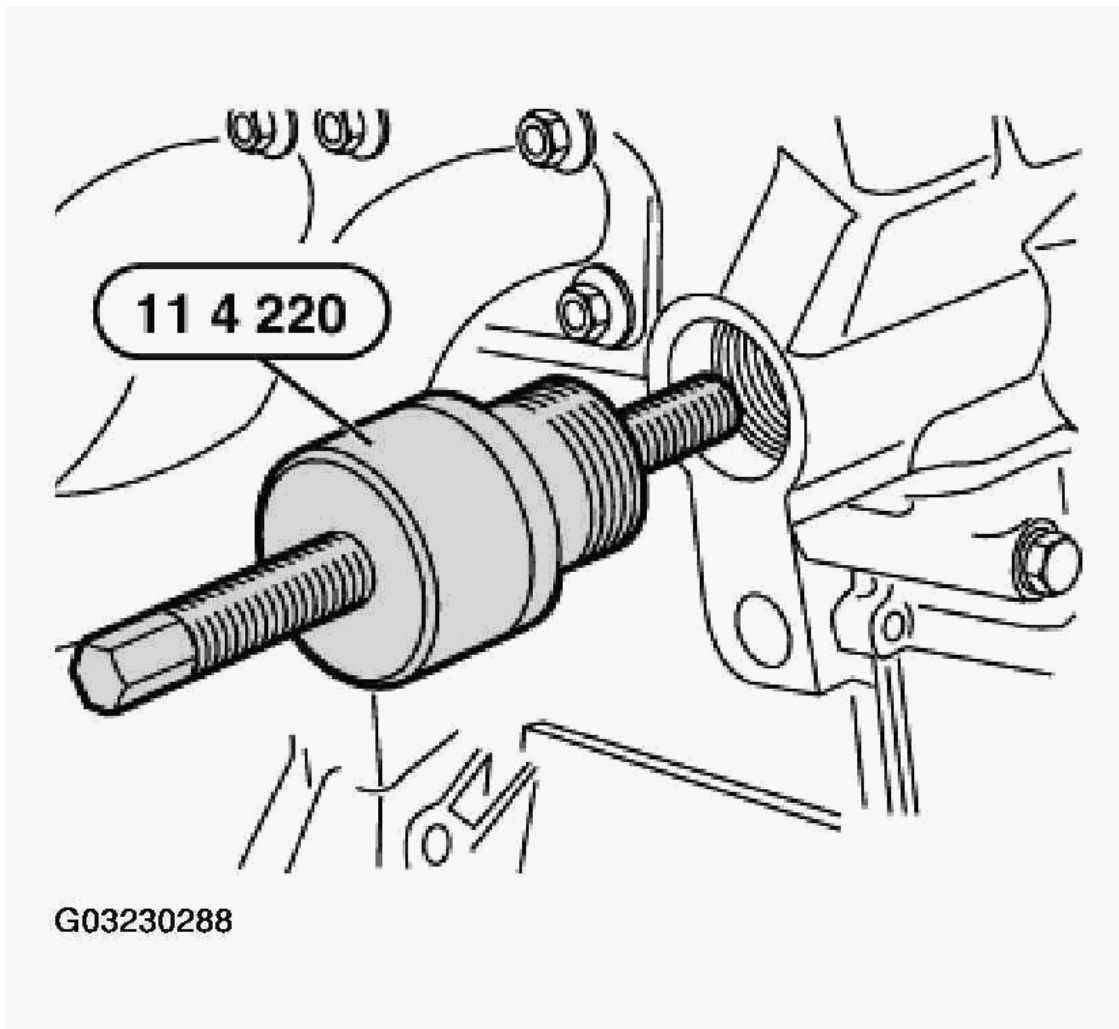


Fig. 246: Removing Chain Tensioner

Courtesy of BMW OF NORTH AMERICA, INC.

Install cylinder for chain tensioning piston, refer to **11 31 090 REMOVING AND INSTALLING/REPLACING CHAIN TENSIONING PISTON (M52 / M52TU / M54 / M56)** .

Assemble engine.

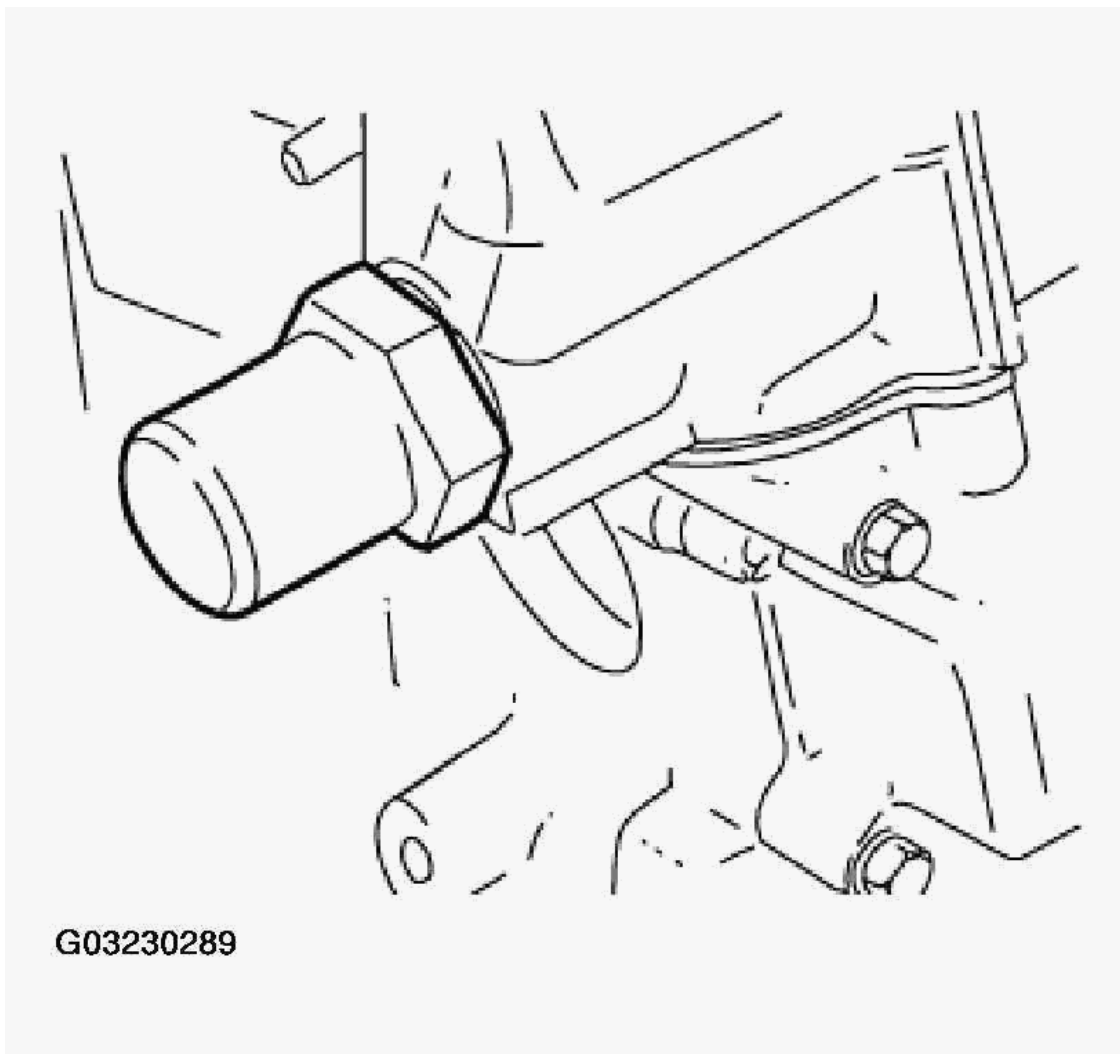


Fig. 247: Installing Cylinder For Tensioning Piston

Courtesy of BMW OF NORTH AMERICA, INC.

11 31 090 REMOVING AND INSTALLING/REPLACING CHAIN TENSIONING PISTON (M52 / M52TU / M54 / M56)

Important!

Spring pressure!

Unfasten cylinder for chain tensioning piston.

Installation:

Replace sealing ring.

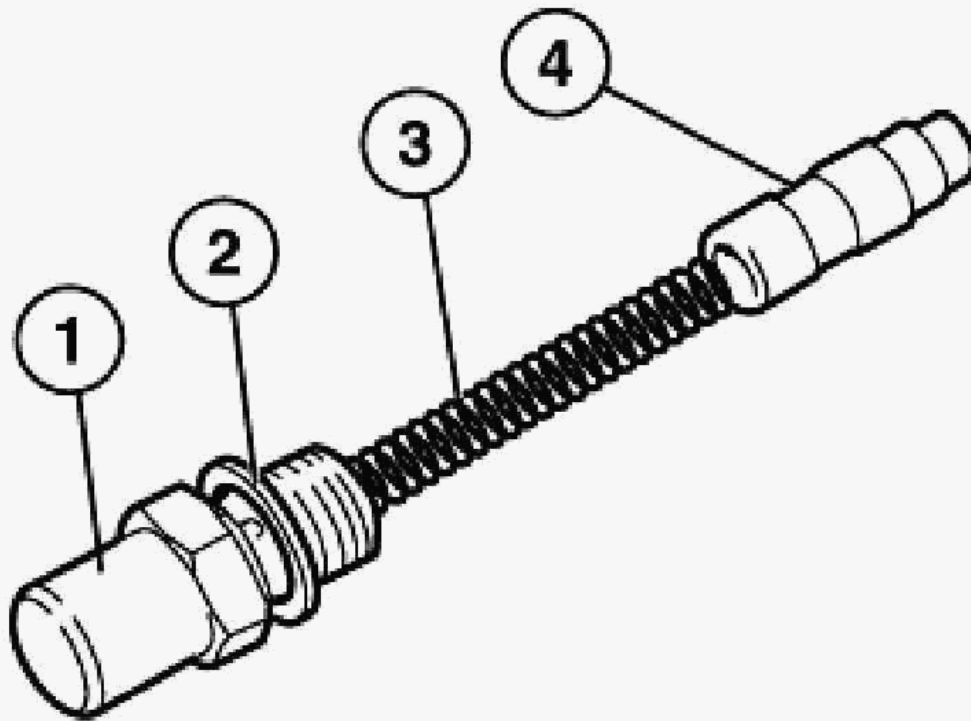
Tightening torque, refer to 11 31 8AZ in **ENGINE - TIGHTENING TORQUES** .



Fig. 248: Removing Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of components:

1. Cylinder for chain tensioning piston.
2. Sealing ring.
3. Spring.
4. Piston.



- 1) Cylinder for chain tensioning piston
- 2) Sealing ring
- 3) Spring
- 4) Piston

G03230291

Fig. 249: Exploded View Of Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

11 31 505 ADJUSTING CAMSHAFT TIMING (M52TU / M54 / M56)

NOTE: For Special Tool identification, see SPECIAL TOOLS - X5 (3.0i) .

Special Tools Required:

2002 BMW X5

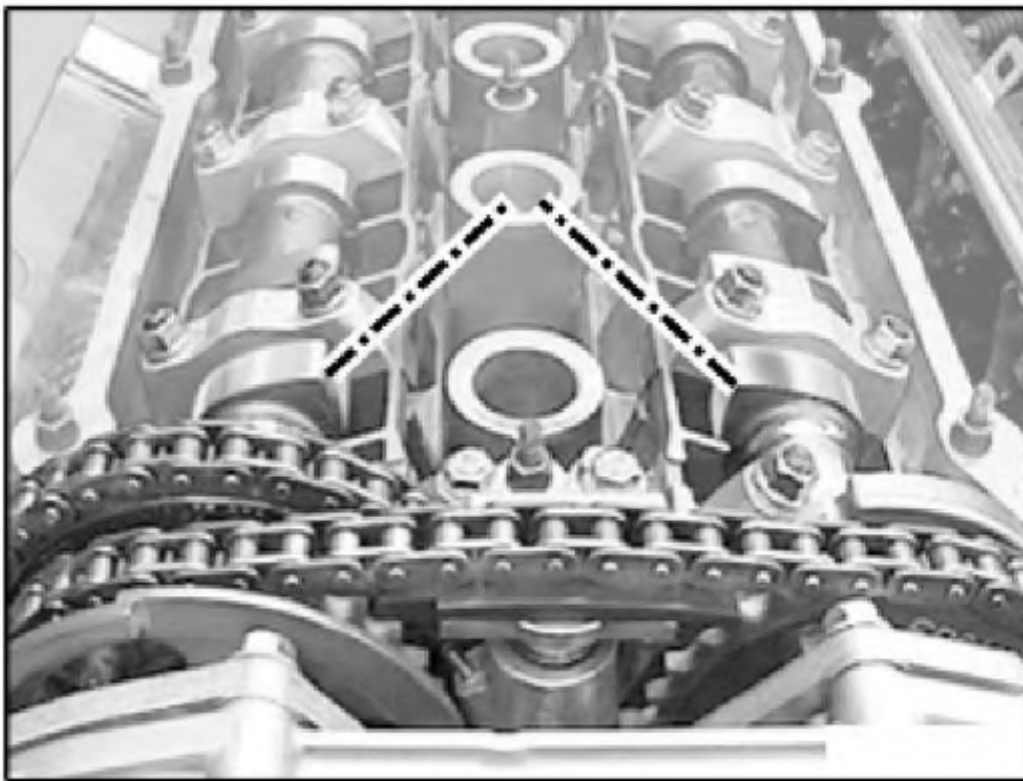
2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

- 00 9 250
- 11 2 300
- 11 3 240
- 11 3 244
- 11 3 292
- 11 4 220
- 11 5 180
- 11 6 150

Before carrying out adjustment work:

Check camshaft timing. Refer to **11 31 005 CHECKING CAMSHAFT TIMING (M52TU / M54 / M56)** .

Crank engine in direction of rotation until cam tips on inlet and exhaust camshafts on 1st cylinder face one another.

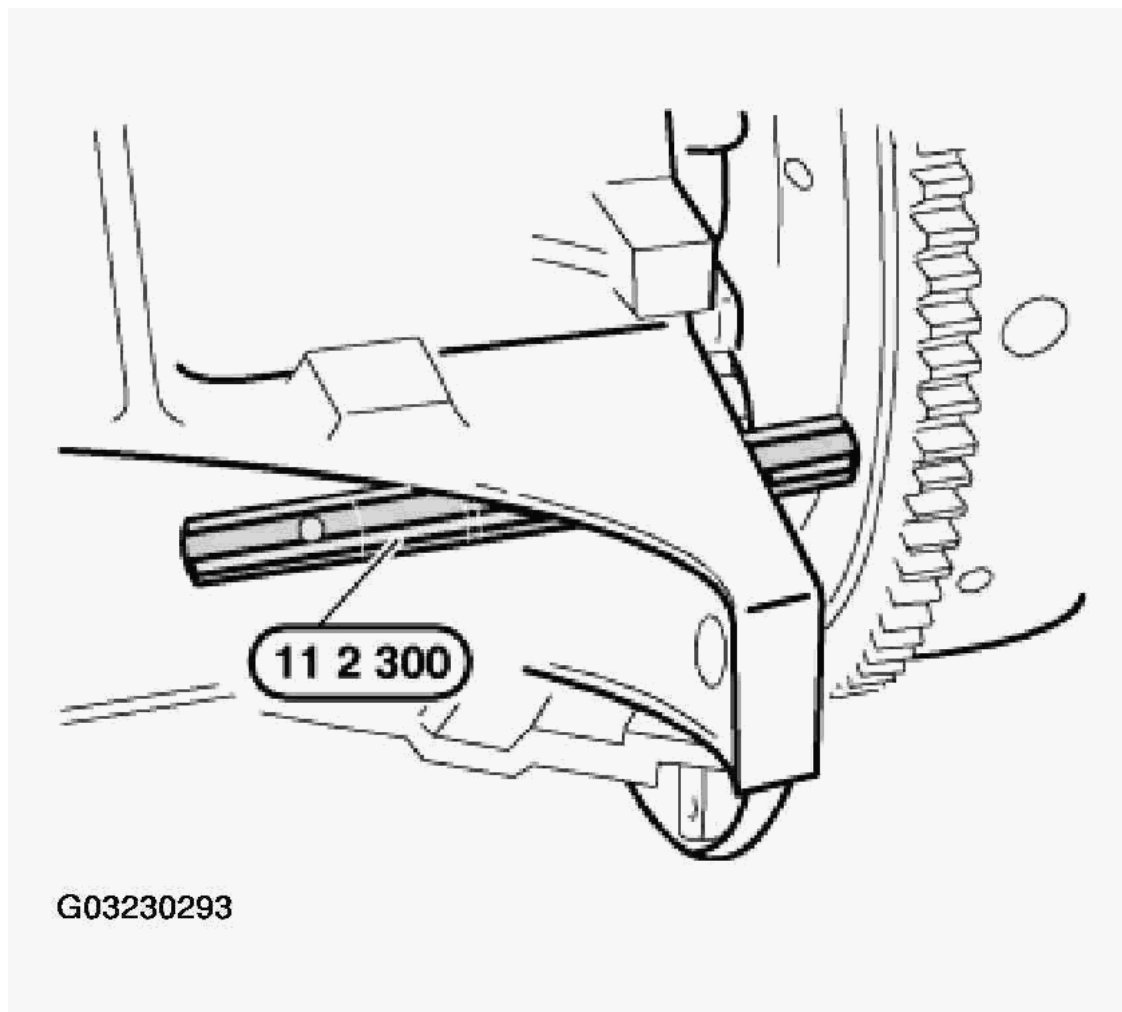


G03230292

Fig. 250: Aligning Cam Tips

Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft with special tool 11 2 300 in TDC position of 1st cylinder.

**Fig. 251: Installing Plug Mandrel**

Courtesy of BMW OF NORTH AMERICA, INC.

Important!

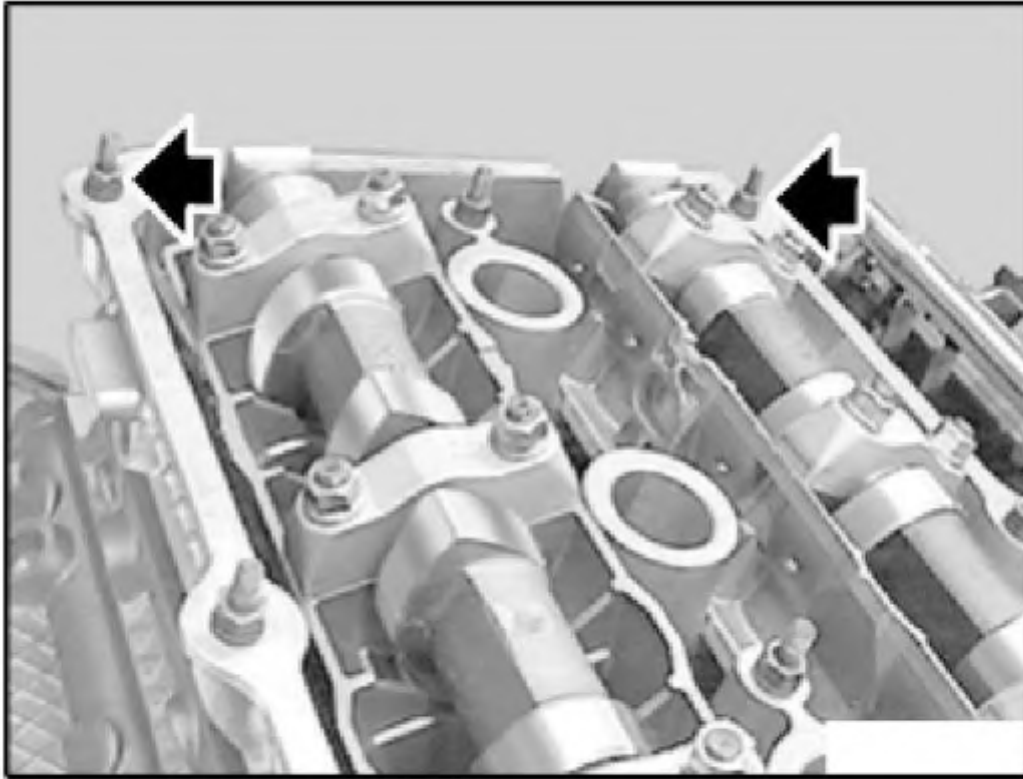
Do not turn the engine back.

Remove special tools 11 2 300 / 11 5 180 before starting engine.

Unscrew studs.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230294

Fig. 252: Unscrewing Studs

Courtesy of BMW OF NORTH AMERICA, INC.

Remove double VANOS adjustment unit, refer to **11 36 010 REMOVING AND INSTALLING OR REPLACING DOUBLE VANOS ADJUSTMENT UNIT (M52TU / M54 / M56)** .

Press down top of chain tensioner and lock off with special tool 11 3 292 .

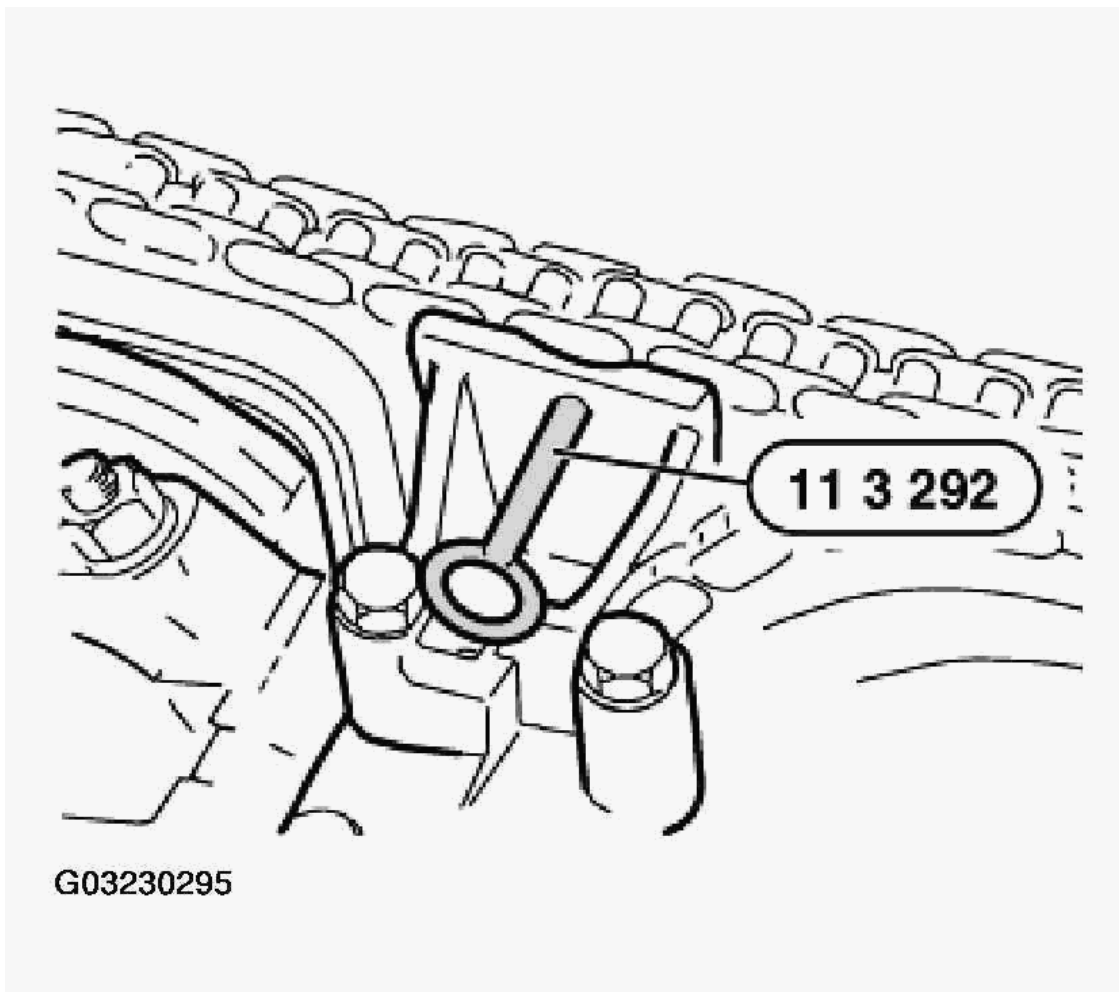


Fig. 253: Locking Chain Tensioner With 11 3 292
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Cylinder for chain tensioning piston is under spring pressure.

Remove cylinder for chain tensioning piston.

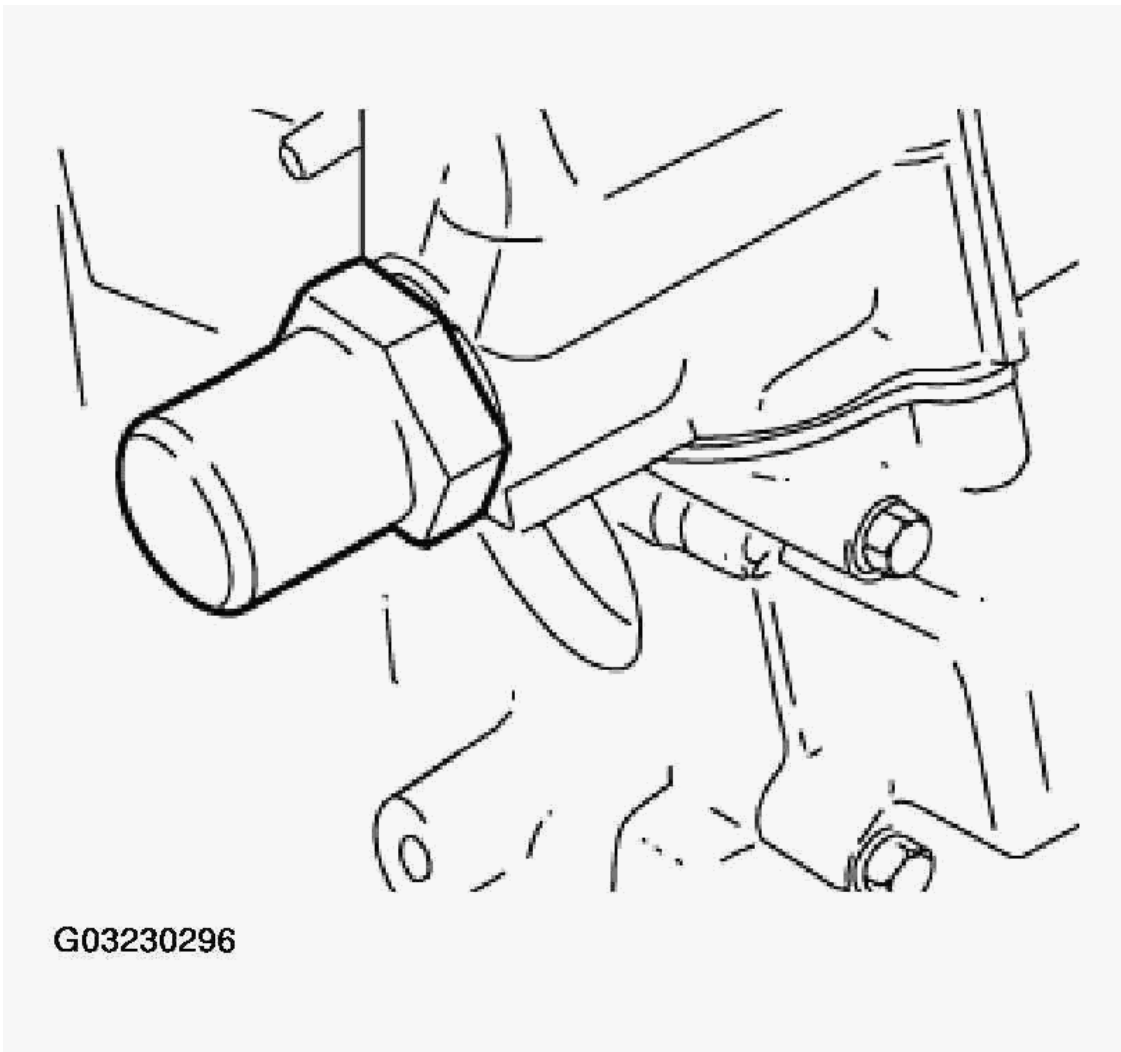


Fig. 254: Removing Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool 11 4 220 .

Fit adjusting screw to bow cover.

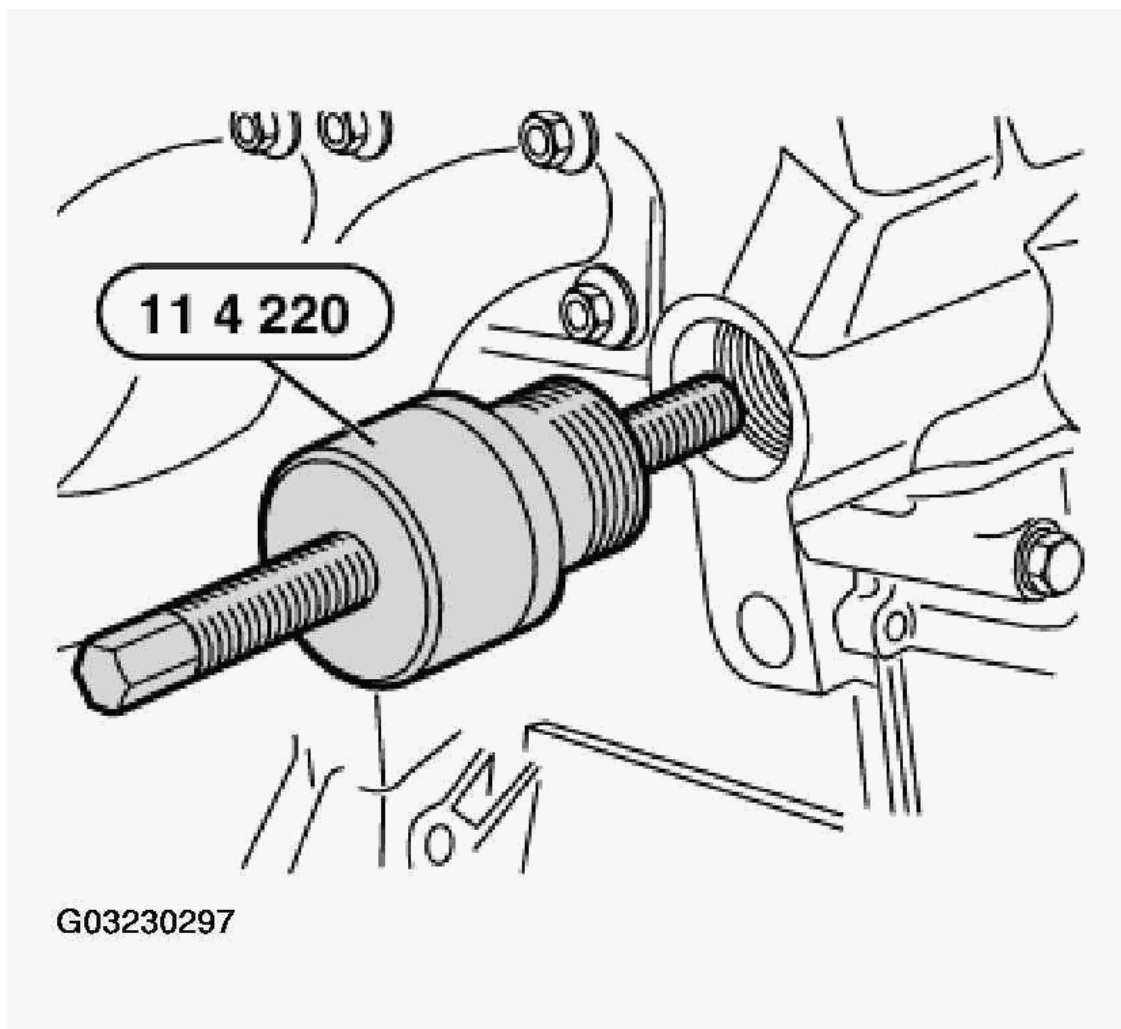
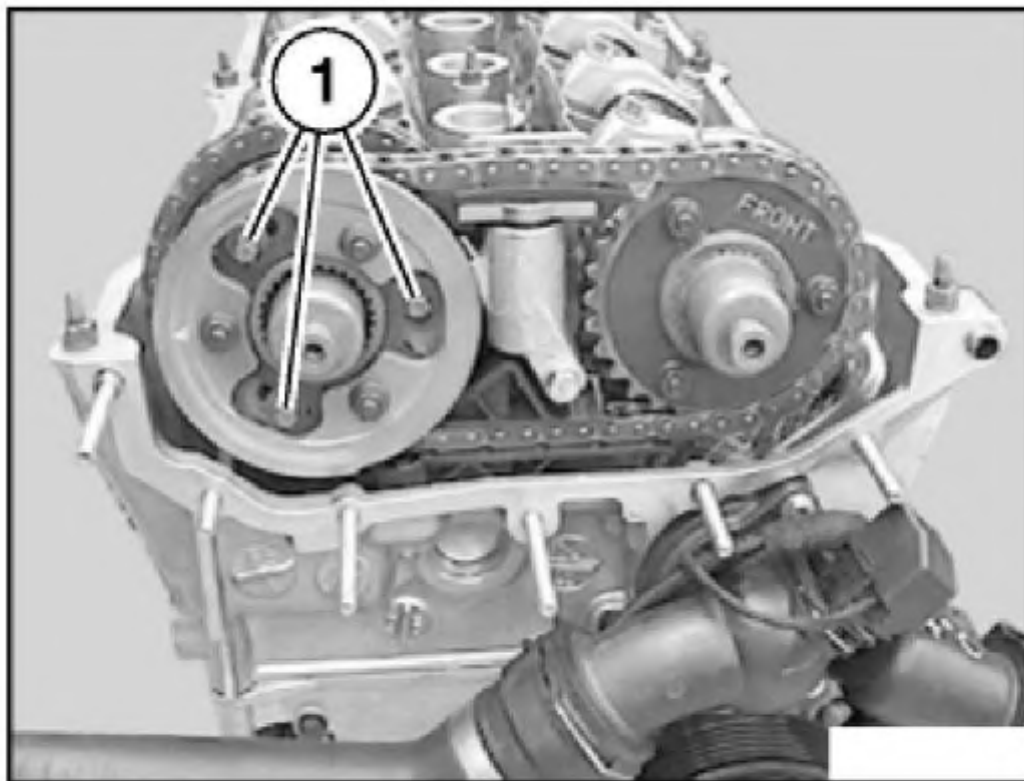


Fig. 255: Installing Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) by half a turn.

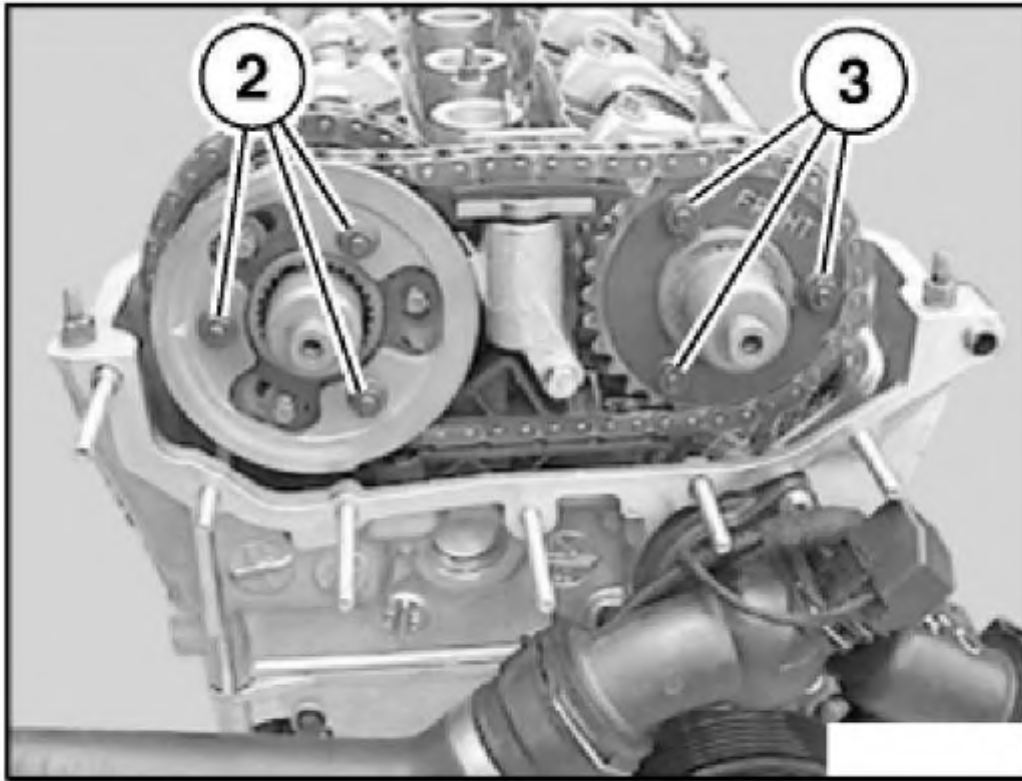


G03230298

Fig. 256: Releasing Screws On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (2) by two turns.

Release nuts (3) by one turn.



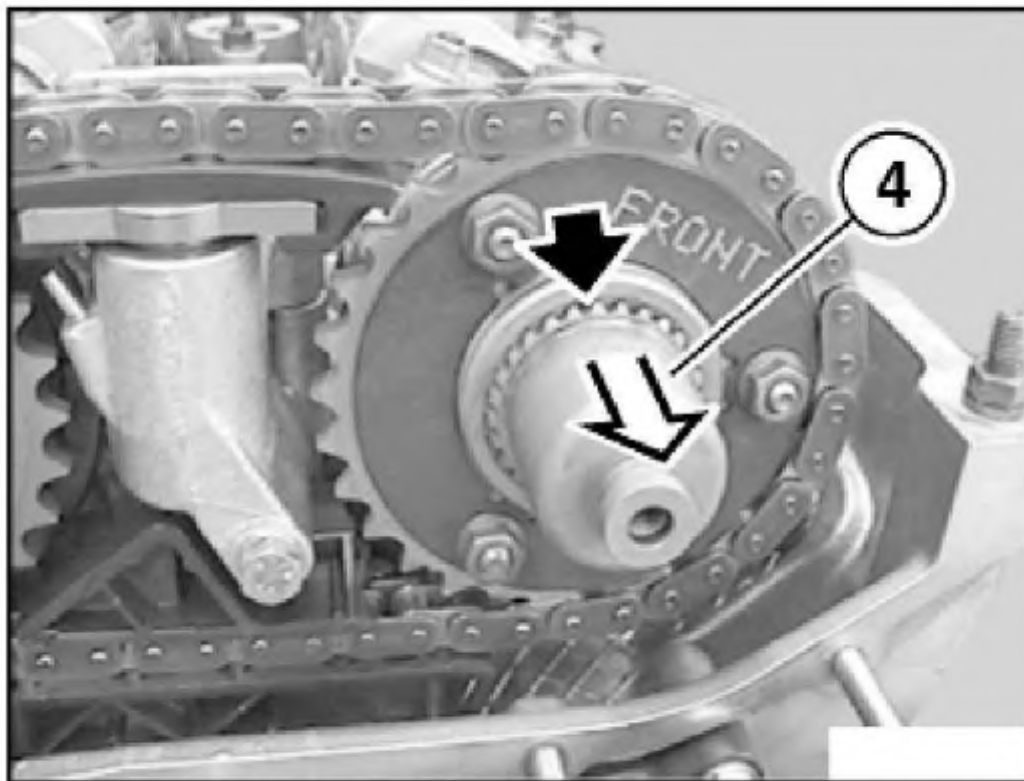
G03230299

Fig. 257: Releasing Nuts On Exhaust And Inlet Side
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Toothed shaft (4) slips very easily from splines.

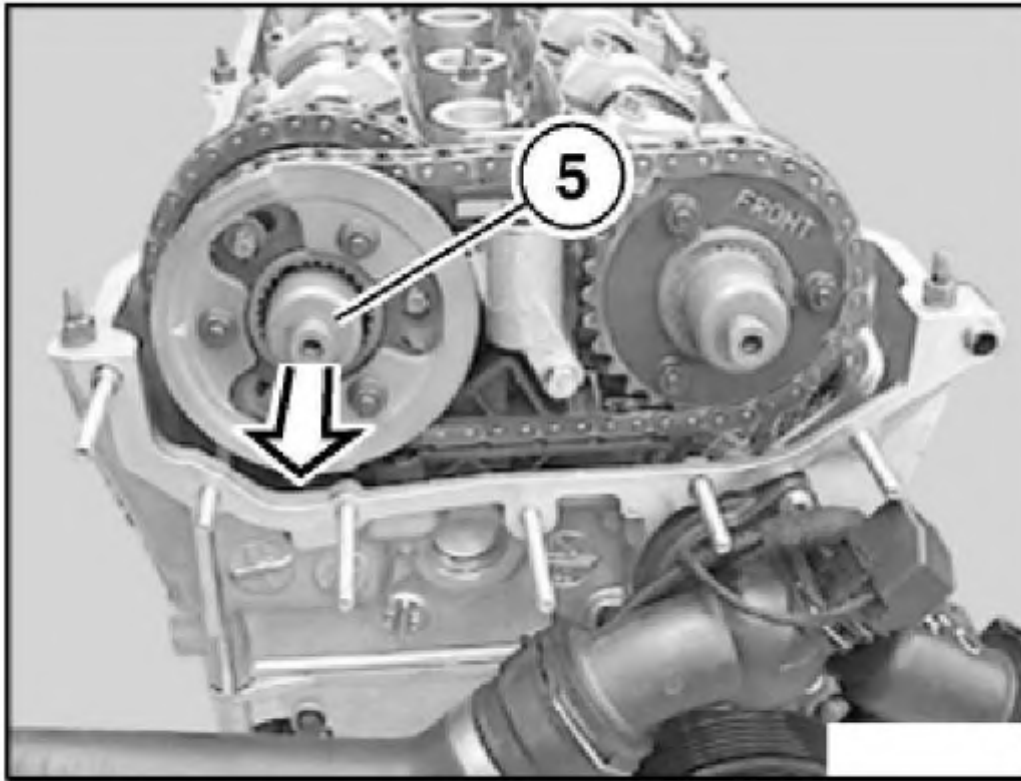
Pull out toothed shaft (4) until approx. 1 mm of splines can be seen.



G03230300

Fig. 258: Aligning Toothed Shaft Splines
Courtesy of BMW OF NORTH AMERICA, INC.

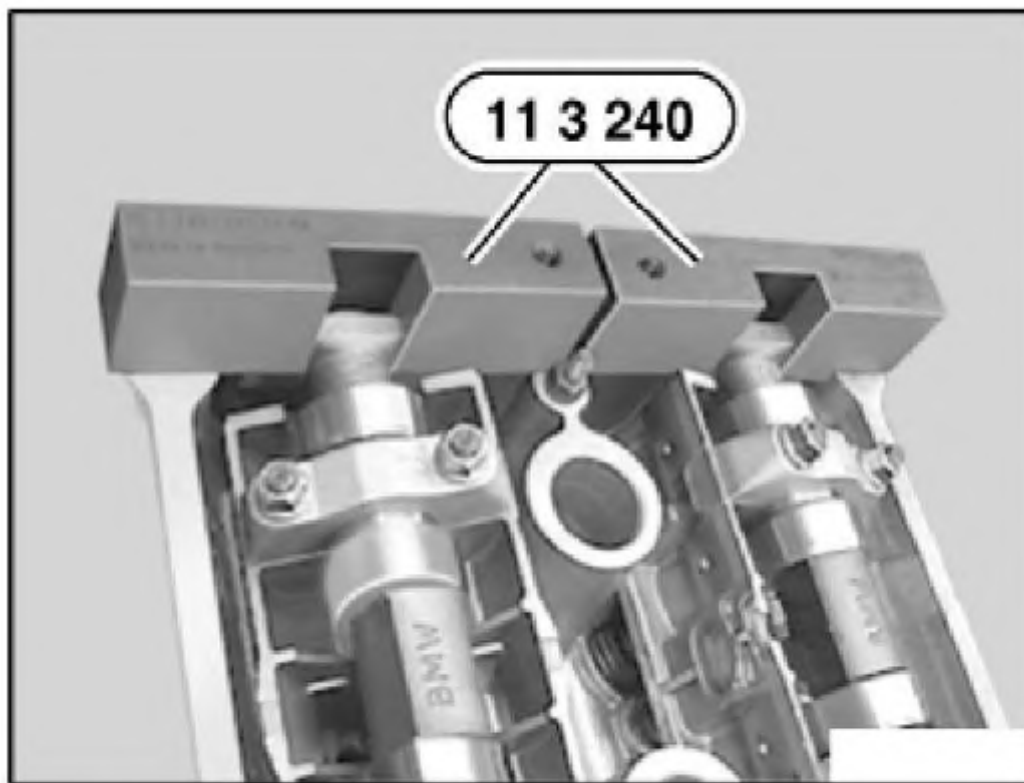
Withdraw toothed shaft (5) up to stop.



G03230301

Fig. 259: Positioning Toothed Shaft Up To Stop
Courtesy of BMW OF NORTH AMERICA, INC.

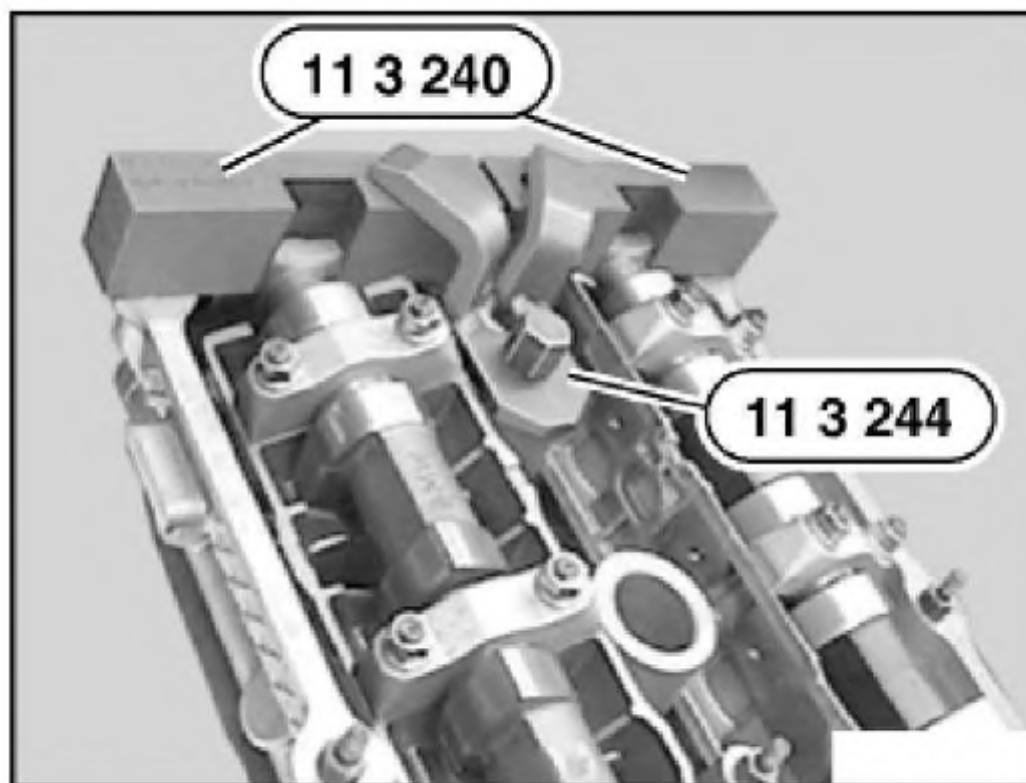
Fit special tool 11 3 240 to camshafts on cylinder 6. Align camshafts so that special tool 11 3 240 rests without gaps on cylinder head.



G03230302

Fig. 260: Installing Locking Fixture Onto Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 3 244 to special tool 11 3 240 and locate by way of spark plug thread.



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Fig. 261: Installing Support Bracket 11 3 244
Courtesy of BMW OF NORTH AMERICA, INC.

Press down chain tensioner at top and remove special tool 11 3 292 .

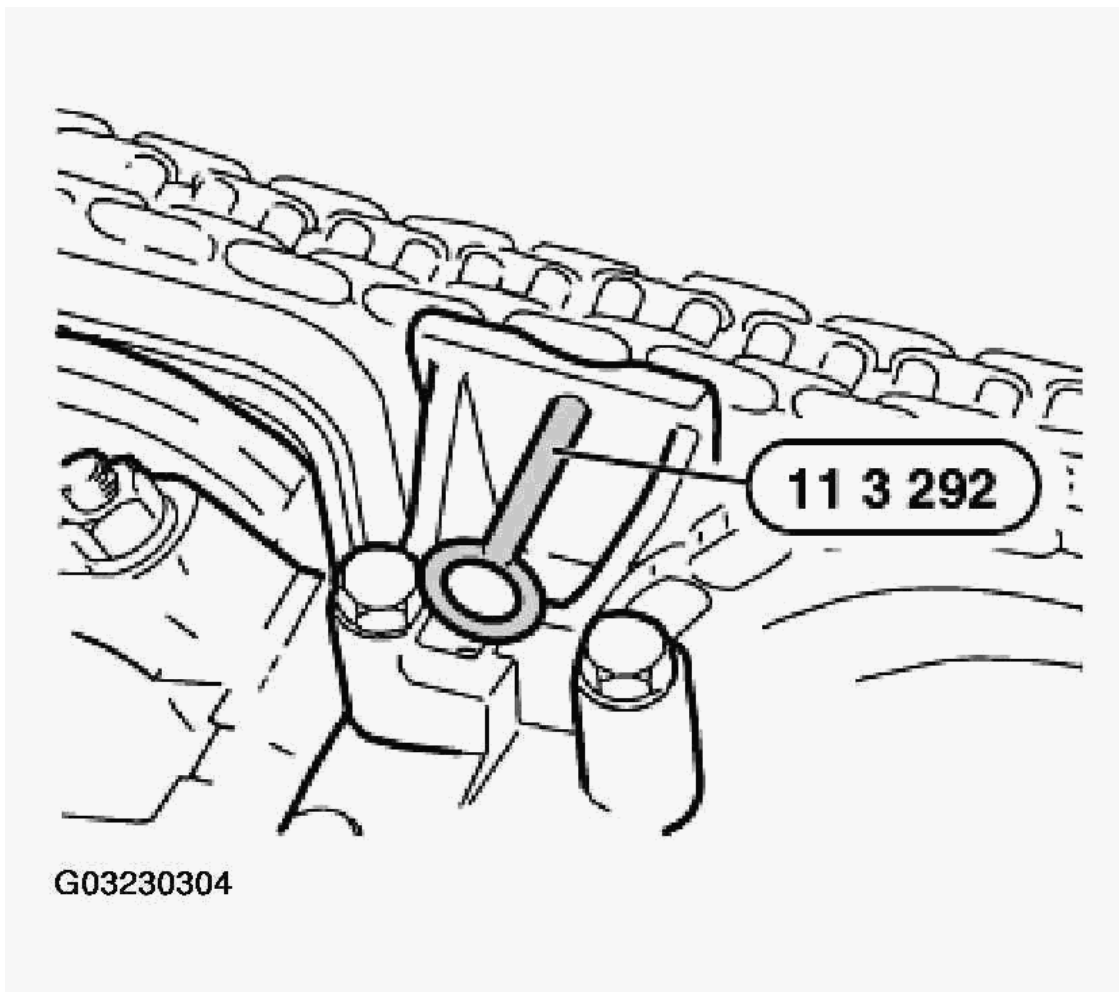
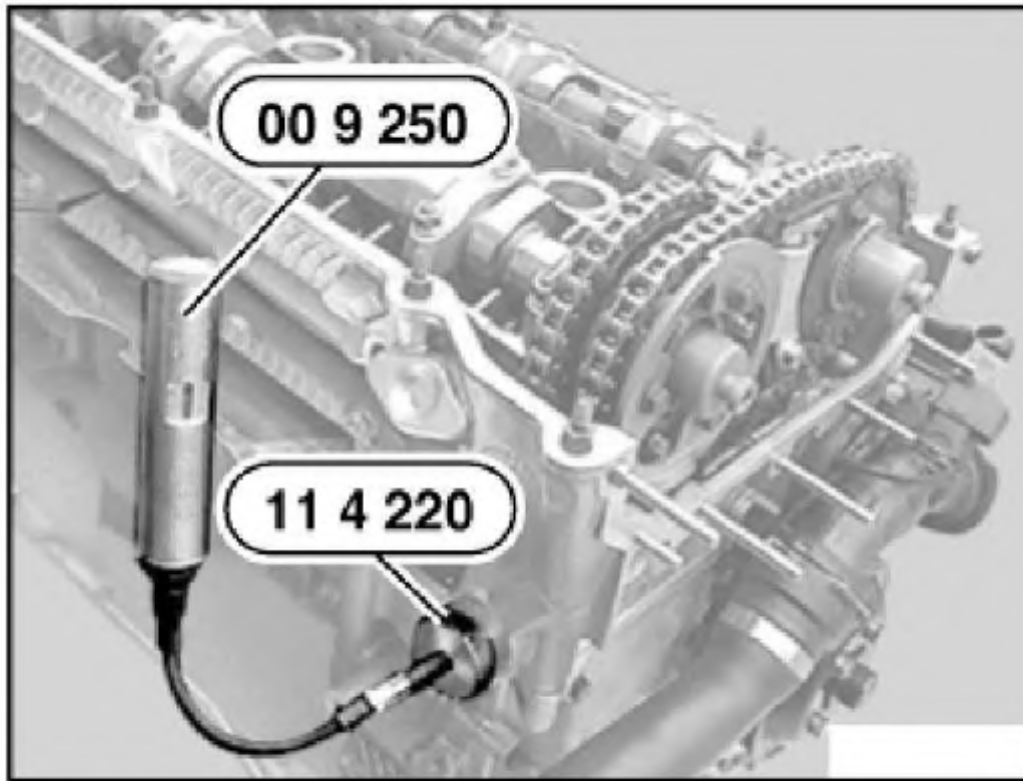


Fig. 262: Removing Special Tool 11 3 292
Courtesy of BMW OF NORTH AMERICA, INC.

Preload tensioning rail with special tool 11 4 220 by rotating adjusting screw with special tool 00 9 250 or standard torque wrench to 0.7 N.m.



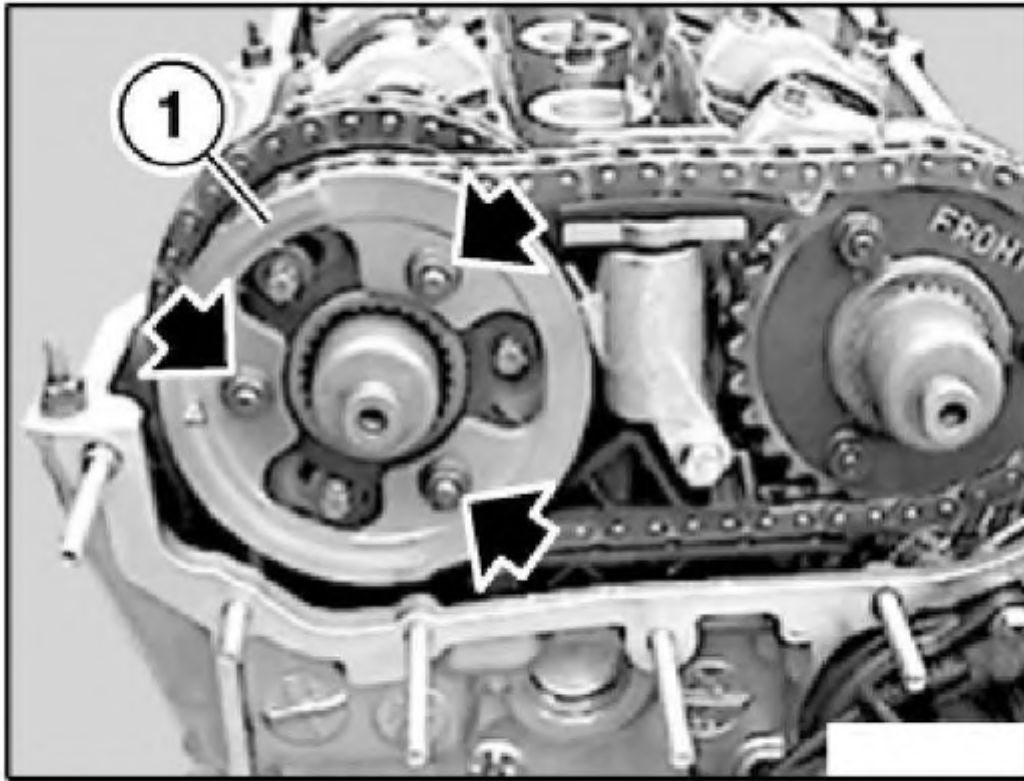
G03230305

Fig. 263: Preloading Tensioning Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Preload cup spring slightly by pressing on sensor gear (1) and tighten nuts by hand.

Important!

Do not tighten down nuts fully.



G03230306

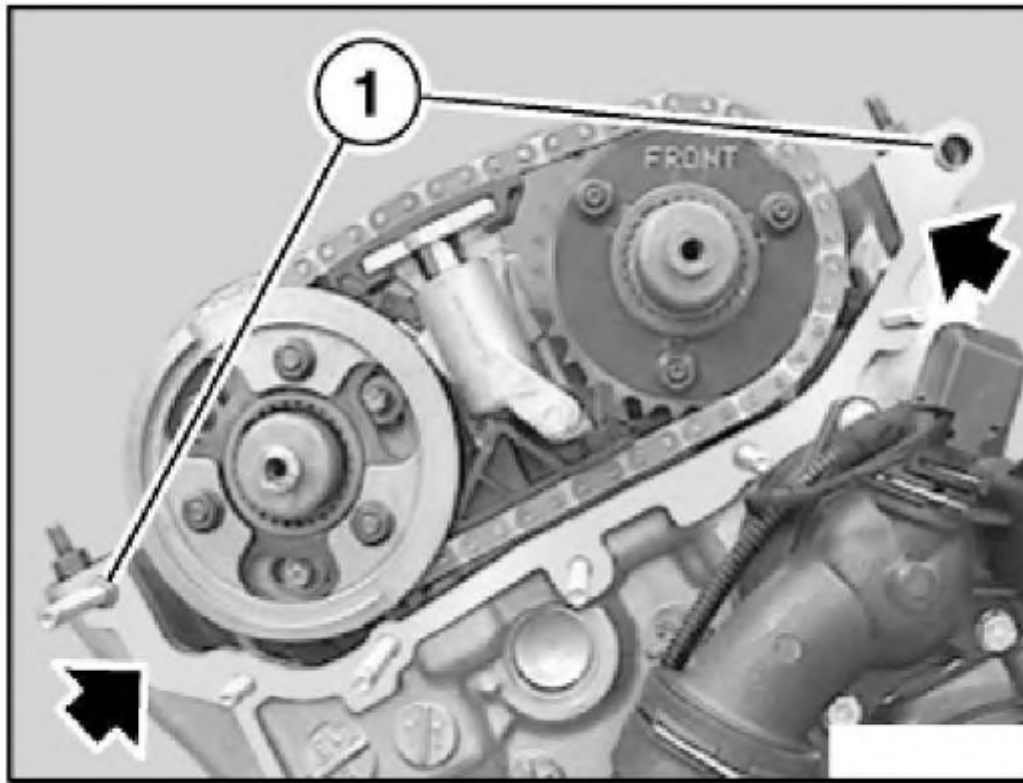
Fig. 264: Preloading Cup Spring

Courtesy of BMW OF NORTH AMERICA, INC.

Remove gasket.

Check dowel sleeves (1) for damage and correct installation position.

Keep sealing face clean and free of oil.



G03230307

Fig. 265: Checking Dowel Sleeves

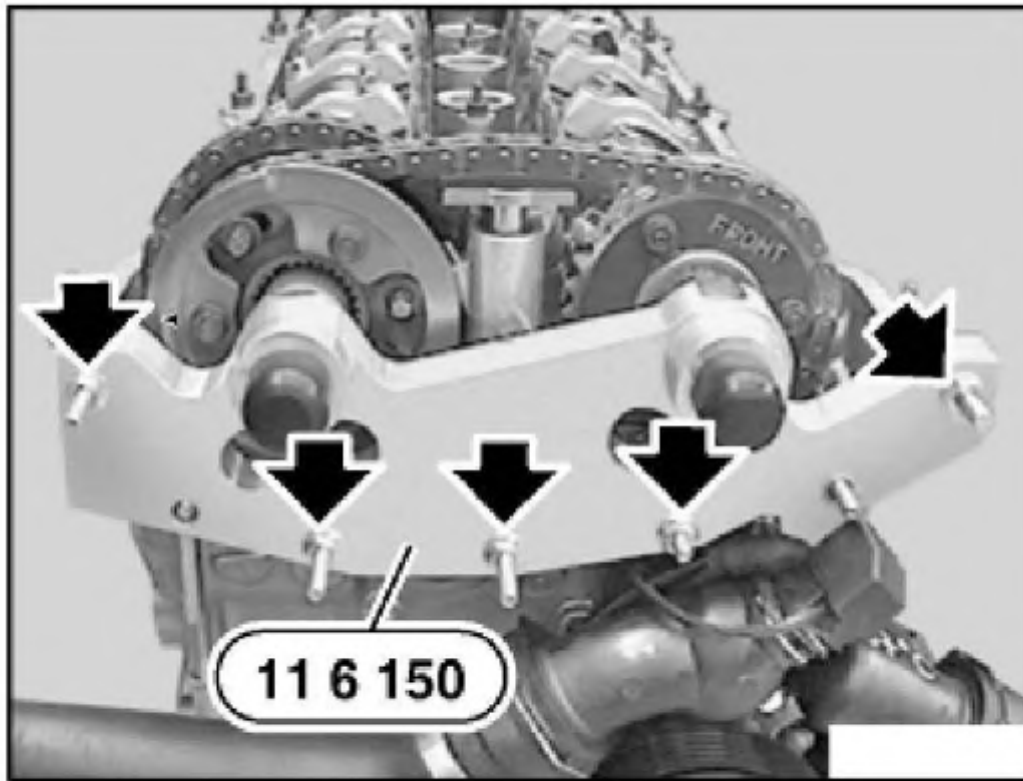
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Fit special tool 11 6 150 "without gasket" only.

If gasket remains underneath special tool 11 6 150 , camshaft timing will be "incorrectly" set.

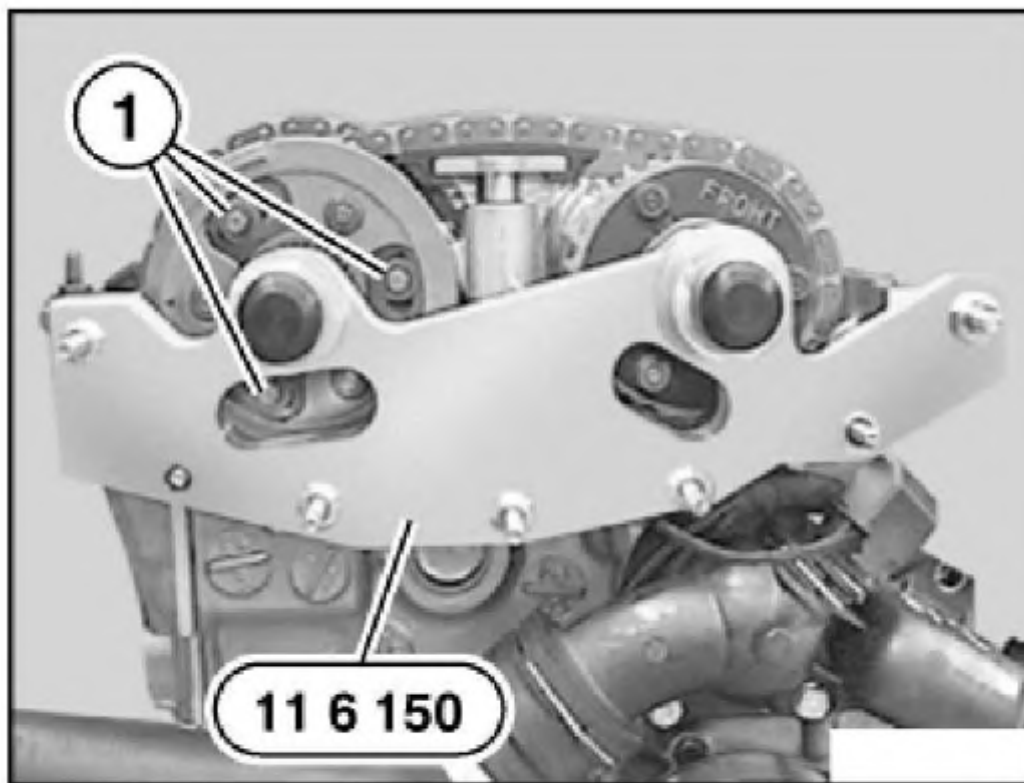
Attach special tool 11 6 150 "without gasket", tighten nuts by hand and then tighten down uniformly until special tool 11 6 150 is in full contact with cylinder head.



G03230308

Fig. 266: Installing Adjusting Plate On Cylinder Head Without Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

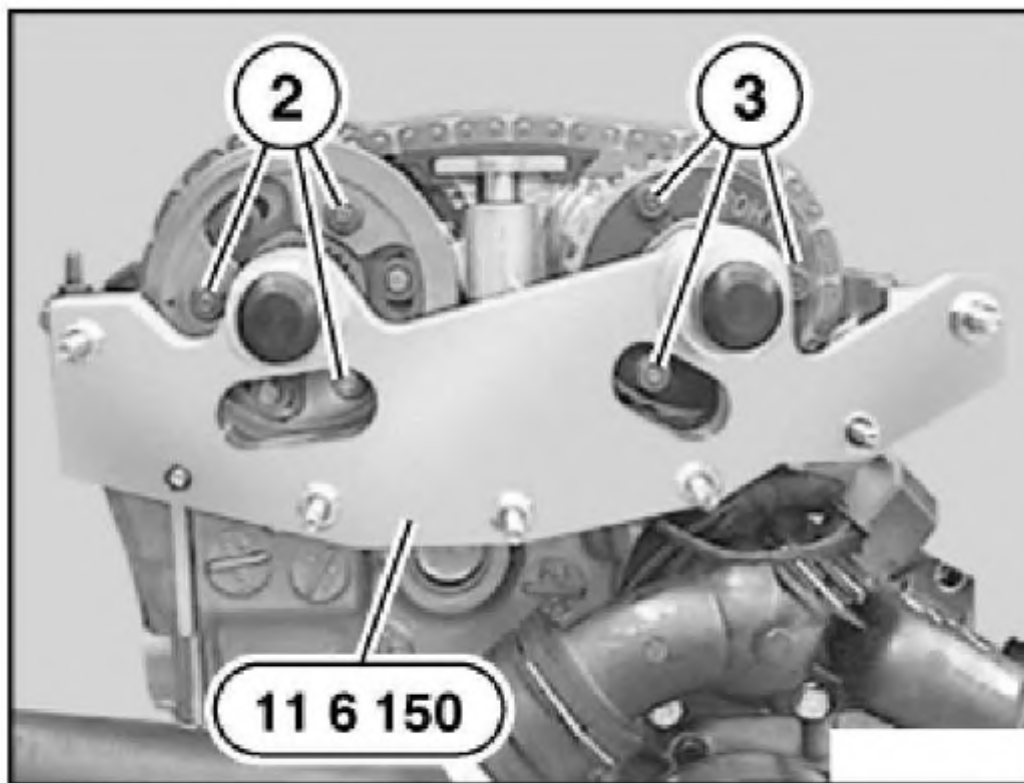
Insert screws (1) on exhaust side and initially tighten to approx. 5 N.m.



G03230309

Fig. 267: Tightening Screws On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten nuts (2) on exhaust side and nuts (3) on inlet side to approx. 5 N.m.

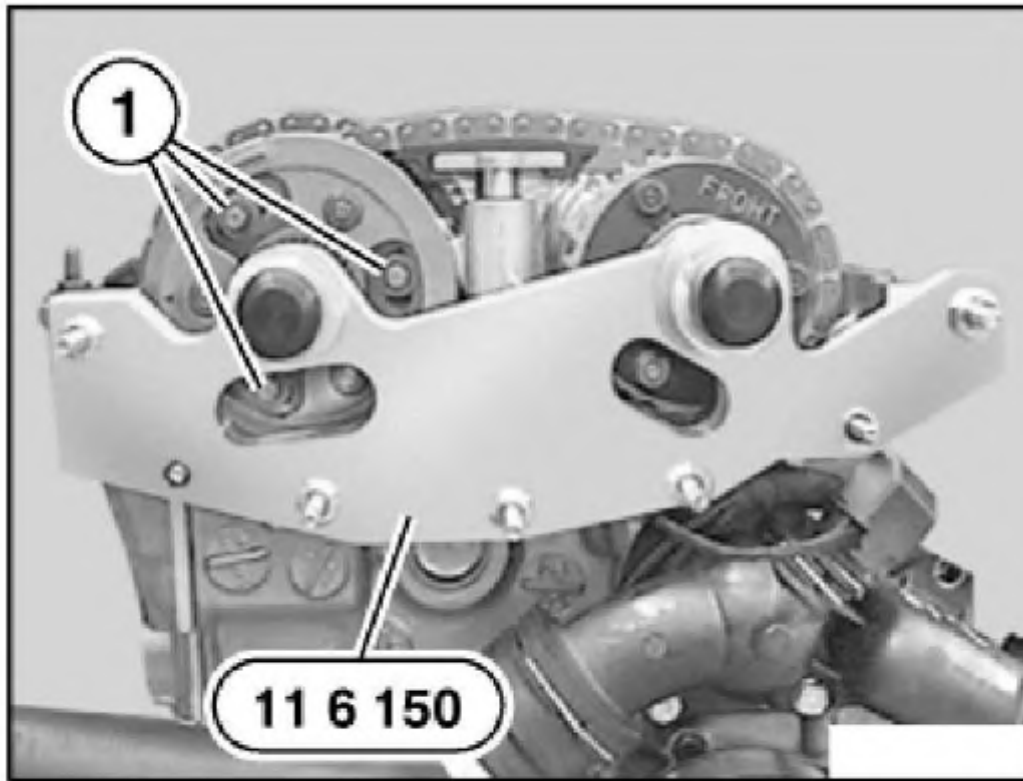


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Fig. 268: Tightening Nuts On Exhaust And Inlet Side
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down screws (1) on exhaust side.

Tightening torque, refer to 11 31 3AZ in **ENGINE - TIGHTENING TORQUES** .

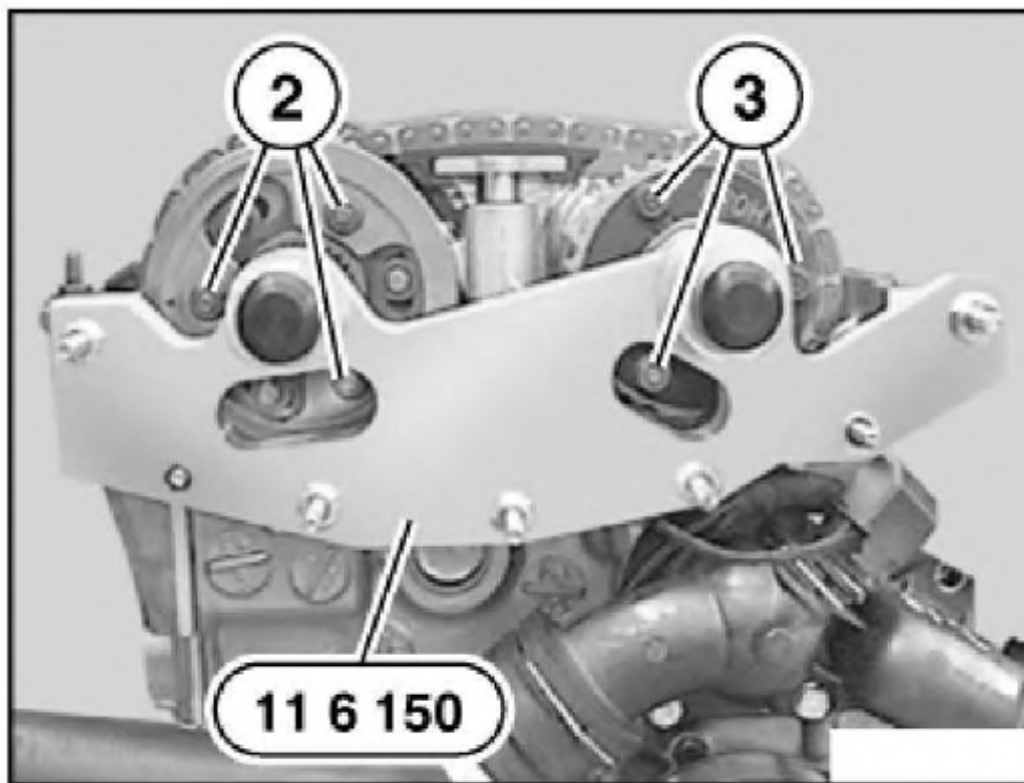


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Fig. 269: Tightening Screws On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down nuts (2) on exhaust side and nuts (3) on inlet side.

Tightening torque, refer to 11 31 11AZ in **ENGINE - TIGHTENING TORQUES** .



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Fig. 270: Tightening Nuts On Exhaust Side And Inlet Side
Courtesy of BMW OF NORTH AMERICA, INC.

Pull special tool 11 2 300 / 11 5 180 back until flywheel is no longer secured.

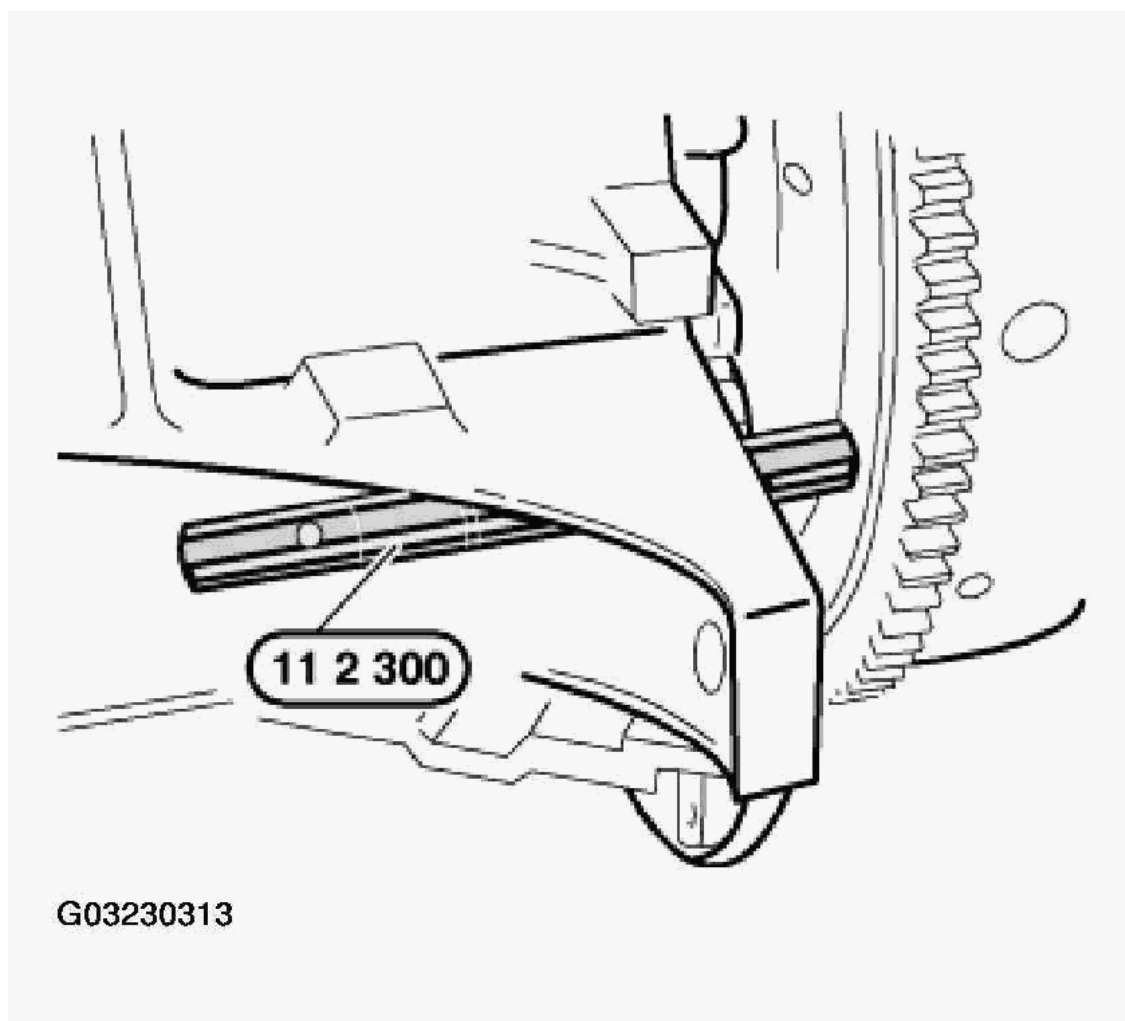
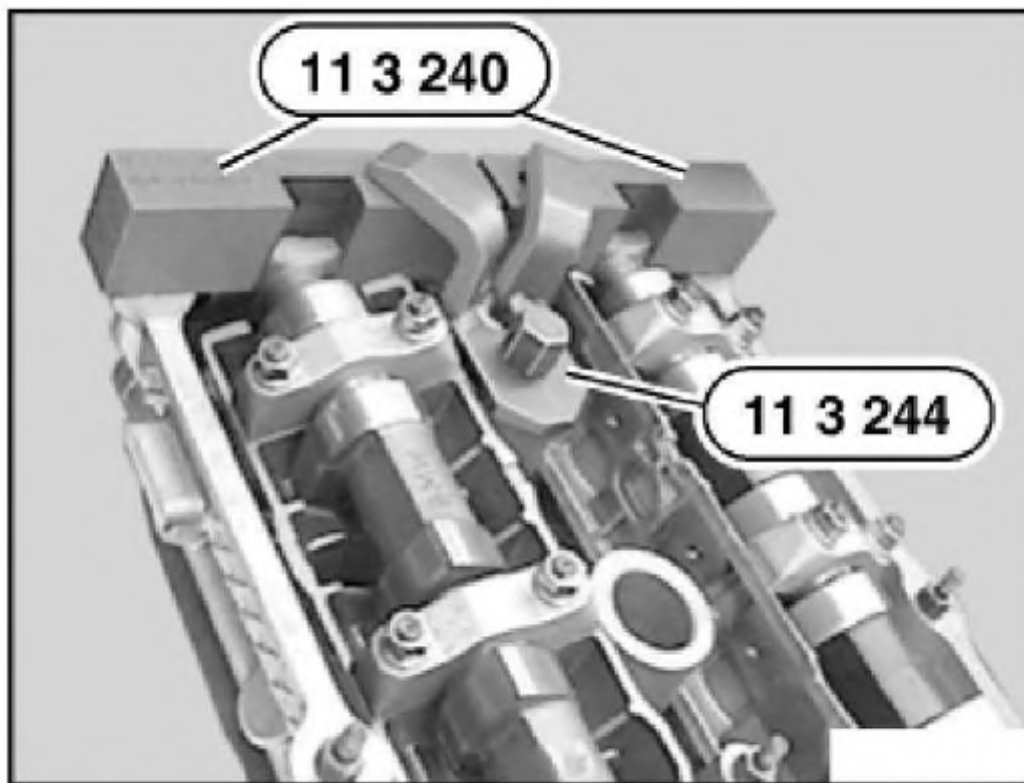


Fig. 271: Releasing Plug Mandrel From Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 3 244 and special tool 11 3 240 .



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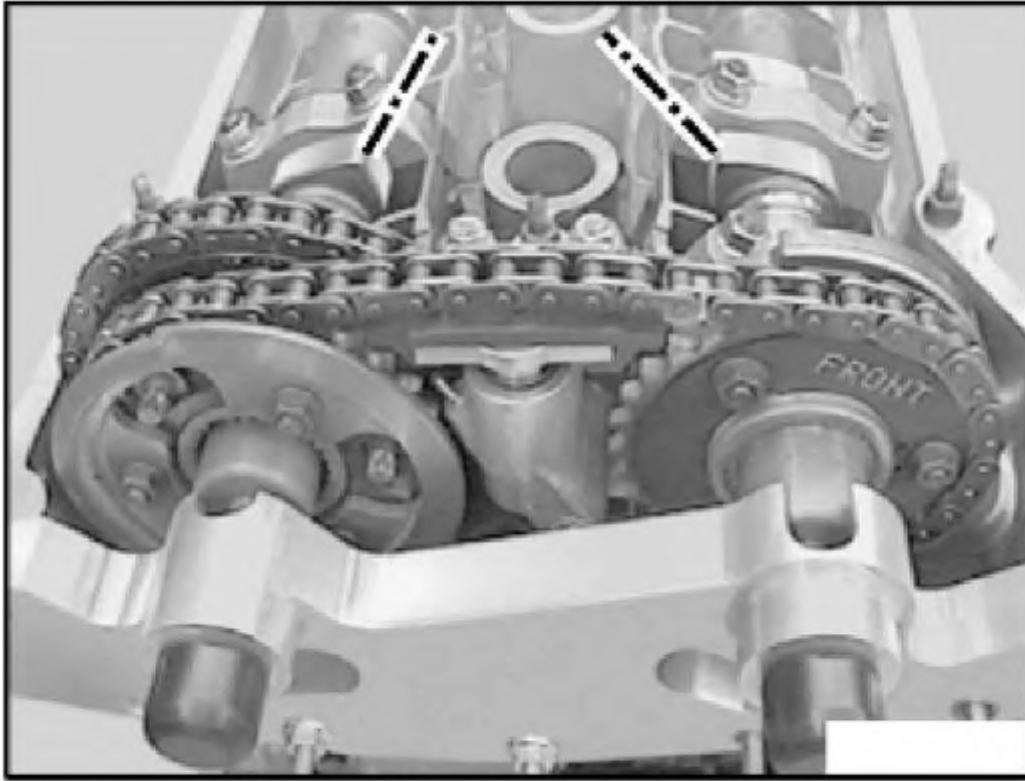
Fig. 272: Removing Locking Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

Crank engine twice in direction of rotation until cam tips on inlet and exhaust camshafts on 1st cylinder face one another.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230315

Fig. 273: Aligning Cam Tips

Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft in firing TDC position with special tool 11 2 300 .

Important!

Do not turn the engine back.

Remove special tools 11 2 300 / 11 5 180 before starting engine.

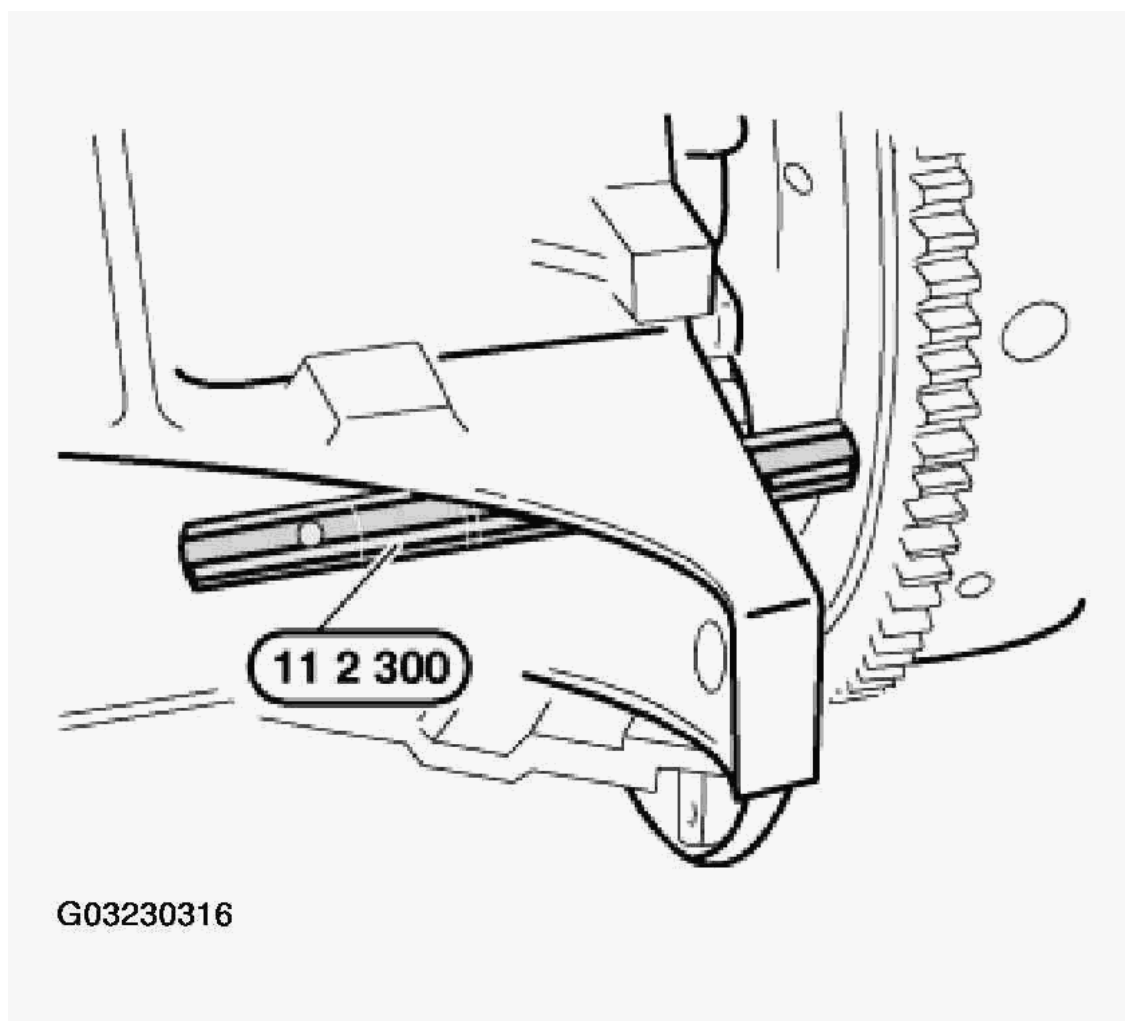
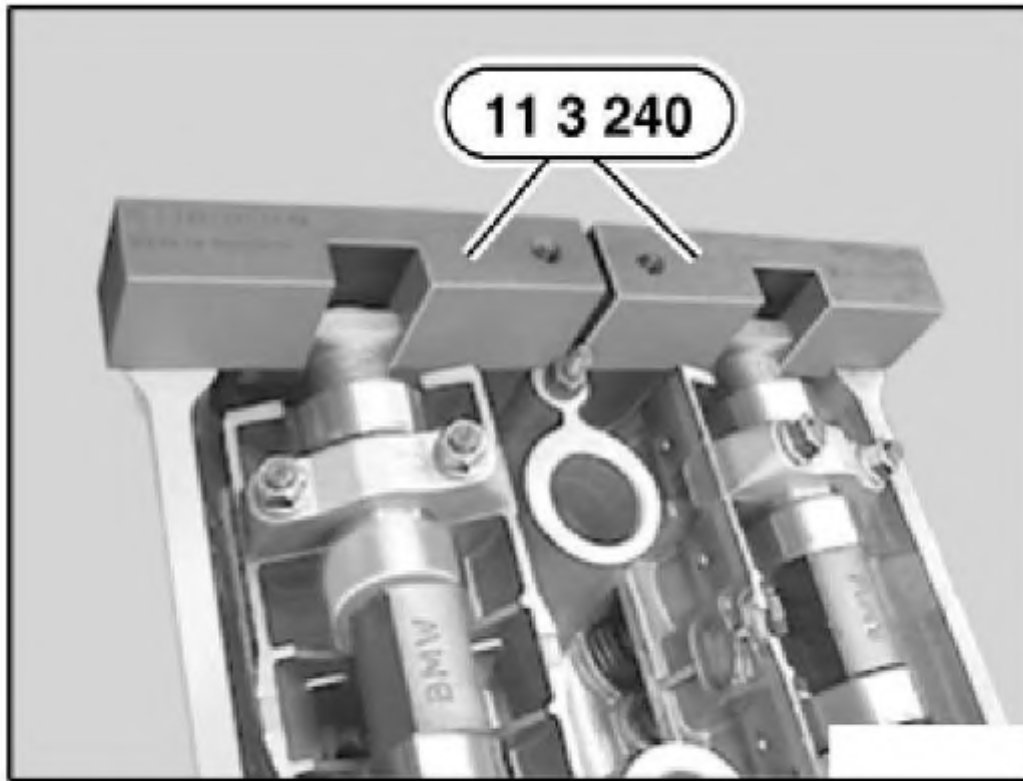


Fig. 274: Securing Flywheel With Plug Mandrel
Courtesy of BMW OF NORTH AMERICA, INC.

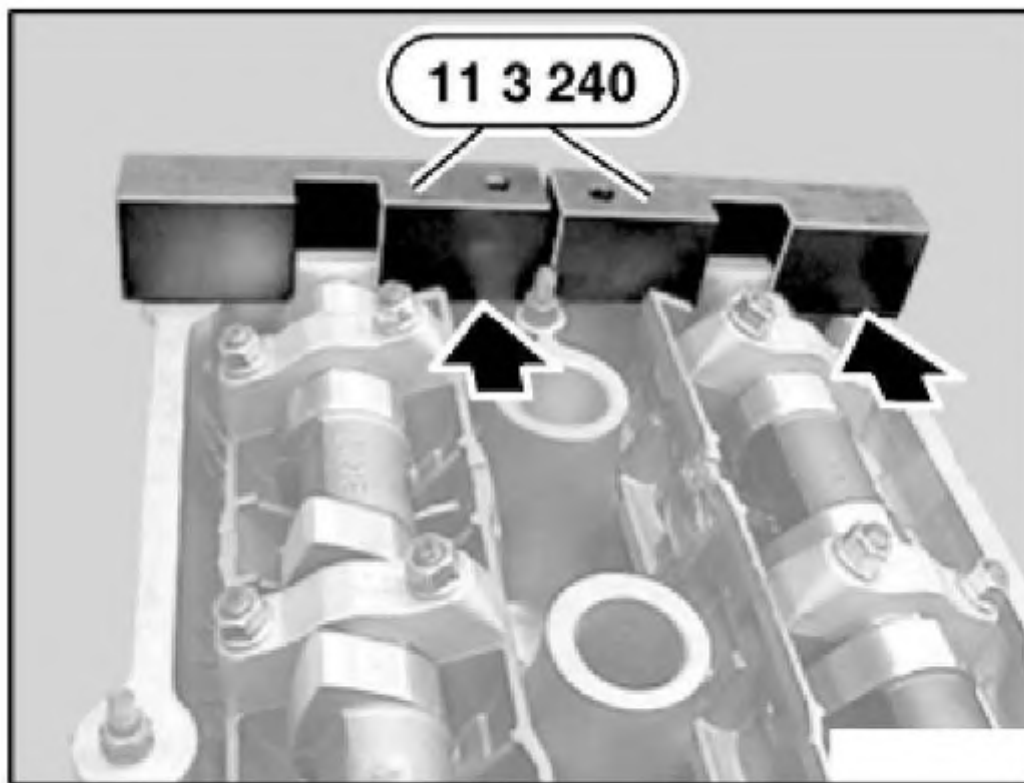
Fit special tool 11 3 240 to camshafts.



G03230317

Fig. 275: Installing Locking Fixture To Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The timing is correctly set if the special tool 11 3 240 rests without a gap on the cylinder head or protrudes up to 1 mm to the inlet side. The timing must be reset if the special tool 11 3 240 protrudes to the exhaust side.



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Fig. 276: Checking Locking Fixture Alignment On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten and remove special tool 11 4 220 .

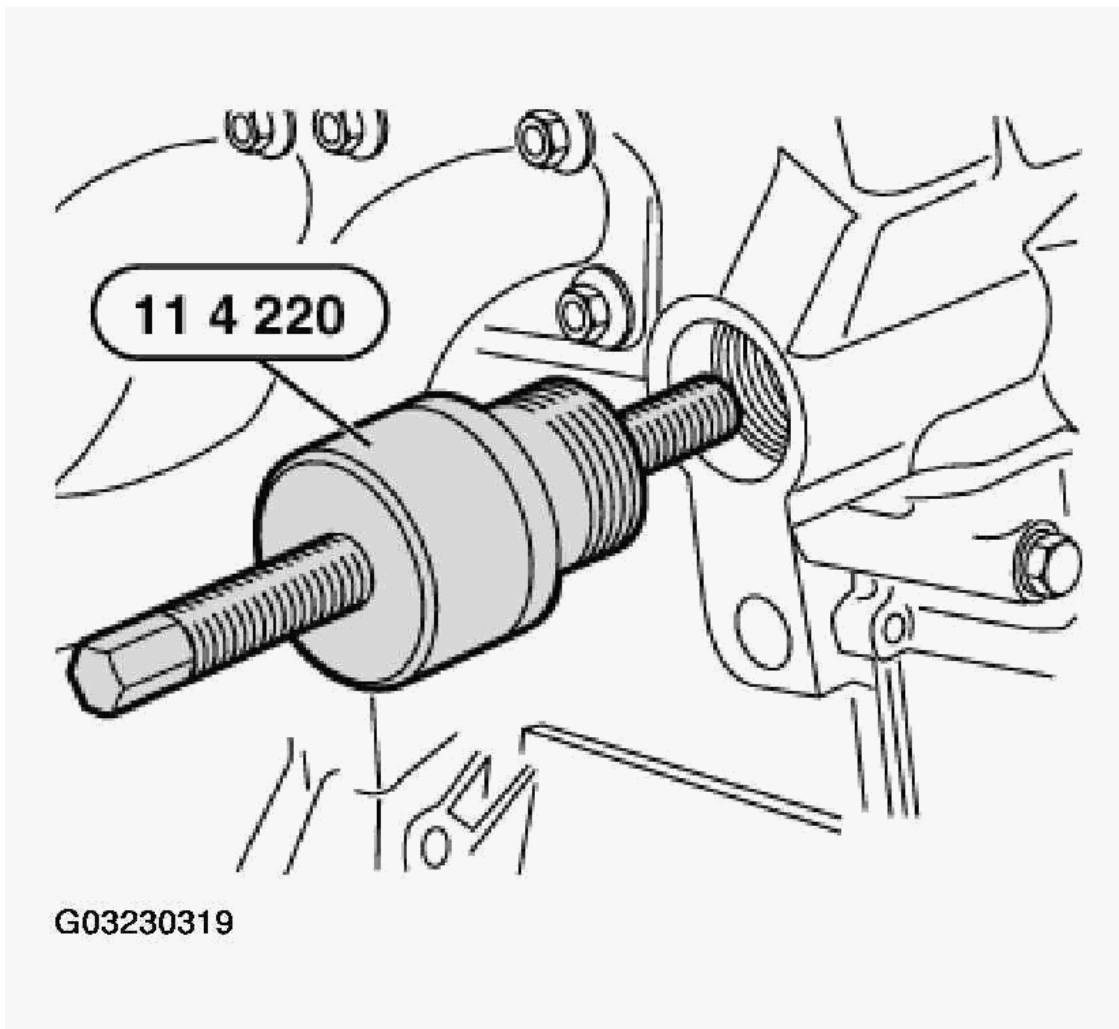


Fig. 277: Removing Chain Tensioner

Courtesy of BMW OF NORTH AMERICA, INC.

Install cylinder for chain tensioning piston, refer to **11 31 090 REMOVING AND INSTALLING/REPLACING CHAIN TENSIONING PISTON (M52 / M52TU / M54 / M56)** .

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

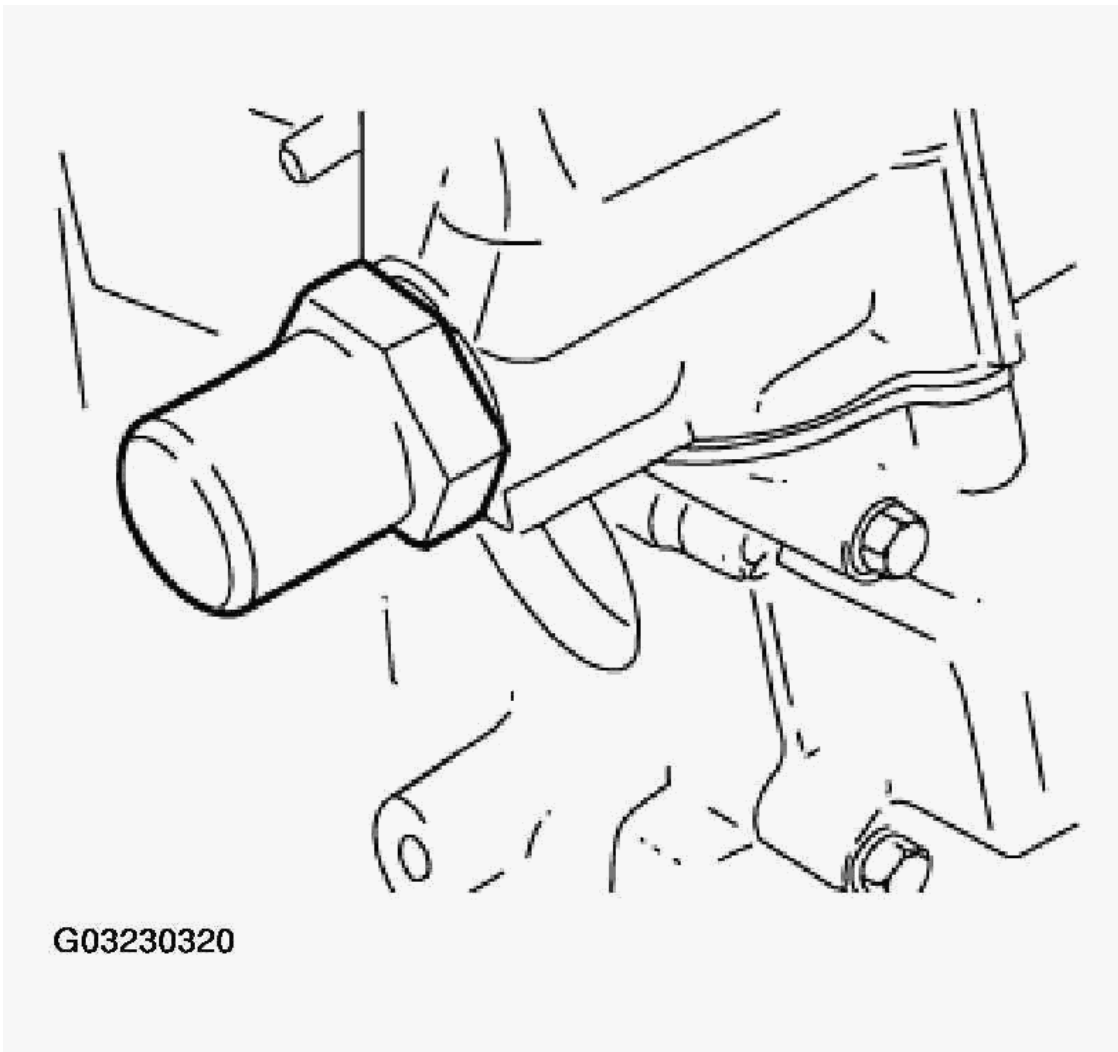


Fig. 278: Installing Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 2 300 / 11 5 180 .

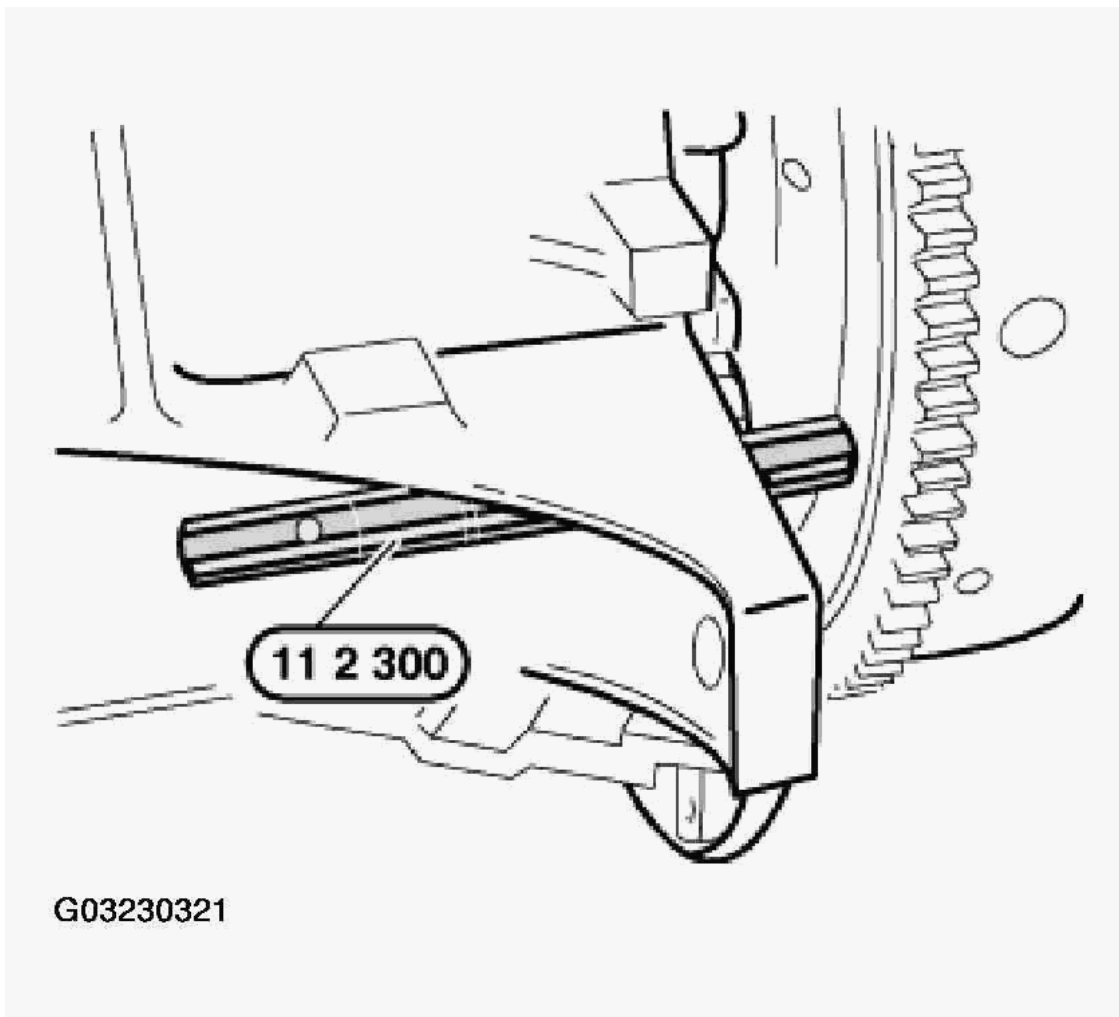


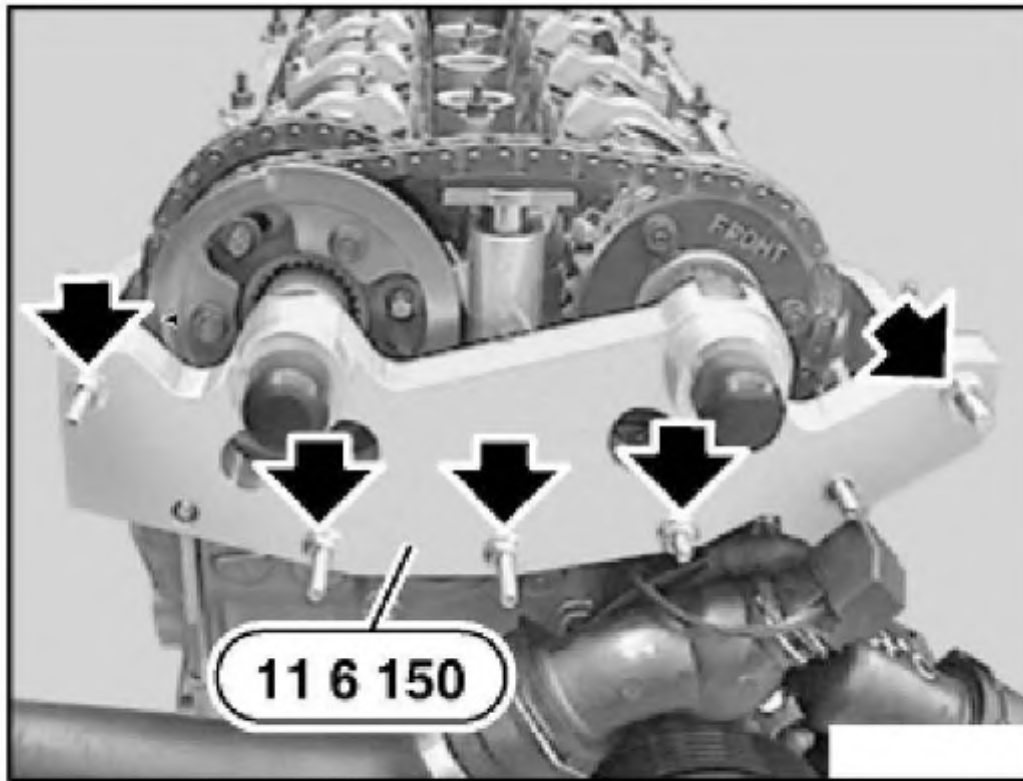
Fig. 279: Removing Plug Mandrel

Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 6 150 .

Install VANOS adjustment unit, refer to **11 36 010 REMOVING AND INSTALLING OR REPLACING DOUBLE VANOS ADJUSTMENT UNIT (M52TU / M54 / M56)** .

Assemble engine.



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Fig. 280: Removing Adjustment Plate
Courtesy of BMW OF NORTH AMERICA, INC.

VALVES WITH SPRINGS

11 34 552 REMOVING AND INSTALLING OR REPLACING ALL VALVES (M52 / S52 / M52TU / M54 / M56)

(Cylinder head removed.)

Preliminary tasks are described in **11 12 503 DISASSEMBLING AND ASSEMBLING CYLINDER HEAD (M52 / S52 / M52TU / M54 / M56)** .

Replace valve stem seals, refer to **11 34 560 REPLACING ALL VALVE STEM SEALS (M52 / S52 / M52TU / M54 / M56)** .

Remove valves from cylinder head.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

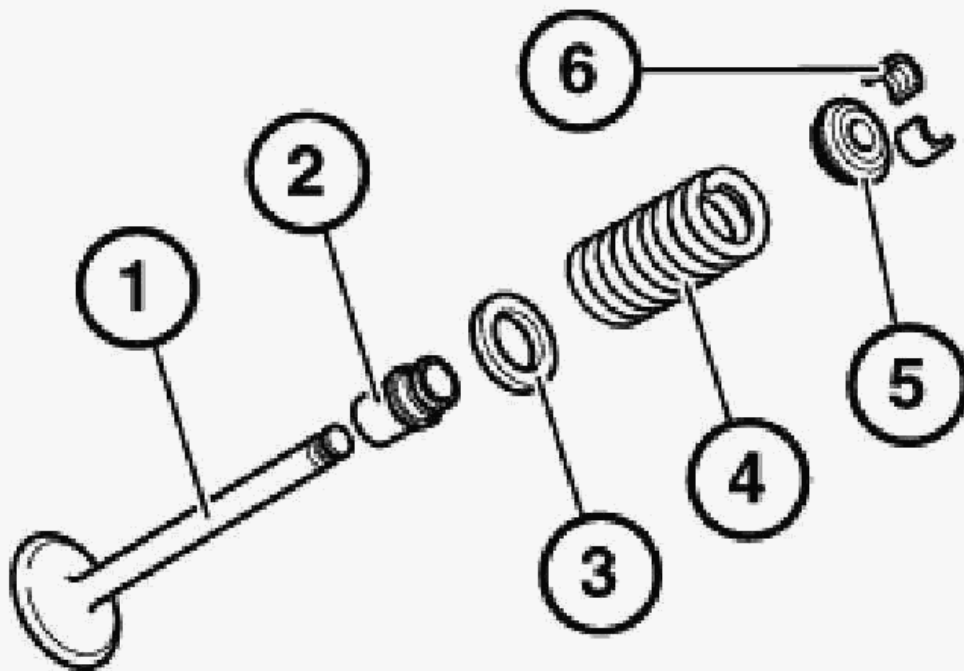
If necessary, check valve guide for wear, refer to **11 12 595 CHECKING A VALVE GUIDE FOR WEAR (M52 / S52 / M52TU / M54 / M56)** .

If necessary, ream valve guide, refer to **11 12 600 REAMING A VALVE GUIDE (M52 / S52 / M52TU / M54 / M56)** .

If necessary, remachine valve seat, refer to **11 12 527 REMACHINING A VALVE SEAT (M52 / S52 / M52TU / M54 / M56)** .

Arrangement:

1. Valve.
2. Valve-stem seal.
3. Lower plate spring.
4. Valve spring.
5. Top plate spring.
6. Valve tapers.



- 1) Valve
- 2) Valve-stem seal
- 3) Lower plate spring
- 4) Valve spring
- 5) Top plate spring
- 6) Valve tapers

G03230323

Fig. 281: Exploded View Of Valve Components
Courtesy of BMW OF NORTH AMERICA, INC.

2002 BMW X5
2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

11 34 560 REPLACING ALL VALVE STEM SEALS (M52 / S52 / M52TU / M54 / M56)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 11 1 200
- 11 1 480
- 11 1 960

(Cylinder head removed.)

Preliminary tasks are described in **11 12 503 DISASSEMBLING AND ASSEMBLING CYLINDER HEAD (M52 / S52 / M52TU / M54 / M56)** .

Remove all valve springs, refer to **11 34 715 REPLACING ALL VALVE SPRINGS (M52 / S52 / M52TU / M54 / M56)** .

Remove valve stem seal with special tool 11 1 480 .

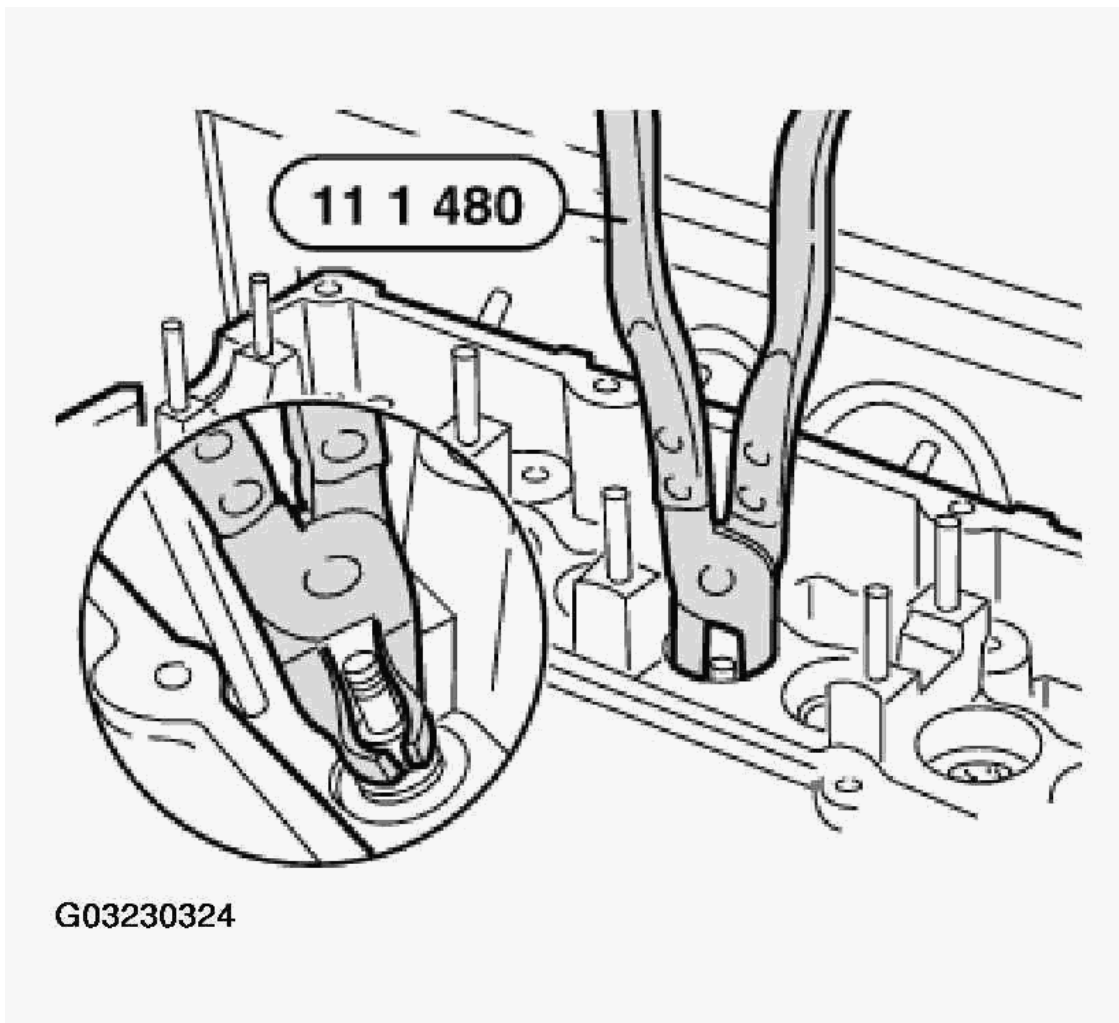


Fig. 282: Removing Valve Stem Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Lubricate valve stem with oil and insert valve. Fit special tool 11 1 960 .

Coat new valve stem seal (1) with oil and install.



Fig. 283: Installing Valve Stem Seal On Assembly Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Press valve stem seal firmly home by hand with special tool 11 1 200 .

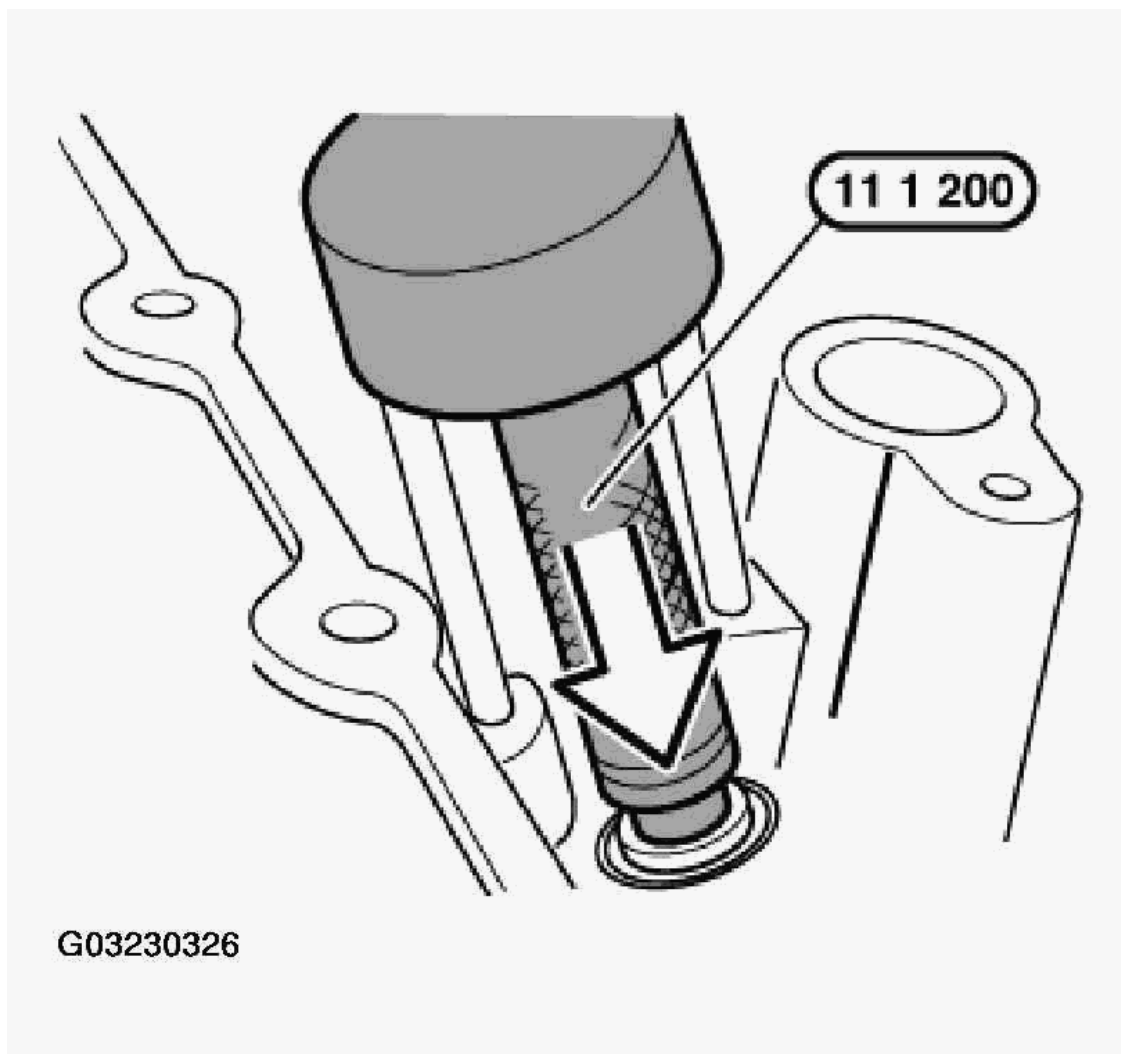


Fig. 284: Installing Valve Stem Seal Using Drift
Courtesy of BMW OF NORTH AMERICA, INC.

11 34 715 REPLACING ALL VALVE SPRINGS (M52 / S52 / M52TU / M54 / M56)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 11 0 342
- 11 0 345
- 11 1 045
- 11 1 065
- 11 1 441
- 11 3 030
- 11 3 250

(Cylinder head removed.)

Preliminary tasks are described in **11 12 503 DISASSEMBLING AND ASSEMBLING CYLINDER HEAD (M52 / S52 / M52TU / M54 / M56)** .

Brace bucket tappets with special tool 11 3 250 .

Lift out bearing strip with bucket tappet.

Installation:

Only re-use used bucket tappets in the same tappet bore.

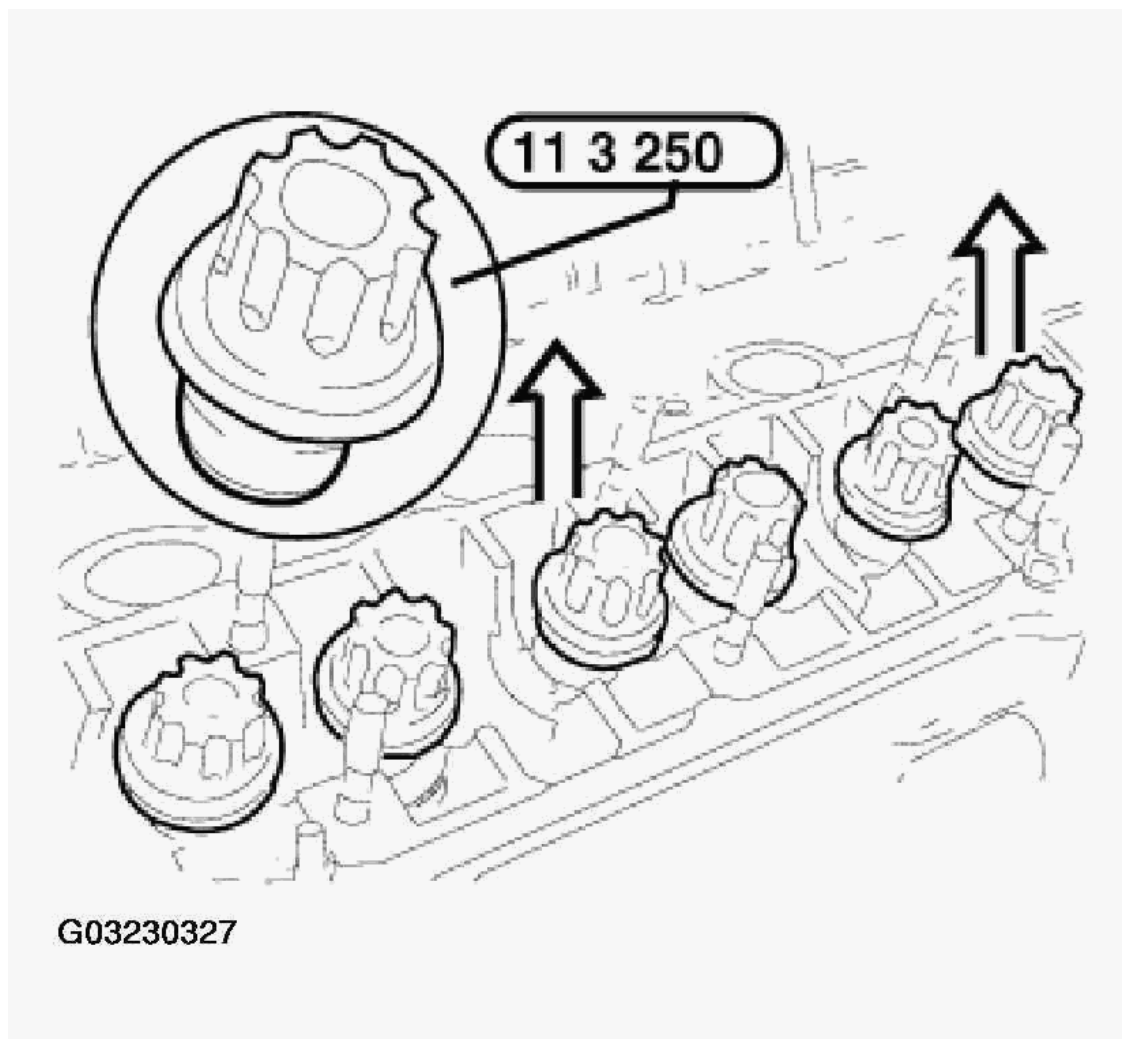


Fig. 285: Bracing Bucket Tappets With Suction Cups
Courtesy of BMW OF NORTH AMERICA, INC.

Arrange bucket tappets by cylinder and place on special tool 11 3 030 in correct order.

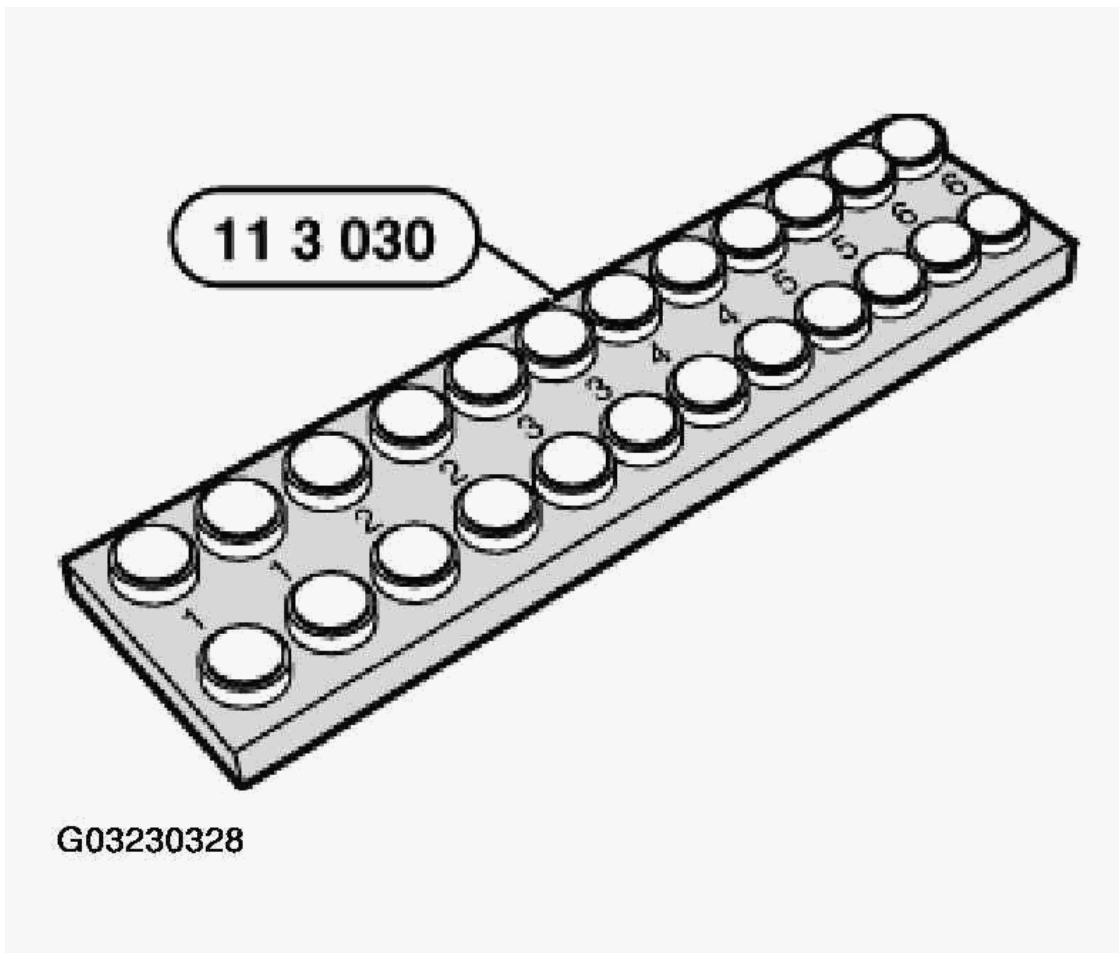


Fig. 286: Arranging Tappets On Placemat Board
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 1 441 from below in special tool 11 1 065 and secure with special tool 11 1 045 .

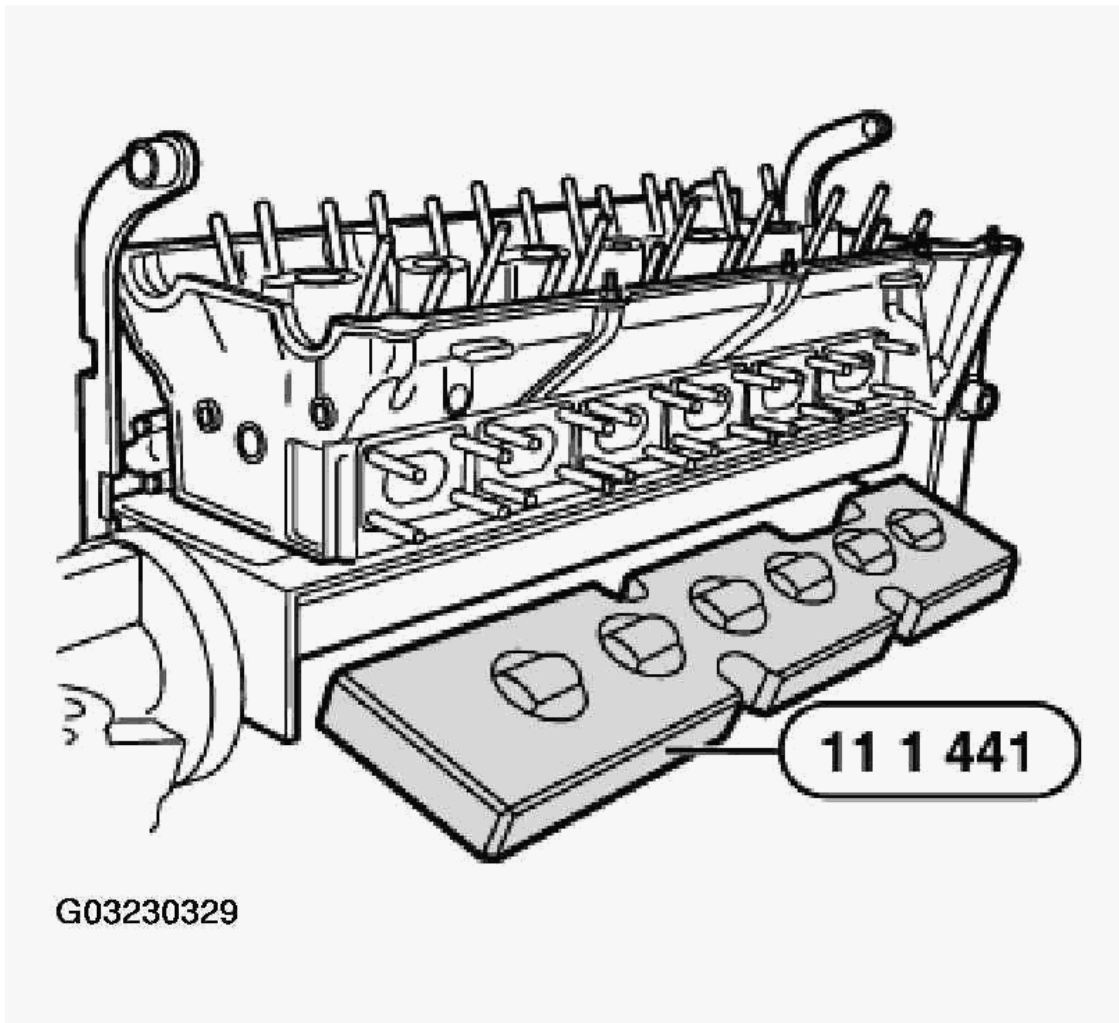


Fig. 287: Installing Holding Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Align special tool 11 0 345 in direction of valve shaft and select appropriate groove in special tool 11 0 342 .

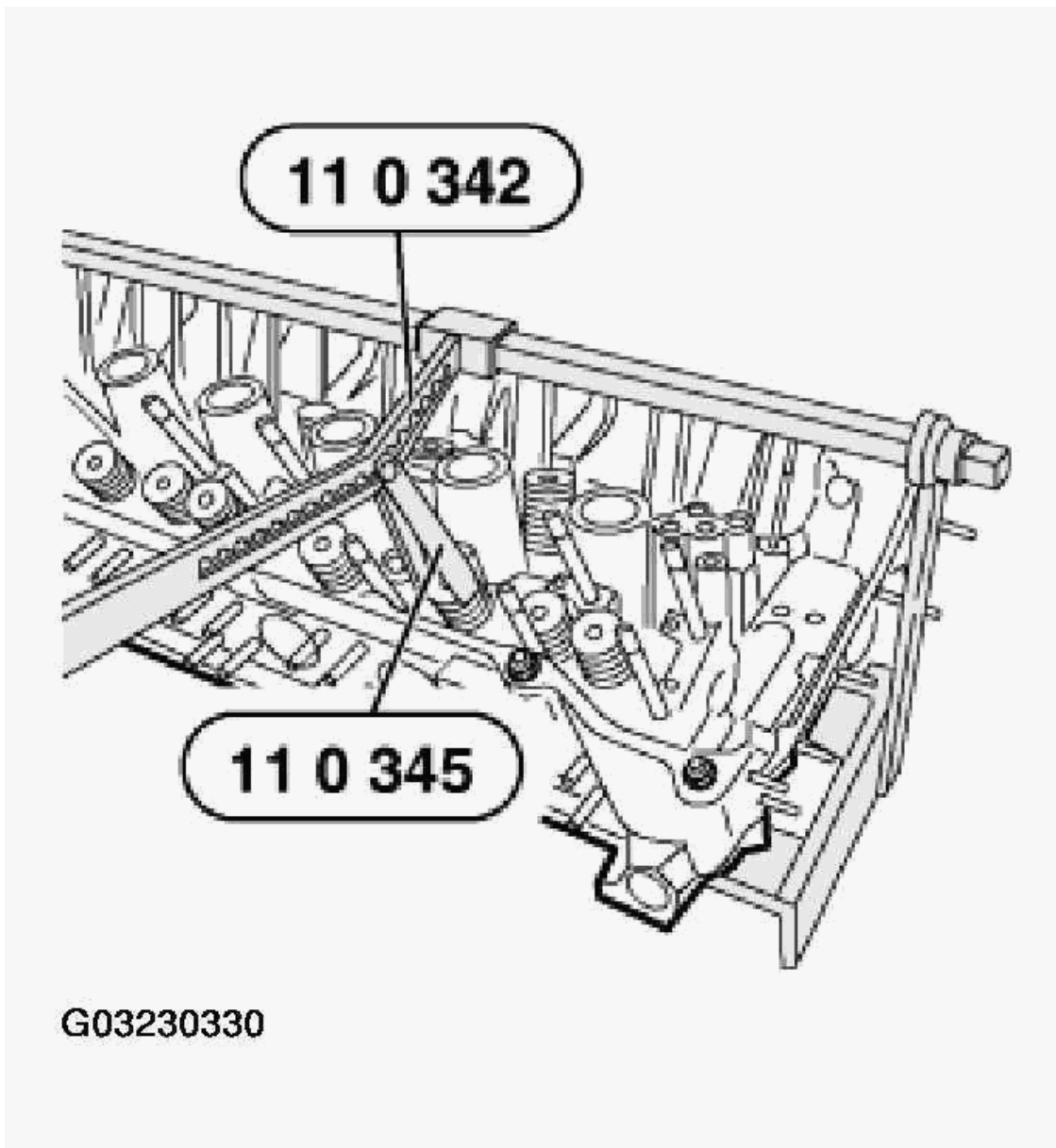
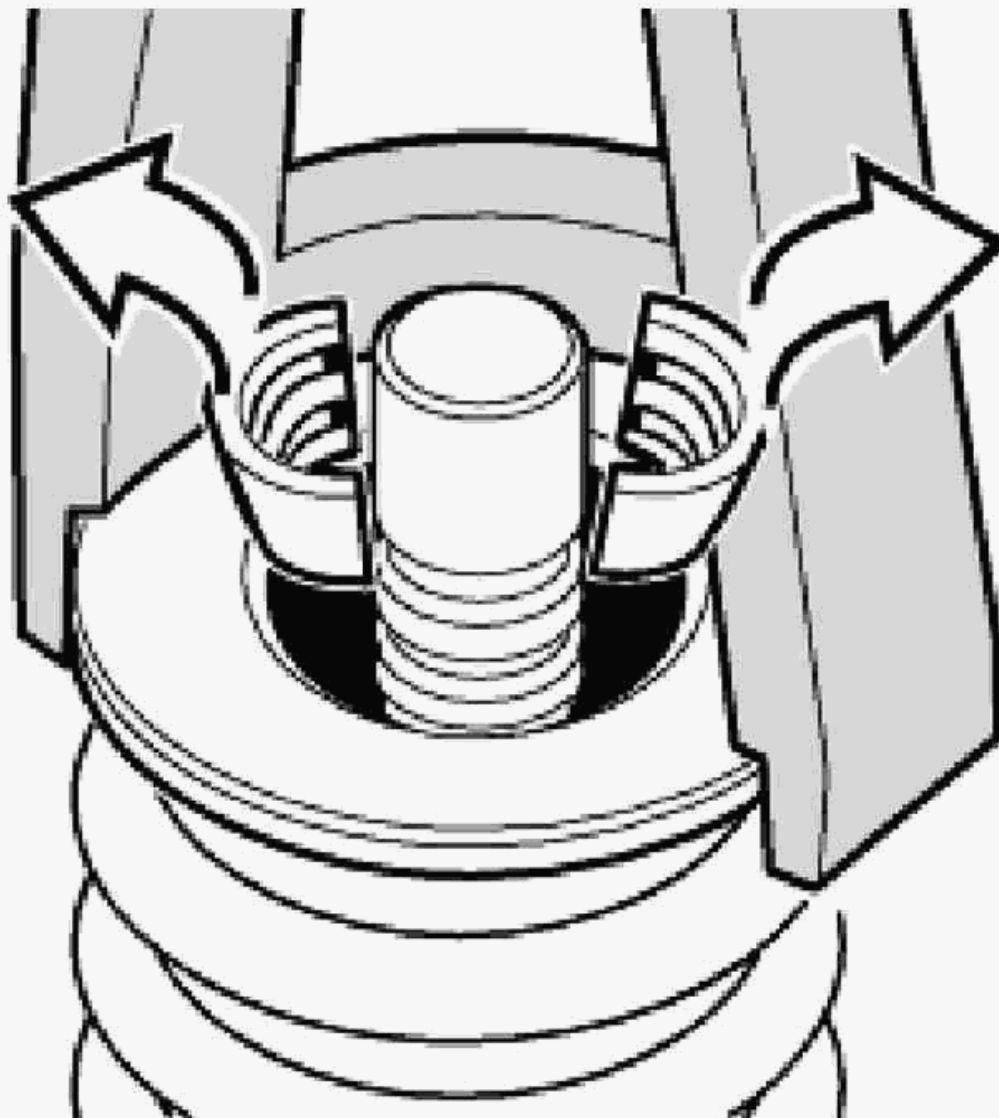


Fig. 288: Installing Valve Spring Compressor
Courtesy of BMW OF NORTH AMERICA, INC.

Press down valve spring on spring cap, top, and remove valve keys.

Remove valve spring and plate spring.



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Fig. 289: Removing Valve Spring Components
Courtesy of BMW OF NORTH AMERICA, INC.

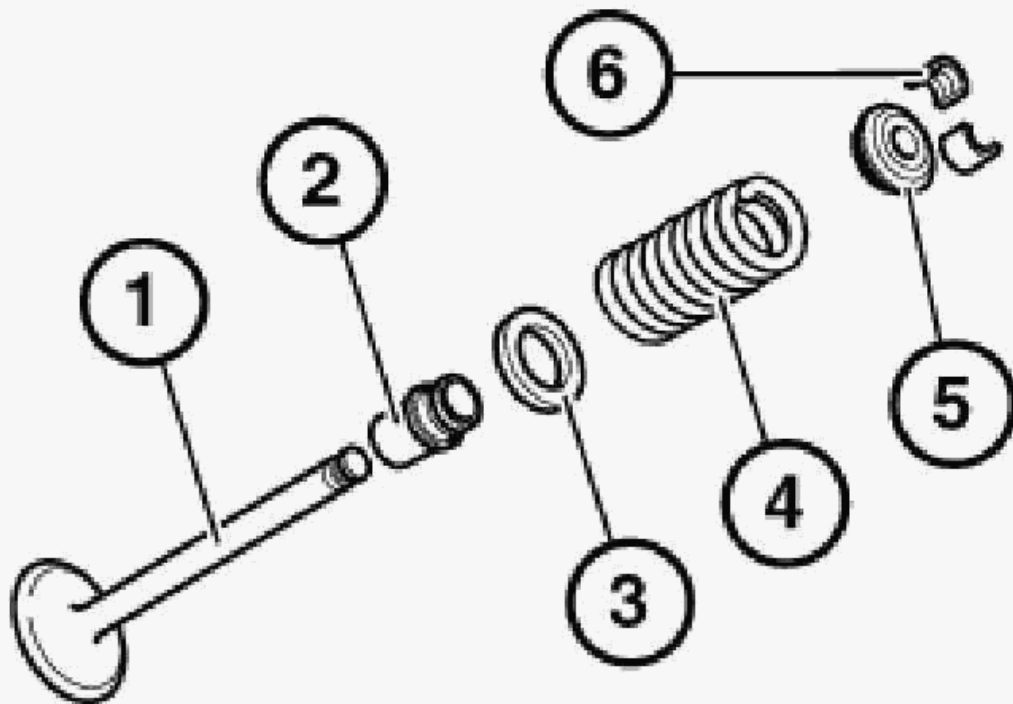
Arrangement:

1. Valve.
2. Valve-stem seal.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

3. Lower plate spring.
4. Valve spring.
5. Top plate spring.
6. Valve tapers.



- 1) Valve
- 2) Valve-stem seal
- 3) Lower plate spring
- 4) Valve spring
- 5) Top plate spring
- 6) Valve tapers

G03230332

Fig. 290: Exploded View Of Valve

Courtesy of BMW OF NORTH AMERICA, INC.

VARIABLE CAMSHAFT TIMING**11 36 010 REMOVING AND INSTALLING OR REPLACING DOUBLE VANOS ADJUSTMENT UNIT (M52TU / M54 / M56)**

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 00 9 250
- 11 2 300
- 11 3 240
- 11 3 450
- 11 4 220
- 11 6 170

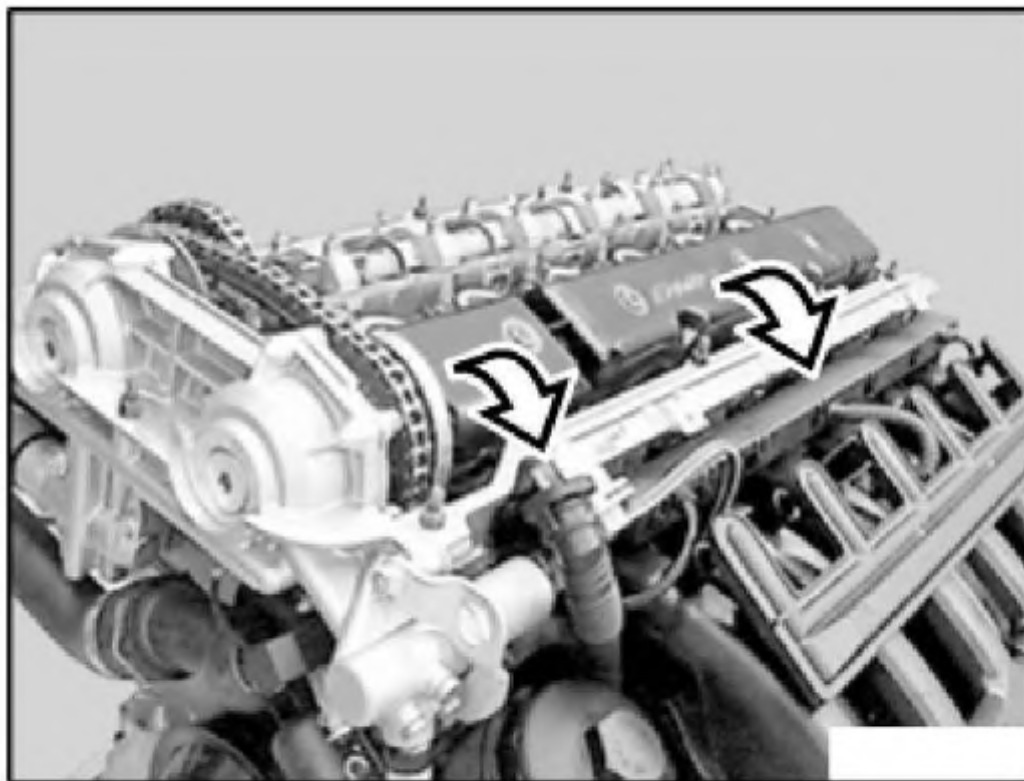
Necessary Preliminary Tasks:

- Remove intake filter housing with air-mass flow sensor
- Remove fan impeller with fan clutch and fan cowl, refer to **11 52 020 REMOVING AND INSTALLING/REPLACING FAN CLUTCH (S52 / S54 / M52 / M52TU / M54 / M56)** .
- Remove cylinder head cover, refer to **11 12 000 REMOVING AND INSTALLING, SEALING CYLINDER HEAD COVER (M52TU / M54 / M56)** .
- Remove spark plugs, refer to **12 12 011 REPLACING ALL SPARK PLUGS** .

Removal:

Removal of double VANOS adjustment unit is described separately from installation. Assembly sequence for removal and installation is different.

Detach plastic cover for inlet camshaft.



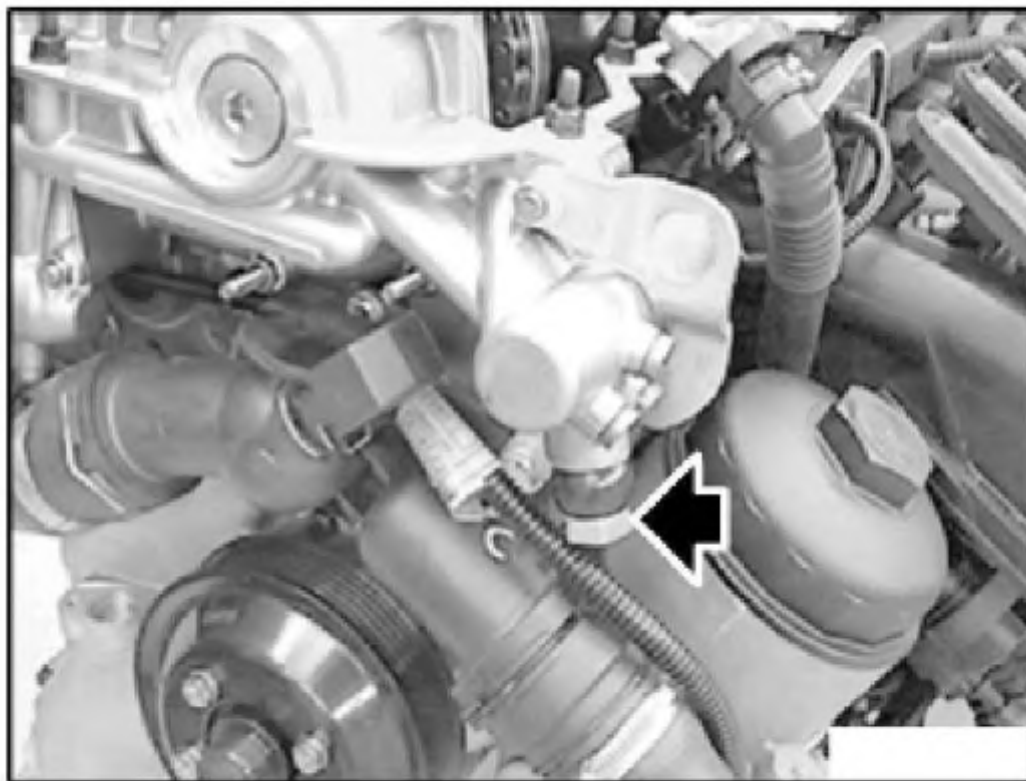
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Fig. 291: Detaching Plastic Cover For Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew oil pressure pipe.

2002 BMW X5

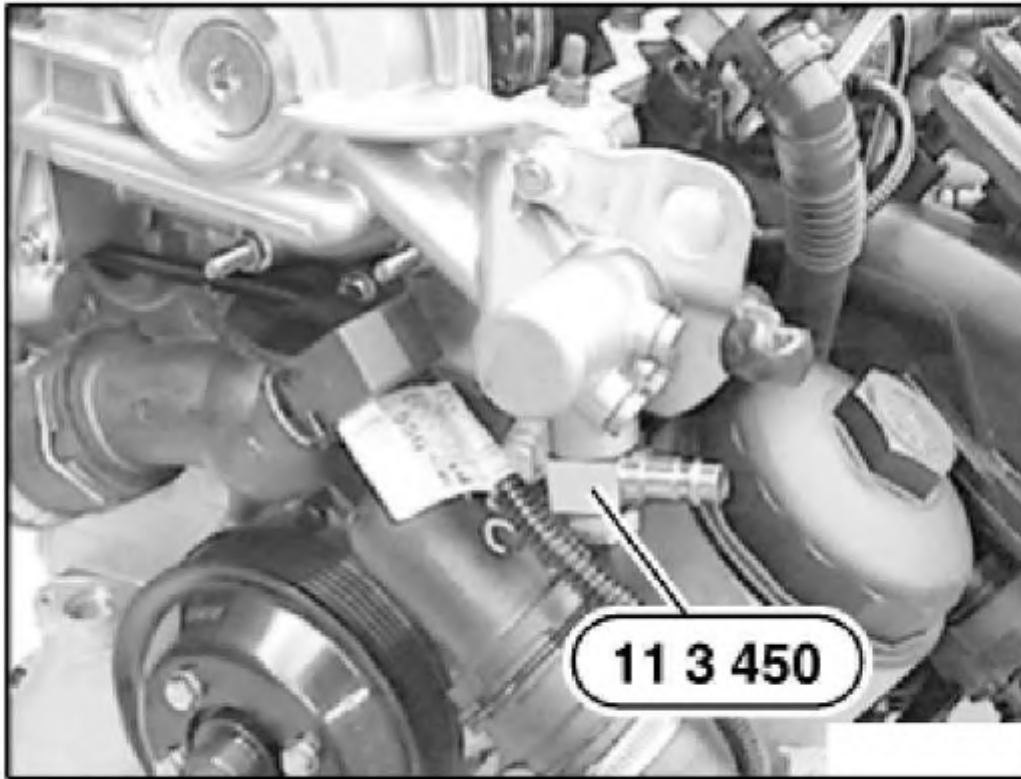
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G03230334

Fig. 292: Unscrewing Oil Pressure Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tool 11 3 450 with banjo bolt of oil pressure line.



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Fig. 293: Installing Compressed Air Connection On Banjo Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

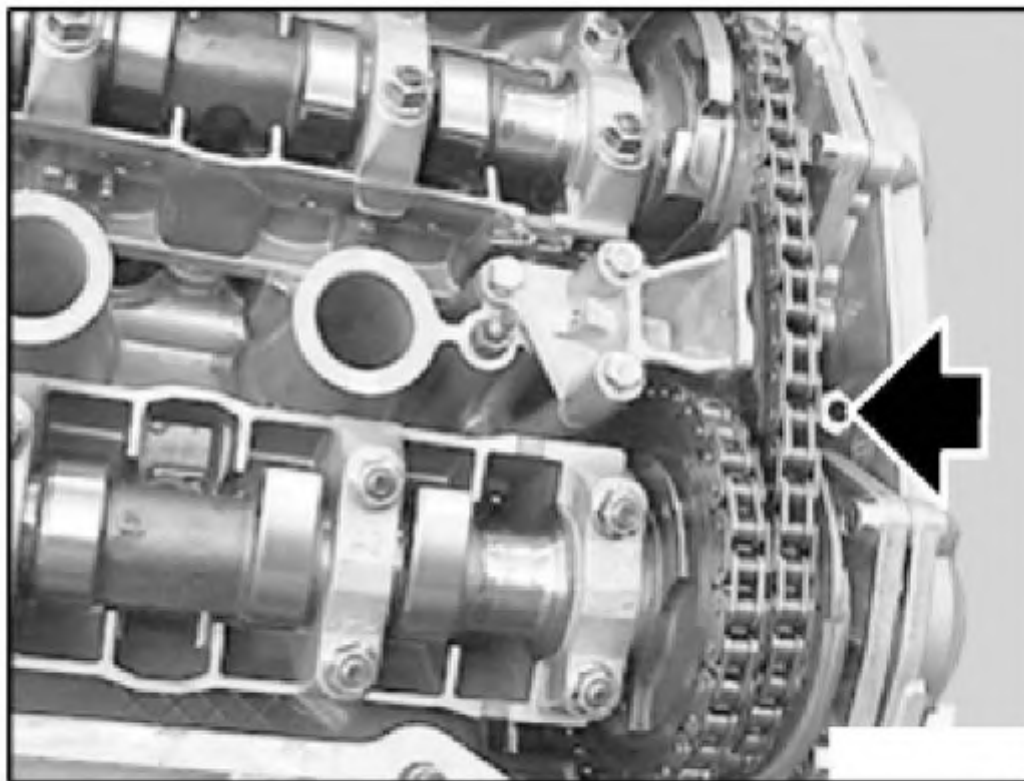
Important!

Cover double VANOS adjustment unit.

When the compressed air supply is connected, several drops of oil are sprayed out of the bore.

2002 BMW X5

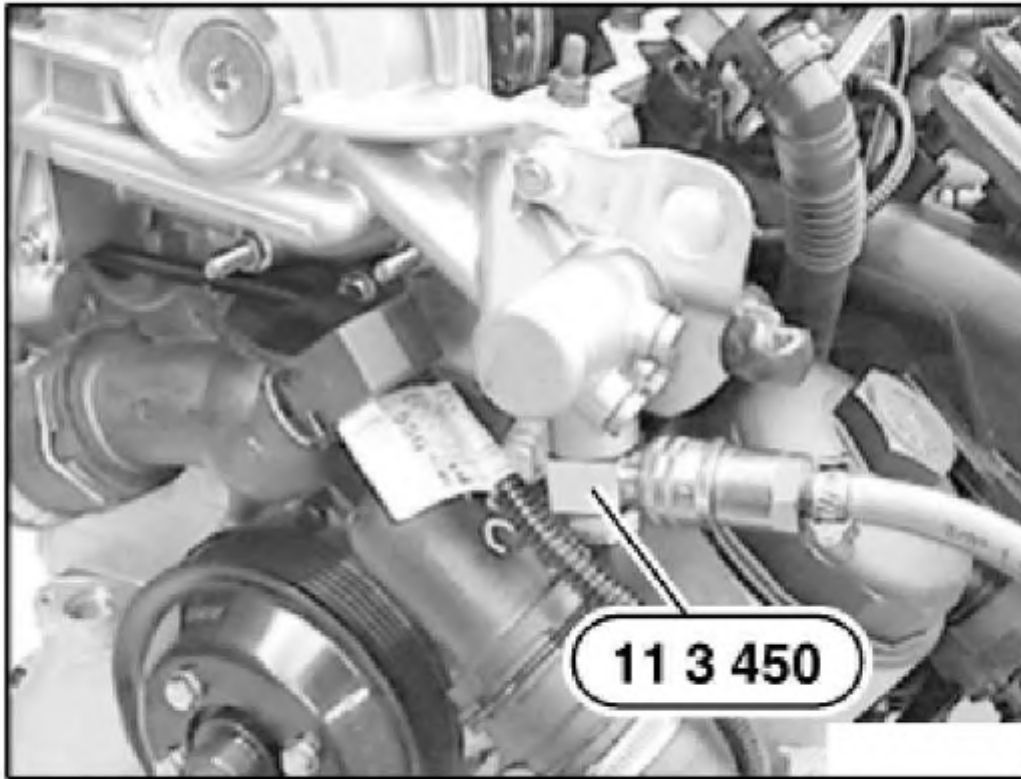
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Fig. 294: Locating Bore In VANOS Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Connect compressed air (2 to 8 bar).



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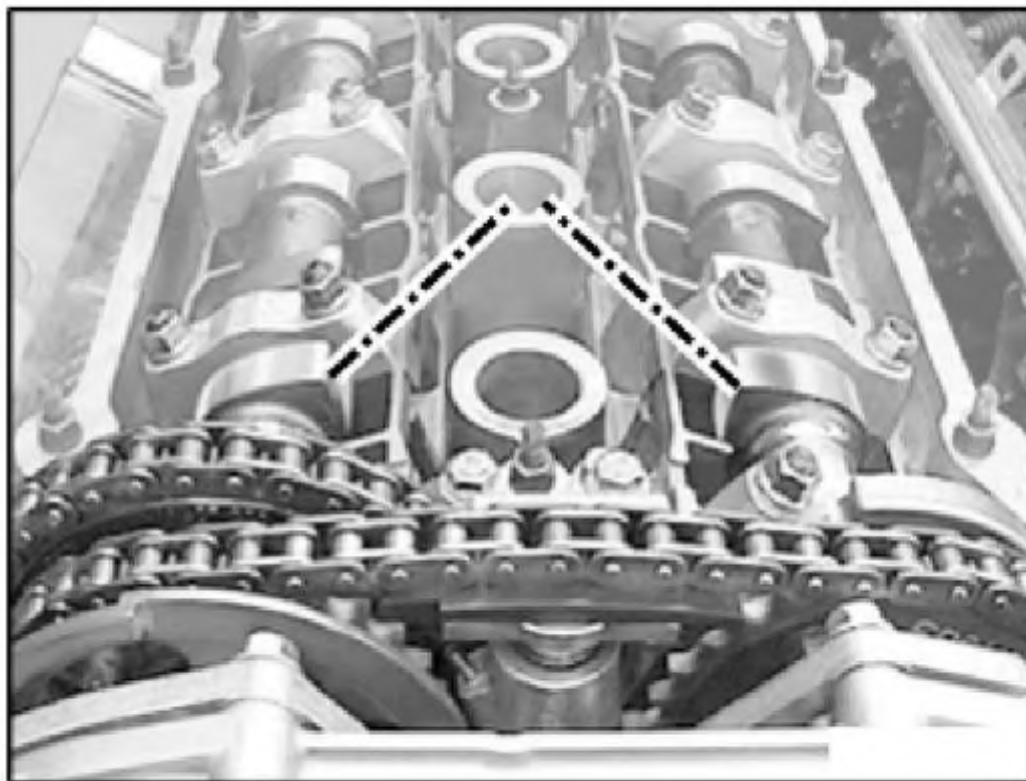
Fig. 295: Connecting Compressed Air To Banjo Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: When the engine is switched off, it is possible that the camshafts are not in their initial positions. With the compressed air supply connected, rotate the engine to return the camshafts to their initial positions.

With compressed air supply connected, crank engine at least two revolutions in direction of rotation until cam tips on inlet and exhaust camshafts on 1st cylinder face each other.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



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Fig. 296: Aligning Cam Tips
Courtesy of BMW OF NORTH AMERICA, INC.

Pull dust guard out of the special tool bore.

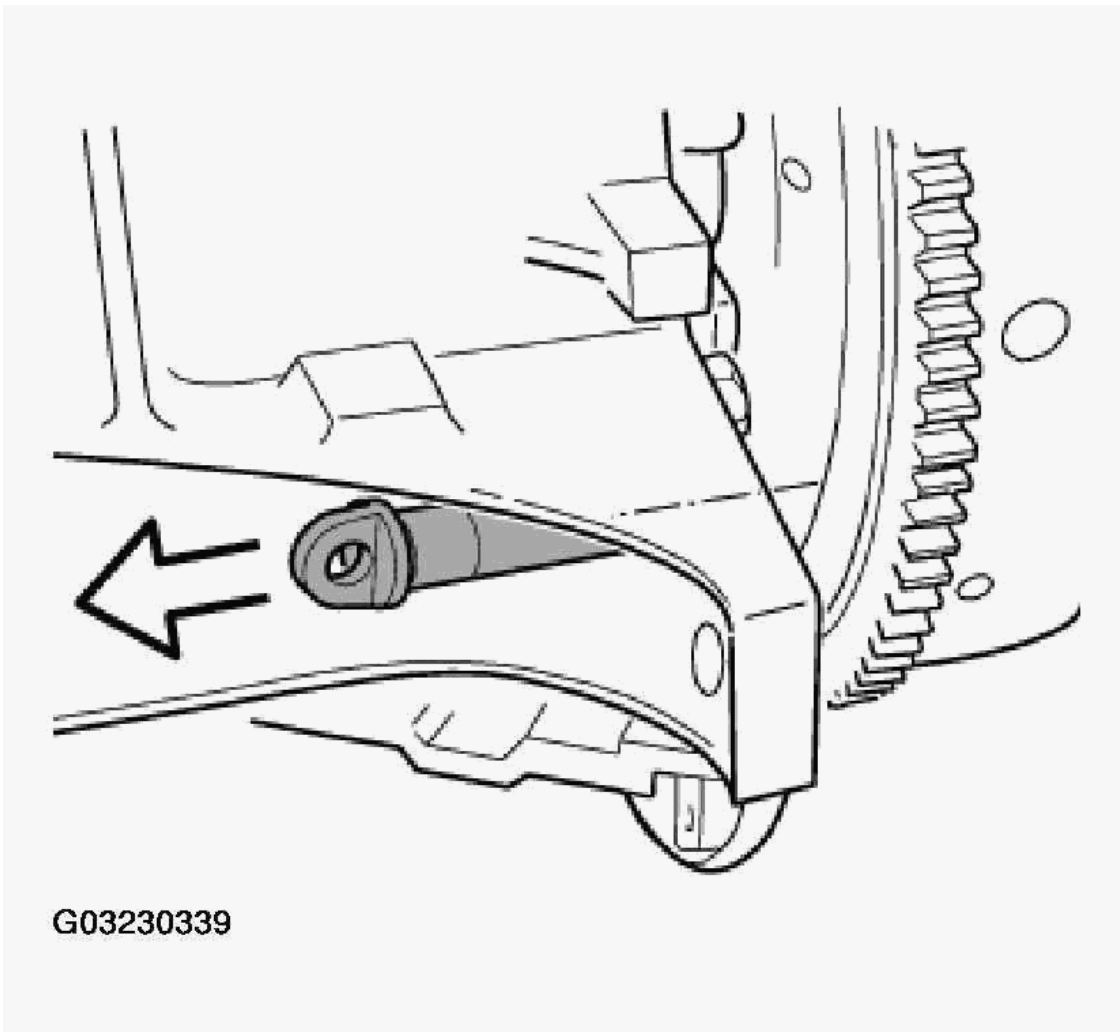


Fig. 297: Removing Dust Guard

Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft in firing TDC position with special tool 11 2 300 .

Important!

Remove special tool 11 2 300 before switching on the engine.

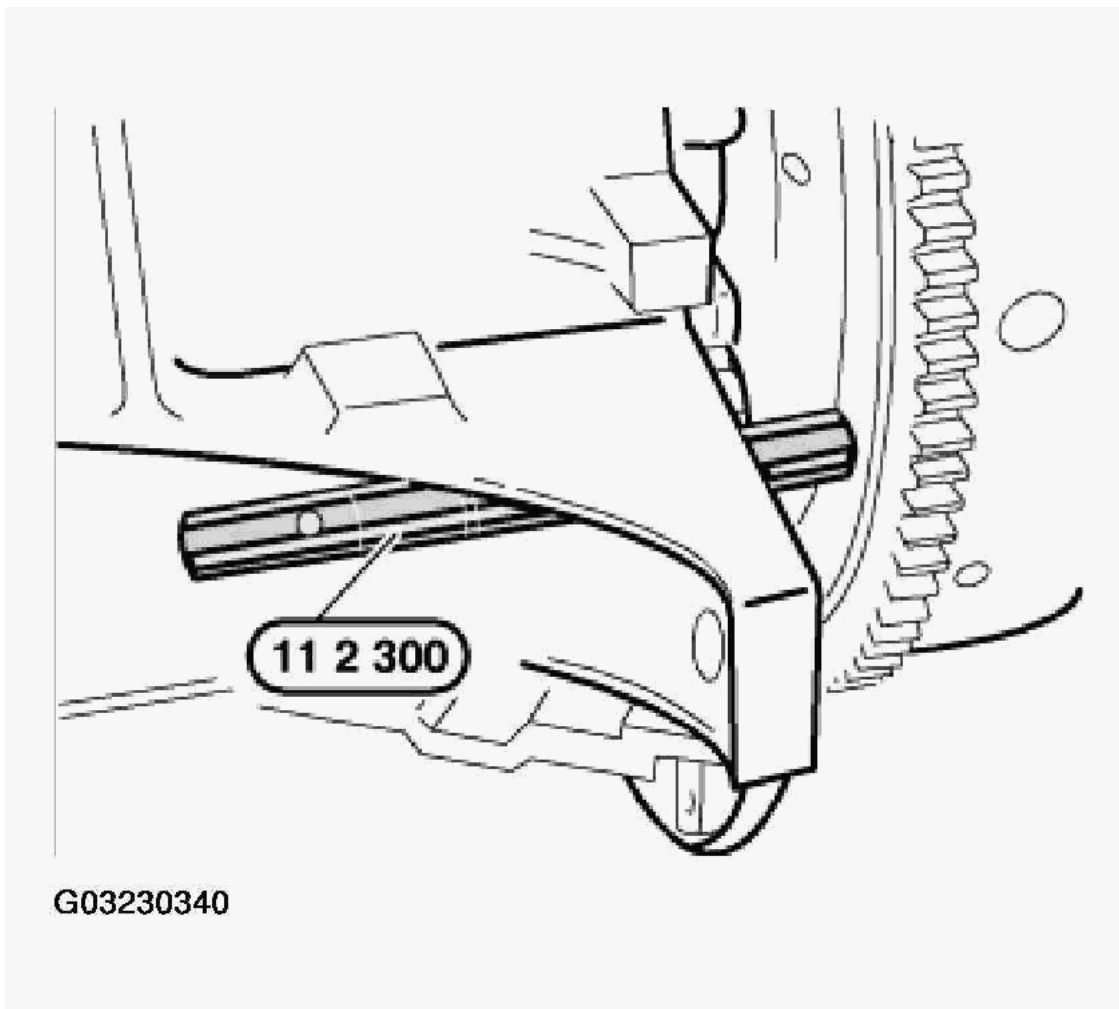


Fig. 298: Installing Plug Mandrel

Courtesy of BMW OF NORTH AMERICA, INC.

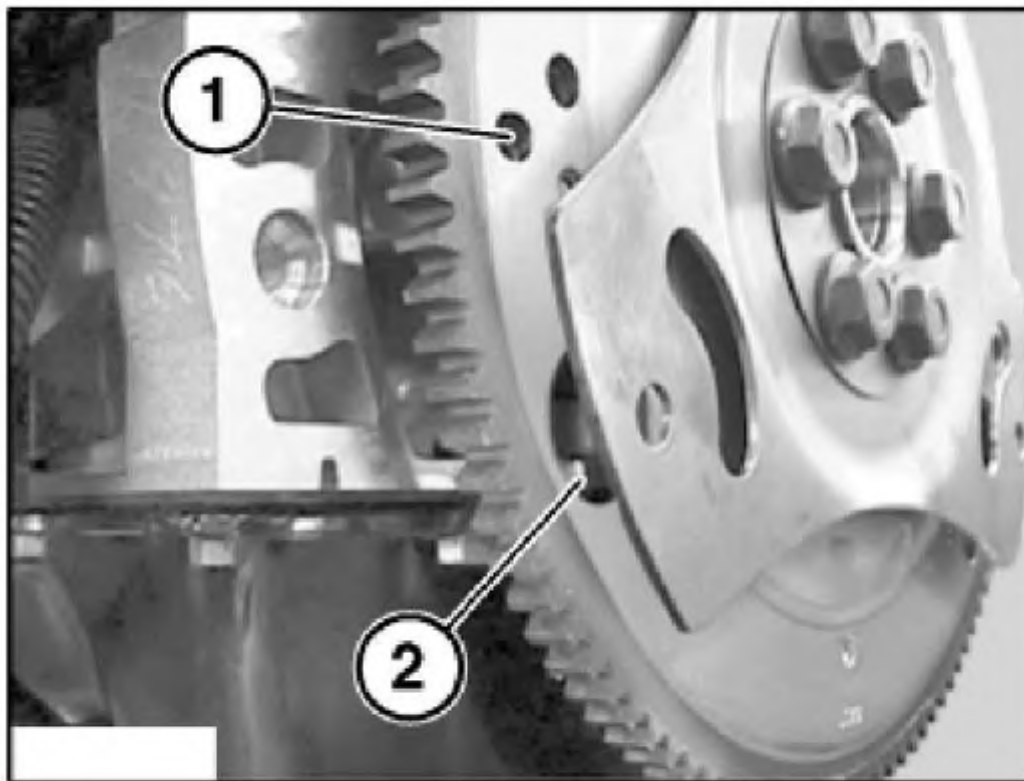
Automatic Transmissions Only:

Illustration does not show automatic transmission.

Important!

On engines with automatic transmissions, there is shortly before the special tool bore (1) a large bore (2) which can be confused with the special tool bore.

If special tool 11 2 300 is secured in the correct bore (1), the engine can no longer be cranked at the central bolt.



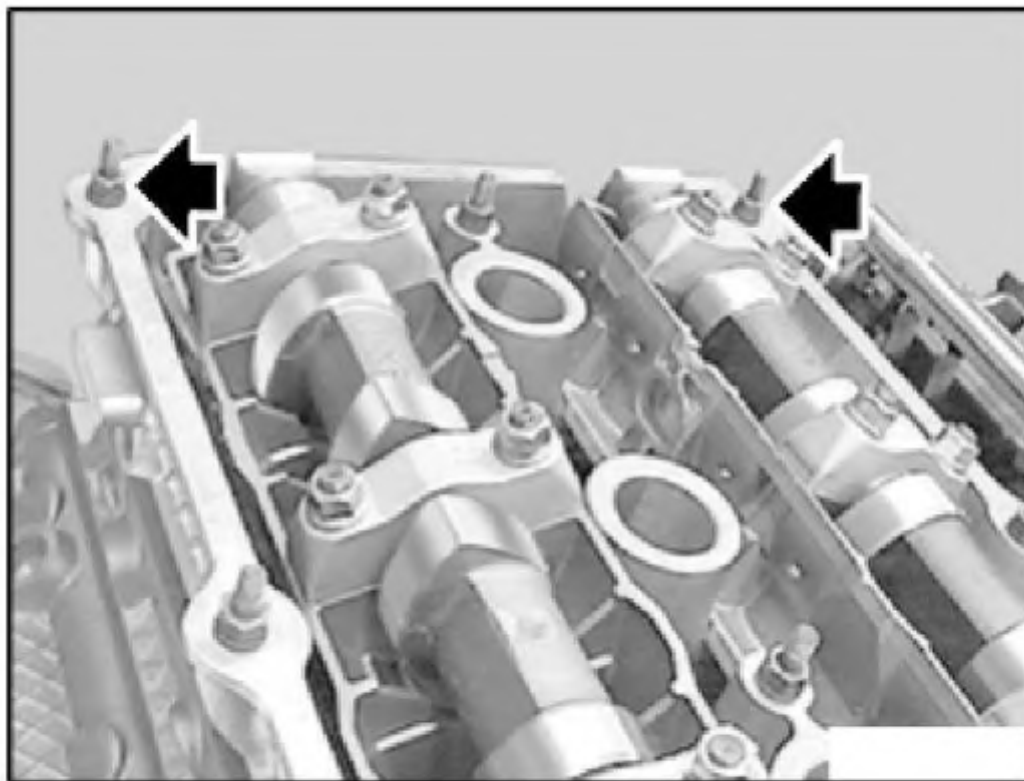
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Fig. 299: Locating Large Bore And Special Tool Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew studs.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

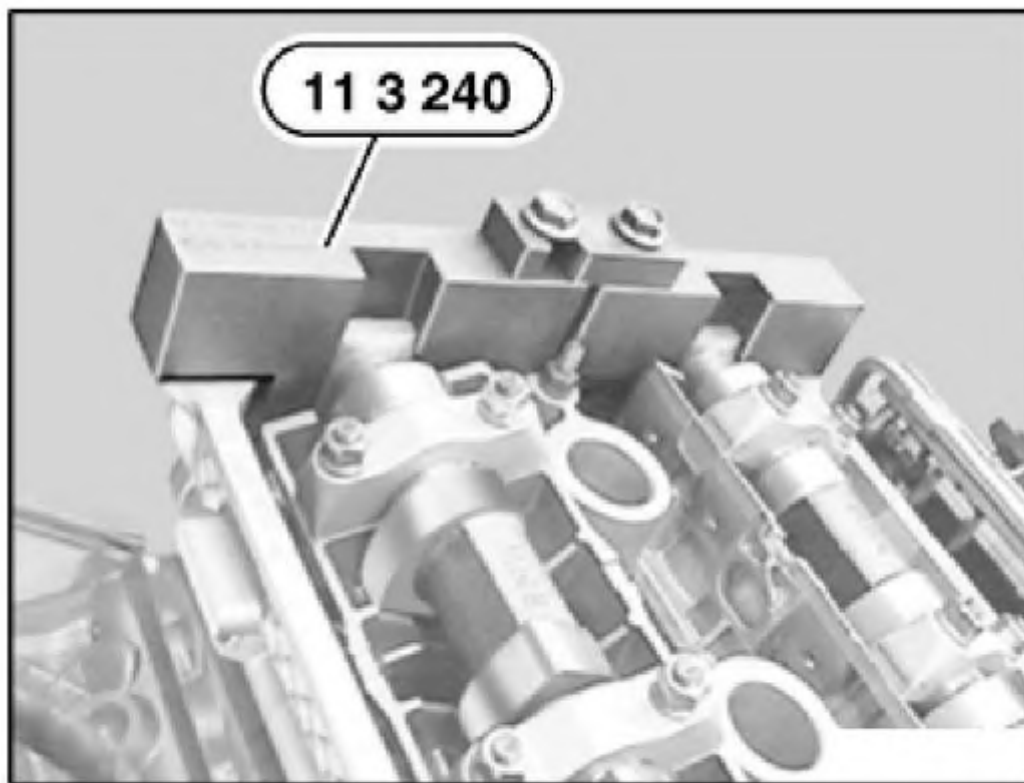


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Fig. 300: Unscrewing Studs

Courtesy of BMW OF NORTH AMERICA, INC.

Secure camshafts with special tool 11 3 240 .

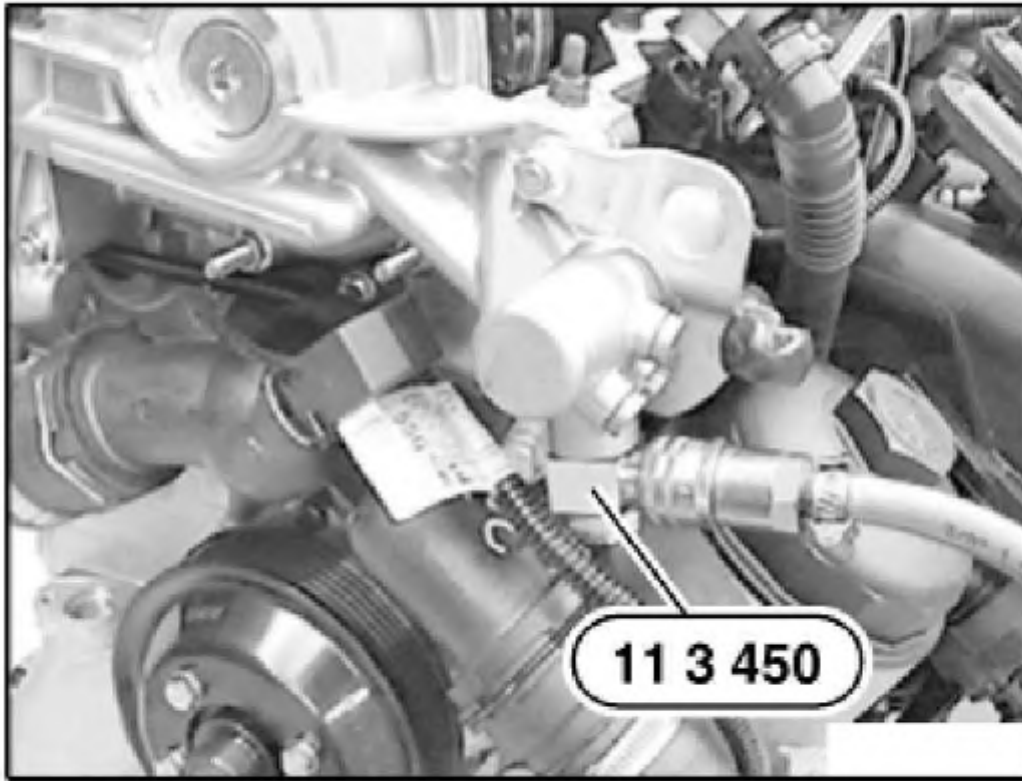


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Fig. 301: Securing Camshafts With Locking Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Detach compressed air connection.

NOTE: special tool 11 3 450 still remains fitted.



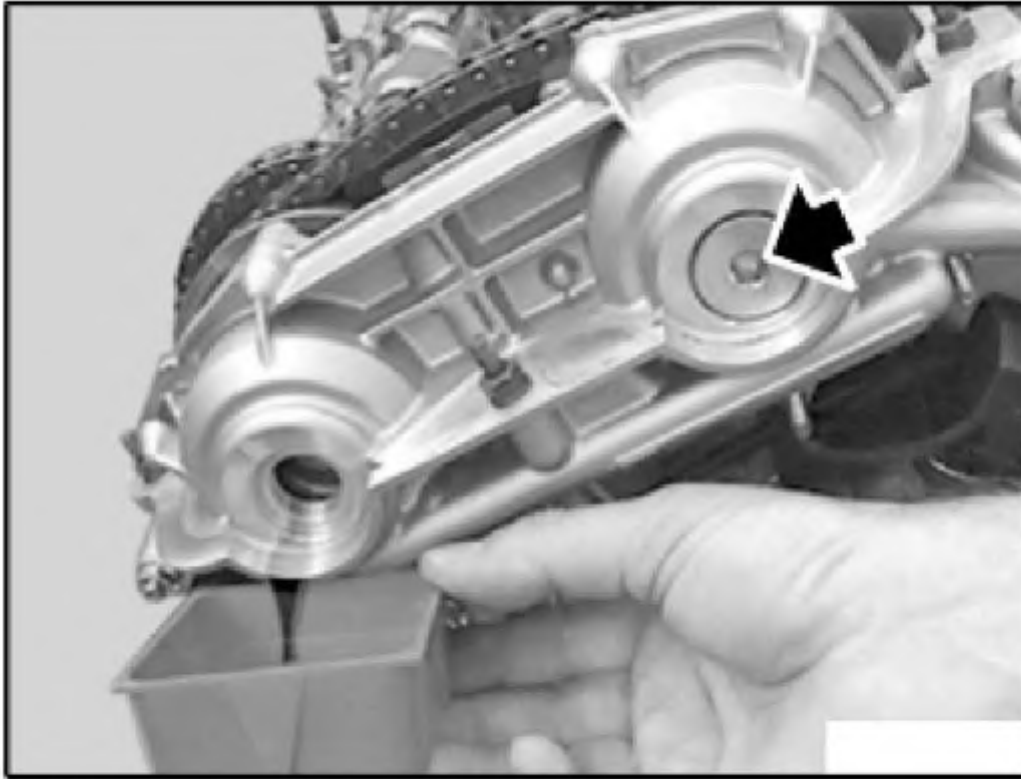
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Fig. 302: Detaching Compressed Air Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

Oil escapes after screw plugs have been removed. Have cleaning cloths and container ready. Make sure no oil runs onto belt drive. Remove any remnants of oil immediately with cleaning cloth.

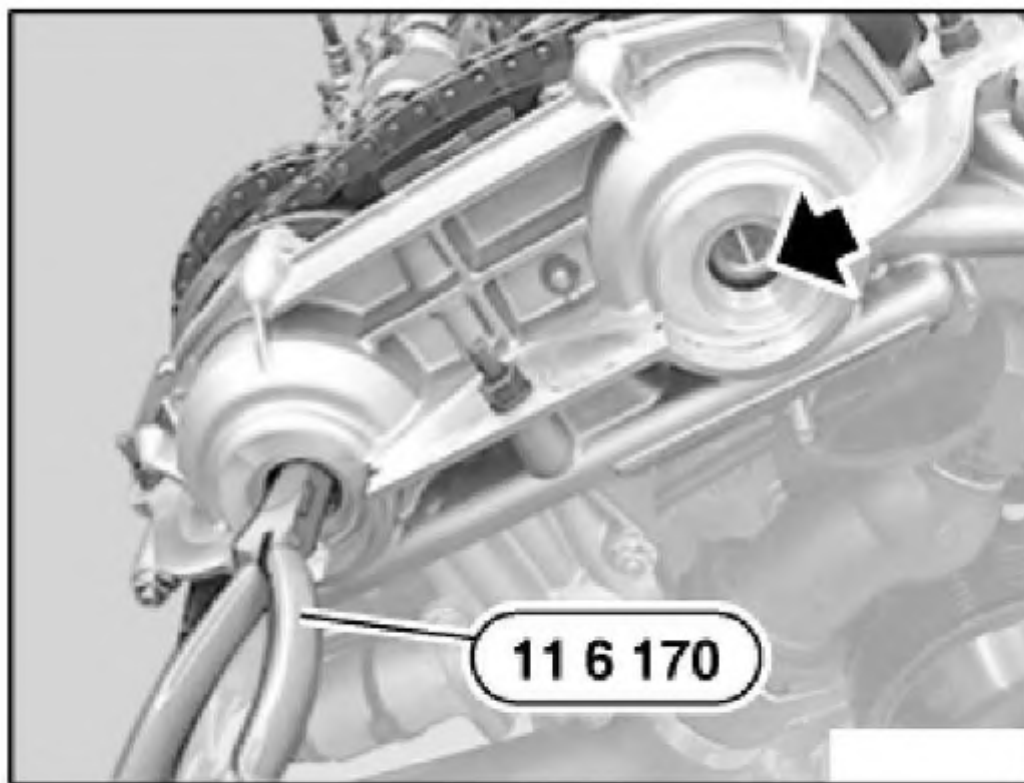
Remove screw plugs, catch escaping oil on inlet and exhaust sides.



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Fig. 303: Catching Escaping Oil On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sealing caps with special tool 11 6 170 or with commercially available short flat nose pliers.



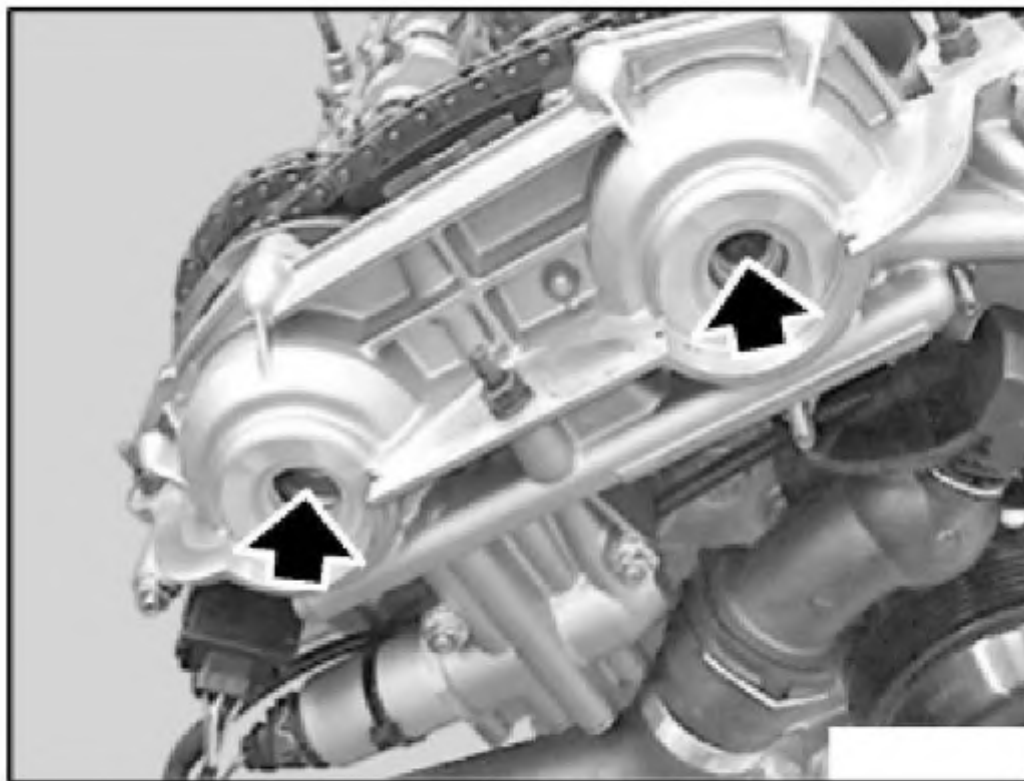
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Fig. 304: Removing Sealing Caps

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Left-hand threads.

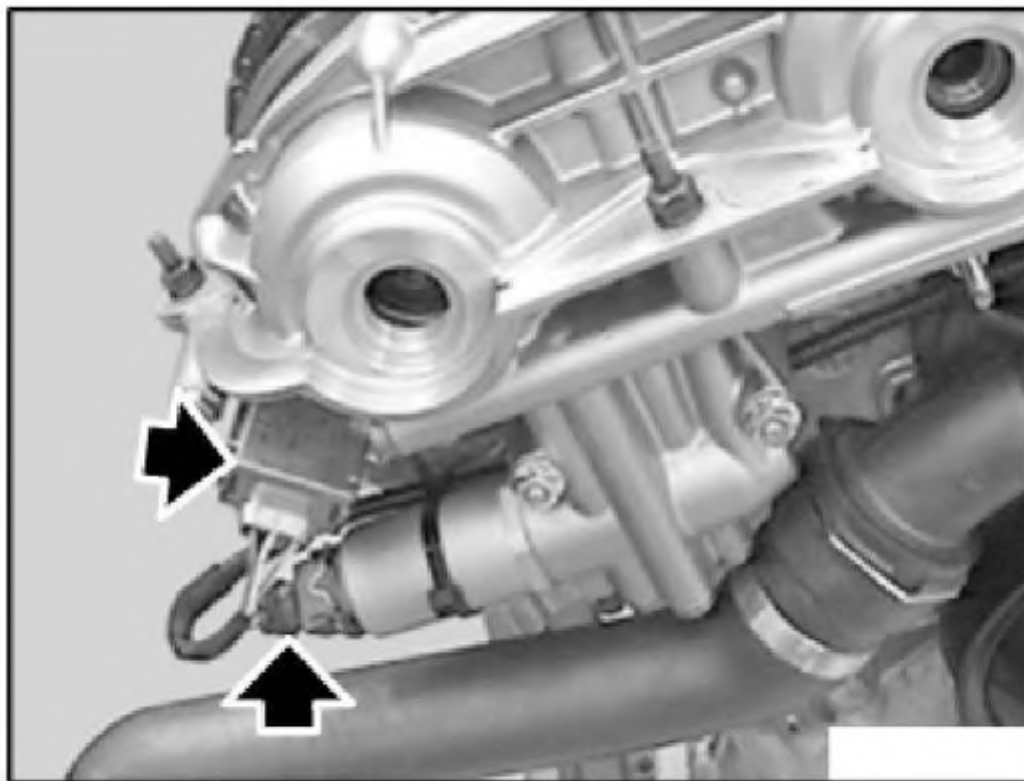
Release fitting screws on inlet and exhaust sides.



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Fig. 305: Releasing Fitting Screws On Exhaust And Inlet
Courtesy of BMW OF NORTH AMERICA, INC.

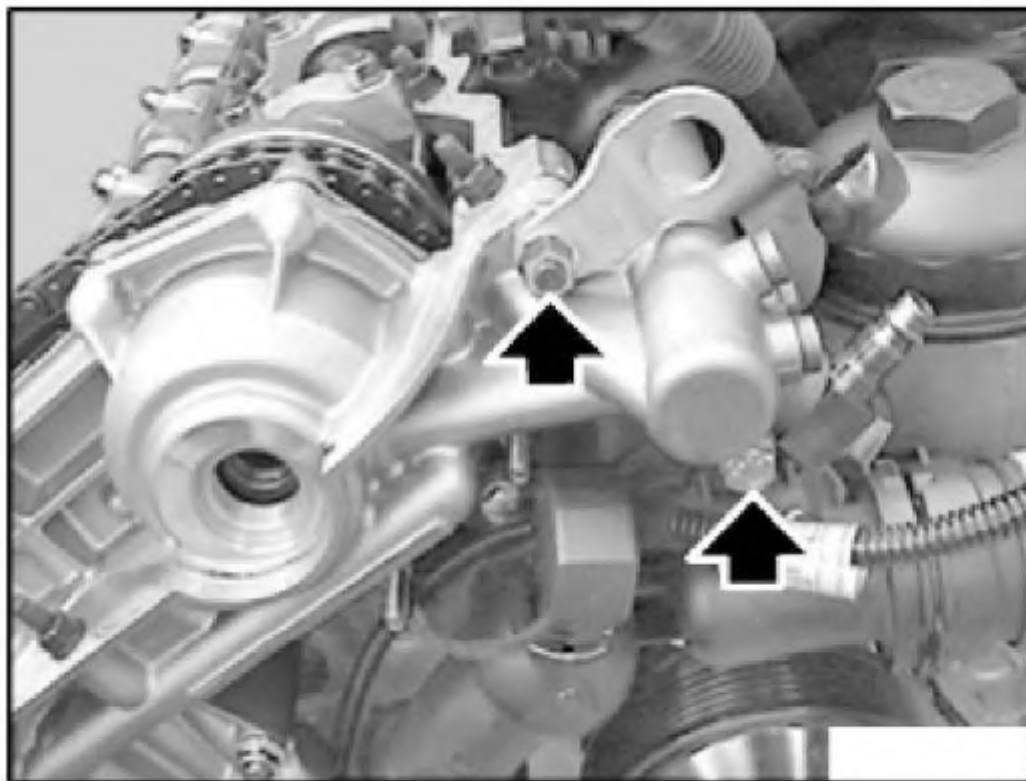
Detach plug connections from camshaft sensor and solenoid valves on exhaust and inlet sides.



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Fig. 306: Detaching Plug Connections From Camshaft Sensor And Solenoid Valves
Courtesy of BMW OF NORTH AMERICA, INC.

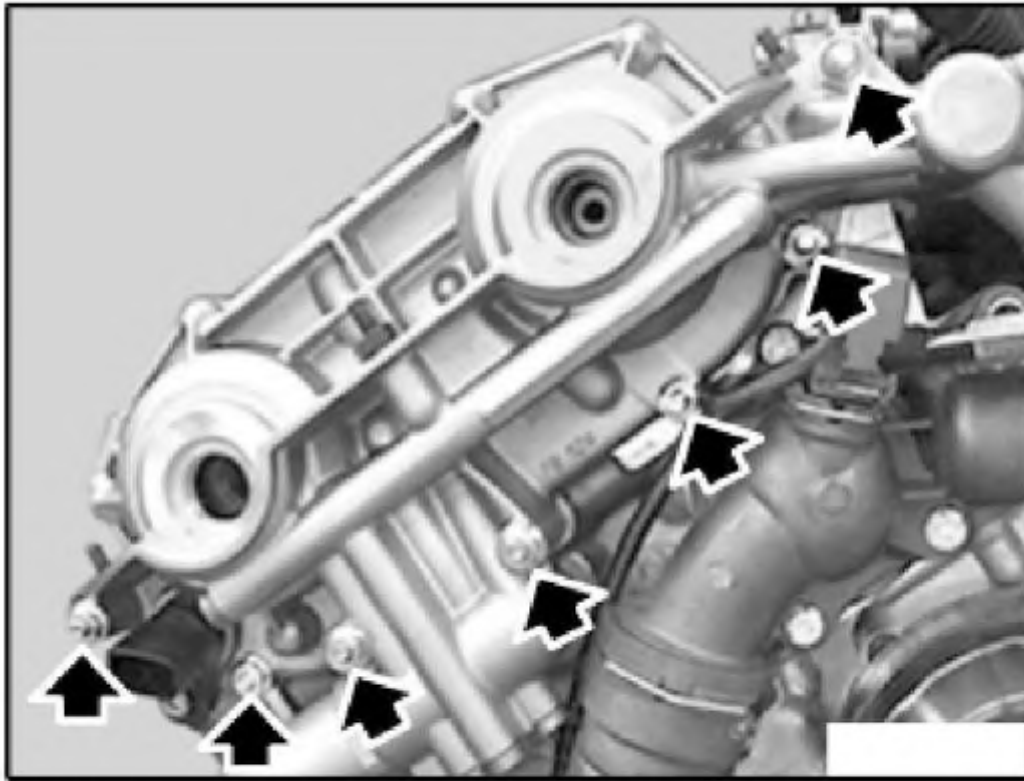
Unscrew suspension eye.



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Fig. 307: Unscrewing Suspension Eye
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts and remove double VANOS adjustment unit.



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Fig. 308: Locating VANOS Unit Retaining Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

With double VANOS adjustment unit removed:

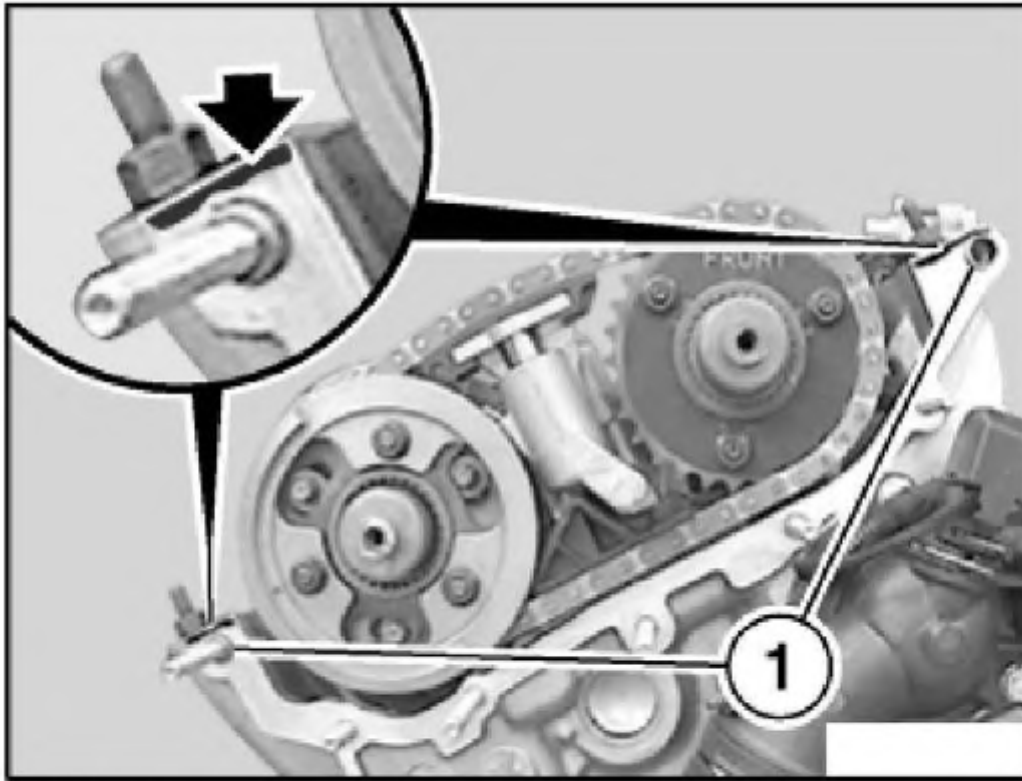
Do not crank engine.

The toothed shaft on the inlet side may move and slip out of the spline teeth, the inlet camshaft is thus no longer non-positively connected and the valves could rest on the piston.

Installation:

Installation of double VANOS adjustment unit is described separately from removal. Assembly sequence for removal and installation is different.

Check dowel sleeves (1) for damage and correct installation position.



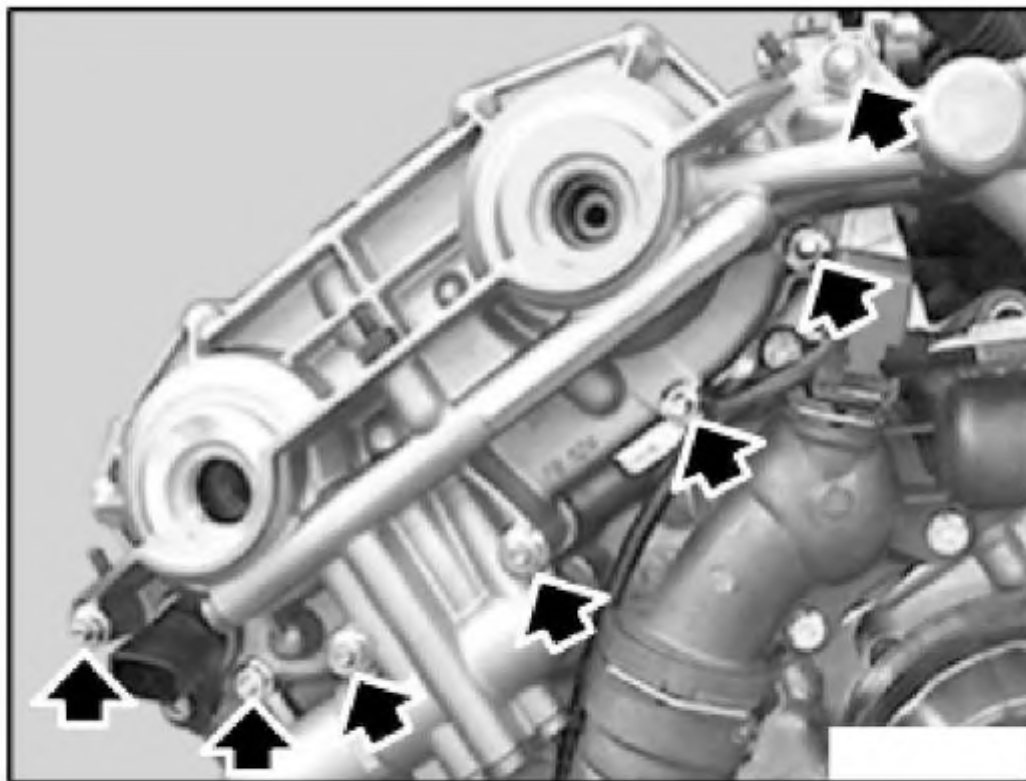
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Fig. 309: Checking Dowel Sleeves**Courtesy of BMW OF NORTH AMERICA, INC.**

Keep sealing faces clean and free of oil. Apply a thin and even coat of sealing compound Drei Bond 1209 to contact surface edges of separating face between cylinder head and double VANOS adjustment unit.

Replace seal.

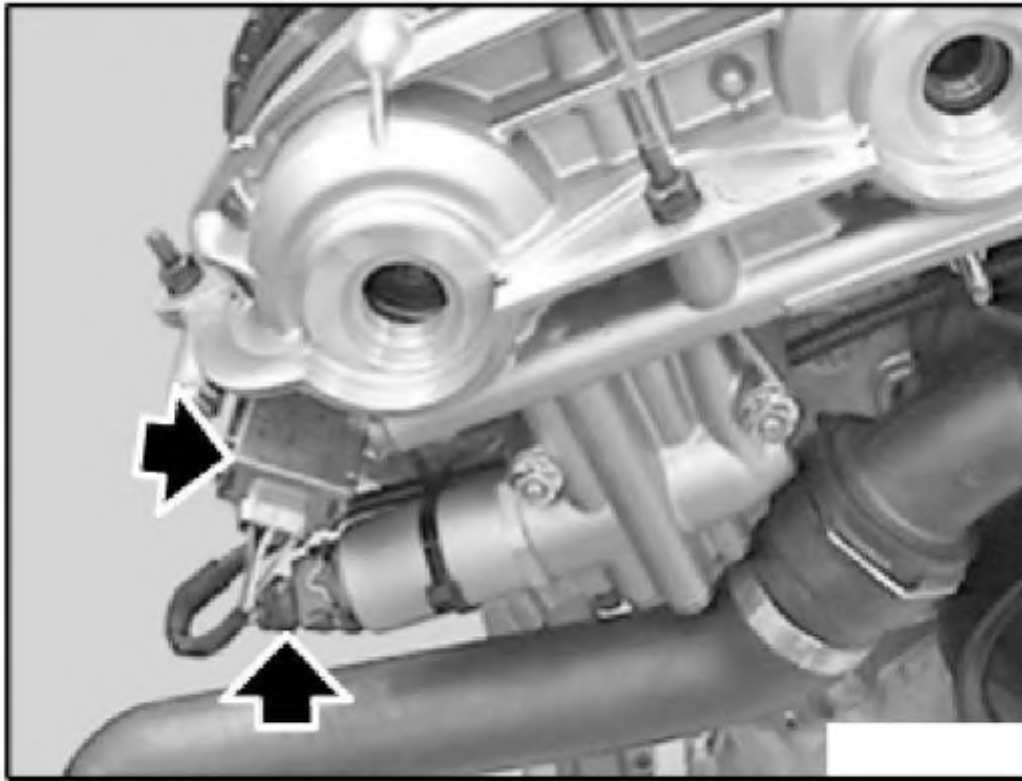
Install and secure double VANOS adjustment unit.



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Fig. 310: Installing VANOS Adjustment Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Attach plug connections of camshaft sensor and solenoid valves on exhaust and inlet sides.



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Fig. 311: Attaching Plug Connections Of Camshaft Sensor And Solenoid Valves
Courtesy of BMW OF NORTH AMERICA, INC.

Important!

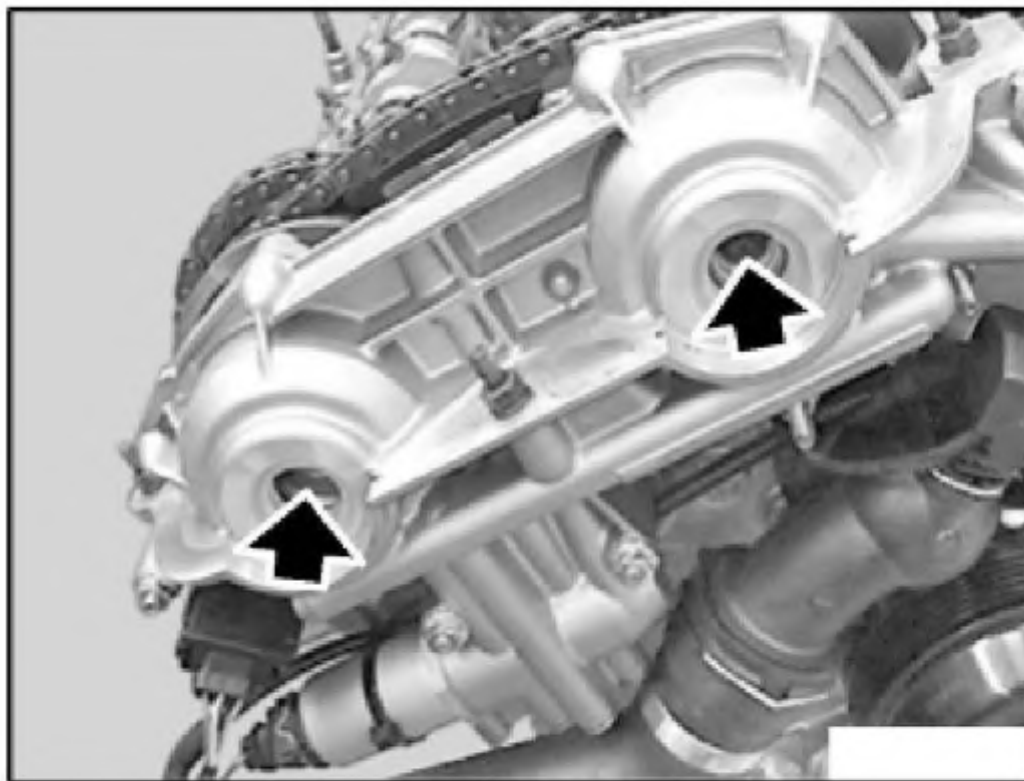
Left-hand threads.

Insert fitting screws for hydraulic piston on toothed shaft on inlet and exhaust sides and tighten down.

Tightening torque, (10 N.m.).

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

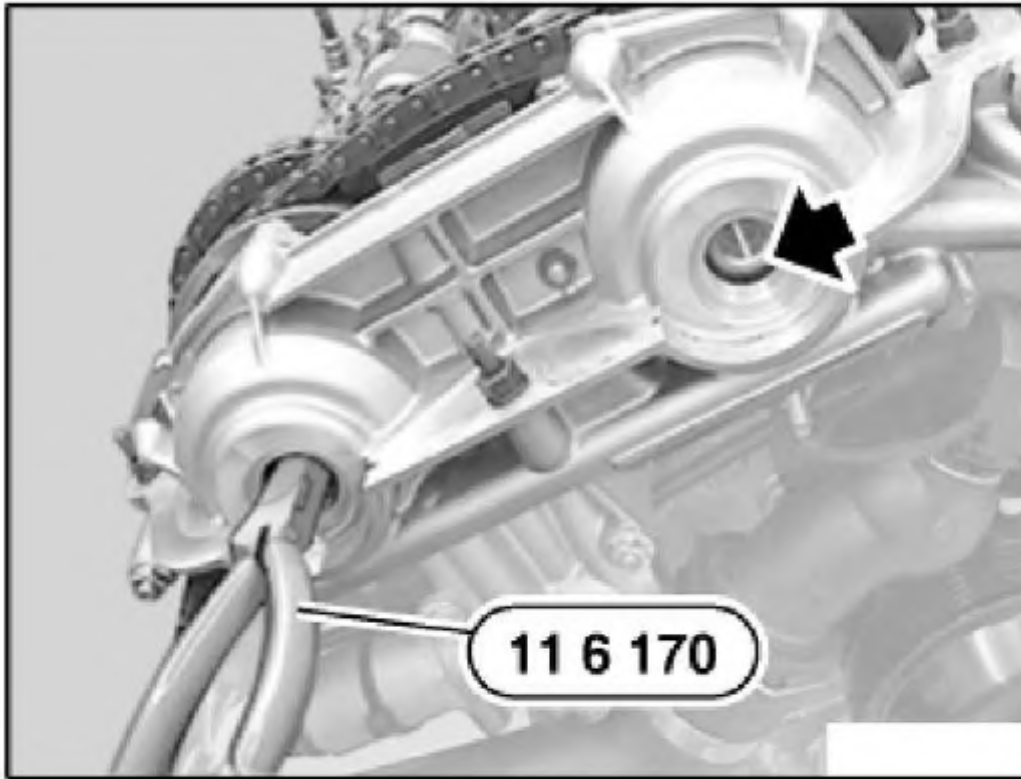


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Fig. 312: Installing Fitting Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Replace sealing caps and install with special tool 11 6 170 or with commercially available short flat nose pliers.



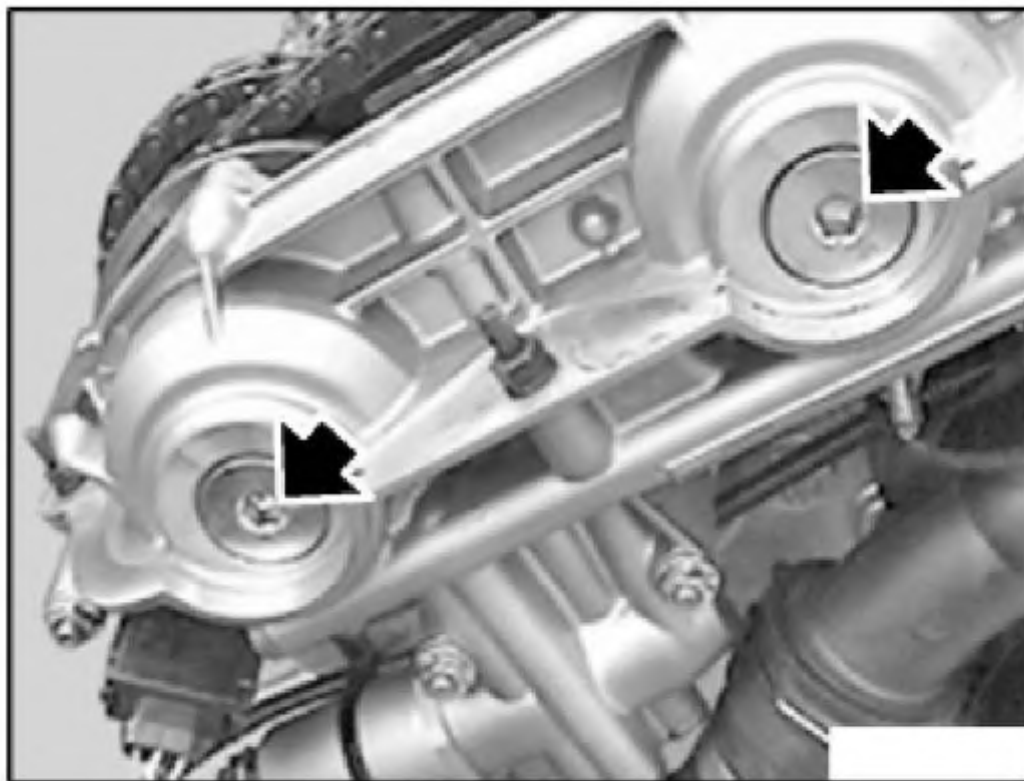
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Fig. 313: Installing Sealing Caps

Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw plugs with new sealing rings and tighten down.

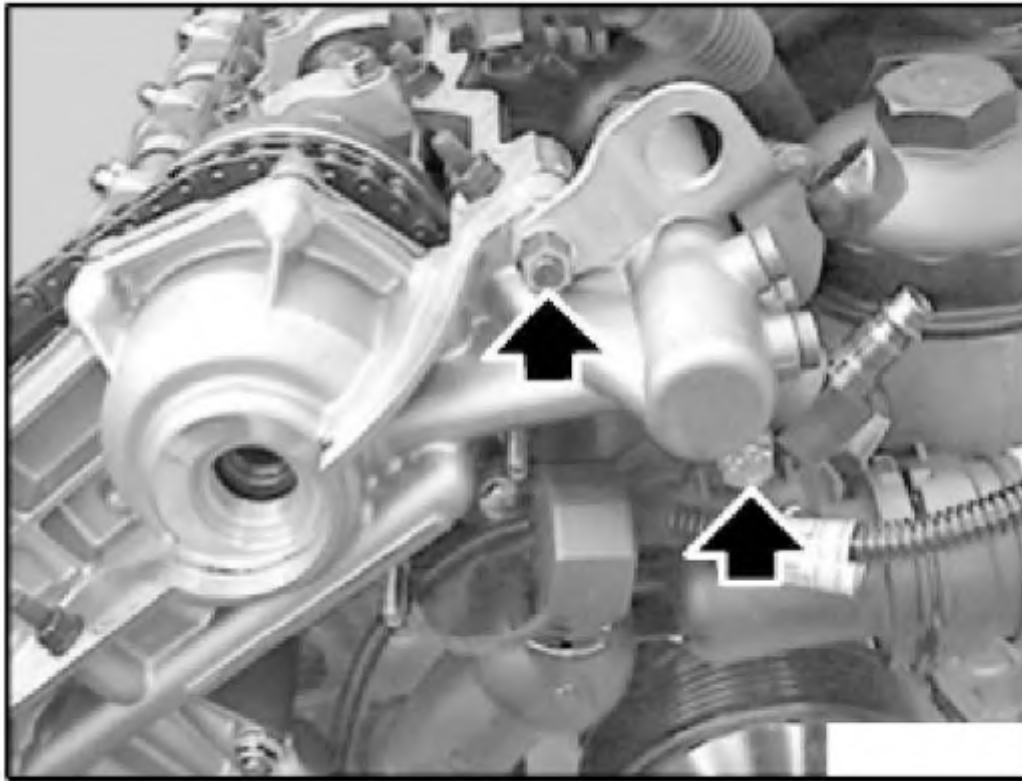
Tightening torque, (50 N.m.).



G03230356

Fig. 314: Inserting Screw Plugs
Courtesy of BMW OF NORTH AMERICA, INC.

Fit suspension lug.



G03230357

Fig. 315: Installing Inspection Lug

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If the double VANOS adjustment unit has been replaced, you must check and, if necessary, adjust the camshaft timing. If work has been carried out which has "no" effect on the timing and it is assured that the timing adjustment is correct, the timing check described in the following does not have to be conducted.

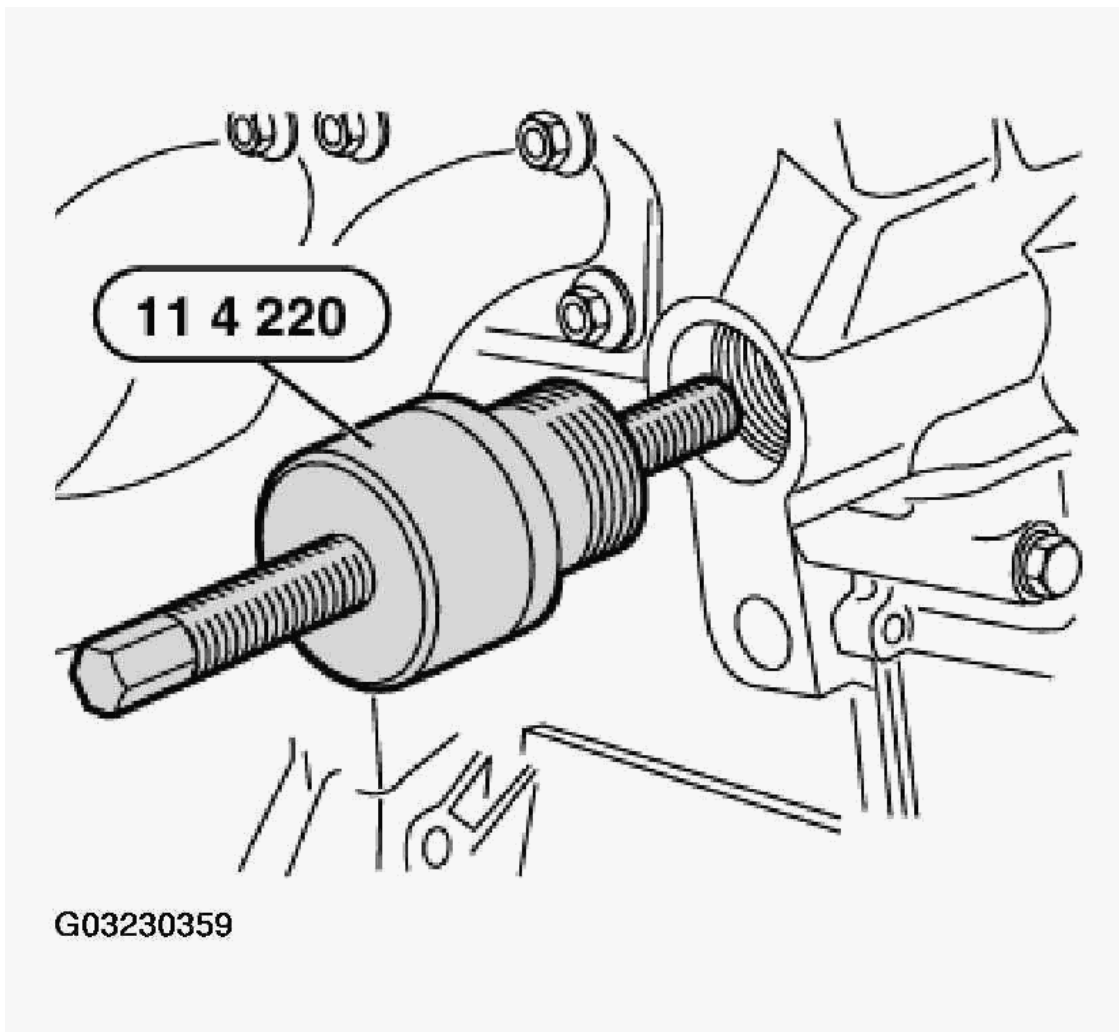
IMPORTANT: Cylinder for chain tensioning piston is under spring pressure.

Remove cylinder for chain tensioning piston.



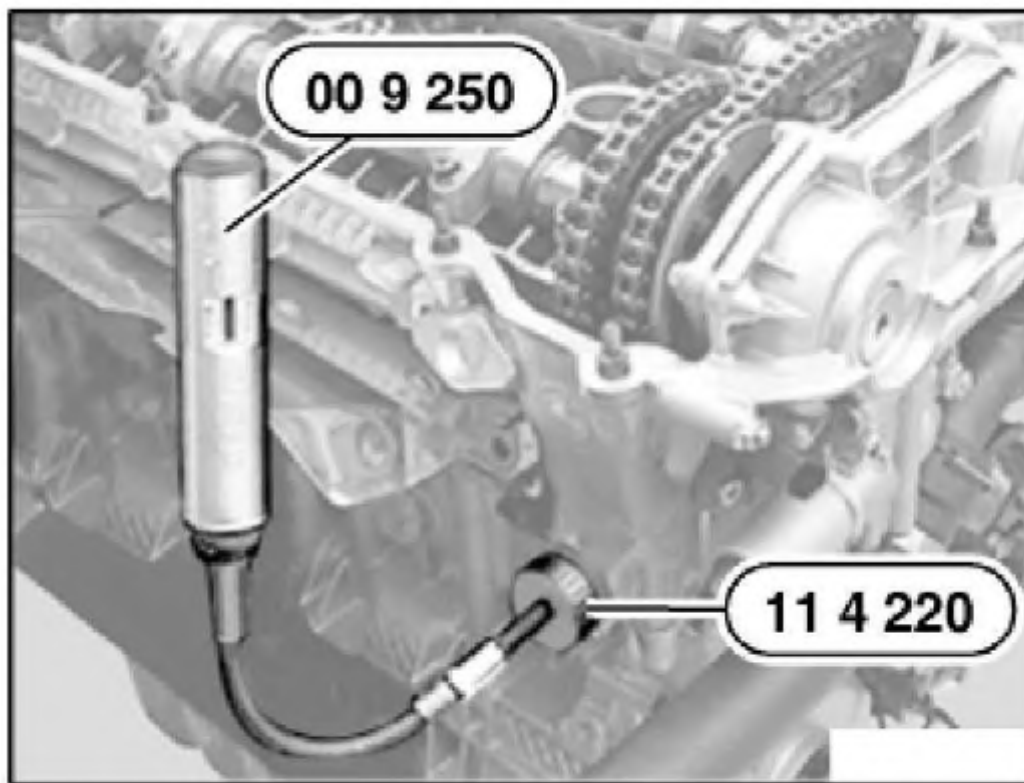
Fig. 316: Locating Cylinder For Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 4 220 in cylinder head and bring adjustment screw into contact with tensioning rail.

**Fig. 317: Installing Chain Tensioner**

Courtesy of BMW OF NORTH AMERICA, INC.

Preload tensioning rail with special tool 11 4 220 by rotating adjusting screw with special tool 00 9 250 or standard torque wrench to 0.7 N.m.



G03230360

Fig. 318: Preloading Tensioning Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Pull special tool 11 2 300 back until flywheel is no longer secured in position.

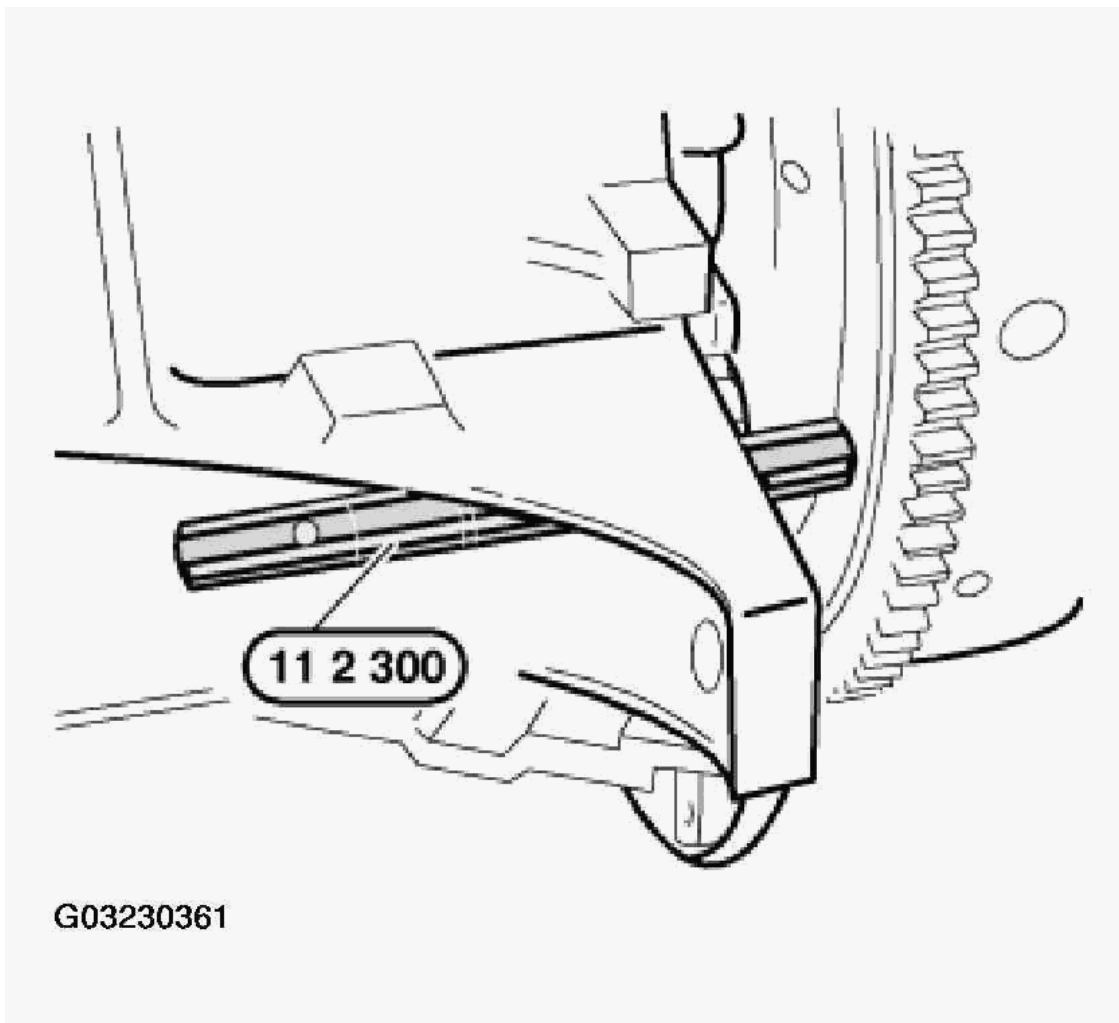
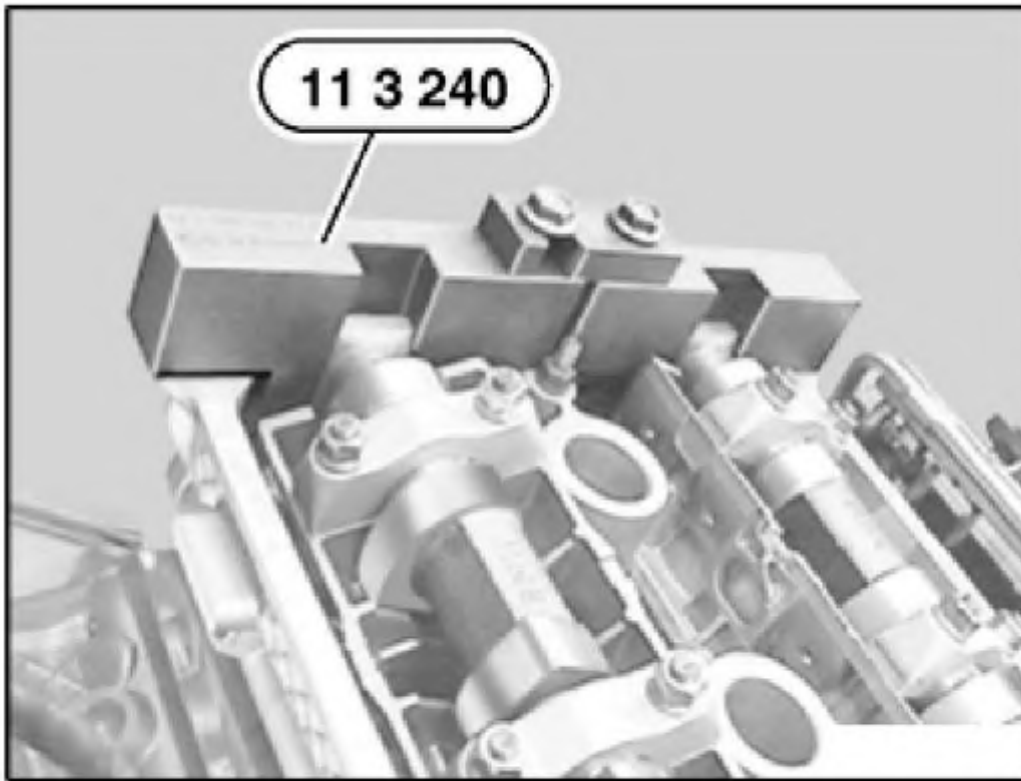


Fig. 319: Releasing Flywheel From Plug Mandrel
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 3 240.



G03230362

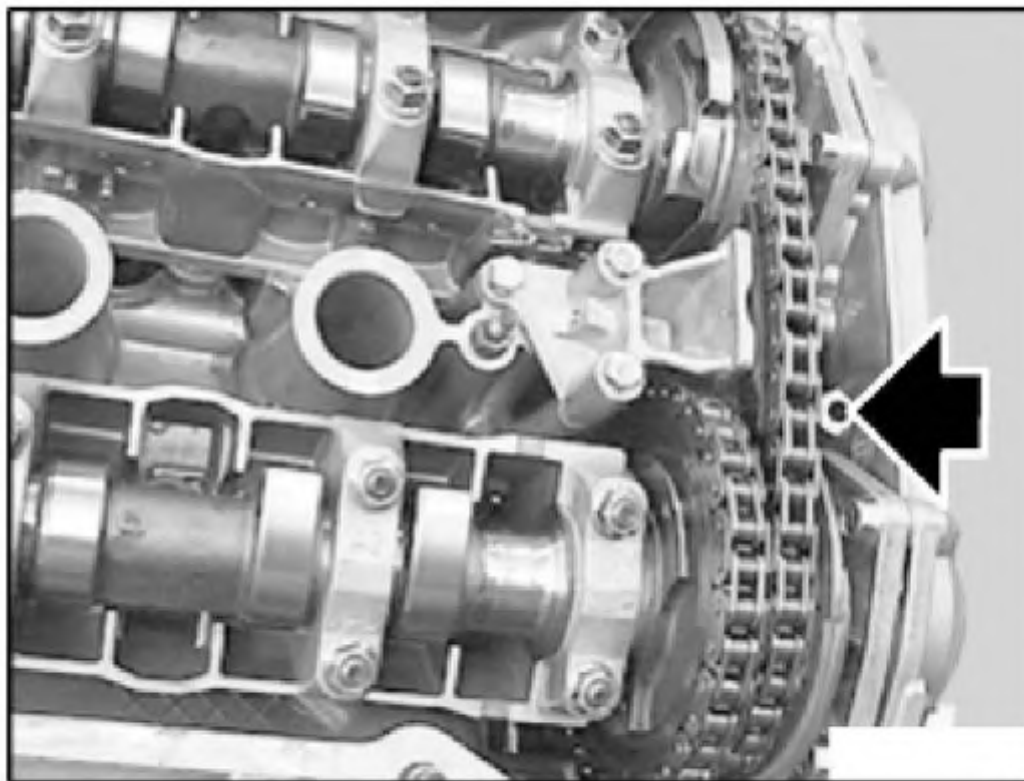
Fig. 320: Removing Locking Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Cover double VANOS adjustment unit; when the compressed air supply is connected, several drops of oil are sprayed out of the bore.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



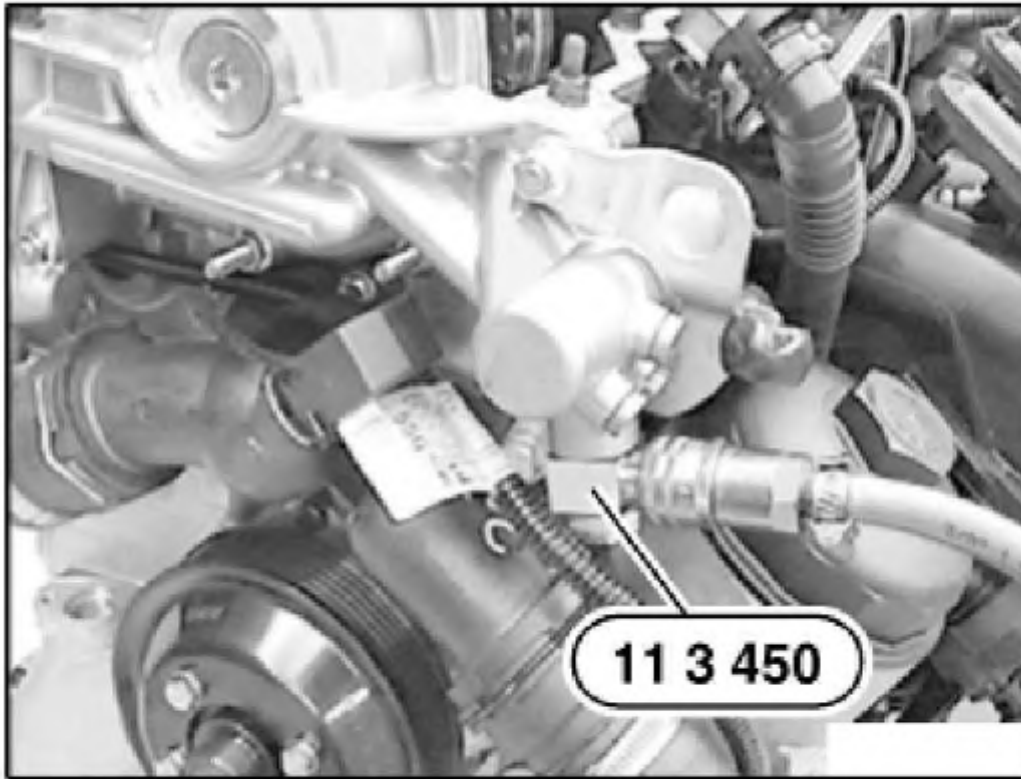
G03230363

Fig. 321: Locating Bore In VANOS Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Connect compressed air (2 to 8 bar).

2002 BMW X5

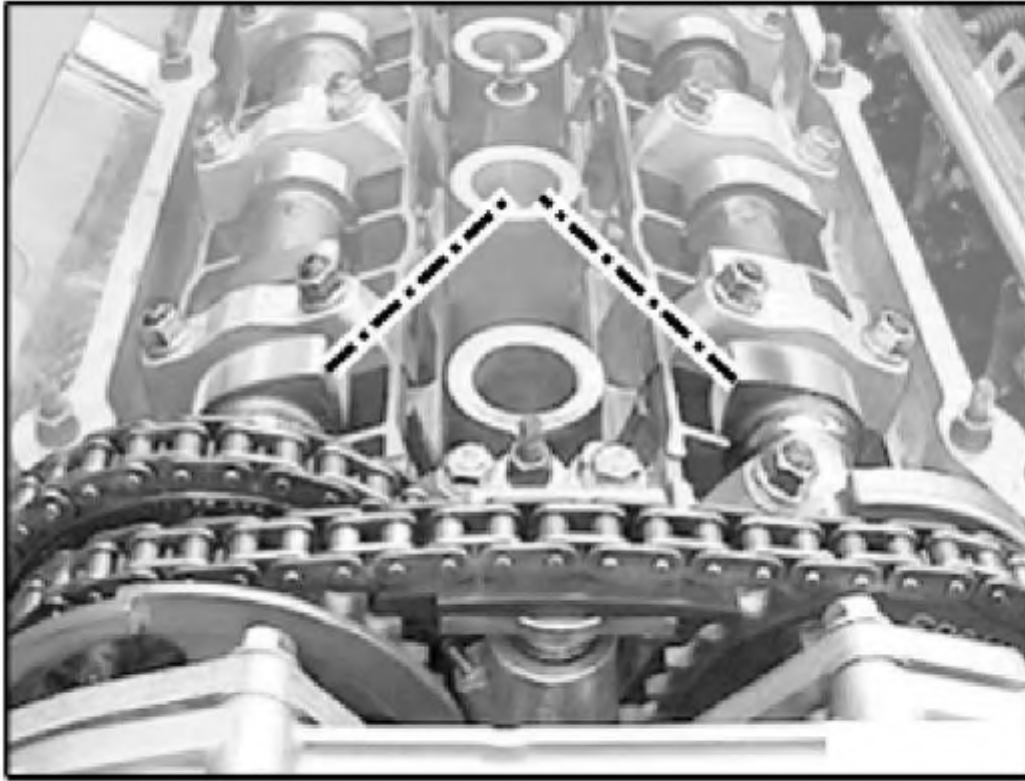
2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230364

Fig. 322: Connecting Compressed Air To Fitting
Courtesy of BMW OF NORTH AMERICA, INC.

With compressed air supply connected, crank engine twice in direction of rotation until cam tips on inlet and exhaust camshafts on 1st cylinder face each other.



G03230365

Fig. 323: Aligning Cam Tips

Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft with special tool 11 2 300 in TDC position of 1st cylinder.

IMPORTANT: Do not turn the engine back. Remove special tool 11 2 300 before switching on the engine.

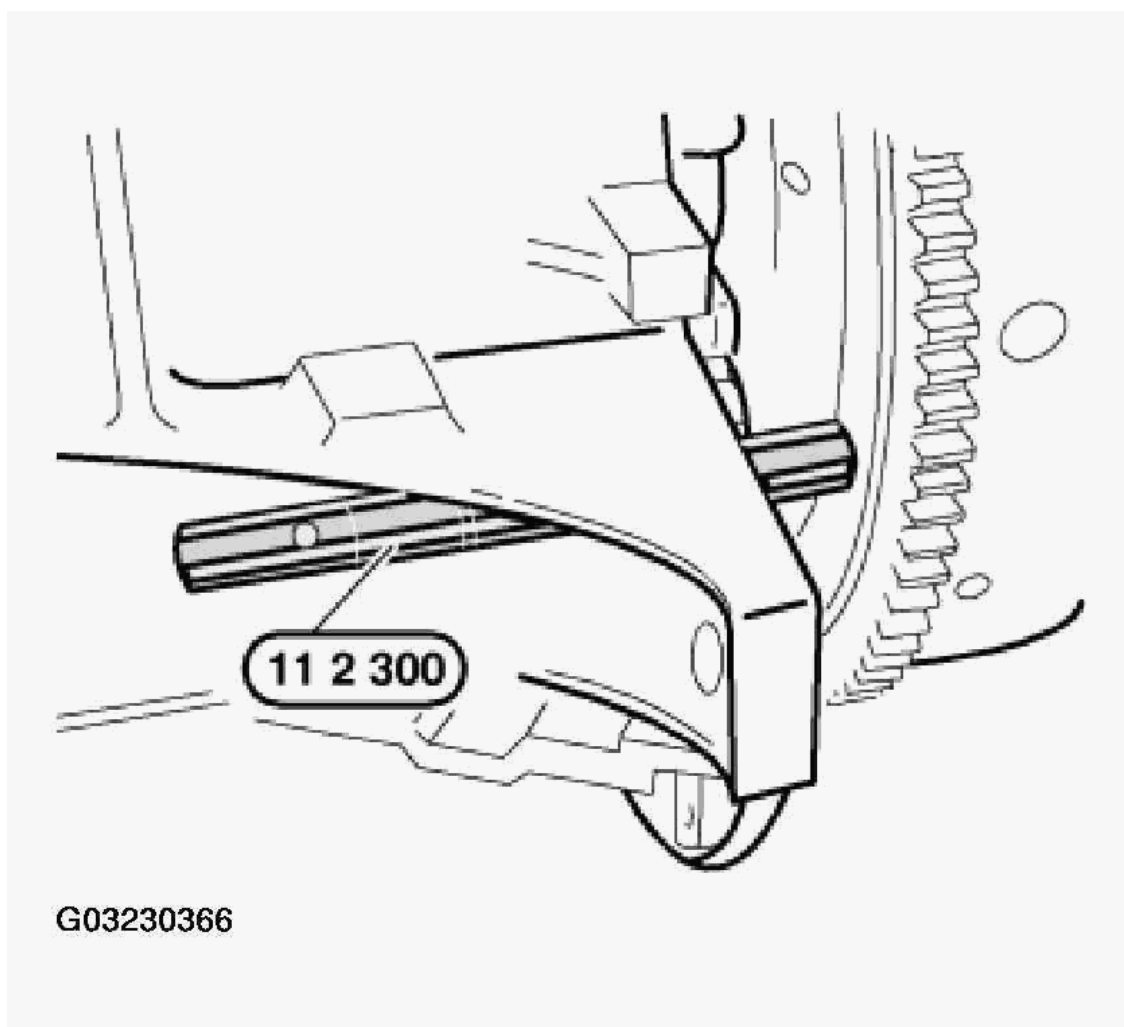
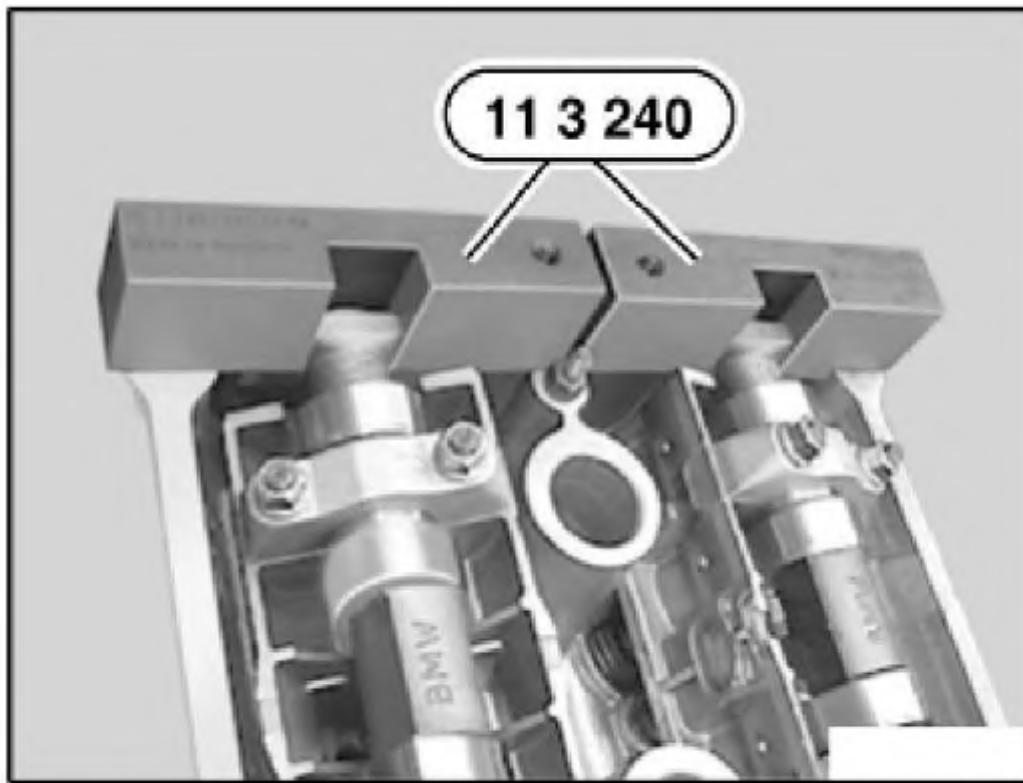


Fig. 324: Securing Crankshaft With Plug Mandrel
Courtesy of BMW OF NORTH AMERICA, INC.

Check camshaft setting:

Fit special tool 11 3 240 to camshafts.

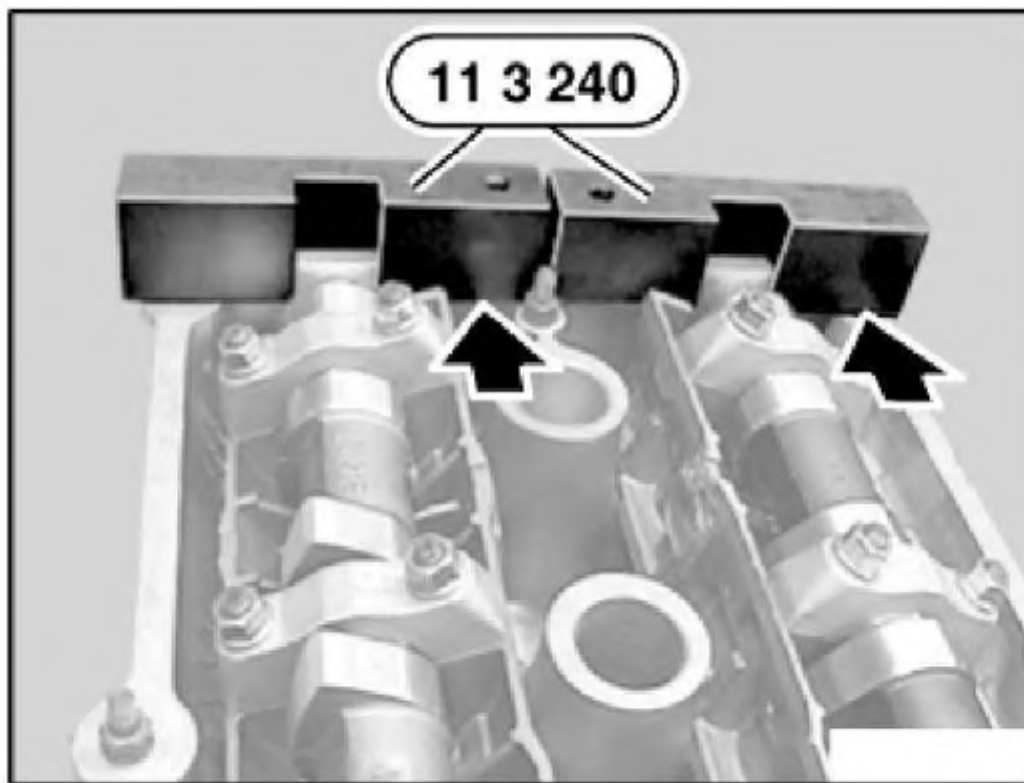


G03230367

Fig. 325: Installing Locking Fixture On Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The timing is correctly set if the special tool 11 3 240 rests without a gap on the cylinder head or protrudes up to 1 mm to the inlet side. The timing must be reset if the special tool 11 3 240 protrudes to the exhaust side.

If necessary, adjust camshaft timing. Refer to **11 31 505 ADJUSTING CAMSHAFT TIMING (M52TU / M54 / M56)**.

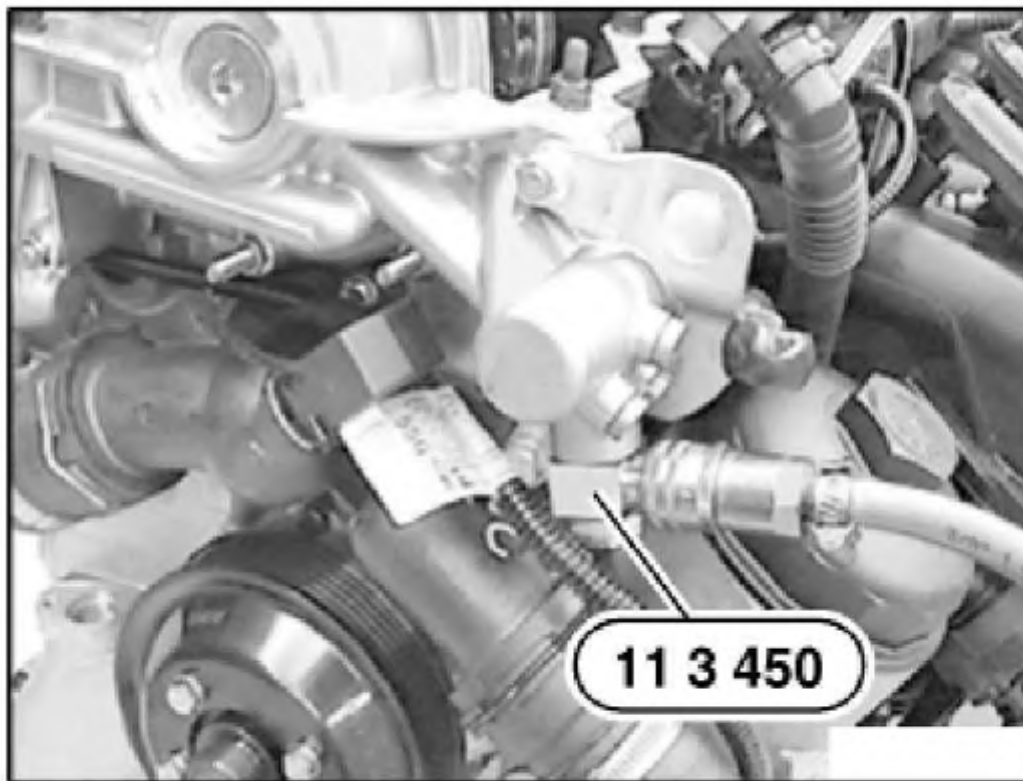


G03230368

Fig. 326: Checking Locking Fixture Alignment
Courtesy of BMW OF NORTH AMERICA, INC.

Detach compressed air connection.

Remove special tool 11 3 450.



G03230369

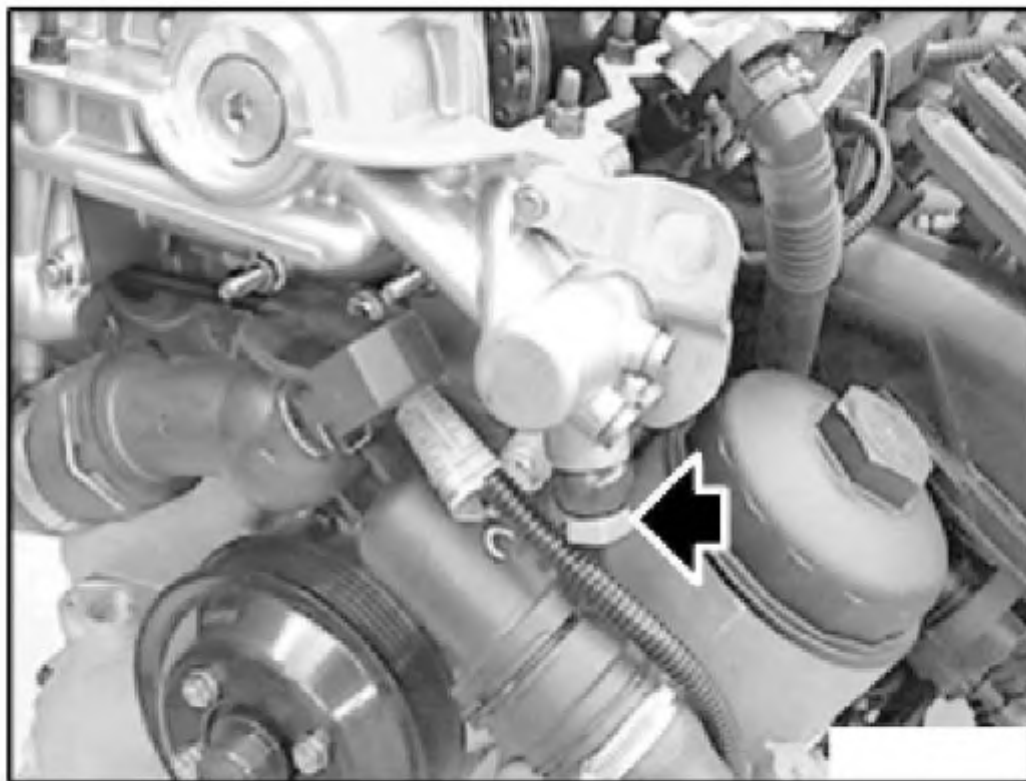
Fig. 327: Detaching Compressed Air Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Fit oil pressure line with new seals.

Tightening torque, (32 N.m.).

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230370

Fig. 328: Identifying Oil Pressure Line
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten and remove special tool 11 4 220.

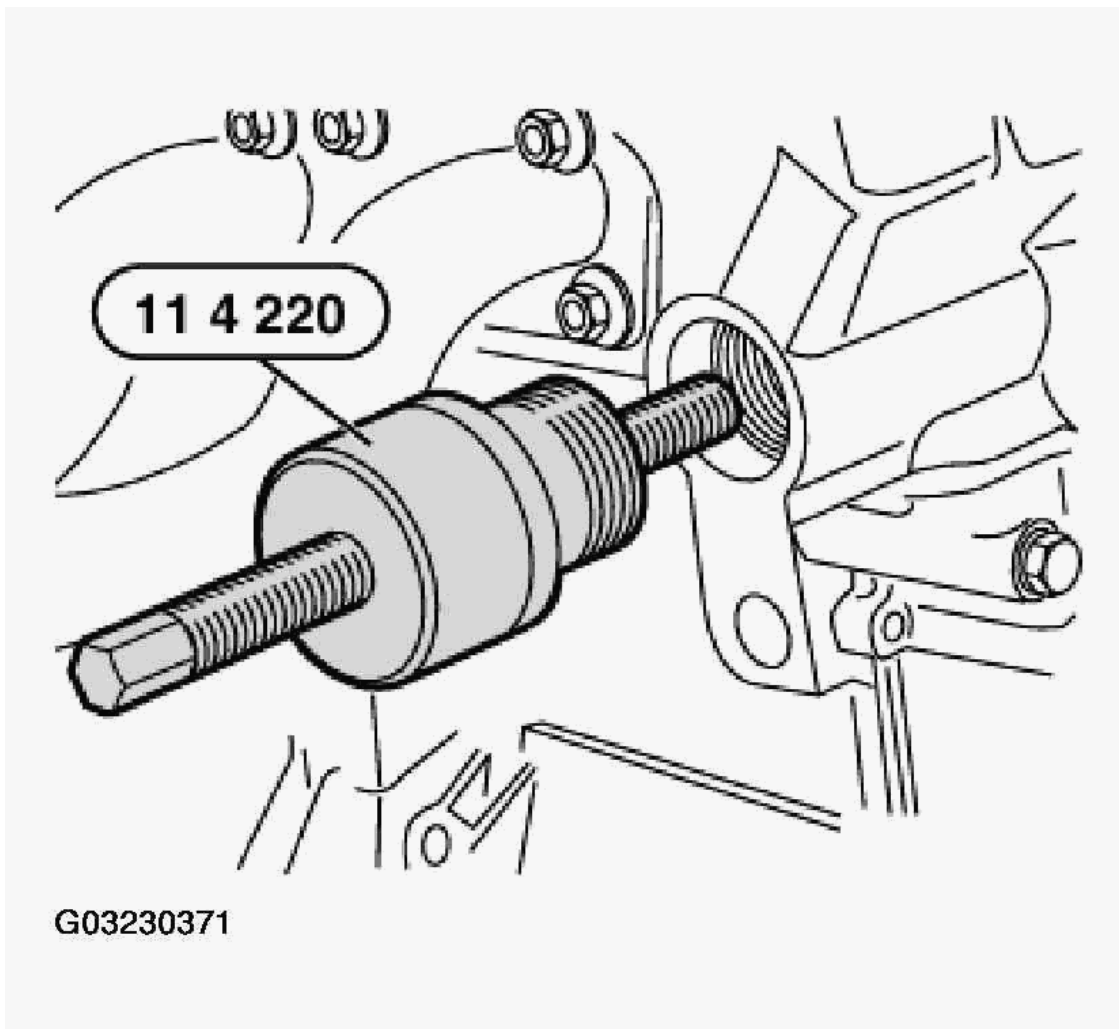


Fig. 329: Removing Chain Tensioner

Courtesy of BMW OF NORTH AMERICA, INC.

Install cylinder for chain tensioning piston. Refer to **11 31 090 REMOVING AND INSTALLING/REPLACING CHAIN TENSIONING PISTON (M52 / M52TU / M54 / M56)** .

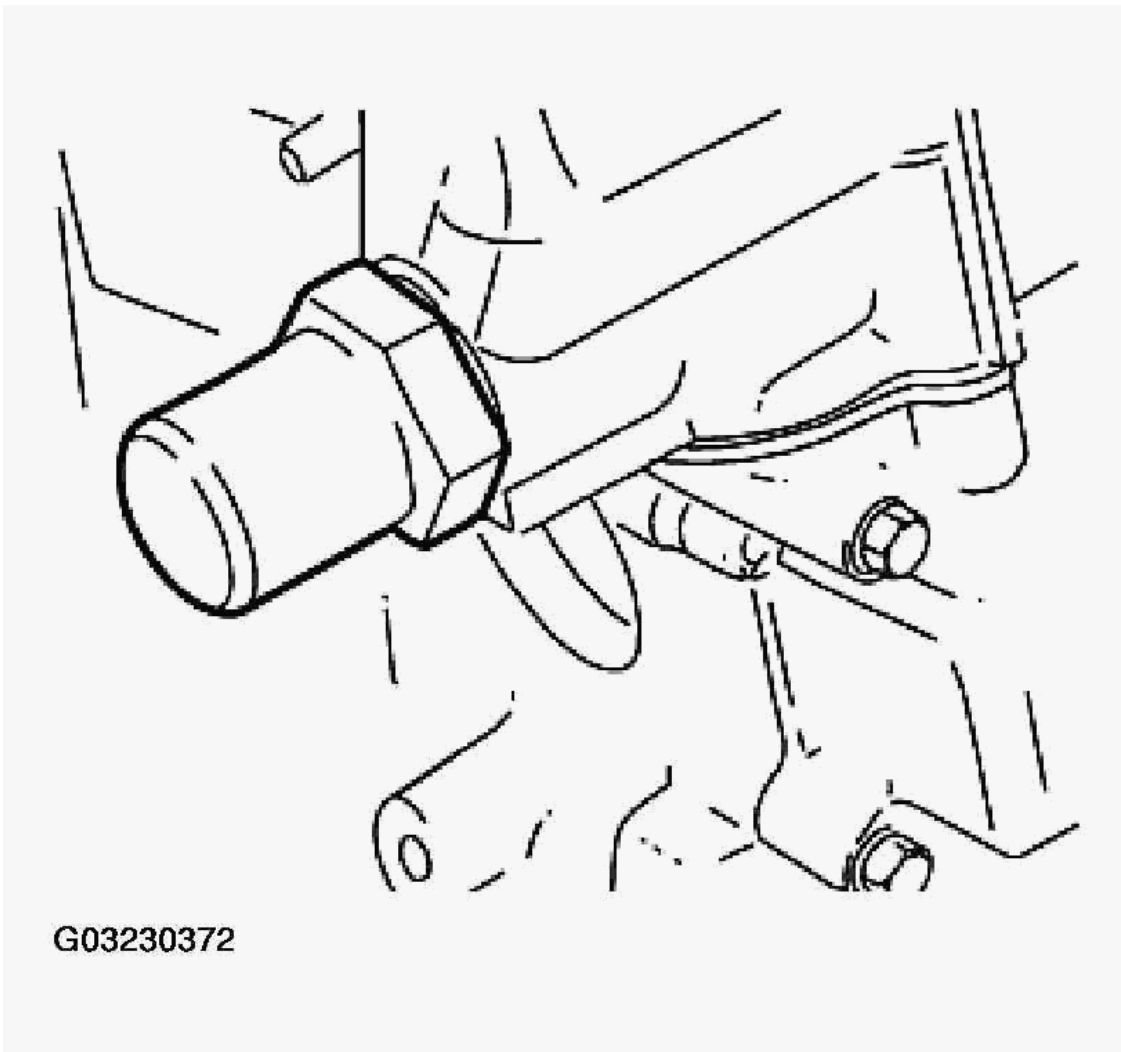
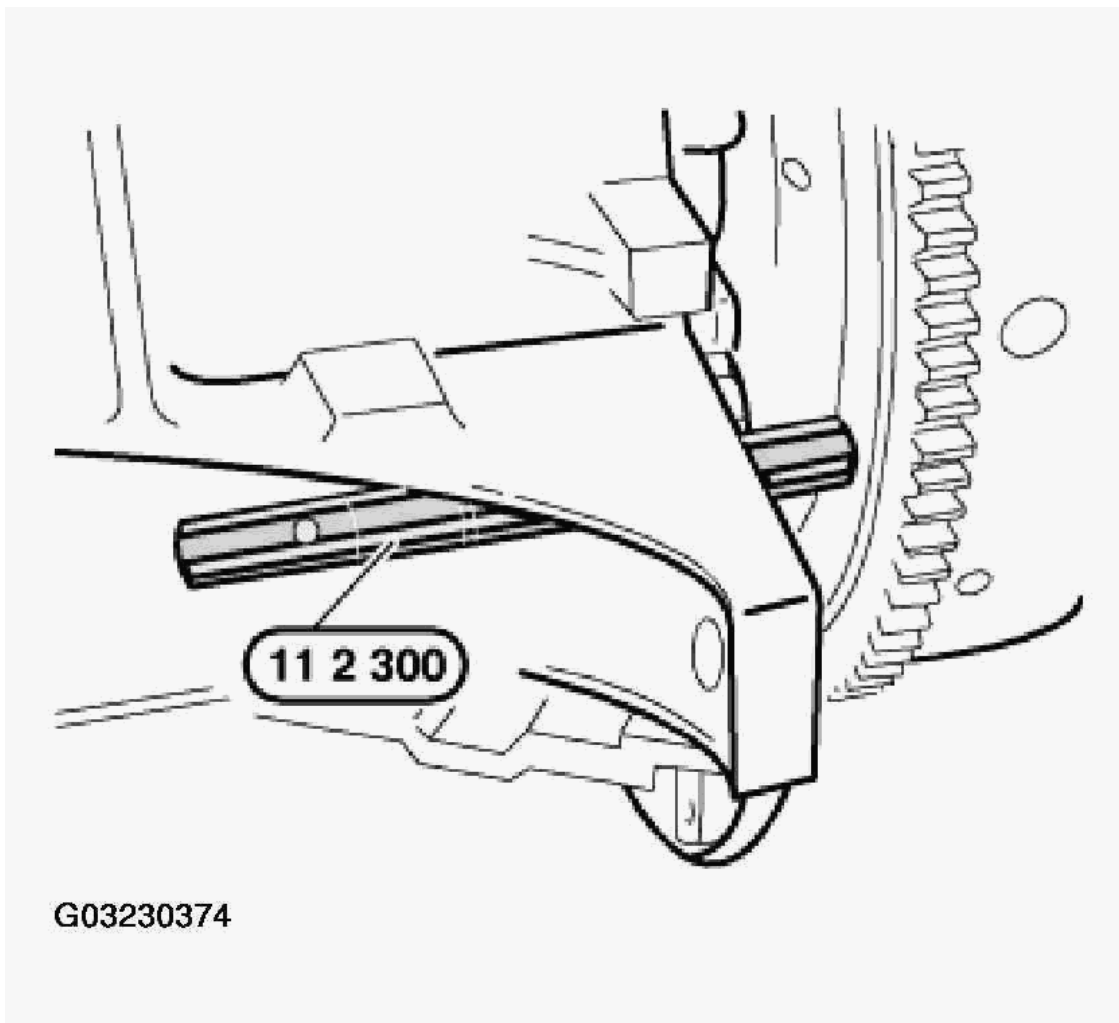


Fig. 330: Installing Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 3 240.



G03230374

Fig. 331: Removing Locking Fixture

Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 2 300.

Assemble engine.

11 36 570 REPLACING SOLENOID VALVE FOR INLET SIDE ON VANOS ADJUSTMENT UNIT

NOTE: For Special Tool identification, see SPECIAL TOOLS - X5 (3.0i) .

Special Tools Required:

- 32 2 110

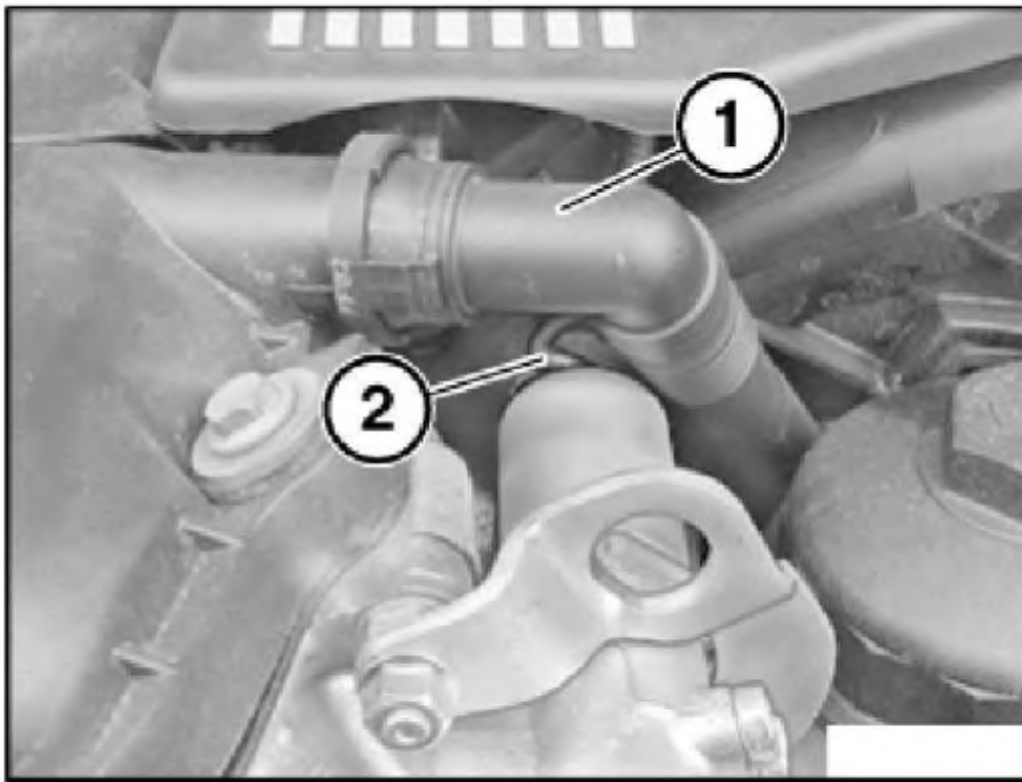
Necessary Preliminary Tasks:

- Read out fault memory of DME control unit.

- Check stored fault messages.
- Switch off ignition.

Unlock hose (1) and detach.

Unlock plug (2) and remove.



G03230375

Fig. 332: Removing Solenoid Valve Hose And Plug
Courtesy of BMW OF NORTH AMERICA, INC.

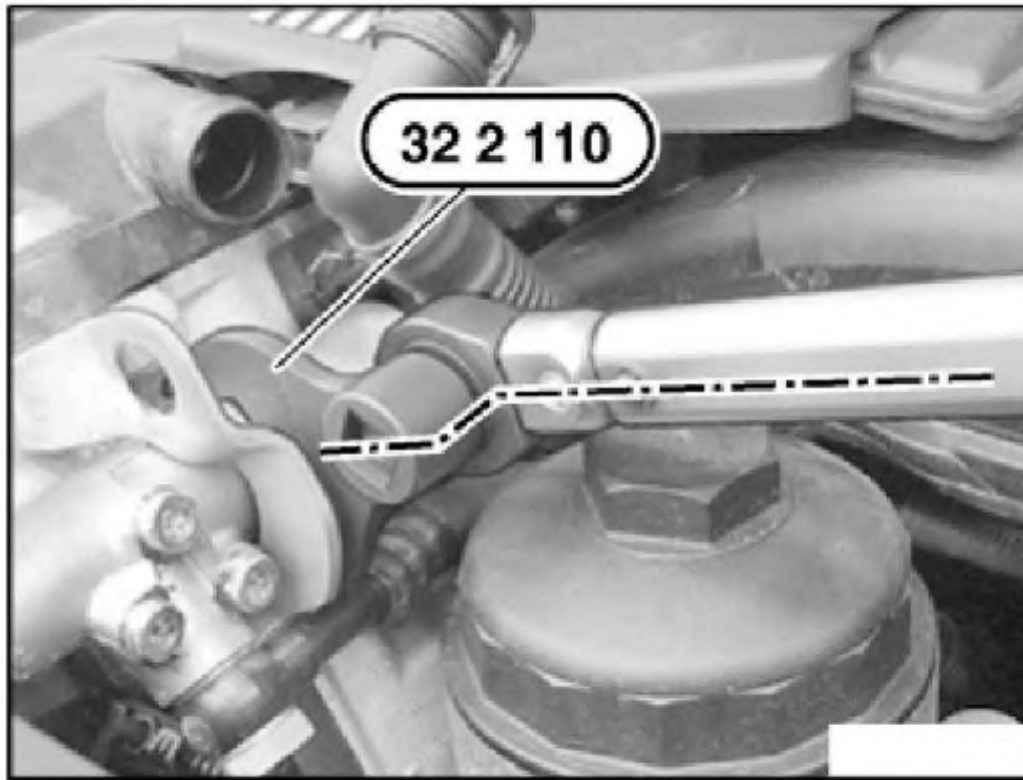
NOTE: Once it has been removed, oil drips from the solenoid valve.

Have a cleaning cloth ready.

Make sure no oil drips onto the belt drive. Remove any remnants of oil immediately with cleaning cloth.

Do not damage oil line when releasing solenoid valve.

Release solenoid valve with special tool 32 2 110 .



G03230376

Fig. 333: Removing Solenoid Valve

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tightening torque, (30 N.m.).

Now clear the fault memory.

11 36 575 REPLACING SOLENOID VALVE FOR EXHAUST SIDE ON VANOS ADJUSTMENT UNIT

NOTE: For Special Tool identification, see SPECIAL TOOLS - X5 (3.0i) .

Special Tools Required:

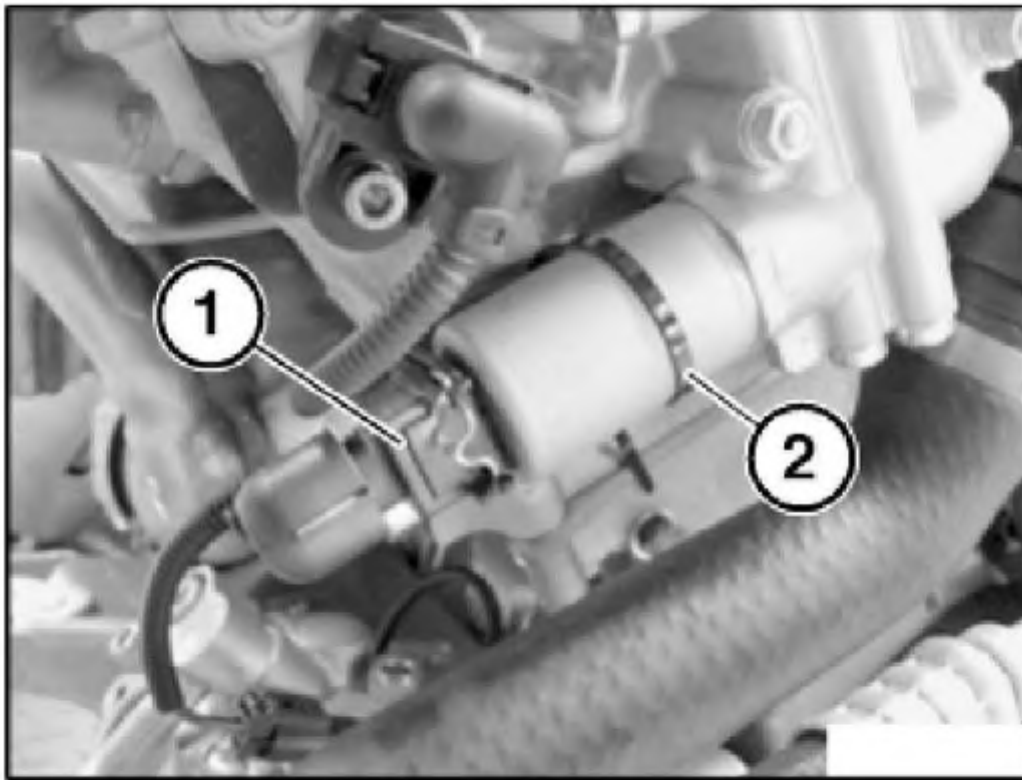
- 11 6 420

Necessary Preliminary Tasks:

- Read out fault memory of DME control unit.
- Check stored fault messages.
- Switch off ignition.

Unlock plug (1) and remove.

Cut through cable tie (2).



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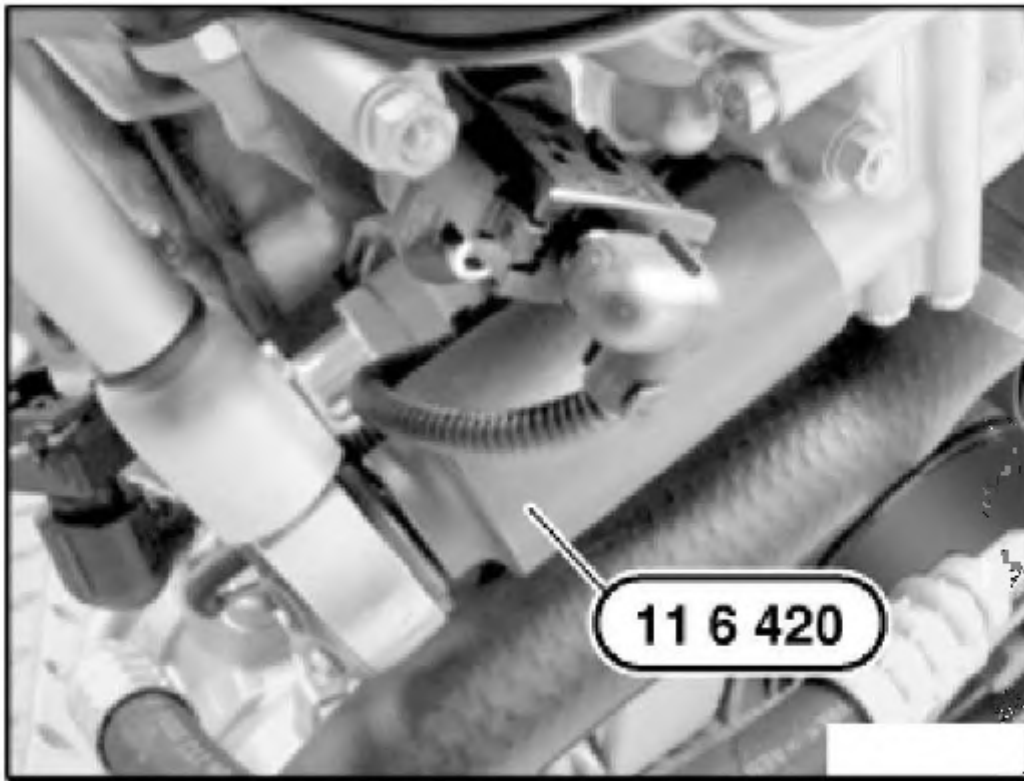
Fig. 334: Unlocking Plug And Removing Cable Tie
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Once it has been removed, oil drips from the solenoid valve.

Have a cleaning cloth ready.

Make sure no oil drips onto the belt drive. Remove any remnants of oil immediately with cleaning cloth.

Release solenoid valve with special tool 11 6 420 .



G03230378

Fig. 335: Releasing Solenoid Valve

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tightening torque, (30 N.m.).

Now clear the fault memory.

OIL SUPPLY

11 40 000 CHECKING ENGINE OIL PRESSURE

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 11 4 050
- 13 3 061
- 13 3 063
- 13 6 051
- 13 6 054

NOTE: For engine oil pressure to be checked, oil pressure switch must be removed and special tools must be installed and connected.

To avoid an excess discharge of oil when removing oil pressure switch:

Unscrew oil filter cap; the engine oil flows out of the oil filter housing into the oil sump.

Installation:

Replace sealing ring.

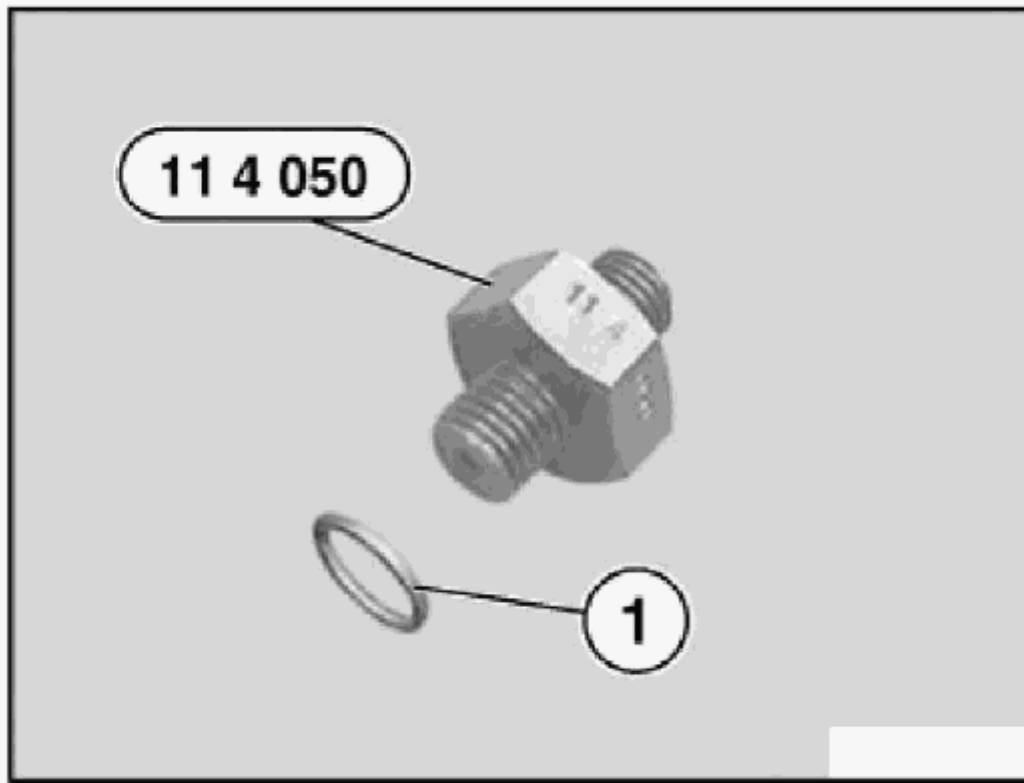
Tightening torque, refer to 11 42 2AZ in **ENGINE - TIGHTENING TORQUES** .

Remove oil pressure switch.

Installation:

Tightening torque, (27 N.m.).

Install special tool 11 4 050 with sealing ring (1) in place of oil pressure switch.



G03230379

Fig. 336: Identifying Oil Pressure Switch Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Checking Engine Oil Pressure With DIS Tester:

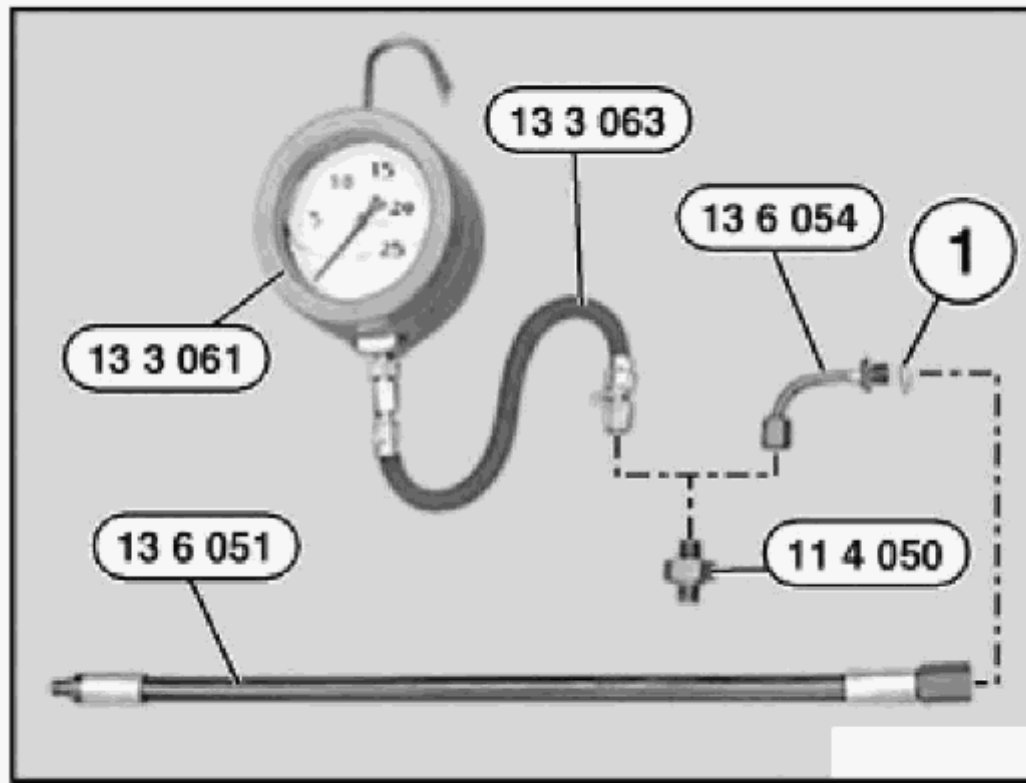
Attach special tool 13 6 054 with sealing ring (1) and special tool 13 6 051 and connect to DIS Tester.

Checking Engine Oil Pressure With Pressure Gauge:

Install special tool 13 3 063 and special tool 13 3 061 (pressure gauge).

Start engine and check engine oil pressure.

Specified value, refer to **ENGINE - TECHNICAL DATA** .



G03230380

Fig. 337: View Of Pressure Gauge Assembly

Courtesy of BMW OF NORTH AMERICA, INC.

OIL PUMP WITH FILTER AND DRIVE

11 41 000 REMOVING AND INSTALLING/REPLACING OIL PUMP (M52TU / M54 / M56)

Remove oil sump, refer to 11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (M52TU / M54 / M56) or 11 13 000 REMOVING AND INSTALLING/REPLACING OIL SUMP (M54) .

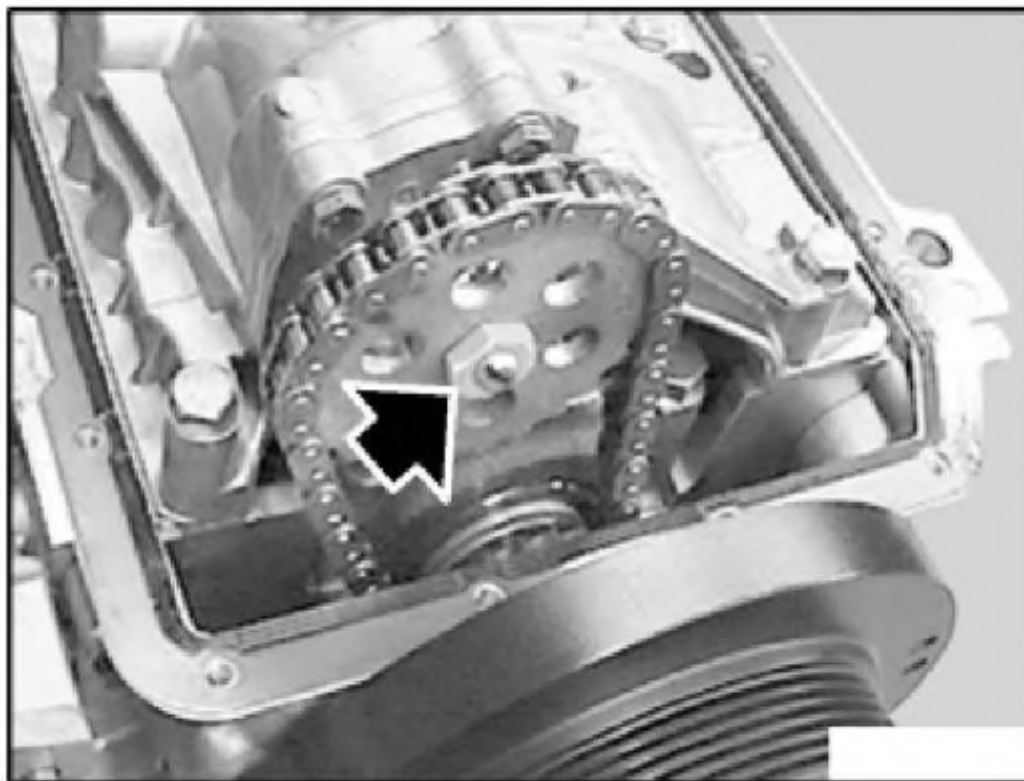
CAUTION: Left-hand threads. Unfasten nut.

Installation:

Tightening torque, refer to 11 41 4AZ in ENGINE - TIGHTENING TORQUES .

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230381

Fig. 338: Removing Sprocket Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Remove sprocket with chain.

Installation:

Align splines of chain wheel and oil pump shaft to each other.

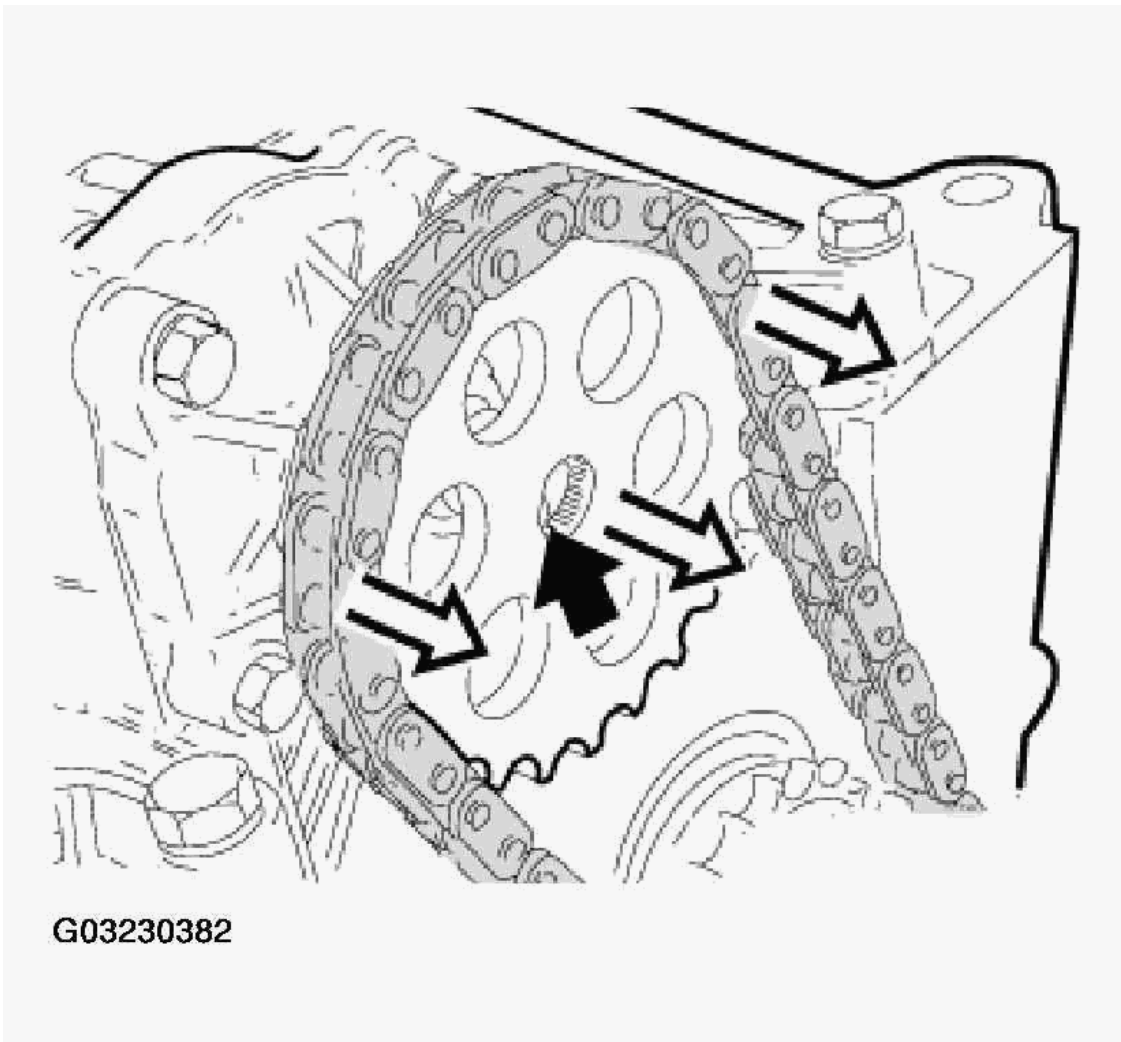
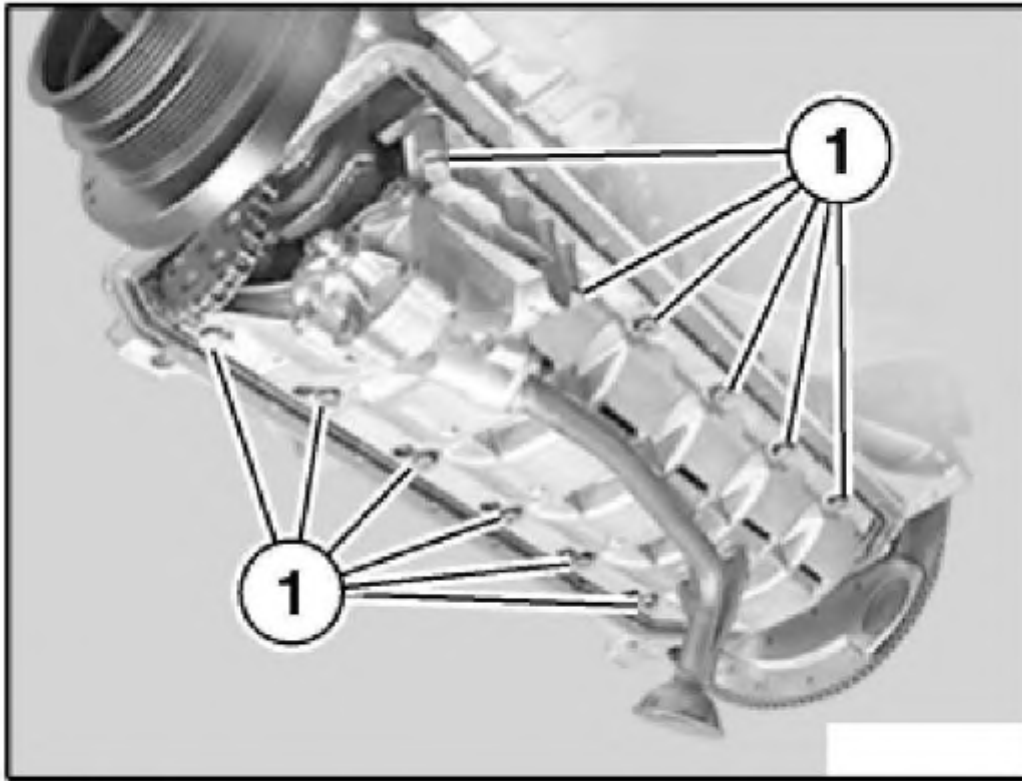


Fig. 339: Aligning Splines Of Chain Wheel And Oil Pump Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Version 1:

Oil pump integrated in oil scraper:

Release screws (1), remove oil pump with oil scraper.



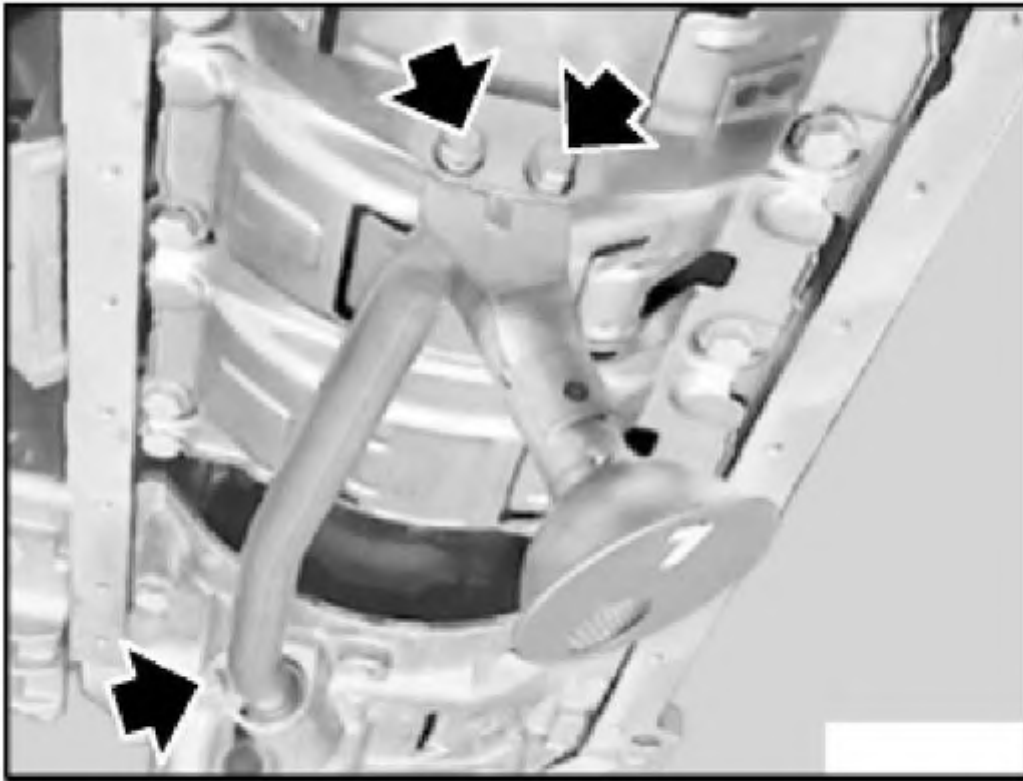
G03230383

Fig. 340: Locating Oil Scraper Retaining Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

Oil pump and oil scraper - two parts:

Release screws and remove oil pump intake pipe.



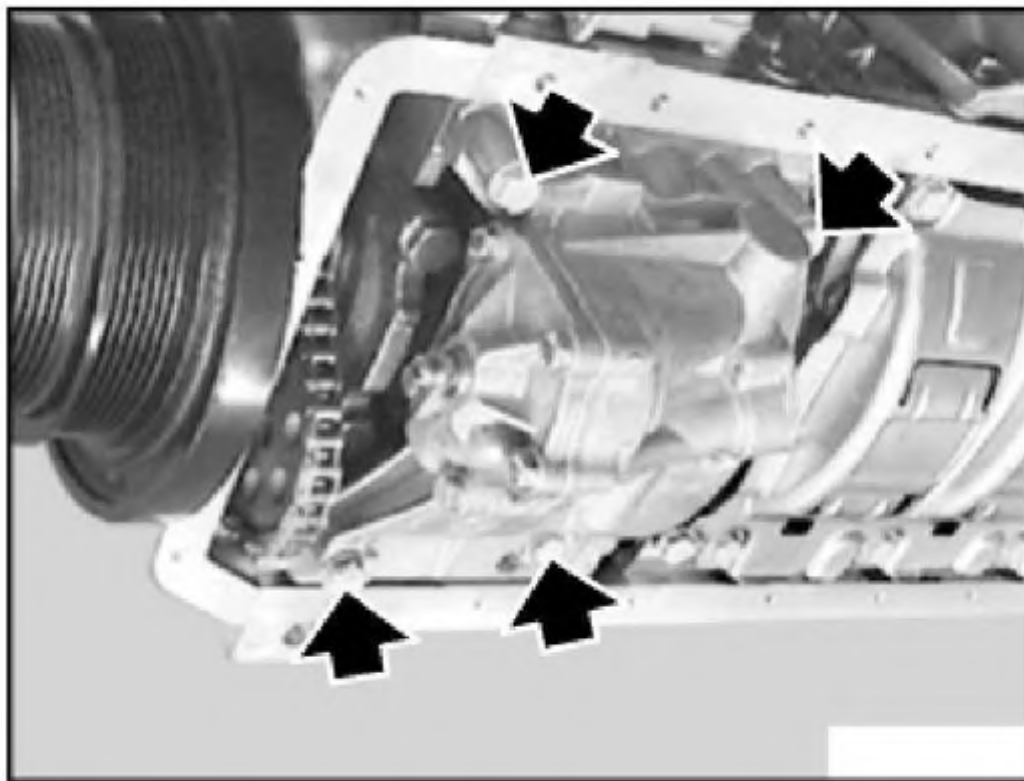
G03230384

Fig. 341: Identifying Oil Pump Intake Pipe Retaining Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

Oil pump and oil scraper - two parts:

Release screws and remove oil pump.

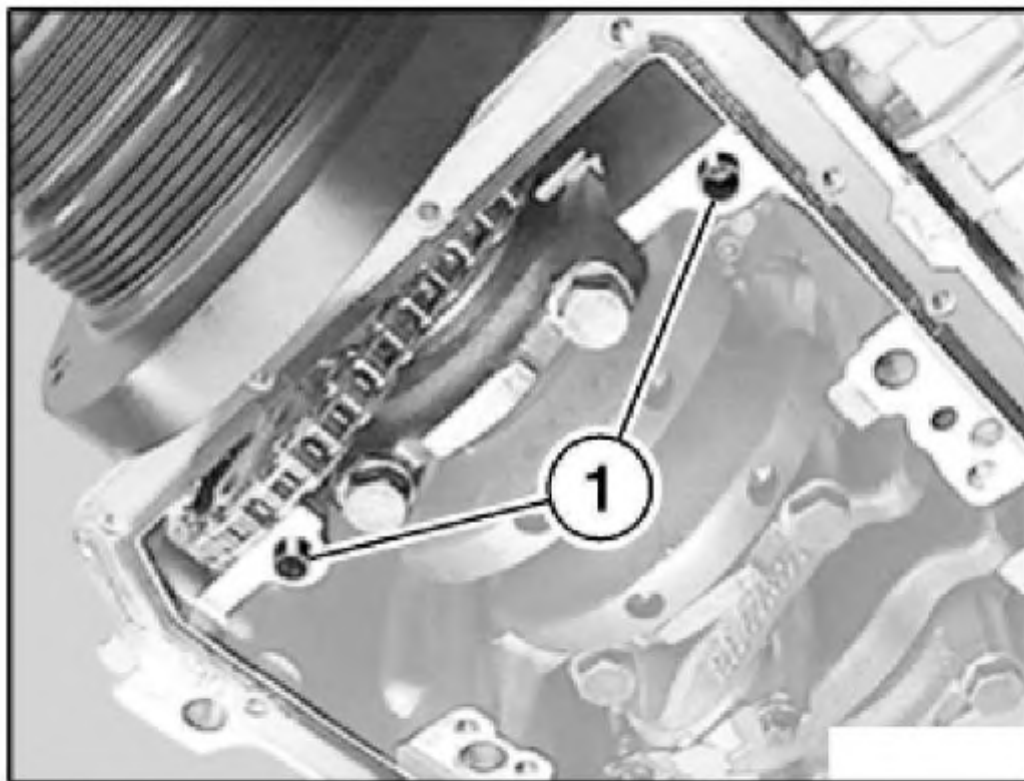


G03230385

Fig. 342: Locating Oil Pump Retaining Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check dowel sleeves (1) for damage and correct installation position.



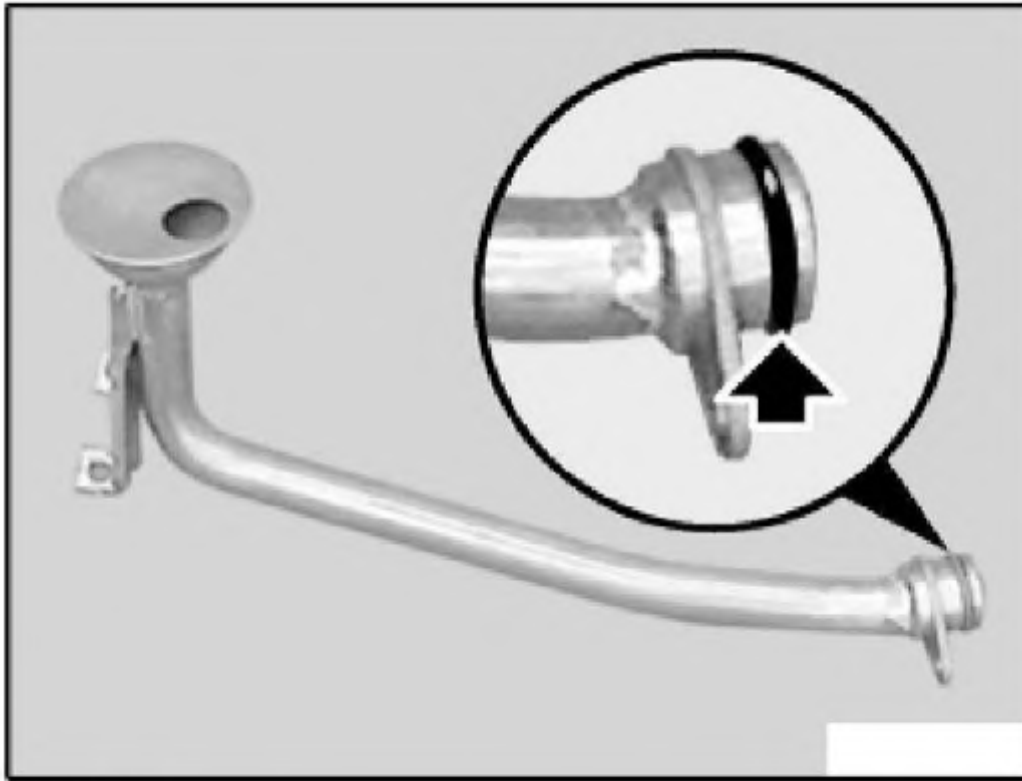
G03230386

Fig. 343: Checking Dowel Sleeves

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace O-ring on intake pipe.



G03230387

Fig. 344: Identifying Intake Pipe O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove control piston.

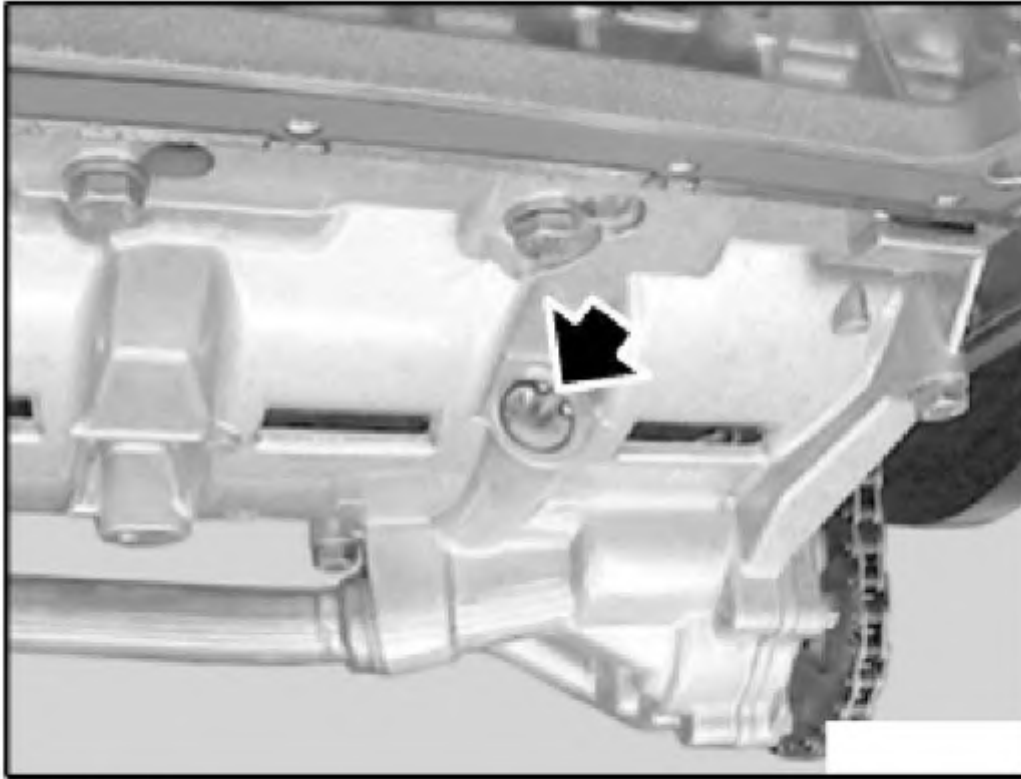
Press sleeve downwards with suitable drift.

CAUTION: The sleeve for the control plunger is under spring pressure.

Remove circlip.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



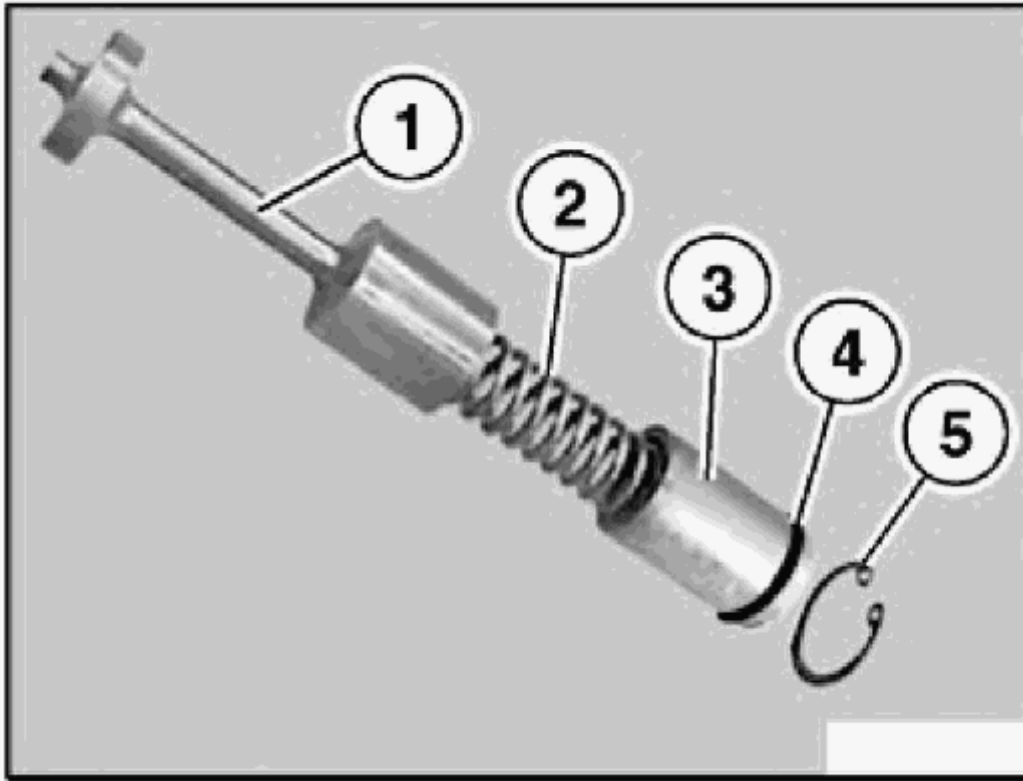
G03230388

Fig. 345: Locating Control Piston

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

1. Control plunger.
2. Spring.
3. Sleeve.
4. O-ring (replace).
5. Circlip.



1. Control plunger
2. Spring
3. Sleeve
4. O-ring (replace)
5. Circlip

G03230389

Fig. 346: Exploded View Of Control Piston
Courtesy of BMW OF NORTH AMERICA, INC.

2002 BMW X5
2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

11 42 020 REMOVING AND INSTALLING COMPLETE FULL-FLOW OIL FILTER (M52 / S52 / M52TU / M54 / M56)

Remove intake air housing with air-mass flow sensor.

Unfasten oil filter cover to allow oil to flow out of main flow oil filter housing and back into oil pan.

This operation is described in BMW engine oil service, refer to **00 00 250 BMW ENGINE OIL SERVICE INCL. SUPPLEMENTARY SERVICE (M54 / M56)** .

Remove alternator, refer to **12 31 020 REMOVING AND INSTALLING OR ALTERNATOR (M52, M52TU, S50US, S52, M54, M56)** .

If necessary, empty supply tank for power steering.

If necessary, remove supply tank (lines remain connected).

If necessary, remove vane pump for power steering (lines remain connected).

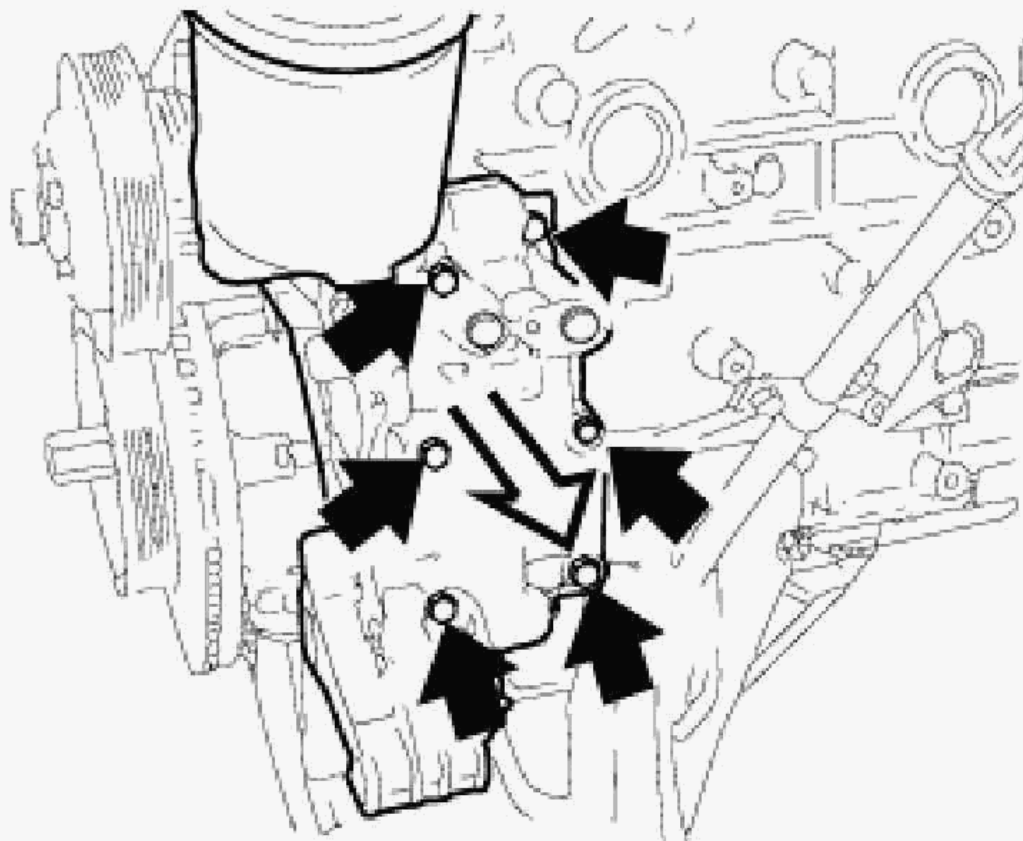
If necessary, remove alternator drive belt tensioner.

Remove connector for oil pressure switch.

If necessary, disconnect plug for oil temperature switch.

Disconnect oil pressure line for VANOS adjustment unit from oil filter housing.

Unfasten screws and remove complete full-flow oil filter.



G03230390

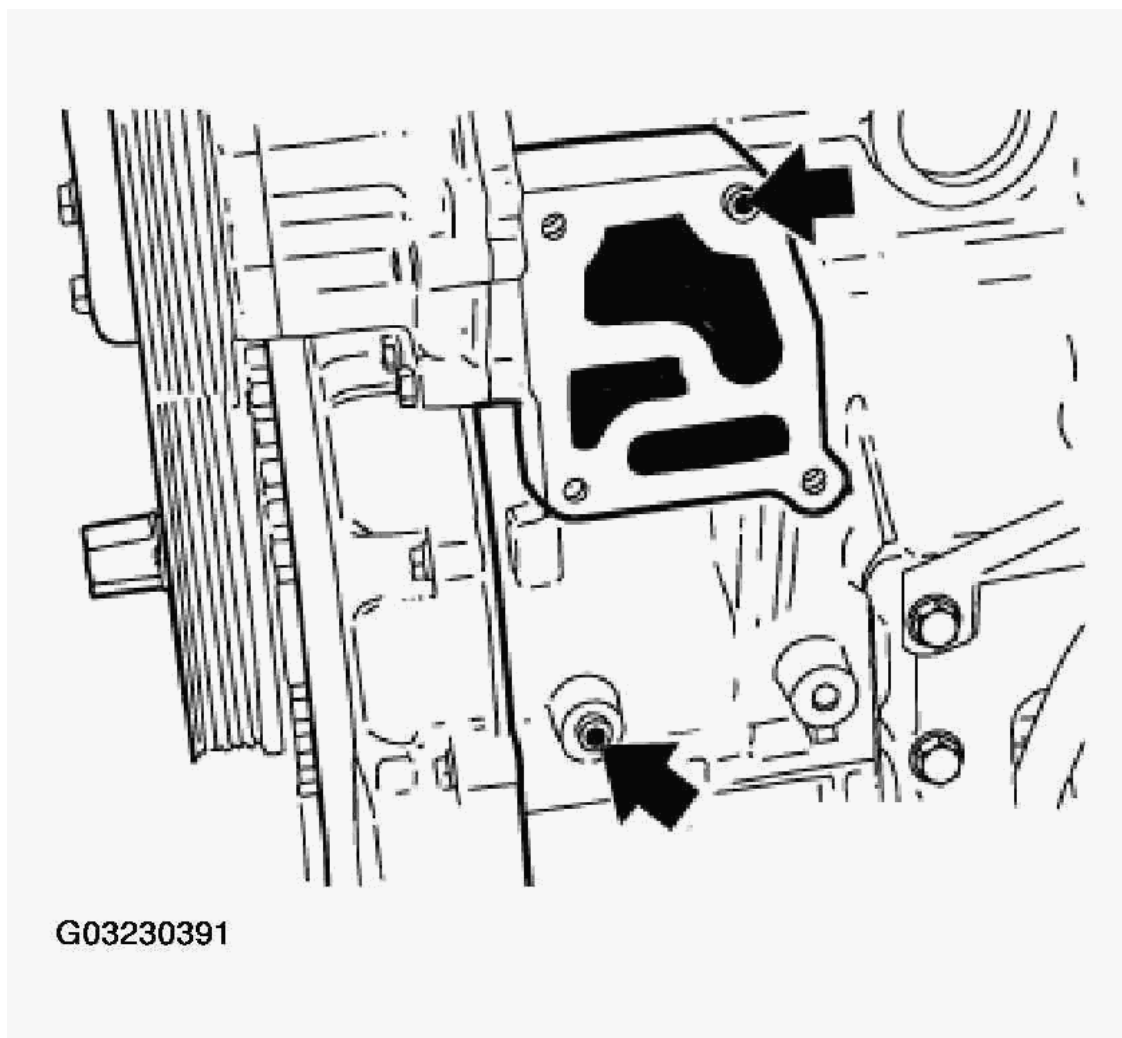
Fig. 347: Removing Complete Full-Flow Oil Filter
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check dowel sleeves for damage and correct installation position.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



G03230391

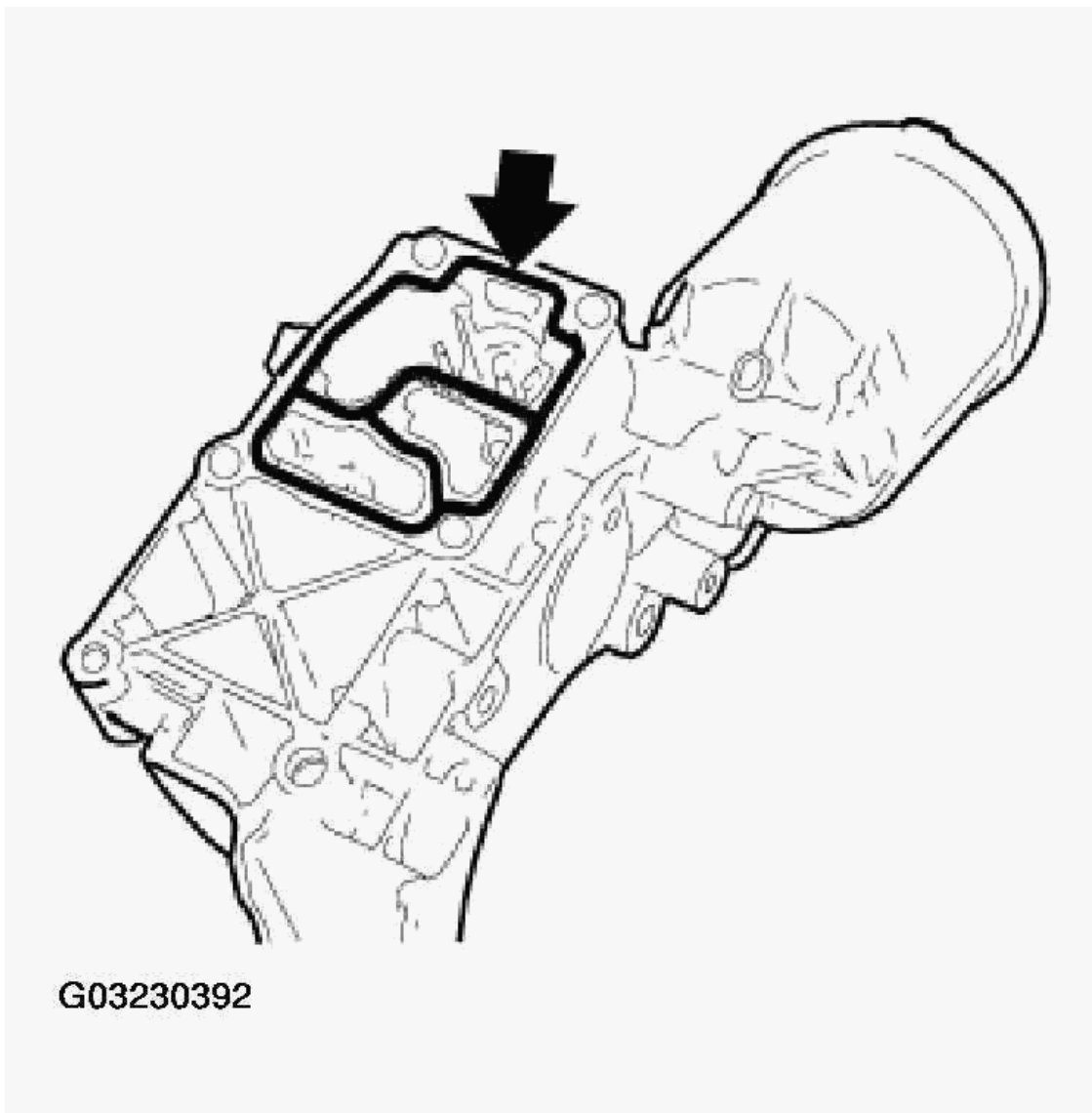
Fig. 348: Locating Dowel Sleeves

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace seal.

Top up engine oil.



G03230392

Fig. 349: Identifying Oil Filter Seal

Courtesy of BMW OF NORTH AMERICA, INC.

WATER PUMP WITH DRIVE

11 51 000 REMOVING AND INSTALLING COMPLETE WATER PUMP (M52 / S52 / M52TU / M54 / M56)

Remove alternator drive belt, refer to **11 28 010 REPLACING ALTERNATOR DRIVE BELT (M52 / S52 / M52TU / M54 / M56)** .

NOTE: M52TU / M54 / M56: Water drain plug is located on exhaust side on cylinder 2 in engine block.

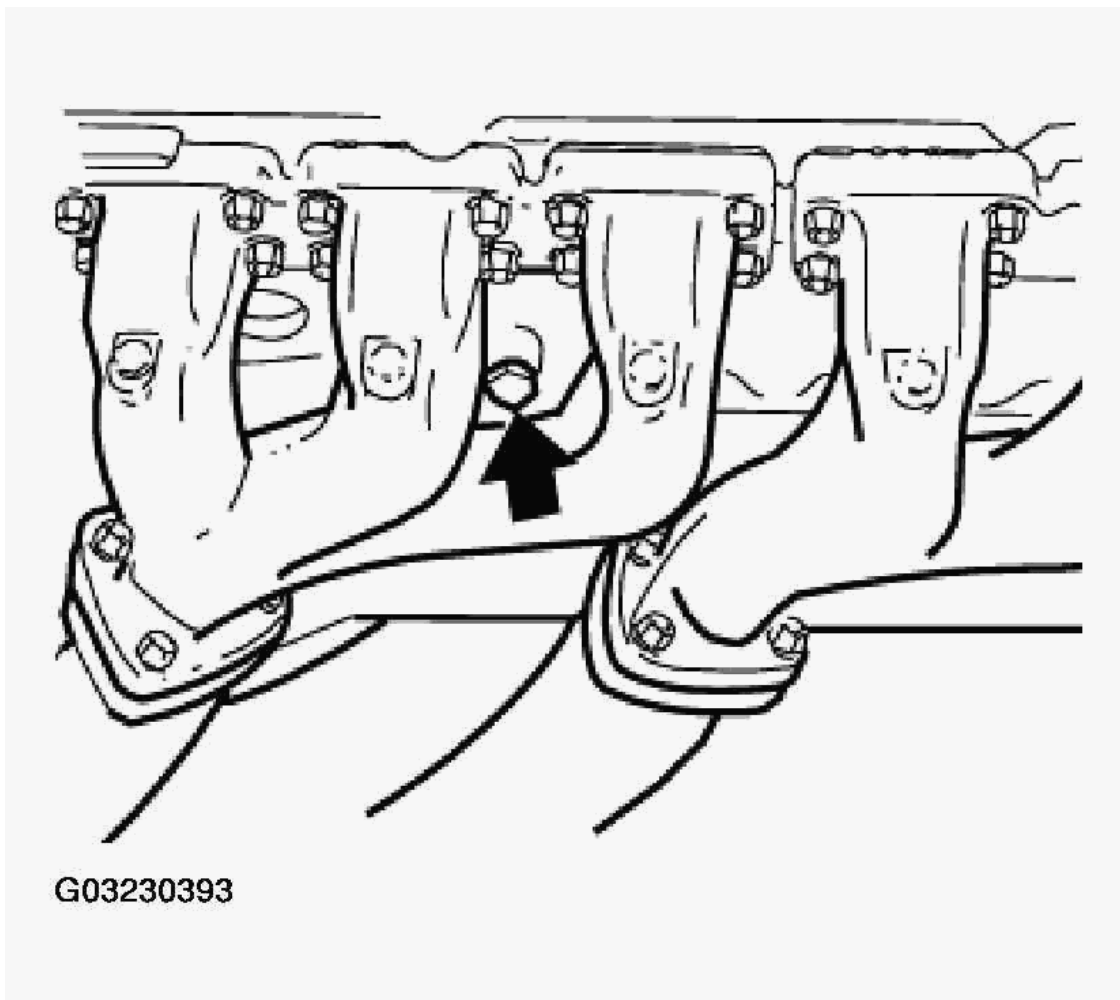


Fig. 350: Locating Water Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Drain and dispose of coolant.

Installation:

Replace seal.

Tightening torque, (25 N.m.).

Vent cooling system and check for leaks, refer to **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR LEAKS (M54 / M56)** .

Release belt pulley.

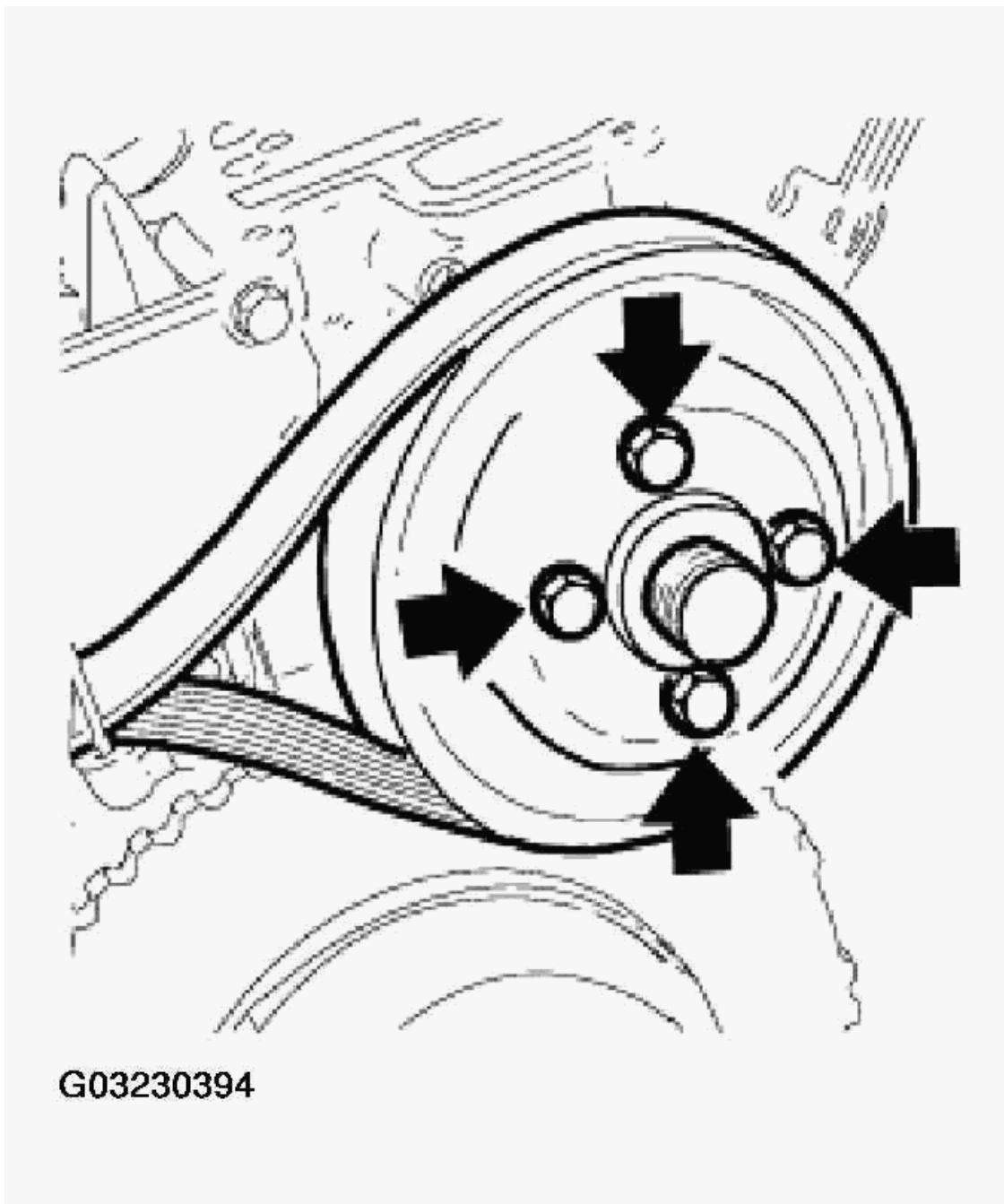


Fig. 351: Identifying Belt Pulley Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release water pump.

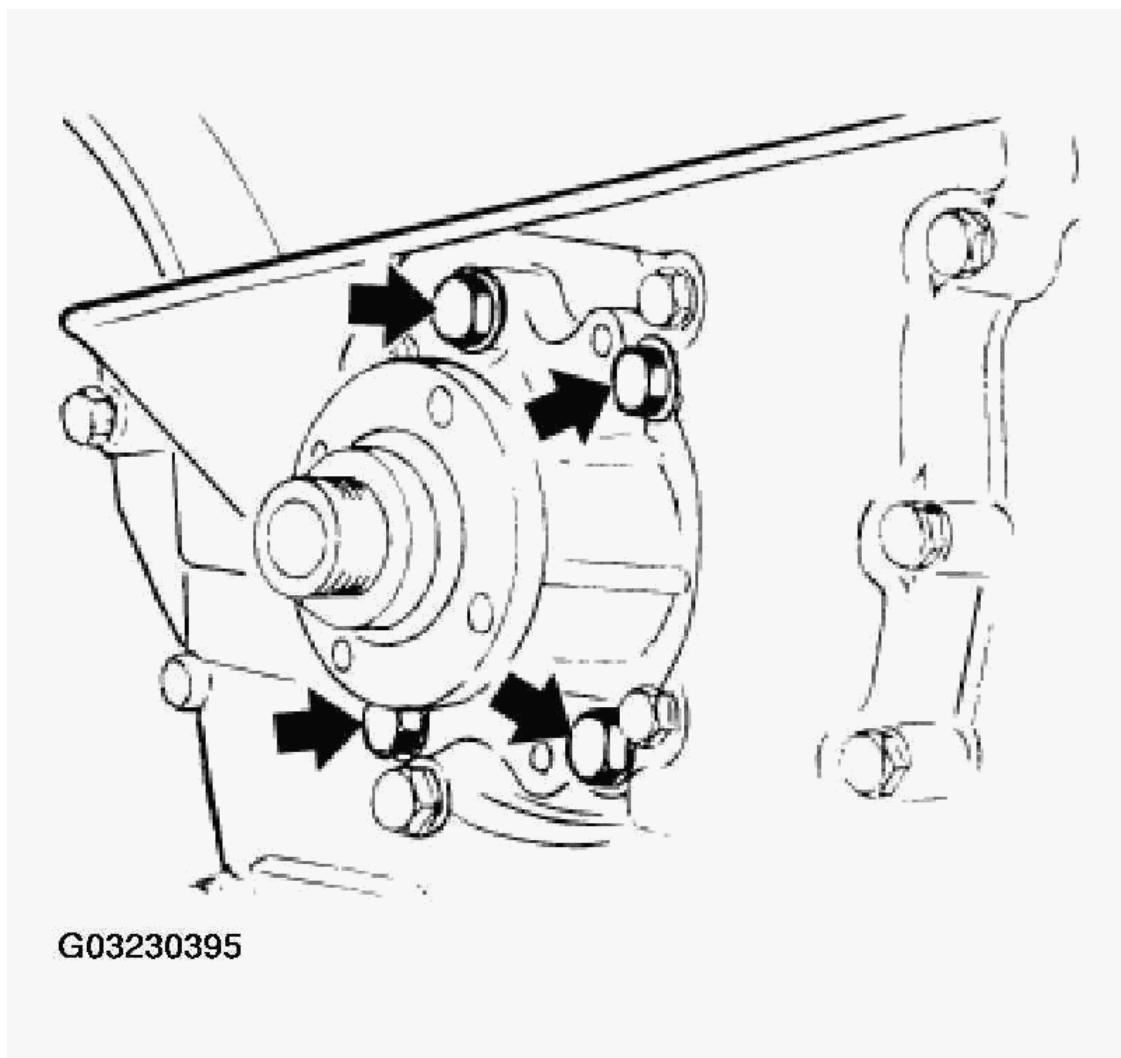


Fig. 352: Locating Water Pump Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten two screws (M 6) into thread of water pump and release water pump out of timing case.

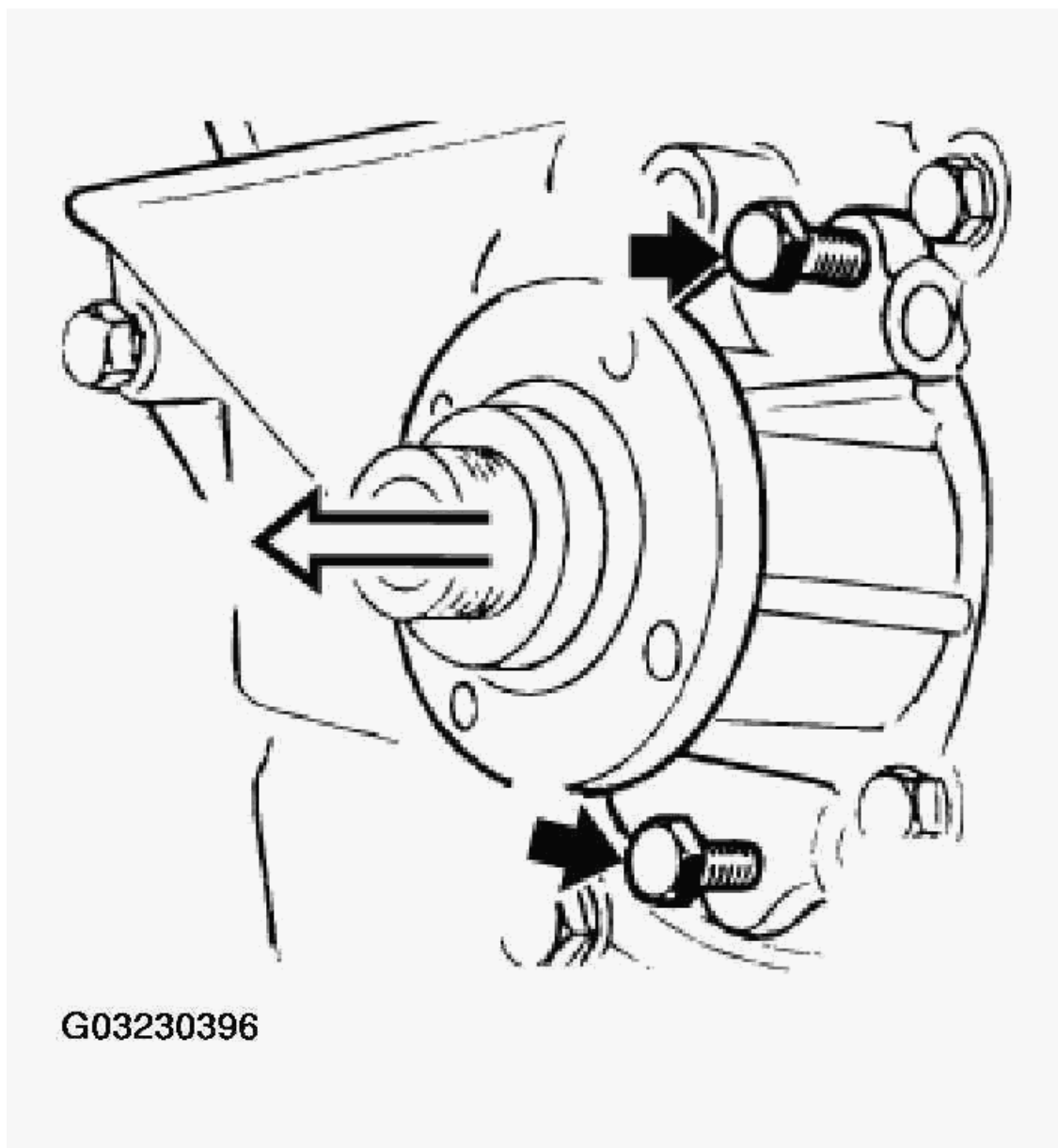
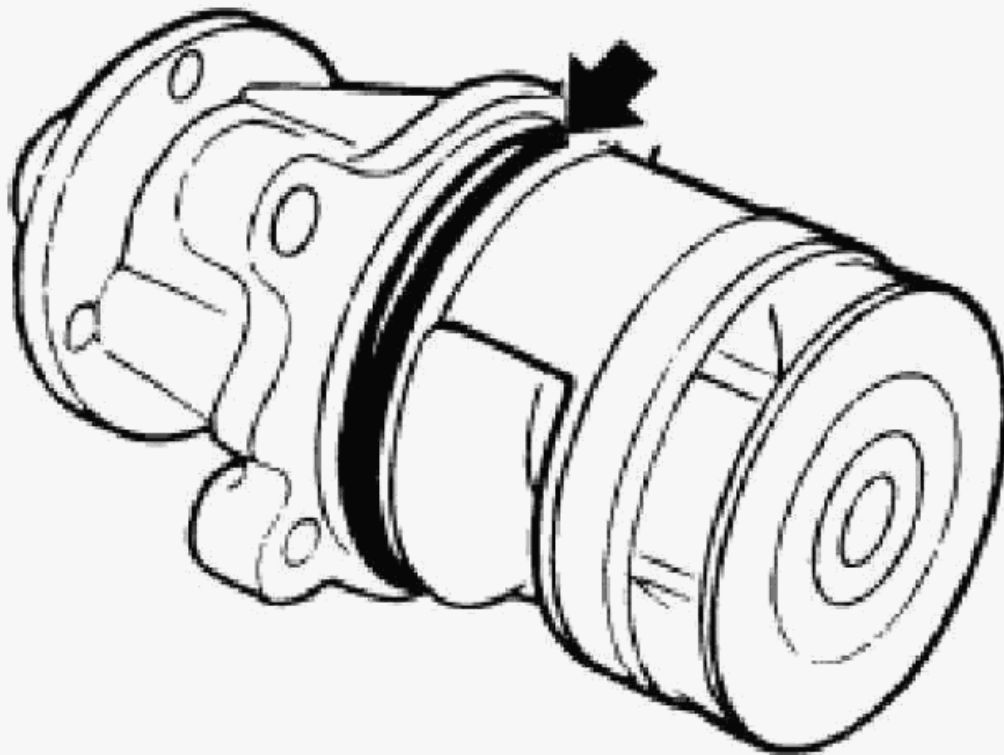


Fig. 353: Inserting Screws Into Threads Of Water Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace O-ring and coat with coolant as anti-friction agent.



G03230397

Fig. 354: Identifying Water Pump O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

FAN

11 52 020 REMOVING AND INSTALLING/REPLACING FAN CLUTCH (S52 / S54 / M52 / M52TU / M54 / M56)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 11 5 030
- 11 5 040

If necessary, remove air duct.

Important!

Left-hand threads.

Using special tool 11 5 030 , grip pulley and unfasten cap nut from water pump using special tool 11 5 040 .

If necessary, unfasten fan cowl.

Take the fan wheel with fan coupling off the water pump and remove.

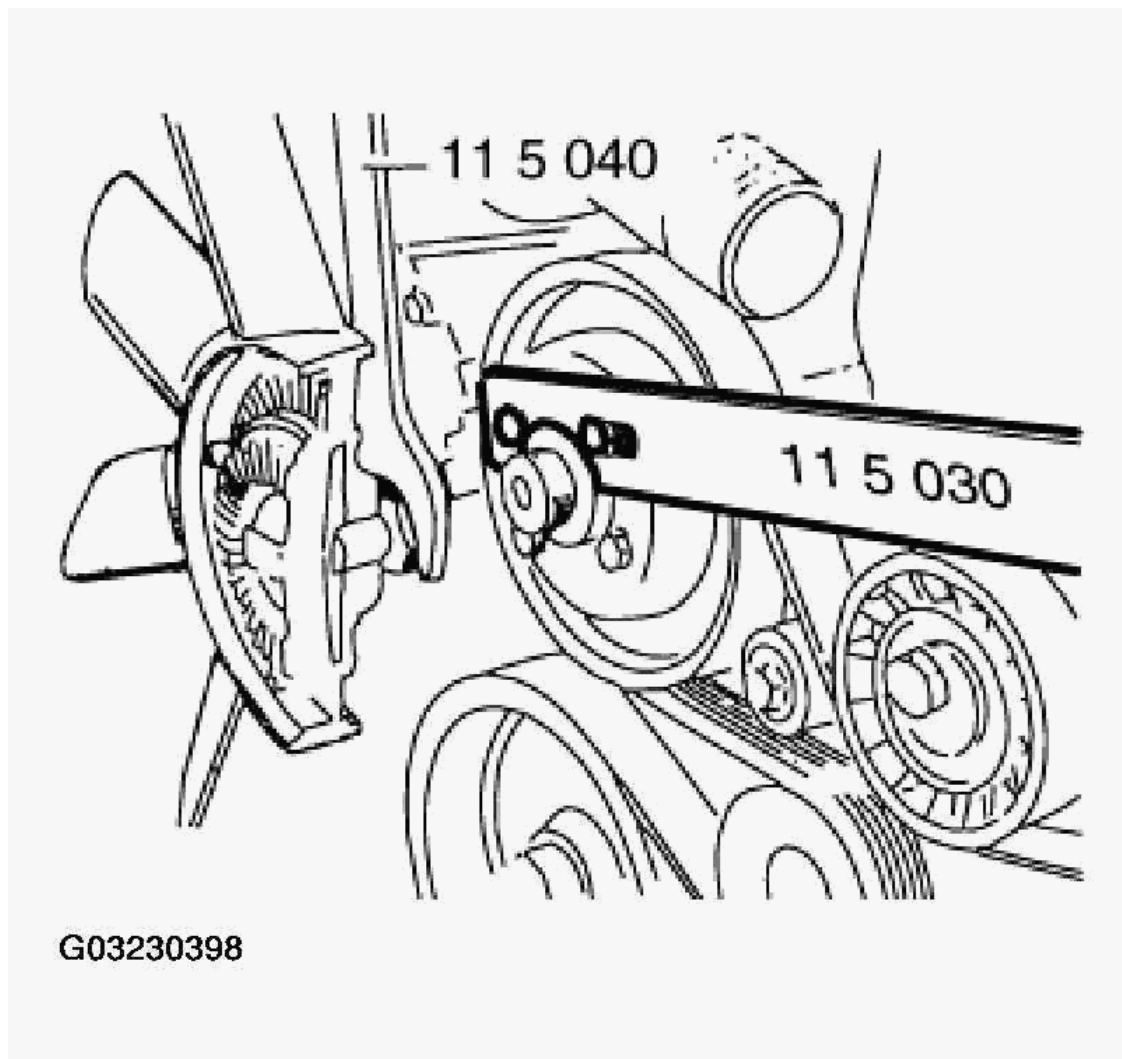


Fig. 355: Unfastening Cap Nut From Water Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tighten down fan impeller using special tool 11 5 040 .

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

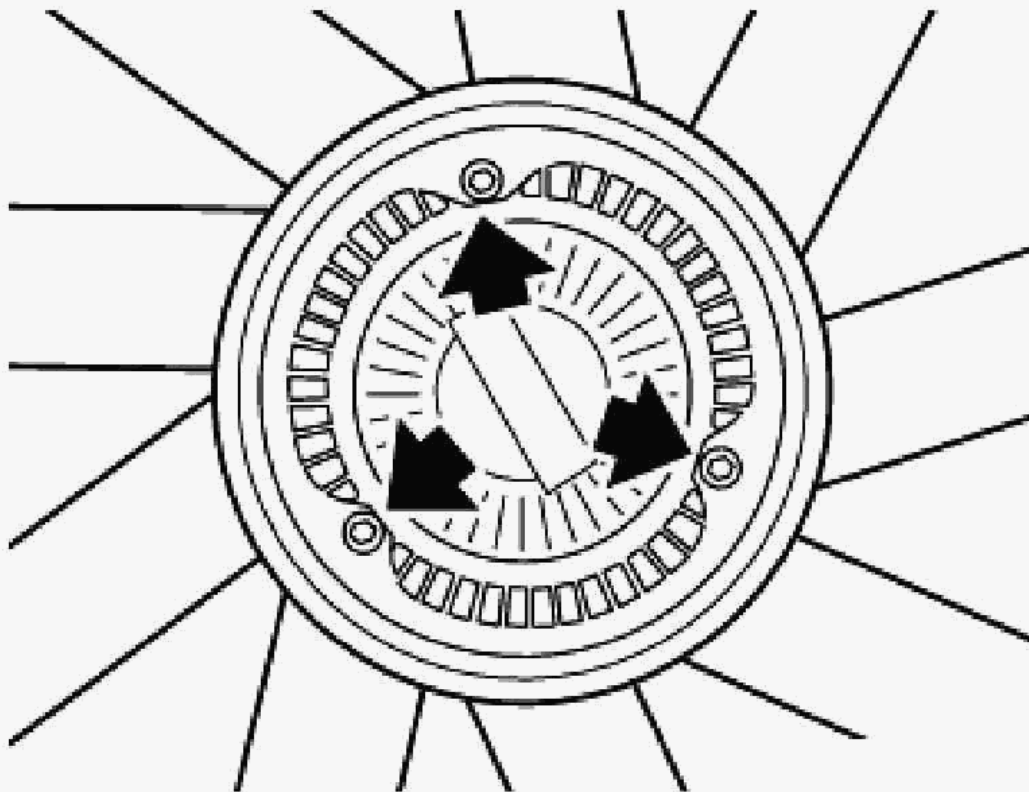
Tightening torque, (45 N.m.).

NOTE: When using special tool 11 5 040 , 30 N.m. on the torque wrench scale are equivalent to a tightening torque of 40 N.m.



Fig. 356: View Of Open-Ended Spanner WAF 32
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws and detach fan from fan coupling.



G03230400

Fig. 357: Identifying Fan To Fan Coupling Screws
Courtesy of BMW OF NORTH AMERICA, INC.

THERMOSTAT AND CONNECTIONS

11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (M52TU / M54 / M56)

Remove fan clutch with fan impeller, refer to **11 52 020 REMOVING AND INSTALLING/REPLACING FAN CLUTCH (S52 / S54 / M52 / M52TU / M54 / M56)** .

Drain and dispose of coolant.

NOTE: The water drain plug is located on the exhaust side on cylinder 2 in the engine block.

Installation:

Replacing sealing ring on water drain plug.

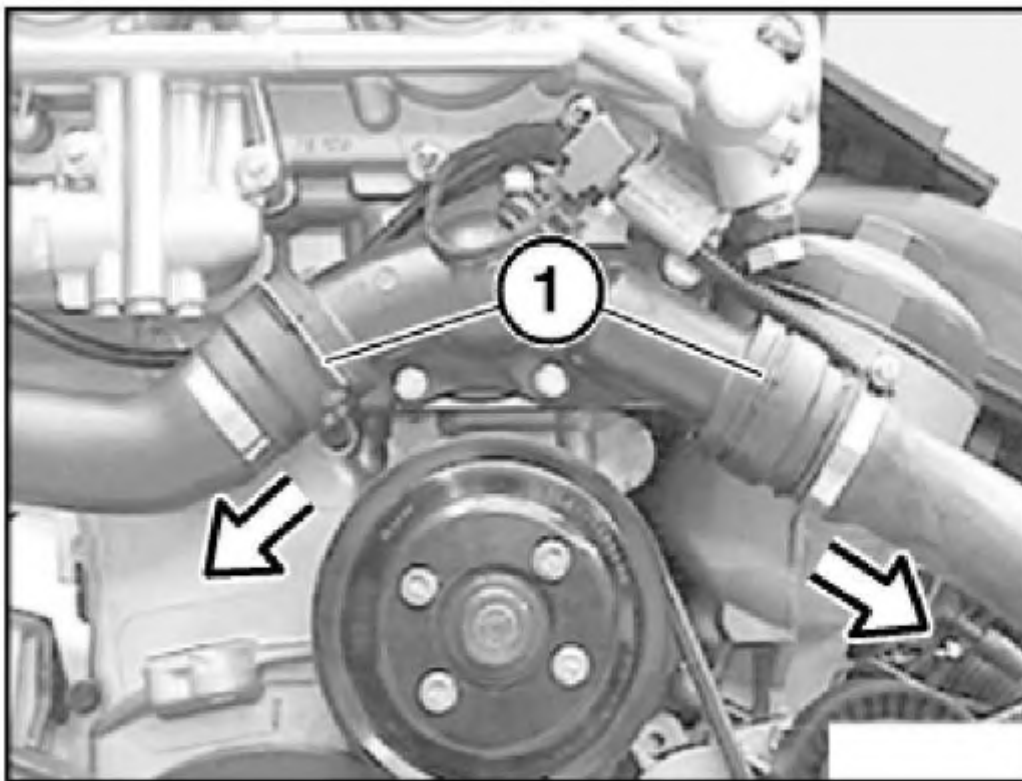
Tightening torque, (25 N.m.).

Vent cooling system and check for leaks, refer to **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR LEAKS (M54 / M56)** .

Pull locks and disconnect water hoses.

Installation:

Refer to general instructions for work on cooling system. Refer to **17 00 ... INSTRUCTIONS FOR WORKING ON COOLING SYSTEM** .

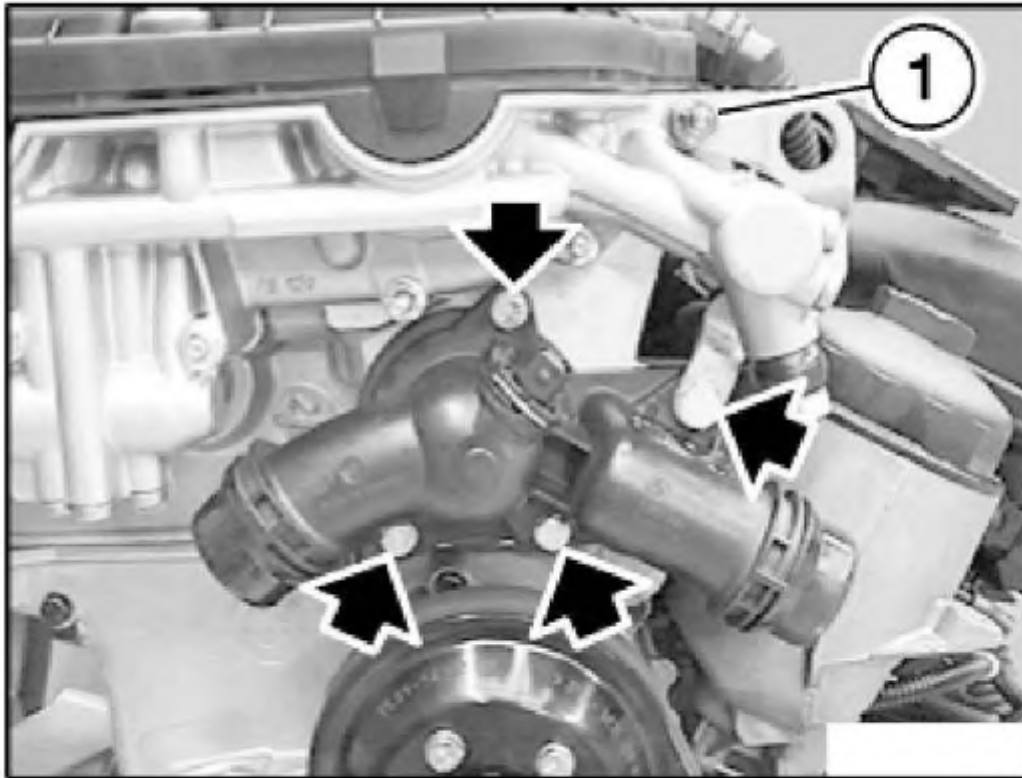


G03230401

Fig. 358: Disconnecting Water Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen nut (1).

Release screws on thermostat housing, remove thermostat housing.



G03230402

Fig. 359: Removing Screws On Thermostat Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep sealing faces clean and free of oil.

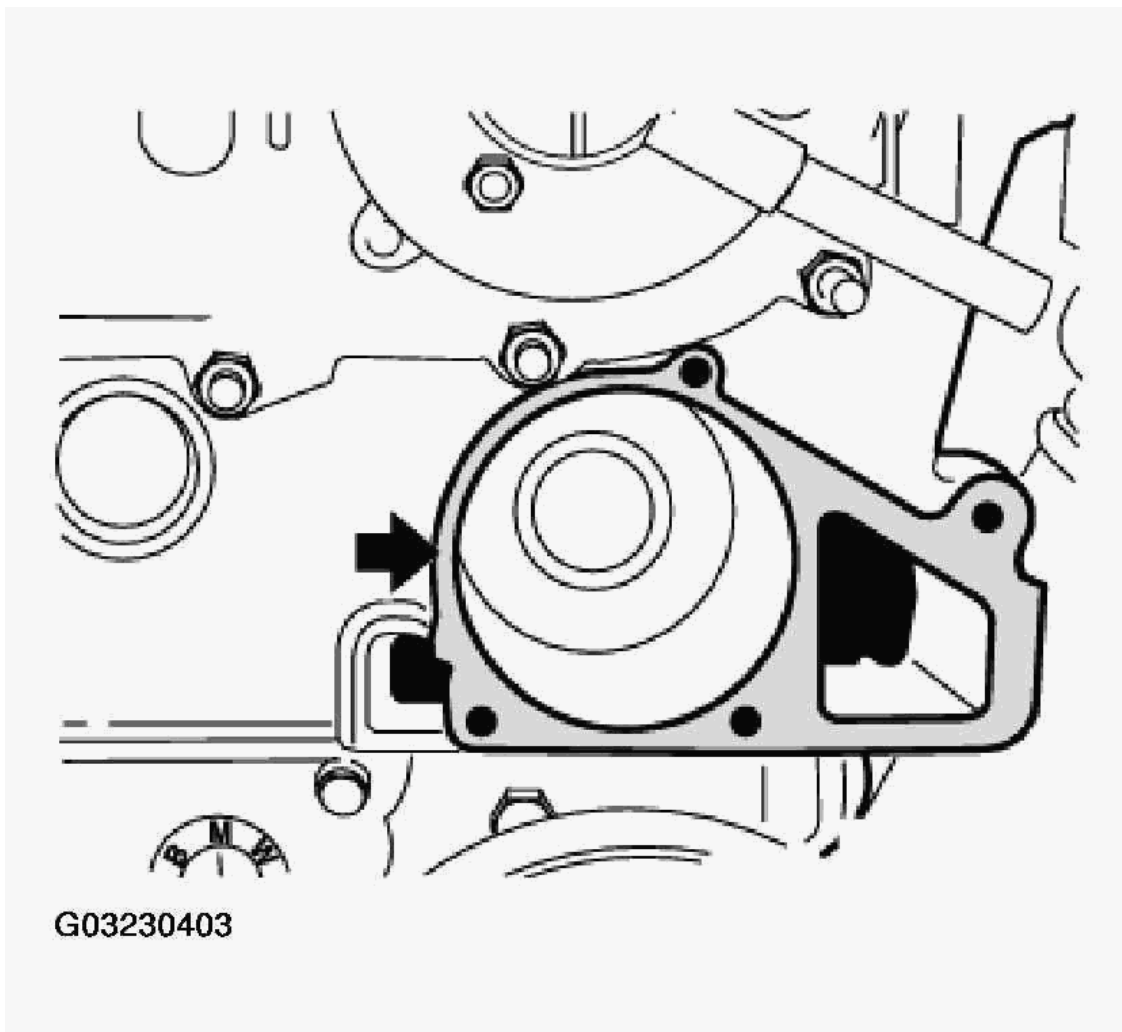


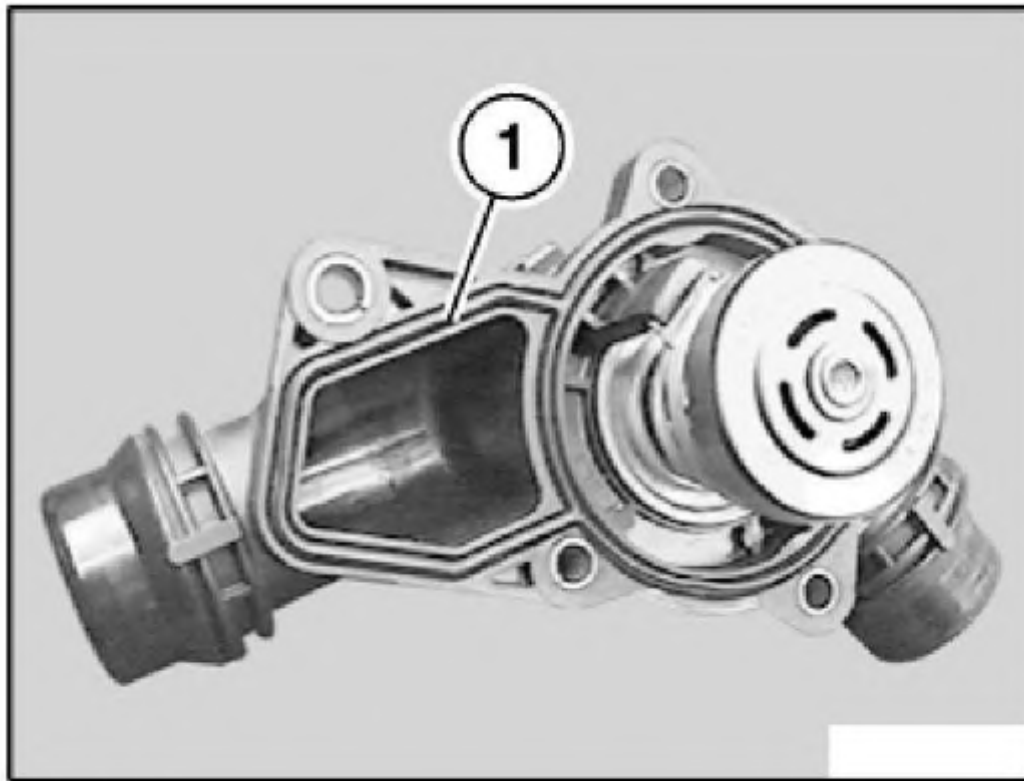
Fig. 360: Identifying Sealing Face

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Coolant thermostat is integrated in coolant thermostat housing and can only be replaced as a single unit.

Installation:

Replace seal (1).



G03230404

Fig. 361: View Of Seal On Housing

Courtesy of BMW OF NORTH AMERICA, INC.

INTAKE MANIFOLD

11 61 050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (M54)

Instructions for disconnecting and connecting battery, refer to **12 00... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY** .

Disconnect negative battery lead.

Remove engine cover.

CAUTION: Do not mix up oxygen monitor sensors for cylinders 1 to 3 and 4 to 6 at plug connection to wiring harness. Mark plug connections.

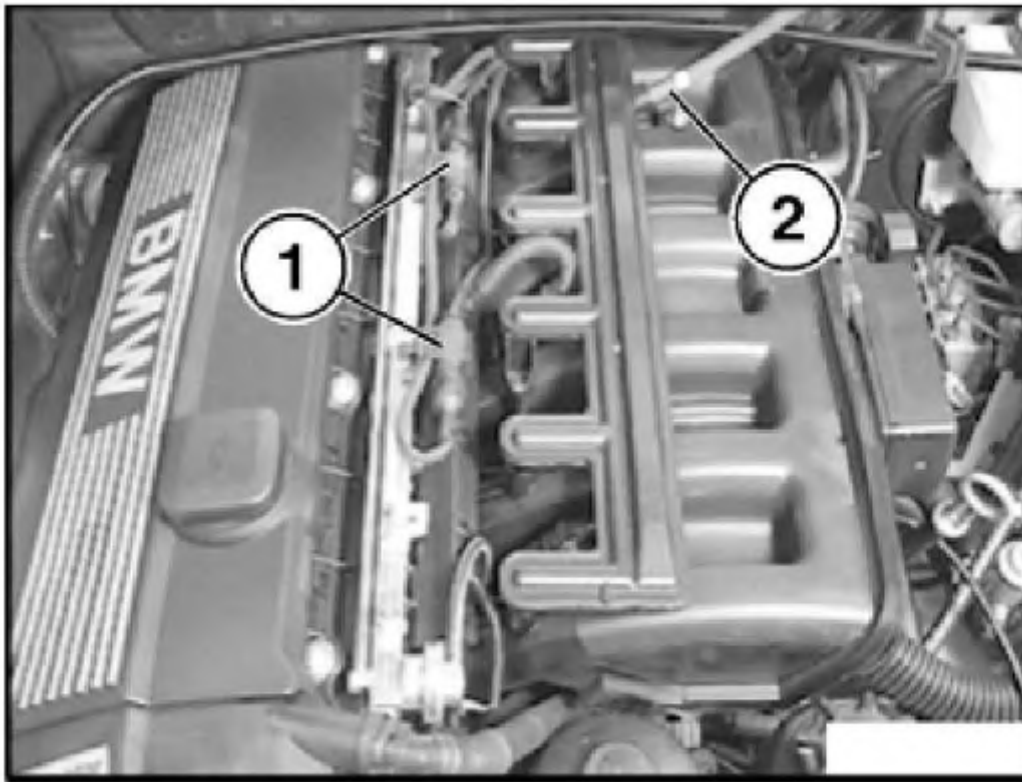
2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

Unclip plug connections (1) from holders.

Detach battery positive lead from intake air manifold.

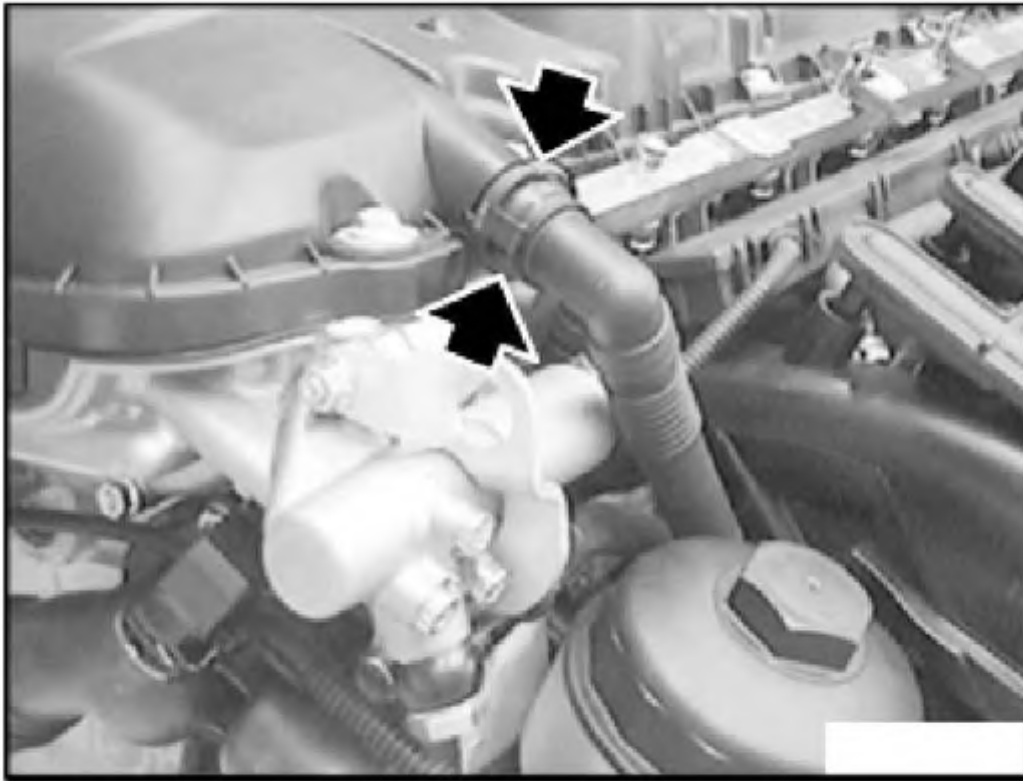
Detach retainer (2) from battery positive lead.



G03230405

Fig. 362: Detaching Retainer From Battery Positive Lead
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and detach vent hose from cylinder head cover.



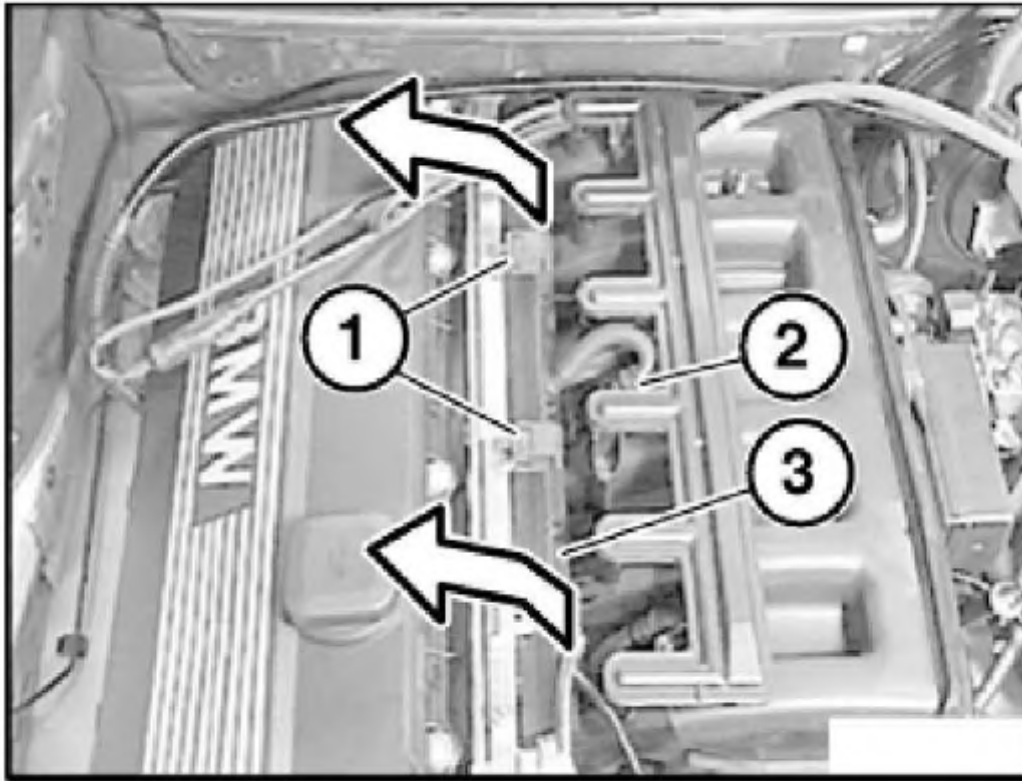
G03230408

Fig. 363: Detaching Vent Hose From Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off retainer (1).

Disconnect plug connection (2) for intake air temperature sensor.

Detach terminal strip (3) from fuel injectors and place to one side.

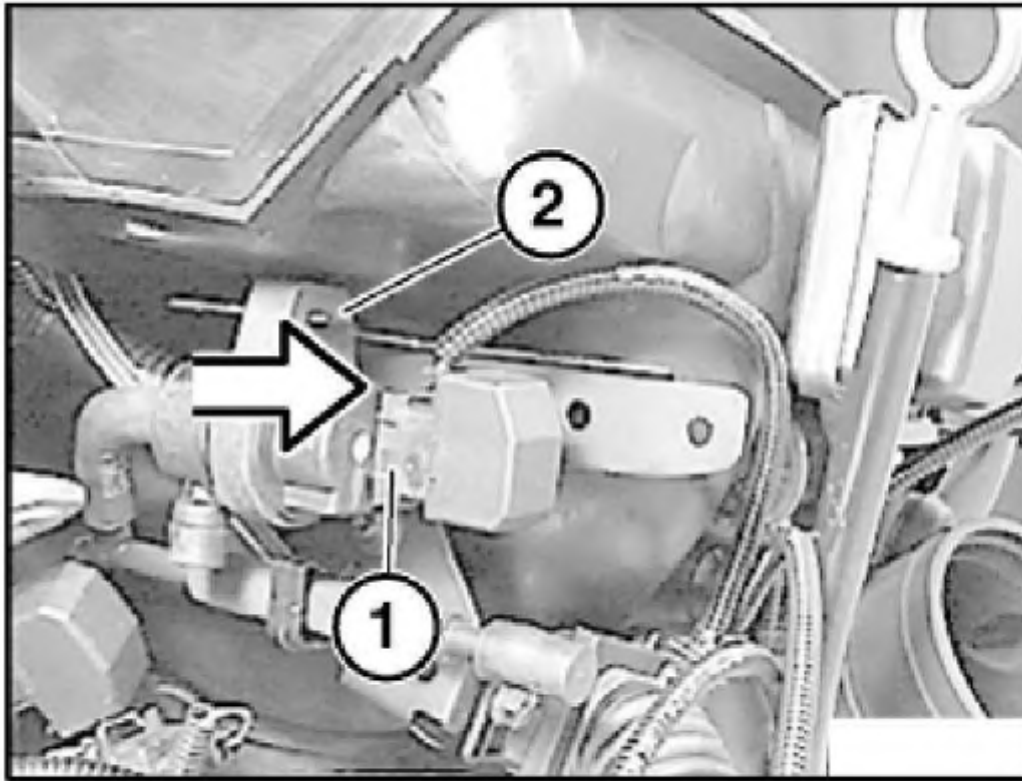


G03230409

Fig. 364: Removing Retainer, Plug Connections And Terminal Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on tank venting valve.

Remove tank venting valve from retainer (2) on manifold.



G03230410

Fig. 365: Removing Tank Venting Valve And Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

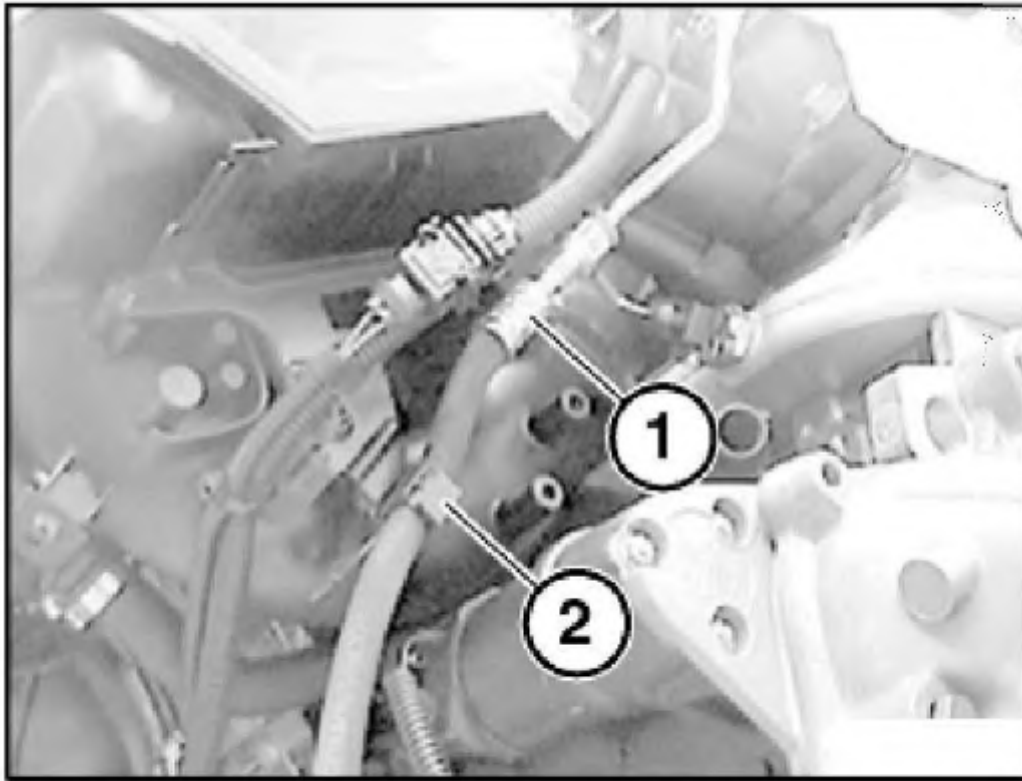
NOTE: For a better overview, this work step is shown on an engine that has been removed.

CAUTION: Catch and dispose of fuel as it escapes.

Instructions for removing and installing fuel hoses, refer to **13 53 540 REPLACING, SEALING FUEL HOSES** .

Unclip fuel line (1) from holder (2).

Unlock fuel line (1).



G03230411

Fig. 366: Unclipping Fuel Line

Courtesy of BMW OF NORTH AMERICA, INC.

Loosen guide tube for dipstick.

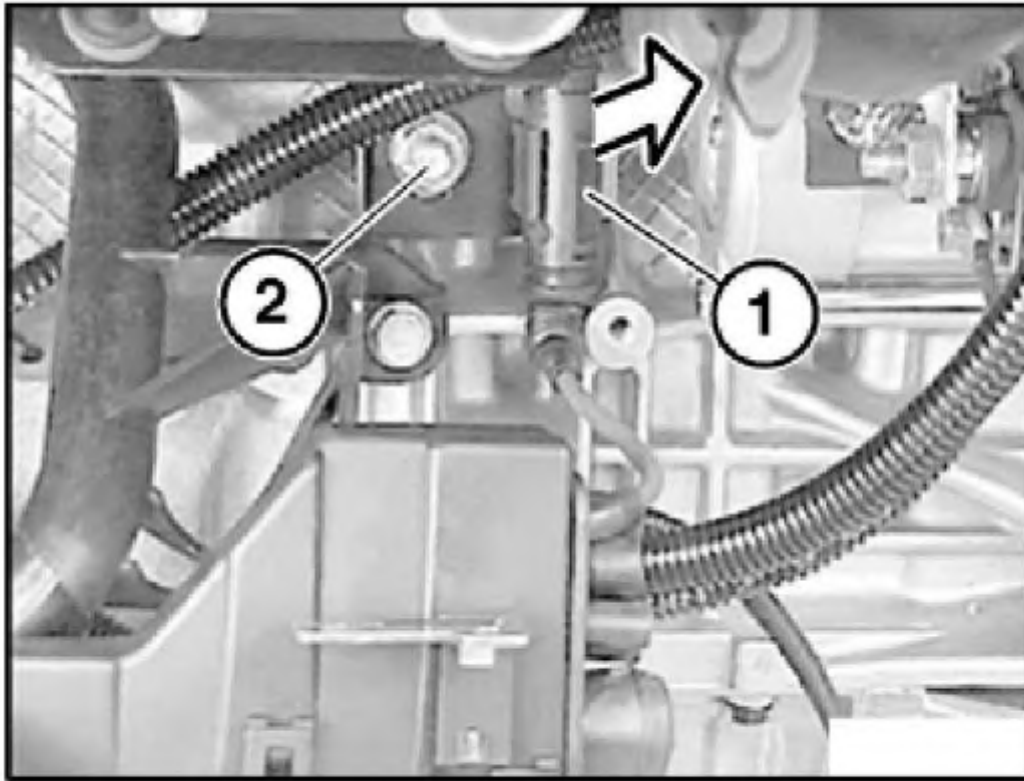
Press lock and detach return line from guide tube for oil dipstick.

Remove throttle assembly, refer to **13 54 030 REMOVING AND INSTALLING/SEALING THROTTLE ASSEMBLY (M54)** .

Disconnect plug connections and lay cable duct to one side.

Unclip plug connection (1) for knock sensors from holder.

Release nut (2) on manifold support.



G03230412

Fig. 367: Releasing Plug Connection And Nut On Manifold Support
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts on manifold.

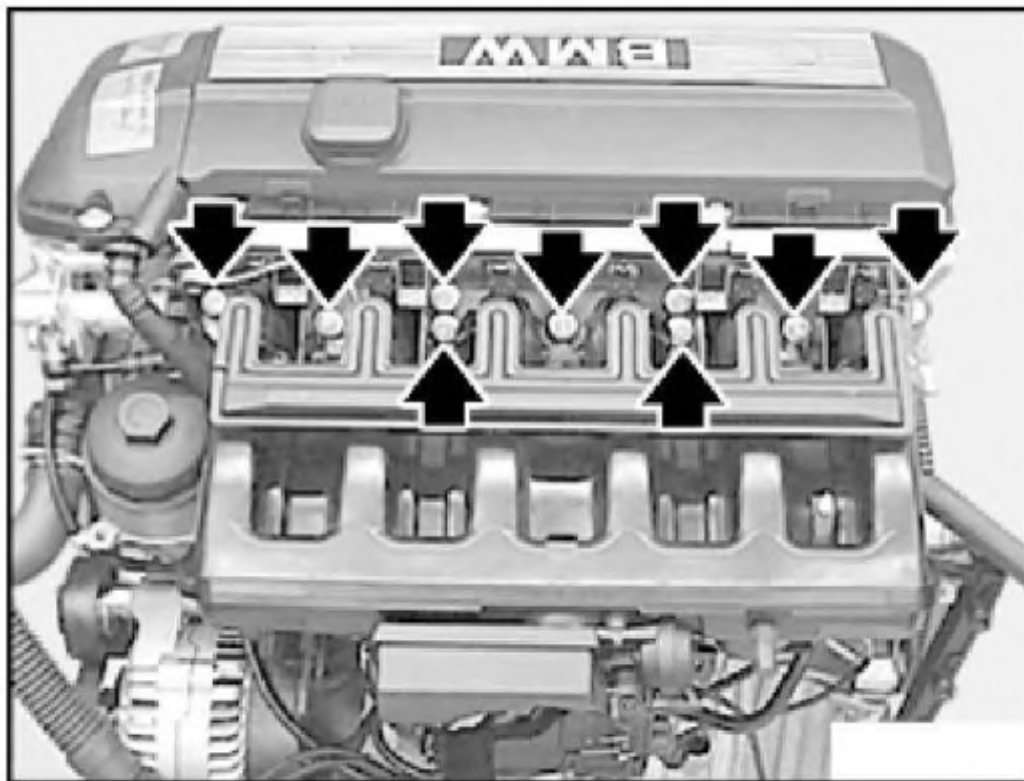
NOTE: **Engines with air injection:**

Detach vacuum line on reverse side of intake air manifold.

Remove intake air manifold.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54



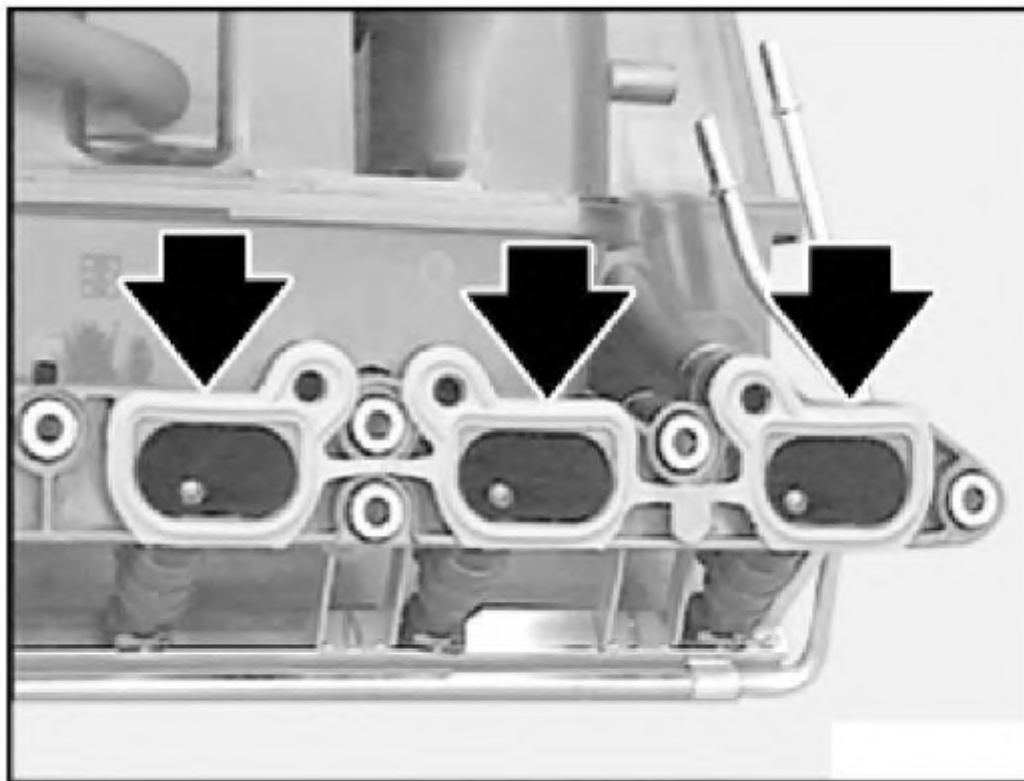
G03230413

Fig. 368: Locating Nuts On Intake Manifold

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check gaskets on all cylinders and replace if necessary.

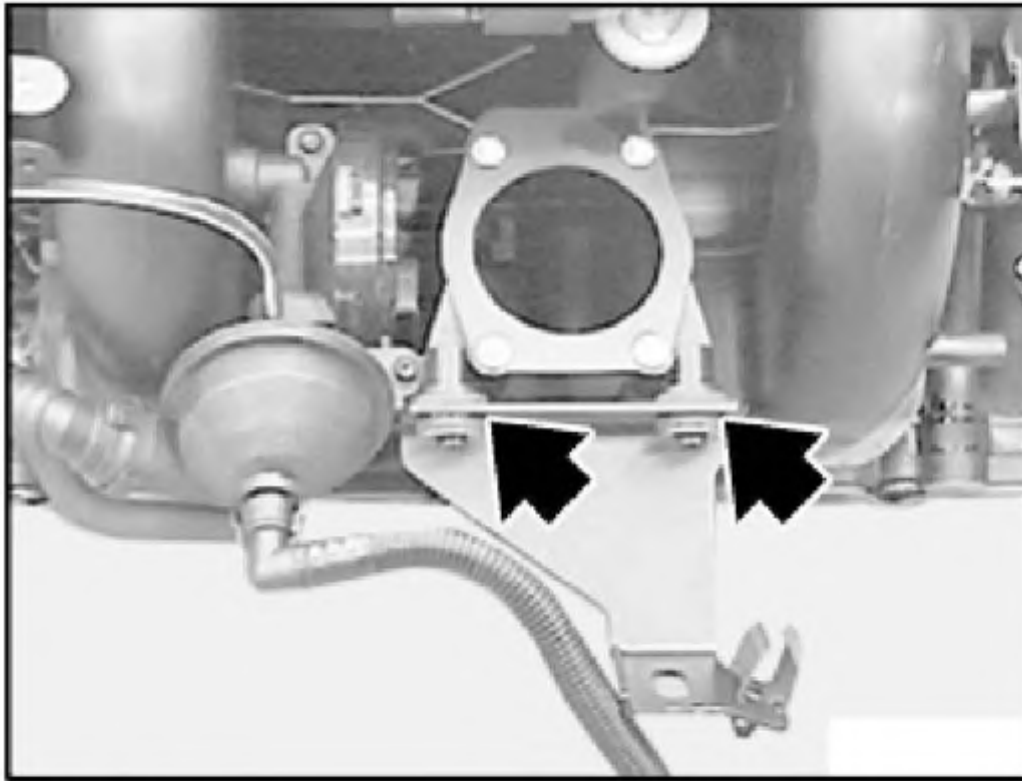


G03230414

Fig. 369: Identifying Intake Manifold Gaskets
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check rubber dampers and if necessary replace together with manifold support.



G03230415

Fig. 370: View Of Intake Manifold Rubber Dampers
Courtesy of BMW OF NORTH AMERICA, INC.

EXHAUST MANIFOLD

11 62 140 REMOVING AND INSTALLING, SEALING OR REPLACING BOTH EXHAUST MANIFOLDS WITH CATALYTIC CONVERTER (M54)

Remove intermediate muffler, refer to **18 12 061 REPLACING INTERMEDIATE MUFFLER (M62, M54)** .

Remove reinforcement plate, refer to **FRONT AXLE SUPPORT** .

CAUTION: The article "removing and installing reinforcement plate" contains important installation instructions. Protect stabilizer against paint damage.

Remove retaining bracket and rubber mount from stabilizer.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

Detach left and right stabilizer from stabilizer.

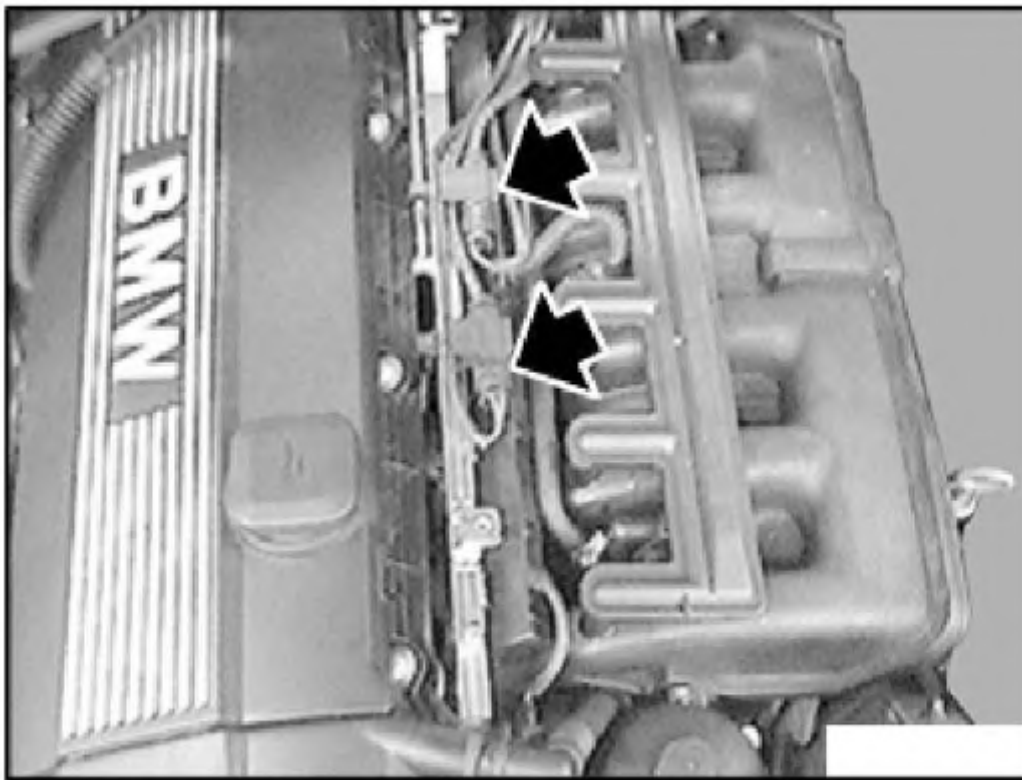
Installation:

Replace nuts. Tightening torque, refer to **TORQUE SPECIFICATIONS** .

NOTE: **The oxygen sensors are in danger of being damaged when the exhaust manifolds are removed and installed.**

Remove oxygen control sensors, refer to **11 78 510 REPLACING OXYGEN CONTROL SENSOR (M52TU / M54 / M56)** .

Remove cover for fuel injectors.



G03230416

Fig. 371: Removing Cover For Fuel Injectors
Courtesy of BMW OF NORTH AMERICA, INC.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

NOTE: Do not mix up oxygen monitor sensors for cylinders 1 to 3 and 4 to 6 at plug connection to wiring harness.

Mark plug connections.

Unclip the cable from the retainer. Disconnect plug connection. Unclip cable on rear side of engine from cable guide.

Remove oxygen monitor sensors, refer to **11 78 613 REPLACING BOTH OXYGEN MONITOR SENSORS (M52TU / M54 / M56)** .

NOTE: Rear exhaust manifold with catalytic converter can only be removed after front exhaust manifold with catalytic converter has first been removed.

Remove front exhaust manifold with catalytic converter.

Remove rear exhaust manifold with catalytic converter.

Installation:

Clean sealing faces, replace gaskets.

Coat thread with copper paste -CRC-.

Replace nuts.

Tightening torque, refer to 11 62 1AZ in **ENGINE - TIGHTENING TORQUES** .

EMISSION CONTROL, OXYGEN SENSOR

11 78 510 REPLACING OXYGEN CONTROL SENSOR (M52TU / M54 / M56)

NOTE: For Special Tool identification, see **SPECIAL TOOLS - X5 (3.0i)** .

Special Tools Required:

- 11 7 020

Read out fault memory, clear if necessary.

Refer to **13 00 002 CHECKING FUNCTION OF DIGITAL ENGINE** .

NOTE: The plug connection must be disconnected before the oxygen control sensor is removed.

If the plug connection separation point is below the cover for the fuel injectors:

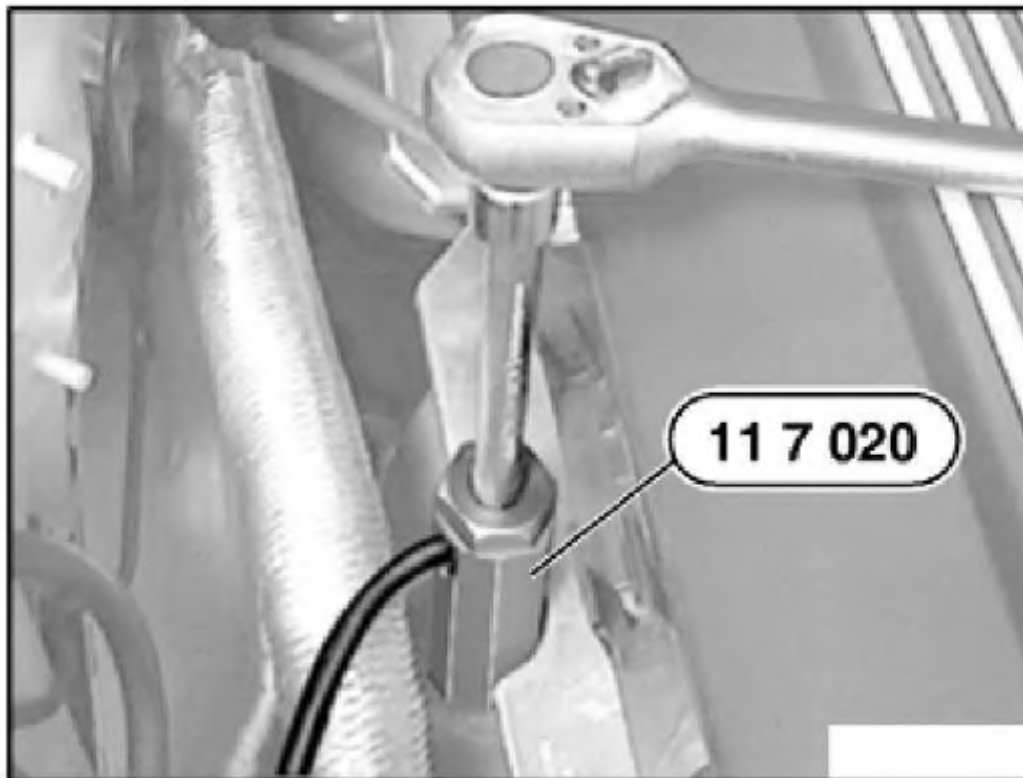
If necessary, remove lower section of microfilter housing.

Remove cover from fuel injectors.

Unclip oxygen control sensor cable from retainer.

Disconnect plug connection for oxygen control sensor.

Release oxygen control sensor with special tool 11 7 020 .



G03230417

Fig. 372: Removing Oxygen Control Sensor Using Socket Wrench Socket WAF 22
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The threads of new oxygen sensors are already coated with Never Seez Compound.

If an oxygen sensor is used again, apply a thin and even coat of Never Seez Compound to the thread only.

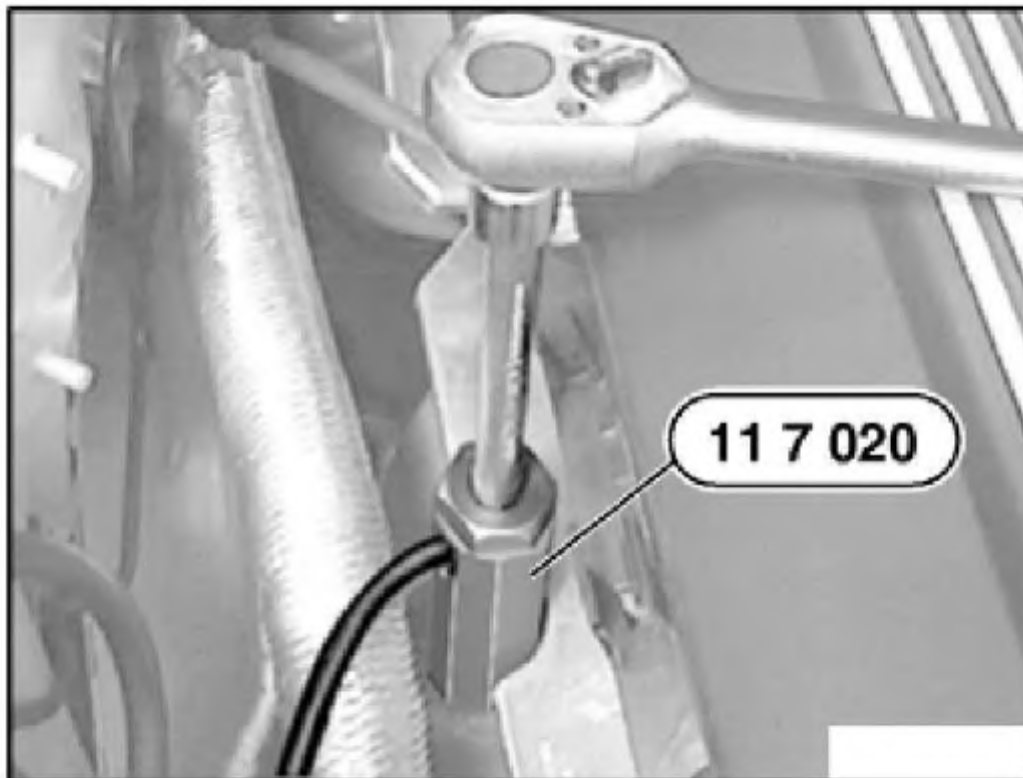
Part of oxygen control sensor which projects into exhaust system branch must not be cleaned or come into contact with lubricant.

Installation:

Secure oxygen control sensor with special tool 11 7 020 .

Tightening torque, (50 N.m.).

Pay attention to cable routing of oxygen control sensor.



G03230418

Fig. 373: Installing Oxygen Control Sensor Using Socket Wrench Socket WAF 22
Courtesy of BMW OF NORTH AMERICA, INC.

2002 BMW X5

2001-2003 ENGINE Engine Mechanical - Repair Instructions - X5 (3.0i) M54

NOTE: For Special Tool identification, see SPECIAL TOOLS - X5 (3.0i) .

Special Tools Required:

- 11 7 020
- 11 7 030

Read out fault memory, clear if necessary.

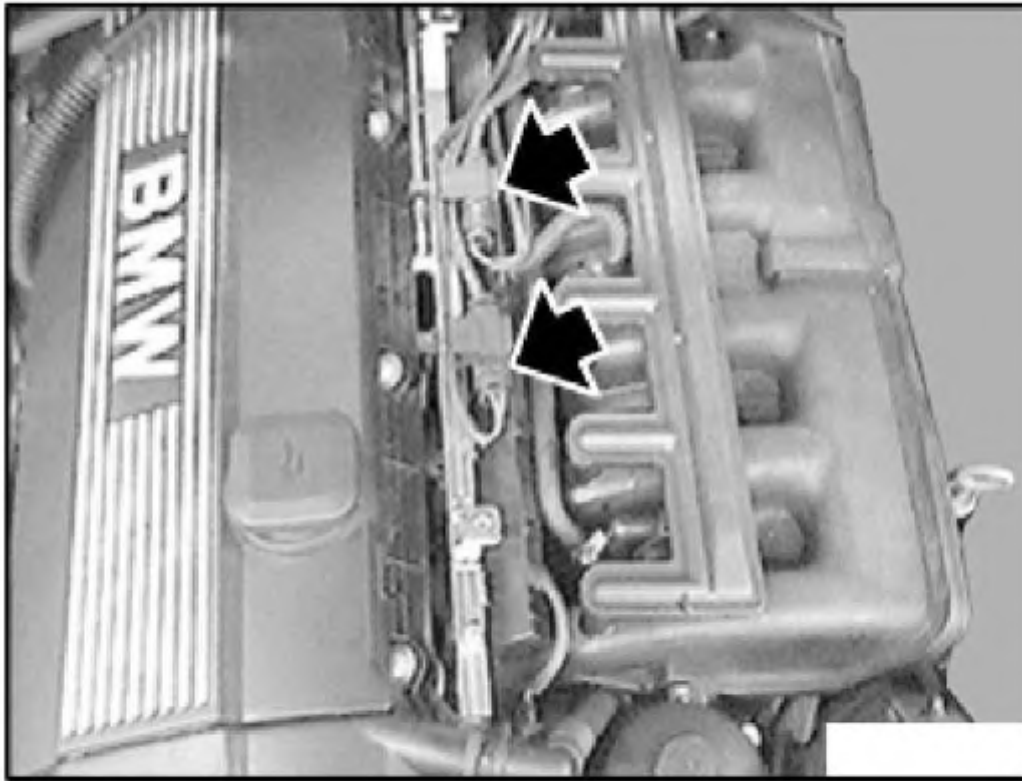
Refer to **13 00 002 CHECKING FUNCTION OF DIGITAL ENGINE** .

Illustrations show M54.

Remove cover from fuel injectors.

NOTE: Do not mix up oxygen monitor sensors for cylinders 1 to 3 and 4 to 6 at plug connection to wiring harness.

Mark plug connections.



G03230420

Fig. 374: Removing Cover From Fuel Injectors
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip the cable from the retainer. Disconnect plug. Unclip cable on rear side of engine from cable guide.

NOTE: On vehicles with automatic transmission: In event of unfavorable tolerances, accessibility to the oxygen monitor sensor from cylinders 4 to 6 is only possible after the exhaust system has been removed.

Release oxygen monitor sensor from cylinders 1 to 3 with special tool 11 7 030 .

Release oxygen monitor sensor from cylinders 4 to 6 with special tool 11 7 020 .

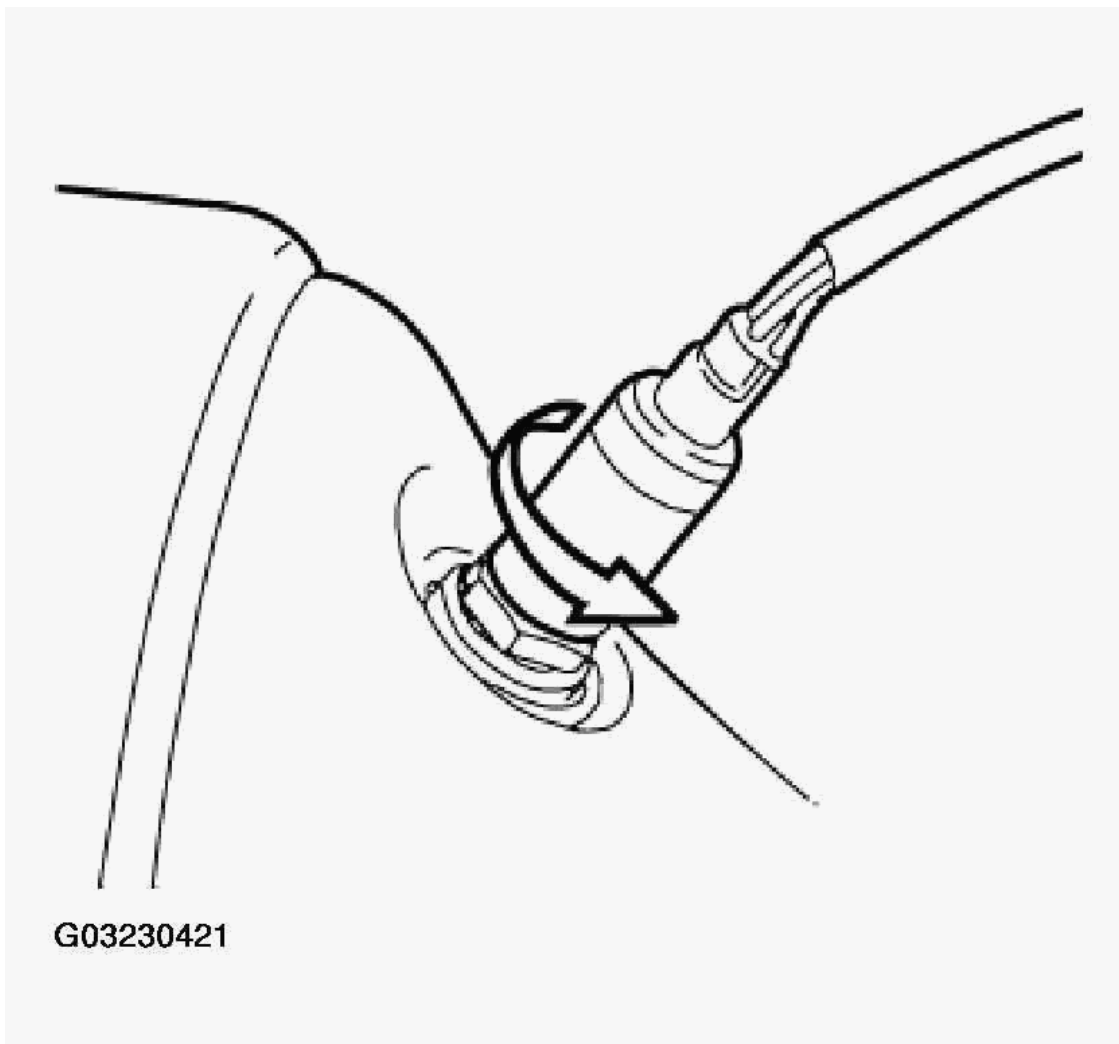


Fig. 375: Identifying Oxygen Monitor Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The threads of new oxygen monitor sensors are already coated with Never Seez compound.

If an oxygen monitor sensor is reused, only apply a thin and uniform coat of Never Seiz compound to thread.

Part of oxygen control sensor which projects into exhaust system branch must not be cleaned or come into contact with lubricant.

Installation:

Secure oxygen monitor sensor for cylinders 1 to 3 with special tool 11 7 030 .

Secure oxygen monitor sensor for cylinders 4 to 6 with special tool 11 7 020 .

Tightening torque, (20 N.m.).

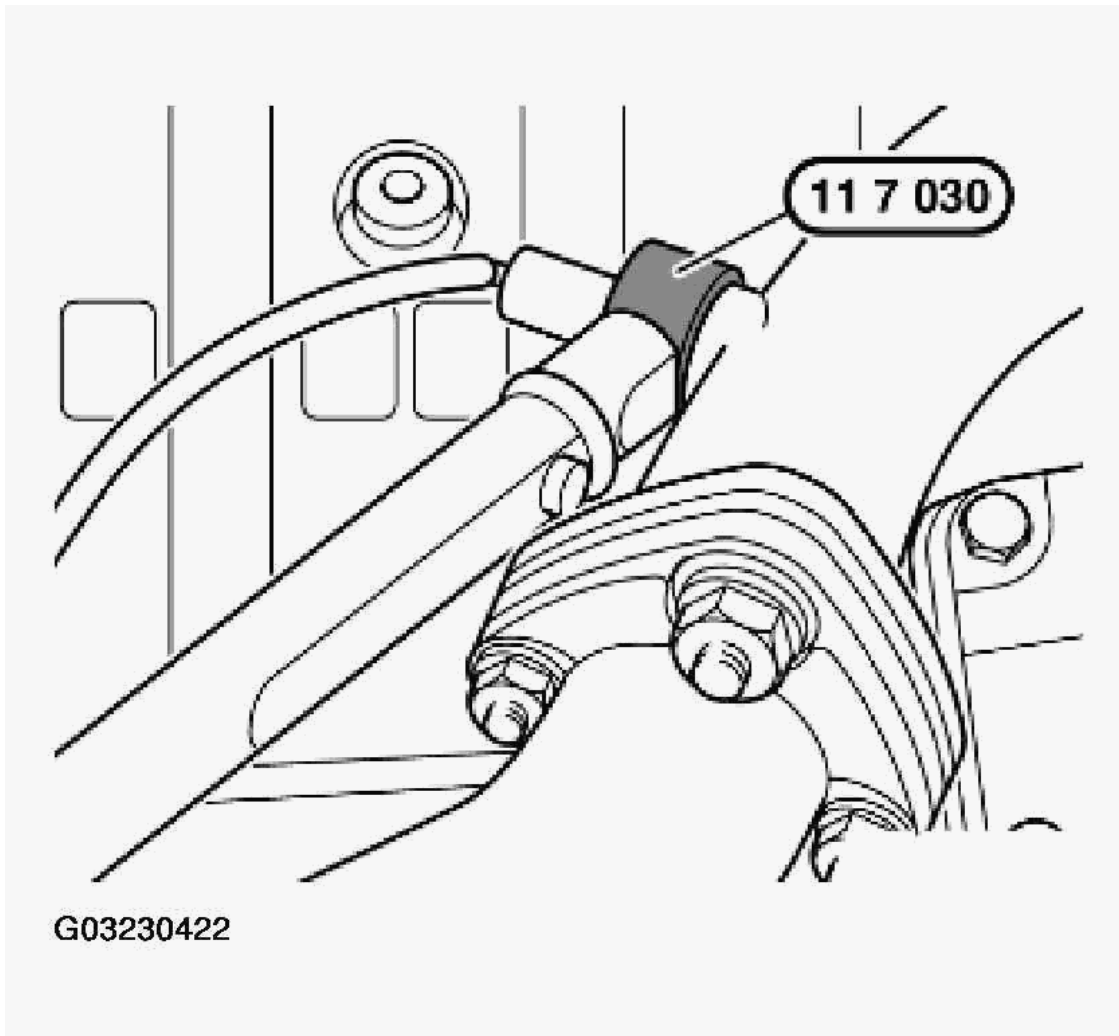


Fig. 376: Identifying Socket Wrench Socket WAF 22
Courtesy of BMW OF NORTH AMERICA, INC.

Cover oxygen monitor sensors when applying underseal.

Pay attention to cable routing of oxygen monitor sensors.