ENGINE

Engine - Repair Instructions - X6 (N54)

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

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 MOUNTING ENGINE ON ASSEMBLY STAND (N54)

Special tools required:

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

See **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS** .

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

**IMPORTANT: Aluminum screws/bolts must be replaced each time they are released.
Aluminum screws/bolts are permitted with and without color coding (blue).
For reliable identification:
Aluminum screws/bolts are not magnetic.
Jointing torque and angle of rotation must be observed without fail (risk of damage).**

Necessary preliminary tasks:

- Remove **engine**.

Mount engine with special tool **11 8 541** on special tool **00 2 300** .

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

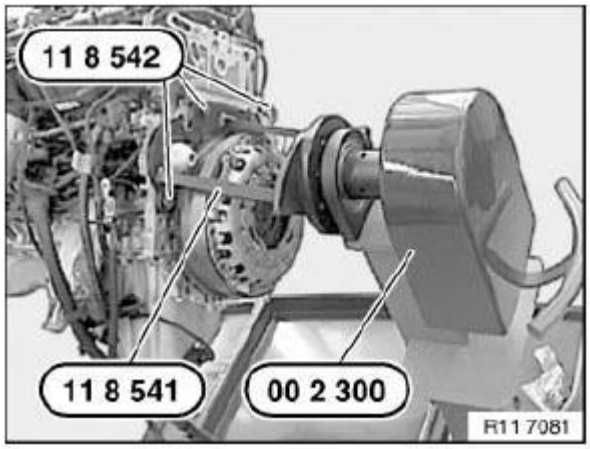


Fig. 1: Mounting Engine Or Engine Block With Special Tool 11 8 542 To 11 8 541
Courtesy of BMW OF NORTH AMERICA, INC.

11 00 REMOVING AND INSTALLING/REPLACING FRONT IGNITION COIL COVER (N54)

Release screws (see arrows).

Tightening torque **11 12 7AZ** , see **CYLINDER HEAD**

Raise front ignition coil cover (1) approx. 5 - 10 cm.

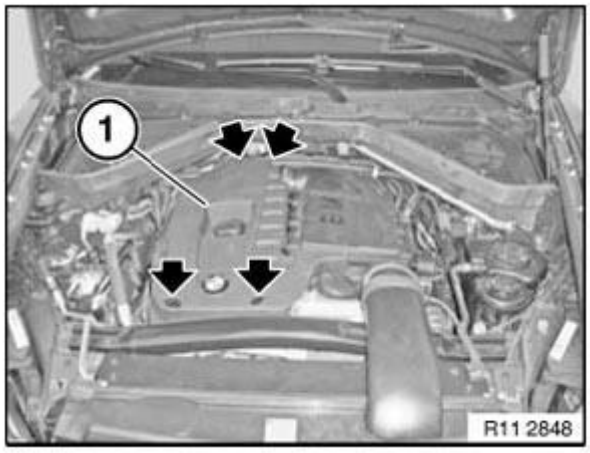


Fig. 2: Identifying Front Ignition Coil Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully release connections for vacuum lines (1 and 2).

Installation:

Connections (1 and 2) must snap audibly into place!

Remove ignition coil cover.

NOTE: When working on cylinder no. 6, also remove the rear ignition coil cover .

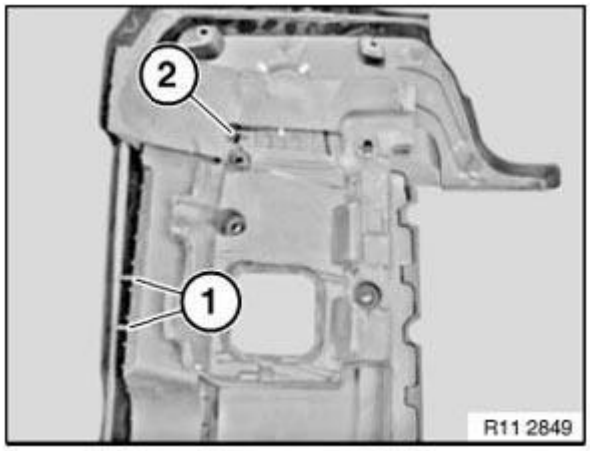


Fig. 3: Identifying Connections
Courtesy of BMW OF NORTH AMERICA, INC.

11 00 REMOVING AND INSTALLING/REPLACING IGNITION COIL COVER (N54)

Necessary preliminary tasks:

- **Remove microfilter housing** . See **MICROFILTER** .

Release screws.

Tightening torque **11 12 7AZ** , see **CYLINDER HEAD**

Remove ignition coil cover (1) towards top.

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

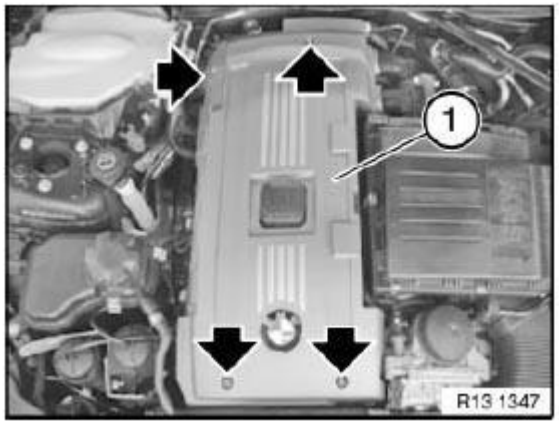


Fig. 4: Identifying Ignition Coil Cover
Courtesy of BMW OF NORTH AMERICA, INC.

11 00 REMOVING AND INSTALLING/REPLACING REAR IGNITION COIL COVER (N54)

Necessary preliminary tasks:

- Remove front **ignition coil cover.**
- Remove **CLEAN AIR PIPE** .

Release screws.

Tightening torque **11 12 7AZ** , see **CYLINDER HEAD**

Remove rear ignition coil cover (1) towards top.

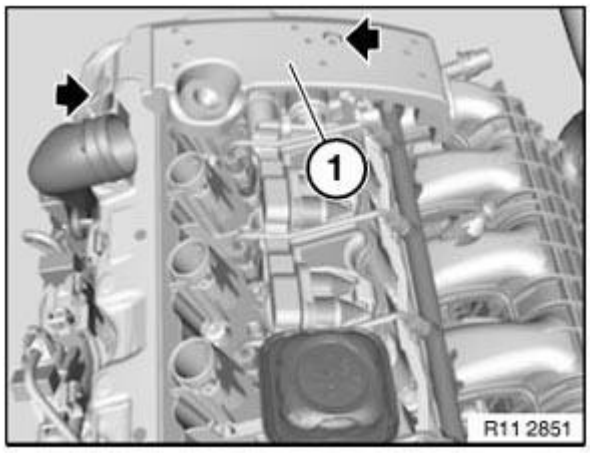


Fig. 5: Identifying Rear Ignition Coil Cover
Courtesy of BMW OF NORTH AMERICA, INC.

11 00... OVERVIEW OF CONSUMABLES

1.0 Sealing compound for **injection.**

SEALING COMPOUND REFERENCE CHART

	Repair instructions (engine)	Designation EPC	Part number EPC	Application examples
1.1	N40, N42, N45, N46, N43, N45N, N46N	Loctite 171000 primer	83 19 7 515 683	For hardening Loctite 128367 sealing compound
1.2	N40, N42, N45, N46, N43, N45N, N46N	Loctite 128357 liquid gasket	83 19 7 536 051	Sealing between crankcase upper and lower halves
1.3	N51, N52, N53, N54, N52N, N55	Loctite 171000 primer	83 19 7 515 683	For hardening Loctite 193140 sealing compound
1.4	N51, N52, N53, N54, N52N, N55	Loctite 193140 liquid gasket	83 19 0 439 030	Sealing between crankcase upper and lower halves
1.5	S65, S85	Loctite 171000 primer	83 19 7 515 683	For hardening Loctite 193140 sealing compound
1.6	S65, S85	Loctite 193140 liquid gasket	83 19 0 439 030	Sealing between crankcase upper and lower halves

2.0 Sealing compound for **application.**

SEALING COMPOUND REFERENCE CHART

	Designation in repair instruction	Designation EPC	Part number EPC	Application examples
2.1	M41, M47, M47TU, M47T2, M50, M51, M52, M52TU, M54, M57, M57TU, M57T2, M60, M62 N40, N42, N45, N45N, N46, N46N, N43, N47, N47S N51, N52, N52N, N53, N54, N55, N57, N57S N62, N62TU, N73, N73H S14, S38, S50, S52, S54, S62, S65, S85	Drei Bond 1209 liquid gasket	07 58 9 062 376	For sealing junction points on crankcase
2.2	N12, N14, W16	Loctite 5970 liquid gasket	83 19 0 404 517	Sealing between crankcase upper and lower halves
2.3	N12, N14, W16	Loctite 273 liquid gasket	83 19 0 443 083	Sealing between cover sleeve and crankcase

11 00... SERVICE - ENGINE OIL (N54)

Special tools required:

- **11 9 240**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

WARNING: Danger 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 normal operating temperature.

Observe the exact engine oil filling capacity.

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

Checking and drop-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 container.

Observe country-specific waste-disposal regulations.

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

Tightening torque **11 42 1AZ** , see **OIL FILTER AND LINES**

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

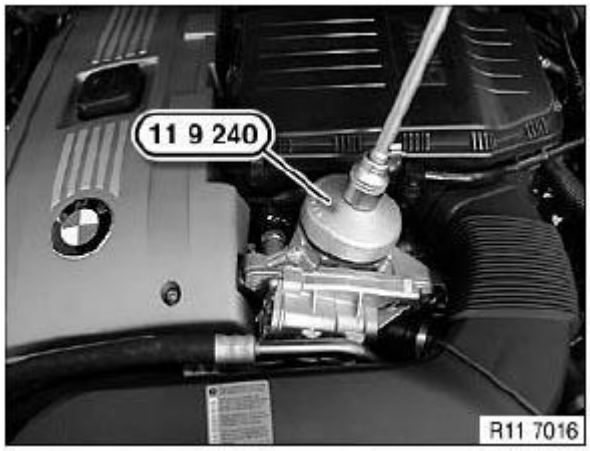


Fig. 6: Identifying Special Tool 11 9 240

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 **11 13 1AZ** , see **OIL SUMP**

Installation:

Replace sealing ring.

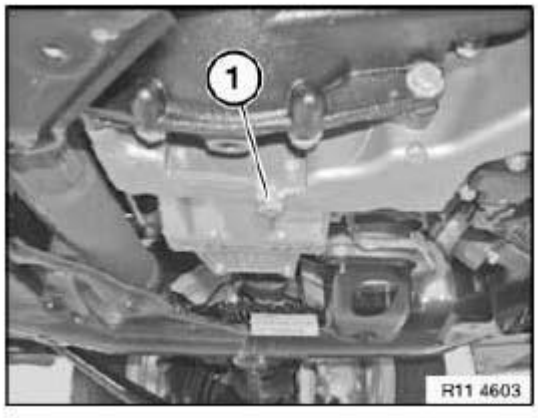


Fig. 7: Identifying Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

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

Replace gasket (3) and renew if necessary.

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

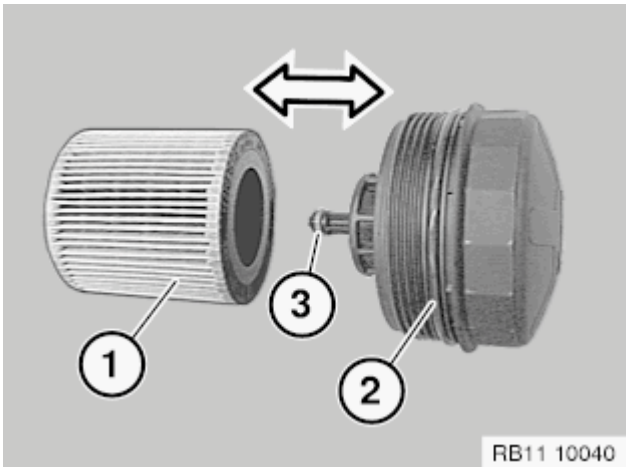


Fig. 8: Identifying Oil Filter Element And Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 42 1AZ** , see **OIL FILTER AND LINES**

NOTE: Pour in engine oil .

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

Turn off engine.

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

Assemble engine.

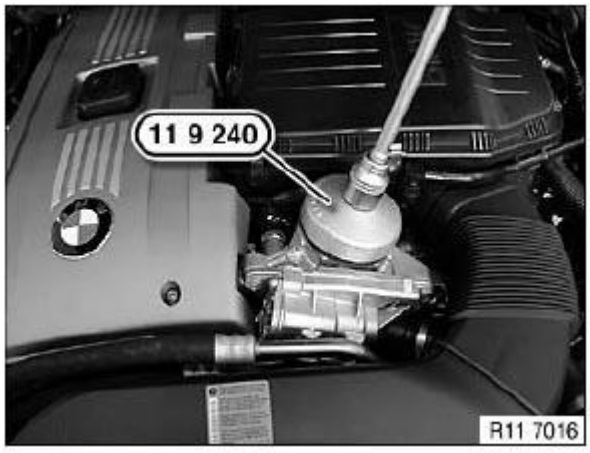


Fig. 9: Identifying Special Tool 11 9 240
Courtesy of BMW OF NORTH AMERICA, INC.

Checking engine oil level:

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

11 00 039 CHECKING COMPRESSION IN ALL CYLINDERS (N43/ N53/ N54)

Special tools required:

- **11 0 222**
- **11 0 224**
- **11 8 731**
- **11 8 732**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

- 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** . See **12 12 011 REPLACING ALL SPARK PLUGS (N53, N54, N63)** .

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

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

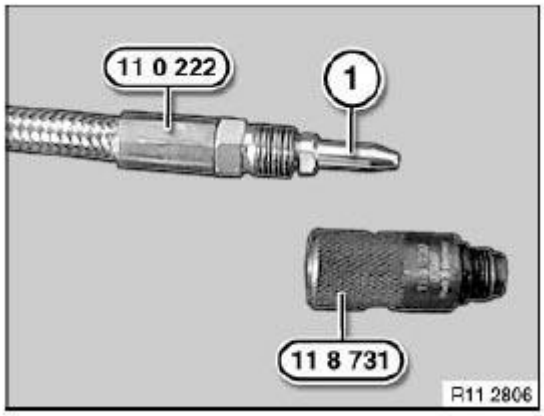


Fig. 10: Identifying Tip And Special Tool 11 0 222
Courtesy of BMW OF NORTH AMERICA, INC.

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

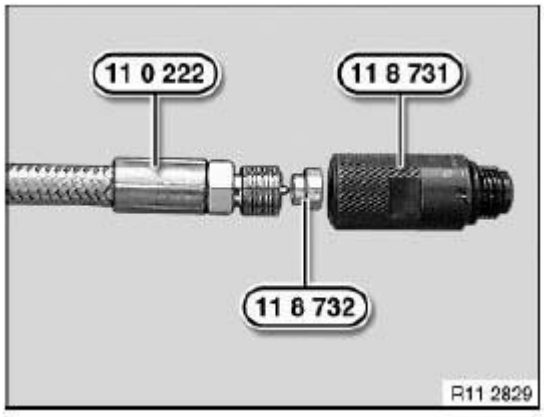


Fig. 11: Identifying Special Tool 11 0 222, 11 8 732 And 11 8 731
Courtesy of BMW OF NORTH AMERICA, INC.

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

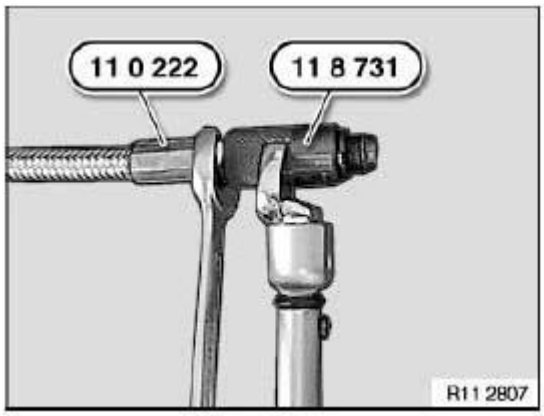


Fig. 12: Screwing Special Tool 11 0 222 Into Special Tool 11 8 731 To 10 Nm
Courtesy of BMW OF NORTH AMERICA, INC.

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 until compression pressure stops rising.

- **Nominal values** , compression pressure. See **11 00 ENGINE IN GENERAL N54 B30** .

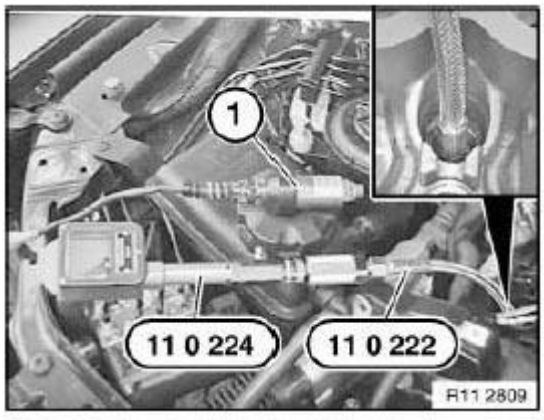


Fig. 13: Identifying Adapter Lead
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine

Now clear the fault memory.

11 00 050 REMOVING AND INSTALLING ENGINE (N54)

Special tools required:

- **11 0 000**
- **11 5 281**
- **11 5 282**
- **11 8 680**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released. Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:
Aluminum screws/bolts are not magnetic.
Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Disconnect battery negative lead. See **BATTERY** .
- Move engine bonnet/hood into **assembly position** .
- Drain **engine oil** .
- Remove **air cleaner housing** . See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N54)** .
- Remove **fan cowl** with electric fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N54)** .
- Remove **radiator** . See **17 11 000 REMOVING AND INSTALLING RADIATOR (N52K, N54)** .
- Detach all coolant hoses from engine.
- Remove left and right fresh air duct.
- Remove intake air **manifold** .
- Detach vacuum line from **brake booster** . See **34 33 071 REPLACING VACUUM HOSE FOR BRAKE BOOSTER (N54)** .
- Unfasten **ignition wiring harness** and lay to one side. See **12 51 100 REPLACING WIRING HARNESS SECTION FOR IGNITION AND INJECTORS (N54)** .
- Unfasten **engine wiring harness** and lay to one side. See **12 51 001 REPLACING WIRING HARNESS SECTION FOR ENGINE (N54)** .
- Remove front left and right **output shafts** . See **OUTPUT SHAFT** .
- Remove **exhaust system** . See **EXHAUST SYSTEM COMPLETE** .
- Remove **transmission** . See **24 00 030 REMOVING AND INSTALLING AUTOMATIC TRANSMISSION (GA6HP19Z) N54** .

Evacuate A/C system. See **64 50 009 DRAWING OFF, EVACUATING AND FILLING A/C SYSTEM (R 134A)** .

Release screws (1) for A/C lines.

Disconnect plug connection (2) on air-conditioning compressor.

Do **not** remove air-conditioning compressor.

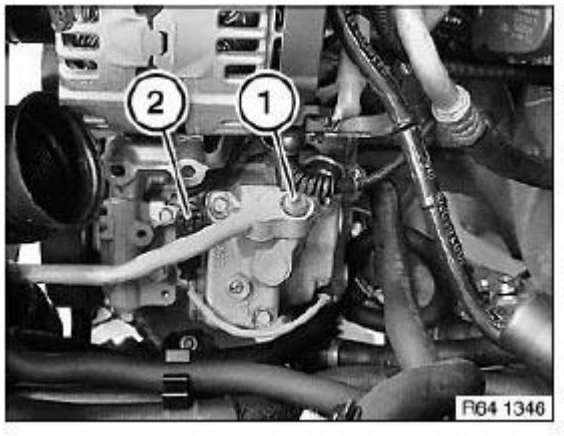


Fig. 14: Identifying Screws And Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1 and 2) from power steering pump bracket.

Set power steering pump down on front axle carrier.

NOTE: Do not disconnect hydraulic lines.

If Dynamic Drive optional equipment is fitted, release bracket.

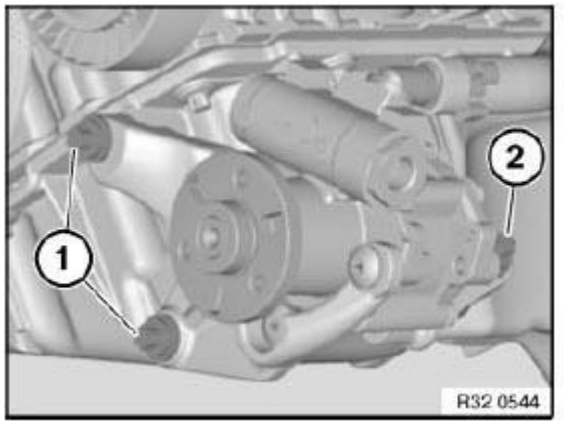


Fig. 15: Identifying Power Steering Pump Bracket Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect fuel lines (1 and 2).

Close off fuel line (1) with special tool **11 5 281** .

Close off fuel line (2) with special tool **11 5 282** .

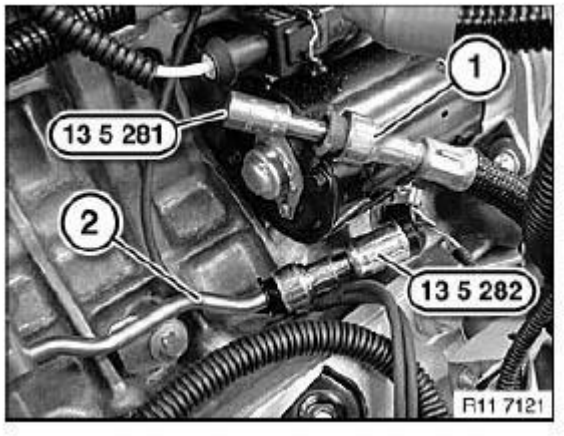


Fig. 16: Identifying Fuel Line And Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool **11 8 680** to lifting eye on transmission side.

Press locking pin (1) in direction of arrow until locking balls (2) are loose.

Secure special tool **11 8 680** to lifting eye. Release locking pin (1).

Installation:

Special tool **11 8 680** is correctly installed when locking balls (2) are arrested.

Special tool **11 8 680** is firmly secured to lifting eye.

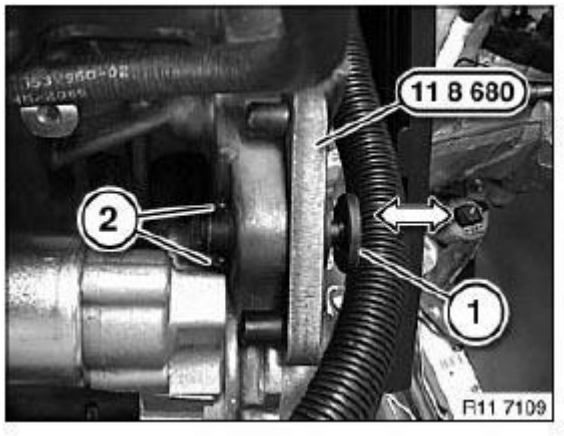


Fig. 17: Identifying Locking Pin And Locking Balls
Courtesy of BMW OF NORTH AMERICA, INC.

Suspend special tool **11 0 000** from special tool **11 8 680** in eye (1).

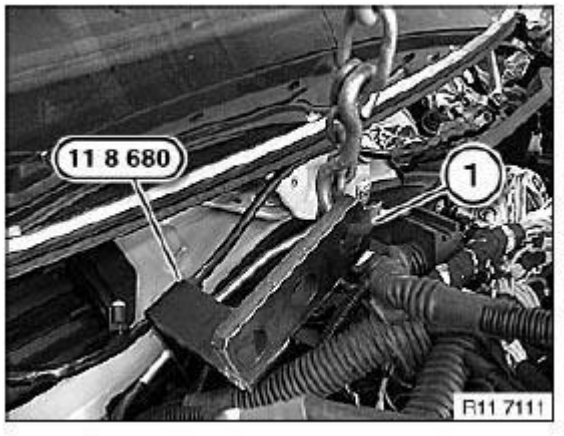


Fig. 18: Identifying Special Tool 11 8 680 And Eye
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in towing hook (1).

Suspend special tool **11 0 000** from engine crane.

Suspend special tool **11 0 000** from the designated mounting eyelets (2) only.

Unscrew left and right **engine mounts** .

Lift engine out with crane.

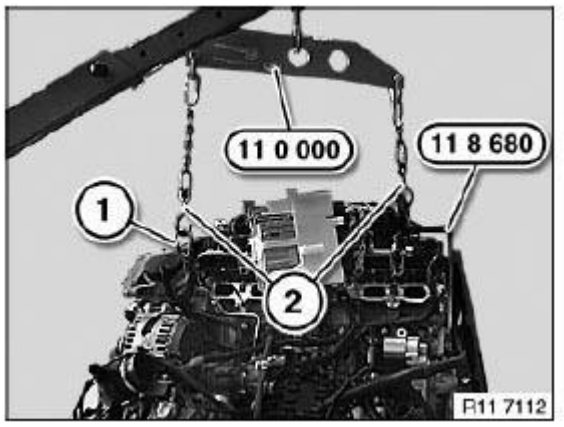


Fig. 19: Identifying Towing Hook And Designated Mounting Eyelets
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Observe following in case of **replacement engine** .

Check function of DME.

11 00 590 REPLACEMENT POWER PLANT (N54)

Necessary preliminary tasks:

- Remove and install **engine** .
- Mount engine on **assembly stand** .
- If necessary, remove foreign bodies from turbocharger group.
- Check all assemblies and convert to replacement power plant.

Remove transportation locks (1).

NOTE: Catch escaping engine oil with a suitable cloth (2).

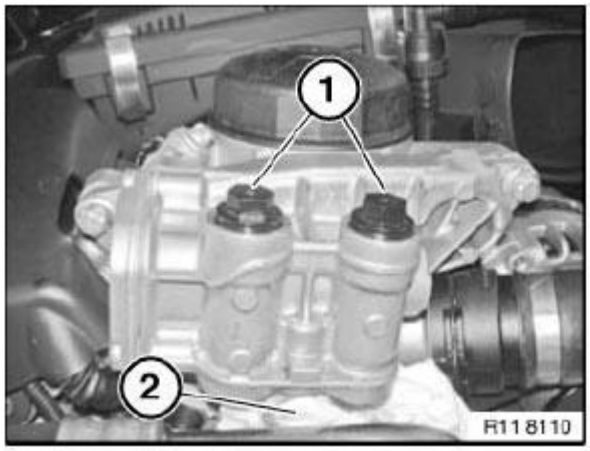


Fig. 20: Identifying Transportation Locks And Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

Transportation locks (1) are no longer needed.

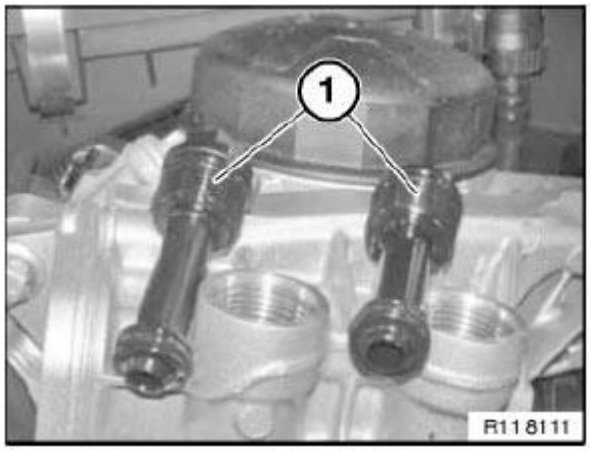


Fig. 21: Identifying Transportation Locks

Courtesy of BMW OF NORTH AMERICA, INC.

Modify screw plugs (1) from old power plant.

Insert screw plugs (1).

Tightening torque: **11 42 11AZ** , see **OIL FILTER AND LINES**

Secure **oil cooler lines** with mounting bar (2).

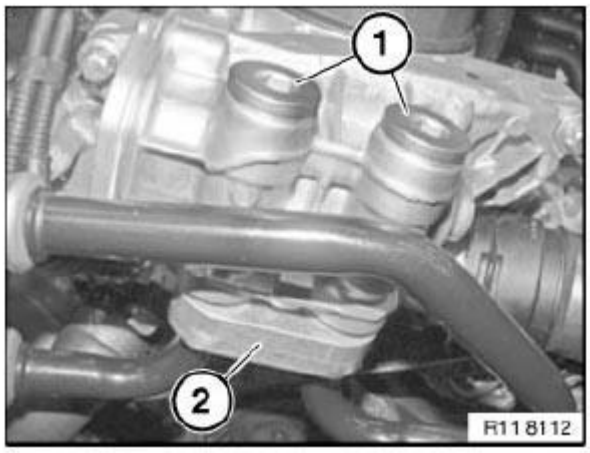


Fig. 22: Identifying Screw Plugs And Mounting Bar
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N54)

Special tools required:

- **00 0 200**
- **00 0 202**
- **00 0 204**
- **00 0 208**
- **00 0 451**
- **00 0 452**

See **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS** .

WARNING: Risk of injury!

Owing to the new guidelines on pedestrian protection, side panels are no longer suitable for supporting the

engine.

Observe following instructions relating to special tool:

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

Necessary preliminary tasks:

- Secure **engine bonnet/hood in service position**
- Remove **acoustic cover** .

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

Modification:

Replace profile strips with special tools **00 0 451** .

Replace front supports with special tools **00 0 452** .

NOTE: Ensure that the longer feet of special tools 00 0 452 point to the middle of the vehicle.

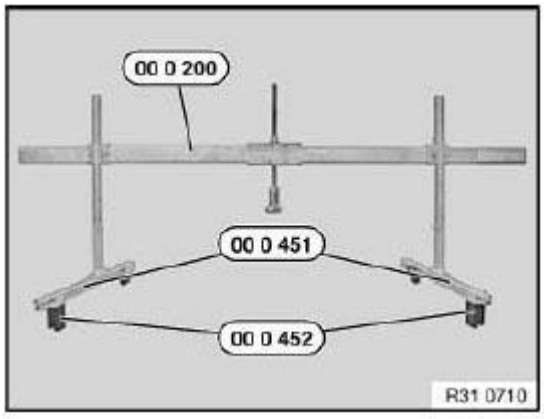


Fig. 23: Identifying Special Tools (00 0 200, 00 0 451, 00 0 452)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The support points on the left side are shown.

Position transverse member **00 0 200** with a 2nd person helping on designated areas (1, 2).

NOTE: Make sure that the front supports 00 0 452 are correctly positioned on the

support carriers.

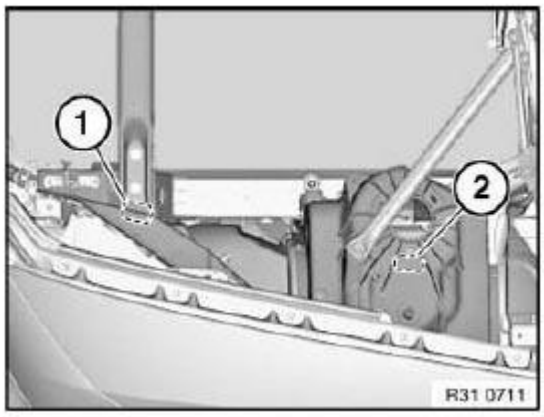


Fig. 24: Positioning Transverse Member 00 0 200 On Designated Areas
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Screw towing hook (72 15 8 108 670) into crankcase and tighten down to approx. 30 Nm.

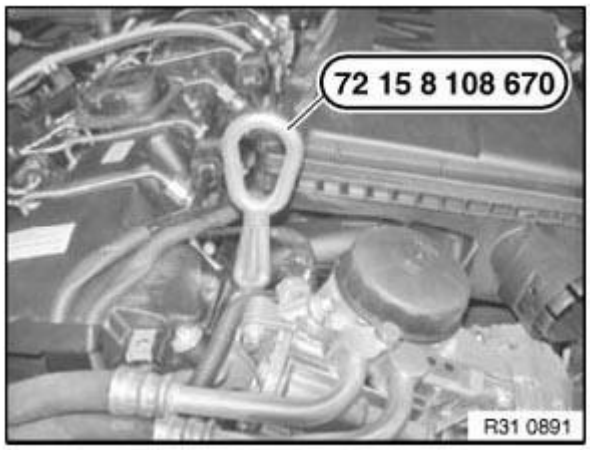


Fig. 25: Identifying Towing Hook (72 15 8 108 670)
Courtesy of BMW OF NORTH AMERICA, INC.

Align transverse member so that spindle **00 0 202** is correctly positioned over towing hook.

Secure suitable chain to spindle **00 0 202** and suspend from towing hook (1).

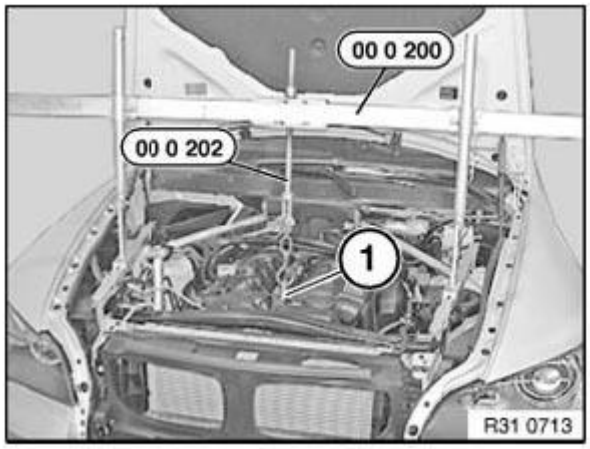


Fig. 26: Identifying Spindle 00 0 202 And Towing Hook
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury!

Tighten down all adjusting screws and nuts on cross member 00 0 200 .

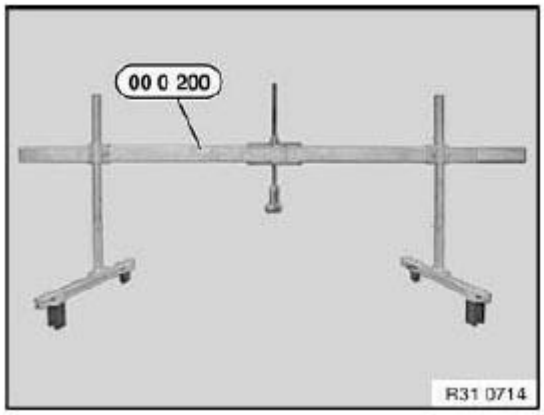


Fig. 27: Identifying Cross Member 00 0 200
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Raise engine approx. 10 mm with transverse member.

Installation:

Replace self-locking nut.

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

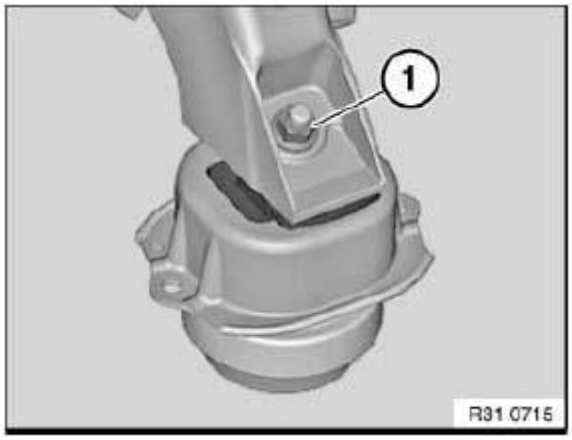


Fig. 28: Identifying Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE IDENTIFICATION

Drive in engine numbers at marked surface with impact tool.

M47/M47TU/M47T2

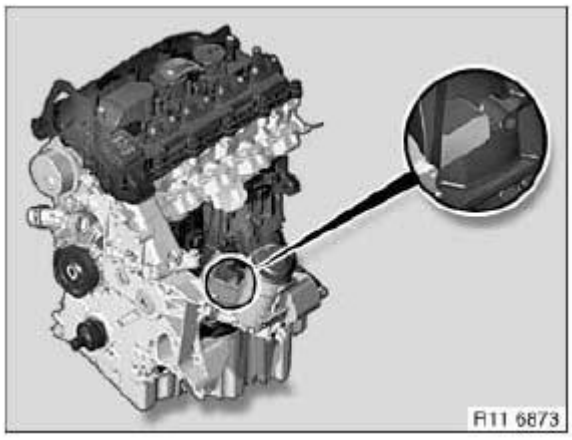


Fig. 29: Identifying Engine Numbers - M47/M47TU/M47T2
Courtesy of BMW OF NORTH AMERICA, INC.

M57/M57TU/M57T2

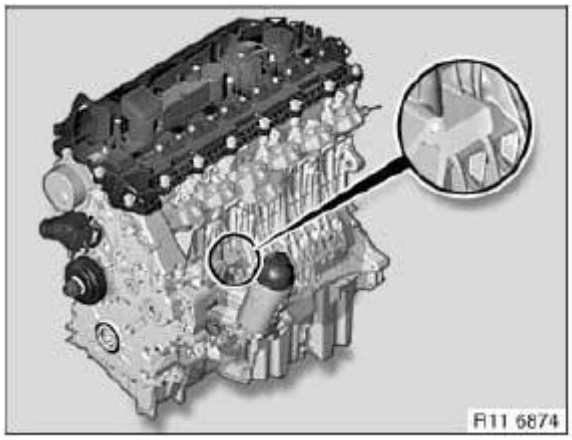


Fig. 30: Identifying Engine Numbers - M57/M57TU/M57T2
Courtesy of BMW OF NORTH AMERICA, INC.

M67/M67TU

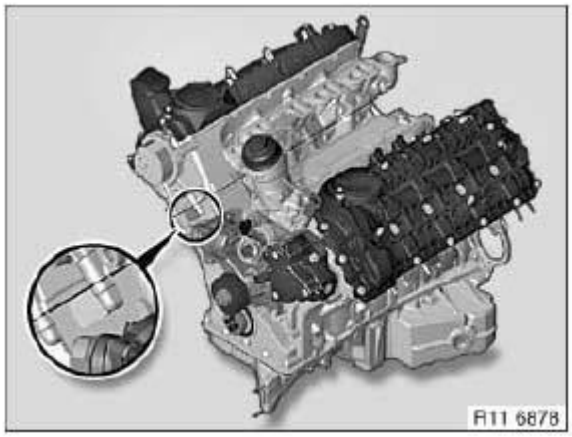


Fig. 31: Identifying Engine Numbers - M67/M67TU
Courtesy of BMW OF NORTH AMERICA, INC.

N47/N47S

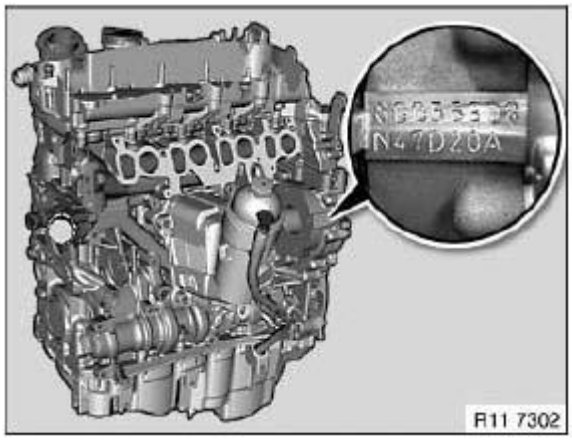


Fig. 32: Identifying Engine Numbers - N47/N47S
Courtesy of BMW OF NORTH AMERICA, INC.

M52/M52TU

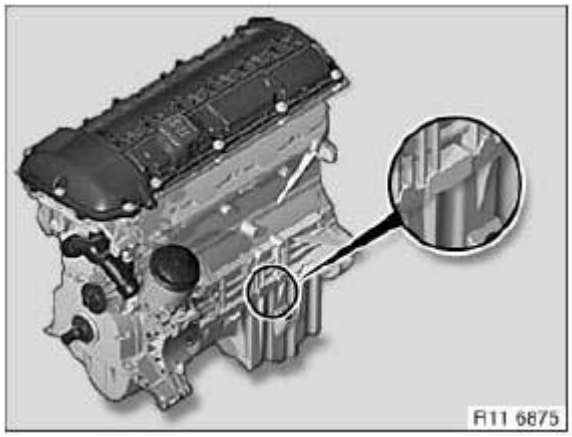


Fig. 33: Identifying Engine Numbers - M52/M52TU
Courtesy of BMW OF NORTH AMERICA, INC.

M54

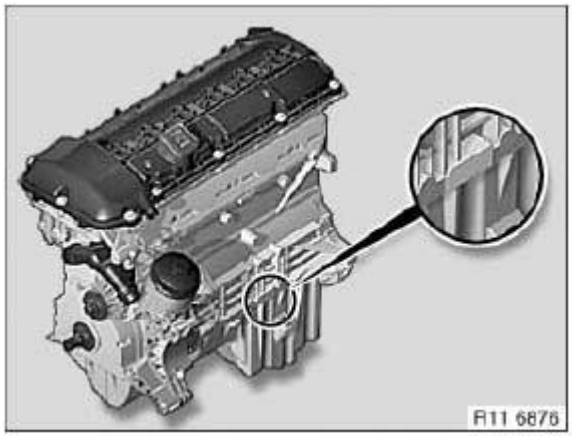


Fig. 34: Identifying Engine Numbers - M54
Courtesy of BMW OF NORTH AMERICA, INC.

M56

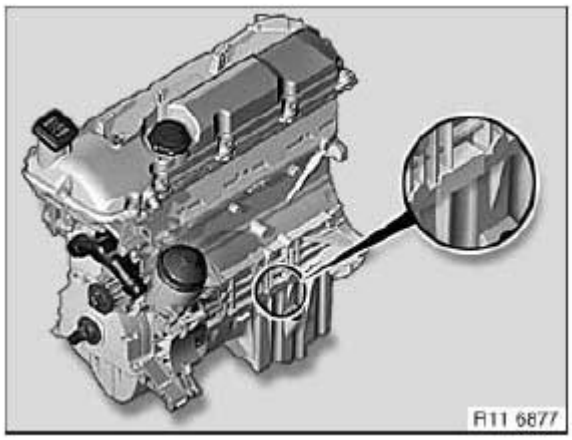


Fig. 35: Identifying Engine Numbers - M56
Courtesy of BMW OF NORTH AMERICA, INC.

N40/N45/N45T/N43

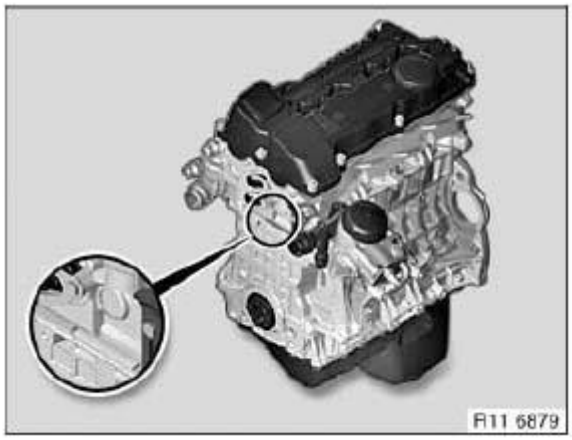


Fig. 36: Identifying Engine Numbers - N40/N45/N45T/N43
Courtesy of BMW OF NORTH AMERICA, INC.

N42/N46/N46T

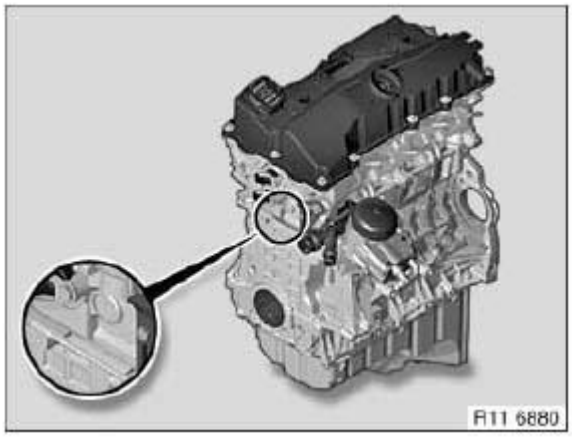


Fig. 37: Identifying Engine Numbers - N42/N46/N46T
Courtesy of BMW OF NORTH AMERICA, INC.

N51/N52/N52K/N53/N54

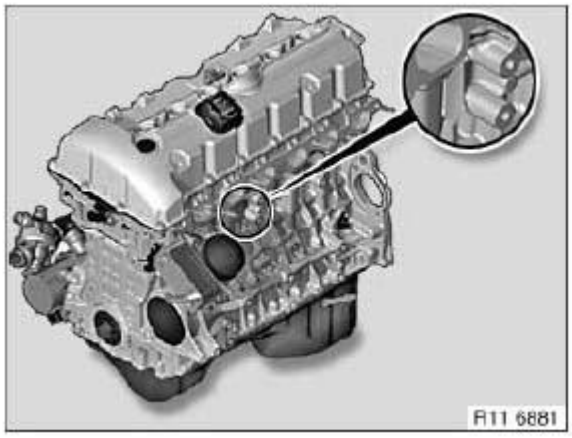


Fig. 38: Identifying Engine Numbers - N51/N52/N52K/N53/N54
Courtesy of BMW OF NORTH AMERICA, INC.

N62

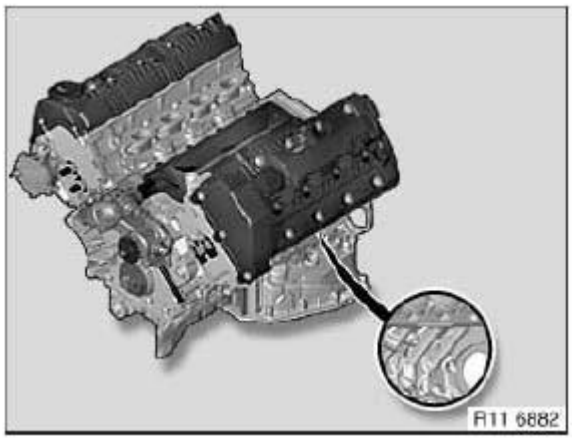


Fig. 39: Identifying Engine Numbers - N62
Courtesy of BMW OF NORTH AMERICA, INC.

N73

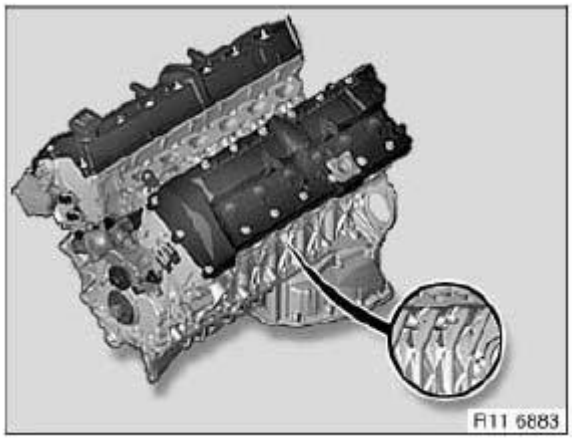


Fig. 40: Identifying Engine Numbers - N73
Courtesy of BMW OF NORTH AMERICA, INC.

S54

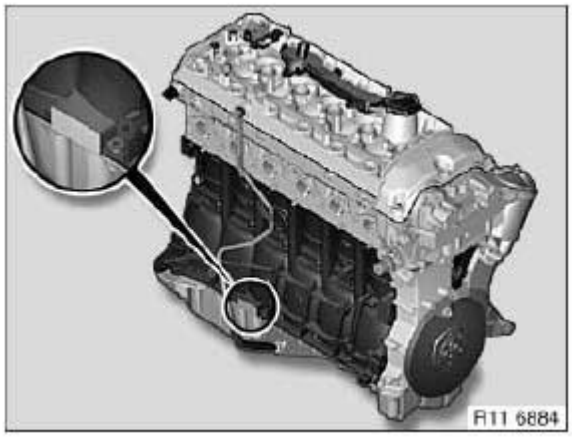


Fig. 41: Identifying Engine Numbers - S54
Courtesy of BMW OF NORTH AMERICA, INC.

S85/S65

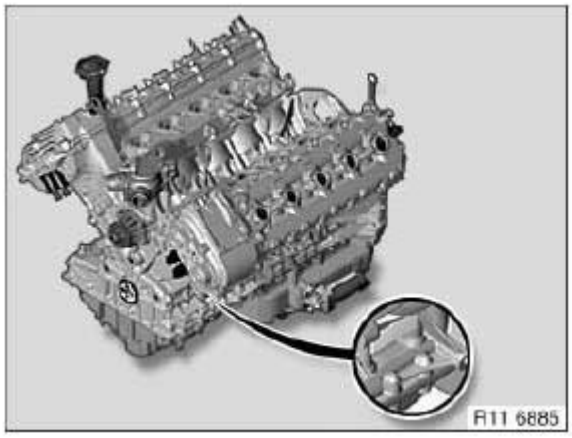


Fig. 42: Identifying Engine Numbers - S85/S65
Courtesy of BMW OF NORTH AMERICA, INC.

W10/W11

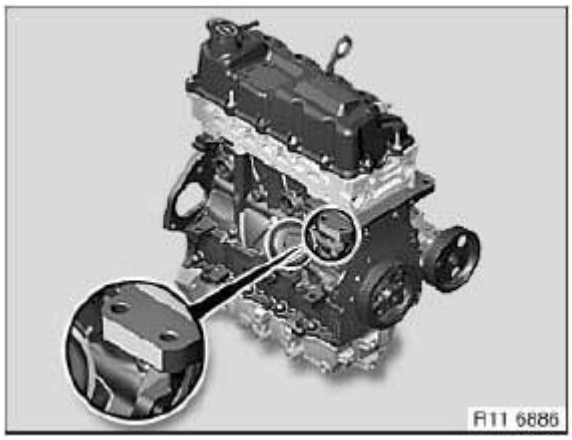


Fig. 43: Identifying Engine Numbers - W10/W11
Courtesy of BMW OF NORTH AMERICA, INC.

W17

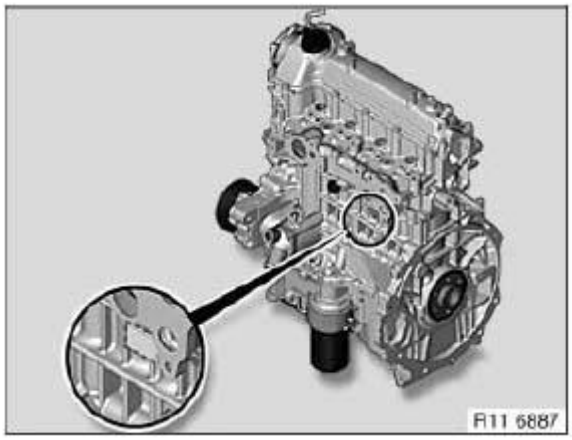


Fig. 44: Identifying Engine Numbers - W17
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CYLINDER HEAD WITH COVER

11 12 000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER (N54)

Special tools required:

- **11 8 620**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

Necessary preliminary tasks:

- Remove **acoustic cover**
- Remove **rod-type ignition coils** . See **12 13 511 REPLACING IGNITION COILS (N54, N53, N43)** .
- Unclip **wiring harness** for injectors. See **12 51 100 REPLACING WIRING HARNESS SECTION FOR IGNITION AND INJECTORS (N54)** .
- Remove **injectors** . See **13 53 310 REMOVING AND INSTALLING OR REPLACING AN INJECTOR (N54, N53)** .
- Remove rear **air duct** . See **13 71 170 REMOVING AND INSTALLING REAR AIR DUCT (N54)**

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

Unclip vacuum lines (1).

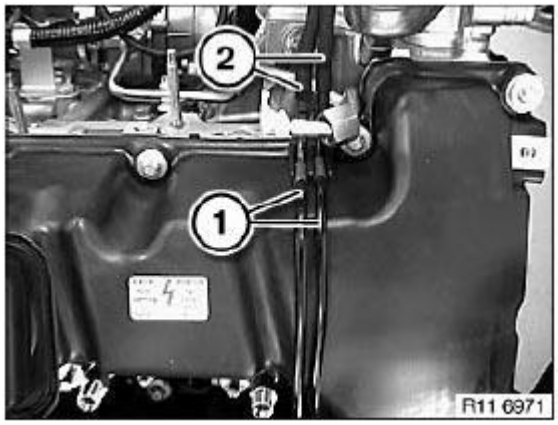


Fig. 45: Identifying Vacuum Lines And Vacuum Lines
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

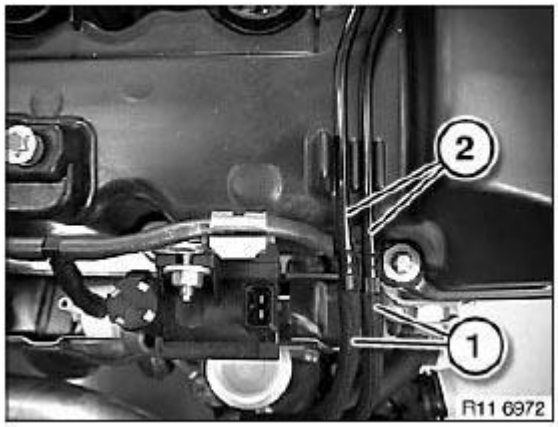


Fig. 46: Identifying Vacuum Lines And Vacuum Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect crankcase breather (1) on cylinder head cover and pull off in direction of arrow.

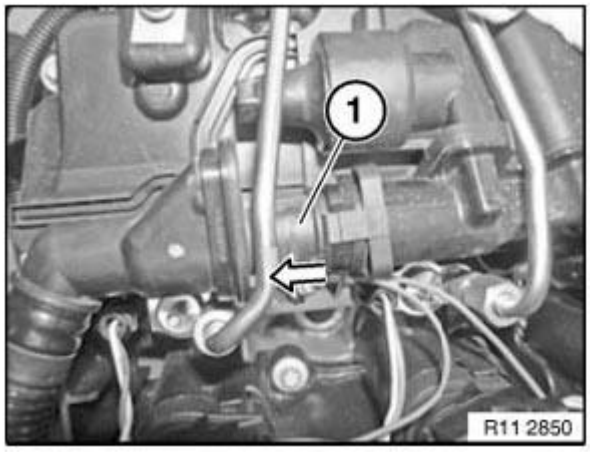


Fig. 47: Identifying Crankcase Breather
Courtesy of BMW OF NORTH AMERICA, INC.

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

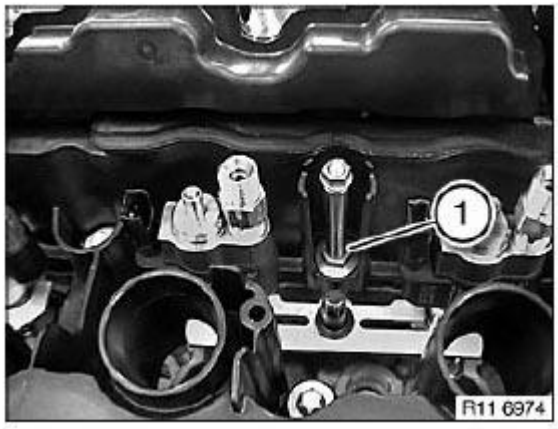


Fig. 48: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

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

Remove slotted sleeves (2).

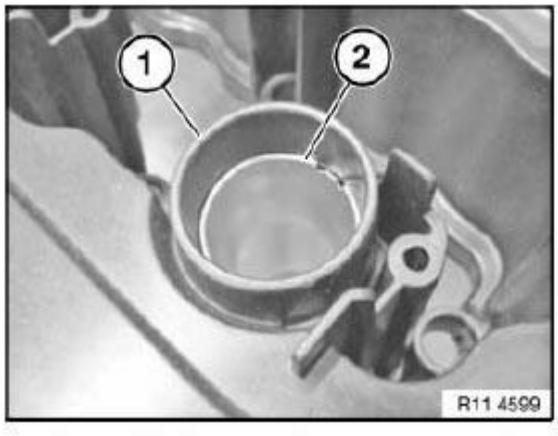


Fig. 49: Identifying Slotted Sleeves And Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on cylinder head cover.

Fig. 50: Identifying Screws On Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 and 2).

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

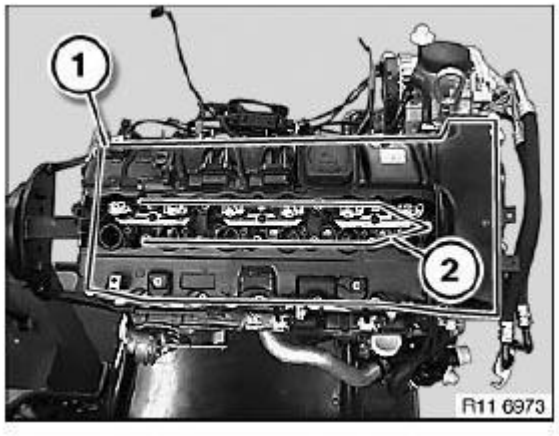


Fig. 51: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean sealing surface.

Replace seal (1).

Press gasket (1) into cylinder head cover.

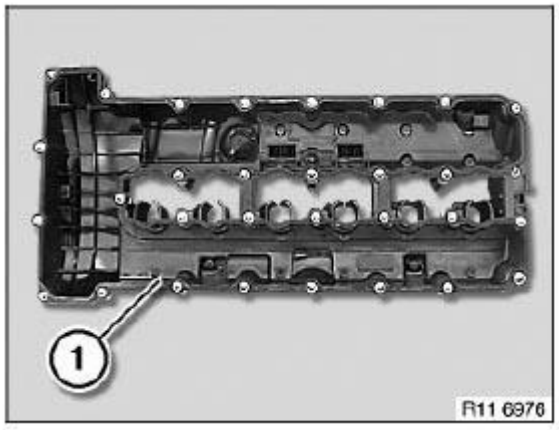


Fig. 52: Identifying Cylinder Head Cover Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 12 100 REMOVING AND INSTALLING CYLINDER HEAD (N54)

Special tools required:

- **11 0 320**
- **11 4 420**

- **11 4 430**
- **11 4 471**
- **11 4 472**
- **11 8 580**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

**IMPORTANT: Aluminum screws/bolts must be replaced each time they are released.
Aluminum screws/bolts are permitted with and without color coding (blue).
For reliable identification:
Aluminum screws/bolts are not magnetic.
Jointing torque and angle of rotation must be observed without fail (risk of damage).**

Necessary preliminary tasks:

- Remove **engine**
- Remove **inlet and exhaust adjustment units**

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 gearcase, the crankshaft must no longer be rotated.
This would cause the timing chain on the crankshaft sprocket wheel to jam or jump.**

Installation:

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

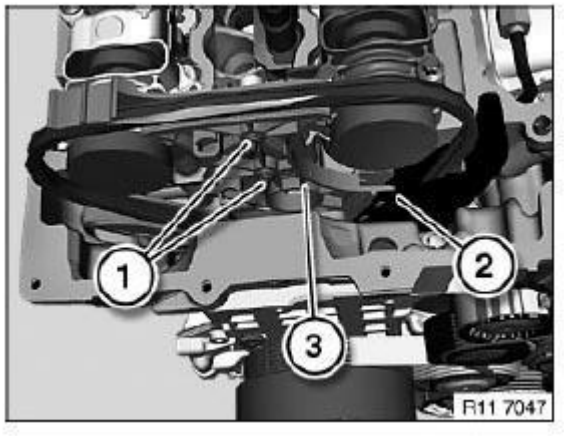


Fig. 53: Identifying Screws, Timing Chain Module And Junction
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The lowest screw can only be released when the timing chain module is pressed forward slightly.

IMPORTANT: Secure the lowest screw with a gripper against falling down.

Release screws (1).

Tightening torque **11 12 3AZ** , see **CYLINDER HEAD**

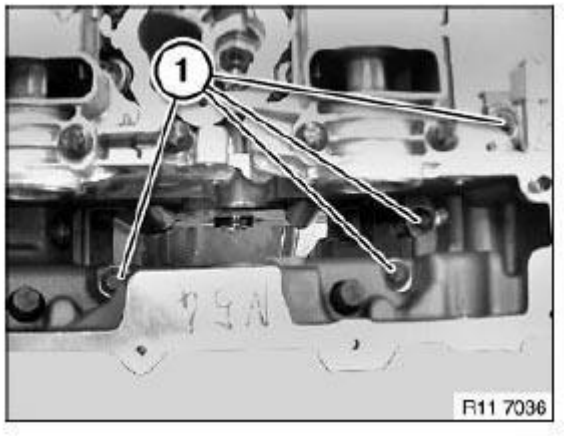


Fig. 54: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe different bolt heads.

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

Tightening torque **11 12 2AZ** , see **CYLINDER HEAD**

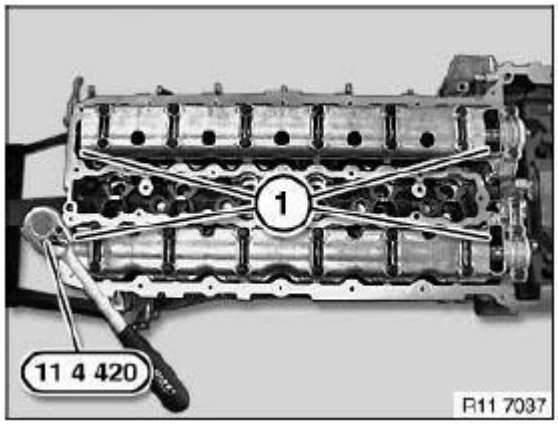


Fig. 55: Identifying M9 Cylinder Head Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 12 1AZ** , see **CYLINDER HEAD**

IMPORTANT: All cylinder head bolts must be replaced.
Risk of damage!
Joining torque and angle of rotation must be observed without fail.

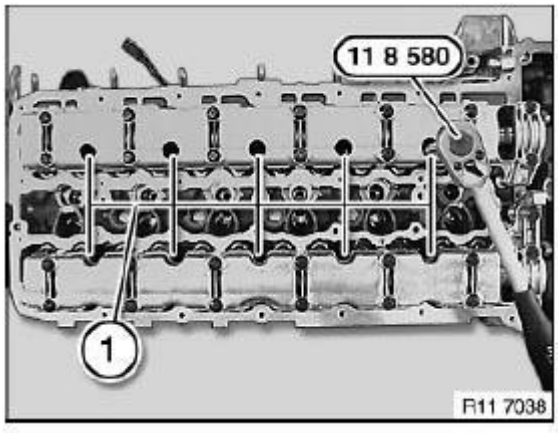


Fig. 56: Removing M10 Cylinder Head Bolts With Special Tool 11 8 580
Courtesy of BMW OF NORTH AMERICA, INC.

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

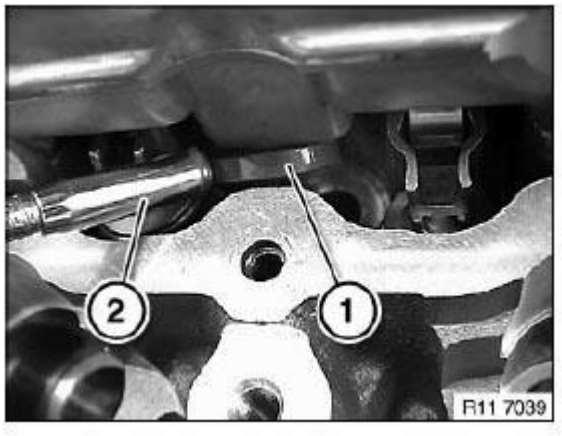


Fig. 57: Removing Cylinder Head Bolts Shims With Magnet
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 12 4AZ** , see **CYLINDER HEAD**

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.

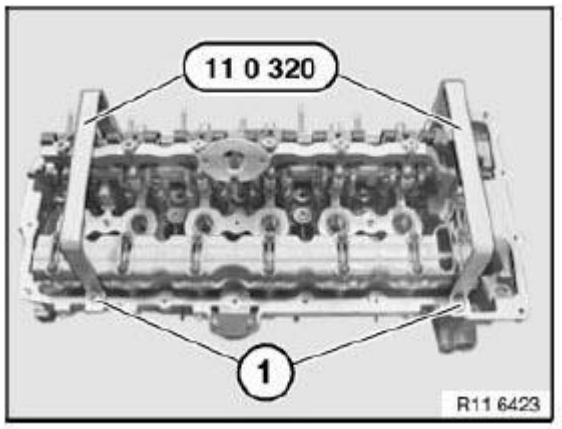


Fig. 58: Identifying Special Tool 11 0 320 And Existing Cylinder Head Cover Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

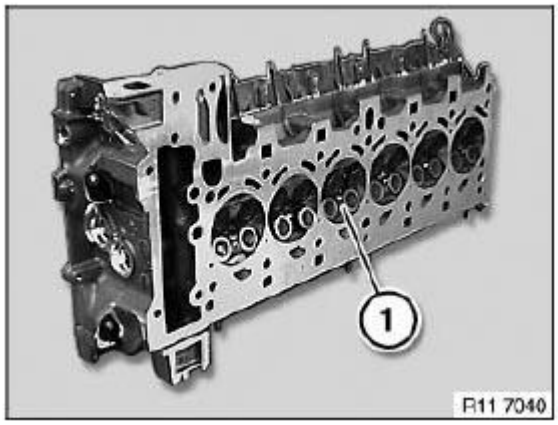


Fig. 59: Identifying Valves
Courtesy of BMW OF NORTH AMERICA, INC.

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

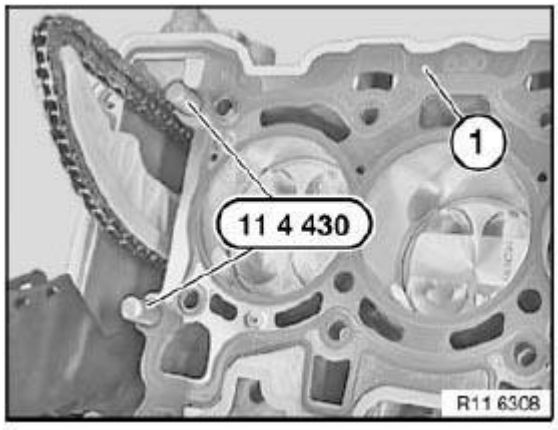


Fig. 60: Identifying Special Tool 11 4 430
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Do not use any metal-cutting tools.

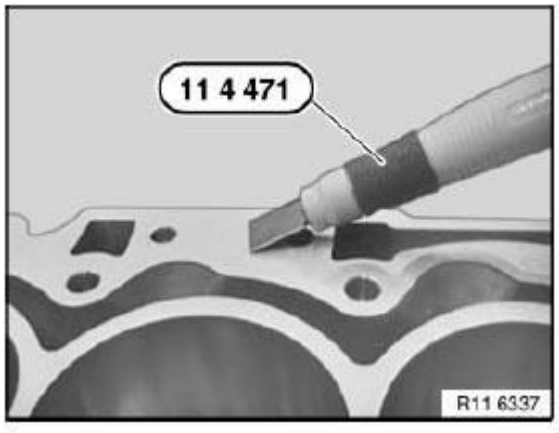


Fig. 61: Removing Coarse Residues On Sealing Faces With Special Tool 11 4 471 From Cylinder Head And Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

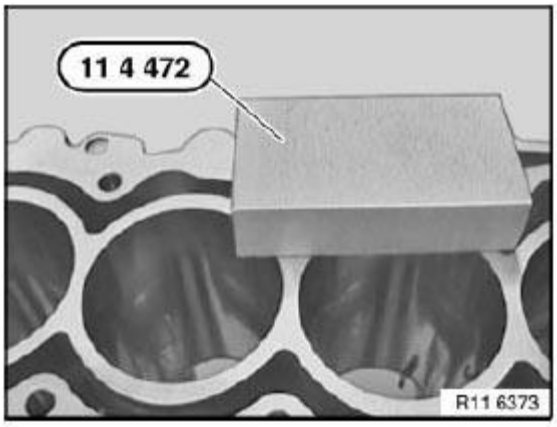


Fig. 62: Identifying Special Tool 11 4 472
Courtesy of BMW OF NORTH AMERICA, INC.

Risk of corrosion and cracking!

There must be no fluids or contaminants in any of the threaded holes (1) for the cylinder head bolt connections.

Clean all pocket holes.

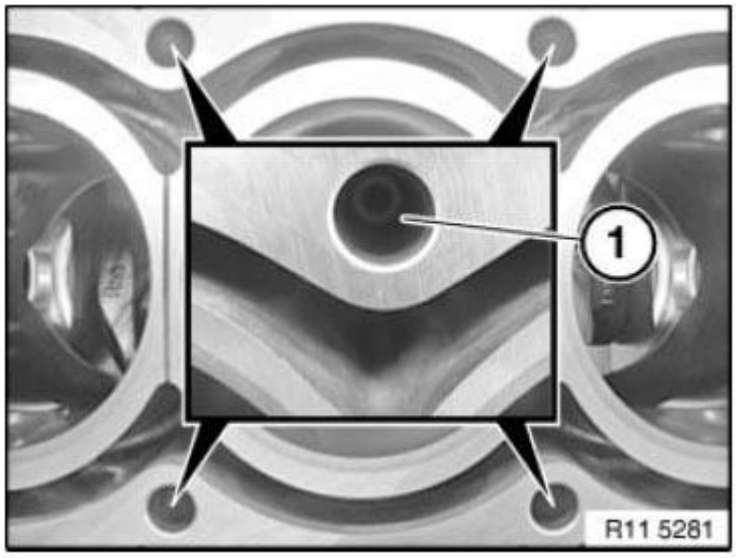


Fig. 63: Identifying Threaded Hole
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace cylinder head gasket .

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

Installation:

Fit new cylinder head screws.

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

Tightening torque **11 12 1AZ** , see **CYLINDER HEAD**

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

Tightening torque **11 12 2AZ** , see **CYLINDER HEAD**

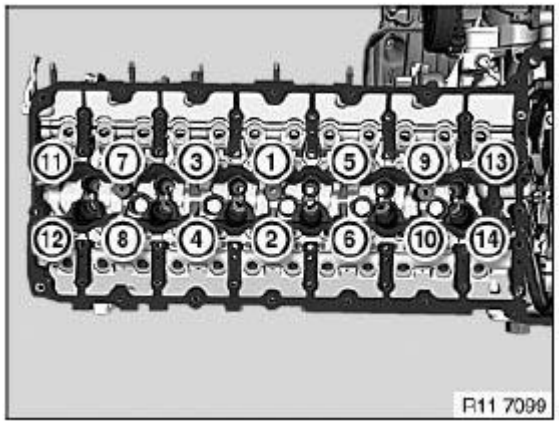


Fig. 64: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Graphic 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:

- **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°

Installation:

Replace screws (1).

Tightening torque **11 12 3AZ** , see **CYLINDER HEAD**

IMPORTANT: Secure the lowest screw with a gripper against falling down.

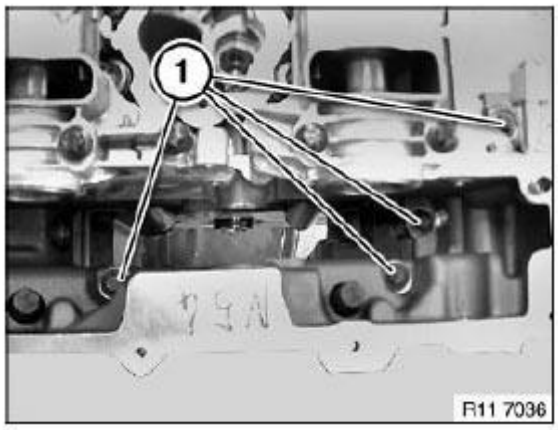


Fig. 65: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 12 101 REPLACING CYLINDER HEAD GASKET (N54)

Special tools required:

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

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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).

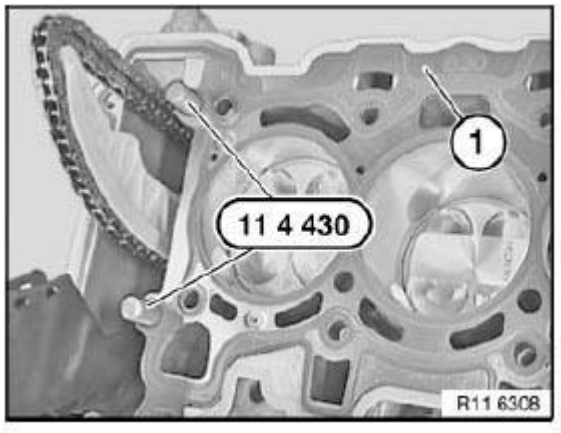


Fig. 66: Identifying Identification On Cylinder Head Gasket (N54)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

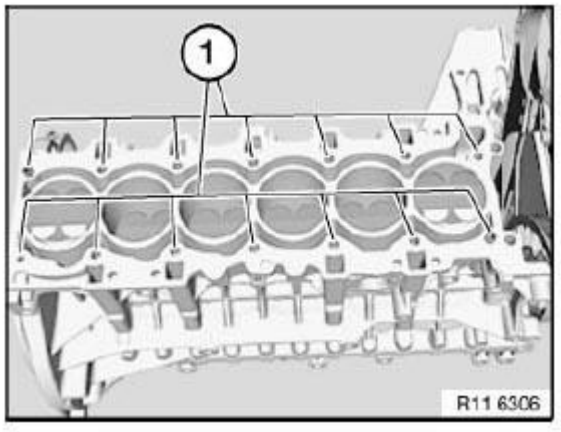


Fig. 67: Identifying Pocket Holes (1)
Courtesy of BMW OF NORTH AMERICA, INC.

Identification (1) of head gasket (N54).

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

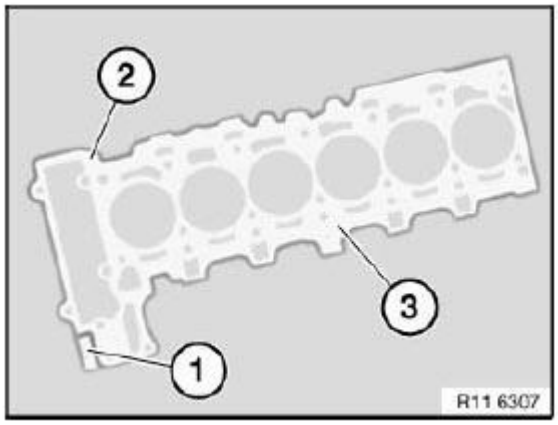


Fig. 68: Identifying Identification Of Head Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

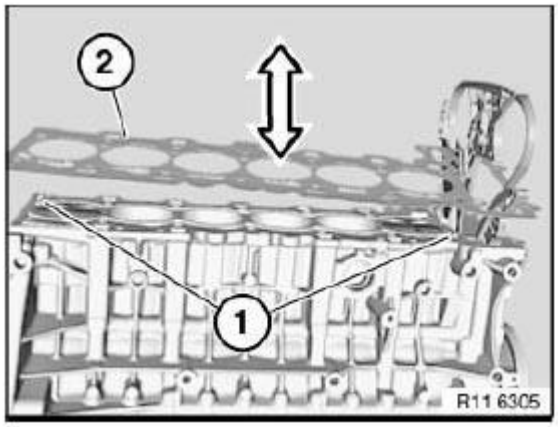


Fig. 69: Placing Head Gasket In Direction Of Arrow On Engine Block
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check cylinder head for deviation from flatness. See CYLINDER HEAD .

Check cylinder head for water leaks.

Assemble engine.

11 12 719 RESURFACING CYLINDER HEAD SEALING FACE (N54)

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 **valves**.

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

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

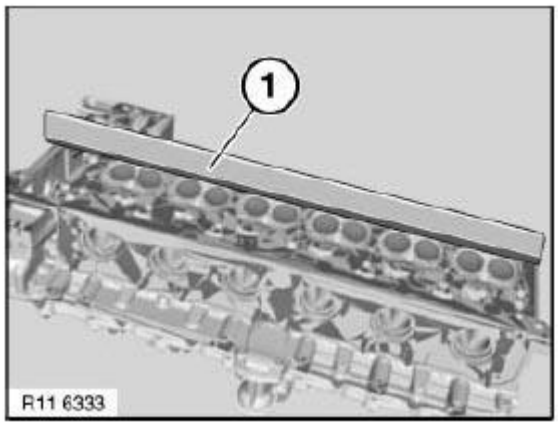


Fig. 70: Checking Evenness Of Cylinder Head Sealing Faces With Standard Straight-Edge
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

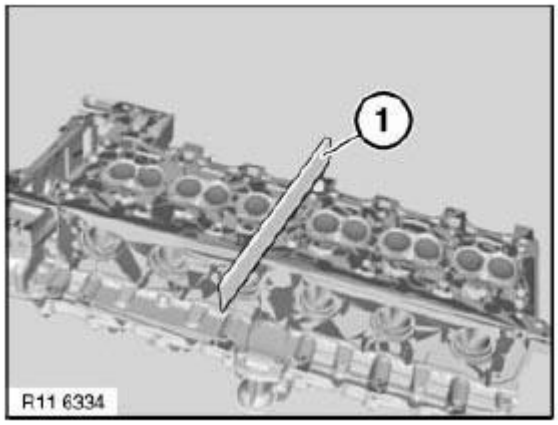


Fig. 71: Checking Evenness Of Cylinder Head Sealing Faces With Standard Straight-Edge
Courtesy of BMW OF NORTH AMERICA, INC.

Check cylinder head for **water leaks** .

Assemble engine.

11 12 729 CHECK CYLINDER HEAD FOR WATER LEAKS (N54)

Special tools required:

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

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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.

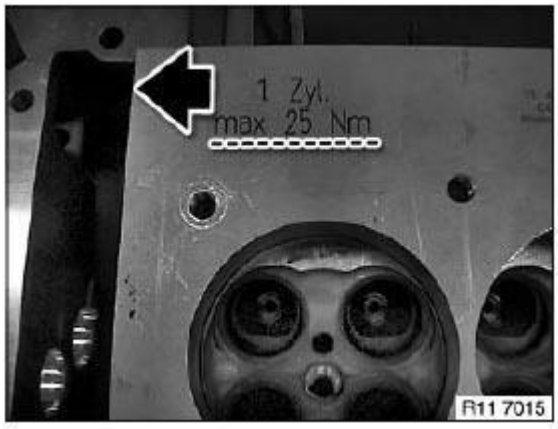


Fig. 72: Identifying Special Tool 11 4 341 Securing Bolts 11 4 345 Tightening Torque 25 Nm
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

1 cyl is marked.

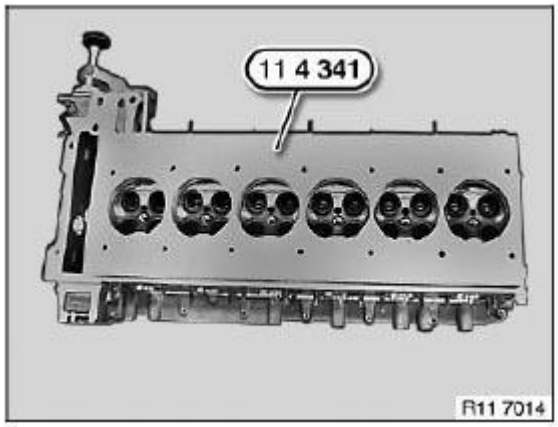


Fig. 73: Identifying Special Tool 11 4 341
Courtesy of BMW OF NORTH AMERICA, INC.

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

Sealing flange must rest flat.

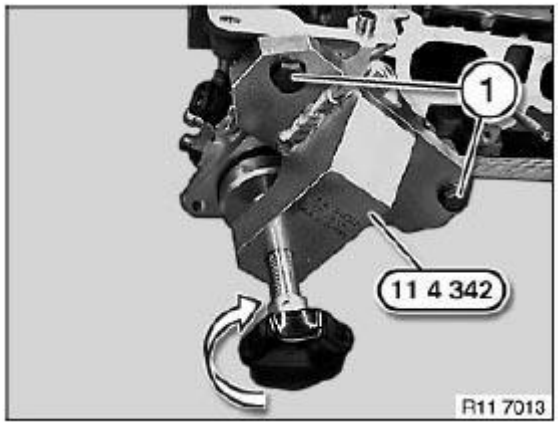


Fig. 74: Fitting Special Tool 11 4 342 With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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.

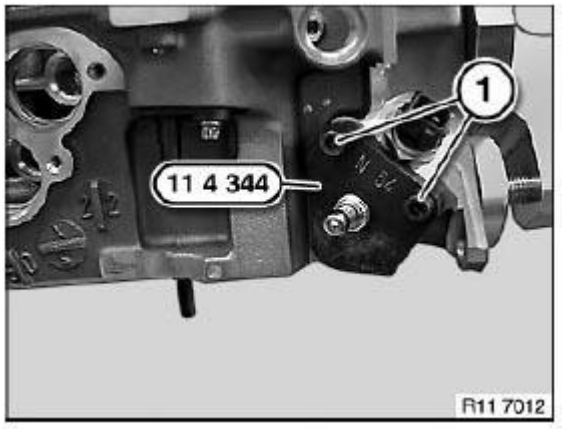


Fig. 75: Identifying Special Tool 11 4 344 And Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

OIL SUMP

11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (N54) AWD

IMPORTANT: When working on the engine oil, coolant or fuel circuit, you must protect the alternator against 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.
Aluminum screws/bolts are permitted with and without color coding (blue).
For reliable identification:
Aluminum screws/bolts are not magnetic.
Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Remove **fan cowl** with electric fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N54)** .
- Remove **front differential** . See **31 50 001 REMOVING AND INSTALLING/REPLACING FRONT DIFFERENTIAL** .
- Remove left **charge-air duct**
- Release **power steering pump** and place to one side. See **32 41 033 REMOVING AND INSTALLING/REPLACING POWER STEERING PUMP FOR POWER STEERING GEAR WITH ACTIVE FRONT STEERING (N54)** or **32 41 037 REMOVING AND INSTALLING/REPLACING POWER STEERING PUMP FOR POWER STEERING GEAR**

WITH DYNAMIC DRIVE (N54) .

Observe torque specification without fail during installation.

- Drain and add **engine oil.**

Unclip electric leads (3) of monitor sensors from holder (4).

Disconnect plug connections (2) of monitor sensors and lay to one side.

Release bolts (1) on transmission.

Tightening torque **11 13 6AZ** , see **OIL SUMP**

Lay holder (4) to one side.

Disconnect plug connection (5) on oil level sensor and lay to one side.

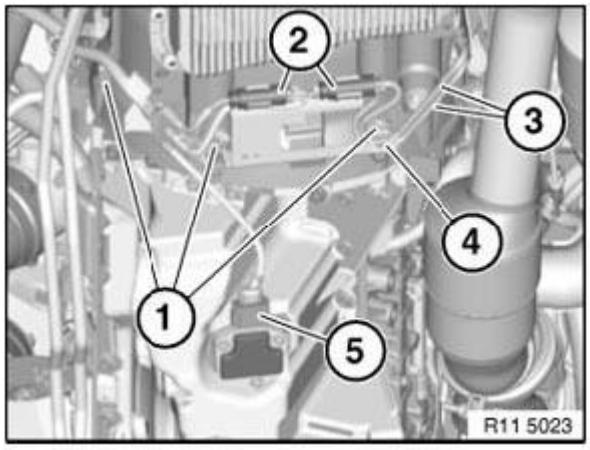


Fig. 76: Identifying Electric Leads, Holder And Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 13 7AZ** , see **OIL SUMP**

Release holder (2) with transmission oil cooler lines (3) from oil sump.

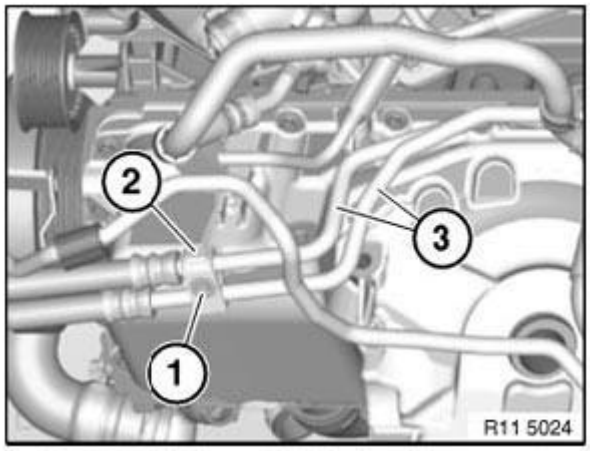


Fig. 77: Identifying Screw, Holder And Transmission Oil Cooler Lines
Courtesy of BMW OF NORTH AMERICA, INC.

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

Release bolts along line (1).

Tightening torque **11 13 2/3 and 4AZ** , see **OIL SUMP**

Installation:

Replace aluminum screws.

If necessary, release nuts (2). Remove oil level sensor.

Tightening torque **11 13 8AZ** , see **OIL SUMP**

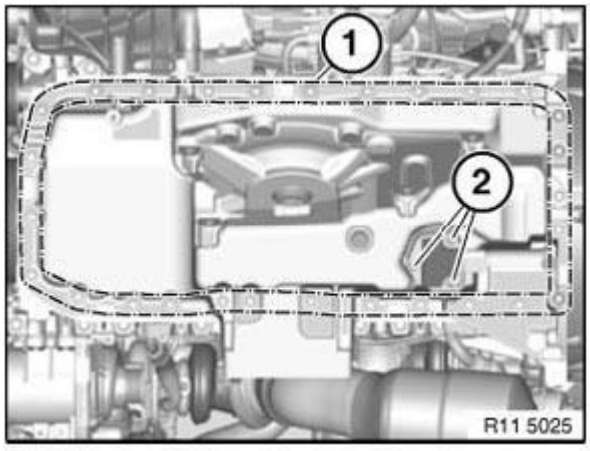


Fig. 78: Identifying Line And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring.

IMPORTANT: There must be no adhesive residues in the lower crankcase retaining threads. Clean retaining threads and sealing faces.

Installation:

Replace all seals.

Assemble engine.

HOUSING COVER

11 14 005 REPLACING FRONT CRANKSHAFT RADIAL SEAL (N54)

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**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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 may turn in relation to the crankshaft.
The timing must be adjusted again.

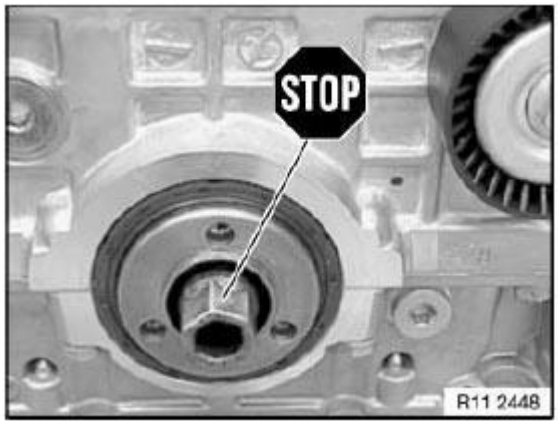


Fig. 79: Warning - Do Not Release Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Turn back special tool 11 9 222.

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

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

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

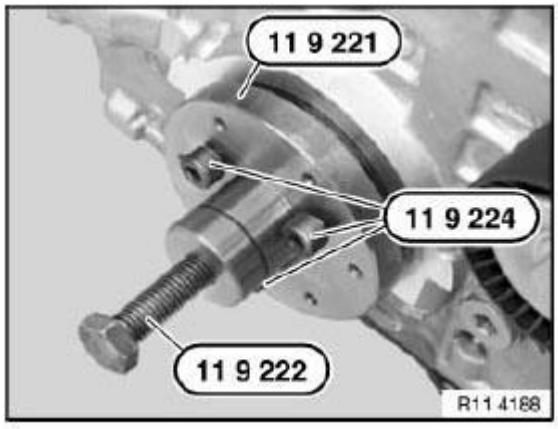


Fig. 80: Identifying Special Tool (11 9 222, 11 9 221, 11 9 224)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Screw in spindle **11 0 372** .

Release crankshaft radial seal from crankcase.

NOTE: Repeat this operation several times if necessary.

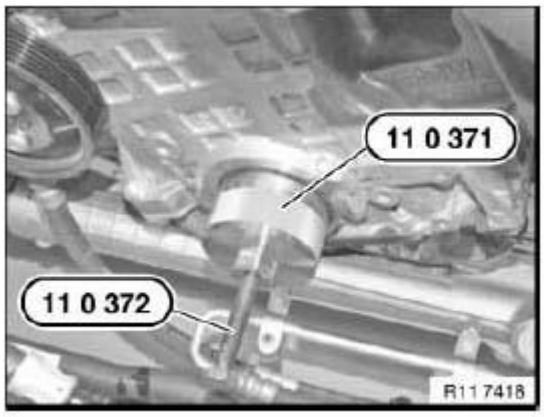


Fig. 81: Identifying Special Tool 11 0 371 And Spindle 11 0 372
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

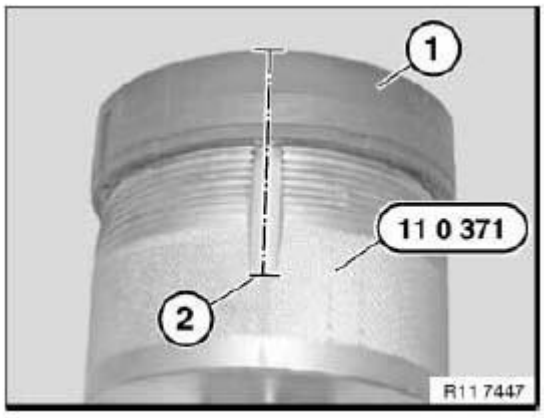


Fig. 82: Identifying Crankshaft Radial Seal And Cutting Line
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

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

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

NOTE: Graphic shows an N42 engine by way of example.

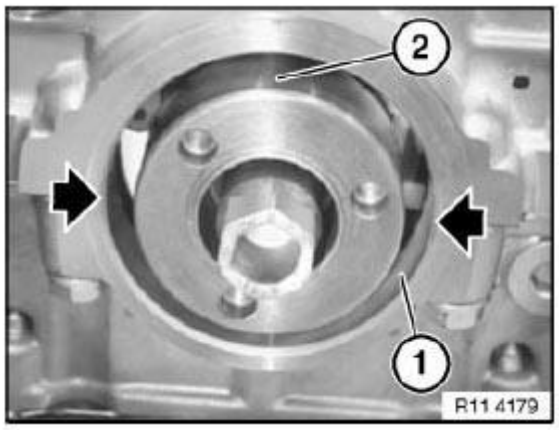


Fig. 83: Identifying Sealing Surface And Crankshaft Radial Seal Running Surface
Courtesy of BMW OF NORTH AMERICA, INC.

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

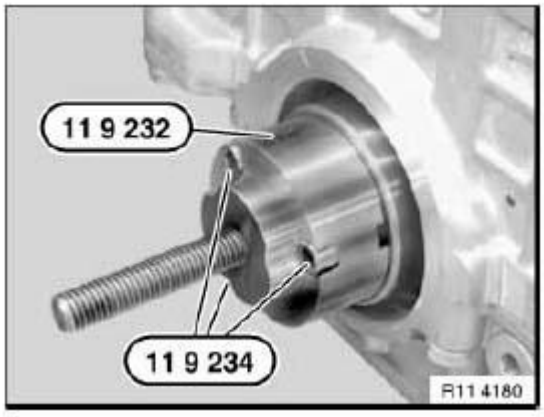


Fig. 84: Identifying Special Tool (11 9 232, 11 9 234)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Support bushing (1) is contained in scope of delivery of crankshaft radial seal (2).

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

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

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

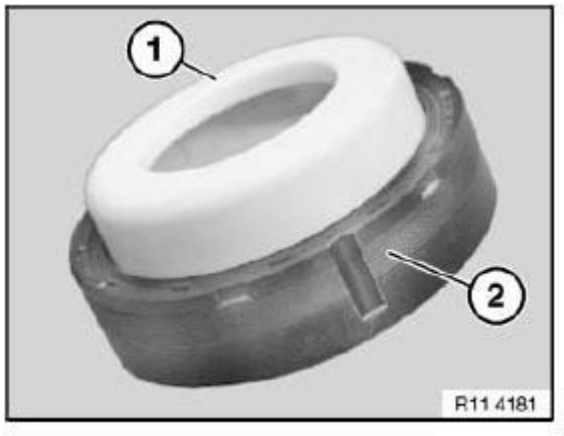


Fig. 85: Identifying Support Bushing And Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

Screw on metering needle.

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

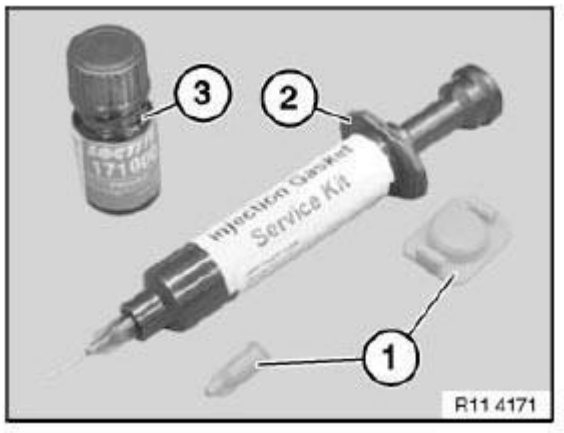


Fig. 86: Identifying Screw Caps And Injector
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

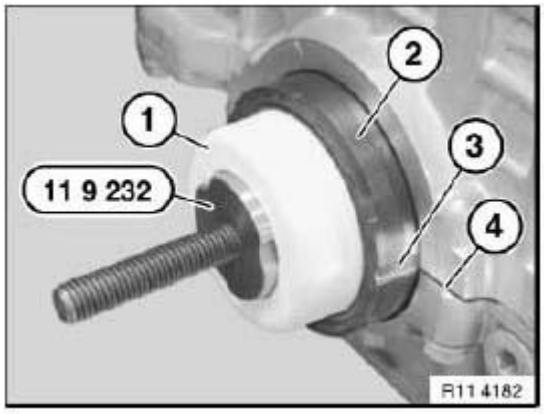


Fig. 87: Identifying Support Bushing, Crankshaft Radial Seal, Groove And Crankcase Partition
Courtesy of BMW OF NORTH AMERICA, INC.

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

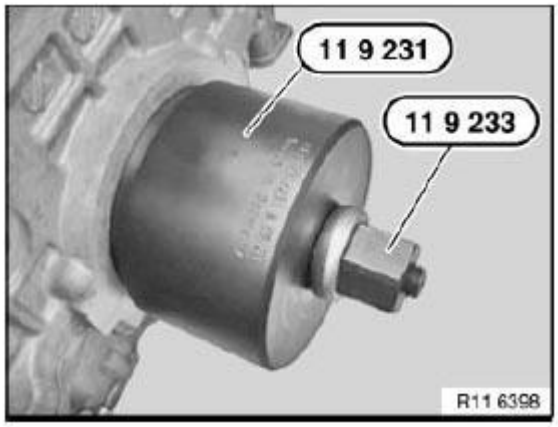


Fig. 88: Identifying Special Tool (11 9 231, 11 9 233)
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

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

NOTE: Graphic shows an N42 engine by way of example.

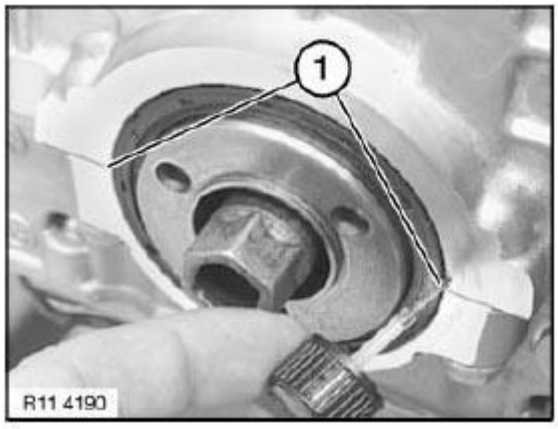


Fig. 89: Inserting Brush With Loctite Primer, Manufacturer Number 171000 Into Grooves On Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: Graphic shows an N42 engine by way of example.

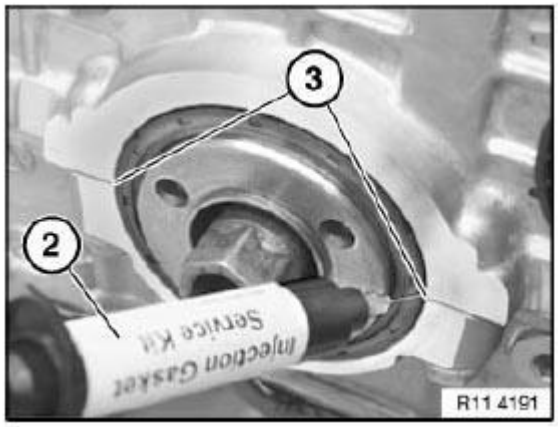


Fig. 90: Filling Both Grooves Flush With Sealant Using Injector/Syringe
Courtesy of BMW OF NORTH AMERICA, INC.

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.

NOTE: Graphic shows an N42 engine by way of example.

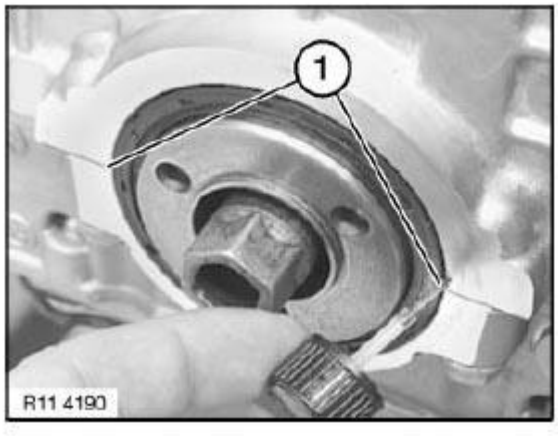


Fig. 91: Coating Surface Of Sealing Compound In Both Grooves With Loctite Primer, Manufacturer Number 171000
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 010 REPLACING SEALING COVER FOR VACUUM PUMP (N54)

Special tools required:

- **11 8 531**
- **11 8 532**
- **11 8 533**
- **11 8 534**
- **11 8 535**
- **11 8 537**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

Necessary preliminary tasks:

- Remove **fan cowl** . See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N54)** .
- Remove alternator **drive belt.**
- Remove both drive belt **tensioners.**

NOTE: For purposes of clarity, illustrations show alternator and power steering pump removed.

Secure special tool **11 8 535** with special tools **11 8 531** and **11 8 537** .

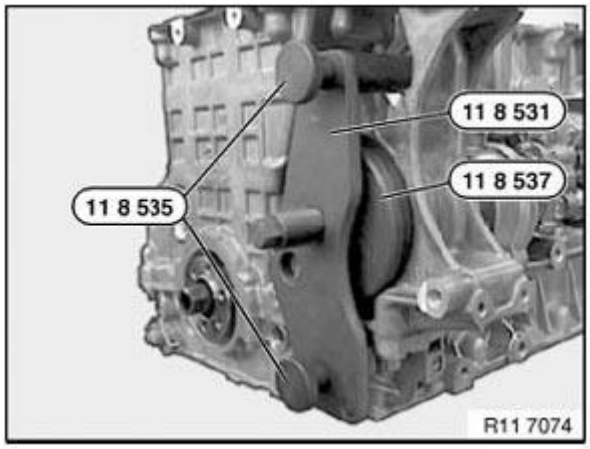


Fig. 92: Identifying Special Tools (11 8 535, 11 8 531, 11 8 537)
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool **11 8 537** by hand on sealing cover.

Screw in special tool **11 8 534** .

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

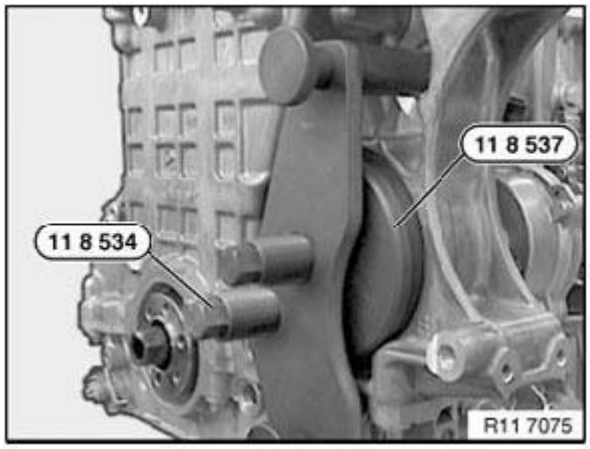


Fig. 93: Identifying Special Tools (11 8 537, 11 8 534)
Courtesy of BMW OF NORTH AMERICA, INC.

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

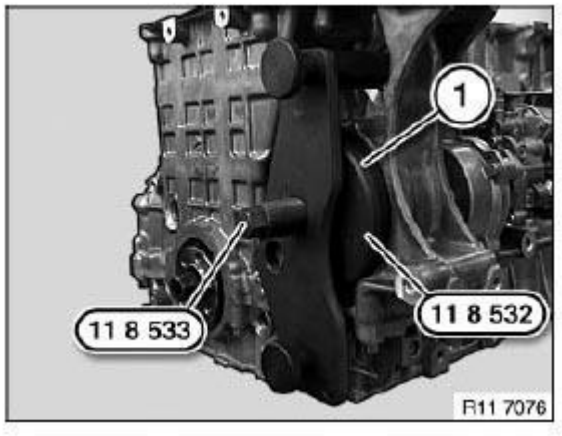


Fig. 94: Identifying Sealing Cover And Special Tools (11 8 532, 11 8 533)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 151 REPLACING CRANKSHAFT RADIAL SEAL (N54) TO 12.31.08

Special tools required:

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

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

Necessary preliminary tasks:

- Remove **transmission.** See **24 00 030 REMOVING AND INSTALLING AUTOMATIC TRANSMISSION (GA6HP19Z) N54** .
- Remove **flywheel.**

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

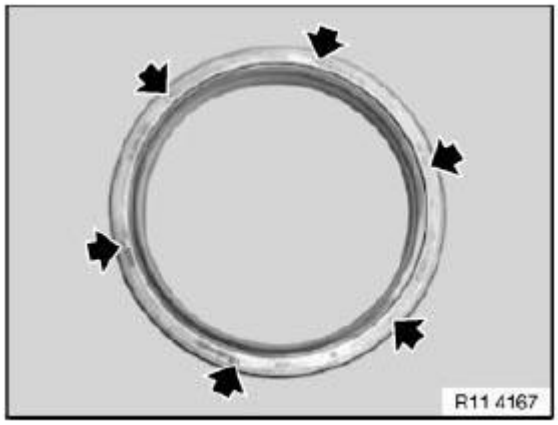


Fig. 95: Locating Radial Seal Six Removal Openings
Courtesy of BMW OF NORTH AMERICA, INC.

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

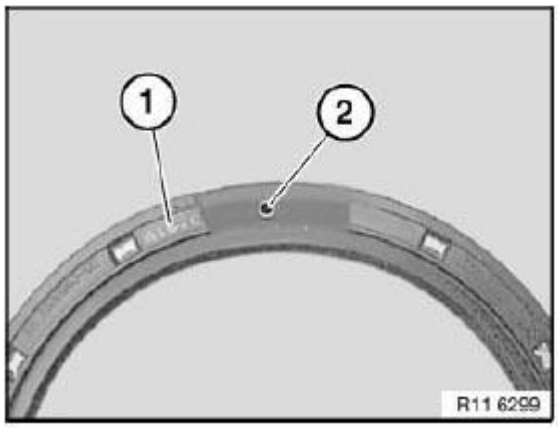


Fig. 96: Identifying Rubber Coating On Top Side Of Radial Seal And Removal Opening
Courtesy of BMW OF NORTH AMERICA, INC.

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.

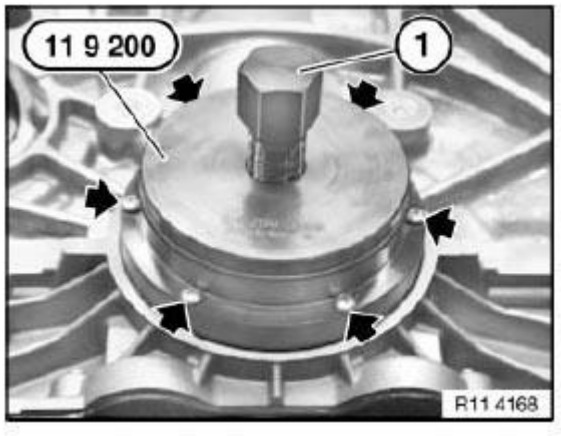


Fig. 97: Identifying Spindle And Special Tool 11 9 200
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

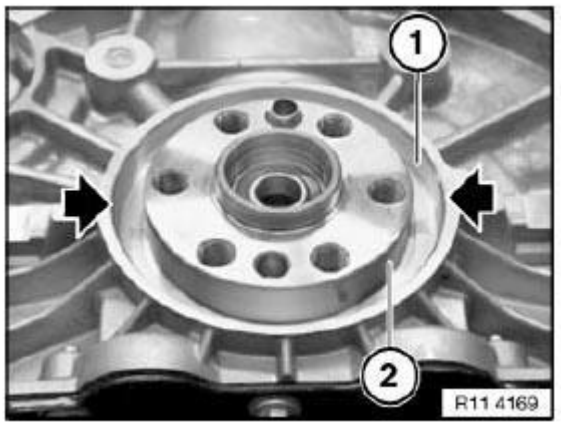


Fig. 98: Identifying Sealing Surface And Running Surface Of Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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.

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

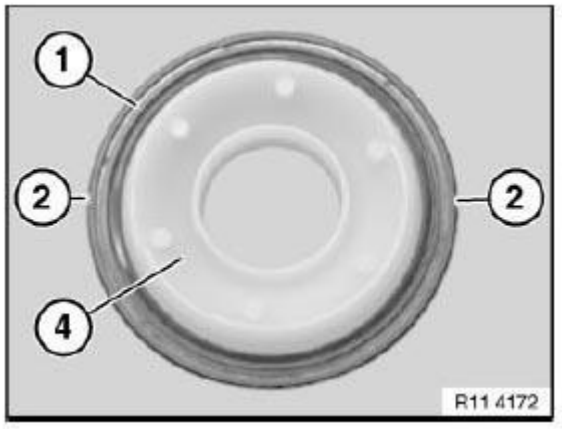


Fig. 99: Identifying Radial Shaft Seal And Groove
Courtesy of BMW OF NORTH AMERICA, INC.

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.

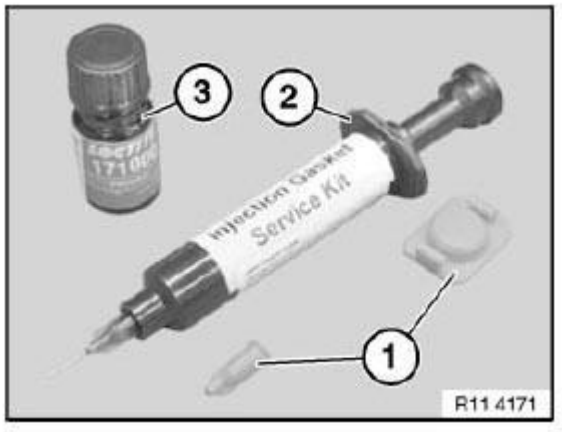


Fig. 100: Identifying Screw Caps, Injector And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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).

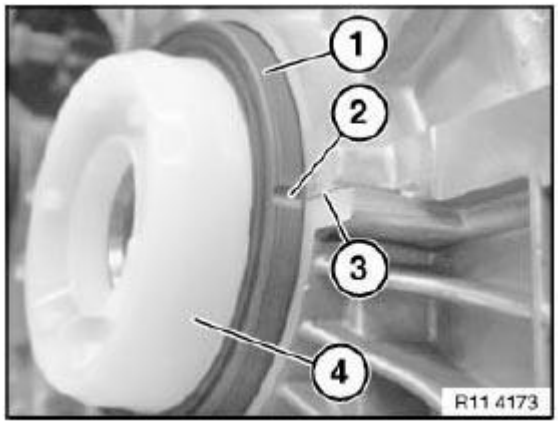


Fig. 101: Identifying Support Sleeve, Radial Shaft Seal, Groove And Housing Partition
Courtesy of BMW OF NORTH AMERICA, INC.

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.

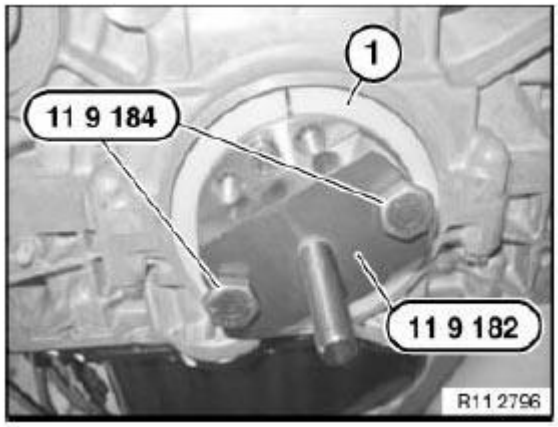


Fig. 102: Identifying Spacer Ring And Special Tools (11 9 182, 11 9 184)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

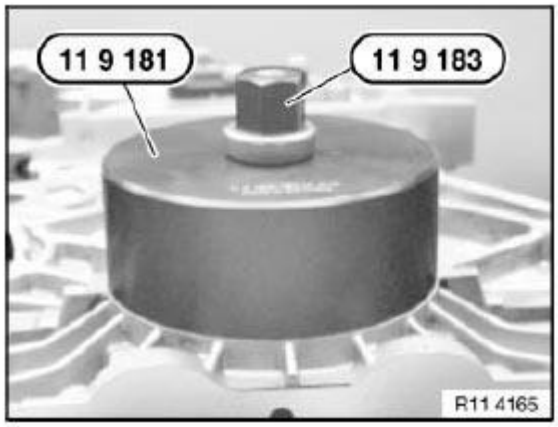


Fig. 103: Identifying Special Tools (11 9 181, 11 9 183)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

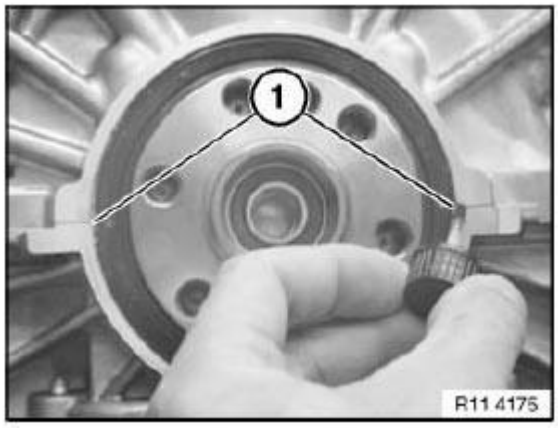


Fig. 104: Inserting Brush With Loctite Primer, Manufacturer Number 171000 Into Grooves On Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

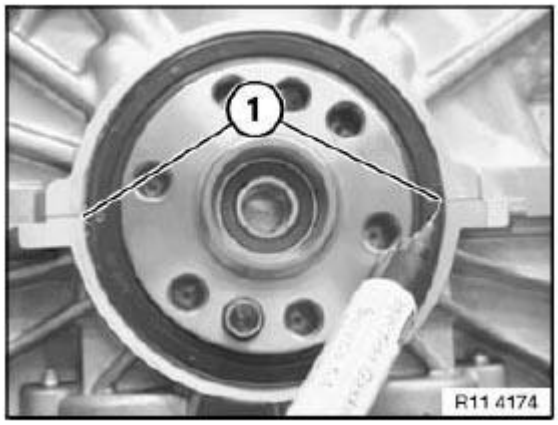


Fig. 105: Filling Both Grooves Flush With Loctite Sealing Compound, Manufacturer Number 193140
Courtesy of BMW OF NORTH AMERICA, INC.

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.

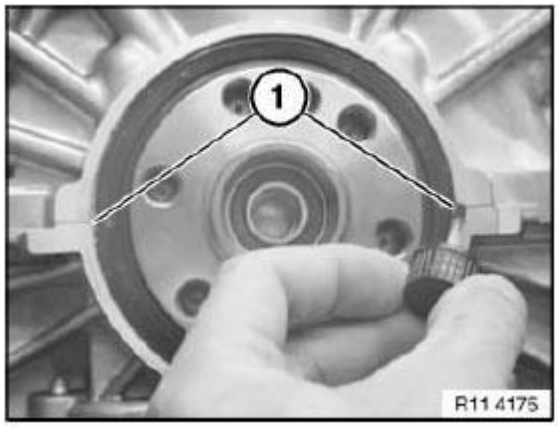


Fig. 106: Coating Surface Of Sealing Compound In Both Grooves With Loctite Primer, Manufacturer Number 171000
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 151 REPLACING RADIAL CRANKSHAFT SEAL ON TRANSMISSION SIDE (N54N54T) FROM 01.01.09

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.

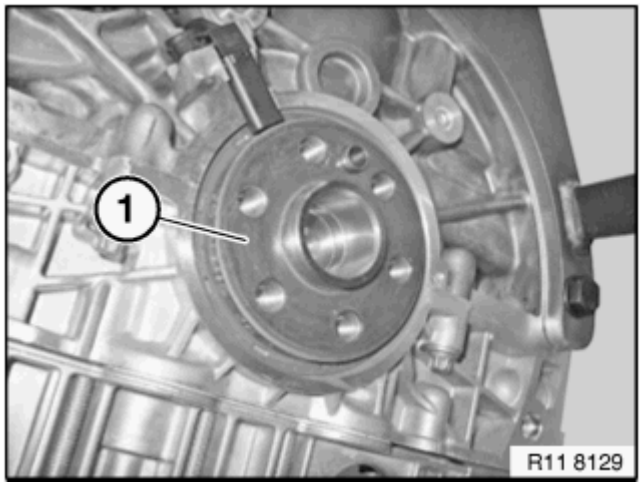


Fig. 107: Identifying Magnet Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw on pulse sensor (1).

Slide PULSE SENSOR (2) upwards.

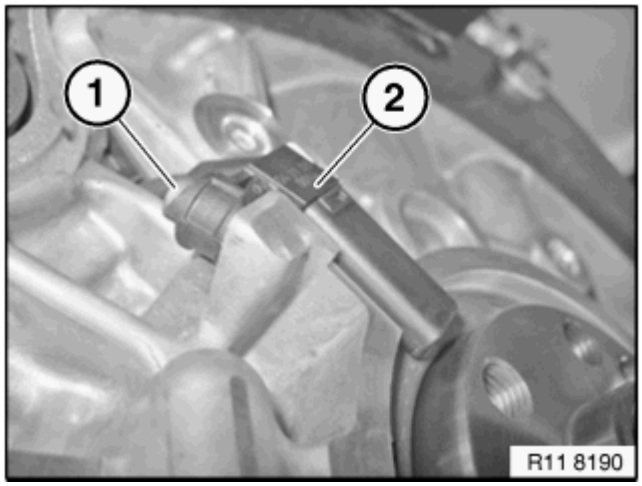


Fig. 108: Identifying Pulse Sensor And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Drill size maximum 2.5 millimeters.

Remove shavings immediately.

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

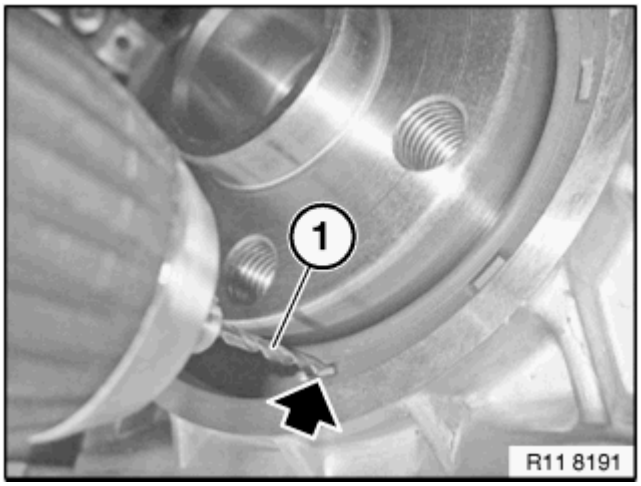


Fig. 109: Drilling Hole In Radial Shaft Seal Using Drill
Courtesy of BMW OF NORTH AMERICA, INC.

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

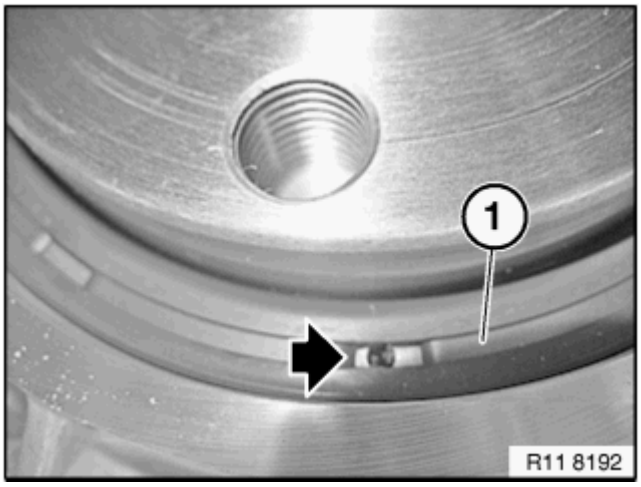


Fig. 110: Identifying Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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.

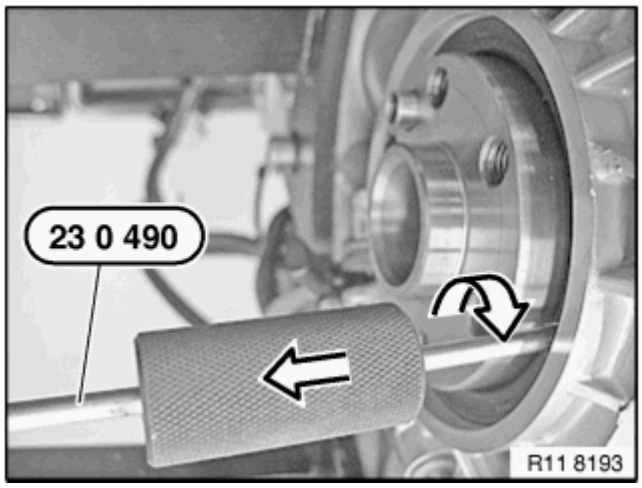


Fig. 111: Screwing In Special Tool 23 0 490 In Clockwise Direction
Courtesy of BMW OF NORTH AMERICA, INC.

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

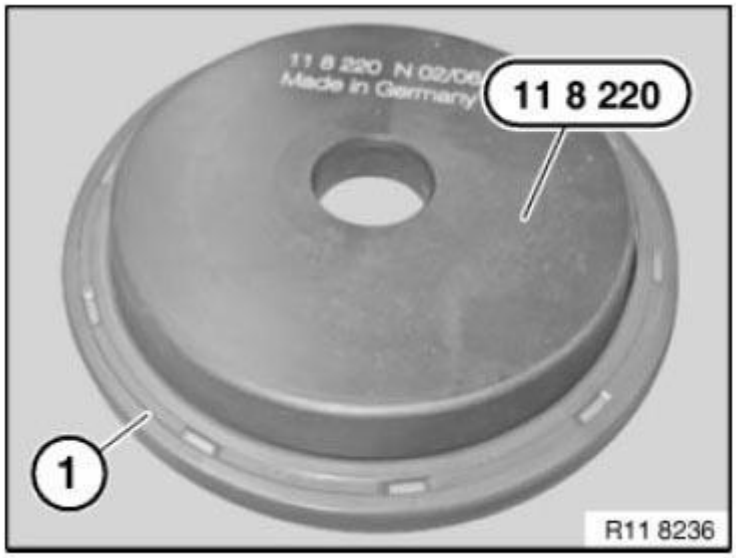


Fig. 112: Identifying Radial Shaft Seal On Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

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

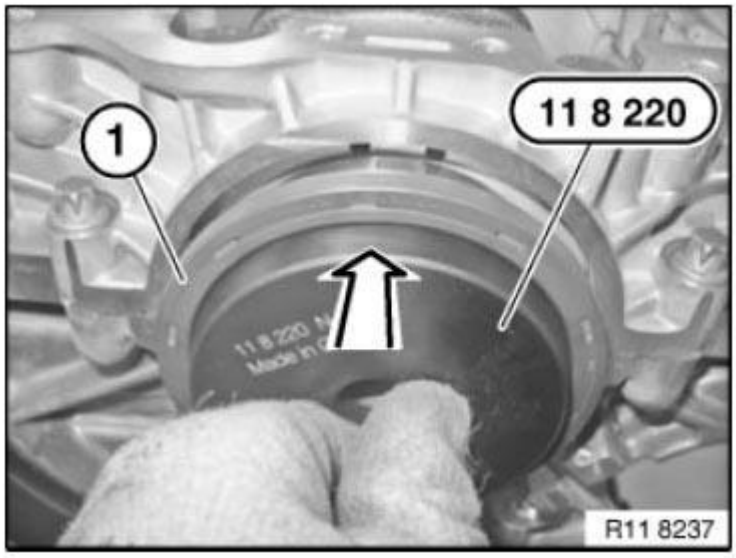


Fig. 113: Positioning Radial Shaft Seal Using Special Tool 11 8 220 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

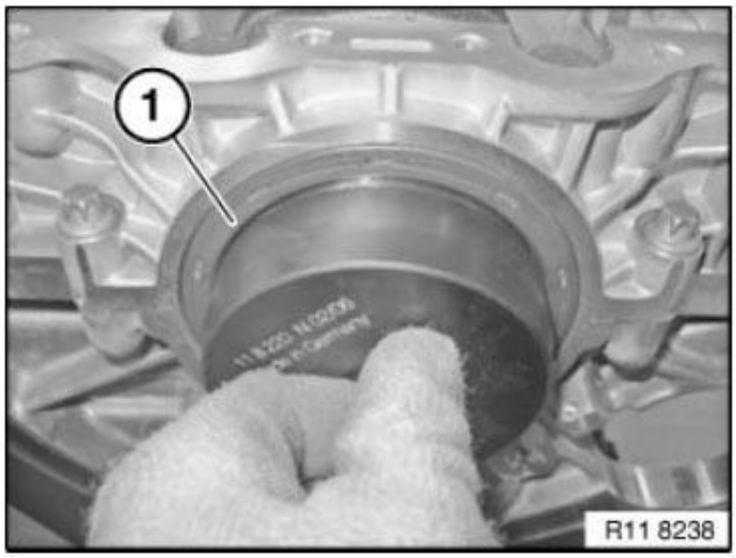


Fig. 114: Moving Radial Shaft Seal Parallel Up Against Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

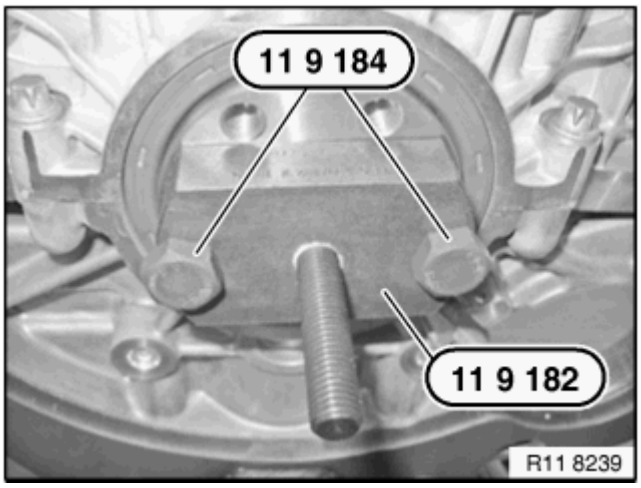


Fig. 115: Fastening Special Tool 11 9 182 With Special Tool 11 9 184 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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).

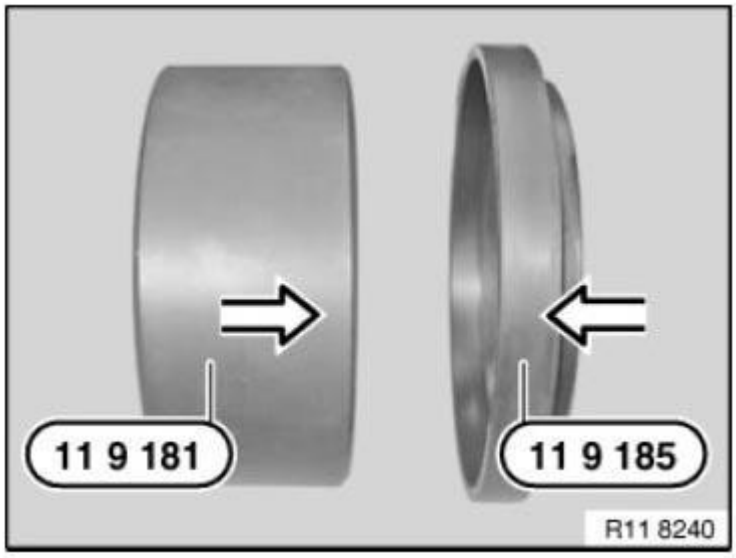


Fig. 116: Connecting Special Tool 11 9 185 Onto Special Tool 11 8 181
Courtesy of BMW OF NORTH AMERICA, INC.

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).

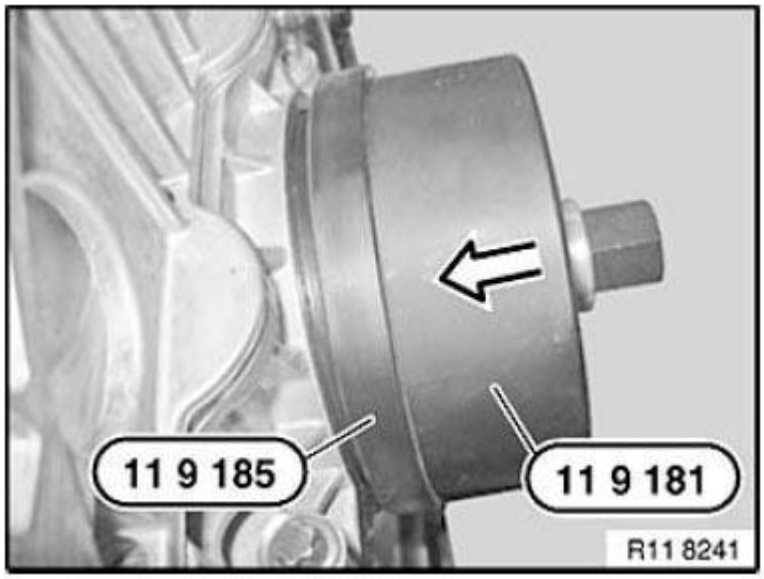


Fig. 117: Installing Rear Crankshaft Seal Using Tool 119 180/181
Courtesy of BMW OF NORTH AMERICA, INC.

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

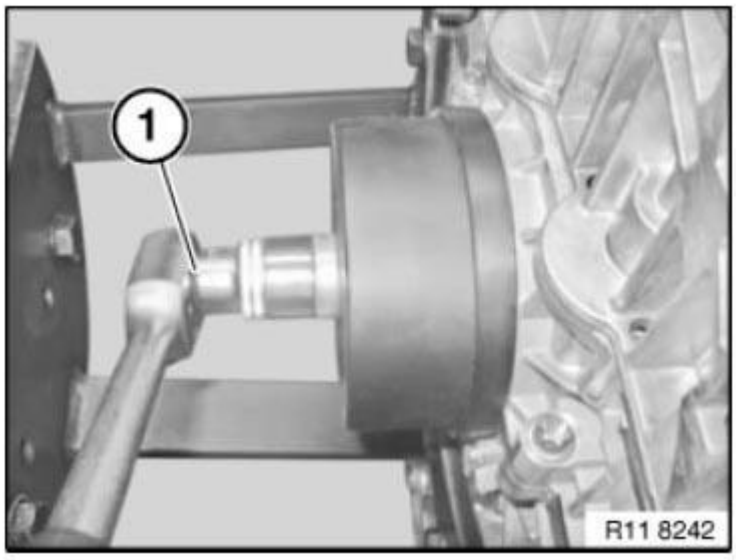


Fig. 118: Screwing On Radial Shaft Seal Using Special Tool 11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

CRANKSHAFT WITH BEARING

11 21 500 REPLACING CRANKSHAFT (N54)

Special tools required:

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

See **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS** .

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released.
Aluminum screws/bolts are permitted with and without color coding (blue).
For reliable identification:
Aluminum screws/bolts are not magnetic.
Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Remove **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 screws (1).

Tightening torque **11 13 5AZ** , see **OIL SUMP**

Installation:

Replace aluminum screws.

Remove oil deflector (2).

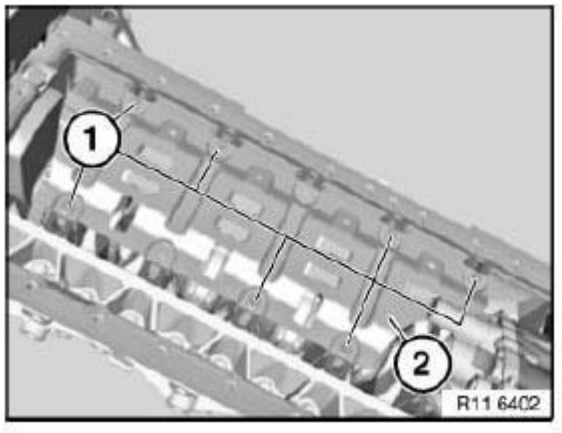


Fig. 119: Identifying Screws And Oil Deflector
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 11 2AZ** , see **11 11 ENGINE BLOCK**

Unfasten screws (2).

Tightening torque **11 11 3AZ** , see **11 11 ENGINE BLOCK**

Installation:

Replace aluminum screws.

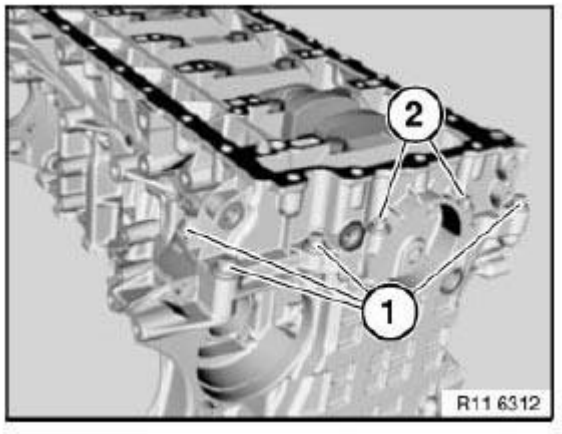


Fig. 120: Identifying Screws (1 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 11 4AZ** , see **11 11 ENGINE BLOCK**

Unfasten screws (2).

Tightening torque **11 11 2AZ** , see **11 11 ENGINE BLOCK**

Installation:

Replace aluminum screws.

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

Tightening torque **11 11 1AZ** , see **11 11 ENGINE BLOCK**

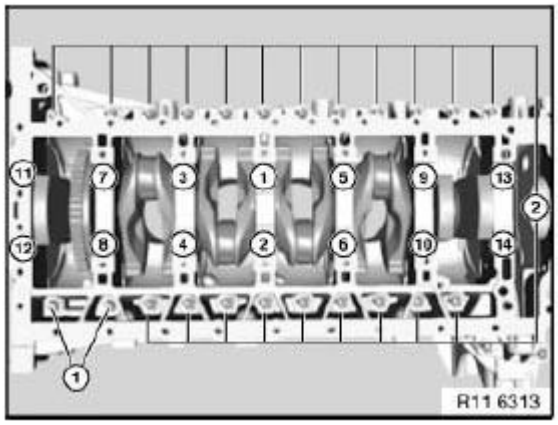


Fig. 121: Identifying Screws (2 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 11 3AZ** , see **11 11 ENGINE BLOCK**

Installation:

Replace aluminum screws.

Remove crankshaft lower section in upward direction.

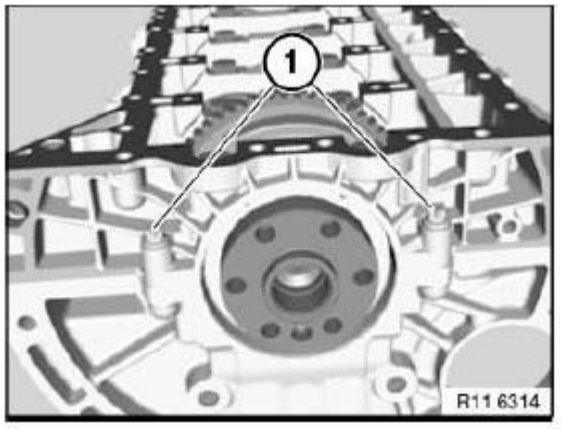


Fig. 122: Identifying Screws (3 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove both crankshaft radial seals (1).

NOTE: Illustrations show N46.

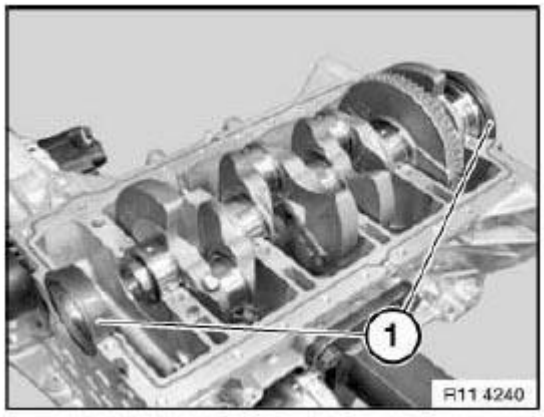


Fig. 123: Identifying Crankshaft Radial Seals
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **main bearing shells** (2 and 3), replace if necessary.

Remove and install crankshaft (1) in direction of arrow.

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

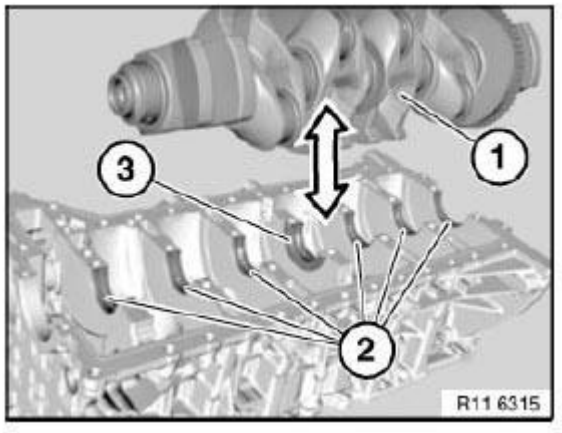


Fig. 124: Identifying Crankshaft And Main Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

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

Reinstall crankshaft.

Installation:

Lubricate all bearing points with engine oil.

Clean all sealing surfaces.

NOTE: Illustrations show N46.

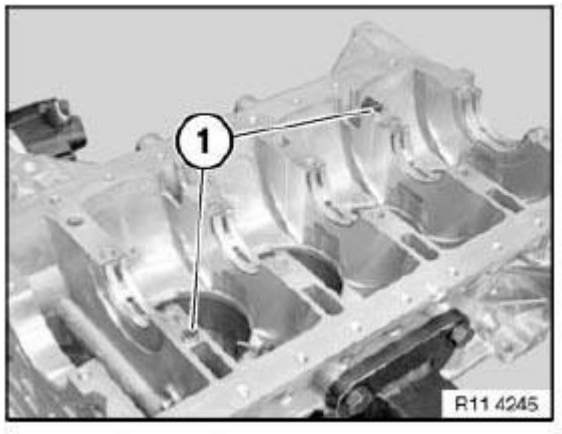


Fig. 125: Identifying Guide Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 11 1AZ** , see **11 11 ENGINE BLOCK**

Tighten screws (2) from inside outwards.

Tightening torque **11 11 2AZ** , see **11 11 ENGINE BLOCK**

Tighten screws (1).

Tightening torque **11 11 4AZ** , see **11 11 ENGINE BLOCK**

Installation:

Replace aluminum screws.

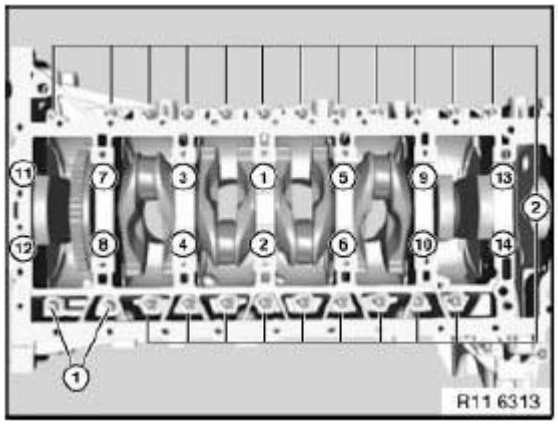


Fig. 126: Identifying Steel Screws Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Fig. 127: Tightening Aluminum Screws Exclusively With 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.**

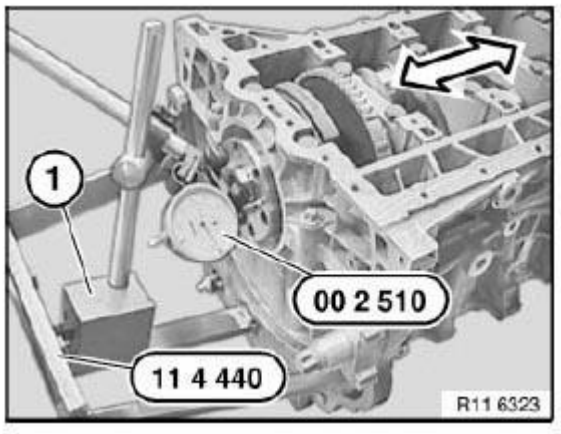


Fig. 128: Positioning Special Tool 00 2 510 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Always replace nozzles (1).

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

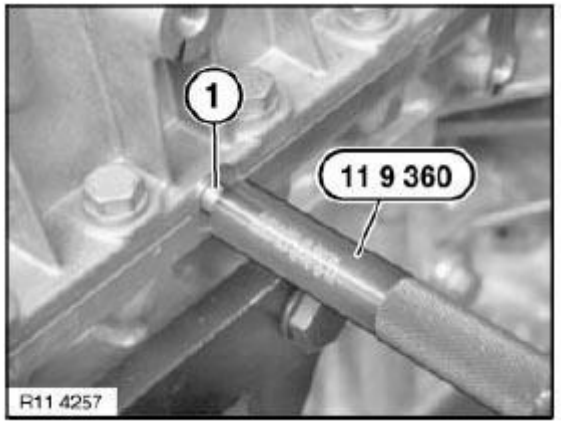


Fig. 129: Driving In Both Nozzles With Special Tool 11 9 360 Into Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace **crankshaft radial seal at front.**

Replace **crankshaft radial seal at rear.**

Installation:

Use **primer 1.3 and liquid gasket 1.4.**

Prepare liquid gasket (1) in special tool **11 4 370** .

Screw on nozzle for injecting liquid gasket.

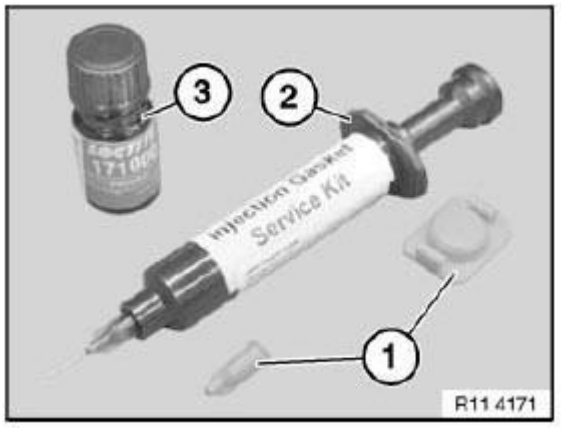


Fig. 130: Identifying Liquid Gasket And Special Tool 11 4 370
Courtesy of BMW OF NORTH AMERICA, INC.

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

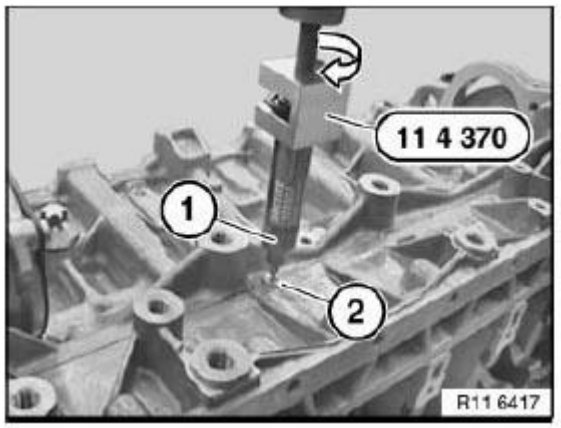


Fig. 131: Inserting Liquid Gasket With Special Tool 11 4 370
Courtesy of BMW OF NORTH AMERICA, INC.

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

(Picture shows N40).

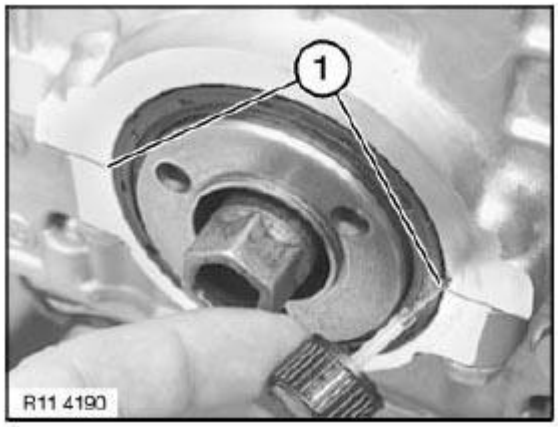


Fig. 132: Coating Surface Of Sealing Compound In Both Grooves With Loctite Primer, Manufacturer Number 171000
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 21 531 REPLACING ALL CRANKSHAFT MAIN BEARINGS (N54)

Special tools required:

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

See **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS** .

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released.
Aluminum screws/bolts are permitted with and without color coding (blue).
For reliable identification:
Aluminum screws/bolts are not magnetic.
Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Remove **crankshaft**

Check setting of oil spray nozzles, adjusting if necessary:

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

Installation:

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

If necessary, adjust oil nozzle.

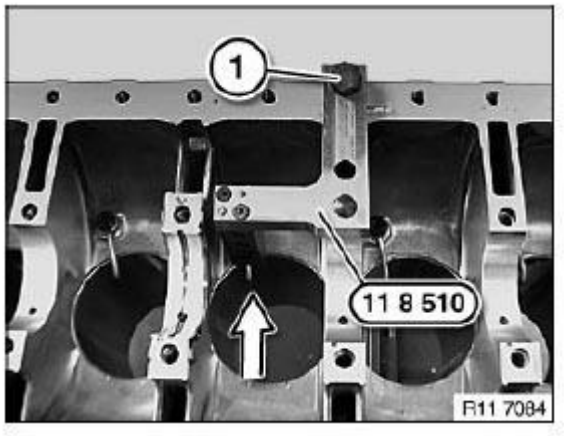


Fig. 133: Identifying Special Tool 11 8 510 And Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust oil nozzle.

Release screw (1).

Tightening torque **11 11 5AZ** , see **11 11 ENGINE BLOCK**

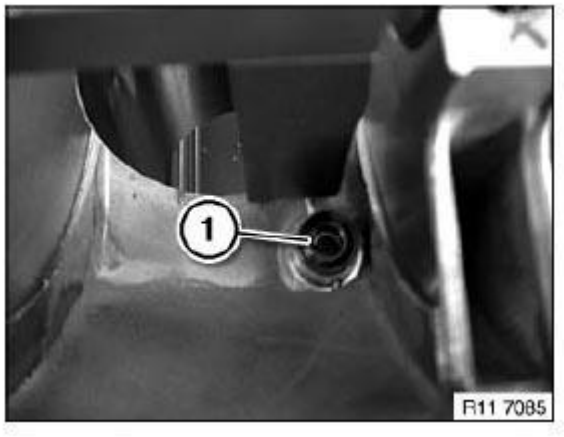


Fig. 134: Identifying Screw (1)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove bearing shells (2) and (3).

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

Observe bearing classification.

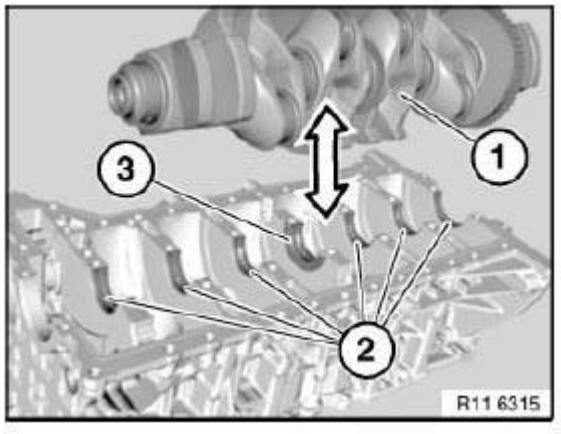


Fig. 135: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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.

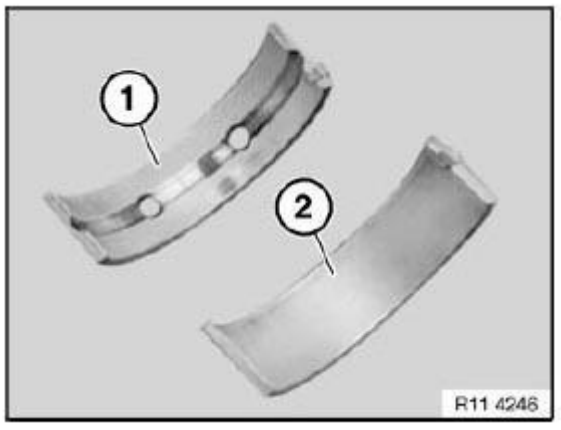


Fig. 136: Identifying Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

Main bearing classification (1) for crankcase lower half (bedplate), code numbers 1 2 3, see table.

Observe **bearing classification.**

Bearing classification (2) of **connecting rods** code letters b and r.

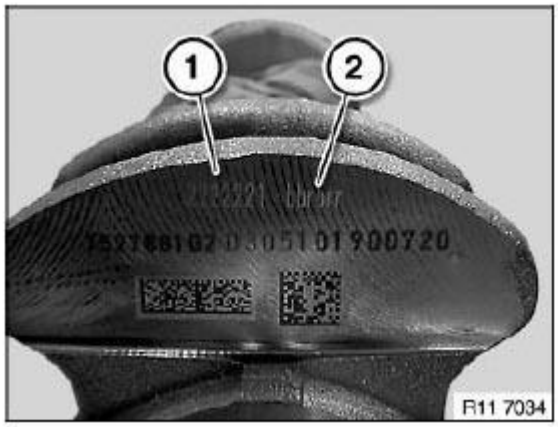


Fig. 137: Identifying Main Bearing Classification
Courtesy of BMW OF NORTH AMERICA, INC.

Main bearing classification (1) in crankcase, code letters A/B or C, see table.

Installation:

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

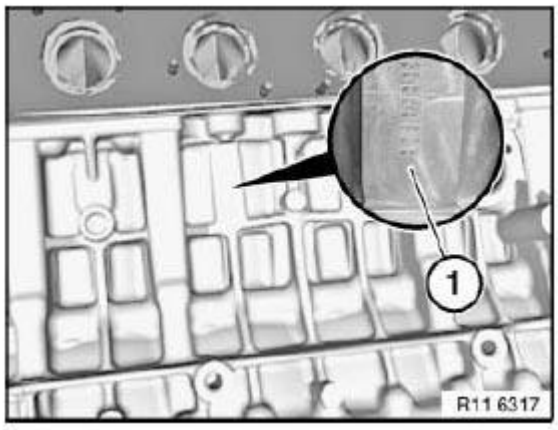


Fig. 138: Identifying Main Bearing Classification In Crankcase, Code Letters A/B Or C
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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.

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).

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

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

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

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

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

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

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

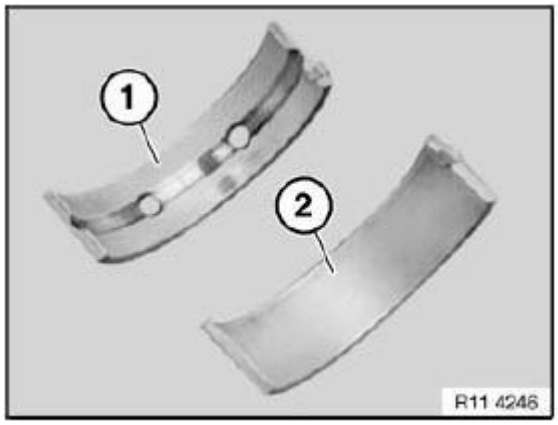


Fig. 139: Identifying Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Possible color combinations for mounting the crankshaft in the crankcase.

CRANKSHAFT COLOR COMBINATIONS REFERENCE CHART

(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.

Clean sealing faces with special tool **11 4 470** only.

Determine bearing play with special tool **00 2 590** .

Installation:

All measuring points must be free from oil and grease.

Use used screws to determine bearing play.

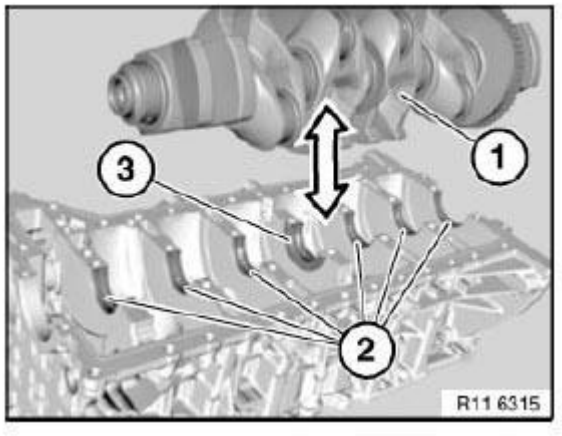


Fig. 140: Installing Bearing Shells And Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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 clearance **radial.**

Installation:

Remove plastic thread.

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

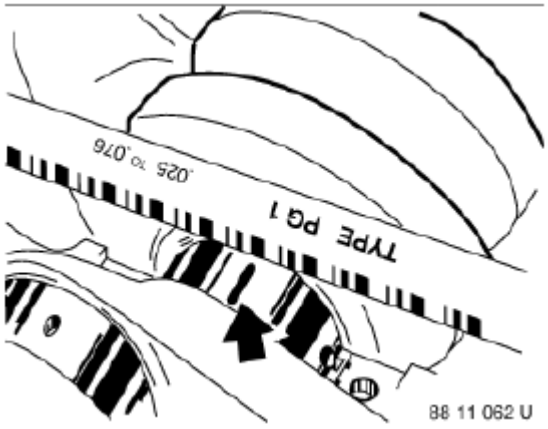


Fig. 141: Reading Off Bearing Play At Width Of Flattened Plastic
Courtesy of BMW OF NORTH AMERICA, INC.

Install crankcase lower section (bedplate).

Assemble engine.

11 21 505 SEALING CRANKCASE LOWER SECTION (N54, N54T)

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. See **22 11 100 REPLACING RIGHT ENGINE SUPPORT ARM (N54)** or **22 11 110 REPLACING LEFT ENGINE SUPPORT ARM (N54)** .
- Remove **OIL SUMP**.

Release screws (1).

Pull out oil pump intake pipe (2).

Tightening torque: **11 13 5AZ**

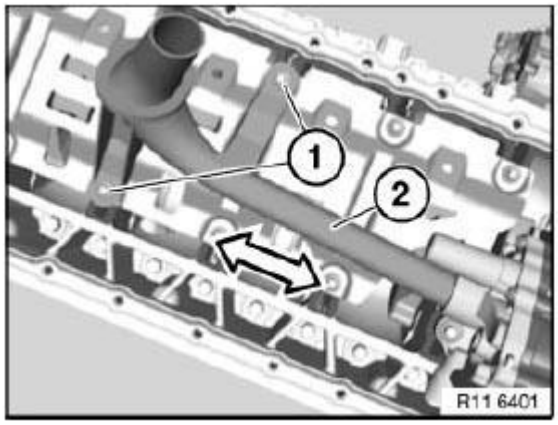


Fig. 142: Removing Pump Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: **11 13 5AZ** .

Installation note:

Replace aluminum screws.

Remove oil deflector (2).

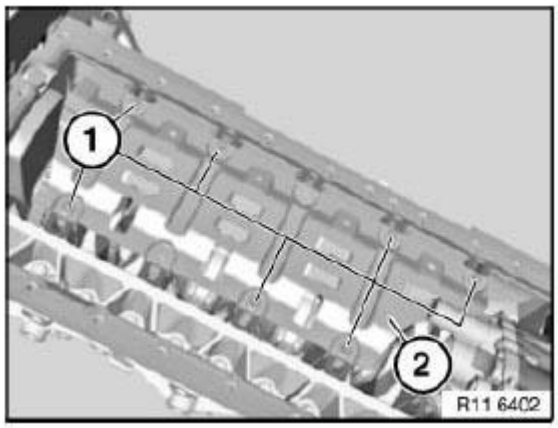


Fig. 143: Identifying Oil Deflector And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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: **11 41 4AZ** .

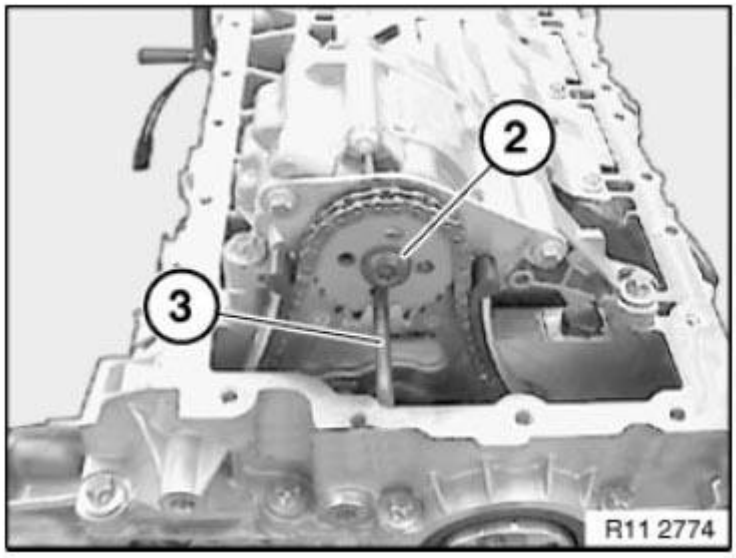


Fig. 144: Identifying Oil Pump Drive Gear And Steel Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

Tightening torque: **11 41 3AZ** .

Installation note:

Replace aluminum screws.

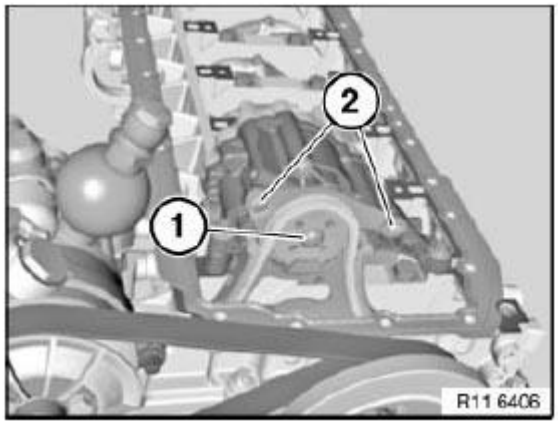


Fig. 145: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw plug (1) from crankcase at front.

NOTE: Replace gasket.

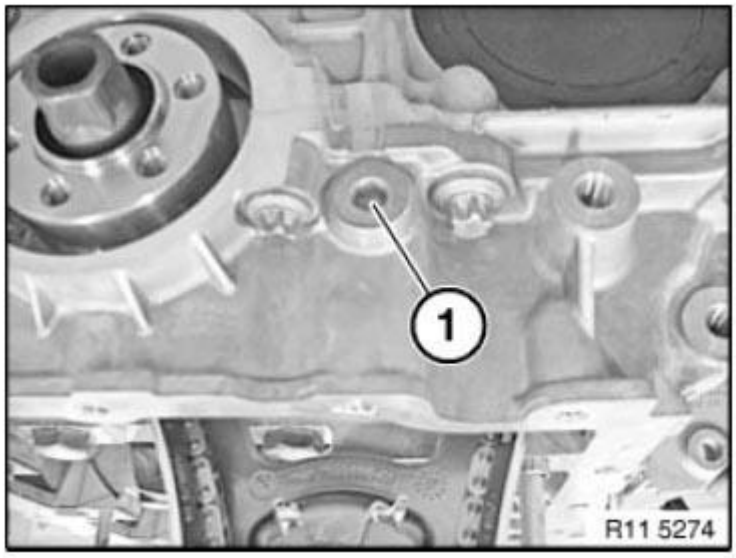


Fig. 146: Identifying Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

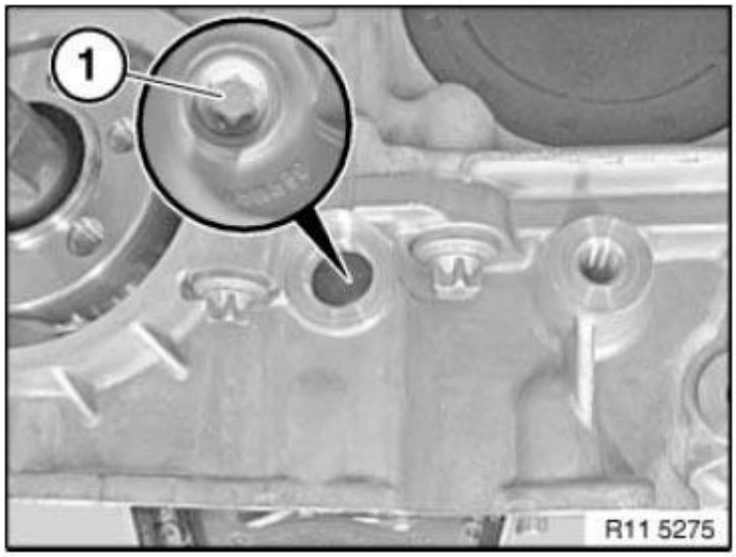


Fig. 147: Identifying Oil Pump Triangular Drive Mounting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Version 1

IMPORTANT: Observe different screw lengths.

Release screws (1).

Tightening torque 11 41 2AZ .

Tightening torque 11 41 2AZ .

Installation note:

Replace aluminum screws.

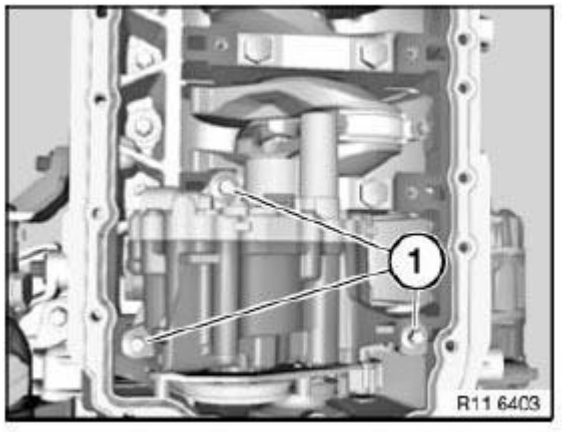


Fig. 148: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

IMPORTANT: Observe different screw lengths.

Release oil pump screws (1).

Tightening torque: 11 41 2AZ .

Installation note:

Replace aluminum screws.

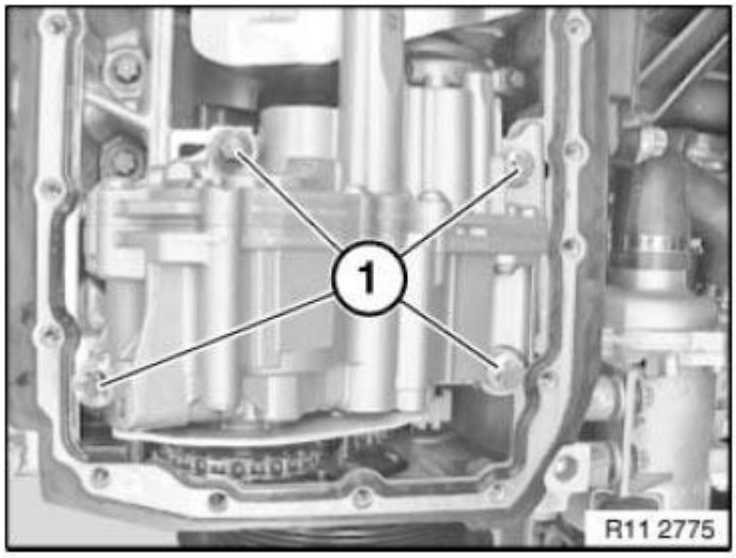


Fig. 149: Identifying Oil Pump Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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.

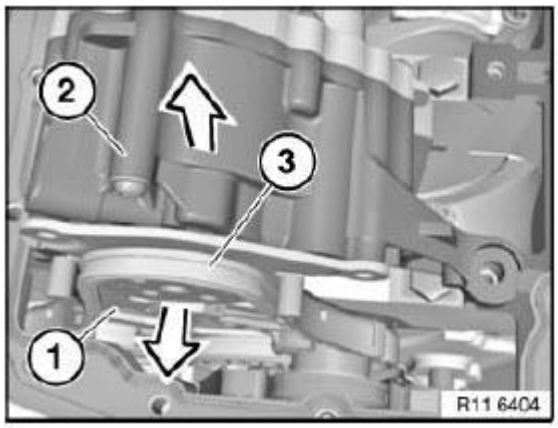


Fig. 150: Removing Sprocket
Courtesy of BMW OF NORTH AMERICA, INC.

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).

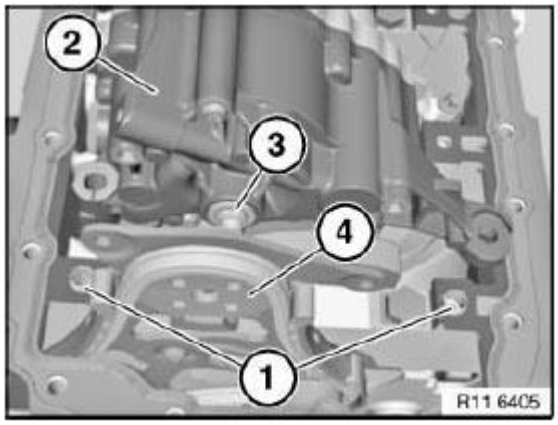


Fig. 151: Identifying Spacer Bushings And Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

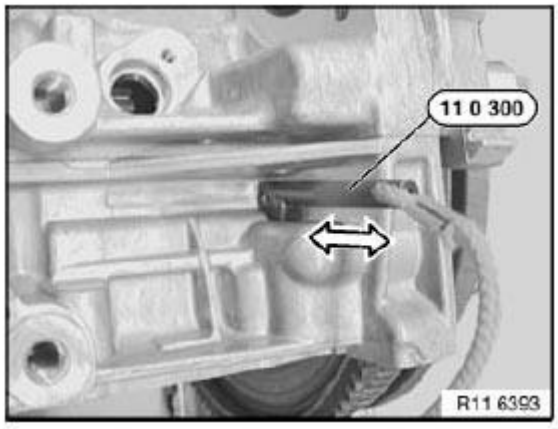


Fig. 152: Securing Flywheel In Position Using Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

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)

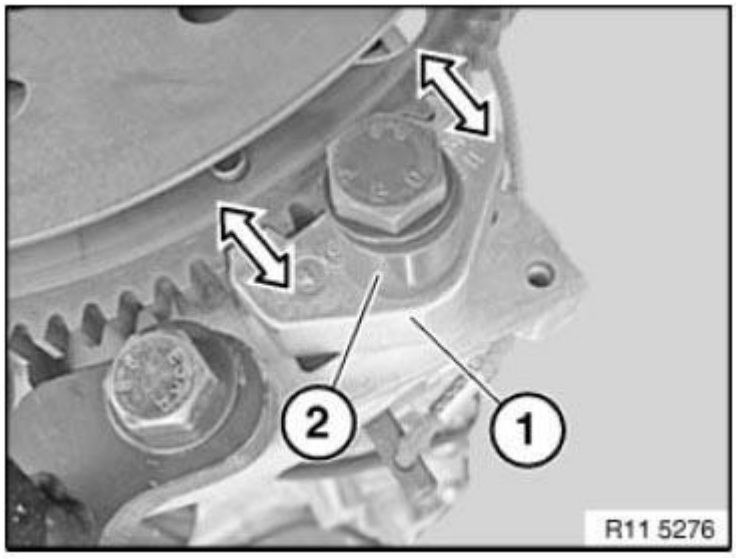


Fig. 153: Securing Flywheel Using Special Tool 11 9 260 And Special Tool 11 9 266
Courtesy of BMW OF NORTH AMERICA, INC.

Automatic transmission

Release flywheel bolts (1).

Release special tool (2).

Remove flywheel (3).

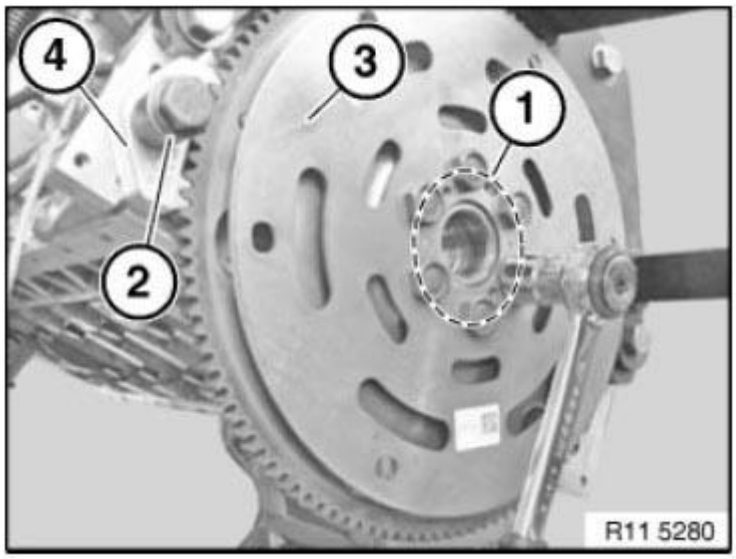


Fig. 154: Identifying Flywheel With Mounting Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Manual transmission

IMPORTANT: Position crankshaft at top dead center.

Remove dual-mass flywheel.

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

Remove **VIBRATION DAMPER** .

Release flywheel bolts with special tool **11 4 180** /

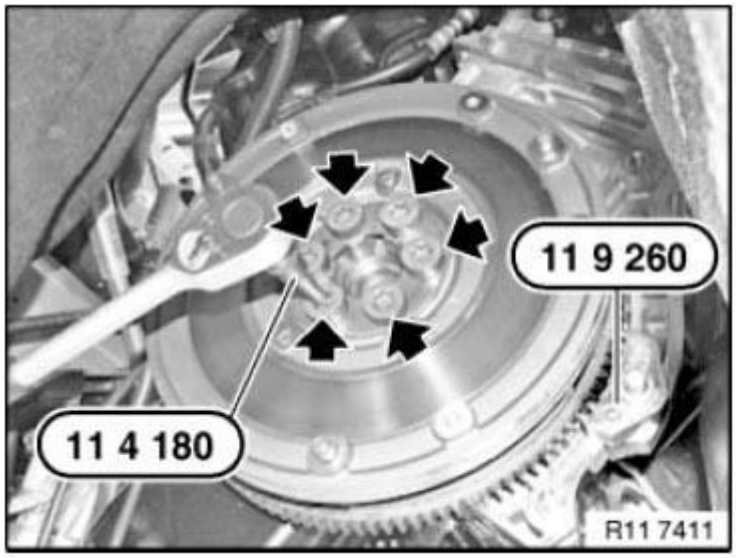


Fig. 155: Removing Flywheel Bolts Using Special Tool 11 4 180
Courtesy of BMW OF NORTH AMERICA, INC.

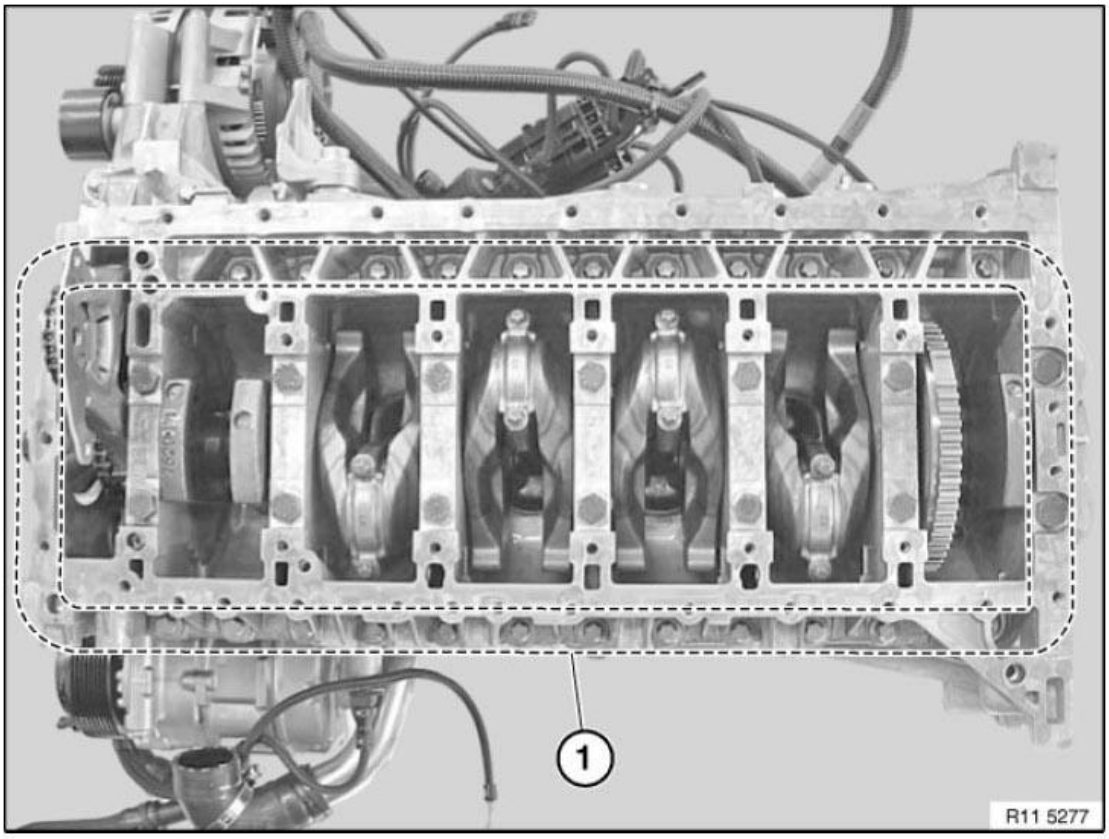


Fig. 156: Identifying Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

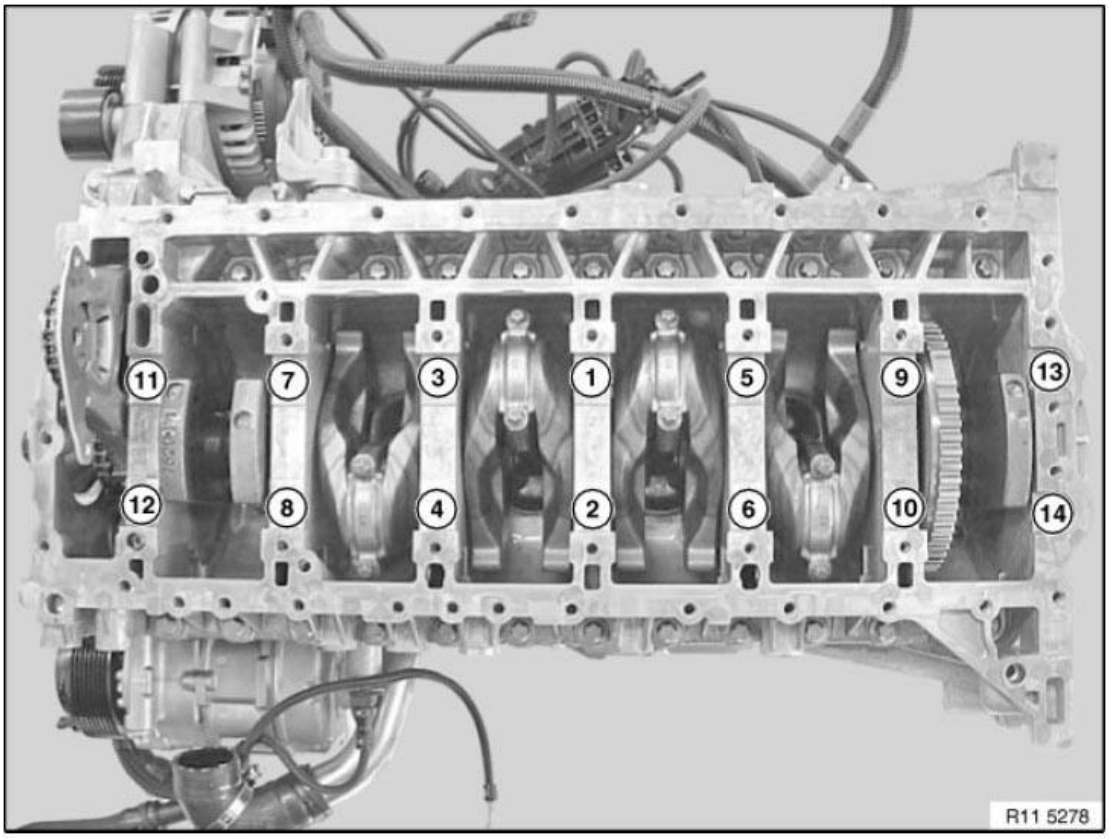


Fig. 157: Identifying Crankcase Bolt Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

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).

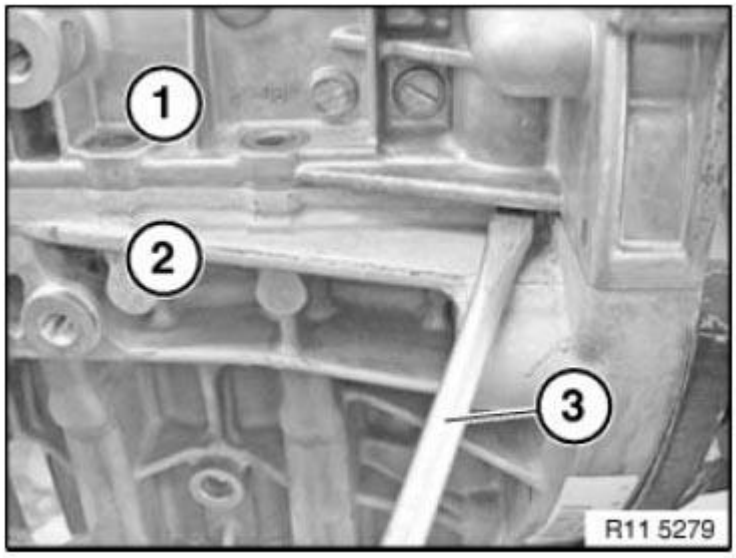


Fig. 158: Removing Crankcase Lower Section From Upper Section Using Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Timing chain is preloaded.

Do not raise crankshaft.

Carefully remove radial shaft seal (1).

Catch escaping engine oil with a cloth (2).

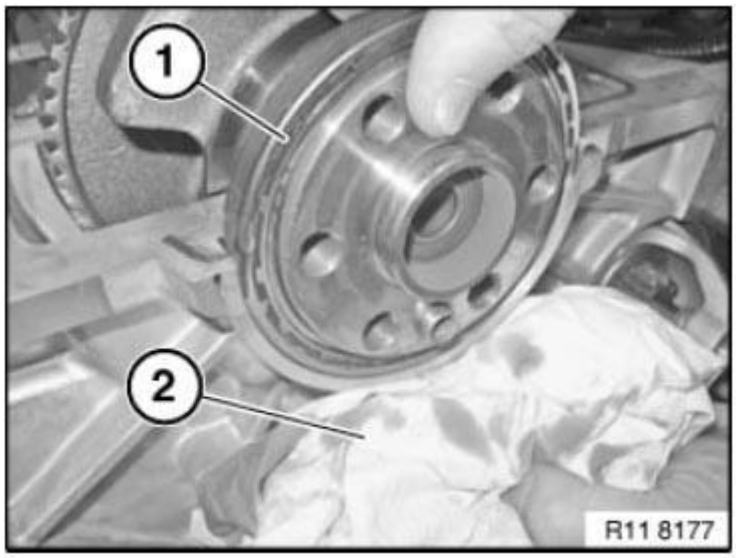


Fig. 159: Removing Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully remove radial shaft seal (1) towards front.

Catch escaping engine oil with a cloth (2).

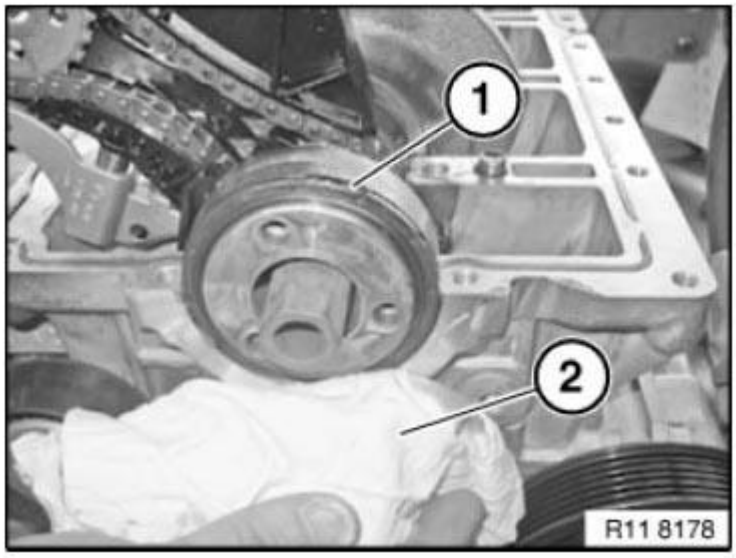


Fig. 160: Catching Escaping Engine Oil Using Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

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

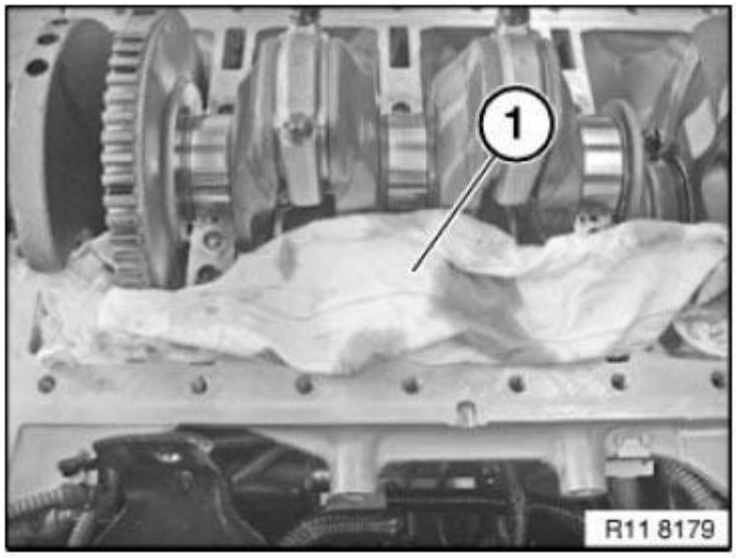


Fig. 161: Protecting Crankcase Against Sealant Residues Using Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Installation note:

Replace injector nozzles (2).

Clean all threads with compressed air.

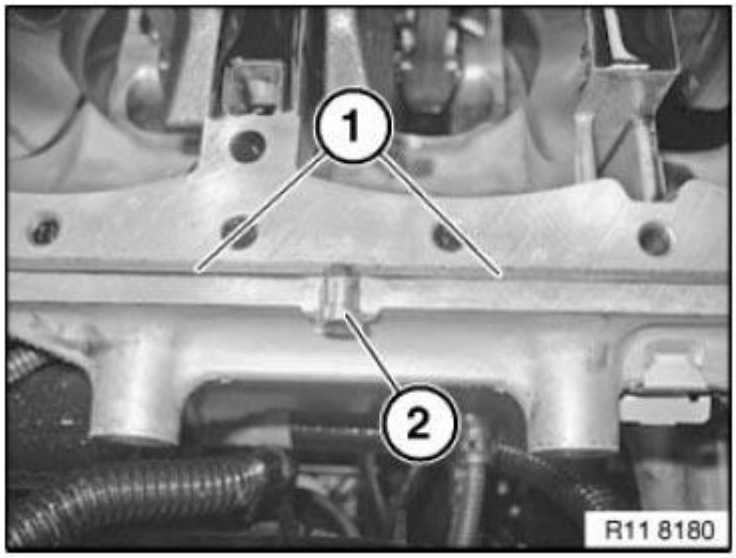


Fig. 162: Identifying Injector Nozzle And Sealing Compound Residue
Courtesy of BMW OF NORTH AMERICA, INC.

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.

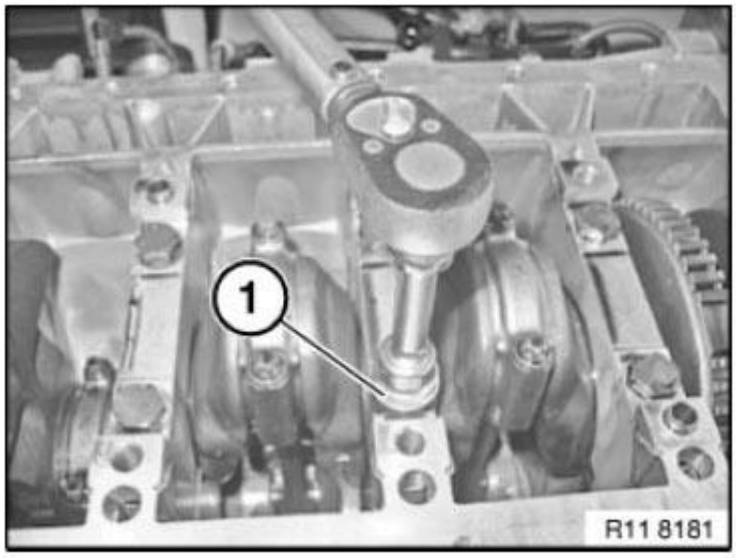


Fig. 163: Positioning Crankcase Lower Section On Crankcase Upper Section
Courtesy of BMW OF NORTH AMERICA, INC.

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

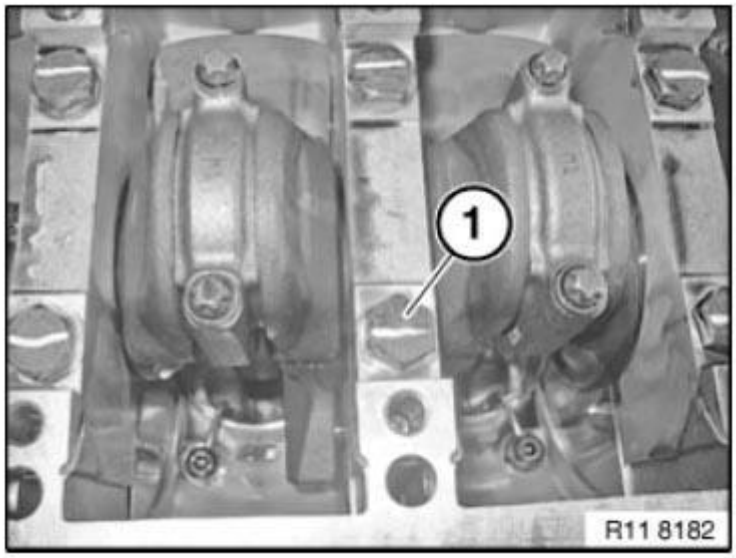


Fig. 164: Identifying M10 Crankcase Bolts With Colored Marking
Courtesy of BMW OF NORTH AMERICA, INC.

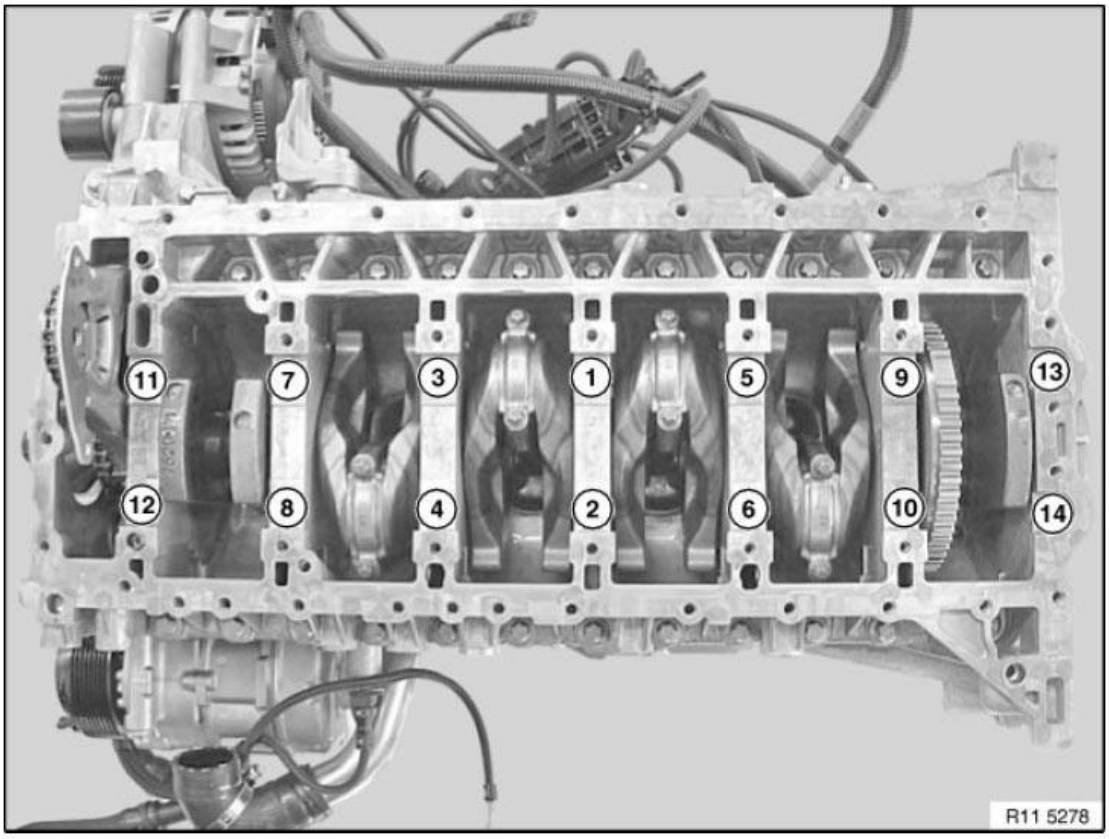


Fig. 165: Identifying M10 Crankcase Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

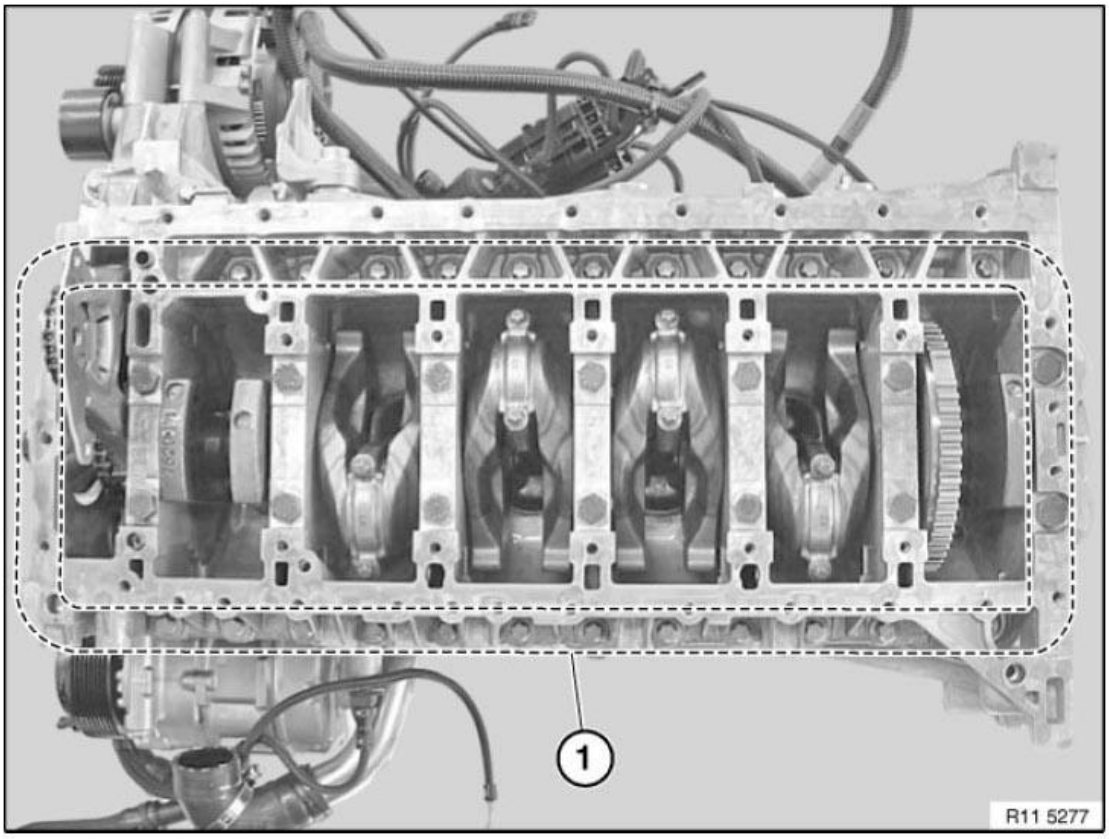


Fig. 166: Identifying Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Insert all crankcase bolts (1).

IMPORTANT: Observe different lengths and sizes of the bolts.

Tightening torque: **11 11 2, 3 AND 4AZ.**

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

NOTE: Replace screw.

Tightening torque: **11 41 4 AZ** .

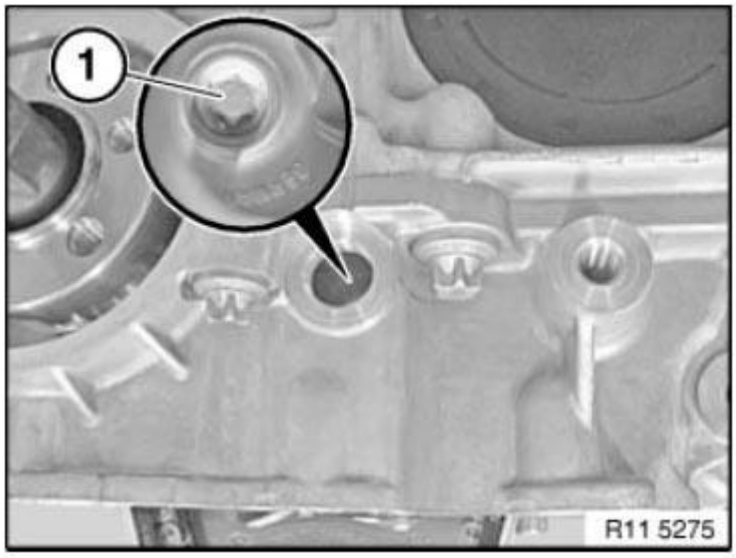


Fig. 167: Identifying Oil Pump Triangular Drive Mounting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten screw plug on front of crankcase.

Tightening torque: **11 41 8.**

Installation note:

Replace sealing ring.

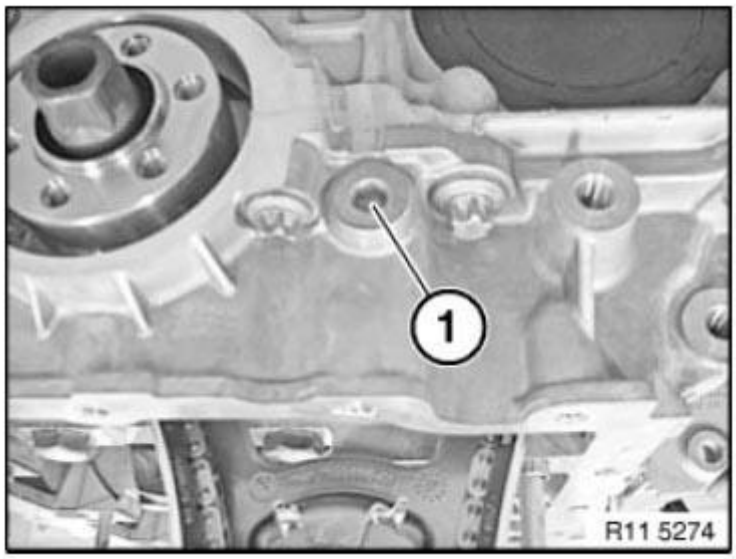


Fig. 168: Identifying Screw Plug On Front Of Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

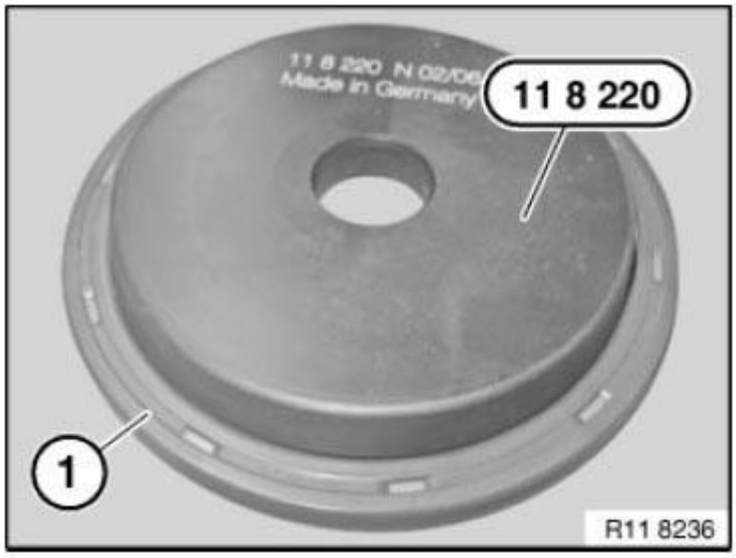


Fig. 169: Identifying Radial Shaft Seal On Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

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

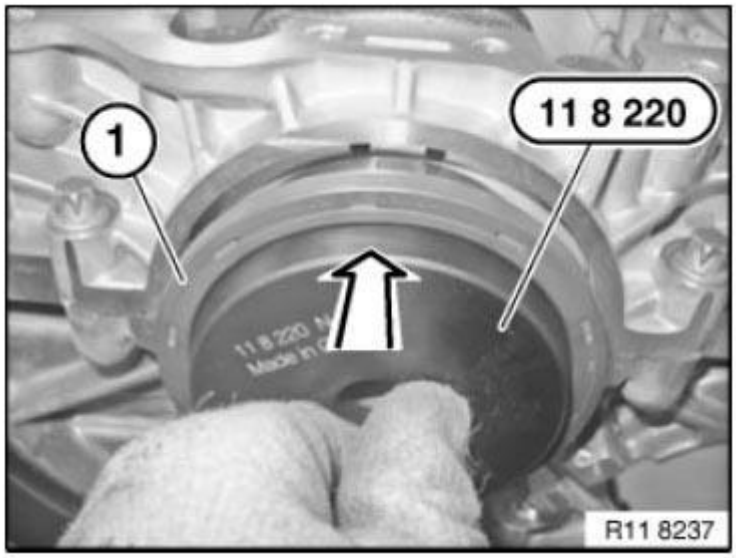


Fig. 170: Positioning Radial Shaft Seal On Crankshaft Using Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

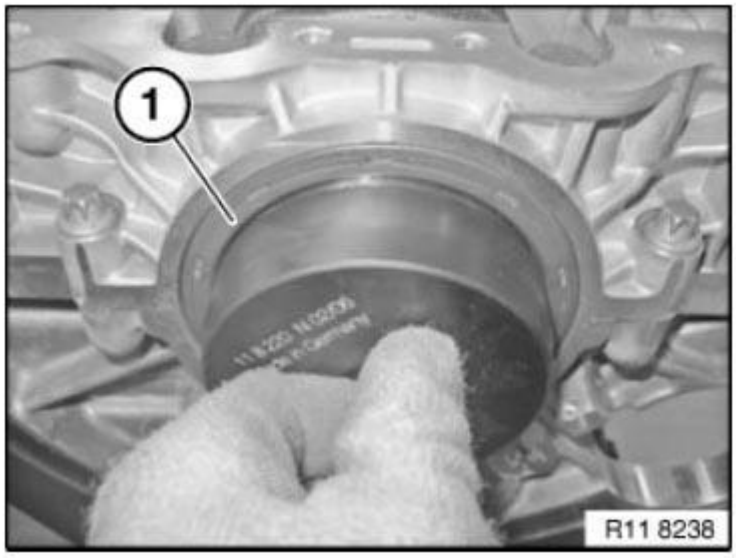


Fig. 171: Moving Radial Shaft Seal Parallel Up Against Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

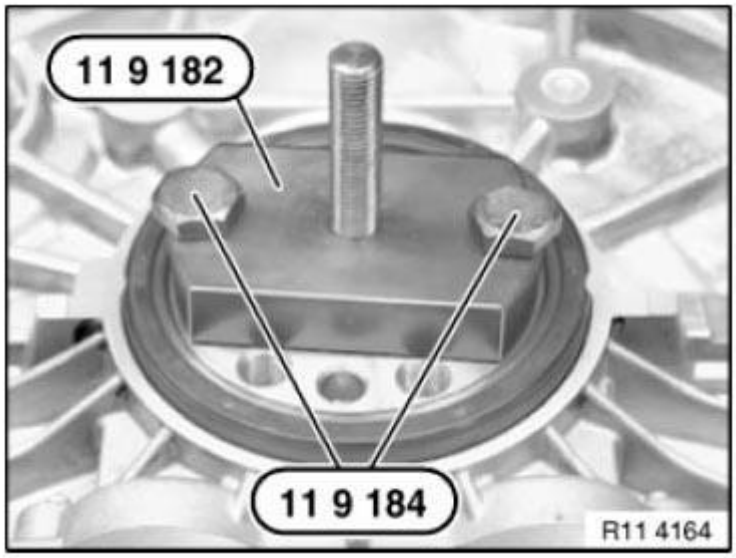


Fig. 172: Mounting Special Tool 11 9 182 Over Crankshaft Using Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

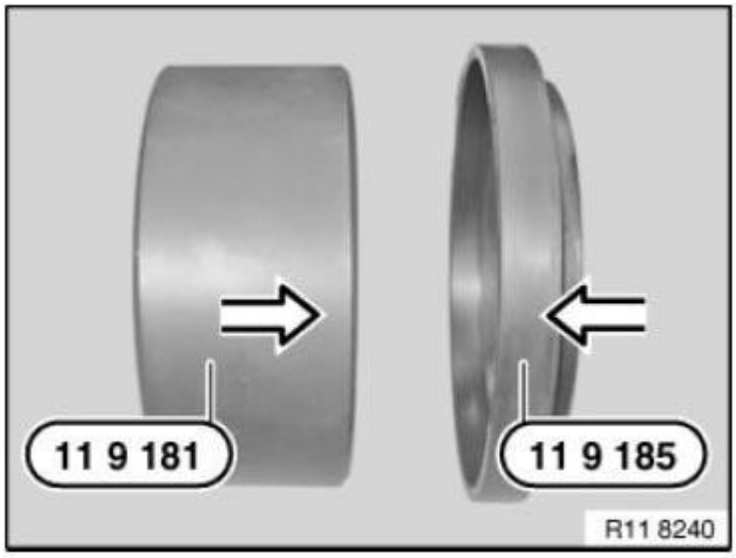


Fig. 173: Connecting Special Tool 11 9 185 To Special Tool 11 8 181
Courtesy of BMW OF NORTH AMERICA, INC.

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

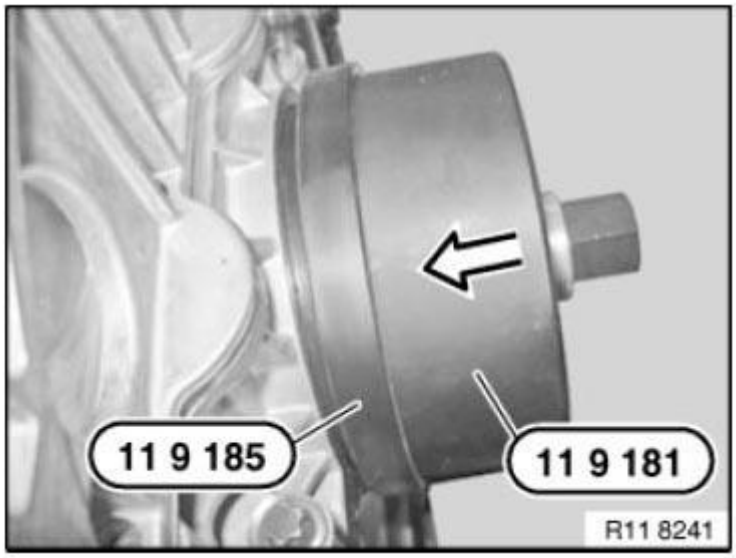


Fig. 174: Pulling Radial Shaft Seal Using Special Tool 11 9 181/11 9 185/11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

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

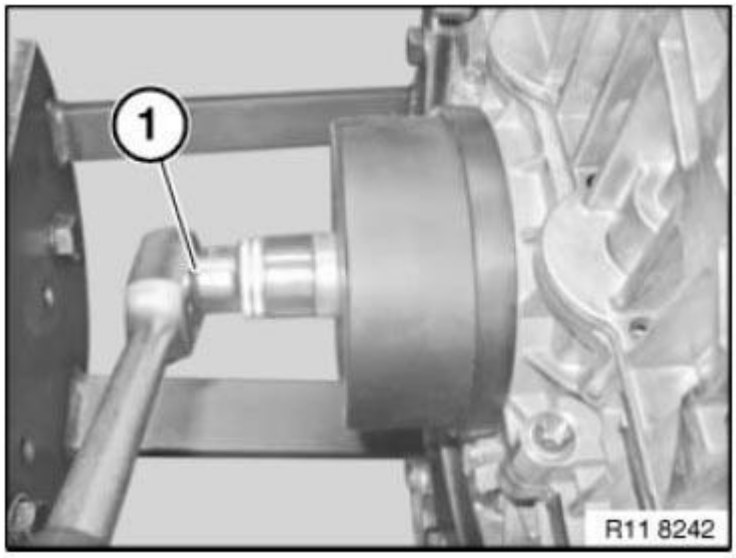


Fig. 175: Installing Radial Shaft Seal Using Special Tool 119 183
Courtesy of BMW OF NORTH AMERICA, INC.

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.

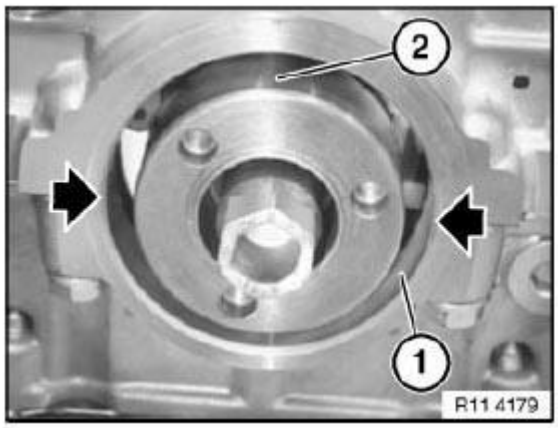


Fig. 176: Identifying Sealing Surface And Running Surface For Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

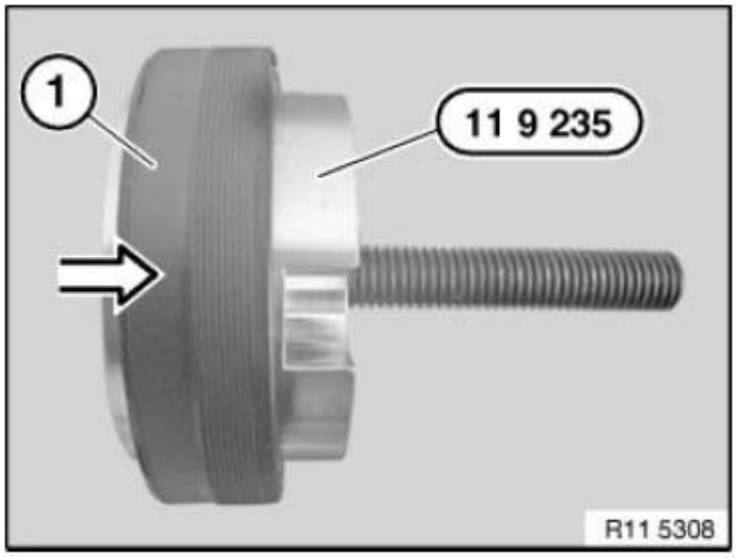


Fig. 177: Pushing Radial Shaft Seal 11 9 235 Carefully On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: 11 9 235Special tool can only be fastened with

2 opposite bolts.

Determine hole pattern on special tool.

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

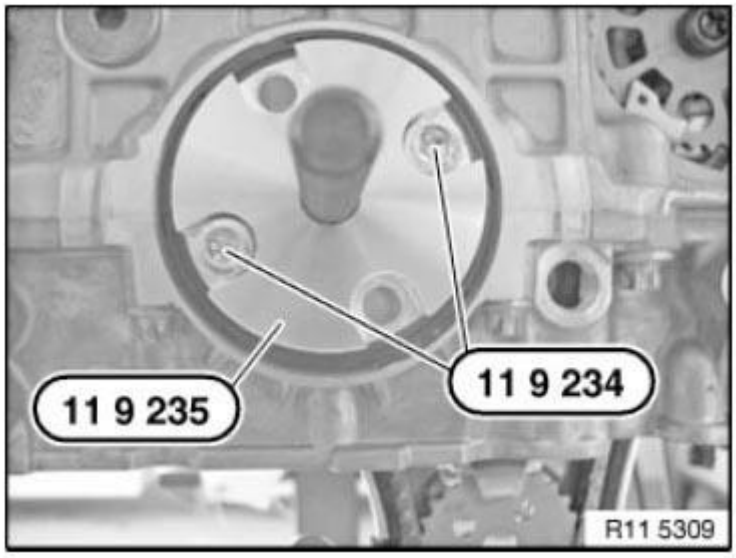


Fig. 178: Identifying Special Tools On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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.

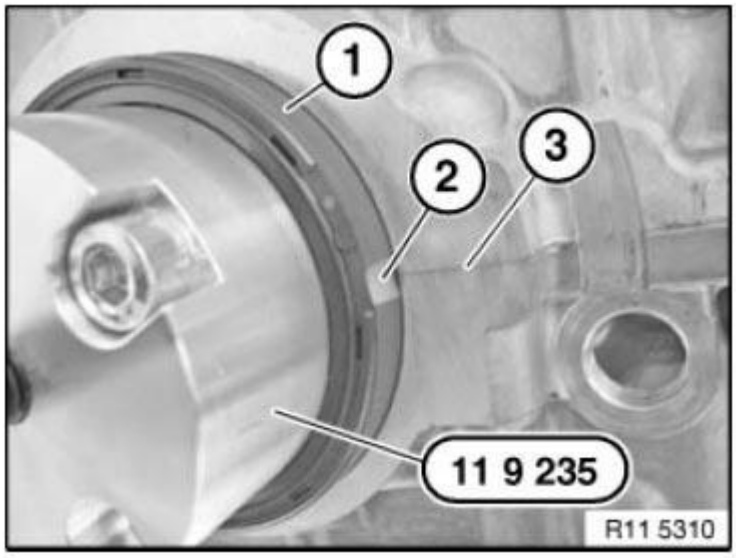


Fig. 179: Identifying Radial Shaft Seal Groove
Courtesy of BMW OF NORTH AMERICA, INC.

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

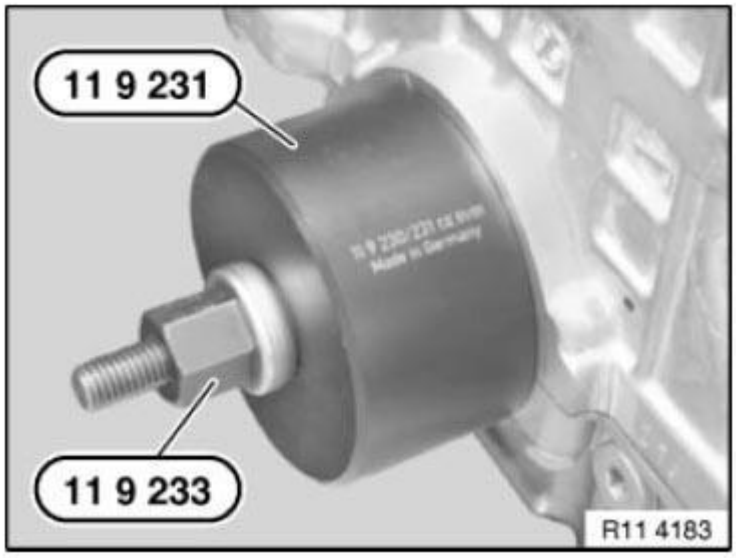


Fig. 180: Identifying Special Tools 119 231 And 11 9 233
Courtesy of BMW OF NORTH AMERICA, INC.

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

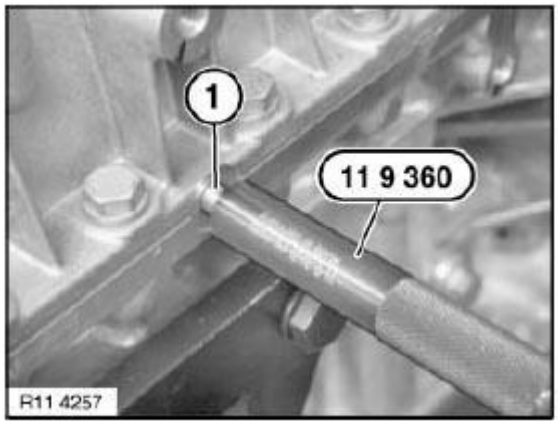


Fig. 181: Installing Nozzles Using Special Tool 11 9 360
Courtesy of BMW OF NORTH AMERICA, INC.

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.

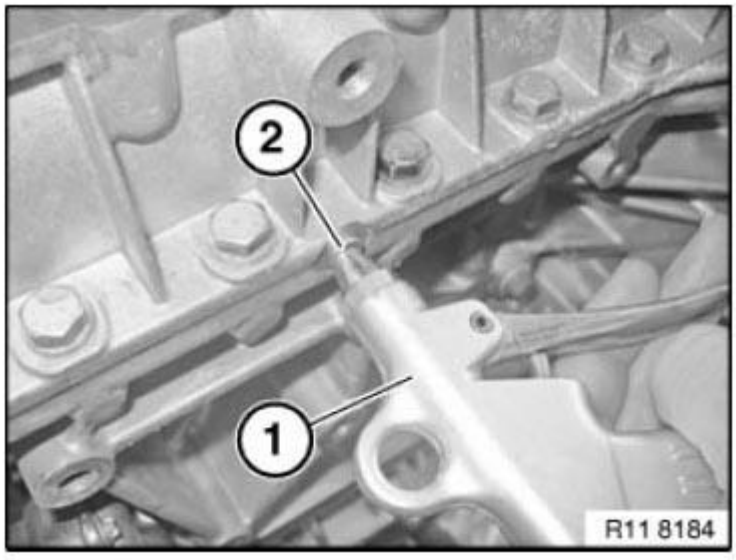


Fig. 182: Blowing Compressed Air Into Injector Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Use **PRIMER 1.3 AND LIQUID SEAL 1.4**.

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

Injector nozzles for injecting sealing compound are not required.

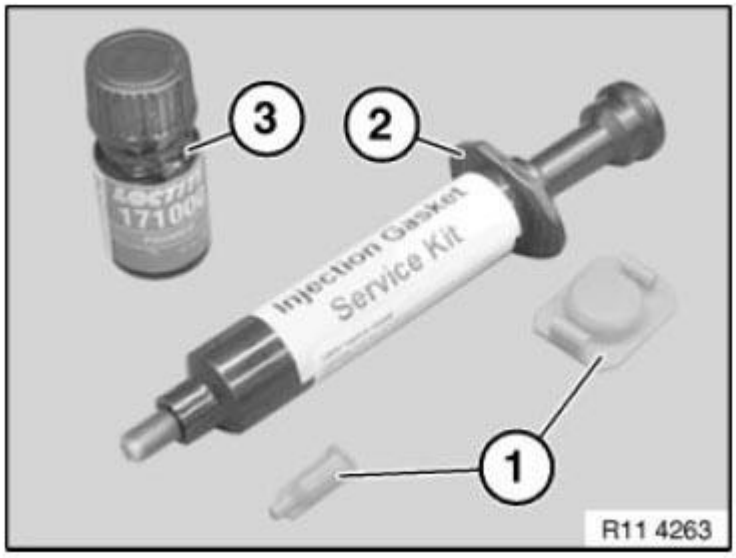


Fig. 183: Identifying Liquid Sealing Compound, Injector Nozzles And Primer Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

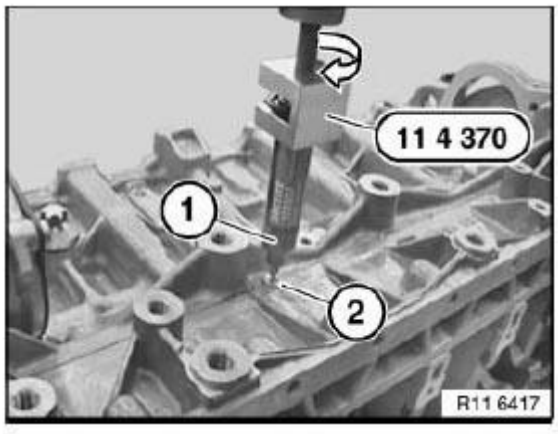


Fig. 184: Inserting Liquid Sealing Compound Using Special Tool 11 4 370
Courtesy of BMW OF NORTH AMERICA, INC.

Stop (seal off) escaping liquid sealing compound with primer 1.3.

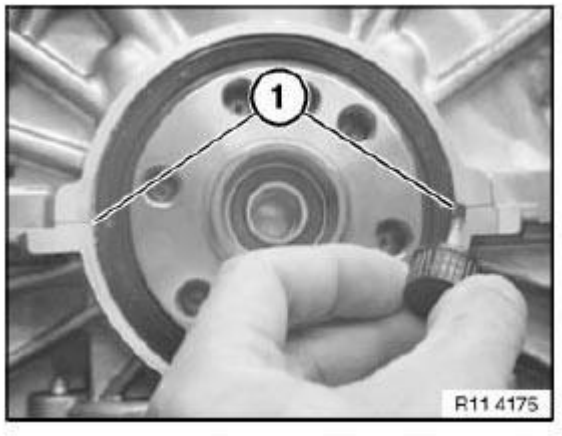


Fig. 185: Stopping Escaping Liquid Sealing Compound With Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Stop (seal off) escaping liquid sealing compound with primer 1.3.

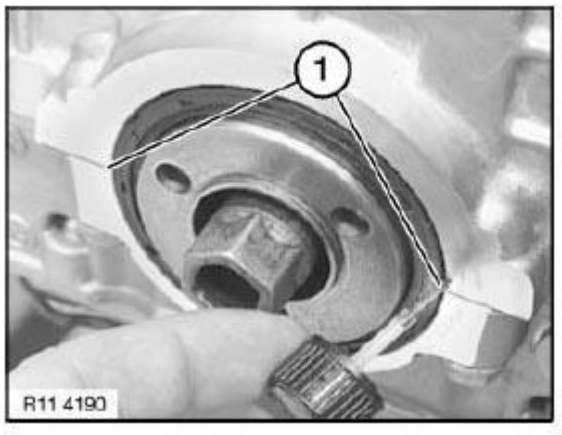


Fig. 186: Stopping Escaping Liquid Sealing Compound With Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

FLYWHEEL

11 22 500 REMOVING AND INSTALLING/REPLACING FLYWHEEL (N54)

Special tools required:

- **11 4 180**
- **11 9 260**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

Necessary preliminary tasks:

- Remove **transmission** .
- Remove **clutch** (except Automatic and DKG.

Enlarge special tool **11 9 260** with slot.

Enlarge slot on special tool **11 9 260** to **8 mm.**

Fig. 187: Identifying Enlarge Slot On Special Tool 11 9 260 To 8 mm
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** , see **FLYWHEEL**

Installation:

The flywheel is secured with a dowel pin.

Fit new flywheel screws.

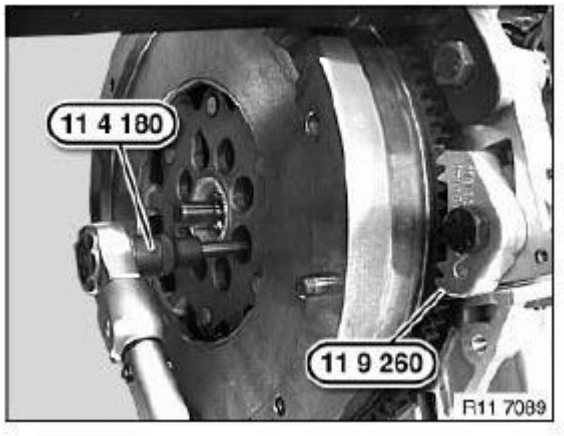


Fig. 188: Releasing Flywheel Screws With Special Tool 11 4 180
Courtesy of BMW OF NORTH AMERICA, INC.

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** , see **FLYWHEEL**

Installation:

The flywheel is secured with a dowel pin.

Fit new flywheel screws.

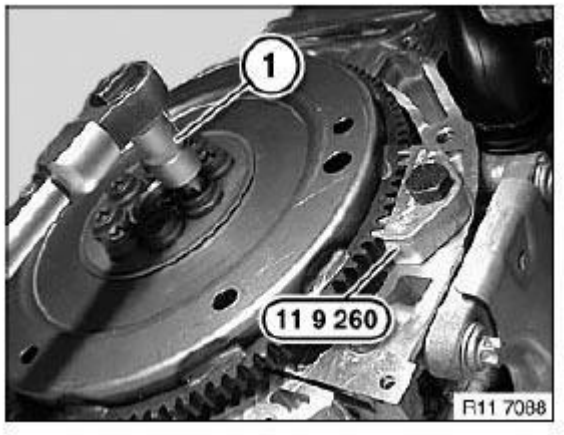


Fig. 189: Releasing Flywheel Screws With Suitable Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

VIBRATION DAMPER

11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (N54)

Necessary preliminary tasks:

- Remove front **underbody protection**
- Remove **drive belt**

Release screws (1).

Tightening torque **11 23 1AZ** , see **VIBRATION DAMPER**

Remove vibration damper (2).

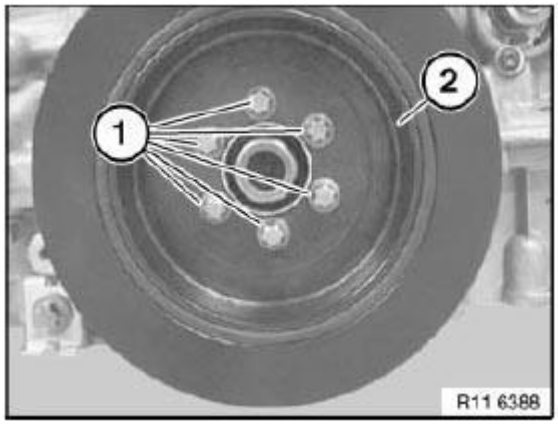


Fig. 190: Identifying Screws And Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CONNECTING ROD WITH BEARING

11 24 571 REPLACING ALL CONNECTING ROD BEARINGS (N54)

Special tools required:

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

See **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS** .

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.

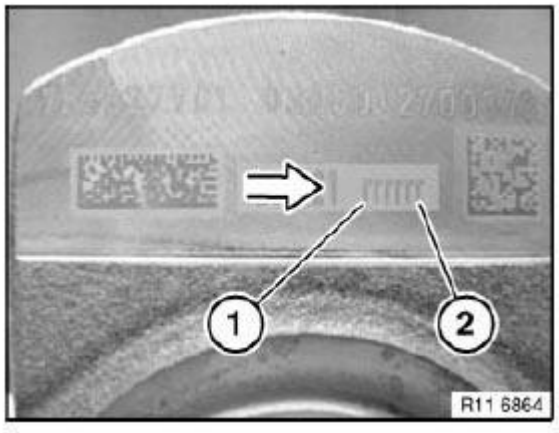


Fig. 191: Identifying Connecting Rod And Connecting Rod Bearing Cap Color
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Example:

Possible classification:

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 conrod bearing shells.

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

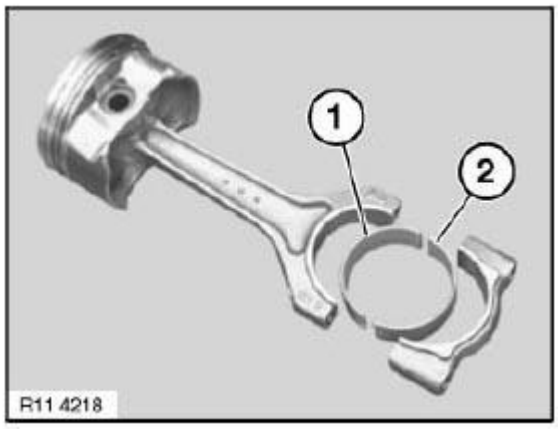


Fig. 192: Identifying Bearing Shell Color
Courtesy of BMW OF NORTH AMERICA, INC.

Check conrod bearing clearance.

Piston in BDC position.

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

Fit bearing cap so that pairing letters match up.

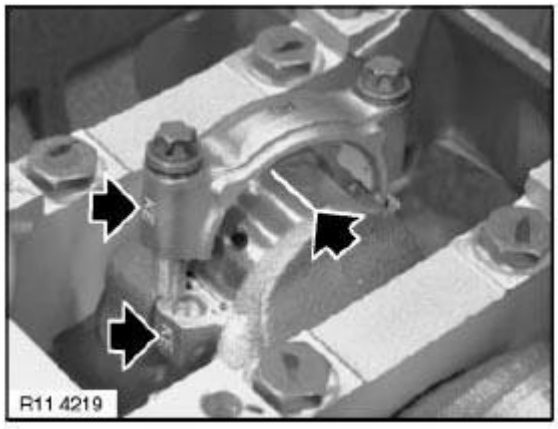


Fig. 193: Identifying Bearing Cap Pairing Letters

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not distort conrods or crankshaft.

Use the old conrod bolts to check conrod clearance.

Tighten down conrod bolts with special tool **00 9 120** .

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

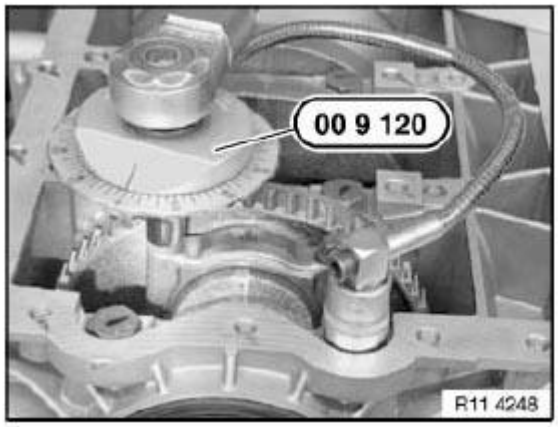


Fig. 194: Tightening Down Conrod Bolts With Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

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

Conrod bearing clearance.

- Remove plastic thread.
- Coat crankshaft and bearing shells with oil.
- Install new conrod bolts and tighten down with special tool **00 9 120** .

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

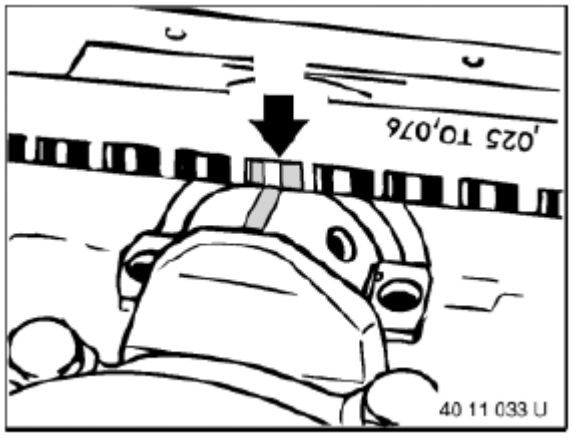


Fig. 195: Reading Off Bearing Clearance At Width Of Crushed Plastic Thread With Aid Of Measuring Scale
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

PISTON WITH RINGS AND PIN

11 25 530 REMOVING AND INSTALLING/REPLACING ALL PISTONS (N54)

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**

See **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS** .

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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 **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.

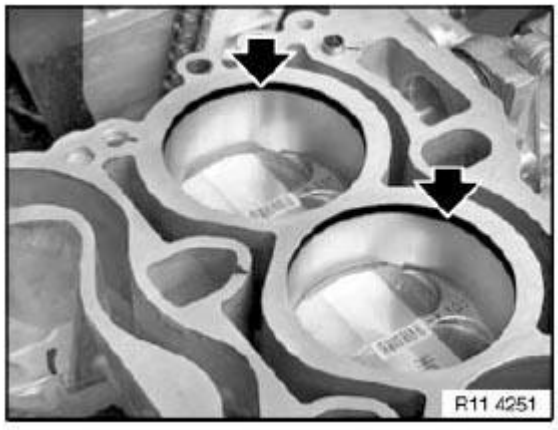


Fig. 196: Locating Oil Carbon Residue
Courtesy of BMW OF NORTH AMERICA, INC.

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

Oil spray nozzle (2) must not be maladjusted or bent.

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

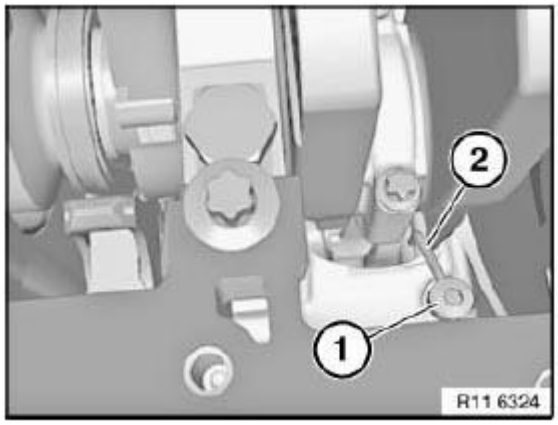


Fig. 197: Identifying Screw And Oil Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Release connecting rod bolts (1).

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

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.

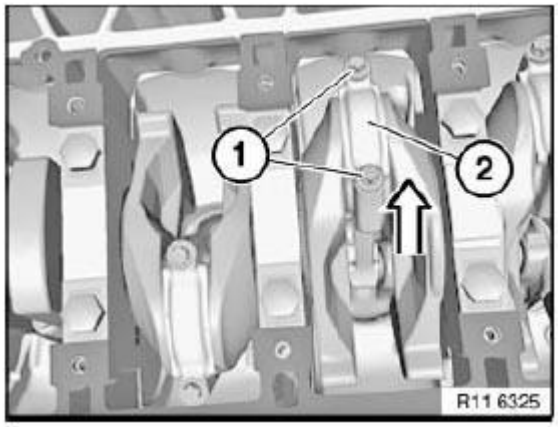


Fig. 198: Identifying Connecting Rod Bolts And Connecting Rod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

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.

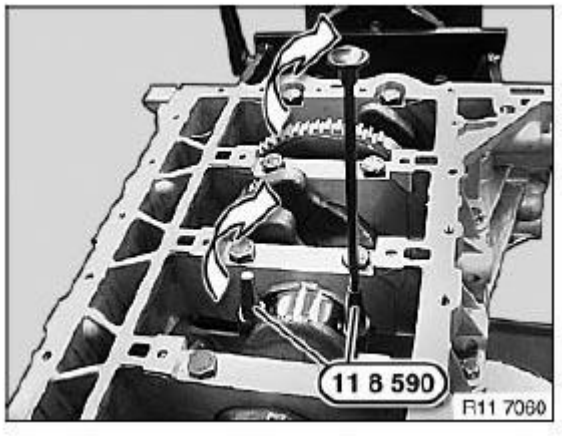


Fig. 199: Identifying Special Tool 11 8 590
Courtesy of BMW OF NORTH AMERICA, INC.

Preliminary work:

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

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

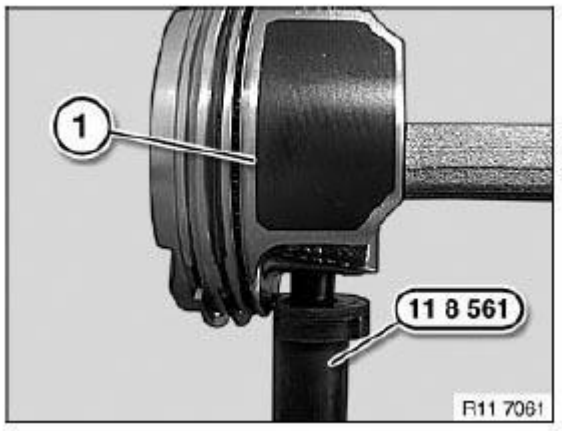


Fig. 200: Identifying Piston And Special Tool 11 8 561
Courtesy of BMW OF NORTH AMERICA, INC.

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.

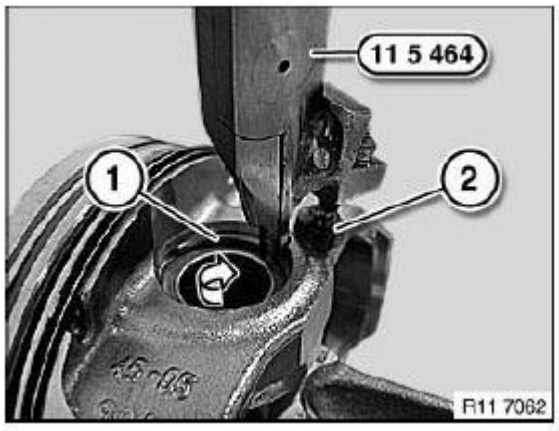


Fig. 201: Removing Piston Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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.

Installation:

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

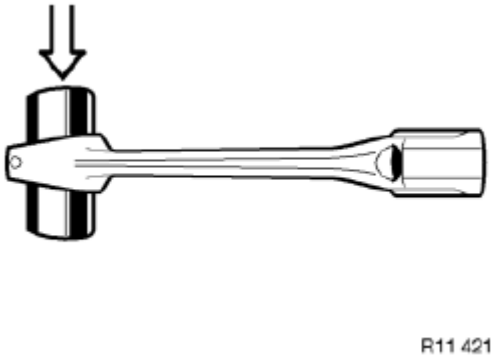


Fig. 202: Identifying Gudgeon Pin And Connecting Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Measuring **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 gudgeon pin.

Piston diameter at measuring point A.

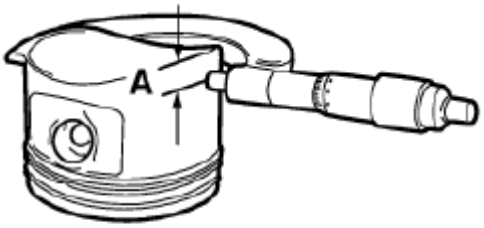


Fig. 203: Measuring Piston Diameter With Micrometer At Measuring Point A From Bottom Edge Of Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust micrometer to cylinder bore of engine block. Set internal calliper 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 .

Installation:

If necessary, replace piston.

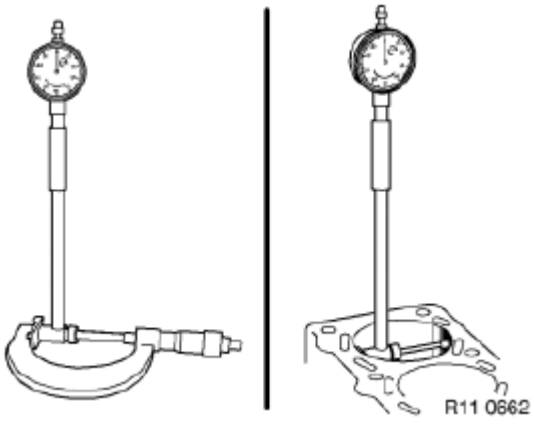


Fig. 204: Measuring Bottom, Centre And Top Of Cylinder Bore In Direction Of Travel And Direction Of Engine Rotation
Courtesy of BMW OF NORTH AMERICA, INC.

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).

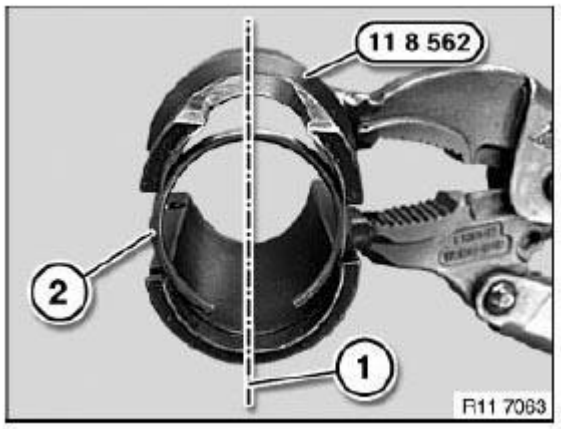


Fig. 205: Bring Piston Circlip Into Assembly Position
Courtesy of BMW OF NORTH AMERICA, INC.

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.

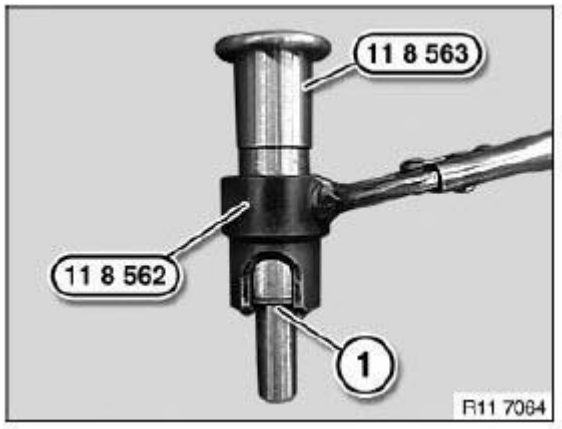


Fig. 206: Sliding Special Tool 11 8 563 Up To Piston Pin Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

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.

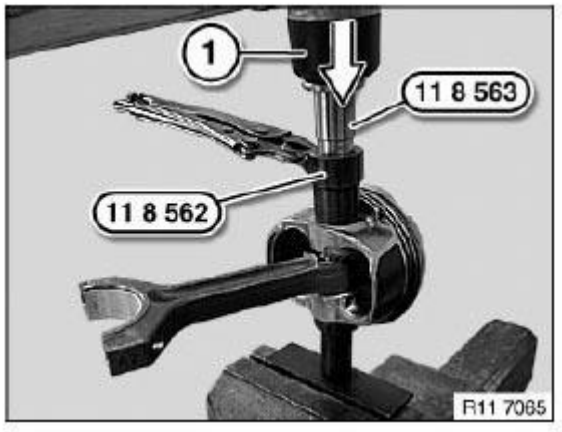


Fig. 207: Installing Piston Pin Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

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

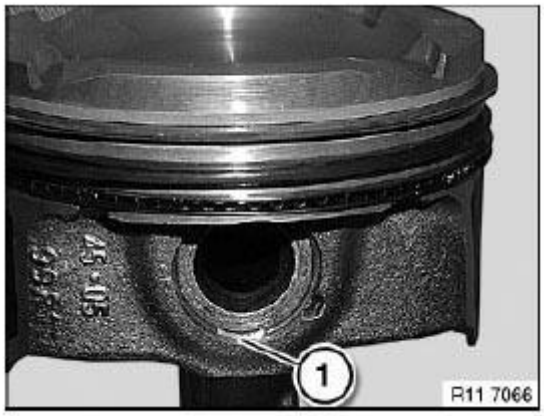


Fig. 208: Identifying Piston Pin Circlip Opening Points
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: B 30.
Install 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).

Installation:

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

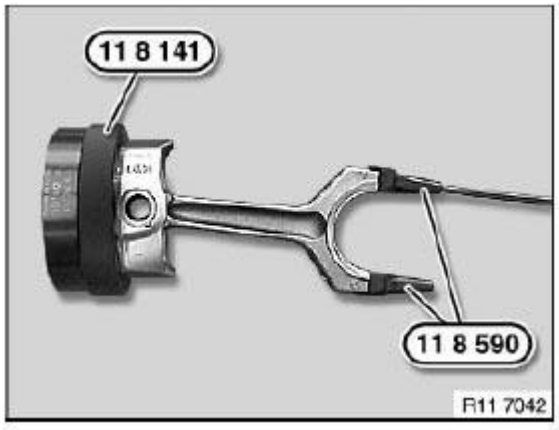


Fig. 209: Identifying Special Tools (11 8 141, 11 8 590)
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

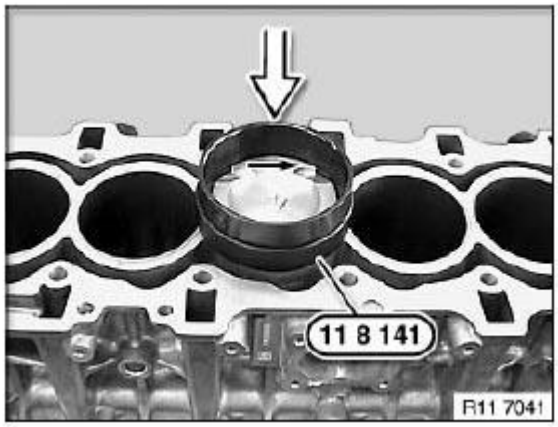


Fig. 210: Identifying Special Tool 11 8 141
Courtesy of BMW OF NORTH AMERICA, INC.

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.

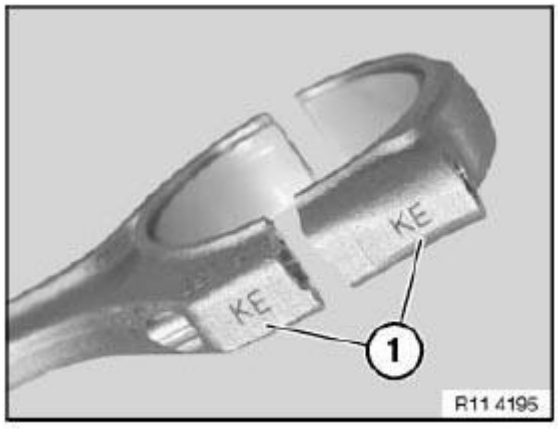


Fig. 211: Identifying Connecting Rod And Connecting Rod Bearing Cap Mark
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a light coat of oil to crank pin.

Assemble connecting rod and crank pin.

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

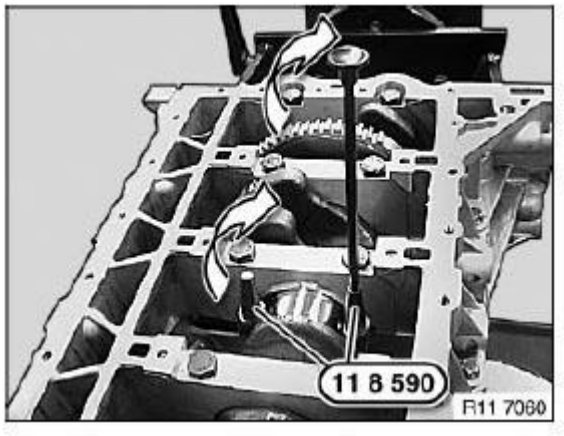


Fig. 212: Identifying Special Tool 11 8 560
Courtesy of BMW OF NORTH AMERICA, INC.

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

Install new connecting rod bolts (1).

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

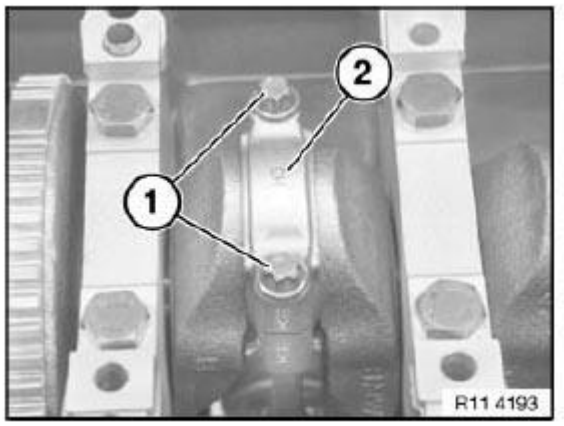


Fig. 213: Identifying Bearing Caps And Connecting Rod Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust torsion angle of conrod with special tool **00 9 120**

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

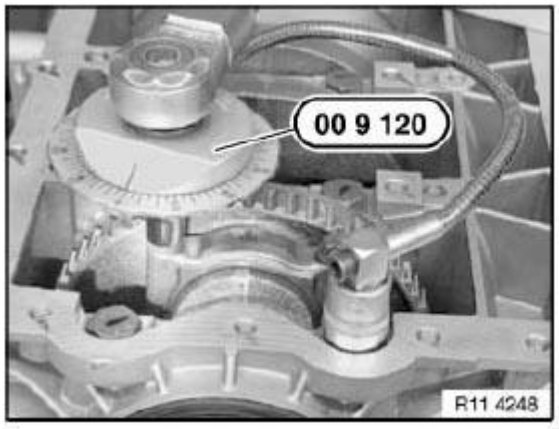


Fig. 214: Adjusting Torsion Angle Of Conrod With Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 25 671 REPLACING PISTON RINGS ON ALL PISTONS (N54)

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.

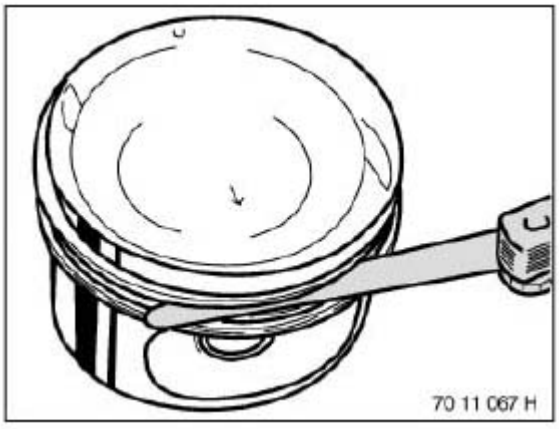


Fig. 215: Measuring Axial Clearance Of Piston Rings In Piston Ring Groove
Courtesy of BMW OF NORTH AMERICA, INC.

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.

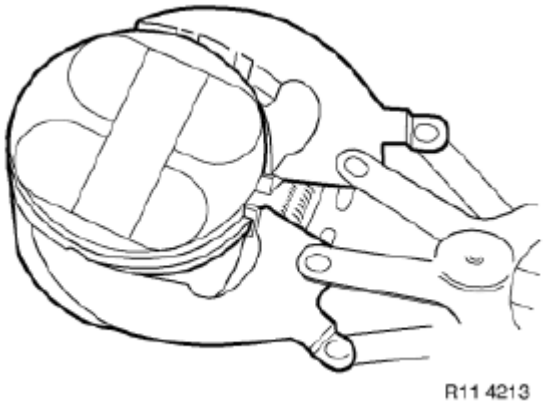


Fig. 216: Removing Compression Ring And Stepped Ring Upwards With Piston Ring Pliers
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

Determine **gap** with a feeler gauge.

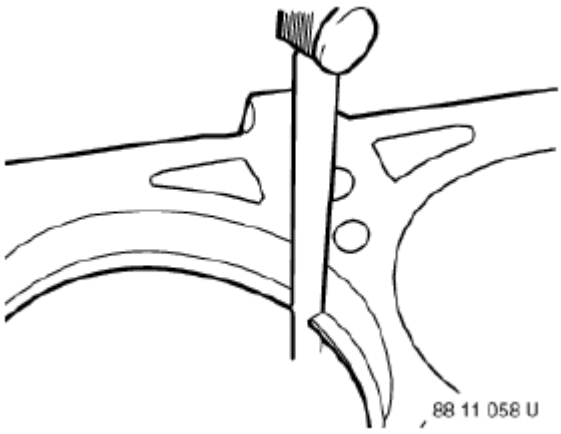


Fig. 217: Measuring Ring End Gap
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic representation of piston rings.

Installation:

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

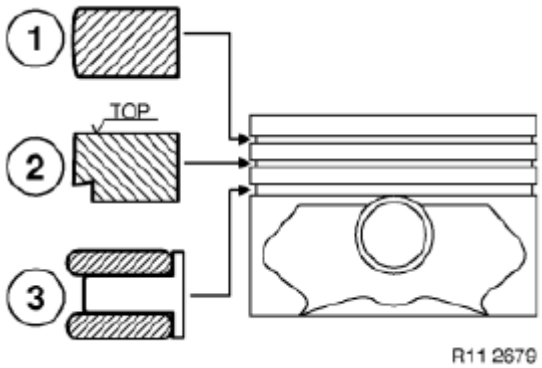


Fig. 218: Identifying Piston Ring Top Identification
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

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

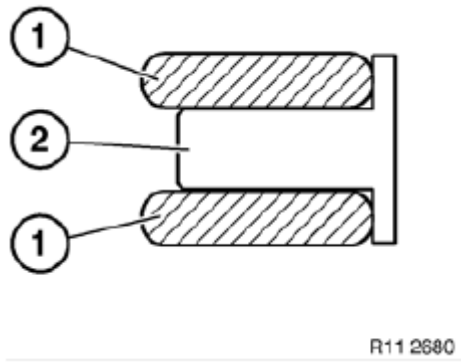


Fig. 219: Identifying Support Spring And Steel Band Rings
Courtesy of BMW OF NORTH AMERICA, INC.

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

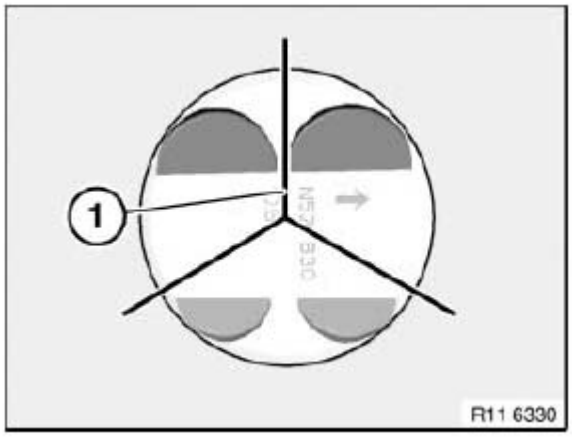


Fig. 220: Identifying Contact Points
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

V-RIBBED BELT WITH TENSIONER

11 28 010 REPLACING ALTERNATOR DRIVE BELT (N54)

Special tools required:

- **11 3 340**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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** . See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N54)** .

Unfasten hose clip (1).

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

Pull off air hose (2).

Installation:

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

Recirculated air hose must audibly snap into place.

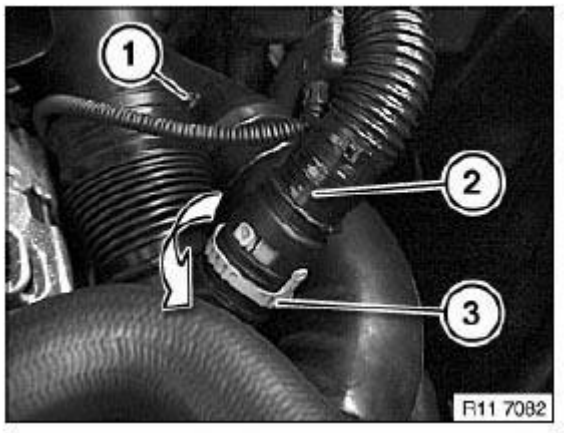


Fig. 221: Identifying Hose Clip, Air Hose And Quick-Connect Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

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

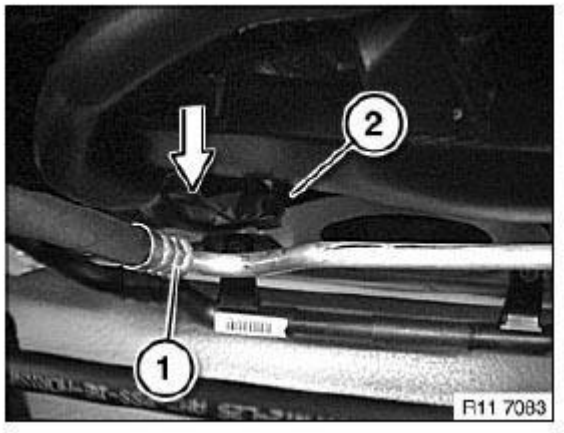


Fig. 222: Identifying Line And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

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

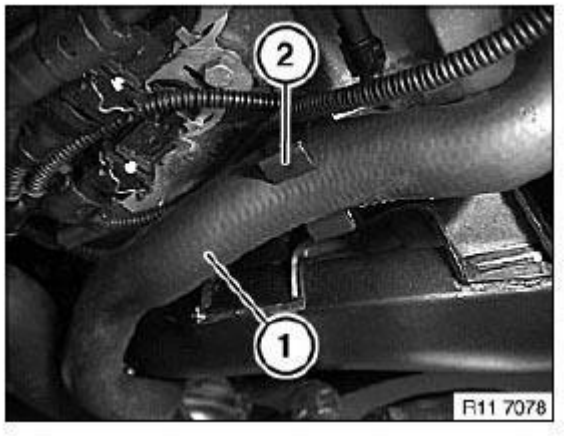


Fig. 223: Identifying Coolant Hose And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Fold air duct (2) down.

NOTE: Do not remove air duct (2).

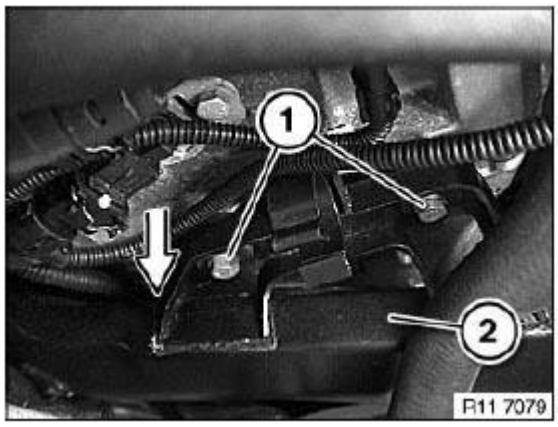


Fig. 224: Identifying Screw And Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

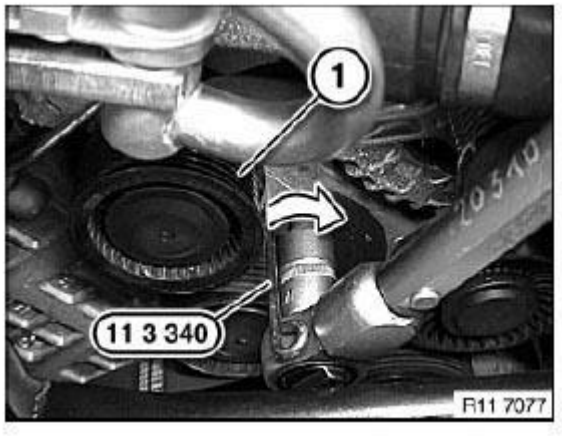


Fig. 225: Identifying Belt Tensioner And Special Tool 11 3 340
Courtesy of BMW OF NORTH AMERICA, INC.

Remove drive belt (1).

Installation:

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

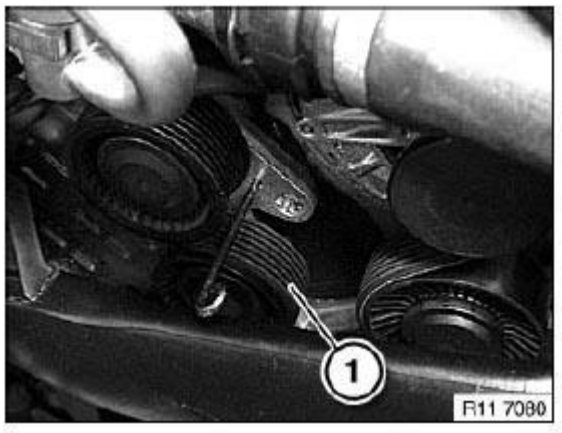


Fig. 226: Identifying Drive Belt
Courtesy of BMW OF NORTH AMERICA, INC.

Pretension tensioning pulley (1) in direction of arrow.

Remove special tool **11 3 340** .

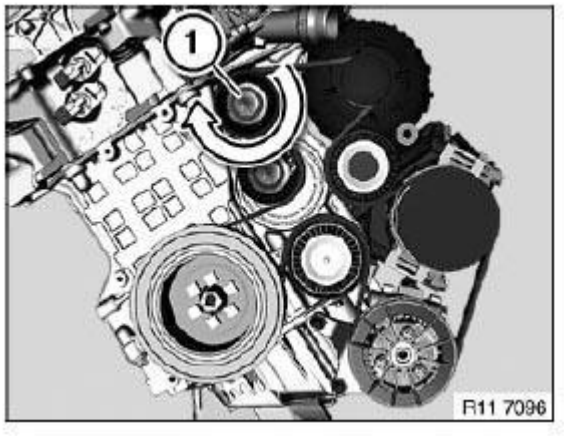


Fig. 227: Identifying Tensioning Pulley
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Note arrangement of drive belt

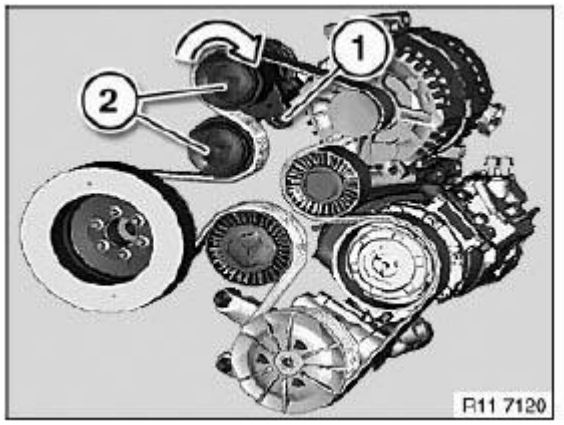


Fig. 228: Identifying Drive Belt Routing
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Installation:

Risk of damage!

Check that drive belt is in correct installation position.

Belt drive system E71

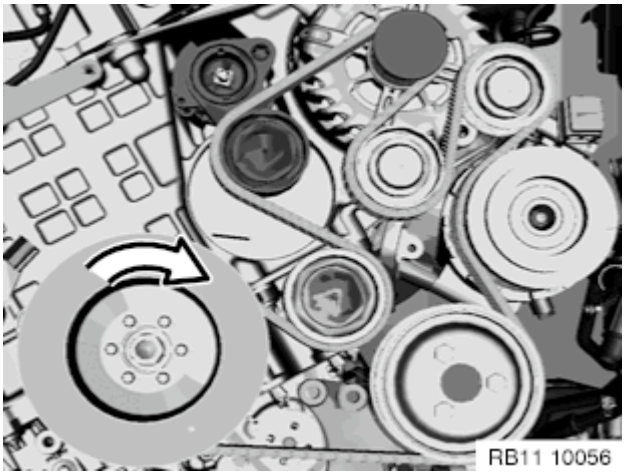


Fig. 229: Identifying Drive Belt Routing (E71)
Courtesy of BMW OF NORTH AMERICA, INC.

11 28 020 REPLACE ALTERNATOR DRIVE BELT TENSIONER (N54)

Special tools required:

- **11 3 340**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

Necessary preliminary tasks:

- Remove **drive belt**

Remove special tool **11 3 340** .

Release screw on belt tensioner.

Tightening torque **11 28 1AZ** , see **11 28 V-RIBBED BELT WITH TENSION AND DEFLECTION ELEMENT**

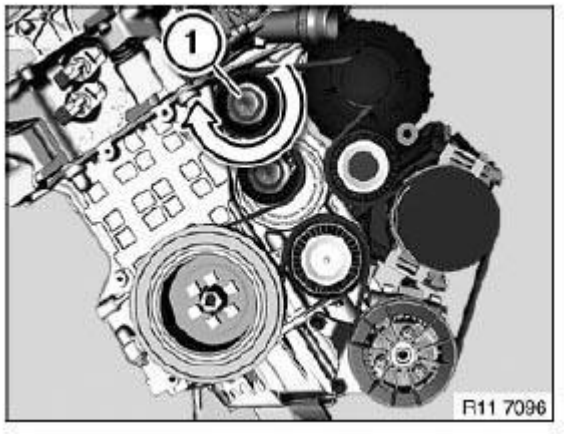


Fig. 230: Identifying Screw On Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CAMSHAFT

11 31 005 CHECKING CAMSHAFT TIMING (N54)

Special tools required:

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

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

Necessary preliminary tasks:

- Remove **cylinder head cover**
- Remove front **underbody protection**

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

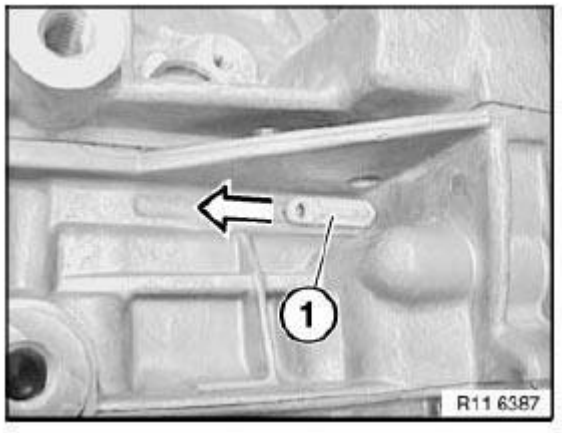


Fig. 231: Identifying Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

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

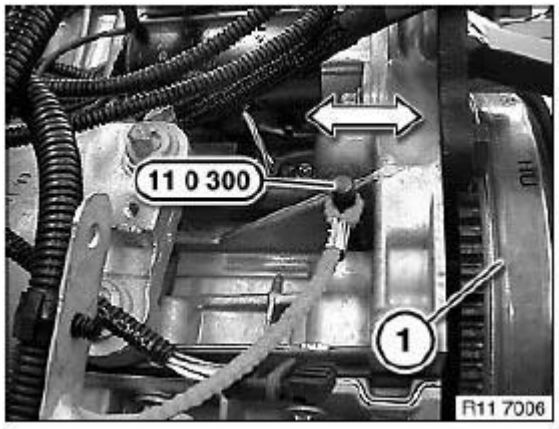


Fig. 232: Identifying Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

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

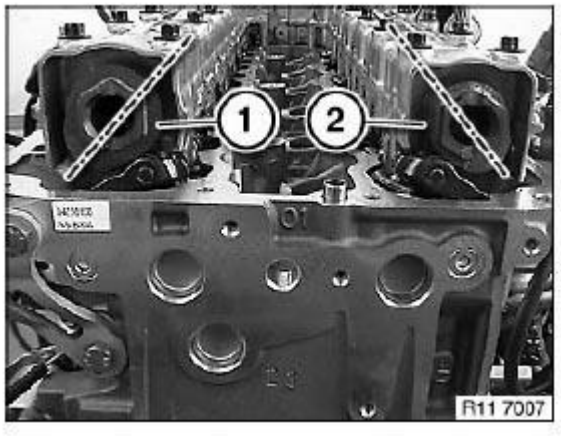


Fig. 233: Identifying Cams Of Inlet Camshaft And Cams Of Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

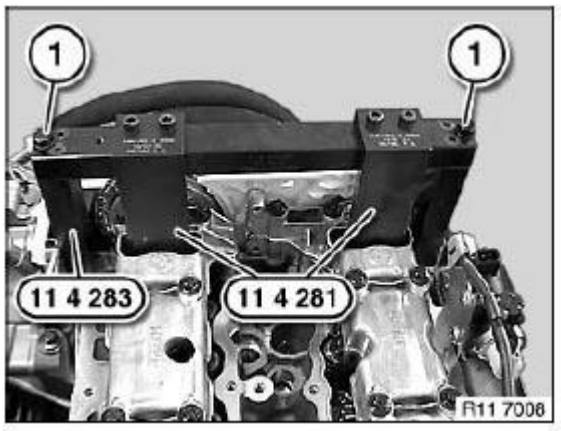


Fig. 234: Identifying Screws Secure Special Tool 11 4 283 On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

11 31 025 REMOVING AND INSTALLING OR REPLACING INLET CAMSHAFT (N54)

Special tools required:

- **00 9 120**
- **11 4 350**

- **11 8 550**
- **11 8 551**
- **11 8 552**
- **11 8 553**
- **11 9 000**

See **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS** .

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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 inlet 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.

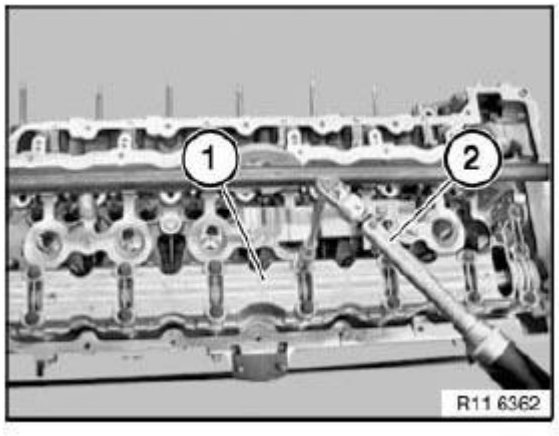


Fig. 235: Removing Bearing Cap Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Remove upper bearing shell.

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

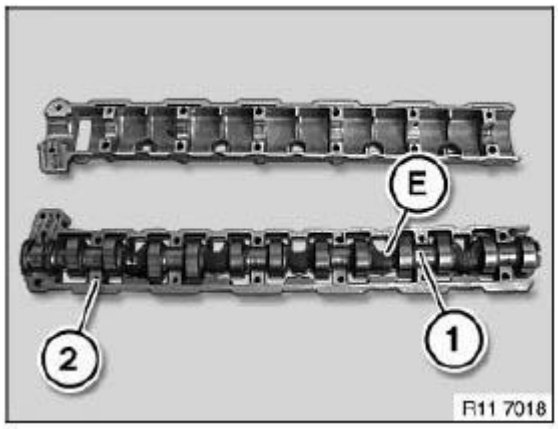


Fig. 236: Identifying Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

A Exhaust camshaft
E Inlet camshaft

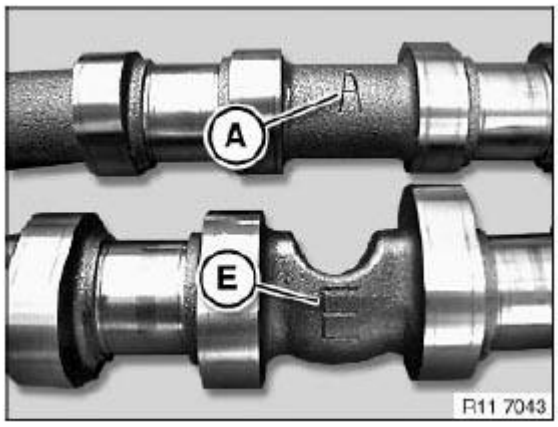


Fig. 237: Identifying Camshaft Markings
Courtesy of BMW OF NORTH AMERICA, INC.

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

Plain compression rings (1) are engaged at joint.

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

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

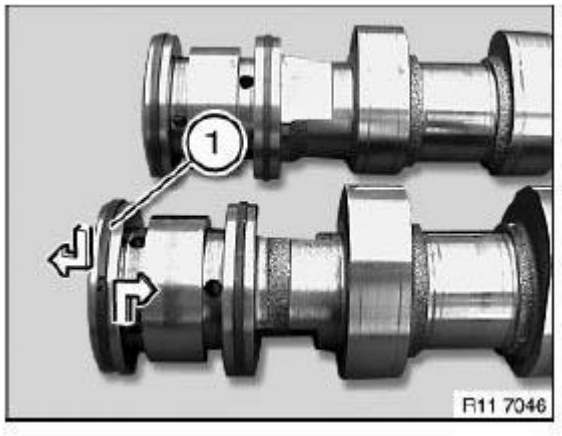


Fig. 238: Checking Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Removal on engine:
Engine at cylinder no. 1 firing TDC position.
Removed cylinder head:
When using special tool 11 9 000, it will be necessary to remove the aluminum profile insert.

Installing camshaft bearing bank:

Pre-install special tool 11 8 551 on cylinder nos. 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 = Inlet side

A = Exhaust side

Press down roller cam follower on cylinder no. 3 with spindle nut (2) of special tool 11 8 551.

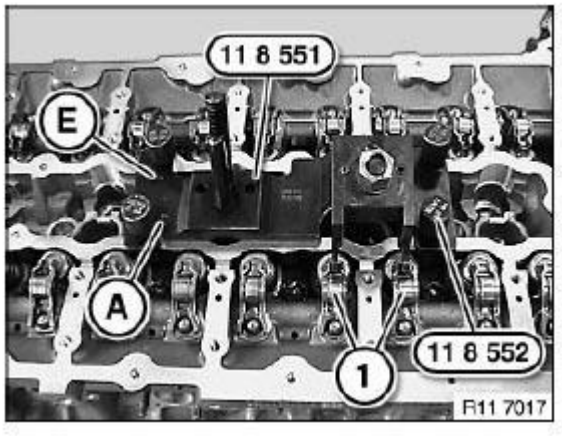


Fig. 239: Identifying Spindle Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

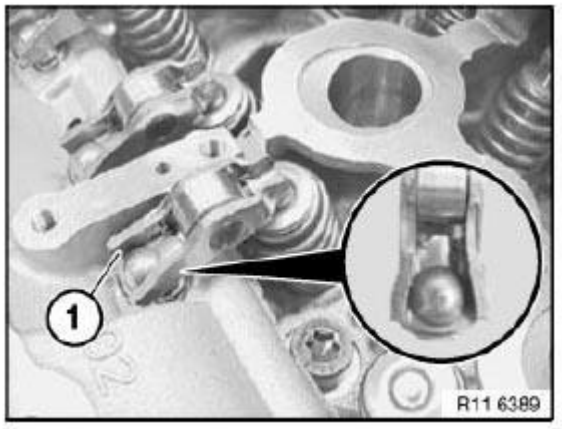


Fig. 240: Identifying Roller Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Pre-install bearing strip of inlet camshaft.

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

Installation:

Lay inlet camshaft (1) in bearing strip.

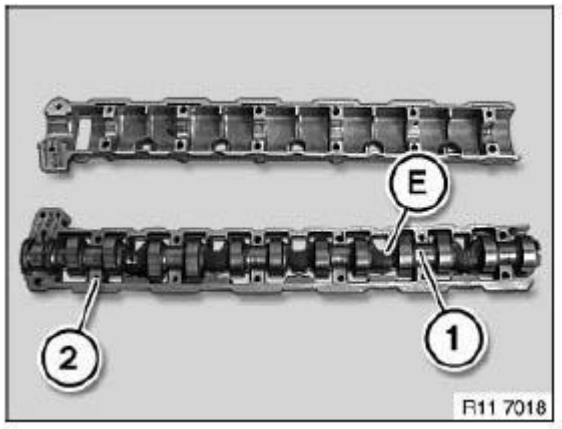


Fig. 241: Lay Inlet Camshaft (1) In Bearing Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate inlet camshaft (1) at cylinder no. 1 into position (2).

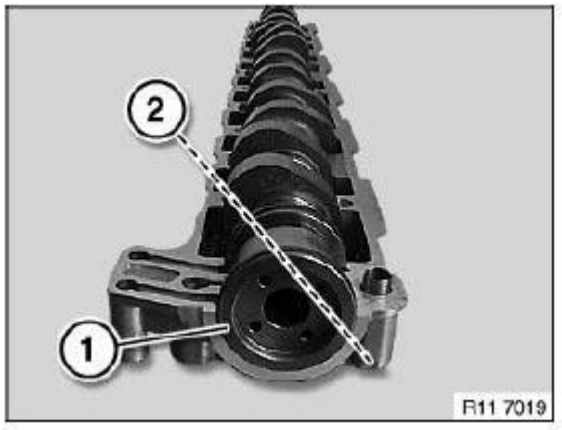


Fig. 242: Rotate Inlet Camshaft (1) At Cylinder No. 1 Into Position
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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.

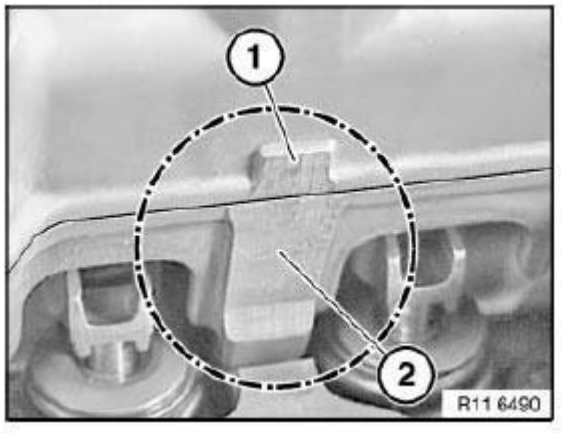


Fig. 243: Identifying Lower And Upper Bearing Banks Aligned To Each Other At Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

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.

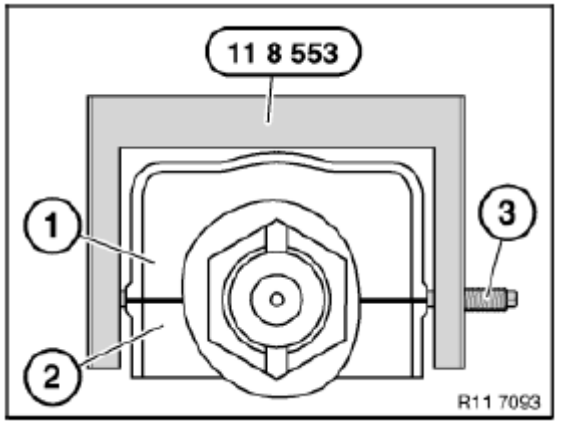


Fig. 244: Schematic Depiction Of Special Tool 11 8 553 At Lower Bearing Bank And Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

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).

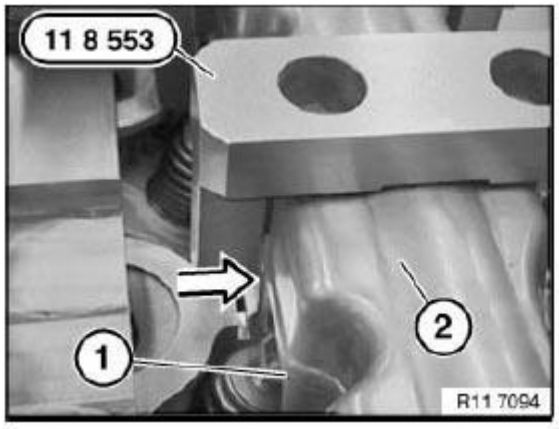


Fig. 245: Ensure Legs Come Into Exact Contact On Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

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.

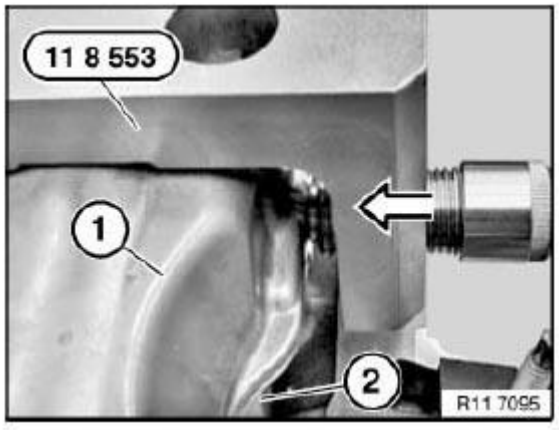


Fig. 246: Initially Tighten Screw Of Special Tool 11 8 553 To Ground Surfaces Of Lower Bearing Bank (1) And Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

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

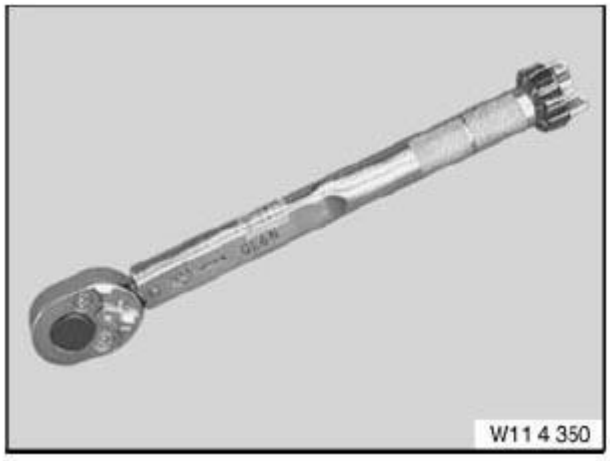


Fig. 247: Identifying Special Tool 11 4 350
Courtesy of BMW OF NORTH AMERICA, INC.

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.

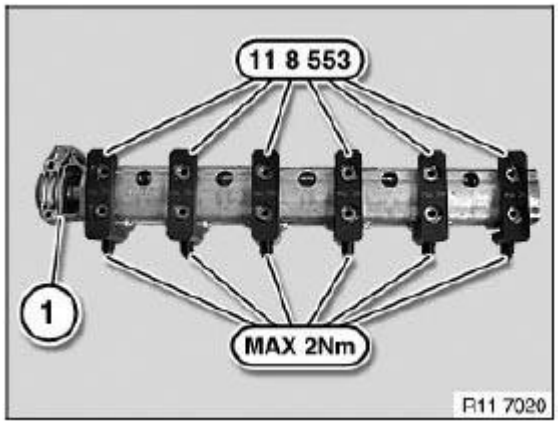


Fig. 248: Identifying Bearing Strips And Special Tool 11 8 553
Courtesy of BMW OF NORTH AMERICA, INC.

Install inlet camshaft with bearing banks (1) on cylinder head.

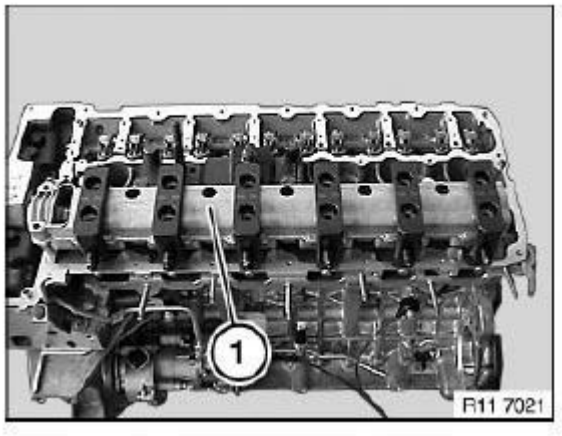


Fig. 249: Identifying Bearing Banks On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Check position of intake camshaft (1) at cylinder no. 6.

Roller cam follower (2) is not actuated.

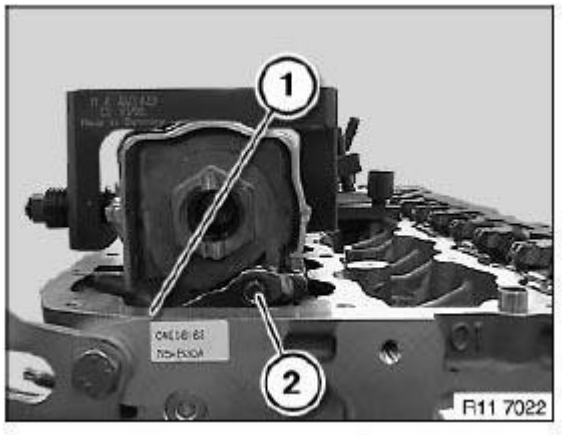


Fig. 250: Identifying Intake Camshaft And Roller Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

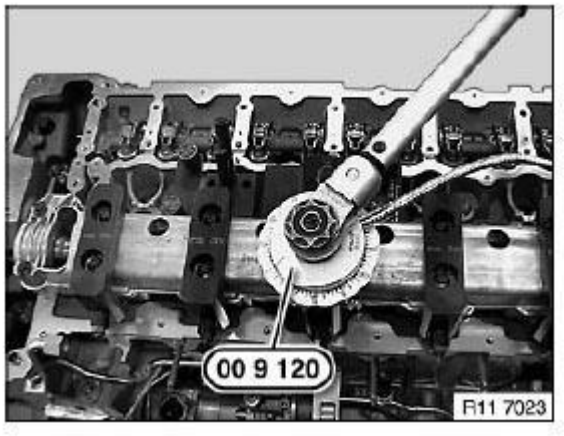


Fig. 251: Tightening Lower And Upper Bearing Banks With Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust valve timing.

Assemble engine.

11 31 028 REMOVING AND INSTALLING OR REPLACING EXHAUST CAMSHAFT (N54)

Special tools required:

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

See **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS** .

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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 adjusting 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.

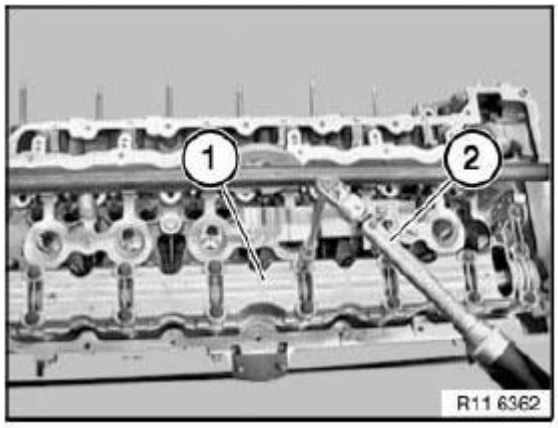


Fig. 252: Removing Bearing Cap Screw
Courtesy of BMW OF NORTH AMERICA, INC.

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

A Exhaust camshaft.
E Inlet camshaft

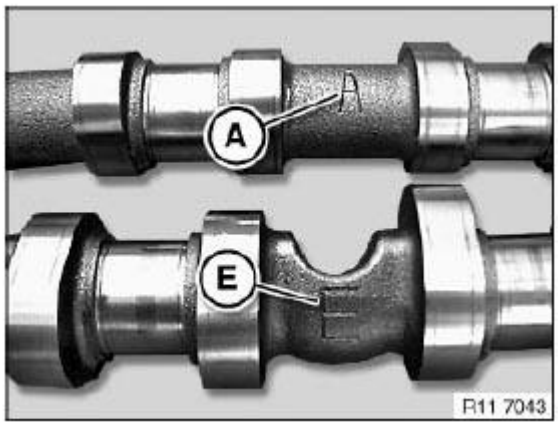


Fig. 253: Identifying Camshaft Markings
Courtesy of BMW OF NORTH AMERICA, INC.

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

Plain compression rings (1) are engaged at joint.

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

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

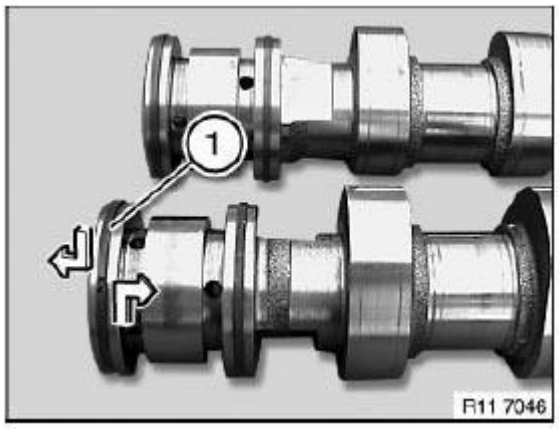


Fig. 254: Checking Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Removal on engine:
Engine at cylinder no. 1 firing TDC position.
Removed cylinder head:
When using special tool 11 9 000, it will be necessary to remove the aluminum profile insert.

Installation:

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

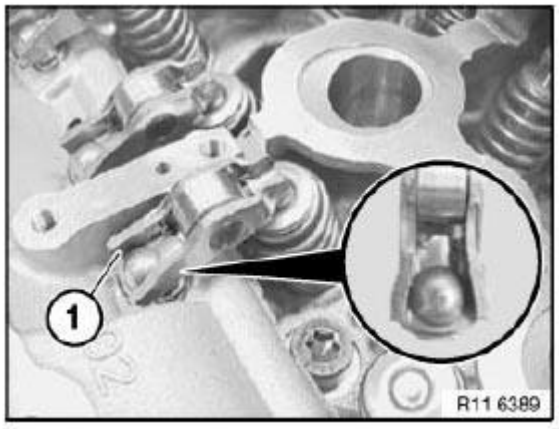


Fig. 255: Identifying Roller Cam Follower

Courtesy of BMW OF NORTH AMERICA, INC.

Installing camshaft bearing bank

Pre-install special tool 11 8 551 on cylinder no. 2.

Observe markings E and A

E: Inlet 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.

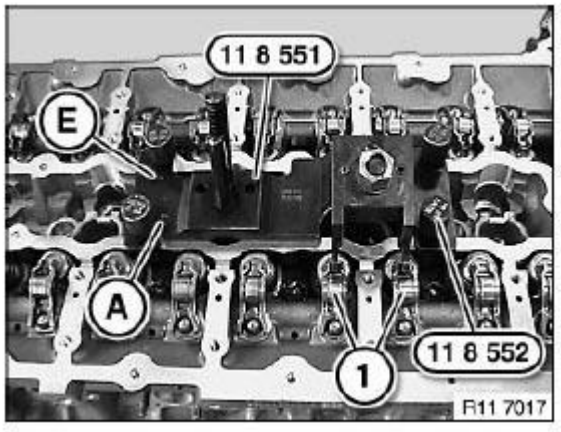


Fig. 256: Identifying Roller Cam Follower And Special Tool 11 8 551
Courtesy of BMW OF NORTH AMERICA, INC.

Lay lower bearing strip (1) on cylinder head.

Installation:

Lubricate all bearing points with engine oil.

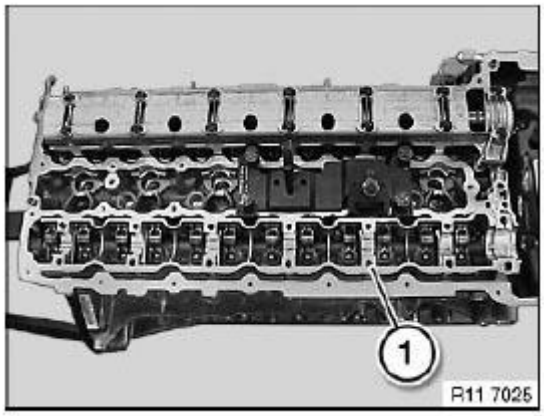


Fig. 257: Lay Lower Bearing Strip (1) On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Insert exhaust camshaft (1) in lower bearing bank.

Installation:

Lubricate all bearing positions and cams with engine oil.

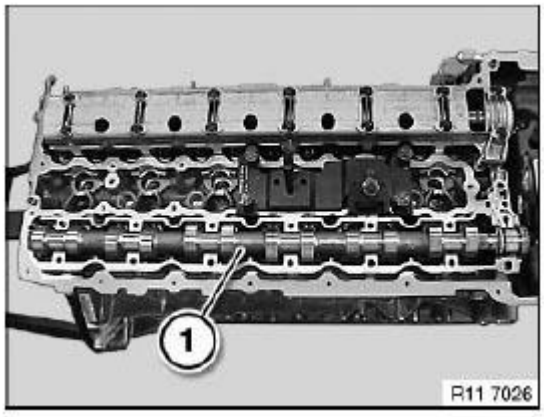


Fig. 258: Identifying Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation position (1) of exhaust camshaft (2) at cylinder no. 1.

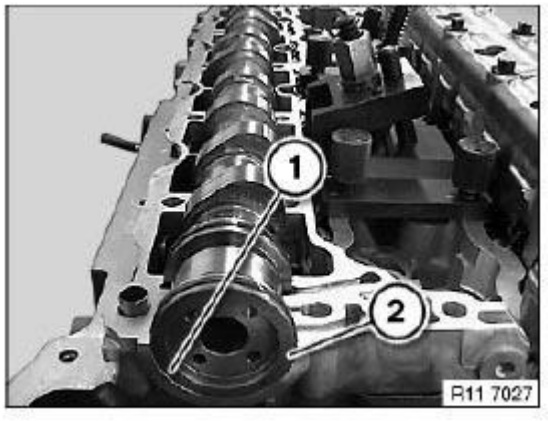


Fig. 259: Identifying Installation Position Of Exhaust Camshaft At Cylinder No. 1
Courtesy of BMW OF NORTH AMERICA, INC.

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 cylinder no. 6.

Roller cam follower (1) is not actuated.

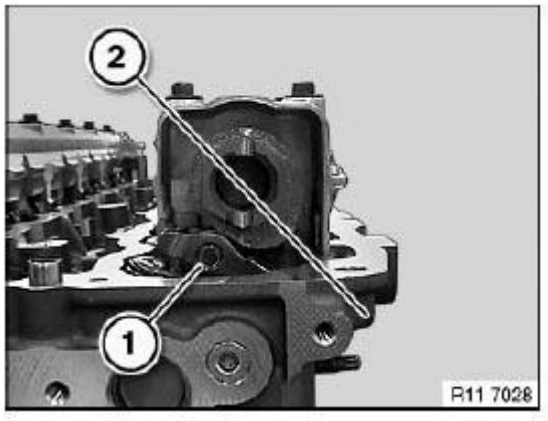


Fig. 260: Identifying Roller Cam Follower And Position Of Exhaust Camshaft At Cylinder No. 6
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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.

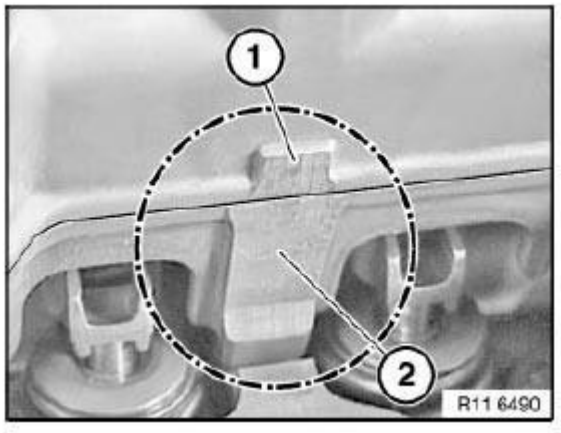


Fig. 261: Identifying Lower And Upper Bearing Banks Aligned To Each Other At Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

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.

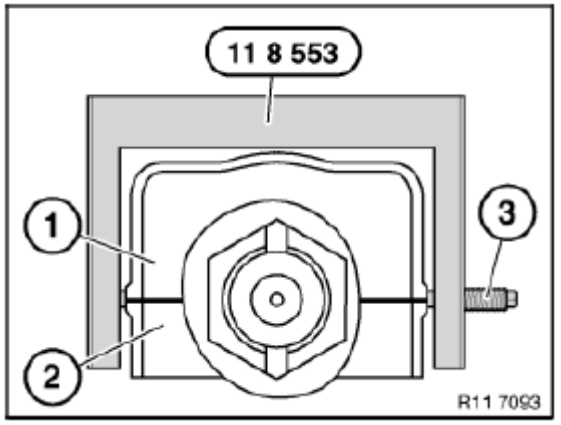


Fig. 262: Schematic Depiction Of Special Tool 11 8 553 At Upper Bearing Bank And Lower Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

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).

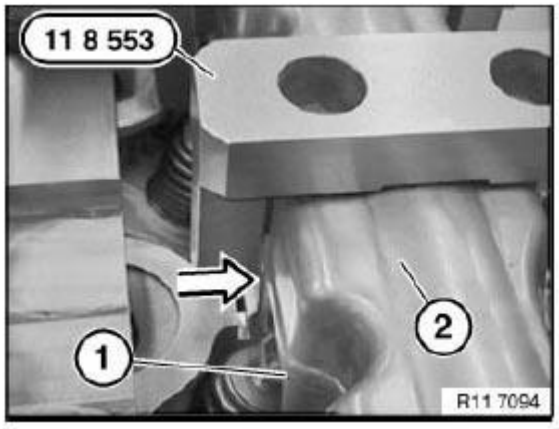


Fig. 263: Identifying Lower Bearing Bank And Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

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.

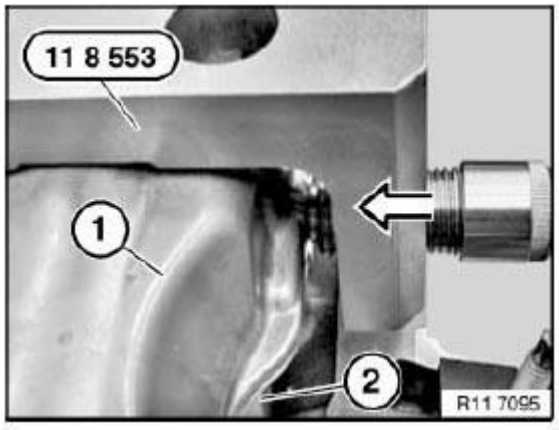


Fig. 264: Identifying Special Tool 11 8 553, Lower Bearing Bank And Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

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

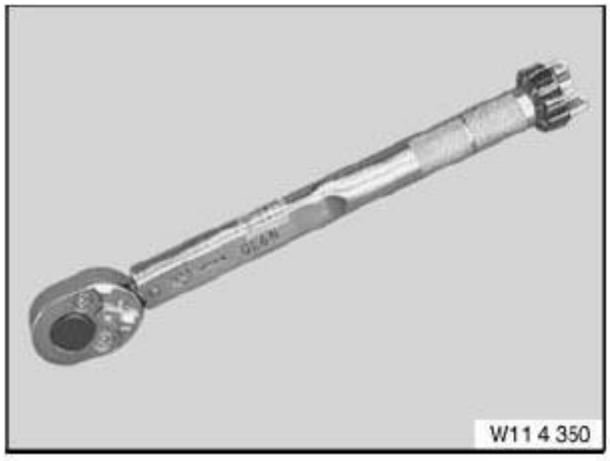


Fig. 265: Identifying Special Tool 11 4 350
Courtesy of BMW OF NORTH AMERICA, INC.

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.

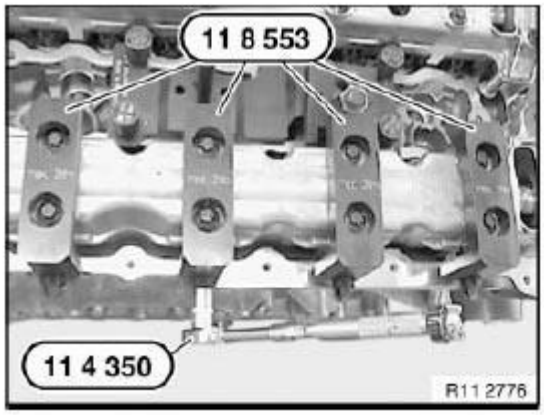


Fig. 266: Identifying Special Tools (11 8 553, 11 4 350)
Courtesy of BMW OF NORTH AMERICA, INC.

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, see **11 31 CAMSHAFT**

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

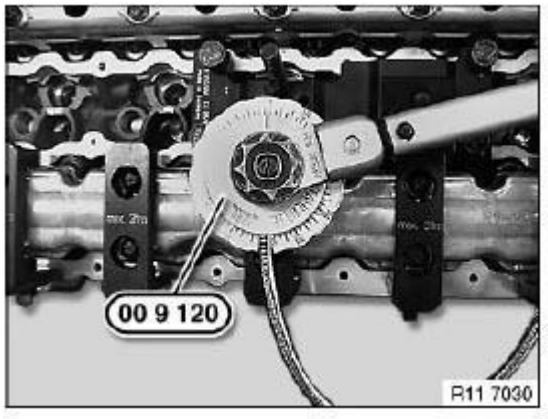


Fig. 267: Tightening Lower And Upper Bearing Banks With Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 051 REPLACING TIMING CHAIN (N54)

Special tools required:

- **00 9 140**
- **11 0 300**
- **11 4 280**
- **11 8 180**
- **11 8 660**
- **11 9 260**

See **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS** .

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

Necessary preliminary tasks:

- Remove **fan cowl** . See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N54)** .
- 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:

Install fastener (1) with bore facing outwards.

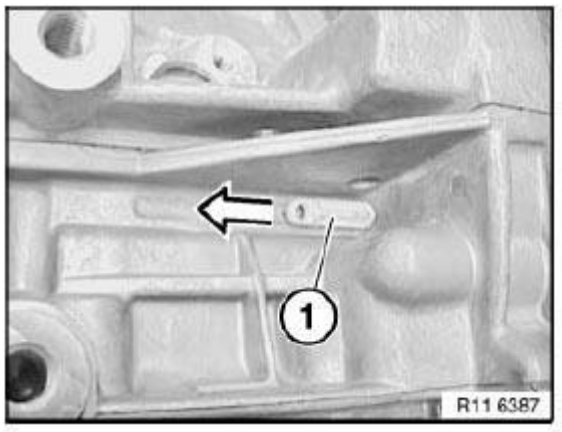


Fig. 268: Identifying Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Secure engine in firing TDC position of cylinder no. 1 with special tool **11 0 300** .

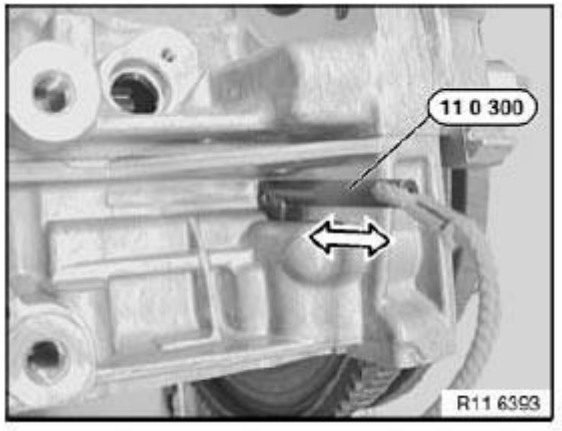


Fig. 269: Identifying Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: Picture shows automatic transmission.

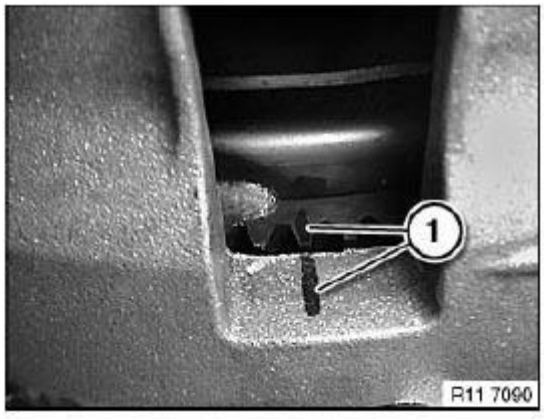


Fig. 270: Identifying Flywheel And Transmission Housing Marking Line
Courtesy of BMW OF NORTH AMERICA, INC.

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

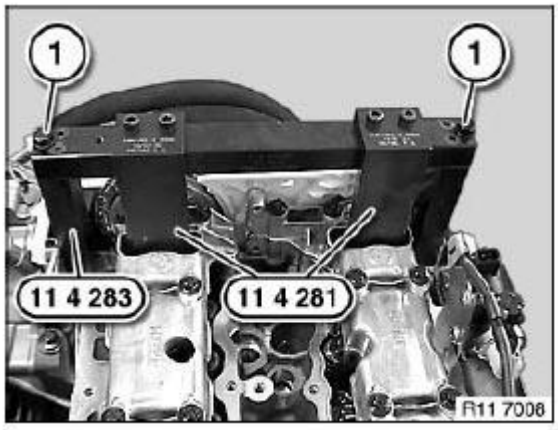


Fig. 271: Identifying Special Tool 11 4 280
Courtesy of BMW OF NORTH AMERICA, INC.

Procedure, transmission removed.

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

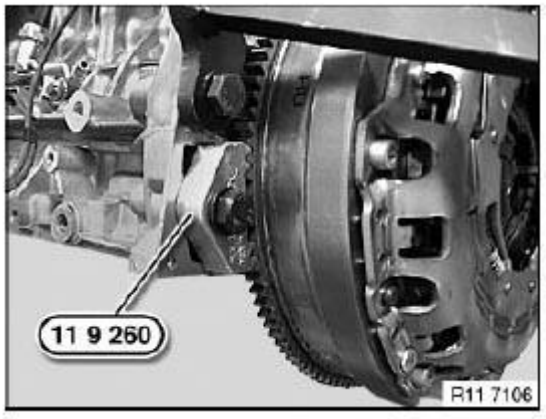


Fig. 272: Identifying Special Tool 11 9 260
Courtesy of BMW OF NORTH AMERICA, INC.

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

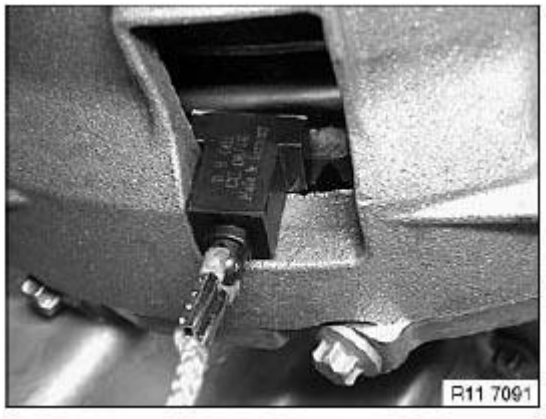


Fig. 273: Identifying Special Tool 11 8 660
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tool **11 8 180** on manual transmission with bolts (1).

Secure flywheel in direction of arrow.

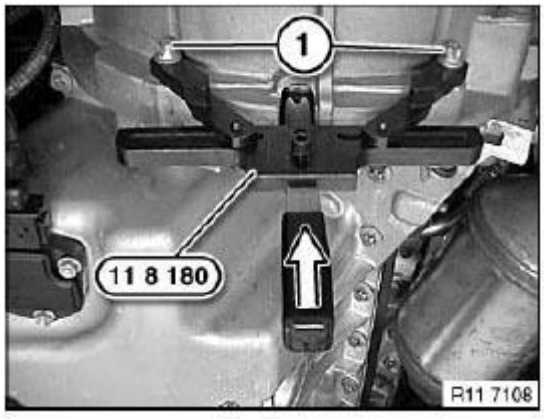


Fig. 274: Identifying Special Tool 11 8 180 And Manual Transmission Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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** , see **11 21 CRANKSHAFT AND BEARINGS**

Remove central bolt with hub towards front.

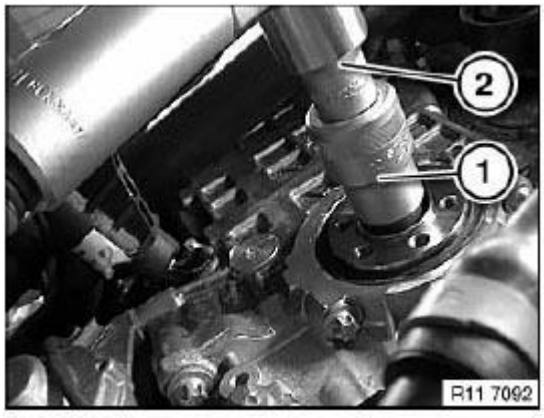


Fig. 275: Identifying 3/4" Socket And A 3/4" Extension
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque **11 31 6AZ** , see **11 31 CAMSHAFT**

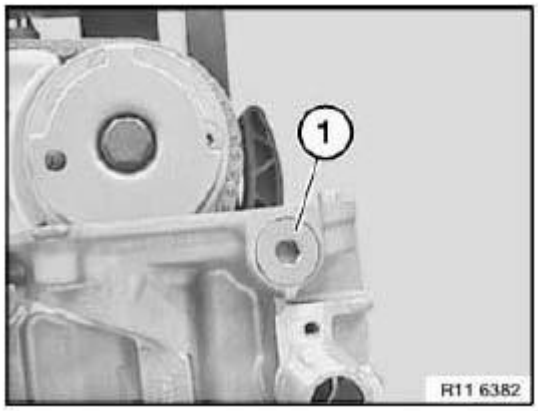


Fig. 276: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque **11 31 6AZ** , see **11 31 CAMSHAFT**

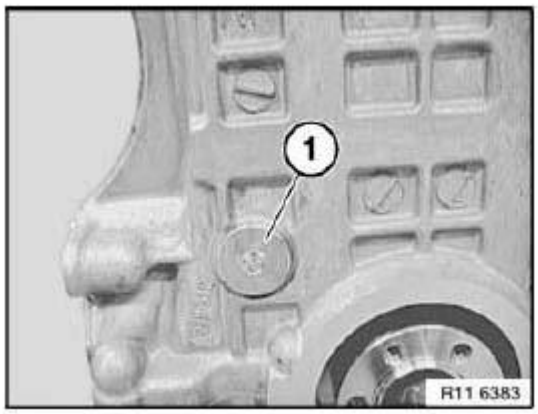


Fig. 277: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on chain drive at top.

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

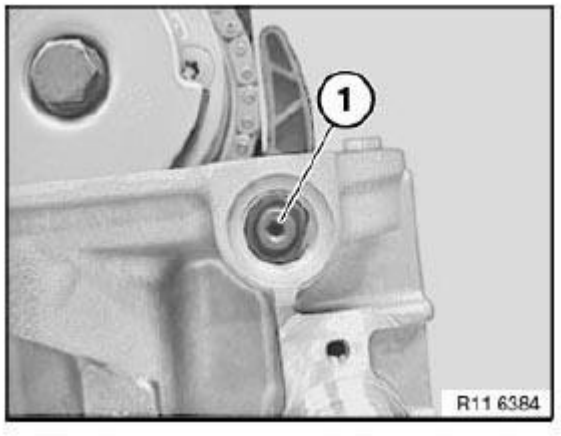


Fig. 278: Identifying Screw On Chain Drive At Top
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on chain drive at bottom.

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

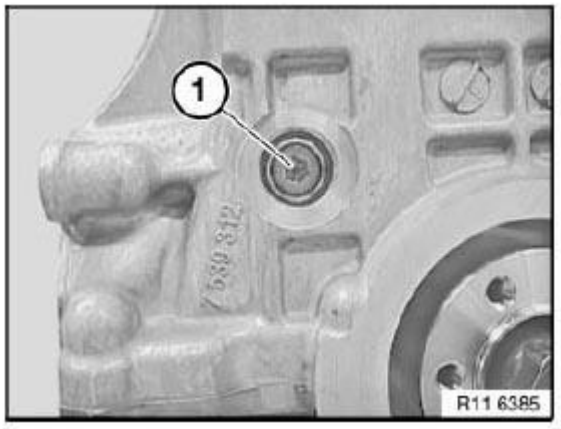


Fig. 279: Identifying Screw On Chain Drive At Bottom
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

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

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

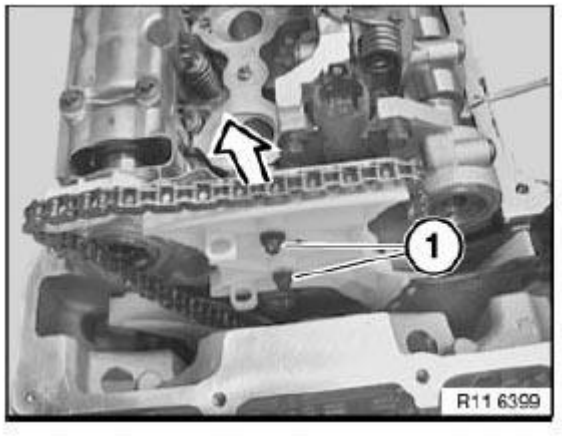


Fig. 280: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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.

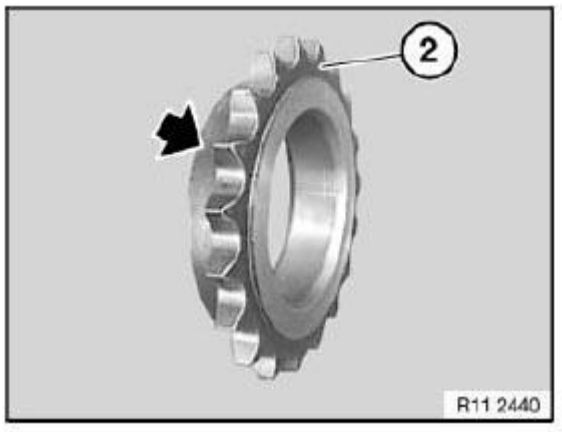


Fig. 281: Identifying Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Installation:

Always hold timing chain under tension.

Timing chain (1) may jam on chain module (3).

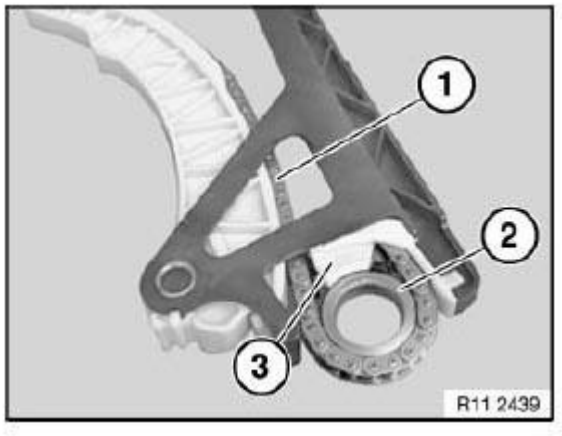


Fig. 282: Identifying Timing Chain And Chain Module
Courtesy of BMW OF NORTH AMERICA, INC.

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) are clipped into place on sprocket wheel/oil pump module.

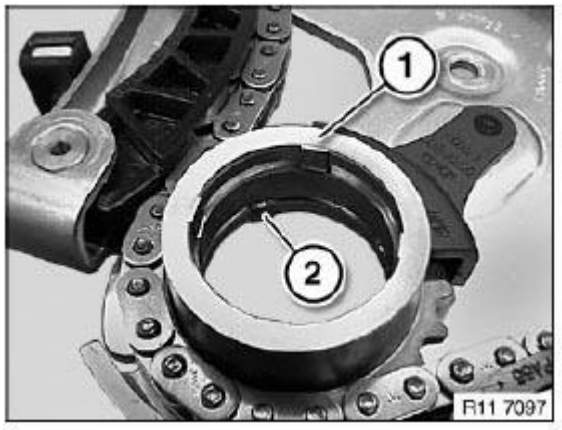


Fig. 283: Identifying Friction Plates
Courtesy of BMW OF NORTH AMERICA, INC.

Make sure friction plate (3) is in correct installation position.

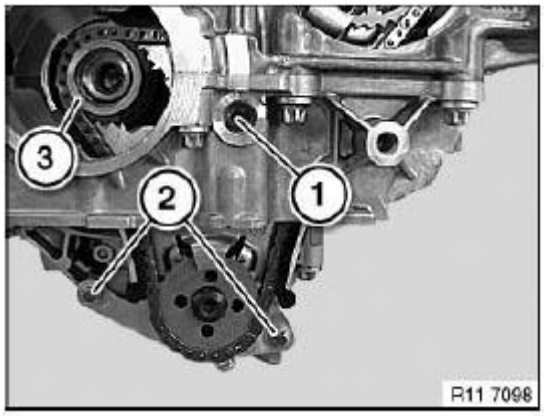


Fig. 284: Ensure Friction Plate (3) Is In Correct Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

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.

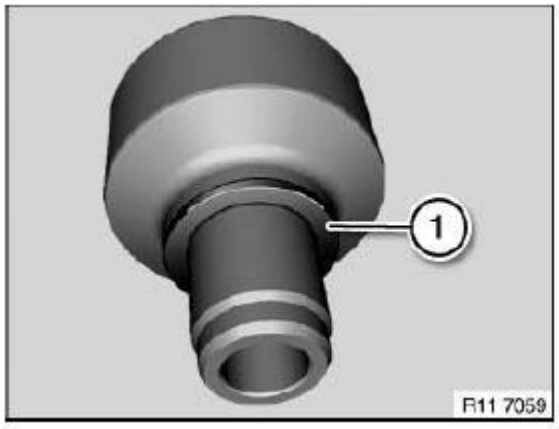


Fig. 285: Push On Friction Plate (1) Without Retainers
Courtesy of BMW OF NORTH AMERICA, INC.

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** , see **11 21 CRANKSHAFT AND BEARINGS**

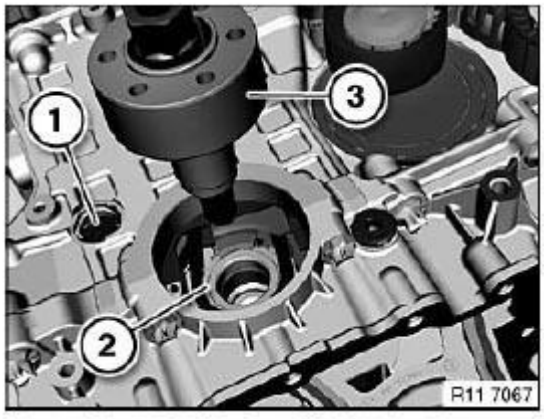


Fig. 286: Identifying Bolt, Gear Wheels And Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool **00 9 140** with magnet to engine carrier (1).

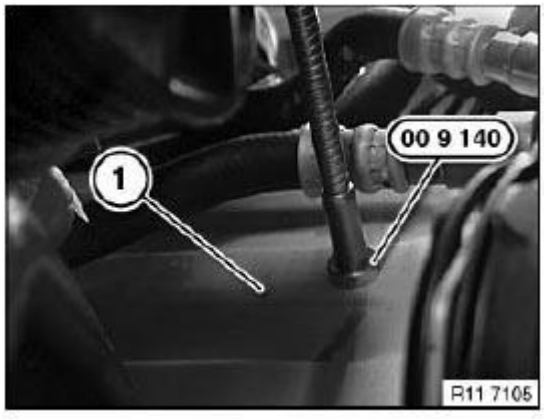


Fig. 287: Identifying Special Tool 00 9 140 And Engine Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Secure central bolt with special tool **00 9 140** .

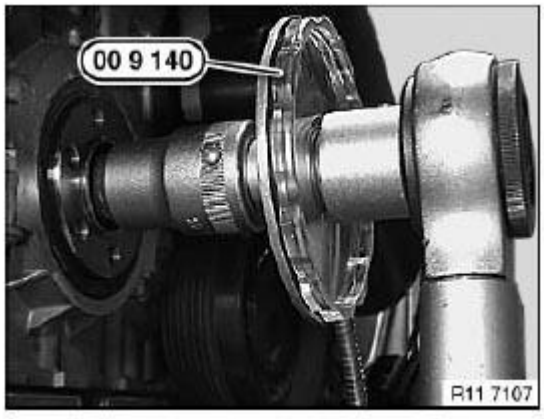


Fig. 288: Securing Central Bolt With Special Tool 00 9 140
Courtesy of BMW OF NORTH AMERICA, INC.

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 (N54)

Necessary preliminary tasks:

Release chain tensioner (1).

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

IMPORTANT: Have a cleaning cloth ready. A small quantity of engine oil will emerge after the screw connection has been released.
Make sure no oil runs onto the belt drive.

Installation:

No sealing ring is fitted during series-production assembly.

A sealing ring must be fitted by service personnel when the chain tensioner is fitted.

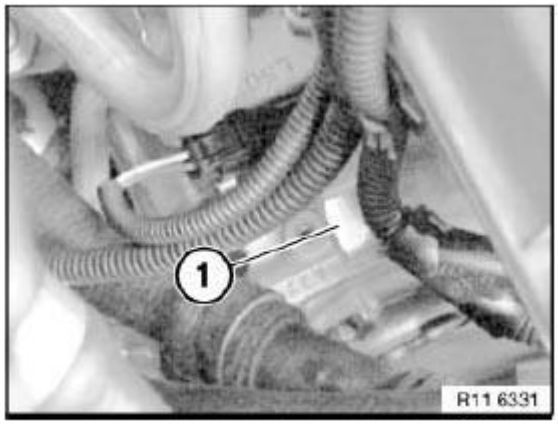


Fig. 289: Identifying Chain Tensioner

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.

Fig. 290: Compressing Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Repeat procedure twice.

Assemble engine.

11 31 505 ADJUSTING CAMSHAFT TIMING (N54)

Special tools required:

- **00 9 120**
- **00 9 250**
- **11 0 300**
- **11 4 281**
- **11 4 283**
- **11 8 520**
- **11 9 340**

See **MAINTENANCE AND GENERAL INFORMATION - SPECIAL TOOLS** .

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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:

Install fastener (1) with bore facing outwards.

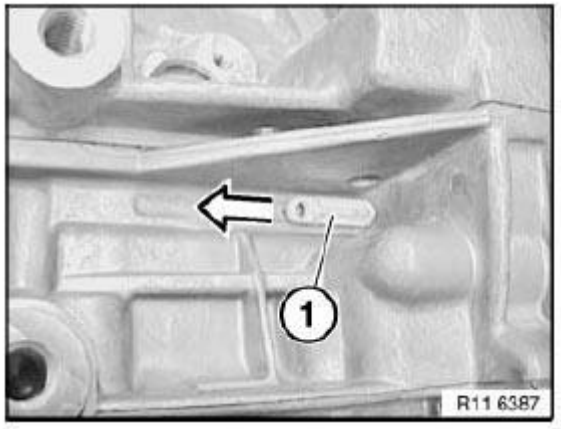


Fig. 291: Identifying Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

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

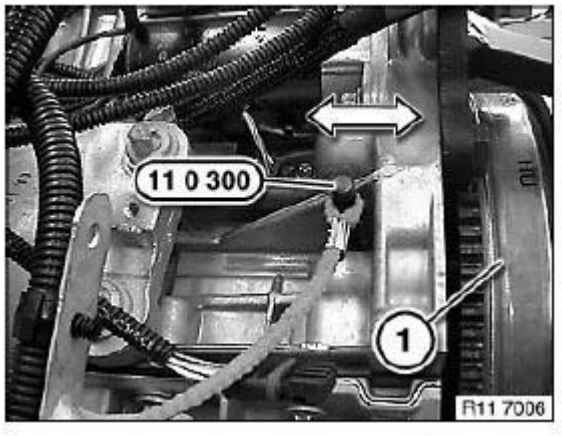


Fig. 292: Identifying Flywheel And Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

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.

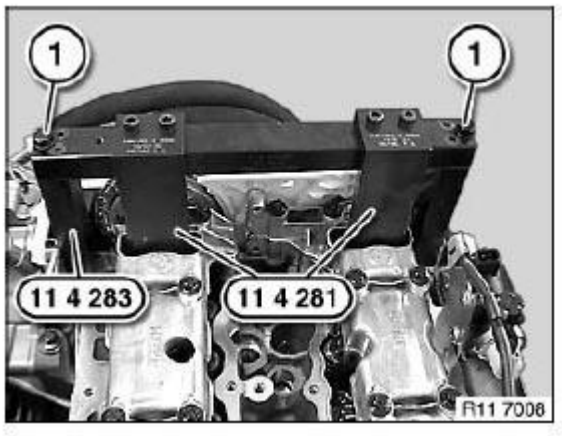


Fig. 293: Fit Special Tool 11 4 283 On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

With cylinder no. 1 in firing TDC position, cams of exhaust camshaft (2) and inlet camshaft (1) at cylinder no. 6 point downwards at an angle.

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

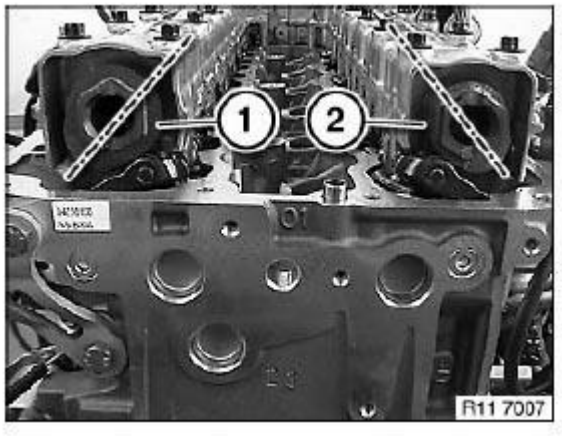


Fig. 294: Ensure Cams Of Exhaust Camshaft (2) And Inlet Camshaft (1) At Cylinder No. 6 Point Downward At An Angle
Courtesy of BMW OF NORTH AMERICA, INC.

Release central bolt (1) of exhaust camshaft.

Installation:

Replace screw (1).

Tightening torque **11 36 1AZ** , see **11 36 VARIABLE CAMSHAFT CONTROL**

Release central bolt (2) of inlet camshaft.

Installation:

Replace screw (2).

Tightening torque **11 36 1AZ** , see **11 36 VARIABLE CAMSHAFT CONTROL**

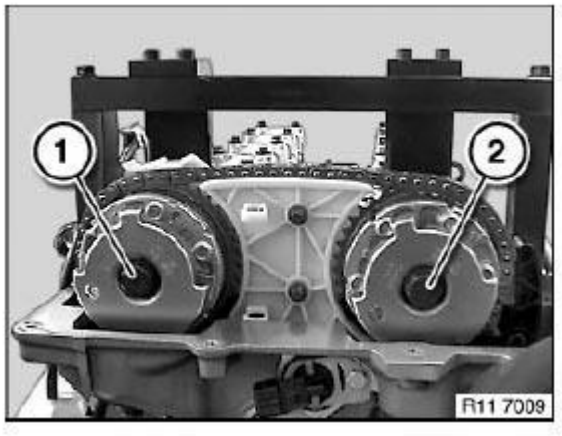


Fig. 295: Identifying Central Bolt Of Exhaust Camshaft And Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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: M6 x 45 bolts (1 and 2) with captive shim.

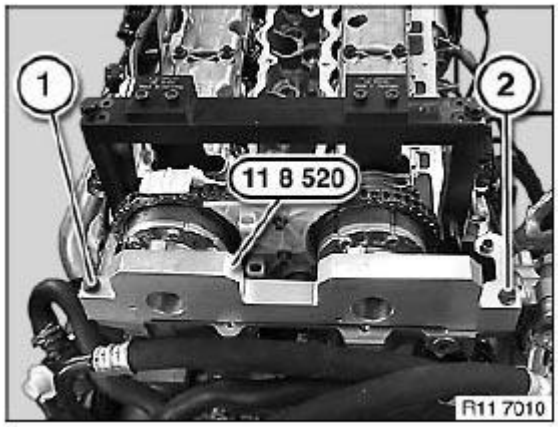


Fig. 296: Identifying Special Tool 11 8 520 And Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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** , see **11 36 VARIABLE CAMSHAFT CONTROL**

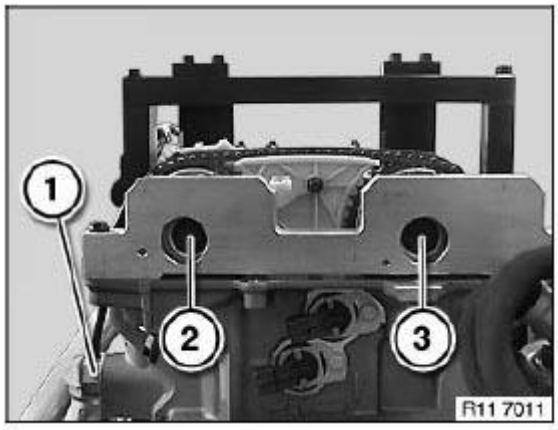


Fig. 297: Identifying Chain Tensioner And Central Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

ROCKER ARM WITH BEARING MOUNT

11 33 050 REMOVING AND INSTALLING OR REPLACING ALL ROCKER ARMS (N54, N54T)

Special tools required:

- **11 4 480**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

**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.
Classification is not required on the N54 engine. All numbers from 1 to 6 can be optionally installed as a replacement.**

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:

Before installing exhaust and inlet camshafts, make sure roller cam followers are correctly seated.

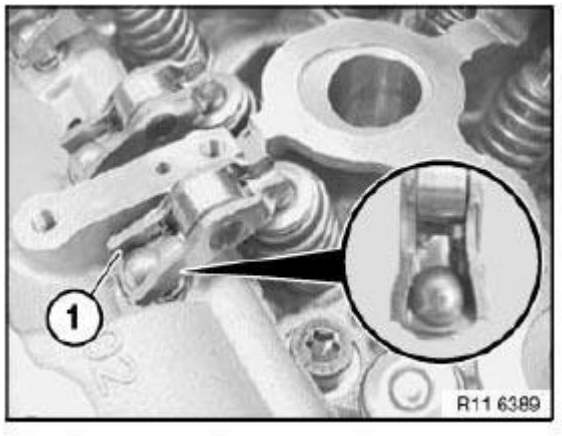


Fig. 298: Identifying Roller Cam Followers
Courtesy of BMW OF NORTH AMERICA, INC.

Remove HVCA element in direction of arrow.

Installation:

If the HVCA elements are reused, they must be placed together with the cam followers in neat order if necessary in special tool **11 4 480** .

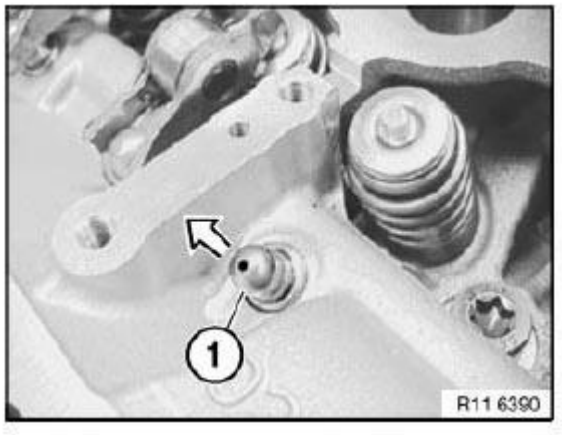


Fig. 299: Identifying HVCA Elements
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

VALVES WITH SPRINGS

11 34 552 REMOVING AND INSTALLING OR REPLACING ALL VALVES (N54)

Special tools required:

- **11 4 480**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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.

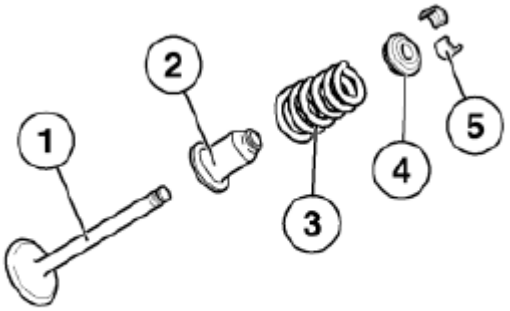


Fig. 300: Identifying Valve Parts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

11 34 560 REPLACING ALL VALVE STEM SEALS (N54)

Special tools required:

- **11 1 480**

- **11 6 380**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

Necessary preliminary tasks:

- Remove **cylinder head.**
- Remove **inlet camshaft.**
- Remove **exhaust camshaft.**
- Remove **roller cam follower.**
- Remove all **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:

Insert all **valves** .

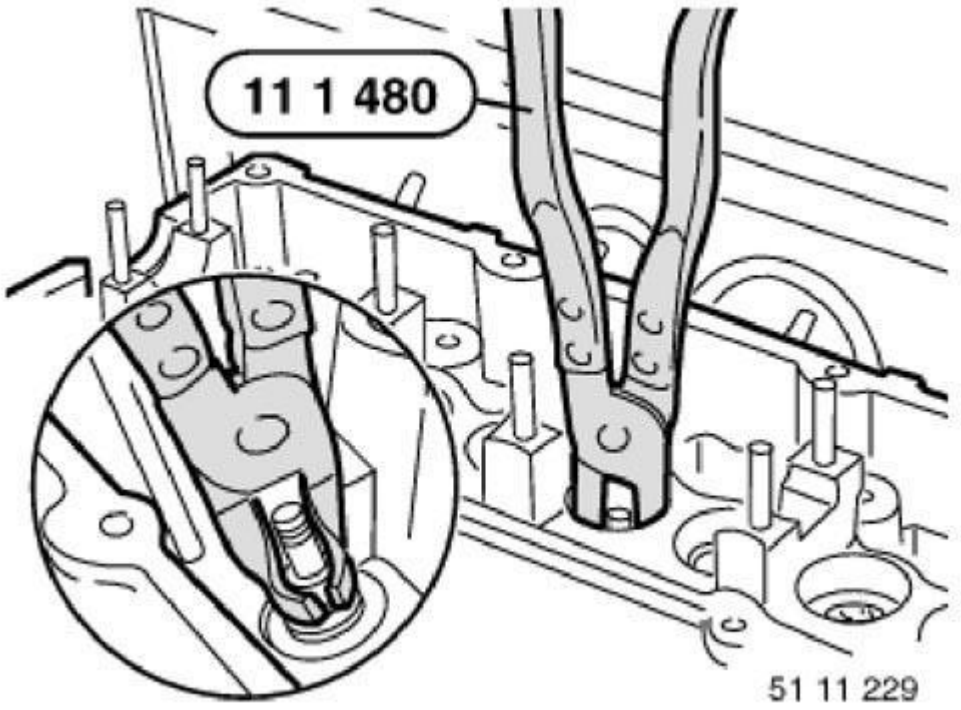


Fig. 301: Detaching Valve Stem Seal From Valve Stem
Courtesy of BMW OF NORTH AMERICA, INC.

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.

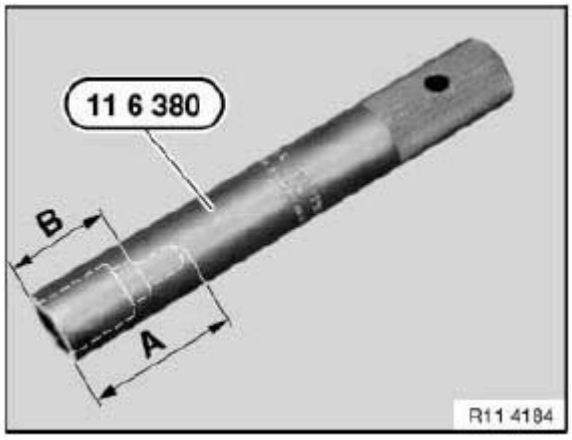


Fig. 302: Identifying Special Tool 11 6 380
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Different diameters at valve stem.
All valve stem seals are colour-coded.
Valve dia. 5 mm: valve stem seal is red or brown.
Valve dia. 6 mm: valve stem seal is green or light green.

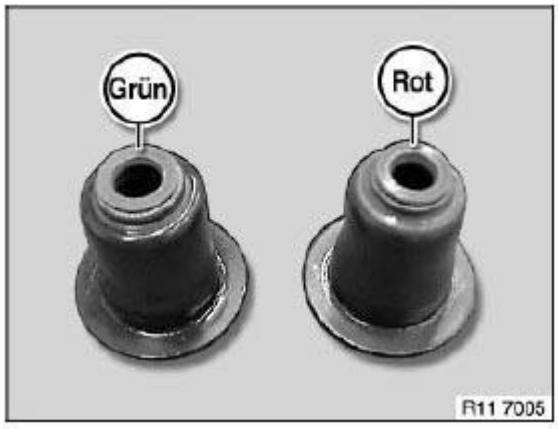


Fig. 303: Identifying Valve Stem Seals Color
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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.

NOTE: Illustrations show N46.

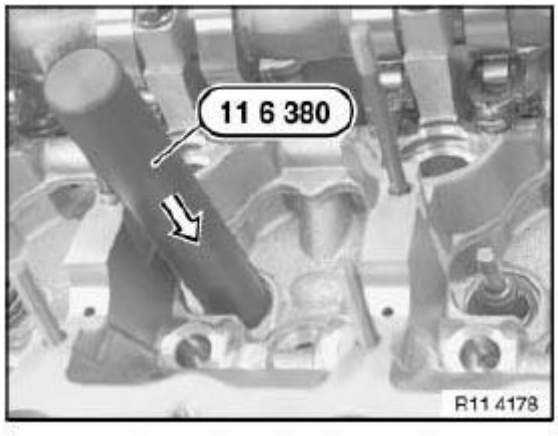


Fig. 304: Identifying Special Tool 11 6 380
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 34 715 REPLACING ALL VALVE SPRINGS (N54)

Special tools required:

- **11 0 009**
- **11 0 346**
- **11 4 480**
- **11 9 000**
- **11 9 017**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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**

Intake 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** .

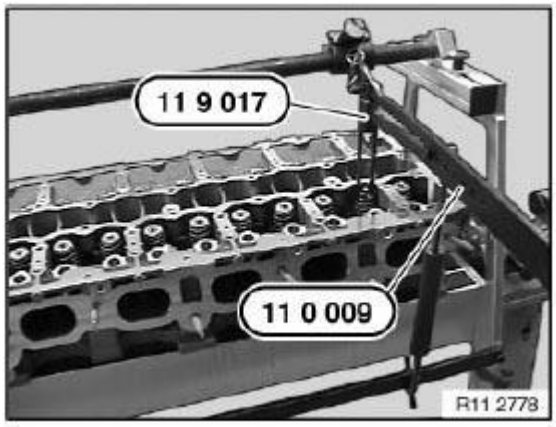


Fig. 305: Identifying Special Tools 11 0 009 And 11 9 017
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

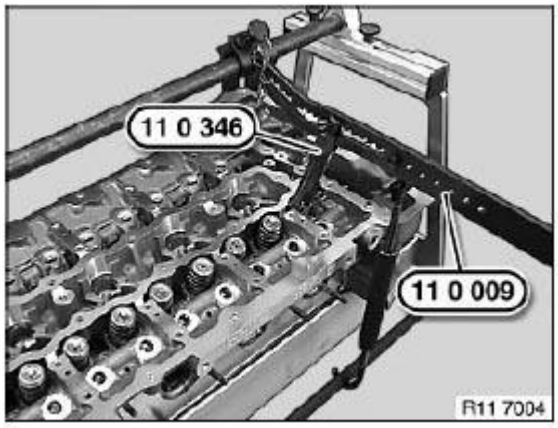


Fig. 306: Pressing Valve Spring Down On Spring Retainer With Special Tools 11 0 009 And 11 0 346
Courtesy of BMW OF NORTH AMERICA, INC.

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.

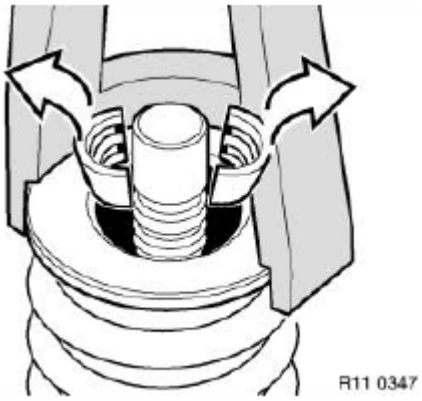


Fig. 307: Removing Valve Spring And Spring Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Incorrect installation possible.
Incorrect installation will result in valve spring breakage!

Color marking (1) is normally on lower end of valve spring.

Installation:

Intake Violet/green or violet/yellow valve:

Exhaust White/green or white/yellow valve:

If the colors on the valve springs can no longer be identified, these must be replaced for safety reasons.

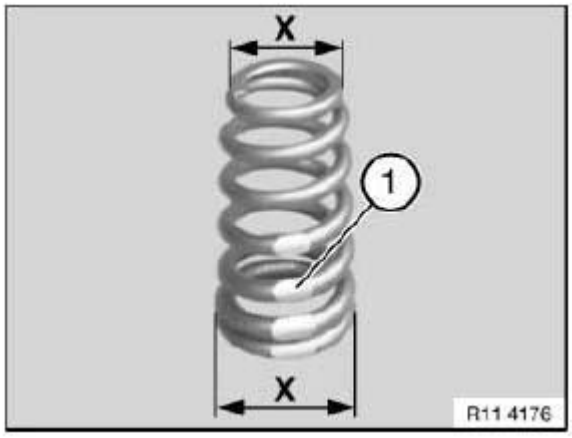


Fig. 308: Color Marking Is Normally On Lower End Of Valve Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement:

1. Valve
2. Valve stem seal with spring plate, bottom
3. Valve spring
4. Top plate spring
5. Valve cotters

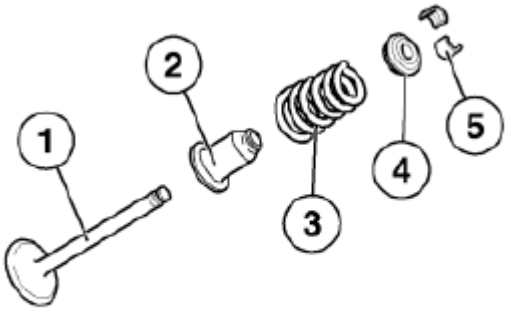


Fig. 309: Identifying Valve Parts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME control unit.

VARIABLE CAMSHAFT TIMING

11 36 046 REMOVING AND INSTALLING/REPLACING INLET AND EXHAUST ADJUSTMENT UNITS (N54)

Special tools required:

- **11 0 300**
- **11 4 280**
- **11 4 281**
- **11 4 283**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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.

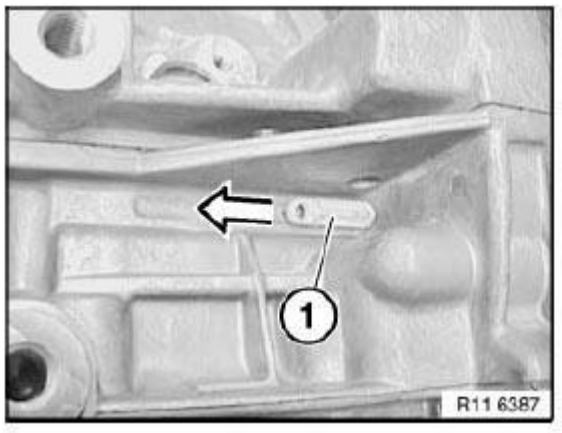


Fig. 310: Identifying Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

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

Rotate flywheel (1) at central bolt until firing TDC position at cylinder no. 1 is reached.

IMPORTANT: The TDC bore can be mixed up in automatic transmissions.

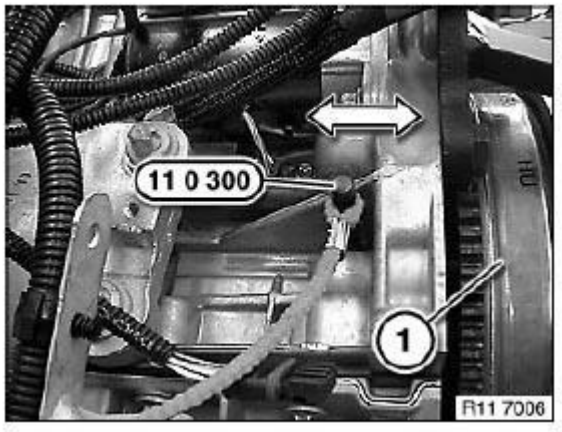


Fig. 311: Identifying Flywheel And Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

With cylinder no. 1 in firing TDC position, inlet camshaft (1) at cylinder no. 6 points downwards at an angle to the left.

With cylinder no. 1 in firing TDC position, exhaust camshaft (2) at cylinder no. 6 points downwards at an angle to the right.

Installation:

If the timing is checked while the engine is installed, this is only possible with a mirror.

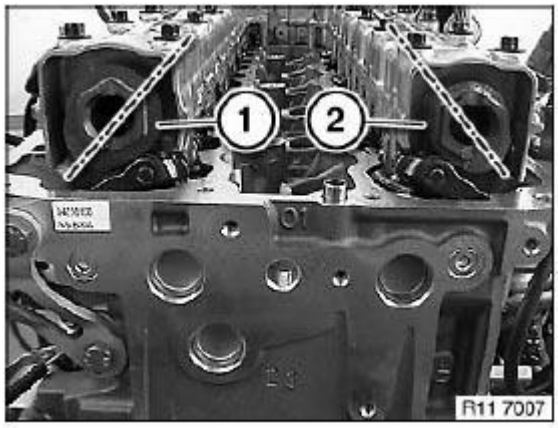


Fig. 312: Identifying Inlet Camshaft And Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool **11 4 283** with screws (1).

Fit special tool **11 4 281** on special tool **11 4 283** .

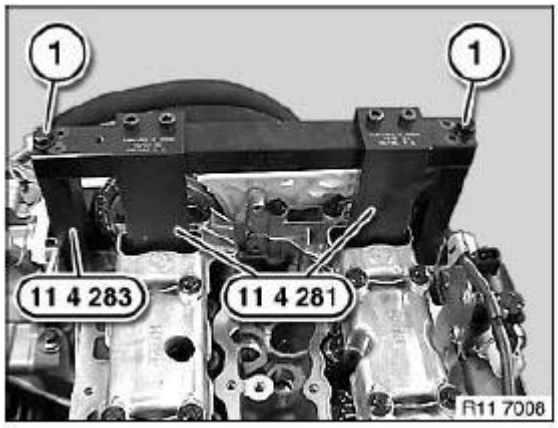


Fig. 313: Secure Special Tool 11 4 283 On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Release central bolt of exhaust adjustment unit (1).

Release central bolt of inlet adjustment unit (2).

Tightening torque **11 36 1AZ** , see **11 36 VARIABLE CAMSHAFT CONTROL**

Release **chain tensioner**

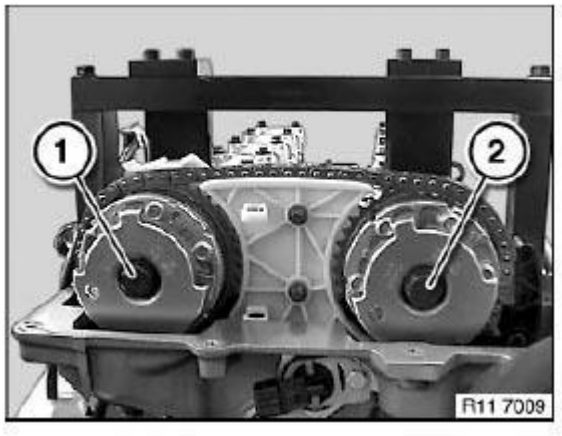


Fig. 314: Identifying Central Bolt Of Exhaust Camshaft And Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Detach exhaust adjustment unit (1) from exhaust camshaft.

Detach inlet adjustment unit (2) from inlet camshaft.

Installation:

To facilitate removal and installation of the inlet and exhaust adjustment units, turn the sensor gears at the opening downwards.

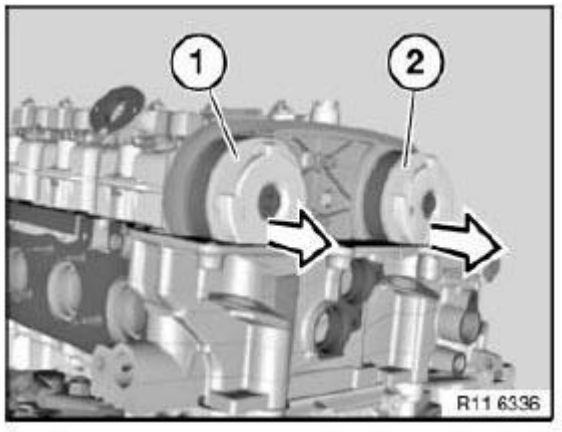


Fig. 315: Identifying Exhaust Adjustment Unit And Inlet Adjustment Unit
Courtesy of BMW OF NORTH AMERICA, INC.

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.

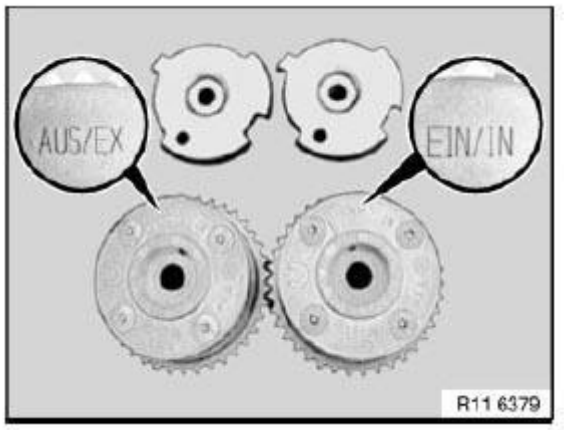


Fig. 316: Identifying VANOS Mark Of Exhaust Camshaft And Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Position inlet and exhaust adjustment units on camshafts.

Installation position of inlet and exhaust adjustment units can be freely selected.

Installation:

Replace screws (1 and 2).

Insert screws (1 and 2).

Adjust **valve timing** .

Fit **chain tensioner** .

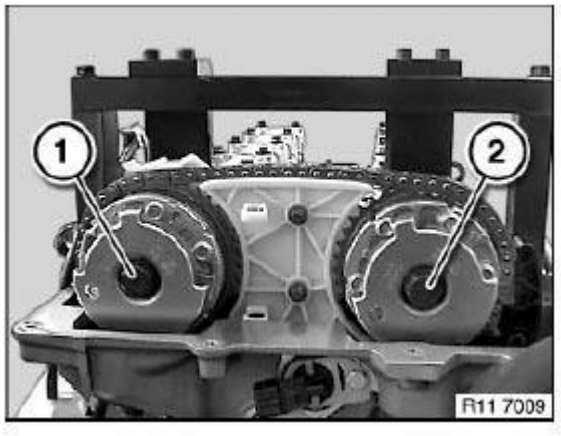


Fig. 317: Identifying Central Bolt Of Exhaust Camshaft And Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Incorrect installation possible.

Make sure that timing chain is guided in tensioning rail (1).

NOTE: Schematic representation on removed chain drive.

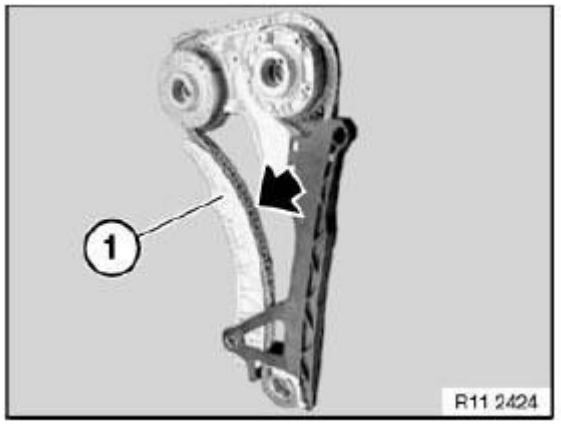


Fig. 318: Identifying Tensioning Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

OIL SUPPLY

11 40 000 CHECKING ENGINE OIL PRESSURE (N54)

Special tools required:

- **11 4 050**
- **13 3 061**
- **13 3 063**
- **13 6 051**
- **13 6 054**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

See **FUEL SYSTEM - SPECIAL TOOLS** .

Necessary preliminary tasks:

- Remove front **ignition coil cover.**

Disconnect plug connection (1) on oil pressure switch.

Installation:

Plug connection (1) must snap audibly into place!

Remove oil pressure switch (2).

Tightening torque **12 61 1AZ** , see **OIL PRESSURE/OIL TEMPERATURE GAUGE**

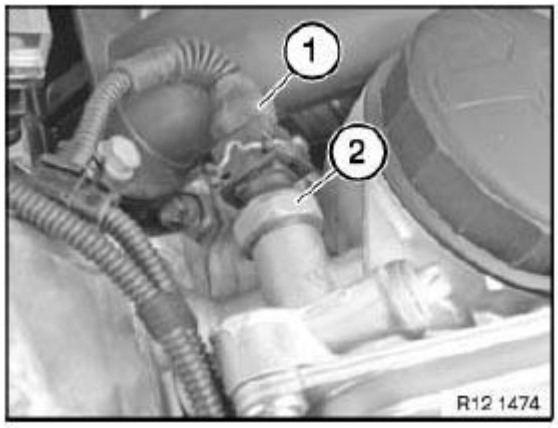


Fig. 319: Identifying Plug Connection And Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool **11 4 050** with sealing ring (1).

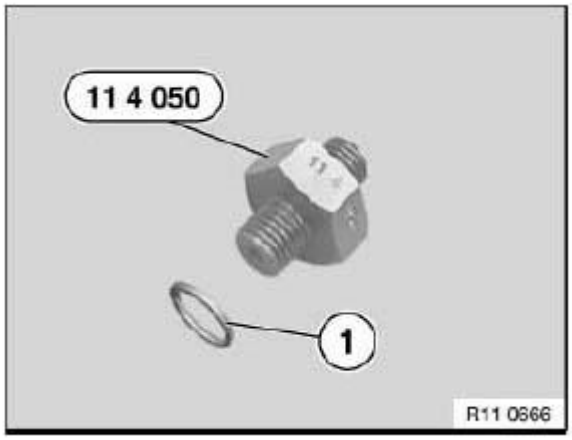


Fig. 320: Identifying Special Tool 11 4 050 And Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Checking engine oil pressure with BMW diagnosis system:

Connect special tools **13 6 054** and **13 6 051** .

Checking 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** .

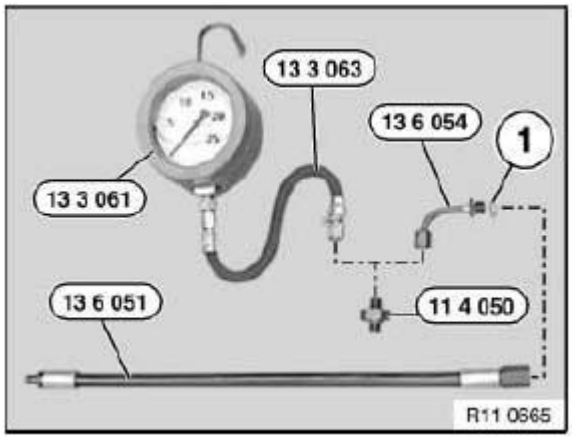


Fig. 321: Identifying Special Tools 13 3 063 And 13 3 061
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

OIL PUMP WITH FILTER

11 41 000 REMOVING AND INSTALLING OIL PUMP (N54)

Special tools required:

- **11 0 300**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

Necessary preliminary tasks:

- Remove **oil sump**

Release screws (1).

Tightening torque **11 41 1AZ** , see **11 41 OIL PUMP WITH STRAINER AND DRIVE**

Installation:

Replace aluminum screws.

Remove intake pipe (2) in direction of arrow.

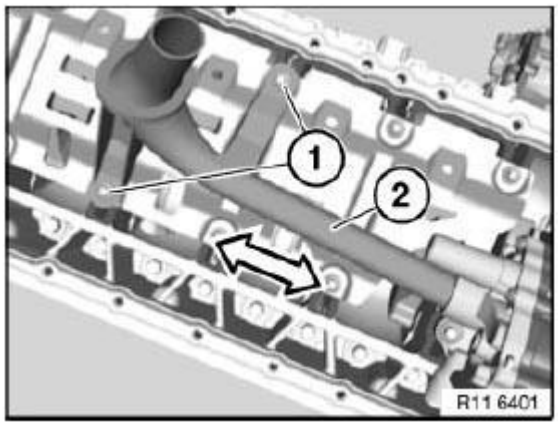


Fig. 322: Identifying Screws And Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

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** , see **11 41 OIL PUMP WITH STRAINER AND DRIVE**

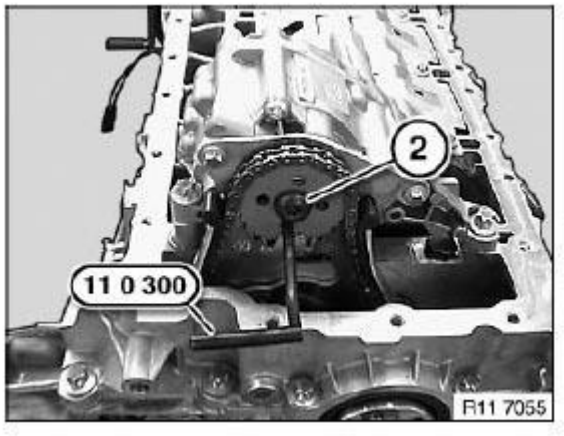


Fig. 323: Identifying Central Bolt And Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (2).

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

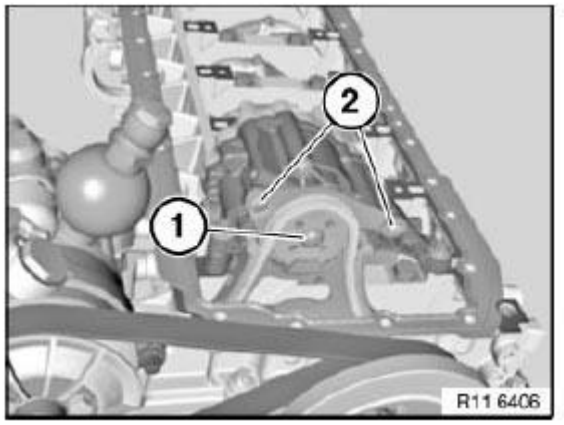


Fig. 324: Identifying Screws (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

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

Installation:

Replace aluminum screws.

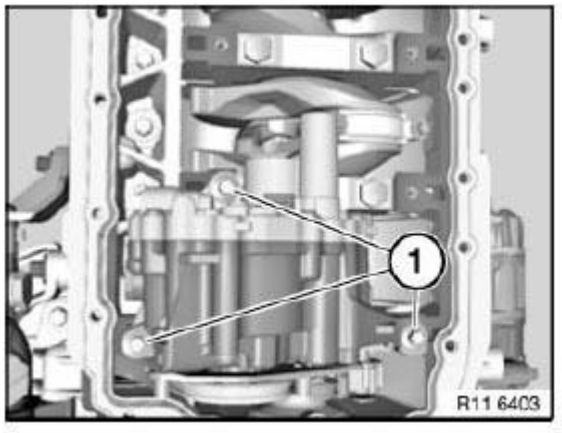


Fig. 325: Identifying Screws (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Pull of drive gear (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.

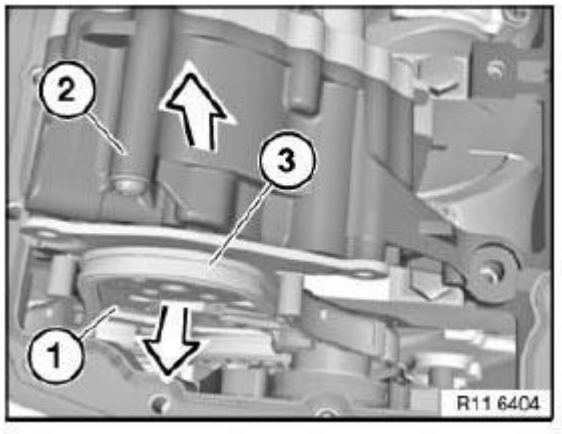


Fig. 326: Identifying Drive Gear, Oil Pump And Timing Chain
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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).

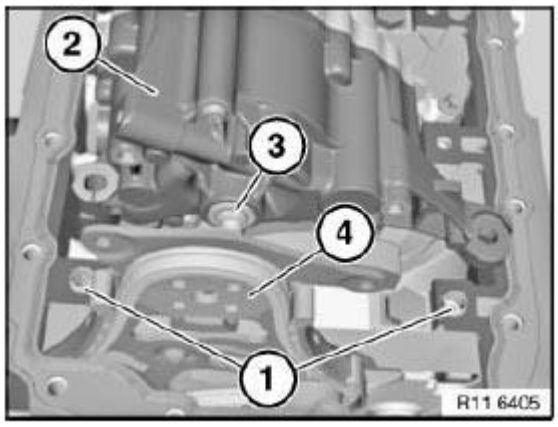


Fig. 327: Identifying Spacers, Twin Surface And Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 41 010 REMOVING AND INSTALLING/REPLACING CHAIN MODULE FOR OIL PUMP/VACUUM PUMP (N54)

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**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released. Aluminum screws/bolts are permitted with and without color coding (blue). For reliable identification: Aluminum screws/bolts are not magnetic. Jointing torque and angle of rotation must be observed without fail (risk of damage).

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

The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Remove **cylinder head cover**
- Remove **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** into crankcase.

Position special tool **11 0 290** on sprocket wheel and on special tool **11 8 650** .

Release screw (1).

Tightening torque **11 66 2AZ** , see **11 66 VACUUM PUMP**

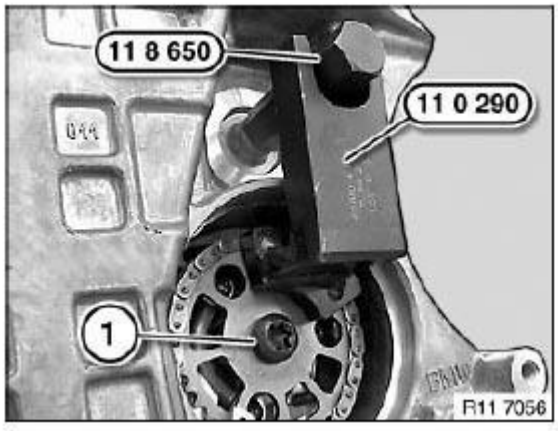


Fig. 328: Identifying Screw And Special Tools (11 0 290, 11 8 650)
Courtesy of BMW OF NORTH AMERICA, INC.

Press timing chain with chain tensioner (1) in direction of arrow.

Secure chain module with special tool **11 4 120** in hole (2).

Feed out sprocket wheel (3) at hexagon head of vacuum pump (4).

Installation:

A lock pin is pre-installed if the triangular drive is replaced.

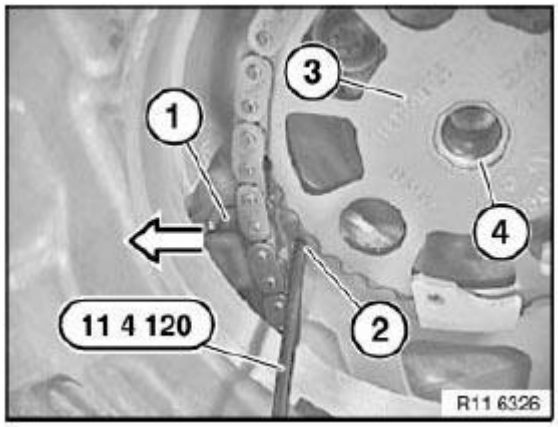


Fig. 329: Identifying Sprocket Wheel And Vacuum Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Secure oil pump sprocket wheel with special tool **11 9 190** to oil pump housing.

Release bolt (2) on sprocket wheel.

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

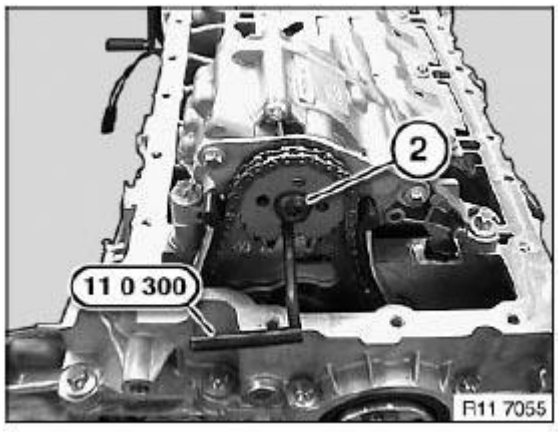


Fig. 330: Identifying Sprocket Wheel Bolt And Special Tool 11 9 190
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (2).

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

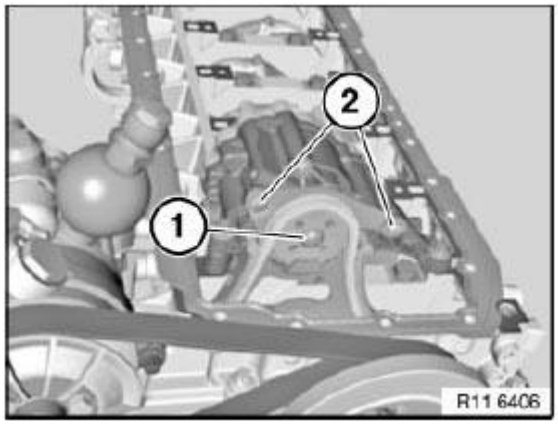


Fig. 331: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Secure **crankshaft and camshaft** .

Do **not** remove special tools **11 0 300** and **11 4 280** .

Fit special tool **11 9 280** .

Release central bolt (1).

NOTE: A 3/4 inch tool is needed to release the central bolt.

A second person is required.

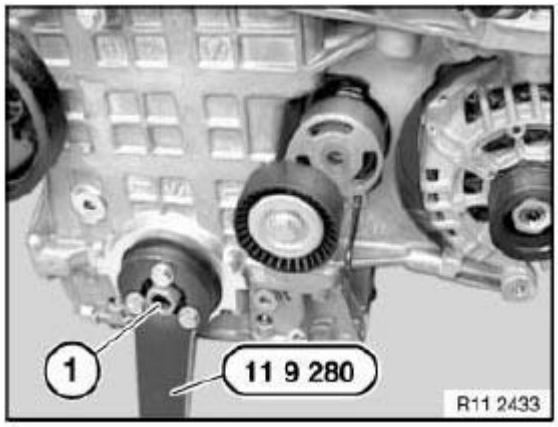


Fig. 332: Identifying Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Remove hub (2) towards front.

Installation:

Replace **crankshaft radial seal** at front.

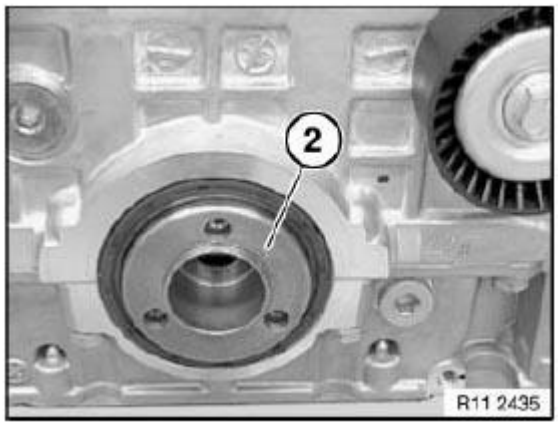


Fig. 333: Identifying Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Open screw plug on bedplate.

Installation:

Replace seal.

Release screw (1) with special tool **11 8 640** on triangular drive.

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

Installation:

Replace aluminum screws.

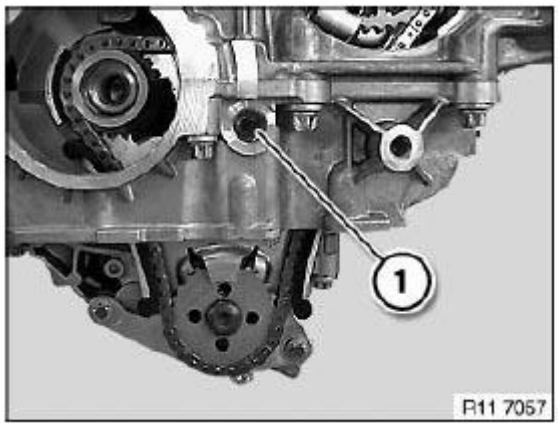


Fig. 334: Identifying Screw And Special Tool 11 8 640
Courtesy of BMW OF NORTH AMERICA, INC.

Remove triangular drive (1) in direction of arrow.

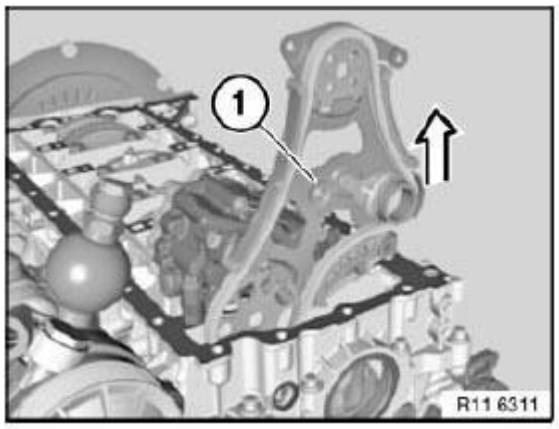


Fig. 335: Identifying Triangular Drive
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket wheel (2).
Collar on sprocket wheel (2) points to timing chain drive.

Incorrect assembly will result in engine damage.

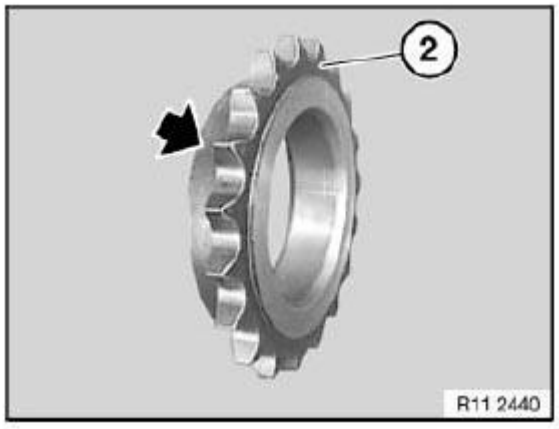


Fig. 336: Identifying Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

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 wheel.

The third friction plate is attached to the crankshaft hub.

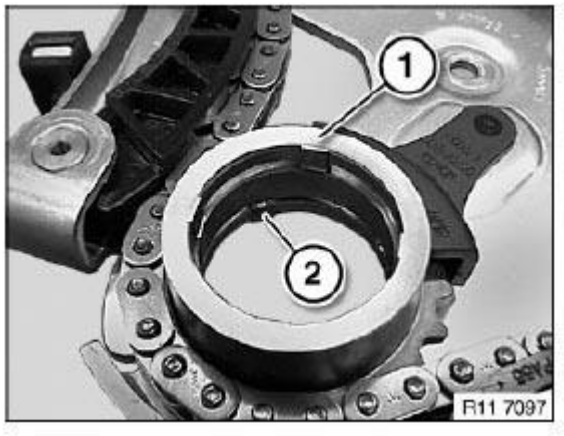


Fig. 337: Identifying Friction Plates
Courtesy of BMW OF NORTH AMERICA, INC.

Feed in oil pump chain module.

Secure oil pump chain module with screws (2).

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

Secure screw (1) with special tool **11 8 640** .

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

Installation:

Check both friction plates (3) with retainers for correct installation position.

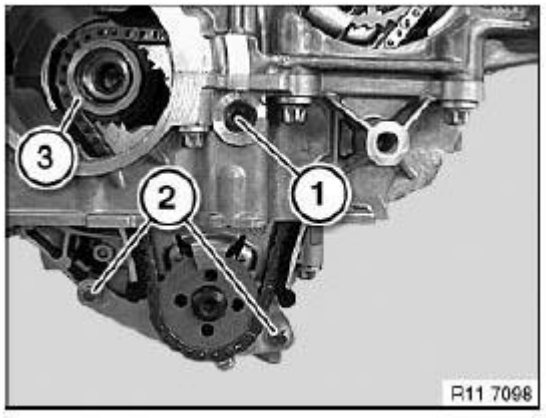


Fig. 338: Check Both Friction Plates (3) With Retainers For Correct Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

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.

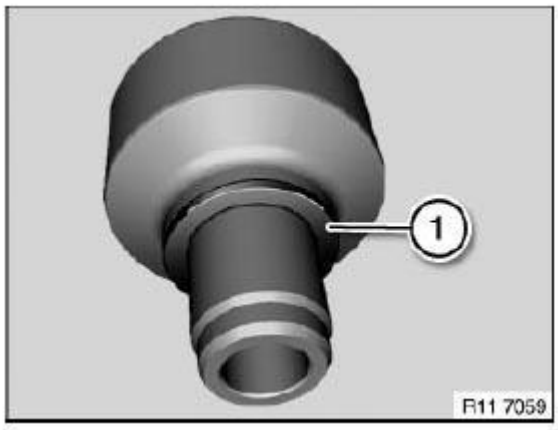


Fig. 339: Push On Friction Plate (1) Without Retainers
Courtesy of BMW OF NORTH AMERICA, INC.

Fit central bolt (1).

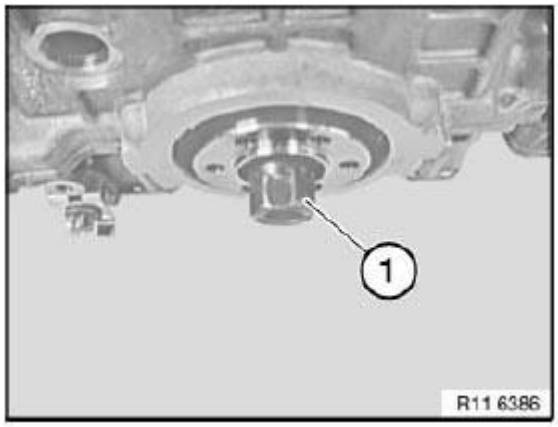


Fig. 340: Identifying Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tools **11 8 650** and **11 0 290** .

Tighten bolt (1).

Tightening torque **11 66 2AZ** , see **11 66 VACUUM PUMP**

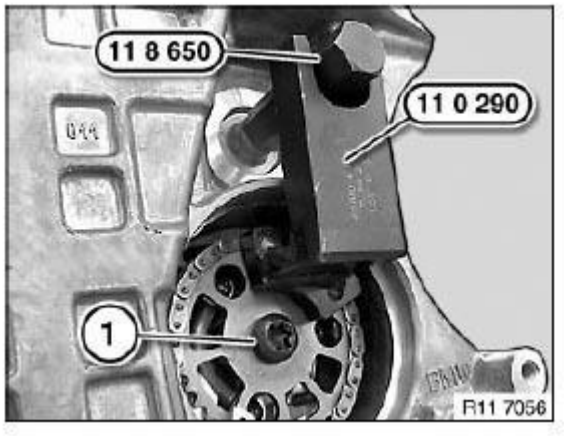


Fig. 341: Identifying Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool **11 0 300** .

Tighten bolt (2).

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

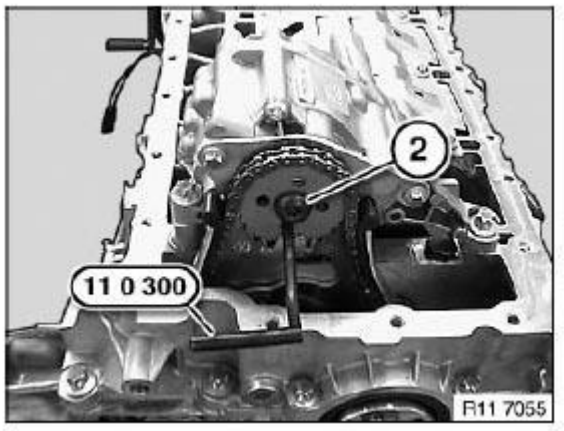


Fig. 342: Identifying Special Tool 11 0 300 And Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

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

Do **not** remove special tools **11 0 300** and **11 4 280** .

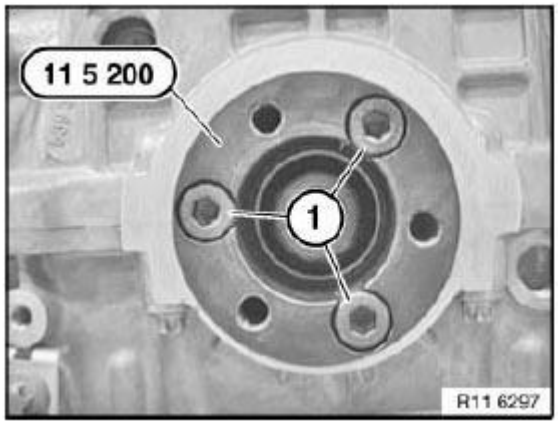


Fig. 343: Identifying Special Tool 11 5 200 And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten central bolt to jointing torque.

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

Mark torsion angle tightening on tool with stroke of paint (1).

IMPORTANT: Do not remove tool from central bolt during torsion angle tightening. Risk of damage!

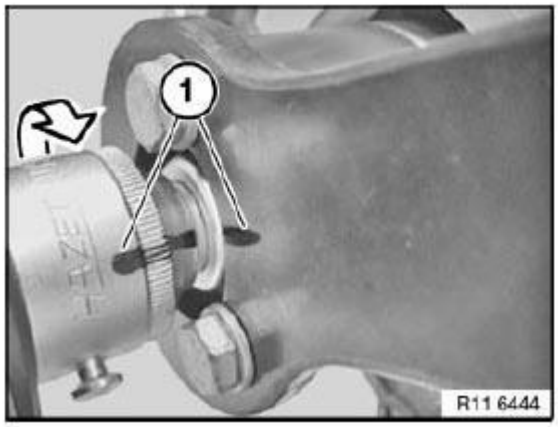


Fig. 344: Identifying Paint Mark Of Torsion Angle Tightening And Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace **crankshaft radial seal** at front.

Assemble engine.

OIL FILTER AND LINES

11 42 020 REMOVING AND INSTALLING/REPLACING FULLFLOW OIL FILTER (N54)

Special tools required:

- **11 9 240**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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** . See **17 00 005 DRAINING AND ADDING COOLANT (N54)** .
- 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** , see **OIL FILTER AND LINES**

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

Installation:

Replace sealing rings on oil filter cap.

Moisten sealing rings with engine oil.

Fig. 345: 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** , see **OIL FILTER AND LINES**

Installation:

Replace all seals.

If necessary, replace filter element.

Modify oil pressure switch when replacing.

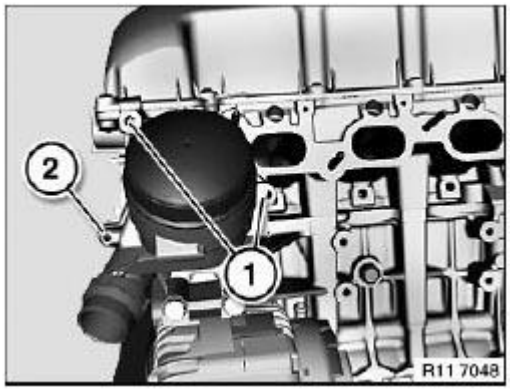


Fig. 346: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 42 198 REMOVING AND INSTALLING OIL FEED LINE FOR EXHAUST TURBOCHARGER (N54)

Remove **exhaust turbocharger (1-3) or turbocharger (4-6)**

Release screw (2). Tightening torque **11 42 9AZ.**

Important! Where necessary, to release the oil feed line (3), do not place pliers on the pipe. Risk of damage!

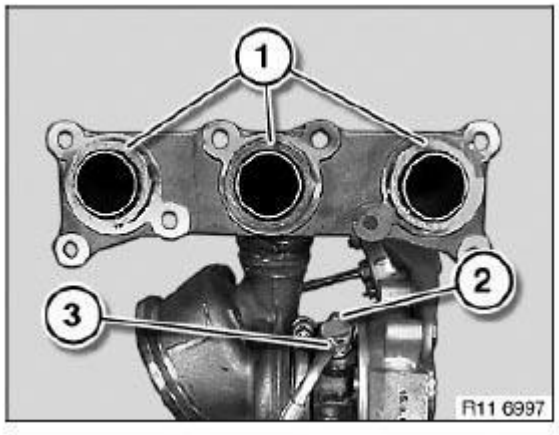


Fig. 347: Identifying Oil Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, release oil feed line (3) with suitable pliers at connection and remove.

Installation note: Replace O-rings.

Assemble engine.

11 42 250 REMOVING AND INSTALLING OIL RETURN LINE FOR EXHAUST TURBOCHARGER (N54)

Remove both **CATALYTIC CONVERTERS** .

Remove right engine support arm.

Undo screws (1 and 2)

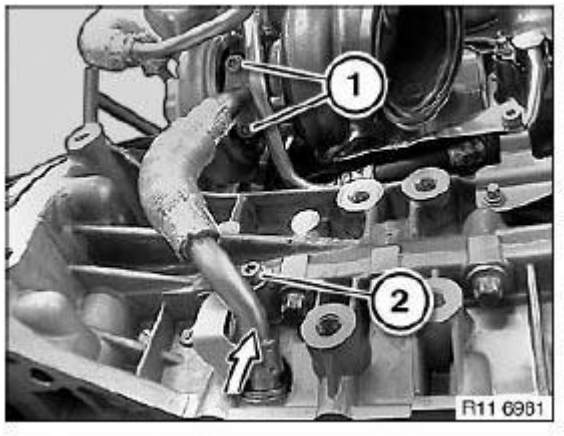


Fig. 348: Removing Oil Return Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque **11 42 7AZ.** .

Remove oil return line in direction of arrow.

Installation note: Renew O-rings and gaskets.

Assemble engine.

11 42 248 REMOVING AND INSTALLING/RENEWING THE OIL RETURN LINE FOR EXHAUST TURBOCHARGER CYL. 1-3 (N54)

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).

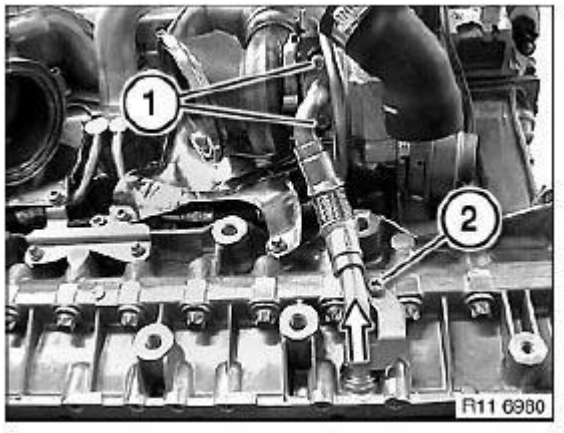


Fig. 349: Locating Oil Return Pipe Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque: **11 42 7AZ.**

Remove oil return line in direction of arrow.

Installation note: Renew O-rings and gaskets.

Assemble engine.

11 42 035 REMOVING AND INSTALLING/REPLACING THERMOSTAT HOUSING (N54, N54T)

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.

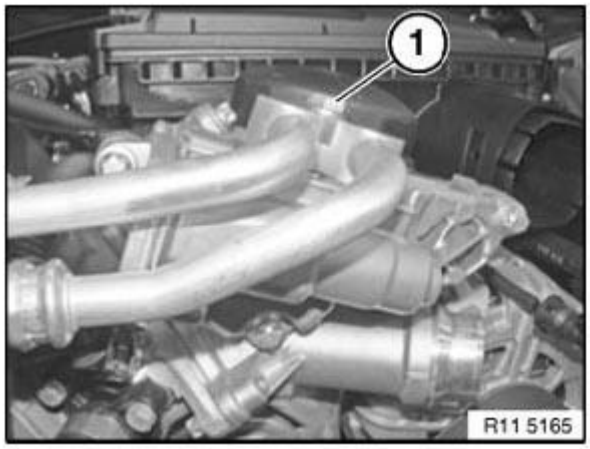


Fig. 350: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on thermostat housing. Remove oil-coolant heat exchanger towards front. Picture shows E9x
Installation note: Replace gasket.

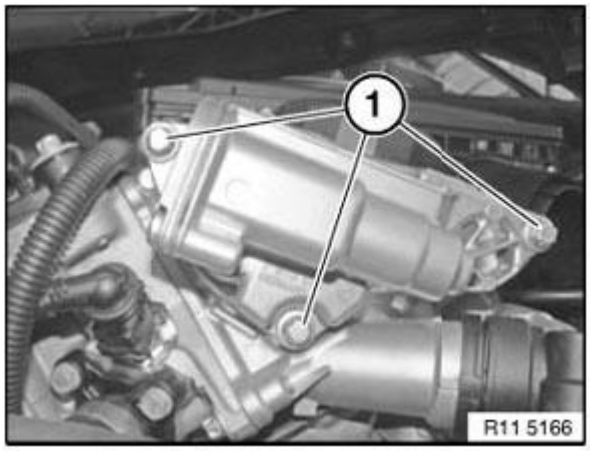


Fig. 351: Identifying Bolts On Oil-Coolant Heat Exchanger
Courtesy of BMW OF NORTH AMERICA, INC.

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.

OIL COOLER

11 44 000 REMOVING AND INSTALLING/REPLACING OIL-COOLANT HEAT EXCHANGER (N54)

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** . See **17 00 005 DRAINING AND ADDING COOLANT (N54)** .
- Remove **fan cowl** . See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N54)** .

Release screw (1).

Tightening torque **11 42 3AZ** , see **OIL FILTER AND LINES**

Do not detach oil lines from oil-coolant heat exchanger in upward direction.

Installation:

Replace O-rings.

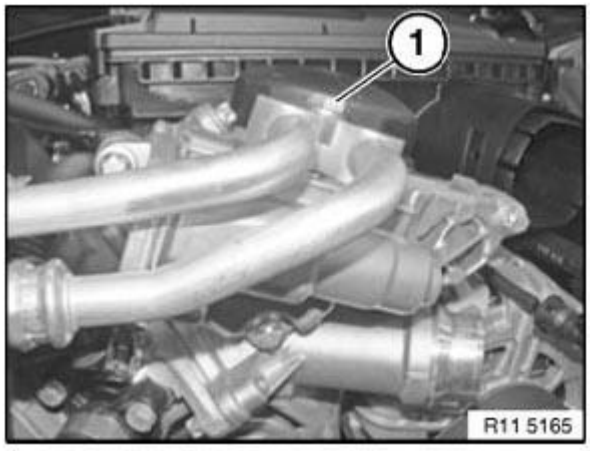


Fig. 352: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1) on oil-coolant heat exchanger.

Remove oil-coolant heat exchanger towards front.

Installation:

Replace seal.

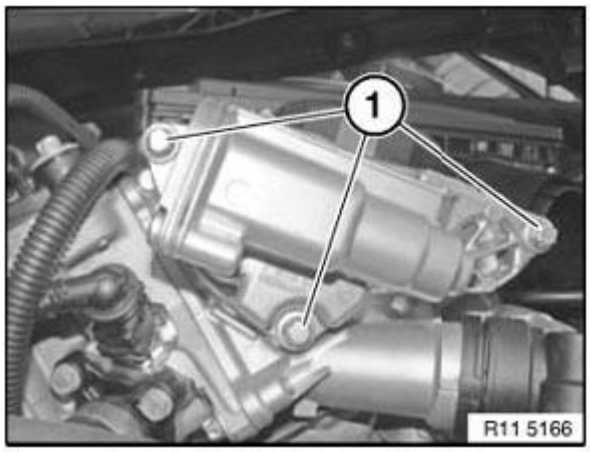


Fig. 353: Identifying Bolts On Oil-Coolant Heat Exchanger
Courtesy of BMW OF NORTH AMERICA, INC.

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 (N54)

WARNING: Danger of scalding!

Only perform this work after engine has cooled down.

Recycling:

Catch and dispose of drained coolant in a suitable container.

Observe country-specific waste-disposal regulations.

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released.
Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:
Aluminum screws/bolts are not magnetic.
Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Partially release anti-roll bar (all-wheel drive only).
- Drain **COOLANT** .
- Remove **coolant thermostat** .

Release coolant hose (1).

Disconnect plug connection (4).

Release screws (5).

Installation:

Replace aluminum screws.

Tightening torque **11 51 1AZ** , see **11 51 COOLANT PUMP WITH DRIVE**

Installation:

If a coolant pump is reused, it must be mechanically rotated once (breakaway torque at pump gears).

One coolant pump rotation will be sufficient.

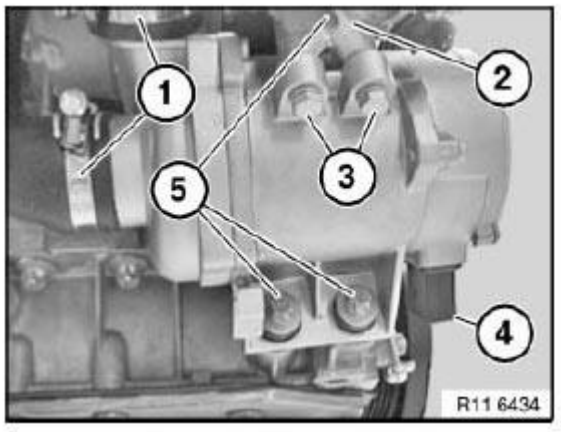


Fig. 354: Identifying Coolant Hose, Plug Connection And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Venting instructions must be observed **without fail** . See **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR WATER LEAKS (N54)** .

THERMOSTAT AND CONNECTOR

11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N54)

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:

- Remove front **UNDERBODY PROTECTION**
- Draining **coolant** . See **17 00 005 DRAINING AND ADDING COOLANT (N54)** .

NOTE: Illustration shows coolant thermostat removed.

Disconnect coolant hoses (arrows) on the thermostat (1) with clamping tongs.

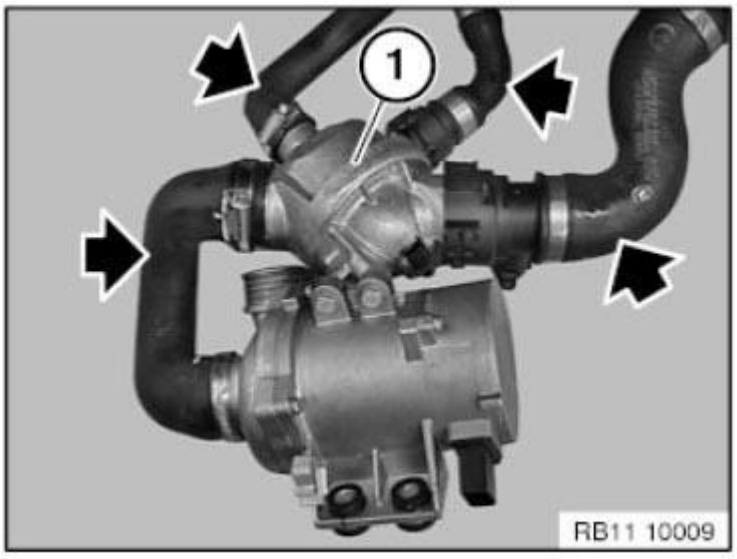


Fig. 355: Locating Thermostat Coolant Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

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 **11 53 1AZ** , see **THERMOSTAT AND CONNECT**

Remove **coolant thermostat** (7).

NOTE: Illustration shows coolant thermostat removed.

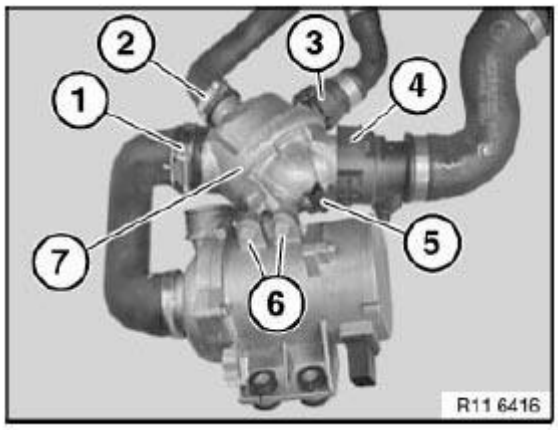


Fig. 356: Identifying Coolant Hose, Plug Connection And Coolant Thermostat
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N54, ALL-WHEEL DRIVE)

WARNING: Danger of scalding!

Only perform this work after engine has cooled down.

Recycling:

Catch and dispose of drained coolant in a suitable container.

Observe country-specific waste-disposal regulations.

IMPORTANT: Protect plug connections against coolant and contamination. Cover plug connections with suitable materials.

Necessary preliminary tasks:

- Remove front **UNDERBODY PROTECTION**
- Draining **coolant** . See **17 00 005 DRAINING AND ADDING COOLANT (N54)** .

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 **11 53 1AZ** , see **THERMOSTAT AND CONNECT**

Remove **coolant thermostat** (7).

NOTE: Illustration shows coolant thermostat removed.

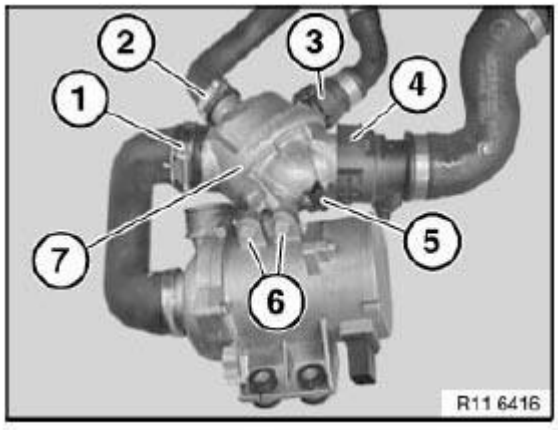


Fig. 357: Identifying Coolant Hose, Plug Connection And Coolant Thermostat
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 53 740 REMOVING AND INSTALLING/REPLACING FEED LINE (N54)

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** . See **17 00 005 DRAINING AND ADDING COOLANT (N54)** .
- Remove both **catalytic exhaust-gas converters** . See **EXHAUST CATALYTIC CONVERTER** .

Unfasten hose clip (1).

Tightening torque **11 51 4AZ** , see **11 51 COOLANT PUMP WITH DRIVE**

Detach coolant hose of feed line in direction of arrow from coolant pump (2).

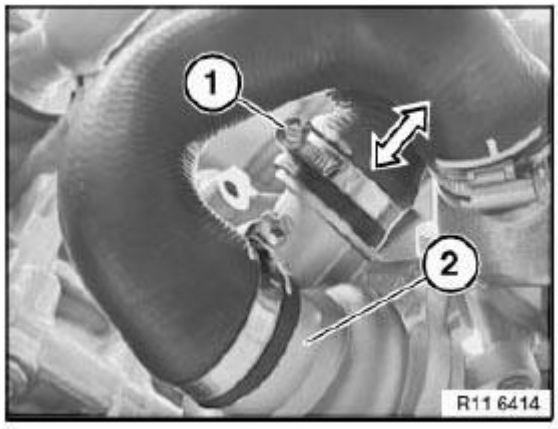


Fig. 358: Identifying Hose Clip And Coolant Pump
Courtesy of BMW OF NORTH AMERICA, INC.

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** , see **THERMOSTAT AND CONNECT**

If necessary, release coolant feed lines (3 and 4) with suitable pliers at connection.

Installation:

Replace O-rings.

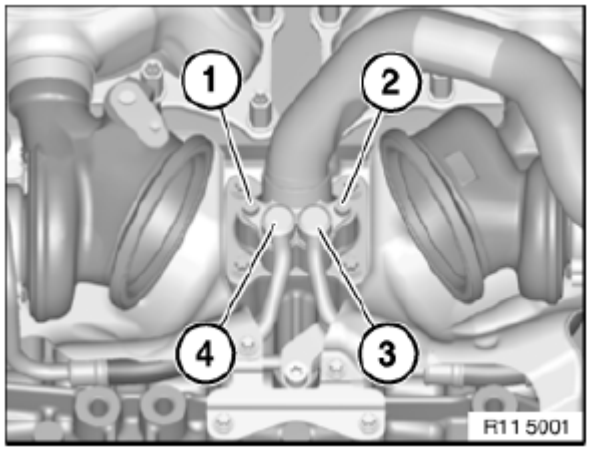


Fig. 359: Identifying Screws And Coolant Feed Lines
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, the graphic shows the released coolant feed lines removed.

Release screws (1).

Tightening torque **11 53 3AZ** , see **THERMOSTAT AND CONNECT**

Remove feed line (2).

Installation:

Replace seal.

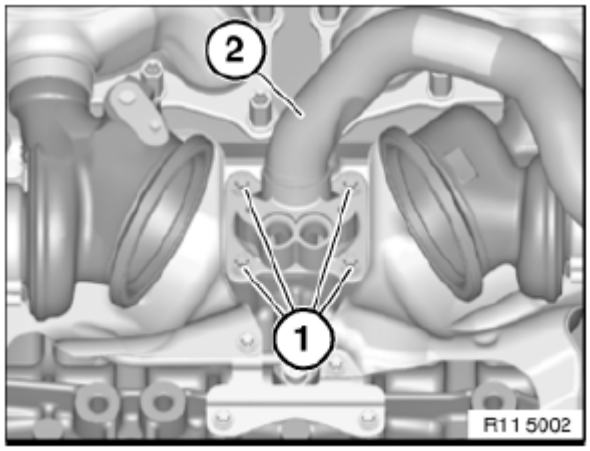


Fig. 360: Identifying Screws And Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Top up **coolant** . See **17 00 005 DRAINING AND ADDING COOLANT (N54)** .

Venting instructions must be observed **without fail** . See **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR WATER LEAKS (N54)** .

INTAKE MANIFOLD

11 61 050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (N54)

Necessary preliminary tasks:

- Remove **INTAKE FILTER HOUSING (N54) .**
- Remove **acoustic cover.**
- Remove **charge-air duct**

Disconnect crankcase breather (1) on cylinder head cover and pull off in direction of arrow.

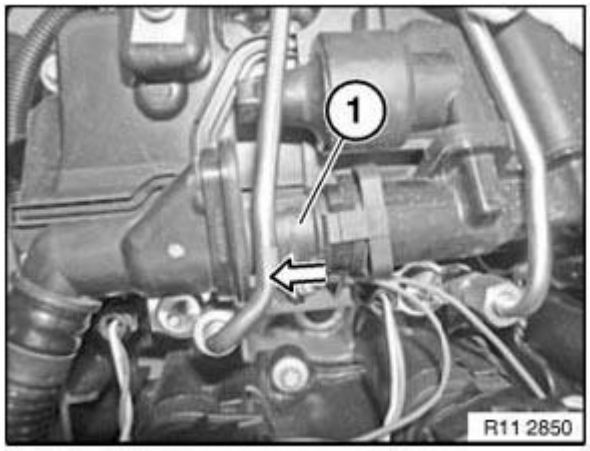


Fig. 361: Identifying Crankcase Breather On Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off vacuum hose (1).

Detach tank vent valve (2) from mounting.

Release hose (3) and set down in engine compartment.

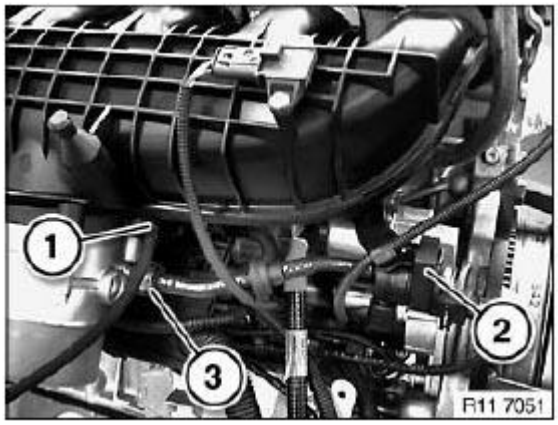


Fig. 362: Identifying Vacuum Hose, Tank Vent Valve And Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on oil pressure switch.

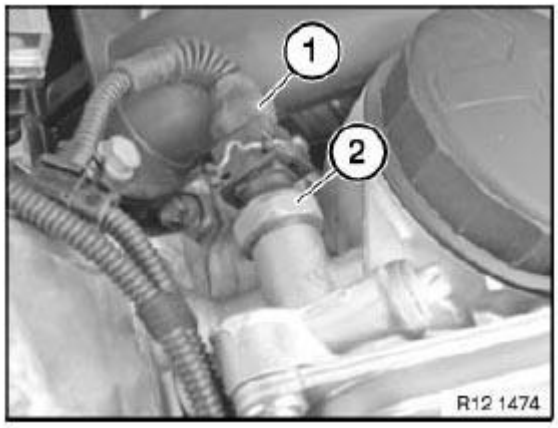


Fig. 363: Identifying Plug Connection On Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

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** , see **INTAKE MANIFOLD**

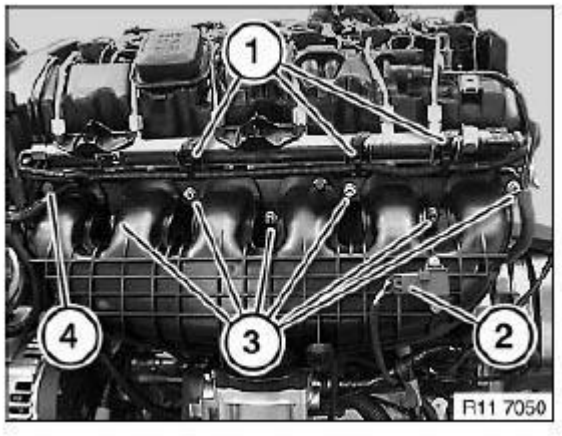


Fig. 364: Identifying Retainers On Fuel Rail And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Raise intake air manifold.

Release screws (1).

Set down distributor housing (2) in engine compartment.

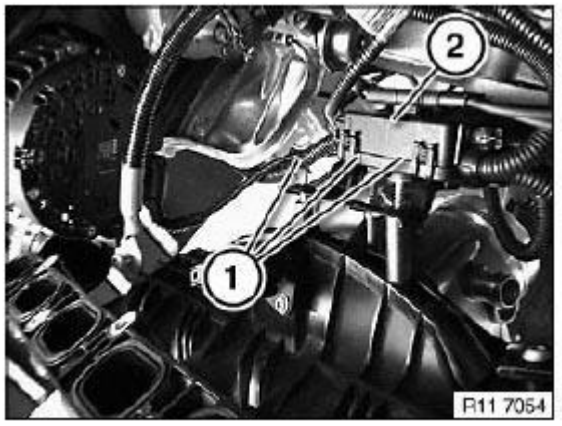


Fig. 365: Identifying Screws And Distributor Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Cut cable tie (1).

Disconnect plug connection (2).

Installation:

Replace all seals (3).

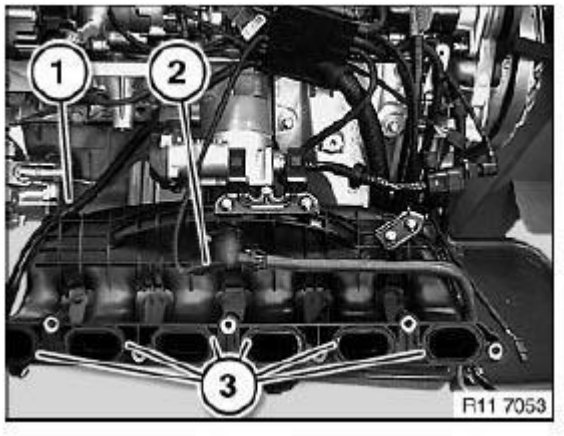


Fig. 366: Identifying Cable Tie, Plug Connection And Seals
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace all seals.

Assemble engine.

11 61 362 REPLACING RIGHT CHARGE-AIR DUCT (N54)

See **REPLACING RIGHT CHARGE-AIR DUCT (N54)** .

11 61 365 REPLACING FRONT CHARGE-AIR DUCT (N54)

See **REPLACING FRONT CHARGE-AIR DUCT (N54)** .

11 61 368 REMOVING AND INSTALLING/REPLACING REAR LEFT CHARGE-AIR DUCT (N54)

Necessary preliminary tasks:

- Switch off ignition
- Remove **intake filter housing** . See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N54)** .

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** , see **13 71 AIR INTAKE SILENCER**

Installation:

Install charge-air hoses dry and free from grease.

Detach charge-air hose (1) from charge-air duct (2).

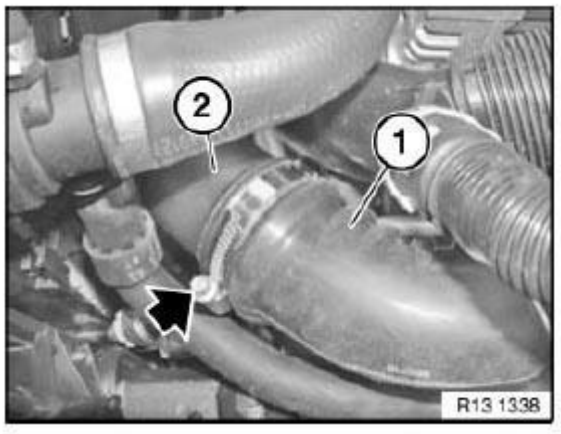


Fig. 367: Identifying Charge-Air Hose And Charge-Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

Release quick-connect couplings (1) by turning lock through 90°.

Detach recirculated-air hoses (2) and lay to one side.

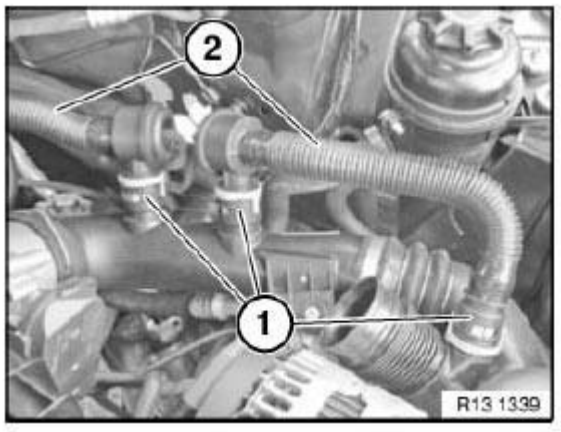


Fig. 368: Identifying Quick-Connect Couplings And Recirculated-Air Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Bring lock (1) back 90° into installation position.

Pay attention to markings.

Recirculated-air hoses must snap audibly into place.

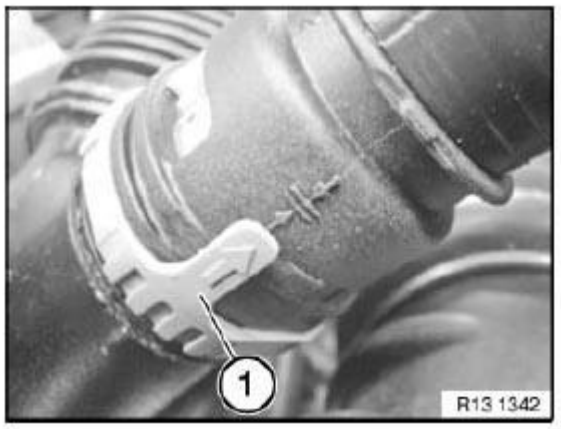


Fig. 369: Bring Lock (1) Back 90° Into Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug (1) and remove.

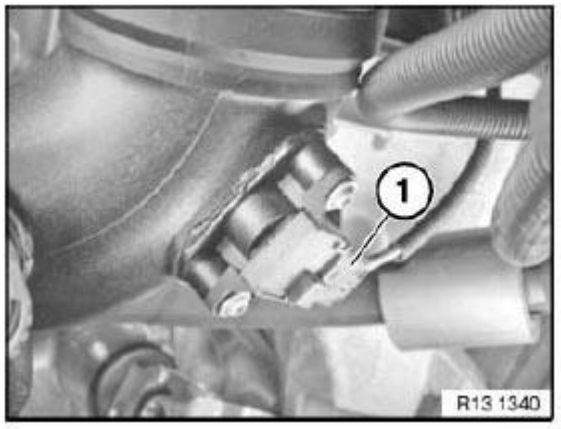


Fig. 370: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

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** , see **13 71 AIR INTAKE SILENCER**

Unlock quick-connect coupling (1).

Detach charge-air duct (2) from throttle valve assembly and remove.

Installation:

Coat sealing ring of quick-connect coupling with antiseize agent.

Charge-air duct (2) must snap audibly into place.

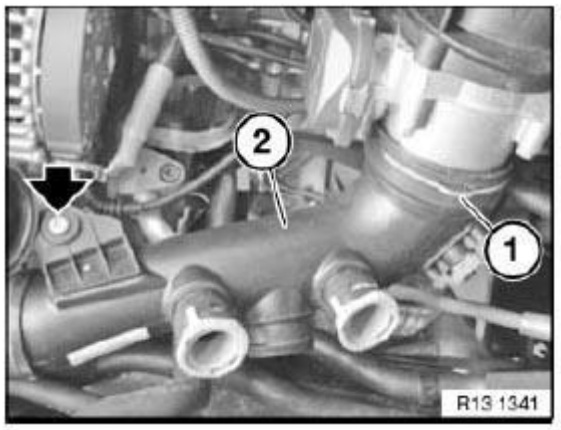


Fig. 371: Identifying Quick-Connect Coupling And Charge-Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

Only for E71 and only when replacing the charge air duct!

If the charge air duct (1) is renewed, the Y-pipe (3) must be renewed with two blow-off valves (2). The vacuum hoses must be adapted.

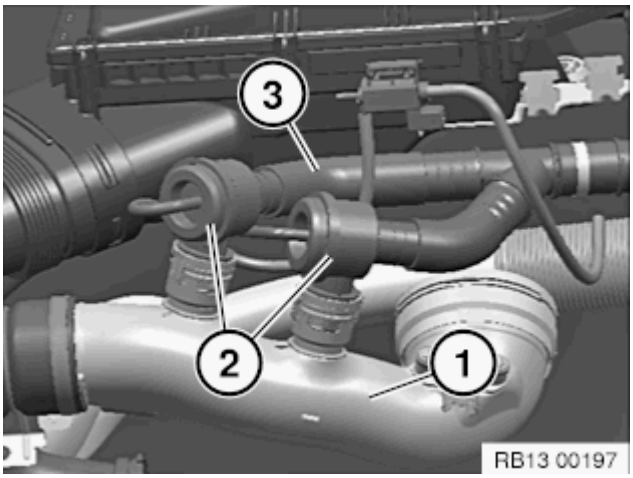


Fig. 372: Renewing Y-Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Install the charge air duct (1) with a connection for the blow-off valve.

Install the blow-off pipe (2) with a blow-off valve. A vacuum line with a T-piece is no longer needed. Instead, install a new vacuum line (3) between the blow-off valve and the electric changeover valve or intake plenum.

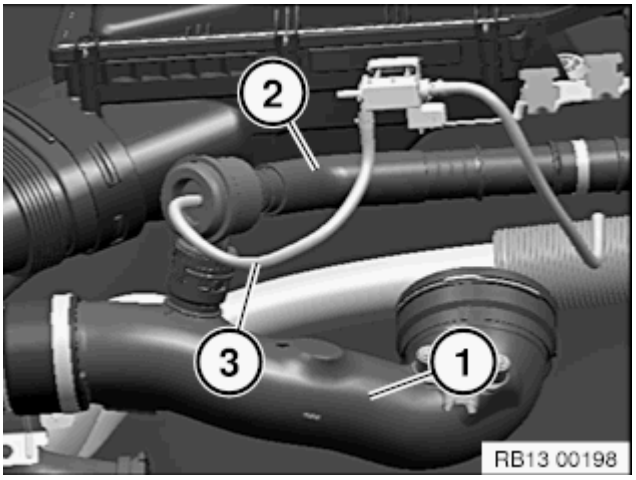


Fig. 373: Installing Charge Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Read out fault memory of DME control unit

11 61 368 REPLACING CHARGE-AIR DUCT (N54)

Necessary preliminary tasks:

- Remove **intake filter housing** . See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N54)** .
- Remove **fan cowl** . See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N54)** .

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 hose clip (1).

Tightening torque **13 71 6AZ** , see **13 71 AIR INTAKE SILENCER**

Installation:

Install charge-air hoses dry and free from grease.

Release quick-connect couplings (2) by turning lock through 90°.

Detach recirculated-air hoses (2) and lay to one side.

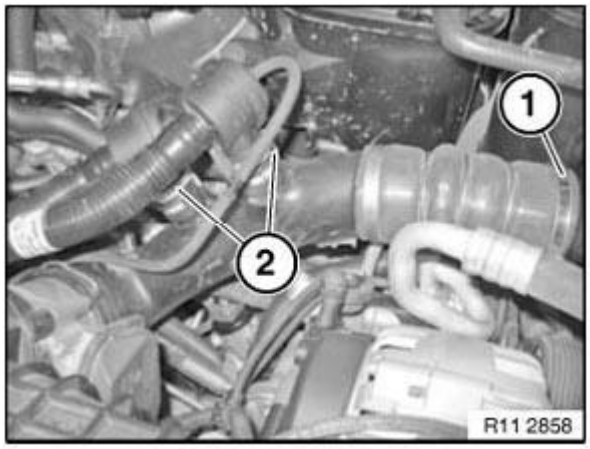


Fig. 374: Identifying Hose Clip And Quick-Connect Couplings
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Bring lock (1) back 90° into installation position.

Pay attention to markings.

Recirculated-air hoses must snap audibly into place!

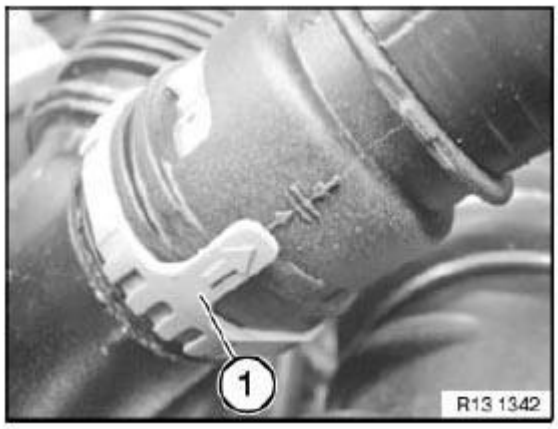


Fig. 375: Bring Lock (1) Back 90° Into Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Release quick-release coupling (1) on charge-air duct.

Unlock connector (2) and remove.

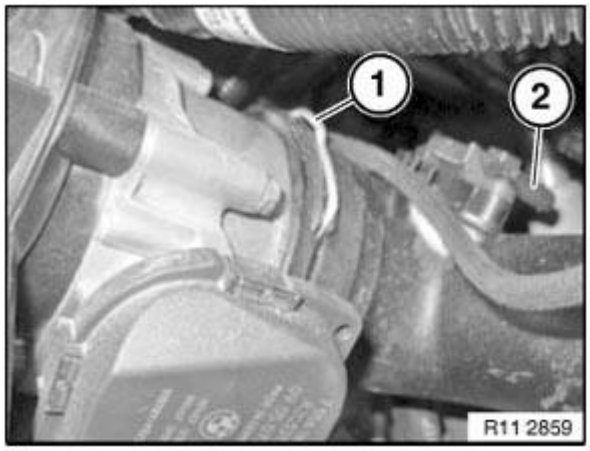


Fig. 376: Identifying Quick-Release Coupling And Connector
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Coat sealing rings of quick-connect couplings with antiseize agent. Pressure pipes cannot be fitted without antiseize agent!

IMPORTANT: Risk of breakage!
Carry out operation carefully. The holder (1) on the charge-air duct can break during removal.

Remove charge-air duct by levering out holder (1) in direction of arrow.

Installation:

Coat holder (1) on charge-air duct with antiseize agent.

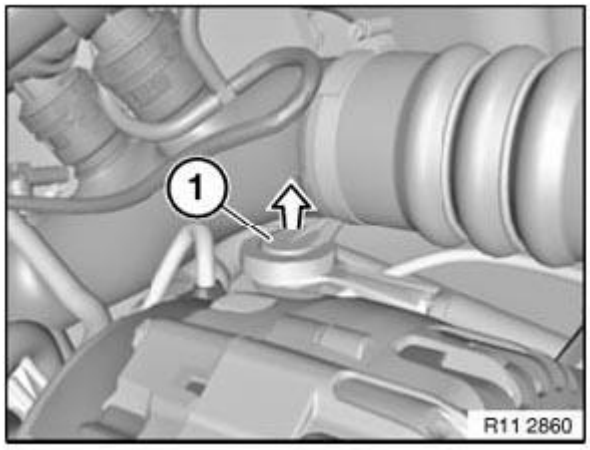


Fig. 377: Identifying Holder On Charge-Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock quick-connect coupling.

Detach charge-air duct (1) from intercooler (2).

Installation:

- Coat sealing rings of quick-connect couplings with antiseize agent.
- Pressure pipes must audibly snap into place.

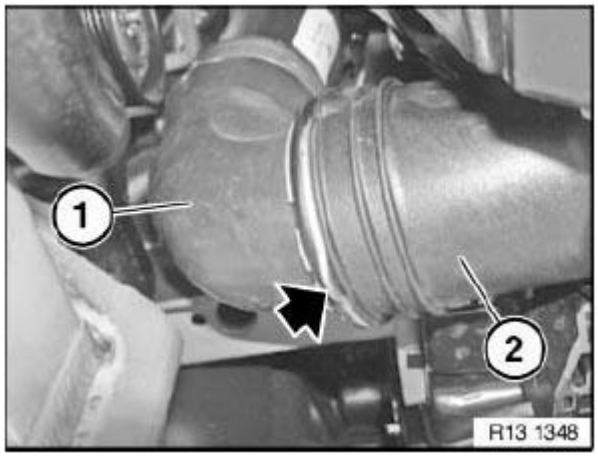


Fig. 378: Identifying Charge-Air Duct And Intercooler
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Read out fault memory of DME control unit

11 61 730 BMW LEAK TEST FOR INTAKE SYSTEM (N54)

IMPORTANT: Pressure and vacuum lines can be recognized by the size of their fasteners and are colour-coded blue and red respectively.

Designation:

- Pressure line blue
- Vacuum line red

Pressure and vacuum lines must not be mixed up.

Mixing up the lines will result in engine damage.

Necessary preliminary tasks:

- Remove upper section of **intake filter housing** . See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N54)** .
- Prepare BMW diagnosis system

- Start diagnosis program

1. Drive
2. Engine electronics
3. Air supply
4. Boost pressure control system or perception of lack of power

Ordering note:

- Workshop Equipment - Start BMW
- Workshop equipment catalogue
- Measuring and test equipment
- Service and diagnosis
- Order number 81 29 0 426 464

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 12V battery cables (3) to vehicle battery positive and negative.
4. Controller for vacuum connection.
5. Vacuum connection (Red).

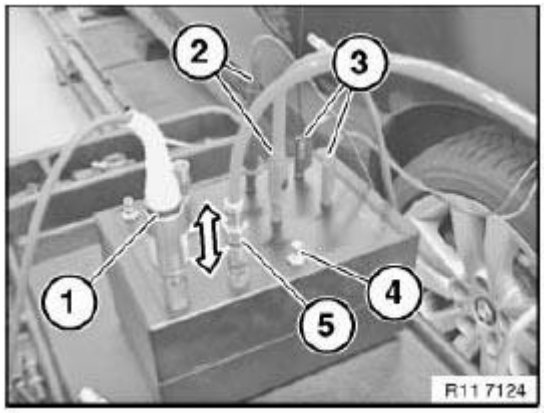


Fig. 379: Identifying Stimuli Cables And 12V Battery Cables
Courtesy of BMW OF NORTH AMERICA, INC.

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.

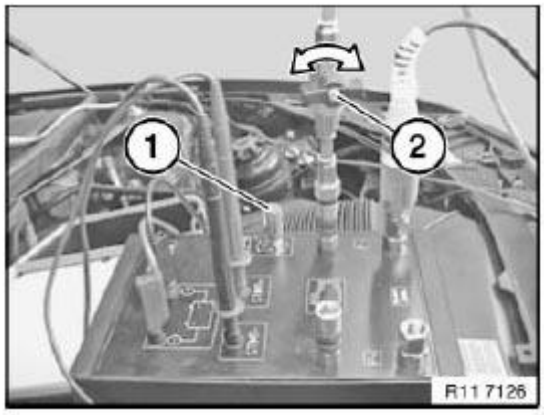


Fig. 380: Identifying Controller And Stop Cock
Courtesy of BMW OF NORTH AMERICA, INC.

Connections on EPPC

- "VAC" connection (1) to vacuum reservoir
- "OUT" connection (2) to exhaust turbocharger

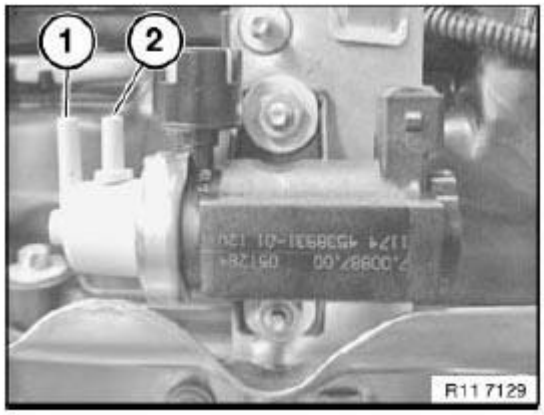


Fig. 381: Identifying OUT Connection And VAC Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Checking wastegate on cylinders 1-3

Detach vacuum line (1) from EPPC (2), cylinders 1-3 (OUT).

Clamp off connecting line with suitable tool (1).

Attach vacuum line to pneumatic coupling with Red pneumatic hose in direction of arrow.

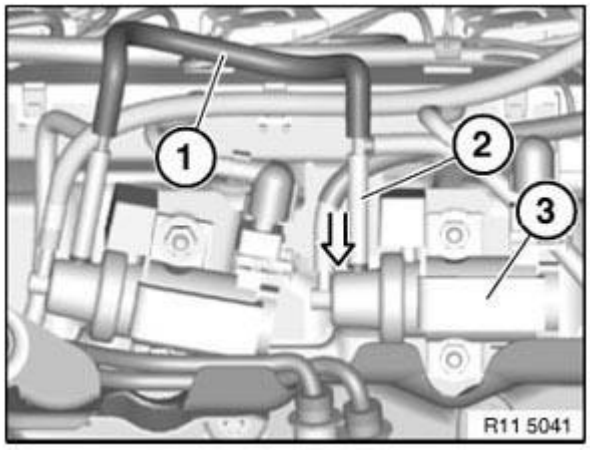


Fig. 382: Identifying Vacuum Line And EPPC
Courtesy of BMW OF NORTH AMERICA, INC.

Checking wastegate on cylinders 4-6

Detach vacuum line (1) from EPPC (2), cylinders 4-6 (OUT).

Clamp off connecting line with suitable tool (1).

Attach vacuum line to pneumatic coupling with Red pneumatic hose in direction of arrow.

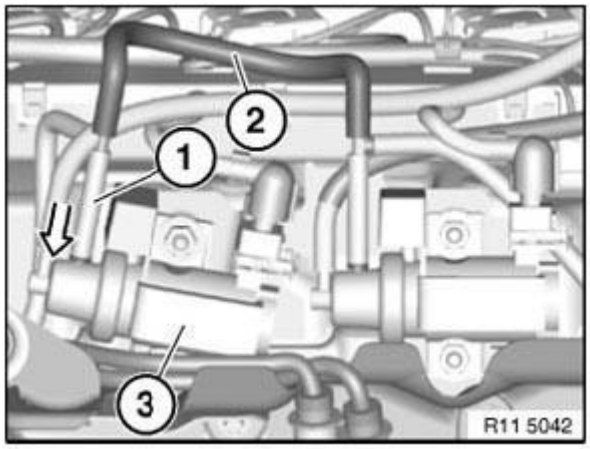


Fig. 383: Identifying Vacuum Line And EPPC
Courtesy of BMW OF NORTH AMERICA, INC.

Initial position (1) of wastegate linkage depressurized.

Flap of vacuum unit (wastegate valve) is open.

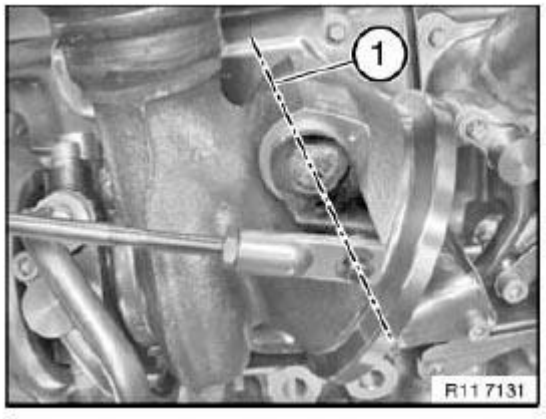


Fig. 384: Identifying Position Of Wastegate Linkage Depressurized
Courtesy of BMW OF NORTH AMERICA, INC.

Initial position (1) of wastegate linkage with vacuum pressure.

Flap of vacuum unit (wastegate valve) is closed.

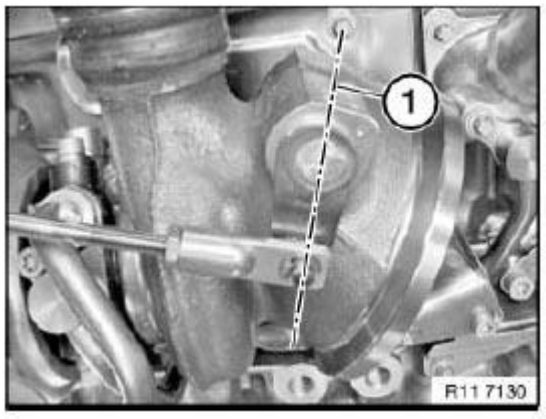


Fig. 385: Identifying Position Of Wastegate Linkage With Vacuum Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

Checking flap of vacuum unit (wastegate valve)

Flap (1) of vacuum unit (wastegate valve) must be open in depressurized state.

Flap (1) of vacuum unit (wastegate valve) must be closed in event of vacuum pressure.

Check shaft on turbine wheel for rotatability.

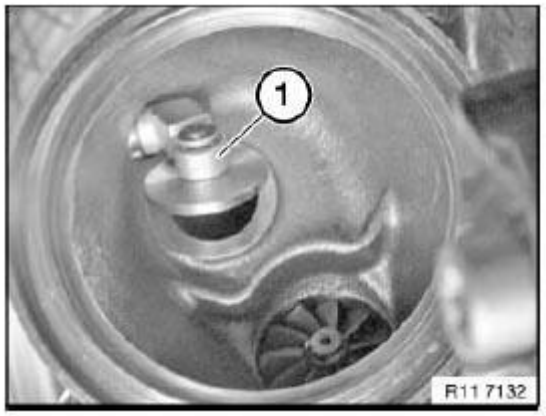


Fig. 386: Identifying Flap Of Vacuum Unit (Wastegate Valve)
Courtesy of BMW OF NORTH AMERICA, INC.

Pressure measurement

Prepare BMW diagnosis system on BMW auxiliary diagnosis unit - pressure.

1. Screw in pressure sensor (1).
2. Insert blue pressure line (2) as far as it will go into pneumatic coupling.
3. Connect stimulus leads (3) to positive and negative terminals.
4. Connect 12V battery cables (4) to vehicle battery positive and negative.

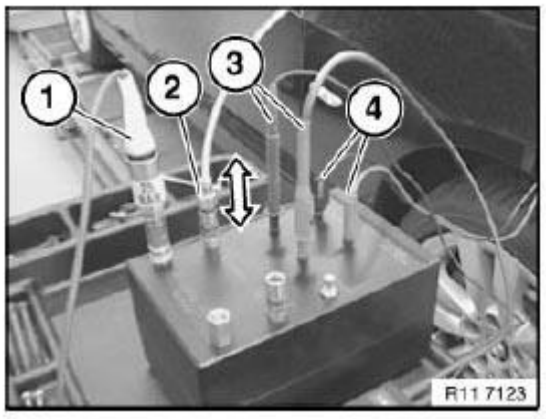


Fig. 387: Identifying Pressure Sensor, Blue Pressure Line And Stimulus Leads
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Pneumatic coupling locks automatically.

NOTE: For an exact leak test, seal clean-air pipe (1) with special tool (3) bearing number 82 29 2 146 625.

Secure clamp (2) to 4 Nm.

Secure union nut (4) to 10 Nm.

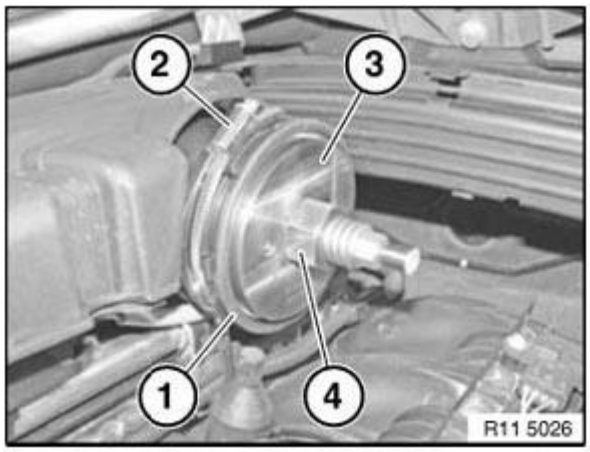


Fig. 388: Identifying Seal Clean-Air Pipe And Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Insert blue pressure line (3) as far as it will go into pneumatic coupling (2).

Note on removal:

Slide lock (1) of pneumatic coupling (2) in direction of arrow.

Release blue pressure line (3).

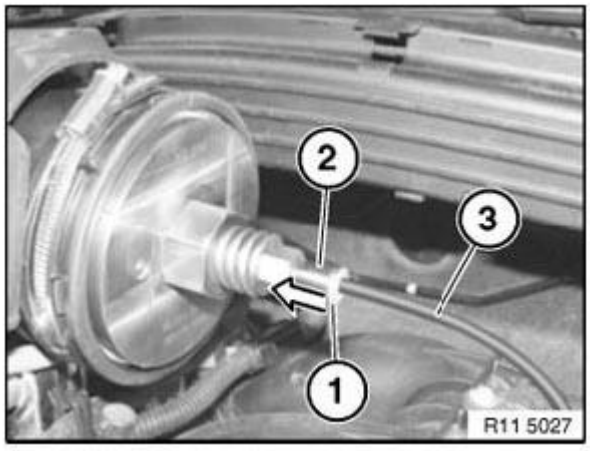


Fig. 389: Identifying Lock, Pneumatic Coupling And Blue Pressure Line
Courtesy of BMW OF NORTH AMERICA, INC.

Checking blow-off valves

Necessary preliminary tasks:

- Remove both **blow-off valves**

NOTE: To check the function of the blow-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.

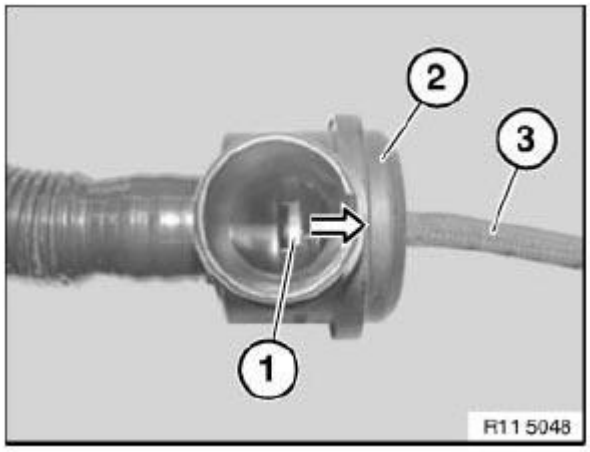


Fig. 390: Identifying Plunger, Blow-Off Valves And Vacuum Hose
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Plunger (1) must maintain this position while vacuum pressure is being created.
If this is not the case, replace the blow-off valve (2).

Checking activation of blow-off valves with EPPC

Observe BMW diagnosis instructions.

Check all vacuum lines for damage and firm seating.

Connections on EPPC

- "VAC" connection (1) to vacuum reservoir
- "OUT" connection (2) to blow-off valve

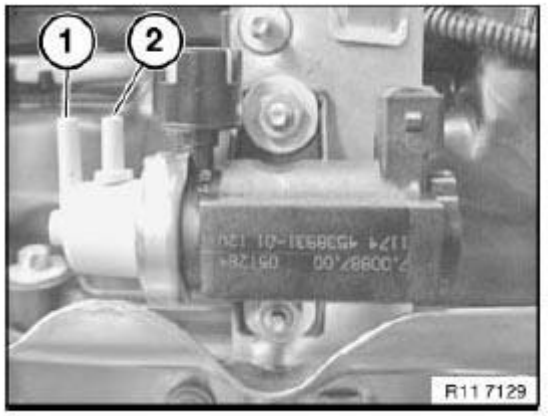


Fig. 391: Identifying OUT Connection And VAC Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Observe BMW diagnosis instructions.

SUPERCHARGER

11 65 164 REMOVING AND INSTALLING/REPLACING BOTH BLOW-OFF VALVES (N54)

Necessary preliminary tasks:

- Remove **intake filter housing** . See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N54)** .

IMPORTANT: Only when replacing the blow-off valves! There is one less blow-off valve for the charge air duct. Therefore, the charge air duct, too, must be renewed with two connections for the blow-off valves. Conversion of the charge air duct is described at the end of the instructions.

Carefully detach vacuum hoses (1) and lay to one side.

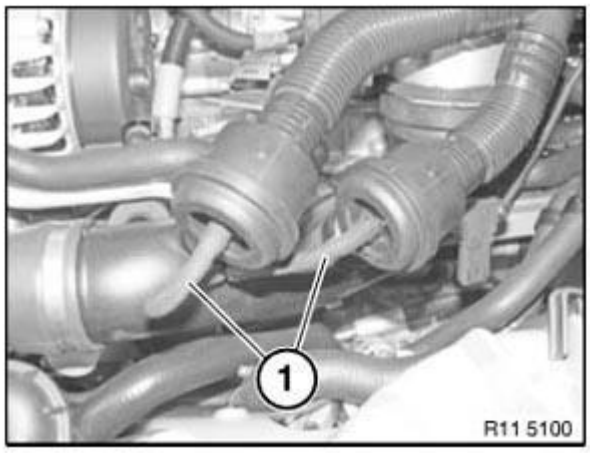


Fig. 392: Identifying Vacuum Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Release locks (1 and 4) by turning through approx. 45° in direction of arrow.

Remove both blow-off valves (2 and 3) towards top.

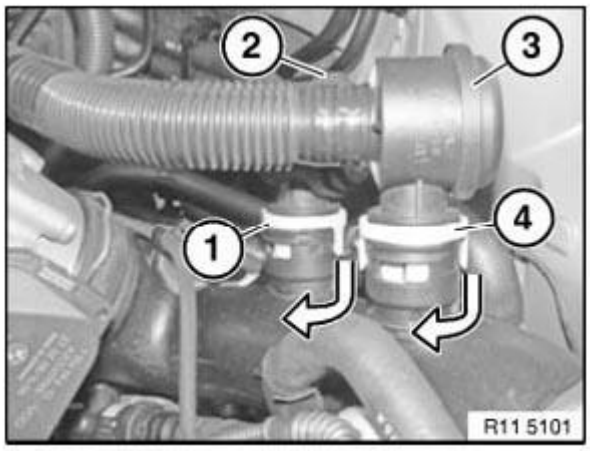


Fig. 393: Identifying Locks And Blow-Off Valves
Courtesy of BMW OF NORTH AMERICA, INC.

Insert blow-off valve (1) in charge-air duct connection.

Installation:

Blow-off valve (1) must snap audibly into place!

Turn lock (2) in direction of arrow until markings (3) line up.

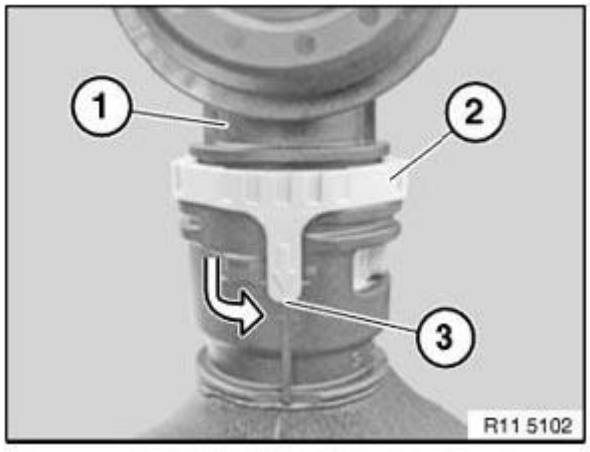


Fig. 394: Identifying Blow-Off Valve And Lock
Courtesy of BMW OF NORTH AMERICA, INC.

Only when replacing the blow-off valve!

If the Y-pipe (3) is renewed with two blow-off valves (2), the charge air duct (1) must also be renewed with two connections for the blow-off valves. The vacuum hoses must be adapted.

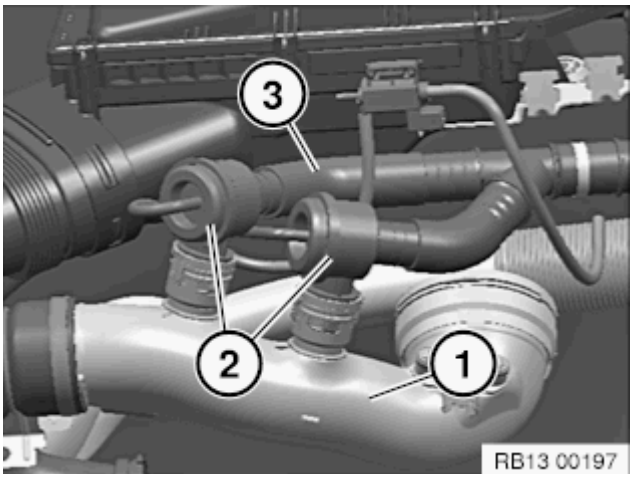


Fig. 395: Identifying Y-Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Install the charge air duct (1) with a connection for the blow-off valve.

Install the blow-off pipe (2) with a blow-off valve. A vacuum line with a T-piece is no longer needed. Instead, install a new vacuum line (3) between the blow-off valve and the electric changeover valve or intake plenum.

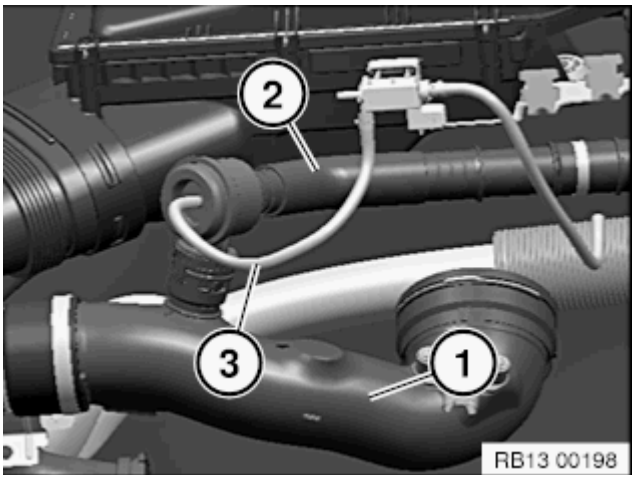
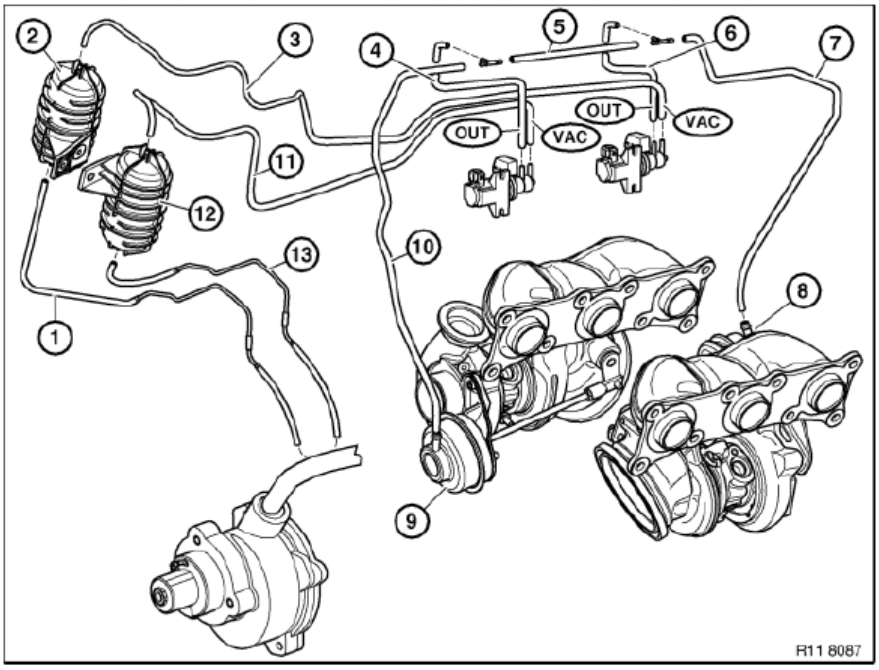


Fig. 396: Installing Blow Off Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 65 CONNECTION DIAGRAM, VACUUM ACTIVATION (N54)



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.

Fig. 397: Vacuum Diagram (N54)
Courtesy of BMW OF NORTH AMERICA, INC.

11 65... REMOVING AND INSTALLING VACUUM UNIT (WASTEGATE VALVE) FOR CYLINDERS 4-6 (N54)

IMPORTANT: This repair instruction serves exclusively as preliminary work for other repair instructions!
It only describes how to remove and install the vacuum unit (wastegate valve)!
The setting on the vacuum unit (wastegate valve) must not be altered!

The following operations are **not** dealt with in this repair instruction:

- Information for ordering parts
- Necessary preliminary tasks
- Adjustment and inspection/testing tasks
- Vacuum measurements
- Calibration

These operations are described in the associated repair instructions for the relevant engine and the relevant vehicle.

IMPORTANT: Do not adjust and do not release lock nut (1).

Vacuum unit (wastegate valve) is adjusted to factory specifications.

Adjustment and inspection/testing tasks will be required if lock nut (1) is adjusted or released.

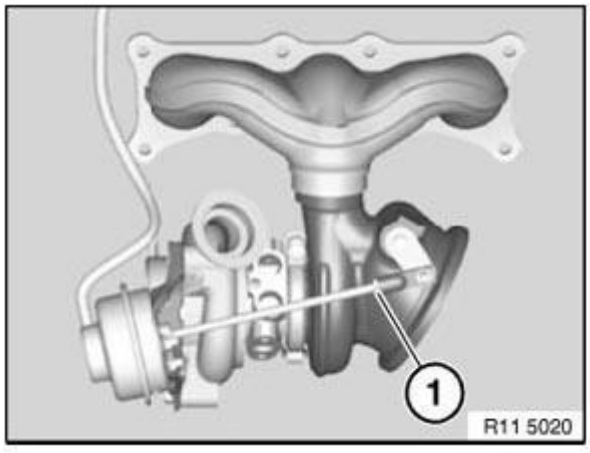


Fig. 398: Identifying Lock Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Detach vacuum hose (2) from vacuum unit (wastegate valve).

IMPORTANT: Locking clip (4) cannot be replaced if it is lost.
Bear this in mind and store the locking clip in a safe place.

Release locking clip (4).

Disengage linkage of vacuum unit (wastegate valve).

Unfasten screws (1 and 3).

Tightening torque **11 65 11AZ** , see **65 52 REAR CABIN MONITOR**

Remove vacuum unit (wastegate valve) with bracket.

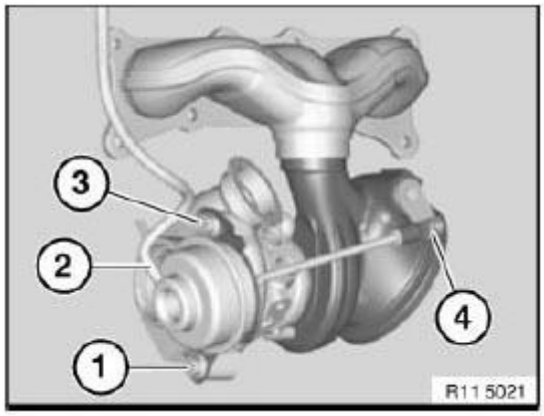


Fig. 399: Identifying Screws, Vacuum Hose And Locking Clip
Courtesy of BMW OF NORTH AMERICA, INC.

11 65 022 REMOVING AND INSTALLING/REPLACING EXHAUST-GAS TURBOCHARGER FOR CYLINDERS 1-3 (N54)

Necessary preliminary tasks:

- Remove **fan cowl** with electric fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N54)** .
- Draining **coolant** . See **17 00 005 DRAINING AND ADDING COOLANT (N54)** .
- Remove front right **WHEEL ARCH COVER (FRONT SECTION) .**
- Remove both **catalytic exhaust-gas converters** . See **EXHAUST CATALYTIC CONVERTER** .
- Remove **vacuum unit (wastegate valve)** , cylinders 4-6
- Remove right charge-air duct
- Remove **AIR DUCT** , cylinders 1-3
- Remove **coolant thermostat**
- Remove **coolant pump**

Release screws (2).

Tightening torque **11 42 7AZ** , see **OIL FILTER AND LINES**

Installation:

Replace seal.

Release screw (1).

Tightening torque **11 42 8AZ** , see **OIL FILTER AND LINES**

Remove oil return line (3) in direction of arrow.

Installation:

Replace O-ring.

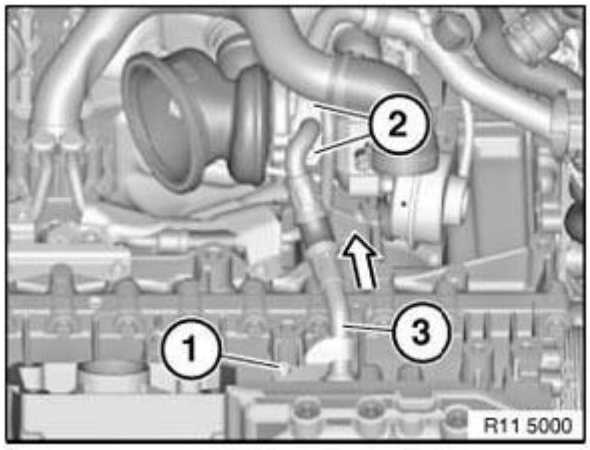


Fig. 400: Identifying Screws And Oil Return Line
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Where necessary, to release the coolant feed lines (3 and 4), do not place pliers on the pipes.
Risk of damage!

Release screws (1 and 2).

Tightening torque **11 53 10AZ** , see **THERMOSTAT AND CONNECT**

If necessary, release coolant feed lines (3 and 4) with suitable pliers at connection.

Installation:

Replace O-rings.

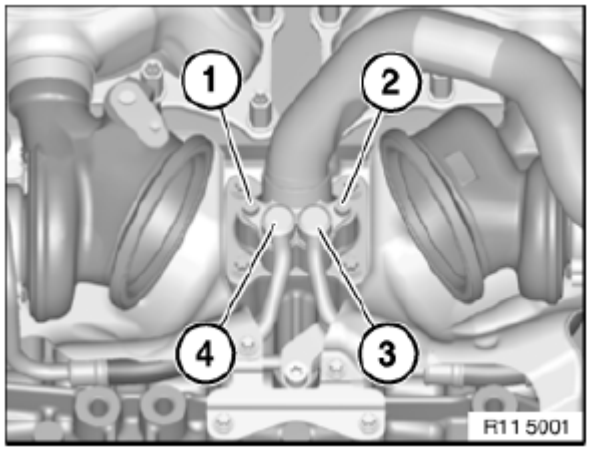


Fig. 401: Identifying Coolant Feed Lines
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, the graphic shows the released coolant feed lines removed.

Release screws (1).

Tightening torque **11 53 3AZ** , see **THERMOSTAT AND CONNECT**

Remove feed line (2).

Installation:

Replace seal.

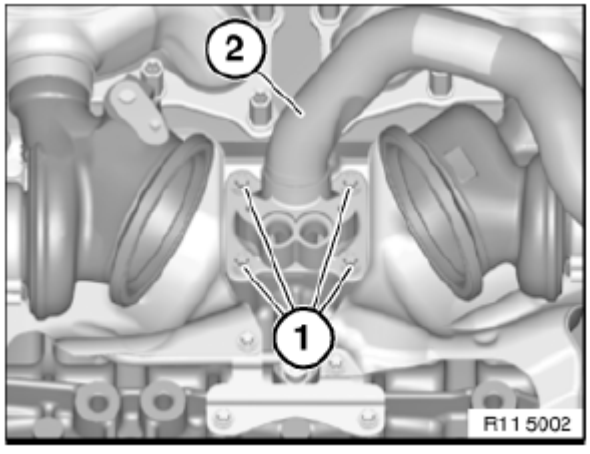


Fig. 402: Identifying Screws And Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Where necessary, to release the coolant feed and return lines (1 and 3), do not

**place pliers on the pipes.
Risk of damage!**

Release screw (2).

Tightening torque **11 53 8AZ** , see **THERMOSTAT AND CONNECT**

If necessary, release coolant feed line (1) with suitable pliers at connection.

Installation:

Replace O-rings.

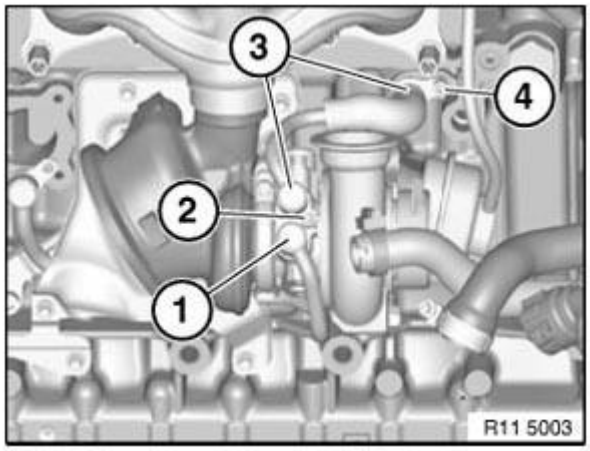


Fig. 403: Identifying Screw And Coolant Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, release coolant return line (3) with suitable pliers at front connection.

Release screw (4).

Tightening torque **11 53 9AZ** , see **THERMOSTAT AND CONNECT**

If necessary, release coolant return line (3) with suitable pliers at rear connection and remove.

Installation:

Replace O-rings.

Release screws (1).

Tightening torque **11 65 2AZ** , see **SUPERCHARGER**

Remove retaining plate (2).

Release screws (3).

Tightening torque **11 65 2AZ** , see **SUPERCHARGER**

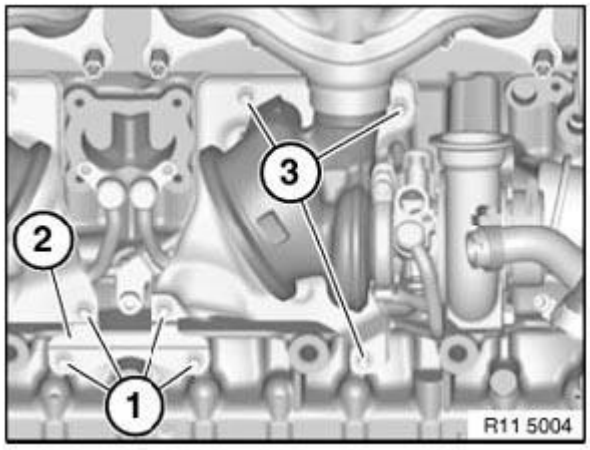


Fig. 404: Identifying Retaining Plate And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Carefully swing out heat shield (2) in direction of arrow. Risk of damage!

Remove heat shield (2) in direction of arrow.

NOTE: Coolant feed line (1) can be removed with heat shield (2).

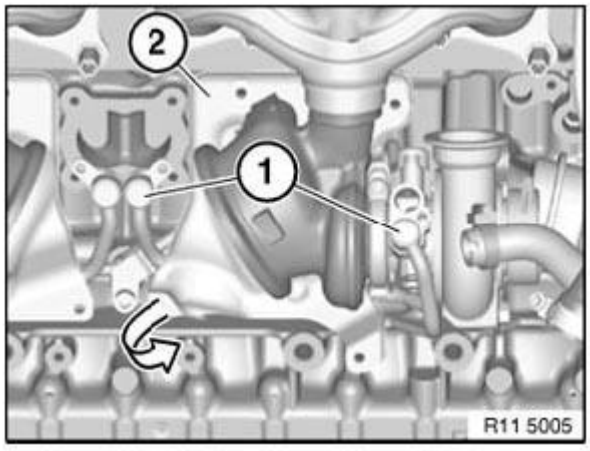


Fig. 405: Identifying Heat Shield And Coolant Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 65 3AZ** , see **SUPERCHARGER**

Set holder (2) down on cylinder head cover.

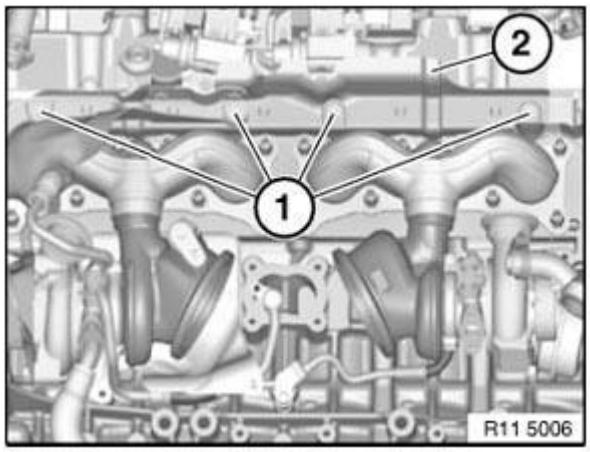


Fig. 406: Identifying Screws And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 42 4AZ** , see **OIL FILTER AND LINES**

Release oil feed line (2) in direction of arrow.

Installation:

Replace O-ring.

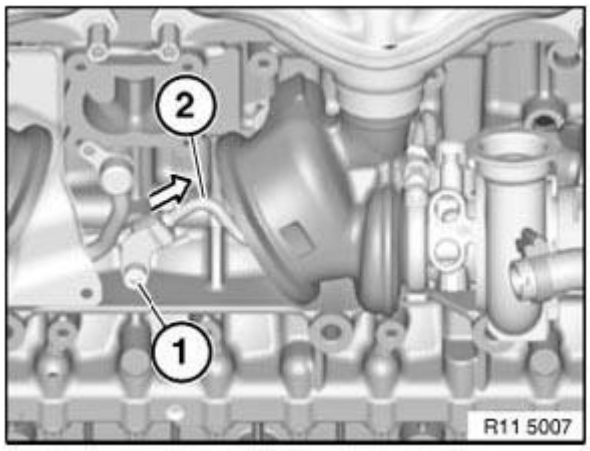


Fig. 407: Identifying Screw And Oil Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 42 5AZ** , see **OIL FILTER AND LINES**

IMPORTANT: Where necessary, to release the oil feed line (2), do not place pliers on the pipe. Risk of damage!

If necessary, release oil feed line (2) with suitable pliers at connection and remove.

Installation:

Replace O-rings.

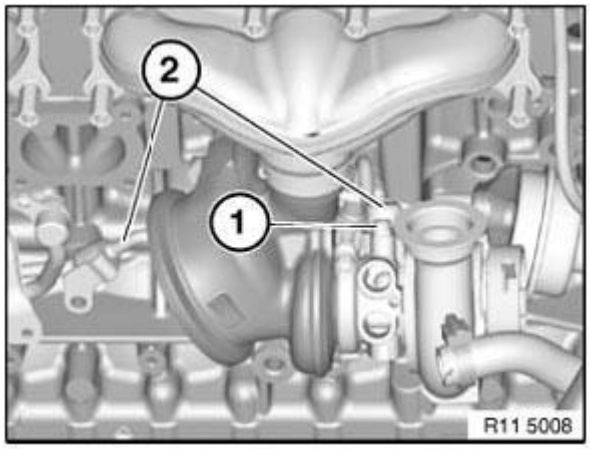


Fig. 408: Release Oil Feed Line (2) With Suitable Pliers
Courtesy of BMW OF NORTH AMERICA, INC.

Detach vacuum hose (3) from vacuum unit (wastegate valve).

Unscrew nuts (2).

Tightening torque **11 65 1AZ** , see **SUPERCHARGER**

Remove turbocharger (1) towards top.

IMPORTANT: Do not misuse linkage of vacuum unit (wastegate valve) to transport turbocharger (1)! Risk of damage!

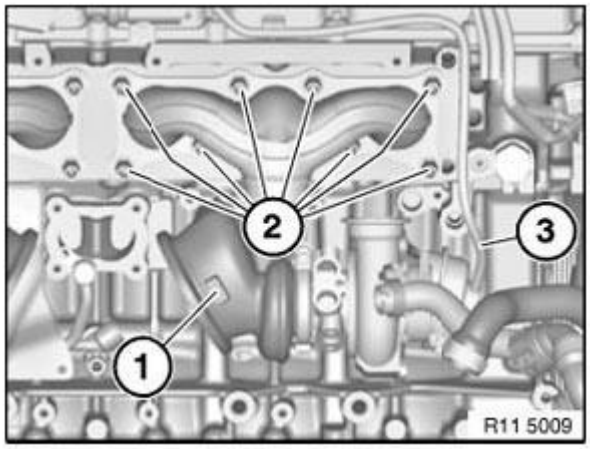


Fig. 409: Identifying Vacuum Hose And Turbocharger
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace graphite sealing rings (1).

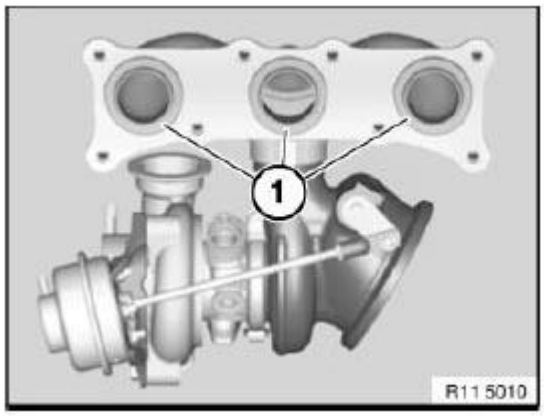


Fig. 410: Identifying Graphite Sealing Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Clear fault memory in DME control unit.

Carry out **BMW LEAK TEST** for intake system.

Observe DME control unit instructions.

11 65 024 REMOVING AND INSTALLING/REPLACING EXHAUST-GAS TURBOCHARGER FOR CYLINDERS 4-6 (N54)

Necessary preliminary tasks:

- Remove **fan cowl** with electric fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N54)** .
- Draining **coolant** . See **17 00 005 DRAINING AND ADDING COOLANT (N54)** .
- Remove front right **WHEEL ARCH COVER (FRONT SECTION) .**
- Remove both **catalytic exhaust-gas converters** . See **EXHAUST CATALYTIC CONVERTER** .
- Remove **vacuum unit (wastegate valve)** , cylinders 4-6
- Remove right charge-air duct
- Remove **AIR DUCT (N54)** , cylinders 1-3
- Remove **AIR DUCT (N54)** , cylinders 4-6

Release screws (2).

Tightening torque **11 42 7AZ** , see **OIL FILTER AND LINES**

Installation:

Replace seal.

Unscrew bolt (3).

Tightening torque **11 42 8AZ** , see **OIL FILTER AND LINES**

Remove oil return line (1) in direction of arrow.

Installation:

Replace O-ring.

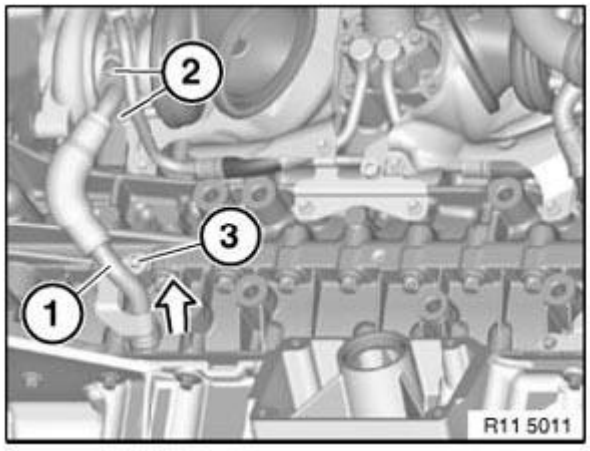


Fig. 411: Identifying Screws, Bolt And Oil Return Line
Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Where necessary, to release the coolant feed lines (3 and 4), do not place pliers on the pipes.
Risk of damage!**

Release screws (1 and 2).

Tightening torque **11 53 10AZ** , see **THERMOSTAT AND CONNECT**

If necessary, release coolant feed lines (3 and 4) with suitable pliers at connection.

Installation:

Replace O-rings.

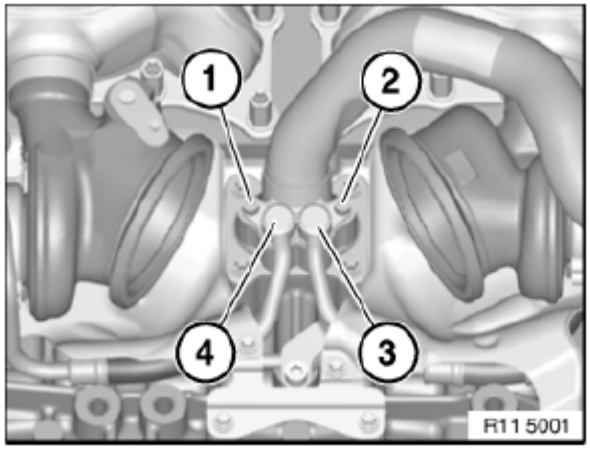


Fig. 412: Identifying Screws And Coolant Feed Lines
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, the graphic shows the released coolant feed lines removed.

Release screws (1).

Tightening torque **11 53 3AZ** , see **THERMOSTAT AND CONNECT**

Remove feed line (2).

Installation:

Replace seal.

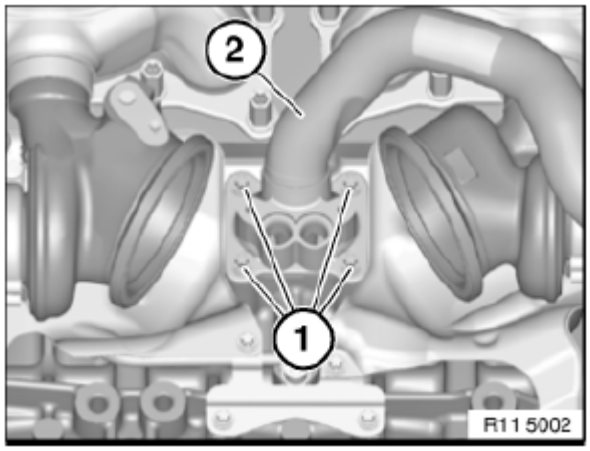


Fig. 413: Identifying Screws And Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Where necessary, to release the coolant return line (2), do not place pliers on the pipe.
Risk of damage!

Release screw (1).

Tightening torque **11 53 9AZ** , see **THERMOSTAT AND CONNECT**

If necessary, release coolant return line (2) with suitable pliers at connection.

Installation:

Replace O-ring.

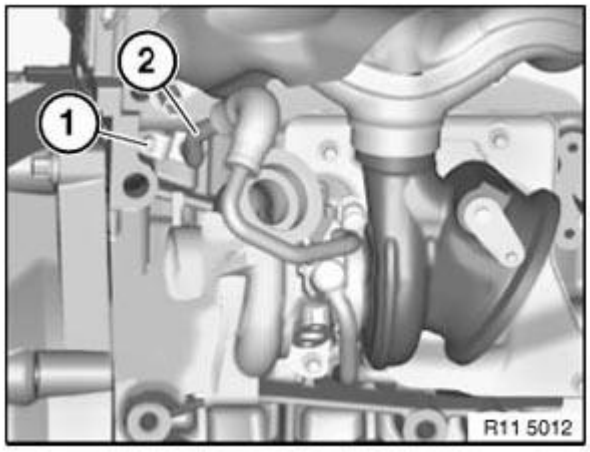


Fig. 414: Identifying Screw And Coolant Return Line
Courtesy of BMW OF NORTH AMERICA, INC.

**IMPORTANT: Where necessary, to release the coolant feed and return lines (2 and 3), do not place pliers on the pipes.
Risk of damage!**

Release screw (1).

Tightening torque **11 53 8AZ** , see **THERMOSTAT AND CONNECT**

If necessary, release coolant feed line (3) with suitable pliers at connection.

Installation:

Replace O-rings.

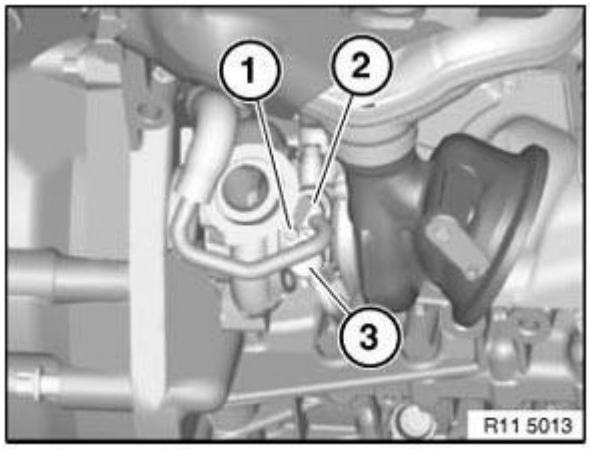


Fig. 415: Identifying Screw And Coolant Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, release coolant return line (2) with suitable pliers at connection and remove.

Installation:

Replace O-rings.

Release screws (1).

Tightening torque **11 65 2AZ** , see **SUPERCHARGER**

Remove retaining plate (2).

Unfasten screws (3 and 4).

Tightening torque **11 65 2AZ** , see **SUPERCHARGER**

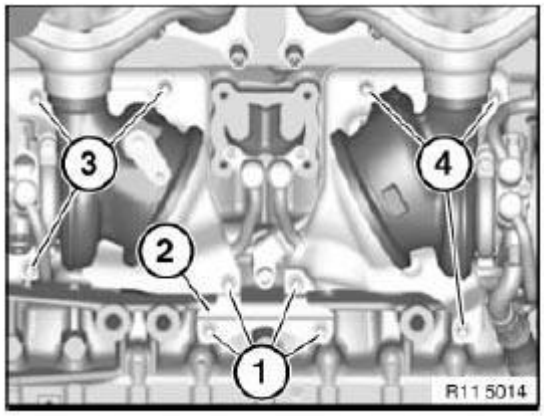


Fig. 416: Identifying Screws, Retaining Plate And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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 line (1) can be removed with heat shield (2).

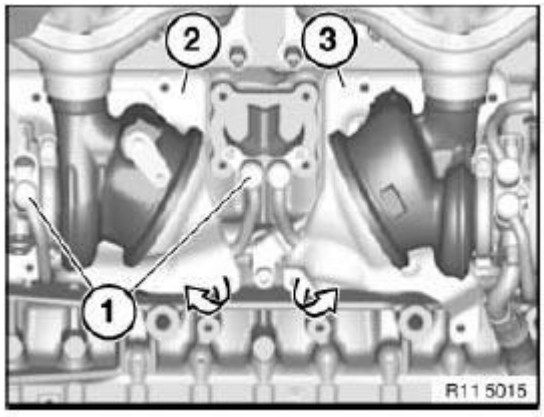


Fig. 417: Identifying Heat Shield And Coolant Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 42 4AZ** , see **OIL FILTER AND LINES**

Release oil feed line (2) in direction of arrow.

Installation:

Replace O-ring.

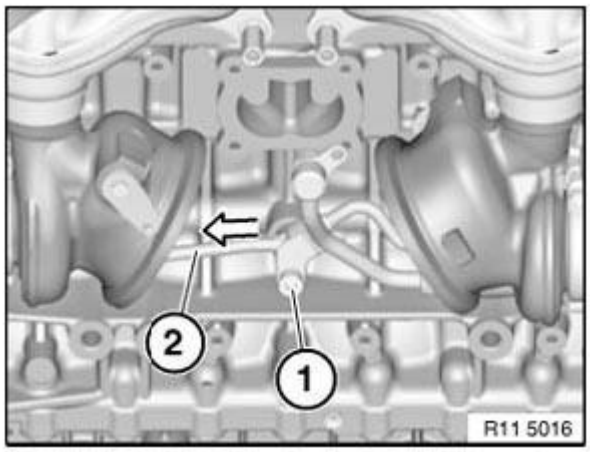


Fig. 418: Identifying Screw And Oil Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 65 3AZ** , see **SUPERCHARGER**

Set holder (2) down on cylinder head cover.

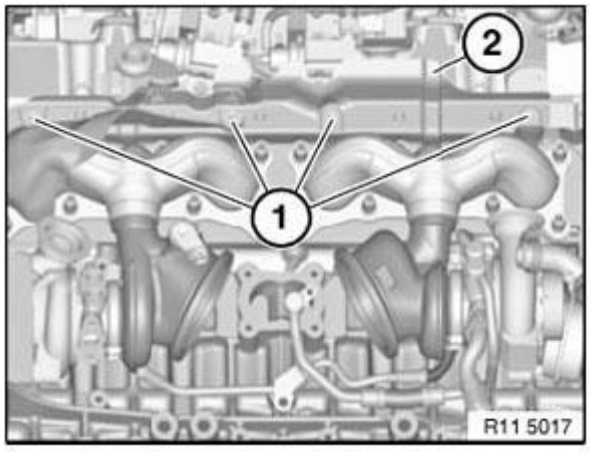


Fig. 419: Identifying Screws And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Tightening torque **11 65 1AZ** , see **SUPERCHARGER**

Remove turbocharger (2) downwards.

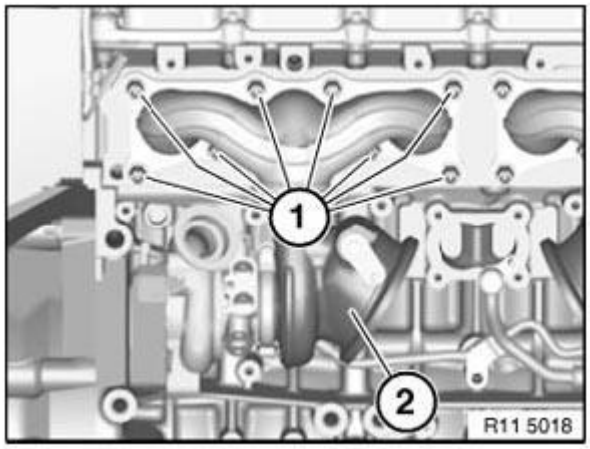


Fig. 420: Identifying Nuts And Turbocharger
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (2).

Tightening torque **11 42 5AZ** , see **OIL FILTER AND LINES**

IMPORTANT: Where necessary, to release the oil feed line (3), do not place pliers on the pipe. Risk of damage!

If necessary, release oil feed line (3) with suitable pliers at connection and remove.

Installation:

Replace O-rings.

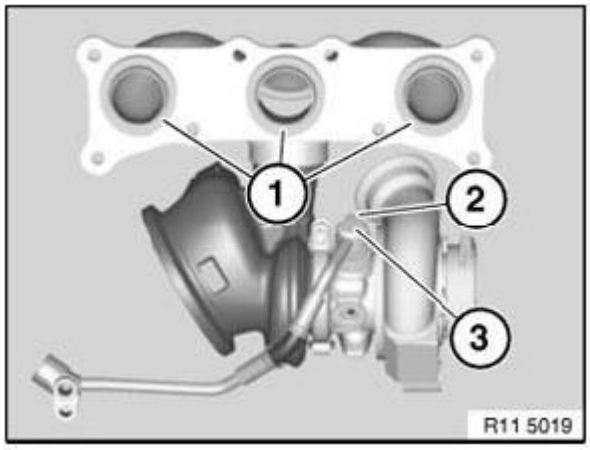


Fig. 421: Identifying Screw And Oil Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace graphite sealing rings (1).

Assemble engine.

Clear fault memory in DME control unit.

Carry out **BMW LEAK TEST** for intake system.

Observe DME control unit instructions.

11 65 580 REPLACING VACUUM UNIT (WASTEGATE VALVE) (N54)

**IMPORTANT: Overpressure and vacuum lines are identified by the size of the seals and colour-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 turbocharger (1-3) or turbocharger (4-6)**

Release locking clip (2).

Disengage linkage of vacuum unit (wastegate valve).

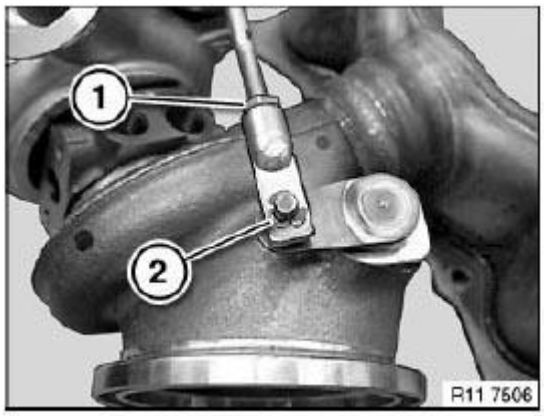


Fig. 422: Identifying Locking Clip
Courtesy of BMW OF NORTH AMERICA, INC.

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.

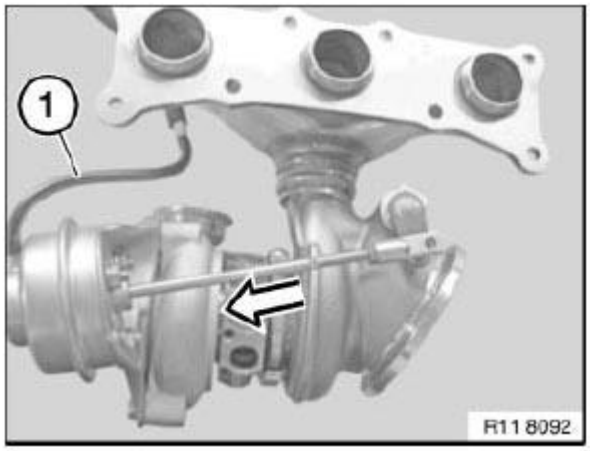


Fig. 423: Identifying Vacuum Line
Courtesy of BMW OF NORTH AMERICA, INC.

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.

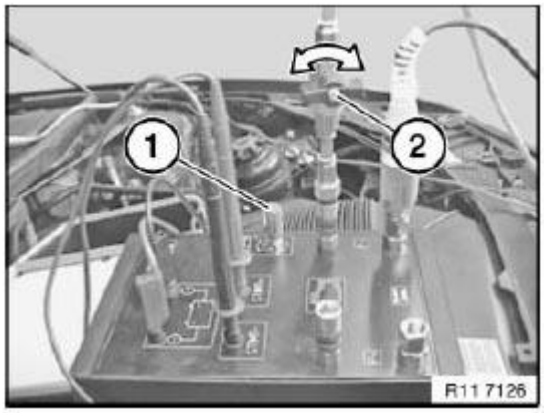


Fig. 424: Identifying Controller And Stop Cock
Courtesy of BMW OF NORTH AMERICA, INC.

Determine gap dimension.

Gap dimension between turnbuckle and adjusting lever.

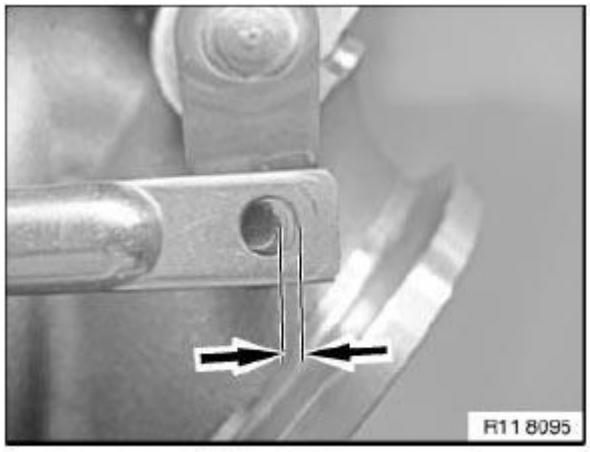


Fig. 425: Identifying Gap Dimension Between Turnbuckle And Adjusting Lever
Courtesy of BMW OF NORTH AMERICA, INC.

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.

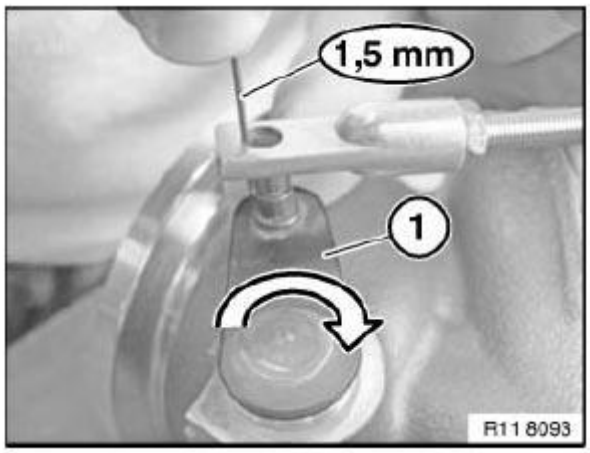


Fig. 426: Checking Wastegate Valve Gap Dimension (1 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

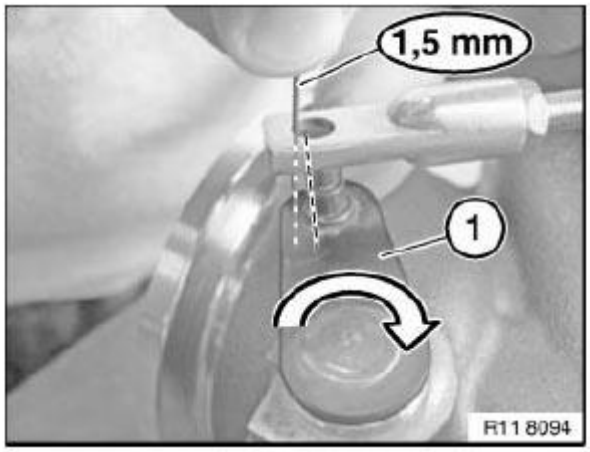


Fig. 427: Checking Wastegate Valve Gap Dimension (2 Of 2)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1 and 3).

Tightening torque **11 65 11AZ** , see **SUPERCHARGER**

Installation:

Replace vacuum unit 2 (wastegate valve).

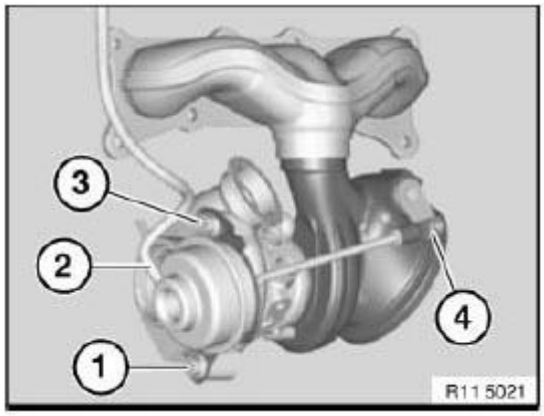


Fig. 428: Identifying Screws, Vacuum Hose And Locking Clip
Courtesy of BMW OF NORTH AMERICA, INC.

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).

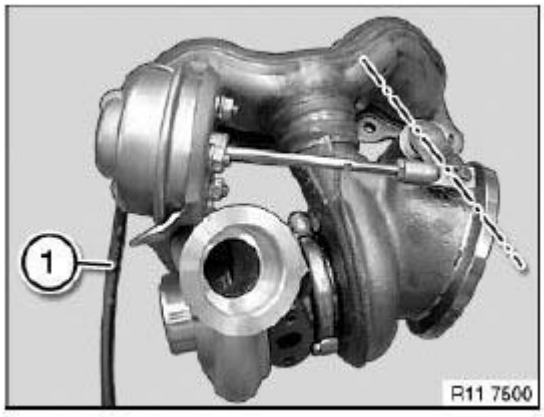


Fig. 429: Identifying Red Vacuum Line
Courtesy of BMW OF NORTH AMERICA, INC.

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).

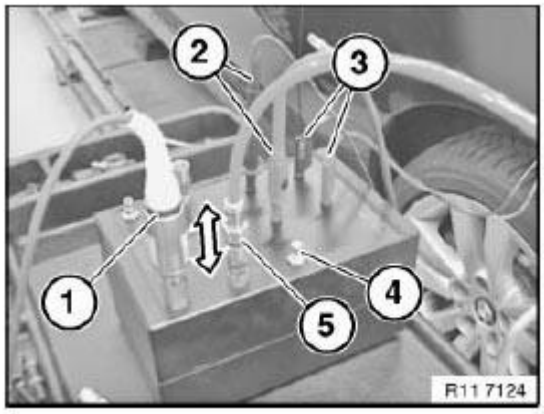


Fig. 430: Identifying 12V Battery Cables
Courtesy of BMW OF NORTH AMERICA, INC.

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.

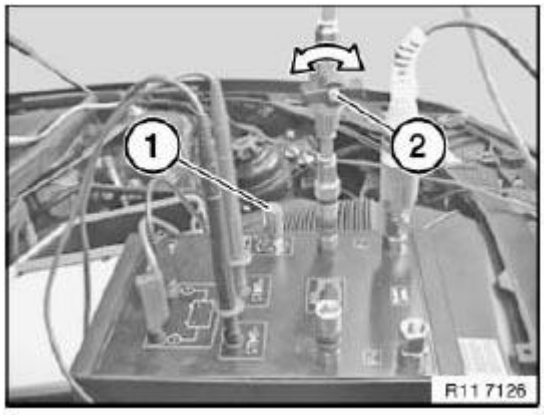


Fig. 431: Identifying Controller And Stop Cock
Courtesy of BMW OF NORTH AMERICA, INC.

Initial position (1) of wastegate linkage with preset vacuum pressure.

Wastegate valve virtually closed.

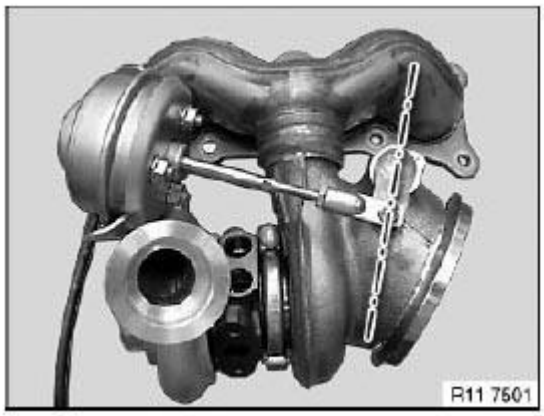


Fig. 432: Identifying Position Of Wastegate Linkage With Preset Vacuum Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

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.

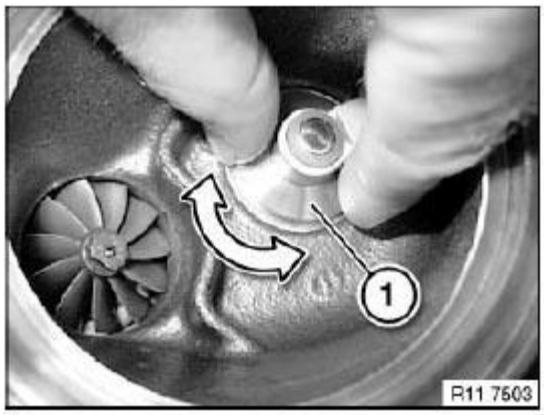


Fig. 433: Checking Turnability At Wastegate Valve
Courtesy of BMW OF NORTH AMERICA, INC.

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.

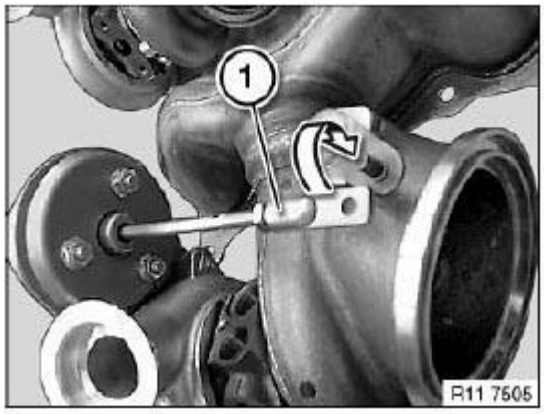


Fig. 434: Identifying Turnbuckle
Courtesy of BMW OF NORTH AMERICA, INC.

Secure lock nut (1); to do so, secure turnbuckle against turning with a suitable tool.

Tightening torque **11 65 10AZ** , see **SUPERCHARGER**

Mount locking clip (2).

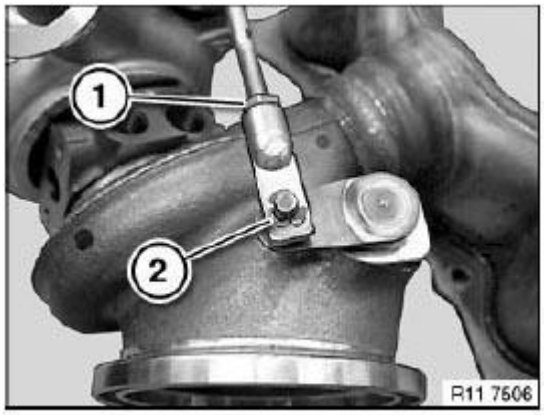


Fig. 435: Identifying Lock Nut And Locking Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Observe diagnosis instructions.

Execute test module for boost pressure control.

VACUUM PUMP

11 66 000 REMOVING AND INSTALLING/REPLACING VACUUM PUMP (N54)

Special tools required:

- **11 0 290**
- **11 4 120**
- **11 8 650**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

Necessary preliminary tasks:

- Remove **drive belt**
- Remove **tensioner** for drive belt
- Remove **sealing cover** for vacuum pump
- Remove **high-pressure pump** . See **13 51 017 REMOVING AND INSTALLING OR REPLACING HIGH-PRESSURE FUEL PUMP (N54, N53)** .

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** , see **11 66 VACUUM PUMP**

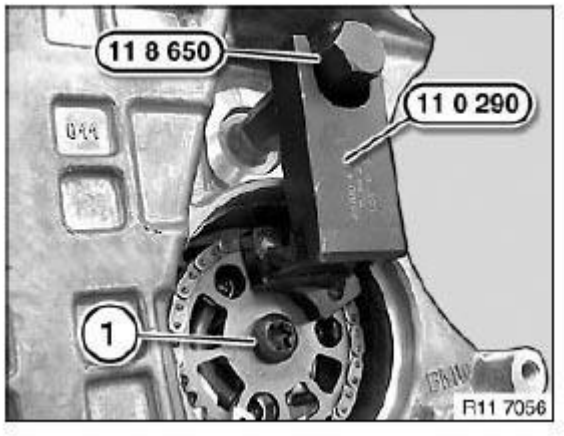


Fig. 436: Identifying Screw And Special Tools (11 0 290, 11 8 650)
Courtesy of BMW OF NORTH AMERICA, INC.

Press chain tensioner (1) with chain in direction of arrow.

Install special tool **11 4 120** .

Remove sprocket wheel (2) in direction of arrow.

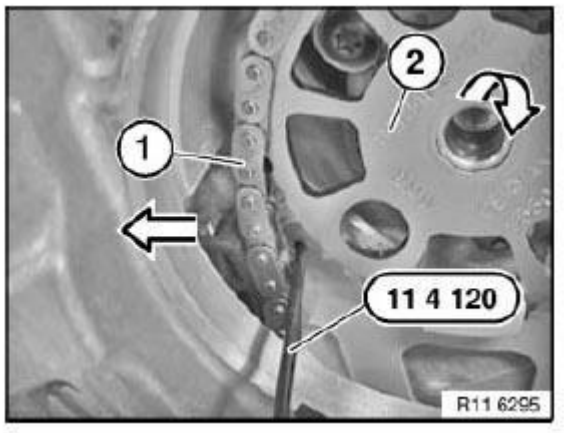


Fig. 437: Removing Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 66 1AZ** , see **11 66 VACUUM PUMP**

Release screws (1).

Secure screws (1) against falling out.

Remove vacuum pump.

Installation:

Replace seal.

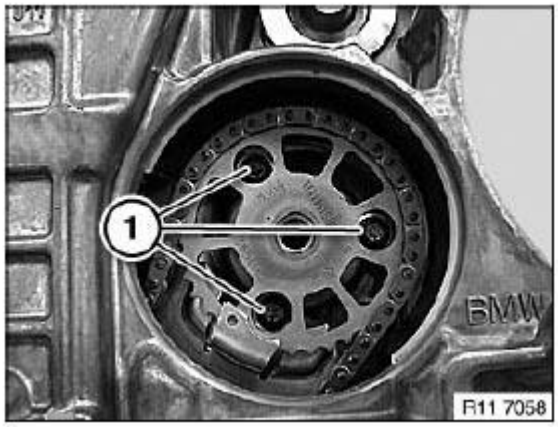


Fig. 438: Identifying Vacuum Pump Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

EMISSION CONTROL OXYGEN SENSOR

11 78 513 REPLACING BOTH LAMBDA OXYGEN CONTROL SENSORS (N54)

Special tools required:

- **11 7 030**
- **11 9 150**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

WARNING: Scalding hazard!

Work should only be carried out on an exhaust system that has cooled down.

Necessary preliminary tasks:

- Remove **CATALYTIC CONVERTER** , cylinders 1 - 3

Installation:

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** .

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** , see **EMISSION CONTROL**

Installation:

Cable color black, cylinders 1 to 3.

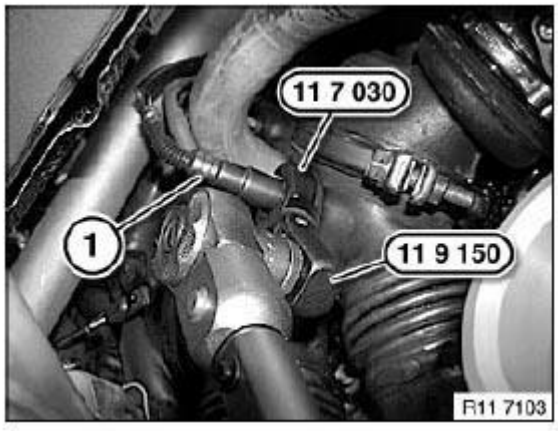


Fig. 439: Identifying Oxygen Control Sensor And Special Tools (11 7 030, 11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

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** , see **EMISSION CONTROL**

Installation:

Cable color grey, cylinders 4 to 6.

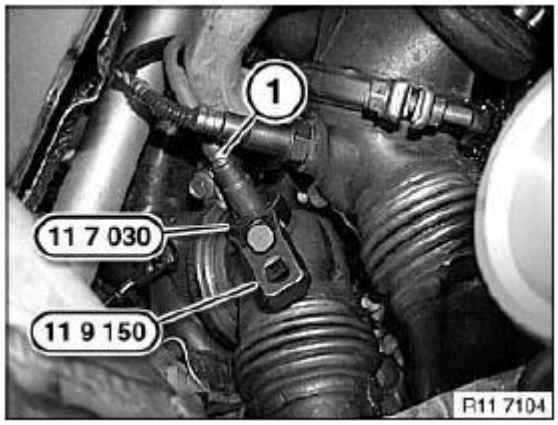


Fig. 440: Identifying Oxygen Control Sensor And Special Tools (11 7 030, 11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME control unit.

11 78 513 REPLACING BOTH LAMBDA OXYGEN CONTROL SENSORS (N54)

Special tools required:

- **11 7 030**
- **11 9 150**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

WARNING: Scalding hazard!

Work should only be carried out on an exhaust system that has cooled down.

Necessary preliminary tasks:

- Remove **catalytic converter** , cylinders 1 - 3. See **EXHAUST CATALYTIC CONVERTER** .

Installation:

The threads of new lambda control/monitor sensors are already coated with Never Seez Compound.

If a lambda control/monitor sensor is to be reused, apply a thin and even coating of Never Seez Compound to the thread only.

The part of the lambda control/monitor sensor which projects into the exhaust system branch (sensor ceramics) must **not** be cleaned and **not** coated with lubricant.

Unlock and disconnect plug connection for lambda control sensor, cylinders 1 - 3.

Installation:

Plug connection must snap audibly into place!

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** , see **EMISSION CONTROL**

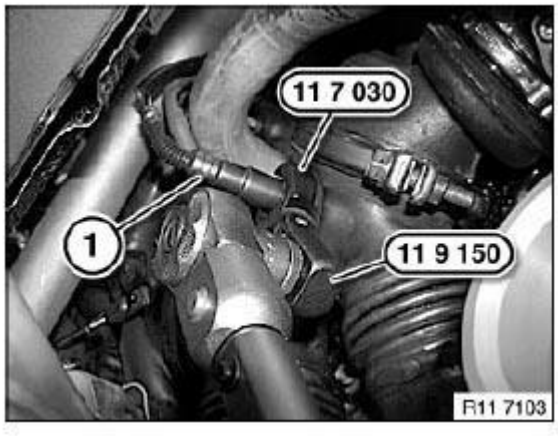


Fig. 441: Identifying Oxygen Control Sensor And Special Tools (11 7 030, 11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Cable color black for oxygen control sensor (1), cylinders 1 - 3.

Unlock and disconnect plug connection for oxygen control sensor, cylinders 4 - 6.

Installation:

Plug connection must snap audibly into place!

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.

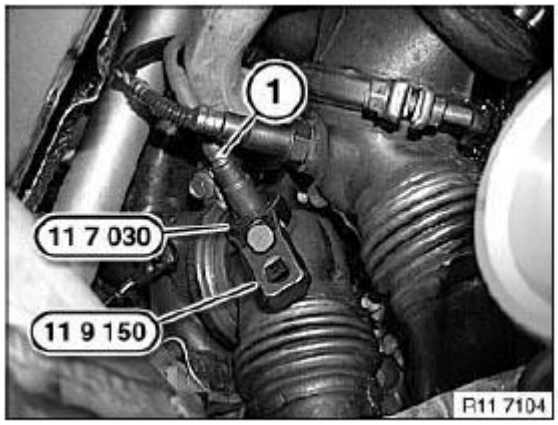


Fig. 442: Identifying Oxygen Control Sensor And Special Tools (11 7 030, 11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque **11 78 1AZ** , see **EMISSION CONTROL**

Installation:

Cable color grey for oxygen control sensor (1), cylinders 4 - 6.

Assemble engine.

Check function of DME control unit.

11 78 545 REPLACING BOTH LAMBDA OXYGEN MONITOR SENSORS (N54)

Special tools required:

- **11 7 020**
- **11 7 030**
- **11 9 150**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

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:

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** , see **EMISSION CONTROL**

Installation:

Cable color black, cylinders 1 to 3.

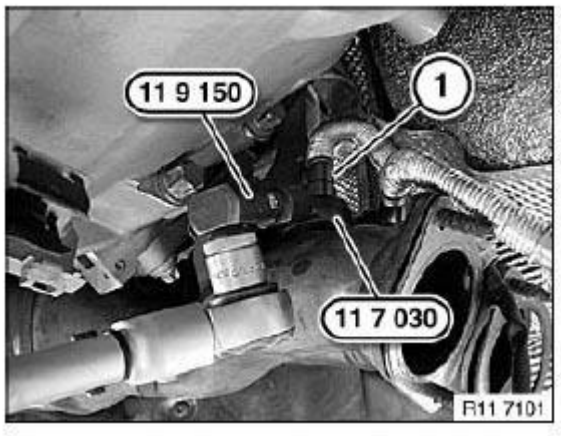


Fig. 443: Identifying Monitor Sensor And Special Tools (11 7 030, 11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

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** , see **EMISSION CONTROL**

Installation:

Cable color grey, cylinders 4 to 6.

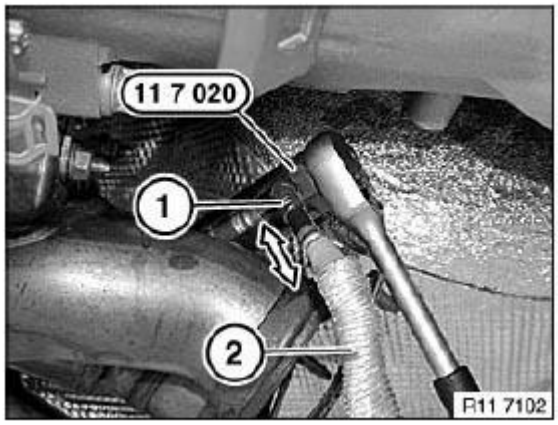


Fig. 444: Identifying Monitor Sensor And Insulation
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME control unit.

11 78 613 REPLACING BOTH LAMBDA OXYGEN MONITOR SENSORS (N54)

Special tools required:

- **11 7 020**
- **11 7 030**
- **11 9 150**

See **ENGINE - SPECIAL TOOLS (N54, N63)** .

WARNING: Scalding hazard!

Work should only be carried out on an exhaust system that has cooled down.

Necessary preliminary tasks:

- Remove rear **UNDERBODY PROTECTION** .
- Remove **EXHAUST SYSTEM** .

Installation:

The threads of new lambda control/monitor sensors are already coated with Never Seez Compound.

If a lambda control/monitor sensor is to be reused, apply a thin and even coating of Never Seez Compound to the thread only.

The part of the lambda control/monitor sensor which projects into the exhaust system branch (sensor ceramics) must **not** be cleaned and not coated with lubricant.

Unlock and disconnect plug connection for oxygen monitor sensor, cylinders 1 - 3.

Installation:

Plug connection must snap audibly into place!

Release oxygen 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** , see **EMISSION CONTROL**

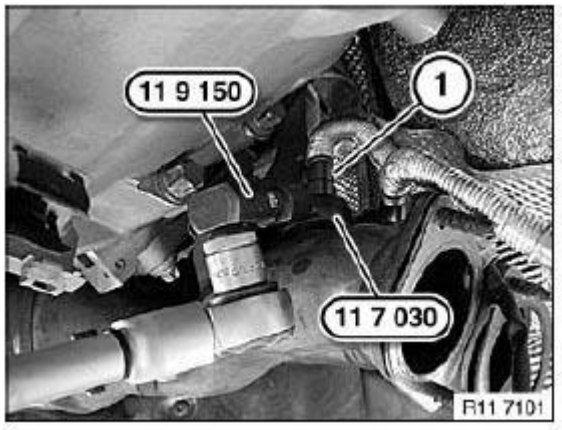


Fig. 445: Identifying Oxygen Monitor Sensor And Special Tools (11 7 030, 11 9 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Cable color black for oxygen monitor sensor (1), cylinders 1 - 3.

NOTE: Release insulation (2) in direction of arrow.

Unlock and disconnect plug connection for oxygen monitor sensor, cylinders 4 - 6.

Installation:

Plug connection must snap audibly into place!

Release oxygen monitor sensor (1) with special tool **11 7 020** .

Tightening torque **11 78 1AZ** , see **EMISSION CONTROL**

Installation:

Cable color grey for oxygen monitor sensor (1), cylinders 4 - 6.

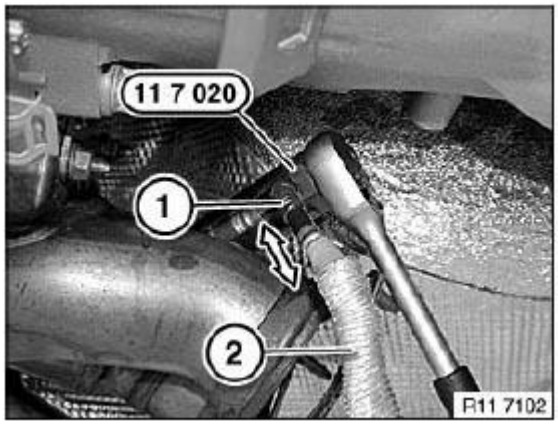


Fig. 446: Identifying Oxygen Monitor Sensor And Insulation
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME control unit.

