1996-99 ENGINE

Repair - 4 Cyl. (M44)

ENGINE, GENERAL

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

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

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

Protective measures/rules of conduct

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

First aid measures

- Do not induce vomiting.

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

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

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

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

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

Protective measures/rules of conduct

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

First aid measures

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

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

**WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!**

Recycling

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released

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

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

00 00 249 BMW ENGINE OIL SERVICE (M40 / M42 / M43 / M43TU / M44)

Change engine oil and oil filter.

Version with central screw

Unscrew oil-filter cover

Oil flows from oil-filter housing into oil pan.

Installation

Replace sealing ring.

Tightening Torque, refer to 11 42 2AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

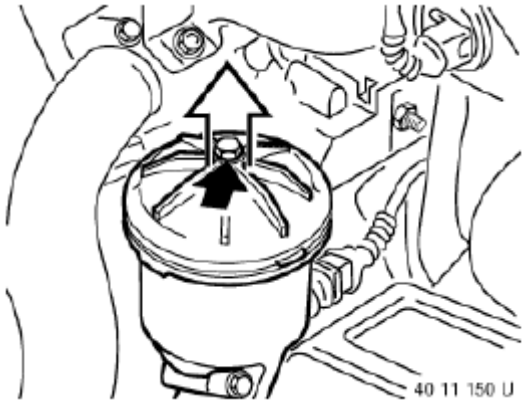


Fig. 1: Locating Oil-Filter Cover Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Replace sealing ring in oil-filter cover and sealing ring on bolt.

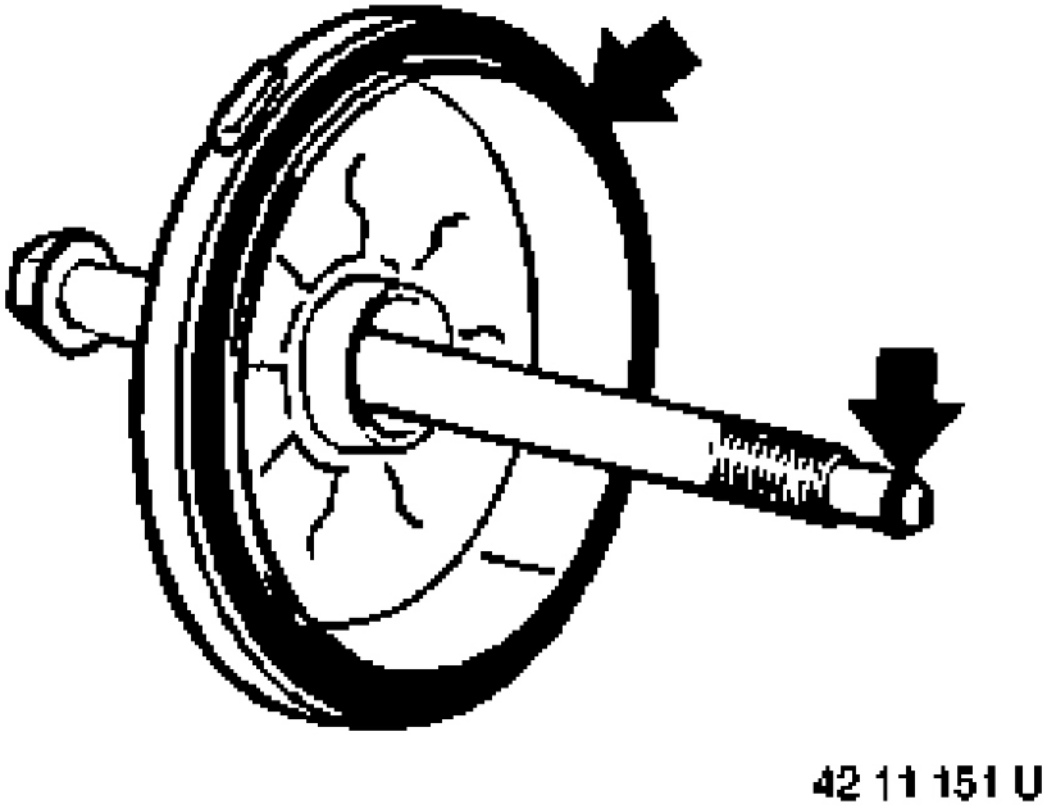


Fig. 2: Identifying Oil-Filter Cover Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Remove oil filter insert.

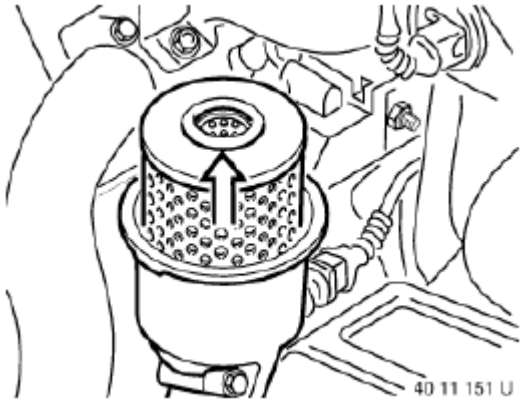


Fig. 3: Removing Oil Filter Insert
Courtesy of BMW OF NORTH AMERICA, INC.

Version with screw cap

Loosen the oil filter cap using special tool 11 7 331. See **ENGINE - SPECIAL TOOLS (M44)** .

Oil flows from oil-filter housing into oil pan.

Installation

Tightening Torque, refer to 11 42 2AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

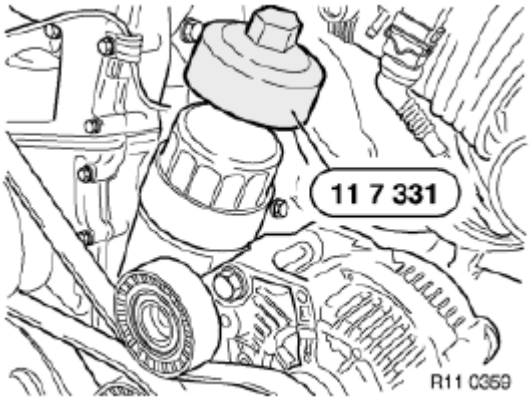


Fig. 4: Identifying Special Tool (11 7 331)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Replace seals and coat with oil.

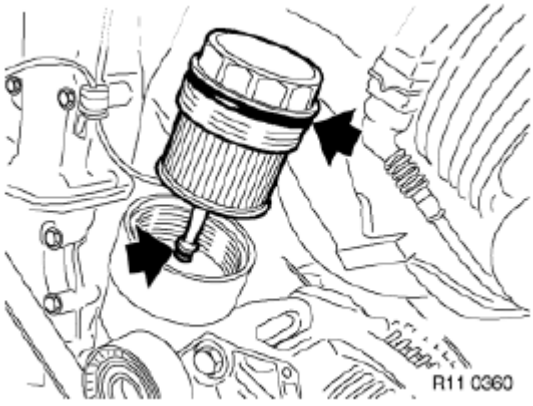


Fig. 5: Locating Oil Filter Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

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 - TORQUE SPECIFICATIONS (M44)**

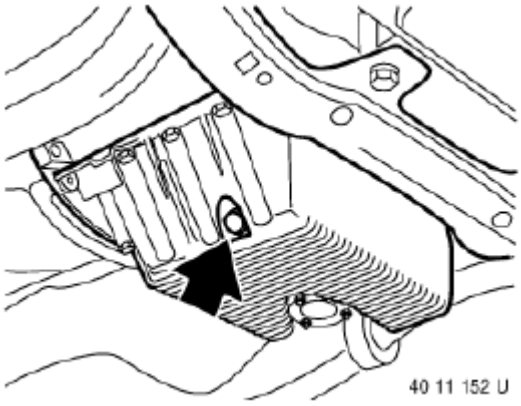


Fig. 6: Locating Oil Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: On CNG vehicle (gas), only use engine oils specifically approved for this vehicle.

Pour in engine oil.

Start engine and allow to idle until oil indicator light goes out.

Stop engine and check oil level.

11 00 039 CHECKING COMPRESSION OF ALL CYLINDERS (M40 / M42 / M43 / M43TU / M44)

- Read out fault memory of DME control unit
- Check stored faults
- Rectify faults
- Clear fault memory

CAUTION: High tension - mortal danger!
Interrupt power supply to ignition coils.

Disconnect DME relay (K6300).

E46 installation location

- Connect DIS Tester
- Select Diagnosis

- Carry out vehicle identification
- Function selection
- Component and signal function
- Components
- Relays
- DME relay
- Documents
- Installation location (IL)
- Displays

Remove all spark plugs.

Screw special tool 11 0 226 by hand into spark plug thread and connect special tool 11 0 224. See **ENGINE - SPECIAL TOOLS (M44)** .

NOTE: Check that seal is in perfect condition.

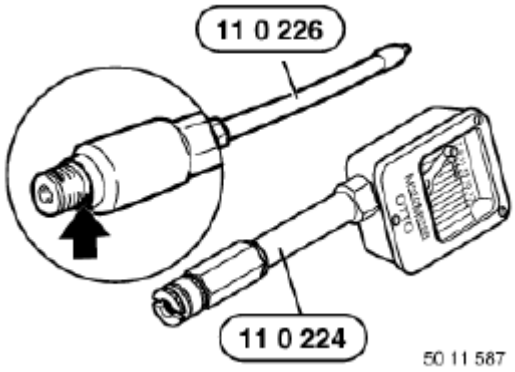


Fig. 7: Identifying Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Depress accelerator and actuate starter until compression stops rising.

Compression pressure, refer to **ENGINE - TECHNICAL DATA (M44)** .

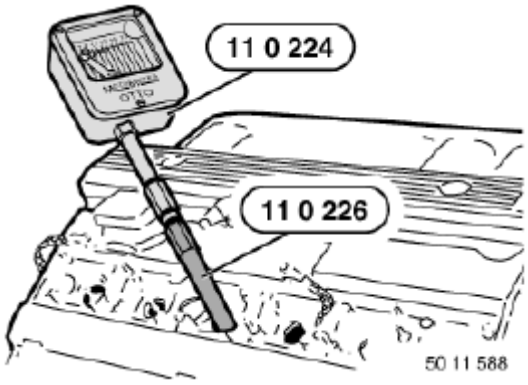


Fig. 8: Identifying Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Now clear the fault memory.

11 00 045 CHECKING ABSOLUTE COMPRESSION OF ALL CYLINDERS

With BMW Diagnosis Information System (DIS)

Fig. 9: Identifying 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 (M44)

Special tools required

- **11 0 070** . See **ENGINE - SPECIAL TOOLS (M44)** .

Disconnect negative battery lead.

Remove the ignition coil from the spring strut dome.

E36

Lift engine hood into assembly position and remove firewall (air manifold).

Z3

Move engine hood to assembly position:

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

Hold engine bonnet/hood.

Unclip retainer (1).

Unhook damper and suspend in ball head (2).

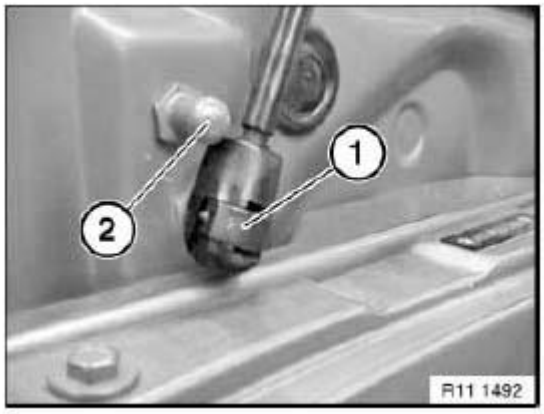


Fig. 10: Identifying Retainer And Ball Head
Courtesy of BMW OF NORTH AMERICA, INC.

Remove Bowden cable for throttle actuation from throttle.

Remove suction filter housing.

Remove fan clutch with fan impeller.

Remove radiator.

Disconnect heater hoses at heater and heating valve.

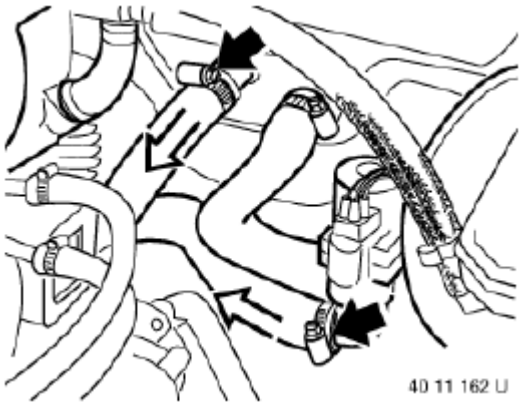


Fig. 11: Locating Heater Hoses Clamps
Courtesy of BMW OF NORTH AMERICA, INC.

Release oil tank for hydraulic steering and tie back to one side.

NOTE: Lines remain connected.

Fig. 12: Locating Oil Tank Bolts For Hydraulic Steering
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten vane pump for power steering unit from alternator carrier and tie up to one side (lines remain connected).

Remove manifold lower section.

Unfasten the wire harness section for the engine.

CAUTION: Catch and dispose of fuel as it escapes.

Loosen fuel supply line and return line.

Remove transmission. See appropriate article in TRANSMISSION section.

Attach engine to special tool **11 0 070.**

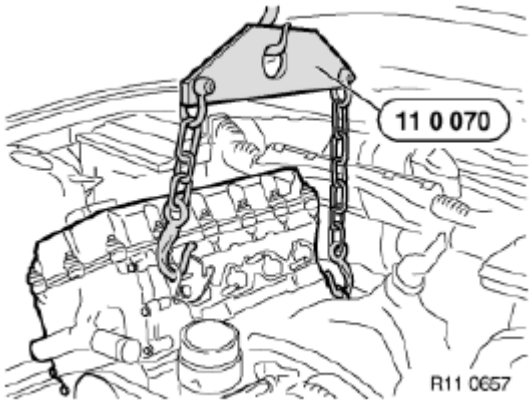


Fig. 13: Attaching Engine To Special Tool (11 0 070)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten right ground wire.

Unscrew left and right engine mounts.

Automatic transmission:

Release oil lines from engine carrier and from oil sump.

Lift out engine.

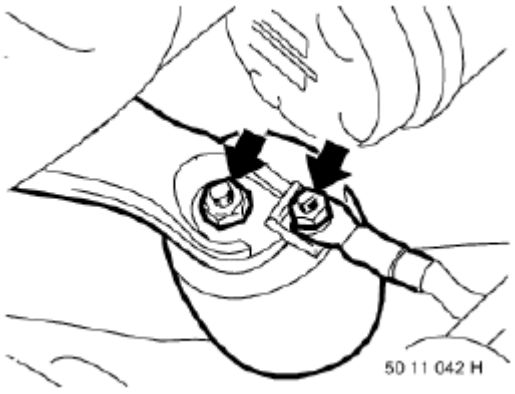


Fig. 14: Locating Engine Mount Screws And Ground Wire
Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE IDENTIFICATION

Drive in engine numbers at marked surface with impact tool.

M47 / M47TU / M47T2

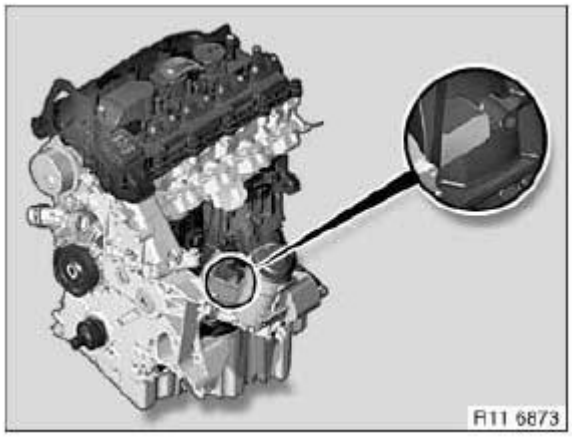


Fig. 15: Identifying Engine Identification M47 / M47TU / M47T2 Location
Courtesy of BMW OF NORTH AMERICA, INC.

M57 / M57TU / M57T2

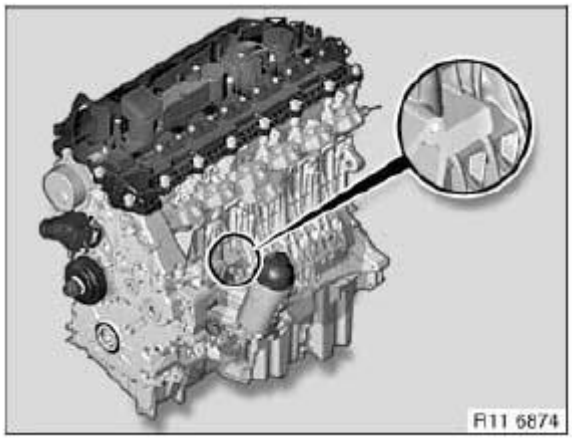


Fig. 16: Identifying Engine Identification M57 / M57TU / M57T2 Location
Courtesy of BMW OF NORTH AMERICA, INC.

M67 / M67TU

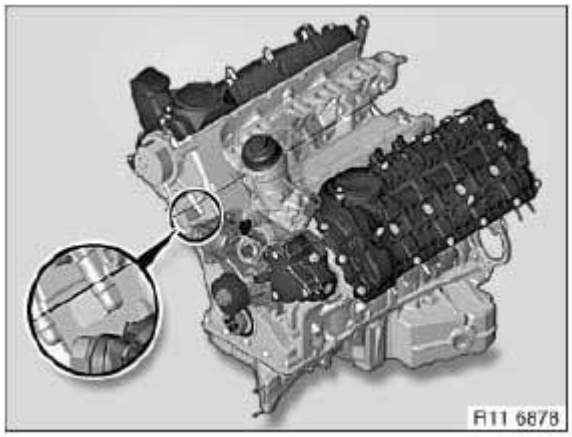


Fig. 17: Identifying Engine Identification M67 / M67TU Location
Courtesy of BMW OF NORTH AMERICA, INC.

N47 / N47S

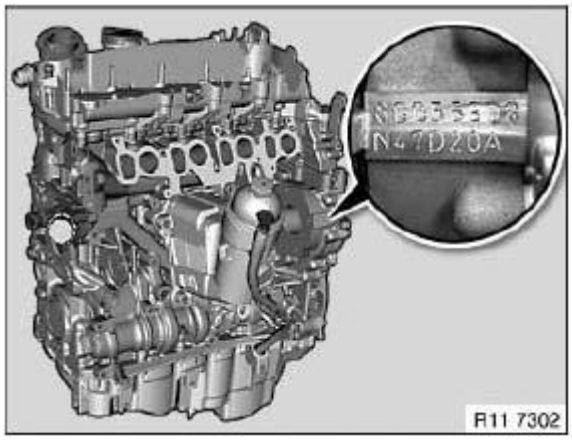


Fig. 18: Identifying Engine Identification N47 / N47S Location
Courtesy of BMW OF NORTH AMERICA, INC.

M52 / M52TU

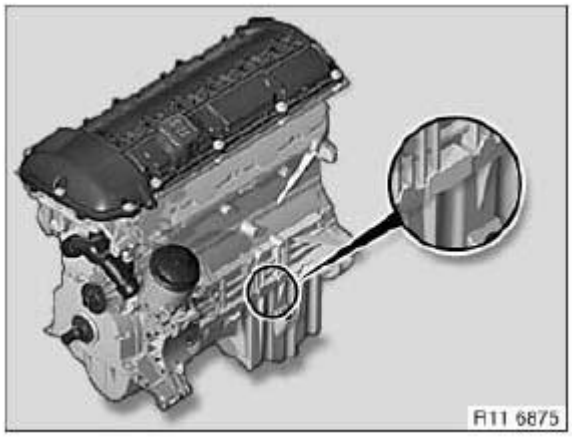


Fig. 19: Identifying Engine Identification M52 / M52TU Location
Courtesy of BMW OF NORTH AMERICA, INC.

M54

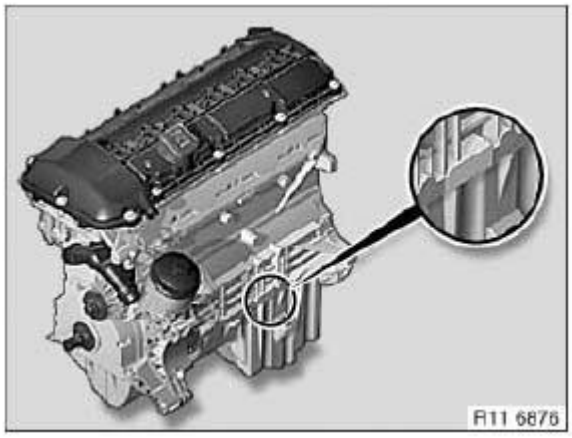


Fig. 20: Identifying Engine Identification M54 Location
Courtesy of BMW OF NORTH AMERICA, INC.

M56

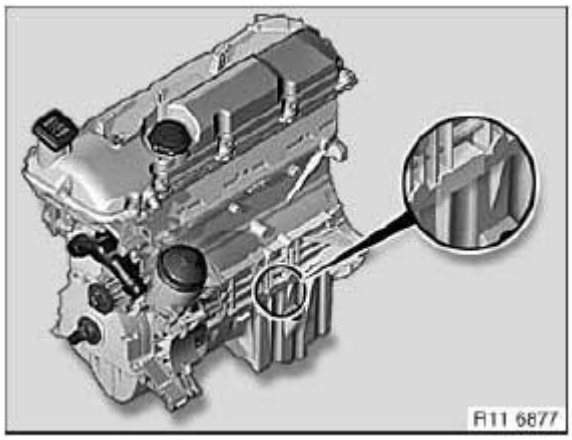


Fig. 21: Identifying Engine Identification M56 Location
Courtesy of BMW OF NORTH AMERICA, INC.

N40 / N45 / N45T / N43

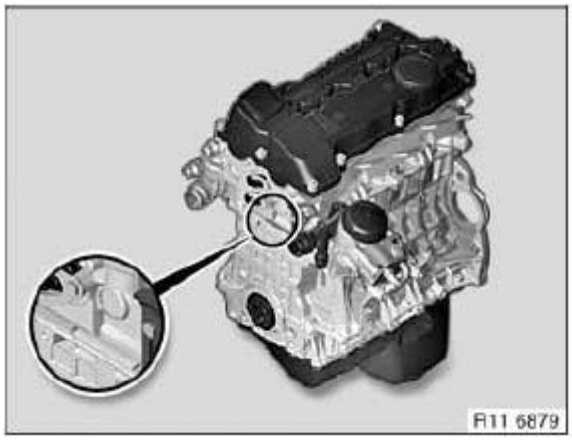


Fig. 22: Identifying Engine Identification N40 / N45 / N45T / N43 Location
Courtesy of BMW OF NORTH AMERICA, INC.

N42 / N46 / N46T

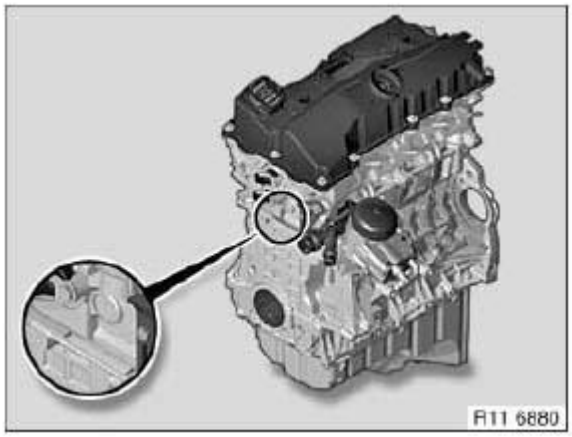


Fig. 23: Identifying Engine Identification N42 / N46 / N46T Location
Courtesy of BMW OF NORTH AMERICA, INC.

N51 / N52 / N52K / N53 / N54

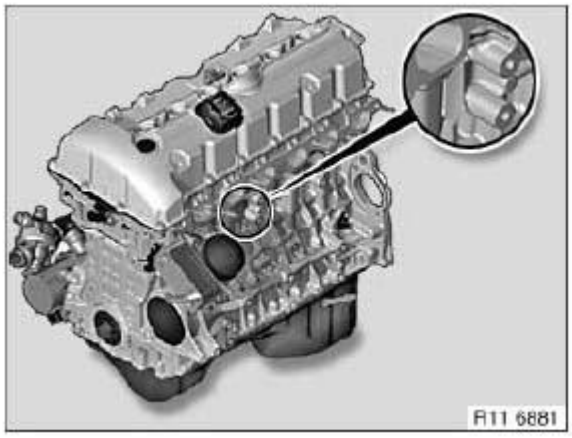


Fig. 24: Identifying Engine Identification N51 / N52 / N52K / N53 / N54 Location
Courtesy of BMW OF NORTH AMERICA, INC.

N62

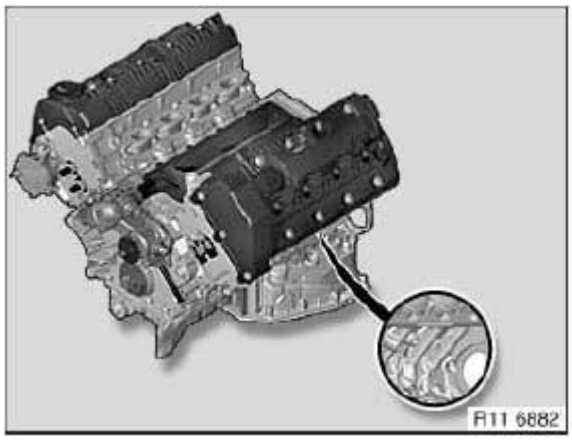


Fig. 25: Identifying Engine Identification N62 Location
Courtesy of BMW OF NORTH AMERICA, INC.

N73

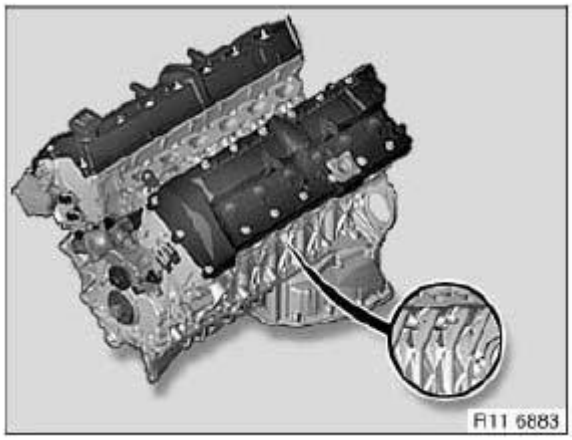


Fig. 26: Identifying Engine Identification N73 Location
Courtesy of BMW OF NORTH AMERICA, INC.

S54

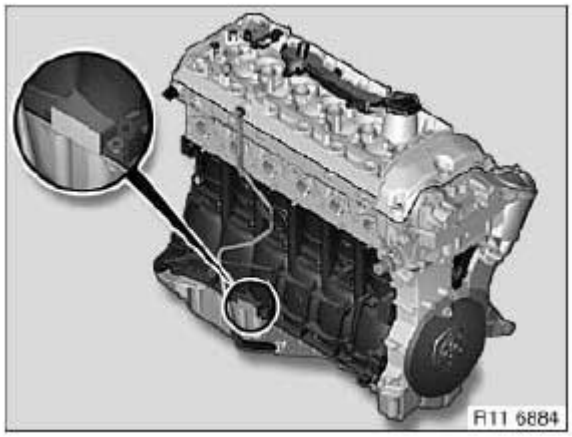


Fig. 27: Identifying Engine Identification S54 Location
Courtesy of BMW OF NORTH AMERICA, INC.

S85 / S65

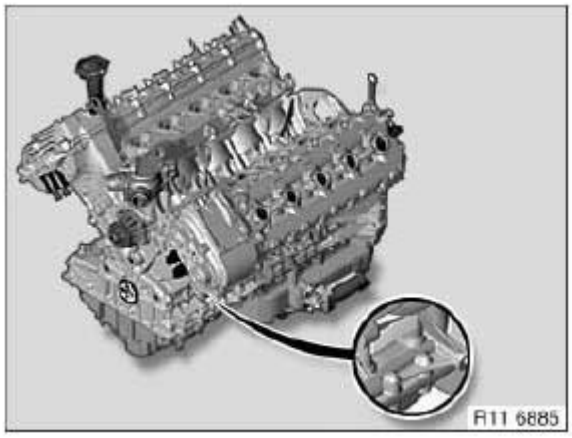


Fig. 28: Identifying Engine Identification S85 / S65 Location
Courtesy of BMW OF NORTH AMERICA, INC.

W10 / W11

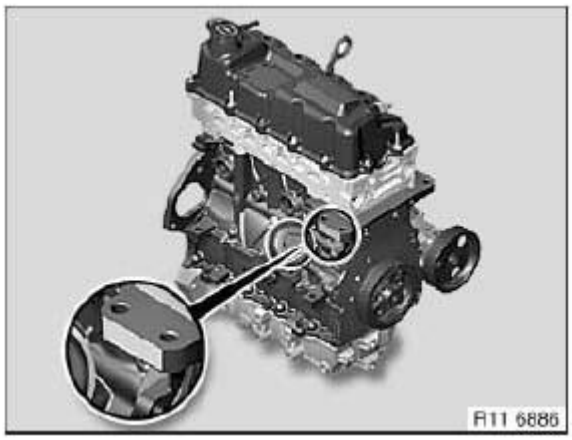


Fig. 29: Identifying Engine Identification W10 / W11 Location
Courtesy of BMW OF NORTH AMERICA, INC.

W17

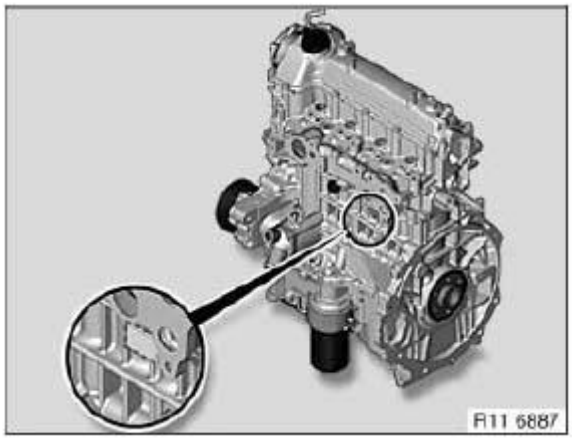


Fig. 30: Identifying Engine Identification W17 Location
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CYLINDER HEAD WITH COVER

11 12 000 REMOVING AND INSTALLING/SEALING CYLINDER HEAD COVER (M44)

Disconnect the battery ground cable and the battery positive cable.

Remove the ignition coil from the spring strut dome.

Remove battery.

Loosen the screws and remove the battery bracket.

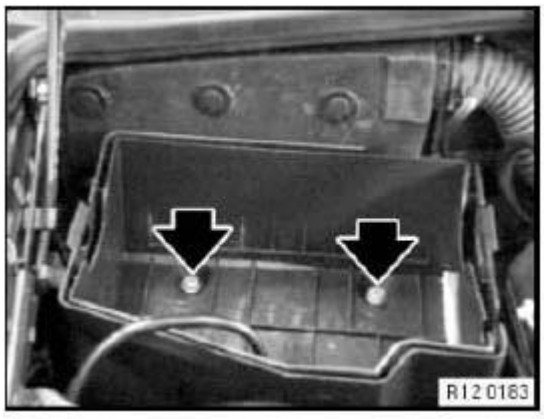


Fig. 31: Locating Battery Bracket Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Slightly lift the grille and loosen the cable duct from the end firewall (air manifold). Pull the cable duct upwards.

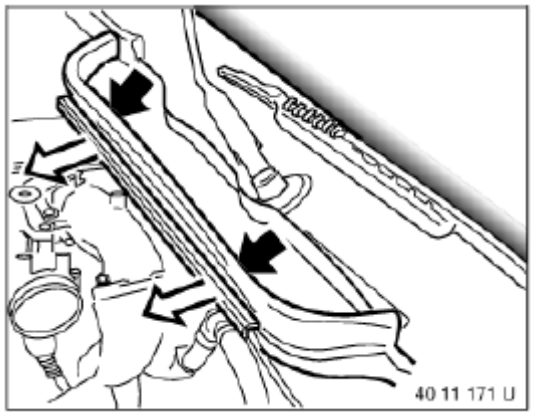


Fig. 32: Locating Cable Duct
Courtesy of BMW OF NORTH AMERICA, INC.

Take off cover.

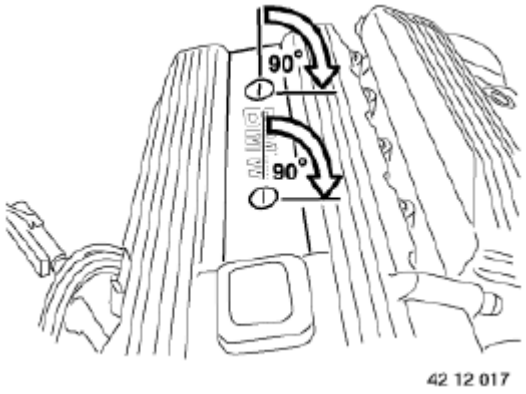


Fig. 33: Taking Off Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Remove spark-plug connectors.

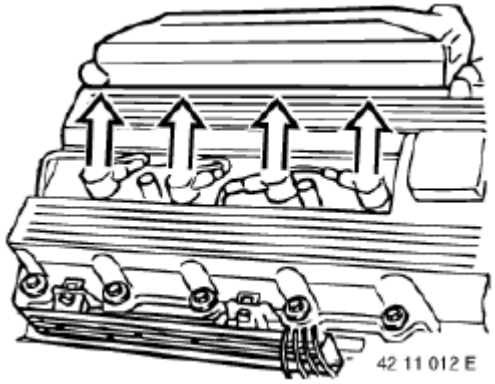


Fig. 34: Removing Spark-Plug Connectors
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen the ignition lead and remove it with the cable duct.

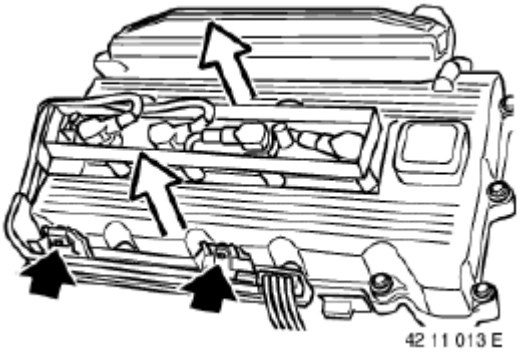


Fig. 35: Loosening Ignition Lead
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off the hose for the engine breather.

Unscrew cover bolts and remove cylinder head cover.

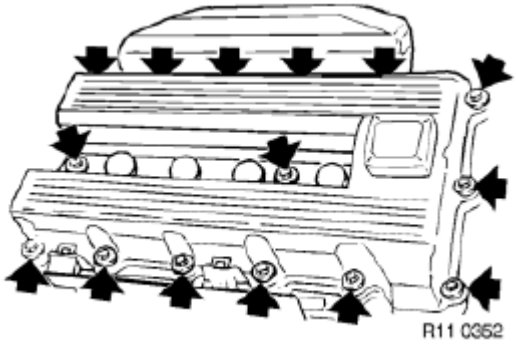


Fig. 36: Locating Cylinder Head Cover Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Cylinder head cover is separated from cylinder head by rubber mounts and seals to insulate it from vibration.

Carefully note arrangement of cover retaining fixture.

1. Cap screw
2. Washer
3. Rubber mount

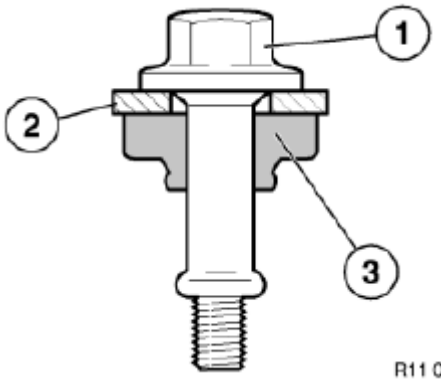


Fig. 37: Identifying Arrangement Of Cover Retaining Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check cylinder-head-cover seal and replace if necessary.

Pre-install cylinder-head-cover seal at cylinder head cover.

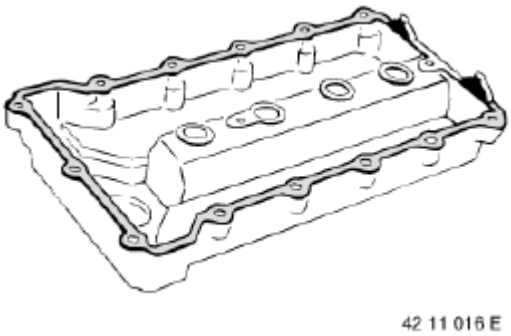


Fig. 38: Identifying Cylinder-Head-Cover Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Clean gasket residue from sealing surfaces.

Coat contact surfaces of joint with Drei Bond 1209.

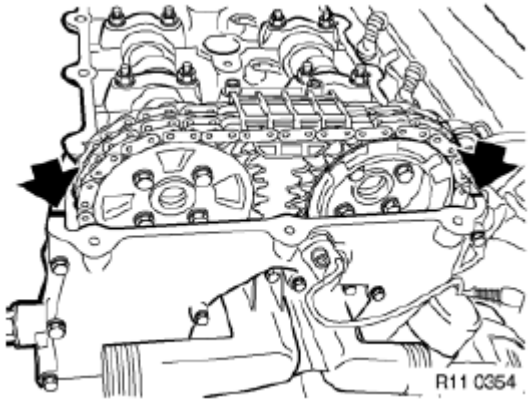


Fig. 39: Locating Gasket Sealing Surfaces (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Clean gasket residue from sealing surfaces.

Apply a thin, uniform bead of Drei Bond 1209 sealing agent to transition area of half-moon sections.

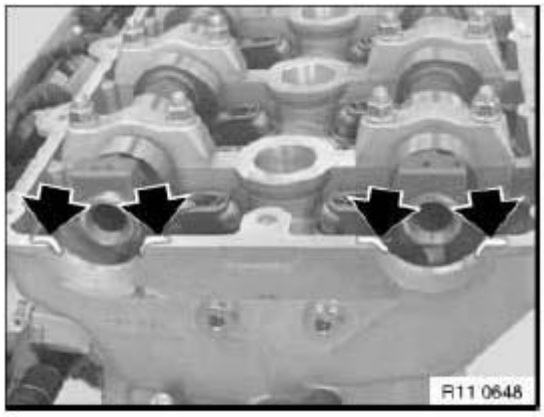


Fig. 40: Locating Gasket Sealing Surfaces (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: The oil feed of the spray lead is sealed with a sealing ring.
Check/replace sealing ring.
Preassemble the sealing ring to the oil feed.

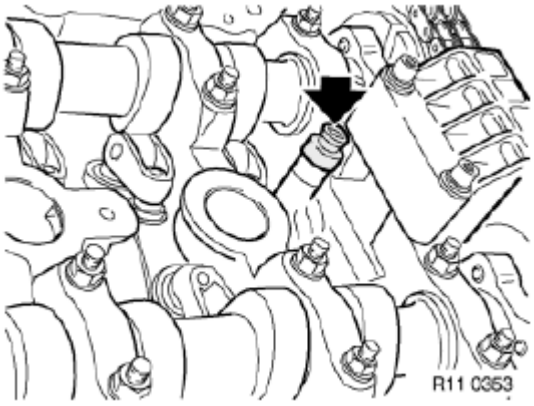


Fig. 41: Locating Oil Feed Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

When installing cylinder head cover, make sure that cylinder head cover seal is correctly seated on rear side of cylinder head.

Install cover bolts and align cylinder head cover. Hand-tighten all cover bolts without preload. Tighten cap screws crosswise from inside to outside.

Tightening torque, refer to 11 12 11AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

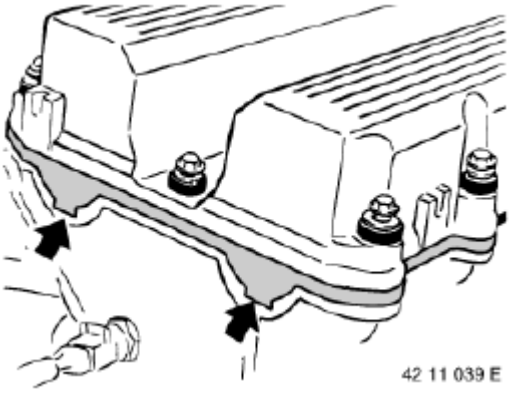


Fig. 42: Locating Cylinder Head Cover Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 100 REMOVING AND INSTALLING CYLINDER HEAD (M44)

Remove suction-filter housing with air-mass sensor.

Remove gear-case cover, top, refer to **11 14 100 Removing and installing, sealing or replacing timing case cover at top (M44)**

Remove all spark plugs.

Drain coolant from engine block.

Installation

Replace sealing ring.

Tightening torque, refer to 11 11 5AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

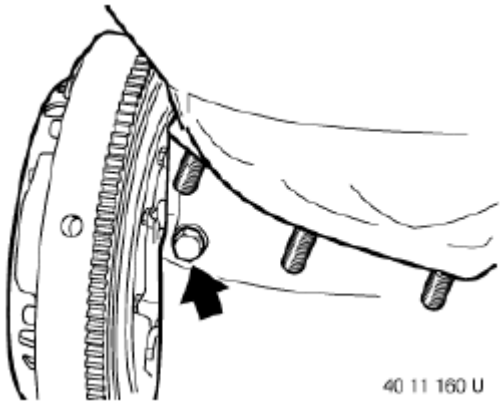


Fig. 43: Locating Coolant Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Remove exhaust pipe from exhaust manifold.

Remove lower section of manifold, refer to **11 61 044**

Remove the hydraulic chain tensioner, refer to **11 31 091**

Release water hose from rear branch flange.

Disconnect heater feed and return hoses.

Removal

Removal of cylinder head is described separately from installation. Assembly sequence for removal and installation is different.

Turn central screw to rotate crankshaft in normal direction of rotation until piston of first cylinder is at firing TDC.

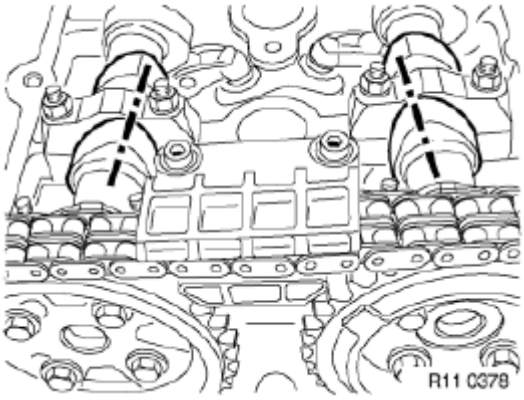


Fig. 44: Turning Central Screw To Rotate Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: At firing TDC, alignment bores are pointing upwards.

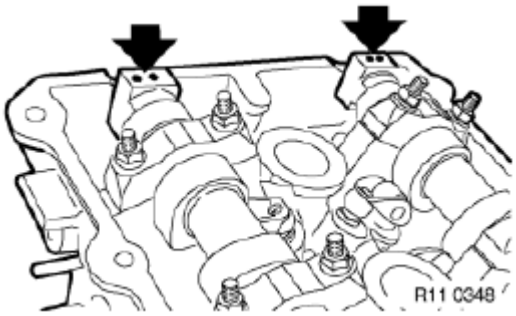


Fig. 45: Alignment Bores Point Upward
Courtesy of BMW OF NORTH AMERICA, INC.

Position camshaft with Special Tool 11 3 240 in firing TDC position of first cylinder.

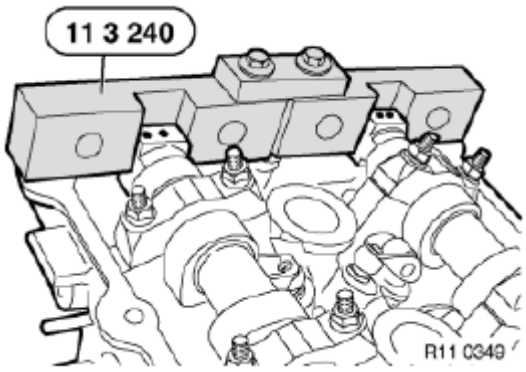


Fig. 46: Identifying Special Tool (11 3 240)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove the chain wheels.

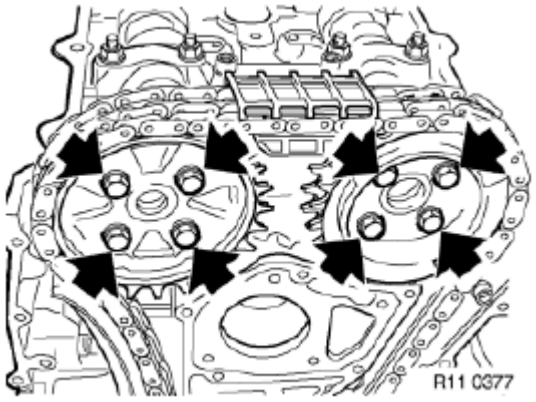


Fig. 47: Locating Chain Wheel Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Release the slide rail from the cylinder head.

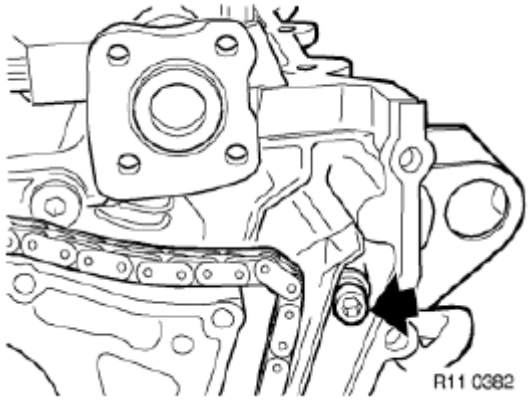


Fig. 48: Locating Slide Rail Adjusting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Turn the adjusting screw of the slide rail back approx. two revolutions.

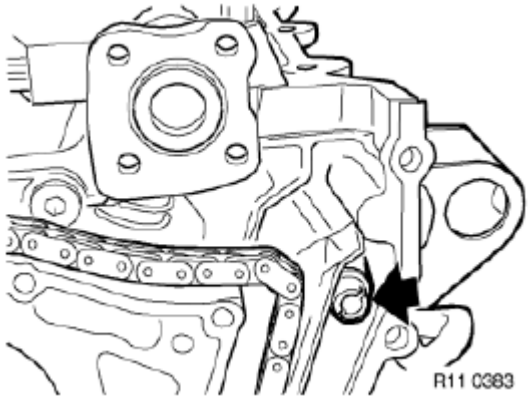


Fig. 49: Turn Slide Rail Adjusting Screw

Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Turn the engine back approx. 45° on the central screw.

This prevents contact between valves and pistons.

NOTE: Use Special Tool 11 2 250. See ENGINE - SPECIAL TOOLS (M44) .

Release cylinder-head bolts in sequence 10 ... 1.

Remove cylinder head and cylinder-head seal.

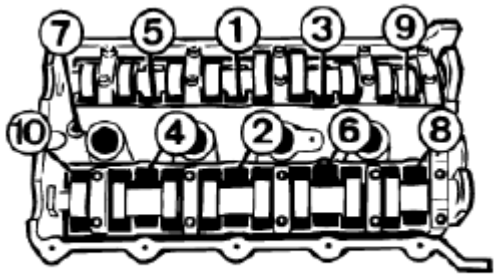


Fig. 50: Identifying Cylinder-Head Bolts Torque Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Installation of cylinder head is described separately from removal. Assembly sequence for removal and installation is different.

Clean sealing faces of cylinder head and engine block; if necessary, remove traces of sealing compound with hardwood spatula. Ensure that no gasket debris drops into the oil and coolant ducts.

Check that dowel sleeves are undamaged and correctly located.

Replace cylinder-head seal and rubber-profile seal.

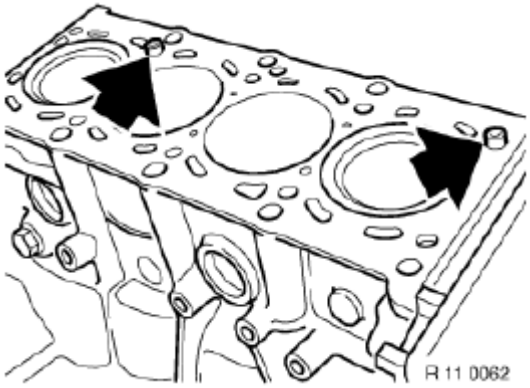


Fig. 51: Locating Dowel Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Use cylinder-head bolts once only.

Threaded bores in engine block must be free of dirt and oil.

NOTE: Risk of cracking, incorrect tightening values.

Put the cylinder head on.

Install the new cylinder-head bolts (lightly oiled).

For torsion angle adjustment, use Special Tool 00 9 120 or Special Tool 11 2 110.

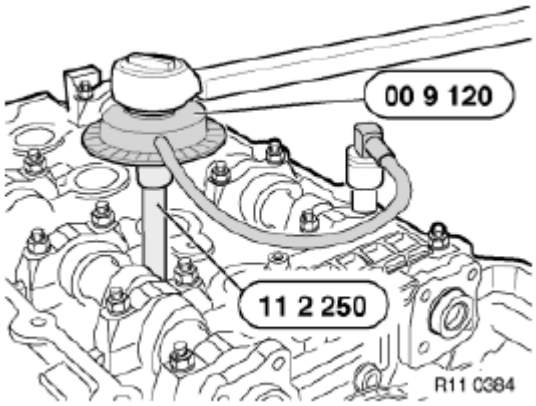


Fig. 52: Identifying Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down the cylinder-head bolts in order 1 ... 10.

Tightening torque, refer to 11 12 6AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

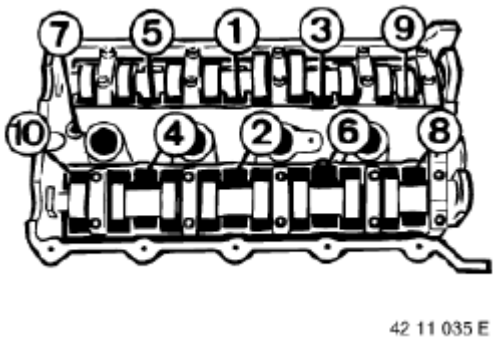


Fig. 53: Identifying Cylinder-Head Bolts Torque Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Place the adjusting screw of the slide rail free of play on the cylinder head.

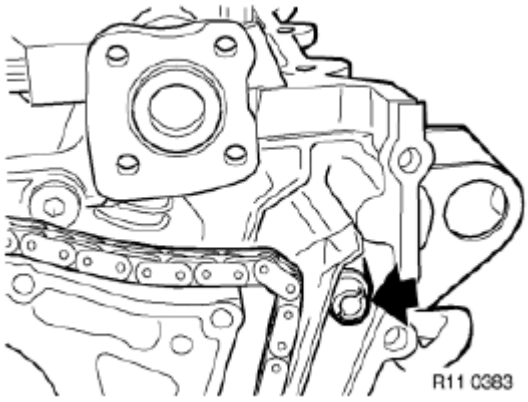


Fig. 54: Locating Slide Rail Adjusting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Insert the screw and tighten down the slide rail.

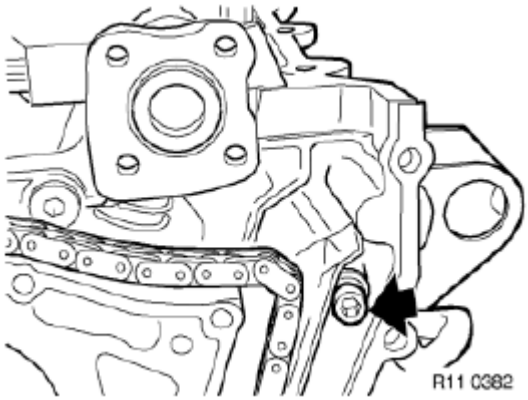


Fig. 55: Insert Screw And Tighten Down Slide Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Locate camshaft with Special Tool 11 3 240 in firing TDC position of first cylinder.

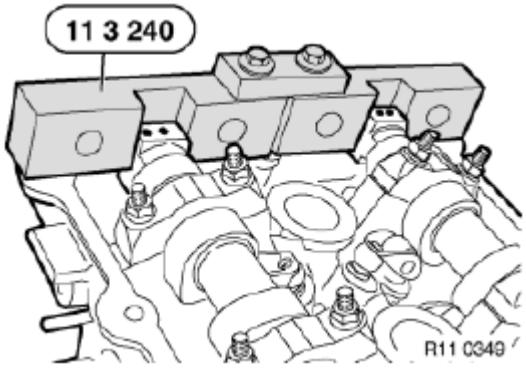


Fig. 56: Identifying Special Tool (11 3 240)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: At firing TDC, alignment bores are pointing upwards.

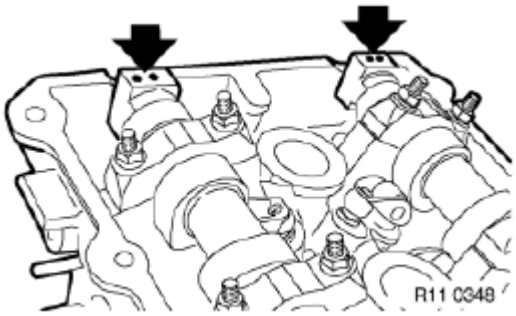


Fig. 57: Alignment Bores Point Upward
Courtesy of BMW OF NORTH AMERICA, INC.

Remove dust cover from locating bore.

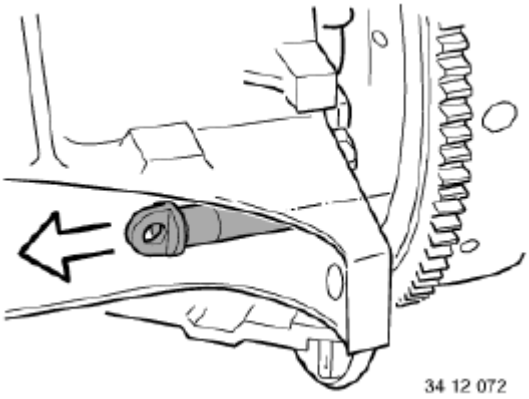


Fig. 58: Removing Dust Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate engine from 45° before TDC position engine-wise until in TDC position.

Secure crankshaft in TDC position with Special Tool 11 2 300.

CAUTION: Remove Special Tool 11 2 300 before starting engine.

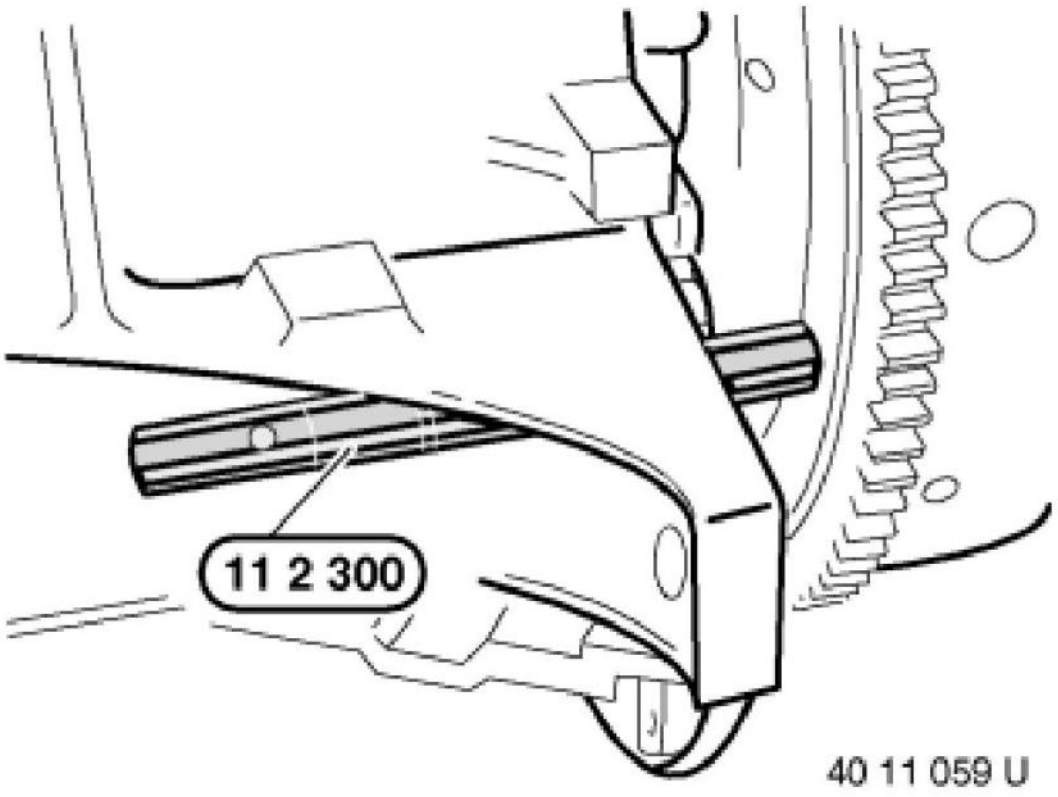


Fig. 59: Identifying Special Tool (11 2 300)
Courtesy of BMW OF NORTH AMERICA, INC.

Place the chain with the chain wheels.

NOTE: Arrow on chain wheel in cylinder axis points up.
Align long bores centrally.

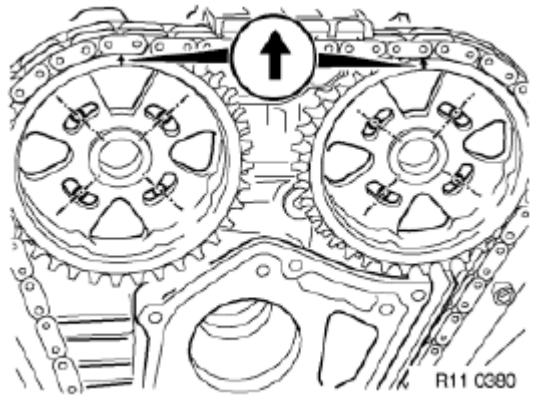


Fig. 60: Locating Arrow On Chain Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Place the sensor gear onto the inlet chain wheel.

NOTE: Arrow on sensor gear in cylinder axis points up.

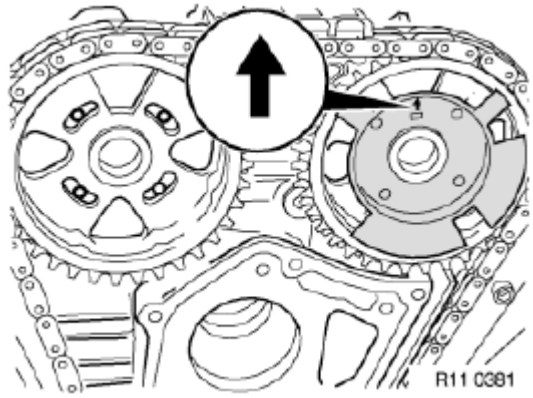


Fig. 61: Locating Arrow On Sensor Gear In Cylinder Axis Points
Courtesy of BMW OF NORTH AMERICA, INC.

Insert all chain wheel screws and tighten so that they are free of play; the chain wheels remain loose.

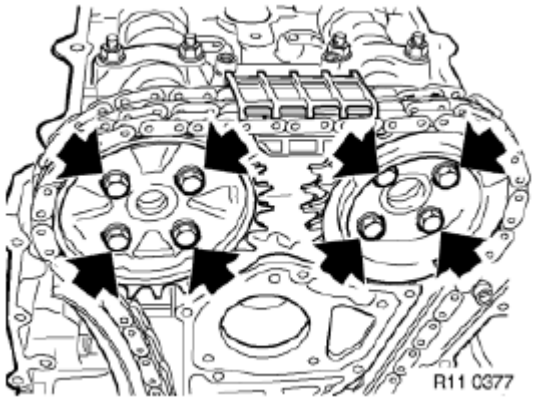


Fig. 62: Locating Chain Wheel Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Install hydraulic chain tensioner.

CAUTION: Note installation instructions,

refer to **11 31 091**

Tighten down the chain wheels.

For tightening torque, refer to 11 31 3AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

Remove Special Tools 11 2 300 and 11 3 240.

Assemble engine.

11 12 101 REPLACING CYLINDER-HEAD SEAL (M44)

See removing and installing cylinder head in **11 12 100**

11 12 503 DISMANTLING AND REASSEMBLING CYLINDER HEAD (M44)

(cylinder head removed)

Remove exhaust manifold.

Installation

Coat threads with copper paste CRC.

Replace the gasket and nuts.

Tightening torque, refer to 11 62 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

Screw in Special Tool 11 1 442.

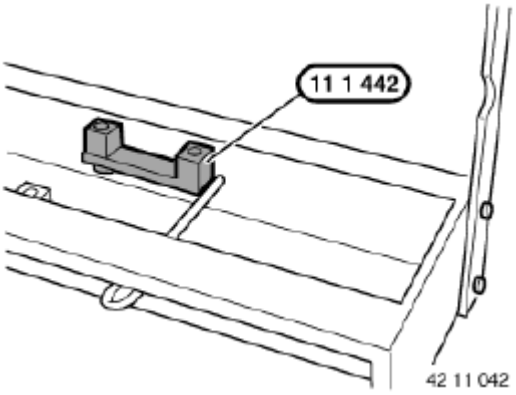


Fig. 63: Identifying Special Tool (11 1 442)
Courtesy of BMW OF NORTH AMERICA, INC.

Secure Special Tool 11 1 065 to Special Tool 00 1 490.

Prepare Special Tools for cylinder-head disassembly:

- Special Tool 11 1 071
- Special Tool 11 1 067
- Special Tool 11 0 192. See **ENGINE - SPECIAL TOOLS (M44)** .

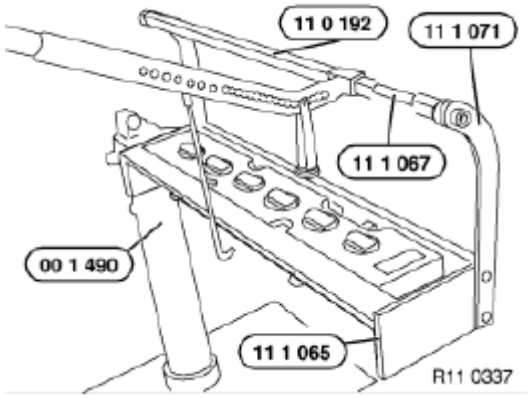


Fig. 64: Identifying Special Tools For Cylinder-Head
Courtesy of BMW OF NORTH AMERICA, INC.

- Special Tool 11 1 045
- Special Tool 11 0 345
- Special Tool 11 0 342
- Special Tool 11 0 343
- Special Tool 11 1 441

Assemble Special Tool. See **ENGINE - SPECIAL TOOLS (M44)** .

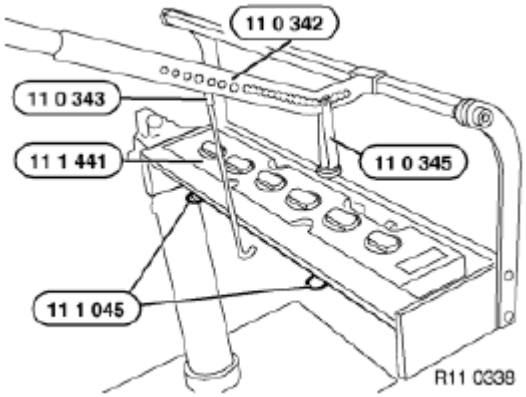


Fig. 65: Identifying Special Tools For Cylinder-Head
Courtesy of BMW OF NORTH AMERICA, INC.

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

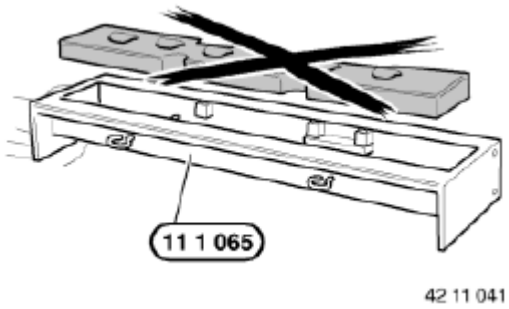


Fig. 66: Identifying Special Tool (11 1 441)
Courtesy of BMW OF NORTH AMERICA, INC.

Fit cylinder head with exhaust end pointing forwards and right on Special Tool 11 1 065 and secure with two cylinder head screws.

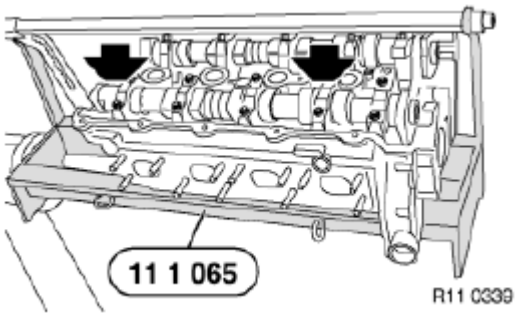


Fig. 67: Identifying Special Tool (11 1 065)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all valves, refer to **11 34 552**

11 12 527 REWORKING ONE VALVE SEAT (M44)

(cylinder head dismantled)

Machine valve seat face with Special Tool 00 3 520 or 00 3 580 with specifications of tool manufacturer.

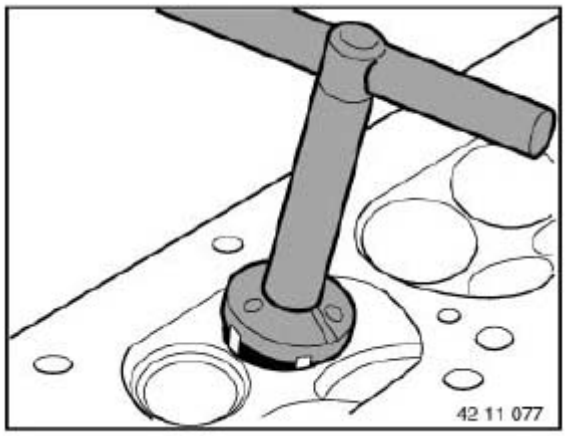


Fig. 68: Machining Valve Seat Face
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: 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.

1. Valve-seat angle
2. Correction angle, outer
3. Correction angle, inner
4. Outside diameter of seat face
5. Valve-seat width

Pos. (1) to (5) refer to **ENGINE - TECHNICAL DATA (M44)**

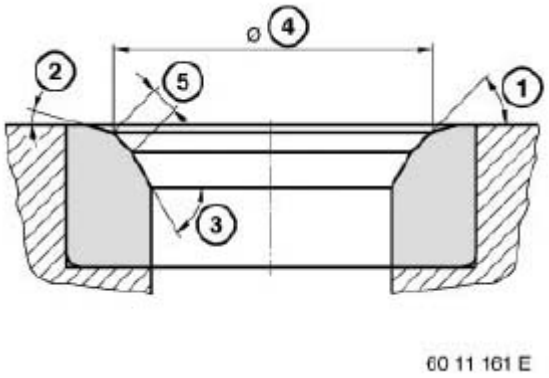


Fig. 69: Identifying Valve-Seat Angles
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 595 CHECKING ONE VALVE GUIDE FOR WEAR (M44)

(valve removed)

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

Mount dial gauge and measure tilt clearance.

NOTE: Maximum permitted tilt clearance,

refer to **ENGINE - TECHNICAL DATA (M44)**

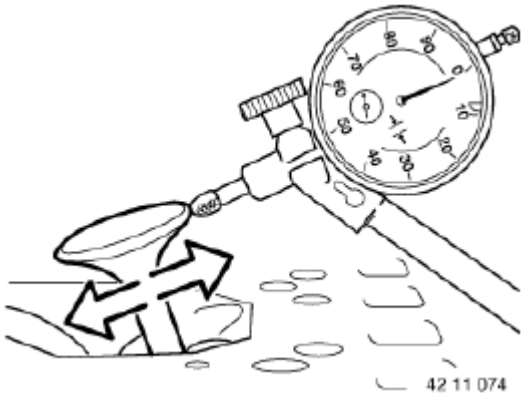


Fig. 70: Measuring Valve Guide
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If tilt clearance is excessive, the valve guide should be reamed and a repair valve with a larger shaft diameter,

refer to **ENGINE - TECHNICAL DATA (M44)** , should be installed.

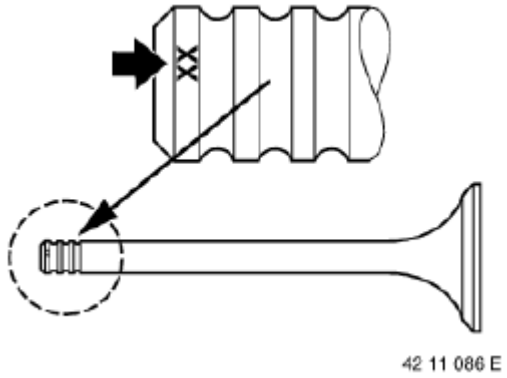


Fig. 71: Measuring Valve Tip
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, ream out valve guide, refer to **11 12 600**

11 12 600 REAMING OUT ONE VALVE GUIDE (M44)

(Valve removed)

NOTE: If clearance between valve shaft and valve guide is too large, ream out valve guide and install repair valve with larger shaft diameter.

Assemble reaming tool and guide taper (1) from special tool kit 00 4 210 depending on shaft diameter. Press guide taper (1) against valve seat and ream out valve guide (when dry) from combustion-chamber end. Rotate reaming tool once in downwards direction.

NOTE: After the reaming operation, rework the valve seat,

refer to **11 12 527**

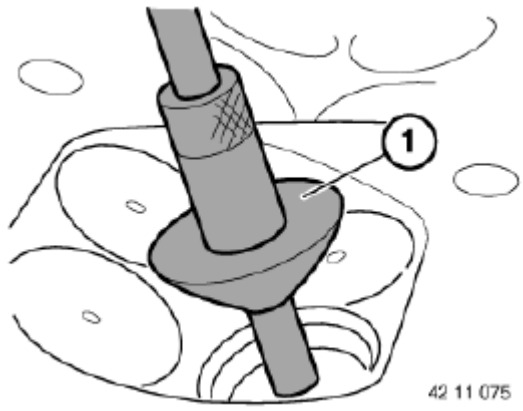


Fig. 72: Identifying Guide Taper
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 719 MILL DOWN CYLINDER HEAD SEALING FACE (M44)

(cylinder head dismantled)

Check evenness of cylinder-head surface with straight edge (commercially available).

Deviation from level: max. 0.05 mm.

NOTE: Machine limit,

refer to **ENGINE - TECHNICAL DATA (M44)**

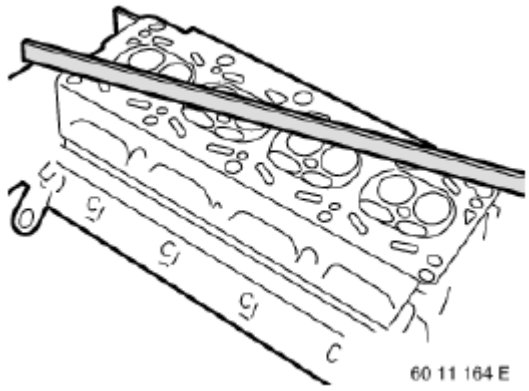


Fig. 73: Checking Evenness Of Cylinder-Head Surface
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 729 CHECK CYLINDER HEAD FOR WATER LEAKS (M44)

(cylinder head dismantled)

Seal coolant apertures with Special Tool kit 11 1 440.

NOTE: Remove the temperature sensor for the coolant and replace with Special Tool 11 1 439 (drain plug).

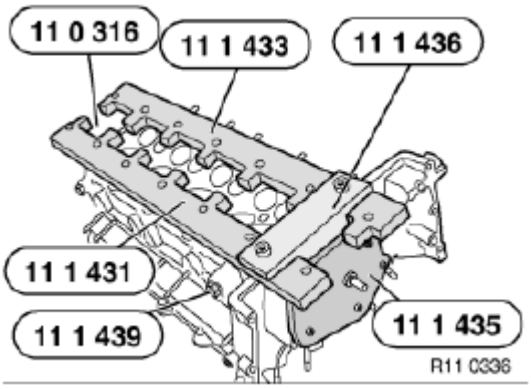


Fig. 74: Identifying Special Tool Kit 11 1 440
Courtesy of BMW OF NORTH AMERICA, INC.

Immerse cylinder head in a water bath.

Test pressure 4.5 bar

Check cylinder head for escaping air (cracks).

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

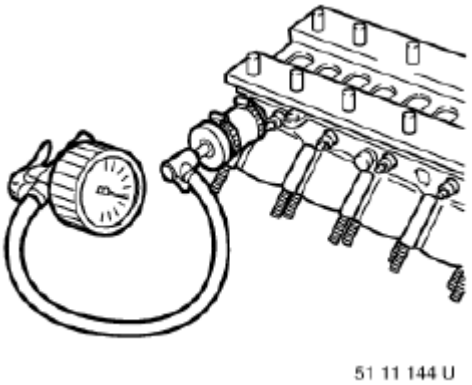


Fig. 75: Checking Cylinder Head For Escaping Air
Courtesy of BMW OF NORTH AMERICA, INC.

11 34 552 REMOVING AND INSTALLING OR REPLACING ALL VALVES - CYLINDER HEAD REMOVED (M44)

Preliminary work is described in section on dismantling and assembling the cylinder head, refer to **11 12 503**

Replacing valve stem seals, refer to **11 34 560**

Remove valves from cylinder head.

If necessary, check valve guide for wear, refer to **11 12 595**

If necessary, ream the valve guide, refer to **11 12 600**

If necessary, rework valve seat, refer to **11 12 527**

Installation sequence:

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

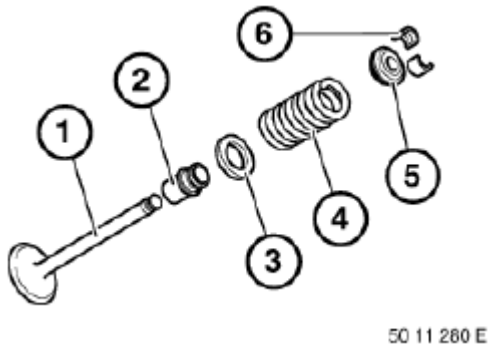


Fig. 76: Identifying Valve Component Installation Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

11 34 560 REPLACING ALL VALVE-SHAFT SEALS - CYLINDER HEAD REMOVED (M44)

Preliminary work is described in section on dismantling and assembling the cylinder head, refer to **11 12 503**

Remove all valve springs, refer to **11 34 715**

Remove valve stem seal with Special Tool 11 1 480.

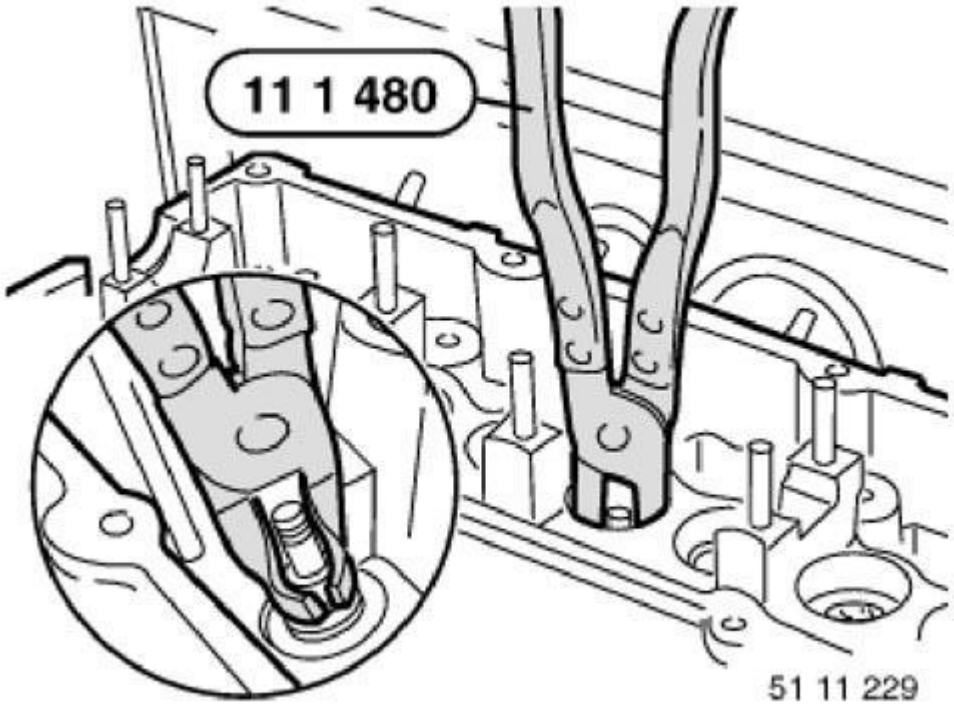


Fig. 77: Identifying Special Tool (11 1 480)
Courtesy of BMW OF NORTH AMERICA, INC.

Lubricate valve stem with oil and insert valve.

Fit Special Tool 11 1 960.

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

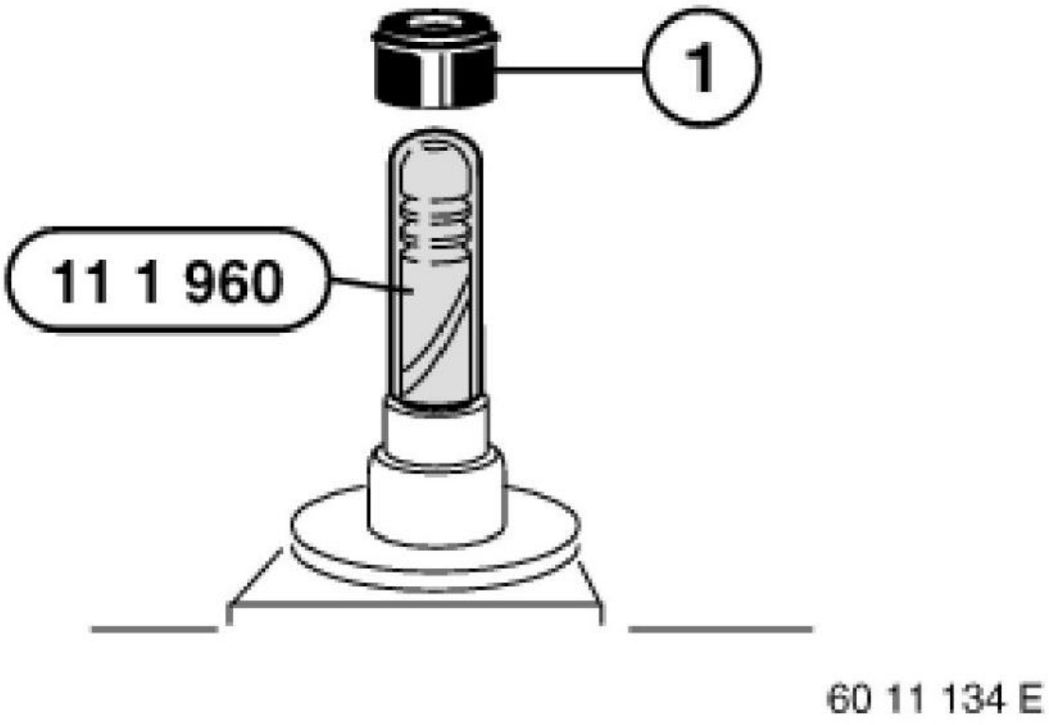


Fig. 78: Identifying Valve Stem Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Press valve stem seal firmly home by hand with Special Tool 11 1 200.

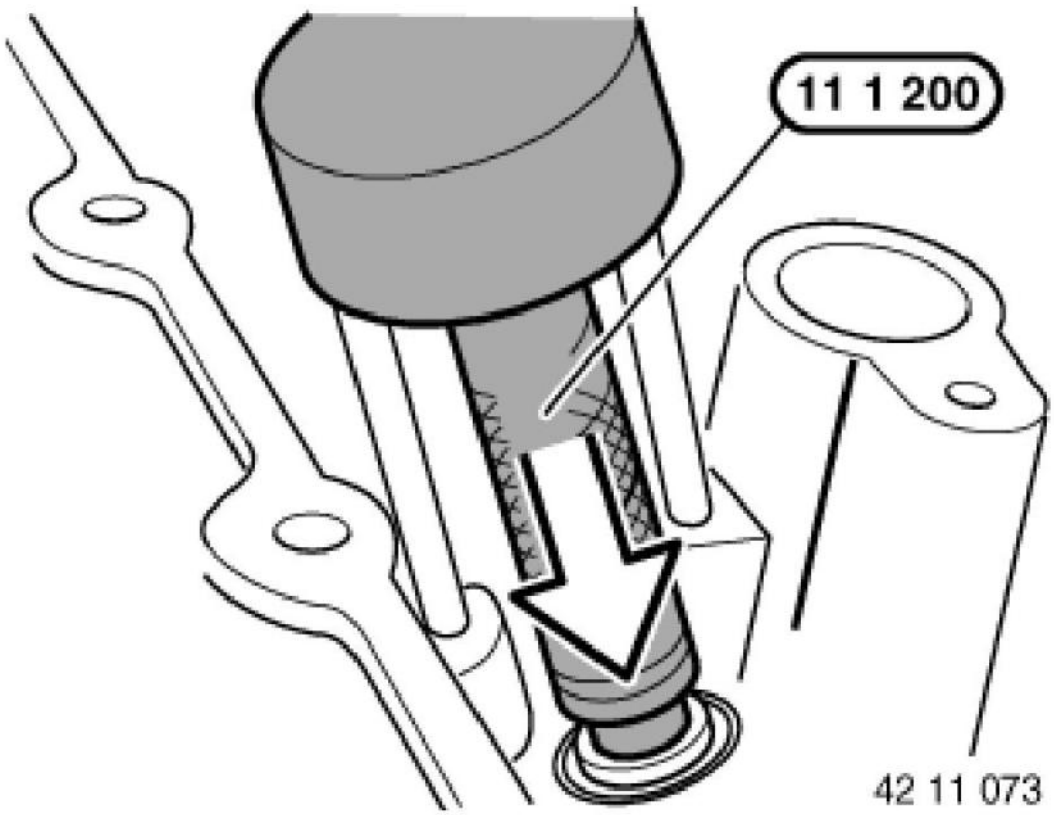


Fig. 79: Pressing Valve Stem Seal
Courtesy of BMW OF NORTH AMERICA, INC.

11 34 715 REPLACING ALL VALVE SPRINGS - CYLINDER HEAD REMOVED (M44)

Preliminary work is described in section on dismantling and assembling the cylinder head, refer to **11 12 503**

Remove the camshafts, refer to **11 31 501**

Insert Special Tool 11 1 441 from below in Special Tool 11 1 065 and secure with Special Tool 11 1 045.

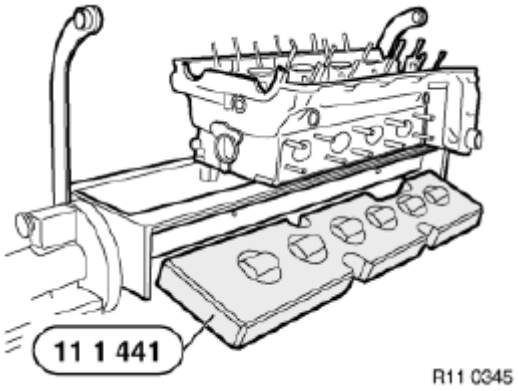


Fig. 80: Identifying Special Tool (11 1 441)
Courtesy of BMW OF NORTH AMERICA, INC.

Align Special Tool 11 0 345 in direction of valve shaft and select appropriate groove in Special Tool 11 0 342.

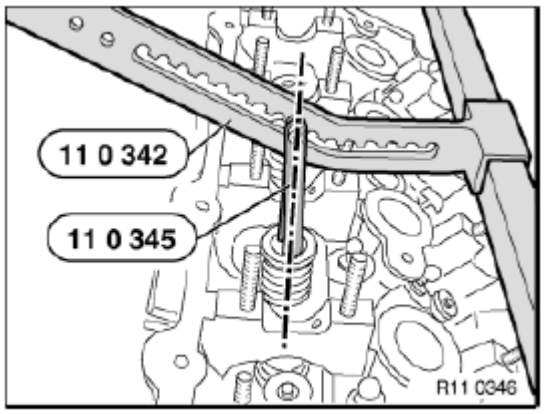


Fig. 81: Aligning Special Tool (11 0 345) In Direction Of Valve Shaft And Select
Courtesy of BMW OF NORTH AMERICA, INC.

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

Remove valve spring and plate spring.

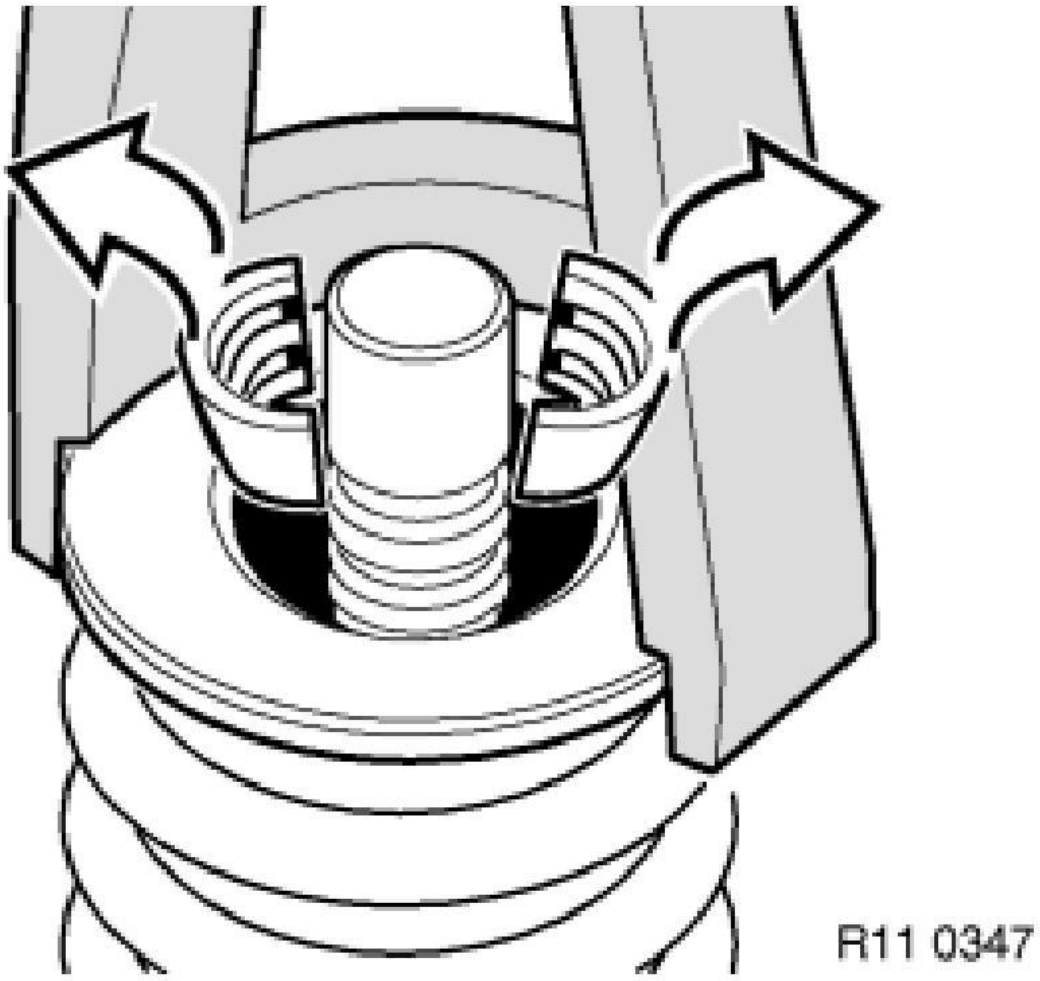


Fig. 82: Removing Valve Spring And Plate Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation sequence:

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

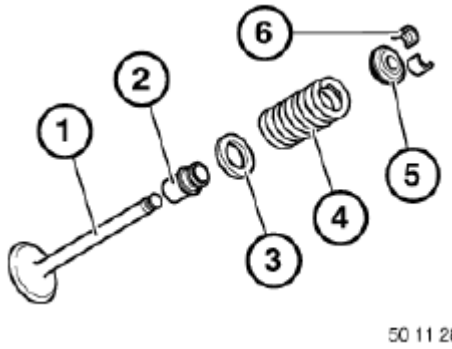


Fig. 83: Identifying Valve Component Installation Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

OIL SUMP

11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL PAN (M44)

NOTE: For removal of oil pan, front axle support must be lowered. There is no need to perform a front axle alignment check. Draining off engine oil, refer to 00 00 249

Disconnect adapter from brake booster.

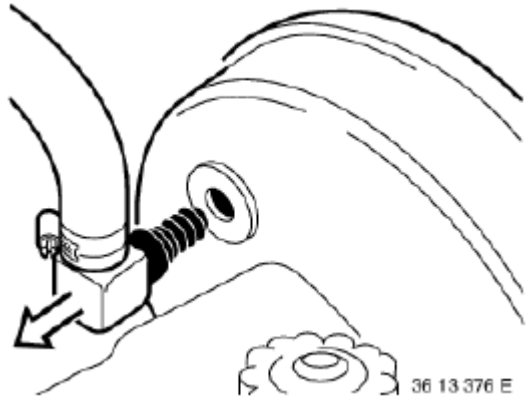


Fig. 84: Disconnecting Adapter From Brake Booster
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen guide pipe for dipstick.

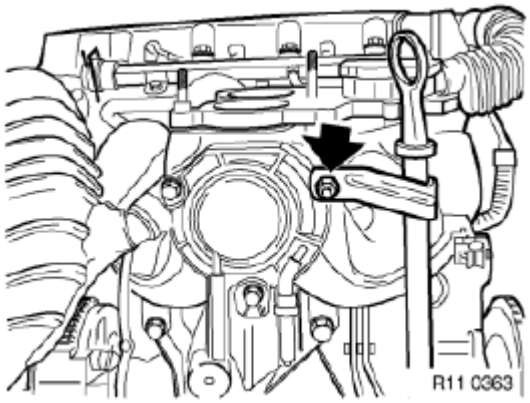


Fig. 85: Locating Guide Pipe For Dipstick
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check/replace sealing ring.

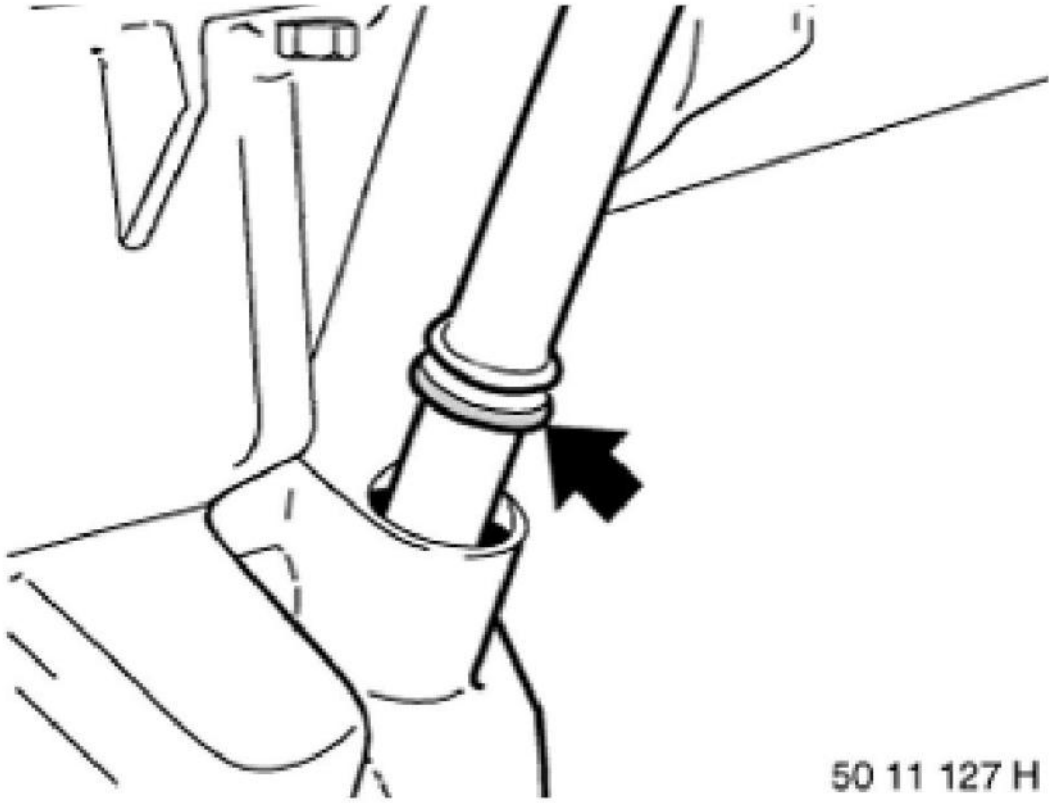


Fig. 86: Locating Dipstick Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

E36/7 (Z3)

Measure and note down left and right protrusion of detent buffer (1). Remove left and right detent buffers (1).

Installation

Reinstall detent buffers (1) to noted dimension.

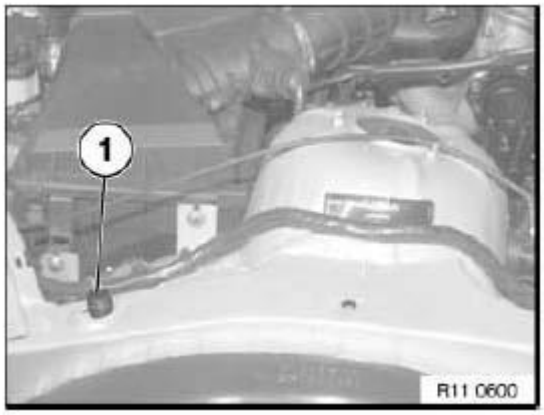


Fig. 87: Identifying Detent Buffers
Courtesy of BMW OF NORTH AMERICA, INC.

E36/7 (Z3)

Unclip cable and lines and place to one side.

Attach special tool 00 0 200 to special tool 00 0 201/202/204/207.

NOTE: Special tool 00 0 207 is secured in bore of detent buffer and behind the carrier support beside the spring dome.

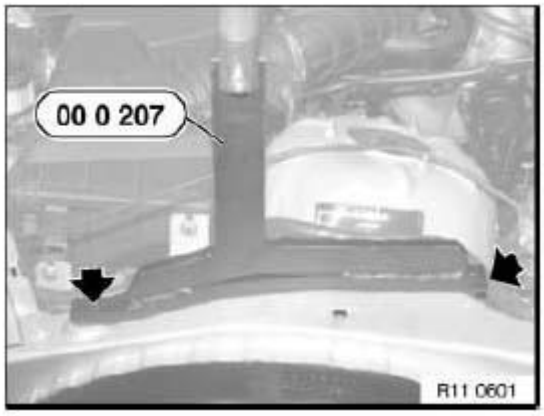


Fig. 88: Identifying Special Tool (00 0 207)
Courtesy of BMW OF NORTH AMERICA, INC.

E36/7 (Z3)

Fit special tool 00 0 200, secure to front suspension lug on engine and lift engine approx. 5 mm.

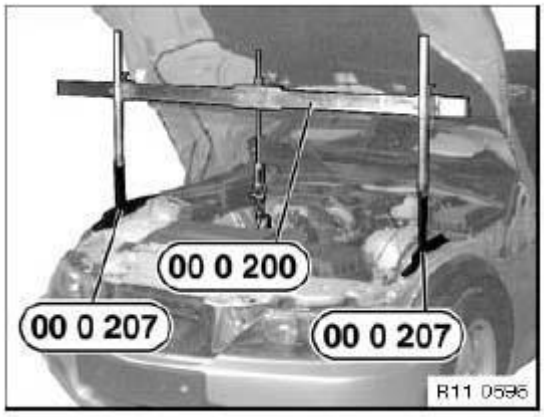


Fig. 89: Identifying Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

All other E36 models

Fit special tool 00 0 200 to special tool 00 0 201/202/204/206 and attach.

NOTE: The brackets must be located on the bolt connections on both side walls. Attach special tool 00 0 200 to front suspension lug on engine and lift engine approx. 5 mm.

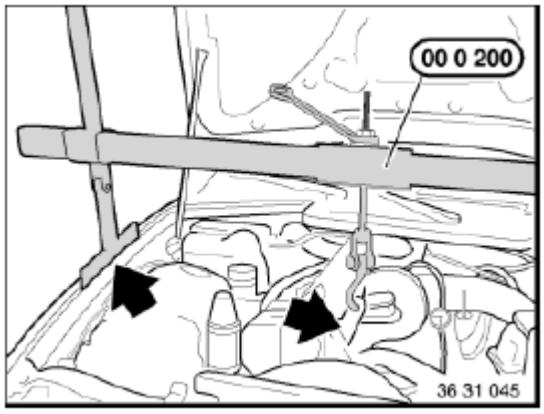


Fig. 90: Identifying Special Tool (00 0 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten steering spindle from steering gear.

Unscrew engine mountings on bottom left and right.

Brace front axle support with special tool 00 2 030 in conjunction with special tool 31 2 220.

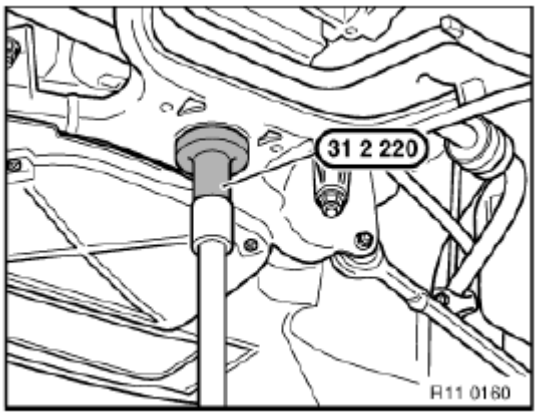


Fig. 91: Identifying Special Tool (31 2 220)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten left and right control arm from engine carrier.

Unfasten screw connection on front axle support and lower the front axle support.

NOTE: The steering gear must not be disconnected from the front axle support.

Release the bracket for the fuel lines from the oil pan.

Automatic transmission:

Remove oil pipes from oil pan.

Release oil pan screws, gearbox and engine side.

Lower oil pan and remove from rear.

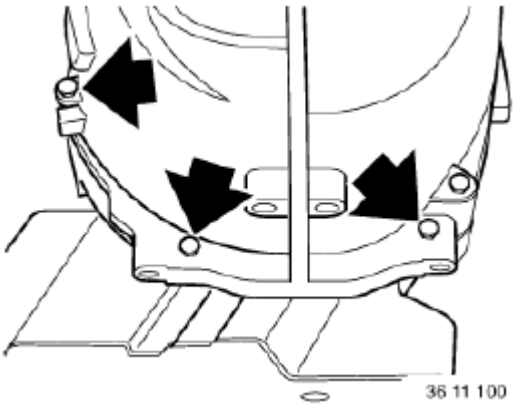


Fig. 92: Locating Oil Pan Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove oil wiper.

Remove intake snorkel for oil pump if necessary.

Installation

The intake snorkel is secured with self-tapping screws. For this reason, no threading is present on new oil pans. Thread can be shaped using existing screws.

Replace seal for intake snorkel.

Installation

Sealing faces clean and free of seal debris.

Replace the oil pan seal.

Fill the openings in the oil pan seal above the joint for the end cover and the timing case with three Bond 1209.

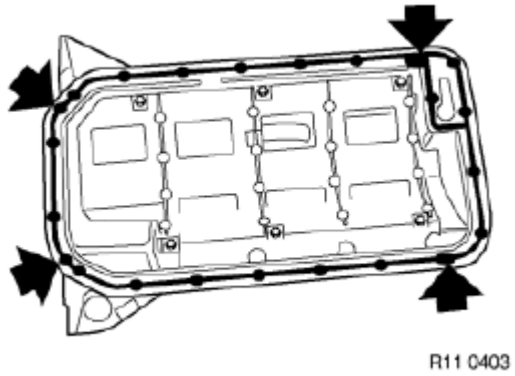


Fig. 93: Locating Oil Sump Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Insert all screws in oil pan.

Insert but do not yet tighten oil pan screws, gearbox side.

Tighten down screws on engine end.

Tighten screws on transmission end.

11 13 500 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP - ENGINE REMOVED (M44)

Drain engine oil.

Remove exhaust manifold.

Installation

Coat threads with copper paste.

Replace the seal and nuts.

Tightening torque, refer to 11 62 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

Remove engine carrier.

Mount engine on assembly stand.

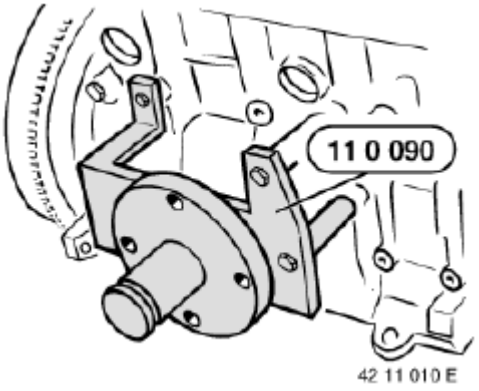


Fig. 94: Identifying Special Tool (11 0 090)
Courtesy of BMW OF NORTH AMERICA, INC.

Release guide tube for dipstick.

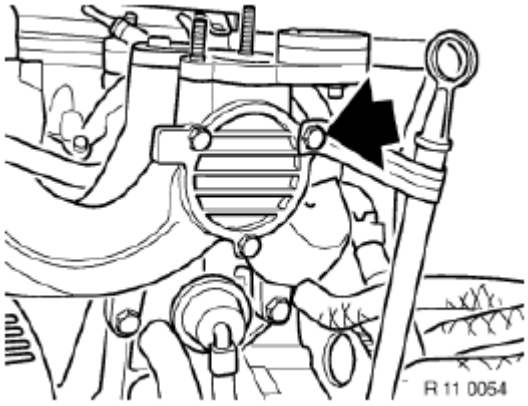


Fig. 95: Locating Guide Tube For Dipstick
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check/replace sealing ring.

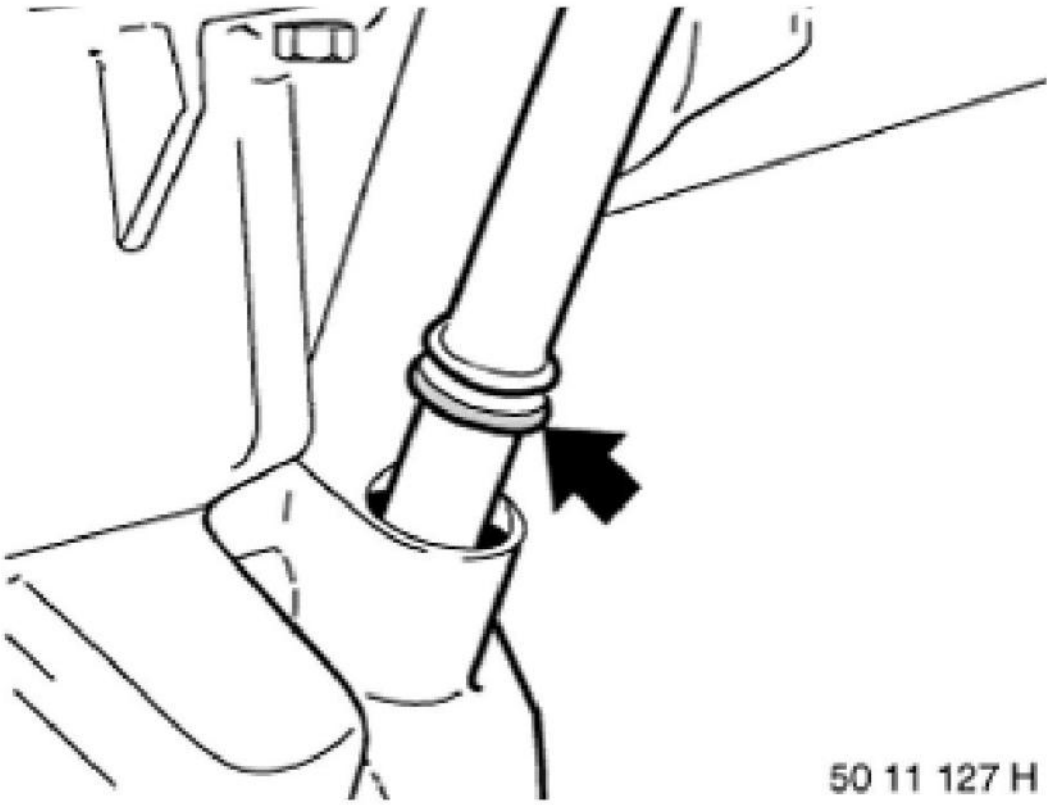


Fig. 96: Locating Dipstick Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew oil sump.

If necessary, remove oil wiper.

If necessary, remove intake snorkel for oil pump.

Installation

The intake snorkel is secured with self-tapping screws. For this reason, no threading is present on new oil sumps. Thread can be shaped using existing screws.

Replace seal for intake snorkel.

Installation

Sealing faces clean and free of seal debris.

Replace the oil sump gasket.

Fill openings in oil sump gasket through parting lines to sealing cover and to timing case with Drei Bond 1209.

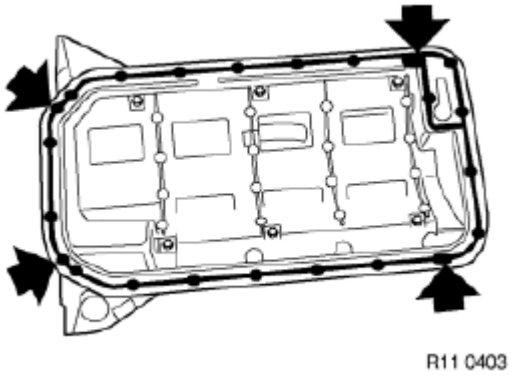


Fig. 97: Locating Oil Sump Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

To prevent any possibility of torsion stress when transmission is fitted, align oil sump on transmission end with engine block.

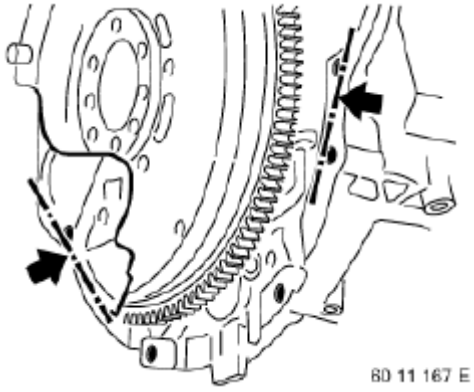


Fig. 98: Aligning Oil Sump On Transmission End With Engine Block
Courtesy of BMW OF NORTH AMERICA, INC.

HOUSING COVER

11 14 100 REMOVING AND INSTALLING, SEALING OR REPLACING TIMING CASE COVER AT TOP (M44)

Remove cylinder head cover, refer to **11 12 000.**

Remove coolant thermostat, refer to **11 53 000.**

Remove cylinder detection sensor from timing case cover.

Unfasten timing case cover.

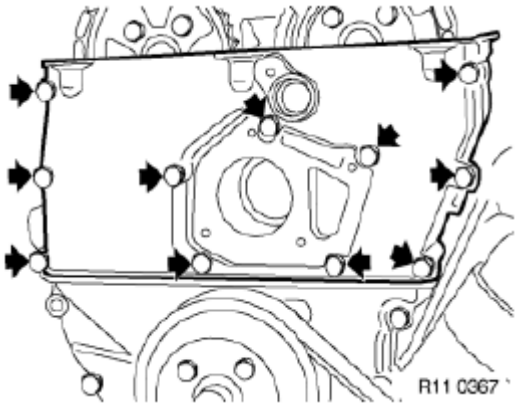


Fig. 99: Locating Timing Case Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove rubber sealing strip.

Installation

Replace the rubber-profile seal.

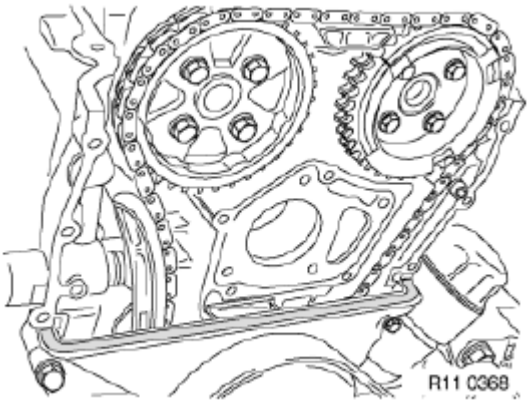


Fig. 100: Identifying Rubber Sealing Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Cut seal at joints.

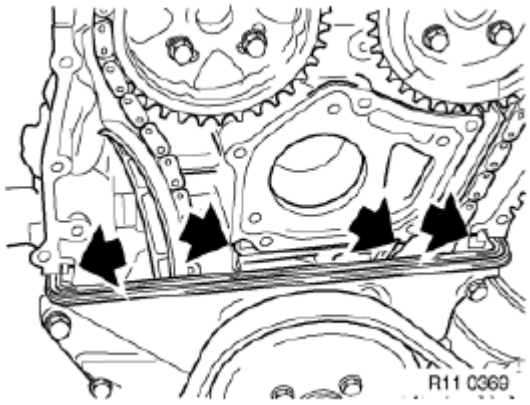


Fig. 101: Locating Seal Joints
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Replace seal.

NOTE: Separate seals for the top gear case cover are available as spare parts.

Installation

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

Apply Drei Bond 1209 at both the upper and lower sealing surfaces of the cylinder head.

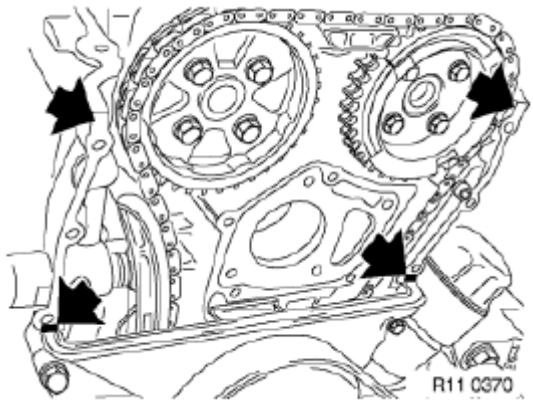


Fig. 102: Locating Sealing Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Install special tool 11 4 110.

Fit new seals.

Coat top and bottom of seals with Drei Bond 1209.

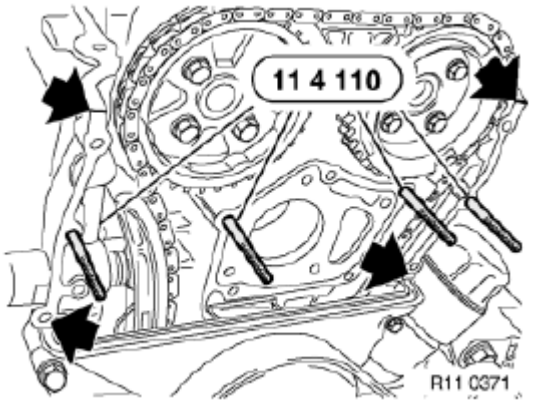


Fig. 103: Identifying Special Tool (11 4 110)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Apply Drei Bond 1209 sealing compound thinly and evenly to the groove ends.

Seat new rubber seal in groove.

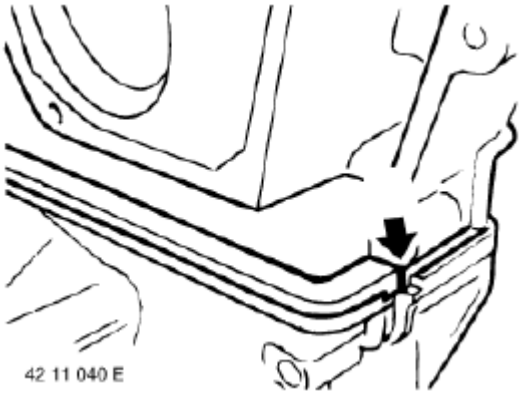


Fig. 104: Identifying Drei Bond Applying Area
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Apply a thin coating of grease to top side of rubber profile gasket and both sides of special tool 11 2 330 and place special tool on gasket.

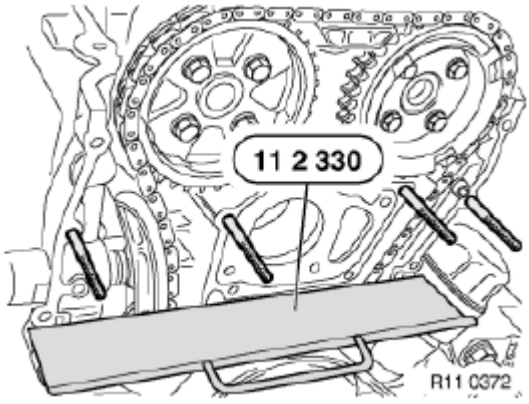


Fig. 105: Identifying Special Tool (11 2 330)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Fit gear case cover. Insert screws and fit flush.

Carefully pull out special tool 11 2 330.

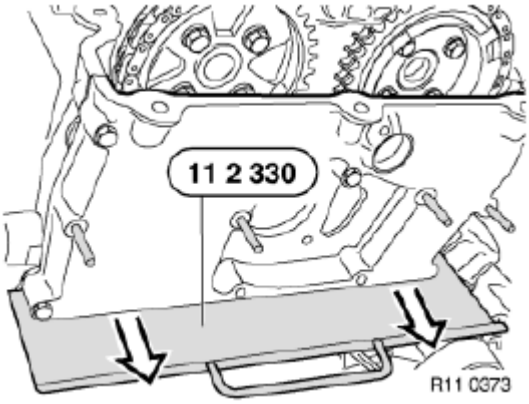


Fig. 106: Identifying Special Tool (11 2 330)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove the sealing ring for the oil feed of the spray lead.

Installation

Check/replace sealing ring. Preassemble the sealing ring to the oil feed.

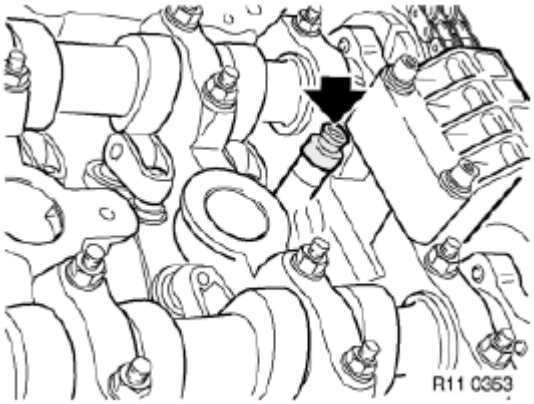


Fig. 107: Locating Oil Feed Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Install cylinder head cover without seal.

Install M 6 screws with large washers and press gear case cover down until upper edge of gear case cover and cylinder head are aligned.

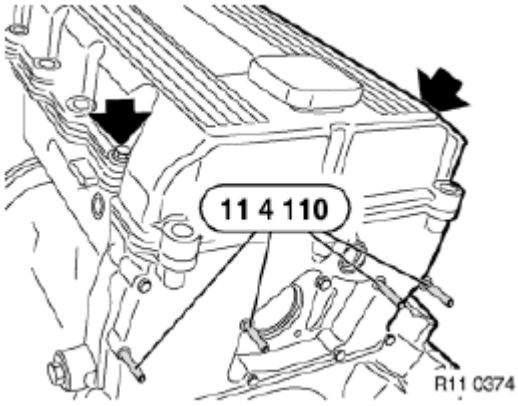


Fig. 108: Identifying Special Tool (11 4 110)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Tighten the screws.

Remove special tool 11 4 110, insert and tighten the remaining screws.

Tightening torque, refer to 11 14 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

CAUTION: If all screws are tightened, they must be tightened again in a second operation.

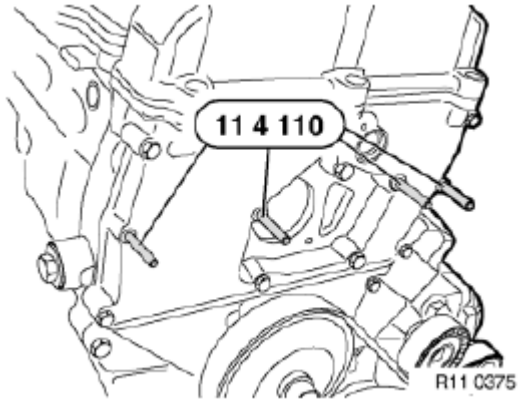


Fig. 109: Identifying Special Tool (11 4 110)
Courtesy of BMW OF NORTH AMERICA, INC.

11 14 110 REMOVING AND INSTALLING, SEALING OR REPLACING TIMING CASE COVER AT BOTTOM (M44)

Remove timing case cover at top, refer to **11 14 100 Removing and installing, sealing or replacing timing case cover at top (M44).**

Remove vibration damper, refer to **11 23 010.**

Release belt pulley.

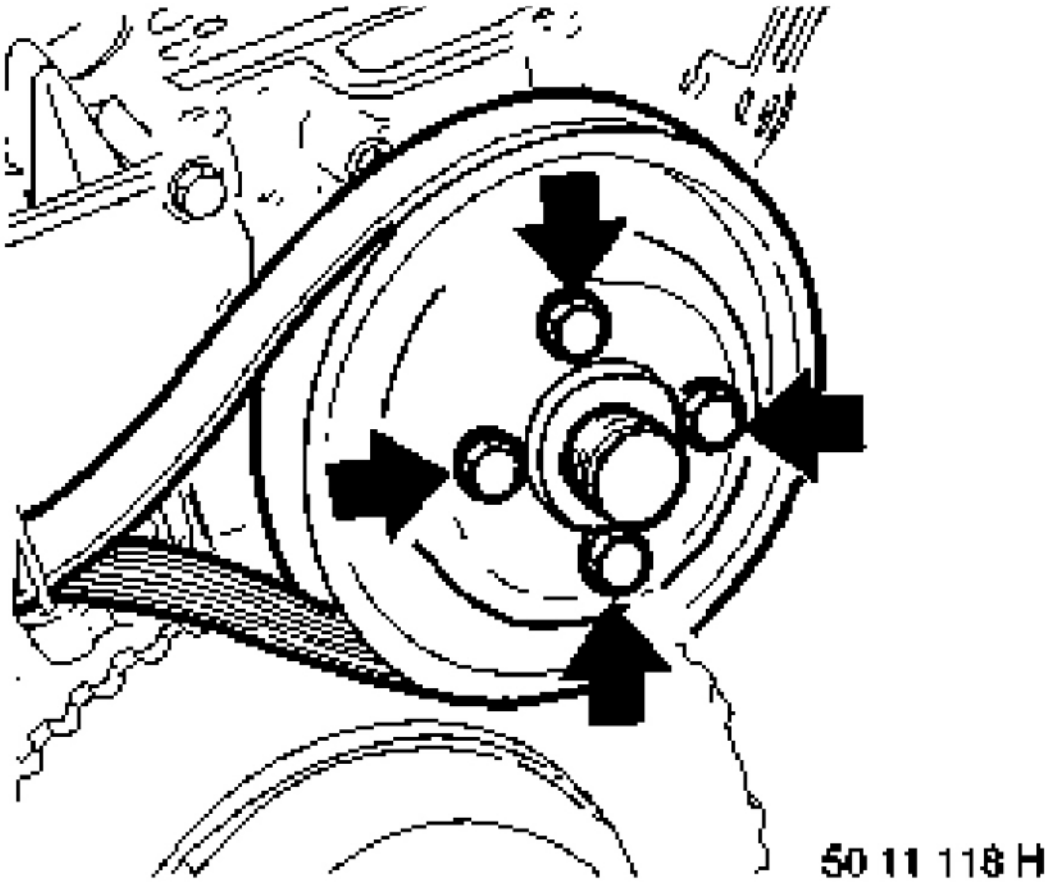


Fig. 110: Locating Belt Pulley Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws

Remove gear case cover, bottom.

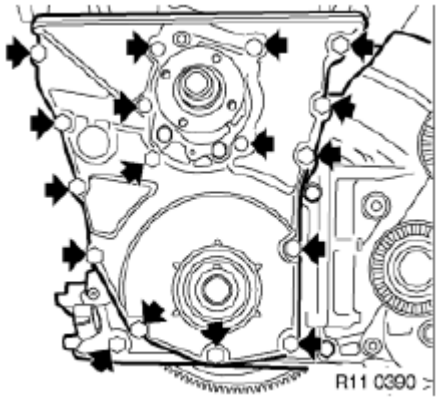


Fig. 111: Locating Gear Case Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Note dowel sleeves (1).

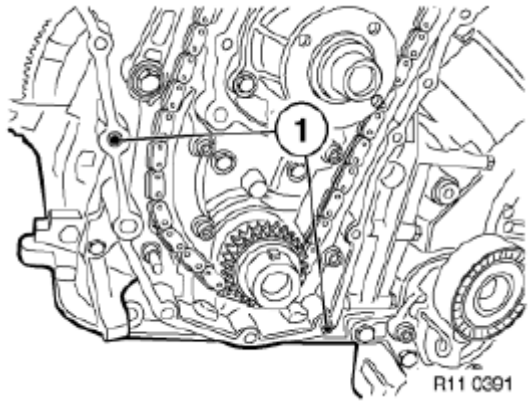


Fig. 112: Identifying Dowel Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

To fasten the seals, insert special tool 11 4 110.

Replace seal.

Coat the seal on the front and rear ends thinly with Drei Bond 1209.

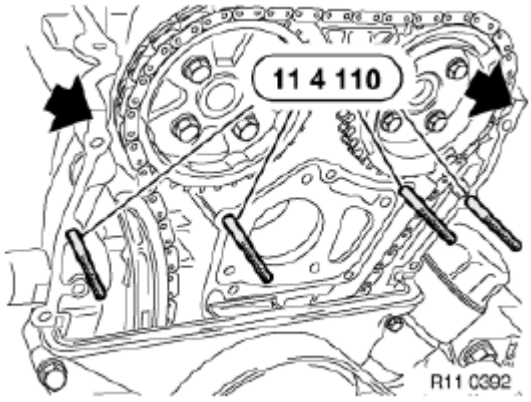


Fig. 113: Identifying Special Tool (11 4 110)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

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

Fully tighten all screws in alternate sequence.

Tightening torque, refer to 11 14 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

CAUTION: If all screws are tightened, they must be tightened again in a second operation.

Replace radial seal, refer to **11 14 141.**

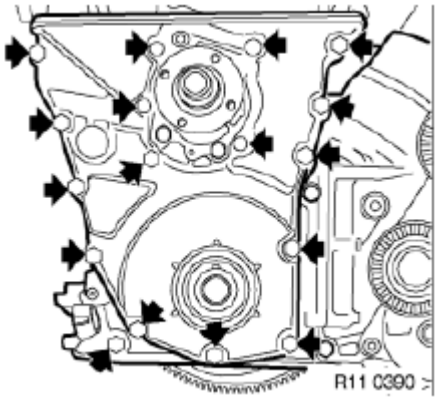


Fig. 114: Locating Gear Case Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

11 14 115 REMOVING AND INSTALLING, SEALING OR REPLACING TIMING CASE (M44)

Removal

Removal and installation are described separately.

Remove timing chain, guide rail and tensioning rail, refer to **11 31 051.**

Remove alternator.

Remove alternator carrier. Unscrew oil-filter cover

These tasks are described in **Removing Main Flow Oil Filter** . See **11 42 020.**

Remove oil sump, refer to **11 13 000.**

Release gear case.

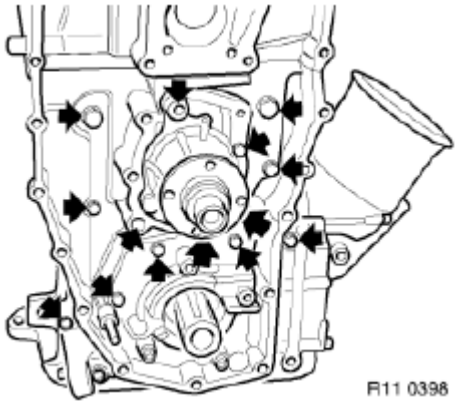


Fig. 115: Locating Timing Case Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove oil pump and control valve, refer to **11 41 000.**

If necessary, remove main flow oil filter, refer to **11 42 020.**

If necessary, remove water pump, refer to **11 51 000.**

Installation

Installation and removal are described separately.

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

Ensure dowel sleeves (1) are correctly located.

Replace seal.

Coat the seal for the oil sump separating joint with Drei Bond 1209.

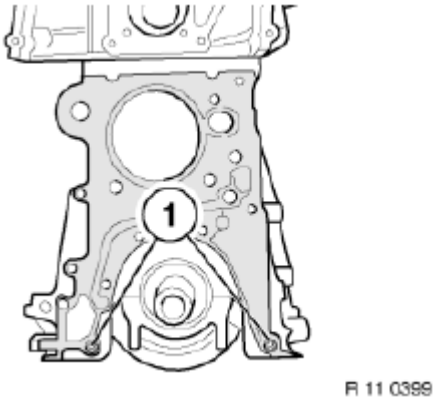


Fig. 116: Identifying Dowel Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

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

Apply Drei Bond 1209 sealing compound thinly and evenly to the groove ends.

Seat new rubber seal in groove.

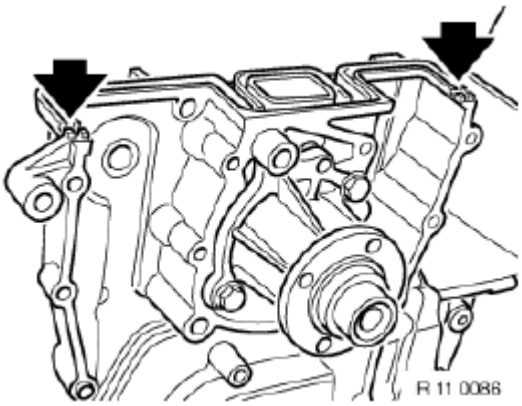


Fig. 117: Locating Sealing Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a thin coating of grease to top side of rubber profile gasket and both sides of special tool 11 2 330.

Place special tool 11 2 330 on top side of rubber profile gasket.

Fit gear case.

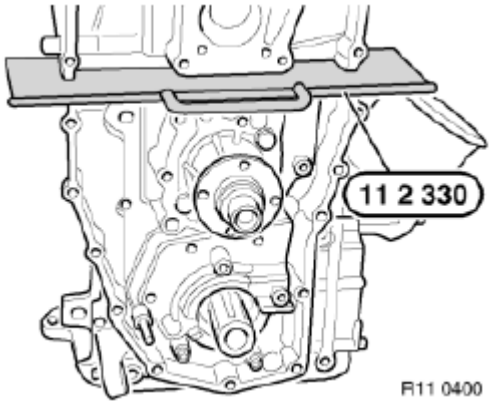


Fig. 118: Identifying Special Tool (11 2 330)
Courtesy of BMW OF NORTH AMERICA, INC.

Install and tighten all screws.

Tightening torque, refer to 11 14 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

CAUTION: If all screws are tightened, they must be tightened again in a second operation.

Carefully pull out special tool 11 2 330.

Replace radial seal in timing case cover at bottom, refer to **11 14 141.**

Assemble engine.

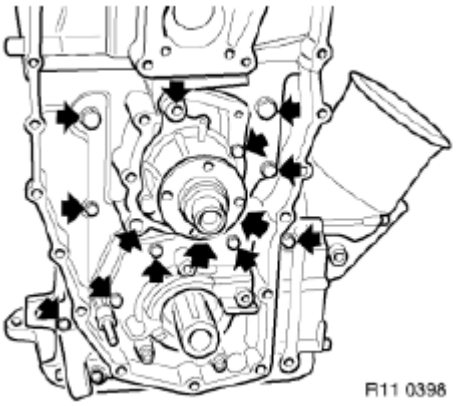


Fig. 119: Locating Timing Case Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

11 14 141 REPLACING RADIAL SEAL BELOW TIMING CASE COVER (M44)

Remove vibration damper, refer to **11 23 010**

Fit Special Tool 11 2 313 on crankshaft.

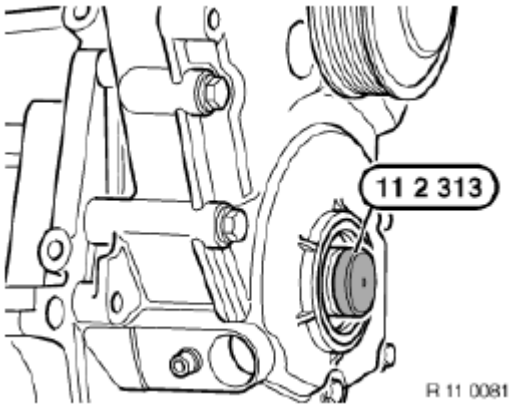


Fig. 120: Identifying Special Tool (11 2 313) On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in Special Tool 11 2 310 so far until it is rigidly connected with radial sealing ring.

Remove radial sealing ring by tightening in the screw.

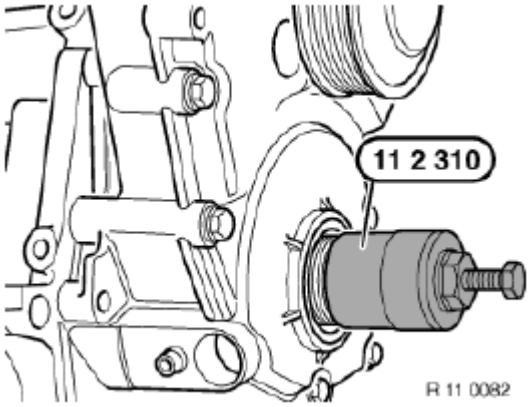


Fig. 121: Identifying Special Tool (11 2 310)
Courtesy of BMW OF NORTH AMERICA, INC.

Coat sealing lips of new radial sealing ring with oil.

With Special Tool 11 4 150 and central screw, install radial sealing ring flush with timing-case cover.

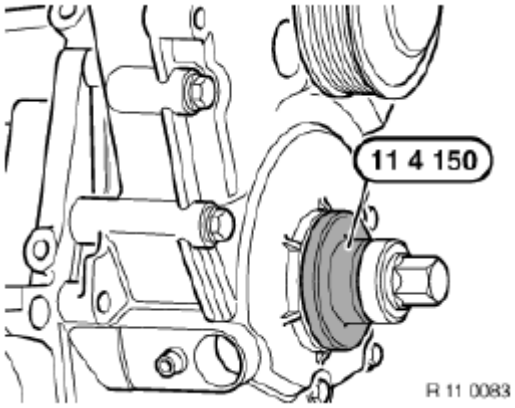


Fig. 122: Identifying Special Tool (11 4 150)
Courtesy of BMW OF NORTH AMERICA, INC.

11 14 151 REPLACING CRANKSHAFT RADIAL SEAL (TRANSMISSION SIDE)

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

- **M40 / M42 / M43 / M43TU / M44**
- **M50 / M52 / M52TU / M54 / M56**
- **S52 / S54**

Necessary preliminary tasks:

- Remove gearbox
- Drain off engine oil
- Remove flywheel

Unfasten oil sump screws on transmission end.

Loosen oil pan.

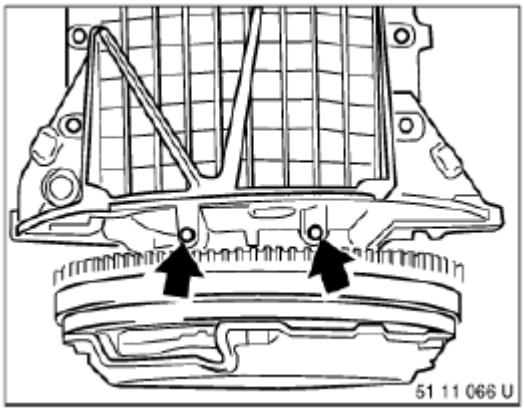


Fig. 123: Locating Oil Sump Screws On Transmission End
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws in end cover at rear.

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

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

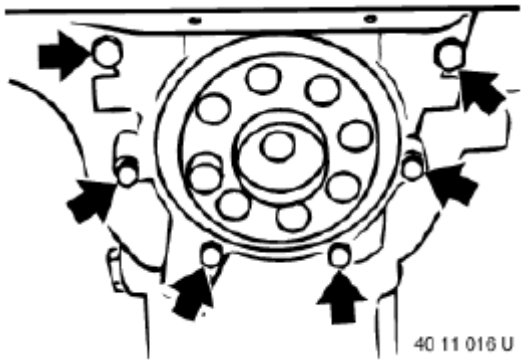


Fig. 124: Locating End Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: As from 4/98, a new type of radial seal is used in the Series and as a replacement. This radial seal may only be supported with a "support bushing".

If the radial seal is supported without the support bushing (1) for more than six months, operational reliability will no longer be assured and the radial seal must not be used any further.

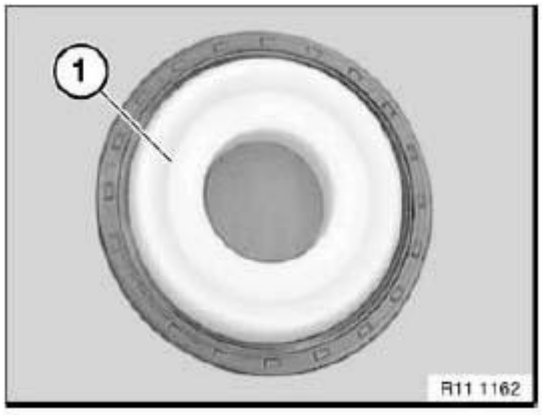


Fig. 125: Identifying Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

Distinguishing feature:

- (1) New version "without hose spring"
- (2) Old version "with hose spring"

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

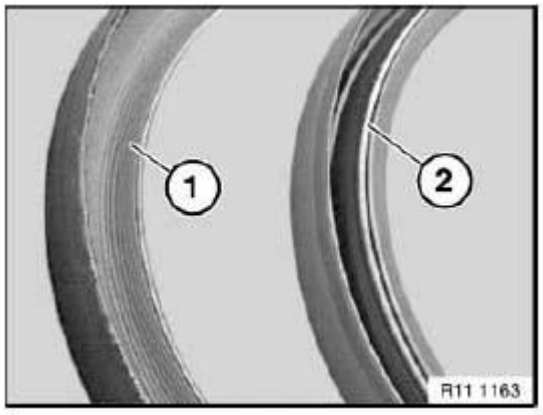


Fig. 126: Identifying Support Bushing New Version (1) And Old Version (2)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The end cover is offered in the kit with a radial seal.

If necessary, lift out the radial sealing ring and drive in new sealing ring using special tool 11 1 260 in conjunction with special tool 00 5 500.

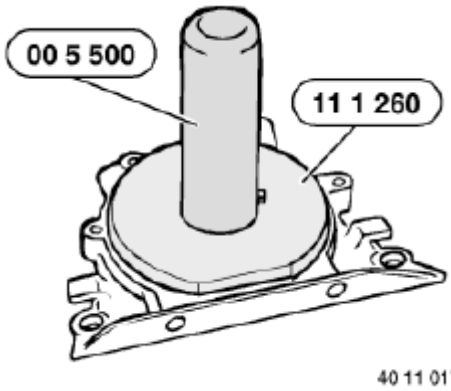


Fig. 127: Identifying Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

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

Replace seal (2).

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

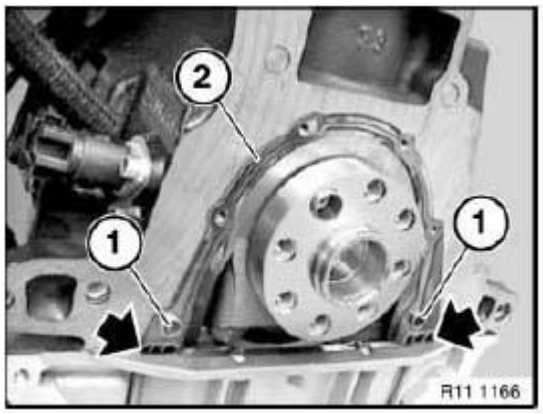


Fig. 128: Identifying Dowel Sleeves And Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

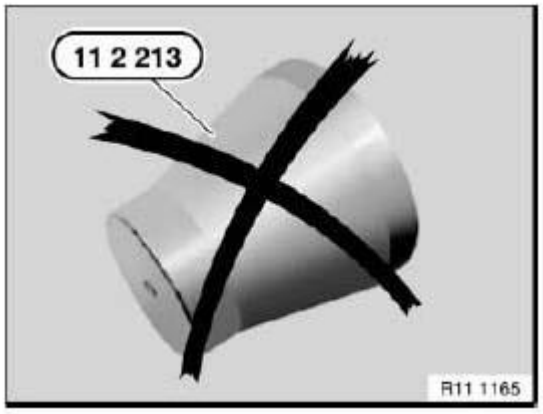


Fig. 129: Do Not Use Special Tool (11 2 213)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Lubricate contact face of crankshaft.

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

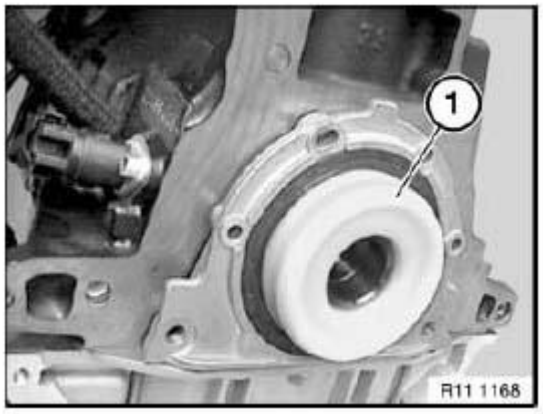


Fig. 130: Identifying Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

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

Replace screws (1).

Insert all screws and tighten down end cover.

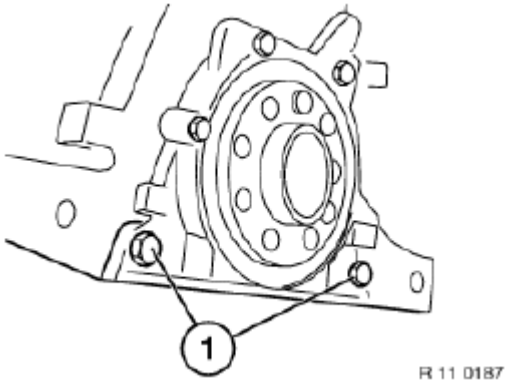


Fig. 131: Identifying End Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

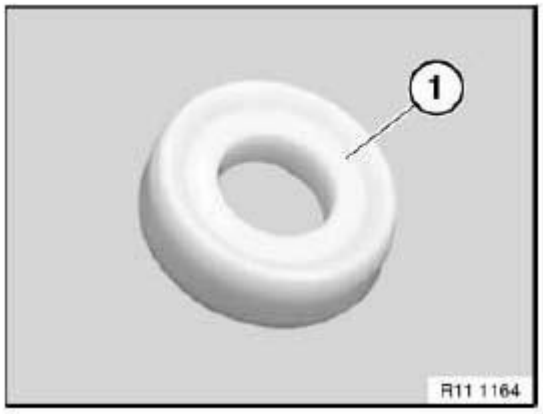


Fig. 132: Identifying Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

CRANKSHAFT WITH BEARING

11 21 500 REPLACING CRANKSHAFT (M44)

(Engine removed)

Remove lower timing case, refer to **11 14 115**

Remove piston, refer to **11 25 530**

Remove flywheel. See **11 22 500**

Remove rear end cover, the procedure is described as part of replacing crankshaft radial sealing ring, refer to **11 14 151**

Remove screws securing main bearing caps.

Remove main bearing cover 1 ... 5.

Lever out crankshaft.

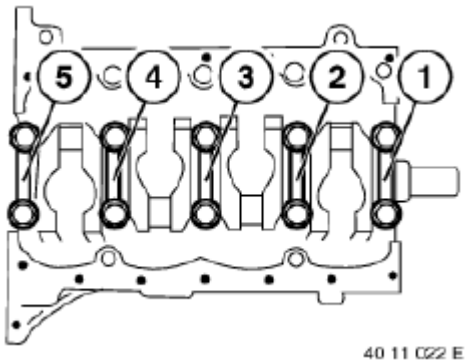


Fig. 133: Identifying Main Bearing Caps And Cover
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, unfasten increment gear.

Installation

Replace screws.

Install screws and tighten down in two passes.

Tightening torque, refer to 11 21 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

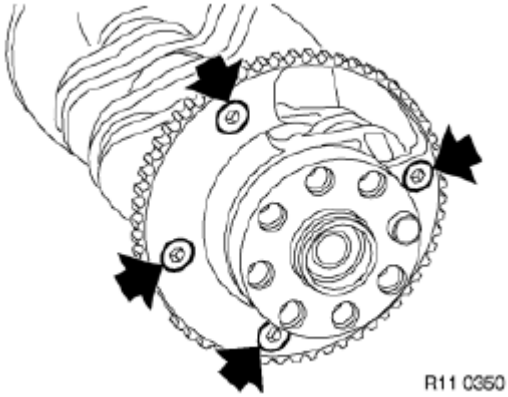


Fig. 134: Locating Crankshaft Screws
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Note grinding stage of crankshaft, refer to ENGINE - TECHNICAL DATA (M44)

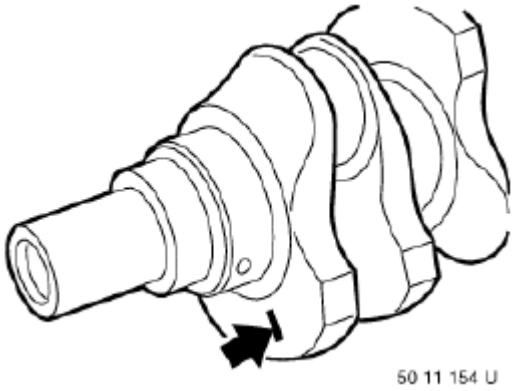


Fig. 135: Locating Grinding Stage Of Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Replacing main crankshaft bearing shells, refer to **11 21 531**

Replacing conrod bearing shells, refer to **11 24 571**

Replacing grooved ball bearing in crankshaft, refer to **11 21 571**

11 21 531 REPLACING ALL MAIN CRANKSHAFT BEARING SHELLS (M44) (ENGINE DISMANTLED)

NOTE: Clean components before installing.

CAUTION: Note grinding stage of crankshaft, refer to ENGINE - TECHNICAL DATA (M44)

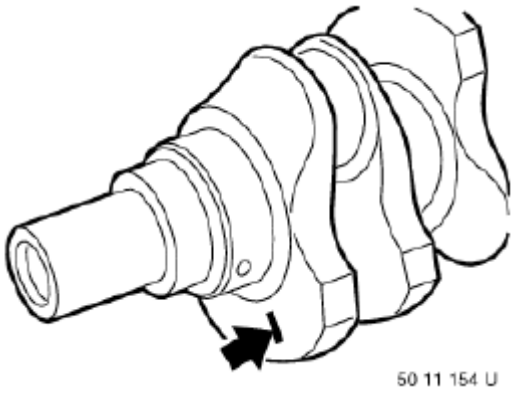


Fig. 136: Locating Grinding Stage Of Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

In order to avoid the possibility of injury from the piston or connecting rod, the location of spray nozzles is equipped with special tool 11 7 320.

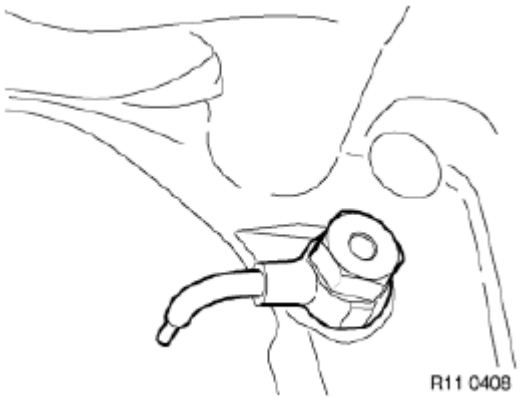


Fig. 137: Identifying Injection Nozzles

Courtesy of BMW OF NORTH AMERICA, INC.

Check the setting of the spray nozzles.

Attach special tool 11 7 320 to the intake side in the receiving bore hole in the engine block.

The spray nozzles must fit into the guide of special tool 11 7 320.

If necessary, loosen the spray nozzles and adjust and tighten them using special tool 11 7 320.

Tightening torque, refer to 11 11 7AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

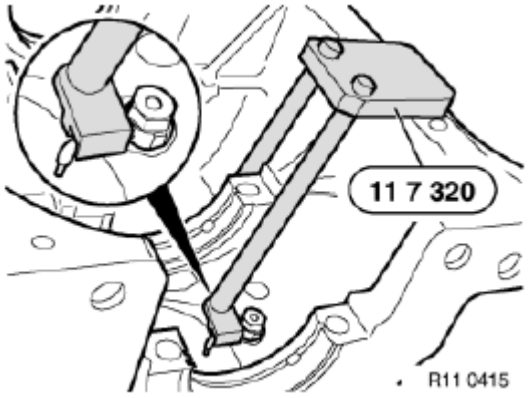


Fig. 138: Identifying Special Tool 11 7 320
Courtesy of BMW OF NORTH AMERICA, INC.

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.

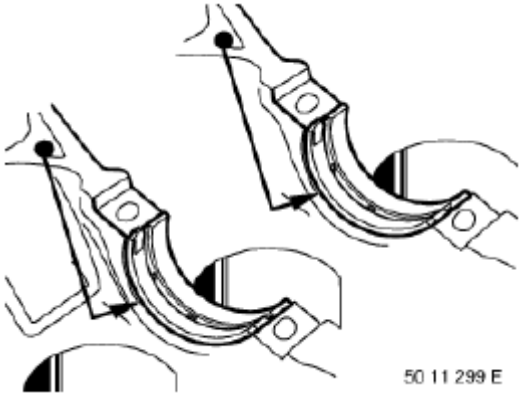


Fig. 139: Identifying Main Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Guide bearing shell installed at bearing No. 4 is sole means of axial alignment

for crankshaft.

Install guide bearing shell in crankcase.

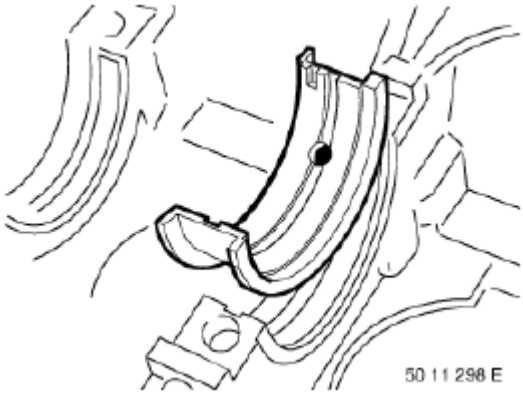


Fig. 140: Identifying Guide Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

Install crankshaft.

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

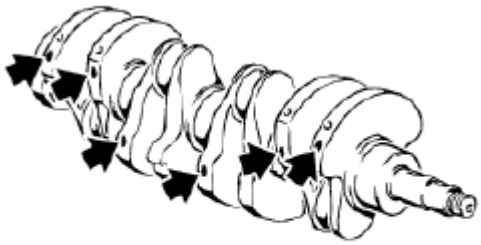


Fig. 141: Identifying Crankshaft Tolerance Of Main Journal
Courtesy of BMW OF NORTH AMERICA, INC.

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

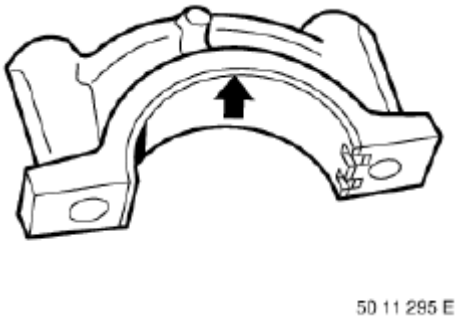


Fig. 142: Identifying Main Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Main bearing caps 1 ... 3 bear identification markings on exhaust side.

The main bearing caps 4 and 5 are not marked.

Note that main bearing cap 4 has shoulders machined into end faces.

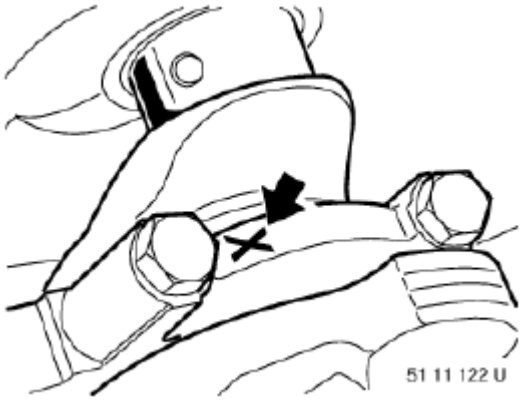


Fig. 143: Locating Main Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Check main bearing clearance:

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

Do not twist crankshaft.

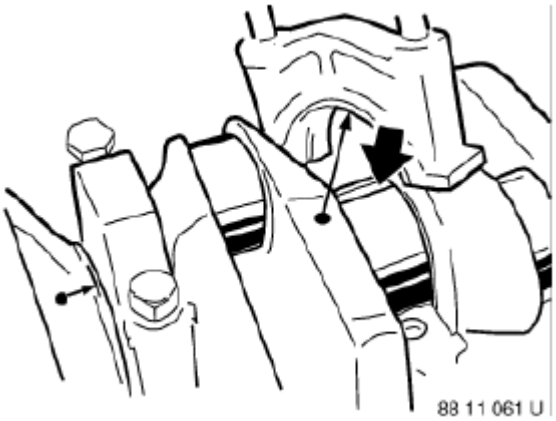


Fig. 144: Identifying Main Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Place main bearing caps in position with grooves of all caps on same side. Align main bearing cap flush with side of bearing seat.

NOTE: To check main bearing clearance, use old main bearing screws.

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

Wash and oil screws.

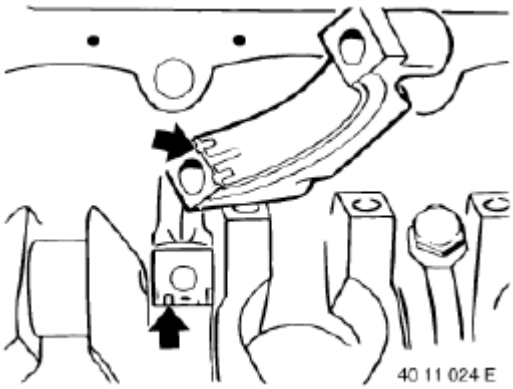


Fig. 145: Locating Main Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

1. Tighten the main bearing bolts to joining torque.
2. Tighten down screws with special tool 11 2 110 or with special tool 00 9 120 with torsion angle.

Tightening torque, refer to 11 11 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

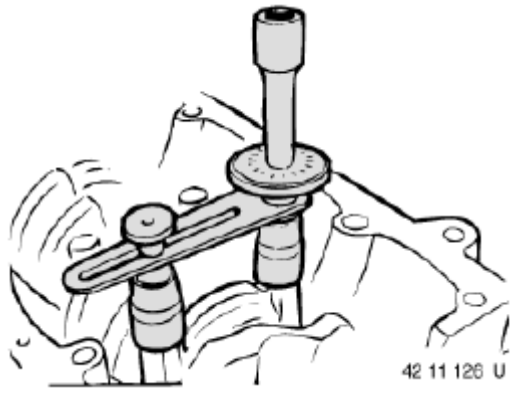


Fig. 146: Tightening Main Bearing Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove main bearing cover and read off bearing clearance on width of squashed plastic thread using the measuring scale.

Main bearing clearance, refer to **ENGINE - TECHNICAL DATA (M44)**

Install new bearing shells with different color codes if necessary in order to check bearing clearance.

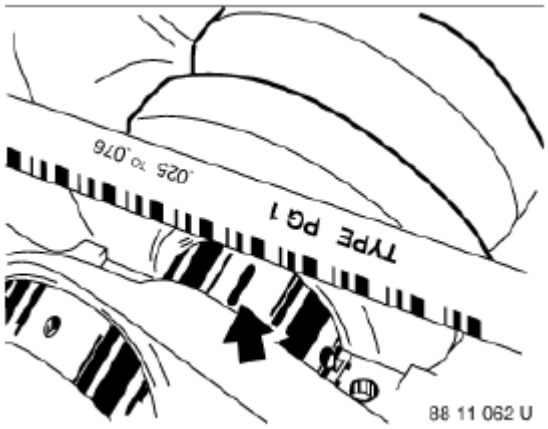


Fig. 147: Checking Bearing Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

Summary:

Color code/shaft diameter/bearing strength

Ge = yellow

Gn = green

Ws = white

1. Crankshaft
2. Bearing clearance
3. Bearing shells: yellow, green or white
4. Bearing cover

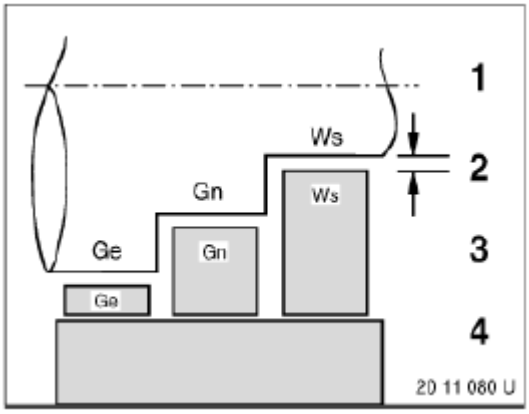


Fig. 148: Identifying Main Bearing Color Specification
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Remove plastic thread. Coat main bearing shells and crankshaft with engine oil. Place main bearing caps in position with grooves of all caps on same side. Align main bearing cap flush with side of bearing seat. Always replace main bearing screws with new ones. No oil is permitted in the blind bores (danger of cracking). Wash and oil screws.

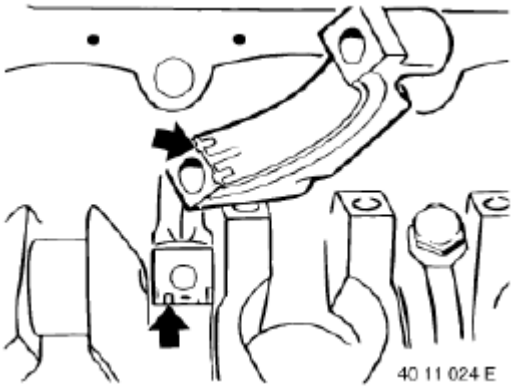


Fig. 149: Locating Main Bearing Caps Groove
Courtesy of BMW OF NORTH AMERICA, INC.

1. Tighten the main bearing bolts to joining torque.
2. Tighten down screws with special tool 11 2 110 or with special tool 00 9 120 with torsion angle.

Tightening torque, refer to 11 11 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

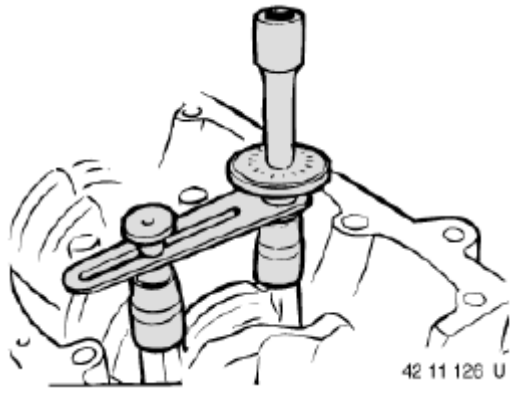


Fig. 150: Tightening Main Bearing Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Check end float.

End float, refer to **ENGINE - TECHNICAL DATA (M44)**

If necessary, check the guide bearing shell, crankshaft and engine block.

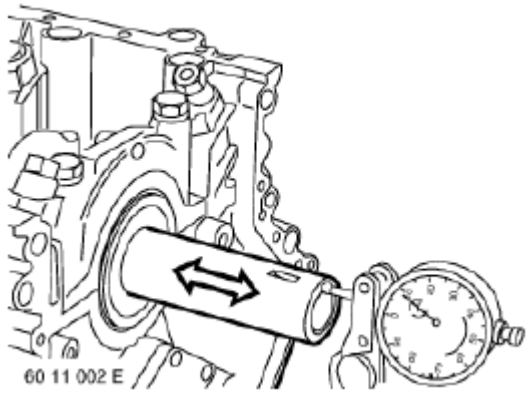
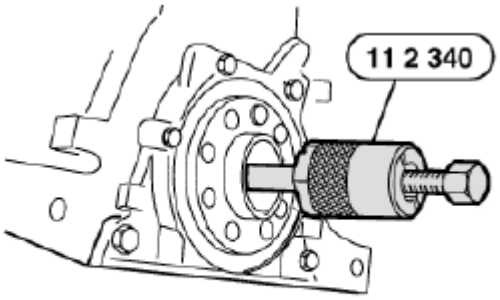


Fig. 151: Checking End Float
Courtesy of BMW OF NORTH AMERICA, INC.

11 21 571 REPLACING GROOVED BALL BEARINGS IN CRANKSHAFT (M44)

(clutch removed)

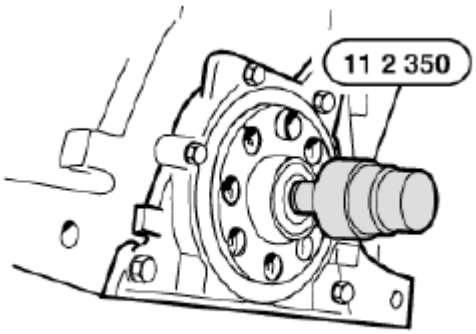
Remove thrust bearing with Special Tool 11 2 340.



50 11 305 E

Fig. 152: Identifying Special Tool (11 2 340)
Courtesy of BMW OF NORTH AMERICA, INC.

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



50 11 306 E

Fig. 153: Identifying Special Tool (00 5 500)
Courtesy of BMW OF NORTH AMERICA, INC.

FLYWHEEL

11 22 500 REMOVING AND INSTALLING OR REPLACING FLYWHEEL (M44)

(clutch removed)

Arrest flywheel with Special Tool 11 2 170.

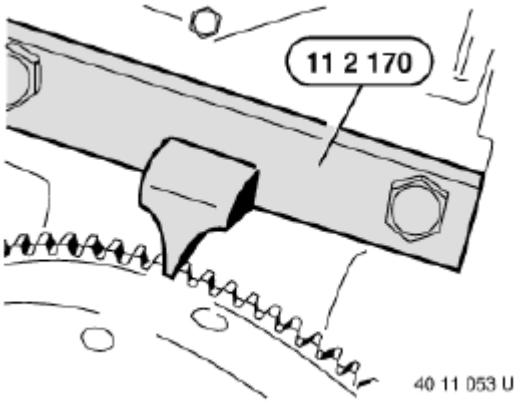


Fig. 154: Identifying Special Tool (11 2 170)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws and remove flywheel.

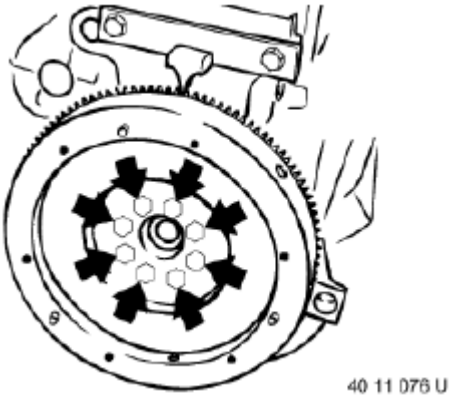


Fig. 155: Locating Flywheel Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Remember to fit hollow bush.

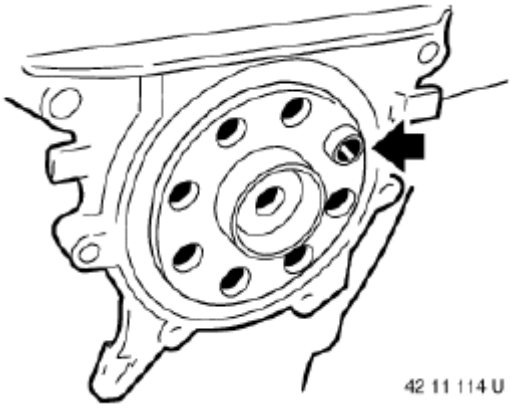


Fig. 156: Locating Hollow Bush
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

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

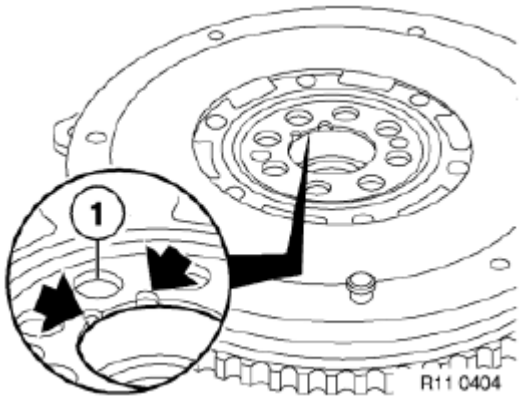


Fig. 157: Identifying Dowel Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Clean thread and install new micro-encapsulated screws.

Tightening torque, refer to 11 22 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

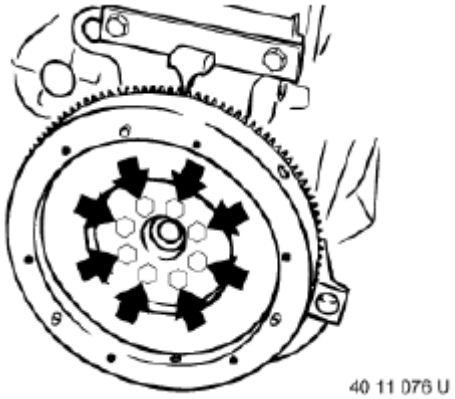


Fig. 158: Locating Micro-Encapsulated Screws
Courtesy of BMW OF NORTH AMERICA, INC.

VIBRATION DAMPER

11 23 010 REMOVING AND INSTALLING OR REPLACING VIBRATION DAMPER (M44)

Special tools required

- **11 2 150**
- **11 2 410** . See **ENGINE - SPECIAL TOOLS (M44)** .

If necessary, remove drive belt and belt pulley for the air-conditioning compressor.

Remove alternator drive belt.

Attach special tool **11 2 150** in conjunction with special tool **11 2 410.**

When releasing and tightening down central bolt, grip special tool 11 2 150 with assistance of a second person.

If it is not possible to grip the tool securely: Remove mounted parts until the special tool **11 2 150** can be supported on the engine carrier without damaging other components.

CAUTION: Protect engine bracket from damage.

Insert wood between engine carrier and special tool **11 2 150.**

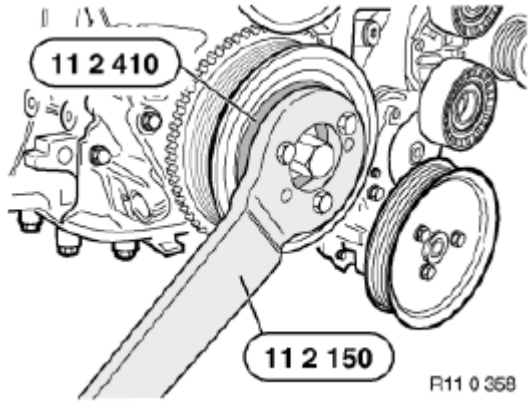


Fig. 159: Identifying Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew central bolt.

Replace radial seal in lower timing case cover.

Installation:

Align vibration damper with groove to featherkey.

Replace central bolt.

Tightening torque see 11 23 5AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

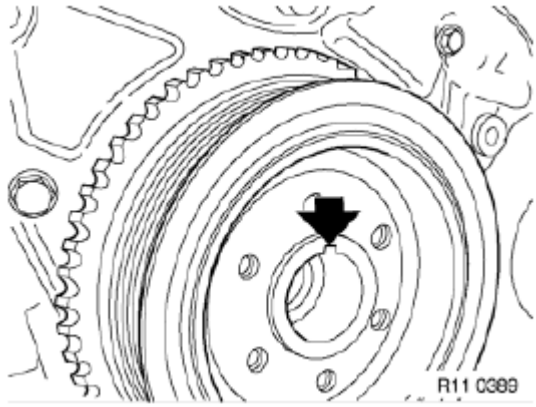


Fig. 160: Aligning Vibration Damper With Groove To Featherkey
Courtesy of BMW OF NORTH AMERICA, INC.

CONNECTING ROD WITH BEARING

11 24 571 REPLACING ALL CONNECTING-ROD BEARINGS (M44)

(piston removed)

Install new conrod bearing shells.

On each conrod, fit one red and one blue conrod bearing shell (regardless of colored mark on conrod shaft.

CAUTION: Note grinding stage of crankshafts, refer to ENGINE - TECHNICAL DATA (M44)

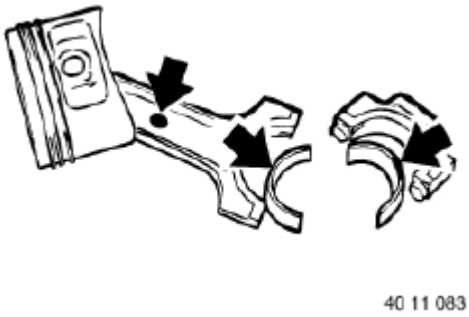


Fig. 161: Locating Conrod Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Installing pistons, refer to **11 25 530**

Check conrod 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.

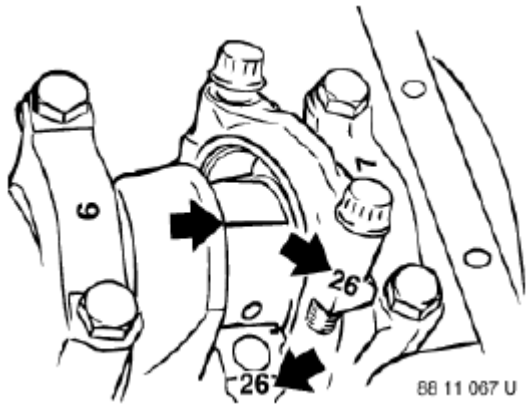


Fig. 162: Checking Conrod Bearing Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Do not turn the connecting rods or crankshaft.

Use the old conrod bolts to check conrod clearance.

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

Tightening torque, refer to 11 24 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

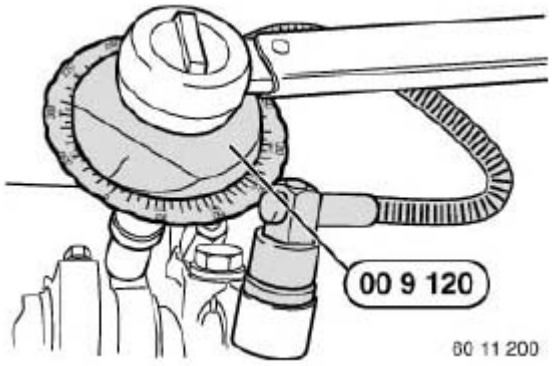


Fig. 163: Identifying Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Conrod bearing clearance, refer to **ENGINE - TECHNICAL DATA (M44)**

Remove plastic thread.

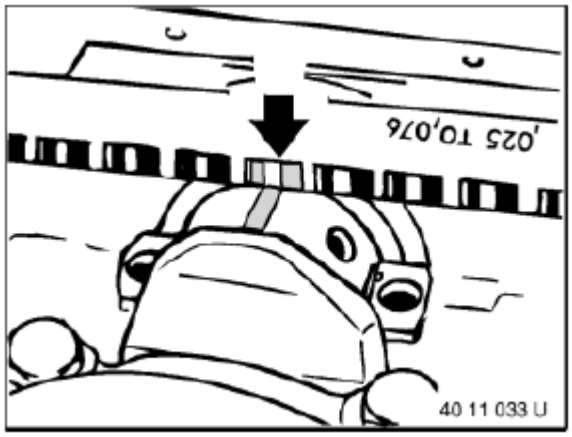


Fig. 164: Checking Bearing Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

Summary:

Color code/shaft diameter/bearing strength

Color code 2 classification.

Rt = red

Bl = blue

1. Crankpin
2. Bearing clearance
3. Bearing shells: red or blue
4. Conrod

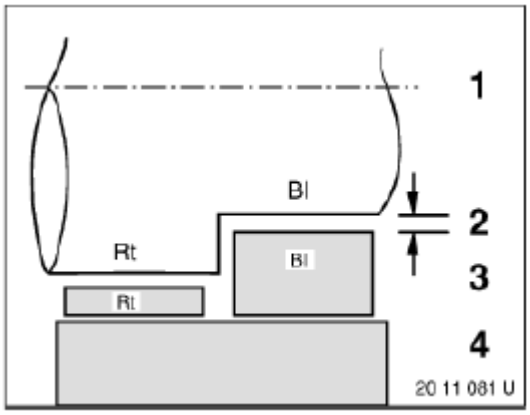


Fig. 165: Identifying Color Code Specification
Courtesy of BMW OF NORTH AMERICA, INC.

PISTON WITH RINGS AND PIN

11 25 530 REMOVING AND INSTALLING OR REPLACING ALL PISTONS (M44)

(engine removed)

Removal

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

Remove cylinder head, refer to **11 12 100 Removing and installing cylinder head (M44)**.

Remove oil pan, see **11 13 500**

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

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

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

Be careful not to damage the spray nozzles for cooling the pistons when removing the pistons.

In order to avoid the possibility of injury from the piston or connecting rod, the location of spray nozzles is equipped with special tool 11 7 320.

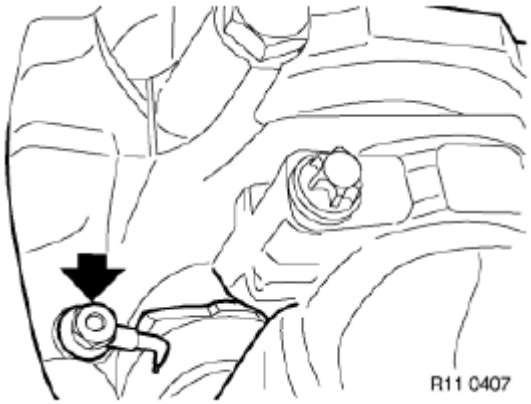


Fig. 166: Locating Injection Nozzles
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew conrod bearing cover.

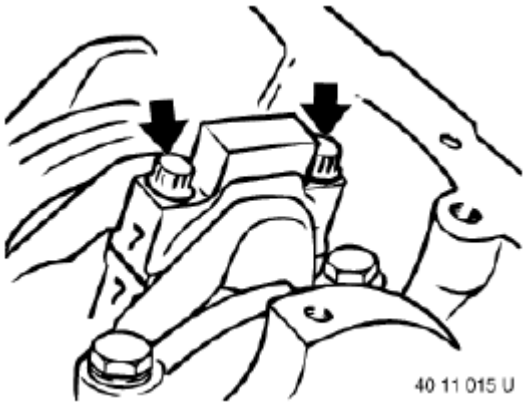


Fig. 167: Locating Conrod Bearing Cover Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 3 480 in conrod.

Remove conrod with piston from cylinder head side.

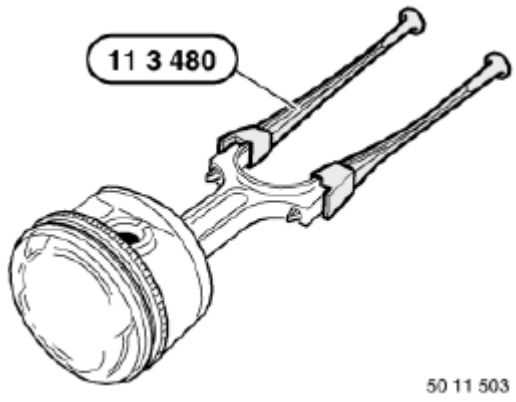


Fig. 168: Identifying Special Tool (11 3 480)
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out retaining ring and press out piston pin.

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

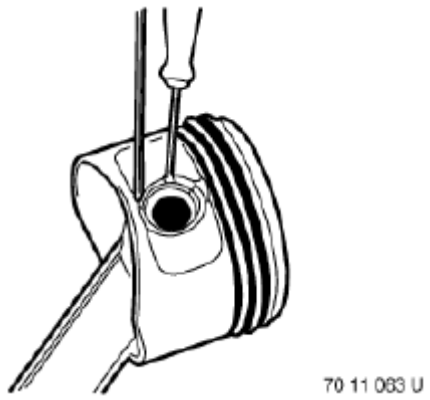


Fig. 169: Lifting Out Retaining Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

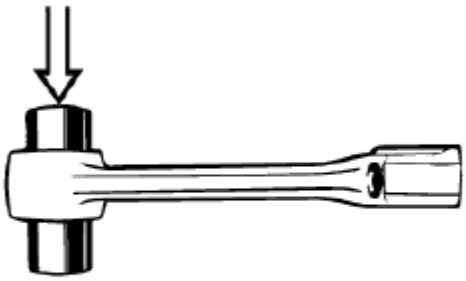
Installation of pistons is described separately from removal. Assembly sequence for removal and installation is different.

If necessary, replace connecting rods.

Spare connecting rods can only be obtained in complete sets.

It should be possible to press piston pin into bush by hand using only slight pressure. Clearance should then be

minimal.



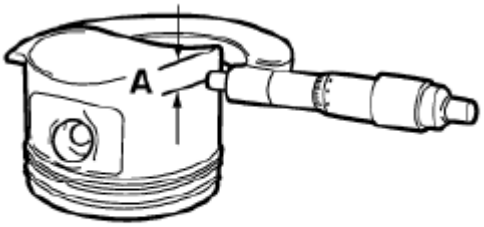
70 11 068 U

Fig. 170: Pressing Piston Pin Into Bush
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.

Measuring point A, refer to **ENGINE - TECHNICAL DATA (M44)**



88 11 051 U

Fig. 171: Measuring Piston Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust micrometer on cylinder bore of engine block and set plug gauge on micrometer to zero. Measure bottom, center and top of cylinder bore in direction of travel and direction of engine rotation.

Diameter of the cylinder bore, refer to **ENGINE - TECHNICAL DATA (M44)**

Piston installation clearance, refer to **ENGINE - TECHNICAL DATA (M44)**

Max. permissible total wear clearance, refer to **ENGINE - TECHNICAL DATA (M44)**

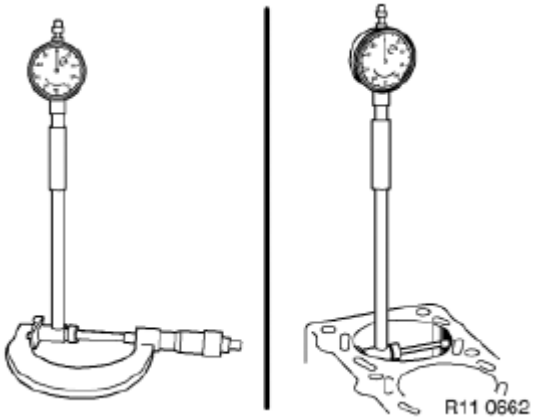


Fig. 172: Adjusting Micrometer On Cylinder Bore Of Engine Block
Courtesy of BMW OF NORTH AMERICA, INC.

Install conrod bearing, refer to **11 24 571**

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

Fit connecting rod 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.

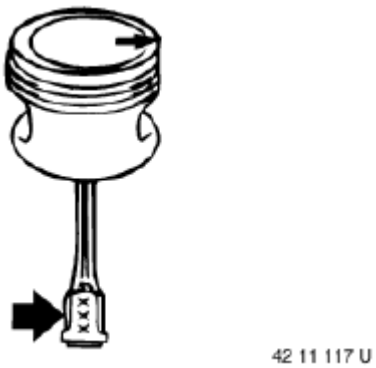


Fig. 173: Identifying Mark On Connecting Rod With Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Install retaining ring.

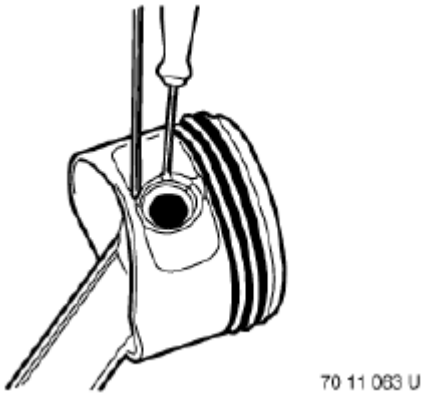


Fig. 174: Lifting Out Retaining Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 3 480 in conrod.

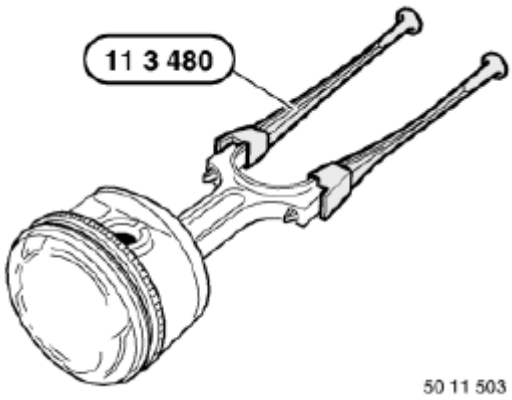


Fig. 175: Identifying Special Tool (11 3 480)
Courtesy of BMW OF NORTH AMERICA, INC.

Lightly coat pistons and piston rings with oil.

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

Press together piston rings with special tool 11 2 260.

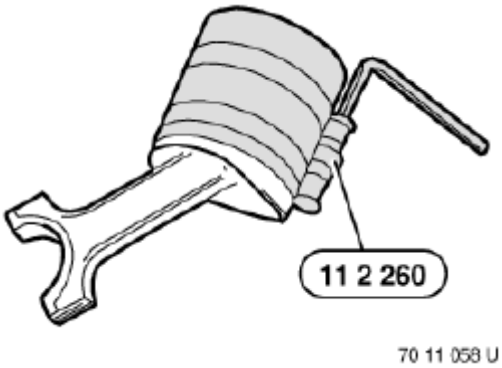


Fig. 176: Identifying Special Tool (11 2 260)
Courtesy of BMW OF NORTH AMERICA, INC.

Install pistons with arrows pointing towards camshaft drive.

The tightening strap must locate firmly right around circumference of engine block.

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

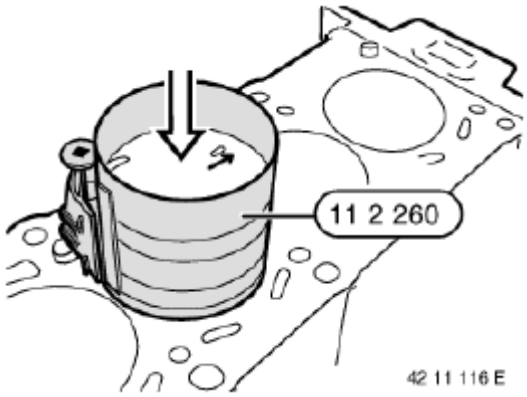


Fig. 177: Pressing Piston With Special Tool (11 2 260)
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Be careful not to damage the spray nozzles for cooling the pistons when installing the pistons.

Attach crankpin to connecting rod.

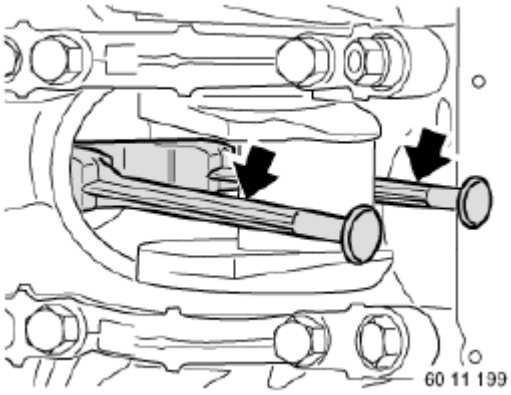


Fig. 178: Locating Connecting Rod
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Install new conrod bolts.

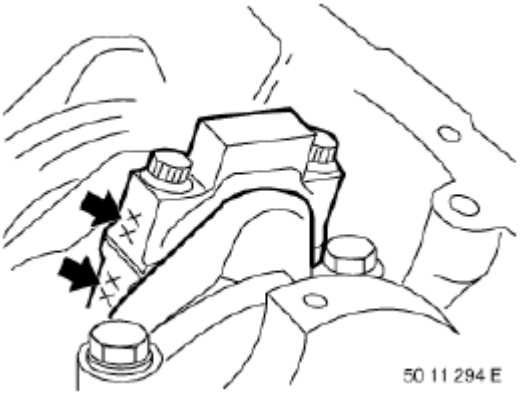


Fig. 179: Locating Connecting-Rod Bearing Cap Number
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque, refer to 11 24 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

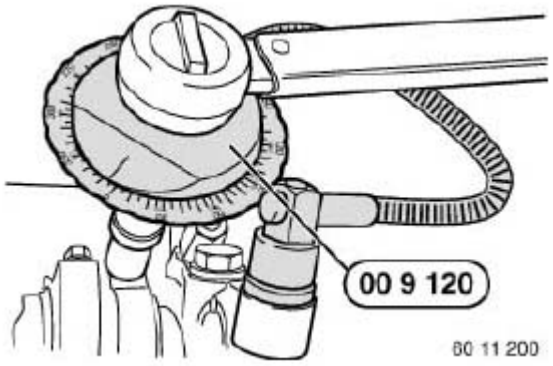


Fig. 180: Tightening Bearing With Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Check the setting of the spray nozzles.

Attach special tool 11 7 320 to the intake side in the receiving bore hole in the engine block.

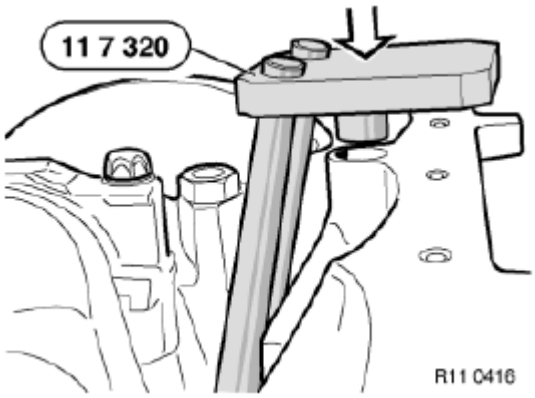


Fig. 181: Identifying Special Tool (11 7 320)
Courtesy of BMW OF NORTH AMERICA, INC.

The spray nozzles must fit into the guide of special tool 11 7 320.

If necessary, loosen the spray nozzles and adjust and tighten them using special tool 11 7 320.

Tightening torque, refer to 11 11 7AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

Assemble engine.

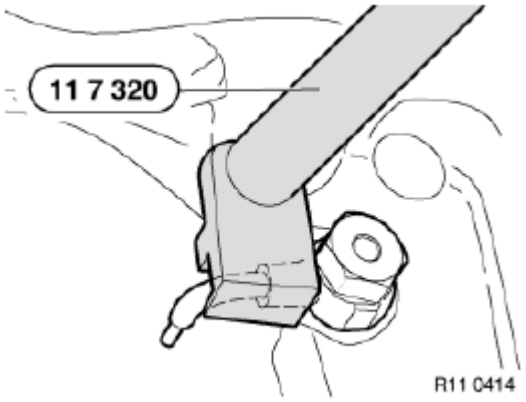


Fig. 182: Identifying Special Tool (11 7 320)
Courtesy of BMW OF NORTH AMERICA, INC.

11 25 671 REPLACING PISTON RINGS ON ALL PISTONS (M44)

(Piston removed)

Remove piston rings with a piston-ring compressing pliers.

NOTE: It might not be possible to find the identification on used piston rings. Put aside piston rings in correct sequence and installation position. New pistons may only be installed together with new piston rings.

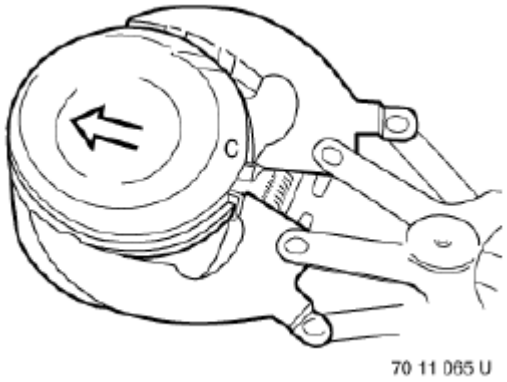


Fig. 183: Installing Piston Rings With Piston-Ring Compressing Pliers
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

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

1. Plain compression ring
2. Stepped taper-face ring "TOP"
3. Disk ring with support spring

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

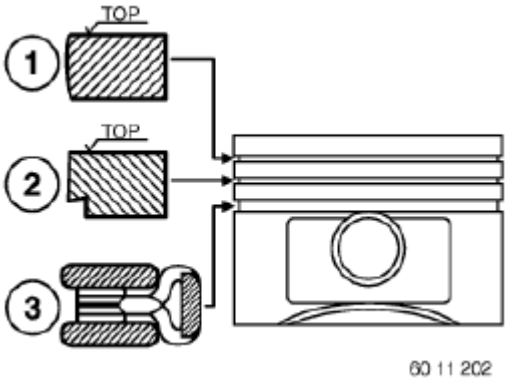


Fig. 184: Arranging Piston Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Measuring end float, refer to **ENGINE - TECHNICAL DATA (M44)**

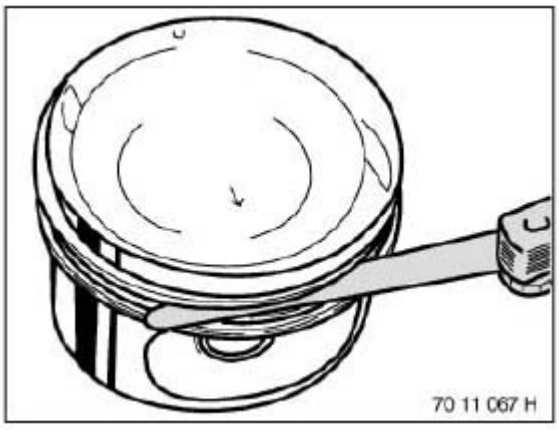


Fig. 185: Measuring End Float
Courtesy of BMW OF NORTH AMERICA, INC.

Measuring contact clearance, refer to **ENGINE - TECHNICAL DATA (M44)**

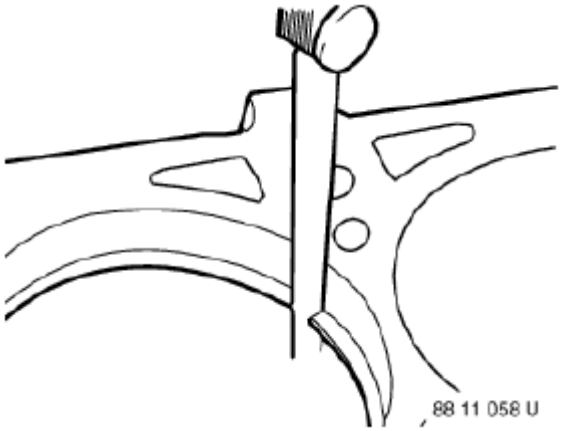


Fig. 186: Measuring Contact Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

V-RIBBED BELT WITH TENSIONER

11 28 010 REPLACING ALTERNATOR DRIVE BELT (M44)

NOTE: If the drive belt are to be reused, mark the rotation direction and reinstall the drive belt with the same rotation direction.

Remove fan coupling with fan wheel, refer to **11 52 020**

Remove the dust cab.

Push the tensioning device for the drive belt of the alternator back on the bolt connection of the pulley.

CAUTION: The bolt connection of the pulley for the tensioning device for the drive belt has left-hand thread and is peened.
Only change the pulley in conjunction with the tensioning device for the drive belt.

Remove drive belt.

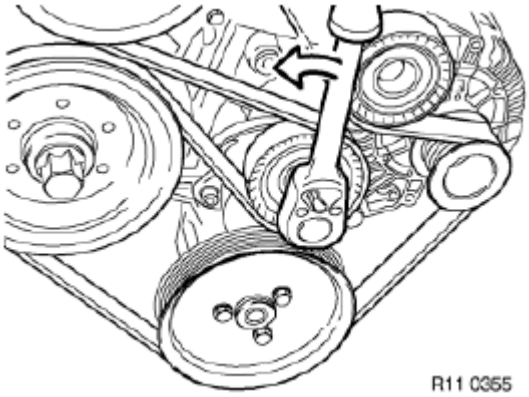


Fig. 187: Pushing Tensioning Device Back
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

If necessary, apply preload to the tensioning device for the drive belt as far as possible and lock with Special Tool 11 3 340. This will make it easier to put on the drive belt.

CAUTION: The tensioning device for the drive belt is under high spring pressure. Press Special Tool 11 3 340 in as far as possible.

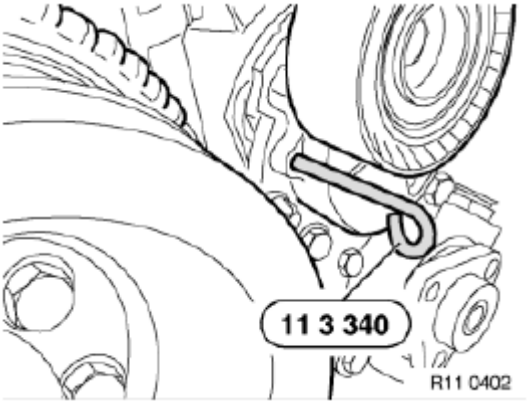


Fig. 188: Identifying Special Tool (11 3 340)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Installation

Put on the drive belt.

Push the tensioning device for the drive belt back on the pulley until Special Tool 11 3 340 is no longer under pressure; remove Special Tool 11 3 340.

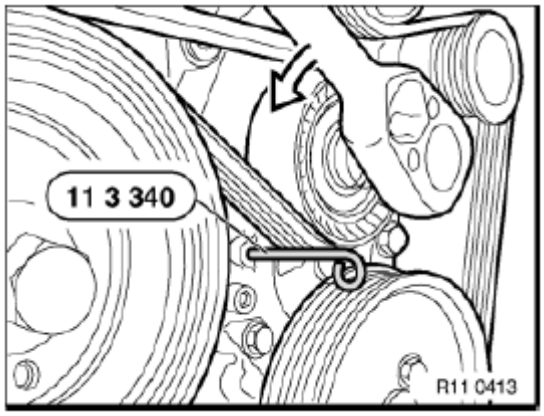


Fig. 189: Identifying Special Tool (11 3 340)
Courtesy of BMW OF NORTH AMERICA, INC.

Layout of drive belt.

Make sure that drive belt is correctly seated in pulley grooves.

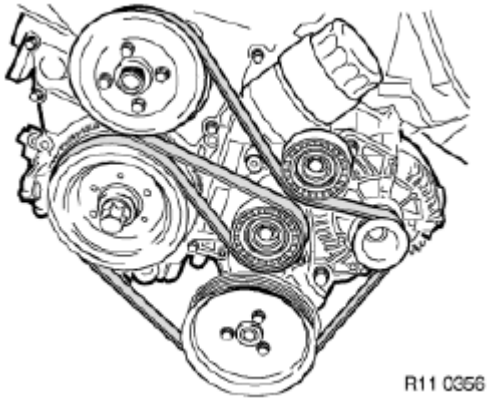


Fig. 190: Identifying Drive Belt Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

11 28 020 REPLACE THE TENSIONING DEVICE FOR THE DRIVE BELT OF THE GENERATOR (M44)

Remove alternator drive belt. See **11 28 010**

Remove the belt wheel of the vane pump.

CAUTION: The bolt connection (1) of the pulley for the tensioning device for the drive belt has left-hand thread and is peened.
Only change the pulley in conjunction with the tensioning device for the

drive belt.

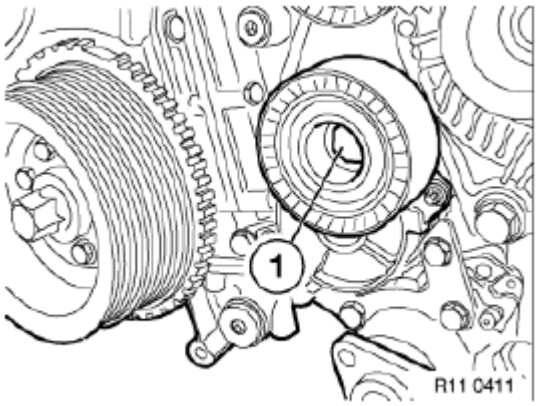


Fig. 191: Identifying Pulley Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen screws (1).

Loosen the screws (2) and remove with the tensioning device for the drive belt.

NOTE: If the screw (2) is inaccessable because of the lug (3), lock the tensioning device for the drive belt using Special Tool 11 3 340.

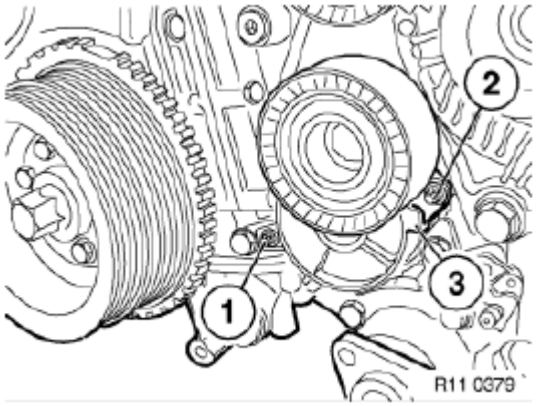


Fig. 192: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, apply preload to the tensioning device for the drive belt on the pulley as far as possible and lock with Special Tool 11 3 340.

CAUTION: The tensioning device for the drive belt is under high spring pressure. Press Special Tool 11 3 340 in as far as possible.

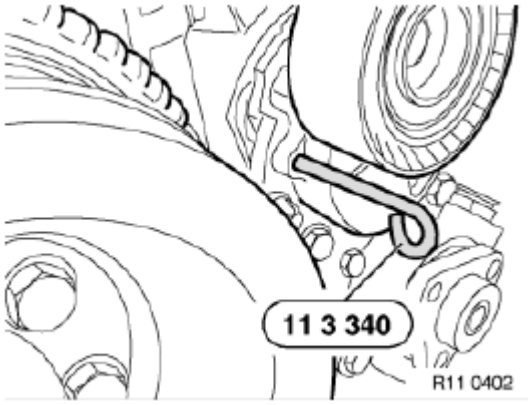


Fig. 193: Identifying Special Tool (11 3 340)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1 and 2).

Remove the tensioning device for the drive belt.

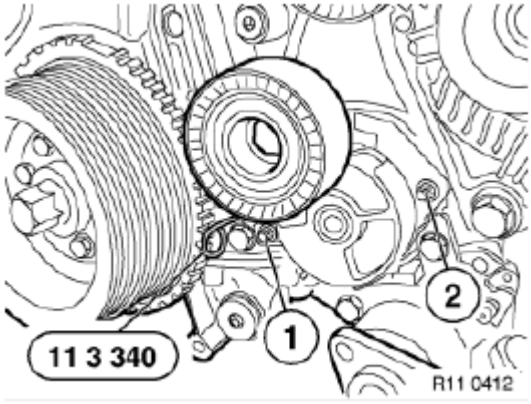


Fig. 194: Identifying Special Tool (11 3 340) And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

CAMSHAFT

11 31 001 REPLACING CAMSHAFT (M44)

(intake or exhaust side as applicable)

Remove spark plugs.

Remove all fingers, refer to **11 33 050**

Remove the gear-case cover, top, refer to **11 14 100 Removing and installing, sealing or replacing timing case cover at top (M44)**

Remove the hydraulic chain tensioner, refer to **11 31 091**

Removal

Removal of the camshaft is described separately from installation. Assembly sequence differs between removal and installation.

Turn central screw to rotate crankshaft in normal direction of rotation until piston of first cylinder is at firing TDC.

NOTE: At firing TDC, alignment bores are pointing upwards.

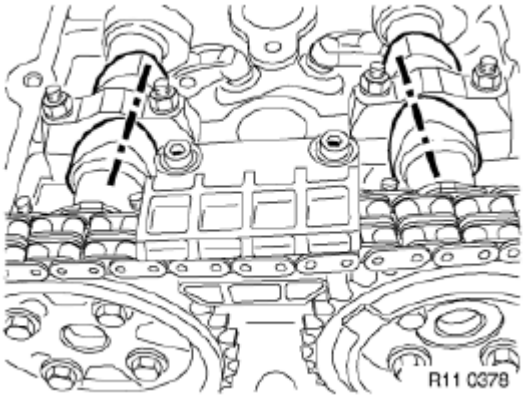


Fig. 195: Camshaft Alignment
Courtesy of BMW OF NORTH AMERICA, INC.

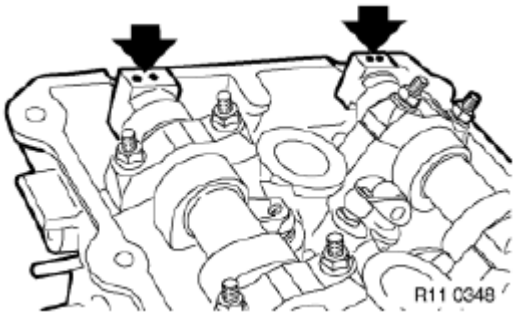


Fig. 196: Locating Alignment Bores
Courtesy of BMW OF NORTH AMERICA, INC.

Remove dust cover from locating bore.

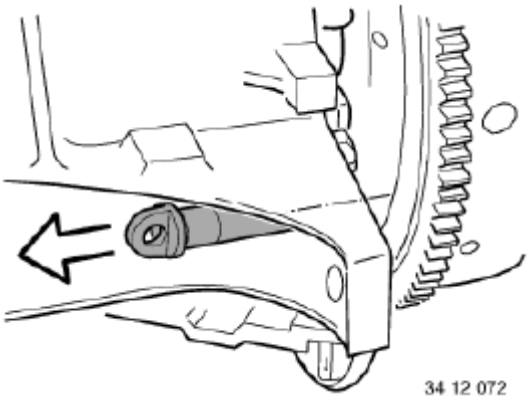


Fig. 197: Removing Dust Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft in TDC position with Special Tool 11 2 300.

CAUTION: Remove Special Tool prior to operating engine.

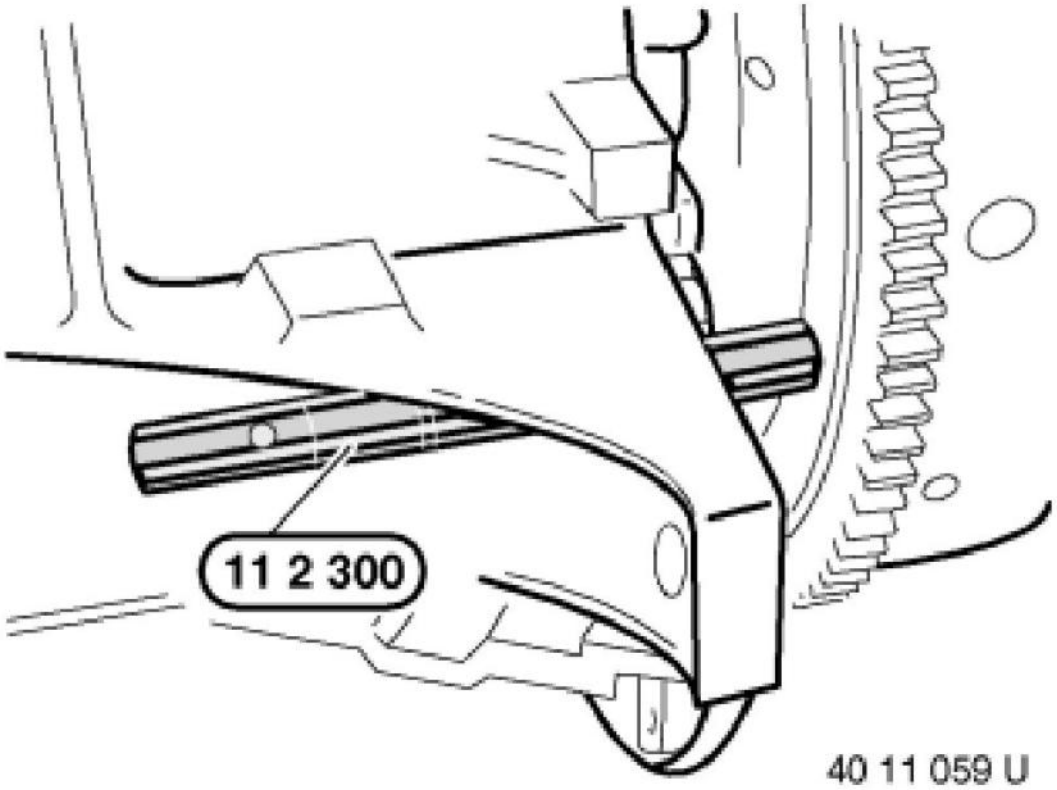


Fig. 198: Identifying Special Tool (11 2 300)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove the chain wheels.

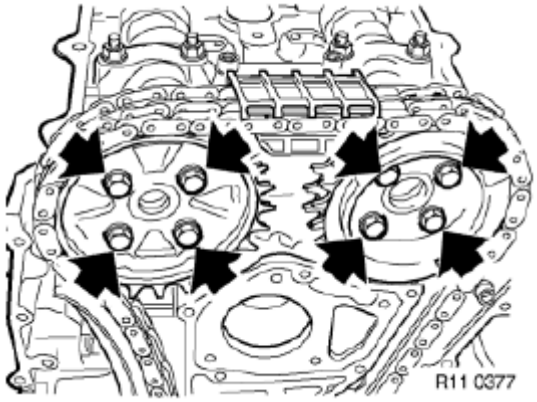


Fig. 199: Locating Chain Wheels Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release the chain guide.

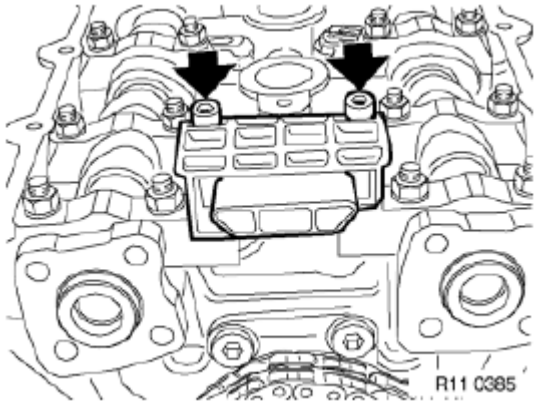


Fig. 200: Locating Chain Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Release the bearing cover and lay aside in correct order.

Lift out camshaft.

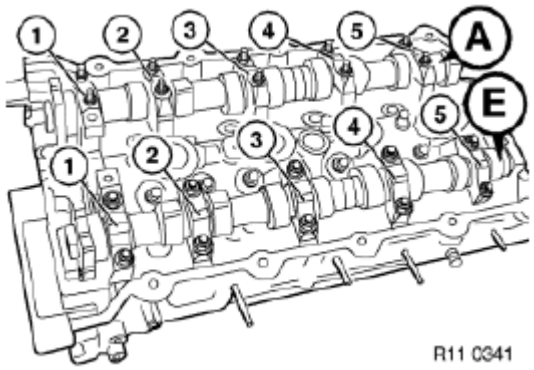


Fig. 201: Locating Camshaft Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Installation of the camshaft is described separately from removal. Assembly sequence differs between removal and installation.

Install camshaft.

NOTE: The camshafts are designated each with a cast letter.

(A) for exhaust camshaft.

(E) for intake camshaft.

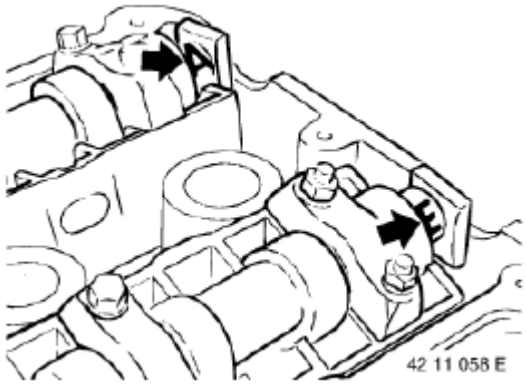


Fig. 202: Locating Exhaust And Intake Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

The designations of the bearing covers can be read on the intake side.

E1 ... E5 for the intake side.

A1 ... A5 for the exhaust side.

Fit the bearing cover and tighten down.

Tightening torque, refer to 11 31 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

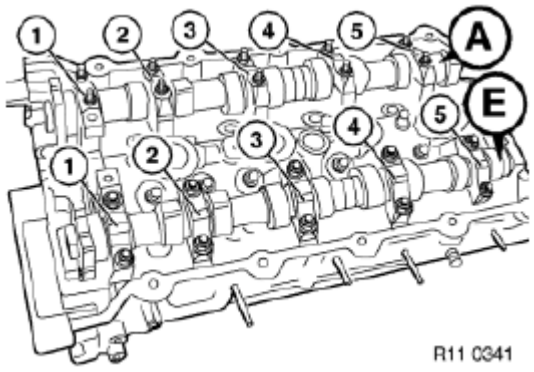


Fig. 203: Locating Camshaft Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Install chain guide.

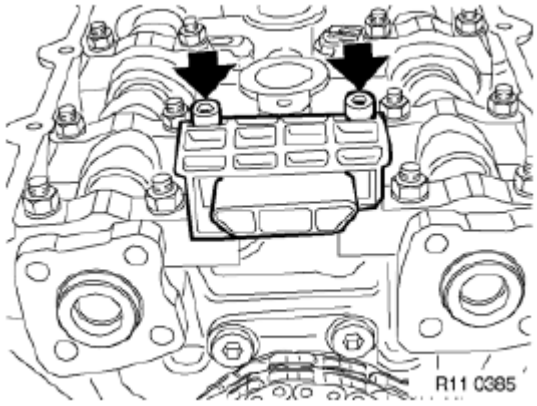


Fig. 204: Locating Chain Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Position the camshafts using Special Tool 11 3 240 in firing TDC position of first cylinder.

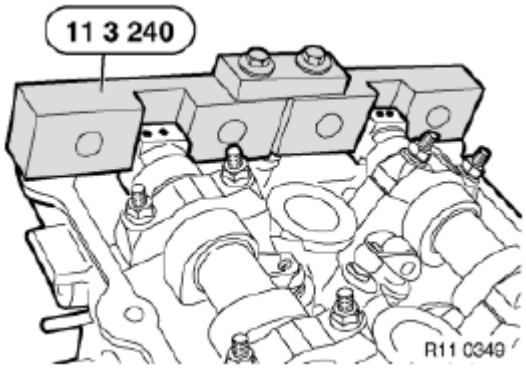


Fig. 205: Identifying Special Tool (11 3 240)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: At firing TDC, alignment bores are pointing upwards.

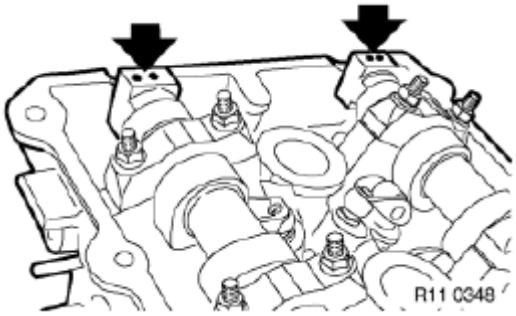


Fig. 206: Locating Alignment Bores
Courtesy of BMW OF NORTH AMERICA, INC.

Place the chain with the chain wheels.

NOTE: Arrow on chain wheel in cylinder axis points up.

Align long bores centrally.

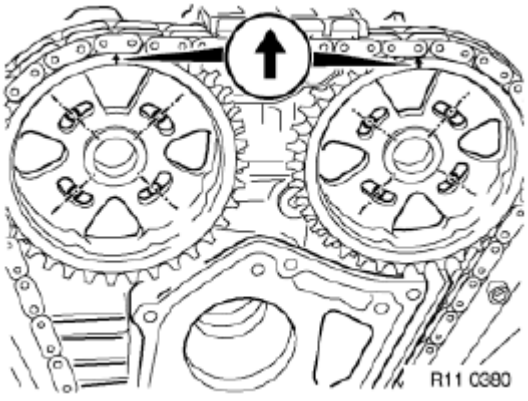


Fig. 207: Locating Arrow On Chain Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Place the sensor gear onto the inlet chain wheel.

NOTE: Arrow on sensor gear in cylinder axis points up.

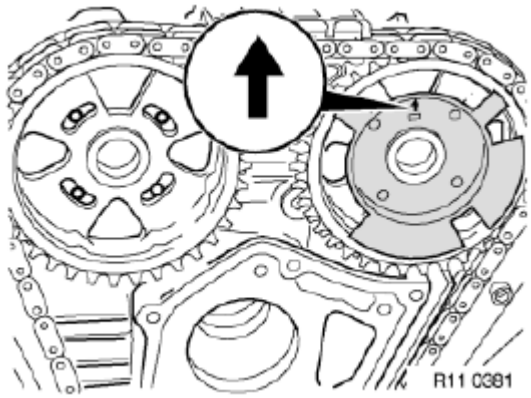


Fig. 208: Locating Arrow On Sensor Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Insert all chain wheel screws and tighten so that they are free of play; the chain wheels remain loose.

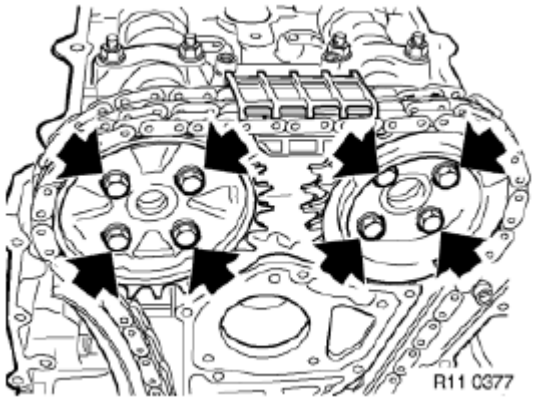


Fig. 209: Locating Chain Wheels Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Install hydraulic chain tensioner.

CAUTION: Note installation instructions,

refer to **11 31 091**

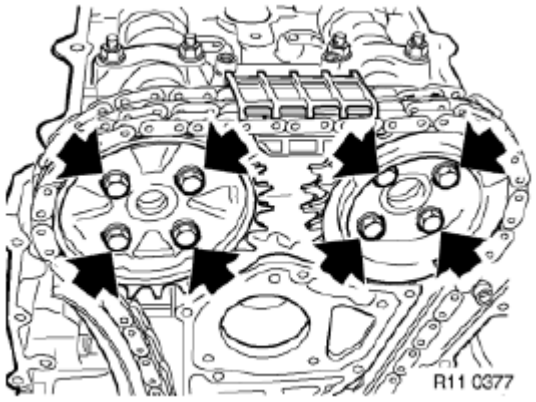


Fig. 210: Locating Chain Wheels Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down the chain wheels.

Tightening torque, refer to 11 31 3AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

Remove Special Tools 11 2 300 and 11 3 240.

Install all fingers, refer to **11 33 050**

Assemble engine.

11 31 005 CHECKING TIMING OF CAMSHAFT(S) (M44)

Remove fan coupling with fan wheel, refer to **11 52 020**

Remove cylinder head cover, refer to **11 12 000**

Remove spark plugs.

Turn central screw to rotate crankshaft in normal direction of rotation until piston of first cylinder is at firing TDC.

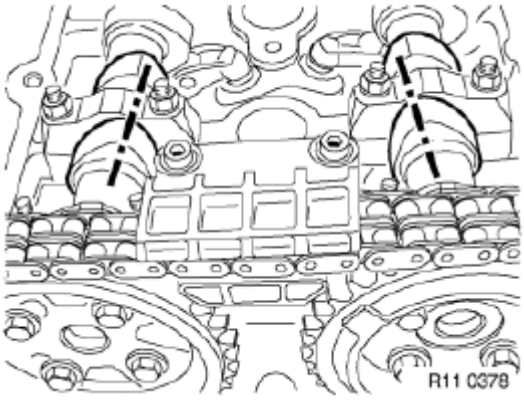


Fig. 211: Camshaft Alignment
Courtesy of BMW OF NORTH AMERICA, INC.

Remove dust cover from locating bore.

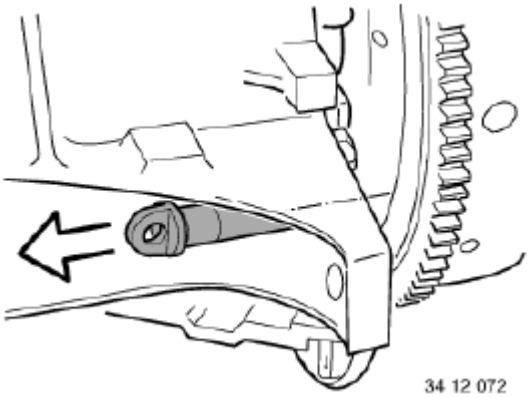


Fig. 212: Removing Dust Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft in TDC position with Special Tool 11 2 300.

CAUTION: Remove Special Tool prior to operating engine.

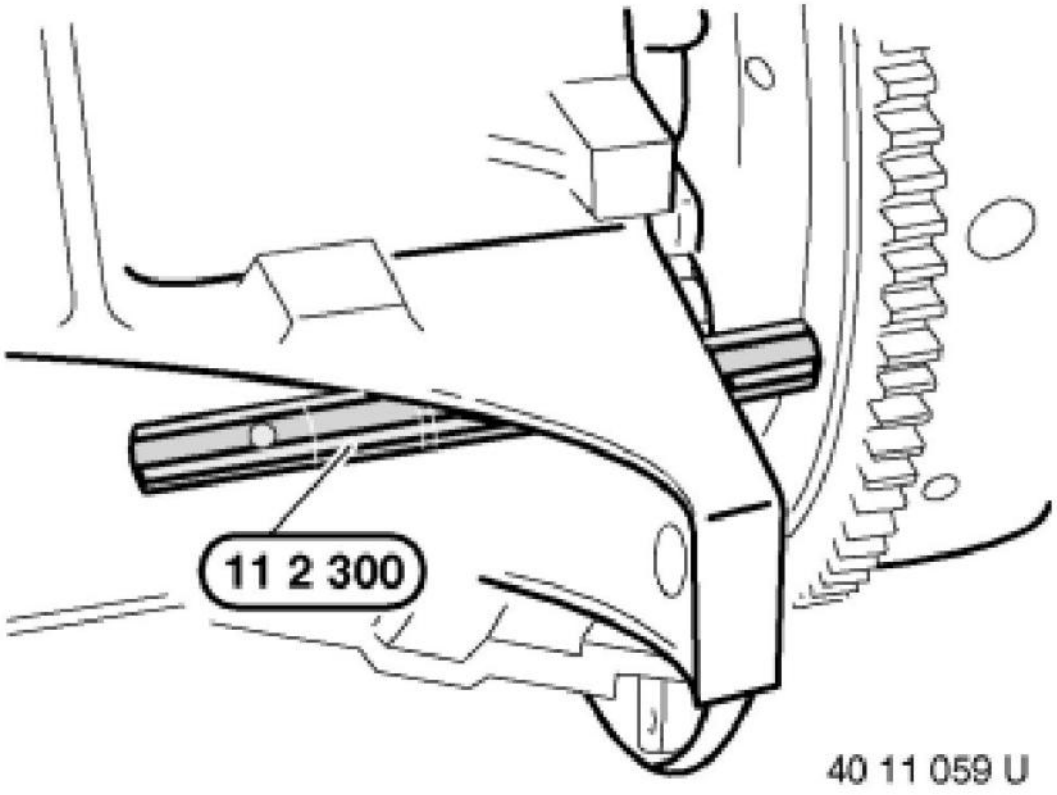


Fig. 213: Identifying Special Tool (11 2 300)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: At firing TDC, alignment bores are pointing upwards.

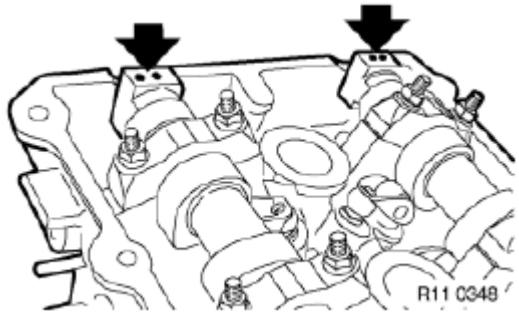


Fig. 214: Locating Alignment Bores
Courtesy of BMW OF NORTH AMERICA, INC.

Fit Special Tool 11 3 240 to camshaft.

NOTE: Special tool 11 3 240 must be flushly seated on the cylinder head.

Adjust camshaft timing if necessary, refer to **11 31 505**

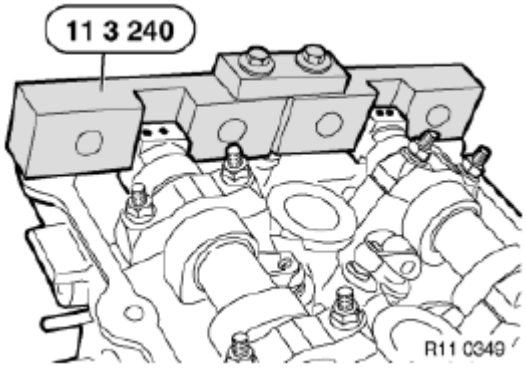


Fig. 215: Identifying Special Tool (11 3 240)
Courtesy of BMW OF NORTH AMERICA, INC.

11 31 051 REPLACING TIMING CHAIN (M44)

Removal

Removal and fitting are described separately.

Remove gear-case cover, top, refer to **11 14 100 Removing and installing, sealing or replacing timing case cover at top (M44)**

Remove spark plugs.

Loosen the central bolt on the vibration damper, refer to **11 23 010**

Rotate engine on loosened central screw engine wise until the first cylinder reaches its TDC firing position.

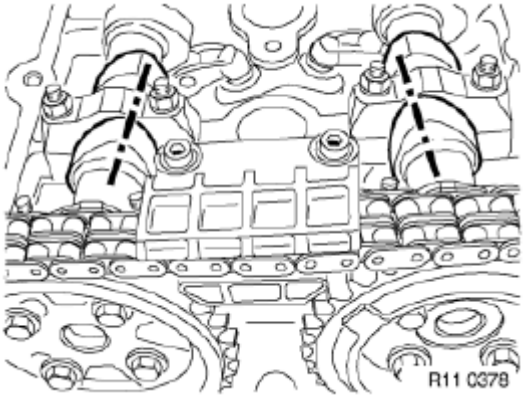


Fig. 216: Aligning Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The alignment bores of the camshafts in the firing TDC position point upwards.

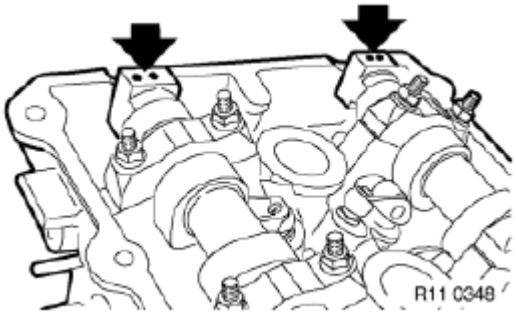


Fig. 217: Locating Alignment Bores
Courtesy of BMW OF NORTH AMERICA, INC.

Remove dust cover from locating bore.

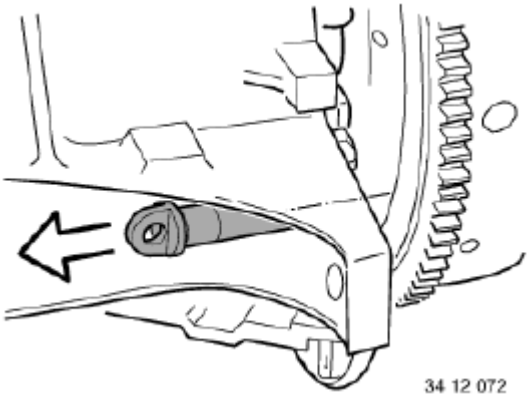


Fig. 218: Removing Dust Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft in TDC position with Special Tool 11 2 300.

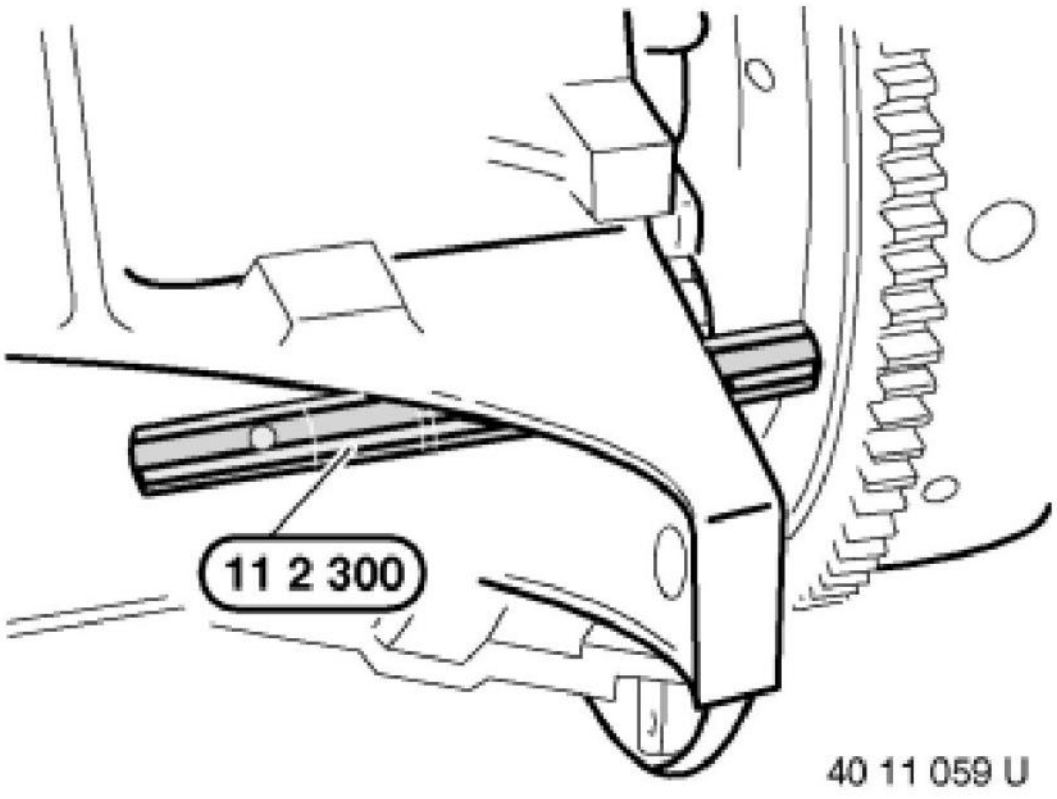


Fig. 219: Identifying Special Tool (11 2 300)
Courtesy of BMW OF NORTH AMERICA, INC.

Position camshaft with Special Tool 11 3 240 in firing TDC position of first cylinder.

NOTE: Crankshaft and camshafts remain locked until assembly is complete.

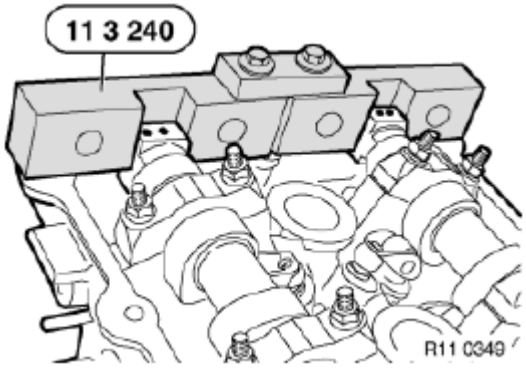


Fig. 220: Identifying Special Tool (11 3 240)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove the loosened central bolt and take out the vibration damper.

Remove gear case cover, bottom, refer to **11 14 110**

Remove the hydraulic chain tensioner, refer to **11 31 091**

Remove the chain wheels.

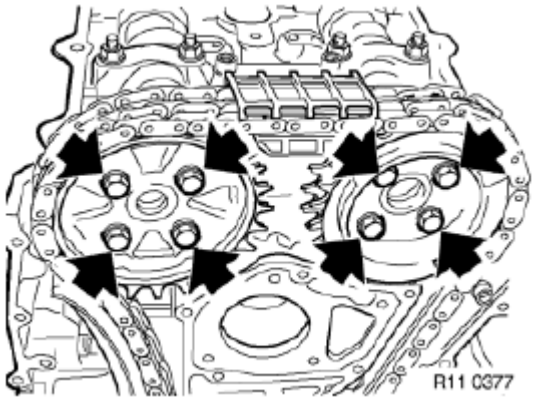


Fig. 221: Locating Chain Wheels Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove timing chain sprocket with timing chain from camshaft.

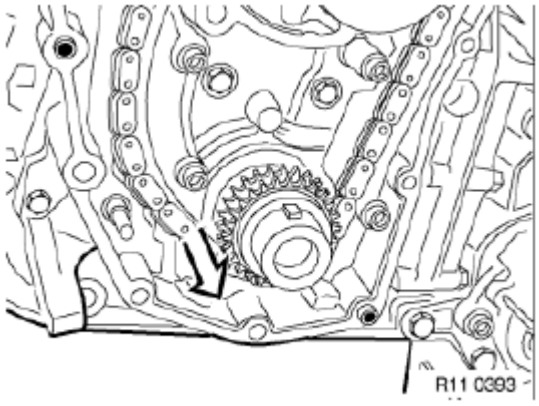


Fig. 222: Locating Timing Chain Sprocket
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, replace the slide and tensioning rails.

Release the slide and tensioning rails.

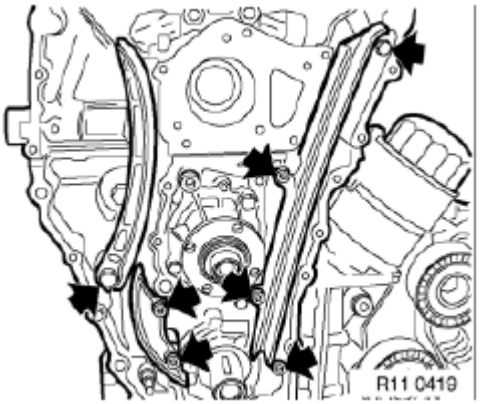


Fig. 223: Locating Tensioning Rails Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Fitting and removal are described separately.

Install the slide and tensioning rails.

Turn the adjusting screw of the slide rail back approx. two revolutions.

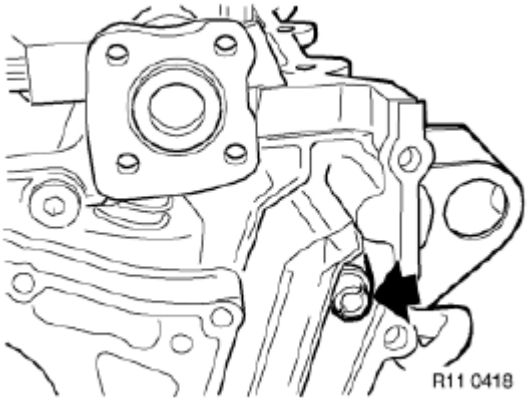


Fig. 224: Locating Adjusting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Fasten the slide rail to the cylinder head using screw (1).

Insert the screws and tighten them all except screw (1).

Remove screw (1).

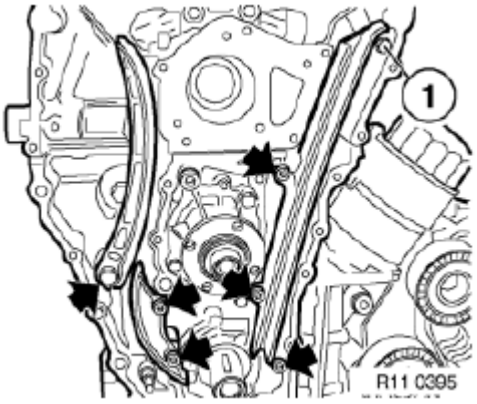


Fig. 225: Locating Slide Rail Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Place the adjusting screw of the slide rail free of play on the cylinder head.

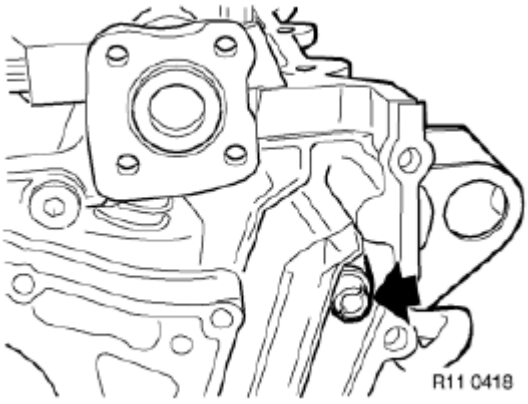


Fig. 226: Locating Adjusting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Insert the screw (1) and tighten down the slide rail.

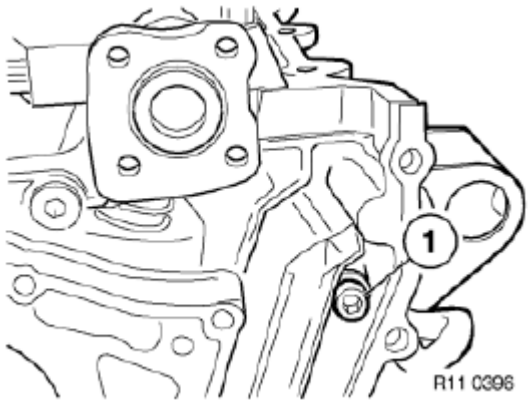


Fig. 227: Insert Screw (1) And Tighten Down Slide Rail

Courtesy of BMW OF NORTH AMERICA, INC.

Check the chain wheel and replace if necessary.

Align sprocket with woodruff key and install sprocket with timing chain in position.

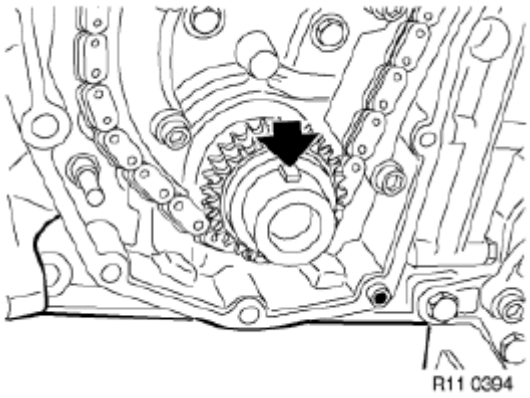


Fig. 228: Locating Woodruff Key
Courtesy of BMW OF NORTH AMERICA, INC.

Check the chain wheels and replace if necessary.

Place the chain with the chain wheels.

NOTE: The arrows on the chain wheels in cylinder axis point up.

Align long bores centrally.

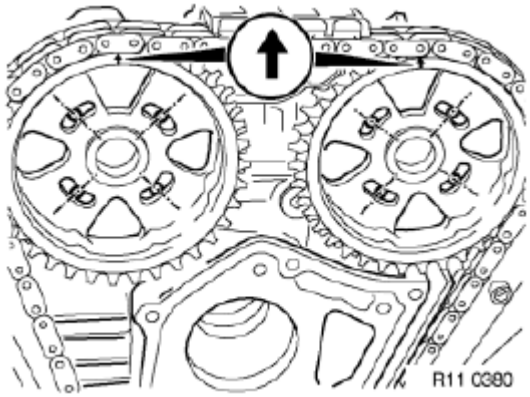


Fig. 229: Locating Arrow On Chain Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Place the sensor gear onto the inlet chain wheel.

NOTE: Arrow on sensor gear in cylinder axis points up.

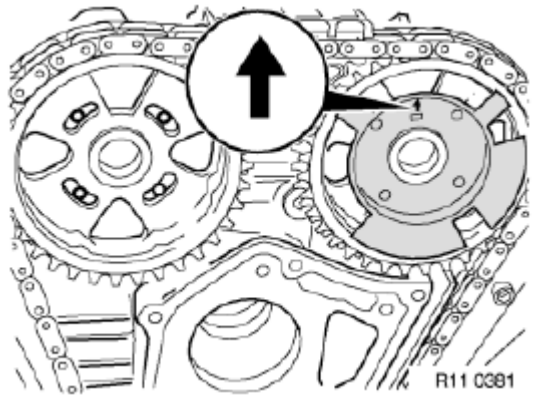


Fig. 230: Locating Arrow On Sensor Gear In Cylinder Axis Points
Courtesy of BMW OF NORTH AMERICA, INC.

Insert all chain wheel screws and tighten so that they are free of play; the chain wheels remain loose.

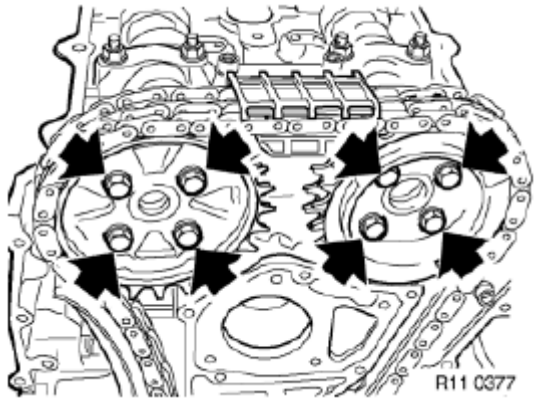


Fig. 231: Locating Chain Wheels Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Install hydraulic chain tensioner.

CAUTION: Note installation instructions,

refer to **11 31 091**

Tighten down the chain wheels.

Tightening torque, refer to 11 31 3AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

Remove Special Tools 11 2 300 and 11 3 240.

If necessary, check the control diagram, refer to **11 31 005**

Assemble engine.

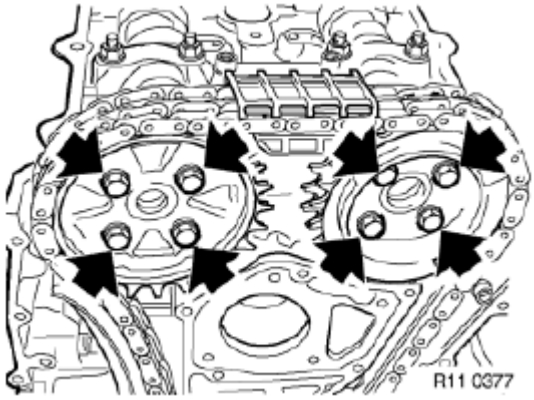


Fig. 232: Locating Chain Wheels Screws
Courtesy of BMW OF NORTH AMERICA, INC.

11 31 091 REMOVING AND INSTALLING OR REPLACING CHAIN TENSIONING DEVICE (M44)

NOTE: The hydraulic chain tensioner (M44) can also be fitted to the M42.

Unfasten screw plug and remove hydraulic chain tensioner.

NOTE: The hydraulic chain tensioner can also be removed if the timing-case cover is removed.

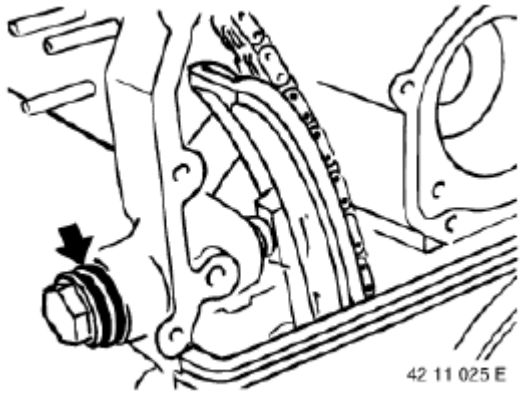


Fig. 233: Locating Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

If a hydraulic chain tensioner is reused, the oil chamber in the tensioner unit must first be drained.

Fasten the hydraulic chain tensioner into vice with protective vice jaws.

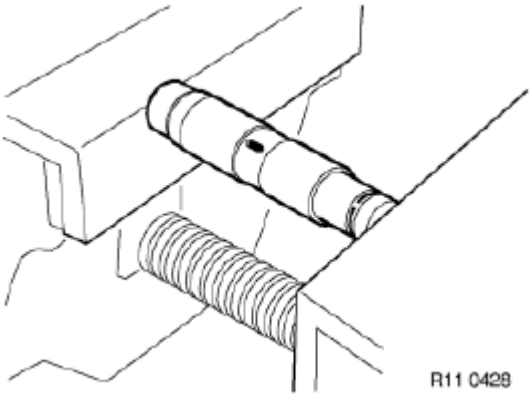


Fig. 234: Identifying Hydraulic Chain Tensioner Into Vice With Protective Vice Jaws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Slowly and carefully push the hydraulic chain tensioner together, leaving the lock washer (2) still visible.

Repeat this procedure twice.

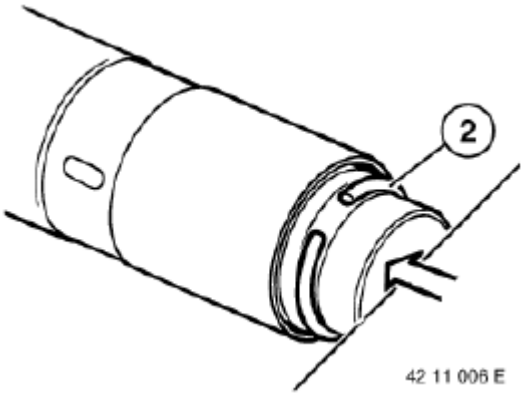


Fig. 235: Identifying Lock Washer
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Insert the hydraulic chain tensioner; replace the sealing ring of the drain plug.

Tighten the drain plug.

Tightening torque, refer to 11 31 7AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

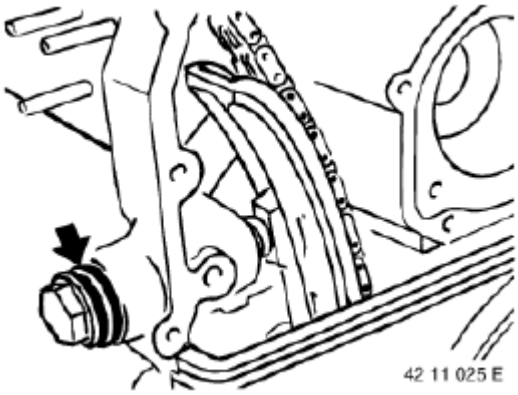


Fig. 236: Locating Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

11 31 501 REPLACING CAMSHAFT - CYLINDER HEAD REMOVED (M44)

Preliminary work is described in section on dismantling and assembling the cylinder head, refer to **11 12 503**

Remove all fingers, refer to **11 33 050**

Release the chain guide.

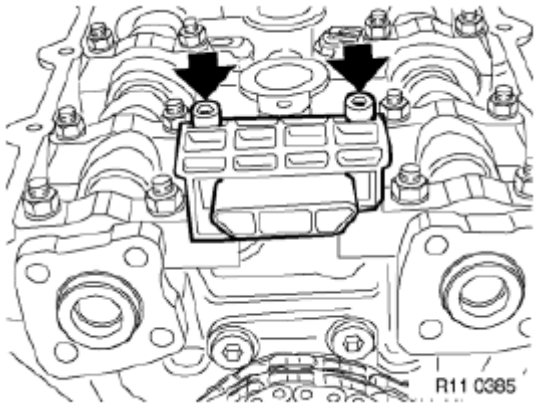


Fig. 237: Locating Chain Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Release the bearing cover and lay aside in correct order.

Lift out camshaft.

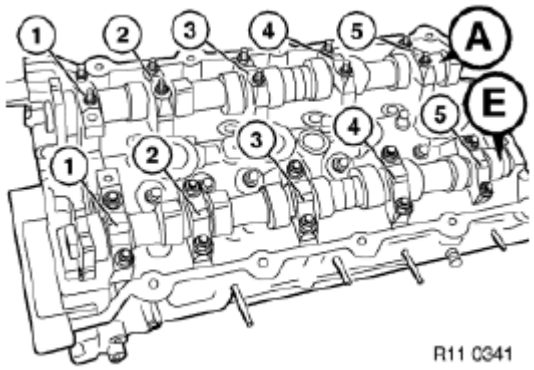


Fig. 238: Locating Camshaft Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

The camshafts are designated each with a cast letter.

(A) for exhaust camshaft.

(E) for intake camshaft.

Install camshaft.

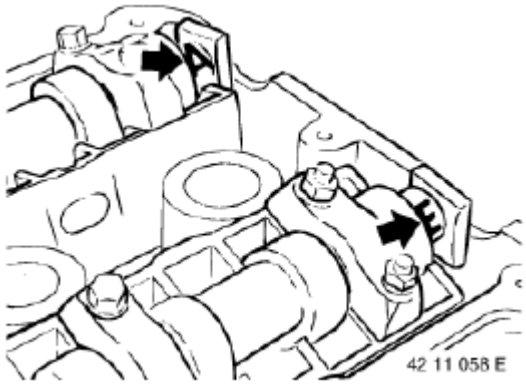


Fig. 239: Locating Exhaust And Intake Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

The designations of the bearing covers can be read on the intake side.

E1 ... E5 for the intake side.

A1 ... A5 for the exhaust side.

Fit the bearing cover and tighten down.

Tightening torque, refer to 11 31 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

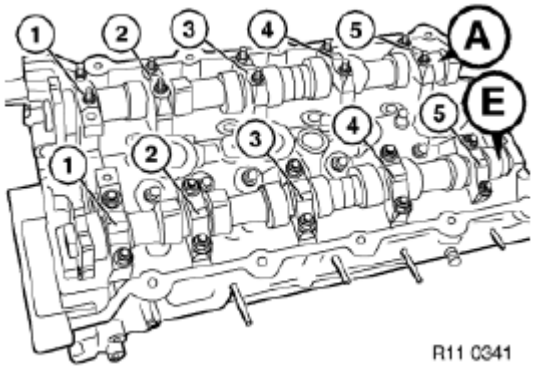


Fig. 240: Locating Exhaust And Intake Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

11 31 505 ADJUSTING TIMING OF CAMSHAFT(S) (M44)

(re Oper. No. 11 31 005)

NOTE: Before performing the adjustment work, check timing of camshaft, refer to 11 31 005

Remove Special Tool 11 3 240 from cylinder head.

Remove Special Tool 11 2 300 from locating bore in engine block.

Rotate the engine on the central bolt engine wise until the camshafts on the fourth cylinder are located in the firing TDC position.

Loosen two screws on each chain wheel.

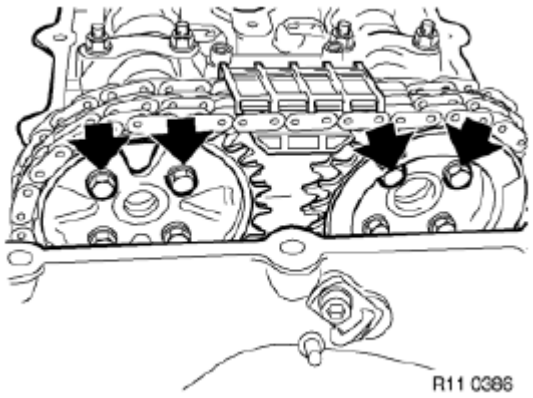


Fig. 241: Locating Chain Wheel Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate the engine on the central bolt engine wise until the camshafts on the fourth cylinder are located in the firing TDC position.

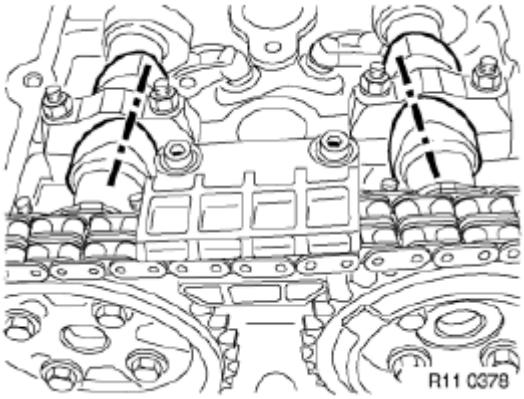


Fig. 242: Turning Central Screw To Rotate Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft in TDC position with Special Tool 11 2 300.

CAUTION: Remove Special Tool prior to operating engine.

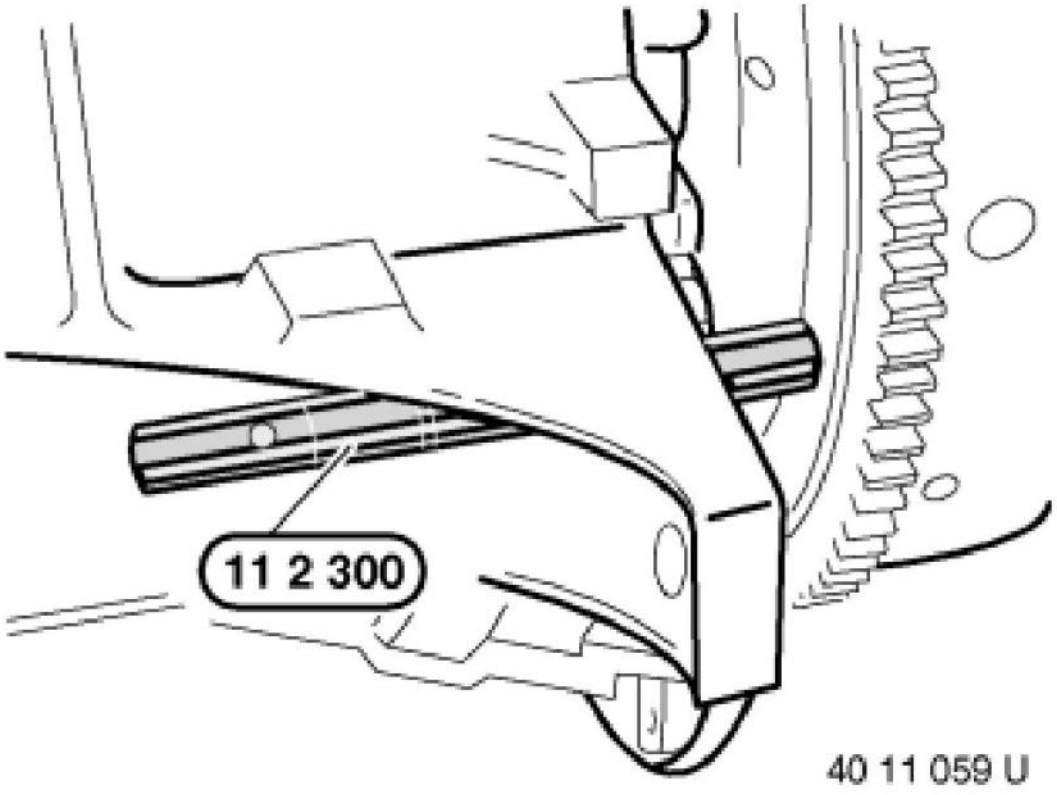


Fig. 243: Identifying Special Tool (11 2 300)
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen the remaining two screws on each chain wheel.

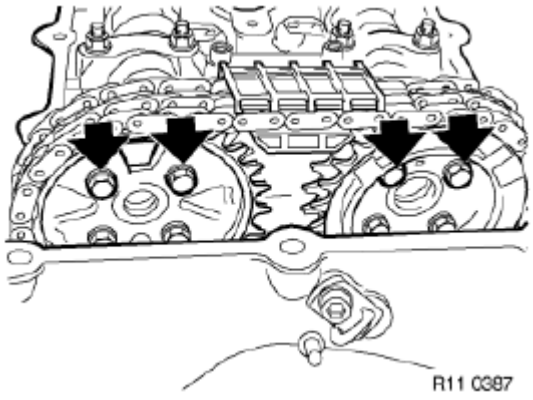


Fig. 244: Locating Chain Wheel Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Align the camshafts so that Special Tool 11 3 240 is flushly seated on the cylinder head.

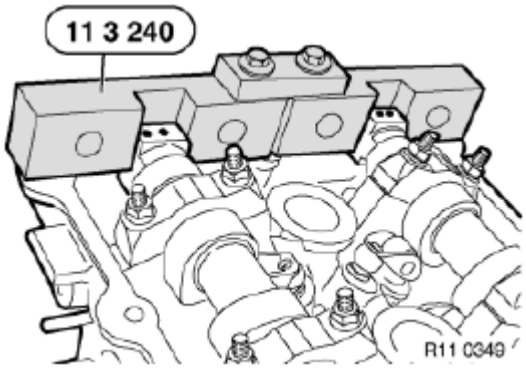


Fig. 245: Identifying Special Tool (11 3 240)
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten two screws for each chain wheel.

For tightening torque, refer to 11 31 3AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

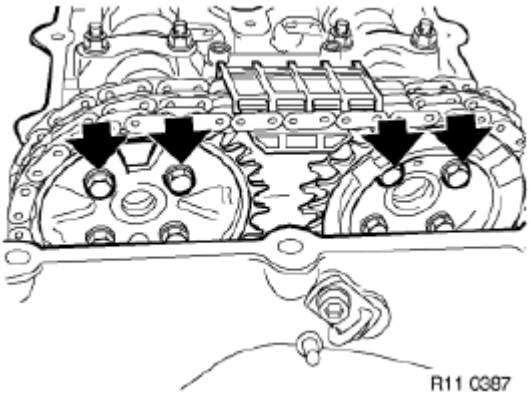


Fig. 246: Locating Chain Wheel Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove Special Tool 11 3 240 from cylinder head.

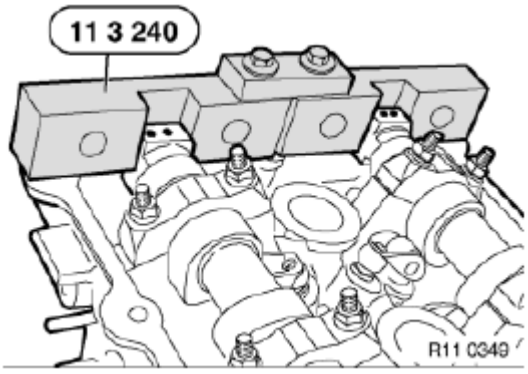


Fig. 247: Identifying Special Tool (11 3 240)

Courtesy of BMW OF NORTH AMERICA, INC.

Remove Special Tool 11 2 300 from locating bore in engine block.

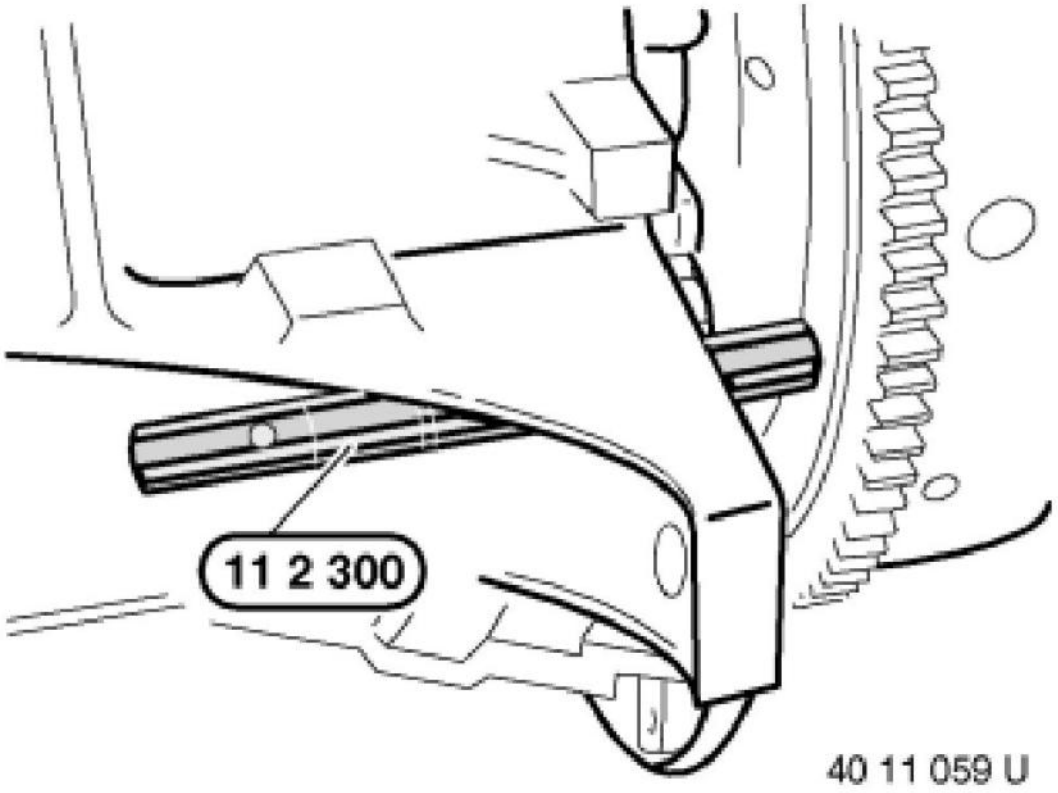


Fig. 248: Identifying Special Tool (11 2 300)
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate the engine on the central bolt engine wise until the camshafts on the fourth cylinder are located in the firing TDC position.

Tighten the remaining two screws on each chain wheel.

Tightening torque, refer to 11 31 3AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

Assemble engine.

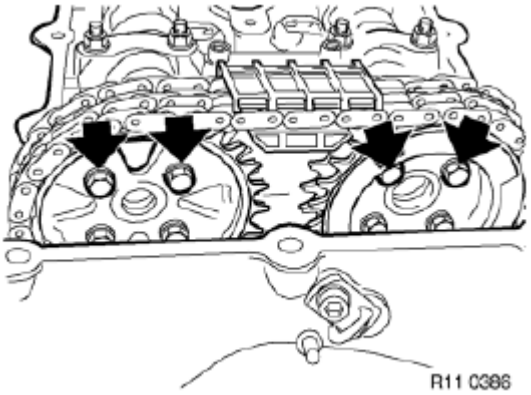


Fig. 249: Locating Chain Wheel Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

ROCKER ARM WITH BEARING

11 33 050 REMOVING AND INSTALLING/REPLACING ALL FINGERS (M44)

Remove cylinder head cover, refer to **11 12 000**

Remove all spark plugs

Remove fan coupling with fan wheel, refer to **11 52 020**

Rotate engine on central screw engine-wise until cams on camshaft point vertically upwards.

NOTE: The individual rocker may only be removed or installed if the camshaft is in this position.

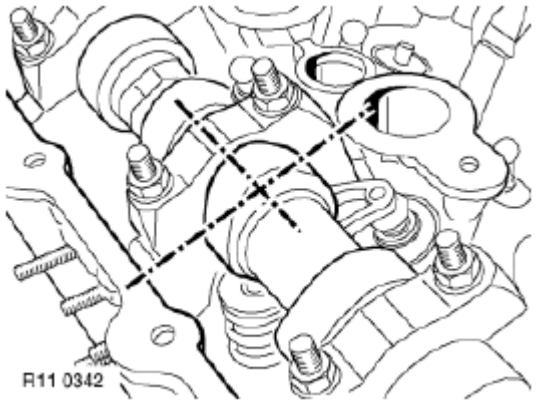


Fig. 250: Rotating Engine On Central Screw Engine-Wise Until Cams On Camshaft Point Vertically Upwards
Courtesy of BMW OF NORTH AMERICA, INC.

Press down valve with special tool 11 5 130 and lift out finger.

NOTE: Place fingers to one side in orderly fashion.
Worn rockers may only be reused on the same grooves of the camshaft.

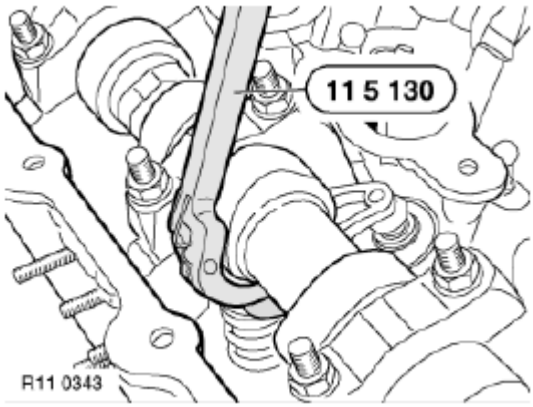


Fig. 251: Identifying Special Tool (11 5 130)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The rockers are crimped between the hydraulic valve clearance compensating element and the cam of the camshaft.

CAUTION: Check that the rocker is installed in the correct position.

If necessary, replace camshaft, refer to **11 31 001**

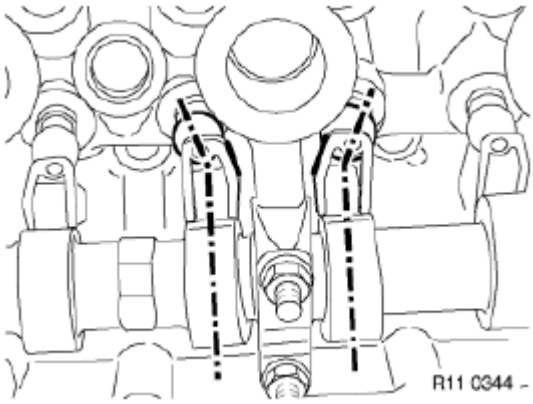


Fig. 252: Rocker Installed In Correct Position
Courtesy of BMW OF NORTH AMERICA, INC.

11 33 062 REPLACING ALL HYDRAULIC VALVE CLEARANCE ADJUSTMENT ELEMENTS (HVA) (M44)

Remove all fingers, refer to **11 33 050**

Pull out the hydraulic valve clearance adjustment elements (HVA).

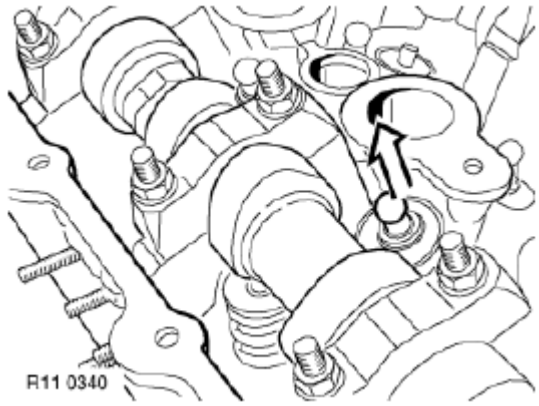


Fig. 253: Pulling Out Hydraulic Valve
Courtesy of BMW OF NORTH AMERICA, INC.

VALVES WITH SPRINGS

11 12 527 REWORKING ONE VALVE SEAT (M44)

(cylinder head dismantled)

Machine valve seat face with Special Tool 00 3 520 or 00 3 580 with specifications of tool manufacturer.

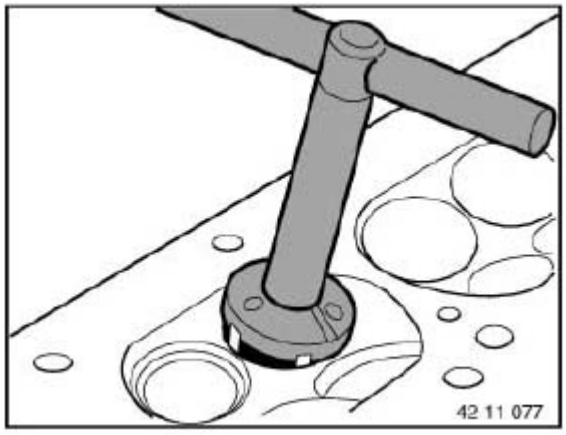


Fig. 254: Grinding Valve Seat Face With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: 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.

1. Valve-seat angle

2. Correction angle, outer
3. Correction angle, inner
4. Outside diameter of seat face
5. Valve-seat width

Pos. (1) to (5) refer to **ENGINE - TECHNICAL DATA (M44)**

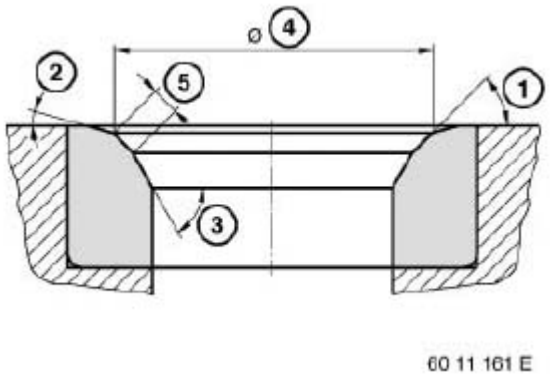


Fig. 255: Identifying Valve Seat Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 595 CHECKING ONE VALVE GUIDE FOR WEAR (M44)

(valve removed)

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

Mount dial gauge and measure tilt clearance.

NOTE: Maximum permitted tilt clearance,

refer to **ENGINE - TECHNICAL DATA (M44)**

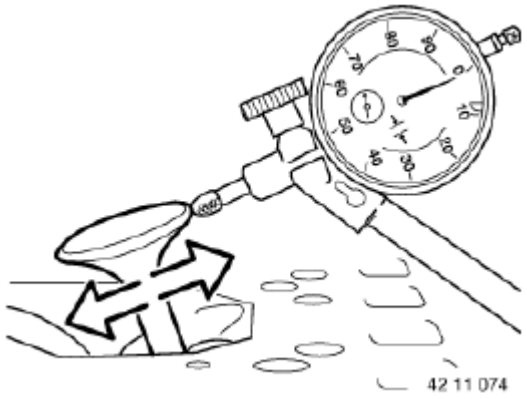


Fig. 256: Measuring Tilt Clearance

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If tilt clearance is excessive, the valve guide should be reamed and a repair valve with a larger shaft diameter,

refer to **ENGINE - TECHNICAL DATA (M44)** , should be installed.

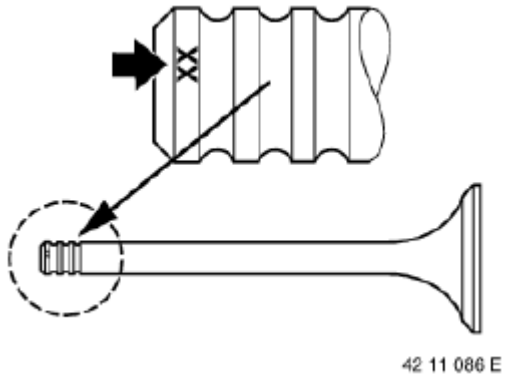


Fig. 257: Locating Mark On Valve Guide
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, ream out valve guide, refer to **11 12 600**

11 12 600 REAMING OUT ONE VALVE GUIDE (M44)

(Valve removed)

NOTE: If clearance between valve shaft and valve guide is too large, ream out valve guide and install repair valve with larger shaft diameter.

Assemble reaming tool and guide taper (1) from special tool kit 00 4 210 depending on shaft diameter. Press guide taper (1) against valve seat and ream out valve guide (when dry) from combustion-chamber end. Rotate reaming tool once in downwards direction.

NOTE: After the reaming operation, rework the valve seat,

refer to **11 12 527**

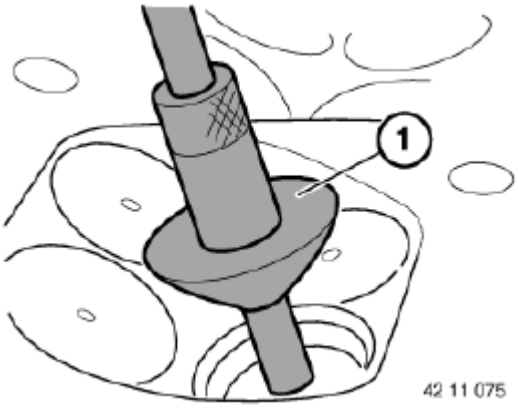


Fig. 258: Identifying Guide Taper
Courtesy of BMW OF NORTH AMERICA, INC.

11 34 552 REMOVING AND INSTALLING OR REPLACING ALL VALVES - CYLINDER HEAD REMOVED (M44)

Preliminary work is described in section on dismantling and assembling the cylinder head, refer to **11 12 503**

Replacing valve stem seals, refer to **11 34 560**

Remove valves from cylinder head.

If necessary, check valve guide for wear, refer to **11 12 595**

If necessary, ream the valve guide, refer to **11 12 600**

If necessary, rework valve seat, refer to **11 12 527**

Installation sequence:

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

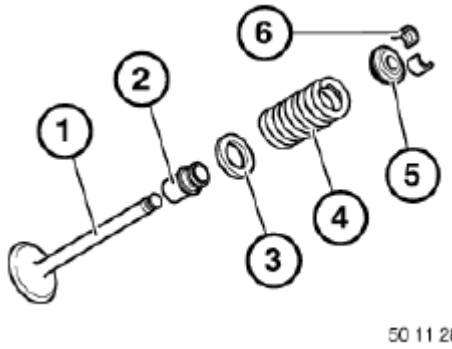


Fig. 259: Identifying Valve Components Installation Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

11 34 560 REPLACING ALL VALVE-SHAFT SEALS - CYLINDER HEAD REMOVED (M44)

Preliminary work is described in section on dismantling and assembling the cylinder head, refer to **11 12 503**

Remove all valve springs, refer to **11 34 715**

Remove valve stem seal with Special Tool 11 1 480.

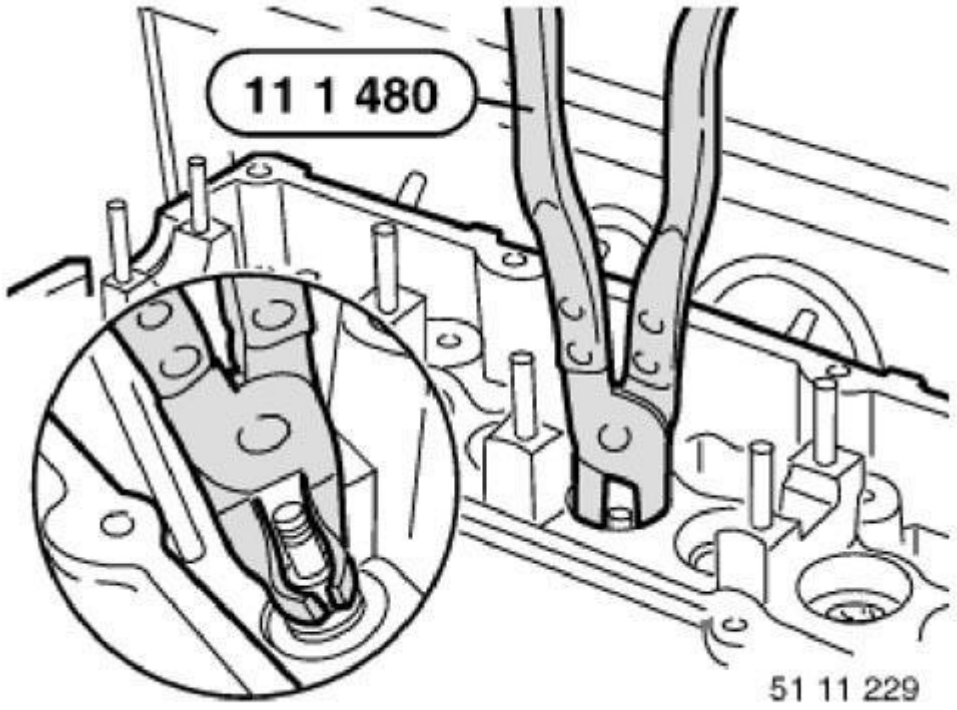


Fig. 260: Identifying Special Tool (11 1 480)
Courtesy of BMW OF NORTH AMERICA, INC.

Lubricate valve stem with oil and insert valve.

Fit Special Tool 11 1 960.

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

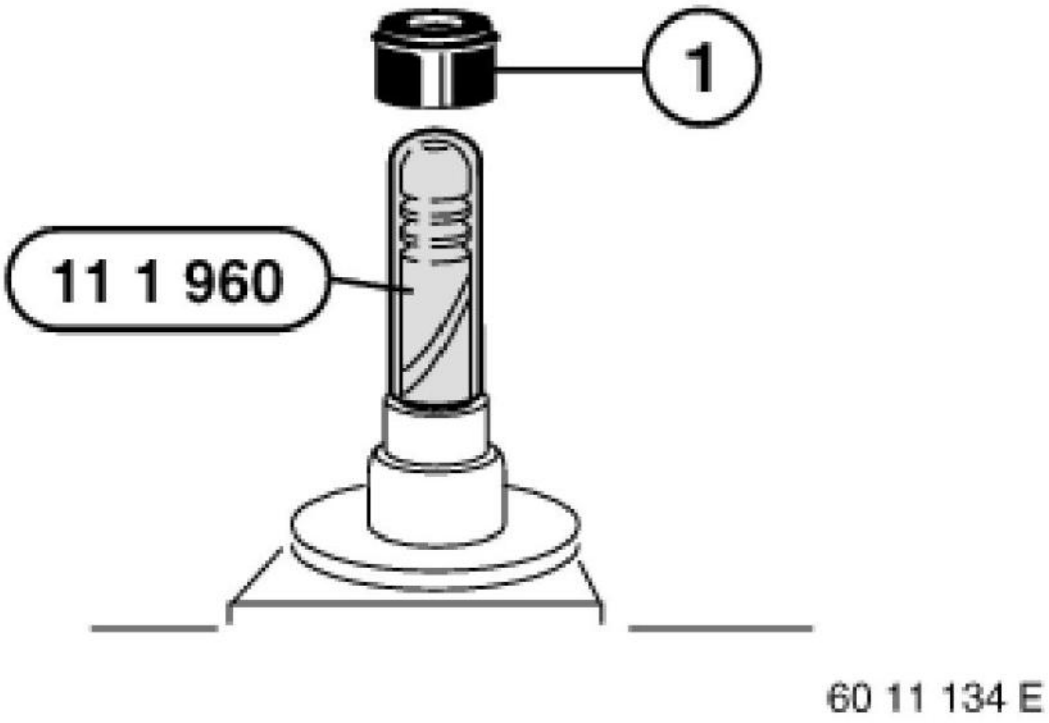


Fig. 261: Identifying Valve Stem Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Press valve stem seal firmly home by hand with Special Tool 11 1 200.

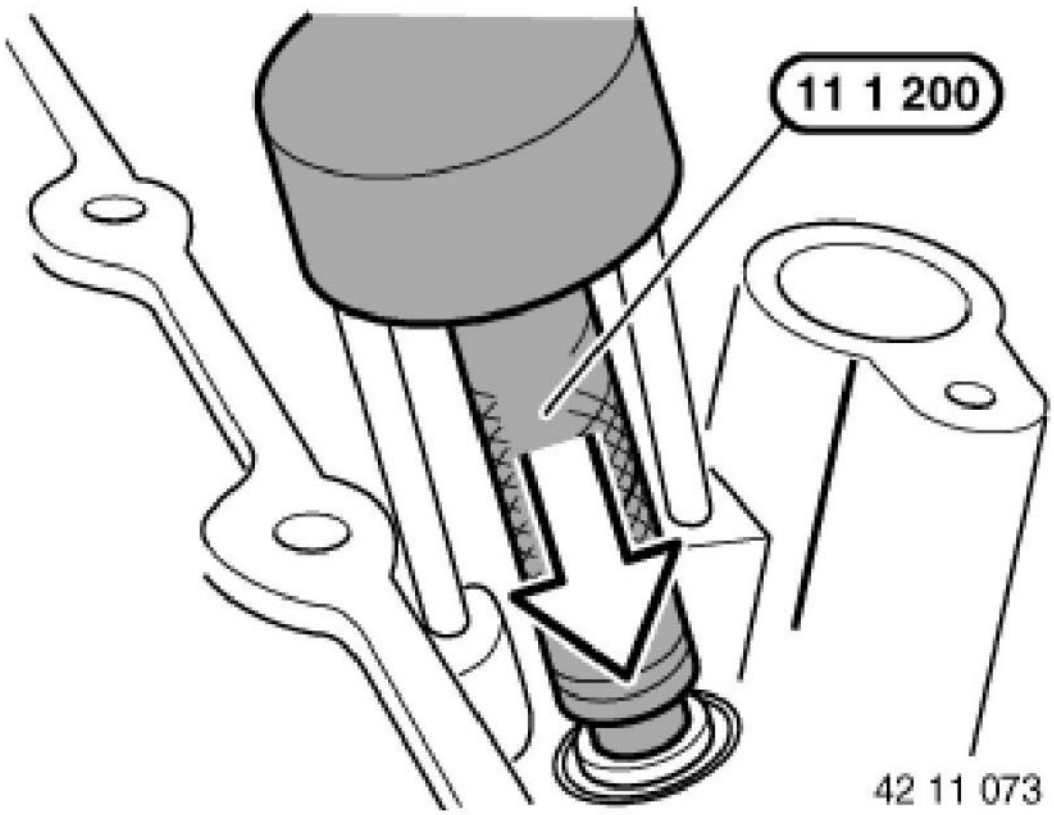


Fig. 262: Pressing Valve Stem Seal
Courtesy of BMW OF NORTH AMERICA, INC.

11 34 715 REPLACING ALL VALVE SPRINGS - CYLINDER HEAD REMOVED (M44)

Preliminary work is described in section on dismantling and assembling the cylinder head, refer to **11 12 503**

Remove the camshafts, refer to **11 31 501**

Insert Special Tool 11 1 441 from below in Special Tool 11 1 065 and secure with Special Tool 11 1 045.

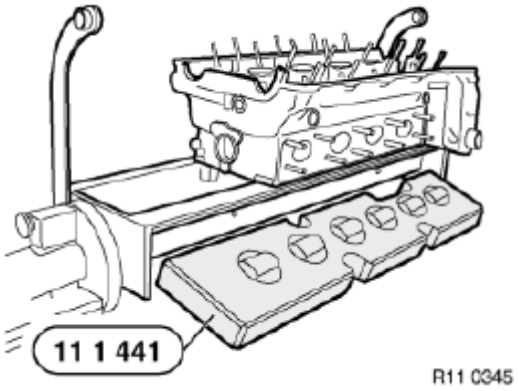


Fig. 263: Identifying Special Tool (11 1 441)
Courtesy of BMW OF NORTH AMERICA, INC.

Align Special Tool 11 0 345 in direction of valve shaft and select appropriate groove in Special Tool 11 0 342.

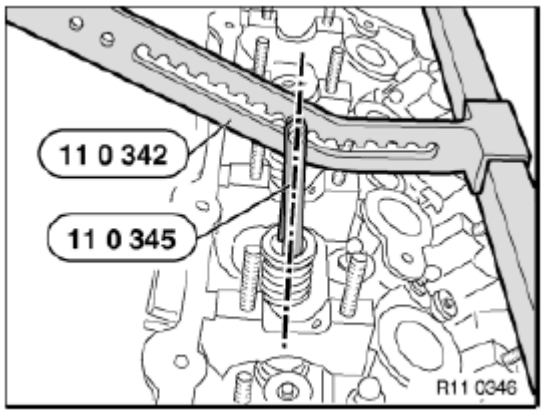


Fig. 264: Aligning Special Tool (11 0 345) In Direction Of Valve Shaft And Select
Courtesy of BMW OF NORTH AMERICA, INC.

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

Remove valve spring and plate spring.

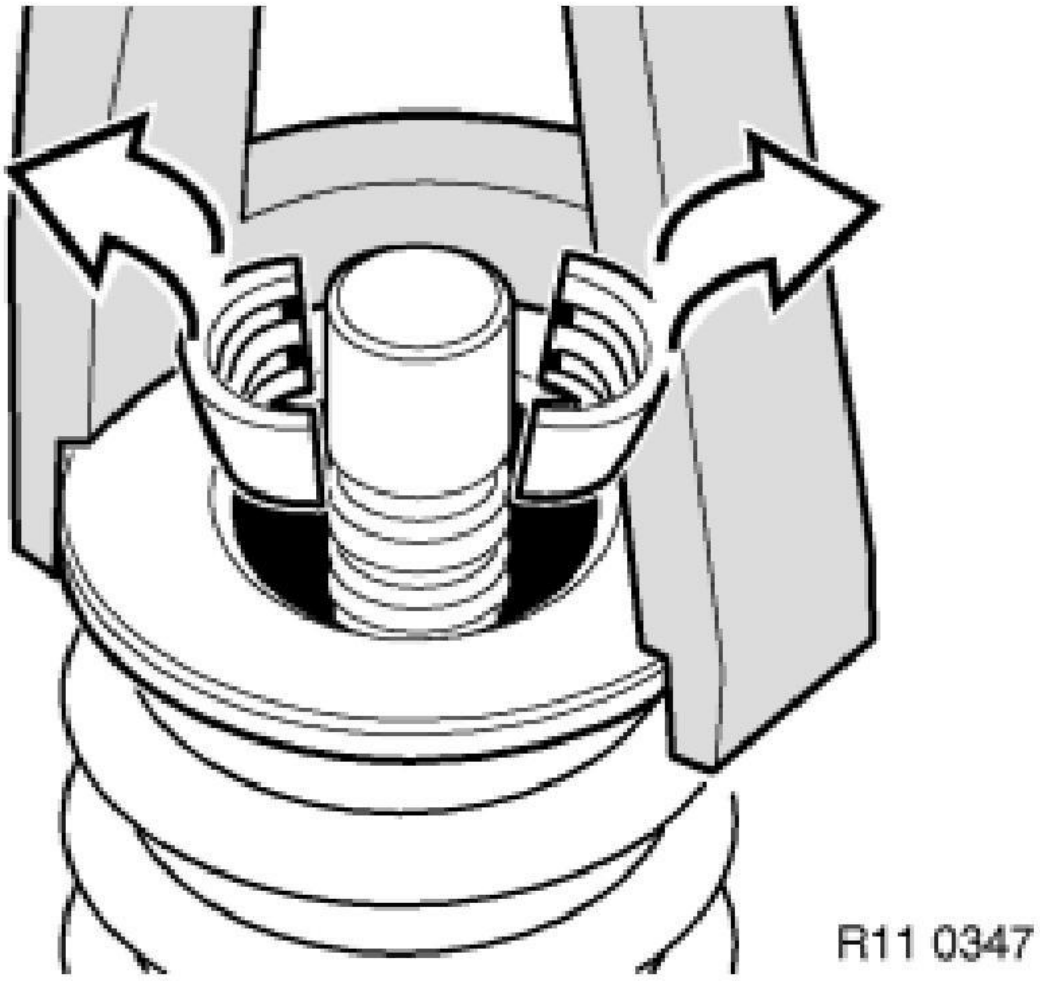


Fig. 265: Removing Valve Spring And Plate Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation sequence:

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

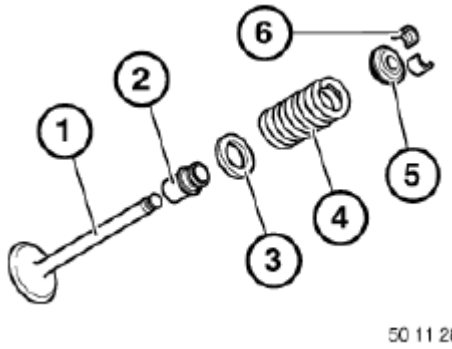


Fig. 266: Identifying Valve Component Installation
Courtesy of BMW OF NORTH AMERICA, INC.

OIL SUPPLY

11 40 000 CHECKING ENGINE OIL PRESSURE (M40 / M42 / M43 / M43TU / M44)

Version with central screw

Unscrew oil-filter cover

NOTE: Oil flows from oil-filter housing into oil pan.

Installation

Replace sealing ring.

Tightening Torque, refer to 11 42 2AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

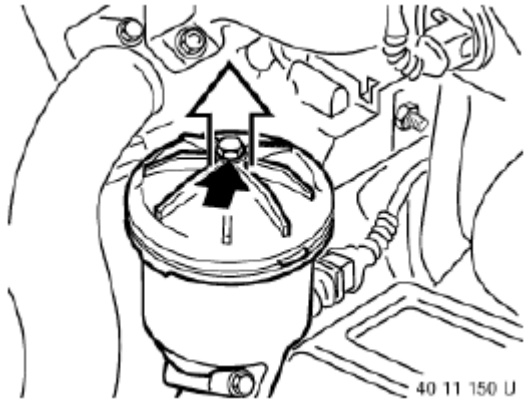


Fig. 267: Locating Oil-Filter Cover Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Replace sealing ring in oil-filter cover and sealing ring on bolt.

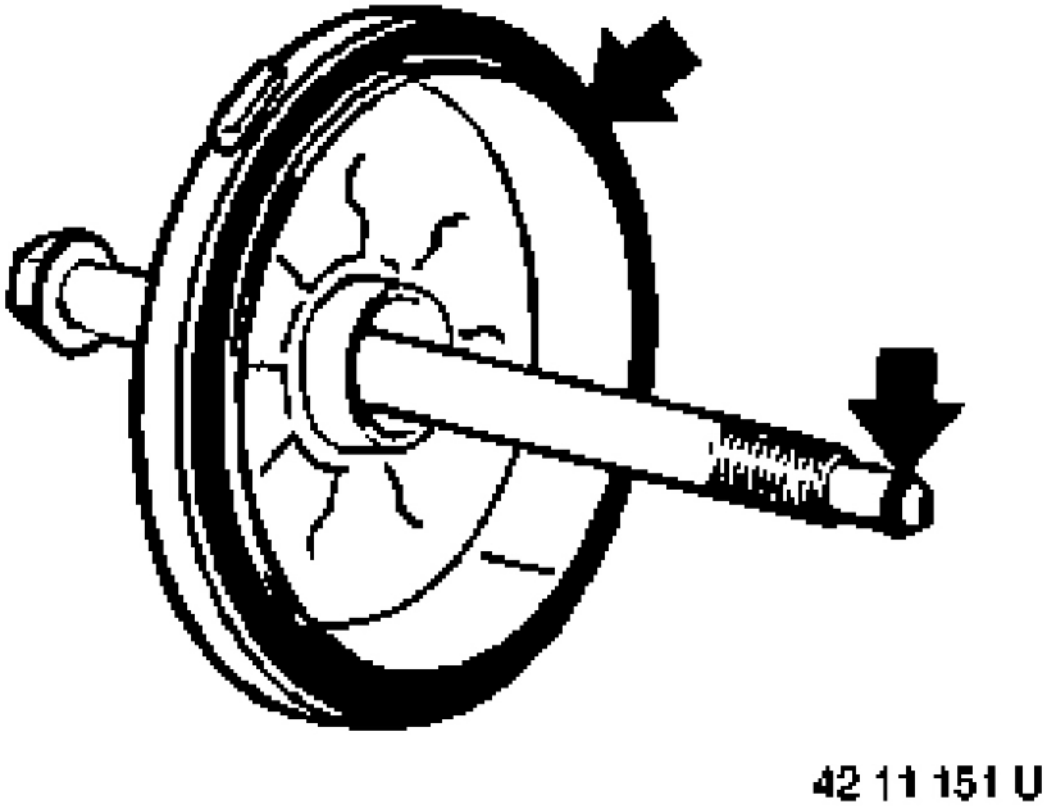


Fig. 268: Identifying Oil-Filter Cover Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Check/replace sealing rings on special tool 11 4 170.

Install special tool 11 4 170.

Tightening Torque, refer to 11 42 2AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

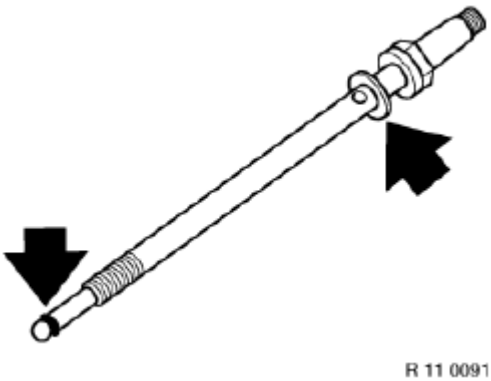


Fig. 269: Locating Sealing Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Connect special tools 13 3 061 / 063.

Start engine and check engine oil pressure, refer to **ENGINE - TECHNICAL DATA (M44)** .

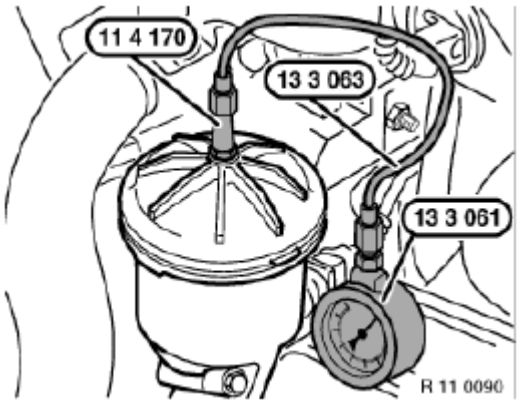


Fig. 270: Identifying Special Tools (11 4 170, 13 3 063 And 13 3 061)
Courtesy of BMW OF NORTH AMERICA, INC.

Version with screw cap

Loosen the oil filter cap using special tool 11 7 331.

NOTE: Oil flows from oil-filter housing into oil pan.

Installation

Tightening Torque, refer to 11 42 2AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

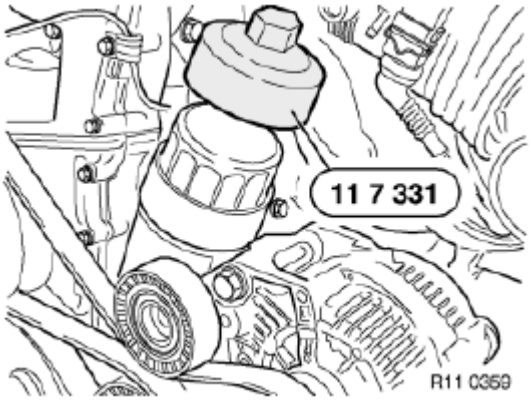


Fig. 271: Identifying Special Tool (11 7 331)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Replace sealing rings.

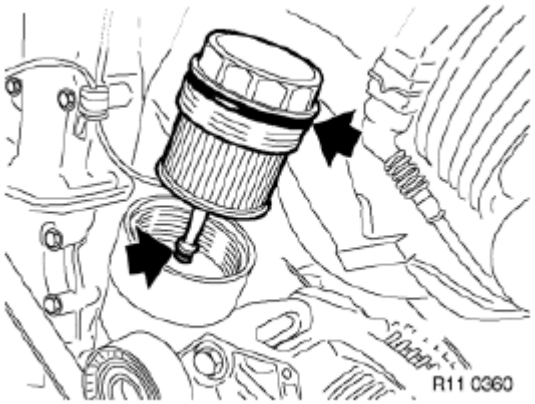


Fig. 272: Locating Oil Filter Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Check seals on special tool 11 7 332 and replace if necessary.

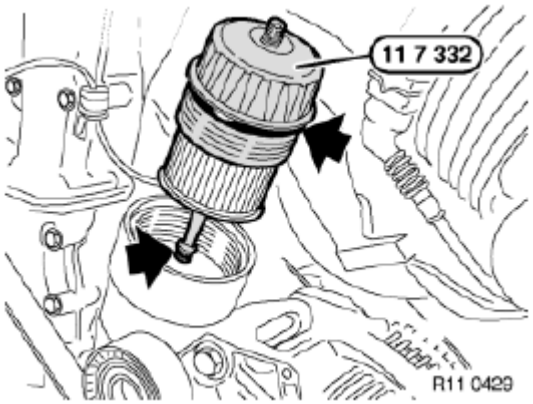


Fig. 273: Identifying Seals On Special Tool (11 7 332)
Courtesy of BMW OF NORTH AMERICA, INC.

Instead of the oil filter cover, screw special tool 11 7 332 onto the oil filter housing and tighten using special tool 11 7 331.

Tightening Torque, refer to 11 42 2AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

Connect special tools 13 3 061 / 063.

Start engine and check engine oil pressure, refer to **ENGINE - TECHNICAL DATA (M44)** .

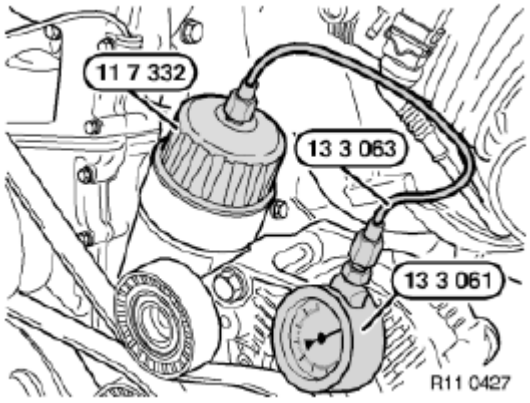


Fig. 274: Identifying Special Tools (11 7 332, 13 3 063 And 13 3 061)
Courtesy of BMW OF NORTH AMERICA, INC.

OIL PUMP WITH FILTER AND DRIVE

11 41 000 REMOVING AND INSTALLING / REPLACING OIL PUMP (M44)

Remove lower timing case, refer to **11 14 115**

Release screws, remove oil-pump cover.

Lift out rotor set.

NOTE: Outer and inner rotor form a matched pair and must always be replaced as a set.

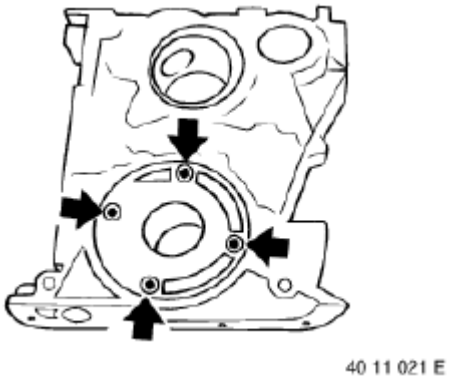


Fig. 275: Locating Oil-Pump Cover Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Strong spring force.

Using a suitable drift, press spacer down until circlip is no longer under strain.

Remove circlip, remove control valve.

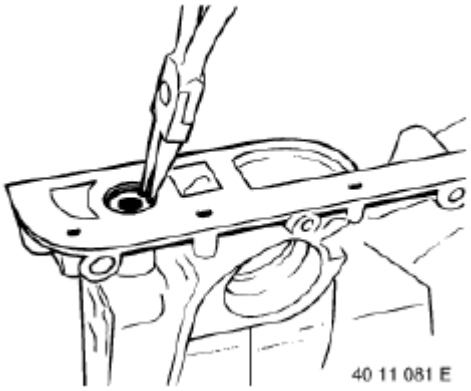


Fig. 276: Pressing Spacer Down Until Circlip Is No Longer Under Strain
Courtesy of BMW OF NORTH AMERICA, INC.

Installation sequence:

1. Control valve
2. Coil spring
3. Space bush
4. Circlip

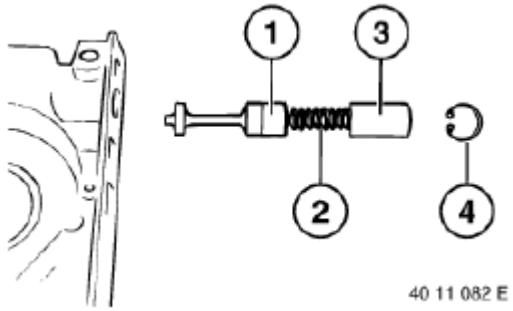


Fig. 277: Identifying Control Valve, Coil Spring, Space Bush And Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

OIL FILTER AND LINES

11 42 020 REMOVING AND INSTALLING, SEALING OR REPLACING MAIN-FLOW OIL FILTER (M44)

Unfasten oil filter cover to allow oil to flow out of main flow oil filter housing and back into oil pan.

This operation is described in section on BMW engine oil service, refer to **00 00 249**

Remove alternator

Unfasten vane pump for power steering unit from carrier (lines remain connected).

Remove alternator carrier.

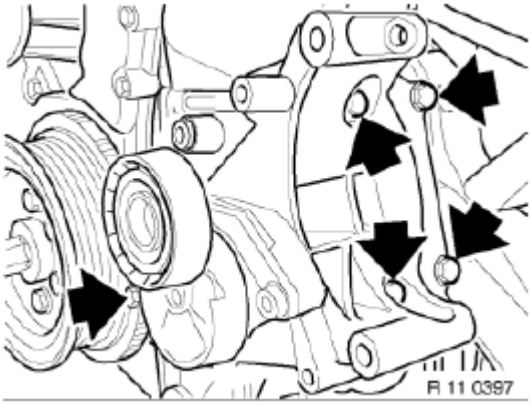


Fig. 278: Locating Alternator Carrier Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove full-flow oil-filter housing.

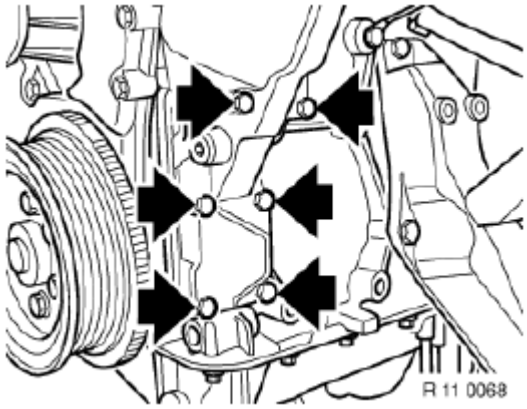


Fig. 279: Locating Full-Flow Oil-Filter Housing Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Sealing faces clean and free of seal debris.

Replace seal.

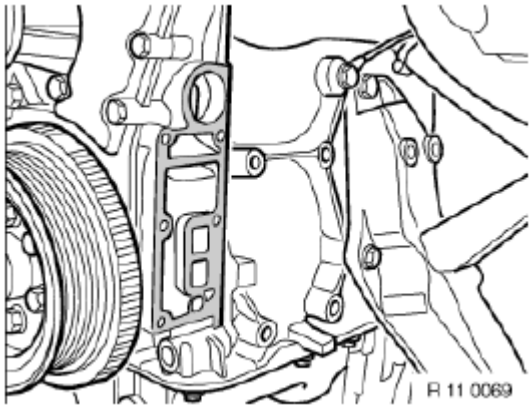


Fig. 280: Identifying Sealing Faces
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Replace the sealing rings on the non-return valve.

Check installed direction.

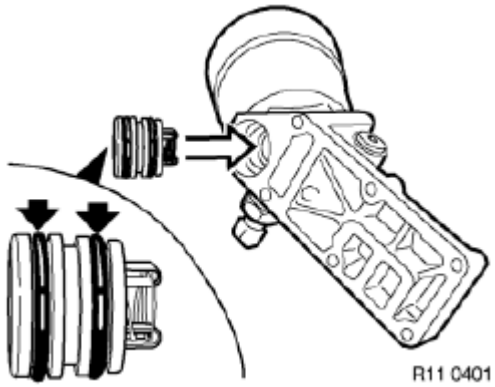


Fig. 281: Identifying Sealing Rings On Non-Return Valve
Courtesy of BMW OF NORTH AMERICA, INC.

WATER PUMP WITH DRIVE

11 51 000 REMOVING AND INSTALLING / REPLACING WATER PUMP (M44)

Remove alternator drive belt, refer to **11 28 010**

Release the belt pulley from the water pump.

Drain coolant.

Release water pump.

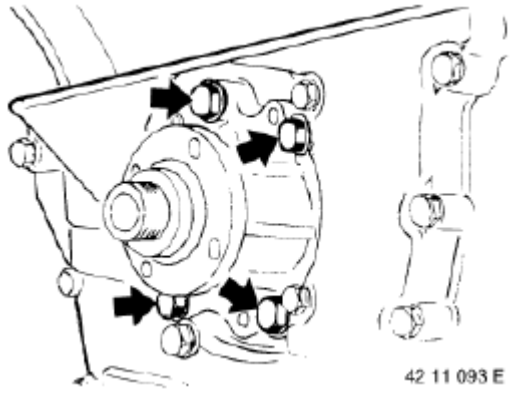


Fig. 282: Locating Water Pump Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Insert two M6 screws in water-pump thread and press out water pump evenly from gear case.

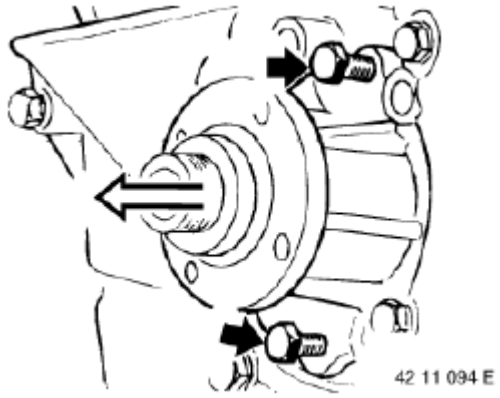


Fig. 283: Locating Water Pump Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Replace sealing ring.

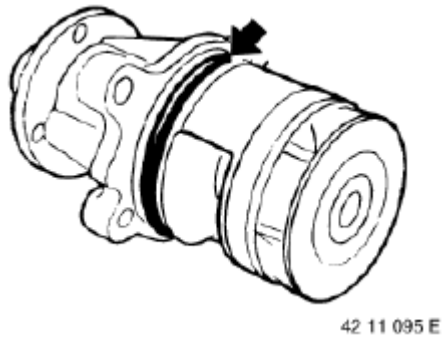


Fig. 284: Locating Sealing Ring

Courtesy of BMW OF NORTH AMERICA, INC.

FAN

11 52 020 REMOVING AND INSTALLING / REPLACING FAN COUPLING (M44)

CAUTION: Left-hand threads.

Lock belt pulley in position using Special Tool 11 5 050.

Release union nut with Special Tool 11 5 040 from water pump.

Take the fan wheel with fan coupling off of the water pump and remove.

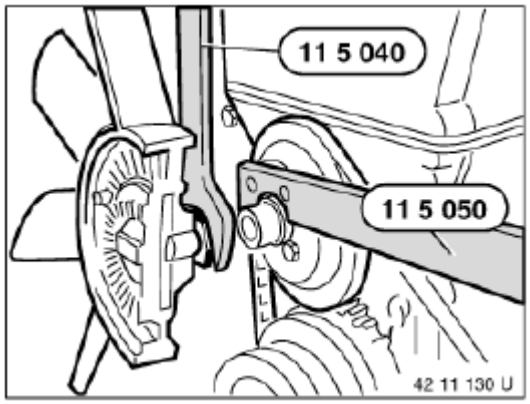


Fig. 285: Identifying Special Tool (11 5 040 And 11 5 050)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Tightening torque, refer to 11 52 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)**

NOTE: Tightening torque 40 Nm when using Special Tool 11 5 040 is equivalent to 30 Nm on scale of a torque wrench.

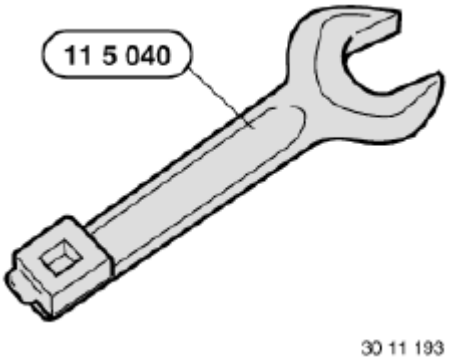


Fig. 286: Identifying Special Tool (11 5 040)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws and detach fan from fan coupling.

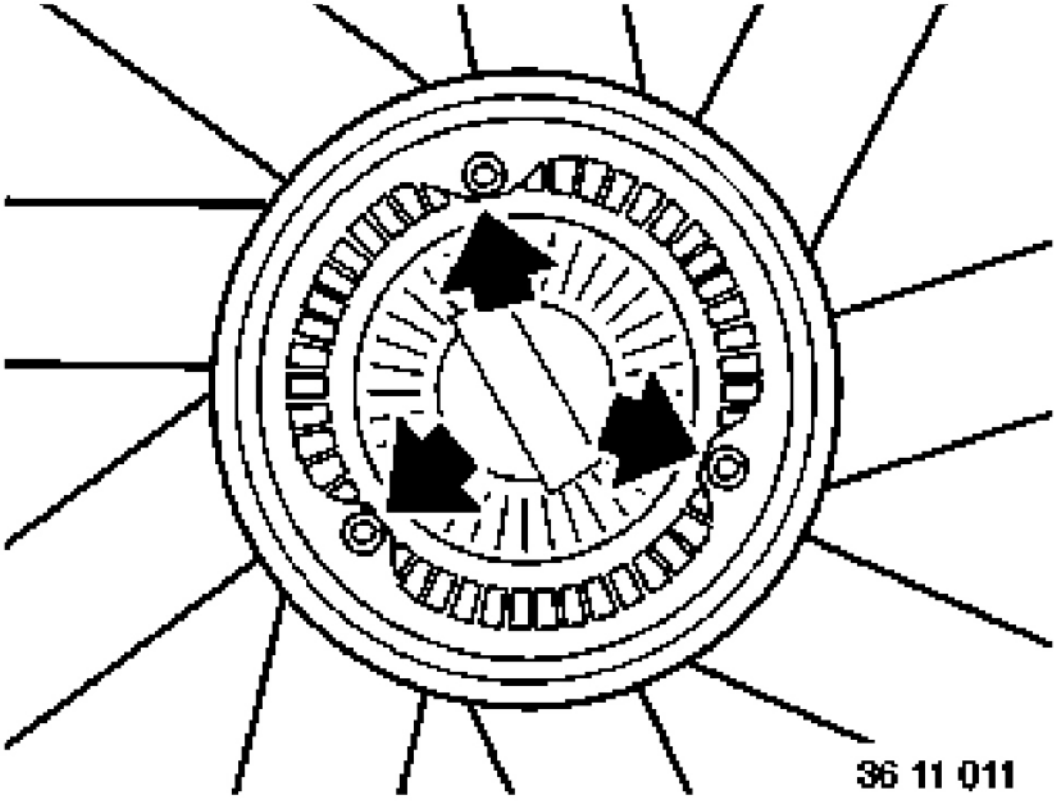


Fig. 287: Locating Fan Coupling Screws
Courtesy of BMW OF NORTH AMERICA, INC.

THERMOSTAT AND CONNECTIONS

11 53 000 REMOVING AND INSTALLING / REPLACING COOLANT THERMOSTAT (M44)

Remove fan coupling with fan wheel, refer to **11 52 020**

Drain coolant.

Release the coolant water lines.

Remove coolant thermostat housing.

NOTE: Coolant thermostat is integrated in coolant-thermostat housing and can only be replaced as a complete assembly.

Replace sealing ring.

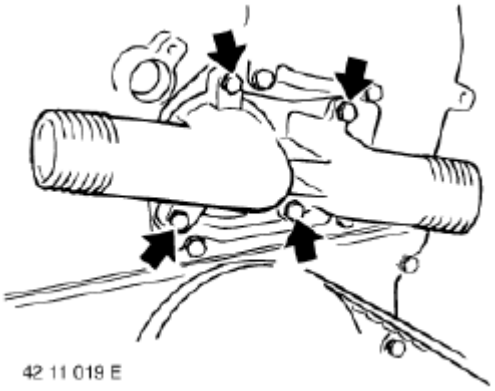


Fig. 288: Locating Thermostat Housing Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

INTAKE MANIFOLD

11 61 040 REMOVING AND INSTALLING UPPER SECTION OF MANIFOLD (M44)

Remove Bowden cable for throttle actuation from throttle body.

Loosen the manifold support in front.

Remove the rubber gaiter from the throttle valve.

Remove connector for throttle potentiometer.

Pull off hose for tank ventilation.

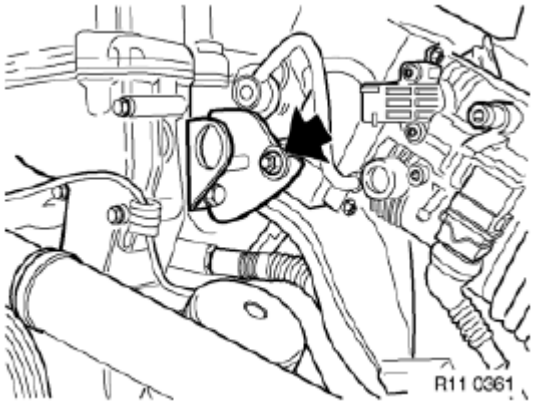


Fig. 289: Locating Rubber Gaiter Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect adapter from brake booster.

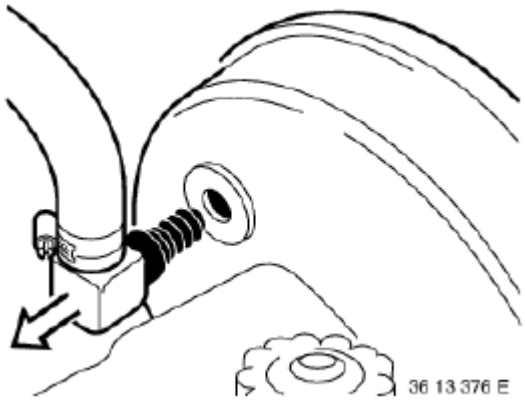


Fig. 290: Disconnecting Adapter From Brake Booster
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen the manifold support in back.

Release and remove collector upper housing.

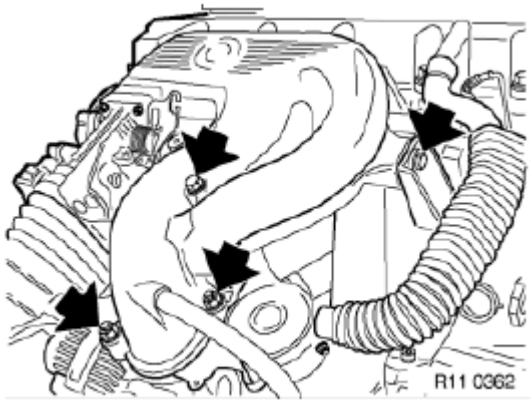


Fig. 291: Locating Collector Upper Housing Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

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

Replace the seals above and below the flange for the pressure regulating valve.

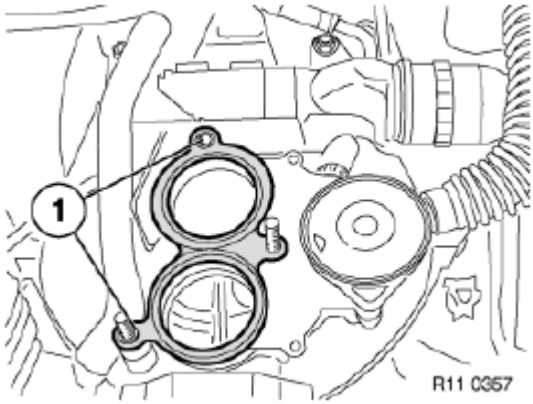


Fig. 292: Identifying Dowel Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

11 61 044 REMOVING AND INSTALLING LOWER SECTION OF MANIFOLD (M44)

Remove top section of manifold, refer to **11 61 040**

Loosen guide pipe for dipstick.

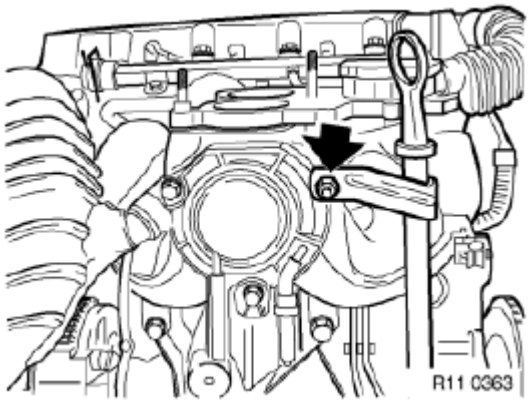


Fig. 293: Locating Guide Pipe For Dipstick
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen the screws (1 and 2) and remove the manifold support.

Installation

Insert screws (1 and 2) and fit flush. Tighten the screws (1 and 2).

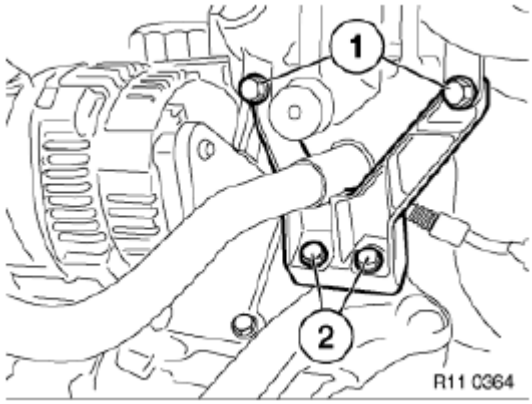


Fig. 294: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Catch escaping fuel and dispose of it correctly. Unfasten fuel delivery and fuel return lines.

Lower the coolant water level.

Disconnect preheating hose from flange for pressure regulating valve.

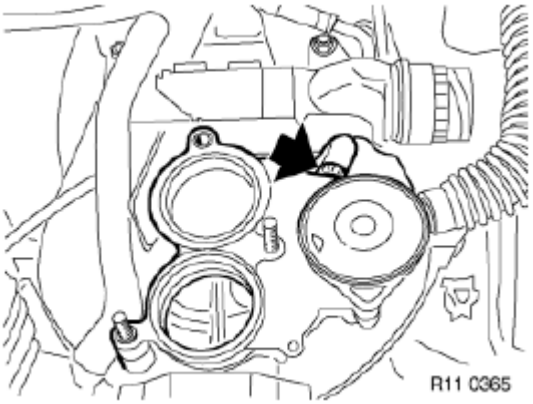


Fig. 295: Locating Preheating Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Remove flange for pressure-control valve.

Installation

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

Replace the seals above and below the flange for the pressure regulating valve.

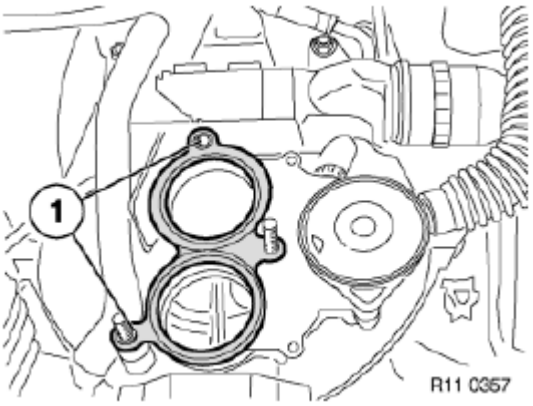


Fig. 296: Identifying Dowel Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Separate the plug connections for the camshaft sensor and the crankshaft sensor at the cable duct.

Release the cable duct from the lower housing of the collector.

Separate the screw connections for the alternator and the starter.

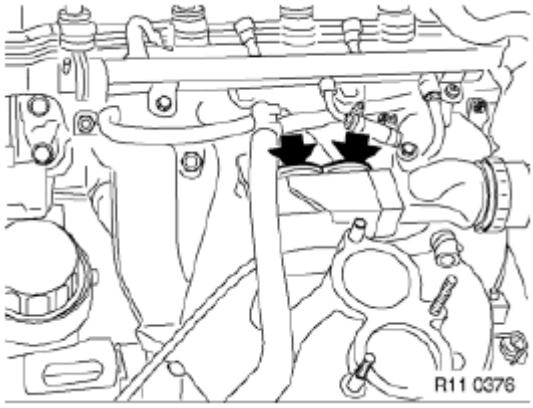


Fig. 297: Locating Cable Duct
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten lower section of manifold and remove from stud bolts until plug connections for oil pressure switch and temperature sensor for coolant are accessible.

Disconnect plug connections for oil pressure switch and temperature sensor for coolant.

Remove the lower housing of the collector.

NOTE: Bracket (1) for the plug connection of the knock sensors.

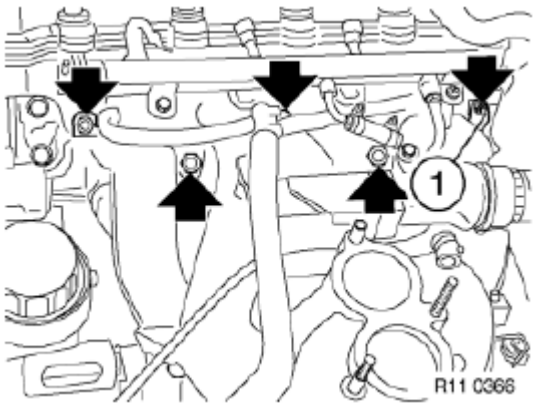


Fig. 298: Identifying Bracket (1)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check for correct fit of hollow bushes (1).

Clean sealing faces.

Replace seal.

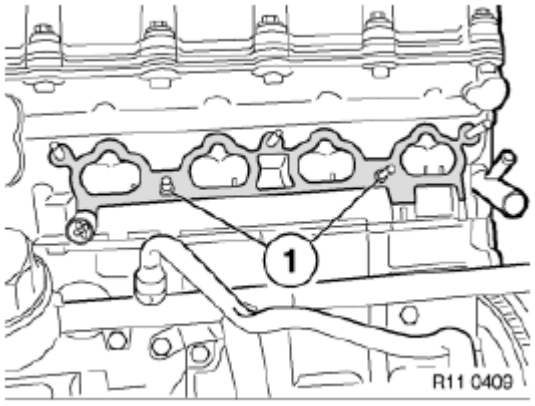


Fig. 299: Identifying Hollow Bushes (1)
Courtesy of BMW OF NORTH AMERICA, INC.

EXHAUST MANIFOLD

11 62 000 REMOVING AND INSTALLING, SEALING / REPLACING EXHAUST MANIFOLD (M43 / M43TU / M44)

Remove exhaust system from exhaust manifold.

If necessary, remove air injection pipe.

Unfasten nuts and remove exhaust manifold.

Installation

Coat threads with CRC copper paste.

Replace gaskets and nuts.

Tightening Torque, refer to 11 62 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

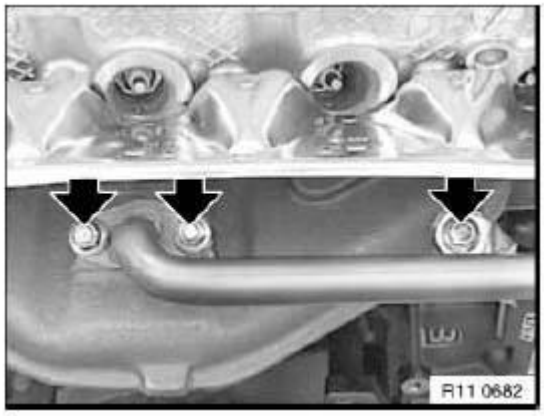


Fig. 300: Locating Gaskets And Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

EMISSION CONTROL, OXYGEN SENSOR

11 78 510 REPLACING LAMBDA OXYGEN SENSOR (AS NECESSARY, LEFT OR RIGHT) (M44)

Disconnect connector for oxygen sensor.

Unclip Lambda oxygen sensor cable from bracket.

Unfasten oxygen sensor.

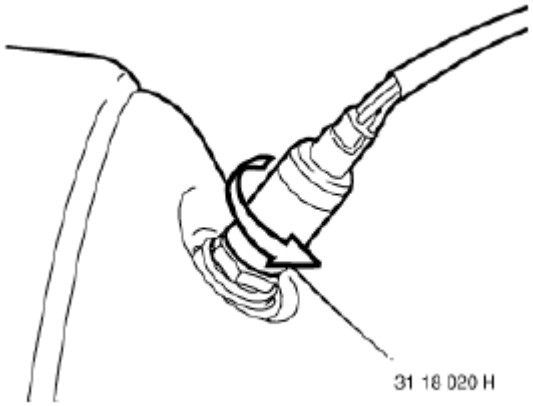


Fig. 301: Disconnecting Connector For Oxygen Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

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 even coat of Never Seez Compound to the threads only.

Do not clean the Lambda oxygen sensor section which protrudes into the exhaust line and ensure that it avoids all contact with lubricants.

Installation

Tighten oxygen sensor with special tool 11 7 030.

Tightening Torque, refer to 11 78 1AZ in **ENGINE - TORQUE SPECIFICATIONS (M44)** .

Protect (mask) Lambda oxygen sensor when applying under seal.

Note cable routing of oxygen sensor.

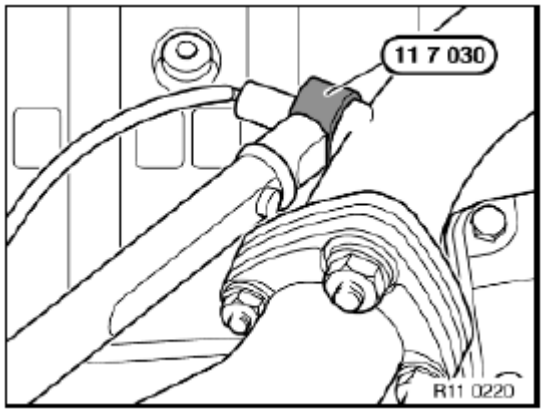


Fig. 302: Identifying Special Tool (11 7 030)
Courtesy of BMW OF NORTH AMERICA, INC.

