ENGINE

Engine - Repair Instructions

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.

11 00... ENGINE OIL SERVICE

WARNING: Risk of scalding!

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

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

Observe the exact engine oil filling capacity.

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

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

IMPORTANT: Risk of damage!

Protect belt drive against dirt.

Cover with suitable materials.

Recycling

Catch and dispose of drained engine oil in a suitable collecting vessel.

Observe country-specific waste disposal regulations.

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

Tightening torque: 25 Nm

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

Picture shows E9x

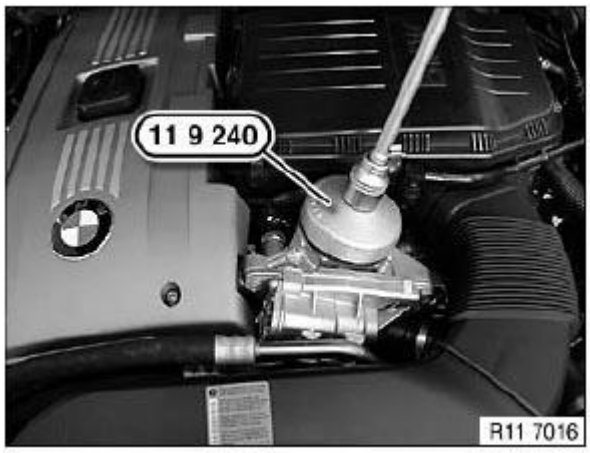


Fig. 1: Removing Oil Filter Cover Using Special Tool 11 9 240
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Presentation: without underbody protection.

Unclip service opening on underbody protection.

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

Tightening torque: 25 Nm

Installation note

Replace sealing ring.

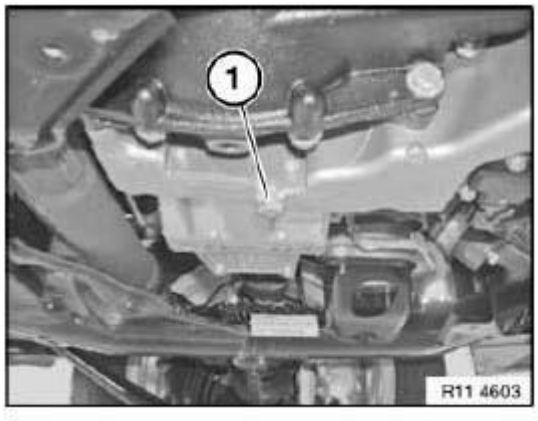


Fig. 2: Identifying Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation note:

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

Replace gasket (3) and renew if necessary.

NOTE: Coat sealing rings (2, 3) with engine oil.

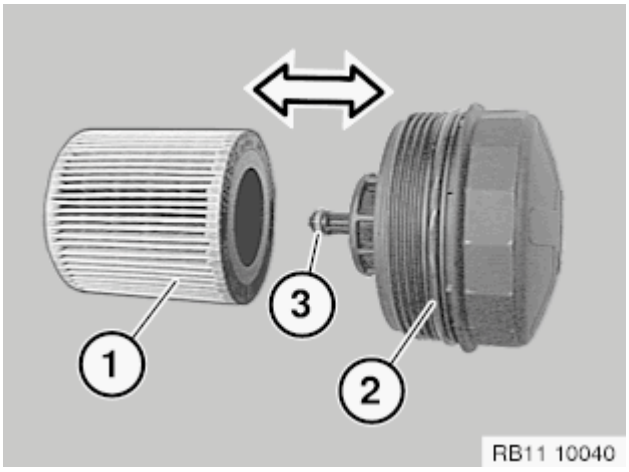


Fig. 3: Identifying Oil Filter Element And Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Secure oil filter cover with special tool **11 9 240** .

Tightening torque: 25 Nm.

NOTE: Pour in engine oil.

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

Switch off engine

Check oil filter cover and screw plug on oil sump for leaks.

Assemble engine.

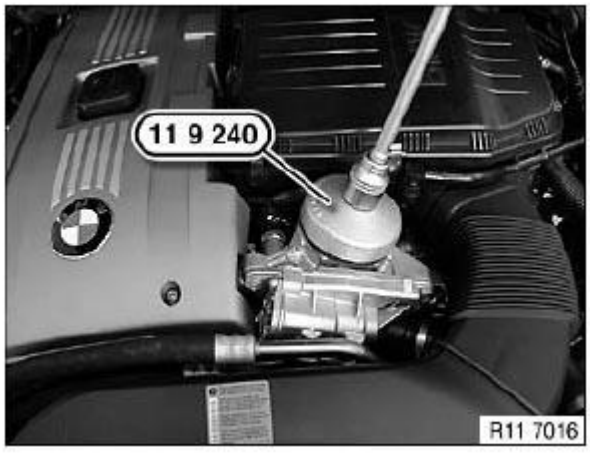


Fig. 4: Installing Oil Filter Cover Using Special Tool 11 9 240
Courtesy of BMW OF NORTH AMERICA, INC.

Checking engine oil level:

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

11 00 REMOVING AND INSTALLING/REPLACING IGNITION COIL COVER

Necessary preliminary tasks:

- Remove microfilter housing
- E60/E61 only: **REMOVE TENSION STRUT**

Release screws.

Tightening torque **11 12 7AZ** .

Remove ignition coil cover (1) towards top.

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

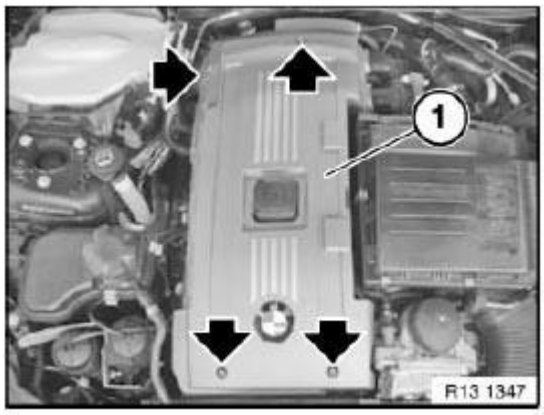


Fig. 5: Locating Acoustic Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

11 00 039 CHECKING COMPRESSION IN ALL CYLINDERS

Special tools required:

- **11 0 222**
- **11 0 224**
- **11 8 731**

- **11 8 732**

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

IMPORTANT: High tension - mortal danger!

Interrupt power supply to ignition coils.

Read and comply with notes on compression pressure check.

Necessary preliminary tasks:

- Remove **SPARK PLUGS** .

Unscrew tip (1) from special tool 11 0 222.

IMPORTANT: Then check the Schrader valve that is now visible for secure seating.

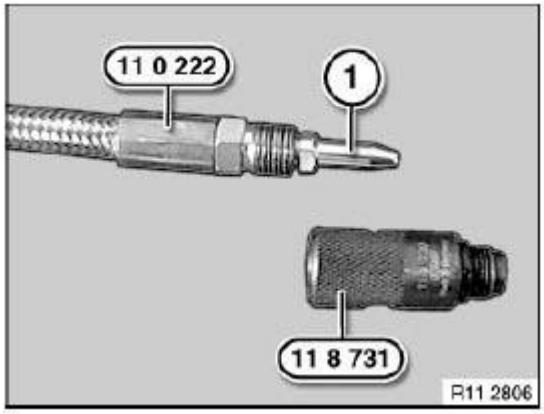


Fig. 6: Identifying Special Tool (11 0 222) And (11 8 732)
Courtesy of BMW OF NORTH AMERICA, INC.

Prepare special tool **11 0 222** in conjunction with **11 8 732** and **11 8 731.**

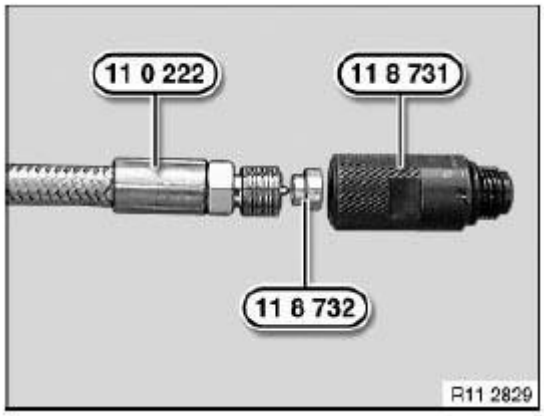


Fig. 7: Identifying Special Tools (11 0 222) In Conjunction With (11 8 732) And (11 8 731)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool **11 0 222** into special tool **11 8 731** to 10 Nm.

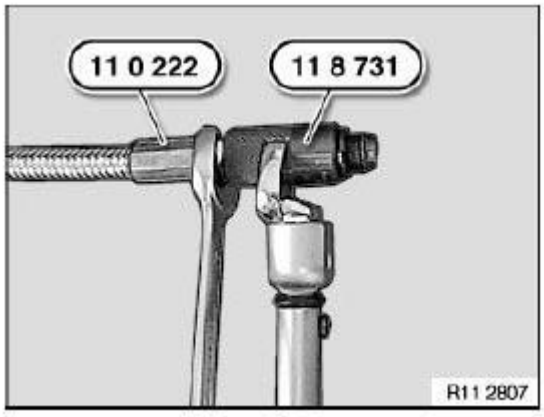


Fig. 8: Screwing Special Tool (11 0 222) Into Special Tool (11 8 731)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not to forget to coat spark plug thread of special tool 11 8 731 with oil.

Screw special tool **11 0 222** by hand into spark plug thread and connect special tool **11 0 224.**

Use adapter lead (1) if the compression pressure is being checked with the BMW diagnosis system.

Depress accelerator pedal and actuate starter motor until compression pressure stops rising.

- **NOMINAL VALUES** , compression pressure

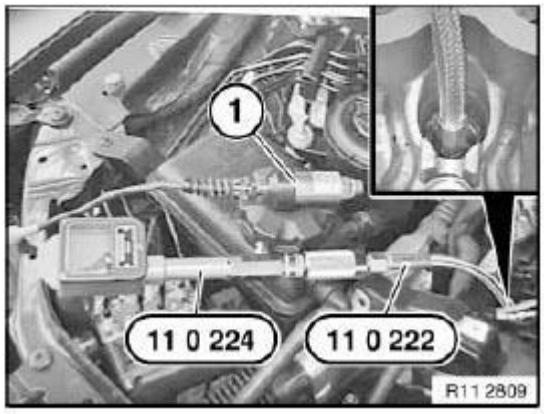


Fig. 9: Checking Compression Pressure Use Adapter Lead And BMW Diagnosis System
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine

Now clear the fault memory.

11 00 670 SECURING ENGINE IN INSTALLATION POSITION

Special tools required:

- **00 6 000**
- **00 6 001**
- **00 6 002**
- **00 6 051**
- **00 6 052**
- **00 6 060**
- **00 6 080**

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

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

IMPORTANT: Before lifting the engine, check the lifting lugs for damage (cracks) and to ensure they are seated securely.

IMPORTANT: To safely support the cross-member, make sure that the lock carrier (front end

- side frame connection) is installed.

Necessary preliminary tasks:

- Secure **ENGINE BONNET/HOOD IN SERVICE POSITION**
- Remove **INTAKE FILTER HOUSING**

Assemble cross member **00 6 000** with special tools **00 6 051** , **00 6 060** , **00 6 052** .

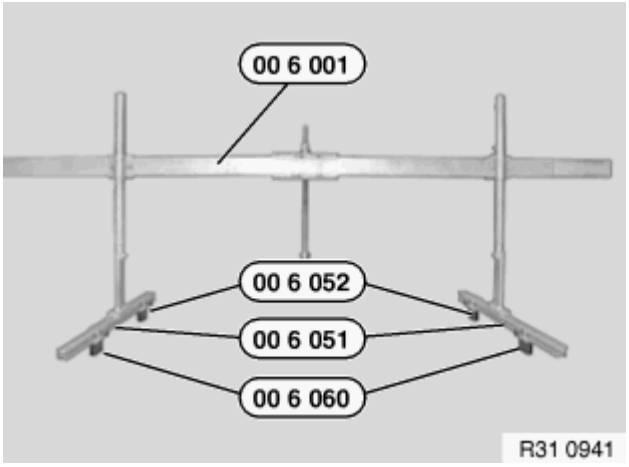


Fig. 10: Identifying Cross Member Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

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

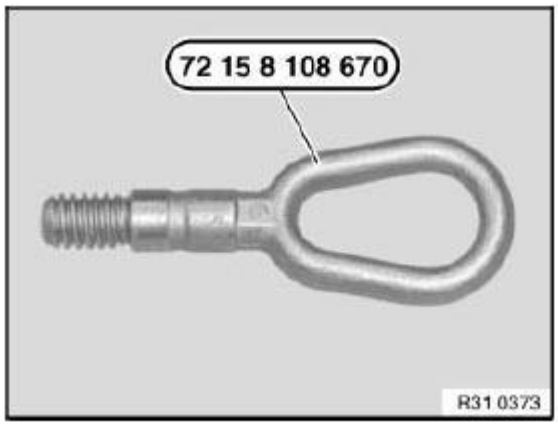


Fig. 11: Identifying Towing Hook (72 15 8 108 670)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Release front screws (1) on acoustic cover (2). Tightening torque for N52K: **11 12 6AZ** .

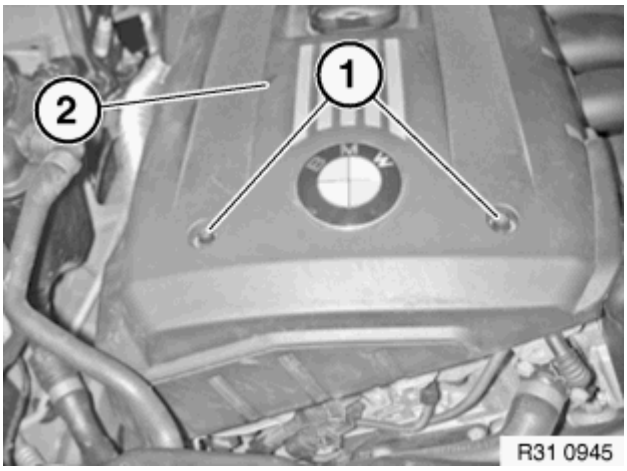


Fig. 12: Identifying Acoustic Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Raise acoustic cover (1) slightly. Screw in towing hook (2) and tighten down to approx. 30 Nm.

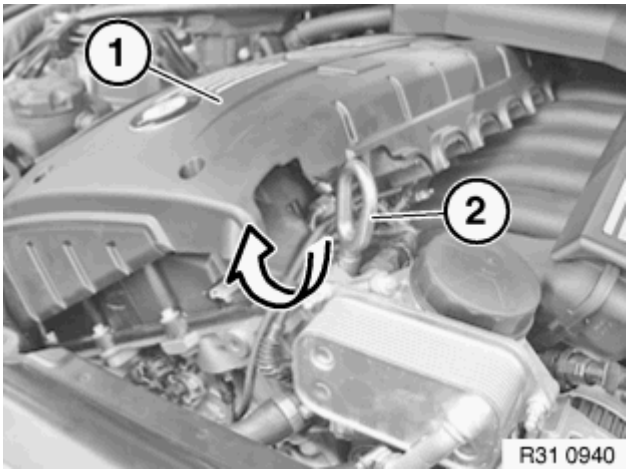


Fig. 13: Installing Towing Hook
Courtesy of BMW OF NORTH AMERICA, INC.

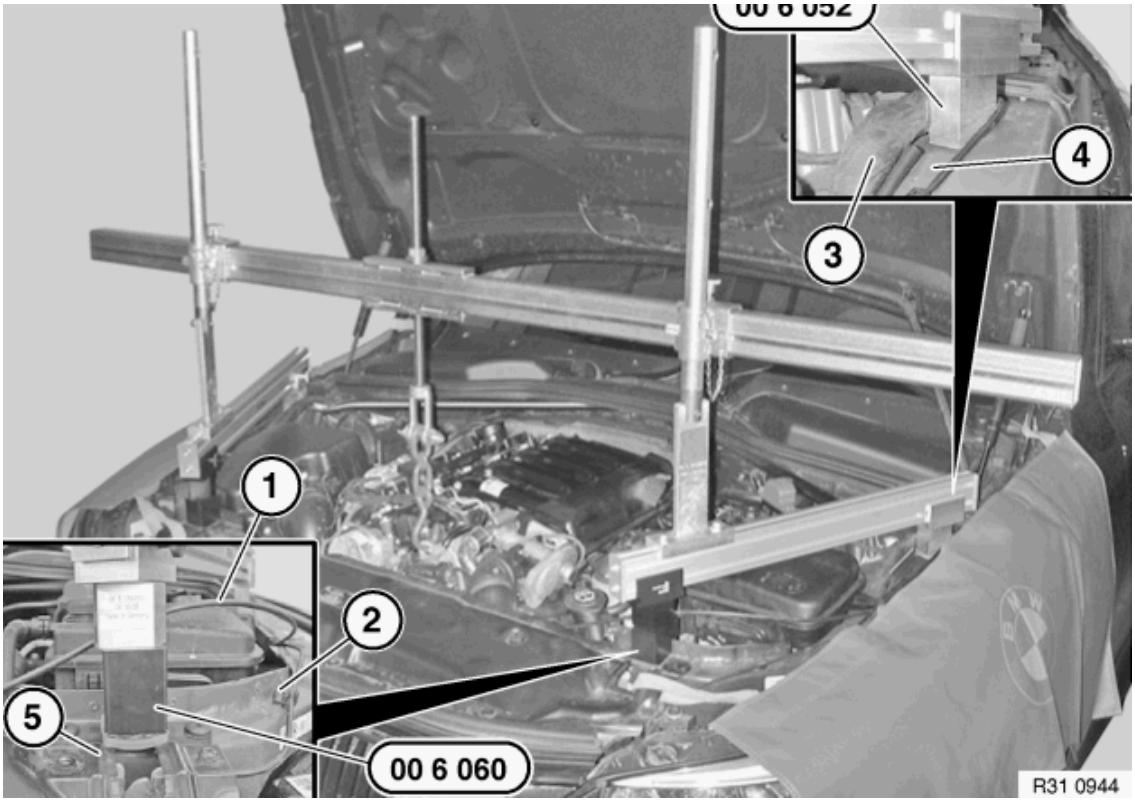


Fig. 14: Pulling Bowden Cable Out Of Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage! Carefully pull Bowden cable (1) on driver's side out of bracket (2) and do not kink. Carefully press wiring harness (3) to one side.

IMPORTANT: Risk of damage! Fit cross-member 00 6 000 with a 2nd person helping. Fit supports at rear on spring strut dome (4) and at front in area of lock (5). Screw connections of cross-member 00 6 001 must point to windscreen.

Adapt bevel of special tool 00 6 052 to inclination of spring strut dome. Secure chain with coat hook 00 6 080 to spindle 00 6 002 and align centrally over towing hook. Attach special tool to towing hook.

WARNING: Danger of injury! Tighten down all adjusting screws and nuts on cross-member 00 6 000.

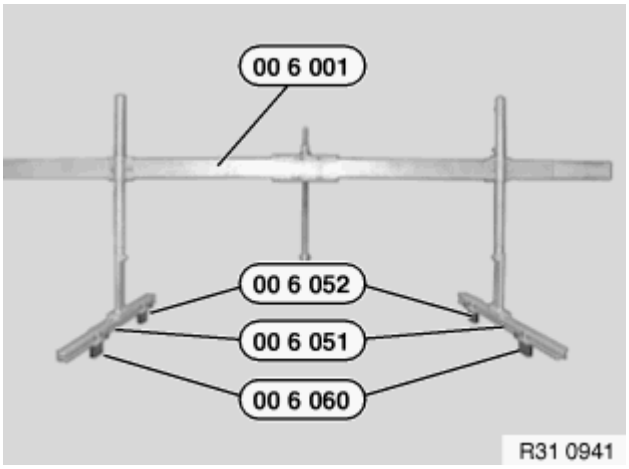


Fig. 15: Identifying Cross Member Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw on left and nut on right (1) and discard. Raise engine approx. 10 mm with cross member.

Installation note: Replace microencapsulated screw. Replace self-locking nut.

Tightening torque **22 11 2AZ** .

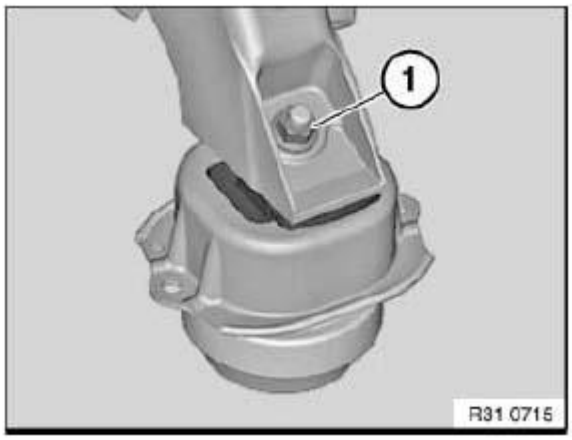


Fig. 16: Identifying Nut
Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE IDENTIFICATION

Drive in engine numbers at marked surface with impact tool.

M47 / M47TU / M47T2

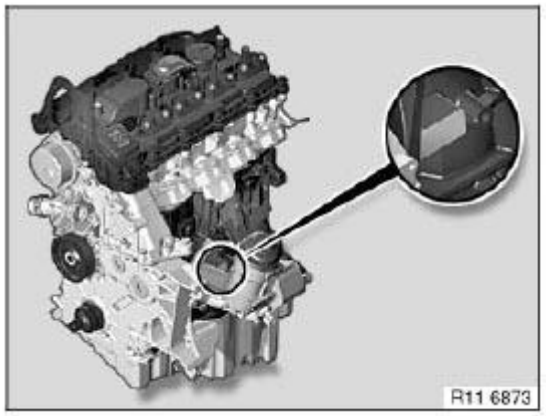


Fig. 17: Identifying Engine Identification Marks - M47 / M47TU / M47T2
Courtesy of BMW OF NORTH AMERICA, INC.

M57 / M57TU / M57T2

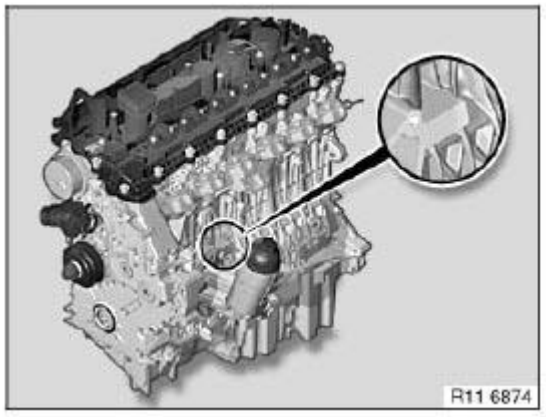


Fig. 18: Identifying Engine Identification Marks - M57 / M57TU / M57T2
Courtesy of BMW OF NORTH AMERICA, INC.

M67 / M67TU

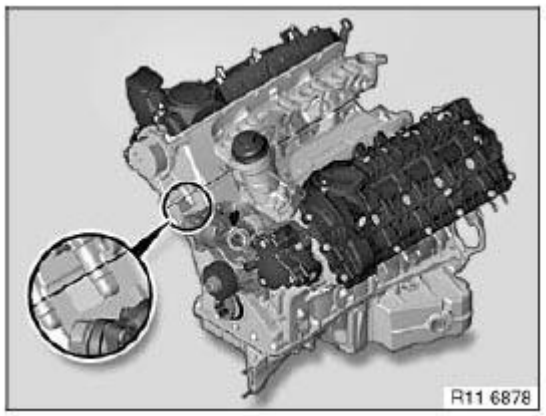


Fig. 19: Identifying Engine Identification Marks - M67 / M67TU
Courtesy of BMW OF NORTH AMERICA, INC.

N47 / N47S

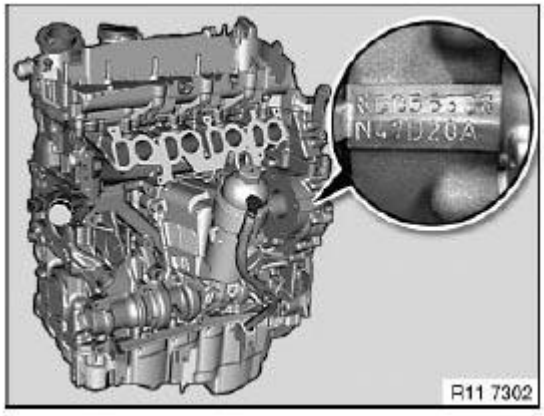


Fig. 20: Identifying Engine Identification Marks - N47 / N47S
Courtesy of BMW OF NORTH AMERICA, INC.

M52 / M52TU

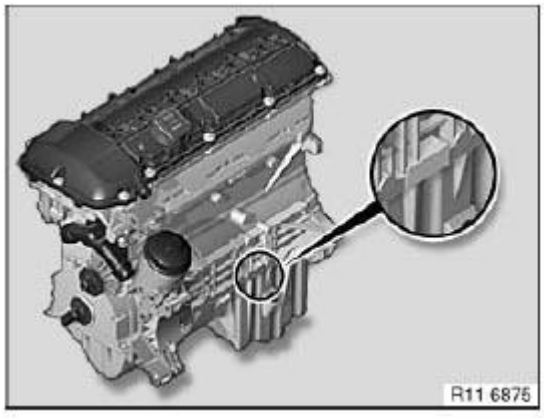


Fig. 21: Identifying Engine Identification Marks - M52 / M52TU
Courtesy of BMW OF NORTH AMERICA, INC.

M54

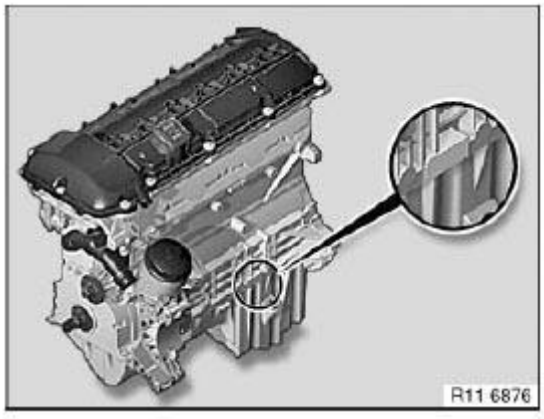


Fig. 22: Identifying Engine Identification Marks - M54
Courtesy of BMW OF NORTH AMERICA, INC.

M56

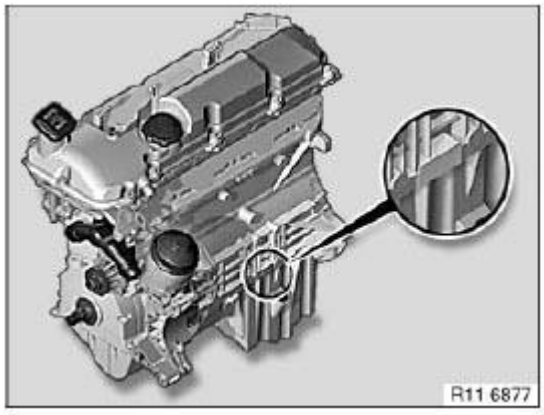


Fig. 23: Identifying Engine Identification Marks - M56
Courtesy of BMW OF NORTH AMERICA, INC.

N40 / N45 / N45T / N43

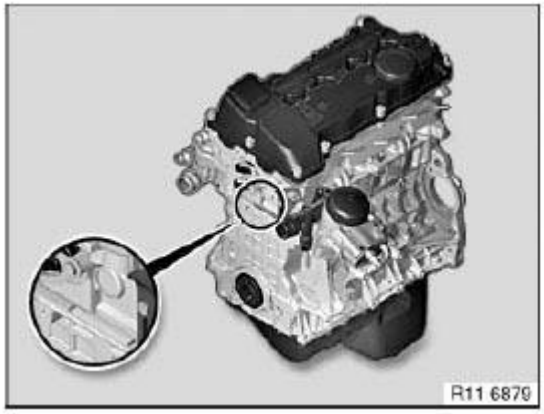


Fig. 24: Identifying Engine Identification Marks - N40 / N45 / N43T / N43
Courtesy of BMW OF NORTH AMERICA, INC.

N42 / N46 / N46T

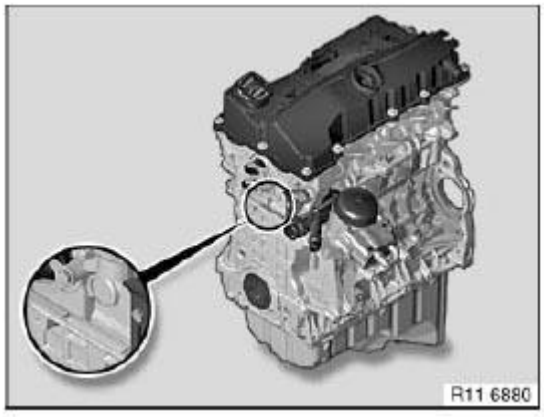


Fig. 25: Identifying Engine Identification Marks - N42 / N46 / N46T
Courtesy of BMW OF NORTH AMERICA, INC.

N51 / N52 / N52K / N53 / N54

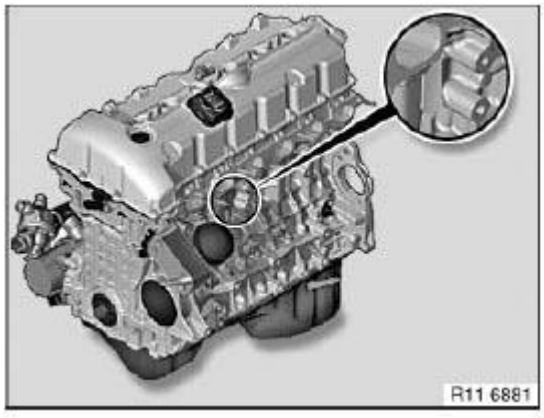


Fig. 26: Identifying Engine Identification Marks - N51 / N52 / N52K / N54
Courtesy of BMW OF NORTH AMERICA, INC.

N62

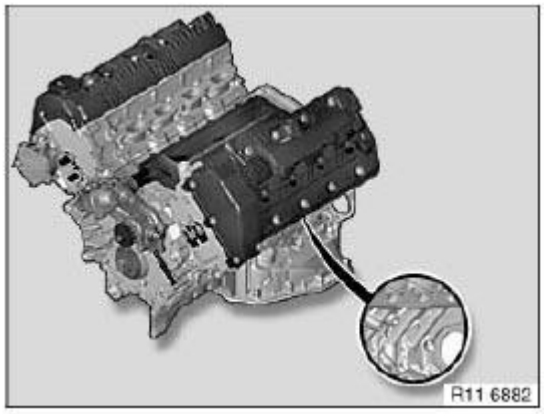


Fig. 27: Identifying Engine Identification Marks - N62
Courtesy of BMW OF NORTH AMERICA, INC.

N73

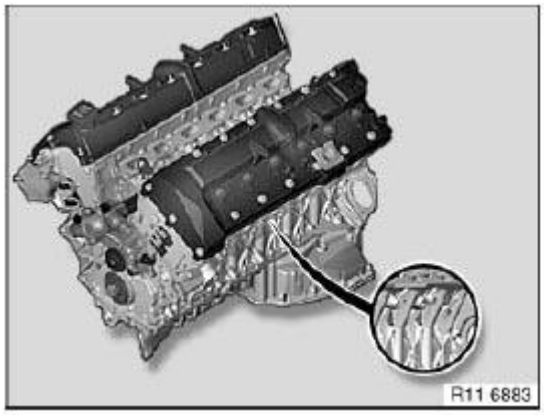


Fig. 28: Identifying Engine Identification Marks - N73
Courtesy of BMW OF NORTH AMERICA, INC.

S54

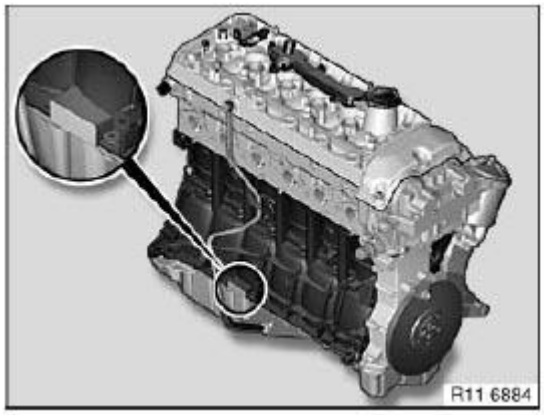


Fig. 29: Identifying Engine Identification Marks - S54
Courtesy of BMW OF NORTH AMERICA, INC.

S85 / S65

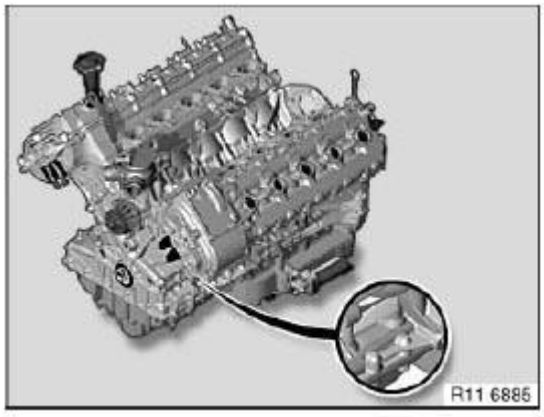


Fig. 30: Identifying Engine Identification Marks - S85 / S65
Courtesy of BMW OF NORTH AMERICA, INC.

W10 / W11

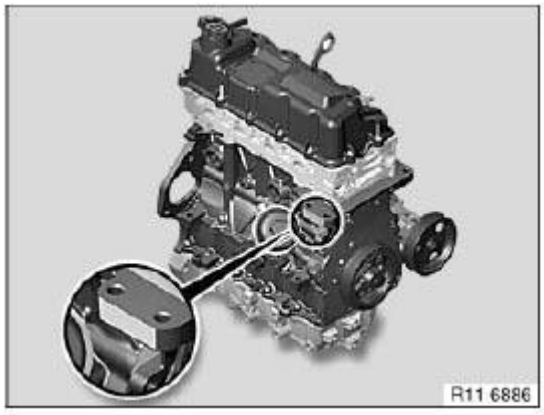


Fig. 31: Identifying Engine Identification Marks - W10 / W11
Courtesy of BMW OF NORTH AMERICA, INC.

W17

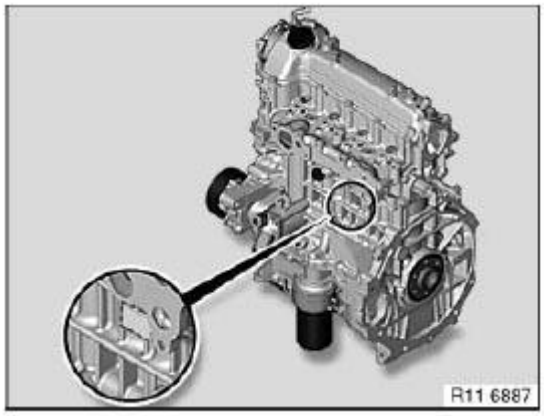


Fig. 32: Identifying Engine Identification Marks - W17
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

MOUNTING ENGINE ON ASSEMBLY STAND

Special tools required:

- **00 2 300**
- **11 8 541**
- **11 8 542**

IMPORTANT: Aluminium screws/bolts must be replaced each time they are released .

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

Risk of damage!

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

Necessary preliminary tasks:

- Remove engine.

Mount engine with special tool **11 8 541** to special tool **00 1 450.**

Mount engine or engine block with special tool **11 8 542** to **11 8 541.**

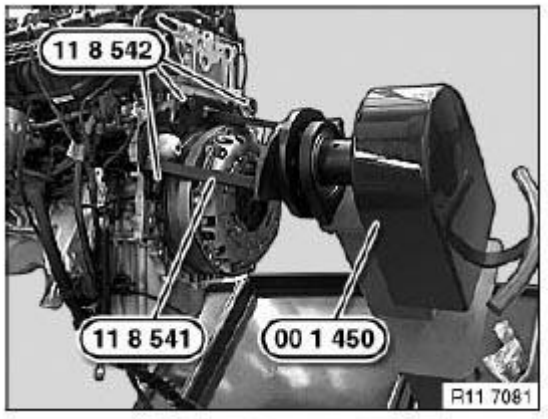


Fig. 33: Mounting Engine Or Engine Block With Special Tool (11 8 542) To (11 8 541)
Courtesy of BMW OF NORTH AMERICA, INC.

CYLINDER HEAD WITH COVER

11 12 000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER

Special tools required:

- **11 8 620**

Necessary preliminary tasks:

- Disconnect negative battery lead.
- Remove acoustic cover.
- Remove **ROD-TYPE IGNITION COILS** .
- Unclip injector wiring harness.
- Remove injectors.
- Remove tension strut.
- Remove fresh air duct.

Disconnect vacuum lines (2) from vacuum lines (1).

Unclip vacuum lines (1).

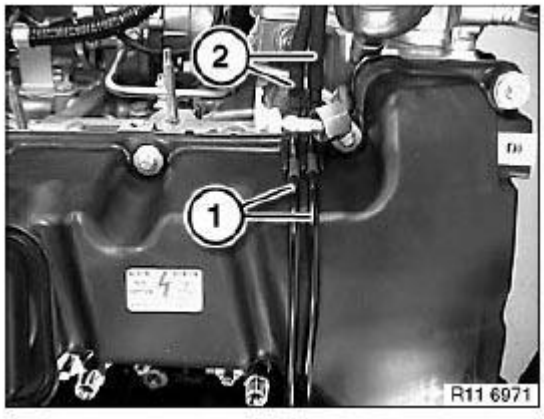


Fig. 34: Identifying Vacuum Lines And Vacuum Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect vacuum lines (1) from vacuum lines (2).

Unclip vacuum line (2) and lay to one side.

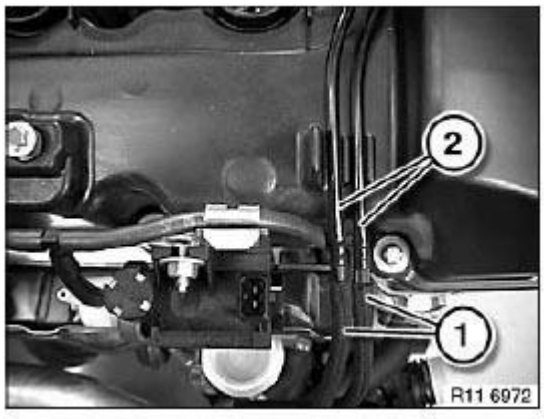


Fig. 35: Identifying Vacuum Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) with special tool 11 8 620.

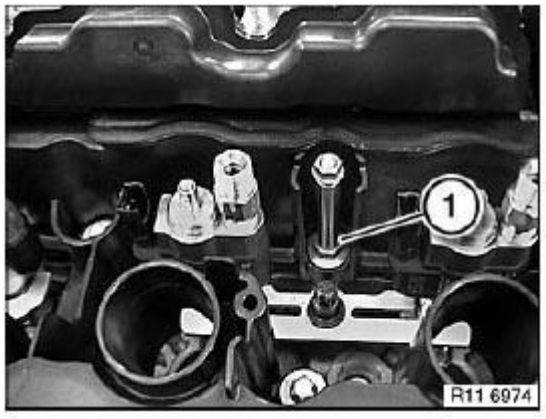


Fig. 36: Releasing Screw Using Special Tool (11 8 620)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

Remove slotted sleeves (2).

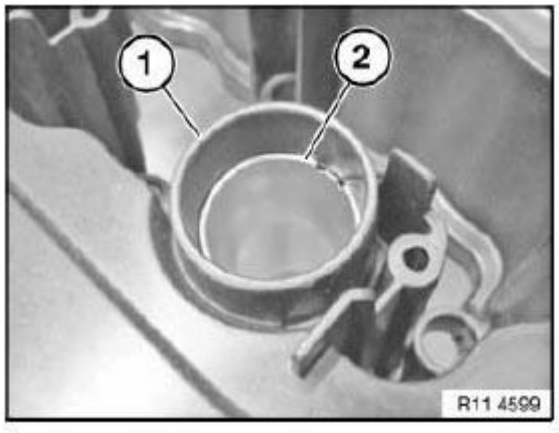


Fig. 37: Identifying Slotted Sleeves And Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on valve cover.

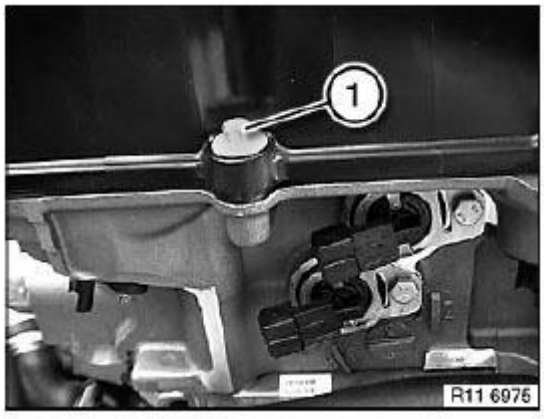


Fig. 38: Identifying Valve Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 and 2).

Tightening torque: **11 12 4AZ** .

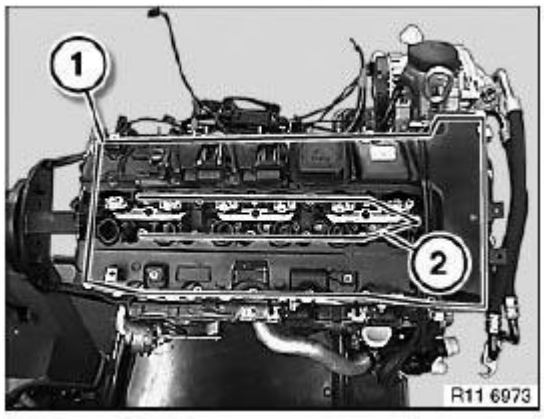


Fig. 39: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace seal (1).

Press gasket (1) into valve cover.

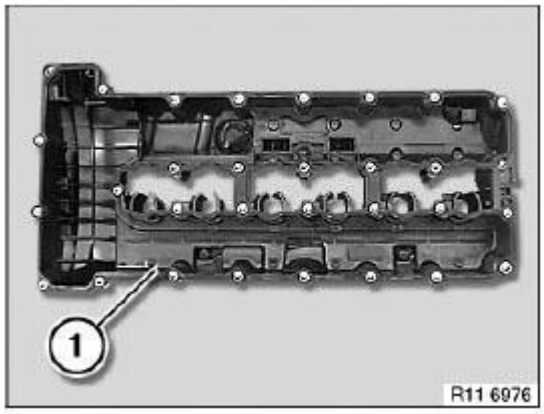


Fig. 40: Identifying Valve Cover Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 12 100 REMOVING AND INSTALLING CYLINDER HEAD

Special tools required:

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

IMPORTANT: Aluminium screws/bolts must be replaced each time they are released .

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

Risk of damage!

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

Fit new cylinder head screws.

Do not wash off bolt coating.

There must be no coolant, water or engine oil in the pocket holes.

Risk of corrosion and cracking!

Necessary preliminary tasks:

- Remove engine
- Remove **INLET AND EXHAUST ADJUSTMENT UNIT**

Release screws (1).

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

Set down timing chain.

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

Installation note:

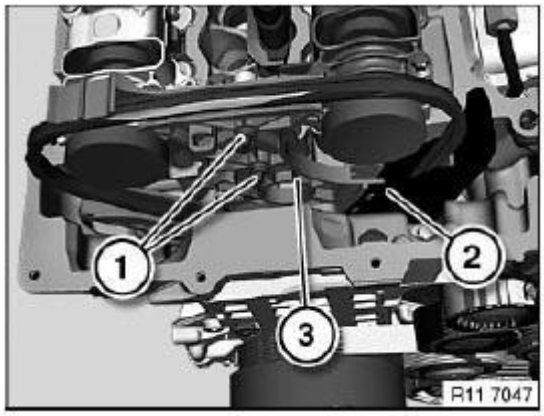


Fig. 41: Identifying Timing Chain Module, Junction And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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

Release screws (1).

Tightening torque **11 12 3AZ** .

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

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

Release bolt (2).

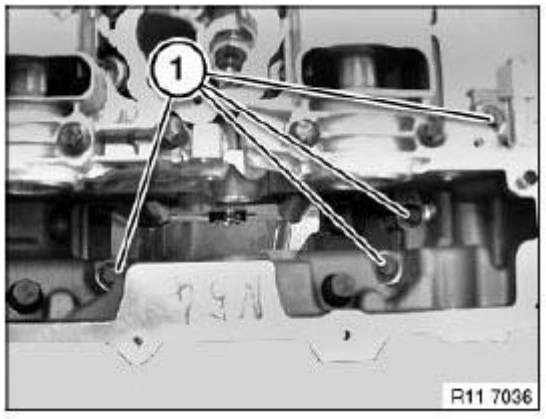


Fig. 42: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe different bolt heads.

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

Tightening torque **11 12 2AZ** .

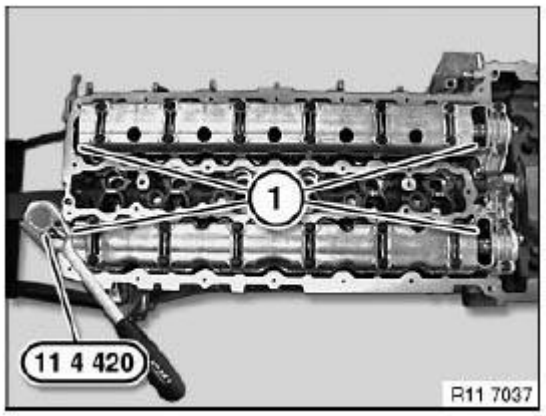


Fig. 43: Releasing M9 Cylinder Head Bolts Using Special Tool (11 4 420)
Courtesy of BMW OF NORTH AMERICA, INC.

Release M10 cylinder head bolts (1) with special tool **11 8 580** from outside inwards.

Tightening torque **11 12 1AZ** .

IMPORTANT: All cylinder head bolts must be replaced.

Risk of damage!

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

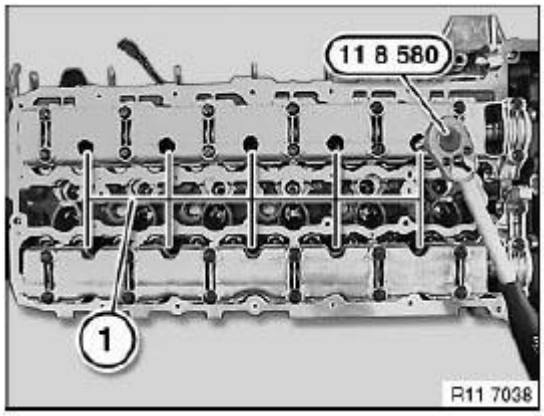


Fig. 44: Releasing M10 Cylinder Head Bolts Using Special Tool (11 8 580)
Courtesy of BMW OF NORTH AMERICA, INC.

Shims (1) of cylinder head bolts can only be removed with a magnet (2) between cylinder head and bearing strip.

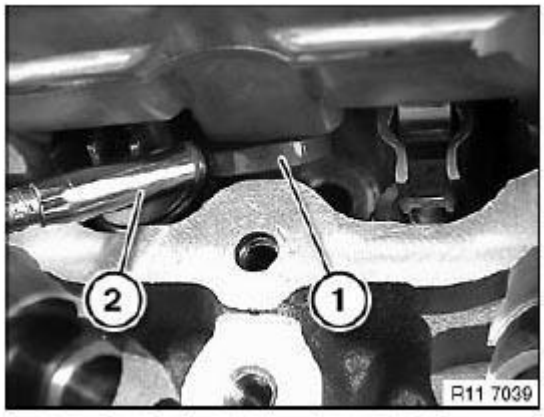


Fig. 45: Removing Shims Of Cylinder Head Bolts Using Magnet
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 12 4AZ** .

IMPORTANT: Removing and install cylinder head with a second person helping.
Weight of cylinder head with add-on parts is approx. 40 kg.
Do not set cylinder head down on sealing face, risk of damage to valves.

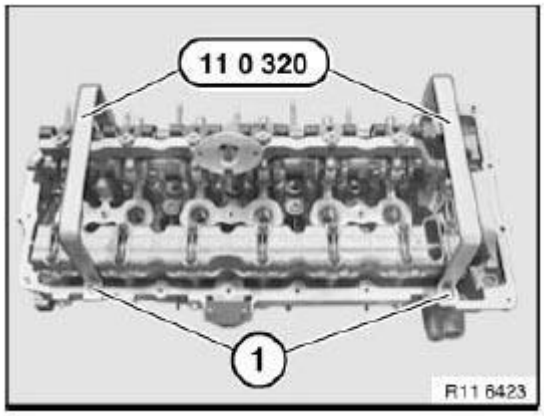


Fig. 46: Securing Special Tool (11 0 320) With Existing Cylinder Head Cover Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Set down cylinder head with inlet and exhaust camshafts on side only, risk of damage to valves (1).

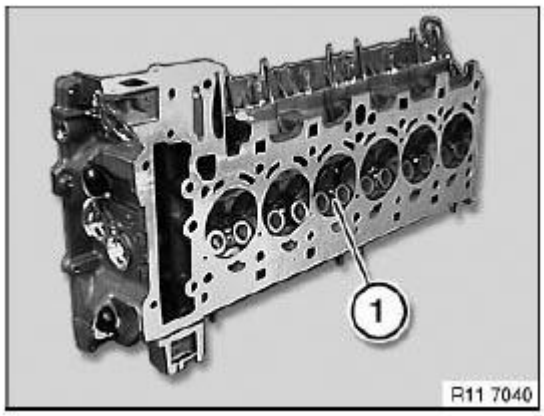


Fig. 47: Identifying Valves
Courtesy of BMW OF NORTH AMERICA, INC.

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

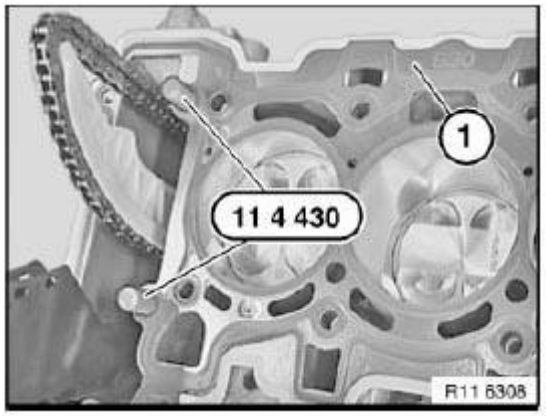


Fig. 48: Inserting Special Tool (11 4 430) Into Bores
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Do not use any metal-cutting tools.

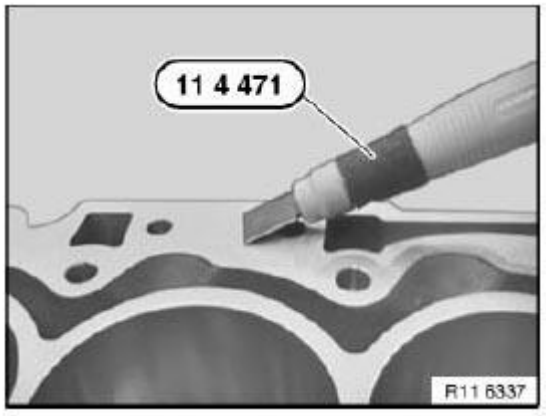


Fig. 49: Removing Coarse Residues On Sealing Faces Using Special Tool (11 4 471) From Cylinder Head And Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Do not use any metal-cutting tools.

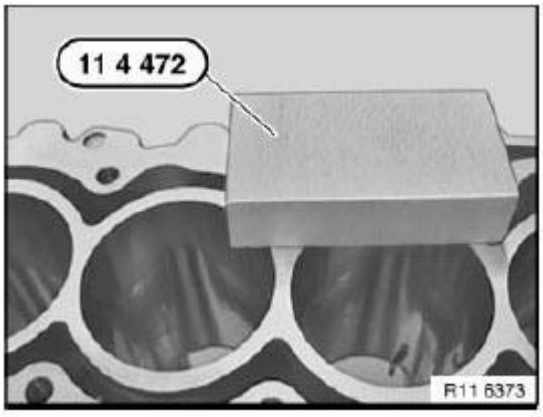


Fig. 50: Identifying Special Tool (11 4 471)
Courtesy of BMW OF NORTH AMERICA, INC.

There must be no coolant, water or engine oil in the pocket holes.

Risk of corrosion and cracking!

Clean all pocket holes.

Installation note:

Replace **CYLINDER HEAD GASKET**.

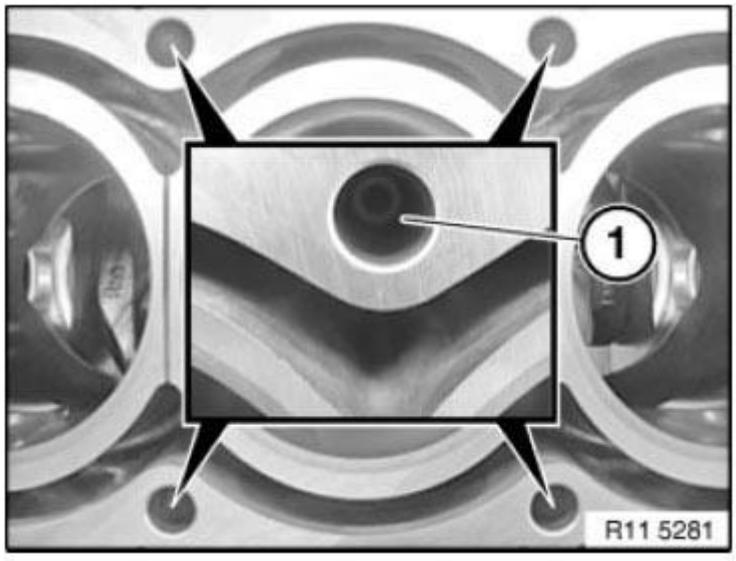


Fig. 51: Identifying Threaded Hole
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation note:

Fit new cylinder head screws.

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

Tightening torque **11 12 1AZ** .

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

Tightening torque **11 12 2AZ** .

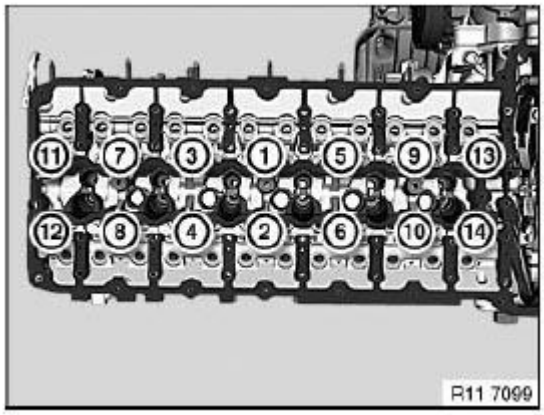


Fig. 52: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Picture shows inlet and exhaust camshafts removed.

Observe sequence for tightening cylinder head bolts without fail.

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

Installation note:

- Tightening torque:

  All cylinder head bolts 1 to 14 to 30 Nm

- 1st angle of rotation:

  All cylinder head bolts 1 to 14 to 90°

- 2nd angle of rotation:

  Only cylinder head bolts 1 to 10 to 90°

- 3rd angle of rotation:

  All cylinder head bolts 1 to 14 to 45°

Replace screws (1).

Tightening torque **11 12 3AZ** .

IMPORTANT: Secure bolt (1) with a gripper against falling down.

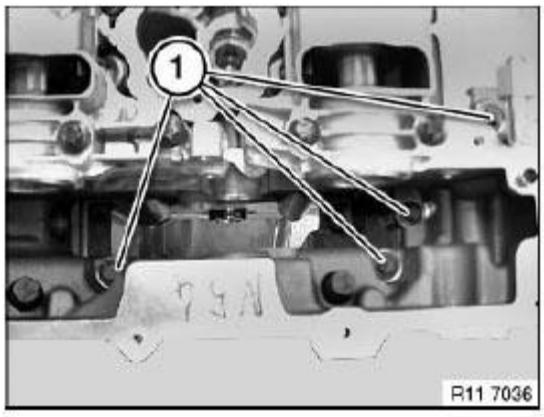


Fig. 53: Identifying Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 12 101 REPLACING CYLINDER HEAD GASKET

Special tools required:

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

Necessary preliminary tasks:

- Remove **CYLINDER HEAD**.

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

Remove head gasket.

IMPORTANT: Check identification (1) on cylinder head gasket (N54).

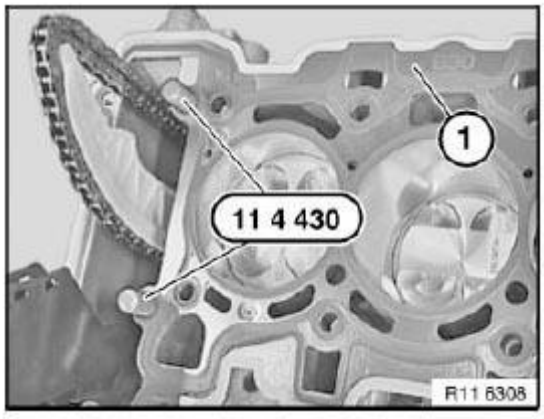


Fig. 54: Identifying Special Tool (11 4 430) And Identification Marks On Cylinder Head Gasket (N54)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

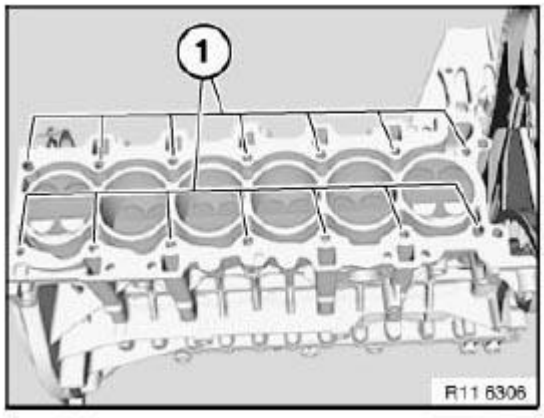


Fig. 55: Identifying Pocket Holes
Courtesy of BMW OF NORTH AMERICA, INC.

Identification (1) of head gasket (N54).

Gasket (3) is a sheet-metal gasket with rubber coating.

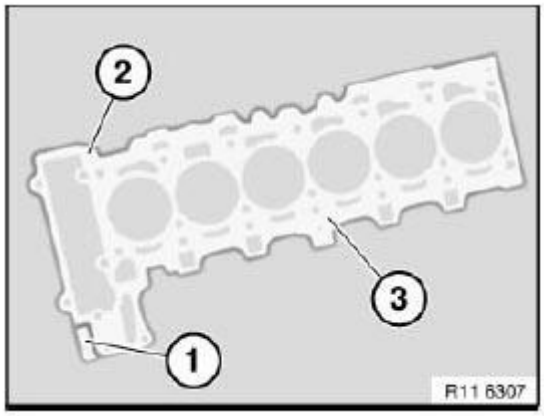


Fig. 56: Identifying Identification Mark Of Head Gasket (N54) And Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

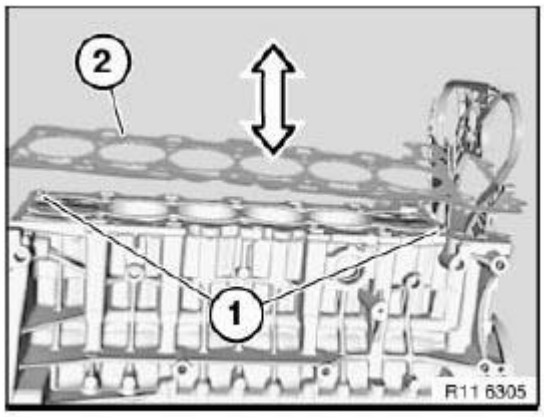


Fig. 57: Checking Adapter Sleeves For Damage And Firm Seating
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check cylinder head for DEVIATION FROM FLATNESS.

Check cylinder head for WATER LEAKS.

Assemble engine.

11 12 719 RESURFACING CYLINDER HEAD SEALING SURFACE

IMPORTANT: Reconditioning on cylinder head max. 0.3 mm

Necessary preliminary tasks:

- Remove **CYLINDER HEAD**.
- Remove **EXHAUST CAMSHAFT**.
- Remove **INLET CAMSHAFT**.
- Remove **ROLLER CAM FOLLOWERS**.
- Remove all HVCA elements.
- Remove all **VALVES**.

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

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

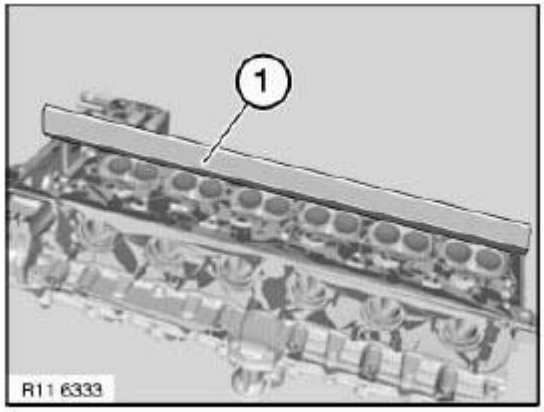


Fig. 58: Checking Evenness Of Cylinder Head Sealing Faces Using Standard Straight-Edge
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

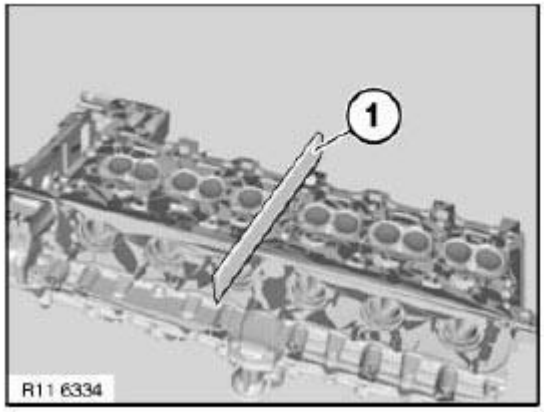


Fig. 59: Checking Evenness Of Cylinder Head Sealing Faces Using Standard Straight-Edge
Courtesy of BMW OF NORTH AMERICA, INC.

Check cylinder head for **WATER LEAKS**.

Assemble engine.

11 12 729 CHECK CYLINDER HEAD FOR WATERTIGHTNESS

Special tools required:

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

IMPORTANT: Pressure-test cylinder head to max. 3 bar .

Heat cylinder head to 60°.

Check for bubble formation in a water bath.

Necessary preliminary tasks:

- Remove **CYLINDER HEAD**.
- Disassemble **CYLINDER HEAD**.

NOTE: Observe mounting of special tool 11 4 341 on 1 cylinder.
Secure special tool 11 4 341 with bolts 11 4 345 to 25 Nm.

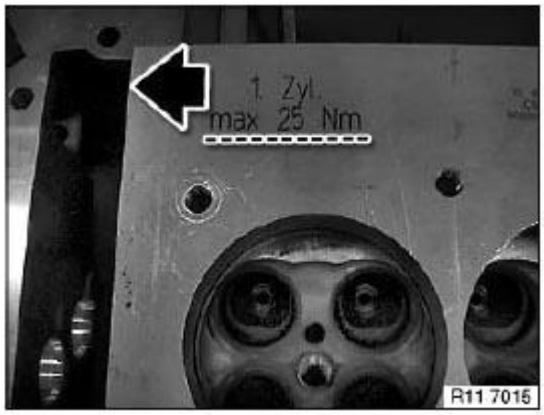


Fig. 60: Mounting Of Special Tool (11 4 341) On 1 Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation note:

1 cyl is marked.

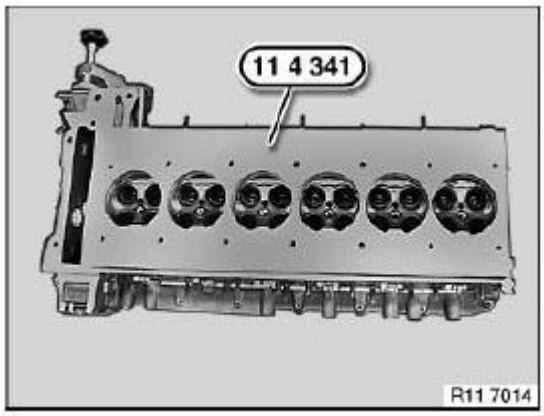


Fig. 61: Identifying Special Tool (11 4 341)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Sealing flange must rest flat.

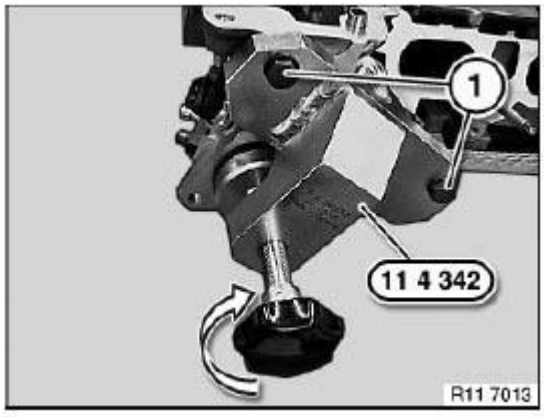


Fig. 62: Fitting Special Tool (11 4 342) With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: Compressed air at valve (2) must not exceed 3 bar.

Heat cylinder head to 60°.

Check for bubble formation in a water bath.

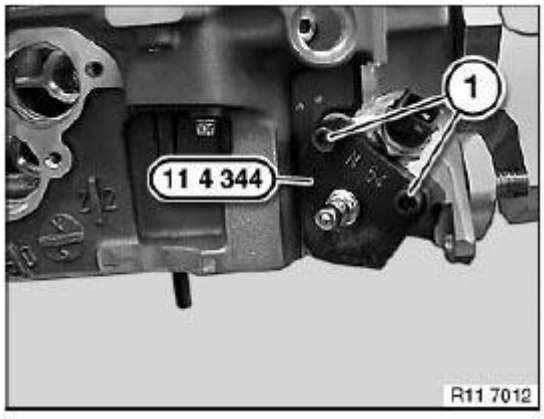


Fig. 63: Securing Special Tool (11 4 344) With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

OIL SUMP

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

IMPORTANT: When performing repair work on the engine oil, coolant or fuel circuit, you must protect the alternator against dirt contamination.

Risk of damage!

Cover alternator with suitable materials.

Failure to comply with this procedure may result in an alternator malfunction.

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

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

For reliable identification:

Aluminium screws/bolts are not magnetic .

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

Necessary preliminary tasks:

- Remove **FAN COWL** .
- Secure engine in **INSTALLATION POSITION**.

- Lower **FRONT AXLE** .
- Release **POWER STEERING PUMP** and place to one side

Observe tightening specifications without fail during installation.

- Drain and add **ENGINE OIL**.

NOTE: On vehicles with option SA205 (automatic transmission), it is necessary to remove the transmission oil cooler lines from the oil sump.

Release bolts (3) on transmission.

Tightening torque: 19 Nm

Detach return hose (2).

IMPORTANT: Bolts of oil sump have different lengths.

Observe different tightening torques.

Release screws along line (1).

Tightening torque:

ASA screw Oil sump (aluminium) to crankcase lower half. Aluminium screws/bolts are permitted with and without color coding (blue).	M8 x 26	Replace screw. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	Jointing torque: 8 Nm Angle of rotation: 60 °
ASA screw Oil sump (aluminium) to crankcase lower half. Aluminium screws/bolts are permitted with and without color coding (blue).	M8 x 112 / M8 x 92	Replace screw. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	Jointing torque: 8 Nm Angle of rotation: 180 °

Installation note:

Replace aluminum screws.

If necessary, release nuts (4). Remove oil level sensor.

Tightening torque: 8 Nm

Installation note:

Replace sealing ring.

IMPORTANT: There must be no adhesive residues in the lower crankcase section retaining threads.

Clean retaining threads and sealing surfaces.

Installation note:

Replace all gaskets.

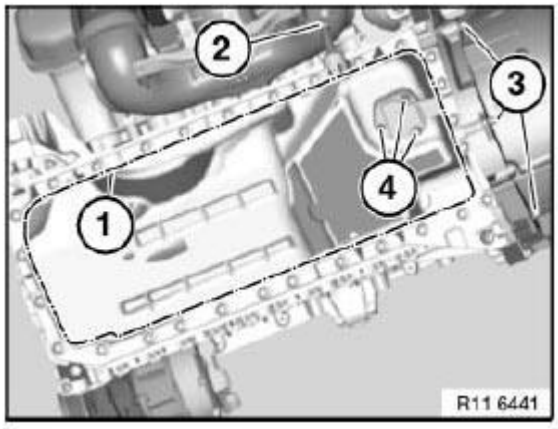


Fig. 64: Identifying Return Hose, Screw & Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

IMPORTANT: When performing repair work on the engine oil, coolant or fuel circuit, you must protect the alternator against dirt contamination.

Risk of damage!

Cover alternator with suitable materials.

Failure to comply with this procedure may result in an alternator malfunction.

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

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

For reliable identification:

Aluminium screws/bolts are not magnetic .

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

Necessary preliminary tasks:

- Remove **FAN COWL** .
- Remove **DRIVE SHAFTS**
- Secure **ENGINE IN INSTALLATION POSITION**.
- Lower **FRONT AXLE** .
- Release **POWER STEERING PUMP** and place to one side

  Observe tightening specifications without fail during installation.

- Drain and add **ENGINE OIL**.

NOTE: On vehicles with option SA205 (automatic transmission), it is necessary to remove the transmission oil cooler lines from the oil sump.

Release bolts (3) on transmission.

Tightening torque: 19 Nm

Detach return hose (2).

IMPORTANT: Bolts of oil sump have different lengths.

Observe different tightening torques.

Release bolts along line (1).

Tightening torque: see 2AZ and 3AZ in **11 13 OIL PAN** .

Installation note:

Replace aluminum screws.

If necessary, release nuts (4). Remove oil level sensor.

Tightening torque: 8 Nm

Installation note:

Replace sealing ring.

IMPORTANT: There must be no adhesive residues in the lower crankcase section retaining threads.

Clean retaining threads and sealing surfaces.

Installation note:

Replace all gaskets.

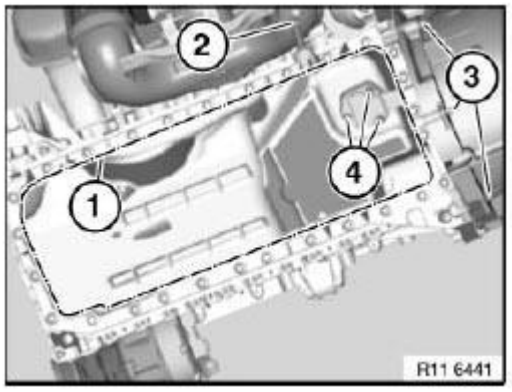


Fig. 65: Identifying Bolts On Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

HOUSING COVER

11 14 005 REPLACING FRONT CRANKSHAFT SEAL

Special tools required:

- **11 0 371**
- **11 0 372**
- **11 4 370**
- **11 9 221**
- **11 9 222**
- **11 9 224**
- **11 9 231**
- **11 9 232**
- **11 9 233**

- **11 9 234**

Necessary preliminary tasks:

- Remove **VIBRATION DAMPER**.

IMPORTANT: Do not release central bolt.

Risk of damage

If the central bolt is released, the sprocket wheels of the timing chain and the oil pump will no longer be non-positively connected to the crankshaft. The camshafts to the crankshaft can warp.

The timing must be ADJUSTED again.

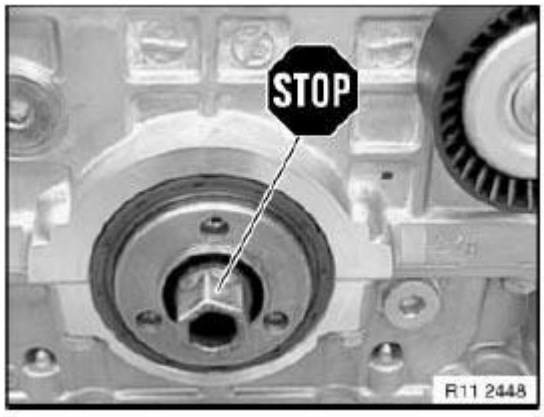


Fig. 66: Identifying Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Turn back special tool 11 9 222.

Push special tool **11 9 221** onto crankshaft.

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

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

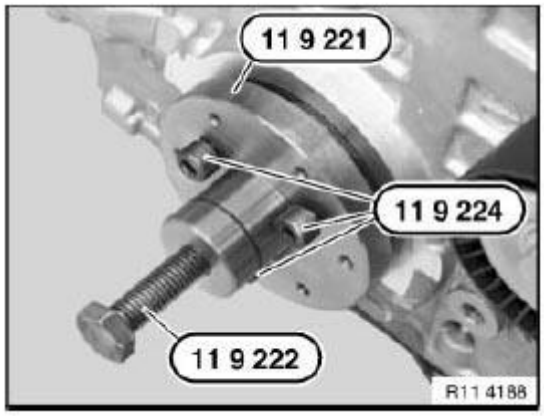


Fig. 67: Identifying Special Tool (11 9 222) (11 9 224) And (11 9 222)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Screw in spindle **11 0 372.**

Release crankshaft seal from housing.

Repeat the operation several times if necessary.

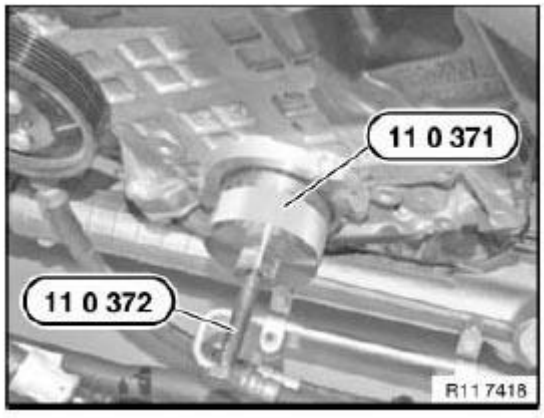


Fig. 68: Screwing Special Tool (11 0 371) Into Crankshaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

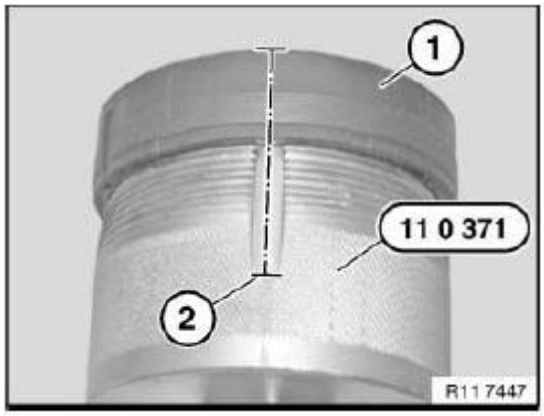


Fig. 69: Identifying Crankshaft Seal And Cutting Line With Special Tool (11 0 371)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation note:

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

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

Illustration N42.

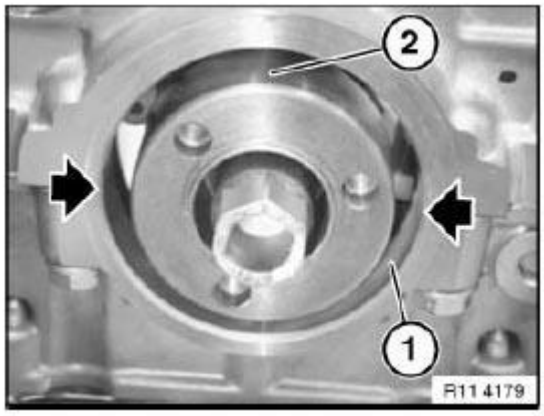


Fig. 70: Identifying Sealing Cleaning Area And Running Surface Of Crankshaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

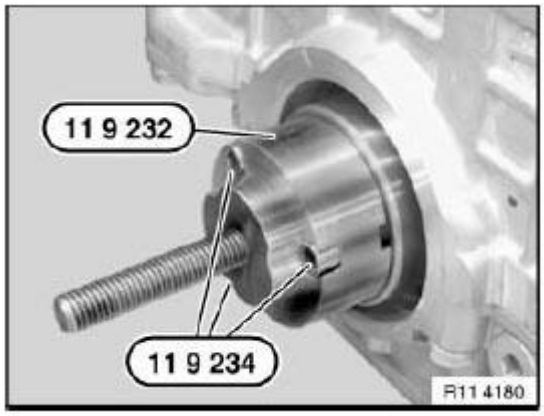


Fig. 71: Screwing Special Tool (11 9 232) With Screws (Special Tool (11 9 234)) To Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Support sleeve (1) is supplied with crankshaft seal (2).

When crankshaft seal (2) is installed, only support sleeve (1) may be used as a slip sleeve.

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

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

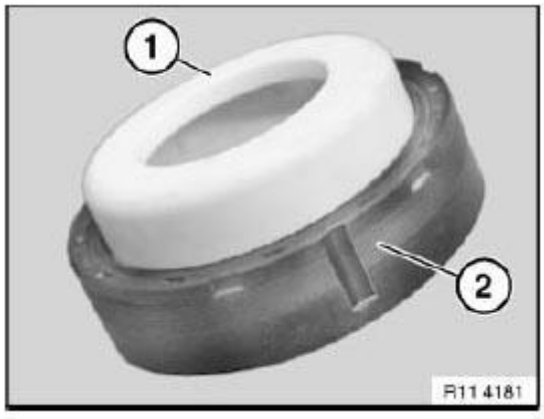


Fig. 72: Identifying Sleeve And Crankshaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

Screw on metering needle.

Insert piston for pressing out or use special tool **11 4 370.**

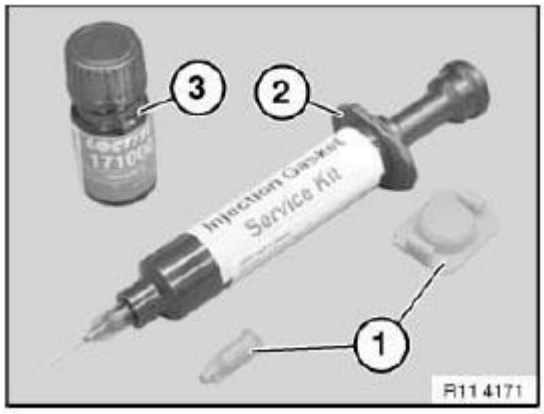


Fig. 73: Identifying Screw Caps And Injector
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

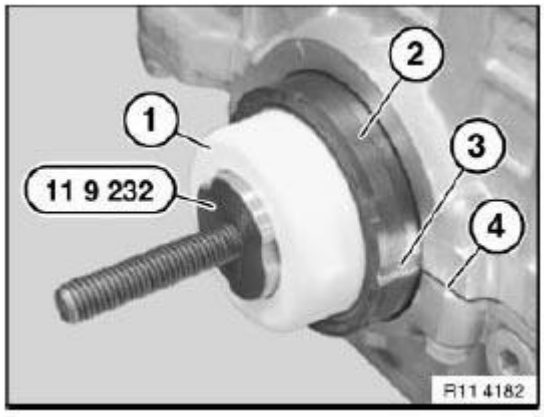


Fig. 74: Identifying Support Sleeve, Crankshaft Seal, Groove, Housing Partition And Special Tool (11 9 232)
Courtesy of BMW OF NORTH AMERICA, INC.

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

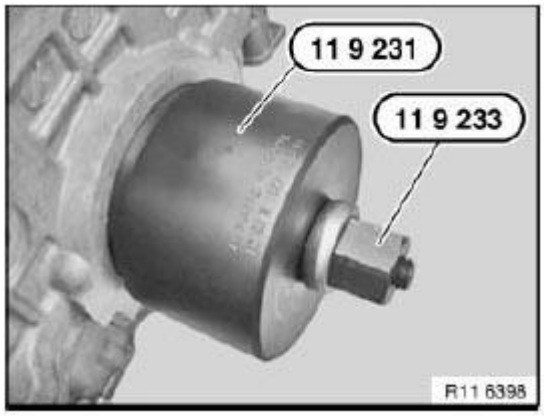


Fig. 75: Identifying Special Tools (11 9 231) And (11 9 233)
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

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

Graphic shows an N42 engine by way of example.

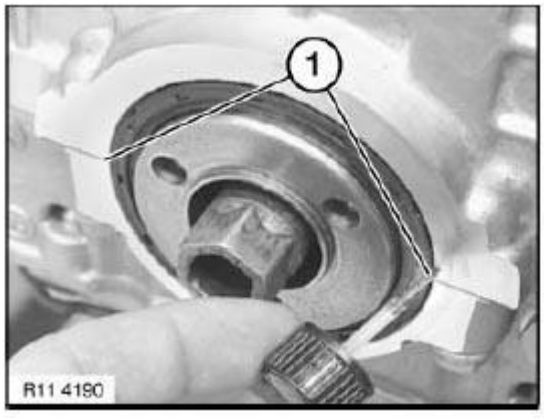


Fig. 76: Inserting Brush Into Grooves On Crankshaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Using injector/syringe (2), fill both grooves (3) flush with sealant.

Graphic shows an N42 engine by way of example.

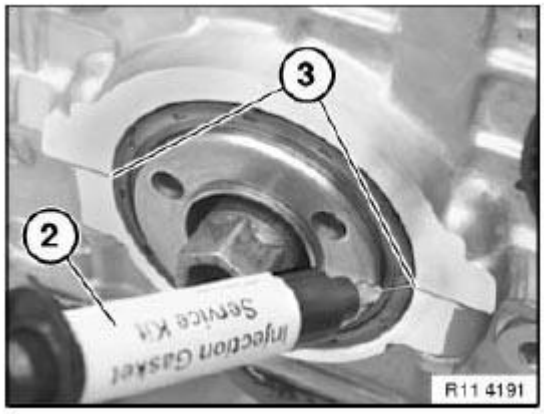


Fig. 77: Filling Both Grooves Flush With Sealant Using Injector/Syringe
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Graphic shows an N42 engine by way of example.

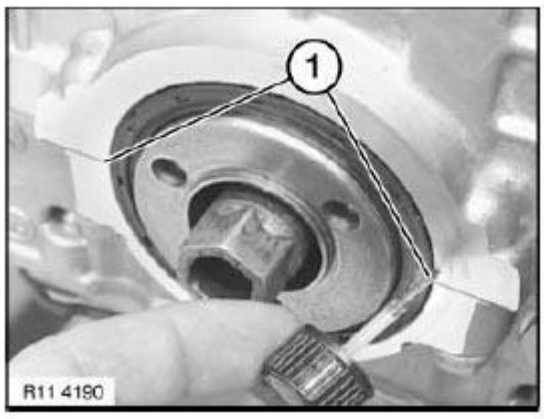


Fig. 78: Coating Surface Of Sealing Compound In Both Grooves With Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 010 REPLACING SEALING CAP FOR VACUUM PUMP

Special tools required:

- **11 8 531**
- **11 8 532**
- **11 8 533**

- **11 8 535**
- **11 8 537**

Necessary preliminary tasks:

- Remove **FAN COWL** .
- Remove alternator **DRIVE BELT**.
- Remove both drive belt **TENSIONERS**.

NOTE: For purposes of clarity, illustrations show alternator and servo pump.

Secure special tool **11 8 531** with special tool **11 8 535.**

Twist out special tool **11 8 533** in direction of arrow until special tool **11 8 532** is released from mounting.

Secure special tool **11 8 532** against falling down.

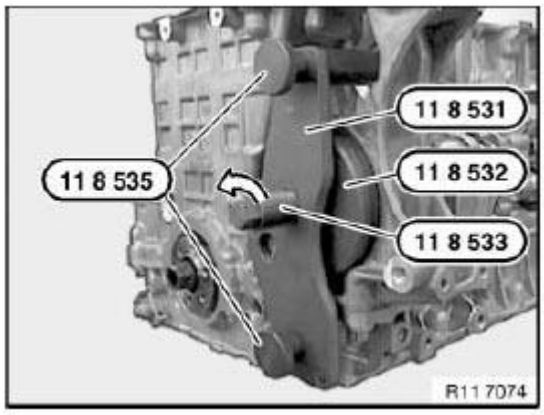


Fig. 79: Twisting Out Special Tool (11 8 533) And (11 8 532)
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool **11 8 532** by hand on sealing cover.

Screw in special tool 11 8 544.

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

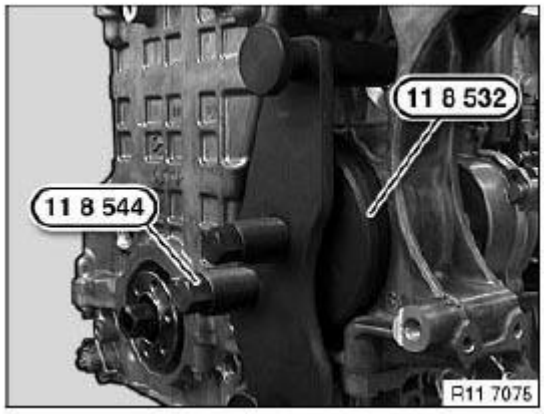


Fig. 80: Positioning Special Tool (11 8 532) On Sealing Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in new sealing cover (1) with special tools **11 8 532** and **11 8 533** until flush with housing.

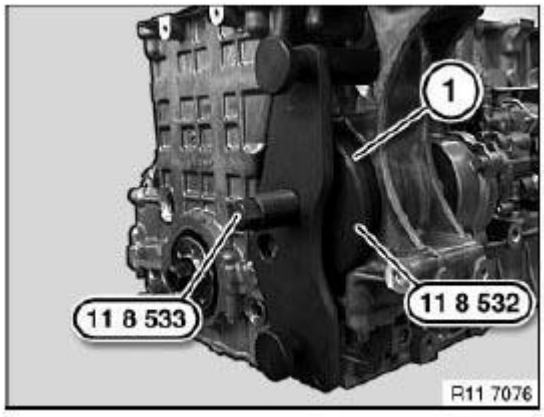


Fig. 81: Identifying Sealing Cover With Special Tools (11 8 532) And (11 8 533)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 151 REPLACING RADIAL CRANKSHAFT SEAL ON TRANSMISSION SIDE (UP TO 12/31/08)

Special tools required:

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

Necessary preliminary tasks:

- Remove transmission.
- Remove **FLYWHEEL**.

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

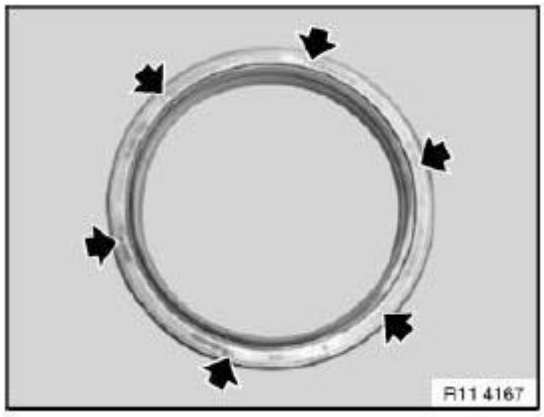


Fig. 82: Locating Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

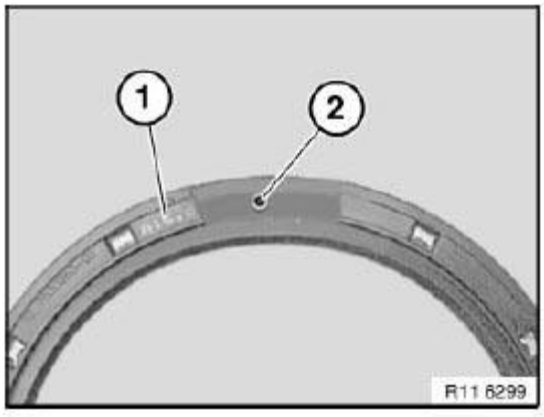


Fig. 83: Identifying Rubber Coating
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

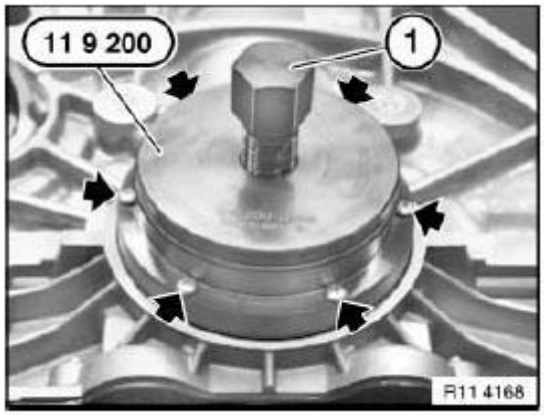


Fig. 84: Locating Metal Screws With Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

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

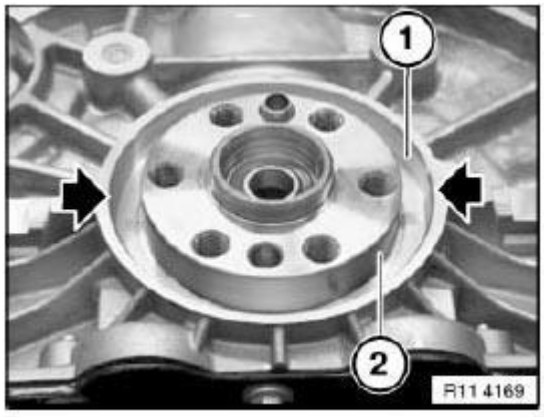


Fig. 85: Identifying Sealing Cleaning Area And Radial Shaft Seal Running Surface Area
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Support sleeve (4) is supplied with radial shaft seal (1).
When radial shaft seal (1) is installed, only support sleeve (4) may be used as a slip sleeve.
Radial shaft seal (1) has a groove (2) on both left and right sides.

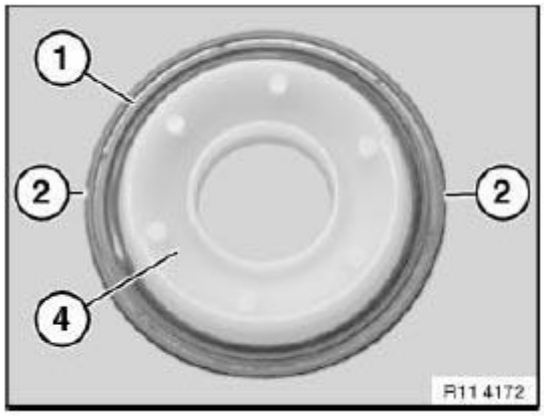


Fig. 86: Identifying Radial Shaft Seal, Groove And Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: The seal between the engine block and radial seal is described below. The engine block will not be leakproof at the outside of the radial seal if you fail to comply with the individual work steps and the work sequence.

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

Screw on metering needle.

Insert piston for pressing out.

Injector (2) contains the sealing compound Loctite, manufacturer's number 193140.

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

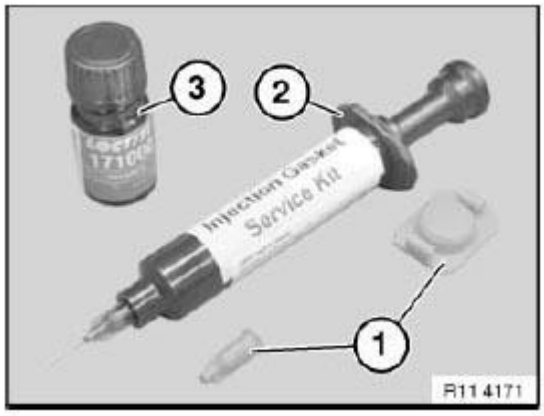


Fig. 87: Identifying Screw Caps And Injector
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

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

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

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

Carefully remove support sleeve (4).

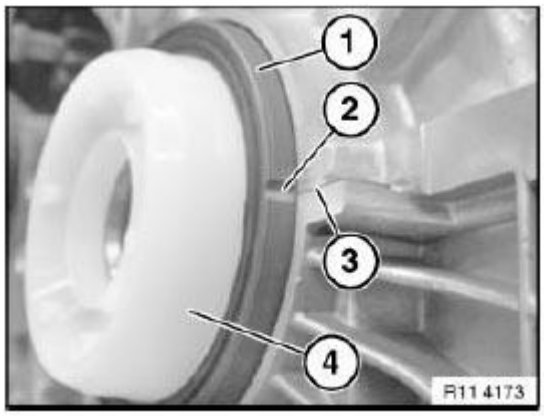


Fig. 88: Identifying Sleeve, Radial Shaft Seal, Groove And Housing Partition
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

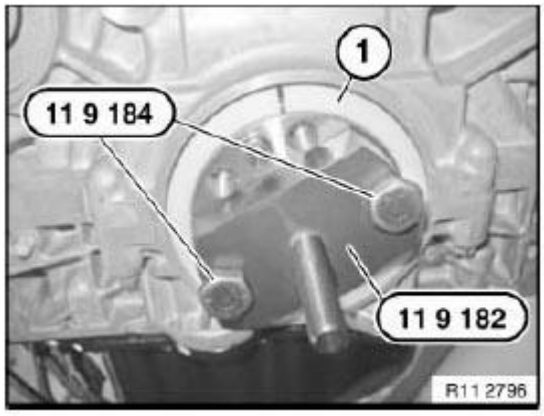


Fig. 89: Identifying Spacer Ring With Special Tool (11 9 182) And (11 9 184)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Then remove spacer ring again.

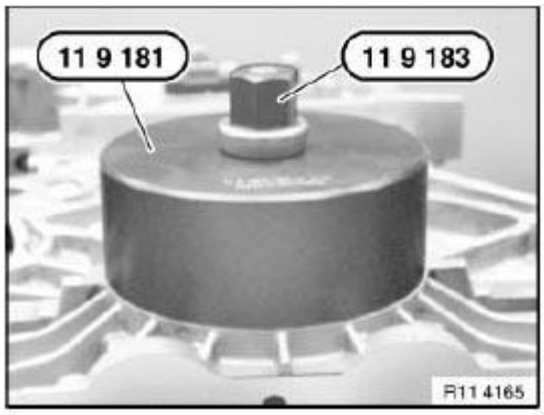


Fig. 90: Identifying Special Tools (11 9 181) And (11 9 183)
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

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

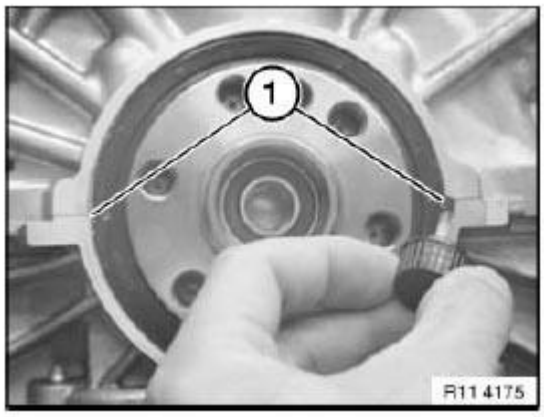


Fig. 91: Coating Surface Of Sealing Compound In Both Grooves With Loctite Primer, Manufacturer Number 171000
Courtesy of BMW OF NORTH AMERICA, INC.

Fill both grooves (1) flush with Loctite sealing compound, manufacturer's number 193140.

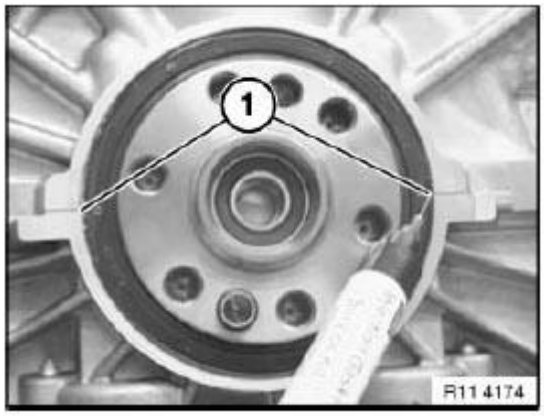


Fig. 92: Filling Both Grooves Flush With Loctite Sealing Compound
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: Loctite primer, manufacturer's number 171000, binds the Loctite sealing compound, manufacturer's number 193140, and prevents leakage.

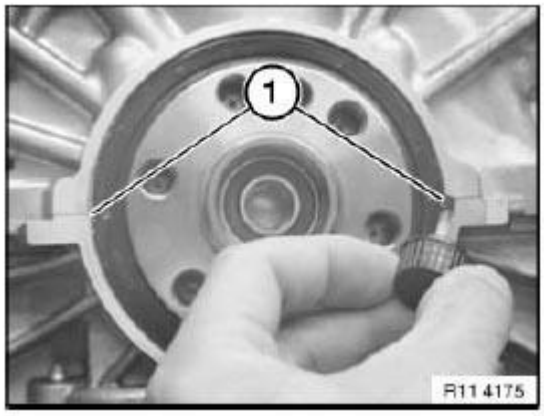


Fig. 93: Coating Surface Of Sealing Compound In Both Grooves With Loctite Primer, Manufacturer Number 171000
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 151 REPLACING RADIAL CRANKSHAFT SEAL ON TRANSMISSION SIDE (FROM 1/1/09)

Necessary preliminary tasks:

- Remove **FLYWHEEL**.

IMPORTANT: Magnet wheel (1) is magnetic.

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

Remove magnet wheel (1) from crankshaft.

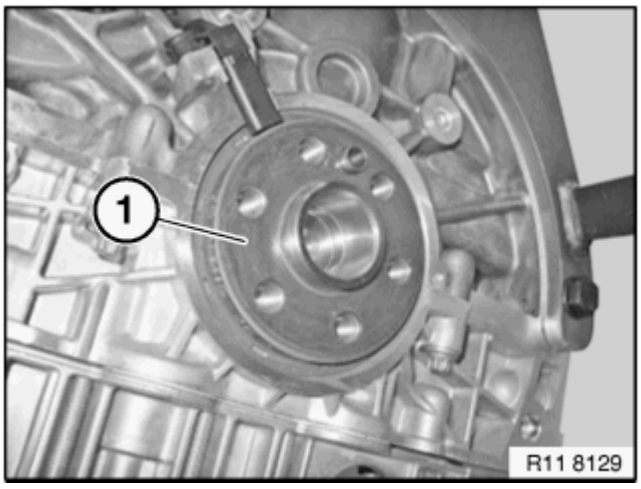


Fig. 94: Identifying Magnet Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw on pulse sensor (1).

Slide pulse sensor (2) upwards.

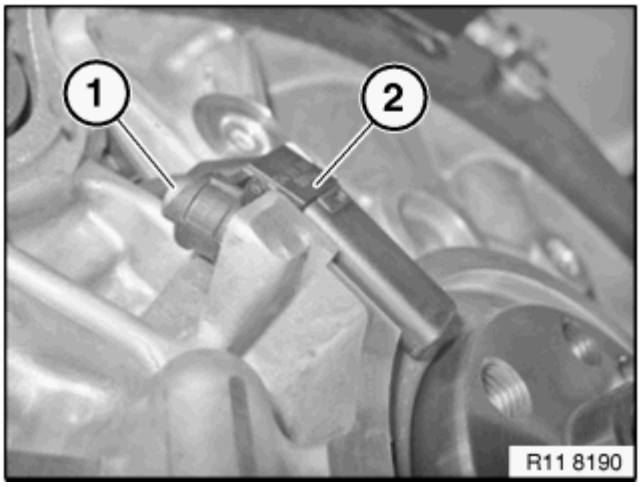


Fig. 95: Identifying Pulse Sensor And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Drill size maximum 2.5 millimeters.

Remove shavings immediately.

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

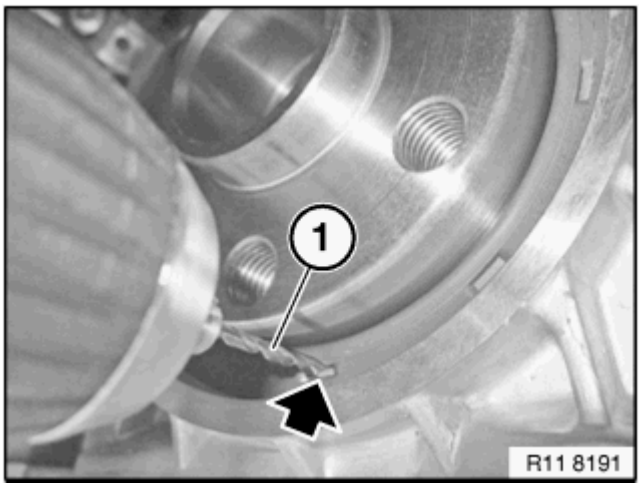


Fig. 96: Drilling Hole In Radial Shaft Seal Using Drill
Courtesy of BMW OF NORTH AMERICA, INC.

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

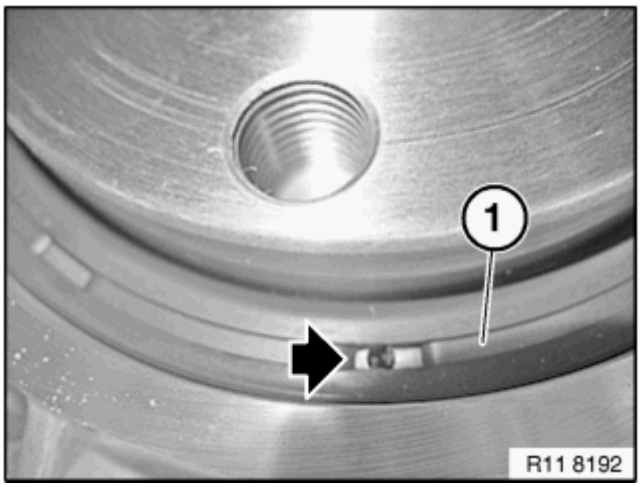


Fig. 97: Identifying Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

IMPORTANT: Immediately carefully remove residual shavings.

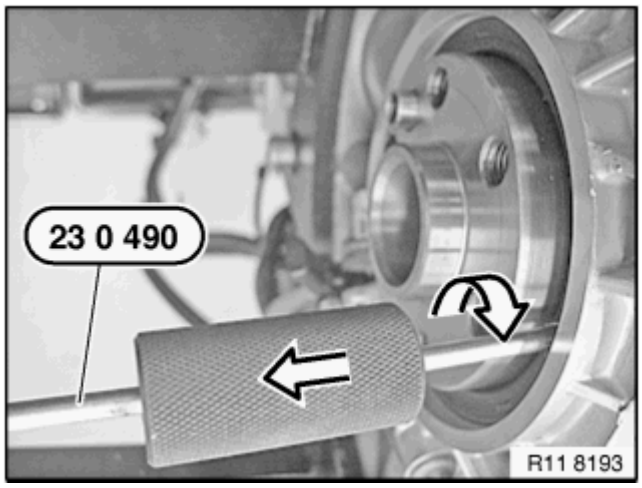


Fig. 98: Screwing In Special Tool 23 0 490 In Clockwise Direction
Courtesy of BMW OF NORTH AMERICA, INC.

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

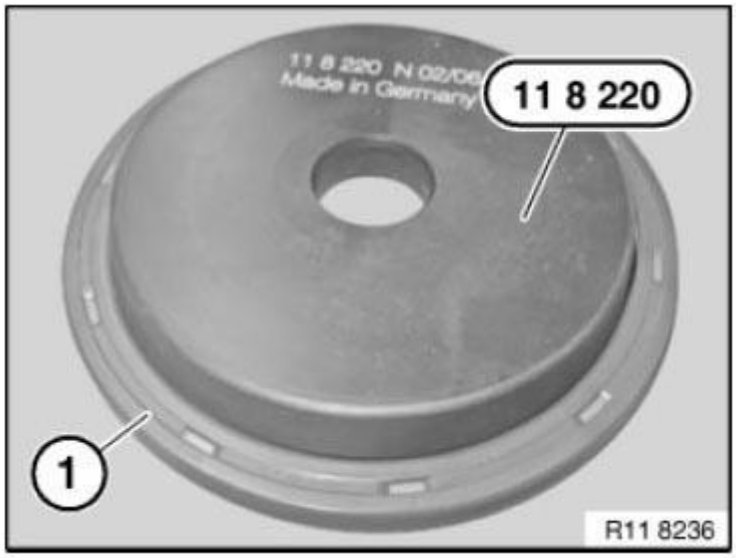


Fig. 99: Identifying Radial Shaft Seal On Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

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

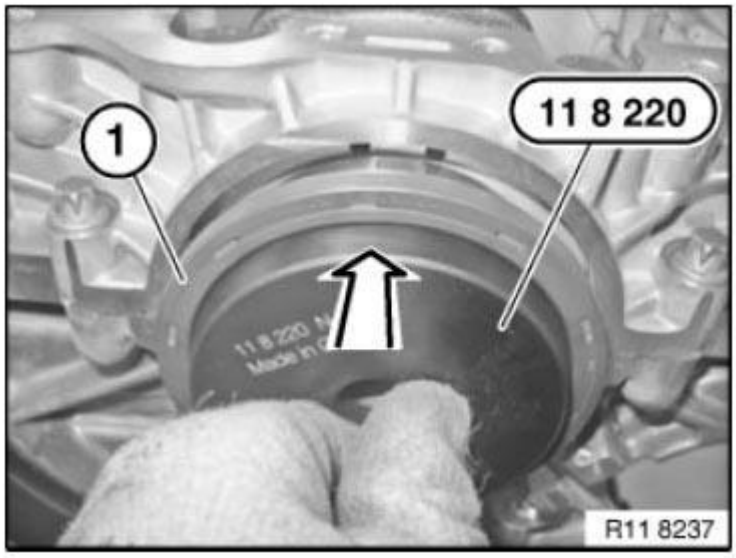


Fig. 100: Positioning Radial Shaft Seal Using Special Tool 11 8 220 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

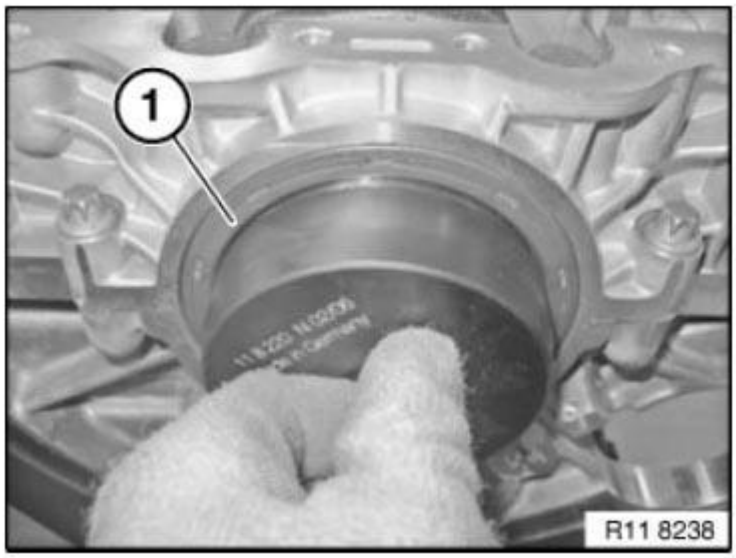


Fig. 101: Moving Radial Shaft Seal Parallel Up Against Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

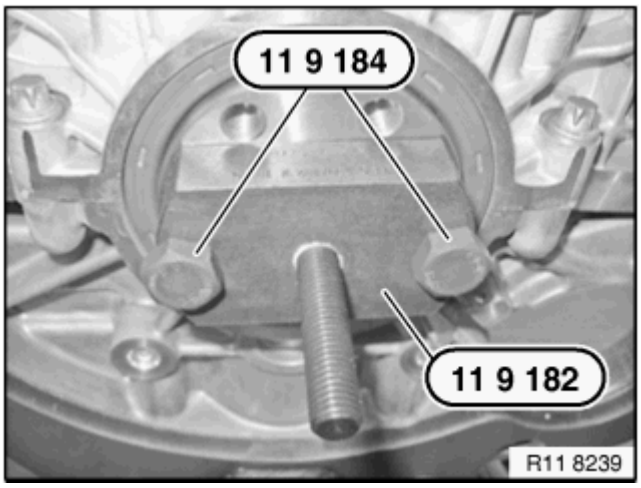


Fig. 102: Fastening Special Tool 11 9 182 With Special Tool 11 9 184 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

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

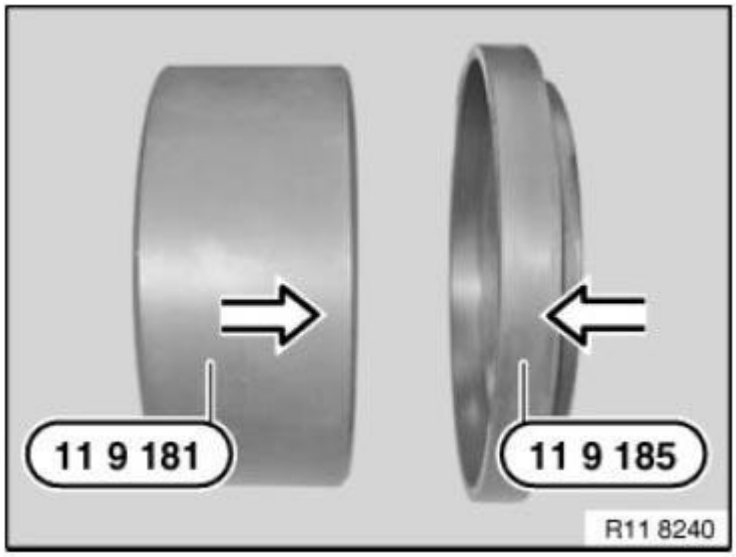


Fig. 103: Connecting Special Tool 11 9 185 Onto Special Tool 11 8 181
Courtesy of BMW OF NORTH AMERICA, INC.

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

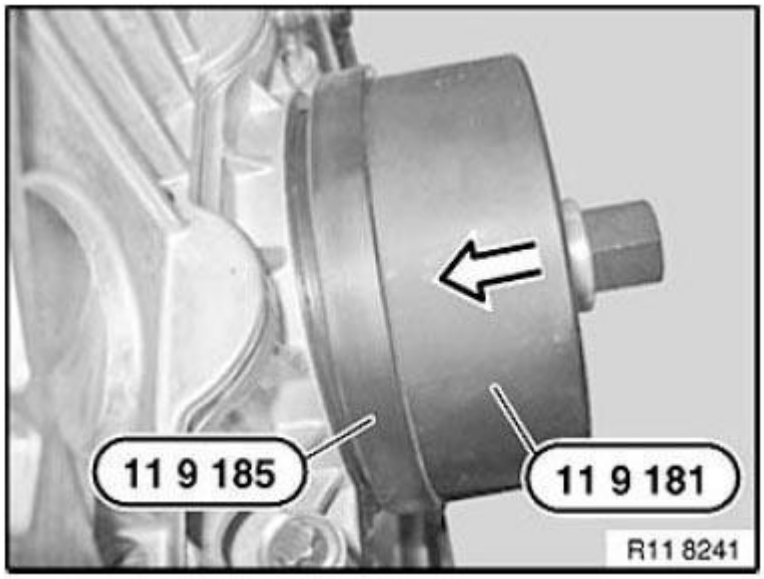


Fig. 104: Installing Rear Crankshaft Seal Using Tool 119 180/181
Courtesy of BMW OF NORTH AMERICA, INC.

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

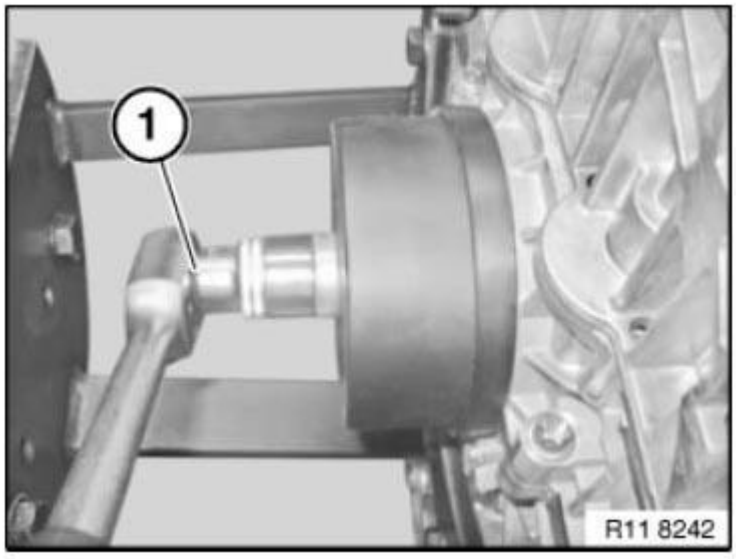


Fig. 105: Screwing On Radial Shaft Seal Using Special Tool 11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

CRANKSHAFT WITH BEARING

11 21 500 REPLACING CRANKSHAFT

Special tools required:

- **00 2 510**
- **00 9 120**
- **11 4 370**
- **11 4 440**
- **11 9 360**

IMPORTANT: Aluminium screws/bolts must be replaced each time they are released .

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

For reliable identification:

Aluminium screws/bolts are not magnetic .

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

Necessary preliminary tasks:

- Remove engine
- Mount engine on **ASSEMBLY STAND**
- Remove **VIBRATION DAMPER**
- Remove oil sump
- Remove **OIL PUMP**
- Remove **TRIANGULAR DRIVE** for oil pump
- Remove **TIMING CHAIN MODULE**
- Remove **CYLINDER HEAD**
- Remove **FLYWHEEL**
- Removing all **PISTONS**

Release bolts (1).

Tightening torque **11 13 5AZ** .

Installation note:

Replace aluminium screws.

Remove oil deflector (2).

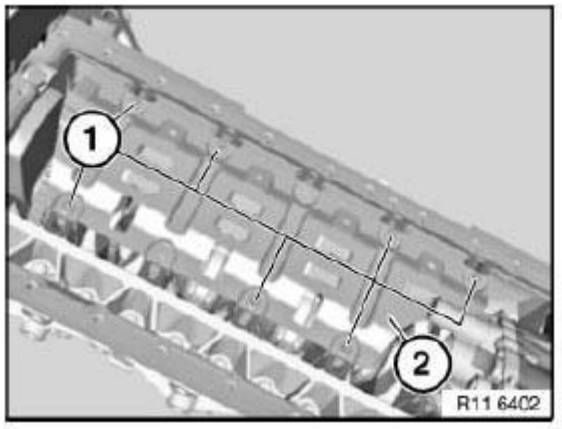


Fig. 106: Identifying Bolts And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1).

Tightening torque **11 11 2AZ** .

Release screws (2).

Tightening torque **11 11 3AZ** .

Installation note:

Replace aluminium screws.

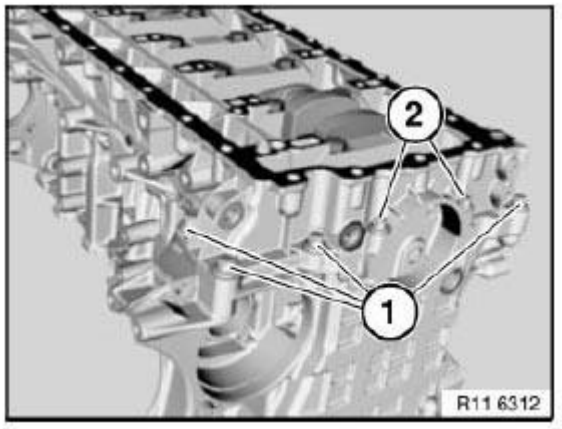


Fig. 107: Identifying Bolts And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1).

Tightening torque **11 11 4AZ** .

Release screws (2).

Tightening torque **11 11 2AZ** .

Installation note:

Replace aluminium screws.

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

Tightening torque **11 11 1AZ** .

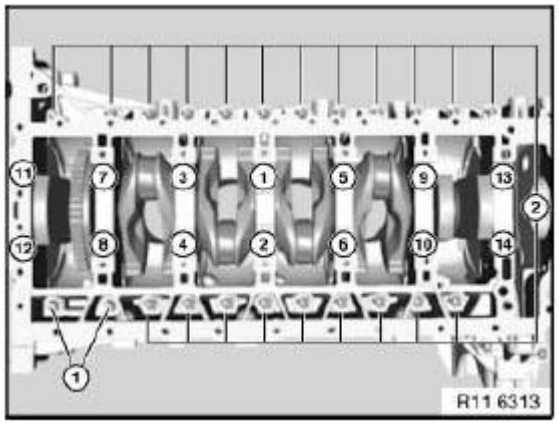


Fig. 108: Identifying Screws In Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1).

Tightening torque **11 11 3AZ** .

Installation note:

Replace aluminium screws.

Remove crankshaft lower section in upward direction.

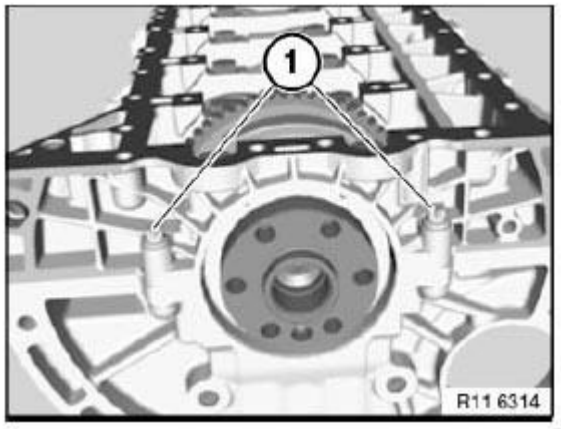


Fig. 109: Identifying Bolts Location
Courtesy of BMW OF NORTH AMERICA, INC.

Remove both crankshaft radial seals (1).

NOTE: Illustrations show N46.

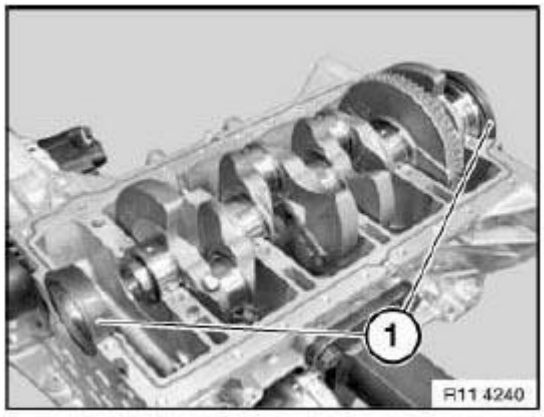


Fig. 110: Identifying Radial Shaft Seals
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **MAIN BEARING SHELLS** (2 and 3), replace if necessary.

Remove crankshaft (1) in direction of arrow.

IMPORTANT: Remove crankshaft with aid of a second person.

Weight of crankshaft approx. 25 kg.

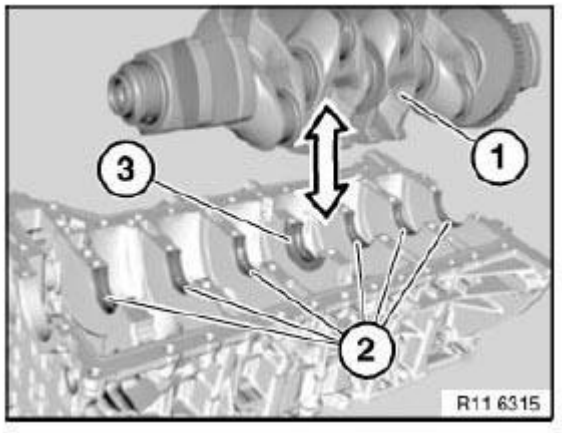


Fig. 111: Identifying Bearing Shell And Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Check guide sleeves (1) for damage and correct seating.

Reinstall crankshaft.

Installation note:

Lubricate all bearing points with engine oil.

Clean all sealing surfaces.

NOTE: Illustrations show N46.

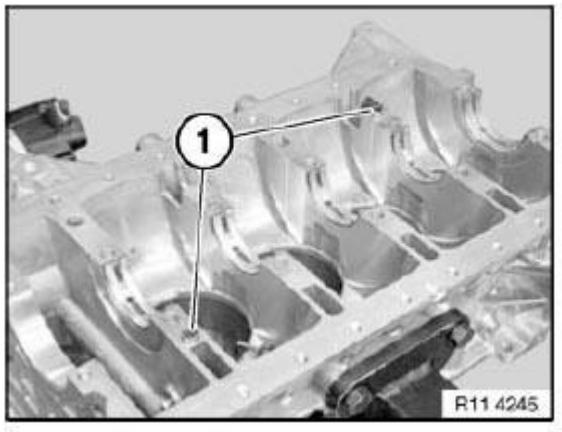


Fig. 112: Identifying Adapter Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 11 1AZ** .

Tighten screws (2) from inside outwards.

Tightening torque **11 11 2AZ** .

Tighten screws (1).

Tightening torque **11 11 4AZ** .

Installation note:

Replace aluminium screws.

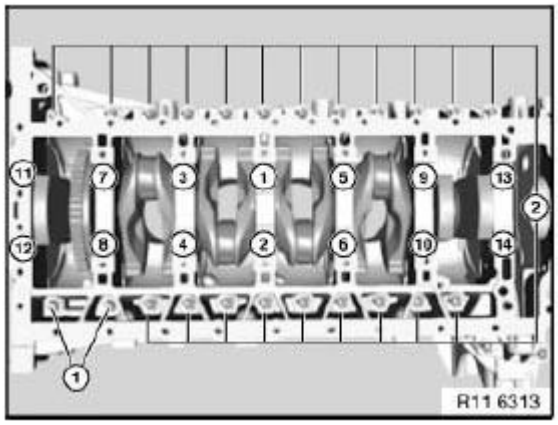


Fig. 113: Identifying Screws In Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten aluminium screws exclusively with special tool **00 9 120** .

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

Fig. 114: Identifying Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

Set up stand with magnetic base on special tool **11 4 440** .

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

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

Move crankshaft in direction of arrow.

Determine **BEARING PLAY** .

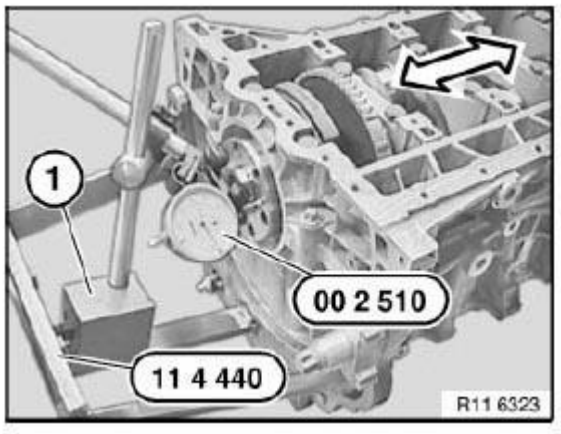


Fig. 115: Setting Up Stand With Magnetic Foot On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Always replace nozzles (1).

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

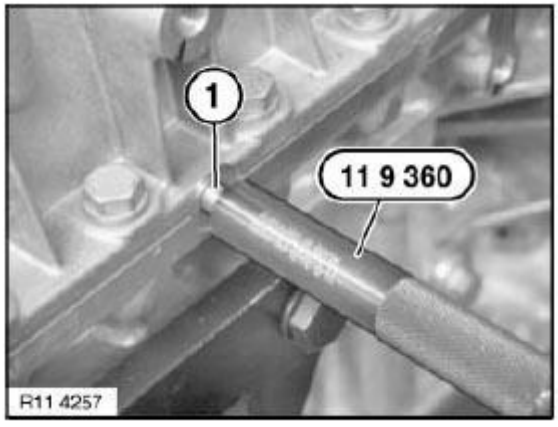


Fig. 116: Inserting Nozzles Using Special Tool 11 9 360
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace **CRANKSHAFT RADIAL SEAL at front** .

Replace **CRANKSHAFT RADIAL SEAL at rear** .

Installation note:

Use primer and liquid gasket:

- Loctite 171000 primer, BMW part number 83 19 7 515 683
- Loctite 193140 liquid gasket, BMW part number 83 19 0 439 030

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

Screw on nozzle for injecting liquid gasket.

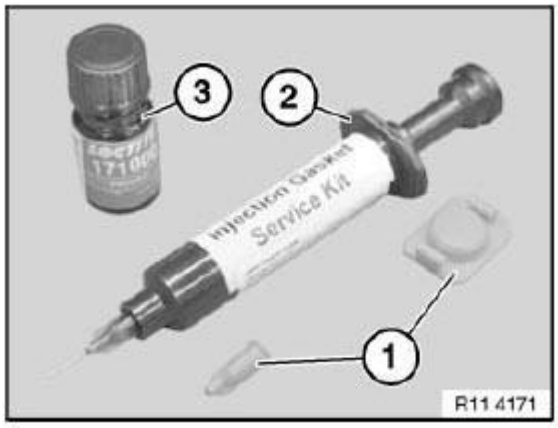


Fig. 117: Identifying Injector, Sealing Compound And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

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

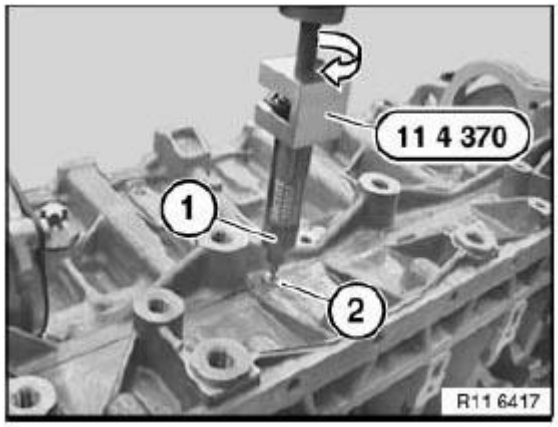


Fig. 118: Inserting Liquid Sealing Compound Using Special Tool 11 4 370
Courtesy of BMW OF NORTH AMERICA, INC.

Stop (seal off) escaping liquid sealing compound with primer (Loctite 171000 primer, BMW part number 83 19 7 515 683).

(Graphic shows N40).

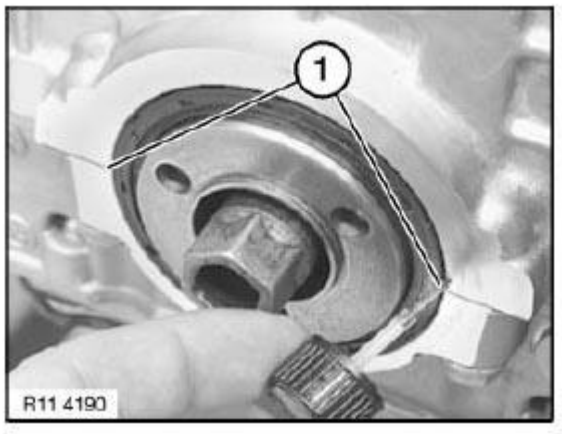


Fig. 119: Stopping Escaping Liquid Sealing Compound Using Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 21 505 SEALING CRANKCASE LOWER SECTION

IMPORTANT: Aluminium-magnesium materials.

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

A magnesium crankcase requires aluminum screws/bolts exclusively.

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

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

For reliable identification:

Aluminum screws/bolts are not magnetic.

Risk of damage!

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

IMPORTANT: Changed procedure.

It is not necessary to remove the cylinder head and the crankshaft.

Necessary preliminary tasks:

- Remove engine.
- Mount engine on **ASSEMBLY STAND**.
- Remove **CLUTCH** (if fitted).
- Remove **LEFT** and **RIGHT** engine support arm.
- Remove oil sump.

Release screws (1).

Pull out oil pump intake pipe (2).

Tightening torque:

ASA screw Oil deflector to crankcase lower half. Aluminium screws/bolts are permitted with and without color coding (blue).	M6 x 20	Replace screw. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	Jointing torque: 4 Nm Angle of rotation: 90 °

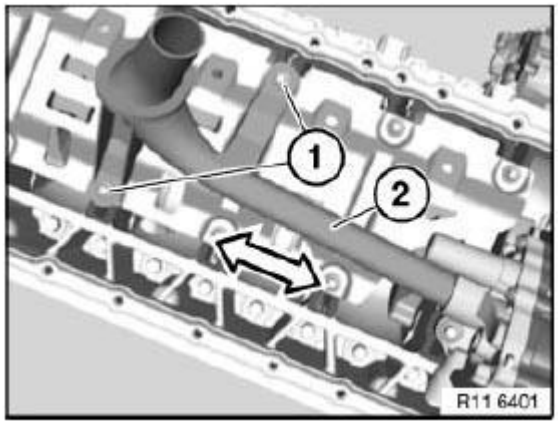


Fig. 120: Removing Pump Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque:

ASA screw Oil deflector to crankcase lower half. Aluminium screws/bolts are permitted with and without color coding (blue).	M6 x 20	Replace screw. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	Jointing torque: 4 Nm Angle of rotation: 90 °

Installation note:

Replace aluminum screws.

Remove oil deflector (2).

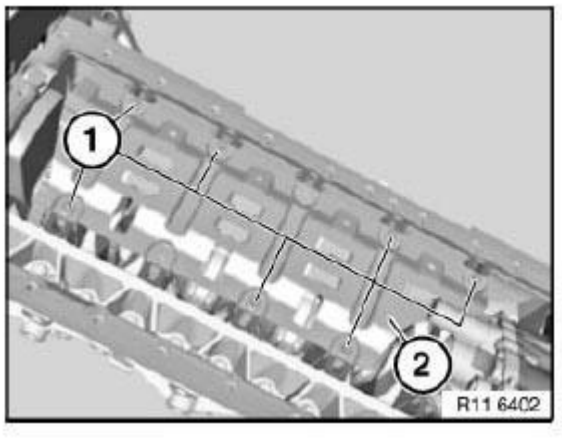


Fig. 121: Identifying Oil Deflector And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Secure oil pump drive gear with 6.0 mm dia. steel pin (3) to oil pump.

IMPORTANT: Release central bolt (2) only together with 6.0 mm dia. steel pin (3).

Do not remove sprocket.

Release central bolt (2).

Tightening torque:

Sprocket to oil pump	M8	Jointing torque: 20 Nm Angle of rotation: 45 °

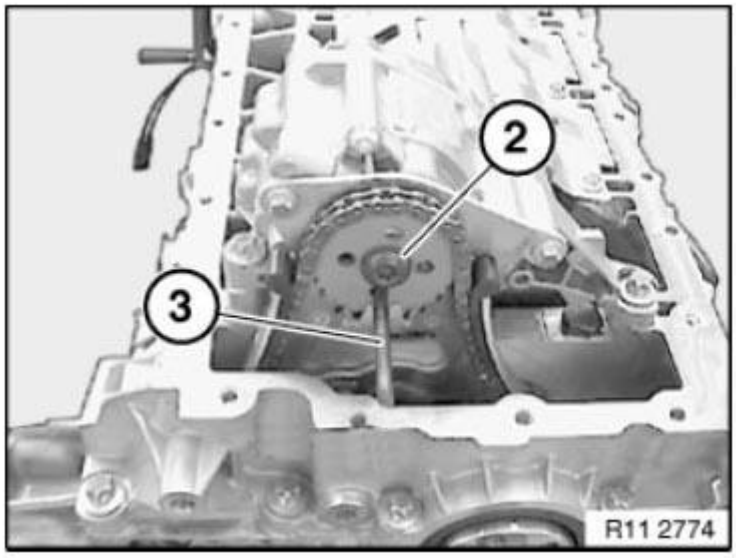


Fig. 122: Identifying Oil Pump Drive Gear And Steel Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

Tightening torque:

Chain module to crankcase and oil pump	M6 x 16	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	Jointing torque: 4 Nm Angle of rotation: 45 °

Installation note:

Replace aluminum screws.

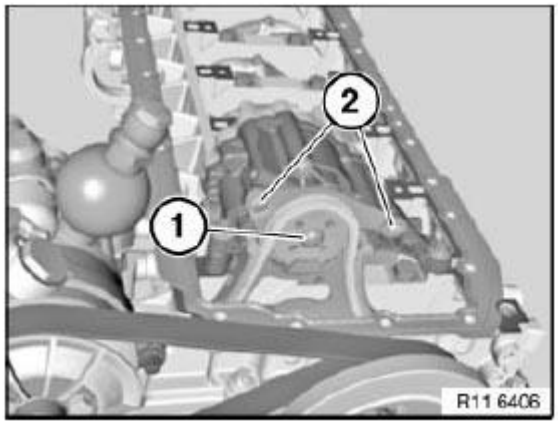


Fig. 123: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw plug (1) from crankcase at front.

NOTE: Replace gasket.

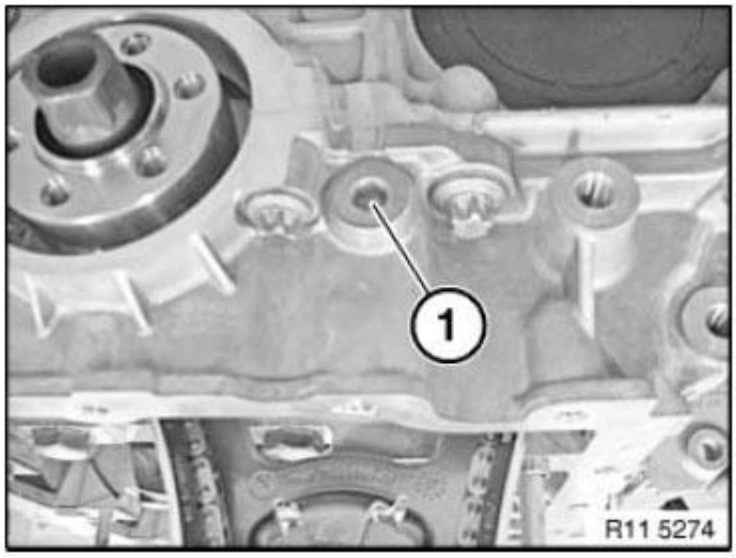


Fig. 124: Identifying Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

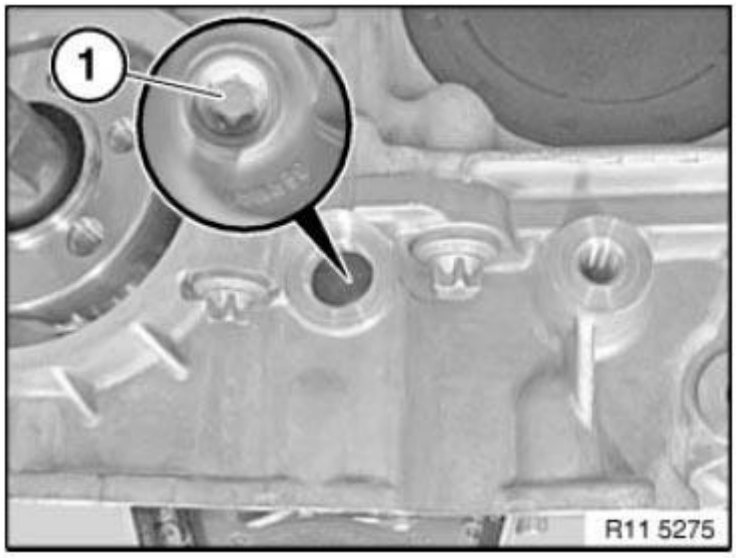


Fig. 125: Identifying Oil Pump Triangular Drive Mounting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Version 1

IMPORTANT: Observe different screw lengths.

Release screws (1).

Tightening torque:

Oil pump to bedplate	M8 x 123	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	Jointing torque: 10 Nm Angle of rotation: 180 °
	M8 x 31	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	Jointing torque: 10 Nm Angle of rotation: 90 °

Installation note:

Replace aluminum screws.

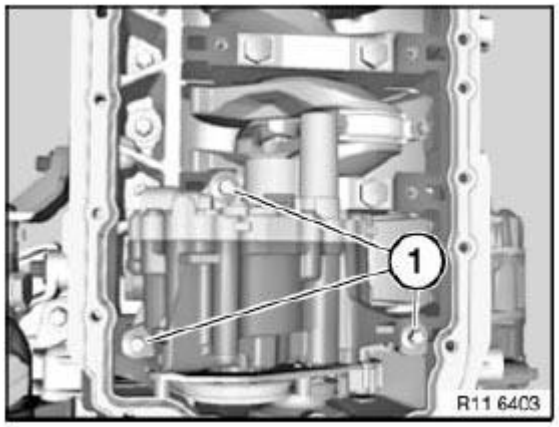


Fig. 126: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

IMPORTANT: Observe different screw lengths.

Release oil pump screws (1).

Tightening torque:

Oil pump to bedplate	M8 x 123	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	Jointing torque: 10 Nm Angle of rotation: 180 °
	M8 x 31	Replace screws. Thread repairs exclusively with aluminium Helicoil threaded insert. Jointing torque and angle of rotation must be observed without fail.	Jointing torque: 10 Nm Angle of rotation: 90 °

Installation note:

Replace aluminum screws.

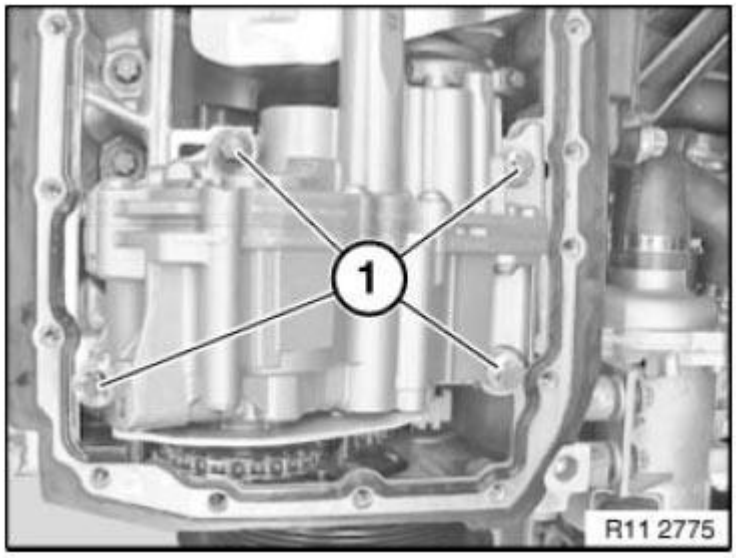


Fig. 127: Identifying Oil Pump Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach sprocket (1) in direction of arrow.

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

Do not remove camshaft sprocket.

Remove oil pump (2) in direction of arrow.

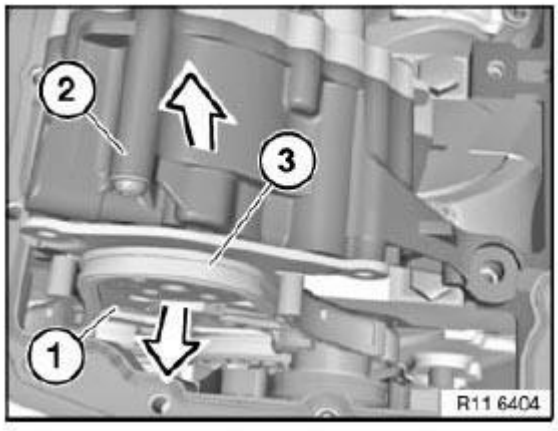


Fig. 128: Removing Sprocket
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

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

Install oil pump (2).

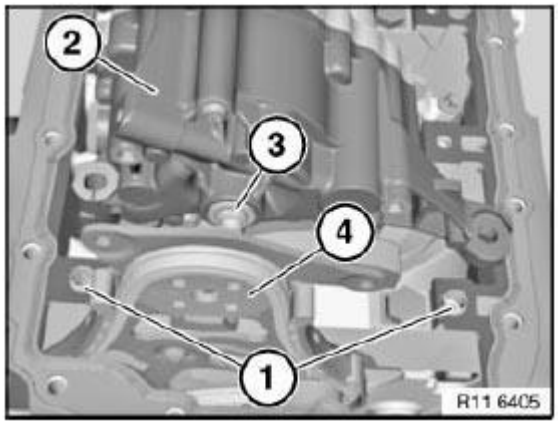


Fig. 129: Identifying Spacer Bushings And Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The dowel hole for the TDC setting is located on the intake side underneath the starter motor.

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

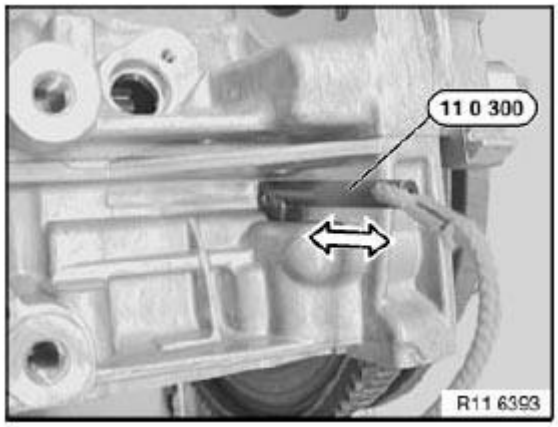


Fig. 130: Securing Flywheel In Position Using Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

Secure flywheel with special tool (1) 11 9 260 and special tool (2) 11 9 266.

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

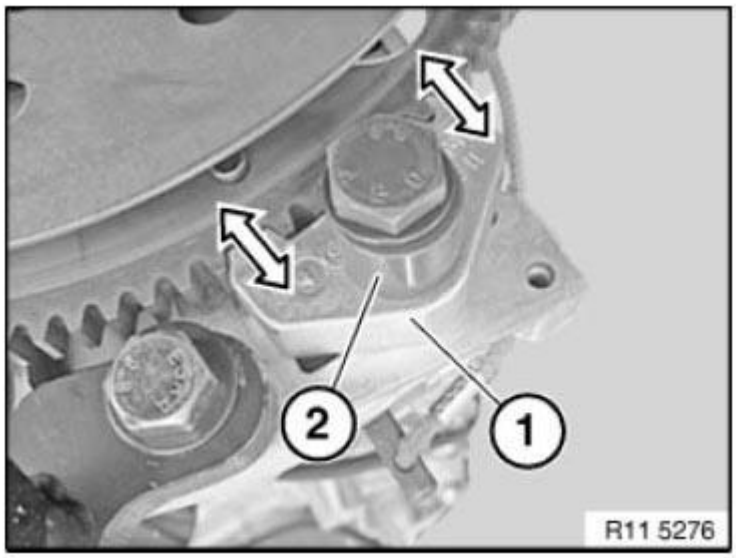


Fig. 131: Securing Flywheel Using Special Tool 11 9 260 And Special Tool 11 9 266
Courtesy of BMW OF NORTH AMERICA, INC.

Automatic transmission

Release flywheel bolts (1).

Release special tool (2).

Remove flywheel (3).

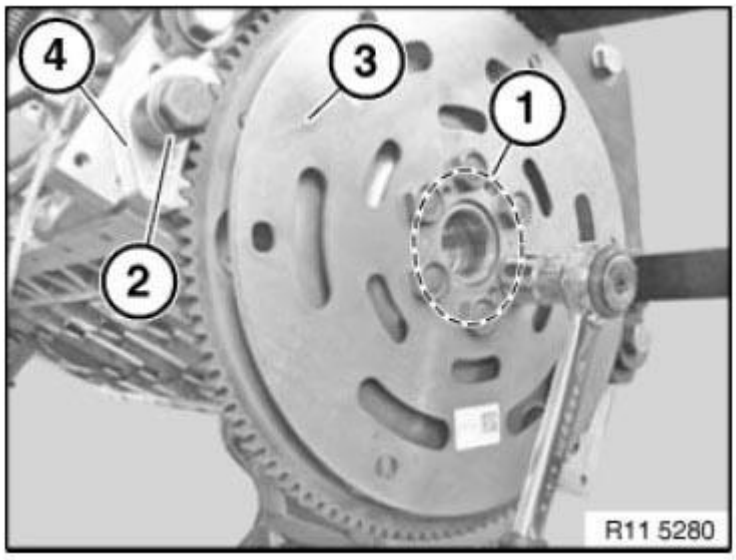


Fig. 132: Identifying Flywheel With Mounting Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Manual transmission

IMPORTANT: Position crankshaft at top dead center.

Remove dual-mass flywheel.

Secure flywheel with special tool 11 9 260 (holder).

Remove **VIBRATION DAMPER**.

Release flywheel bolts with special tool 11 4 180 (socket WAF 46).

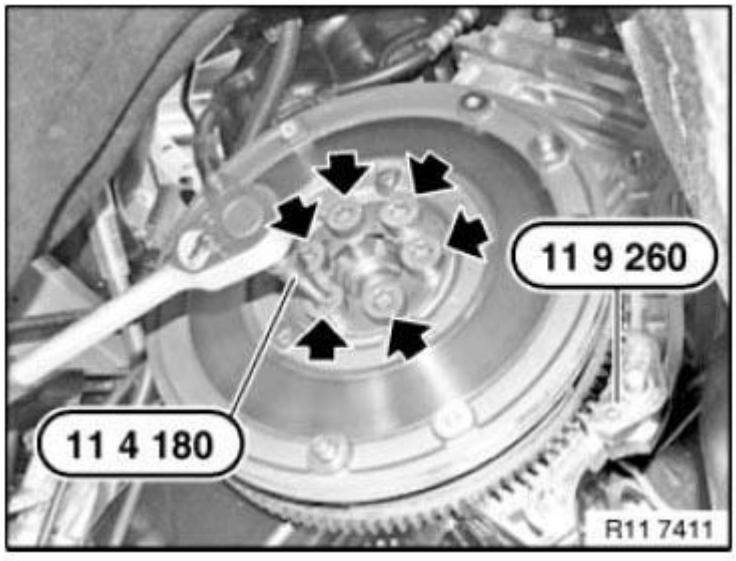


Fig. 133: Removing Flywheel Bolts Using Special Tool 11 4 180
Courtesy of BMW OF NORTH AMERICA, INC.

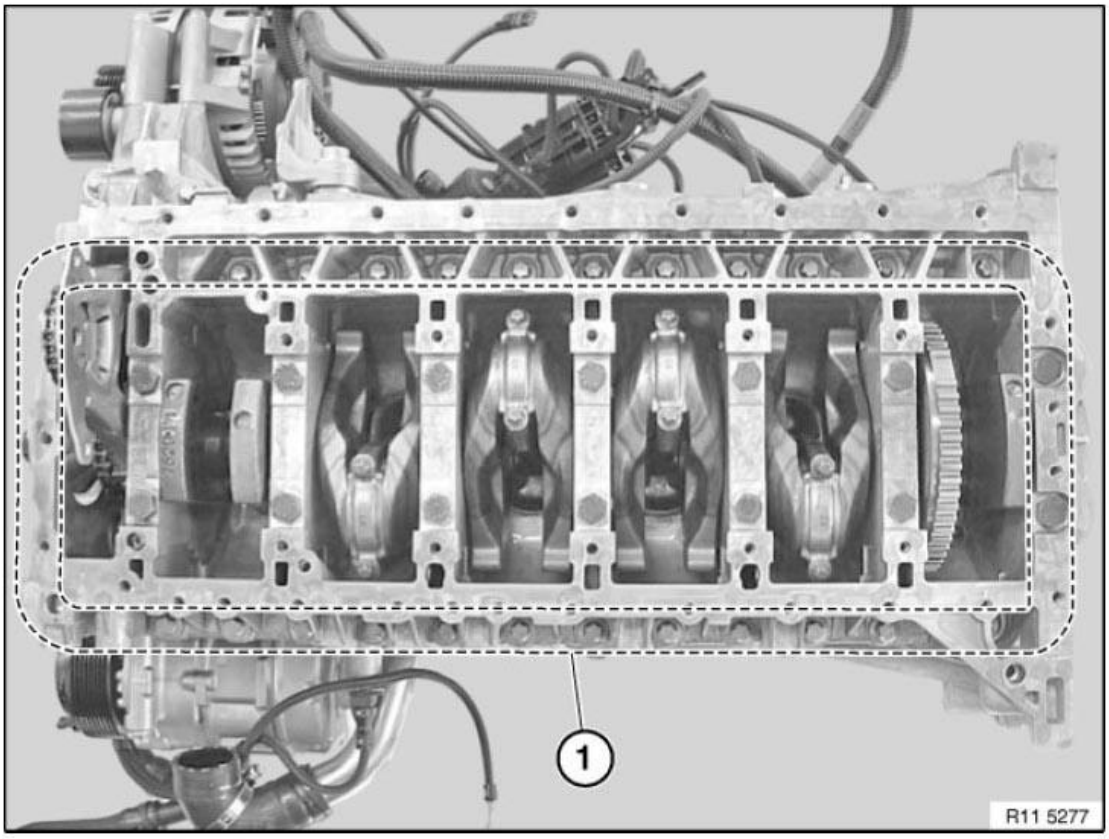


Fig. 134: Identifying Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

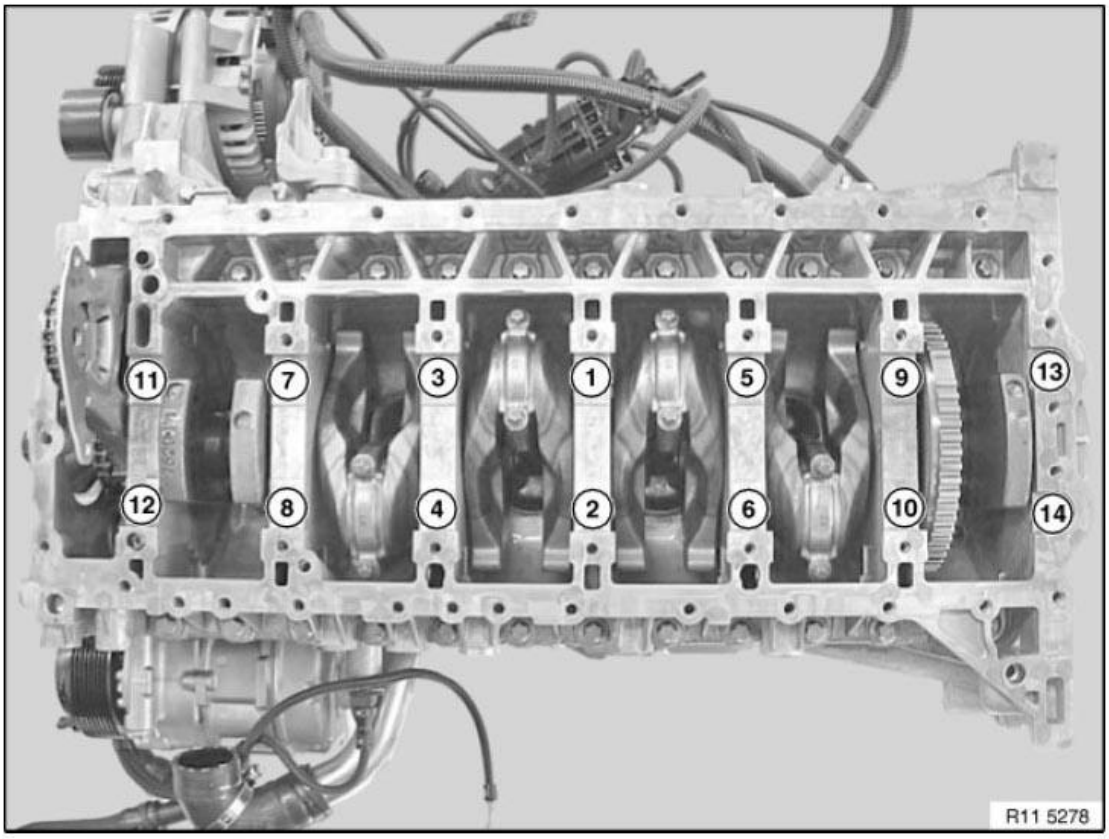


Fig. 135: Identifying Crankcase Bolt Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Release crankcase bolts M10 in sequence 14 to 1.

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

Remove crankcase lower section (1) upwards.

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

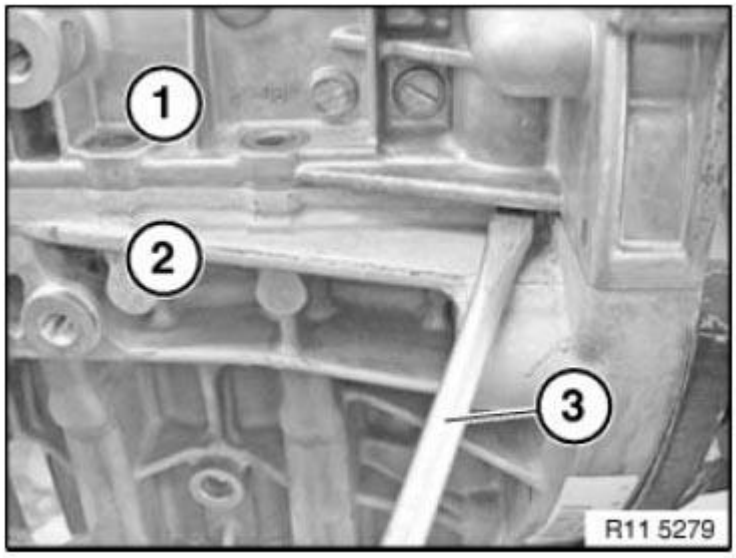


Fig. 136: Removing Crankcase Lower Section From Upper Section Using Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Timing chain is preloaded.

Do not raise crankshaft.

Carefully remove radial shaft seal (1).

Catch escaping engine oil with a cloth (2).

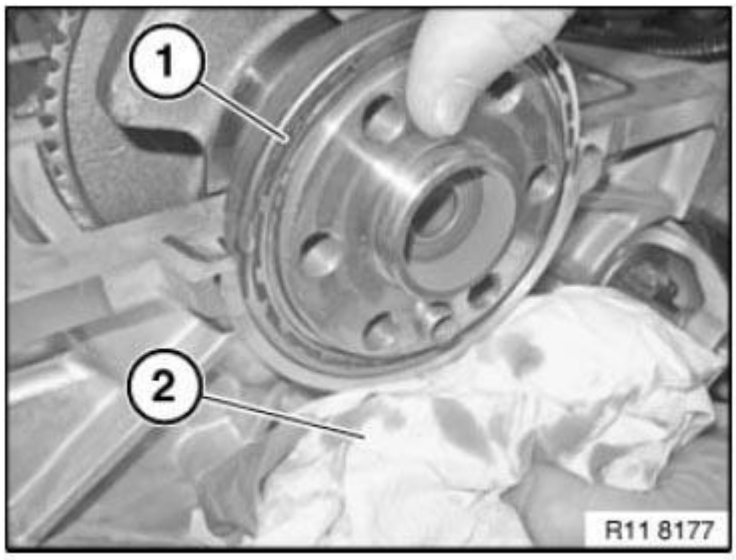


Fig. 137: Removing Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully remove radial shaft seal (1) towards front.

Catch escaping engine oil with a cloth (2).

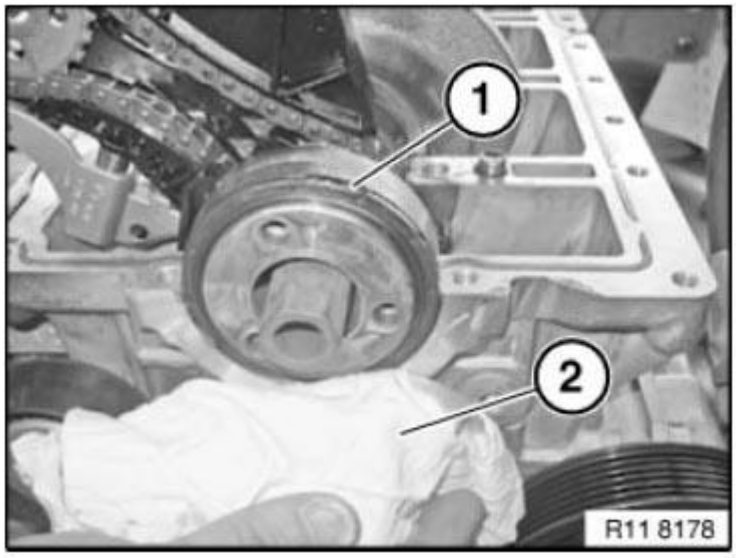


Fig. 138: Catching Escaping Engine Oil Using Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

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

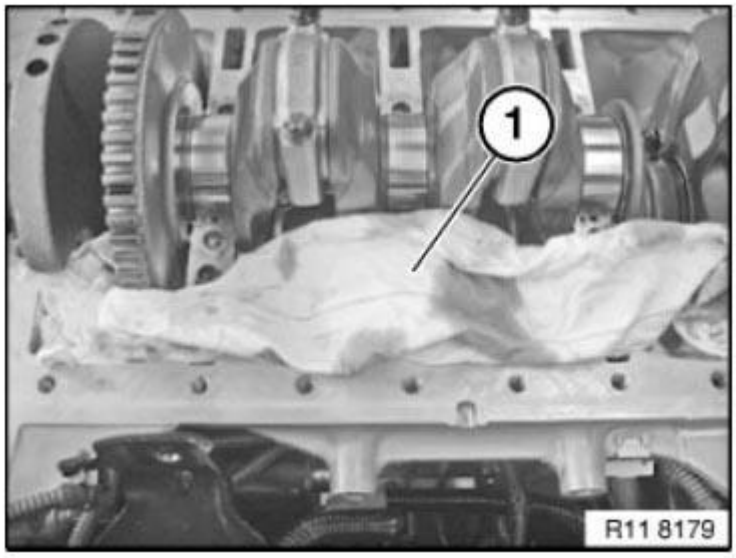


Fig. 139: Protecting Crankcase Against Sealant Residues Using Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sealing compound residues (1) with special tool 11 4 470 (cleaning kit).

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

Installation note:

Replace injector nozzles (2).

Clean all threads with compressed air.

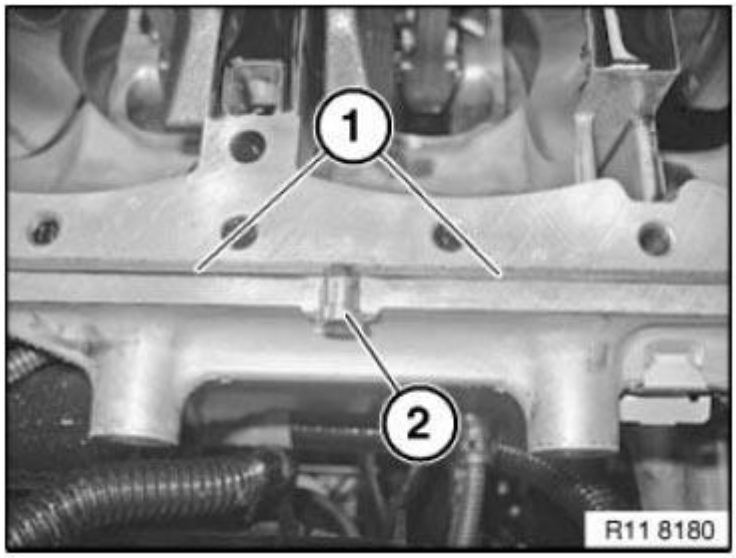


Fig. 140: Identifying Injector Nozzle And Sealing Compound Residue
Courtesy of BMW OF NORTH AMERICA, INC.

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

Screw in all M10 crankcase bolts.

Joint all M10 crankcase bolts (1) **20 NM** from inside outwards.

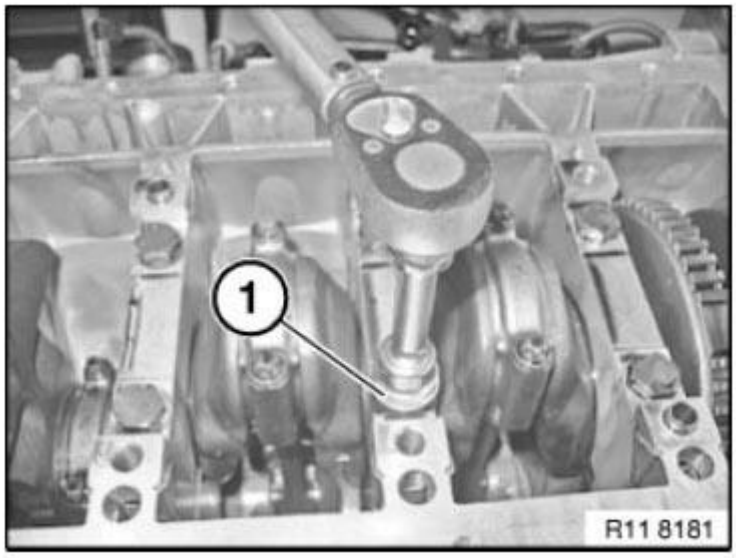


Fig. 141: Positioning Crankcase Lower Section On Crankcase Upper Section
Courtesy of BMW OF NORTH AMERICA, INC.

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

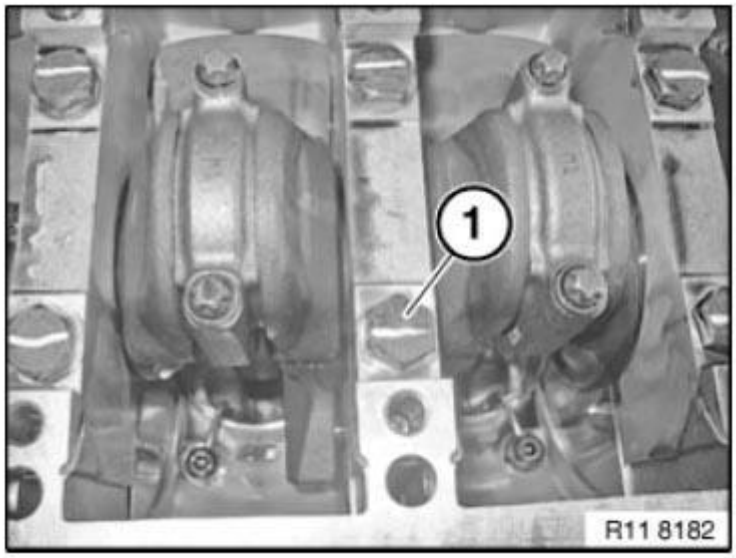


Fig. 142: Identifying M10 Crankcase Bolts With Colored Marking
Courtesy of BMW OF NORTH AMERICA, INC.

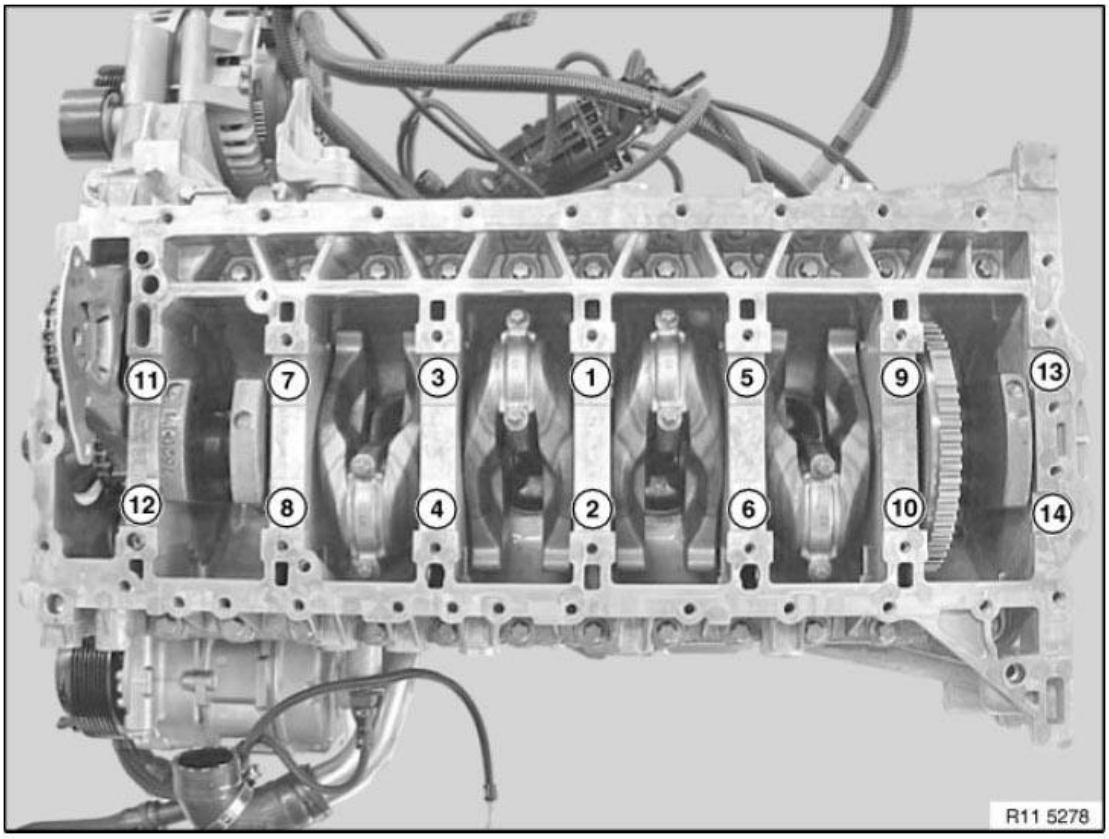


Fig. 143: Identifying M10 Crankcase Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankcase bolts M10 in sequence 1 to 14 with special tool 00 9 120 (torque angle measuring dial).

Tightening torque:

Main bearing bolts (steel bolts 10.9)	M10 x 100	Replace bolts	Jointing torque: 20 Nm Angle of rotation: 70 °

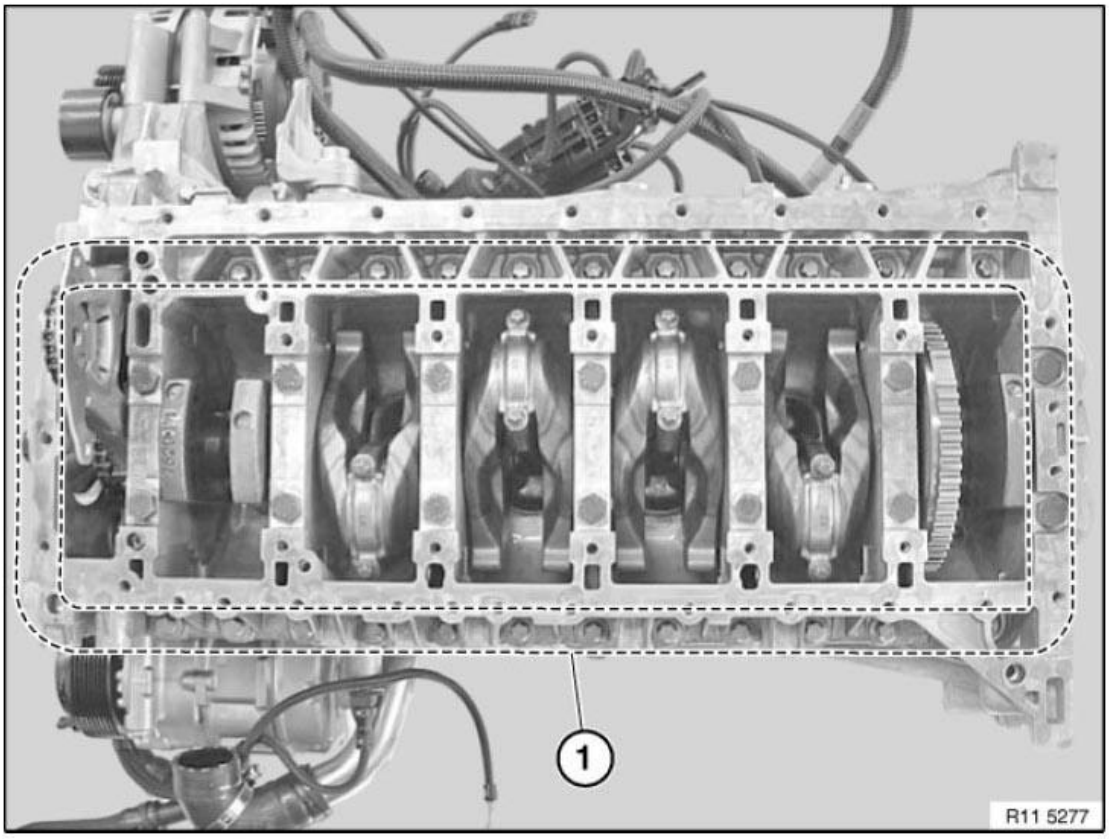


Fig. 144: Identifying Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Insert all crankcase bolts (1).

IMPORTANT: Observe different lengths and sizes of the bolts.

Tightening torque: see 2AZ, 3AZ, and 4AZ in **11 11 ENGINE BLOCK**

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

NOTE: Replace screw.

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

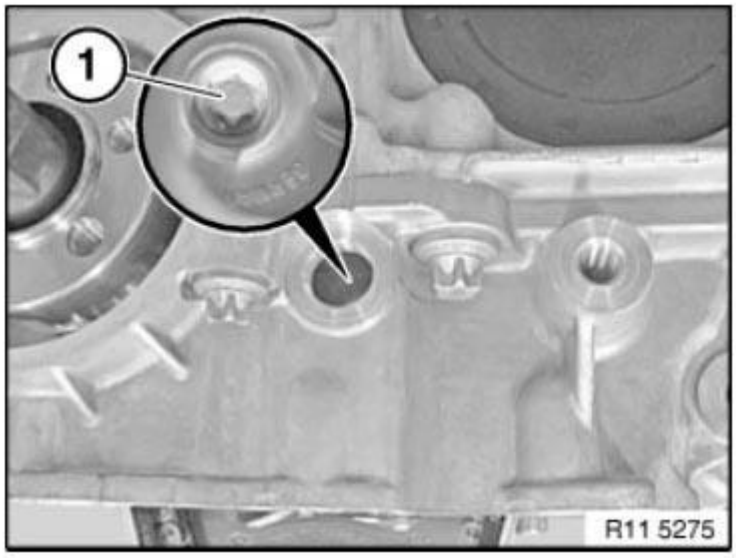


Fig. 145: Identifying Oil Pump Triangular Drive Mounting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten screw plug on front of crankcase.

Tightening torque: see **11 41**

Installation note:

Replace sealing ring.

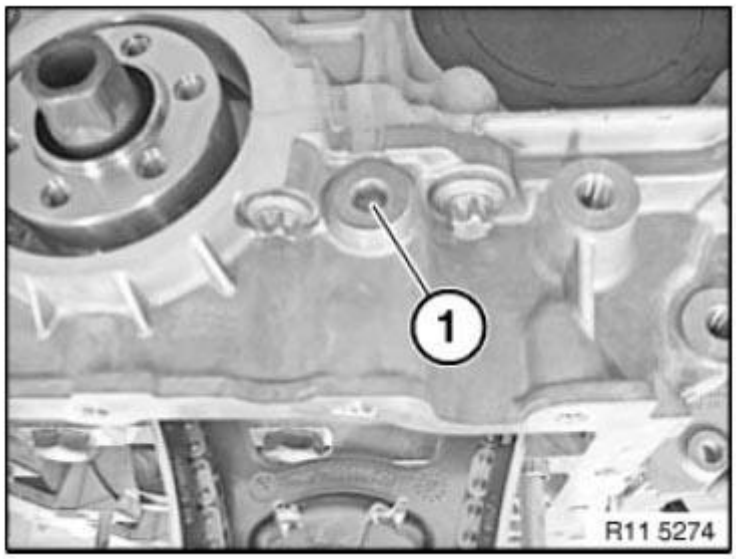


Fig. 146: Identifying Screw Plug On Front Of Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

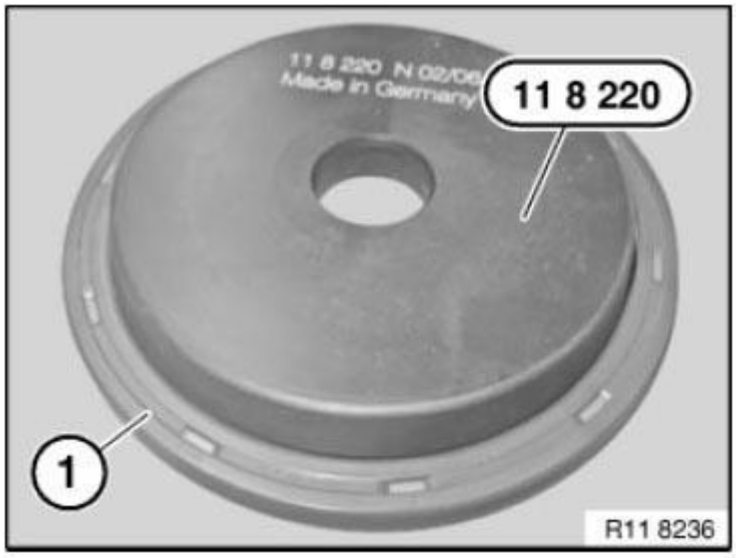


Fig. 147: Identifying Radial Shaft Seal On Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

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

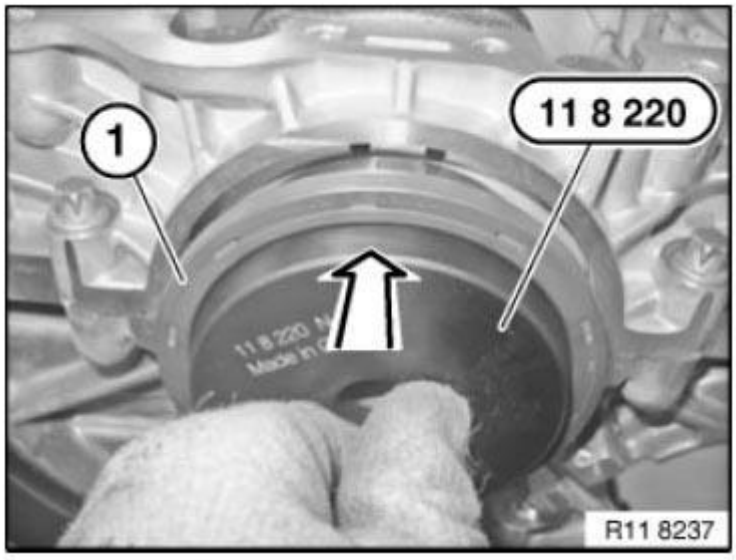


Fig. 148: Positioning Radial Shaft Seal On Crankshaft Using Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

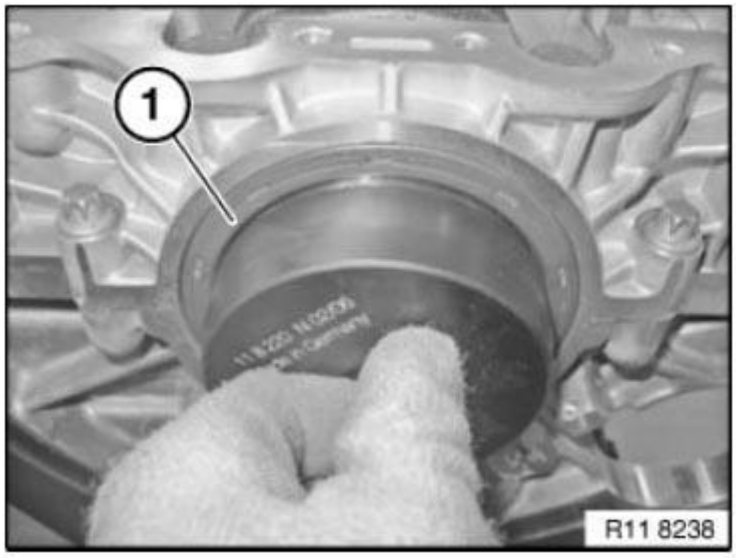


Fig. 149: Moving Radial Shaft Seal Parallel Up Against Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

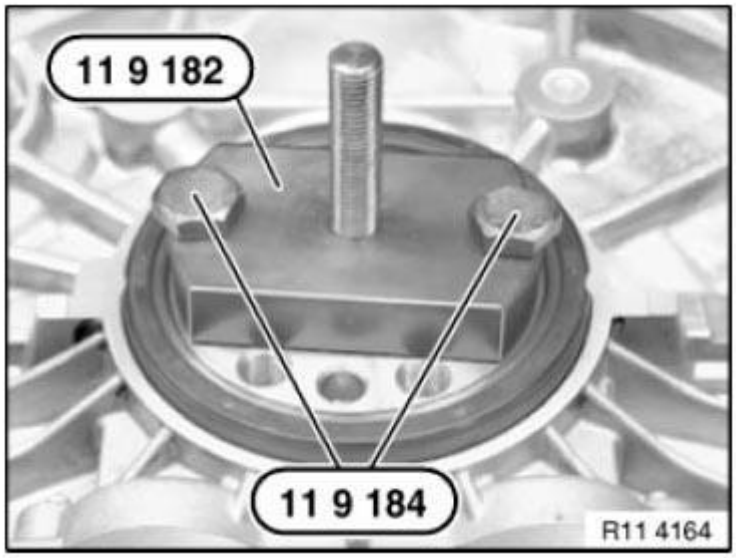


Fig. 150: Mounting Special Tool 11 9 182 Over Crankshaft Using Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Prepare special tool 11 9 181 (bush) for installation. Connect special tool 11 9 185 (ring) onto special tool 11 8 181.

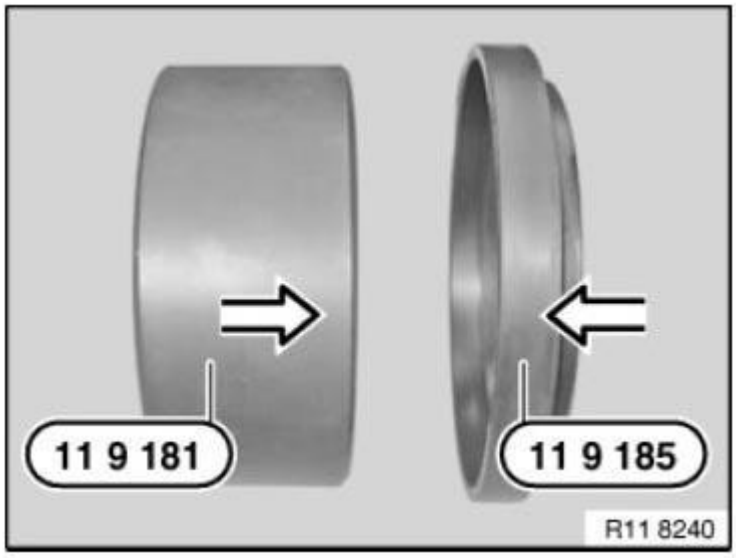


Fig. 151: Connecting Special Tool 11 9 185 To Special Tool 11 8 181
Courtesy of BMW OF NORTH AMERICA, INC.

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

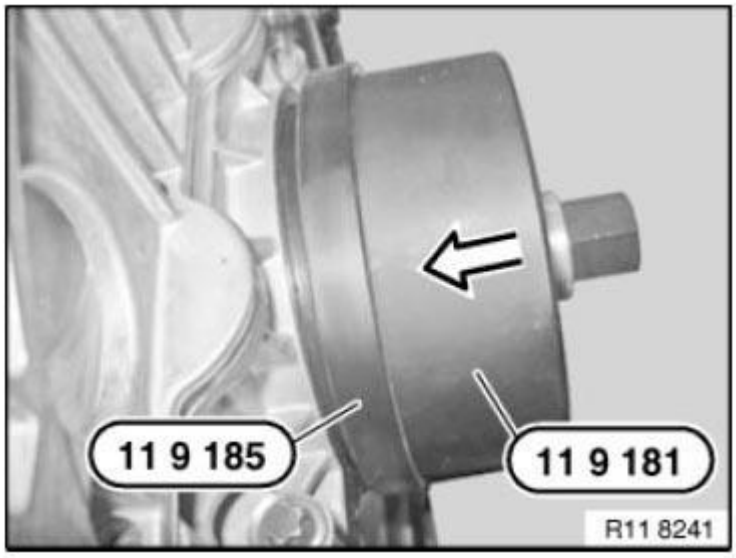


Fig. 152: Pulling Radial Shaft Seal Using Special Tool 11 9 181/11 9 185/11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

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

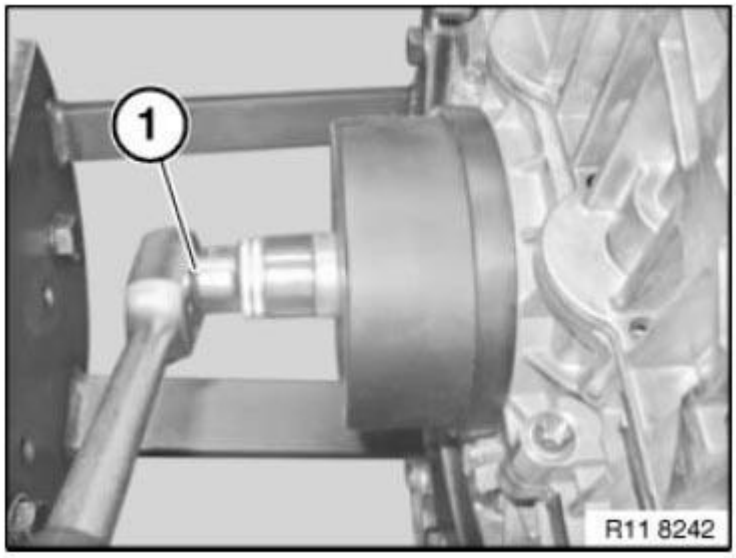


Fig. 153: Installing Radial Shaft Seal Using Special Tool 119 183
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

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

NOTE: Graphic N42.

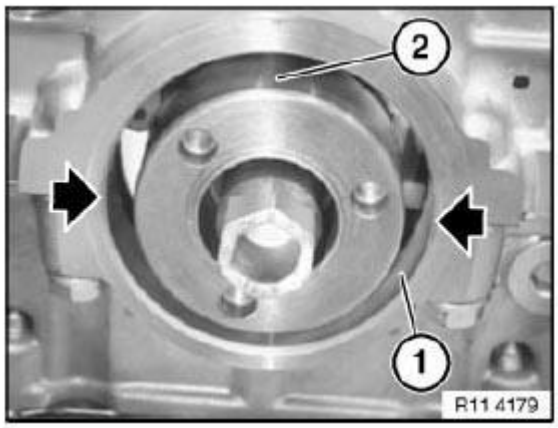


Fig. 154: Identifying Sealing Surface And Running Surface For Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

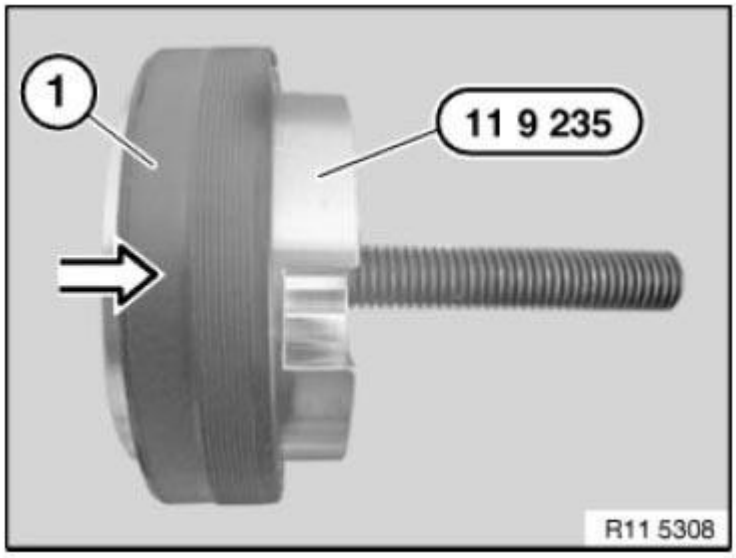


Fig. 155: Pushing Radial Shaft Seal 11 9 235 Carefully On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Special tool 11 9 235 (spindle) can only be fastened with 2 opposite bolts.

Determine hole pattern on special tool.

Screw special tool 11 9 235 with special tool 11 9 234 (screw) on crankshaft.

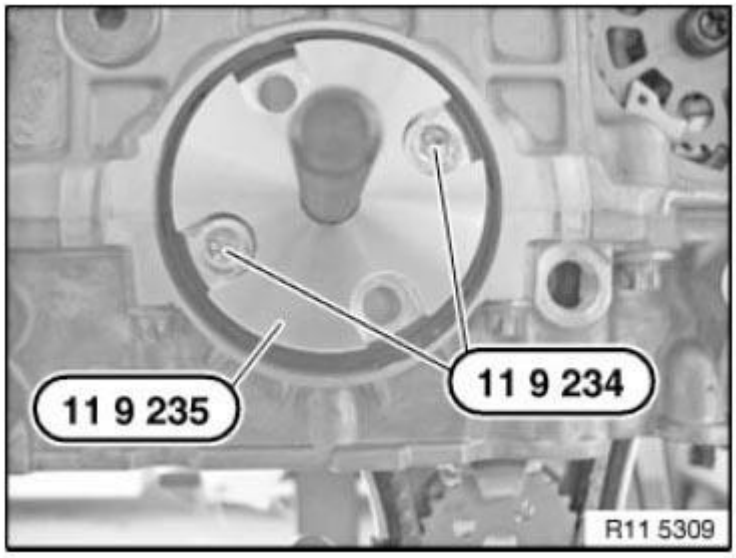


Fig. 156: Identifying Special Tools On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

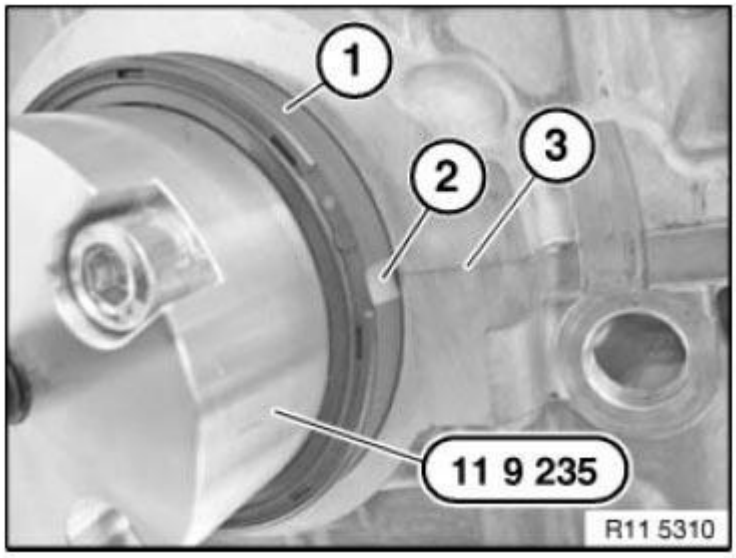


Fig. 157: Identifying Radial Shaft Seal Groove
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in radial shaft seal with special tool 11 9 231 (bush) in conjunction with special tool 11 9 233 (nut) until flush.

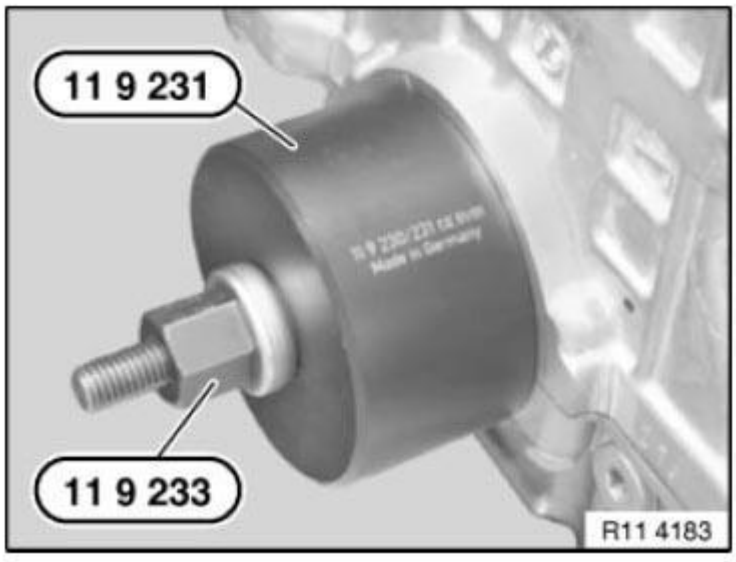


Fig. 158: Identifying Special Tools 119 231 And 11 9 233
Courtesy of BMW OF NORTH AMERICA, INC.

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

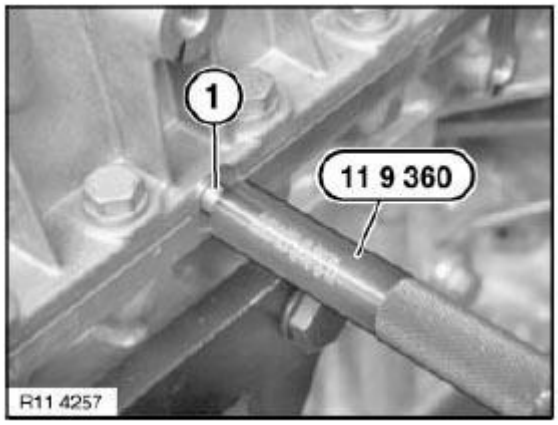


Fig. 159: Installing Nozzles Using Special Tool 11 9 360
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

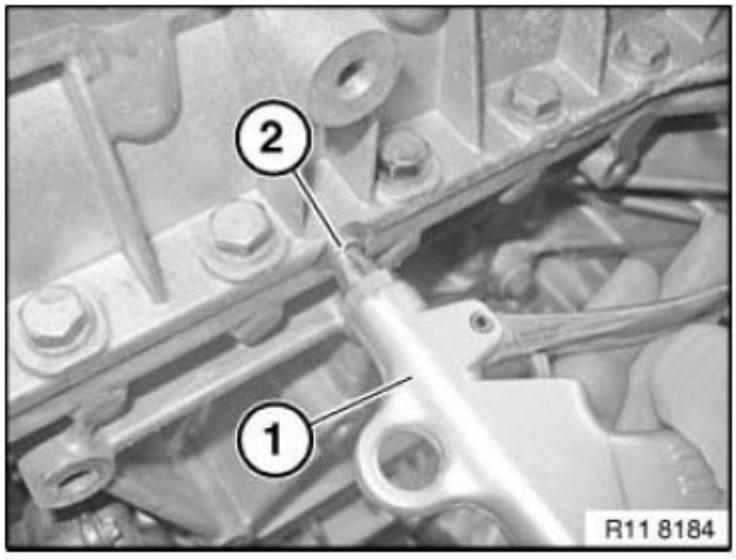


Fig. 160: Blowing Compressed Air Into Injector Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Use primer and liquid gasket:

- Loctite 171000 primer, BMW part number 83 19 7 515 683
- Loctite 193140 liquid gasket, BMW part number 83 19 0 439 030

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

Injector nozzles for injecting sealing compound are not required.

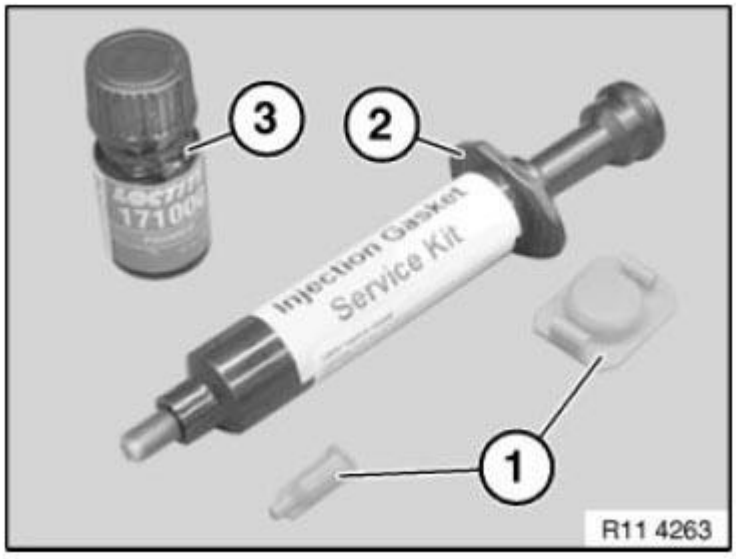


Fig. 161: Identifying Liquid Sealing Compound, Injector Nozzles And Primer Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

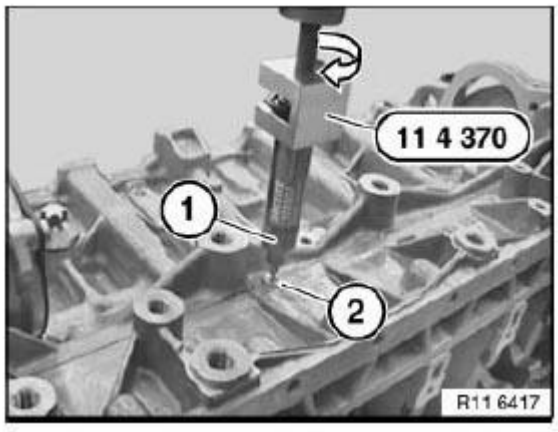


Fig. 162: Inserting Liquid Sealing Compound Using Special Tool 11 4 370
Courtesy of BMW OF NORTH AMERICA, INC.

Stop (seal off) escaping liquid sealing compound with primer (Loctite 171000 primer, BMW part number 83 19

7 515 683).

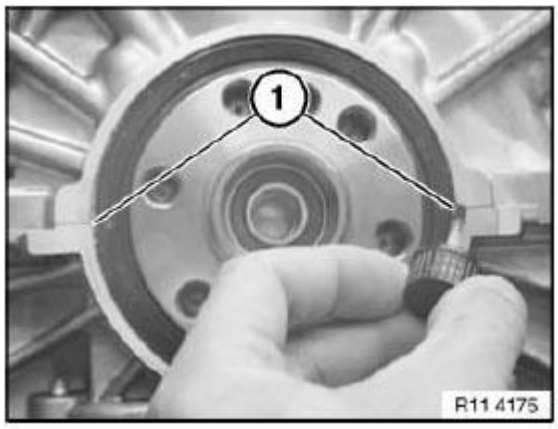


Fig. 163: Stopping Escaping Liquid Sealing Compound With Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Stop (seal off) escaping liquid sealing compound with primer (Loctite 171000 primer, BMW part number 83 19 7 515 683).

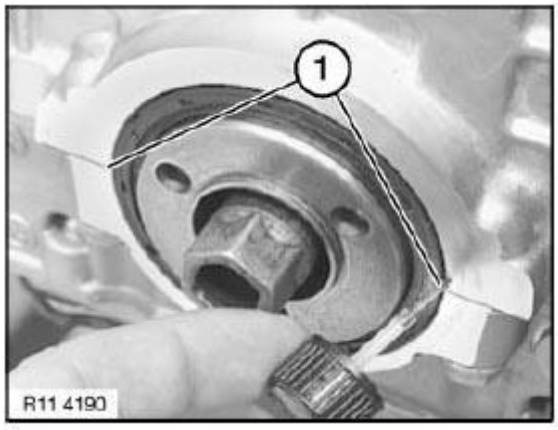


Fig. 164: Stopping Escaping Liquid Sealing Compound With Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 21 531 REPLACING ALL CRANKSHAFT MAIN BEARINGS

Special tools required:

- **00 2 590**
- **11 4 470**
- **11 8 510**

IMPORTANT: Aluminium screws/bolts must be replaced each time they are released .

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

For reliable identification:

Aluminium screws/bolts are not magnetic .

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

Necessary preliminary tasks:

- Remove **CRANKSHAFT**.

Check setting of oil spray nozzles, adjusting if necessary:

Attach special tool **11 8 510** to bolt connection on main bearing, secure with bolt (1).

Installation note:

Oil nozzle must be located precisely in groove of special tool **11 8 510** .

If necessary, adjust oil nozzle.

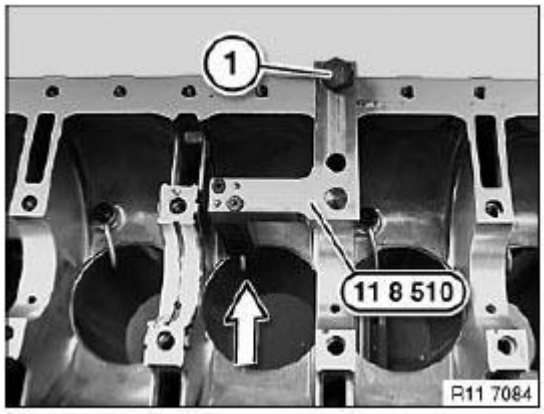


Fig. 165: Attaching Special Tool (11 8 510) To Bolt Connection On Main Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust oil nozzle.

Release screw (1).

Tightening torque: **11 11 5AZ** .

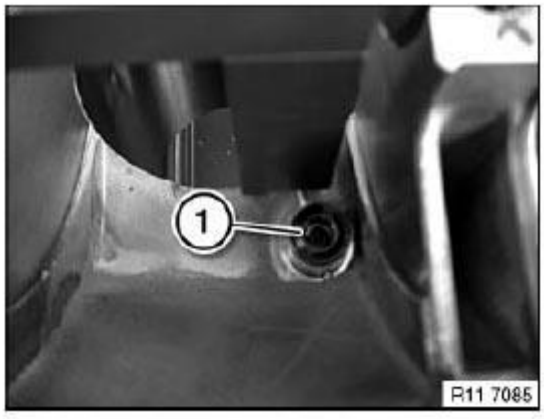


Fig. 166: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Remove bearing shells (2) and (3).

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

Observe BEARING CLASSIFICATION .

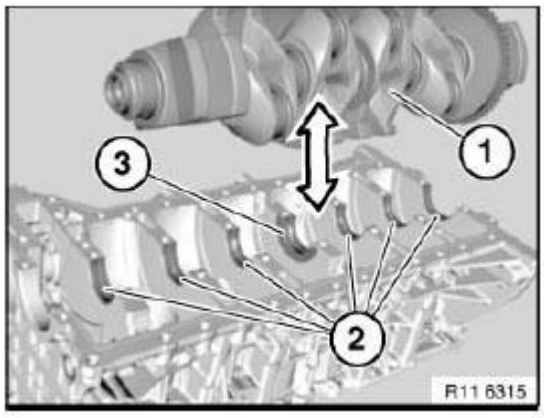


Fig. 167: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

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

IMPORTANT: Allocation of bearing points:

Bearing point 1 is at the front on the timing chain drive in the direction of travel.

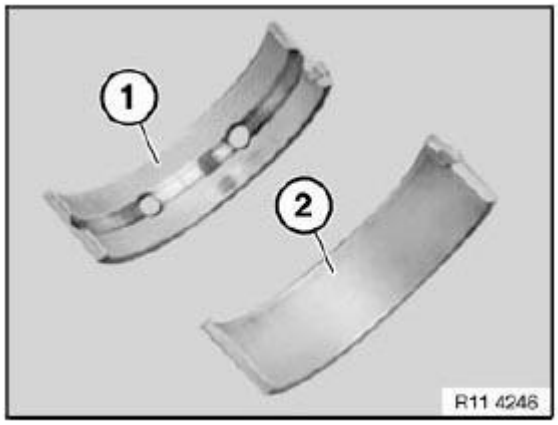


Fig. 168: Identifying Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

Main bearing classification (1) for crankcase lower half (bedplate), code numbers 1 2 3, see **MAIN BEARING CLASSIFICATION**.

Observe **BEARING CLASSIFICATION** .

Bearing classification (2) of **CONNECTING RODS** code letters b and r.

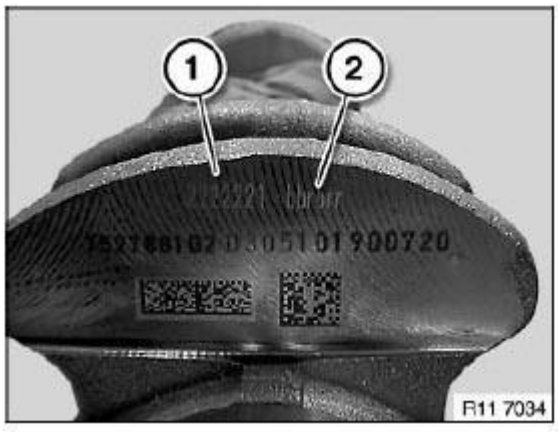


Fig. 169: Identifying Bearing Classifications
Courtesy of BMW OF NORTH AMERICA, INC.

Main bearing classification (1) in crankcase, code letters A/B or C, see **MAIN BEARING CLASSIFICATION**.

Installation note:

When all the letters and number code have been determined, the bearing shell color must be allocated.

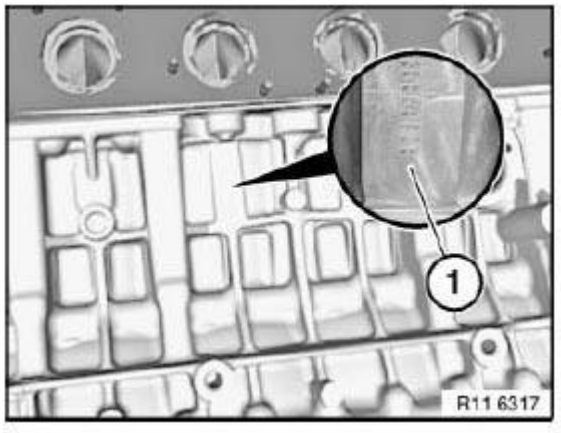


Fig. 170: Identifying Bearing Classification Of Crankcase Upper Section
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

The letter/number combination produces a bearing shell pairing.

Identification by different colors.

IMPORTANT: First bearing point is on the timing drive.

The color combination Yellow and Red must not be fitted.

Engine damage will result if excessively small bearing play is determined.

Code letters on crankcase

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

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

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

Code numbers on crankshaft

Code number 1 = bearing shell (2) Yellow.

Code number 2 = bearing shell (2) Green.

Code number 3 = bearing shell (2) Red.

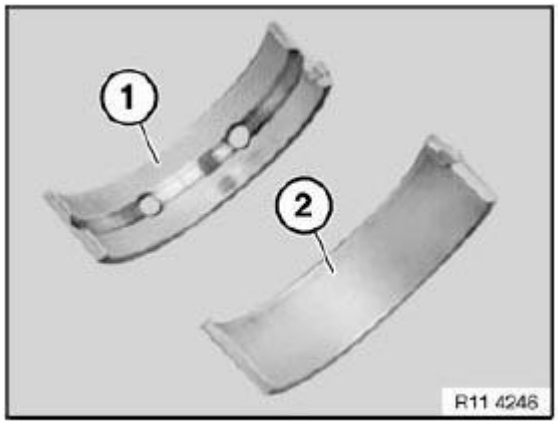


Fig. 171: Identifying Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The color combination Yellow and Red must not be fitted; the bearing colors Green/Green must be selected for this color combination, see table.

Installation example

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

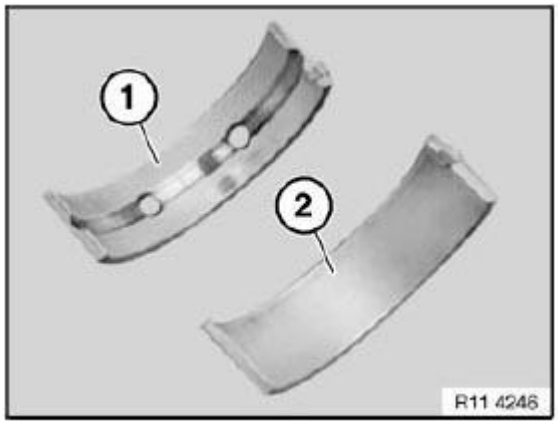


Fig. 172: Identifying Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

Lager 2: **A** and **2** colors Yellow and Green.

Lager 3: **B** and **2** colors Green and Green.

Lager 4: **C** and **2** colors Red and Green.

Lager 5: **B** and **1** colors Green and Yellow.

Lager 6: **C** and **3** colors Red and Red.

Lager 7: **C** and **1** colors Green and Green.

The color combination **Yellow and Red** must not be fitted.

Installation note:

Possible color combinations for mounting the crankshaft in the crankcase.

MAIN BEARING CLASSIFICATION

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

Insert all bearing shells (2 and 3).

IMPORTANT: Clean sealing surfaces.

Do not clean sealing faces with a metal-cutting tool.

Only use special tool 11 4 470 (cleaning kit) to clean sealing surfaces.

Determine bearing play with special tool 00 2 590 (measurement aid).

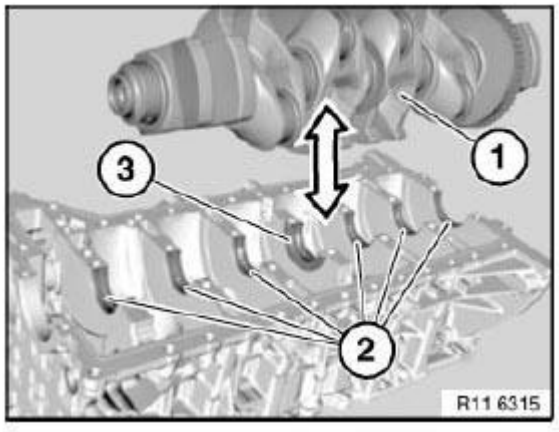


Fig. 173: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

All measuring points must be free from oil and grease.

Use used screws to determine bearing play.

Set up crankcase lower section (bedplate) with bearing shells.

Remove crankcase lower section (bedplate).

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

Crankshaft bearing play **radial** .

Installation note:

Remove plastic thread.

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

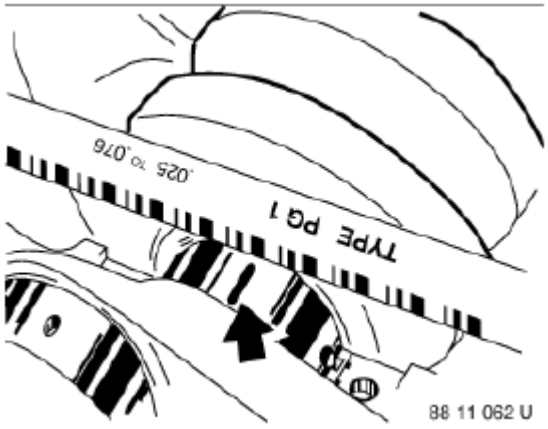


Fig. 174: Checking Radial Clearance At Width Of Flattened Plastic Thread (Plastigage)
Courtesy of BMW OF NORTH AMERICA, INC.

Install crankcase lower section (bedplate).

Assemble engine.

FLYWHEEL

11 22 500 REMOVING AND INSTALLING OR REPLACING FLYWHEEL

Special tools required:

- **11 4 180**

- **11 9 260**

Necessary preliminary tasks:

- Remove transmission.
- Remove **CLUTCH** .

Enlarge special tool **11 9 260** with an elongated hole.

Work out elongated hole on special tool **11 9 260** to **8 mm.**

Fig. 175: Identifying Special Tool (11 9 260)
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles with manual transmissions:

Secure flywheel with special tool **11 9 260.**

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

Tightening torque: **11 22 1AZ** .

Installation note:

Flywheel is secured with a dowel pin.

Fit new flywheel screws.

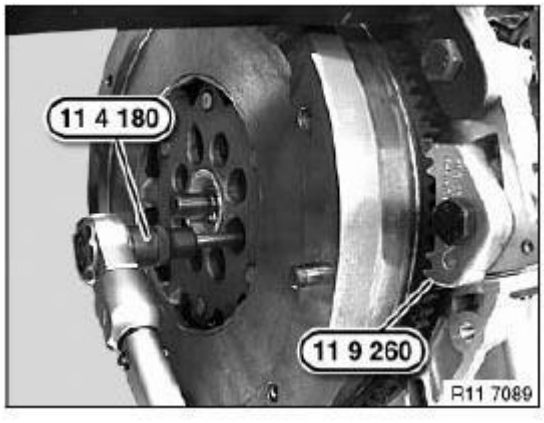


Fig. 176: Releasing Flywheel Screws Using Special Tool (11 4 180)
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles with automatic transmissions:

Secure flywheel with special tool **11 9 260.**

Release flywheel screws with a suitable tool (1).

Tightening torque: **11 22 1AZ** .

Installation note:

Flywheel is secured with a dowel pin.

Fit new flywheel screws.

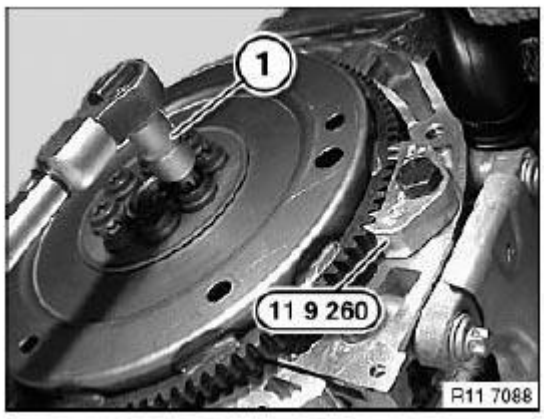


Fig. 177: Releasing Flywheel Bolts Using Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

Special tools required:

- **23 4 031**
- **23 4 033**
- **23 4 035**
- **23 4 036**
- **23 4 040**

Necessary preliminary tasks:

- Transmission removed.
- Remove **CLUTCH RELEASE BEARING**

Pressing out roller bearing:

Install special tool **23 4 031** in front of drive shaft spline teeth.

Screw in grease spindle **23 4 033** completely.

Brass tip must immerse fully into roller bearing.

Press in grease with grease gun **23 4 040** until roller bearing is disengaged from drive shaft.

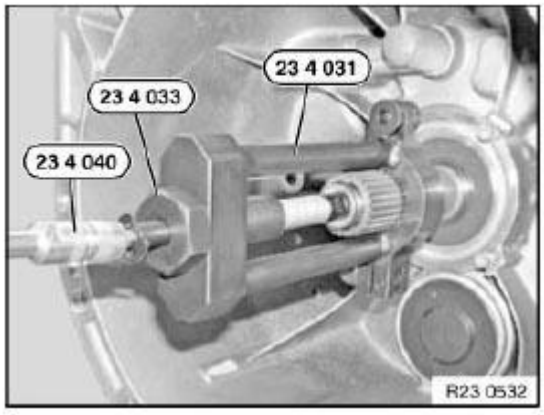


Fig. 178: Identifying Special Tools (23 4 031), (24 4 031) And (24 4 033)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool **23 4 031.**

Remove pressed-in grease (1) from drive shaft completely.

Then reinstall special tool.

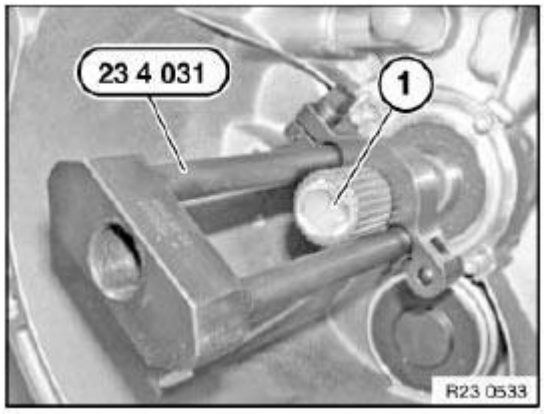


Fig. 179: Identifying Special Tool (23 4 031)
Courtesy of BMW OF NORTH AMERICA, INC.

Pressing in roller bearing:

Slide in pressure spindle **23 4 035.**

Attach thrust piece **23 4 036** to pressure spindle.

Push roller bearing (1) onto thrust piece.

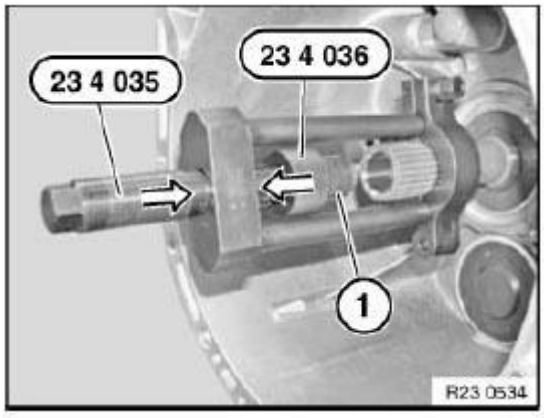


Fig. 180: Pushing Roller Bearing Onto Thrust Piece
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in pressure spindle (1) until roller bearing is fully pressed in.

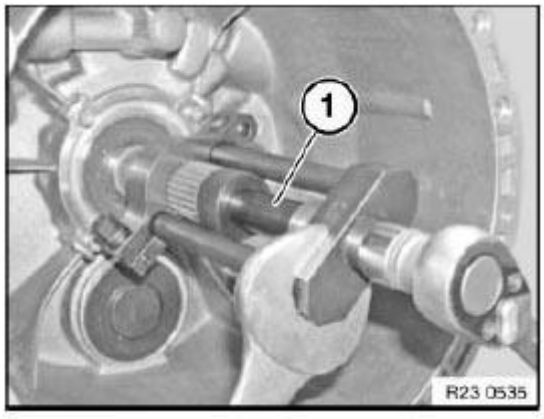


Fig. 181: Screwing Pressure Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

VIBRATION DAMPER

11 23 010 REMOVING AND INSTALLING OR REPLACING VIBRATION DAMPER

Necessary preliminary tasks:

- Detach front **UNDERBODY PROTECTION** .
- Remove **DRIVE BELT**.

Release screws (1).

Tightening torque: **11 23 1AZ** .

Remove vibration damper (2).

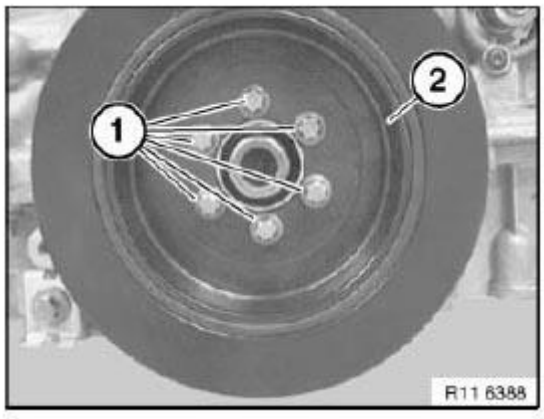


Fig. 182: Identifying Screws And Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CONNECTING ROD WITH BEARING

11 24 571 REPLACING ALL CONNECTING ROD BEARINGS

Special tools required:

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

IMPORTANT: All crank pins are connected with the crankshaft.

Blue / Red bearing shell colors are no longer used in combination.

Necessary preliminary tasks:

- Remove all **PISTONS**.

IMPORTANT: All crankshaft crank pins are classified.

Bearing shell colors are different in connecting rod and in connecting rod bearing cap.

Possible classifications per connecting rod at top and bottom:

r: Connecting rod = Yellow.

Connecting rod bearing cap = Red.

b: Connecting rod = Violet.

Connecting rod bearing cap = Blue.

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

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

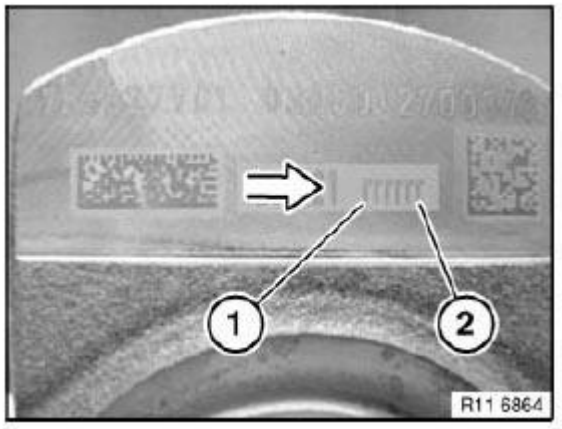


Fig. 183: Identifying Crank Pin And Arrow
Courtesy of BMW OF NORTH AMERICA, INC.

Example:

Possible classification: rbbrrb

Cyl. 1: Classification **r** = rod side Yellow bearing cap side Red.

Cyl. 2: Classification **b** = rod side Violet bearing cap side Blue.

Cyl. 3: Classification **b** = rod side Violet bearing cap side Blue.

Cyl. 4: Classification **r** = rod side Yellow bearing cap side Red.

Cyl. 5: Classification **r** = rod side Yellow bearing cap side Red.

Cyl. 6: Classification **b** = rod side Violet bearing cap side Blue.

Install new connecting rod bearing shells.

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

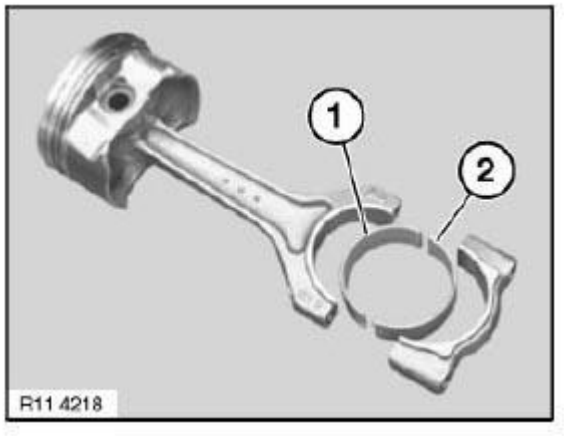


Fig. 184: Identifying Connecting Rod Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Check connecting rod bearing clearance.

Piston in BDC position.

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

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

Fit bearing cap so that pairing letters match up.

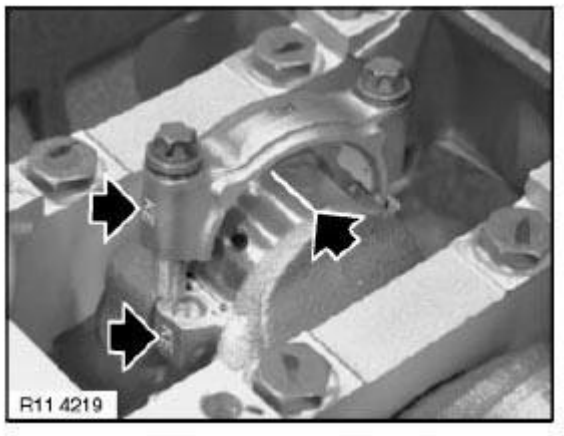


Fig. 185: Identifying Connecting Rod Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not distort connecting rods or crankshaft.

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

Tighten down connecting rod bolts with special tool **00 9 120** .

Tightening torque **11 24 1AZ** .

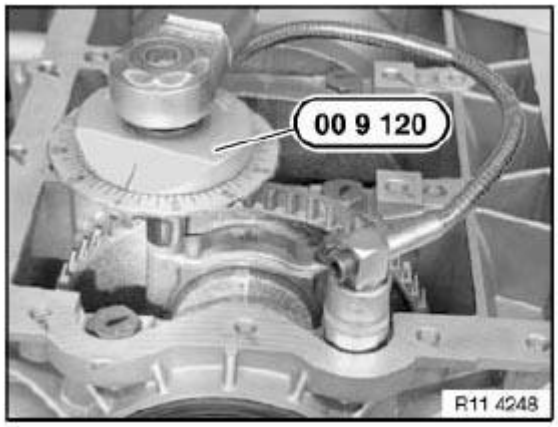


Fig. 186: Identifying Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

Remove bearing cap. Read off bearing clearance at width of crushed plastic thread with aid of measuring scale.

Conrod bearing clearance .

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

Tightening torque **11 24 1AZ** .

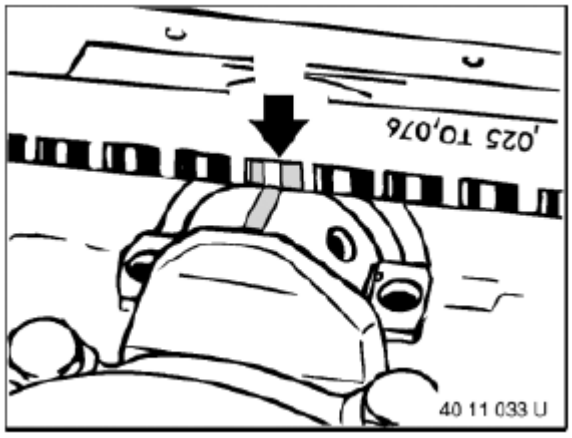


Fig. 187: Checking Conrod Bearing Play
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

PISTON WITH RINGS AND PIN

11 25 530 REMOVING AND INSTALLING/REPLACING ALL PISTONS

Special tools required:

- **00 9 120**
- **11 5 464**
- 11 8 141
- **11 8 560**
- **11 8 561**
- **11 8 562**
- **11 8 563**
- **11 8 590**

WARNING: Protective goggles must be worn when working on the piston pin circlip.

IMPORTANT: If pistons, connecting rods and bearing shells are reused, they must be reinstalled in the same places.

Individual connecting rod replacement is not permitted; they are classified according to weight categories.

Connecting rods and connecting rod bearing caps are marked with the same pairing letters; mixing them up will result in engine damage.

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

Necessary preliminary tasks:

- Remove engine.
- Mount engine on **ASSEMBLY STAND**.
- Remove **INTAKE AIR MANIFOLD**.
- Remove **CYLINDER HEAD**.
- Remove engine oil sump.
- Remove **OIL PUMP**.

NOTE: In event of heavy oil carbon residue:
Carefully remove oil carbon residue from cylinder wall.

NOTE: Illustrations show N46.

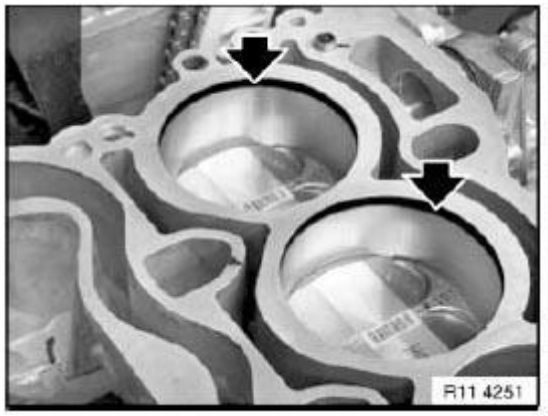


Fig. 188: Locating Cylinder Wall
Courtesy of BMW OF NORTH AMERICA, INC.

Do **not** release screw (1).

OIL SPRAY NOZZLE (2) must not be maladjusted or bent.

If necessary, readjust (**risk of damage**).

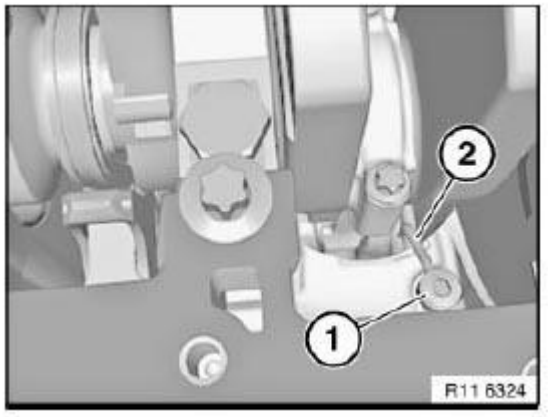


Fig. 189: Identifying Screw And Oil Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Release connecting rod bolts (1).

Tightening torque, **11 24 1AZ** .

Remove connecting rod bearing cap (2) in direction of arrow.

IMPORTANT: Connecting rods and connecting rod bearing caps are marked with the same pairing letters; mixing them up will result in engine damage.

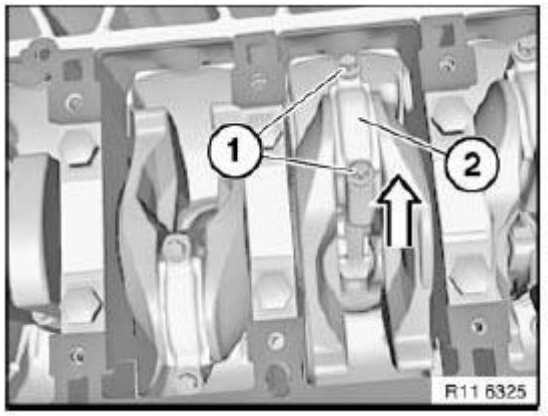


Fig. 190: Removing Conrod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool **11 8 590** into base of connecting rod.

Press out connecting rod and piston to cylinder head side.

IMPORTANT: Risk of damage to oil spray nozzle.

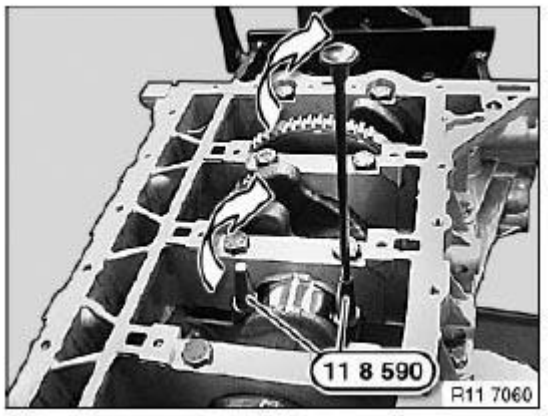


Fig. 191: Screwing Special Tool (11 8 590) Into Base Of Connecting Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Preliminary work:

Clamp special tool **11 8 561** in a vice.

Secure piston (1) with connecting rod to special tool **11 8 561.**

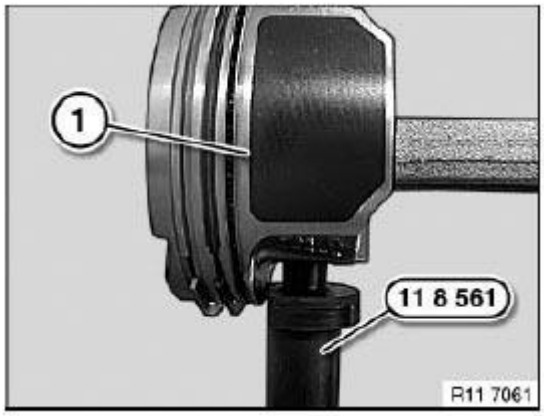


Fig. 192: Securing Piston With Conrod To Special Tool (11 8 561)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Protective goggles must be worn for the next work step.

WARNING: Protective goggles must be worn.

To lever out piston circlip (1), support special tool **11 5 464** on piston (2).

Lever out piston circlip (1) with special tool **11 5 464** in direction of arrow.

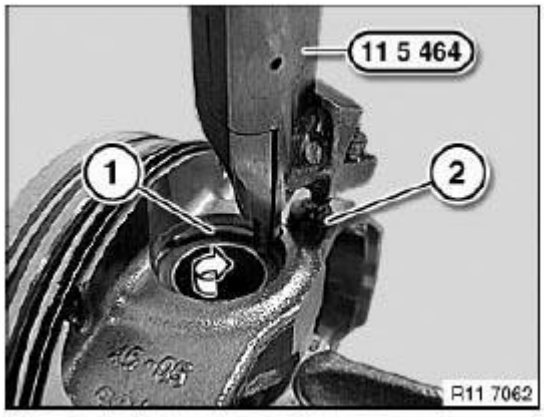
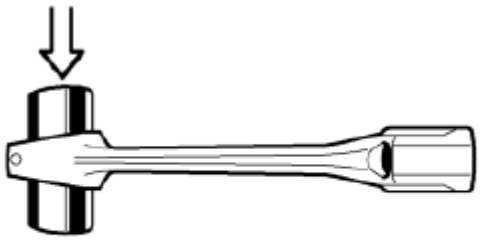


Fig. 193: Removing Piston Circlip Using Special Tool (11 5 464)
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, replace connecting rods.

IMPORTANT: Connecting rods are divided into weight categories and are only available as a set.

Old and new connecting rods must not be installed in mixed combinations.



R11 4212

Fig. 194: Identifying Connecting Rod
Courtesy of BMW OF NORTH AMERICA, INC.

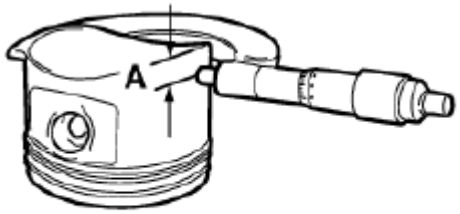
Installation note:

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

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.

Piston diameter at measuring point A.



88 11 051 U

Fig. 195: Measuring Piston Diameter With Micrometer At Measuring Point A From Bottom Edge Of Piston
Courtesy of BMW OF NORTH AMERICA, INC.

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

Diameter of cylinder bore.

Piston installation clearance.

TOTAL PERMISSIBLE WEAR TOLERANCE .

If necessary, replace piston.

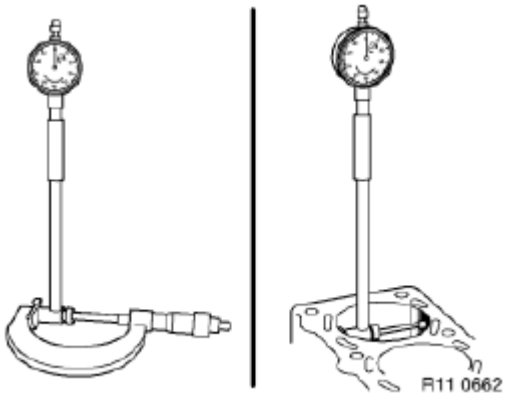


Fig. 196: Measuring Cylinder Bore Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: ***Protective goggles*** **must be worn.**

IMPORTANT: The opening of the piston pin circlip must be installed in the 6 o'clock position on the piston.

Risk of damage!

Insert piston circlip (2) into groove of special tool **11 8 562** .

Bring piston circlip (2) into assembly position (1).

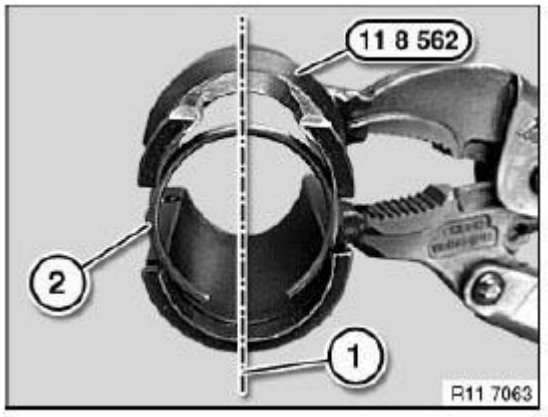


Fig. 197: Inserting Piston Circlip Into Groove Of Special Tool (11 8 562)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Protective goggles must be worn.

Slide special tool **11 8 563** up to piston pin circlip (2)

Special tools **11 8 562** and **11 8 563** are prepared.

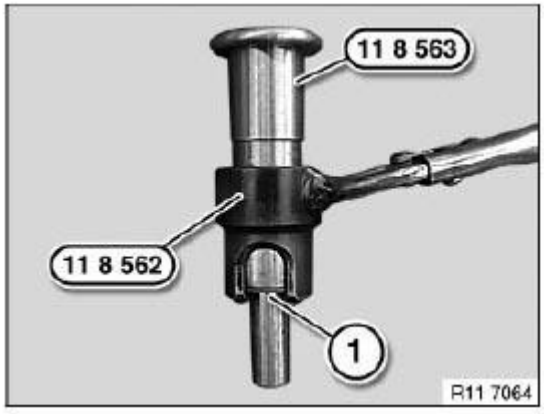


Fig. 198: Identifying Special Tools (11 8 562) And (11 8 563)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Protective goggles must be worn.

Cutout on special tool **11 8 562** must point to piston crown; only then can special tool **11 8 563** be correctly fitted.

When special tools **11 8 562** and **11 8 563** are correctly positioned, the piston pin circlip must be driven in with a plastic hammer in the direction of the arrow.

NOTE: See illustration.

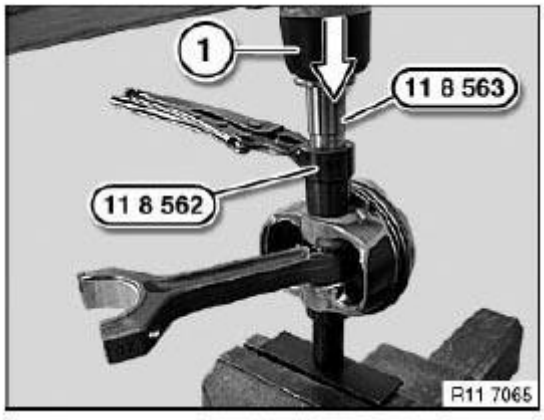


Fig. 199: Removing Piston Pin Using Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Piston pin circlip is correctly installed when opening (1) points downwards.

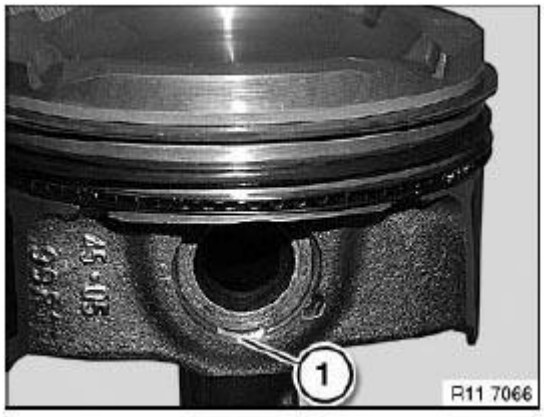


Fig. 200: Identifying Piston Pin Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: B 30.

Instal all **PISTON RINGS** .

Install all **BEARING SHELLS** .

Coat piston and piston rings with oil.

Pre-install piston (2) in special tool **11 8 141.**

Screw on special tool **11 8 590** in connecting rod (2).

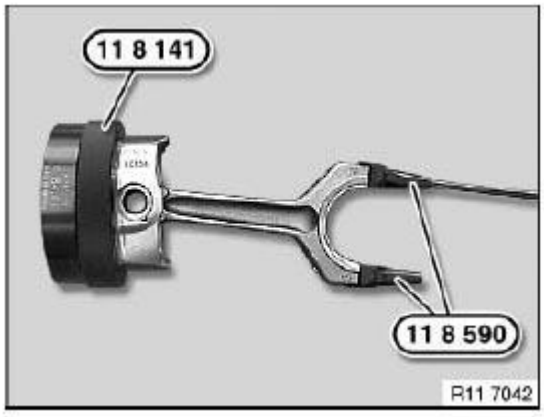


Fig. 201: Identifying Special Tool (11 8 141) And (11 8 590)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Check protective lugs (1) on special tool **11 8 590** for correct position and damage.

Insert piston with connecting rod in cylinder.

IMPORTANT: Risk of damage to oil spray nozzle.
Danger of piston ring failure.
Press in piston in direction of arrow with finger pressure only, do not drive in.

Insert piston so that arrow on piston crown points to camshaft drive.

Press in piston (1) with special tool **11 8 141.**

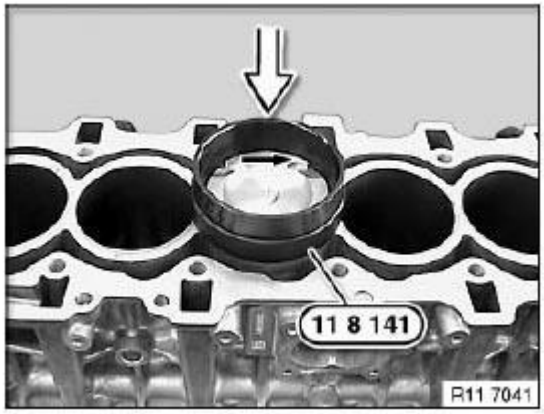


Fig. 202: Pressing Piston Using Special Tool (11 8 141)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Connecting rod and connecting rod bearing cap are marked with pairing letters (1) and must not be mixed up.

Mixing them up or incorrectly fitting the connecting rod bearing cap on the big end will result in engine damage .

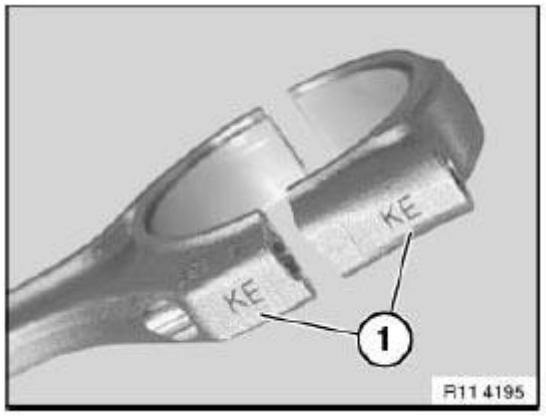


Fig. 203: Identifying Connecting Rod And Connecting Rod Bearing Cap With Pairing Letters
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a light coat of oil to crank pin.

Assemble connecting rod and crank pin.

Screw of special tool **11 8 560** in counterclockwise direction.

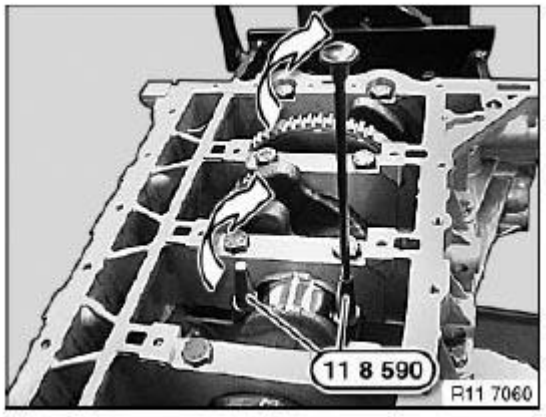


Fig. 204: Screwing Of Special Tool (11 8 560)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Install new connecting rod bolts (1).

Tightening torque: **11 24 1AZ**

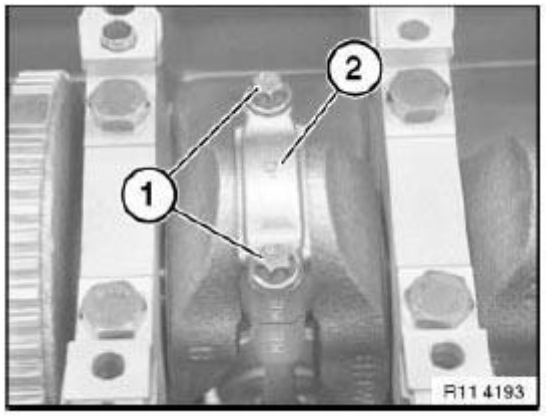


Fig. 205: Identifying Connecting Rod Bolts And Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust torsion angle of connecting rod with special tool **00 9 120** (see illustration).

Tightening torque: **11 24 1AZ**

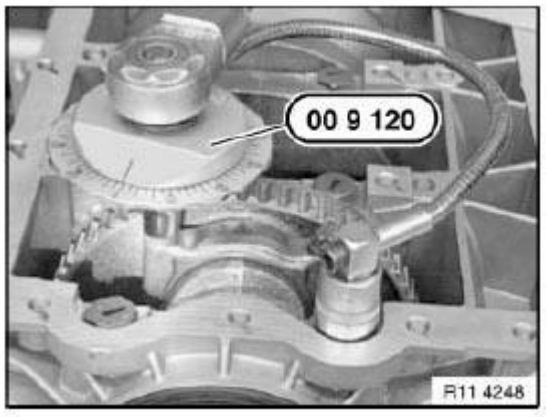


Fig. 206: Adjusting Torsion Angle Of connecting rod With Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 25 671 REPLACING PISTON RINGS ON ALL PISTONS

Necessary preliminary tasks:

- Remove all **PISTONS**.

Measuring axial clearance of piston rings in piston ring groove.

TECHNICAL DATA .

NOTE: It is not possible to measure the axial clearance of the oil scraper rings.

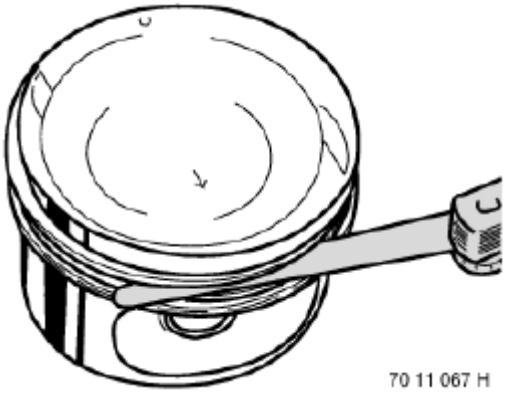


Fig. 207: Measuring Axial Clearance Of Piston Rings In Piston Ring Groove
Courtesy of BMW OF NORTH AMERICA, INC.

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

Oil scraper ring comprises two steel band rings and a support spring.

NOTE: Oil scraper ring cannot be removed with piston ring pliers.
Put aside piston rings in correct sequence and installation position.
It might not be possible to find the identification on used piston rings.

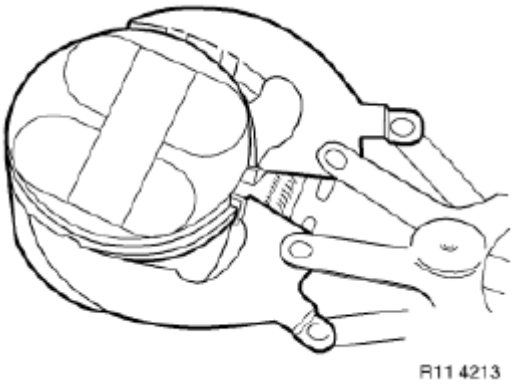


Fig. 208: Removing Compression Ring And Stepped Ring Upwards With Piston Ring Pliers
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

Determine gap with a feeler gauge. See **ENGINE BLOCK, CYLINDER CRANKCASE N54 B30** and **PISTONS WITH RINGS AND PINS N54 B30** .

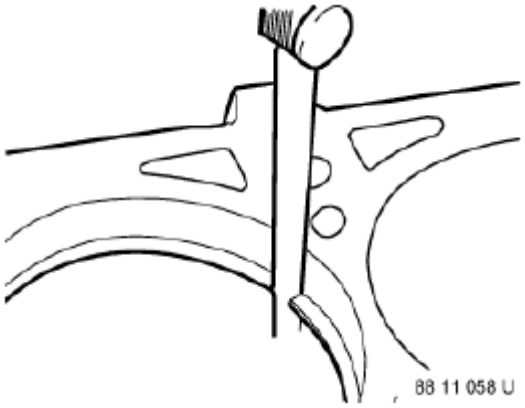


Fig. 209: Checking Piston Gap Using Feeler Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic representation of piston rings.

Installation note:

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

1. Plain compression ring
2. Stepped compression ring "Top"
3. Two-part oil scraper ring

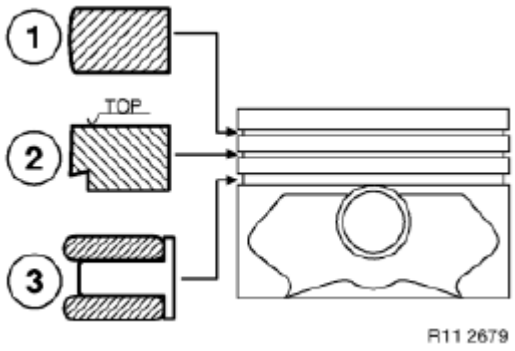


Fig. 210: Schematic Representation Of Piston Rings
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Oil control ring comprises two steel band rings (1) and a support spring (2).

Installation note:

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

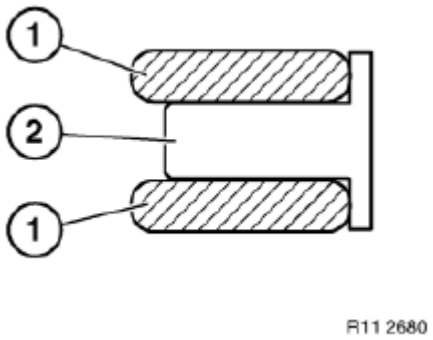


Fig. 211: Identifying Support Spring And Steel Band Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Offset the contact points (1) of the piston rings by approx. 120° to each other but do not position above the piston pin boss.

NOTE: See illustration N52.

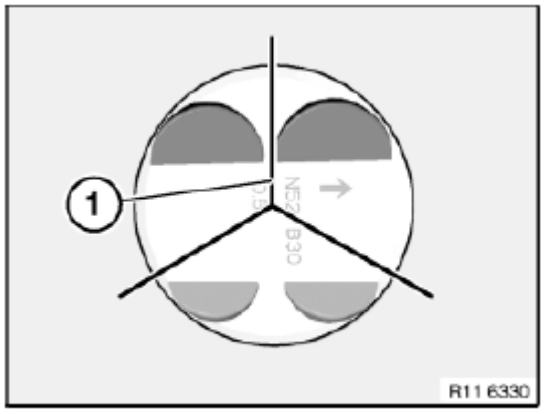


Fig. 212: Identifying Piston Rings Offset Contact Points
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

V-RIBBED BELT AND TENSIONER

11 28 010 REPLACING ALTERNATOR DRIVE BELT

Special tools required:

- **11 3 340**

IMPORTANT: Mark the direction of rotation of the drive belt if it is to be reused. Depending on the build date (version), the idler pulleys can be fitted with and without grooves.

Necessary preliminary tasks:

- Remove **FAN COWL** .

Unfasten hose clip (1).

Release quick-connect fastener (3) 90° on boost pressure pipe in direction of arrow.

Pull off air hose (2).

Installation note:

Bring lock (3) back 90° into installation position.

Recirculated air hose must audibly snap into place.

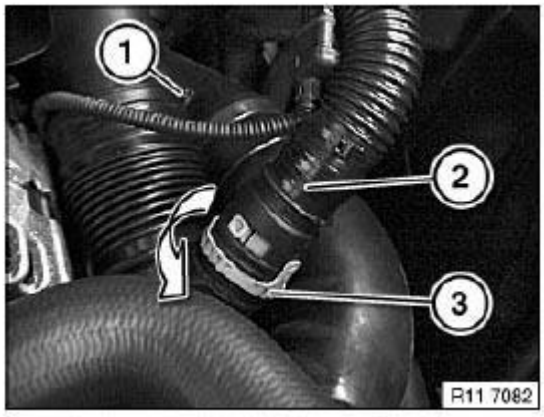


Fig. 213: Releasing Quick-Connect Fastener On Boost Pressure Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip line (1) from holder (2) in direction of arrow.

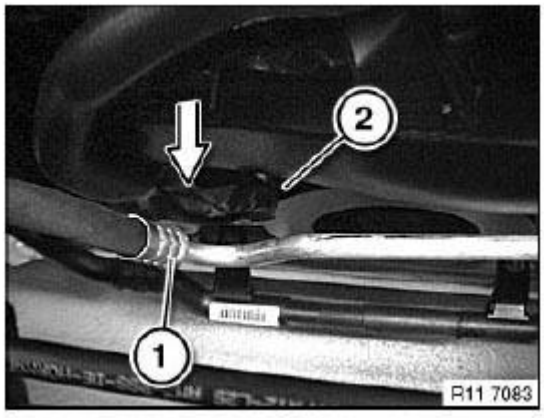


Fig. 214: Removing Line From Holder

Courtesy of BMW OF NORTH AMERICA, INC.

Release coolant hose (1) from holder (2).

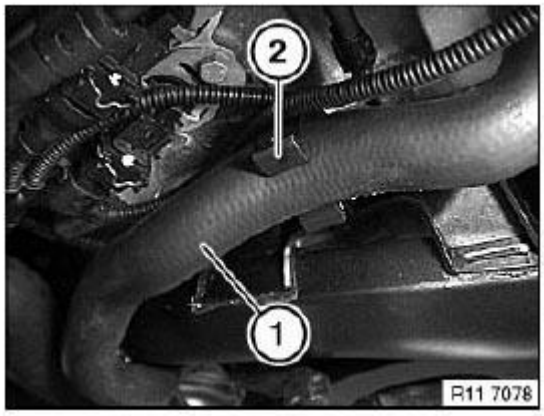


Fig. 215: Identifying Coolant Hose And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Fold air duct (2) down.

NOTE: Do not remove air duct (2).

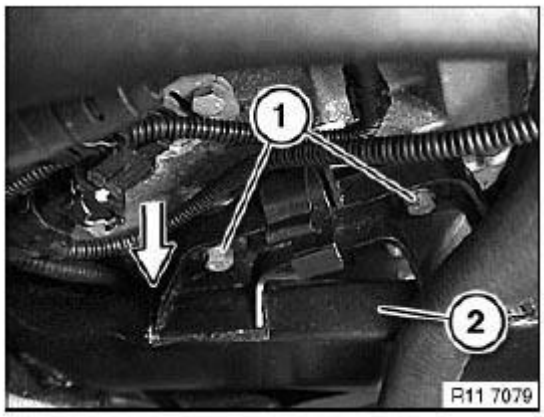


Fig. 216: Folding Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

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

Secure belt tensioner in place with special tool **11 3 340** .

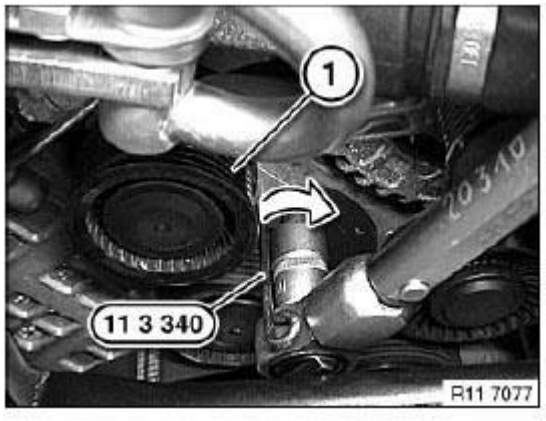


Fig. 217: Turning Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Remove drive belt (1).

Installation note:

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

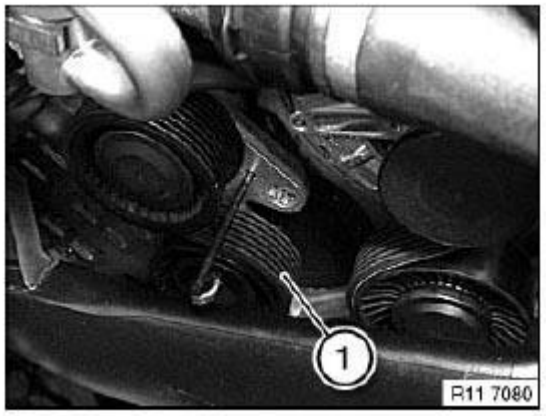


Fig. 218: Identifying Drive Belt
Courtesy of BMW OF NORTH AMERICA, INC.

Pretension tensioning pulley (1) in direction of arrow.

Remove special tool **11 3 340** .

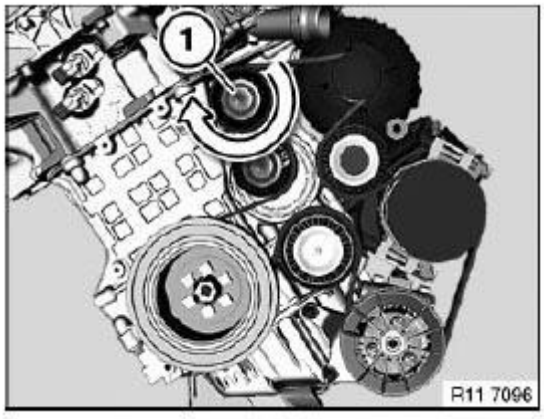


Fig. 219: Tensioning Tension Pulley
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Note arrangement of drive belt

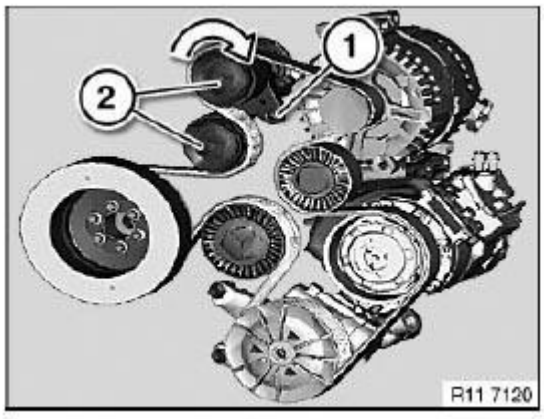


Fig. 220: Arrangement Of Drive Belt
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Installation note:

Risk of damage!

Check that drive belt for is in correct installation position.

11 28 020 REPLACE ALTERNATOR DRIVE BELT TENSIONER

Special tools required:

- **11 3 340**

Necessary preliminary tasks:

- Remove **DRIVE BELT**.

Remove special tool **11 3 340.**

Release screw on belt tensioner.

Tightening torque:**11 28 1AZ** .

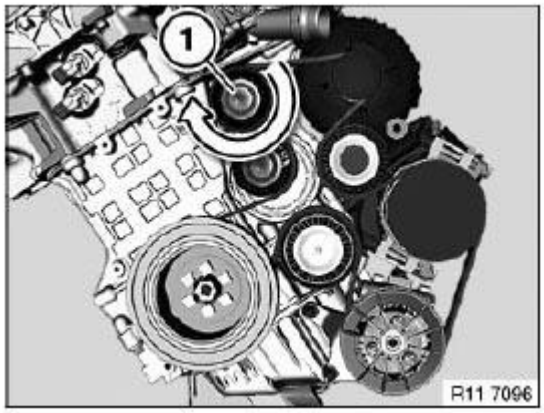


Fig. 221: Releasing Belt Tensioner Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CAMSHAFT

11 31 005 CHECKING CAMSHAFT TIMING

Special tools required:

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

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER**.
- Remove **FRONT UNDERBODY PROTECTION** .

Remove fastener (1) in direction of arrow.

Installation note:

Install fastener (1) with bore facing outwards.

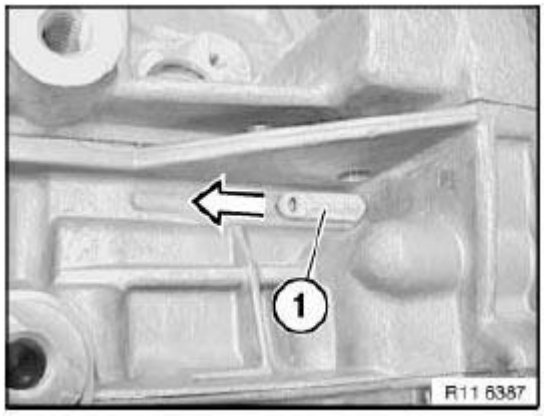


Fig. 222: Removing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

Slide in special tool **11 0 300** in direction of arrow and block crankshaft.

IMPORTANT: On engines with automatic transmissions, there is shortly before the special tool bore for the TDC position a large bore which can be confused with the special tool bore.

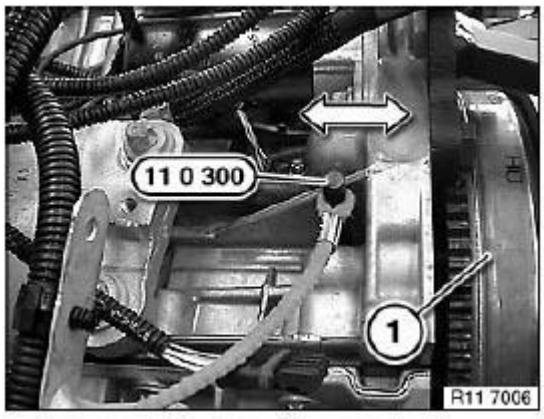


Fig. 223: Sliding Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

angle.

With 1st cylinder in firing TDC position, cams of exhaust camshaft (2) at 6th cylinder point downwards at an angle.

Roller cam follower is not actuated.

NOTE: If the timing is checked while the engine is installed, the position of the camshaft can only be checked with a mirror.

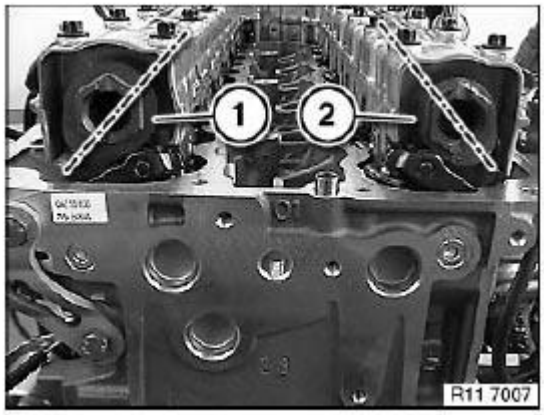


Fig. 224: Identifying Inlet Camshaft And Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool **11 4 283** on cylinder head with screws (1).

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

If special tools **11 4 281** cannot be attached, the **TIMING** must be adjusted.

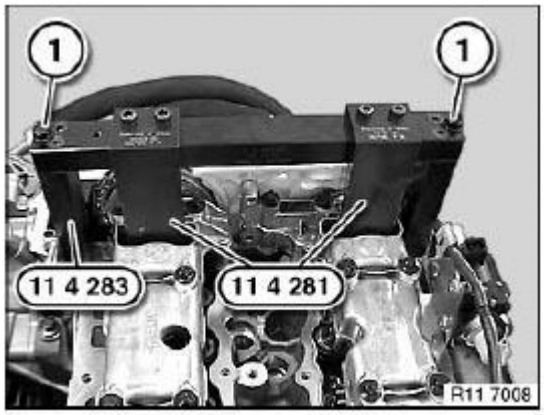


Fig. 225: Securing Special Tool (11 4 283) On Cylinder Head With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

11 31 025 REMOVING AND INSTALLING OR REPLACING INTAKE CAMSHAFT

Special tools required:

- **00 9 120**
- **11 4 350**
- **11 8 550**
- **11 8 551**
- **11 8 552**
- **11 8 553**
- **11 9 000**

IMPORTANT: Risk of damage!

It is absolutely essential to follow an exact procedure for removing and installing the exhaust camshaft.

The upper and lower bearing banks must be tensioned with a total of six special tools 11 8 553 .

Special tool 11 8 550 can be used for intake and exhaust sides.

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER**.
- Remove **INLET ADJUSTMENT UNIT** of inlet camshaft

Release bearing cap screw connections from outside inwards.

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

NOTE: Illustration shows N52.

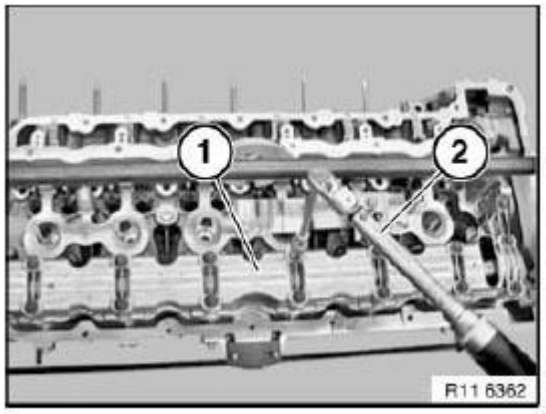


Fig. 226: Lifting Out Lower And Upper Bearing Banks With Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Remove upper bearing shell.

Remove intake camshaft (1) marked with (E).

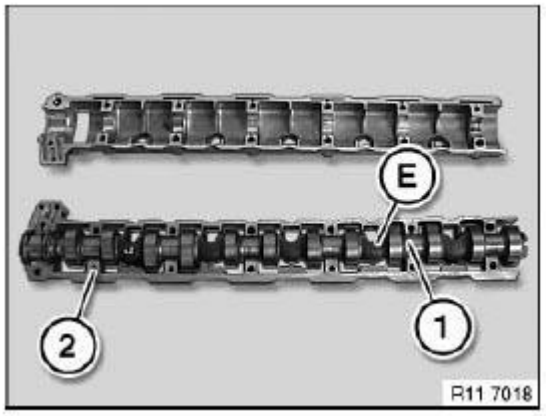


Fig. 227: Identifying Intake Camshaft With Mark
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Both camshafts have different identifications.
Mixing up the two camshafts will result in engine damage .

A Exhaust camshaft.

E Intake camshaft

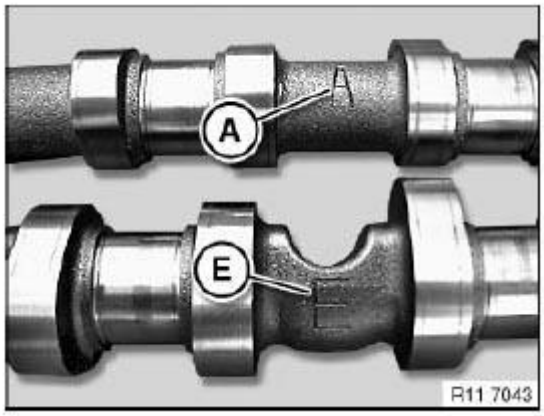


Fig. 228: Identifying Exhaust And Intake Camshaft Identifications Marks
Courtesy of BMW OF NORTH AMERICA, INC.

Metal plain rectangular compression ring:

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

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

The plain rectangular compression rings have catches at the joint.

Press the plain rectangular compression rings (1) apart forwards and towards the rear and remove towards the front.

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

Installation note:

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

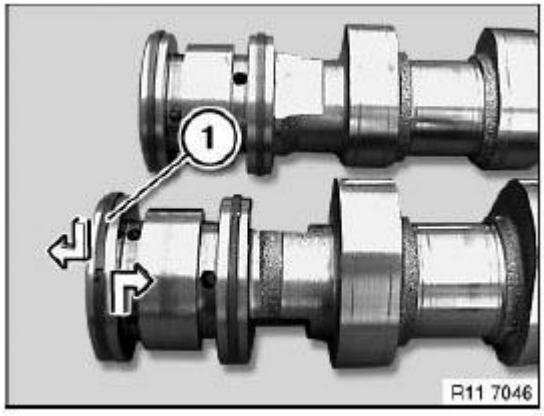


Fig. 229: Pressing Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Graphic shows N12 engine

Plastic plain rectangular compression ring:

Installation note:

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

Insert plastic rectangular compression ring (1) into groove of intake camshaft (2) (see arrow).

Lightly oil plastic rectangular compression ring (1) and rotate in direction of arrow until compression ring (1) is positioned on the intake camshaft.

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

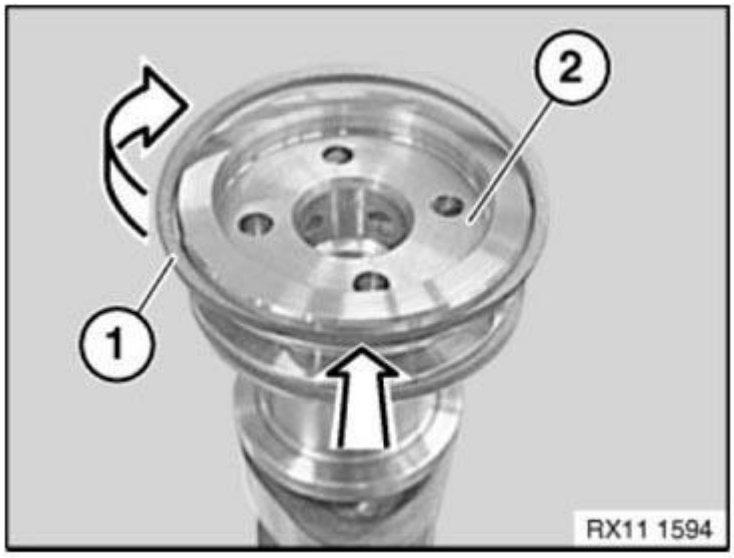


Fig. 230: Inserting Plastic Rectangular Compression Ring Into Groove Of Intake Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Removal on engine:
Set engine to ignition TDC at cylinder No. 1.
Removed cylinder head:
When using special tool 11 9 000 (cylinder head clamping device), it will be necessary to remove the aluminium profile insert.

Installing camshaft bearing strip:

Pre-install special tool **11 8 551** on cylinders 2 and 3.

Insert special tool **11 8 552** in screw connection of cylinder head cover.

Special tool **11 8 551** is marked with letters E and A.

E = intake side.

A = exhaust side.

Press down roller cam followers on 3rd cylinder with spindle nut (2) of special tool **11 8 551** .

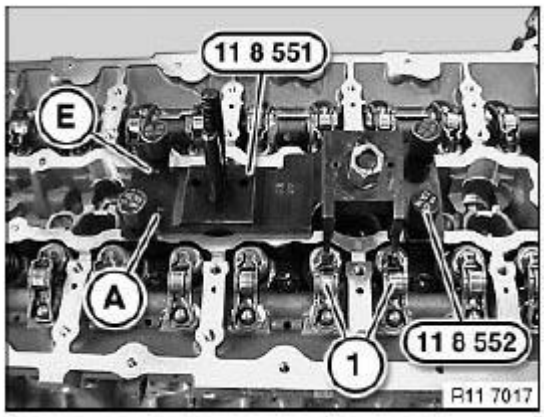


Fig. 231: Identifying Special Tools With Mark Letters E And A
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Before installing intake camshaft, make sure roller cam follower is correctly seated on HVCA element and valve.

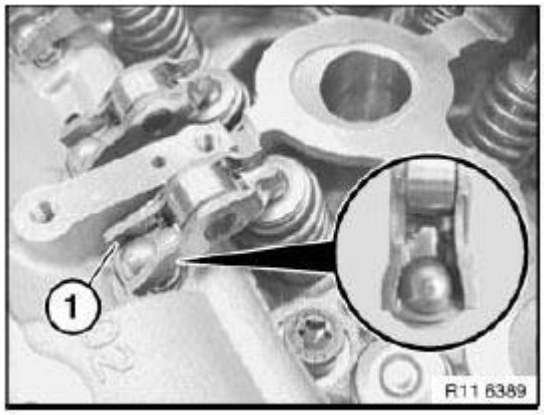


Fig. 232: Installing Roller Cam Follower On HVCA Element And Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Pre-install bearing strip of intake camshaft.

Lubricate all bearing points in lower bearing strip with engine oil.

Installation note:

Lay intake camshaft (1) in bearing strip.

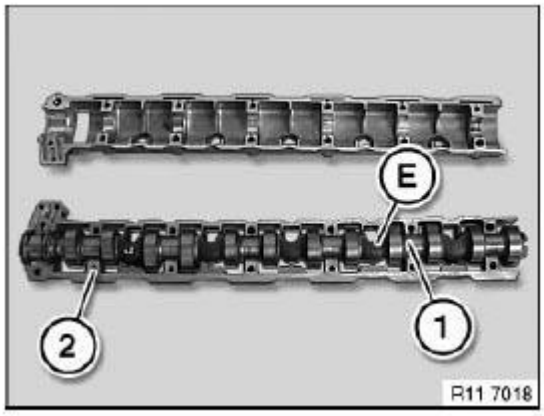


Fig. 233: Identifying Intake Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate intake camshaft (1) at cylinder No. 1 into position (2).

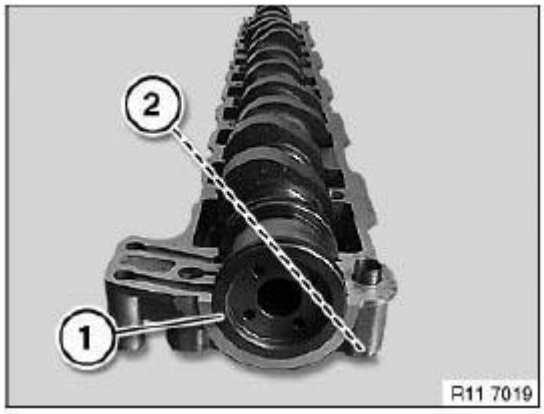


Fig. 234: Rotating Intake Camshaft At Cylinder No. 1
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

Bring thrust piece and legs of special tool **11 8 553** into contact at milled surfaces.

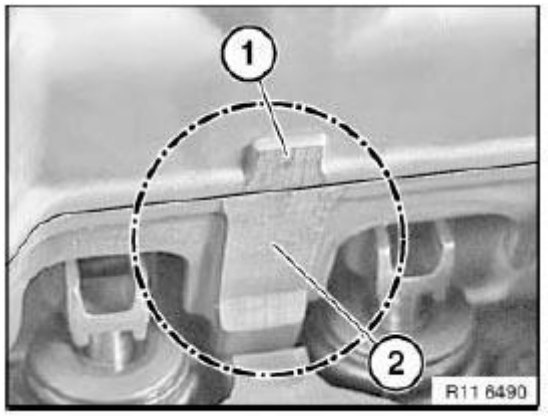


Fig. 235: Identifying Lower And Upper Bearing Banks
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic depiction of special tool 11 8 553 at lower bearing bank (1) and upper bearing bank (2).

IMPORTANT: Tighten screw (3) on thrust piece to 2 Nm.

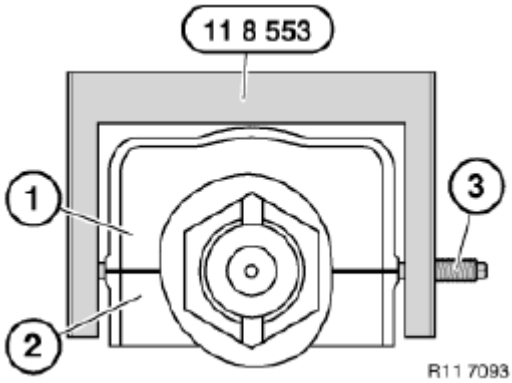


Fig. 236: Identifying Special Tool (11 8 553), Lower Bearing Bank And Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool **11 8 553** over screw connection of bearing banks.

Make sure that legs come into exact contact on ground surfaces, lower bearing bank (1) and upper bearing bank (2).

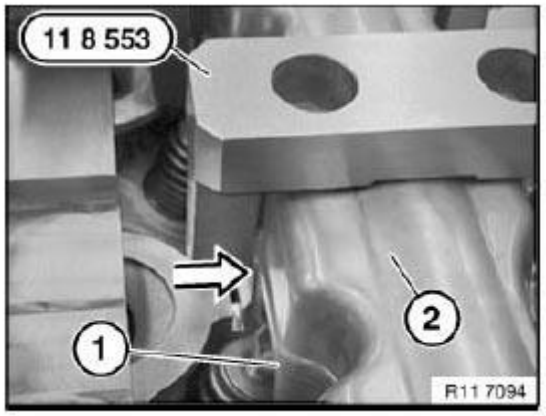


Fig. 237: Positioning Special Tool (11 8 553) Over Screw Connection Of Bearing Banks
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten screw of special tool **11 8 553** to ground surfaces of lower bearing bank (1) and upper bearing bank (2).

IMPORTANT: Tighten screws on thrust piece to 2 Nm.

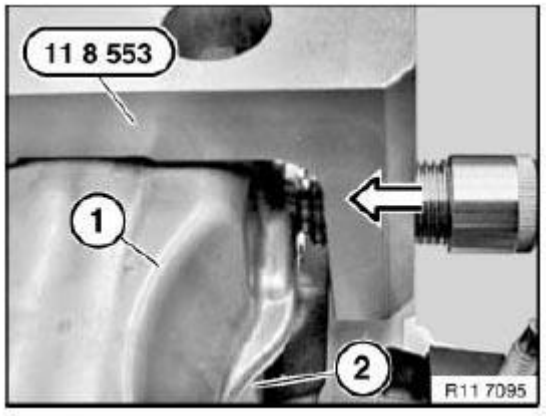


Fig. 238: Tightening Screw Of Special Tool (11 8 553) To Ground Surfaces Of Lower Bearing Bank And Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Set special tool 11 4 350 to 2 Nm.
Pretension all special tools 11 8 553 with special tool 11 4 350 only.

Fig. 239: Identifying Special Tool (11 4 350)
Courtesy of BMW OF NORTH AMERICA, INC.

Install upper and lower bearing strips (1).

Pre-install all special tools **11 8 553** .

IMPORTANT: Secure special tool 11 8 553 to MAX 2 Nm.

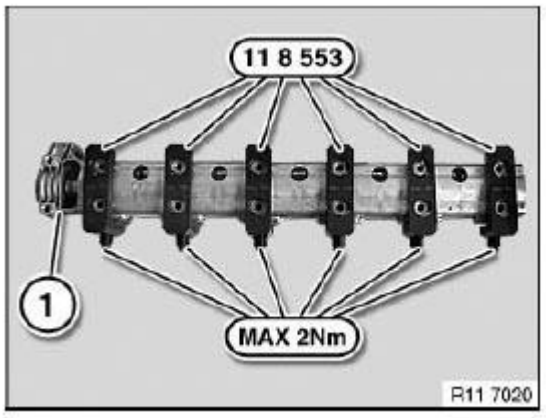


Fig. 240: Identifying Upper And Lower Bearing Strips With Special Tools (11 8 553)
Courtesy of BMW OF NORTH AMERICA, INC.

Install intake camshaft with bearing strips (1) on cylinder head.

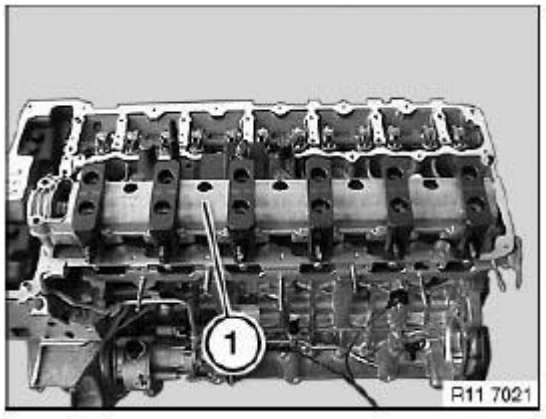


Fig. 241: Identifying Intake Camshaft With Bearing Strips On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Check position of intake camshaft (1) at 6th cylinder.

Roller cam follower (2) is not actuated.

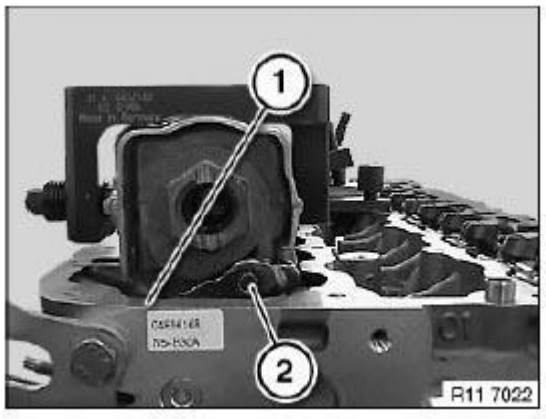


Fig. 242: Identifying Intake Camshaft And Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque: **11 31 1AZ** .

IMPORTANT: Remove special tool 11 8 553 only when camshaft screw connection is completed .

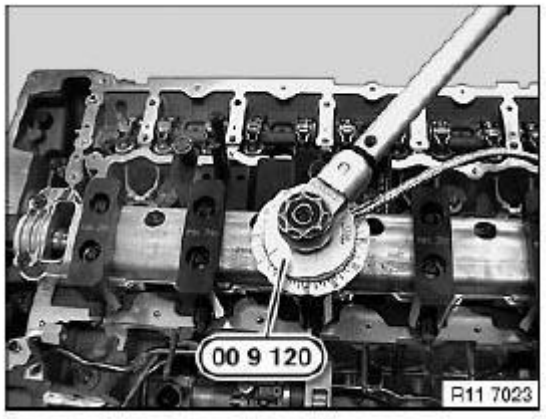


Fig. 243: Tightening Lower And Upper Bearing Banks With Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust **VALVE TIMING**.

Assemble engine.

11 31 028 REMOVING AND INSTALLING OR REPLACING EXHAUST CAMSHAFT

Special tools required:

- **00 9 120**
- **11 4 350**
- **11 8 551**
- **11 8 552**
- **11 8 553**
- **11 9 000**

IMPORTANT: Risk of damage!

It is absolutely essential to follow an exact procedure for removing and installing the exhaust camshaft.

The upper and lower bearing banks must be tensioned with a total of six special tools 11 8 553 .

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER**.
- Remove **EXHAUST ADJUSTMENT UNIT** for exhaust camshaft.
- Adjust **VALVE TIMING**.

Release bearing cap screw connections from outside inwards.

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

NOTE: Illustration shows N52.

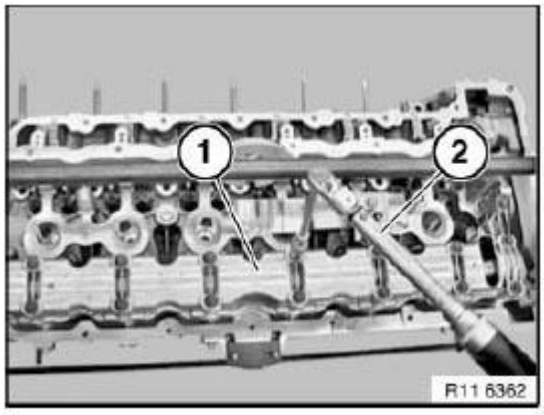


Fig. 244: Lifting Out Lower And Upper Bearing Banks With Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Both camshafts have different identifications.
Mixing up the two camshafts will result in engine damage .

A Exhaust camshaft.

E Intake camshaft

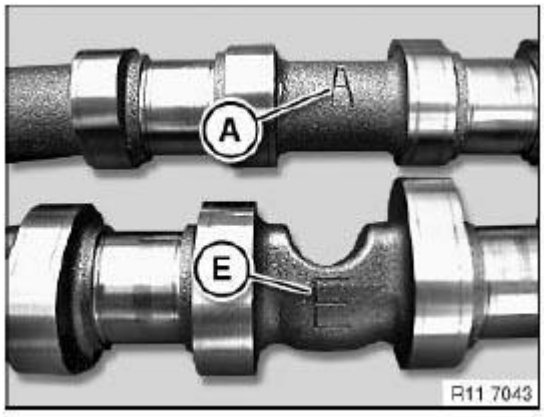


Fig. 245: Identifying Exhaust And Intake Camshaft Identifications Marks
Courtesy of BMW OF NORTH AMERICA, INC.

Metal plain rectangular compression ring:

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

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

The plain rectangular compression rings have catches at the joint.

Press the plain rectangular compression rings (1) apart forwards and towards the rear and remove towards the front.

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

Installation note:

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

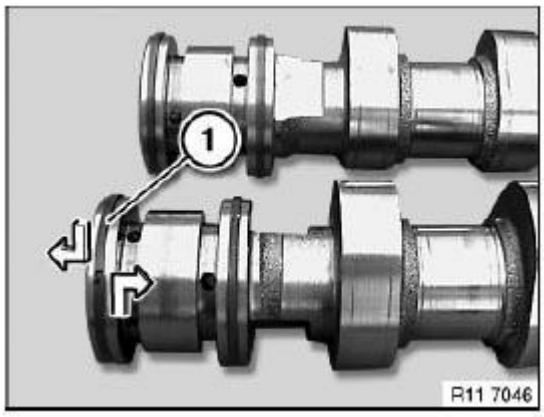


Fig. 246: Pressing Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Graphic shows N12 engine

Plastic plain rectangular compression ring:

Installation note:

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

Insert plastic rectangular compression ring (1) into groove of exhaust camshaft (2) (see arrow).

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

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

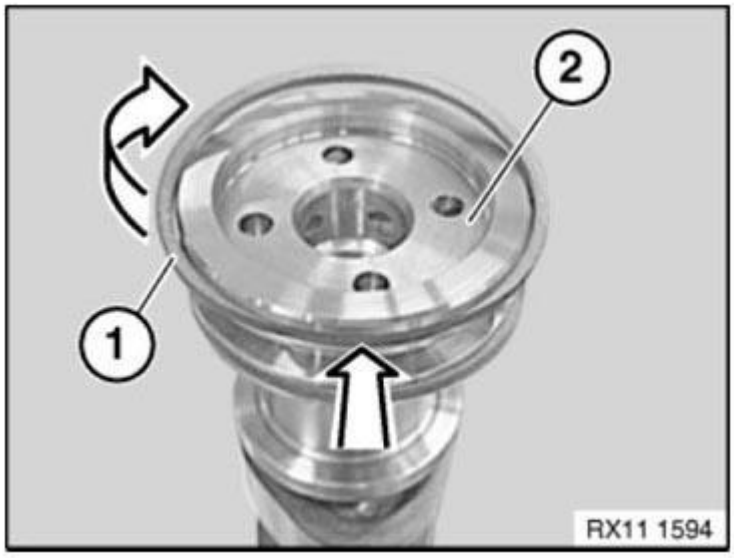


Fig. 247: Inserting Plastic Rectangular Compression Ring Into Groove Of Intake Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Removal on engine:

Engine at cylinder no. 1 firing TDC position.

Removed cylinder head:

When using special tool 11 9 000 (cylinder head clamping device), it will be necessary to remove the aluminium strip.

Installation note:

Before installing exhaust camshaft, make sure roller rocker arm is correctly seated HVCA element and valve.

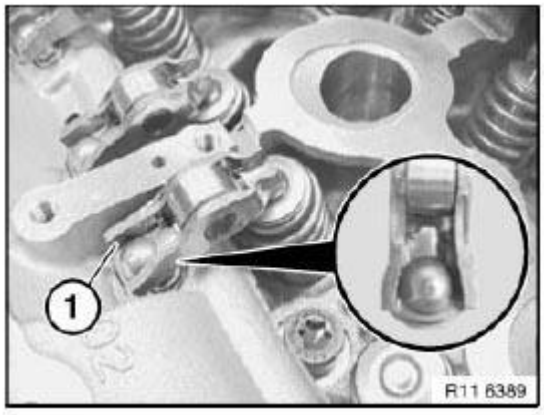


Fig. 248: Installing Roller Cam Follower On HVCA Element And Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Installing camshaft bearing strip:

Pre-install special tool **11 8 551** on cylinder 2.

Observe identification markings E and A

E: intake side.

A: exhaust side.

Insert special tool **11 8 552** in screw connection of cylinder head cover

Press down roller cam follower (1) on cylinder No. 2 with spindle nut of special tool **11 8 551** .

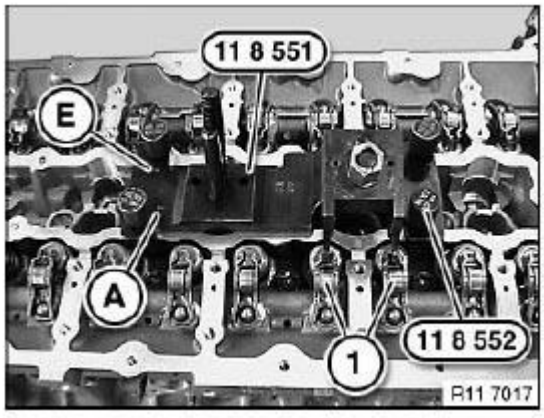


Fig. 249: Identifying Special Tools With Mark Letters E And A
Courtesy of BMW OF NORTH AMERICA, INC.

Lay lower bearing strip (1) on cylinder head.

Installation note:

Lubricate all bearing points with engine oil.

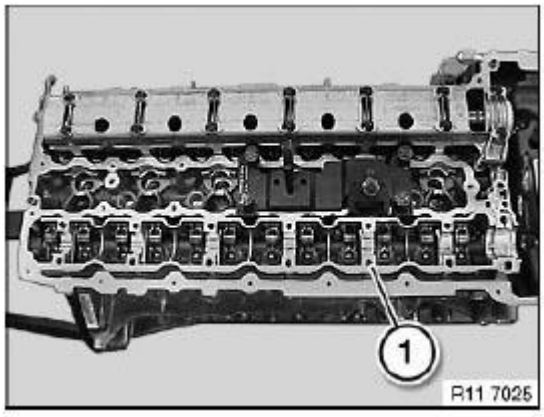


Fig. 250: Identifying Cylinder Head Lower Bearing Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Insert exhaust camshaft (1) in lower bearing bank.

Installation note:

Lubricate all bearing positions and cams with engine oil.

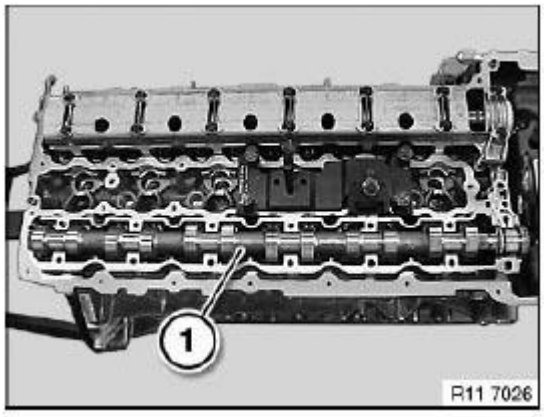


Fig. 251: Identifying Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation position (1) of exhaust camshaft (2) at 1st cylinder.

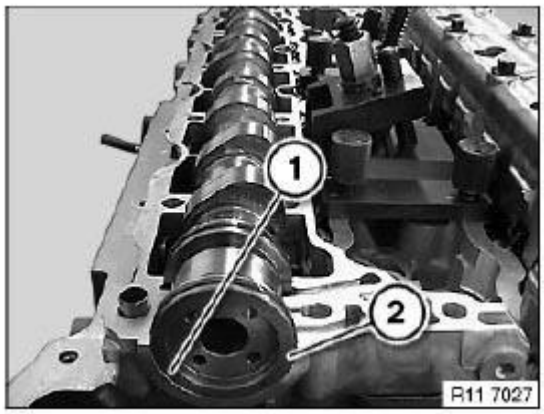


Fig. 252: Identifying Installation Position Of Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Join exhaust camshaft to lower and upper bearing strips with torque wrench from inside outwards to **8 Nm.**

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

Check position of exhaust camshaft (2) at 6th cylinder.

Roller cam follower (1) is not actuated.

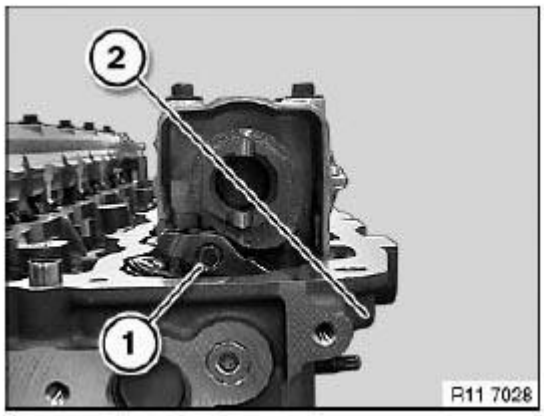


Fig. 253: Identifying Bearing Bank And Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

Bring thrust piece and legs of special tool **11 8 553** into contact at milled surfaces.

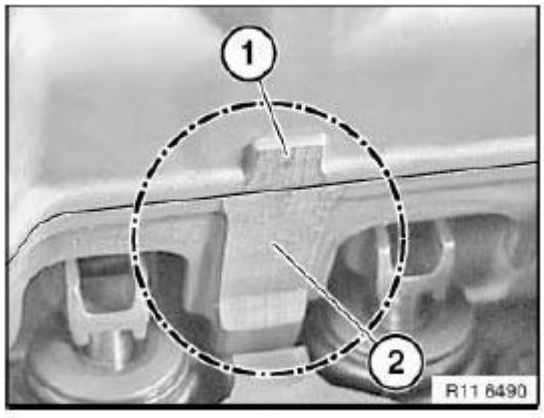


Fig. 254: Identifying Lower And Upper Bearing Banks
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic depiction of special tool 11 8 553 at upper bearing bank (1) and lower bearing bank (2).

IMPORTANT: Tighten screw (3) on thrust piece to 2 Nm.

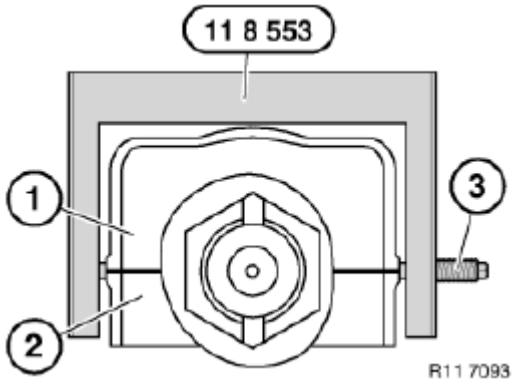


Fig. 255: Identifying Special Tool (11 8 553), Lower Bearing Bank And Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool **11 8 553** over screw connection of bearing banks.

NOTE: Make sure that legs come into exact contact on ground surfaces, lower bearing bank (1) and upper bearing bank (2).

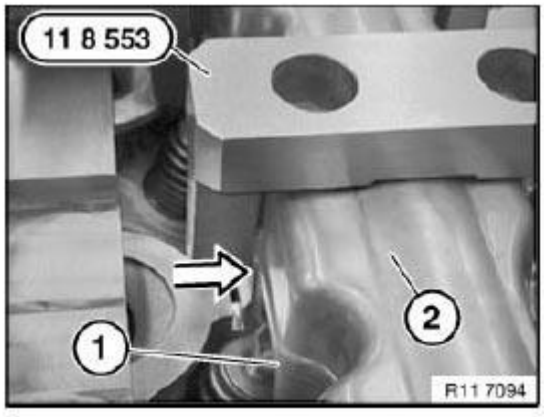


Fig. 256: Positioning Special Tool (11 8 553) Over Screw Connection Of Bearing Banks
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten screw of special tool **11 8 553** to ground surfaces of lower bearing bank (2) and upper bearing bank (1).

IMPORTANT: Tighten screws on thrust piece to 2 Nm.

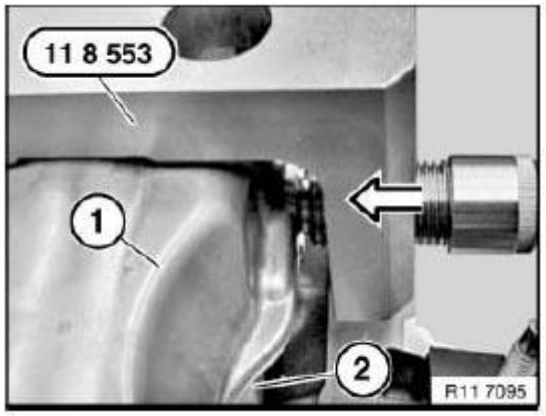


Fig. 257: Tightening Screw Of Special Tool (11 8 553) To Ground Surfaces Of Lower Bearing Bank And Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Set special tool 11 4 350 to 2 Nm.
Pretension all special tools 11 8 553 with special tool 11 4 350 only.

Fig. 258: Identifying Special Tool (11 4 350)
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tools **11 8 553** with screw (1) to inside of cylinder head.

On cylinder No. 2 mount special tool **11 8 553** with screw (1) facing outwards.

Position special tools **11 4 350** so that screw connections (2) of bearing bank are easily accessible.

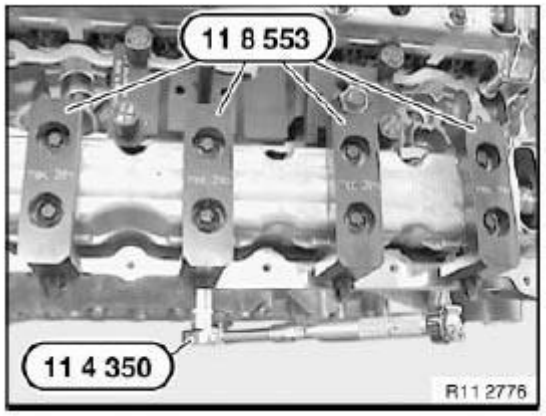


Fig. 259: Identifying Special Tools (11 8 553) And (11 4 350)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Position special tool **11 8 553** over screw connection of bearing banks.

Tightening torque: **11 31 1AZ** .

IMPORTANT: Remove special tool 11 8 553 only when camshaft screw connection is completed .

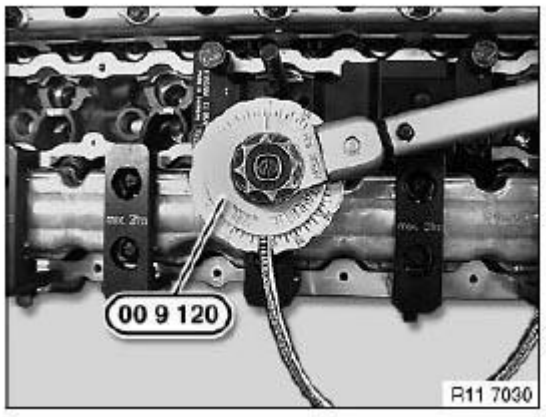


Fig. 260: Tightening Lower And Upper Bearing Banks With Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 051 REPLACING TIMING CHAIN

Special tools required:

- **00 9 140**

- **11 0 300**
- **11 4 280**
- **11 8 180**
- **11 8 660**
- **11 9 260**

Necessary preliminary tasks:

- Remove **FAN COWL** .
- Remove **CYLINDER HEAD COVER**.
- Remove all spark plugs.
- Remove **CHAIN TENSIONER**.
- Remove **CRANKSHAFT RADIAL SEAL** at front
- Remove **BELT TENSIONER**.
- Remove **VIBRATION DAMPER**.
- Remove **INLET AND EXHAUST ADJUSTMENT UNITS**.

Remove fastener (1) in direction of arrow.

Installation note:

Install fastener (1) with bore facing outwards.

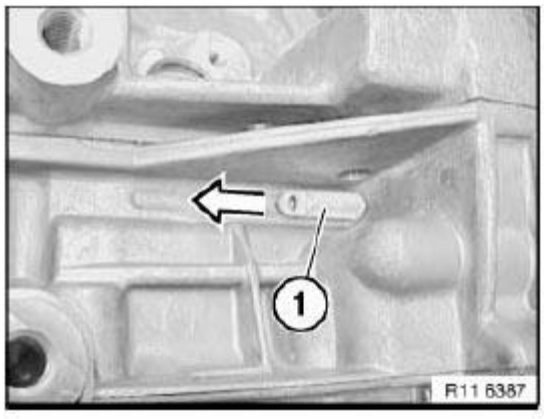


Fig. 261: Removing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Secure engine in firing TDC position of 1st cylinder with special tool **11 0 300.**

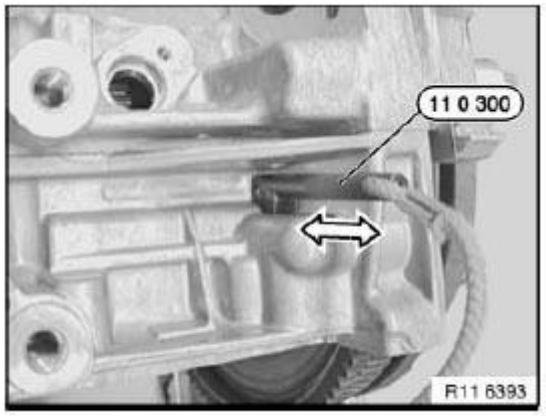


Fig. 262: Securing Engine In Firing TDC Position Of 1st Cylinder With Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

Mark flywheel and transmission housing with a line (1).

NOTE: Illustration shows automatic transmission.

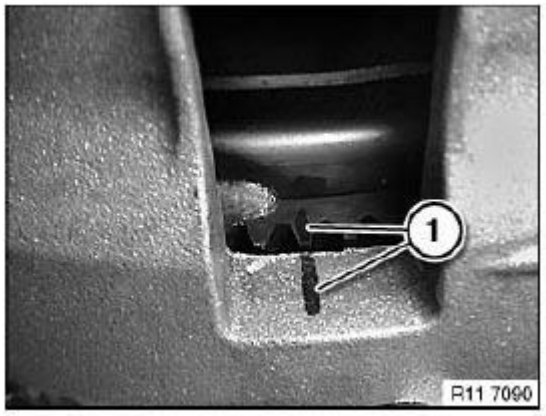


Fig. 263: Identifying Flywheel And Transmission Housing Aligning Mark
Courtesy of BMW OF NORTH AMERICA, INC.

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

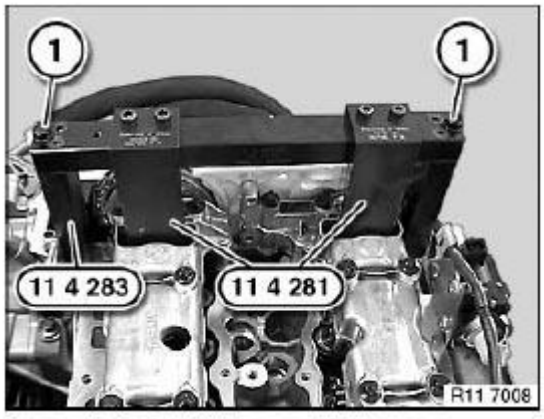


Fig. 264: Identifying Special Tools (11 4 281) And (11 4 283)
Courtesy of BMW OF NORTH AMERICA, INC.

Procedure, transmission removed.

Secure flywheel (crankshaft) with special tool **11 9 260.**

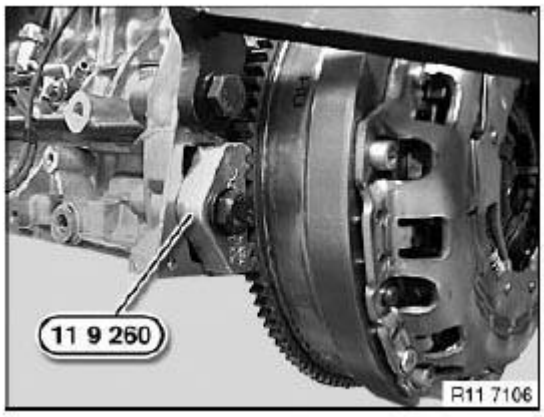


Fig. 265: Securing Flywheel (Crankshaft) With Special Tool (11 9 260)
Courtesy of BMW OF NORTH AMERICA, INC.

Secure flywheel (crankshaft) with special tool **11 8 660** to transmission.

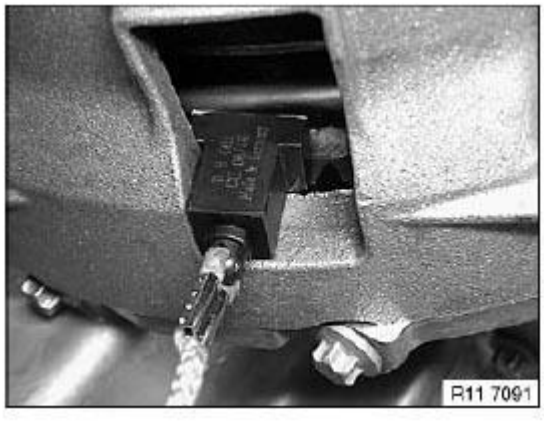


Fig. 266: Securing Flywheel (Crankshaft) With Special Tool To Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tool **11 8 180** on manual transmission with bolts (1) and secure flywheel in direction of arrow.

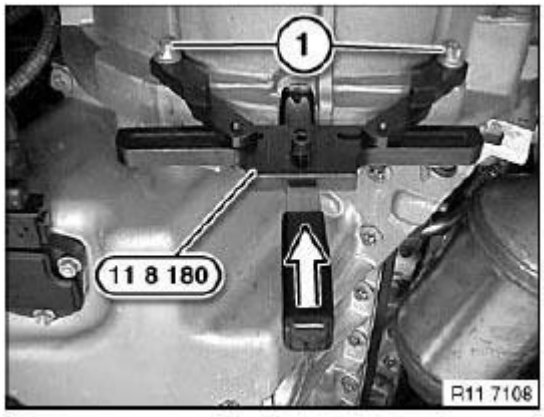


Fig. 267: Mounting Special Tool (11 8 180) On Manual Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: To release central bolt (1), remove special tool 11 0 300 .

Release central bolt with a 3/4" socket (1) and if necessary with a 3/4" extension (2).

Tightening torque: **11 21 1AZ** .

Remove central bolt with hub towards front.

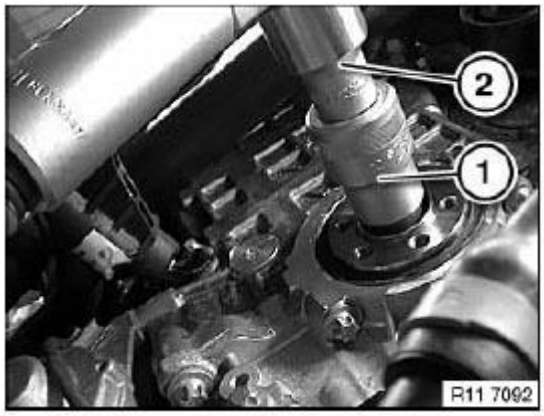


Fig. 268: Releasing Central Bolt With Socket And Extension
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque: **11 31 6AZ** .

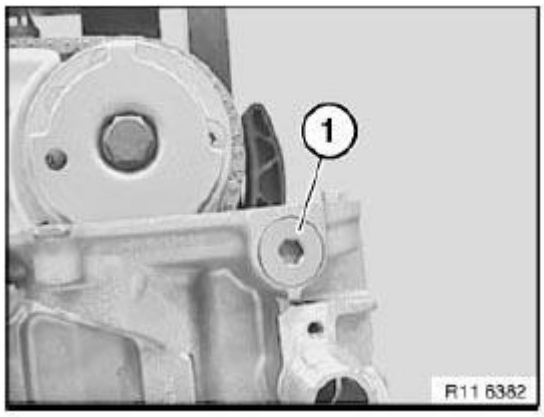


Fig. 269: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque: **11 31 6AZ** .

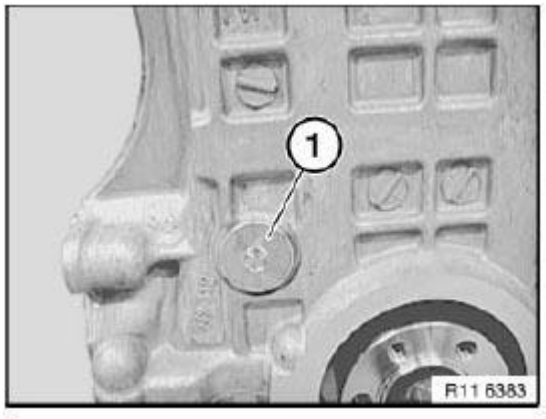


Fig. 270: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on chain drive at top.

Tightening torque: **11 31 2AZ** .

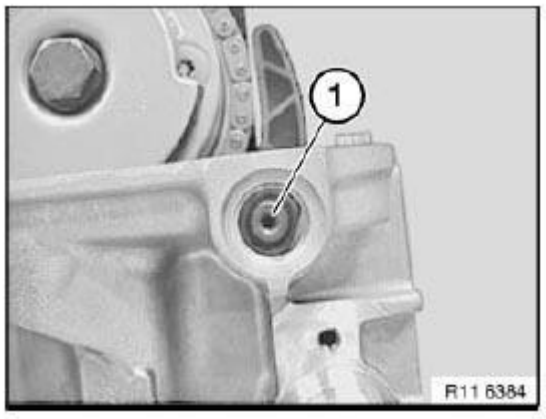


Fig. 271: Identifying Screw On Chain Drive At Top
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on chain drive at bottom.

Tightening torque: **11 31 3AZ** .

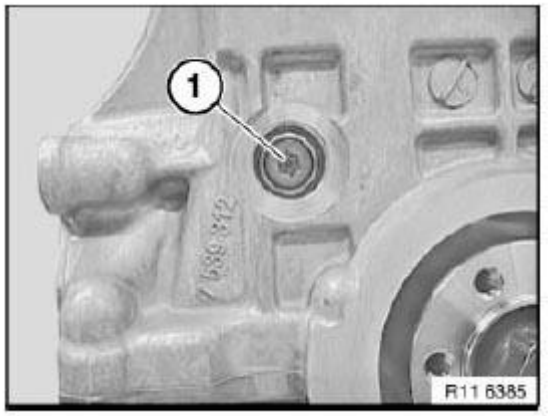


Fig. 272: Identifying Screw On Chain Drive At Bottom
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: **11 31 2AZ** .

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

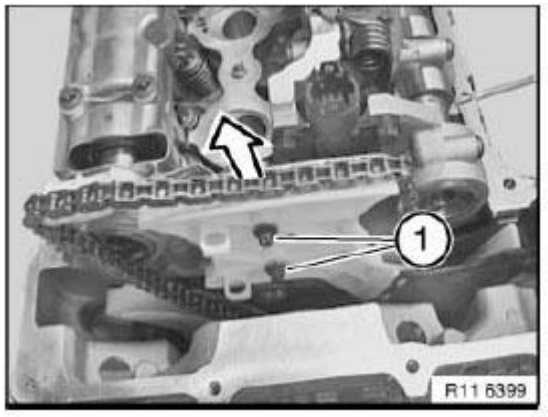


Fig. 273: Removing Timing Chain Module With Timing Chain And Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

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

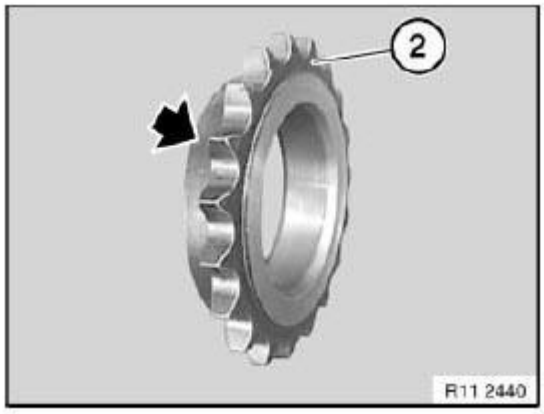


Fig. 274: Locating Collar On Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Installation note:

Always keep timing chain tensioned; it is possible for timing chain (1) to jam on chain module (3).

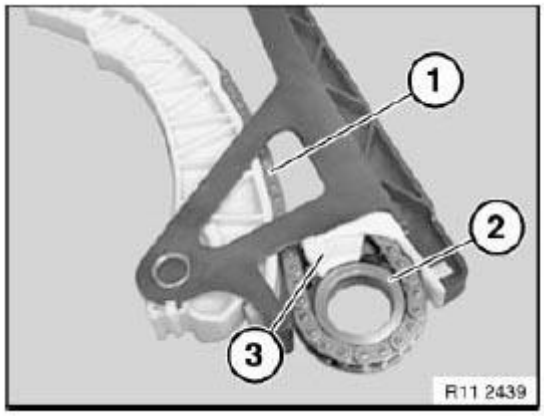


Fig. 275: Identifying Timing Chain, Sprocket Wheel And Chain Guide
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The N54 engine requires special friction plates between the friction surfaces. The engine will incur damage if the plates are damaged or are not fitted.

Friction plates (1 and 2) are clipped into place on sprocket wheel/oil pump module.

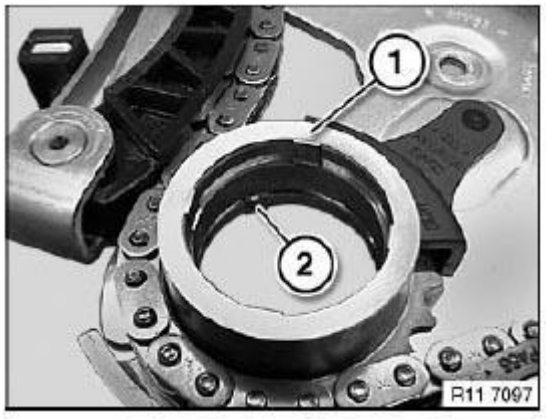


Fig. 276: Identifying Friction Plates
Courtesy of BMW OF NORTH AMERICA, INC.

Make sure friction plate (3) is in correct installation position.

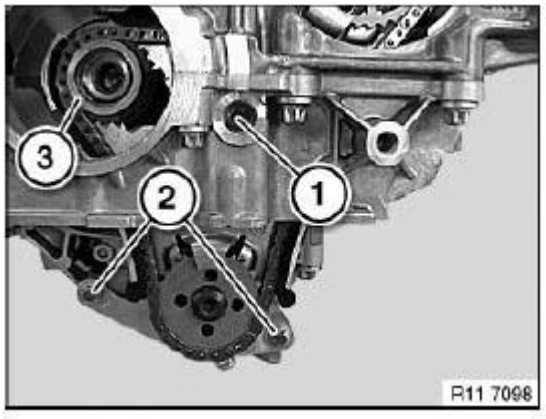


Fig. 277: Identifying Correct Installation Position Of Friction Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Push on friction plate (1) without retainers.

IMPORTANT: The N54 engine requires special friction plates between the friction surfaces. The engine will incur damage if the plates are damaged or are not fitted.

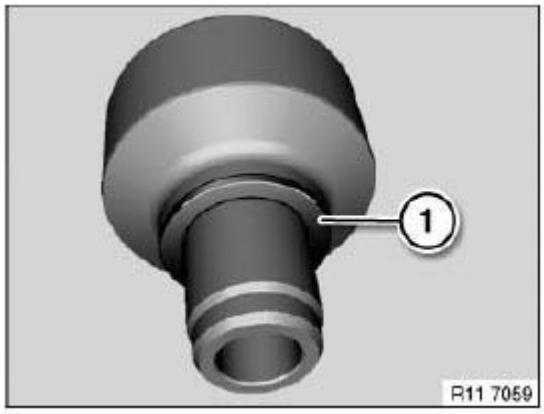


Fig. 278: Identifying Friction Plate Without Retainers
Courtesy of BMW OF NORTH AMERICA, INC.

Insert chain module from above and secure with bolt (1).

Make sure gear wheels (2) are in correct installation position.

Insert hub (3) with friction plate.

Tightening torque: **11 21 1AZ** .

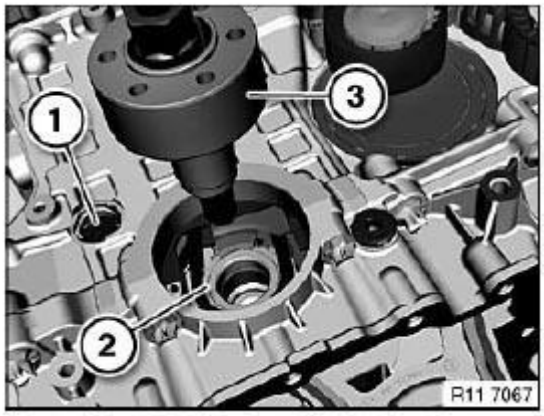


Fig. 279: Identifying Bolt, Gear Wheels And Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool **00 9 140** with magnet to engine carrier (1).

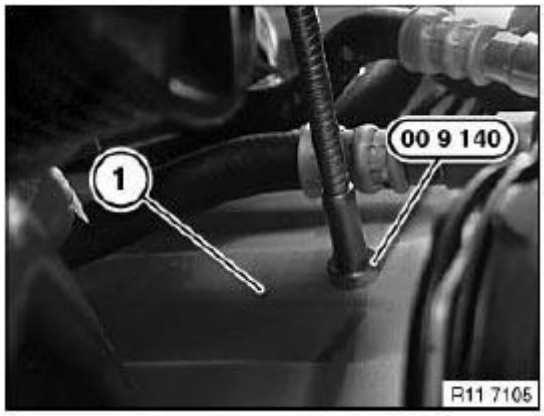


Fig. 280: Securing Special Tool (00 9 140) With Magnet To Engine Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Secure central bolt with special tool **00 9 140.**

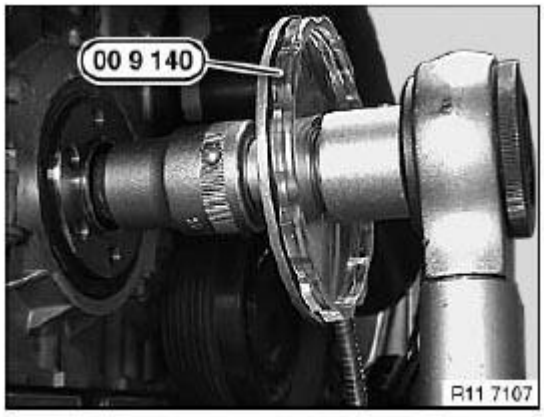


Fig. 281: Securing Central Bolt With Special Tool (00 9 140)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **CRANKSHAFT RADIAL SEAL** at front.

Install **INLET AND EXHAUST ADJUSTMENT UNITS**.

Install **CHAIN TENSIONER**.

Crank engine twice.

Check **TIMING**.

Assemble engine.

11 31 090 INSTALLING AND REMOVING/REPLACING CHAIN TENSIONER PISTON

Release chain tensioner (1).

Tightening torque:**11 31 5AZ** .

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

Installation note:

No sealing ring is fitted during series-production assembly.

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

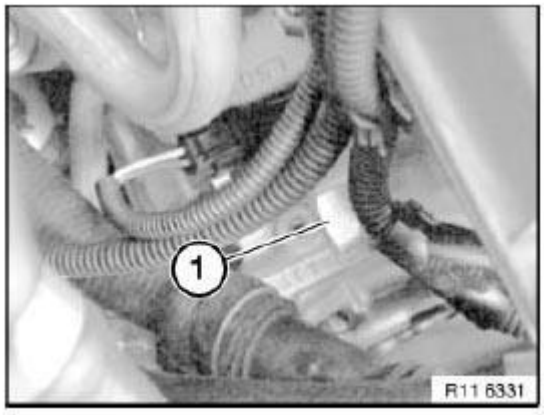


Fig. 282: Identifying Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

If the chain tensioner is reused, its oil chamber must be drained. Place chain tensioner on a level working surface and slowly compress.

Repeat procedure twice.

Fig. 283: Pressing Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 505 ADJUSTING CAMSHAFT TIMING

Special tools required:

- **00 9 120**
- **00 9 250**
- **11 0 300**
- **11 4 281**
- **11 4 283**
- **11 8 520**
- **11 9 340**

IMPORTANT: Risk of damage!

To open the central bolt at the camshaft, grip hexagon on rear of camshaft.

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER**.

Remove fastener (1) in direction of arrow.

Installation note:

Install fastener (1) with bore facing outwards.

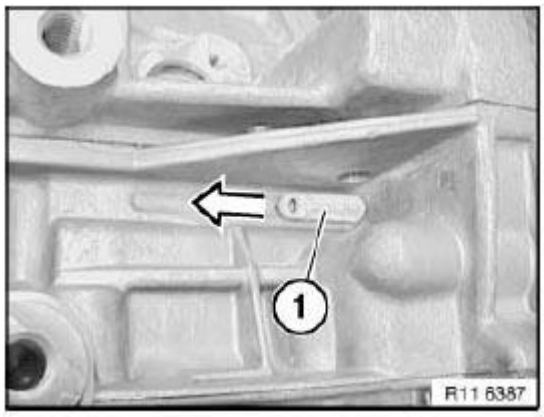


Fig. 284: Removing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

Slide in special tool **11 0 300** in direction of arrow and block crankshaft.

IMPORTANT: On engines with automatic transmissions, there is shortly before the special tool bore for the TDC position a large bore which can be confused with the special tool bore.

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

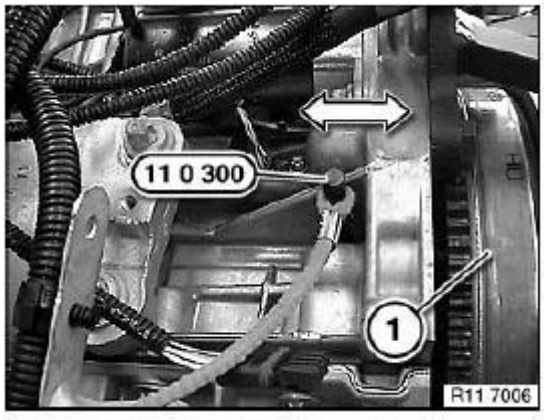


Fig. 285: Sliding Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Fit special tool **11 4 281** on special tool **11 4 283.**

IMPORTANT: If the special tool 11 4 281 cannot be installed, the camshaft must be rotated at the hexagon head at the rear.

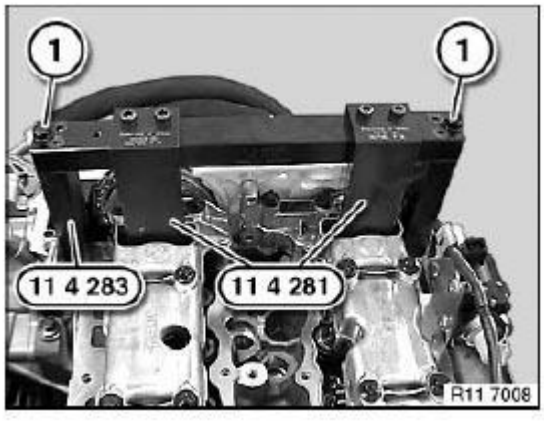


Fig. 286: Identifying Special Tools (11 4 281) And (11 4 283)

Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of exhaust camshaft (2) and inlet camshaft (1) at 6th cylinder point downwards at an angle.

NOTE: If the timing is checked while the engine is installed, the position of the camshaft can only be checked with a mirror.

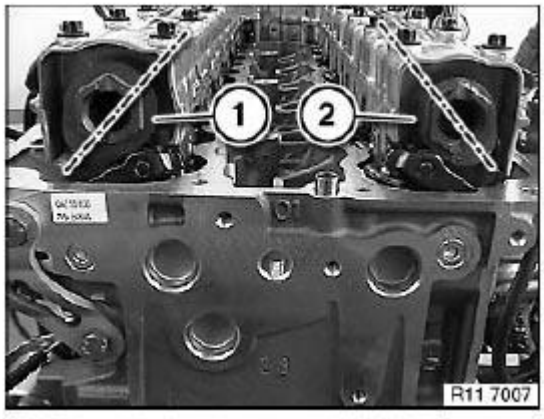


Fig. 287: Identifying Cams Of Exhaust Camshaft And Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Release central bolt (1) of exhaust camshaft.

Installation note:

Replace screw (1).

Tightening torque: **11 36 1AZ** .

Release central bolt (2) of inlet camshaft.

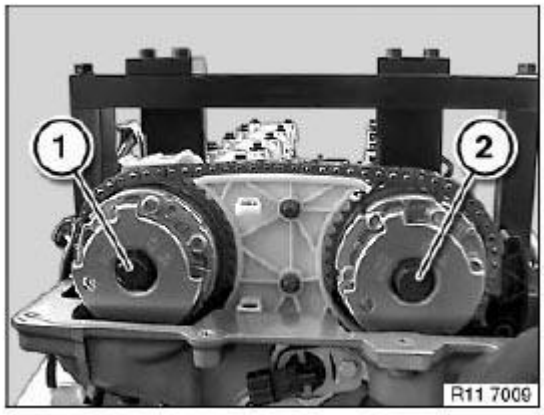


Fig. 288: Identifying Inlet Camshaft Central Bolt And Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace screw (2).

Tightening torque: **11 36 1AZ** .

Rotate sensor gears until locating pins on special tool **11 8 520** match up.

Push special tool **11 8 520** onto cylinder head.

Secure special tool **11 8 520** with bolts (1 and 2).

NOTE: Bolts (1 and 2) M6 x 45 with captive shim.

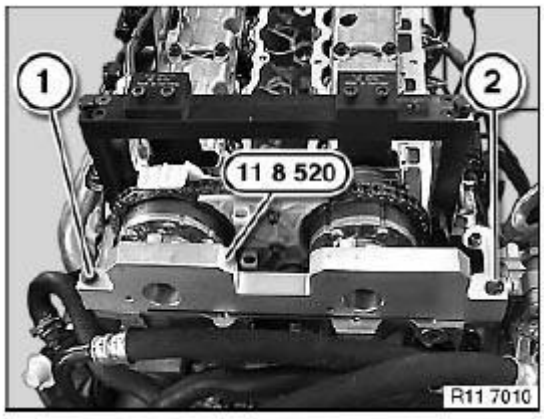


Fig. 289: Securing Special Tool (11 8 520) With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **CHAIN TENSIONER** (1).

Screw special tool **11 9 340** into cylinder head.

Pretension timing chain with special tool **00 9 250** to **0.6 Nm.**

Tighten central bolts (2 and 3) with special tool **00 9 120.**

Tightening torque: **11 36 1AZ** .

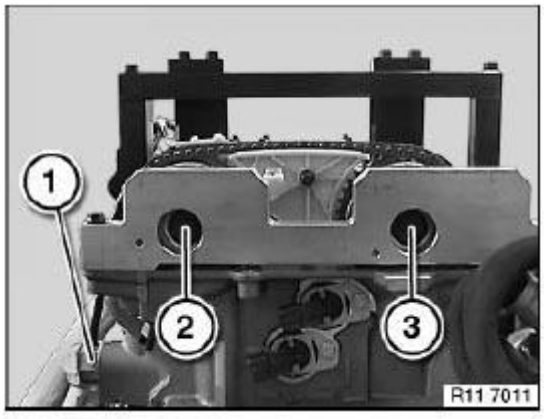


Fig. 290: Identifying Chain Tensioner And Central Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

ROCKER ARM WITH BEARING MOUNT

11 33 050 REMOVING AND INSTALLING/REPLACING ALL CAM FOLLOWERS

Special tools required:

- **11 4 480**

IMPORTANT: Rocker arms (1) are divided into bearing categories.
The tolerance classes are identified in numbers from 1 to 6.
Already used rocker arms (1) may only be reused in the same position.
A classification is not necessary in the N54 engine; in the event of replacement, all numbers from 1 to 6 can alternatively be installed.

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER**.
- Remove **INLET CAMSHAFT**.
- Remove **EXHAUST CAMSHAFT**.

Detach roller cam followers (1) from HVCA element and remove.

Set down roller cam followers in tidy and orderly fashion; if necessary, set down in special tool **11 4 480** .

Installation note:

Before installing exhaust and inlet camshafts, make sure roller cam followers are correctly seated.

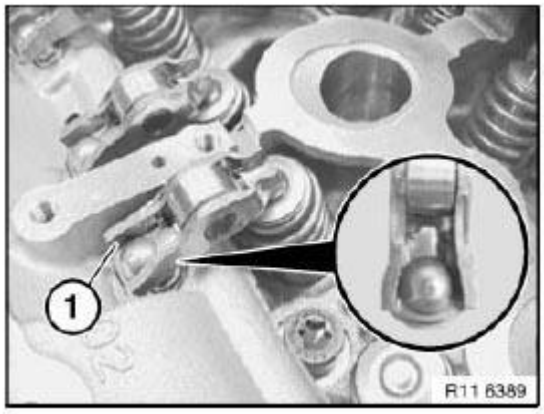


Fig. 291: Installing Roller Cam Follower On HVCA Element And Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Remove HVCA element in direction of arrow.

Installation note:

If the HVCA elements are to be reused, set them down if necessary in special tool **11 4 480** in a tidy and orderly fashion with the roller cam followers.

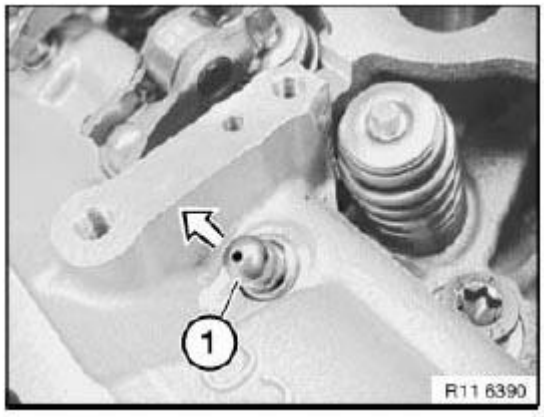


Fig. 292: Removing HVCA Element
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

VALVES WITH SPRINGS

11 34 552 REMOVING AND INSTALLING OR REPLACING ALL VALVES

Special tools required:

- **11 4 480**

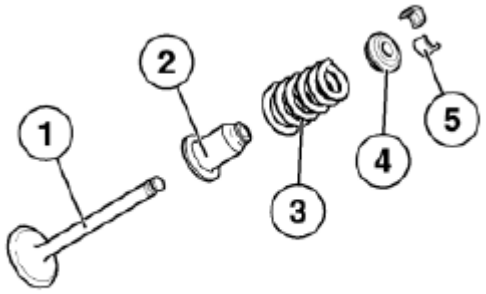
Necessary preliminary tasks:

- Remove **CYLINDER HEAD**.
- Remove **INLET CAMSHAFT**.
- Remove **EXHAUST CAMSHAFT**.
- Remove **ROLLER CAM FOLLOWER**.
- Remove **VALVE SPRINGS**.
- Remove **VALVE STEM SEALS**.

Arrangement:

1. Valve
2. Valve stem seal with spring plate, bottom
3. Valve spring
4. Top plate spring
5. Valve tapers

If the valves are to be reused, set then down in special tool **11 4 480** in a tidy and orderly fashion.



R11 4170

Fig. 293: Identifying Valve Components
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

11 34 560 REPLACING ALL VALVE STEM SEALS

Special tools required:

- **11 1 480**
- **11 6 380**

Necessary preliminary tasks:

- Remove **CYLINDER HEAD**.
- Remove **INLET CAMSHAFT**.
- Remove **EXHAUST CAMSHAFT**.
- Remove **ROLLER CAM FOLLOWER**.
- Remove **VALVE SPRINGS**.

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

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

Installation note:

Insert all **VALVES**.

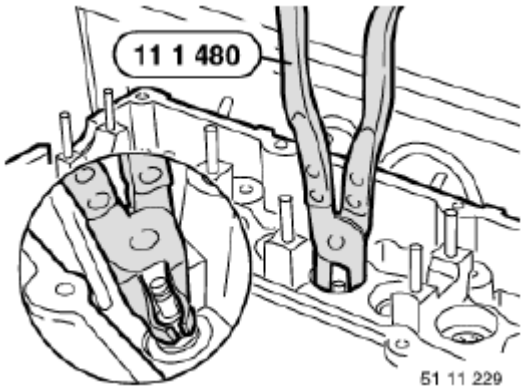


Fig. 294: Detaching Valve Stem Seal From Valve Stem By Pulling Special Tool (11 1 480)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For use on the N54 engine, special tool 11 6 380 must be remachined according to the sketch with a 10mm dia. drill bit to a depth of B = approx. 23 mm. This modification has already been taken into account for reordering.

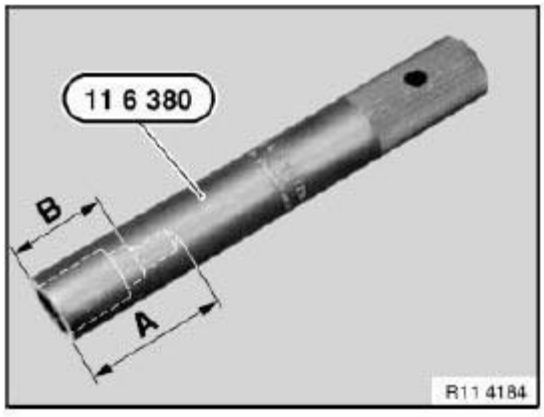


Fig. 295: Identifying Special Tool (11 6 380)

Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Different diameters at valve stem.
All valve stem seals are color-coded.**

Valve dia. 5 mm: valve stem seal is red or brown.

Valve dia. 6 mm: valve stem seal is green or light green.

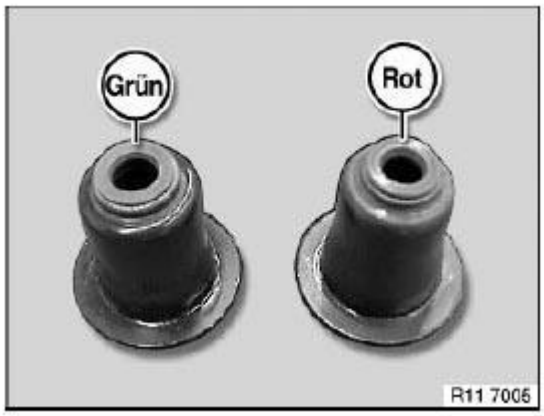


Fig. 296: Identifying Valve Stem Diameters With Color-Coded
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Fit the mounting sleeves (plastic sleeves) supplied in the spare part on the valve stem end

Lubricate mounting sleeve.

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

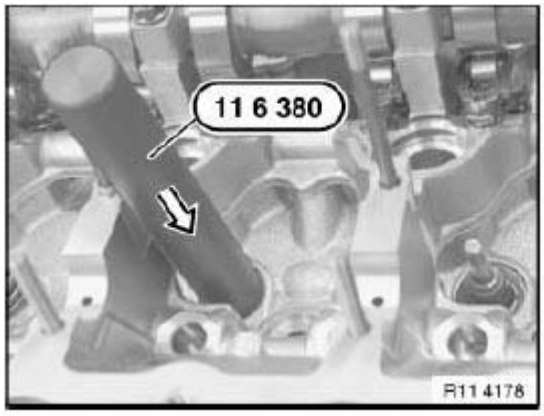


Fig. 297: Pressing Valve Stem Seal With Special Tool (11 6 380)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Illustrations show N46.

Assemble engine.

11 34 715 REPLACING ALL VALVE SPRINGS

Special tools required:

- **11 0 009**
- **11 0 346**
- **11 4 480**
- **11 9 000**
- **11 9 017**

IMPORTANT: Different valve stem diameters.

Mixing up the valve springs will result in damage to the engine.

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER**.
- Remove **CYLINDER HEAD**.
- Remove **EXHAUST CAMSHAFT**.
- Remove **INLET CAMSHAFT**.
- Remove **ROLLER CAM FOLLOWER**.

Inlet valves:

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

Press valve spring down on spring retainer with special tools **11 0 009** and **11 9 017.**

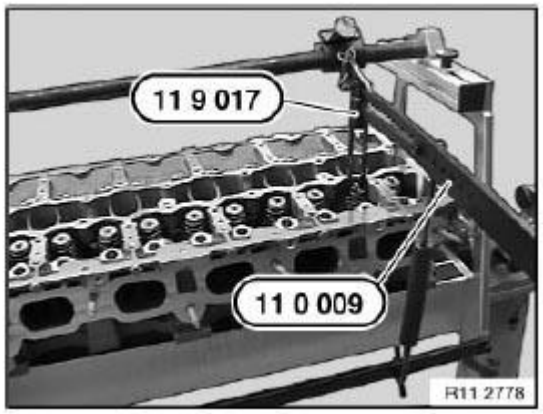


Fig. 298: Pressing Valve Spring Down On Spring Retainer With Special Tools (11 0 009) And (11 9 017)
Courtesy of BMW OF NORTH AMERICA, INC.

Exhaust valves:

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

Press valve spring down on spring retainer with special tools **11 0 009** and **11 0 346.**

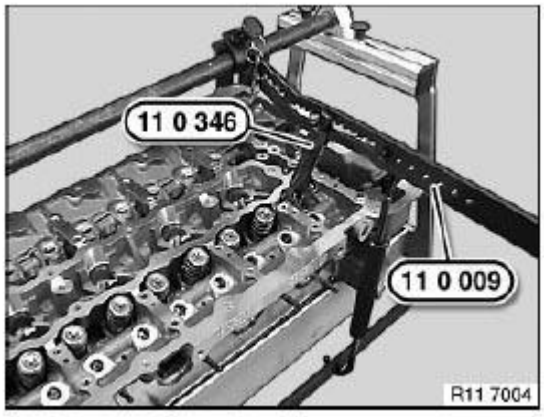


Fig. 299: Pressing Valve Spring Down On Spring Retainer With Special Tools (11 0 009) And (11 0 346)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove valve tapers with a magnet.

Remove valve spring and spring retainer.

Set down on special tool **11 4 480** in a tidy and orderly fashion.

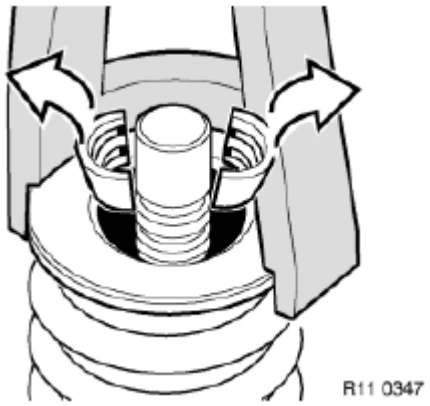


Fig. 300: Removing Valve Spring And Spring Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Incorrect installation possible.

Incorrect installation will result in valve spring breakage!

Color marking (1) is normally on lower end of valve spring.

Installation note:

Inlet valve: Violet/green or violet/yellow

Exhaust valve: White/green or white/yellow

If the colors on the valve springs can no longer be identified, these must be replaced for safety reasons.

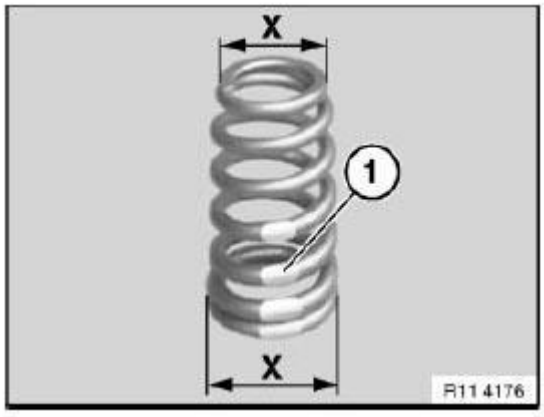


Fig. 301: Identifying Valve Spring With Color Marking
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement:

1. Valve
2. Valve stem seal with spring plate, bottom
3. Valve spring
4. Top plate spring
5. Valve tapers

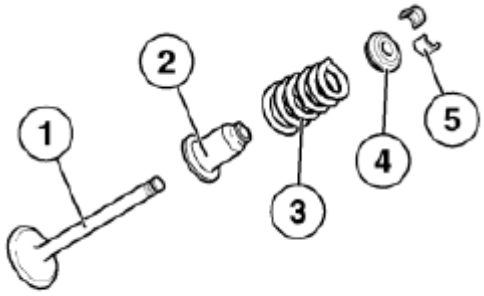


Fig. 302: Identifying Valve Components
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

VARIABLE CAMSHAFT TIMING

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

Special tools required:

- **11 0 300**
- **11 4 280**
- **11 4 281**
- **11 4 283**

IMPORTANT: To open central bolts, release at inlet and exhaust adjustment units with special tool 11 4 280 only.

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER**.

Remove fastener (1) in direction of arrow.

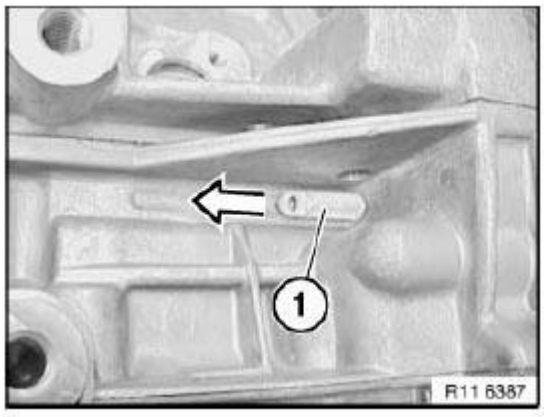


Fig. 303: Removing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Slide in special tool **11 0 300** in direction of arrow.

Rotate flywheel (1) at central bolt until firing TDC position at 1st cylinder is reached.

IMPORTANT: The TDC bore can be mixed up in automatic transmissions.

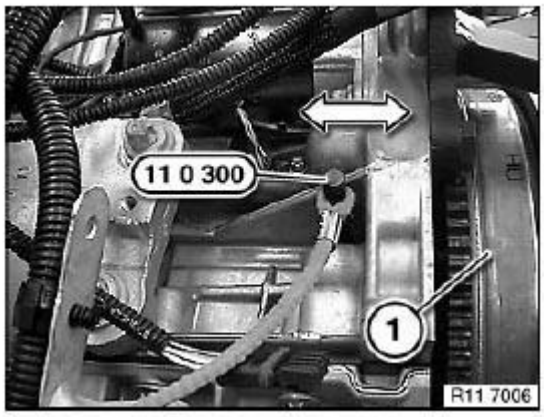


Fig. 304: Sliding Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, inlet camshaft (1) at 6th cylinder points downwards at an angle to the left.

With 1st cylinder in firing TDC position, exhaust camshaft (2) at 6th cylinder points downwards at an angle to the right.

Installation note:

If the timing is checked while the engine is installed, this can only be checked with a mirror.

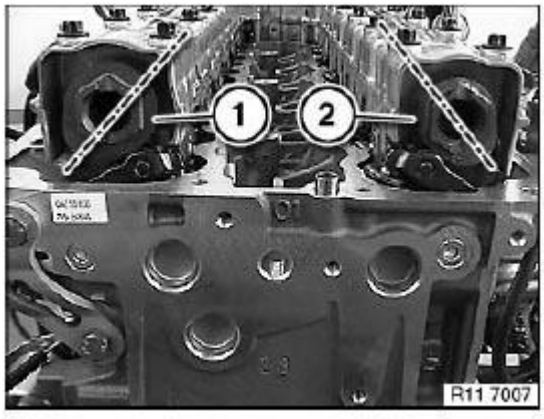


Fig. 305: Identifying Cams Of Exhaust Camshaft And Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

Fit special tool **11 4 281** on special tool **11 4 283.**

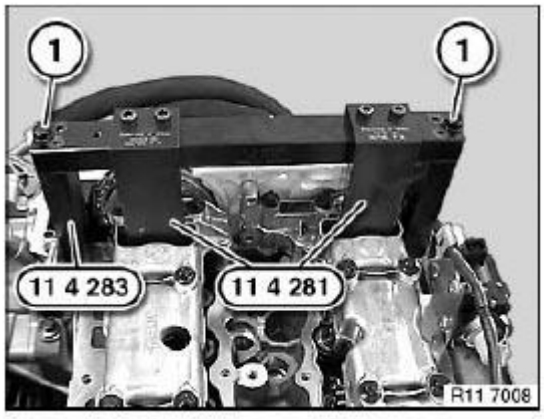


Fig. 306: Identifying Special Tools (11 4 281) And (11 4 283)
Courtesy of BMW OF NORTH AMERICA, INC.

Release central bolt of exhaust adjustment unit (1).

Release central bolt of inlet adjustment unit (2).

Tightening torque: **11 36 1AZ** .

Release **CHAIN TENSIONER**.

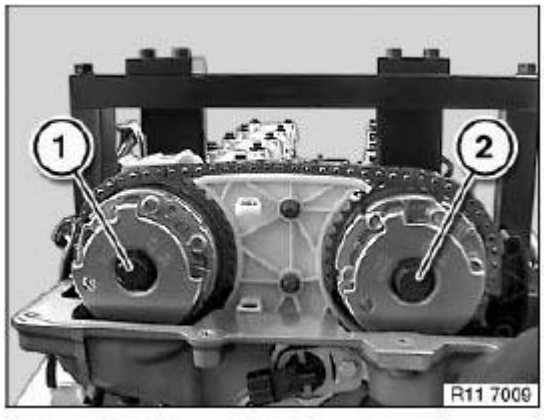


Fig. 307: Identifying Inlet Camshaft Central Bolt And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Detach exhaust adjustment unit (1) from exhaust camshaft.

Detach inlet adjustment unit (2) from inlet camshaft.

Installation note:

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

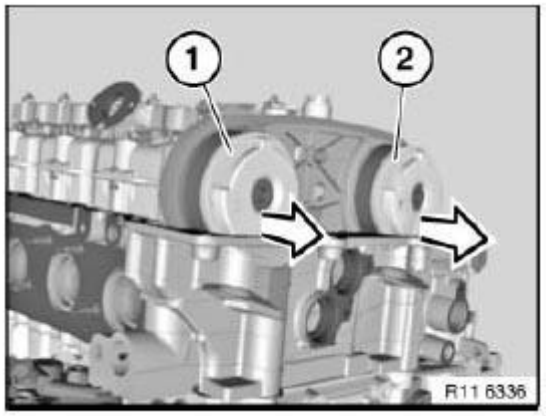


Fig. 308: Detaching Exhaust Adjustment Unit From Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT:

- **Risk of mixing up the inlet and exhaust adjustment units.**
- **Mixing up the inlet and exhaust adjustment units will cause damage to the engine.**

The inlet and exhaust adjustment units are different.

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

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

Sensor gears can be fitted alternatively.

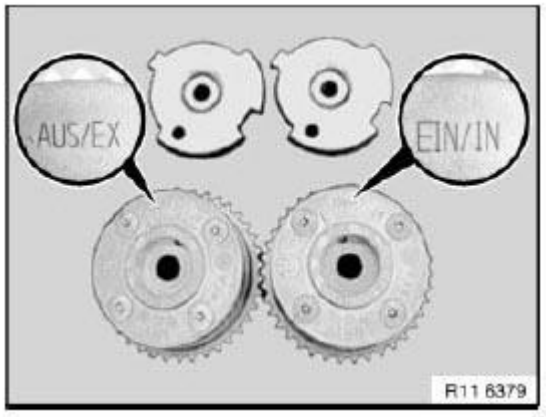


Fig. 309: Identifying AUS And EX Marks For Exhaust Camshaft And EIN And IN For Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Position inlet and exhaust adjustment units on camshafts.

Installation position of inlet and exhaust adjustment units can be freely selected.

Installation note:

Replace screws (1 and 2).

Insert screws (1 and 2).

Adjust **VALVE TIMING**.

Fit **CHAIN TENSIONER**.

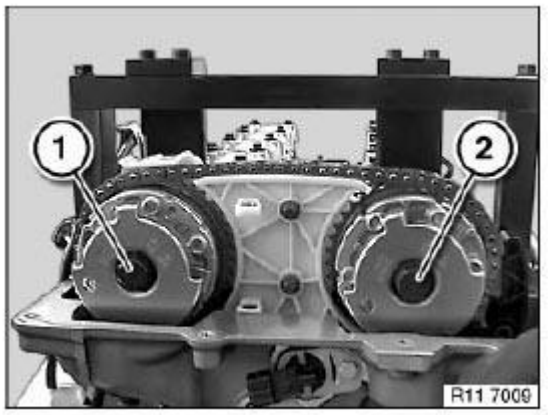


Fig. 310: Identifying Inlet Camshaft Central Bolt And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Incorrect installation possible.

Make sure that timing chain is guided in tensioning rail (1).

NOTE: Schematic representation on removed chain drive.

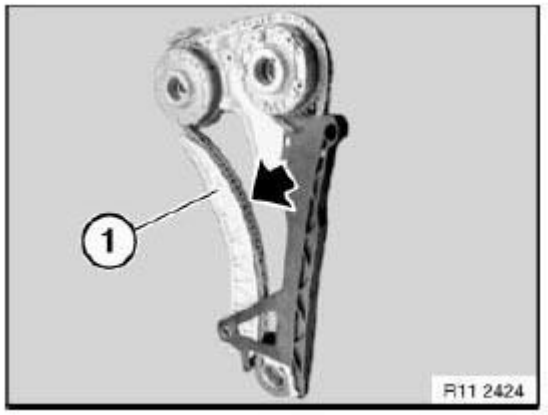


Fig. 311: Identifying Tensioning Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

OIL SUPPLY

11 40 000 CHECKING ENGINE OIL PRESSURE

Special tools required:

- **11 4 050**
- **13 3 061**
- **13 3 063**
- **13 6 051**
- **13 6 054**

Necessary preliminary tasks:

- Remove **FRONT IGNITION COIL COVER**.

Disconnect plug connection on oil pressure switch (1)

Remove oil pressure switch (2).

Tightening torque:**12 61 1AZ**

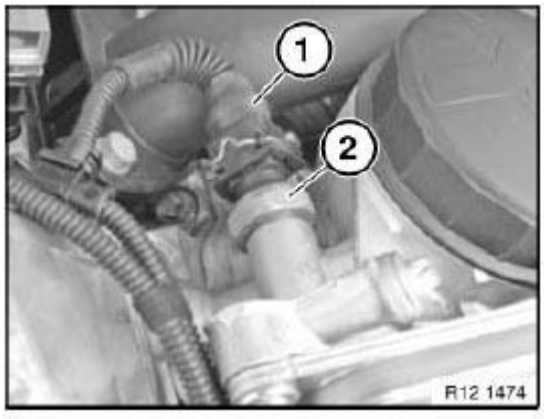


Fig. 312: Identifying Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool **11 4 050** with sealing ring.

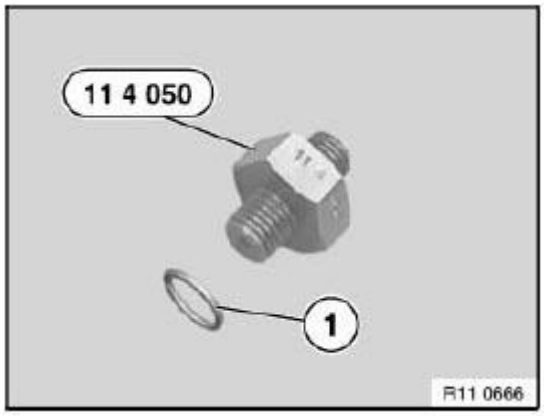


Fig. 313: Identifying Sealing Ring And Special Tool (11 4 050)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking engine oil pressure with BMW diagnosis system:

Connect special tools **13 6 054** and **13 6 051** .

Check engine oil pressure with pressure gauge.

Connect special tools **13 3 063** and **13 3 061** .

Start engine and check engine oil pressure.

Compare actual values with prescribed **SETPOINT VALUES** .

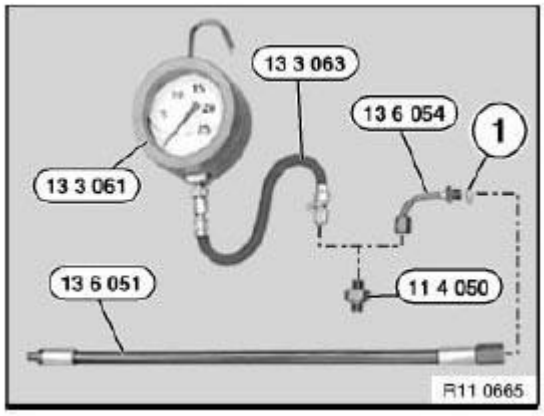


Fig. 314: Checking Engine Oil Pressure With Diagnosis Tester
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

OIL PUMP WITH FILTER AND DRIVE

11 41 000 REMOVING AND INSTALLING OIL PUMP

Special tools required:

- **11 0 300**

Necessary preliminary tasks:

- Remove oil sump.

Release screws (1).

Tightening torque: **11 41 1AZ** .

Installation note:

Replace aluminium screws.

Remove intake pipe (2) in direction of arrow.

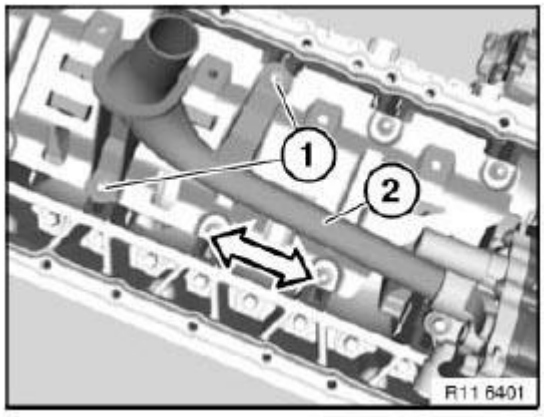


Fig. 315: Removing Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Secure oil pump drive gear with special tool **11 0 300** to oil pump.

IMPORTANT: Release central bolt (2) with special tool 11 0 300 only.

Tightening torque:**11 41 4AZ** .

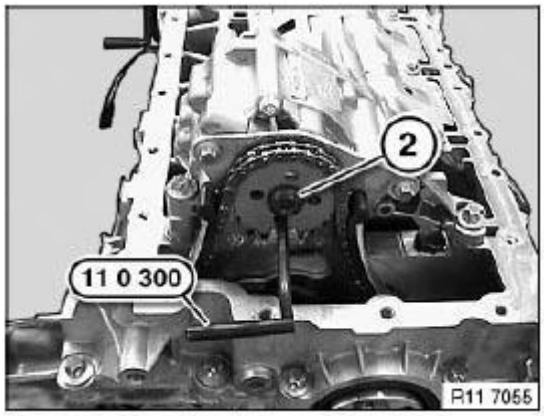


Fig. 316: Identifying Central Bolt With Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (2).

Tightening torque: **11 41 3AZ** .

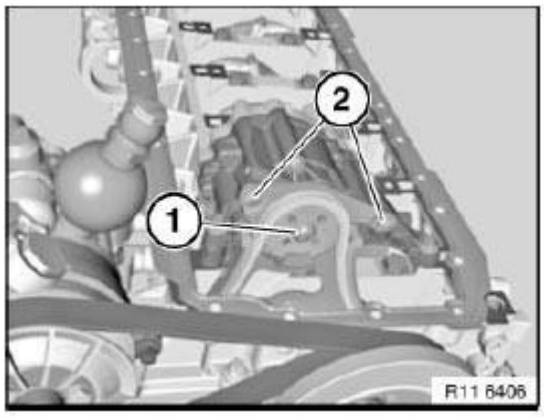


Fig. 317: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: **11 41 2AZ** .

Installation note:

Replace aluminium screws.

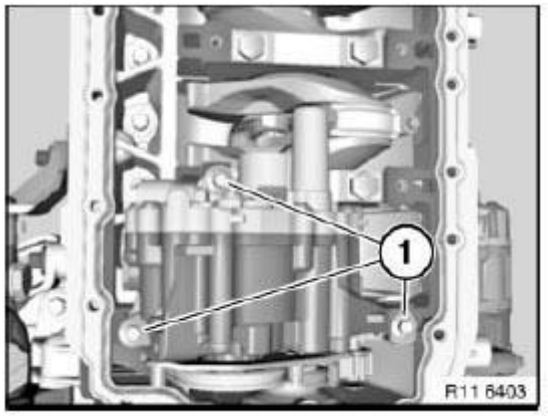


Fig. 318: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Detach sprocket wheel (1) in direction of arrow.

NOTE: Timing chain (3) of triangular drive is pressed upwards by chain tensioner.

Do not remove drive gear.

Remove oil pump (2) in direction of arrow.

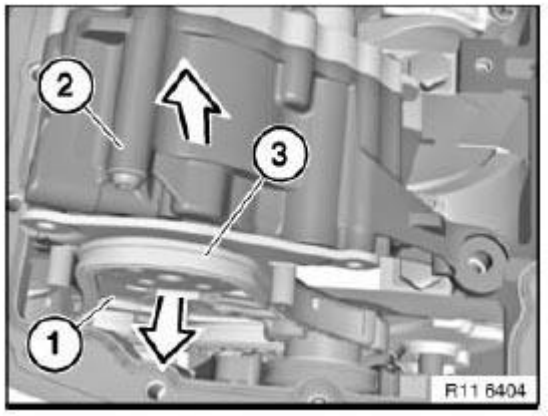


Fig. 319: Detaching Drive Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Check spacers (1) for damage and firm seating.

Replace spacers (1) if necessary.

Align twin surface (3) on oil pump (2) to drive gear.

Install oil pump (2).

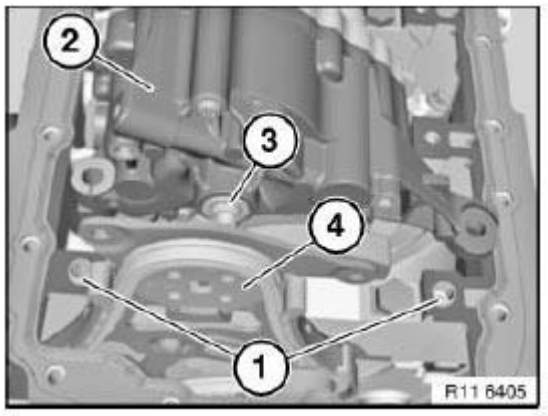


Fig. 320: Identifying Spacer Bushings And Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 41 010 REMOVING AND INSTALLING/REPLACING CHAIN MODULE FOR OIL PUMP/VACUUM PUMP

Special tools required:

- **11 0 290**
- **11 0 300**
- **11 4 120**
- **11 4 280**
- **11 5 200**
- **11 8 640**
- **11 8 650**
- **11 9 190**
- **11 9 280**

IMPORTANT: Aluminium screws/bolts must be replaced each time they are released .

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

For reliable identification:

Aluminium screws/bolts are not magnetic .

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

IMPORTANT: Aluminium screws/bolts must be replaced each time they are released .

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

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

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER**.
- Remove oil sump.
- Remove **DRIVE BELT**.
- Remove drive belt **TENSIONER**.
- Remove **VIBRATION DAMPER**.
- Remove **SEALING COVER** for vacuum pump.
- Remove **CHAIN TENSIONER**.

Turn sprocket wheel (3) at central bolt (crankshaft) into position.

Screw special tool 11 8 650 (holder) into crankcase.

Position special tool 11 0 290 (holder) on sprocket wheel and on special tool 11 8 650 (holder).

Release screw (1).

Tightening torque: see 2AZ in **11 66 VACUUM PUMP** .

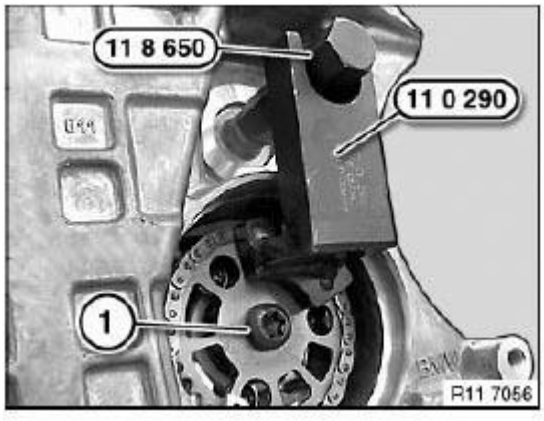


Fig. 321: Identifying Screw With Special Tool (11 8 650) And (11 0 290)
Courtesy of BMW OF NORTH AMERICA, INC.

Press timing chain with chain tensioner (1) in direction of arrow.

Secure chain module with special tool 11 4 120 (lock pin) in hole (2).

Feed out sprocket wheel (3) at hexagon head of vacuum pump (4).

Installation note:

A lock pin is pre-installed if the triangular drive is replaced.

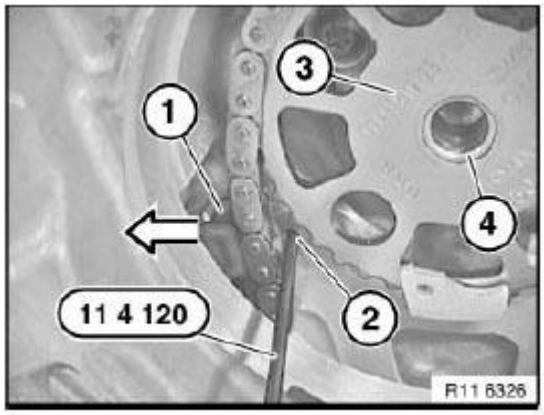


Fig. 322: Pressing Timing Chain With Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

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

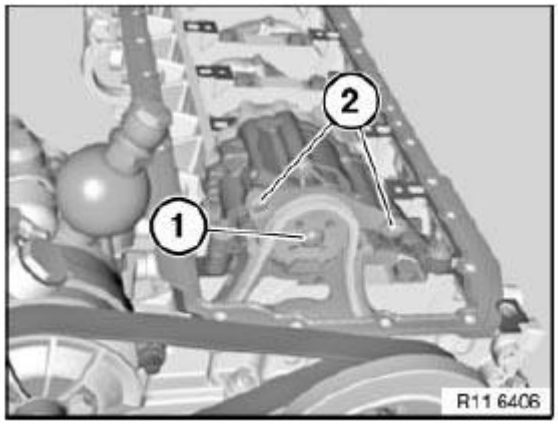


Fig. 323: Identifying Bolt And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Sprocket must be blocked in order to release central bolt (2).

Insert pin (1) with 6 mm dia. between sprocket and housing of oil pump.

Release oil pump central bolt (2).

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

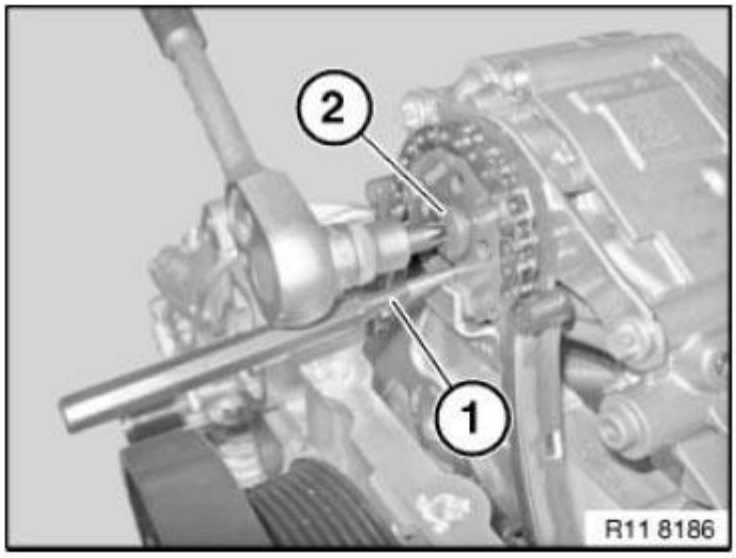


Fig. 324: Identifying Central Bolt And Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Secure **CRANKSHAFT AND CAMSHAFT**.

Do **not** remove special tools 11 0 300 (mandrel) and 11 4 280 (gauge).

Fit special tool 11 9 280.

Release central screw (1).

NOTE: A 3/4 inch tool is needed to release the central bolt.

A second person is required.

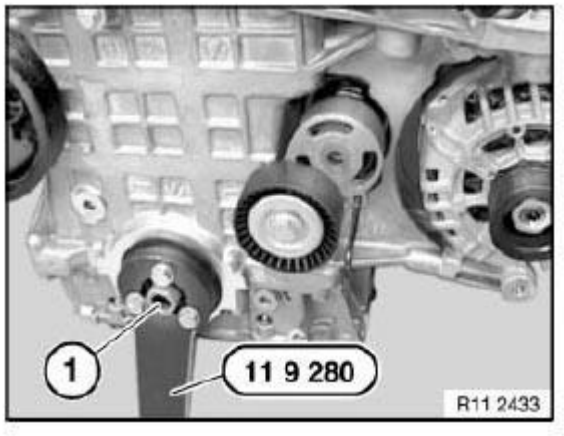


Fig. 325: Identifying Central Bolt With Special Tool (11 9 280)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove hub (2) towards front.

Installation note:

Replace front **CRANKSHAFT SEAL**.

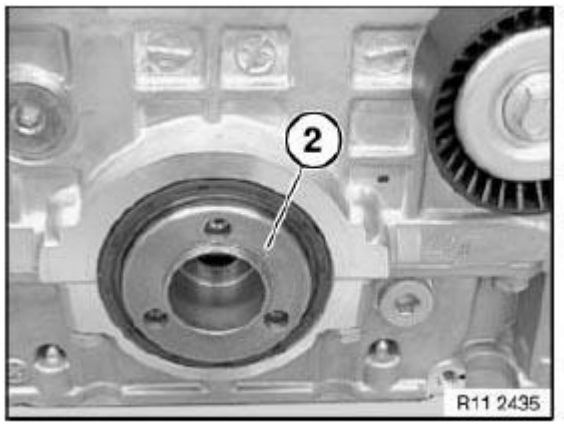


Fig. 326: Identifying Front Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Open screw plug on bedplate.

Installation note:

Replace seal.

Release screw (1) with special tool 11 8 640 (Torx socket) on triangular drive.

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

Installation note:

Replace aluminum screws.

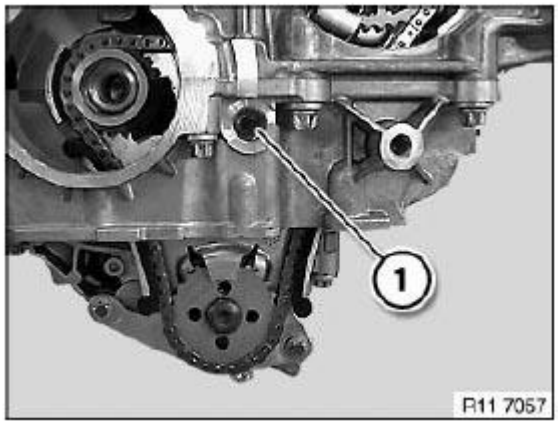


Fig. 327: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Remove triangular drive (1) in direction of arrow.

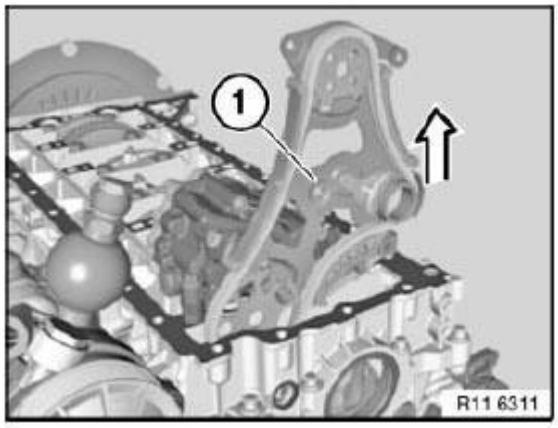


Fig. 328: Removing Chain Module
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket (2).

Collar on sprocket (2) points to **timing chain drive.**

Incorrect assembly will result in **engine damage.**

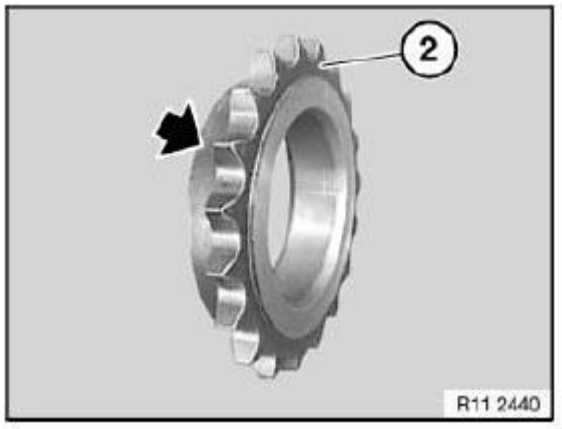


Fig. 329: Identifying Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The N54 engine requires special friction plates between the friction surfaces.

The engine will incur damage if the friction plates are damaged or are not fitted.

Friction plates (1 and 2) must be clipped into place on the oil pump module sprocket.

The third friction plate is attached to the crankshaft hub.

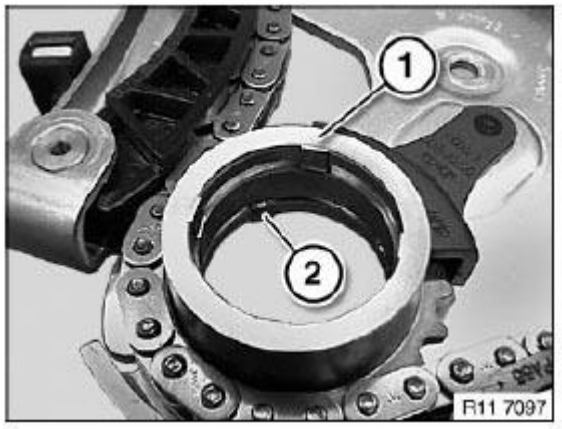


Fig. 330: Identifying Friction Plates
Courtesy of BMW OF NORTH AMERICA, INC.

Feed in oil pump chain module.

Secure oil pump chain module with screws (2).

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

Secure screw (1) with special tool 11 8 640 (Torx socket).

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

Installation note:

Check both friction plates (3) with retainers for correct installation position.

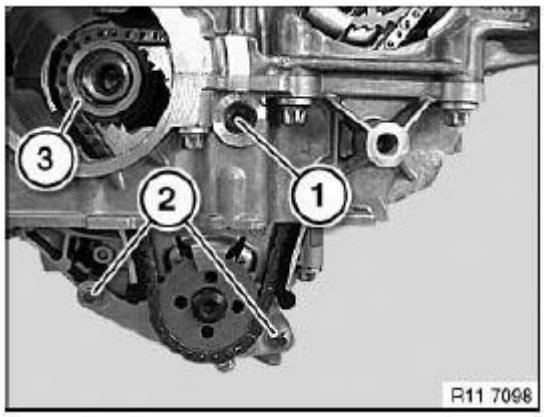


Fig. 331: Identifying Friction Plate Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Push on friction plate (1) without retainers.

IMPORTANT: The N54 engine requires special friction plates between the friction surfaces.

The engine will incur damage if the friction plates are damaged or are not fitted.

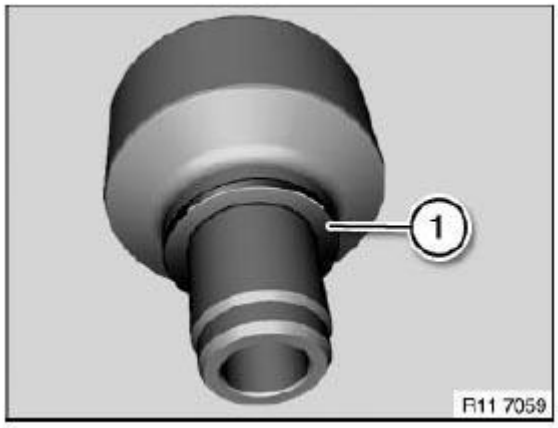


Fig. 332: Identifying Friction Plate Without Retainers
Courtesy of BMW OF NORTH AMERICA, INC.

Fit central bolt (1).

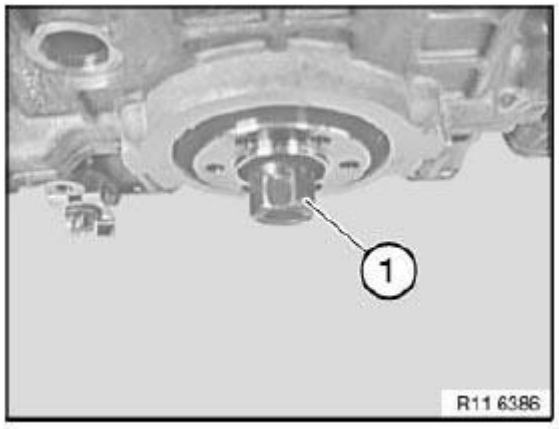


Fig. 333: Identifying Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tools 11 8 650 (holder) and 11 0 290 (holder).

Tighten bolt (1).

Tightening torque: see 2AZ in **11 66 VACUUM PUMP** .

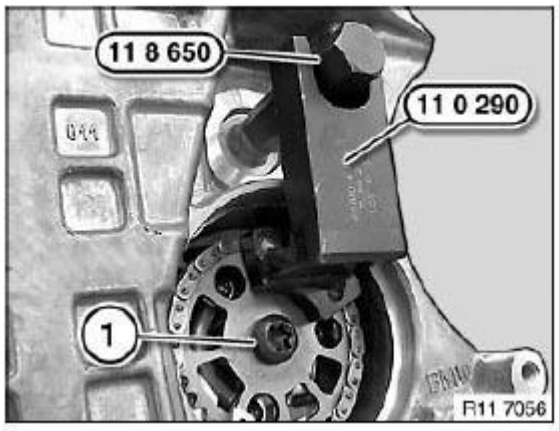


Fig. 334: Positioning Special Tool 11 0 290 On Sprocket Wheel And On Special Tool 11 8 650
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool 11 0 300 (mandrel).

Tighten bolt (2).

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

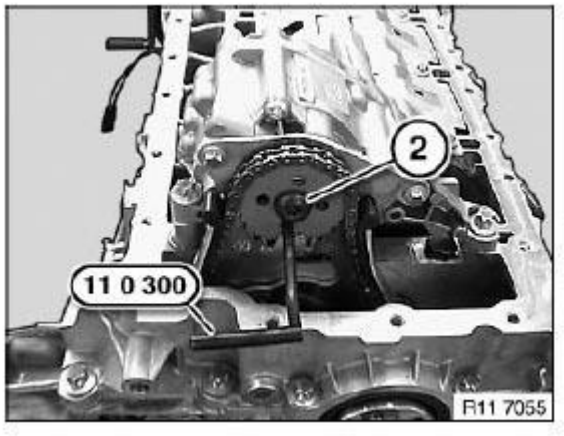


Fig. 335: Securing Oil Pump Drive Gear Using Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

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

Do **not** remove special tools 11 0 300 (mandrel) and 11 4 280 (gauge).

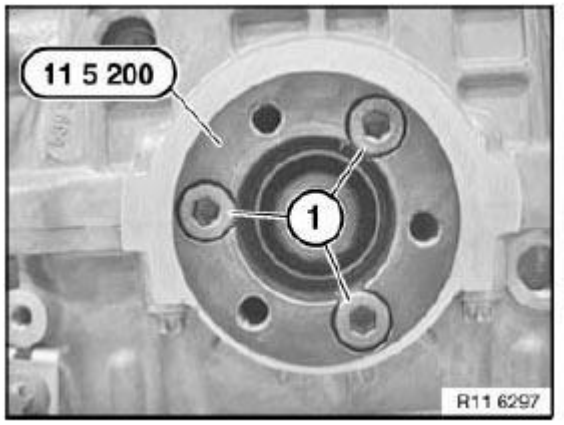


Fig. 336: Identifying Screws With Special Tool (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten central bolt to jointing torque.

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

Mark torsion angle tightening on tool with stroke of paint (1).

See graphic.

IMPORTANT: Do not remove tool from central bolt during torsion angle tightening. Risk of damage!

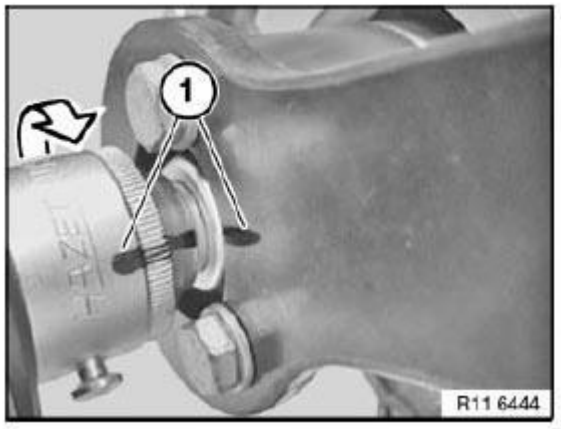


Fig. 337: Identifying Colored Line
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace front **CRANKSHAFT SEAL**.

Assemble engine.

OIL FILTER AND LINES

11 42 020 REMOVING AND INSTALLING/REPLACING FULL-FLOW OIL FILTER

Special tools required:

- **11 9 240**

WARNING: Danger of scalding!

Only perform these tasks on an engine that has cooled down.

IMPORTANT: Risk of damage!

When working on the engine oil, coolant or fuel circuit, it is essential always to protect the alternator and belt drive against contamination.

Cover alternator with suitable materials.

Necessary preliminary tasks:

- Remove **INTAKE AIR MANIFOLD**
- Drain **COOLANT** .
- Unlock coolant hose and detach

- Remove **OIL-WATER HEAT EXCHANGER**

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

Tightening torque **11 42 1AZ** .

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

Installation note:

Replace sealing rings on oil filter cap.

Moisten sealing rings with engine oil.

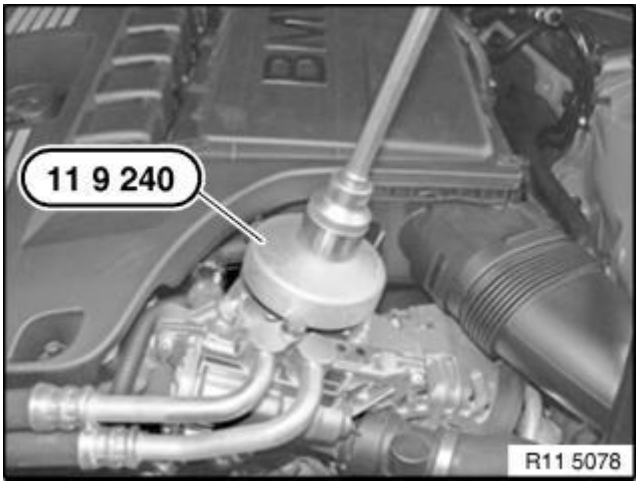


Fig. 338: Identifying Special Tool (11 9 240)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Release screw (2).

NOTE: Have cleaning cloth ready to catch residual oil.

Tightening torque: **11 42 2AZ** .

Installation note:

Replace all seals.

If necessary, replace filter element.

Modify oil pressure switch when replacing.

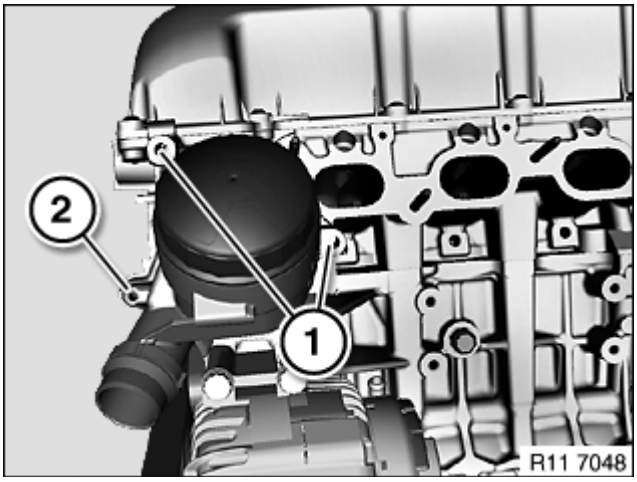


Fig. 339: Oil Filter Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 42 035 REMOVING AND INSTALLING/REPLACING THERMOSTAT HOUSING

WARNING: Warning! Risk of scalding! Only perform this repair work on an engine that has cooled down.

IMPORTANT: Important! You must protect the alternator against contamination before carrying out any work on the oil or cooling circuit. A residual amount of coolant emerges when the hoses are detached. A residual amount of oil emerges when the oil-coolant heat exchanger is released. Have a cleaning cloth ready. Cover alternator with suitable auxiliary materials.

Necessary preliminary tasks:

- Drain **COOLANT** .
- Remove **FAN COWL** .

Release screw (1). Tightening torque **11 42 3AZ** . Pull engine oil pipe down off the thermostat housing.
Installation note: Replace O-rings.

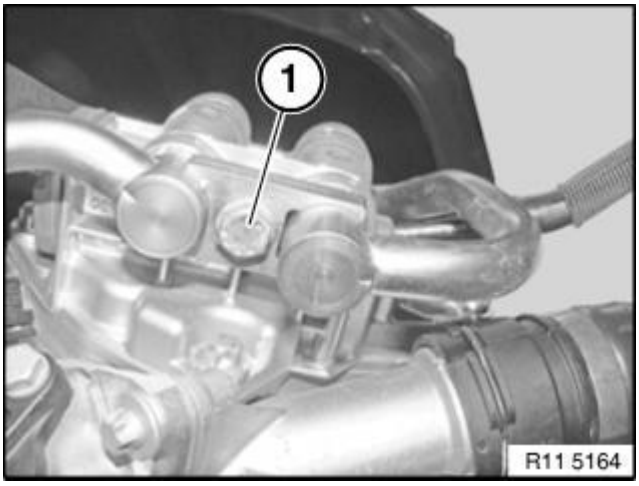


Fig. 340: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on thermostat housing. Remove oil-coolant heat exchanger towards front. Picture shows E9x
Installation note: Replace gasket.

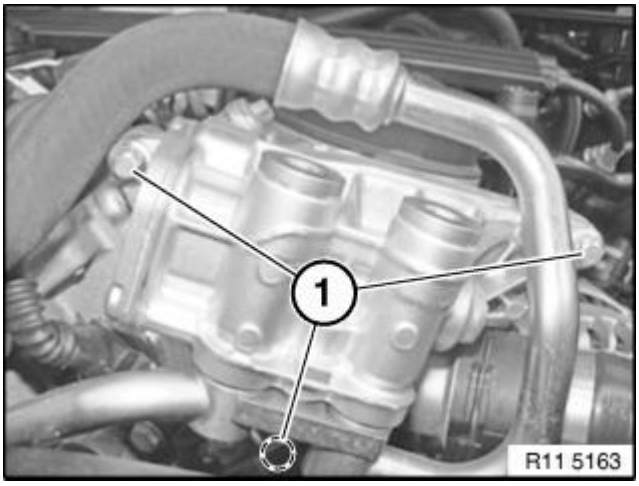


Fig. 341: Identifying Bolts On Oil-Coolant Heat Exchanger
Courtesy of BMW OF NORTH AMERICA, INC.

Reassemble vehicle and set in horizontal position. Vent **COOLING SYSTEM** and check for water leaks. Start engine and run at idle until oil pressure warning lamp goes out. Turn off engine. Wait approx. 5 minutes and check oil level. Top up engine oil if necessary.

11 42 198 REMOVING AND INSTALLING OIL FEED LINE FOR EXHAUST TURBOCHARGER

Remove exhaust turbocharger.

Release screw (2). Tightening torque: 8 Nm

IMPORTANT: Where necessary, to release the oil feed line (3), do not place pliers on the pipe.

Risk of damage!

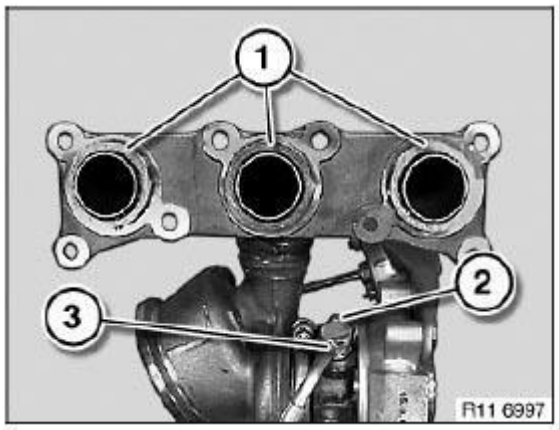


Fig. 342: Identifying Turbocharger
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, release oil feed line (3) with suitable pliers at connection and remove.

Installation note: Replace O-rings.

Assemble engine.

11 42 248 REMOVING AND INSTALLING/RENEWING THE OIL RETURN LINE FOR EXHAUST TURBOCHARGER CYL. 1-3

IMPORTANT: It is not necessary to carry out a chassis/wheel alignment check to release the steering tie rod.

Necessary preliminary tasks:

- Partially release the track rod end on the right.
- Partially release the holder on the steering gear.
- Disconnect the plug connection at the coolant pump.
- Remove heat shield.
- Remove coolant hose from coolant pump.

Release screws (1 and 2).

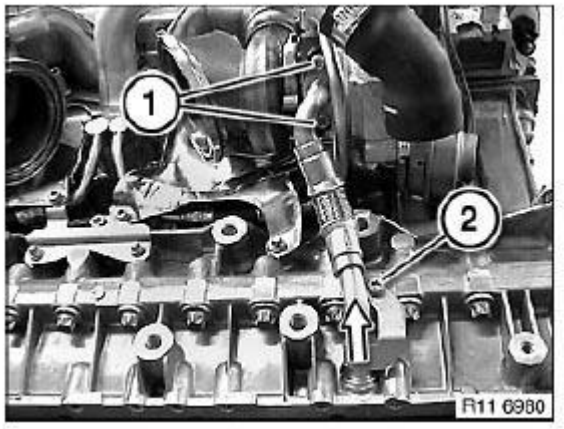


Fig. 343: Locating Oil Return Pipe Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque: 8 Nm

Remove oil return line in direction of arrow.

Installation note: Renew O-rings and gaskets.

Assemble engine.

11 42 250 REMOVING AND INSTALLING OIL RETURN LINE FOR EXHAUST TURBOCHARGER

Remove both catalytic converters.

Remove right engine support arm.

Undo screws (1 and 2)

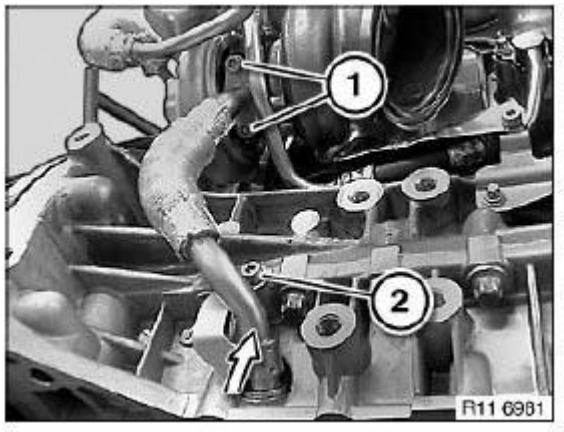


Fig. 344: Removing Oil Return Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque: 8 Nm

Remove oil return line in direction of arrow.

Installation note: Renew O-rings and gaskets.

Assemble engine.

OIL COOLER

11 44 000 REMOVING AND INSTALLING/REPLACING OIL-COOLANT HEAT EXCHANGER

WARNING: Danger of scalding!

Only perform these tasks on an engine that has cooled down.

IMPORTANT: You must protect the alternator against contamination before carrying out any work on the oil or coolant circuit.

A residual amount of coolant emerges when the hoses are detached. A residual amount of oil emerges when the oil-coolant heat exchanger is released. Have a cleaning cloth ready.

Cover alternator with suitable apparatus.

Necessary preliminary tasks:

- Drain **COOLANT** .
- Remove **FAN COWL** .

Release screw (1).

Tightening torque **11 42 3AZ** .

Do not detach oil lines from oil-coolant heat exchanger in downward direction.

Installation note:

Replace O-rings.

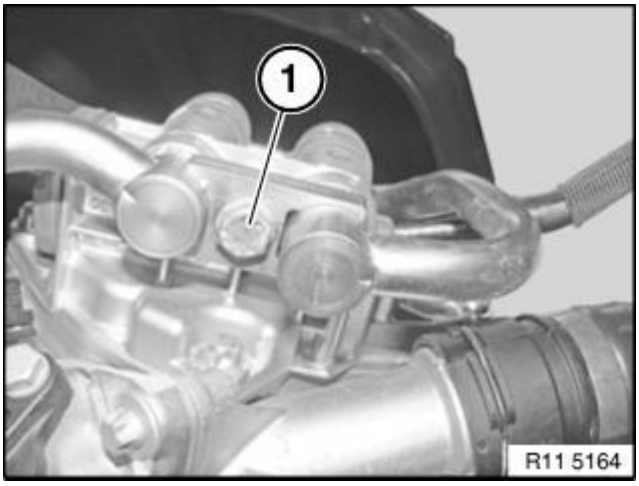


Fig. 345: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1) on oil-coolant heat exchanger.

Remove oil-coolant heat exchanger towards front.

Installation note:

Replace seal.

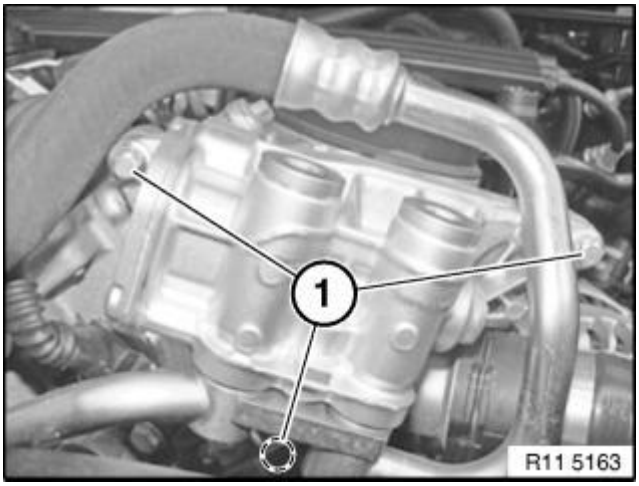


Fig. 346: Identifying Bolts On Oil-Coolant Heat Exchanger
Courtesy of BMW OF NORTH AMERICA, INC.

Reassemble car and set in horizontal position.

Vent **COOLING SYSTEM** and check for water leaks.

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

Stop engine.

Wait approx. 5 minutes and check engine oil level.

Top up engine oil if necessary.

WATER PUMP WITH DRIVE

11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP

WARNING: Danger of scalding!

Only perform these tasks on an engine that has cooled down.

Recycling:

Catch and dispose of drained coolant in a suitable container.

Observe country-specific waste-disposal regulations.

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

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

For reliable identification:

Aluminium screws/bolts are not magnetic .

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

Necessary preliminary tasks:

- Partially release anti-roll bar (all-wheel drive only)
- Drain **COOLANT**
- Remove **COOLANT THERMOSTAT**.

Disconnect coolant hose (1).

Disconnect plug connection (4).

Release screws (5).

Installation note:

Replace aluminum screws.

Tightening torque: **11 51 1AZ** .

Installation note:

If a coolant pump is reused, it must be mechanically rotated once (breakaway torque at pump gears).

One coolant pump rotation will be sufficient.

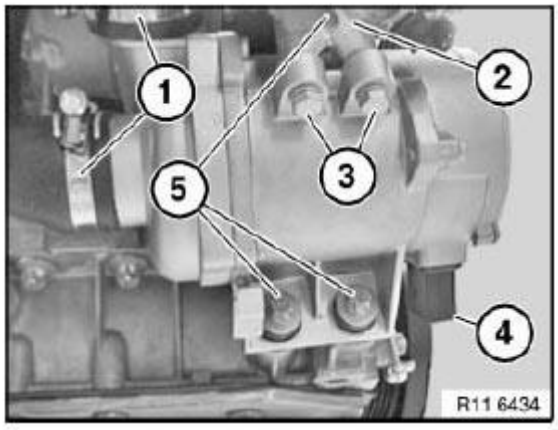


Fig. 347: Identifying Plug Connection & Water Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

BLEEDING INSTRUCTIONS must be observed without fail.

THERMOSTAT AND CONNECTIONS

11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT

WARNING: Risk of scalding!

Only perform these tasks on an engine that has cooled down.

Danger of injury!

Risk of skidding due to coolant on the floor.

Recycling

Catch and dispose of drained coolant in a suitable collecting vessel.

Observe country-specific waste disposal regulations.

IMPORTANT: Read and comply with GENERAL NOTES .

Protect plug connections against coolant and dirt contamination.

Cover plug connections with suitable materials.

Necessary preliminary work:

- Remove **FRONT UNDERBODY PROTECTION**
- Remove **CHARGE AIR COOLER**
- Remove **REINFORCEMENT PLATE**

NOTE: Illustration shows coolant thermostat removed.

Disconnect coolant hoses (arrows) on the thermostat (1) with clamping tongs.

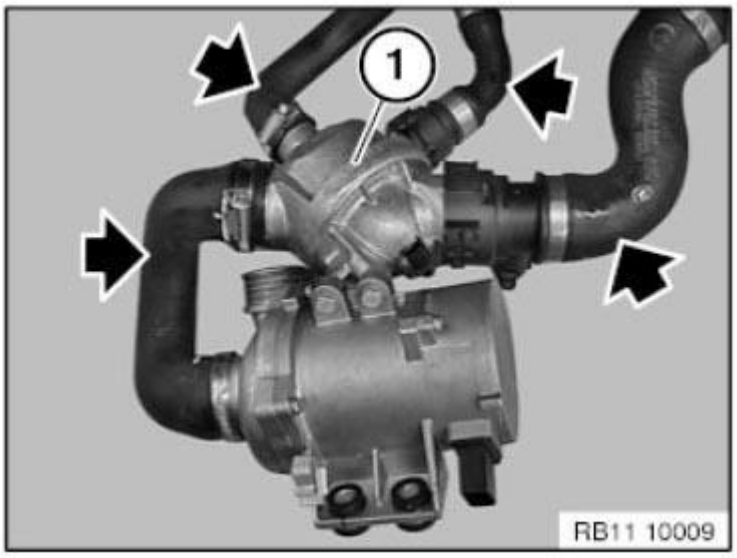


Fig. 348: Locating Thermostat Coolant Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Release hose clamp (1) and detach coolant hose.

Release hose clamp (2) and detach coolant hose.

Unlock and detach coolant hose (3).

Unlock and detach coolant hose (4).

Disconnect plug connection (5).

Release screws (6).

Tightening torque: 8 Nm

Remove coolant thermostat (7).

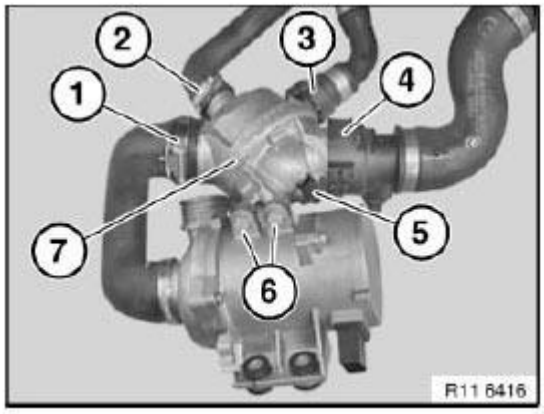


Fig. 349: Identifying Hose Clamp, Coolant Hose, Plug Connection And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Illustration shows coolant thermostat removed.

Assemble engine.

FILL the cooling system.

Observe **CAPACITIES** .

Installation note:

Check coolant hoses for cracks and damage.

Renew coolant hoses as required.

Recommendation:

On vehicles older than five years, renew coolant hoses.

Check function of cooling system.

11 53 740 REMOVING AND INSTALLING/REPLACING FEED LINE

WARNING: Danger of scalding!

Only perform this work after engine has cooled down.

Recycling:

Catch and dispose of drained coolant in a suitable container.

Observe country-specific waste-disposal regulations.

Necessary preliminary tasks:

- Drain **COOLANT** .
- Remove both catalytic exhaust-gas converters. See **CONVERTER FOR CYLINDERS 1-3** and **CONVERTER FOR CYLINDERS 4-6** .

Unfasten hose clip (1).

Tightening torque: **11 51 4AZ** .

Detach coolant hose of feed line in direction of arrow from coolant pump (2).

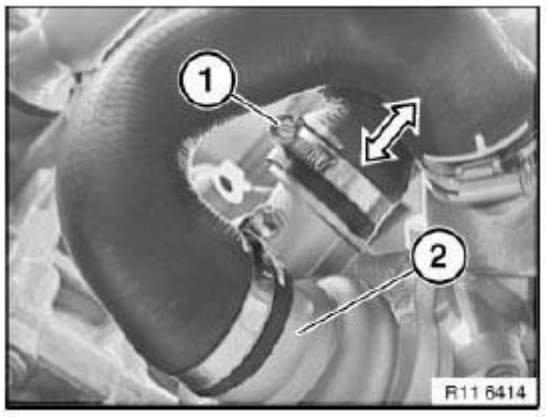


Fig. 350: Identifying Coolant Hose And Coolant Pump
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Where necessary, to release the coolant feed lines (3 and 4), do not place pliers on the pipes.

Release screws (1 and 2).

Tightening torque: **11 53 10AZ** .

If necessary, release coolant feed lines (3 and 4) with suitable pliers at connection.

Installation note:

Replace O-rings.

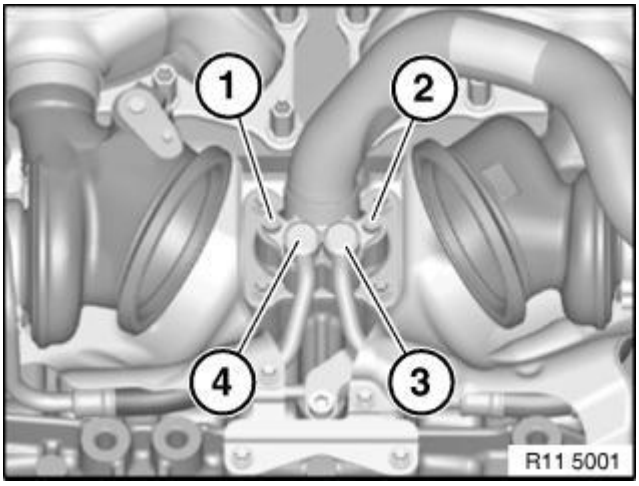


Fig. 351: Identifying Screws And Feed Lines
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, the graphic shows the released coolant feed lines removed.

Release screws (1).

Tightening torque: **11 53 3AZ** .

Remove feed line (2).

Installation note:

Replace seal.

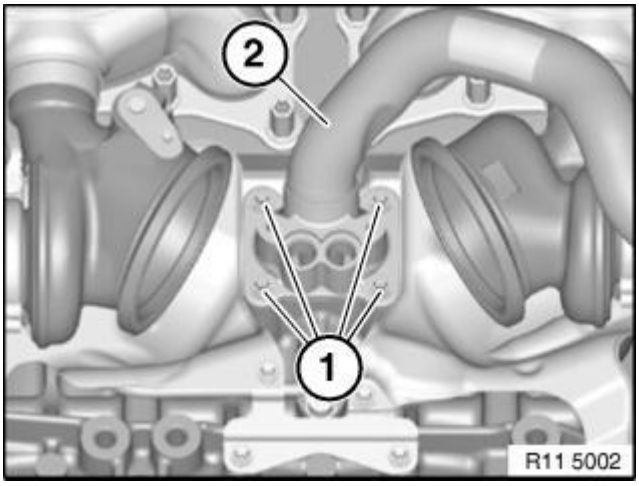


Fig. 352: Identifying Screws And Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Top up **COOLANT** .

VENTING INSTRUCTIONS must be observed without fail .

INTAKE MANIFOLD

11 61 050 REMOVING AND INSTALLING INTAKE PLENUM

Necessary preliminary tasks:

- Remove **INTAKE FILTER HOUSING** .
- Remove engine cover.
- If necessary, remove **TENSION STRUT** (risk of damage to charge air pressure sensor).

Detach crankcase breather at cylinder head cover (1).

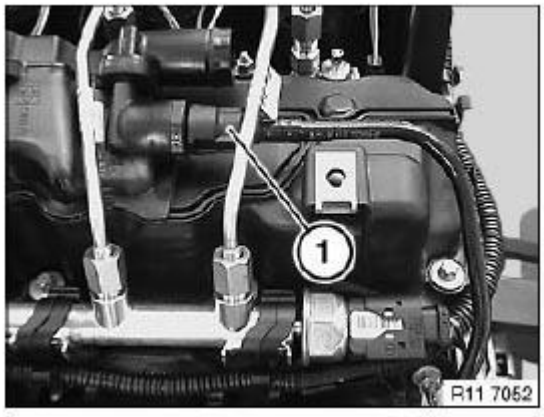


Fig. 353: Identifying Crankcase Breather At Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off vacuum hose (1).

Detach tank vent valve (2) from mounting.

Release hose (3) and set down in engine compartment.

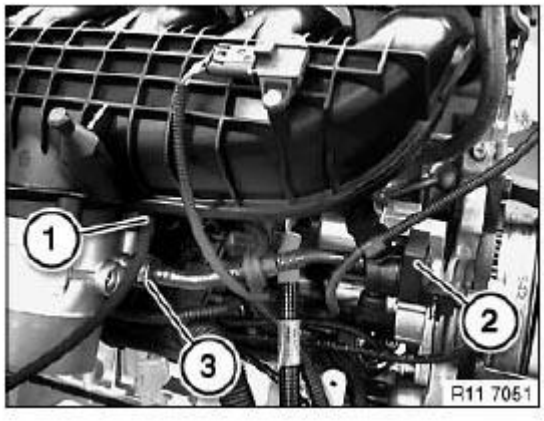


Fig. 354: Identifying Vacuum Hose, Tank Vent Valve And Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on oil pressure switch.

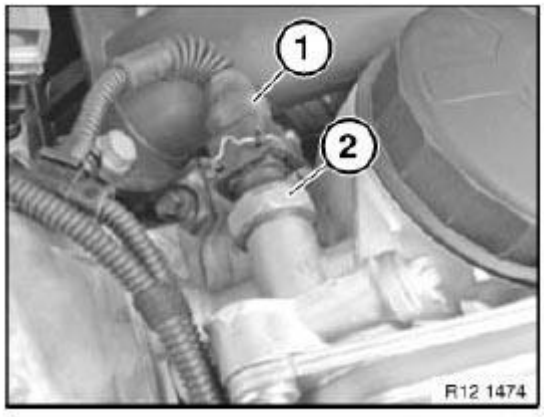


Fig. 355: Identifying Plug Connection On Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Release retainers (1) on fuel rail and place to one side.

Disconnect plug connection (2).

NOTE: Do not detach fuel line.

Unscrew nuts (3).

Release screw (4).

Tightening torque: **11 61 1AZ** .

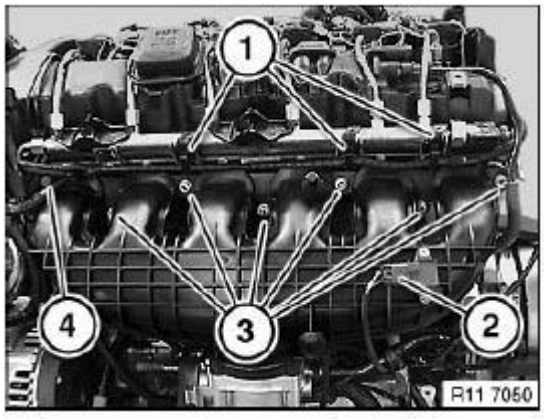


Fig. 356: Identifying Retainers, Plug Connection, Nuts And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Raise intake air manifold.

Release bolts (1).

Set down distributor housing (2) in engine compartment.

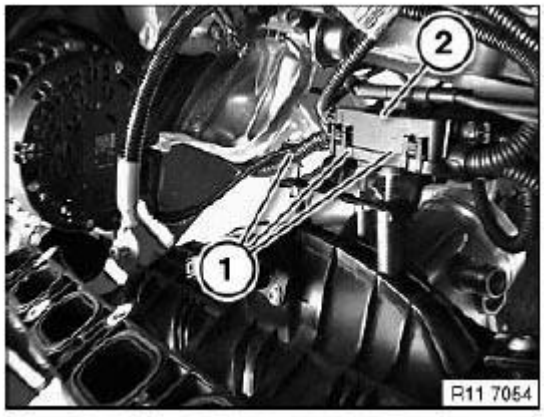


Fig. 357: Identifying Distributor Housing With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Cut cable tie (1).

Disconnect plug connection (2).

Installation note:

Replace all seals (3).

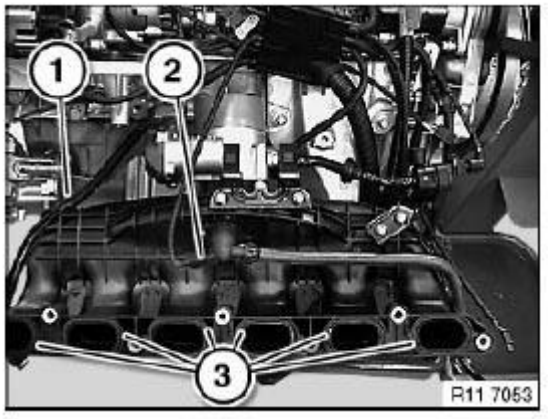


Fig. 358: Identifying Cable Tie, Plug Connection And Seals
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace all seals.

Assemble engine.

11 61 362 REPLACING RIGHT CHARGE-AIR DUCT

Special tools required:

- **11 8 670**

Necessary preliminary tasks:

- Remove **COOLANT EXPANSION TANK**
- Remove **FRONT UNDERBODY PROTECTION**

IMPORTANT: Coat sealing rings of quick-connect couplings with antiseize agent.

Pressure pipes cannot be fitted without antiseize agent!

Mark vacuum hoses (1) and detach.

Unfasten bolts and nuts.

Tightening torque: see 6AZ in **11 65 TURBOCHARGER AND CONTROL** .

Raise bracket (2) slightly.

Mark vacuum hoses on underside and detach.

Remove holder (2).

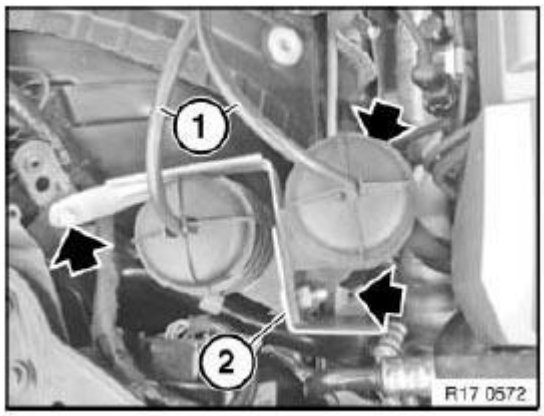


Fig. 359: Identifying Vacuum Hoses And Bracket With Bolts And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts and remove heat shield.

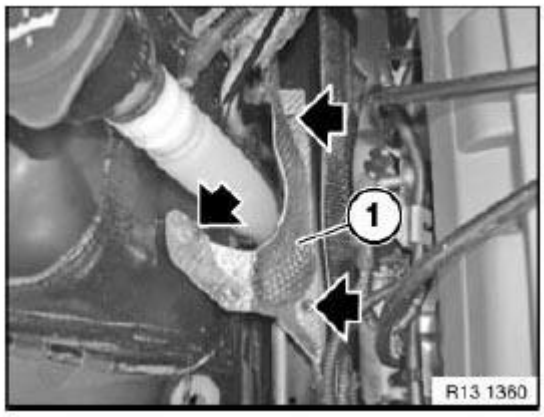


Fig. 360: Identifying Heat Shield With Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Release clamp and detach charge-air duct (1).

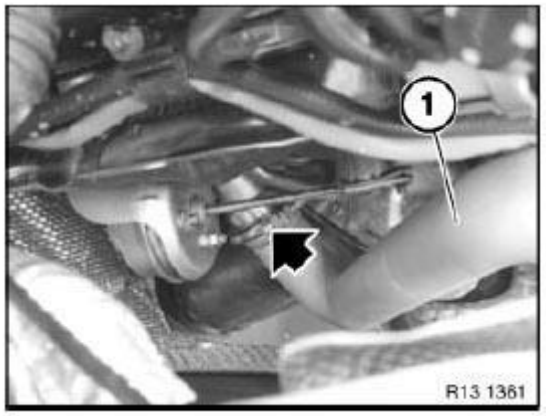


Fig. 361: Identifying Charge-Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

Release clamp and detach charge-air duct (1).

Tightening torque: see 9AZ in **13 71 AIR INTAKE SILENCER** .

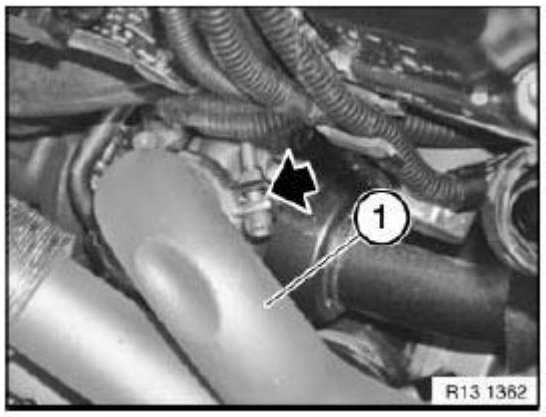


Fig. 362: Identifying Charge-Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Check O-rings and replace if necessary.

Prior to fitting, coat O-ring with suitable antiseize agent.

Fig. 363: Locating O-Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach coolant hose (1).

Unlock quick-connect coupling.

Detach charge-air duct (2) from intercooler (3) and remove.

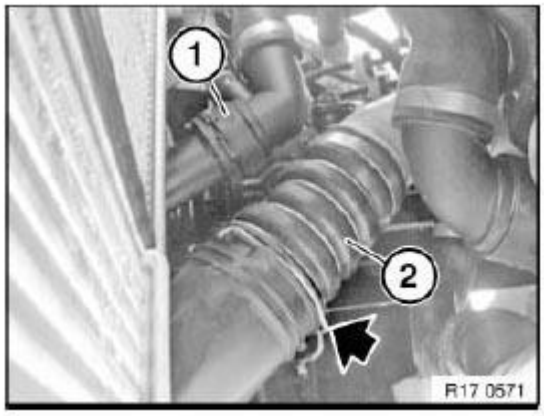


Fig. 364: Identifying Coolant Hose And Charge-Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage! to sealing rings!

Special tool 11 8 670 is essential.

Attach charge-air duct (1) with special tool 11 8 670 to intercooler.

Installation note:

- Coat sealing rings of quick-connect couplings with antiseize agent.
- Pressure pipes must audibly snap into place

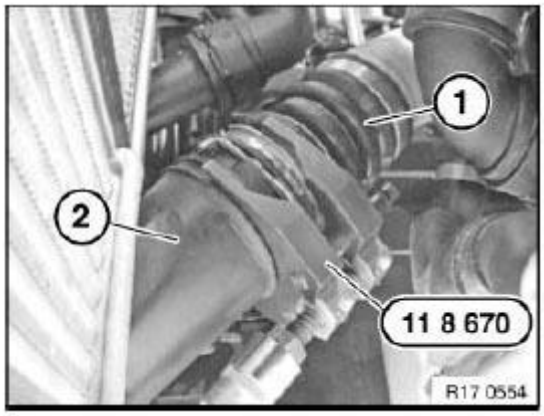


Fig. 365: Identifying Charge-Air Duct And Intercooler With Special Tool 11 8 670
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check DME (turbocharger) for correct operation.

11 61 365 REPLACING FRONT CHARGE AIR DUCT

Necessary preliminary tasks:

- Remove **FAN COWL** .
- Remove **FRONT UNDERBODY PROTECTION** .

IMPORTANT: Coat sealing rings of snap fasteners with lubricant.

Pressure pipes with quick-connect couplings cannot be fitted without antiseize agent.

Unlock snap fastener.

Detach charge air duct (1) from charge air cooler (2).

Installation note:

- Coat sealing rings of snap fasteners with lubricant.
- Pressure pipes must audibly snap into place.

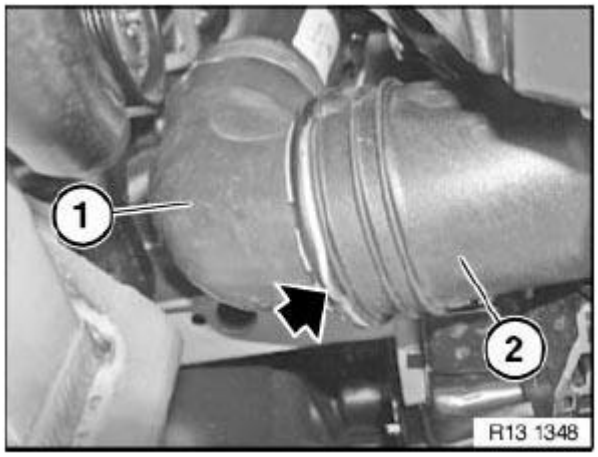


Fig. 366: Identifying Charge-Air Duct From Intercooler
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage to sealing rings!

Special tool 11 8 670 PLIERS is mandatory.

Attach charge air duct (1) with special tool 11 8 670 to charge air cooler (2).

Installation note:

Texts refer to and illustrations show the right side.

The procedure is identical for the left side.

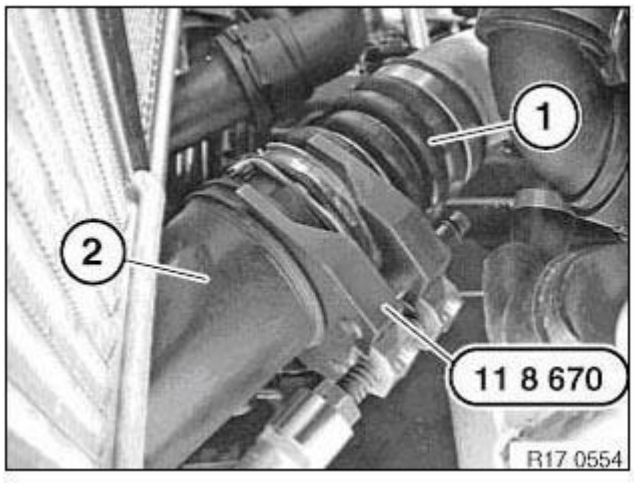


Fig. 367: Identifying Charge Air Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Charge air hoses with clamp fastenings must be installed dry and free from

grease!

If charge air hoses with clamp fastenings are not installed dry and free from grease, this may result in turbocharger failure!

Unfasten clamp.

Tightening torque: see 6AZ in **13 71 AIR INTAKE SILENCER** .

Detach front charge-air duct (1) from charge-air duct (2).

Feed out front charge-air duct (1) towards top and remove.

Installation note:

Install charge-air hose (charge-air duct) dry and free from grease.

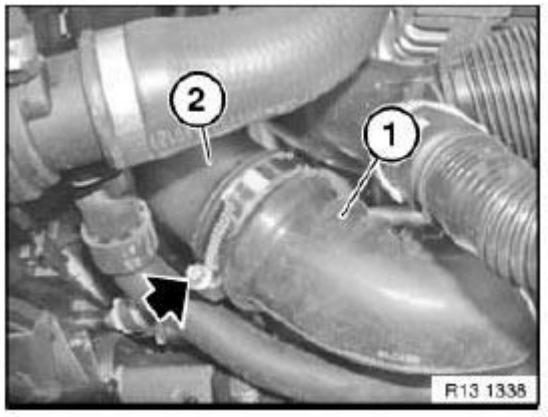


Fig. 368: Identifying Charge-Air Hose And Charge-Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

11 61 368 REMOVING AND INSTALLING/REPLACING REAR LEFT CHARGE-AIR DUCT

Necessary preliminary tasks:

- Switch off ignition
- Remove **INTAKE FILTER HOUSING**

IMPORTANT: Charge-air hoses with clamp fastenings must be installed dry and free from grease!
If charge-air hoses with clamp fastenings are not installed dry and free from grease, this may result in turbocharger failure!

Loosen hose clamp.

Tightening torque **13 71 6AZ** .

Installation note:

Install charge-air hoses dry and free from grease.

Detach charge-air hose (1) from charge-air duct (2).

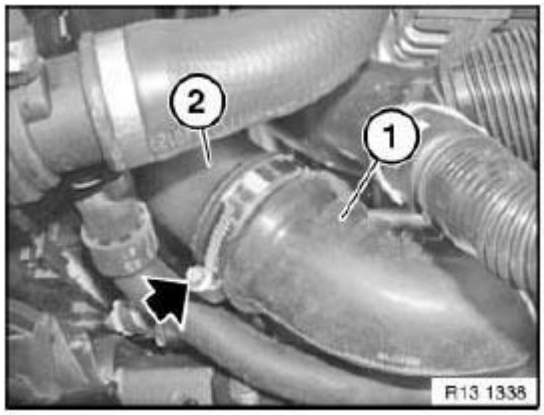


Fig. 369: Identifying Charge-Air Hose And Charge-Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

Release quick-connect couplings (1) by turning lock through 90°.

Detach recirculated-air hoses (2) and lay to one side.

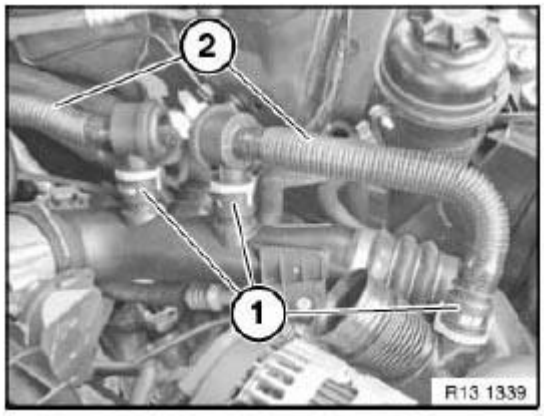


Fig. 370: Identifying Charge-Air Hose And Charge-Air Duct Recirculated-Air Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Bring lock (1) back 90° into installation position.

Pay attention to markings.

Recirculated-air hoses must snap audibly into place.

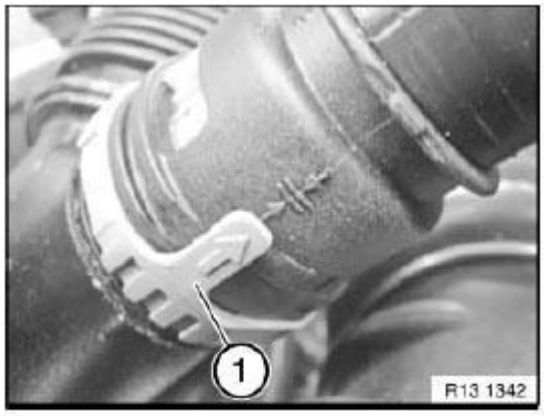


Fig. 371: Identifying Installation Position Of Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug (1) and remove.

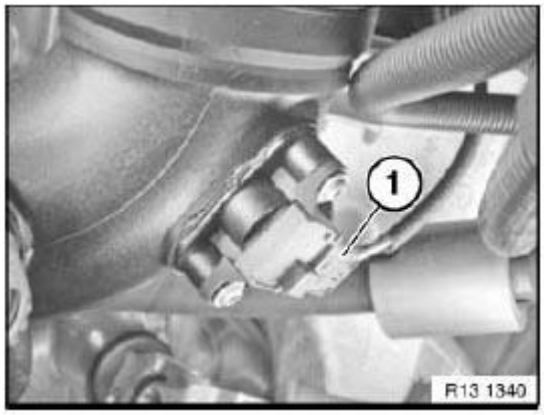


Fig. 372: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Coat sealing rings of quick-connect couplings with antiseize agent. Pressure pipes cannot be fitted without antiseize agent!

Release screw.

Tightening torque **13 71 4AZ** .

Unlock quick-connect coupling (1).

Detach charge-air duct (2) from throttle valve assembly and remove.

Installation note:

Coat sealing ring of quick-connect coupling with antiseize agent.

Charge-air duct (2) must snap audibly into place.

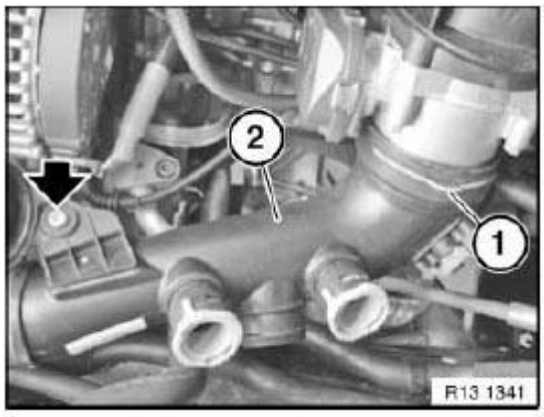


Fig. 373: Identifying Quick-Connect Coupling And Charge-Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Read out fault memory of DME control unit

11 61 730 BMW LEAK TEST FOR INTAKE SYSTEM

IMPORTANT: Overpressure and vacuum lines are identified by the size of the seals and color-coded Red and Blue and must not be mixed up with each other.

Build up pressure with Blue color.

Generate vacuum pressure with Red color.

Mixing up the functions will result in damage to the engine.

Necessary preliminary tasks:

- Release upper section of intake air filter.
- Prepare BMW diagnosis system.
- Start diagnosis program.

1. Drive
2. Engine electronics
3. 3 Air supply

4. Boost pressure control

or Perception

Lack of power

Note on ordering:

- Workshop equipment.
- Workshop planning.
- Workshop equipment catalogue.
- Measuring and test equipment.

Pressure measurement:

Prepare BMW diagnosis system on diagnosis unit.

1. Screw in pressure sensor.
2. Overpressure connection (Blue).
3. Connect stimuli cables (3) to positive and negative.
4. Connect 12 V battery cables (4) to vehicle battery positive and negative.

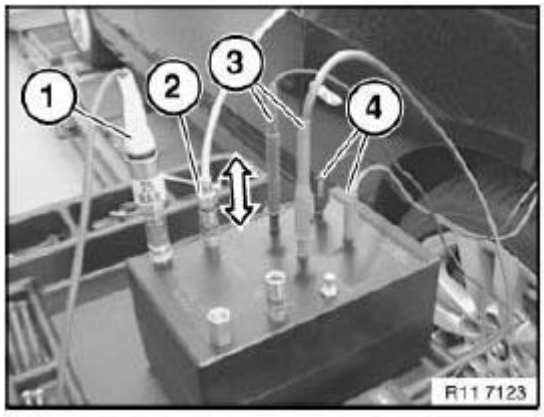


Fig. 374: Installing BMW Diagnosis System On Diagnosis Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Secure seal plug (1) with union nut (2) in intake duct and seal.

NOTE: Twin-Turbo: both intake ducts must be sealed.

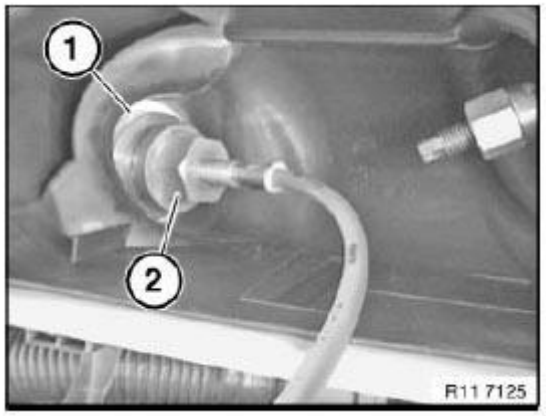


Fig. 375: Identifying Seal Plug And Union Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Insert Blue pneumatic hose (4) in pneumatic coupling (2) of sealing plug (1).

Seal plug (3) has no pneumatic coupling.

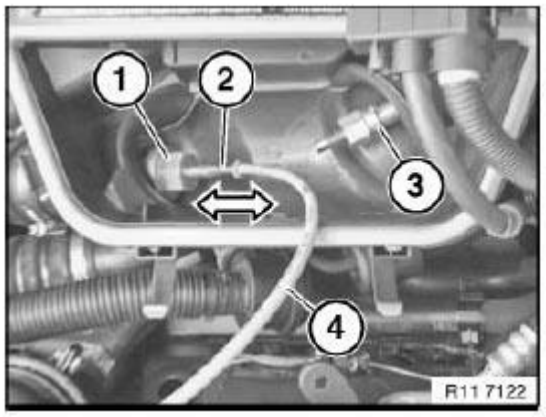


Fig. 376: Inserting Blue Pneumatic Hose In Pneumatic Coupling Of Sealing Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Vacuum pressure measurement:

Prepare diagnosis tester on diagnosis unit.

1. Screw in pressure sensor.
2. Connect stimuli cables (2) to positive and negative.
3. Connect 12 V battery cables (3) to vehicle battery positive and negative.
4. Controller for vacuum connection.
5. Vacuum connection (Red).

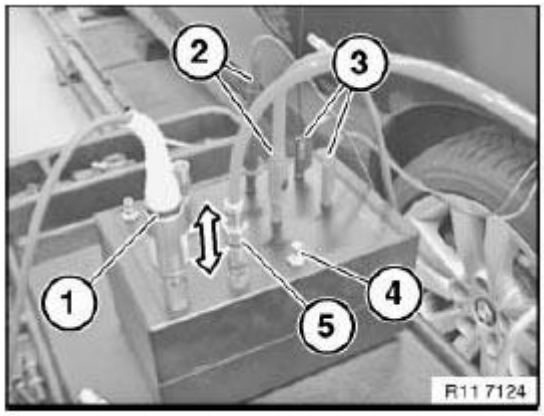


Fig. 377: Measuring Vacuum Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

Calibration for vacuum pressure measurement:

Seal stop cock (2) in direction of arrow.

Release lock nut on controller (1).

Carry out pressure adjustment in accordance with BMW diagnosis instruction.

Secure controller (1) hand-tight against turning.

Open stop cock (2) again.

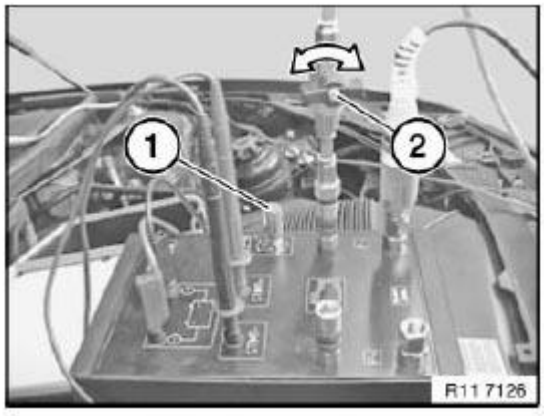


Fig. 378: Measuring Calibration For Vacuum Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

Connections on EPPC:

1. Connection (VAC) to vacuum reservoir.
2. Connection (OUT) with ring to turbocharger.

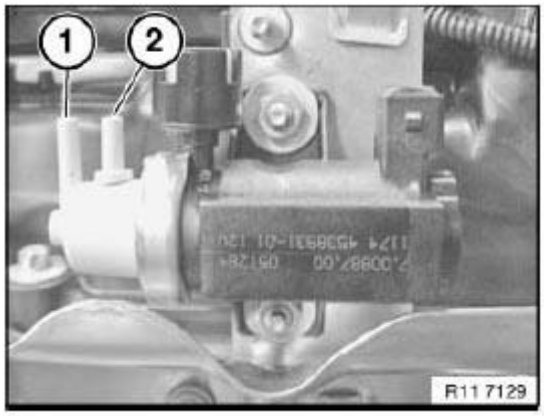


Fig. 379: Identifying Connections On EPPC
Courtesy of BMW OF NORTH AMERICA, INC.

Checking wastegate on cylinders 1-3:

Detach vacuum line from EPPC (2), cylinders 1-3 (OUT).

Disconnect connecting line with suitable tool (1).

Attach vacuum line to pneumatic coupling (3) with Red pneumatic hose in direction of arrow.

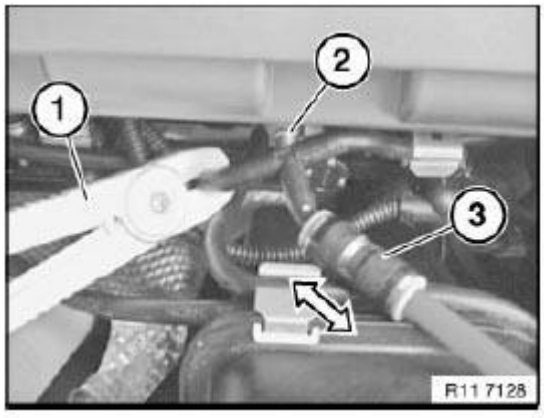


Fig. 380: Detaching Vacuum Line From EPPC, Cylinders 1-3 (Out)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking wastegate on cylinders 4-6:

Detach vacuum line from EPPC (2), cylinders 4-6 (OUT).

Disconnect connecting line with suitable tool (1).

Attach vacuum line to pneumatic coupling (3) with Red pneumatic hose in direction of arrow.

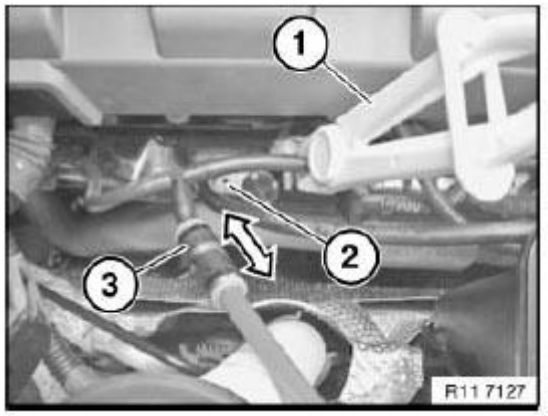


Fig. 381: Detaching Vacuum Line From EPPC, Cylinders 4-6 (Out)
Courtesy of BMW OF NORTH AMERICA, INC.

Initial position (1) of wastegate linkage depressurized.

Wastegate valve opened.

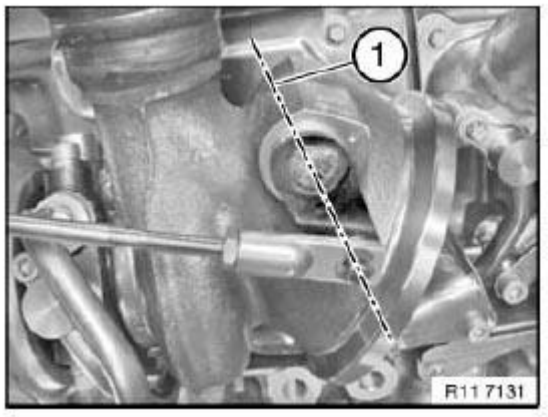


Fig. 382: Positioning Of Wastegate Linkage Depressurized
Courtesy of BMW OF NORTH AMERICA, INC.

Initial position (1) of wastegate linkage with vacuum pressure.

Wastegate valve closed.

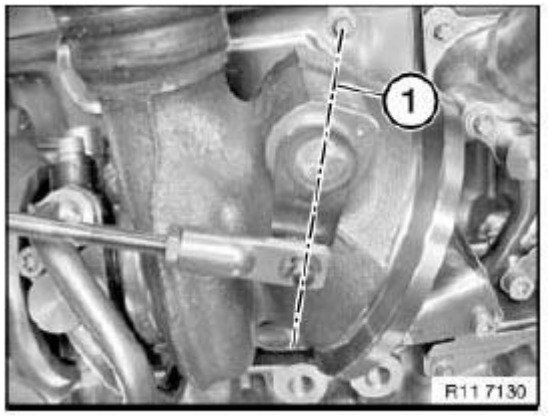


Fig. 383: Initial Position Of Wastegate Linkage With Vacuum Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

Checking wastegate valve (1) with vacuum pressure:

Wastegate valve must be opened without vacuum pressure.

The wastegate valves must close if a vacuum pressure is applied at the wastegate sockets .

Check shaft on turbine wheel for rotatability.

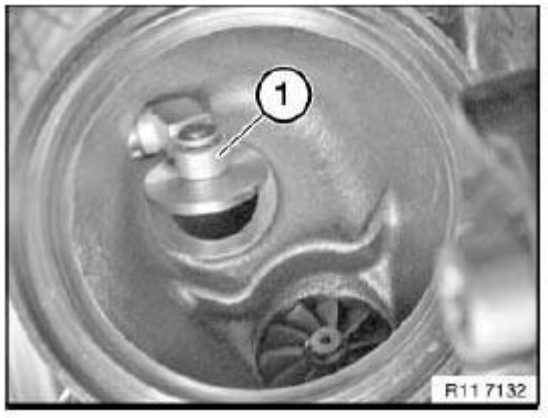


Fig. 384: Identifying Wastegate Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Checking pop-off valves:

Necessary preliminary tasks:

- Remove both pop-off valves

NOTE: To check the function of the pop-off valves (2), it is necessary to build up vacuum pressure at the valves.

Establish vacuum pressure with the BMW auxiliary diagnosis unit - vacuum.

Connect vacuum hose (3).

Establish vacuum pressure at 500 mbar.

Plunger (1) must visibly release the opening in the direction of the arrow as far as it will go.

IMPORTANT: Plunger (1) must maintain this position while vacuum pressure is being created.

If this is not the case, replace the pop-off valve (2).

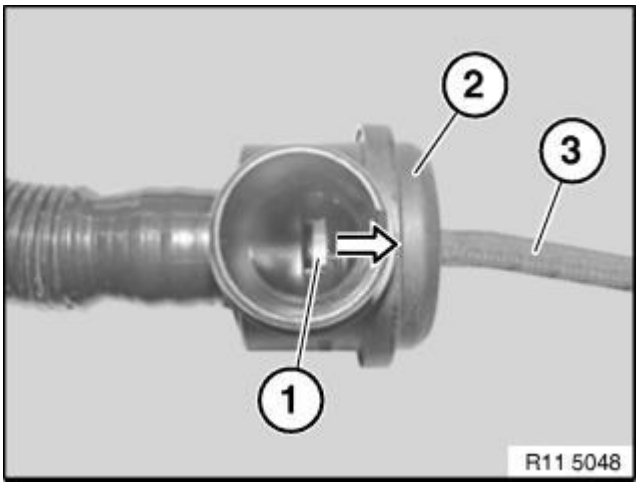


Fig. 385: Identifying Pop-Off Valve And Vacuum Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Observe diagnosis instructions.

SUPERCHARGER WITH CONTROL

11 65 CONNECTION DIAGRAM, VACUUM ACTIVATION (N54)

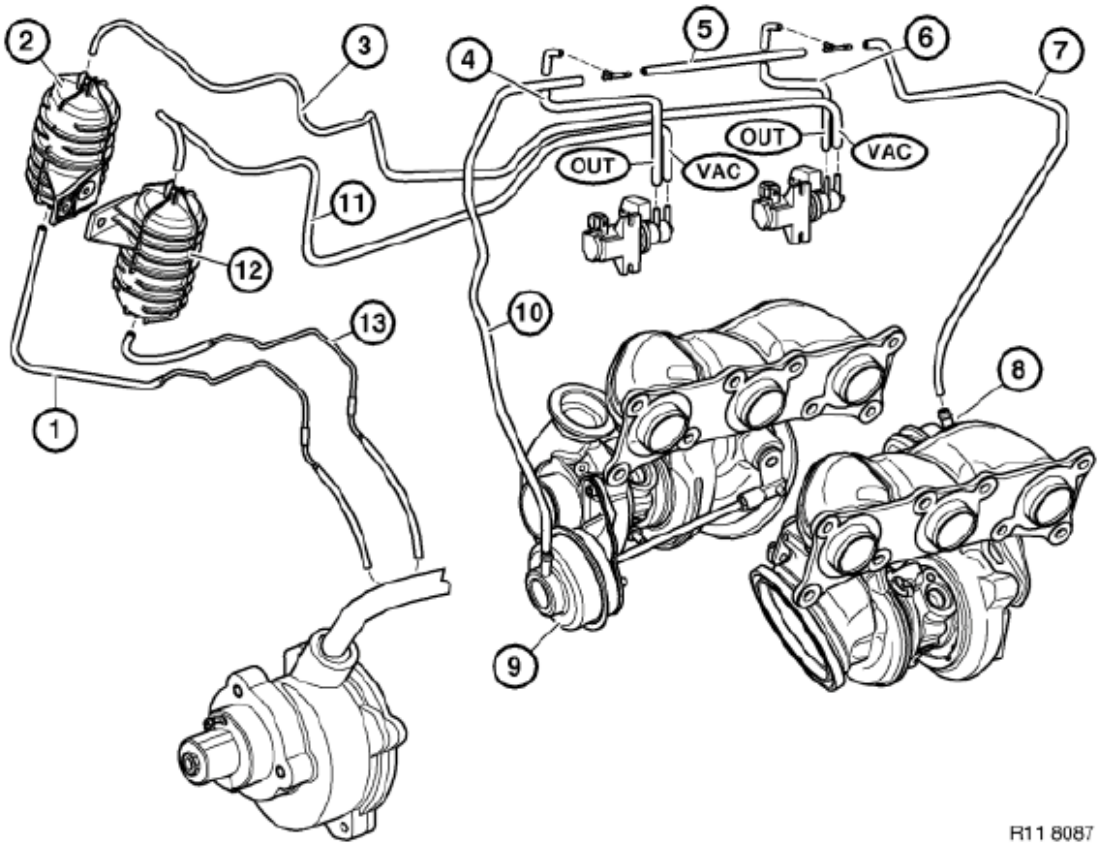


Fig. 386: Vacuum Hose Connection Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

1. Vacuum hose connection vacuum pump **to vacuum accumulator cylinders 4 to 6.**
2. Vacuum accumulator, cylinders 4 to 6.
3. Vacuum hose connection VAC on EPPC (electropneumatic pressure converter) cylinders 4 to 6 to vacuum accumulator.
4. Vacuum hose connection OUT on EPPC (electropneumatic pressure converter) cylinders 1 to 3 to T-piece.
5. Vent line between connecting line 4 and 6 of wastegate units.
6. Vacuum hose connection OUT on EPPC (electropneumatic pressure converter) cylinders 4 to 6 to T-piece.
7. Vacuum line branch T-piece to vacuum unit (wastegate valve) cylinders 4 to 6.
8. Connection vacuum unit (wastegate valve) cylinders 4 to 6.
9. Connection vacuum unit (wastegate valve) cylinders 1 to 3.
10. Vacuum line branch T-piece to vacuum unit (wastegate valve) cylinders 1 to 3.
11. Vacuum hose connection VAC on EPPC (electropneumatic pressure converter) cylinders 1 to 3 to vacuum accumulator.
12. Vacuum accumulator cylinders 1 to 3.
13. Vacuum hose connection vacuum pump to vacuum accumulator cylinders 1 to 3.

11 65 022 REMOVING AND INSTALLING/REPLACING EXHAUST-GAS TURBOCHARGER FOR CYLINDERS 1-3

IMPORTANT: It is not necessary to carry out a chassis/wheel alignment check to release the steering tie rod.

Necessary preliminary tasks:

- Remove both catalytic exhaust-gas converters
- Release tie rod on steering gear. See **REPLACING LEFT OR RIGHT TIE ROD** and **REPLACING (REMOVING AND INSTALLING) LEFT OR RIGHT TIE ROD** .
- Remove intercooler
- Draining coolant
- Remove coolant expansion tank
- Remove **COOLANT THERMOSTAT**
- Remove **COOLANT PUMP**
- Remove both vacuum reservoirs
- Remove right **CHARGE-AIR DUCT**

Release bolts (1).

Tightening torque **11 42 7AZ** .

Installation note:

Replace seal.

Release screw (2).

Tightening torque **11 42 8AZ** .

Remove oil return pipe in direction of arrow.

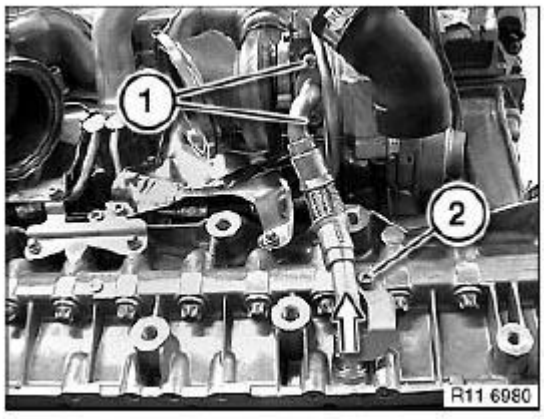


Fig. 387: Removing Oil Return Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace O-ring.

Undo screws (1 and 2)

Tightening torque **11 53 10AZ** .

Release coolant feed lines (3 and 4) if necessary with suitable pliers.

IMPORTANT: Do not place pliers on pipes. Risk of damage!

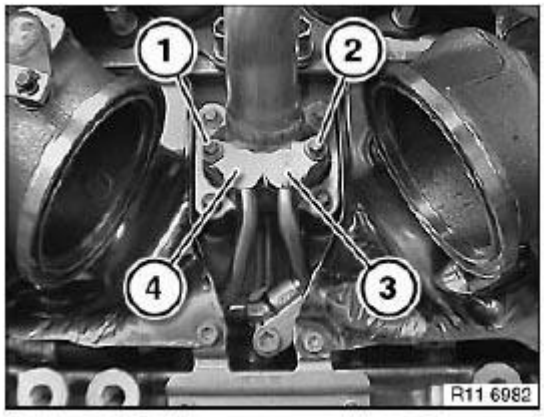


Fig. 388: Identifying Screws And Coolant Feed Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1).

Tightening torque **11 53 3AZ** .

Remove feed line (2).

Installation note:

Replace O-ring.

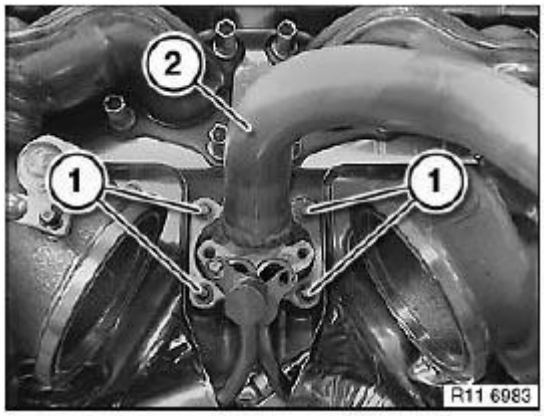


Fig. 389: Identifying Bolts And Feed Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 53 8AZ** .

Release coolant return pipe at connection (2) if necessary with suitable pliers.

Unscrew bolt (3).

Tightening torque **11 53 9AZ** .

Release coolant return pipe at connection (4) if necessary with suitable pliers.

Unfasten coolant return pipe.

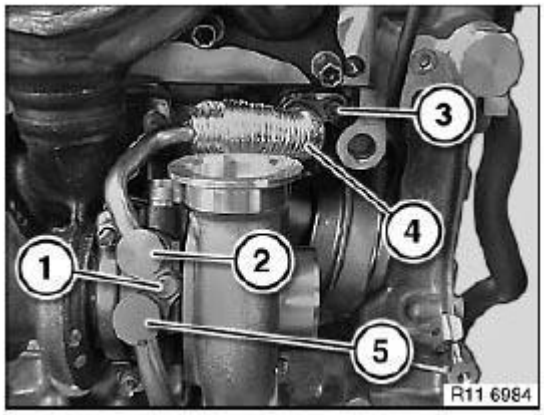


Fig. 390: Identifying Screw, Connection And Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not place pliers on pipes. Risk of damage!

Release bolts (1).

Tightening torque **11 65 2AZ** .

Remove retaining plate (2).

Release screws (3).

Tightening torque **11 65 2AZ** .

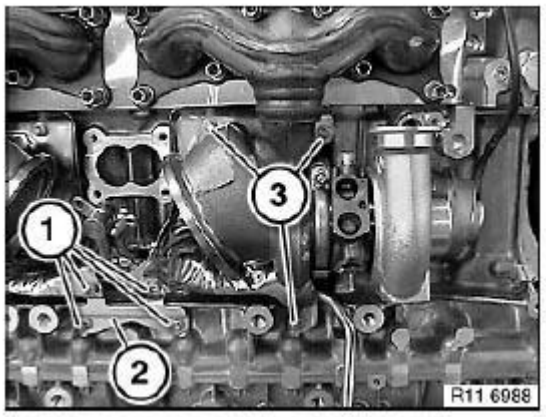


Fig. 391: Identifying Retaining Plate, Bolts And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove heat shield (1) in direction of arrow.

NOTE: Carefully swing out heat shield (1) in direction of arrow.

Risk of damage!

Coolant feed pipe can be removed with heat shield (1).

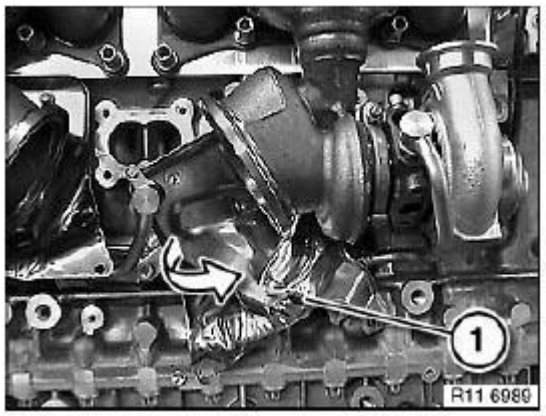


Fig. 392: Swinging Out Heat Shield

Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1).

Tightening torque **11 65 3AZ** .

Set holder (2) down on cylinder head cover.

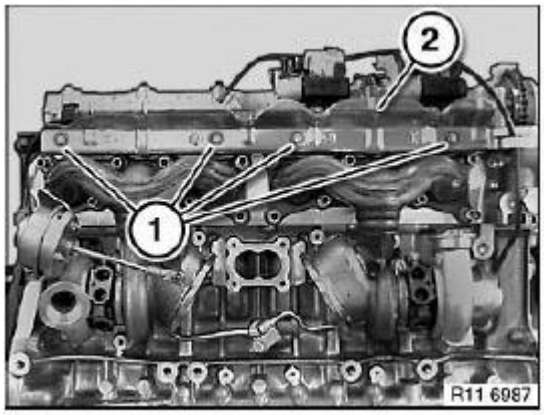


Fig. 393: Identifying Holder And Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 42 4AZ** .

Detach oil feed line in direction of arrow.

Installation note:

Replace O-ring.

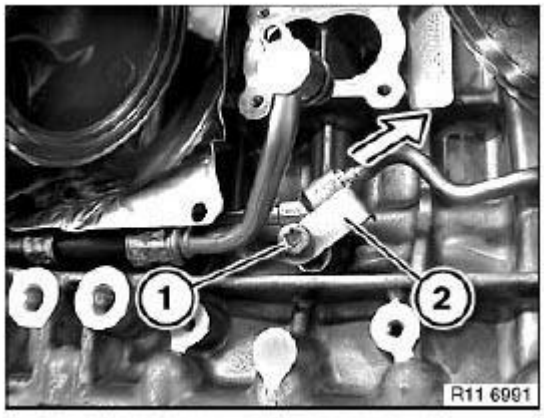


Fig. 394: Detaching Oil Feed Line

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 42 5AZ** .

Release oil pressure line (2) if necessary with suitable pliers.

IMPORTANT: Do not place pliers on pipes. Risk of damage!

Installation note:

Replace O-rings.

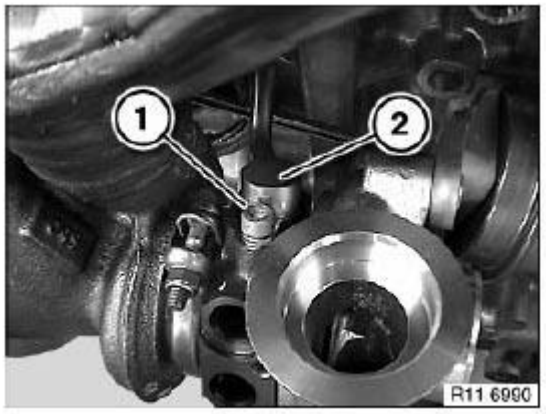


Fig. 395: Identifying Oil Pressure Line And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Detach vacuum hose from vacuum unit (wastegate valve).

Unscrew nuts (1).

Tightening torque **11 65 1AZ** .

Remove turbocharger towards top.

IMPORTANT: Risk of damage!

Do not misuse linkage of vacuum unit (wastegate valve) for transportation.

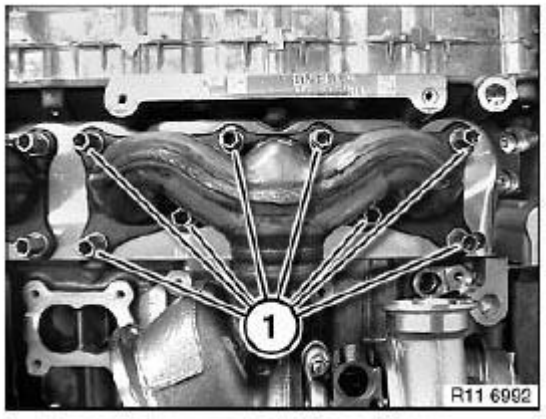


Fig. 396: Identifying Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (2).

Tightening torque **11 42 5AZ** .

IMPORTANT: Risk of damage!

Where necessary, to release the oil feed line (3), do not place pliers on the pipe.

If necessary, release oil feed line (3) with suitable pliers at connection and remove.

Installation note:

Replace O-rings.

Installation note:

Replace graphite sealing rings (1).

NOTE: Picture shows turbocharger for cylinders 4 to 6.

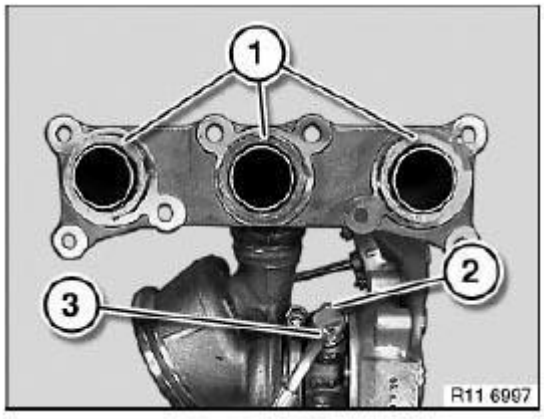


Fig. 397: Identifying Turbocharger Graphite Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Clear fault memory in DME control unit.

Check air intake system for leaks.

Observe DME instructions.

11 65 024 REMOVING AND INSTALLING/REPLACING EXHAUST-GAS TURBOCHARGER FOR CYLINDERS 4-6

Necessary preliminary tasks:

- Remove both catalytic exhaust-gas converters
- Remove intercooler
- Drain coolant
- Remove coolant expansion tank
- Remove **COOLANT THERMOSTAT**
- Remove **COOLANT PUMP**
- Remove both vacuum reservoirs
- Remove right **CHARGE-AIR DUCT**

Release bolts (1).

Tightening torque **11 42 7AZ** .

Installation note:

Replace seal.

Release screw (2).

Tightening torque **11 42 8AZ** .

Remove oil return pipe in direction of arrow.

Installation note:

Replace O-ring.

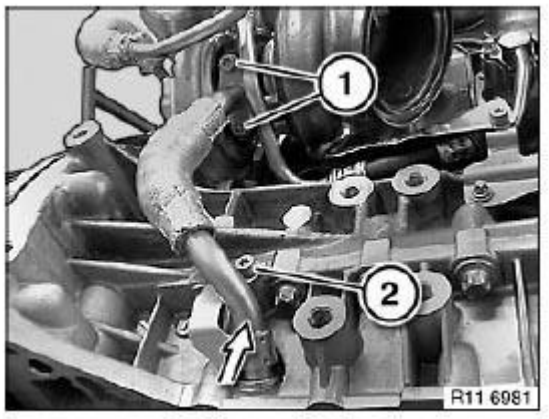


Fig. 398: Removing Oil Return Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 and 2).

Tightening torque **11 53 10AZ** .

Release coolant feed lines (3 and 4) if necessary with suitable pliers.

IMPORTANT: Do not place pliers on pipes. Risk of damage!

Installation note:

Replace O-rings.

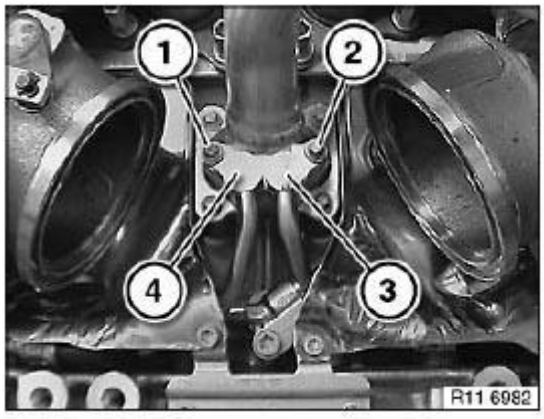


Fig. 399: Identifying Screws And Coolant Feed Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 53 3AZ** .

Remove feed line (2).

Installation note:

Replace O-ring.

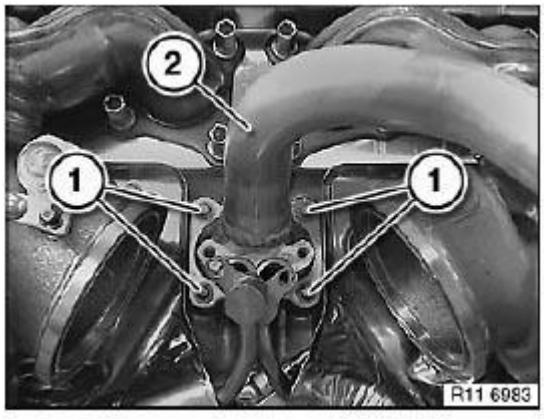


Fig. 400: Identifying Bolts And Feed Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 53 9AZ** .

Release coolant return pipe if necessary with suitable pliers.

IMPORTANT: Do not place pliers on pipes. Risk of damage!

Installation note:

Replace O-ring.

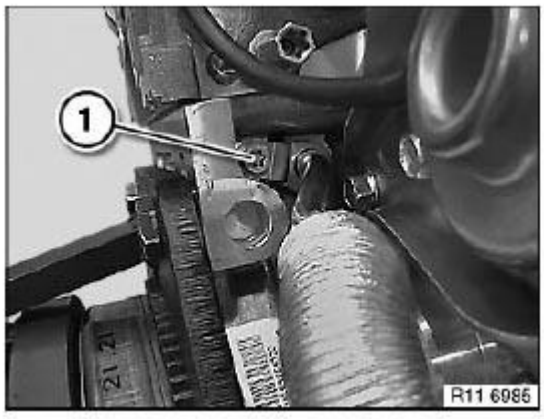


Fig. 401: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 53 8AZ** .

**IMPORTANT: When detach coolant feed pipe (3), pay attention to linkage of vacuum unit (wastegate valve).
Risk of damage!**

Release coolant feed pipe (3) if necessary with suitable pliers.

Release coolant return pipe (2) if necessary with suitable pliers and remove.

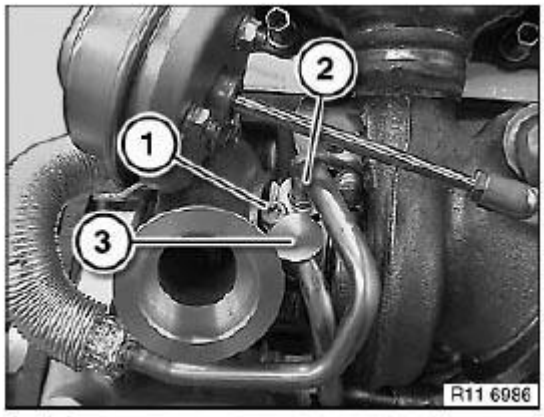


Fig. 402: Identifying Coolant Feed Pipe, Coolant Return Pipe And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not place pliers on pipes. Risk of damage!

Installation note:

Replace O-ring.

Release screws (1).

Tightening torque **11 65 2AZ** .

Remove retaining plate (2).

Unfasten screws (3 and 4).

Tightening torque **11 65 2AZ** .

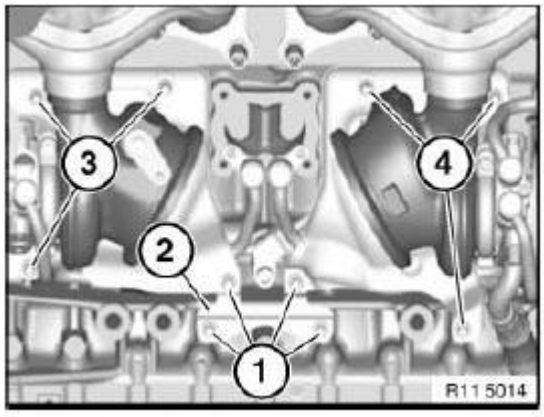


Fig. 403: Identifying Bolts, Retaining Plate And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Carefully swing out heat shields (2 and 3) in direction of arrow. Risk of damage!

Remove heat shield (3) in direction of arrow.

Remove heat shield (2) in direction of arrow.

NOTE: Coolant feed pipe (1) can be removed with heat shield (2).

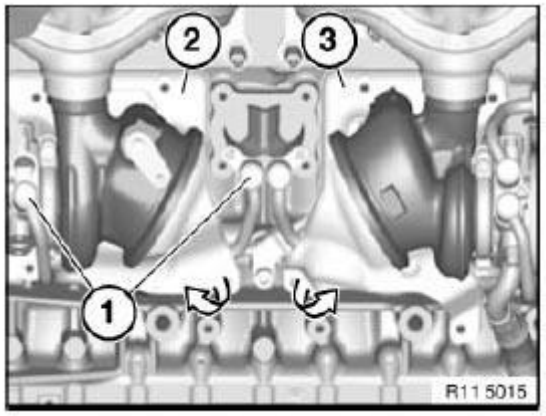


Fig. 404: Removing Heat Shield
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 42 4AZ** .

Detach oil feed line in direction of arrow.

Installation note:

Replace O-ring.

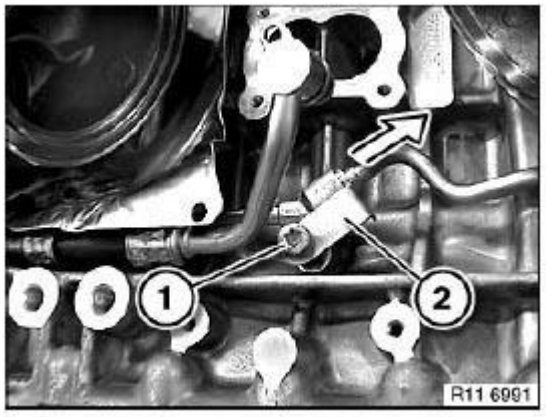


Fig. 405: Detaching Oil Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 65 3AZ** .

Set holder (2) down on cylinder head cover.

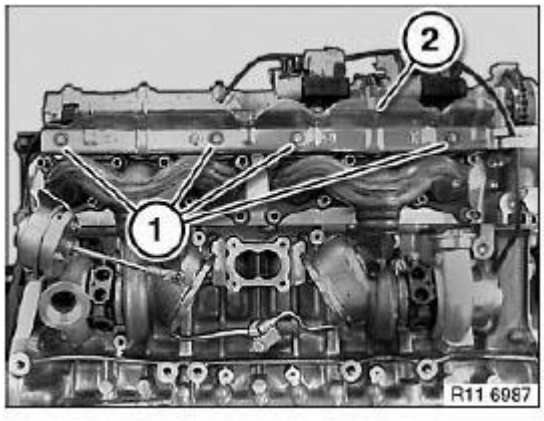


Fig. 406: Identifying Holder And Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Detach vacuum hose from vacuum unit (wastegate valve).

Unscrew nuts (1).

Remove turbocharger towards bottom.

Tightening torque **11 65 1AZ** .

IMPORTANT: Do not misuse linkage of vacuum unit (wastegate valve) for transportation. Risk of damage!

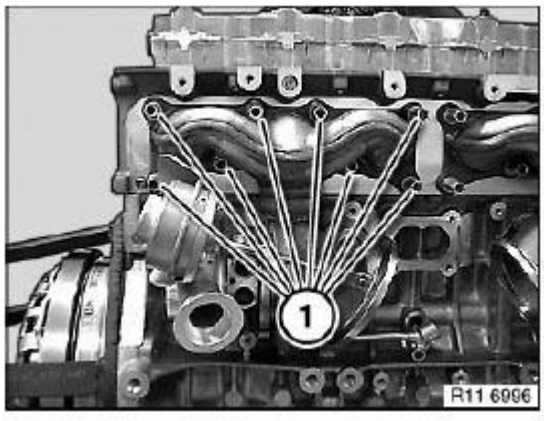


Fig. 407: Identifying Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (2).

Tightening torque **11 42 5AZ** .

IMPORTANT: Risk of damage!

Where necessary, to release the oil feed line (3), do not place pliers on the pipe.

If necessary, release oil feed line (3) with suitable pliers at connection and remove.

Installation note:

Replace O-rings.

Installation note:

Replace graphite sealing rings (1).

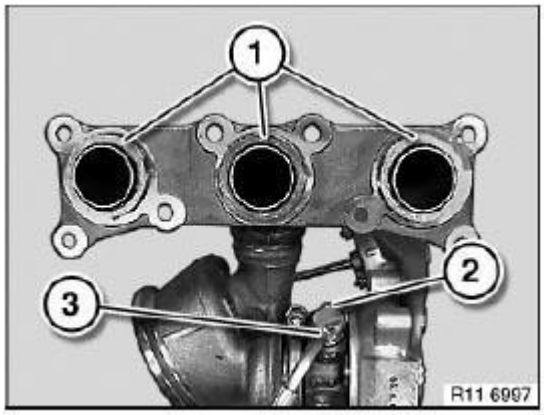


Fig. 408: Identifying Oil Feed Lines And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Clear fault memory in DME control unit.

Check air intake system for leaks.

Observe DME instructions.

11 65 580 REPLACING VACUUM UNIT (WASTEGATE VALVE) (N54)

IMPORTANT: Overpressure and vacuum lines are identified by the size of the seals and color-coded Red and Blue and must not be mixed up with each other.
Build up pressure with Blue color.
Generate vacuum pressure with Red color.
Check ease of movement between turnbuckle and pin of adjusting lever (ensure rectangularity).

Note on ordering:

- Workshop equipment
- Workshop planning
- Workshop equipment catalogue
- Measuring and test equipment
- No. 81 29 0 426 464

Necessary preliminary tasks:

- Prepare BMW diagnosis system
- Start diagnosis program

  Perception:

  1. Noises at turbocharger (clanking)

  or Fault memory entry:

  1. Drive
  2. Engine electronics
  3. Air supply
  4. Boost pressure control
- Remove both exhaust turbochargers. See **TURBOCHARGER FOR CYLINDERS 1-3** and **TURBOCHARGER FOR CYLINDERS 4-6**.

Release locking clip (2).

Disengage linkage of vacuum unit (wastegate valve).

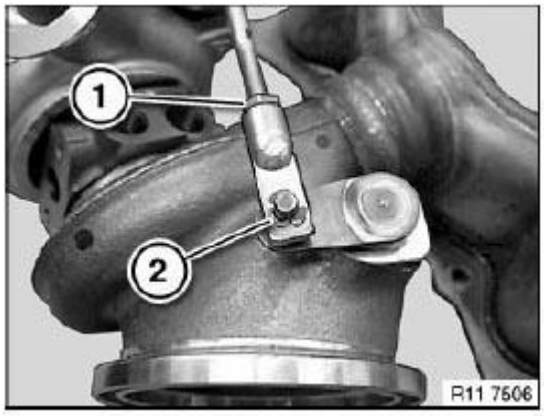


Fig. 409: Identifying Locking Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Check linkage and valve for wear

Connect vacuum line (1) to vacuum unit (wastegate valve).

Vacuum linkage must retract to stop.

Wastegate valve must be sealed off by hand.

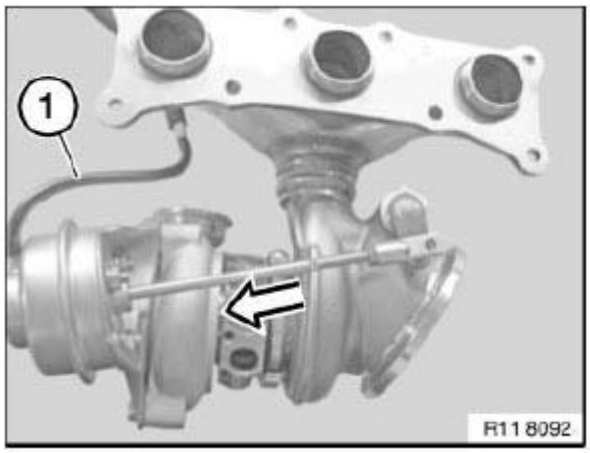


Fig. 410: Identifying Vacuum Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release lock nut on controller (1).

Press setting with measurement.

- Determine ambient pressure
- Seal stop cock (2) in direction of arrow
- Set controller (1) to **500 ± 10 mbar** below ambient pressure (e.g. 980 - 500 = 480 mbar).

Open stop cock (2) again.

Wastegate linkage closes.

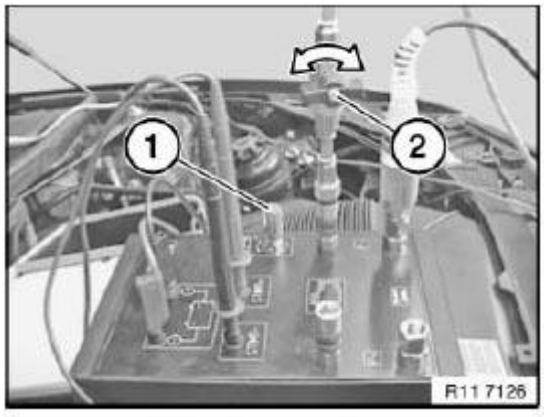


Fig. 411: Sealing Stop Cock
Courtesy of BMW OF NORTH AMERICA, INC.

Determine gap dimension.

Gap dimension between turnbuckle and adjusting lever.

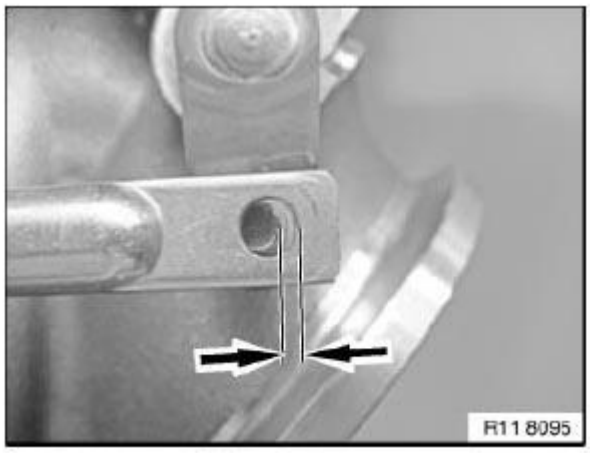


Fig. 412: Identifying Gap Dimension Between Turnbuckle And Adjusting Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Seal off wastegate valve (1) by hand in direction of arrow up to stop.

The turbocharger must be replaced if a 1.5 mm drill bit can be inserted as pictured.

NOTE: Gap dimension > or = 1.5 mm.

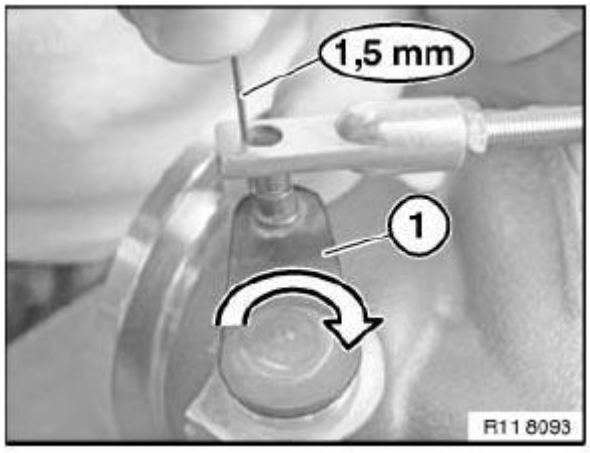


Fig. 413: Sealing Off Wastegate Valve
Courtesy of BMW OF NORTH AMERICA, INC.

The turbocharger is OK if a 1.5 mm drill bit cannot be inserted or can only be inserted at an angle as pictured.

NOTE: Gap dimension < 1.5 mm.

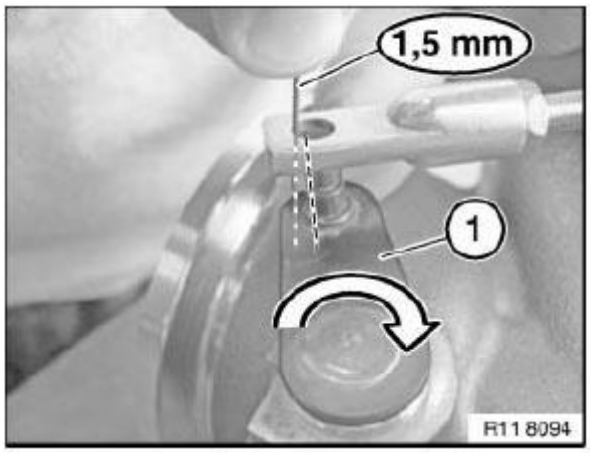


Fig. 414: Identifying Drill Bit Dimension
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1 and 3).

Tightening torque. See 11AZ in **11 65 TURBOCHARGER AND CONTROL** .

Installation note:

Replace vacuum unit 2 (wastegate valve) .

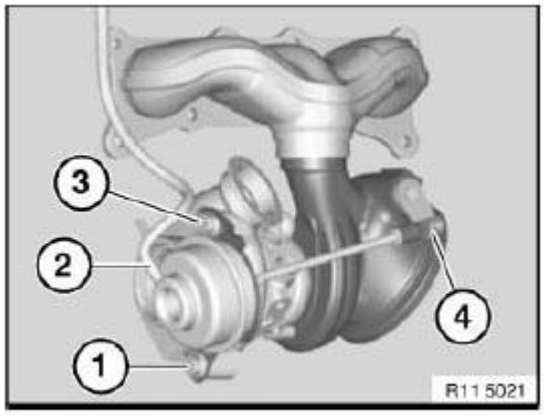


Fig. 415: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Adjusting vacuum unit (wastegate valve) linkage

Initial position of vacuum unit (wastegate valve) linkage depressurized.

Connect red vacuum line (1) to vacuum unit (wastegate valve).

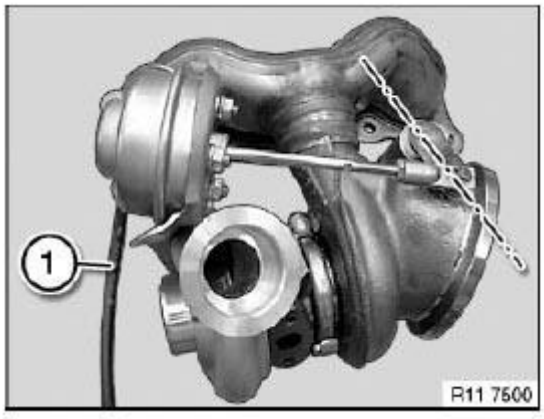


Fig. 416: Identifying Red Vacuum Line
Courtesy of BMW OF NORTH AMERICA, INC.

Vacuum pressure measurement

Prepare BMW diagnosis system on vacuum diagnosis unit.

1. Screw in pressure sensor.
2. Connect 12V battery cables (2) to vehicle battery positive and negative.
3. Connect 12V battery cables (3) to vehicle battery positive and negative **(pump operation max. 3 mins.)** .
4. Controller for vacuum connection.
5. Vacuum connection (Red).

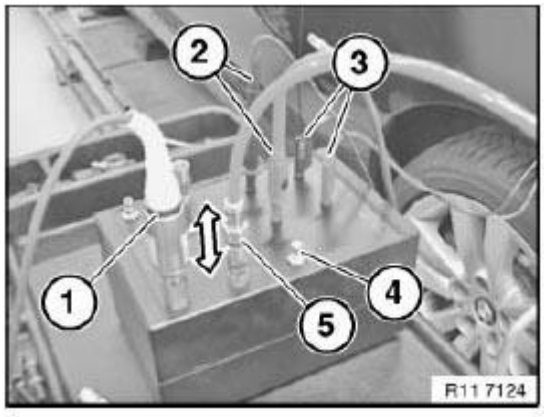


Fig. 417: Measuring Vacuum Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

Calibration for vacuum pressure measurement

Release lock nut on controller (1).

Press setting with measurement.

- Determine ambient pressure
- Seal stop cock (2) in direction of arrow
- Set controller (1) to **200 ± 10 mbar** below ambient pressure (e.g. 980 - 200 = 780 mbar).

Open stop cock (2) again.

Wastegate valve closes.

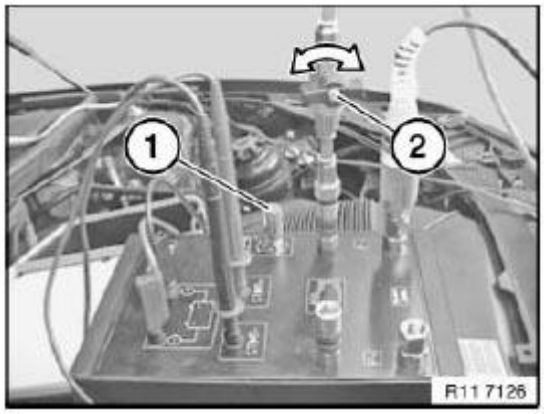


Fig. 418: Sealing Stop Cock
Courtesy of BMW OF NORTH AMERICA, INC.

Initial position (1) of wastegate linkage with preset vacuum pressure.

Wastegate valve virtually closed.

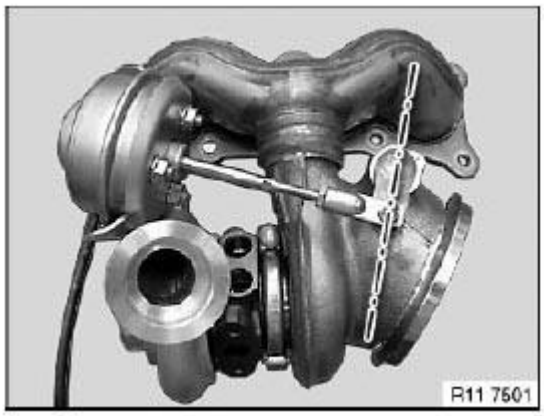


Fig. 419: Identifying Initial Position Of Wastegate Linkage With Preset Vacuum Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

Checking turnability at wastegate valve

a. Wastegate valve can be turned with minimal force.

Adjustment at wastegate valve is OK.

b. Wastegate valve has play and can be turned without resistance, wastegate valve open too far.

   Carry out adjustment at wastegate valve, **shorten** linkage.

c. Wastegate valve cannot be turned, wastegate valve closed.

   Carry out adjustment at wastegate valve, **lengthen** linkage.

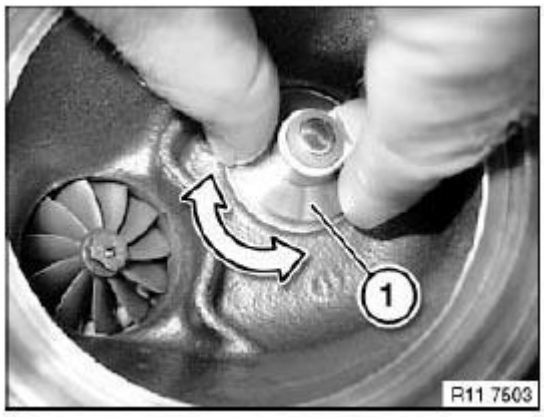


Fig. 420: Checking Wastegate Valve Turnability
Courtesy of BMW OF NORTH AMERICA, INC.

Adjustment at linkage

To **lengthen** linkage, turn turnbuckle (1) max. **180°** in **counterclockwise** direction.

To **shorten** linkage, turn turnbuckle (1) max. **180°** in **clockwise** direction.

Engage turnbuckle (1) on adjusting lever in direction of arrow.

IMPORTANT: Check ease of movement between turnbuckle (1) and pin of adjusting lever (ensure rectangularity).

Check turnability at wastegate valve again.

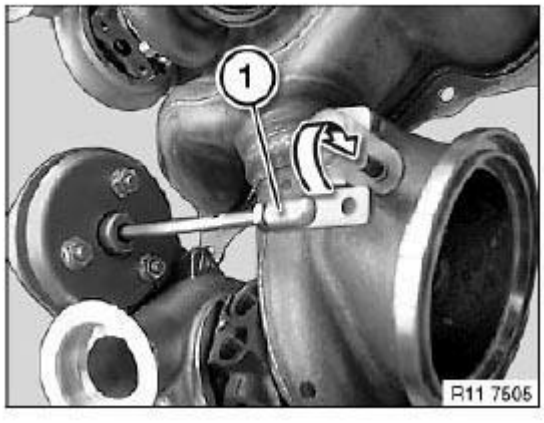


Fig. 421: Engaging Turnbuckle On Adjusting Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Secure lock nut (1); to do so, secure turnbuckle against turning with a suitable tool.

Tightening torque. See 10AZ in **11 65 TURBOCHARGER AND CONTROL** .

Mount locking clip (2).

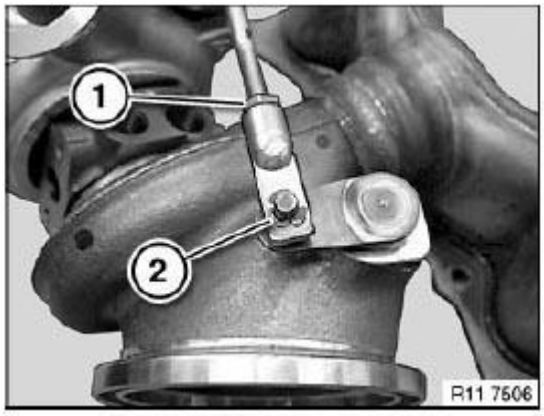


Fig. 422: Identifying Lock Nut And Locking Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Observe diagnosis instructions.

Execute test module for boost pressure control.

VACUUM PUMP

11 66 000 REMOVING AND INSTALLING/REPLACING VACUUM PUMP

Special tools required:

- **11 0 290**
- **11 4 120**
- **11 8 650**

Necessary preliminary tasks:

- Remove **DRIVE BELT**.
- Remove **TENSIONER** for drive belt.
- Remove **SEALING COVER** for vacuum pump.
- Remove **INTAKE AIR MANIFOLD**.
- Remove **HIGH PRESSURE PUMP** .

Rotate crankshaft at central bolt.

Turn sprocket wheel until drilled holes and screws of vacuum pump match up.

Screw in special tool **11 8 650.**

Secure special tool **11 0 290** in sprocket wheel and to special tool **11 8 650.**

Release screw (1).

Tightening torque: **11 66 2AZ** .

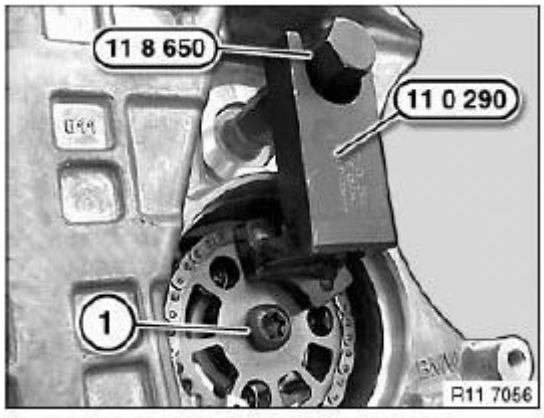


Fig. 423: Identifying Central Bolt With Special Tools (11 8 650) And (11 0 290)
Courtesy of BMW OF NORTH AMERICA, INC.

Press chain tensioner (1) with chain in direction of arrow.

Insert special tool **11 4 120.**

Remove sprocket wheel (2) in direction of arrow.

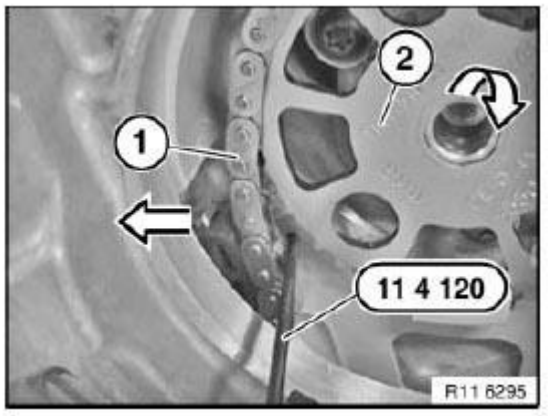


Fig. 424: Removing Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: **11 66 1AZ** .

Release screws (1), secure against falling out.

Remove vacuum pump.

Installation note:

Replace seal.

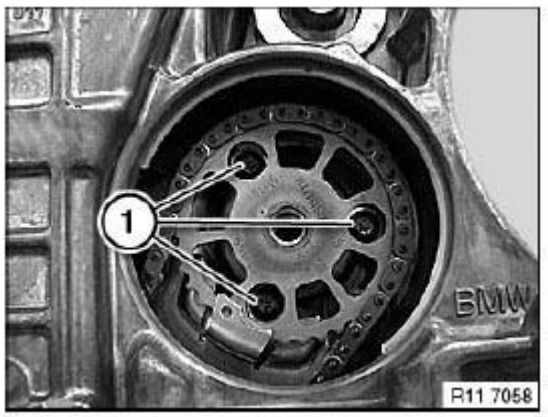


Fig. 425: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

EMISSION CONTROL, OXYGEN SENSOR

11 78 513 REMOVING AND INSTALLING/REPLACING BOTH OXYGEN CONTROL SENSORS

Special tools required:

- **11 7 030**
- **11 9 150**

WARNING: Scalding hazard!

Only perform these tasks after the exhaust system has cooled down.

Necessary preliminary tasks:

- Remove **ACOUSTIC COVER**.
- Release right **TIE ROD** from power steering gear.

It is not necessary to conduct a chassis/wheel alignment check when the tie rod is released.

Installation note:

If an oxygen sensor is to be reused, only apply a thin and uniform coat of Never Seez Compound to thread.

The part of the oxygen control sensor which projects into the exhaust system branch (sensor ceramic) must not be cleaned or come into contact with lubricant.

Disconnect plug connection for oxygen control sensor, cylinders 1 to 3.

Release oxygen control sensor (1) with special tools **11 7 030** and **11 9 150** .

Tightening torque: **11 78 1AZ** .

Installation note:

Cable color black, cylinders 1 to 3.

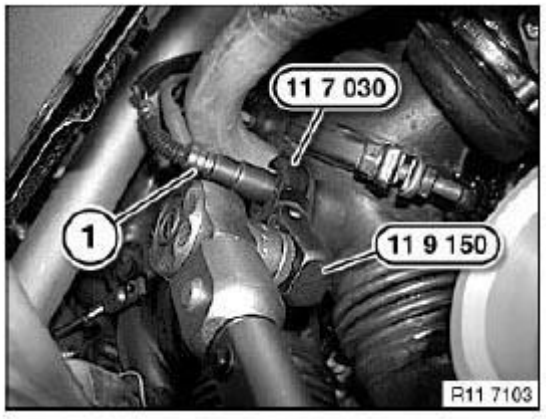


Fig. 426: Releasing Oxygen Control Sensor With Special Tools (11 7 030) And (11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection for oxygen control sensor, cylinders 4 to 6.

Release oxygen control sensor (1) with special tools **11 7 030** and **11 9 150** .

IMPORTANT: When using special tool 11 7 030 in conjunction with special tool 11 9 150 , it is essential to reduced the prescribed tightening torque by 3 Nm.

Tightening torque: **11 78 1AZ** .

Installation note:

Cable color gray, cylinders 4 to 6.

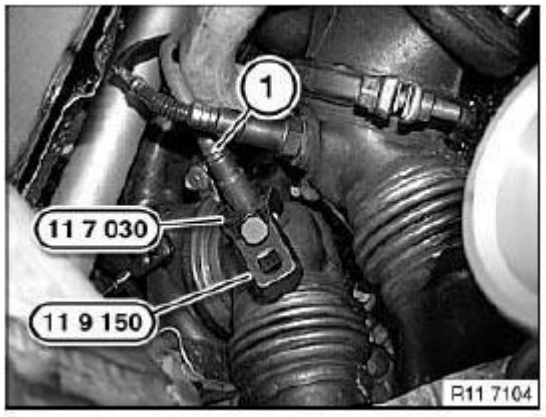


Fig. 427: Releasing Oxygen Control Sensor With Special Tools (11 7 030) And (11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

11 78 545 REMOVING AND INSTALLING/REPLACING BOTH OXYGEN MONITORING SENSORS

Special tools required:

- **11 7 020**
- **11 7 030**
- **11 9 150**

WARNING: Scalding hazard!

Work should only be carried out on an exhaust system that has cooled down.

Necessary preliminary tasks:

- Remove **REAR UNDERBODY PROTECTION** .

Installation note:

If an oxygen sensor is to be reused, only apply a thin and uniform coat of Never Seez Compound to thread.

The part of the oxygen monitor sensor which projects into the exhaust system branch (sensor ceramic) must not be cleaned or come into contact with lubricant.

Disconnect plug connection for oxygen monitor sensor.

Release monitor sensor (1) with special tools **11 7 030** and **11 9 150** .

IMPORTANT: When using special tool 11 7 030 in conjunction with special tool 11 9 150 , it is essential to reduced the prescribed tightening torque by 3 Nm.

Tightening torque: **11 78 1AZ** .

Installation note:

Cable color black, cylinders 1 to 3.

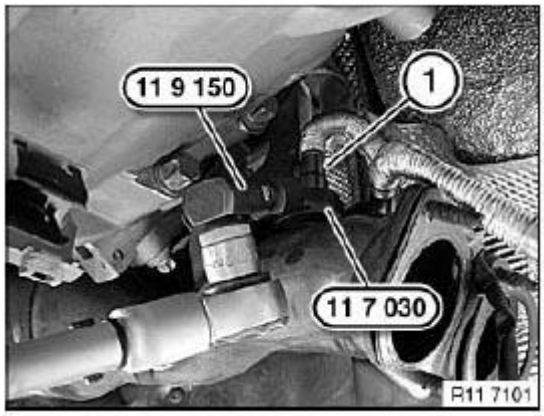


Fig. 428: Releasing Monitor Sensor With Special Tools (11 7 030) And (11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Release insulation (2) in direction of arrow.

Disconnect plug connection for oxygen monitor sensor.

Release monitor sensor (1) with special tool **11 7 020.**

Tightening torque: **11 78 1AZ** .

Installation note:

Cable color gray, cylinders 4 to 6.

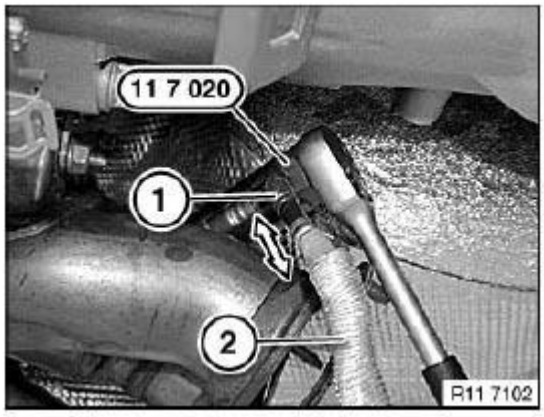


Fig. 429: Releasing Insulation
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

