2002-03 ENGINES

Engine Mechanical - X5 (4.6L) - E53

ENGINE GENERAL

00 00 249 BMW ENGINE OIL SERVICE (M60/M62/M73)

Change engine oil and oil filter.

NOTE: **Do not damage main flow oil filter cover. Only open and tighten with socket wrench.**
Unfasten main flow oil filter cover - engine oil now flows back into oil pan.

Installation:

Tightening torque,

refer to 11 42 2AZ **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

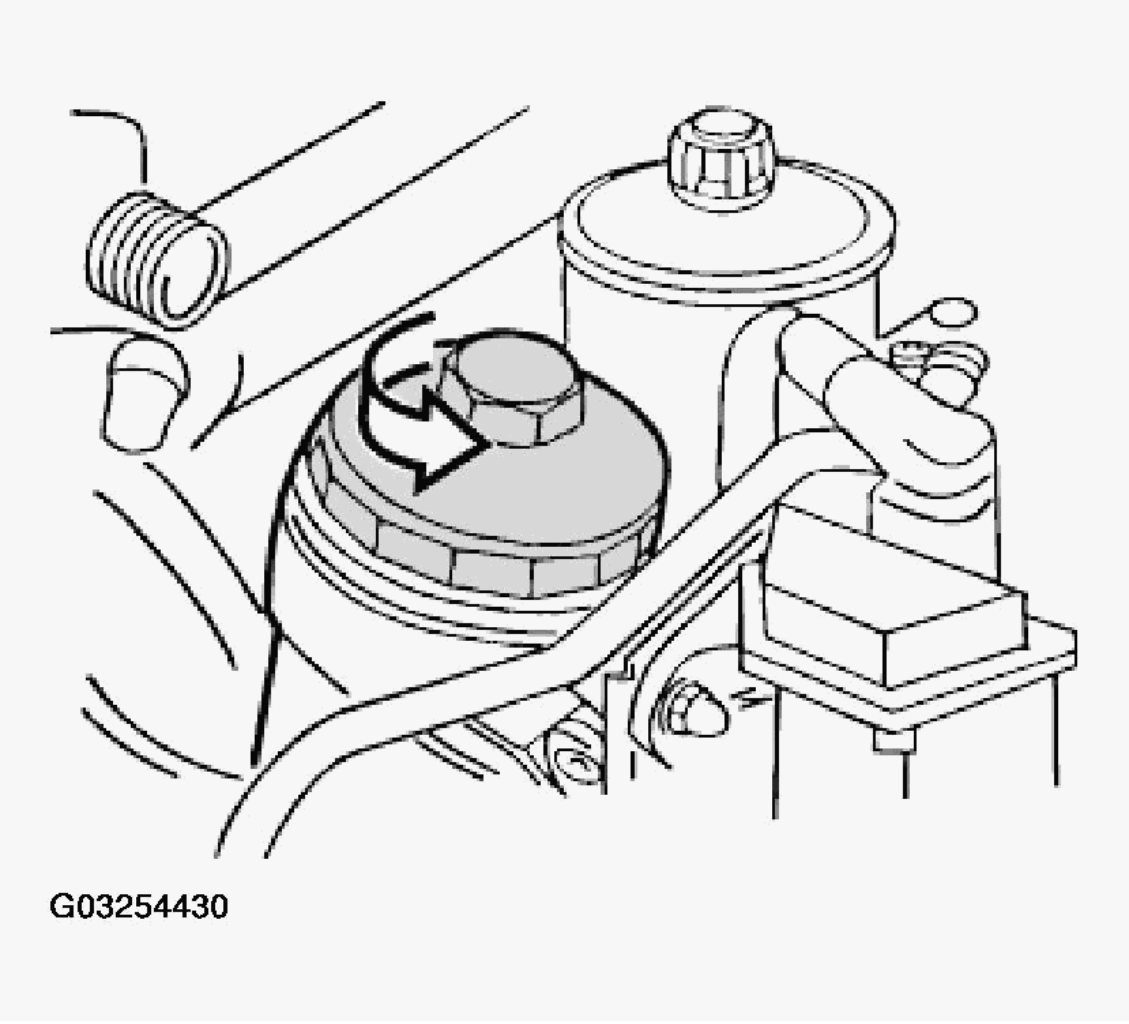


Fig. 1: Removing Oil Filter Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Remove oil filter from oil filter cover.

Installation:

Note direction of installation of oil filter insert.

Oil filter insert must locate in oil filter cover.

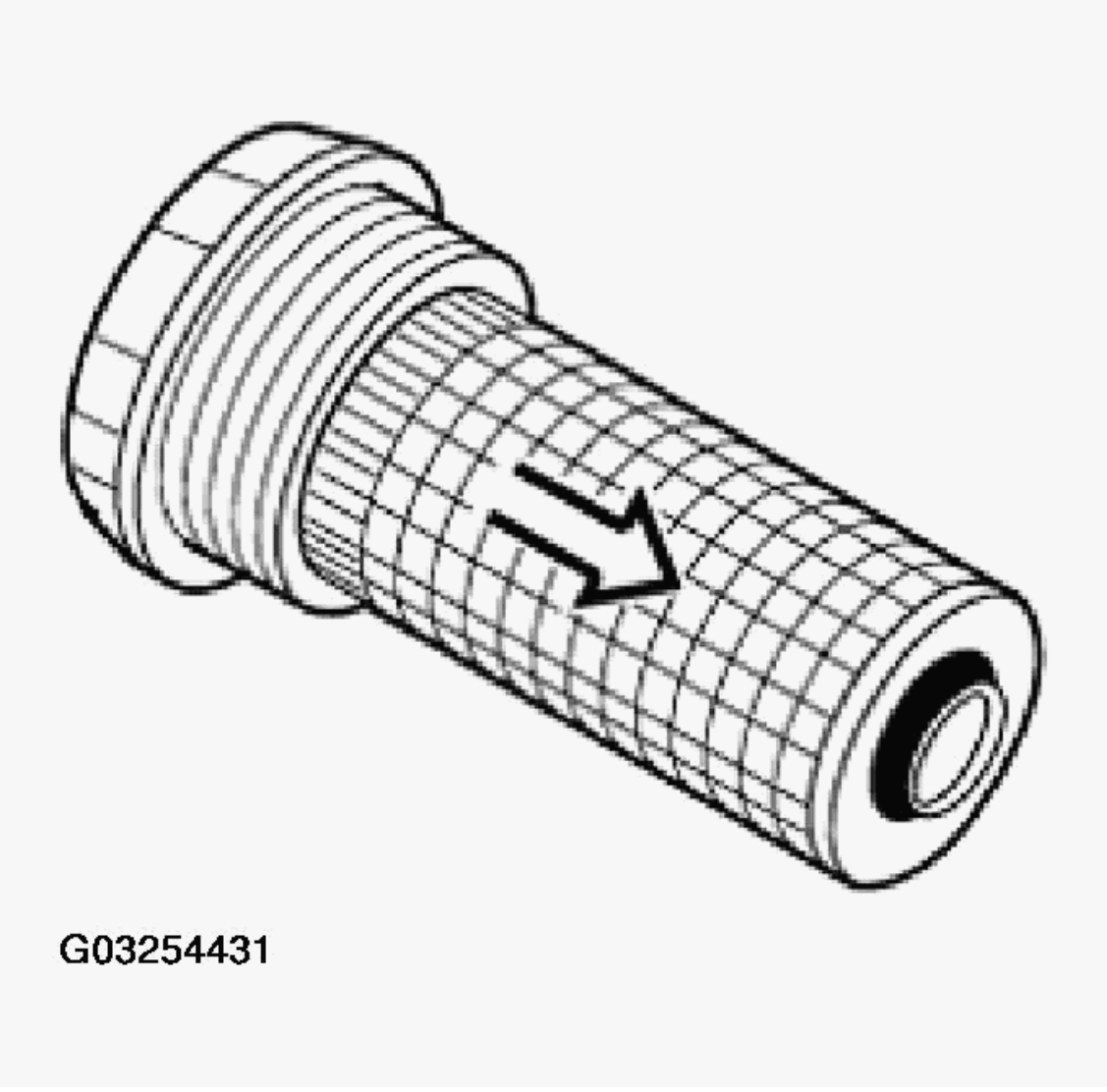


Fig. 2: Removing Oil Filter
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring and coat with oil.

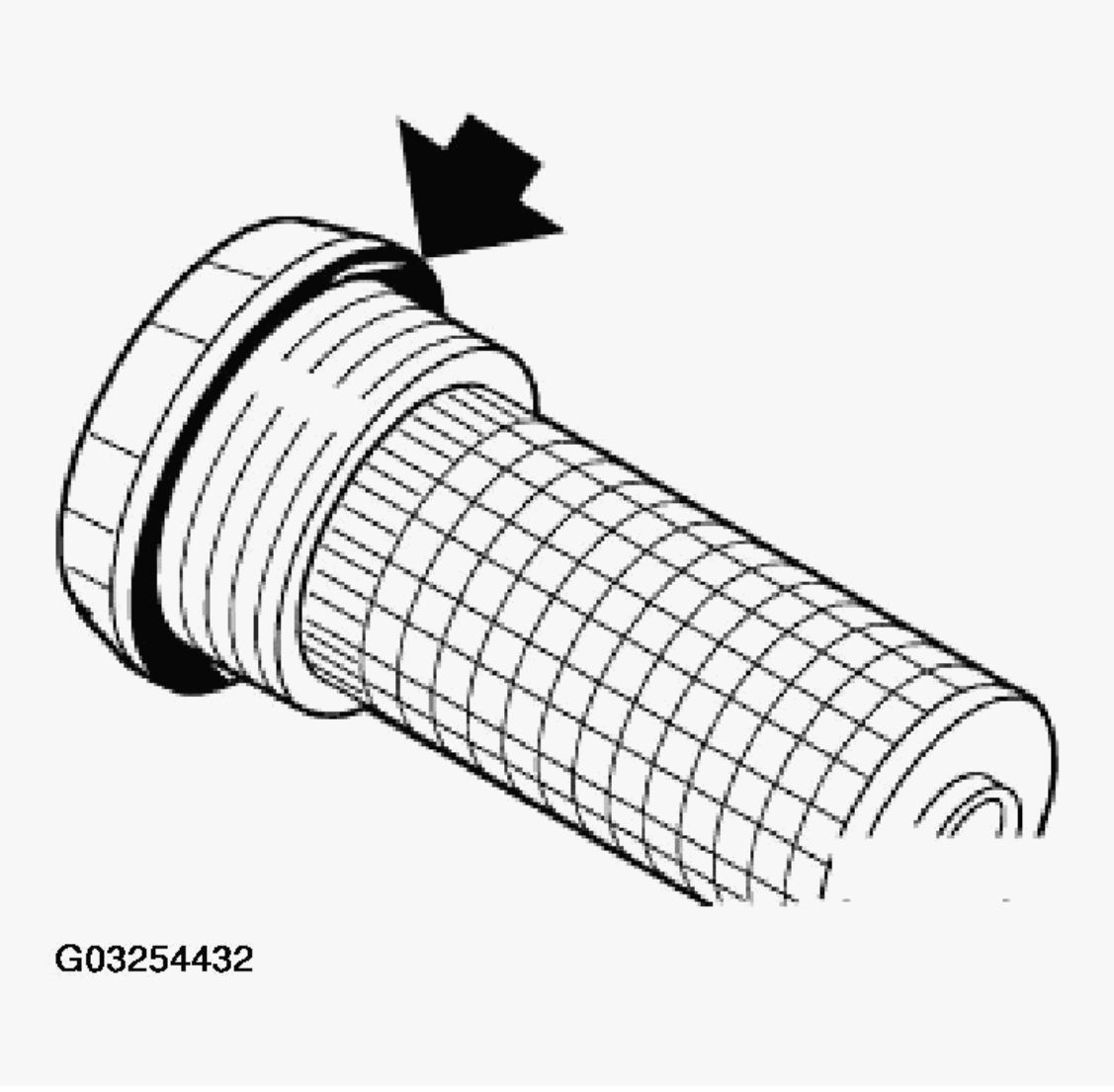


Fig. 3: Replacing Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

After draining oil from oil-filter housing, unscrew oil drain plug or draw out oil with a vacuum unit.

Installation:

Replace sealing ring.

Tightening torque,

refer to 11 13 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

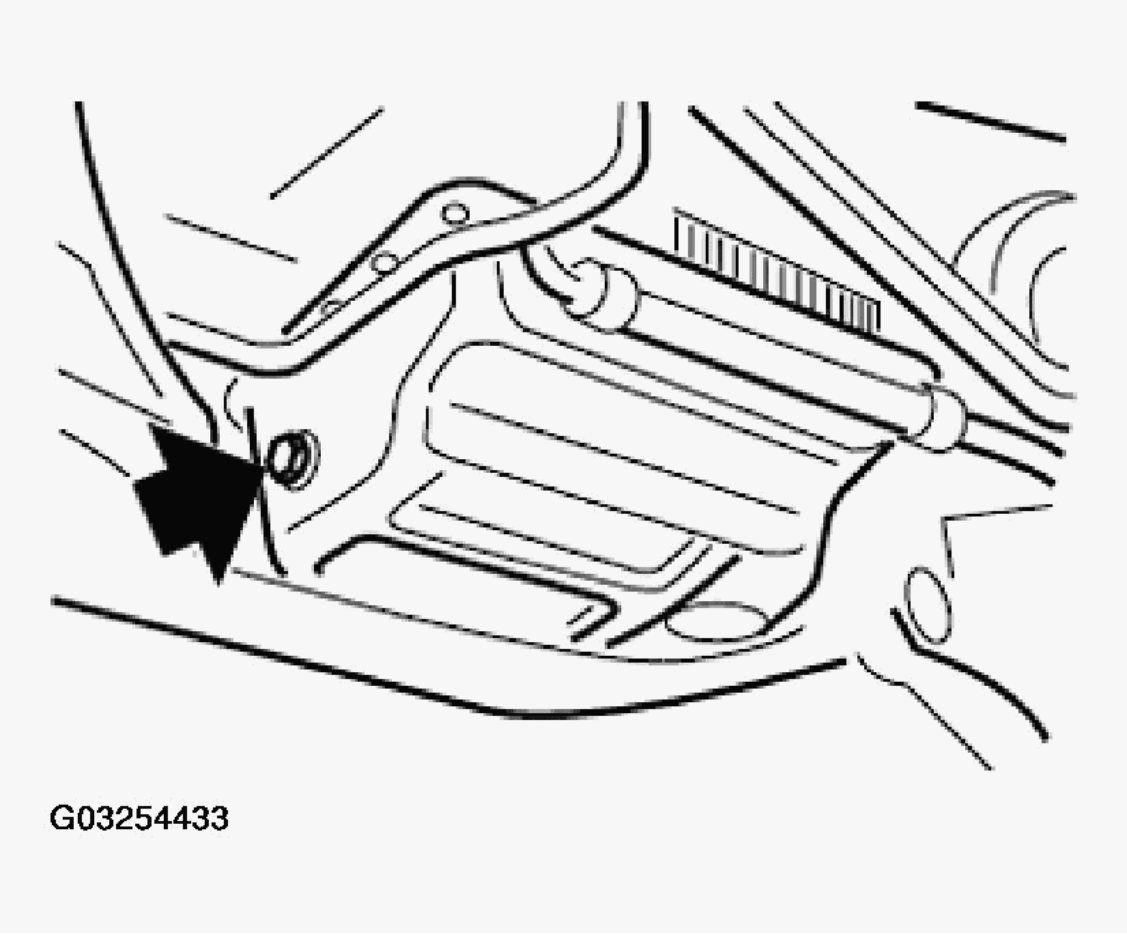


Fig. 4: Identifying Oil Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Pour in engine oil.

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

Stop engine and check oil level.

NOTE: Position car on a flat, horizontal surface.

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

Special tools required:

NOTE: For Special Tool identification, see ENGINE - SPECIAL TOOLS - X5 (4.4L & 4.6L) .

- 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 110226 for tight fit.

Screw special tool 110226 by hand into spark plug thread and connect special tool 110224.

NOTE: Check that sealing ring is in perfect condition (see arrow).

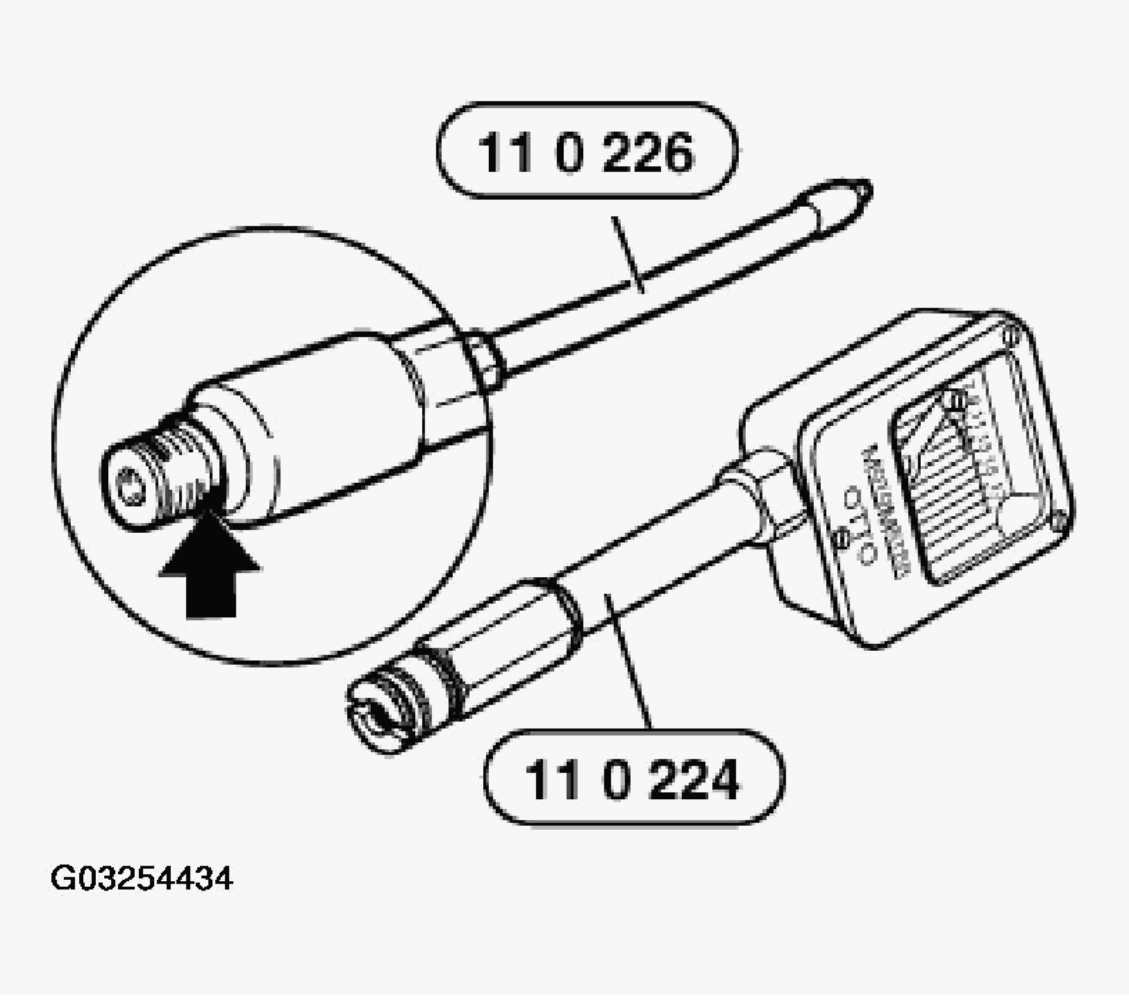


Fig. 5: Checking Schrader Valve On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Depress accelerator and actuate starter until compression stops rising.

Compression pressure.

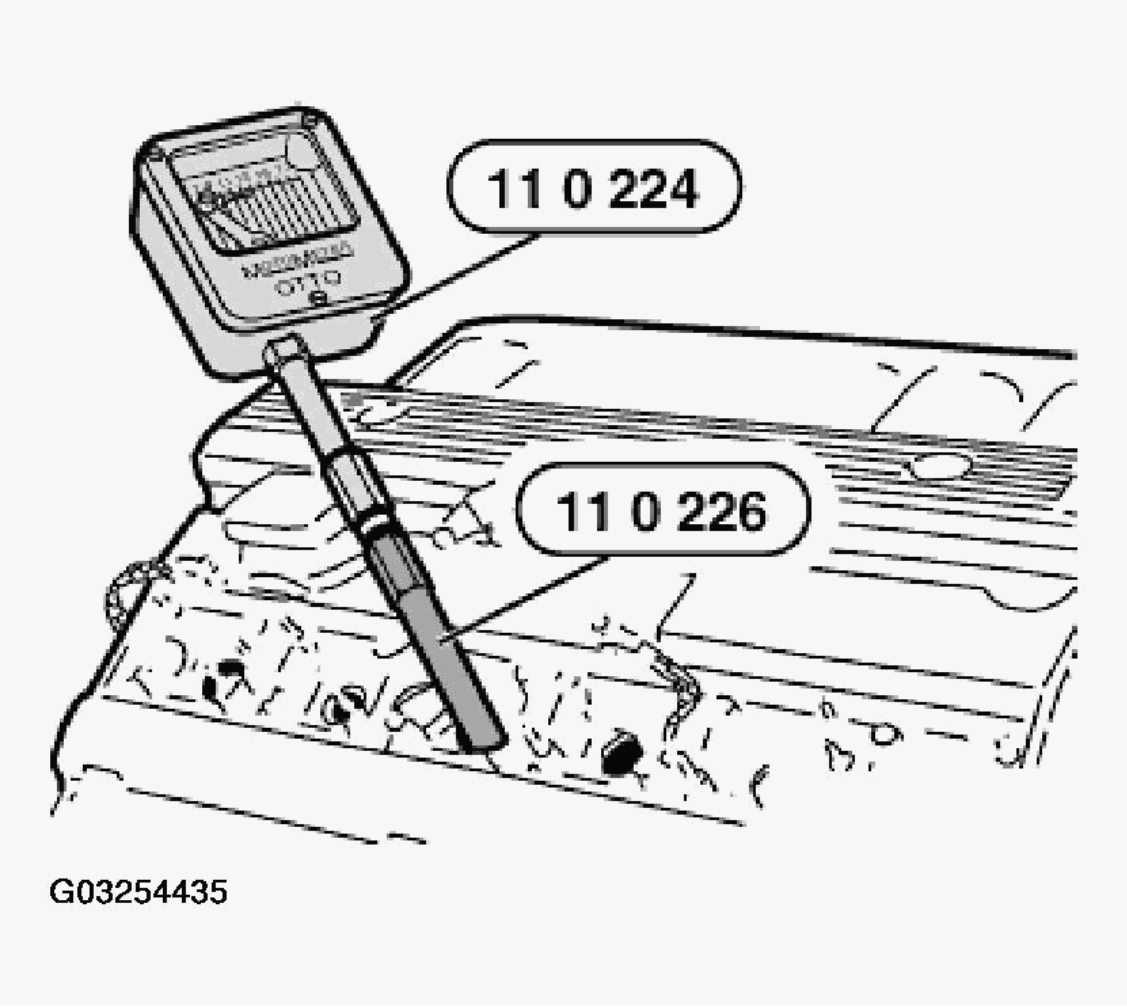


Fig. 6: Checking Compression
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Now clear the fault memory.

11 00 045 CHECKING ABSOLUTE COMPRESSION OF ALL CYLINDERS

With BMW Diagnosis Information System (DIS).



Fig. 7: 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 (M62)

Instructions for disconnecting and connecting battery,

refer to **12 00 ... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY** .

Disconnect negative battery lead.

Remove heater bulkhead,

refer to **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD** .

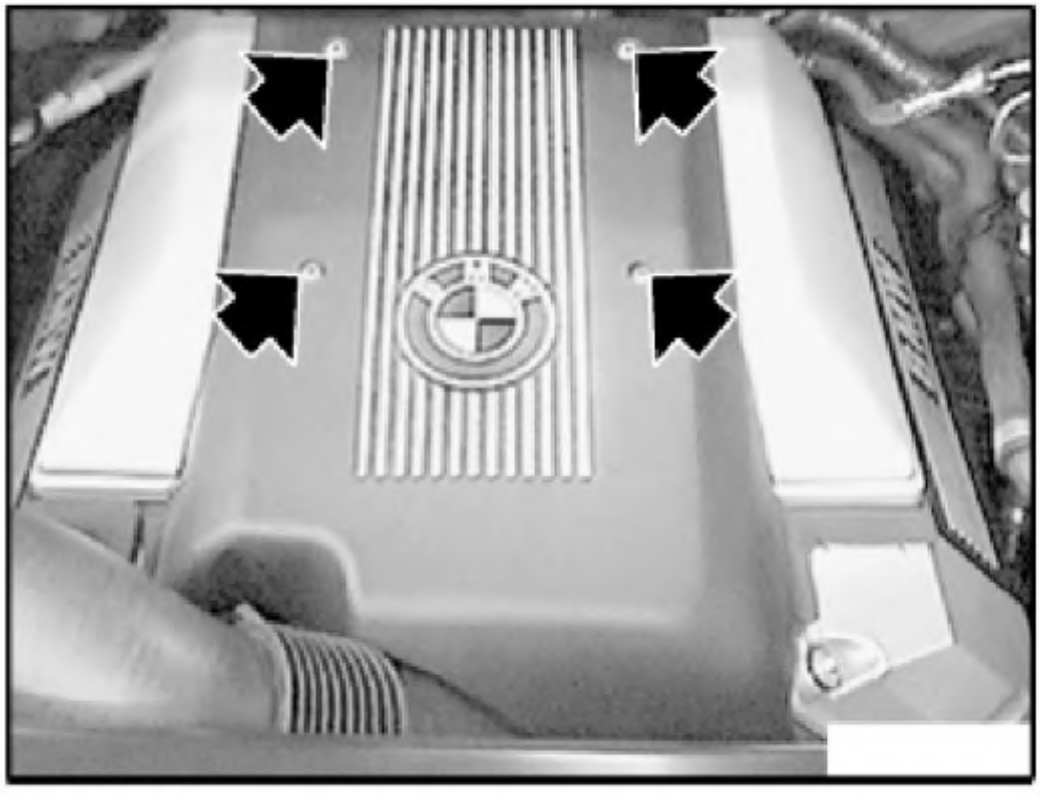
Lift engine hood into assembly position.

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.



Fig. 8: Reattaching Damper To Hood
Courtesy of BMW OF NORTH AMERICA, INC.

Turn fasteners on acoustic cover 90° counterclockwise, remove acoustic cover.



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Fig. 9: Removing Acoustic Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release bellows on throttle. Remove intake filter housing with air-mass flow sensor.

Remove windshield washing reservoir.

Open hose clip (1). Disconnect hose (2) for brake booster from suction jet pump.

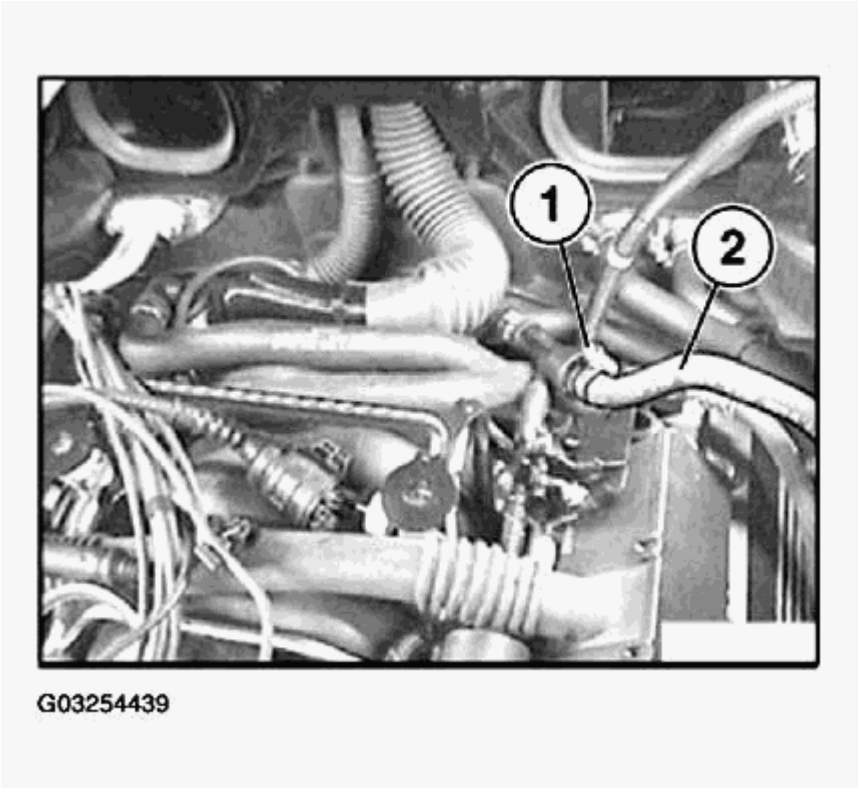


Fig. 10: Identifying Brake Booster Hose And Clip
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Catch and dispose of escaping fuel.
Observe country-specific waste-disposal regulations.

Disconnect fuel feed line from injection pipe and seal hose ends with special tool 13 5 281 and special tool 13 5 282.

Instructions for removing and installing fuel hoses,

refer to **13 53 540 REPLACING, SEALING FUEL HOSES** .

Remove front splash guard.

Remove reinforcement plate.

CAUTION: The work step "Removing and installing reinforcement plate" contains important installation instructions,
refer to 31 10 010 REMOVING AND INSTALLING REINFORCEMENT PLATE .

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

Installation:

Replace sealing ring.

Tightening torque,

refer to 11 11 5AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** . .

Remove alternator drive belt, refer to **11 28 010 REPLACING ALTERNATOR DRIVE BELT (M62)** .

Remove power steering pump, refer to **POWER STEERING VANE PUMP (M52/M54)** .

NOTE: Lines remain connected.

Evacuate A/C system.

Disconnect lines between A/C compressor and condenser.

Disconnect suction line from A/C compressor and tie to one side.

NOTE: A/C compressor remains on engine.

Remove transmission, refer to **REMOVAL & INSTALLATION - X5 (A5S 440Z)** or **REMOVAL & INSTALLATION - X5 (S5D 280Z)** .

Remove heat shield from starter motor.

Release cable connections to starter motor.

Remove starter motor.

Detach oil lines to transmission on heat exchanger for transmission and remove.

Remove heat exchanger for transmission from radiator. Remove radiator, refer to **COOLING SYSTEM - REPAIR INSTRUCTIONS** .

Disconnect water hoses on alternator and thermostat housing.

NOTE: Illustration with engine removed.

Unfasten coolant hoses from coolant manifold.

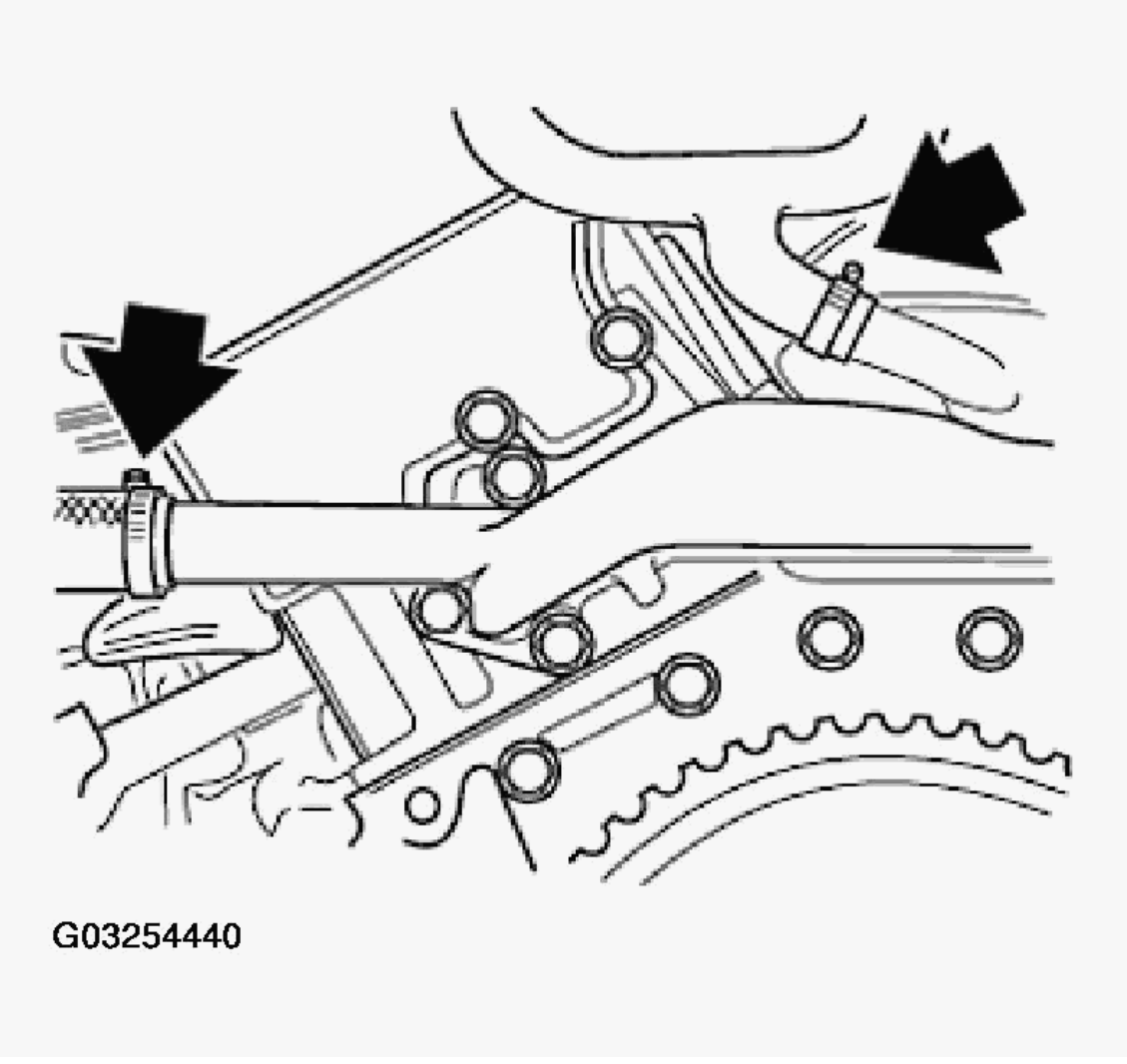


Fig. 11: Unfastening Coolant Hoses From Coolant Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

Detach coolant hoses (1) from heater.

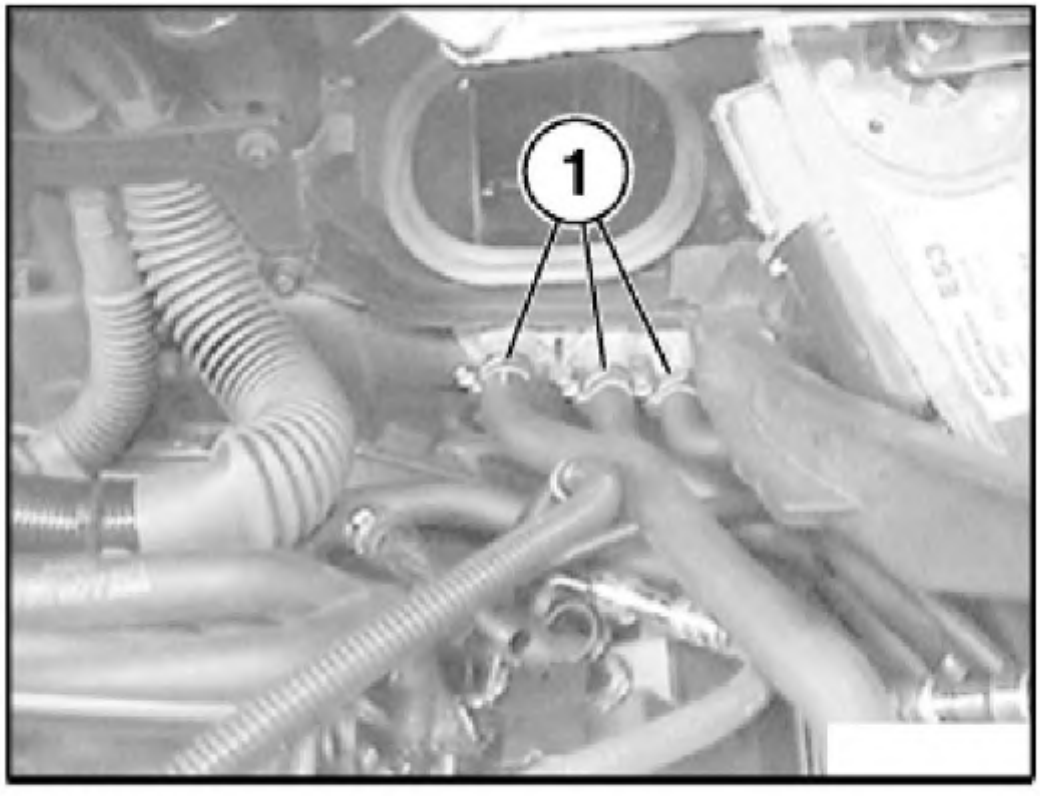


Fig. 12: Detaching Coolant Hoses From Heater
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Remove heating valve (2) completely with hoses.

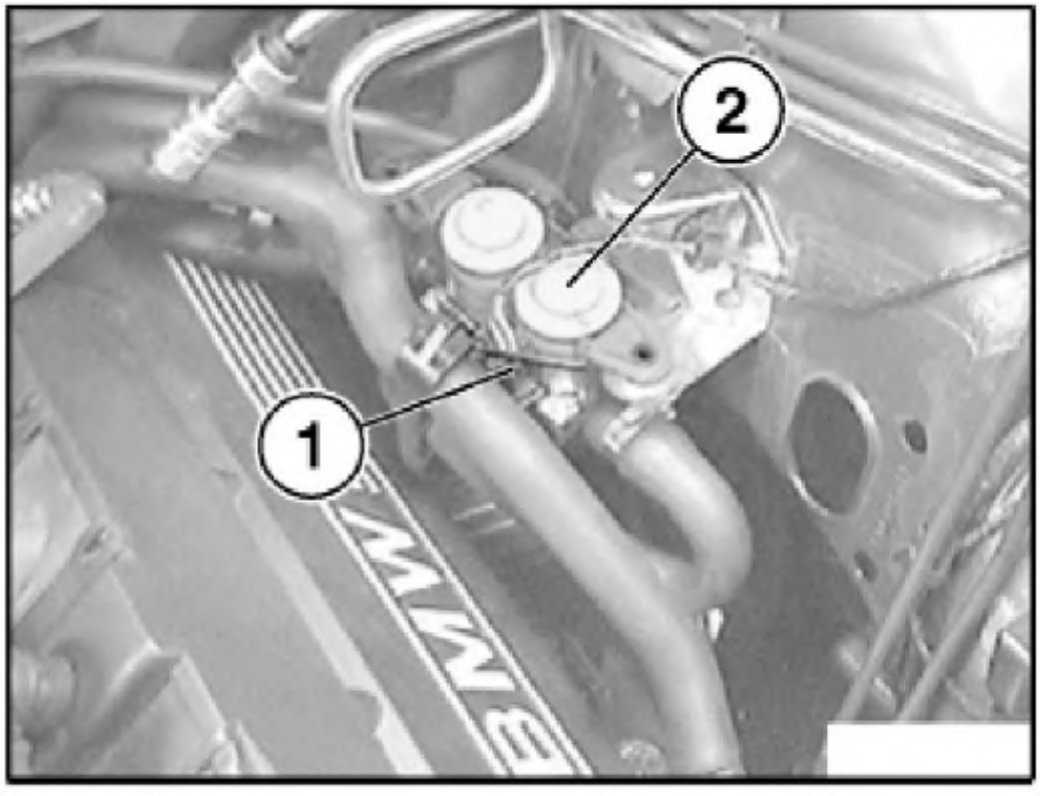


Fig. 13: Removing Heating Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock (1) and detach hose (2) from tank venting valve.

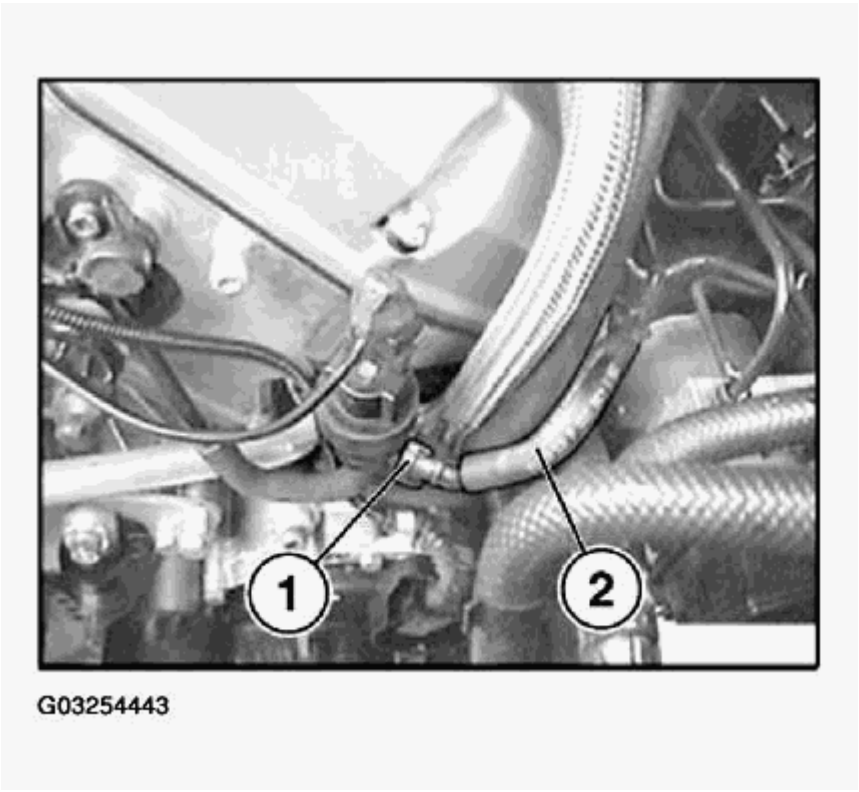


Fig. 14: Detaching Hose From Tank Venting Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect wiring harness section for engine in control unit box and place on engine.

Remove positive lead from support point and place on engine.

Disconnect wiring harness section for transmission in control unit box.

Pull out wiring harness section for transmission and oxygen sensors and place on engine.

Remove expansion tank, refer to 17 11 100 in **COOLING SYSTEM - REPAIR INSTRUCTIONS** .

Open cap (1), draw off hydraulic fluid from supply reservoir for power steering pump. Dispose of hydraulic fluid.

Observe country-specific waste-disposal regulations.

Refit cap (1).

Detach supply reservoir from carrier.

NOTE: Lines remain connected.

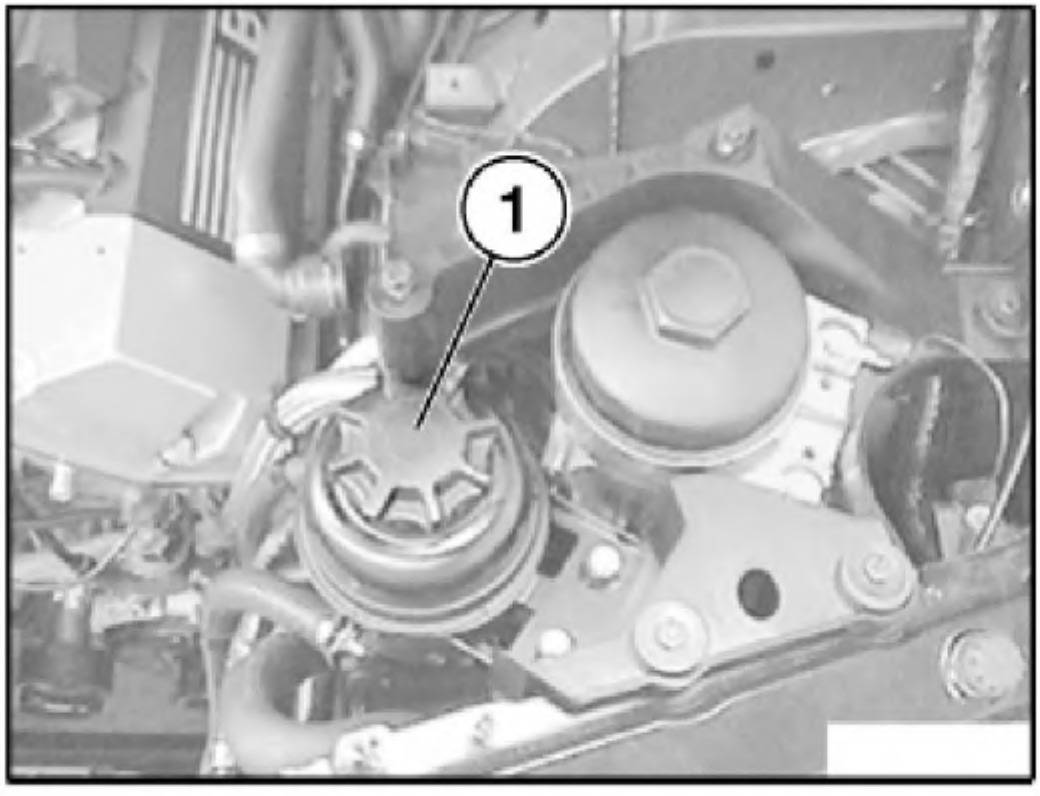


Fig. 15: Identifying Hydraulic Fluid Supply Reservoir
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Grounding strap (1) is screwed to main flow oil filter housing.

Detach main flow oil filter housing from holder, feed out of carrier and suspend from engine.

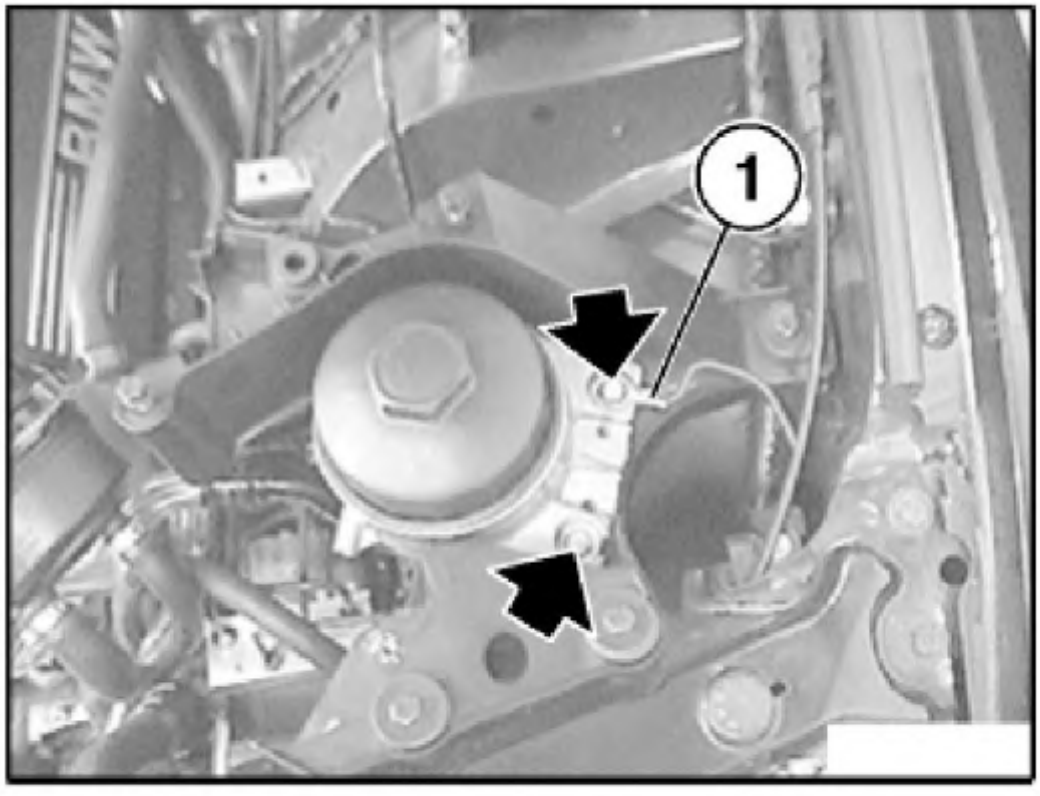
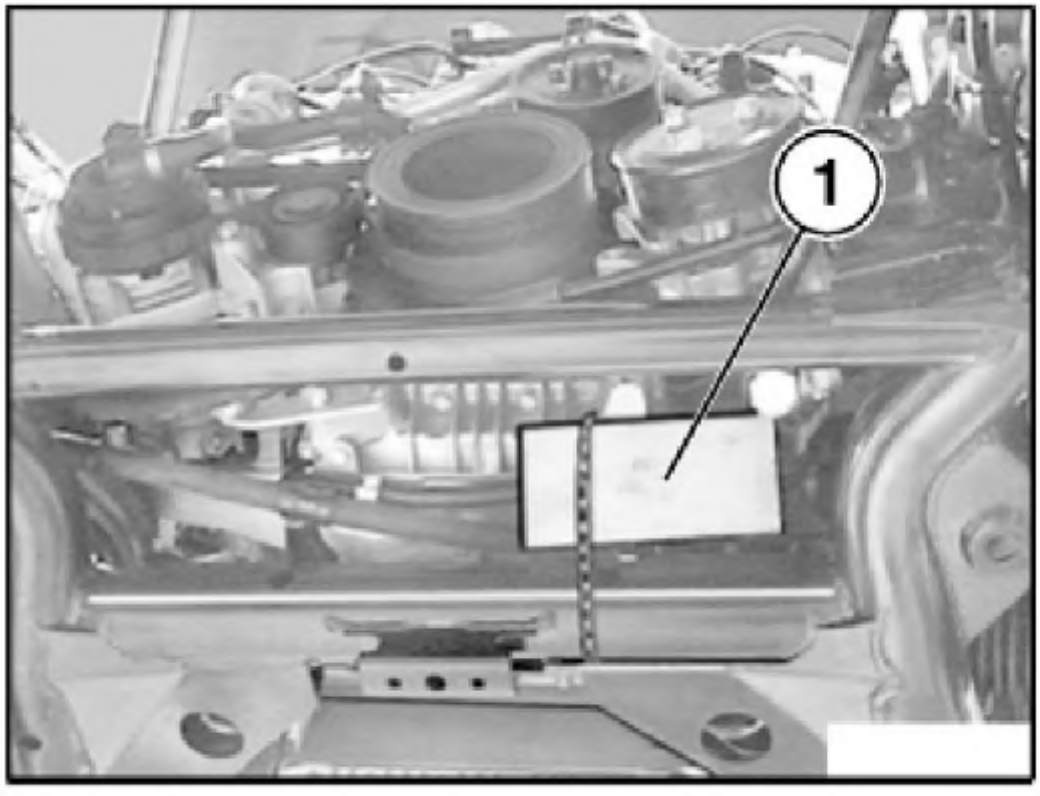


Fig. 16: Removing Oil Filter Housing
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Lines remain connected.

Provisionally reinstall supply reservoir for power steering pump.

NOTE: The engine leans forward once the swivel bearings and output shafts have been removed.
Support engine with a block of wood (1).
If necessary, secure wood with a cable tie to front axle support.



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Fig. 17: Supporting Engine With Block Of Wood
Courtesy of BMW OF NORTH AMERICA, INC.

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

Remove output shafts, refer to **AXLE SHAFTS (FRONT)** .

Remove propeller shaft at front, refer to **PROPELLER SHAFT - REPAIR INSTRUCTIONS** .

NOTE: To remove and install engine with exhaust manifold, you must remove partition wall (3).

- **Unclip hose and cable, disconnect plug connection (1) Feed out wiring harness (2)**
- **Release nut and screws, remove partition wall (3)**

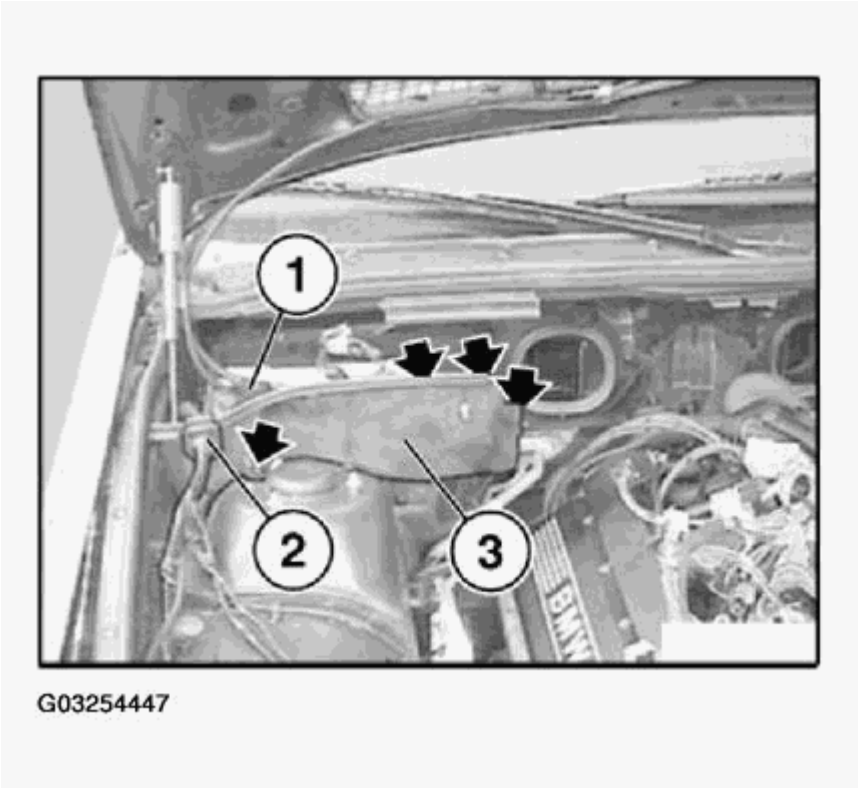


Fig. 18: Removing And Installing Partition Wall
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten ground tape from right of engine support.

Unfasten top left and right nuts on engine mount.

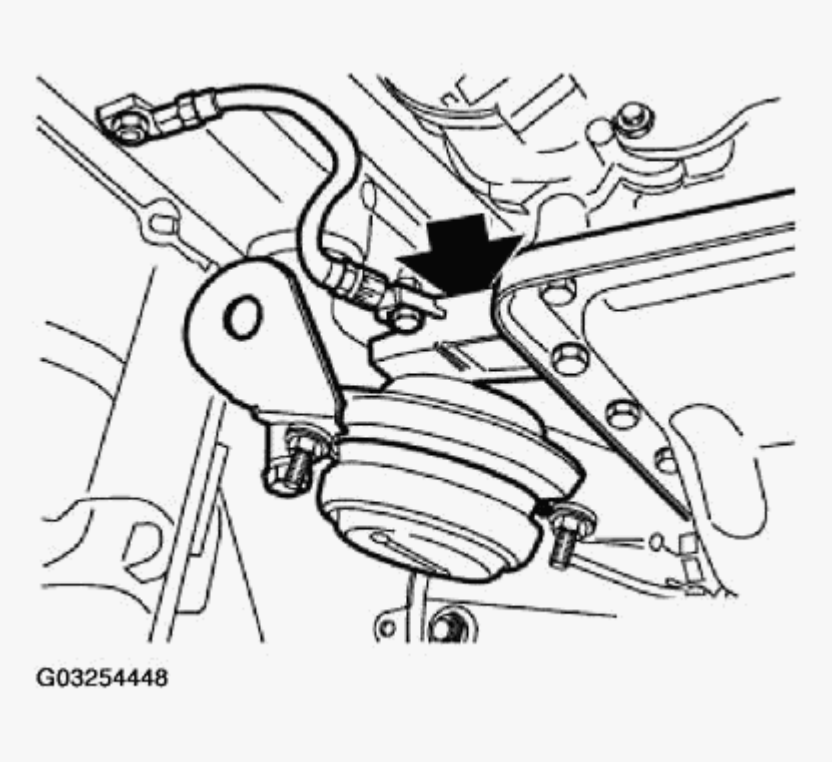


Fig. 19: Removing Engine Mount Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Only raise engine on locating lugs provided for this purpose.

Fit engine to special tool 11 0 000.

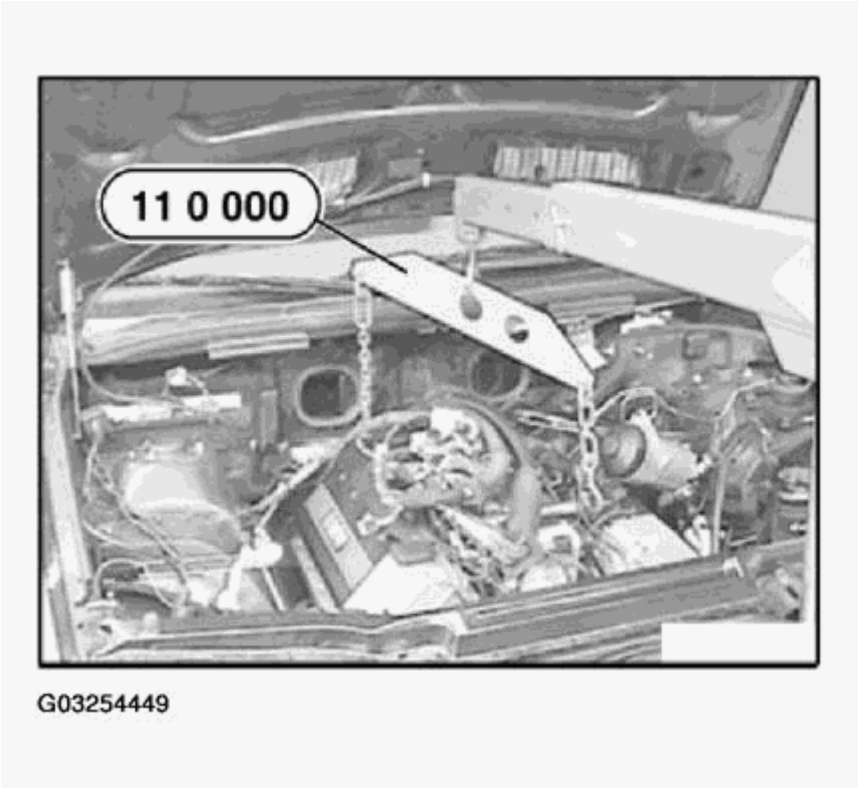


Fig. 20: Fitting Special Tool 11 0 000 To Engine
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Narrow points:

- **Fuel Line, Cylinder Head Cover**
- **A/C Compressor**
- **A/C Compressor Line**
- **Condenser Exhaust Manifold**
- **Front Axle Differential, Steering Spindle**

Carefully lift out engine.

CYLINDER HEAD WITH COVER

11 12 004 REMOVING AND INSTALLING/SEALING BOTH CYLINDER HEAD COVERS (M62)

Instructions for disconnecting and connecting battery,

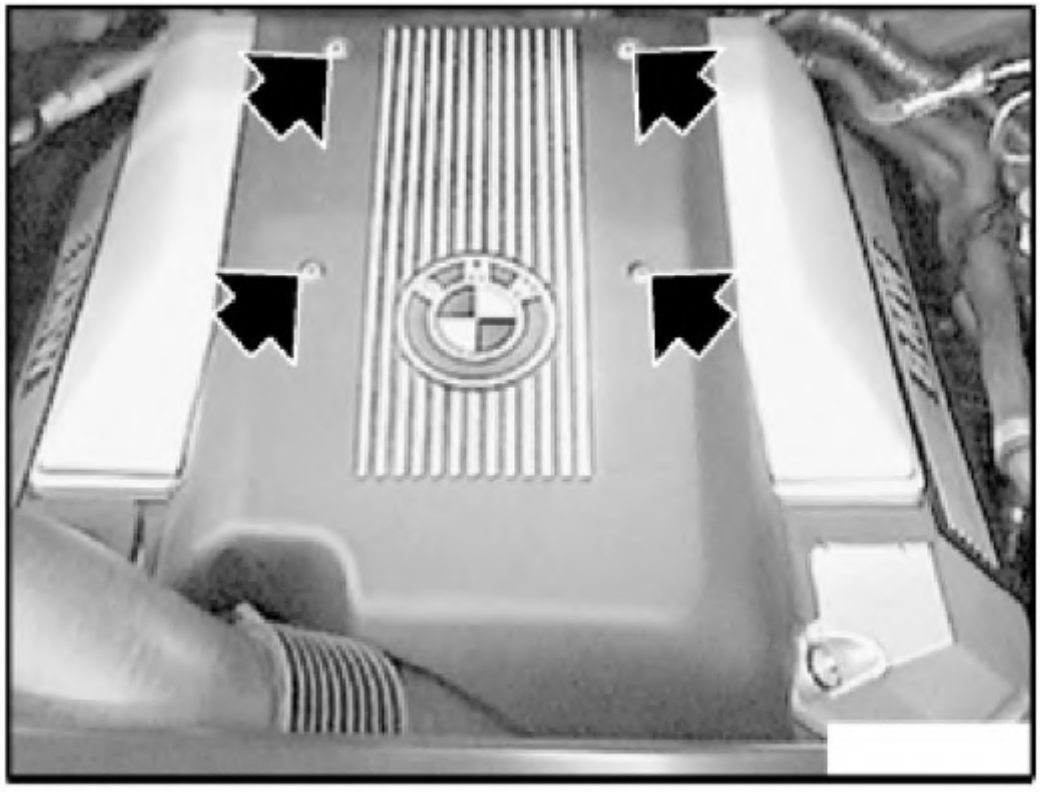
refer to **12 00 ... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY** .

Disconnect battery negative terminal.

Remove heater bulkhead,

refer to **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD** .

Turn fasteners on acoustic cover 90° counterclockwise, remove acoustic cover.



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Fig. 21: Removing Acoustic Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release bellows on throttle. Remove upper section of suction filter housing with mass air flow sensor. Remove lower section of suction filter housing.

Detach battery positive lead from support point on firewall. Feed out battery positive lead and lay to one side.

Cylinder head cover of cylinder bank 1 to 4:

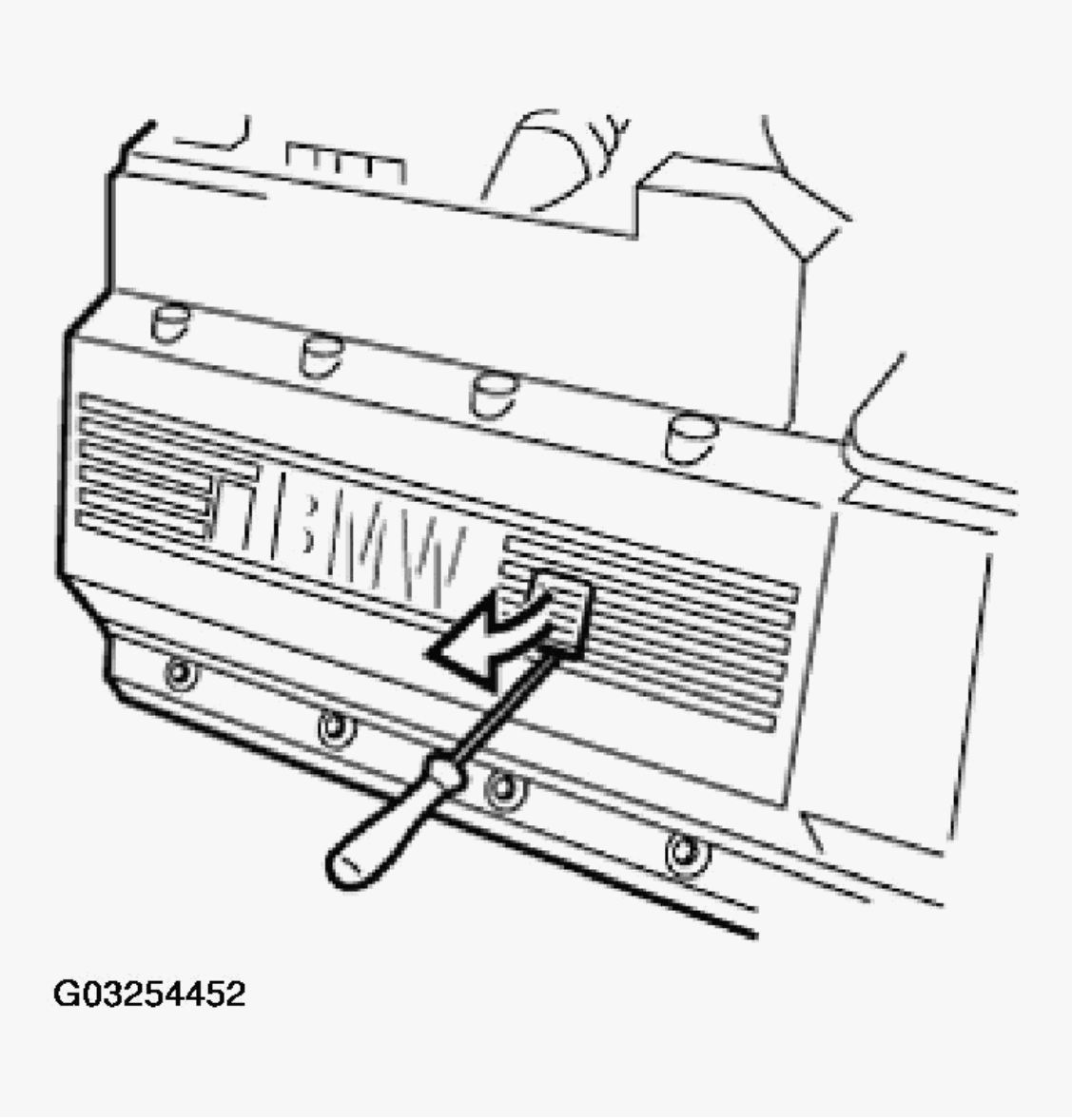


Fig. 22: Removing Cylinder Bank 1-4 Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Remove washer fluid reservoir.

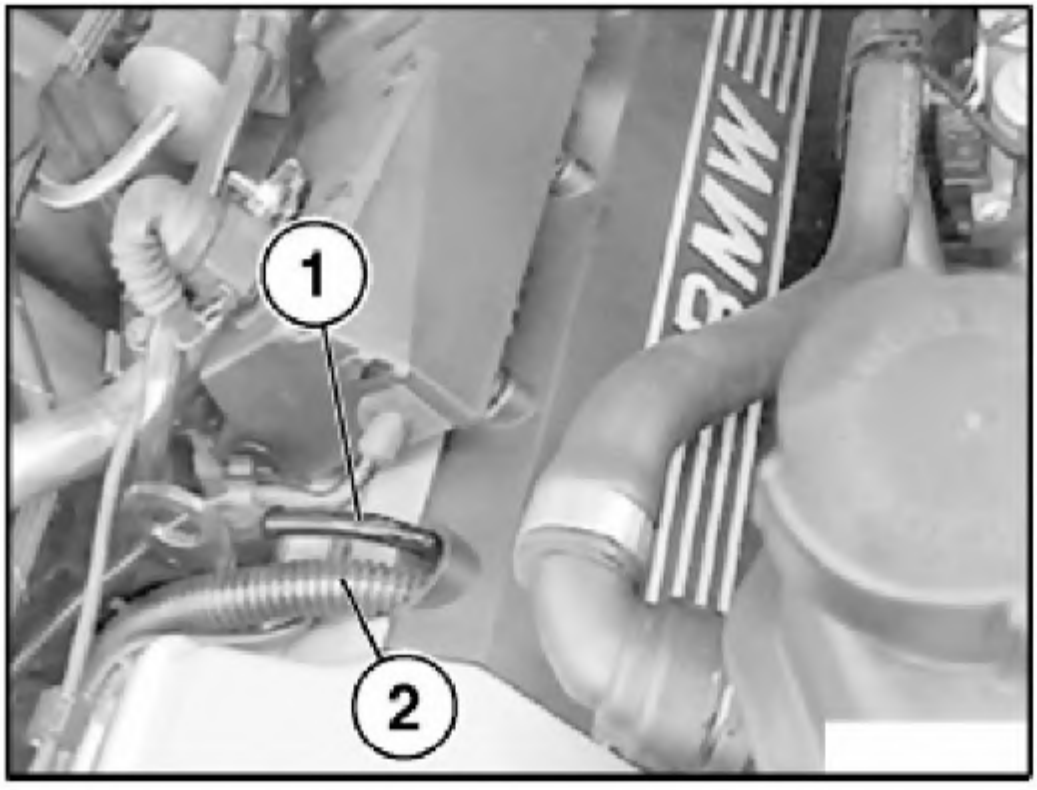
Cylinder head cover of cylinder bank 5 to 8:

Unclip water hoses from holder on heater valve and press to one side.

NOTE: Water pipes remain connected.

NOTE: Vent line for front axle differential and positive lead is laid under cover of ignition coils.

1. Vent Line For Front Axle Differential
2. Positive Lead



1. Vent line for front axle differential
2. Positive lead

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Fig. 23: Identifying Vent Line And Positive Lead
Courtesy of BMW OF NORTH AMERICA, INC.

Remove ignition coils,

refer to 12 13 511 in **IGNITION COIL** .

Cylinder bank 5 to 8:

Detach vent hose (1) from cylinder head cover.



Fig. 24: Detaching Vent Hose From Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten left and right cable ducts and fold inwards.

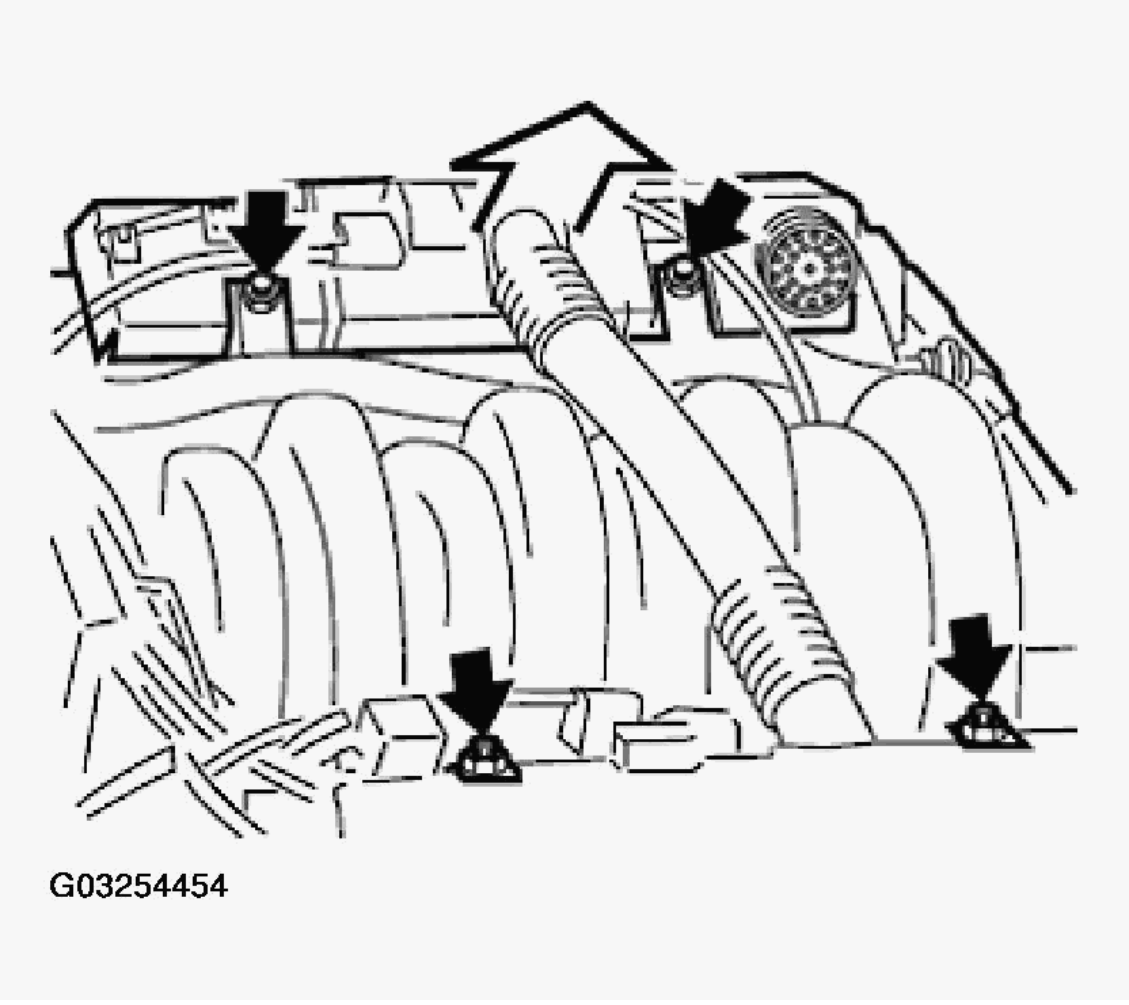


Fig. 25: Unfastening Left And Right Cable Ducts
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten retaining elements on left and right sides.

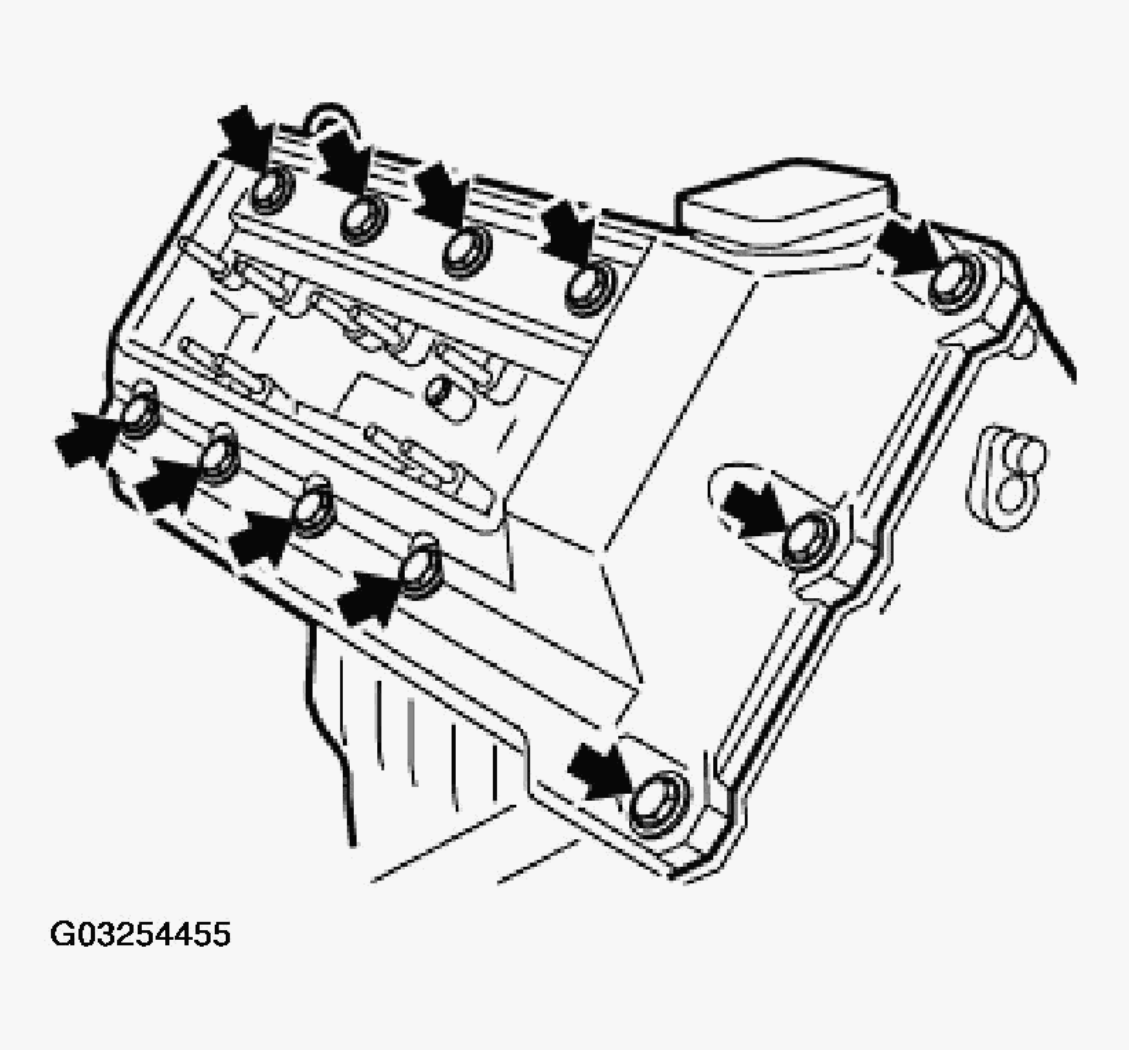


Fig. 26: Unfastening Cylinder Head Cover Retainers
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

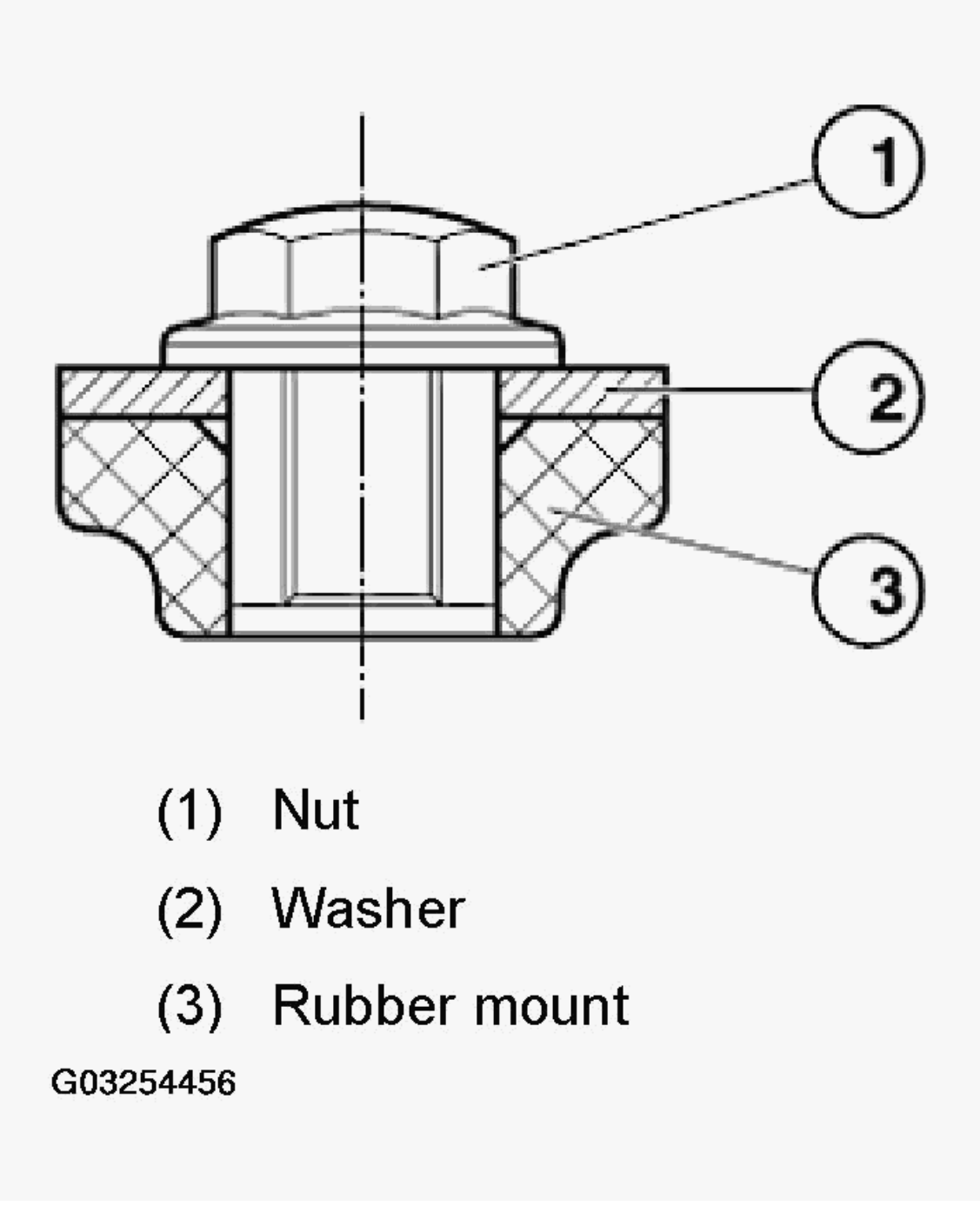


Fig. 27: Layout Of Retaining Elements
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check seal, replace if necessary.

Coat outer and inner grooves and sealing face of cylinder head cover all round with anti-friction rubber coating,

e.g. glycerine.

Press internal gasket into groove in cover without torsional stress, starting at the four corner radii.

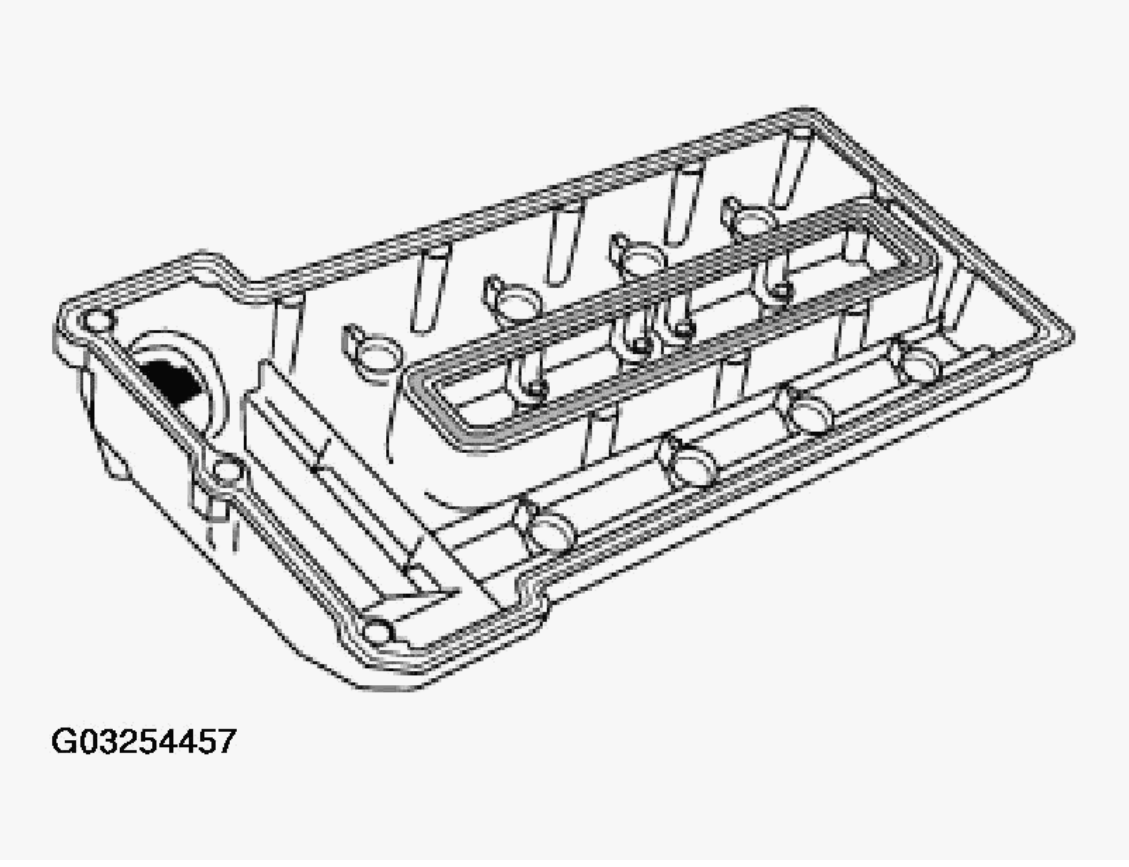


Fig. 28: Installing Cylinder Head Cover Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Align outer gasket loosely on groove in cover. Secure gasket in groove in cover, starting in the corner radii at the back (1) and locate without torsional stress in the groove.

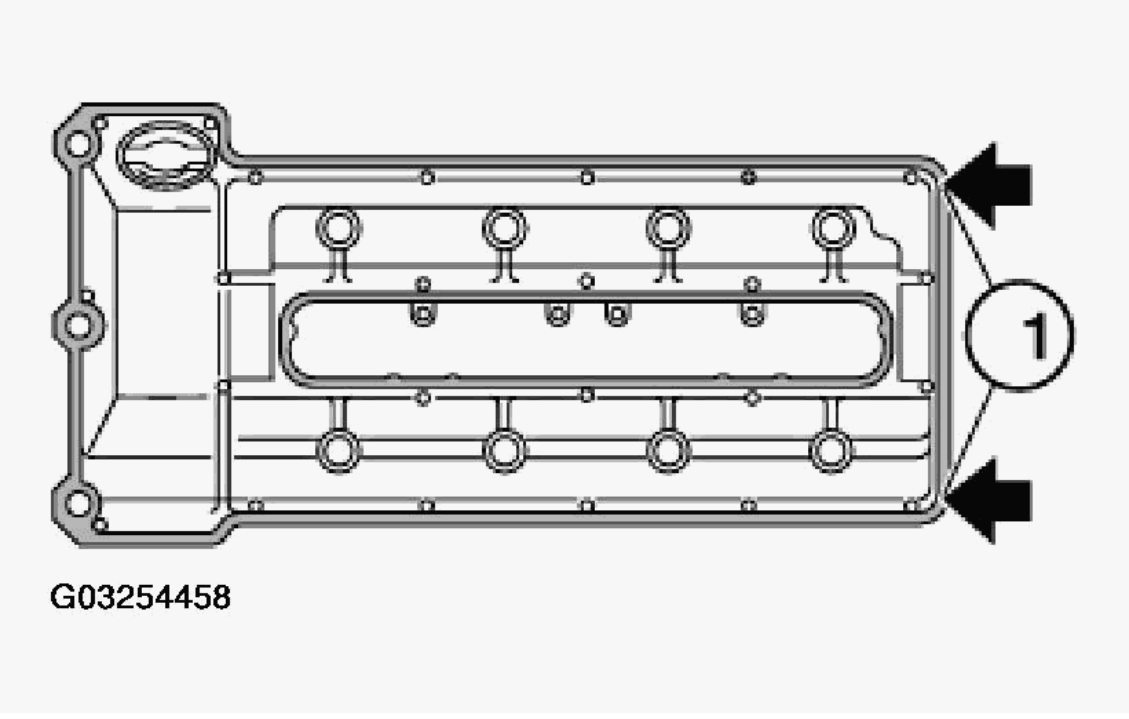


Fig. 29: Aligning Cylinder Head Cover Gasket At Corner
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean gasket residue from sealing surface.

Apply coat of Drei Bond 1209 to contact surfaces of joint.

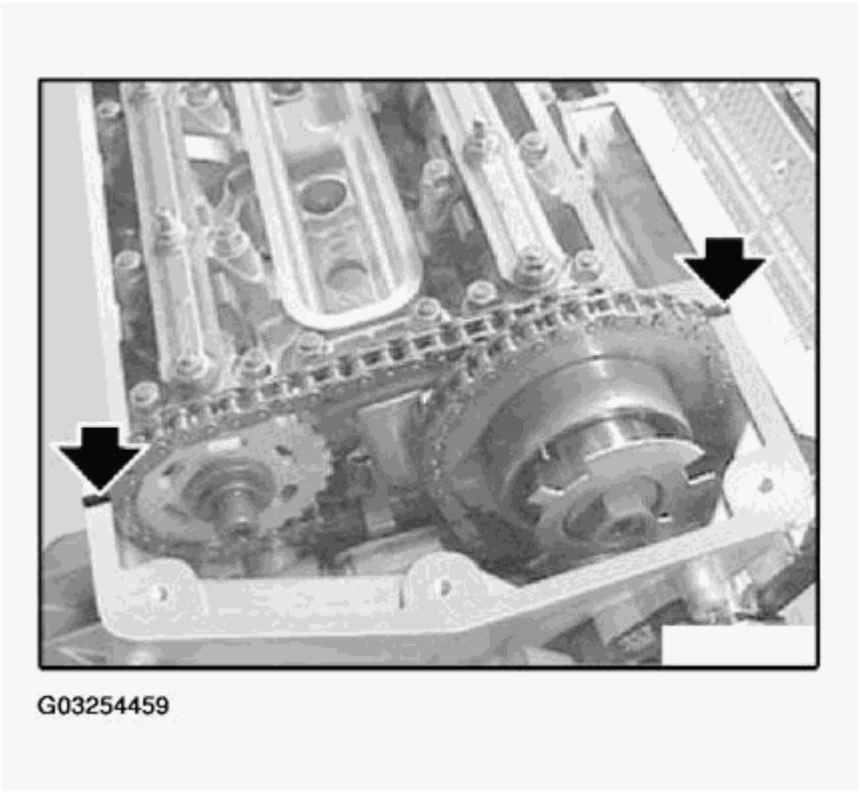


Fig. 30: Applying Sealer To Contact Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Illustration with engine removed.

Installation:

Clean gasket residue from sealing surface.

Apply thin, uniform bead of Drei Bond 1209 to transmission area on half-moon sections.

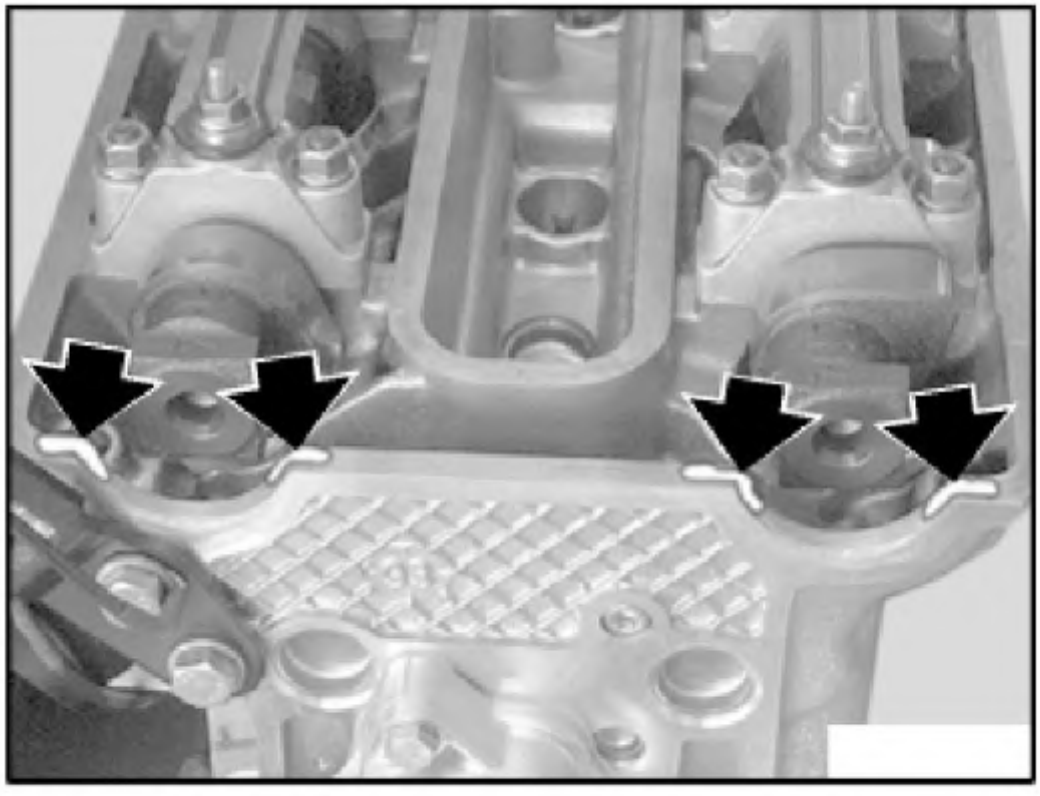


Fig. 31: Applying Sealer To Half-Moon Sections
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Illustration with engine removed.

Installation:

Check that side of gasket is correctly seated and check back of cylinder head.

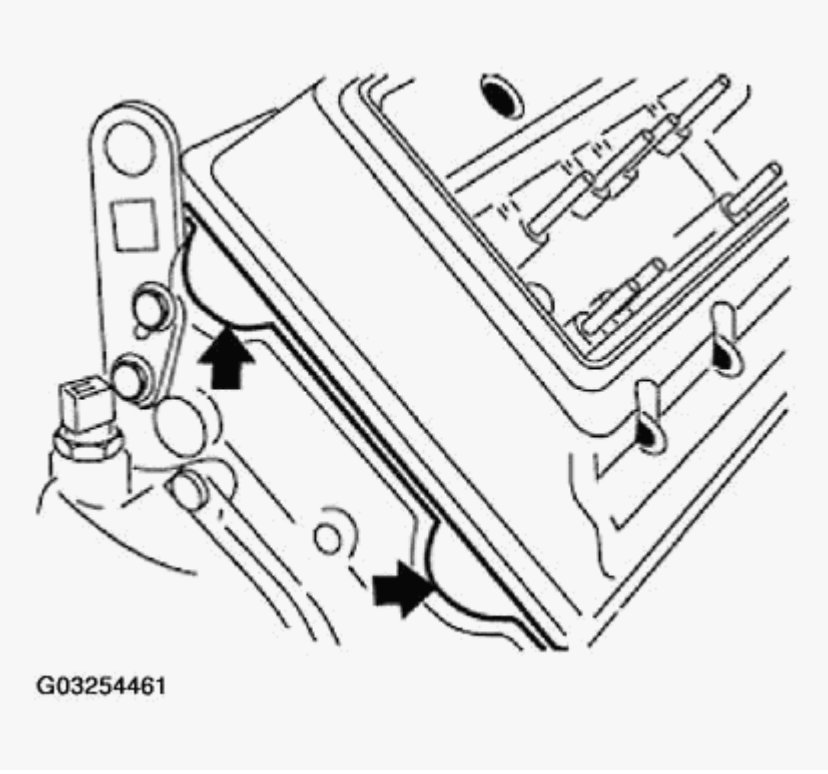


Fig. 32: Checking Seating Of Cylinder Head Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Screw two retaining elements to the locating points,

without preload at this stage, and align the cover. Install all other retaining elements and tighten crosswise from inside to outside.

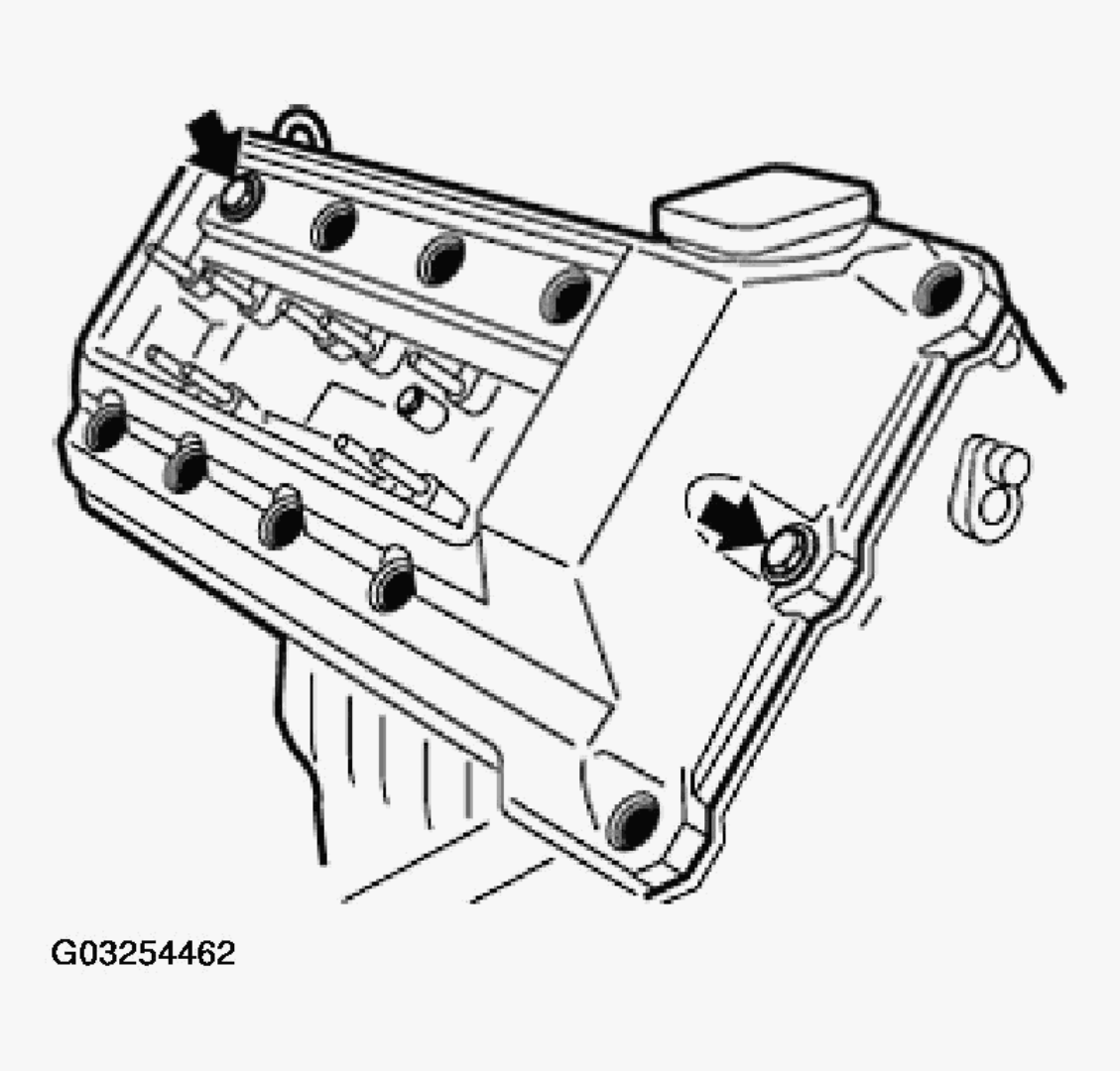


Fig. 33: Installing Retaining Elements
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 005 REMOVING AND INSTALLING/SEALING LEFT CYLINDER HEAD COVER (M62)

This operation is described in section on removing and installing/sealing both cylinder head covers,

refer to **11 12 004 REMOVING AND INSTALLING/SEALING BOTH CYLINDER HEAD COVERS (M62)**

11 12 006 REMOVING AND INSTALLING/SEALING RIGHT CYLINDER HEAD COVER (M62)

This operation is described in section on removing and installing/sealing both cylinder head covers,

refer to **11 12 004 REMOVING AND INSTALLING/SEALING BOTH CYLINDER HEAD COVERS (M62)**

11 12 105 REMOVING AND INSTALLING LEFT CYLINDER HEAD (M62)

Cylinder Bank 5 To 8

Remove left exhaust manifold,

refer to **11 62 060 REMOVING AND INSTALLING/REPLACING LEFT EXHAUST MANIFOLD (M62/N62)** .

Unfasten drain plug for coolant on left engine block. Drain and dispose of coolant.

Installation:

Replace sealing ring.

Tightening torque,

refer to 11 11 5AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Top up coolant. Vent cooling system and check for leaks,

refer to **17 00 005 DRAINING AND TOPPING UP COOLANT (M62)** .

Remove both cylinder head covers,

refer to **11 12 004 REMOVING AND INSTALLING/SEALING BOTH CYLINDER HEAD COVERS (M62)** .

Remove spark plugs,

refer to **12 12 011 REPLACING ALL SPARK PLUGS (M60, M62** .

Remove intake air manifold,

refer to **11 61 050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (M62)** .

Remove coolant manifold,

refer to **11 53 325 REMOVING AND INSTALLING/REPLACING COOLANT MANIFOLD (M62)** .

Removal

Removal of cylinder head is described separately from installation.

Remove left camshaft adjustment unit,

refer to **11 36 610 REMOVING AND INSTALLING/REPLACING LEFT CAMSHAFT ADJUSTMENT**

UNIT (M62 VANOS FROM 9/98) .

Pull back special tool 11 5 180 until flywheel is no longer secured in place.

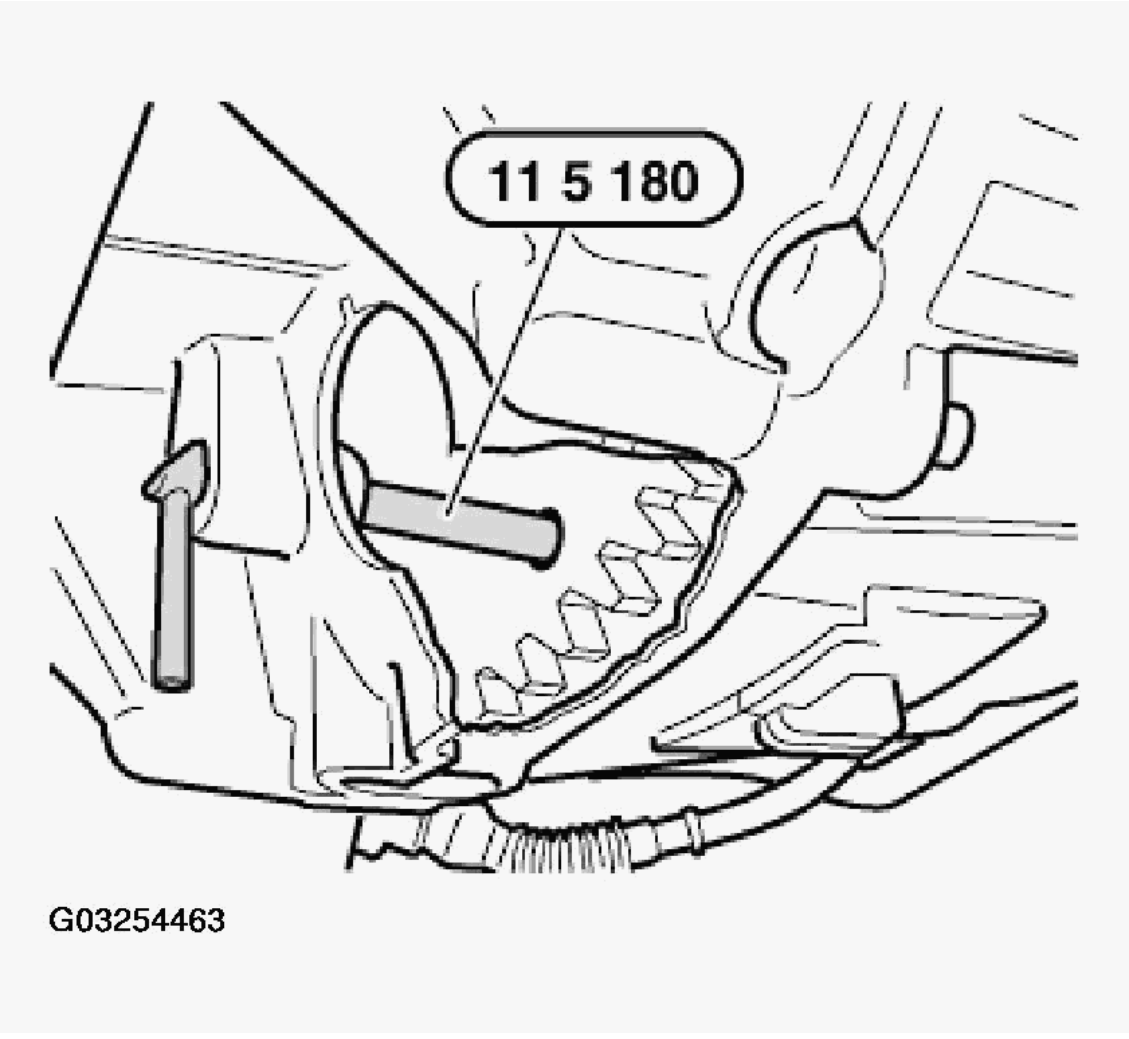


Fig. 34: Pulling Back On Special Tool 11 5 180
Courtesy of BMW OF NORTH AMERICA, INC.

Lift timing chain and hold under tension.

NOTE: Note marks.

Crank engine at central bolt against direction of rotation to 45° before TDC position.

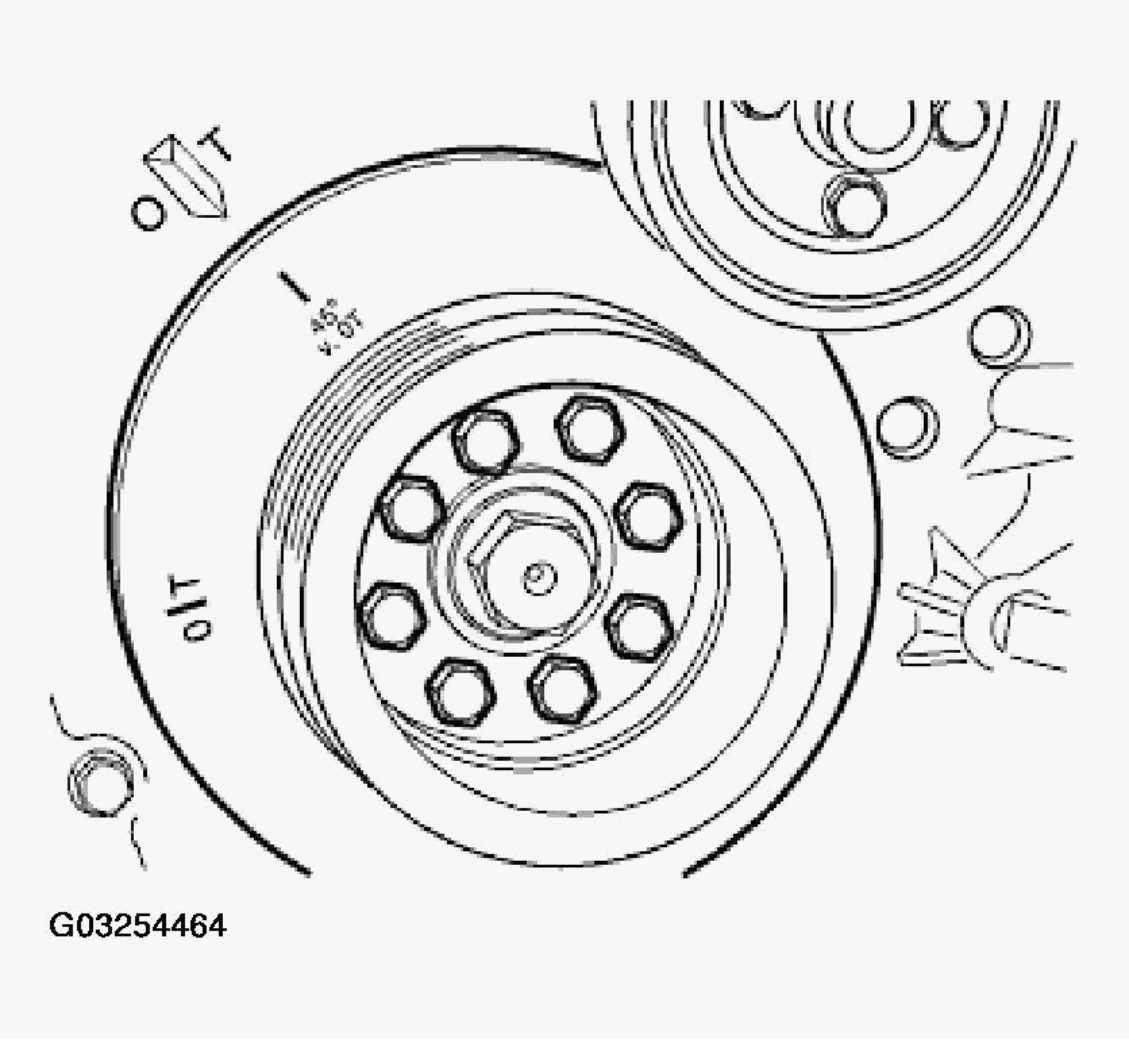


Fig. 35: Placing Crankshaft At 45° BTDC
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/443/442/446.

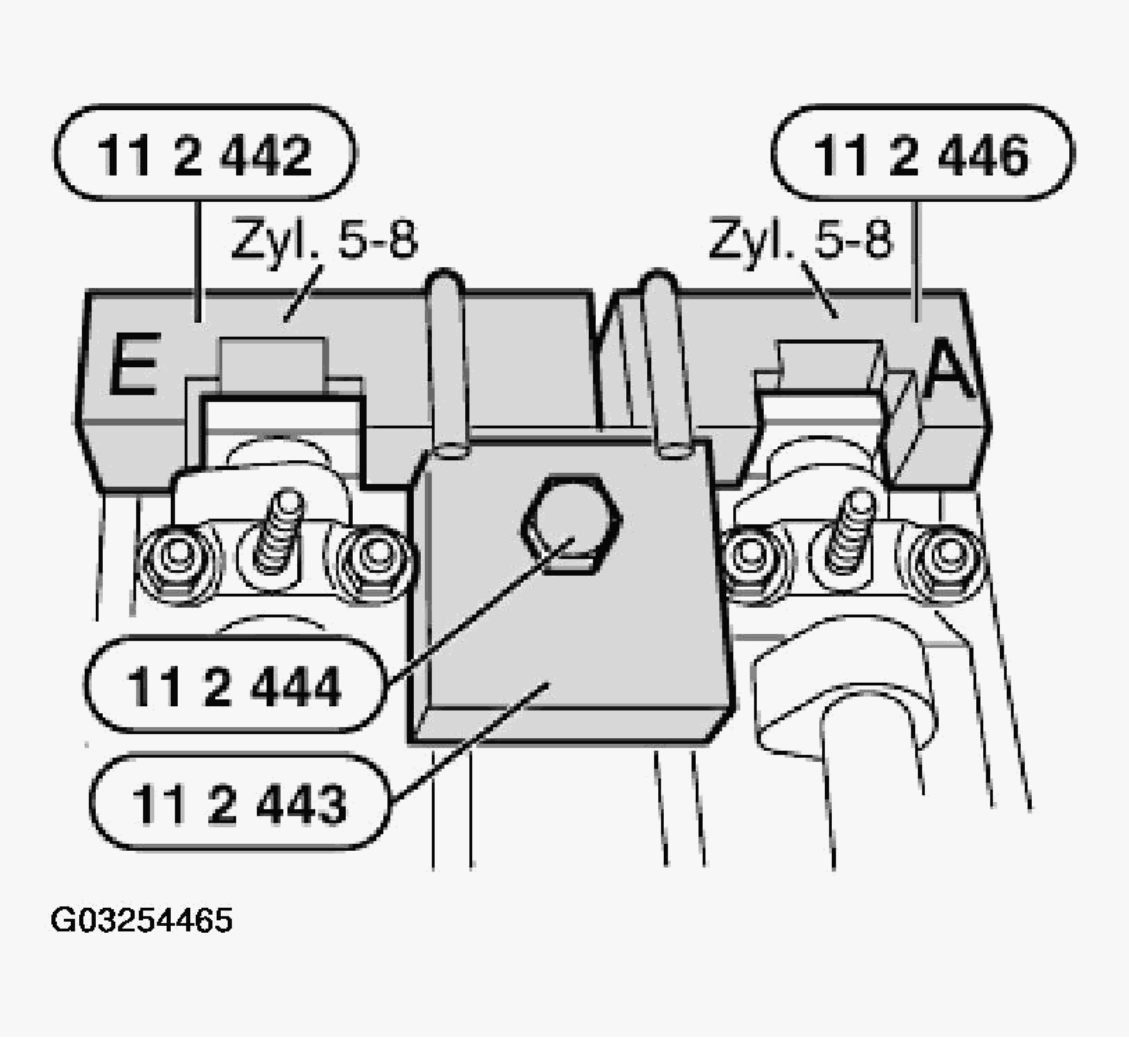


Fig. 36: Removing Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Detach guide rail from cylinder head.

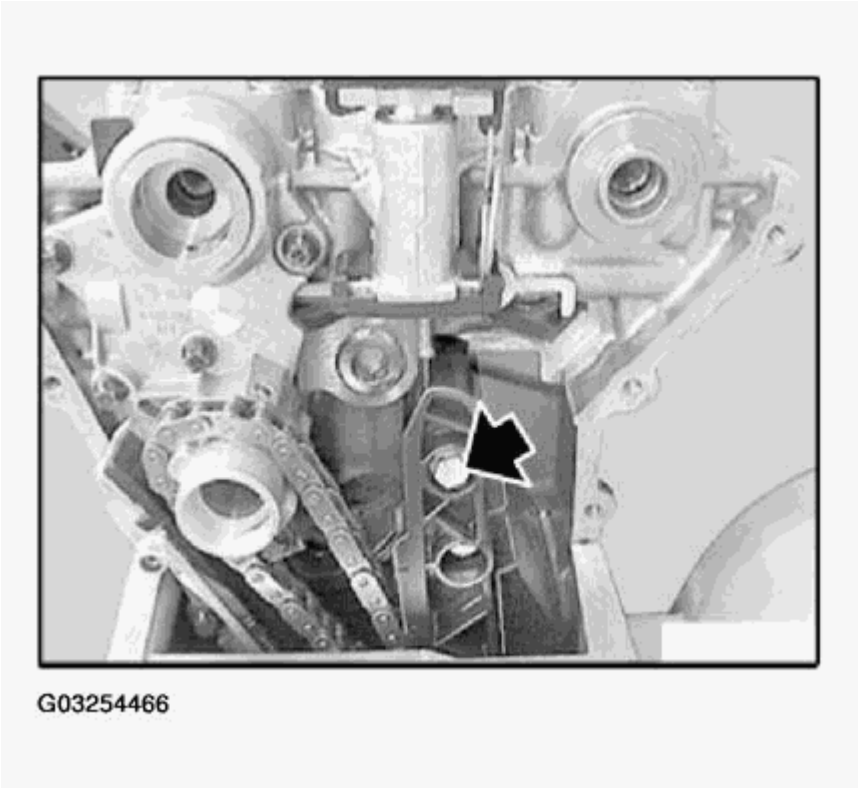


Fig. 37: Detaching Guide Rail From Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Release cylinder head bolts in sequence 10 to 1. Lift off cylinder head.

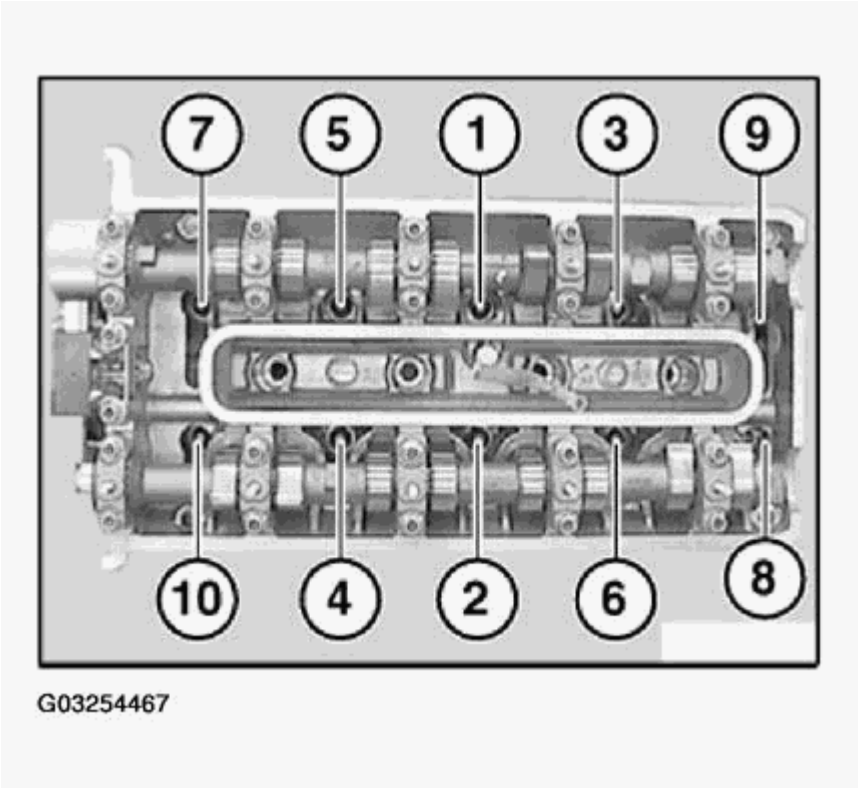


Fig. 38: Identifying Cylinder Head Bolts Releasing Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Installation of cylinder head is described separately from removal.

Clean sealing faces of cylinder head and engine block, if necessary using wooden scraper to remove gasket debris. Ensure that no gasket debris drops into the oil and coolant ducts.

Threaded bores in engine block must be free of dirt and oil (danger of cracking the block)

Coat joint between engine block and timing case cover with Drei Bond 1209.

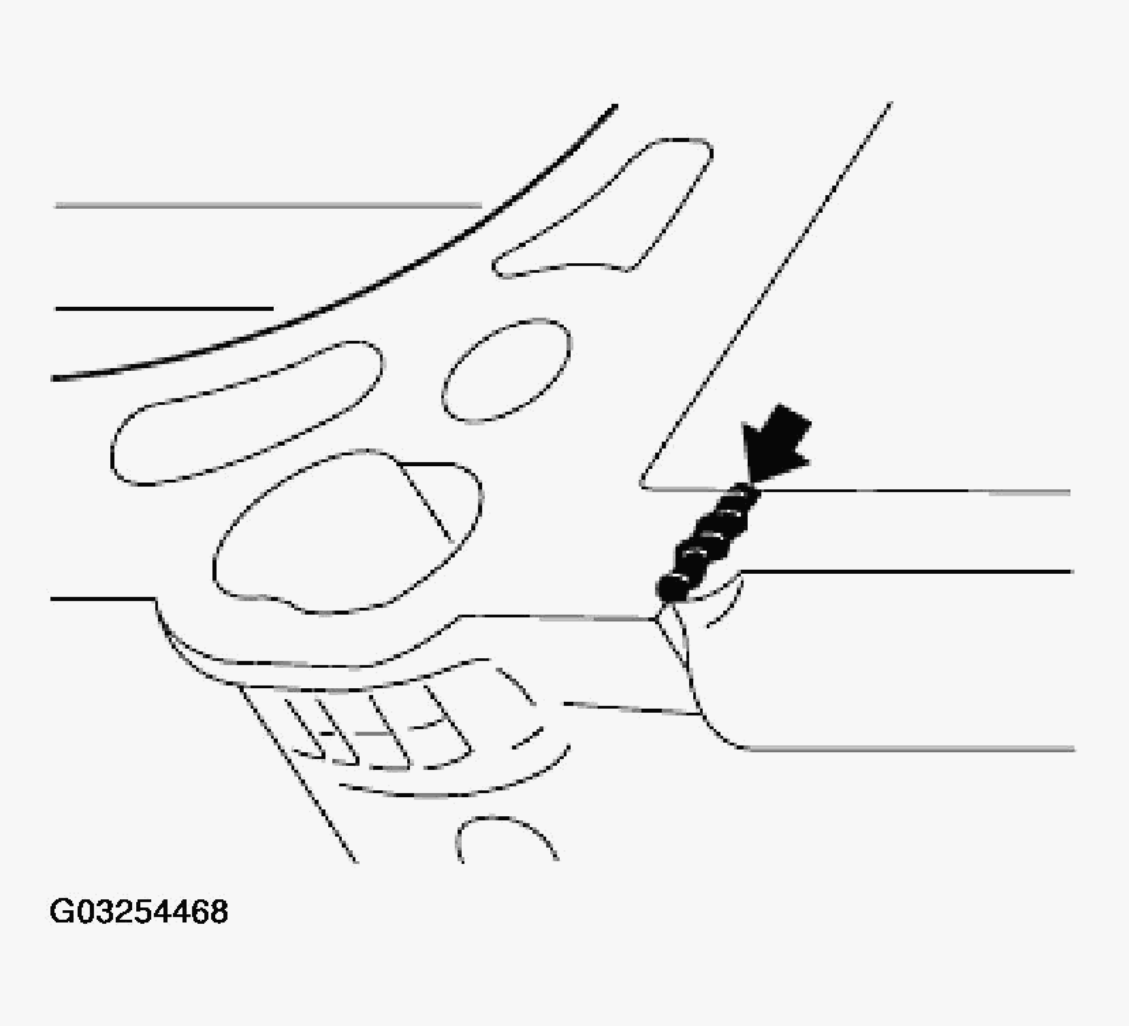


Fig. 39: Sealing Joint Between Engine Block And Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Check that dowel sleeves are undamaged and correctly located.

Place new cylinder head gasket in position.

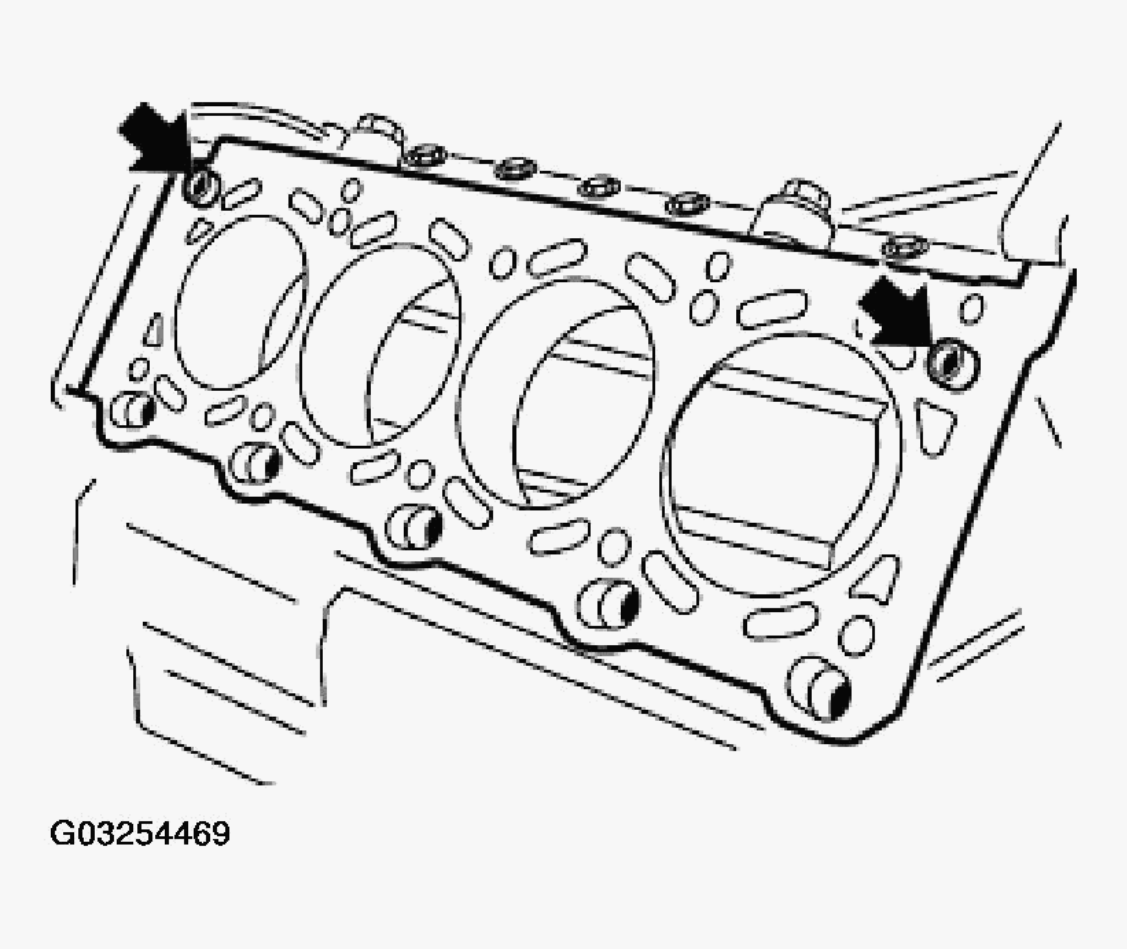


Fig. 40: Cylinder Head Gasket Installed Position
Courtesy of BMW OF NORTH AMERICA, INC.

Put the cylinder head on. Install new cylinder head bolts. Do not wash off bolt coating.

NOTE: Use special tool 00 9 120 as a torsion angle bracket.

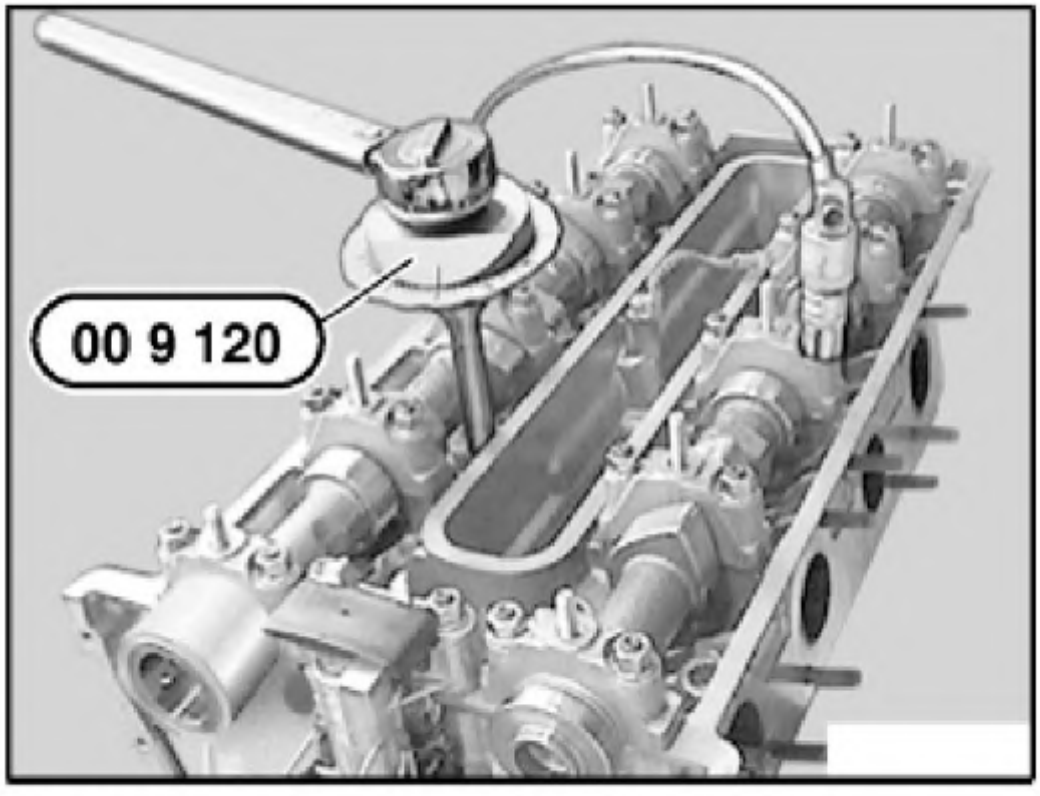


Fig. 41: Torquing Cylinder Head Bolts Using Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

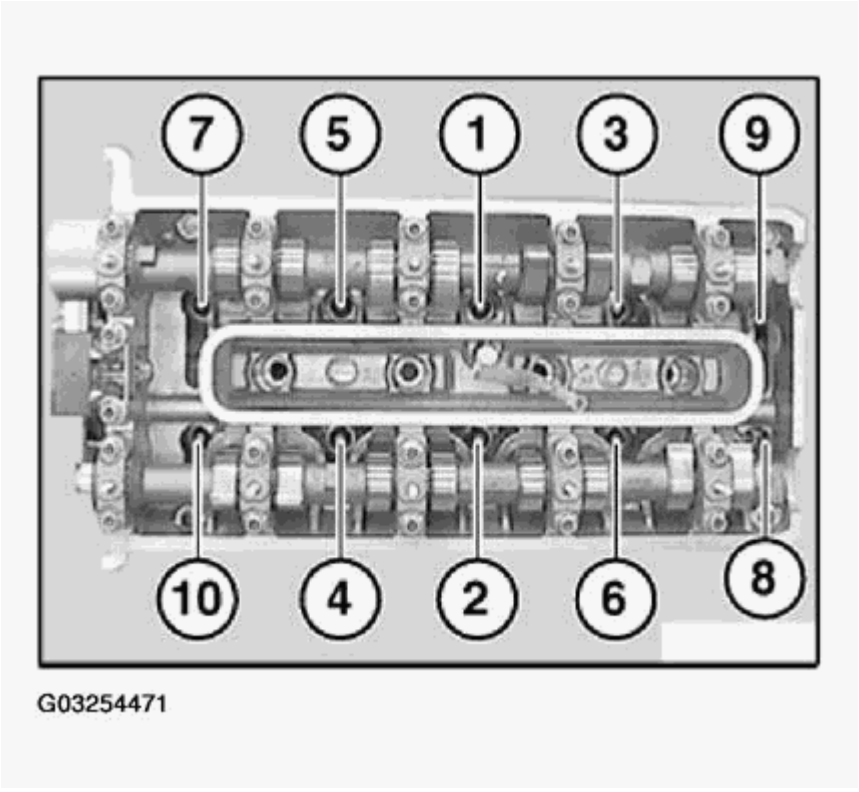


Fig. 42: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down cylinder head bolts in sequence 1 to 10. Tightening torque,

refer to 11 12 8AZ **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Insert and tighten down guide rail screw.

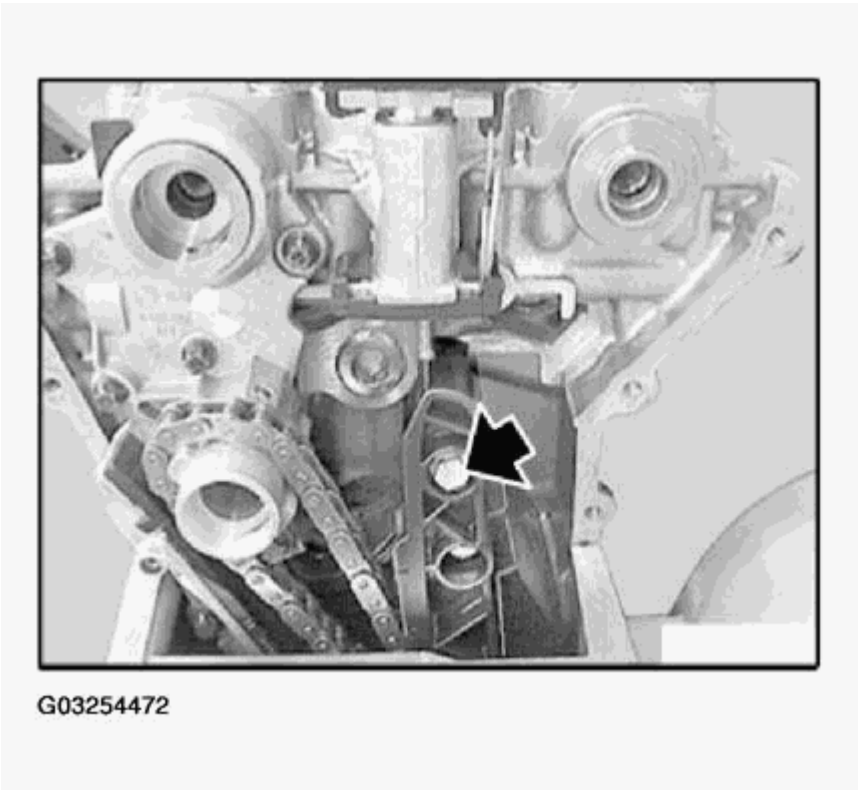


Fig. 43: Installing Guide Rail Screw
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

Rotate camshafts until camshaft markings face upwards.

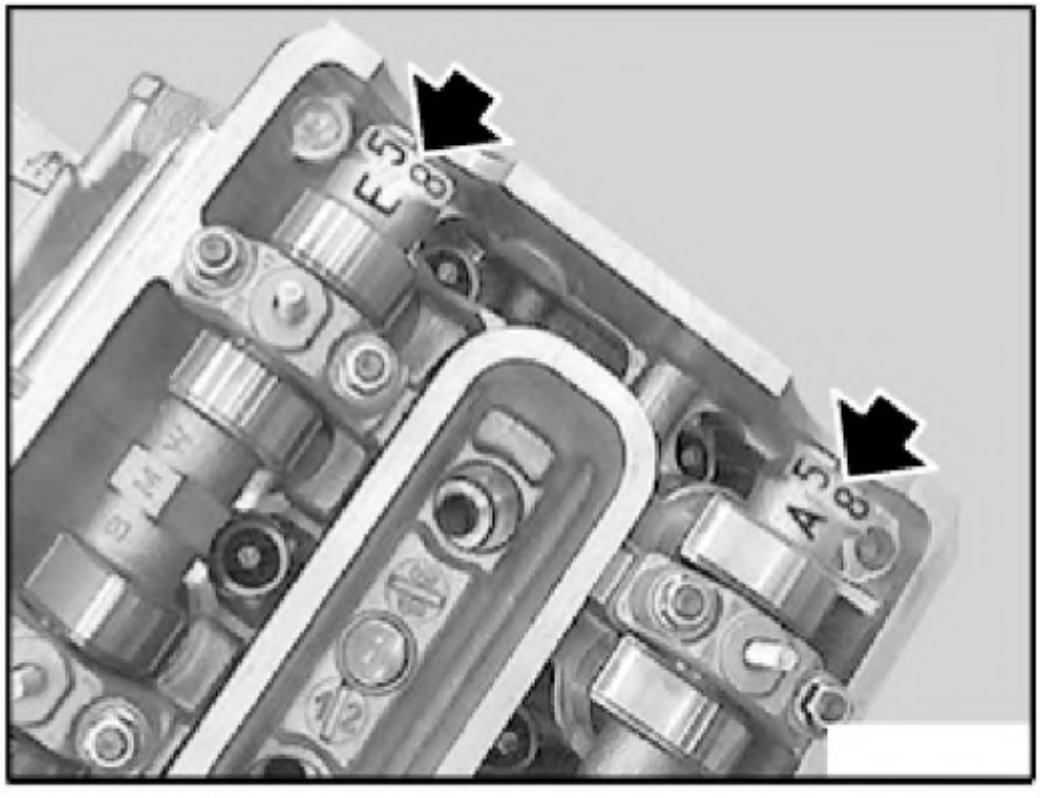


Fig. 44: Identifying Camshaft Markings
Courtesy of BMW OF NORTH AMERICA, INC.

Align camshafts.

Fit special tool 11 2 446/442 to camshafts on cylinder bank 5 to 8.

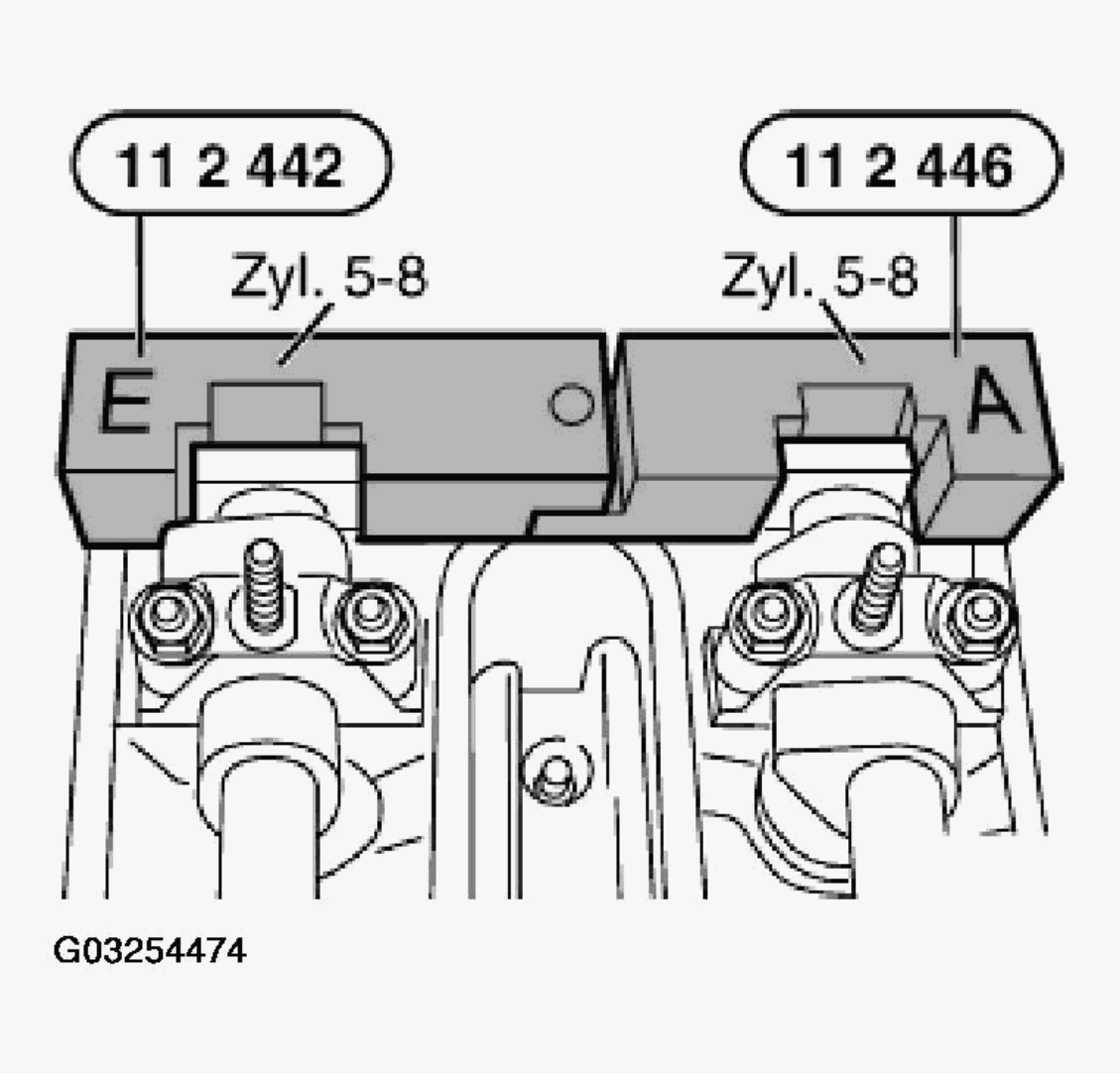


Fig. 45: Fitting Special Tools To Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

Align camshafts with an open-end wrench so that special tools 11 2 442/446 rest without a gap on the cylinder head.

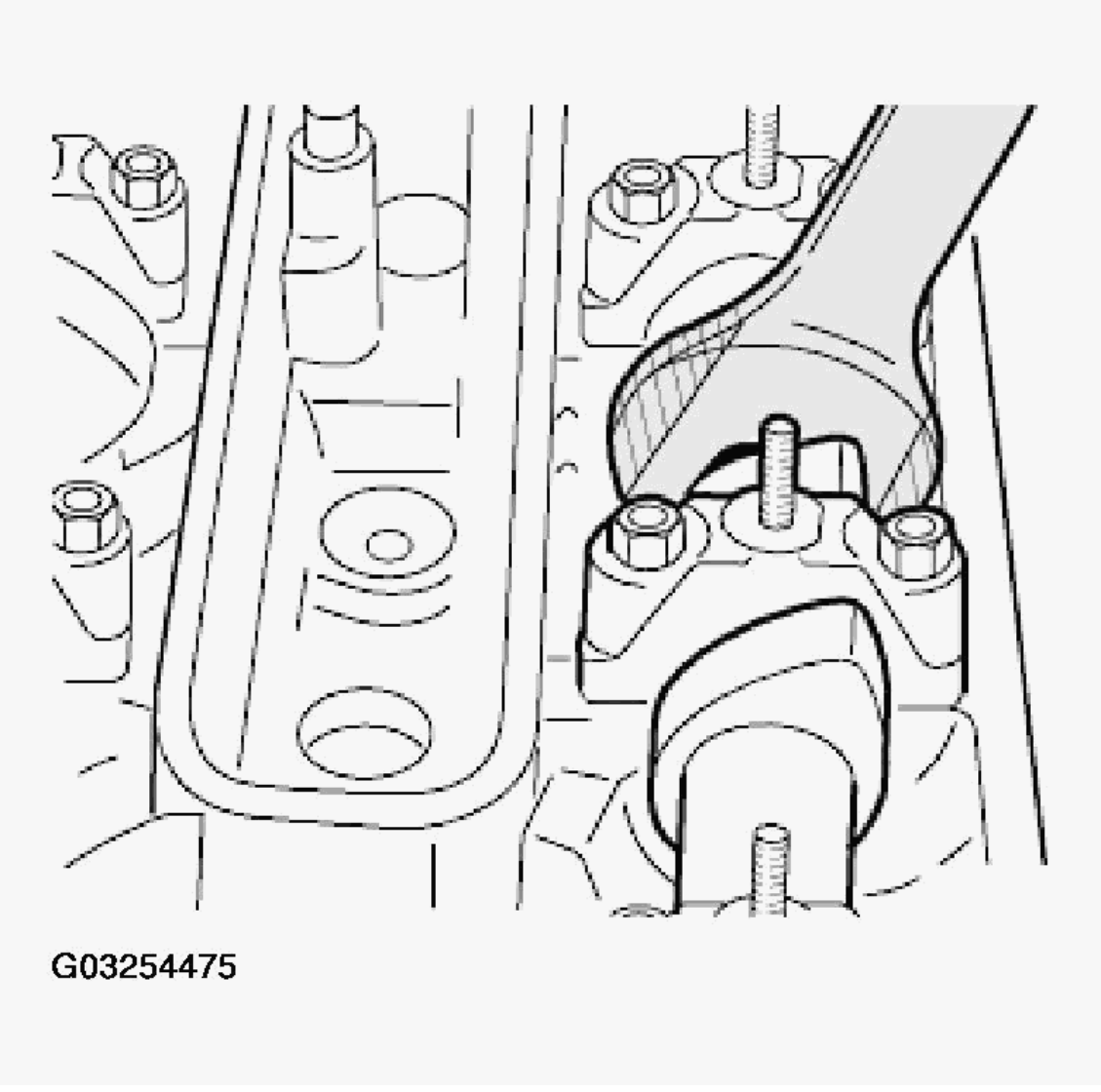


Fig. 46: Aligning Camshafts With An Open-End Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 2 443 to special tool 11 2 446/442 and secure with special tool 11 2 444 using the spark plug thread.

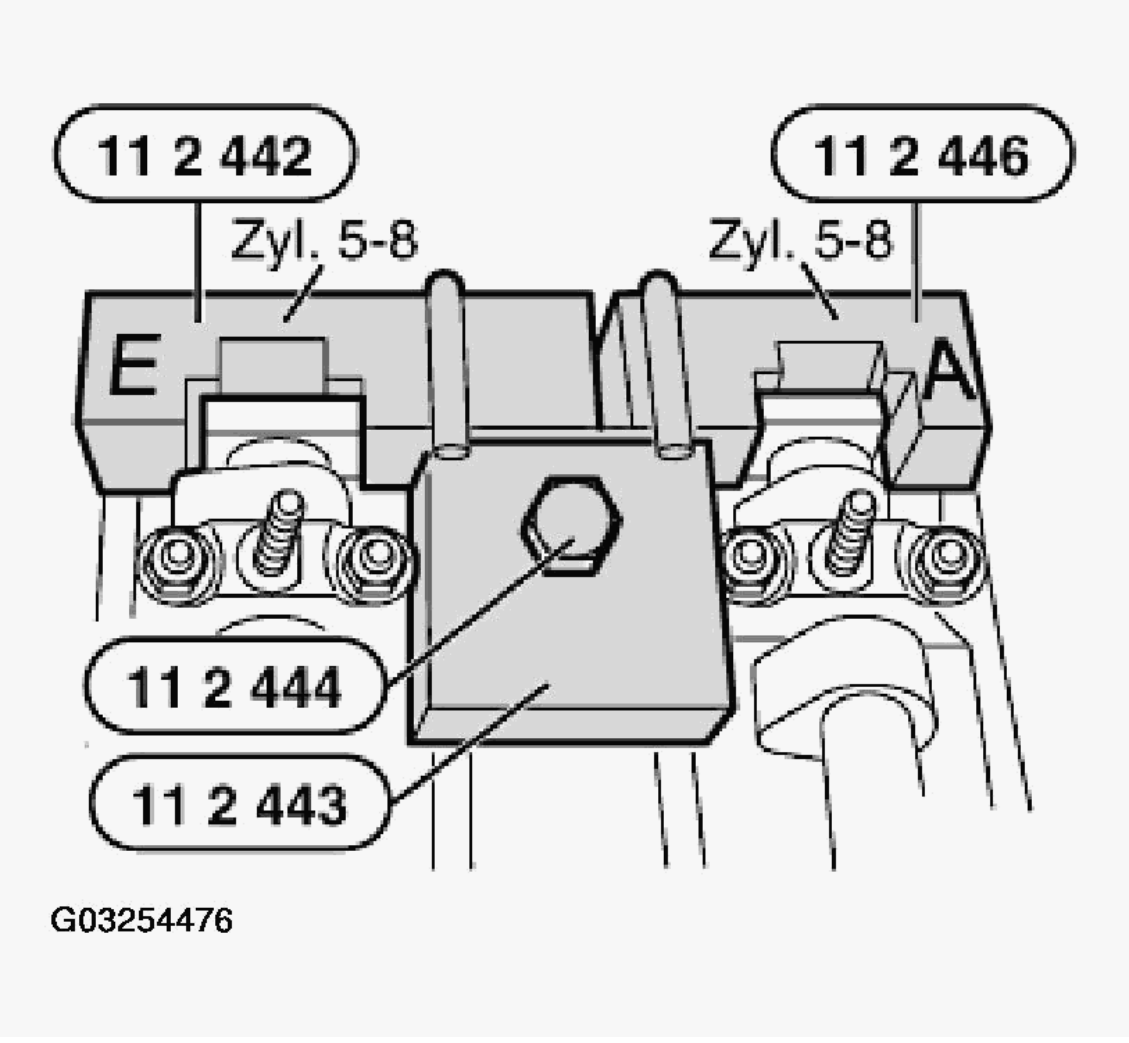


Fig. 47: Securing Fitting Of Special Tool 11 2 443 And 11 2 446/442 With Special Tool 11 2 444
Courtesy of BMW OF NORTH AMERICA, INC.

Lift timing chain and hold under tension.

Crank engine from 45° before TDC position in direction of rotation up to TDC position.

CAUTION: Remove special tool 11 5 180 before starting engine.

Secure crankshaft with special tool 11 5 180 in TDC position.

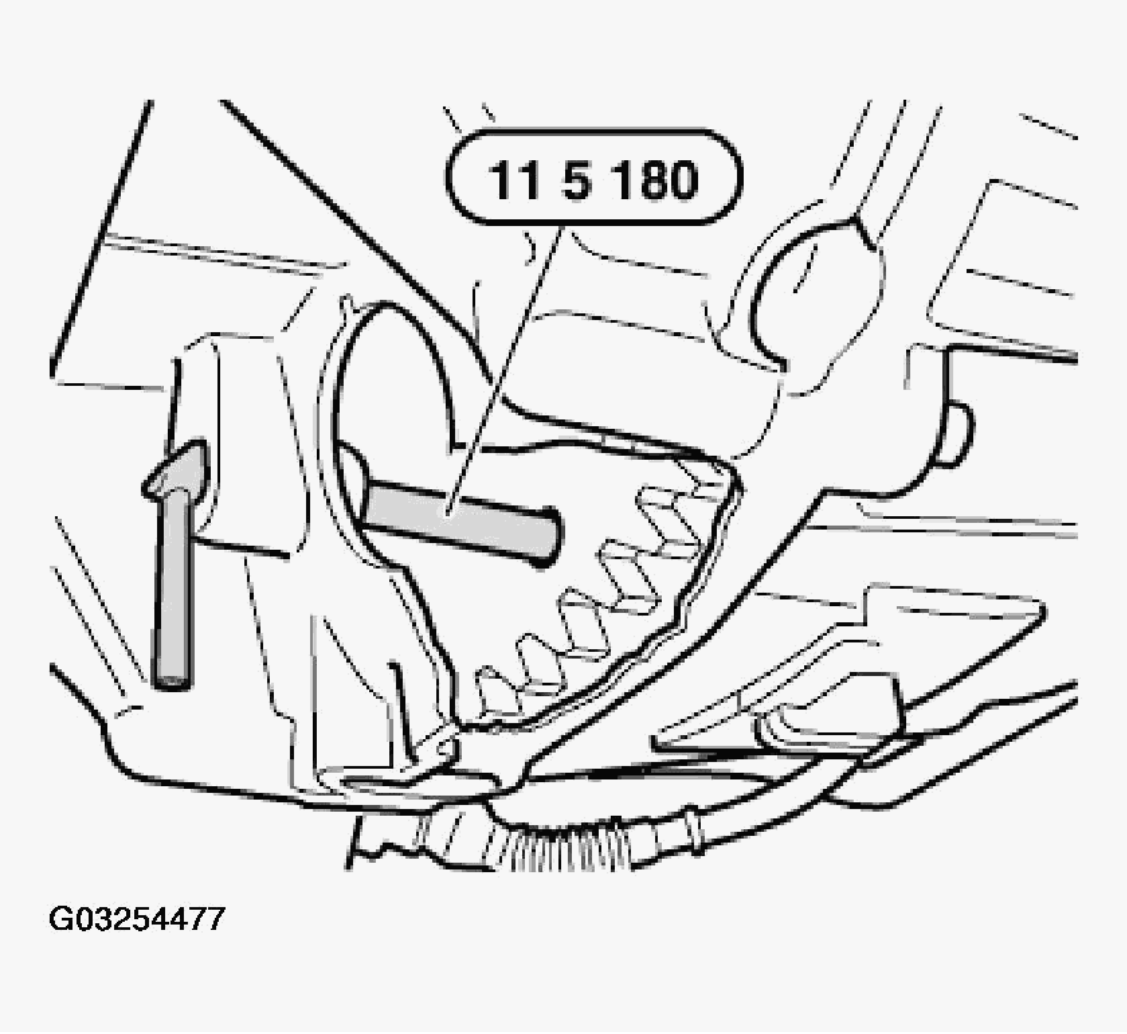


Fig. 48: Securing Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Install left camshaft adjustment unit,

refer to **11 36 610 REMOVING AND INSTALLING/REPLACING LEFT CAMSHAFT ADJUSTMENT UNIT (M62 VANOS FROM 9/98)** .

Assemble engine.

11 12 106 REMOVING AND INSTALLING RIGHT CYLINDER HEAD (M62 VANOS FROM 9/98)

Cylinder bank 1 to 4.

Remove right exhaust manifold, refer to **11 62 065 REMOVING AND INSTALLING/REPLACING RIGHT EXHAUST MANIFOLD (M62/N62)** .

Unfasten drain plug for coolant on right engine block. Drain and dispose of coolant.

Installation:

Replace sealing ring.

Tightening torque, refer to 11 11 5AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Top up coolant. Vent cooling system and check for leaks,

refer to **17 00 005 DRAINING AND TOPPING UP COOLANT (M62)** .

Remove both cylinder head covers, refer to **11 12 004 REMOVING AND INSTALLING/SEALING BOTH CYLINDER HEAD COVERS (M62)** .

Remove spark plugs, refer to **12 12 011 REPLACING ALL SPARK PLUGS (M60, M62** .

Remove fan clutch with fan impeller, refer to **11 52 020 REMOVING AND INSTALLING OR REPLACING FAN COUPLING (M62)** .

Remove intake air manifold, refer to **11 61 050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (M62)** .

Remove coolant manifold, refer to **11 53 325 REMOVING AND INSTALLING/REPLACING COOLANT MANIFOLD (M62)** .

Removal

Removal of cylinder head is described separately from installation.

Remove right camshaft adjustment unit, refer to **11 36 615 REMOVING AND INSTALLING/REPLACING RIGHT CAMSHAFT ADJUSTMENT UNIT (M62 VANOS FROM 9/98)** .

E53

Pull back special tool 11 5 180 until flywheel is no longer secured in place.

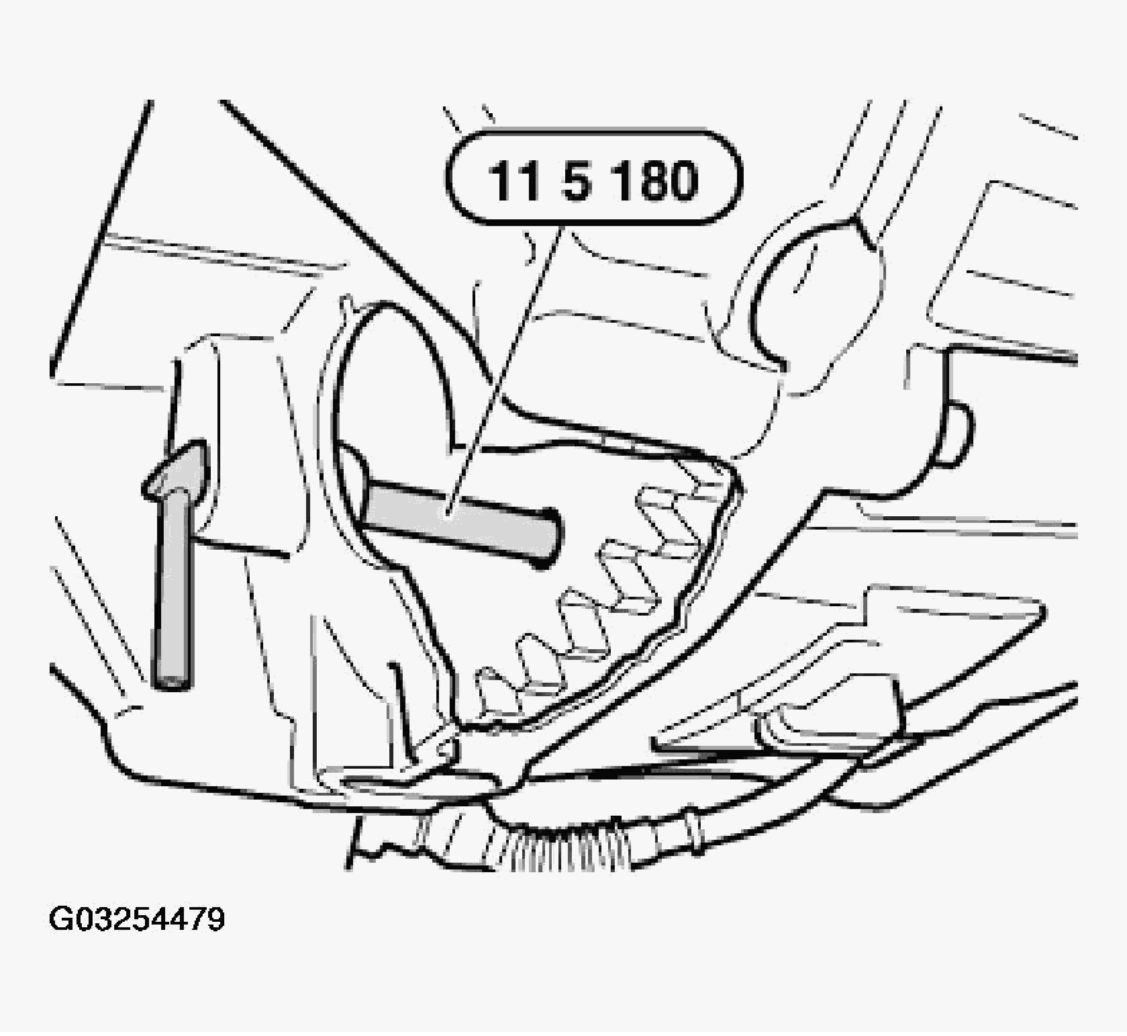


Fig. 49: Installing Special Tool 11 5 180 To Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

Lift timing chain and hold under tension.

NOTE: Note marks.

Crank engine at central bolt against direction of rotation to 45° before TDC position.

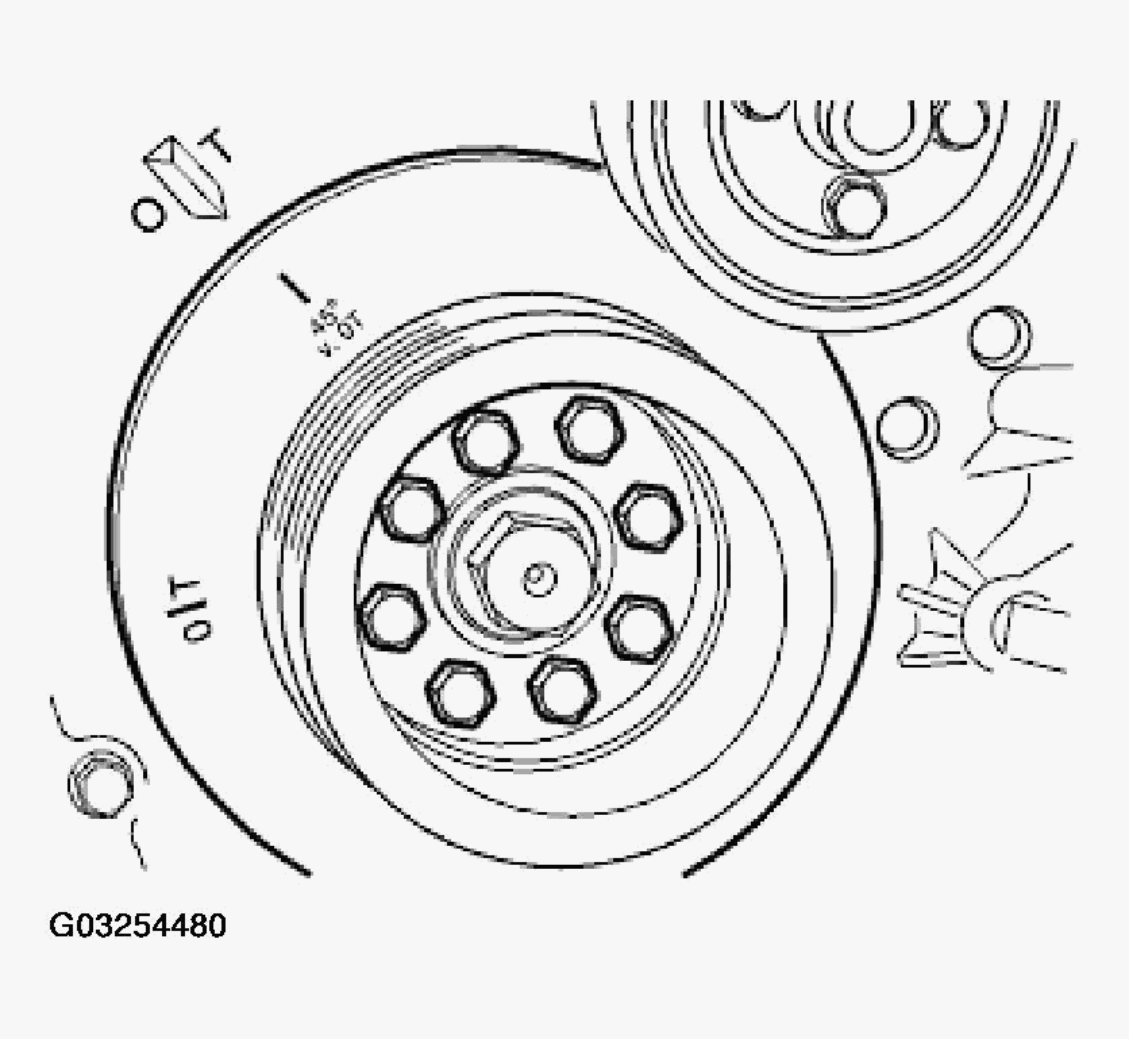


Fig. 50: Turning Crankshaft To 45° BTDC
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/443/445/441.

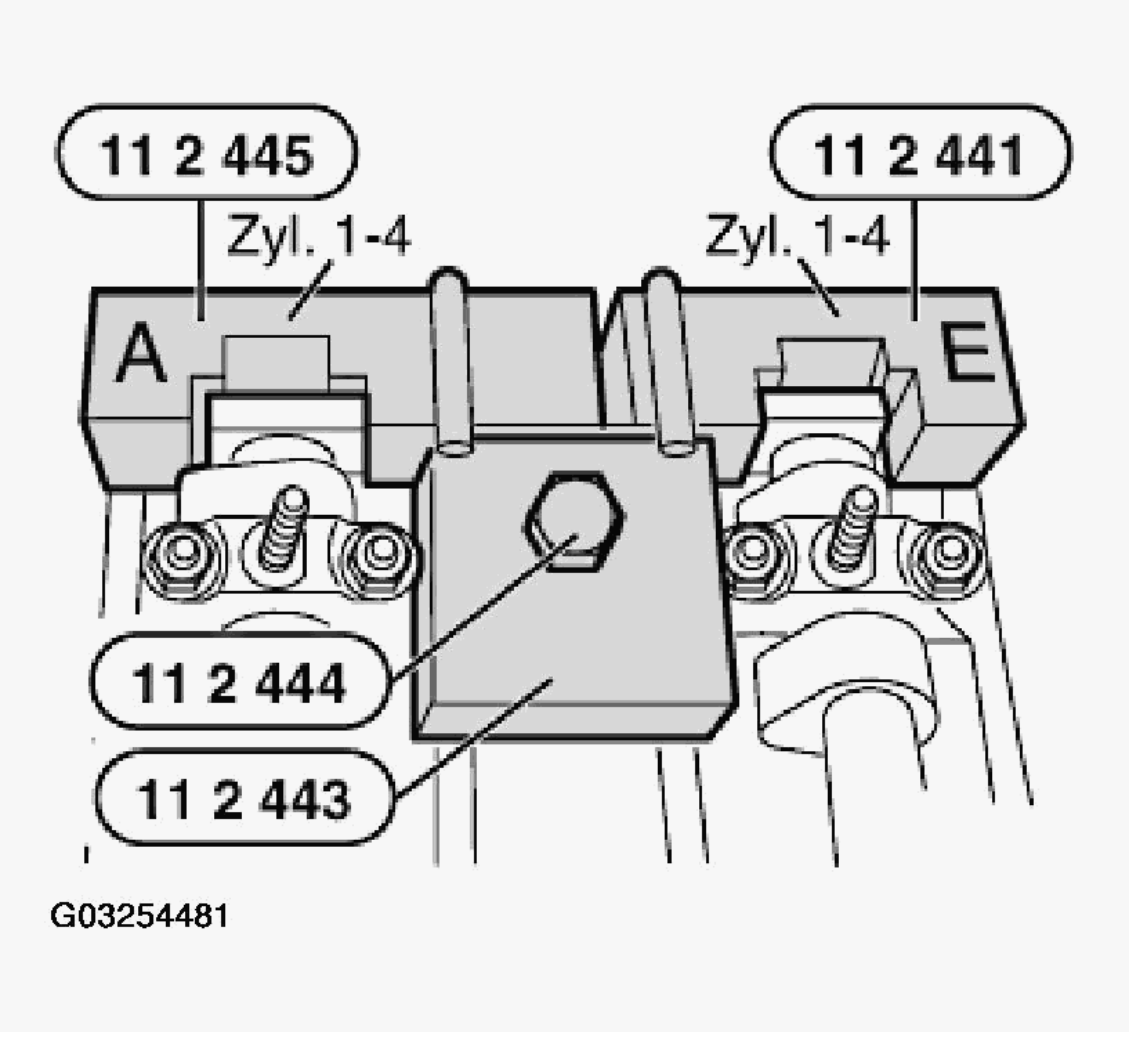


Fig. 51: Removing Special Tools 11 2 444/443/445/441
Courtesy of BMW OF NORTH AMERICA, INC.

Release cylinder head bolts in sequence 10 to 1. Lift off cylinder head.

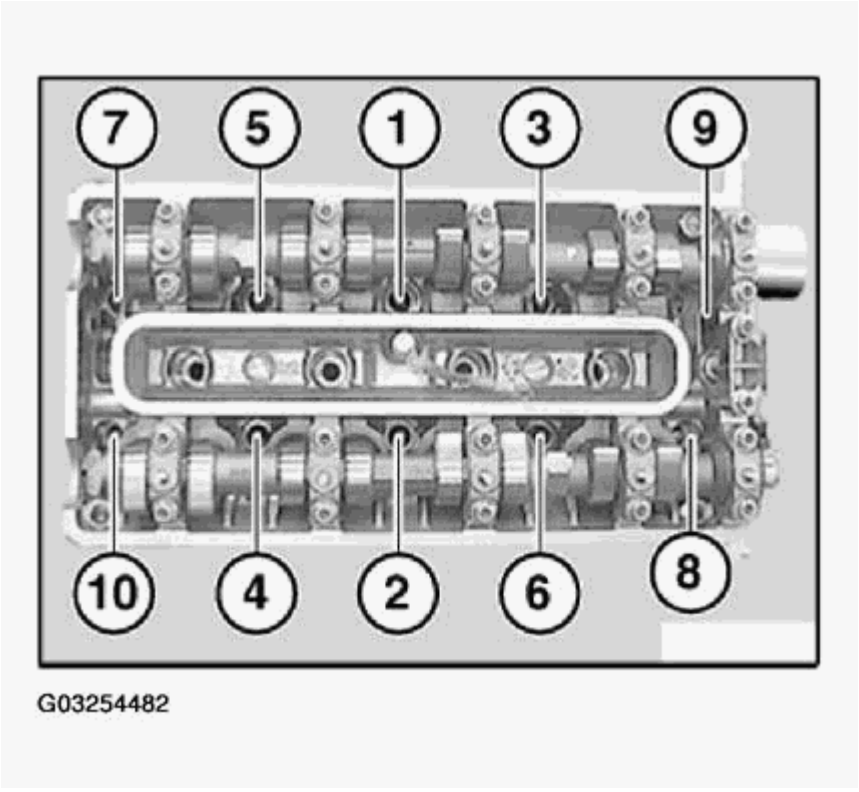


Fig. 52: Cylinder Head Bolt Releasing Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Installation of cylinder head is described separately from removal.

Clean sealing faces of cylinder head and engine block, if necessary using wooden scraper to remove gasket debris. Ensure that no gasket debris drops into the oil and coolant ducts.

Threaded bores in engine block must be free of dirt and oil (danger of cracking).

Coat joint between engine block and timing case cover with Drei Bond 1209.

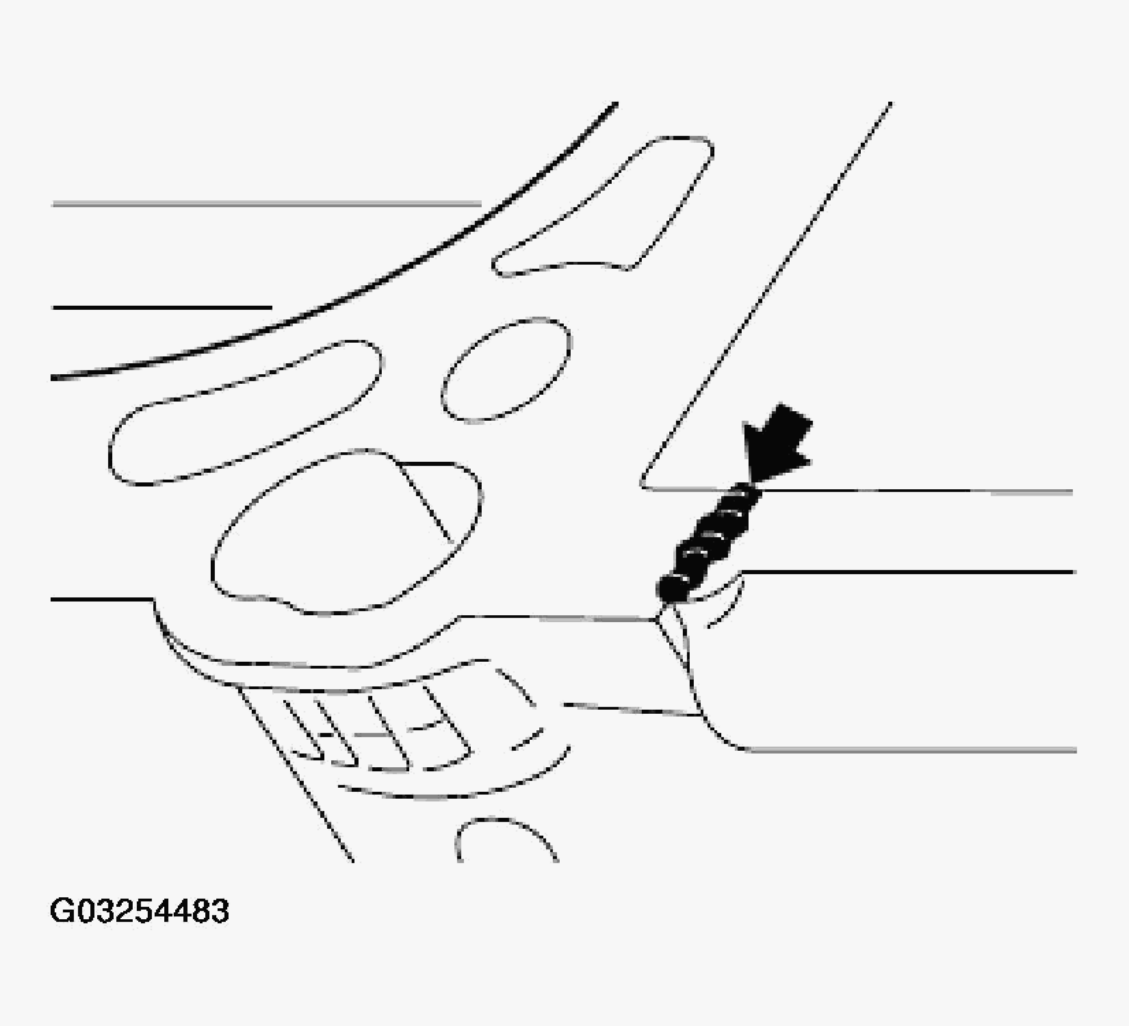


Fig. 53: Sealing Joint Between Engine Block And Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Check that dowel sleeves are undamaged and correctly located.

Place new cylinder head gasket in position.

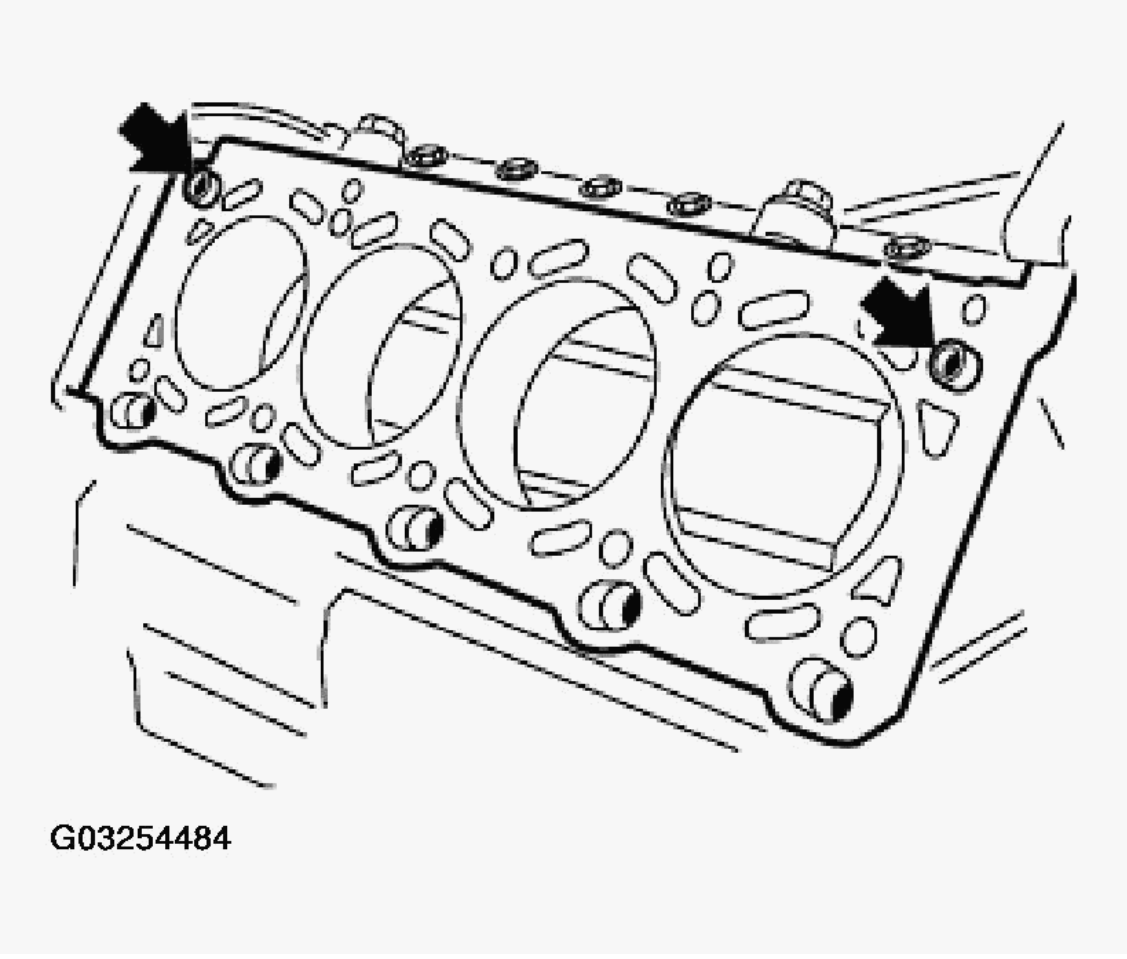


Fig. 54: Cylinder Head Gasket Installed Position
Courtesy of BMW OF NORTH AMERICA, INC.

Put the cylinder head on. Install new cylinder head bolts. Do not wash off bolt coating.

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

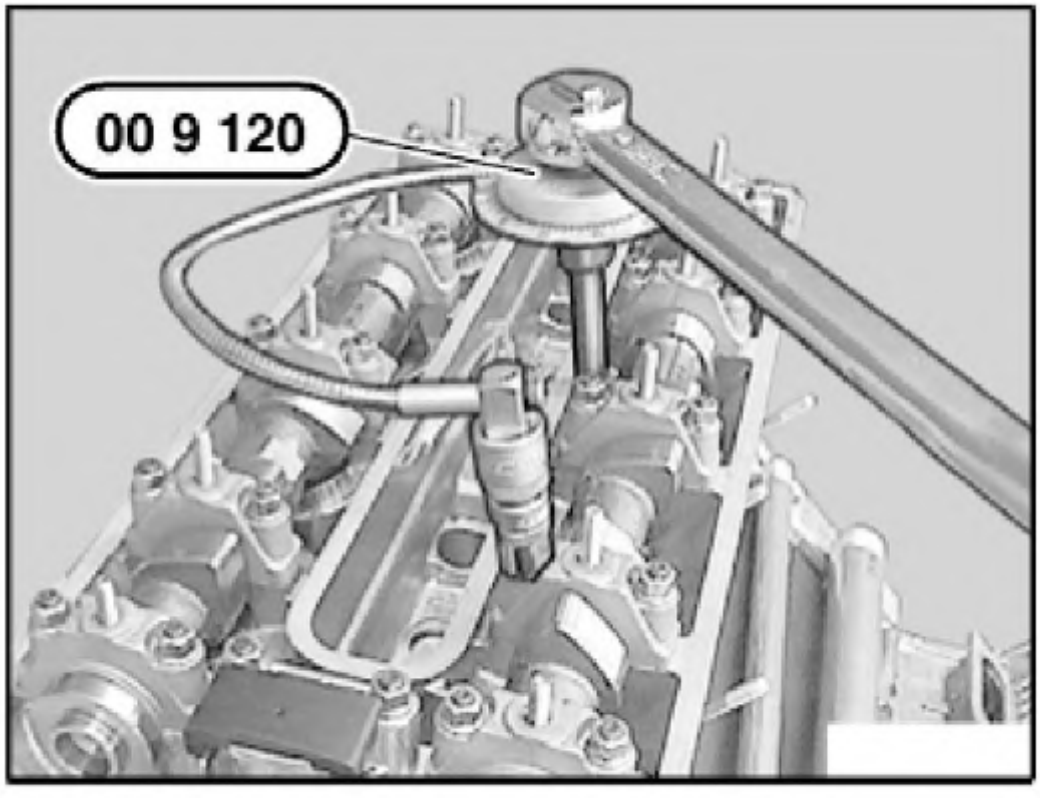


Fig. 55: Installing Cylinder Head Bolts Using Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

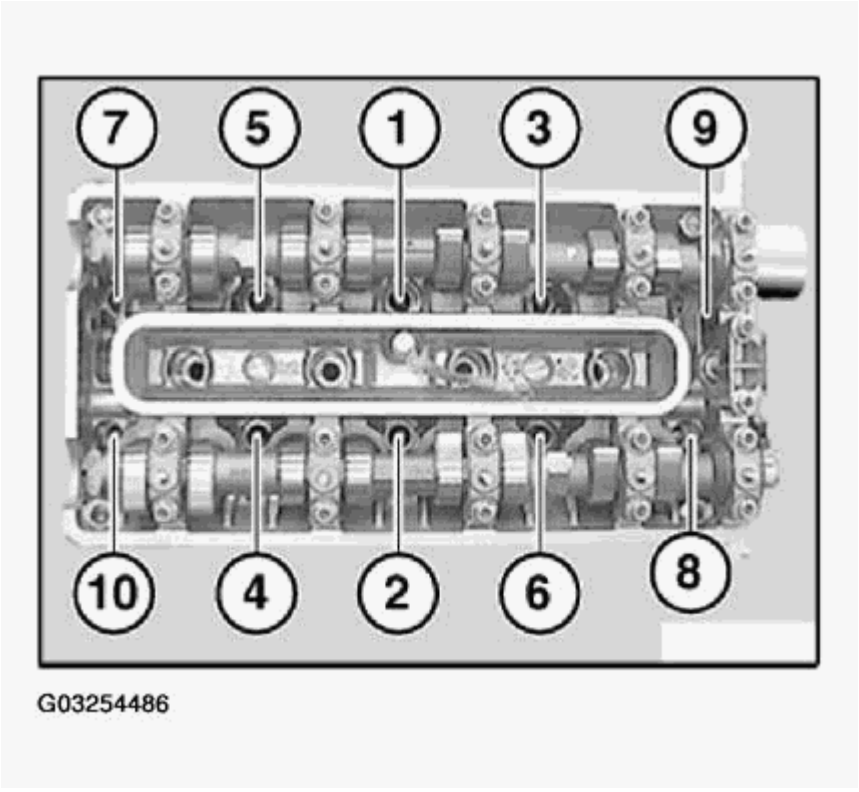


Fig. 56: Identifying Cylinder Head Bolt Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down cylinder head bolts in sequence 1 to 10.

Tightening torque, refer to 11 12 8AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

CAUTION: Do not damage the cylinder head.

Rotate camshafts until camshaft markings face upwards.

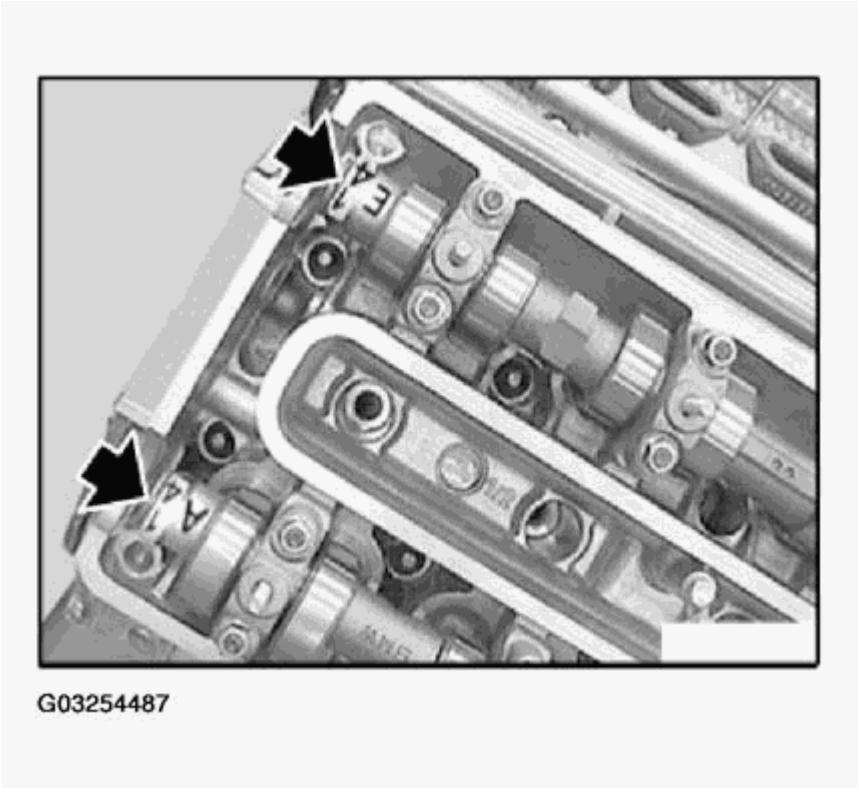


Fig. 57: Identifying Camshaft Markings
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 2 445/441 to camshafts on cylinder bank 1 to 4.

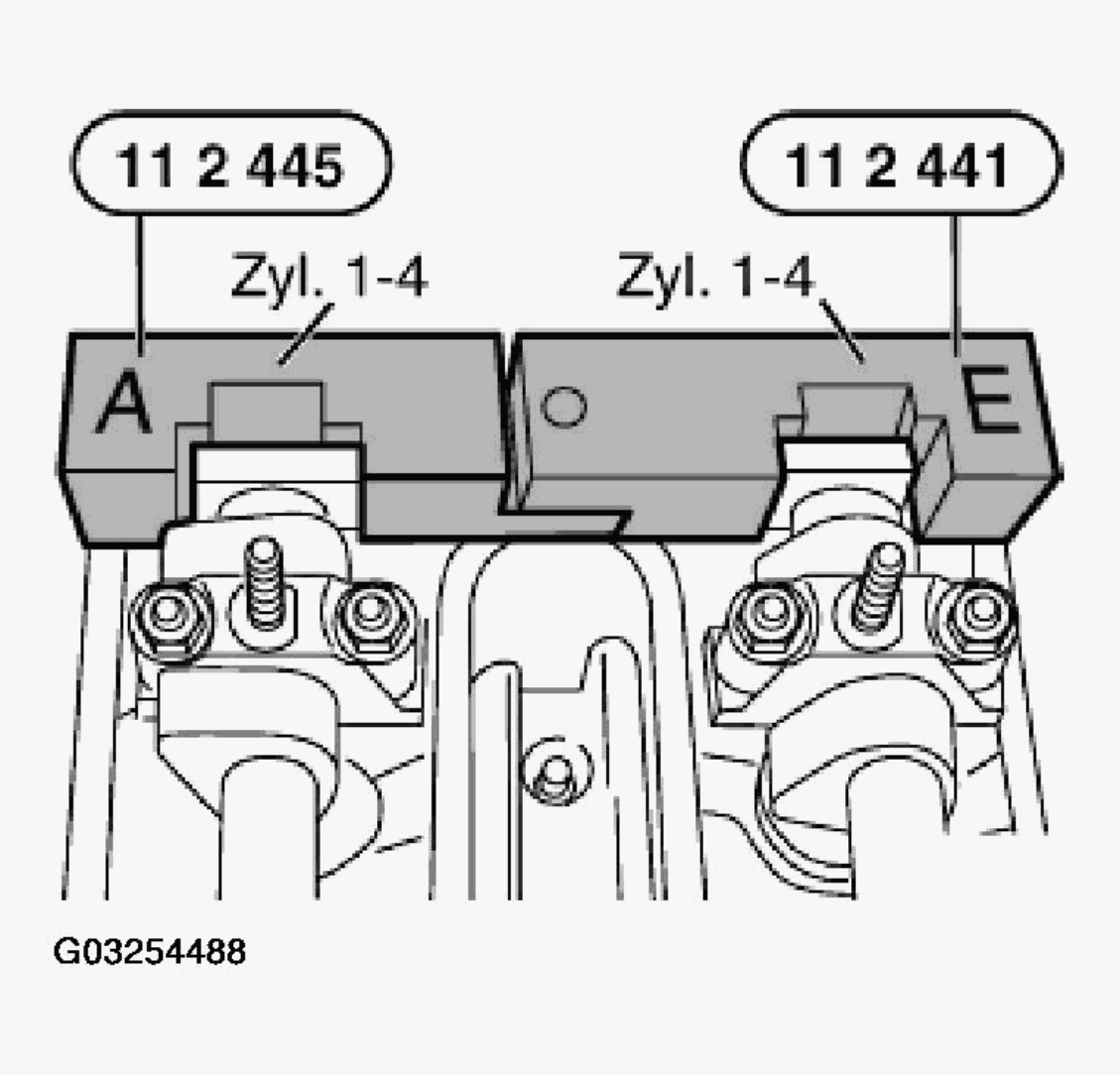


Fig. 58: Fitting Special Tool 11 2 445/441 To Camshafts (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

Align camshafts with an open-end wrench so that special tools 11 2 441/445 rest without a gap on the cylinder head.

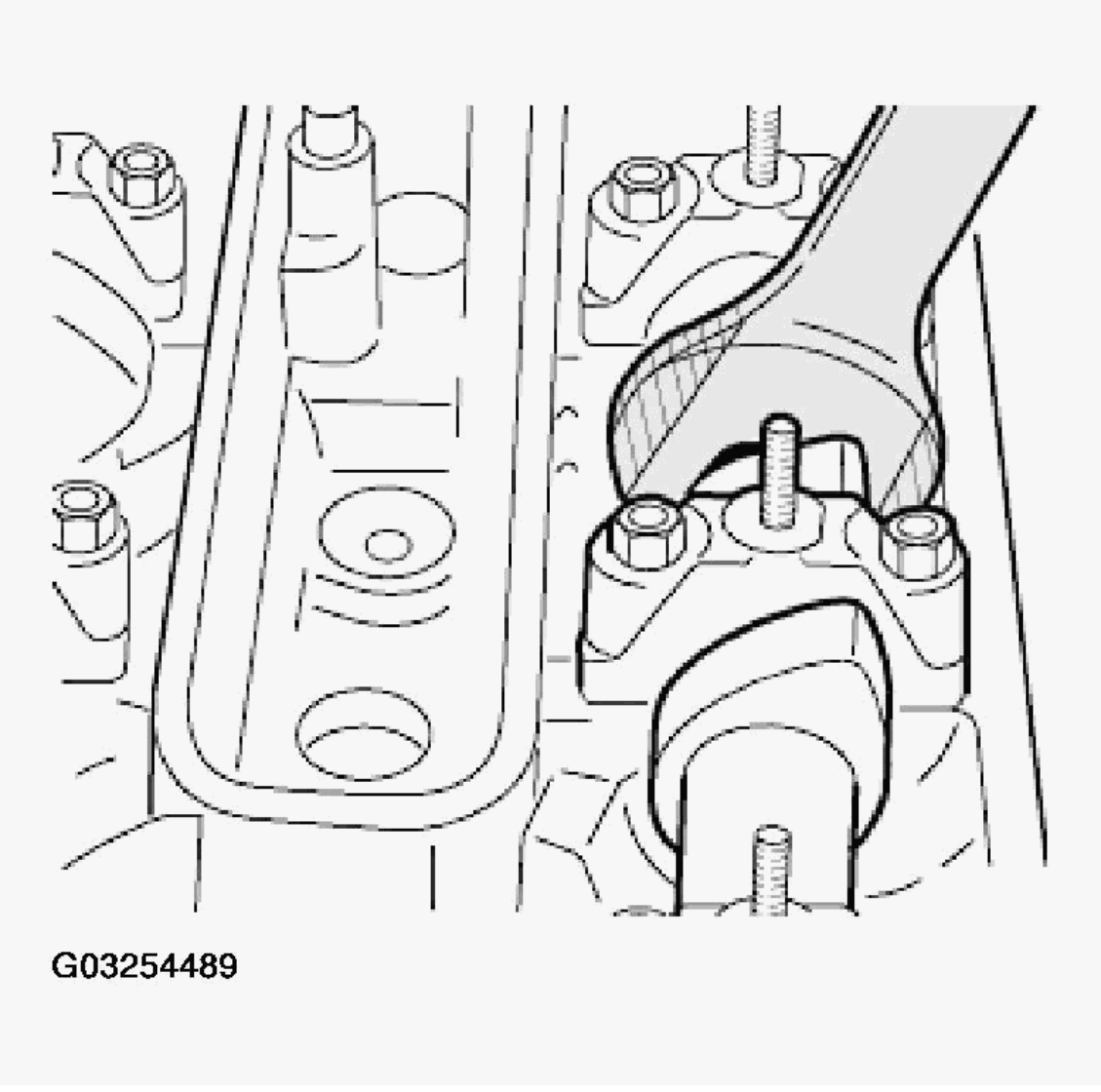


Fig. 59: Aligning Camshafts With An Open-End Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 2 443 to special tool 11 2 445/441 and secure with special tool 112 444 using the spark plug thread.

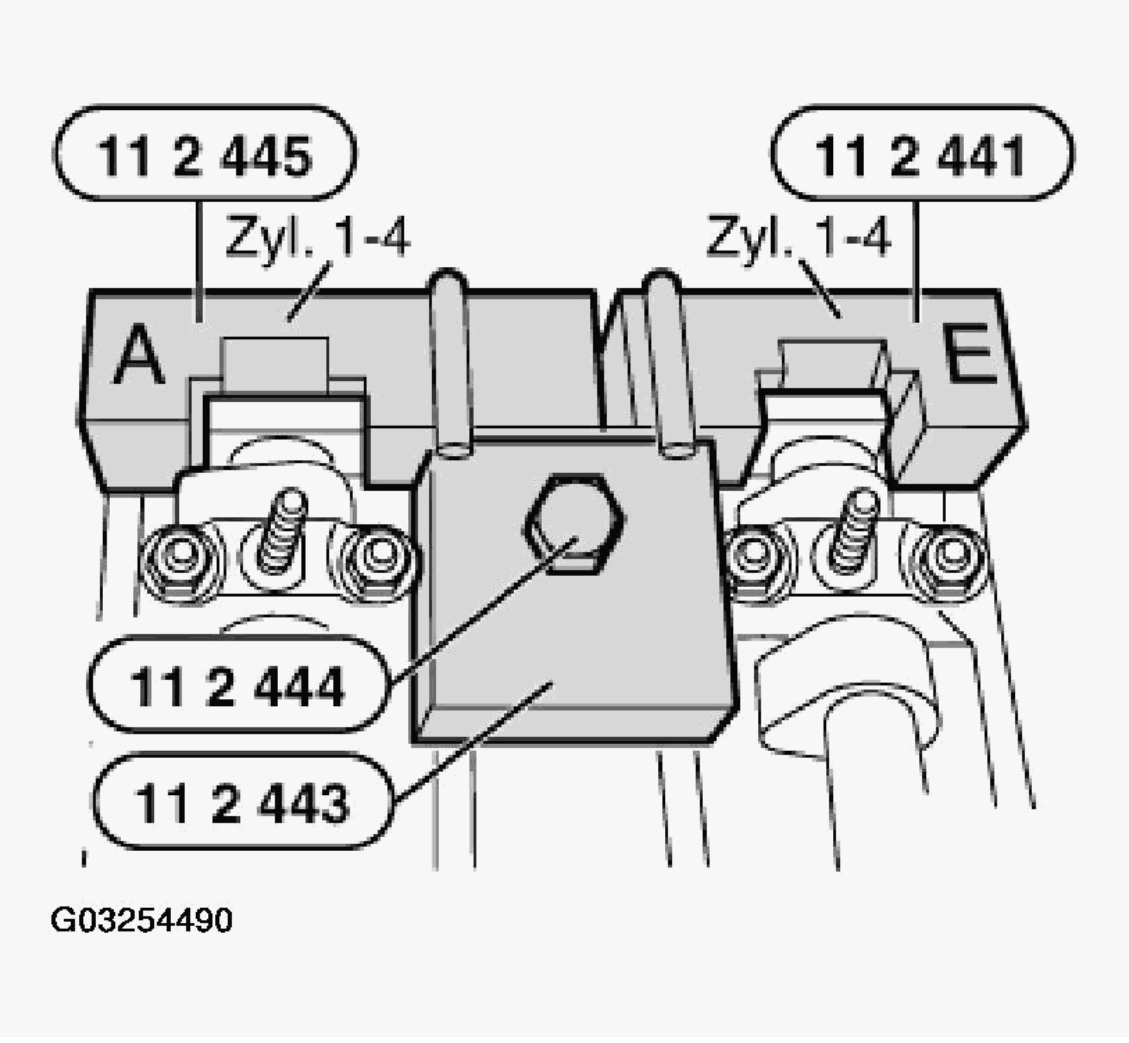


Fig. 60: Fitting Special Tool 11 2 443 To Special Tool 11 2 445/441
Courtesy of BMW OF NORTH AMERICA, INC.

E53 (X5)

Lift timing chain and hold under tension.

Crank engine from 45° before TDC position in direction of rotation up to TDC position.

Secure crankshaft with special tool 11 5 180 in TDC position.

CAUTION: Remove special tool 11 5 180 before starting engine.

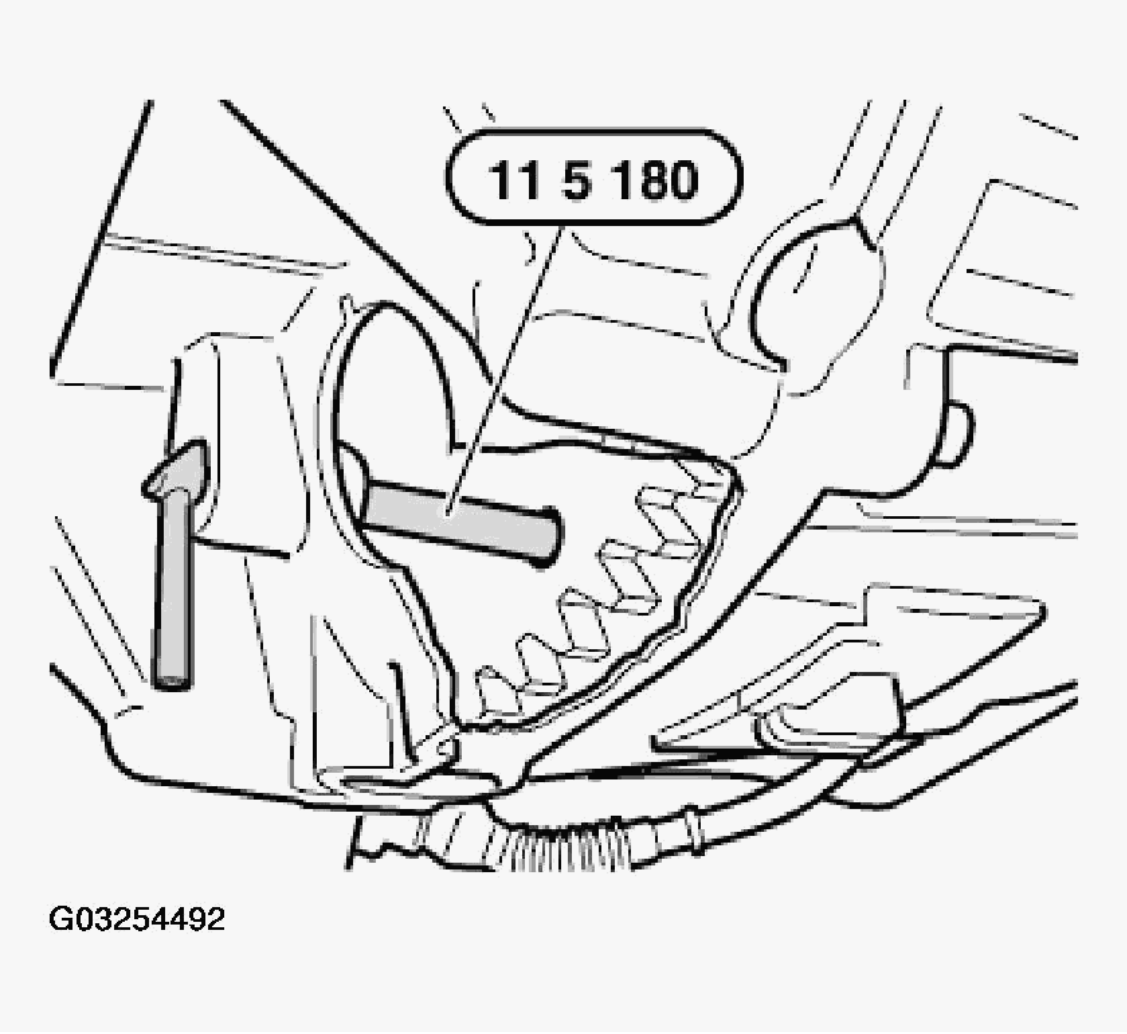


Fig. 61: Securing Crankshaft In TDC Position
Courtesy of BMW OF NORTH AMERICA, INC.

Install right camshaft adjustment unit, refer to **11 36 615 REMOVING AND INSTALLING/REPLACING RIGHT CAMSHAFT ADJUSTMENT UNIT (M62 VANOS FROM 9/98)** . Assemble engine.

11 12 107 REMOVING AND INSTALLING BOTH CYLINDER HEADS (M62)

Remove both cylinder heads.

These tasks are described in the work step Removing and installing right/left cylinder head, refer to **11 12 105 REMOVING AND INSTALLING LEFT CYLINDER HEAD (M62)** and **11 12 106 REMOVING AND INSTALLING RIGHT CYLINDER HEAD (M62 VANOS FROM 9/98)** .

11 12 110 REPLACING LEFT CYLINDER HEAD GASKET (M62/S62/N62)

Cylinder bank 5 to 8.

This task is described in **11 12 105 REMOVING AND INSTALLING LEFT CYLINDER HEAD (M62)** .

11 12 111 REPLACING RIGHT CYLINDER HEAD GASKET (M62/S62/N62)

Cylinder bank 1 to 4.

This task is described in **11 12 106 REMOVING AND INSTALLING RIGHT CYLINDER HEAD (M62 VANOS FROM 9/98)** .

11 12 503 DISMANTLING AND REASSEMBLING CYLINDER HEAD (M62)

NOTE: For Special Tool identification, see ENGINE - SPECIAL TOOLS - X5 (4.4L & 4.6L) .

Cylinder head removed.

Screw special tool 11 0 213 to special tool 11 1 065.

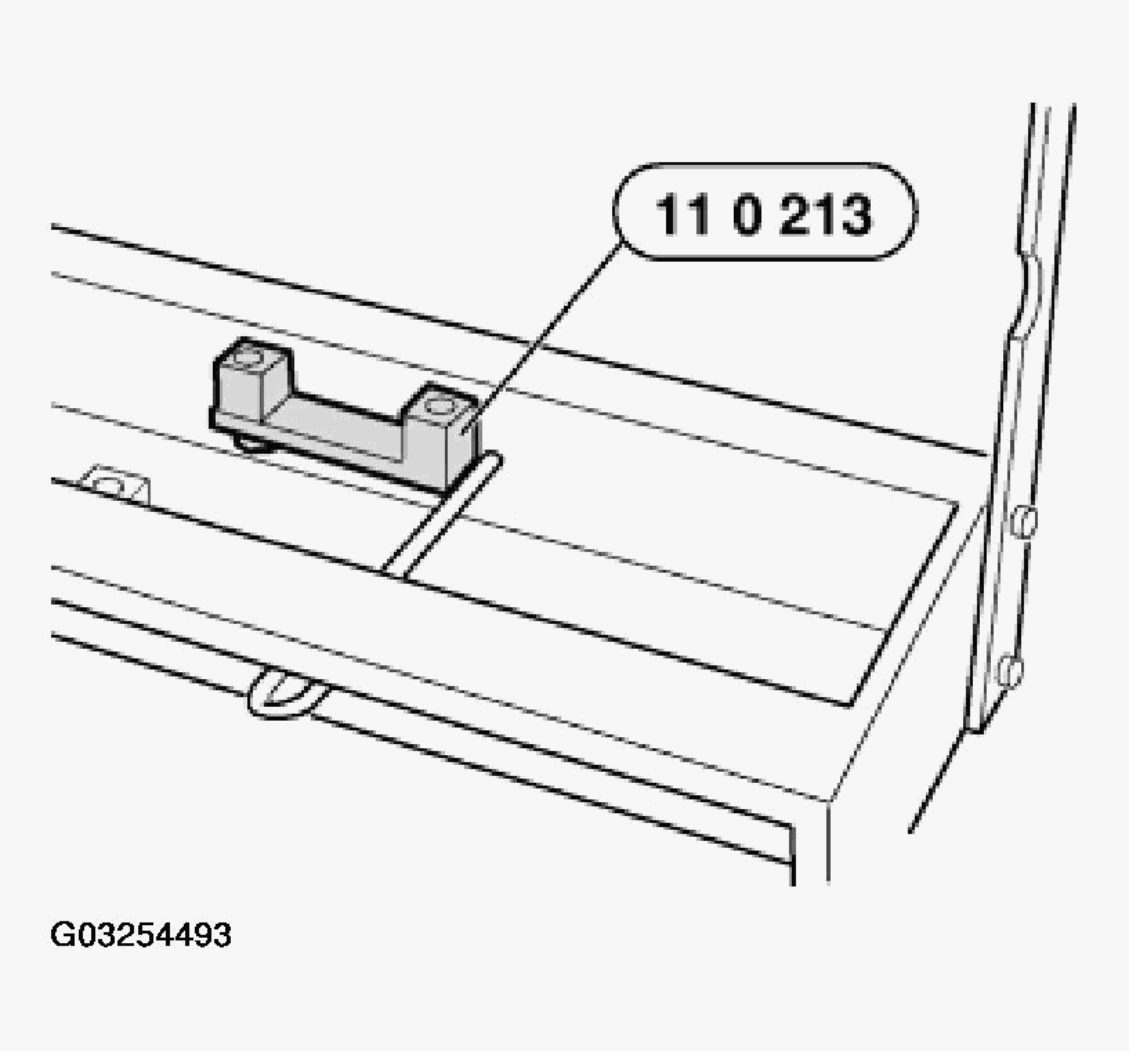


Fig. 62: Installing Special Tool 11 0 213
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 1 065 to special tool 00 1 490.

Provide special tools for cylinder head disassembly:

- special tool 11 1 071
- special tool 11 1 067
- special tool 11 0 192

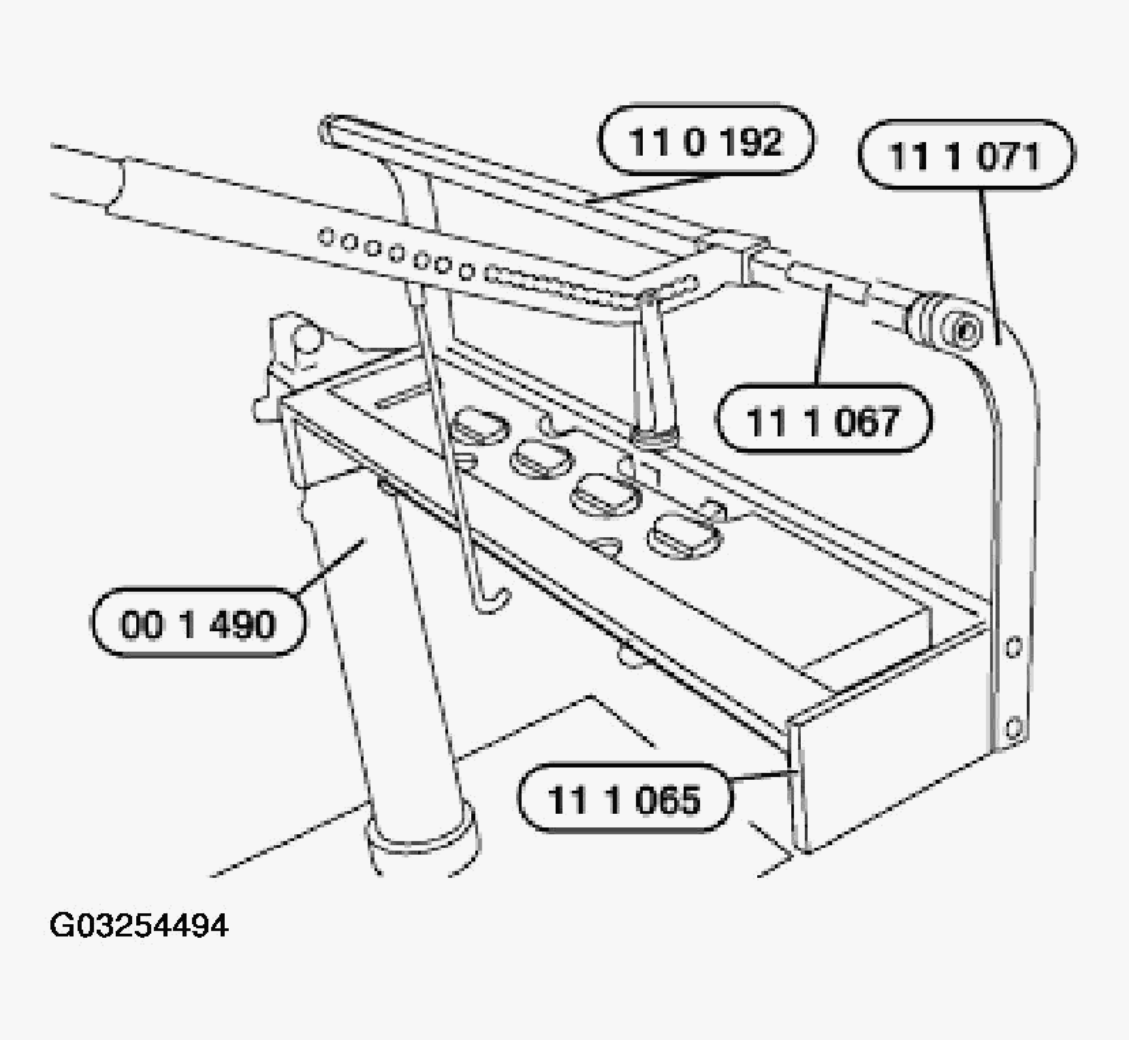


Fig. 63: Assembling Special Tools For Cylinder Head Disassembly (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

- special tool 11 1 045
- special tool 11 0 345
- special tool 11 0 342
- special tool 11 0 343
- special tool 11 0 211

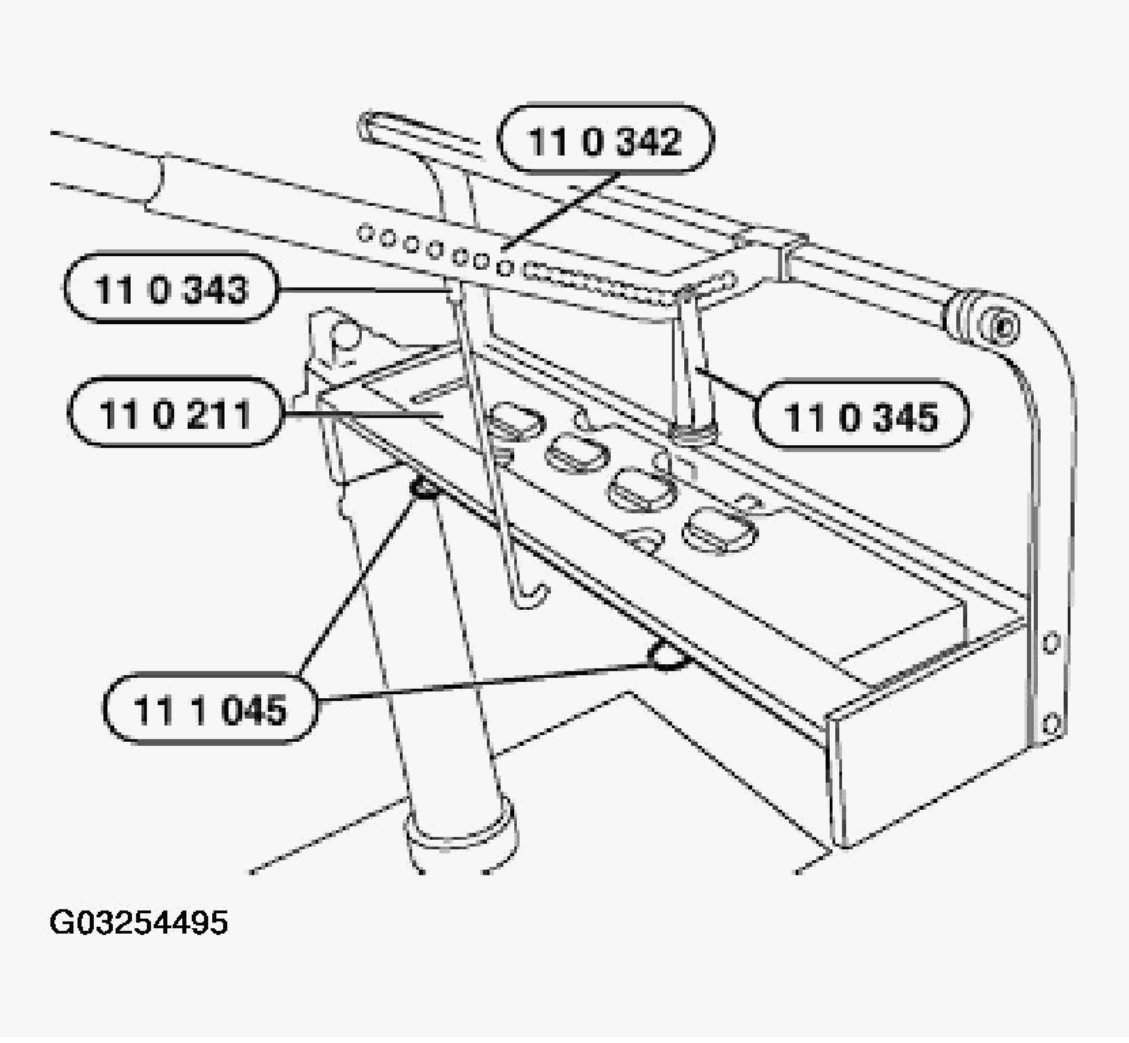


Fig. 64: Assembling Special Tools For Cylinder Head Disassembly (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: At this point, do not install special tool 11 0 211 (support board) in special tool 11 1 065.

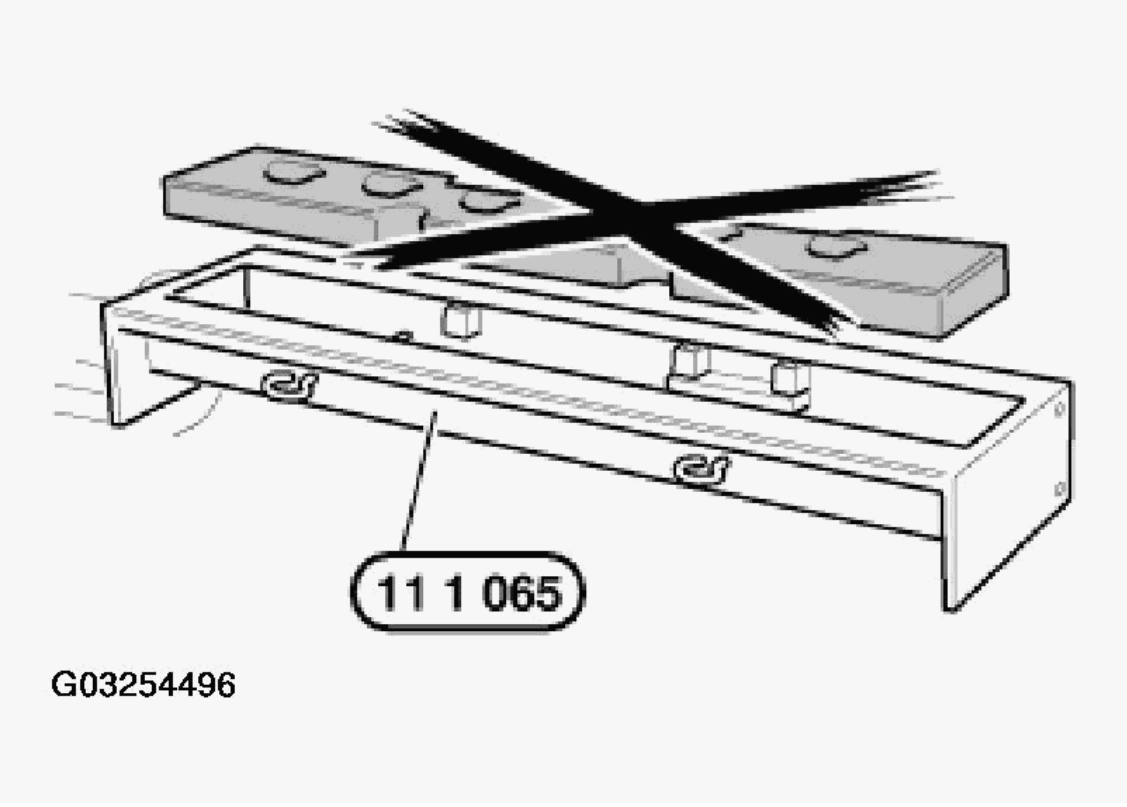


Fig. 65: Do Not Install Special Tool 11 0 211 (Support Board) At This Time
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage sealing surface.
If necessary, cover special tool 11 1 065 with plastic sheeting.

Fit cylinder head on special tool 111 065 and secure with two cylinder head screws.

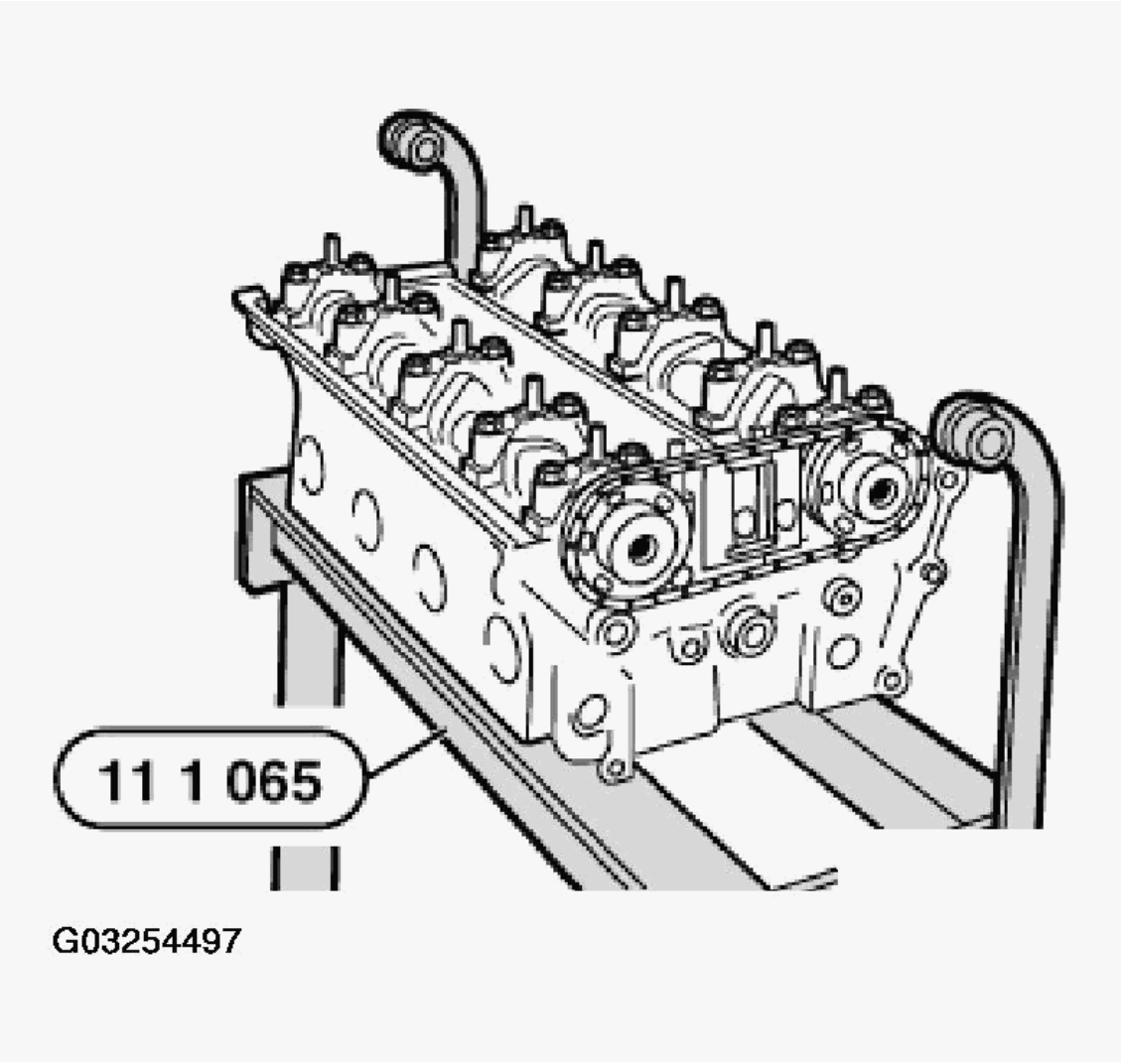


Fig. 66: Fitting Cylinder Head To Special Tool 11 1 065
Courtesy of BMW OF NORTH AMERICA, INC.

Remove camshafts. This task is described in **11 31 011 REPLACING LEFT CAMSHAFTS (M62 VANOS FROM 9/98)** and **11 31 015 REPLACING RIGHT CAMSHAFT (M62 VANOS FROM 9/98)** .

Remove all valve springs,

refer to **11 34 715 REPLACING ALL VALVE SPRINGS (M62)** .

Remove all valve stem seals,

refer to **11 34 560 REPLACING ALL VALVE STEM SEALS (M62, S62)** .

Remove all valves,

refer to **11 34 552 REMOVING AND INSTALLING/REPLACING ALL VALVES (M62)** .

11 12 527 REMACHINING A VALVE SEAT (M62, S62) (CYLINDER HEAD DISMANTLED)

Machine valve seat surface with special tool 00 3 520 or 00 3 580 in accordance with tool manufacturer's instructions.



Fig. 67: Machining Valve Seat Surface With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

After machining the valve-seat face on OD and bore diameter, rework to specified diameter with correction milling tool until valve seat width (5) is obtained.

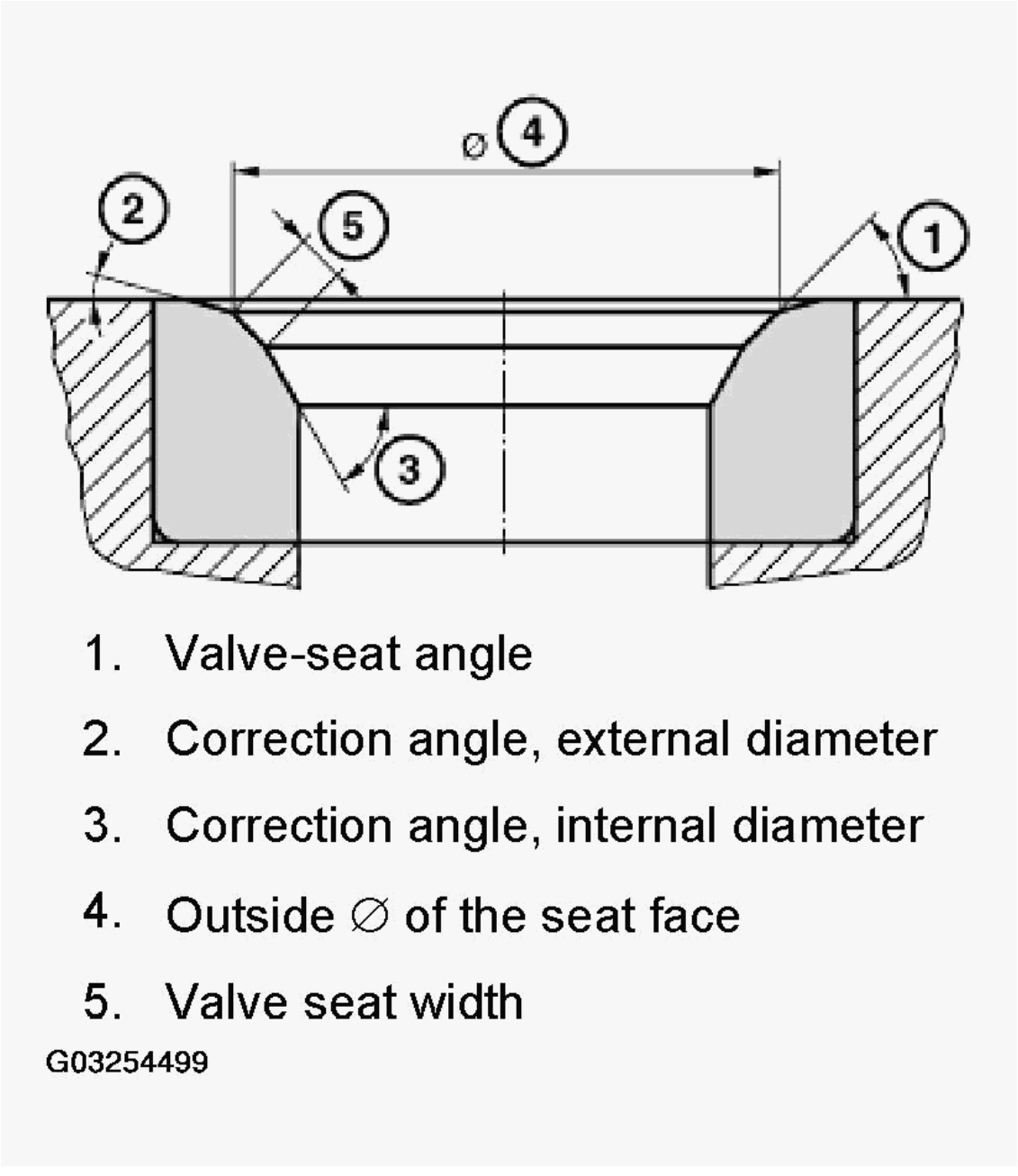


Fig. 68: Identifying Valve Seat Angles
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 595 CHECKING A VALVE GUIDE FOR WEAR (M62, S62)

Valves Removed

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

Mount dial gage and measure tilt clearance.

NOTE: Max. permissible tilt clearance,

refer to **11 12 CYLINDER HEAD WITH VALVE SEAT COVER M62** in Technical Data.

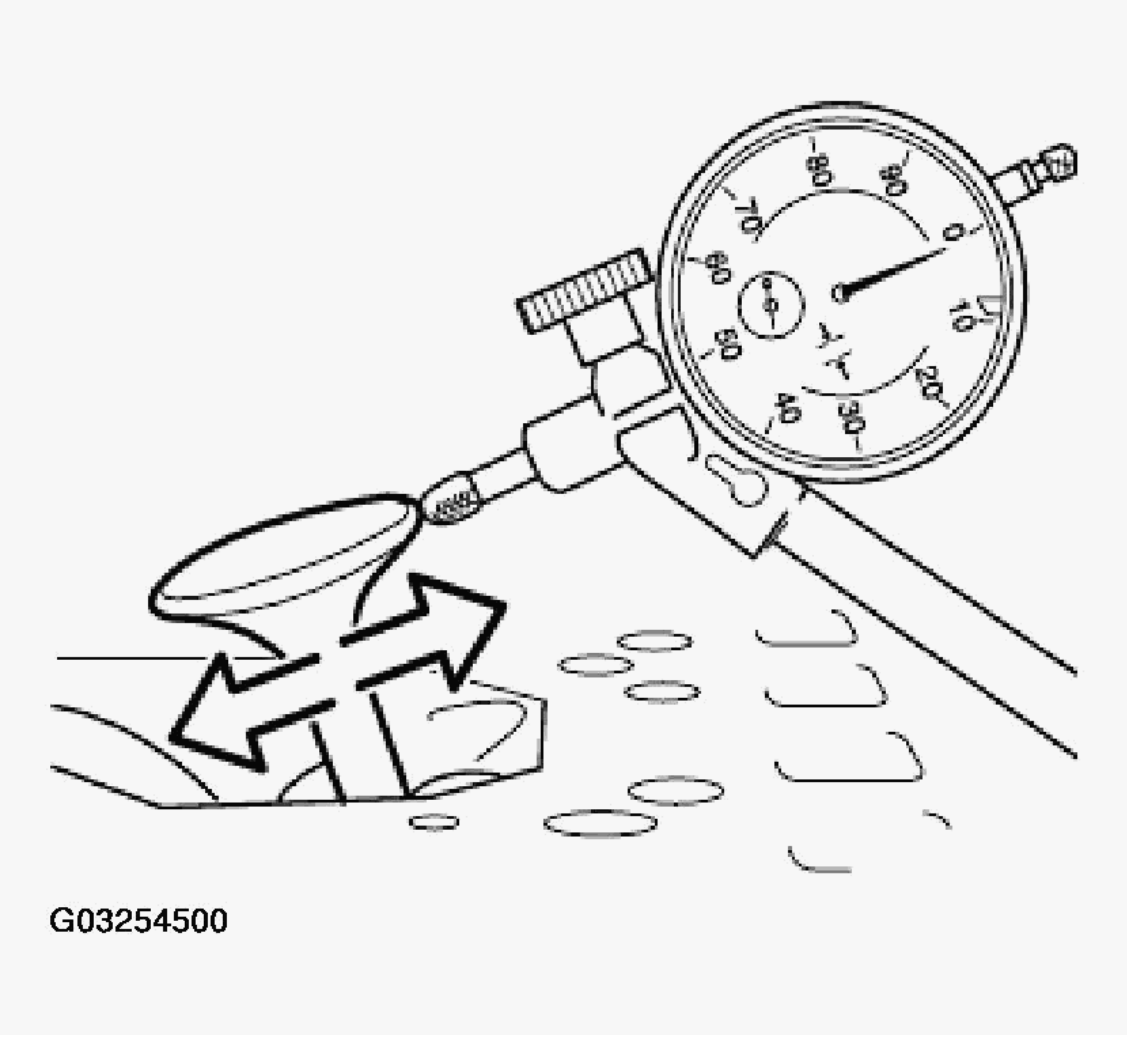


Fig. 69: Measuring Valve Stem End Clearance Using Dial Gage
Courtesy of BMW OF NORTH AMERICA, INC.

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 out valve guide,

refer to **11 12 600 REAMING A VALVE GUIDE (M62, S62) (VALVE REMOVED)** .

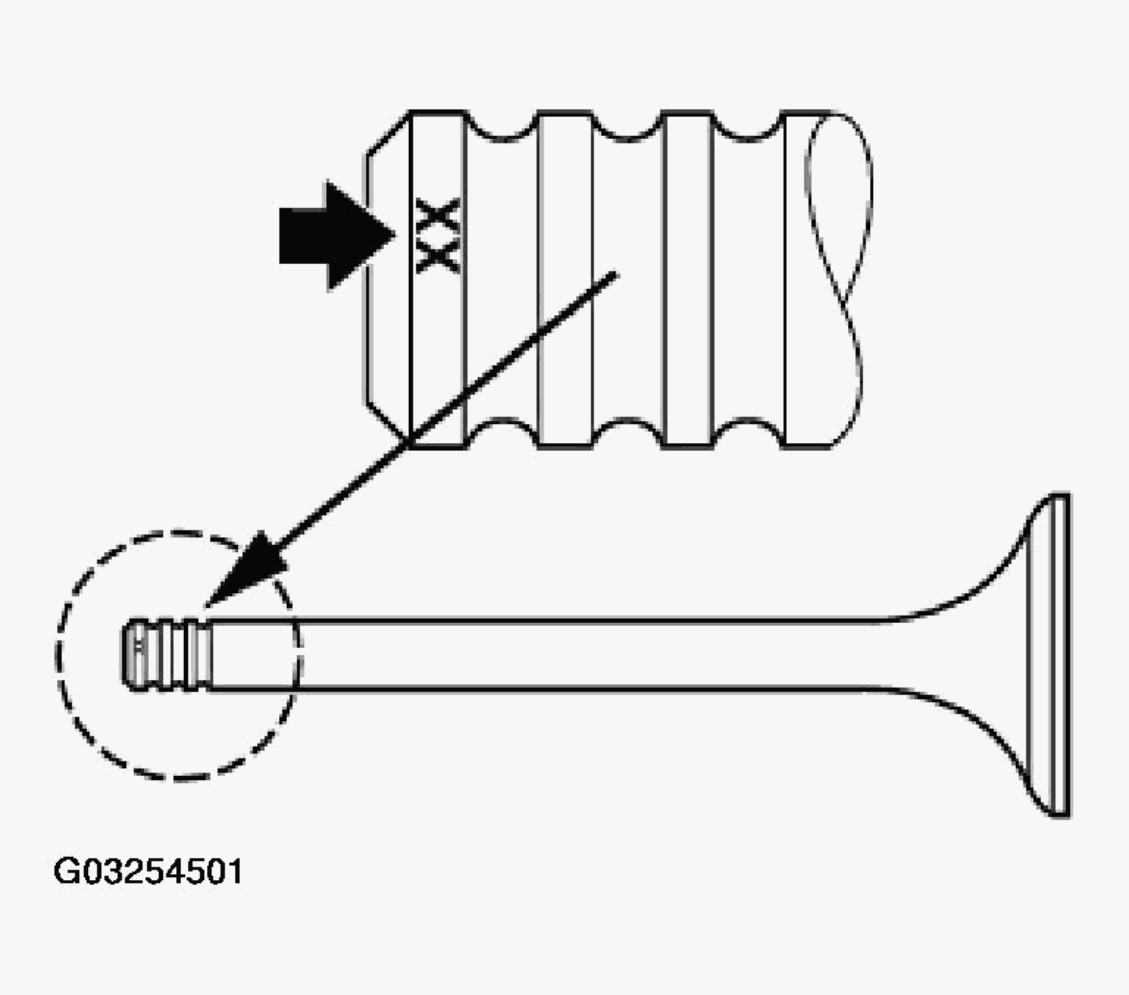


Fig. 70: Identifying Repair Valve With Larger Shaft Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 600 REAMING A VALVE GUIDE (M62, S62) (VALVE REMOVED)

NOTE: **In event of excessive clearance between valve stem and valve guide:**

1. **Ream out valve guide**
2. **Install repair valve with larger stem diameter**

Assemble the reaming tool and guide taper (1) from the special tool kit 00 4 210 depending on the shaft 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: **After reaming out, remachine valve seat,**
refer to 11 12 527 REMACHINING A VALVE SEAT (M62, S62) (CYLINDER HEAD

DISMANTLED) .

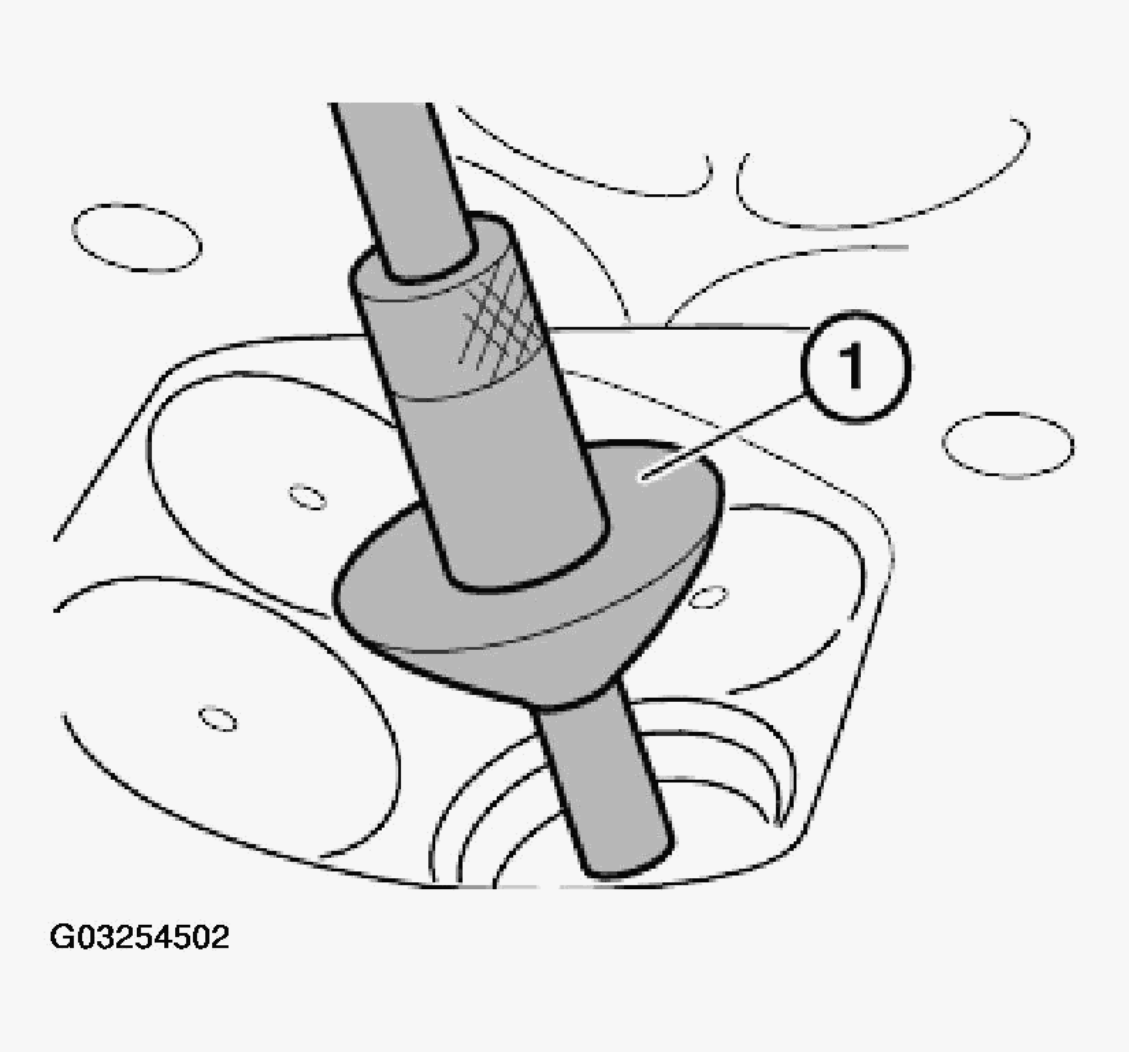


Fig. 71: Reaming Valve Guide
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 719 MILLING DOWN CYLINDER HEAD GASKETING FACE (M62)

Cylinder head dismantled.

Check planeness of cylinder head gasketing face with straightedge (standard).

Deviation from planeness Max. 0.05 mm.

NOTE: Machine limit, refer to 11 12 CYLINDER HEAD WITH COVER M62 B 46 in Technical Data.

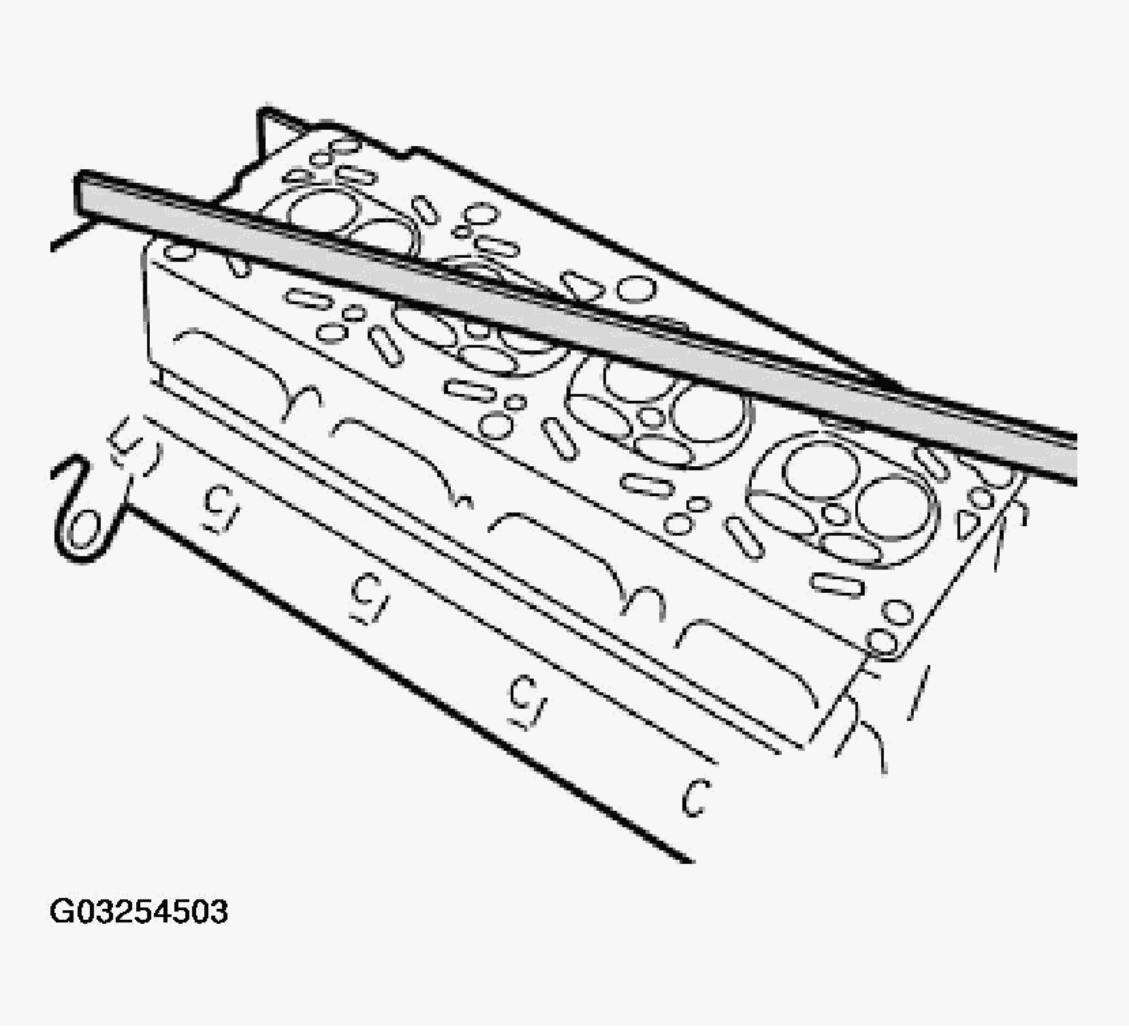


Fig. 72: Checking Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: To compensate for compression, there is a repair cylinder head gasket.

NOTE: The repair cylinder head gasket is designated at the back with a bore beside the 4th or 8th cylinder.

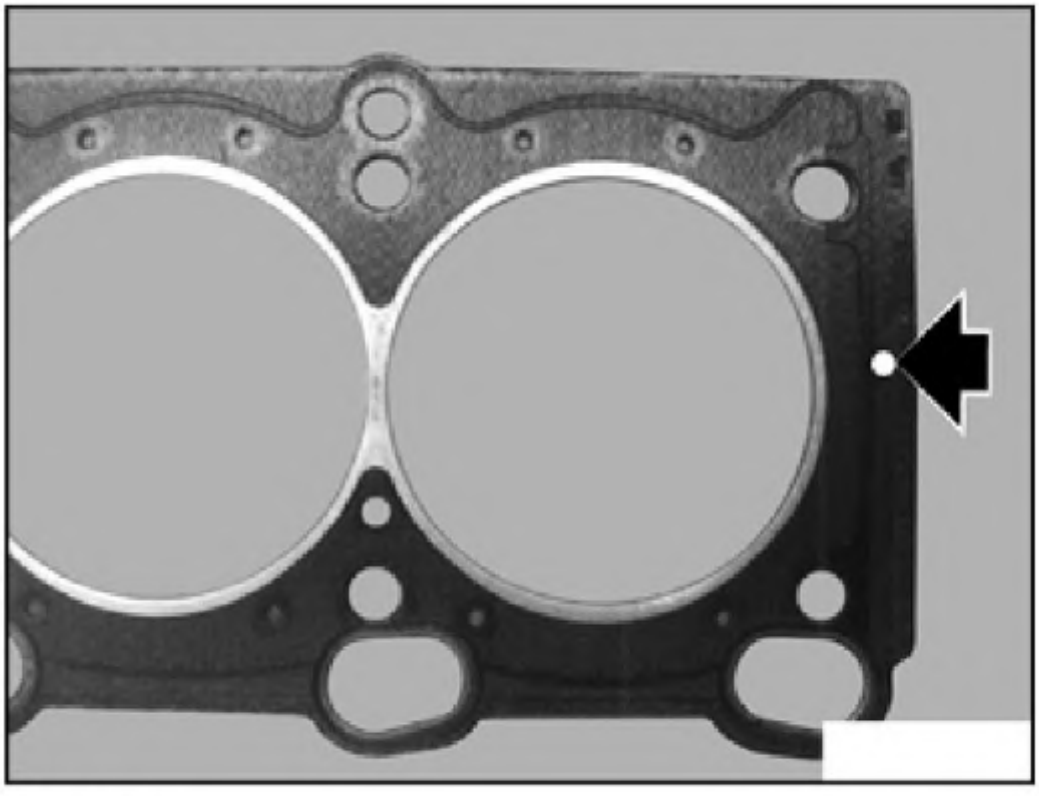


Fig. 73: Identifying Repair Cylinder Head Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 729 CHECKING CYLINDER HEAD FOR WATER LEAKS (M62)

Cylinder head dismantled.

Seal coolant apertures with special tool kit 11 1 470.

NOTE: Special tool 111 473 for cylinder bank 1 -4
Special tool 11 1 474 for cylinder bank 5-8

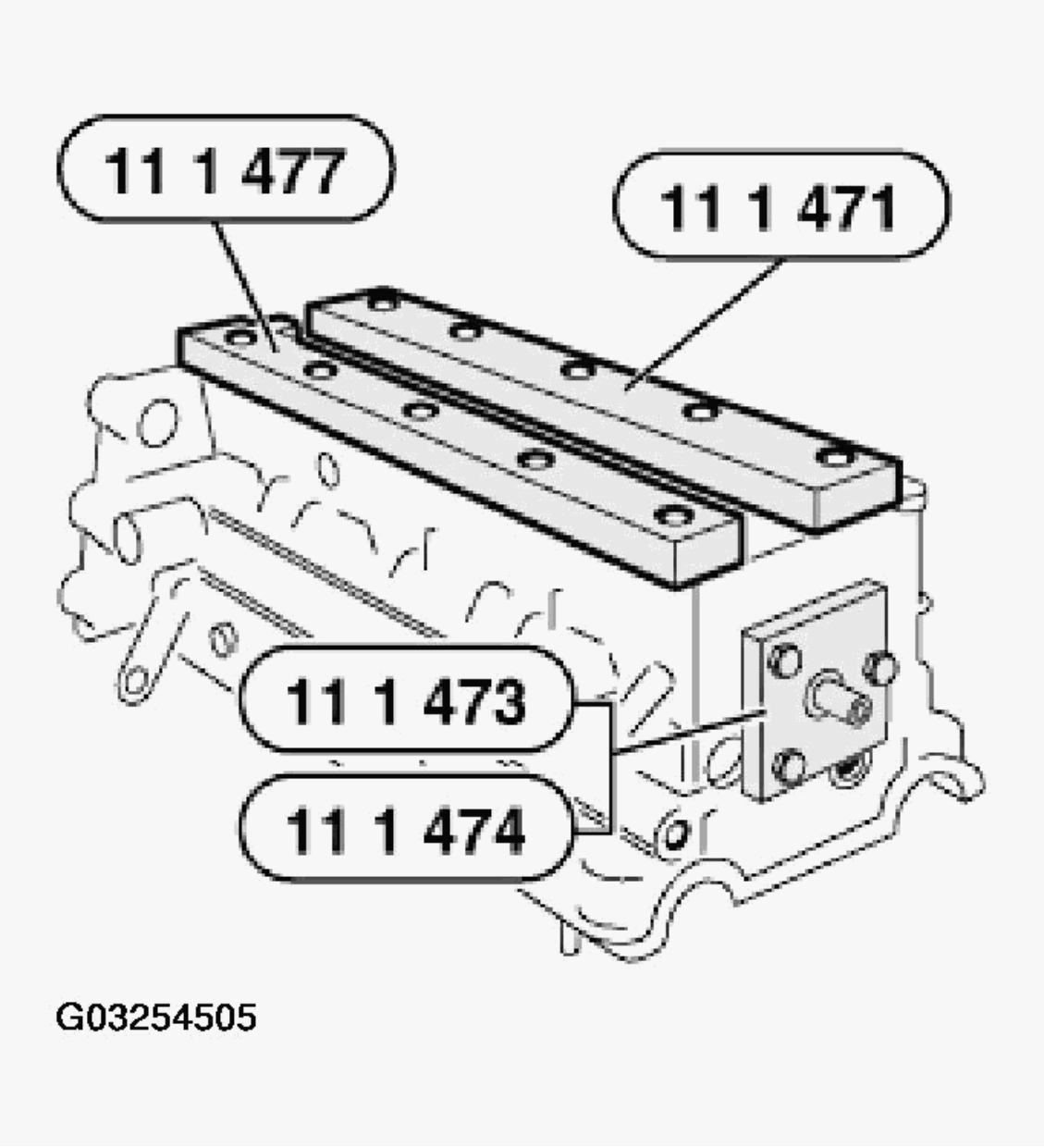


Fig. 74: Sealing Coolant Apertures With Special Tool Kit 11 1 470
Courtesy of BMW OF NORTH AMERICA, INC.

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

Check cylinder head for escaping air (cracks).

NOTE: If necessary, add cleaning agent to water bath.

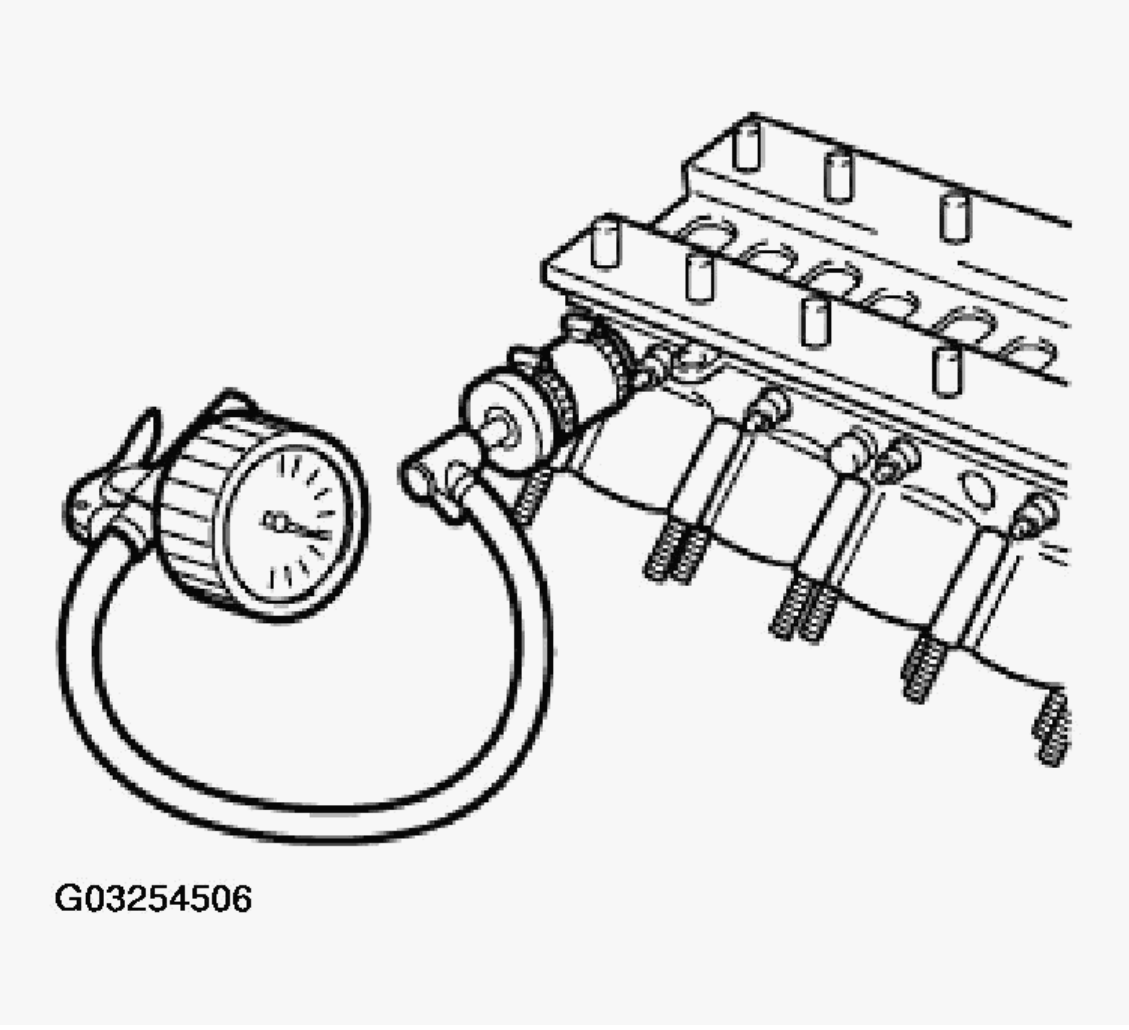


Fig. 75: Checking Cylinder Head For Escaping Air (Cracks)
Courtesy of BMW OF NORTH AMERICA, INC.

OIL SUMP

11 13 010 REMOVING AND INSTALLING/REPLACING UPPER SECTION OF OIL SUMP (M62)

NOTE: For removal of oil sump, front axle support must be lowered.

There is no need to perform a front axle alignment check.

Instructions for disconnecting and connecting battery,

refer to **12 00 ... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY** .

Disconnect negative battery lead.

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.



Fig. 76: Attaching Damper With Special Tool 51 2 170 To Hood
Courtesy of BMW OF NORTH AMERICA, INC.

Turn fasteners on acoustic cover 90° counterclockwise, remove acoustic cover.

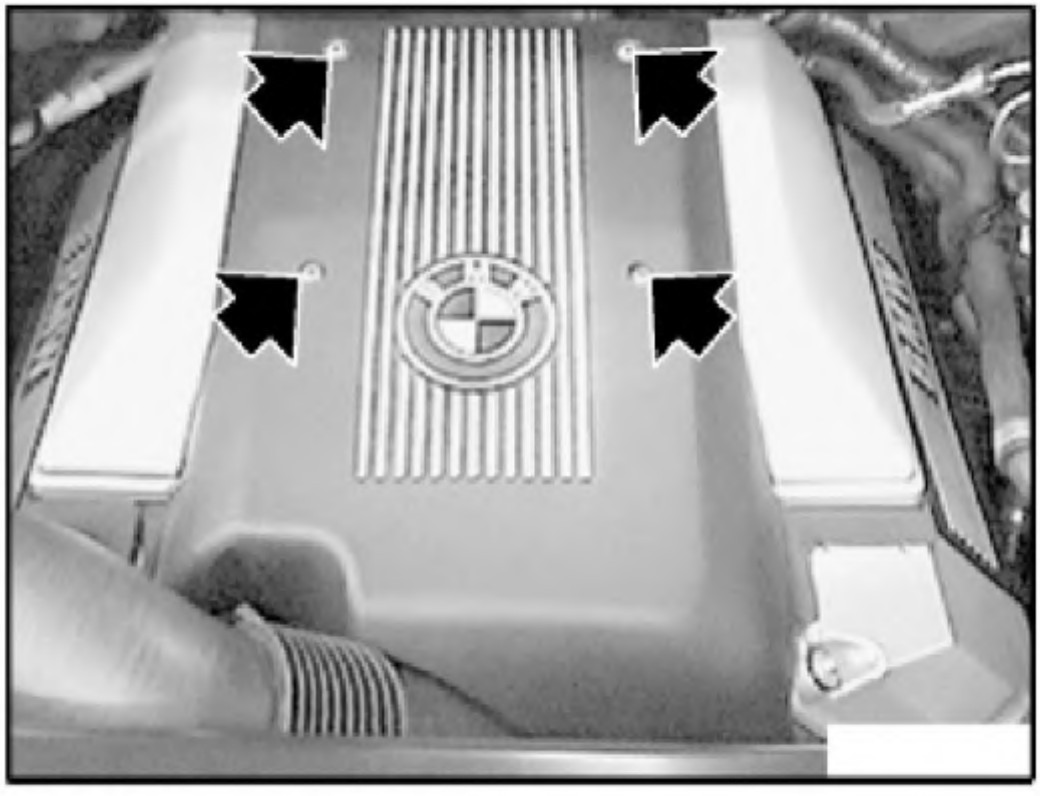


Fig. 77: Removing Acoustic Cover Fasteners Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release bellows on throttle. Remove upper section of suction filter housing with mass air flow sensor.

Release guide tube for oil dipstick on right side of timing case cover.

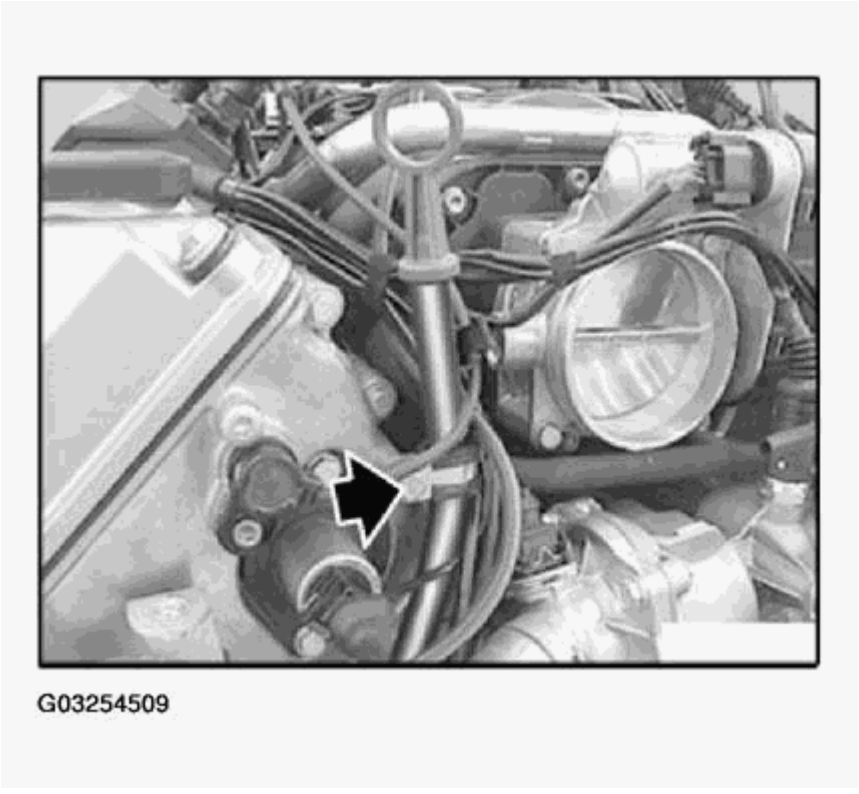


Fig. 78: Releasing Guide Tube For Oil Dipstick
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

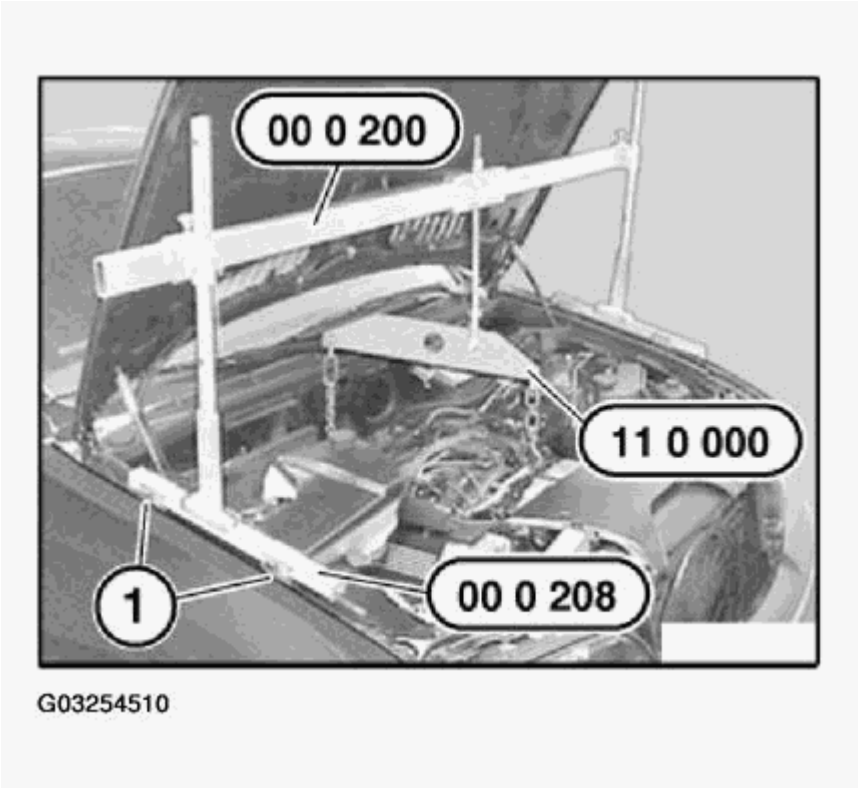


Fig. 79: Attaching Special Engine Lifting Tools To Engine
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: The engine has another center of gravity.

Attach special tool 11 0 000 as shown in illustration to special tool 00 0 200. Only in this way can you ensure that the engine hangs horizontally when the front axle support is released.

CAUTION: Only attach engine to relevant suspension lugs.

Tighten the screws (1 and 2).

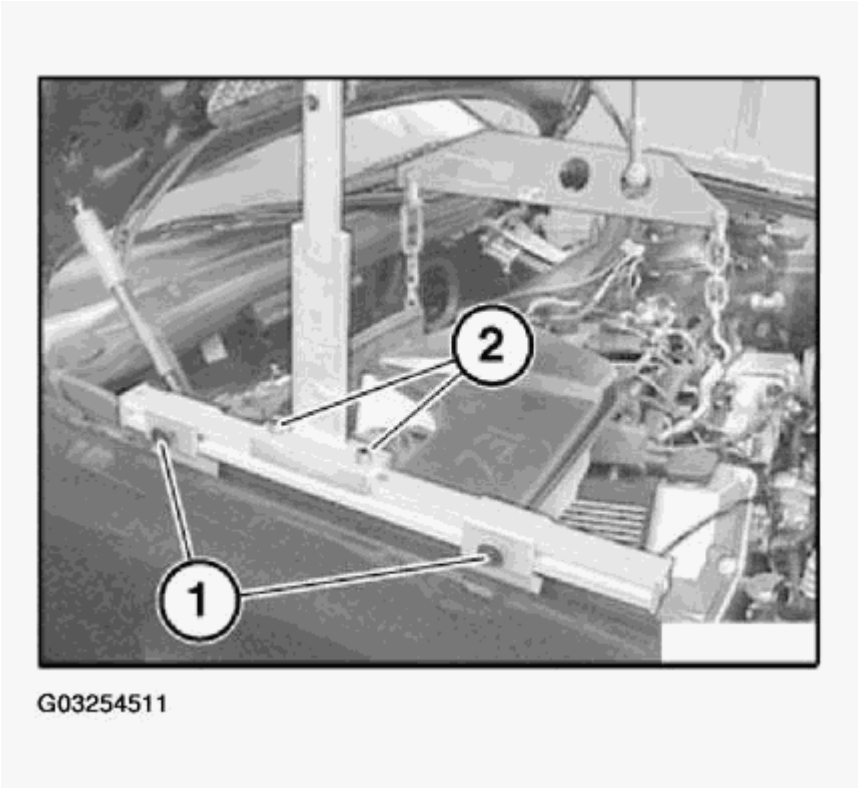


Fig. 80: Tightening Engine Lifting Tool Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten top left and right nuts on engine mount.

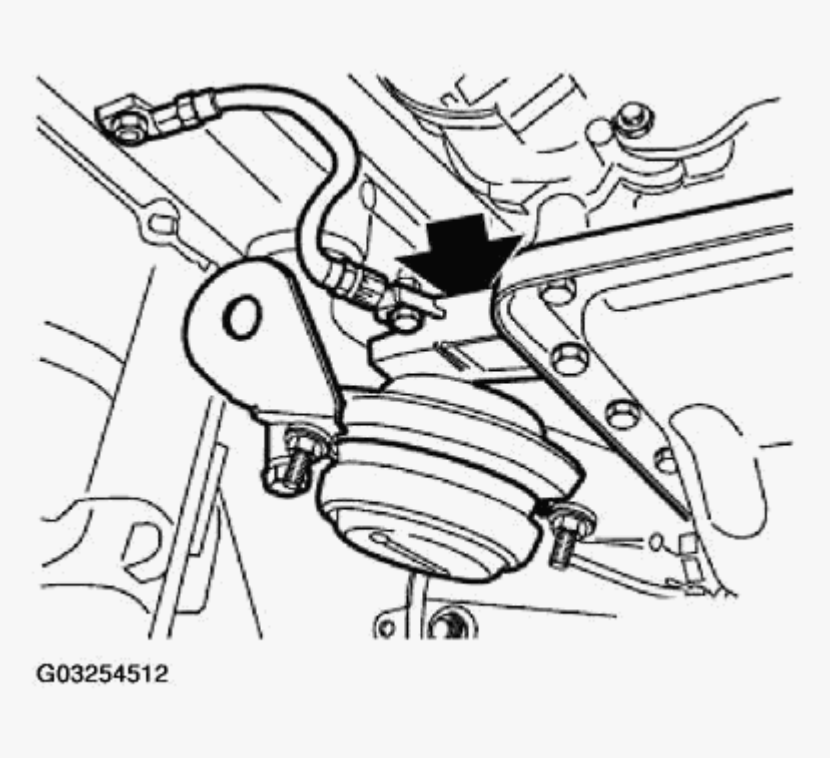


Fig. 81: Removing Engine Mounting Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Raise engine with special tool 00 0 200 approx. 10 to 12 mm.

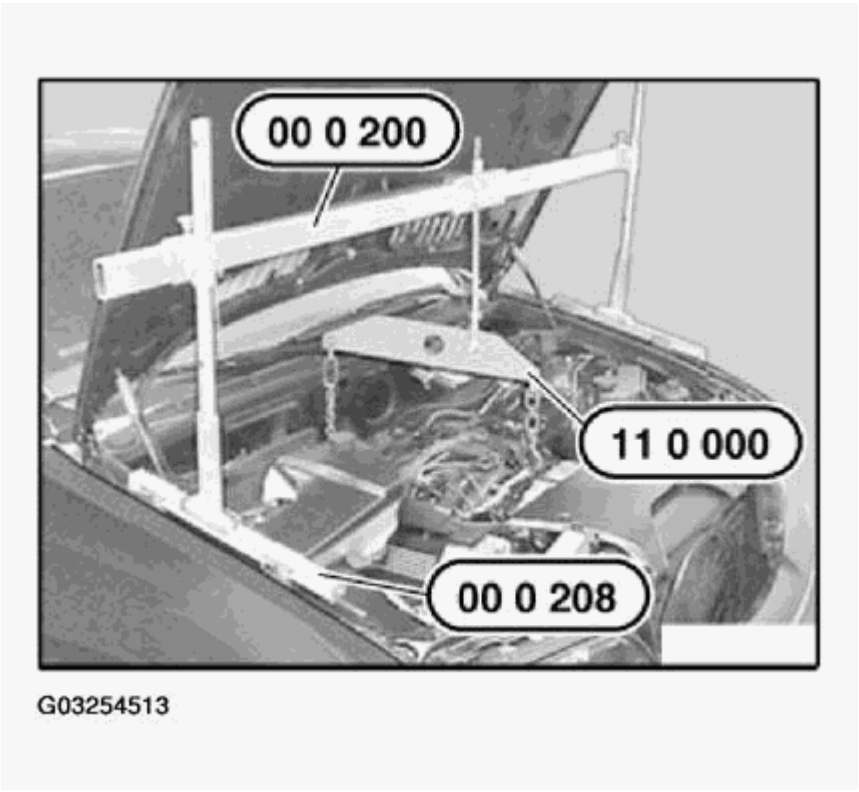


Fig. 82: Raising Engine With Special Tool 00 0 200
Courtesy of BMW OF NORTH AMERICA, INC.

Remove front splash guard.

Remove reinforcement plate.

CAUTION: The work step "Removing and installing reinforcement plate" contains important installation instructions, refer to 31 10 010 REMOVING AND INSTALLING REINFORCEMENT PLATE .

Detach positive lead from starter motor and unclip from cable guides.

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

Remove output shafts, refer to **AXLE SHAFTS (FRONT)** .

Remove bearing pedestal of right output shaft from oil sump, refer to 31 53 040 BEARING PEDESTAL .

.

Remove propeller shaft at front, refer to **PROPELLER SHAFT - REPAIR INSTRUCTIONS** .

Unfasten steering spindle from steering gear. This task is described in, **STEERING COLUMNS** .

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.

Remove front axle differential.

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.

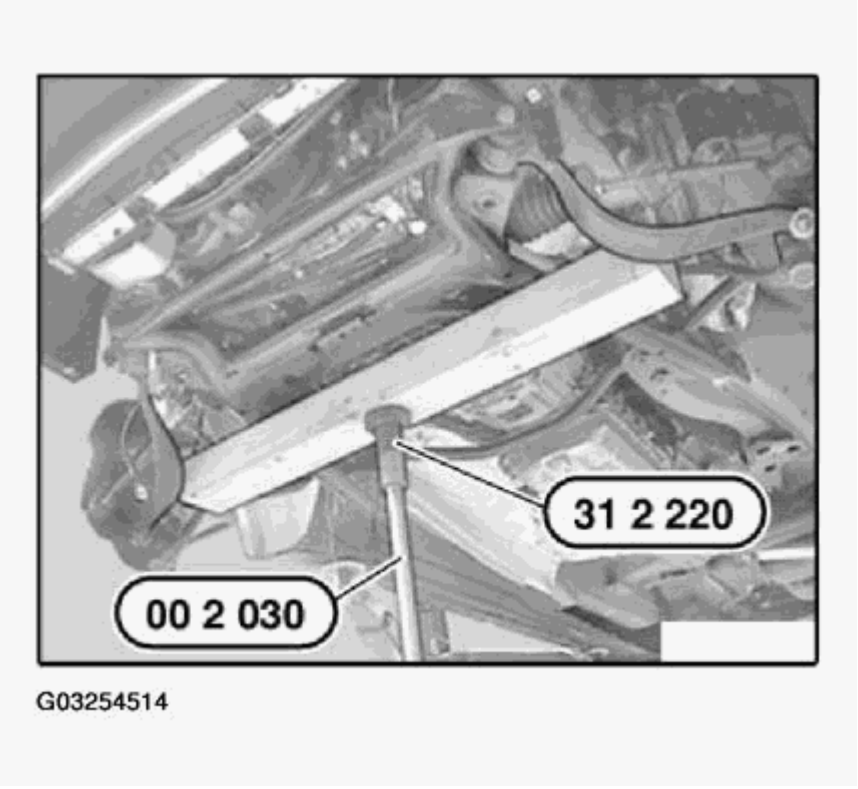


Fig. 83: Supporting Front Axle Support
Courtesy of BMW OF NORTH AMERICA, INC.

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,

refer to **TORQUE SPECIFICATIONS** in FRONT.

Remove alternator drive belt,

refer to **11 28 010 REPLACING ALTERNATOR DRIVE BELT (M62)** .

Remove power steering vane pump from oil sump,

refer to **POWER STEERING VANE PUMP (M52/M54)** .

NOTE: Lines remain connected.

Tie vane pump to one side.

Relieve tension on A/C compressor drive belt and remove adjustable plate from oil sump,

refer to **11 28 050 REPLACING DRIVE BELT FOR A/C COMPRESSOR (M60/M62/M73)** .

Open oil drain plug and drain off engine oil.

Remove lower oil sump section,

refer to **11 13 020 REMOVING AND INSTALLING/REPLACING LOWER SECTION OF OIL SUMP (M62)** .

Unfasten guide tube for dipstick on oil sump.

Installation:

Replace O-ring.

Insert O-ring and washer in oil sump bore.

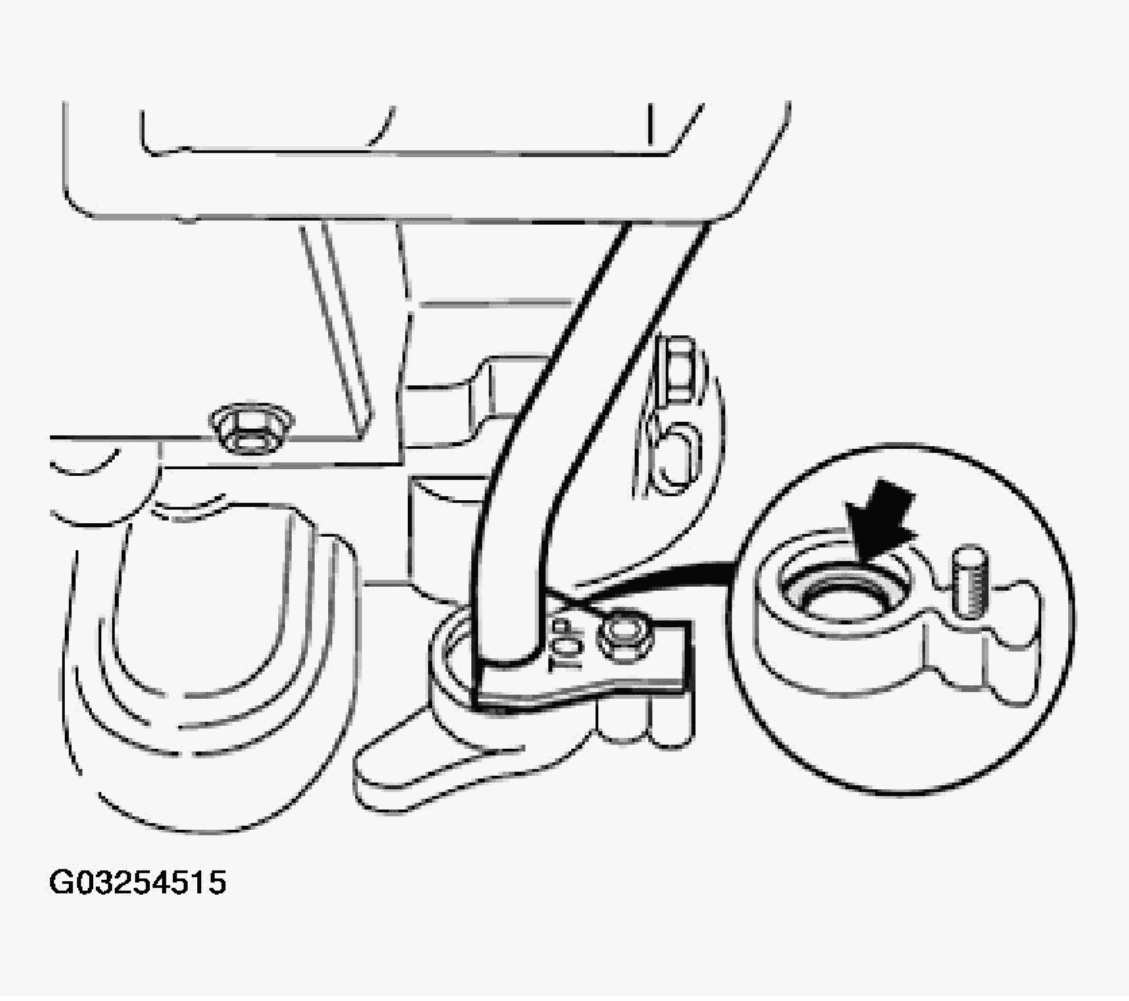


Fig. 84: Installing Guide Tube & Seal For Dipstick To Oil Sump
Courtesy of BMW OF NORTH AMERICA, INC.

Detach oil return line coming from oil separator from oil sump.

Installation:

Replace sealing ring.

Tightening torque,

refer to 11 42 8AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

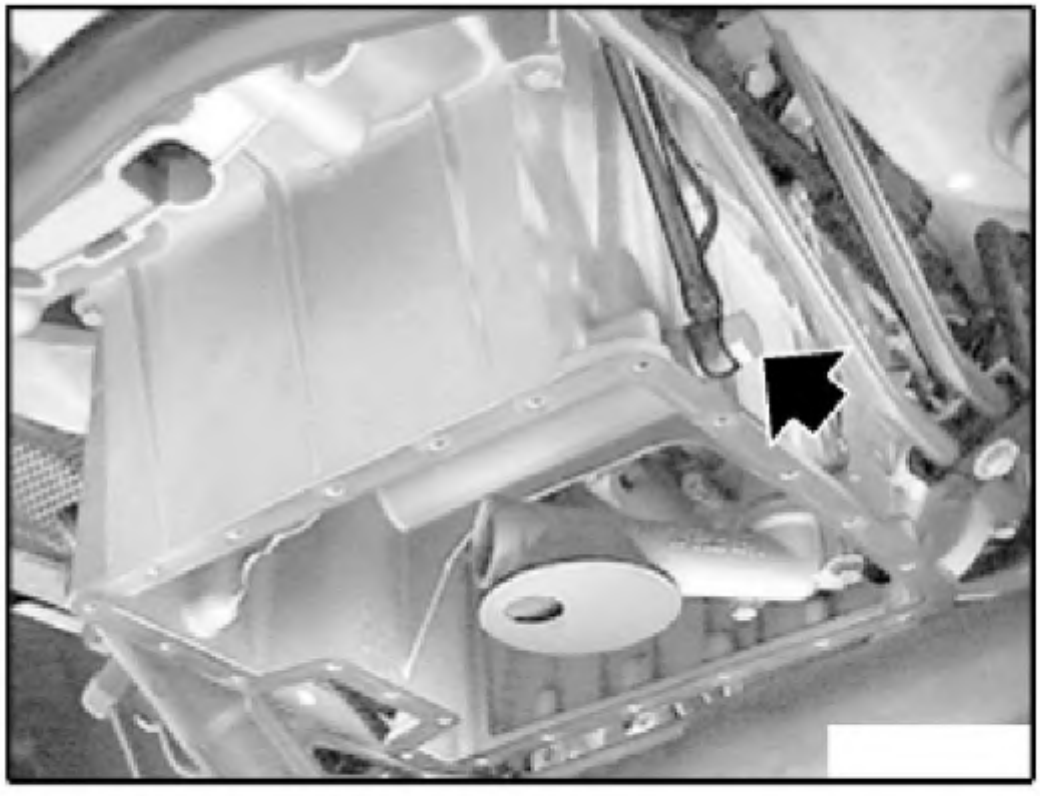
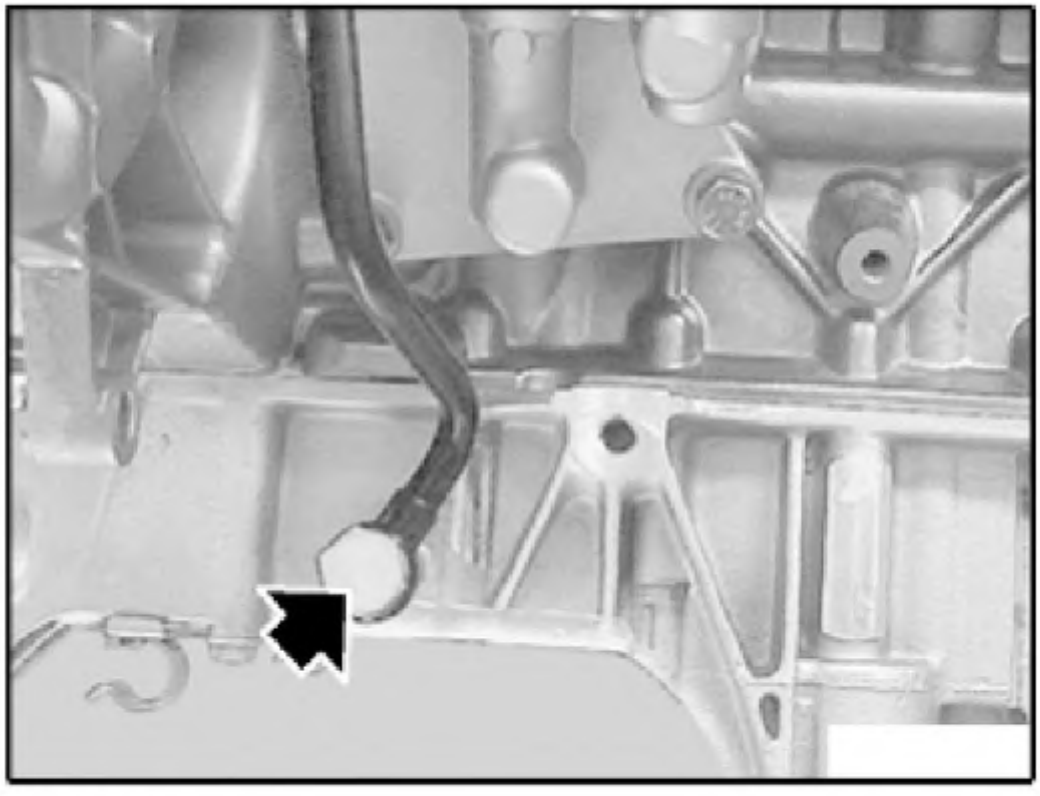


Fig. 85: Detaching Oil Return Line From Oil Sump
Courtesy of BMW OF NORTH AMERICA, INC.

Detach oil return line coming from main flow oil filter from oil sump.



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Fig. 86: Detaching Main Flow Oil Filter Return Line From Oil Sump
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring.

Tightening torque,

refer to 11 42 5AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Remove snorkel on oil pump.

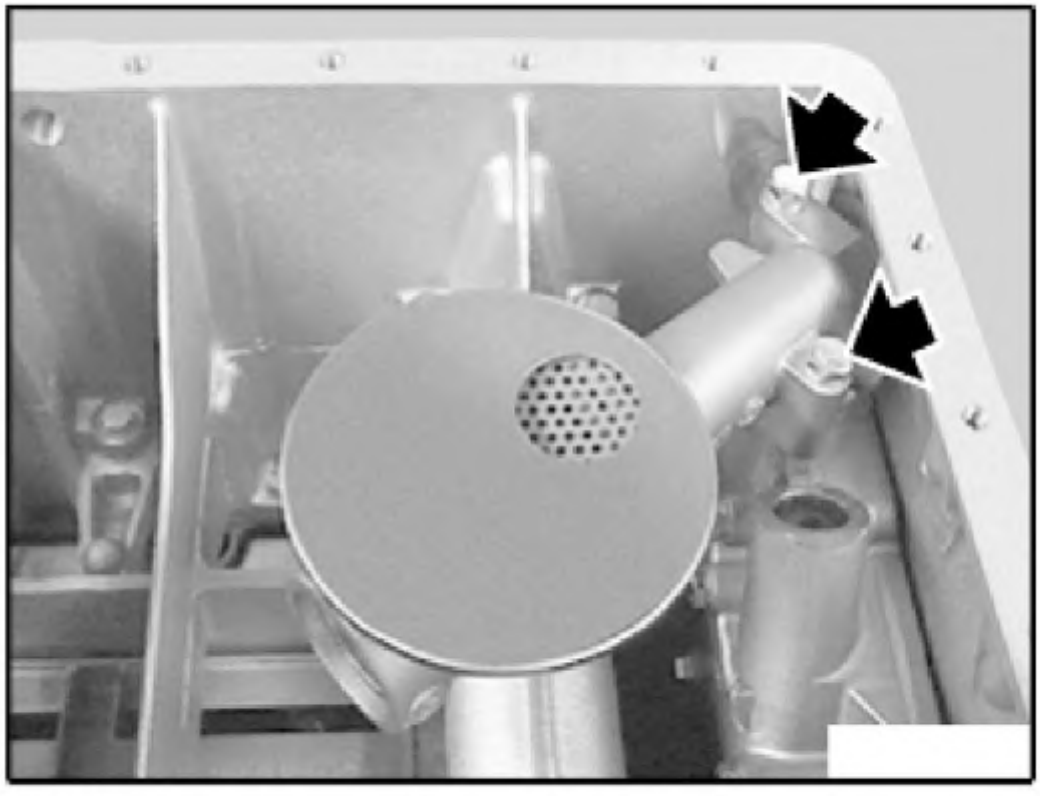


Fig. 87: Removing Snorkel On Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace O-ring.

If necessary, secure O-ring with grease in oil pump.

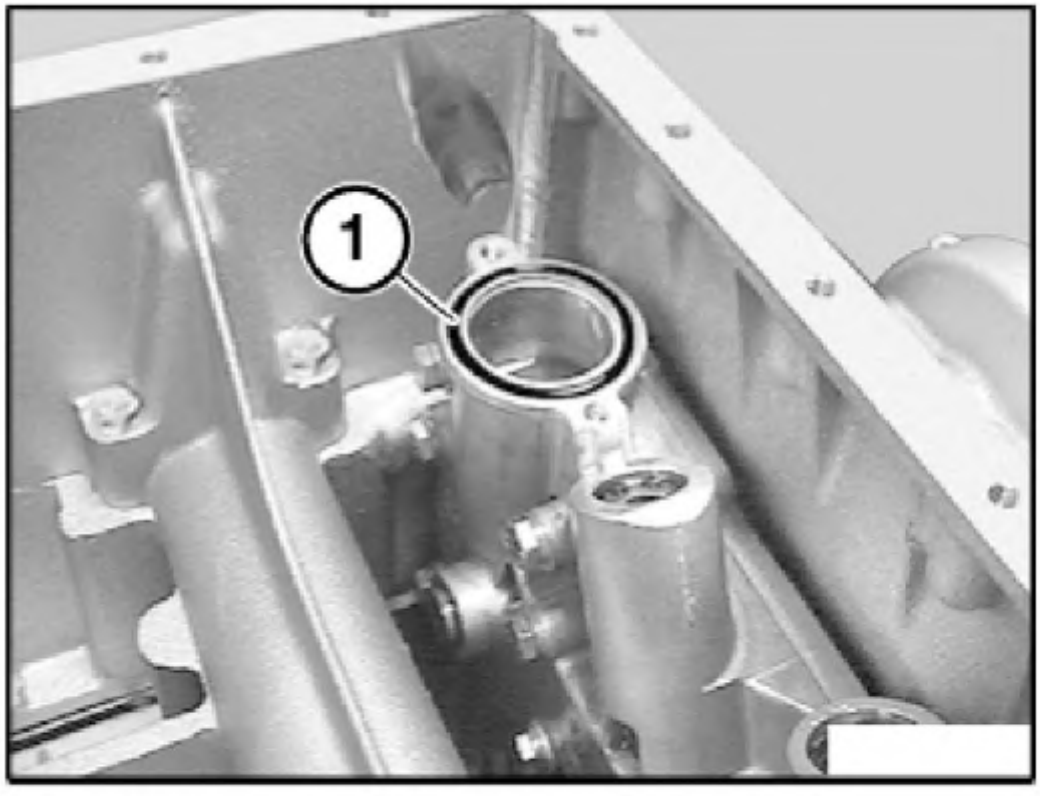


Fig. 88: Replacing Oil Pump Snorkel O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws inside oil sump.

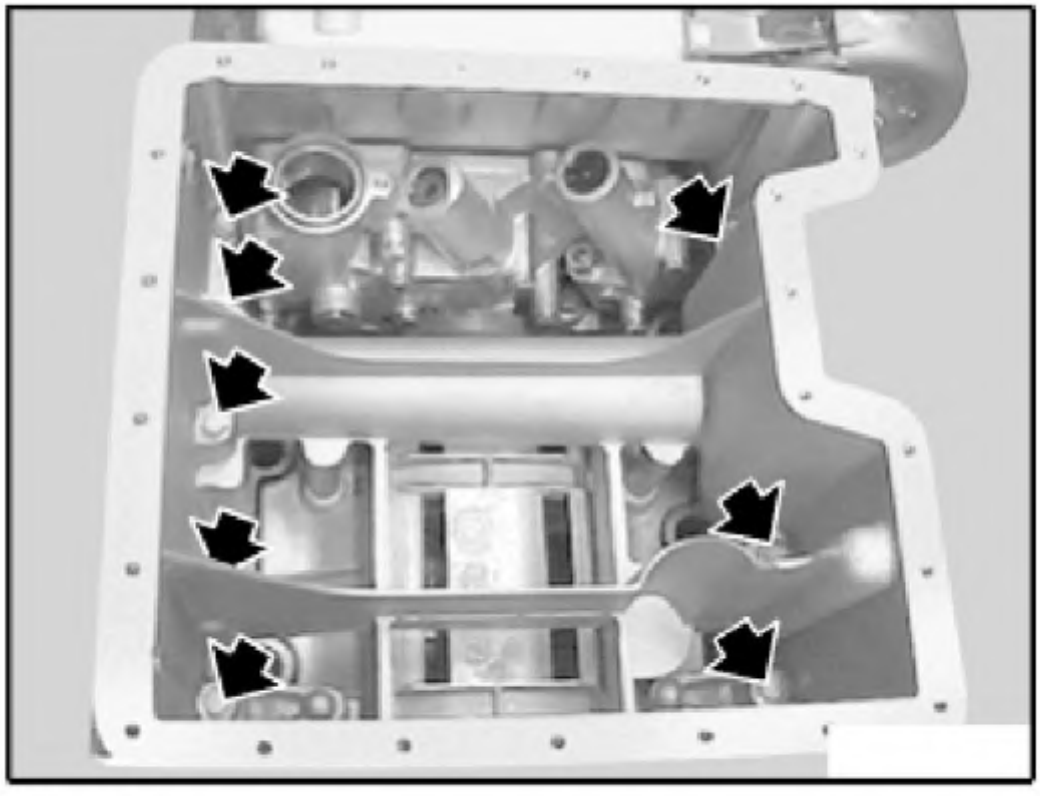


Fig. 89: Removing Oil Sump Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove cable guide (1) for positive lead.

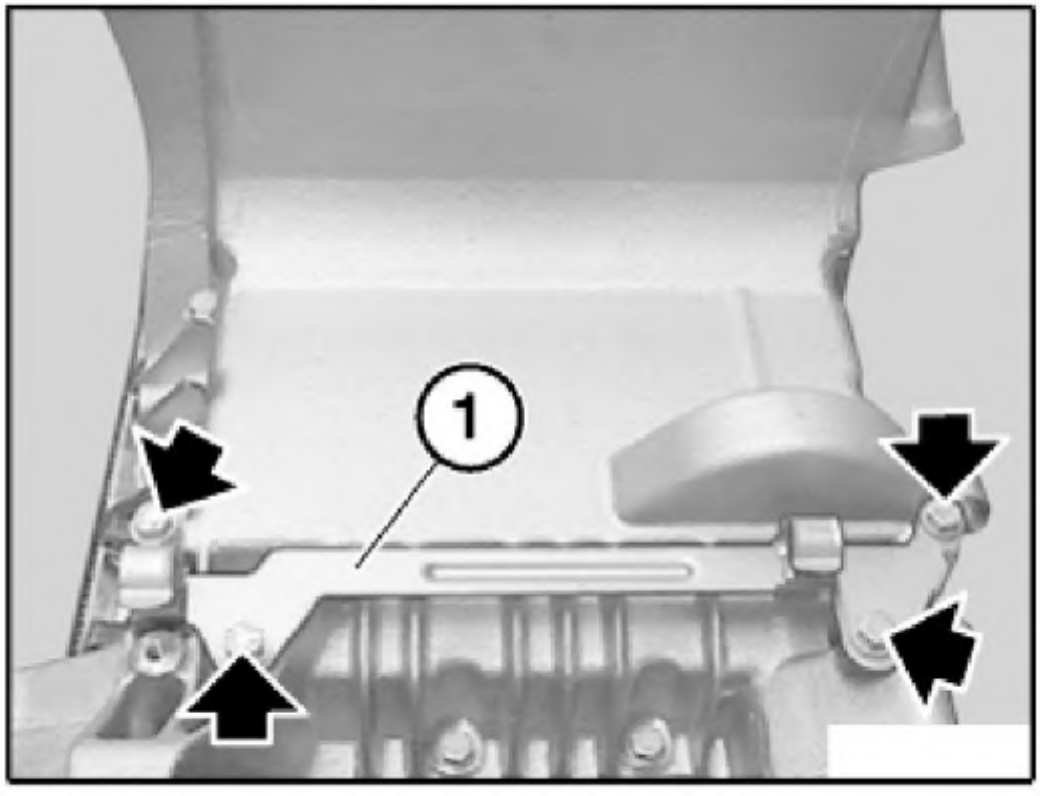


Fig. 90: Removing Cable Guide For Positive Lead
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws to sealing cover.

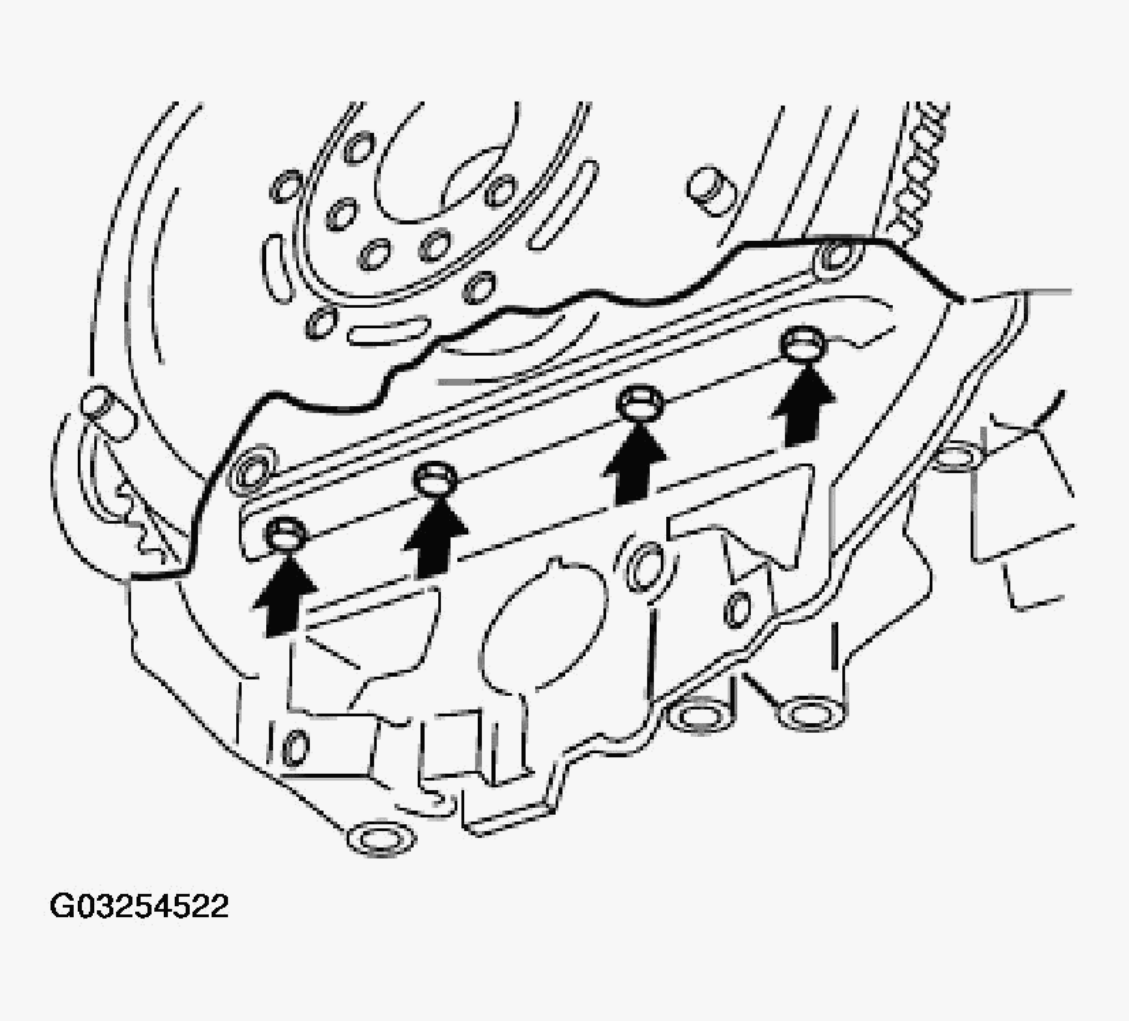


Fig. 91: Unfastening Screws To Sealing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten remaining screws from oil sump.

Remove upper oil sump section towards rear.

Installation:

Sealing faces clean and free of seal debris.

Coat engine block at gap to end cover and to timing case cover with Drei Bond 1209 sealing compound.

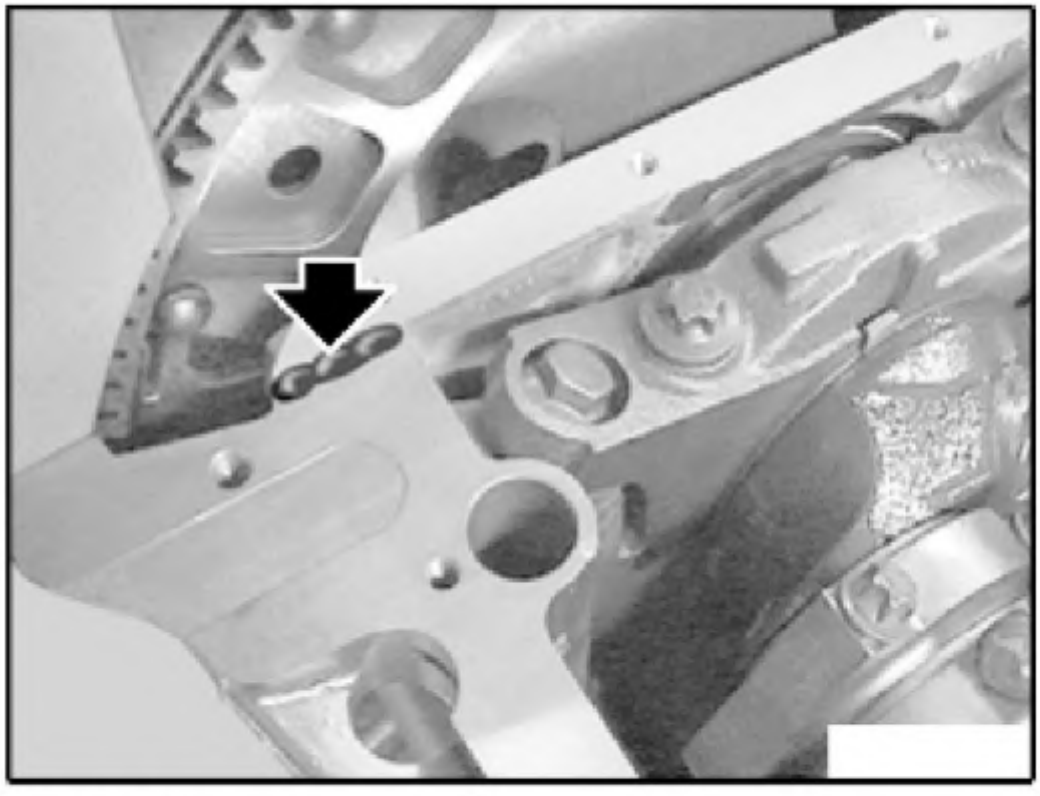


Fig. 92: Sealing Engine Block At Gap
Courtesy of BMW OF NORTH AMERICA, INC.

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.

11 13 020 REMOVING AND INSTALLING/REPLACING LOWER SECTION OF OIL SUMP (M62)

Open cover on main flow oil filter, engine oil returns to oil sump.

Remove reinforcement plate.

CAUTION: The work step "Removing and installing reinforcement plate" contains important installation instructions, refer to 31 10 010 REMOVING AND INSTALLING REINFORCEMENT PLATE .

Open oil drain plug. Drain engine oil.

Unfasten plug connection on oil level switch.

Unclip cable guide.

Release screws (1) and remove lower oil sump section.

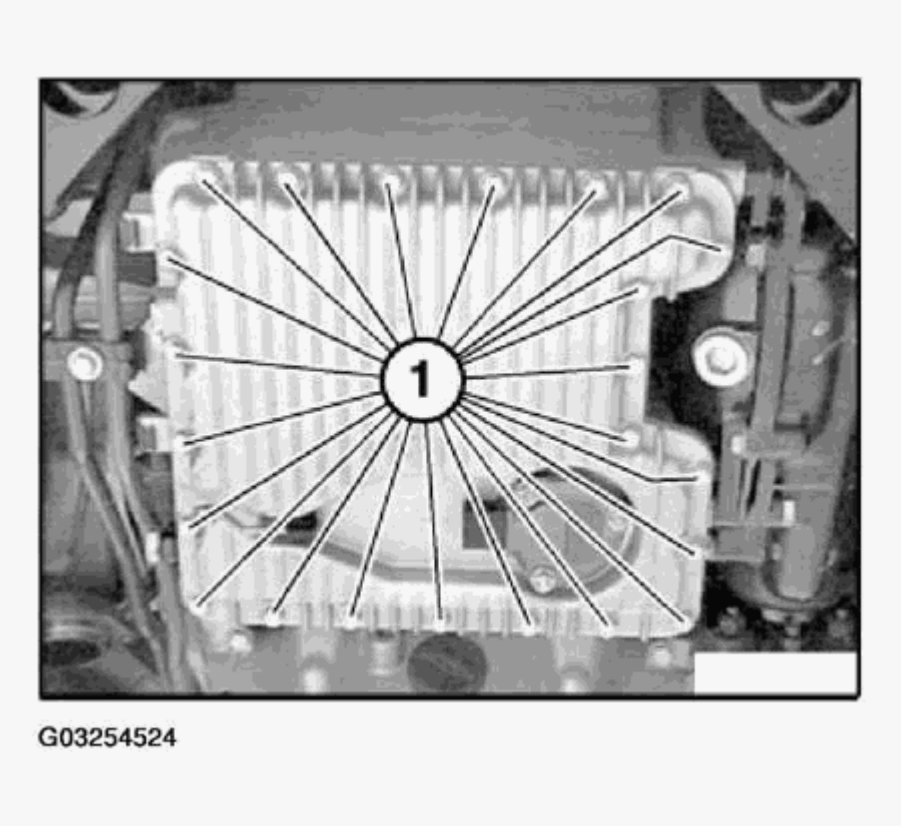


Fig. 93: Removing Lower Oil Sump Section Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean sealing surfaces.

Replace seal.

Insert all screws (1) and tighten down.

Tightening torque,

refer to 11 13 2AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

HOUSING COVER

11 14 080 REMOVING AND INSTALLING TIMING CASE COVER, TOP LEFT (M62 VANOS FROM 9/98)

Remove left cylinder head cover. These tasks are described in **11 12 004 REMOVING AND INSTALLING/SEALING BOTH CYLINDER HEAD COVERS (M62)**

Remove fan clutch with impeller,

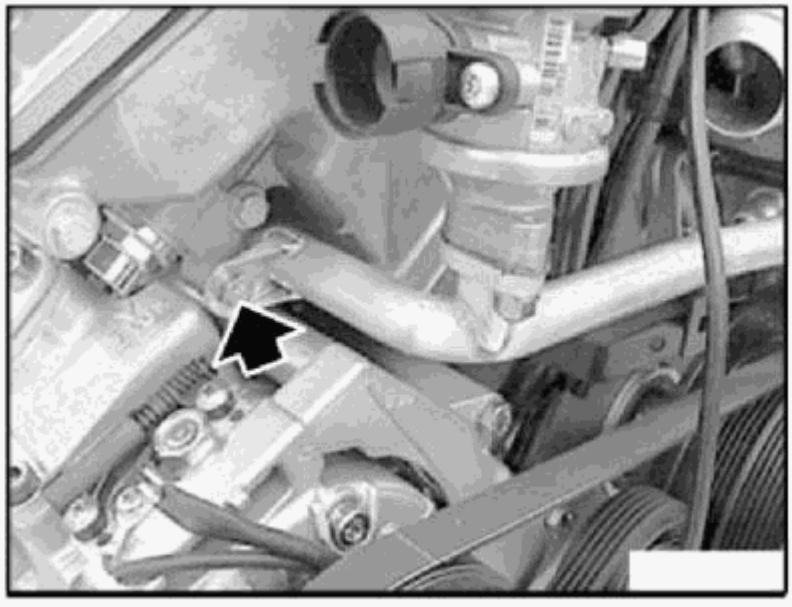
refer to **11 52 020 REMOVING AND INSTALLING OR REPLACING FAN COUPLING (M62)** .

Remove solenoid valve of camshaft adjustment unit, left,

refer to **11 36 585 REMOVING AND INSTALLING/REPLACING SOLENOID VALVE OF CAMSHAFT ADJUSTMENT UNIT, LEFT (M62 VANOS FROM 9/98)** .

Disconnect plug connection to check valve.

Detach secondary-air line on timing case cover, top left and right.



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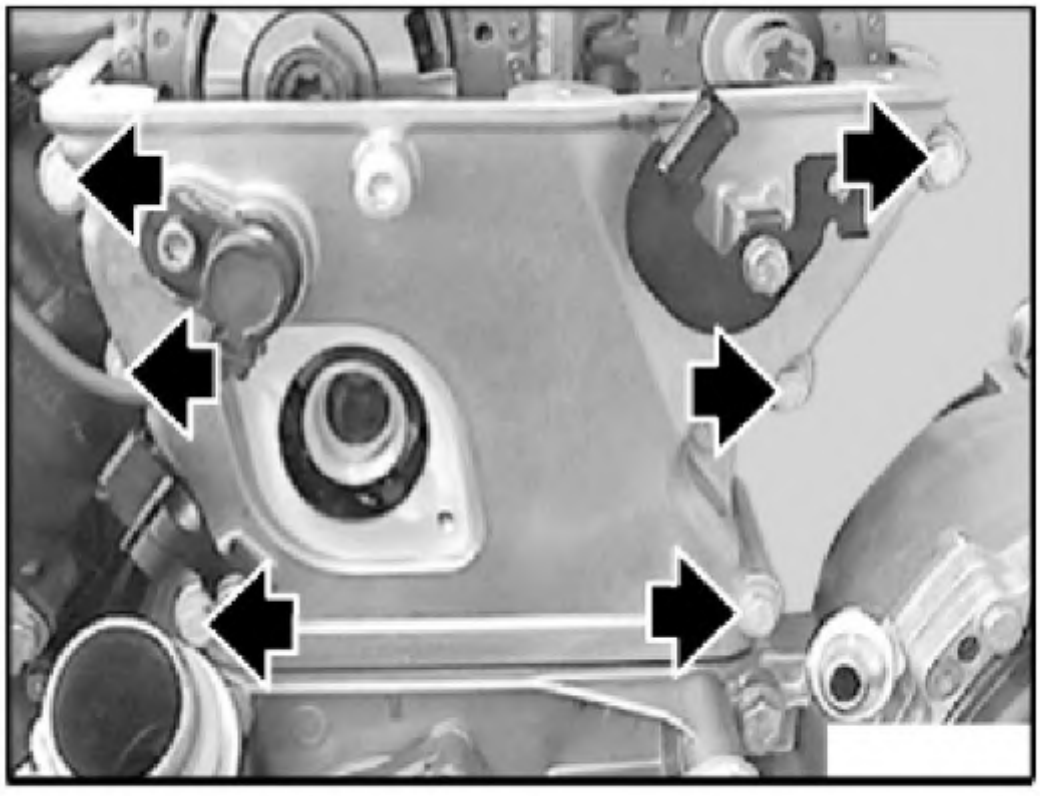
Fig. 94: Removing Secondary-Air Line
Courtesy of BMW OF NORTH AMERICA, INC.

Detach secondary-air line on bracket and remove.

Installation:

Clean sealing faces on cylinder head, replace sealing ring on secondary-air line and apply a thin coat of grease as anti-friction agent.

Unfasten timing case cover.

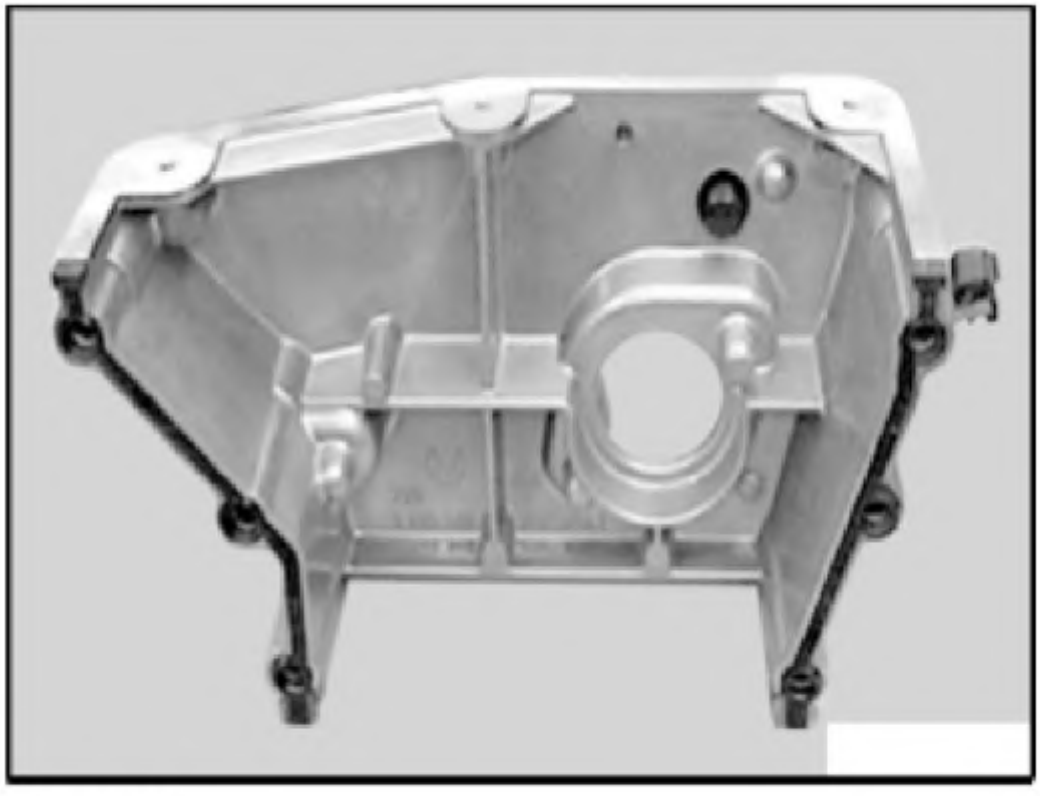


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Fig. 95: Removing Top Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Remove rubber sealing strip.

Installation: Clean groove for rubber profile seal and sealing surfaces of remains of seal.



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Fig. 96: Installing Rubber Sealing Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep sealing faces clean and free of oil.

Apply coat of Drei Bond 1209 to joint between cylinder head and lower timing case cover.



Fig. 97: Sealing Joint Between Cylinder Head And Lower Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Seat new rubber seal in groove.

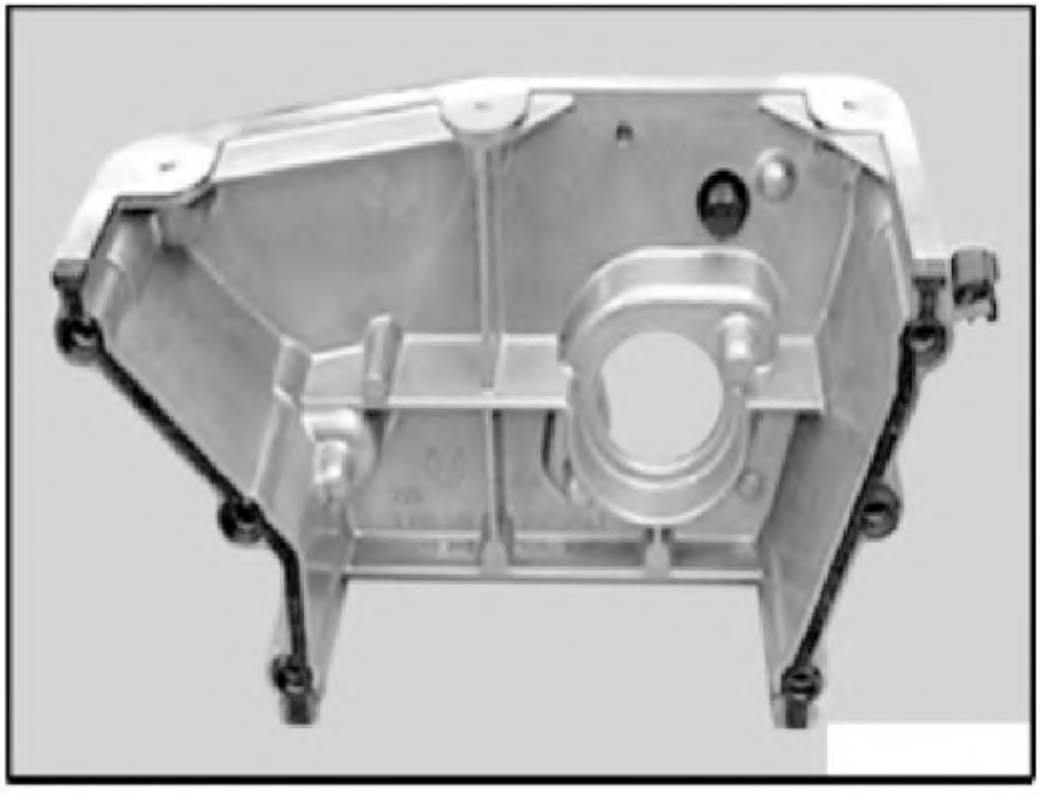


Fig. 98: Seating New Rubber Seal In Groove
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Ensure that seal is correctly seated, then fit timing case cover with inserted screw (1).

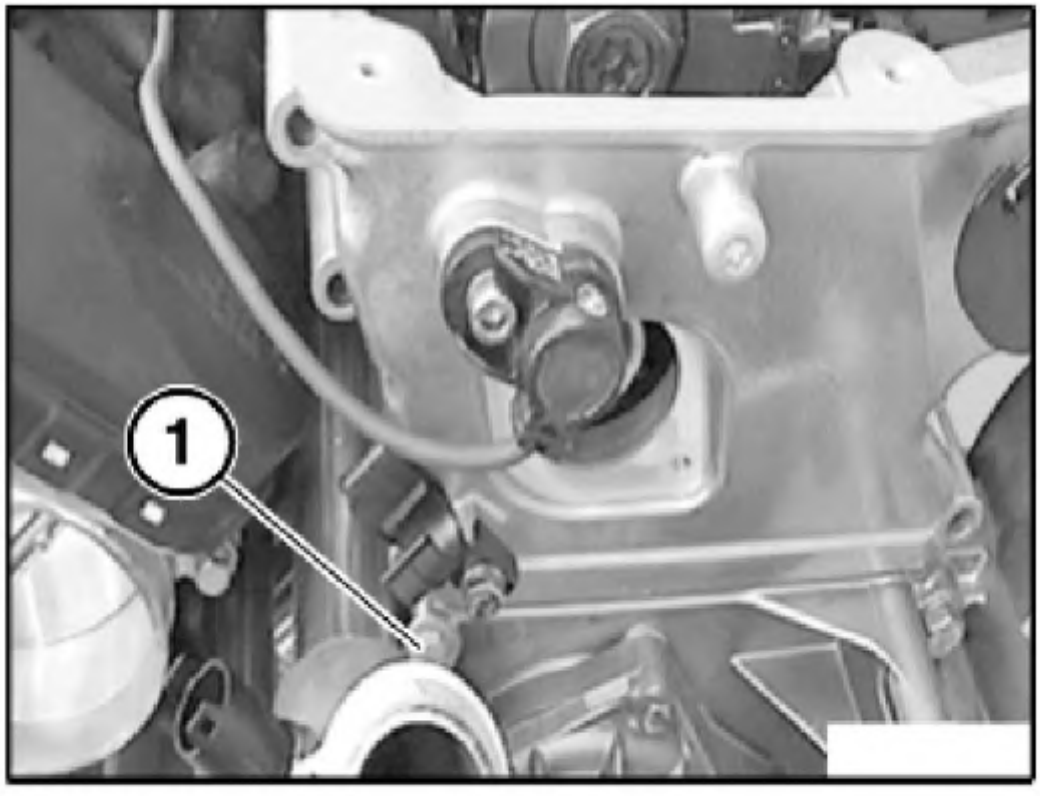


Fig. 99: Inserting Screw To Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: It is not possible to insert screw (1) after fitting the timing case cover.

Installation:

Install screws (1) and fit flush with cylinder head.

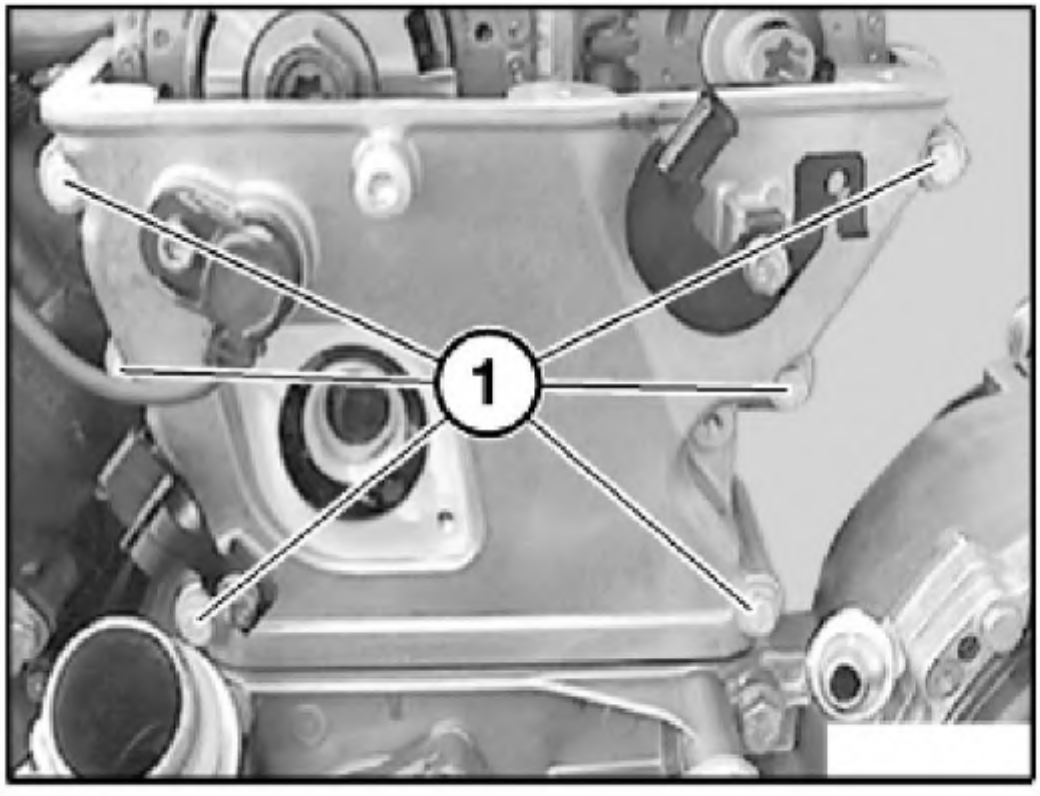
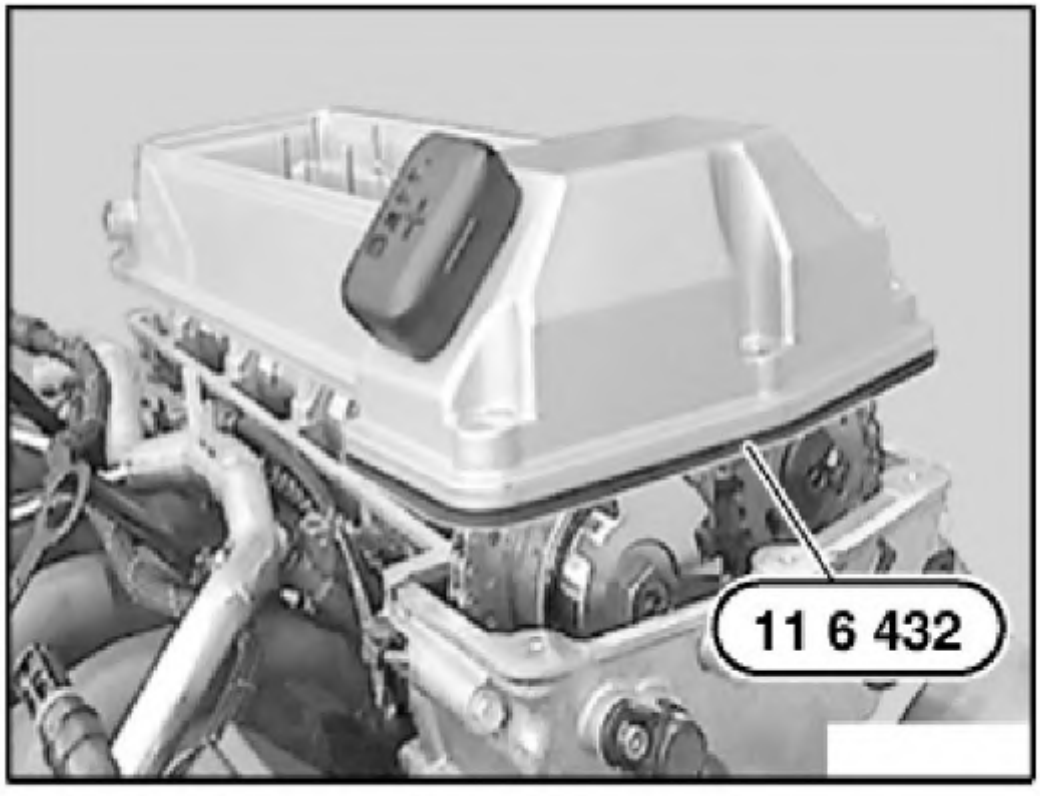


Fig. 100: Installing Top Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Remove outer and inner gasket from cylinder head cover.

Insert special tool 11 6 432 from special tool kit 11 6 430 in groove of cover and fit cylinder head cover.



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Fig. 101: Fitting Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install cover nuts (1) and tighten down uniformly in 1/2 turn steps.

Tightening Torque,

refer to 11 12 11 AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

NOTE: The timing case cover is pressed down onto level of cylinder head by cylinder head cover.

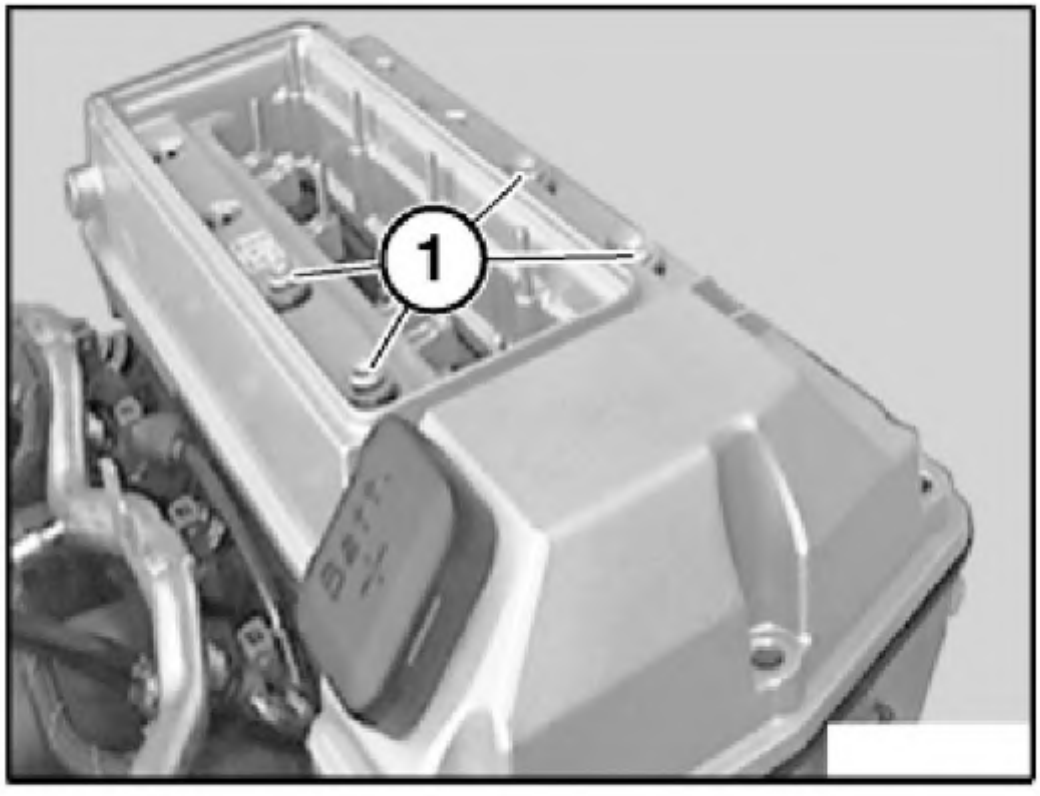


Fig. 102: Installing Cylinder Head Cover Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tighten screws (1) on timing case cover in two passes.

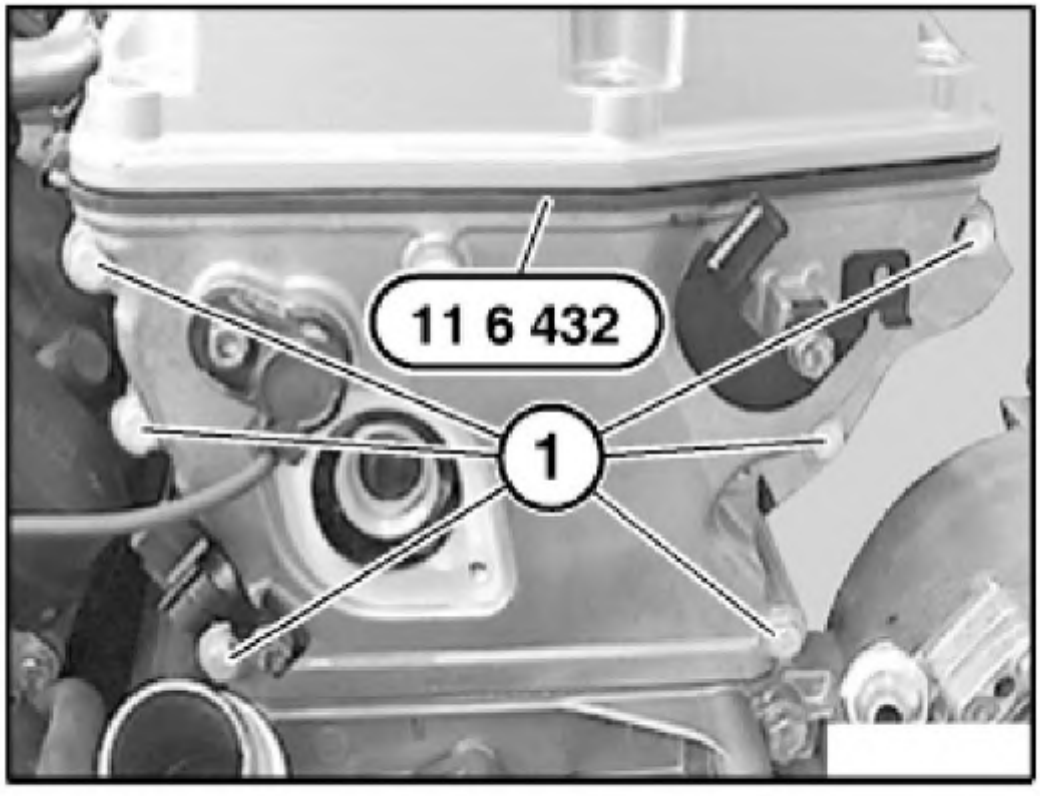


Fig. 103: Tightening Screws On Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Remove cylinder head cover and remove special tool 11 6 432.

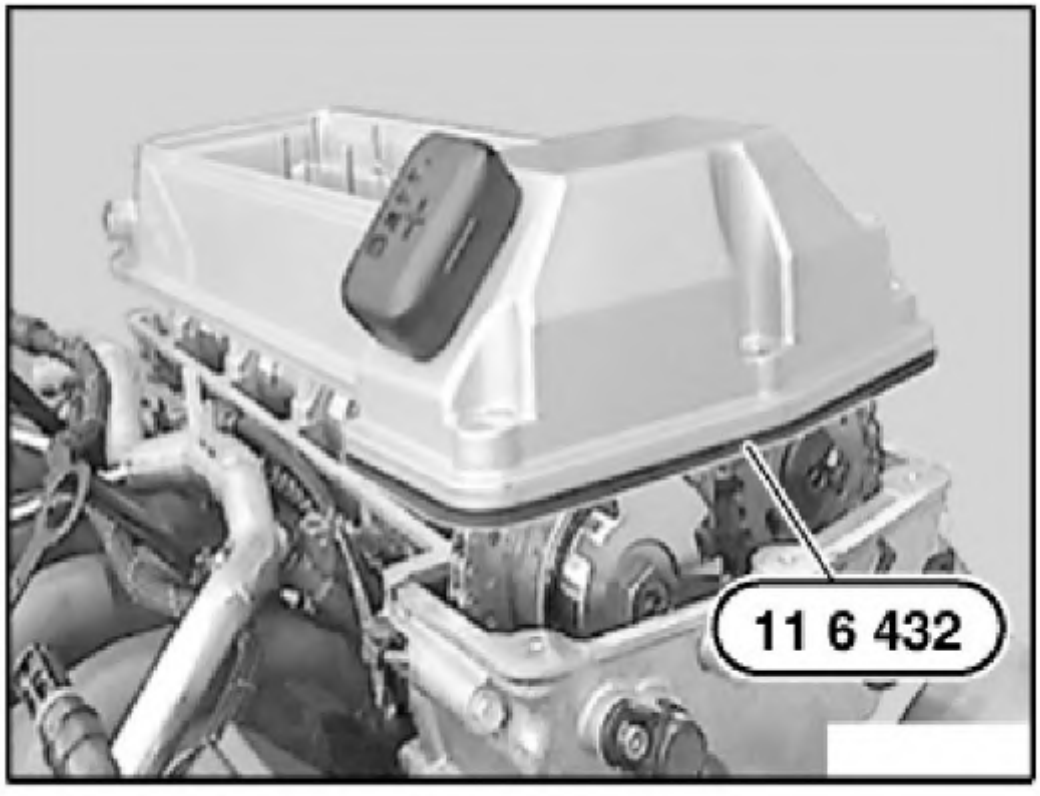


Fig. 104: Removing Special Tool 11 6 432 From Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Install solenoid valve of camshaft adjustment unit, left,

refer to **11 36 585 REMOVING AND INSTALLING/REPLACING SOLENOID VALVE OF CAMSHAFT ADJUSTMENT UNIT, LEFT (M62 VANOS FROM 9/98)** .

Assemble engine.

11 14 085 REMOVING AND INSTALLING TIMING CASE COVER, TOP RIGHT (M62 VANOS FROM 9/98)

Disconnect plug connection to check valve.

Detach secondary-air line on timing case cover, top left and right.

Detach secondary-air line on bracket and remove.

Installation:

Clean sealing faces on cylinder head, replace sealing ring on secondary-air line and apply a thin coat of grease as anti-friction agent.



Fig. 105: Removing Secondary-Air Line
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten top screw from dipstick tube.

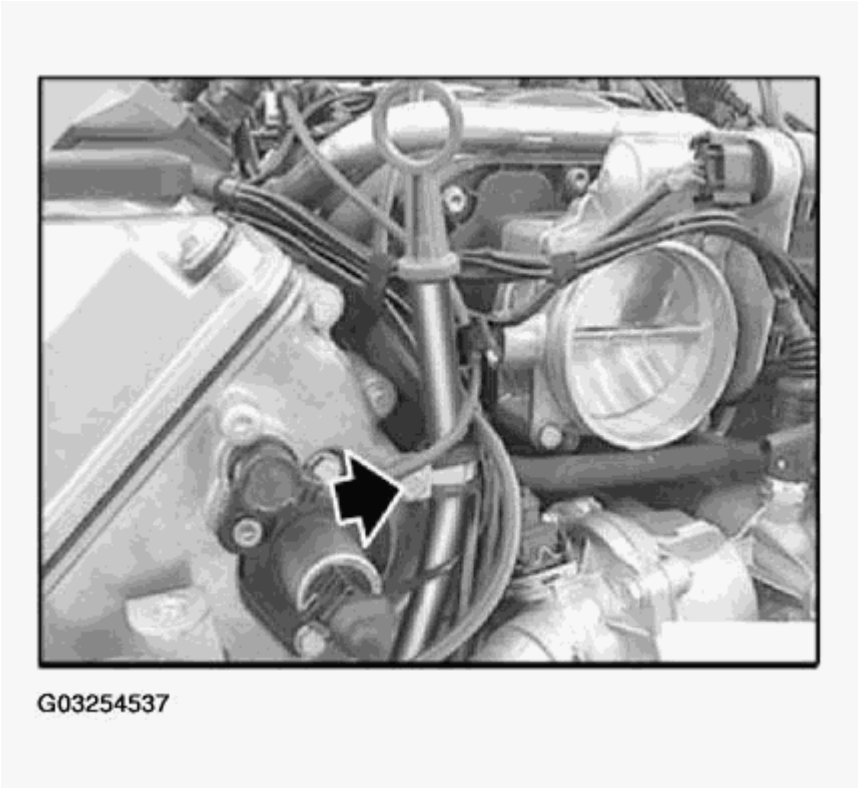


Fig. 106: Removing Dipstick Tube Clamp
Courtesy of BMW OF NORTH AMERICA, INC.

Remove right cylinder head cover. These tasks are described in the work step Removing and installing/sealing both cylinder head covers,

refer to **11 12 004 REMOVING AND INSTALLING/SEALING BOTH CYLINDER HEAD COVERS (M62)** .

Remove piston for chain tensioner,

refer to **11 31 090 INSTALLING AND REMOVING/REPLACING PISTON FOR CHAIN TENSIONER (M62)** .

Release screws on sealing flange.

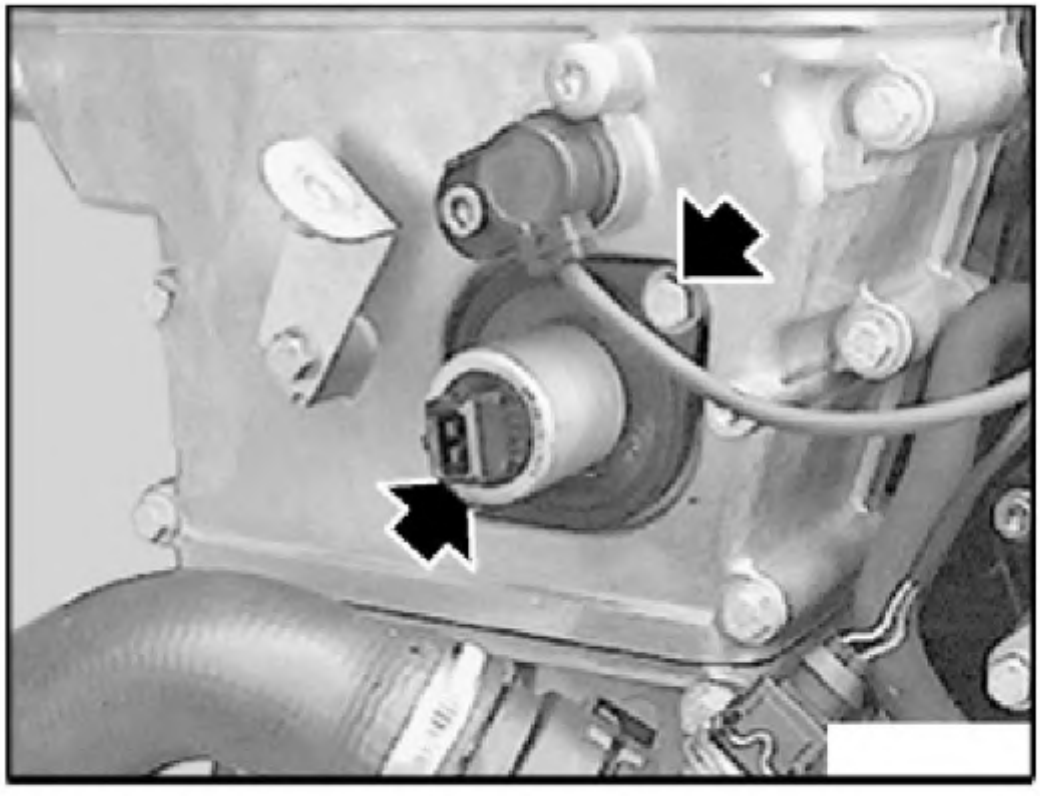


Fig. 107: Removing Screws On Solenoid Valve Sealing Flange
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The sealing flange seals the timing case cover via the solenoid valve.

If necessary, clean solenoid valve with a cloth.

Remove sealing flange (1).

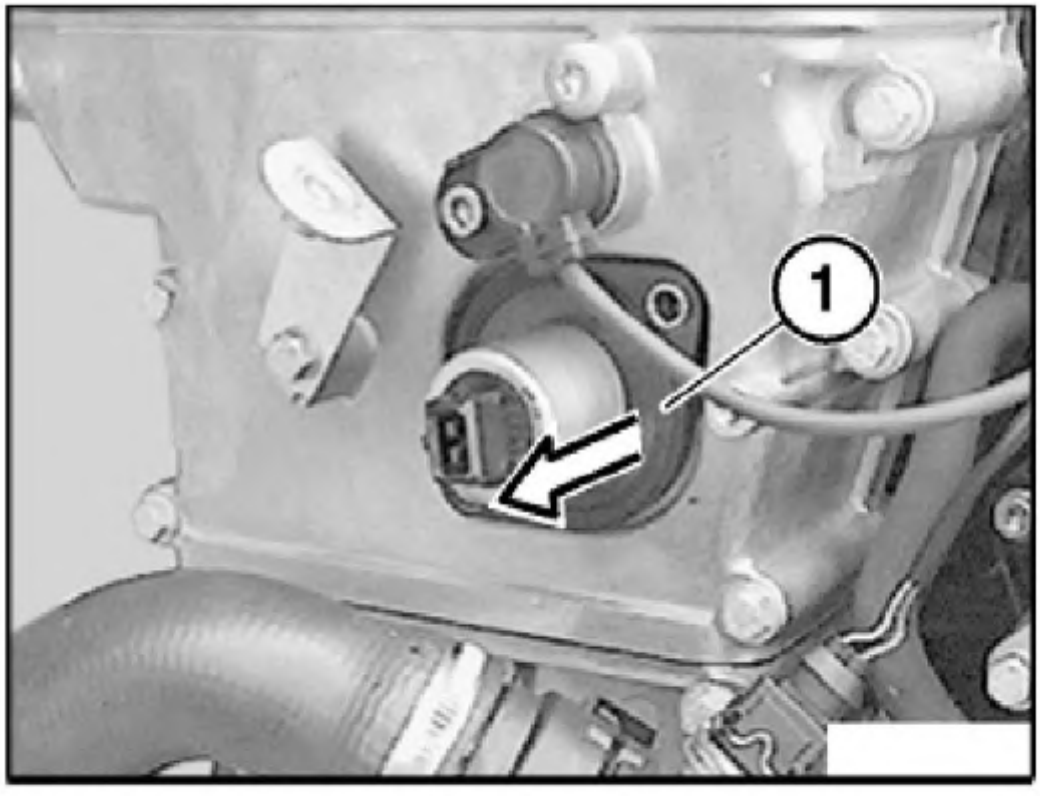


Fig. 108: Removing Solenoid Valve Sealing Flange
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove camshaft sensor or disconnect plug connection to cable duct.

Release screws and remove timing case cover at top.

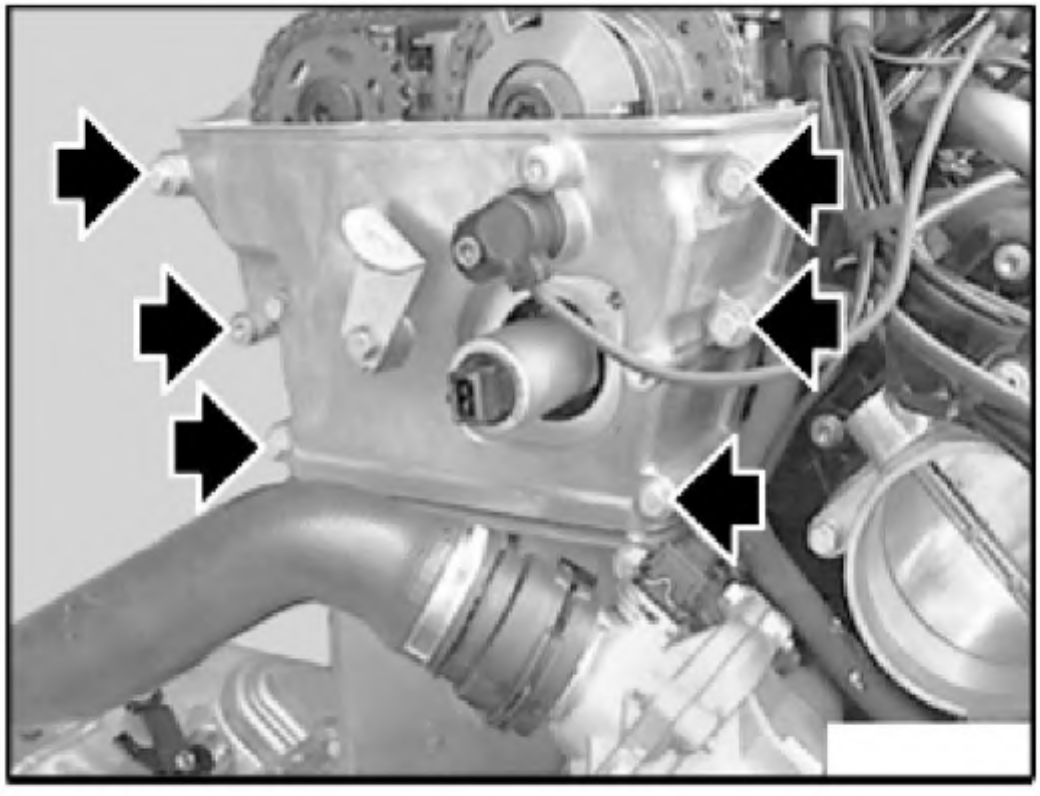
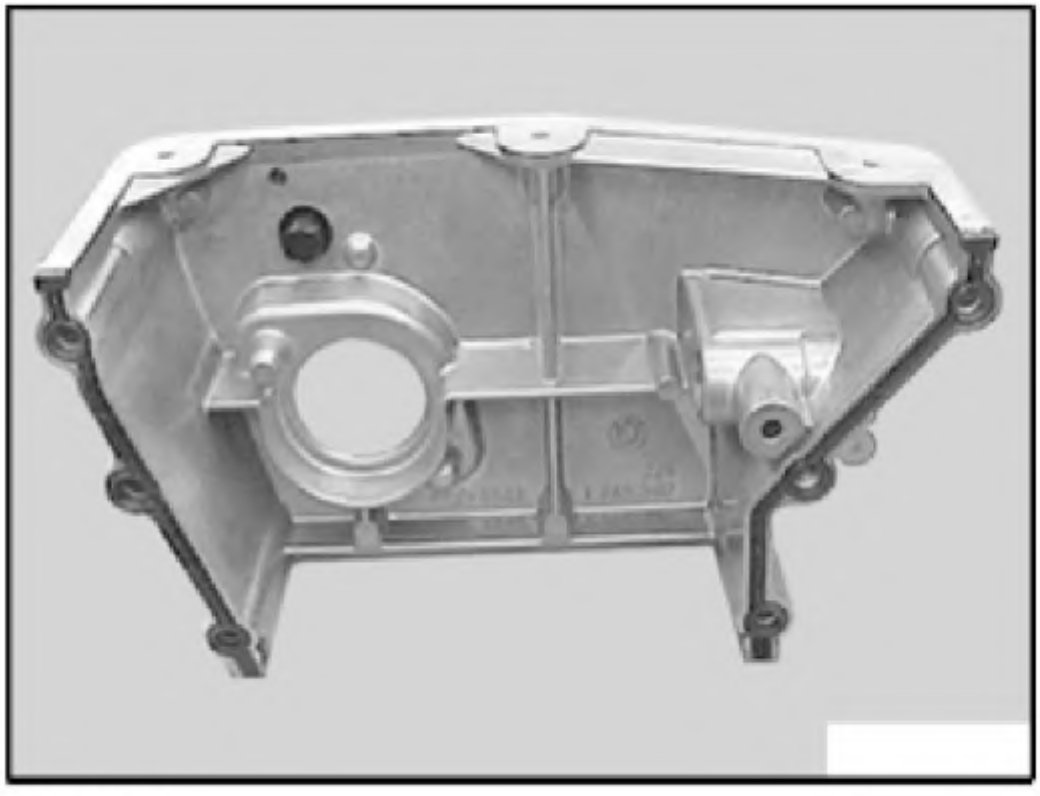


Fig. 109: Removing Top Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Remove rubber sealing strip.

Installation:

Clean groove for rubber profile seal and sealing surfaces of remains of seal.



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Fig. 110: Removing Top Timing Case Cover Rubber Sealing Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring in cylinder head for oil supply of chain tensioner.

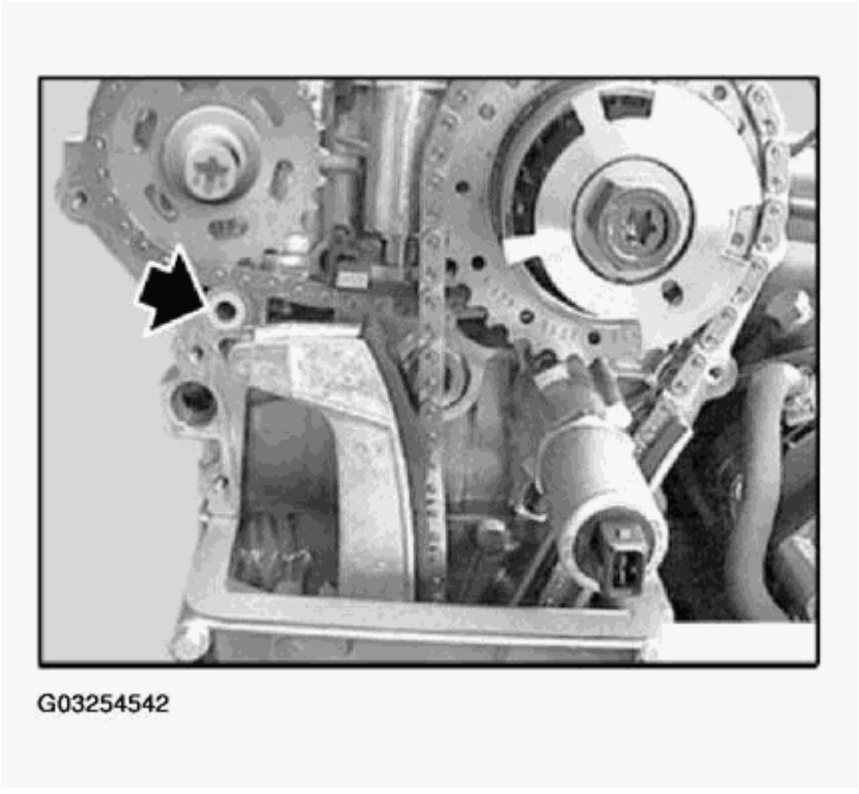


Fig. 111: Replacing Chain Tensioner Oil Supply Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

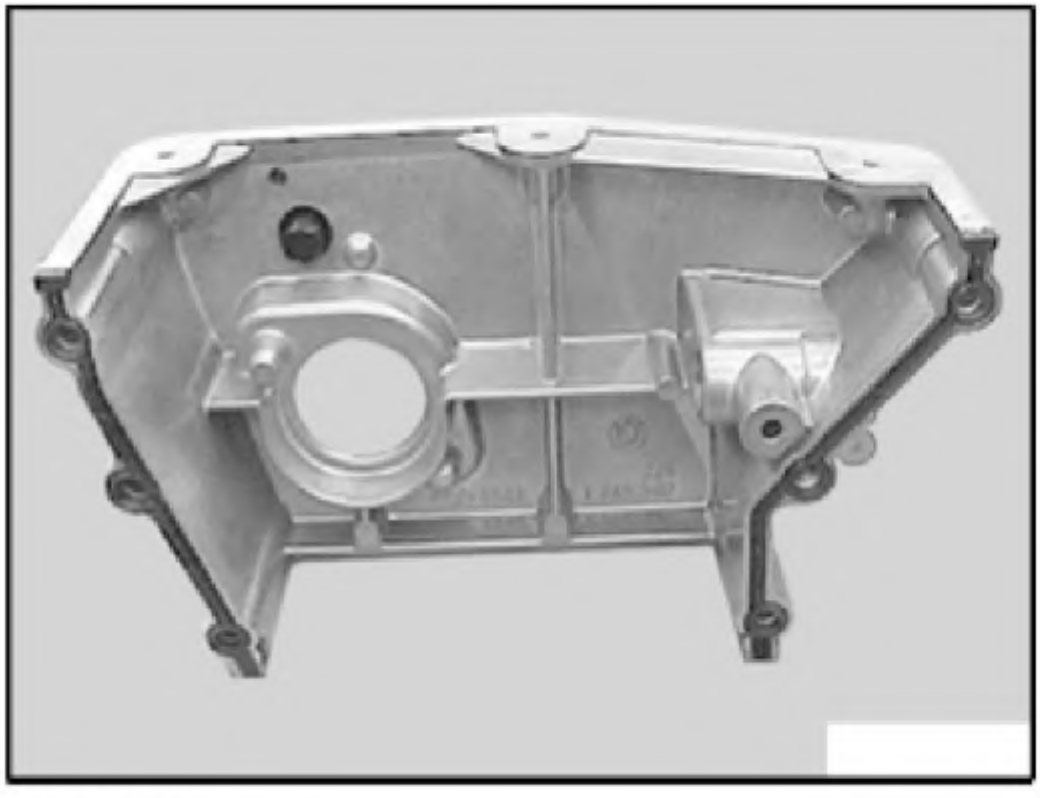
Keep sealing faces clean and free of oil.

Apply coat of Drei Bond 1209 to joint between cylinder head and lower timing case cover.



Fig. 112: Sealing Joint Between Cylinder Head And Lower Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Seat new rubber seal in groove.



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Fig. 113: Seating New Rubber Seal In Groove
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Ensure that seals are correctly seated.

Press bow cover inwards and fit timing case cover.

Install screws (1) and fit flush with cylinder head.

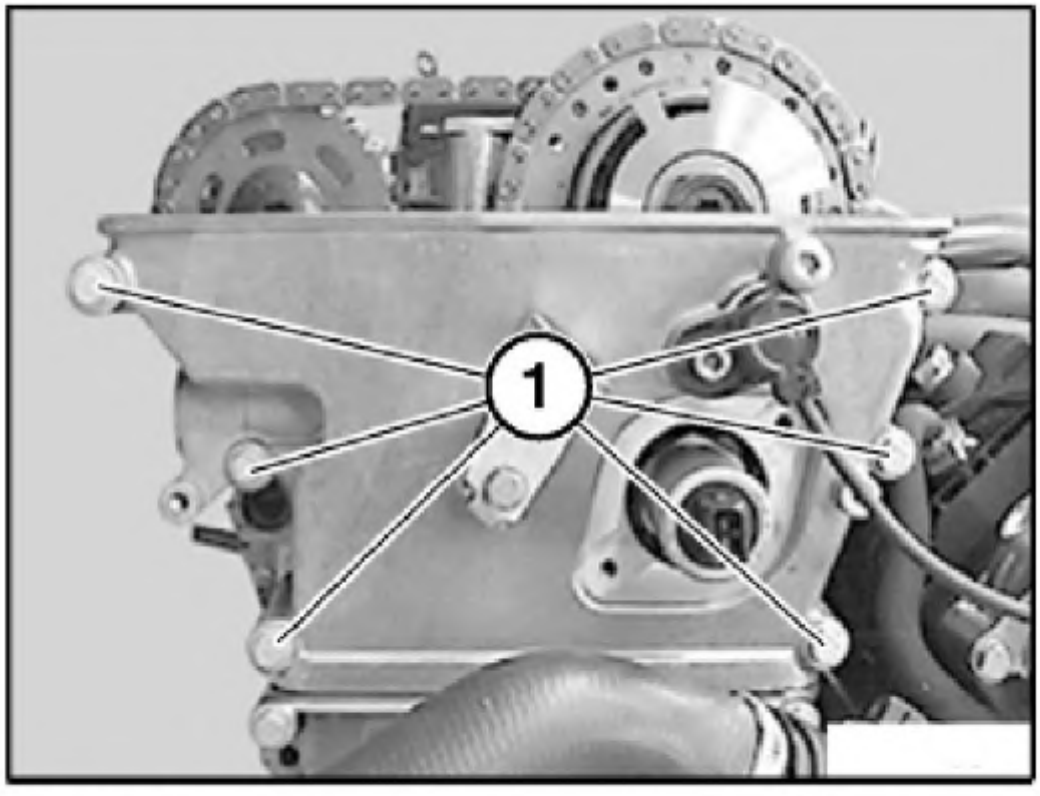


Fig. 114: Installing Top Timing Case Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Remove outer and inner gasket from cylinder head cover.

Insert special tool 11 6 431 from special tool kit 11 6 430 in groove of cover and fit cylinder head cover.

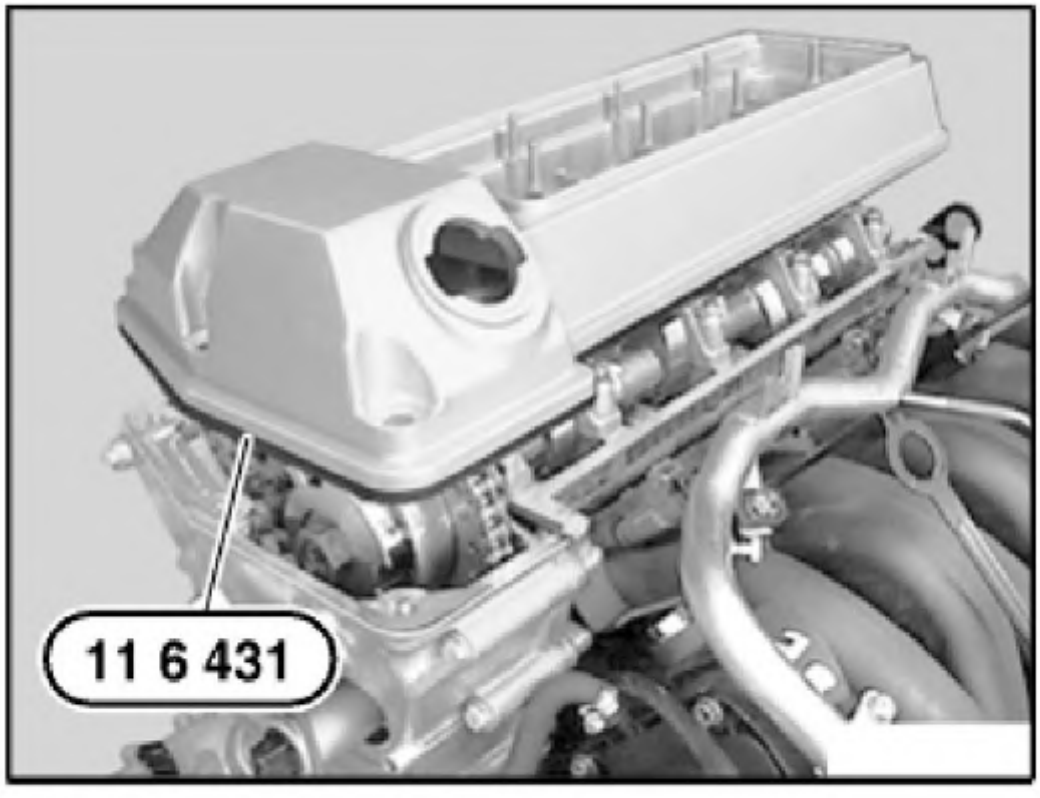


Fig. 115: Fitting Cylinder Head Cover Using Special Tool 11 6 431
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install cover nuts (1) and tighten down uniformly in 1/2 turn steps.

Tightening Torque,

refer to 11 12 11AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

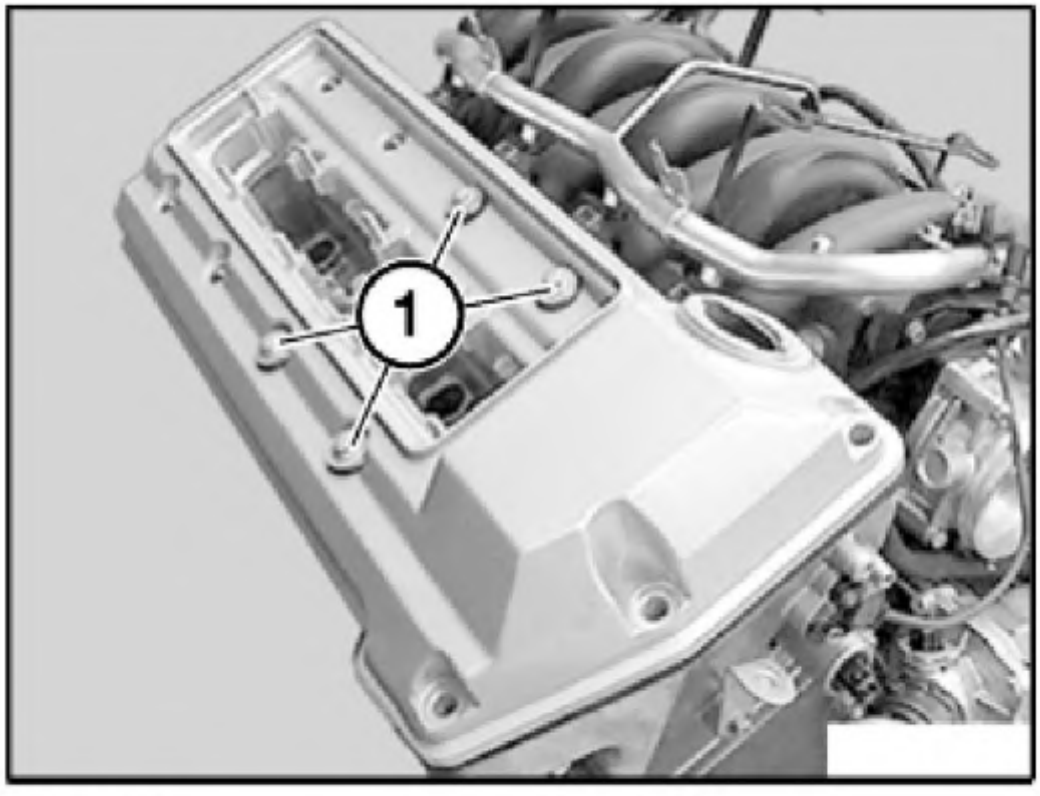


Fig. 116: Installing Cylinder Head Cover Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The timing case cover is pressed down onto level of cylinder head by cylinder head cover.

Installation:

Tighten screws (1) on timing case cover in two passes.

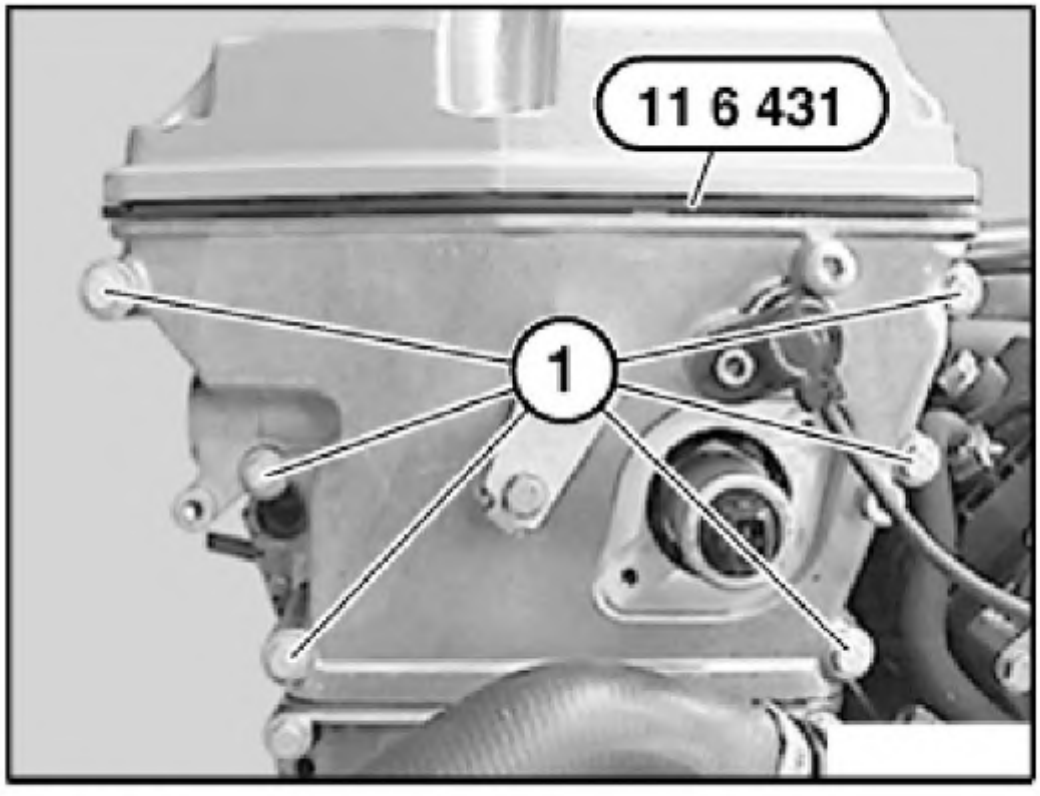


Fig. 117: Tightening Screws On Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Remove cylinder head cover and remove special tool 11 6 431.

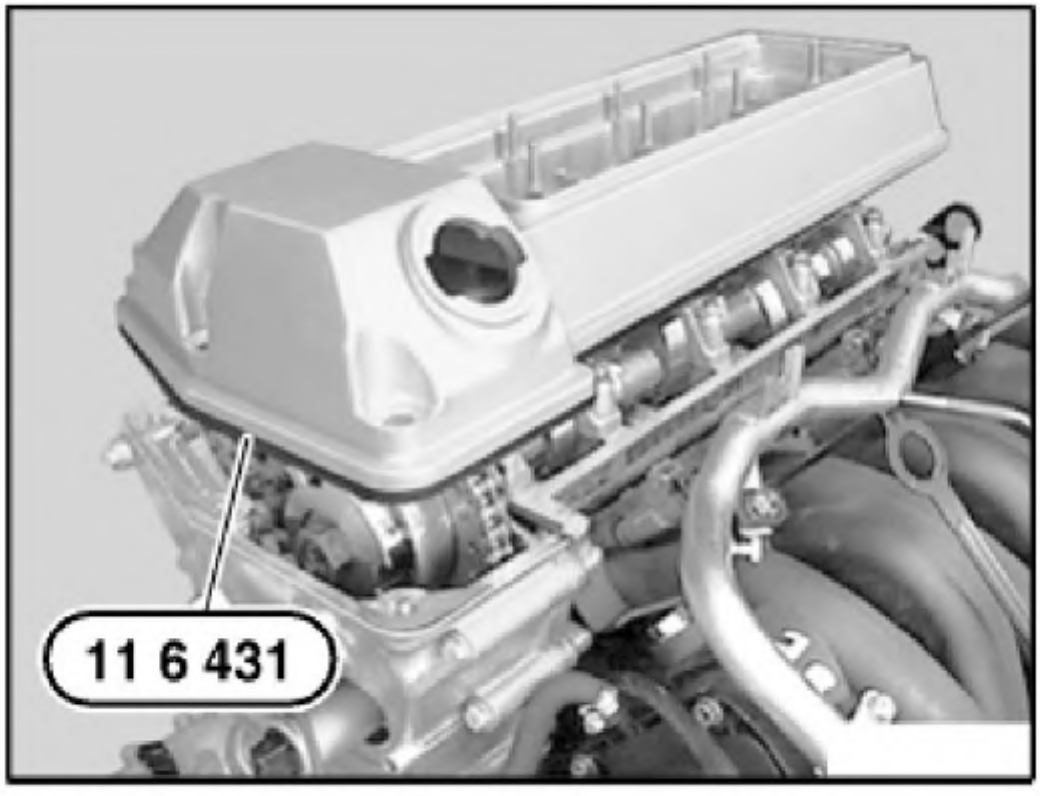


Fig. 118: Removing Special Tool 11 6 431 From Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Clean solenoid valve (1) and sealing face (2).

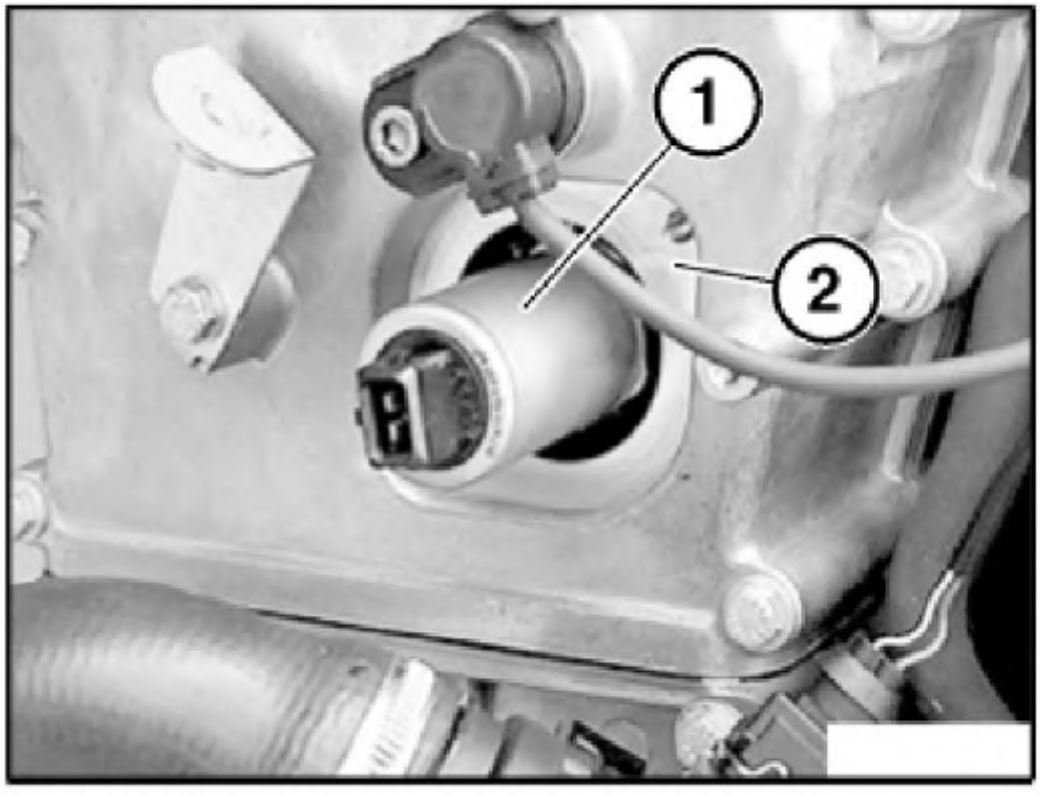


Fig. 119: Identifying Solenoid Valve And Sealing Face
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check sealing flange (1), replace if necessary.

Apply a light coat of oil to inside of sealing flange (1) at sealing face to solenoid valve and carefully install.

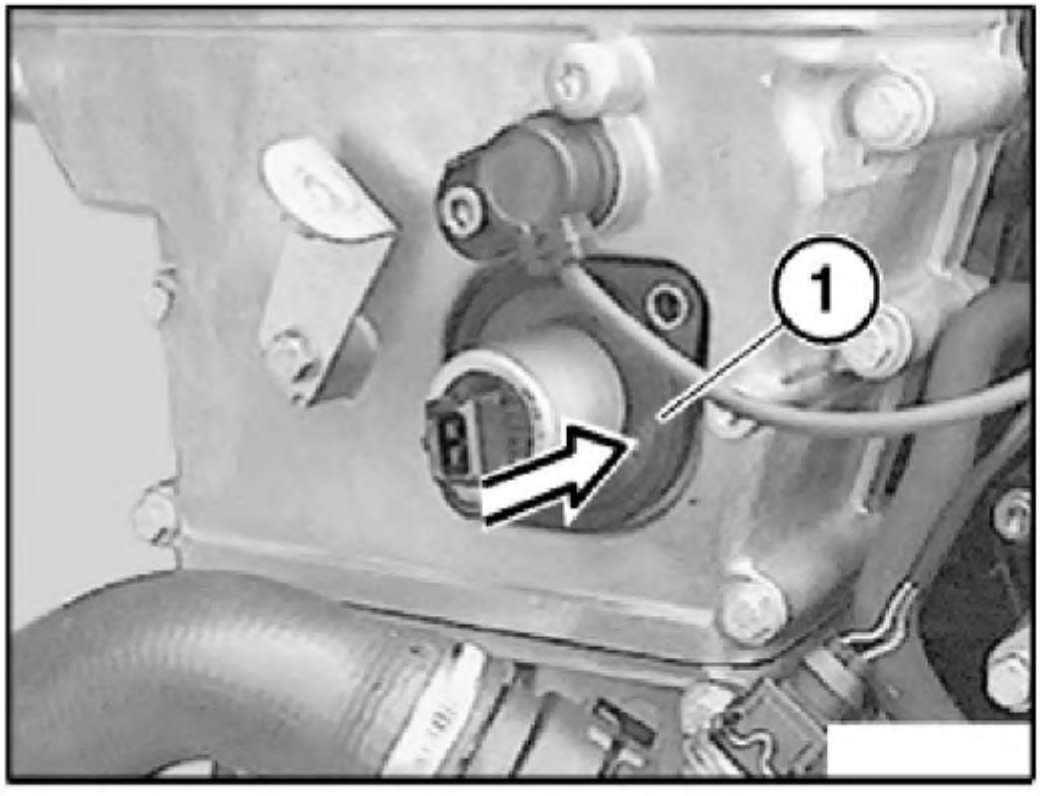
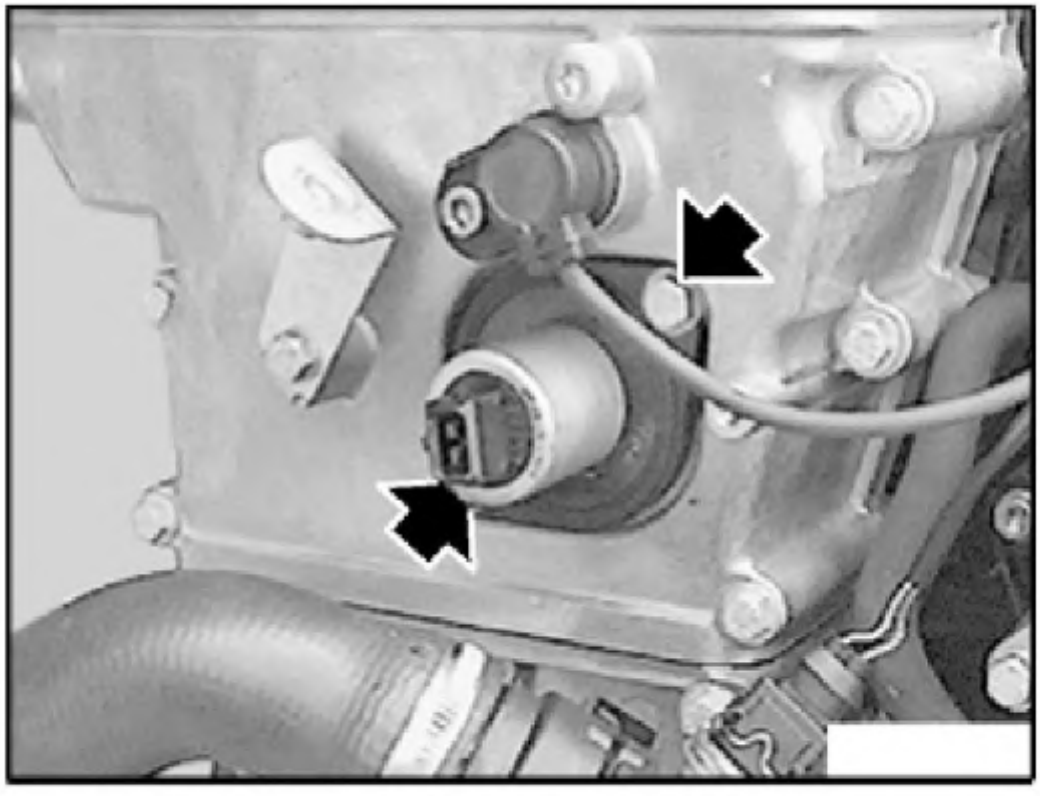


Fig. 120: Replacing Solenoid Valve Sealing Flange
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screws on sealing flange and tighten down.



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Fig. 121: Installing Screws On Sealing Flange
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 110 REMOVING AND INSTALLING TIMING CASE COVER, BOTTOM (M62 VANOS FROM 9/98)

Instructions for disconnecting and connecting battery,

refer to **12 00 ... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY** .

Disconnect negative battery lead.

Unfasten drain plug for coolant on right engine block. Drain and dispose of coolant.

Installation:

Replace sealing ring on drain plug.

Tightening Torque,

refer to 11 11 5AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Top up coolant. Vent cooling system and check for leaks,

refer to **17 00 005 DRAINING AND TOPPING UP COOLANT (M62)** .

Remove timing case covers, top left and right,

refer to **11 14 080 REMOVING AND INSTALLING TIMING CASE COVER, TOP LEFT (M62 VANOS FROM 9/98)** and **11 14 085 REMOVING AND INSTALLING TIMING CASE COVER, TOP RIGHT (M62 VANOS FROM 9/98)** .

Remove hub for vibration damper,

refer to **11 23 031 REMOVING AND INSTALLING/REPLACING HUB FOR VIBRATION DAMPER (M62)** .

Remove water pump with thermostat housing,

refer to **11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP (M62/S62)** .

NOTE: When the liquid-cooled alternator is removed, a residual quantity of coolant emerges from the timing case cover.

Catch and dispose of residual quantity of coolant.

Remove liquid-cooled alternator.

Remove upper oil sump section,

refer to **11 13 010 REMOVING AND INSTALLING/REPLACING UPPER SECTION OF OIL SUMP (M62)** .

Press bow cover against the timing chain. Secure bow cover with a plastic strap (1).

Remove lower timing case cover.



Fig. 122: Removing Lower Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean and remove grease from sealing surfaces of the engine block.

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

Replace seals (2 and 3).

Apply thin coat of Drei Bond 1209 to front and back edges of seals.

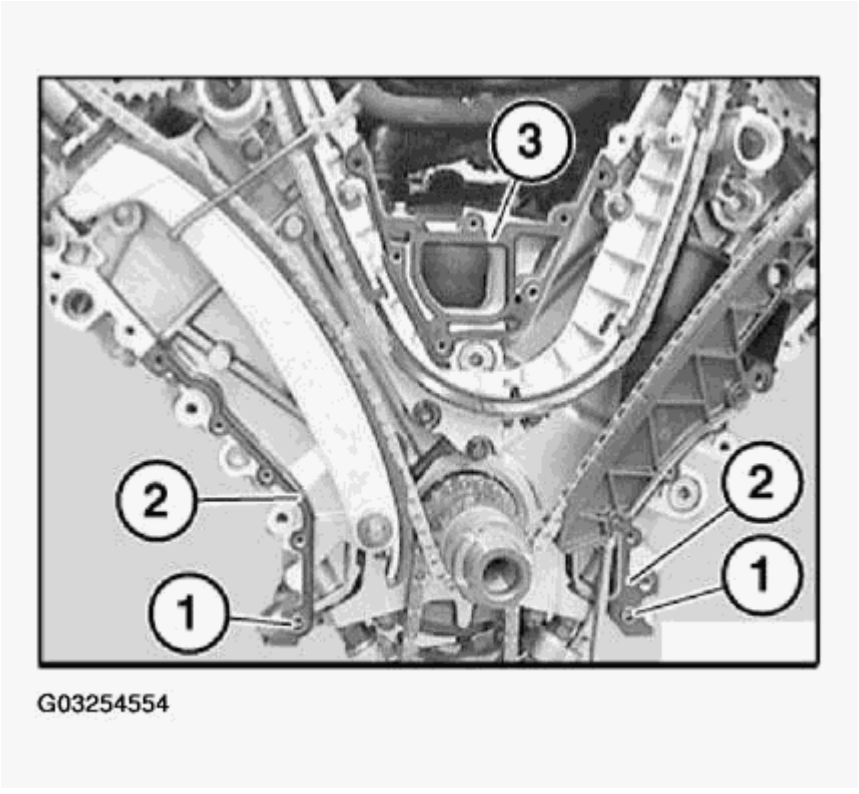


Fig. 123: Applying Sealer
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install timing case cover, insert all screws and initially tighten to approx. 5 Nm.

Firmly tighten all screws in alternate sequence.

Tightening Torque,

refer to 11 14 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .



Fig. 124: Installing Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Once all screws have been tightened down, retighten them in a second operation.

Replace radial seal in timing case cover at bottom,

refer to **11 14 141 REPLACING RADIAL SEAL BELOW TIMING CASE COVER (M62)** .

11 14 141 REPLACING RADIAL SEAL BELOW TIMING CASE COVER (M62)

Removing hub for vibration damper,

refer to **11 23 031 REMOVING AND INSTALLING/REPLACING HUB FOR VIBRATION DAMPER (M62)**

Fit special tool 11 2 383 to crankshaft.



Fig. 125: Fitting Special Tool 11 2 383 To Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Screw on special tool 11 2 380 until it is securely connected to the radial seal.

Remove radial sealing ring by tightening in the screw.



Fig. 126: Removing Radial Sealing Ring Using Special Tool 11 2 380
Courtesy of BMW OF NORTH AMERICA, INC.

Coat sealing lips of new radial sealing ring with oil.

Using special tool 11 1 220 and central screw, install radial seal until flush with timing case cover.



Fig. 127: Installing Radial Seal Until Using Special Tool 11 1 220
Courtesy of BMW OF NORTH AMERICA, INC.

11 14 151 REPLACING CRANKSHAFT RADIAL SEAL (M62/S62)

Transmission Side

- Remove Gearbox
- Drain Off Engine Oil
- Remove Flywheel

Unfasten screws.

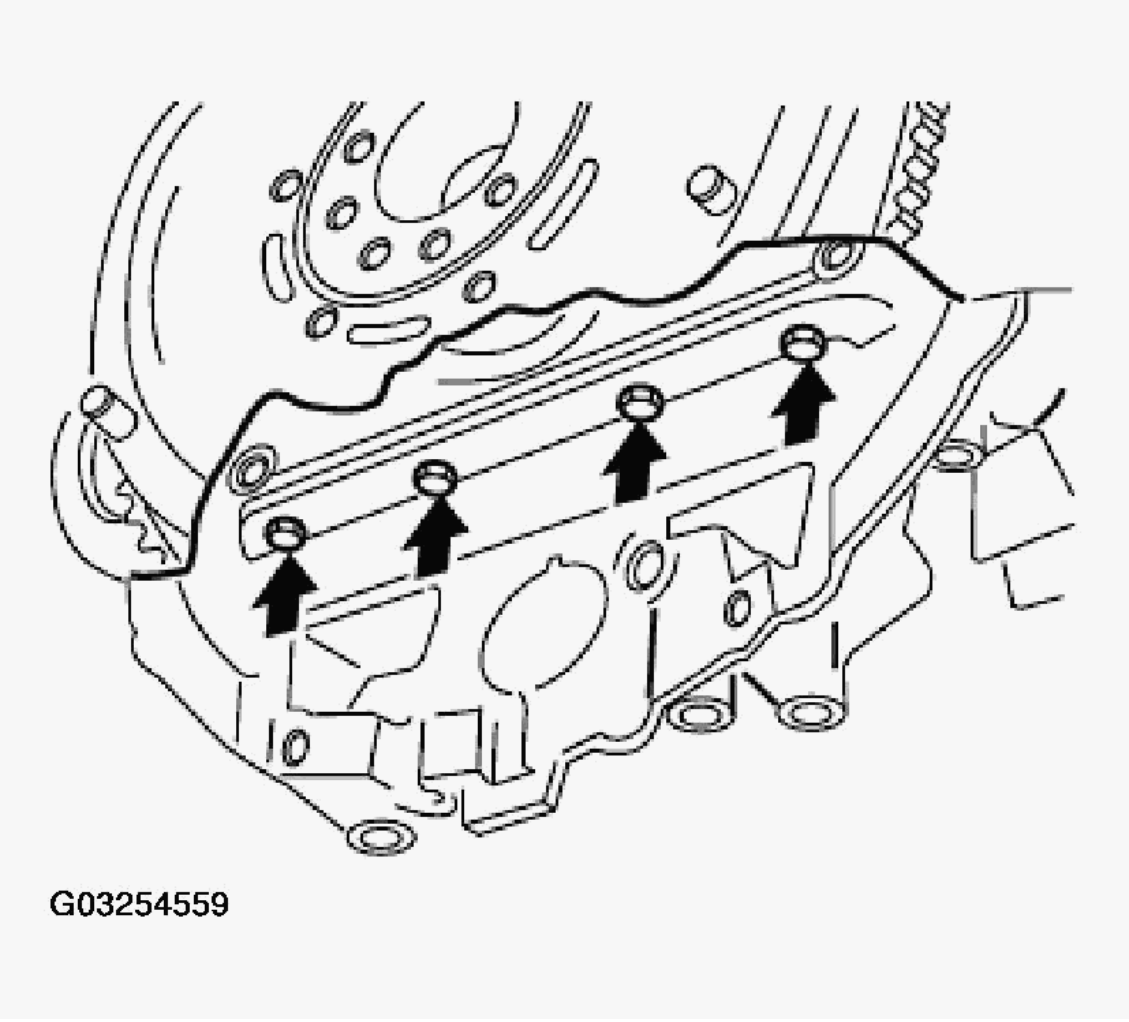


Fig. 128: Identifying Dust Shield Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screw on rear end cover.

Carefully unfasten oil sump gasket from end cover and remove end cover.

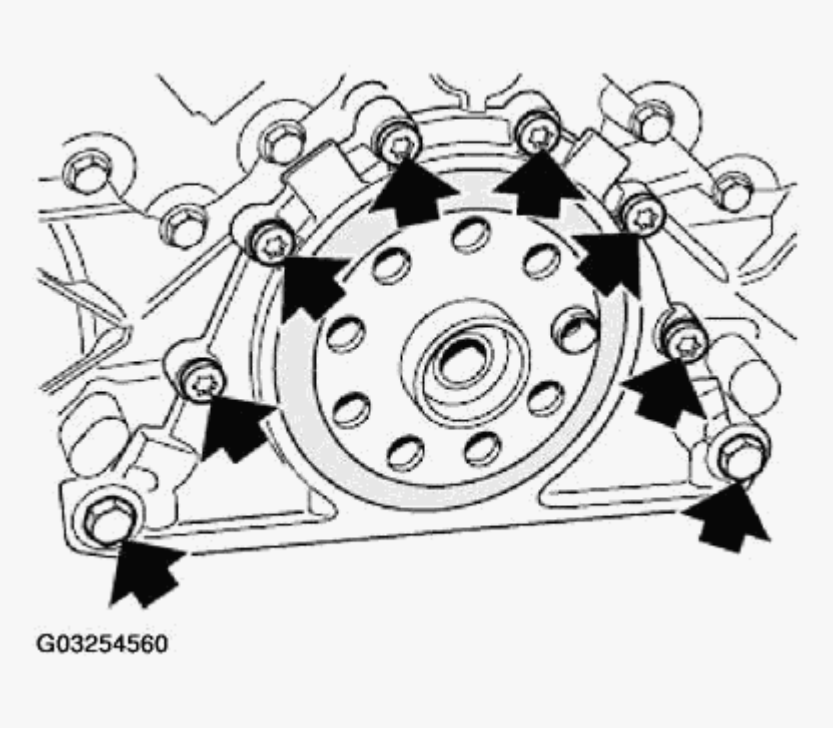


Fig. 129: Removing Rear End Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The end cover is in the set with the radial sealing ring.

If necessary, lift out the radial seal and drive in new sealing ring using special tool 11 1 230 in conjunction with special tool 00 5 500.

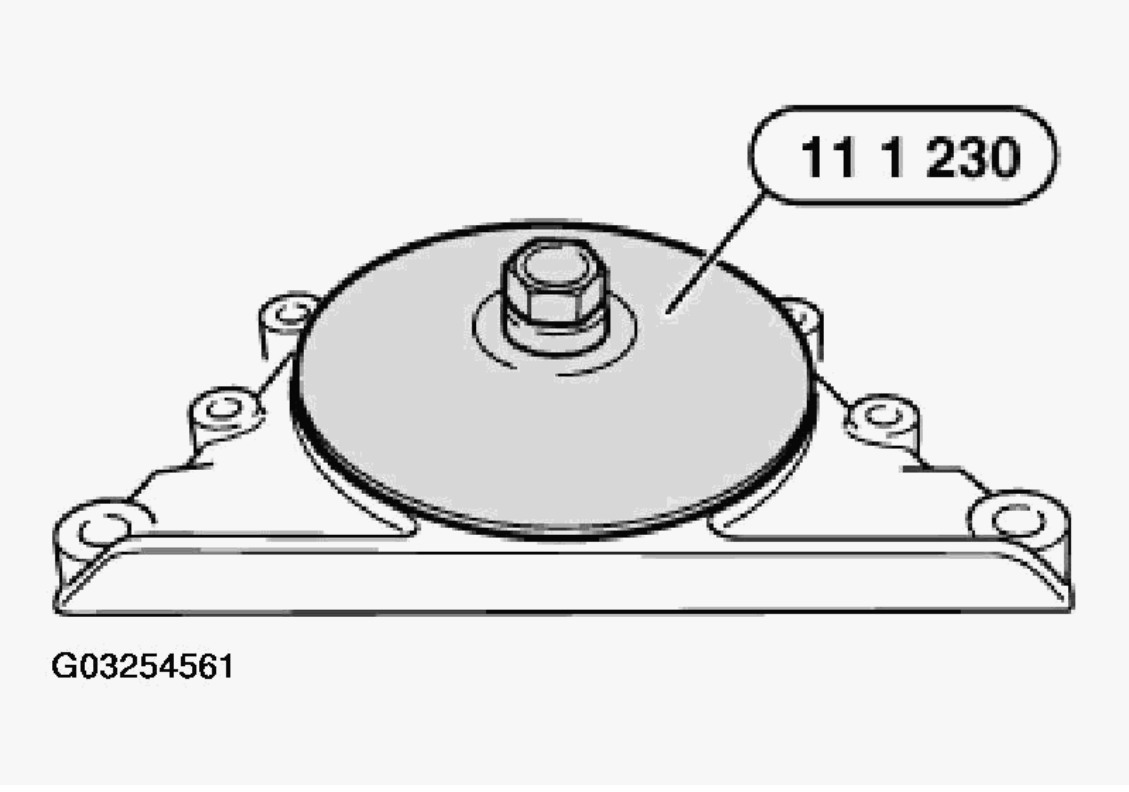


Fig. 130: Drive In New Sealing Ring Using Special Tool 11 1 230
Courtesy of BMW OF NORTH AMERICA, INC.

Check for correct fit of hollow bushes.

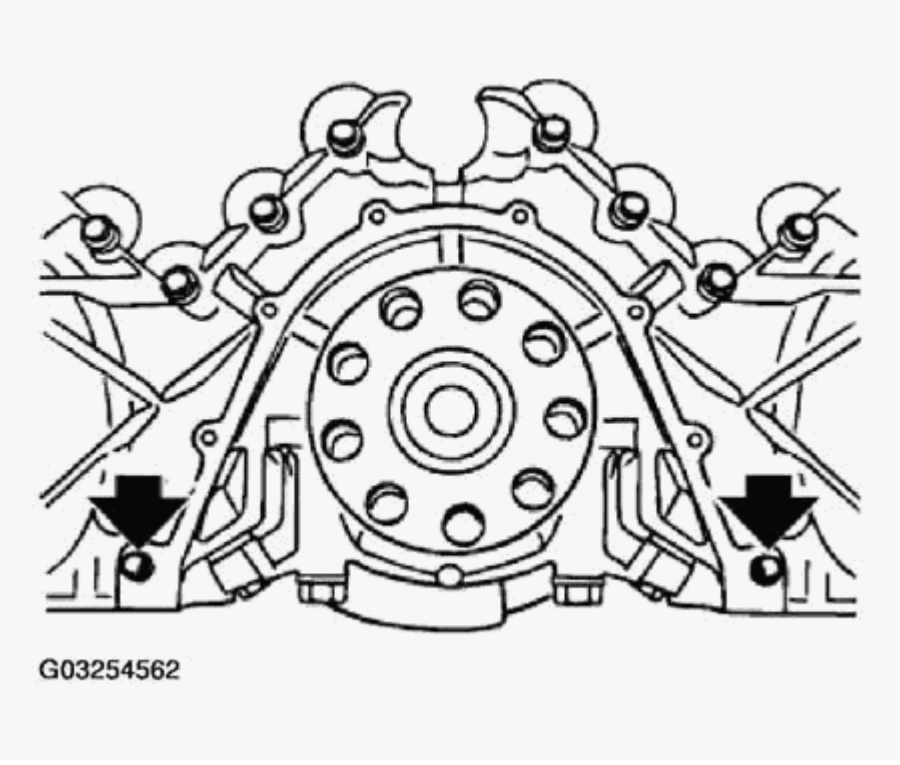


Fig. 131: Checking For Correct Fit Of Hollow Bushes
Courtesy of BMW OF NORTH AMERICA, INC.

Replace seal.

Coat contact points on joint along oil sump with Drei Bond 1209.

Fit special tool 11 2 390 on crankshaft.

Coat sealing lip of radial sealing ring with oil.

Slide on end cover.

Carefully remove special tool 11 2 390.

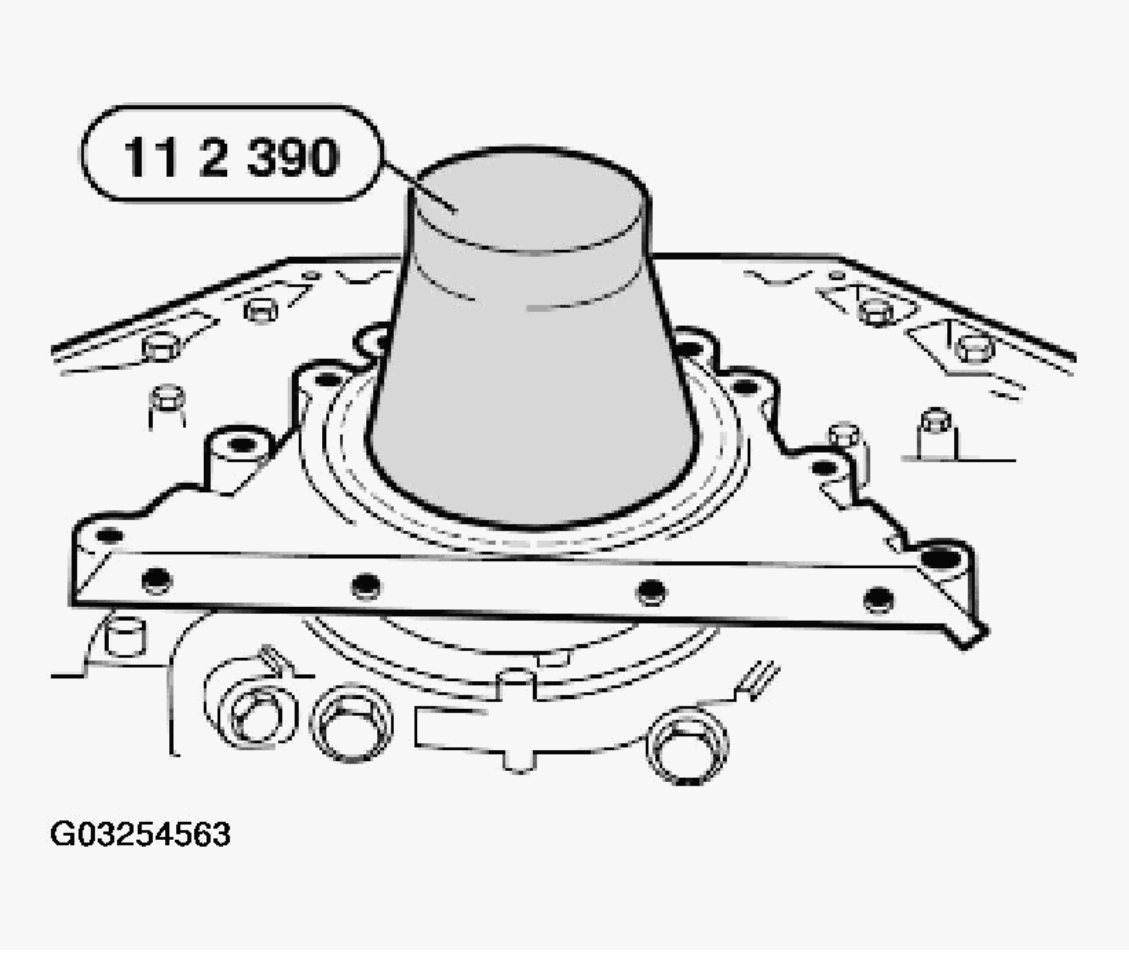


Fig. 132: Installing End Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Replace the sealing washers under the screws (1).

Insert all screws and tighten down end cover.

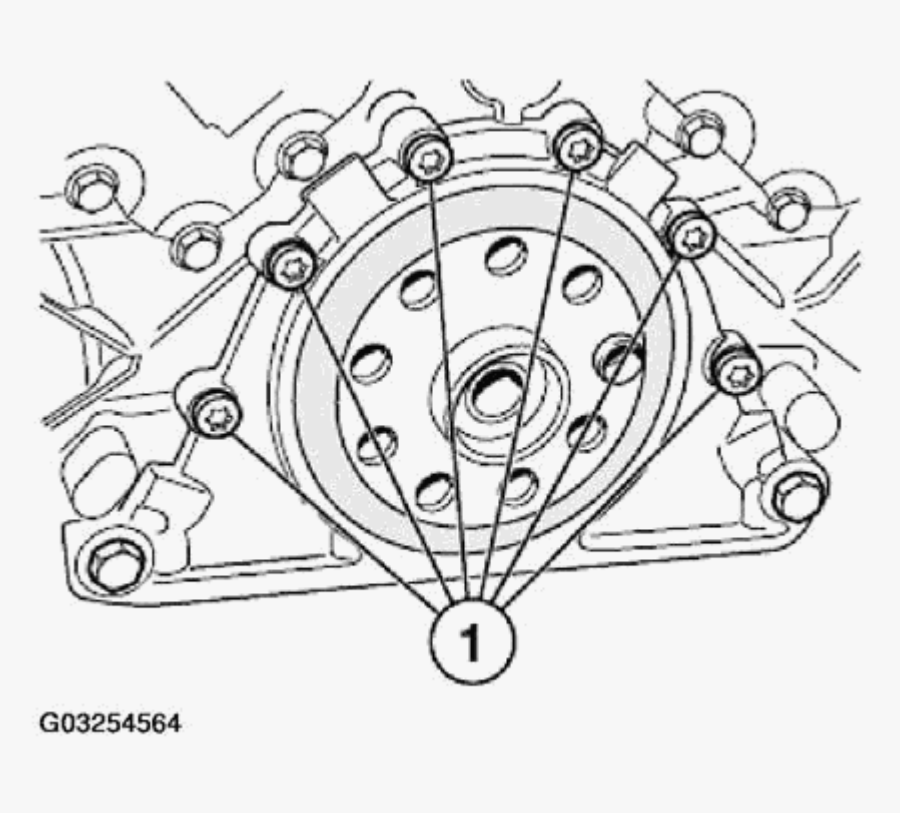


Fig. 133: Installing End Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

CRANKSHAFT WITH BEARING

11 21 500 REPLACING CRANKSHAFT (M62)

Engine Removed

Unscrew oil sump. See **OIL SUMP** .

Remove oil pump. See **OIL PUMP WITH FILTER** .

Remove timing case cover at bottom,

refer to **11 14 110 REMOVING AND INSTALLING TIMING CASE COVER, BOTTOM (M62 VANOS FROM 9/98)** .

Remove piston,

refer to **11 25 530 REMOVING AND INSTALLING/REPLACING ALL PISTONS (M62)** .

Remove flywheel,

refer to **11 22 500 REMOVING AND INSTALLING/REPLACING FLYWHEEL (M62/S62)** or **11 22 510 REMOVING AND INSTALLING/REPLACING FLYWHEEL (M62)** .

Remove rear end cover. This task is described in the section Replacing crankshaft radial seal,

refer to **11 14 151 REPLACING CRANKSHAFT RADIAL SEAL (M62/S62)** .

Unfasten taper screw mount on main bearing. (Collar screws and spacer screws.)

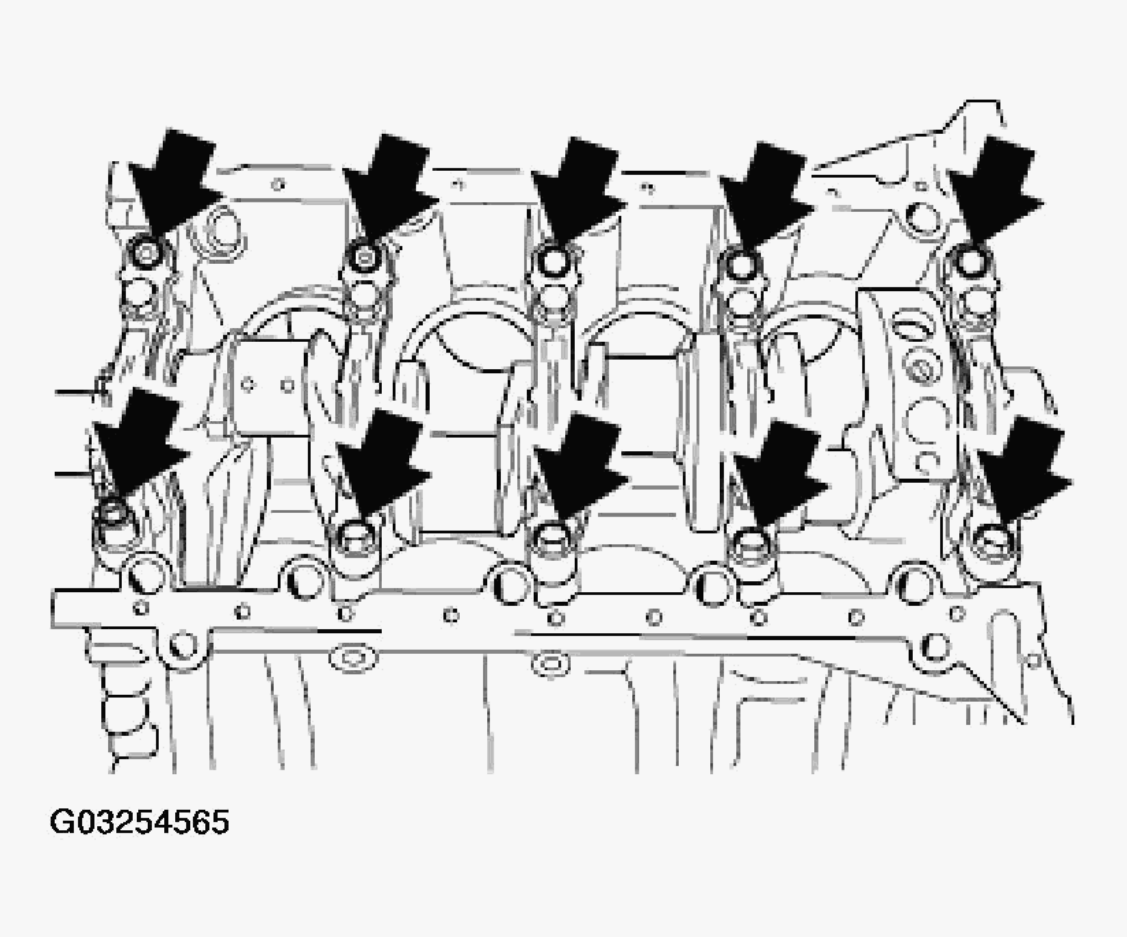


Fig. 134: Removing Taper Screw Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screws securing main bearing caps.

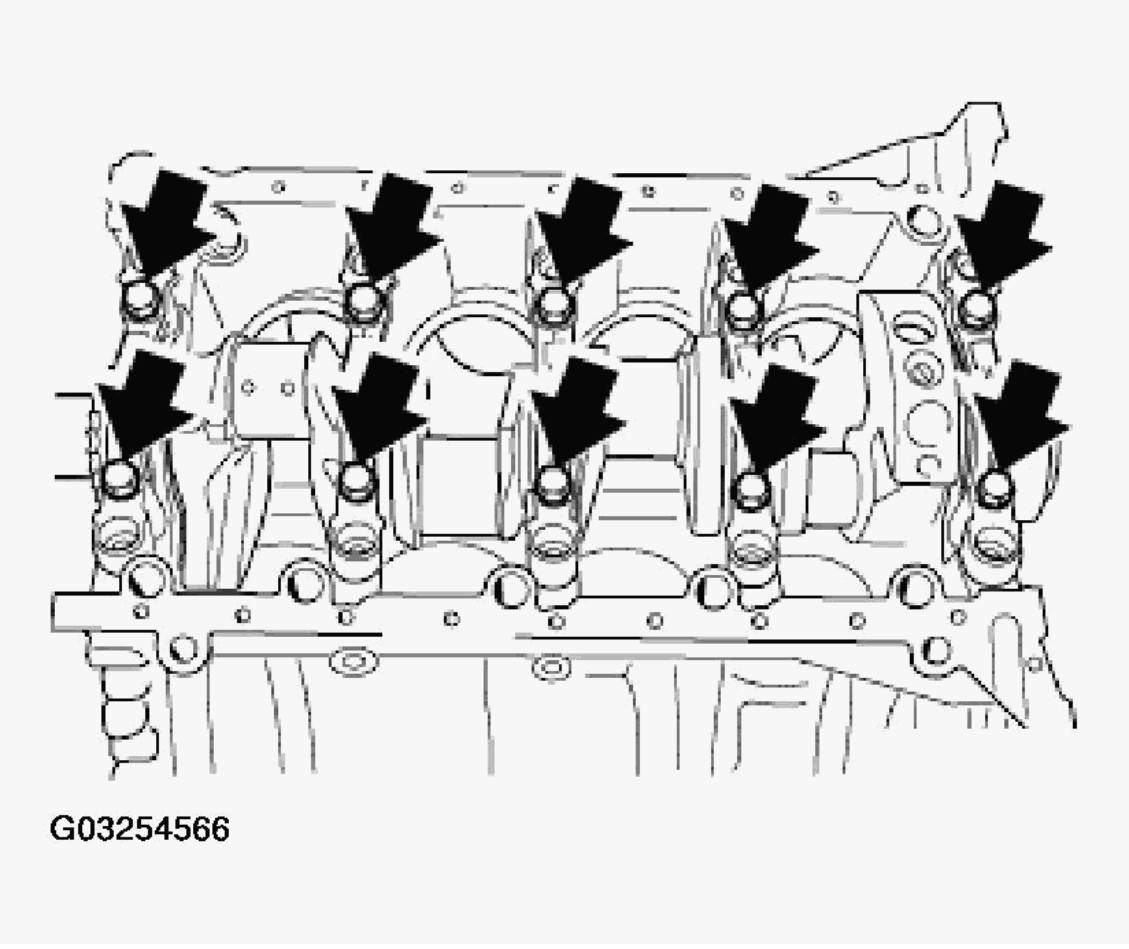


Fig. 135: Removing Main Bearing Caps Securing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove main bearing caps 1 to 5.

Lever out crankshaft.

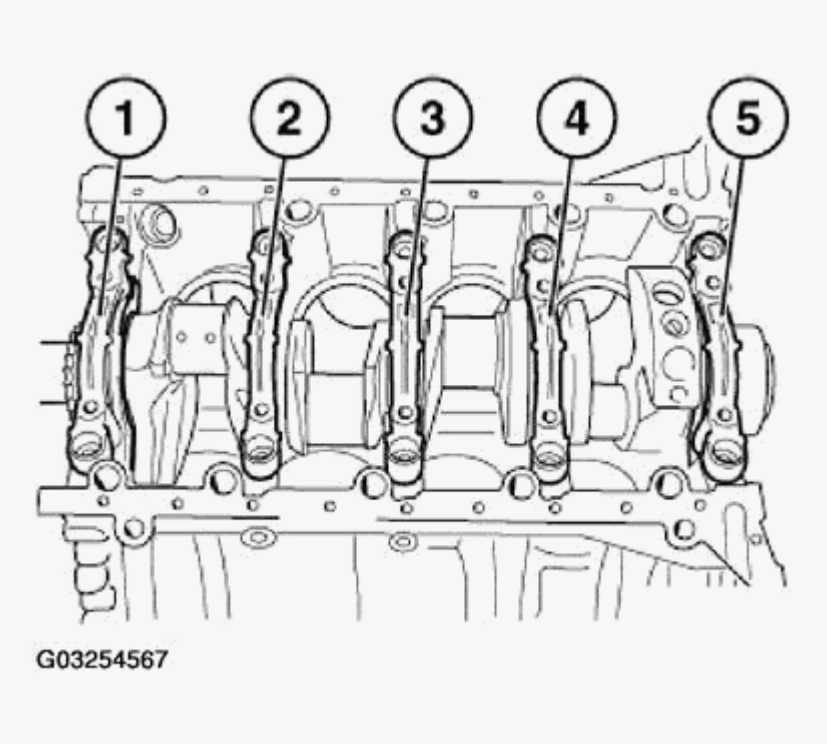


Fig. 136: Removing Main Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Note grinding stage of crankshaft,

refer to CRANKSHAFT AND BEARINGS in Technical Data.

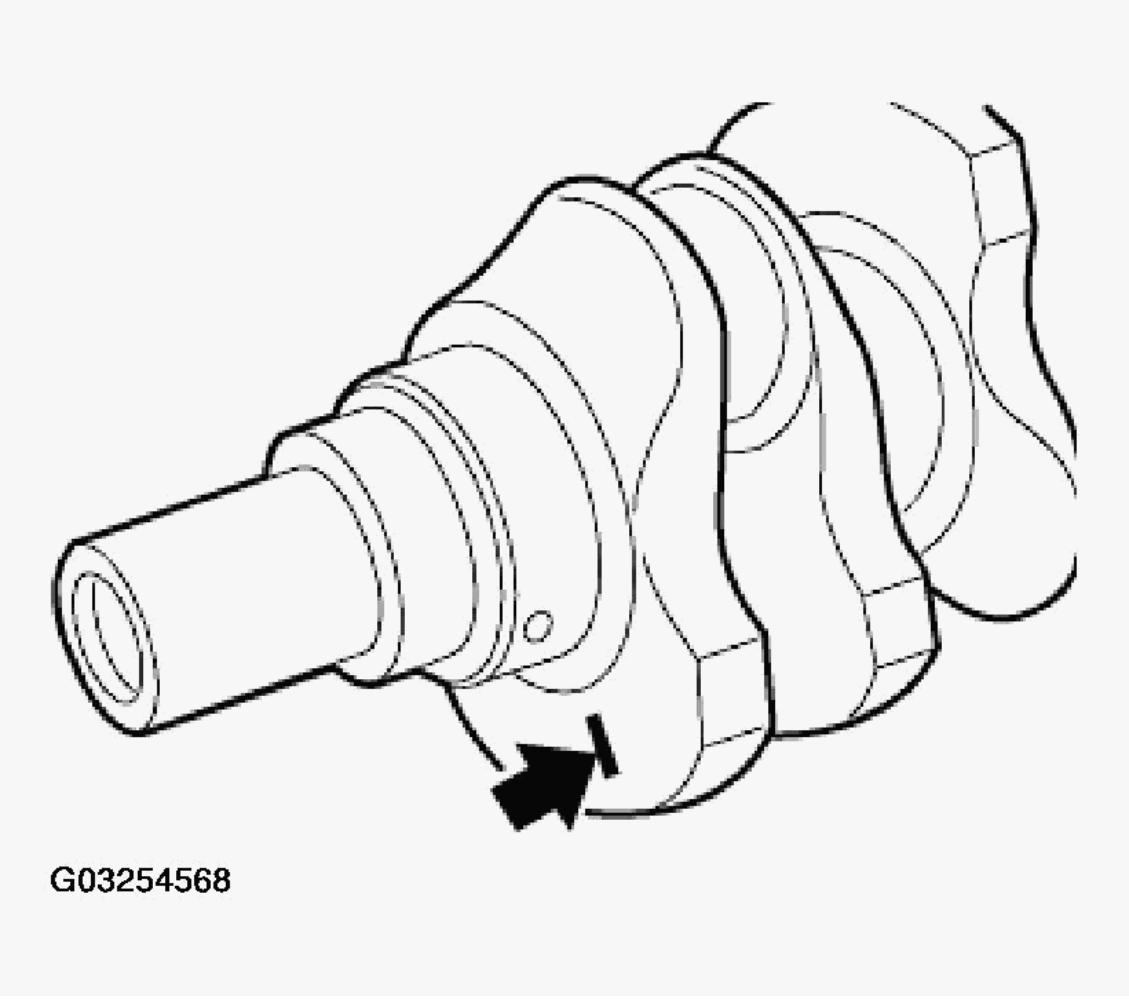


Fig. 137: Identifying Grinding Stage Mark On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove sprocket wheel from crankshaft.

Fit special tool 11 2 383 to crankshaft.

Remove sprocket wheel with special tool 11 2 001 in conjunction with special tool 11 2 005 and special tool 11 2 004.

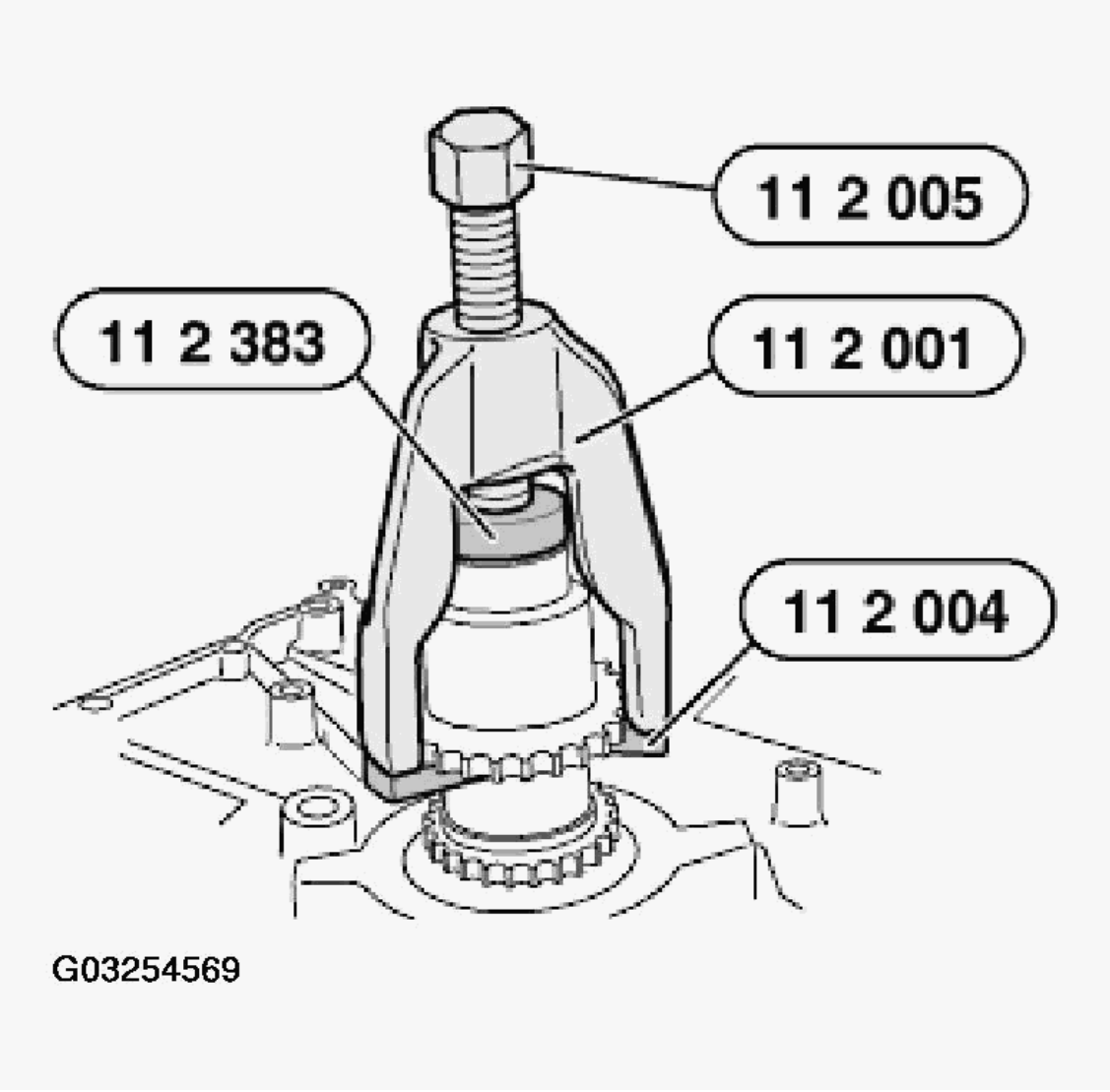


Fig. 138: Removing Sprocket Wheel From Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Shrink-fit sprocket wheel to crankshaft.

Check wedge for correct position.

Heat sprocket wheel with a hot-air blower or on a heating plate to Max. 150°C.

CAUTION: Do not exceed specified temperature!

Replace main crankshaft bearing shells,

refer to **11 21 531 REPLACING MAIN CRANKSHAFT BEARING SHELL (M62)** .

Replace conrod bearing shells,

refer to **11 24 571 REPLACING ALL CONROD BEARINGS (M62)** .

Replace deep-groove ball bearings in crankshaft,

refer to **11 21 571 REPLACING GROOVED BALL BEARING IN CRANKSHAFT (M62/S62)** .

11 21 531 REPLACING MAIN CRANKSHAFT BEARING SHELL (M62)

Engine Dismantled

Clean components before installation.

Preliminary tasks are described in the section replacing crankshaft,

refer to **11 21 500 REPLACING CRANKSHAFT (M62)** .

CAUTION: Note grinding stage of crankshaft,

refer to CRANKSHAFT AND BEARINGS in Technical Data.

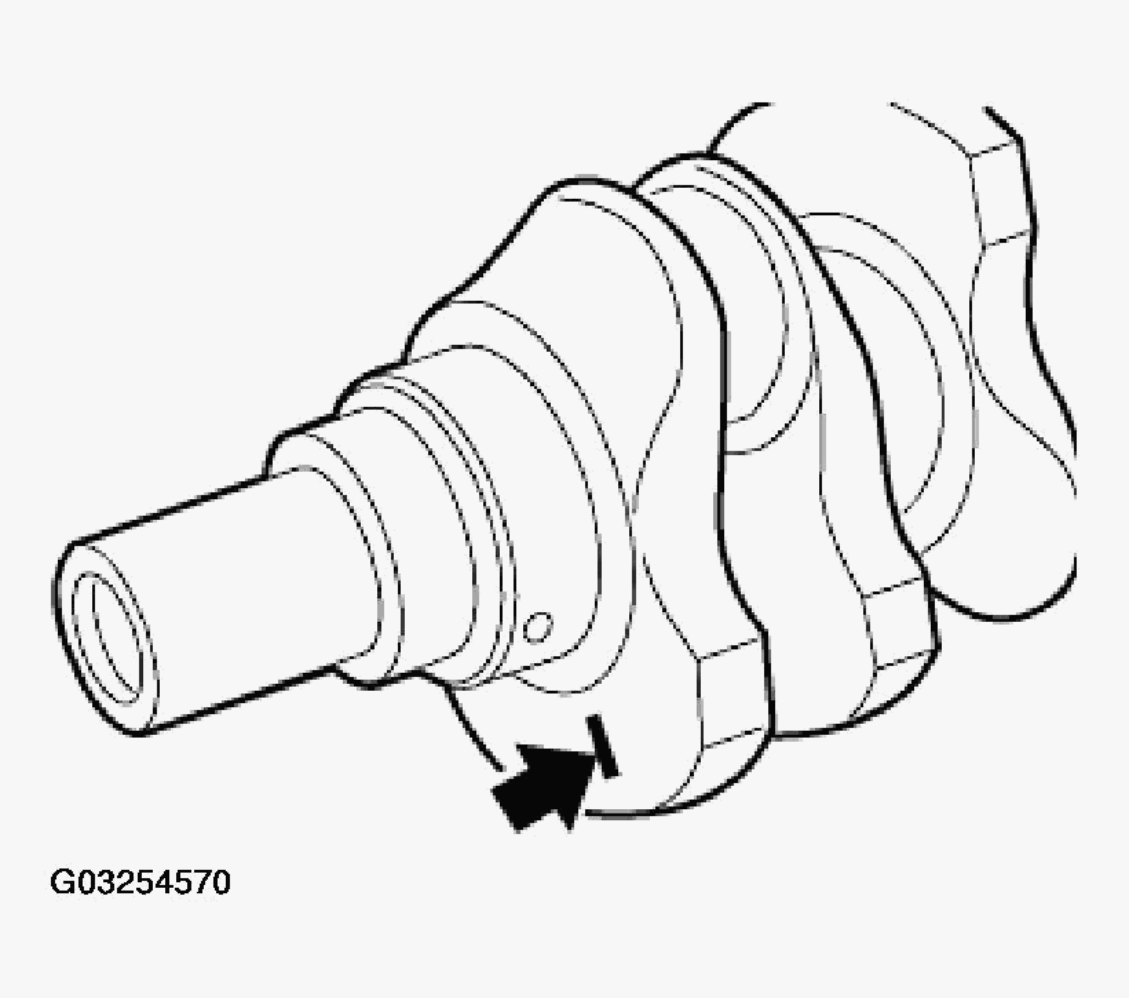


Fig. 139: Identifying Grinding Stage Mark On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Install main bearing shells (1) in the motor block with lubrication groove.

Install main bearing shells (2) without lubrication groove in the main bearing caps.

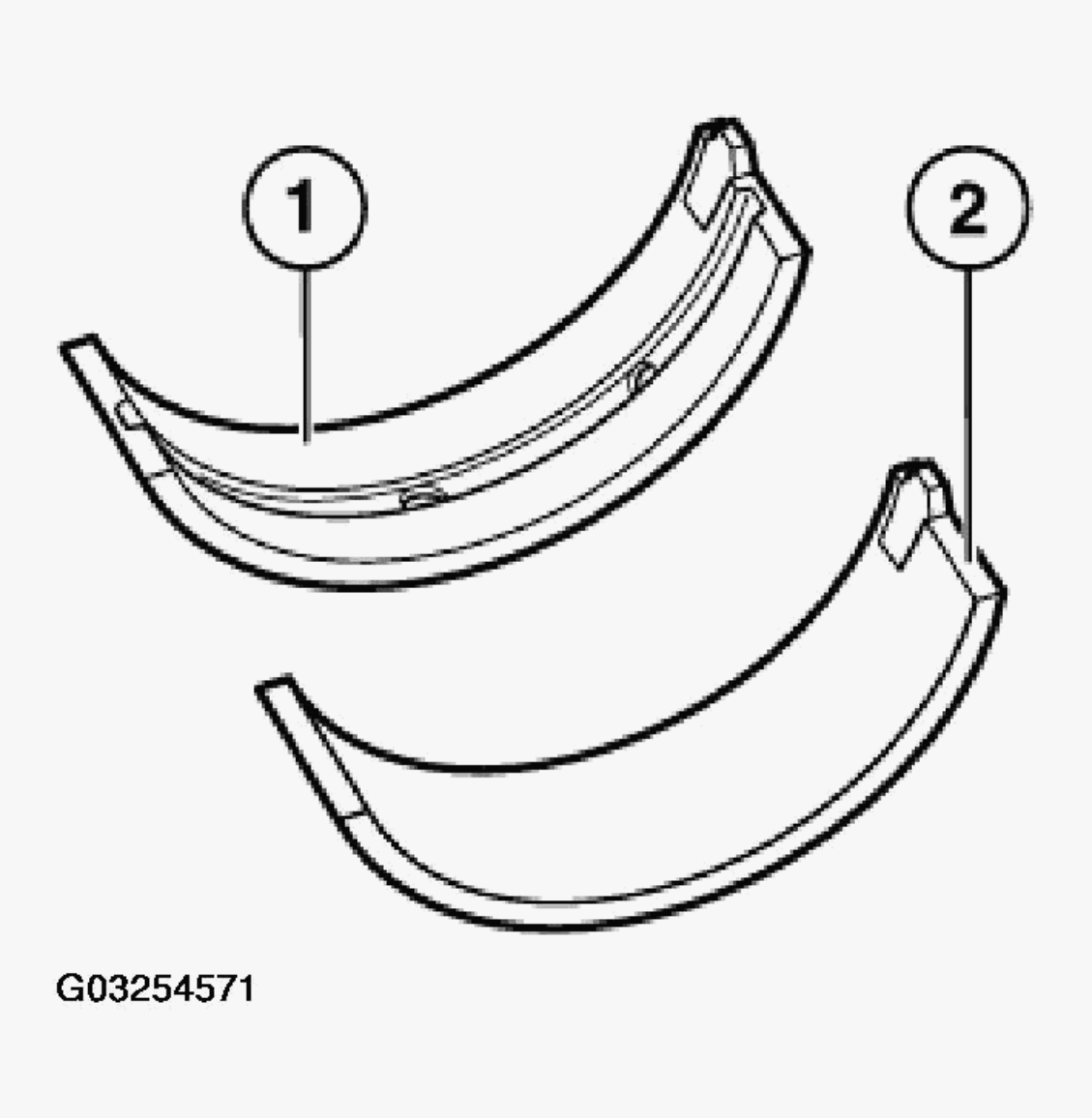


Fig. 140: Identifying Main Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: When crankshaft or main bearing shells are being replaced, the classification for the arrangement of the main bearing shells in the crankcase is no longer of significance. Install yellow main bearing shells in crankcase.

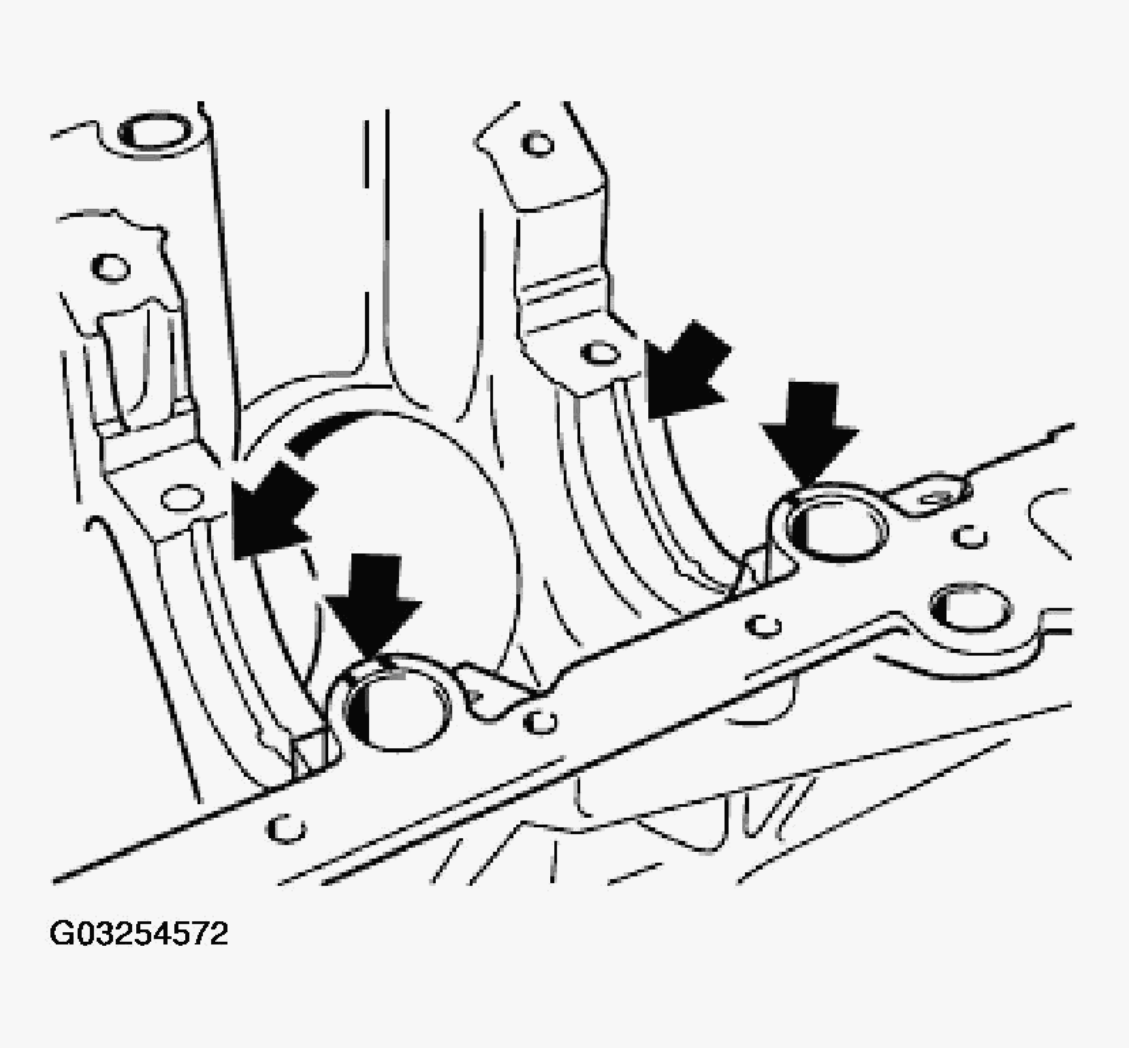


Fig. 141: Installing Main Bearing Shells In Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

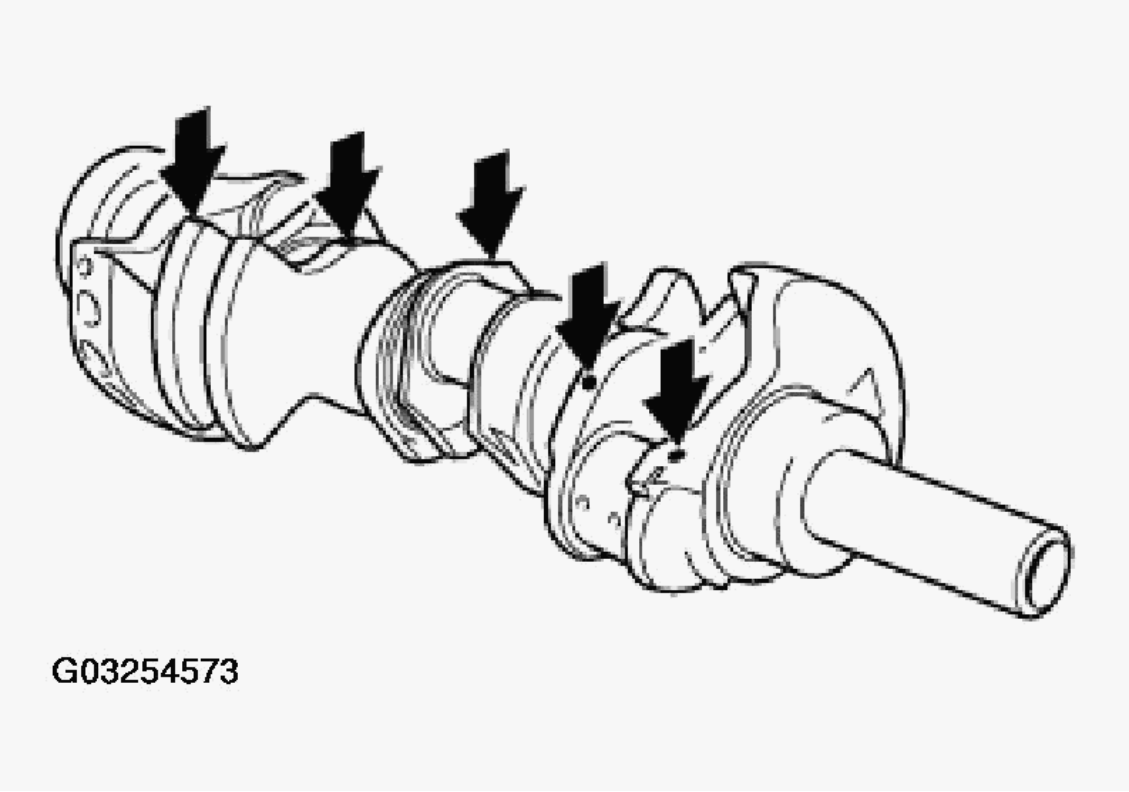


Fig. 142: Identifying Crankshaft Marks
Courtesy of BMW OF NORTH AMERICA, INC.

Coat bearing shells with oil.

Install crankshaft.

NOTE: Place main bearing shells with same color code as that of crankshaft in main bearing caps.

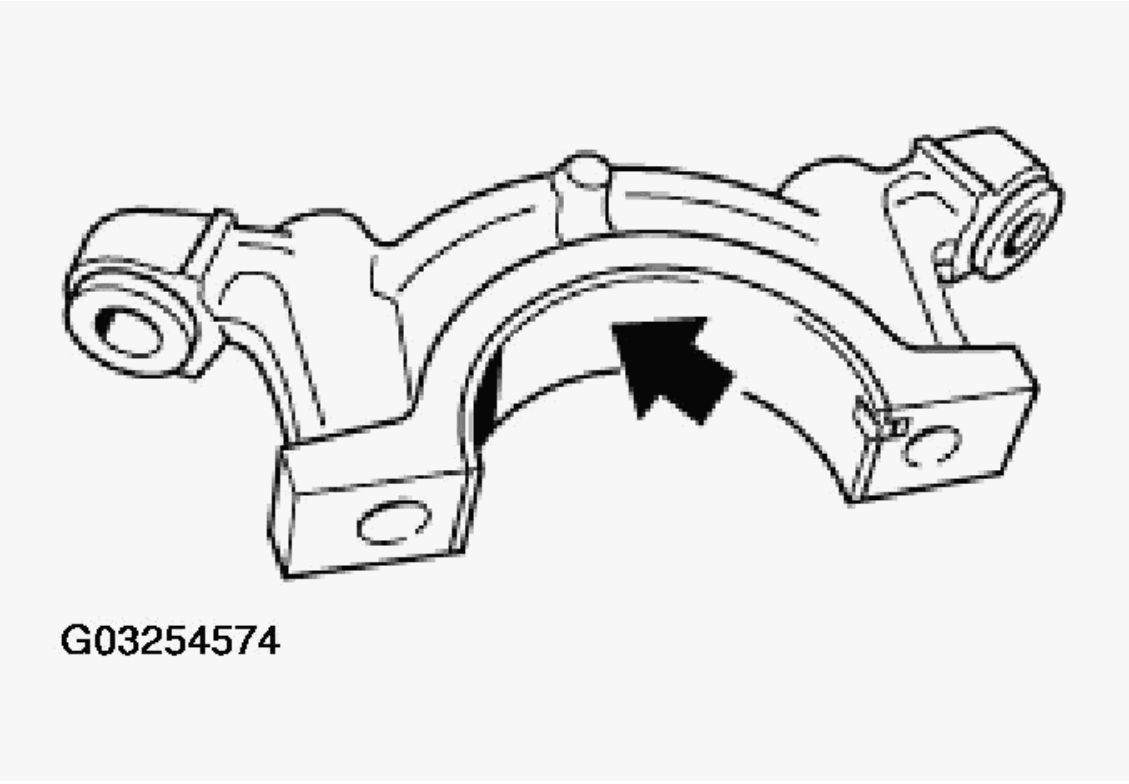


Fig. 143: Installing Main Bearings
Courtesy of BMW OF NORTH AMERICA, INC.

Release hex head in main bearing cap.

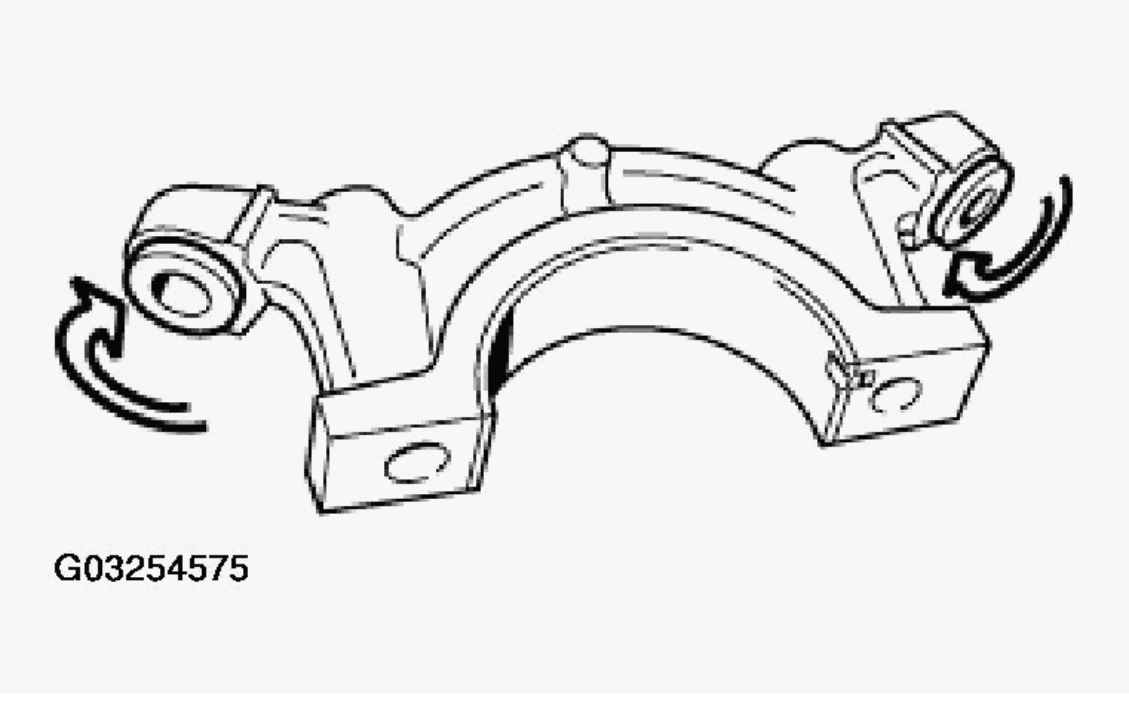


Fig. 144: Releasing Hex Head In Main Bearing Cap

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: (3) Install stop disk for collar bearing (in engine block).

(4) Install stop disk for collar bearing (in main bearing cap).

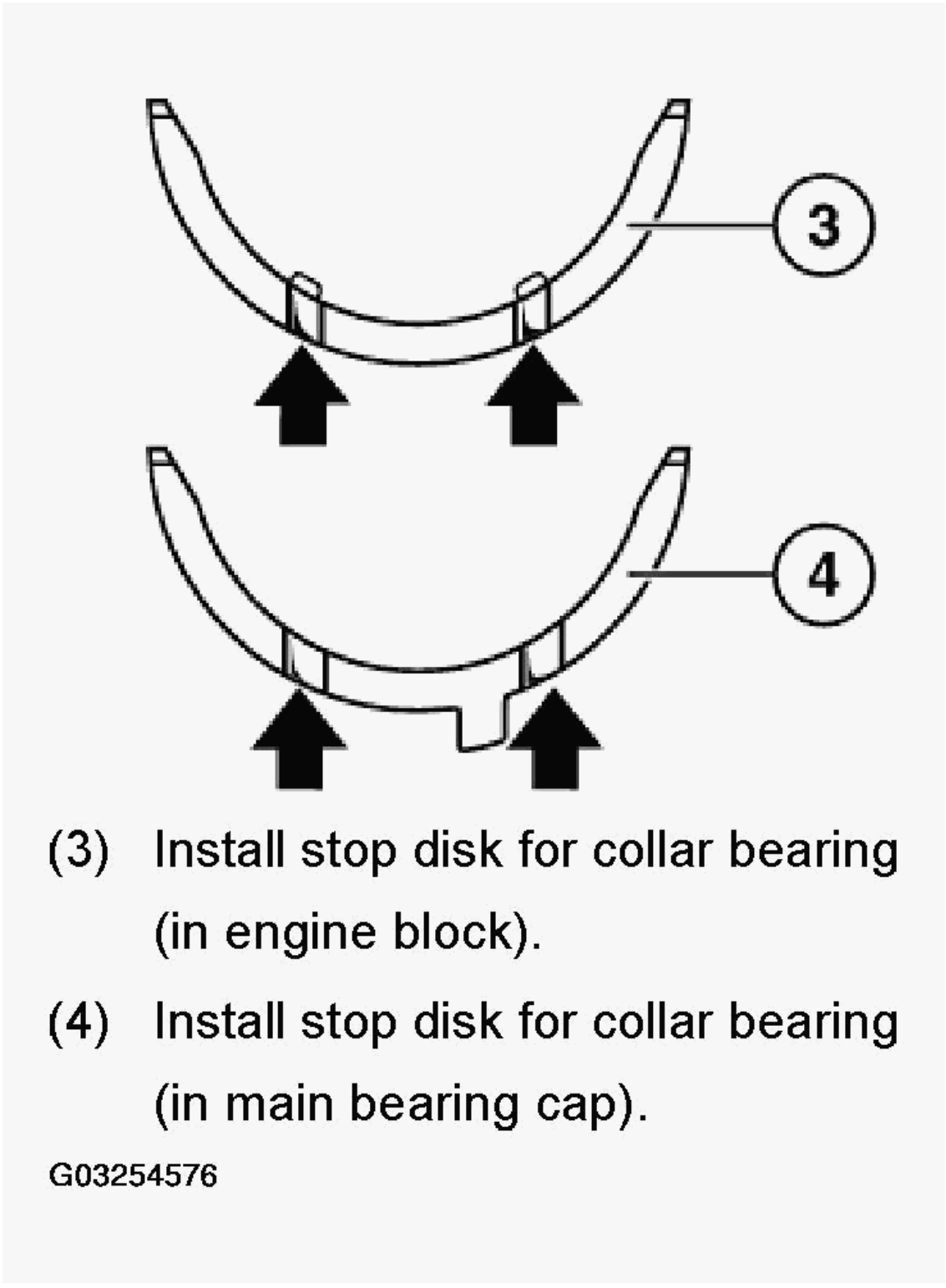


Fig. 145: Identifying Stop Disk For Collar Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Check installed direction. Lubricant groove must be facing crankshaft.

Insert stop disks for collar bearing on both sides between crankshaft and engine block at main bearing 5.

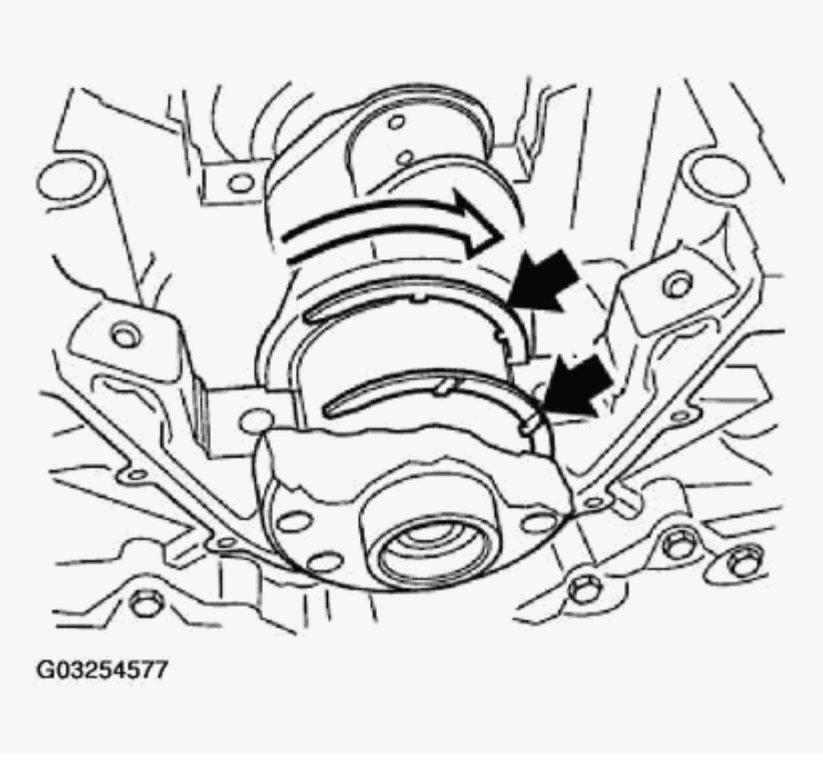


Fig. 146: Installing Stop Disks To Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Align thrust washers with contact face of main bearing caps.

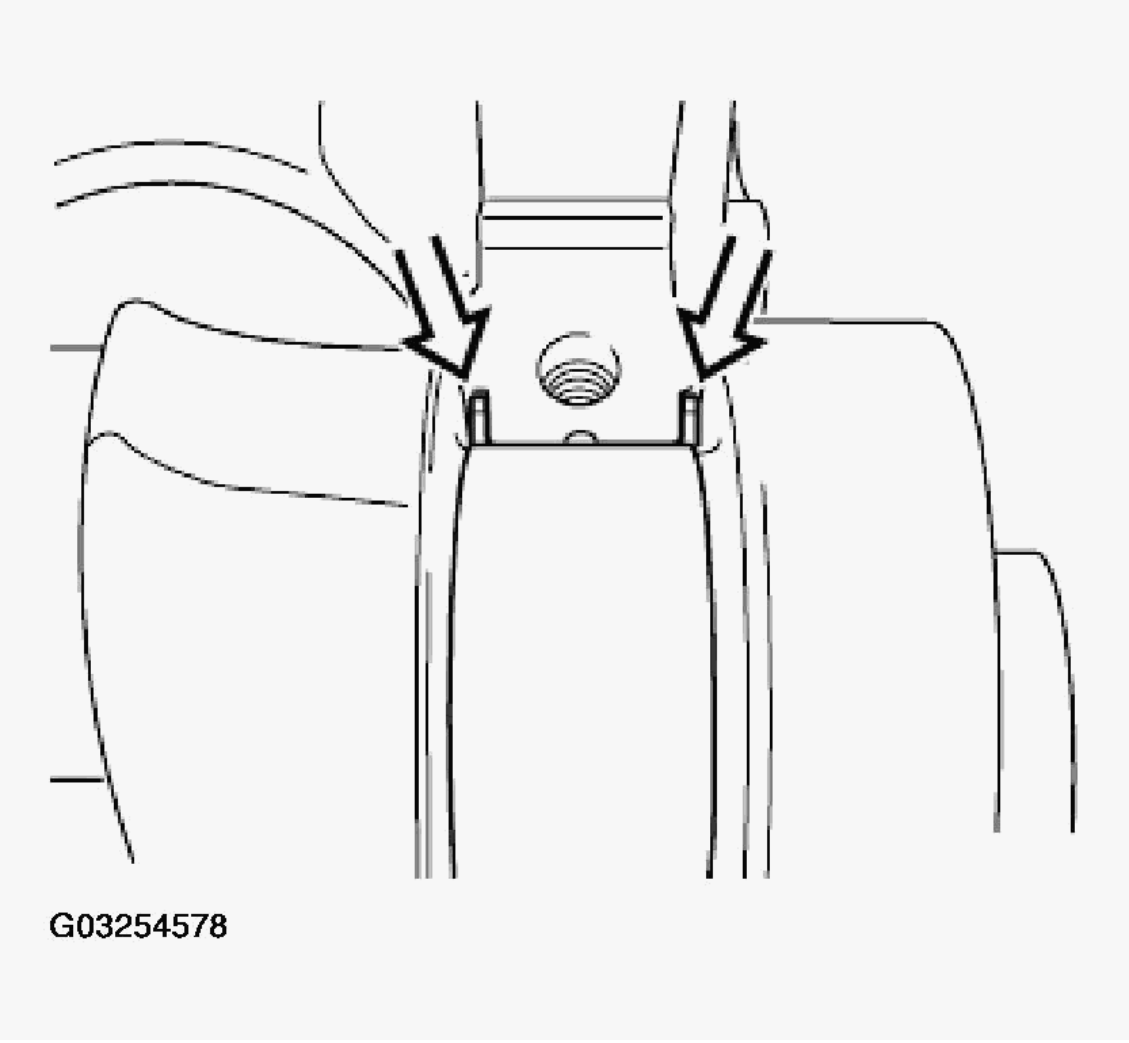


Fig. 147: Aligning Thrust Washers With Contact Face Of Main Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Main bearing caps (1 to 3) are marked with punch numbers.

The main bearing caps 4 and 5 are not marked.

NOTE: Main bearing cap no. 5 can be identified by the recesses for the stop disks of the thrust bearing.

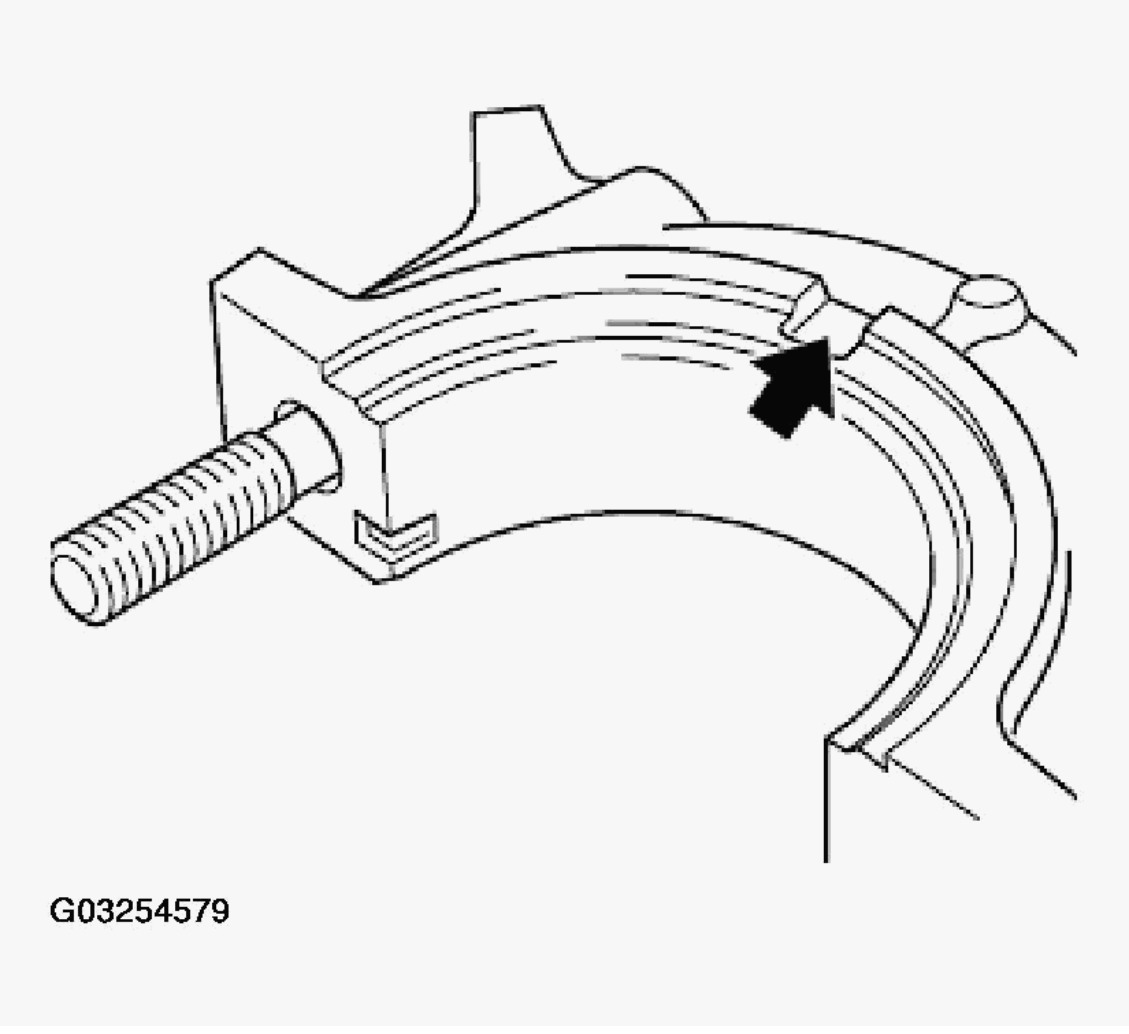


Fig. 148: Identifying Main Bearing Cap No. 5
Courtesy of BMW OF NORTH AMERICA, INC.

Insert stop disks on both sides into grooves of main bearing cap no. 5.

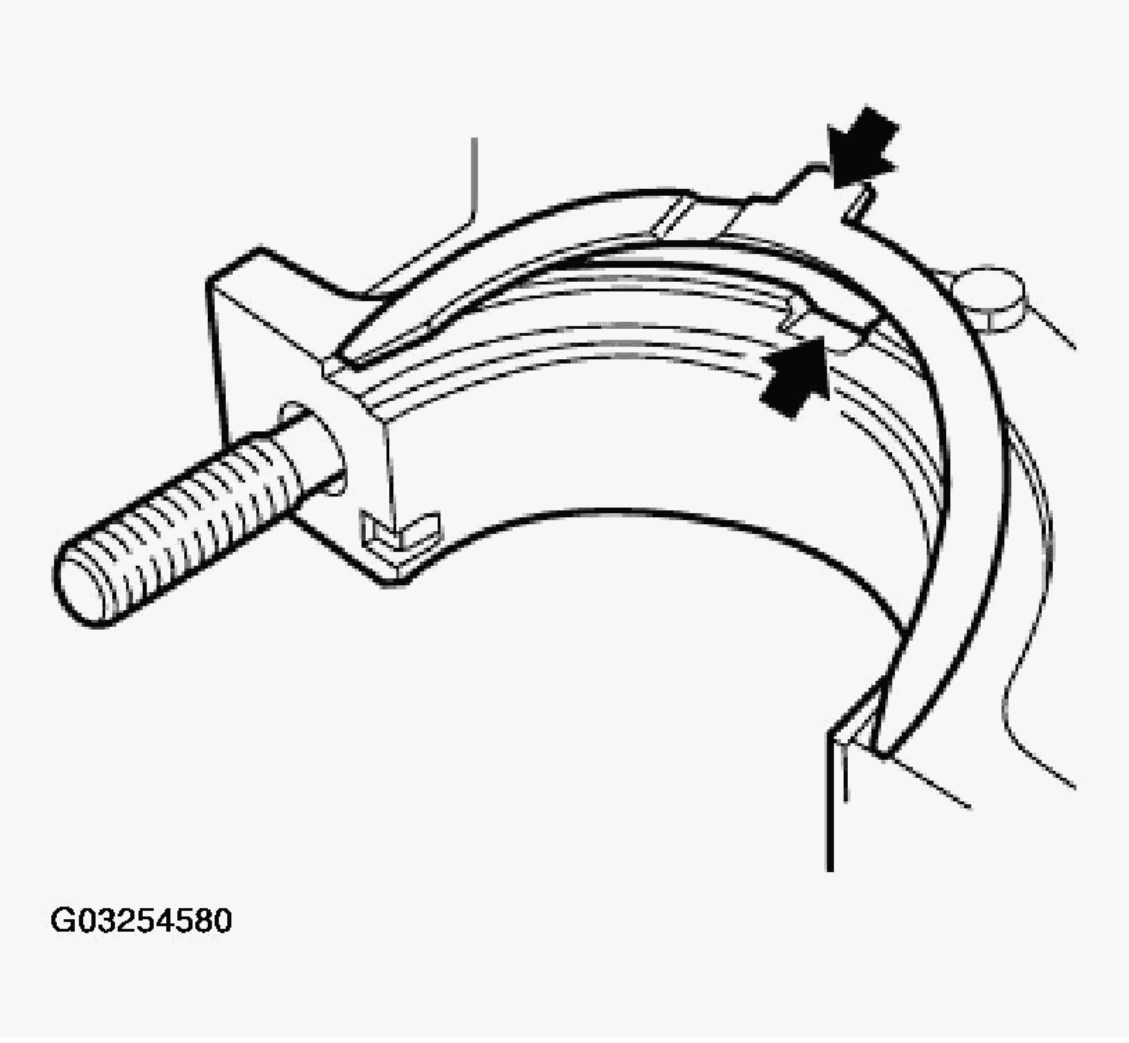


Fig. 149: Inserting Stop Disks Into Main Bearing Cap No.5
Courtesy of BMW OF NORTH AMERICA, INC.

Checking main bearing clearance:

Do not twist crankshaft.

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

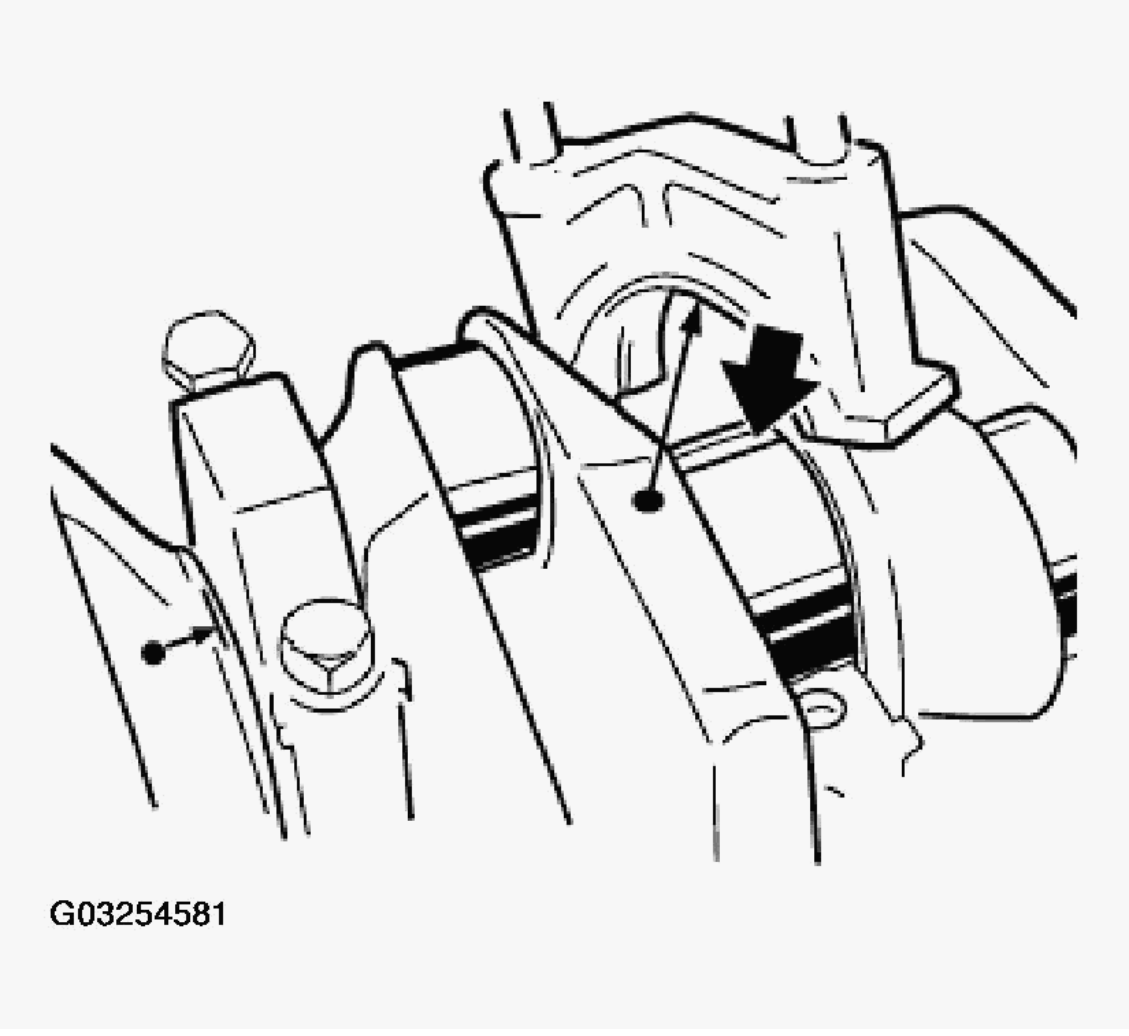


Fig. 150: Checking Main Bearing Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

Position main bearing caps (1 to 5) so that retaining grooves of main bearing shells are on one side.

Align main bearing cap flush with side of bearing seat.

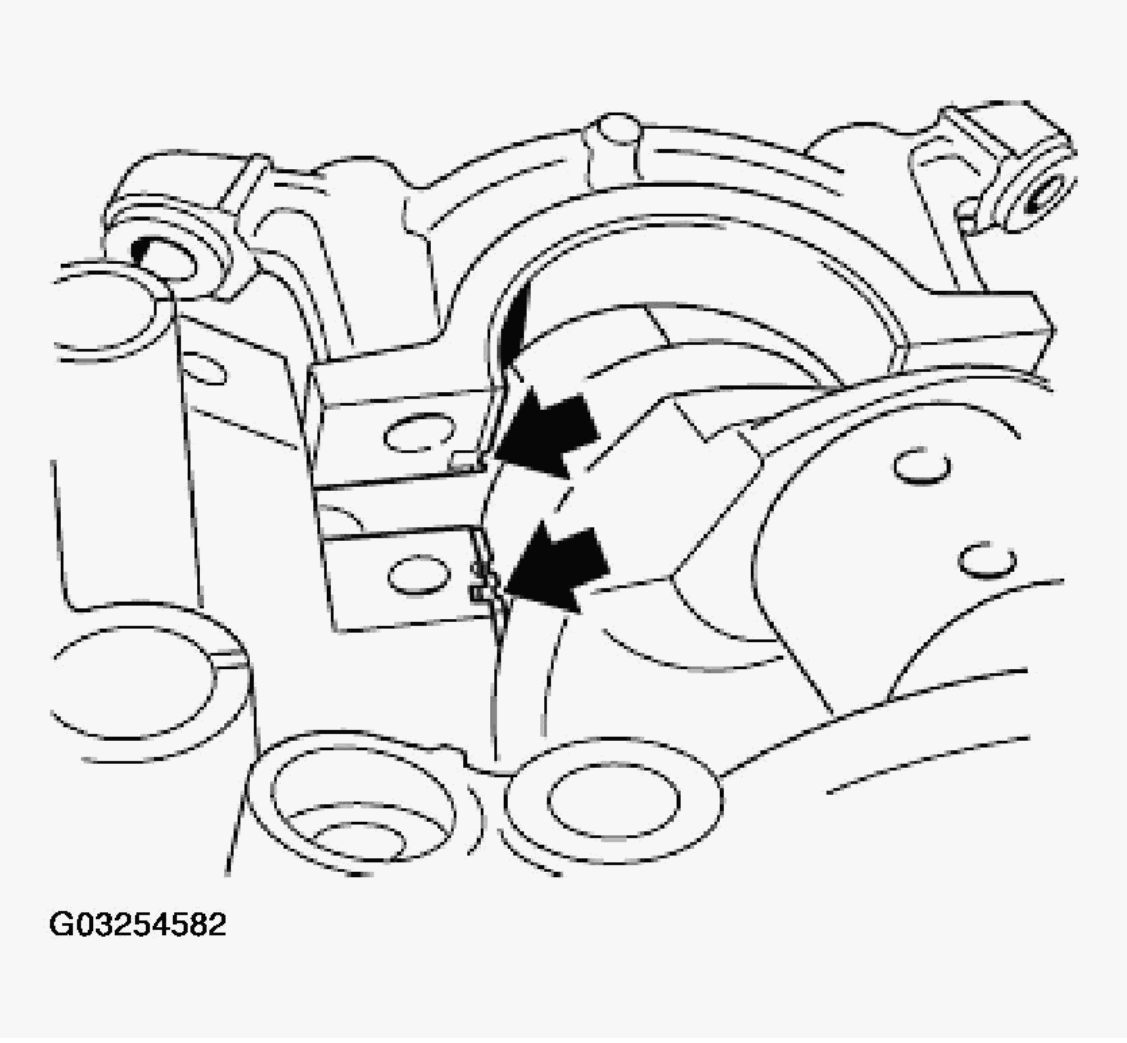


Fig. 151: Aligning Main Bearing Cap Flush With Side Of Bearing Seat
Courtesy of BMW OF NORTH AMERICA, INC.

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

No oil is permitted in the blind bores (danger of cracking).

1. Tighten all screws on main bearing cover with jointing torque.
2. Tighten down all bolts on main bearing cap with special tool 00 9 120 with torsion angle.

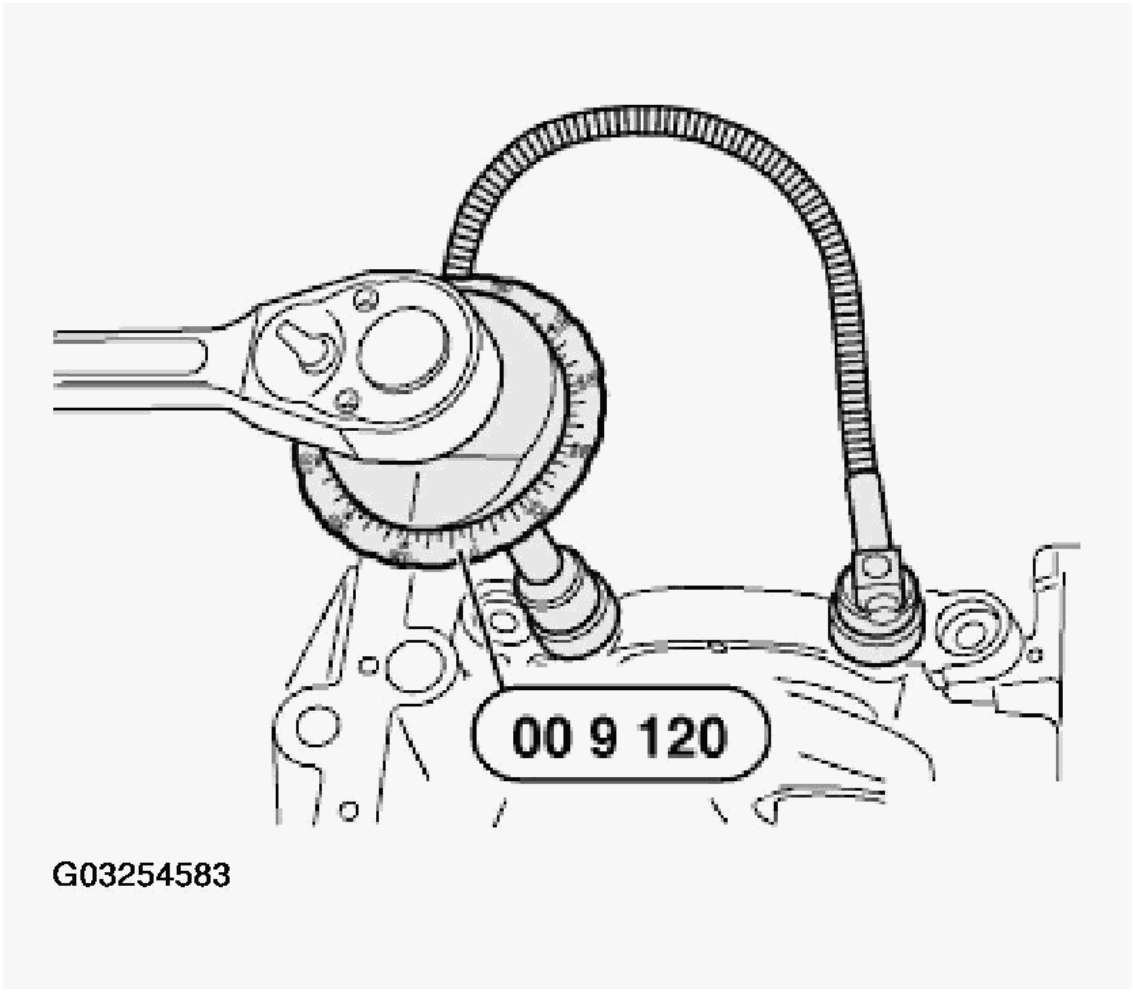


Fig. 152: Tightening Main Bearing Cap Bolts With Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening Torque,

refer to 11 11 2AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Remove main bearing cover and read off main bearing clearance from thickness of crushed plastic thread with the help of the measuring scale.

Main bearing clearance,

refer to **CRANKSHAFT AND BEARINGS** in Technical Data.

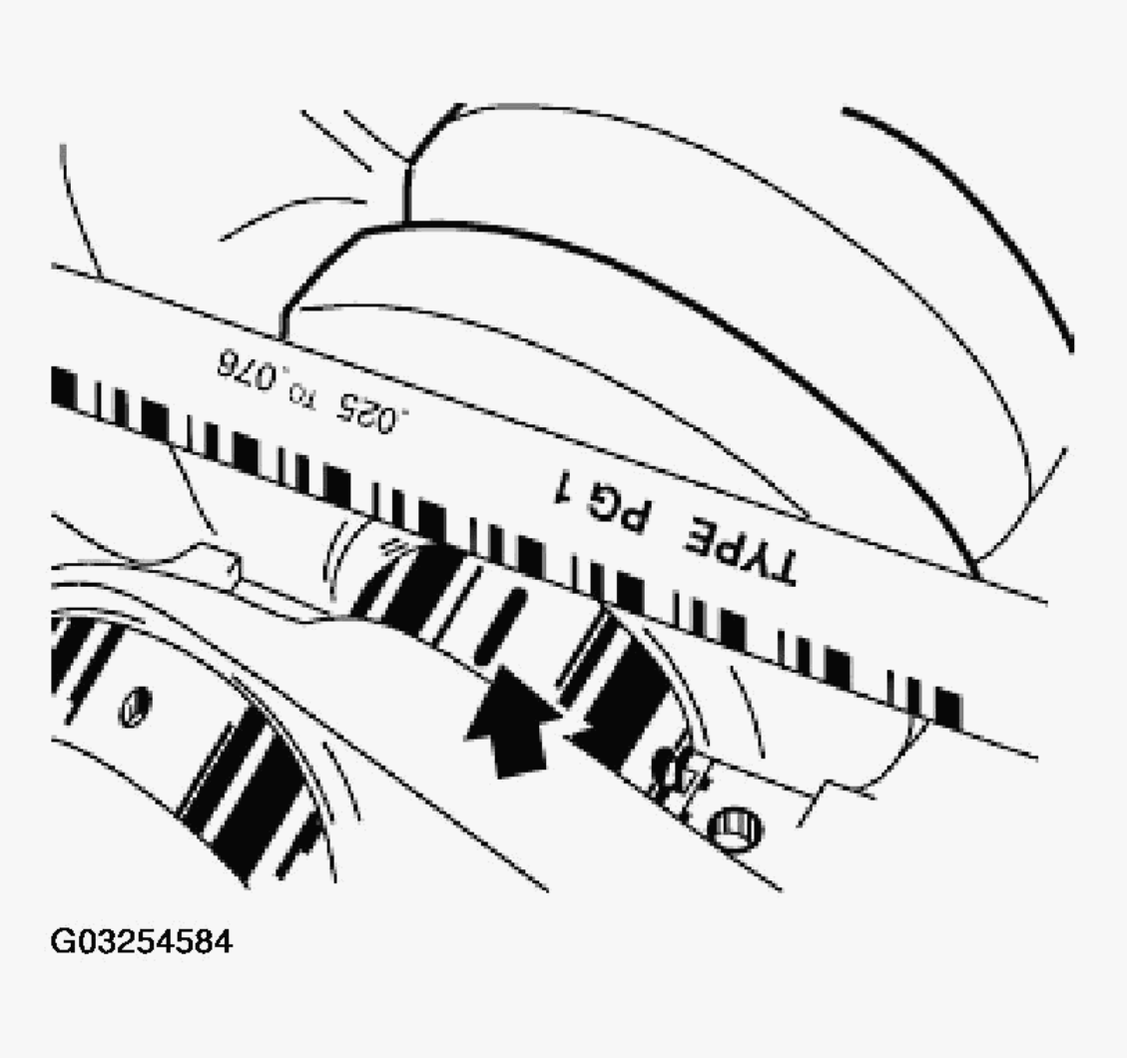


Fig. 153: Measuring Main Bearing Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

Remove plastic thread.

Lubricate crankshaft and main bearing shells.

Position main bearing caps (1 to 5) so that retaining grooves of main bearing shells are on one side.

Align main bearing cap flush with side of bearing seat.

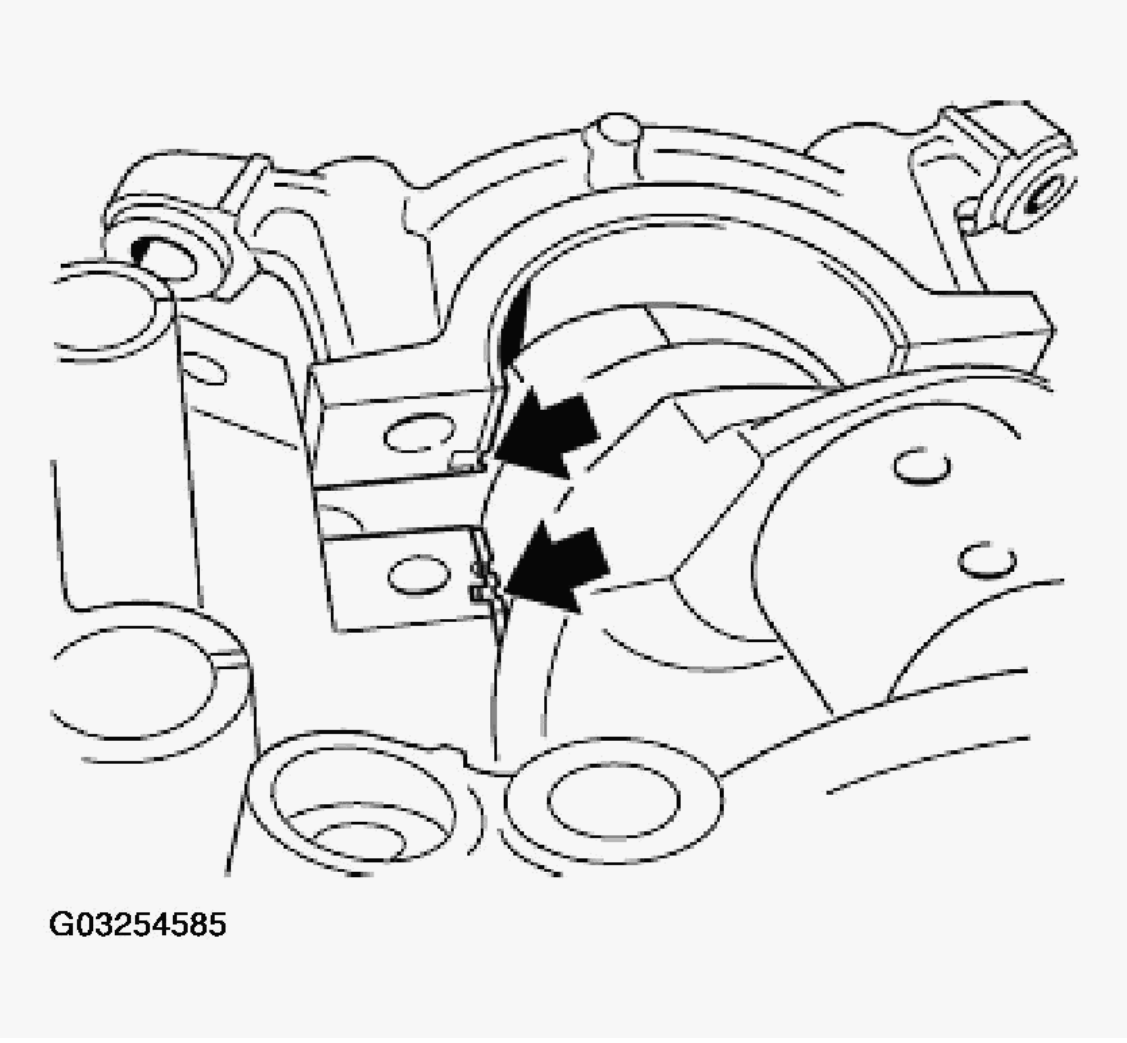


Fig. 154: Aligning Main Bearing Cap Flush With Side Of Bearing Seat
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The main bearing cap screws must always be replaced by new ones.

Do not wash off bolt coating.

No oil is permitted in the blind bores (risk of cracking)!

Tightening specifications for main bearing:

1. Tighten all screws on main bearing cover with jointing torque.
2. Unfasten screws on main bearing cover 5
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 5 with jointing torque.

5. Tighten down all bolts on main bearing cap with special tool 00 9 120 with torsion angle.

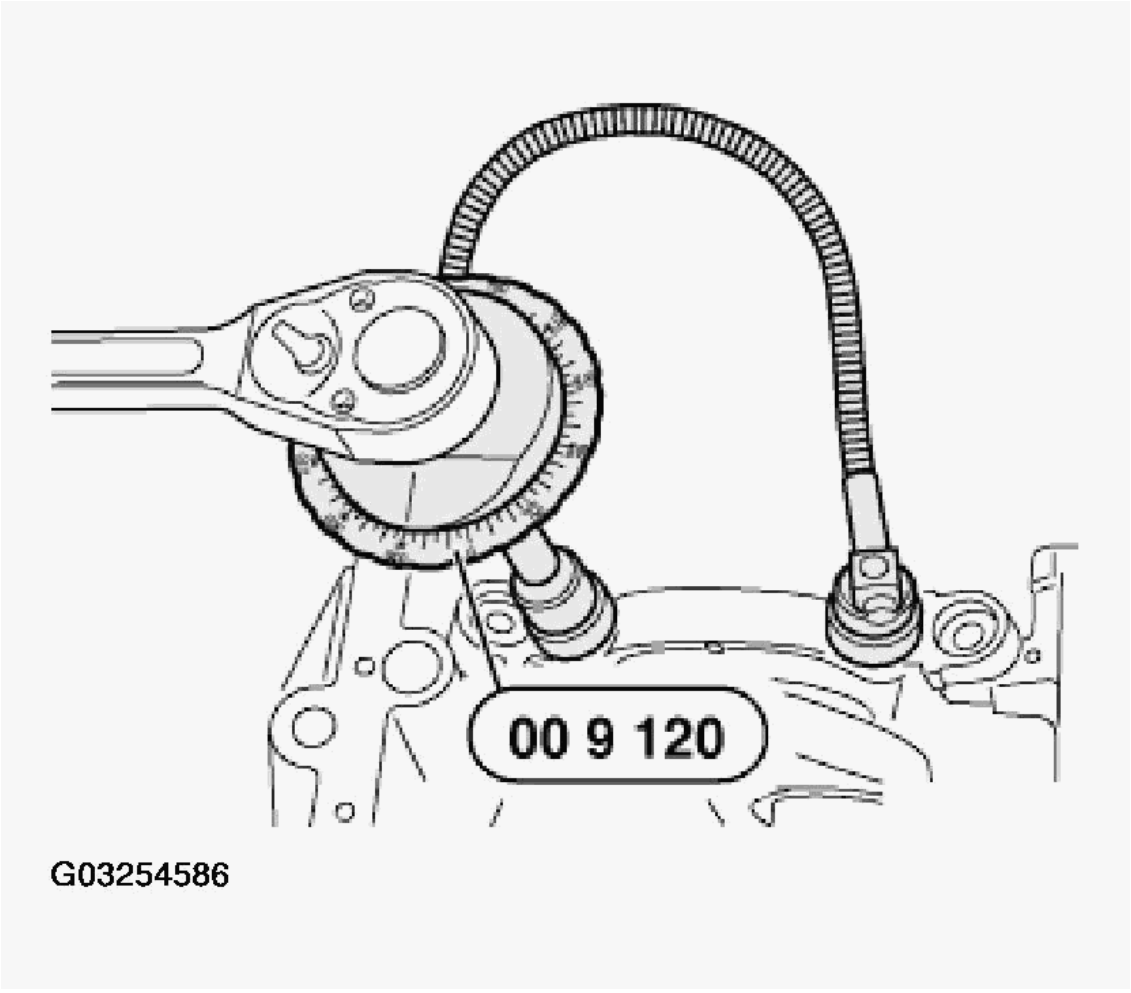


Fig. 155: Tightening Main Bearing Cap Bolts With Special Tool 00 9 120 With Torsion Angle
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening Torque,

refer to 11 11 2AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Check axial play.

Axial play,

refer to **CRANKSHAFT AND BEARINGS** in Technical Data.

Check guide bearing shell, crankshaft and crankcase if necessary.

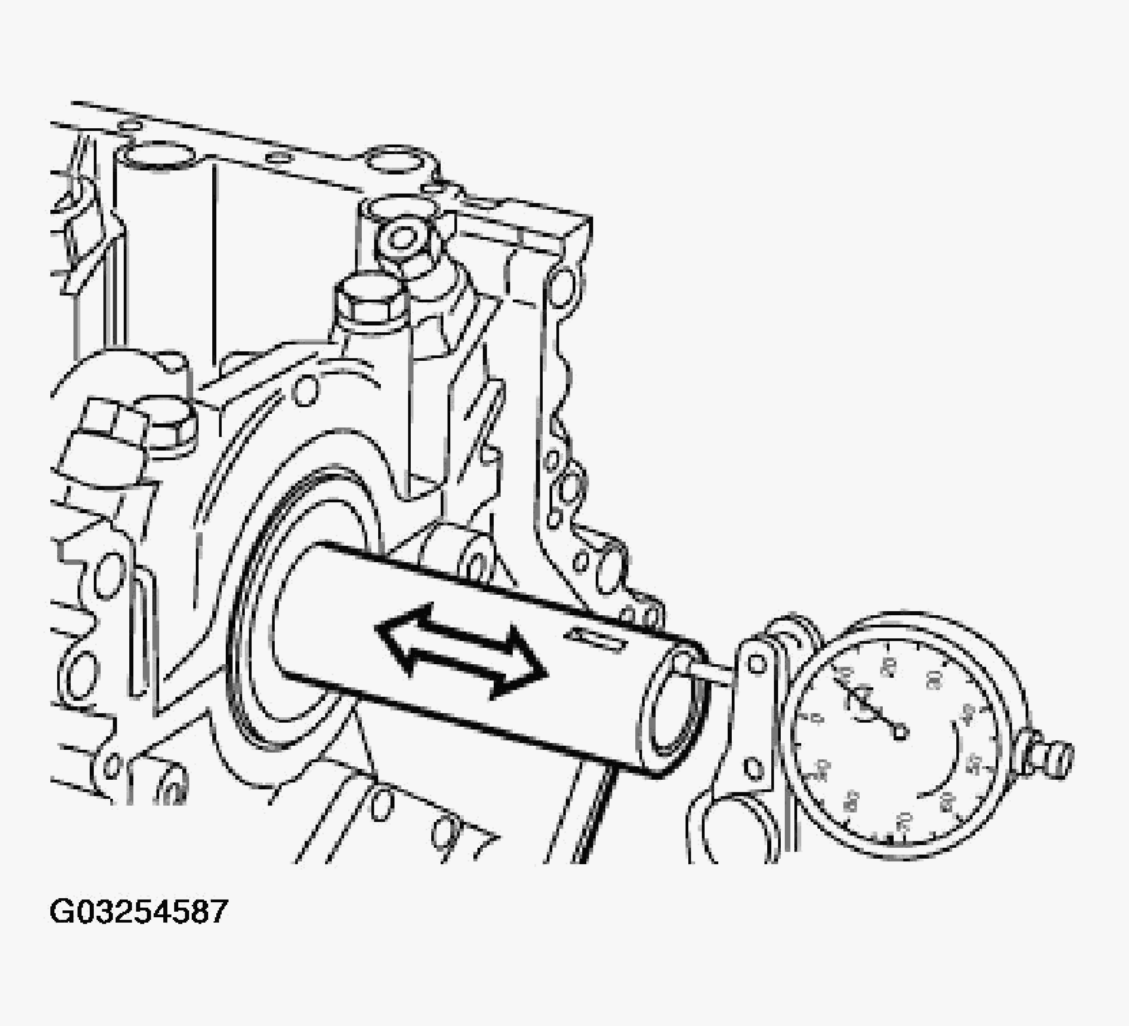


Fig. 156: Checking Axial Play
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten threaded protective bushes.

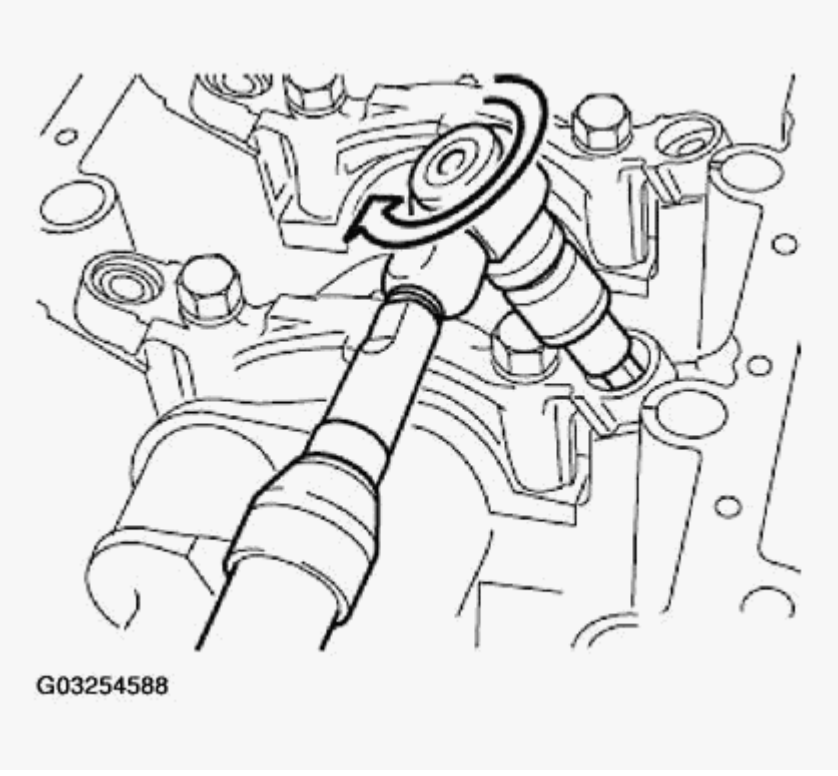


Fig. 157: Tightening Threaded Protective Bushes
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening Torque,

refer to 11 11 3AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Replace collar screws.

Tighten taper screw mount on main bearing (collar screws and spacer pins).

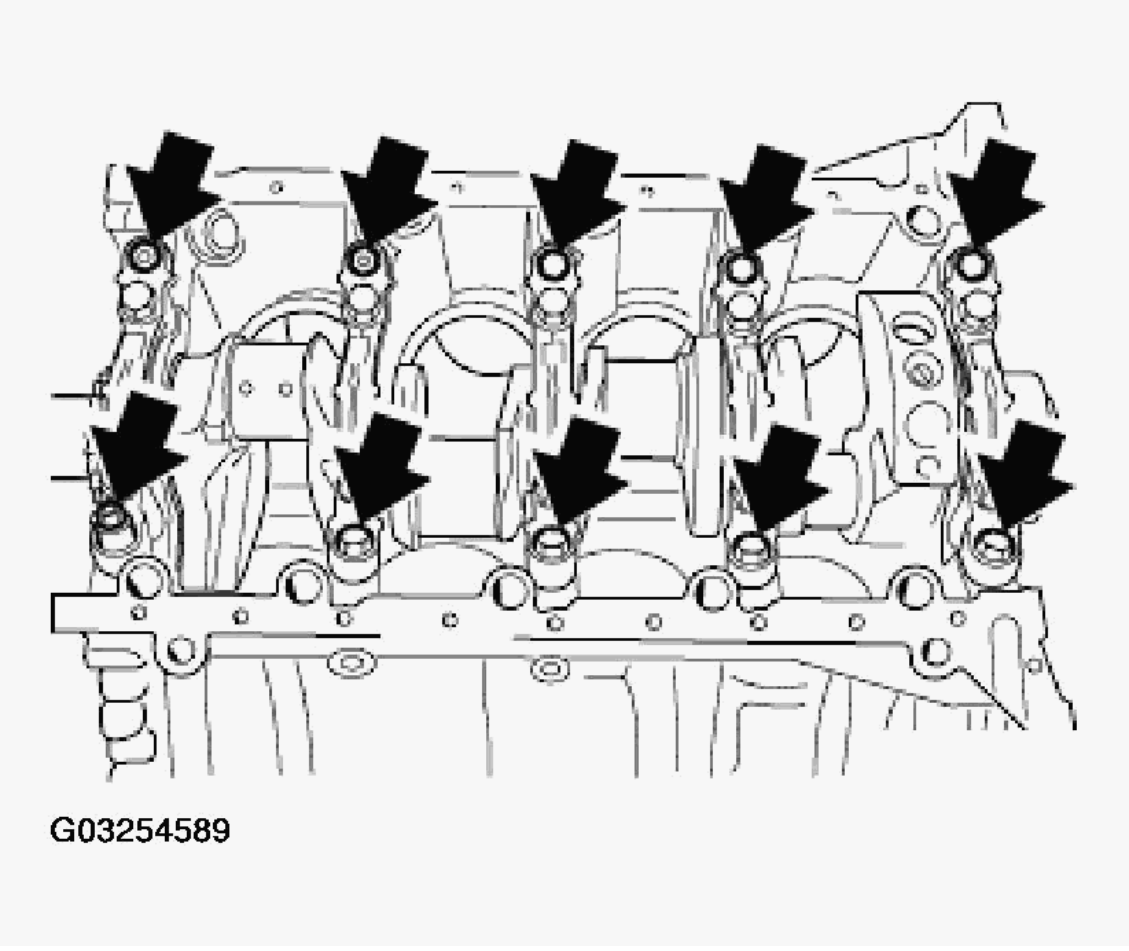


Fig. 158: Tightening Taper Screw Mount On Main Bearing (Collar Screws And Spacer Pins)
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening Torque,

refer to 11 11 3AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

11 21 571 REPLACING GROOVED BALL BEARING IN CRANKSHAFT (M62/S62)

Clutch Removed

Remove grooved ball bearing with special tool 11 2 340 in conjunction with special tool 11 2 016.

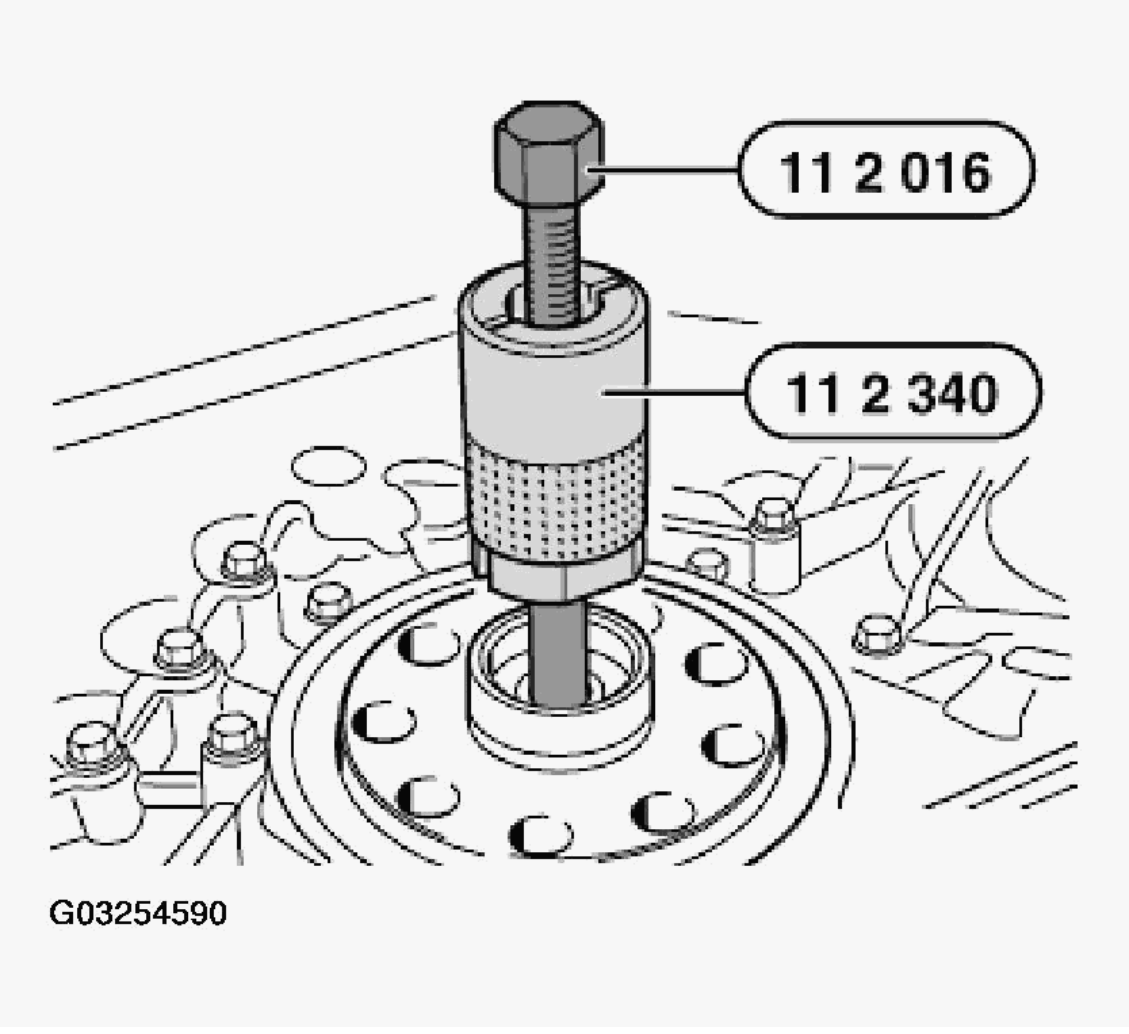


Fig. 159: Removing Grooved Ball Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

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

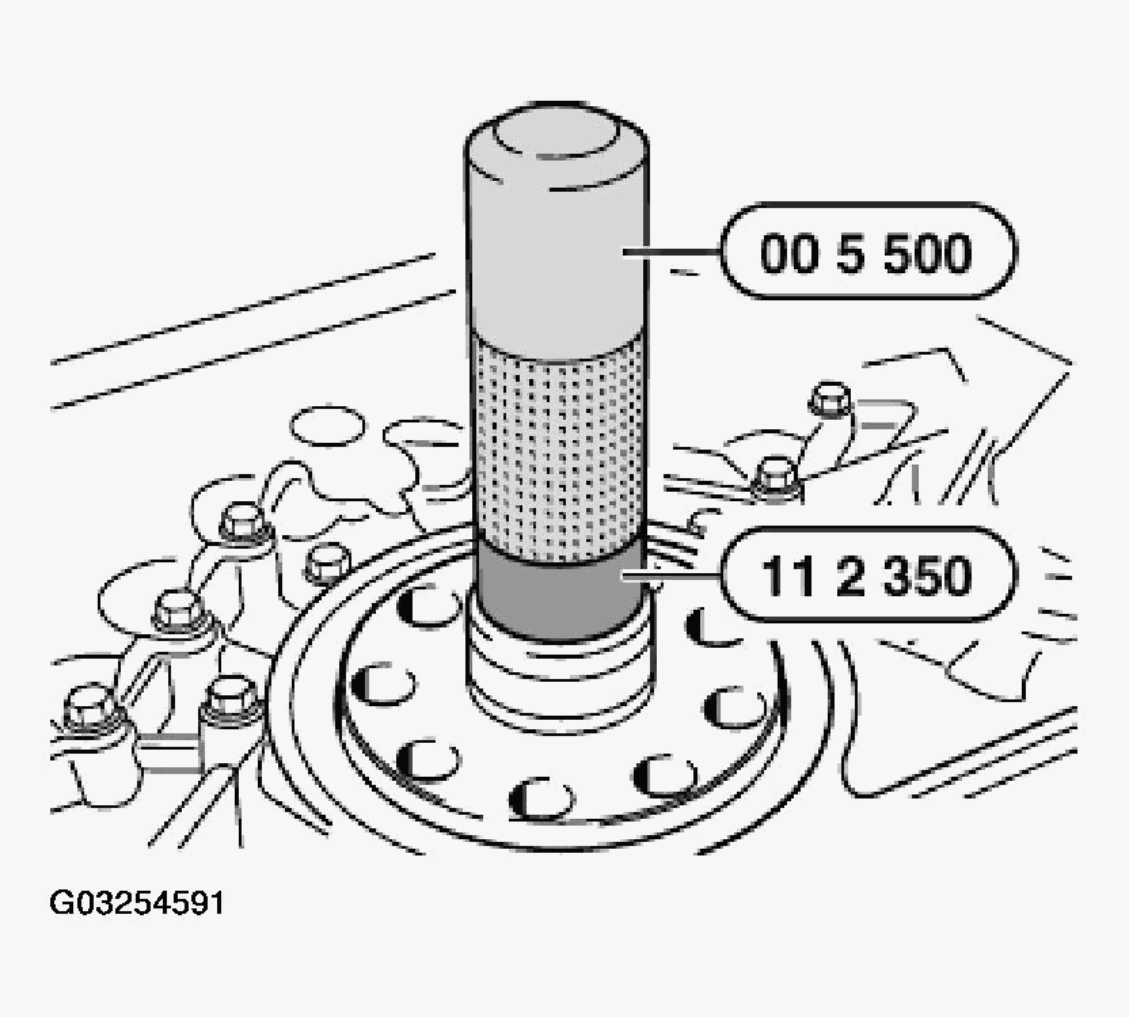


Fig. 160: Installing Grooved Ball Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

FLYWHEEL

11 22 500 REMOVING AND INSTALLING/REPLACING FLYWHEEL (M62/S62)

Clutch or Flexplate Removed

CAUTION: Once the flywheel has been replaced, the pulse generator must be reset,

refer to 12 14 520 in ENGINE ELECTRICAL SYSTEM - REPAIR INSTRUCTION - X5 4.6L .

Block flywheel with special tool 11 2 070.

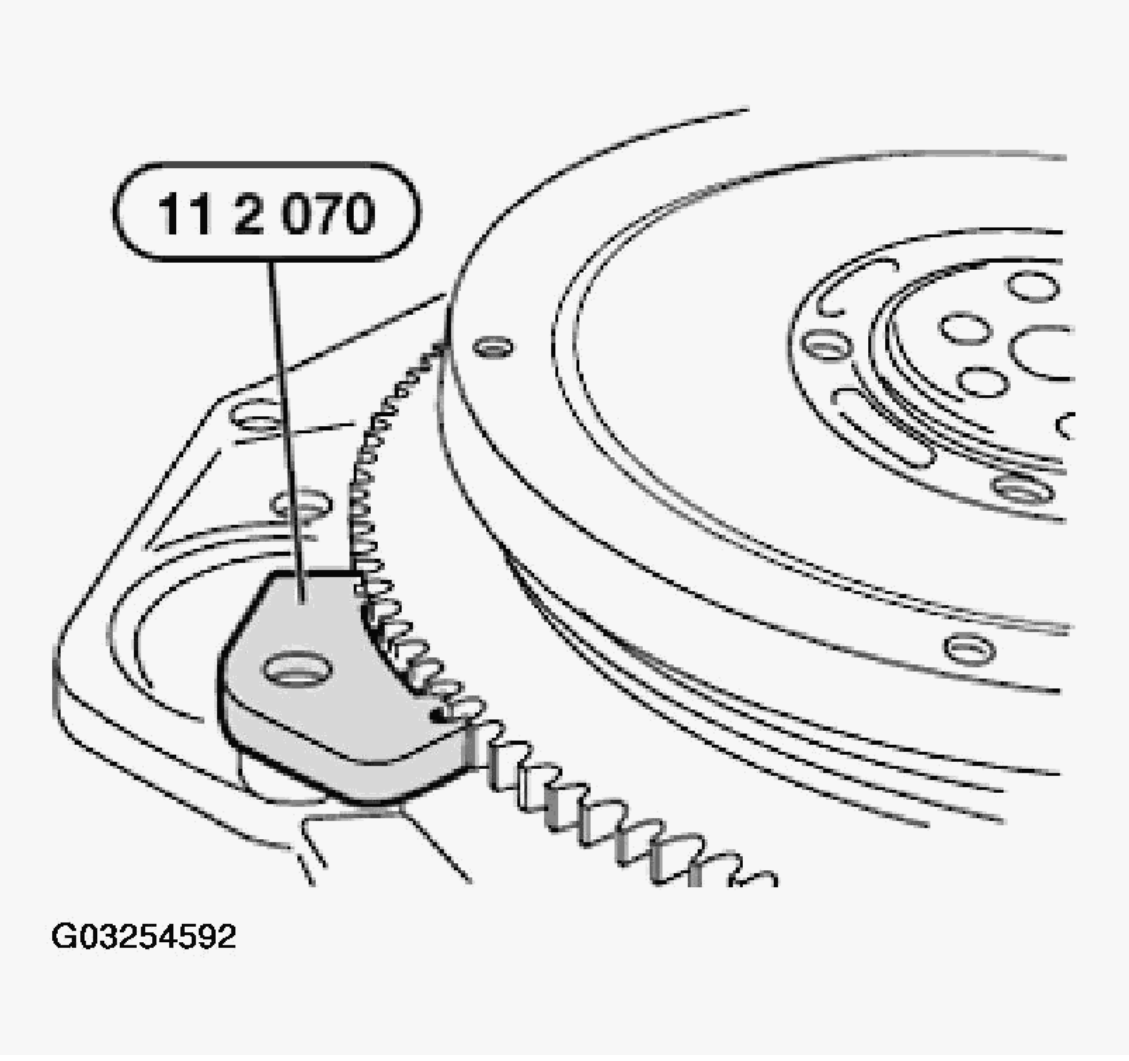


Fig. 161: Blocking Flywheel With Special Tool 11 2 070
Courtesy of BMW OF NORTH AMERICA, INC.

Release and tighten the flywheel (ZMS) only with special tool 11 4 180.

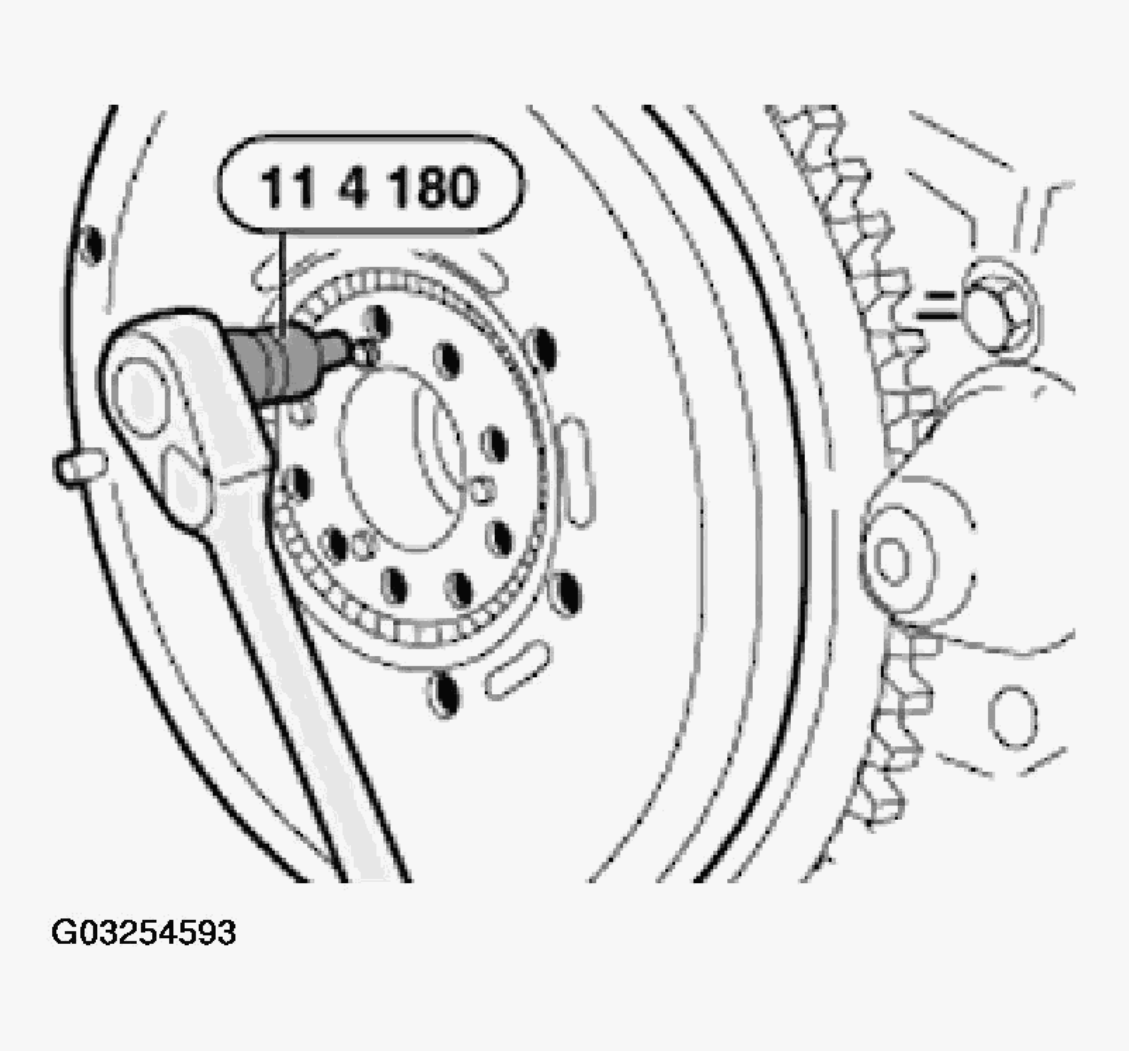


Fig. 162: Releasing Flywheel (ZMS) Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tightening Torque,

refer to 11 22 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Clean thread for flywheel screws in crankshaft.

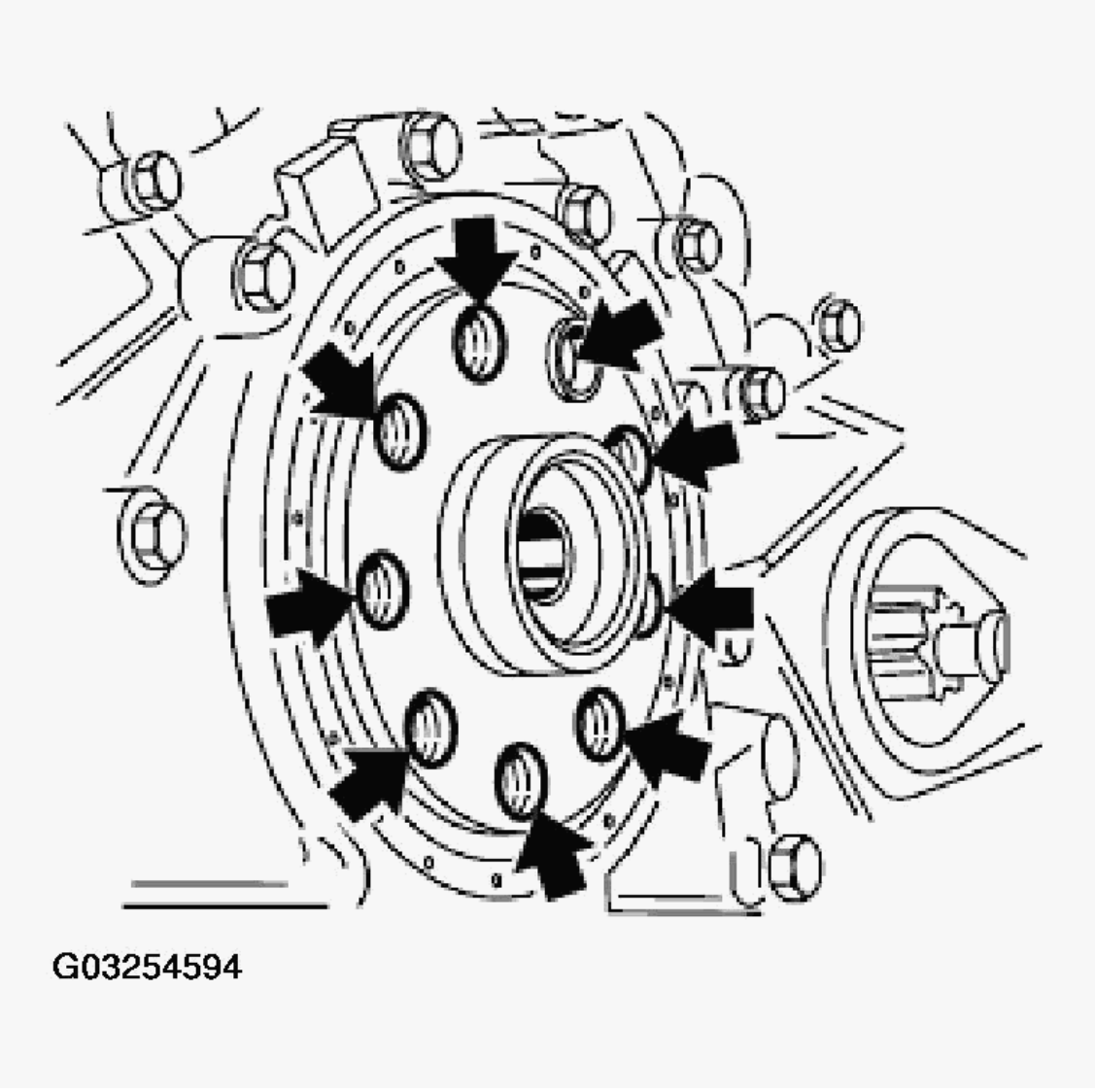


Fig. 163: Cleaning Flywheel Screw Threads In Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

The flywheel (ZMS) is located with a special (shorter) dowel sleeve.

CAUTION: Replace only with original BMW spare parts.

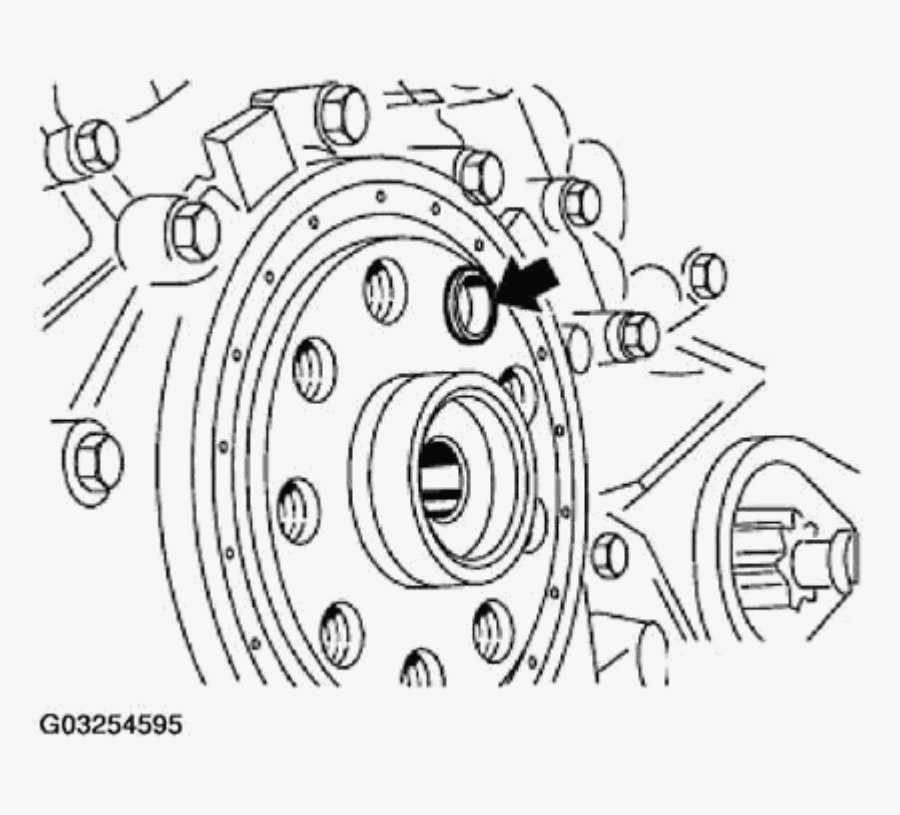


Fig. 164: Identifying Special Flywheel Dowel Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The position of the dowel sleeve (1) in the dual-mass flywheel is marked with two notches beside the respective screw bore.

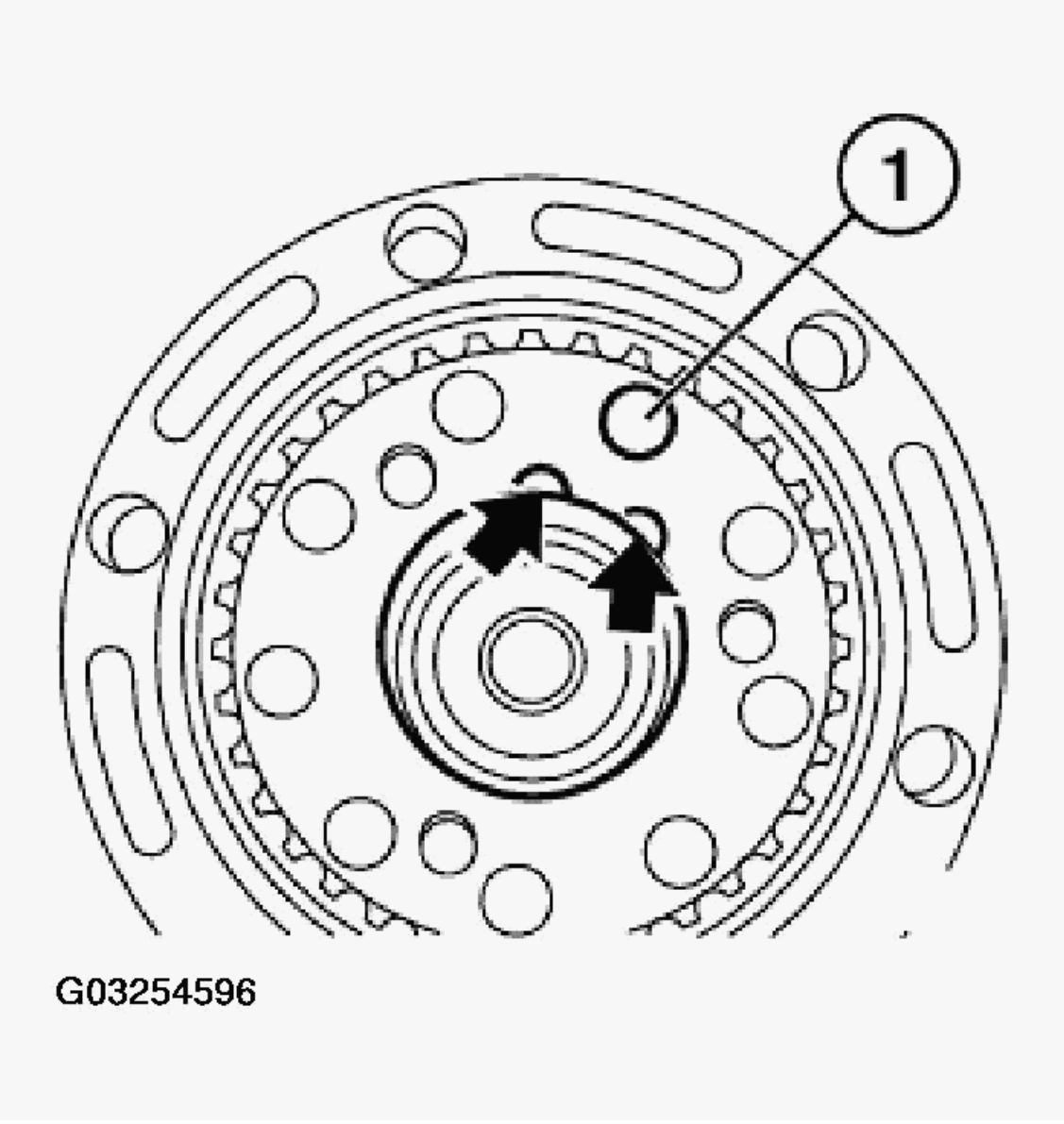


Fig. 165: Identifying Dowel Sleeve Position For Flywheel Installation
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Flywheel screws are part of the flywheel and must not be installed with screw securing adhesive (Loctite).

Lubricate screw threads lightly.

Tightening Torque,

refer to 11 22 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

11 22 510 REMOVING AND INSTALLING/REPLACING FLYWHEEL (M62)

Transmission Removed

CAUTION: Once the flywheel has been replaced, the pulse generator must be reset,

refer to 12 14 520 in ENGINE ELECTRICAL SYSTEM - REPAIR INSTRUCTION - X5 4.6L .

Block the flywheel using special tool 11 2 070.

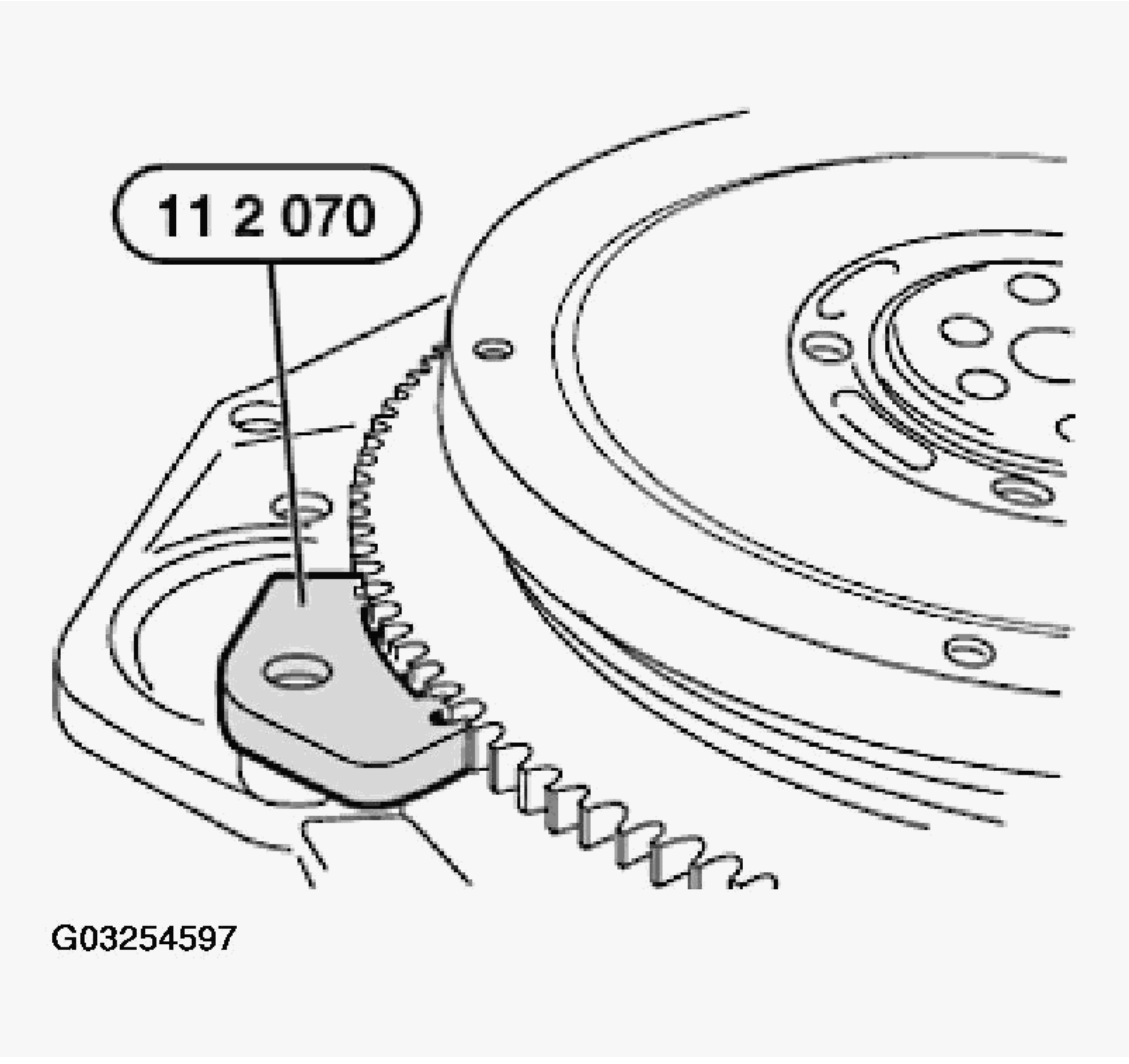


Fig. 166: Blocking Flywheel Using Special Tool 11 2 070
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten flywheel screws.

Remove drive plate (1).

Remove flywheel (2).

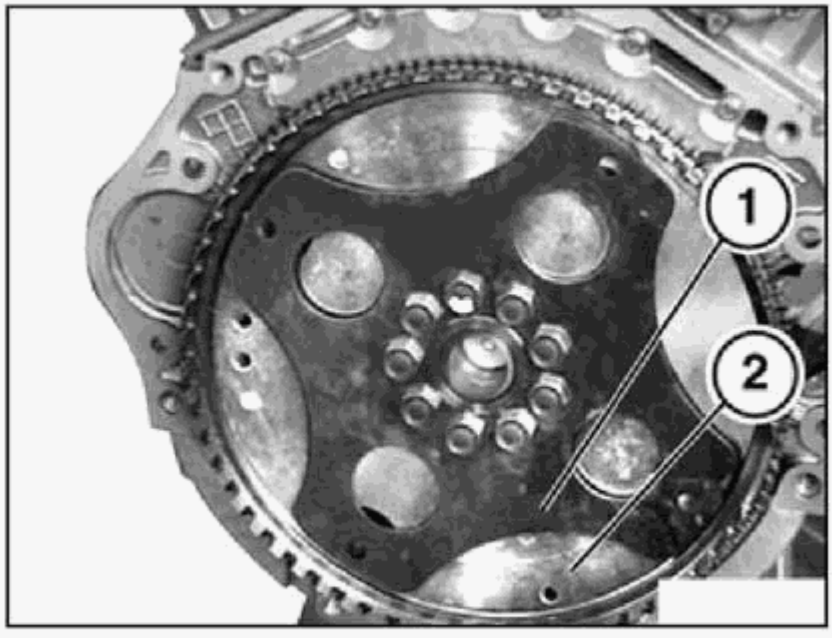


Fig. 167: Identifying Drive Plate And Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

Clean threads on flywheel screws in crankshaft.

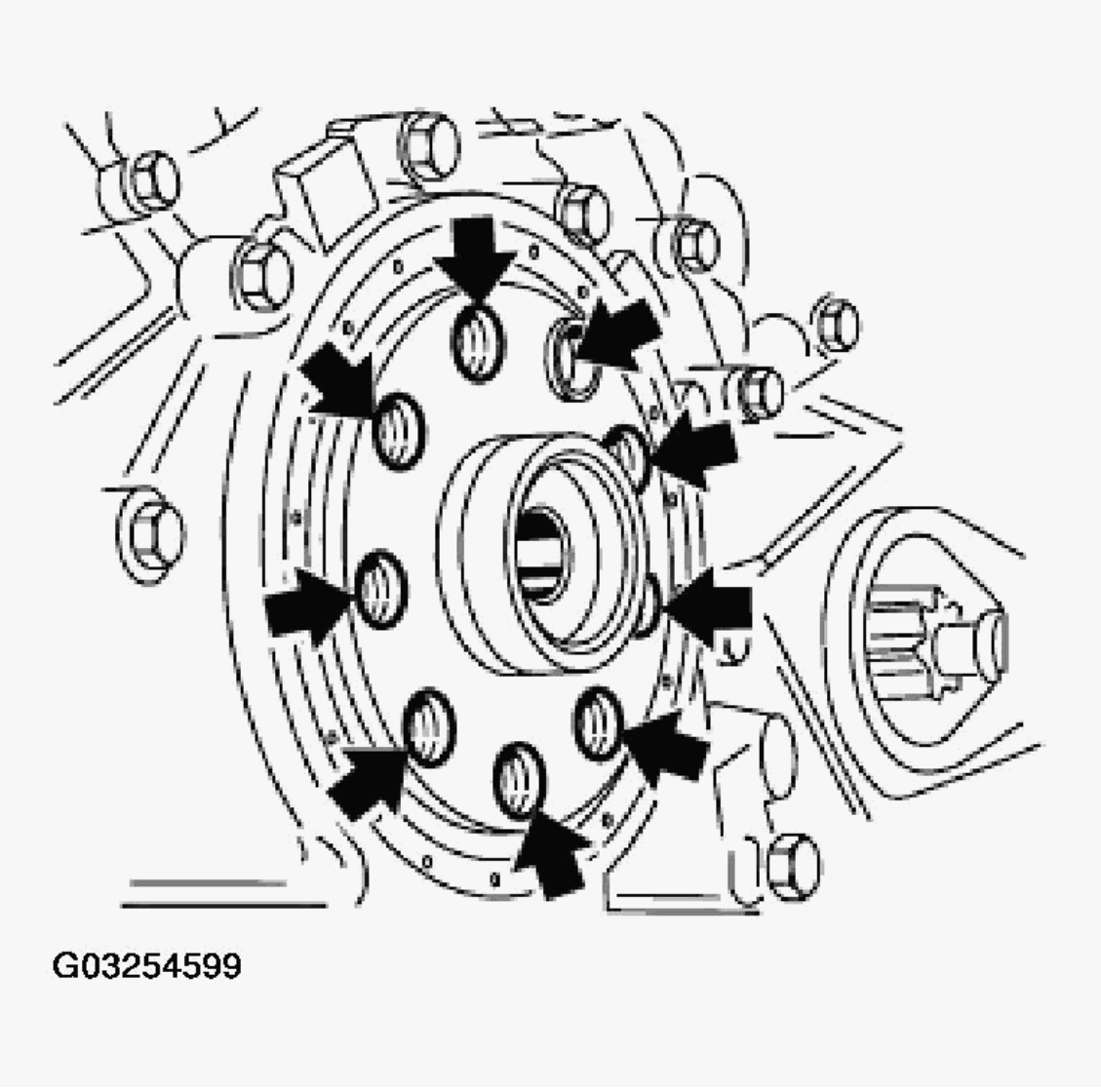


Fig. 168: Cleaning Flywheel Threads
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The flywheel is secured with a dowel sleeve.

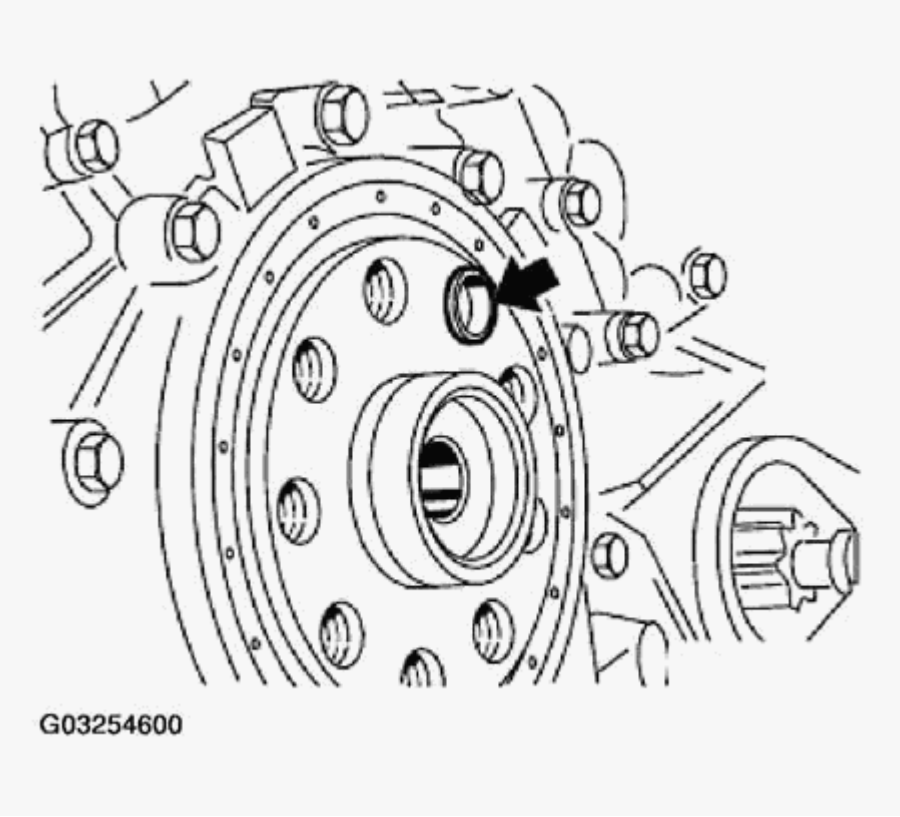


Fig. 169: Identifying Special Flywheel Dowel Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit flywheel (2) and mount drive plate (1) for torque converter correctly. Holes in drive plate (1) and flywheel (2) must be aligned over one another.

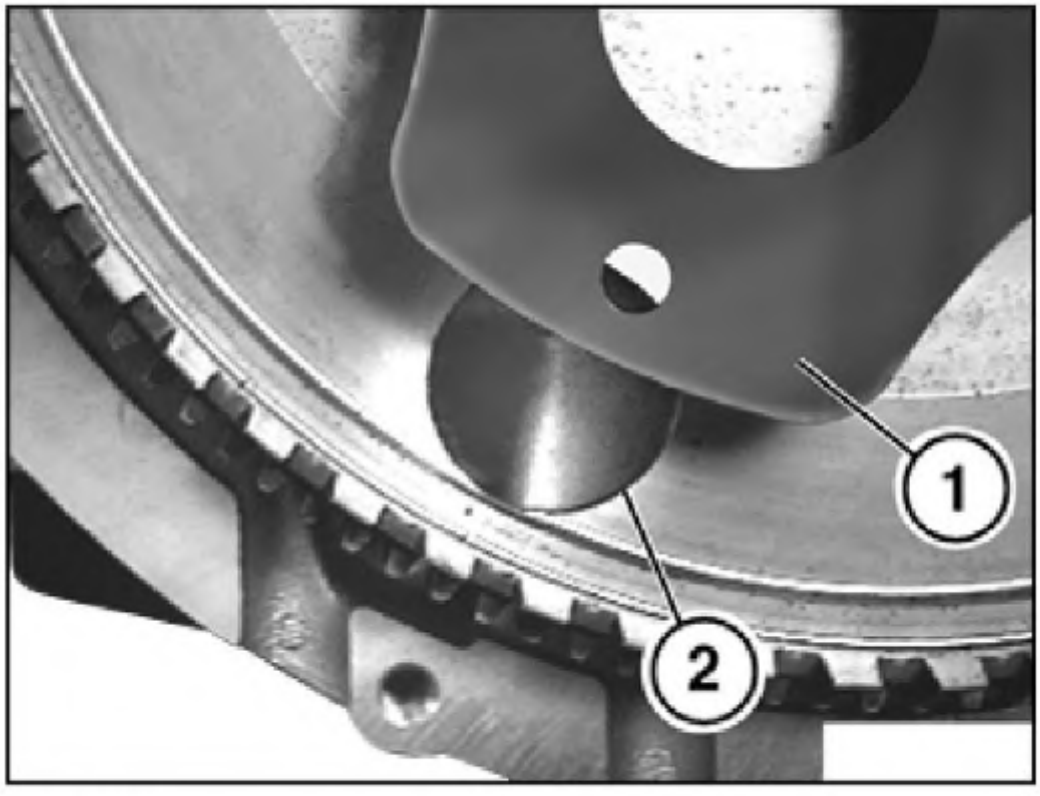


Fig. 170: Identifying Flywheel And Mount Drive Plate Installed Position
Courtesy of BMW OF NORTH AMERICA, INC.

Fit new flywheel screws.

Tightening torque,

refer to 11 22 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

VIBRATION DAMPER

11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (M62)

Unscrew and remove splash guard.

Remove alternator drive belt,

refer to **11 28 010 REPLACING ALTERNATOR DRIVE BELT (M62)**

Remove drive belt for a/c compressor,

refer to **11 28 050 REPLACING DRIVE BELT FOR A/C COMPRESSOR (M60/M62/M73)**

Release screws and remove vibration damper.

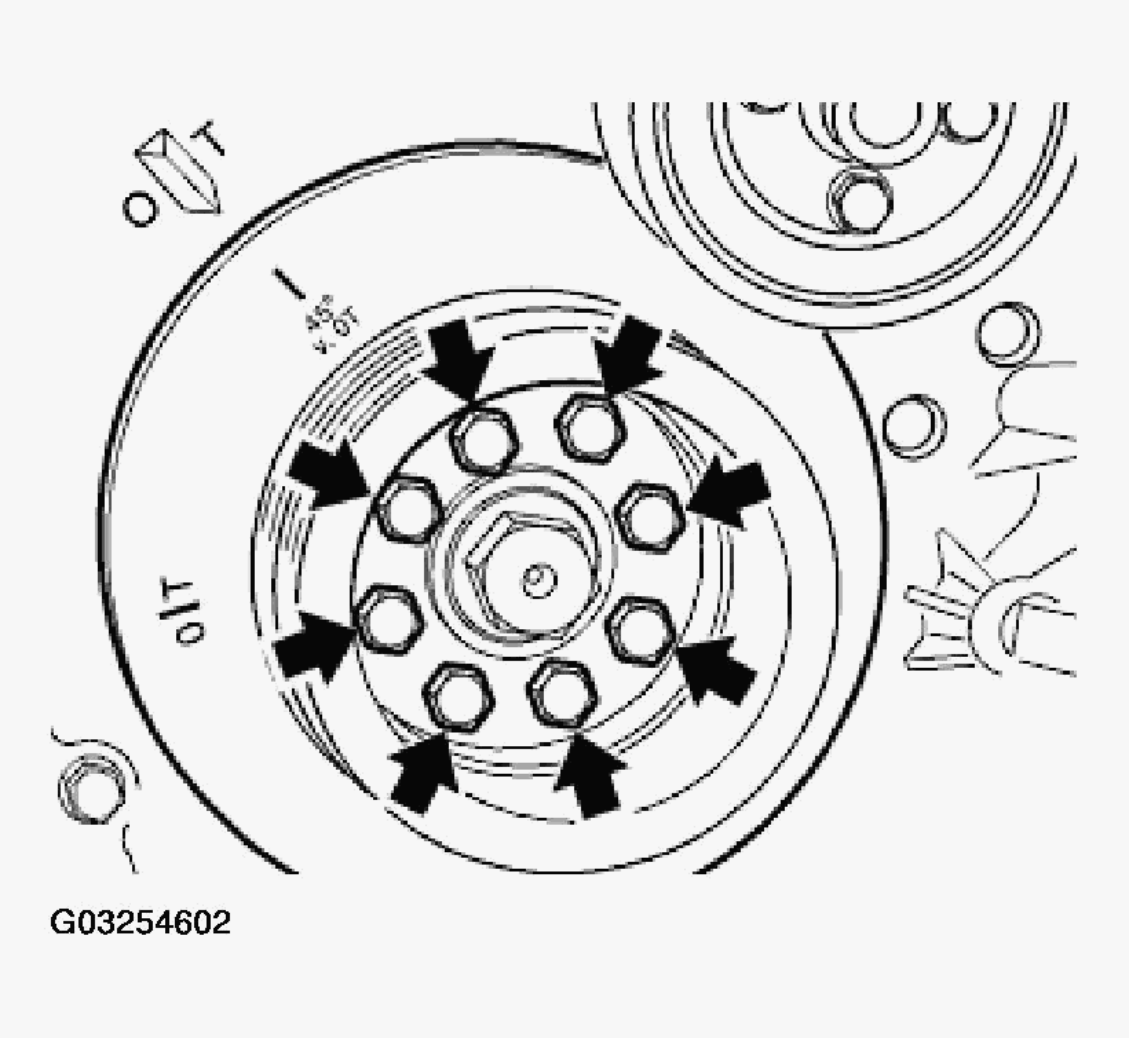


Fig. 171: Identifying Vibration Damper Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The vibration damper is located with a dowel pin. Replace screws.

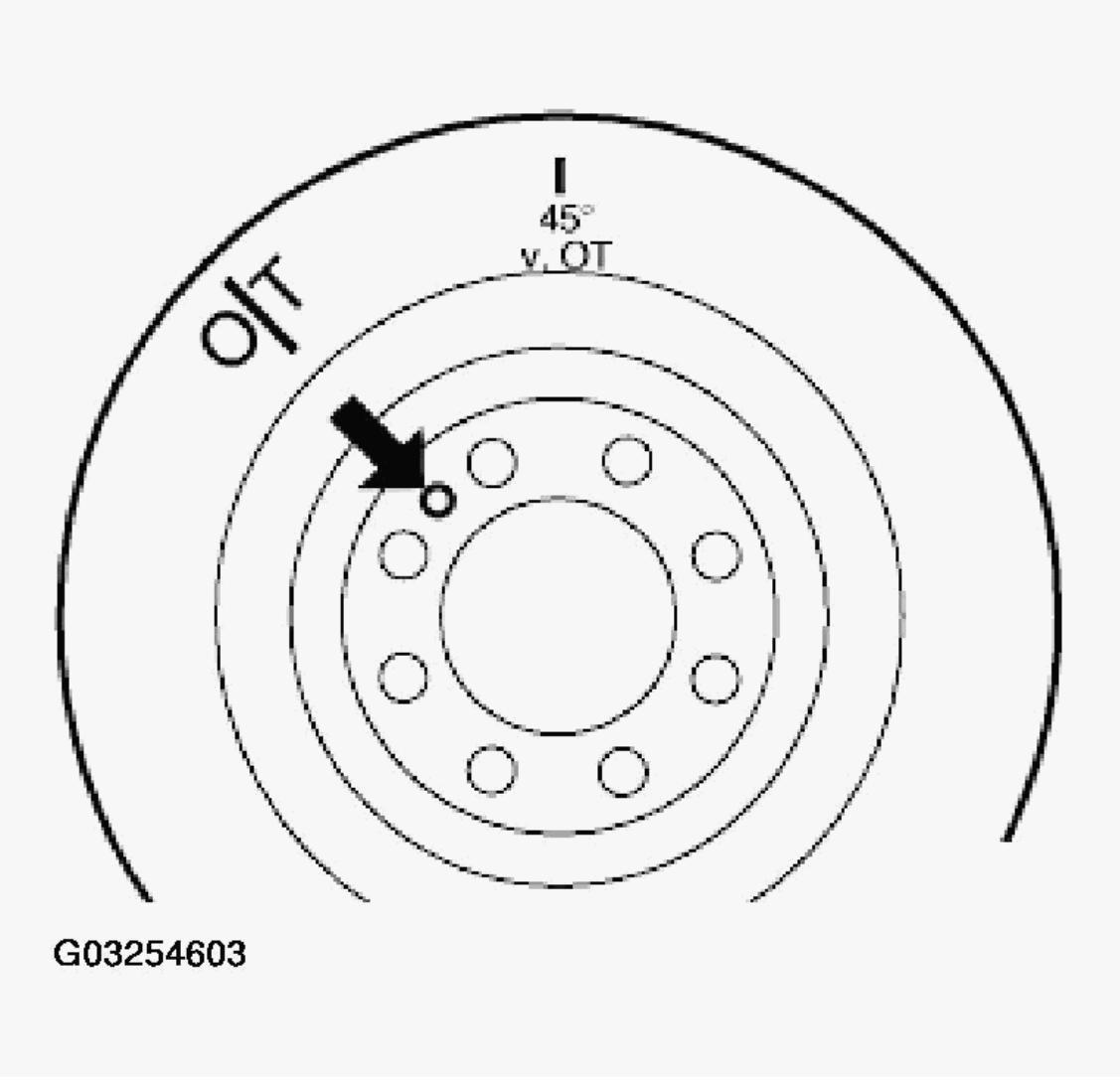


Fig. 172: Identifying Vibration Damper Dowel Pin Location
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque,

refer to 11 23 3AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

11 23 031 REMOVING AND INSTALLING/REPLACING HUB FOR VIBRATION DAMPER (M62)

Remove fan cowl,

refer to **17 11 031 REPLACING FAN COWL (M62/M54)** .

Remove vibration damper,

refer to **11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (M62)** .

NOTE: When releasing and tightening down the central bolt, you must support the special tool 11 2 450 on the engine carrier.

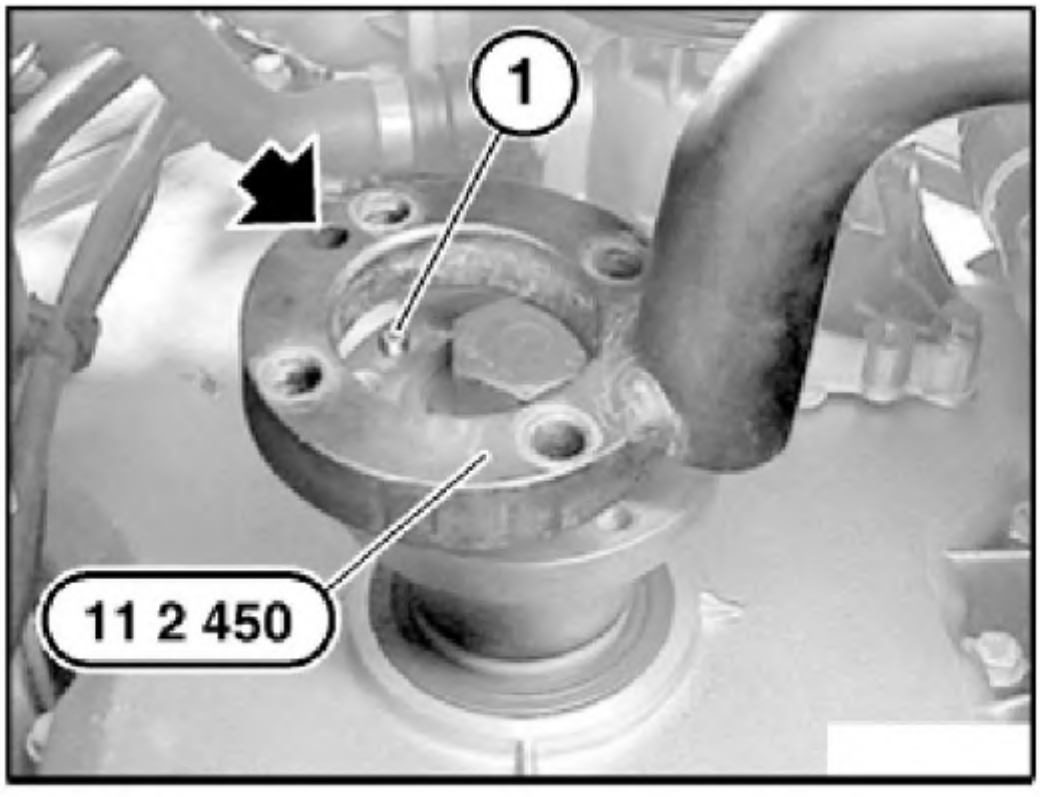
Accessibility is achieved after removal of the power steering pump and the mounting plate with oil-water heat exchanger from radiator.

NOTE: Lines of power steering pump, oil-water heat exchanger and water hoses remain connected.

Remove power steering pump from oil sump.

NOTE: Lines remain connected.

Crank engine at central bolt and align dowel pin (1) to bore in special tool 11 2 450.



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Fig. 173: Aligning Dowel Pin To Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Screw down special tool 11 2 450 with hub for vibration damper.

NOTE: Protect engine bracket from damage.

Insert wood between engine support and special tool 11 2 450.

Release central bolt (1).

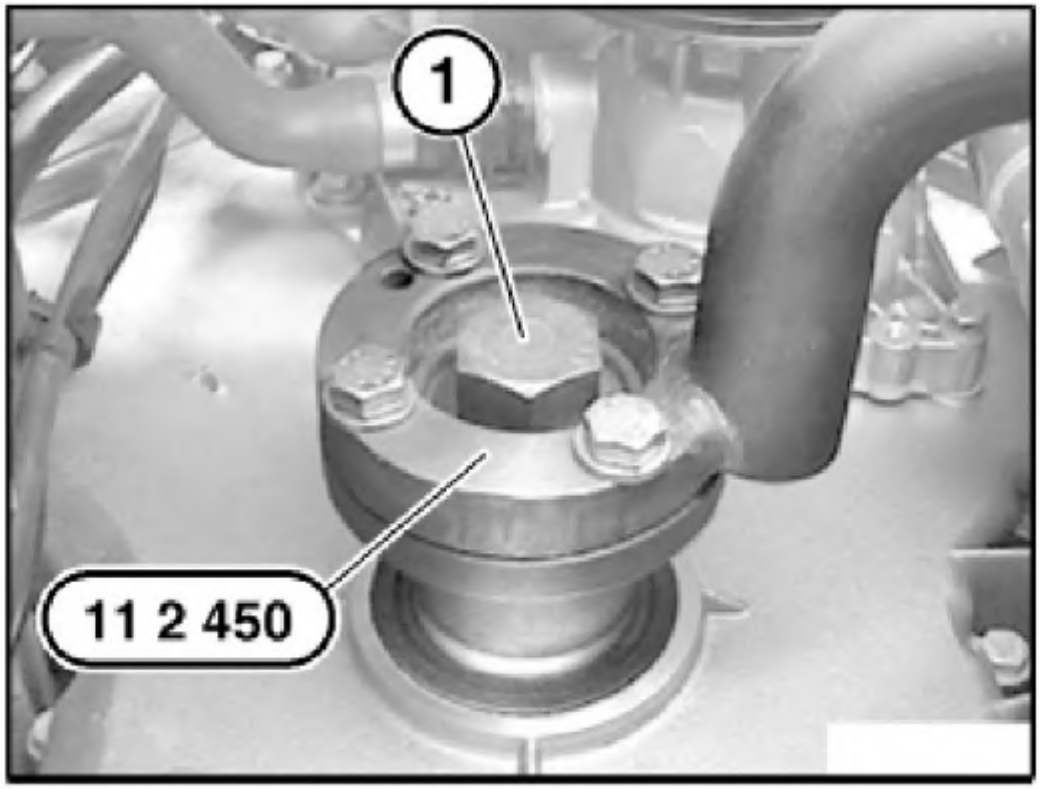


Fig. 174: Removing Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Remove hub for vibration damper.

Installation:

Align groove in hub for vibration damper to featherkey.

Install hub (1) for vibration damper.

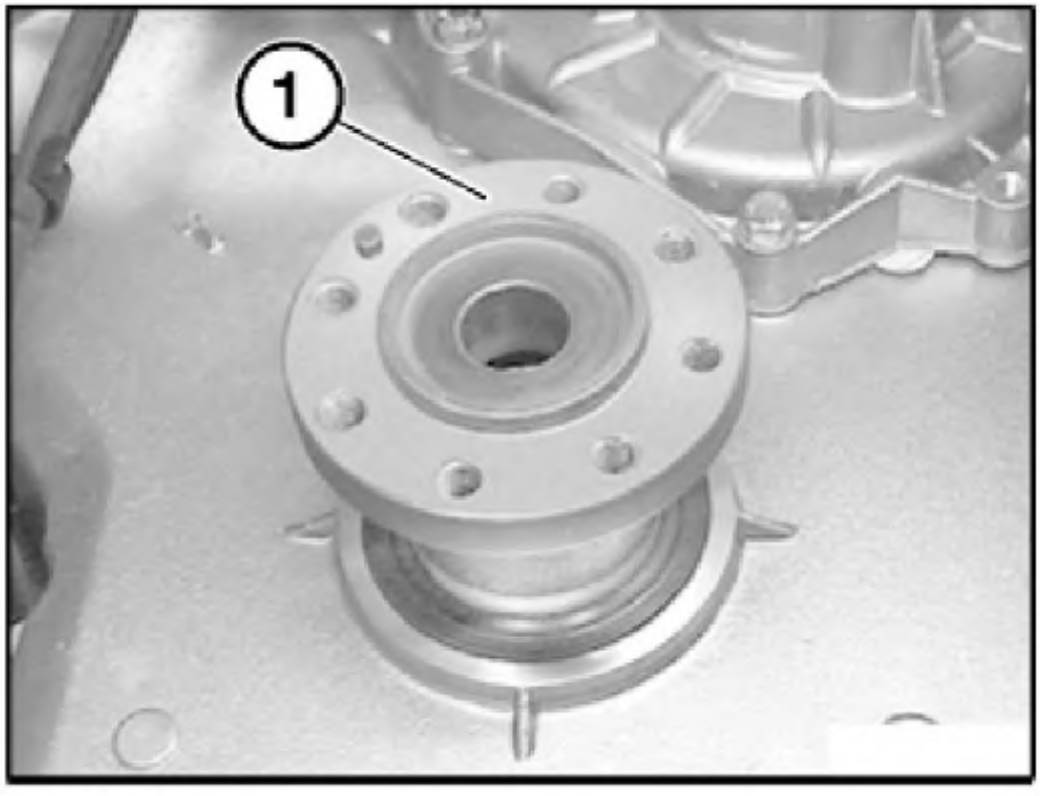


Fig. 175: Installing Hub For Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Lines on oil-water heat exchanger and water hoses remain connected.

Release screw (1) and expansion rivet (2), remove mounting plate with oil-water heat exchanger from radiator.

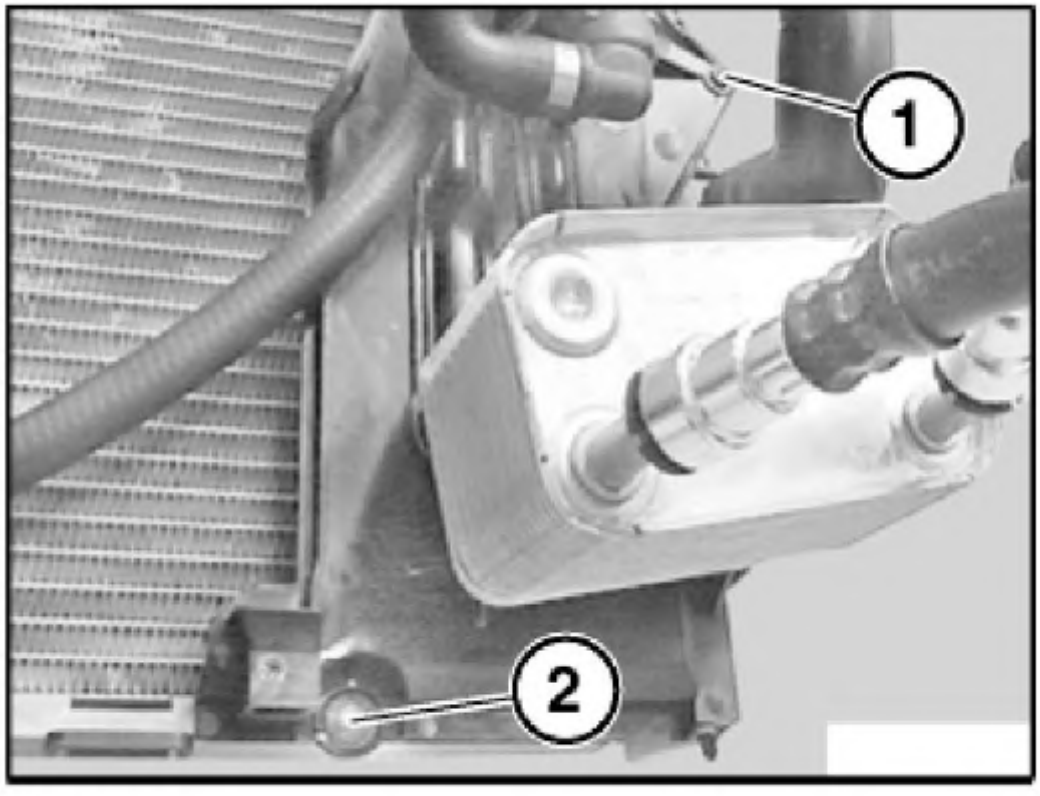


Fig. 176: Remove Mounting Plate With Oil-Water Heat Exchanger From Radiator
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace central screw.

Crank engine at central bolt and align dowel pin (1) to bore in special tool 11 2 450.

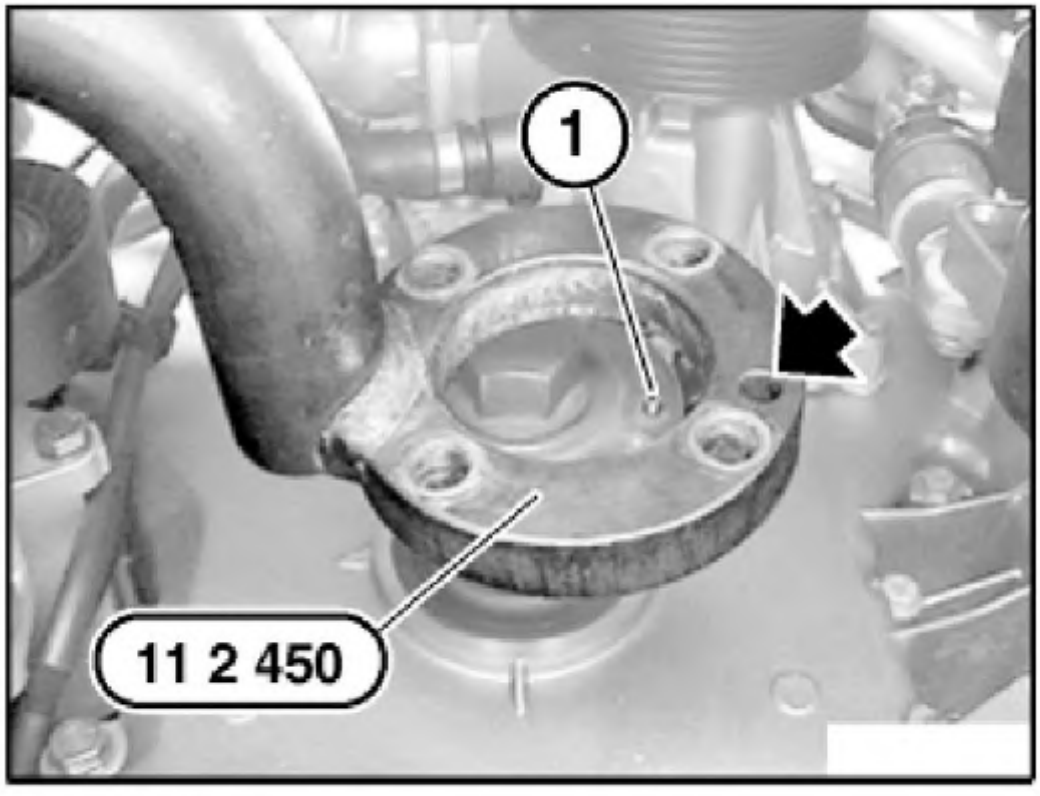


Fig. 177: Aligning Dowel Pin In Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Pull mounting plate downwards as far as water hoses permit.

Feed in special tool 11 2 450 between oil-water heat exchanger (1) and engine carrier.

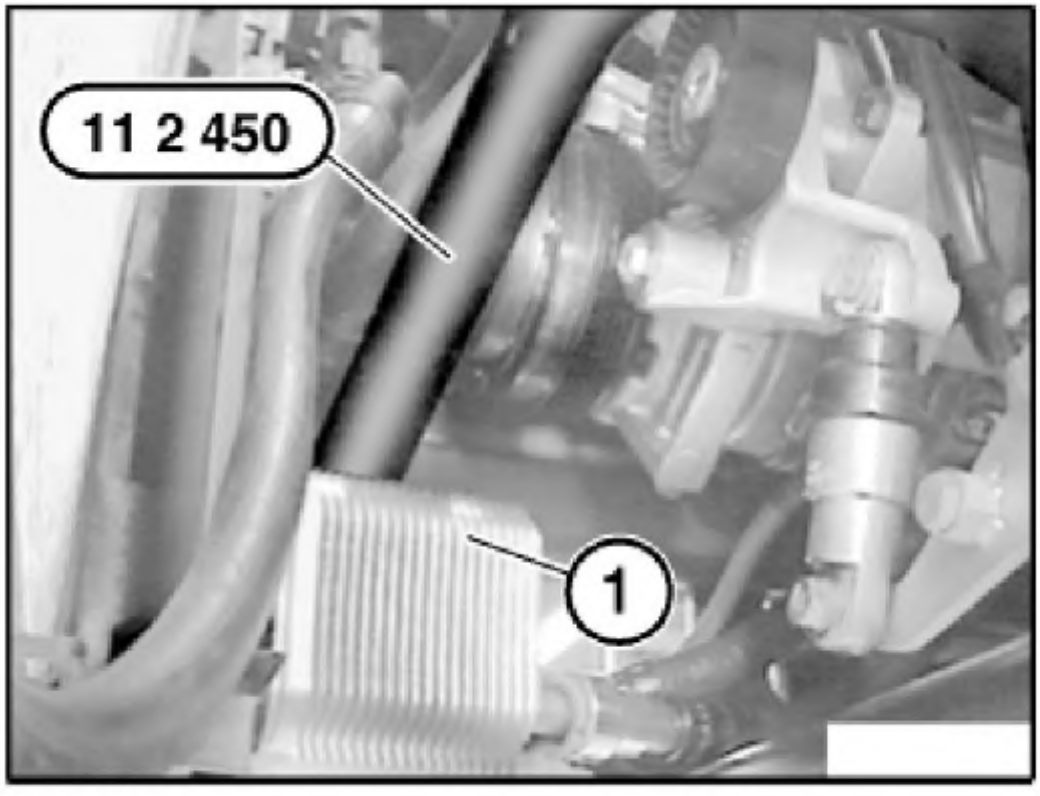


Fig. 178: Feeding Special Tool Between Oil-Water Heat Exchanger And Engine Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Screw down special tool 11 2 450 with hub for vibration damper.

NOTE: Protect engine bracket from damage. Insert wood between engine support and special tool 11 2 450.

Tighten down central bolt (1) to joining torque.

Tightening torque,

refer to 11 23 2AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

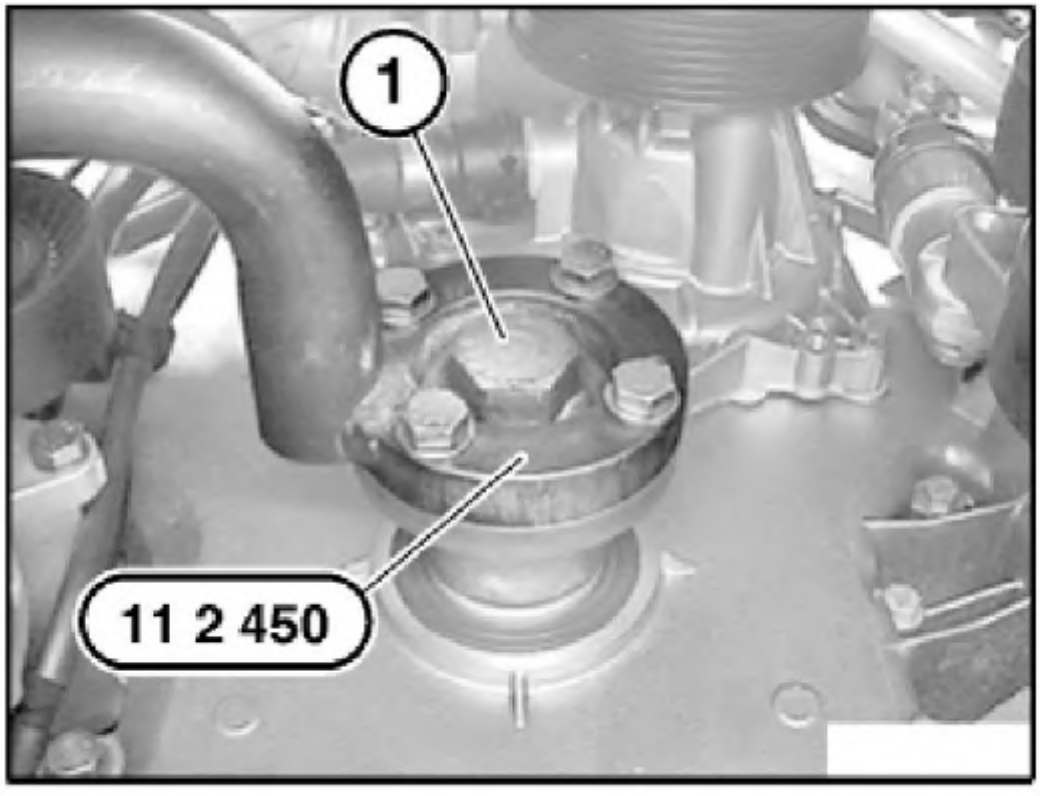


Fig. 179: Installing Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Place special tool 11 3 460 on special tool 11 2 450.

NOTE: Special tool 11 3 460 is magnetic.

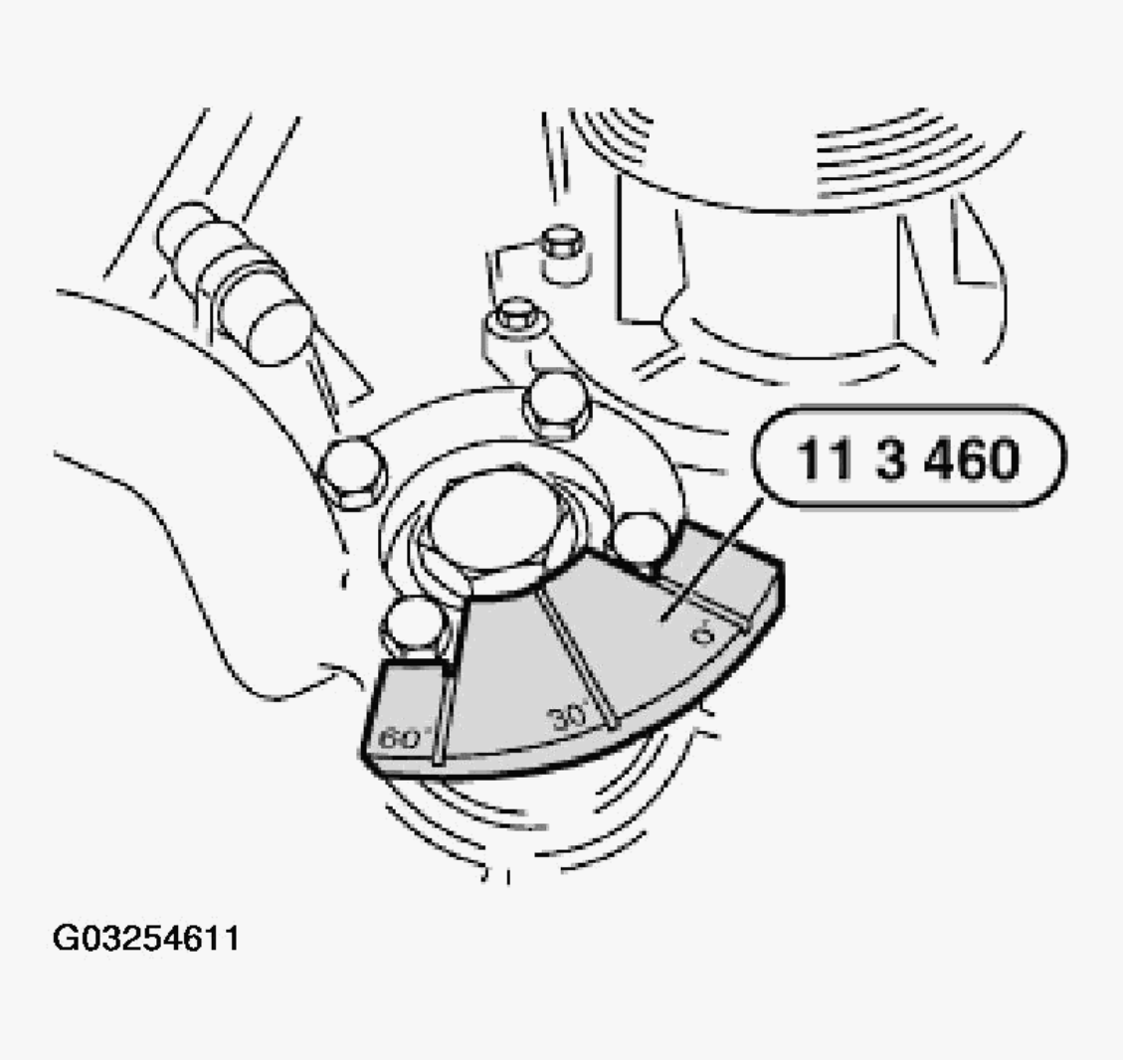


Fig. 180: Placing Special Tool 11 3 460 On Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Select 0° location and mark on insertion nut. Tighten the central screw with torsion angle.

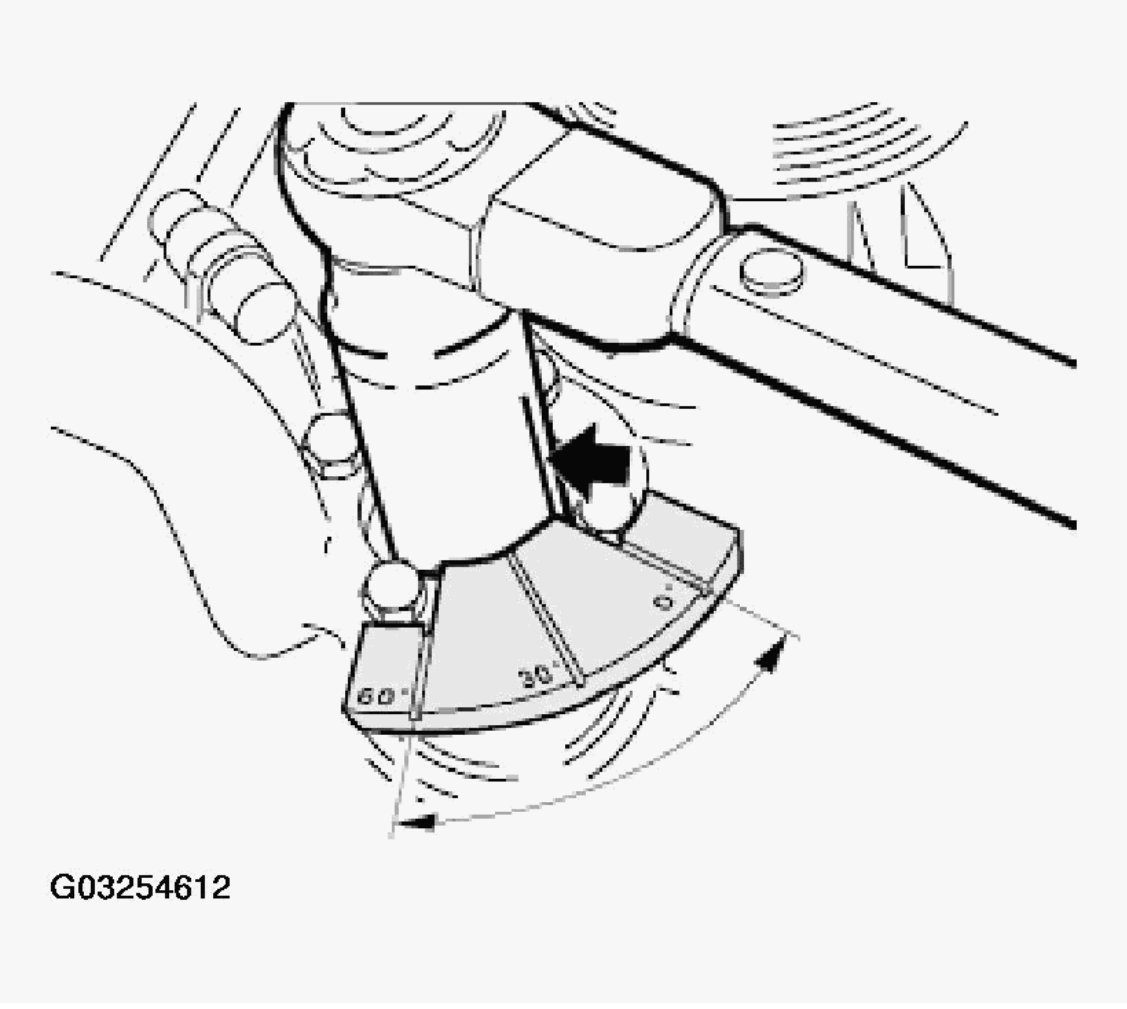


Fig. 181: Tightening Central Screw With Torsion Angle
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque,

refer to 11 23 2AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

CONNECTING ROD WITH BEARING

11 24 571 REPLACING ALL CONROD BEARINGS (M62)

Pistons Removed

CAUTION: Note grinding stage of crankshaft,

refer to CRANKSHAFT AND BEARINGS in Technical Data.

Install new conrod bearing shells.

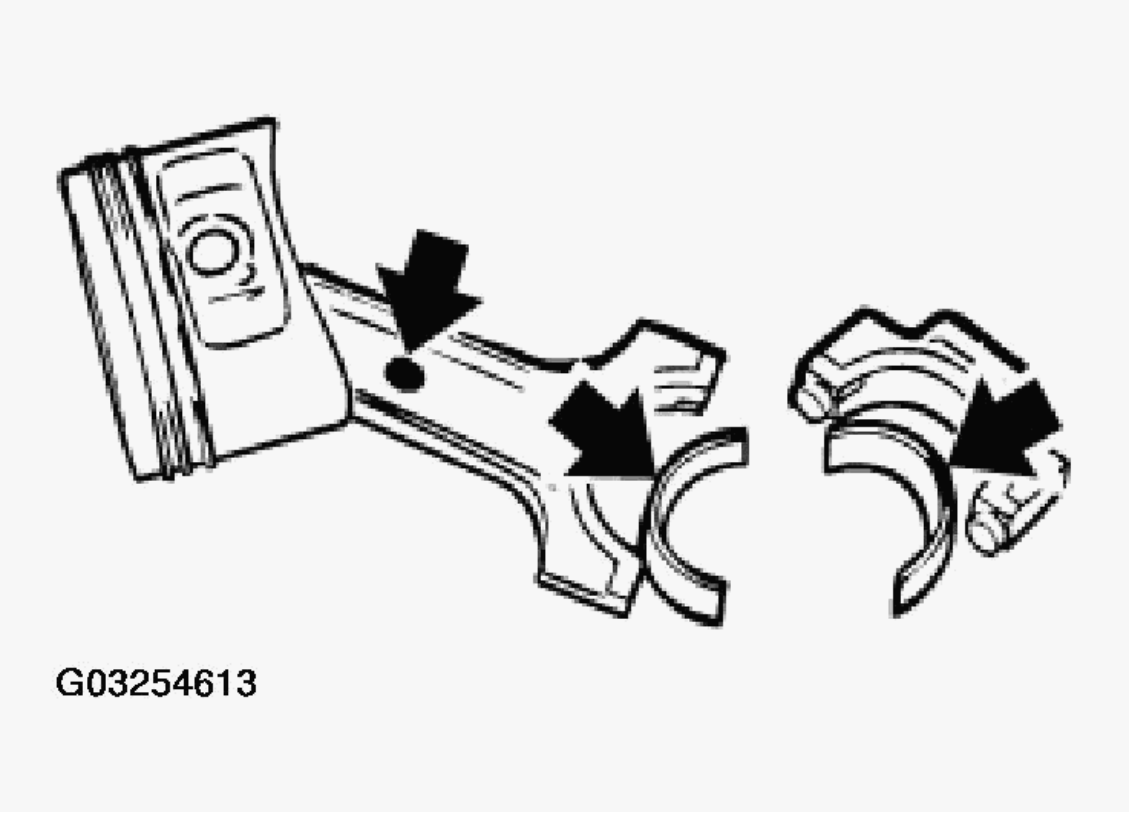


Fig. 182: Installing New Conrod Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Insert one red and one blue bearing shell for each conrod.

Install pistons,

refer to **11 25 530 REMOVING AND INSTALLING/REPLACING ALL PISTONS (M62)** .

Check connecting-rod bearing clearance:

Piston in BDC position.

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

Place bearing caps in position, making sure that matching numbers are paired.

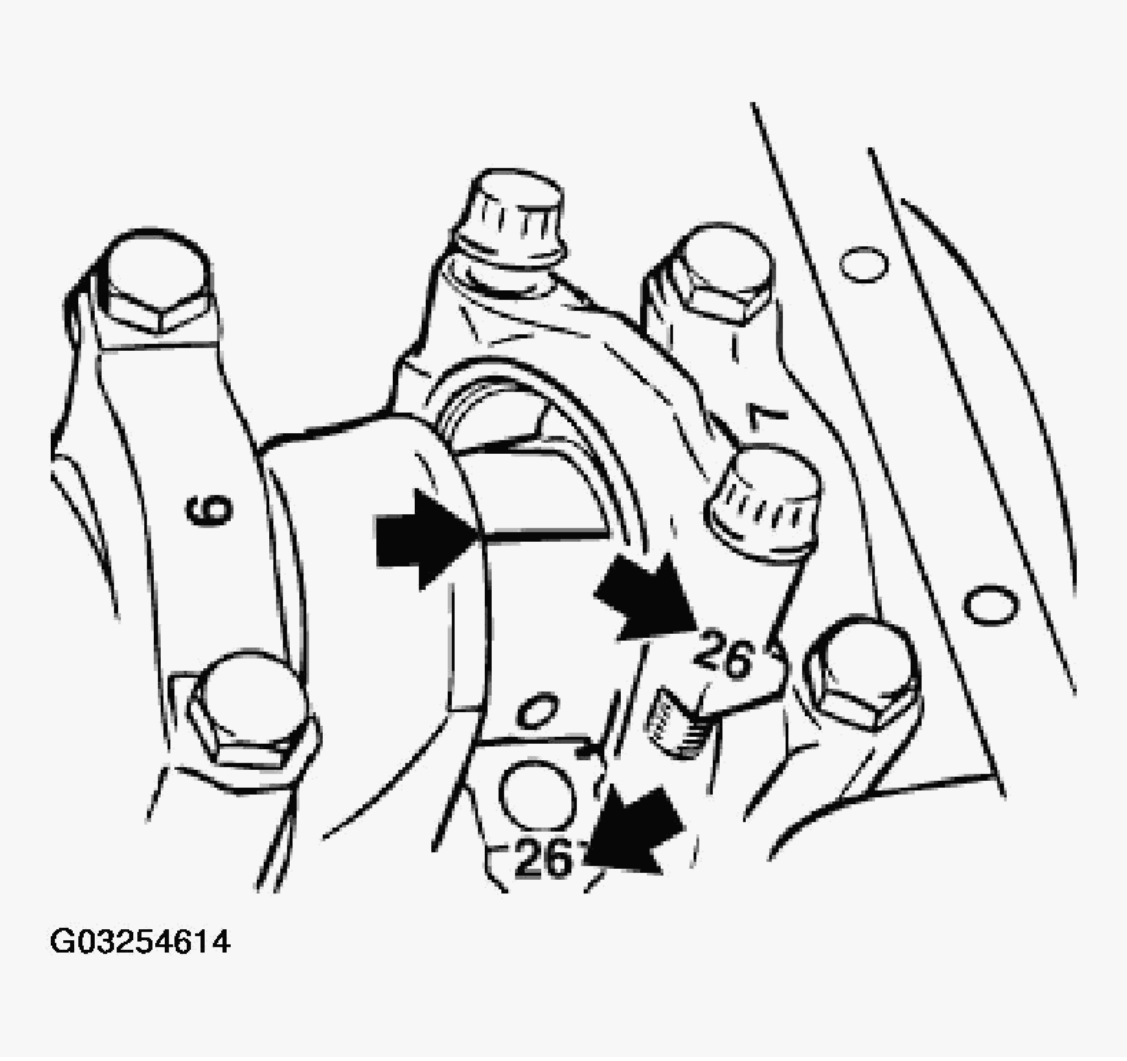


Fig. 183: Identifying Bearing Caps Matching Numbers
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not distort conrods or crankshaft.

Use the old connecting-rod bolts to check connecting-rod clearance.

Tighten down conrod screws with special tool 00 9 120 or special tool 112 110, respectively.

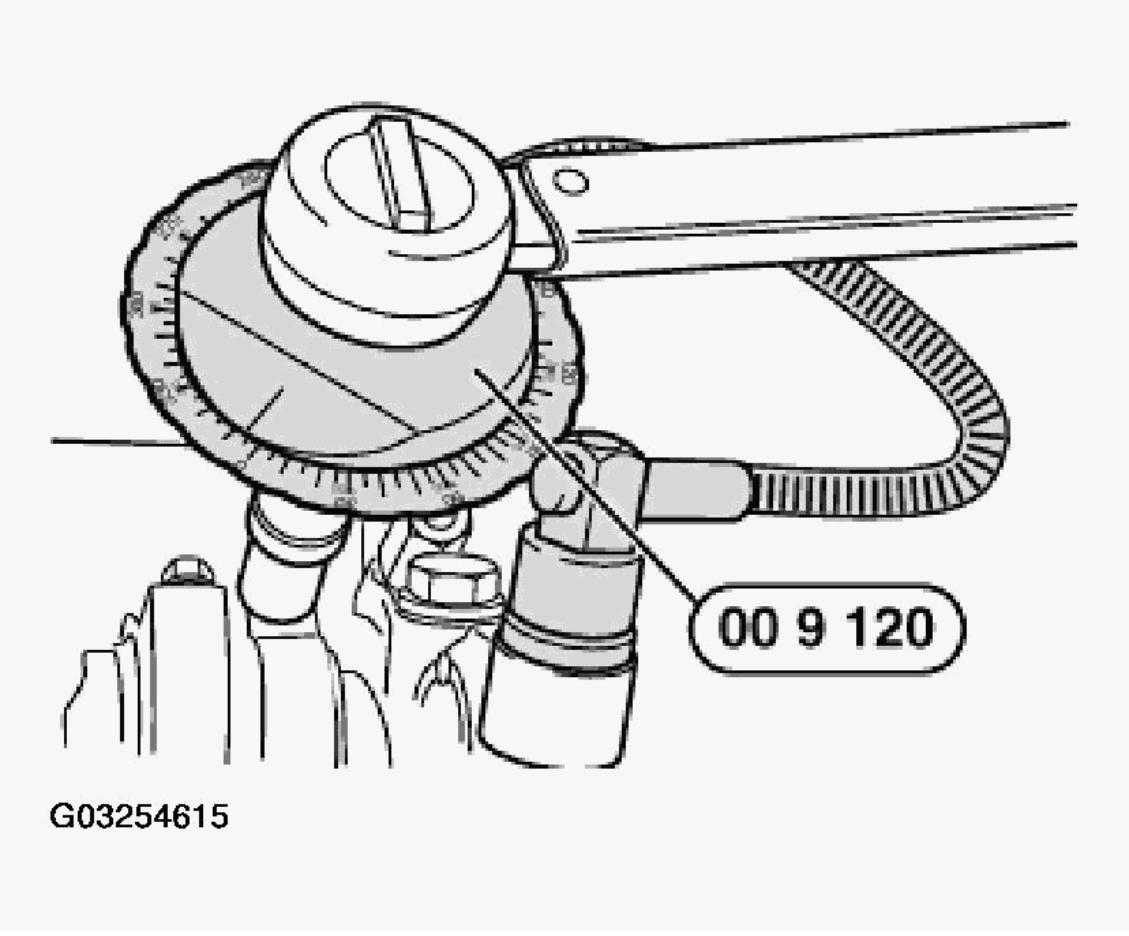


Fig. 184: Tightening Conrod Screws Using Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening Torque,

refer to 11 24 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Remove bearing cover and read off bearing clearance across width of pinched plastic thread with the help of the measuring scale.

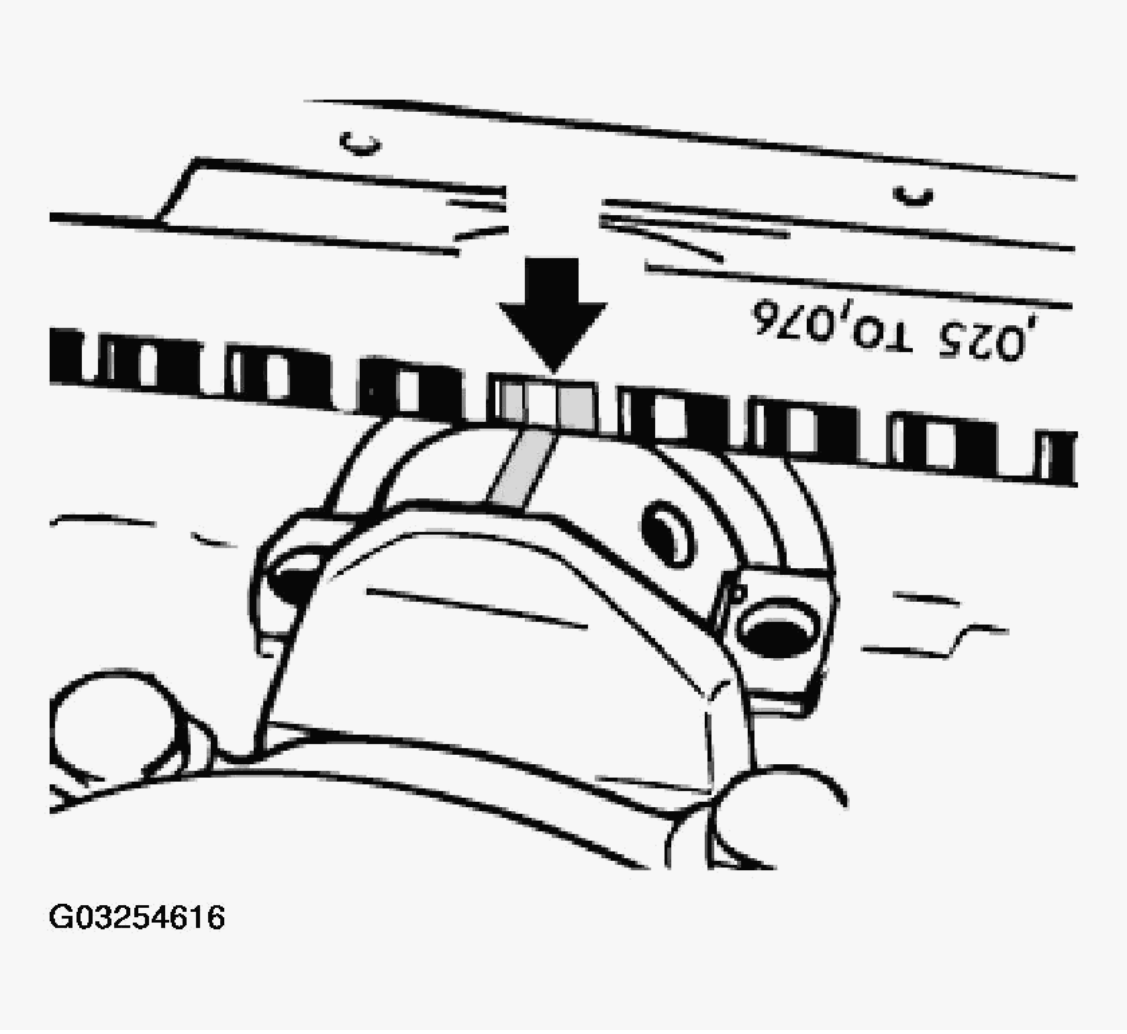


Fig. 185: Measuring Bearing Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

Conrod bearing clearance,

refer to **CONNECTING RODS AND BEARINGS** in Technical Data.

- Remove plastic thread.
- Lubricate crankshaft and bearing shells.
- Insert new conrod bolts and tighten down.

Tightening Torque,

refer to 11 24 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

PISTON WITH RINGS

11 25 530 REMOVING AND INSTALLING/REPLACING ALL PISTONS (M62)

Special tools required:

NOTE: For Special Tool identification, see ENGINE - SPECIAL TOOLS - X5 (4.4L & 4.6L) .

- 11 2 470
- 11 9 500

Removal

Engine Removed

Removal of pistons is described separately from installation. The assembly sequence for removal and installation is different.

- Remove both cylinder heads.

  These tasks are described in the work step Removing and installing right/left cylinder head, refer to **11 12 105 REMOVING AND INSTALLING LEFT CYLINDER HEAD (M62)** and **11 12 106 REMOVING AND INSTALLING RIGHT CYLINDER HEAD (M62 VANOS FROM 9/98)** .

- Remove upper oil sump section,

  refer to **11 13 010 REMOVING AND INSTALLING/REPLACING UPPER SECTION OF OIL SUMP (M62)** .

- Remove oil pump. See **OIL PUMP WITH FILTER** .

IMPORTANT: Re-install piston, conrod and bearing shells back in the same position and in the same installation location.
Conrod and conrod bearing cover are designated with same pair number: do not interchange/confuse.

IMPORTANT: When removing and installing pistons, there is a risk of the spray nozzles being damaged.
Unfasten screw and remove spray nozzle.

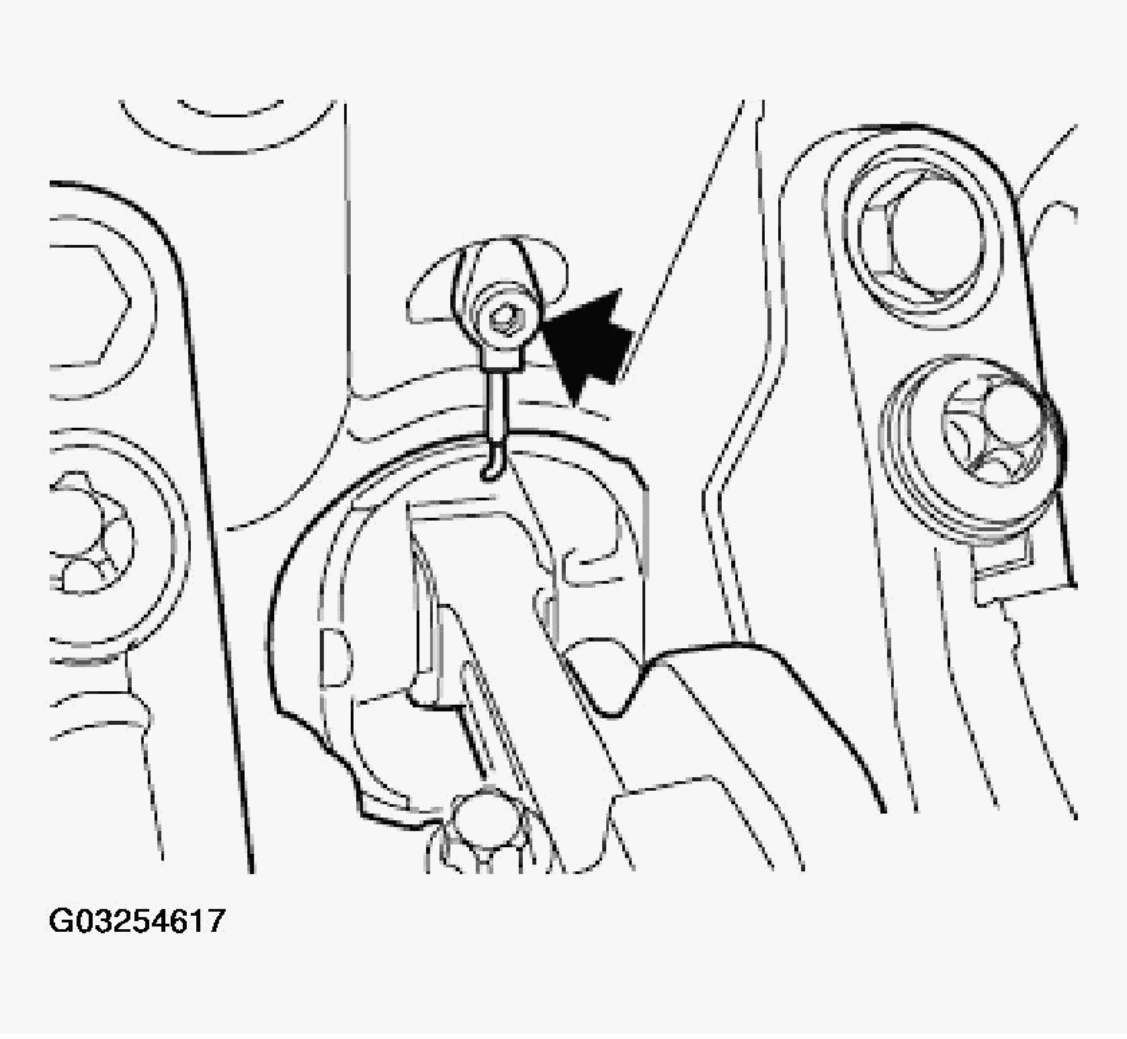


Fig. 186: Removing Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew conrod bearing cover.

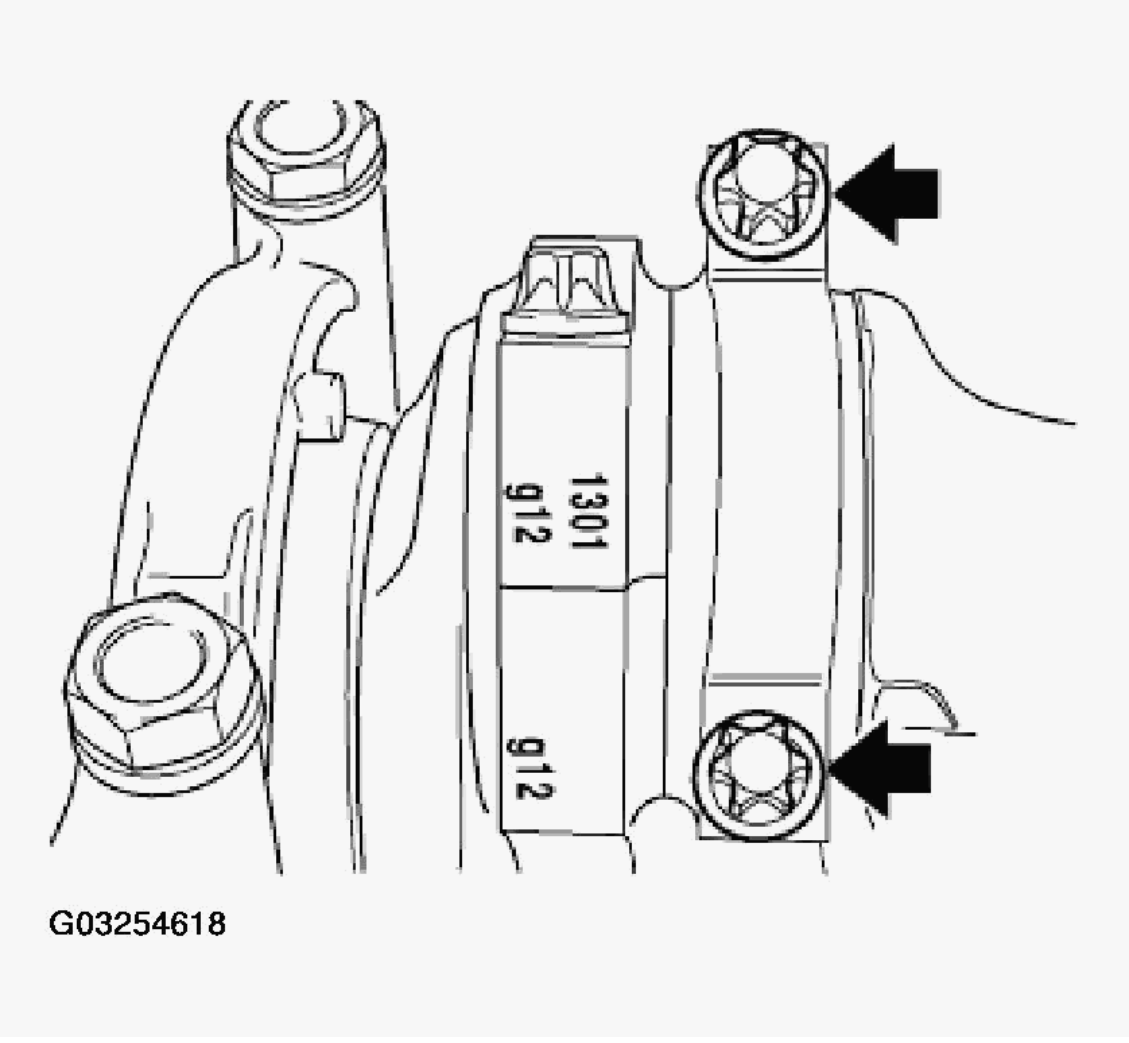


Fig. 187: Unscrewing Conrod Bearing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 2 470 in conrod.

Remove conrod with piston from cylinder head side.

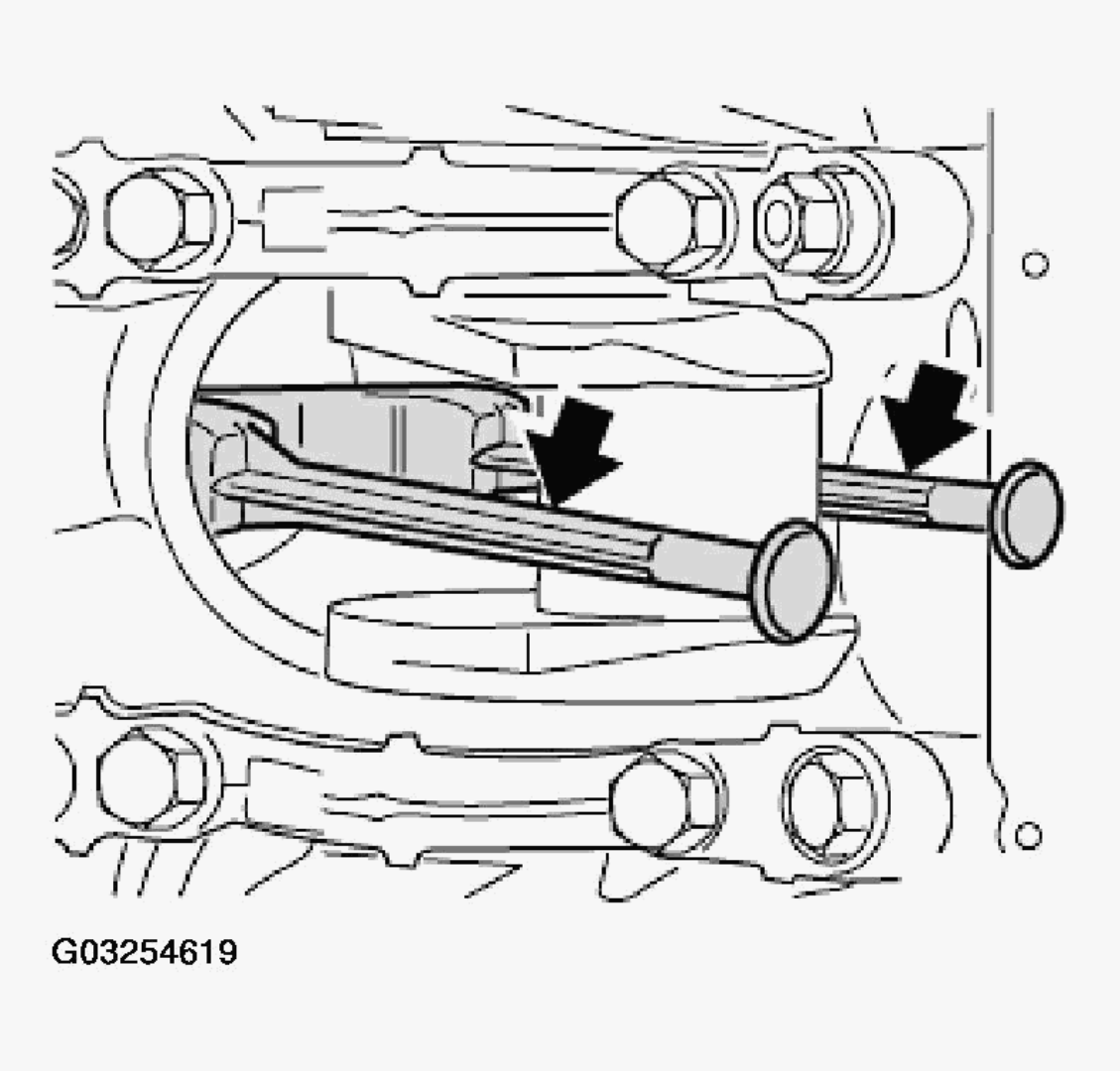
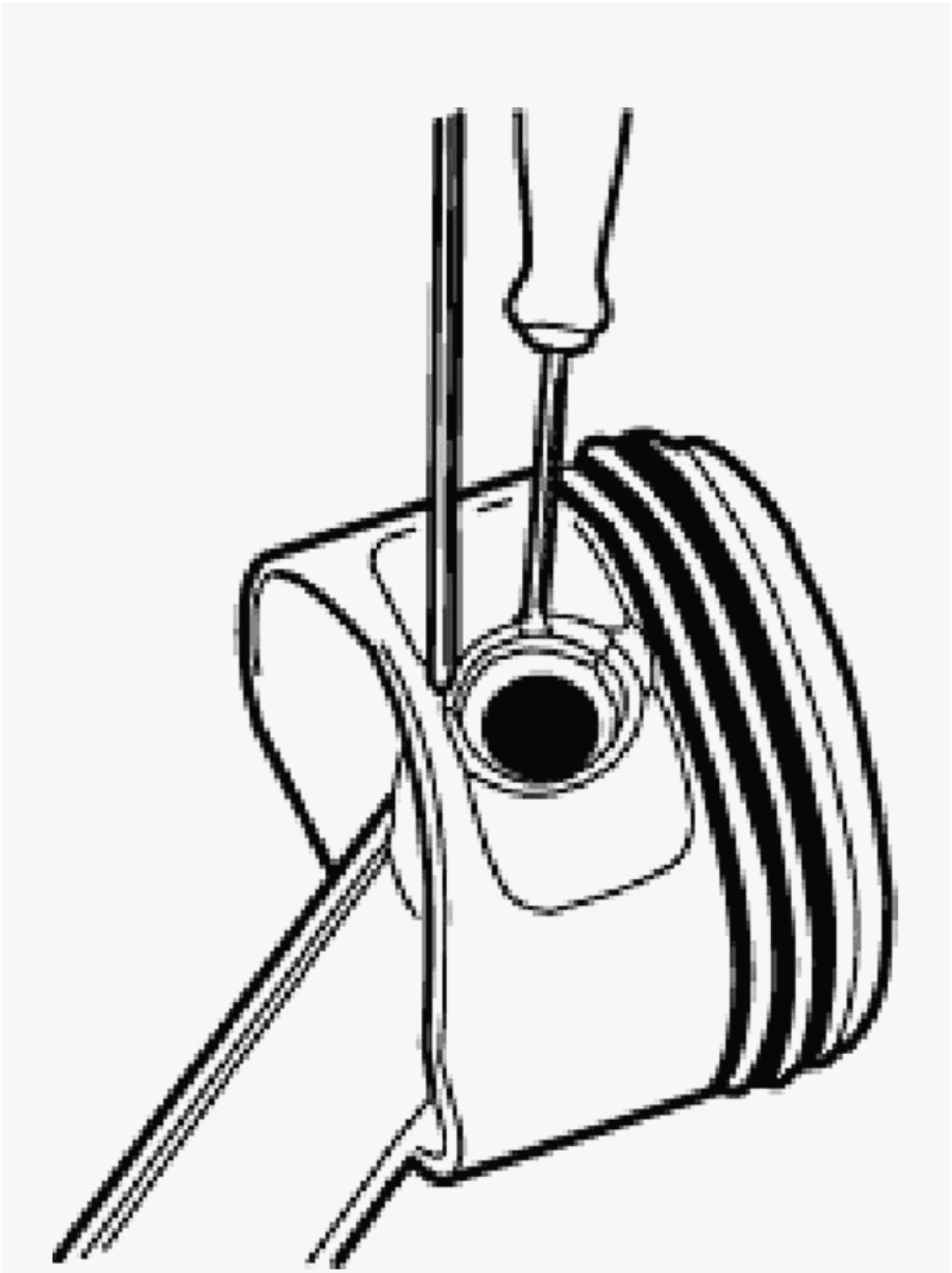


Fig. 188: Removing Conrod
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out retaining ring and press out piston pin.



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Fig. 189: Removing Piston Pin Retaining Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

IMPORTANT: Piston and piston bolts are paired and must not be fitted individually.

Installation of pistons is described separately from removal. The assembly sequence for removal and installation is different.

If necessary, replace connecting rods.

NOTE: The conrods can also be replaced individually.

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

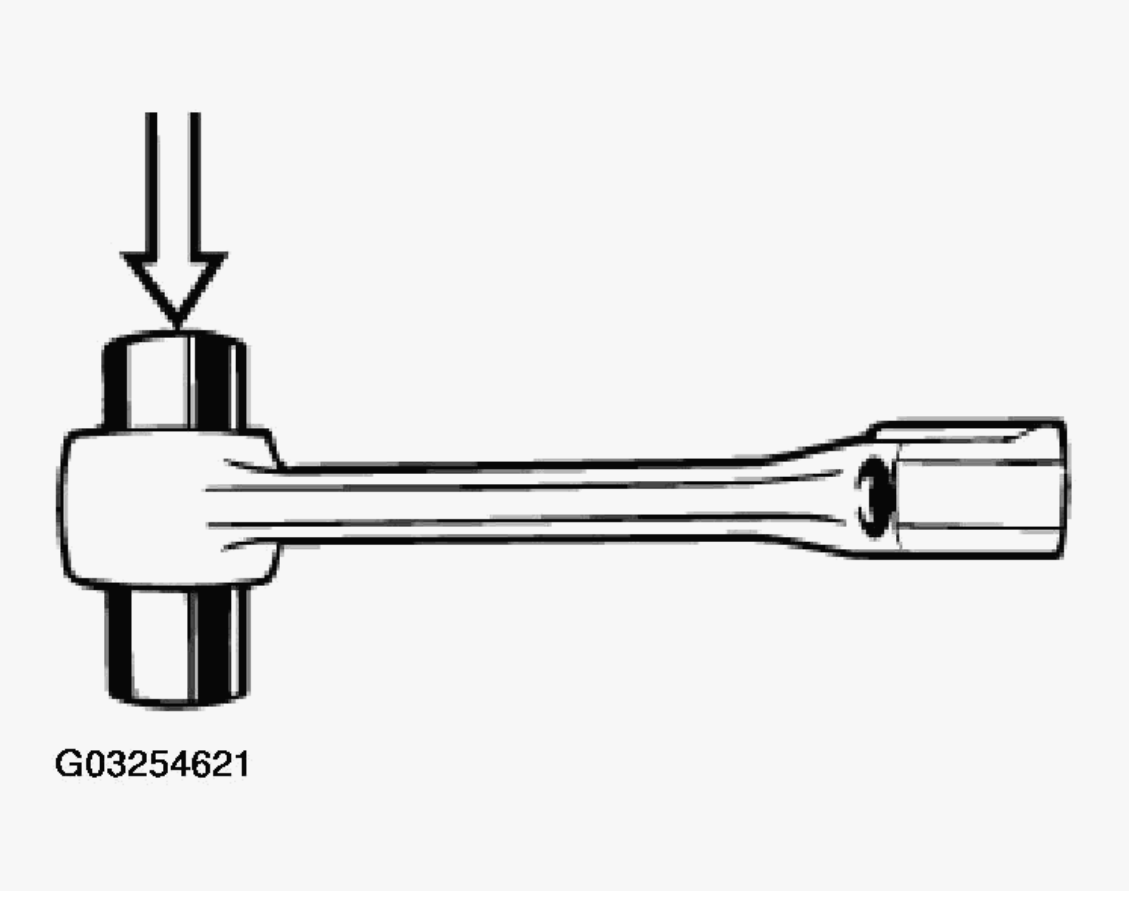


Fig. 190: Testing Piston Pin Fit
Courtesy of BMW OF NORTH AMERICA, INC.

Before installation, measure piston installation clearance.

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

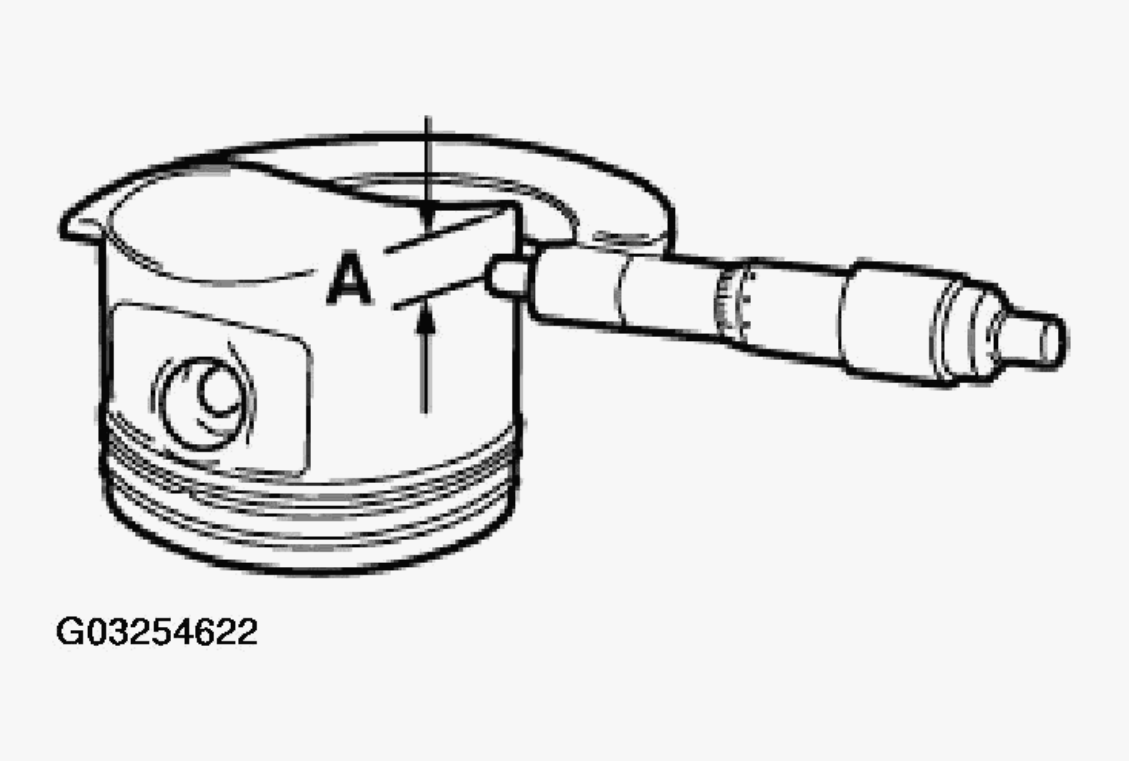


Fig. 191: Measuring Piston Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

For Measuring Point A, refer to **PISTONS WITH RINGS AND PINS** .

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.

Piston installation clearance.

Total permissible wear tolerance.

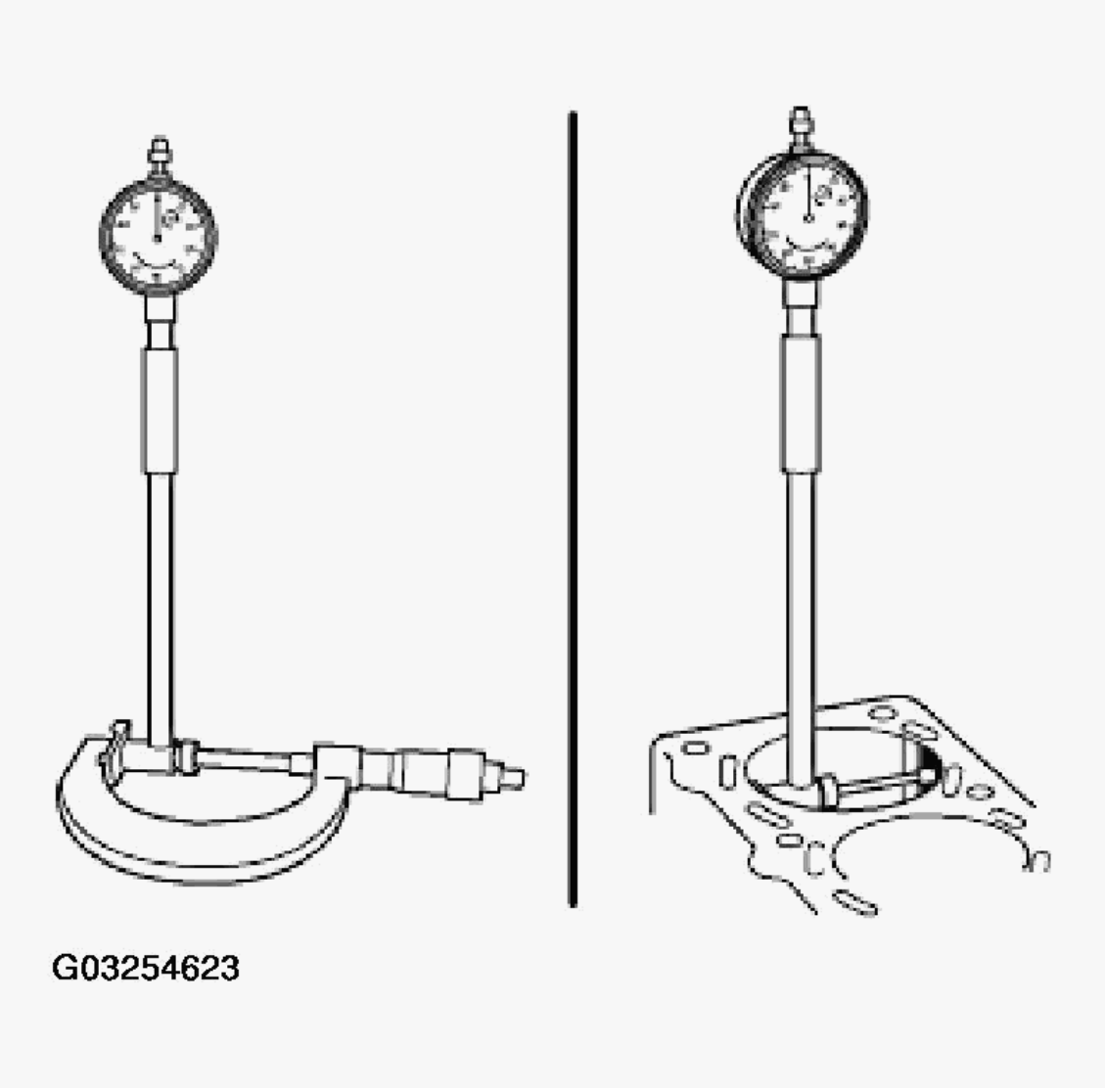


Fig. 192: Measuring Cylinder Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Install conrod bearing.

IMPORTANT: Piston and piston bolts 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.

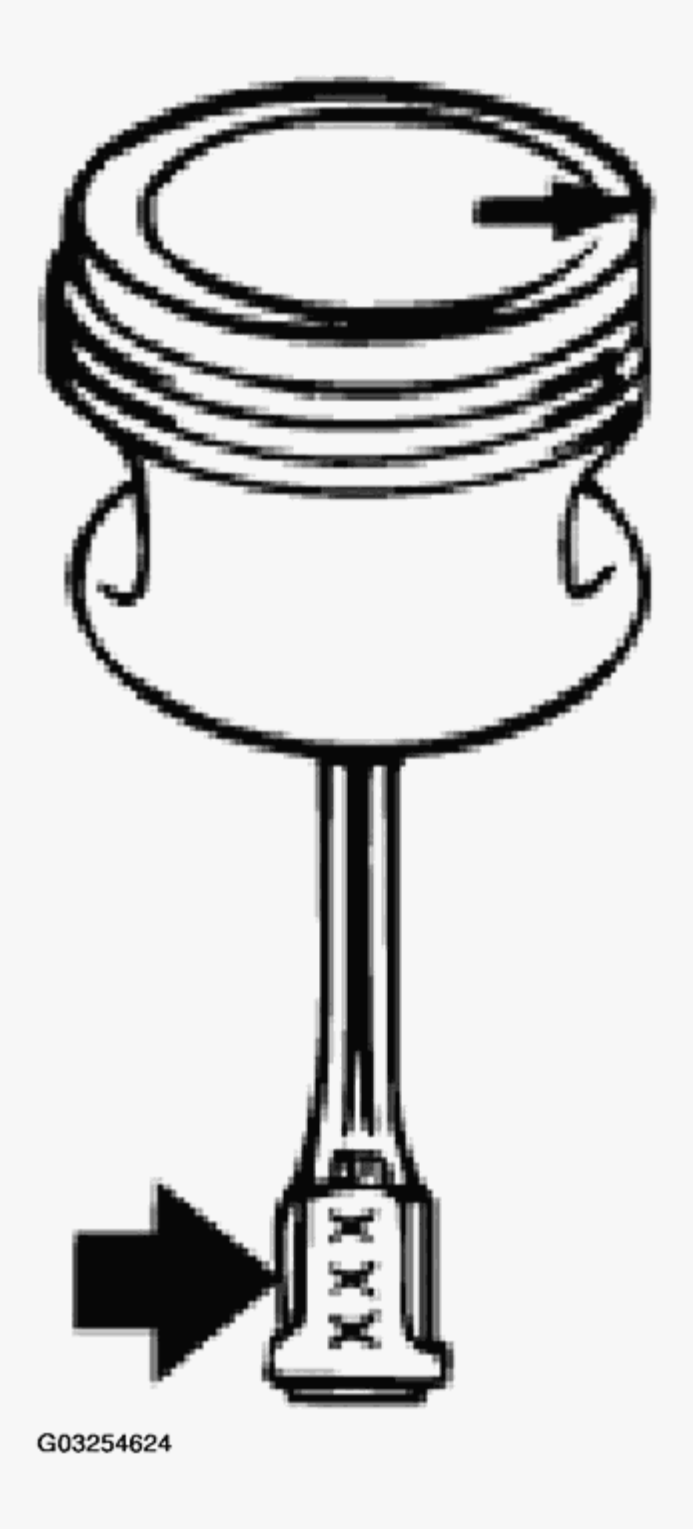
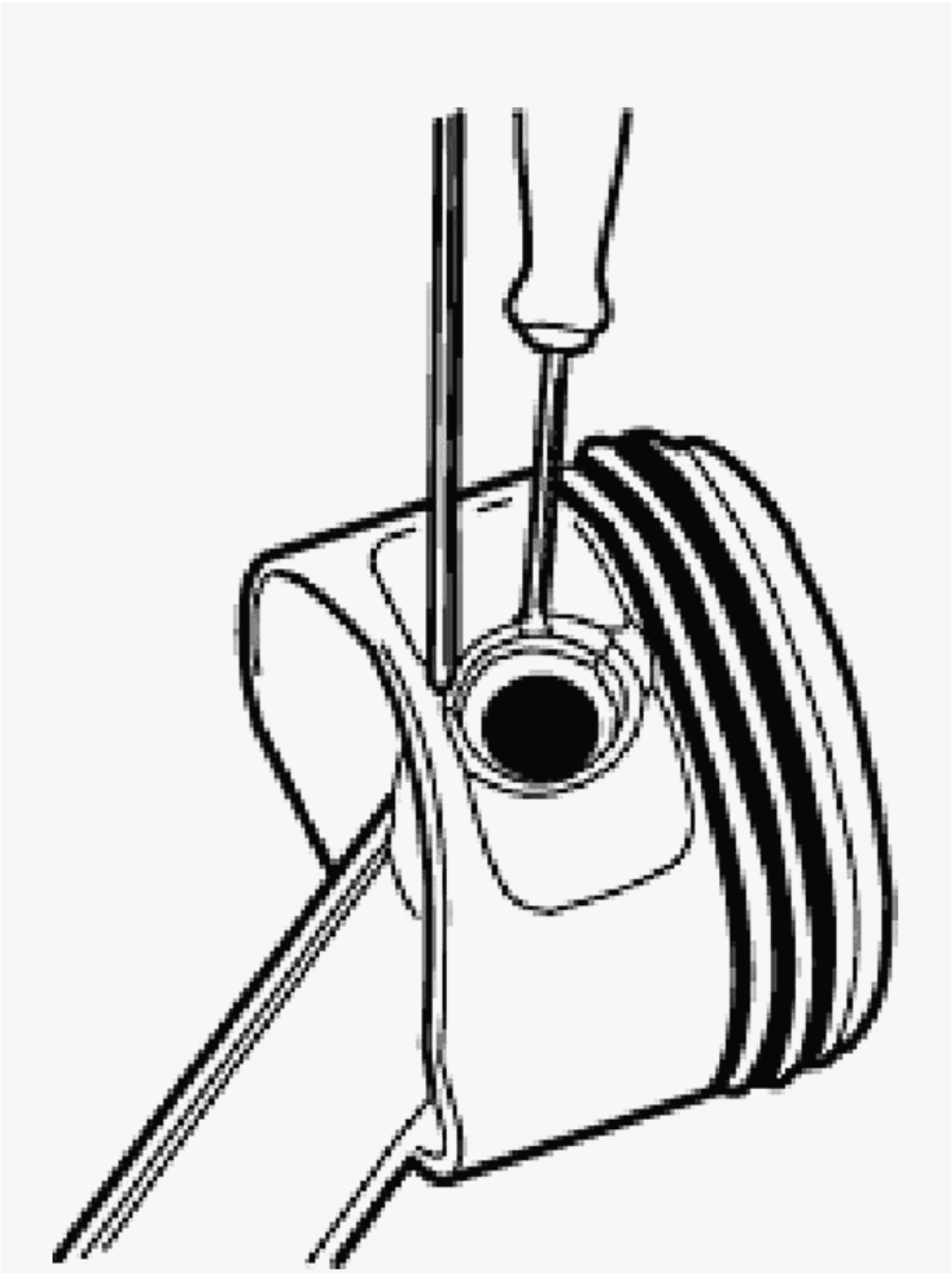


Fig. 193: Identifying Connecting Rod Numbers
Courtesy of BMW OF NORTH AMERICA, INC.

Install retaining ring.



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Fig. 194: Installing Piston Pin Retaining Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool 11 2 470 in conrod.

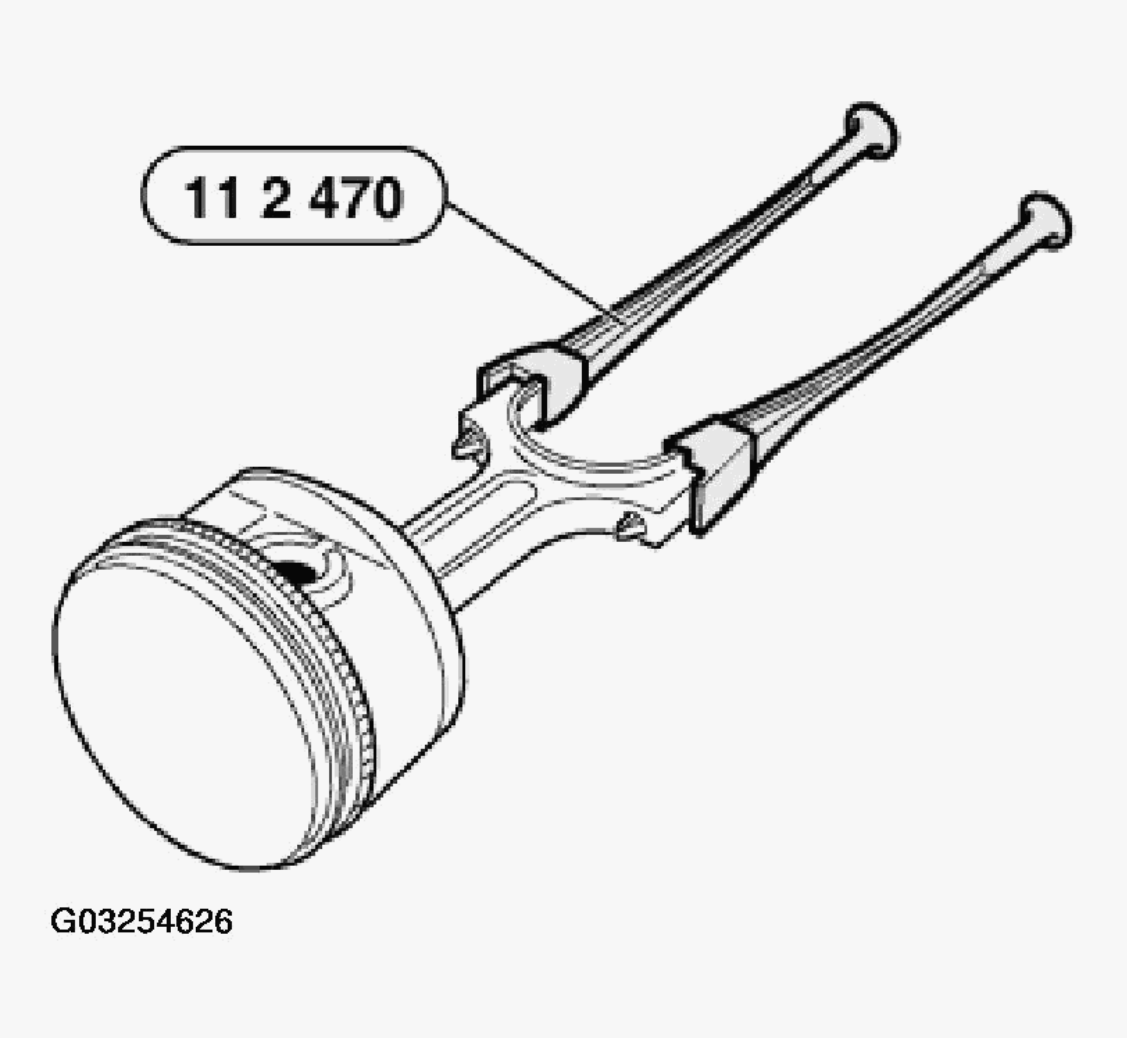


Fig. 195: Installing Special Tool To Conrod
Courtesy of BMW OF NORTH AMERICA, INC.

M62 B46 only:

Lightly coat pistons and piston rings with oil.

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

Compress piston rings with special tool 11 9 500.

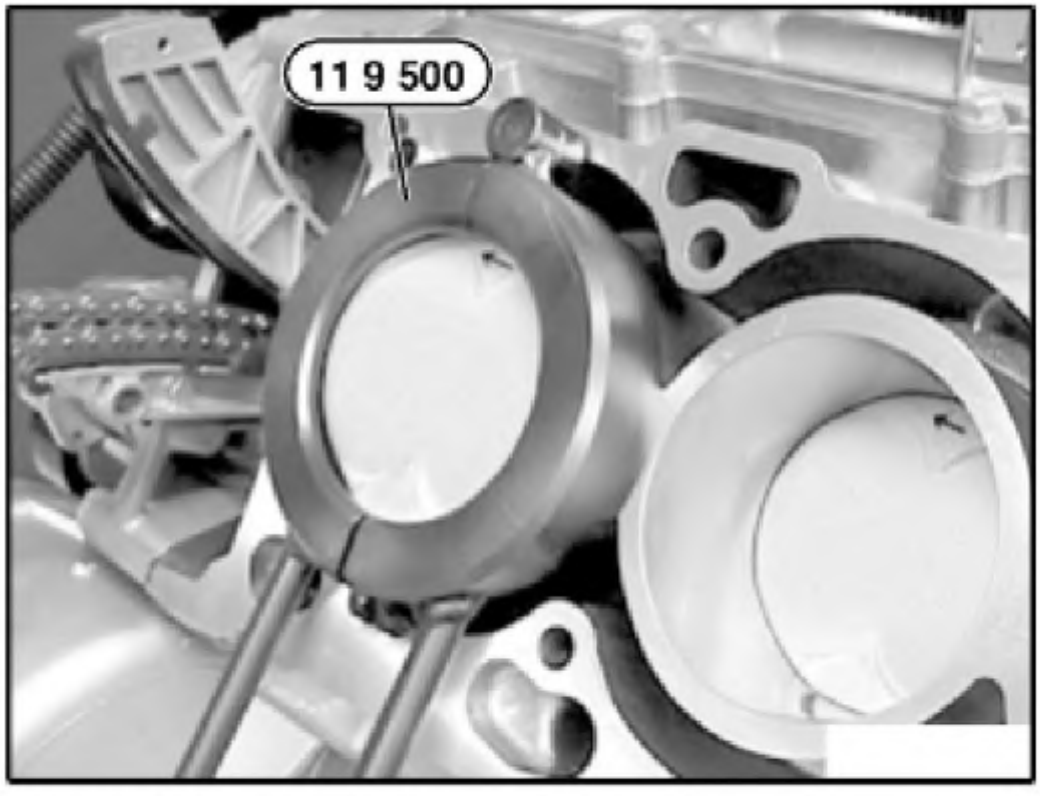


Fig. 196: Compressing Piston Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Keep piston rings compressed with special tool 11 9 500.

Install piston so that arrow points to camshaft drive.

IMPORTANT: Danger of piston ring failure.
Press in piston only with finger force (do not knock in!).

Attach crankpin to connecting rod.

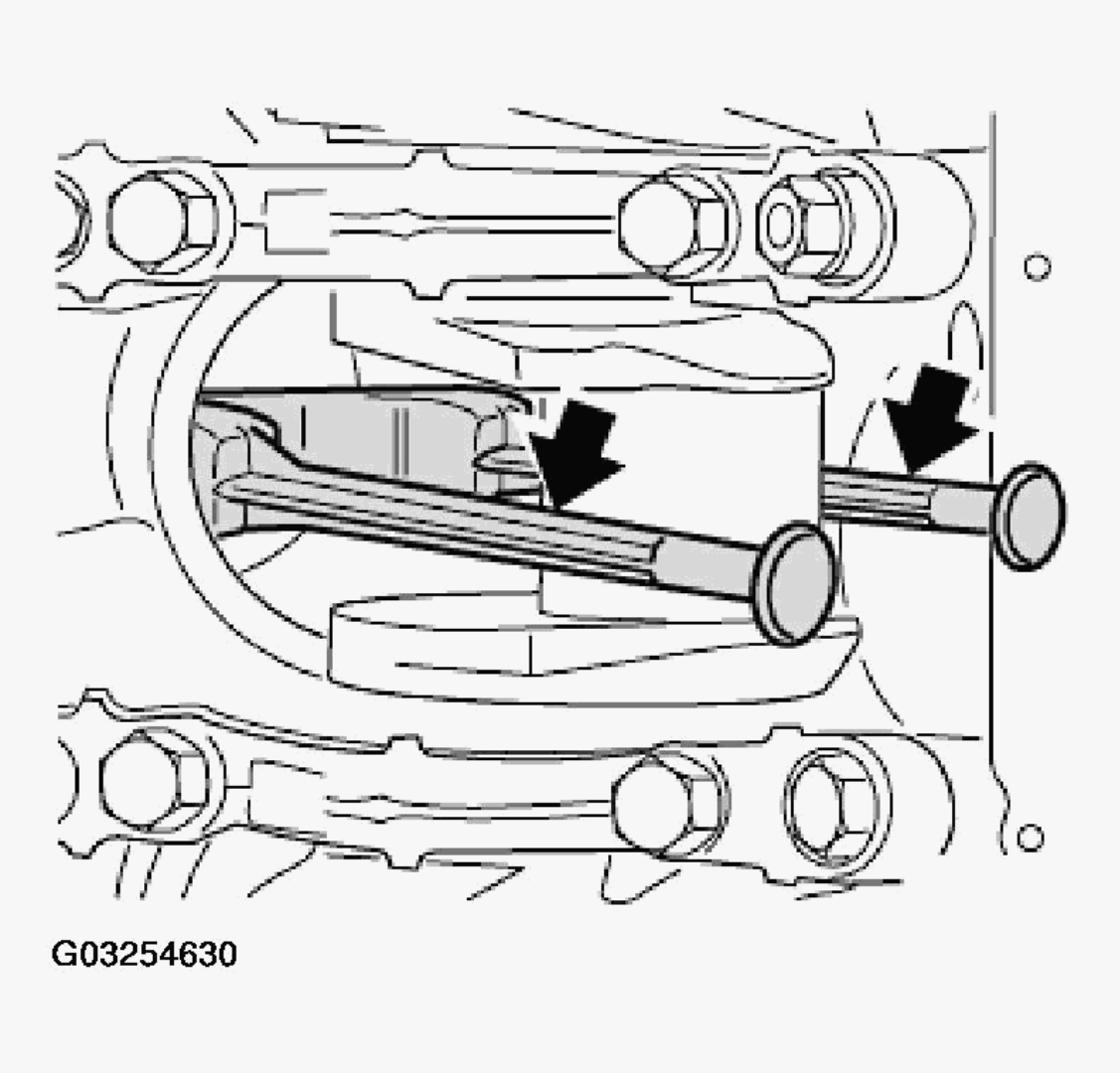


Fig. 197: Attaching Crankpin To Connecting Rod
Courtesy of BMW OF NORTH AMERICA, INC.

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

Fit bearing caps so that pair numbers match up.

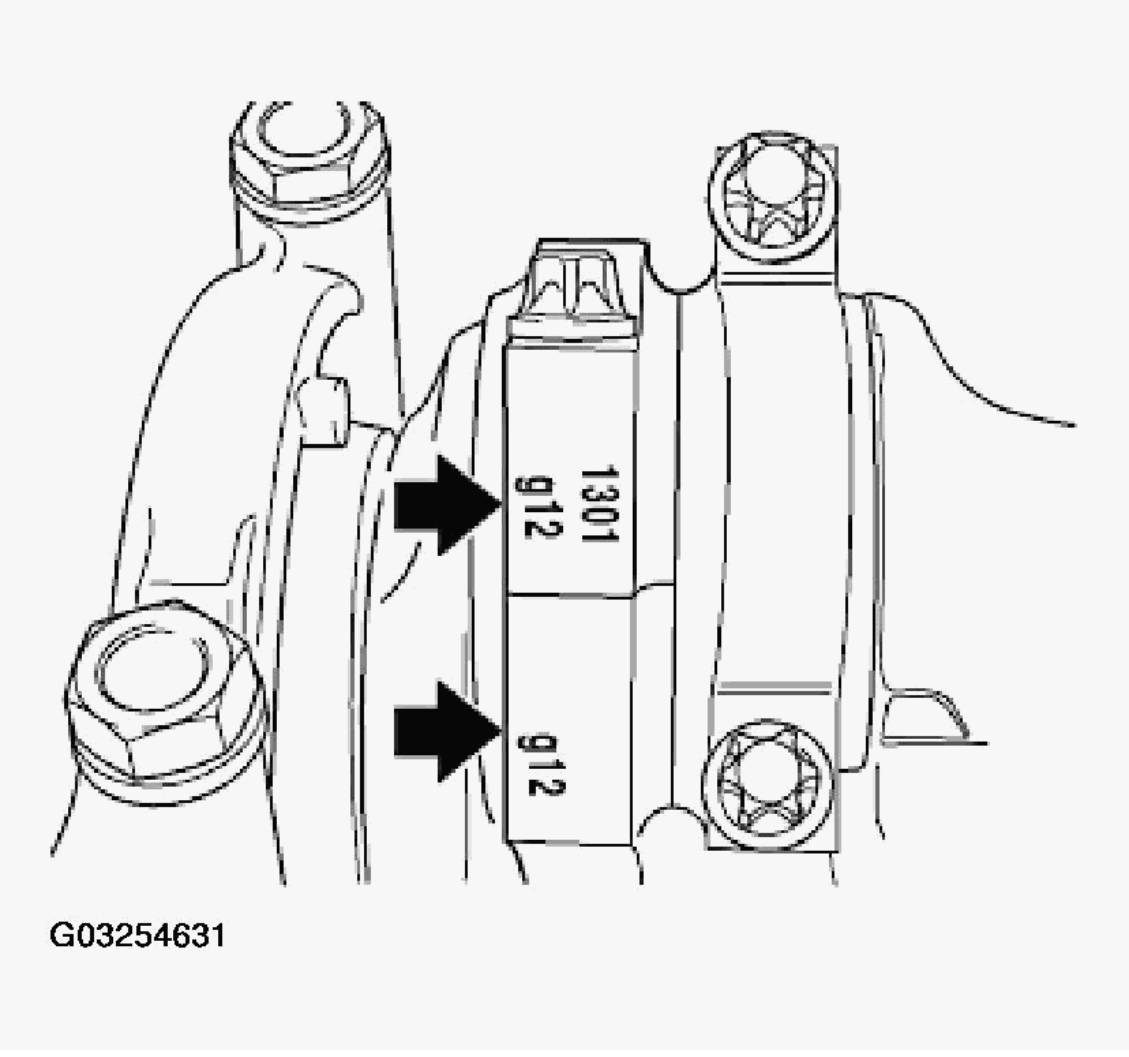


Fig. 198: Identifying Connecting Rod Pair Numbers
Courtesy of BMW OF NORTH AMERICA, INC.

Install new conrod bolts.

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

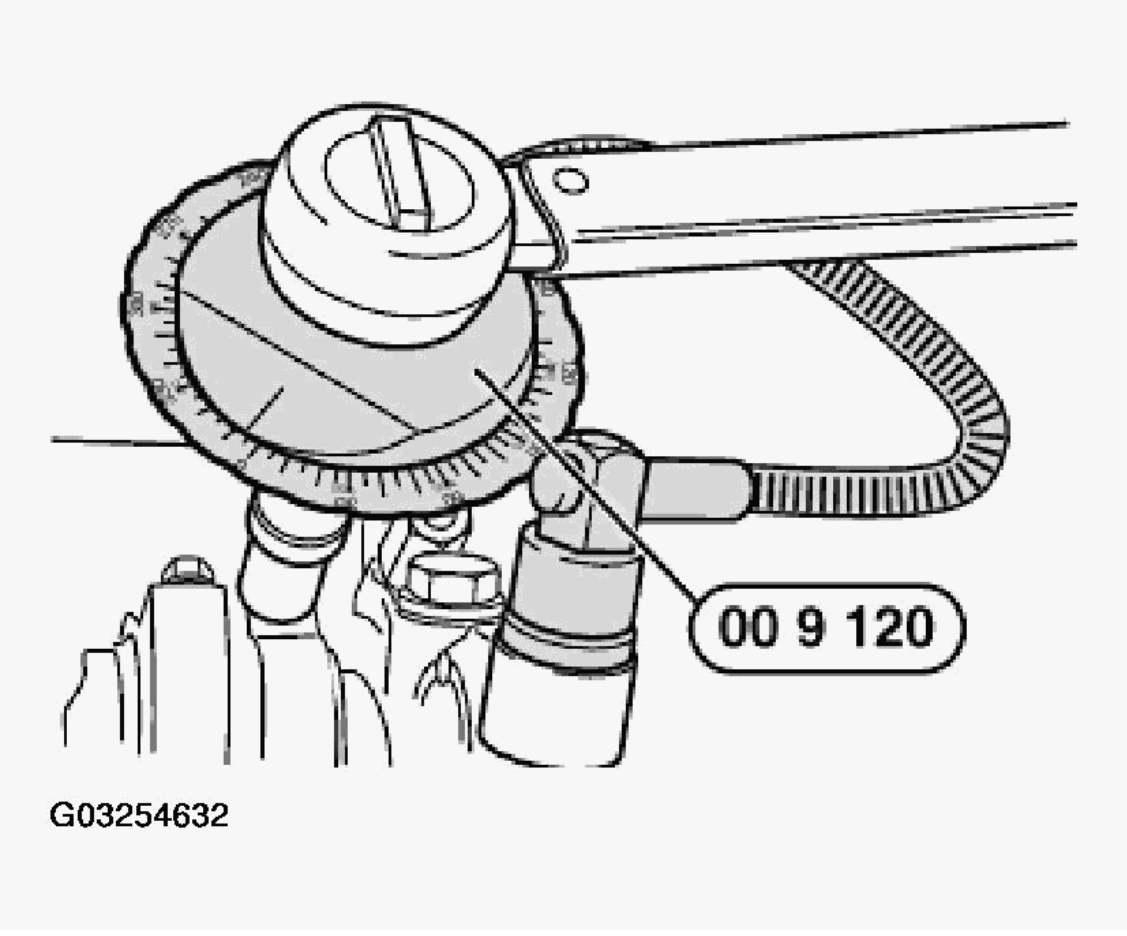


Fig. 199: Tightening Conrod Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening Torque,

refer to 11 24 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Install spray nozzle and tighten down screw.

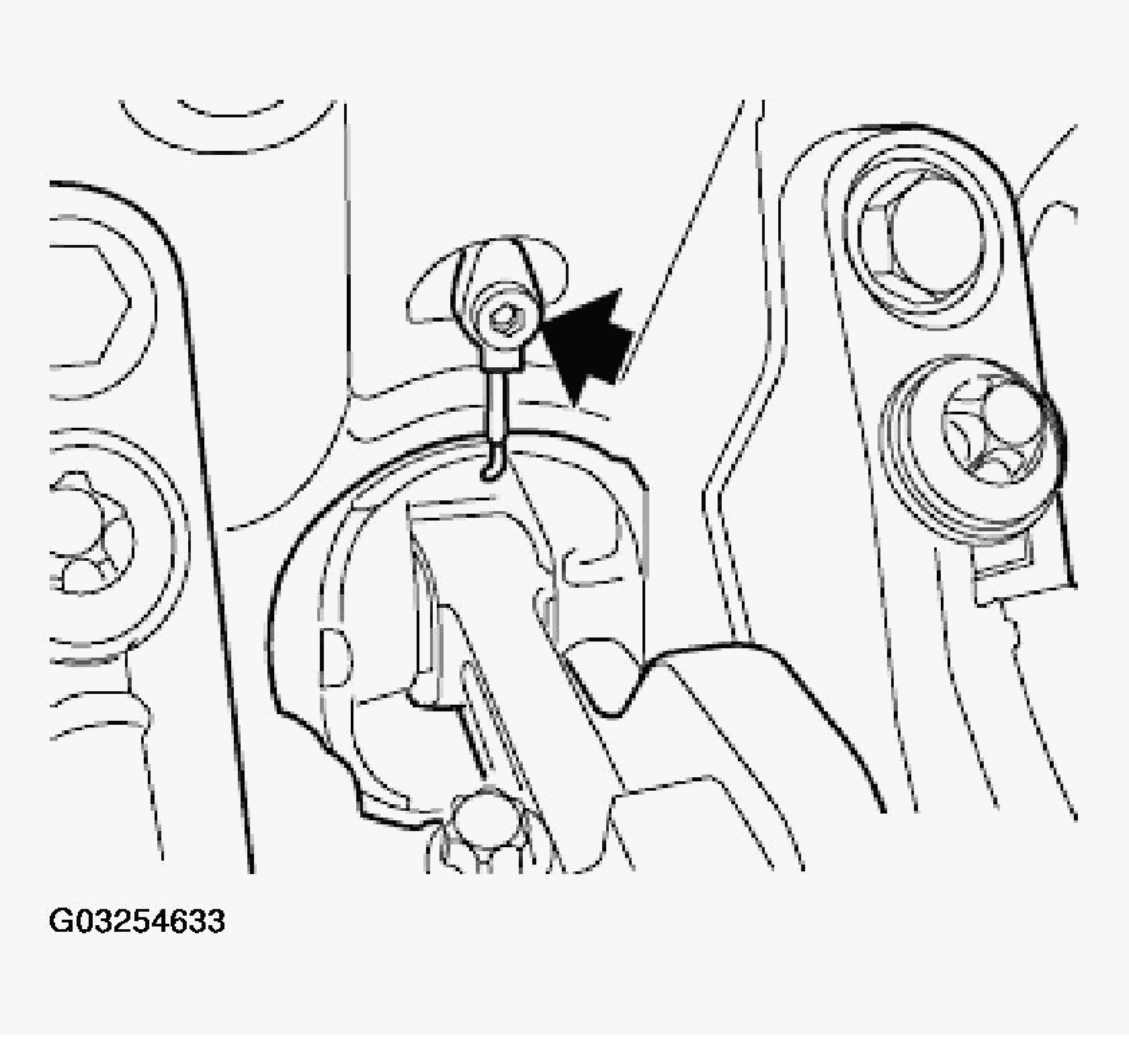


Fig. 200: Installing Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

11 25 671 REPLACING PISTON RINGS ON ALL PISTONS (M62)

Removal

Piston removed. See **11 25 530 REMOVING AND INSTALLING/REPLACING ALL PISTONS (M62)** .

Remove piston rings with a piston-ring compressing pliers.

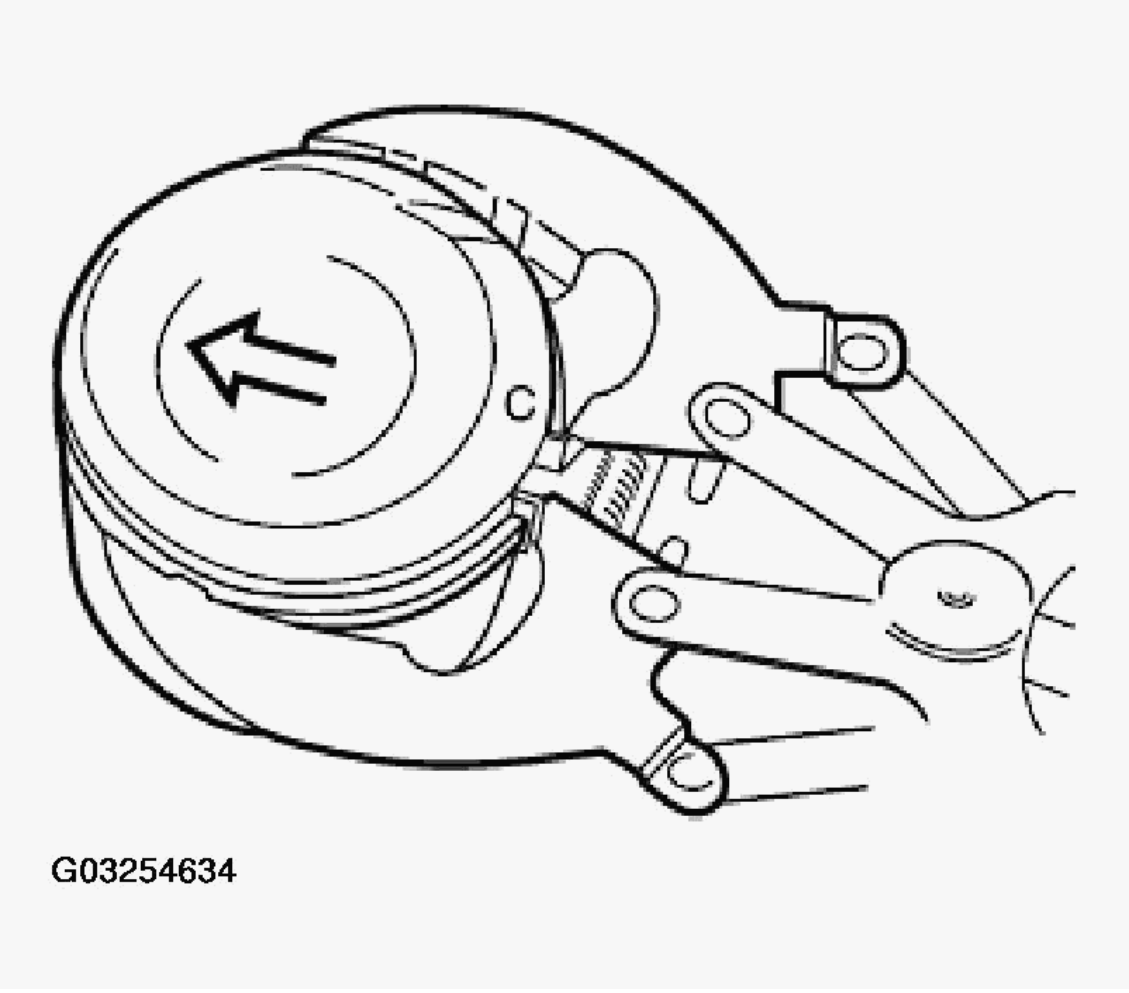


Fig. 201: Removing Piston Rings
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: It might not be possible to find the identification on used piston rings.

Put aside piston rings in correct sequence and installation position.

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

Installation

Insert piston rings with the word "TOP" facing piston crown.

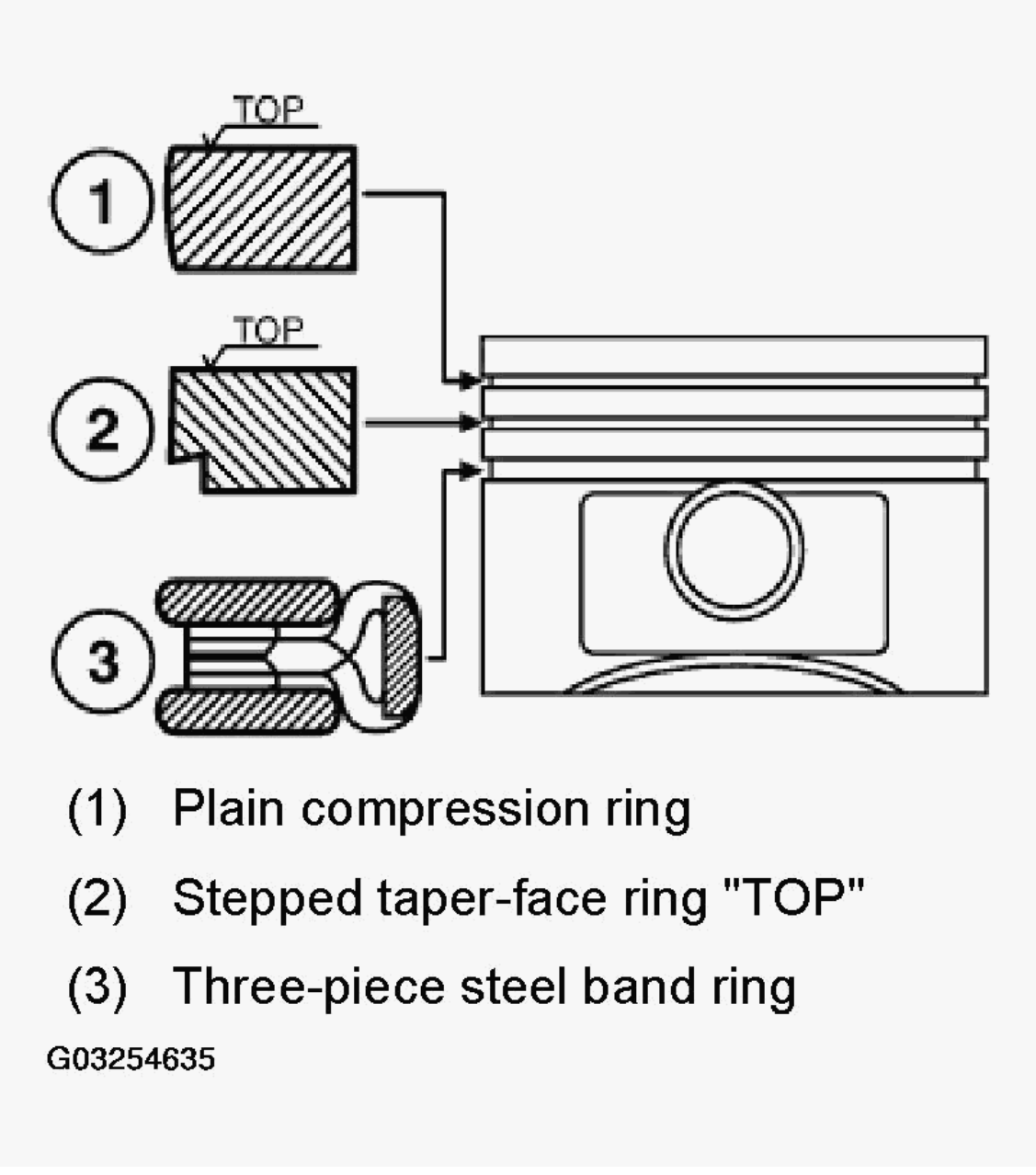


Fig. 202: Identifying Piston Ring Installed Positions
Courtesy of BMW OF NORTH AMERICA, INC.

Arrange piston ring contact points with offset of approx. 120° to one another, but not over piston pin eye.

End float,

refer to **PISTONS WITH RINGS AND PINS** in Technical Data.

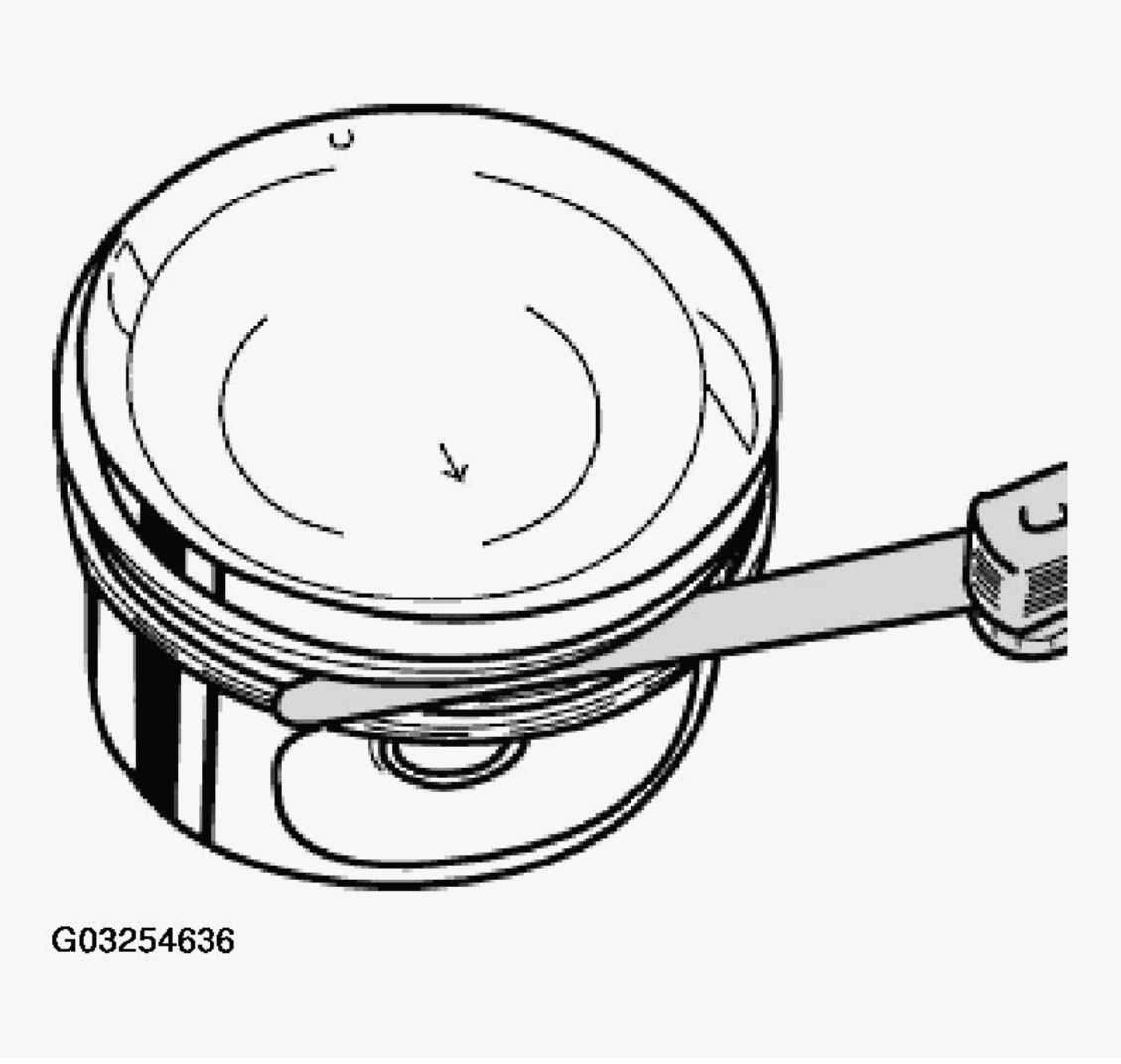


Fig. 203: Measuring Ring End Float
Courtesy of BMW OF NORTH AMERICA, INC.

Gap in cylinder,

refer to **PISTONS WITH RINGS AND PINS** in Technical Data.

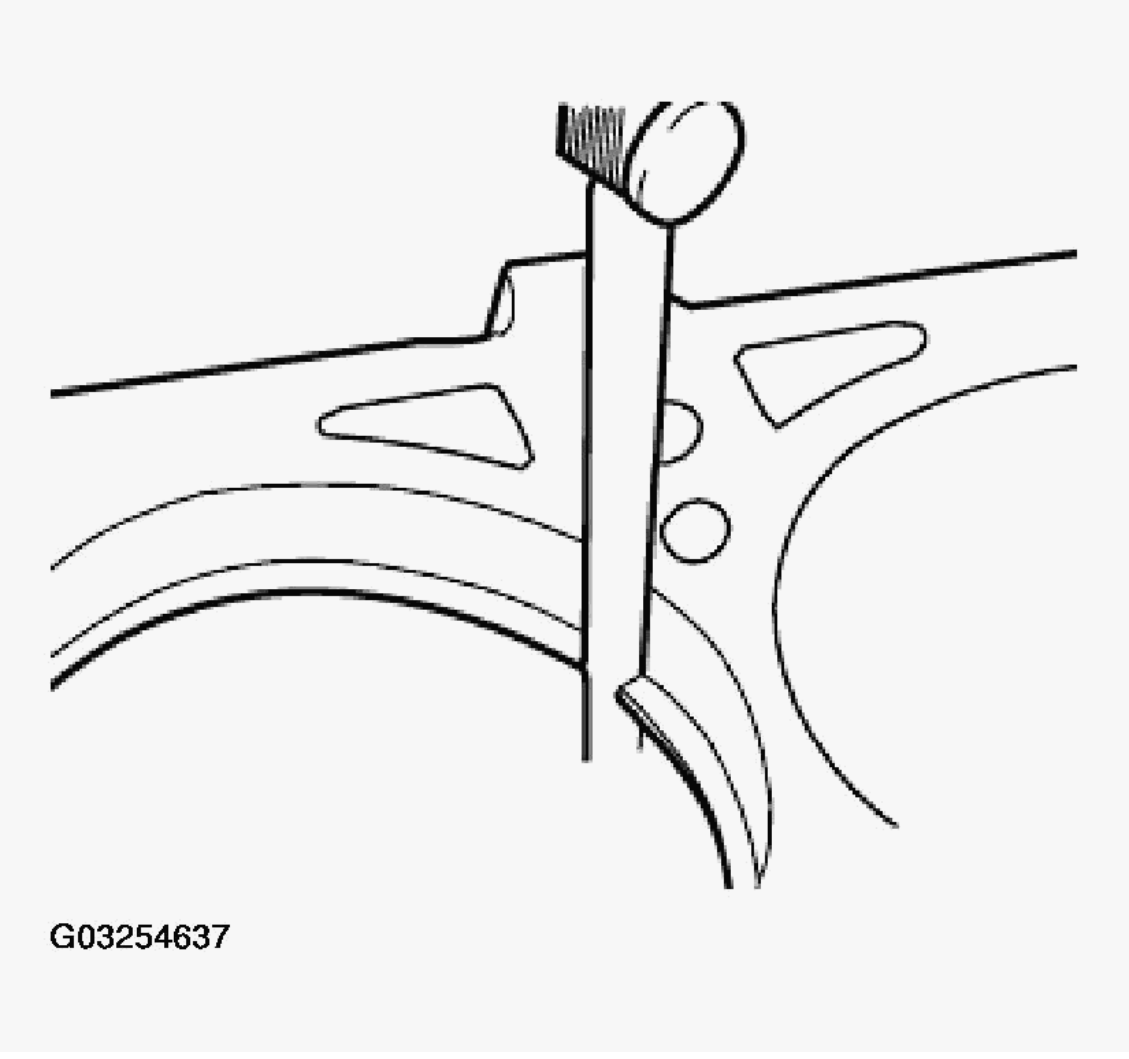


Fig. 204: Measuring Ring End Gap In Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

V-RIBBED BELT WITH TENSIONER

11 28 010 REPLACING ALTERNATOR DRIVE BELT (M62)

NOTE: If the drive belt is to be subsequently reused:

Mark direction of travel and reinstall drive belt in same direction of travel.

Remove fan clutch with impeller,

refer to **11 52 020 REMOVING AND INSTALLING OR REPLACING FAN COUPLING (M62)** .

Layout of drive belt.

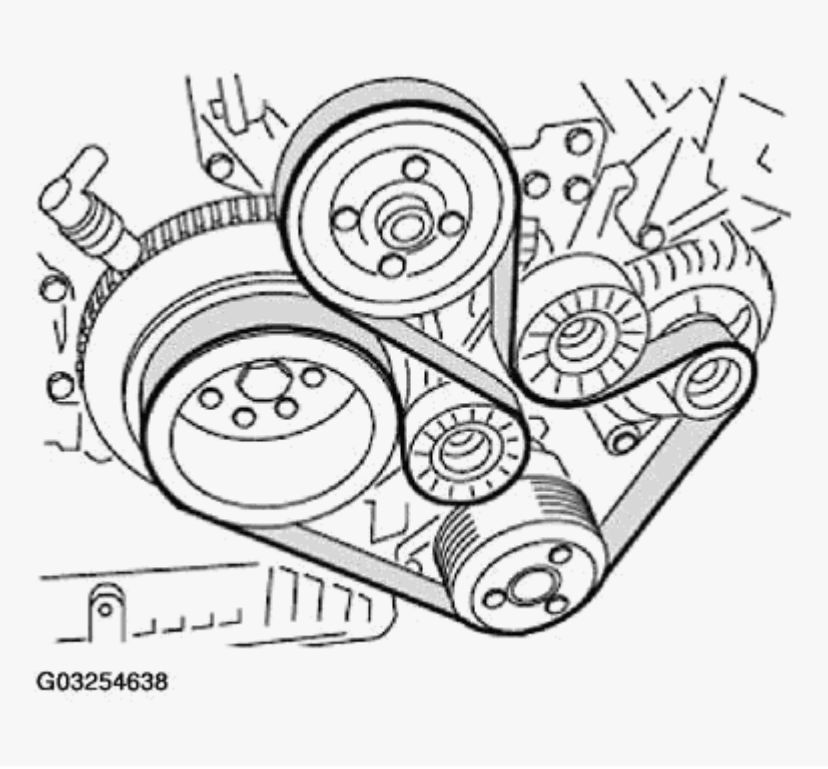


Fig. 205: Layout Of Drive Belts
Courtesy of BMW OF NORTH AMERICA, INC.

Slacken screws (1) and relieve tension on belt drive.

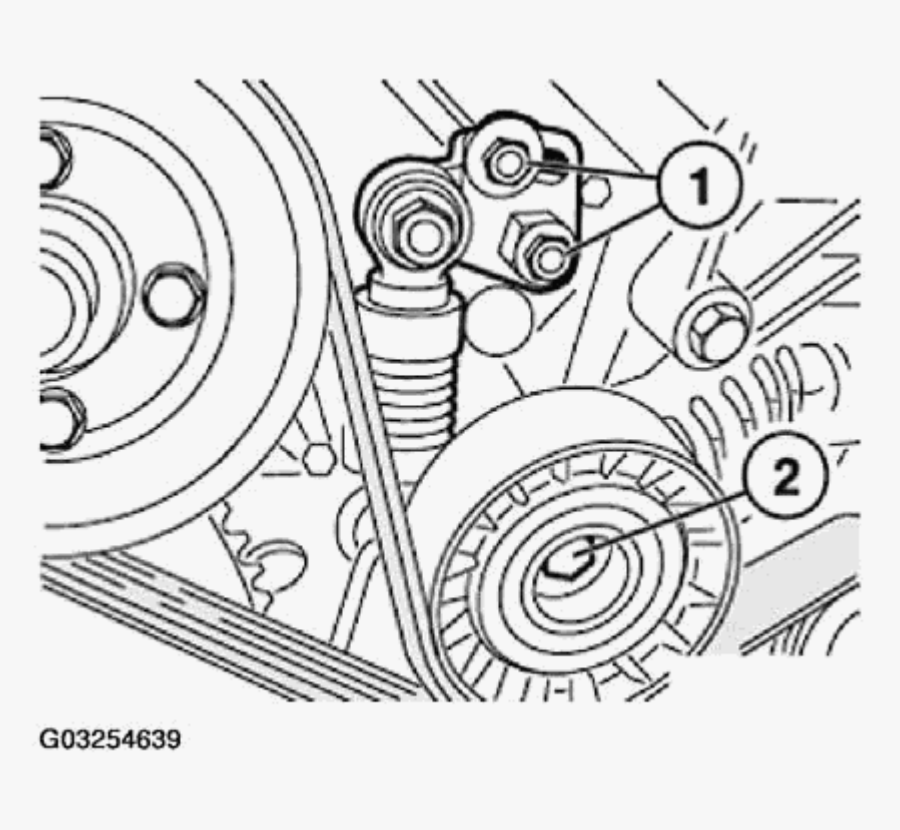


Fig. 206: Identifying Complete Belt Tensioner Removing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Release screws (1 and 2) to remove complete belt tensioner.

Remove drive belt.

CAUTION: You must replace the drive belt if it is contaminated with hydraulic fluid.

Installation:

Check drive belt for coolant and oil residue and replace if necessary.

Installation:

Mount drive belt and check that it is correctly positioned on belt pulleys.

Pretension adjustable plate at hexagon head (1) up to end of elongated hole (2) and tighten down screws (3).

CAUTION: Screws (3) up to 9/98

M8 strength class 8.8 tightening torque 22 Nm.

Screws (3) from 9/98 with liquid-cooled alternator

M8 strength class 10.9 tightening torque 30 Nm.

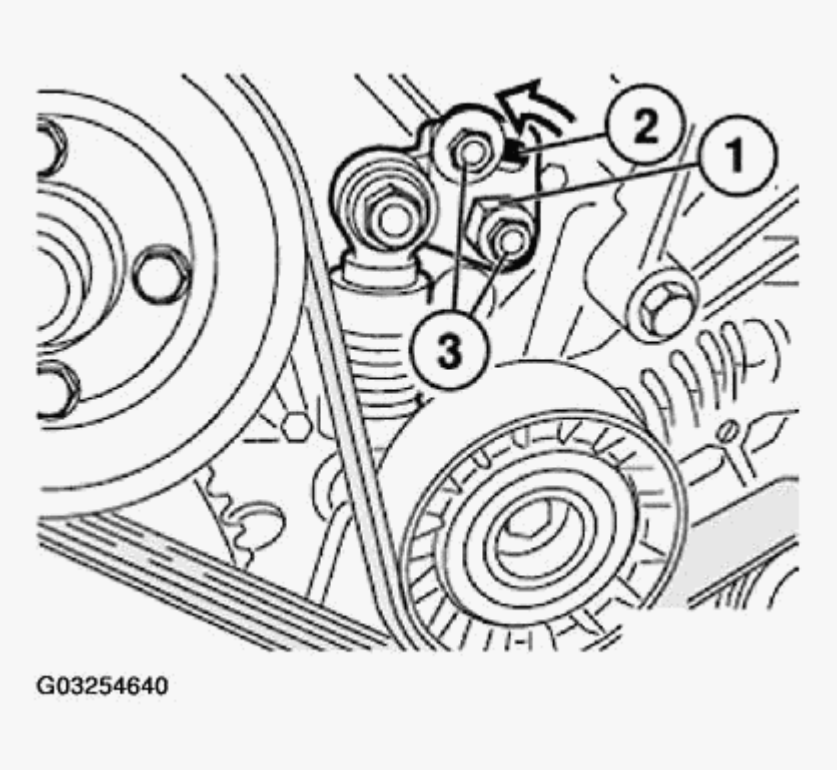


Fig. 207: Installing Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

11 28 050 REPLACING DRIVE BELT FOR A/C COMPRESSOR (M60/M62/M73)

NOTE: If the drive belt is to be reused, mark direction of travel and reinstall drive belt in same direction of rotation.

If necessary, remove splash guard.

Remove alternator drive belt,

refer to **11 28 010 REPLACING ALTERNATOR DRIVE BELT (M62)** .

Loosen nuts (2 and 3) and remove compressor drive belt.

Installation:

Check drive belt for coolant and oil residue and replace if necessary.

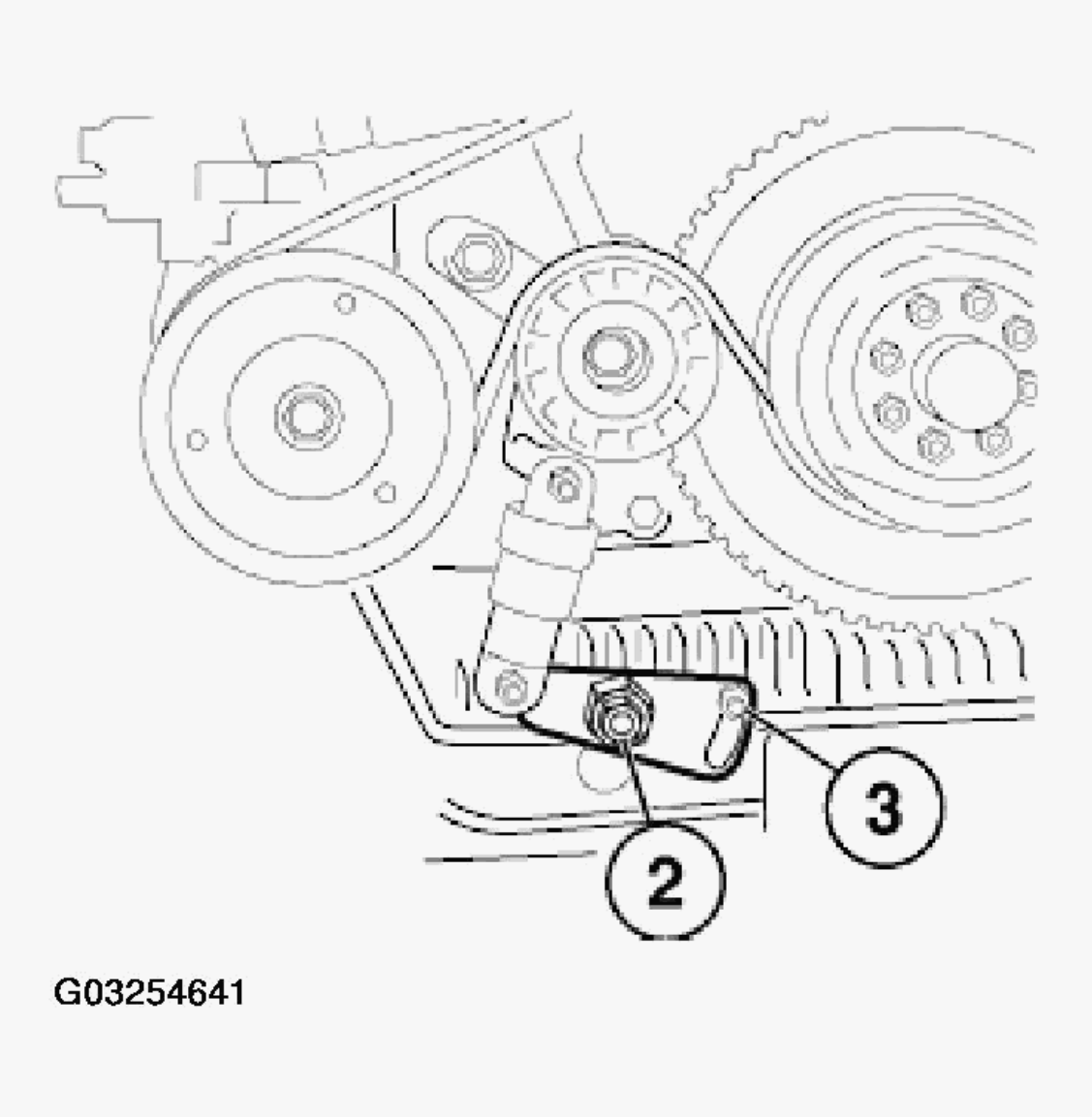


Fig. 208: Removing A/C Compressor Drive Belt
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: It is essential to replace drive belt if it comes into contact with hydraulic fluid.

Installation:

Fit drive belt and check it is correctly located on pulleys.

Tighten hex head (1) to remove adjustment plate up to end of long bore, then tighten nut (3) followed by nut (2).

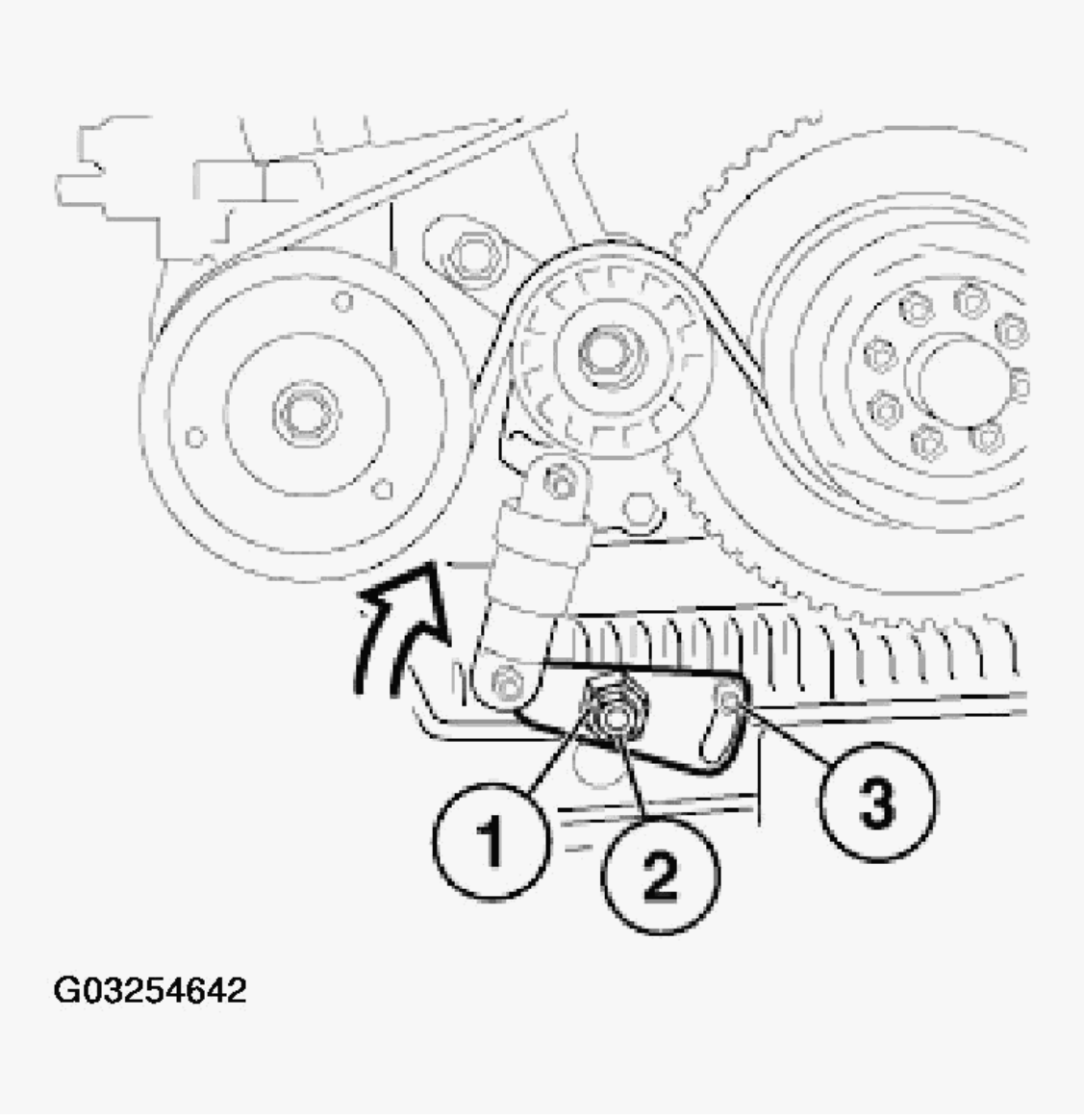


Fig. 209: Installing A/C Compressor Drive Belt
Courtesy of BMW OF NORTH AMERICA, INC.

CAMSHAFT

11 31 010 ADJUSTING CAMSHAFT TIMING (M62 VANOS FROM 9/98)

Special tools required:

NOTE: For Special Tool identification, see ENGINE - SPECIAL TOOLS - X5 (4.4L & 4.6L) .

- 00 9 250
- 11 2 300

- 11 2 441
- 11 2 442
- 11 2 443
- 11 2 444
- 11 2 445
- 11 2 446
- 11 4 230
- 11 4 231
- 11 4 232
- 11 5 180
- 11 6 440
- 11 6 450
- 11 6 451
- 11 6 452
- 11 7 380

Adjusting

Remove intake filter housing with air-mass flow sensor.

Remove fan impeller with fan clutch and fan cowl.

Remove both cylinder head covers.

Remove spark plugs.

CAUTION: In firing TDC position, the inlet camshaft 1 to 4 rotates in the teeth of the camshaft adjustment unit. This twisting is caused by the position of the cams and is not an indication for incorrect timing.

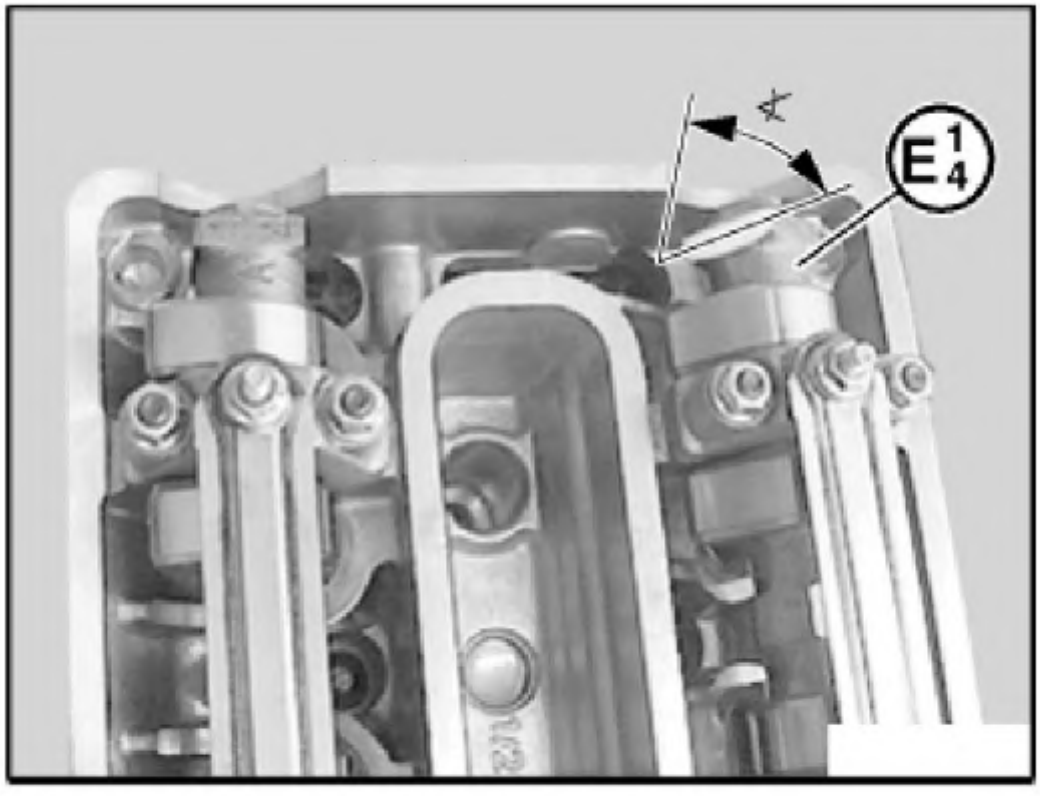


Fig. 210: Identifying Inlet Camshaft Rotation
Courtesy of BMW OF NORTH AMERICA, INC.

Remove oil lines on left and right of cylinder head.

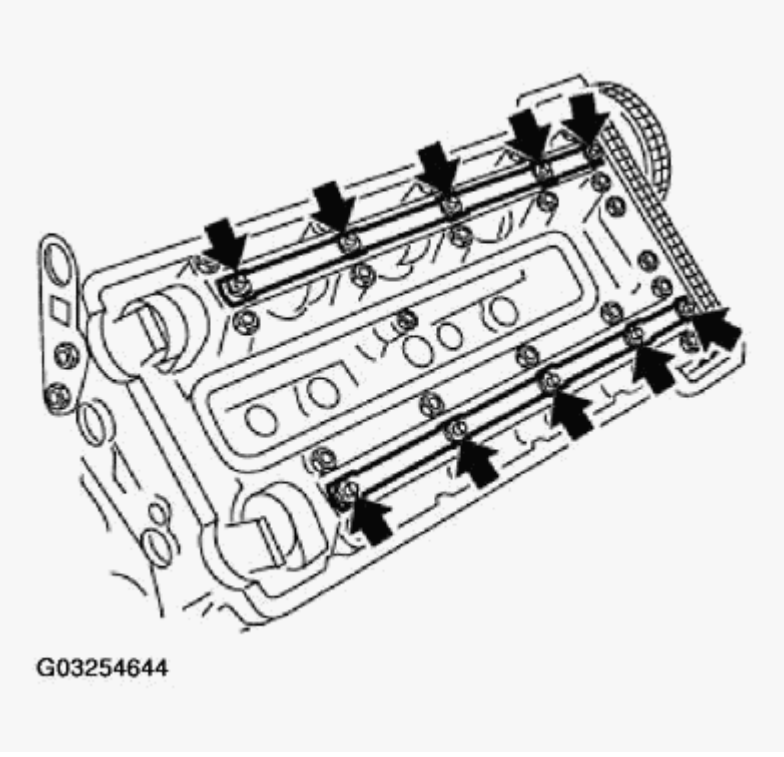


Fig. 211: Identifying Oil Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Turn engine in direction of rotation as far as TDC firing position of first cylinder.

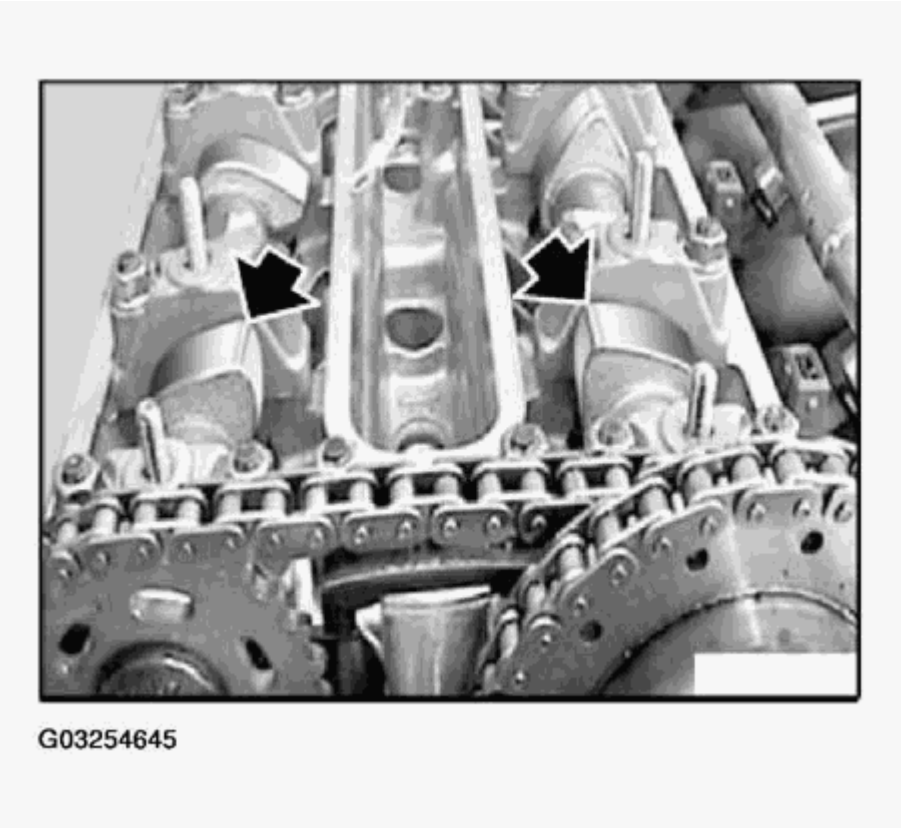


Fig. 212: Rotating Camshaft To TDC (Overlap)
Courtesy of BMW OF NORTH AMERICA, INC.

E53 (X5)

Secure crankshaft with special tool 11 5 180 in TDC firing position of first cylinder.

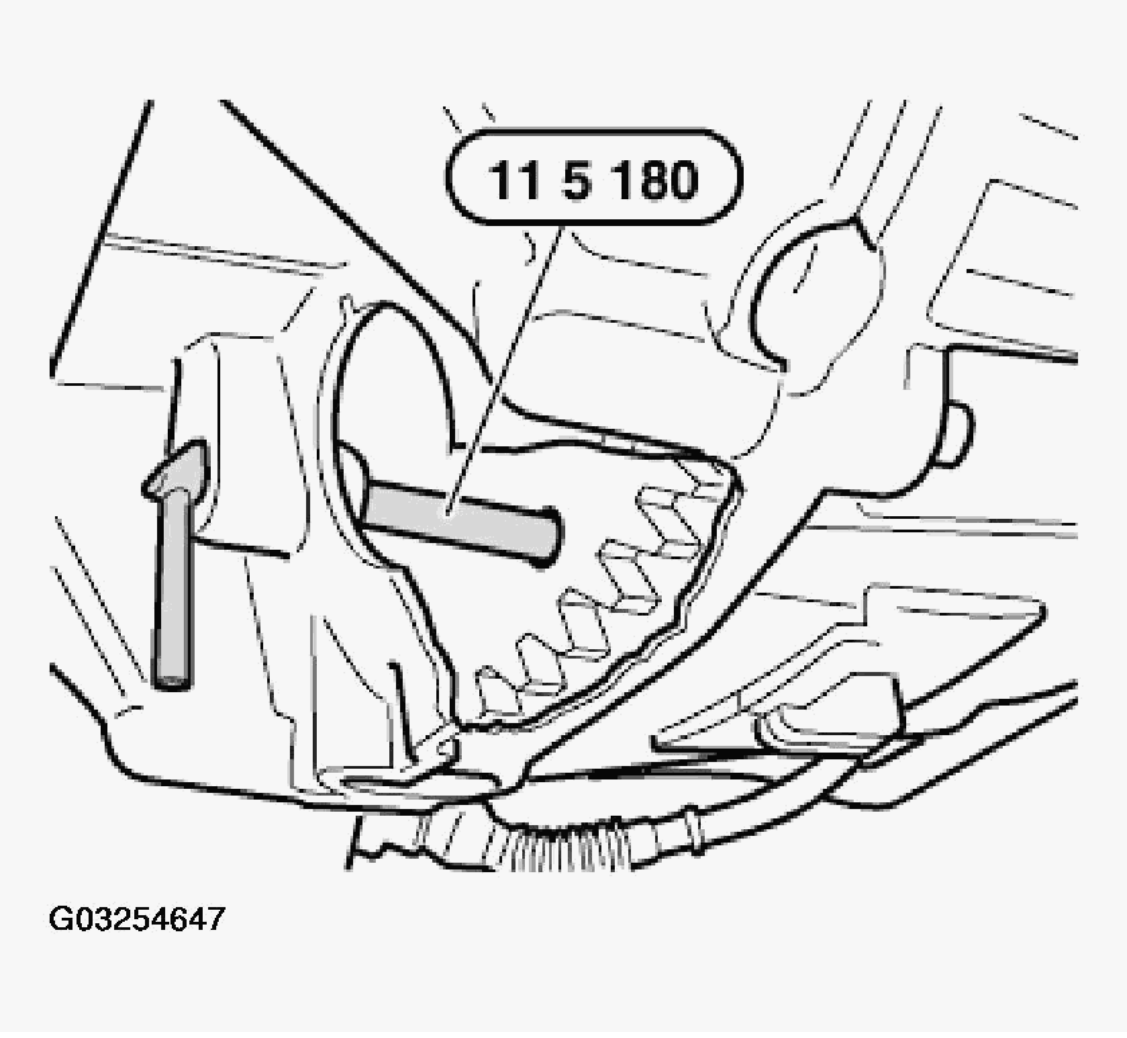


Fig. 213: Securing Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Remove special tool 11 5 180 before starting engine.

Remove chain tensioning piston. See **11 31 090 INSTALLING AND REMOVING/REPLACING PISTON FOR CHAIN TENSIONER (M62)** .

Remove both timing case covers at top. See **11 14 080 REMOVING AND INSTALLING TIMING CASE COVER, TOP LEFT (M62 VANOS FROM 9/98)** and **11 14 085 REMOVING AND INSTALLING TIMING CASE COVER, TOP RIGHT (M62 VANOS FROM 9/98)** .

CAUTION: Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 1 to 4.

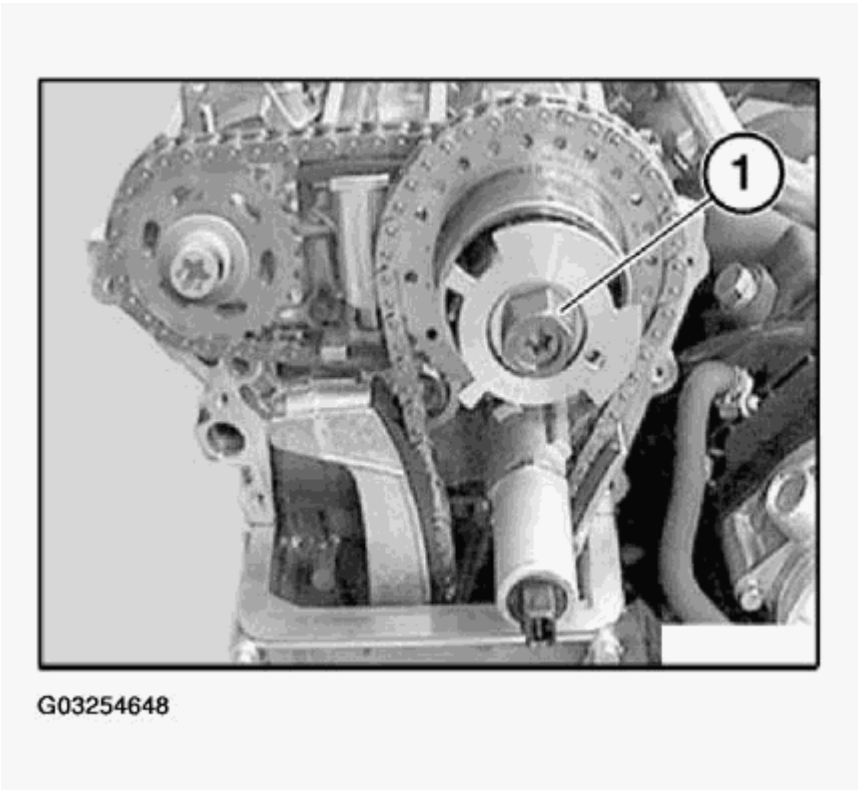


Fig. 214: Releasing Sensor Gear Nut (Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sensor gear (2) on cylinder bank 1 to 4.

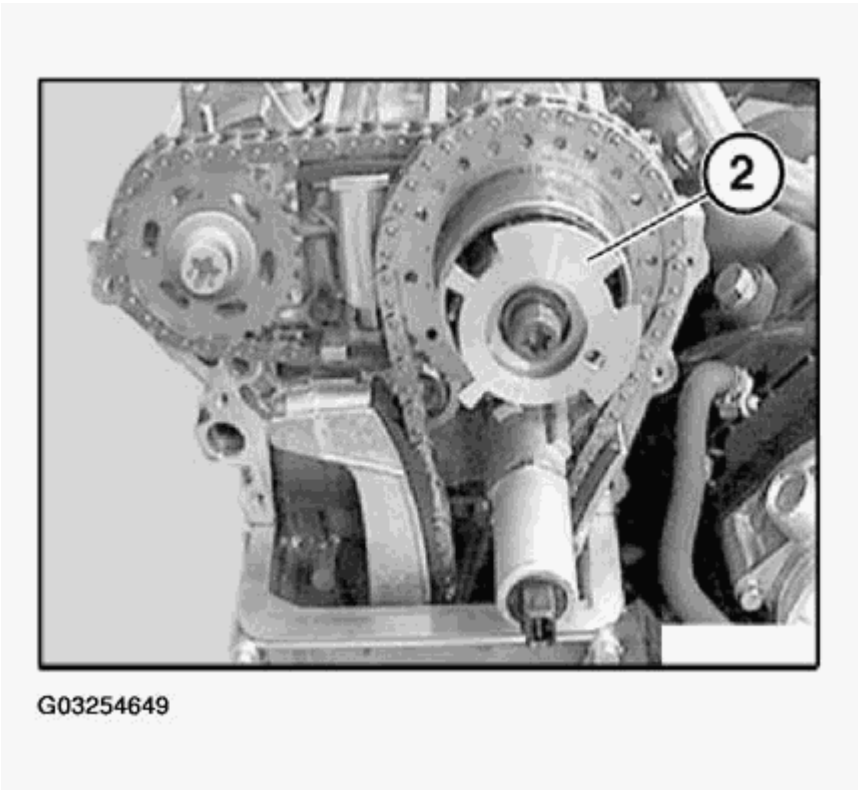


Fig. 215: Removing Sensor Gear (Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 5 to 8.

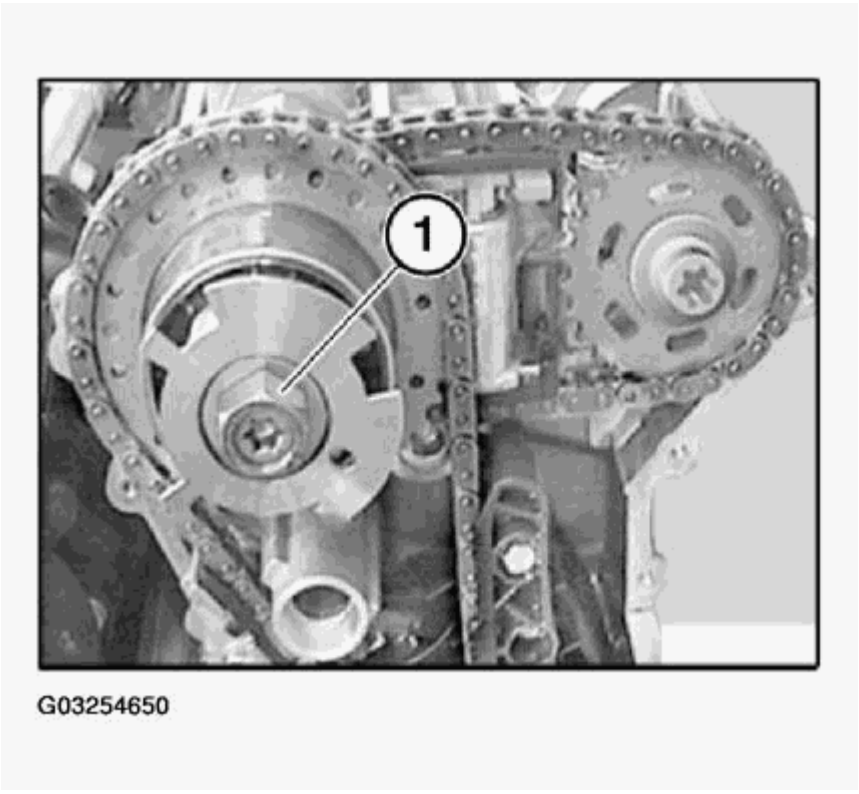


Fig. 216: Releasing Sensor Gear Nut (Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sensor gear (2) on cylinder bank 5 to 8.

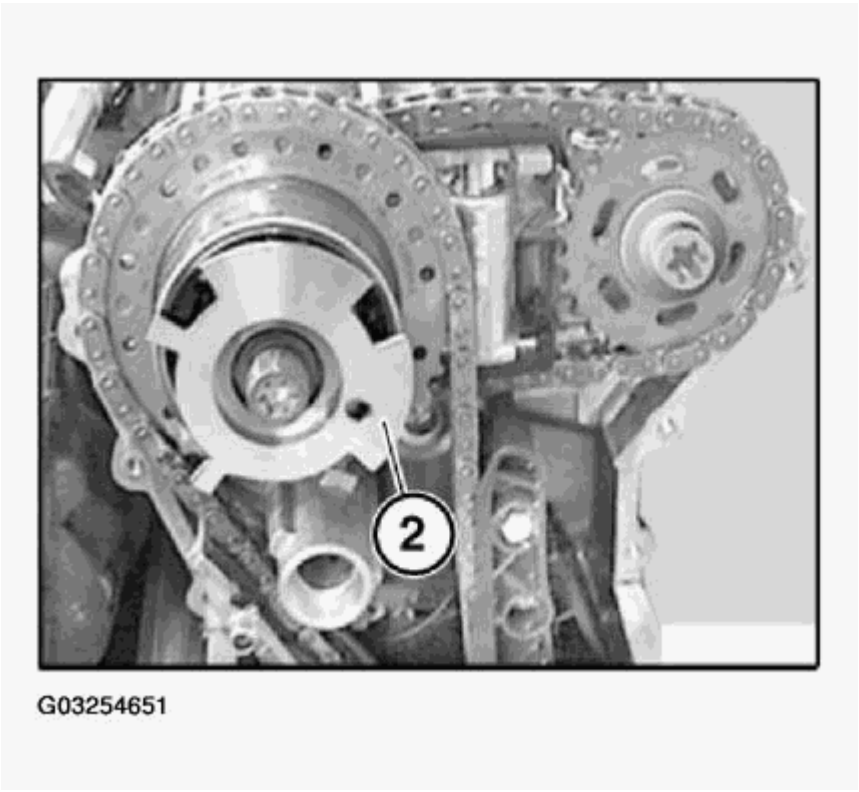


Fig. 217: Removing Sensor Gear (Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When releasing camshaft screw connection: grip camshaft at hexagon head.

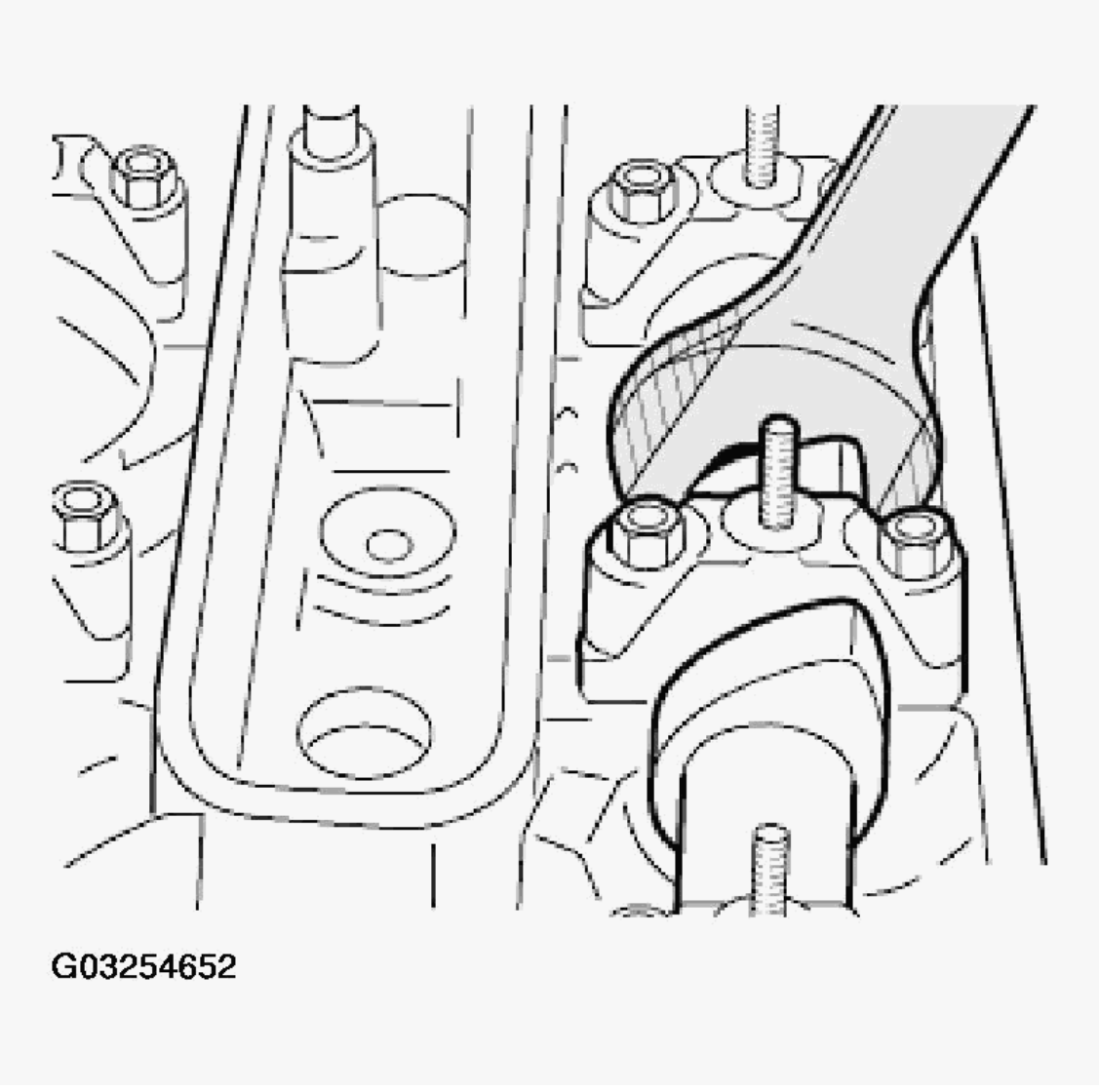


Fig. 218: Releasing Camshaft Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 by approx. a half turn.

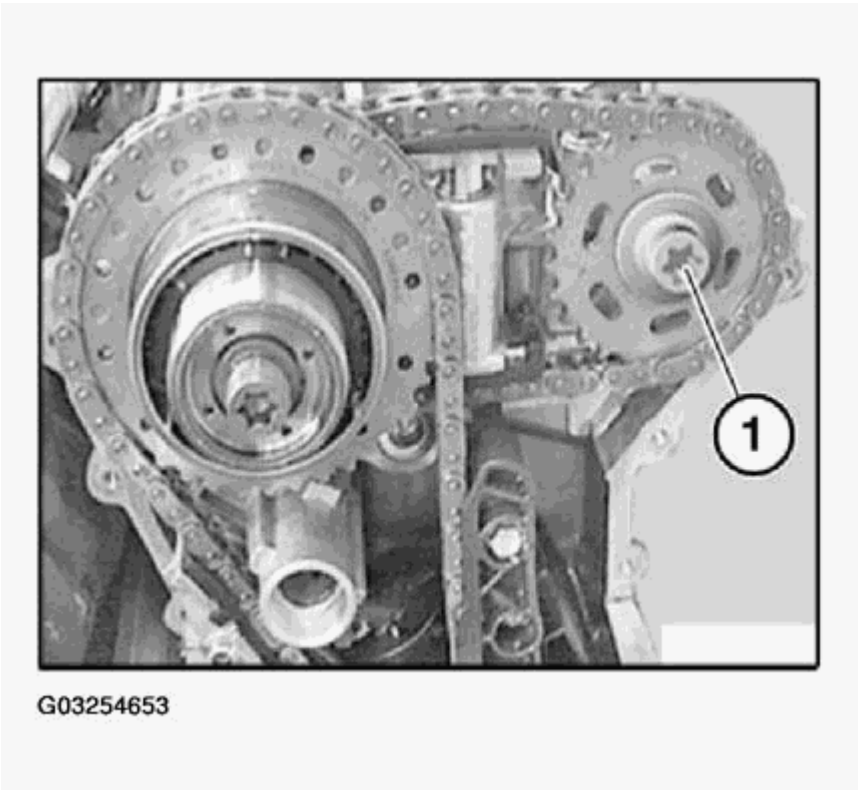


Fig. 219: Slackening Exhaust Camshaft Screw (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 by approx. a half turn.

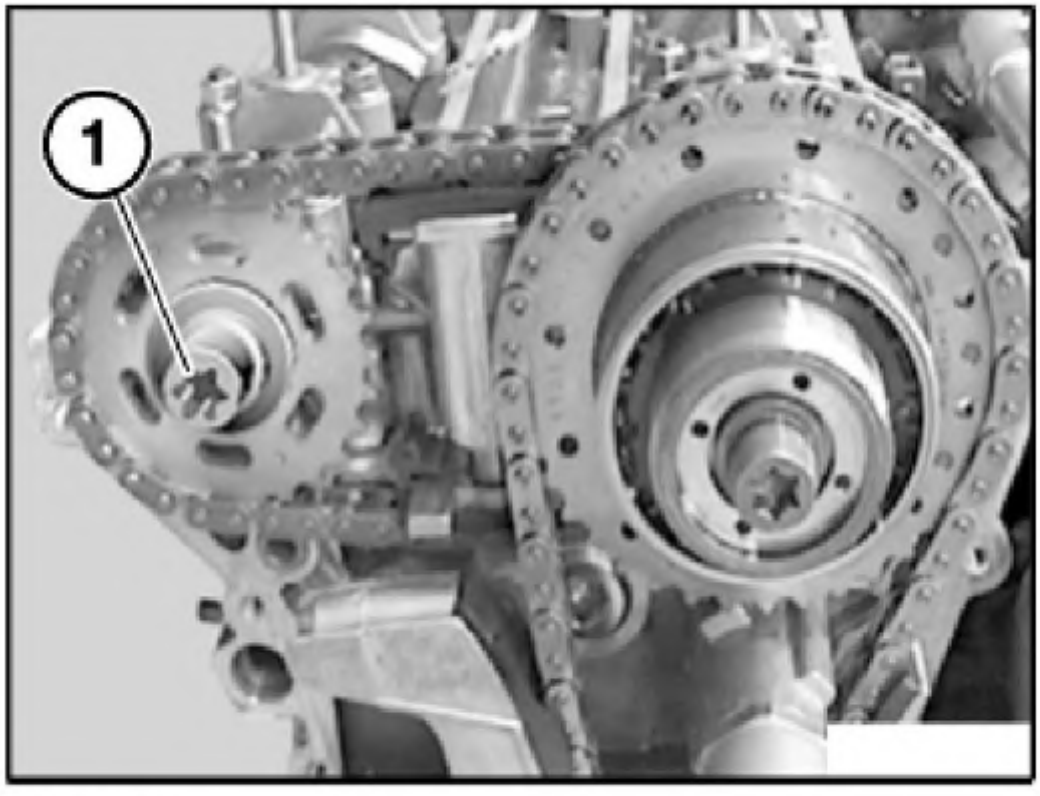


Fig. 220: Slackening Exhaust Camshaft Screw (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 5 to 8 by approx. a half turn.

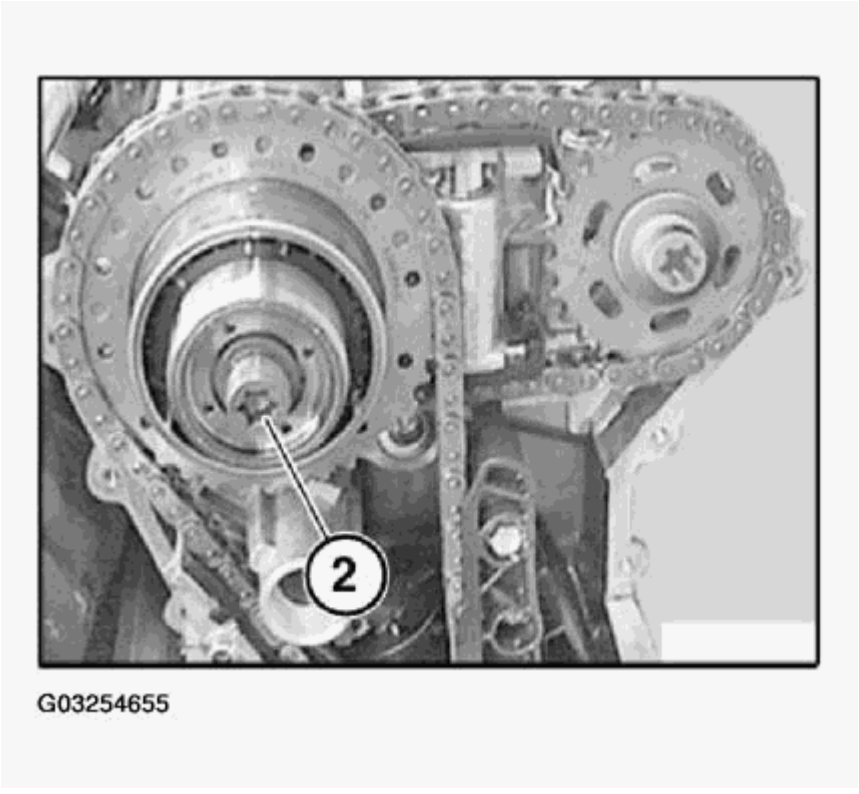


Fig. 221: Slackening Inlet Camshaft Screw (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 1 to 4 by approx. a half turn.

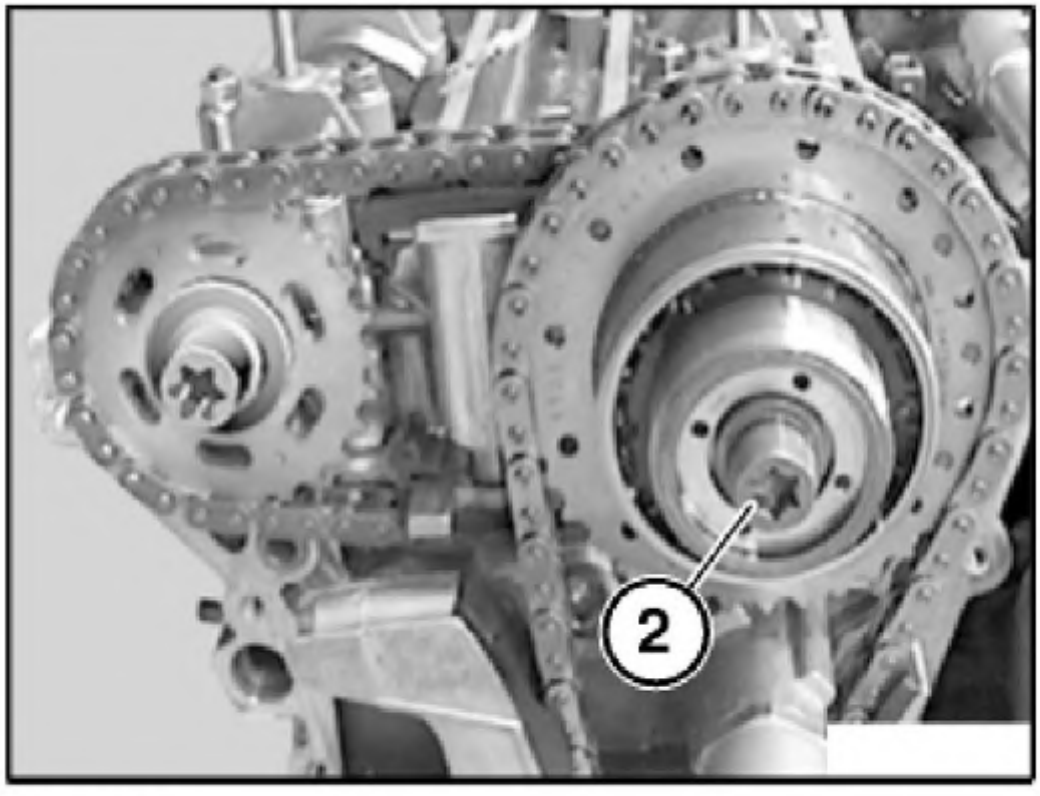


Fig. 222: Slackening Inlet Camshaft Screw (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Align camshafts.

Attach special tool 11 2 445/11 2 441 to camshafts, cylinder bank 1 to 4.

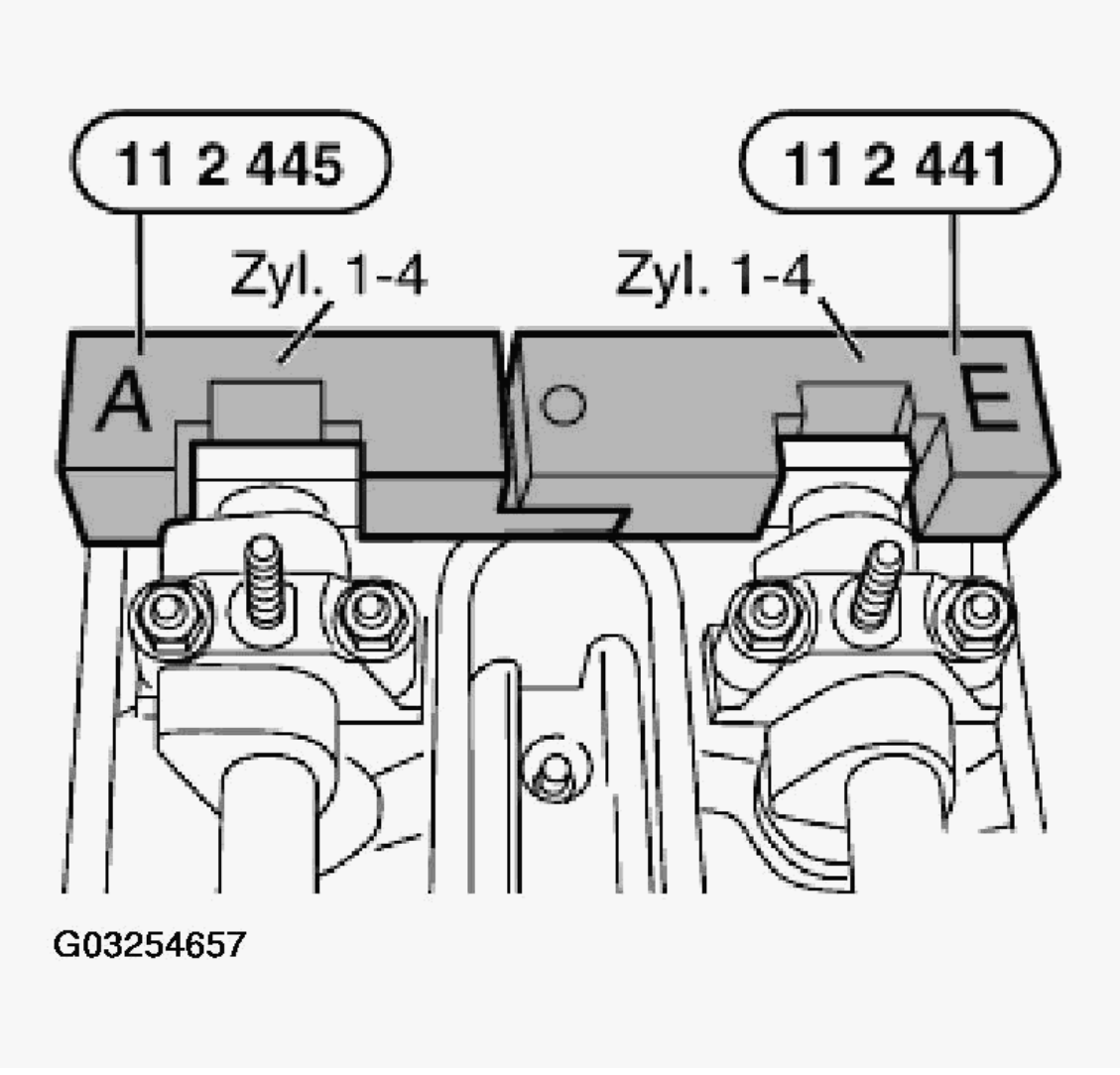


Fig. 223: Attaching Camshaft Alignment Tools (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 443 to special tool 11 2 445/11 2 441 and secure with special tool 11 2 444 via spark plug thread.

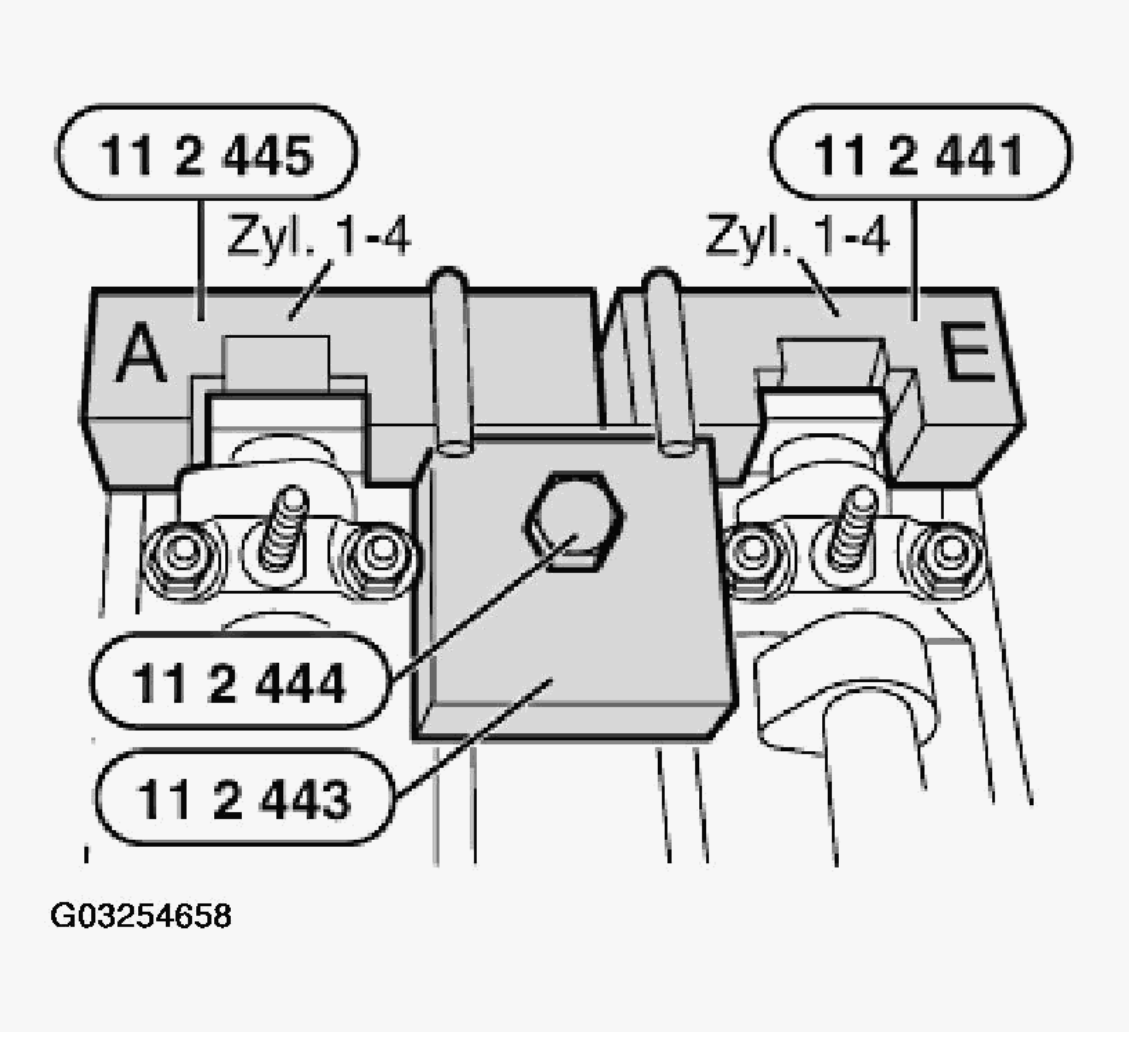


Fig. 224: Connecting Special Tool 11 2 443 To Special Tool 11 2 445/11 2 441
Courtesy of BMW OF NORTH AMERICA, INC.

Align camshafts.

Attach special tool 11 2 446/11 2 442 to camshafts, cylinder bank 5 to 8.

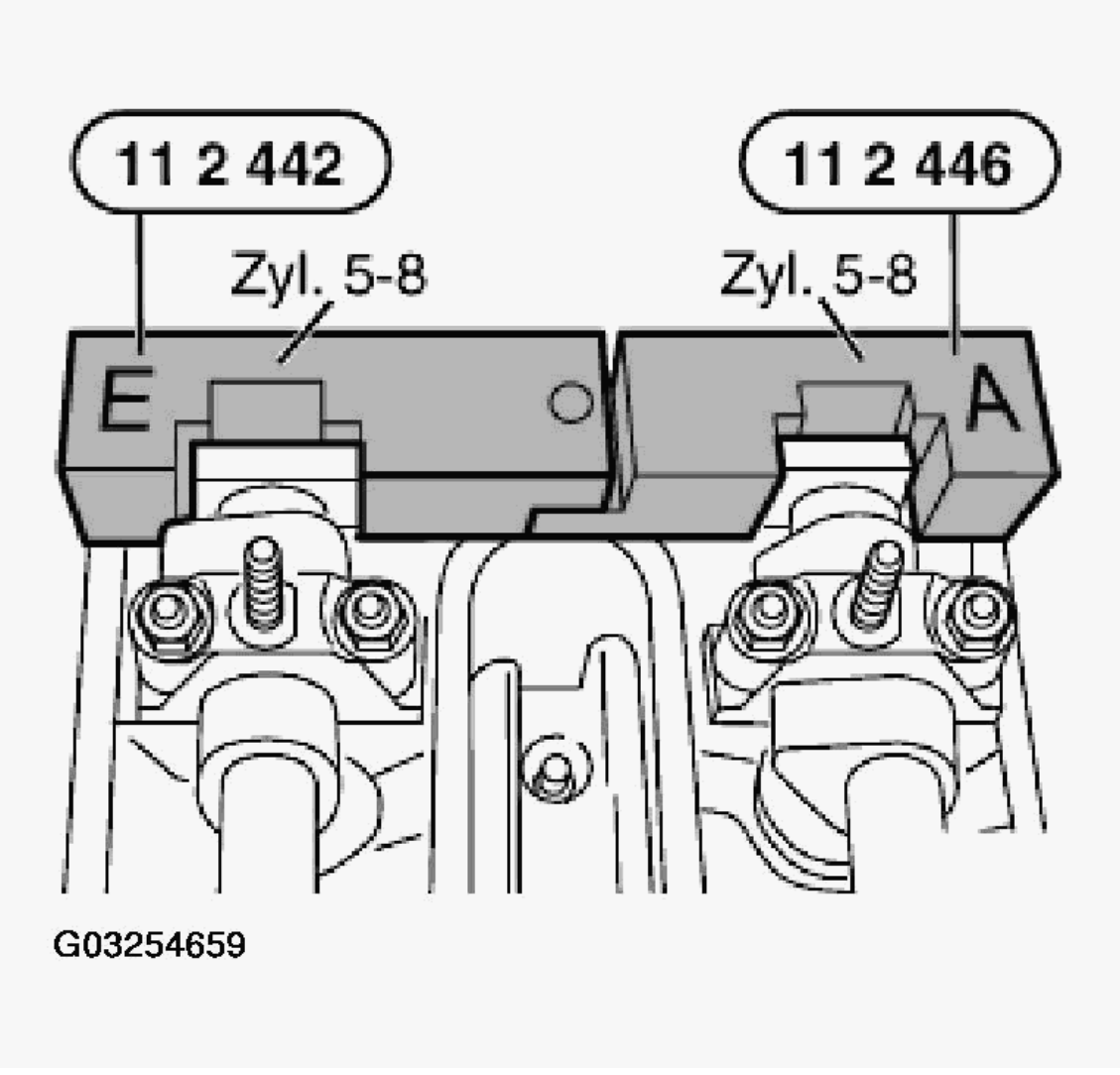


Fig. 225: Attaching Camshaft Alignment Tools (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 443 to special tool 11 2 446/11 2 442 and secure with special tool 11 2 444 via spark plug thread.

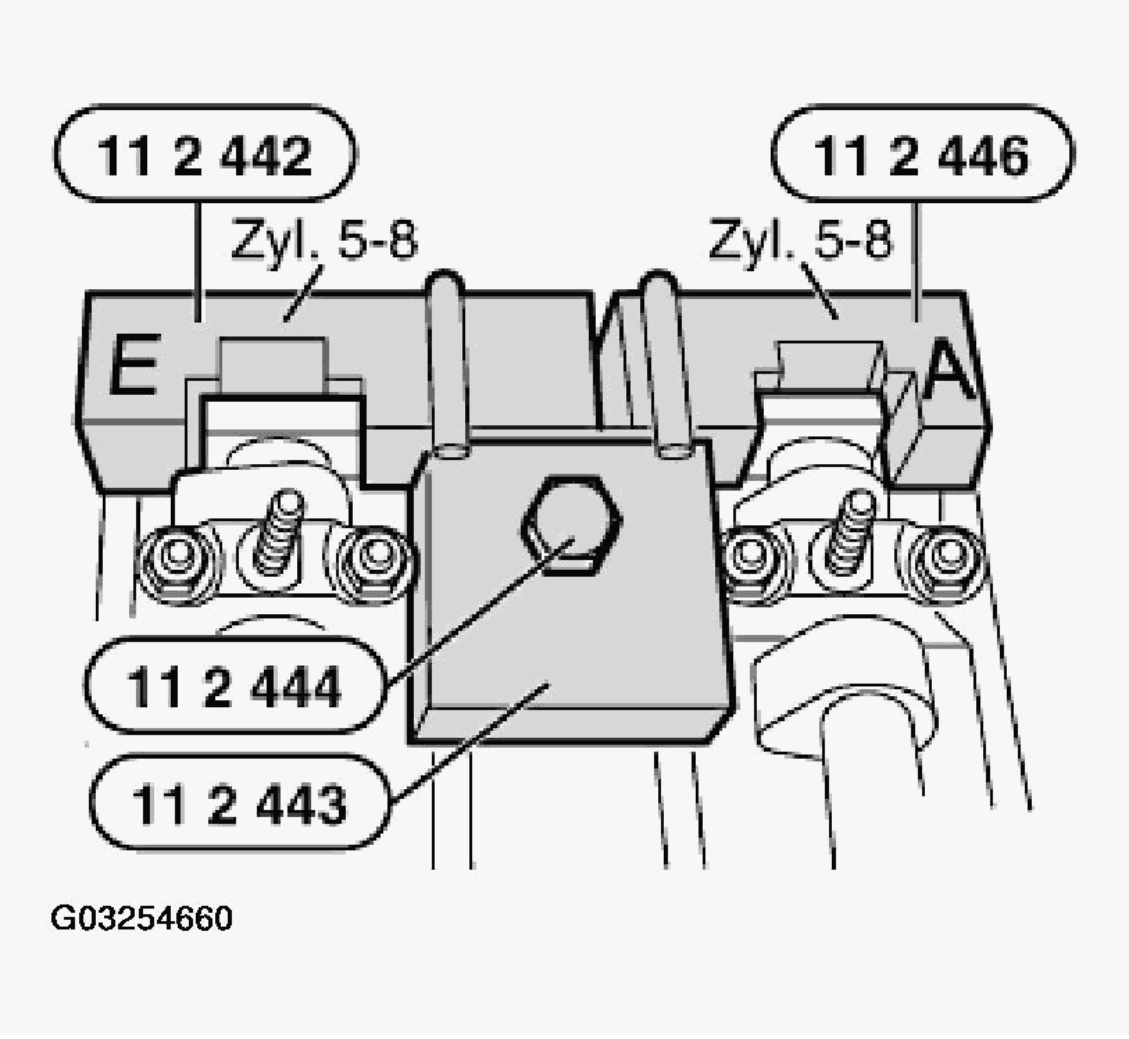


Fig. 226: Connecting Special Tool 11 2 443 To Special Tool 11 2 445/11 2 441
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 7 380 to right cylinder head on cylinder bank 1 to 4.

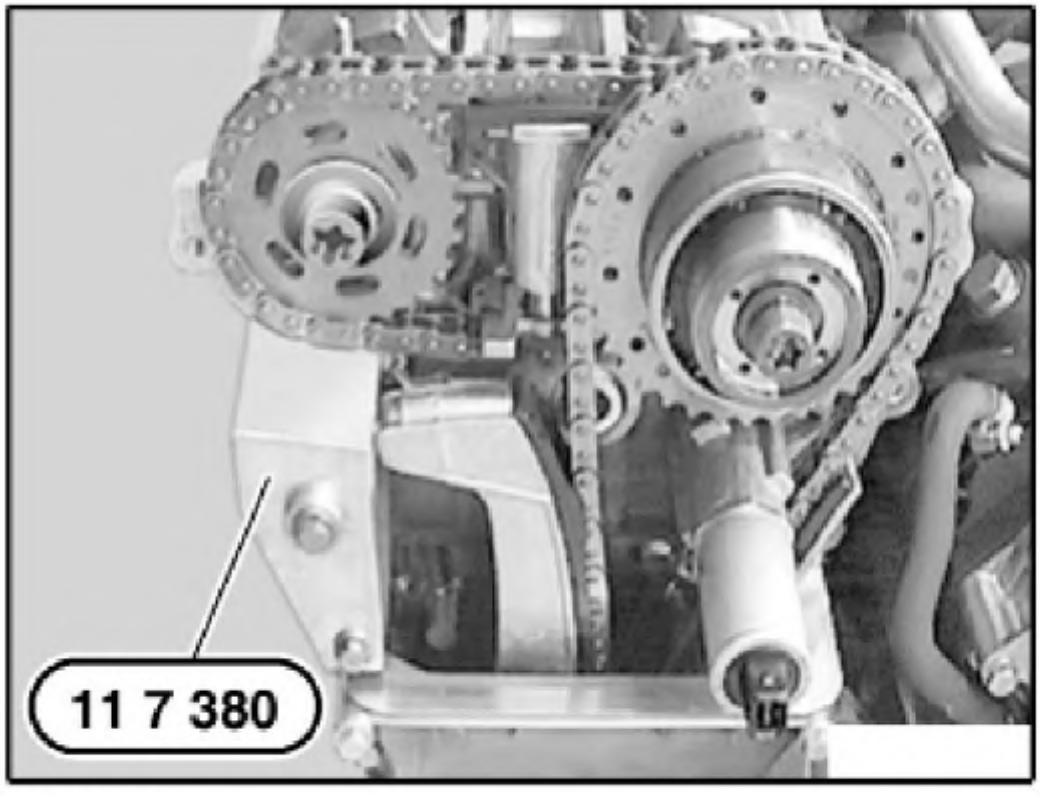


Fig. 227: Fitting Special Tool 11 7 380 To Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The special tool kit 11 3 390 can no longer be fitted in the E53 (X5) with M62 engine due to the altered space conditions.

With the market launch of the E53 (X5) with M62 engine, the special tool kit 11 3 390 is dropped.

The shorter special tool kit 11 4 230 comprising special tools 11 4 231 and 11 4 232 replaces the special tool kit 11 3 390.

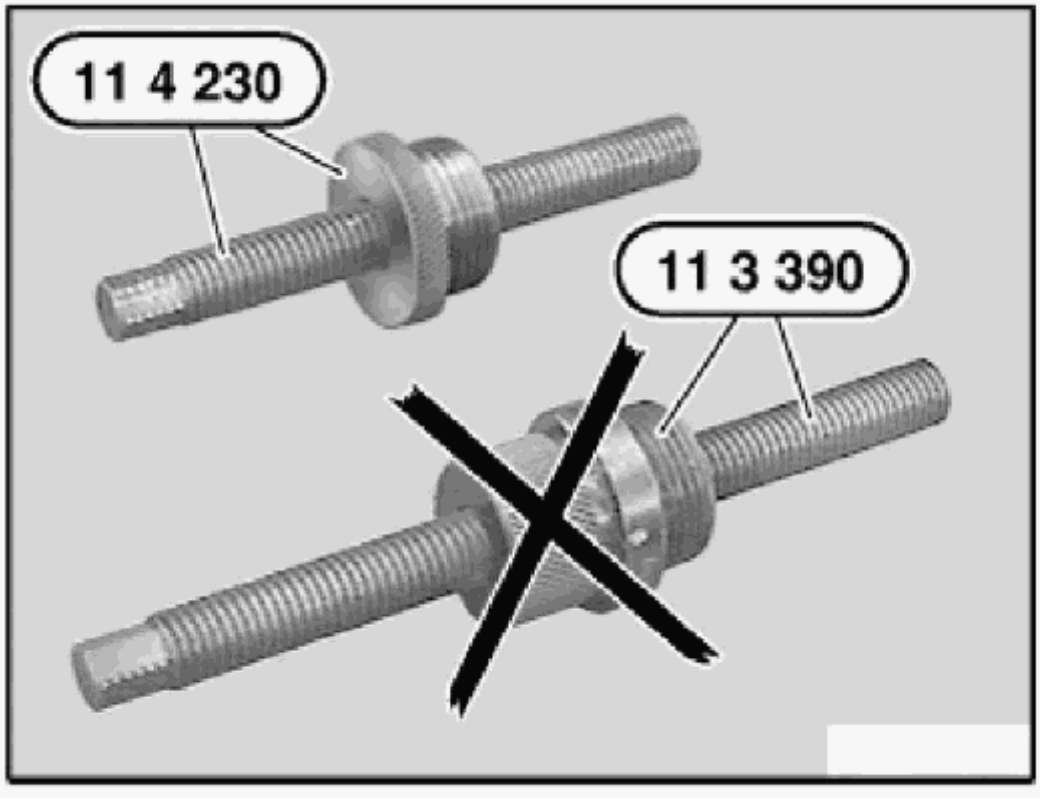


Fig. 228: Precautions For Fitting Special Tool Kit 11 3 390
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool kit 11 4 230 in special tool 11 7 380.

Screw in adjustment screw on tensioning rail, but do not tighten yet.

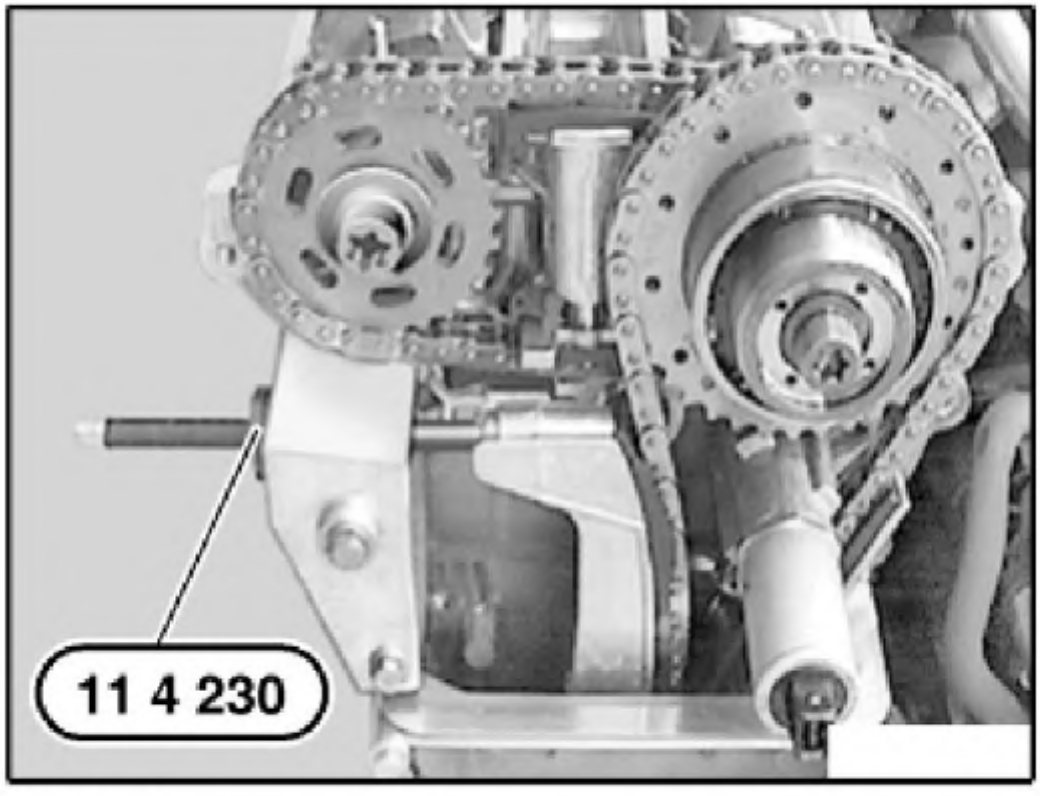


Fig. 229: Inserting Special Tool Adjustment Screw
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.

Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 5 to 8.

Set multimeter to acoustic continuity test.

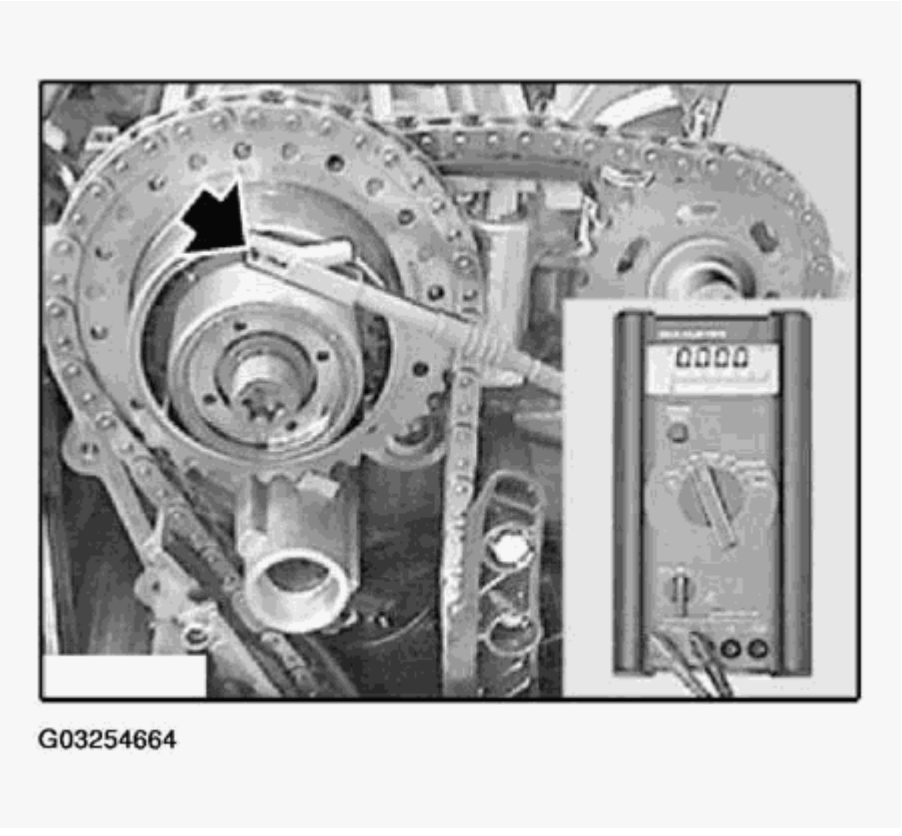


Fig. 230: Connecting Multimeter To Screw Connection On Oil Line (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

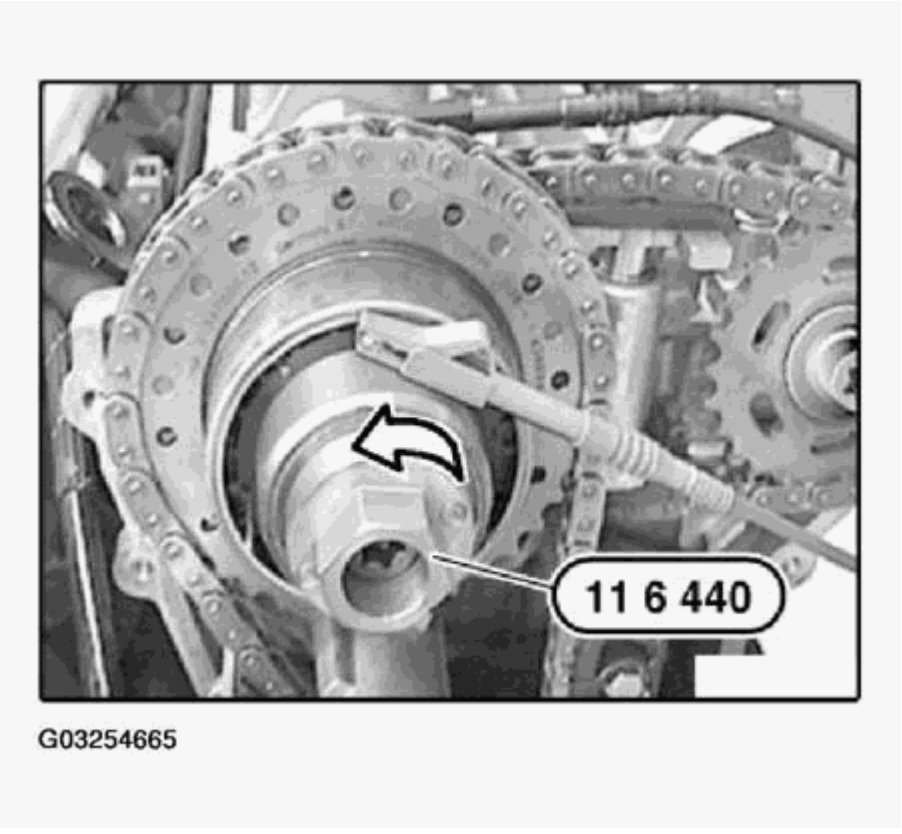


Fig. 231: Attaching Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Rotating the camshaft adjustment unit at 40 Nm to the left-hand stop ensures that the end position is reached and there is no longer an "oil cushion" before the left-hand stop of the camshaft adjustment unit.

In the camshaft adjustment unit, there are three contacts which are closed when the unit is at the left-hand stop.

During the acoustic continuity test with the multimeter, a sound signal can be heard when the camshaft adjustment unit is at the left-hand stop.

CAUTION: Left-hand threads.

Tighten screw connection (2) of inlet camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

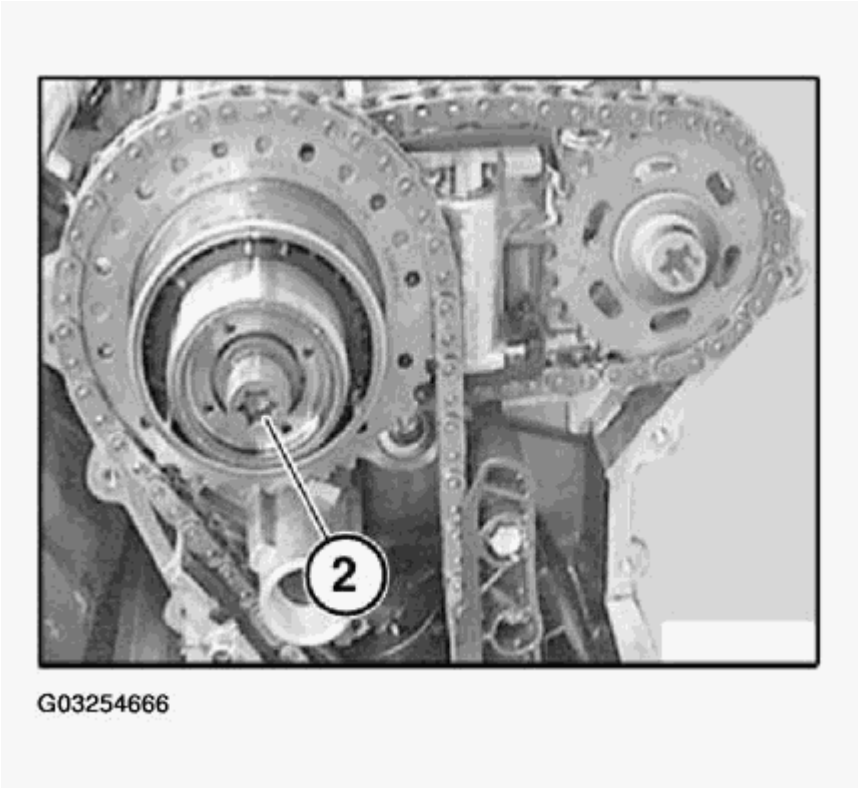


Fig. 232: Tightening Inlet Camshaft Bolt (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

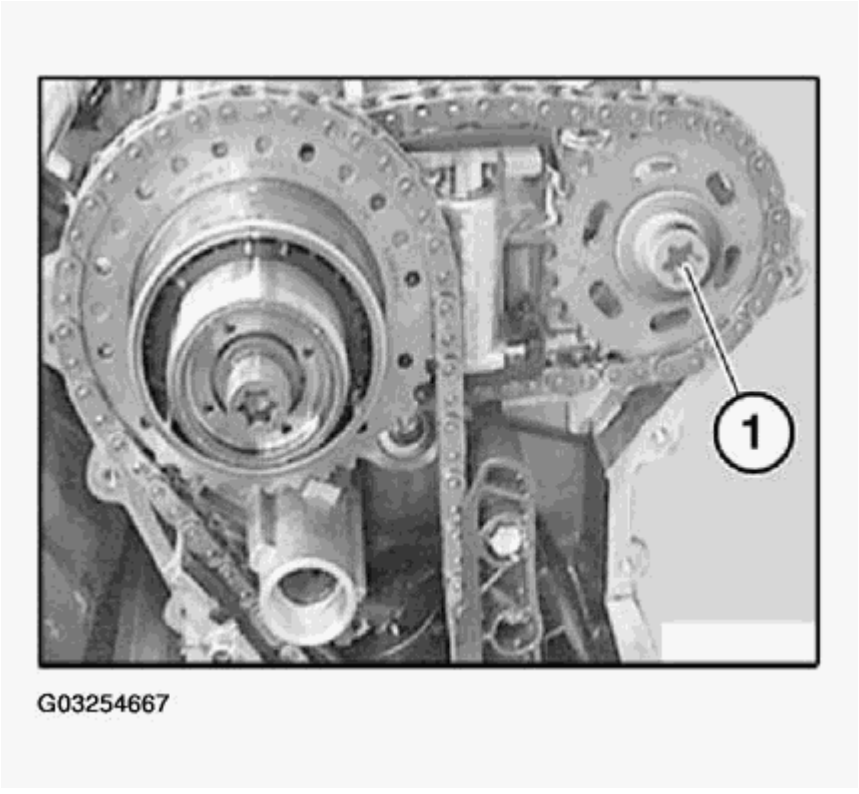


Fig. 233: Tightening Exhaust Camshaft Bolt (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.

Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 1 to 4.

Set multimeter to acoustic continuity test.

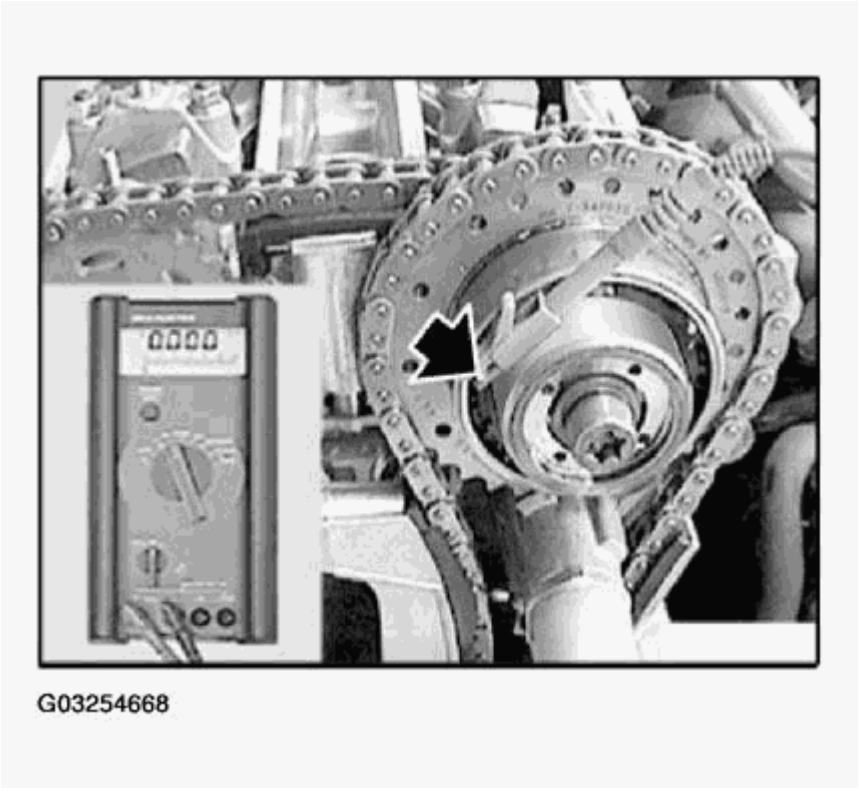


Fig. 234: Connecting Multimeter To Screw Connection On Oil Line (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

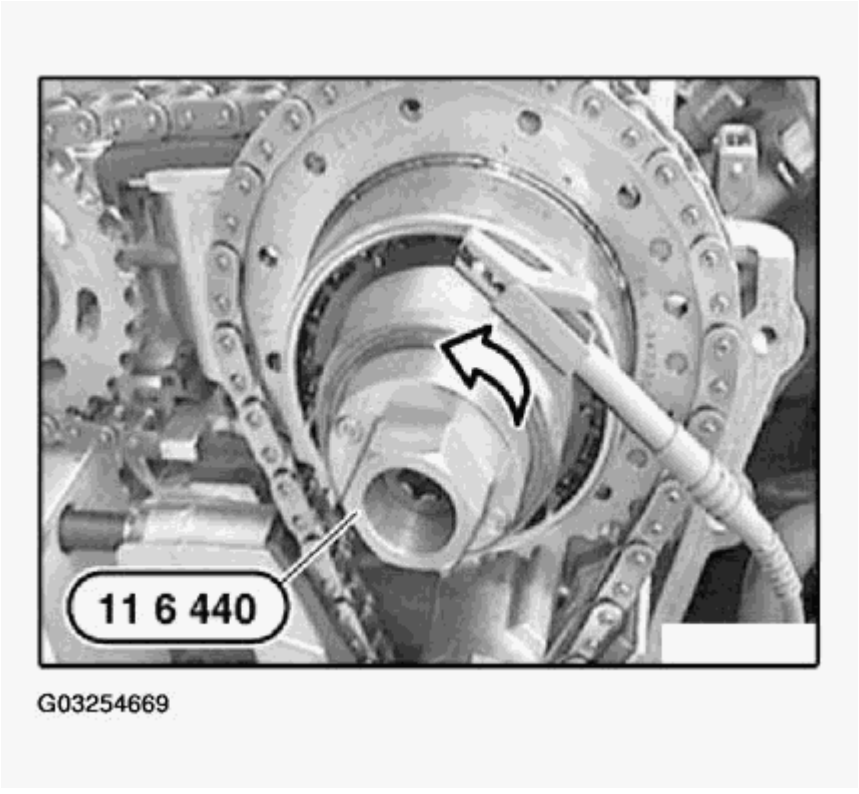


Fig. 235: Attaching Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (2) of inlet camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

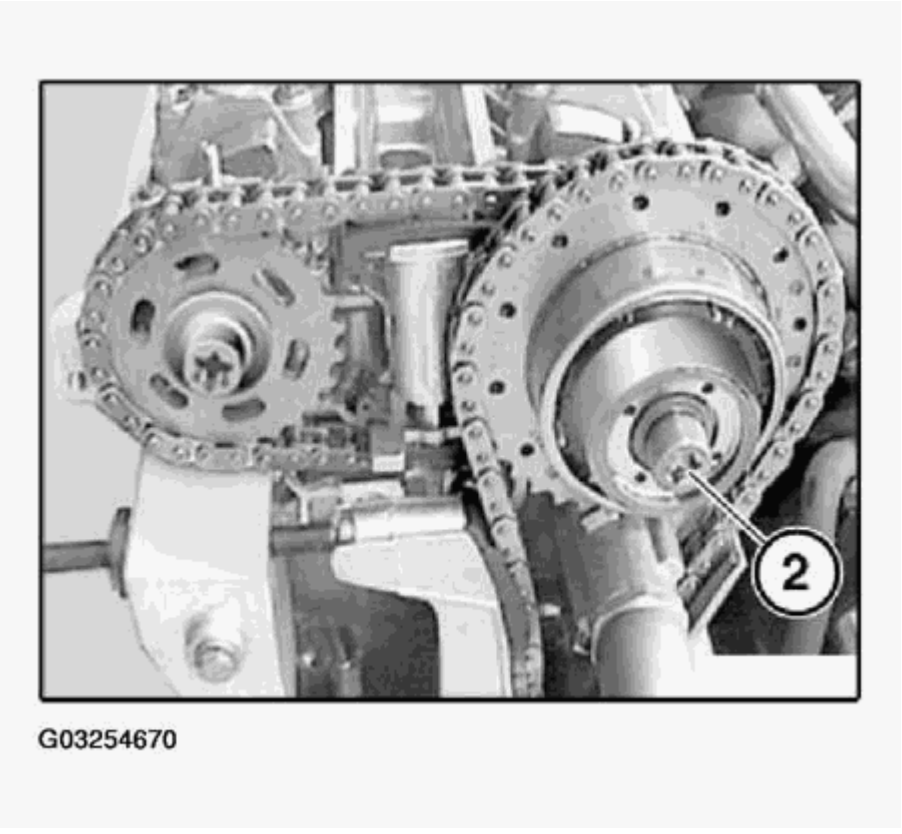


Fig. 236: Tightening Inlet Camshaft Bolt (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

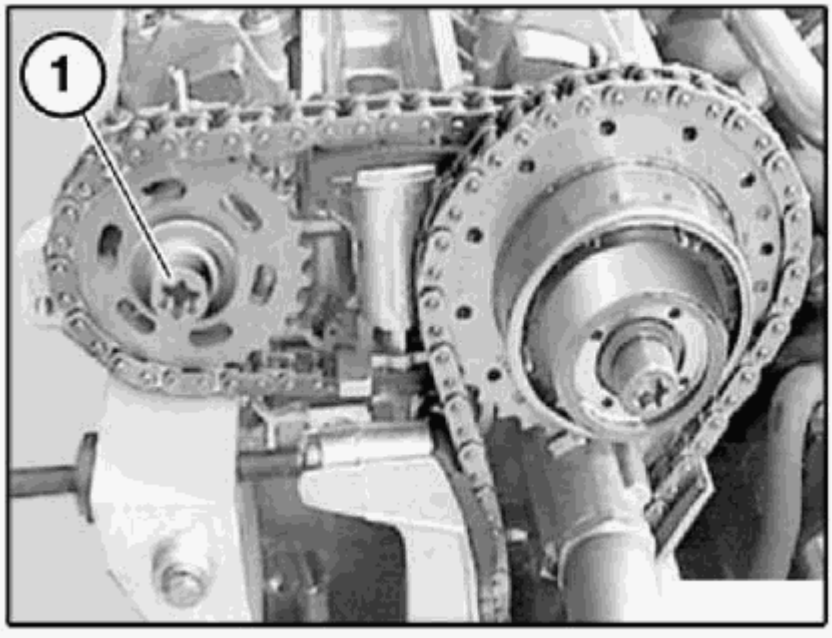


Fig. 237: Tightening Exhaust Camshaft Bolt (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Pretension tensioning rail by turning adjusting screw on special tool 11 4 230 with special tool 00 9 250 to 0.7 Nm.

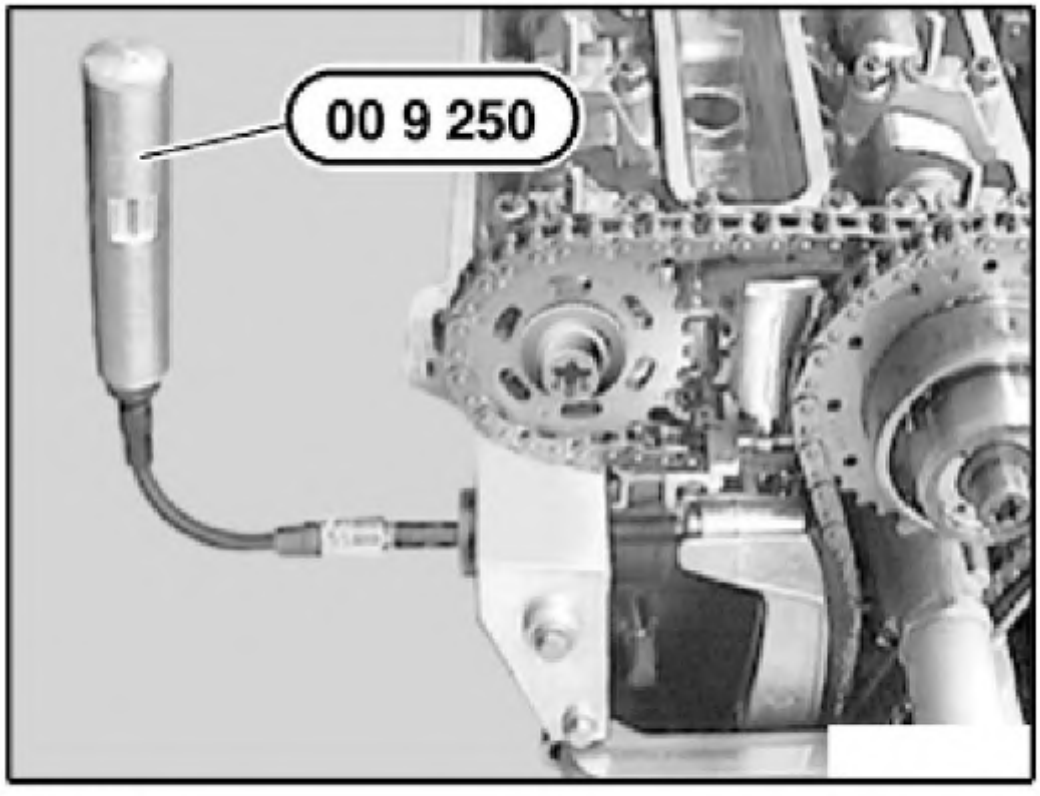


Fig. 238: Pretension Adjusting Screw On Special Tool 11 4 230 With Special Tool 00 9 250
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.

NOTE: Pretensioning the timing chain moves the camshaft adjustment unit and the unit must therefore be reset to the left-hand stop.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

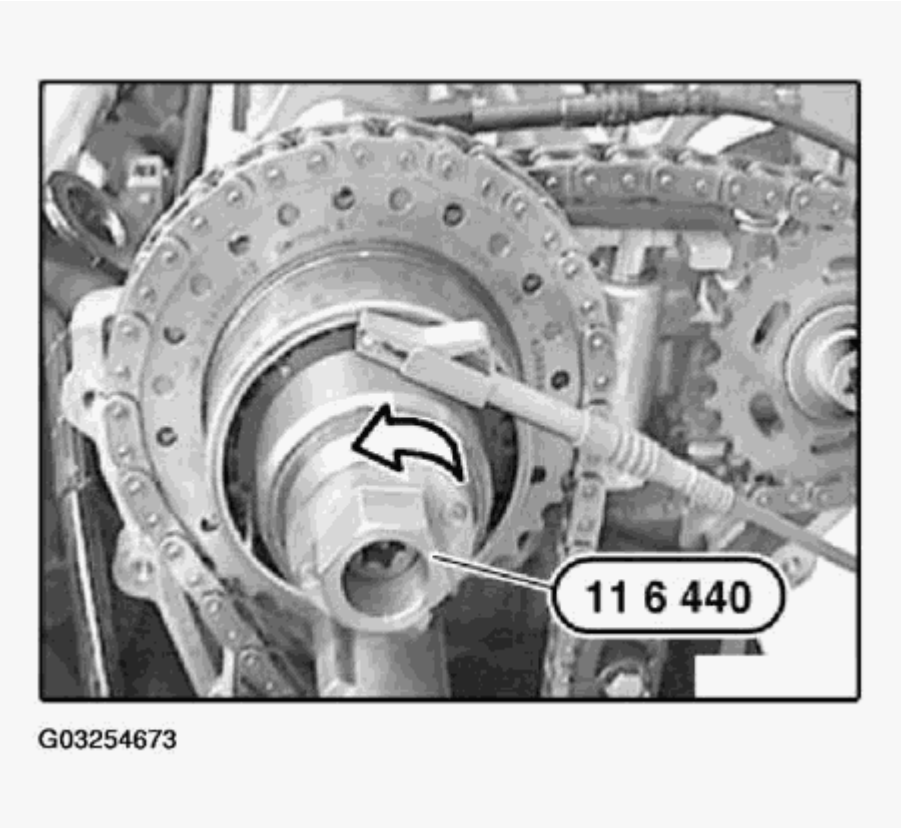


Fig. 239: Attaching Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

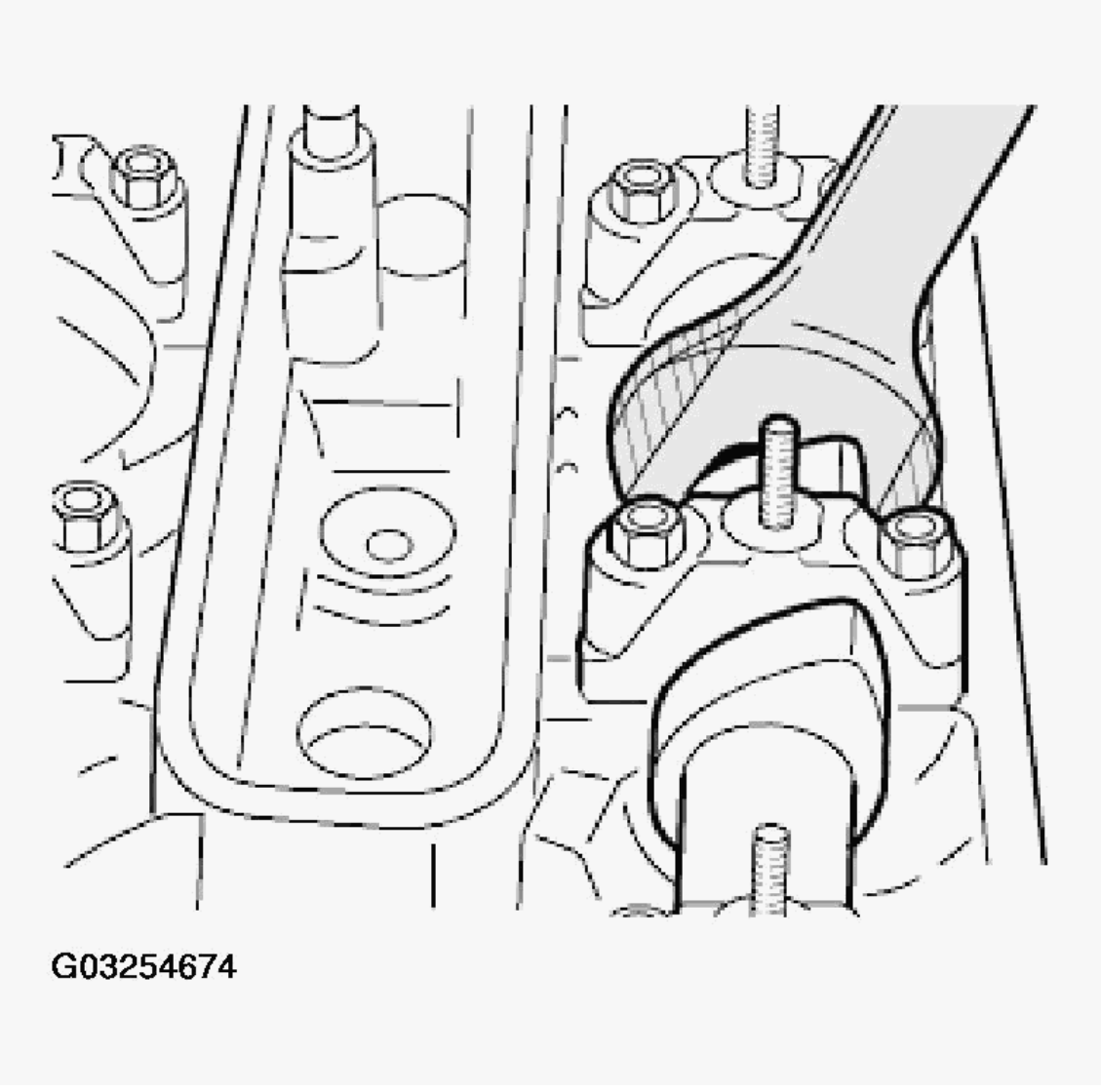


Fig. 240: Gripping Camshaft At Hexagon Head
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 5 to 8.

Tightening torque, see 11 36 14AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

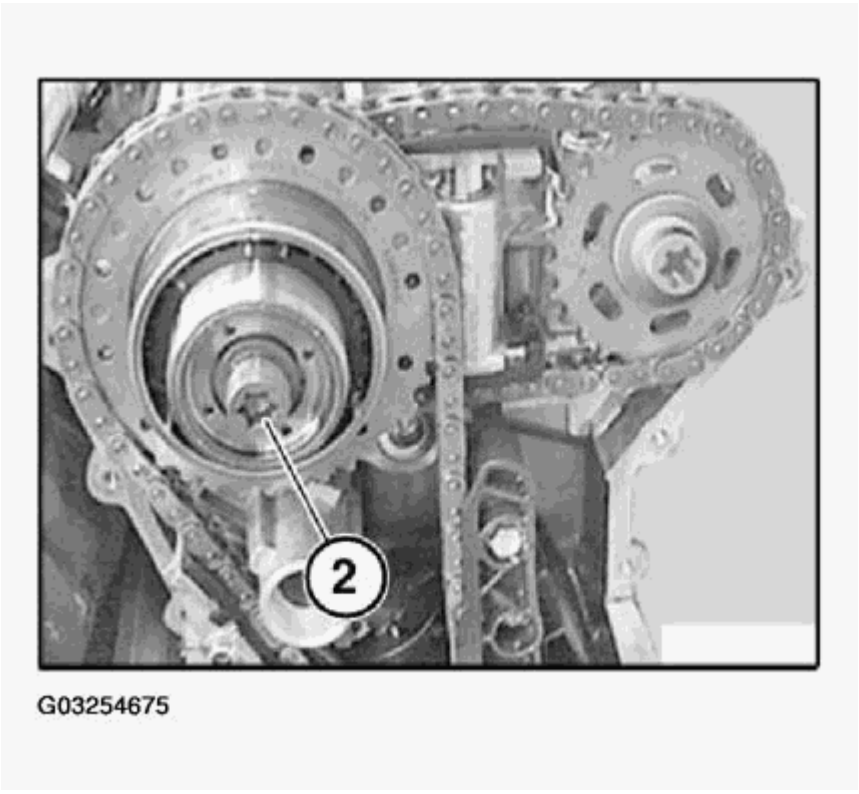


Fig. 241: Tightening Inlet Camshaft Bolt (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

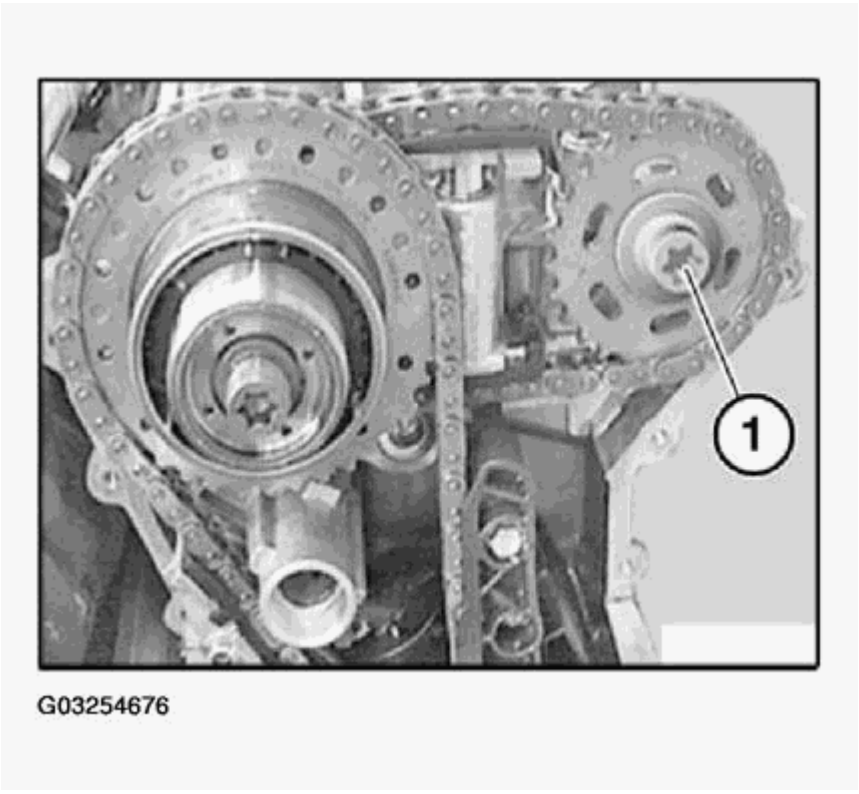


Fig. 242: Tightening Exhaust Camshaft Bolt (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 5 to 8.

Tightening torque, see 11 36 13AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

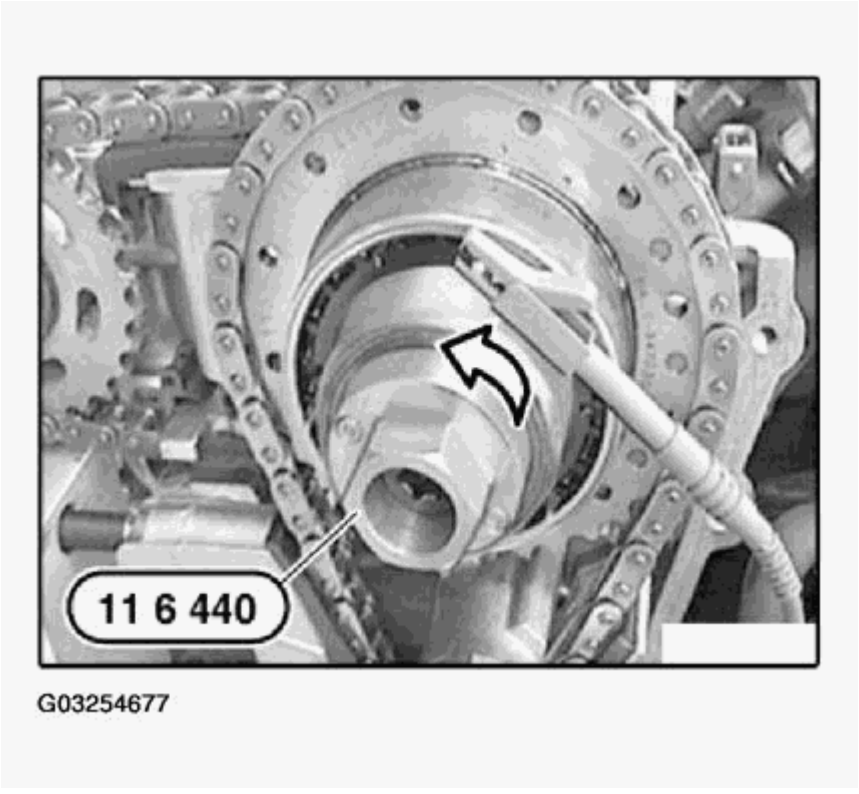


Fig. 243: Connecting Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 1 to 4.

Tightening torque, see 11 36 14AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

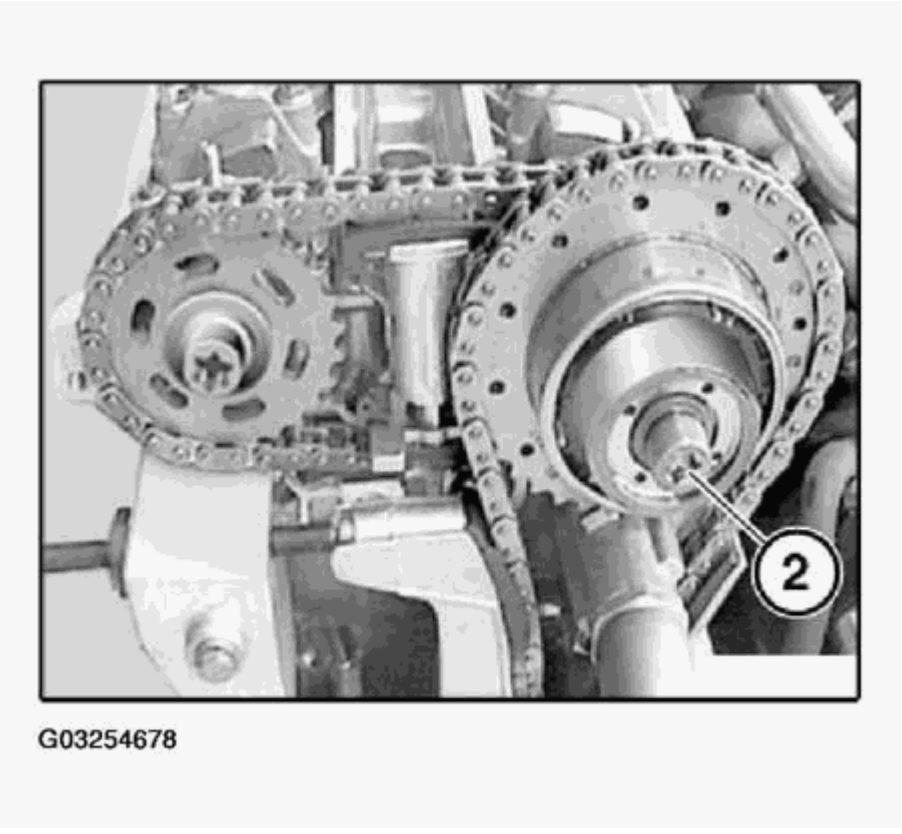


Fig. 244: Tightening Inlet Camshaft Bolt (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 1 to 4.

Tightening torque, see 11 36 13AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

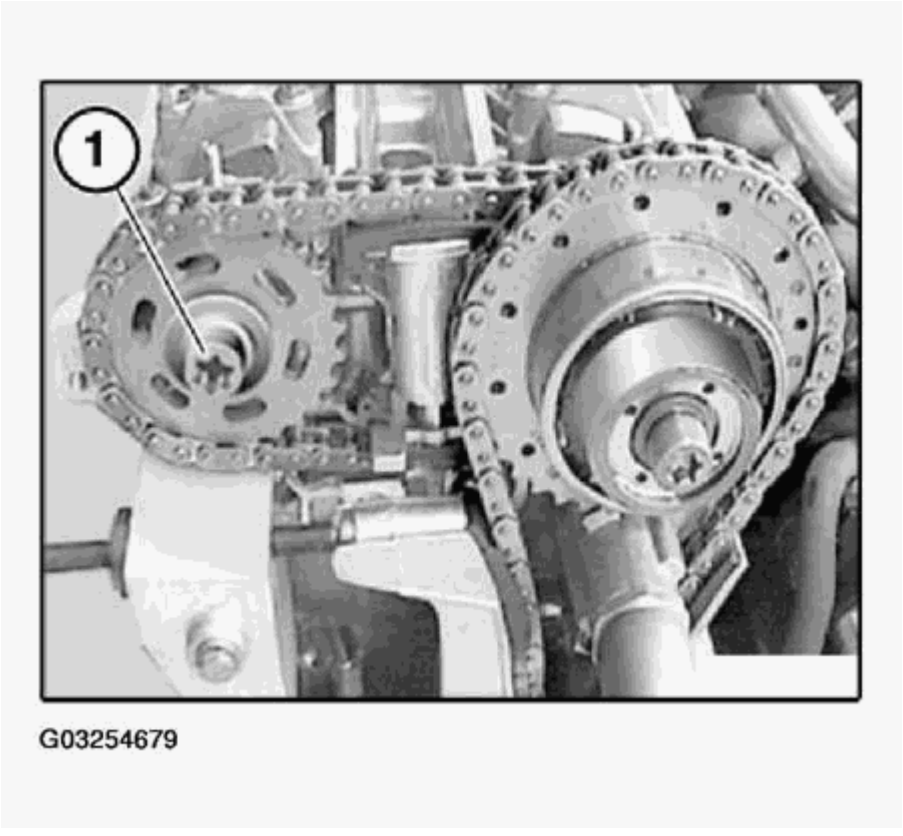


Fig. 245: Tightening Exhaust Camshaft Bolt (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach sensor gear (2) to cylinder bank 1 to 4.

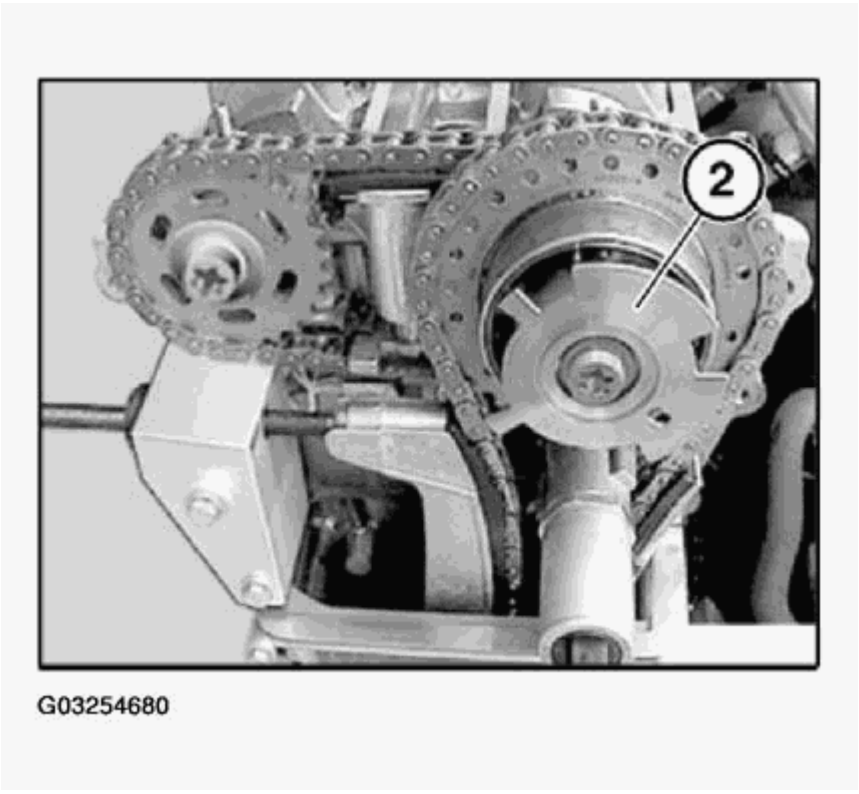


Fig. 246: Connecting Sensor Gear To Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 1 to 4 and initially tighten without play, but do not tighten down yet.

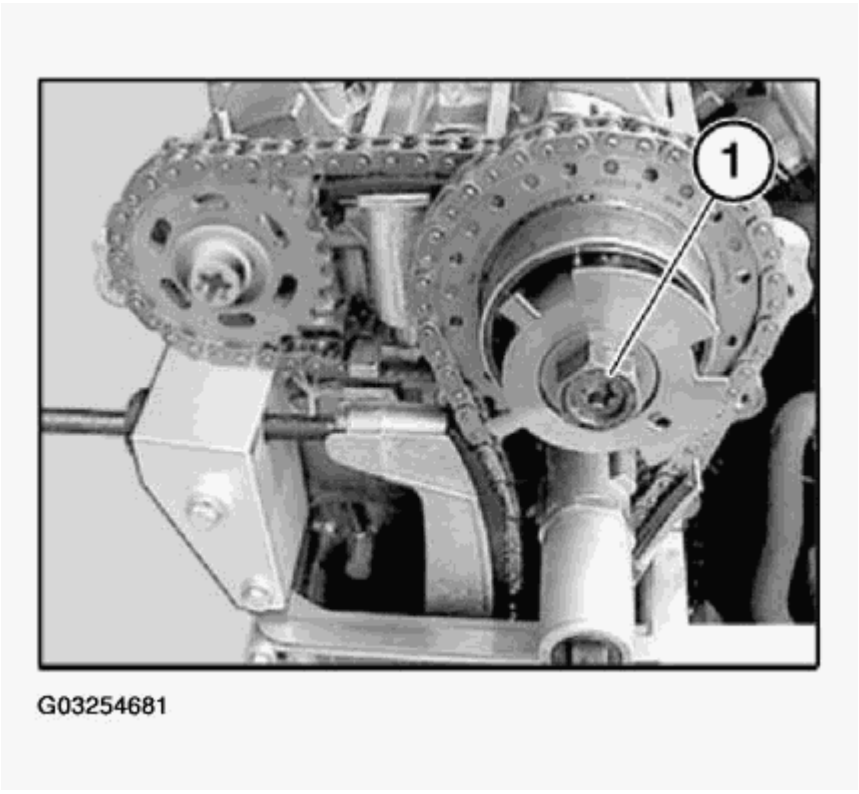


Fig. 247: Fitting Sensor Gear Screw (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

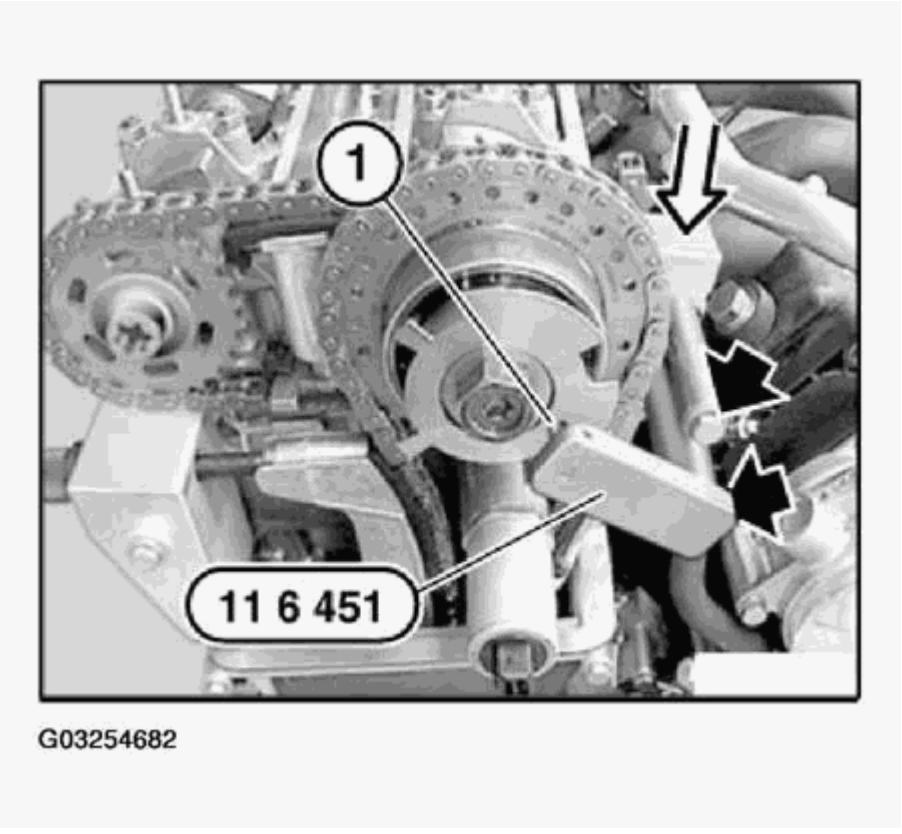


Fig. 248: Aligning Locating Bore On Sensor Gear (Cylinder Bank 1 To 4) To Positioning Pin On Special Tool 11 6 451
Courtesy of BMW OF NORTH AMERICA, INC.

Align locating bore (1) on sensor gear of cylinder bank 1 to 4 to positioning pin on special tool 11 6 451. Fit special tool 11 6 451, insert screws and initially tighten without play. Press special tool 11 6 451 downwards and align to cylinder head. Tighten down special tool 11 6 451.

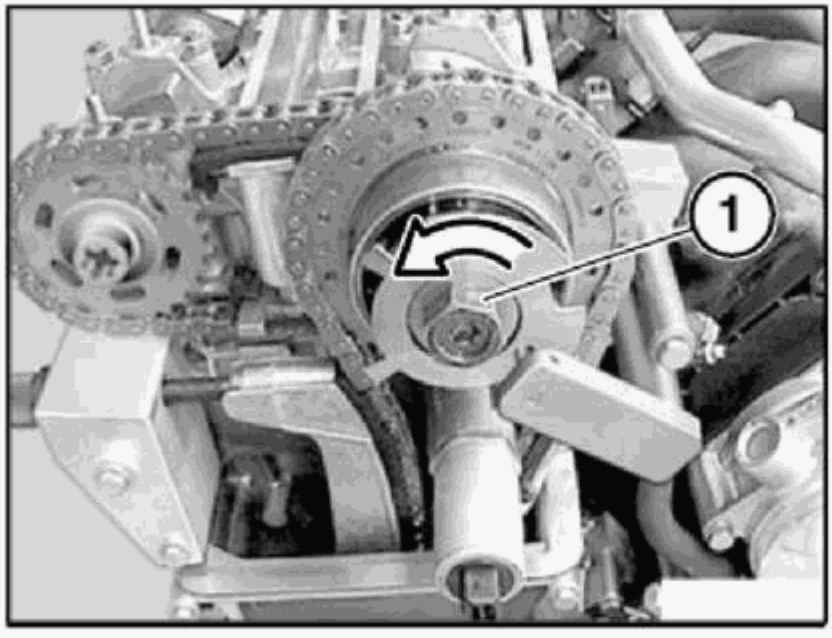


Fig. 249: Tightening Sensor Gear Screw
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.

Tightening torque, see 11 36 15AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Remove special tool 11 6 451 from right cylinder head on cylinder bank 1 to 4.

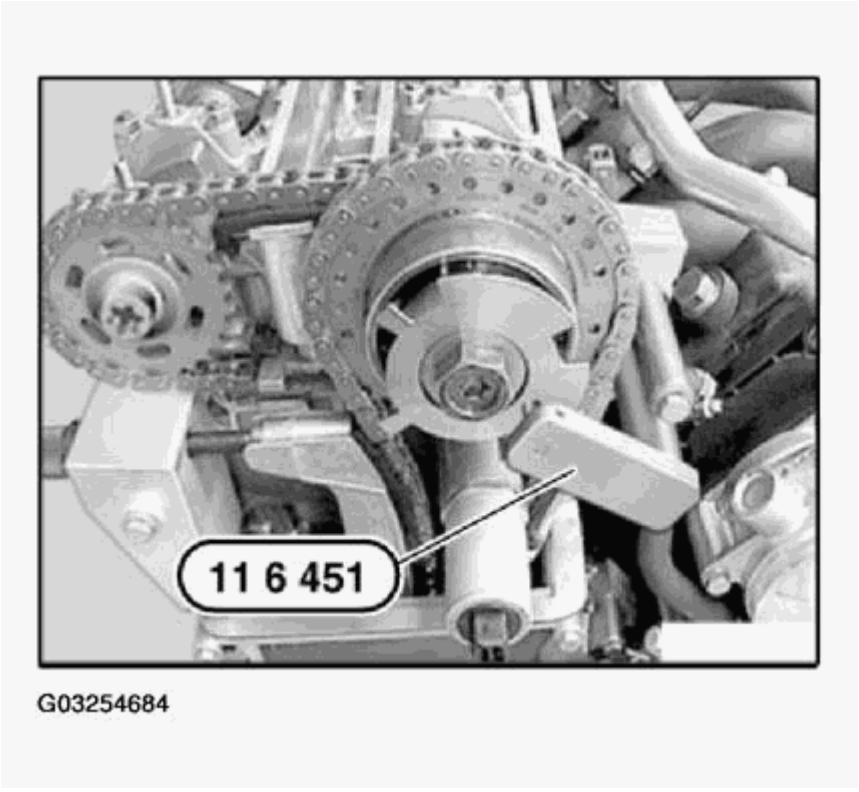


Fig. 250: Removing Special Tool 11 6 451 From Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach sensor gear (2) to cylinder bank 5 to 8.

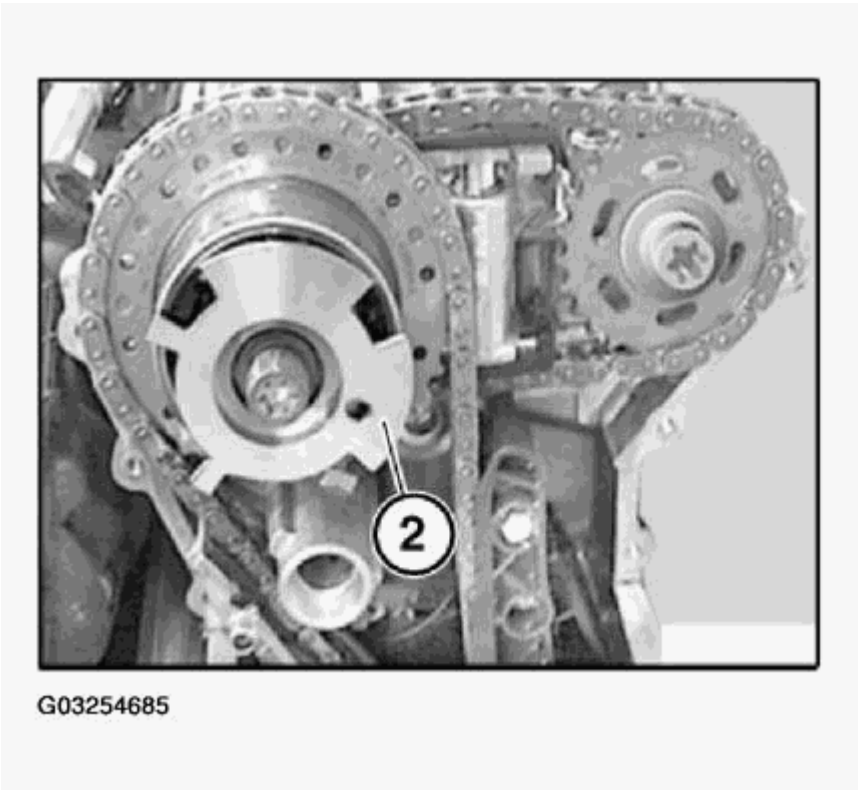


Fig. 251: Connecting Sensor Gear (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 5 to 8 and initially tighten without play, but do not tighten down yet.

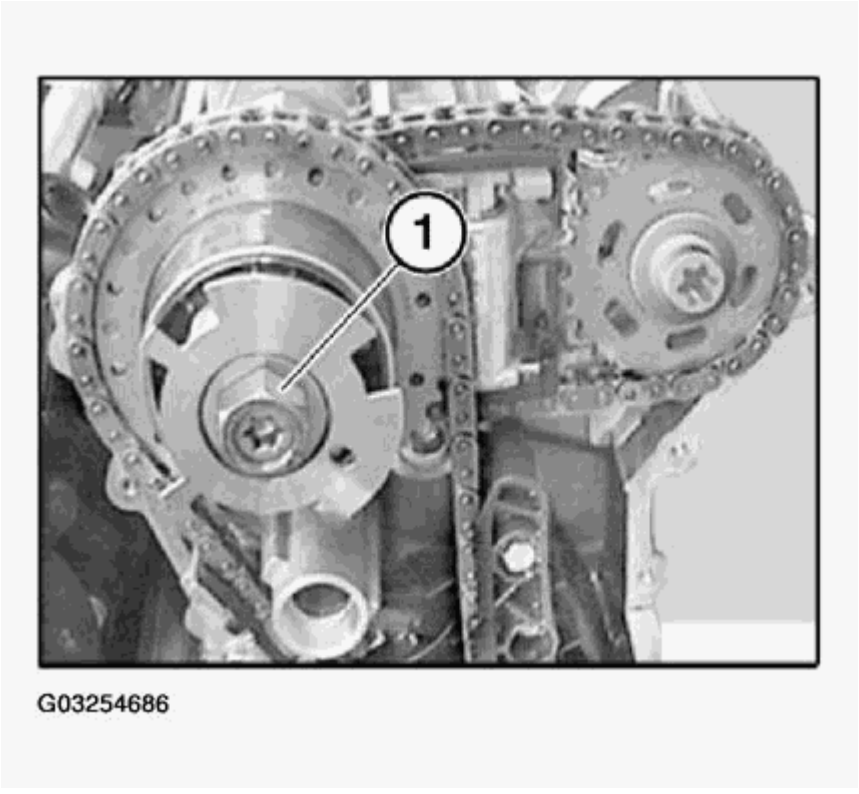


Fig. 252: Fitting Sensor Gear Screw Connection (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

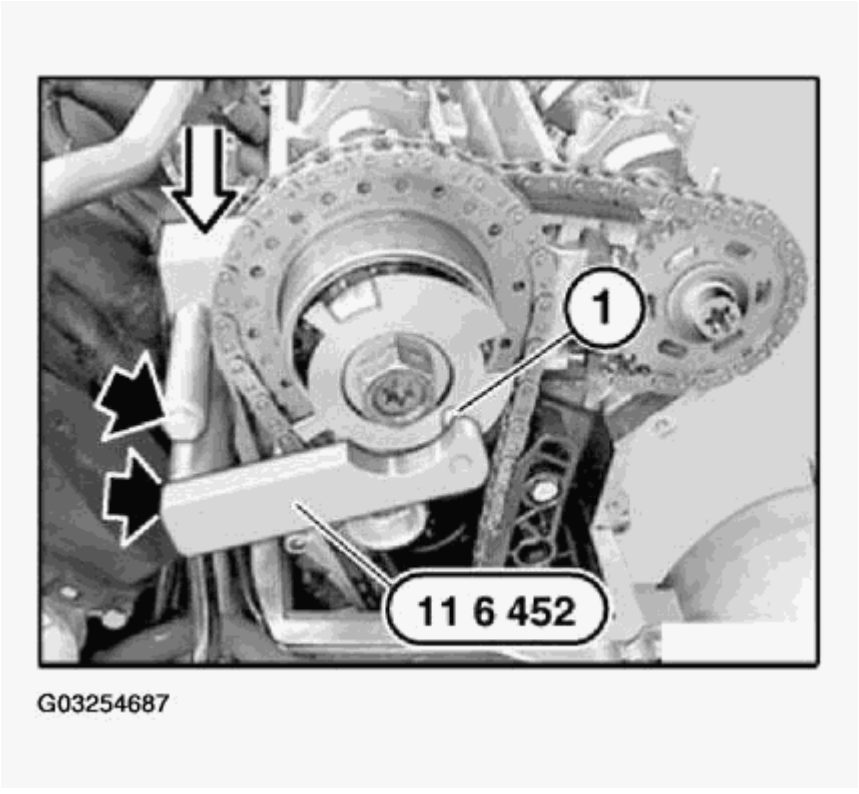


Fig. 253: Aligning Locating Bore On Sensor Gear (Cylinder Bank 5 To 8) To Positioning Pin On Special Tool 11 6 452
Courtesy of BMW OF NORTH AMERICA, INC.

Align locating bore (1) on sensor gear of cylinder bank 5 to 8 to positioning pin on special tool 11 6 452. Fit special tool 11 6 452, insert screws and initially tighten without play. Press special tool 11 6 452 downwards and align to cylinder head. Tighten down special tool 11 6 452.

CAUTION: Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.

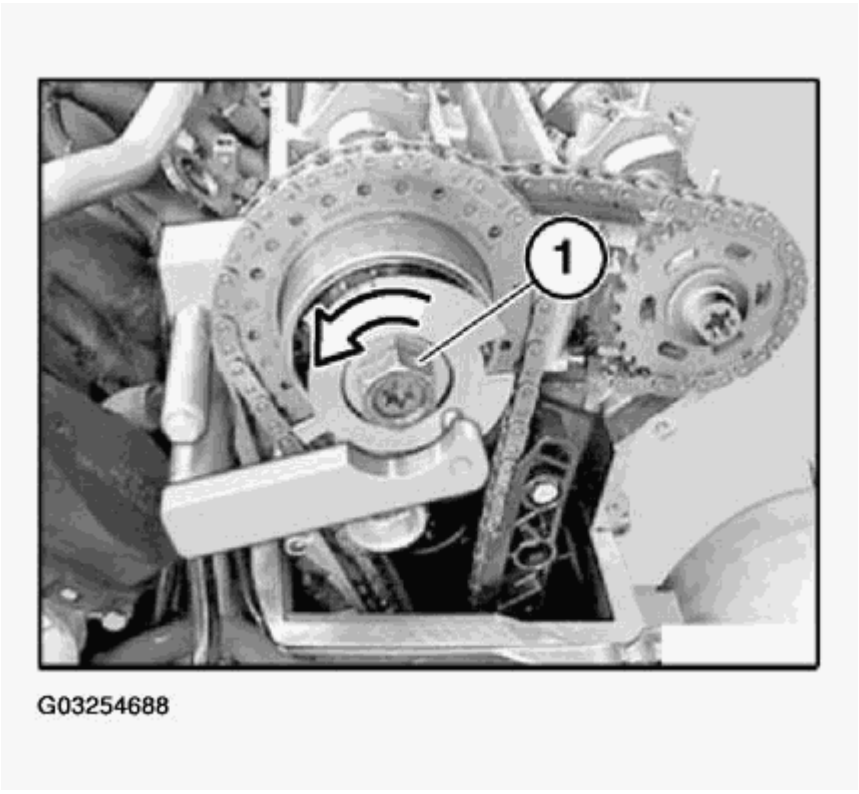


Fig. 254: Tightening Sensor Gear Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque, see 11 36 15AZ **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Remove special tool 11 6 452 from left cylinder head on cylinder bank 5 to 8.

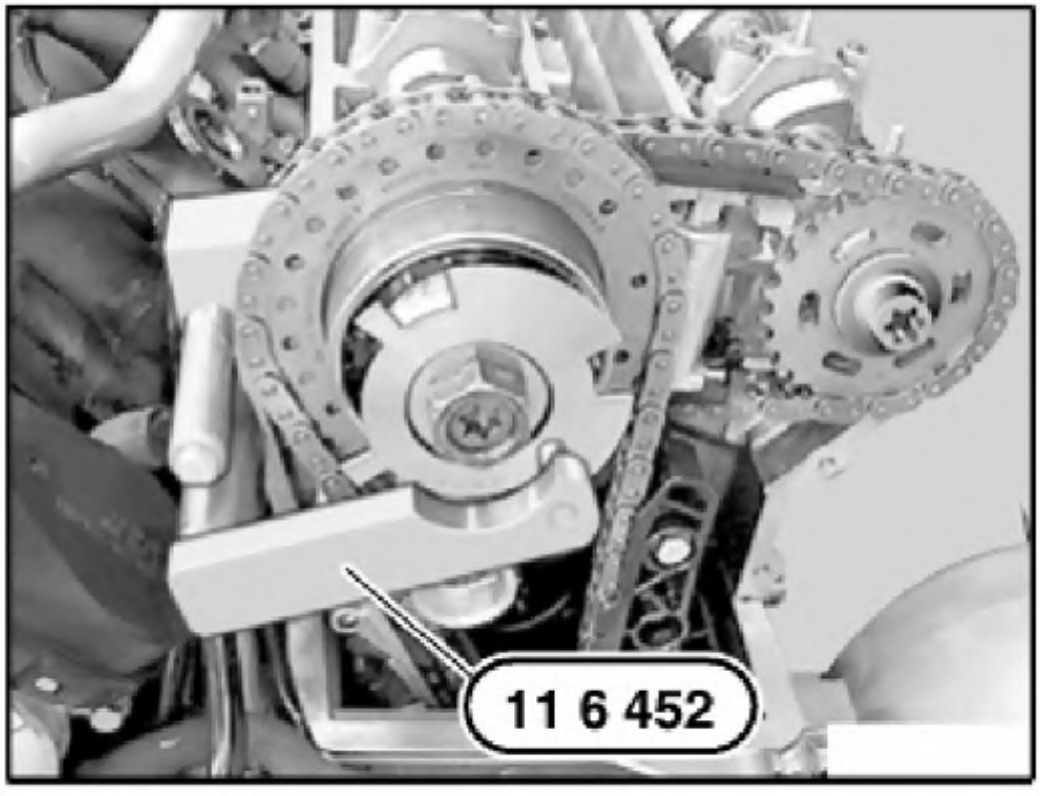


Fig. 255: Removing Special Tool 11 6 452 From Left Cylinder Head (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/11 2 443/11 2 445/11 2 441.

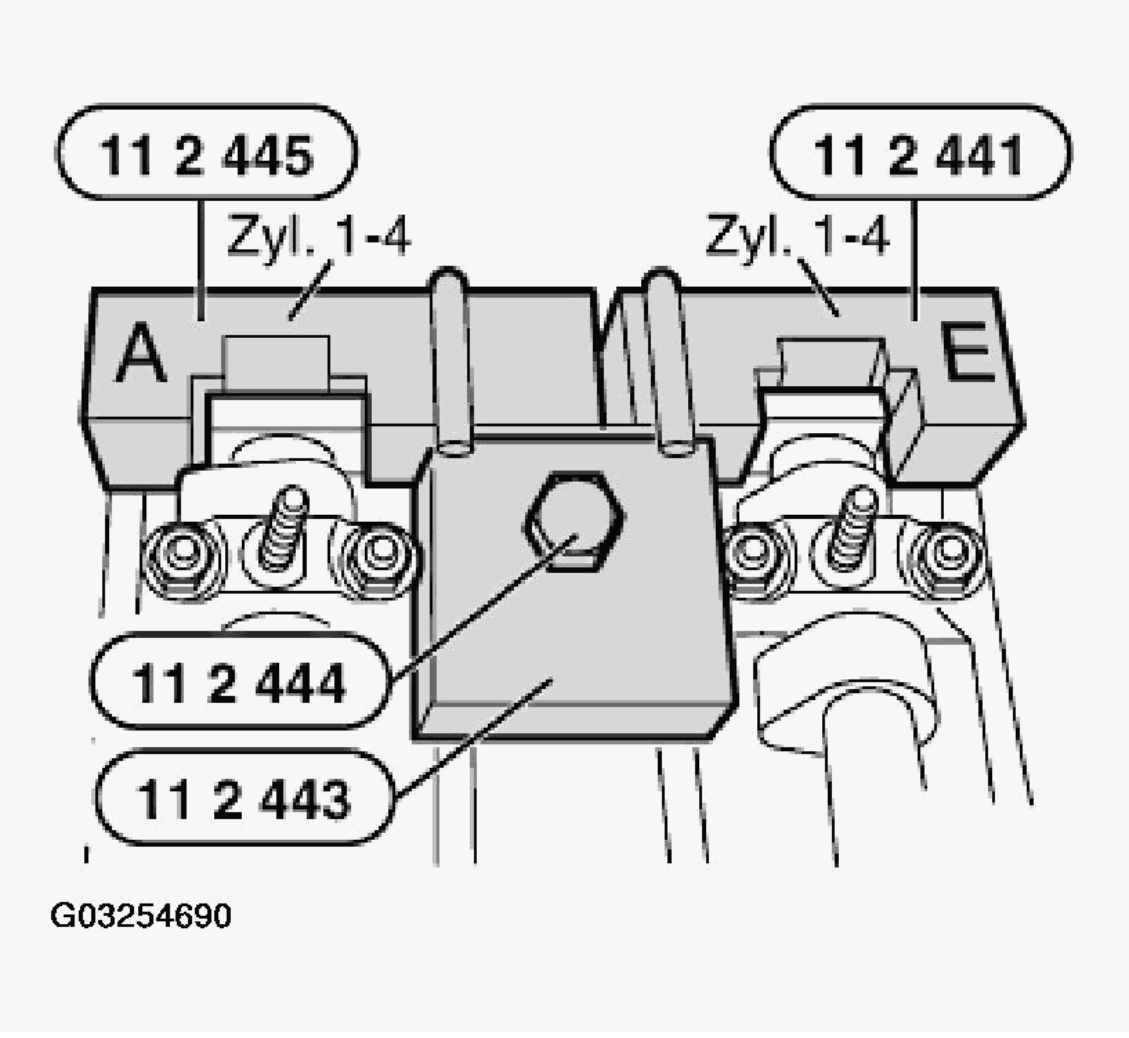


Fig. 256: Removing Special Tools (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/11 2 443/11 2 442/11 2 446.

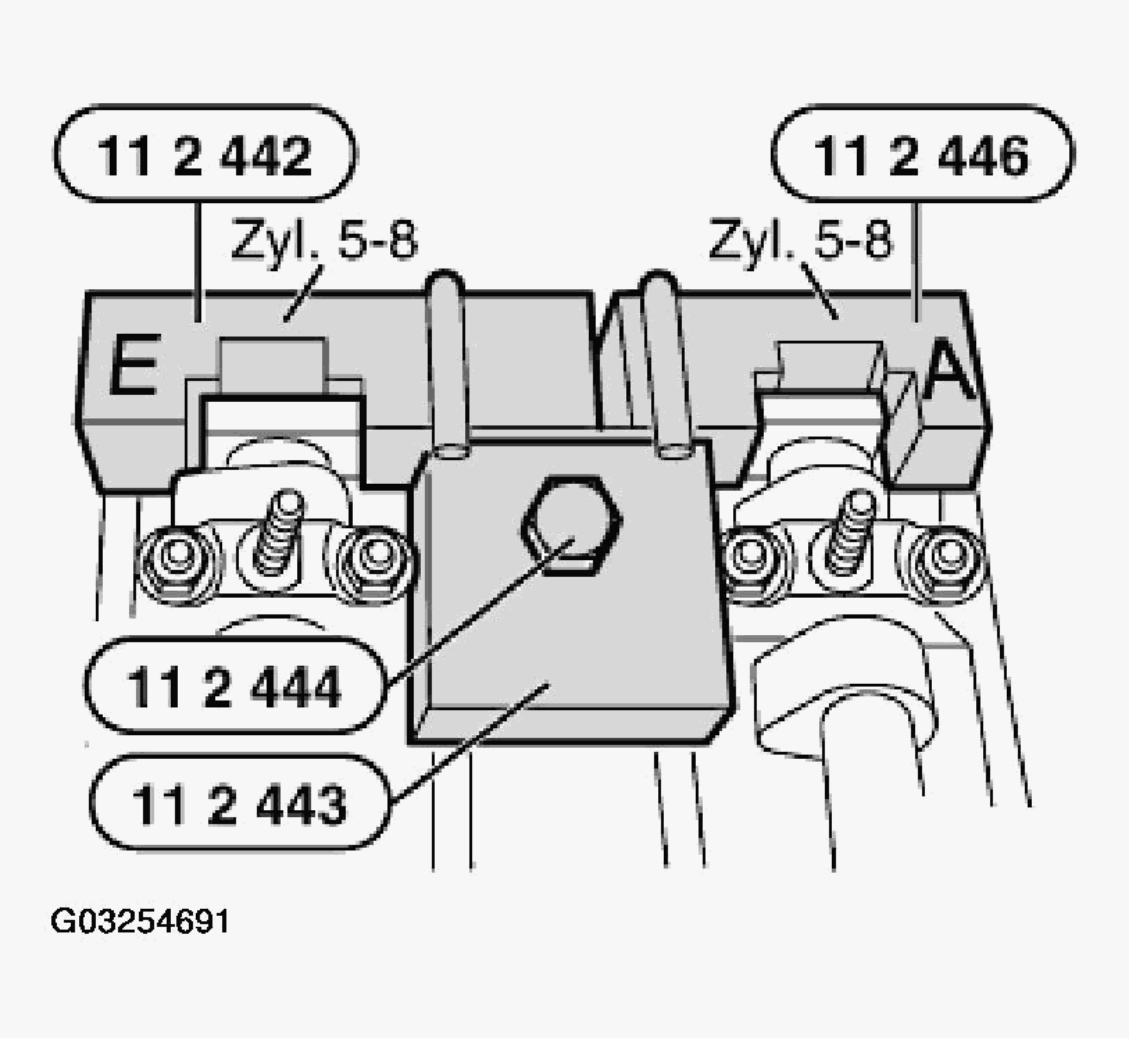


Fig. 257: Removing Special Tools (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on special tool 11 4 230.

Remove special tool 11 7 380 from right cylinder head on cylinder bank 1 to 4.

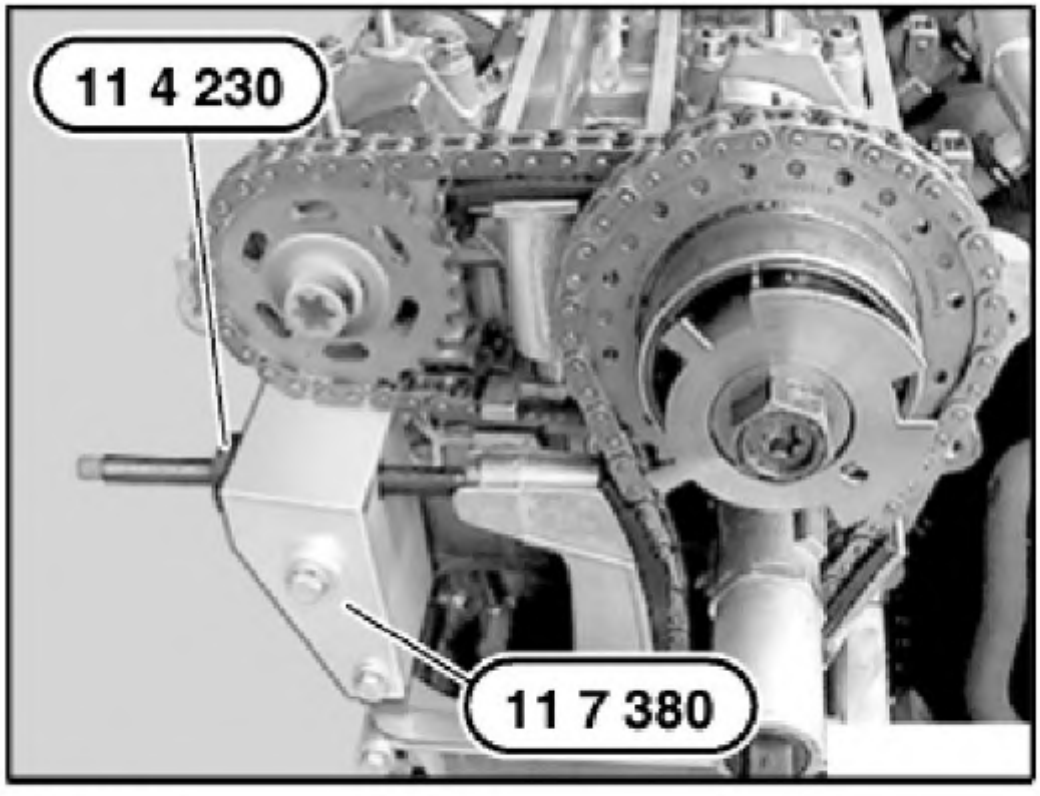


Fig. 258: Removing Special Tool 11 7 380 From Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Install oil lines on left and right of cylinder head.

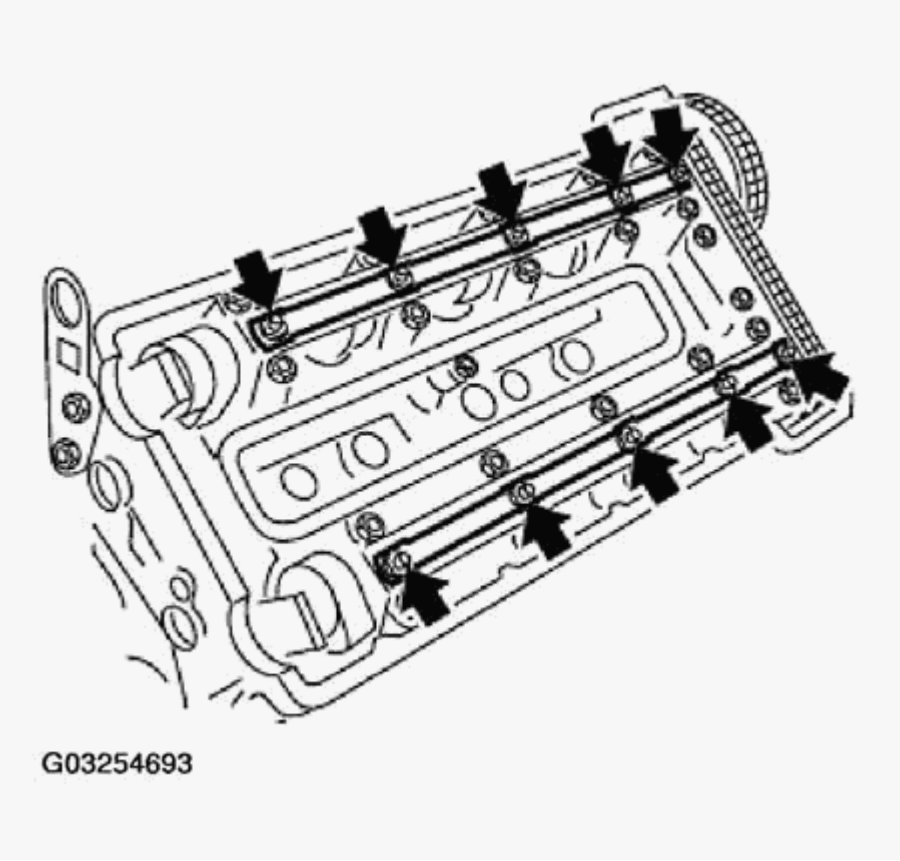


Fig. 259: Installing Oil Lines On Left And Right Of Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Install both timing case covers at top.

Install chain tensioning piston.

Install both cylinder head covers.

E53

Remove special tool 11 5 180.

Assemble engine.

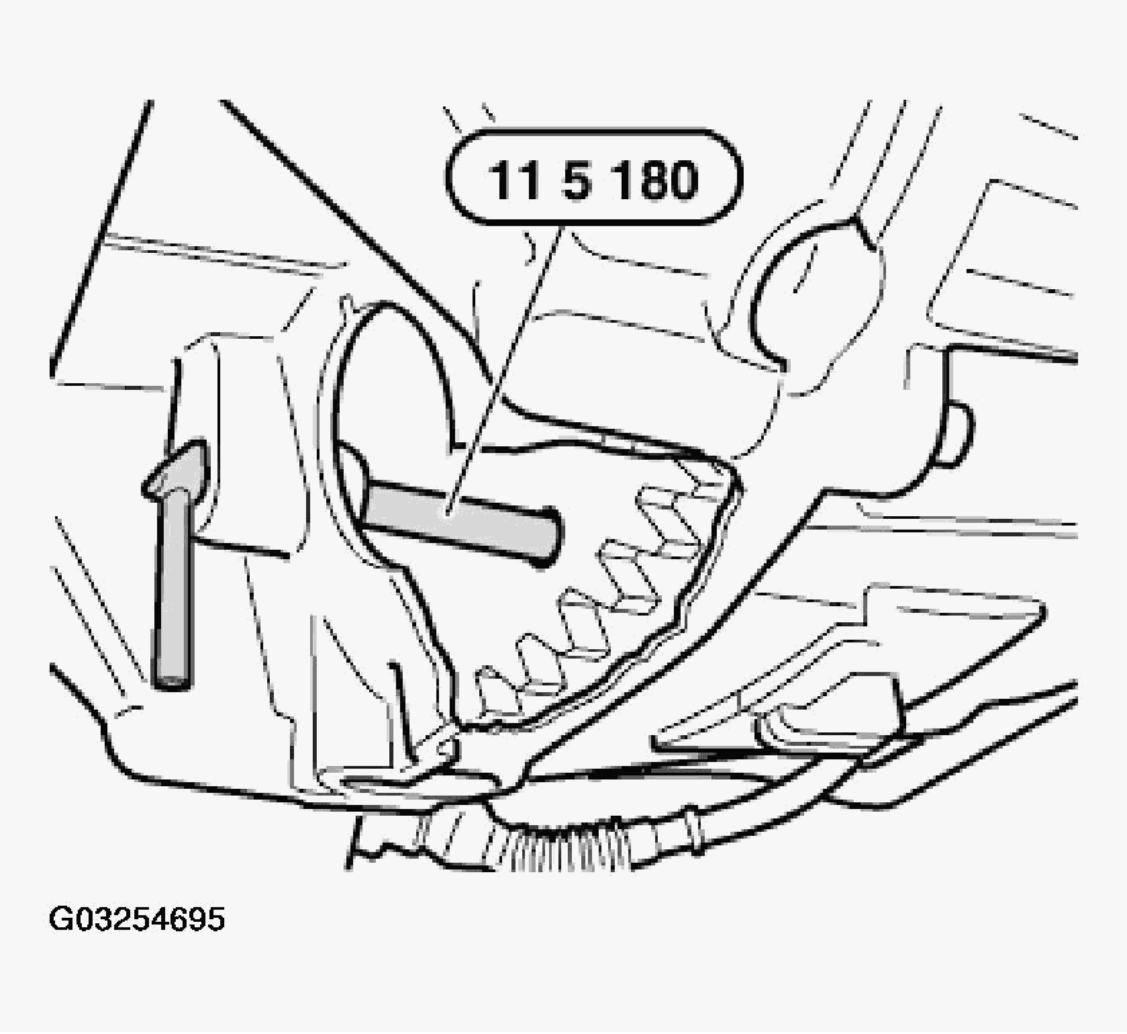


Fig. 260: Removing Special Tool 11 5 180
Courtesy of BMW OF NORTH AMERICA, INC.

11 31 011 REPLACING LEFT CAMSHAFTS (M62 VANOS FROM 9/98)

Special tools required:

NOTE: For Special Tool identification, see ENGINE - SPECIAL TOOLS - X5 (4.4L & 4.6L) .

- 11 2 300
- 11 2 442
- 11 2 443
- 11 2 444
- 11 2 446
- 11 5 180

Removal

Cylinder bank 5 to 8 (if necessary inlet or exhaust side).

Unscrew and remove splash guard.

Remove both cylinder head covers.

Remove all spark plugs.

Removal of camshafts is described separately from installation.

Remove chain tensioning piston. See **11 31 090 INSTALLING AND REMOVING/REPLACING PISTON FOR CHAIN TENSIONER (M62)** .

Remove timing case covers at top left and top right.

Remove left camshaft adjustment unit.

Remove distributor on left camshaft adjustment unit.

E53 (X5)

Pull special tool 11 5 180 back until flywheel is no longer secured in position.

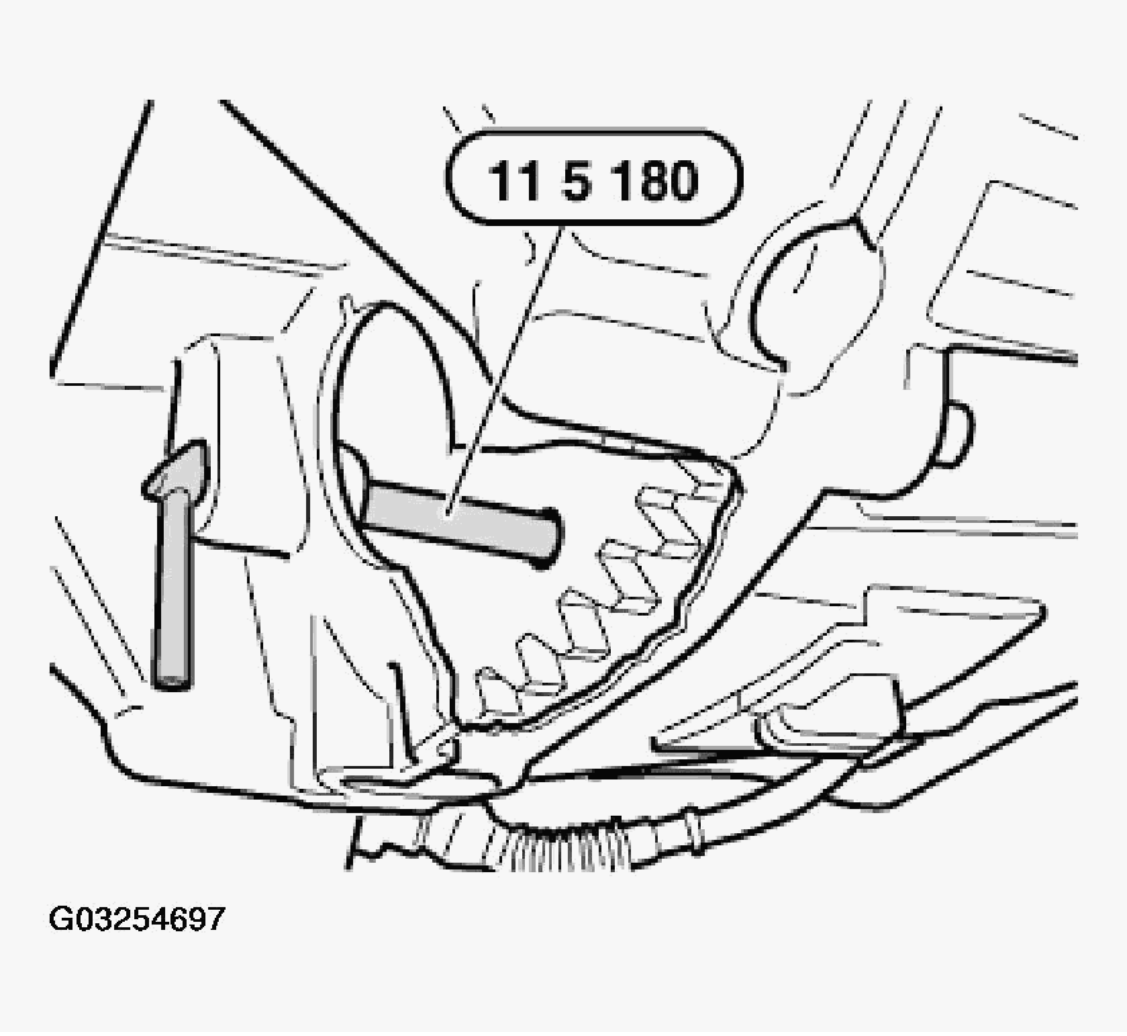


Fig. 261: Pulling Special Tool 11 5 180 For Securing Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

Lift timing chain and hold under tension.

NOTE: Note markings!

Crank engine against direction of rotation at central bolt into 45° before TDC position.

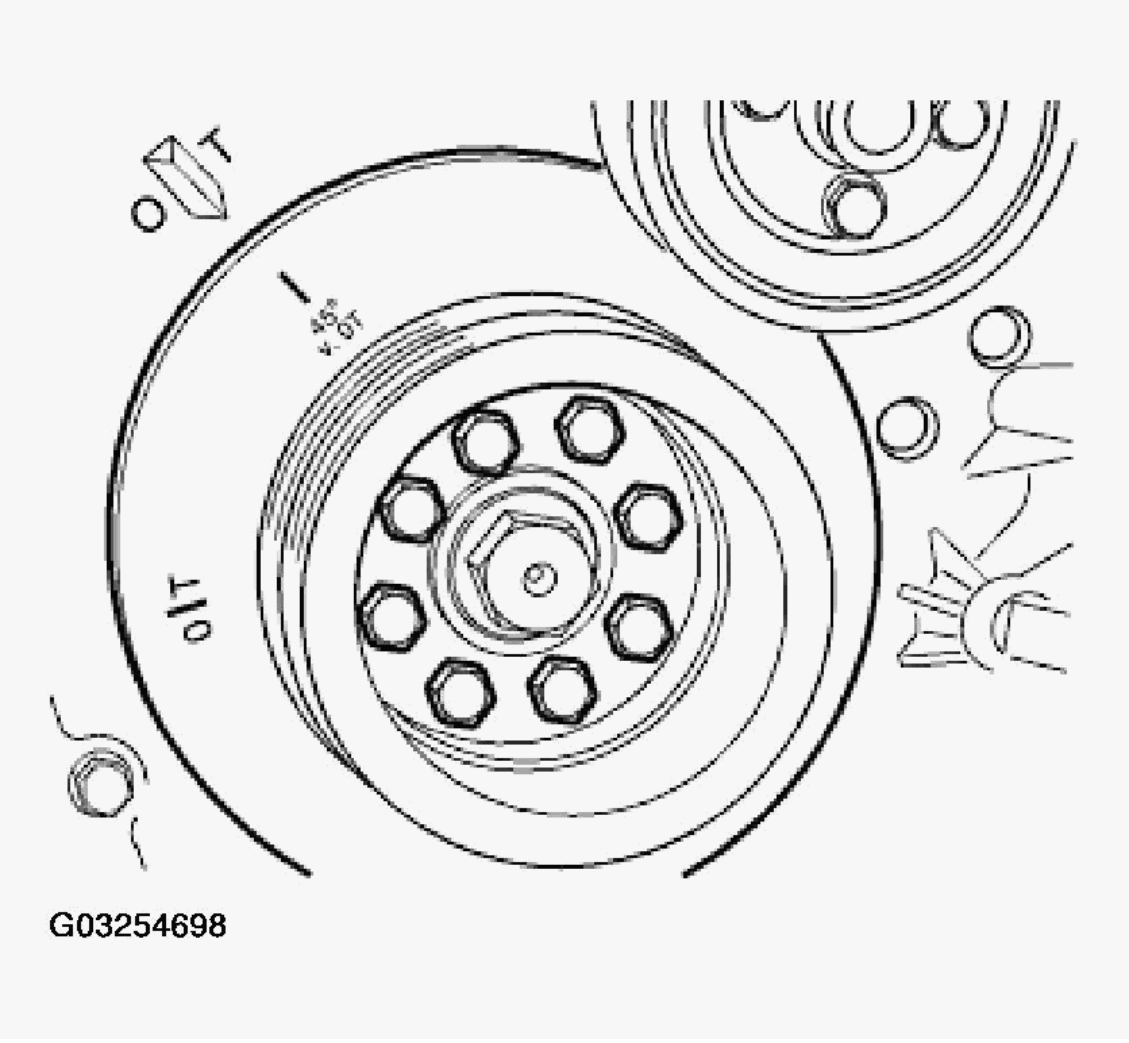


Fig. 262: Rotating Crankshaft To 45° BTDC
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/11 2 443/11 2 442/11 2 446.

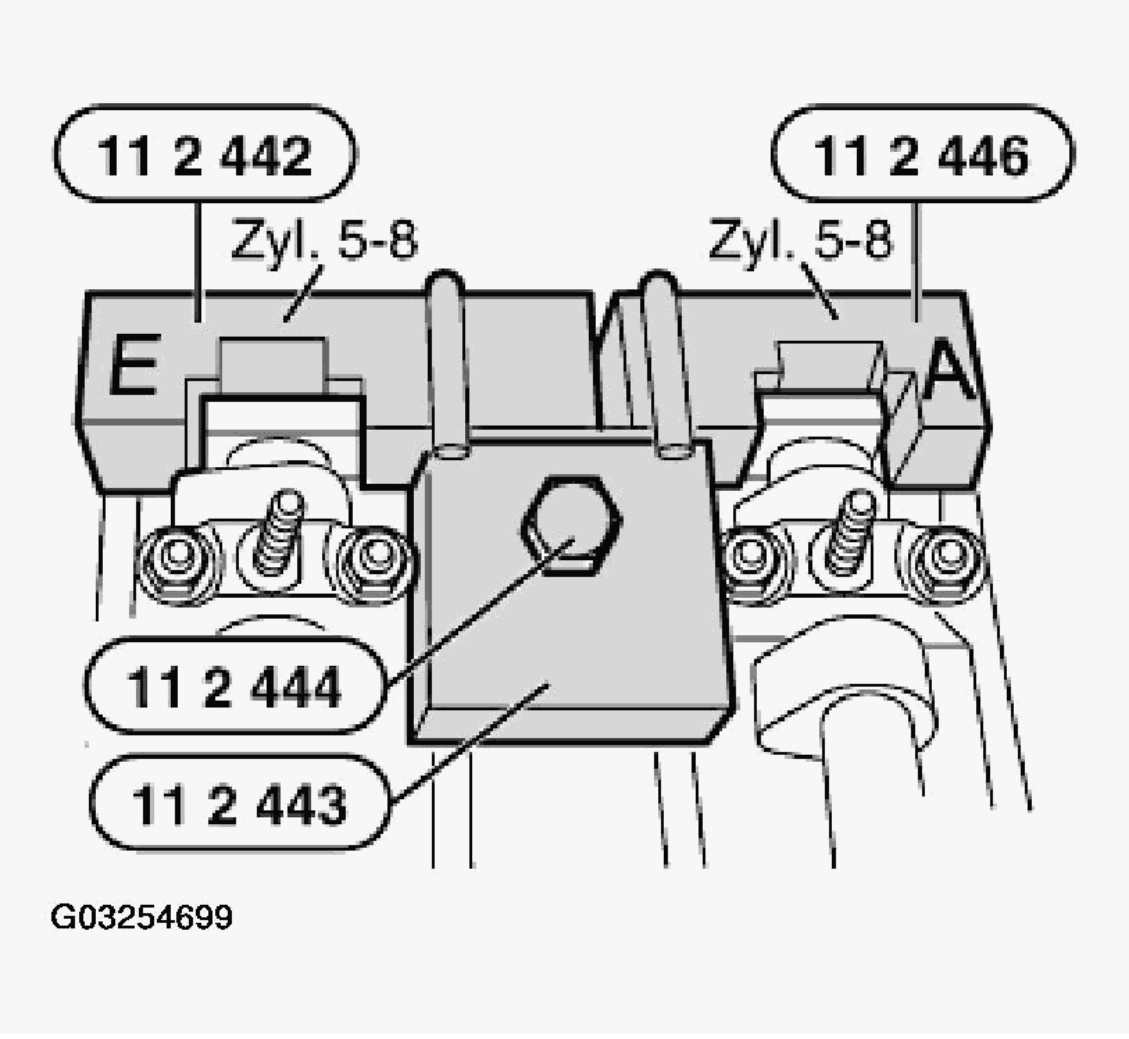


Fig. 263: Removing Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

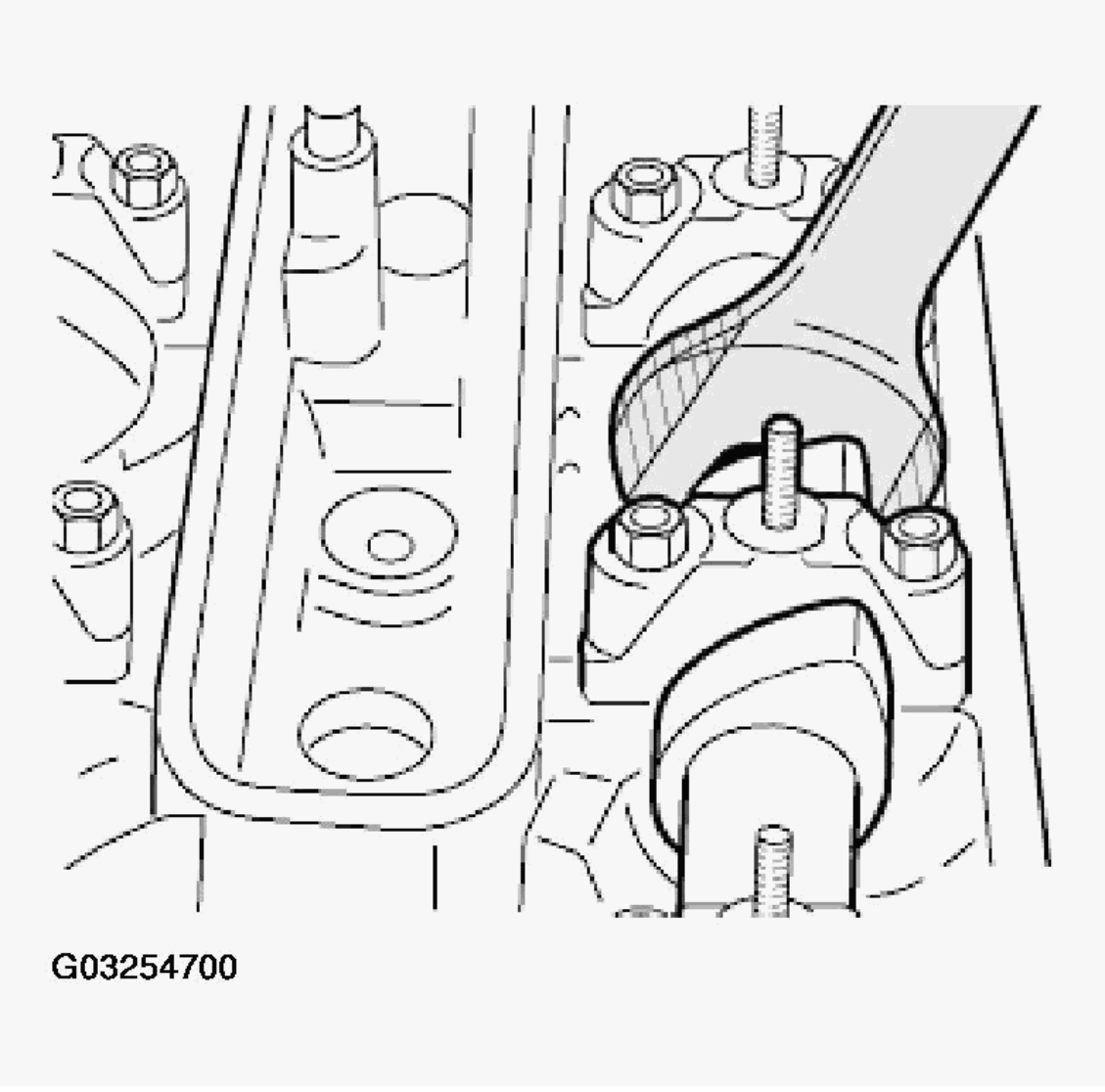


Fig. 264: Gripping Camshaft At Hexagon Head
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate exhaust camshaft at hexagon head until exhaust cam on cylinder 6 is facing upwards.

Rotate inlet camshaft at hexagon head until inlet cam on cylinder 8 is facing upwards.

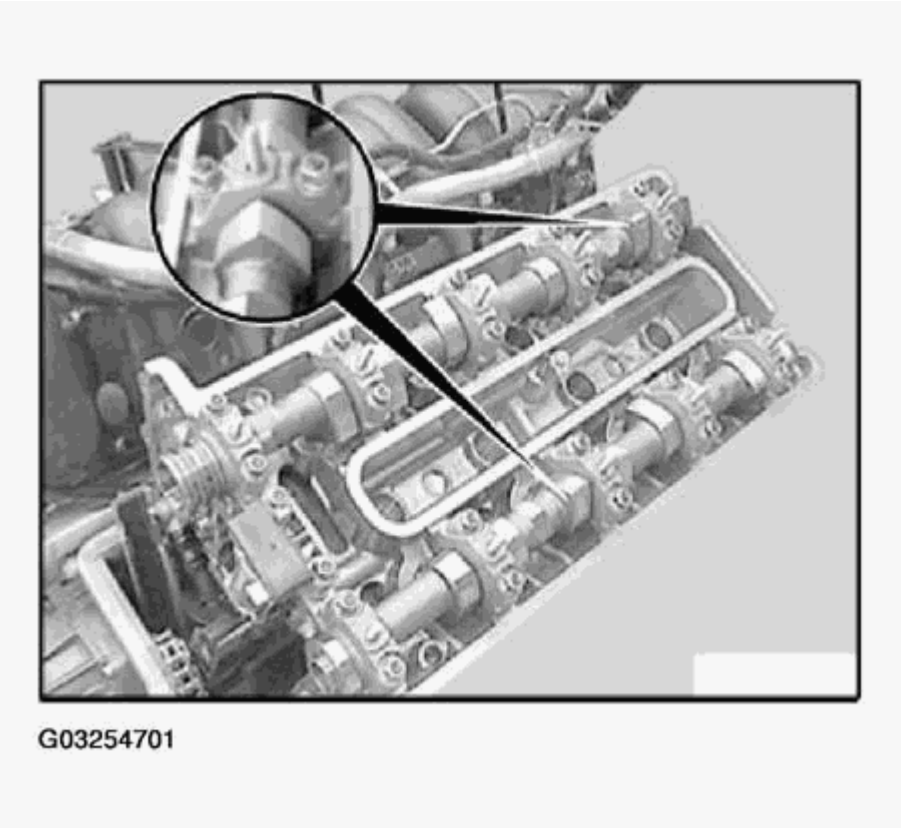


Fig. 265: Rotating Left Bank Camshafts To Removal Position
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The camshafts are now in the removal position.

Release bearing caps of exhaust and inlet camshafts on cylinder bank 5 to 8 in 1/2 turn increments uniformly from outside to inside.

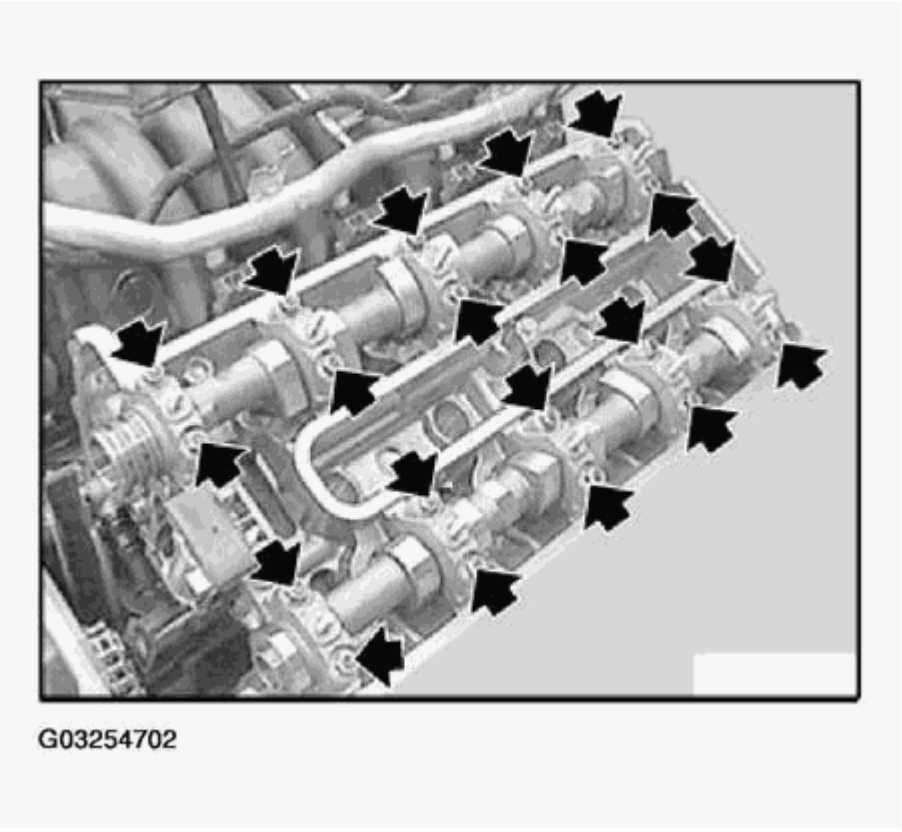


Fig. 266: Removing Bearing Caps Of Exhaust And Inlet Camshafts (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not mix up the camshaft bearing covers of cylinders 1 to 4 and 5 to 8.

Remove bearing covers on cylinder bank 5 to 8 and place to one side in order.

Lift out camshafts.

Installation

Installation of camshafts is described separately from removal.

Insert exhaust and inlet camshafts on cylinder bank 5 to 8.

Rotate exhaust camshaft until exhaust cam on cylinder 6 is facing upwards.

Rotate inlet camshaft until inlet cam on cylinder 8 is facing upwards.

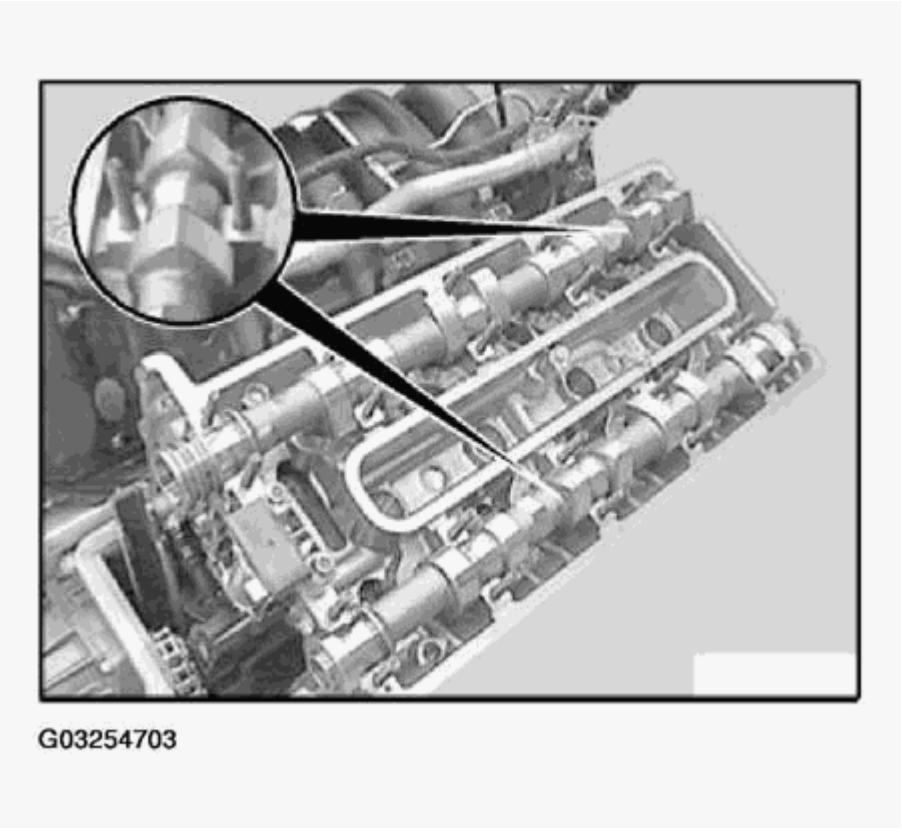


Fig. 267: Rotating Camshafts To Prescribed Positions
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not mix up the camshaft bearing covers of cylinders 1 to 4 and 5 to 8.

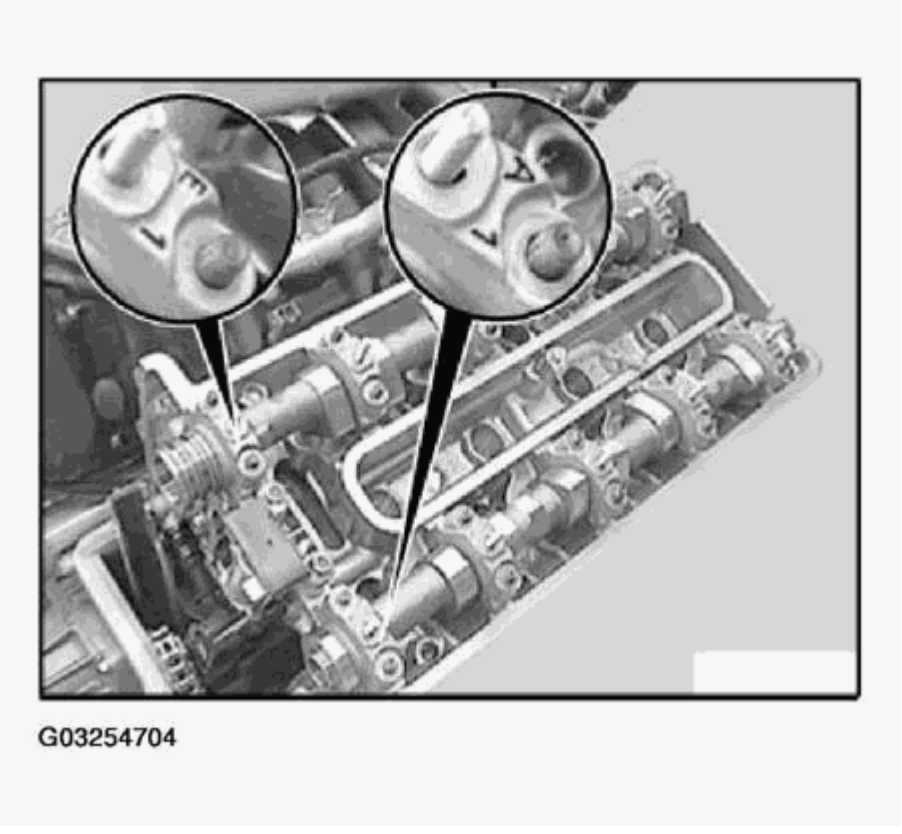


Fig. 268: Identifying Inlet And Exhaust Camshaft Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Fit bearing caps.

Exhaust camshaft bearing caps are marked A1 to A5 from inlet side.

Inlet camshaft bearing caps are marked E1 to E5 from inlet side.

Tighten down bearing caps of camshafts on cylinder bank 5 to 8 in 1/2 turn increments uniformly from inside to outside.

Tightening torque, see 11 31 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

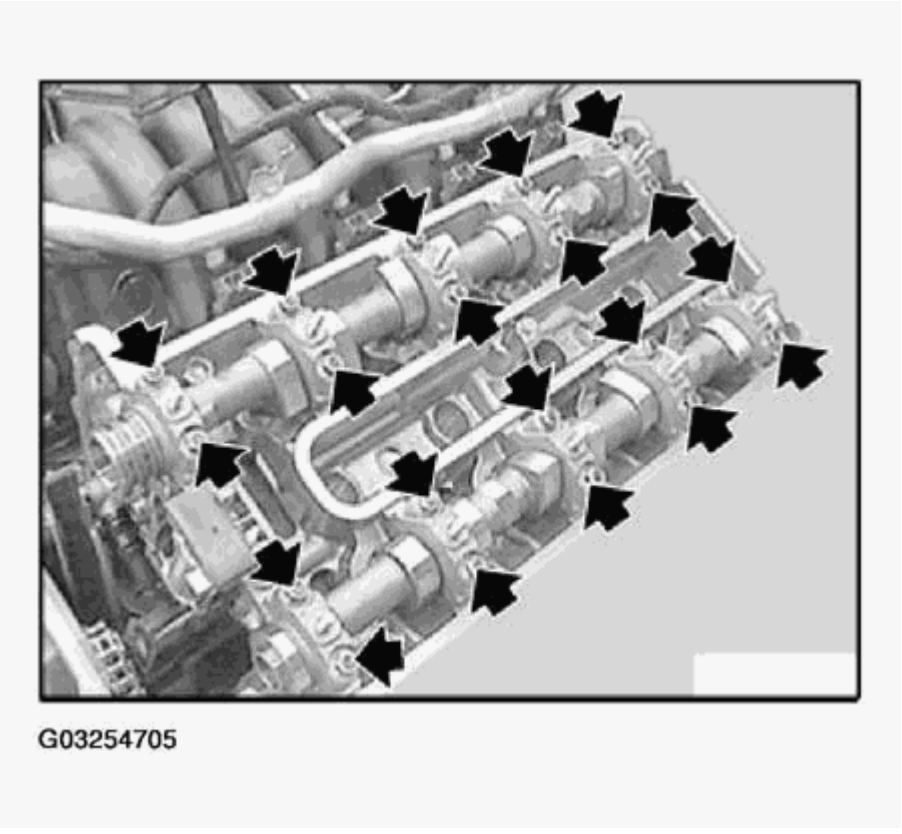


Fig. 269: Tightening Bearing Caps Of Camshafts (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate camshafts until camshaft designation points upwards.

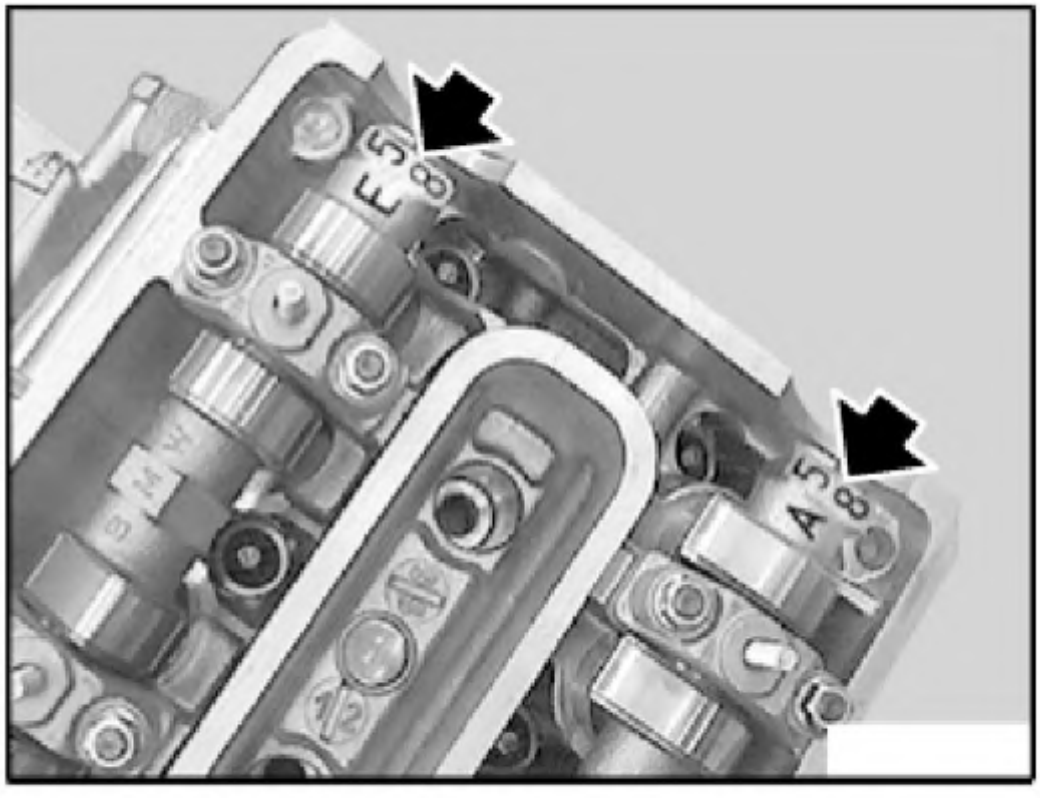


Fig. 270: Rotating Camshaft To Designation Points
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 446/11 2 442 to camshafts, cylinder bank 5 to 8.

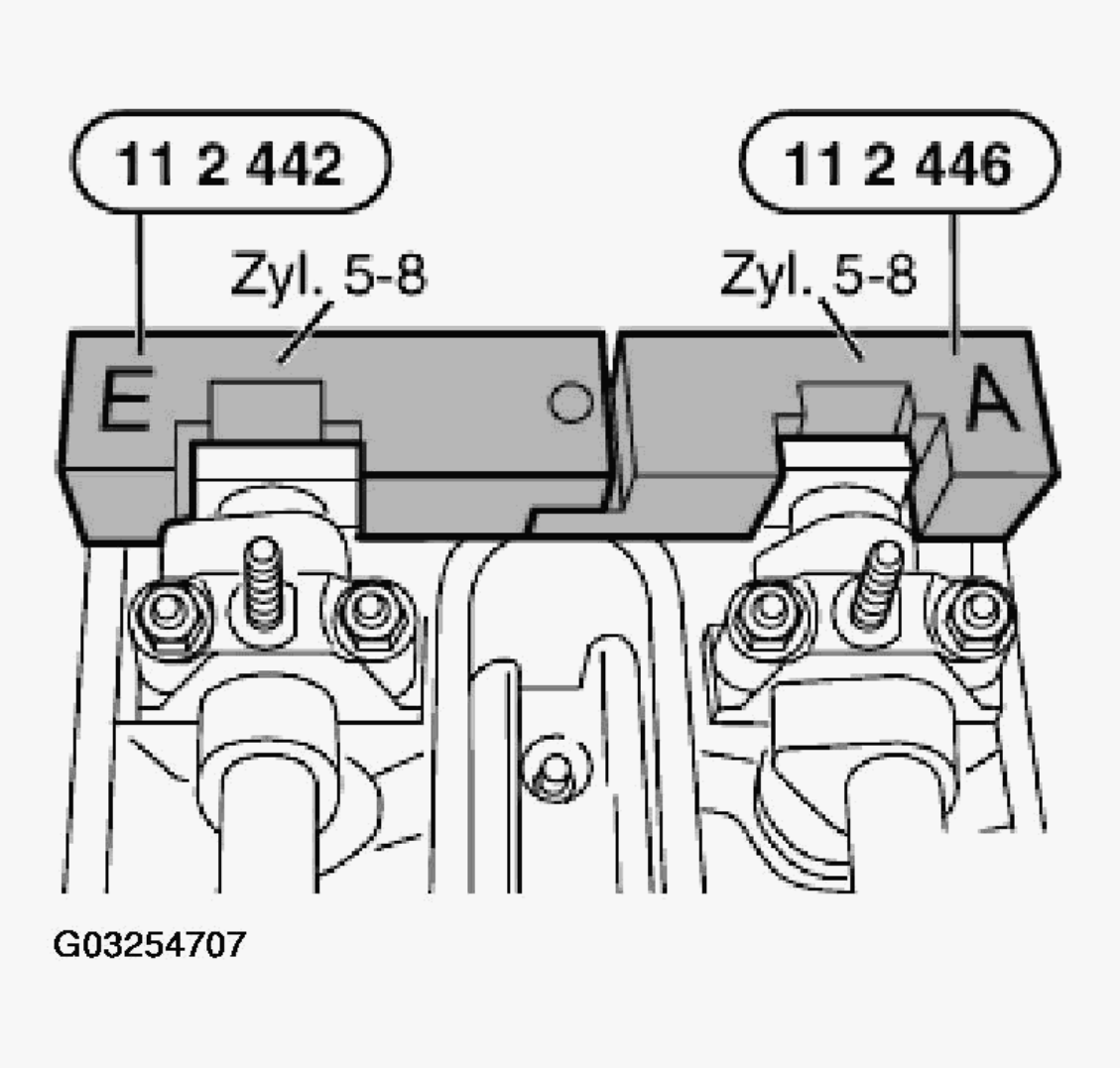


Fig. 271: Connecting Special Tool 11 2 446/11 2 442 To Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

Align inlet and exhaust camshafts with open-end wrench in such a way that special tools 11 2 446/11 2 442 rest without a gap on cylinder head.

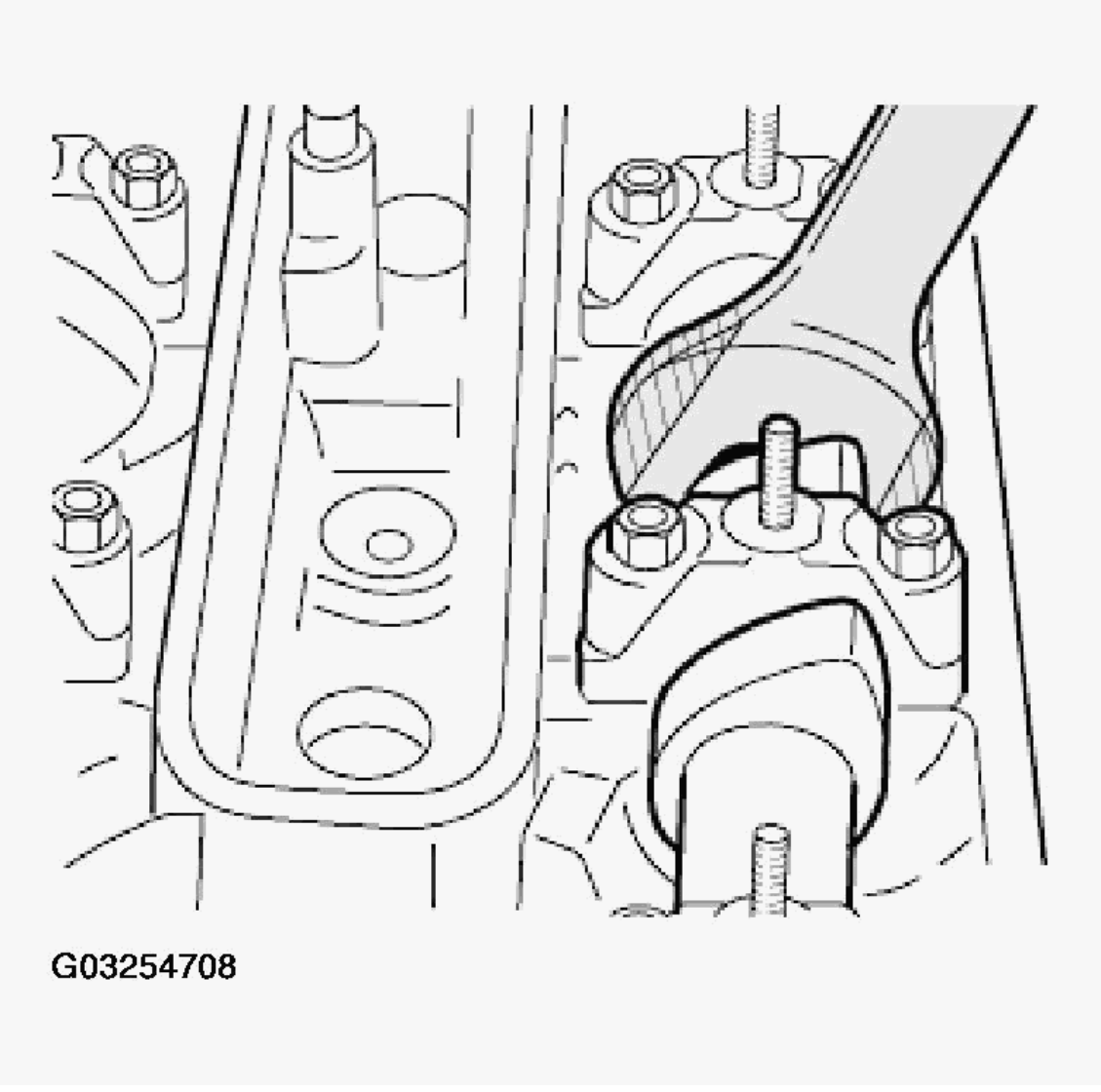


Fig. 272: Aligning Inlet And Exhaust Camshafts Using Open-End Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 443 to special tool 11 2 446/11 2 442 and secure with special tool 11 2 444 via spark plug thread.

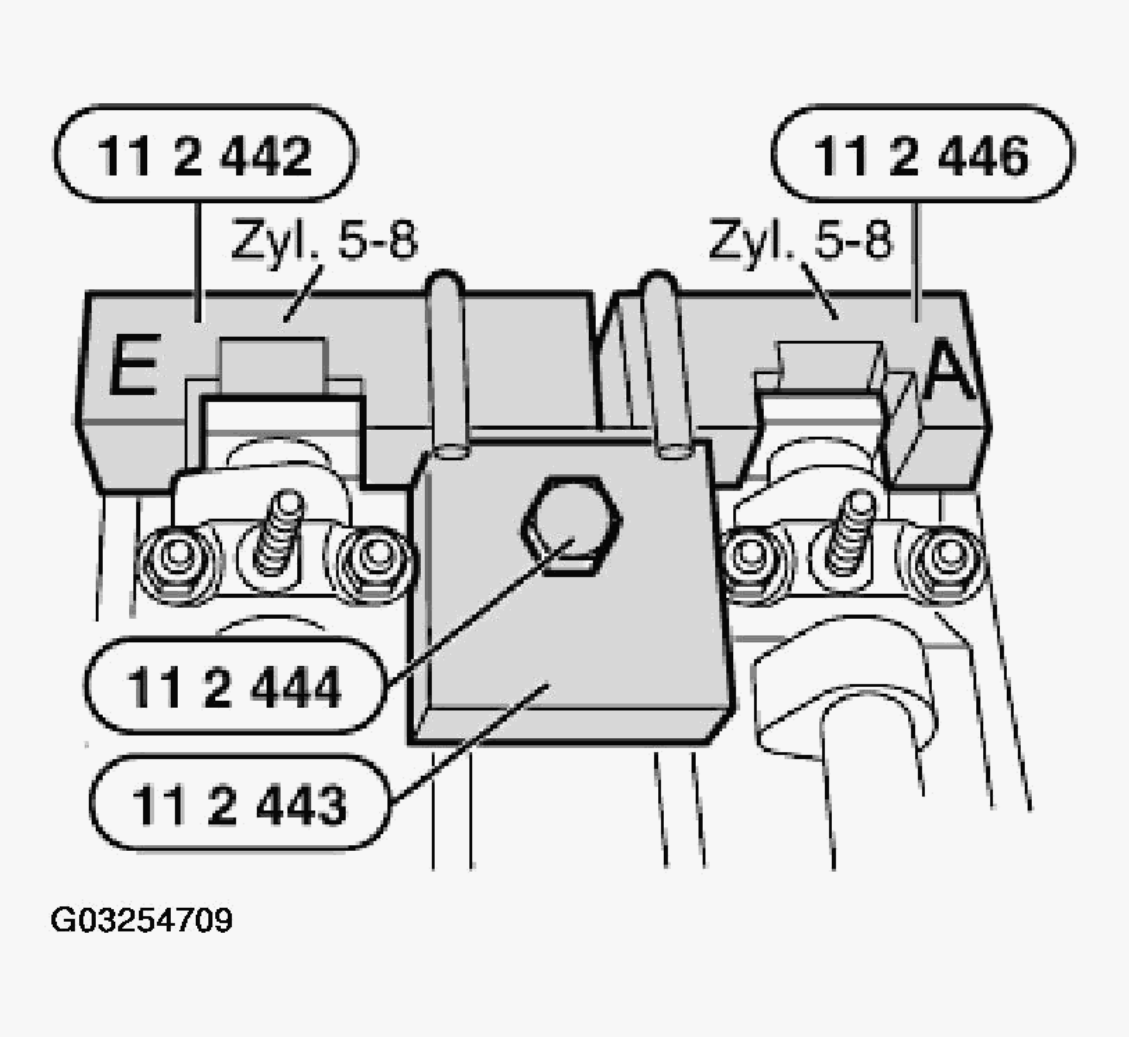


Fig. 273: Connecting Special Tool 11 2 443 To Special Tool 11 2 445/11 2 441
Courtesy of BMW OF NORTH AMERICA, INC.

E53 (X5)

Crank engine from 45° before TDC position in direction of rotation up to TDC position.

Hold crankshaft in TDC position with special tool 11 5 180.

CAUTION: Remove special tool 11 5 180 before starting engine.

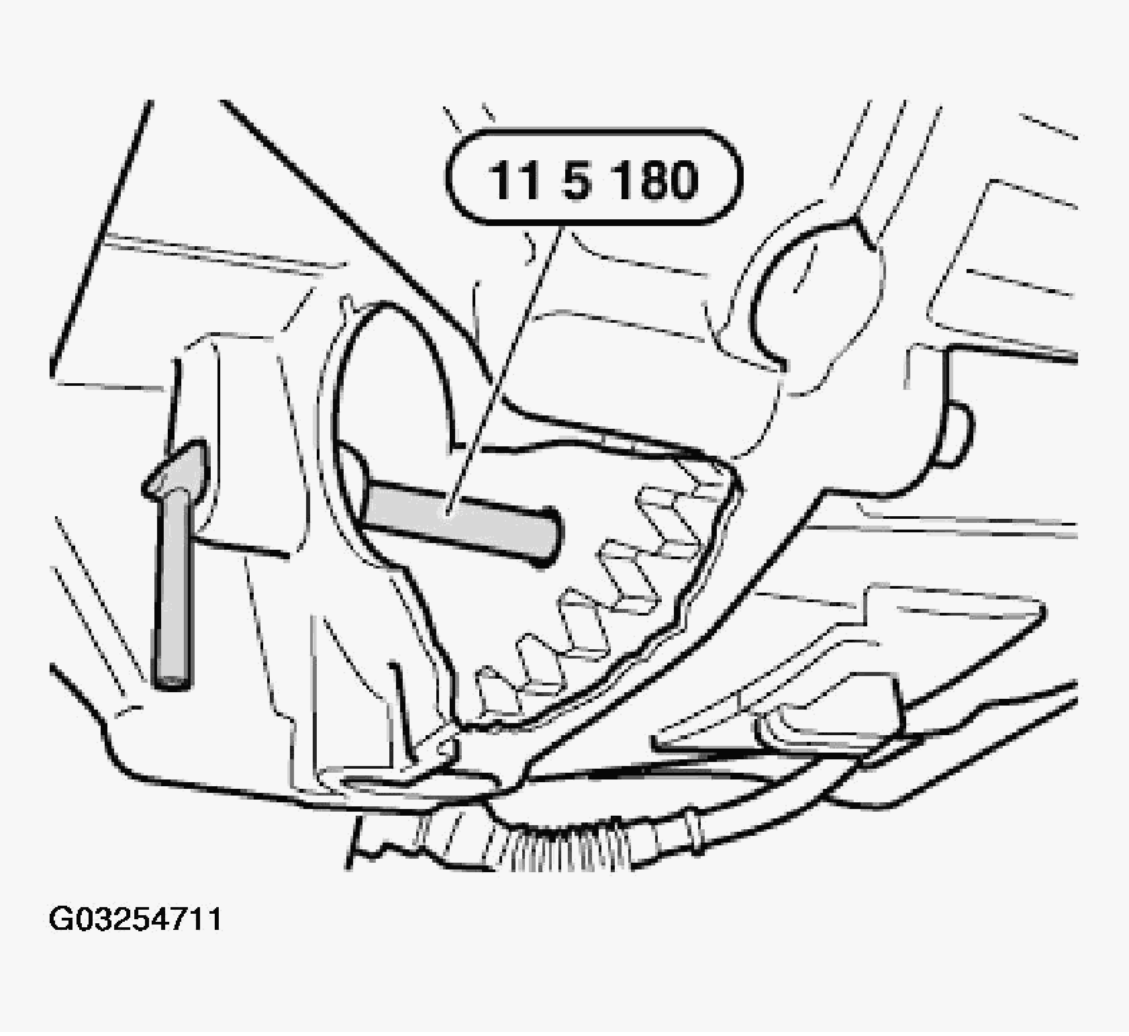


Fig. 274: Holding Crankshaft In TDC Position
Courtesy of BMW OF NORTH AMERICA, INC.

Install distributor on left camshaft adjustment unit.

Install left camshaft adjustment unit.

Install timing case covers at top left and top right.

Install chain tensioning piston.

Install both cylinder head covers.

Assemble engine.

11 31 015 REPLACING RIGHT CAMSHAFT (M62 VANOS FROM 9/98)

Special tools required:

NOTE: For Special Tool identification, see ENGINE - SPECIAL TOOLS - X5 (4.4L & 4.6L) .

- 11 2 300
- 11 2 441
- 11 2 443
- 11 2 444
- 11 2 445
- 11 5 180

Removal

Cylinder bank 1 to 4 (if necessary inlet or exhaust side).

Unscrew and remove splash guard.

Remove both cylinder head covers.

Remove all spark plugs.

Removal of camshafts is described separately from installation.

Remove chain tensioning piston. See **11 31 090 INSTALLING AND REMOVING/REPLACING PISTON FOR CHAIN TENSIONER (M62)** .

Remove timing case covers at top left and top right.

Remove right camshaft adjustment unit.

Remove distributor on right camshaft adjustment unit.

E53

Pull special tool 11 5 180 back until flywheel is no longer secured in position.

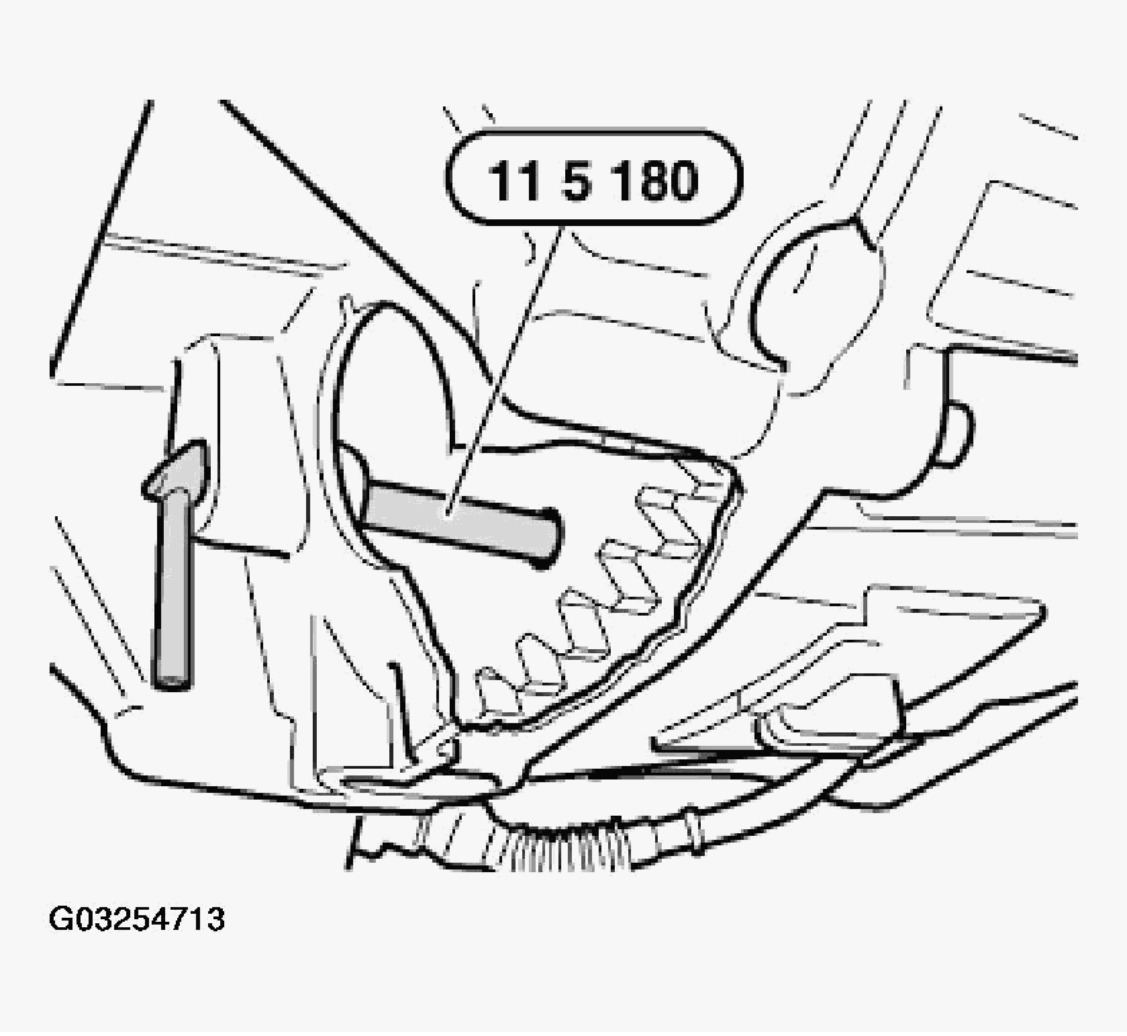


Fig. 275: Pulling Special Tool 11 5 180 For Securing Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

Lift timing chain and hold under tension.

NOTE: Note markings!

Crank engine against direction of rotation at central bolt into 45° before TDC position.

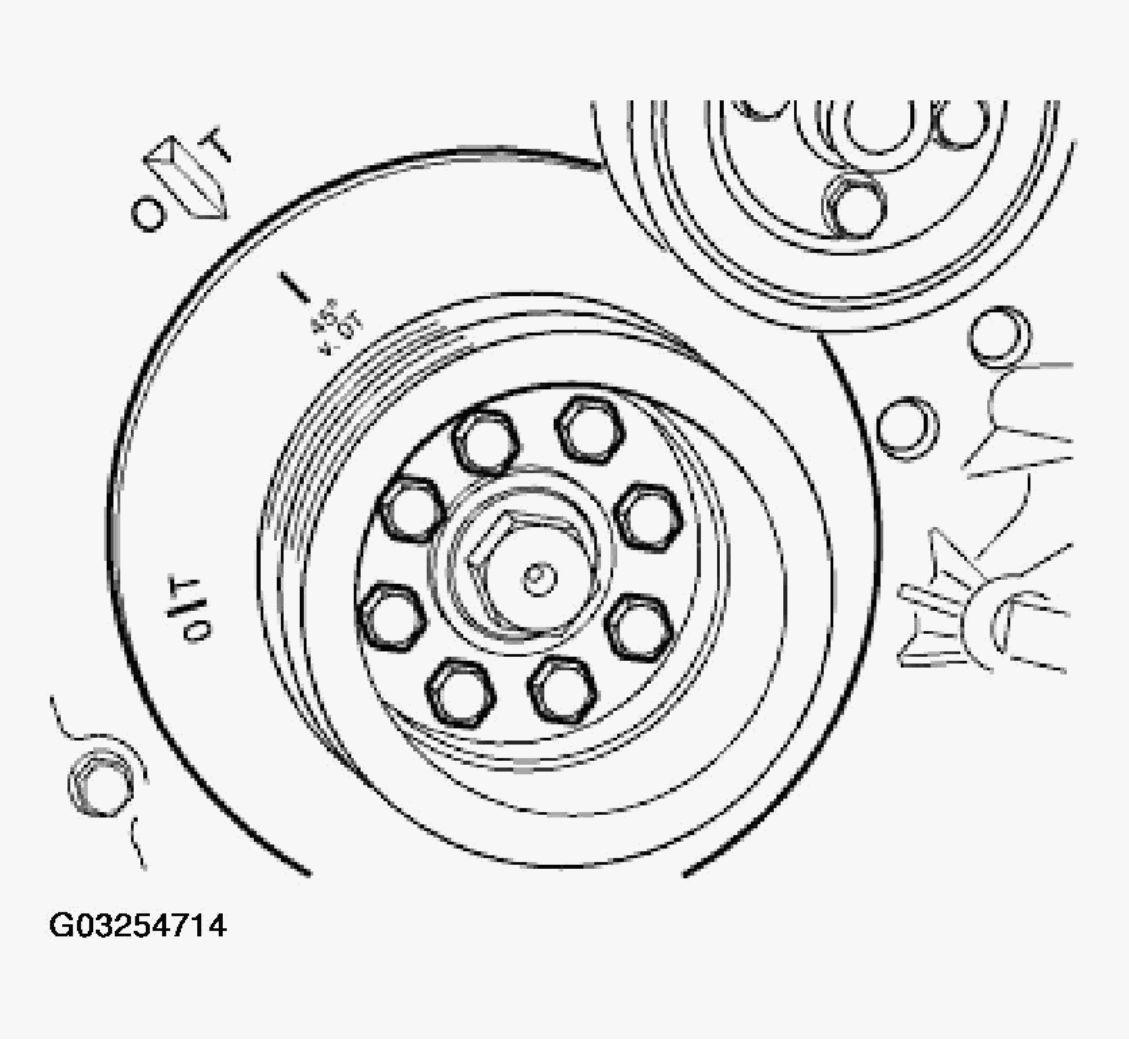


Fig. 276: Rotating Crankshaft To 45° BTDC
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Grip inlet camshaft 1 to 4 with open-end wrench when removing special tool 11 2 441.

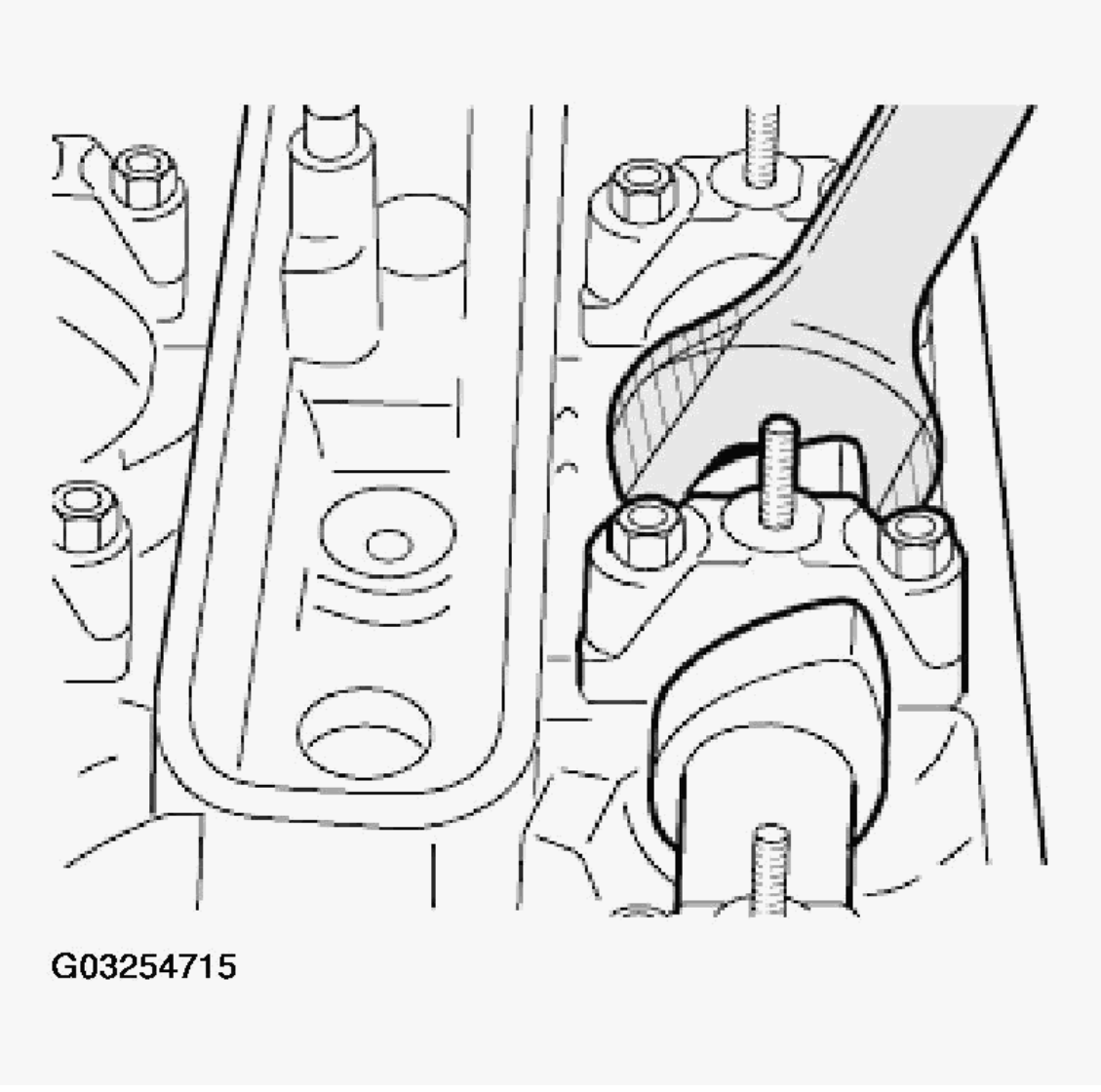


Fig. 277: Griping Inlet Camshaft With Open-End Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/11 2 443/11 2 441/112445.

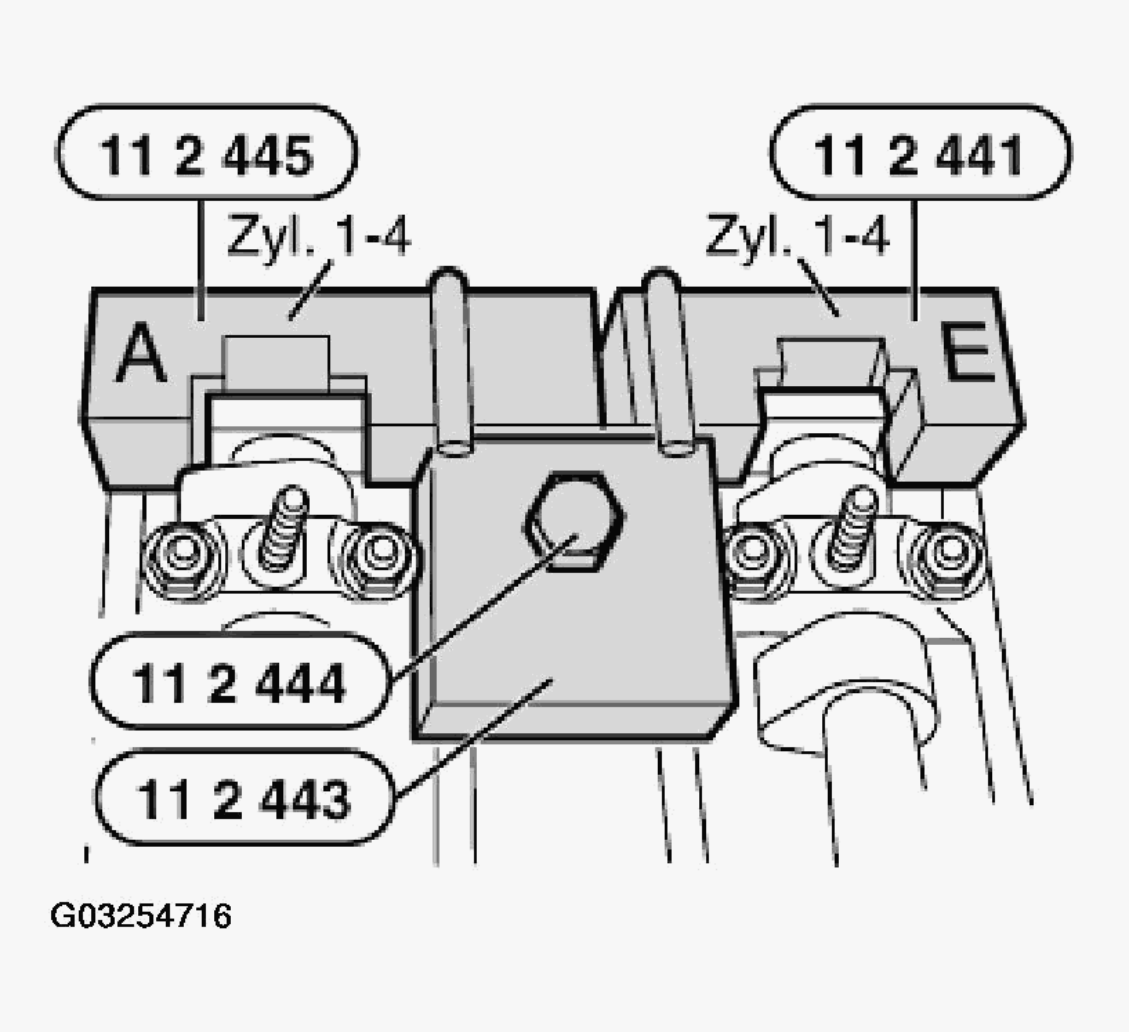


Fig. 278: Removing Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

Rotate exhaust camshaft at hexagon head until exhaust cam on cylinder 2 is facing upwards.

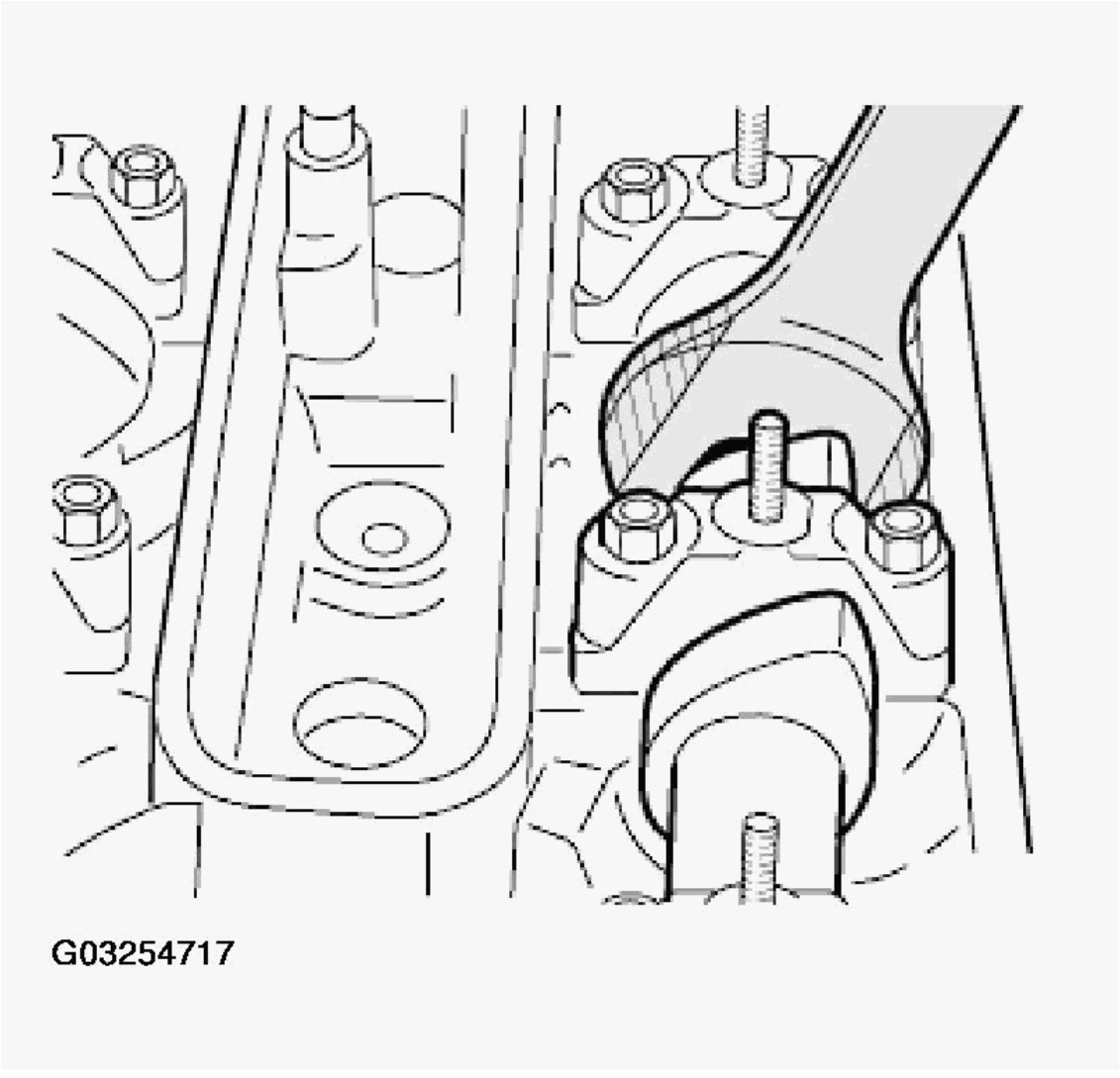


Fig. 279: Aligning Camshafts With An Open-End Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate inlet camshaft at hexagon head until inlet cam on cylinder 1 is facing upwards.

NOTE: The camshafts are now in the removal position.



Fig. 280: Rotating Right Bank Camshafts To Removal Position
Courtesy of BMW OF NORTH AMERICA, INC.

Release bearing caps of exhaust and inlet camshafts on cylinder bank 1 to 4 in 1/2 turn increments uniformly from outside to inside.

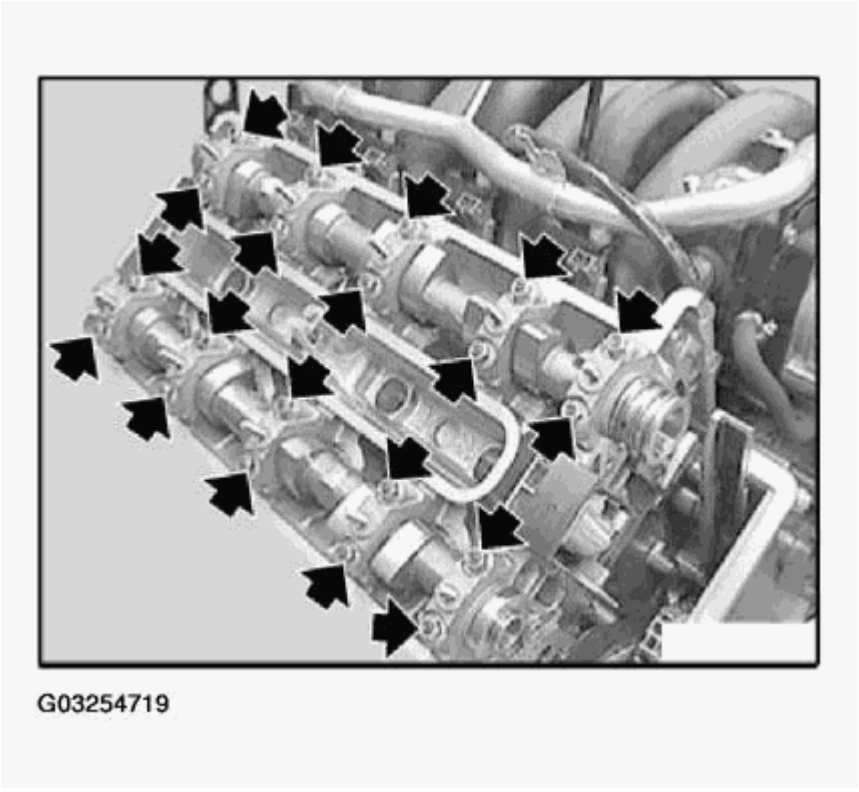


Fig. 281: Releasing Bearing Caps Bolts Of Exhaust And Inlet Camshafts (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not mix up the camshaft bearing covers of cylinders 1 to 4 and 5 to 8.

Remove bearing covers on cylinder bank 1 to 4 and place to one side in order.

Lift out camshafts.

Installation

Installation of camshafts is described separately from removal.

Insert exhaust and inlet camshafts on cylinder bank 1 to 4.

Rotate exhaust camshaft until exhaust cam on cylinder 2 is facing upwards.

Rotate inlet camshaft until inlet cam on cylinder 1 is facing upwards.

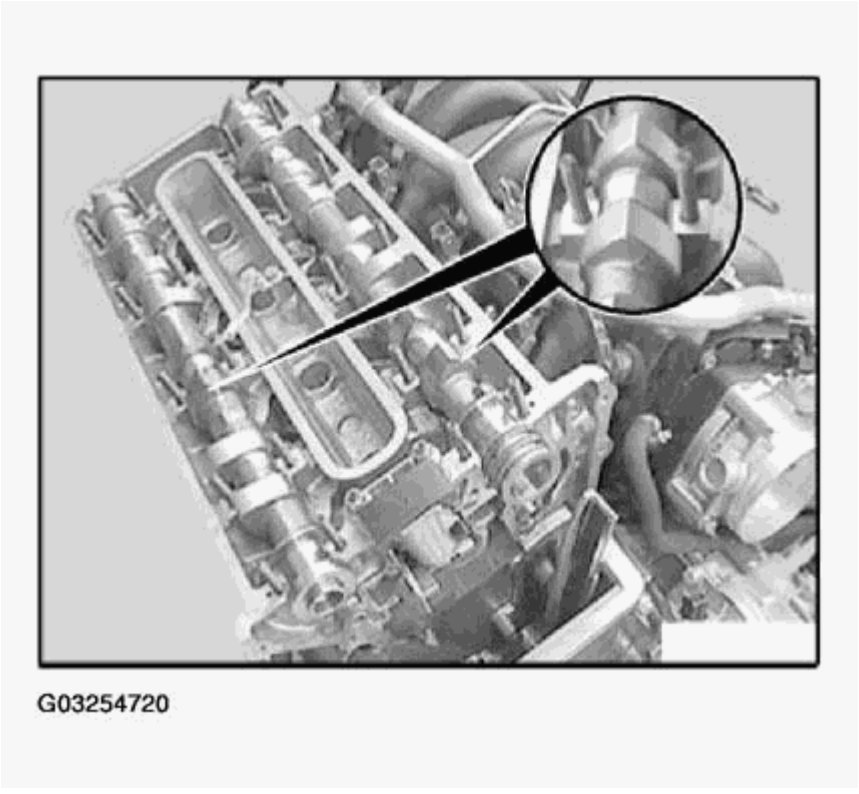


Fig. 282: Rotating Inlet And Exhaust Cams To Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not mix up the camshaft bearing covers of cylinders 1 to 4 and 5 to 8.

Fit bearing caps.

Exhaust camshaft bearing caps are marked A1 to A5 from inlet side.

Inlet camshaft bearing caps are marked E1 to E5 from inlet side.



Fig. 283: Identifying Inlet And Exhaust Cam Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down bearing caps of camshafts on cylinder bank 1 to 4 in 1/2 turn increments uniformly from inside to outside.

Tightening torque, see 11 31 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

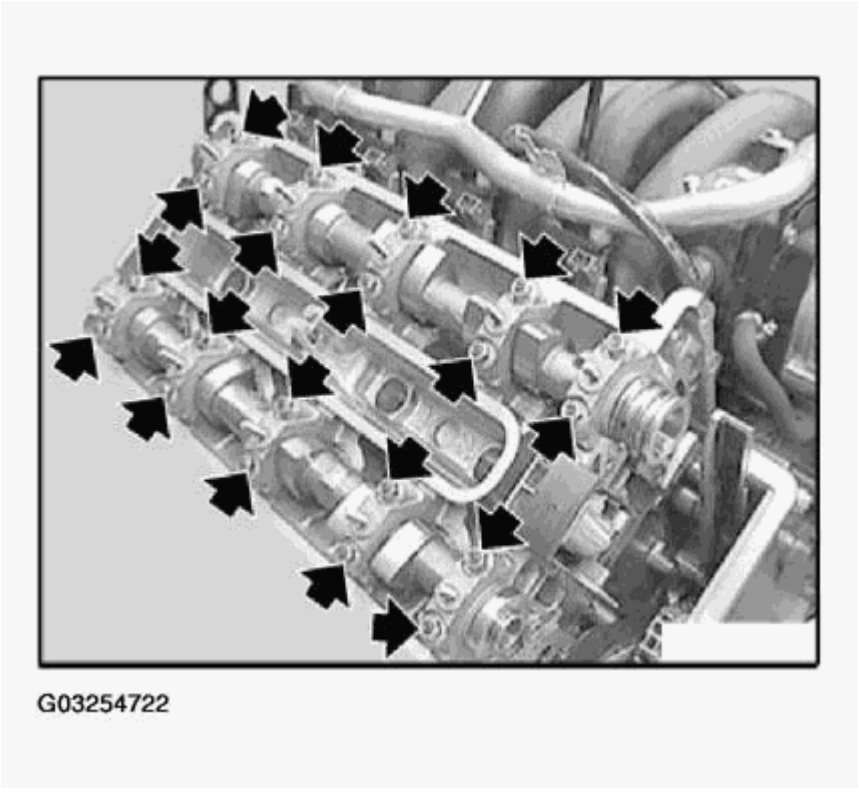


Fig. 284: Tightening Bearing Caps Of Camshafts (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate camshafts until camshaft designation points upwards.

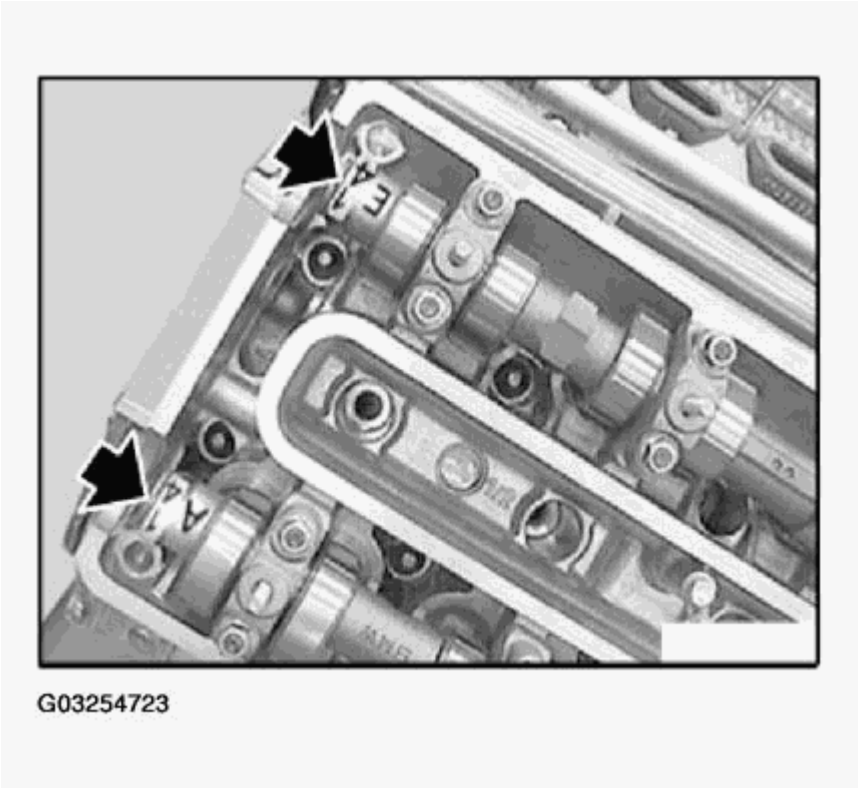


Fig. 285: Rotating Inlet And Exhaust Cams To Designation Points
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 445/11 2 441 to camshafts, cylinder bank 1 to 4.

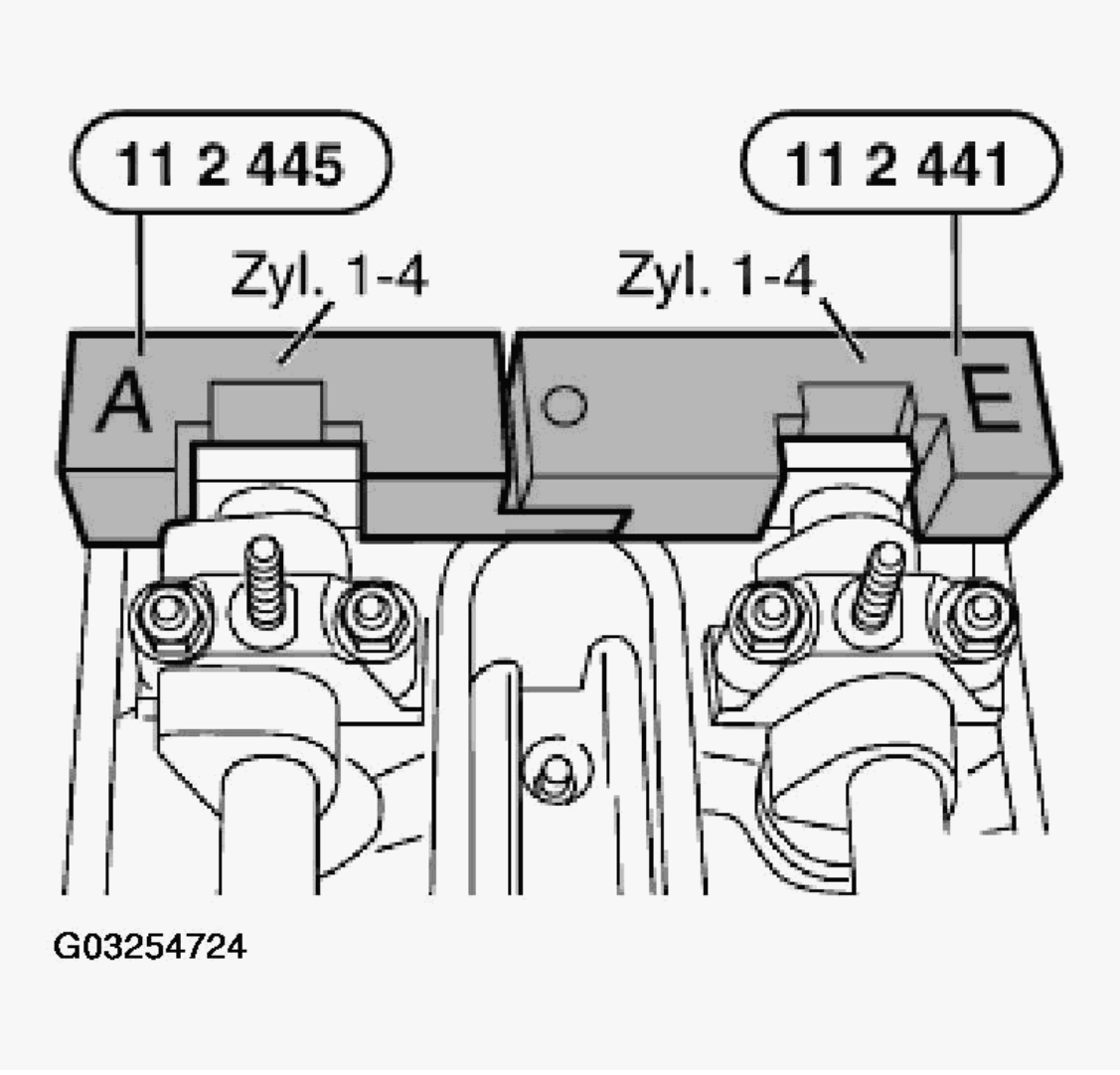


Fig. 286: Connecting Special Tool 11 2 445/11 2 441 To Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

Align inlet and exhaust camshafts with open-end wrench in such a way that special tools 11 2 445/11 2 441 rest without a gap on cylinder head.

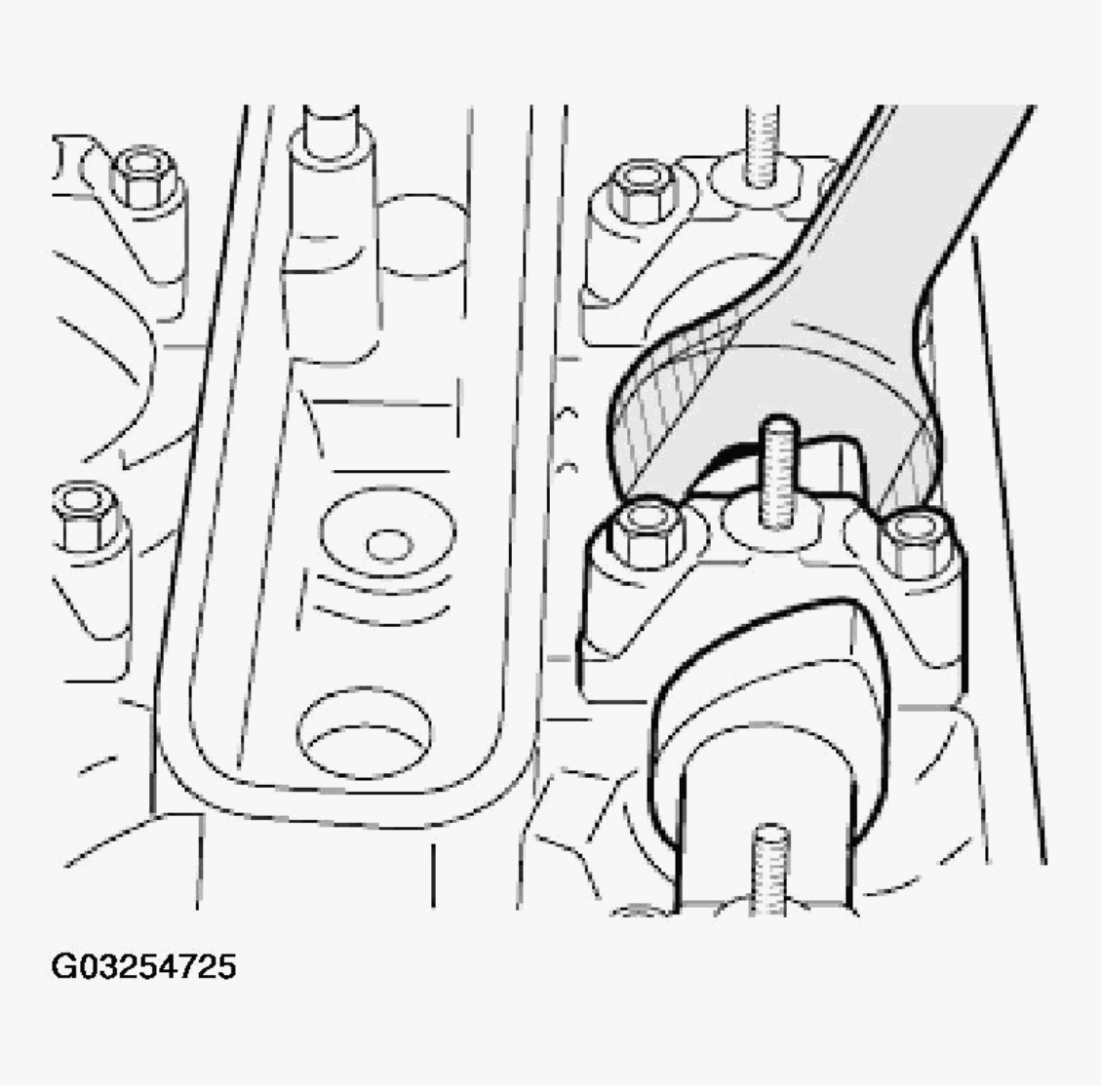


Fig. 287: Aligning Inlet And Exhaust Camshafts With Open-End Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 443 to special tool 11 2 445/11 2 441 and secure with special tool 11 2 444 via spark plug thread.

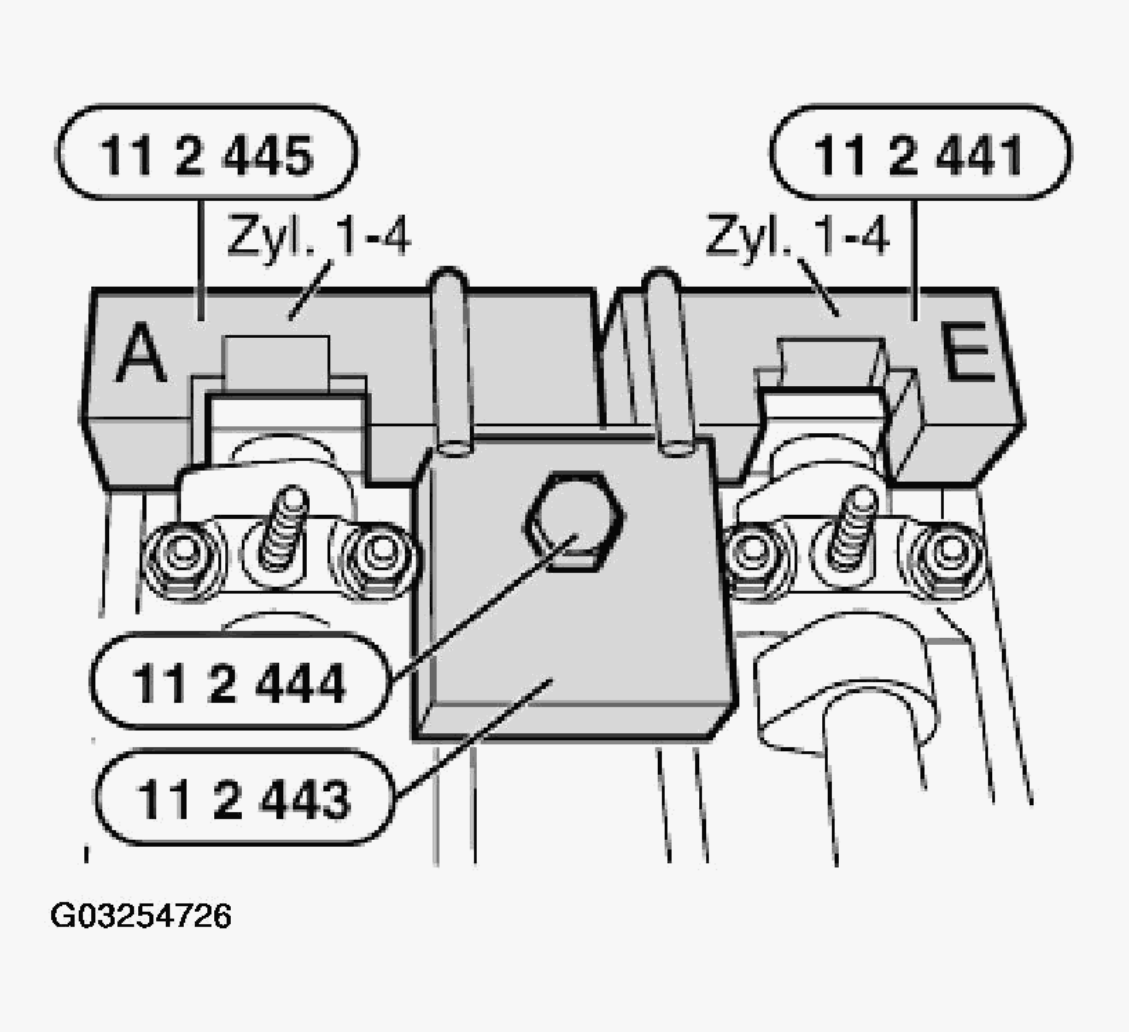


Fig. 288: Connecting Special Tool 11 2 443 To Special Tool 11 2 445/11 2 441
Courtesy of BMW OF NORTH AMERICA, INC.

E53 (X5)

Crank engine from 45° before TDC position in direction of rotation up to TDC position.

Hold crankshaft in TDC position with special tool 11 5 180.

CAUTION: Remove special tool 11 5 180 before starting engine.

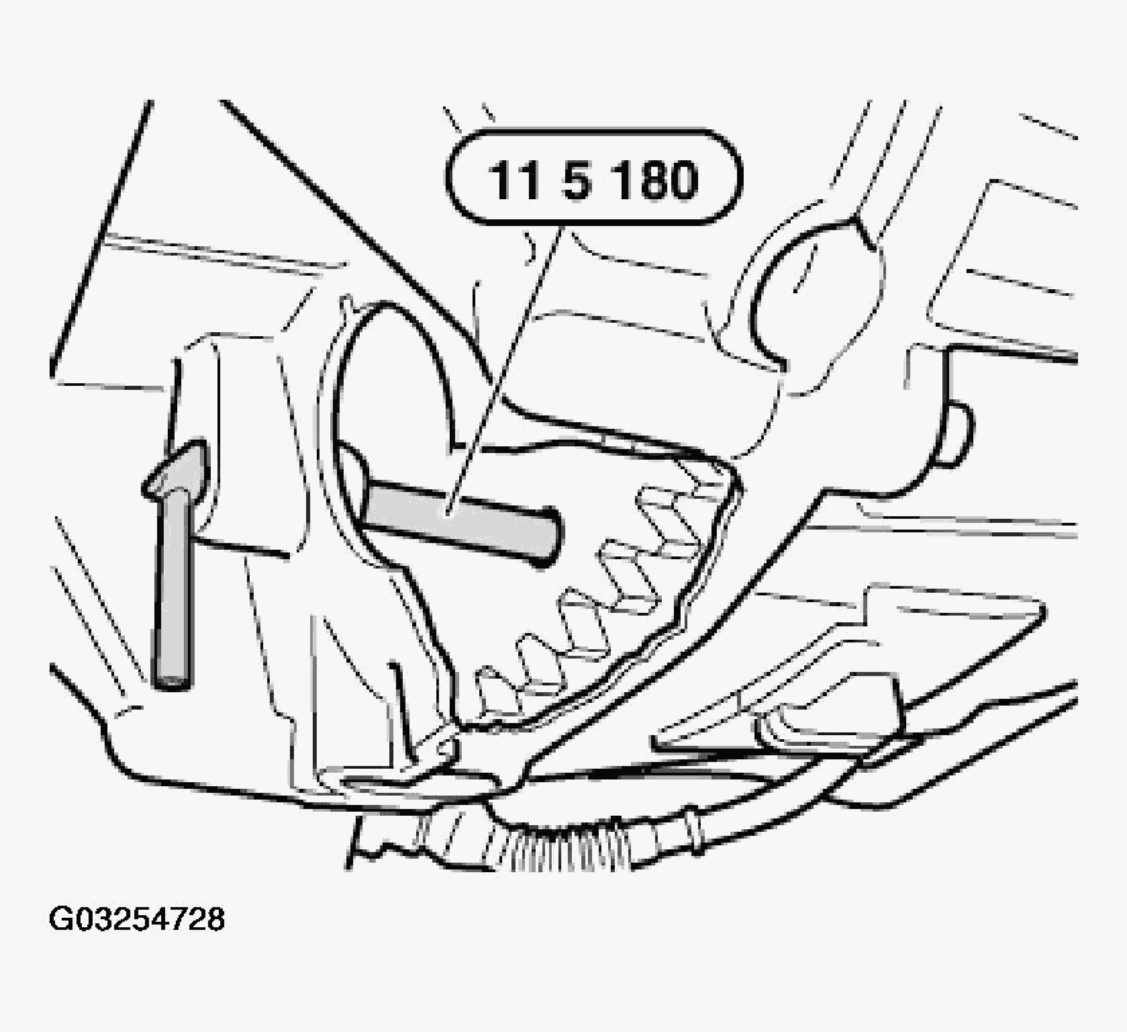


Fig. 289: Securing Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Install distributor on right camshaft adjustment unit.

Install right camshaft adjustment unit.

Install timing case covers at top left and top right.

Install chain tensioning piston. See **11 31 090 INSTALLING AND REMOVING/REPLACING PISTON FOR CHAIN TENSIONER (M62)** .

Install both cylinder head covers.

Assemble engine.

11 31 051 REPLACING TIMING CHAIN (M62 VANOS FROM 9/98)

Special tools required:

NOTE: For Special Tool identification, see ENGINE - SPECIAL TOOLS - X5 (4.4L & 4.6L) .

- 00 9 250
- 11 2 300
- 11 2 441
- 11 2 442
- 11 2 443
- 11 2 444
- 11 2 445
- 11 2 446
- 11 4 230
- 11 4 231
- 11 4 232
- 11 5 180
- 11 6 450
- 11 6 451
- 11 6 452
- 11 7 380

Removal

Removal of timing chain is described separately from installation. Assembly sequence for removal and installation is different.

Remove spark plugs.

Remove both cylinder head covers.

CAUTION: In firing TDC position, the inlet camshaft 1 to 4 rotates in the teeth of the camshaft adjustment unit. This twisting is caused by the position of the cams and is not an indication for incorrect timing.

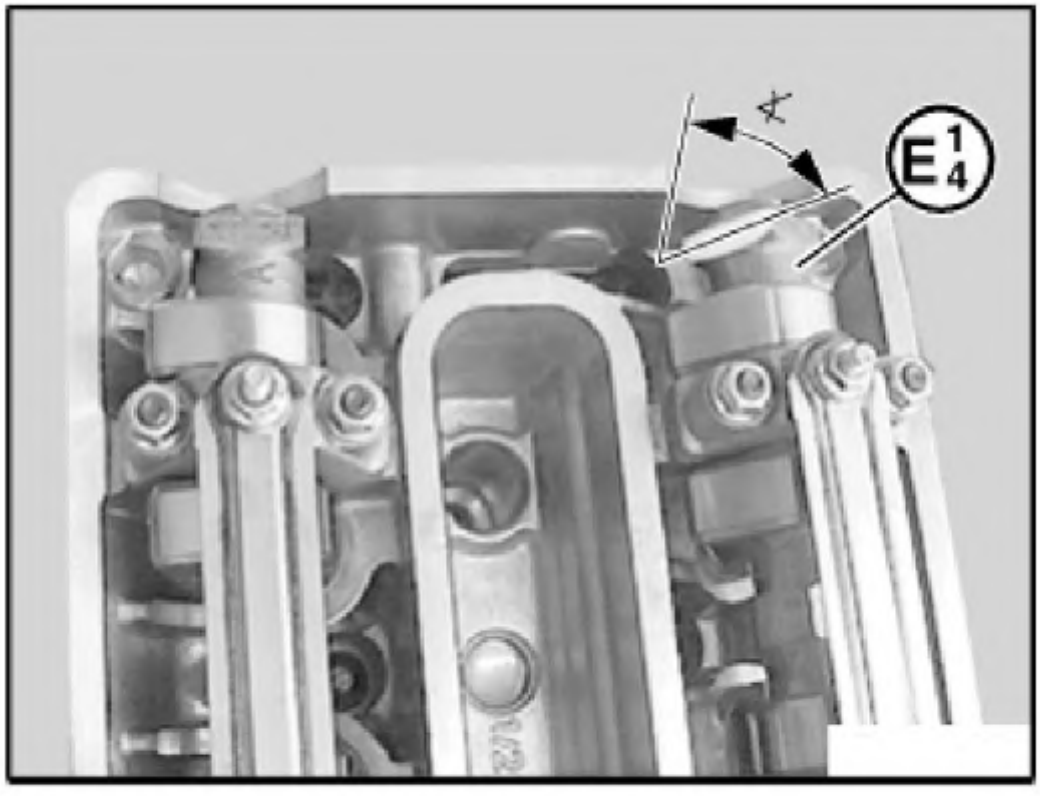


Fig. 290: Identifying Inlet Camshaft Rotation
Courtesy of BMW OF NORTH AMERICA, INC.

Remove oil lines on left and right of cylinder head.

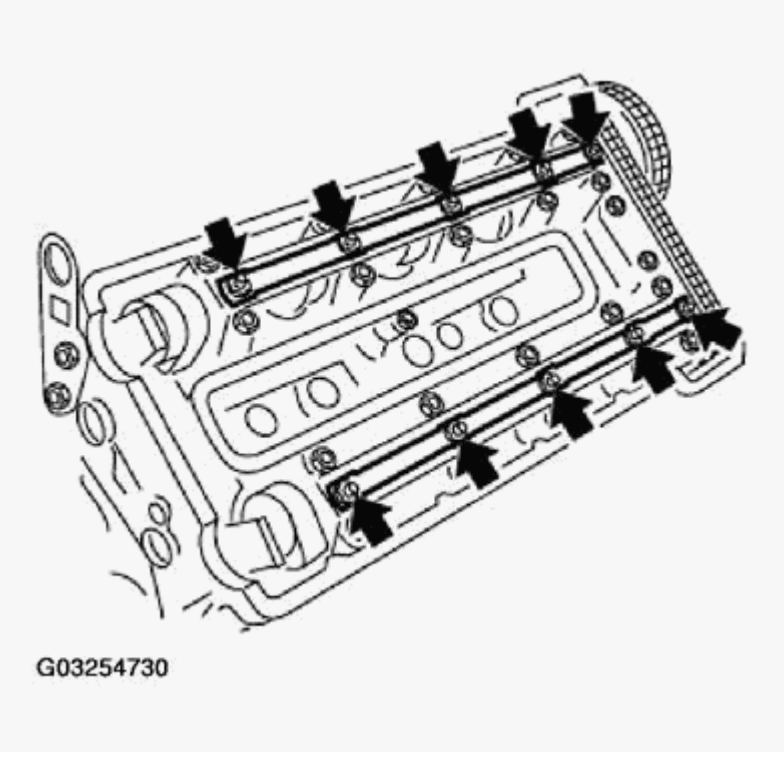


Fig. 291: Removing Oil Lines On Left And Right Of Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Remove vibration damper,

refer to **11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (M62)** .

Rotate engine at slackened central bolt in direction of rotation until the first cylinder is in TDC firing position.

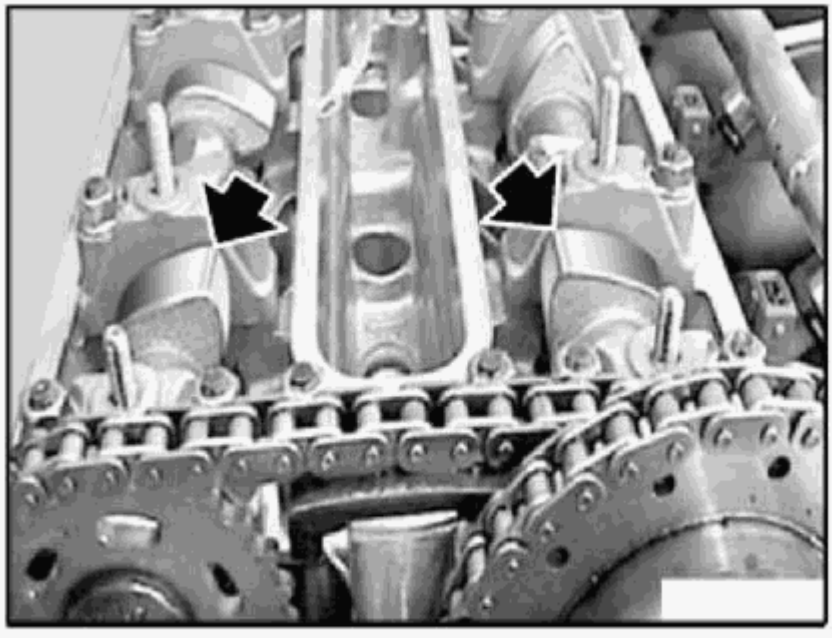


Fig. 292: Rotating Cam To Prescribed Position
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: When the first cylinder is in TDC firing position, the camshaft markings face upwards.

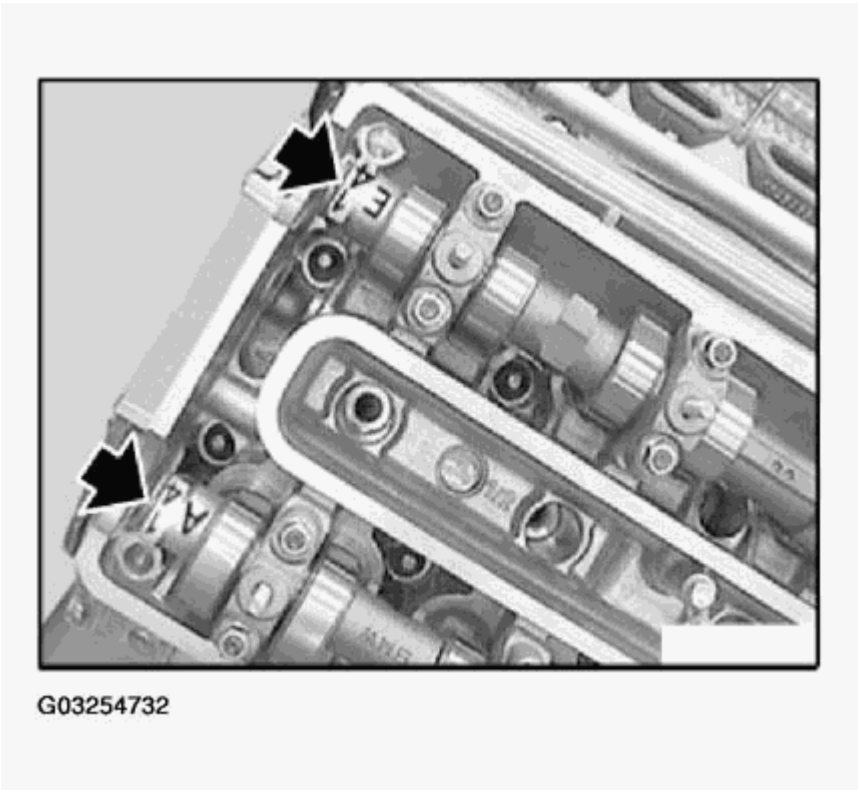


Fig. 293: Identifying Camshaft In TDC Position
Courtesy of BMW OF NORTH AMERICA, INC.

E53

Secure crankshaft in TDC position with special tool 11 5 180.

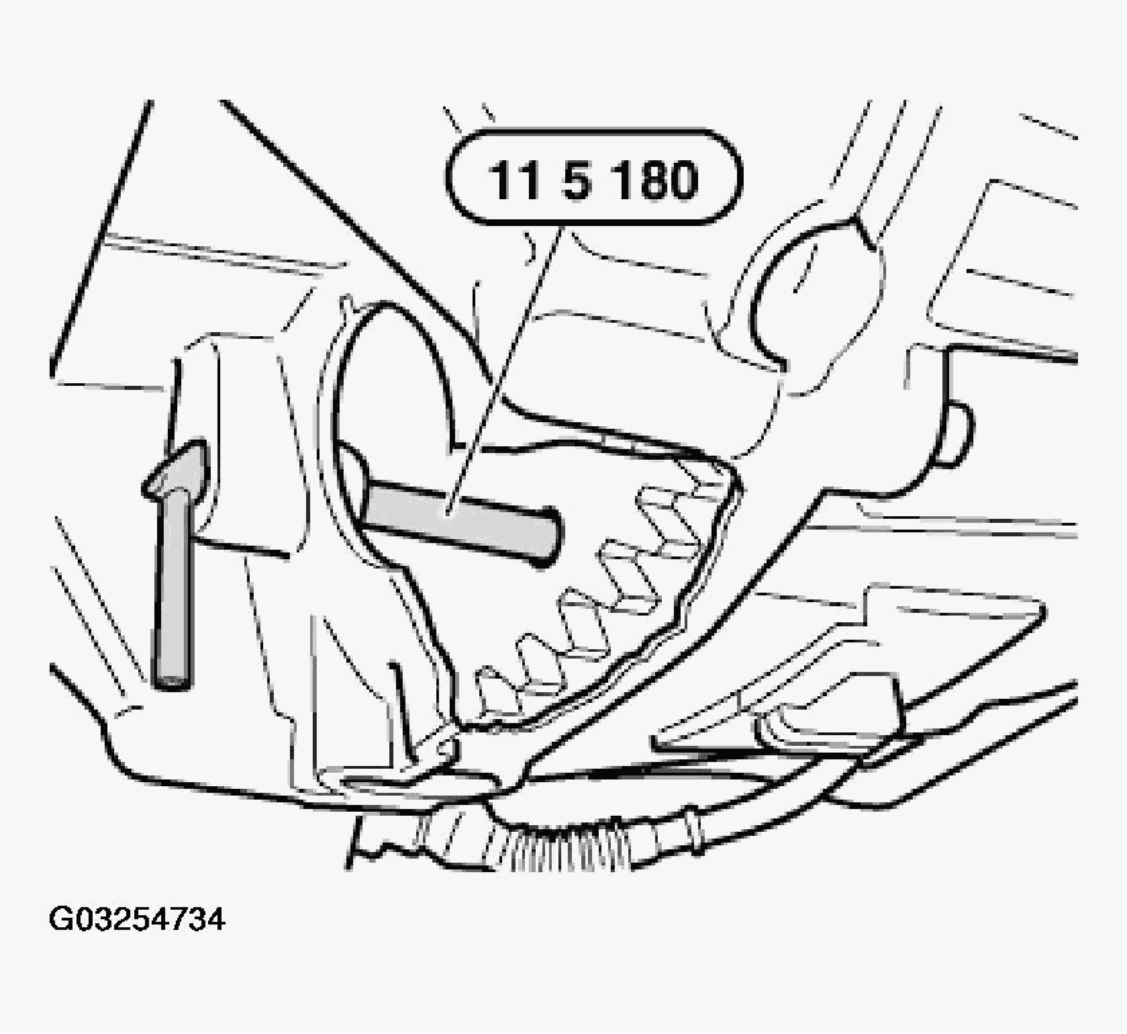


Fig. 294: Securing Crankshaft In TDC Position
Courtesy of BMW OF NORTH AMERICA, INC.

Remove chain tensioning piston. See **11 31 090 INSTALLING AND REMOVING/REPLACING PISTON FOR CHAIN TENSIONER (M62)** .

Remove both timing case covers at top. See **11 14 080 REMOVING AND INSTALLING TIMING CASE COVER, TOP LEFT (M62 VANOS FROM 9/98)** and **11 14 085 REMOVING AND INSTALLING TIMING CASE COVER, TOP RIGHT (M62 VANOS FROM 9/98)** .

CAUTION: Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 1 to 4.

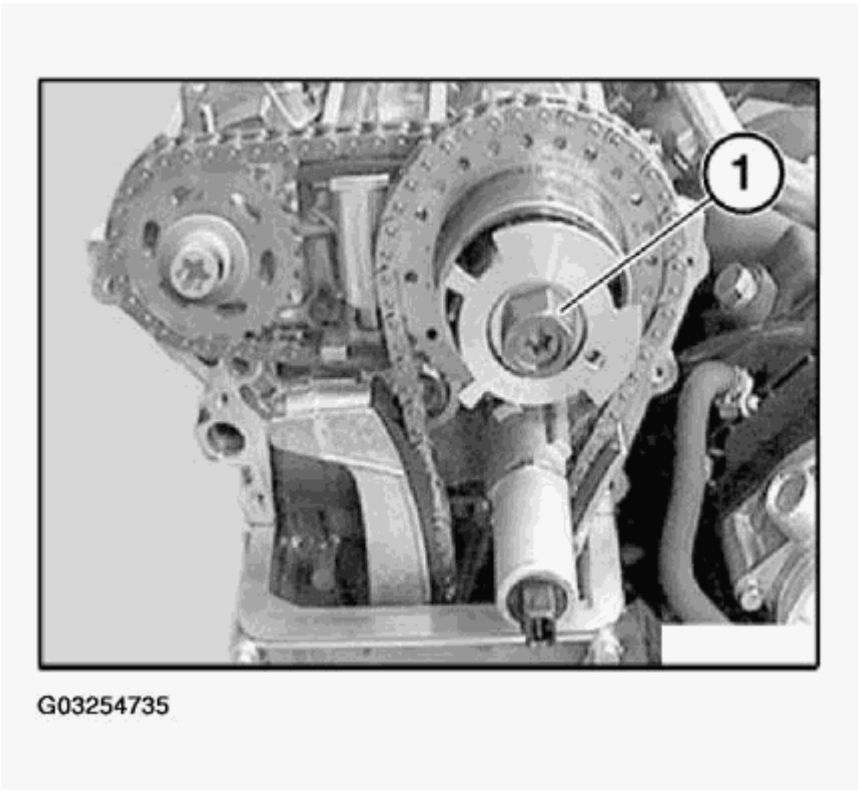


Fig. 295: Releasing Sensor Gear Screw Connection (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sensor gear (2) on cylinder bank 1 to 4.

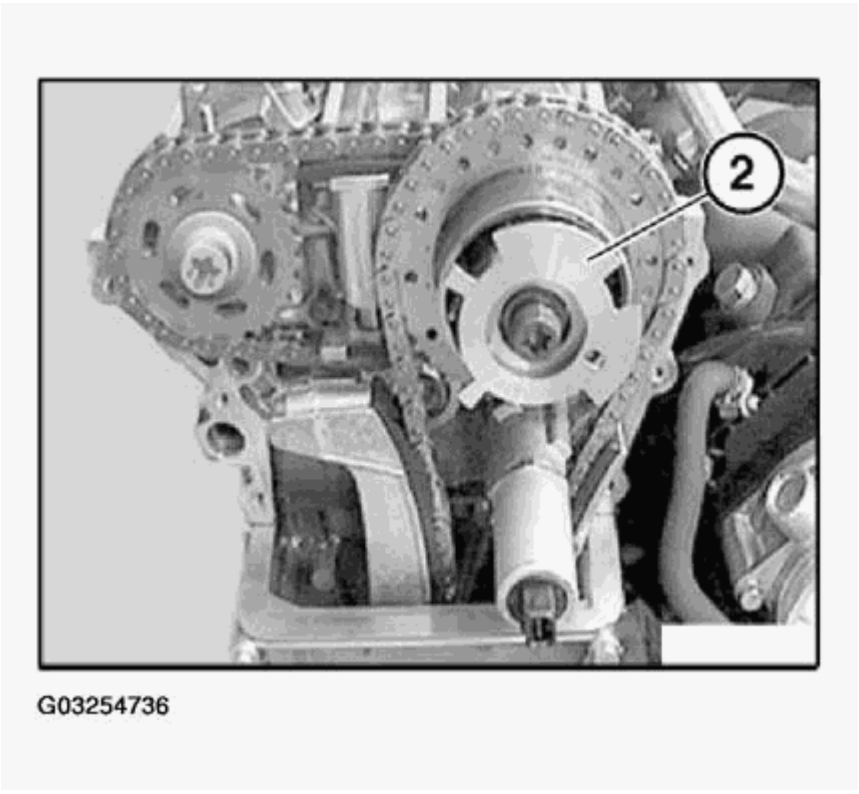


Fig. 296: Removing Sensor Gear (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 5 to 8.

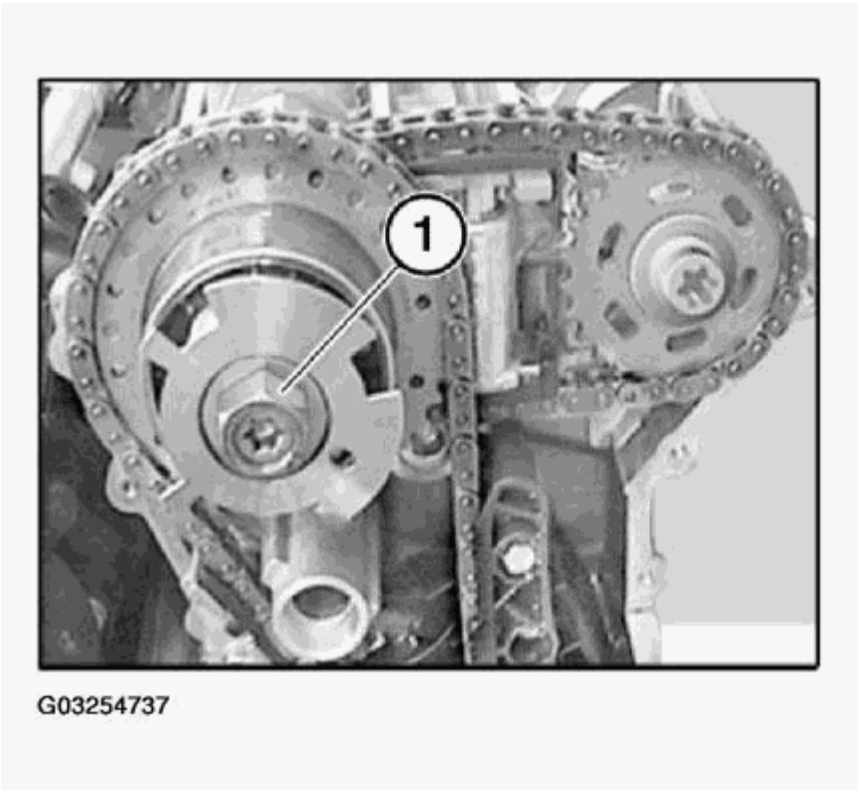


Fig. 297: Releasing Sensor Gear Screw Connection (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sensor gear (2) on cylinder bank 5 to 8.

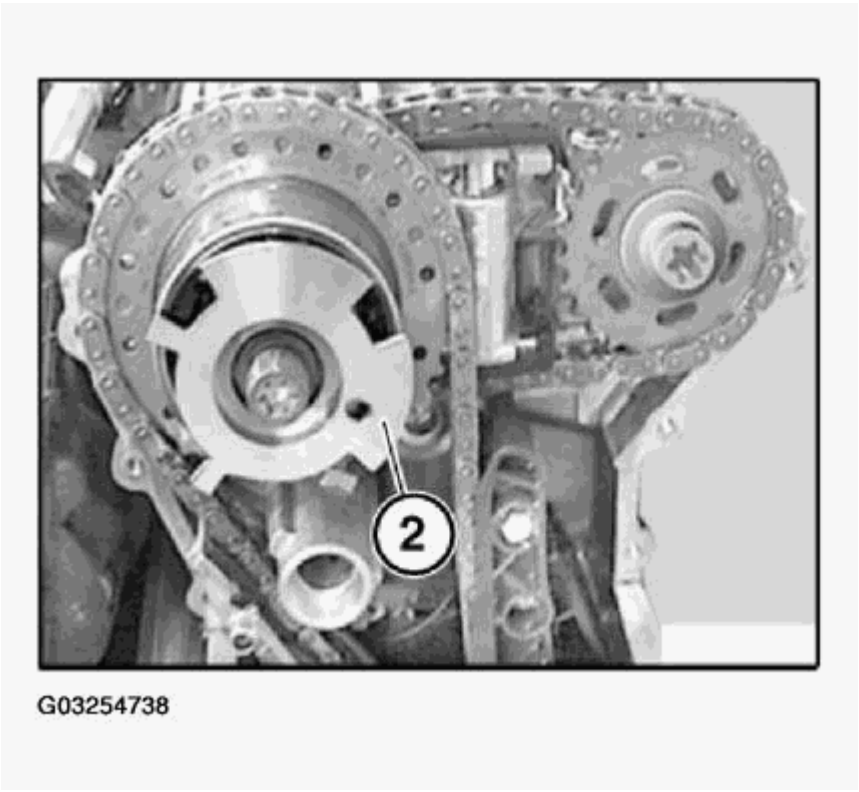


Fig. 298: Removing Sensor Gear (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When releasing camshaft screw connection: grip camshaft at hexagon head.

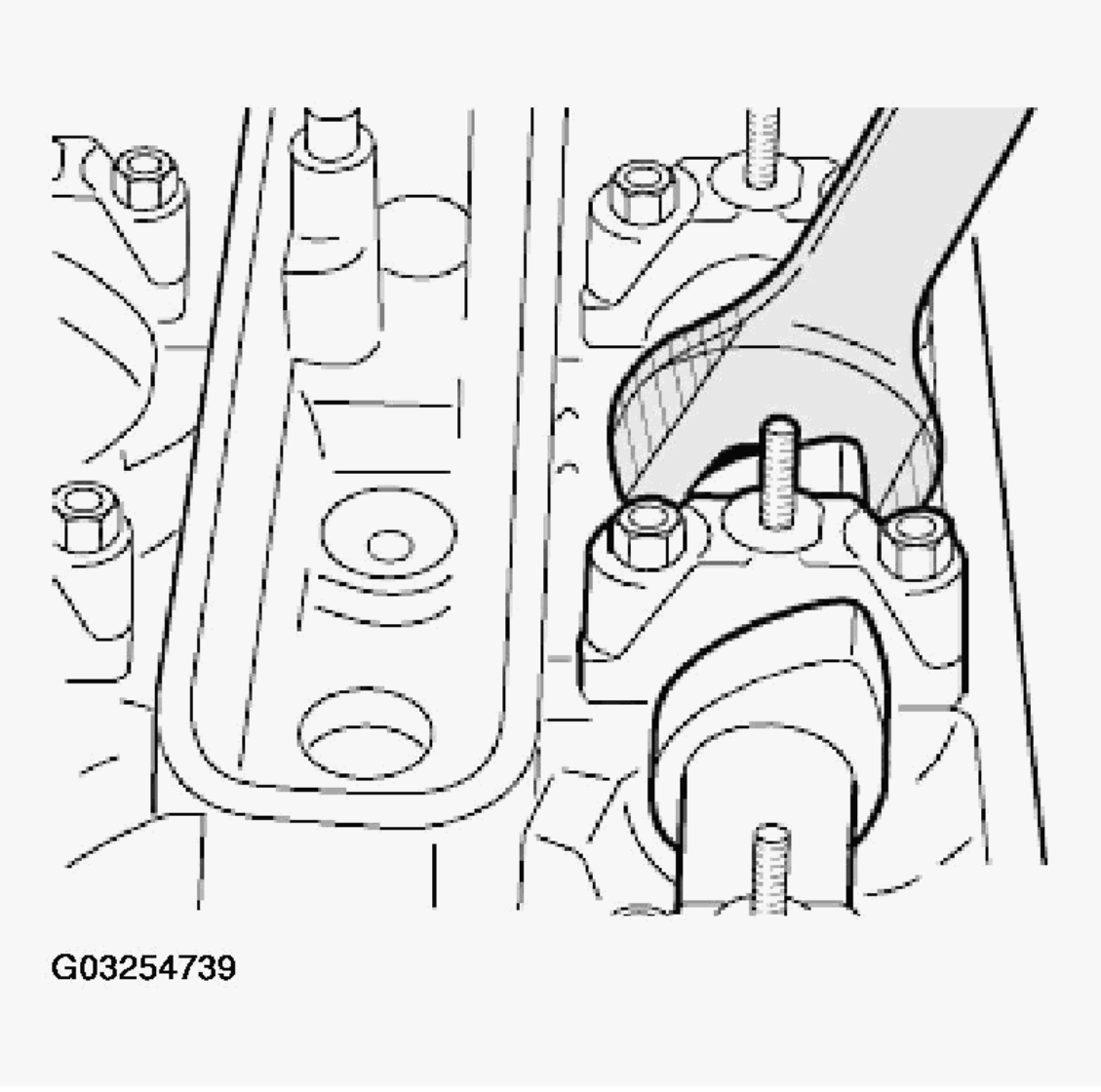


Fig. 299: Grip Camshaft At Hexagon Head Using Open-End Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 by approx. a half turn.

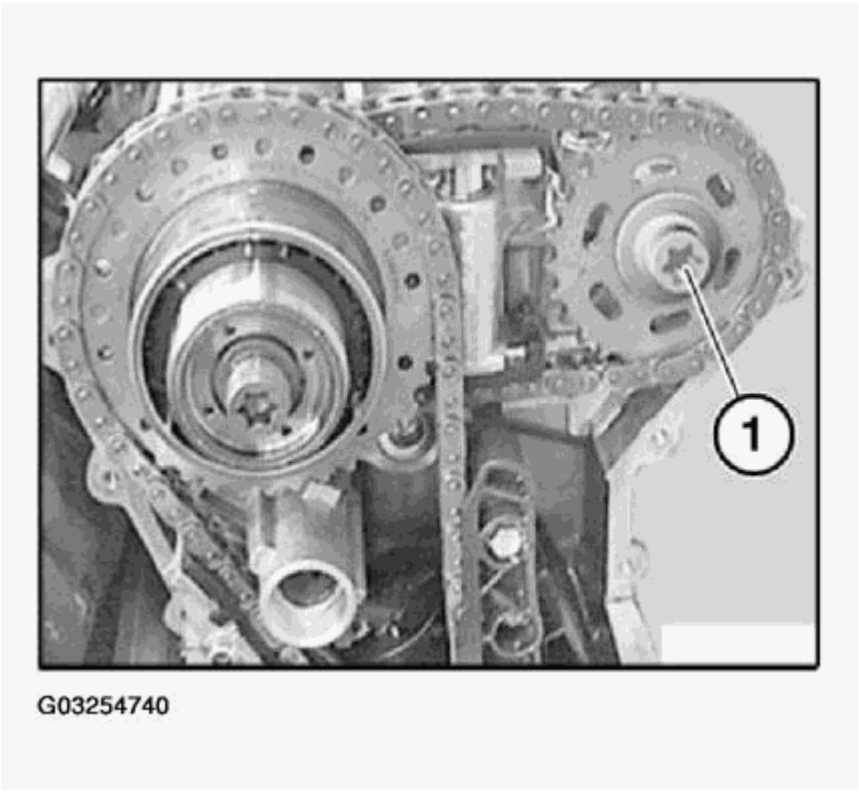


Fig. 300: Slackening Exhaust Camshaft Screw (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 by approx. a half turn.

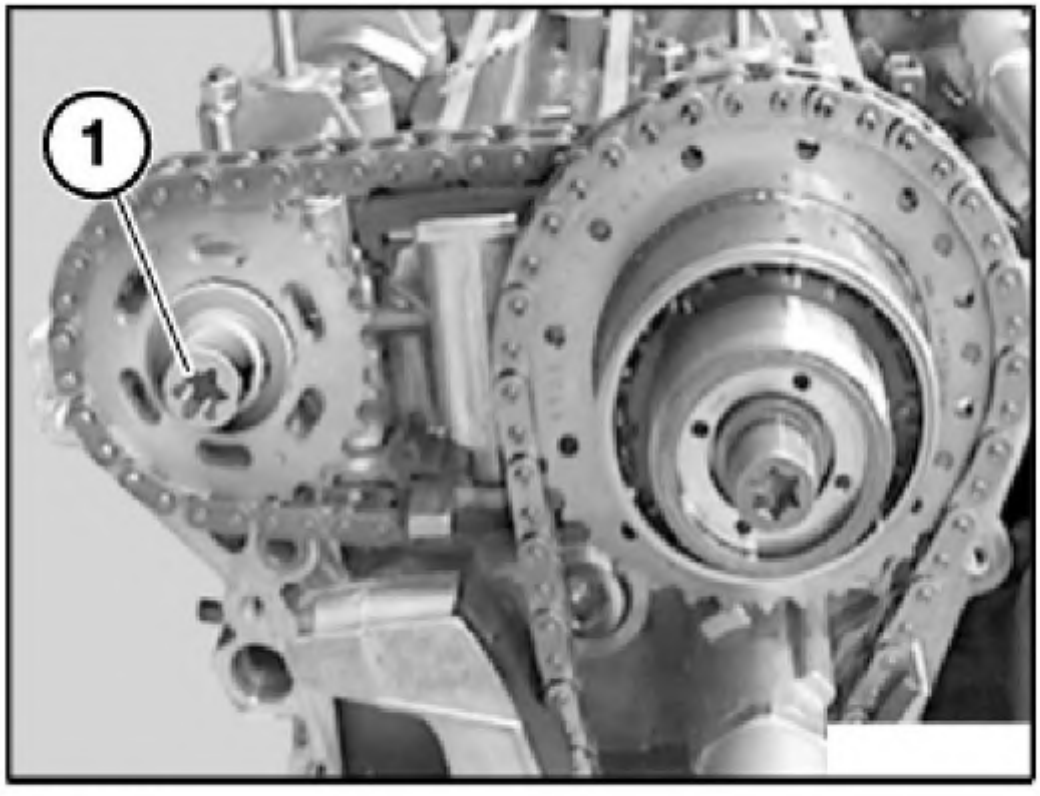


Fig. 301: Slackening Exhaust Camshaft Screw (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 5 to 8 by approx. a half turn.

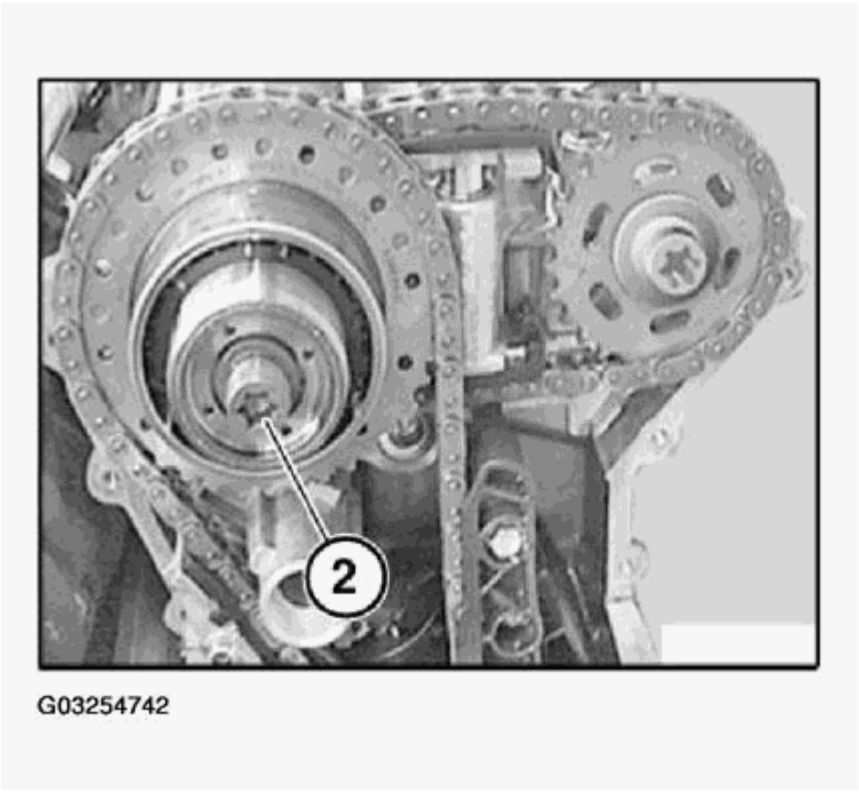


Fig. 302: Slackening Inlet Camshaft Screw (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 1 to 4 by approx. a half turn.

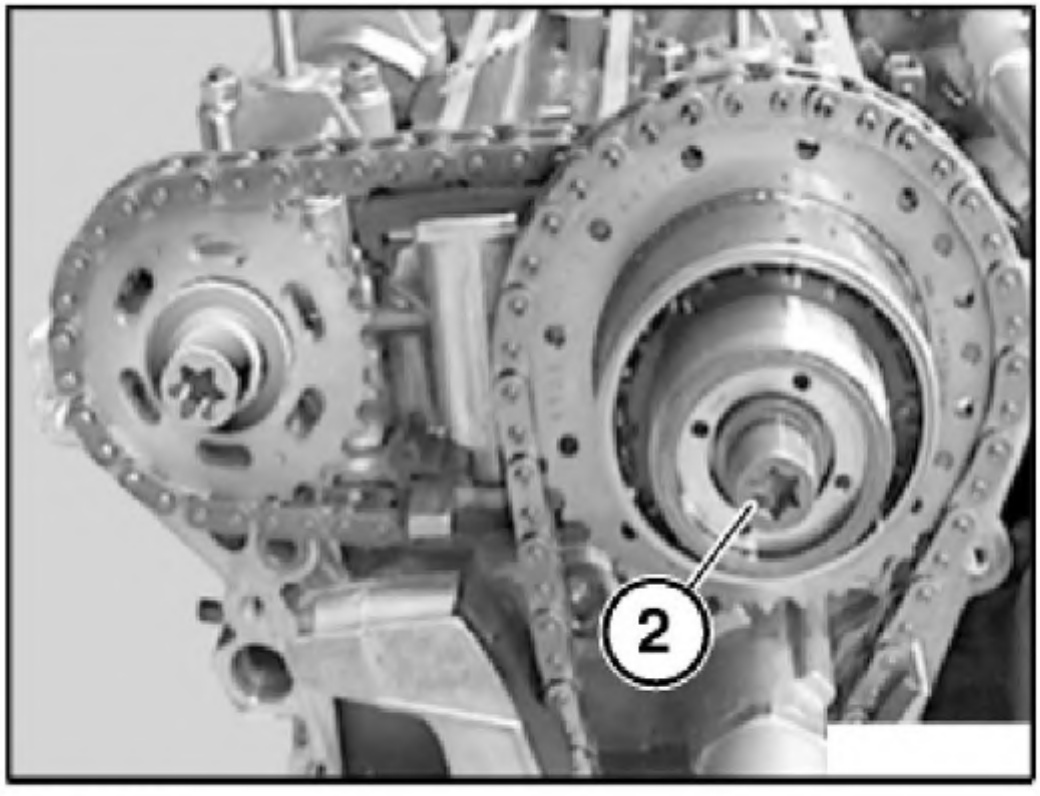


Fig. 303: Slackening Inlet Camshaft Screw (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Align camshafts.

Attach special tool 11 2 445/11 2 441 to camshafts, cylinder bank 1 to 4.

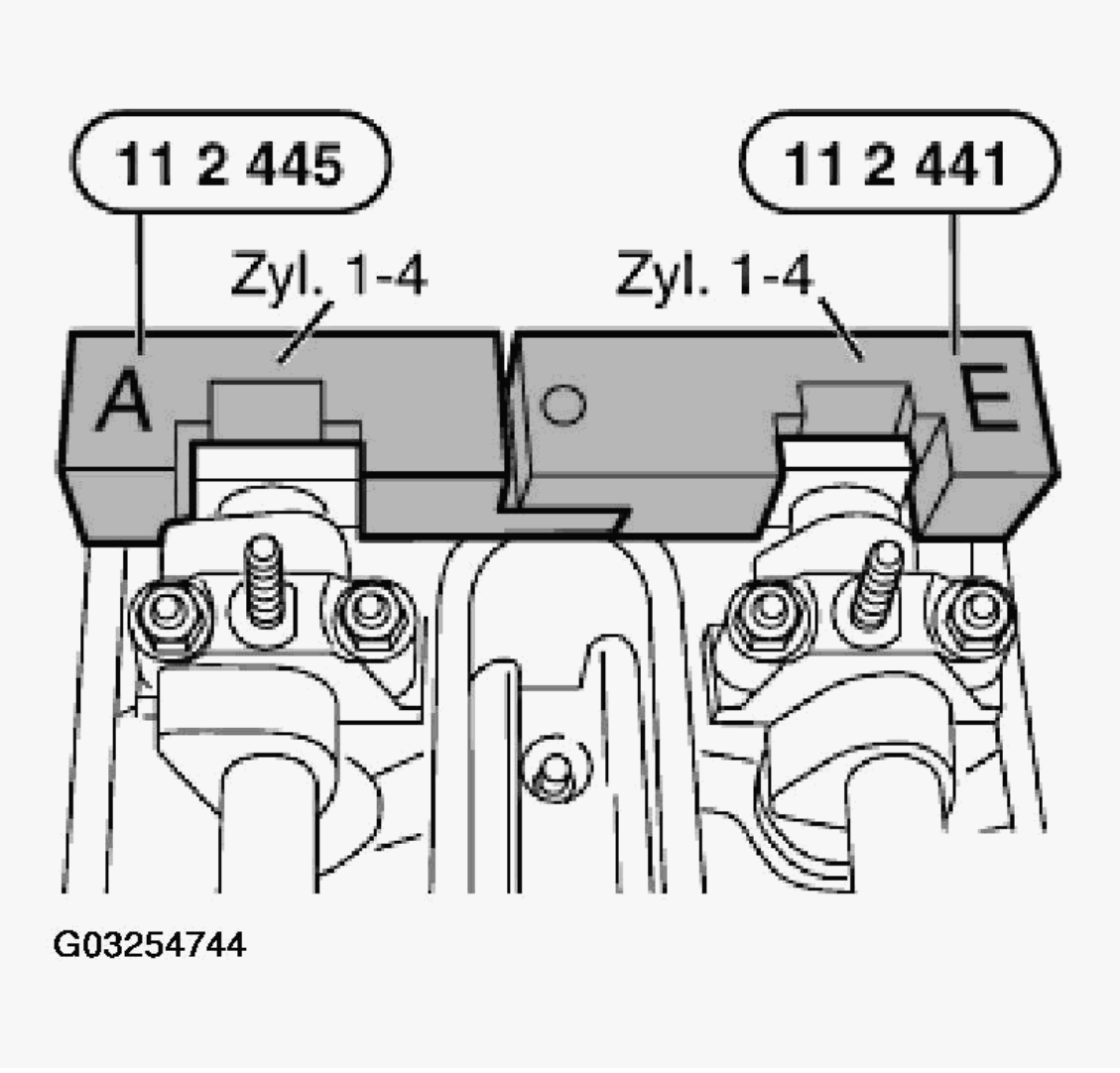


Fig. 304: Connecting Special Tool 11 2 445/11 2 441 To Camshafts (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 443 to special tool 11 2 445/11 2 441 and secure with special tool 11 2 444 via spark plug thread.

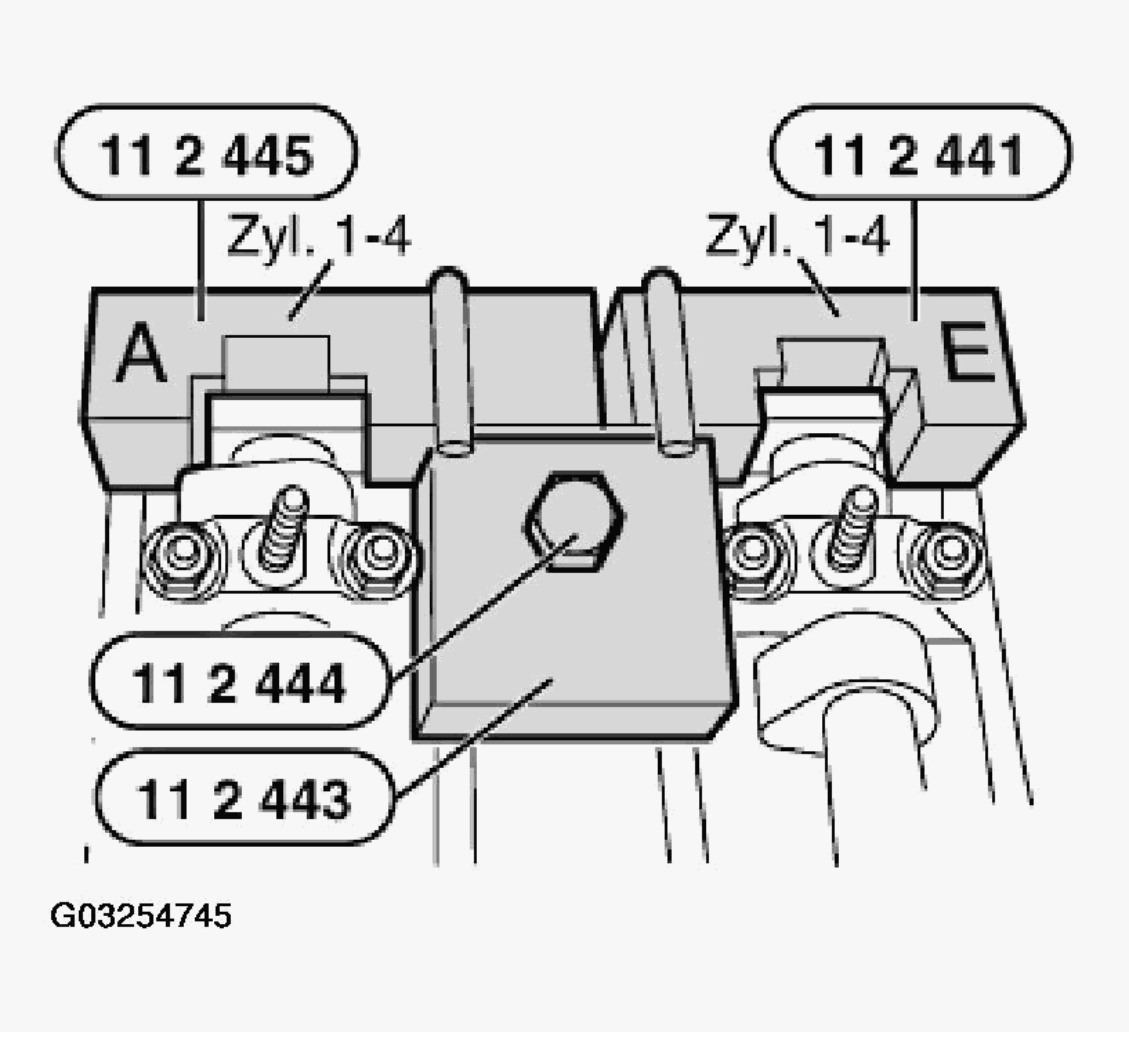


Fig. 305: Connecting Special Tool 11 2 443 To Special Tool 11 2 445/11 2 441
Courtesy of BMW OF NORTH AMERICA, INC.

Align camshafts.

Attach special tool 11 2 446/11 2 442 to camshafts, cylinder bank 5 to 8.

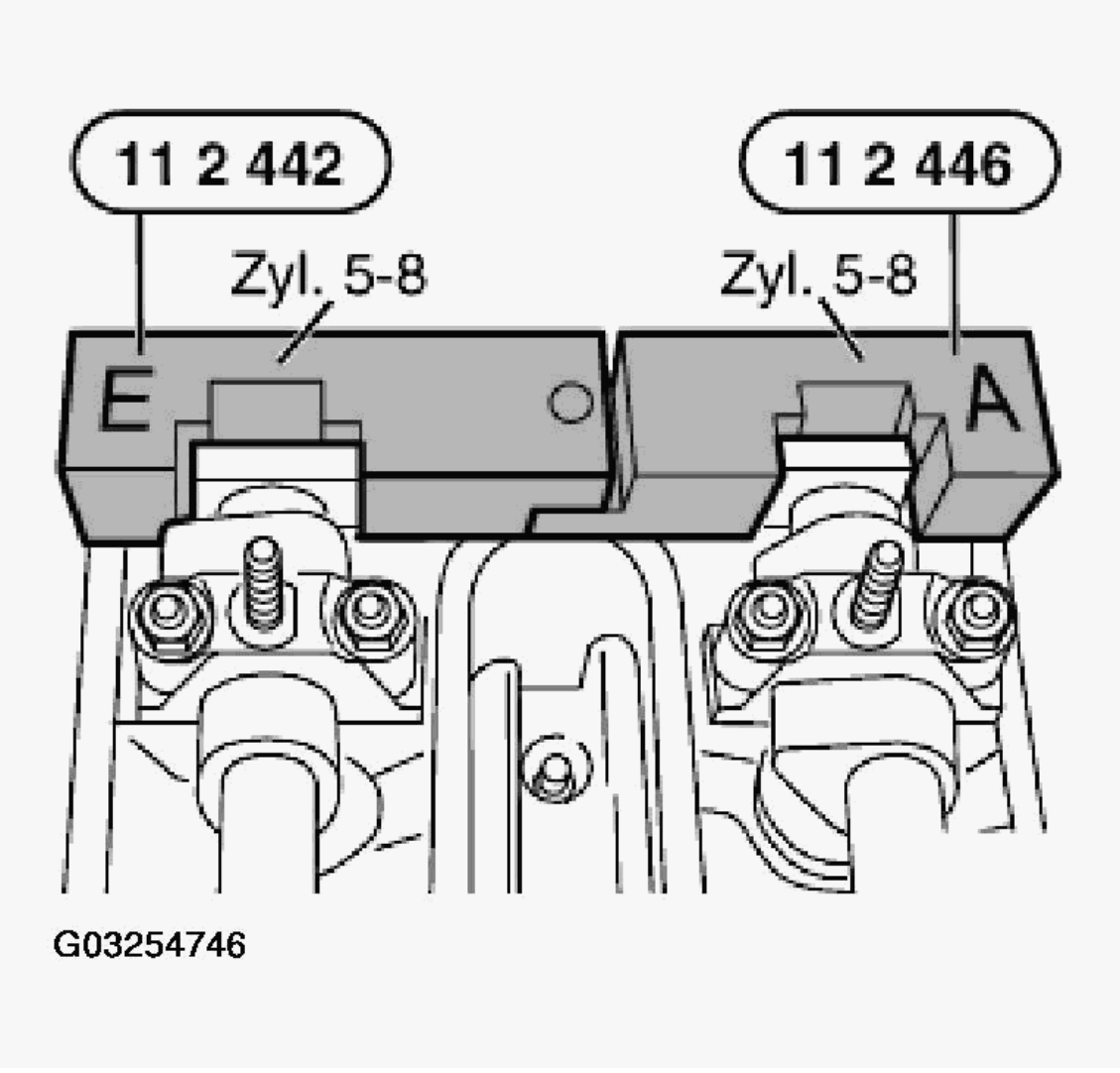


Fig. 306: Connecting Special Tool 11 2 446/11 2 442 To Camshafts (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 443 to special tool 11 2 446/11 2 442 and secure with special tool 11 2 444 via spark plug thread.

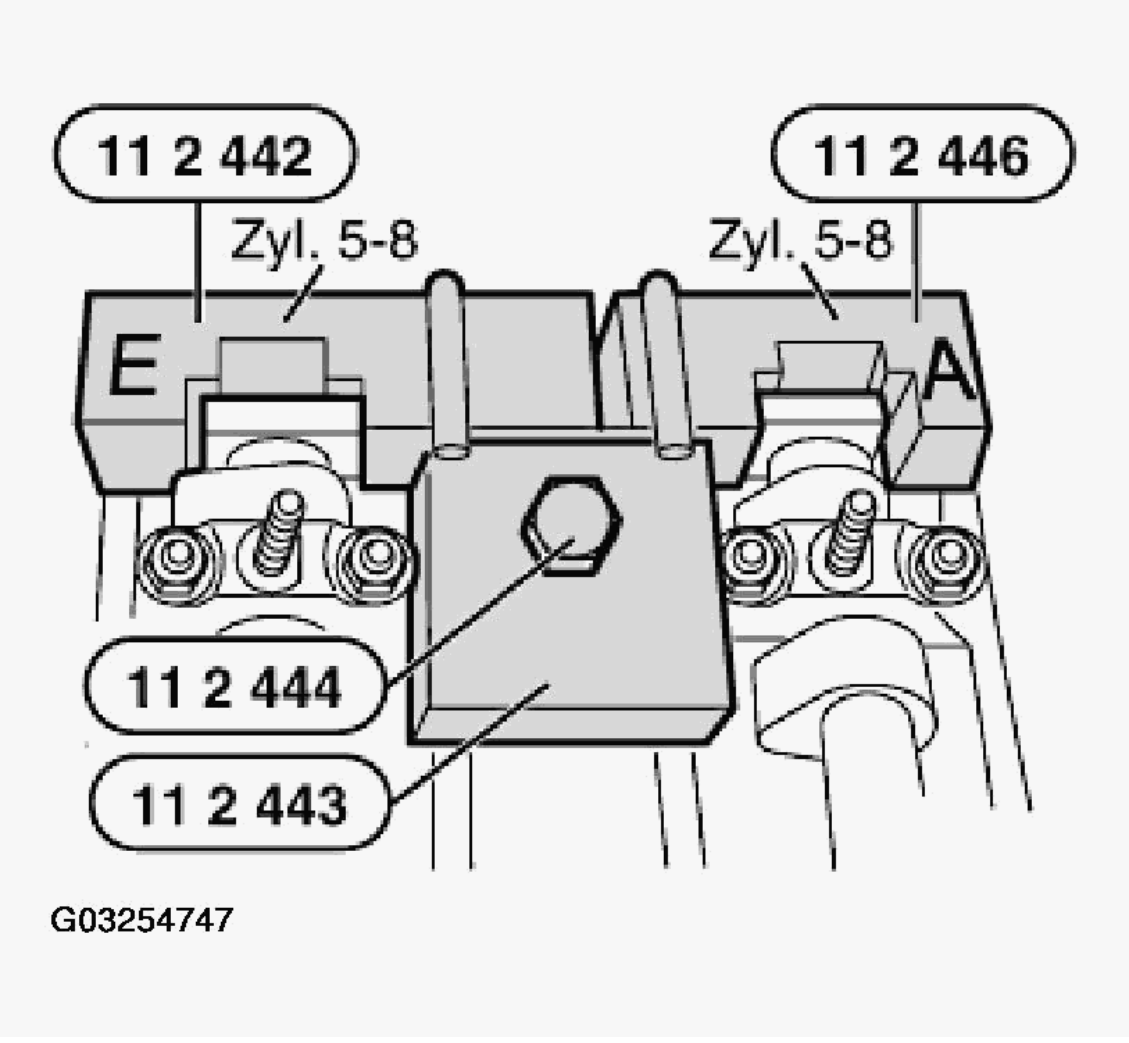


Fig. 307: Connecting Special Tool 11 2 443 To Special Tool 11 2 445/11 2 441
Courtesy of BMW OF NORTH AMERICA, INC.

Remove slackened central bolt and remove hub for vibration damper.

E53

CAUTION: Do not turn engine any more.

Remove special tool 11 5 180.

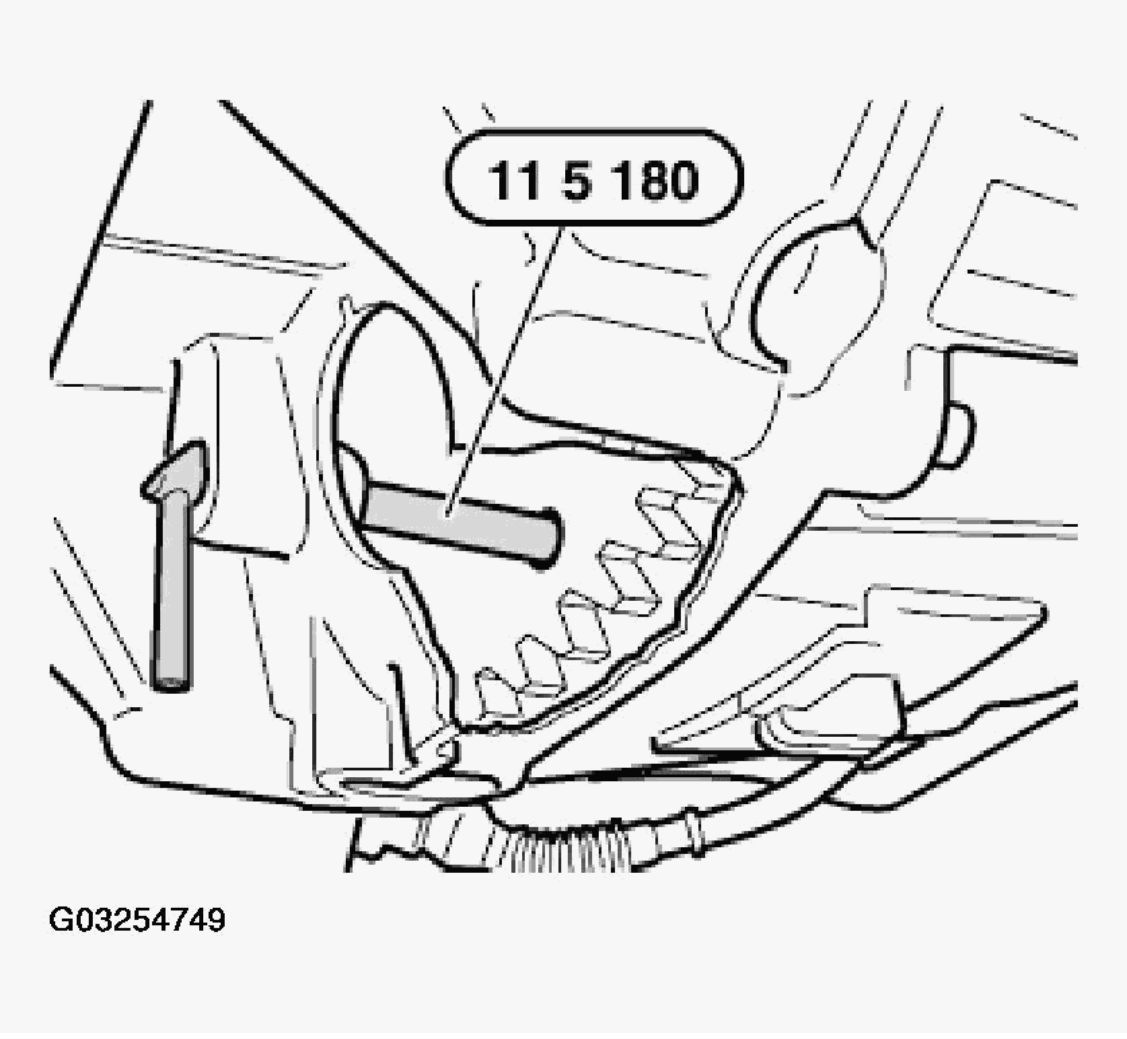


Fig. 308: Removing Special Tool 11 5 180
Courtesy of BMW OF NORTH AMERICA, INC.

Remove upper oil sump section.

Remove water pump with thermostat housing.

Remove lower timing case cover.

Release retaining screw on tensioning rail.

Open plastic strap (1).

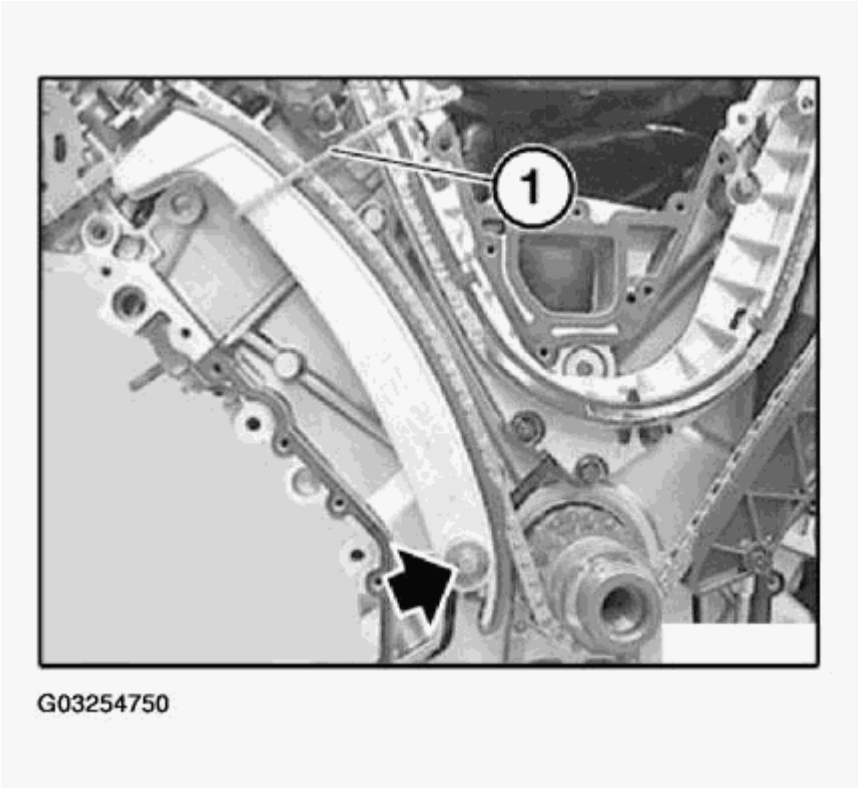


Fig. 309: Identifying Plastic Strap
Courtesy of BMW OF NORTH AMERICA, INC.

Remove tensioning rail with oil guide.

NOTE: Engines in E53 (X5) have an external oil separator. Screw (1) is not fitted.

Release screw (1) for oil separator.

Release retaining screw (2) for guide rail.

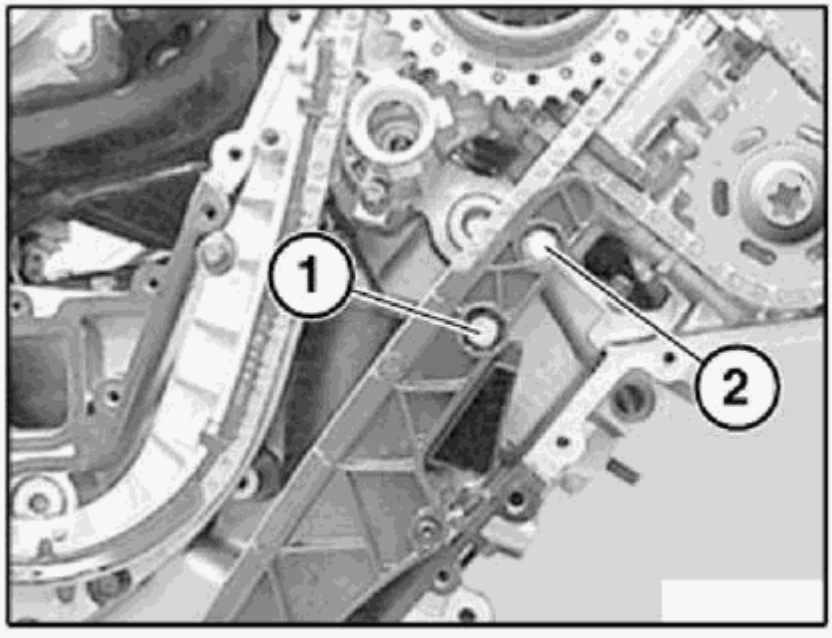


Fig. 310: Releasing Retaining Screw For Guide Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Using a small screwdriver, carefully push back retaining lug on guide rail and detach guide rail.



Fig. 311: Detaching Guide Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Feed timing chain (1) out of camshaft adjustment unit and remove.

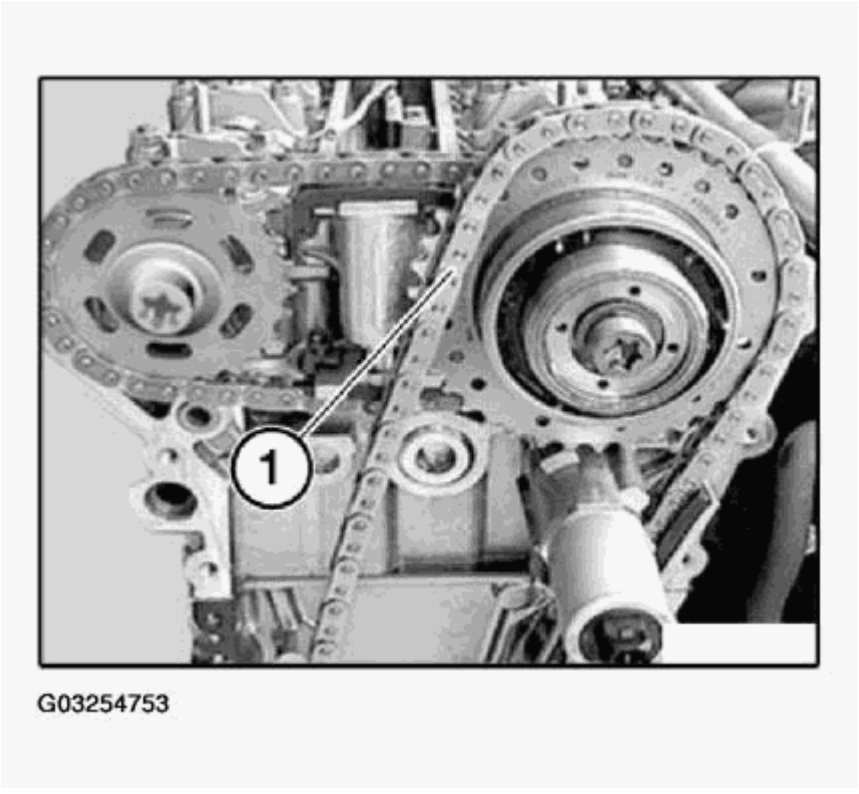


Fig. 312: Removing Timing Chain
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Engines in E53 (X5) have an external oil separator. Grub screw (1) is not fitted.

If necessary, remove reversing rail.

Unfasten grub screw (1).

Release retaining screws (2 and 3) on reversing rail and remove reversing rail.

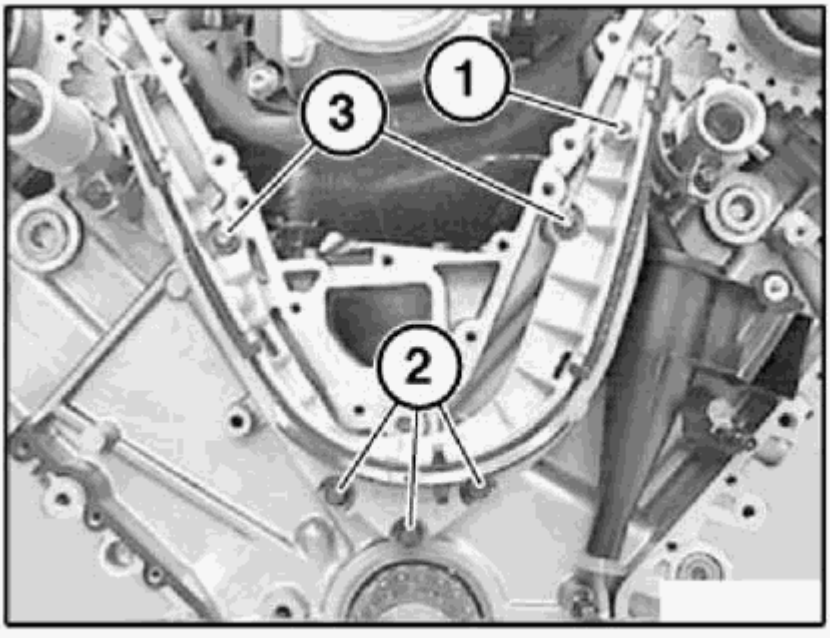


Fig. 313: Removing Reversing Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

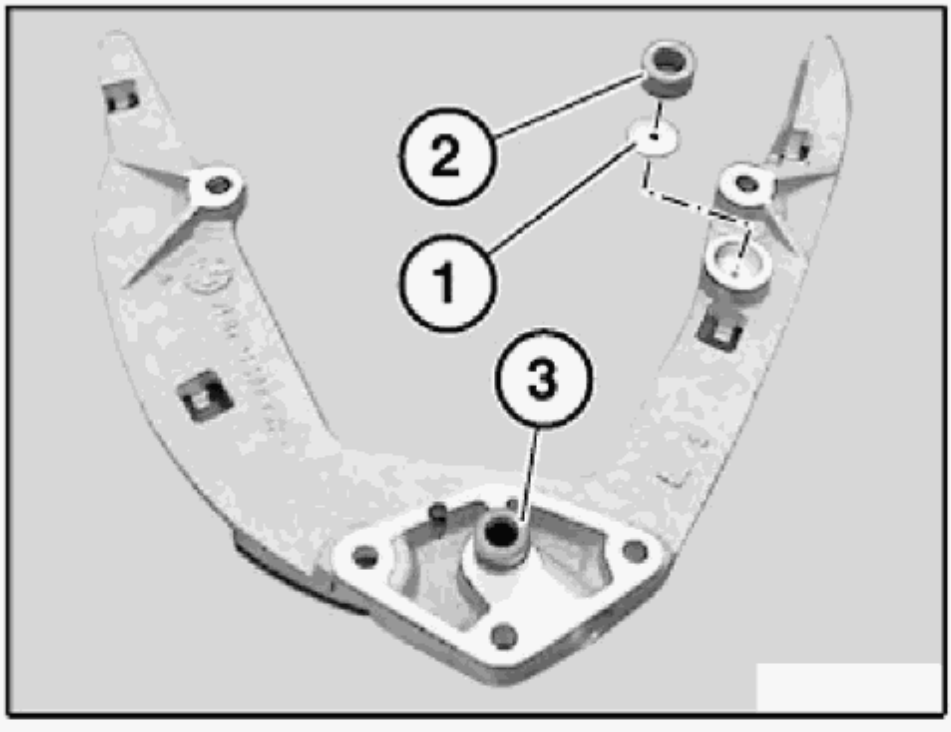
Installation of timing chain is described separately from removal. Assembly sequence for removal and installation is different.

Check guide, reversing and tensioning rails, replace if necessary.

NOTE: There is a small bore in the throttle ring (1).

Check throttle ring (1), replace if necessary.

Coat O-ring (3) with oil as lubricant.



1. Insert throttle ring (1) in reversing rail
2. Replace O-ring (2) and insert in reversing rail
3. Replace O-ring (3)

G03254755

Fig. 314: Identifying O-Ring And Throttle Ring In Reversing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Install reversing rail and insert screws (2 and 3).

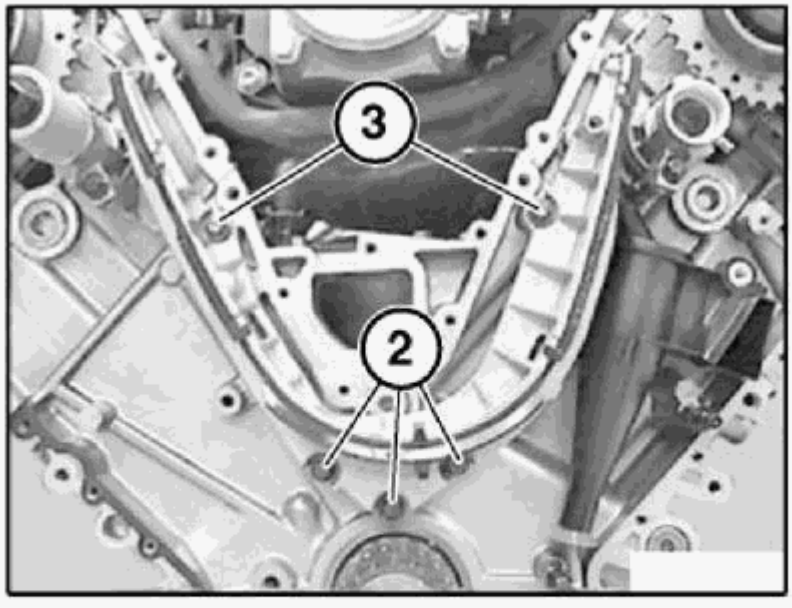


Fig. 315: Installing Reversing Rail
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Screws (2) with M6 thread.

Screws (3) with M7 thread.

Tighten screws (2 and 3).

Tightening torque for screws (2 and 3). See 11 31 10AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

NOTE: Engines in E53 (X5) have an external oil separator. Grub screw (1) and angle section are not fitted.

Replace grub screw (1).

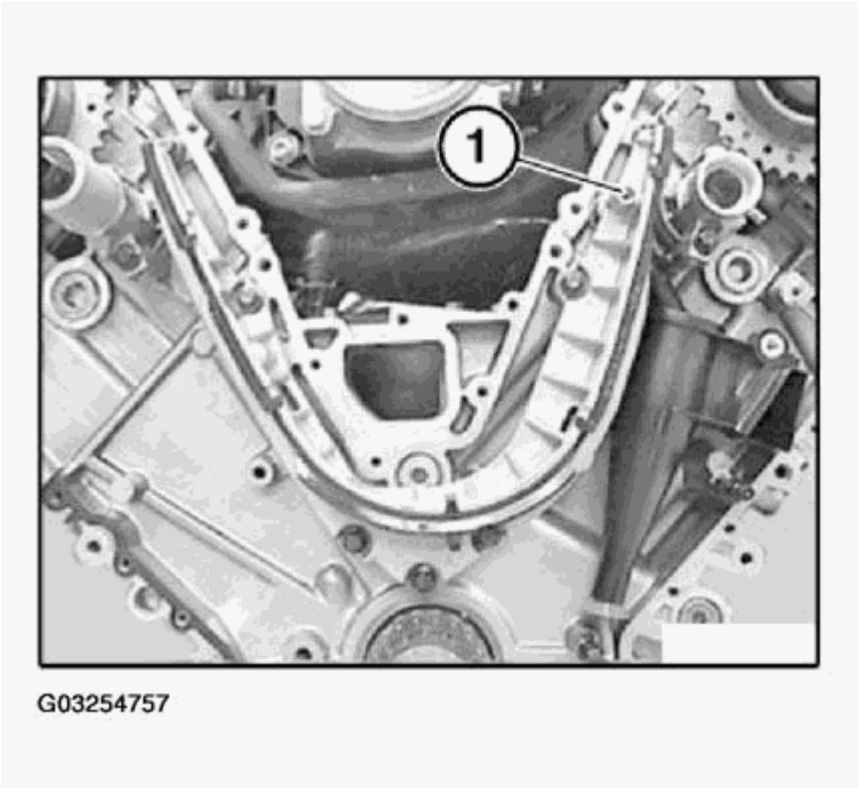


Fig. 316: Replacing Grub Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Insert grub screw only until it makes contact with angle section (1) without play, do not tighten down.

NOTE: The grub screw (1) secures the angle bracket in the cylinder head.

NOTE: The position of the camshaft adjustment unit when fitting and feeding on the timing chain is not assigned and can be freely selected.

Install timing chain over reversing rail, camshaft adjustment unit of cylinder bank 5 to 8 and over crankshaft sprocket wheel.

NOTE: Install timing chain inside screw-in pin (1).

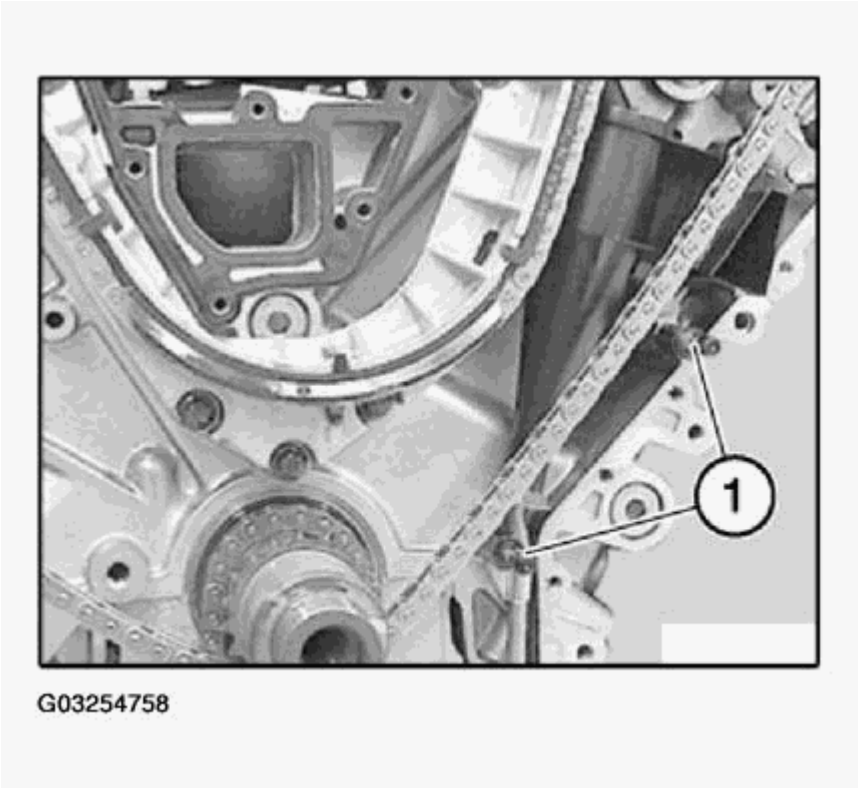


Fig. 317: Installing Timing Chain
Courtesy of BMW OF NORTH AMERICA, INC.

Feed timing chain (1) onto camshaft adjustment unit of cylinder bank 1 to 4.

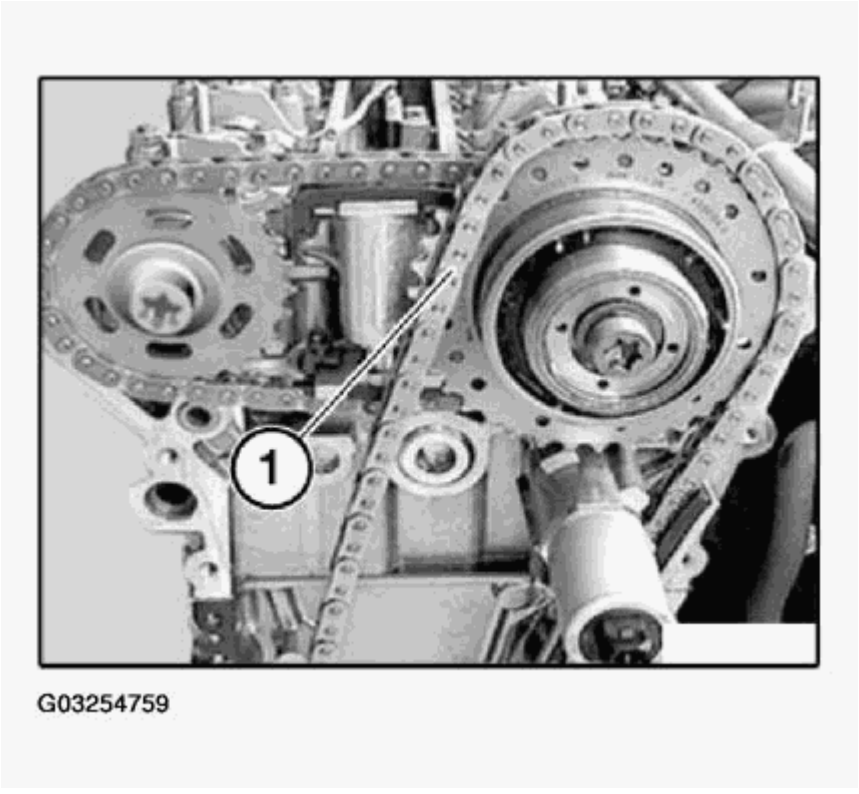


Fig. 318: Feeding Timing Chain Onto Camshaft Adjustment Unit Of Cylinder Bank 1 To 4
Courtesy of BMW OF NORTH AMERICA, INC.

Raise timing chain slightly in area of guide rail.

Slide guide rail over guide pin until retaining lug can be heard snapping into place on lower guide pin.

Align timing chain to guide rail.

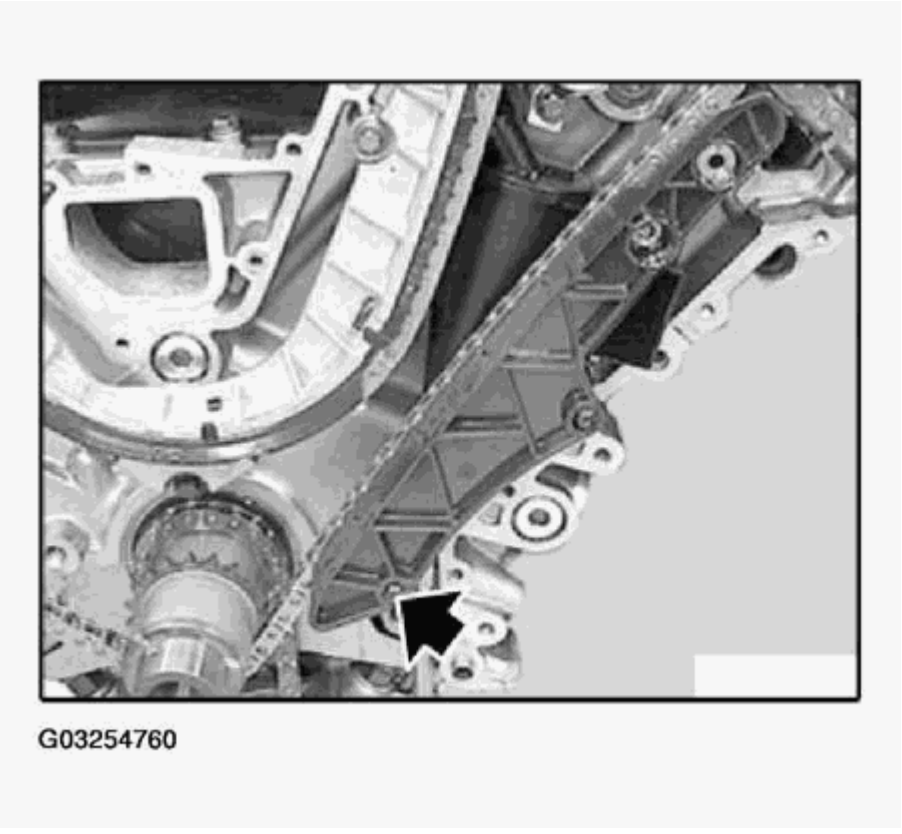


Fig. 319: Installing Timing Chain To Guide Rail
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Engines in E53 (X5) have an external oil separator. Screw (1) is not fitted.

Insert screws (1 and 2).

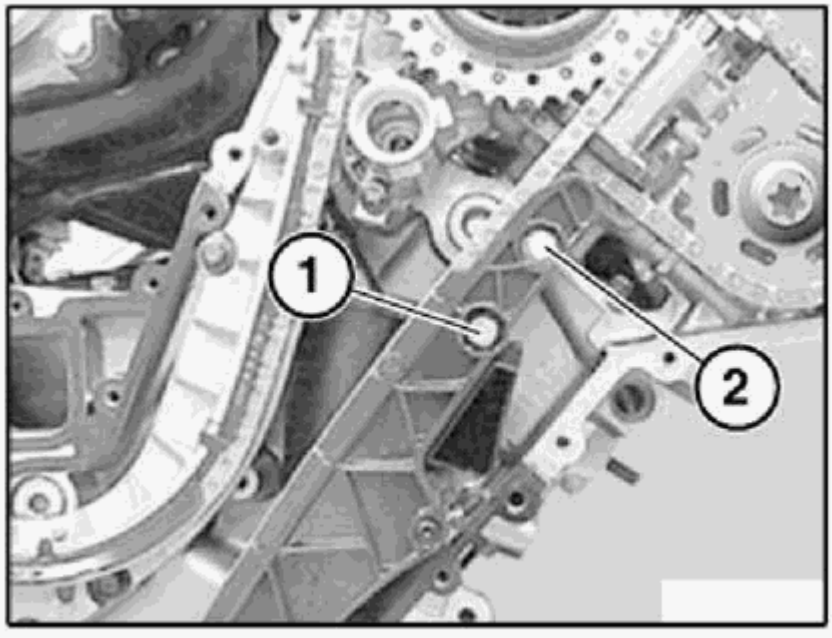


Fig. 320: Tightening Timing Chain To Guide Rail Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten screw (2).

Tighten down screw (1) for oil separator.

Replace O-ring (1).

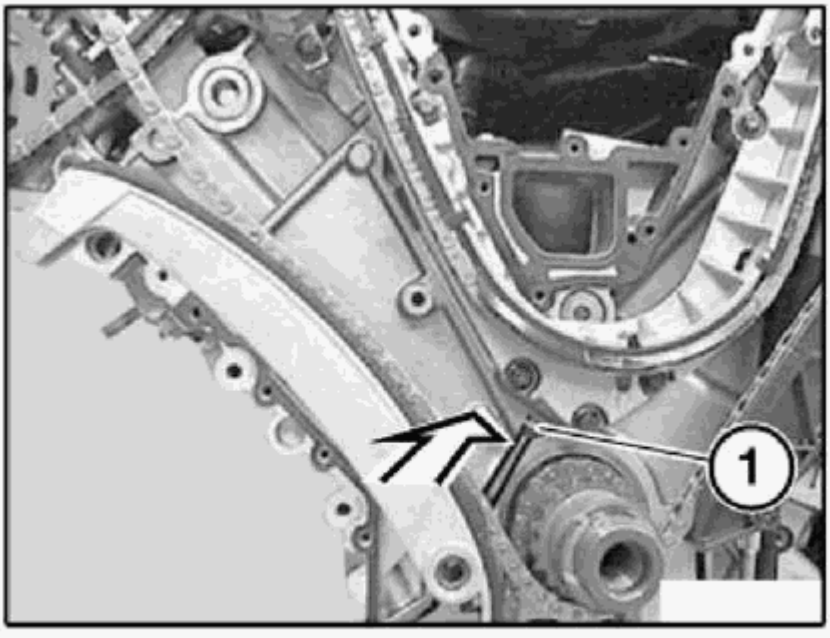


Fig. 321: Replacing O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Install oil guide for bow cover in the pivot rail.

Insert screw on tensioning rail.

Press bow cover against the timing chain. Secure bow cover with a plastic strap (1).

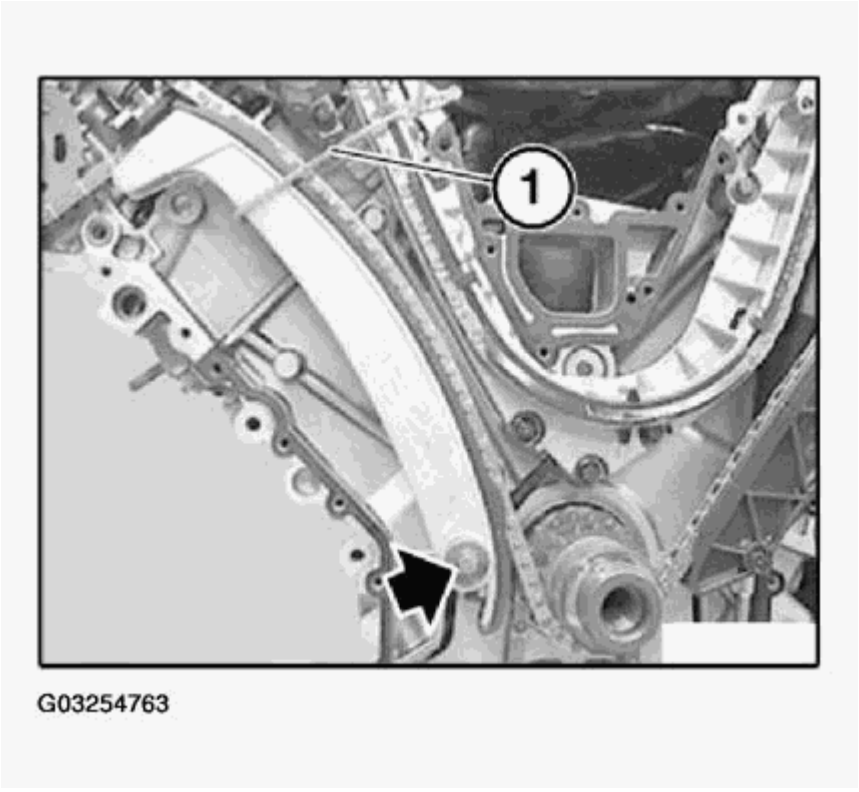


Fig. 322: Securing Bow Cover With Plastic Strap
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down screw on tensioning rail.

Install timing case cover at bottom.

Install upper oil sump section.

E53

Secure crankshaft in TDC position with special tool 11 5 180.

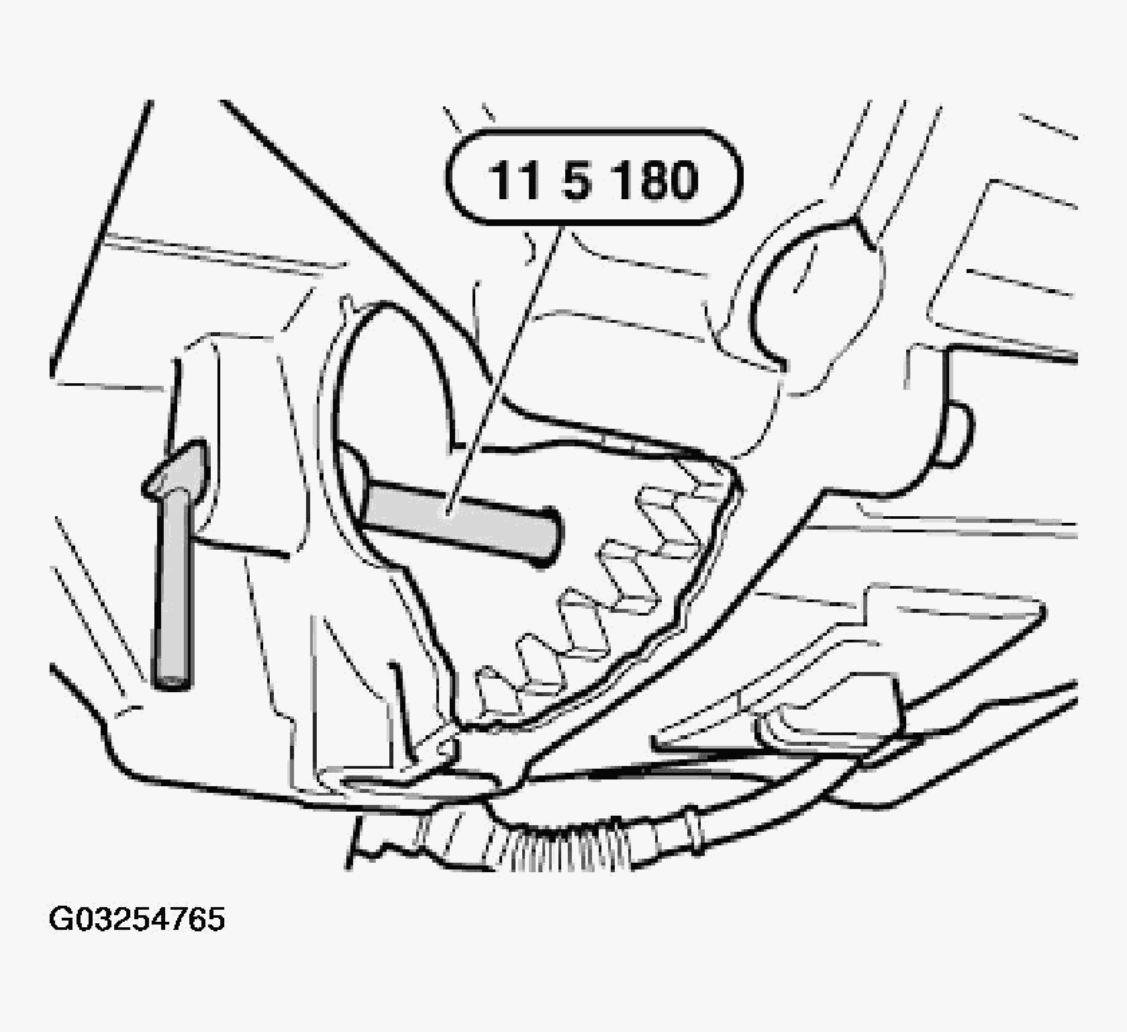


Fig. 323: Securing Crankshaft In TDC Position
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 7 380 to right cylinder head on cylinder bank 1 to 4.

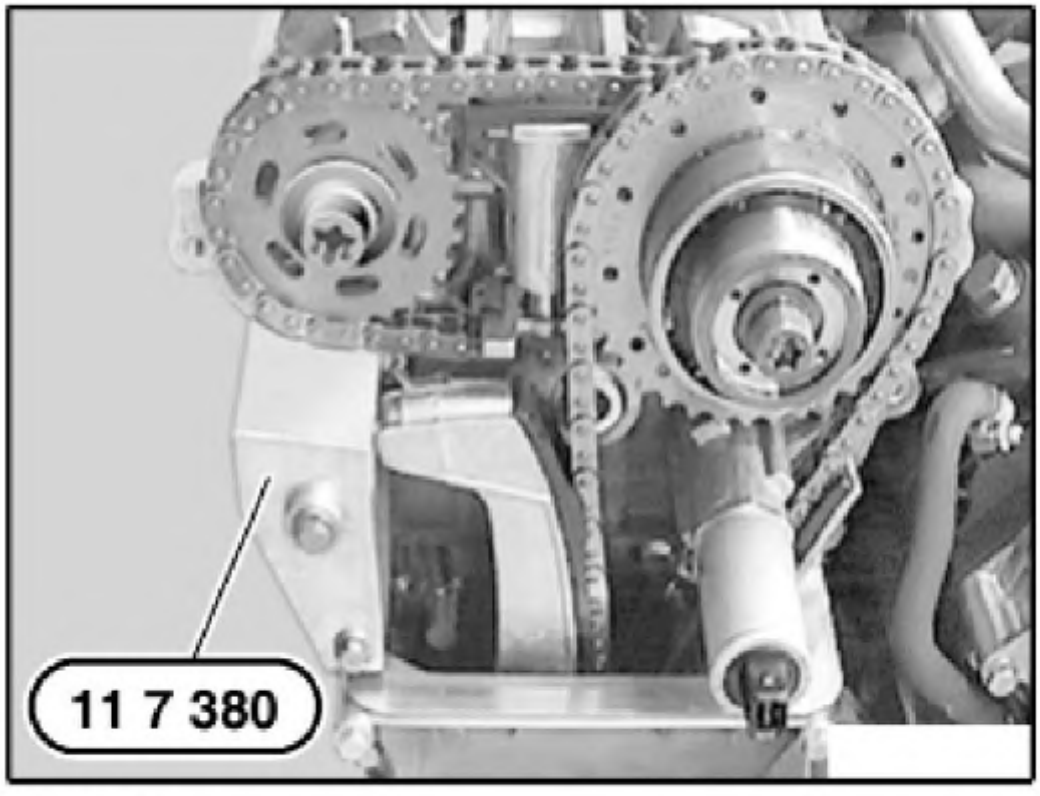


Fig. 324: Fitting Special Tool 11 7 380 To Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The special tool kit 11 3 390 can no longer be fitted in the E53 (X5) with M62 engine due to the altered space conditions.

With the market launch of the E53 (X5) with M62 engine, the special tool kit 11 3 390 is dropped.

The shorter special tool kit 11 4 230 comprising special tools 11 4 231 and 11 4 232 replaces the special tool kit 11 3 390.

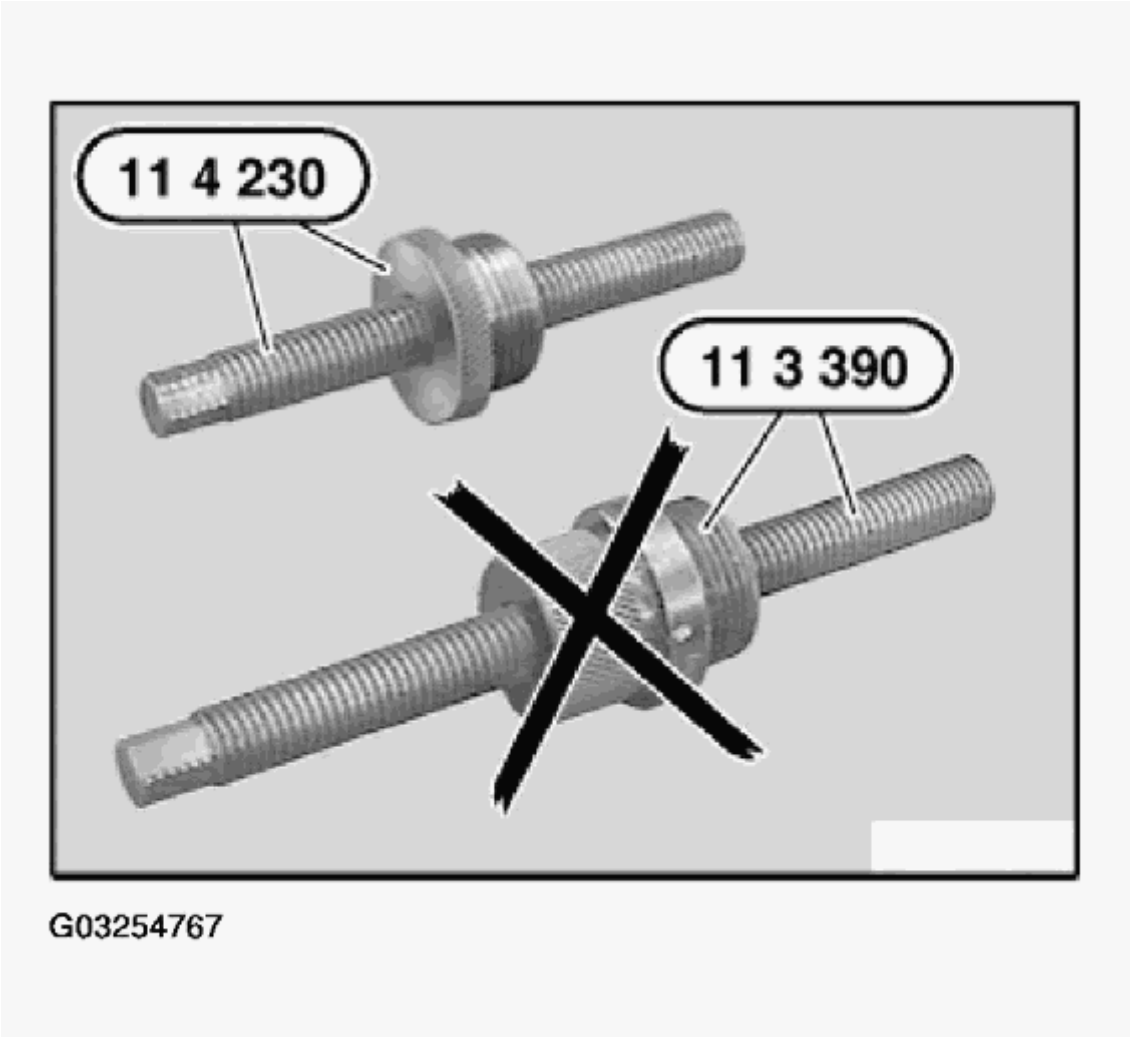


Fig. 325: Precaution When Using Special Tool Kit 11 3 390
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 4 230 in special tool 11 7 380.

Screw in adjustment screw on tensioning rail, but do not tighten yet.

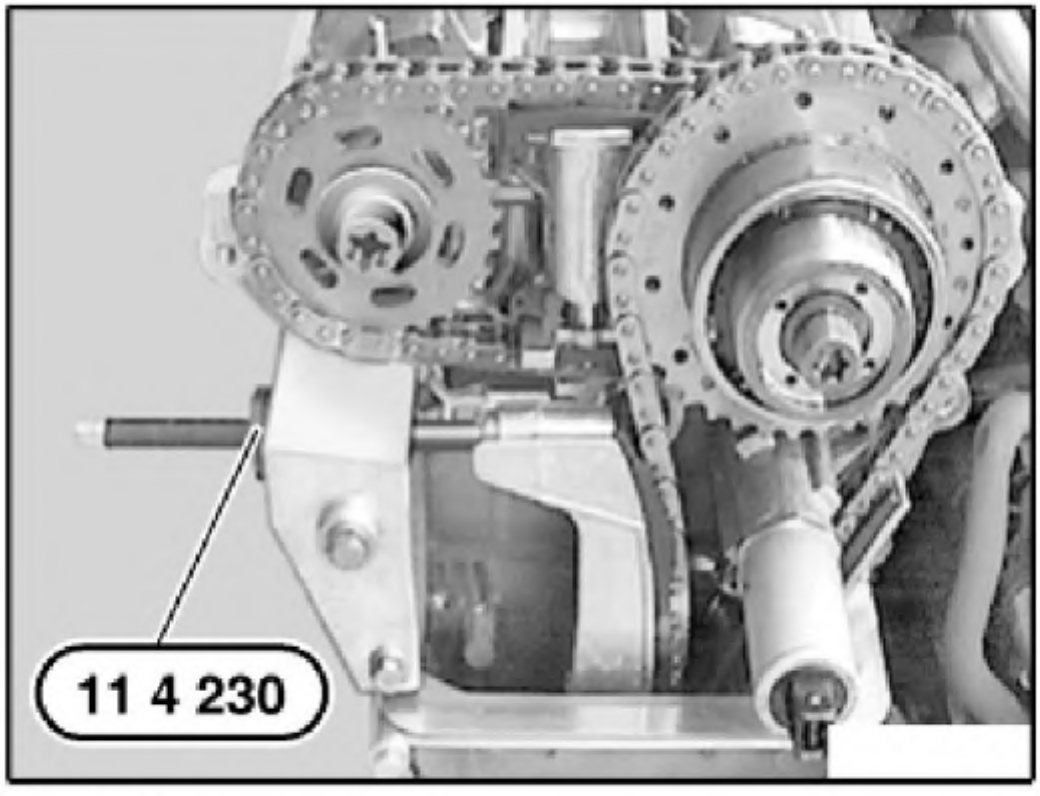


Fig. 326: Inserting Special Tool 11 4 230 In Special Tool 11 7 380
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.

Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 5 to 8.

Set multimeter to acoustic continuity test.

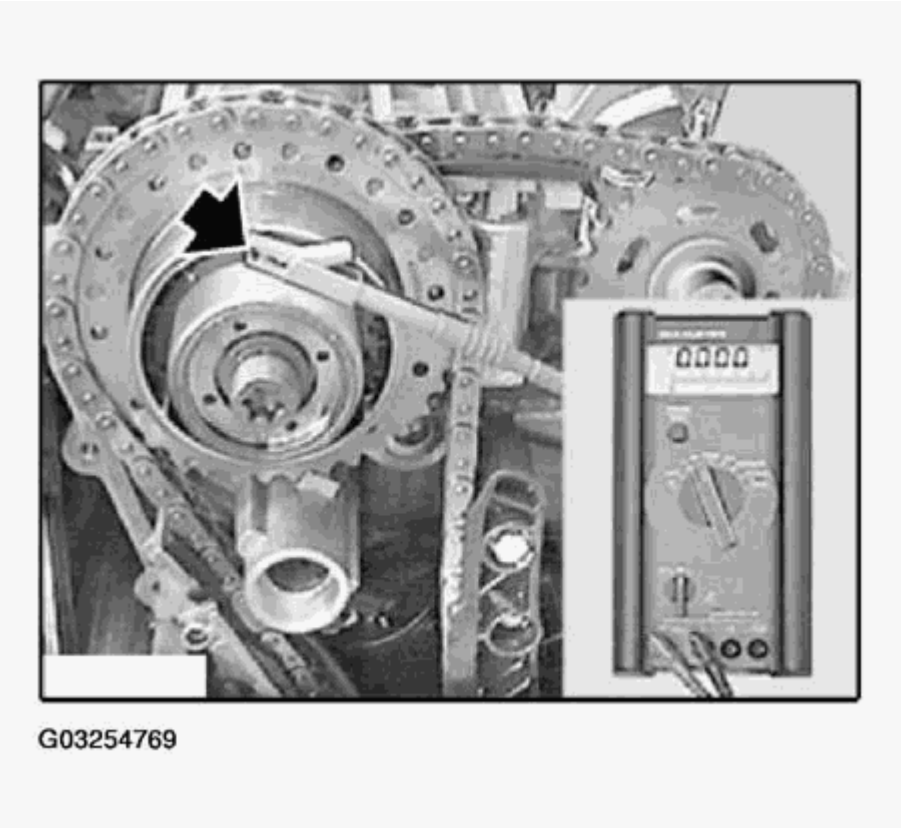


Fig. 327: Connecting Multimeter To Screw Connection On Oil Line (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

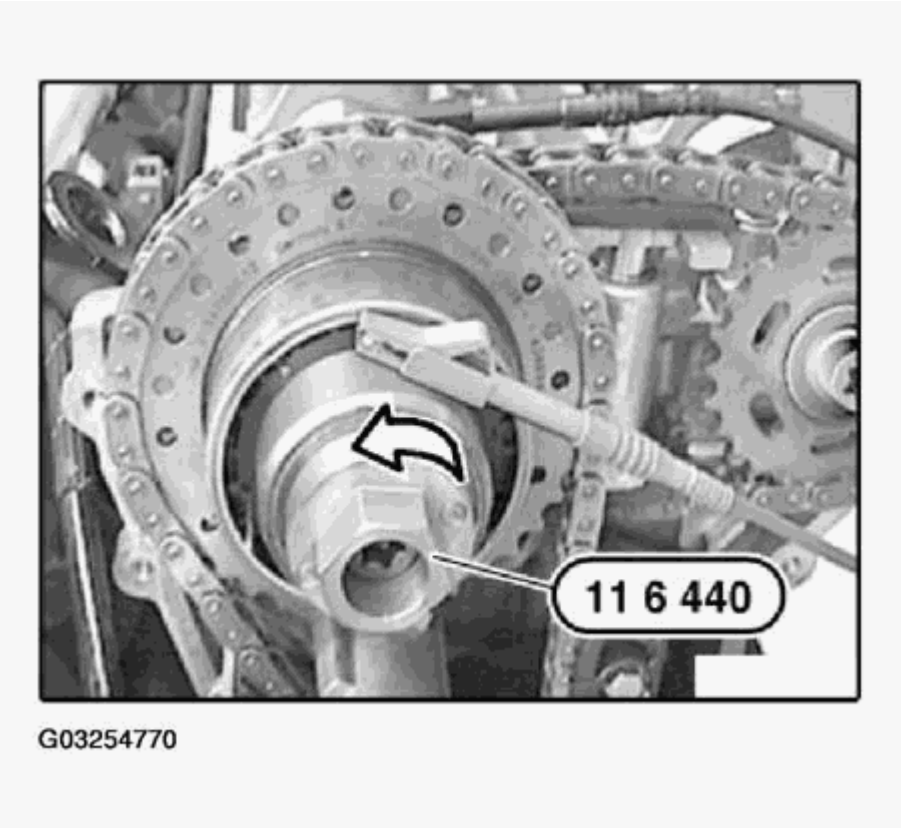


Fig. 328: Connecting Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Rotating the camshaft adjustment unit at 40 Nm to the left-hand stop ensures that the end position is reached and there is no longer an "oil cushion" before the left-hand stop of the camshaft adjustment unit.

In the camshaft adjustment unit, there are three contacts which are closed when the unit is at the left-hand stop.

During the acoustic continuity test with the multimeter, a sound signal can be heard when the camshaft adjustment unit is at the left-hand stop.

CAUTION: Left-hand threads.

Tighten screw connection (2) of inlet camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

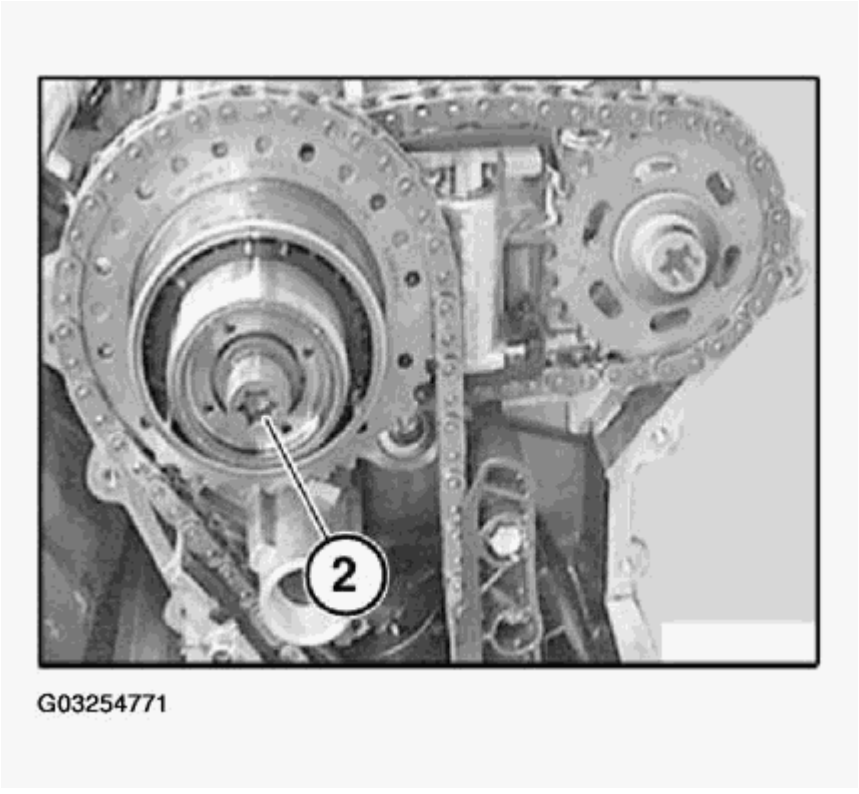


Fig. 329: Tightening Inlet Camshaft Screw (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

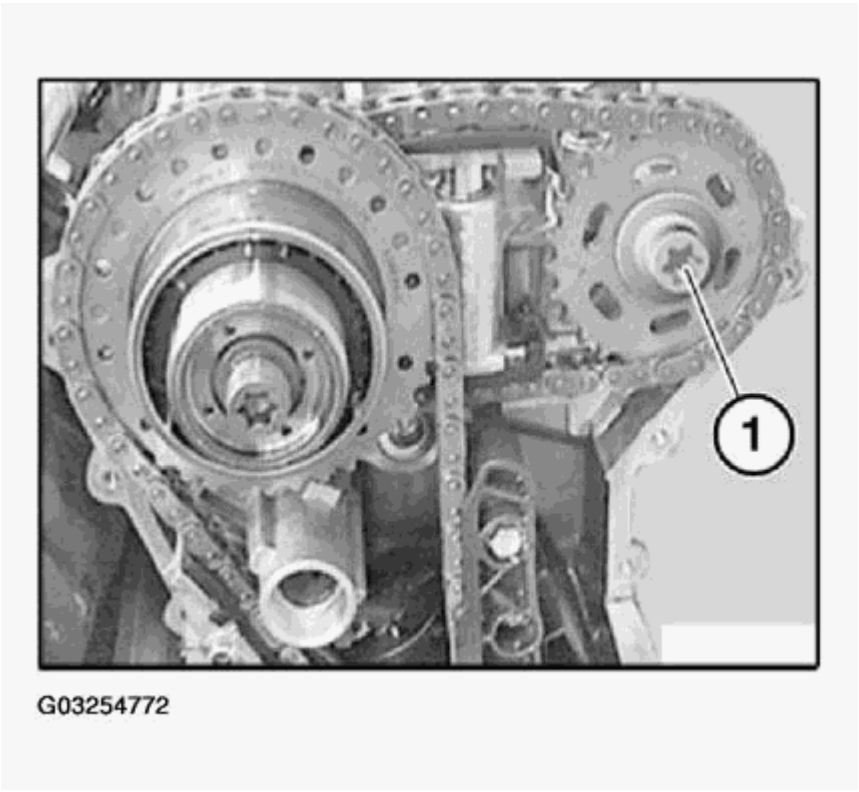


Fig. 330: Tightening Exhaust Camshaft Screw (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.

Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 1 to 4.

Set multimeter to acoustic continuity test.



Fig. 331: Connecting Multimeter To Screw Connection On Oil Line (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

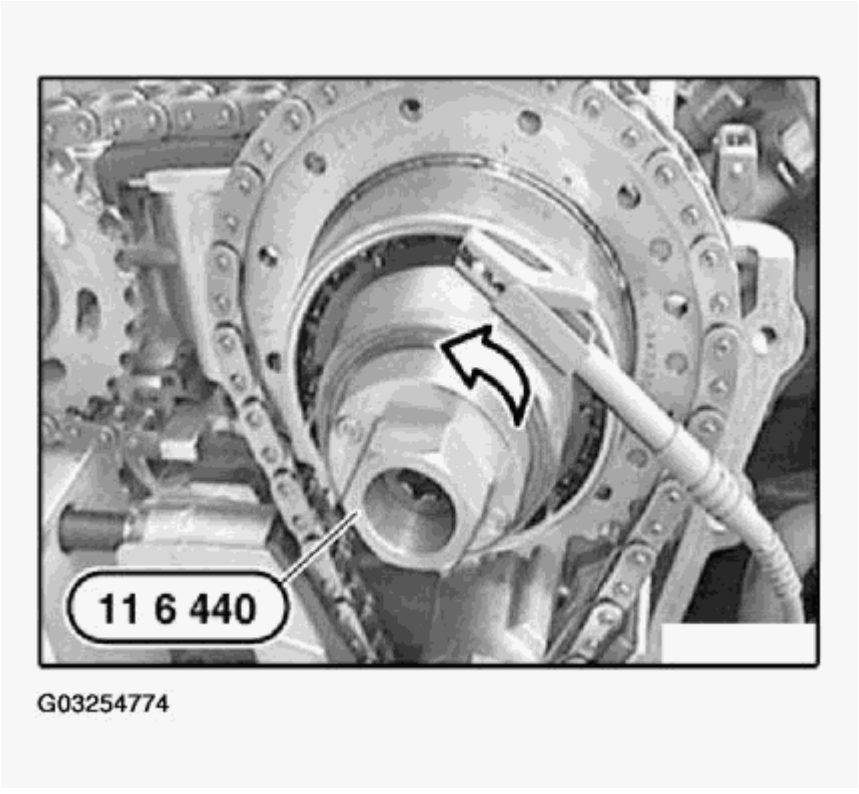


Fig. 332: Connecting Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (2) of inlet camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

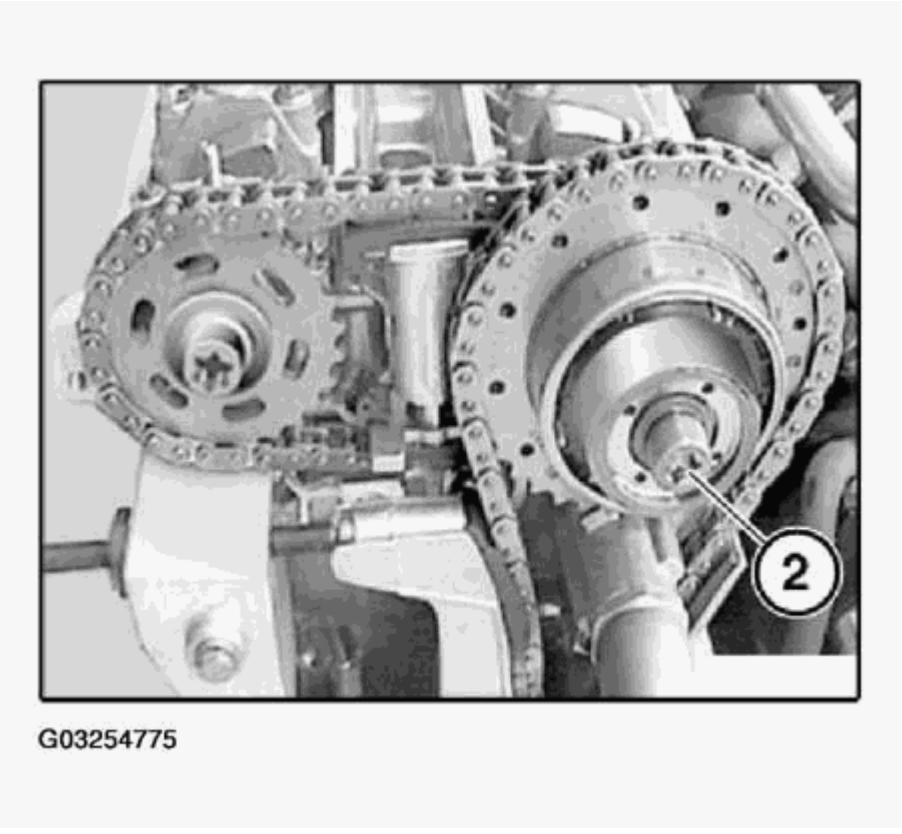


Fig. 333: Tightening Inlet Camshaft Screw (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

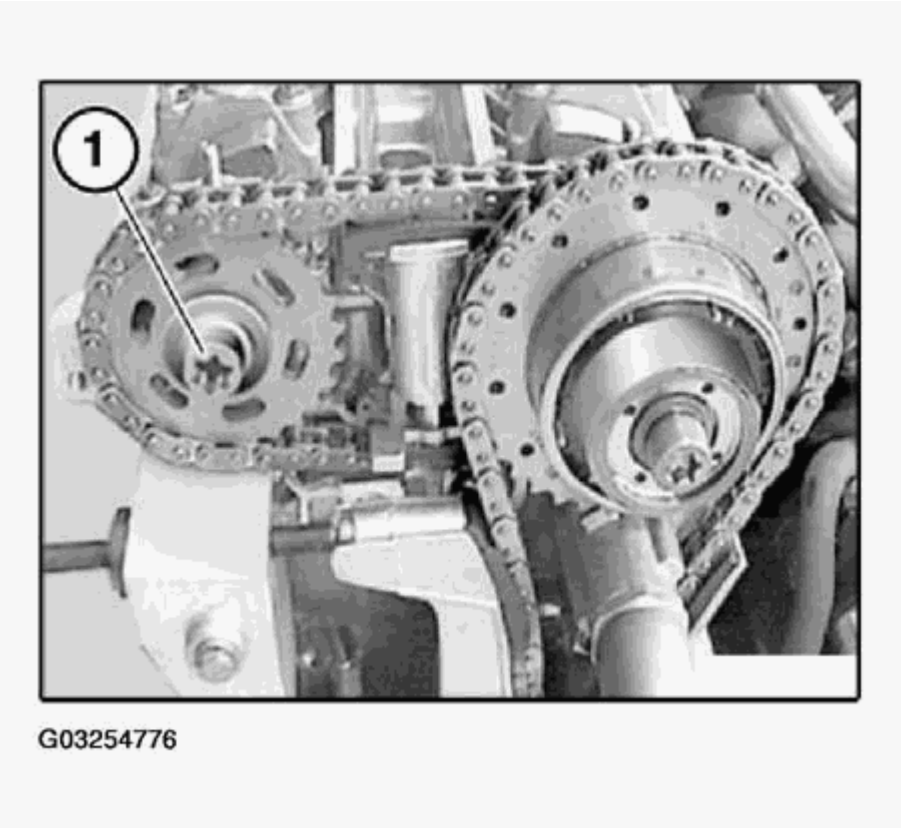


Fig. 334: Tightening Exhaust Camshaft Screw (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Pretension tensioning rail by turning adjusting screw on special tool 11 4 230 with special tool 00 9 250 to 0.7 Nm.

NOTE: If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.

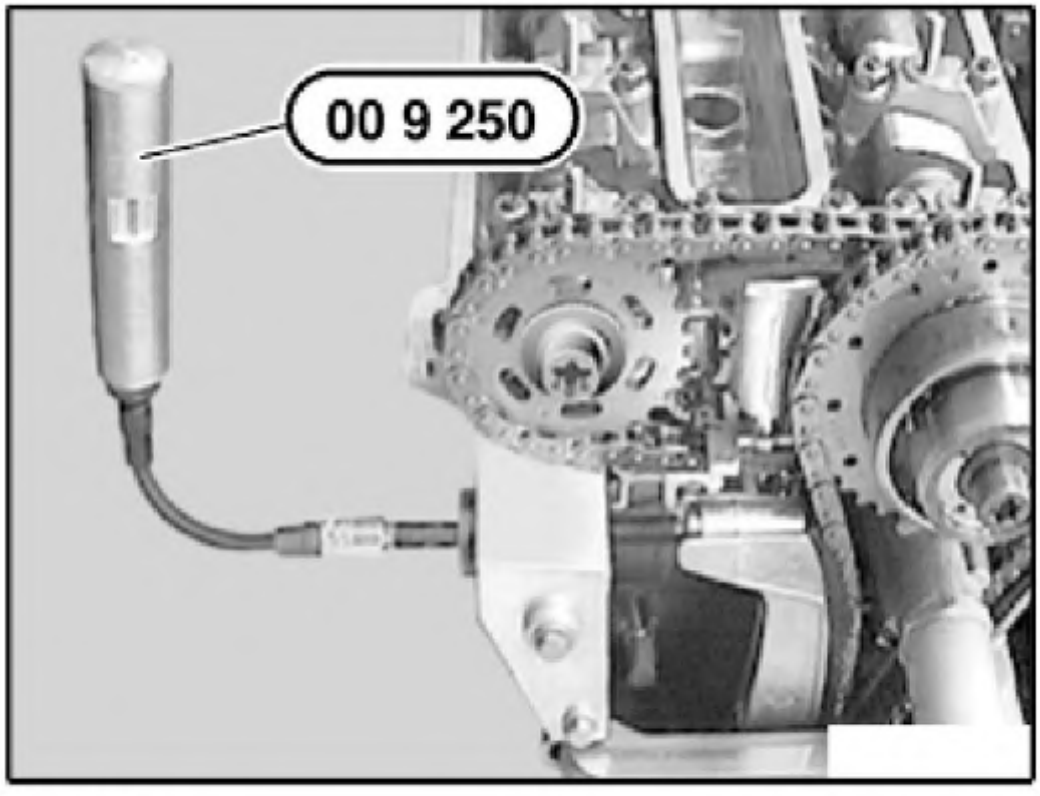


Fig. 335: Turning Adjusting Screw Using Special Tool 00 9 250
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Pretensioning the timing chain moves the camshaft adjustment unit and the unit must therefore be reset to the left-hand stop.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

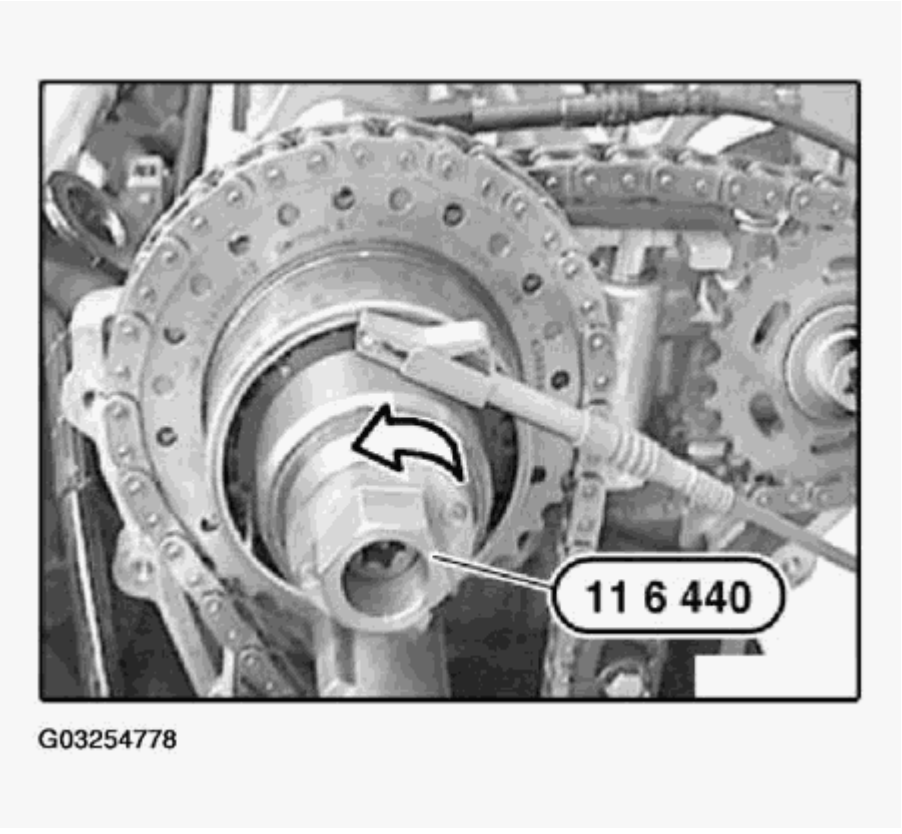


Fig. 336: Connecting Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

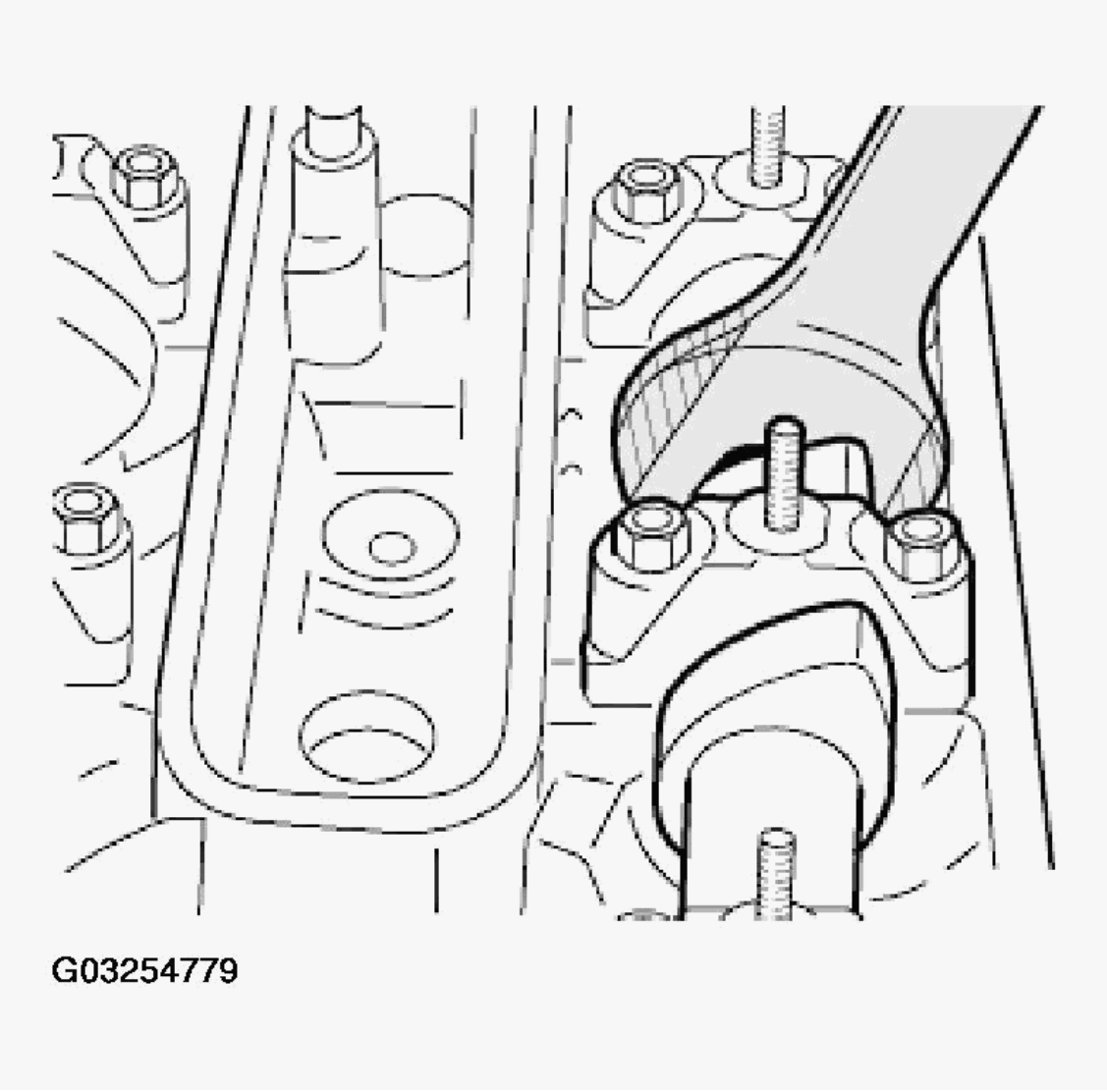


Fig. 337: Gripping Camshaft At Hexagon Head
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 5 to 8.

Tightening torque, see 11 36 14AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

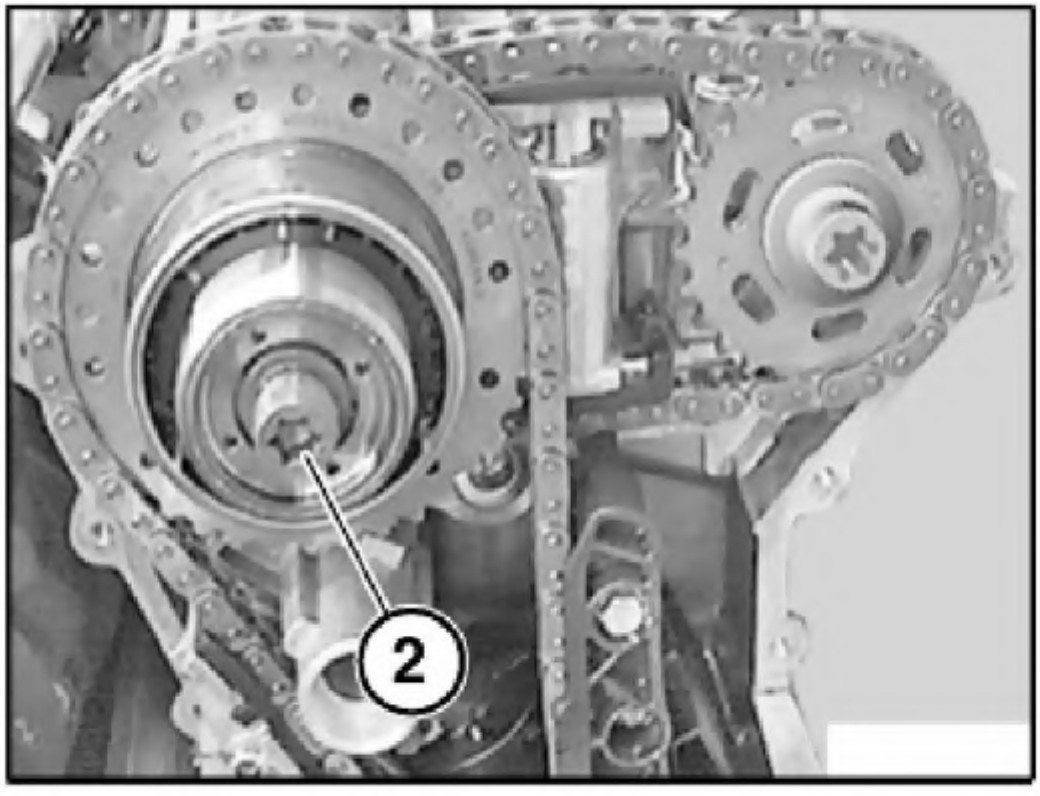


Fig. 338: Tightening Inlet Camshaft Screw (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 5 to 8.

Tightening torque, see 11 36 13AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

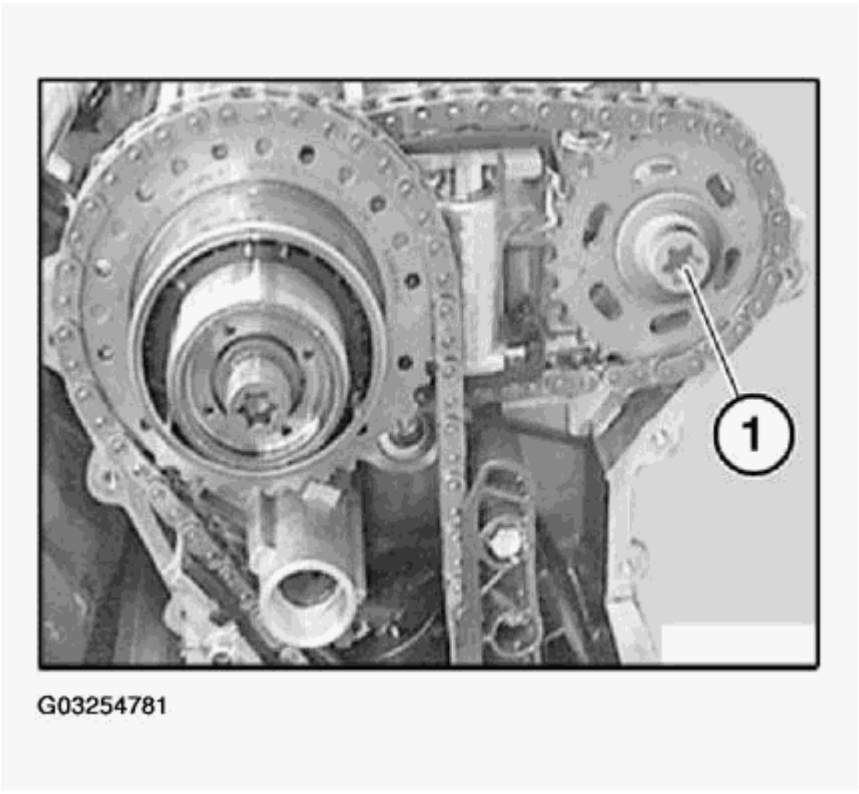


Fig. 339: Tightening Exhaust Camshaft Screw (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

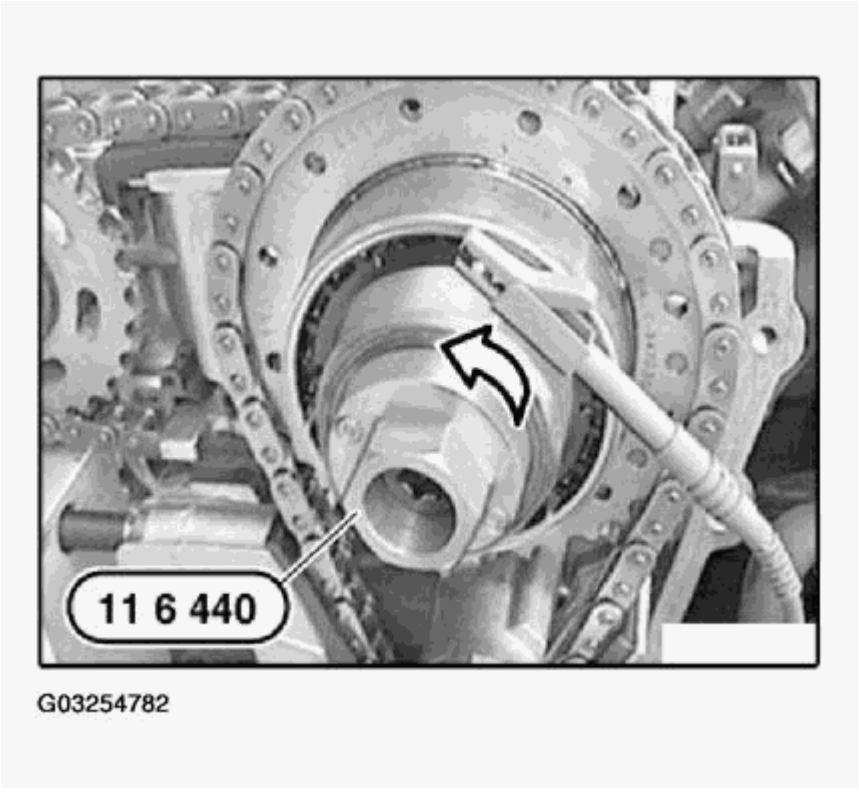


Fig. 340: Connecting Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 1 to 4.

Tightening torque, see 11 36 14AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

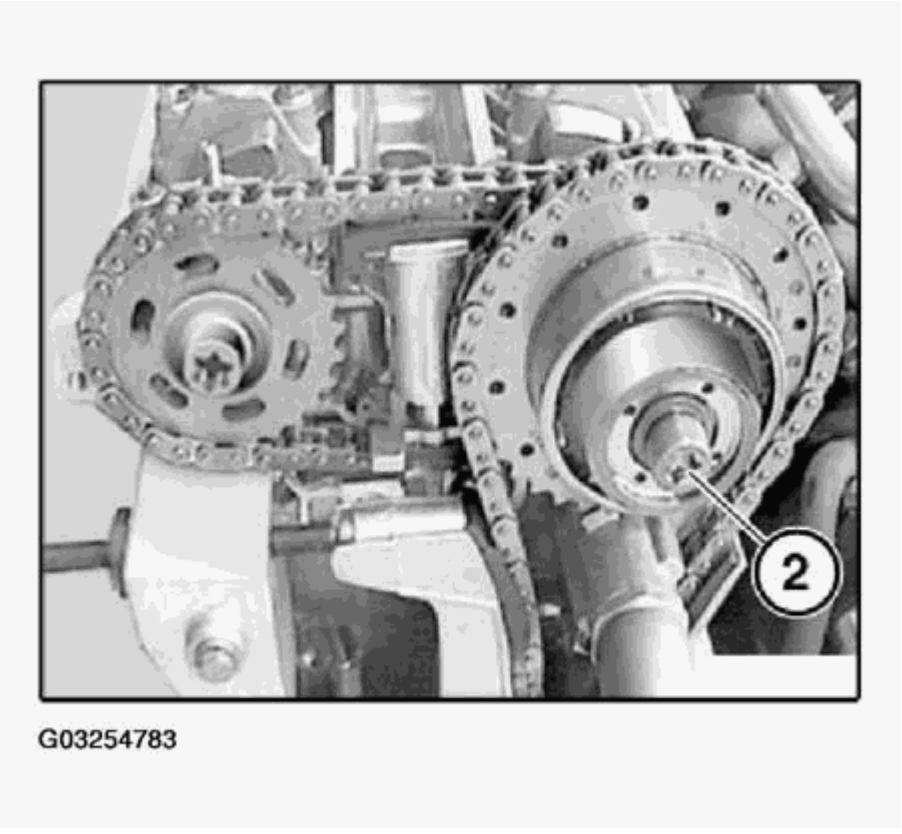


Fig. 341: Tightening Inlet Camshaft Screw (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 1 to 4.

Tightening torque, see 11 36 13AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

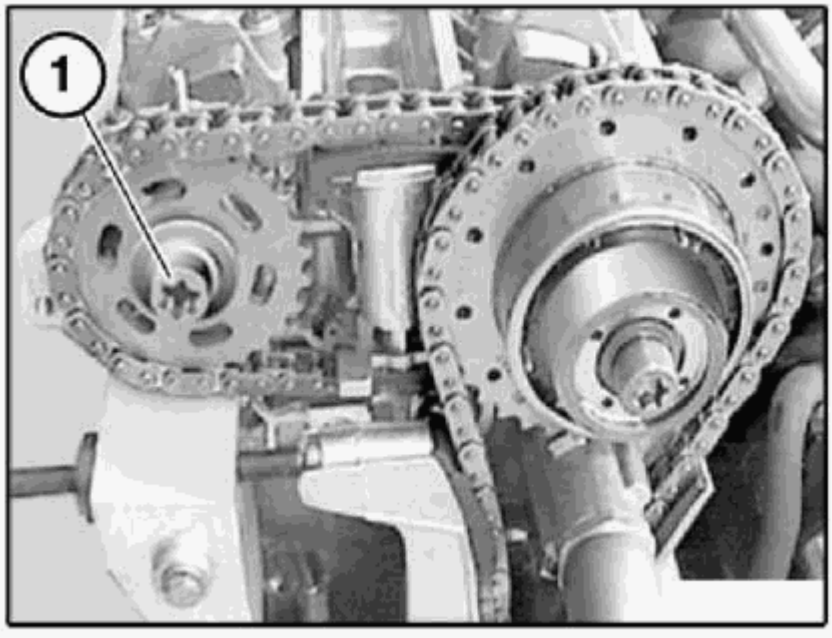


Fig. 342: Tightening Exhaust Camshaft Screw (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach sensor gear (2) to cylinder bank 1 to 4.

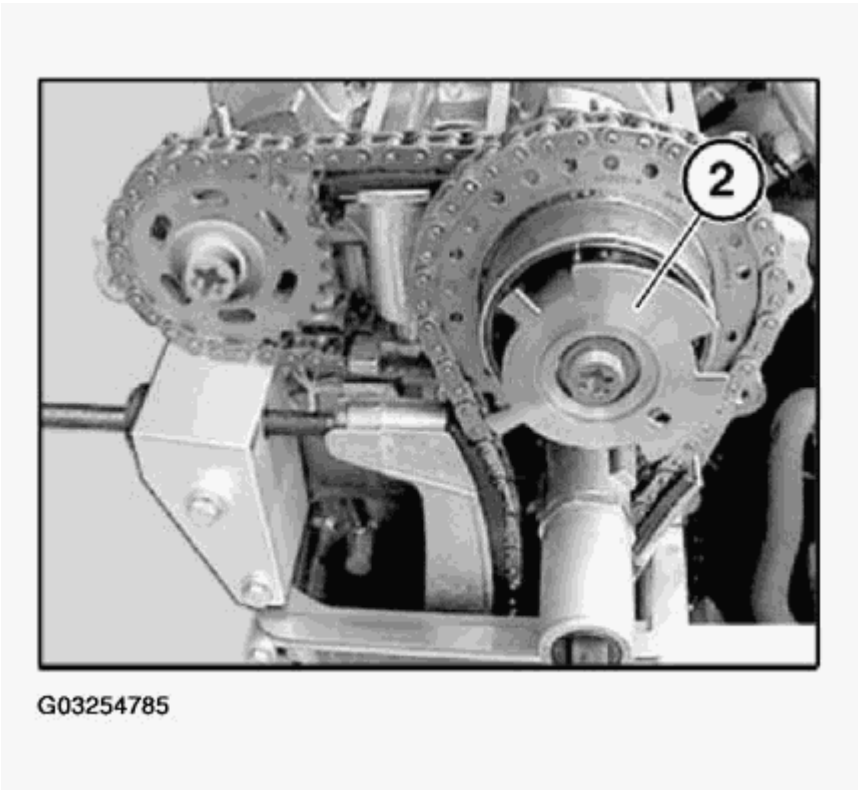


Fig. 343: Connecting Sensor Gear (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 1 to 4 and initially tighten without play, but do not tighten down yet.

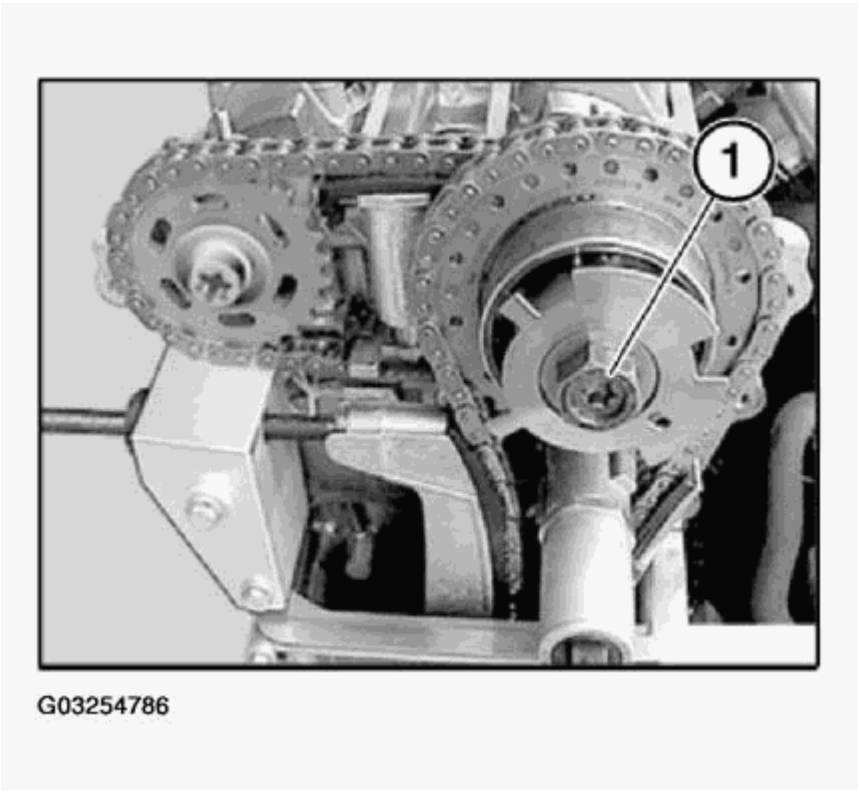


Fig. 344: Fitting Sensor Gear Screw (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

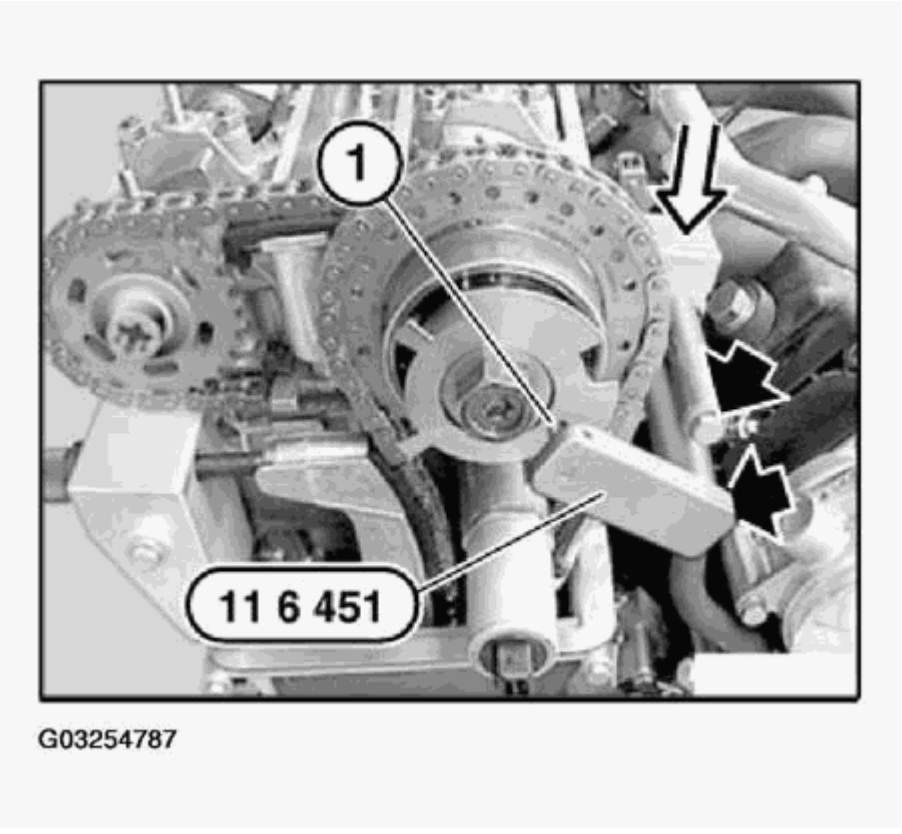


Fig. 345: Aligning Locating Bore On Sensor Gear (Cylinder Bank 1 To 4) To Positioning Pin On Special Tool 11 6 451
Courtesy of BMW OF NORTH AMERICA, INC.

Align locating bore (1) on sensor gear of cylinder bank 1 to 4 to positioning pin on special tool 11 6 451. Fit special tool 11 6 451, insert screws and initially tighten without play. Press special tool 11 6 451 downwards and align to cylinder head. Tighten down special tool 11 6 451.

CAUTION: Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.

Tightening torque, see 11 36 15AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

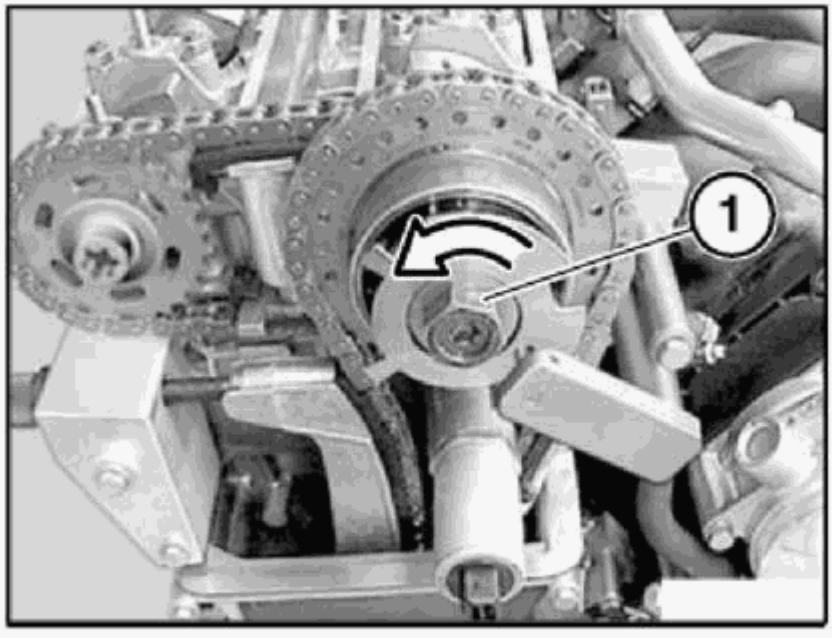


Fig. 346: Tightening Sensor Gear Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 6 451 from right cylinder head on cylinder bank 1 to 4.

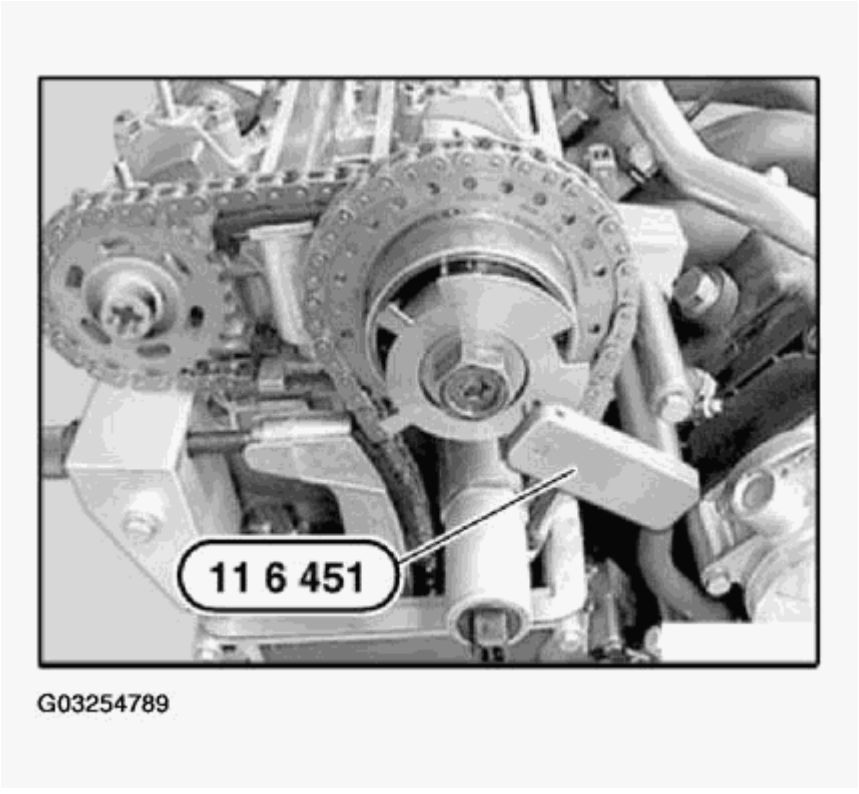


Fig. 347: Removing Special Tool 11 6 451 From Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach sensor gear (2) to cylinder bank 5 to 8.

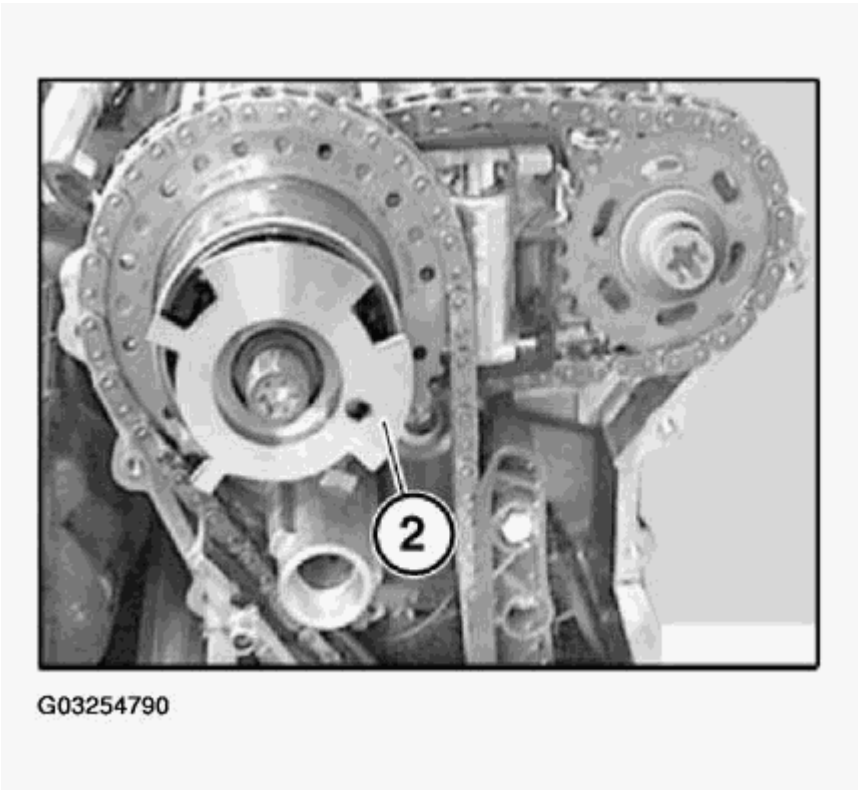


Fig. 348: Installing Sensor Gear (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 5 to 8 and initially tighten without play, but do not tighten down yet.

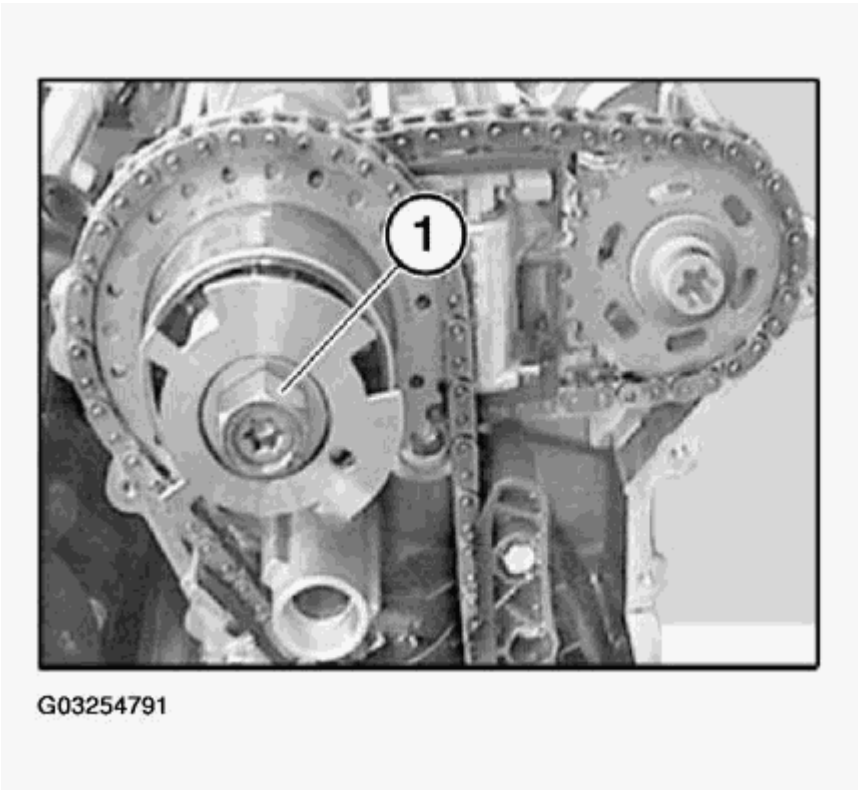


Fig. 349: Fitting Sensor Gear Screw Connection (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

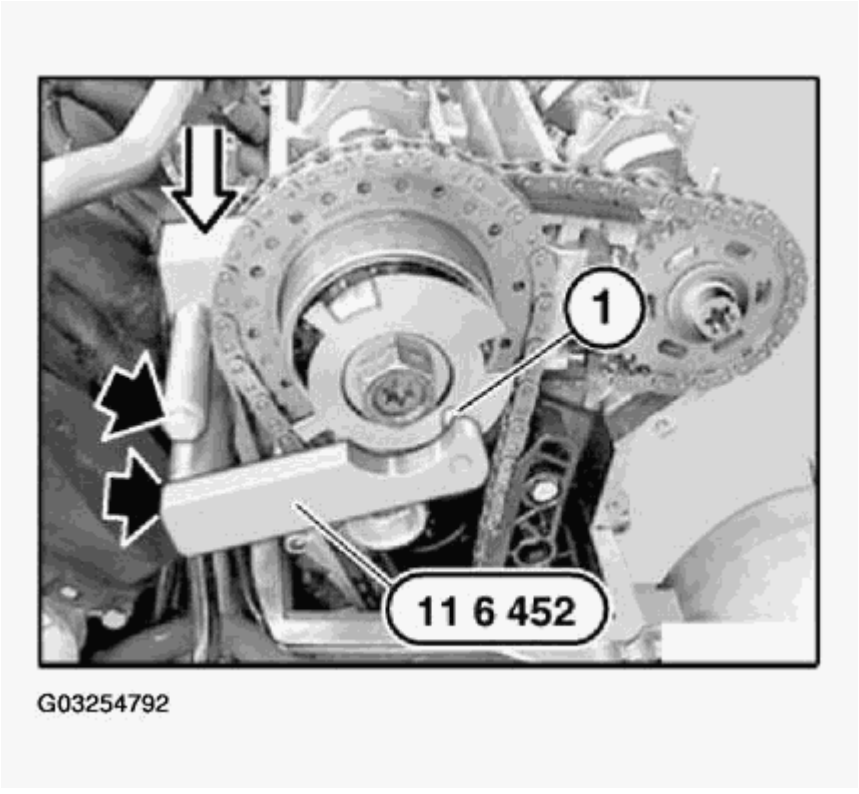


Fig. 350: Aligning Locating Bore On Sensor Gear (Cylinder Bank 5 To 8) To Positioning Pin On Special Tool 11 6 452
Courtesy of BMW OF NORTH AMERICA, INC.

Align locating bore (1) on sensor gear of cylinder bank 5 to 8 to positioning pin on special tool 11 6 452. Fit special tool 11 6 452, insert screws and initially tighten without play. Press special tool 11 6 452 downwards and align to cylinder head. Tighten down special tool 11 6 452.

CAUTION: Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.

Tightening torque, see 11 36 15AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

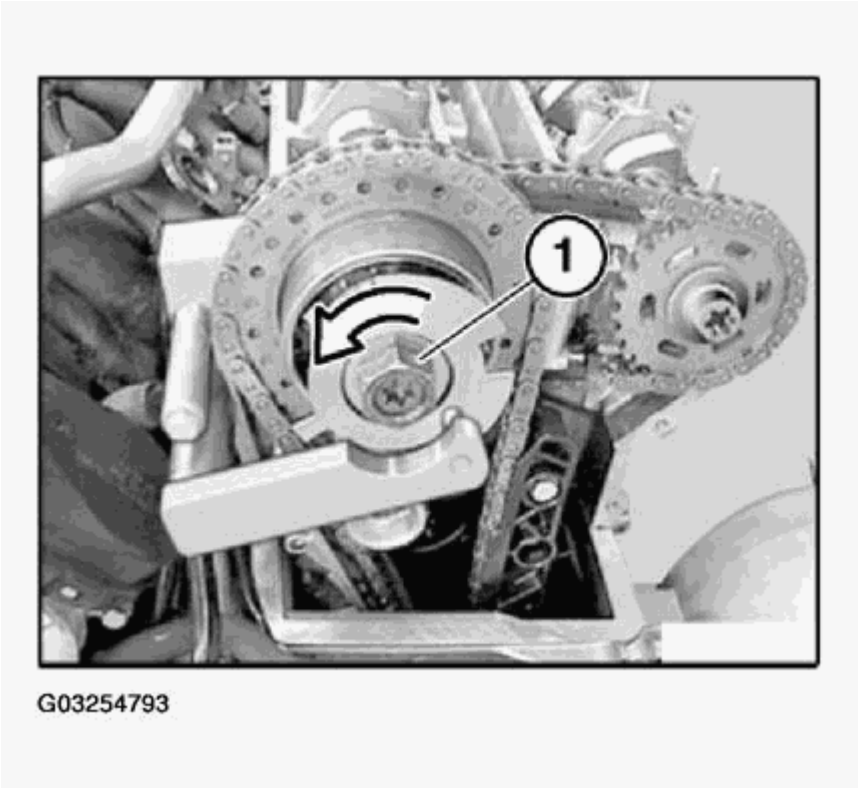


Fig. 351: Tightening Sensor Gear Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 6 452 from left cylinder head on cylinder bank 5 to 8.

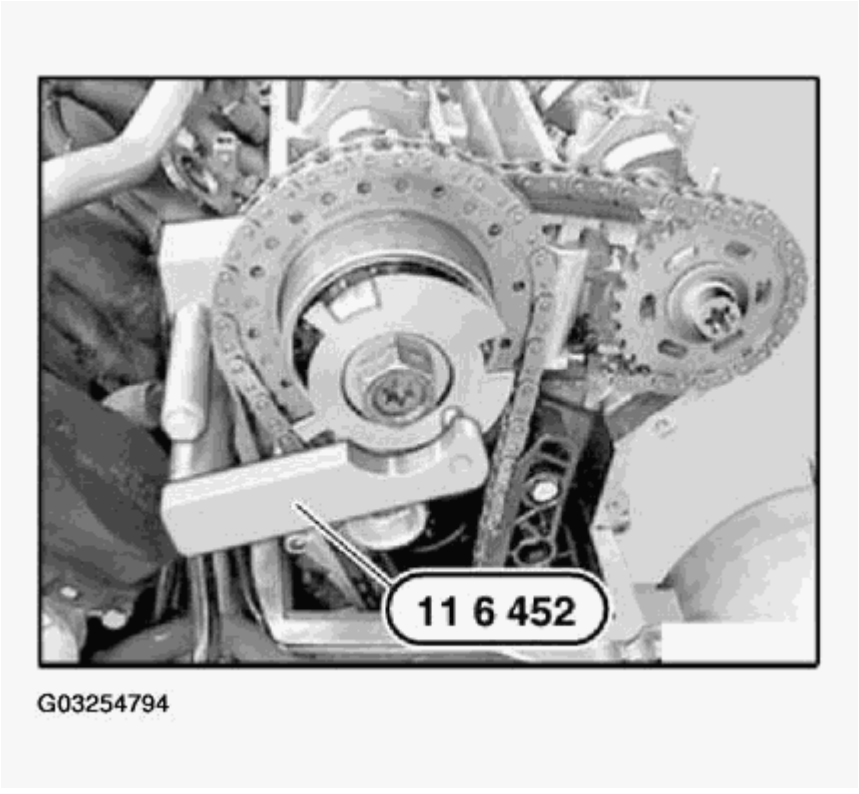


Fig. 352: Removing Special Tool 11 6 452 From Left Cylinder Head (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/11 2 443/11 2 445/11 2 441.

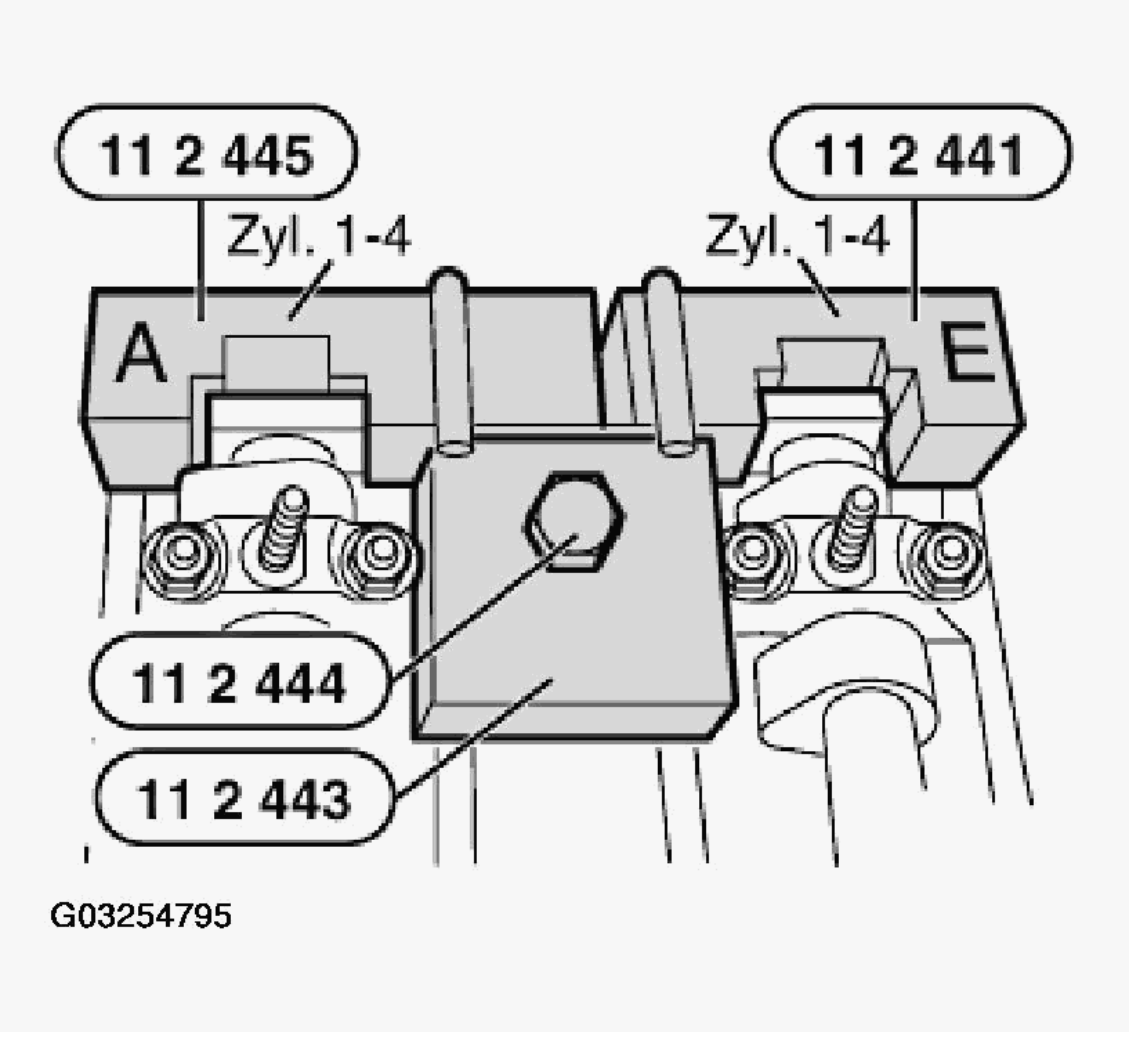


Fig. 353: Removing Special Tools (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/11 2 443/11 2 442/11 2 446.

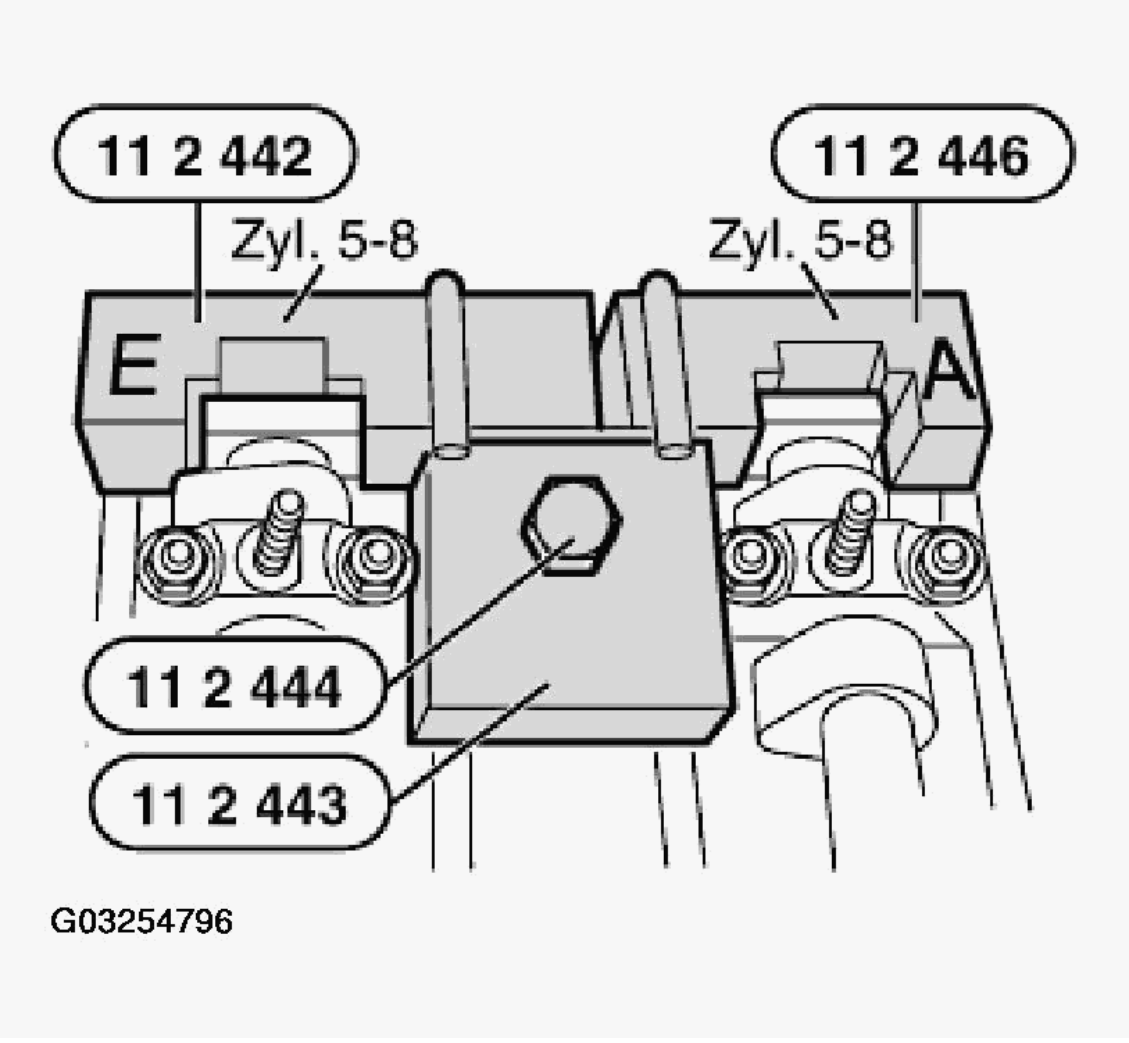


Fig. 354: Removing Special Tools (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on special tool 11 4 230.

Remove special tool 11 7 380 from right cylinder head on cylinder bank 1 to 4.

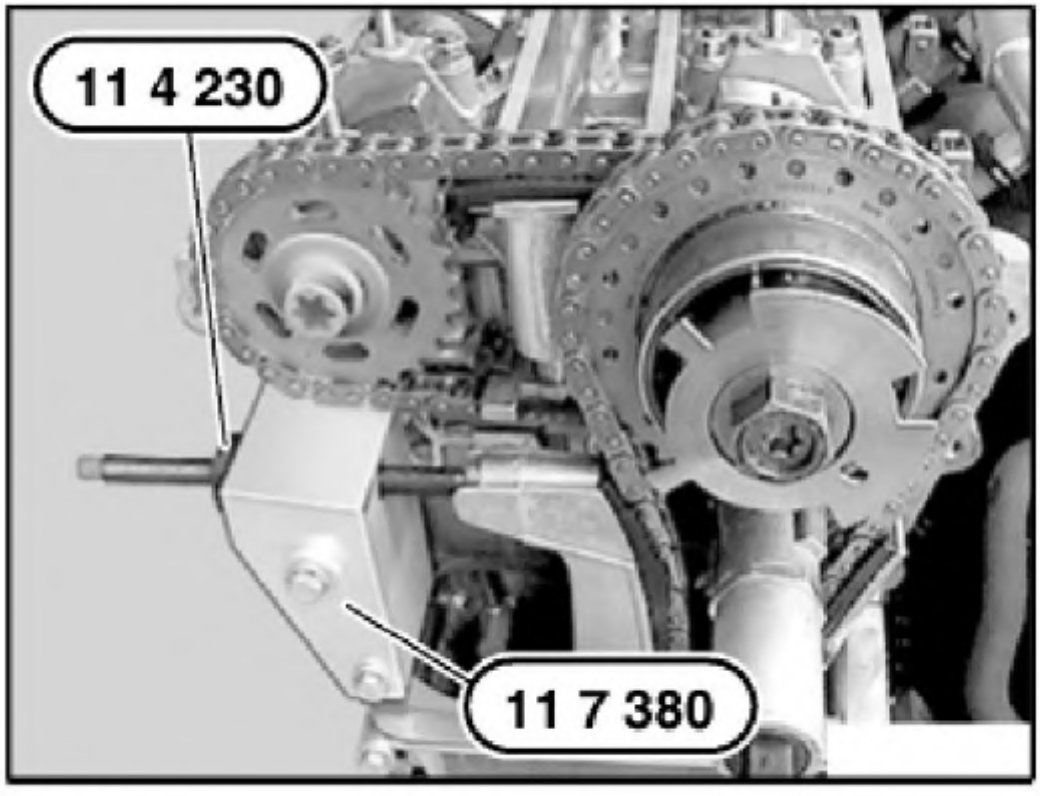


Fig. 355: Removing Special Tool 11 7 380 From Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Install oil lines on left and right of cylinder head.

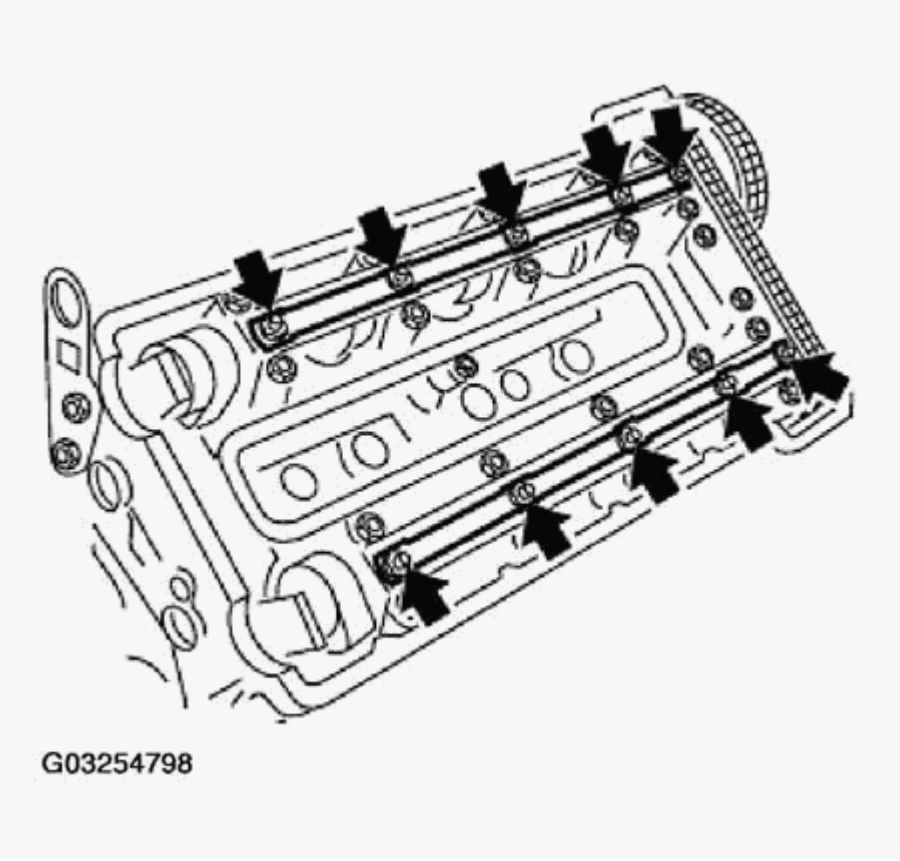


Fig. 356: Installing Oil Lines On Left And Right Of Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Install both timing case covers at top.

Install chain tensioning piston.

E53

Remove special tool 11 5 180.

Assemble engine.

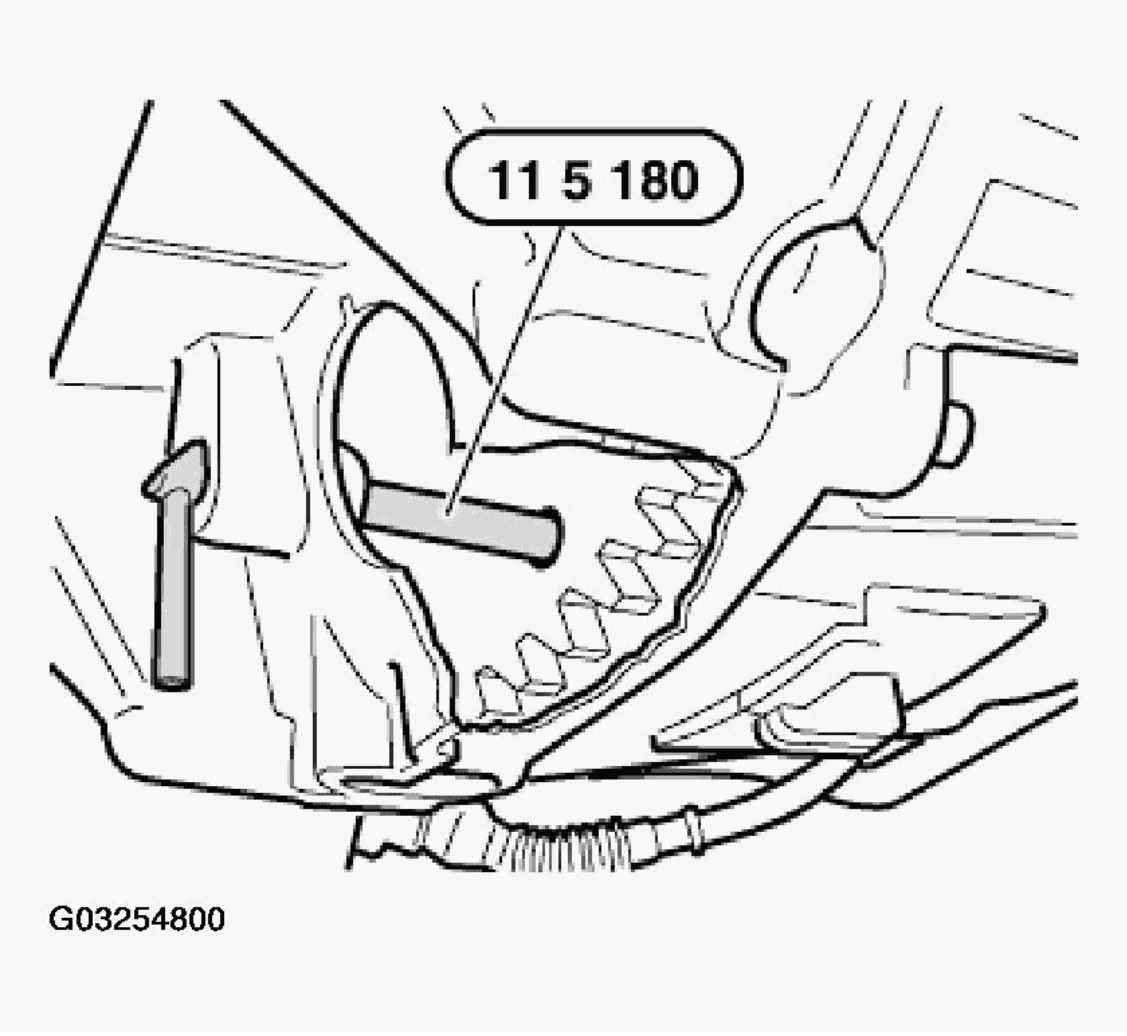


Fig. 357: Removing Special Tool 11 5 180
Courtesy of BMW OF NORTH AMERICA, INC.

11 31 090 INSTALLING AND REMOVING/REPLACING PISTON FOR CHAIN TENSIONER (M62)

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

Remove lower section of suction filter housing.

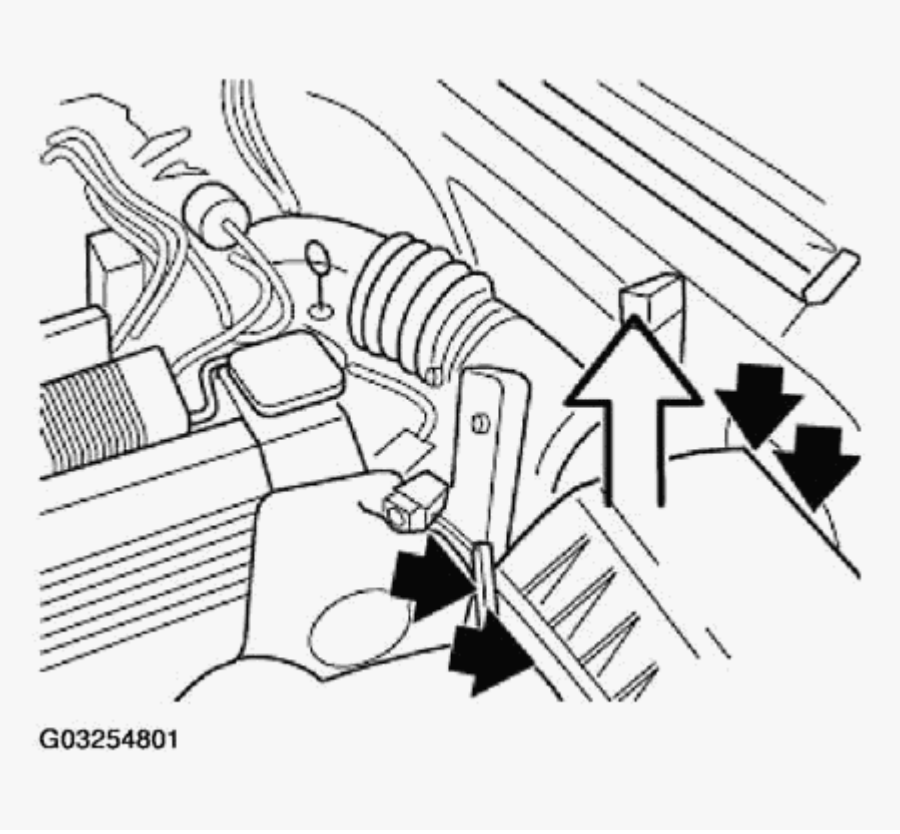


Fig. 358: Removing Upper And Lower Section Of Suction Filter Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screw connection.

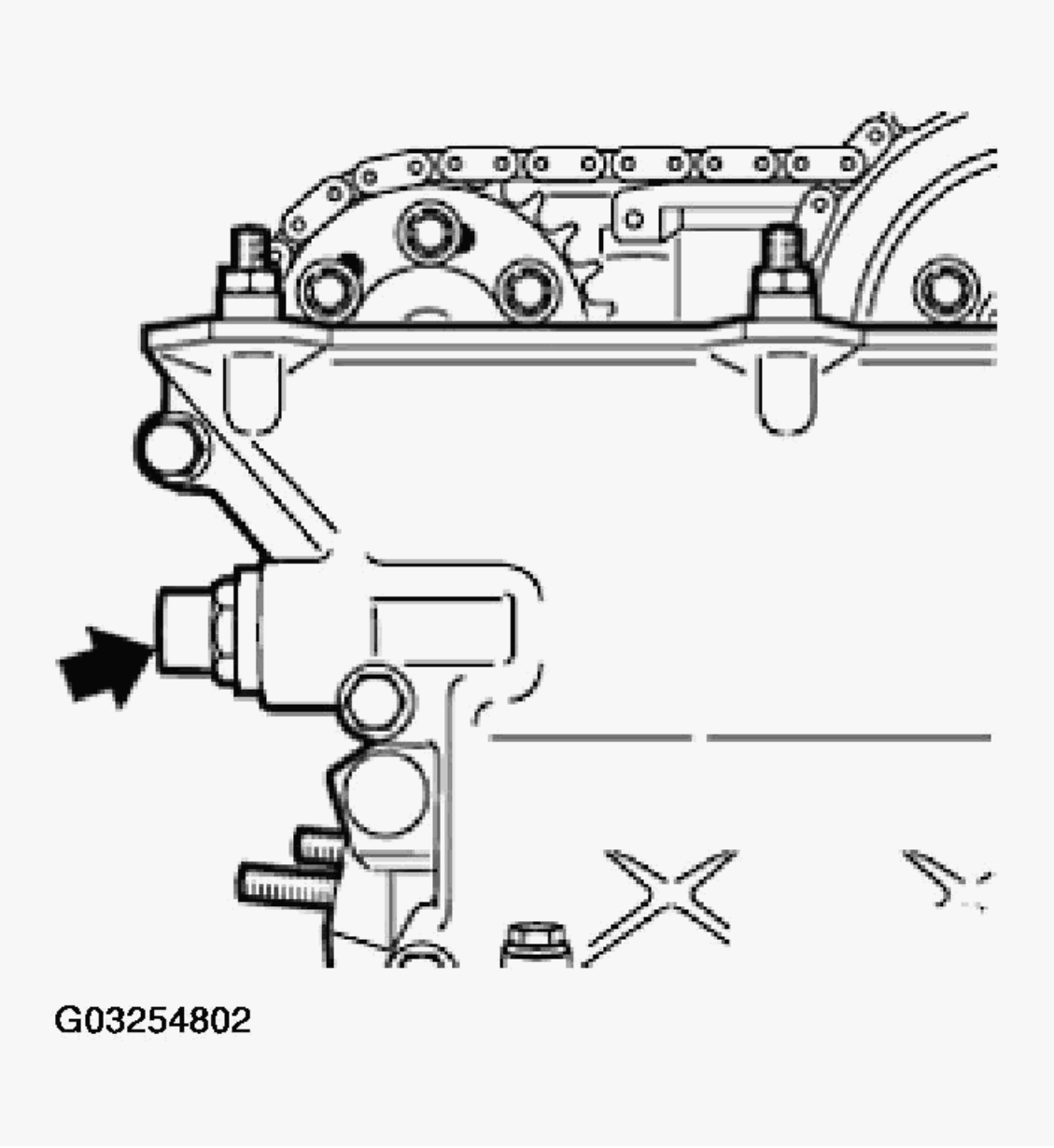


Fig. 359: Unfastening Screw Connection For Chain Tensioner Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring.

For tightening torque,

refer to 11 31 7AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Remove screw connection and piston for chain tensioner.

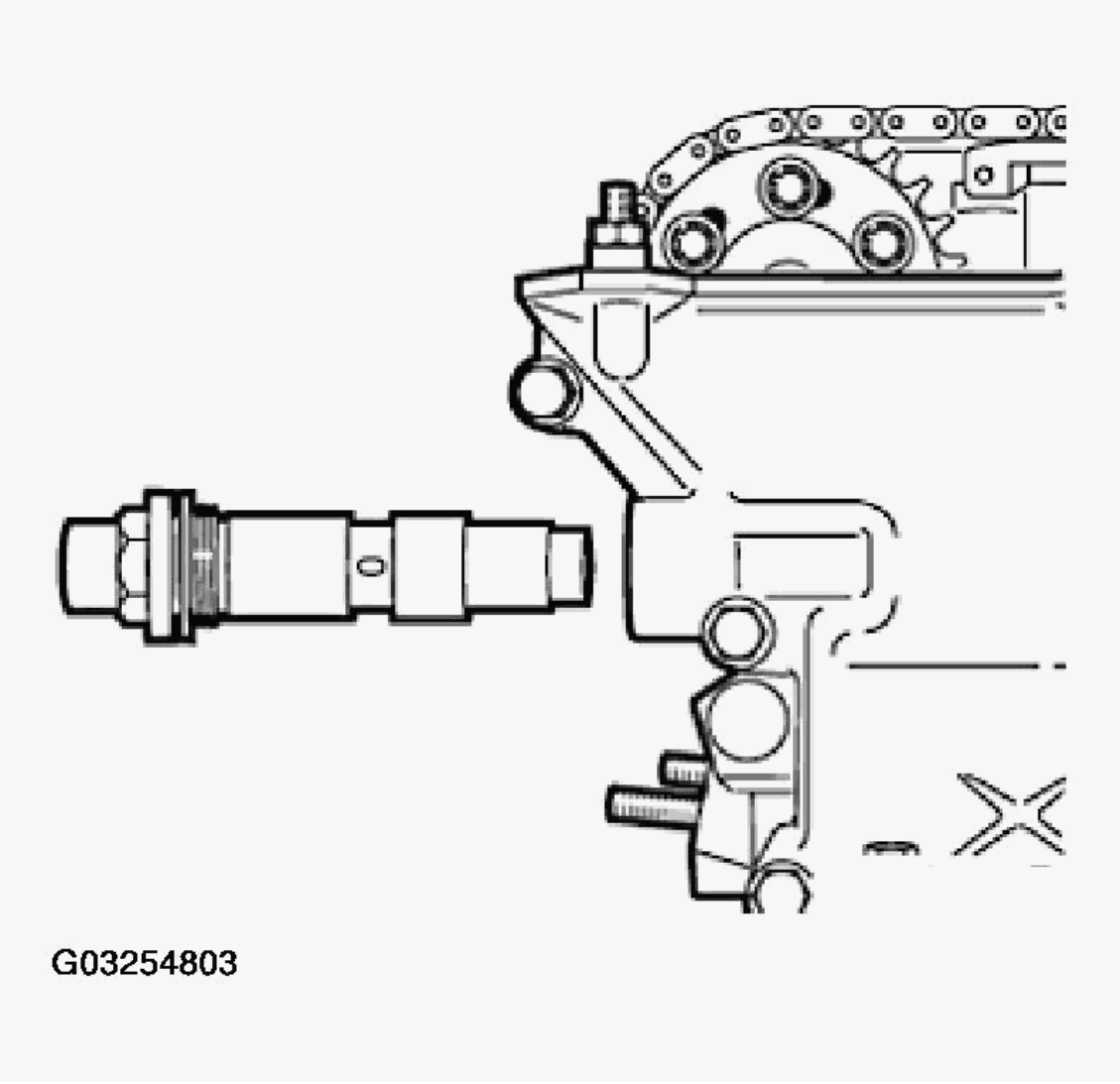


Fig. 360: Removing Chain Tensioner Piston
Courtesy of BMW OF NORTH AMERICA, INC.

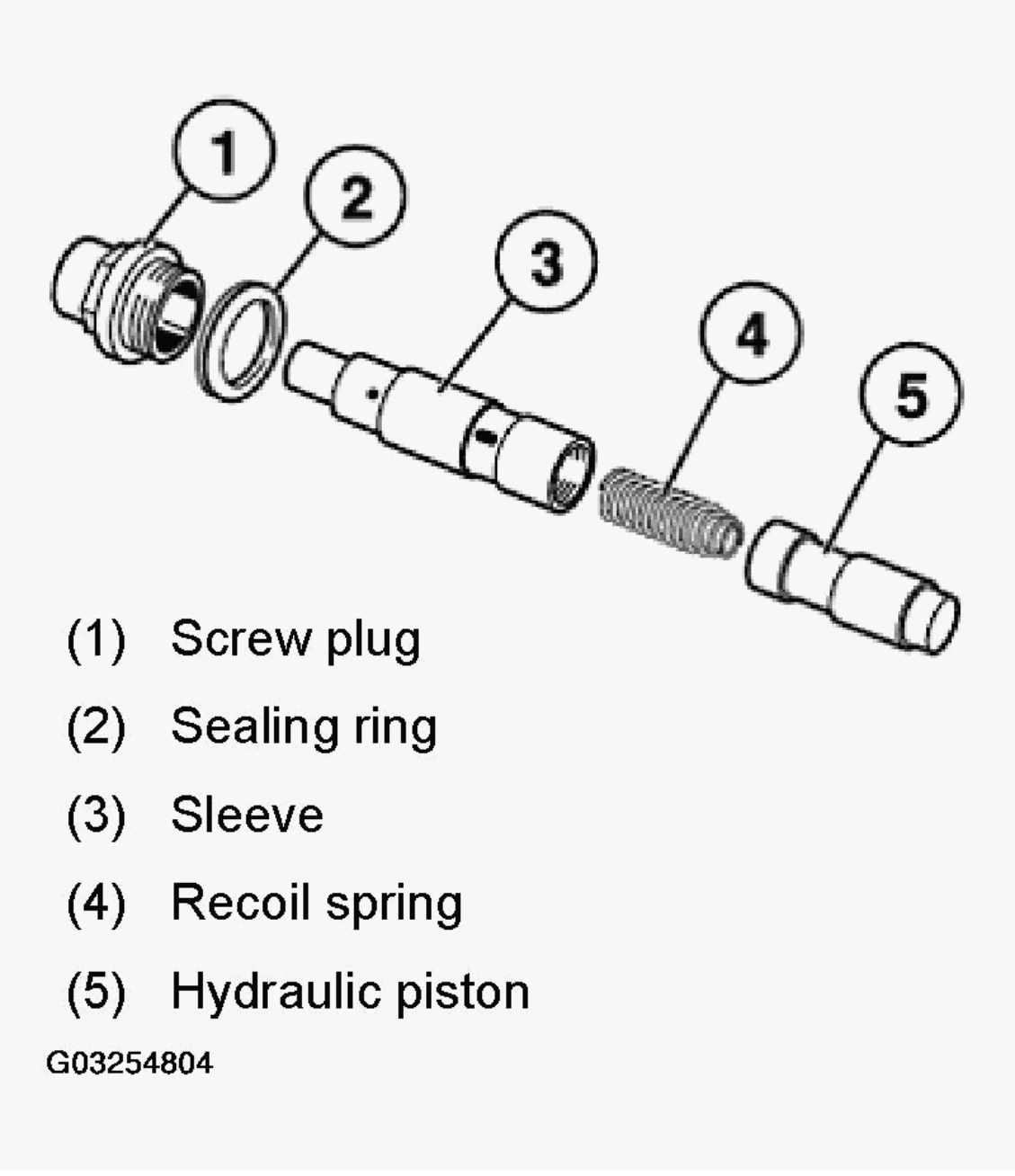


Fig. 361: Identifying Components Arrangement
Courtesy of BMW OF NORTH AMERICA, INC.

Tapered end of recoil spring (4) faces hydraulic piston (5).

Installation:

To simplify assembly, drain oil chamber between sleeve and hydraulic piston.

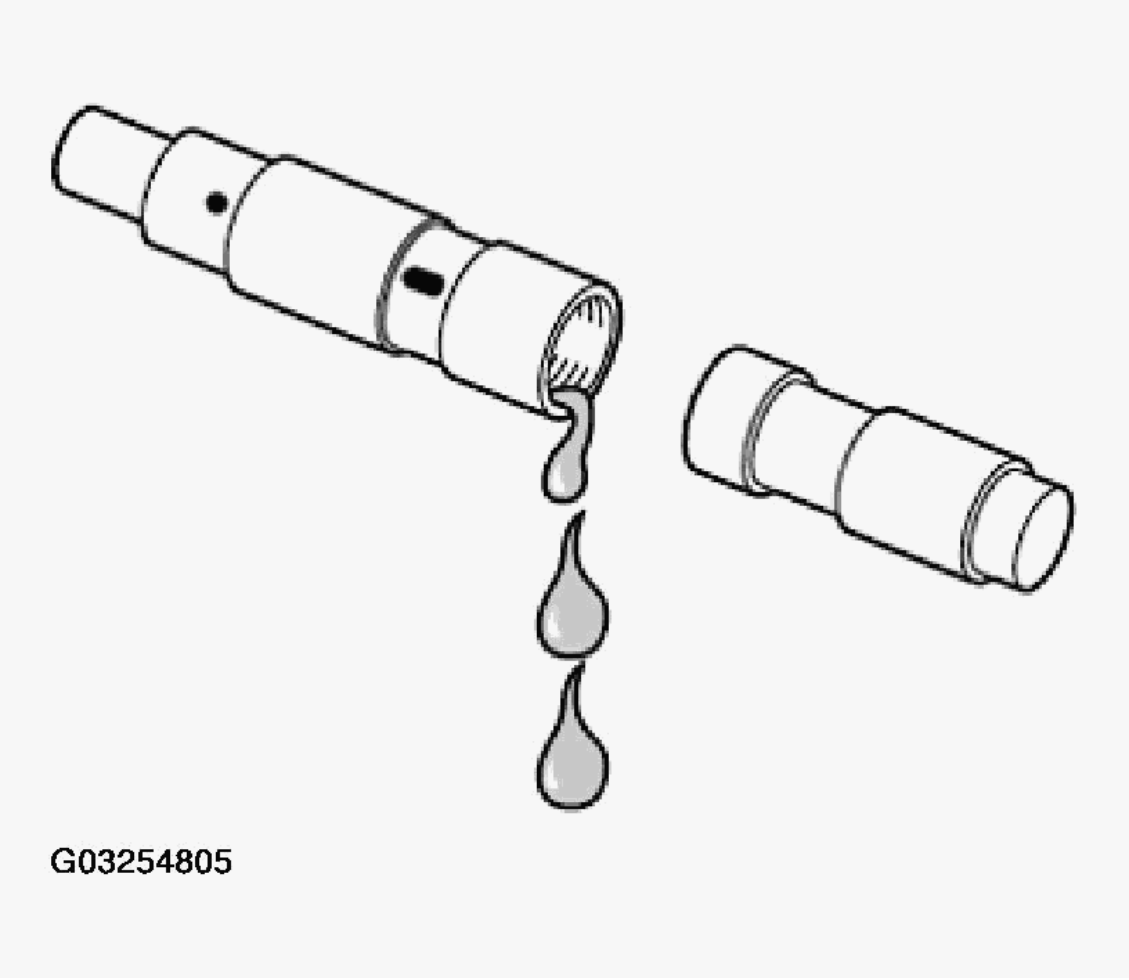


Fig. 362: Draining Oil From Piston
Courtesy of BMW OF NORTH AMERICA, INC.

VALVES WITH SPRINGS

11 34 552 REMOVING AND INSTALLING/REPLACING ALL VALVES (M62)

Cylinder Head Removed

Preliminary work is described in section on dismantling and assembling the cylinder head,

refer to **11 12 503 DISMANTLING AND REASSEMBLING CYLINDER HEAD (M62)**

Replacing valve stem seals,

refer to **11 34 560 REPLACING ALL VALVE STEM SEALS (M62, S62)**

Remove valves from cylinder head.

If necessary, check valve guide for wear,

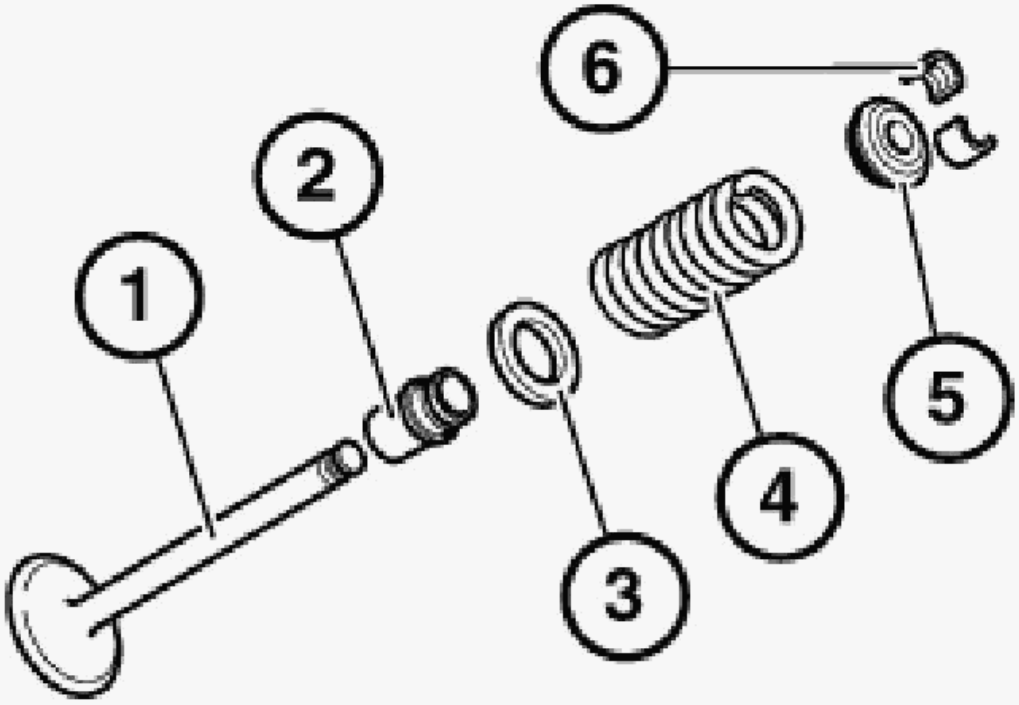
refer to **11 12 595 CHECKING A VALVE GUIDE FOR WEAR (M62, S62)**

If necessary, ream the valve guide,

refer to **11 12 600 REAMING A VALVE GUIDE (M62, S62) (VALVE REMOVED)**

If necessary, rework valve seat,

refer to **11 12 527 REMACHINING A VALVE SEAT (M62, S62) (CYLINDER HEAD DISMANTLED)**



(1) Valve

(2) Valve-stem seal

(3) Lower plate spring

(4) Valve spring

(5) Upper plate spring

(6) Valve tapers

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Fig. 363: Identifying Valve Components
Courtesy of BMW OF NORTH AMERICA, INC.

Installation sequence:

1. Valve
2. Valve-stem seal
3. Lower plate spring
4. Valve spring
5. Upper plate spring

11 34 560 REPLACING ALL VALVE STEM SEALS (M62, S62)

Cylinder Head Removed

Preliminary tasks are described in disassembly and assembly of cylinder head,

refer to **11 12 503 DISMANTLING AND REASSEMBLING CYLINDER HEAD (M62)** .

CAUTION: Do not damage races on bucket tappets. Insert protective film, special tool 11 0 200.

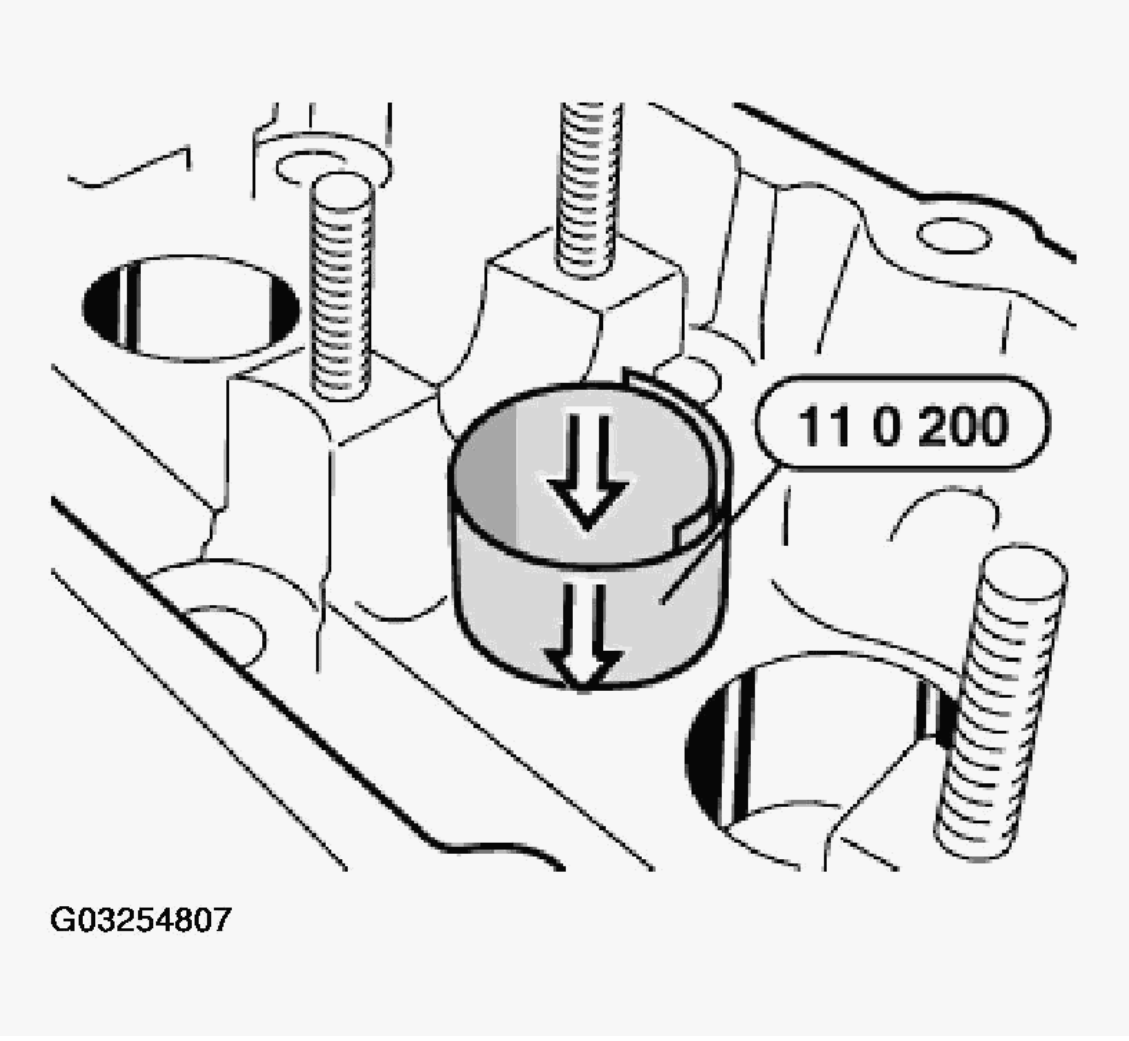


Fig. 364: Inserting Protective Film Special Tool 11 0 200
Courtesy of BMW OF NORTH AMERICA, INC.

Remove valve stem seal with special tool 11 1 480.

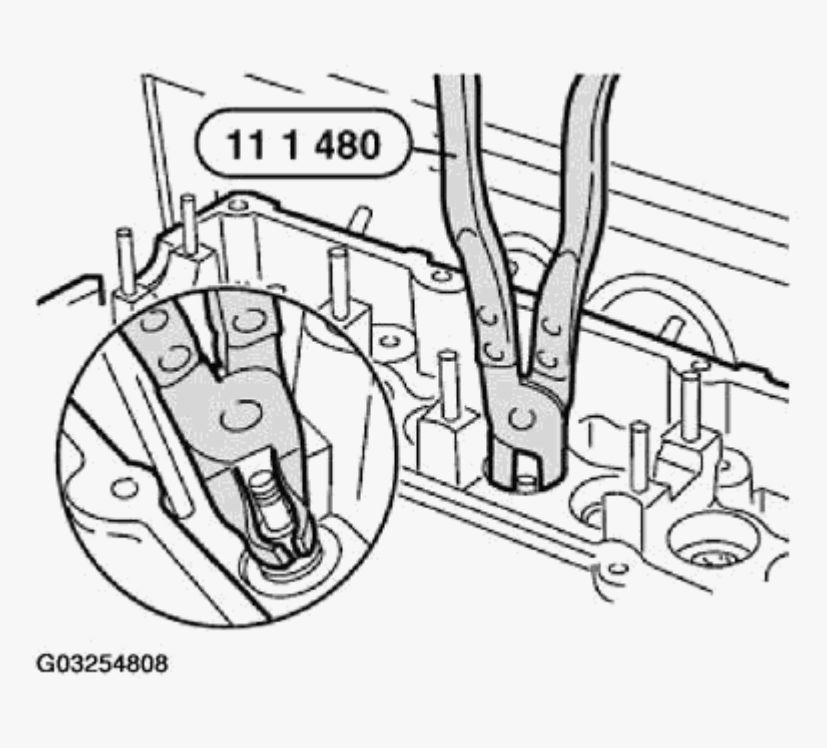


Fig. 365: Removing Valve Stem Seal With Special Tool 11 1 480
Courtesy of BMW OF NORTH AMERICA, INC.

Lubricate valve stem with oil and insert valve. Fit special tool 11 1 960. Coat new valve stem seal (1) with oil and install.

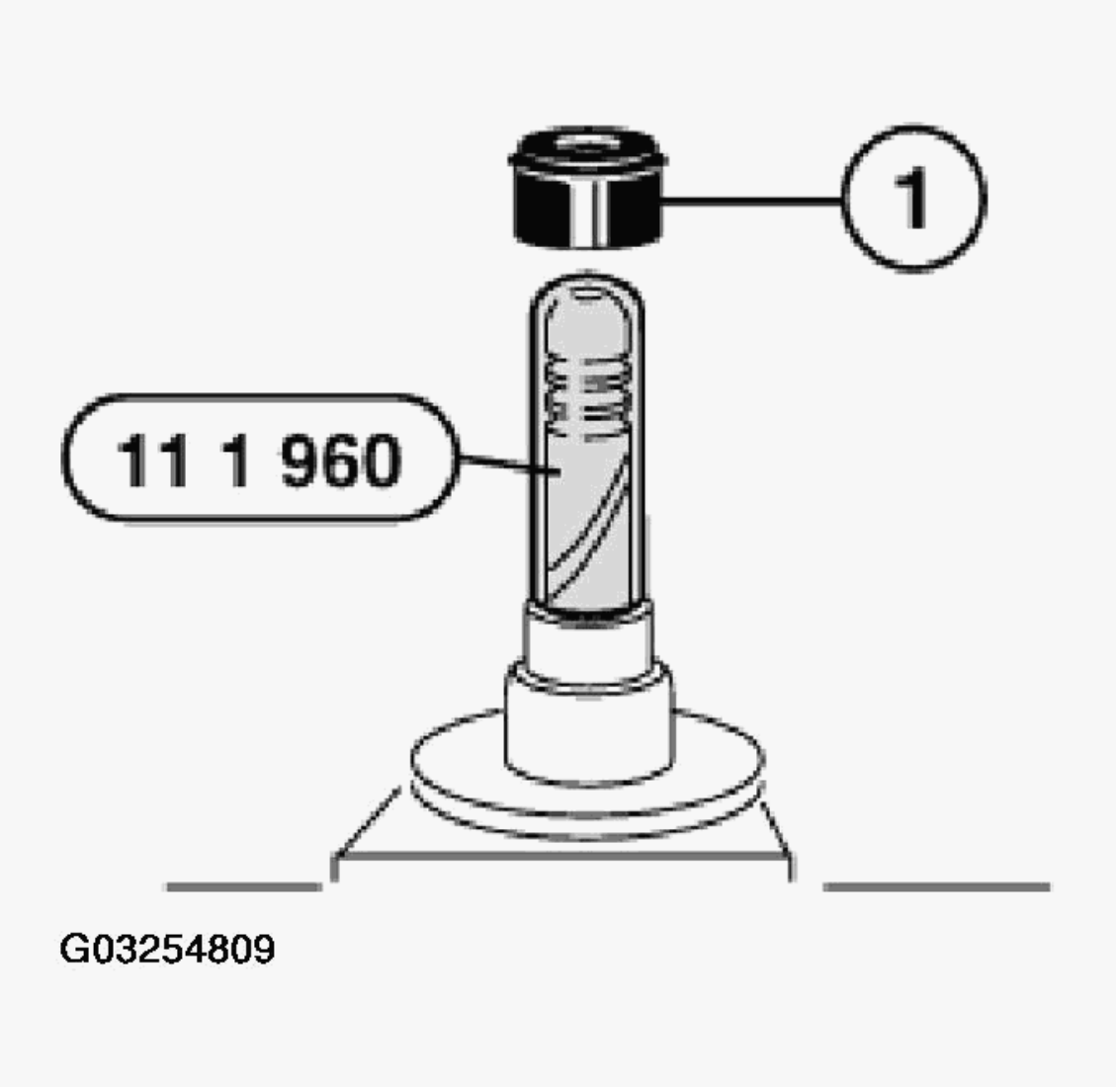


Fig. 366: Installing Valve Stem Seal Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Press-fit valve stem seal firmly home by hand using special tool 11 1 200.

Remove special tool 11 1 960.

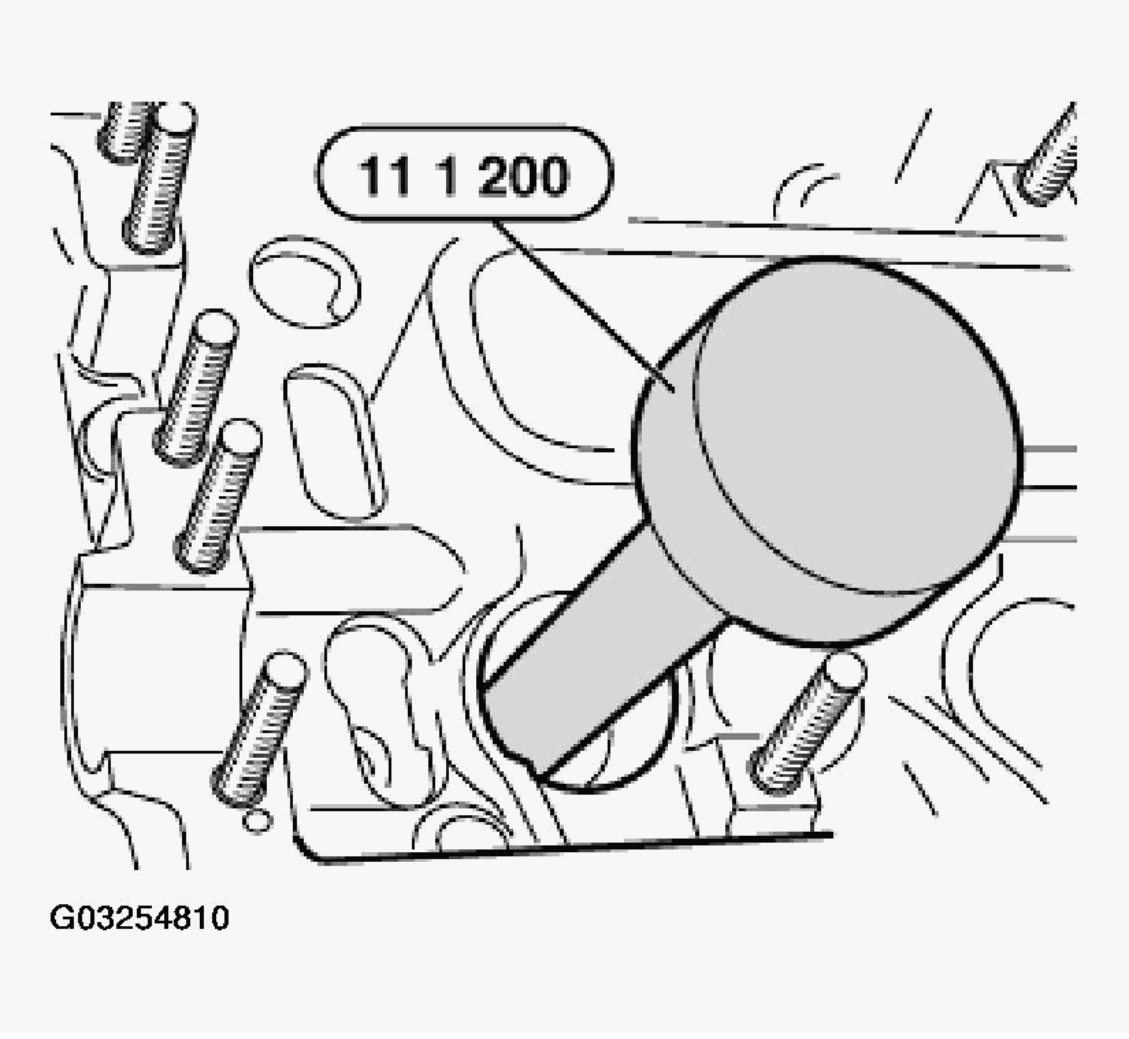


Fig. 367: Installing Valve Stem Seal Using Special Tool 11 1 960
Courtesy of BMW OF NORTH AMERICA, INC.

11 34 715 REPLACING ALL VALVE SPRINGS (M62)

Cylinder Head Removed

Preliminary tasks are described in disassembly and assembly of cylinder head,

refer to **11 12 503 DISMANTLING AND REASSEMBLING CYLINDER HEAD (M62)** .

Remove bucket tappet with special tool 11 3 250.

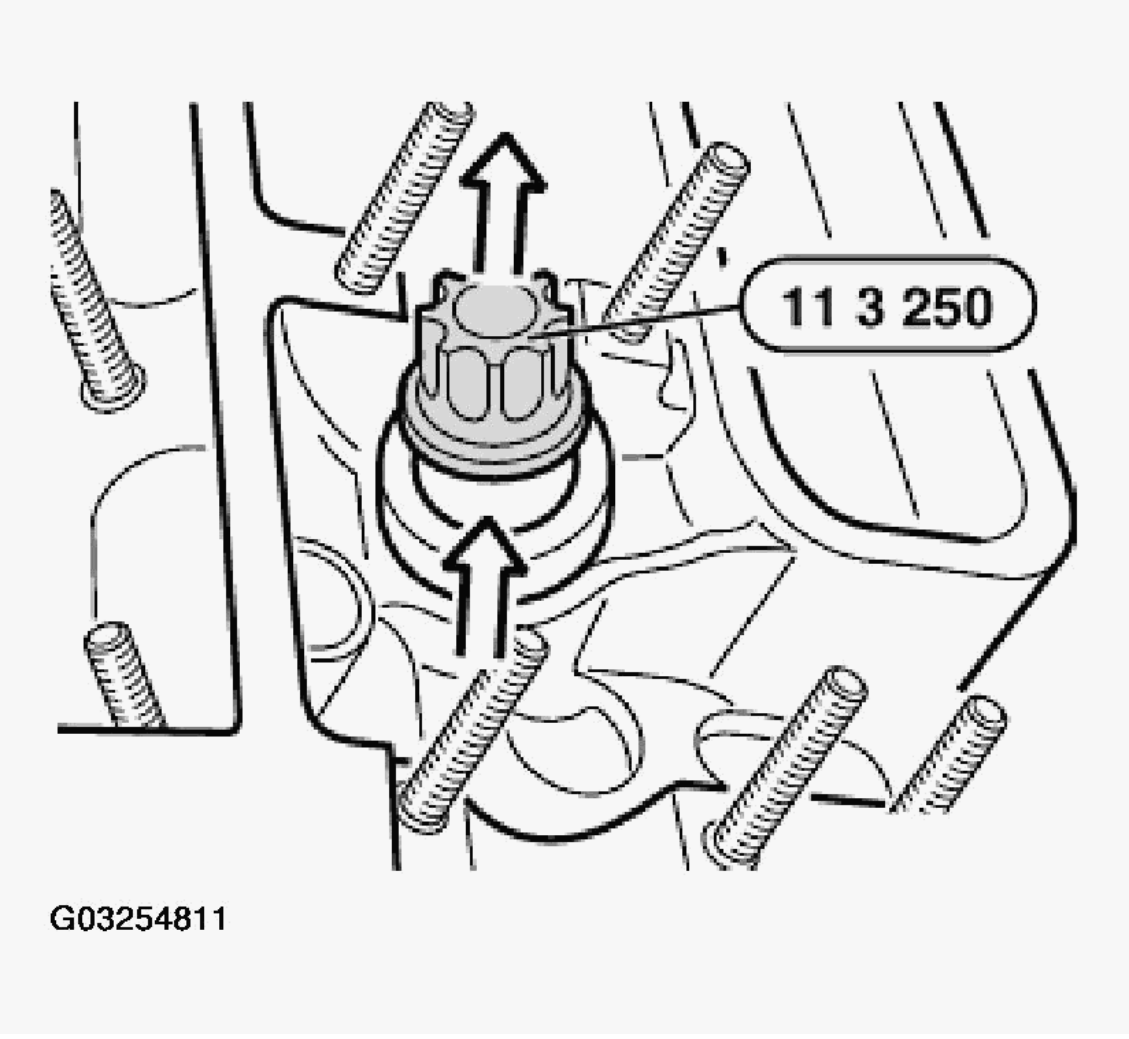


Fig. 368: Removing Bucket Tappet
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Worn bucket tappets may only be reused in the same tappet bore.

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

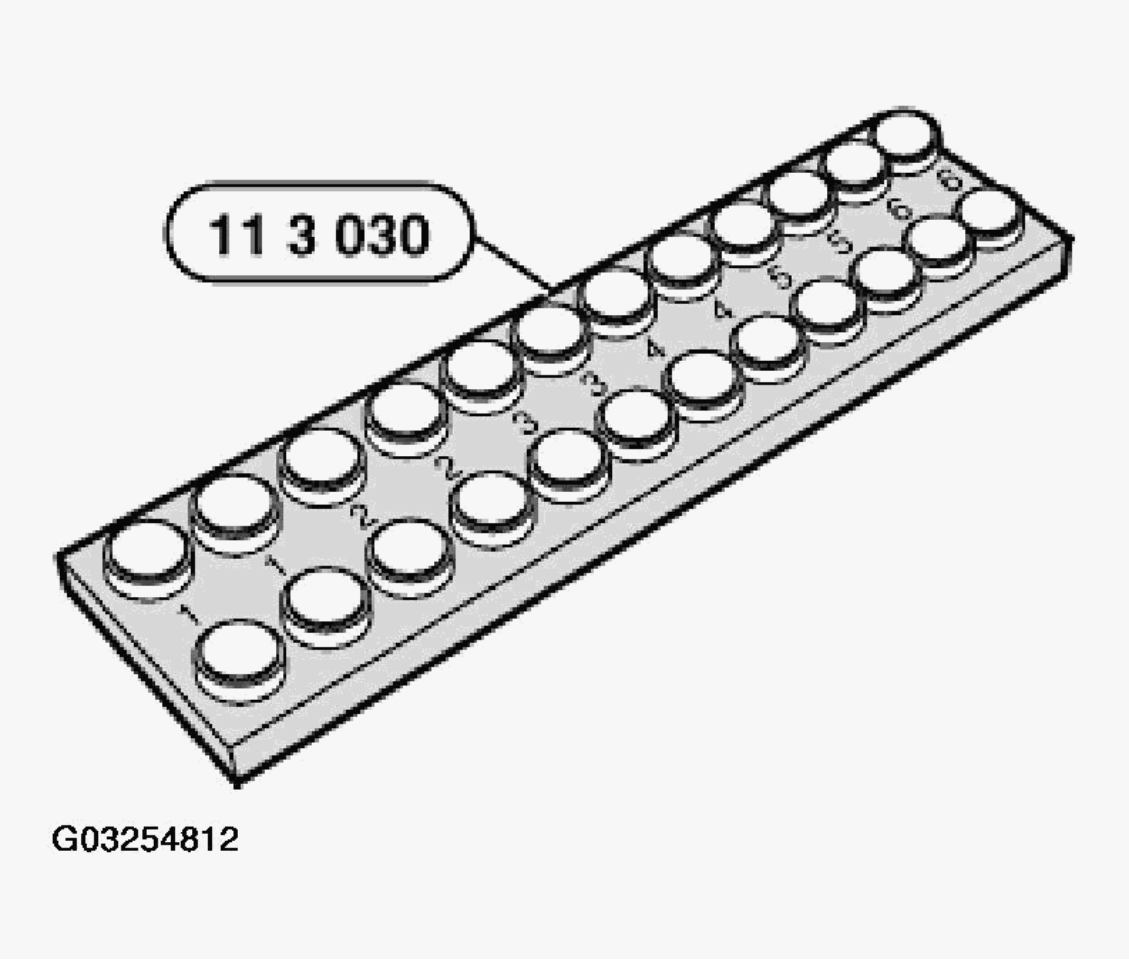


Fig. 369: Sorting Bucket Tappets
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 0 211 from below in special tool 11 1 065 and secure with special tool 11 1 045.

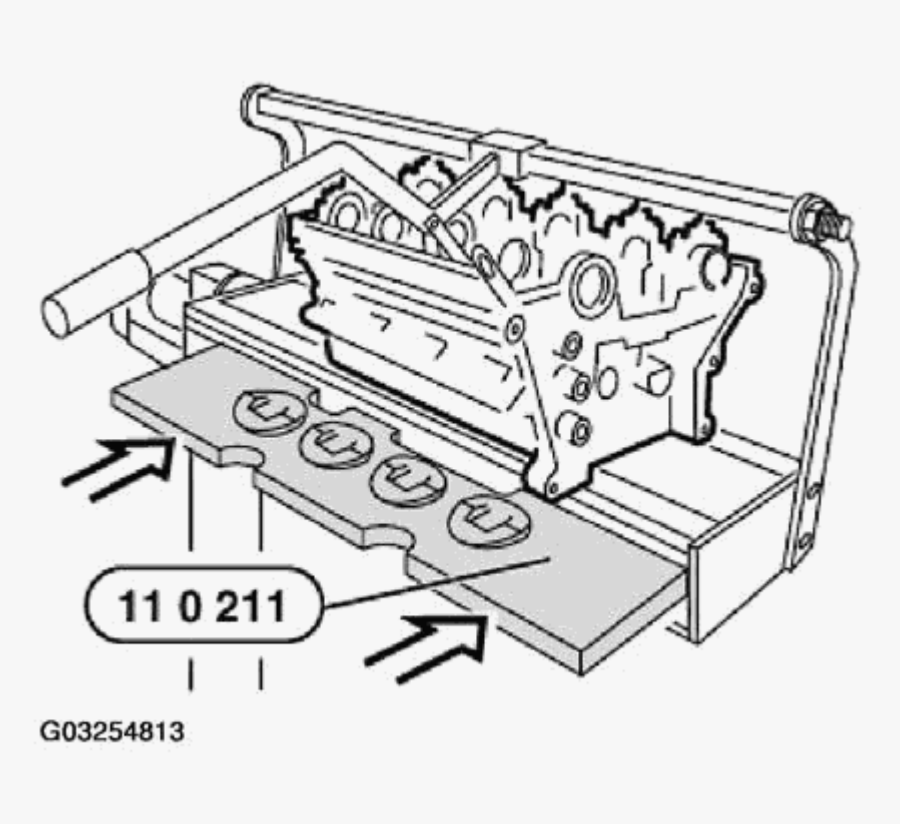


Fig. 370: Fitting Special Tool 11 0 211 Into Position
Courtesy of BMW OF NORTH AMERICA, INC.

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

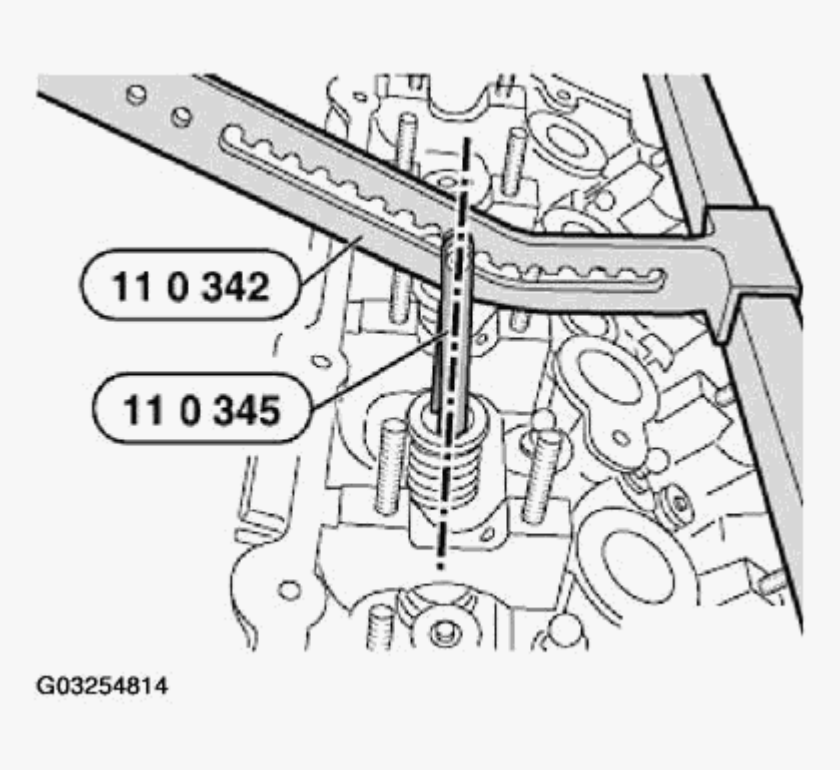


Fig. 371: Aligning Special Tool 11 0 345 In Direction Of Valve Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

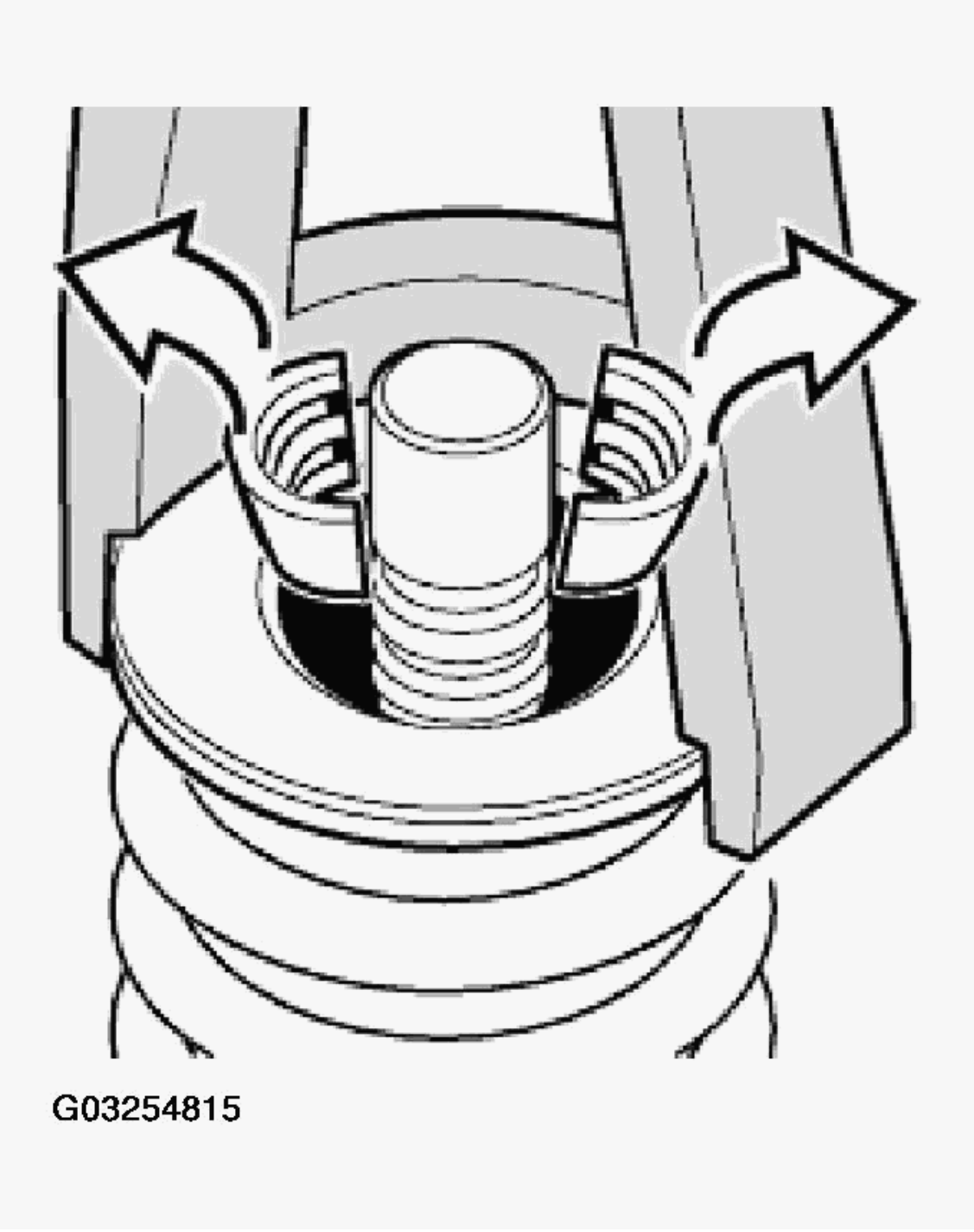
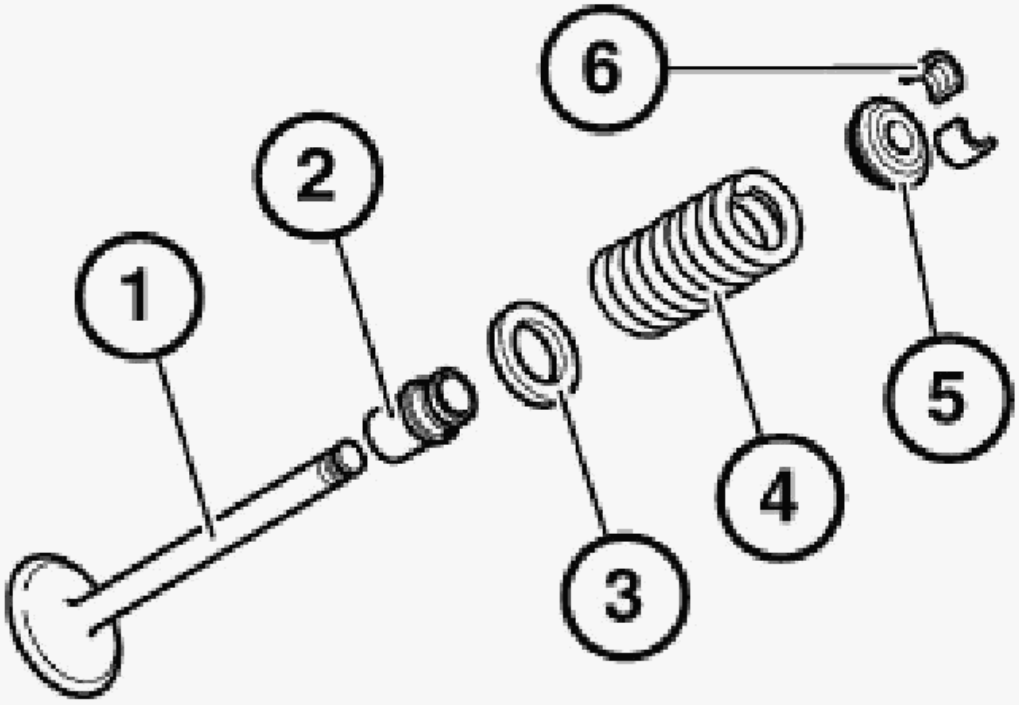


Fig. 372: Removing Valve Keys
Courtesy of BMW OF NORTH AMERICA, INC.

Remove valve spring and plate spring.

Arrangement:

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



(1) Valve

(2) Valve-stem seal

(3) Lower plate spring

(4) Valve spring

(5) Upper plate spring

(6) Valve tapers

G03254816

Fig. 373: Identifying Arrangements Of Valve Components
Courtesy of BMW OF NORTH AMERICA, INC.

VARIABLE, CAMSHAFT TIMING

11 31 010 ADJUSTING CAMSHAFT TIMING (M62 VANOS FROM 9/98)

Special tools required:

NOTE: For Special Tool identification, see ENGINE - SPECIAL TOOLS - X5 (4.4L & 4.6L) .

- 00 9 250
- 11 2 300
- 11 2 441
- 11 2 442
- 11 2 443
- 11 2 444
- 11 2 445
- 11 2 446
- 11 4 230
- 11 4 231
- 11 4 232
- 11 5 180
- 11 6 440
- 11 6 450
- 11 6 451
- 11 6 452
- 11 7 380

Adjusting Camshaft Timing

Remove intake filter housing with air-mass flow sensor.

Remove fan impeller with fan clutch and fan cowl.

Remove both cylinder head covers.

Remove spark plugs.

CAUTION: In firing TDC position, the inlet camshaft 1 to 4 rotates in the teeth of the camshaft adjustment unit. This twisting is caused by the position of the

cams and is not an indication for incorrect timing.

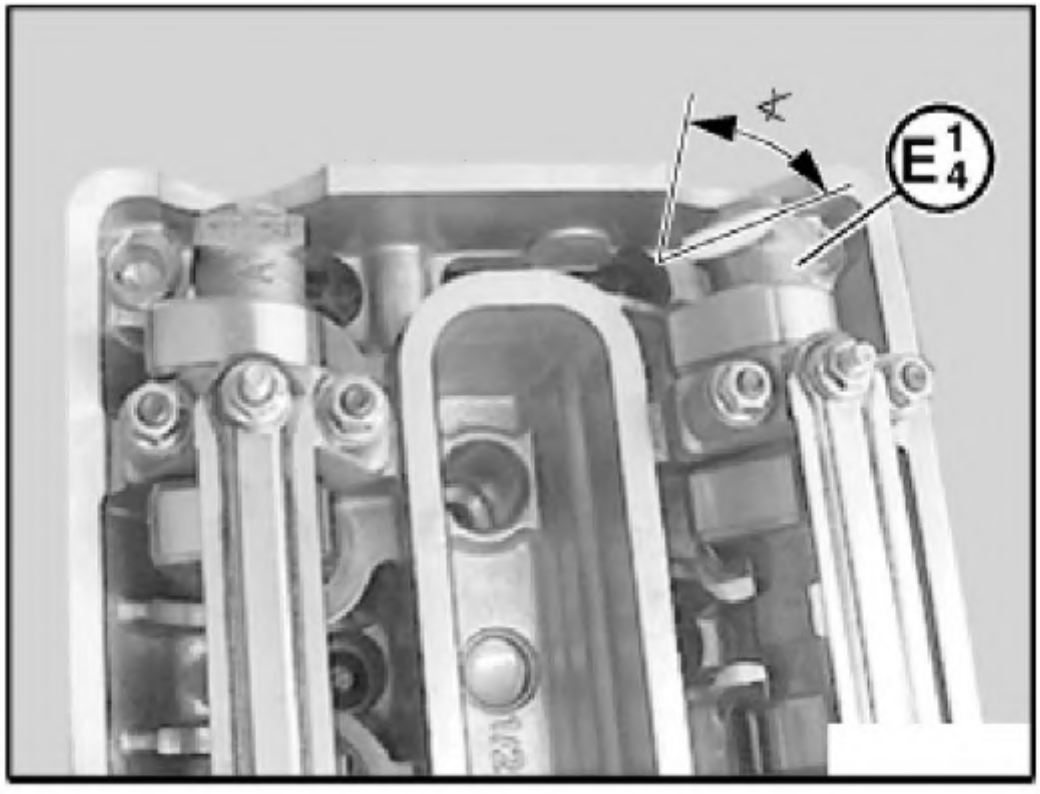


Fig. 374: Identifying Inlet Camshaft Rotation
Courtesy of BMW OF NORTH AMERICA, INC.

Remove oil lines on left and right of cylinder head.

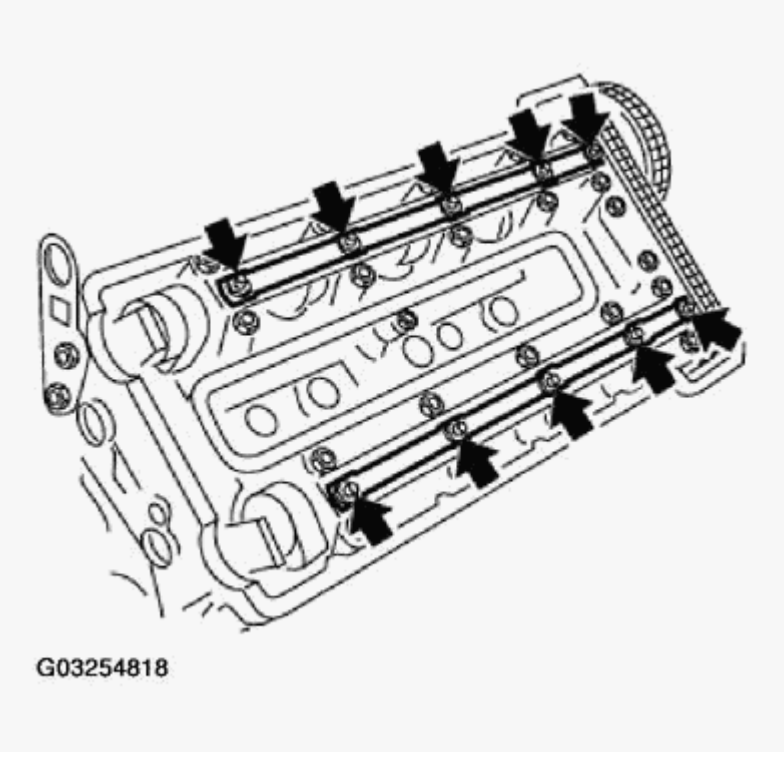


Fig. 375: Removing Oil Lines On Left And Right Of Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Turn engine in direction of rotation as far as TDC firing position of first cylinder.

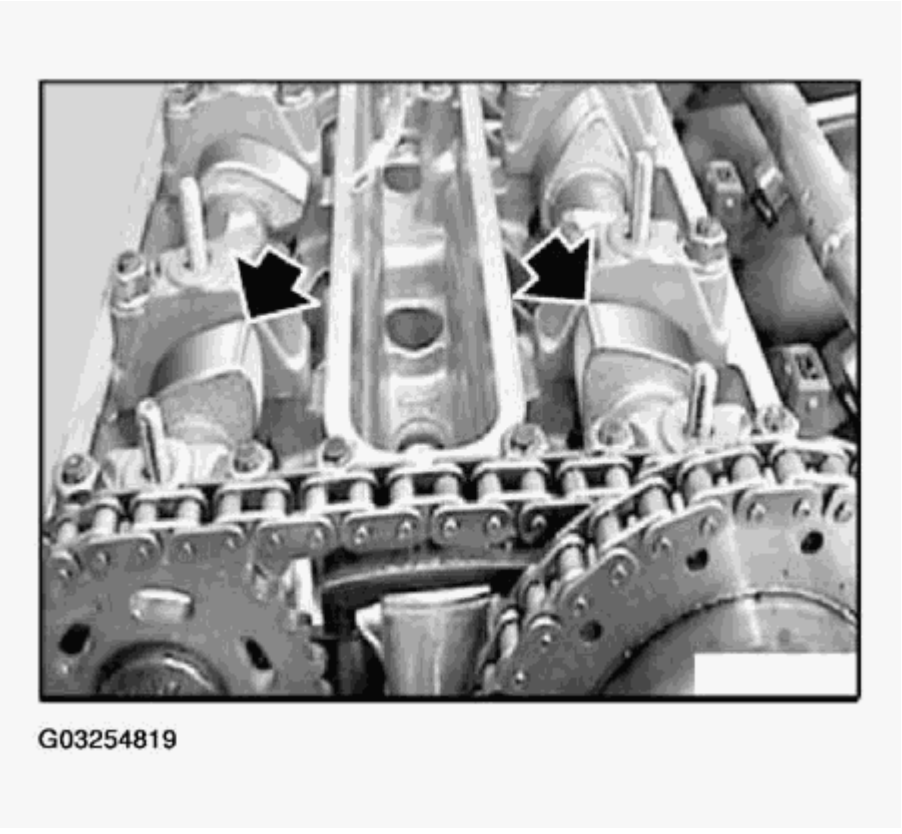


Fig. 376: Identifying Direction Of Rotation Of Cam
Courtesy of BMW OF NORTH AMERICA, INC.

E38/E39

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

CAUTION: Remove special tool 11 2 300 before starting engine.

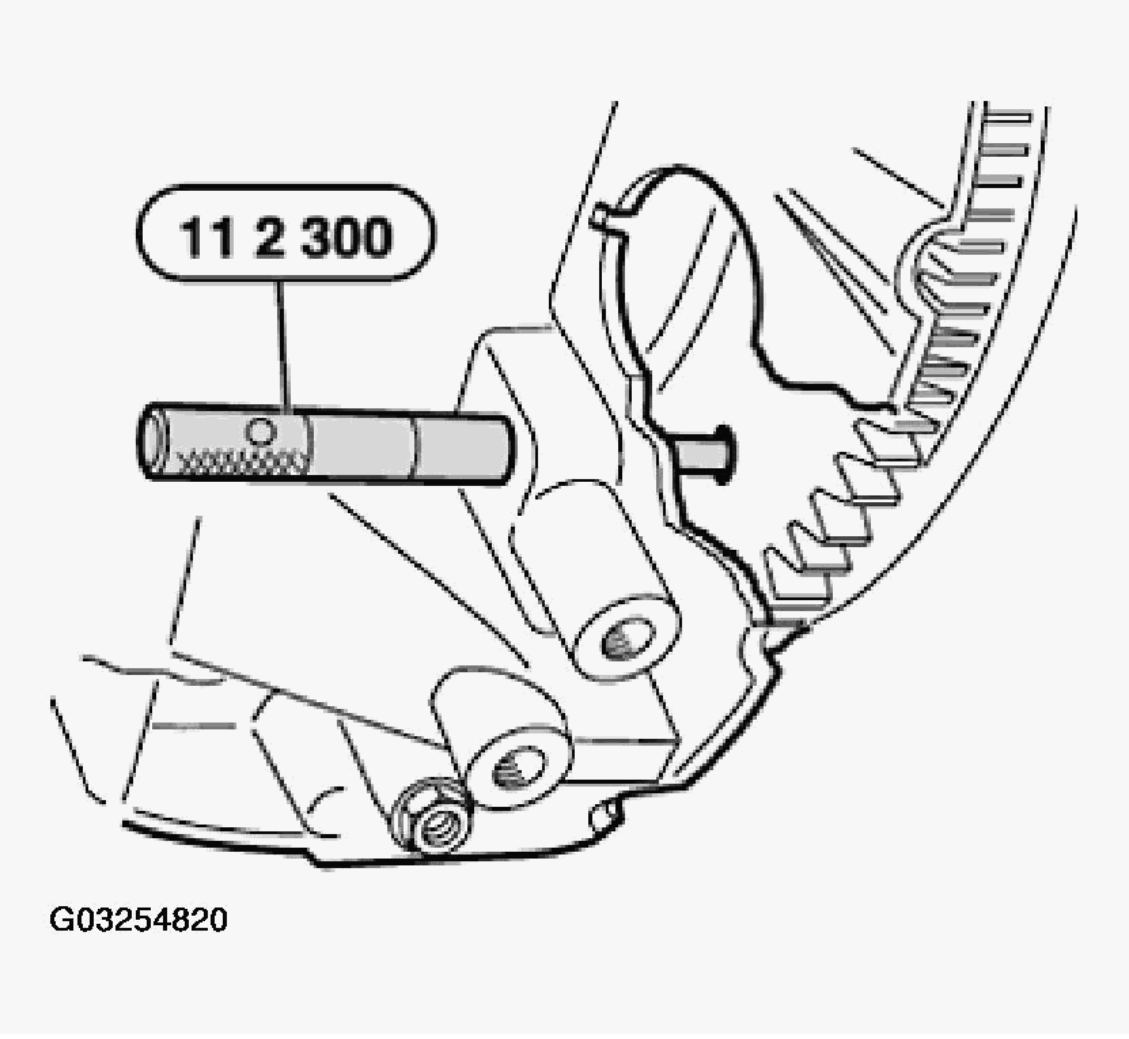


Fig. 377: Securing Crankshaft With Special Tool 11 2 300
Courtesy of BMW OF NORTH AMERICA, INC.

E53

Secure crankshaft with special tool 11 5 180 in TDC firing position of first cylinder.

CAUTION: Remove special tool 11 5 180 before starting engine.

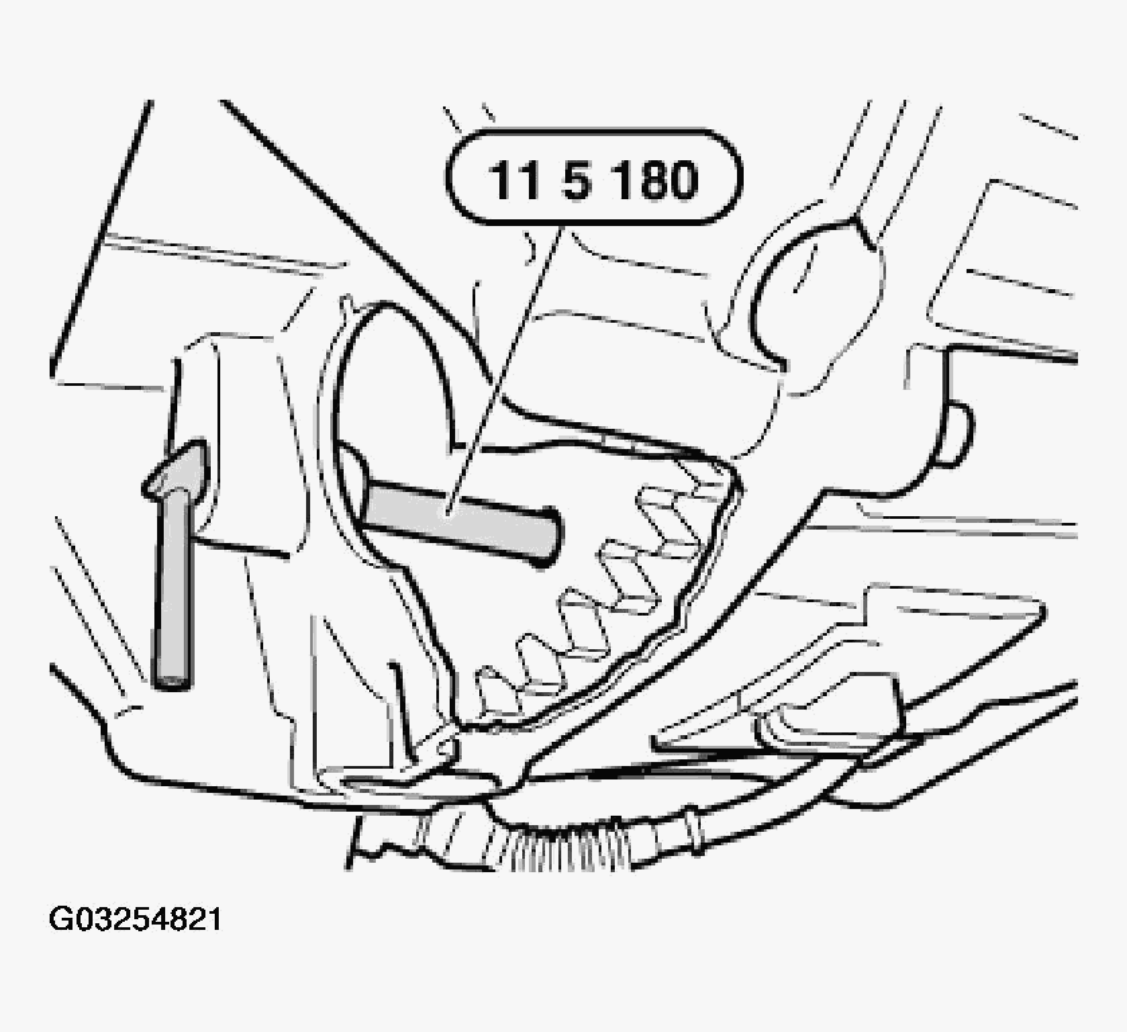


Fig. 378: Securing Crankshaft With Special Tool 11 5 180
Courtesy of BMW OF NORTH AMERICA, INC.

Remove chain tensioning piston. See **11 31 090 INSTALLING AND REMOVING/REPLACING PISTON FOR CHAIN TENSIONER (M62)** .

Remove both timing case covers at top. See **11 14 080 REMOVING AND INSTALLING TIMING CASE COVER, TOP LEFT (M62 VANOS FROM 9/98)** and **11 14 085 REMOVING AND INSTALLING TIMING CASE COVER, TOP RIGHT (M62 VANOS FROM 9/98)** .

CAUTION: Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 1 to 4.

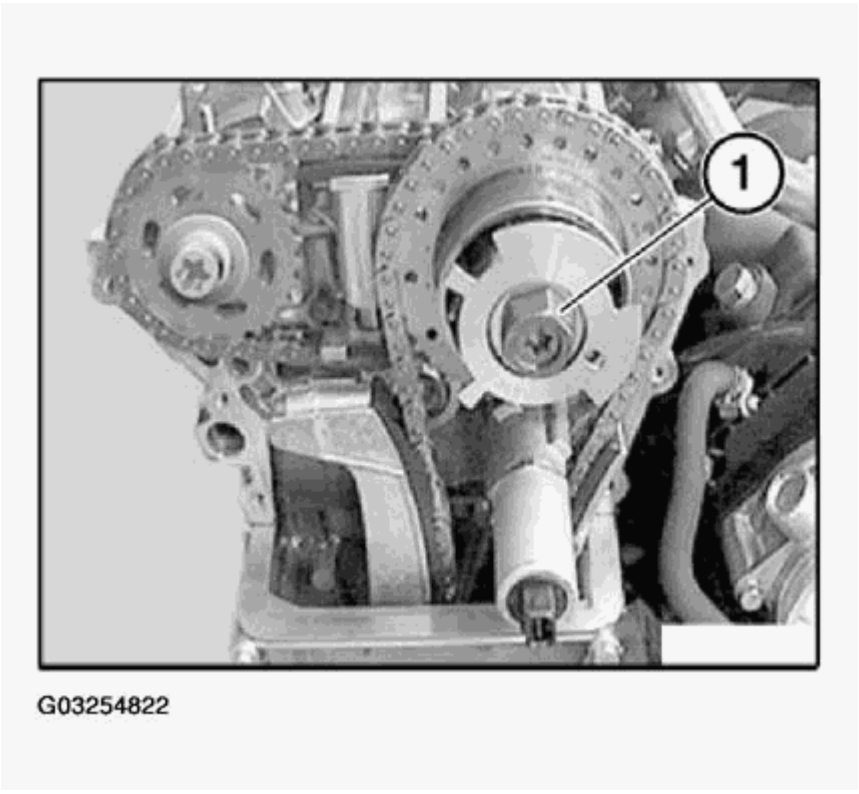


Fig. 379: Releasing Nut On Sensor Gear Screw Connection (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sensor gear (2) on cylinder bank 1 to 4.

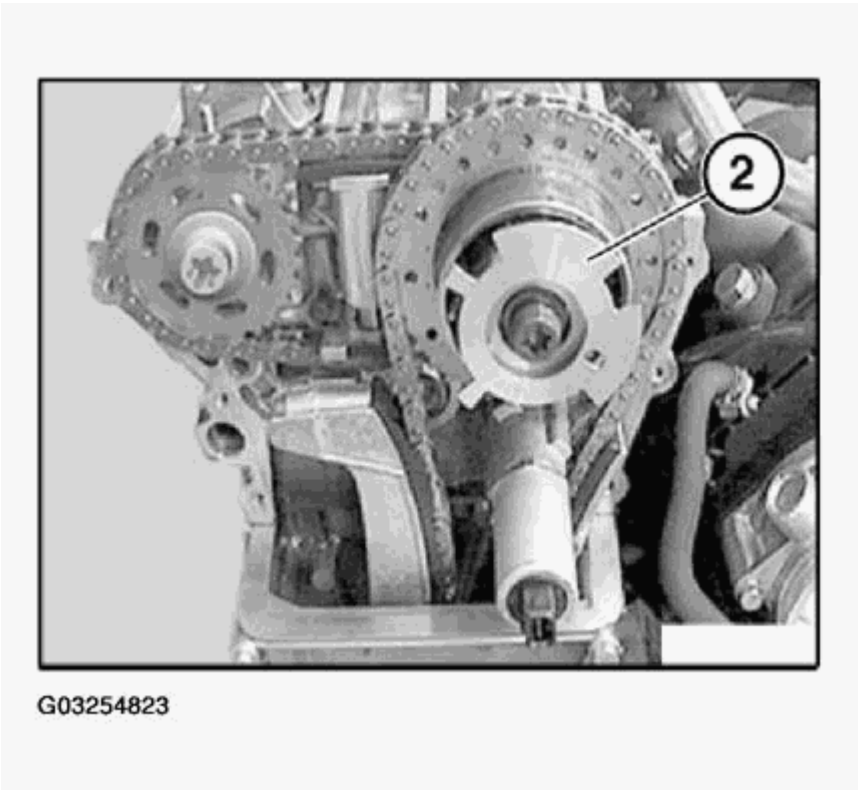


Fig. 380: Removing Sensor Gear (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 5 to 8.

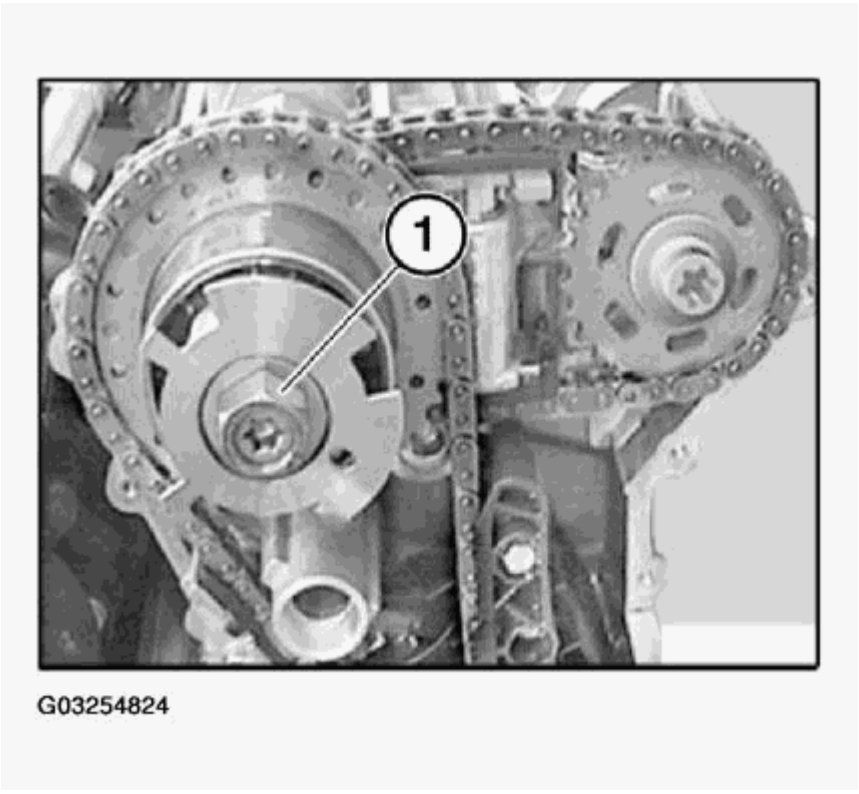


Fig. 381: Releasing Nut On Sensor Gear Screw Connection (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sensor gear (2) on cylinder bank 5 to 8.

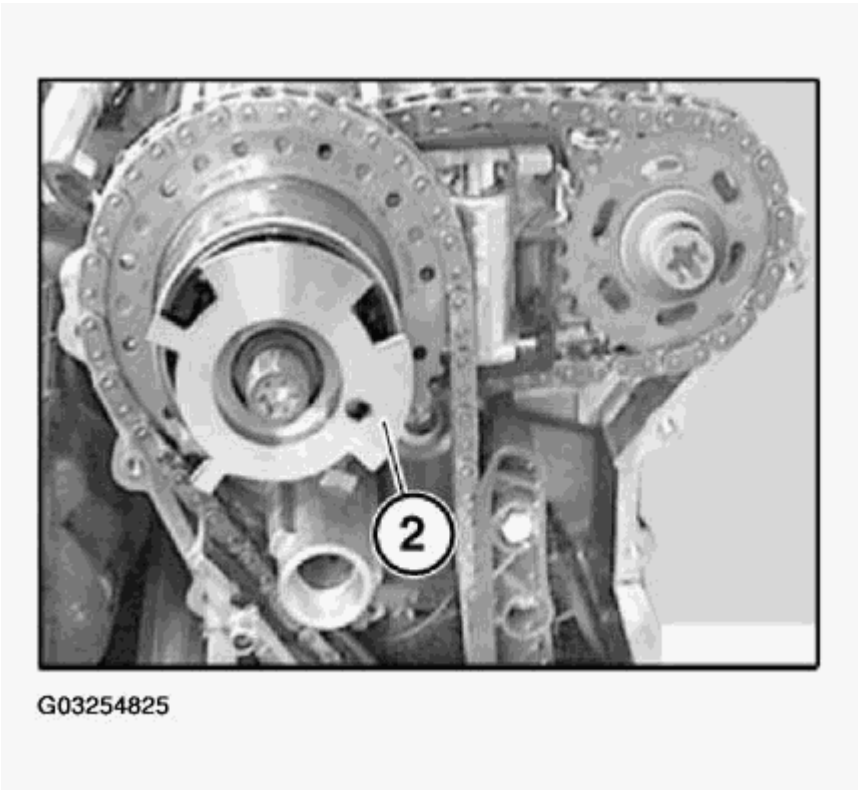


Fig. 382: Removing Sensor Gear (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When releasing camshaft screw connection: grip camshaft at hexagon head.

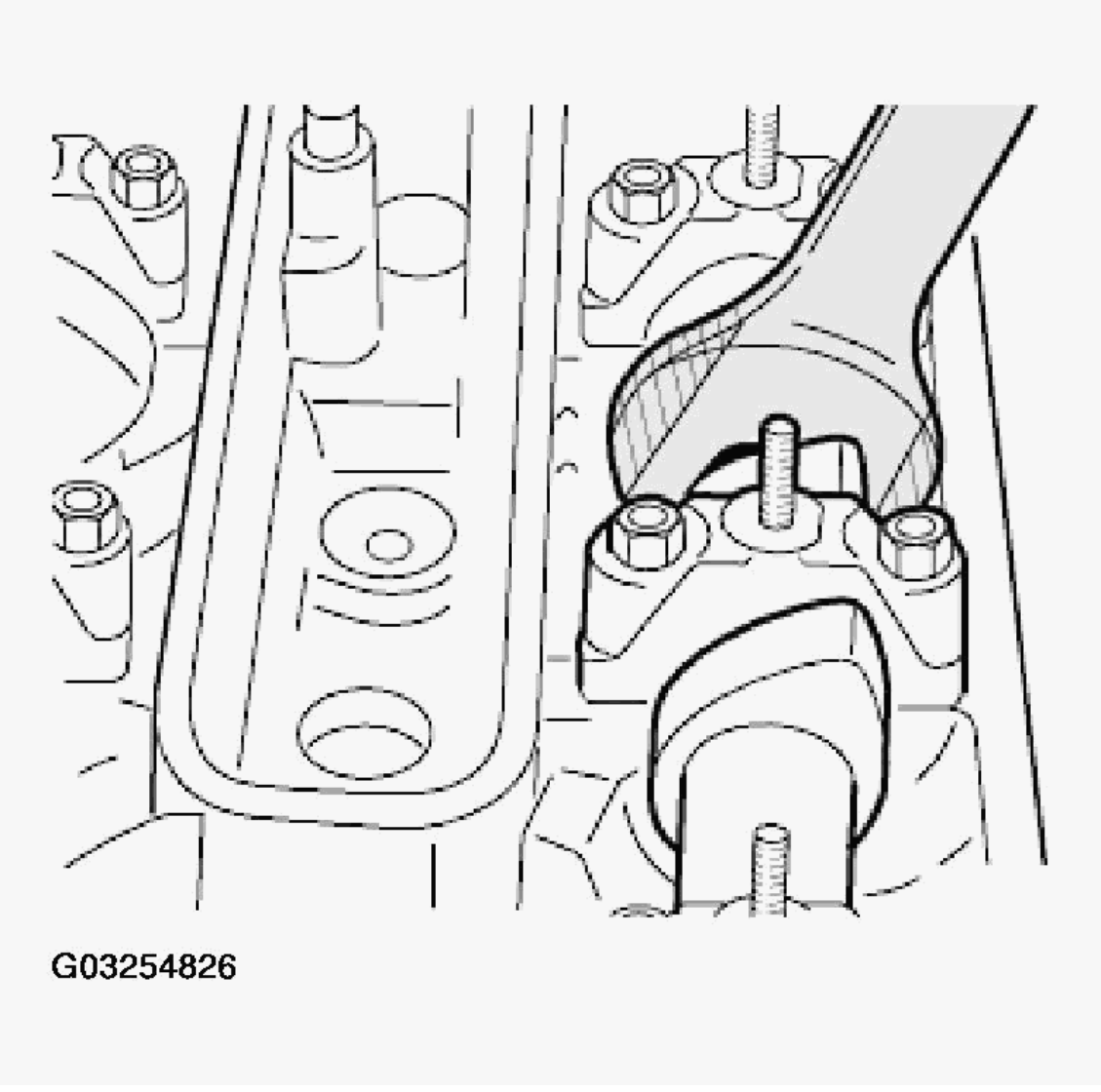


Fig. 383: Releasing Camshaft Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 by approx. a half turn.

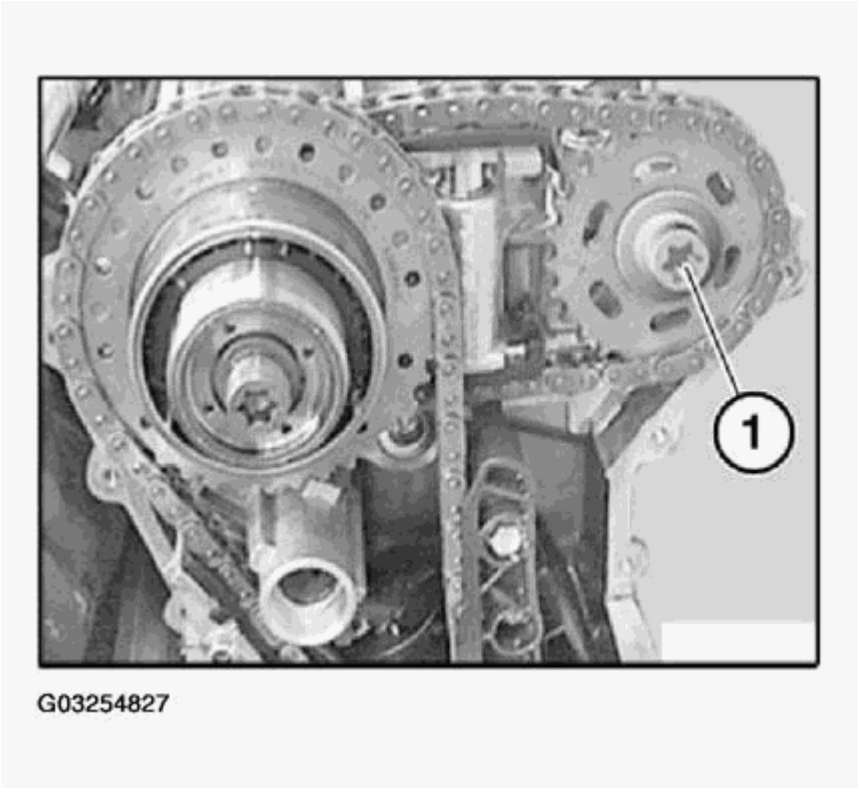


Fig. 384: Slackening Screw Connection Of Exhaust Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 by approx. a half turn.

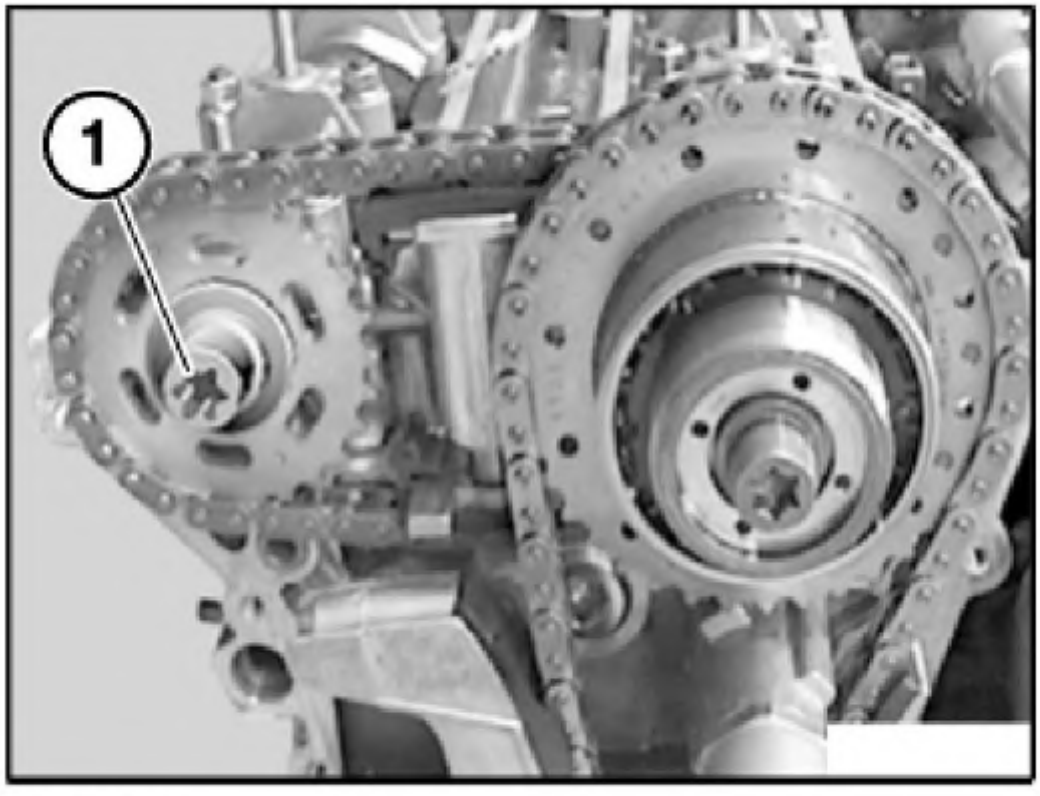


Fig. 385: Slackening Screw Connection Of Exhaust Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 5 to 8 by approx. a half turn.

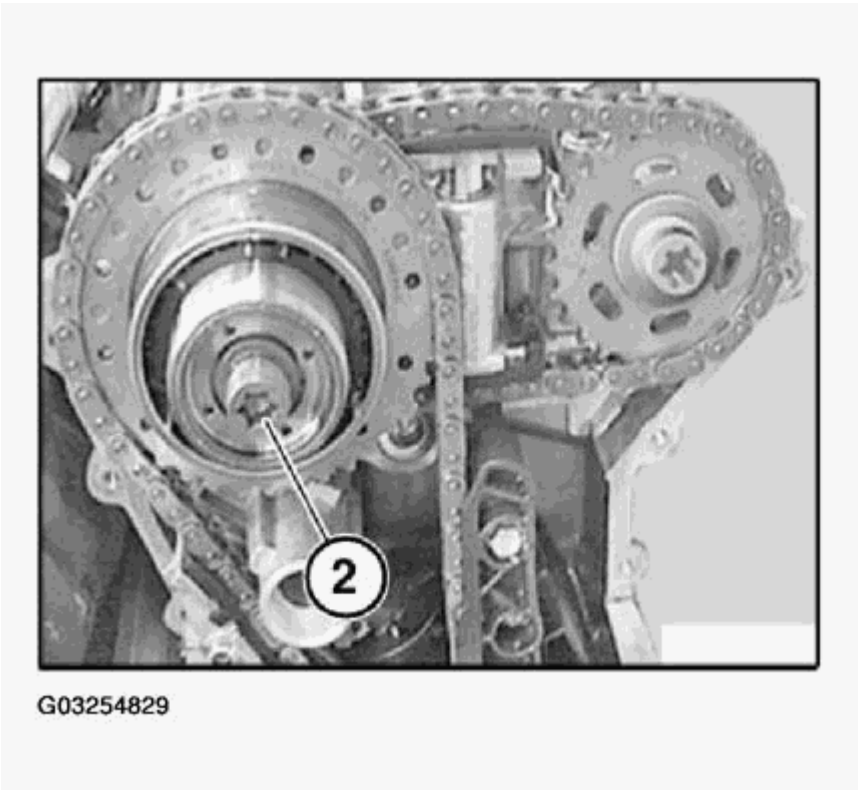


Fig. 386: Slackening Screw Connection Of Inlet Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 1 to 4 by approx. a half turn.

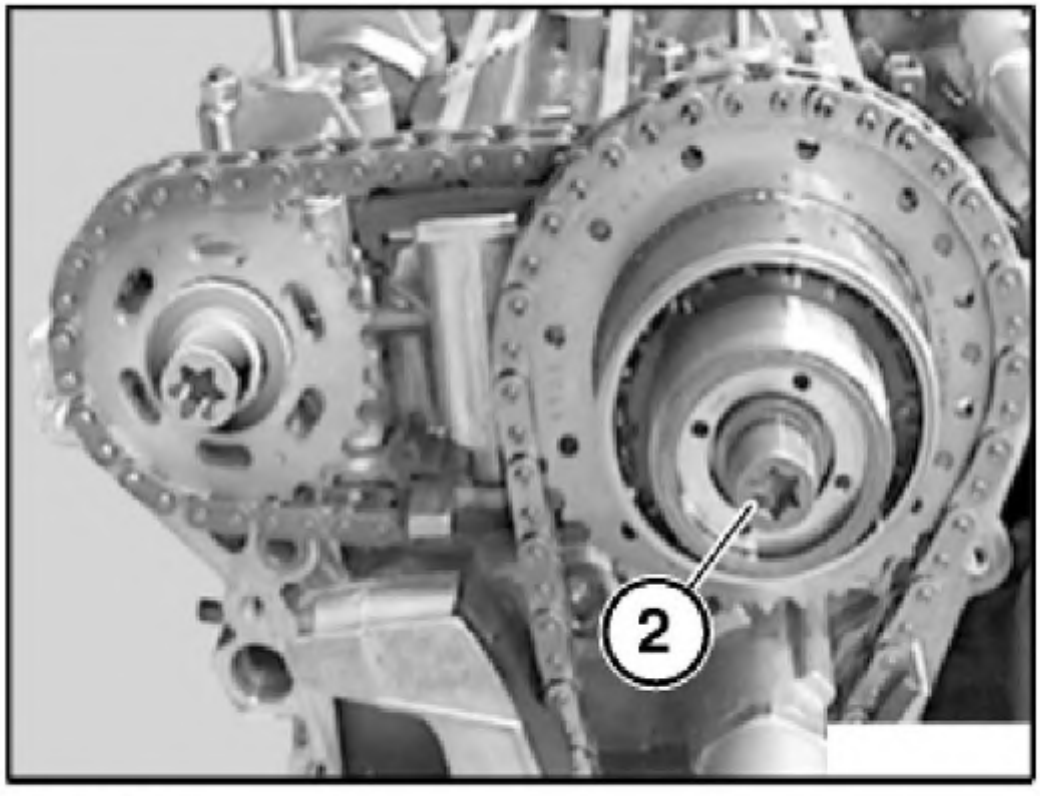


Fig. 387: Slackening Screw Connection Of Inlet Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Align camshafts.

Attach special tool 11 2 445/11 2 441 to camshafts, cylinder bank 1 to 4.

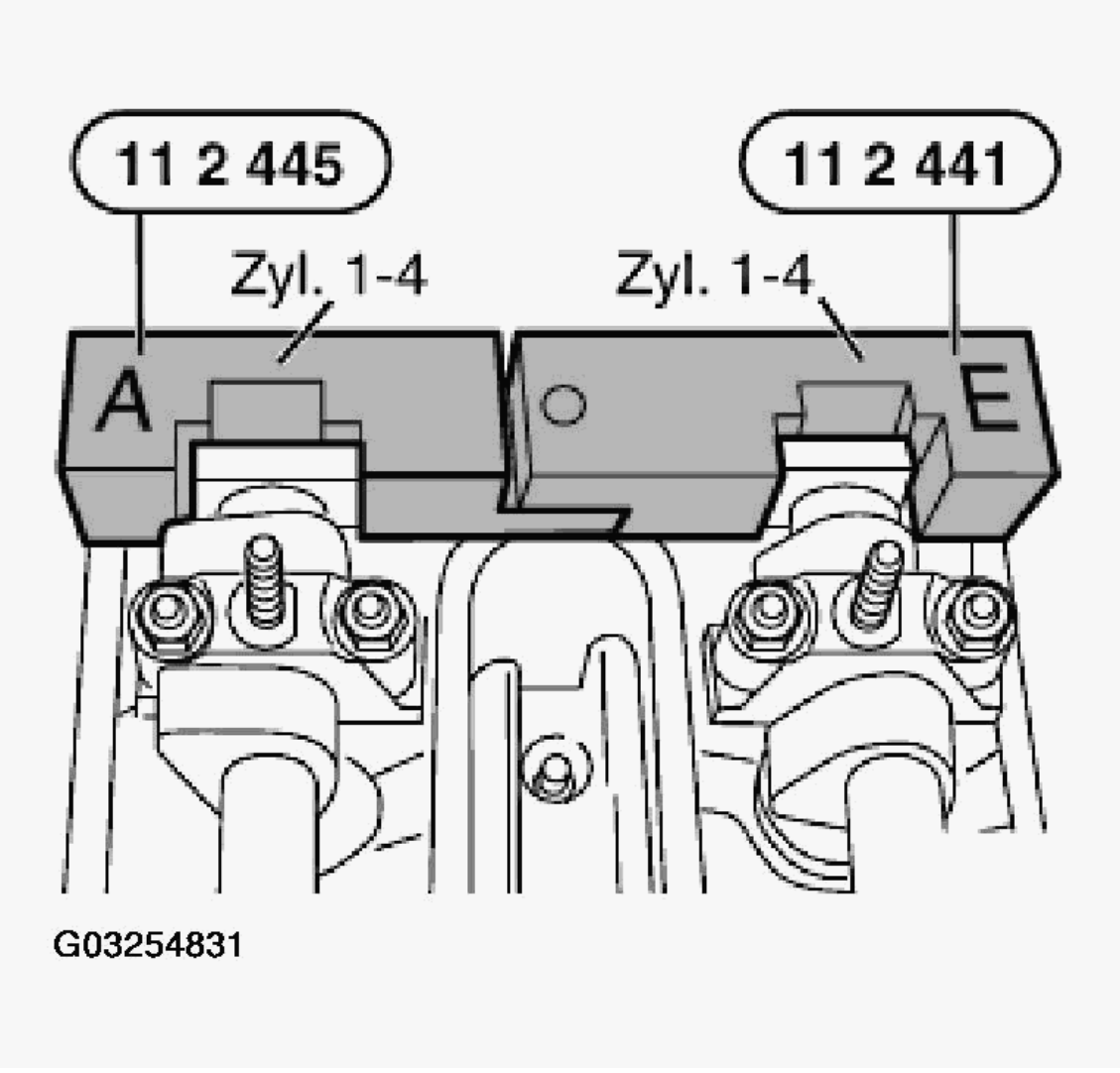


Fig. 388: Connecting Special Tool 11 2 445/11 2 441 To Camshafts (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 443 to special tool 11 2 445/11 2 441 and secure with special tool 11 2 444 via spark plug thread.

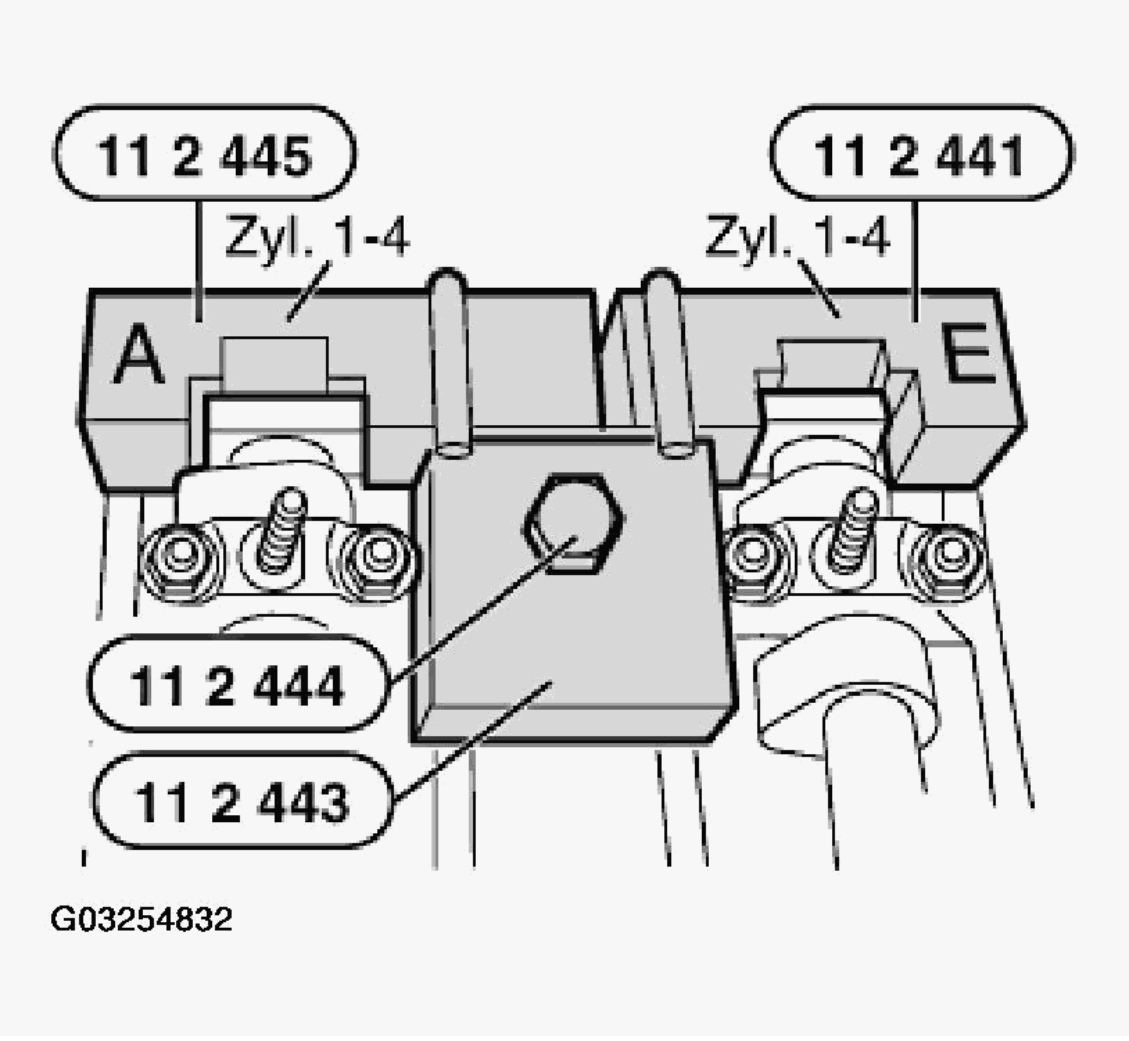


Fig. 389: Connecting Special Tool 11 2 443 To Special Tool 11 2 445/11 2 441
Courtesy of BMW OF NORTH AMERICA, INC.

Align camshafts.

Attach special tool 11 2 446/11 2 442 to camshafts, cylinder bank 5 to 8.

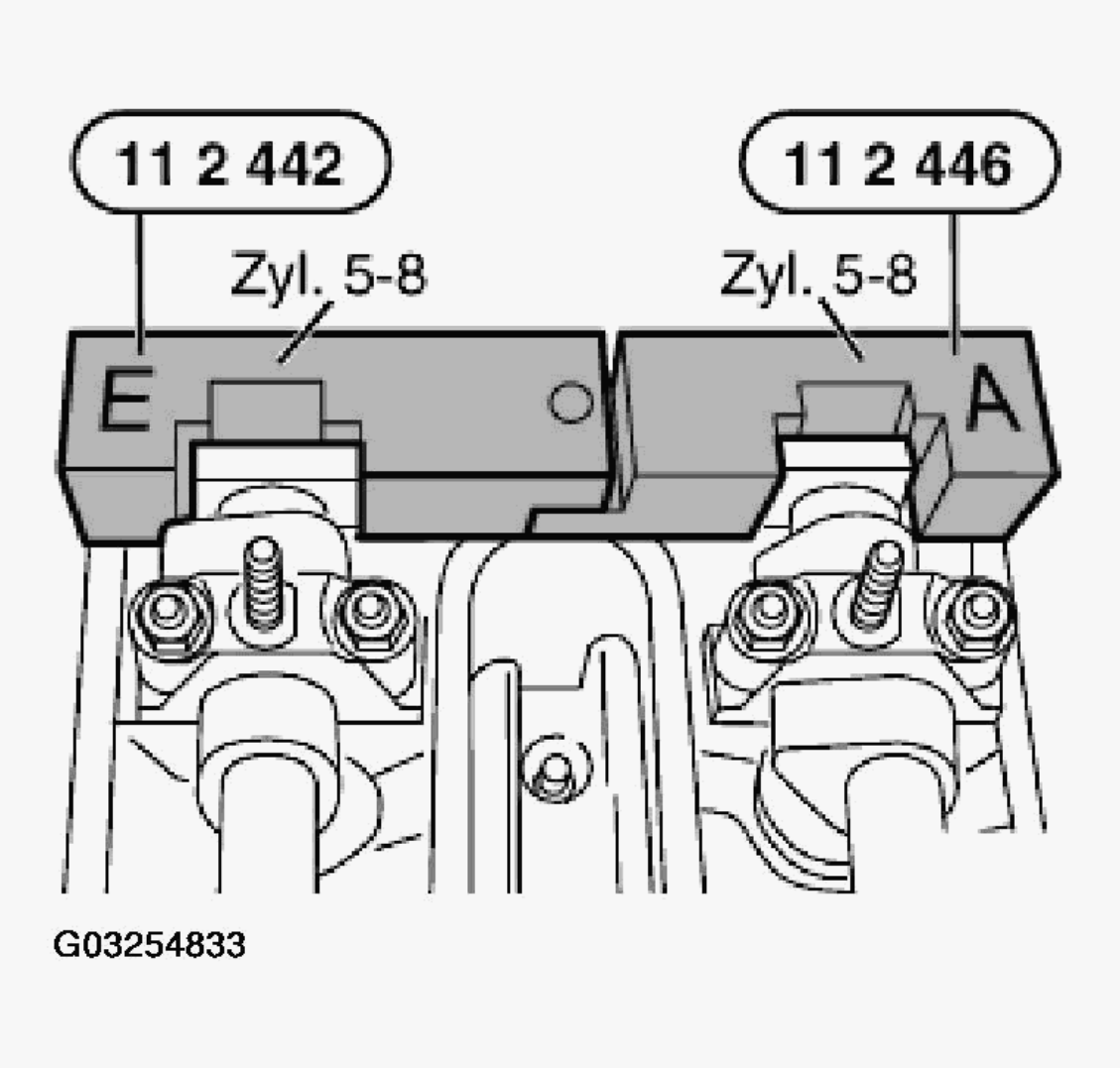


Fig. 390: Connecting Special Tool 11 2 446/11 2 442 To Camshafts (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 443 to special tool 11 2 446/11 2 442 and secure with special tool 11 2 444 via spark plug thread.

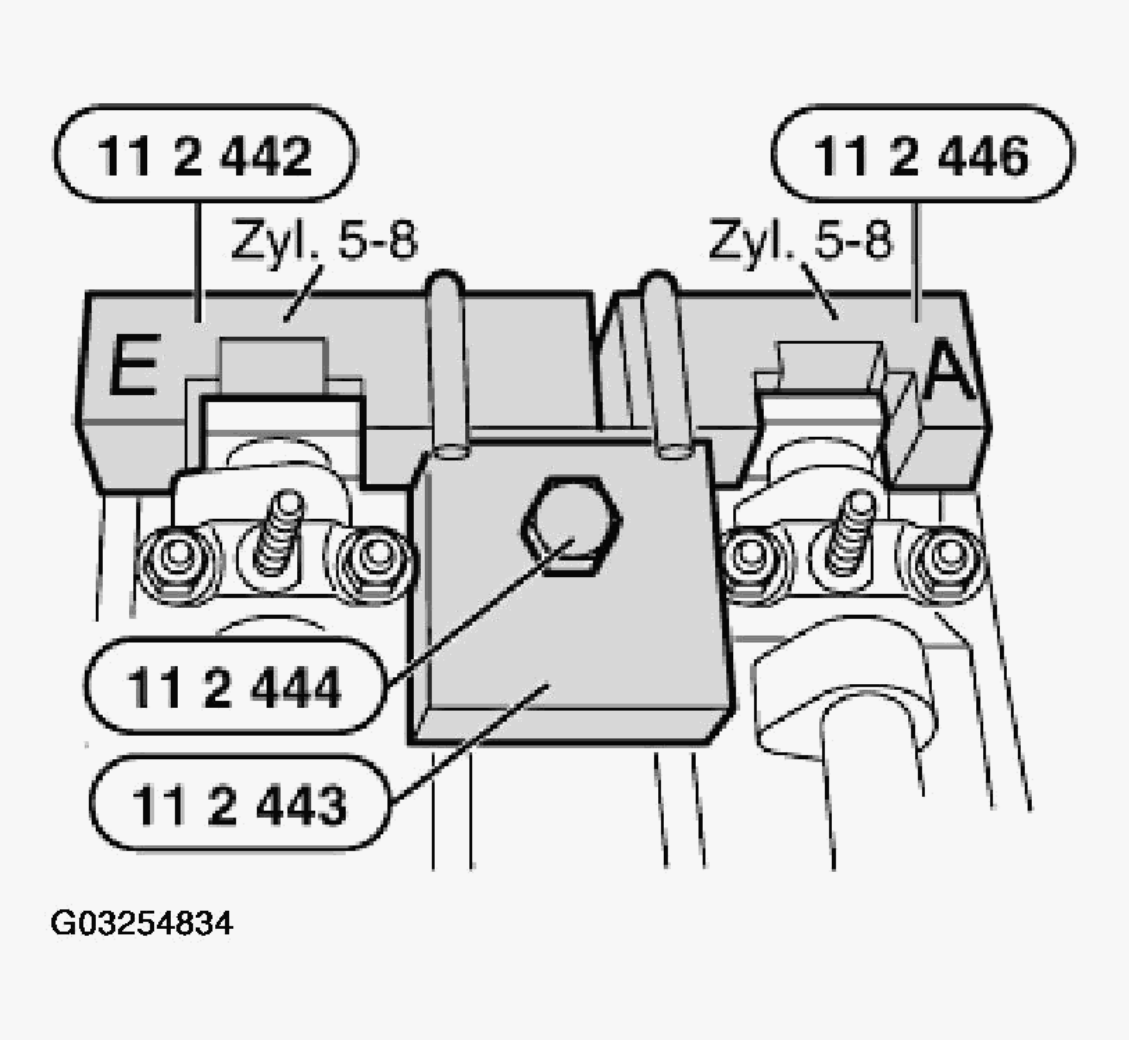


Fig. 391: Connecting Special Tool 11 2 443 To Special Tool 11 2 445/11 2 441
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 7 380 to right cylinder head on cylinder bank 1 to 4.

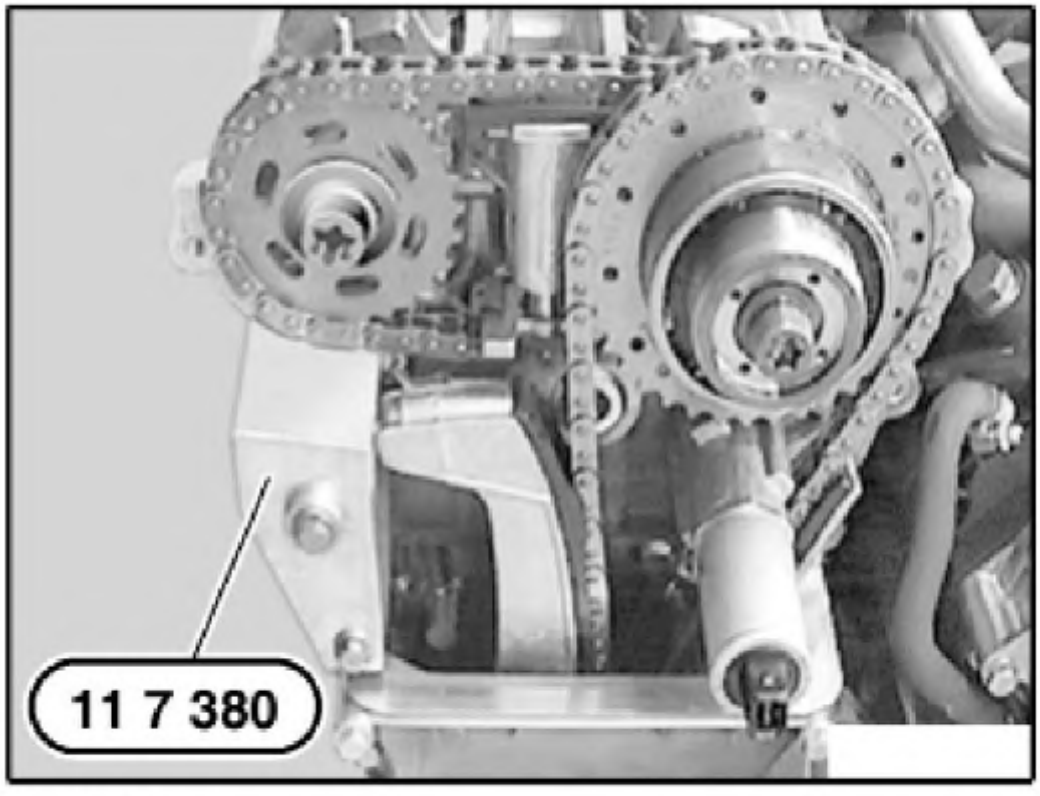


Fig. 392: Fitting Special Tool 11 7 380 To Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The special tool kit 11 3 390 can no longer be fitted in the E53 (X5) with M62 engine due to the altered space conditions.

With the market launch of the E53 (X5) with M62 engine, the special tool kit 11 3 390 is dropped.

The shorter special tool kit 11 4 230 comprising special tools 11 4 231 and 11 4 232 replaces the special tool kit 11 3 390.

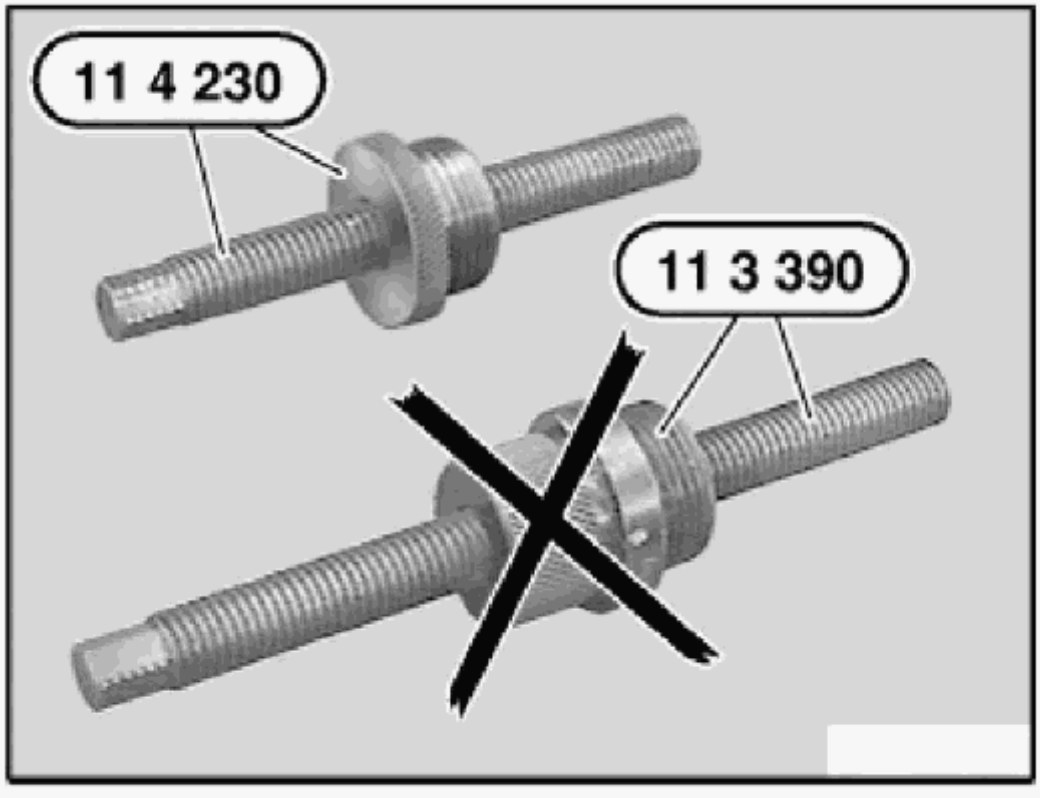


Fig. 393: Precautions When Using Special Tool Kit 11 4 230
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool kit 11 4 230 in special tool 11 7 380.

Screw in adjustment screw on tensioning rail, but do not tighten yet.

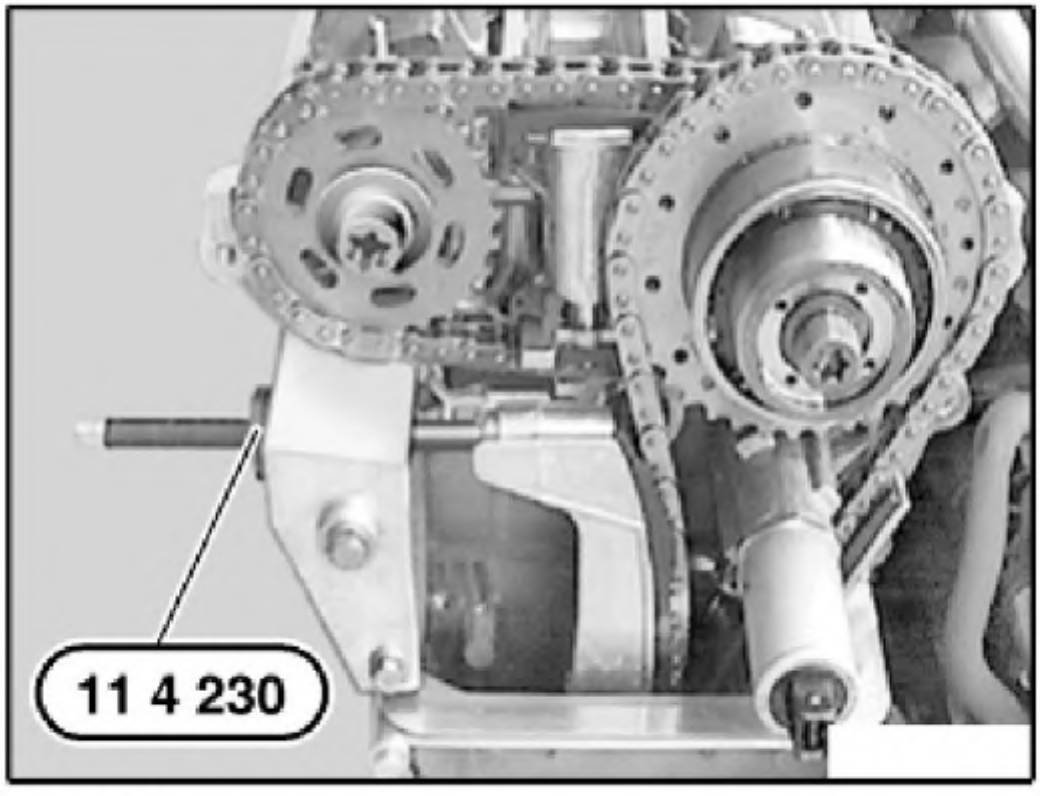


Fig. 394: Inserting Special Tool Kit 11 4 230 In Special Tool 11 7 380
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.

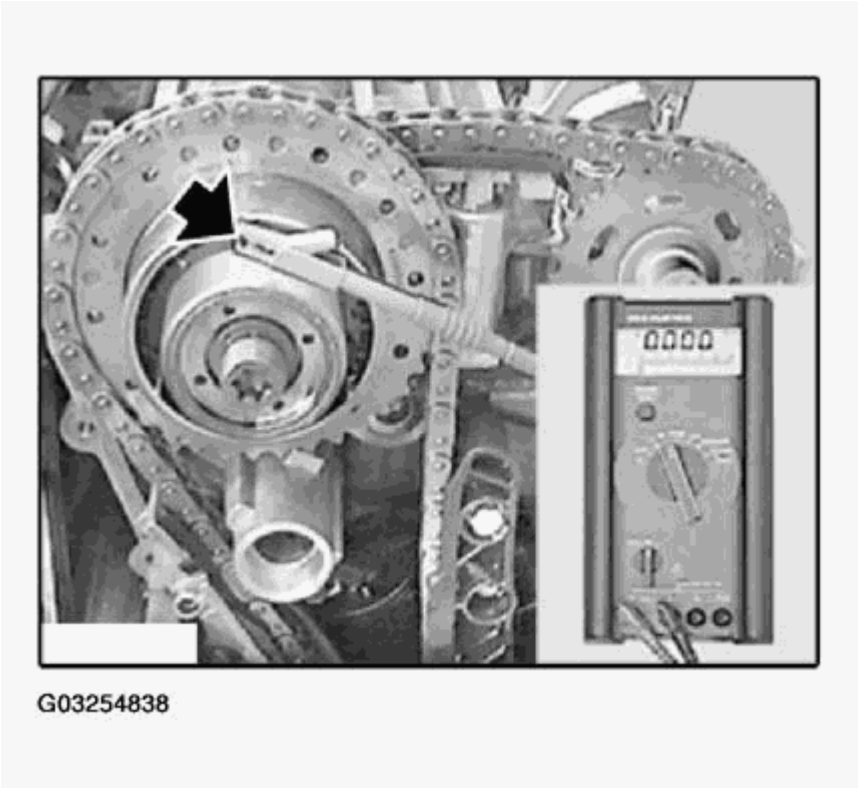


Fig. 395: Connecting Multimeter To Screw Connection On Oil Line (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 5 to 8.

Set multimeter to acoustic continuity test.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

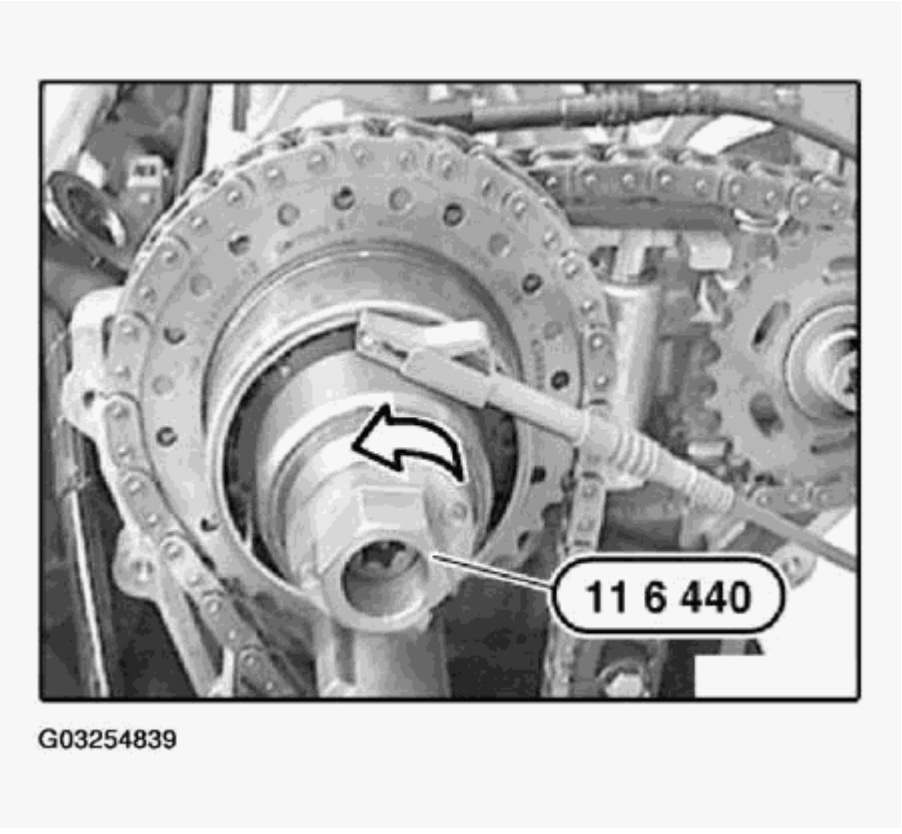


Fig. 396: Connecting Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Rotating the camshaft adjustment unit at 40 Nm to the left-hand stop ensures that the end position is reached and there is no longer an "oil cushion" before the left-hand stop of the camshaft adjustment unit.

In the camshaft adjustment unit, there are three contacts which are closed when the unit is at the left-hand stop.

During the acoustic continuity test with the multimeter, a sound signal can be heard when the camshaft adjustment unit is at the left-hand stop.

CAUTION: Left-hand threads.

Tighten screw connection (2) of inlet camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

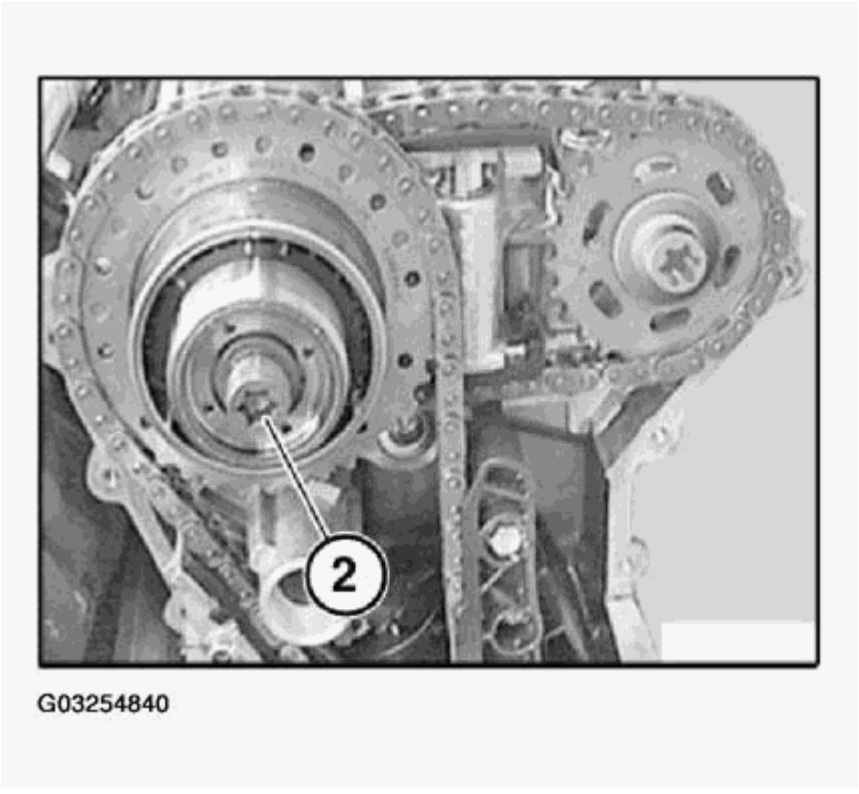


Fig. 397: Tightening Screw Connection Of Inlet Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

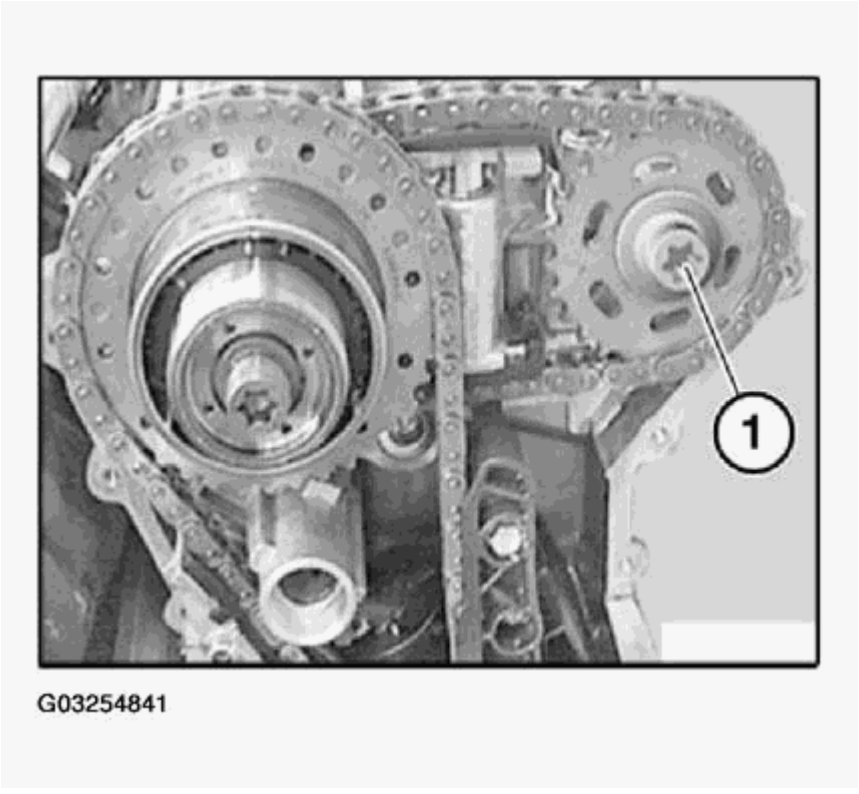


Fig. 398: Tightening Screw Connection Of Exhaust Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.

Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 1 to 4.

Set multimeter to acoustic continuity test.

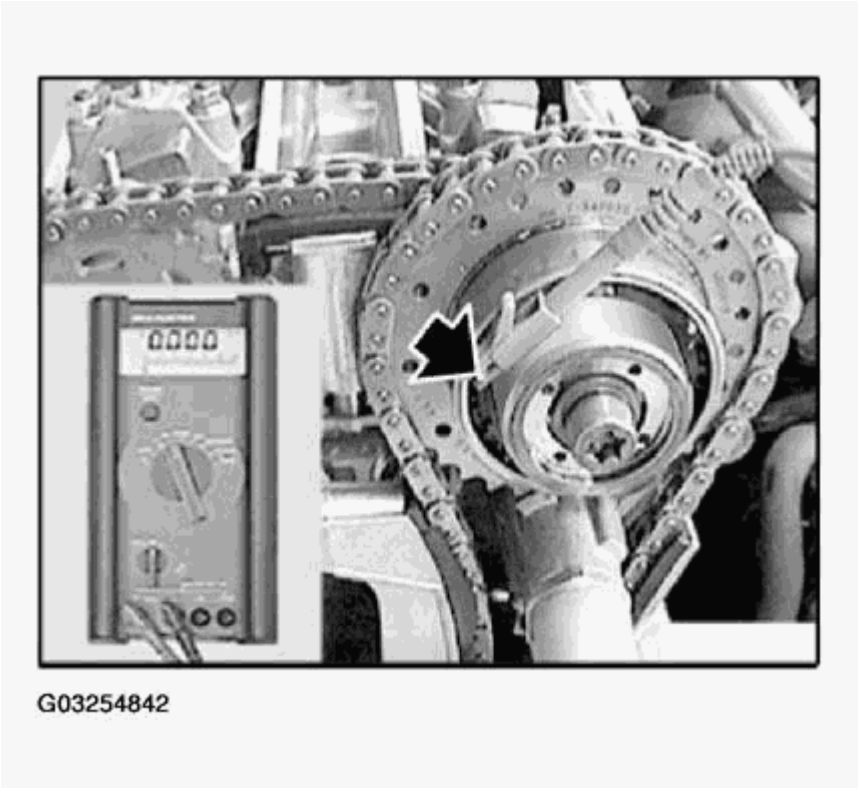


Fig. 399: Connecting Multimeter To Screw Connection On Oil Line (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

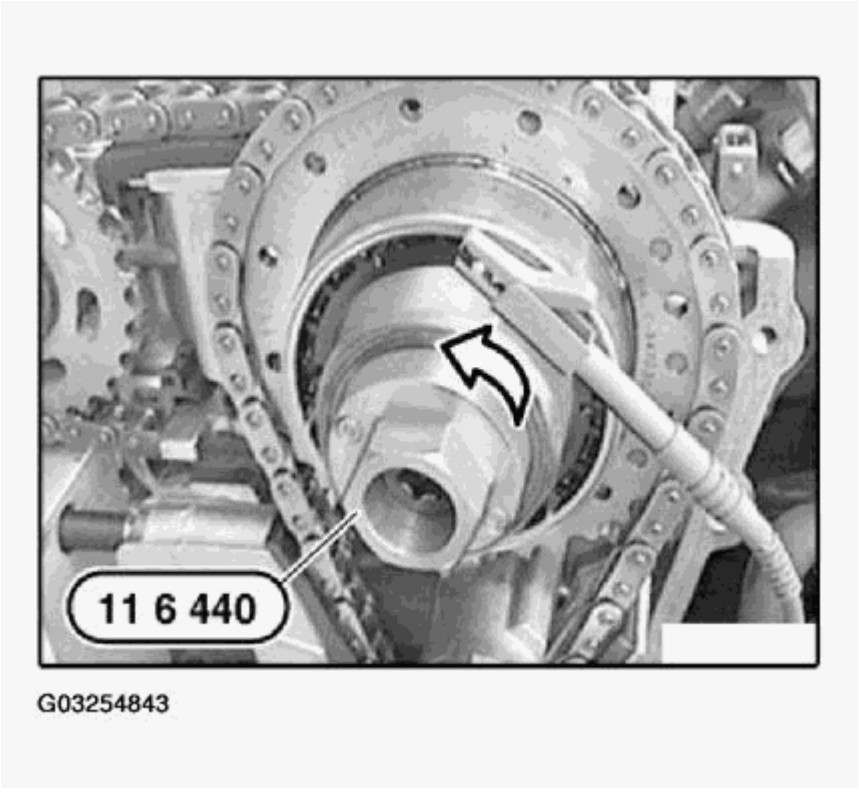


Fig. 400: Connecting Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (2) of inlet camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

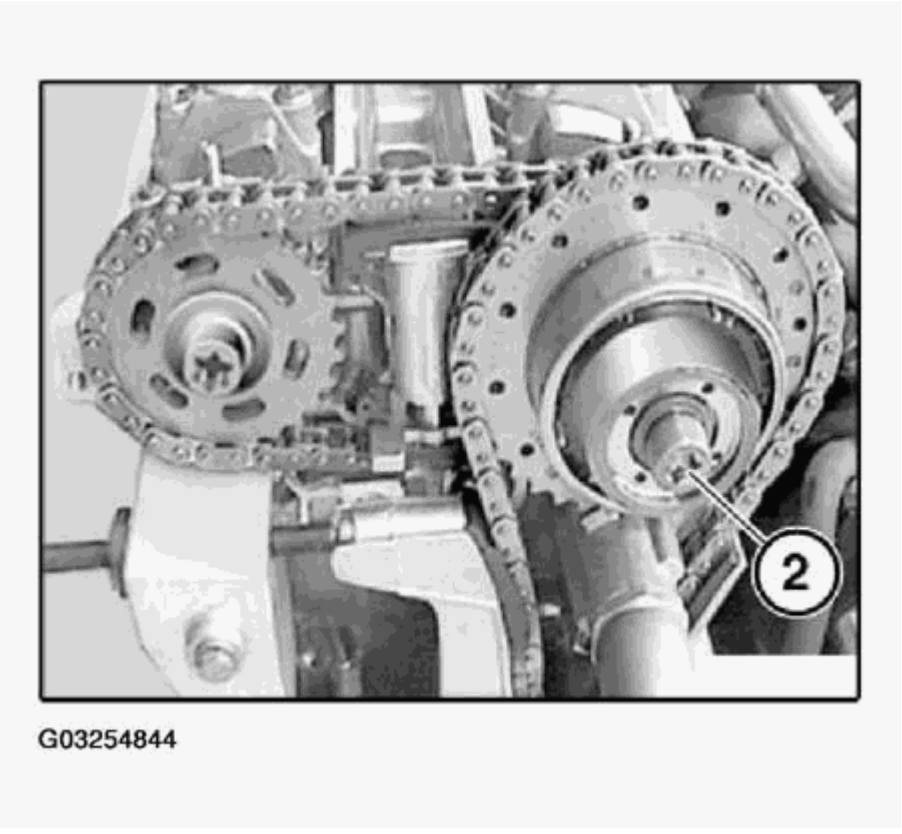


Fig. 401: Tightening Screw Connection Of Inlet Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

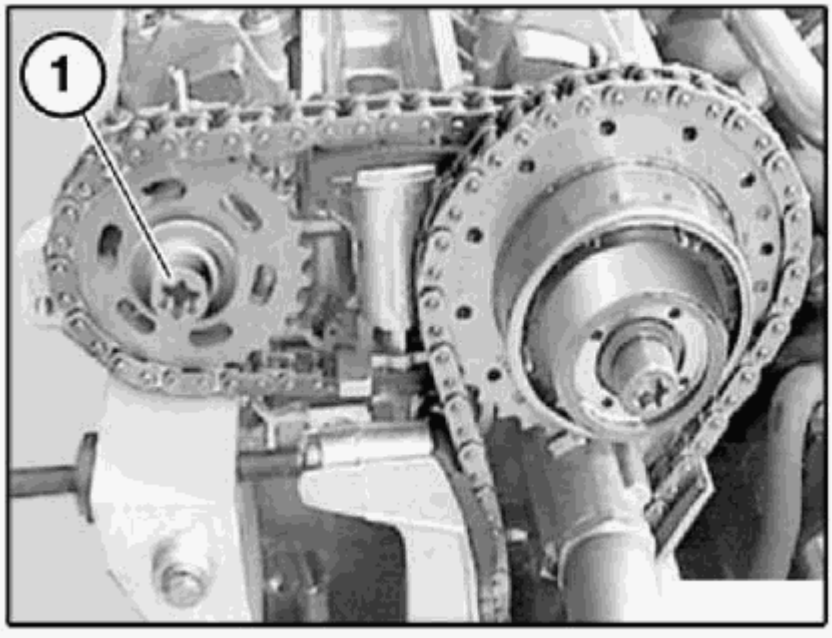


Fig. 402: Tightening Screw Connection Of Exhaust Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Pretension tensioning rail by turning adjusting screw on special tool 11 4 230 with special tool 00 9 250 to 0.7 Nm.

NOTE: If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.

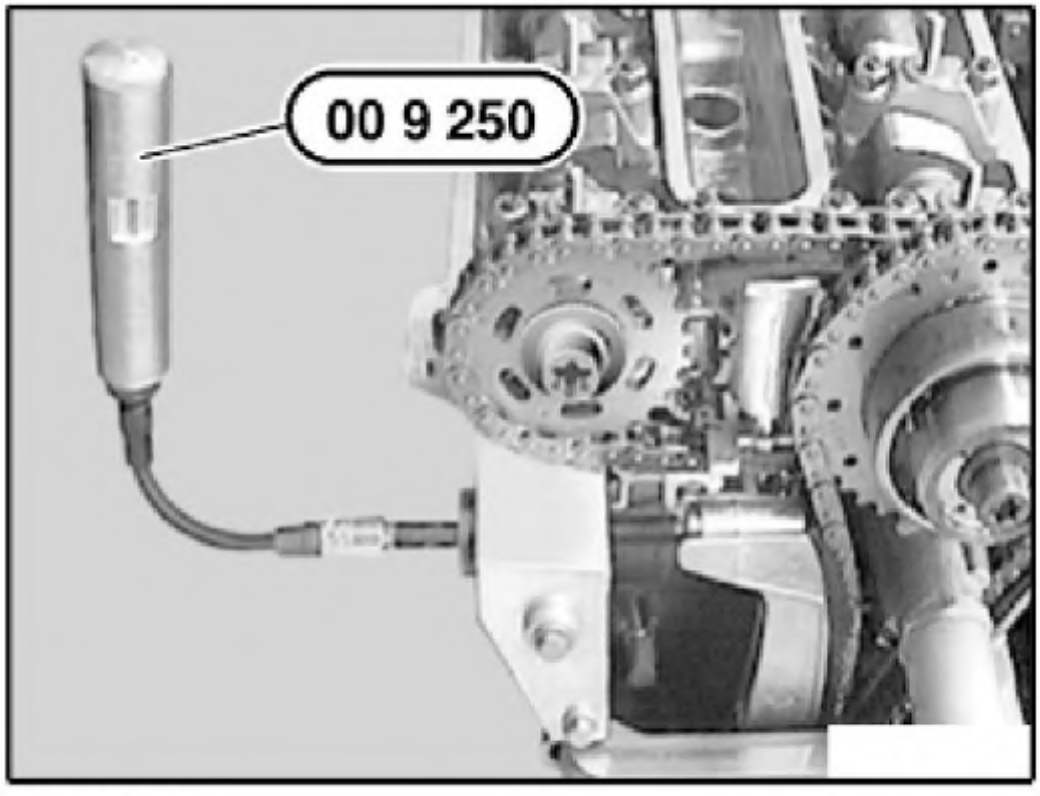


Fig. 403: Turning Adjusting Screw On Special Tool 11 4 230 With Special Tool 00 9 250
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Pretensioning the timing chain moves the camshaft adjustment unit and the unit must therefore be reset to the left-hand stop.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

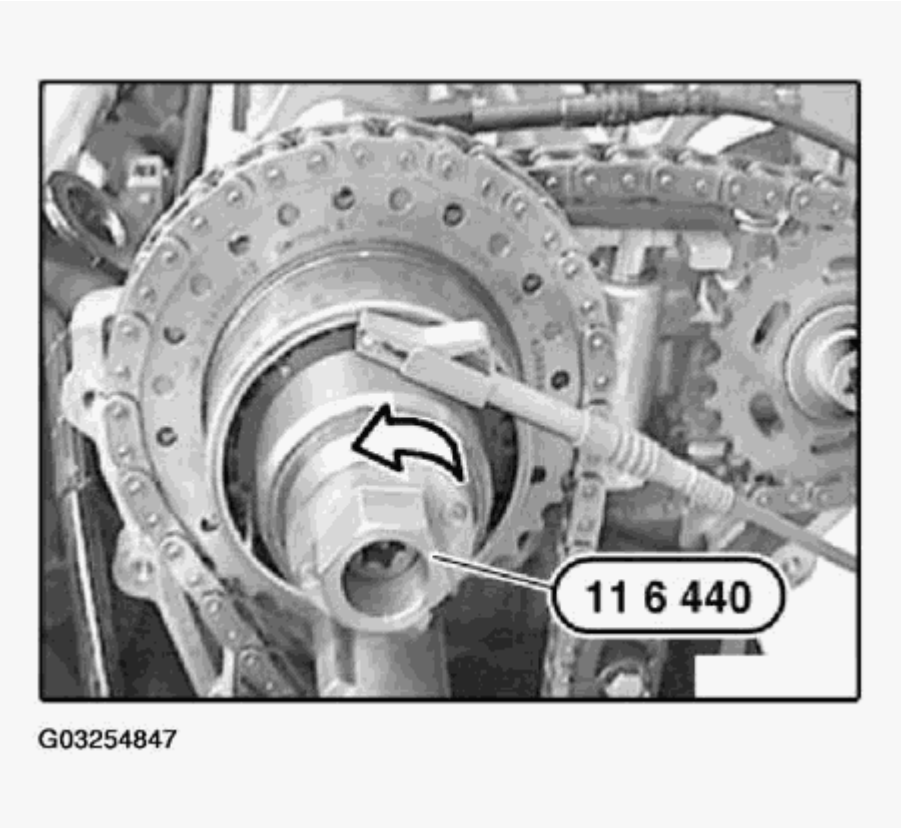


Fig. 404: Connecting Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

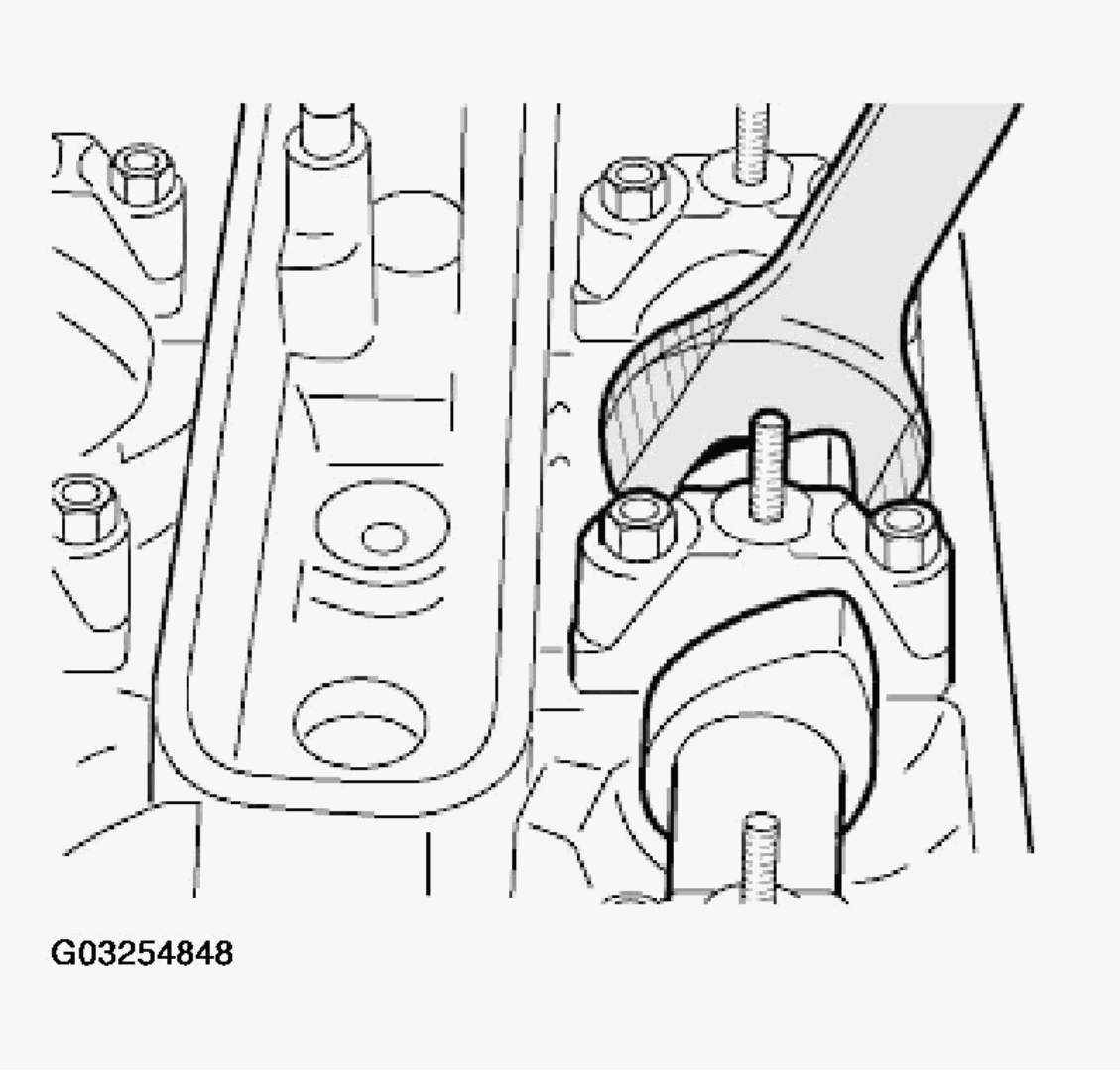


Fig. 405: Gripping Camshaft At Hexagon Head
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 5 to 8.

Tightening torque, see 11 36 14AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

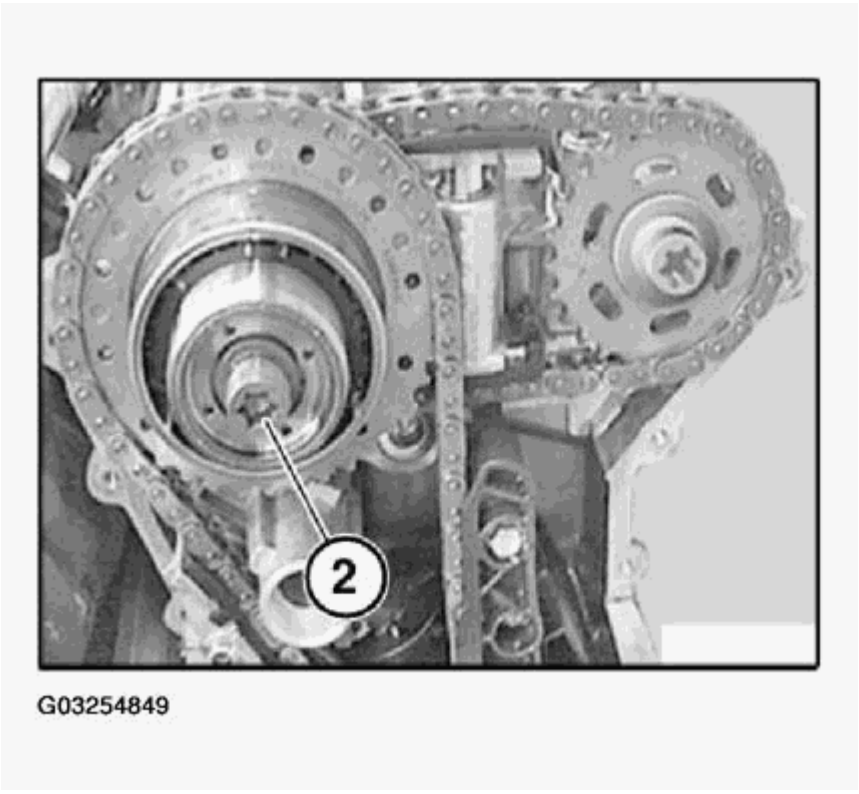


Fig. 406: Tightening Screw Connection Of Inlet Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 5 to 8.

Tightening torque, see 11 36 13AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

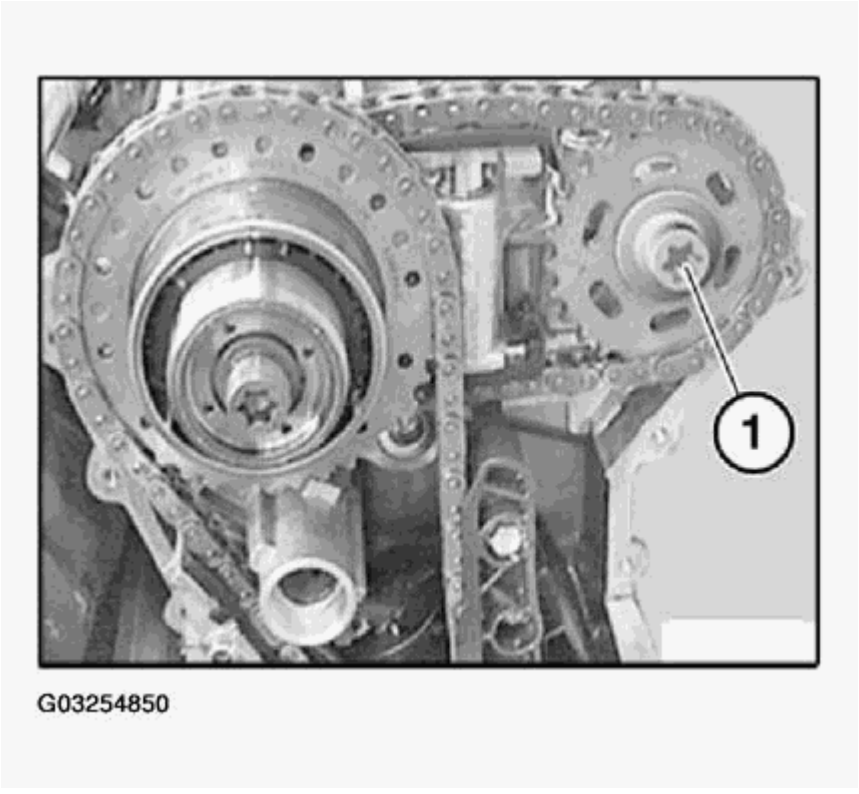


Fig. 407: Tightening Screw Connection Of Exhaust Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

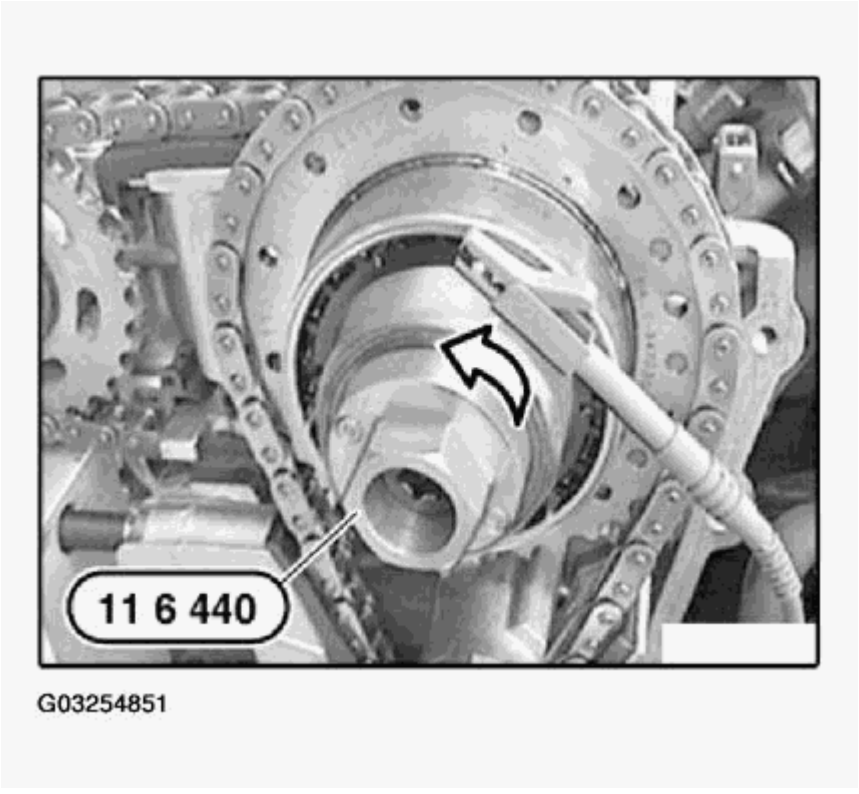


Fig. 408: Attaching Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 1 to 4.

Tightening torque, see 11 36 14AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

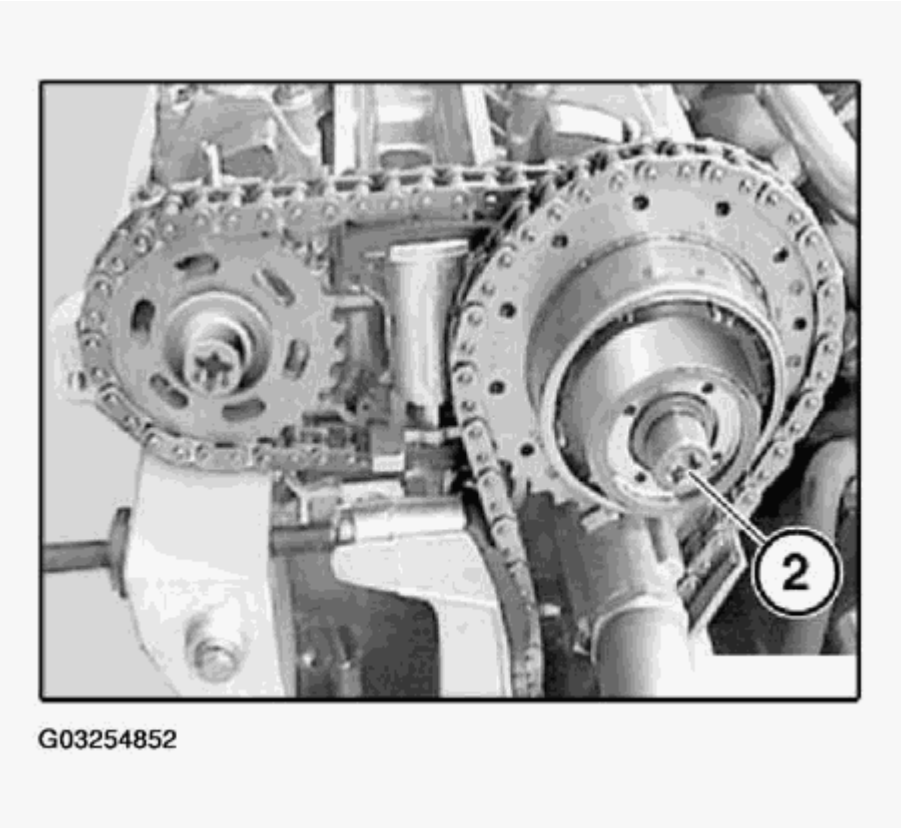


Fig. 409: Tightening Screw Connection Of Inlet Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 1 to 4.

Tightening torque, see 11 36 13AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

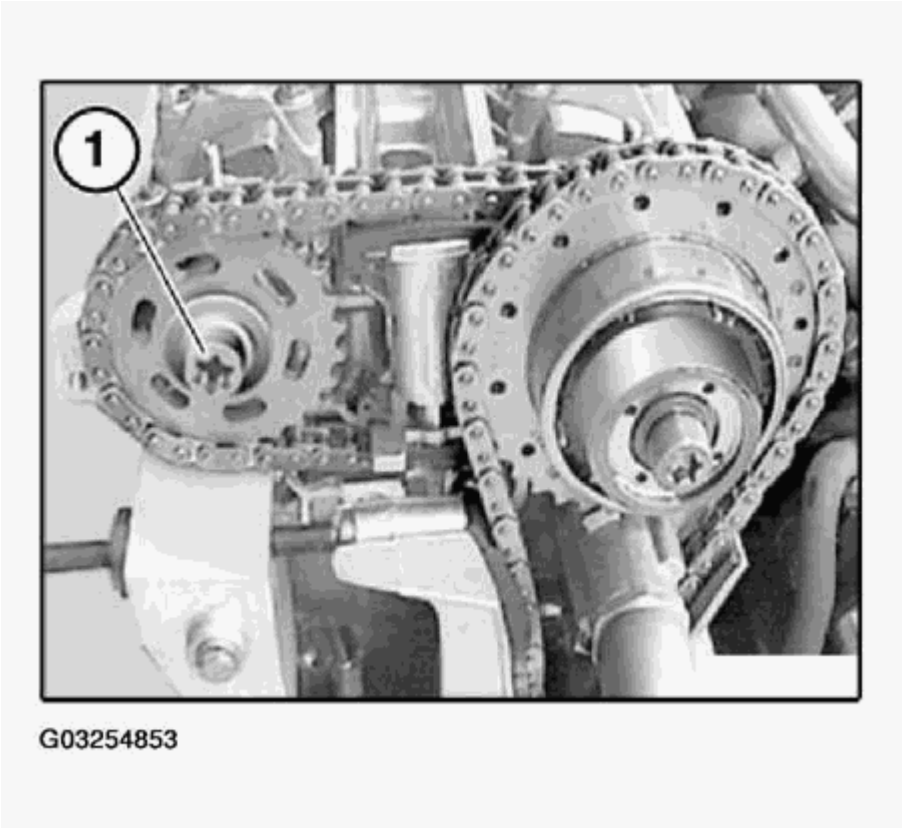


Fig. 410: Tightening Screw Connection Of Exhaust Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach sensor gear (2) to cylinder bank 1 to 4.

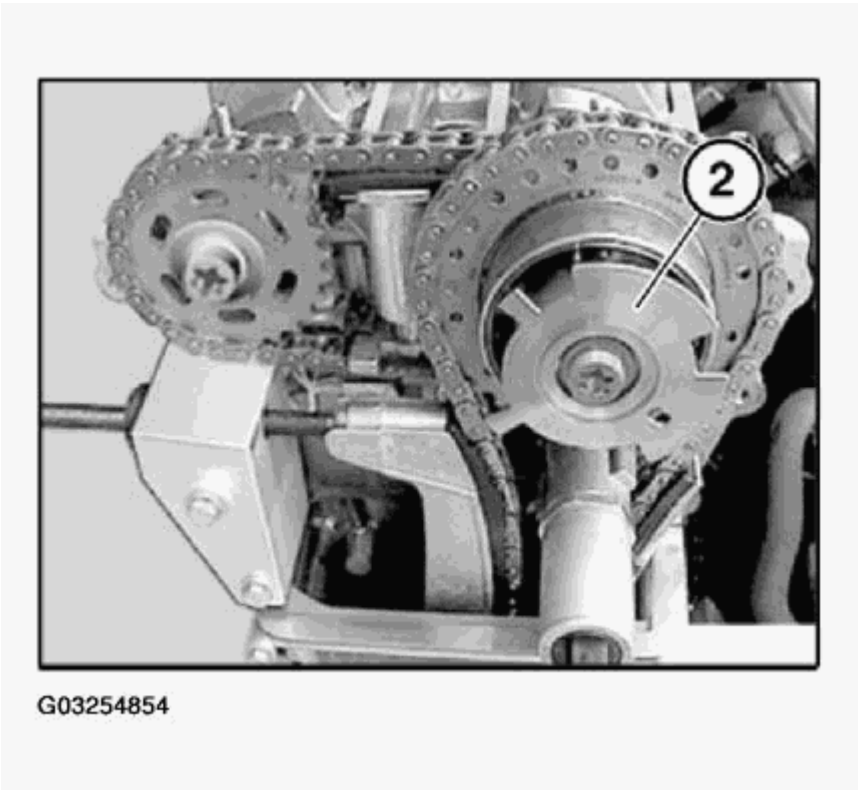


Fig. 411: Attaching Sensor Gear To Cylinder Bank 1 To 4
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 1 to 4 and initially tighten without play, but do not tighten down yet.

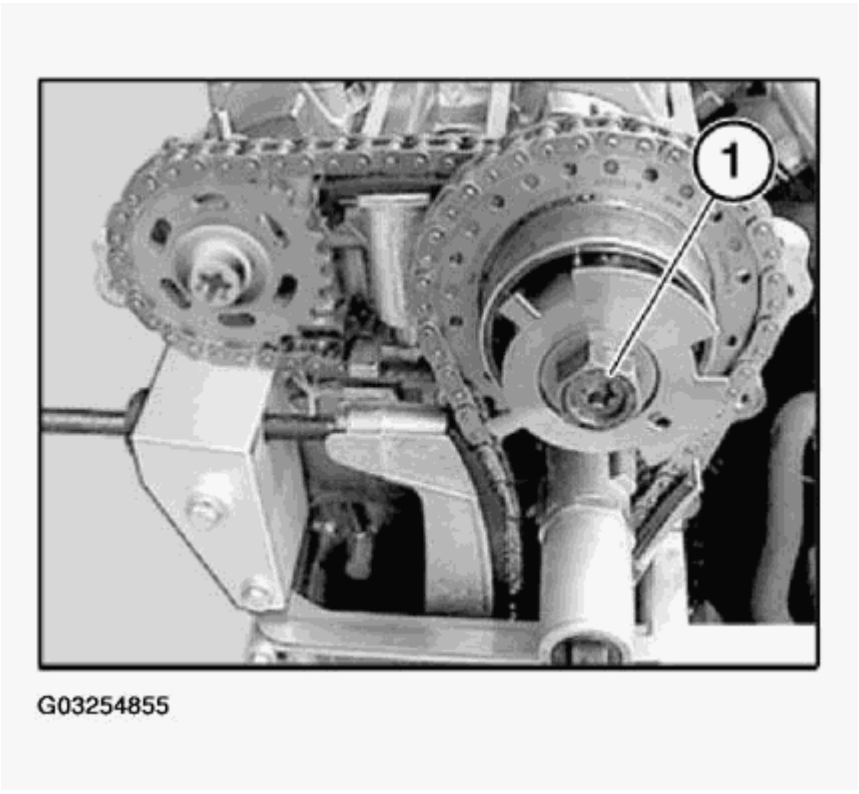


Fig. 412: Fitting Nut Of Sensor Gear Screw Connection (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

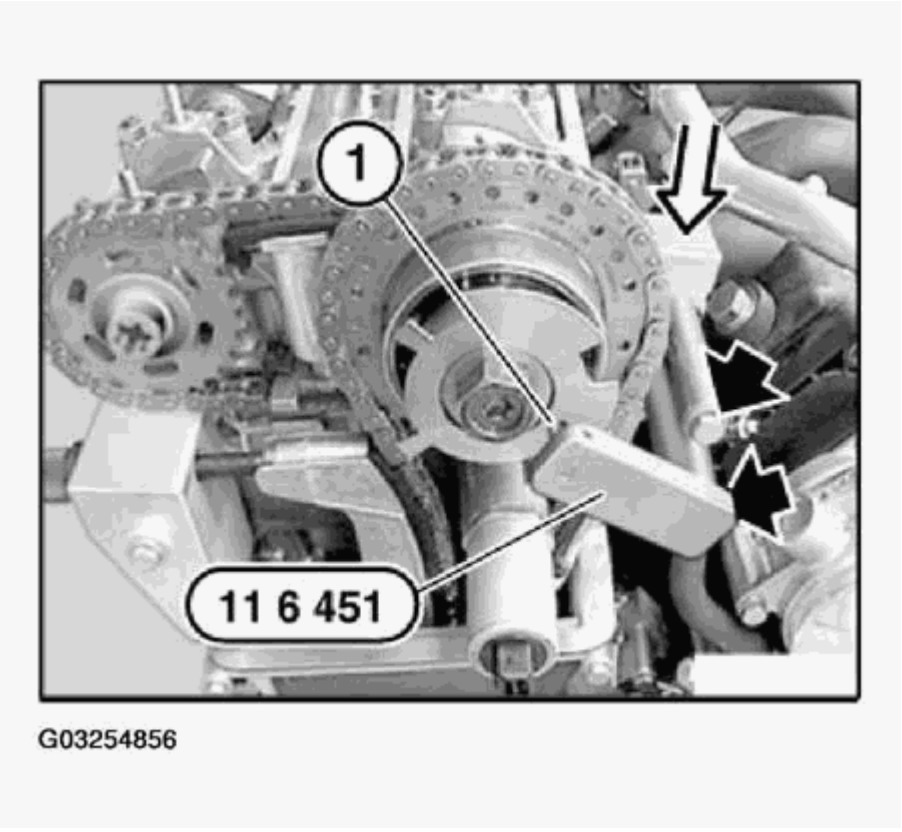


Fig. 413: Aligning Locating Bore On Sensor Gear (Cylinder Bank 1 To 4) To Positioning Pin On Special Tool 11 6 451
Courtesy of BMW OF NORTH AMERICA, INC.

Align locating bore (1) on sensor gear of cylinder bank 1 to 4 to positioning pin on special tool 11 6 451. Fit special tool 11 6 451, insert screws and initially tighten without play. Press special tool 11 6 451 downwards and align to cylinder head. Tighten down special tool 11 6 451.

CAUTION: Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.

Tightening torque, see 11 36 15AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

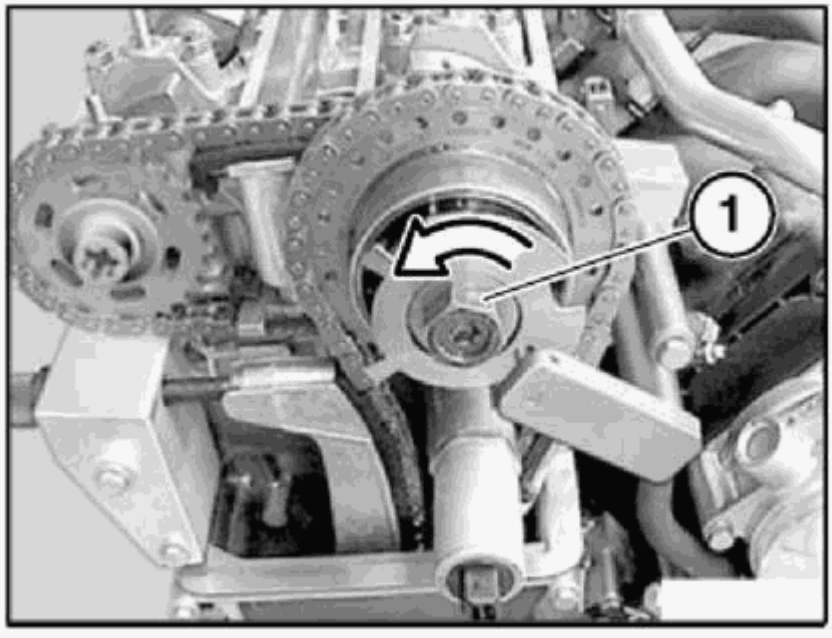


Fig. 414: Tightening Nut On Sensor Gear Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 6 451 from right cylinder head on cylinder bank 1 to 4.

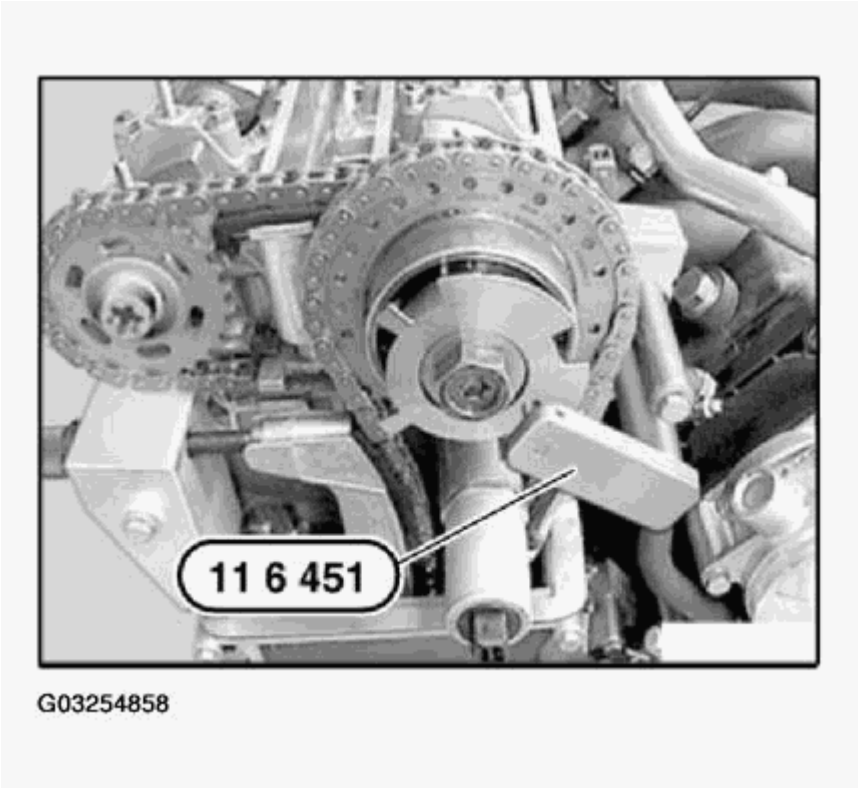


Fig. 415: Removing Special Tool 11 6 451 From Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach sensor gear (2) to cylinder bank 5 to 8.

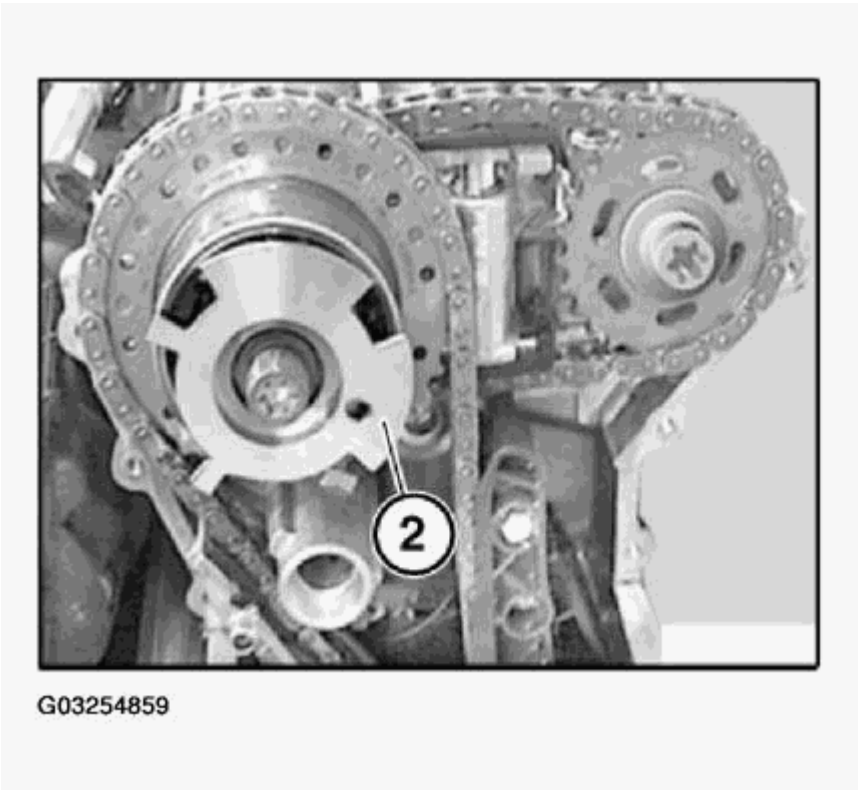


Fig. 416: Connecting Sensor Gear (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 5 to 8 and initially tighten without play, but do not tighten down yet.

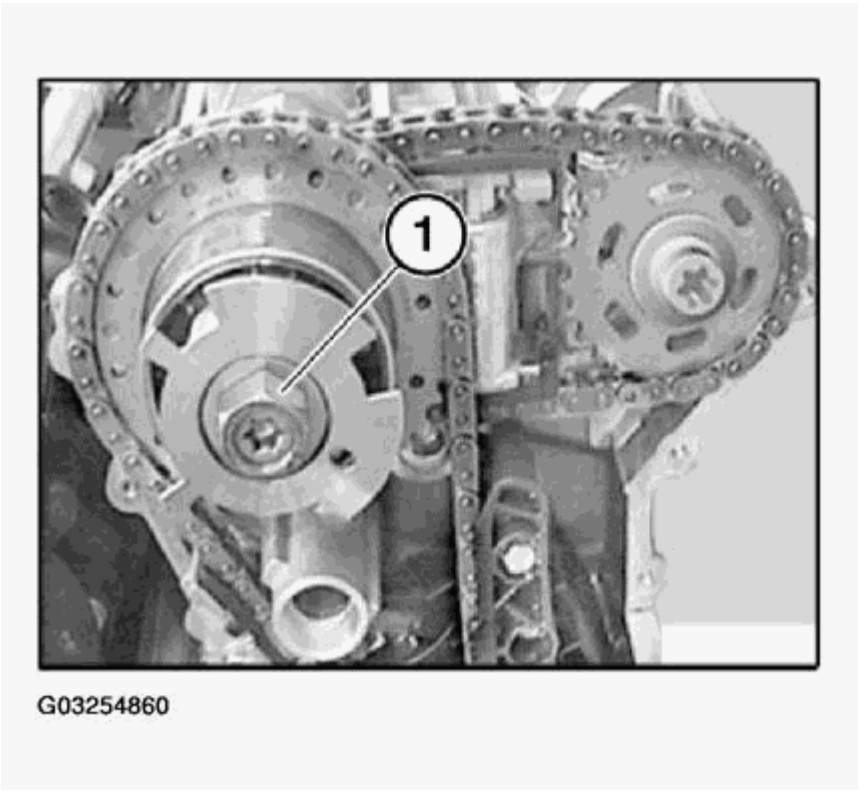


Fig. 417: Fitting Nut Of Sensor Gear Screw Connection (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

Align locating bore (1) on sensor gear of cylinder bank 5 to 8 to positioning pin on special tool 11 6 452. Fit special tool 11 6 452, insert screws and initially tighten without play. Press special tool 11 6 452 downwards and align to cylinder head. Tighten down special tool 11 6 452.

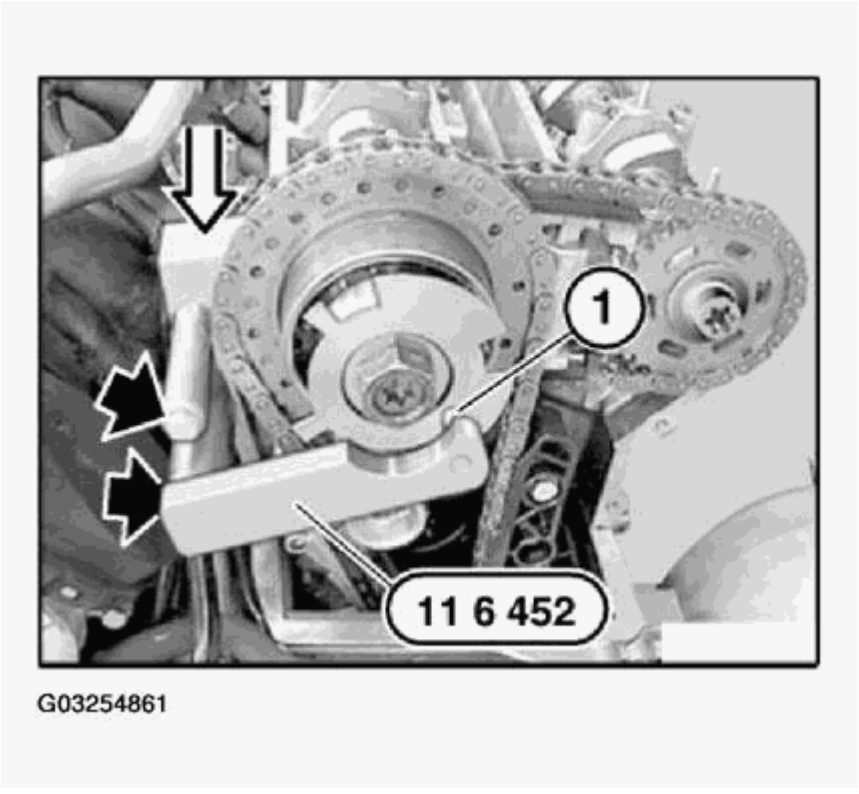


Fig. 418: Aligning Locating Bore On Sensor Gear Of Cylinder Bank 5 To 8 To Positioning Pin On Special Tool 11 6 452
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.

Tightening torque, see 11 36 15AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

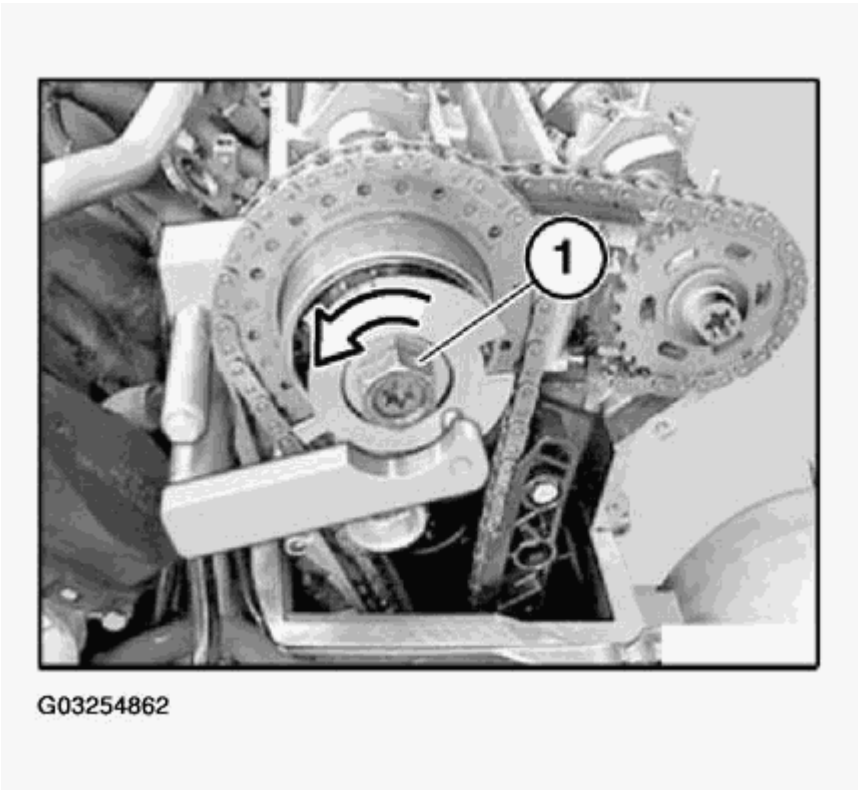


Fig. 419: Tightening Nut On Sensor Gear Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 6 452 from left cylinder head on cylinder bank 5 to 8.

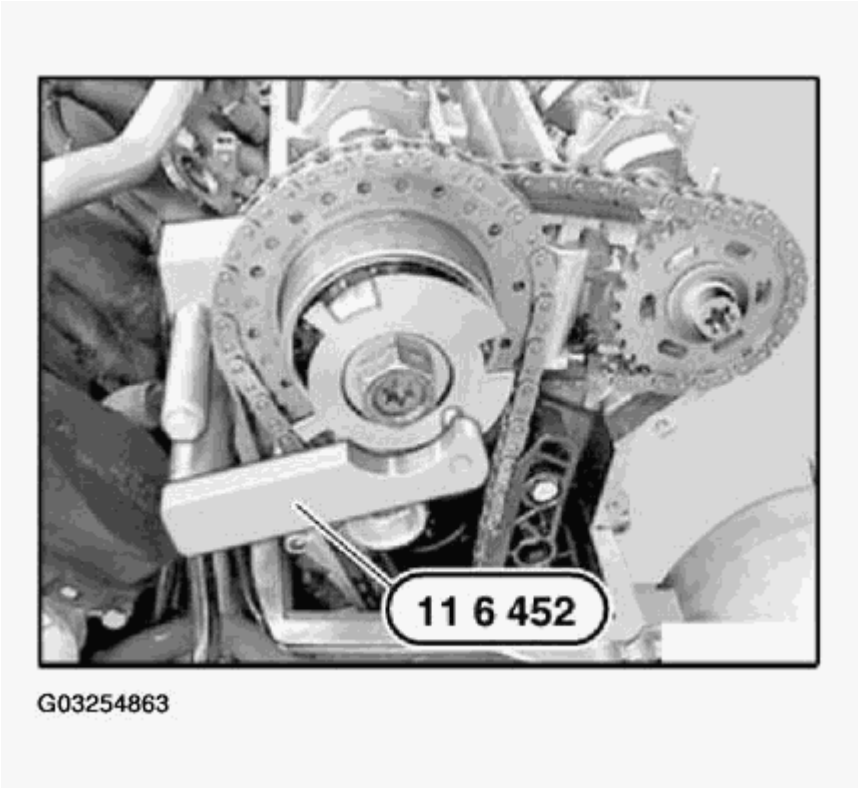


Fig. 420: Removing Special Tool 11 6 452 From Left Cylinder Head (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/11 2 443/11 2 445/11 2 441.

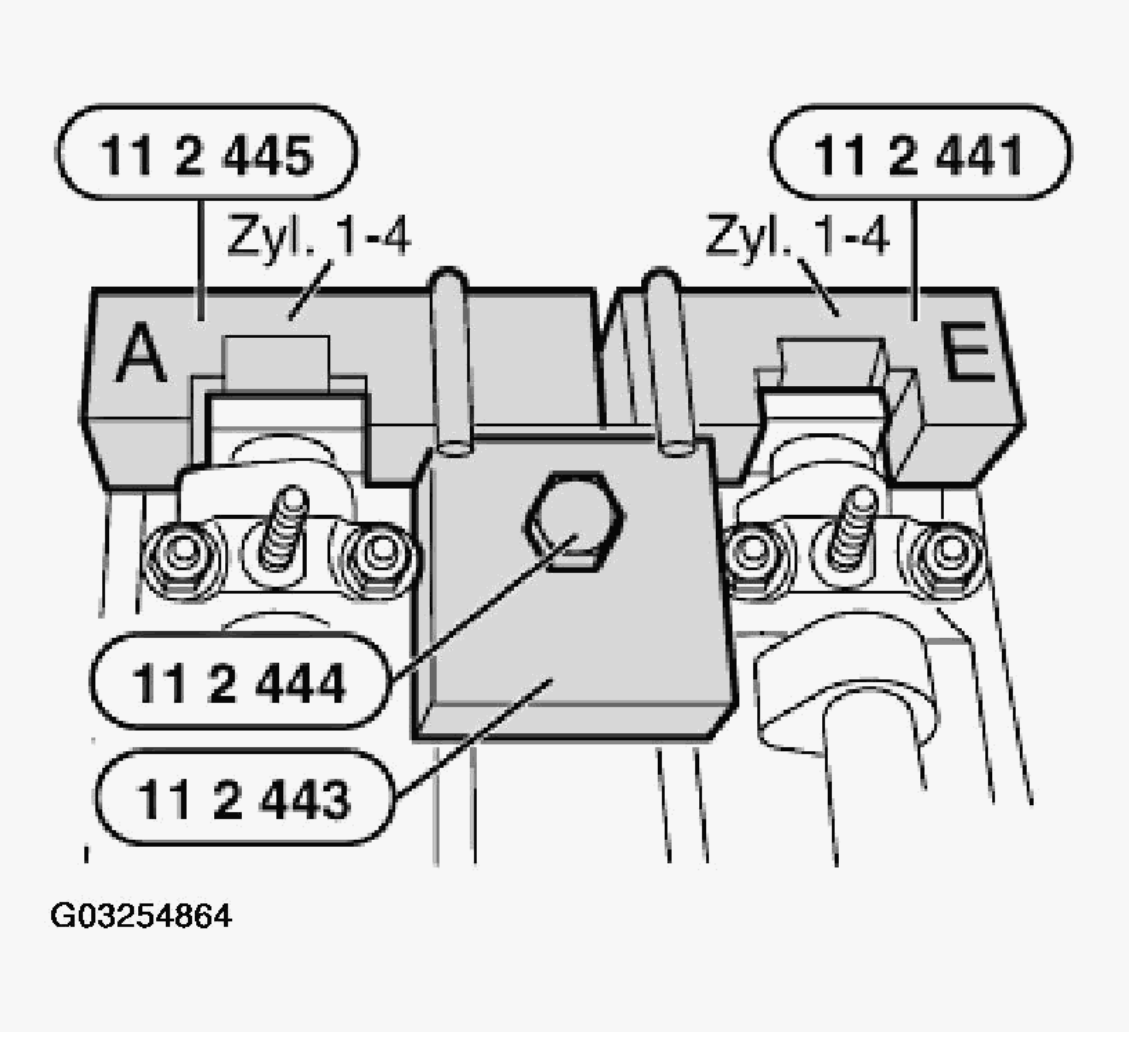


Fig. 421: Removing Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/11 2 443/11 2 442/11 2 446.

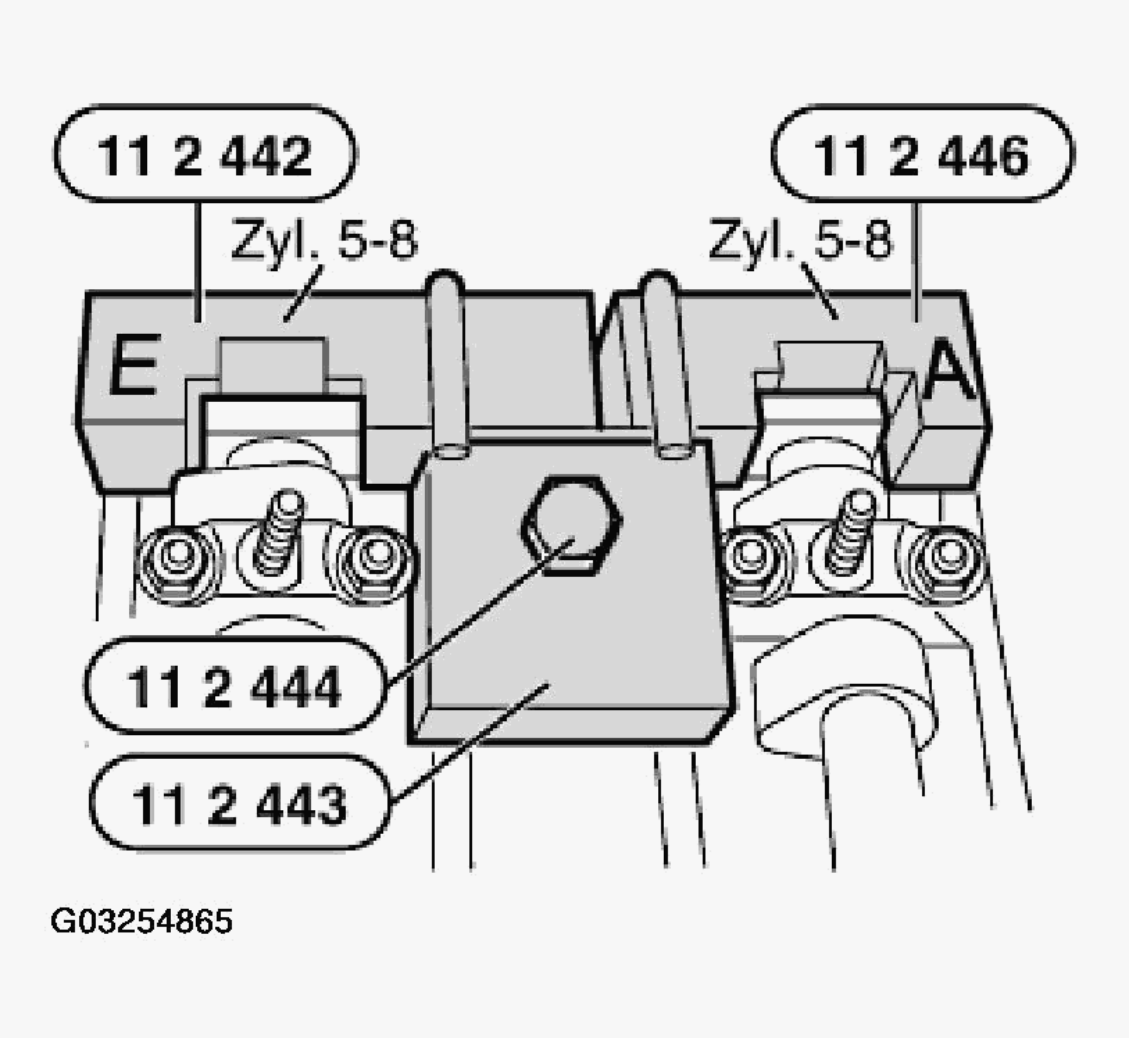


Fig. 422: Removing Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on special tool 11 4 230.

Remove special tool 11 7 380 from right cylinder head on cylinder bank 1 to 4.

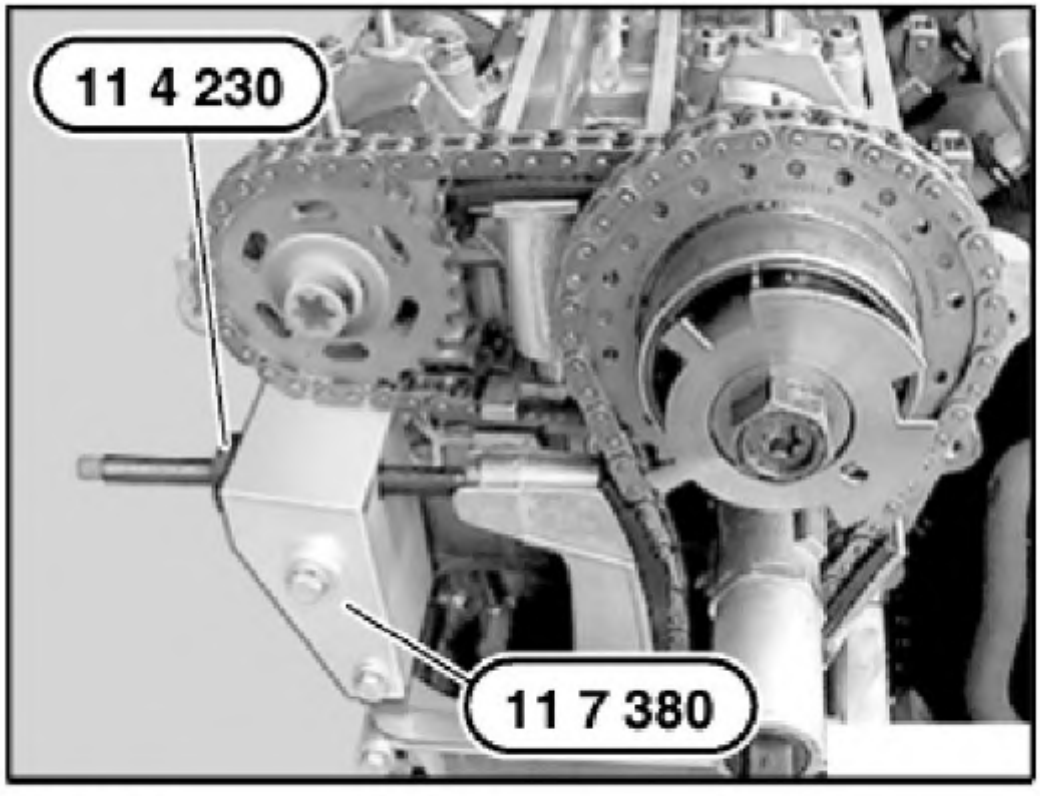


Fig. 423: Removing Special Tool 11 7 380 From Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Install oil lines on left and right of cylinder head.

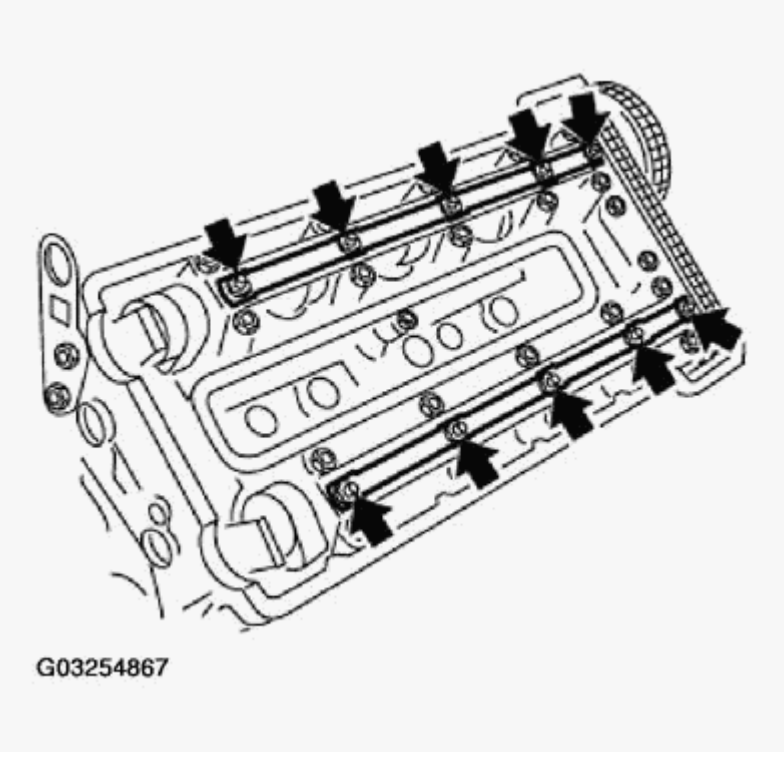


Fig. 424: Installing Oil Lines On Left And Right Of Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Install both timing case covers at top.

Install chain tensioning piston.

Install both cylinder head covers.

E53

Remove special tool 11 5 180.

Assemble engine.

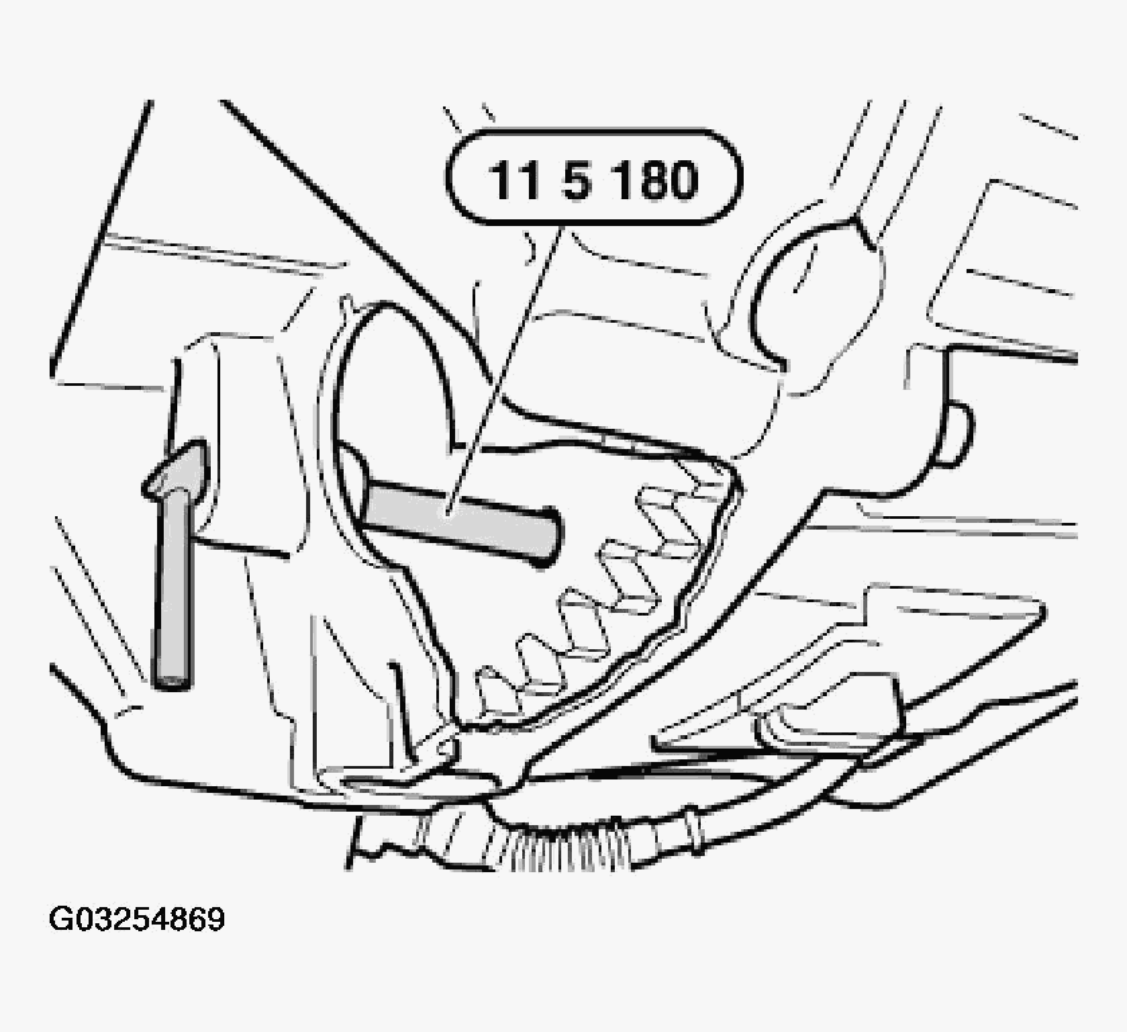


Fig. 425: Removing Special Tool 11 5 180
Courtesy of BMW OF NORTH AMERICA, INC.

11 36 585 REMOVING AND INSTALLING/REPLACING SOLENOID VALVE OF CAMSHAFT ADJUSTMENT UNIT, LEFT (M62 VANOS FROM 9/98)

Remove intake filter housing with air-mass flow sensor.

Remove fan impeller with fan clutch,

refer to **11 52 020 REMOVING AND INSTALLING OR REPLACING FAN COUPLING (M62)** .

Unfasten drain plug for coolant on left engine block.

Drain and dispose of coolant.

Installation:

Replace sealing ring on drain plug.

Tightening Torque,

refer to 11 11 5AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Top up coolant. Vent cooling system and check for leaks,

refer to **17 00 005 DRAINING AND TOPPING UP COOLANT (M62)** .

Pull lock (1) and detach water hose.

Installation:

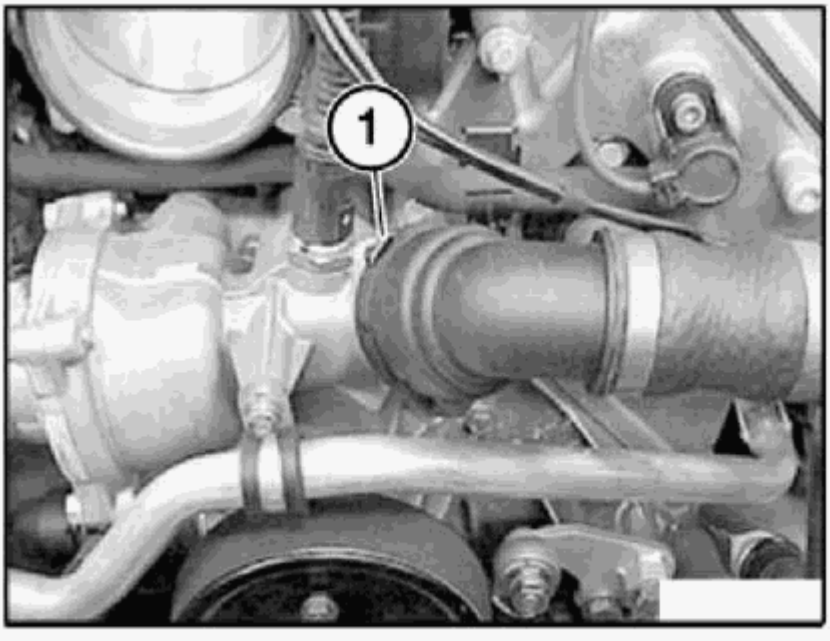
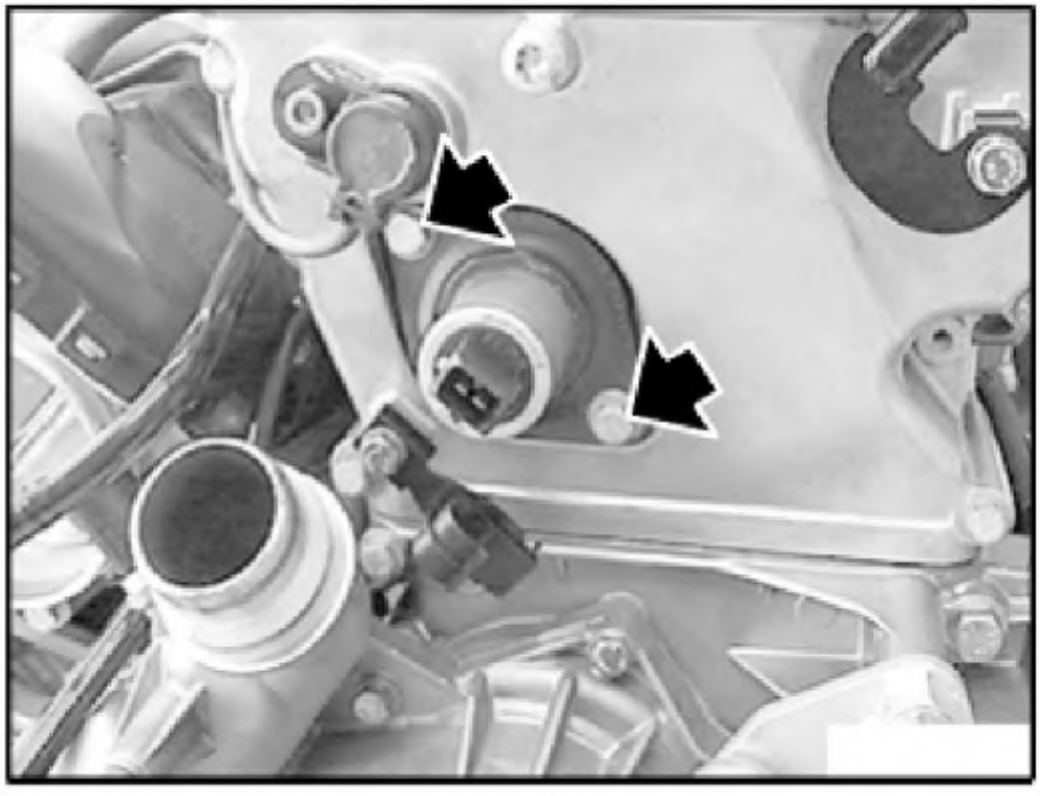


Fig. 426: Identifying Water Hose Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect connector.

Release screws on sealing flange.



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Fig. 427: Solenoid Valve Of Camshaft Adjustment Unit Sealing Flange Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The sealing flange seals the timing case cover via the solenoid valve.

If necessary, clean solenoid valve with a cloth.

Remove sealing flange (1).

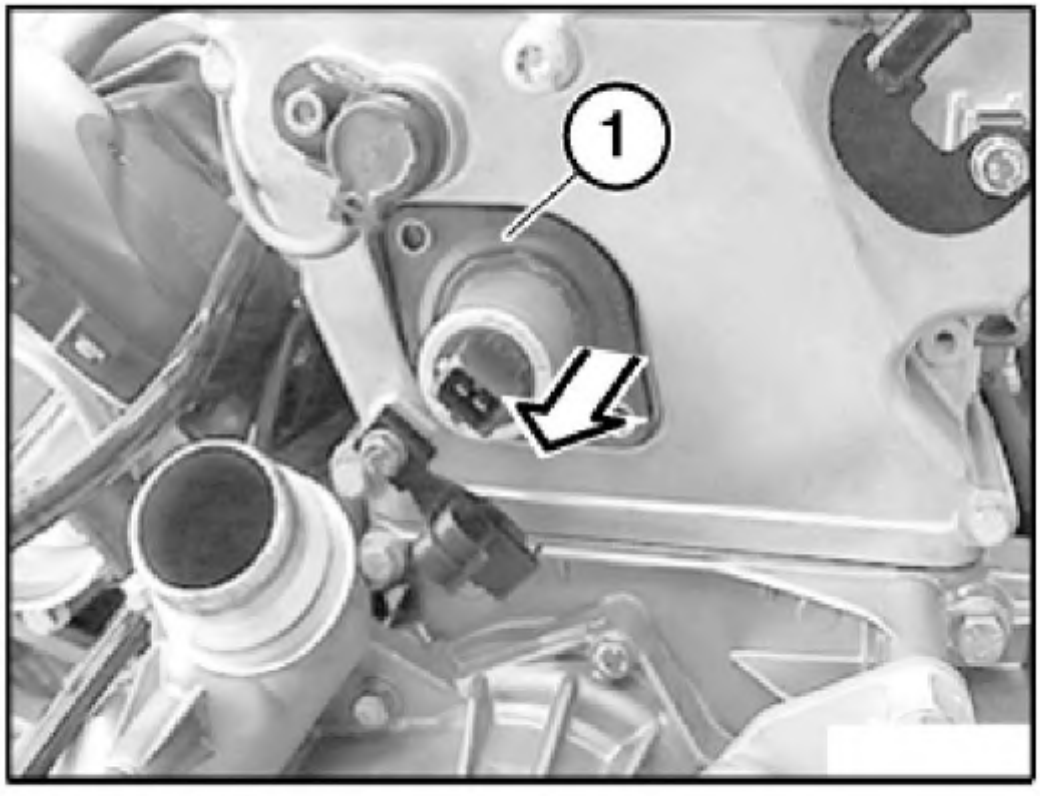


Fig. 428: Removing Camshaft Adjustment Unit Sealing Flange
Courtesy of BMW OF NORTH AMERICA, INC.

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.

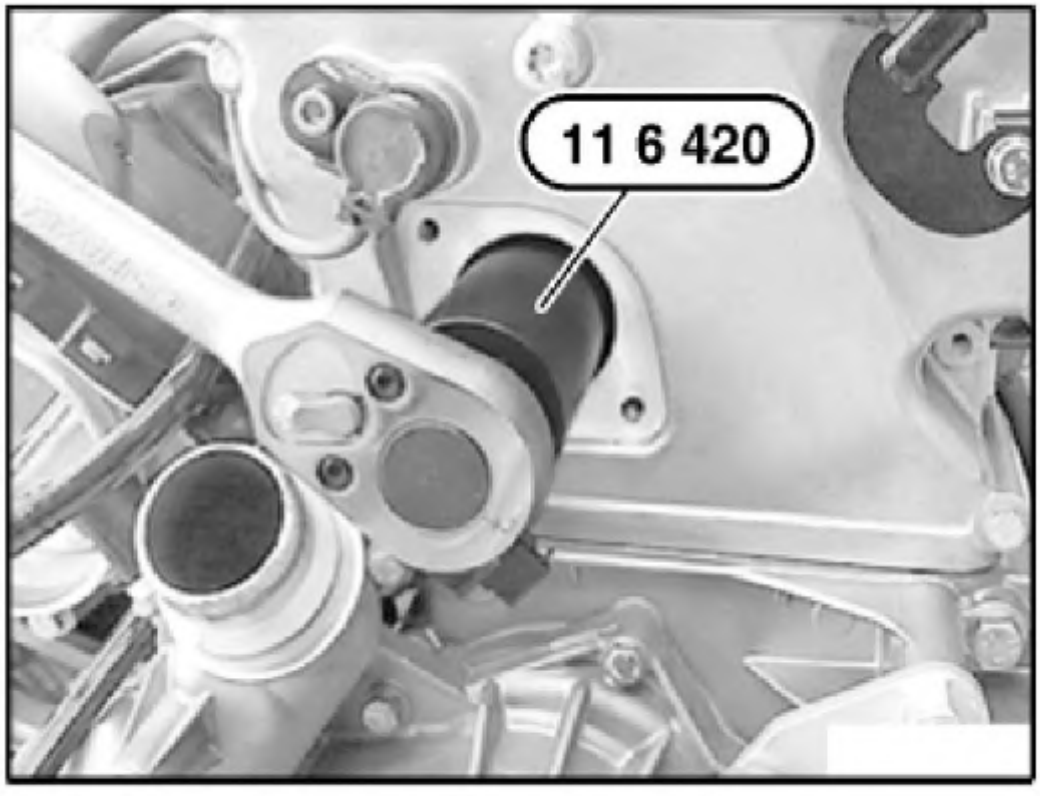


Fig. 429: Removing Camshaft Adjustment Unit Solenoid Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install solenoid valve (1).

Clean solenoid valve (1) and sealing face (2).

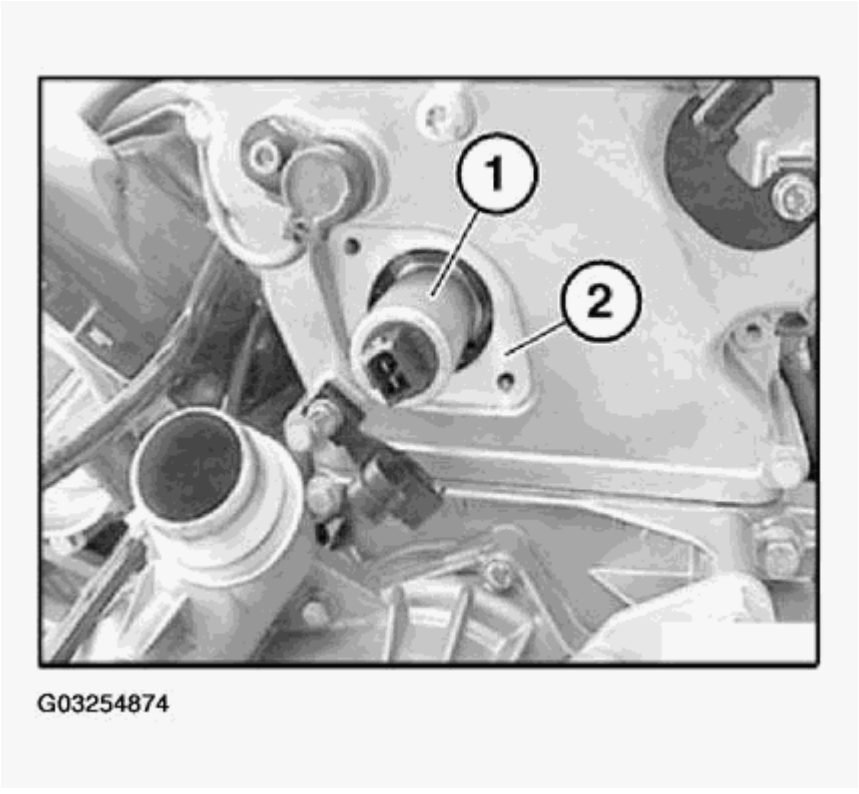


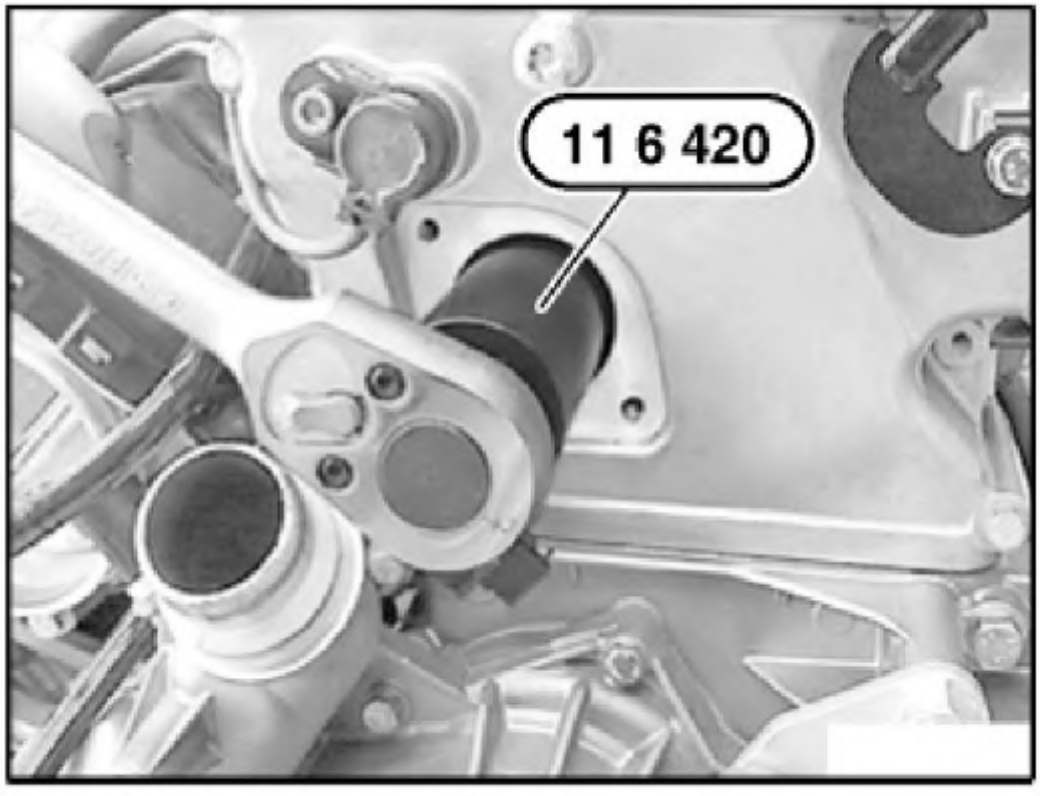
Fig. 430: Installing Camshaft Adjustment Unit Solenoid Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tighten down solenoid valve with special tool 11 6 420.

Tightening Torque,

refer to 11 36 12AZ n **ENGINE - TIGHTENING TORQUES - X5 4.6L** .



G03254875

Fig. 431: Installing Camshaft Adjustment Unit Solenoid Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check sealing flange (1), replace if necessary.

Apply a light coat of oil to inside of sealing flange (1) at sealing face to solenoid valve and carefully install.

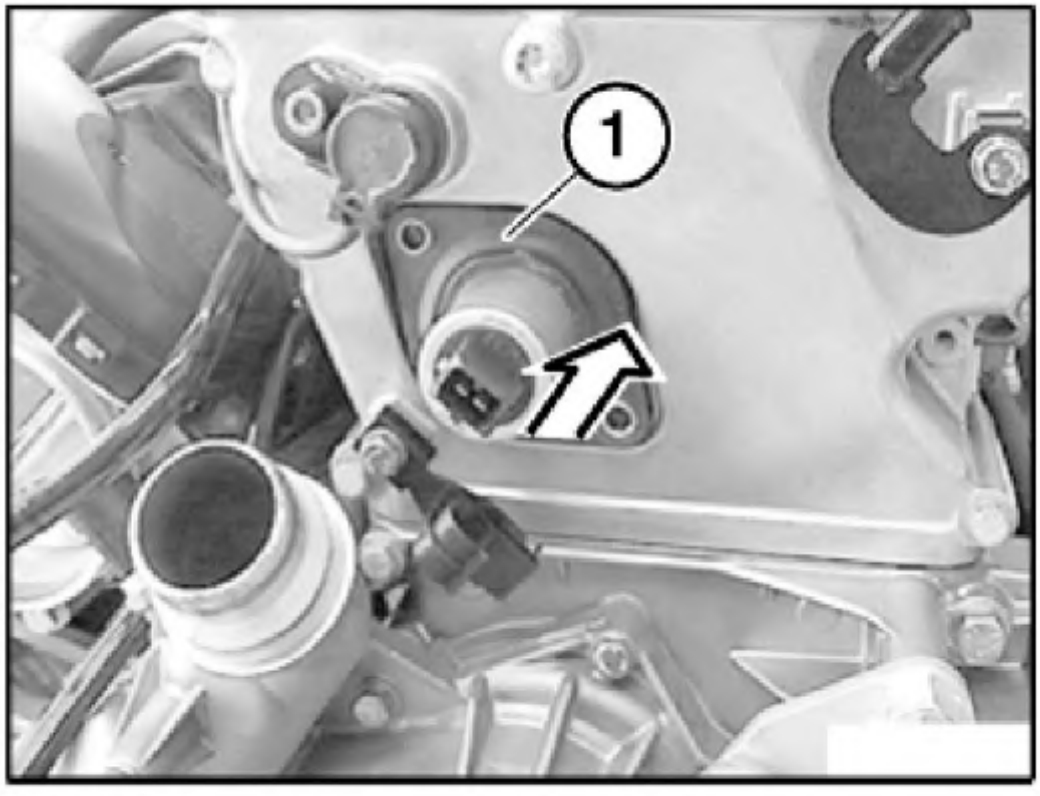
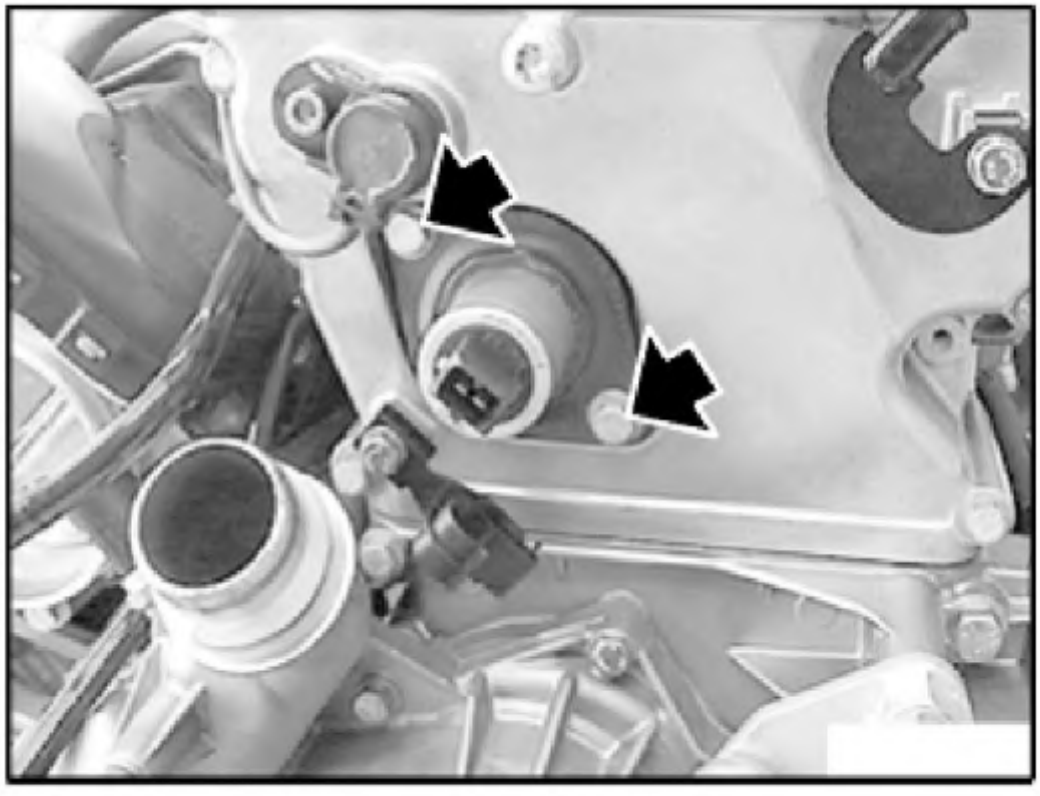


Fig. 432: Installing Camshaft Adjustment Unit Sealing Flange
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert screws on sealing flange and tighten down.



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Fig. 433: Inserting Camshaft Adjustment Unit Sealing Flange Screws
Courtesy of BMW OF NORTH AMERICA, INC.

11 36 590 REMOVING AND INSTALLING/REPLACING SOLENOID VALVE OF CAMSHAFT ADJUSTMENT UNIT, RIGHT (M62 VANOS FROM 9/98)

Remove intake filter housing with air-mass flow sensor.

Release screws on sealing flange.

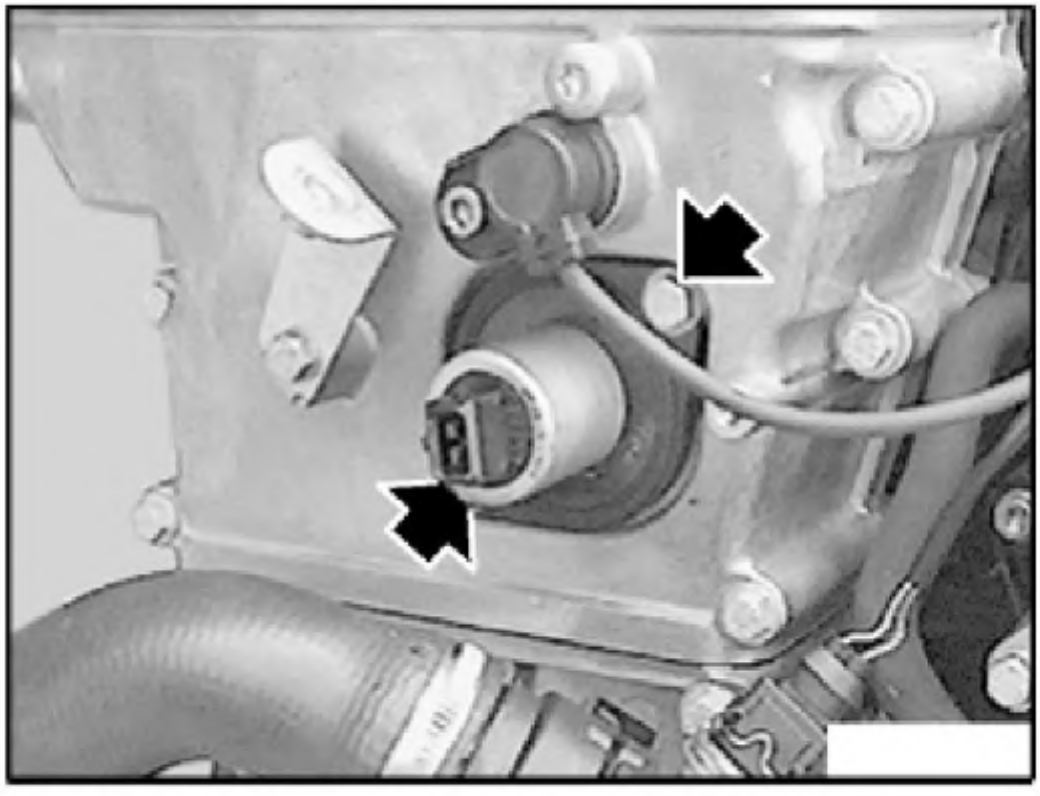


Fig. 434: Removing Camshaft Adjustment Unit Sealing Flange Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The sealing flange seals the timing case cover via the solenoid valve.

If necessary, clean solenoid valve with a cloth.

Remove sealing flange (1).

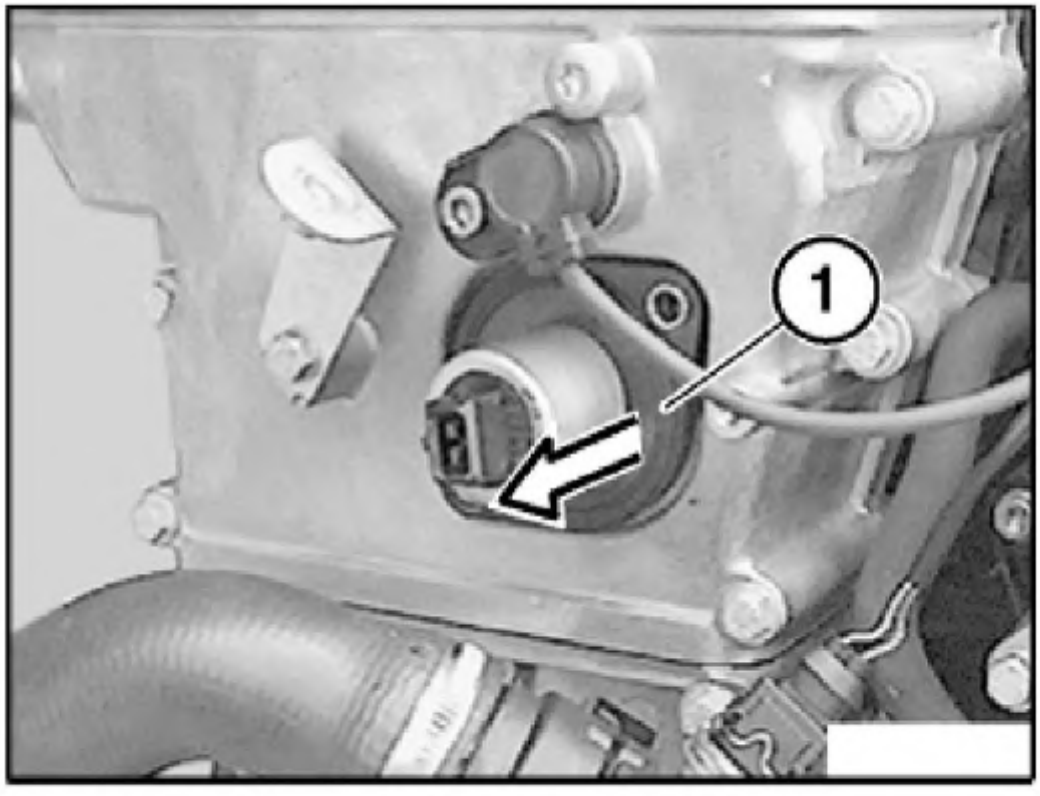


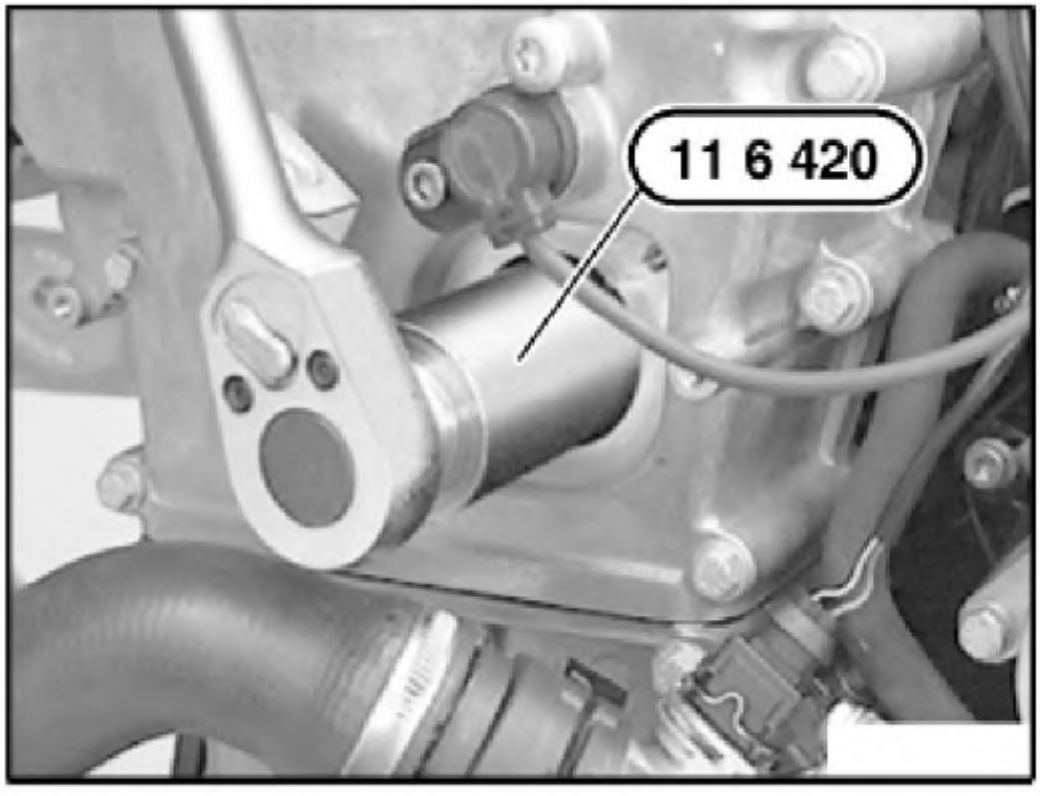
Fig. 435: Removing Camshaft Adjustment Unit Sealing Flange
Courtesy of BMW OF NORTH AMERICA, INC.

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.



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Fig. 436: Removing Camshaft Adjustment Unit Solenoid Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install solenoid valve (1).

Clean solenoid valve (1) and sealing face (2).

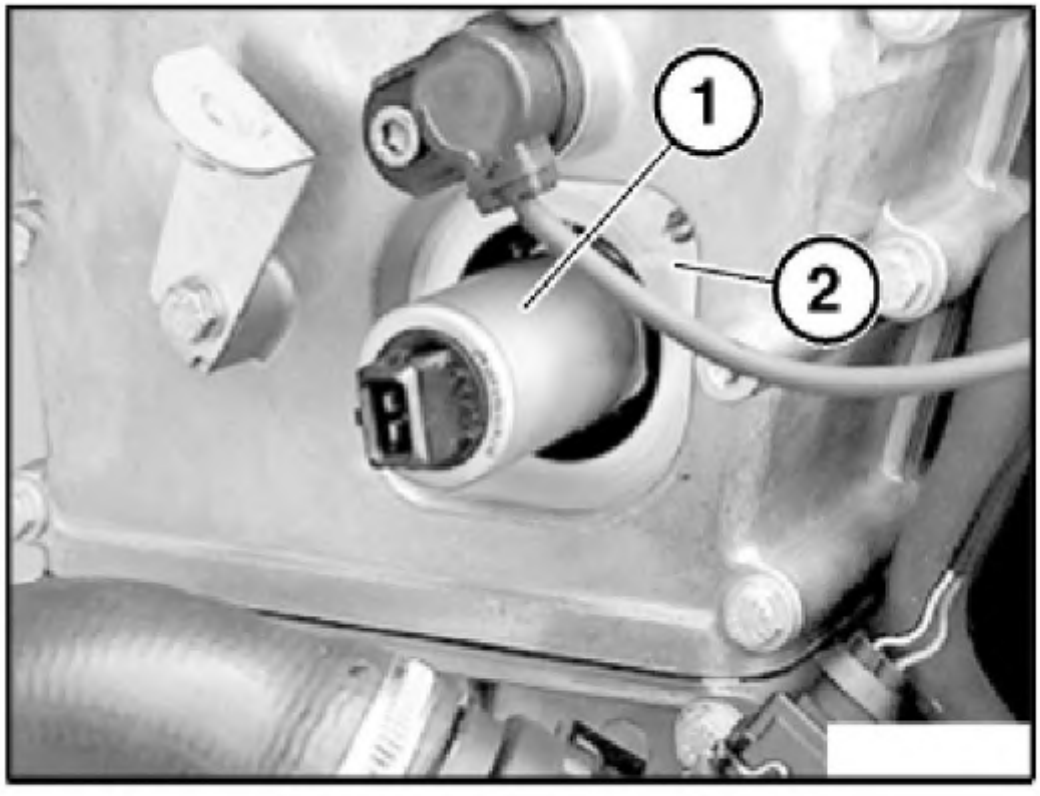


Fig. 437: Installing Camshaft Adjustment Unit Solenoid Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tighten down solenoid valve with special tool 11 6 420.

Tightening Torque,

refer to 11 36 12AZ **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

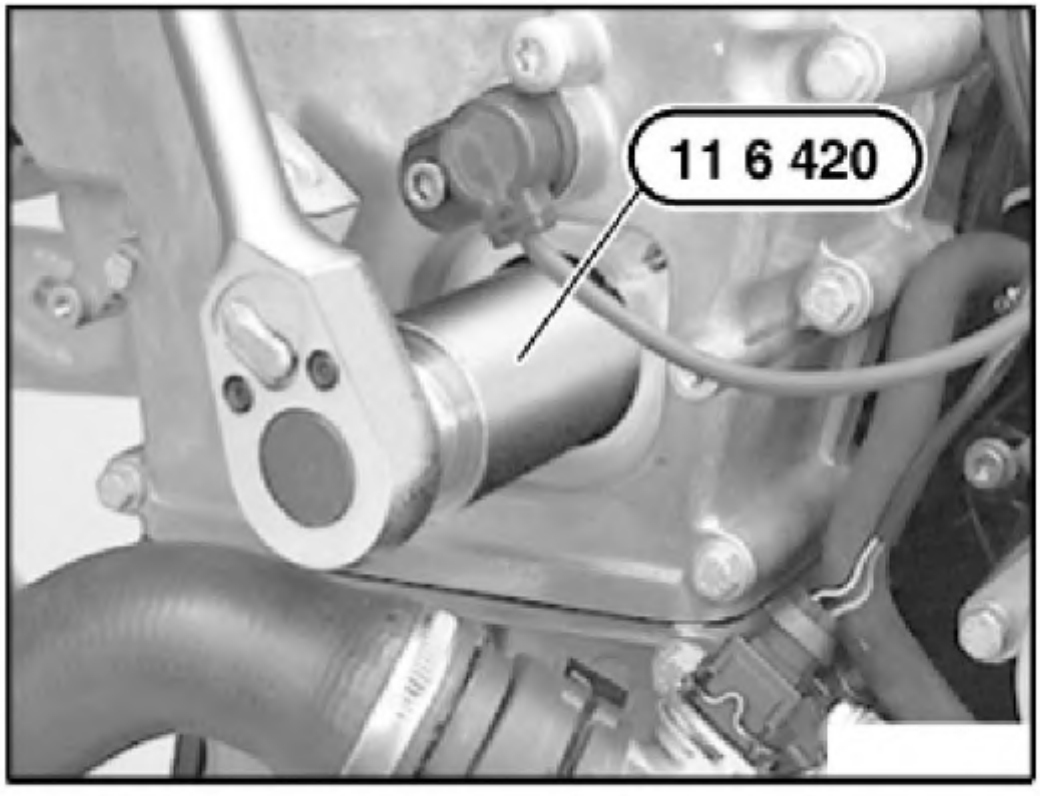


Fig. 438: Tightening Camshaft Adjustment Unit Solenoid Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check sealing flange (1), replace if necessary.

Apply a light coat of oil to inside of sealing flange (1) at sealing face to solenoid valve and carefully install.

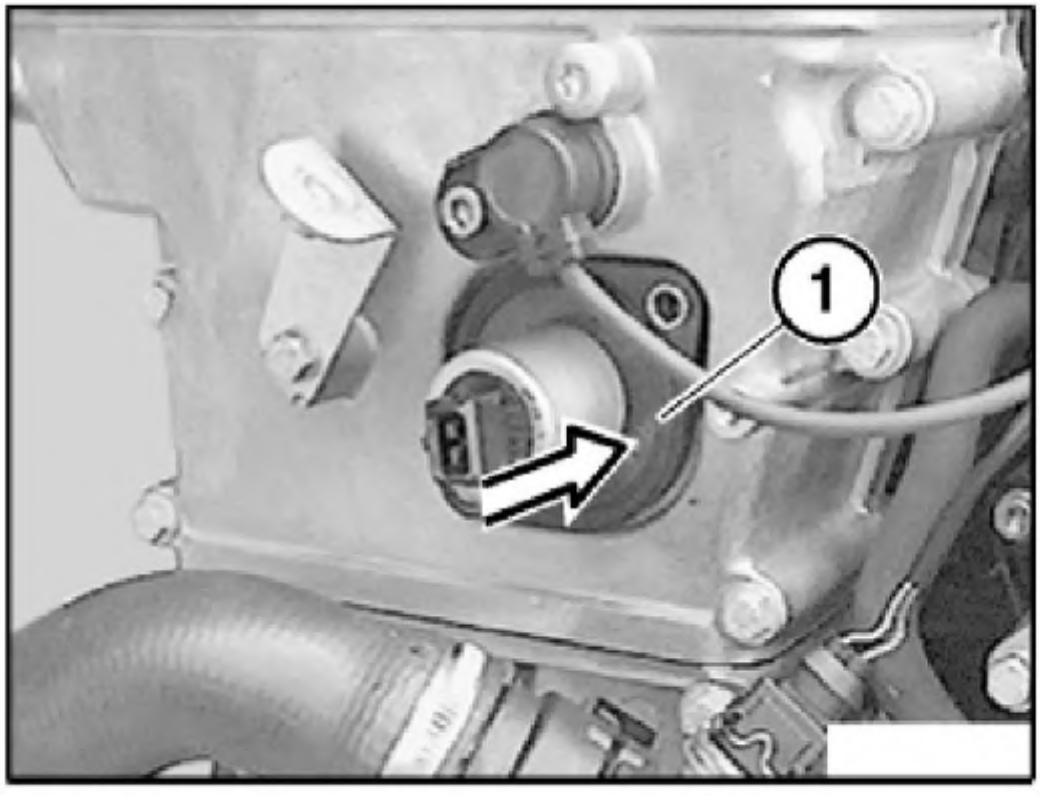
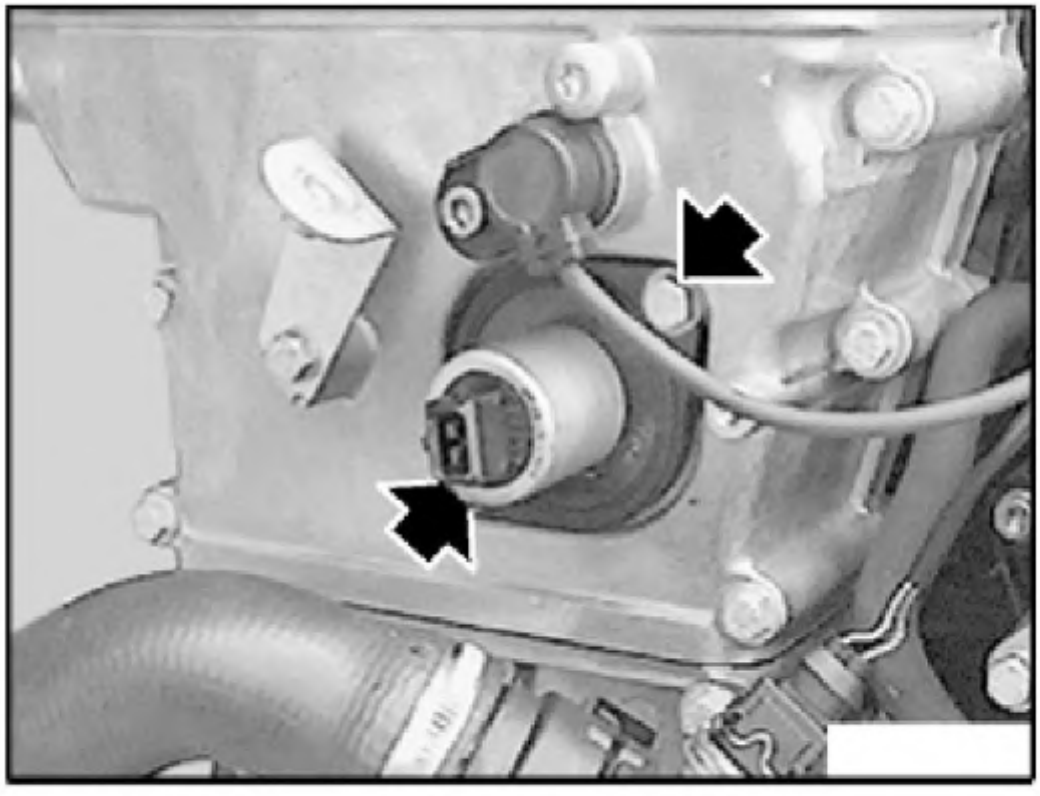


Fig. 439: Installing Camshaft Adjustment Unit Sealing Flange
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert screws on sealing flange and tighten down.



G03254884

Fig. 440: Inserting Camshaft Adjustment Unit Sealing Flange Screws
Courtesy of BMW OF NORTH AMERICA, INC.

11 36 610 REMOVING AND INSTALLING/REPLACING LEFT CAMSHAFT ADJUSTMENT UNIT (M62 VANOS FROM 9/98)

Special tools required:

NOTE: For Special Tool identification, see ENGINE - SPECIAL TOOLS - X5 (4.4L & 4.6L) .

- 00 9 250
- 11 2 300
- 11 2 441
- 11 2 442
- 11 2 443

- 11 2 444
- 11 2 445
- 11 2 446
- 11 3 310
- 11 4 230
- 11 4 231
- 11 4 232
- 11 5 180
- 11 6 440
- 11 6 450
- 11 6 451
- 11 6 452
- 11 7 380

Removal

Remove intake filter housing with air-mass flow sensor.

Remove fan impeller with fan clutch and fan cowl.

Remove both cylinder head covers.

Remove spark plugs.

CAUTION: In firing TDC position, the inlet camshaft 1 to 4 rotates in the teeth of the camshaft adjustment unit. This twisting is caused by the position of the cams and is not an indication for incorrect timing.

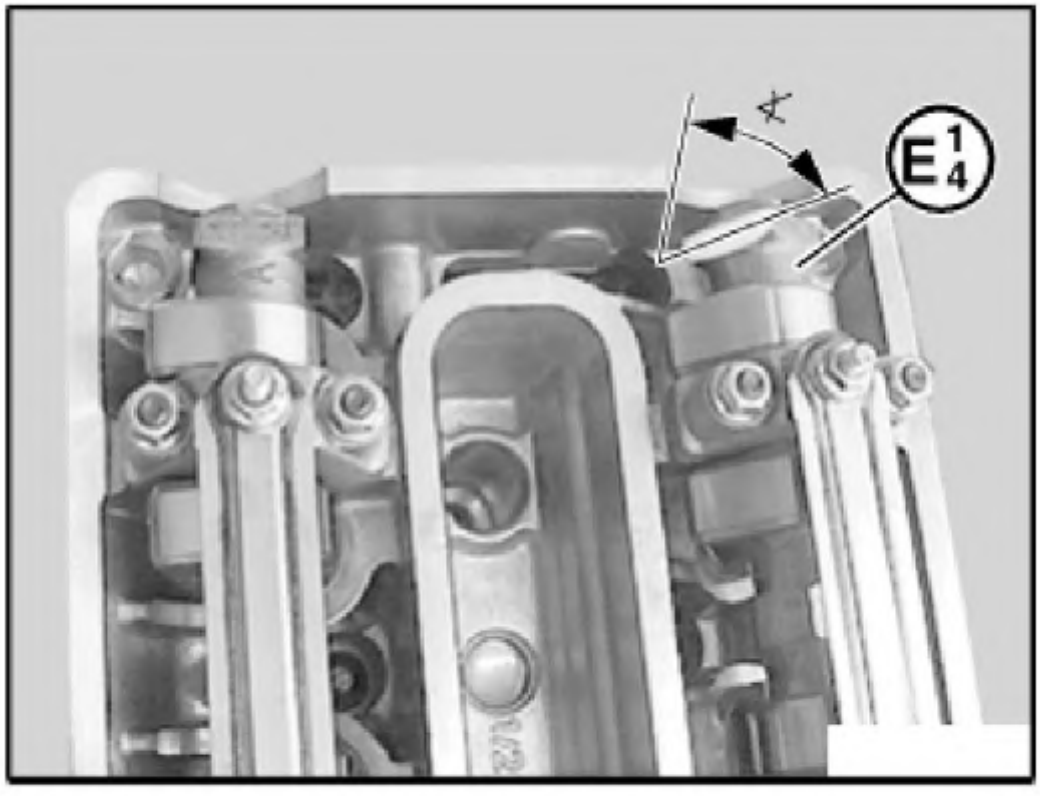


Fig. 441: Identifying Inlet Camshaft Rotation
Courtesy of BMW OF NORTH AMERICA, INC.

Removal of the left camshaft adjustment unit is described separately from installation. Assembly sequence for removal and installation is different.

Remove oil lines on left and right of cylinder head.

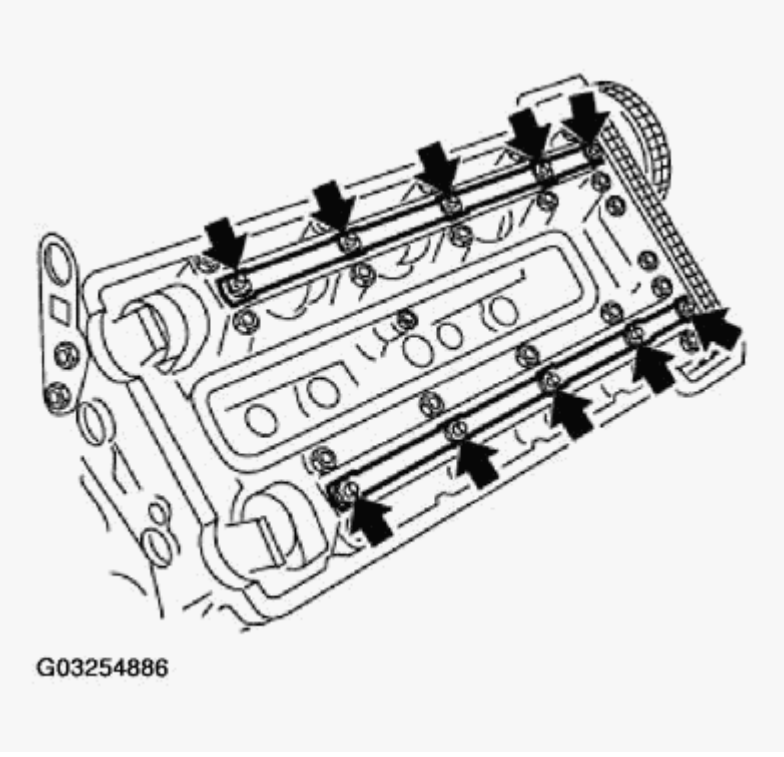


Fig. 442: Removing Oil Lines On Left And Right Of Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Turn engine in direction of rotation as far as TDC firing position of first cylinder.

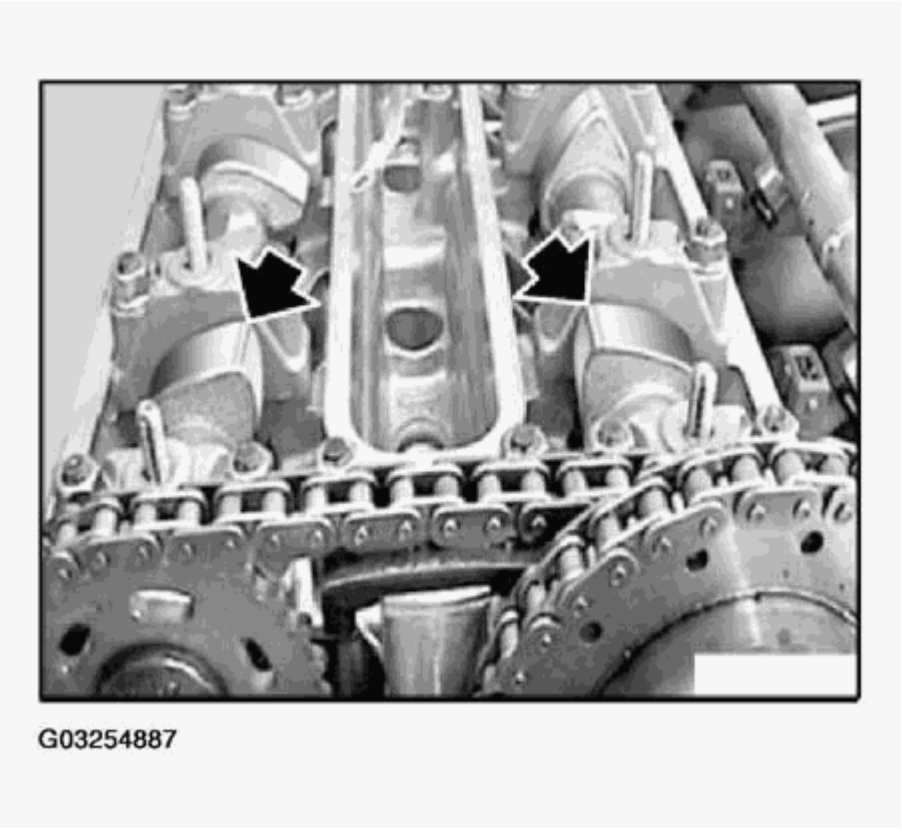


Fig. 443: Rotating Camshaft To TDC (Overlap)
Courtesy of BMW OF NORTH AMERICA, INC.

E53

Secure crankshaft in TDC position with special tool 11 5 180.

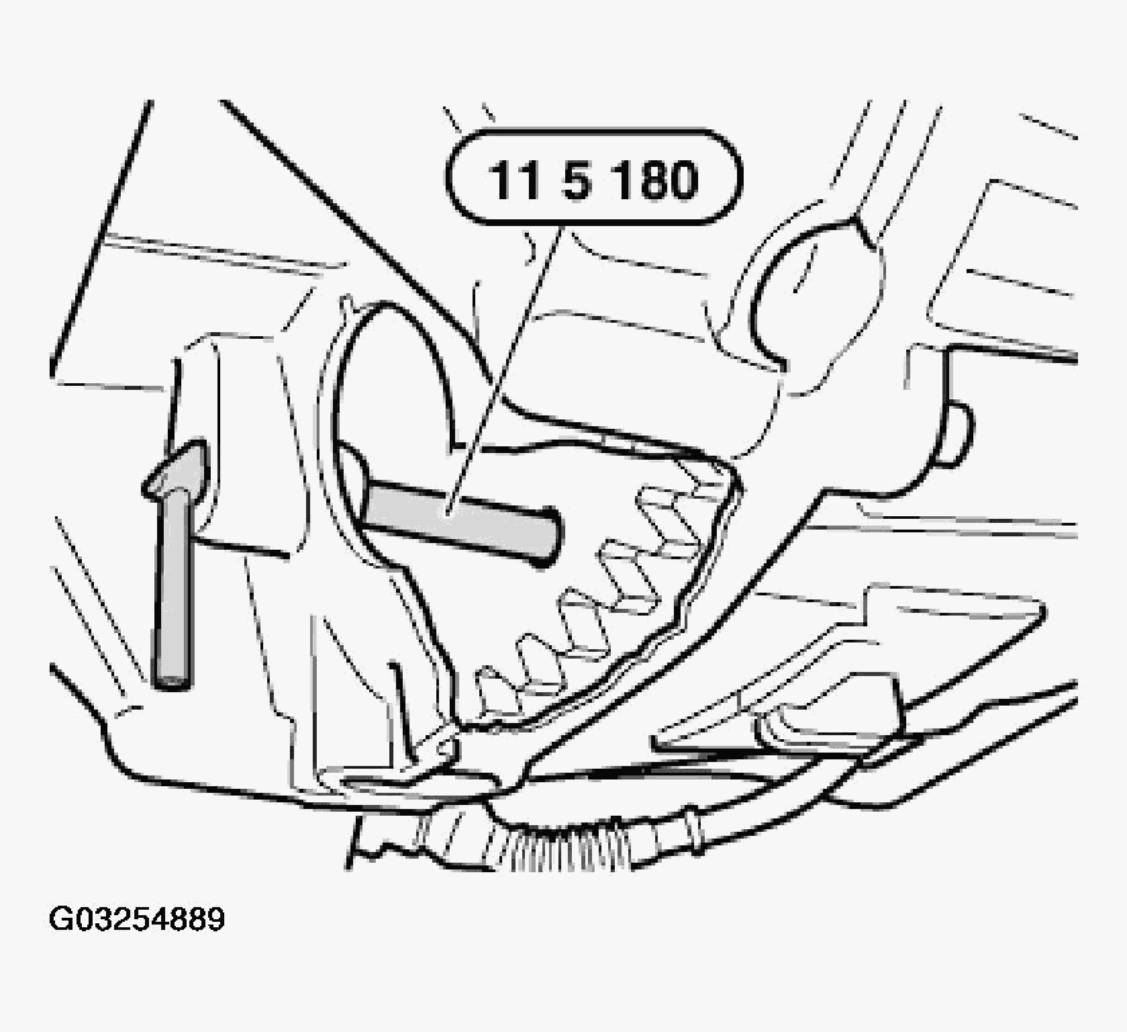


Fig. 444: Securing Crankshaft In TDC Position
Courtesy of BMW OF NORTH AMERICA, INC.

Remove chain tensioning piston. See **11 31 090 INSTALLING AND REMOVING/REPLACING PISTON FOR CHAIN TENSIONER (M62)** .

Remove both timing case covers at top. See **11 14 080 REMOVING AND INSTALLING TIMING CASE COVER, TOP LEFT (M62 VANOS FROM 9/98)** and **11 14 085 REMOVING AND INSTALLING TIMING CASE COVER, TOP RIGHT (M62 VANOS FROM 9/98)** .

CAUTION: Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 5 to 8.

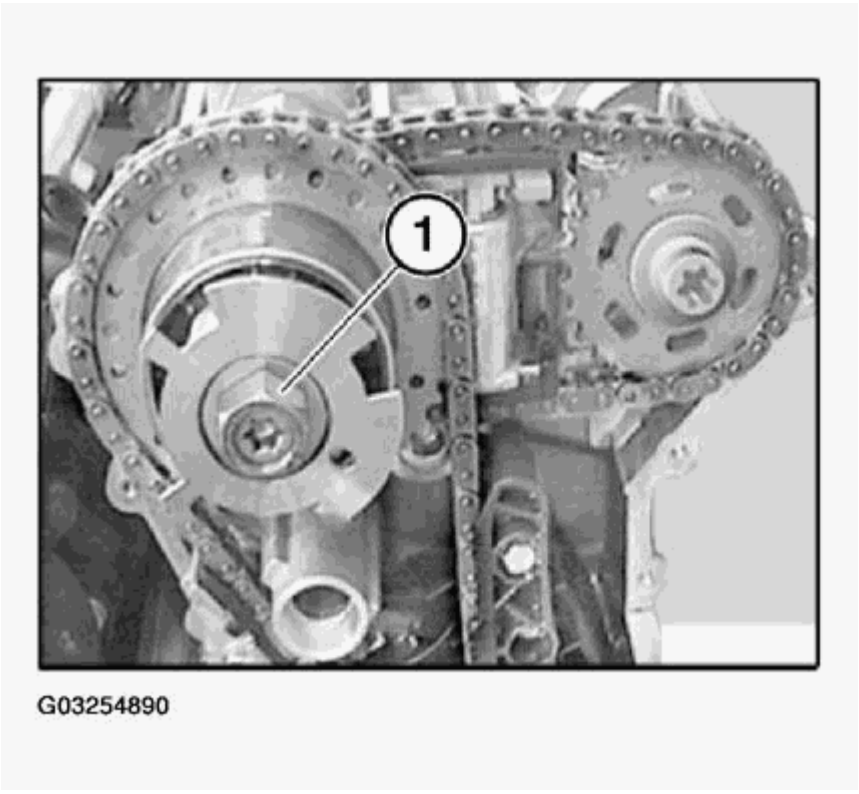


Fig. 445: Releasing Sensor Gear Screw Connection Nut (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sensor gear (2) on cylinder bank 5 to 8.

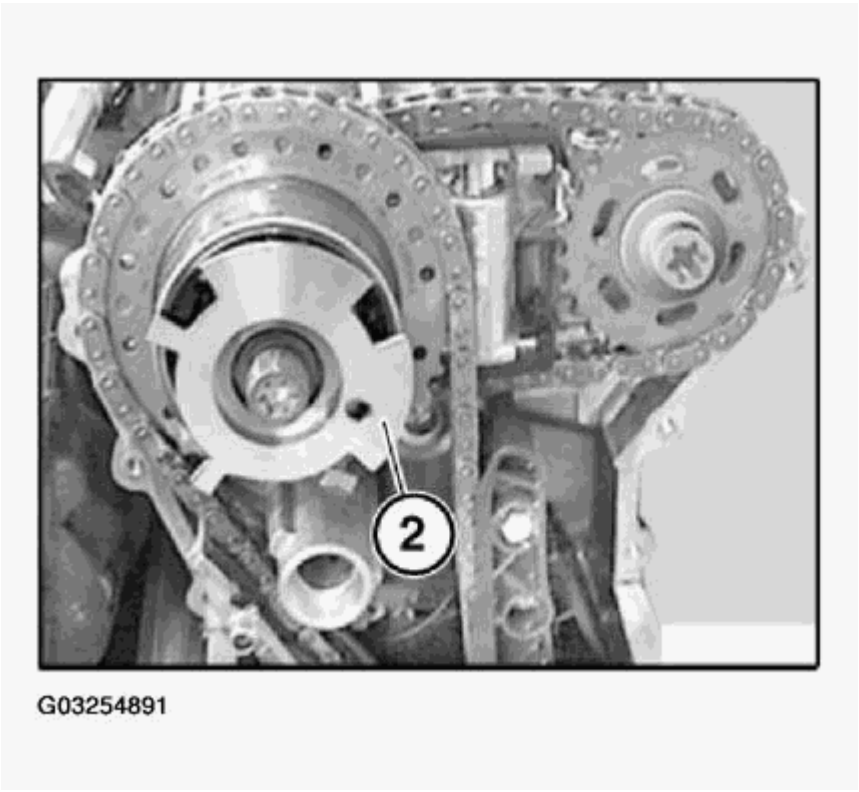


Fig. 446: Removing Sensor Gear (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 1 to 4.

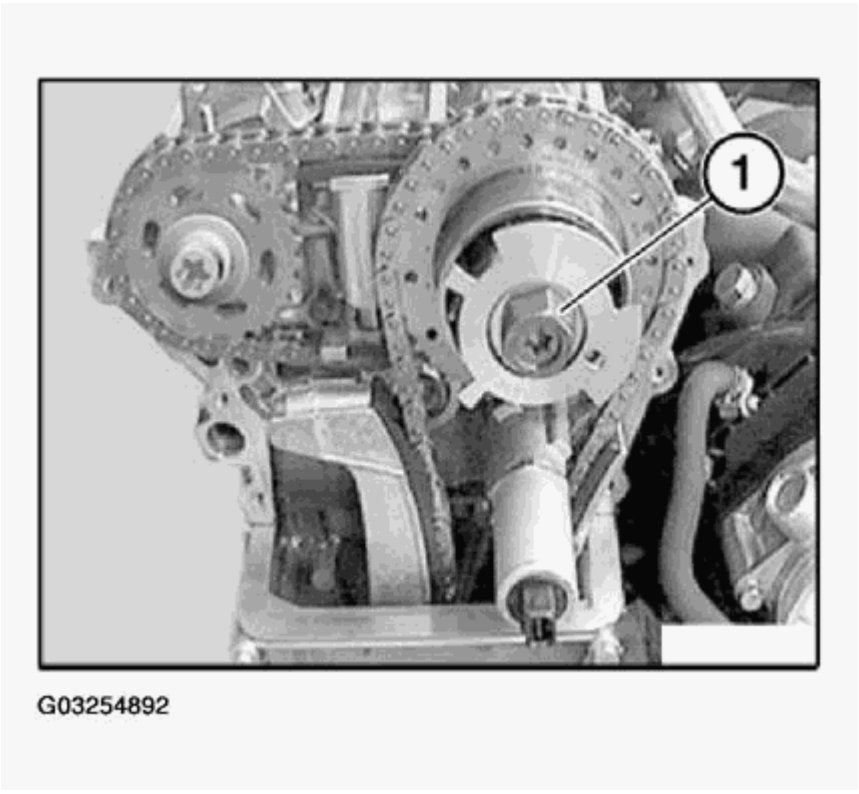


Fig. 447: Releasing Sensor Gear Screw Connection Nut (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sensor gear (2) on cylinder bank 1 to 4.

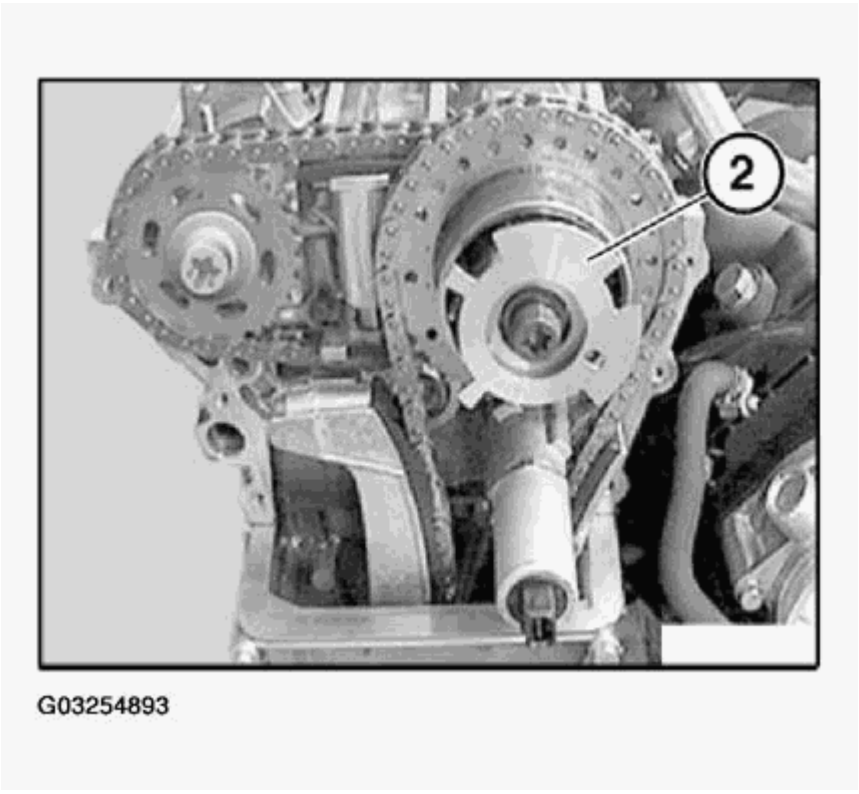


Fig. 448: Removing Sensor Gear (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When releasing camshaft screw connection: grip camshaft at hexagon head.

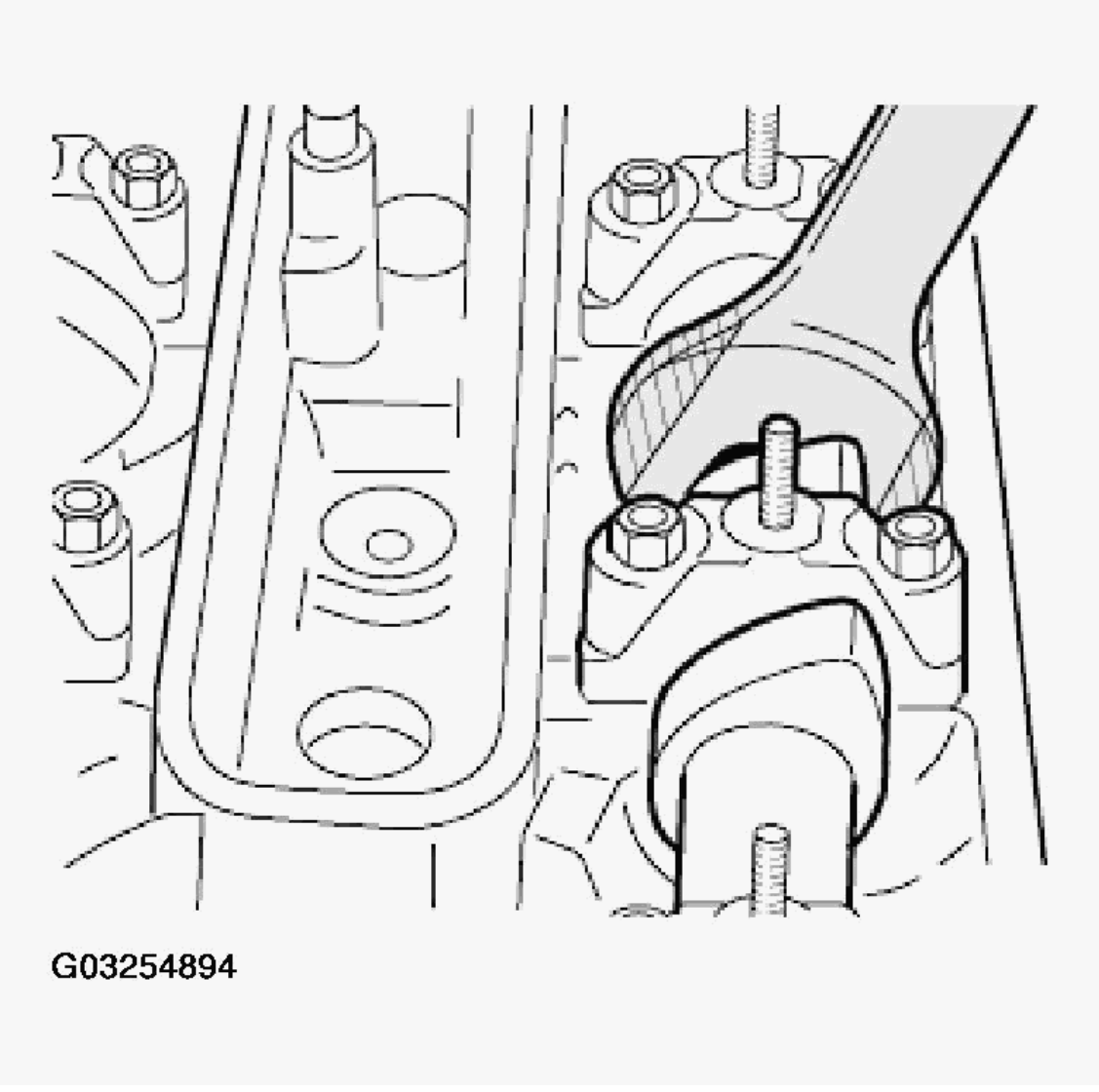


Fig. 449: Gripping Camshaft At Hexagon Head
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 by approx. a half turn.

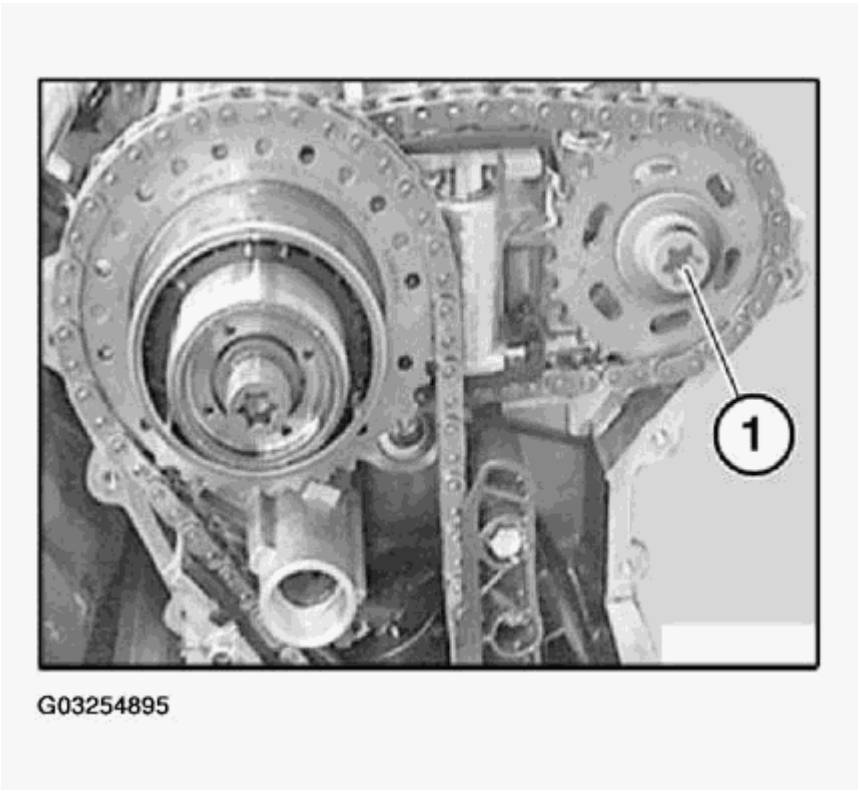


Fig. 450: Slackening Screw Connection Of Exhaust Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 by approx. a half turn.

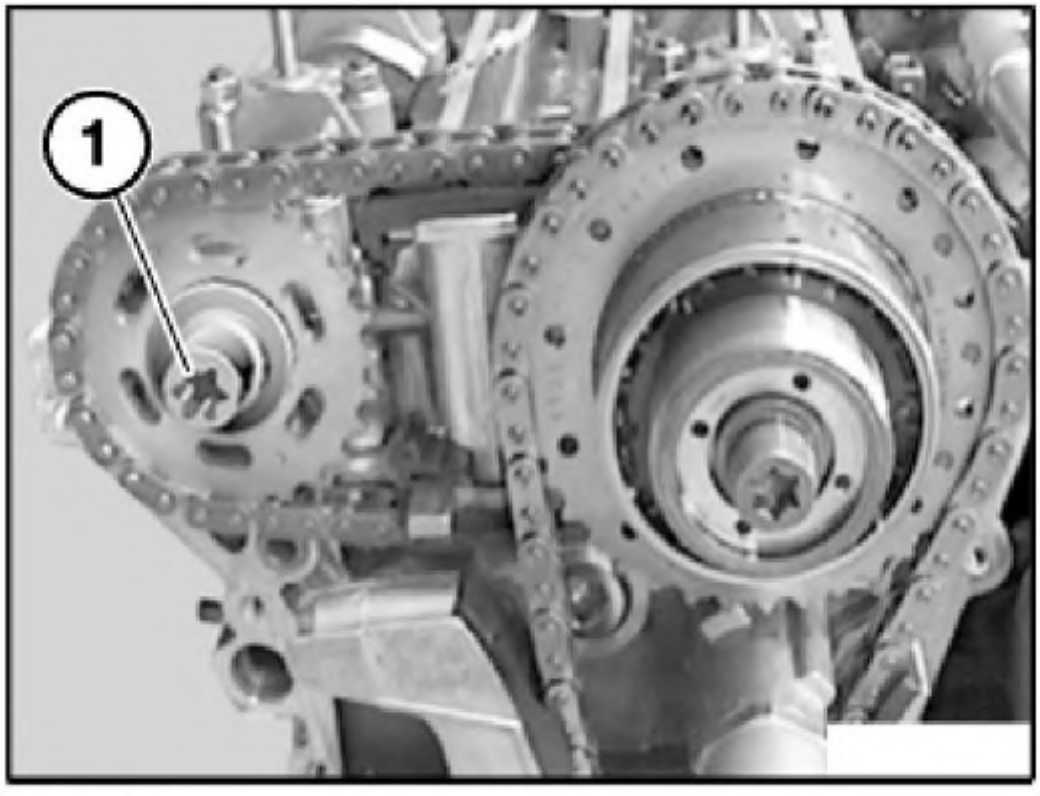


Fig. 451: Slackening Screw Connection Of Exhaust Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 5 to 8 by approx. a half turn.

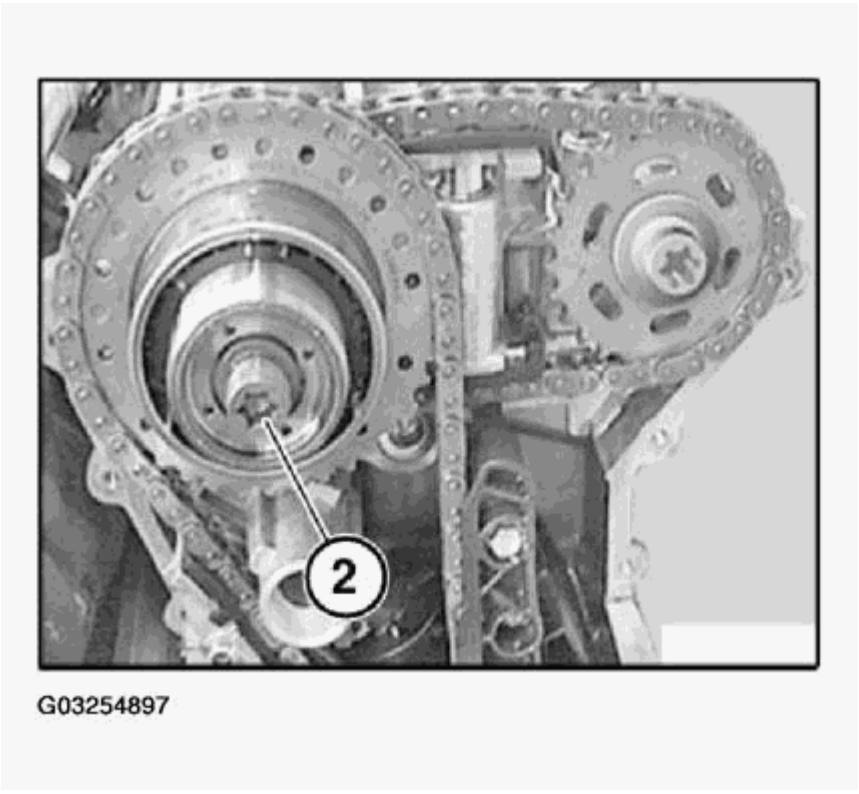


Fig. 452: Slackening Screw Connection Of Inlet Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 1 to 4 by approx. a half turn.

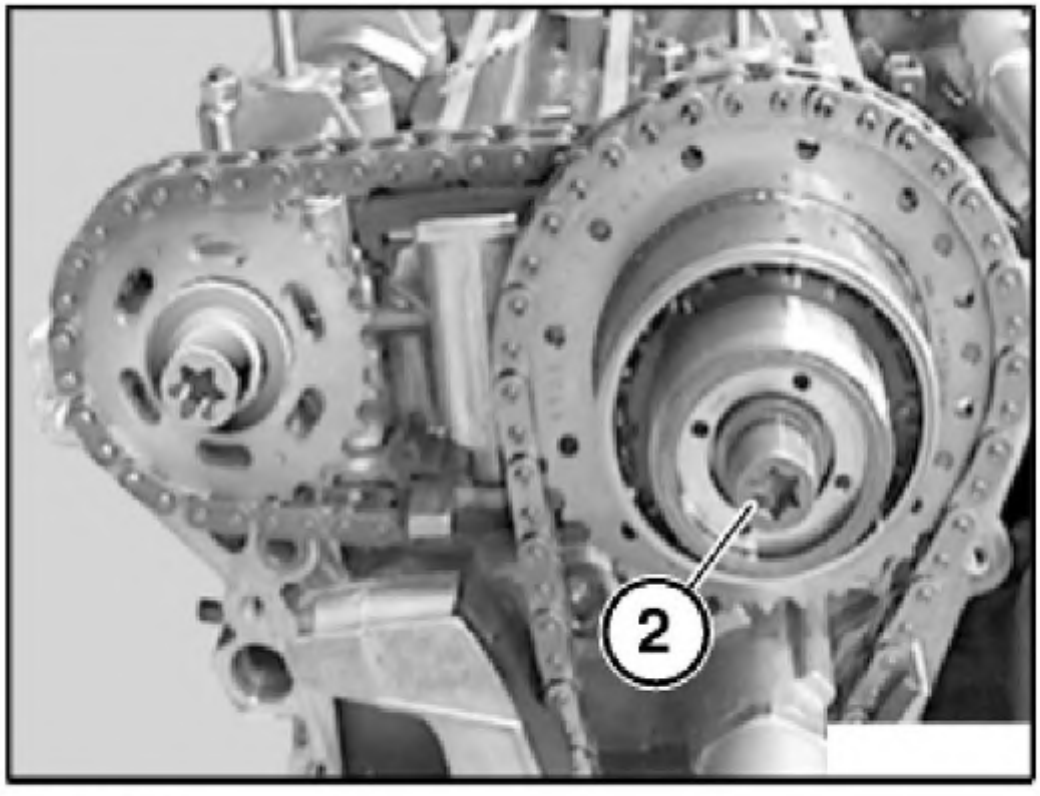


Fig. 453: Slackening Screw Connection Of Inlet Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Align camshafts.

Attach special tool 11 2 445/11 2 441 to camshafts, cylinder bank 1 to 4.

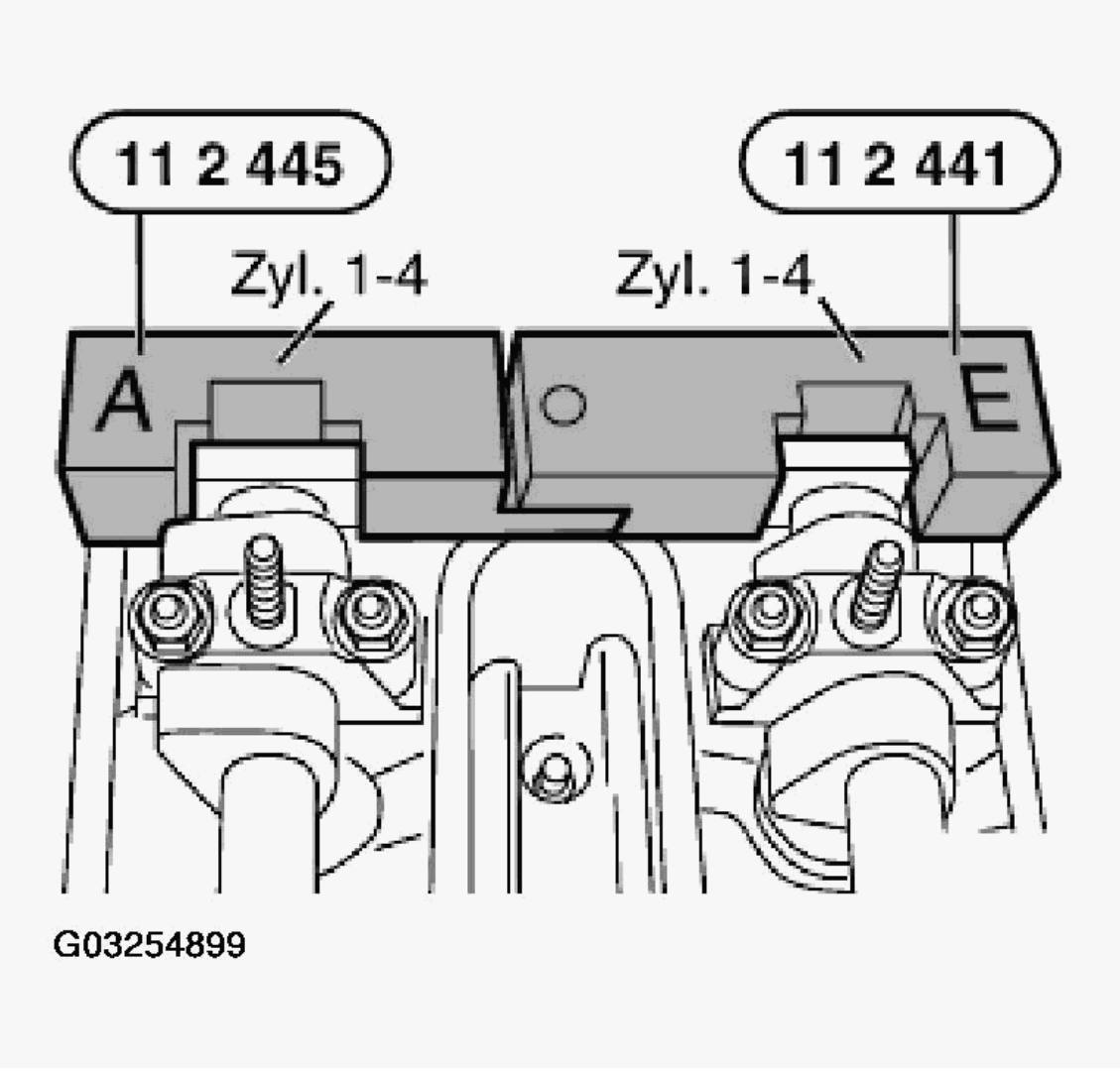


Fig. 454: Attaching Special Tool 11 2 446/11 2 442 To Camshafts (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 443 to special tool 11 2 445/11 2 441 and secure with special tool 11 2 444 via spark plug thread.

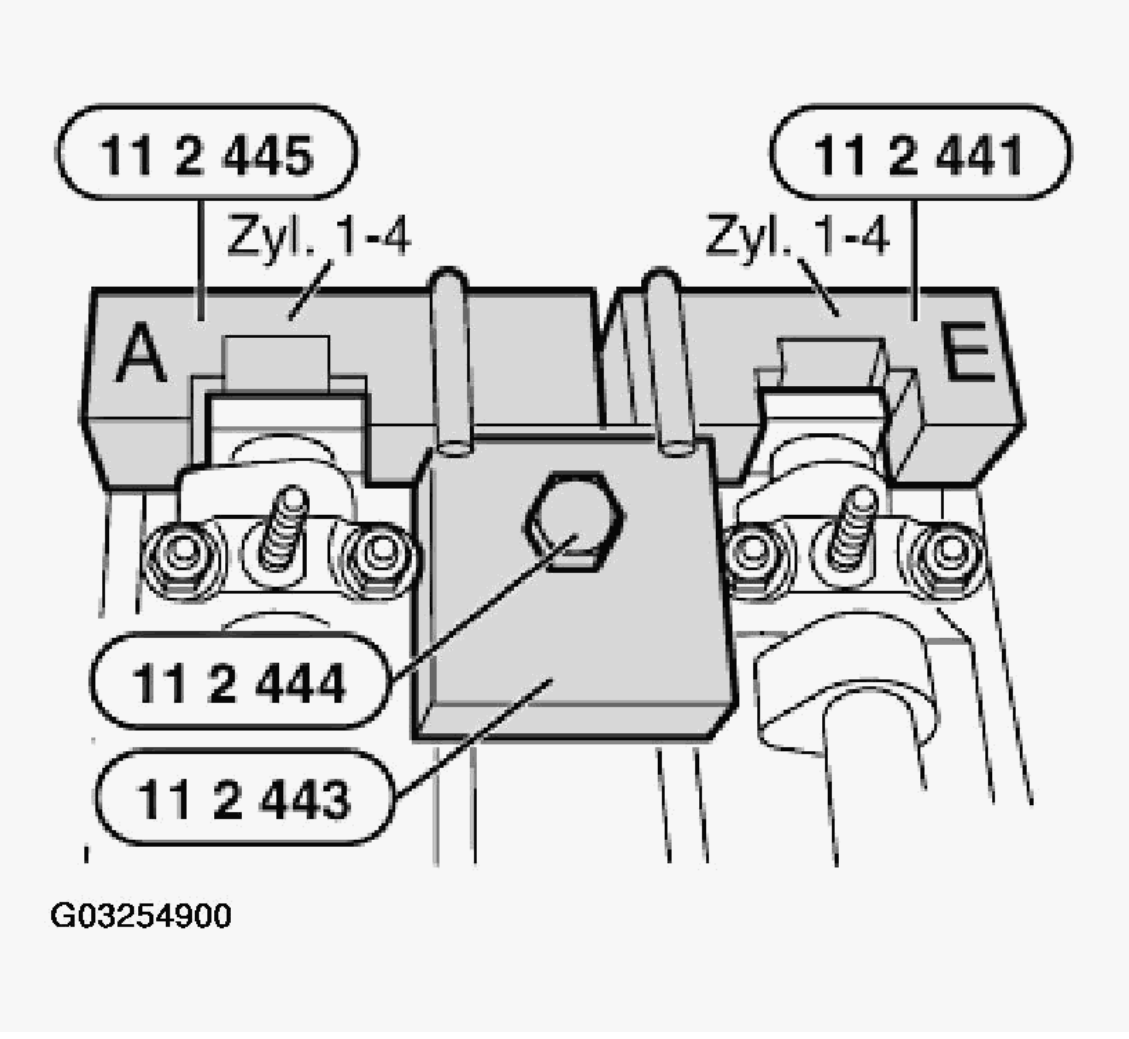


Fig. 455: Connecting Special Tool 11 2 443 To Special Tool 11 2 445/11 2 441 (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Align camshafts.

Attach special tool 11 2 446/11 2 442 to camshafts, cylinder bank 5 to 8.

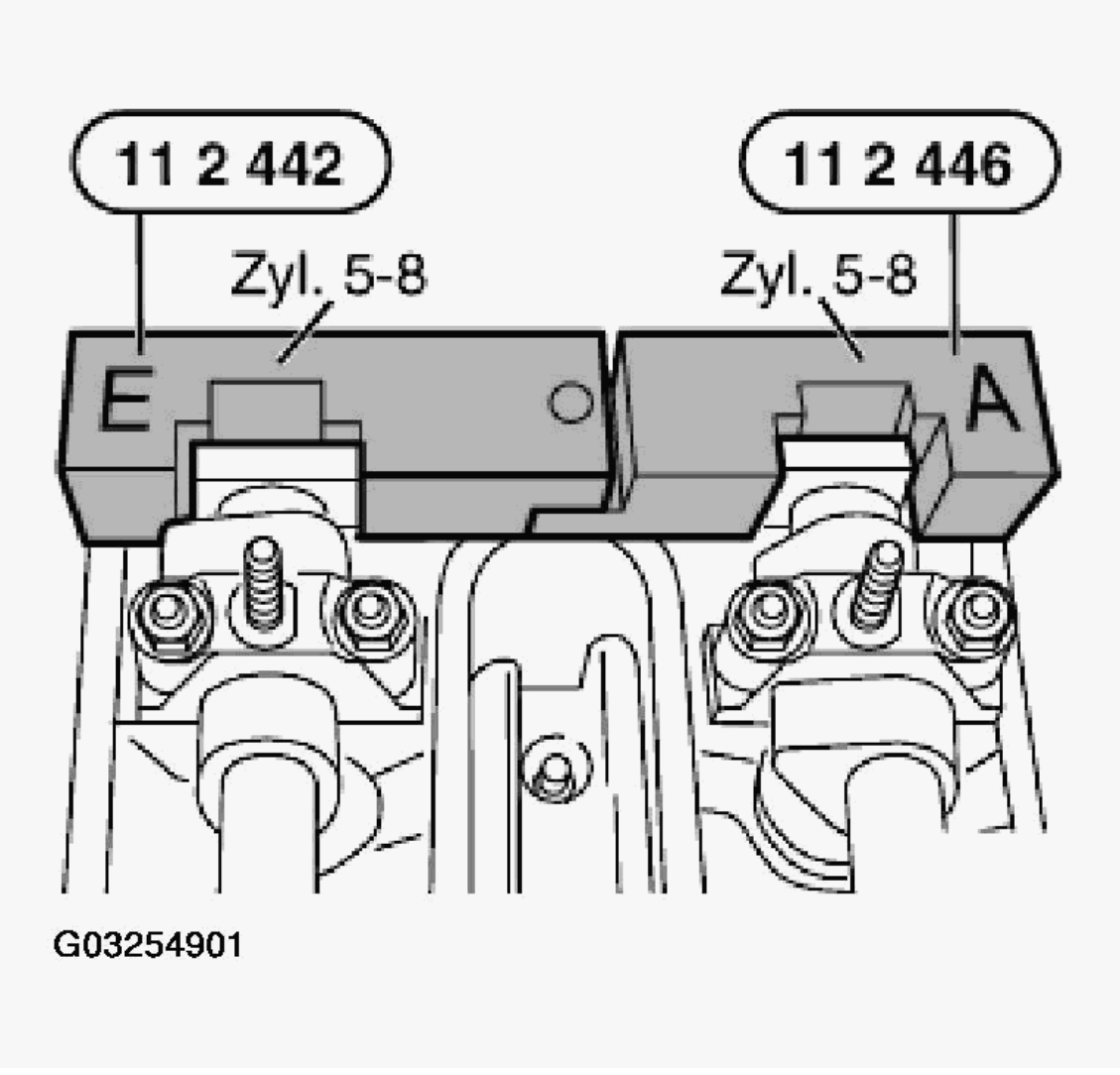


Fig. 456: Attaching Special Tool 11 2 446/11 2 442 To Camshafts (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 443 to special tool 11 2 446/11 2 442 and secure with special tool 11 2 444 via spark plug thread.

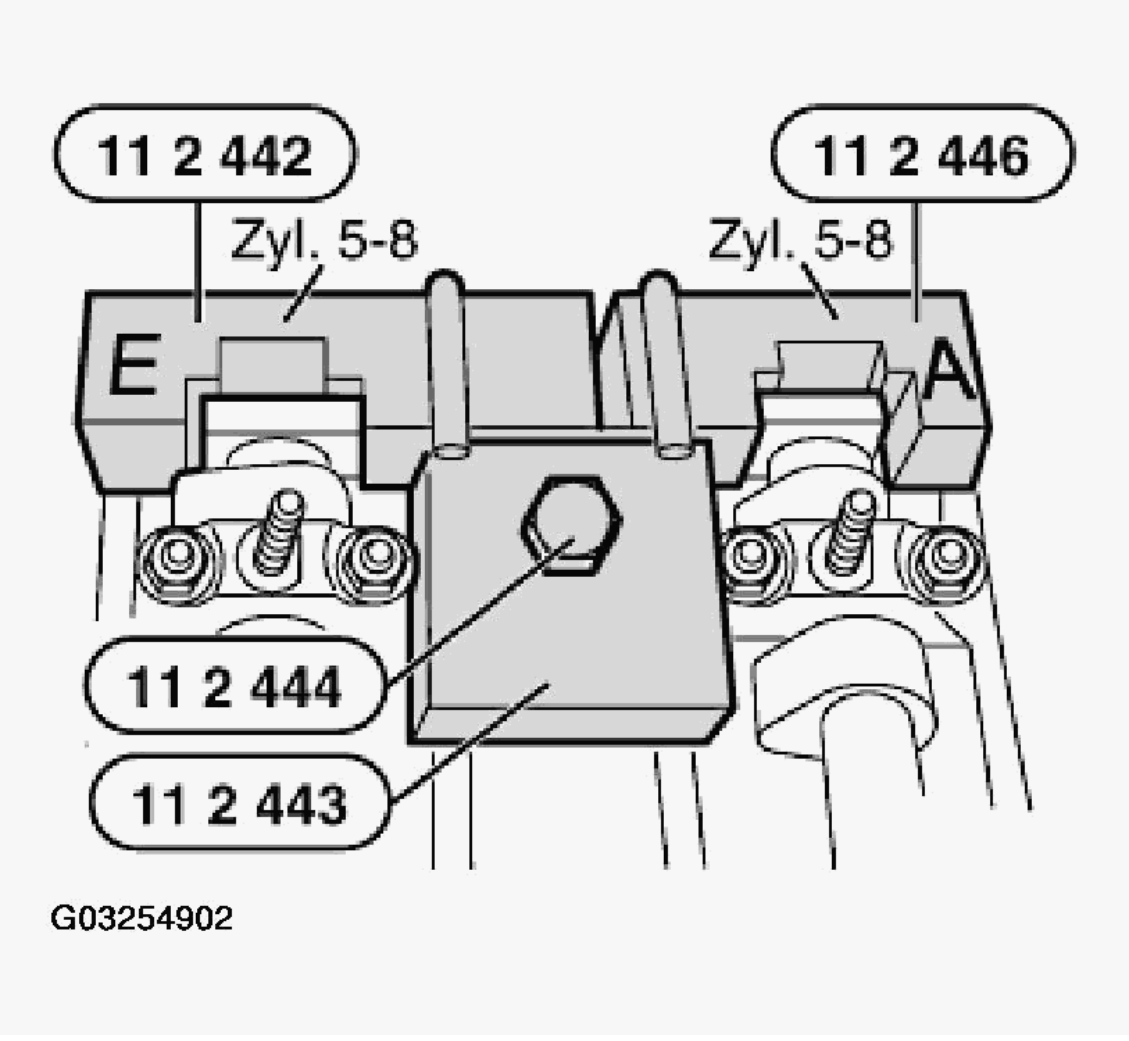


Fig. 457: Connecting Special Tool 11 2 443 To Special Tool 11 2 445/11 2 441 (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Compress chain tensioner on cylinder bank 5 to 8 and lock with special tool 11 3 310.

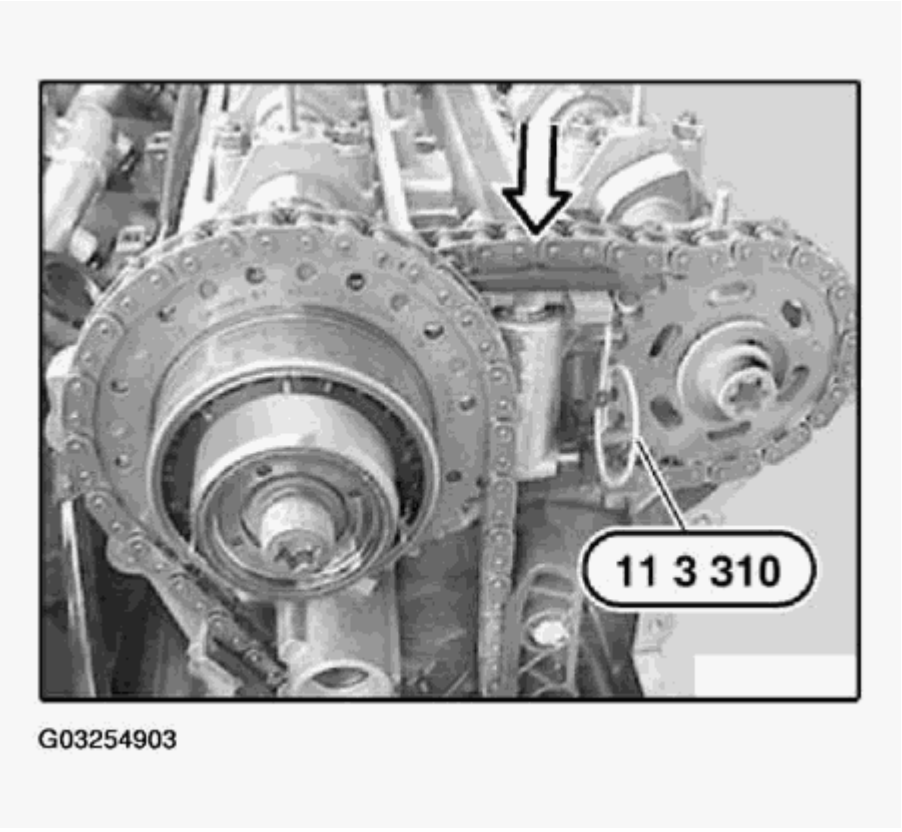


Fig. 458: Locking Chain Tensioner With Special Tool 11 3 310 (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Remove screws (1 and 2) on cylinder bank 5 to 8.

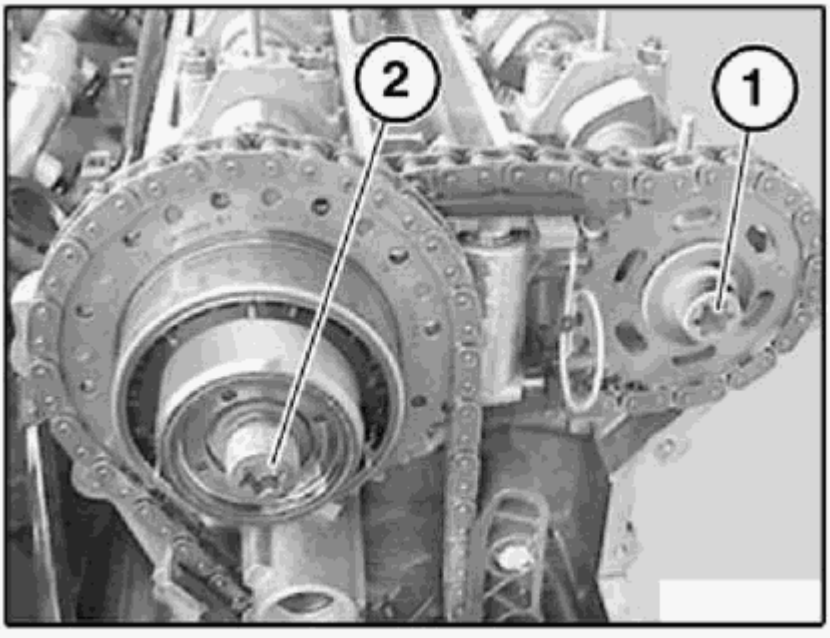


Fig. 459: Removing Camshaft Screws (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Pull exhaust sprocket wheel (1) and camshaft adjustment unit (2) forwards until they are no longer secured on camshafts.

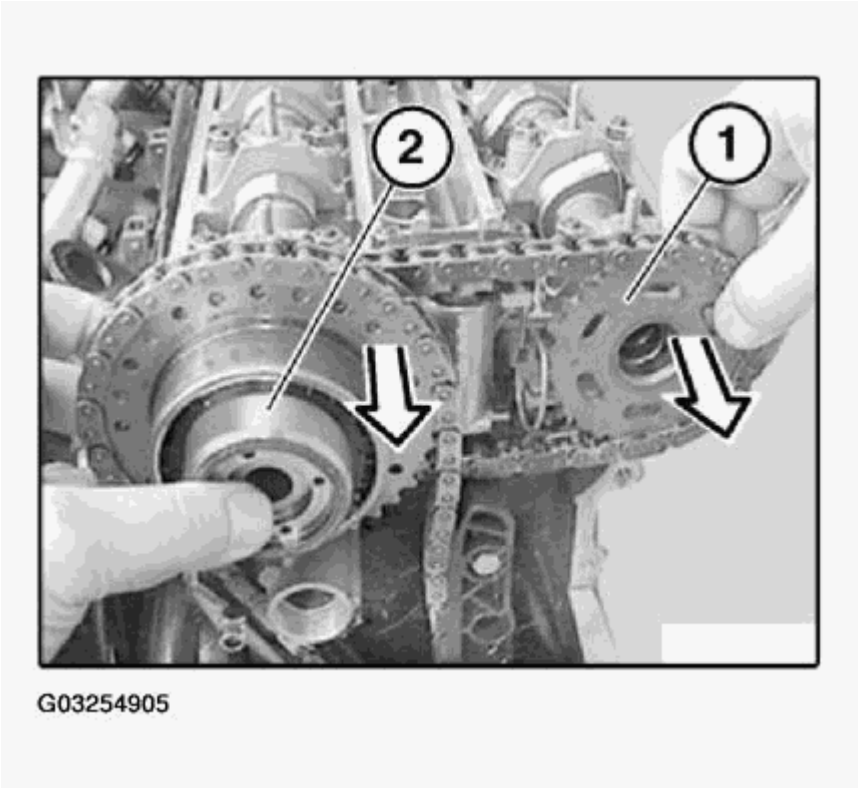


Fig. 460: Releasing Exhaust Sprocket And Camshaft Adjustment Unit From Camshafts (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Feed out timing chain (1) forwards over sprocket wheel of camshaft adjustment unit (2).

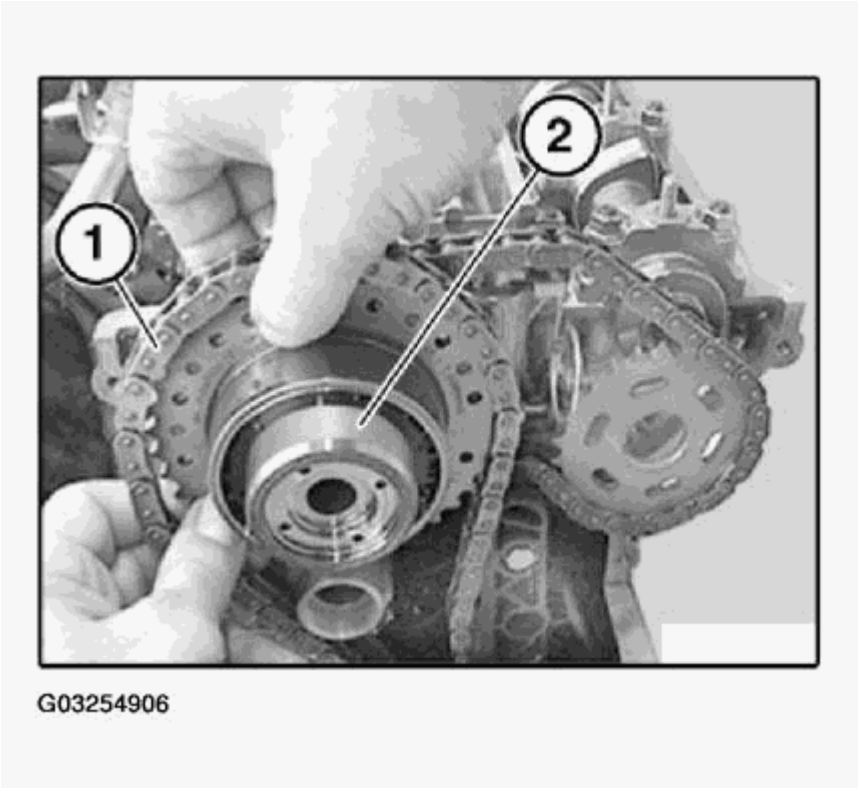


Fig. 461: Removing Timing Chain Over Sprocket Wheel Of Camshaft Adjustment Unit (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Feed out exhaust sprocket wheel with secondary chain and camshaft adjustment unit (2).

Installation

Installation of the left camshaft adjustment unit is described separately from removal. Assembly sequence for removal and installation is different.

Pull up timing chain, position camshaft adjustment unit (2) with exhaust sprocket wheel and fitted secondary chain and feed on timing chain (1) from front over sprocket wheel of camshaft adjustment unit (2).

NOTE: The position of the elongated holes on the exhaust sprocket wheel is not assigned and can be freely selected.

The position of the camshaft adjustment unit (2) when feeding on the timing chain (1) is not assigned and can be freely selected.

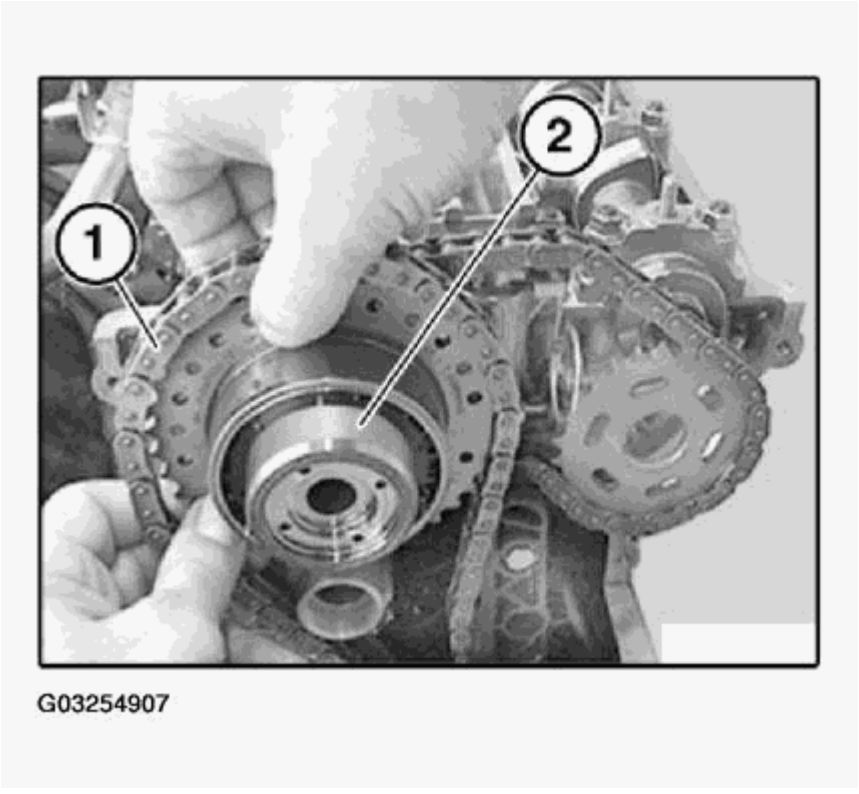


Fig. 462: Installing Timing Chain To Camshaft Adjustment Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Position exhaust sprocket wheel (1) and camshaft adjustment unit (2) on camshafts.

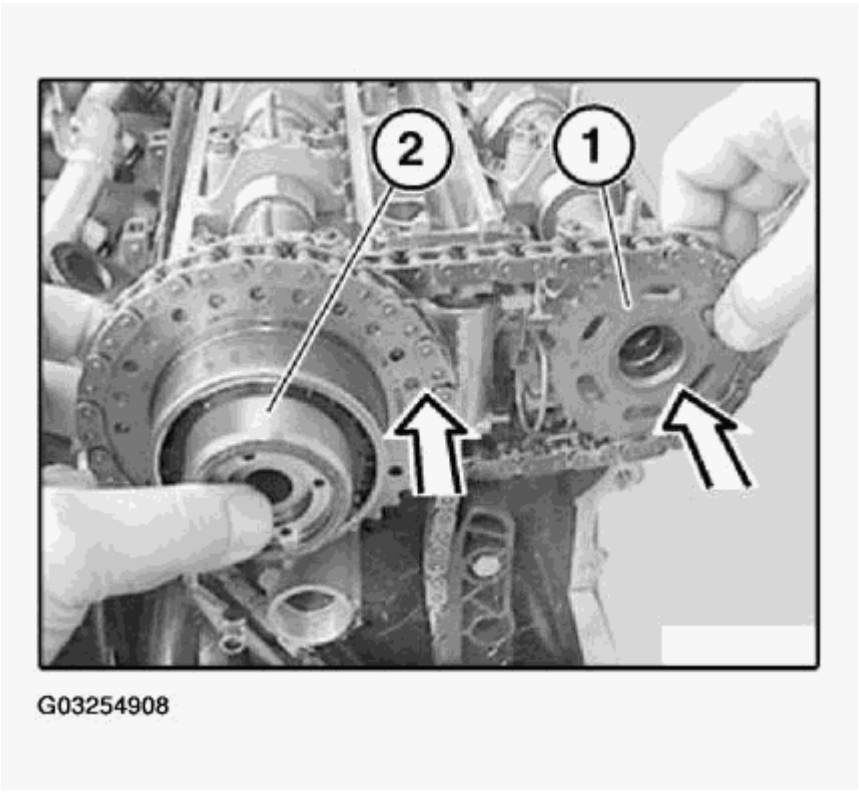


Fig. 463: Installing Exhaust Sprocket Wheel And Camshaft Adjustment Unit To Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Insert screws (1 and 2) on cylinder bank 5 to 8 and initially tighten without play, but do not tighten down yet.

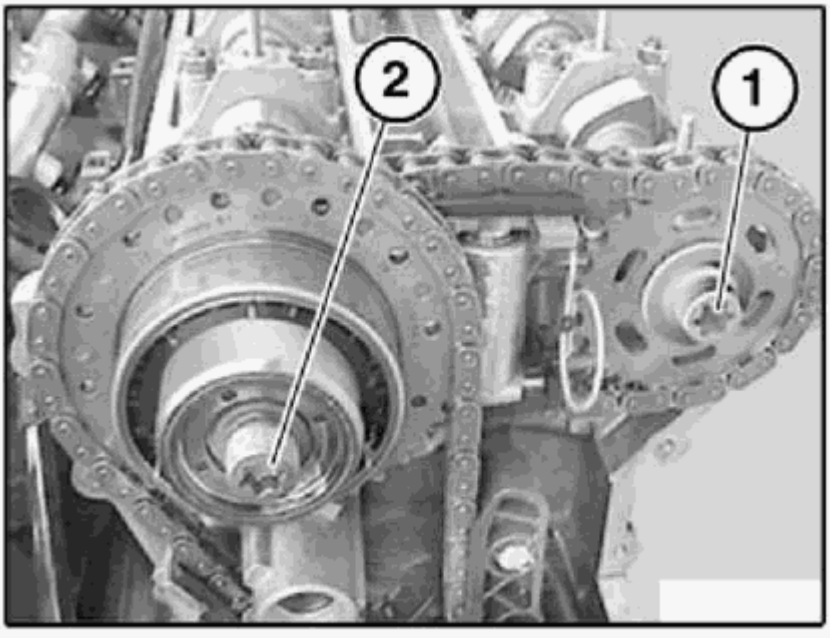


Fig. 464: Installing Camshaft Gear Screws (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Compress chain tensioner and remove special tool 11 3 310.

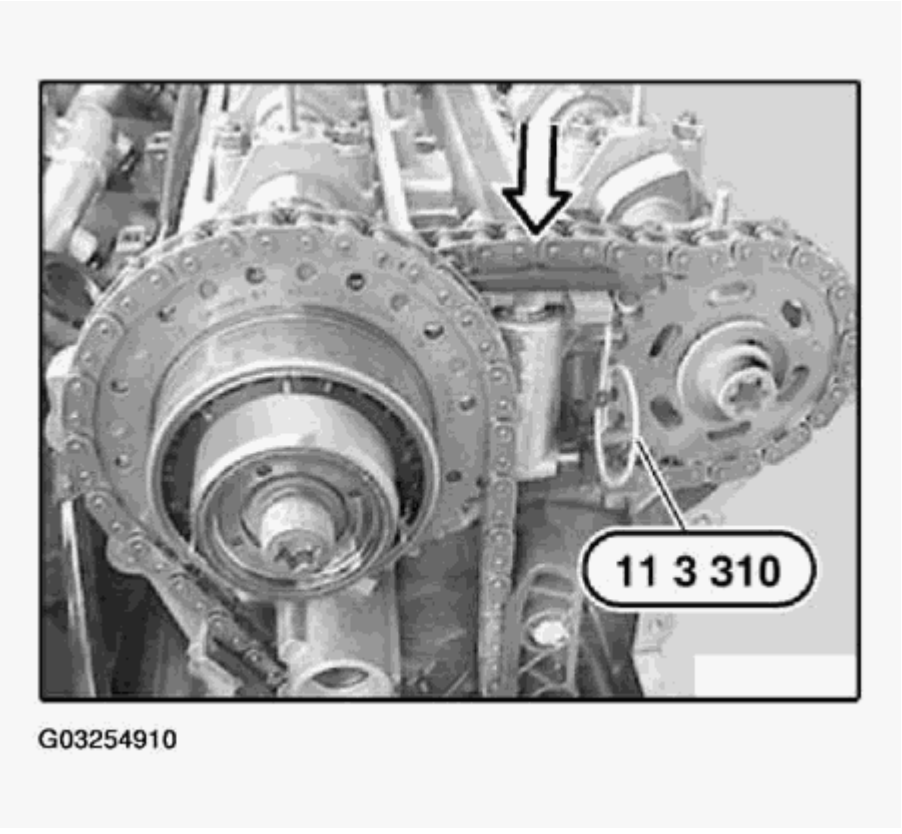


Fig. 465: Removing Special Tool 11 3 310
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 7 380 to right cylinder head on cylinder bank 1 to 4.

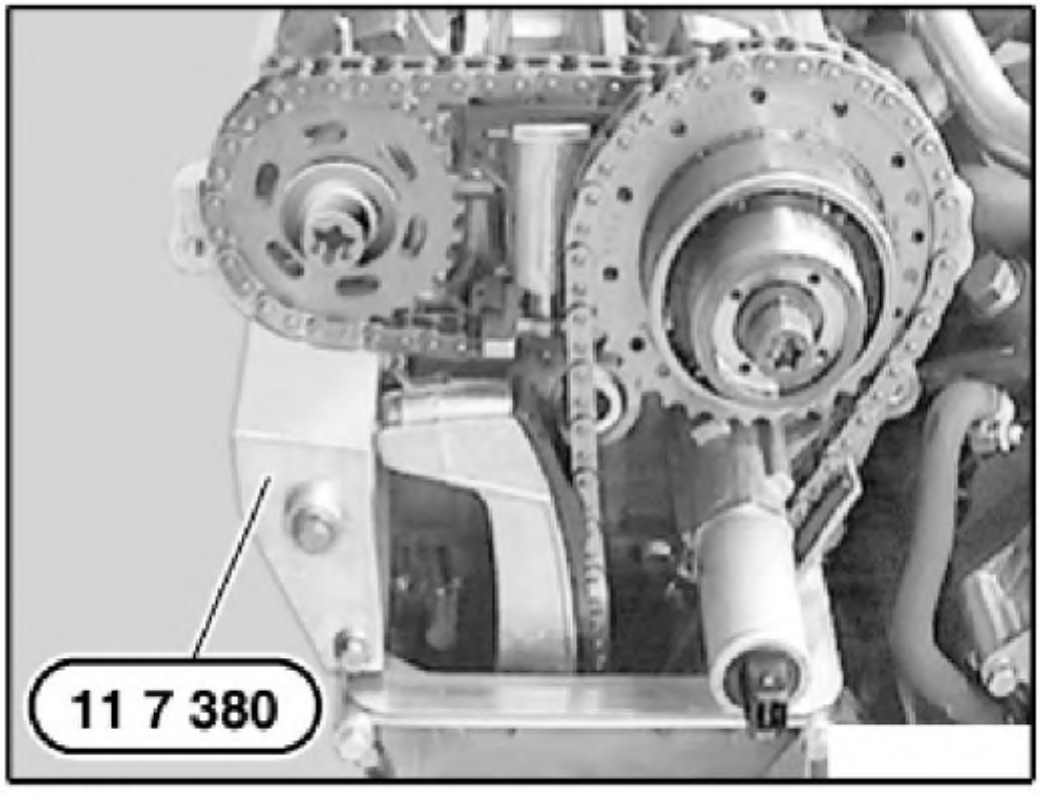


Fig. 466: Fitting Special Tool 11 7 380 To Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The special tool kit 11 3 390 can no longer be fitted in the E53 (X5) with M62 engine due to the altered space conditions.

With the market launch of the E53 (X5) with M62 engine, the special tool kit 11 3 390 is dropped.

The shorter special tool kit 11 4 230 comprising special tools 11 4 231 and 11 4 232 replaces the special tool kit 11 3 390.

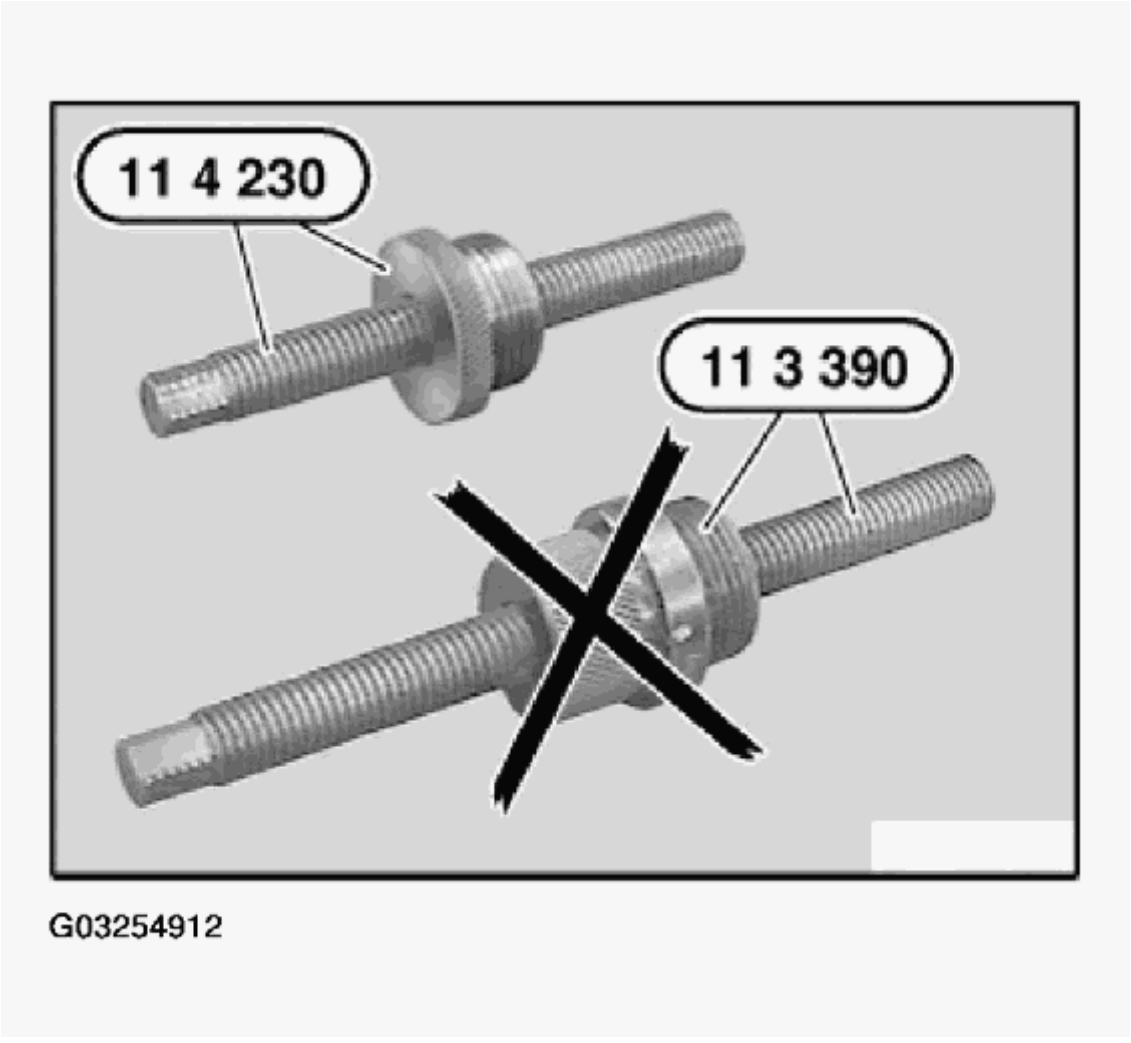


Fig. 467: Precautions When Using Special Tool Kit 11 3 390
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 4 230 in special tool 11 7 380.

Screw in adjustment screw on tensioning rail, but do not tighten yet.

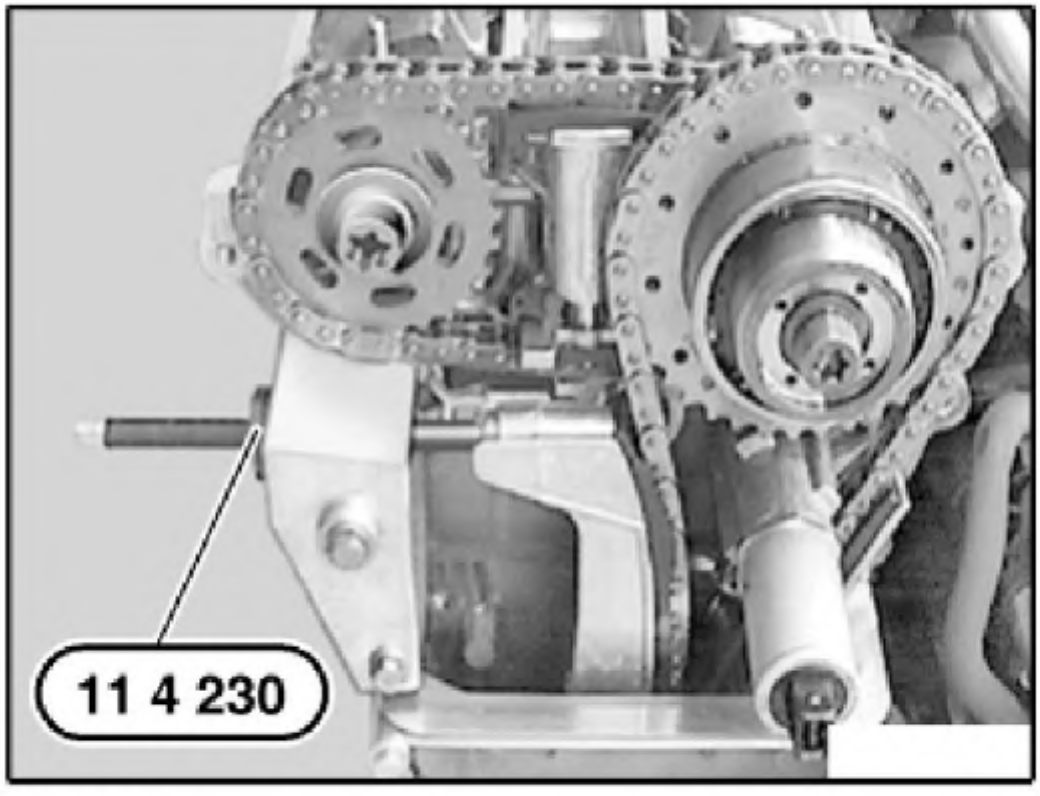


Fig. 468: Inserting Special Tool 11 4 230 In Special Tool 11 7 380
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.

Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 5 to 8.

Set multimeter to acoustic continuity test.

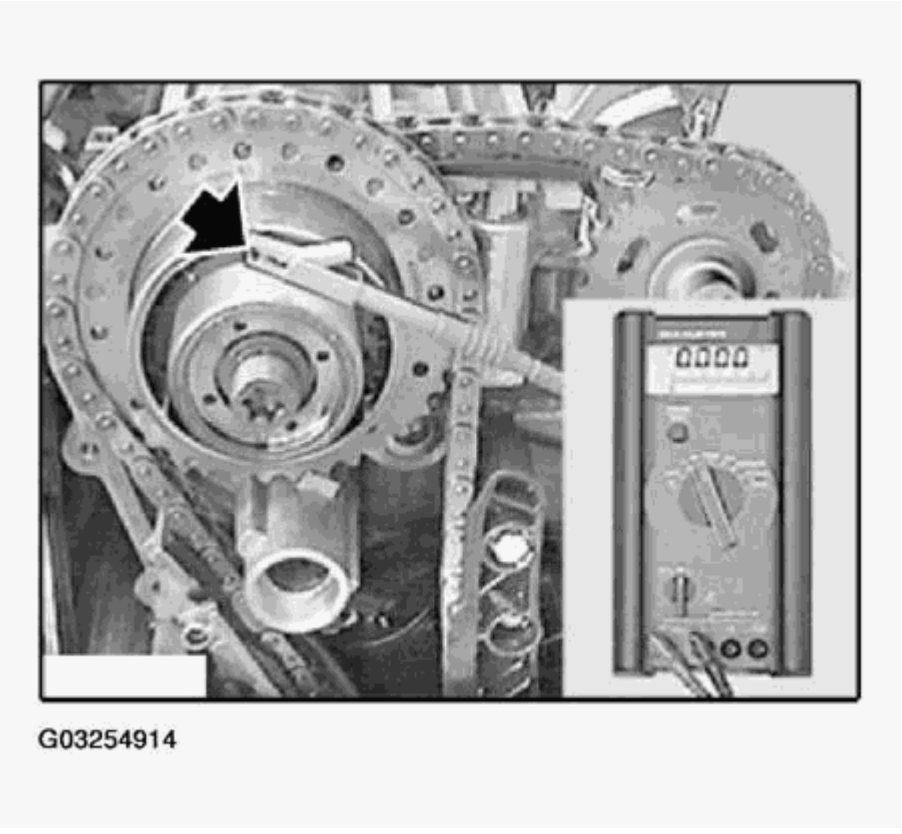


Fig. 469: Connecting Multimeter To Screw Connection On Oil Line (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

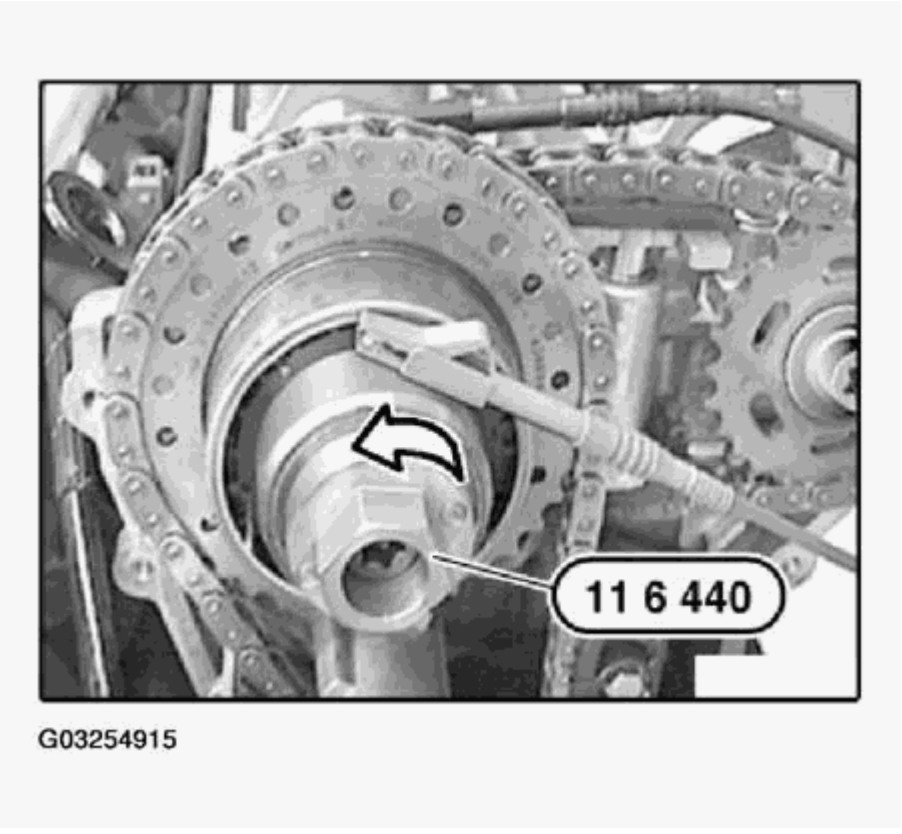


Fig. 470: Attaching Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Rotating the camshaft adjustment unit at 40 Nm to the left-hand stop ensures that the end position is reached and there is no longer an "oil cushion" before the left-hand stop of the camshaft adjustment unit.

In the camshaft adjustment unit, there are three contacts which are closed when the unit is at the left-hand stop.

During the acoustic continuity test with the multimeter, a sound signal can be heard when the camshaft adjustment unit is at the left-hand stop.

CAUTION: Left-hand threads.

Tighten screw connection (2) of inlet camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

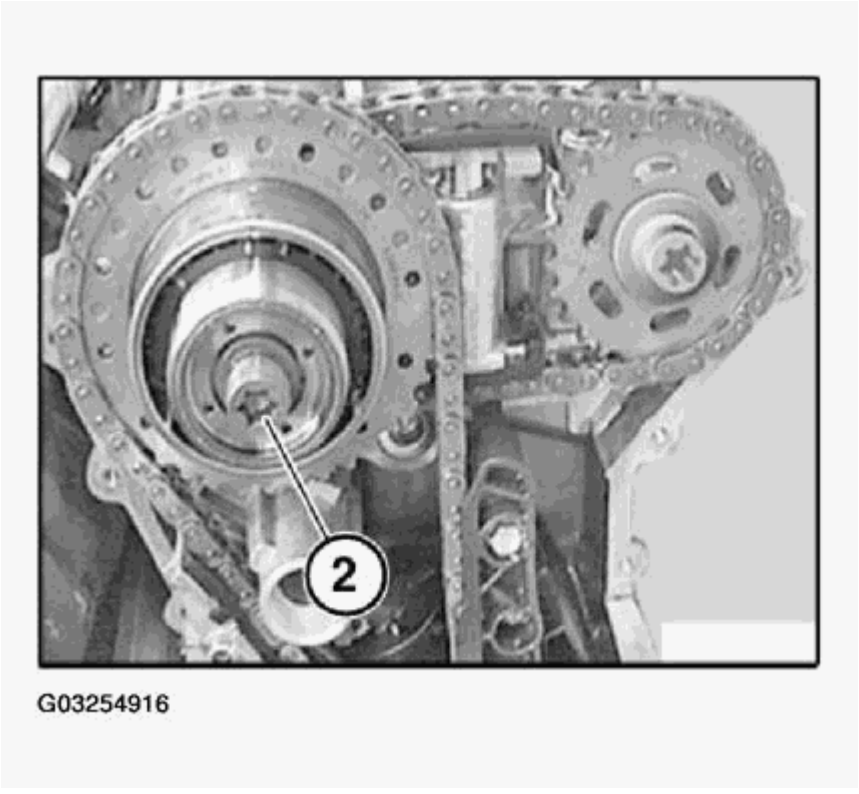


Fig. 471: Tightening Screw Connection Of Inlet Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

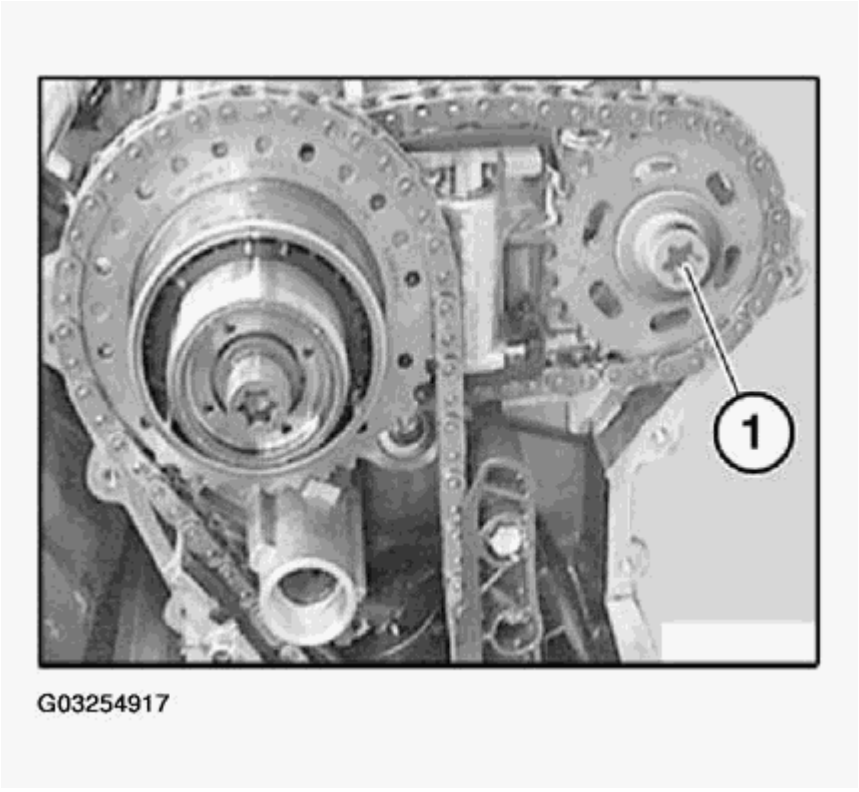


Fig. 472: Tightening Screw Connection Of Exhaust Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.

Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 1 to 4.

Set multimeter to acoustic continuity test.

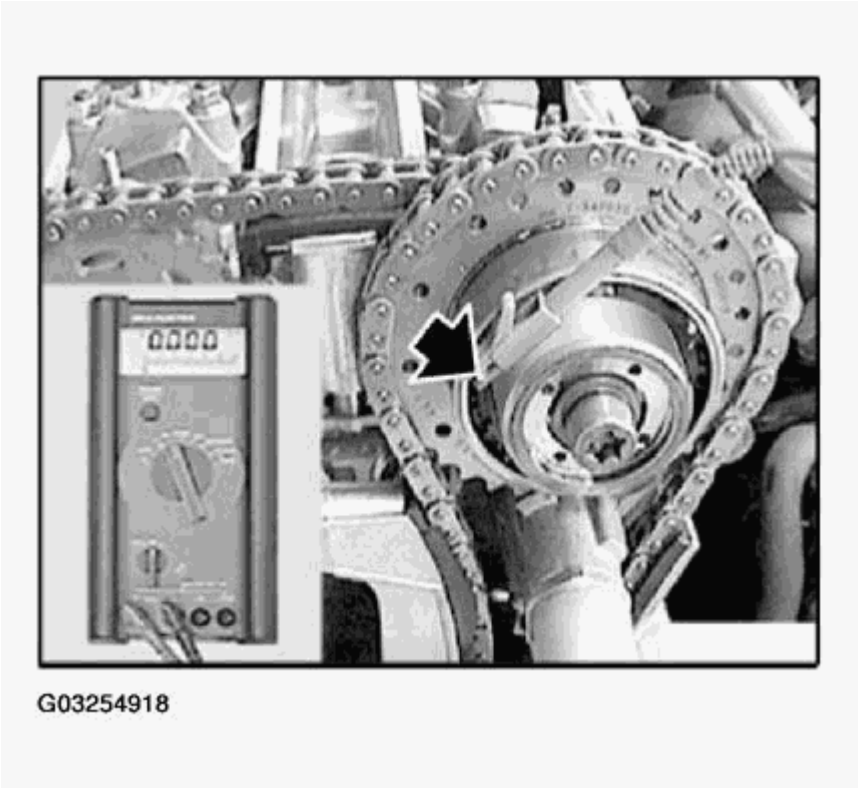


Fig. 473: Connecting Multimeter To Screw Connection On Oil Line (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

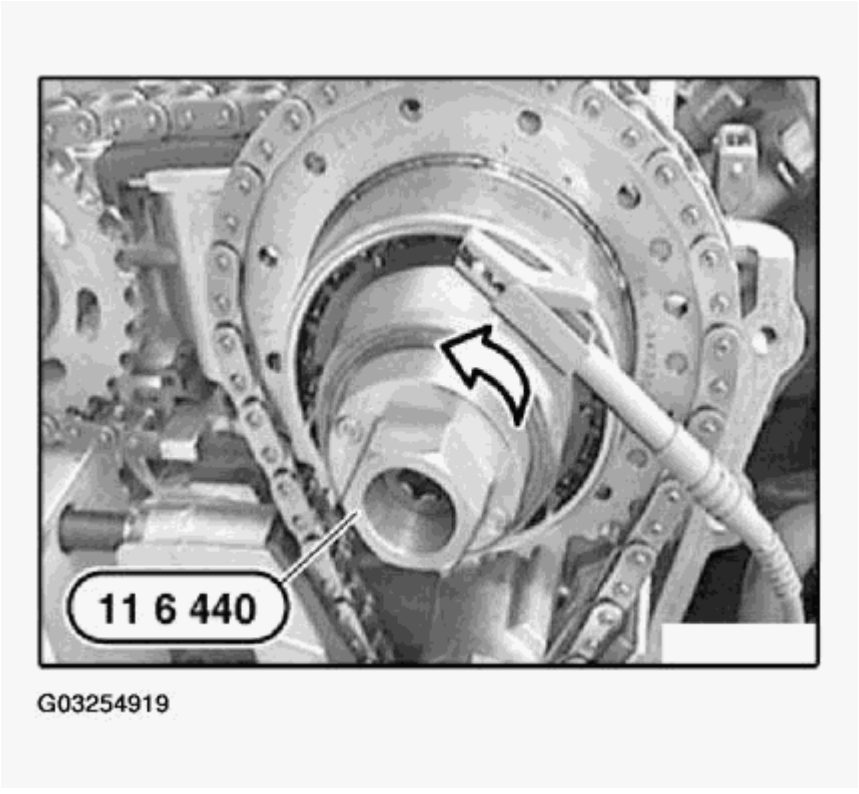


Fig. 474: Attaching Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (2) of inlet camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

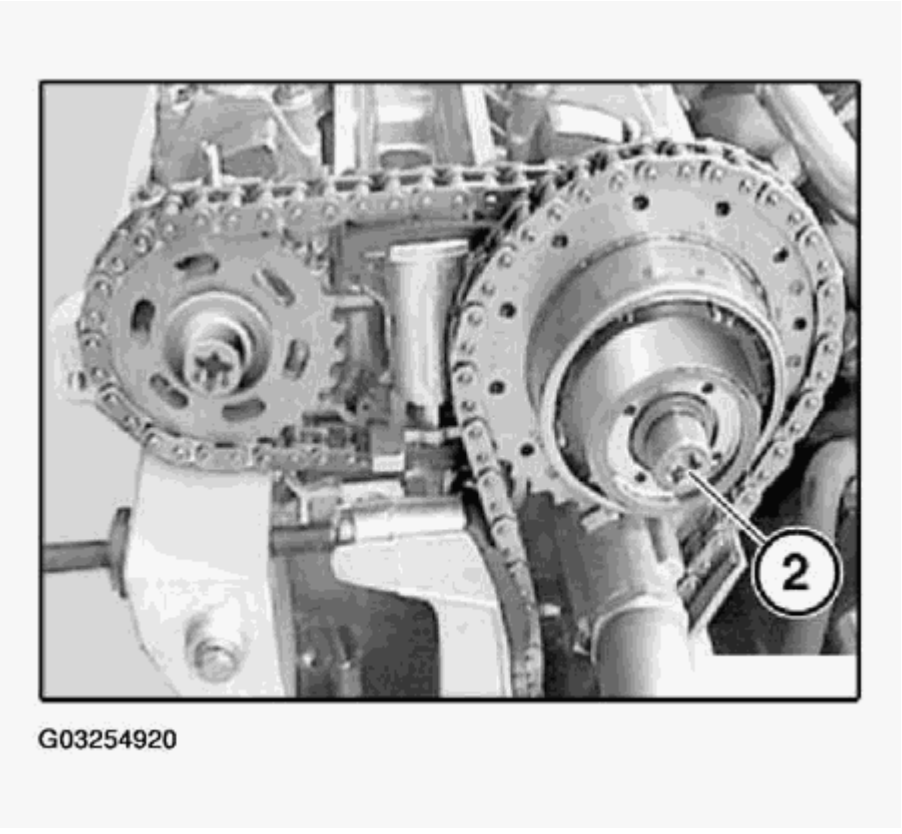


Fig. 475: Tightening Screw Connection Of Inlet Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

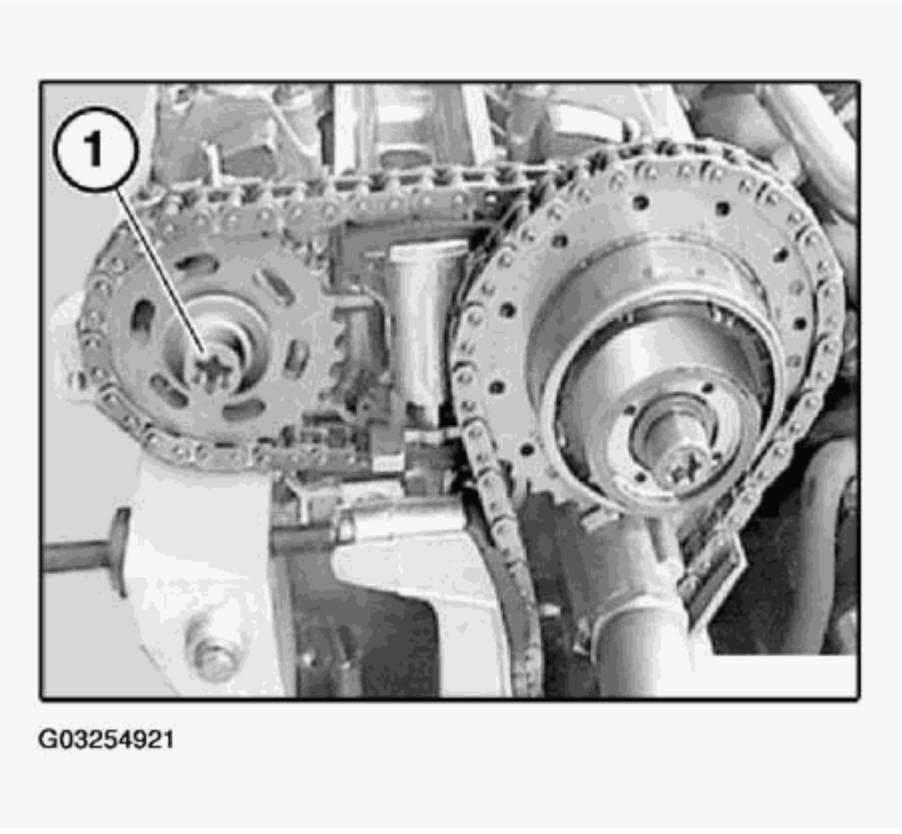
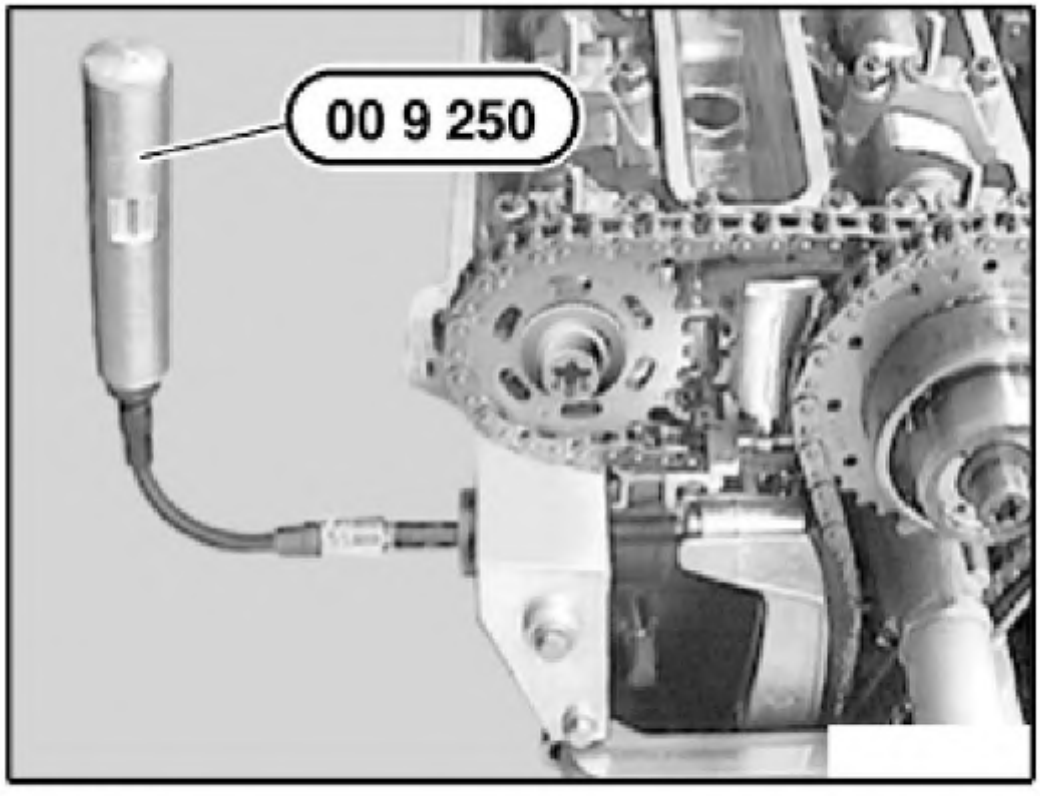


Fig. 476: Tightening Screw Connection Of Exhaust Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Pretension tensioning rail by turning adjusting screw on special tool 11 4 230 with special tool 00 9 250 to 0.7 Nm.

NOTE: If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.



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Fig. 477: Turning Adjusting Screw Using Special Tool 00 9 250
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Pretensioning the timing chain moves the camshaft adjustment unit and the unit must therefore be reset to the left-hand stop.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

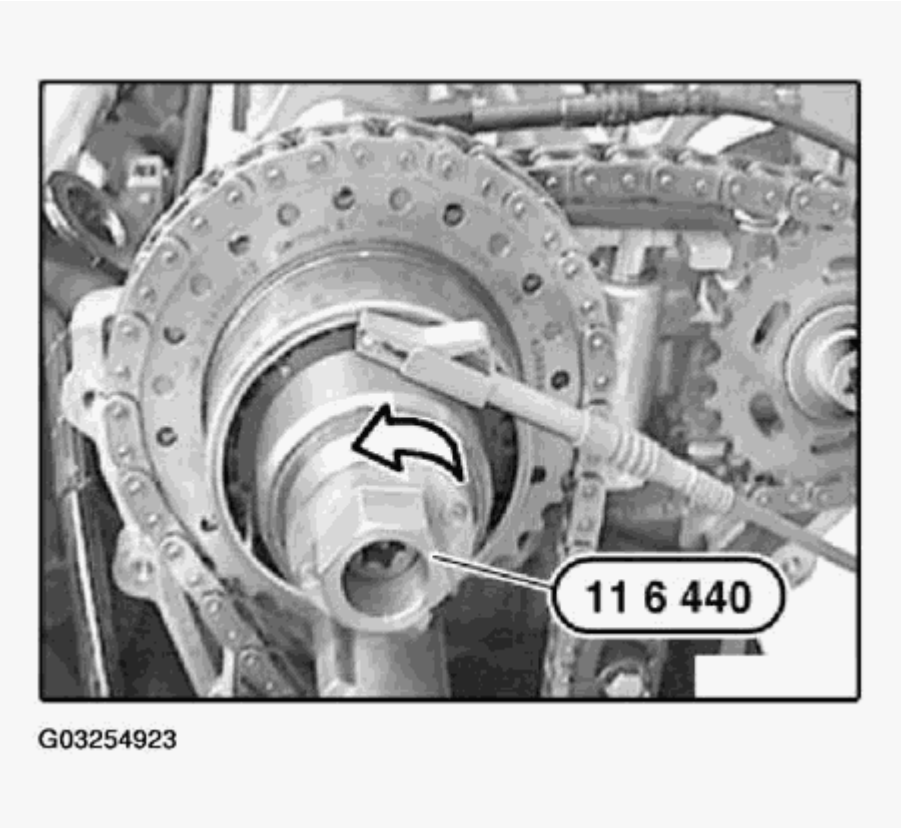


Fig. 478: Attaching Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

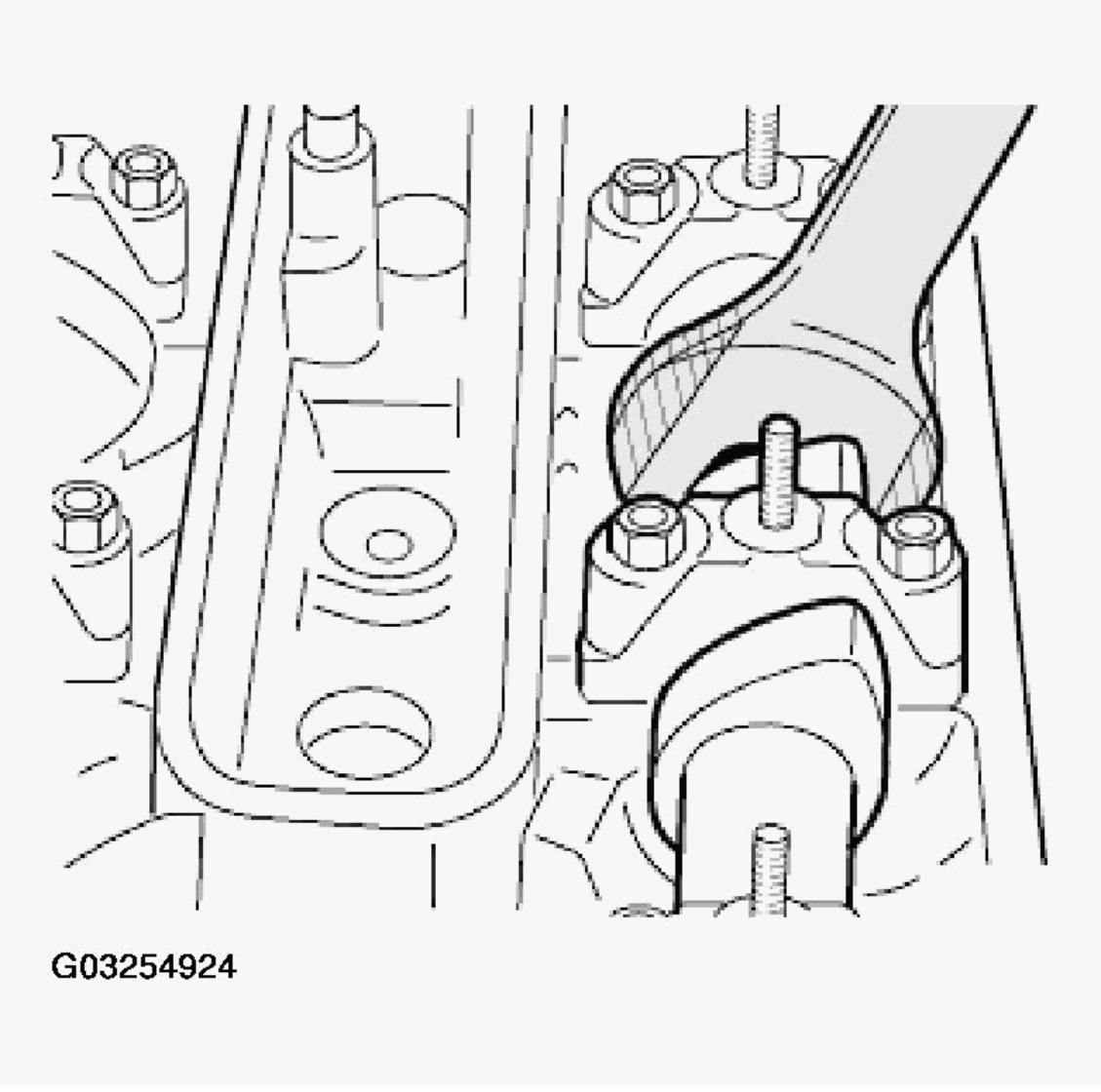


Fig. 479: Gripping Camshaft At Hexagon Head
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 5 to 8.

Tightening torque, see 11 36 14AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

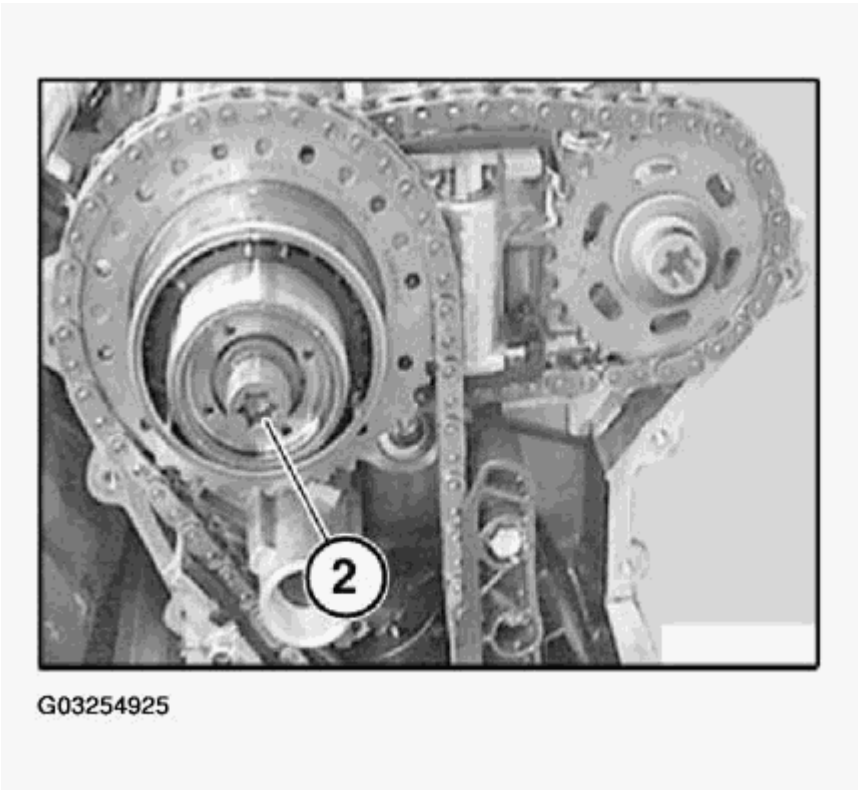


Fig. 480: Tightening Screw Connection Of Inlet Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 5 to 8.

Tightening torque, see 11 36 13AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

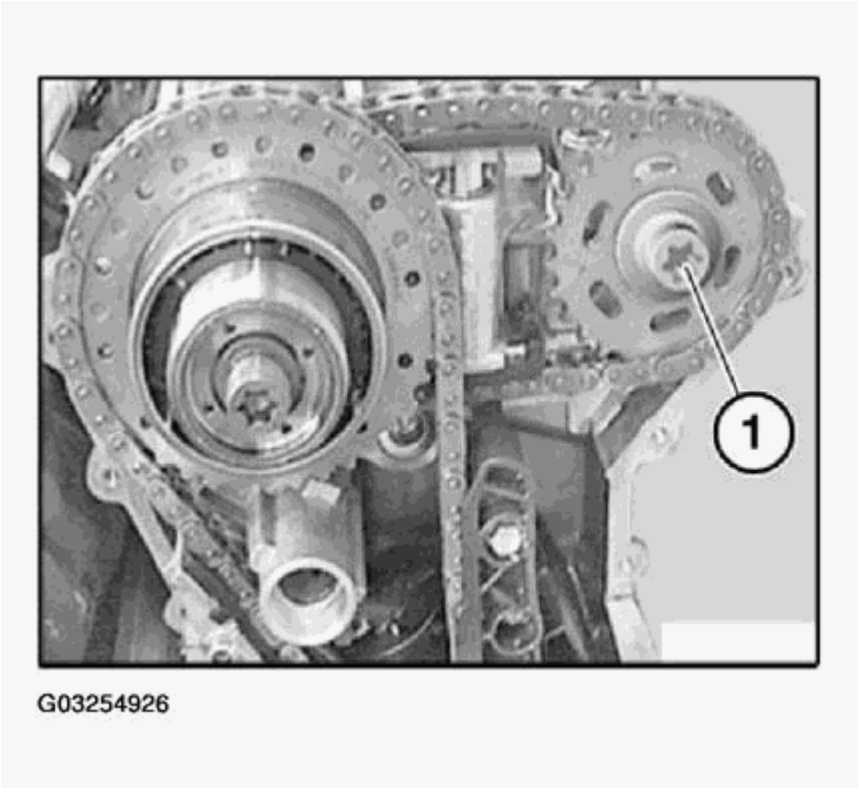


Fig. 481: Tightening Screw Connection Of Exhaust Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

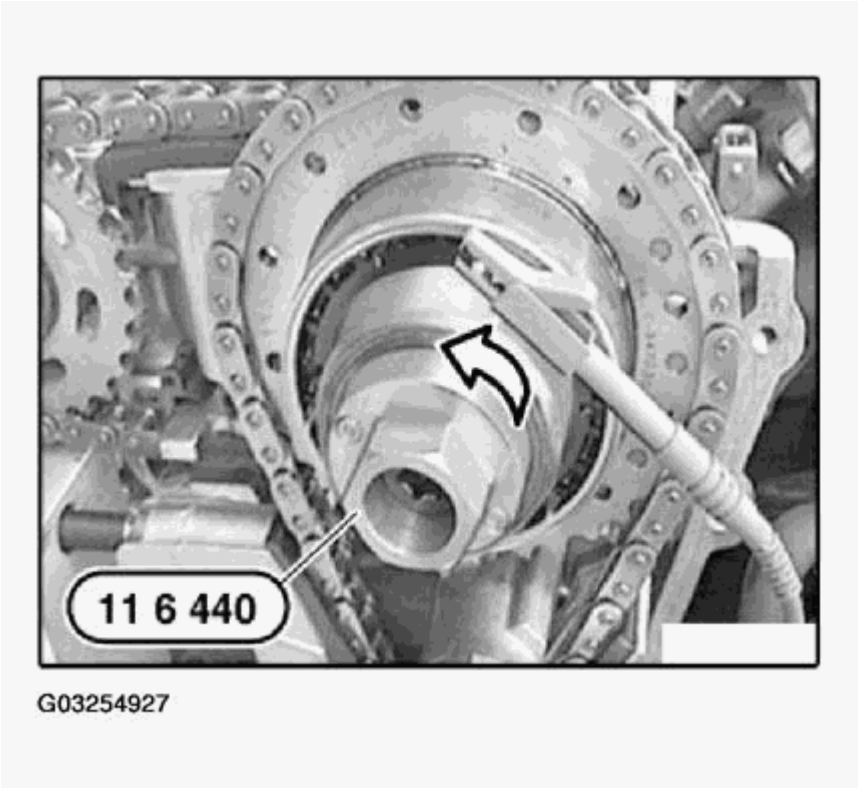


Fig. 482: Attaching Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 1 to 4.

Tightening torque, see 11 36 14AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

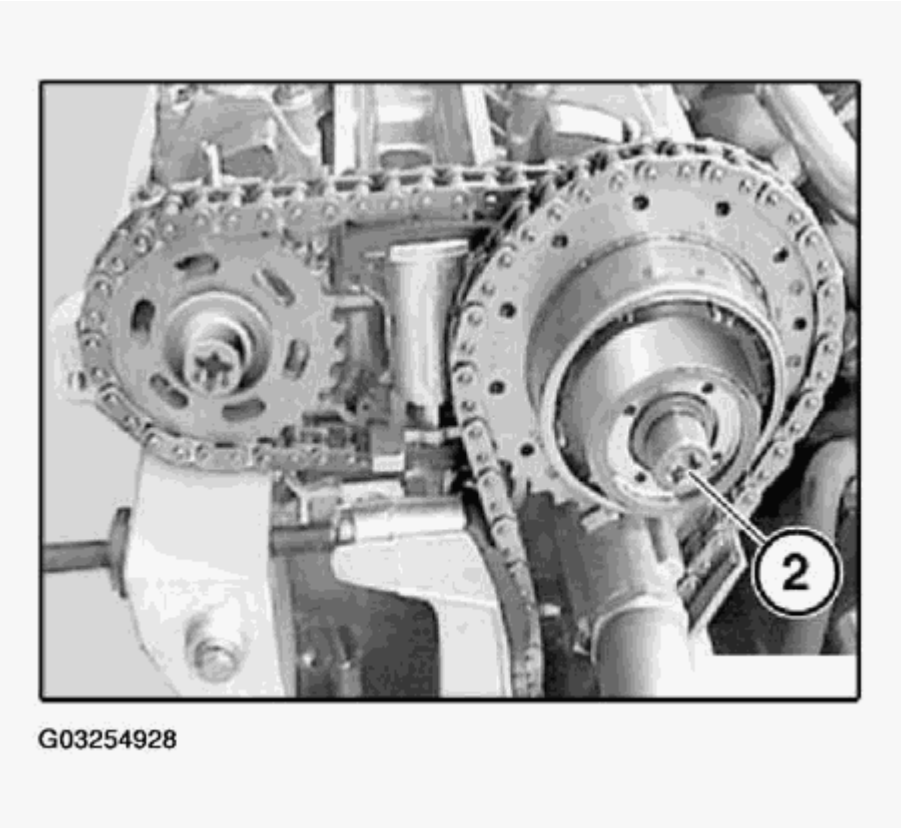


Fig. 483: Tightening Screw Connection Of Inlet Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 1 to 4.

Tightening torque, see 11 36 13AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

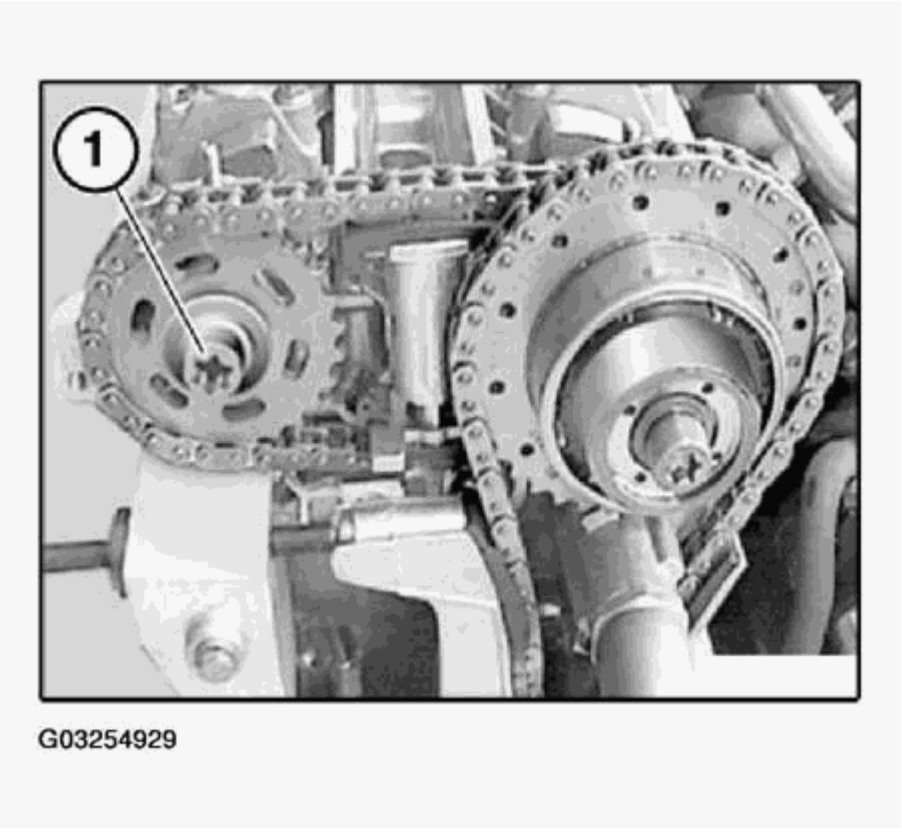


Fig. 484: Tightening Screw Connection Of Exhaust Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach sensor gear (2) to cylinder bank 1 to 4.

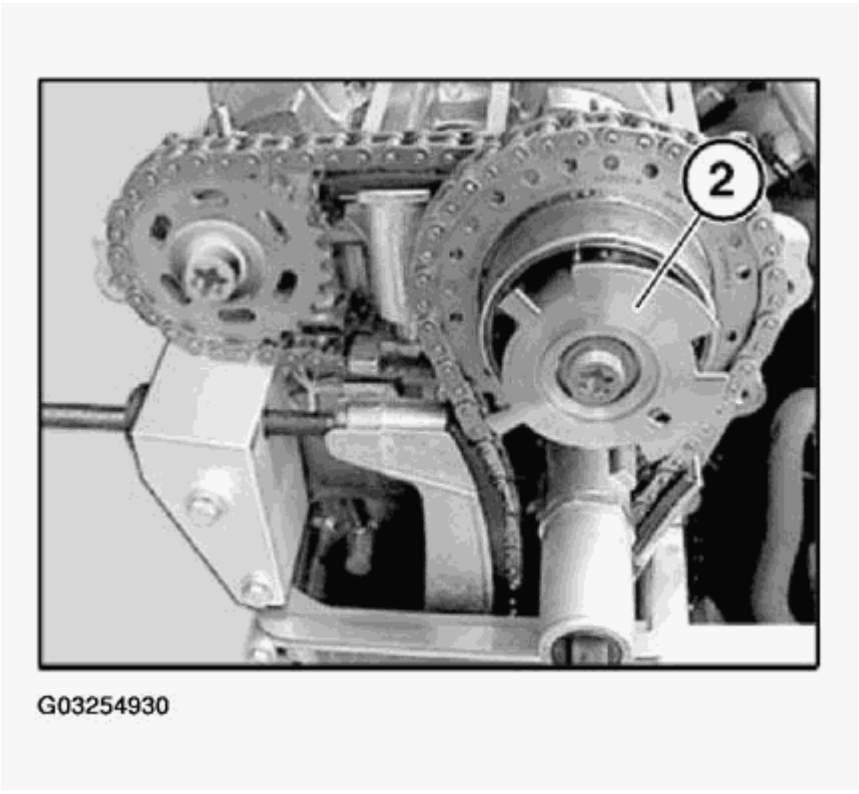


Fig. 485: Attaching Sensor Gear (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 1 to 4 and initially tighten without play, but do not tighten down yet.

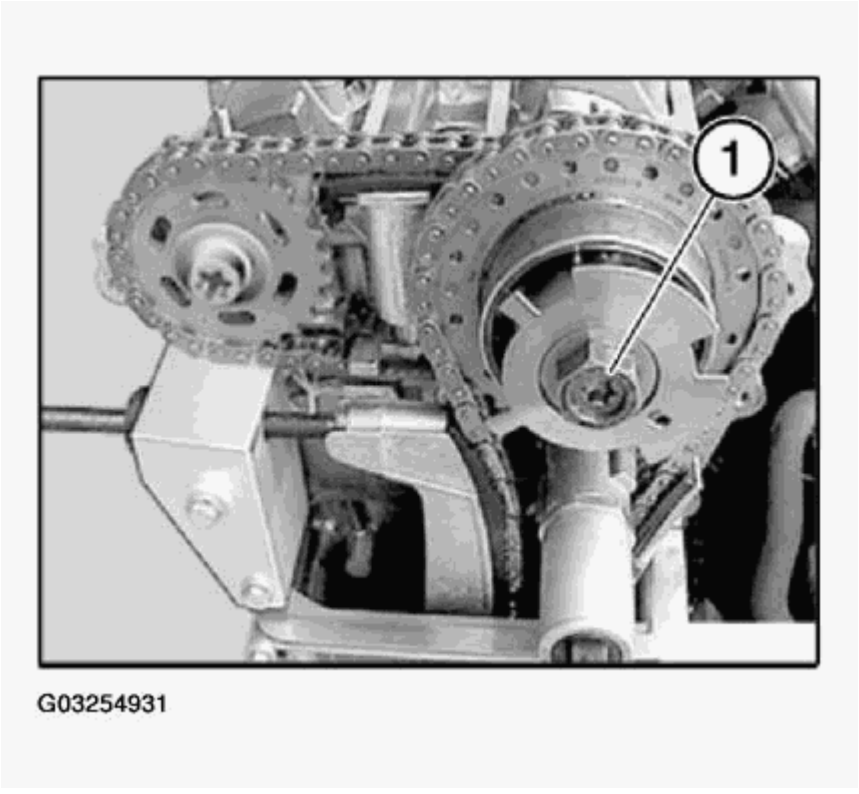


Fig. 486: Fitting Nut Of Sensor Gear Screw Connection (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

Align locating bore (1) on sensor gear of cylinder bank 1 to 4 to positioning pin on special tool 11 6 451. Fit special tool 11 6 451, insert screws and initially tighten without play. Press special tool 11 6 451 downwards and align to cylinder head. Tighten down special tool 11 6 451.

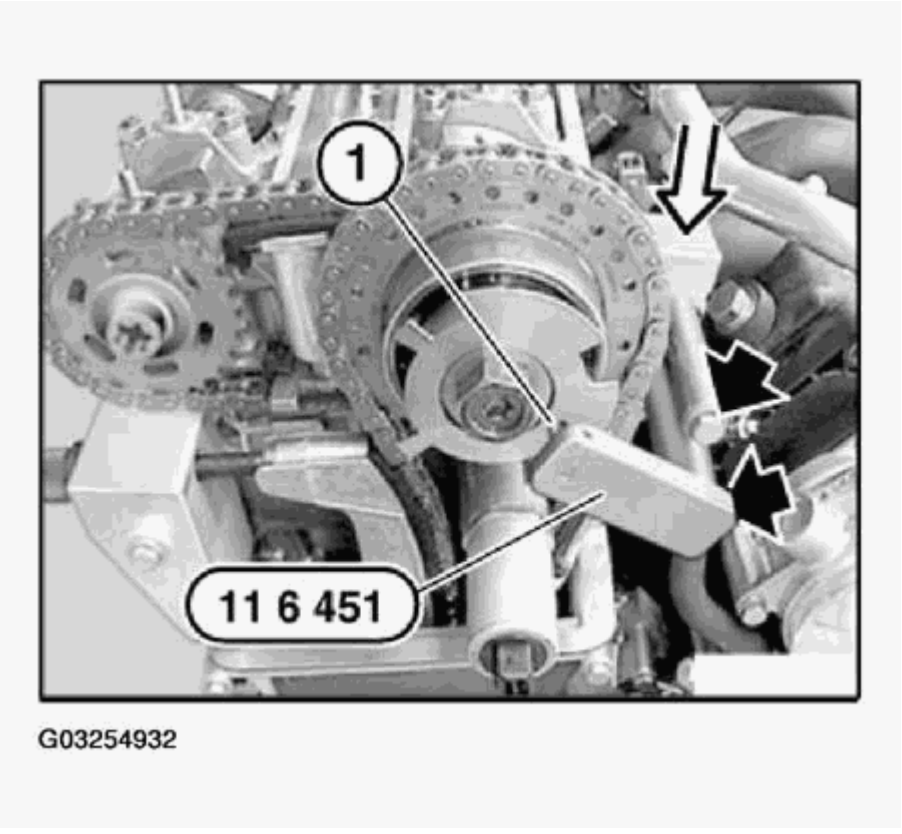


Fig. 487: Aligning Locating Bore On Sensor Gear (Cylinder Bank 1 To 4) To Positioning Pin On Special Tool 11 6 451
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.

Tightening torque, see 11 36 15AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

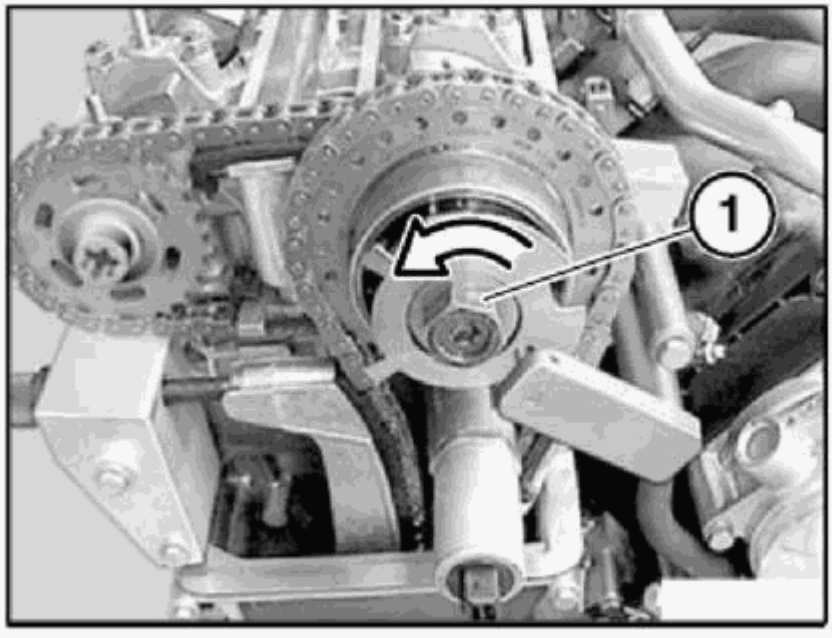


Fig. 488: Tightening Nut On Sensor Gear Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 6 451 from right cylinder head on cylinder bank 1 to 4.

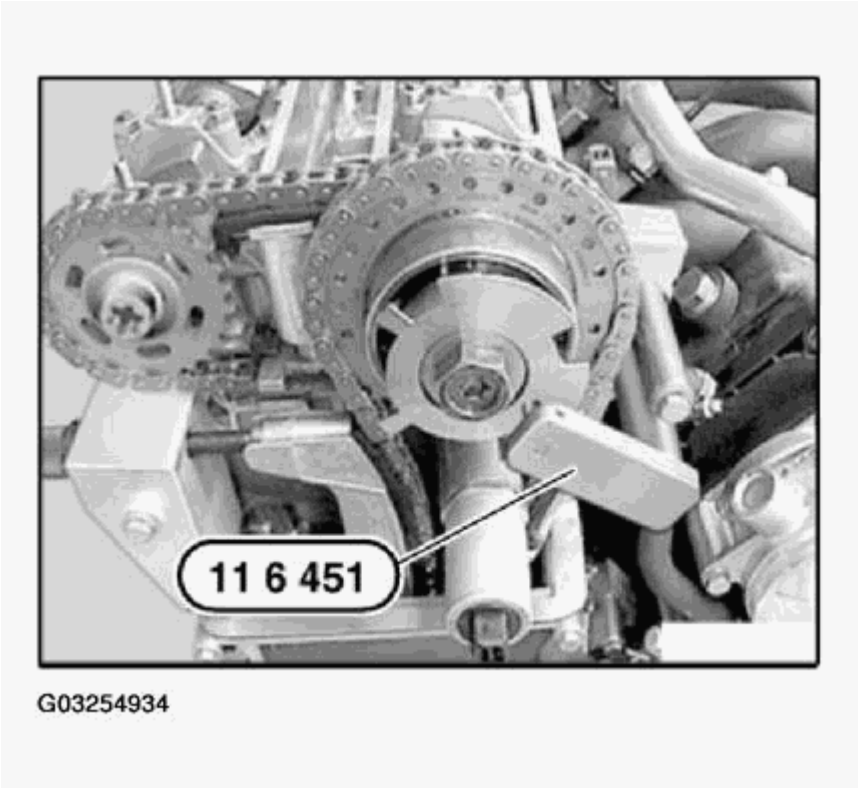


Fig. 489: Removing Special Tool 11 6 451 From Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach sensor gear (2) to cylinder bank 5 to 8.

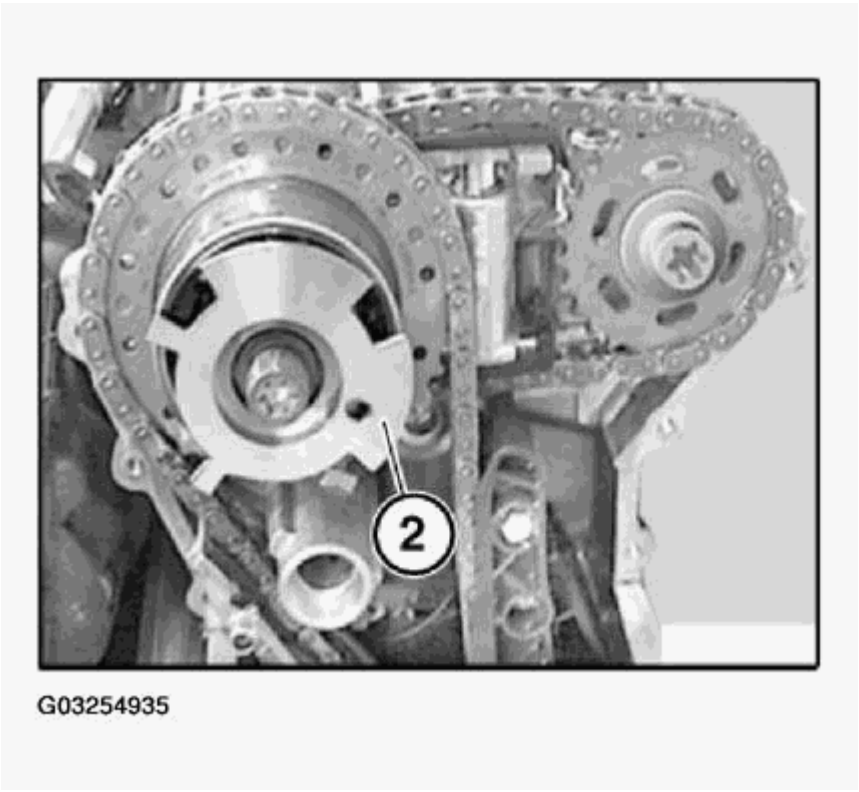


Fig. 490: Connecting Sensor Gear (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 5 to 8 and initially tighten without play, but do not tighten down yet.

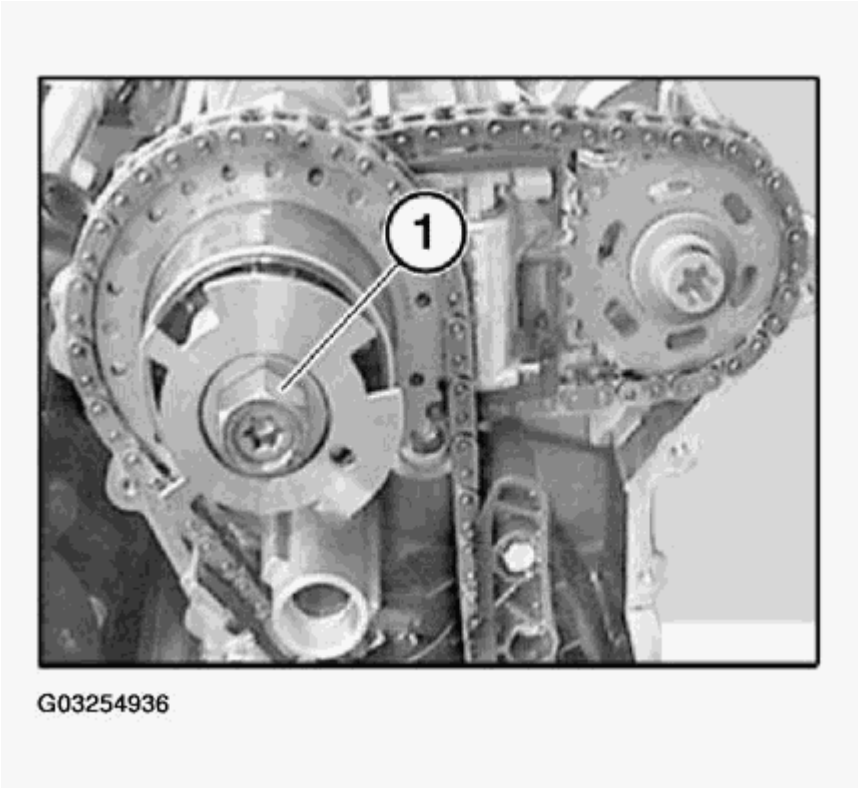


Fig. 491: Fitting Nut Of Sensor Gear Screw Connection (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

Align locating bore (1) on sensor gear of cylinder bank 5 to 8 to positioning pin on special tool 11 6 452. Fit special tool 11 6 452, insert screws and initially tighten without play. Press special tool 11 6 452 downwards and align to cylinder head. Tighten down special tool 11 6 452.

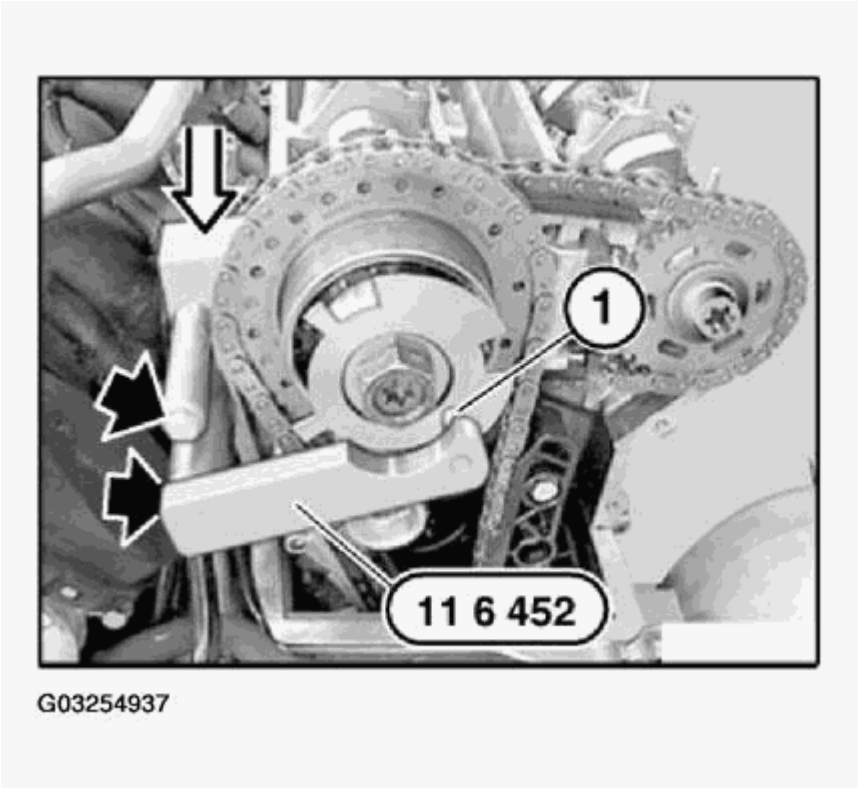


Fig. 492: Aligning Locating Bore On Sensor Gear (Cylinder Bank 5 To 8) To Positioning Pin On Special Tool 11 6 452
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.

Tightening torque, see 11 36 15AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

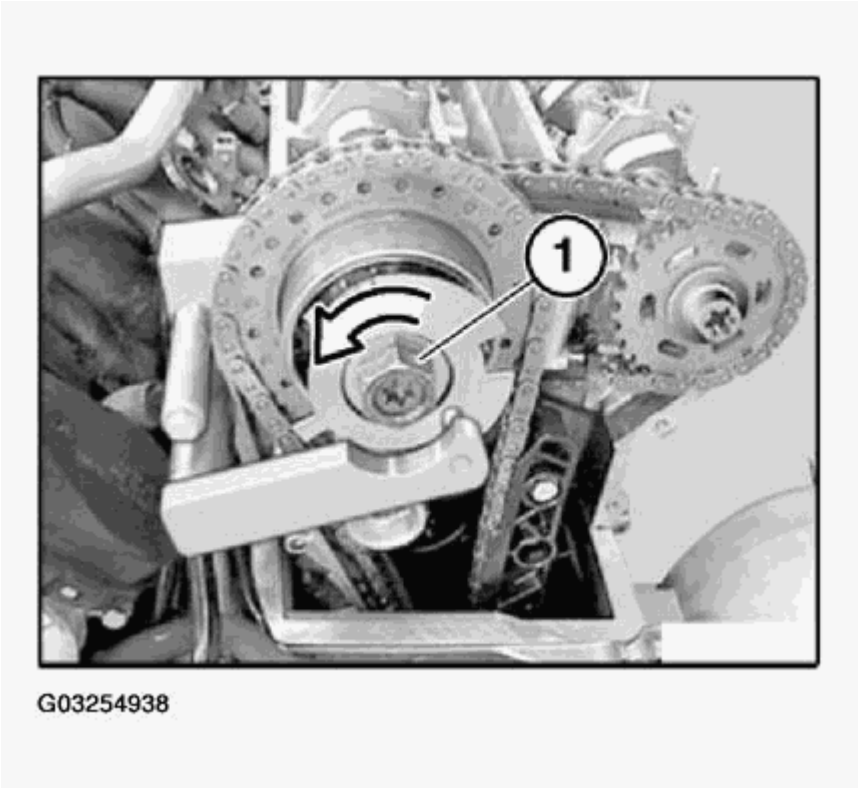


Fig. 493: Tightening Nut On Sensor Gear Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 6 452 from left cylinder head on cylinder bank 5 to 8.

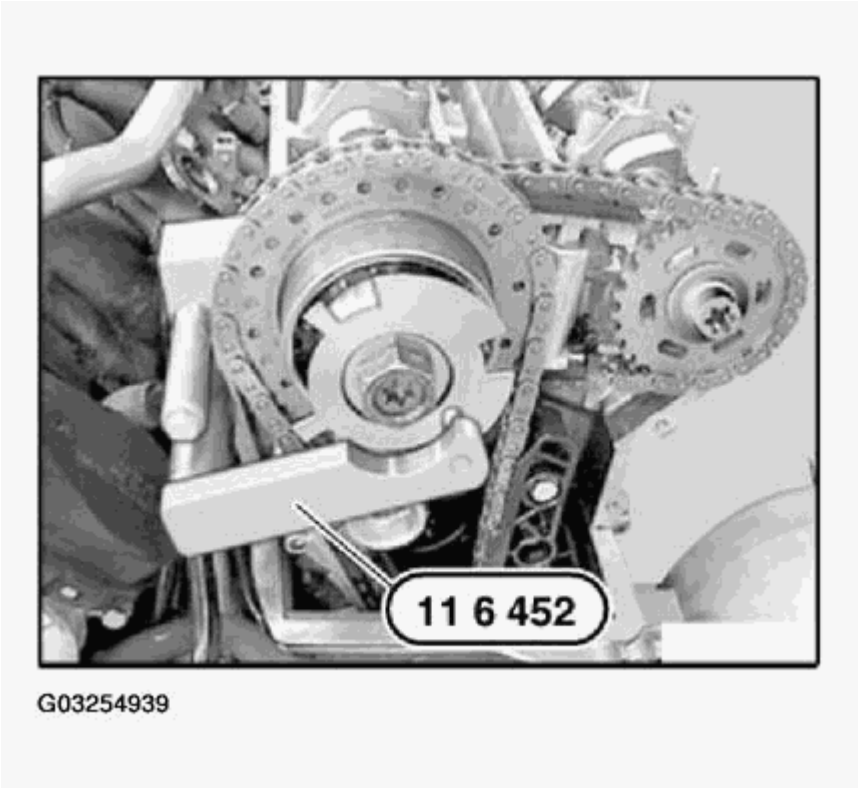


Fig. 494: Removing Special Tool 11 6 452 From Left Cylinder Head (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/11 2 443/11 2 445/11 2 441.

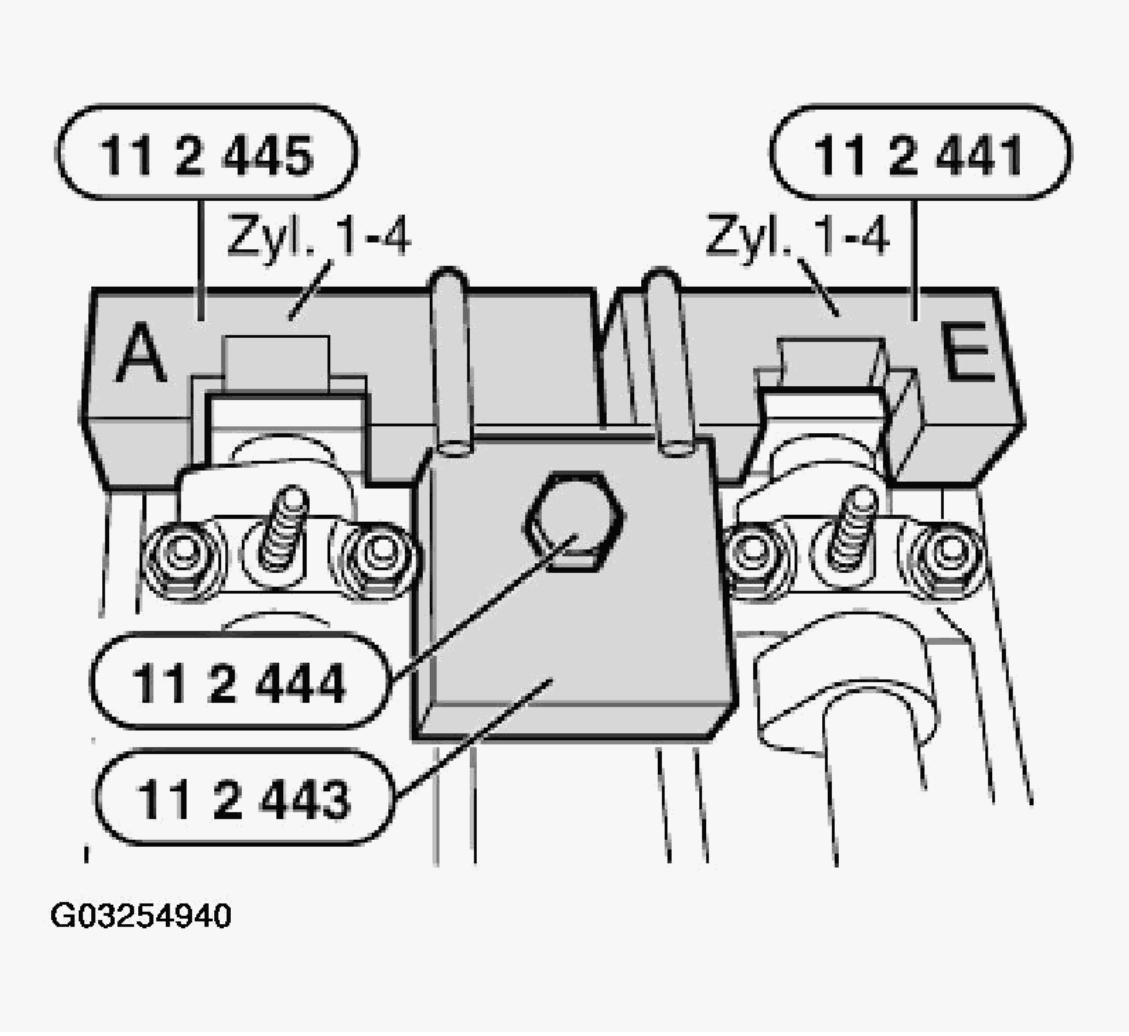


Fig. 495: Removing Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/11 2 443/11 2 442/11 2 446.

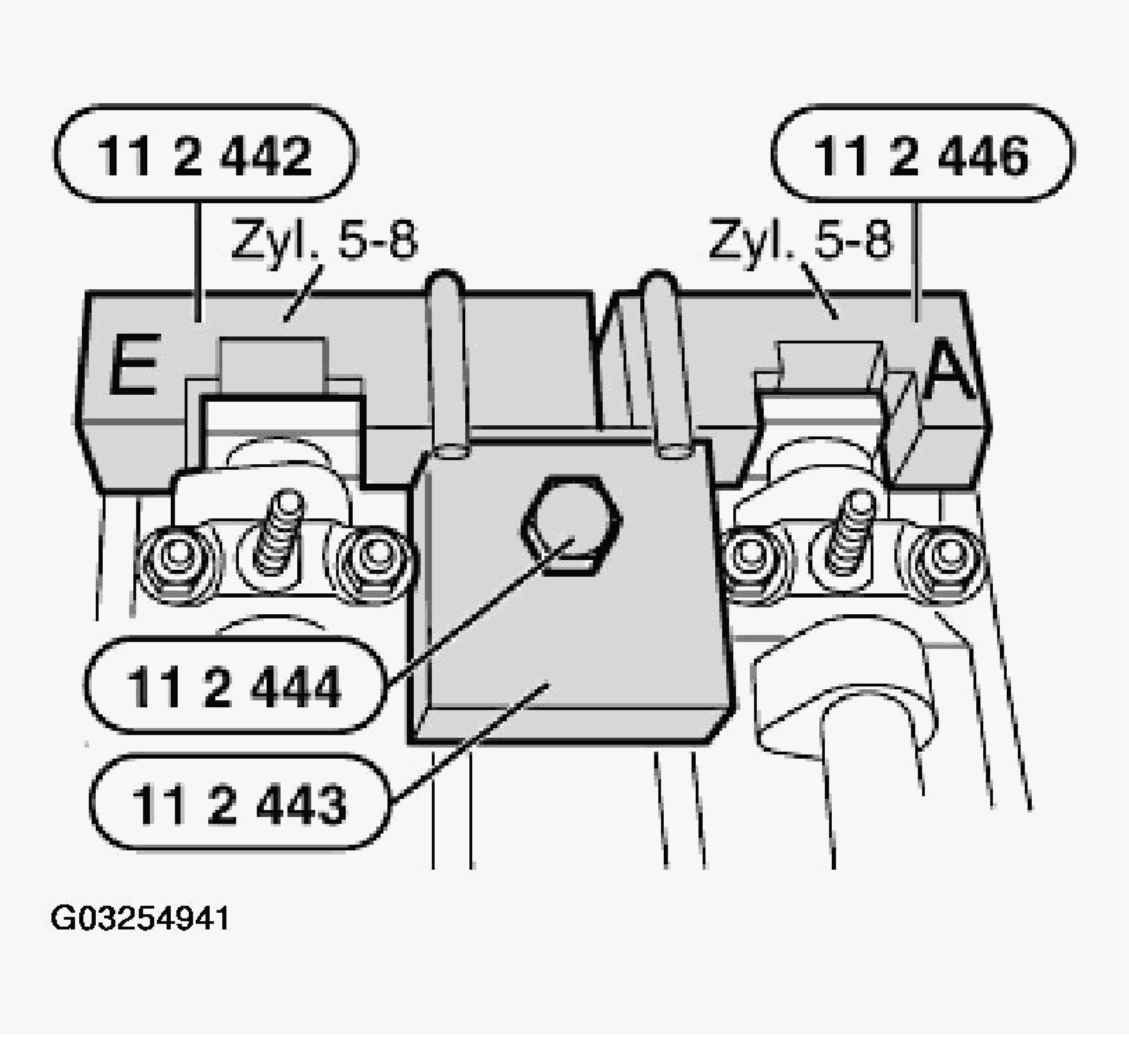


Fig. 496: Removing Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on special tool 11 4 230.

Remove special tool 11 7 380 from right cylinder head on cylinder bank 1 to 4.

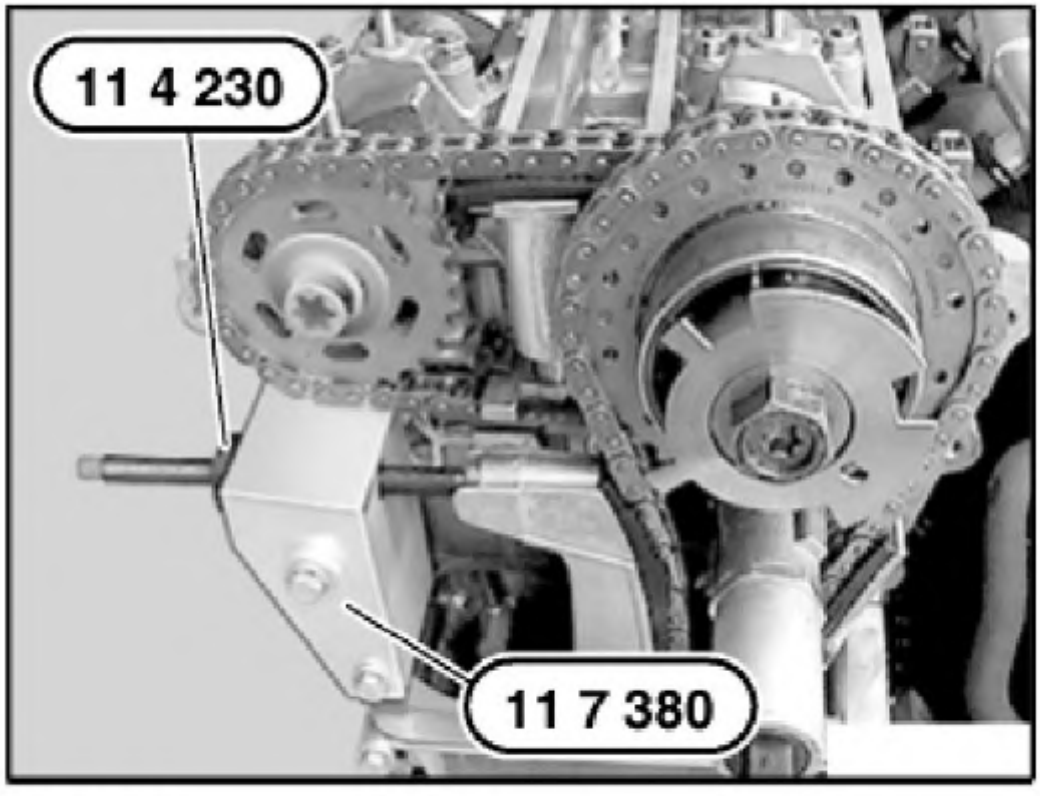


Fig. 497: Removing Special Tool 11 7 380 From Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Install oil lines on left and right of cylinder head.

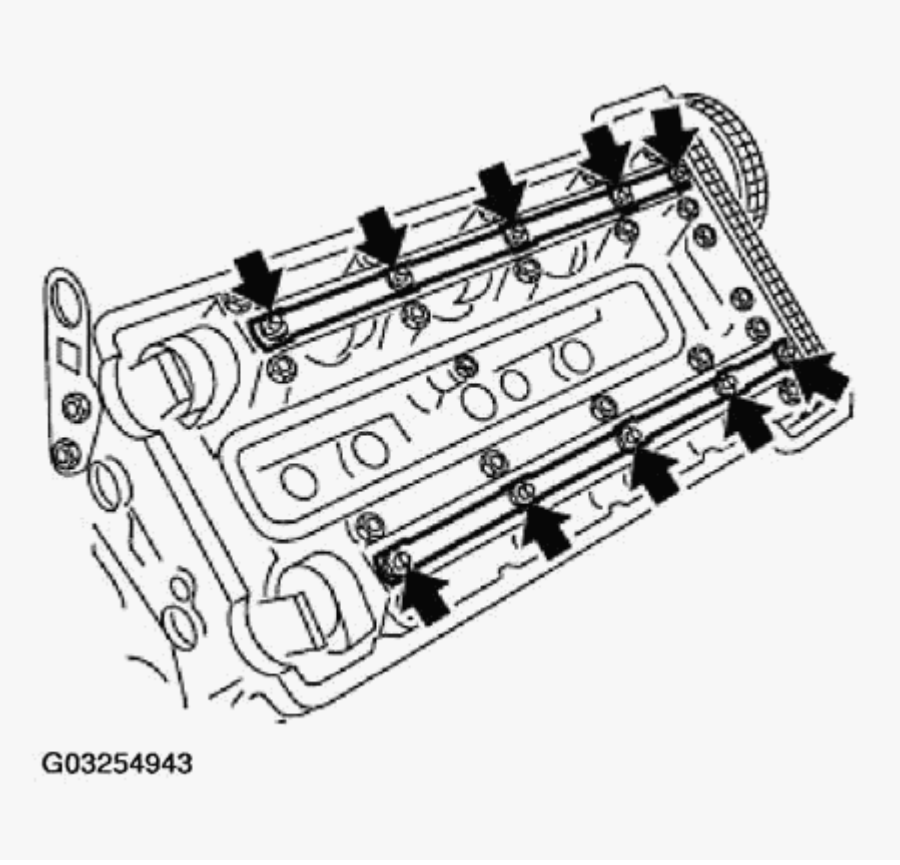


Fig. 498: Installing Oil Lines On Left And Right Of Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Install both timing case covers at top.

Install chain tensioning piston.

Install both cylinder head covers.

E53

Remove special tool 11 5 180.

Assemble engine.

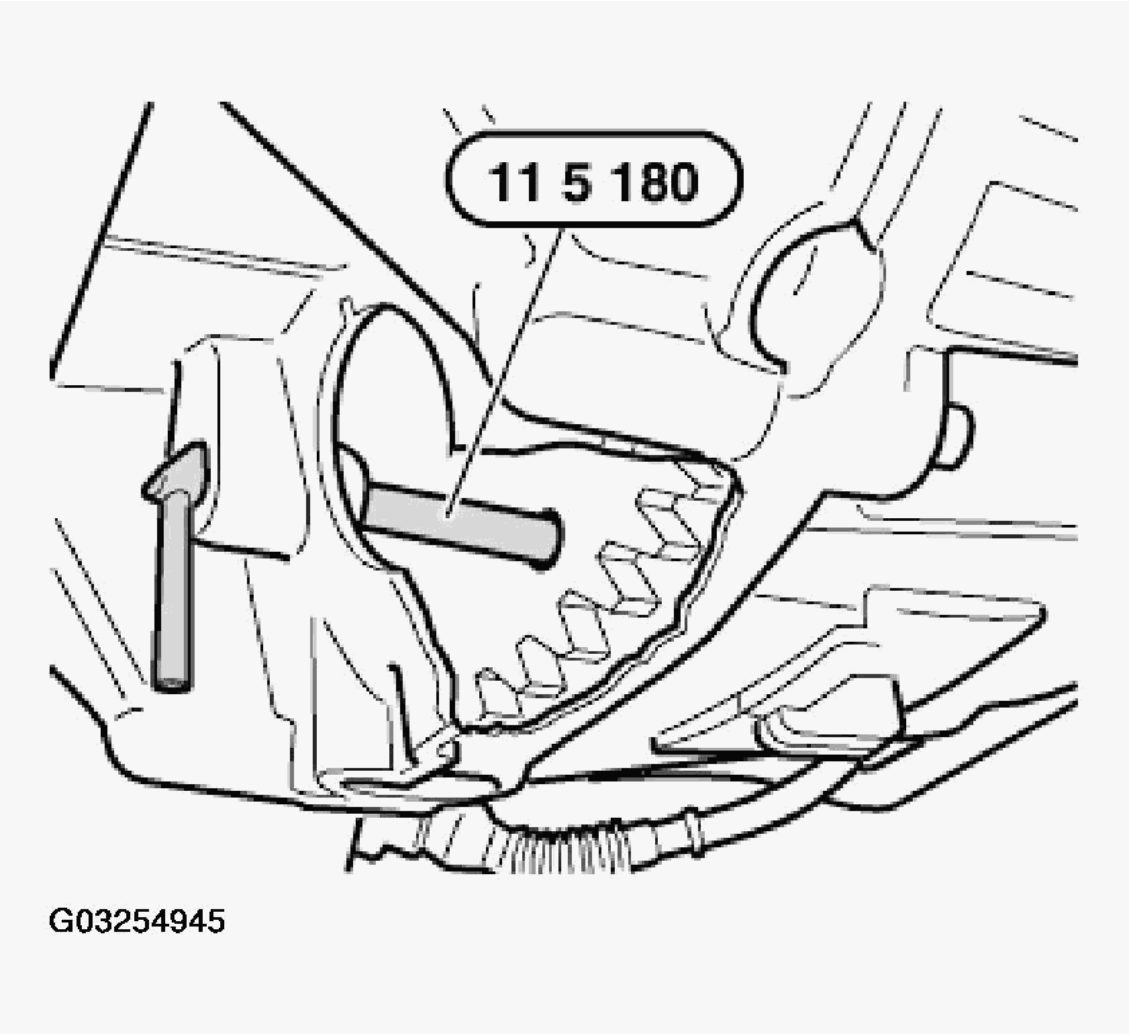


Fig. 499: Removing Special Tool 11 5 180
Courtesy of BMW OF NORTH AMERICA, INC.

11 36 615 REMOVING AND INSTALLING/REPLACING RIGHT CAMSHAFT ADJUSTMENT UNIT (M62 VANOS FROM 9/98)

Special tools required:

NOTE: For Special Tool identification, see ENGINE - SPECIAL TOOLS - X5 (4.4L & 4.6L) .

- 00 9 250
- 11 2 300
- 11 2 441
- 11 2 442
- 11 2 443
- 11 2 444

- 11 2 445
- 11 2 446
- 11 3 310
- 11 4 230
- 11 4 231
- 11 4 232
- 11 5 180
- 11 6 440
- 11 6 450
- 11 6 451
- 11 6 452
- 11 7 380

Removal

Remove intake filter housing with air-mass flow sensor.

Remove fan impeller with fan clutch and fan cowl.

Remove both cylinder head covers.

Remove spark plugs.

CAUTION: In firing TDC position, the inlet camshaft 1 to 4 rotates in the teeth of the camshaft adjustment unit. This twisting is caused by the position of the cams and is not an indication for incorrect timing.

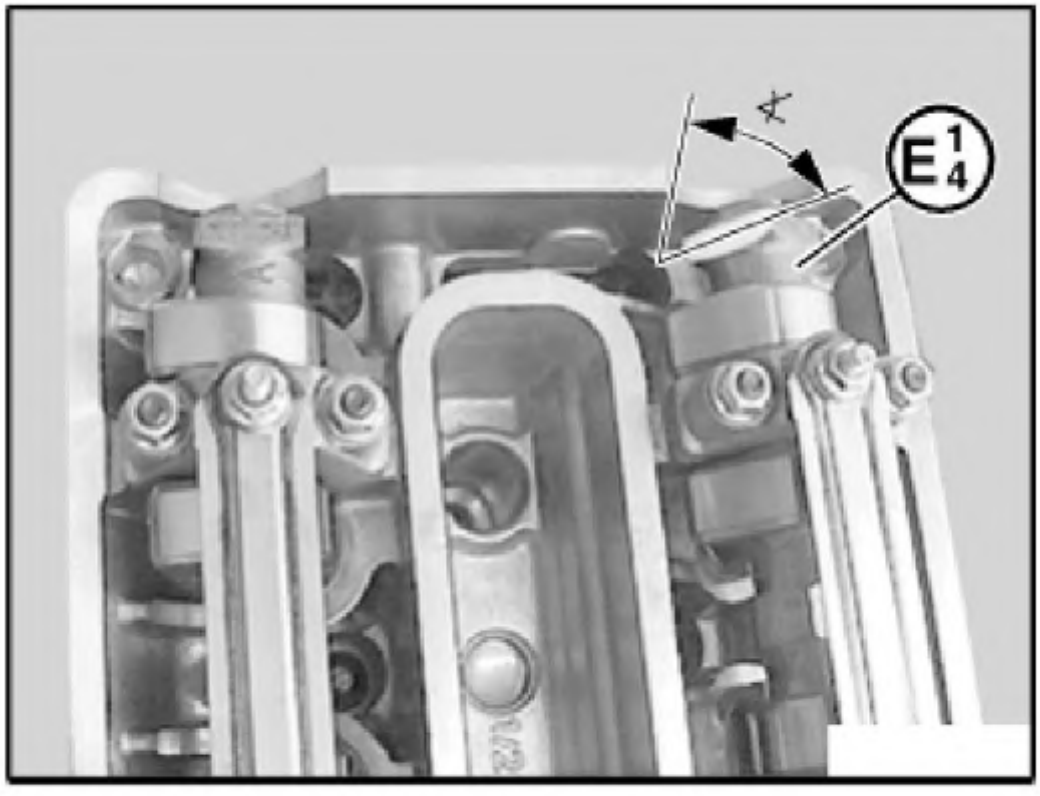


Fig. 500: Identifying Inlet Camshaft Rotation
Courtesy of BMW OF NORTH AMERICA, INC.

Removal of the right camshaft adjustment unit is described separately from installation. Assembly sequence for removal and installation is different.

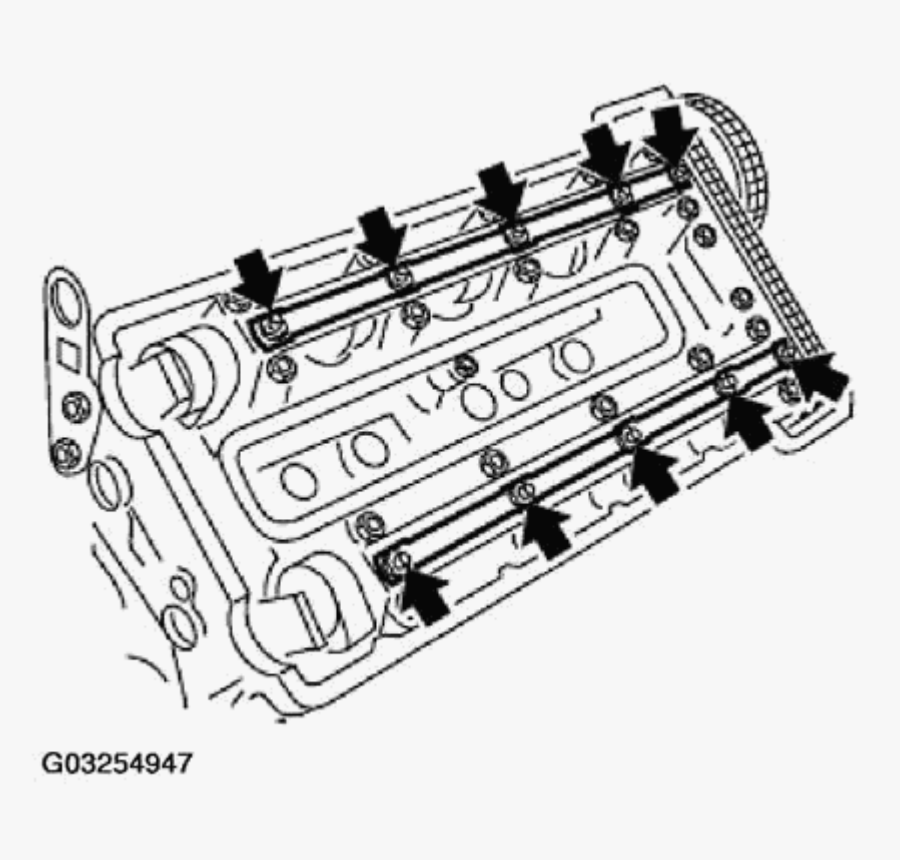


Fig. 501: Removing Oil Lines On Left And Right Of Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Remove oil lines on left and right of cylinder head.

Turn engine in direction of rotation as far as TDC firing position of first cylinder.

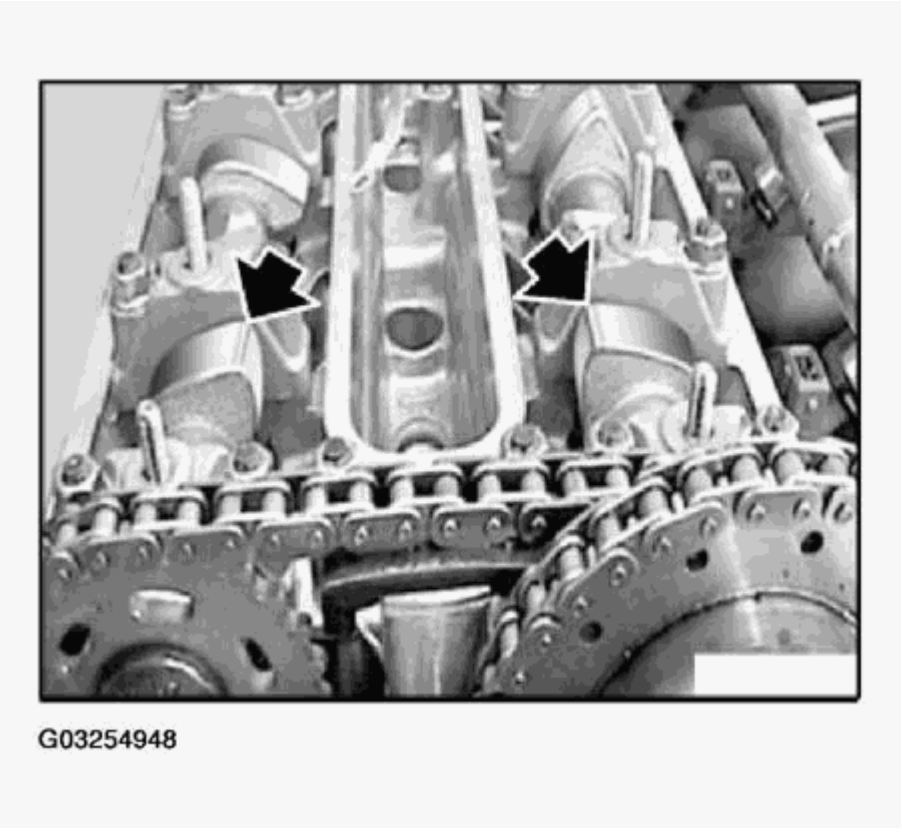


Fig. 502: Rotating Camshaft To TDC (Overlap)
Courtesy of BMW OF NORTH AMERICA, INC.

E53

Secure crankshaft in TDC position with special tool 11 5 180.

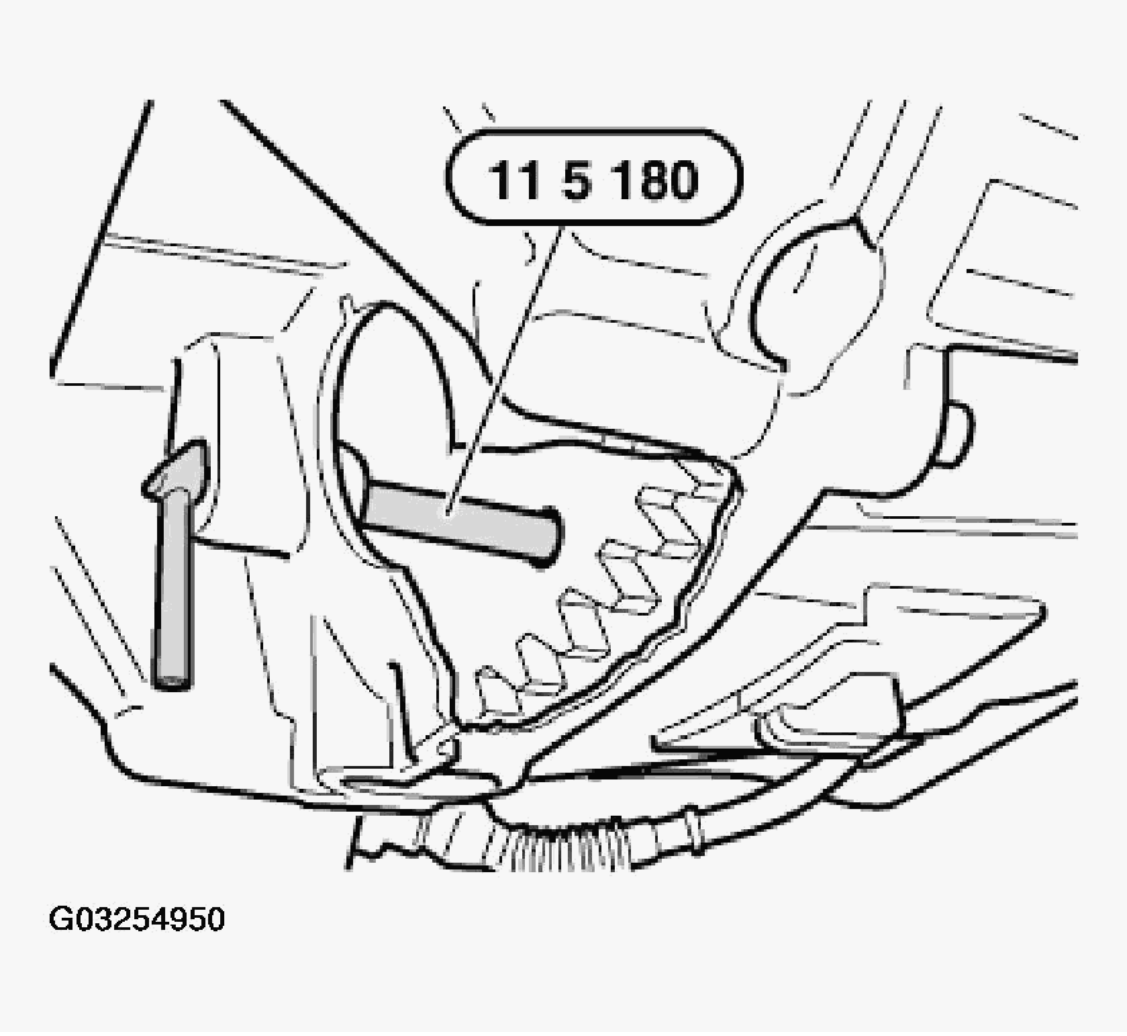


Fig. 503: Securing Crankshaft In TDC Position With Special Tool 11 5 180
Courtesy of BMW OF NORTH AMERICA, INC.

Remove chain tensioning piston. See **11 31 090 INSTALLING AND REMOVING/REPLACING PISTON FOR CHAIN TENSIONER (M62)** .

Remove both timing case covers at top. See **11 14 080 REMOVING AND INSTALLING TIMING CASE COVER, TOP LEFT (M62 VANOS FROM 9/98)** and **11 14 085 REMOVING AND INSTALLING TIMING CASE COVER, TOP RIGHT (M62 VANOS FROM 9/98)** .

CAUTION: Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 1 to 4.

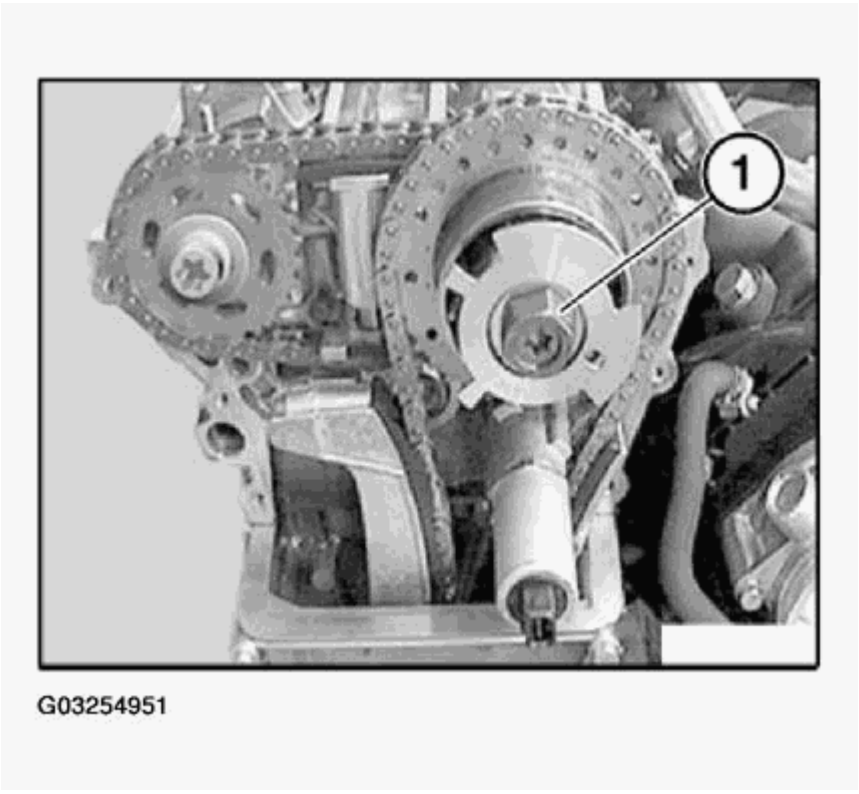


Fig. 504: Releasing Nut On Sensor Gear Screw Connection (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sensor gear (2) on cylinder bank 1 to 4.

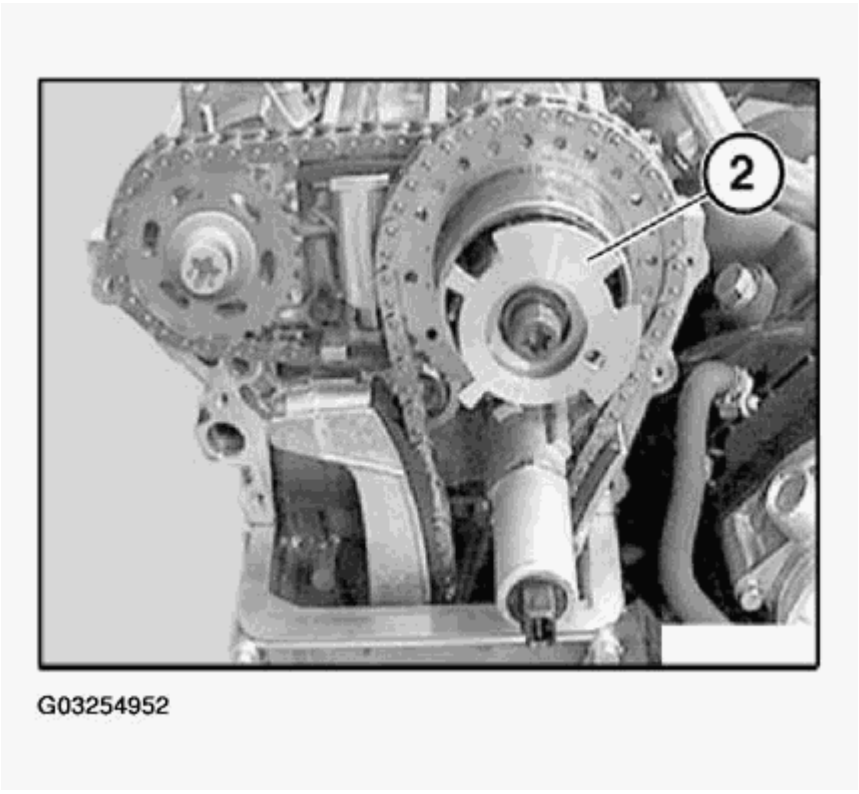


Fig. 505: Removing Sensor Gear (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Release nut (1) on sensor gear screw connection on cylinder bank 5 to 8.

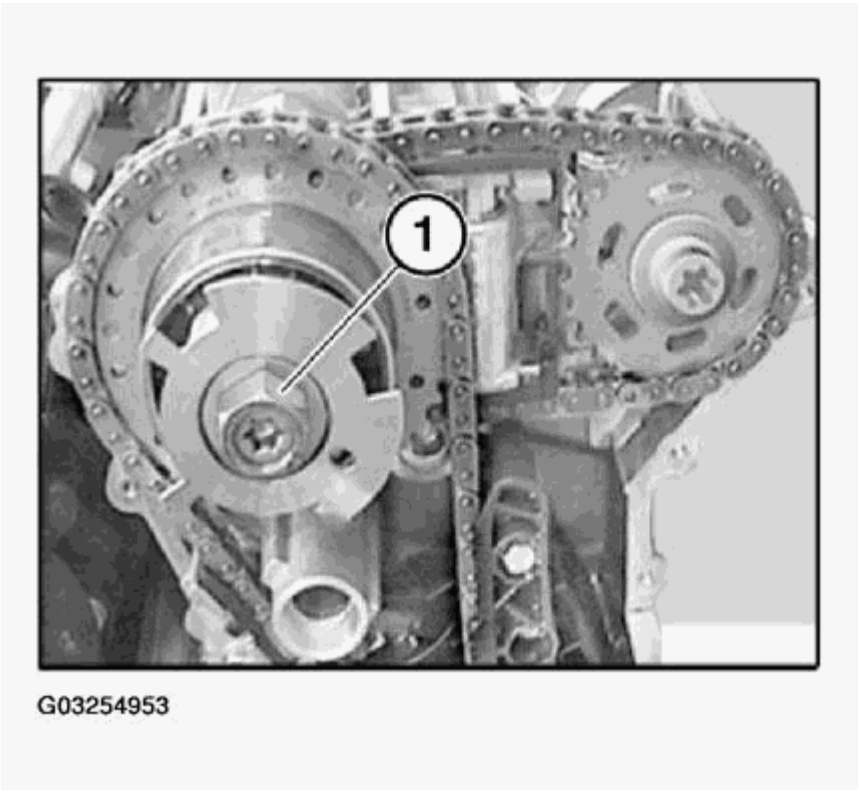


Fig. 506: Releasing Nut On Sensor Gear Screw Connection (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sensor gear (2) on cylinder bank 5 to 8.

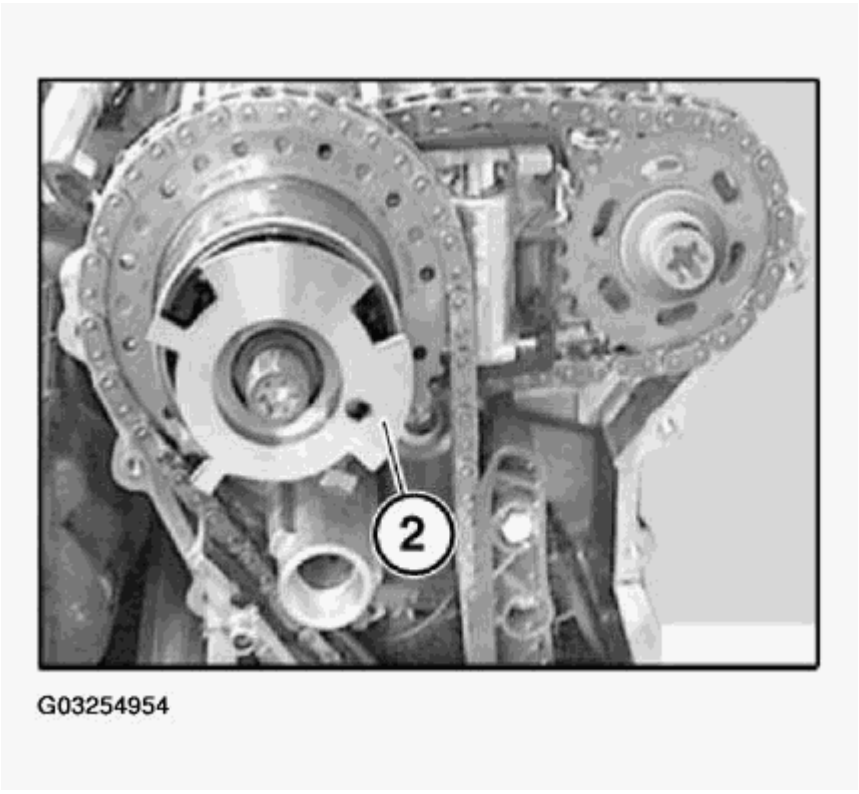


Fig. 507: Removing Sensor Gear (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When releasing camshaft screw connection: grip camshaft at hexagon head.

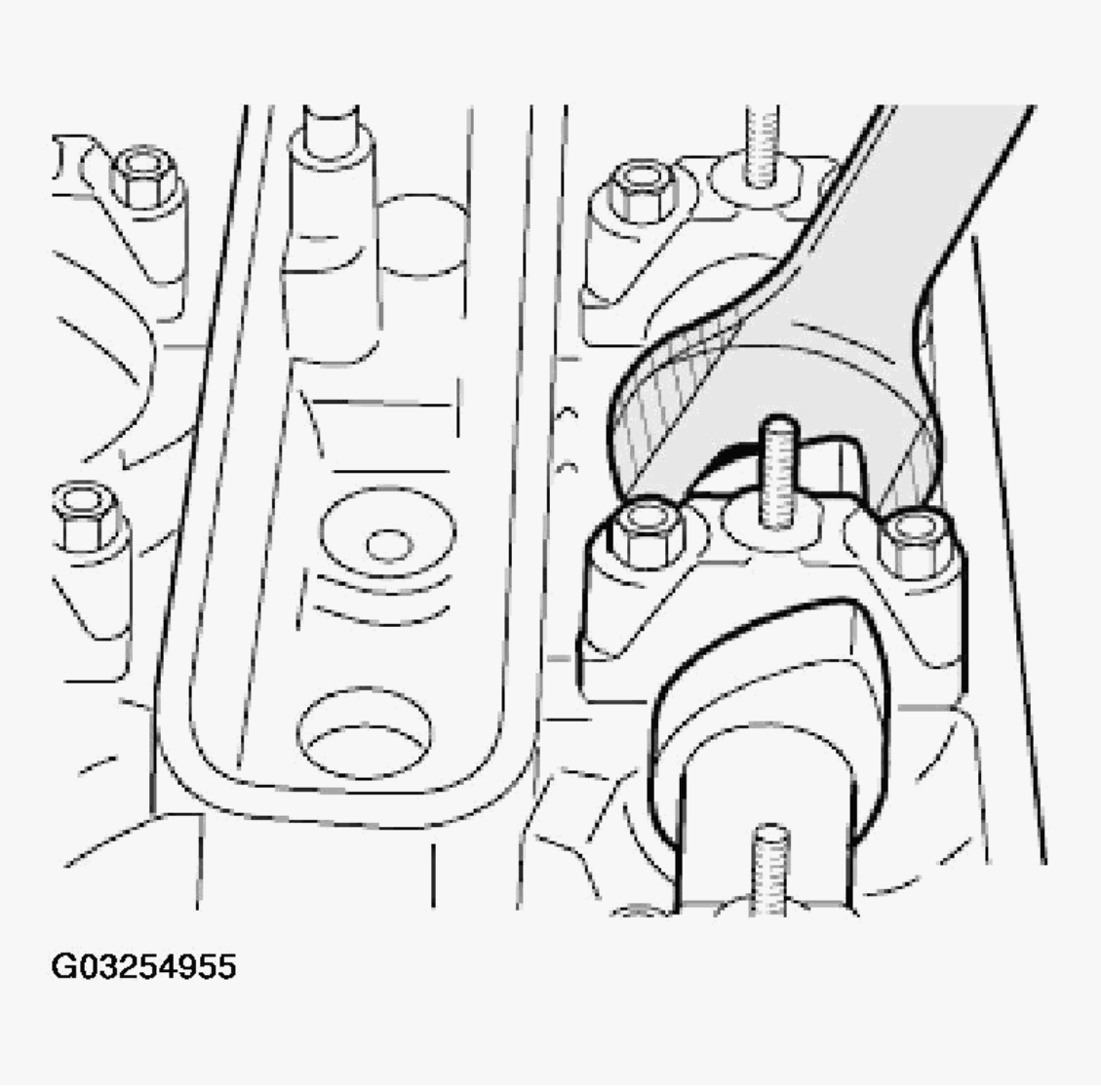


Fig. 508: Releasing Camshaft Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 by approx. a half turn.

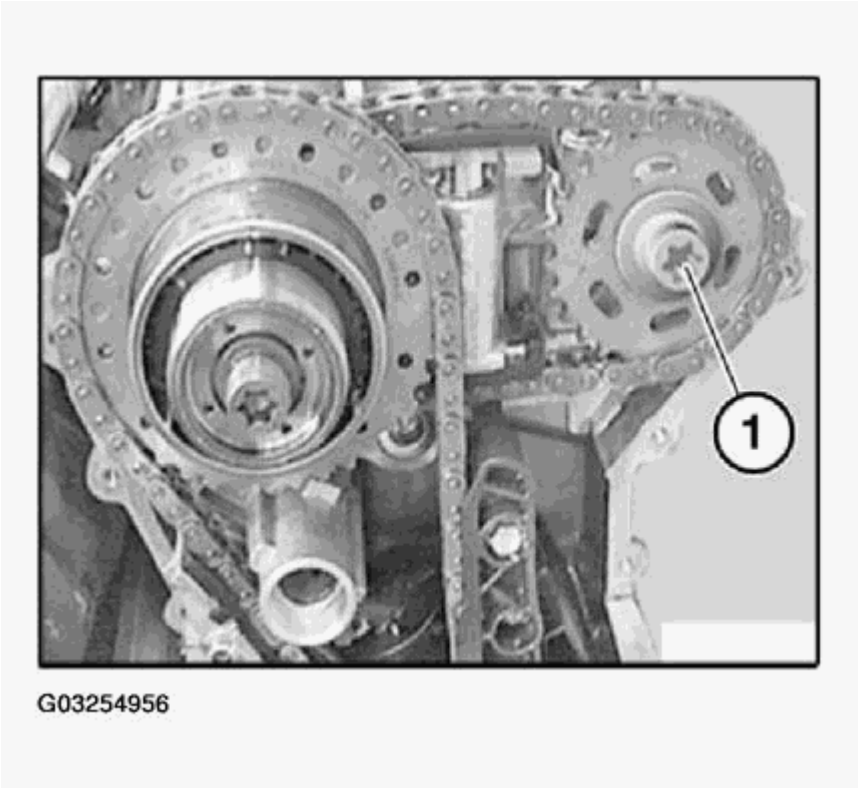


Fig. 509: Slackening Screw Connection Of Exhaust Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 by approx. a half turn.

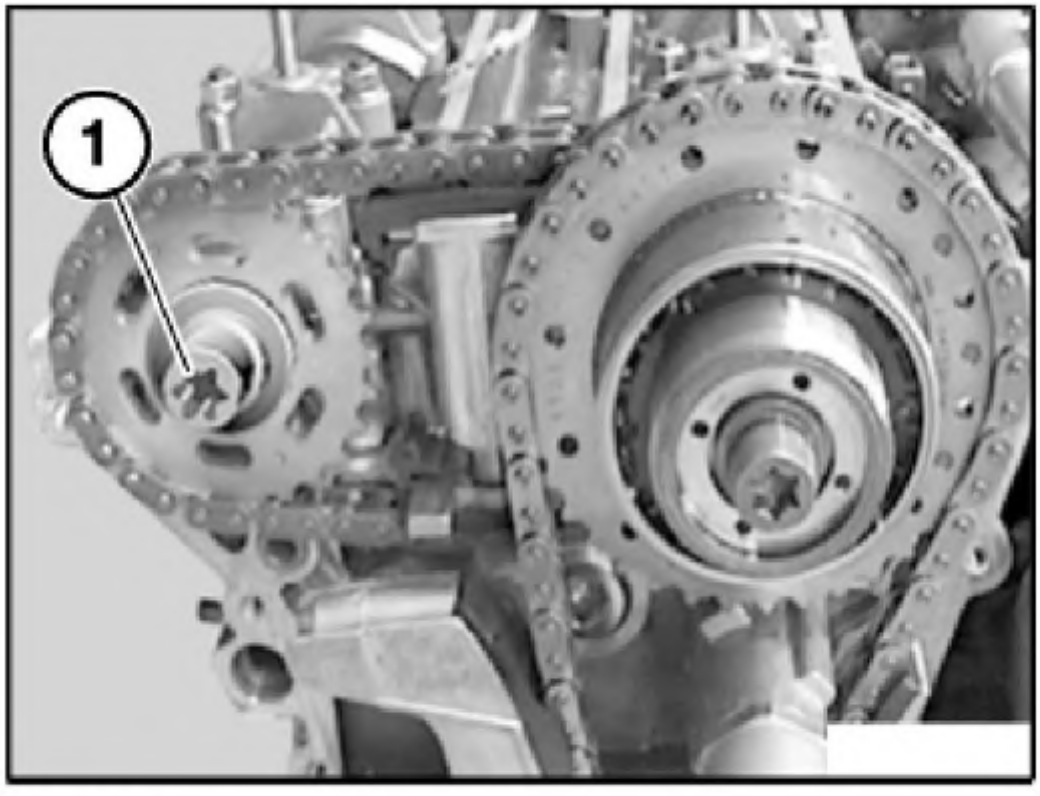


Fig. 510: Slackening Screw Connection Of Exhaust Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 5 to 8 by approx. a half turn.

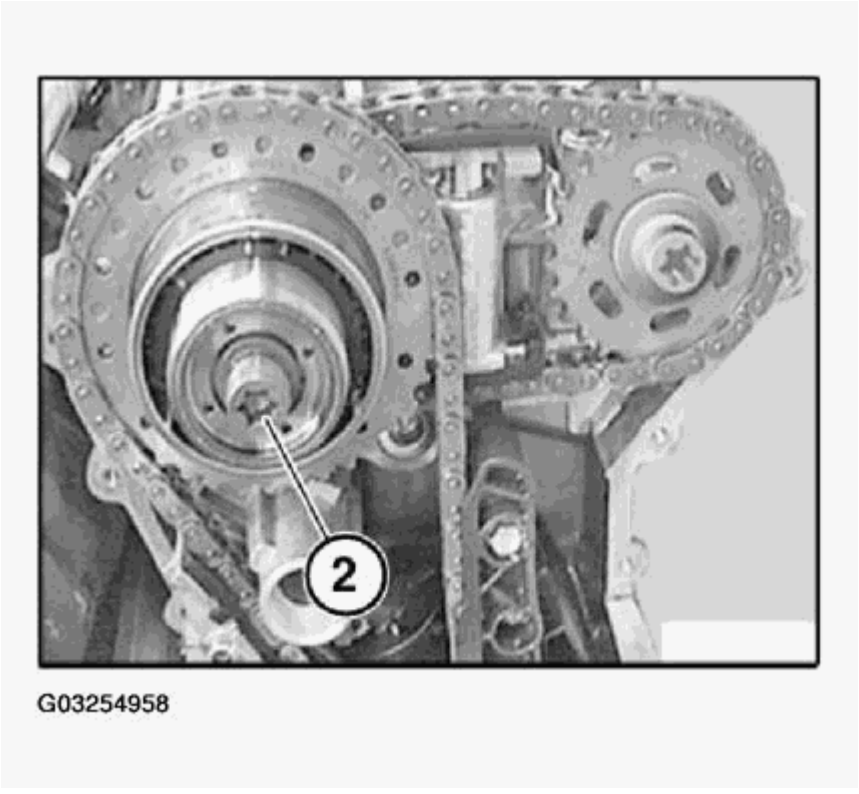


Fig. 511: Slackening Screw Connection Of Inlet Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When releasing camshaft screw connection: grip camshaft at hexagon head.

Slacken screw connection (2) of inlet camshaft on cylinder bank 1 to 4 by approx. a half turn.

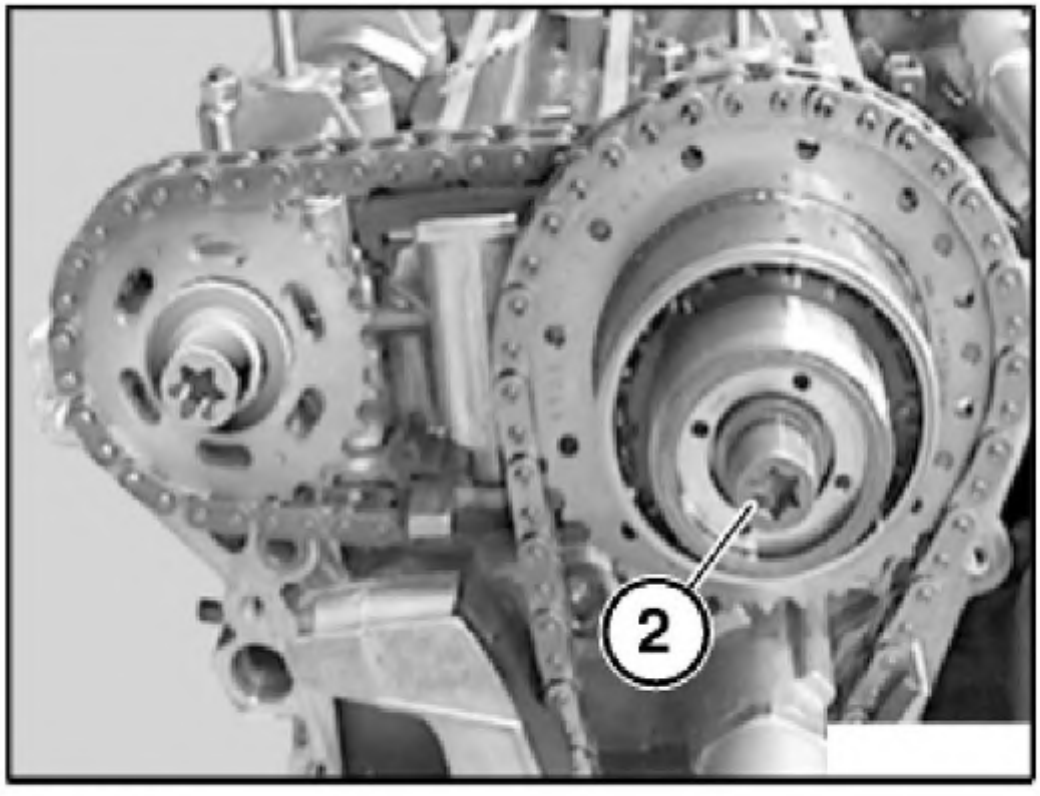


Fig. 512: Slackening Screw Connection Of Inlet Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Align camshafts.

Attach special tool 11 2 445/11 2 441 to camshafts, cylinder bank 1 to 4.

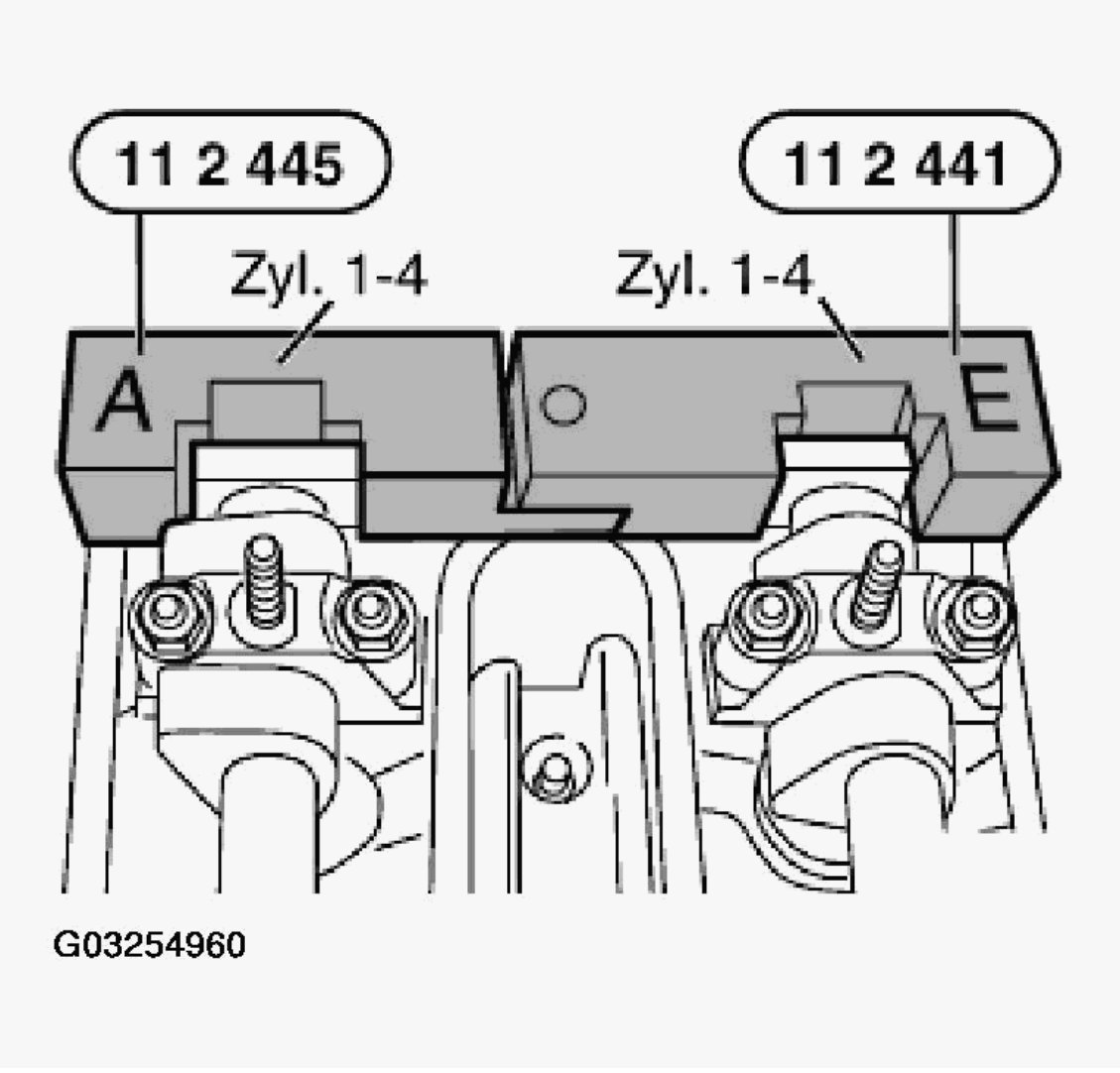


Fig. 513: Connecting Special Tool 11 2 445/11 2 441 To Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 443 to special tool 11 2 445/11 2 441 and secure with special tool 11 2 444 via spark plug thread.

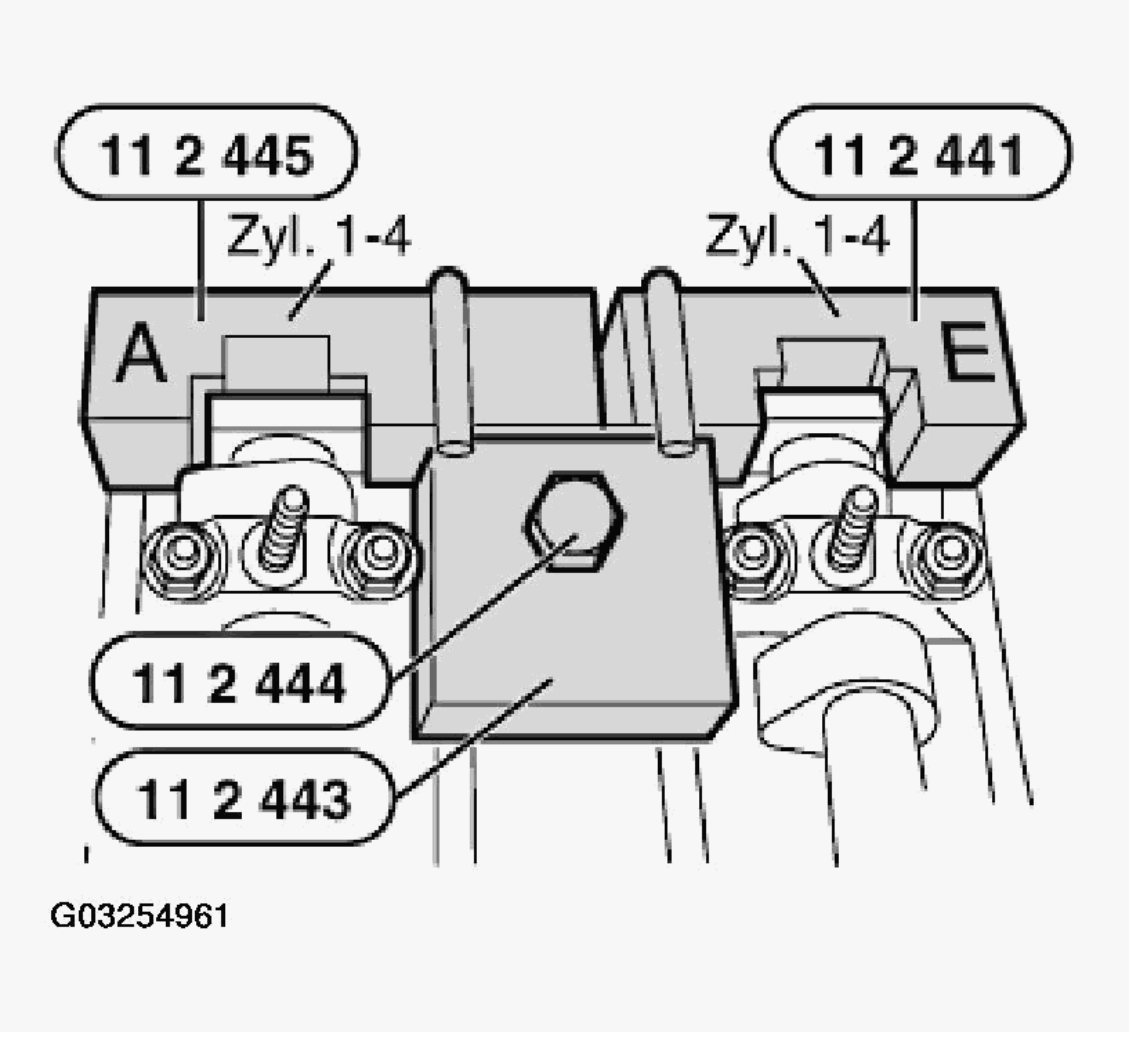


Fig. 514: Connecting Special Tool 11 2 443 To Special Tool 11 2 445/11 2 441
Courtesy of BMW OF NORTH AMERICA, INC.

Align camshafts.

Attach special tool 11 2 446/11 2 442 to camshafts, cylinder bank 5 to 8.

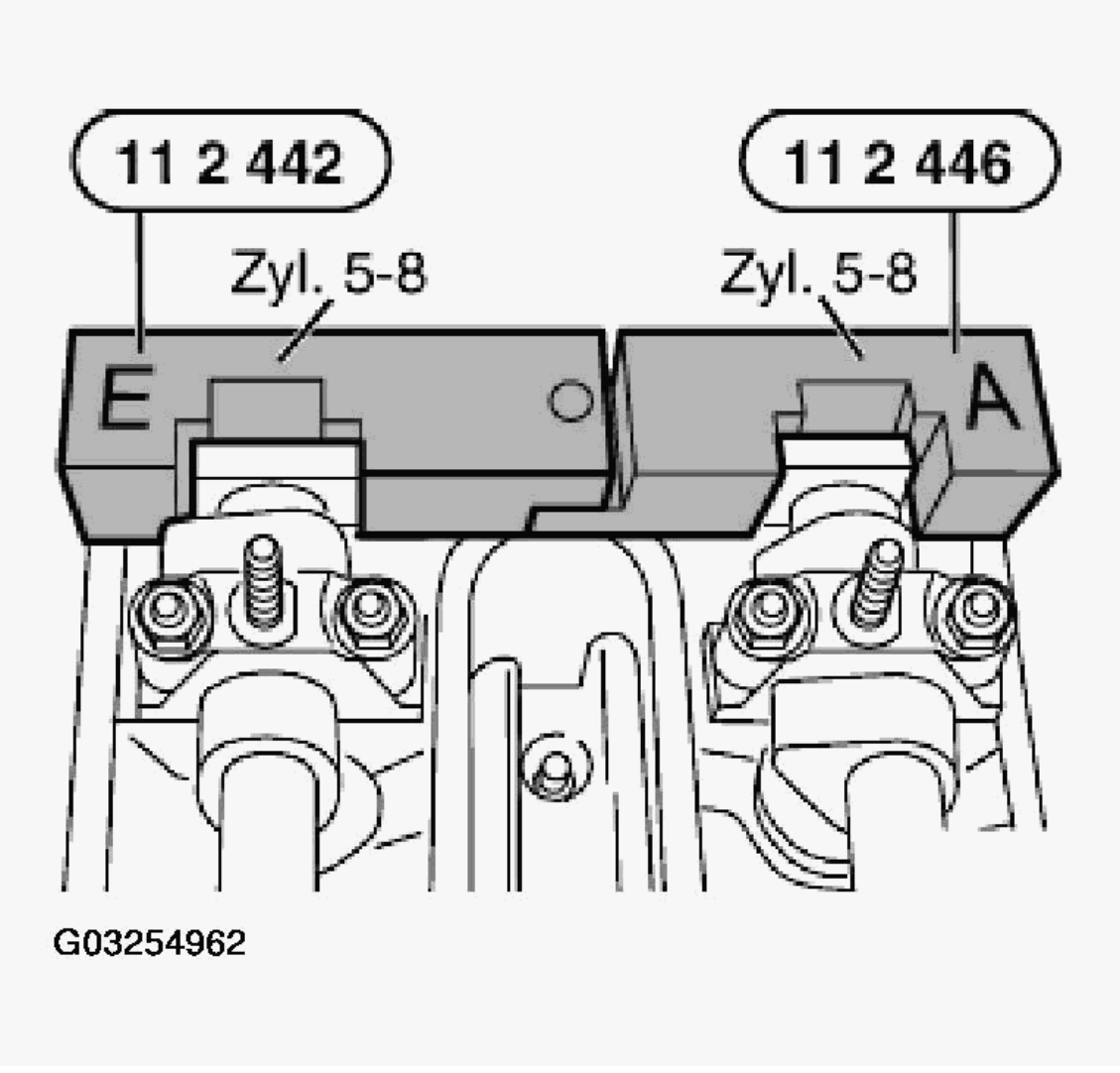


Fig. 515: Connecting Special Tool 11 2 446/11 2 442 To Camshafts (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 2 443 to special tool 11 2 446/11 2 442 and secure with special tool 11 2 444 via spark plug thread.

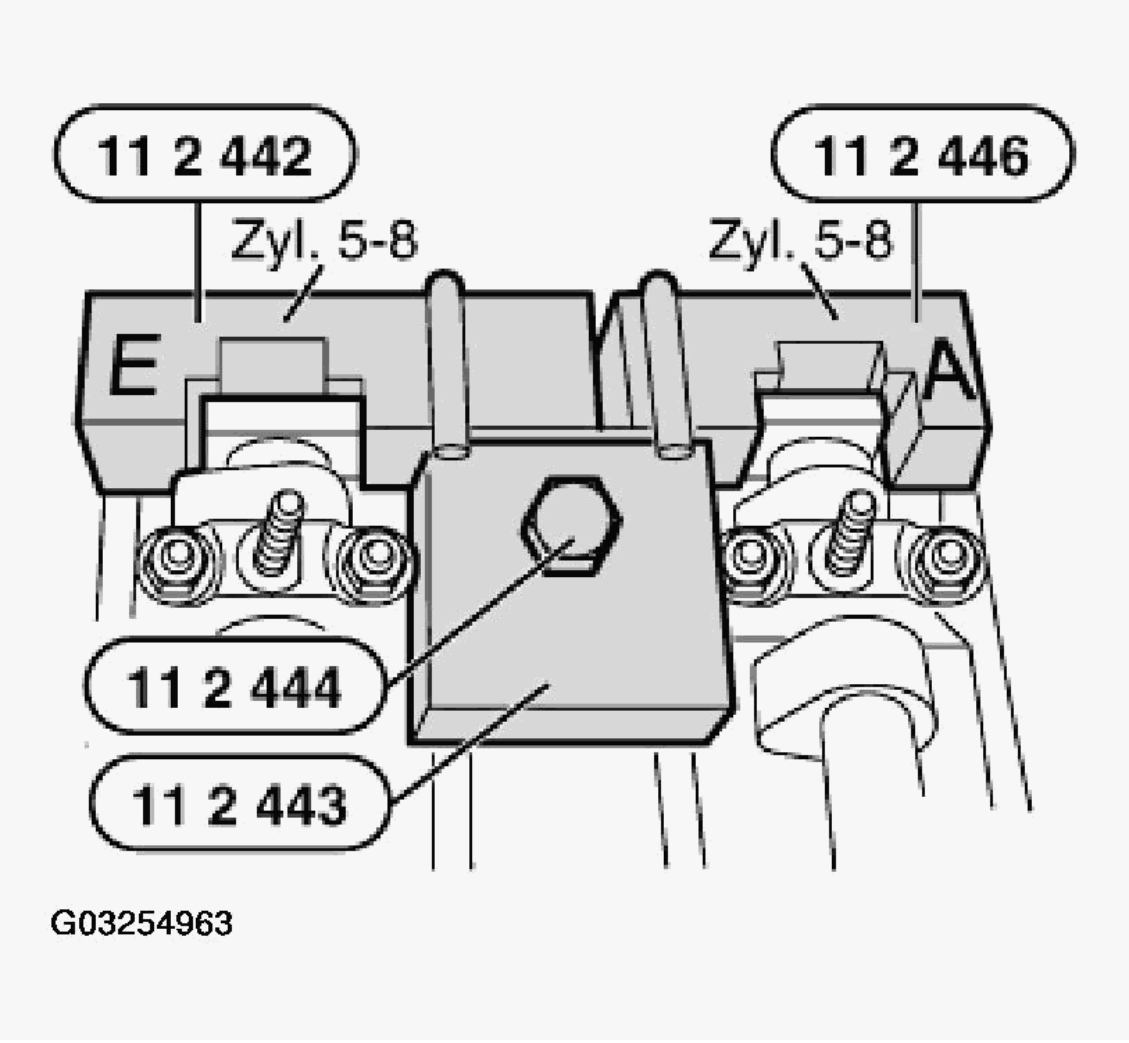


Fig. 516: Connecting Special Tool 11 2 443 To Special Tool 11 2 445/11 2 441
Courtesy of BMW OF NORTH AMERICA, INC.

Compress chain tensioner on cylinder bank 1 to 4 and lock with special tool 11 3 310.



Fig. 517: Compressing Chain Tensioner & Locking With Special Tool 11 3 310
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Remove screws (1 and 2) on cylinder bank 1 to 4.

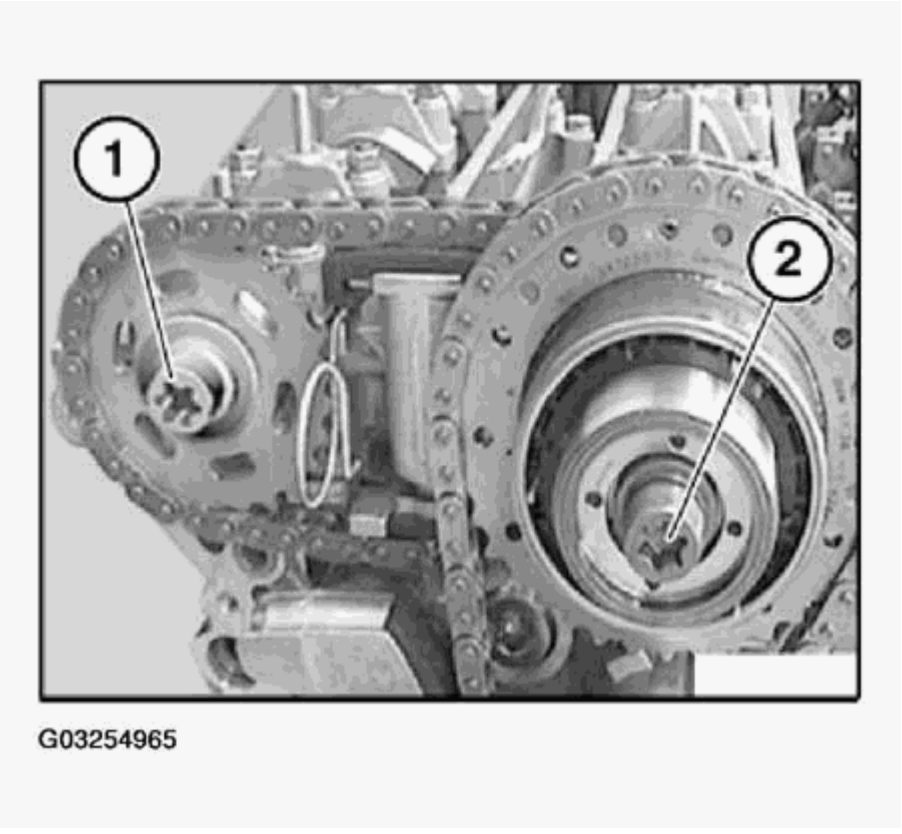


Fig. 518: Removing Camshaft Screws (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Pull exhaust sprocket wheel (1) and camshaft adjustment unit (2) forwards until they are no longer secured on camshafts.

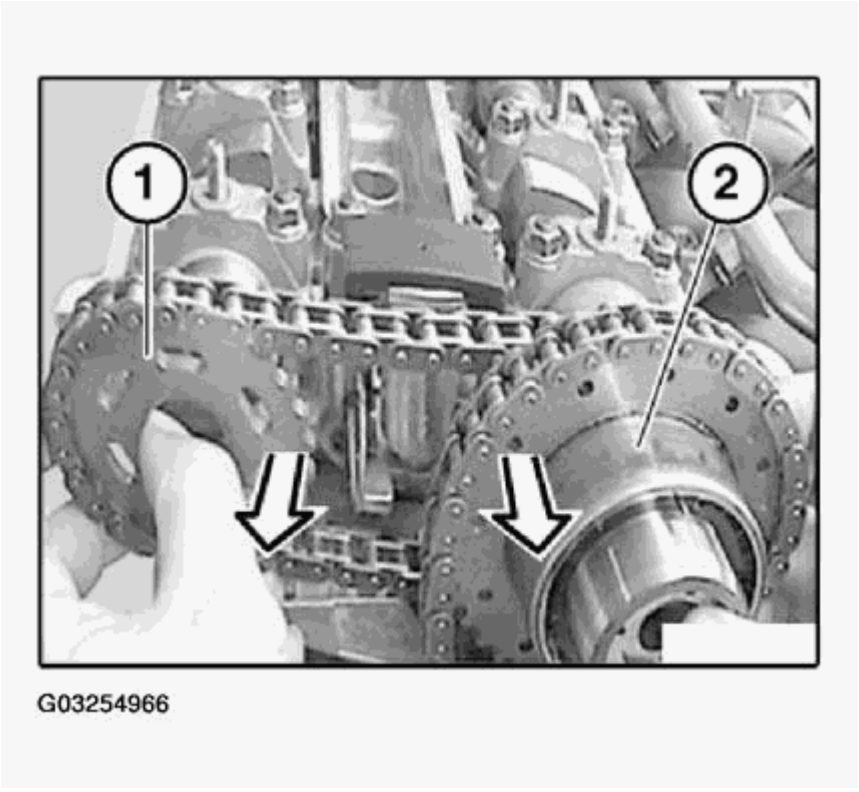


Fig. 519: Releasing Exhaust Sprocket And Camshaft Adjustment Unit From Camshafts (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Feed out timing chain (1) forwards over sprocket wheel of camshaft adjustment unit (2).

Feed out exhaust sprocket wheel with secondary chain and camshaft adjustment unit (2).

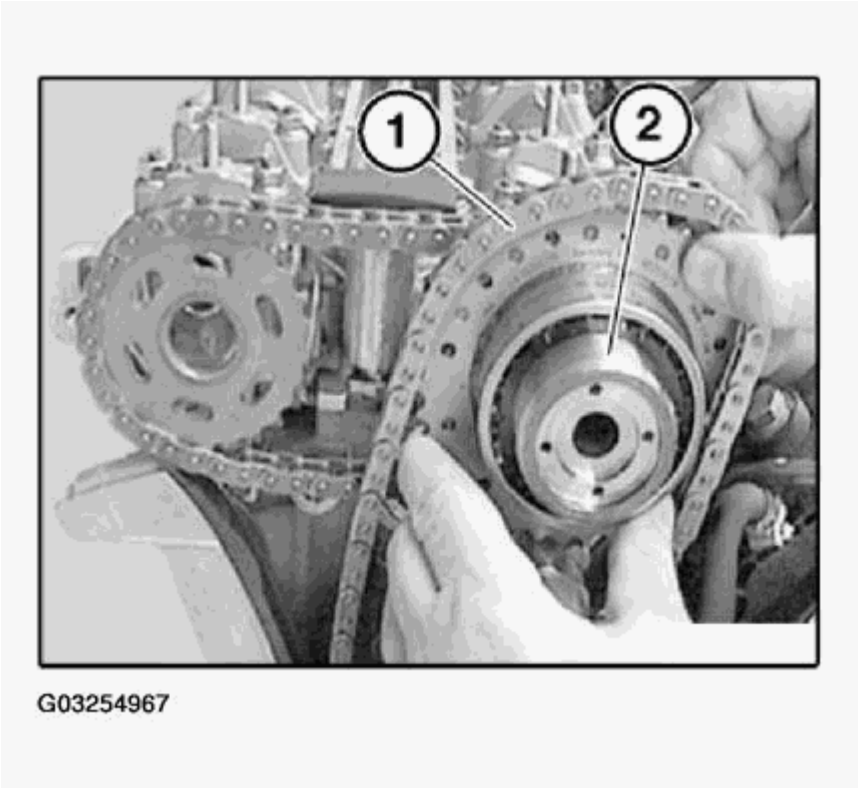


Fig. 520: Removing Timing Chain From Sprocket Wheel Of Camshaft Adjustment Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Installation of the right camshaft adjustment unit is described separately from removal. Assembly sequence for removal and installation is different.

Pull up timing chain, position camshaft adjustment unit (2) with exhaust sprocket wheel and fitted secondary chain and feed on timing chain (1) from front over sprocket wheel of camshaft adjustment unit (2).

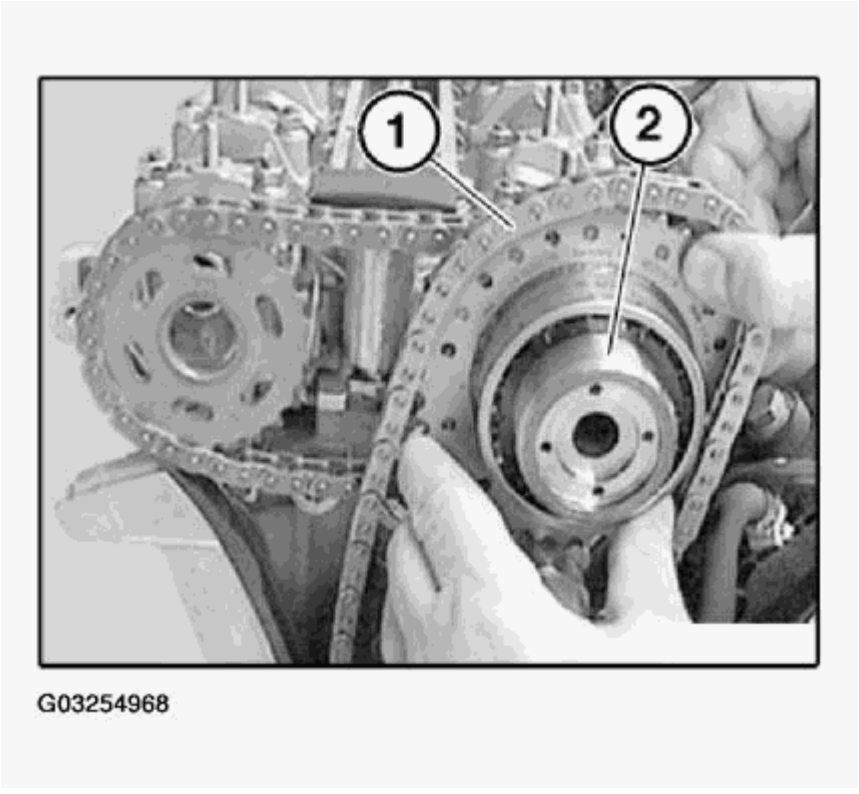


Fig. 521: Installing Timing Chain To Sprocket Wheel Of Camshaft Adjustment Unit
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The position of the elongated holes on the exhaust sprocket wheel is not assigned and can be freely selected.

The position of the camshaft adjustment unit (2) when feeding on the timing chain (1) is not assigned and can be freely selected.

Position exhaust sprocket wheel (1) and camshaft adjustment unit (2) on camshafts.

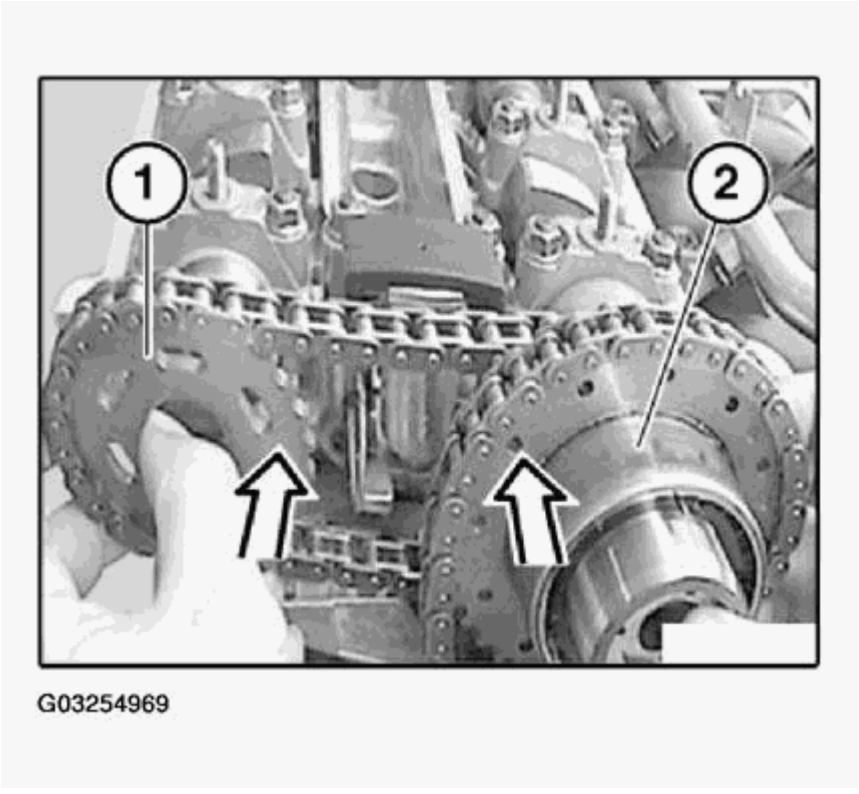


Fig. 522: Installing Exhaust Sprocket Wheel And Camshaft Adjustment Unit To Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Insert screws (1 and 2) on cylinder bank 1 to 4 and initially tighten without play, but do not tighten down yet.

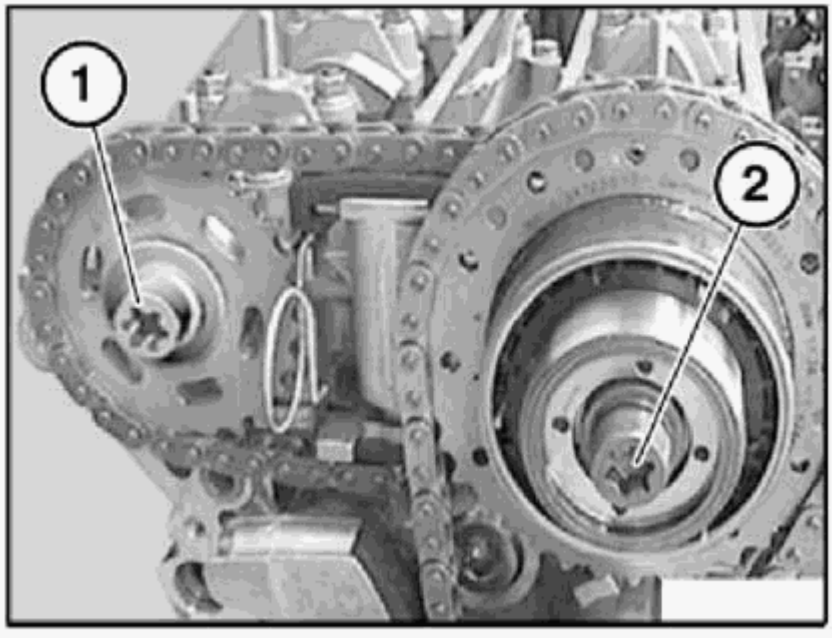


Fig. 523: Inserting Camshaft Screws (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Compress chain tensioner and remove special tool 11 3 310.



Fig. 524: Removing Special Tool 11 3 310
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 7 380 to right cylinder head on cylinder bank 1 to 4.

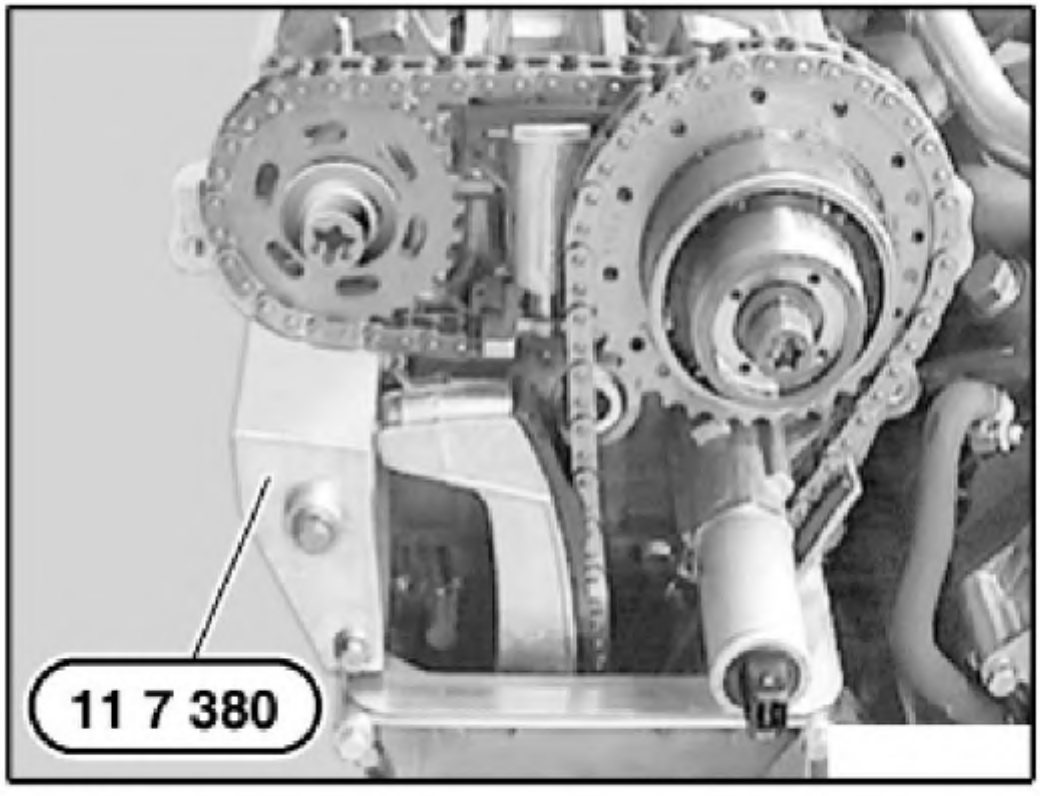


Fig. 525: Fitting Special Tool 11 7 380 To Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The special tool kit 11 3 390 can no longer be fitted in the E53 (X5) with M62 engine due to the altered space conditions.

With the market launch of the E53 (X5) with M62 engine, the special tool kit 11 3 390 is dropped.

The shorter special tool kit 11 4 230 comprising special tools 11 4 231 and 11 4 232 replaces the special tool kit 11 3 390.

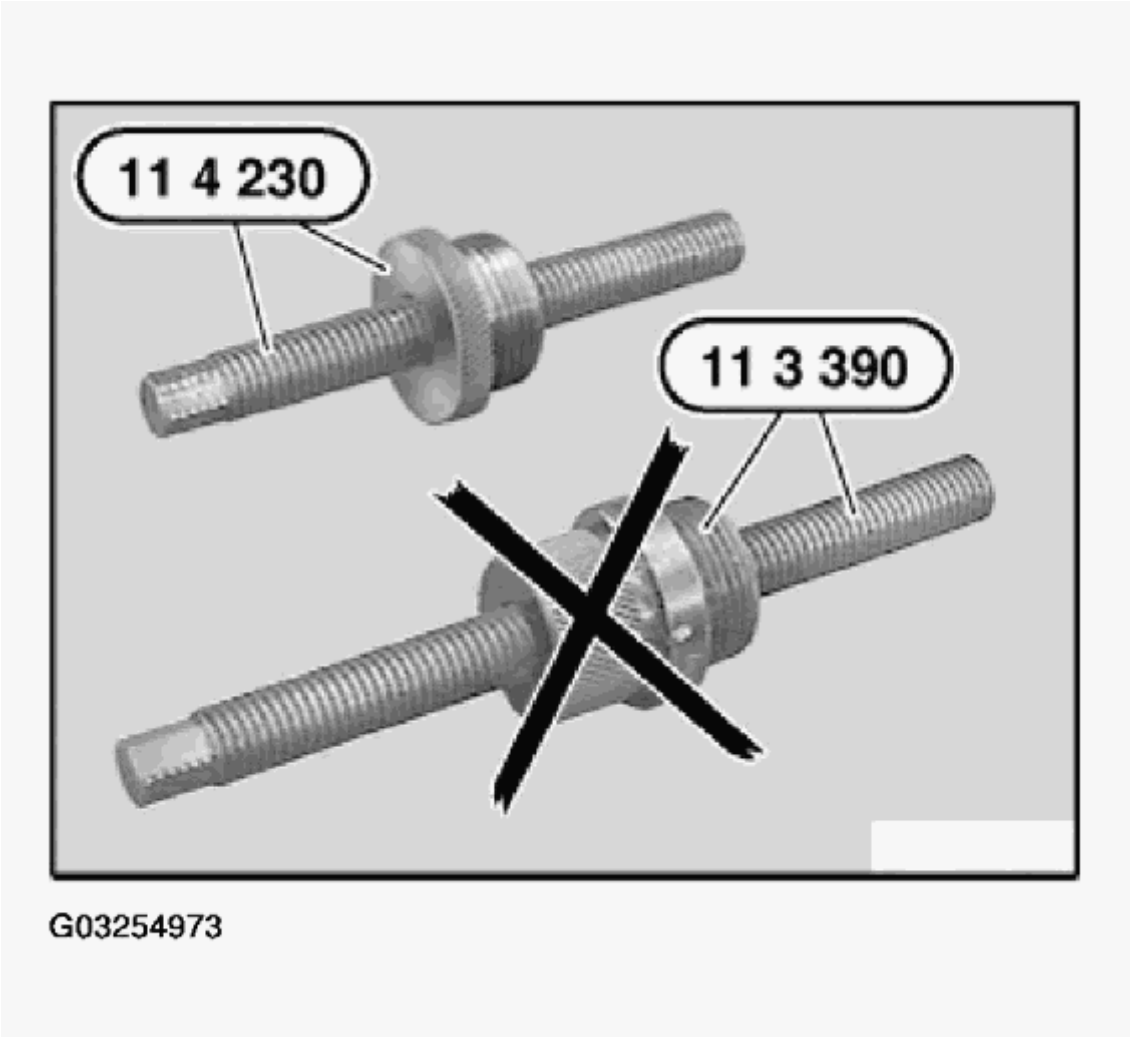


Fig. 526: Precautions When Using Special Tool Kit 11 3 390
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 4 230 in special tool 11 7 380.

Screw in adjustment screw on tensioning rail, but do not tighten yet.

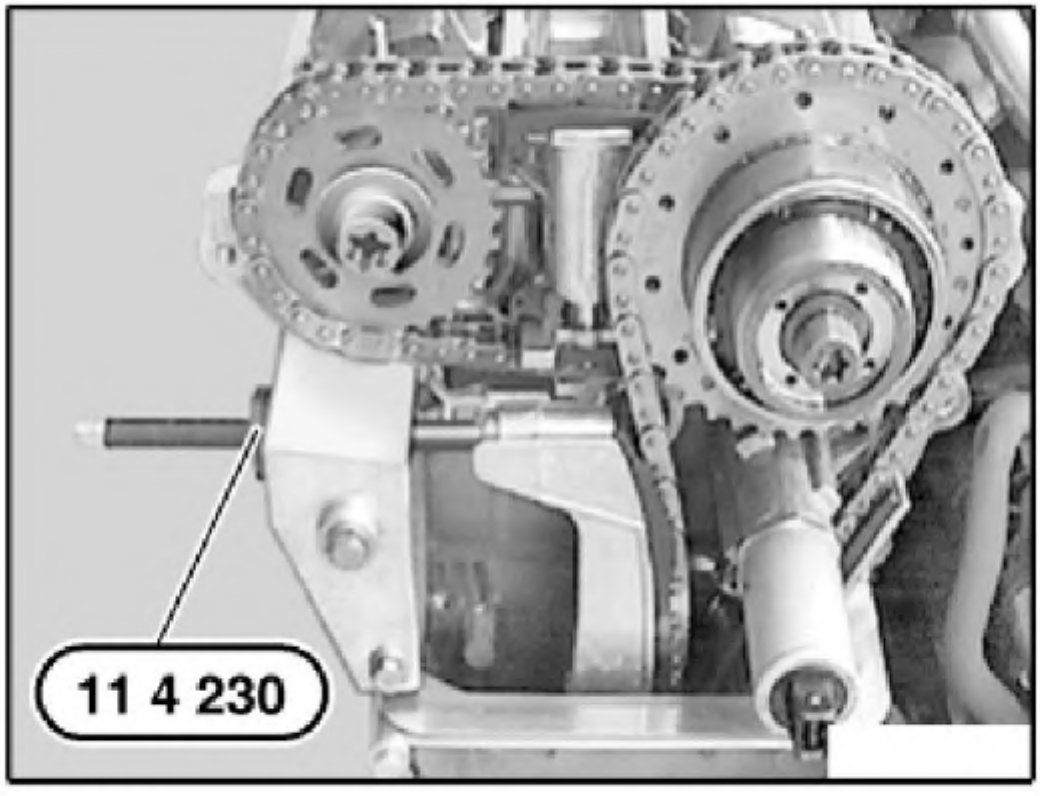


Fig. 527: Inserting Special Tool 11 4 230 In Special Tool 11 7 380
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.

Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 5 to 8.

Set multimeter to acoustic continuity test.

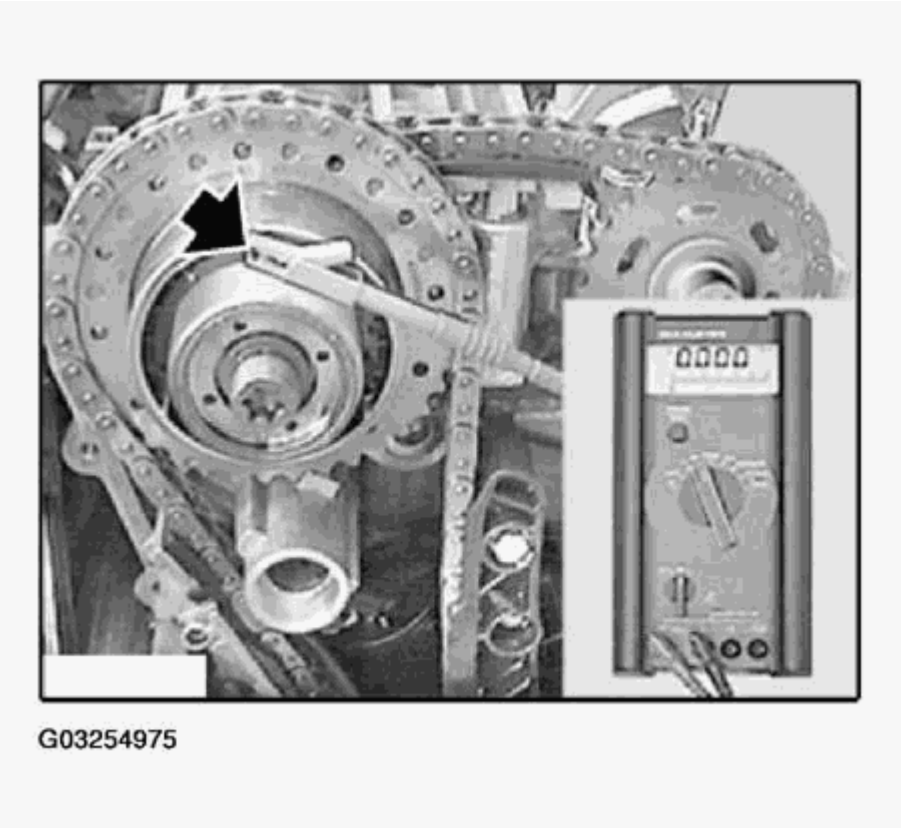


Fig. 528: Connecting Multimeter To Screw Connection On Oil Line (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

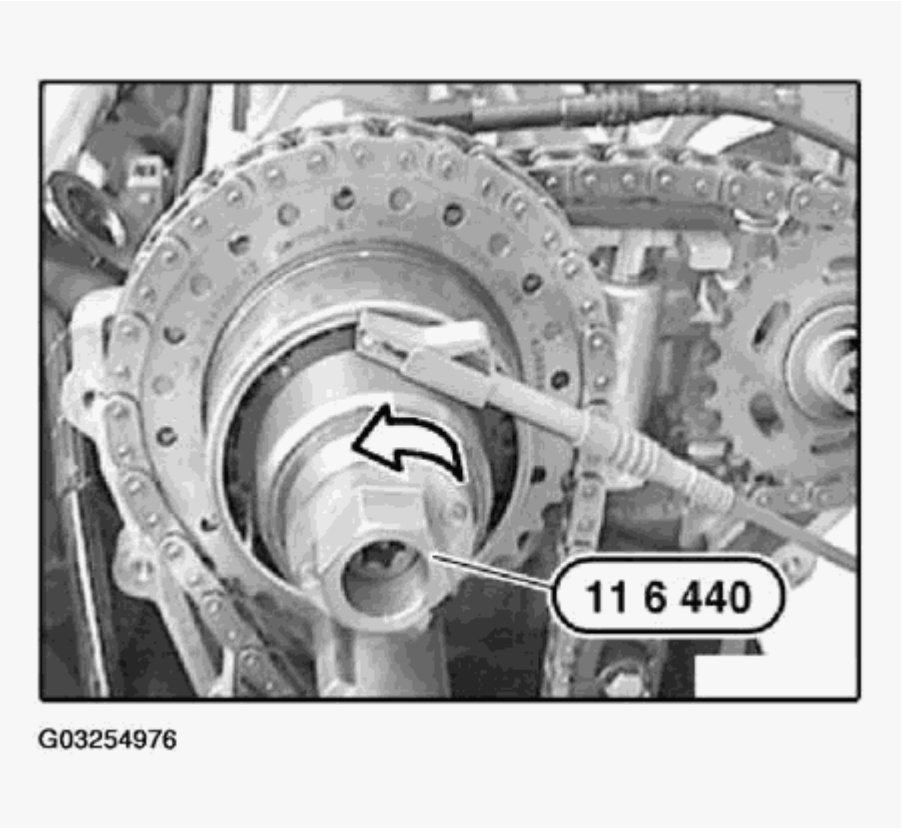


Fig. 529: Connecting Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Rotating the camshaft adjustment unit at 40 Nm to the left-hand stop ensures that the end position is reached and there is no longer an "oil cushion" before the left-hand stop of the camshaft adjustment unit.

In the camshaft adjustment unit, there are three contacts which are closed when the unit is at the left-hand stop.

During the acoustic continuity test with the multimeter, a sound signal can be heard when the camshaft adjustment unit is at the left-hand stop.

CAUTION: Left-hand threads.

Tighten screw connection (2) of inlet camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

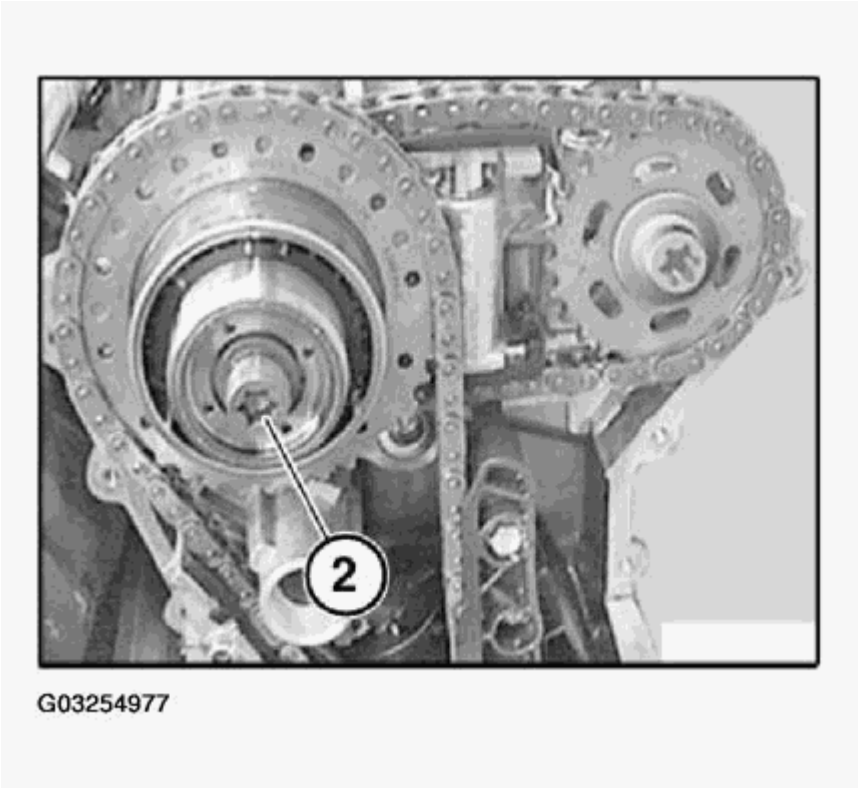


Fig. 530: Tightening Screw Connection Of Inlet Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (1) of exhaust camshaft on cylinder bank 5 to 8 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

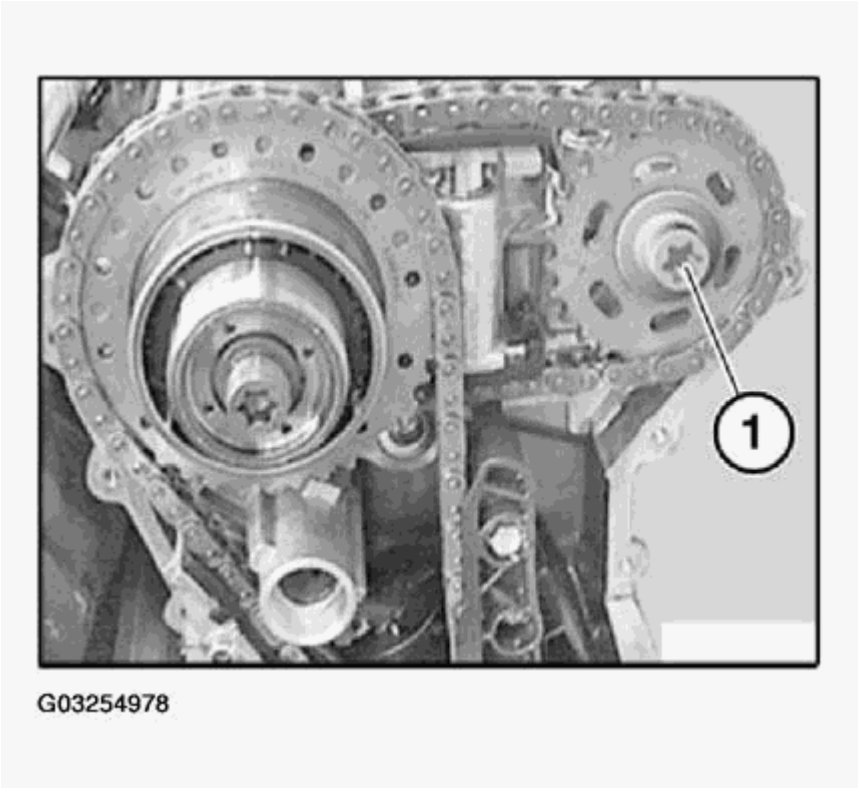


Fig. 531: Tightening Screw Connection Of Exhaust Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The continuity test with the multimeter described in the following is not possible on the M62 B46 because of the different design of the camshaft adjustment unit.

The remaining procedure is identical.

Connect a commercially available multimeter to a contact pin on camshaft adjustment unit and to the screw connection on oil line on cylinder bank 1 to 4.

Set multimeter to acoustic continuity test.



Fig. 532: Connecting Multimeter To Screw Connection On Oil Line (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

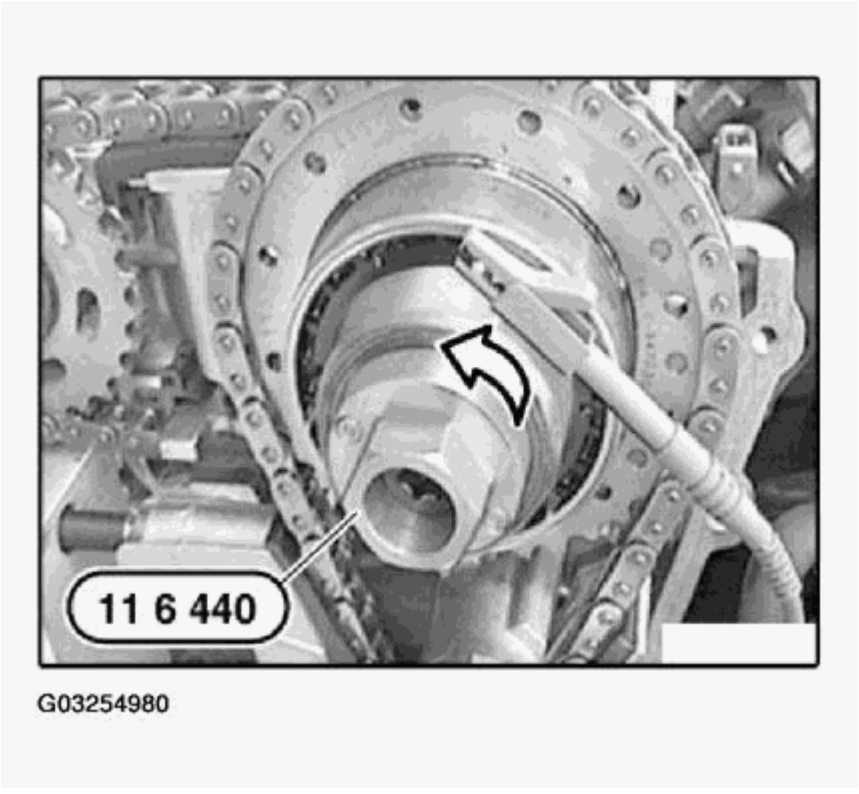


Fig. 533: Connecting Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (2) of inlet camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

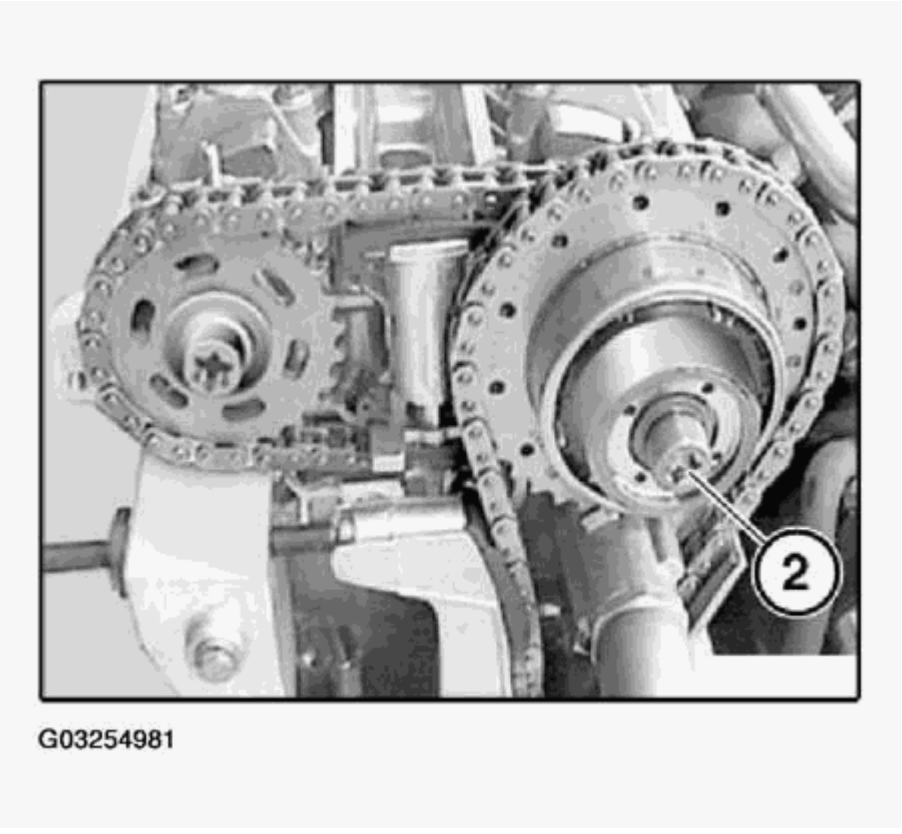


Fig. 534: Tightening Screw Connection Of Inlet Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten screw connection (1) of exhaust camshaft on cylinder bank 1 to 4 to an initial torque of 15 Nm and then slacken off again by a 1/4 turn.

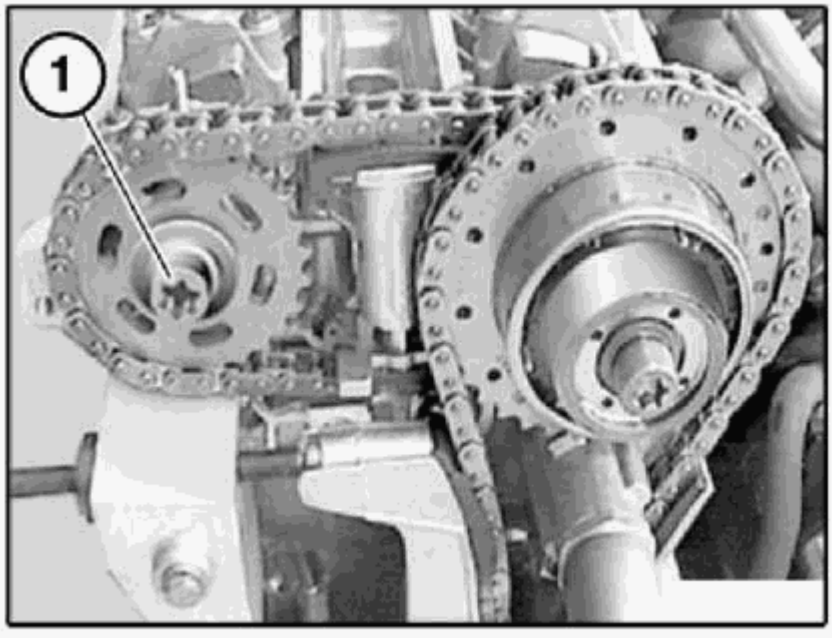


Fig. 535: Tightening Screw Connection Of Exhaust Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Pretension tensioning rail by turning adjusting screw on special tool 11 4 230 with special tool 00 9 250 to 0.7 Nm.

NOTE: If installation tolerance is unfavorable, attach special tool 00 9 250 from underside.

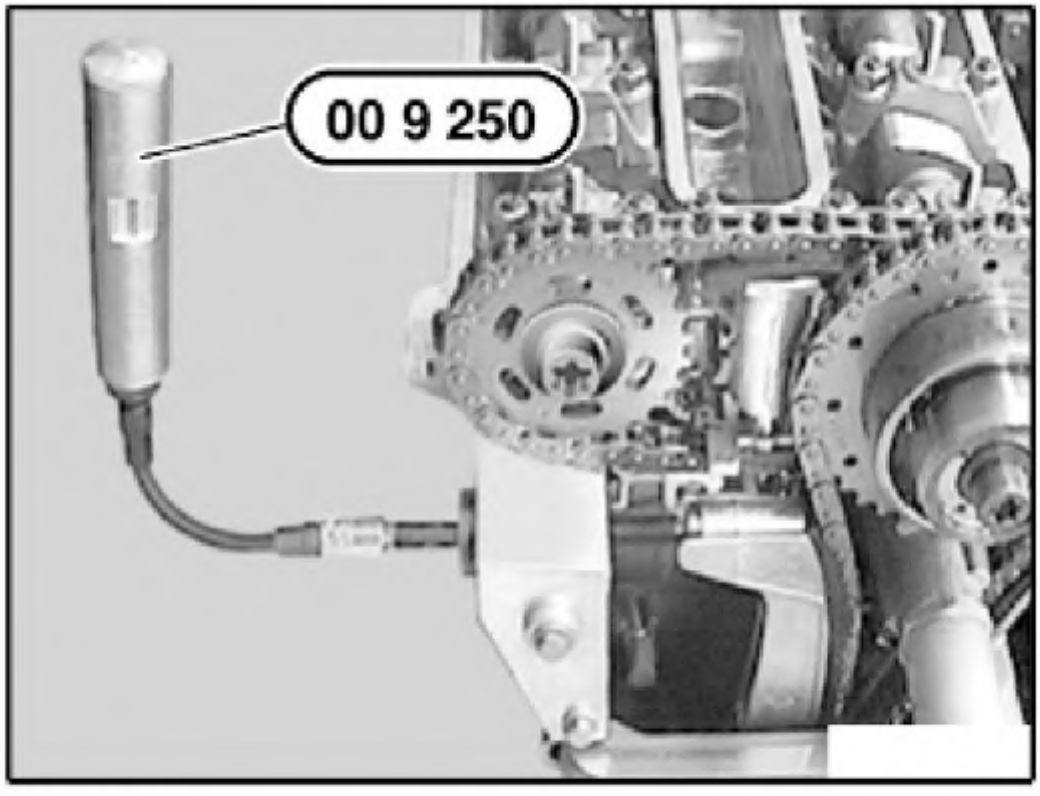


Fig. 536: Turning Adjusting Screw Using Special Tool 00 9 250
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Pretensioning the timing chain moves the camshaft adjustment unit and the unit must therefore be reset to the left-hand stop.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 5 to 8 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.



Fig. 537: Connecting Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not damage the cylinder head.

If necessary, machine open-end wrench accordingly.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

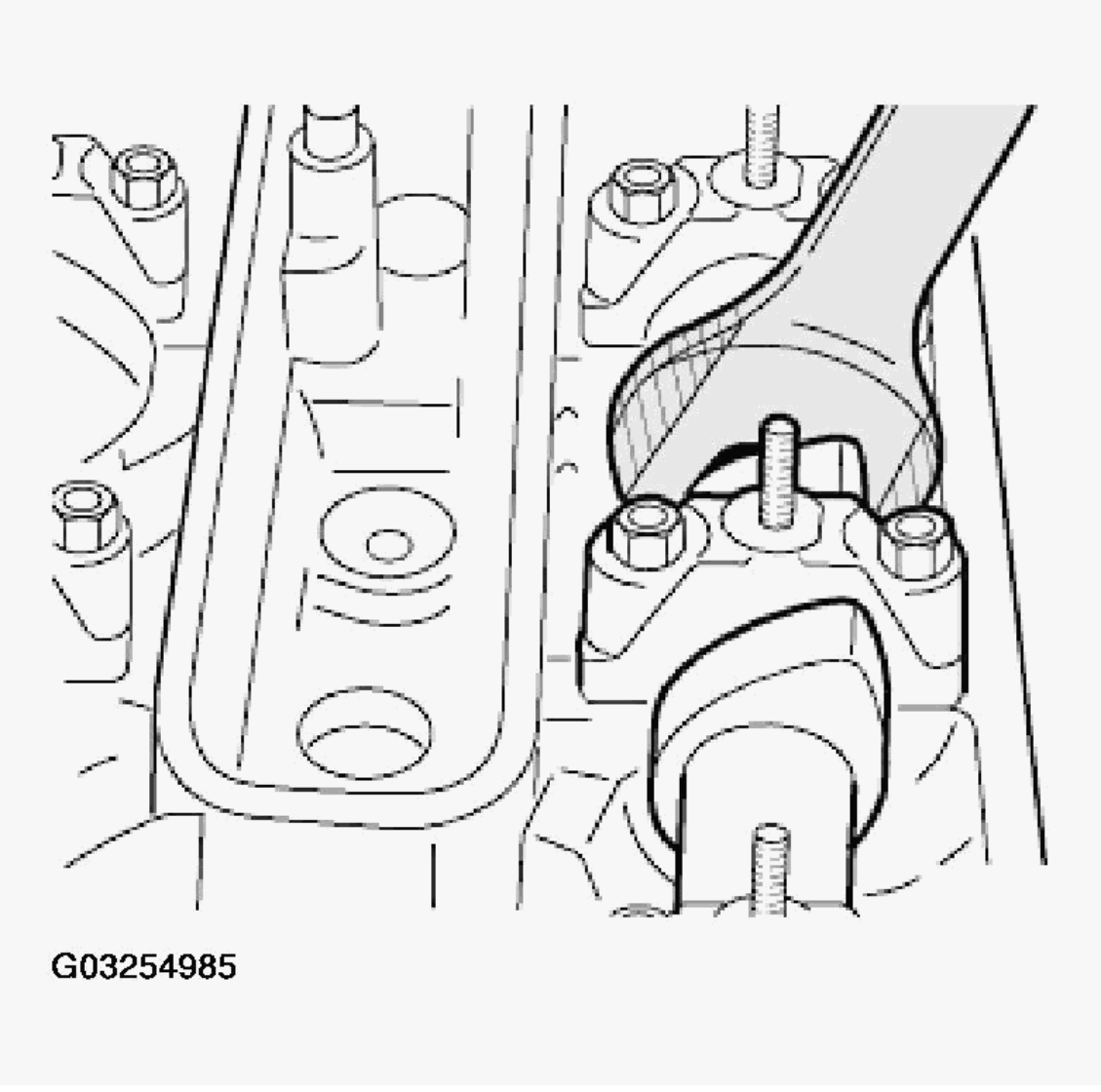


Fig. 538: Gripping Camshaft At Hexagon Head
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 5 to 8.

Tightening torque, see 11 36 14AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

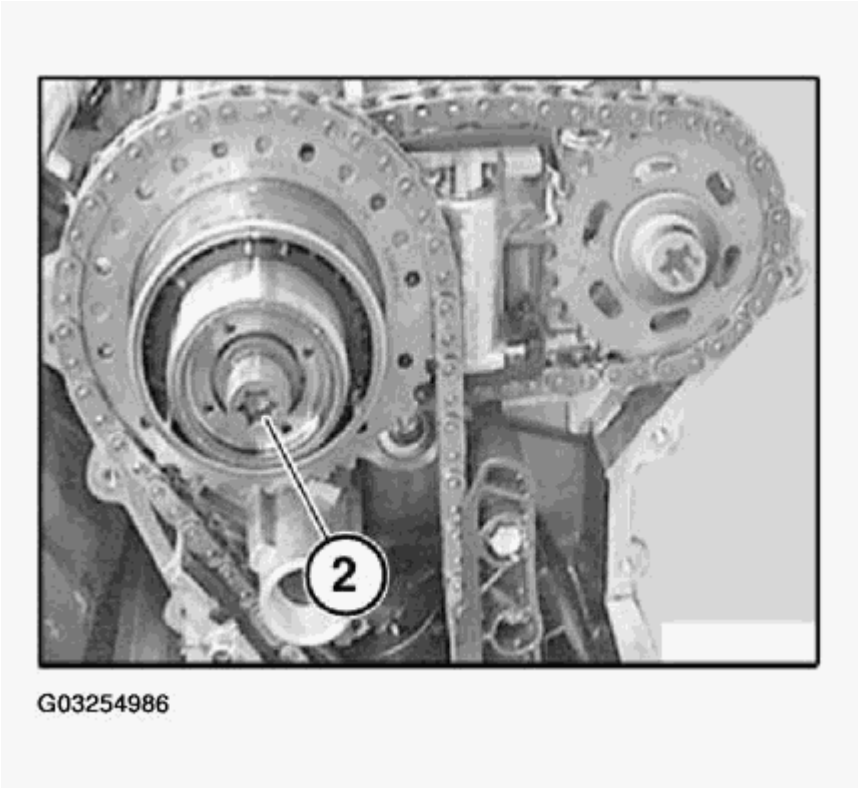


Fig. 539: Tightening Screw Connection Of Inlet Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 5 to 8.

Tightening torque, see 11 36 13AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

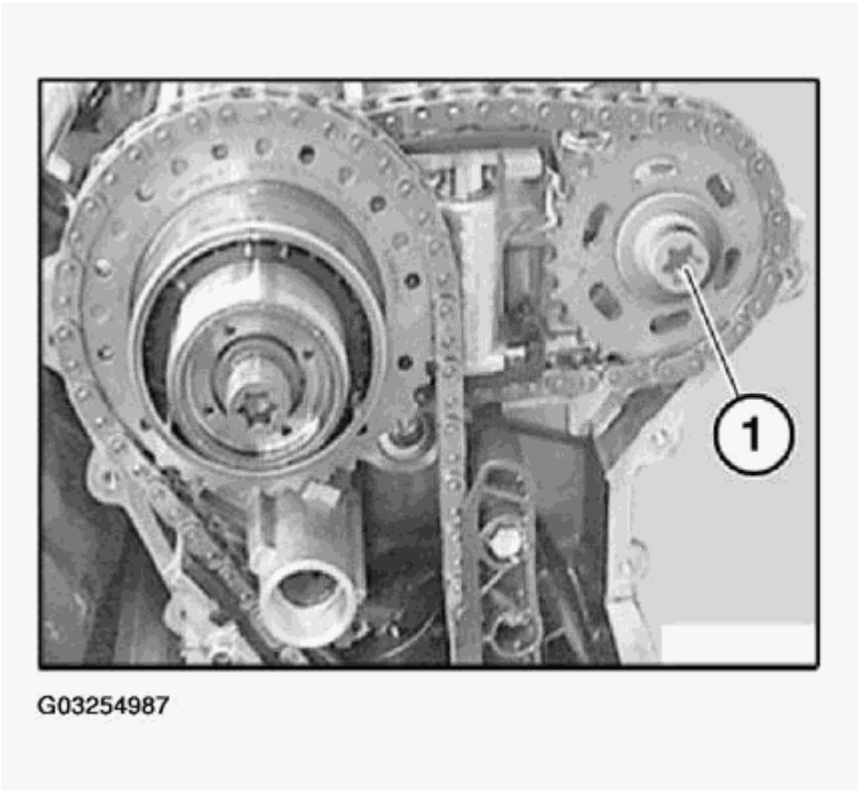


Fig. 540: Tightening Screw Connection Of Exhaust Camshaft (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 6 440 to camshaft adjustment unit on cylinder bank 1 to 4 and move at 40 Nm to left-hand stop.

Check left-hand stop of camshaft adjustment unit with acoustic continuity test on multimeter.

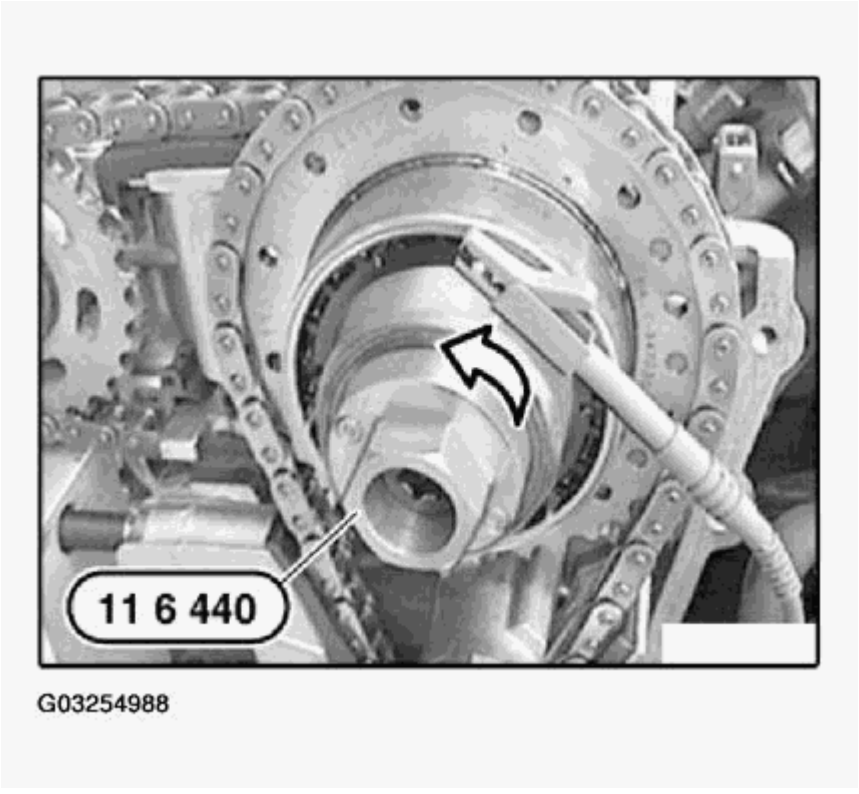


Fig. 541: Connecting Special Tool 11 6 440 To Camshaft Adjustment Unit (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (2) of inlet camshaft on cylinder bank 1 to 4.

Tightening torque, see 11 36 14AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

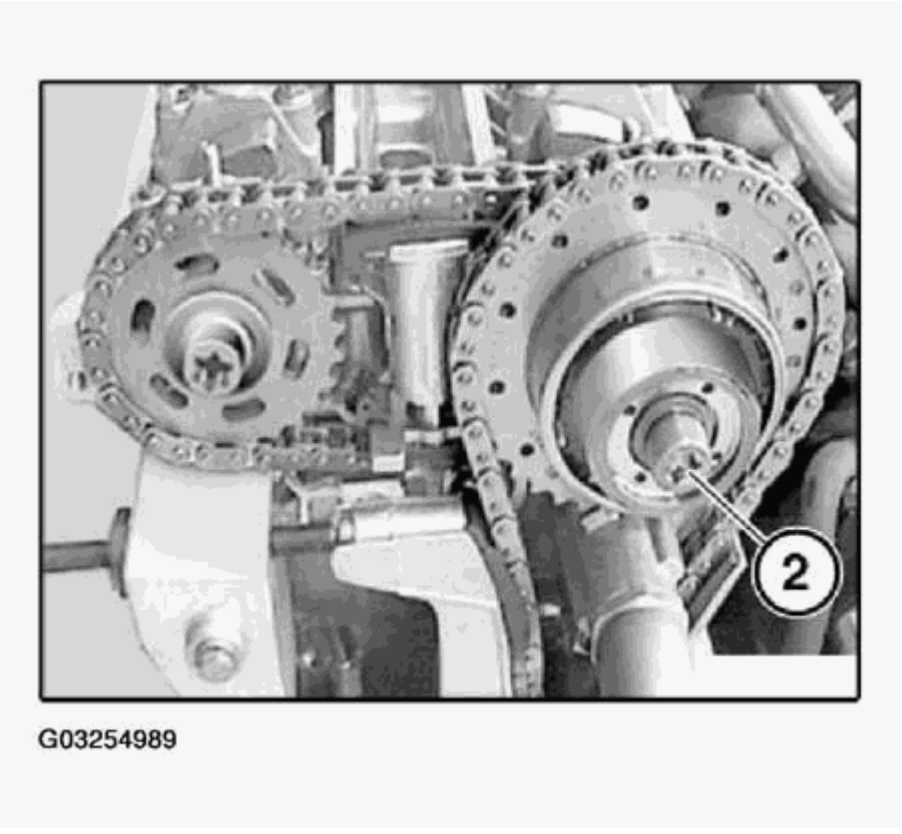


Fig. 542: Tightening Screw Connection Of Inlet Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

When tightening down camshaft screw connection: grip camshaft at hexagon head.

Tighten down screw connection (1) of exhaust camshaft on cylinder bank 1 to 4.

Tightening torque, see 11 36 13AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

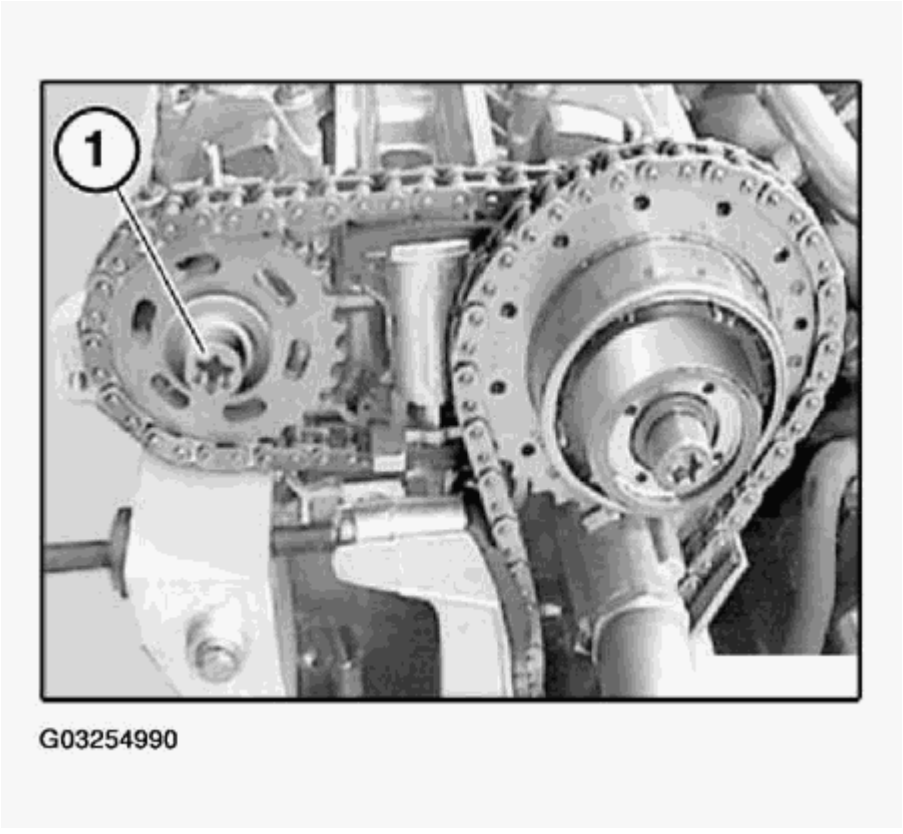


Fig. 543: Tightening Screw Connection Of Exhaust Camshaft (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach sensor gear (2) to cylinder bank 1 to 4.

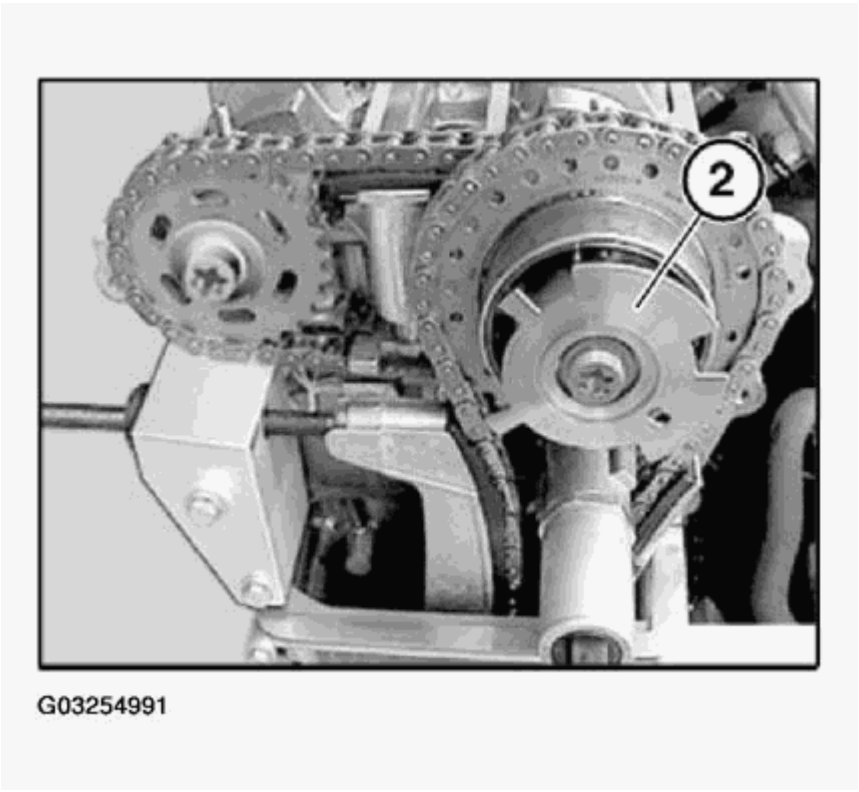


Fig. 544: Connecting Sensor Gear To Cylinder Bank 1 To 4
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 1 to 4 and initially tighten without play, but do not tighten down yet.

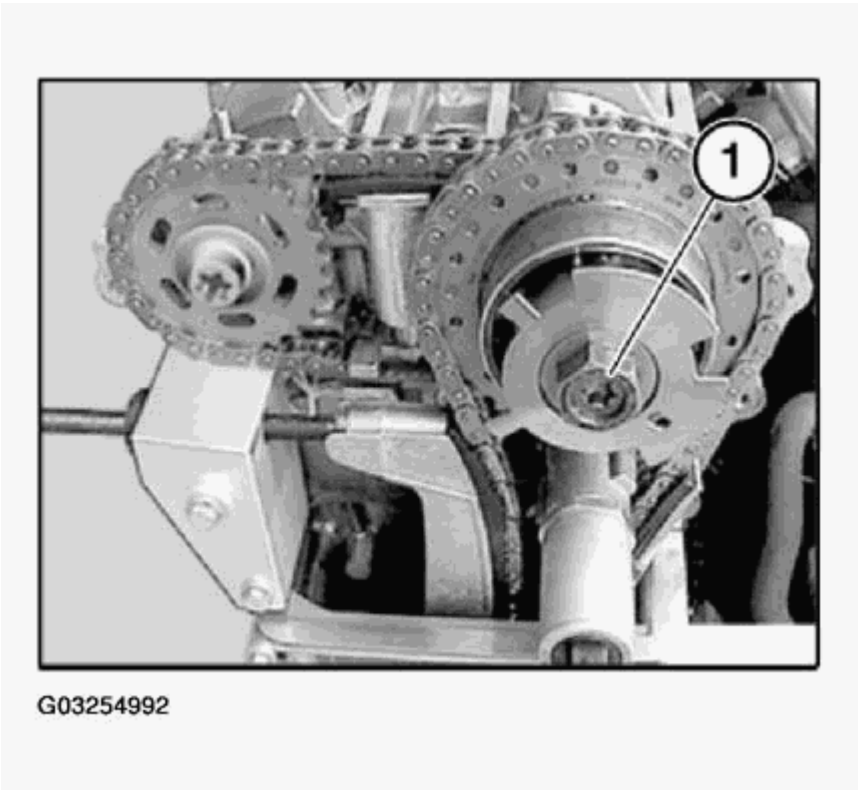


Fig. 545: Fitting Nut Of Sensor Gear Screw Connection (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

Align locating bore (1) on sensor gear of cylinder bank 1 to 4 to positioning pin on special tool 11 6 451. Fit special tool 11 6 451, insert screws and initially tighten without play. Press special tool 11 6 451 downwards and align to cylinder head. Tighten down special tool 11 6 451.

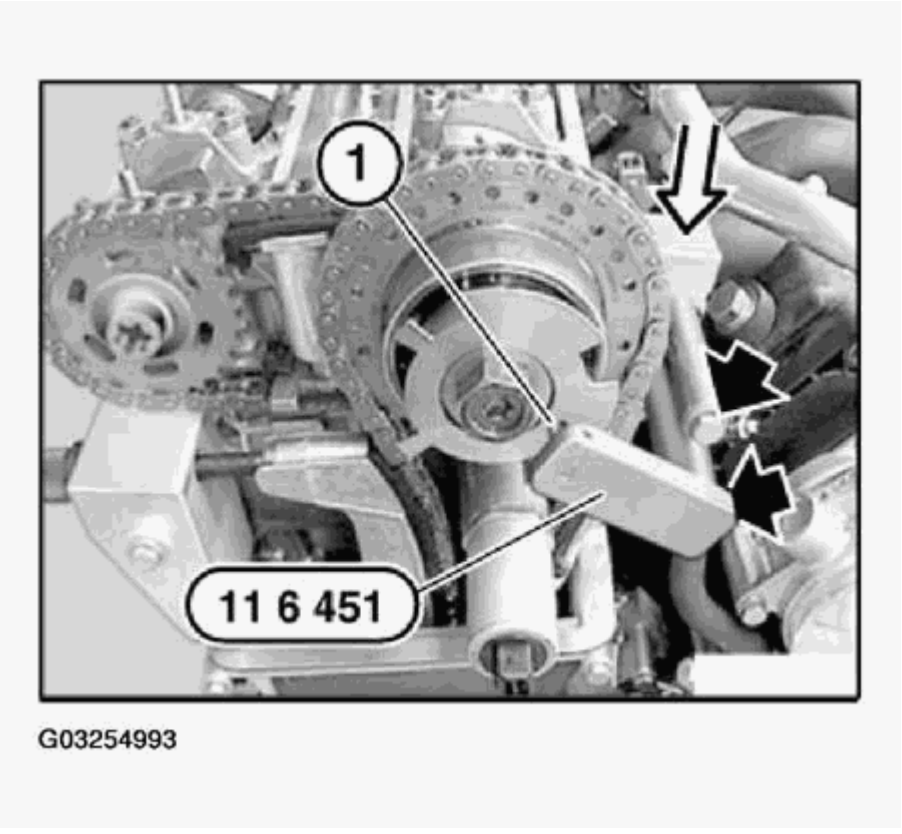


Fig. 546: Aligning Locating Bore On Sensor Gear (Cylinder Bank 1 To 4) To Positioning Pin On Special Tool 11 6 451
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.

Tightening torque, see 11 36 15AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

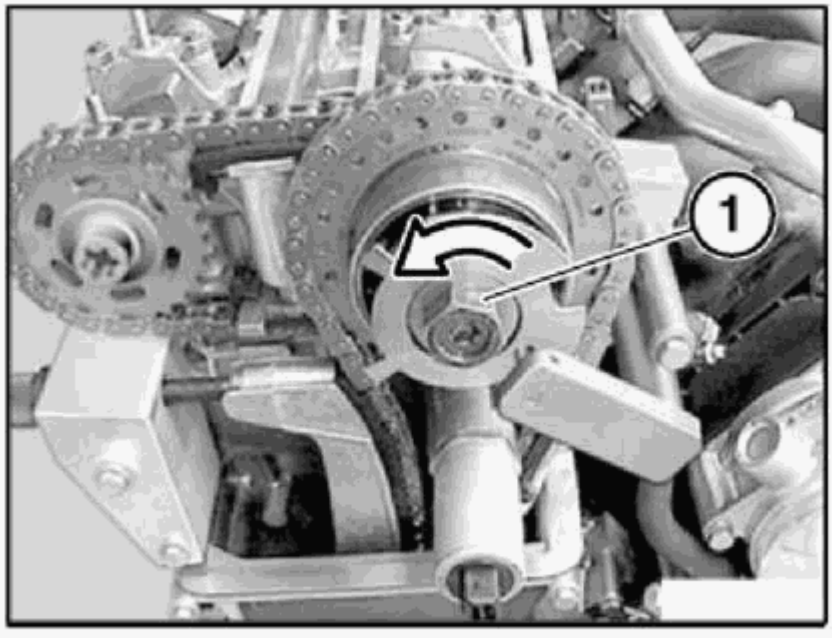


Fig. 547: Tightening Nut On Sensor Gear Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 6 451 from right cylinder head on cylinder bank 1 to 4.

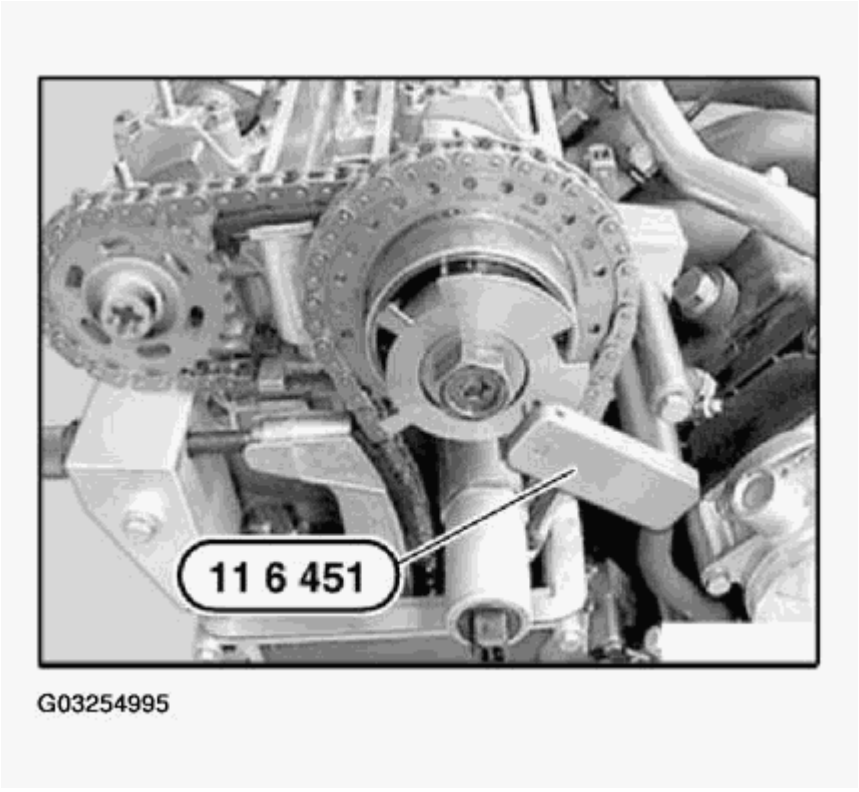


Fig. 548: Removing Special Tool 11 6 451 From Right Cylinder Head (Cylinder Bank 1 To 4)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach sensor gear (2) to cylinder bank 5 to 8.

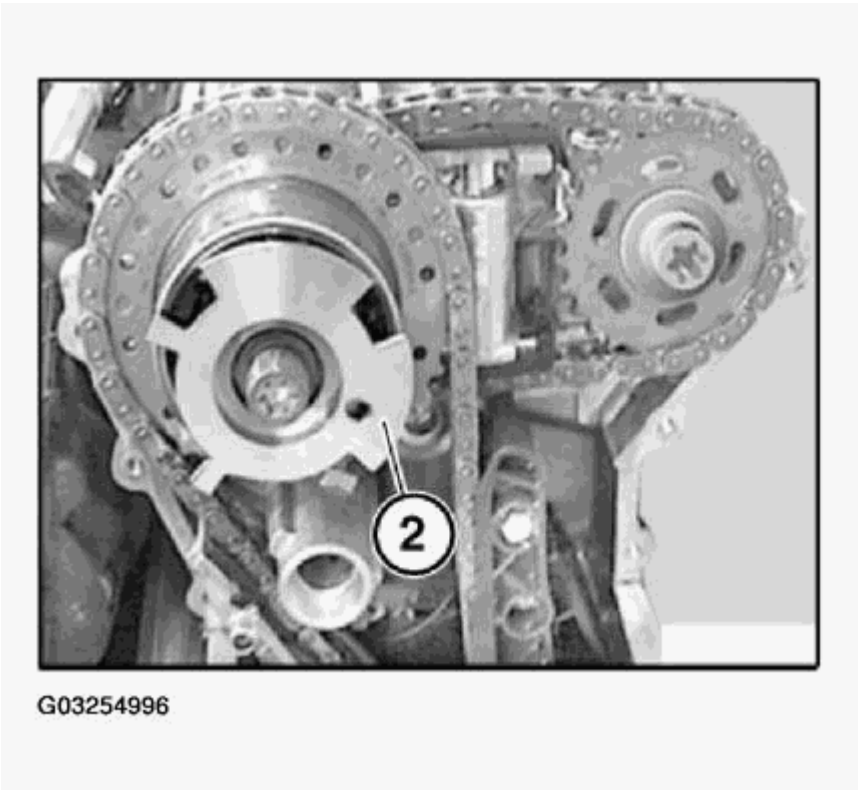


Fig. 549: Connecting Sensor Gear (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Fit nut (1) of sensor gear screw connection on cylinder bank 5 to 8 and initially tighten without play, but do not tighten down yet.

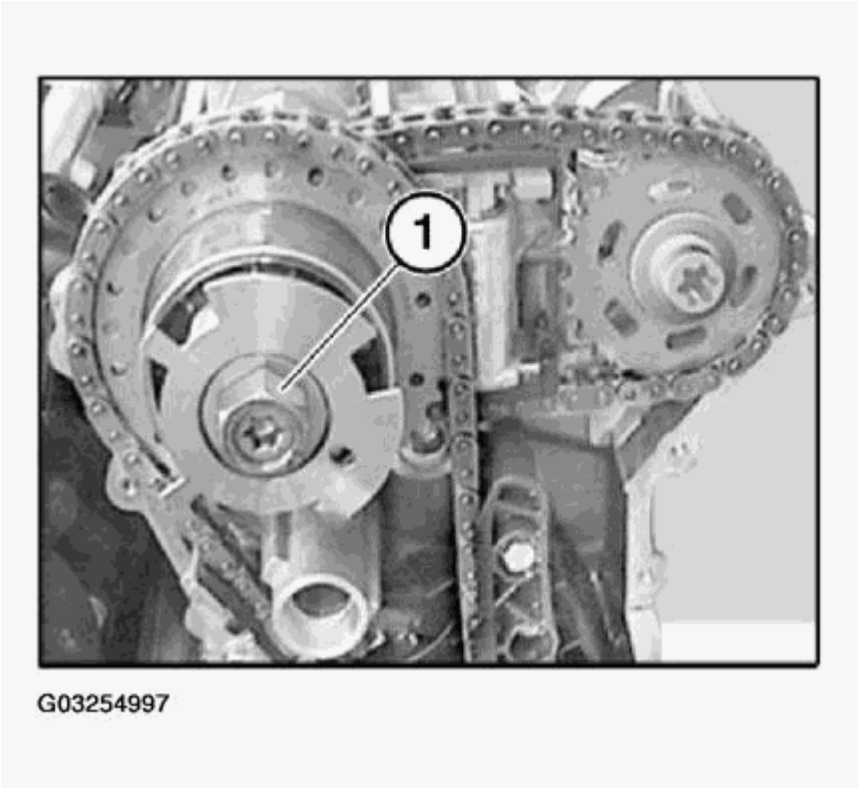


Fig. 550: Fitting Nut Of Sensor Gear Screw Connection (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Special tool kit 11 6 450 comprises:

Special tool 11 6 451 for cylinder bank 1 to 4

Special tool 11 6 452 for cylinder bank 5 to 8

Align locating bore (1) on sensor gear of cylinder bank 5 to 8 to positioning pin on special tool 11 6 452. Fit special tool 11 6 452, insert screws and initially tighten without play. Press special tool 11 6 452 downwards and align to cylinder head. Tighten down special tool 11 6 452.

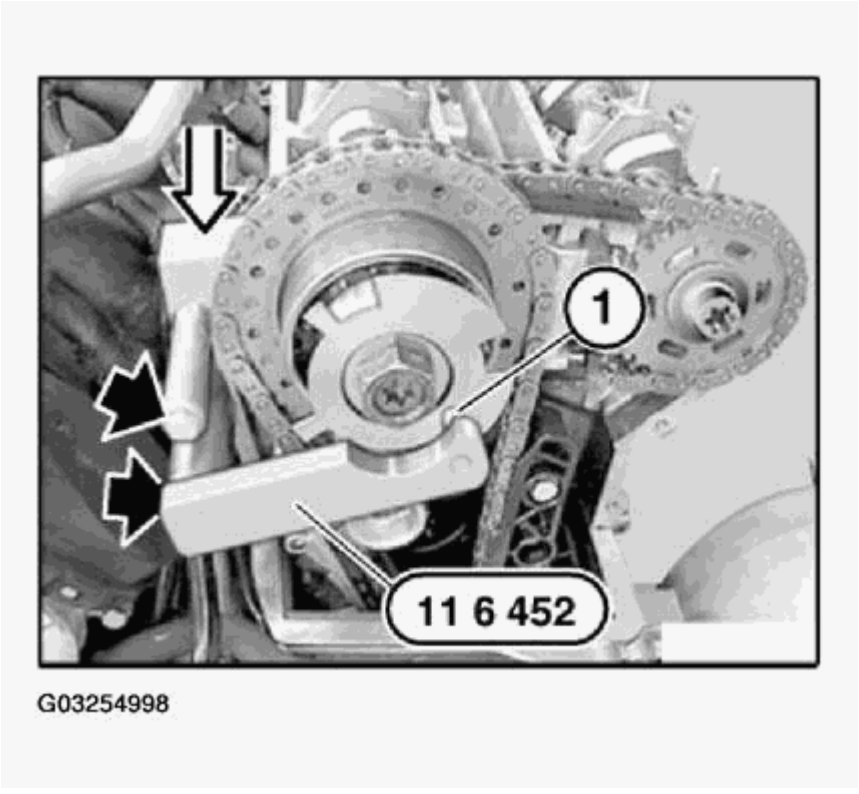


Fig. 551: Aligning Locating Bore On Sensor Gear (Cylinder Bank 5 To 8) To Positioning Pin On Special Tool 11 6 452
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Left-hand threads.

Tighten down nut (1) on sensor gear screw connection.

Tightening torque, see 11 36 15AZ in .**ENGINE - TIGHTENING TORQUES - X5 4.6L** .

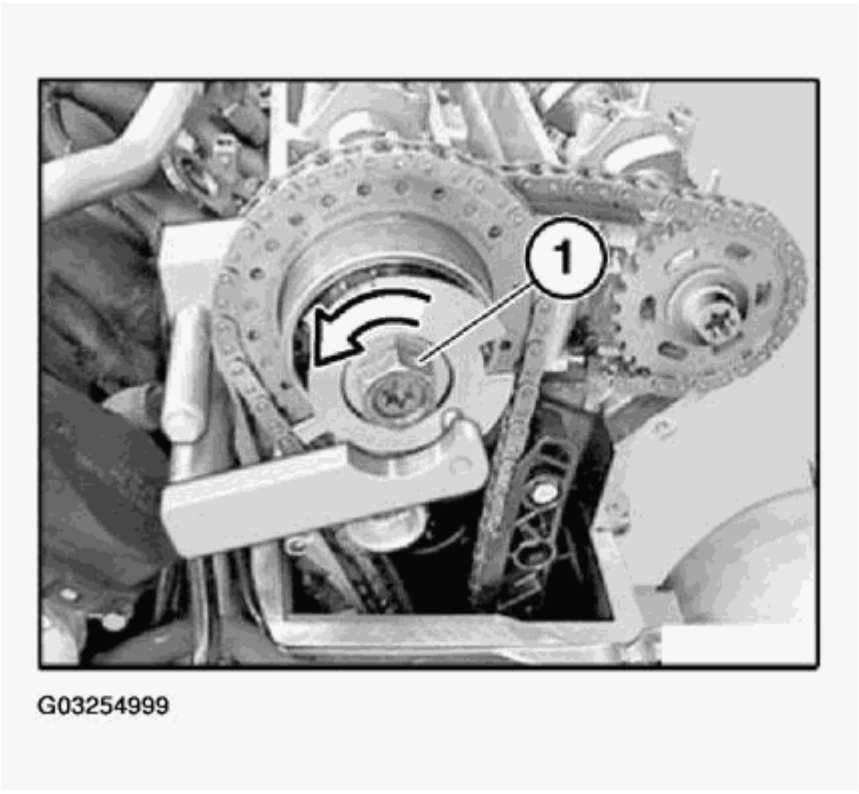


Fig. 552: Tightening Nut On Sensor Gear Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 6 452 from left cylinder head on cylinder bank 5 to 8.

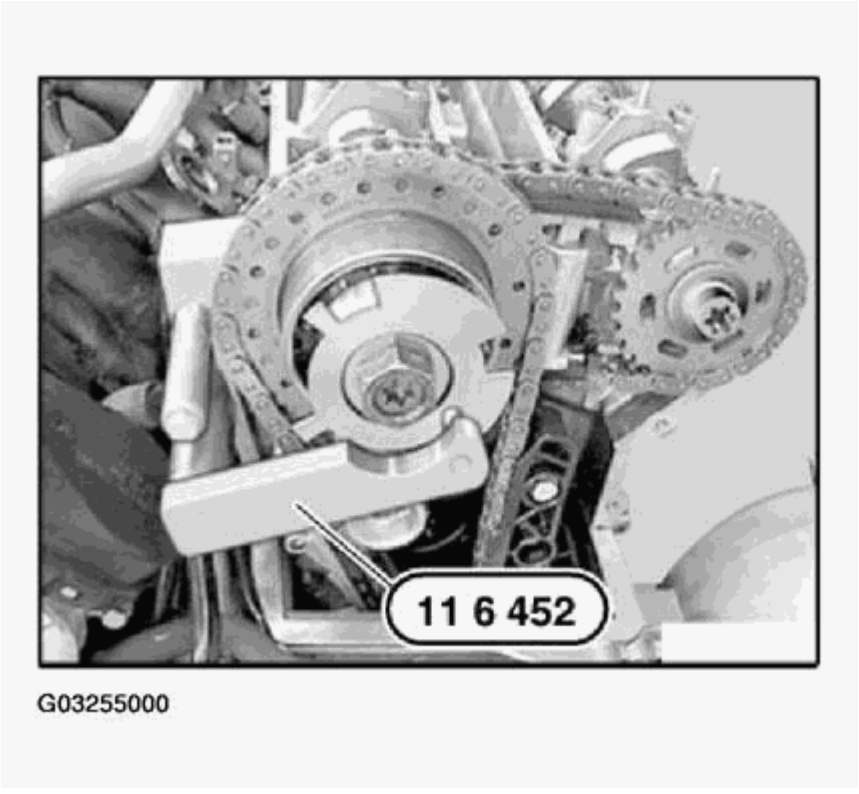


Fig. 553: Removing Special Tool 11 6 452 From Left Cylinder Head (Cylinder Bank 5 To 8)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/11 2 443/11 2 445/11 2 441.

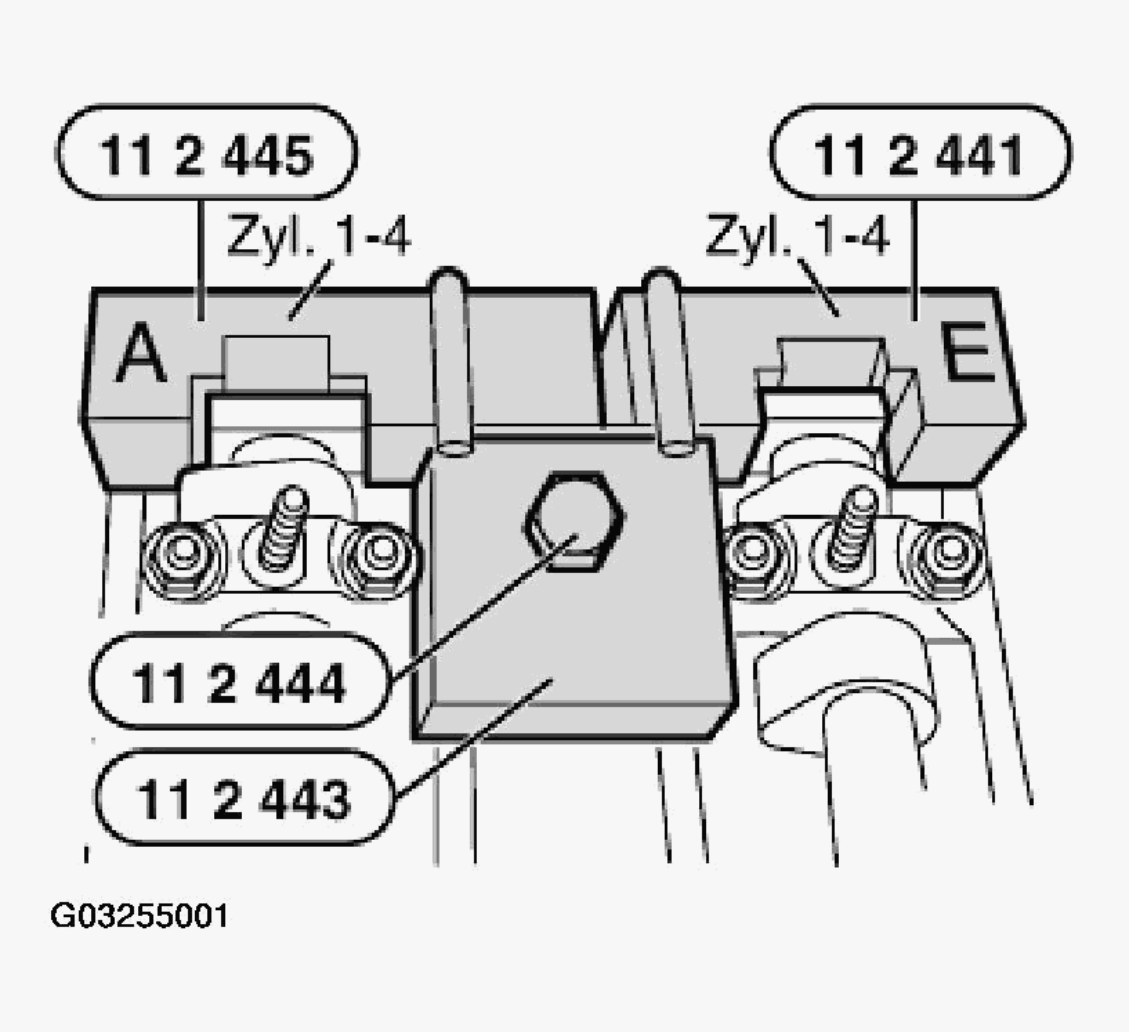


Fig. 554: Removing Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tools 11 2 444/11 2 443/11 2 442/11 2 446.

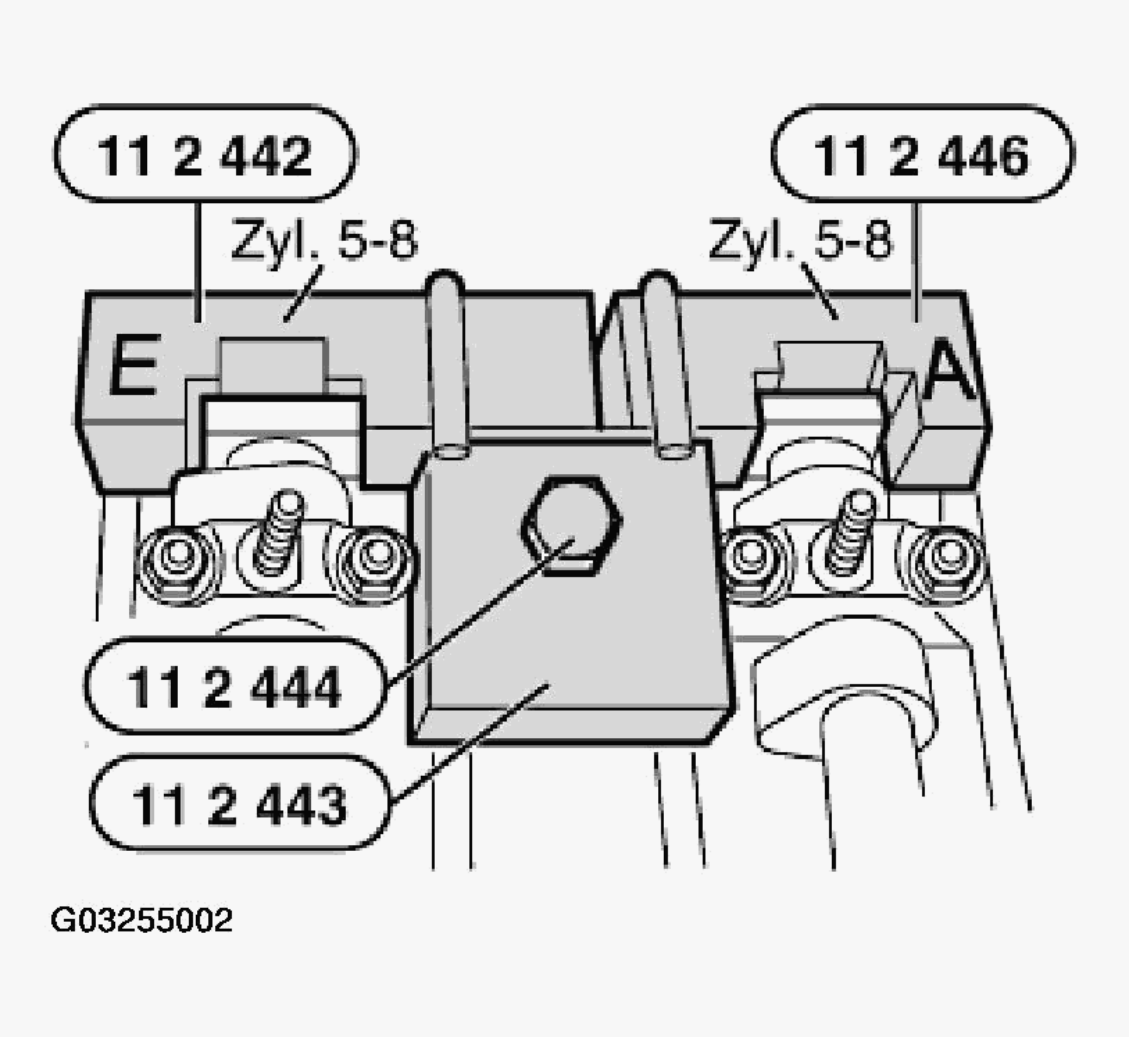


Fig. 555: Removing Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on special tool 11 4 230.

Remove special tool 11 7 380 from right cylinder head on cylinder bank 1 to 4.

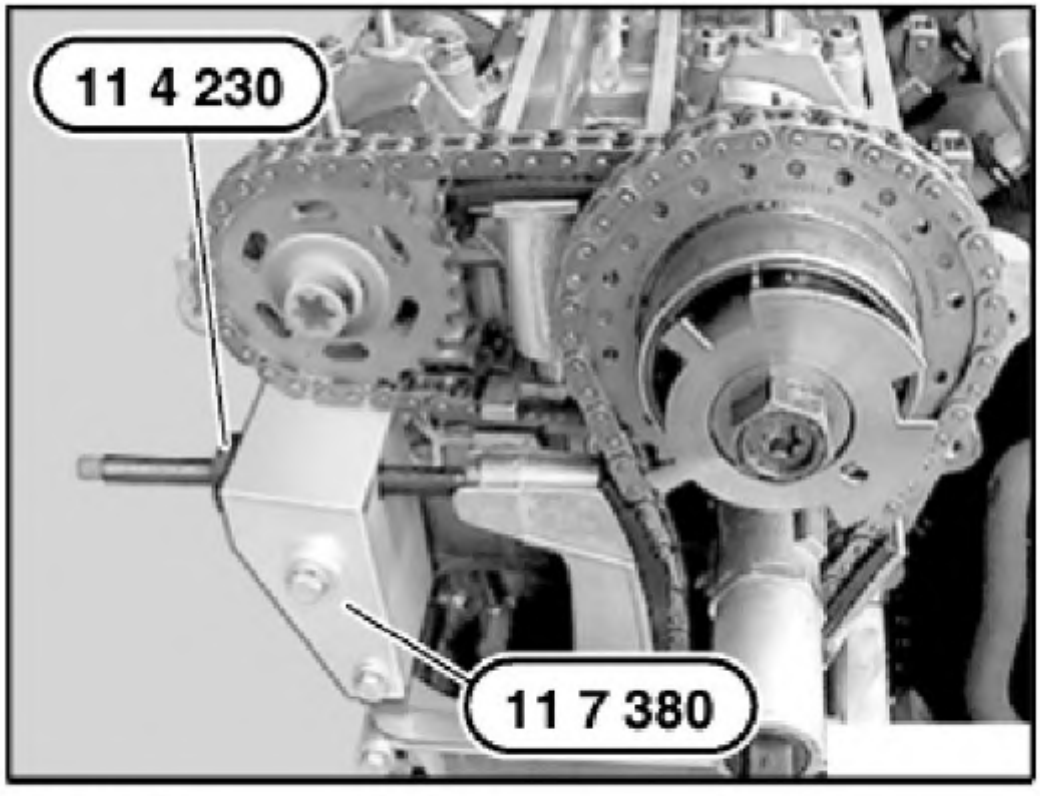


Fig. 556: Removing Specials Tool 11 4 230 And 11 7 380
Courtesy of BMW OF NORTH AMERICA, INC.

Install oil lines on left and right of cylinder head.

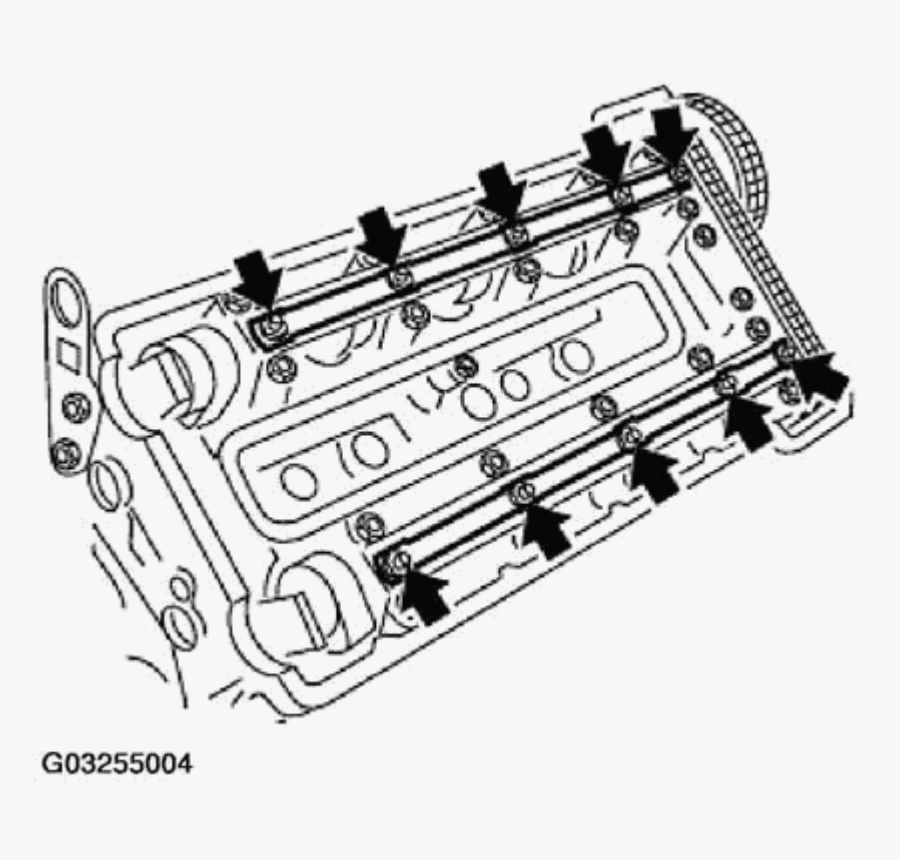


Fig. 557: Installing Oil Lines On Left And Right Of Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Install both timing case covers at top.

Install chain tensioning piston.

Install both cylinder head covers.

E53 (X5)

Remove special tool 11 5 180.

Assemble engine.

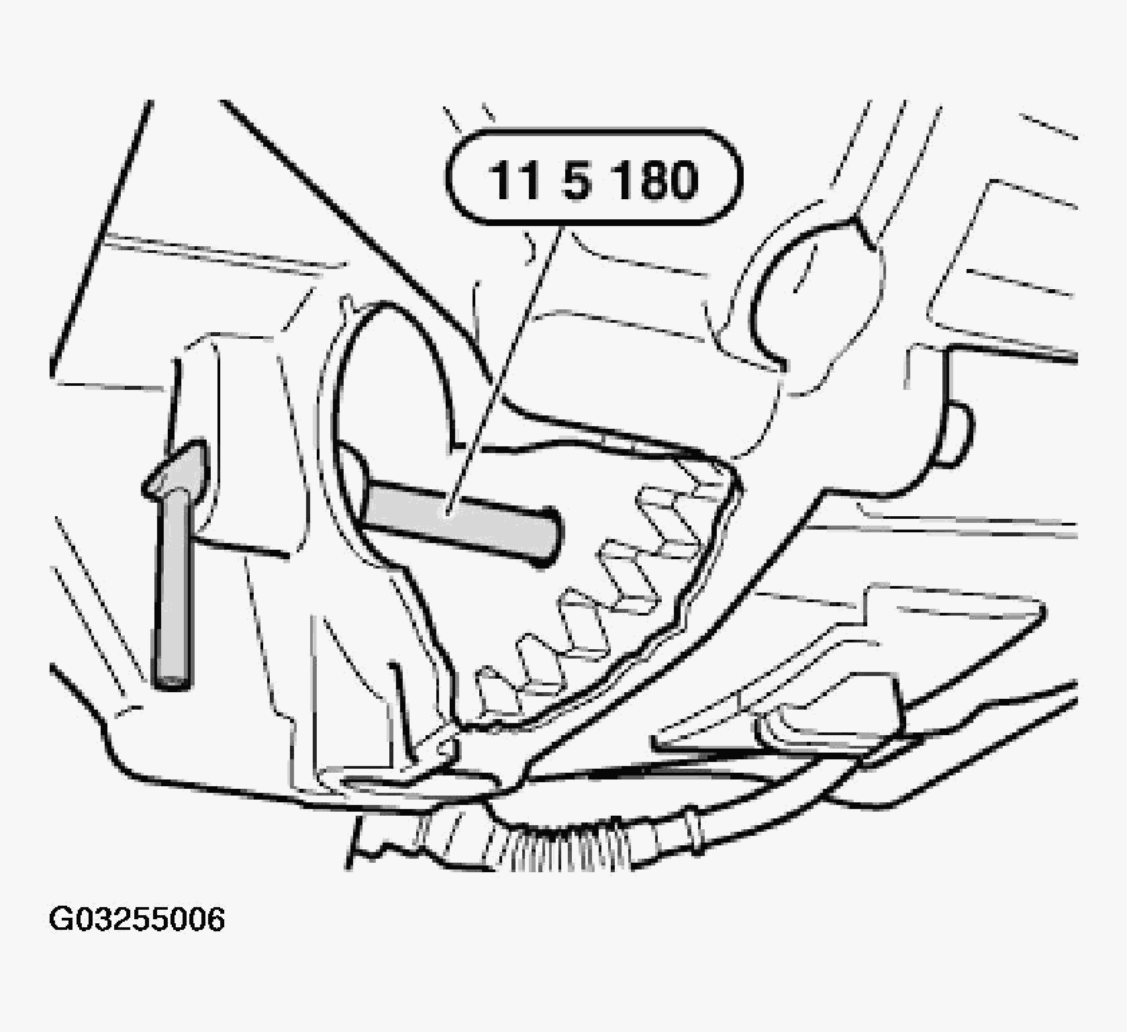


Fig. 558: Removing Special Tool 11 5 180
Courtesy of BMW OF NORTH AMERICA, INC.

11 36 630 REMOVING AND INSTALLING/REPLACING DISTRIBUTOR ON LEFT CAMSHAFT ADJUSTMENT UNIT (M62 VANOS FROM 9/98)

Removal

Removal of the camshaft adjustment unit distributor is described separately from installation.

Remove left camshaft adjustment unit,

refer to **11 36 610 REMOVING AND INSTALLING/REPLACING LEFT CAMSHAFT ADJUSTMENT UNIT (M62 VANOS FROM 9/98)** .

Feed timing chain out of camshaft adjustment unit distributor.

Secure timing chain to prevent it from sliding down.

NOTE: Screw (1) with sealing ring.

Release screws on camshaft adjustment unit distributor.

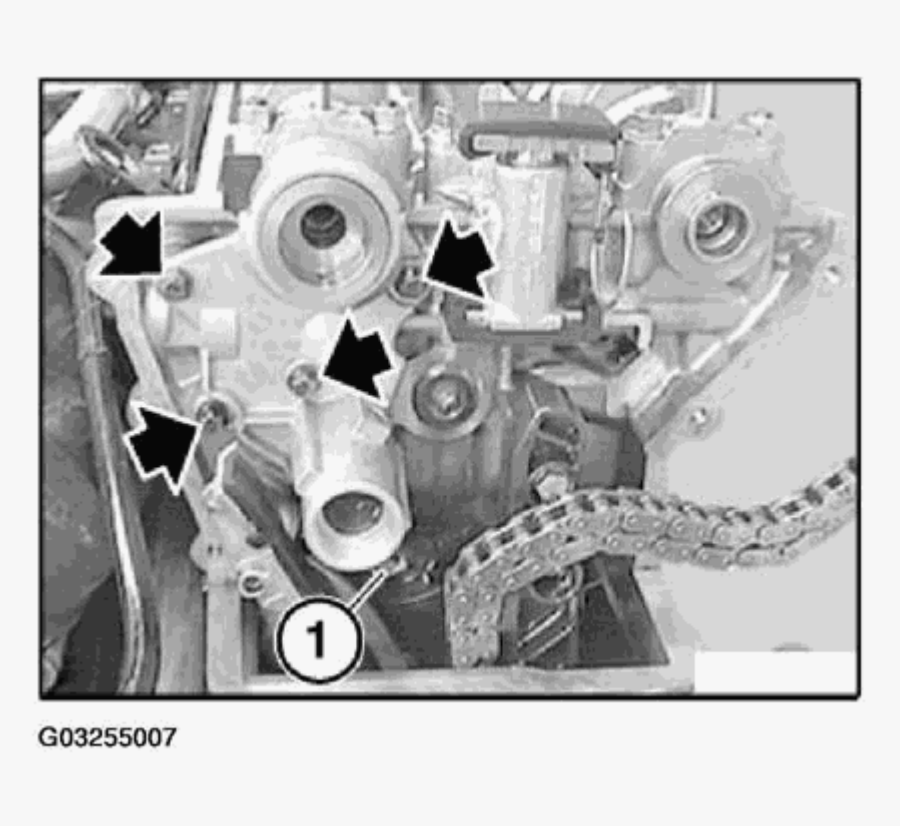


Fig. 559: Removing Camshaft Adjustment Unit Distributor Screws (Left Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If the camshaft adjustment unit distributor and the seal (three plain compression rings) are worn, the removal operation may be awkward.

By moving it back and forth, carefully detach distributor straight from camshaft.

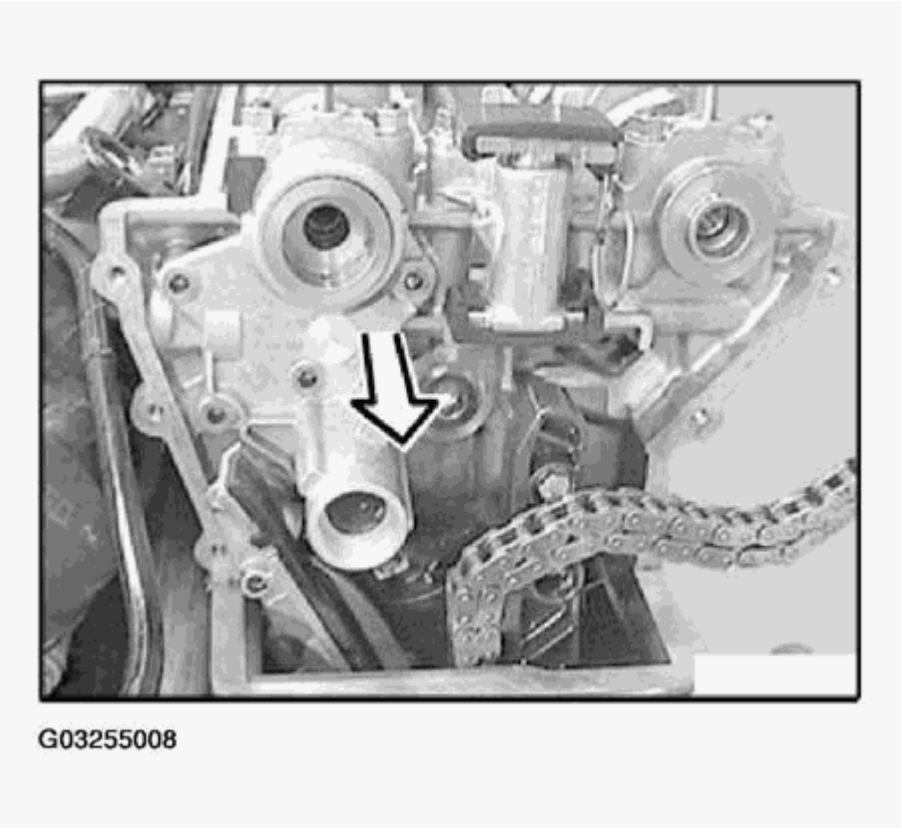


Fig. 560: Removing Camshaft Adjustment Unit Distributor (Left Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The camshaft adjustment unit distributor is sealed on the inside with plain compression rings.

Traces of wear on the distributor plain compression rings up to a depth of approx. 0.1 to 0.2 mm are normal.

If there is pitting or scoring in the longitudinal direction, the plain compression rings and the distributor must be replaced.

If necessary, remove seal (three plain compression rings).

NOTE: The plain compression rings have catches at the joint.

Press compression ring (1) upwards as far as possible and remove catch.

Carefully pull compression ring (1) apart and remove towards front.

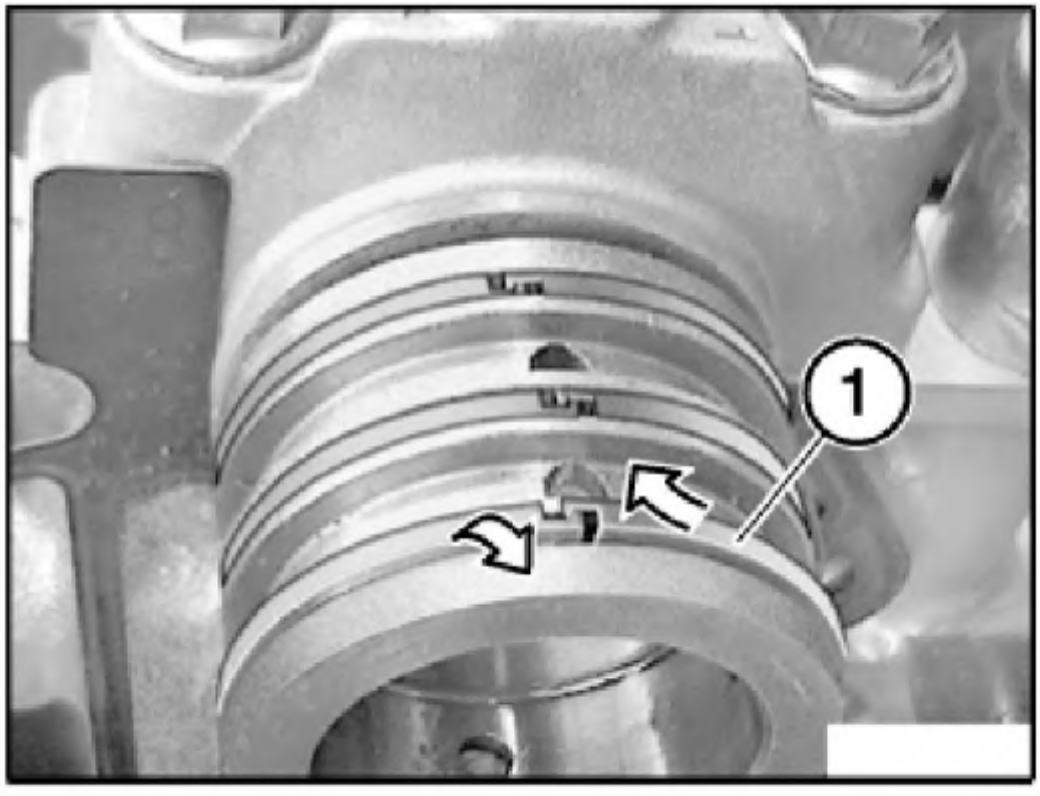


Fig. 561: Removing Compression Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

If necessary, replace seal (three plain compression rings).

Carefully pull compression ring (1) apart and install.

Press compression ring (1) upwards as far as possible and install catch.

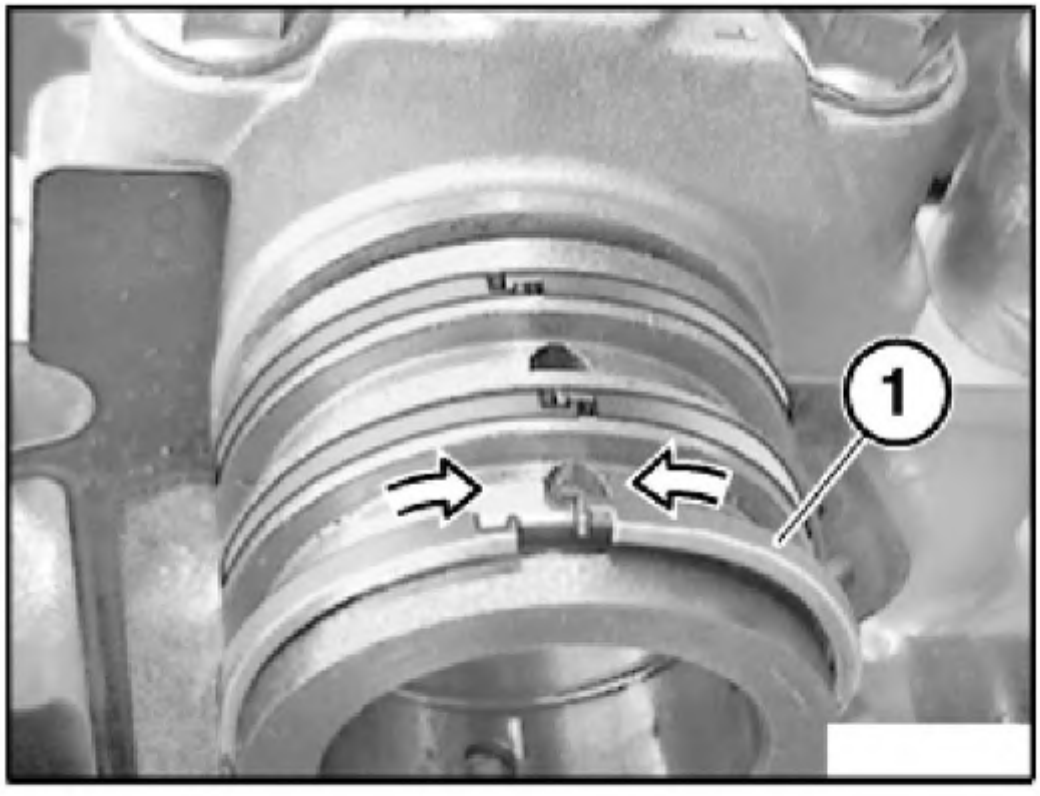


Fig. 562: Installing Compression Ring
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The gasket is secured in a groove on the camshaft bearing cover and over the non-return valve (1).

The non-return valve (1) is "inserted" in the cylinder head and can fall out if the gasket is not fed out carefully.

Carefully feed out gasket.

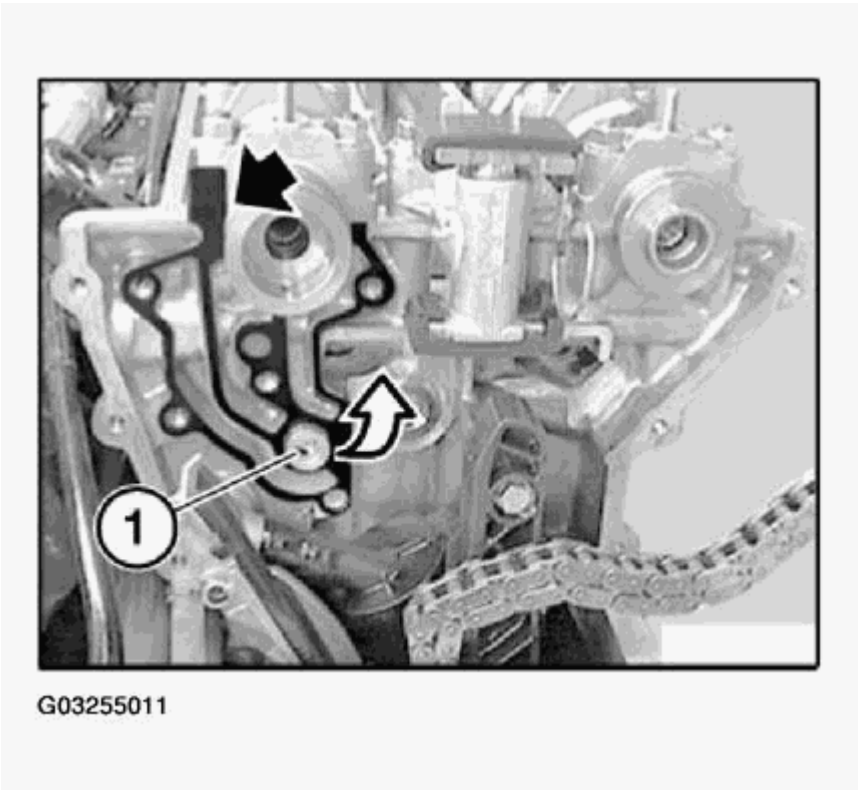


Fig. 563: Removing Camshaft Bearing Cover Gasket (Left Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove non-return valve.

Insert commercially available screw with M10x1 thread or special tool 13 5 132 as and extraction aid by hand in non-return valve (1) and carefully remove.

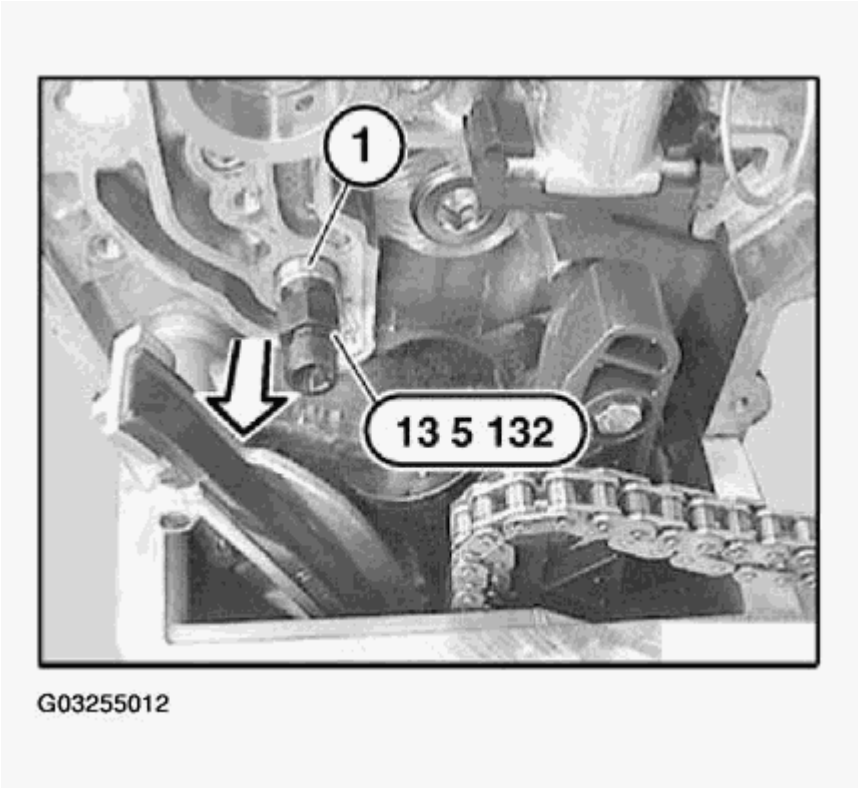


Fig. 564: Removing Non-Return Valve (Left Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring (1) on non-return valve.

CAUTION: Check installed direction.

An incorrectly installed non-return valve will result in engine damage.

Install non-return valve with M10x1 thread facing outwards.

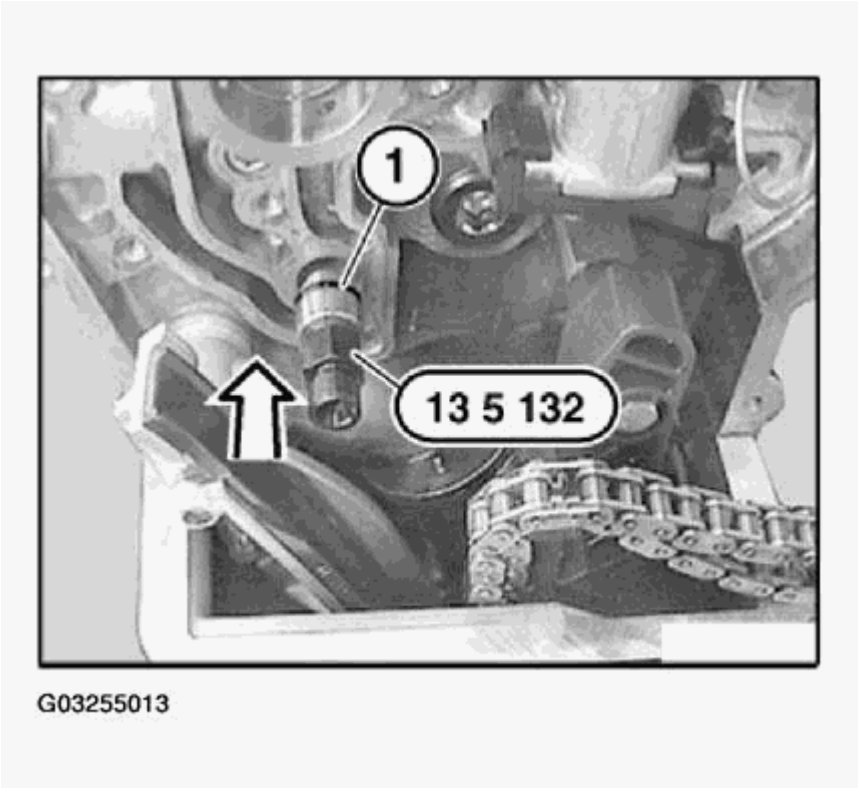


Fig. 565: Identifying Sealing Ring On Non-Return Valve (Left Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Installation of the camshaft adjustment unit distributor is described separately from removal.

Check correct installation position of non-return valve (1).

Feed in new gasket so that it is secured in groove on camshaft bearing cover and over non-return valve (1).

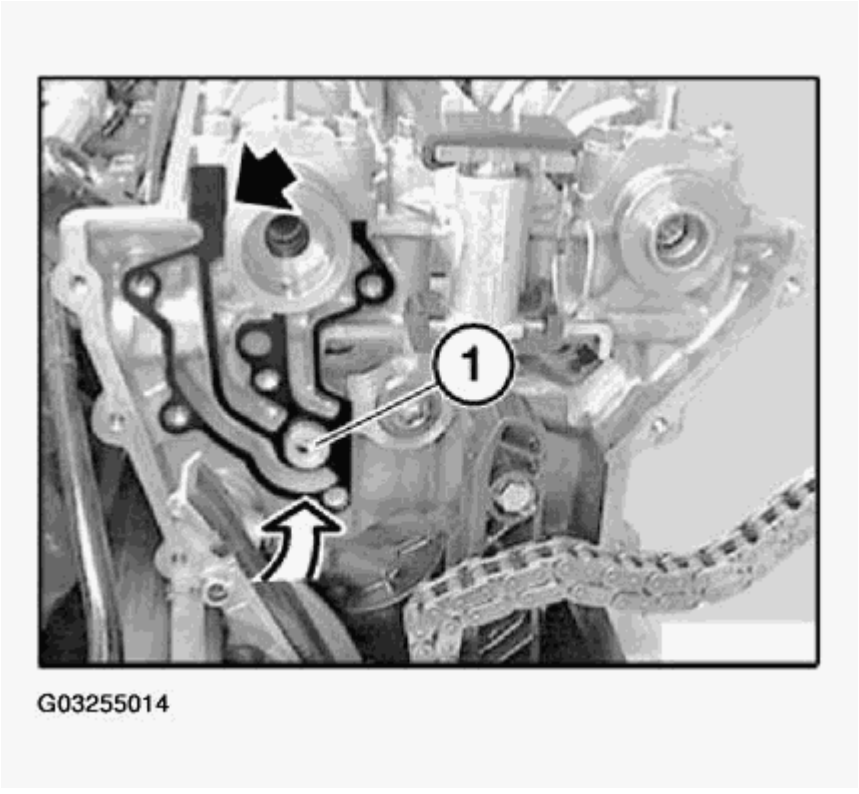


Fig. 566: Installing New Camshaft Bearing Cover Gasket (Left Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

Make sure that contact points on plain compression rings snap into place.

Align contact points of compression rings upwards.

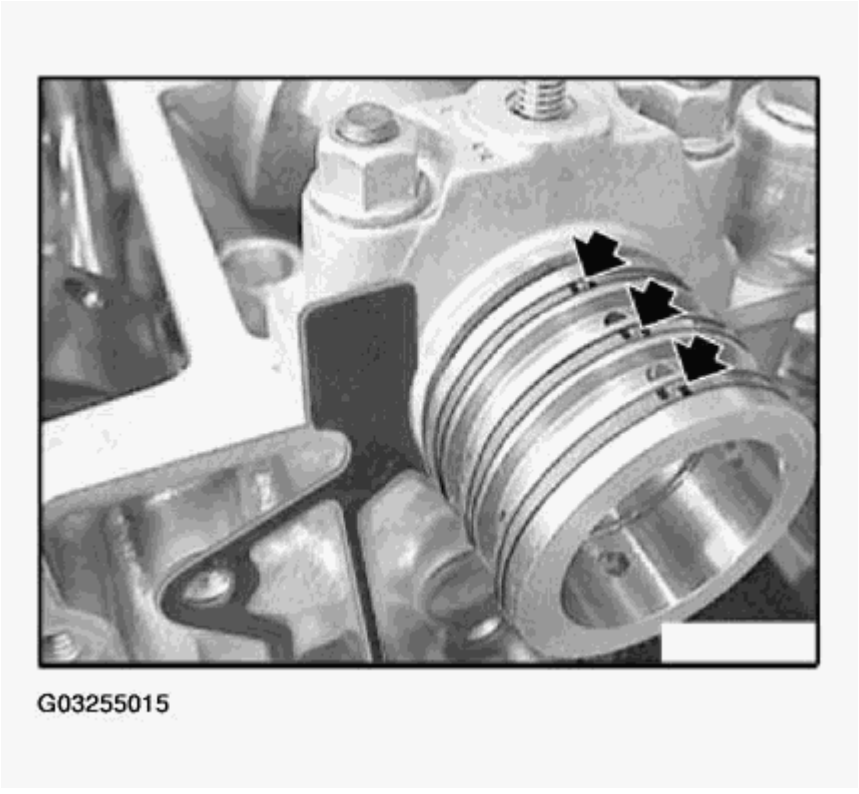


Fig. 567: Aligning Contact Points Of Compression Rings (Left Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

Make sure that gasket is secured in groove on camshaft bearing cover.

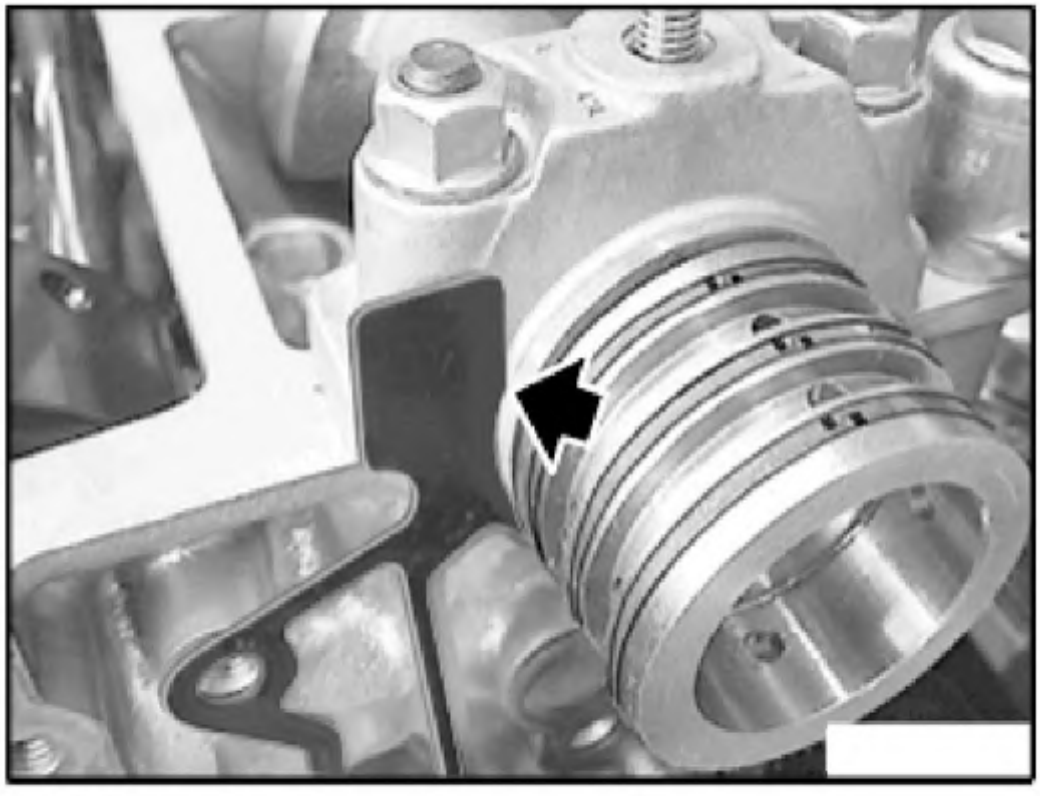


Fig. 568: Ensuring Camshaft Bearing Cover Gasket Is Secured In Groove (Left Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a light coat of oil to camshaft adjustment unit distributor and plain compression rings.

Carefully push on camshaft adjustment unit distributor so that it is straight.

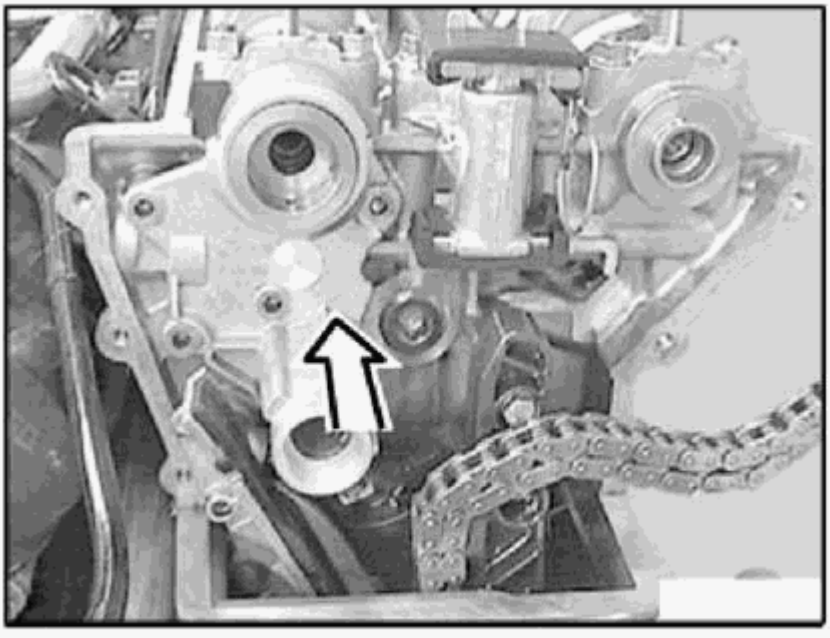


Fig. 569: Installing Camshaft Adjustment Unit Distributor (Left Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Only screw (1) with sealing ring.

Replace sealing ring on screw (1).

Install and tighten down screws.

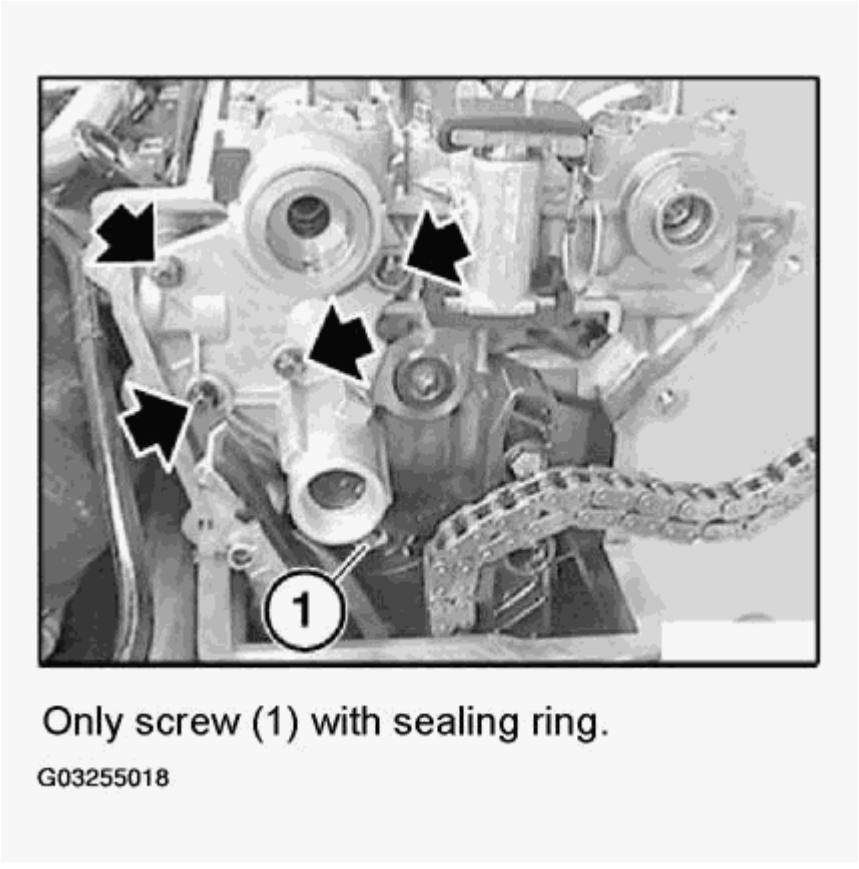


Fig. 570: Installing Camshaft Adjustment Unit Distributor (Left Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

Feed timing chain (1) onto camshaft adjustment unit distributor.

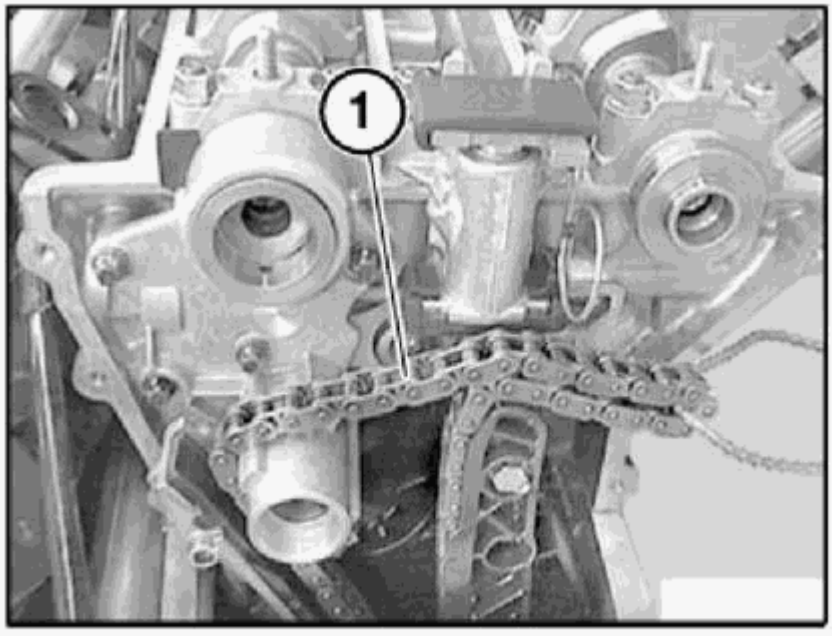


Fig. 571: Installing Timing Chain To Camshaft Adjustment Unit Distributor (Left Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

Install left camshaft adjustment unit,

refer to **11 36 610 REMOVING AND INSTALLING/REPLACING LEFT CAMSHAFT ADJUSTMENT UNIT (M62 VANOS FROM 9/98)** .

Assemble engine.

11 36 635 REMOVING AND INSTALLING/REPLACING DISTRIBUTOR ON RIGHT CAMSHAFT ADJUSTMENT UNIT (M62 VANOS FROM 9/98)

Removal

Removal of the camshaft adjustment unit distributor is described separately from installation.

Remove right camshaft adjustment unit,

refer to **11 36 615 REMOVING AND INSTALLING/REPLACING RIGHT CAMSHAFT ADJUSTMENT UNIT (M62 VANOS FROM 9/98)** .

NOTE: After releasing, oil drips out of 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.

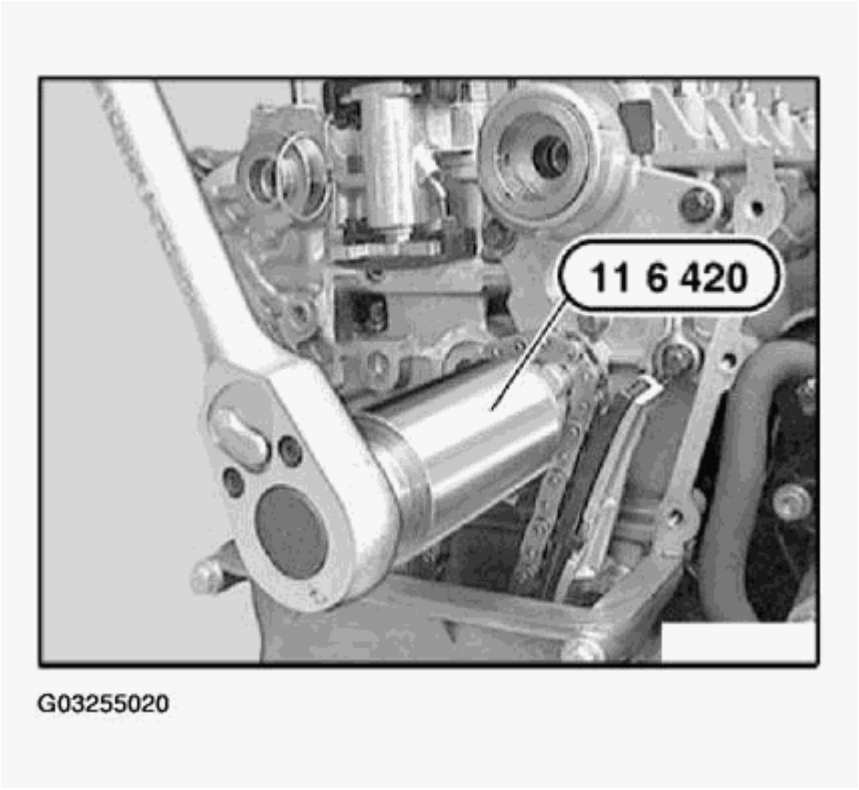


Fig. 572: Releasing Solenoid Valve (Right Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

Feed timing chain out of camshaft adjustment unit distributor.

Secure timing chain to prevent it from sliding down.

NOTE: Screw (1) with sealing ring.

Release screws on camshaft adjustment unit distributor.

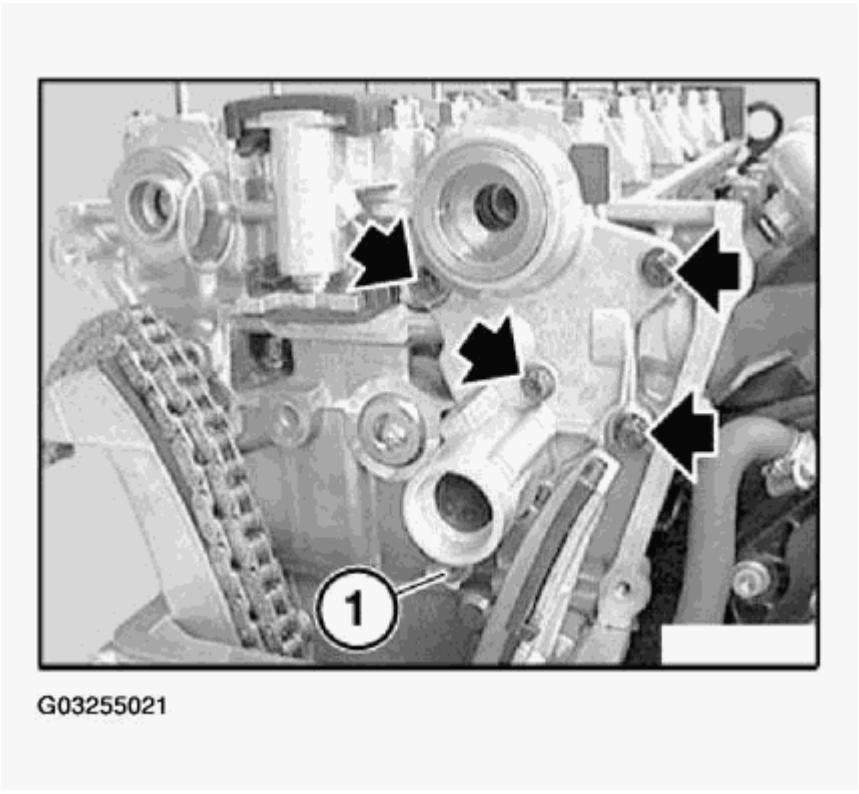


Fig. 573: Removing Camshaft Adjustment Unit Distributor (Right Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If the camshaft adjustment unit distributor and the seal (three plain compression rings) are worn, the removal operation may be awkward.

By moving it back and forth, carefully detach distributor straight from camshaft.

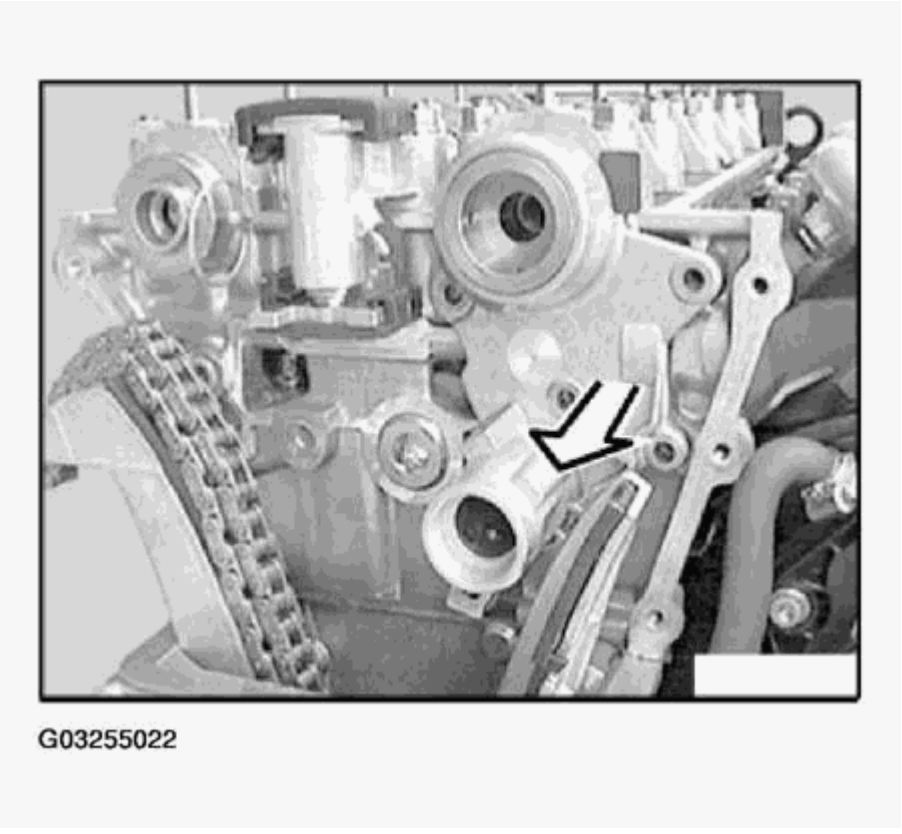


Fig. 574: Removing Camshaft Adjustment Unit Distributor (Right Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The camshaft adjustment unit distributor is sealed on the inside with plain compression rings.

Traces of wear on the distributor plain compression rings up to a depth of approx. 0.1 to 0.2 mm are normal.

If there is pitting or scoring in the longitudinal direction, the plain compression rings and the distributor must be replaced.

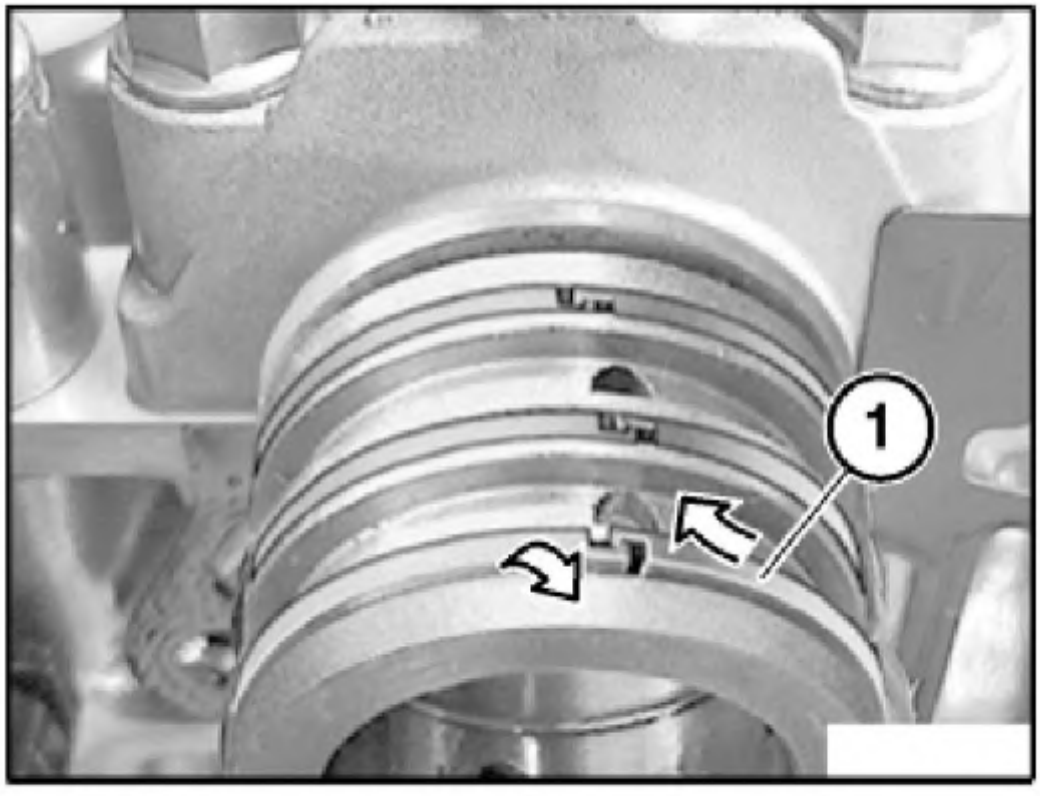


Fig. 575: Removing Compression Ring
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove seal (three plain compression rings).

NOTE: The plain compression rings have catches at the joint.

Press compression ring (1) upwards as far as possible and remove catch.

Carefully pull compression ring (1) apart and remove towards front.

Installation:

If necessary, replace seal (three plain compression rings).

Carefully pull compression ring (1) apart and install.

Press compression ring (1) upwards as far as possible and install catch.

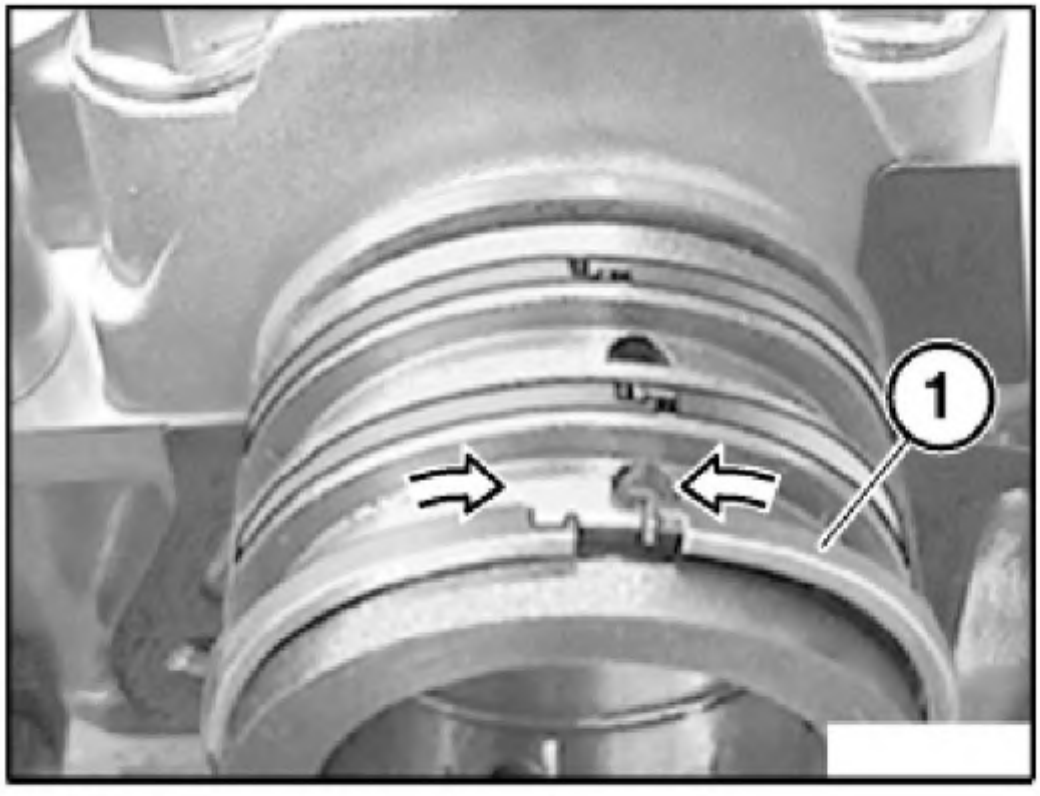


Fig. 576: Installing Compression Ring
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The gasket is secured in a groove on the camshaft bearing cover and over the non-return valve (1).

The non-return valve (1) is "inserted" in the cylinder head and can fall out if the gasket is not fed out carefully.

Carefully feed out gasket.

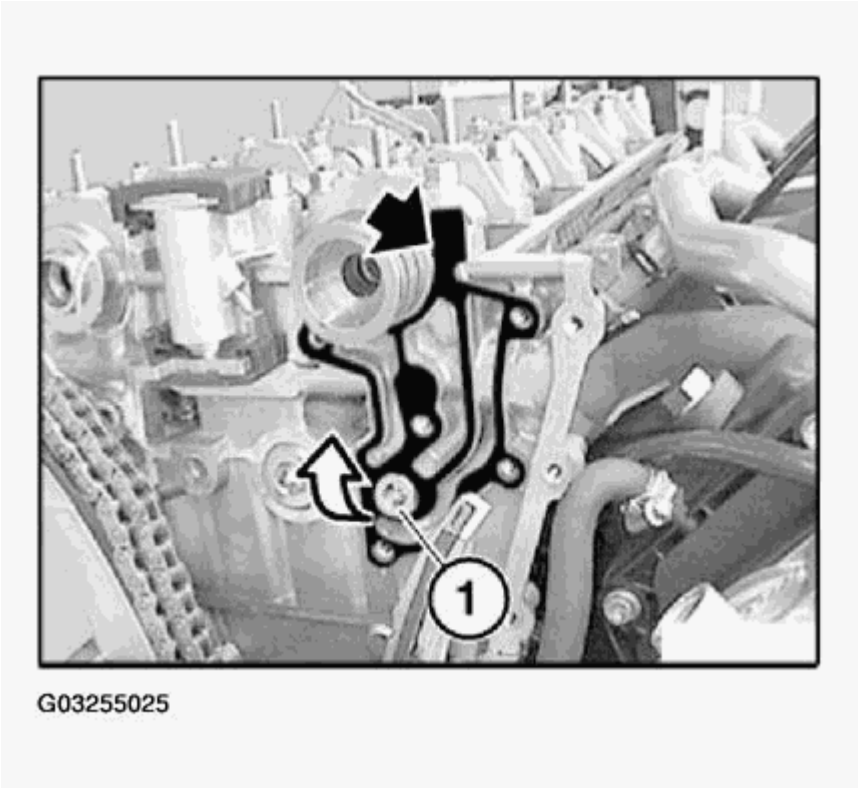


Fig. 577: Removing Camshaft Adjustment Unit Distributor Gasket (Right Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove non-return valve.

Insert commercially available screw with M10x1 thread or special tool 13 5 132 as and extraction aid by hand in non-return valve (1) and carefully remove.

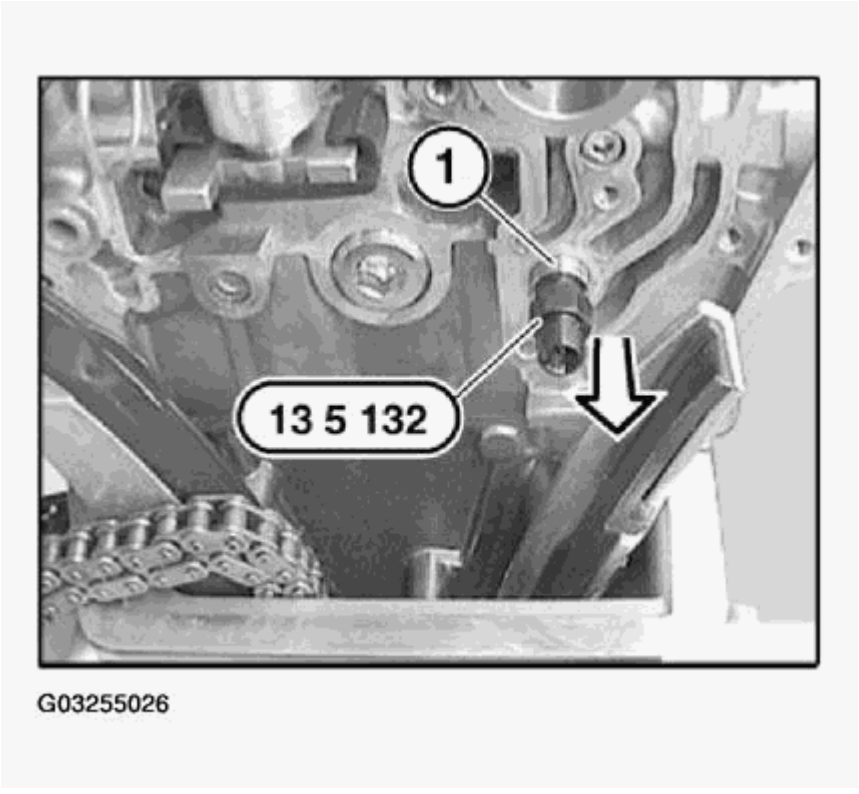


Fig. 578: Removing Non-Return Valve (Right Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring (1) on non-return valve.

CAUTION: Check installed direction.

An incorrectly installed non-return valve will result in engine damage.

Install non-return valve with M10x1 thread facing outwards.

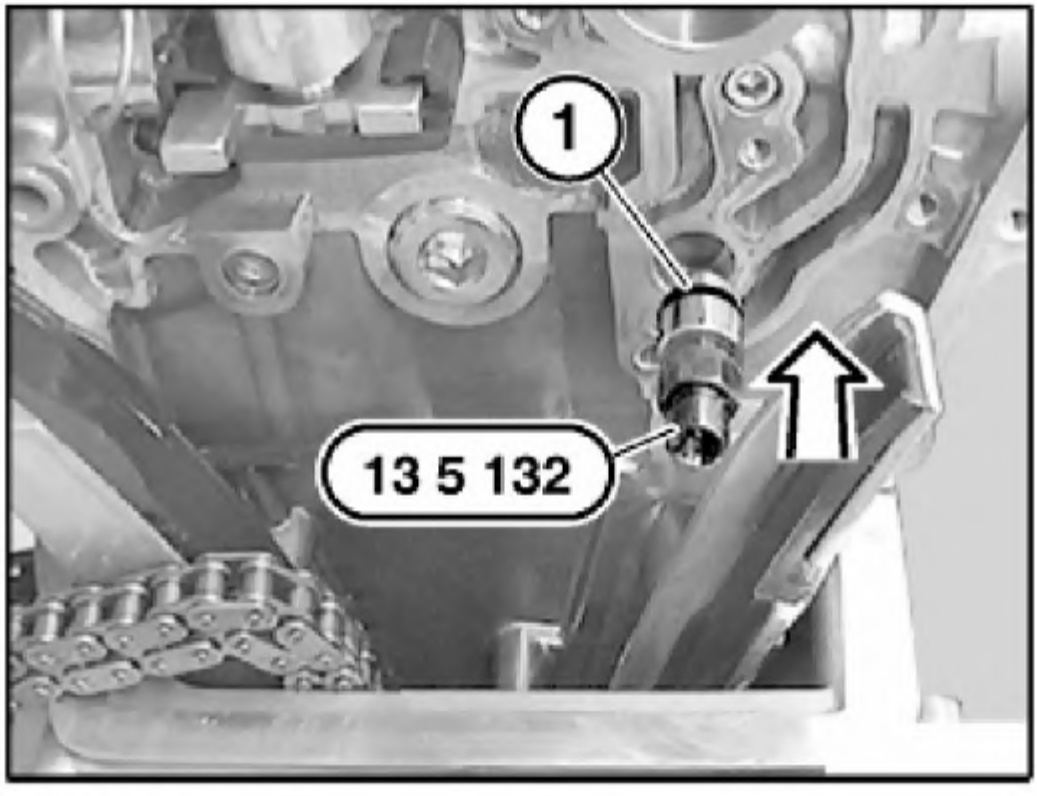


Fig. 579: Installing Non-Return Valve (Right Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Installation of the camshaft adjustment unit distributor is described separately from removal.

Check correct installation position of non-return valve (1).

Feed in new gasket so that it is secured in groove on camshaft bearing cover and over non-return valve (1).

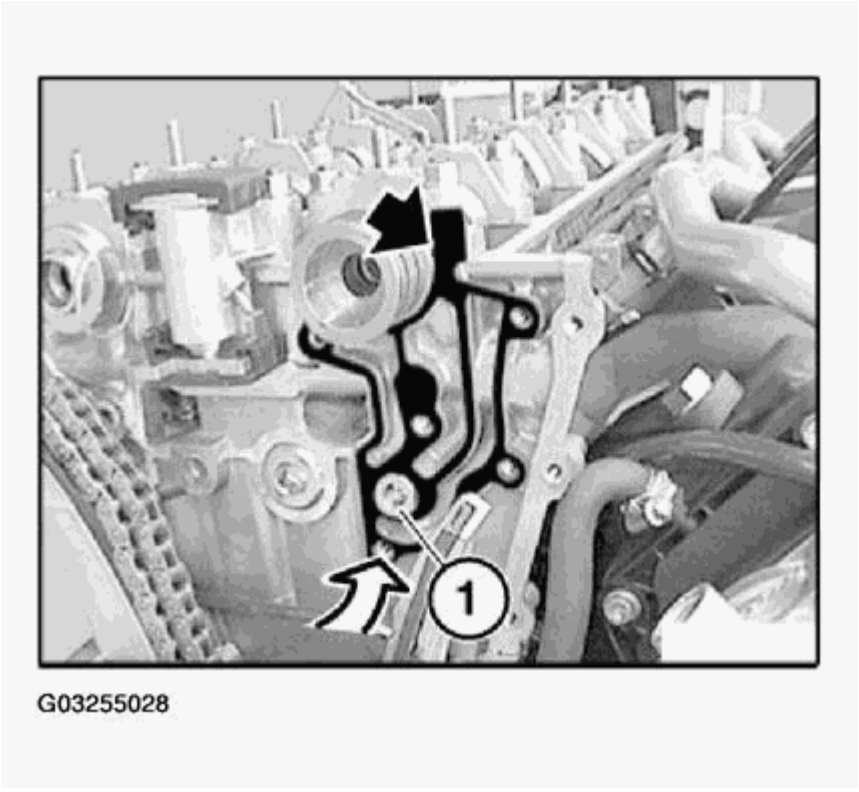


Fig. 580: Installing New Camshaft Adjustment Unit Distributor Gasket (Right Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

Make sure that contact points on plain compression rings snap into place.

Align contact points of compression rings upwards.

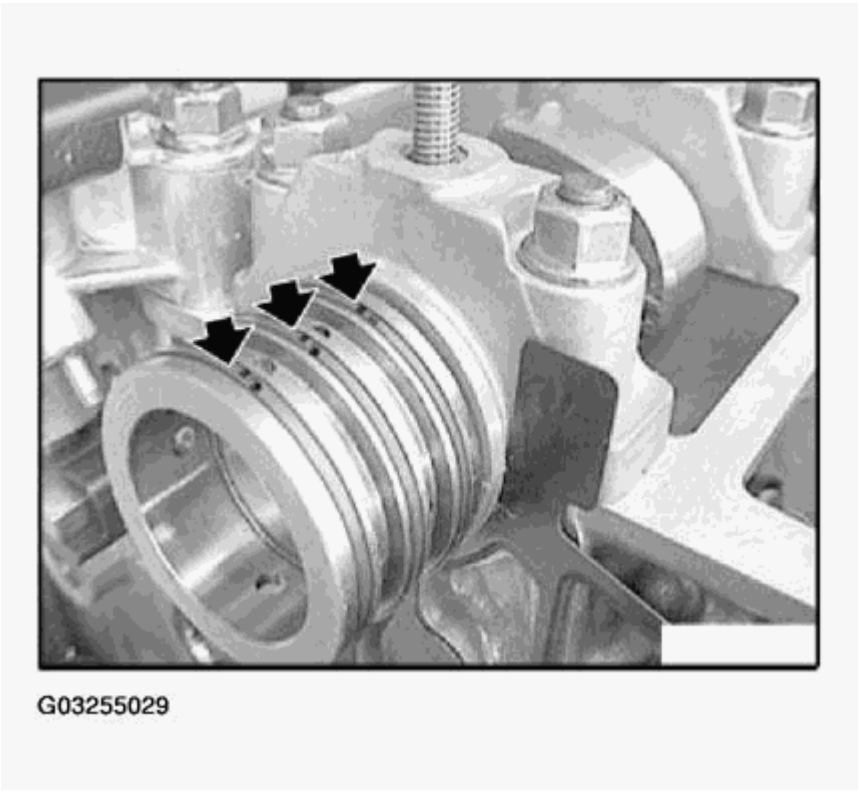


Fig. 581: Identifying Contact Points Of Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Make sure that gasket is secured in groove on camshaft bearing cover.

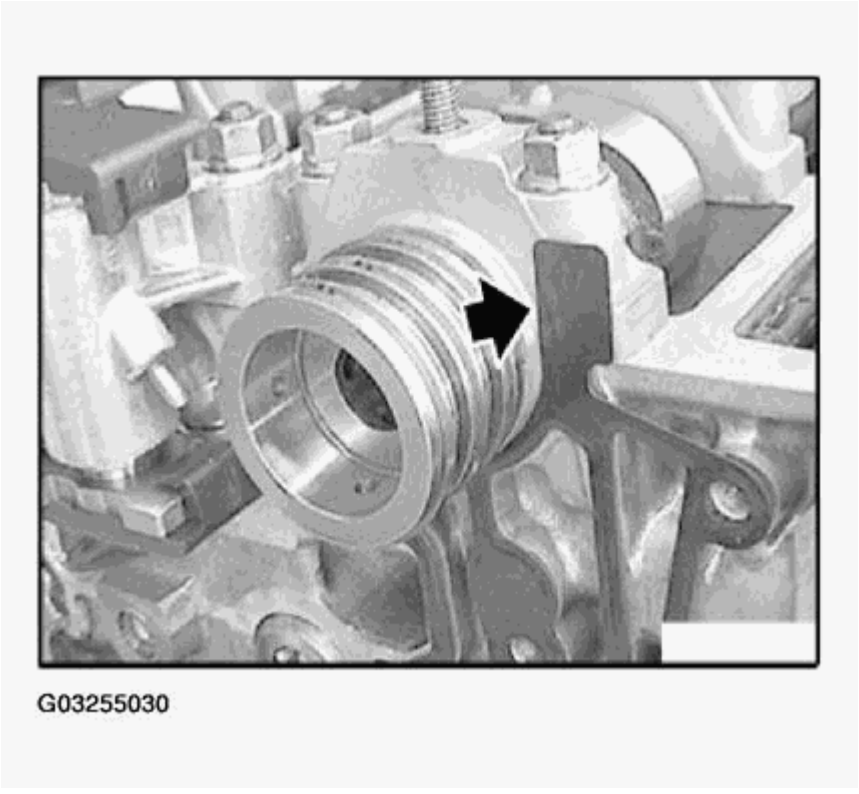


Fig. 582: Ensuring Camshaft Bearing Cover Gasket Is Secured In Groove (Right Bank)
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a light coat of oil to camshaft adjustment unit distributor and plain compression rings.

Carefully push on camshaft adjustment unit distributor so that it is straight.

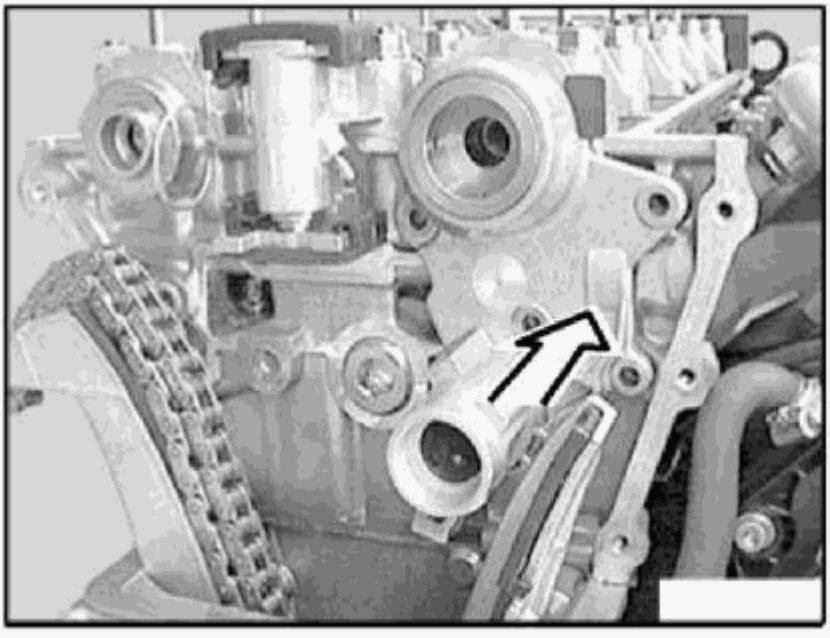


Fig. 583: Installing Camshaft Adjustment Unit Distributor
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Only screw (1) with sealing ring.

Replace sealing ring on screw (1).

Install and tighten down screws.

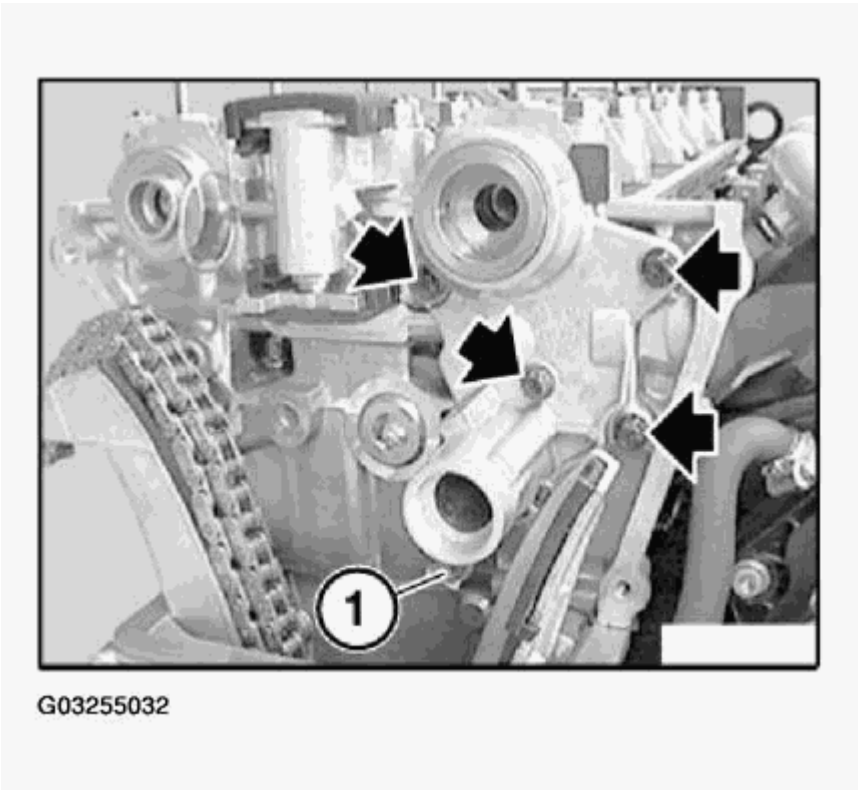


Fig. 584: Installing Camshaft Adjustment Unit Distributor Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Feed timing chain onto camshaft adjustment unit distributor.

Insert solenoid valve and tighten down with special tool 11 6 420.

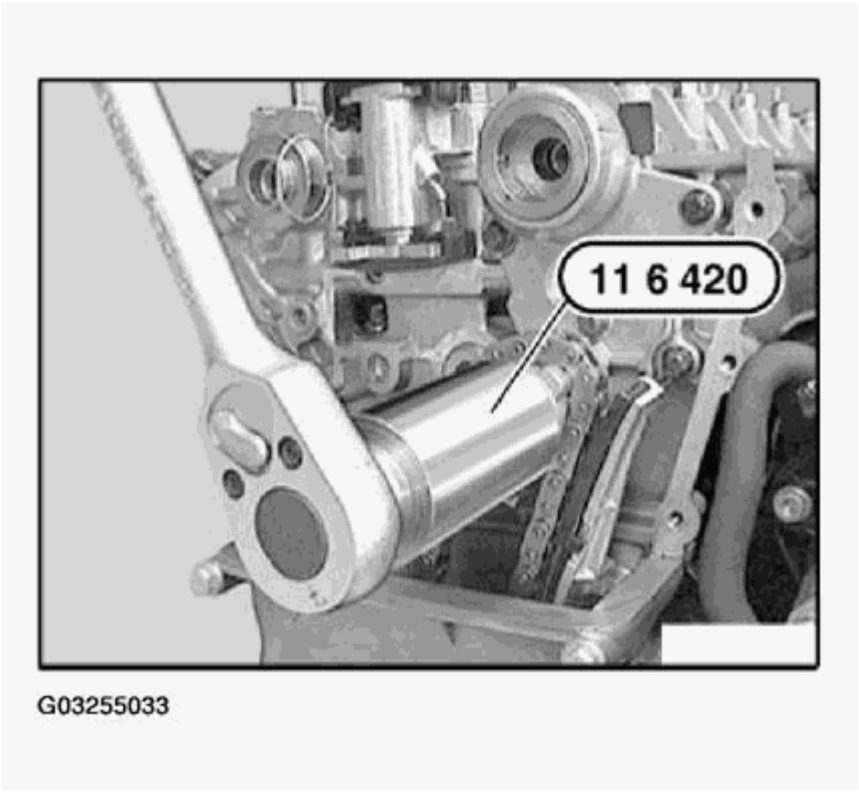


Fig. 585: Installing Solenoid Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening Torque,

refer to 11 36 12AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Install right camshaft adjustment unit,

refer to **11 36 615 REMOVING AND INSTALLING/REPLACING RIGHT CAMSHAFT ADJUSTMENT UNIT (M62 VANOS FROM 9/98)** .

Assemble engine.

OIL SUPPLY

11 40 000 CHECKING ENGINE OIL PRESSURE

Special tools required:

NOTE: For Special Tool identification, see ENGINE - SPECIAL TOOLS - X5 (4.4L & 4.6L) .

- 11 4 050

- 13 3 061
- 13 3 063
- 13 6 051

Checking Engine Oil Pressure

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, see 11 42 2AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Remove oil pressure switch.

Installation:

Tightening torque, see 12 61 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Install special tool 11 4 050 with sealing ring (1) in place of oil pressure switch.

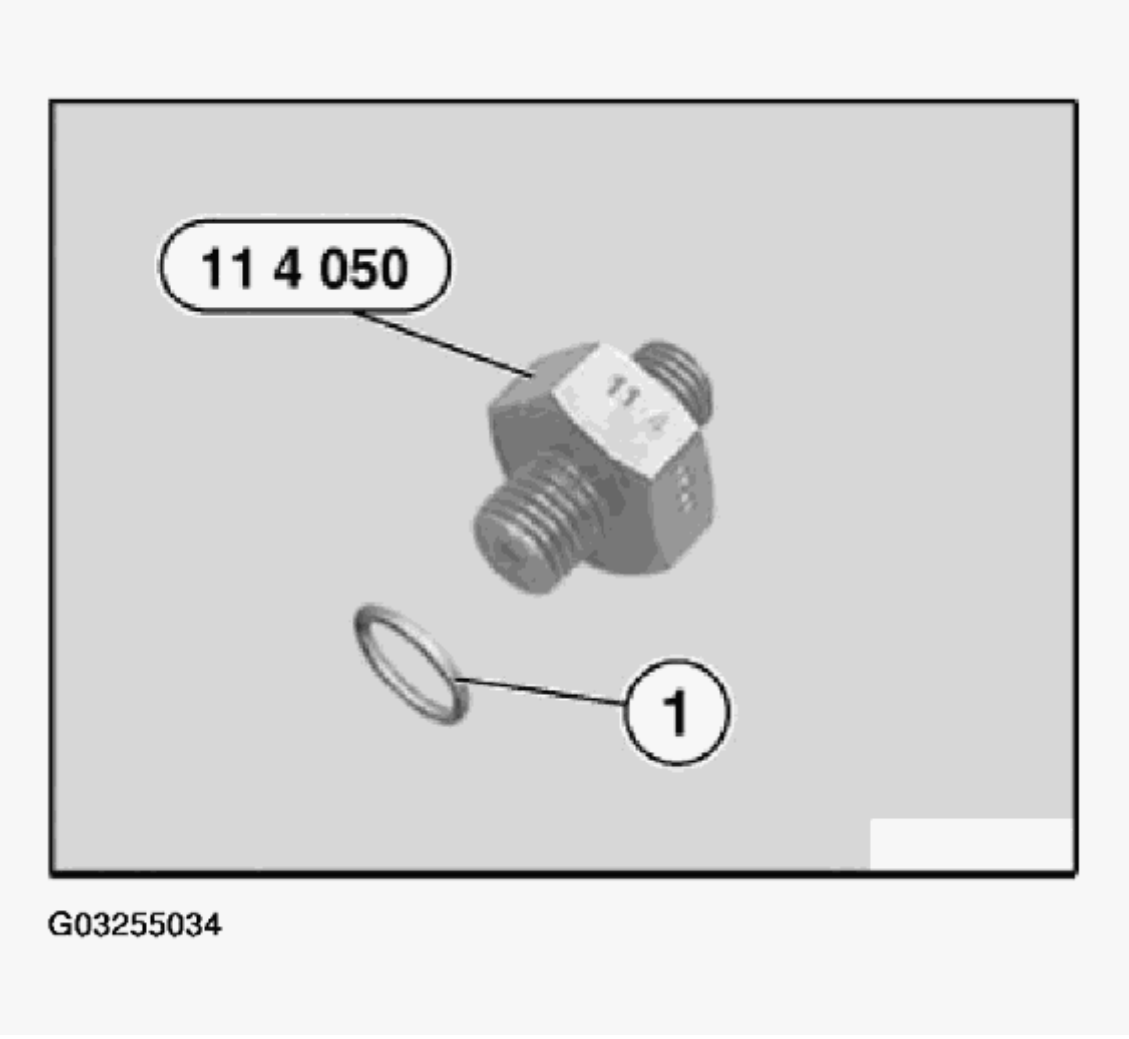


Fig. 586: Identifying Sealing Ring And Special Tool 11 4 050
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Specified value, see **11 41 OIL PUMP WITH STRAINER AND DRIVE M62 B 46** .

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, see **11 41 OIL PUMP WITH STRAINER AND DRIVE M62 B 46** .

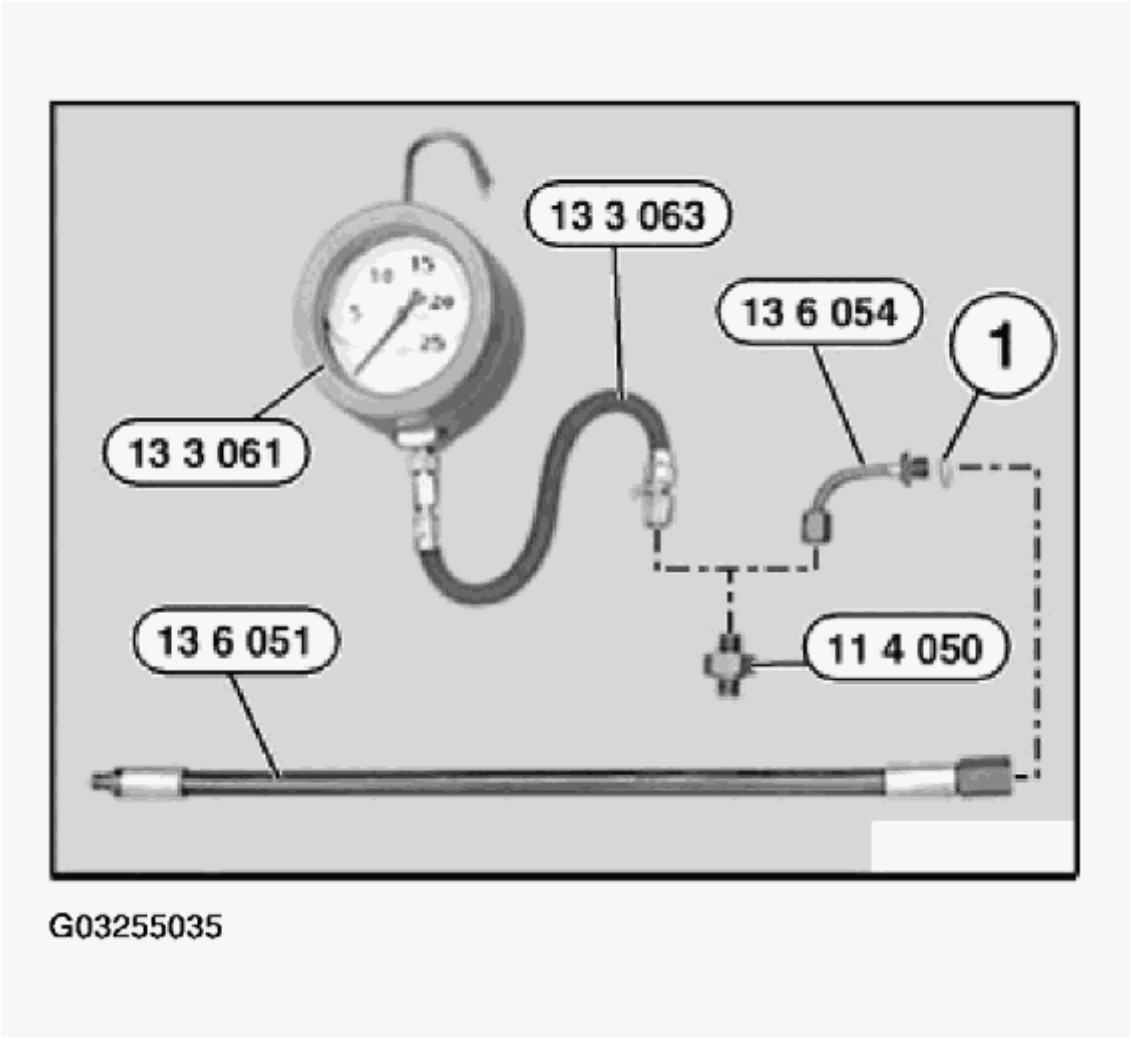


Fig. 587: Checking Engine Oil Pressure With Pressure Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

OIL PUMP WITH FILTER

11 41 000 REMOVING AND INSTALLING/REPLACING OIL PUMP (M62)

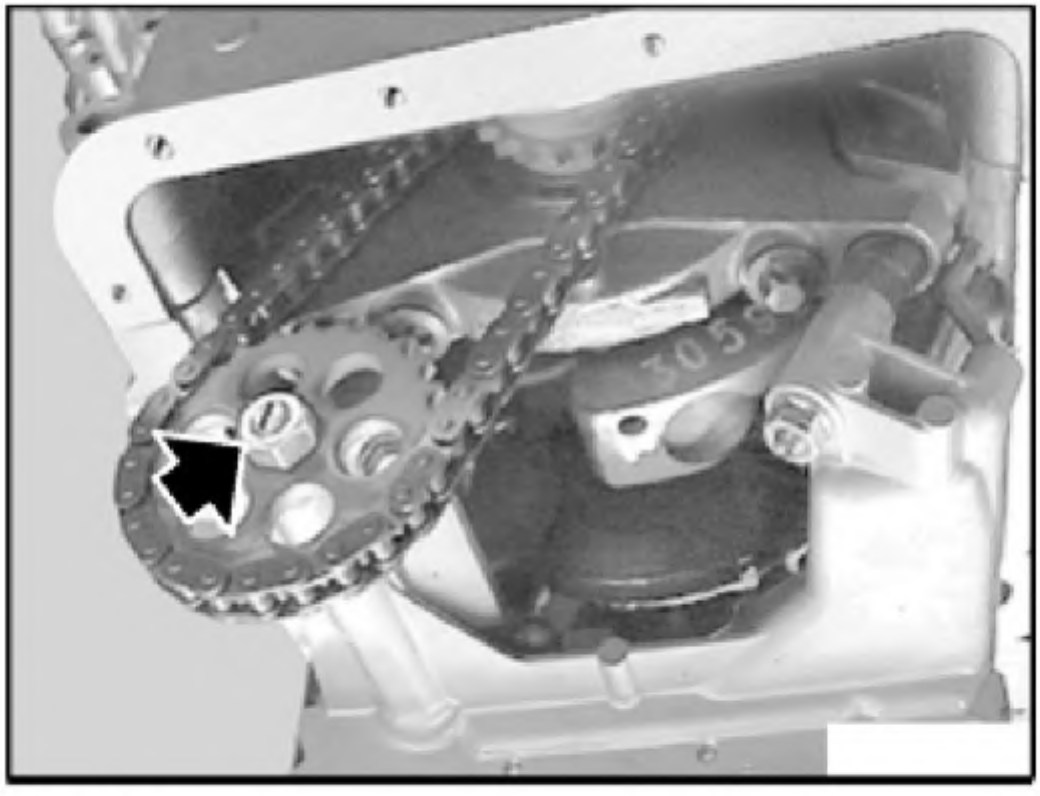
Removal

Remove upper oil sump section,

refer to **11 13 010 REMOVING AND INSTALLING/REPLACING UPPER SECTION OF OIL SUMP (M62)** .

The removal of the oil pump is described separately from the installation.

Release oil pump sprocket wheel and remove with chain.



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Fig. 588: Releasing Oil Pump Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (1) and screw (2).

Remove oil pump.

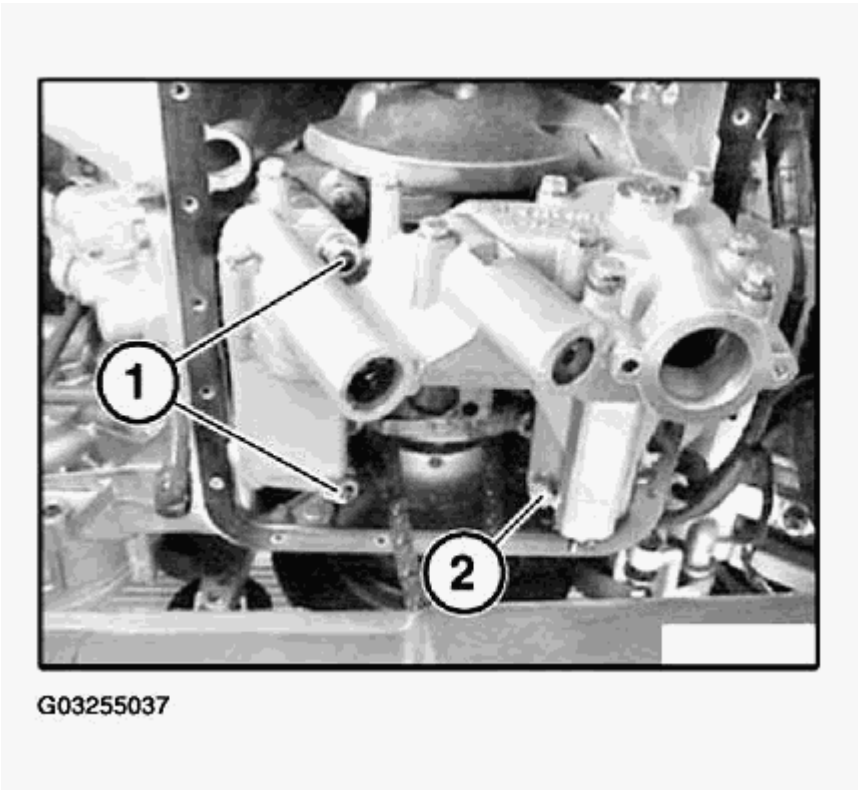


Fig. 589: Removing Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Detach unrefined oil line (1) and governing line (2) (filtered oil) from engine block.

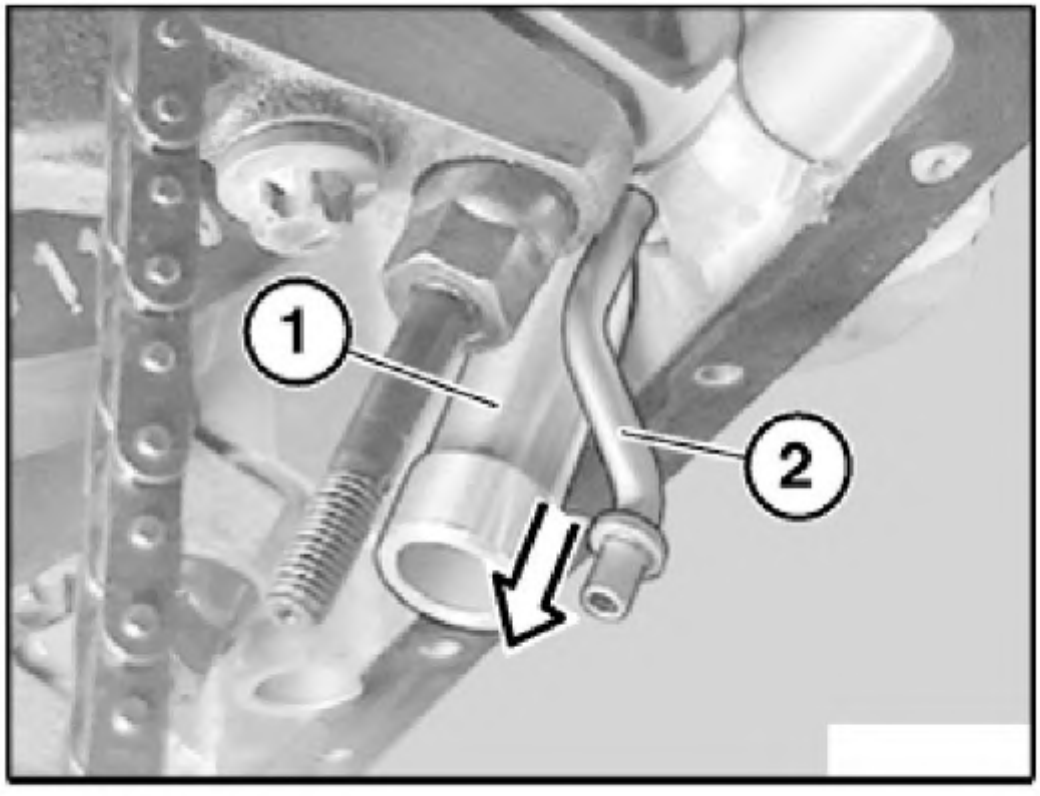


Fig. 590: Detaching Unrefined Oil Line And Governing Line (Filtered Oil) From Engine Block
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove oil pressure control plunger.

Press sleeve (1) downwards with a suitable mandrel.

CAUTION: High spring pressure.

Lever out snap ring (2).

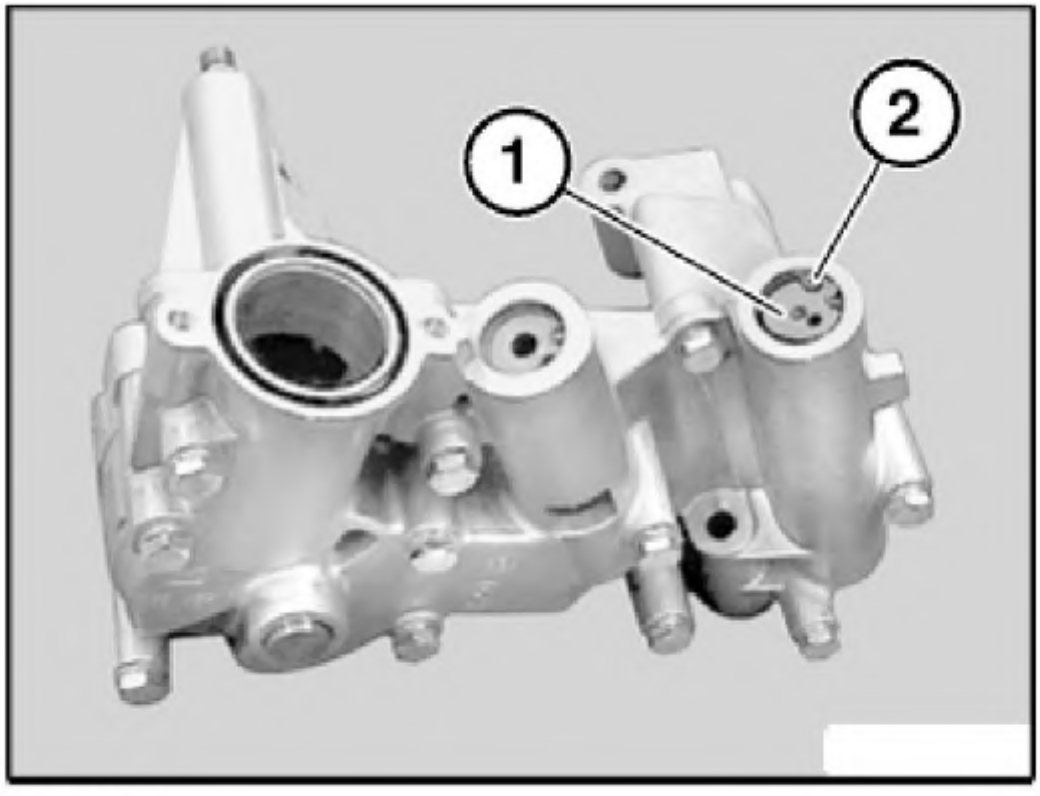
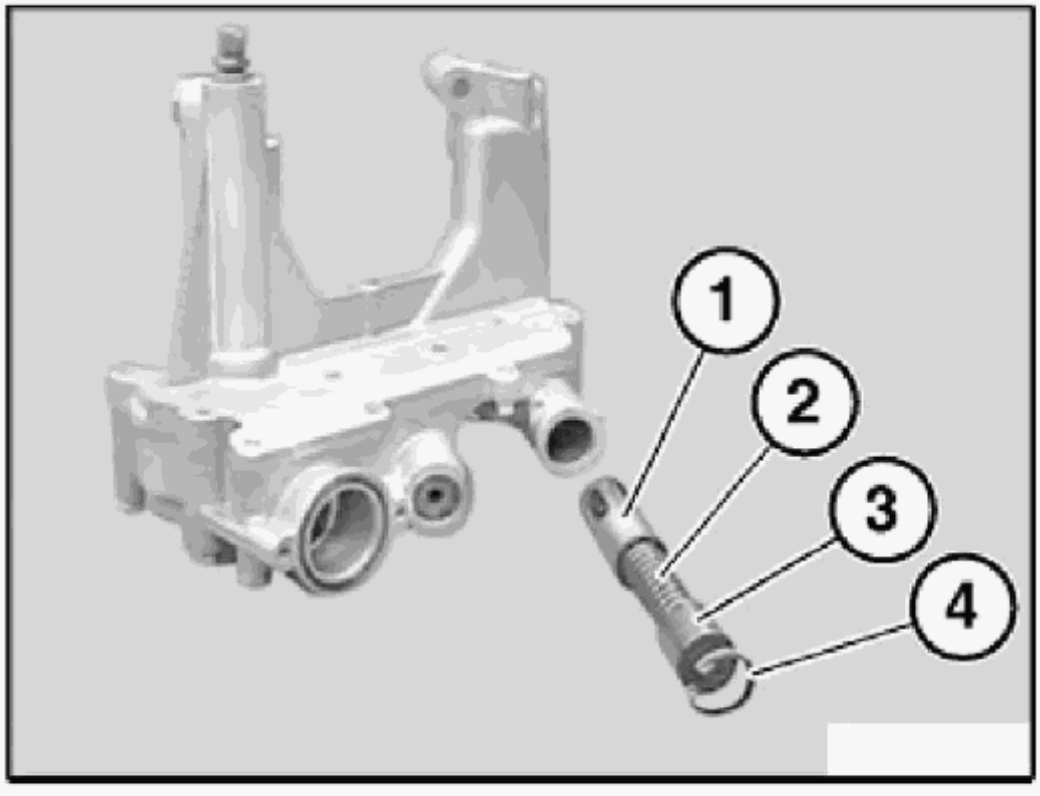


Fig. 591: Removing Oil Pressure Control Plunger
Courtesy of BMW OF NORTH AMERICA, INC.



1. Control plunger
2. Spring
3. Sleeve
4. Circlip

G03255040

Fig. 592: Identifying Oil Pressure Controller Components
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

The installation of the oil pump is described separately from the removal.

CAUTION: Do not shear sealing ring on edge of housing.

Remove sealing ring and apply light coat of oil.

Insert unrefined oil line in engine block.

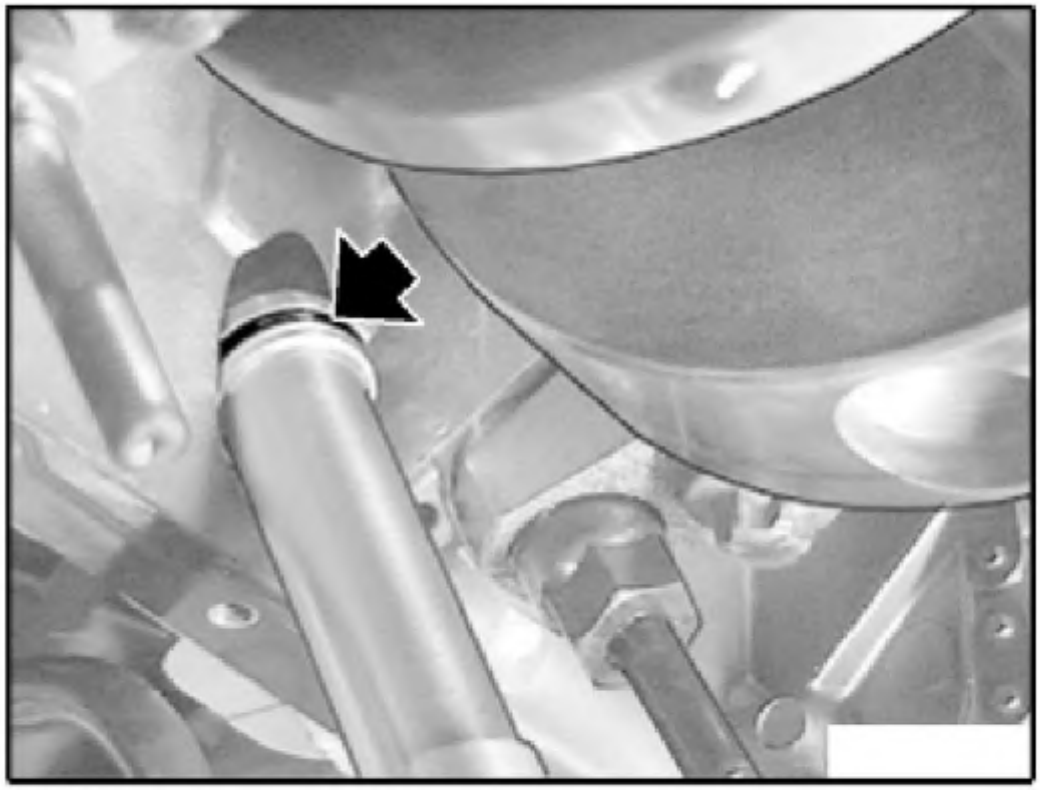


Fig. 593: Identifying Unrefined Oil Line Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Replace sealing ring (1) and apply a light coat of oil.

Insert governing line (filtered oil) in engine block.

NOTE: Preassemble sealing ring (1) on governing line.

Position governing line so that it is secured in oil pump after installation.

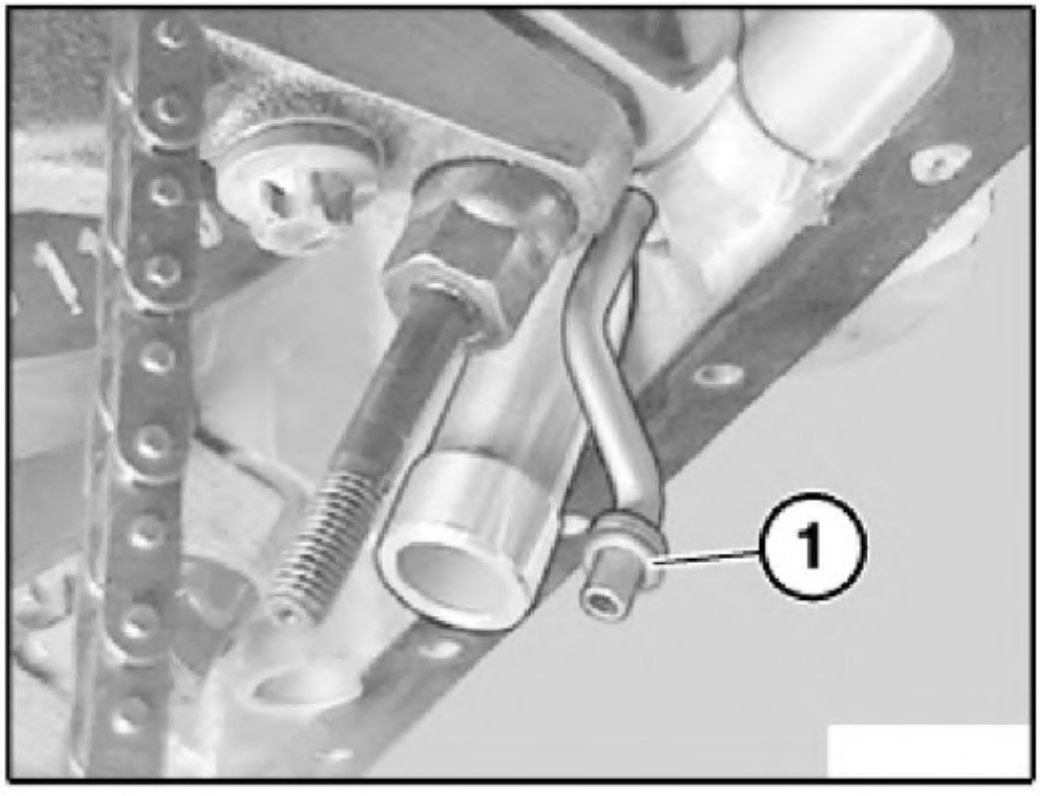
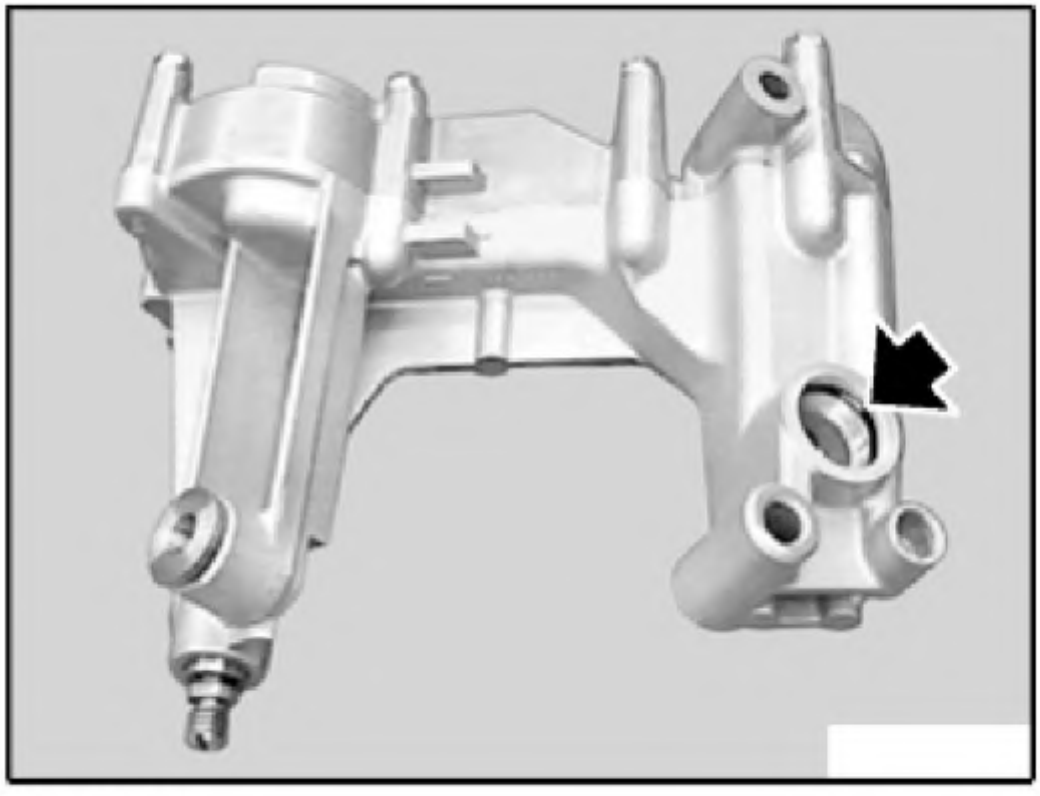


Fig. 594: Identifying Sealing Ring On Governing Line
Courtesy of BMW OF NORTH AMERICA, INC.

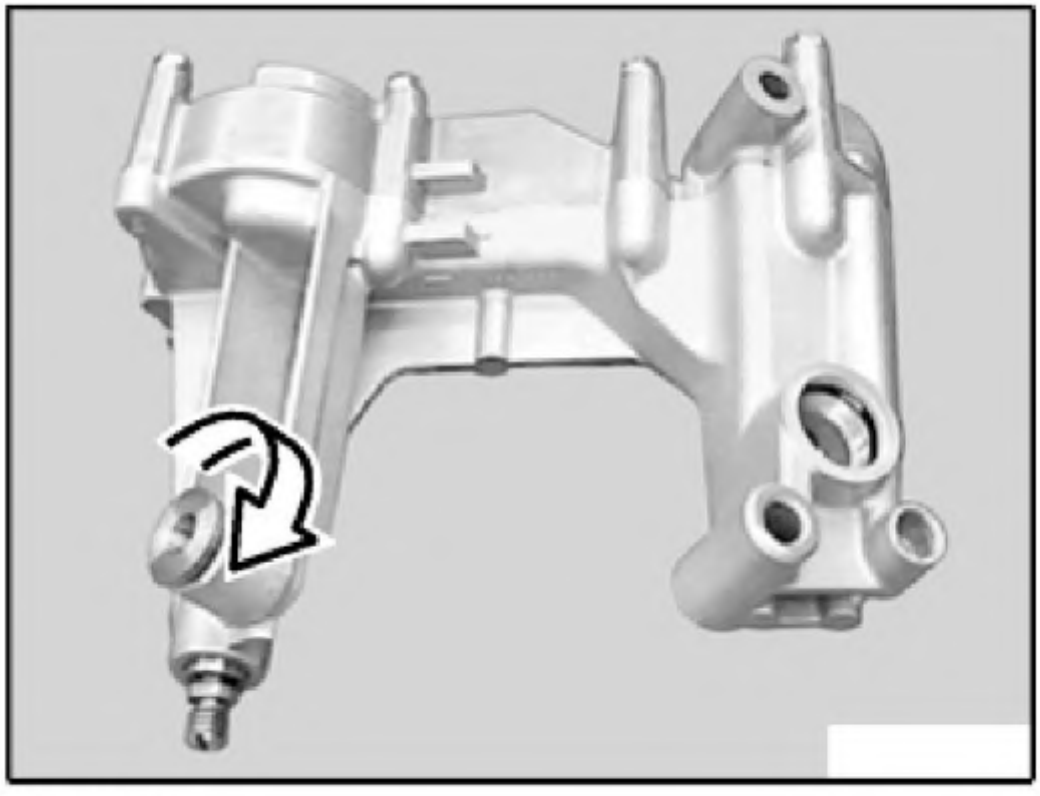
Replace sealing ring in oil pump.



G03255043

Fig. 595: Identifying Sealing Ring In Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Screw cap screw back into oil pump until stop.



G03255044

Fig. 596: Installing Cap To Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Fit oil pump.

Align unrefined oil line and governing line to bores in oil pump.

Push on oil pump fully.

Insert nuts (1) and tighten down.

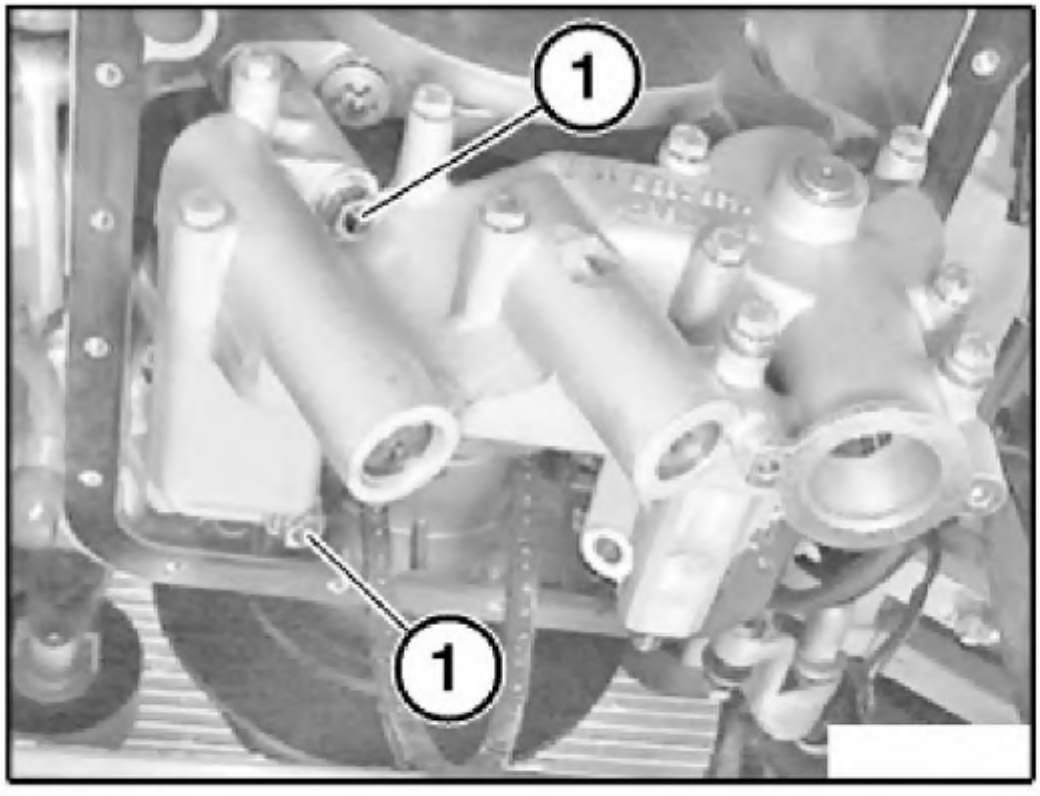
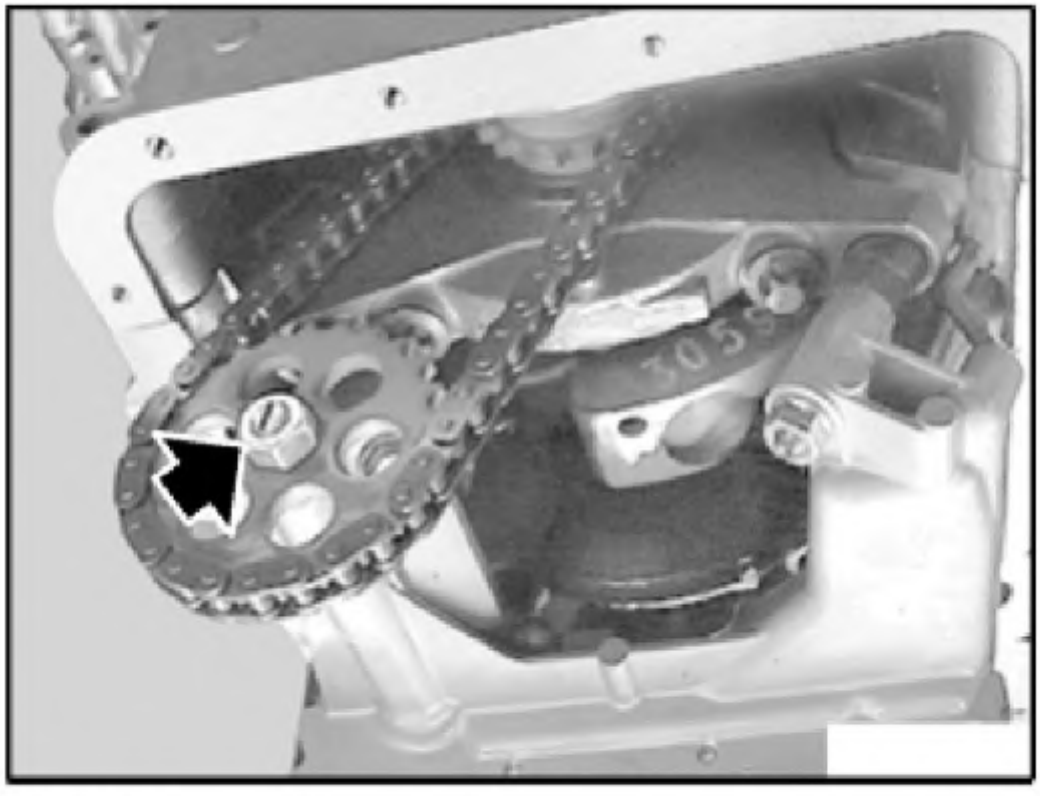


Fig. 597: Installing Oil Pump Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Fit sprocket with chain and tighten nut.

Tightening torque, see 11 41 4AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .



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Fig. 598: Fitting Sprocket With Chain
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust chain deflection (A = 10 +/- 2 mm) by turning adjustment hex screw in the oil pump. Install screw and tighten down.

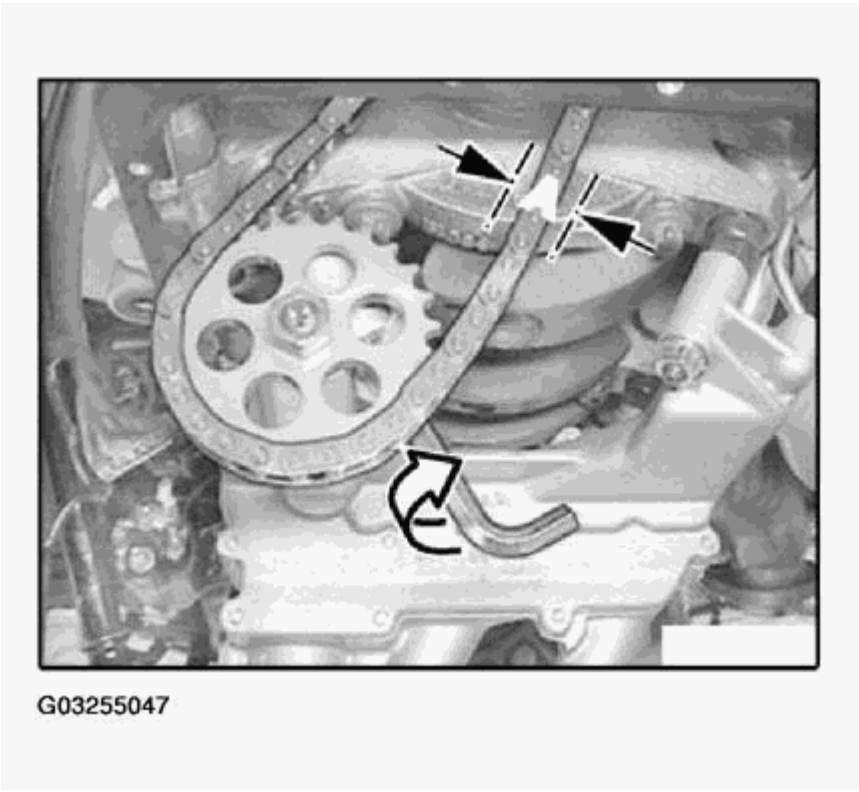


Fig. 599: Checking Chain Deflection
Courtesy of BMW OF NORTH AMERICA, INC.

WATER PUMP WITH DRIVE

11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP (M62/S62)

Drain off coolant and dispose of correctly.

Installation:

Vent cooling system and check for leaks,

refer to **17 00 005 DRAINING AND TOPPING UP COOLANT (M62)** .

Remove vibration damper,

refer to **11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (M62)** .

Remove thermostat housing,

refer to **11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (M62)** .

- Remove pulley.

- Remove coolant hose.
- Unfasten screws.
- Remove water pump.

Installation:

Make sure that sleeves are correctly seated.

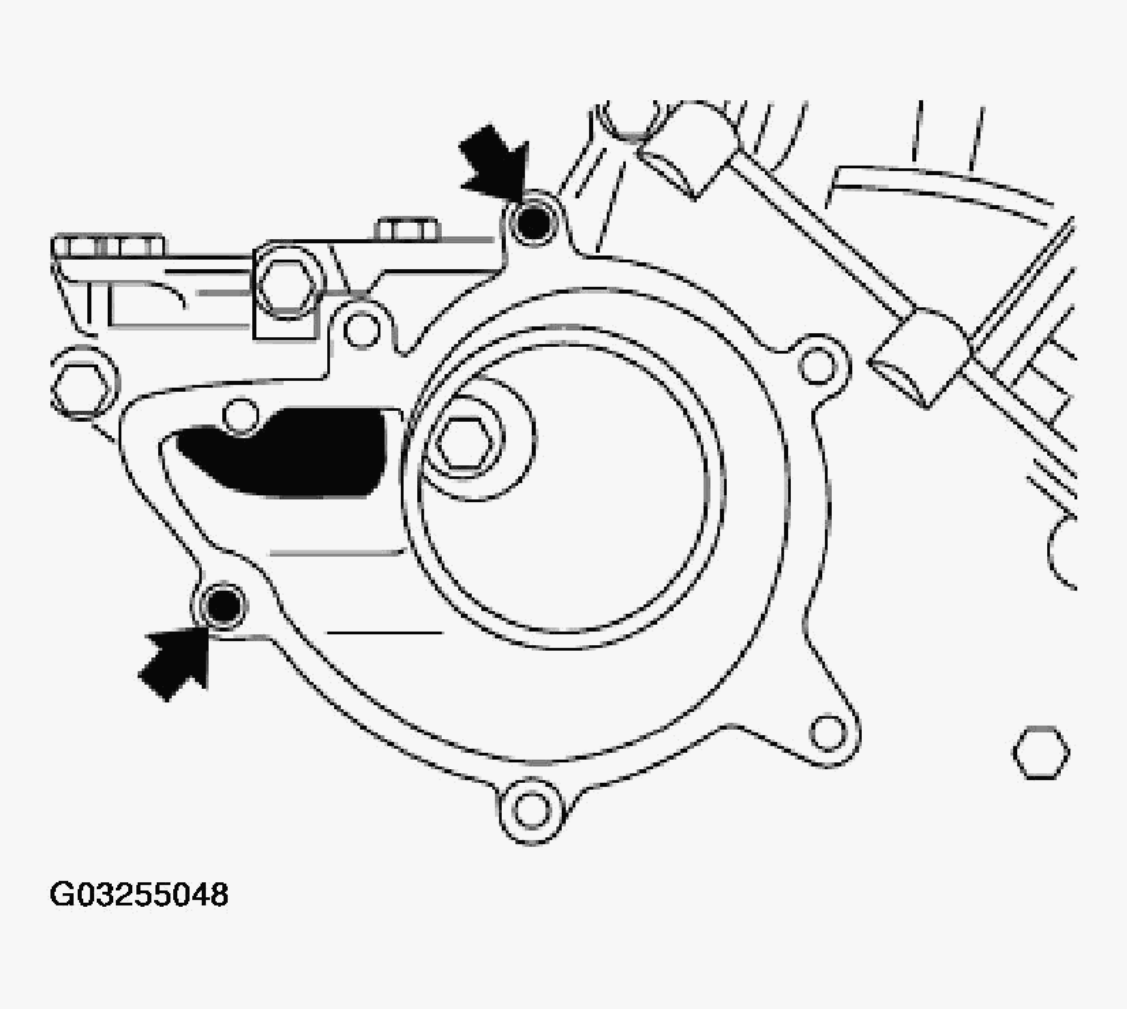


Fig. 600: Identifying Installed Position Of Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Clean sealing faces.

Replace seal.

FAN

11 52 020 REMOVING AND INSTALLING OR REPLACING FAN COUPLING (M62)

CAUTION: Left-hand threads.

Using special tool 11 5 050 brace against pulley and unfasten cap nut from water pump using special tool 11 5 040.

Remove fan wheel with fan coupling from water pump.

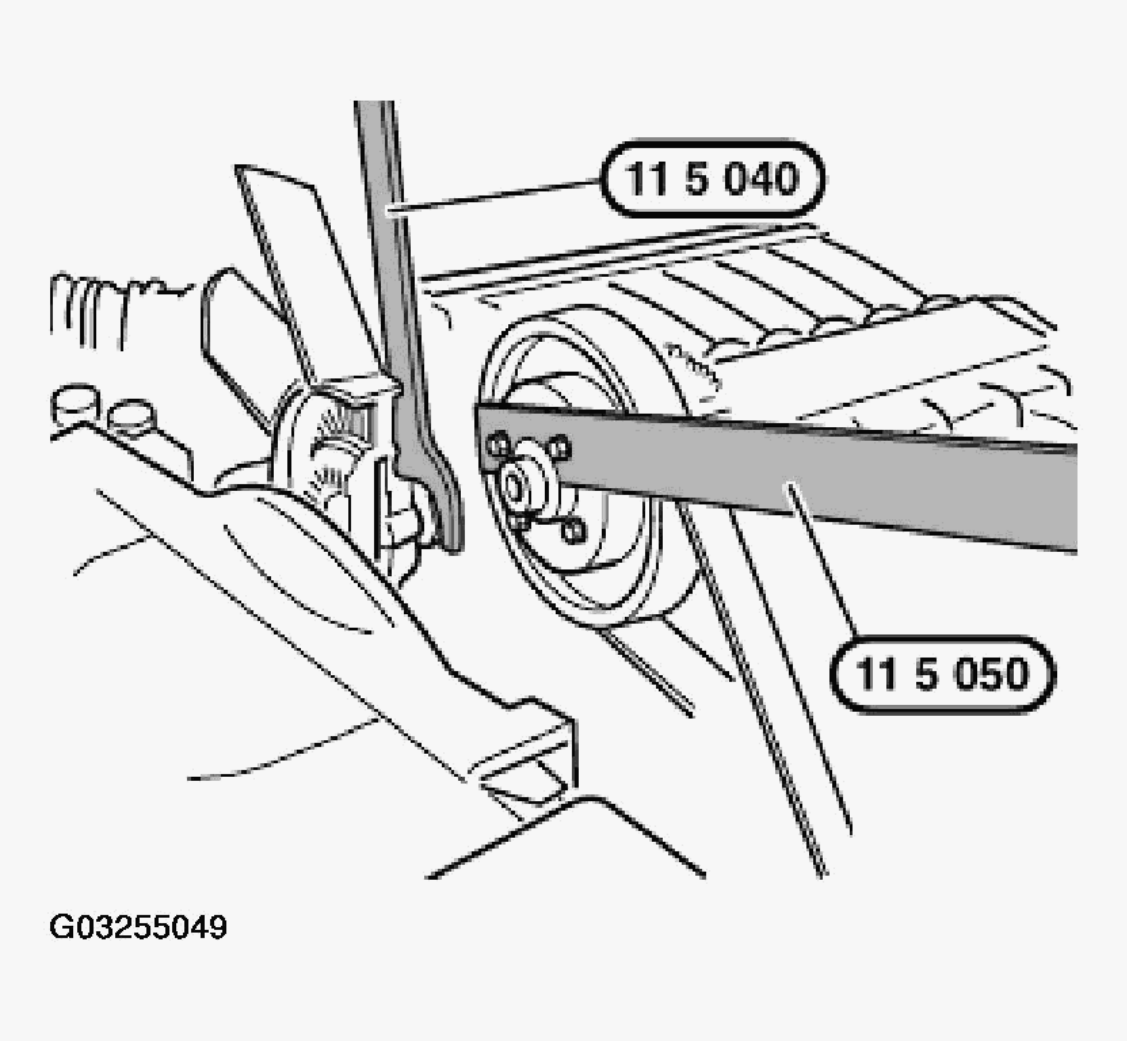


Fig. 601: Removing Fan Wheel & Coupling
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tighten down fan wheel using special tool 11 5 040.

Tightening torque,

refer to 11 52 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

NOTE: When using special tool 115 040, 30 Nm on the torque wrench scale are equivalent to a tightening torque of 40 Nm.



Fig. 602: Identifying Special Tool 11 5 040
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws and detach fan from fan coupling.

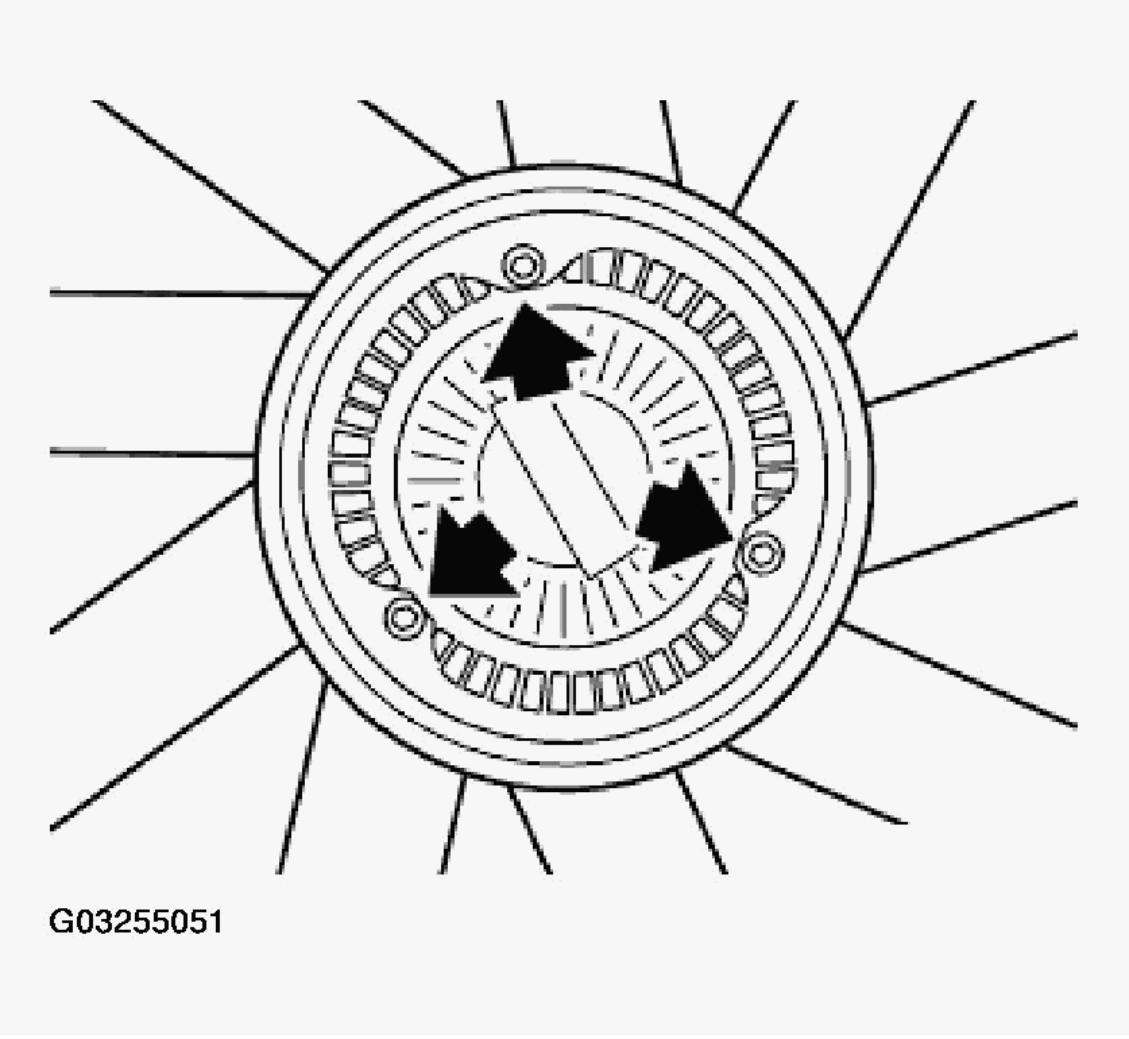


Fig. 603: Removing Fan From Fan Coupling
Courtesy of BMW OF NORTH AMERICA, INC.

THERMOSTAT AND CONNECTING PIPES

11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (M62)

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

Unscrew and remove splash guard.

Drain off coolant and dispose of correctly.

Installation:

Vent cooling system and check for leaks,

refer to **17 00 005 DRAINING AND TOPPING UP COOLANT (M62)** .

- Disconnect coolant hose.
- Disconnect plug-in connection.
- Remove thermostat housing cover with integrated thermostat.

Installation:

Replace sealing ring.

11 53 325 REMOVING AND INSTALLING/REPLACING COOLANT MANIFOLD (M62)

Disconnect intake air manifold,

refer to **11 61 050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (M62)** .

Unscrew and remove splash guard.

Unfasten drain plug for coolant on right engine block.

Drain and dispose of coolant.

Installation:

Replace sealing ring.

Tightening Torque,

refer to 11 11 5AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Top up coolant. Vent cooling system and check for leaks,

refer to **17 00 005 DRAINING AND TOPPING UP COOLANT (M62)** .

NOTE: Illustration with engine removed.

Remove all coolant hoses from coolant manifold.

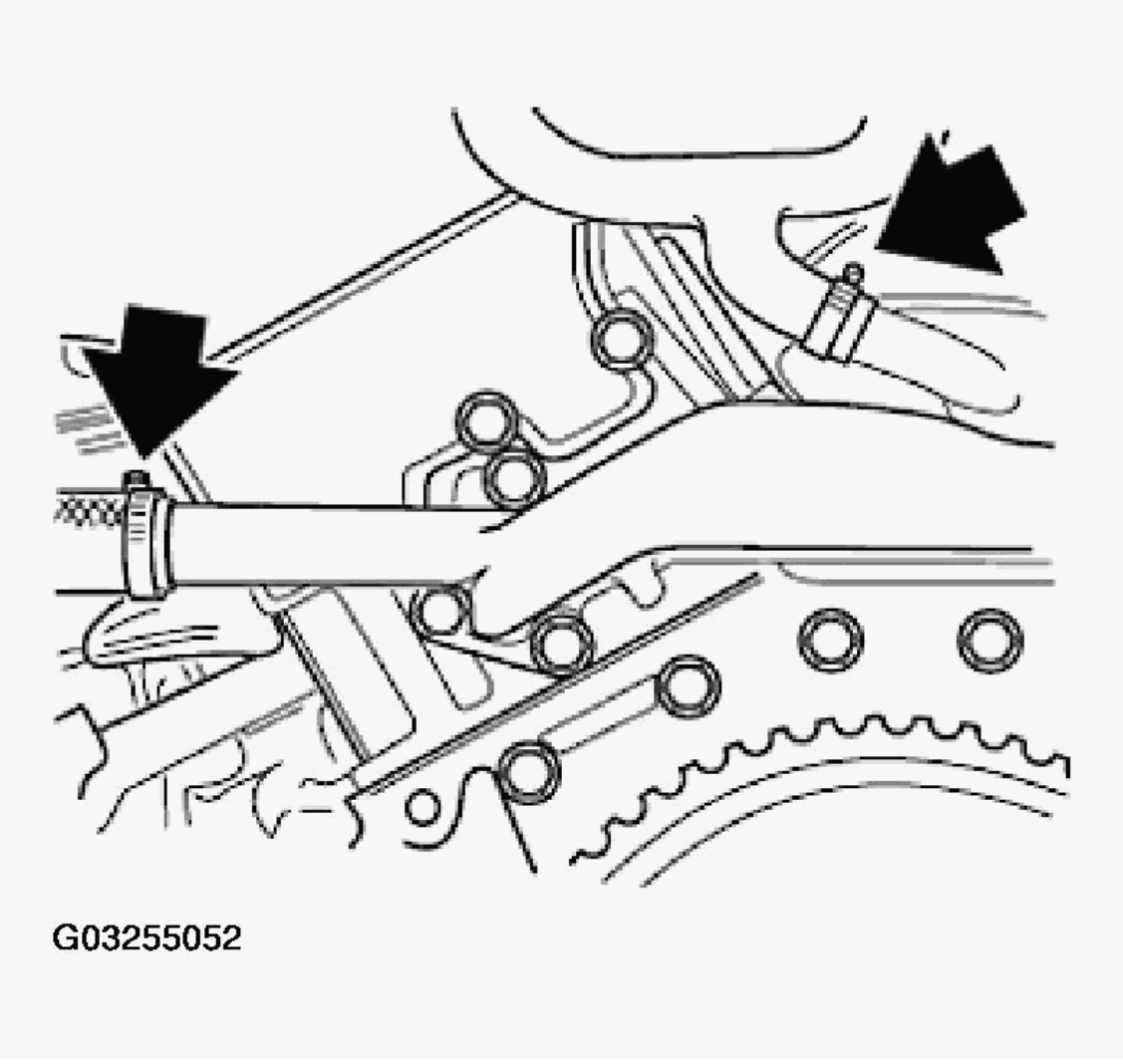


Fig. 604: Removing Coolant Hoses From Coolant Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Illustration with engine removed.

Unfasten left and right screw connection on coolant manifold.

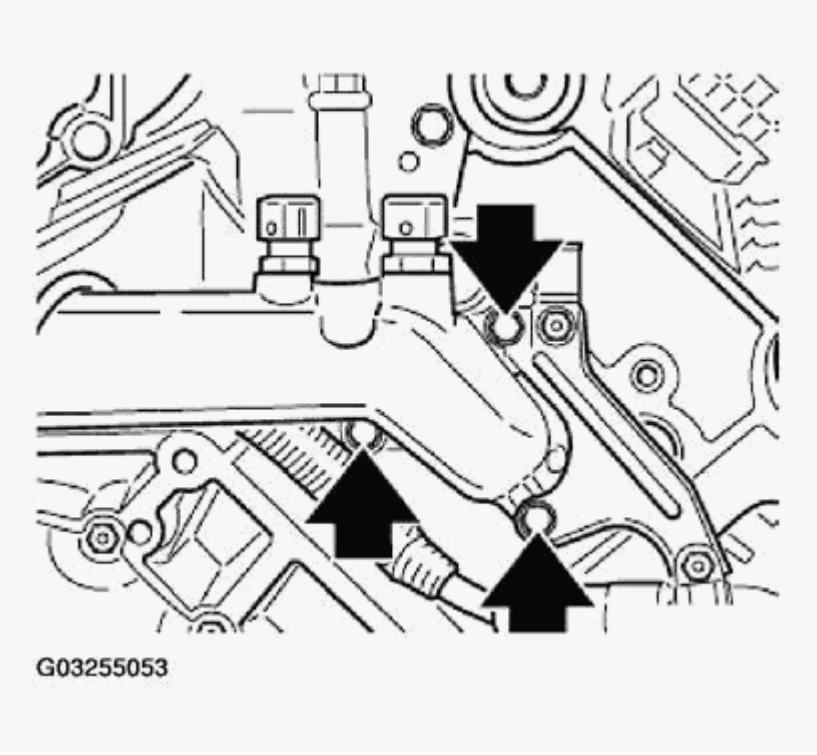


Fig. 605: Unfastening Left And Right Screw Connection On Coolant Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean sealing faces and replace seals and sealing rings.

INTAKE MANIFOLD

11 61 050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (M62)

Instructions for disconnecting and connecting battery,

refer to **12 00 .. INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY** .

Disconnect battery negative terminal.

Remove heater bulkhead,

refer to **51 71 080 REMOVING AND INSTALLING/REPLACING HEATER BULKHEAD** .

Turn fasteners on acoustic cover 90° counterclockwise, remove acoustic cover.



Fig. 606: Removing Acoustic Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Remove covers for ignition coils.

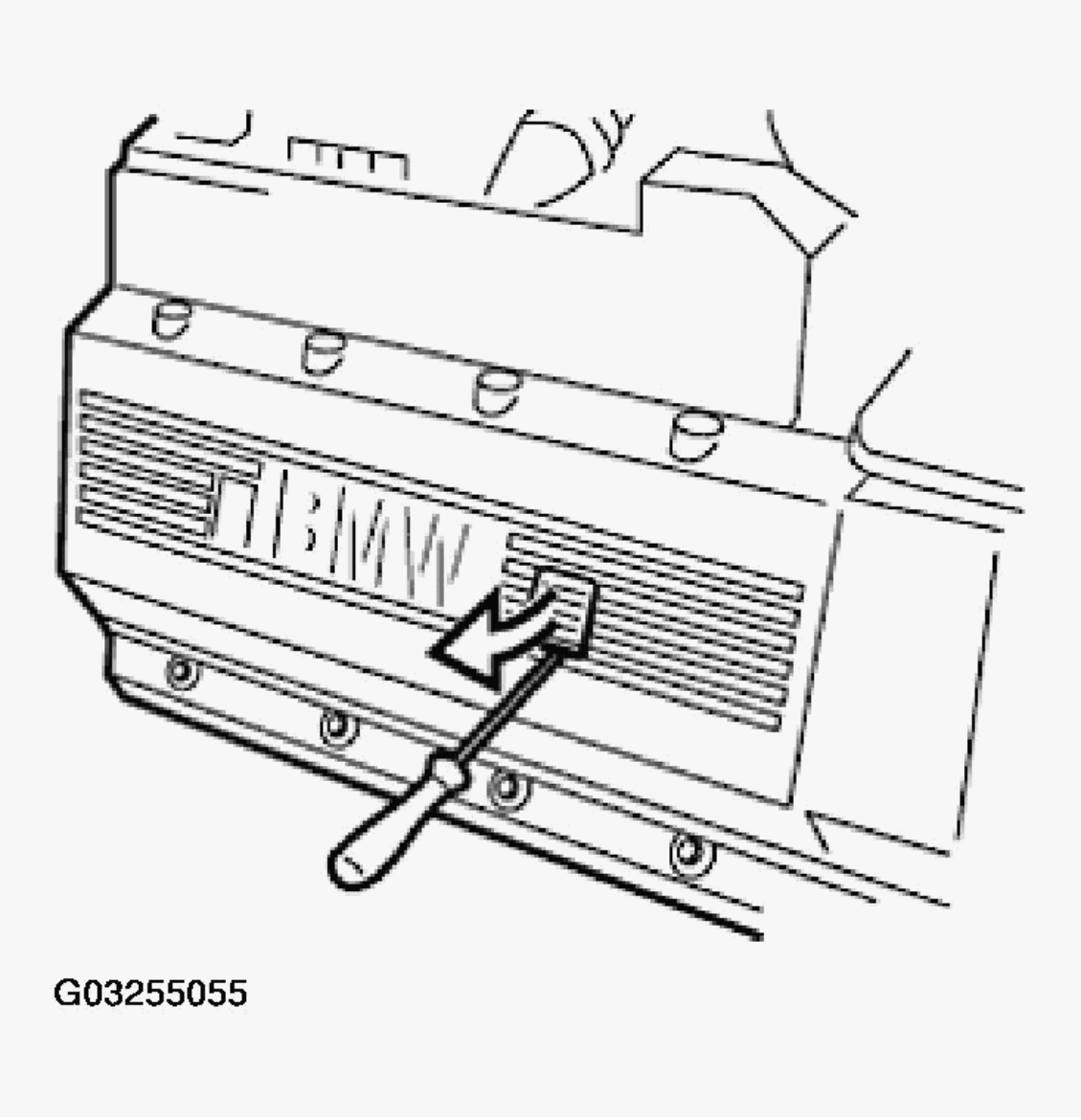


Fig. 607: Removing Covers For Ignition Coils
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connections to ignition coils.

Release bellows on throttle. Remove intake filter housing with air-mass flow sensor.

Detach battery positive lead from support point on firewall. Feed out battery positive lead and lay to one side.

Release wiring harness section for engine from intake air manifold and lay to one side with cable ducts.

Detach hoses for vacuum control of air injection.

Remove vacuum hose from throttle body.

CAUTION: Catch and dispose of escaping fuel.

Disconnect fuel feed line from injection pipe and seal hose ends with special tool 13 5 281 and special tool 13 5 282.

NOTE: Illustration with engine removed.

Disconnect hose (1) for engine ventilation from cylinder head cover, cylinder bank 5 to 8.

Disconnect hose (2) for engine ventilation from oil separator.

Detach connection piece (3) for brake booster.

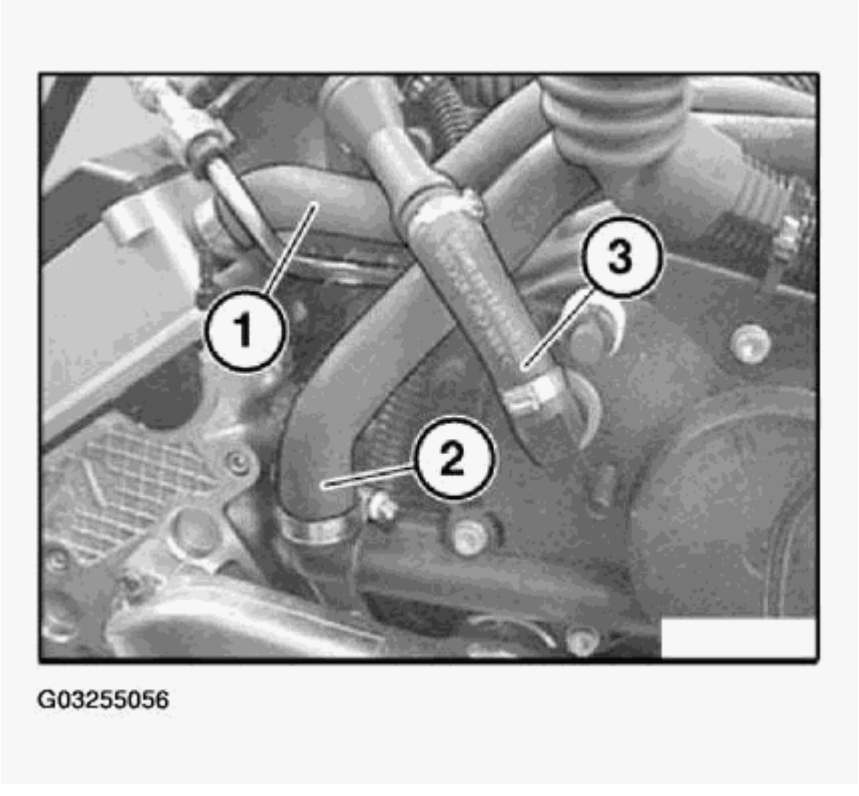


Fig. 608: Removing Hoses For Engine Ventilation
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Illustration with engine removed.

Remove oil separator from cover at rear.

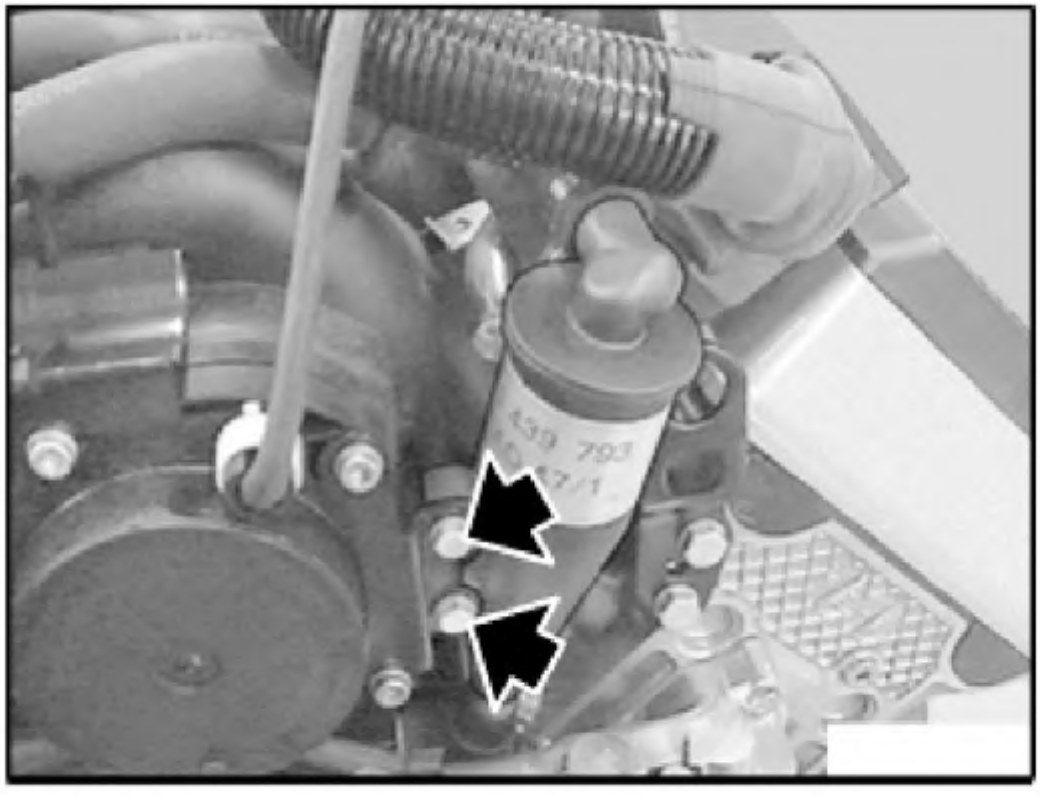


Fig. 609: Removing Oil Separator
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: An oil drain hose from rear cover is connected under intake air manifold.

After the screw connection has been released, the intake air manifold cannot be removed yet.

Unfasten nuts (left and right). Remove decoupling elements.

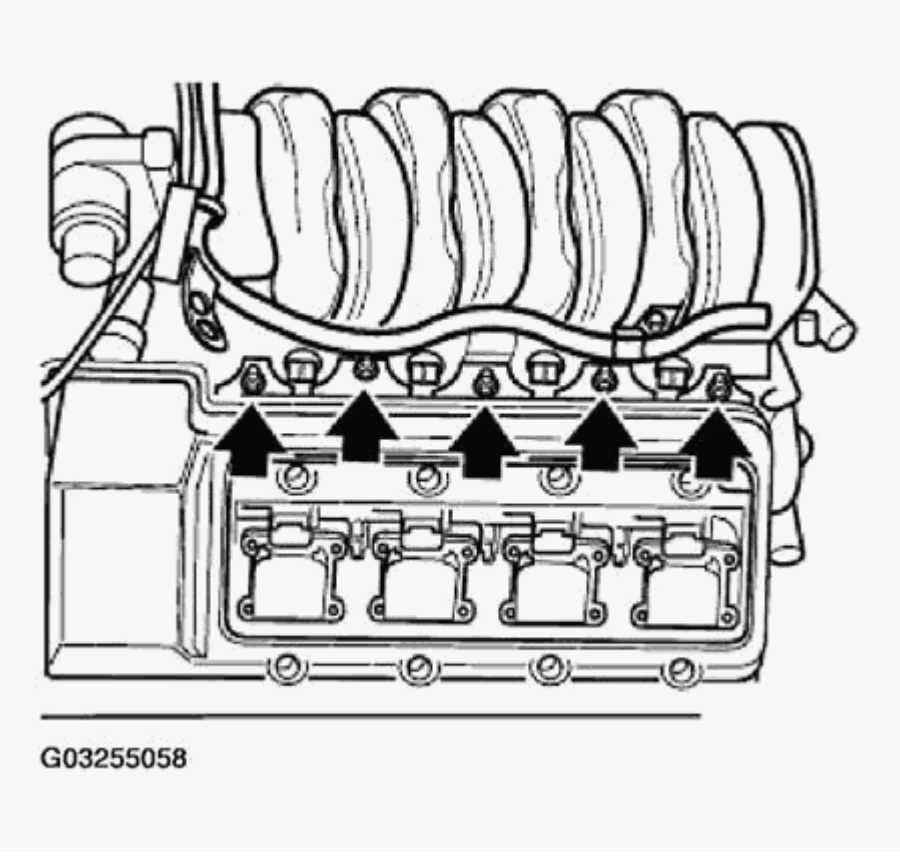
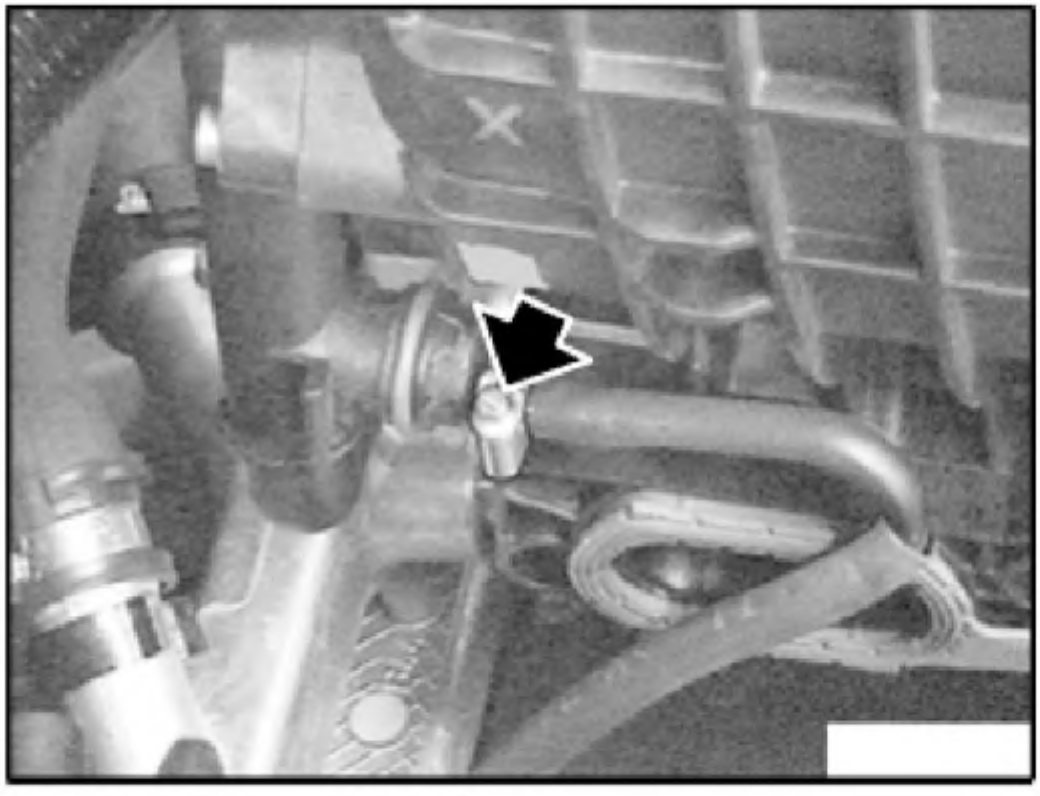


Fig. 610: Removing Intake Manifold & Decoupling Element Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Raise intake air manifold approx. 10 cm and carefully tilt to one side.

Disconnect oil drain hose from rear cover.

Lift out intake air manifold.



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Fig. 611: Disconnecting Oil Drain Hose From Rear Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check oil drain for damage.

If necessary, replace oil drain hose and chafe protector.

Ensure it is routed without kinks.

If necessary, remove vent pipe in intake air manifold:

Remove throttle valve.

Remove covers at front and rear from intake air manifold.

NOTE: Vent pipe is located with a lug (1) and locked with a retaining lug (2) in intake air

manifold.

Carefully press retaining lug (2) back and push vent pipe out of bore.

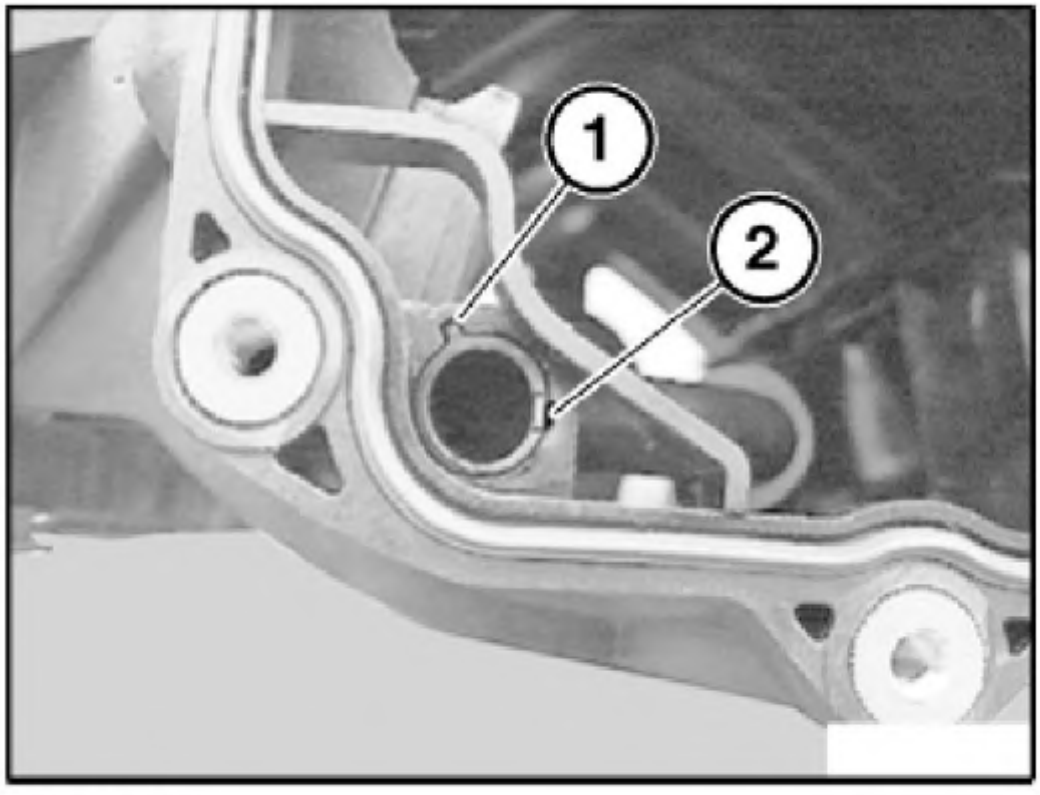


Fig. 612: Identifying Vent Pipe & Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Remove vent pipe (1).

Installation:

Replace seal.

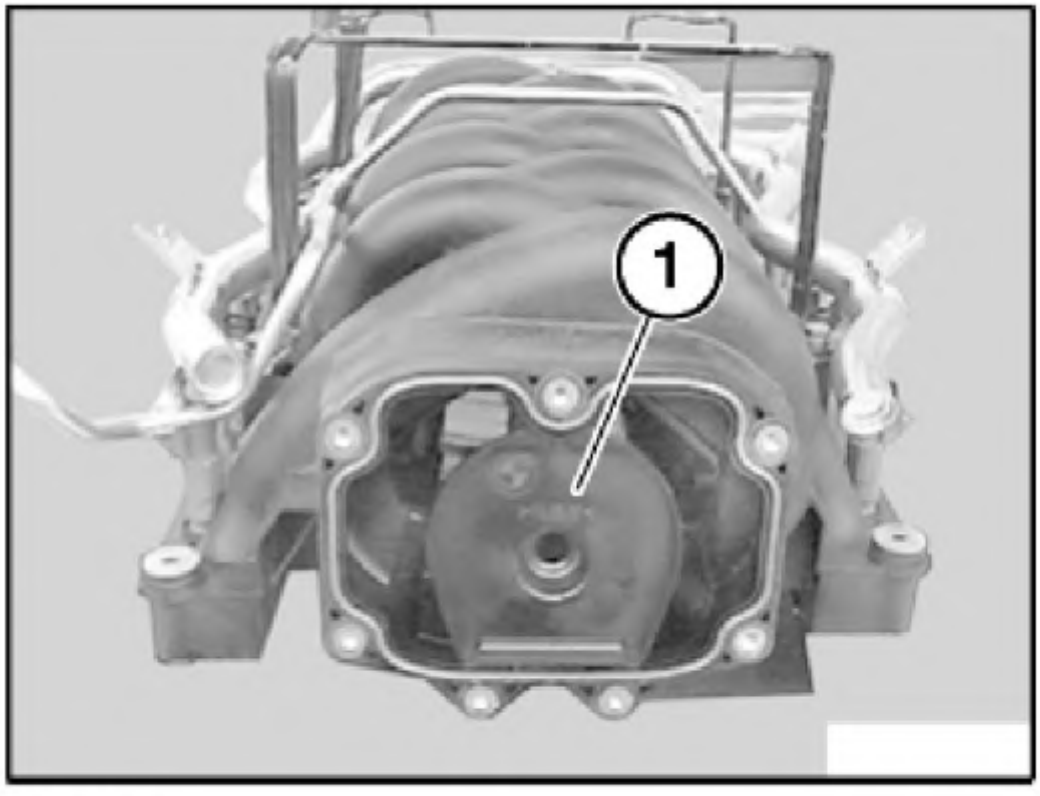


Fig. 613: Identifying Vent Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

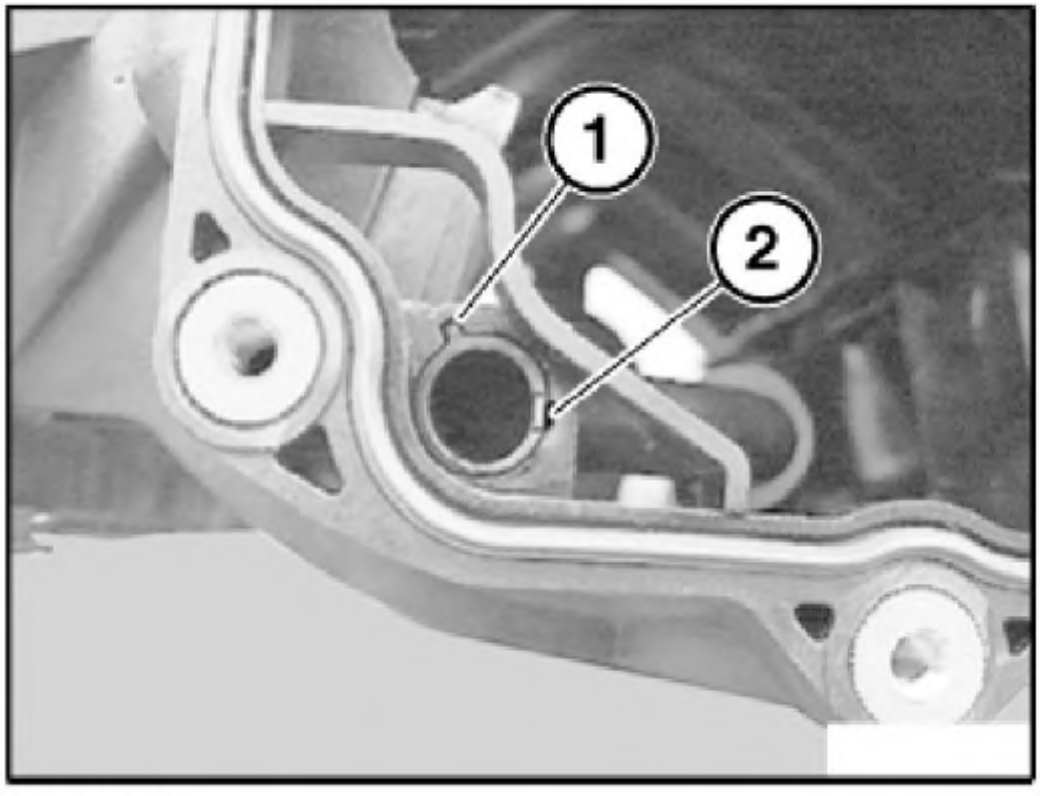
Installation:

Insert vent pipe.

Check fixture (1) and lock (2) of vent pipe in intake air manifold.

Replace seals.

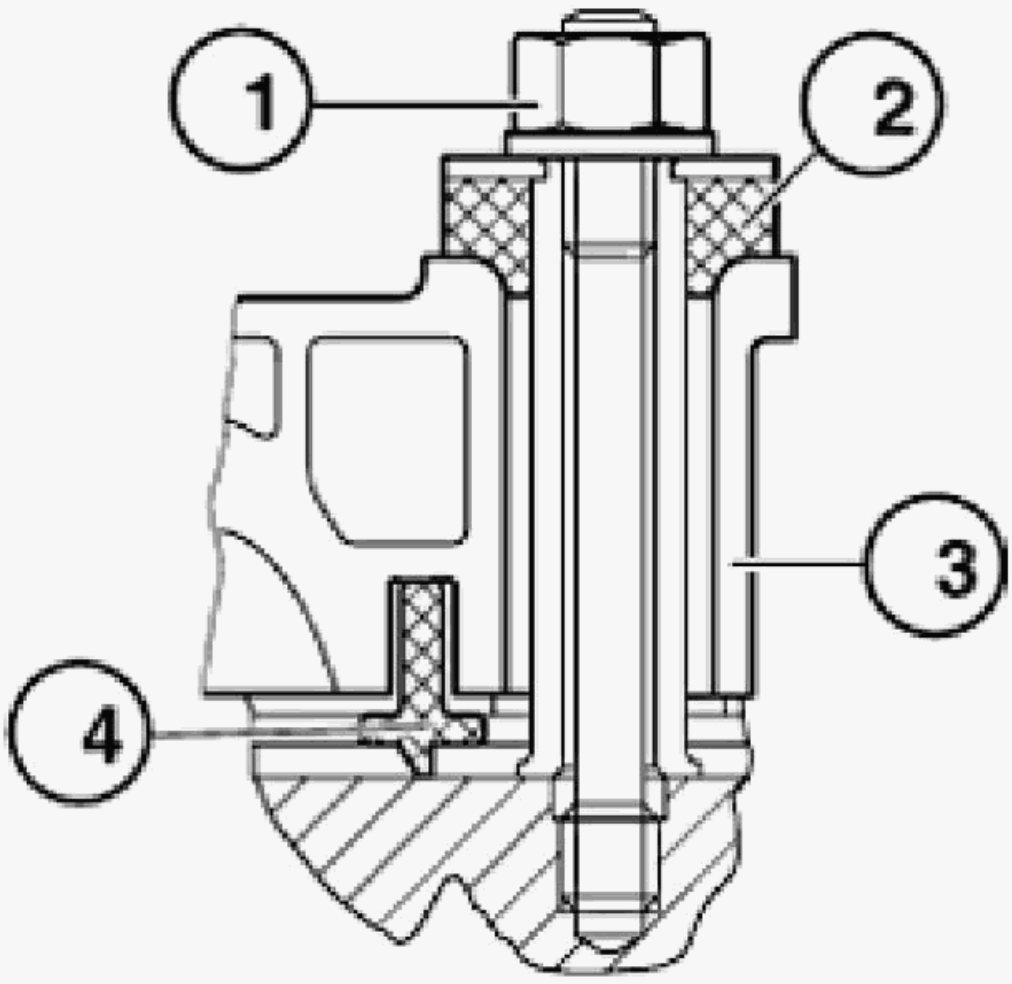
Install covers at front and rear.



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Fig. 614: Installing Vent Pipe & Seal
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The intake air manifold is vibrationally separated from the cylinder head by decoupling elements and gaskets.



(1) Nut

(2) Decoupling element

(3) Intake air manifold

(4) Seal

G03255063

Fig. 615: Identifying Intake Air Manifold Decoupling Elements And Seals
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check seals and replace if necessary.

CAUTION: Ensure that seals are correctly seated.

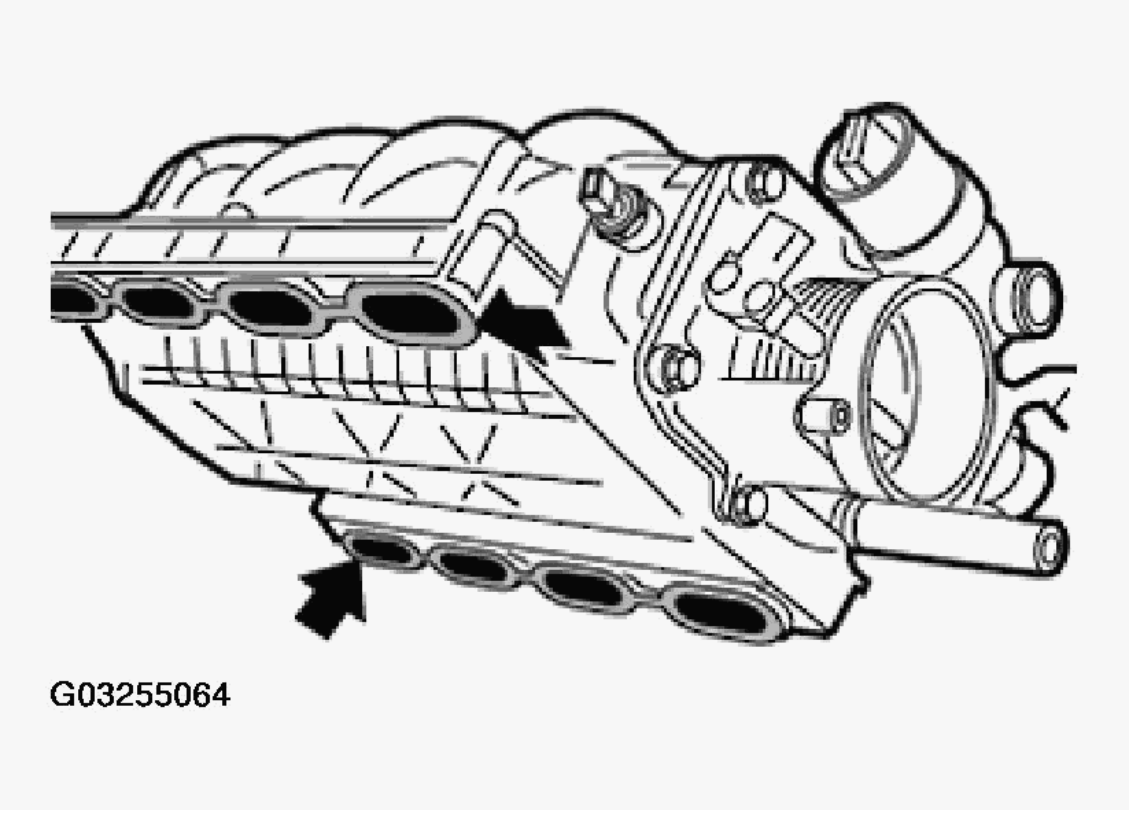


Fig. 616: Checking Seals For Correctly Seating
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fit two decoupling elements on left and right with nuts and do not tighten (i.e. no preload).

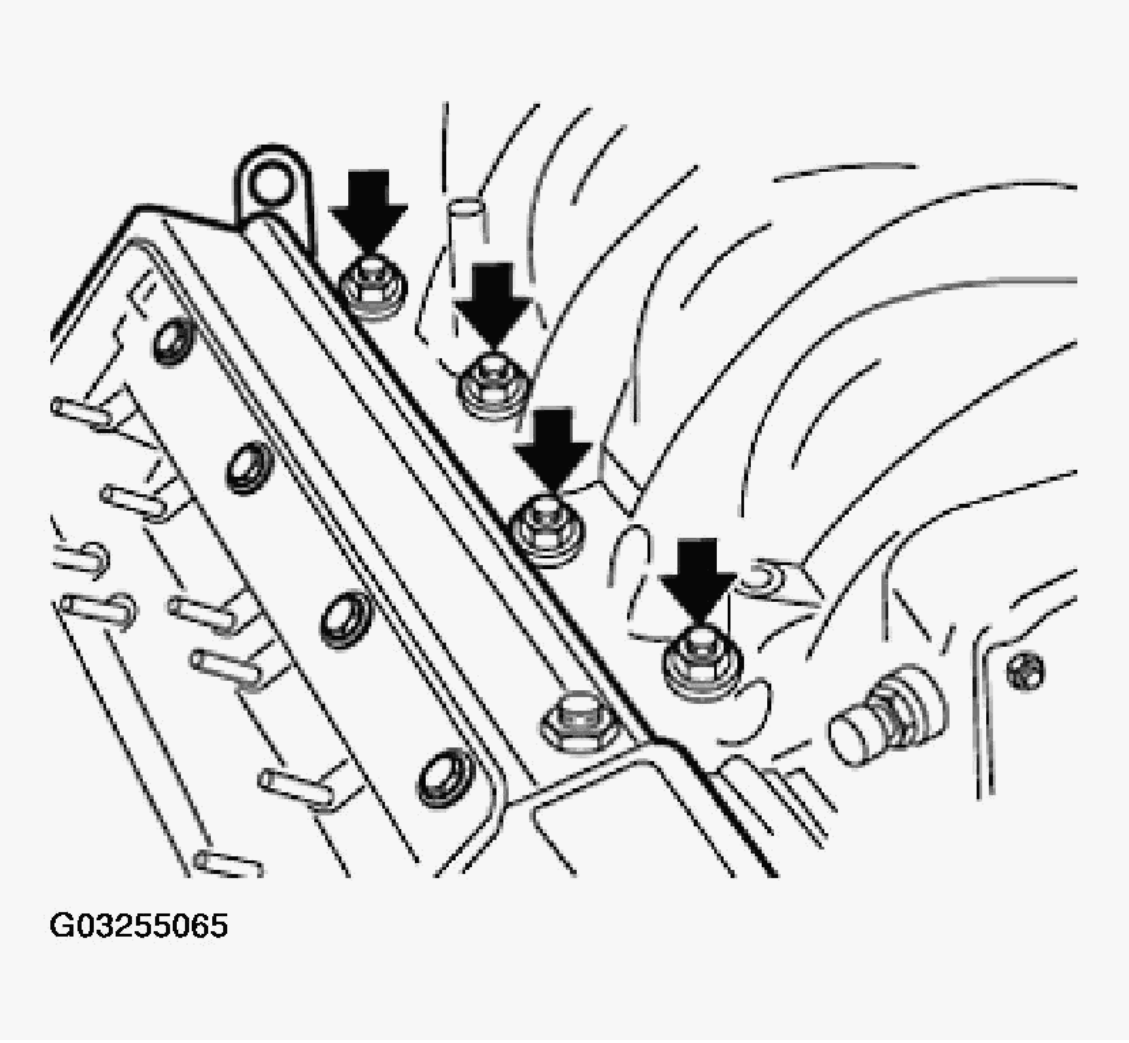


Fig. 617: Installing Decoupling Elements & Intake Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

Align intake air manifold.

Fit all other decoupling elements with nuts and tighten crosswise from inside to outside.

Tightening torque,

refer to 11 61 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

EXHAUST MANIFOLD

11 62 060 REMOVING AND INSTALLING/REPLACING LEFT EXHAUST MANIFOLD (M62/N62)

Cylinder Bank 5 To 8

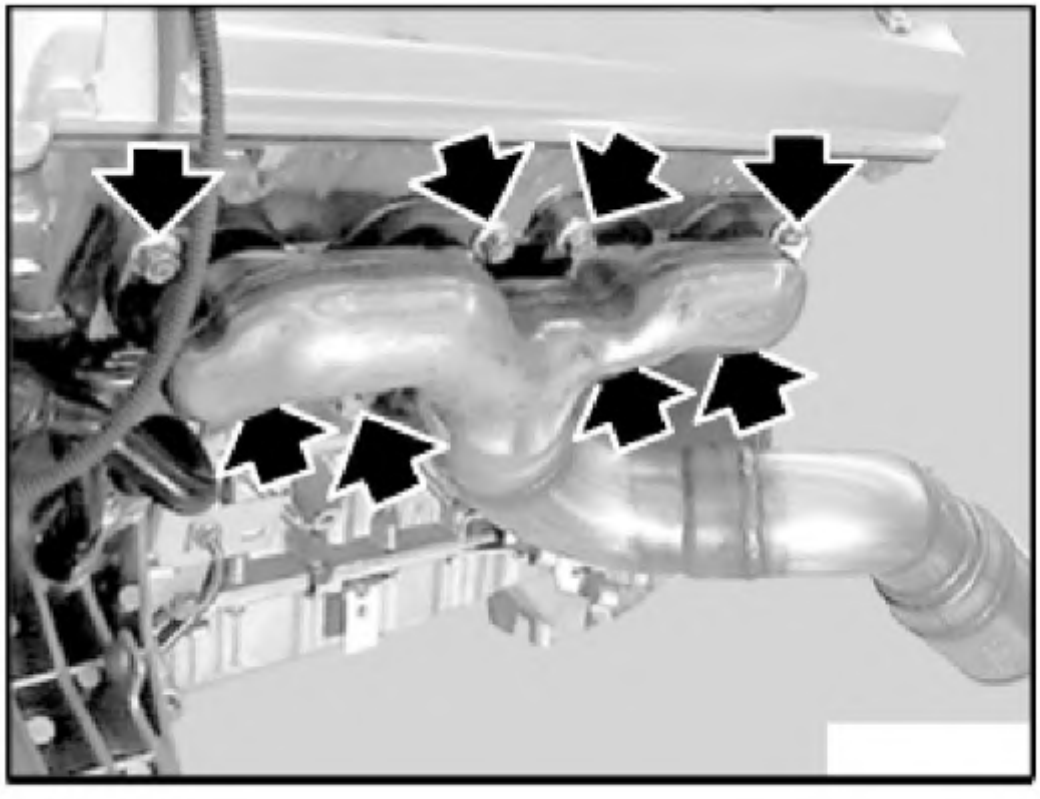
Necessary preliminary tasks:

- Remove reinforcement plate.
- Remove exhaust system.
- Remove front propeller shaft.

NOTE: Illustration with engine removed.

Release screw connection at exhaust manifold.

Feed out exhaust manifold towards bottom.



G03255066

Fig. 618: Removing Left Side Exhaust Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace seals.

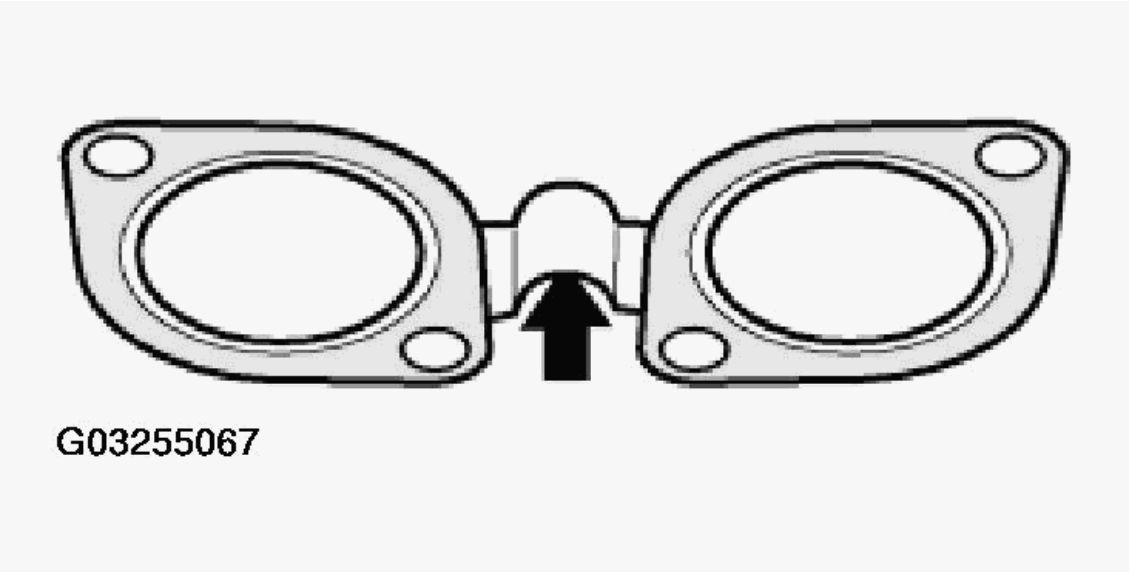


Fig. 619: Identifying Exhaust Manifold Seals
Courtesy of BMW OF NORTH AMERICA, INC.

Beads of seals face the exhaust manifold.

Coat thread with copper paste -CRC-.

Replace nuts.

Tightening torque, see 11 62 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Assemble engine.

Check exhaust system for leaks.

11 62 065 REMOVING AND INSTALLING/REPLACING RIGHT EXHAUST MANIFOLD (M62/N62)

Cylinder Bank 1 To 4

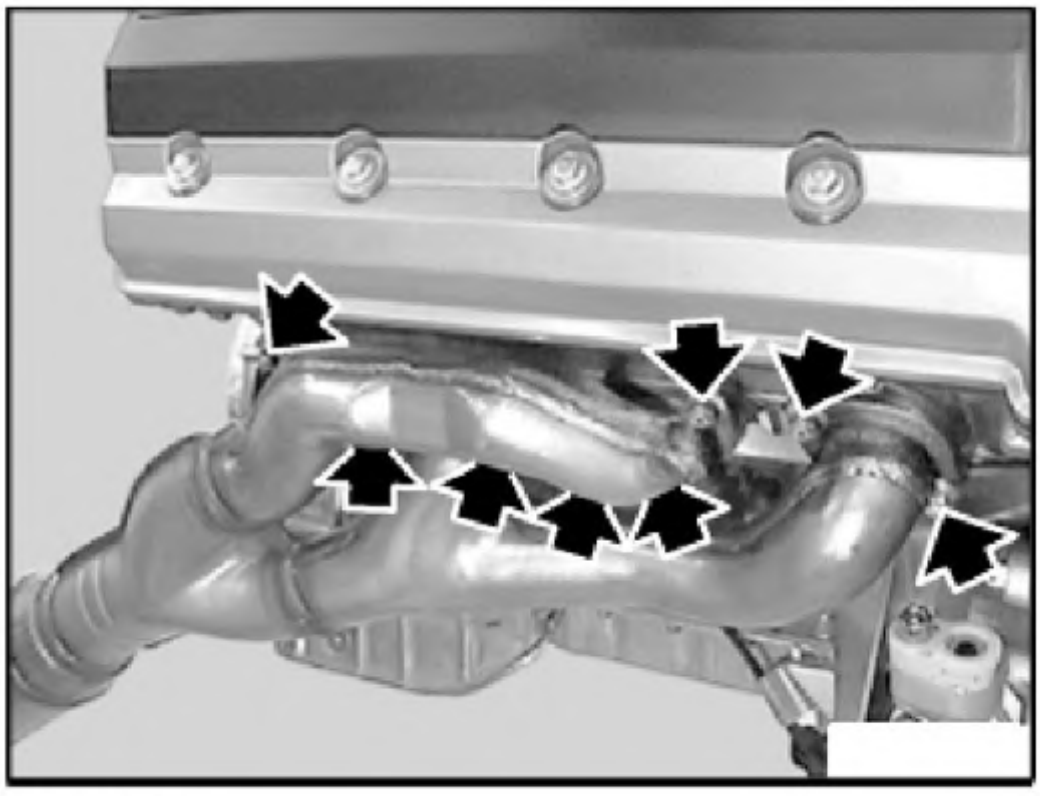
Necessary preliminary tasks:

- Remove exhaust system.
- Remove reinforcement plate.
- Remove propeller shaft.

NOTE: Illustration with engine (M62) removed.

Release screw connection at exhaust manifold.

Feed out exhaust manifold towards bottom.



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Fig. 620: Removing Right Side Exhaust Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace seals.

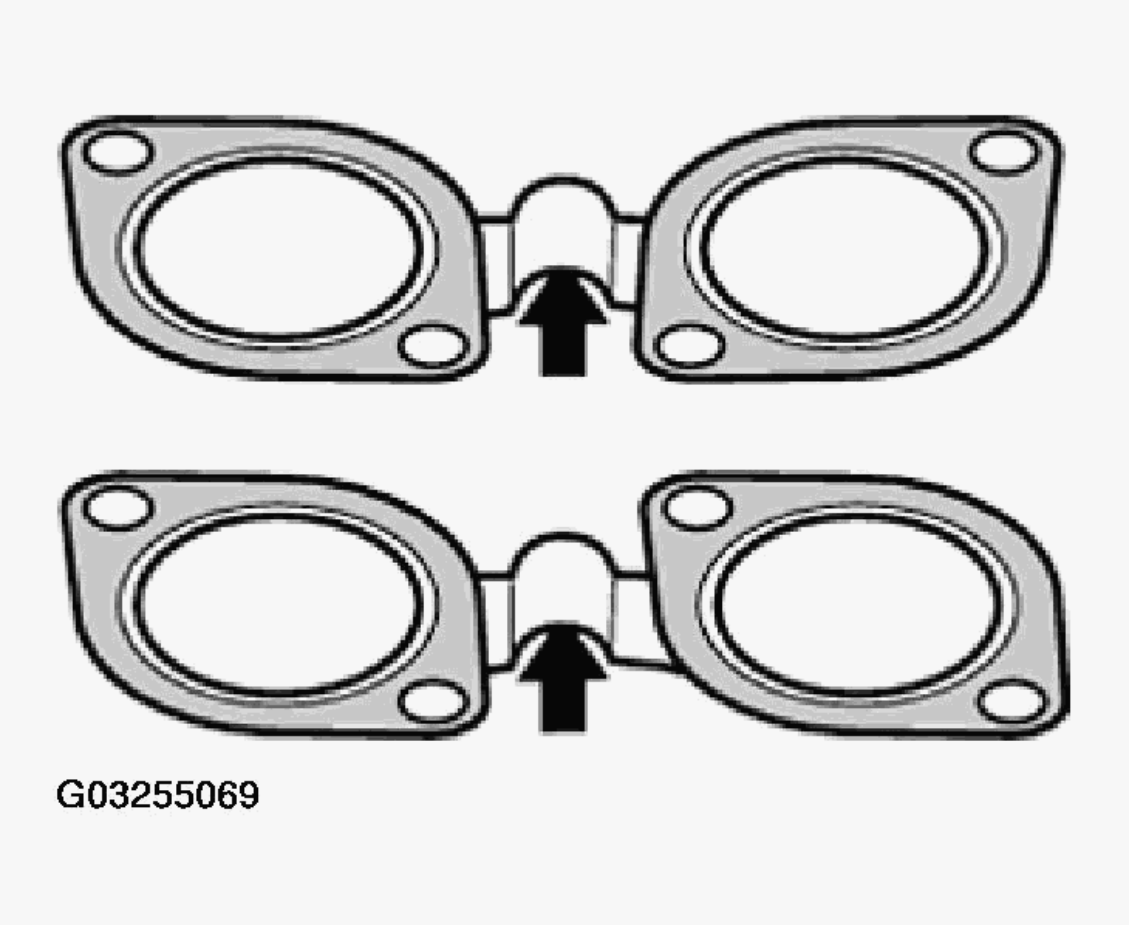


Fig. 621: Identifying Exhaust Manifold Seals
Courtesy of BMW OF NORTH AMERICA, INC.

Seal beads faces the exhaust manifold.

Coat thread with copper paste -CRC-.

Replace nuts.

Tightening torque, see 11 62 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Assemble engine.

Check exhaust system for leaks.

EMISSION CONTROL OXYGEN

11 78 510 REPLACING OXYGEN SENSOR (M62/S62)

(refer Oper. No. 13 00 002 DME TESTING)

Disconnect connector for oxygen sensor.

Unclip Lambda oxygen sensor cable from bracket.

NOTE: Use special tool 11 7 020 or special tool 11 7 030 to unfasten and tighten down the oxygen sensor.

Tightening Torque,

refer to 11 78 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

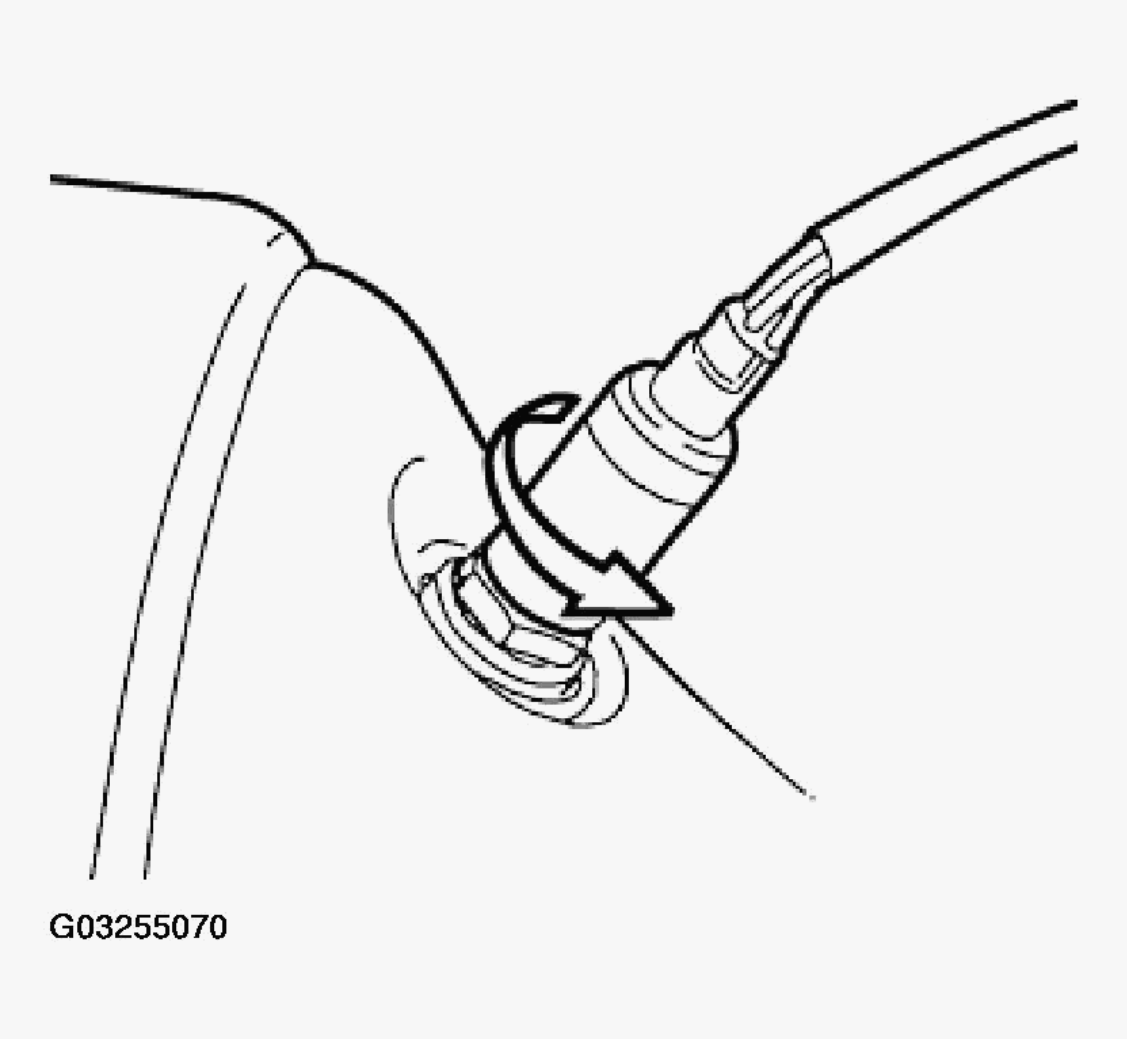


Fig. 622: Removing Oxygen Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

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 event coat of Never Seez Compound to the threads only.

Do not clean the oxygen sensor section jutting into the exhaust line and do not bring it into contact with lubricant.

Protect (mask) oxygen sensor when applying underseal.

Note cable routing of oxygen sensor.

11 78 530 REPLACING LAMBDA CONTROL SENSOR, LEFT (M62)

(refer Oper. No. 13 00 002 DME TESTING)

Read out fault memory, clear if necessary.

Unclip Lambda control sensor cable from retainer.

Disconnect plug connection for Lambda control sensor.

Release Lambda control sensor with special tool 11 7 030.

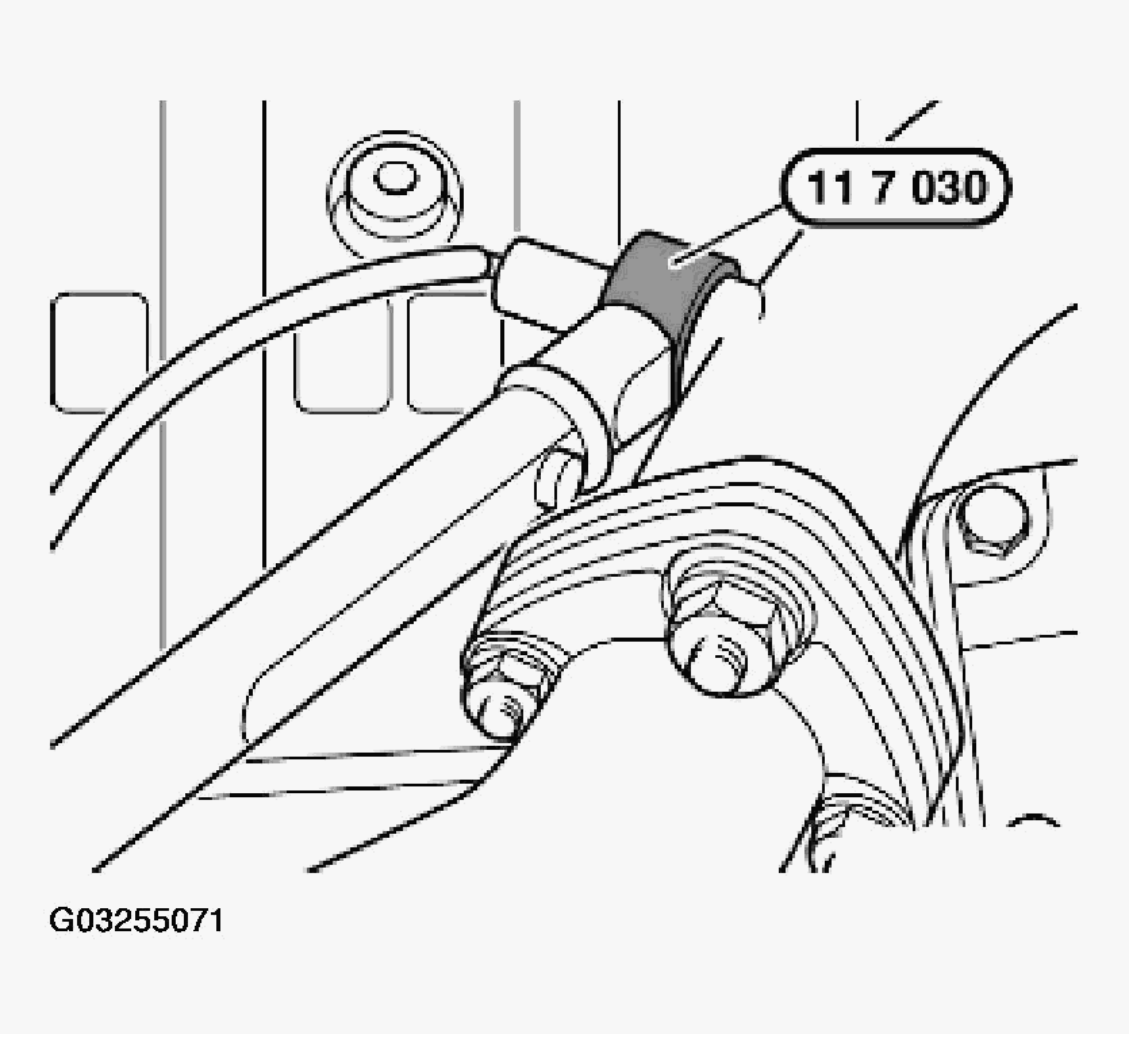


Fig. 623: Removing Lambda Control Sensor (Left)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Do not clean the oxygen sensor section which protrudes into the exhaust line and ensure that it avoids all contact with lubricants.

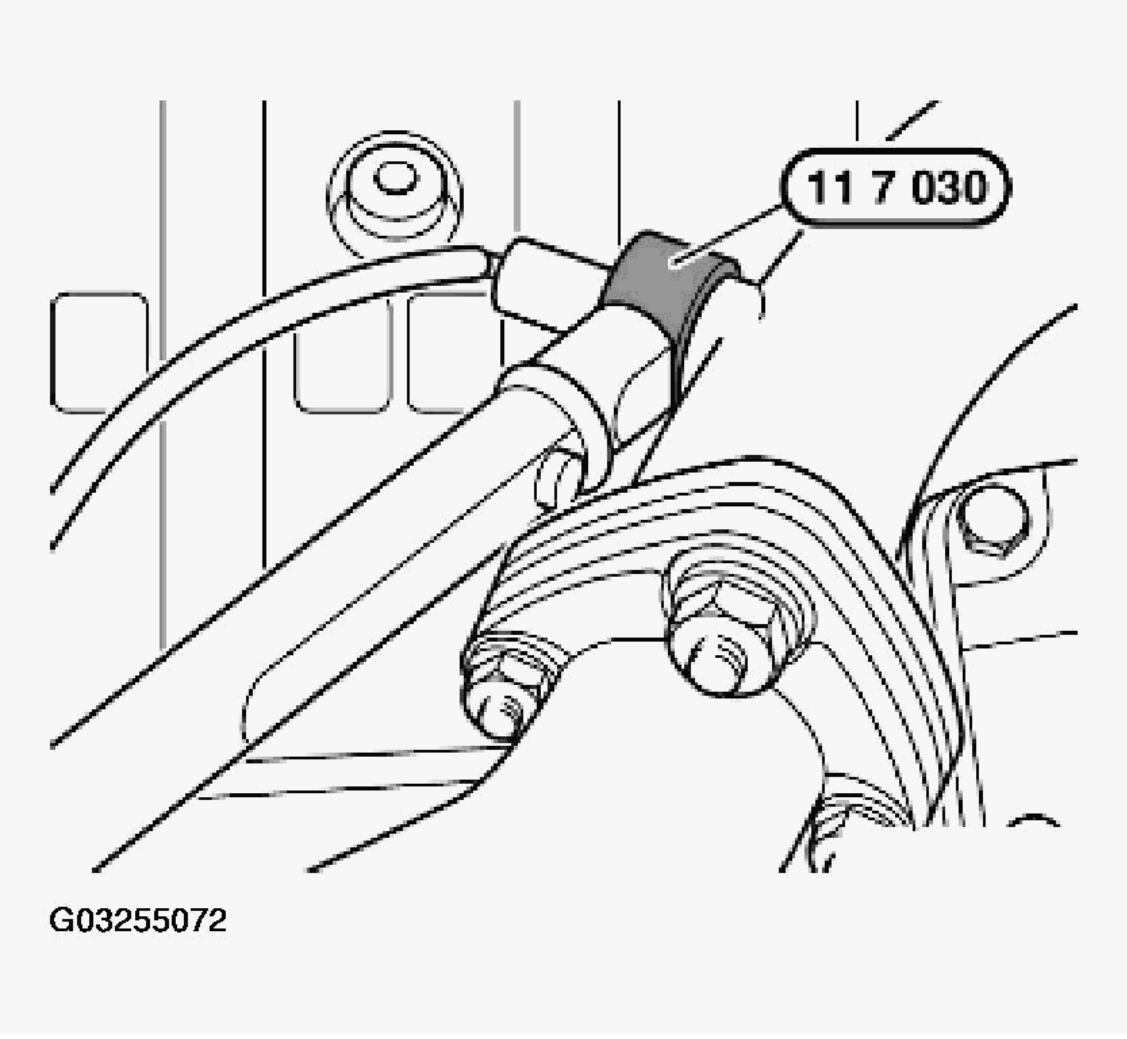


Fig. 624: Installing Lambda Control Sensor (Left)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Secure Lambda control sensor with special tool 11 7 030.

Tightening Torque,

refer to 11 78 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Pay attention to cable routing of Lambda control sensor.

11 78 533 REPLACING LAMBDA CONTROL SENSOR, RIGHT (M62)

(refer Oper. No. 13 00 002 DME TESTING)

Read out fault memory, clear if necessary.

Unclip Lambda control sensor cable from retainer.

Disconnect plug connection for Lambda control sensor.

Release Lambda control sensor with special tool 11 7 030.

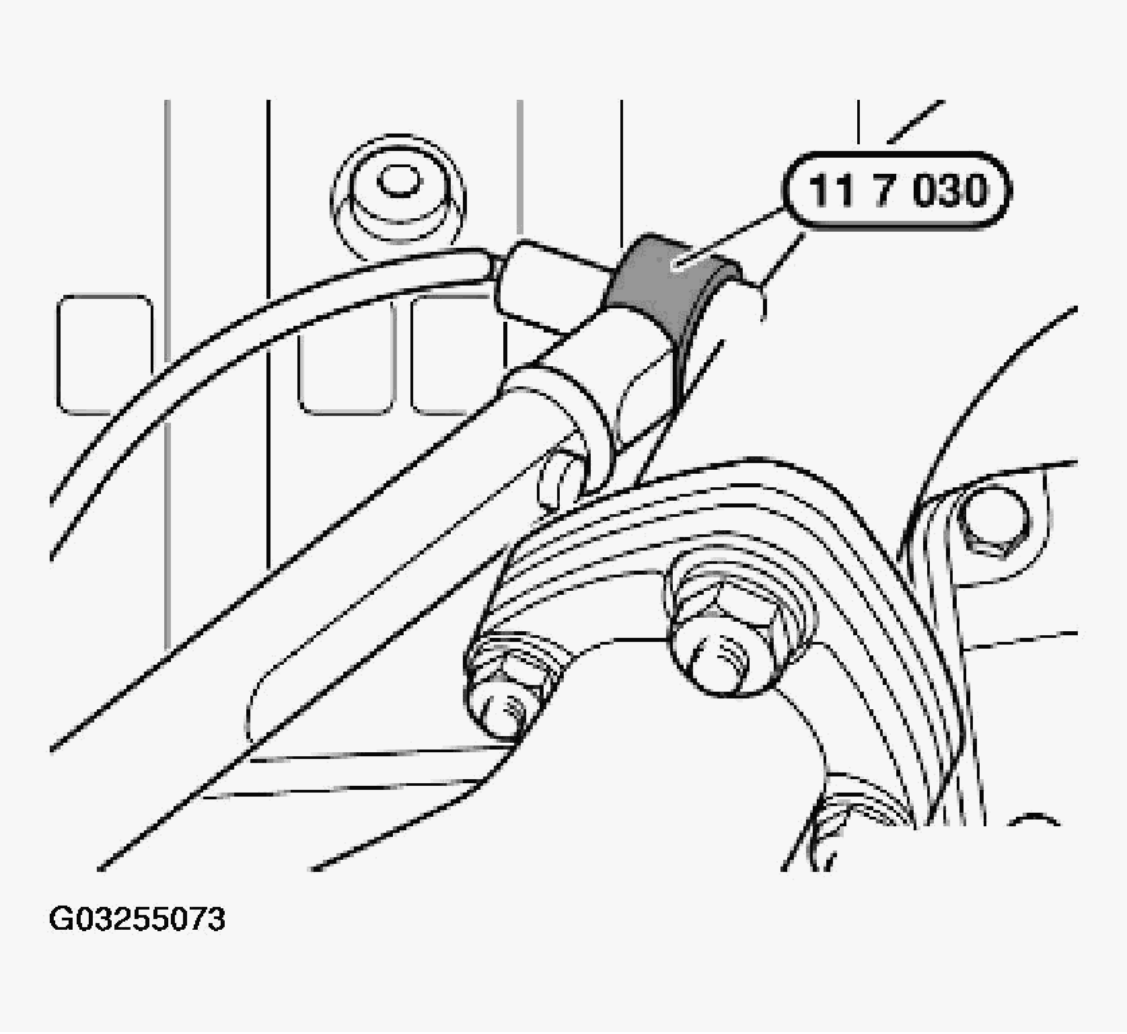


Fig. 625: Removing Lambda Control Sensor (Right)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Do not clean the oxygen sensor section which protrudes into the exhaust line and ensure that it avoids all contact with lubricants.

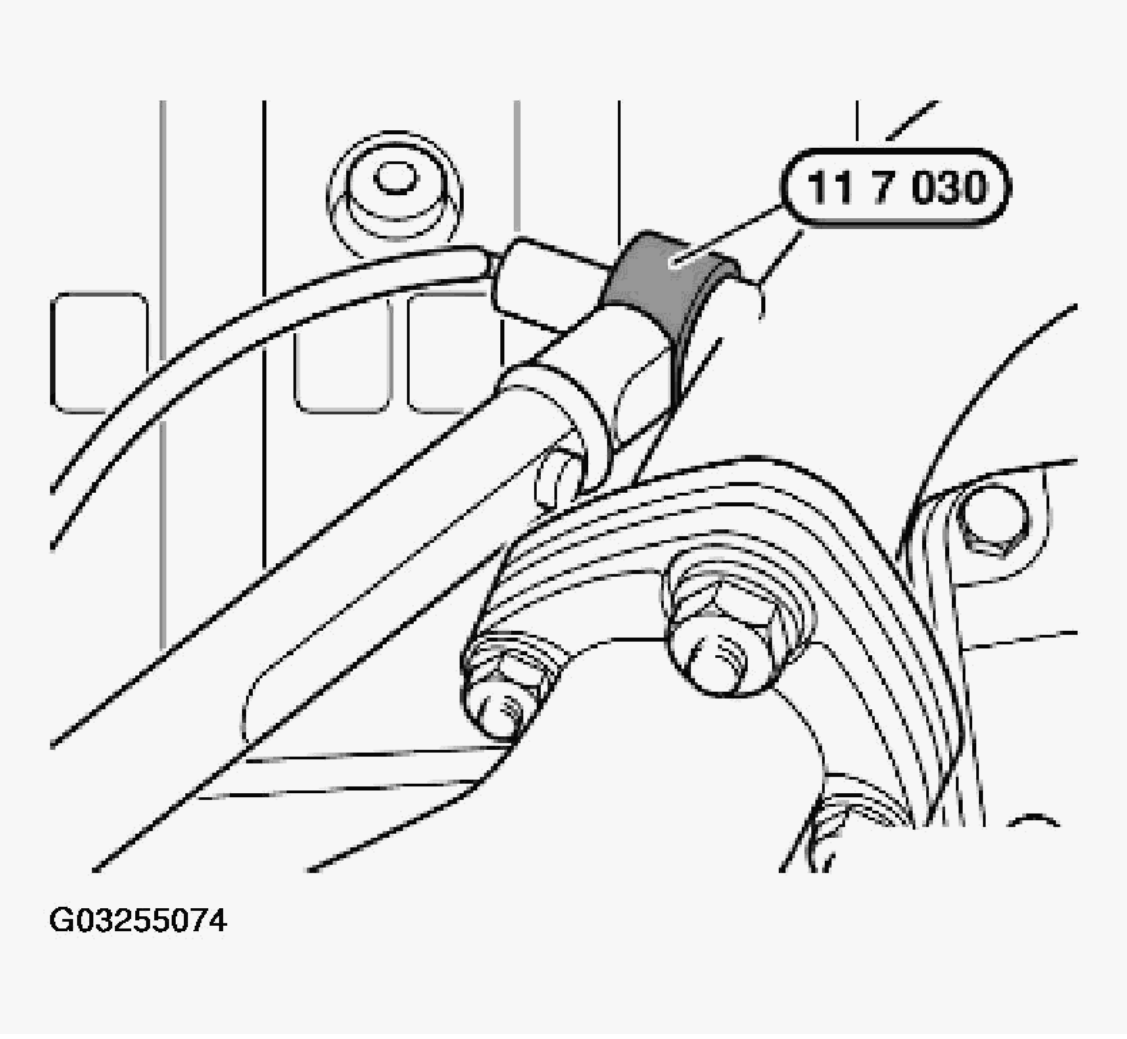


Fig. 626: Installing Lambda Control Sensor (Right)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Secure Lambda control sensor with special tool 11 7 030.

Tightening Torque,

refer to 11 78 1AZ in **ENGINE - TIGHTENING TORQUES - X5 4.6L** .

Pay attention to cable routing of Lambda control sensor.