ENGINE

Engine - Repair - Z4

ENGINE, GENERAL

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

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

IMPORTANT: High tension - mortal danger!

Interrupt power supply to ignition coils.

Read and comply with notes on compression pressure check.

Necessary preliminary tasks

- Remove spark plugs

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

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

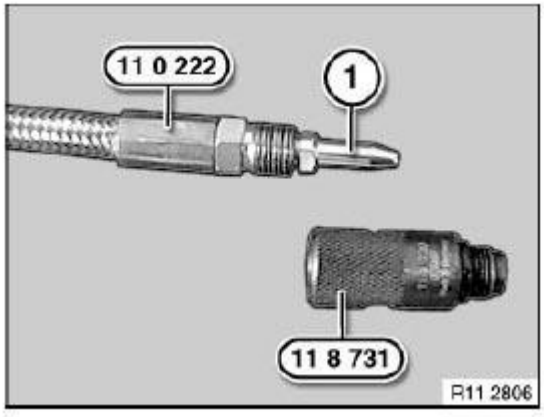


Fig. 1: Removing Tip From Special Tool 11 0 222
Courtesy of BMW OF NORTH AMERICA, INC.

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

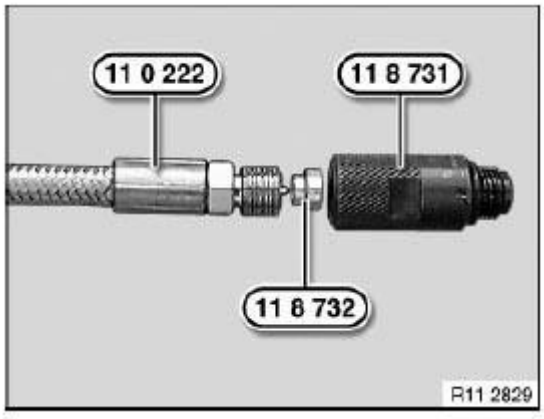


Fig. 2: Identifying Special Tool 11 0 222, 11 8 732 And 11 8 731
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Oil thread on special tool 11 8 731.

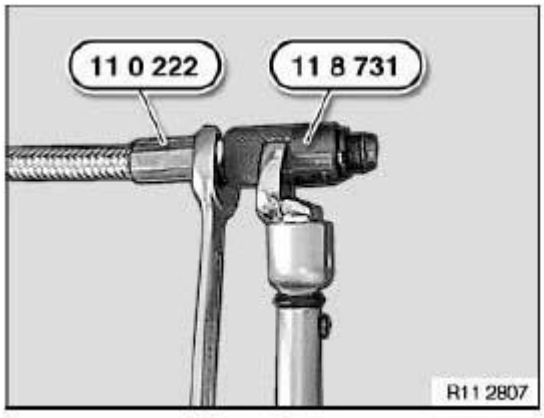


Fig. 3: Inserting Special Tool 11 0 222 Into Special Tool 11 8 731
Courtesy of BMW OF NORTH AMERICA, INC.

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

Use adapter (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

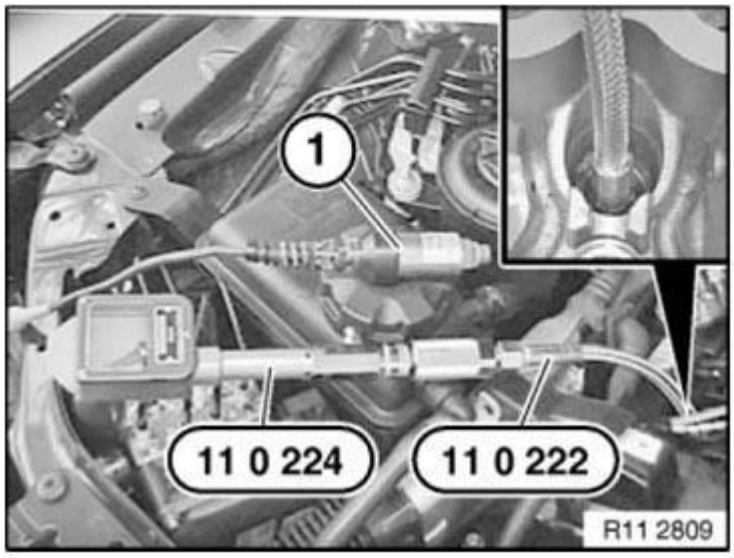


Fig. 4: Installing Special Tool 11 0 222 Into Spark Plug Thread
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine

Delete fault memory.

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.

ENGINE IDENTIFICATION

Punch engine numbers at marked surface with number punch.

Magnesium crankcase with sticker

M47/M47TU/M47T2

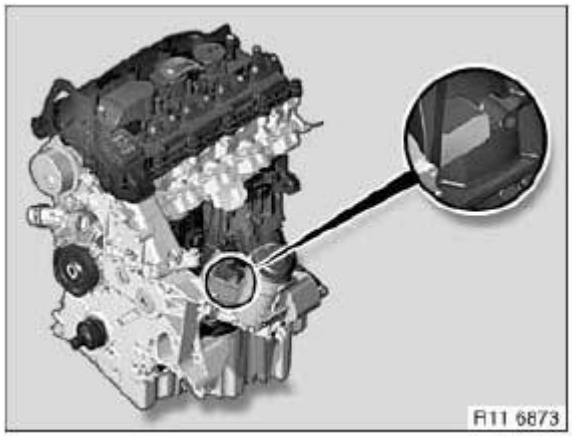


Fig. 5: Identifying Engine Identification Numbers Location (M47/M47TU/M47T2)
Courtesy of BMW OF NORTH AMERICA, INC.

M57/M57TU/M57T2

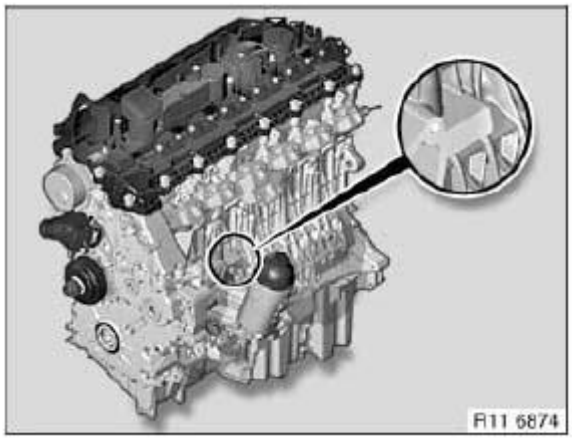


Fig. 6: Identifying Engine Identification Numbers Location - M57/M57TU/M57T2
Courtesy of BMW OF NORTH AMERICA, INC.

M67/M67TU

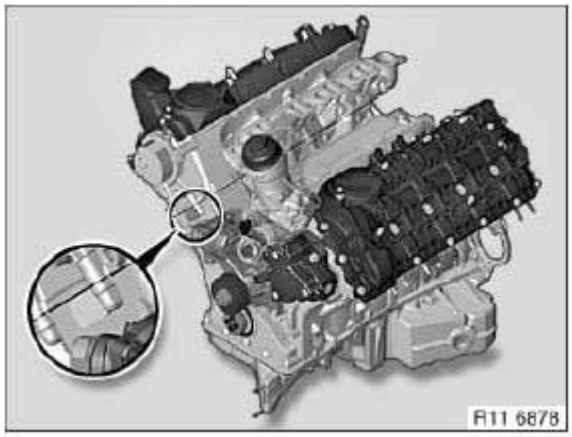


Fig. 7: Identifying Engine Identification Numbers Location - M67/M67TU
Courtesy of BMW OF NORTH AMERICA, INC.

N47/N47S/N47C/N57 N57S

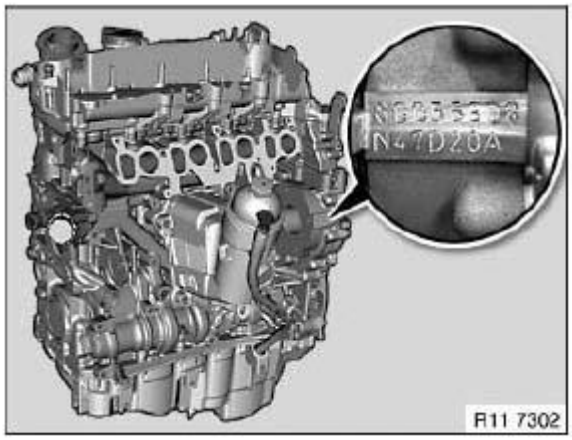


Fig. 8: Identifying Engine Identification Numbers Location - N47/N47S/N47C/N57 N57S
Courtesy of BMW OF NORTH AMERICA, INC.

M52/M52TU

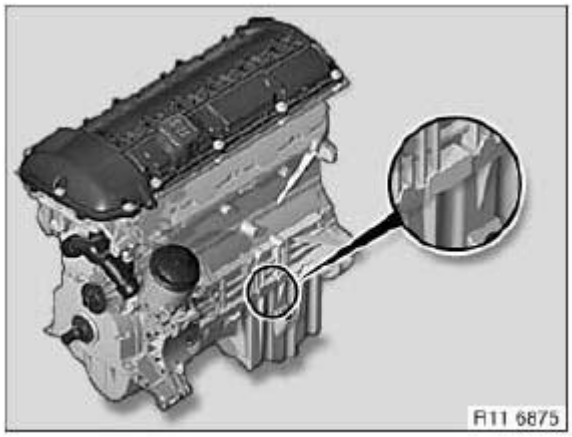


Fig. 9: Identifying Engine Identification Numbers Location (M52 / M52TU)
Courtesy of BMW OF NORTH AMERICA, INC.

M54

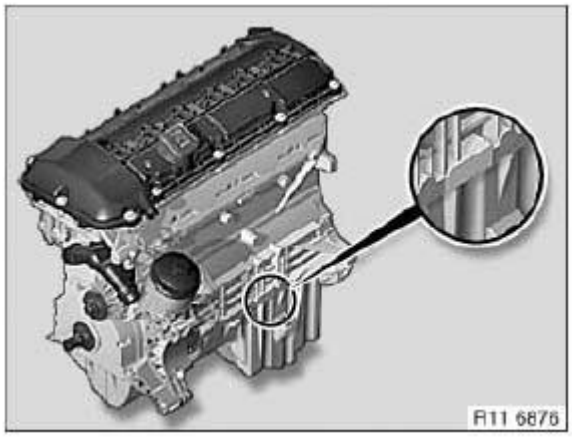


Fig. 10: Identifying Engine Identification Numbers Location (M54)
Courtesy of BMW OF NORTH AMERICA, INC.

M56

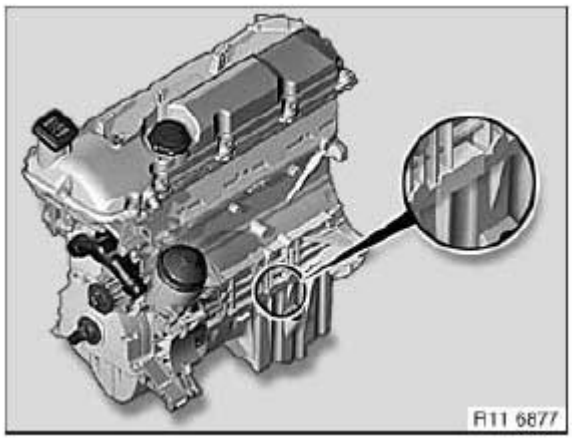


Fig. 11: Identifying Engine Identification Numbers Location - M56
Courtesy of BMW OF NORTH AMERICA, INC.

N40/N45/N45T/N43

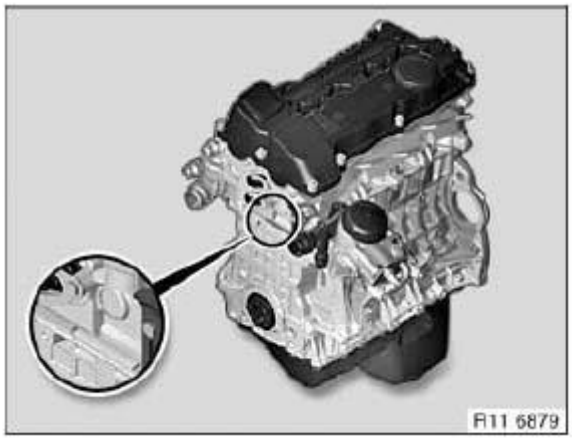


Fig. 12: Identifying Engine Identification Numbers Location - N40/N45/N45T/N43
Courtesy of BMW OF NORTH AMERICA, INC.

N42/N46/N46T

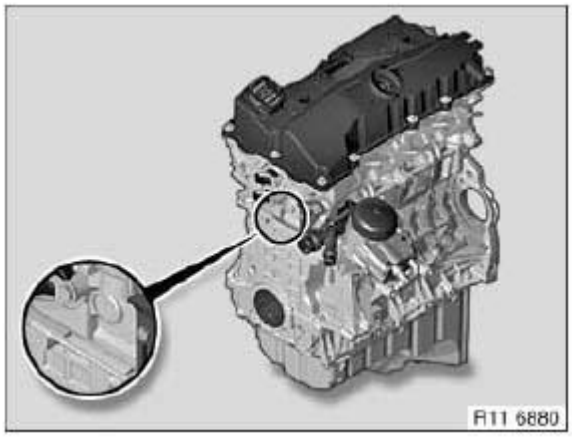


Fig. 13: Identifying Engine Identification Numbers Location - N42/N46/N46T
Courtesy of BMW OF NORTH AMERICA, INC.

N51/N52/N52K/N52T/N53/N54/N55

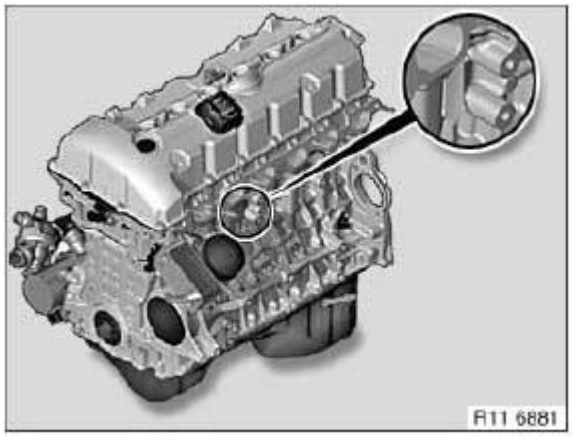


Fig. 14: Identifying Engine Identification Numbers Location - N51/N52/N52K/N52T/N53/N54/N55
Courtesy of BMW OF NORTH AMERICA, INC.

N62/N62TU

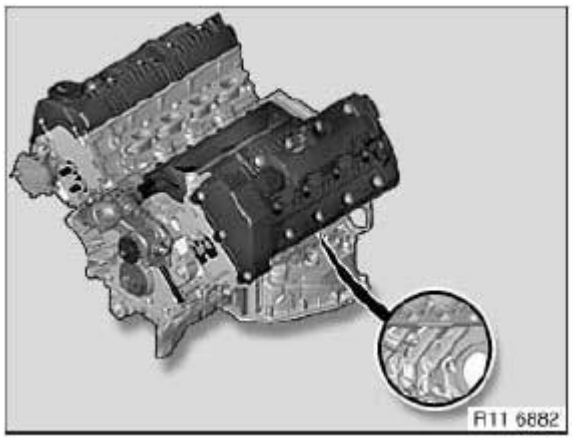


Fig. 15: Identifying Engine Identification Numbers Location - N62/N62TU
Courtesy of BMW OF NORTH AMERICA, INC.

N73

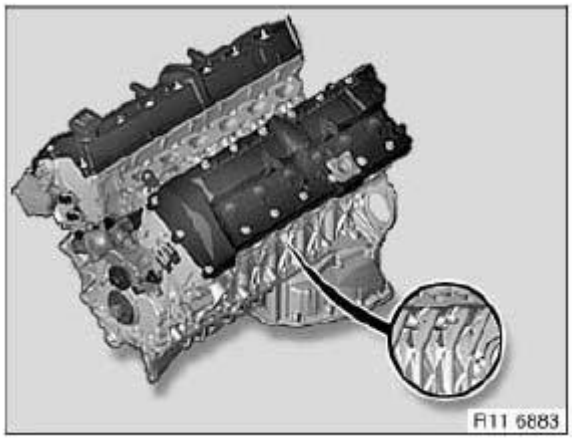


Fig. 16: Identifying Engine Identification Numbers Location - N73
Courtesy of BMW OF NORTH AMERICA, INC.

S54

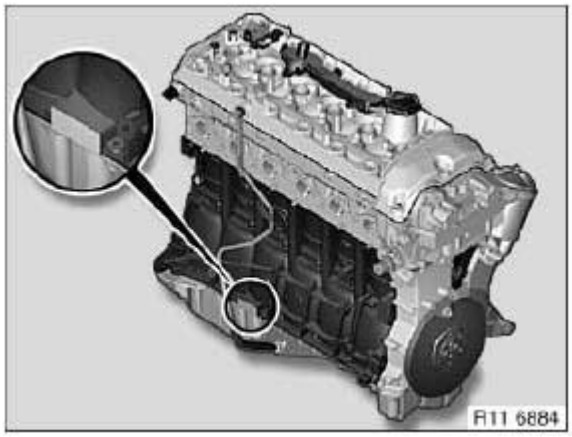


Fig. 17: Identifying Engine Identification Numbers Location - S54
Courtesy of BMW OF NORTH AMERICA, INC.

S85/S65

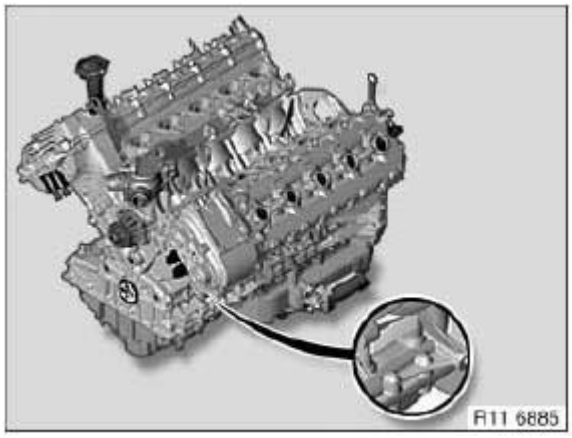


Fig. 18: Identifying Engine Identification Numbers Location - S85/S65
Courtesy of BMW OF NORTH AMERICA, INC.

W10/W11

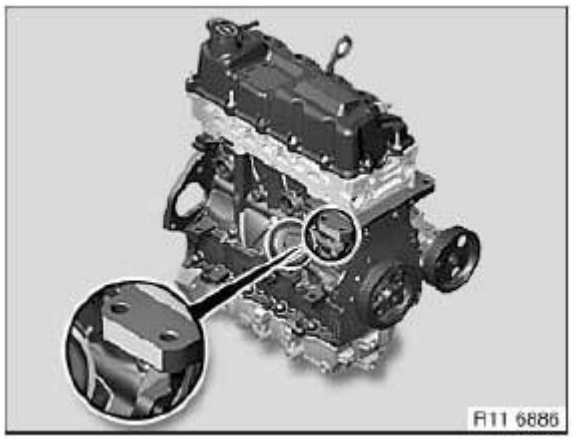


Fig. 19: Identifying Engine Identification - W10/W11
Courtesy of BMW OF NORTH AMERICA, INC.

N12/N14/N16/N18

Fig. 20: Identifying Engine Identification Numbers Location - N12/N14/N16/N18
Courtesy of BMW OF NORTH AMERICA, INC.

W17

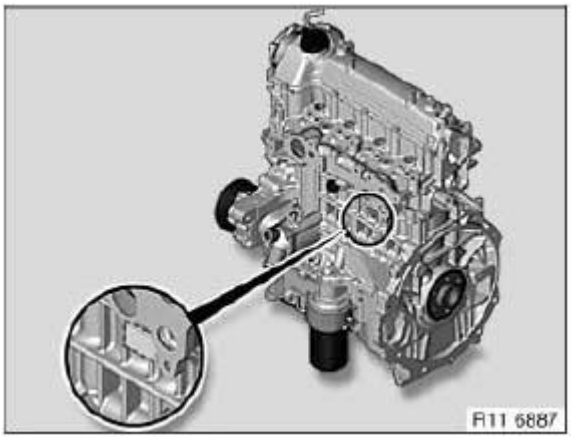


Fig. 21: Identifying Engine Identification Numbers Location - W17
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 00... ENGINE OIL SERVICE (N54, N54T)

WARNING: Risk of scalding!

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

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

Observe the exact engine oil filling capacity.

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

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

IMPORTANT: Risk of damage!

Protect belt drive against dirt.

Cover with suitable materials.

Recycling

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

Observe country-specific waste disposal regulations.

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

Tightening torque **11 42 1AZ** .

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

Picture shows E9x

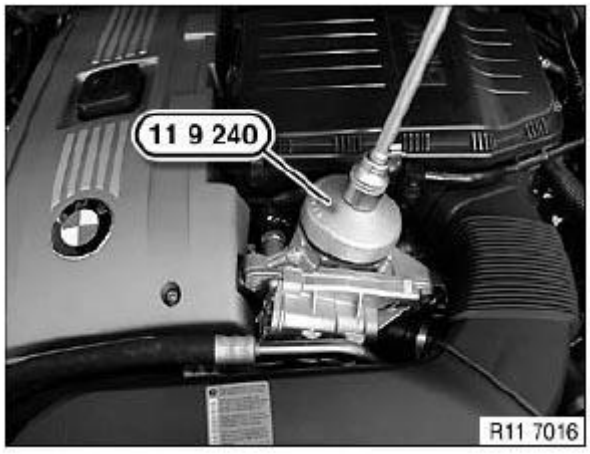


Fig. 22: Removing Oil Filter Cover Using Special Tool 11 9 240
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Presentation: without underbody protection.

Unclip service opening on underbody protection.

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

Tightening torque **11 13 1AZ** .

Installation note

Replace sealing ring.

Picture shows E9x

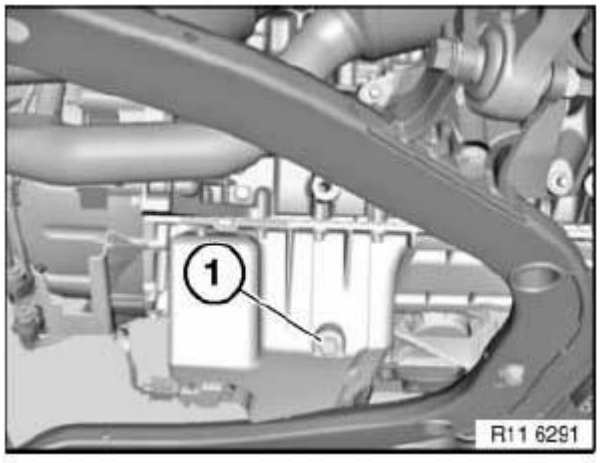


Fig. 23: Identifying Screw Plug On Oil Sump
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation note:

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

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

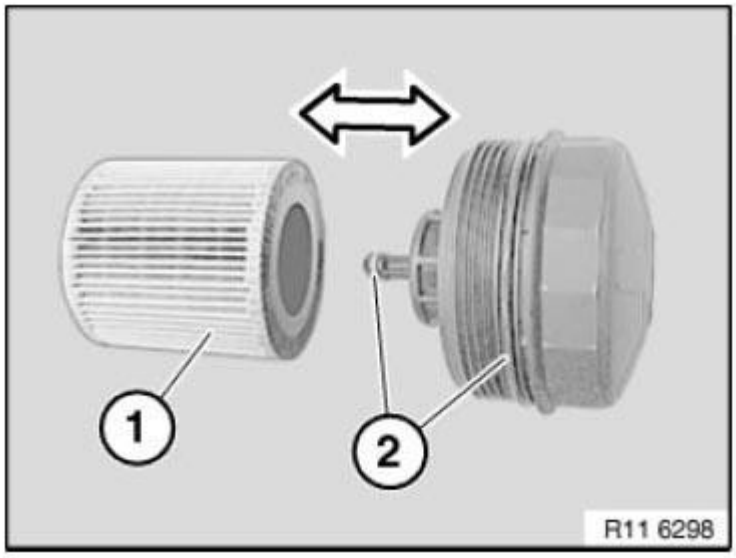


Fig. 24: Removing And Inserting Oil Filter Element
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 42 1AZ** .

NOTE: Pour in ENGINE OIL .

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

Switch off engine

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

Assemble engine.

Fig. 25: Installing Oil Filter Cover Using Special Tool 11 9 240
Courtesy of BMW OF NORTH AMERICA, INC.

Checking engine oil level:

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

11 00 590 EXCHANGE ENGINE (N54, N54T)

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).

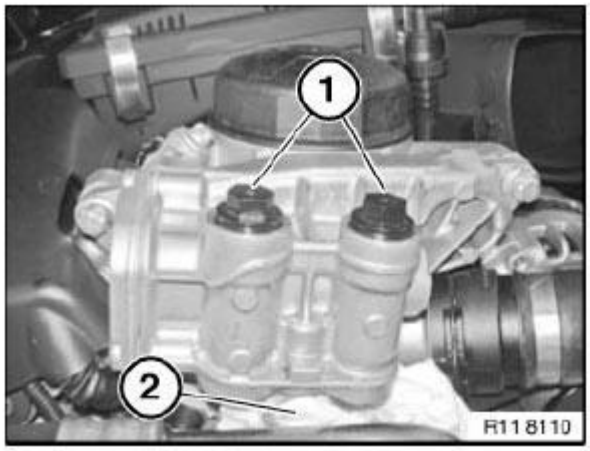


Fig. 26: Identifying Transportation Locks And Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

Transportation locks (1) are no longer needed.

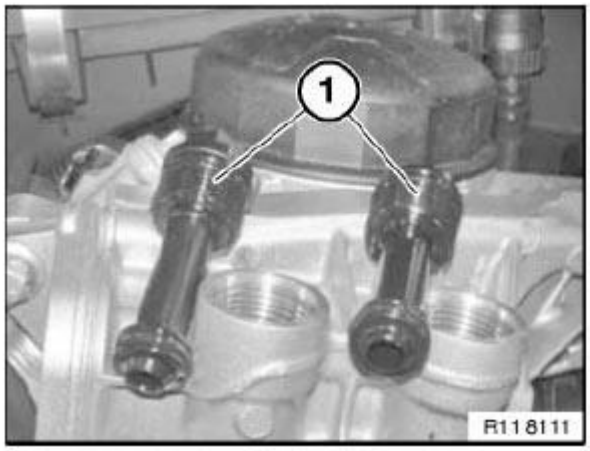


Fig. 27: Identifying Transportation Locks
Courtesy of BMW OF NORTH AMERICA, INC.

Modify screw plugs (1) from old power plant.

Insert screw plugs (1).

Tightening torque: **11 42 11AZ.**

Secure oil cooler lines with mounting bar (2).

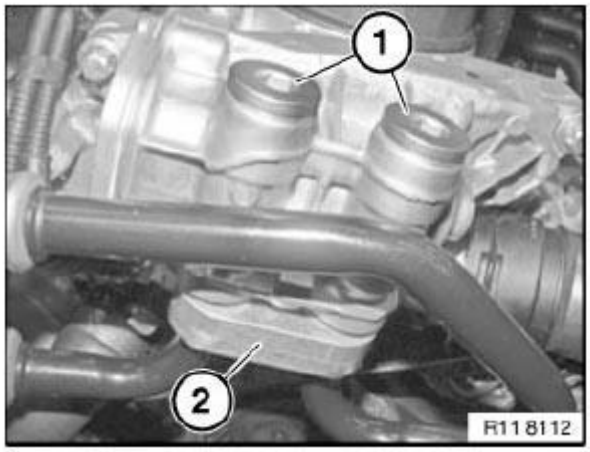


Fig. 28: Identifying Screw Plugs And Mounting Bar
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 00 MOUNTING ENGINE ON ASSEMBLY STAND (N54, N54T)

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 work:

- Remove **ENGINE**

Use special tool 11 8 541 to mount engine on special tool **00 2 300** .

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

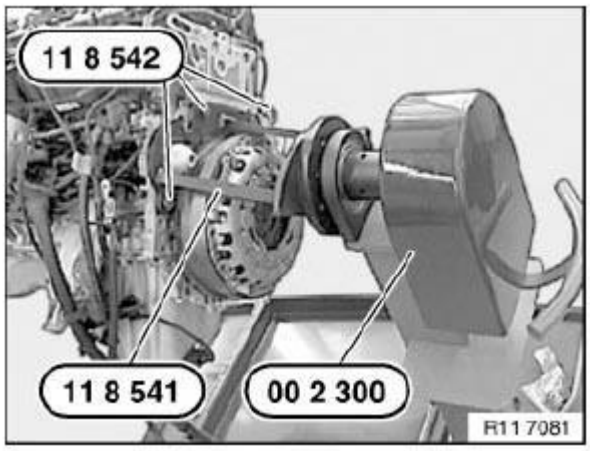


Fig. 29: Mounting Engine Using Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

11 00... OVERVIEW OF CONSUMABLES (ELECTRONIC PARTS CATALOGUE)

1.0 Sealing compound for **injection.**

SEALING COMPOUND REFERENCE CHART - INJECTION

	Repair instructions (engine)	Designation, Electronic Parts Catalogue	Part number, Electronic Parts Catalogue	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 - APPLICATION

	Designation in repair instructions	**Designation, Electronic Parts Catalogue**	**Part number, Electronic Parts Catalogue**	**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, N47top, N47C N47D1 N51, N52, N52N, N53, N54, N55, N57, N57S N62, N62TU, N63, N73, N73H, N74 S14, S38, S50, S52, S54, S62, S65, S85 N12, N14, N16, N18	Drei Bond 1209 liquid gasket	07 58 9 062 376	For sealing separation points on crankcase
2.2	N12, N14, N16, N18 W16, N47top, N47D1, N47C1 N57D1,	Loctite 5970 liquid gasket	83 19 0 404 517 83 19 0 404 517	Sealing between crankcase upper and lower sections. Sealing of gear case cover, oil sump, coolant pump,

				component carrier.
2.3	N12, N14, N16, N18 W16	Loctite 648 liquid gasket	07 58 9 067 732	Sealing between cover sleeve and crankcase

3.0 **Cleaning agent.**

CLEANING AGENT REFERENCE CHART

	Designation in repair instructions	**Designation, Electronic Parts Catalogue**	**Part number, Electronic Parts Catalogue**	**Application examples**
3.1	N45, N46, N45T, N46T, N43, N51, N52, N52Kp, N52TU, N53, N55, N63, N63S, N63Hyprid, N74	Cold cleaner (chlorine free)	83 19 0 026 956	Cleaning assemblies, washing engine

4.0 Lubricant for **application.**

LUBRICANT REFERENCE CHART - APPLICATION

	Designation in repair instructions	**Designation, Electronic Parts Catalogue**	**Part number, Electronic Parts Catalogue**	**Application examples**
4.1	N20, N42, N46, N46TU, N51, N52, N52KP, N52TU, N55, N62, N62TU, N73	Lubricating grease Longtime PD1	83 19 2 160 340	For greasing the splined shaft on actuator drive/gearing of intermediate shaft.
4.2	M47, M47TU, M47T2, M57, M57TU, M57T2,	High temperature paste	83 19 2 152 323	For greasing the threads on the exhaust turbocharger.
4.3	N12, N14, N16, N18 N40, N42, N45, N45TU N46, N46TU, N43. N51, N52, N52Kp, N52TU, N53, N54, N55. N62, N62TU, N63, N73, N73H, N74. S65, S85.	High temperature paste (NEVERSEEZ compound)	83 23 0 140 233	For greasing the threads on the oxygen sensors.
4.4	N47, N47O1 N47C1, N47T	Copper paste	81 22 9 400 794	For greasing the double hex head bolt

	N47D1 N57 N57D1			on the exhaust turbocharger.

5.0 Lubricants to loosen locked **screw connections.**

LUBRICANT REFERENCE CHART - SCREW CONNECTION

	Designation in repair instructions	Designation, Electronic Parts Catalogue	Part number, Electronic Parts Catalogue	Application examples
5.1	M47, M47TU, M47TU2, M57, M57TU, M57TU2. N47, N47C, N47D1, N57, N57D1, W16, W17,	Brunox lubricating grease	83 23 0 445 529	For releasing the glow elements

11..... REMOVING AND INSTALLING/REPLACING ACOUSTIC COVER (N54, N54T)

Release screws (1).

Raise acoustic cover slightly and remove towards front.

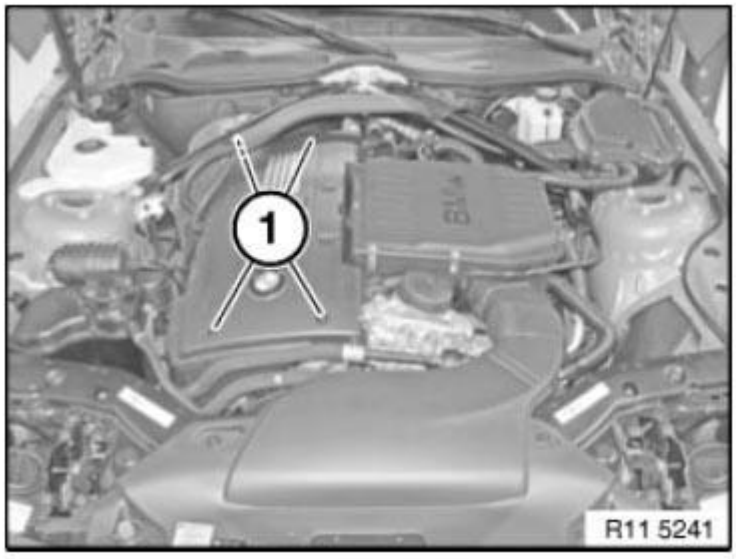


Fig. 30: Identifying Acoustic Cover Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

11 00 050 REMOVING AND INSTALLING ENGINE (N54, N54T)

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**
- Secure **ENGINE HOOD/BONNET**
- Remove **AIR FILTER HOUSING**
- Remove **FAN COWL** with electric fan
- Remove **RADIATOR**
- Remove **CAPACITOR FOR HEATING AND AIR CONDITIONING SYSTEM**
- Remove **CHARGE AIR COOLER**
- Remove **EXPANSION TANK** .
- Detach all coolant hoses from engine
- Remove rear **AIR DUCT**
- Detach vacuum line from brake booster
- Unfasten engine wiring harness from electronics box and lay to one side
- Remove **EXHAUST SYSTEM**
- Remove gearbox. See **2300018 REMOVING AND INSTALLING TRANSMISSION (GS6-53BZ) N54** or **28 00 001 REMOVING AND INSTALLING TWIN-CLUTCH GEARBOX (GS7D36SG) N54**
- Release **LOWER SECTION OF STEERING SPINDLE** from steering gear (do not remove)
- Release grounding strap on left engine support arm.

Release nut (1) and disconnect positive battery cable (2) from positive battery connection point.

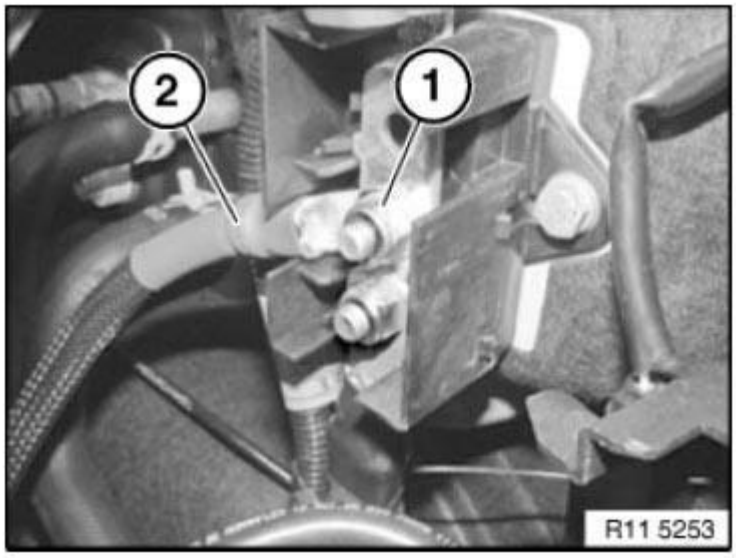


Fig. 31: Identifying Battery Cable And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect fuel lines (1).

Seal fuel lines with special tool 13 5 161 and

13 5 162.

Disconnect tank vent line (2).

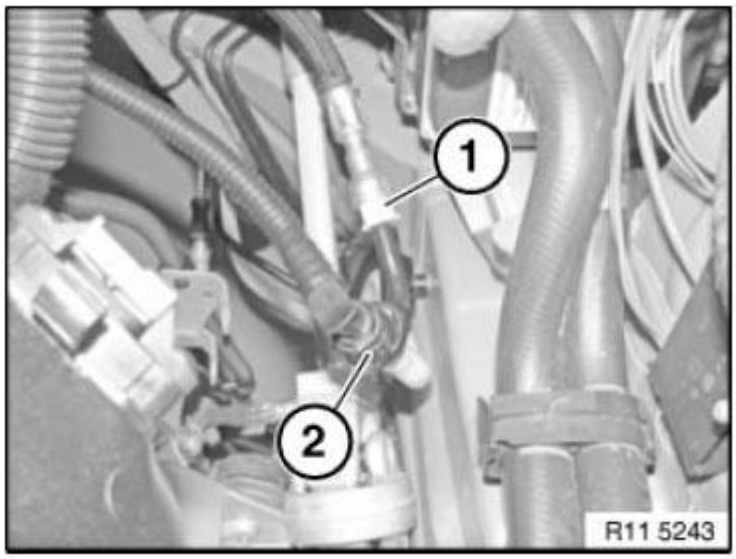


Fig. 32: Identifying Tank Vent Line And Fuel Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolt (1) from engine oil pipe on oil-to-water heat exchanger.

Remove engine oil pipe.

Installation note:

Replace all seals.

Tightening torque **17 21 1AZ** .

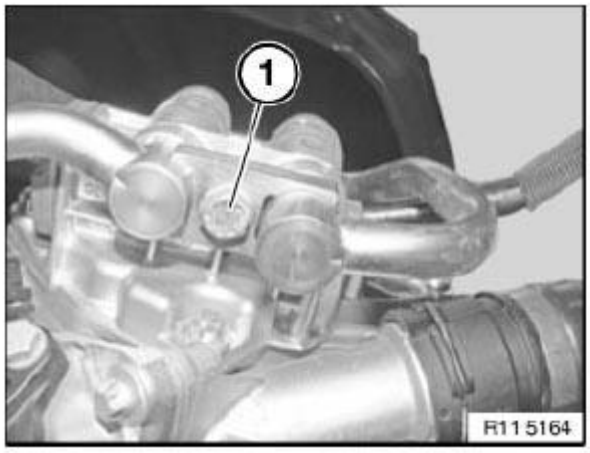


Fig. 33: Identifying Engine Oil Pipe Mounting Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool **11 8 680** to lifting eye on gearbox 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 note:

Special tool **11 8 680** is mounted correctly if the locking balls (2) are locked.

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

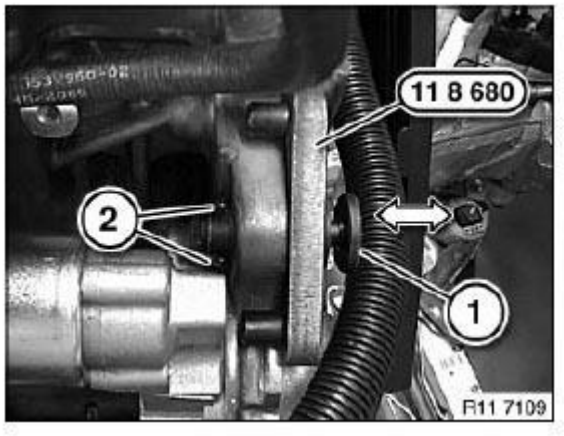


Fig. 34: Pressing Locking Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool **11 0 000** to special tool **11 8 680** in eye (1).

Picture shows E9x.

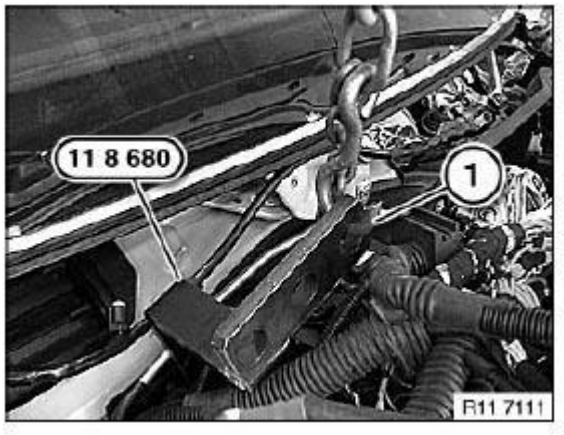


Fig. 35: Connecting Special Tool 11 0 000 To Special Tool 11 8 680
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1) on engine mount on left and right.

Installation note:

Replace self-locking nut.

Tightening torque **22 11 2AZ** .

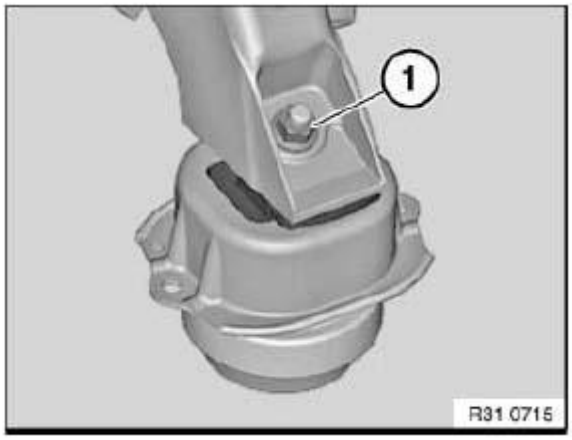


Fig. 36: Identifying Engine Mount Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in towing hook (1).

Suspend special tool (4) **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.

Remove left engine support arm.

Lift engine out with crane.

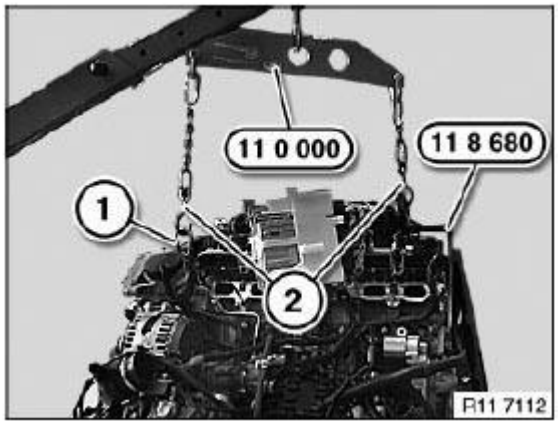


Fig. 37: Identifying Special Tools 11 0 000 And 11 8 680 On Engine Crane
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Secure special tool (1) **11 7 310** to steering box.

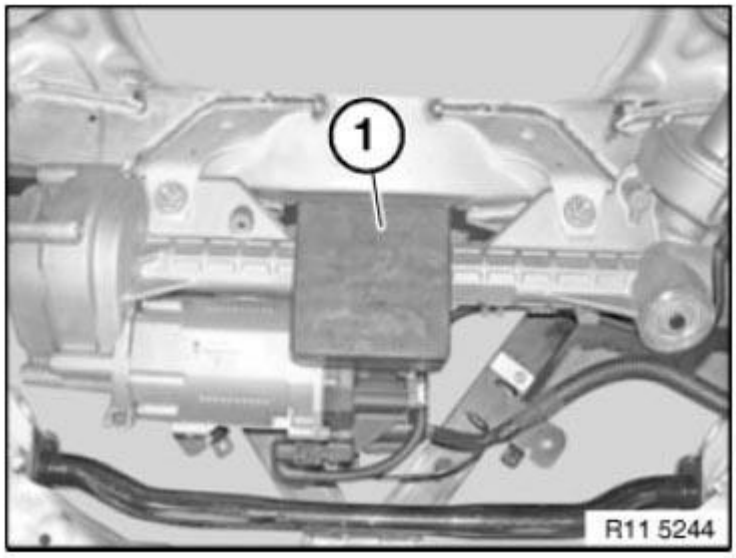


Fig. 38: Connecting Special Tool 11 7 310 To Steering Box
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Observe following in case of **REPLACEMENT ENGINE** .

Check function of Digital Diesel Electronics.

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

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

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

Protective measures/rules of conduct

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

First aid measures

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

NOTE: Do not use solvents/thinners.

00 SAFETY INFORMATION FOR WORKING ON VEHICLES WITH AUTOMATIC ENGINE START-STOP FUNCTION (MSA)

WARNING: If the engine hood/bonnet contact is pulled upwards (workshop mode), the information "switch closed" is output. The automatic engine start-stop function is active.

An automatic engine start is possible.

Observe safety precautions when working on MSA vehicles

Before carrying out practical work on the engine, always ensure that the MSA functionality is deactivated so as to prevent automatic engine starting while work is being carried out in the engine compartment.

MSA function is deactivated by

- Deactivate MSA by means of button (1) in passenger compartment
- Open seat belt buckle and driver's door

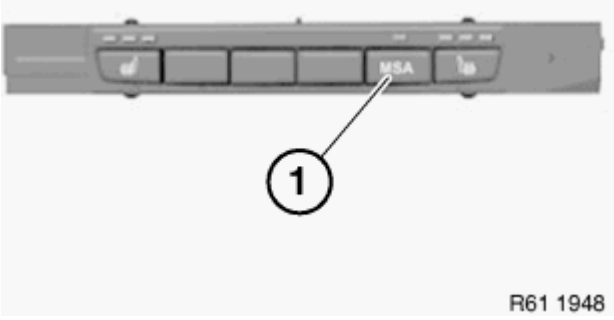


Fig. 39: Identifying MSA Switch In Passenger Compartment
Courtesy of BMW OF NORTH AMERICA, INC.

- Open engine bonnet/hood and ensure that engine hood/bonnet contact is not in workshop mode
- Workshop mode

  A = 10 mm

- Basic setting (engine hood/bonnet open)

  B = 7 mm

To make sure that the engine hood/bonnet contact is at the basic setting, if necessary press the hood/bonnet contact up to the limit position before starting work and slowly release.

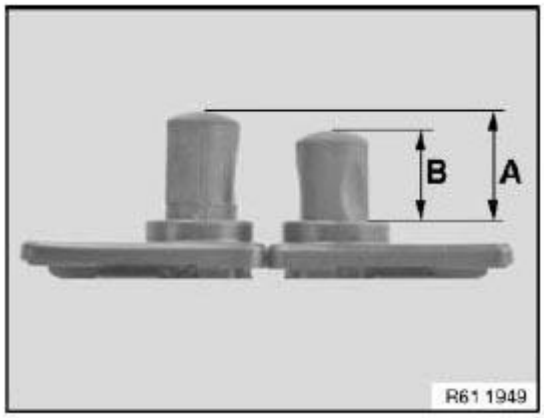


Fig. 40: Identifying Engine Hood/Bonnet Basic Setting And Workshop Mode
Courtesy of BMW OF NORTH AMERICA, INC.

When working with diagnosis tools

- Observe instructions in diagnosis tool

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 00 670 SECURING ENGINE IN INSTALLATION POSITION (N54, N54T)

WARNING: Danger of injury!

Observe following instructions relating to special tool:

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

Necessary preliminary tasks:

- Secure **ENGINE HOOD/BONNET**
- Remove rear **AIR DUCT**

Assemble transverse member 00 6 000 with special tools 00 6 030.

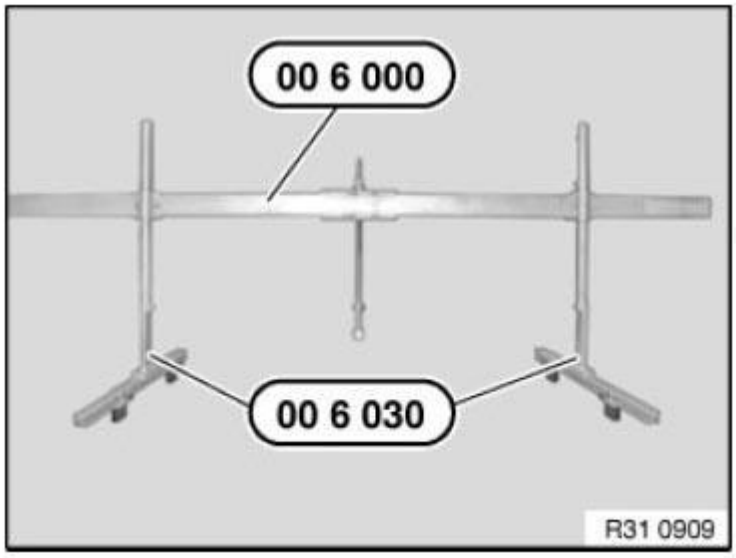


Fig. 41: Assembling Transverse Member 00 6 000 Using Special Tools 00 6 030
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in towing hook (1).

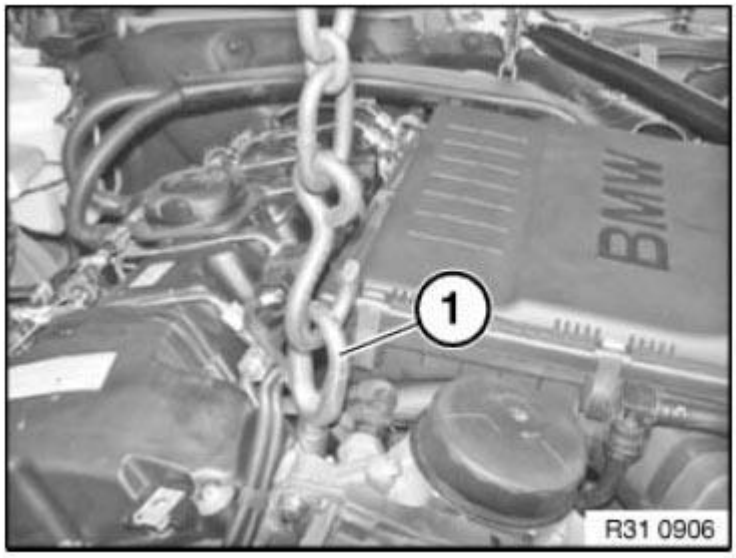


Fig. 42: Identifying Towing Hook
Courtesy of BMW OF NORTH AMERICA, INC.

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.

The support points on the left side are shown.

IMPORTANT: Risk of damage!

Position transverse member 00 6 030 with a 2nd person help on designated areas (1, 2) of side panel.

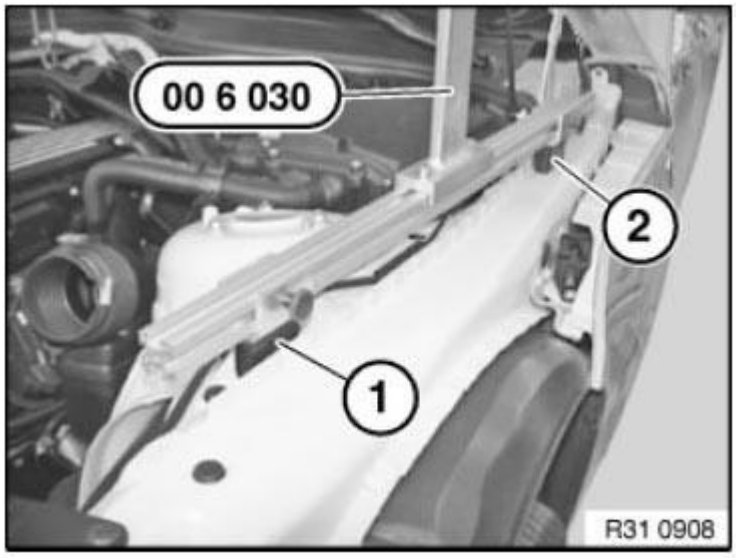


Fig. 43: Positioning Transverse Member 00 6 030 On Side Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool **11 0 020** to spindle 00 6 002.

Fit suitable chains to special tool **11 0 020** and attach to engine towing hook or lifting eye.

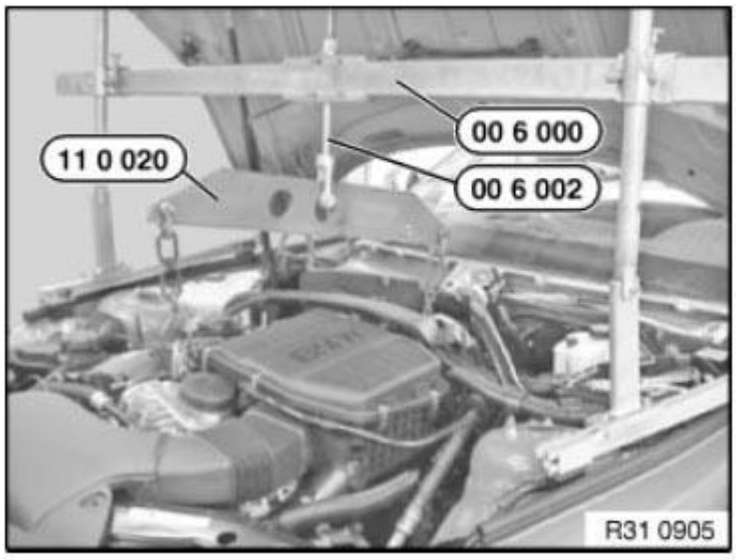


Fig. 44: Connecting Special Tool 110 020 To Engine Towing Hook Or Lifting Eye
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

Tighten down all adjusting screws and nuts on transverse member 00 6 000.

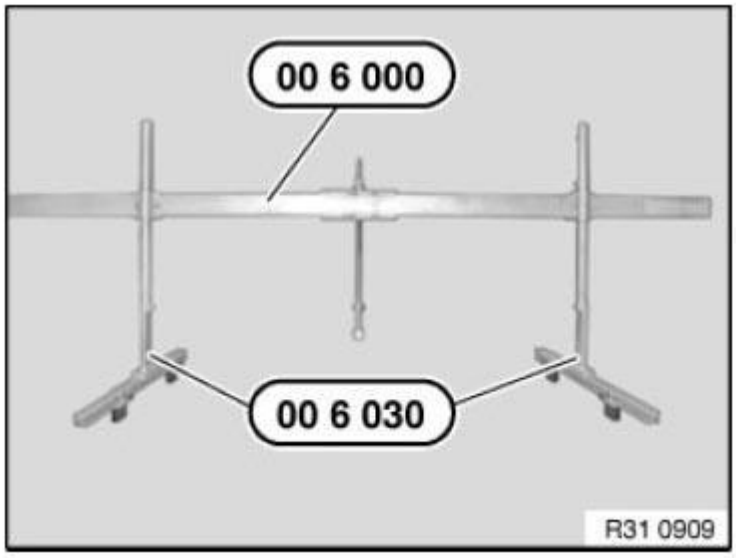


Fig. 45: Identifying Transverse Member On Special Tool 00 6 030
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Raise engine approx. 10 mm with transverse member.

Installation note:

Replace self-locking nuts.

Tightening torque **22 11 2AZ** .

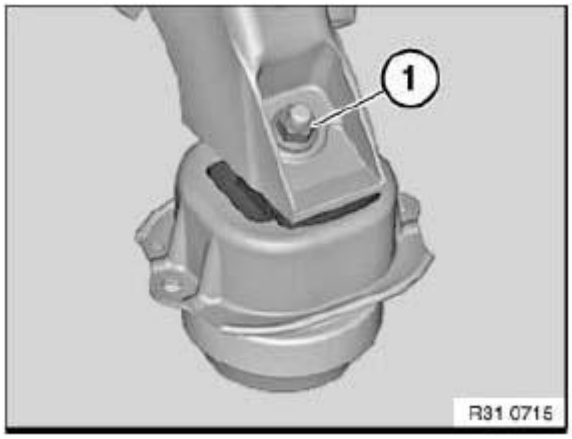


Fig. 46: Identifying Engine Mount Nut
Courtesy of BMW OF NORTH AMERICA, INC.

CYLINDER HEAD WITH COVER

11 12 729 CHECKING CYLINDER HEAD FOR WATERTIGHTNESS (N54, N54T)

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 cylinder no. 1

Secure special tool 11 4 341 using bolts 11 4 345 tightened to **25 Nm**

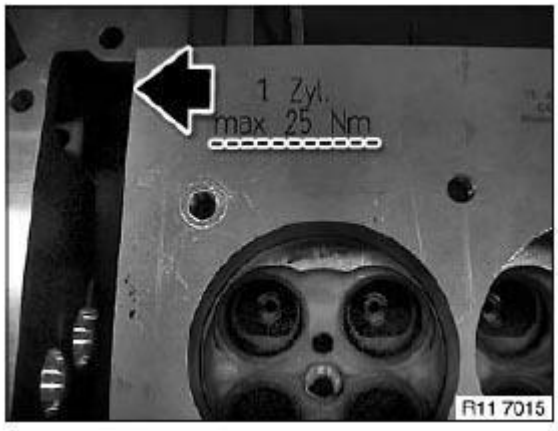


Fig. 47: Identifying Special Tool 11 4 345 On Engine Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

Extend special tool 11 4 341 with special tool 11 4 345.

Installation note:

1 cyl is marked.

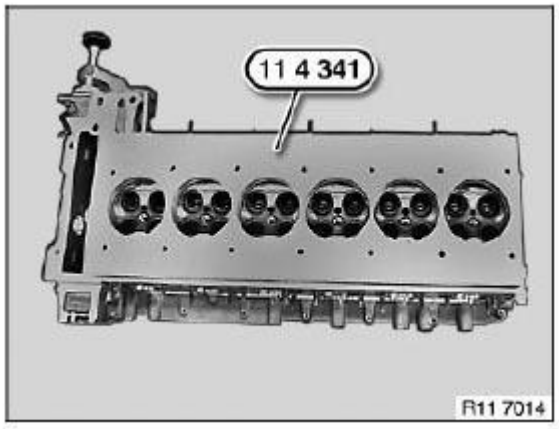


Fig. 48: Identifying Special Tool 11 4 341
Courtesy of BMW OF NORTH AMERICA, INC.

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

Sealing flange must rest flat.

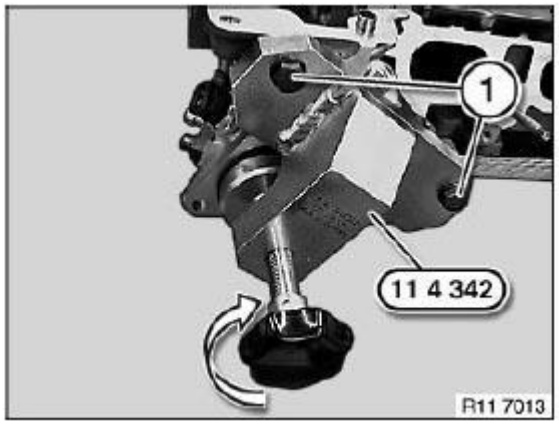


Fig. 49: Installing Special Tool (11 4 342)
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 4 344 with screws (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.

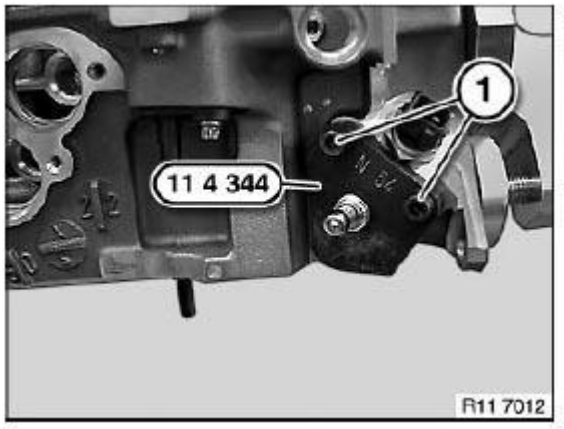


Fig. 50: Identifying Special Tool (11 4 344) With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 12 719 MILLING CYLINDER HEAD SEALING SURFACE (N54, N54T)

IMPORTANT: Remachining on cylinder head max. 0.3 mm

Necessary preliminary tasks:

- Remove **CYLINDER HEAD** .
- Remove **EXHAUST CAMSHAFT** .
- Remove **INTAKE CAMSHAFT** .
- Remove **ROLLER CAM FOLLOWERS** .
- Remove all **VALVES** .

Check evenness of cylinder head sealing faces with a standard straightedge (1).

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

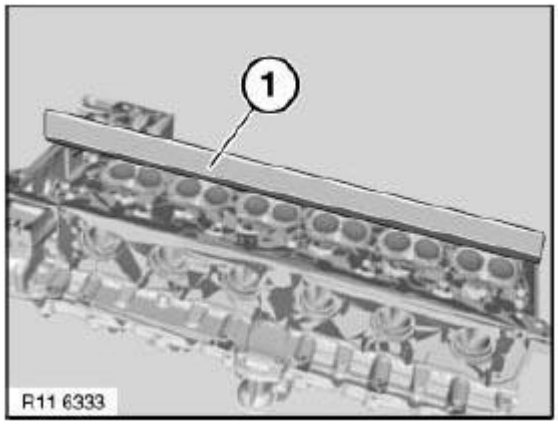


Fig. 51: Checking Cylinder Head Sealing Faces Evenness Using Standard Straight-Edge
Courtesy of BMW OF NORTH AMERICA, INC.

Check evenness of cylinder head sealing faces with a standard straightedge (1).

NOTE: Max. deviation from flatness (transverse) 0.05 mm

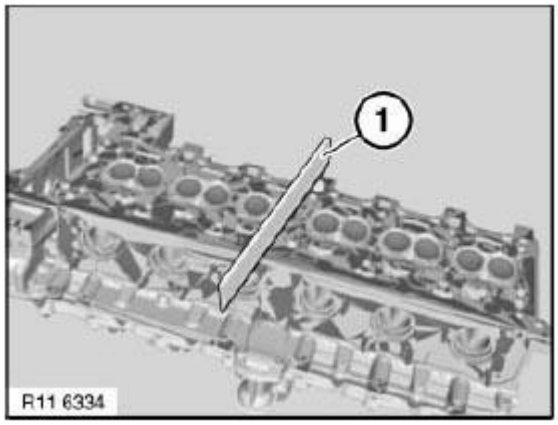


Fig. 52: Checking Cylinder Head Sealing Faces Evenness Using Standard Straight-Edge
Courtesy of BMW OF NORTH AMERICA, INC.

Check cylinder head for **WATER LEAKS** .

Assemble engine.

11 12 100 REMOVING AND INSTALLING CYLINDER HEAD (N54, N54T)

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 **INTAKE AND EXHAUST CAMSHAFT ADJUSTERS**

Release screws (1).

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

Set down timing chain.

IMPORTANT: If the timing chain is stowed in the gear case, the crankshaft must no longer be rotated.

This would cause the timing chain on the crankshaft sprocket to jam or jump.

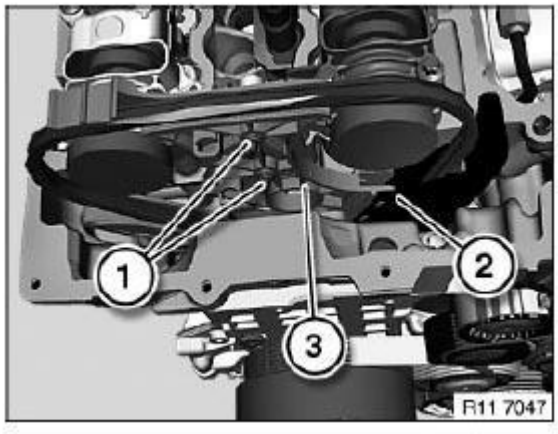


Fig. 53: Identifying Timing Chain Module And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

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** .

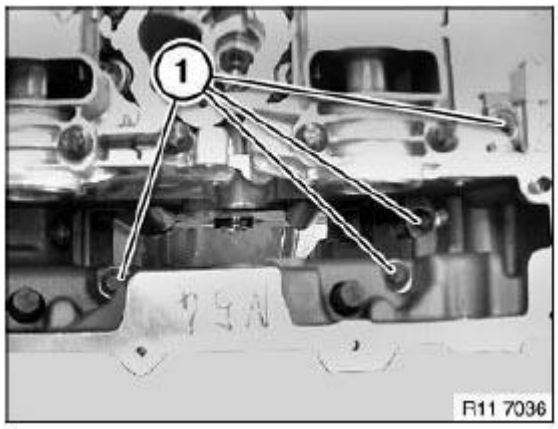


Fig. 54: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe different bolt heads.

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

Tightening torque **11 12 2AZ** .

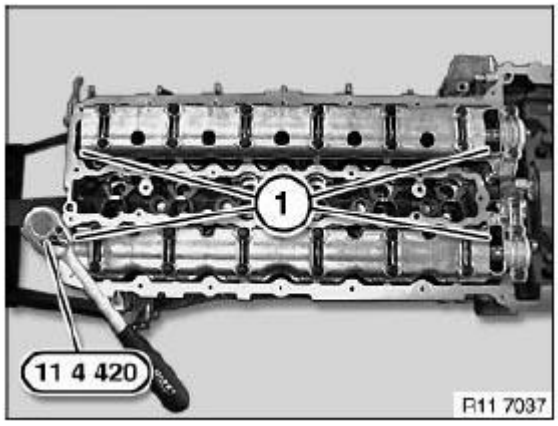


Fig. 55: Removing M9 Cylinder Head Bolts Using Special Tool 11 4 420
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 12 1AZ** .

IMPORTANT: All cylinder head bolts must be replaced.

Risk of damage!

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

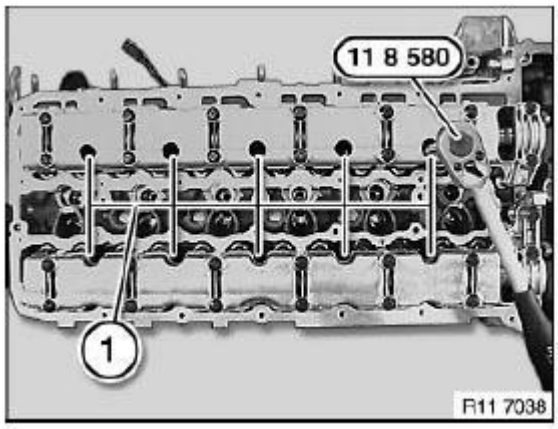


Fig. 56: Removing M10 Cylinder Head Bolts Using Special Tool 11 8 580
Courtesy of BMW OF NORTH AMERICA, INC.

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

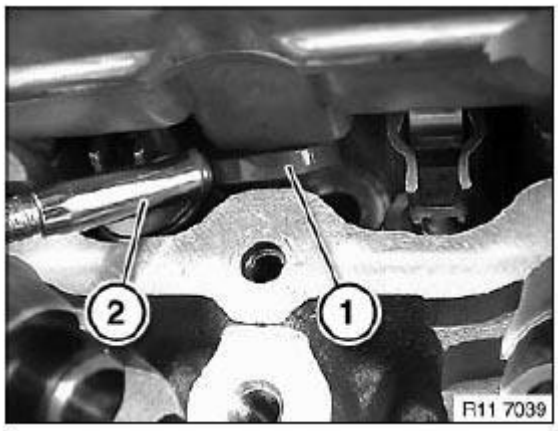


Fig. 57: Removing Cylinder Head Bolt Washer Using Magnet
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 12 4AZ** .

IMPORTANT: Removing and install cylinder head with a second person helping.

Weight of cylinder head with add-on parts is approx. 40 kg.

Do not set cylinder head down on sealing face, risk of damage to valves.

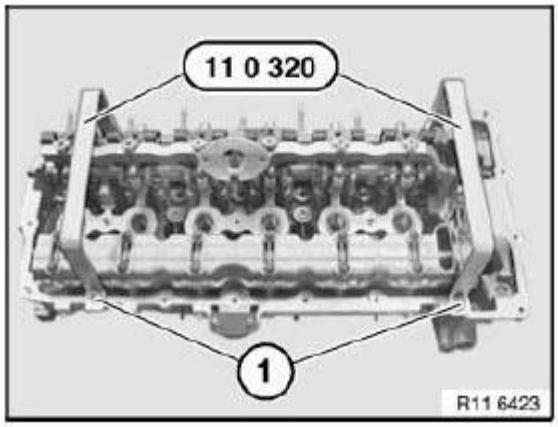


Fig. 58: Installing Cylinder Head Cover Using Special Tool 11 0 320
Courtesy of BMW OF NORTH AMERICA, INC.

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

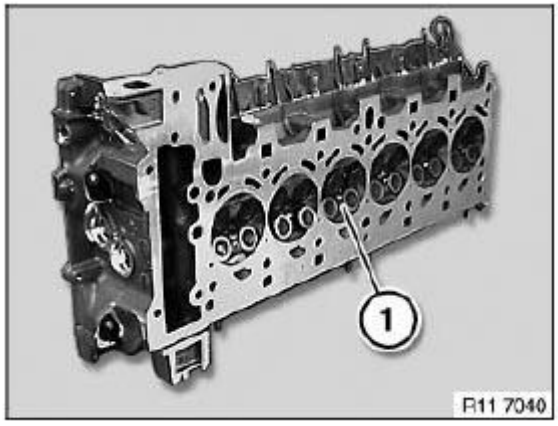


Fig. 59: Identifying Valves
Courtesy of BMW OF NORTH AMERICA, INC.

Insert **11 4 430** special tool into bore holes.

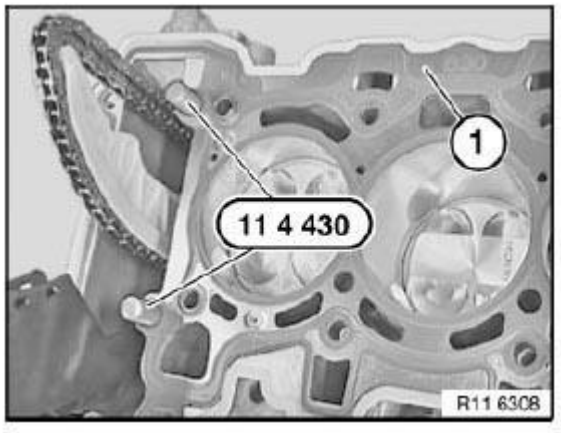


Fig. 60: Inserting Special Tool 11 4 430 Into Bore Holes
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Do not use any metal-cutting tools.

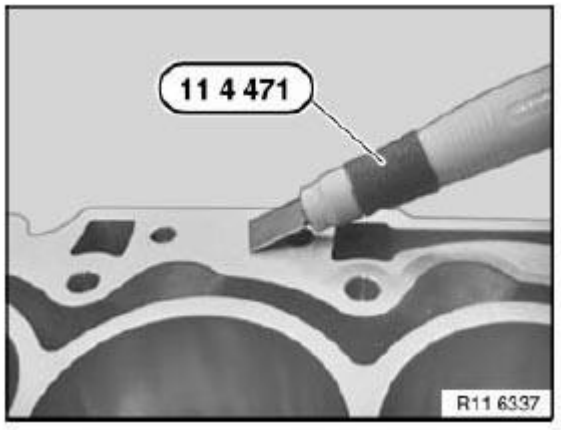


Fig. 61: Removing Coarse Residues On Sealing Surfaces Using Special Tool 11 4 471
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Do not use any metal-cutting tools.

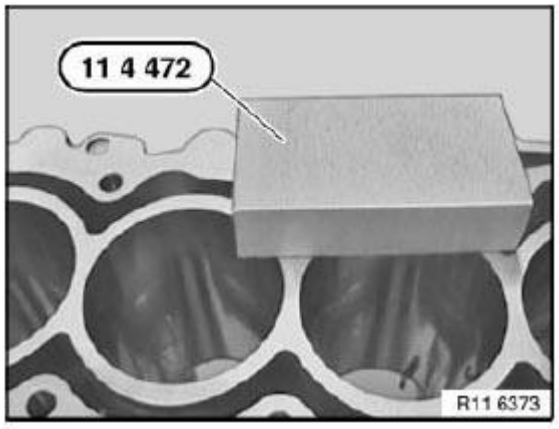


Fig. 62: Removing Fine Residues On Sealing Surfaces Using Special Tool 11 4 472
Courtesy of BMW OF NORTH AMERICA, INC.

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

Risk of cracking and corrosion!

Clean all threaded holes.

Installation note:

Replace **CYLINDER HEAD GASKET** .

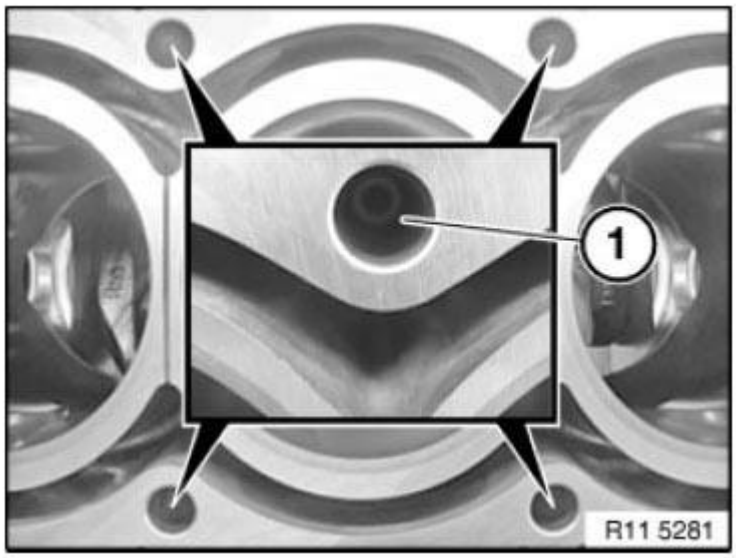


Fig. 63: Identifying Threaded Holes
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation note:

Fit new cylinder head screws.

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

Tightening torque **11 12 1AZ** .

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

Tightening torque **11 12 2AZ** .

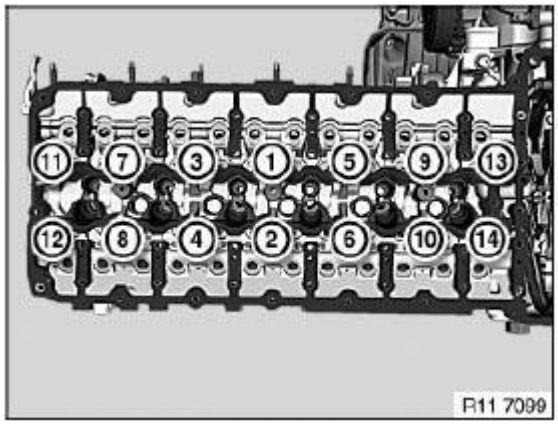


Fig. 64: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Graphic shows intake and exhaust camshafts removed.

Observe sequence for tightening cylinder head bolts without fail

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

Installation note:

- **Jointing 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 note:

Replace screws (1).

Tightening torque **11 12 3AZ** .

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

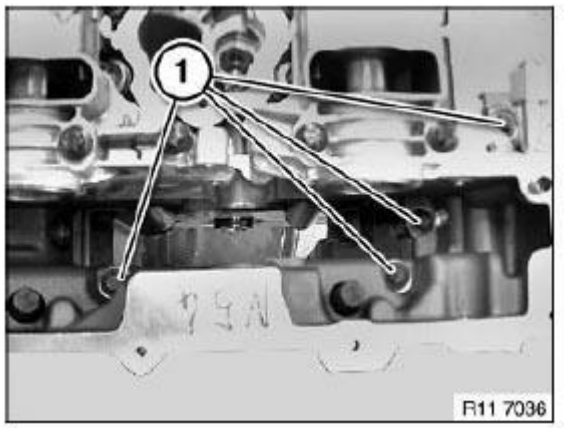


Fig. 65: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 12 000 REMOVING AND INSTALLING/SEALING CYLINDER HEAD COVER (N54, N54T)

Necessary preliminary tasks:

- Disconnect **BATTERY**
- Remove **ROD-TYPE IGNITION COILS**
- Unclip injector **WIRING HARNESS**
- Remove **INJECTORS**
- Remove right **TENSION STRUT**

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

Unclip vacuum lines (1).

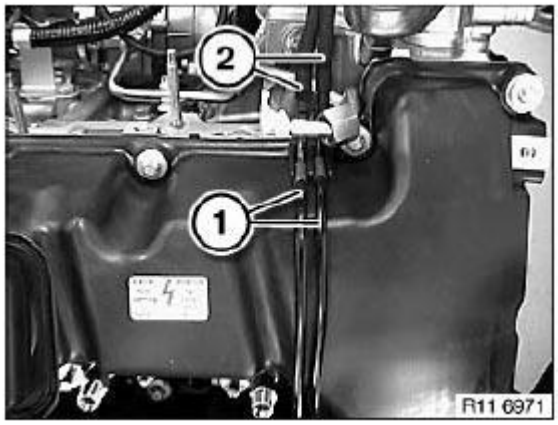


Fig. 66: Identifying Vacuum Lines
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

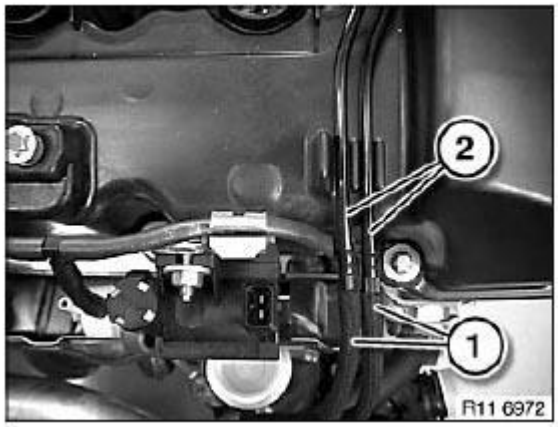


Fig. 67: Identifying Vacuum Lines
Courtesy of BMW OF NORTH AMERICA, INC.

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

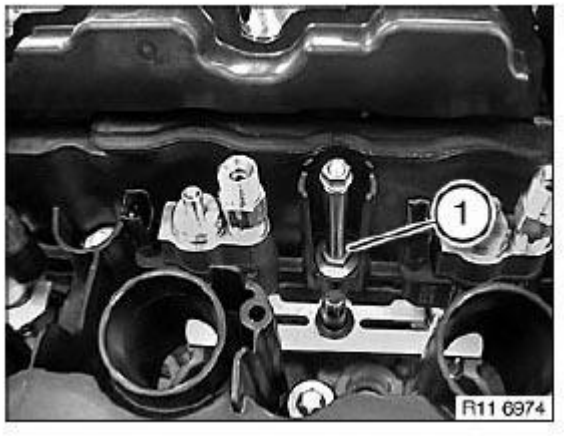


Fig. 68: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

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

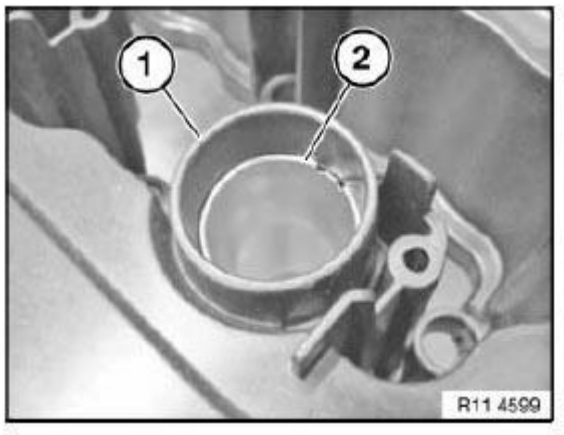


Fig. 69: Identifying Slotted Sleeves And Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on cylinder head cover.

Fig. 70: Identifying Screws On Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 and 2) along lines.

Tightening torque **11 12 4AZ** .

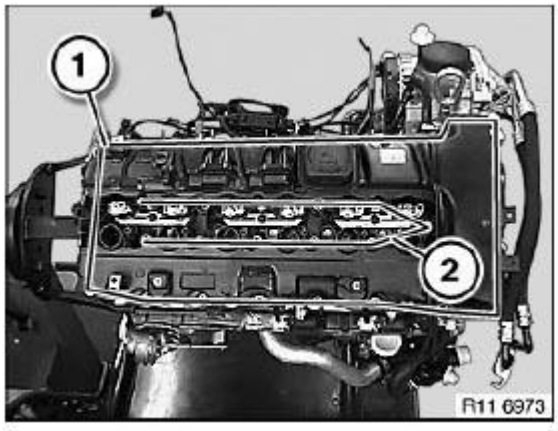


Fig. 71: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace gasket (1).

Press gasket (1) into cylinder head cover.

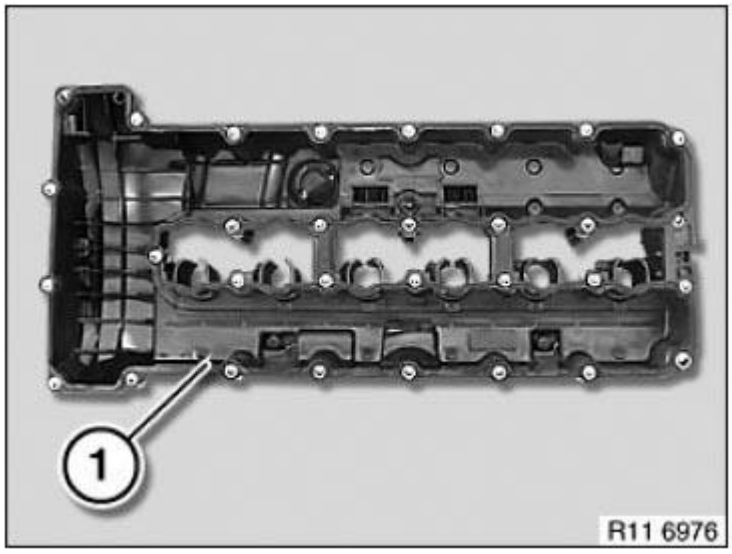


Fig. 72: Identifying Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 12 101 REPLACING CYLINDER HEAD GASKET (N54, N54T)

Necessary preliminary tasks:

- Remove **CYLINDER HEAD** .

Insert **11 4 430** special tool into bore holes.

Remove head gasket.

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

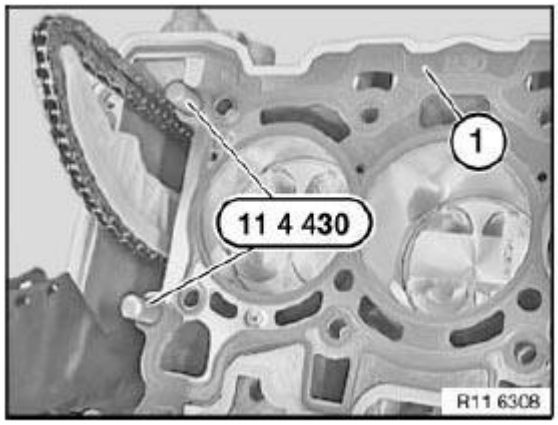


Fig. 73: Inserting 11 4 430 Special Tool Into Bore Holes

Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Work on sealing surface on engine block and on cylinder head with special tool 11 4 470 only.

Do not use any metal-cutting tools.

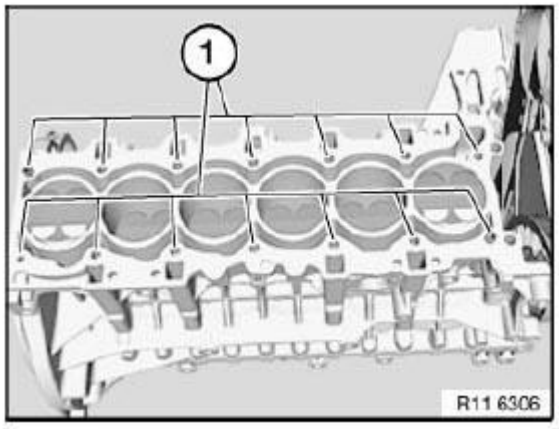


Fig. 74: Identifying Threaded Holes
Courtesy of BMW OF NORTH AMERICA, INC.

Identification (1) of head gasket (N54).

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

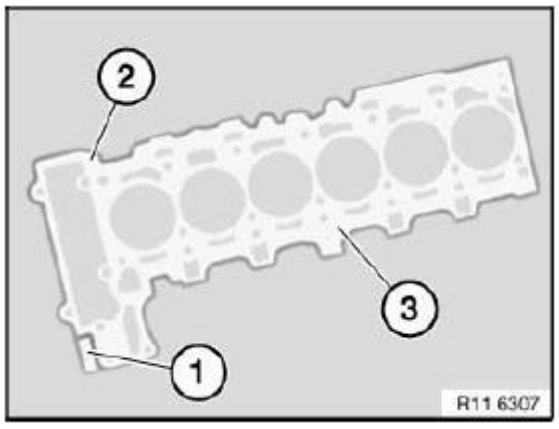


Fig. 75: Identifying Head Gasket Identification Mark
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

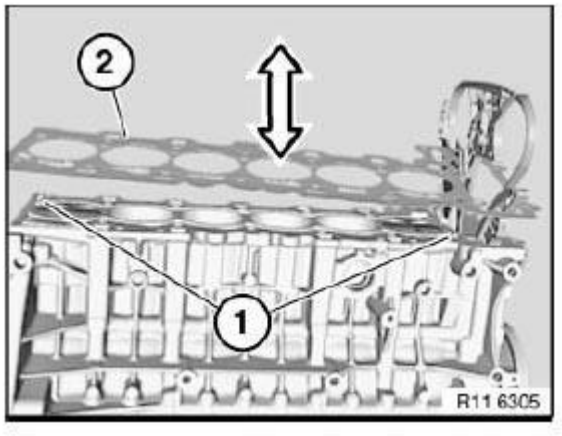


Fig. 76: Placing Head Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check cylinder head for DEVIATION FROM FLATNESS .

Check cylinder head for WATER LEAKS .

Assemble engine.

OIL SUMP

11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (N54, N54T)

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 engine guard
- Secure engine in **INSTALLATION POSITION**
- **LOWERING FRONT AXLE**
- **Observe tightening specifications without fail during installation.**
- Drain and add **ENGINE OIL**

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

Release bolts (3) on transmission.

Tightening torque **11 13 6AZ** .

Detach return hose (2).

IMPORTANT: Bolts of oil sump have different lengths.

Observe different tightening torques.

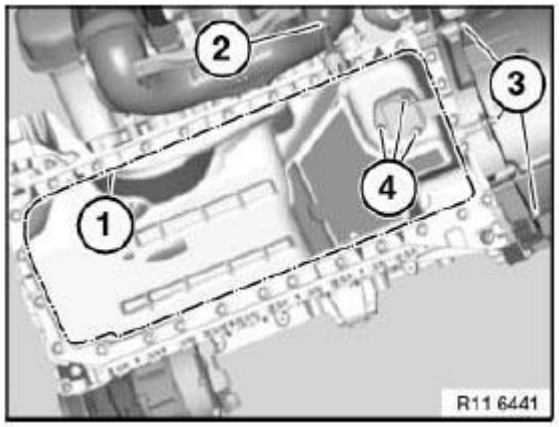


Fig. 77: Identifying Return Hose With Bolts And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts along line (1).

Tightening torque **11 13 2 AND 3AZ** .

Installation note:

Replace aluminum screws.

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

Tightening torque **11 13 8AZ** .

Installation note:

Replace sealing ring.

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

Clean retaining threads and sealing surfaces.

Installation note:

Replace all seals.

Assemble engine.

HOUSING COVER

11 14 151 REPLACING CRANKSHAFT RADIAL SEAL (N54, N54T) UP TO 12.31.08

Necessary preliminary tasks:

- Remove transmission. See **2300018 REMOVING AND INSTALLING TRANSMISSION (GS6-53BZ) N54** or **28 00 001 REMOVING AND INSTALLING TWIN-CLUTCH GEARBOX (GS7D36SG) N54** .
- Remove **FLYWHEEL** .

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

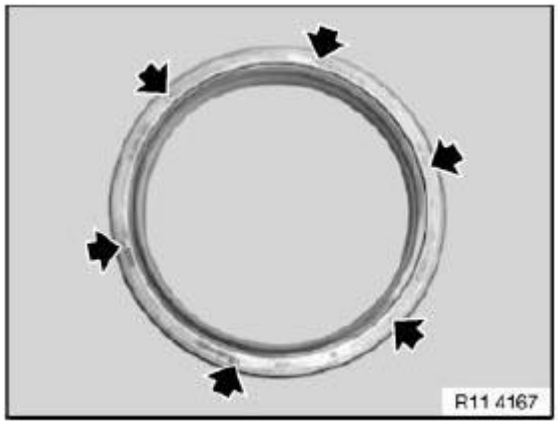


Fig. 78: Locating Crankshaft Radial Seal Removal Openings
Courtesy of BMW OF NORTH AMERICA, INC.

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

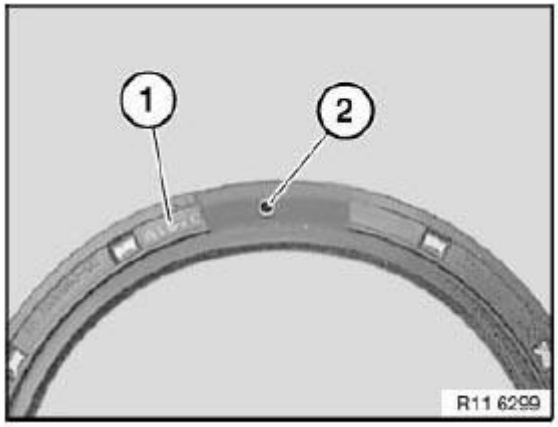


Fig. 79: Identifying Rubber Coating And Removal Opening
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

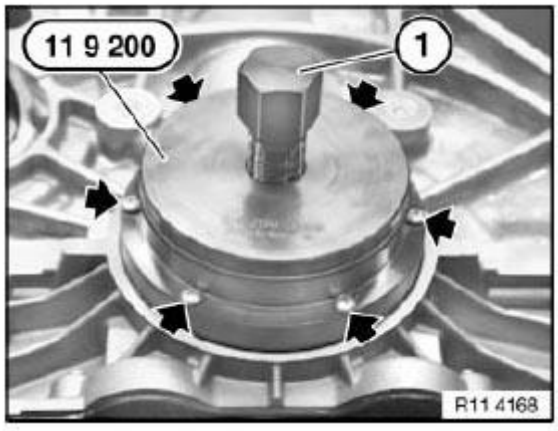


Fig. 80: Identifying Special Tool (11 9 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

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

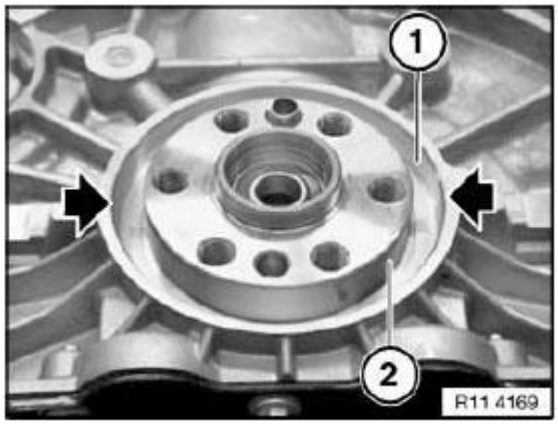


Fig. 81: Identifying Radial Shaft Running Surface Seal
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Support bush (4) is supplied with radial shaft seal (1).

When radial shaft seal (1) is installed, only support bush (4) may be used as a slip bush.

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.

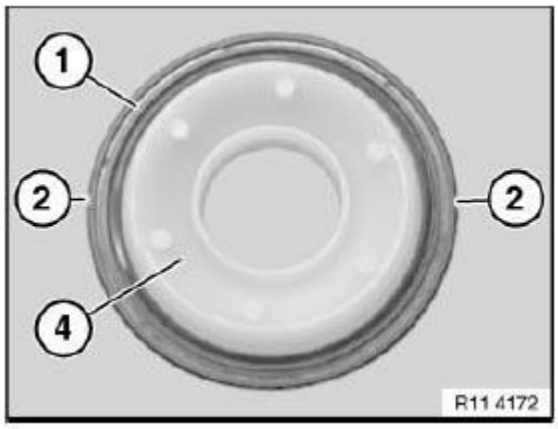


Fig. 82: Identifying Crankshaft Radial Seal, Grooves And Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The seal between the engine block and radial shaft seal is described below.

The engine block will not be leakproof at the outside of the radial shaft seal if you fail to comply with the individual work steps and the work sequence.

NOTE: The required parts are available from the BMW Parts Department (Electronic

Parts Catalogue).

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.

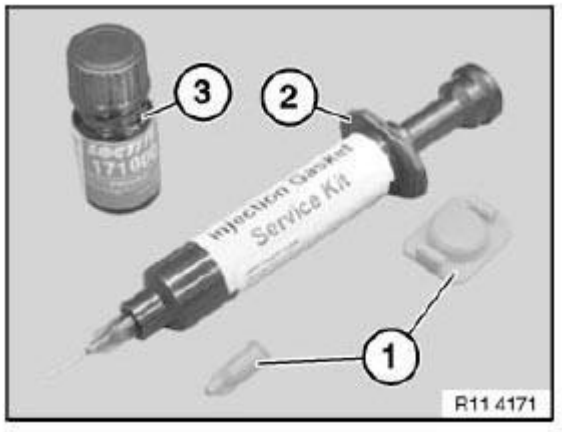


Fig. 83: Identifying Injector, Sealing Compound And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Fit support bush (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 bush (4).

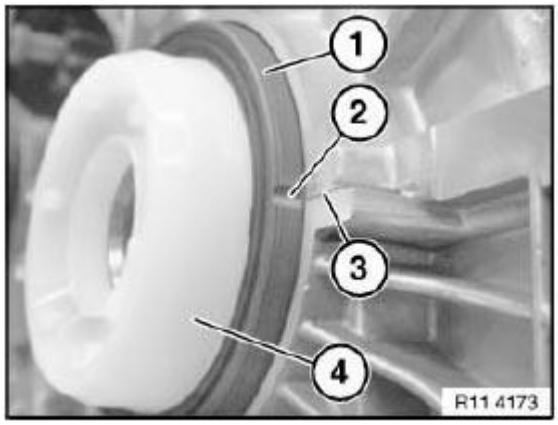


Fig. 84: Identifying Support Sleeve With Radial Shaft Seal On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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.

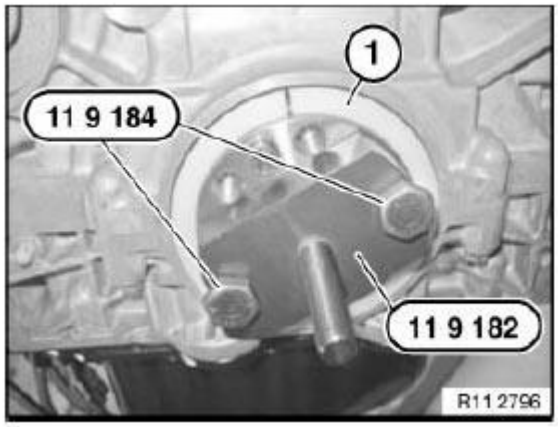


Fig. 85: Identifying Spacer Ring With Special Tool (11 9 182 And 11 9 183)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

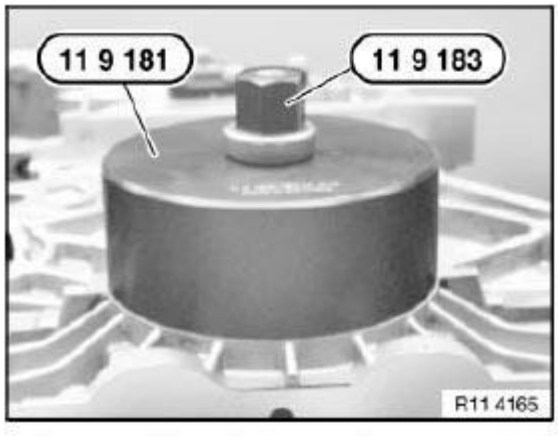


Fig. 86: Identifying Special Tool (11 9 181 And 11 9 183)
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

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

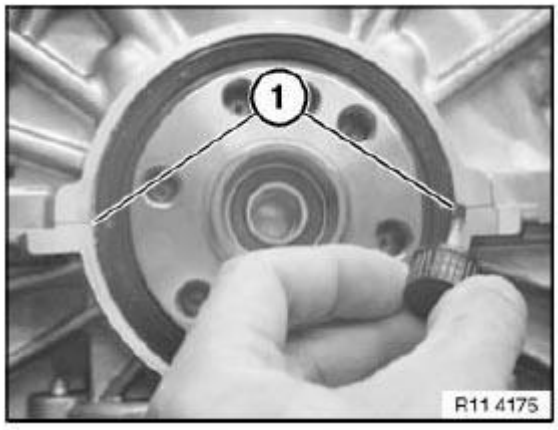


Fig. 87: Coating Surface Of Sealing Compound In Both Grooves Using Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

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

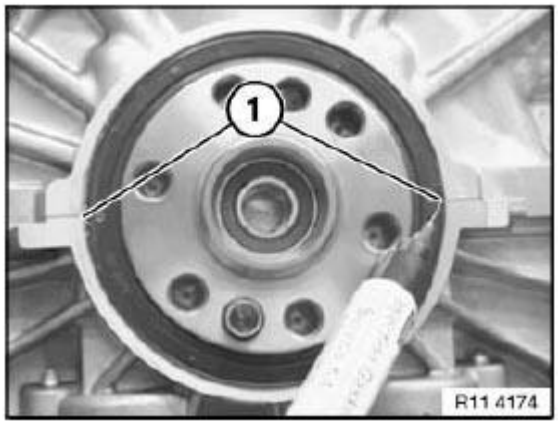


Fig. 88: Filling Both Grooves Flush With Loctite Sealing Compound
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

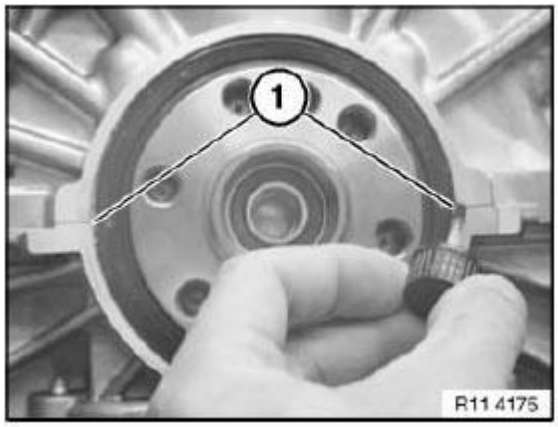


Fig. 89: Coating Surface Of Sealing Compound In Both Grooves Using Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

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.

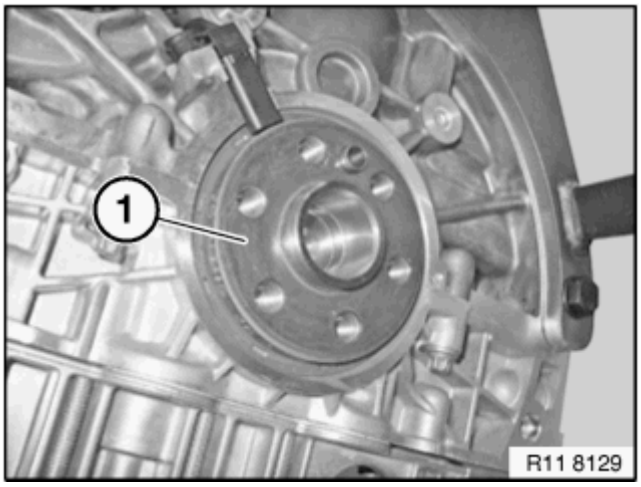


Fig. 90: Identifying Magnet Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw on pulse sensor (1).

Slide PULSE SENSOR (2) upwards.

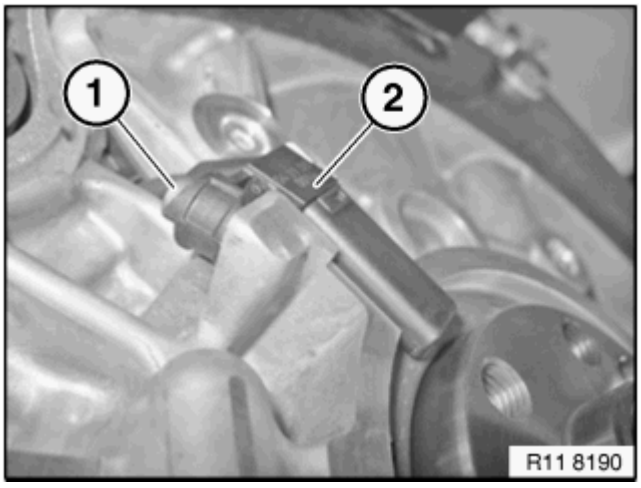


Fig. 91: Identifying Pulse Sensor And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Drill size maximum 2.5 millimeters.

Remove shavings immediately.

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

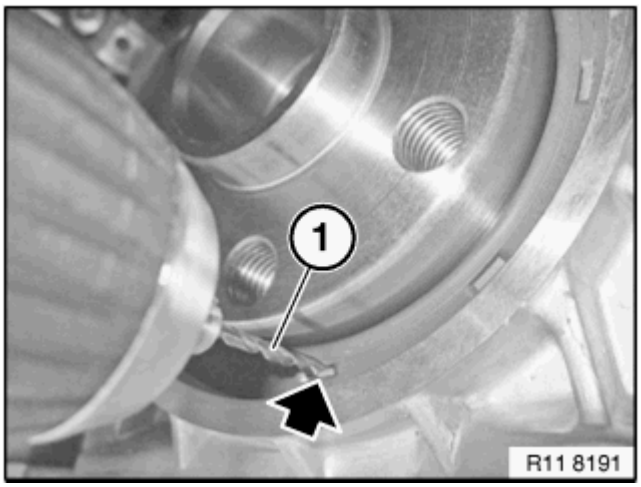


Fig. 92: Drilling Hole In Radial Shaft Seal Using Drill
Courtesy of BMW OF NORTH AMERICA, INC.

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

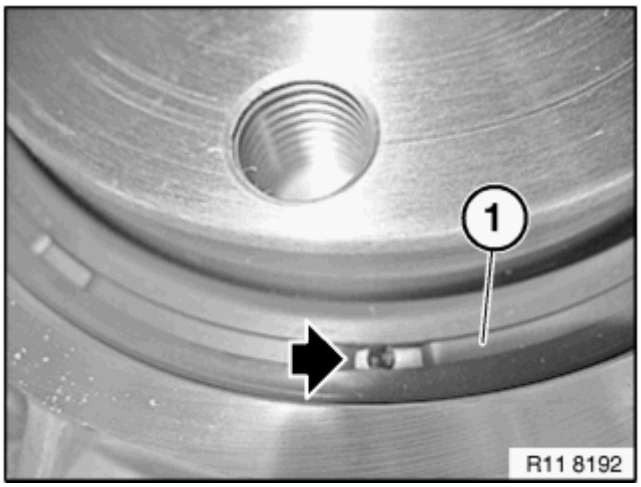


Fig. 93: Identifying Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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.

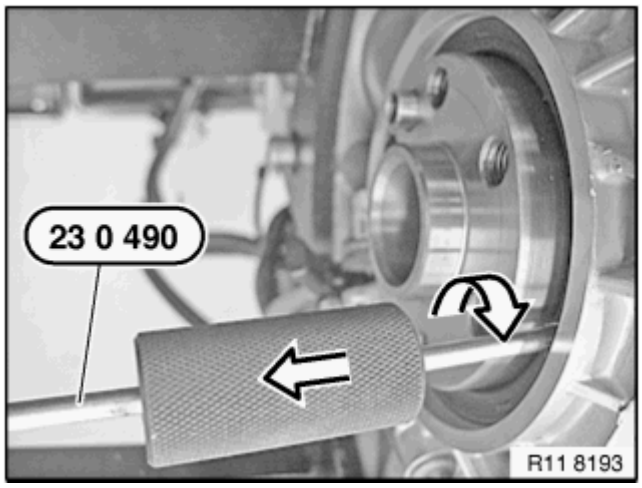


Fig. 94: Screwing In Special Tool 23 0 490 In Clockwise Direction
Courtesy of BMW OF NORTH AMERICA, INC.

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

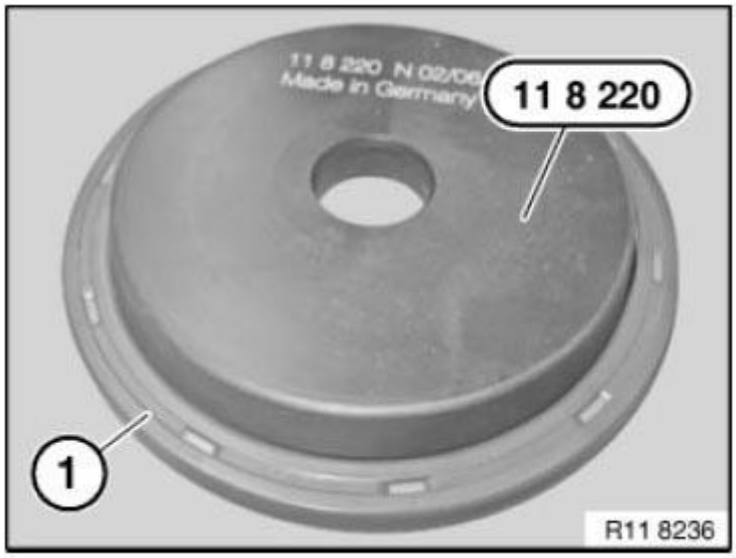


Fig. 95: Identifying Radial Shaft Seal On Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

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

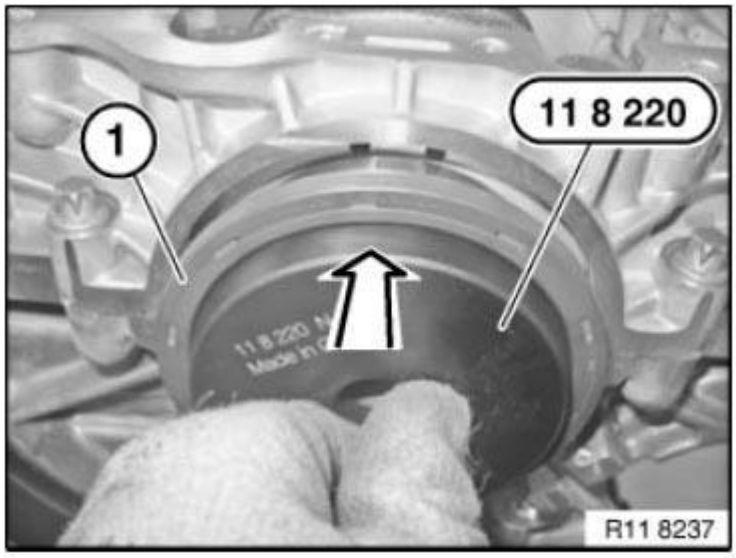


Fig. 96: Positioning Radial Shaft Seal Using Special Tool 11 8 220 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

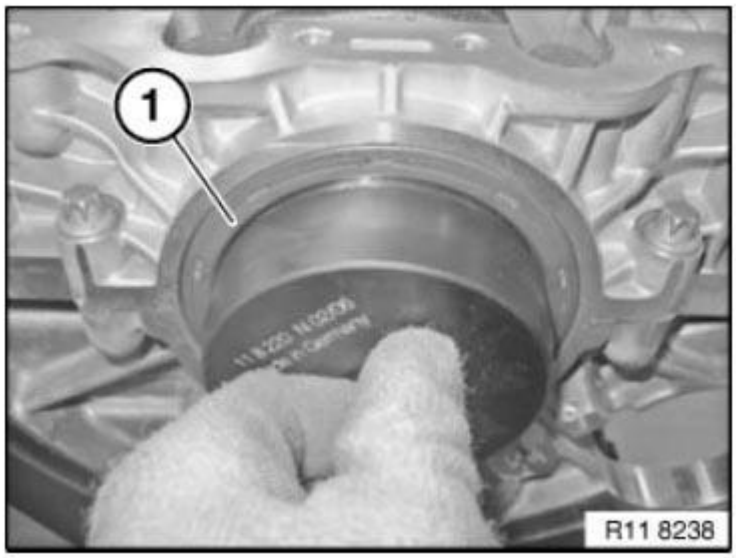


Fig. 97: Moving Radial Shaft Seal Parallel Up Against Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

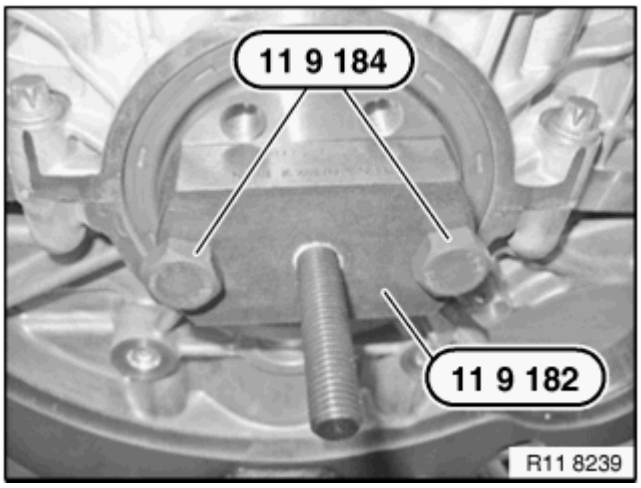


Fig. 98: Fastening Special Tool 11 9 182 With Special Tool 11 9 184 On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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).

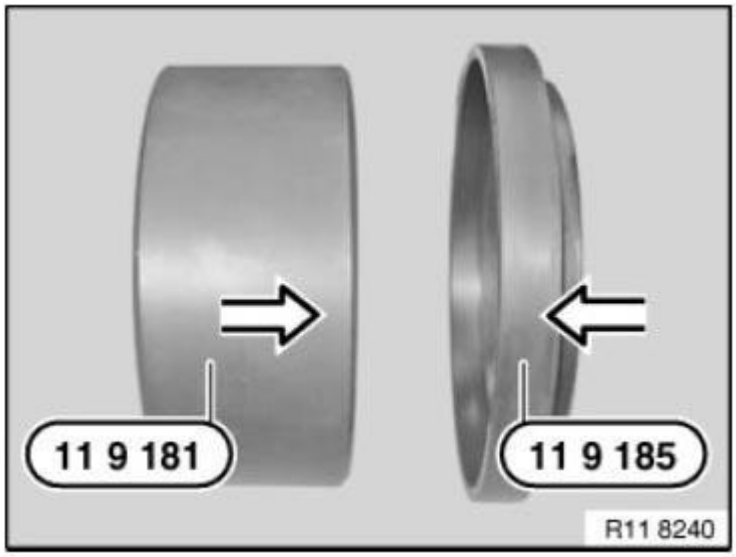


Fig. 99: Connecting Special Tool 11 9 185 Onto Special Tool 11 8 181
Courtesy of BMW OF NORTH AMERICA, INC.

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).

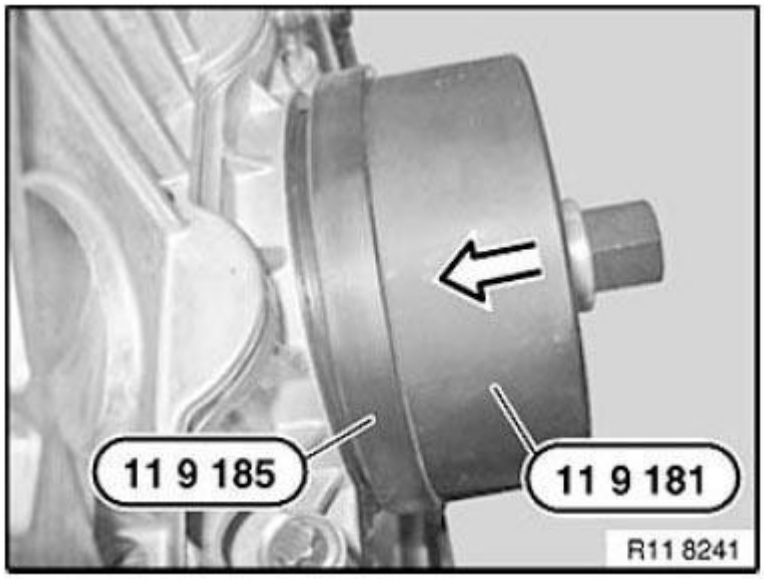


Fig. 100: Installing Rear Crankshaft Seal Using Tool 119 180/181
Courtesy of BMW OF NORTH AMERICA, INC.

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

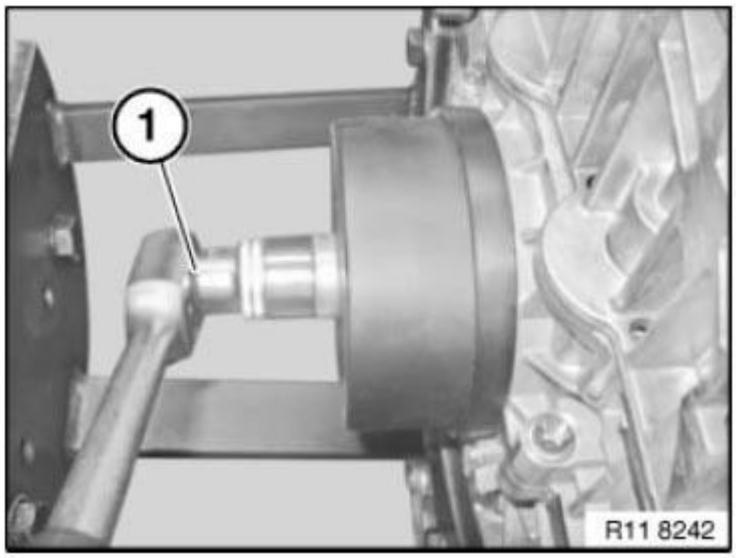


Fig. 101: Screwing On Radial Shaft Seal Using Special Tool 11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

11 14 005 REPLACING FRONT CRANKSHAFT SEAL (N54, N54T)

Necessary preliminary tasks:

- Remove **VIBRATION DAMPER**

IMPORTANT: Do not release central bolt.

Risk of damage!

If the central bolt is released, the sprockets 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.

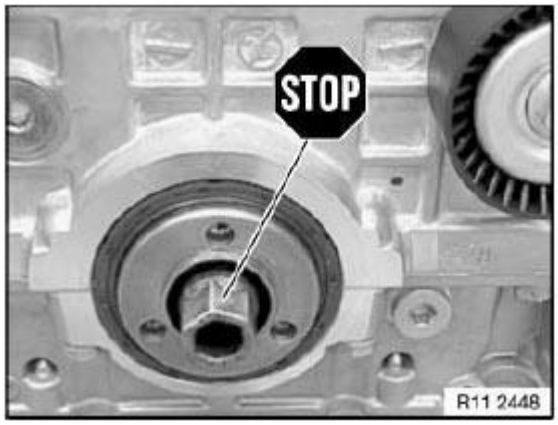


Fig. 102: Identifying Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Turn back special tool 11 9 222.

Push special tool 11 9 221 onto crankshaft hub.

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

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

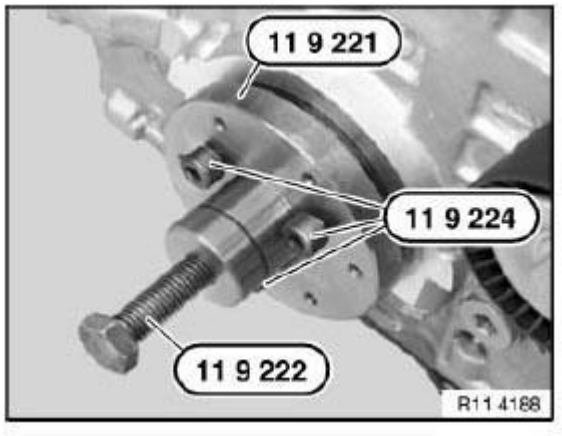


Fig. 103: Identifying Special Tool (11 9 221, 11 9 224 And 11 9 222)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Screw in spindle 11 0 372.

Release crankshaft seal from crankcase.

NOTE: Repeat this operation several times if necessary.

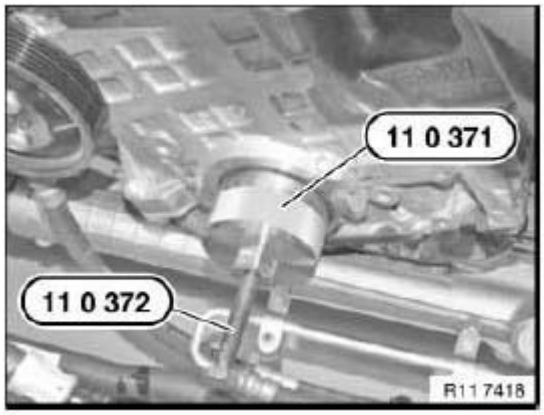


Fig. 104: Identifying Special Tool (11 0 372 And 11 0 371)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

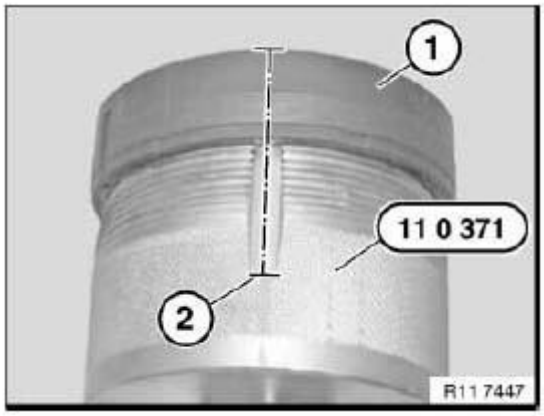


Fig. 105: Identifying Crankshaft Radial Seal And Cutting Line
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The following text describes installation and sealing between the engine block and crankshaft seal.

The engine block will not be leakproof at the outside of the crankshaft seal if you fail to comply with the individual work steps and the work sequence.

Installation note:

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

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

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

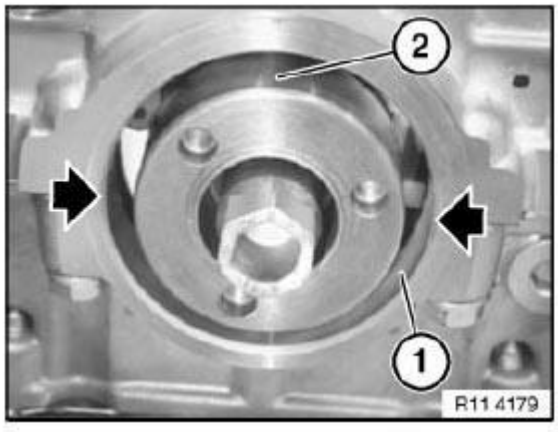


Fig. 106: Identifying Sealing Surface And Running Surface For Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

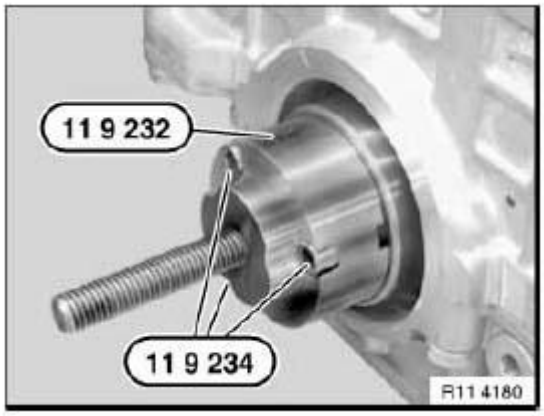


Fig. 107: Identifying Special Tool (11 9 232 And 11 9 234)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

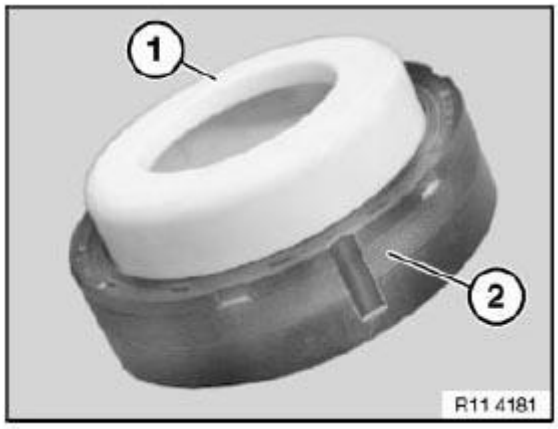


Fig. 108: Identifying Crankshaft Seal And Support Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The required parts are available from the BMW Parts Department (Electronic Parts Catalogue).

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

Screw on metering needle.

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

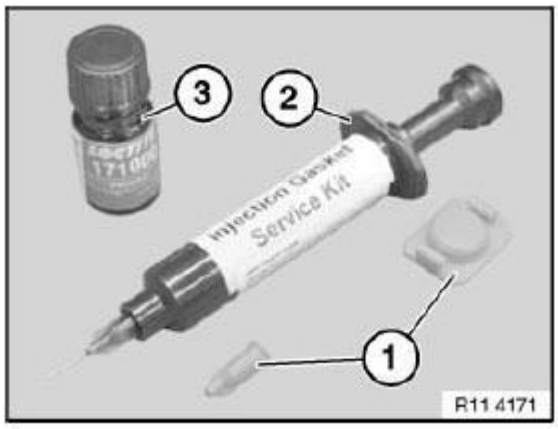


Fig. 109: Identifying Injector, Sealing Compound And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

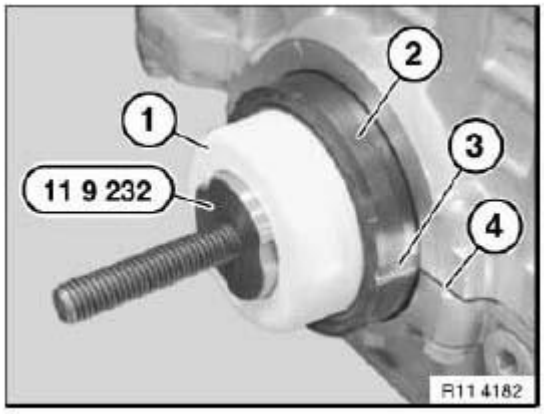


Fig. 110: Identifying Sleeve, Crankshaft Seal, Groove And Housing Partition With Special Tool (11 9 232)
Courtesy of BMW OF NORTH AMERICA, INC.

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

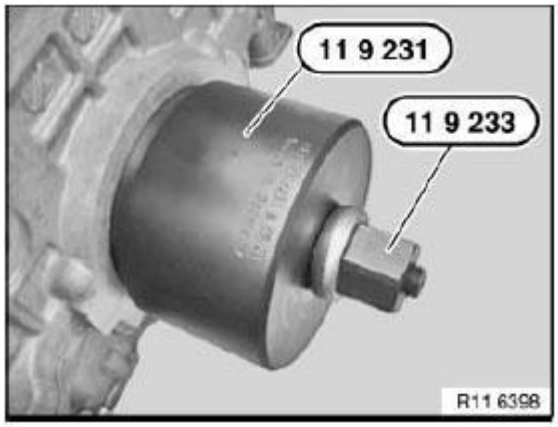


Fig. 111: Identifying Special Tool (11 9 231 And 11 9 233)
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

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

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

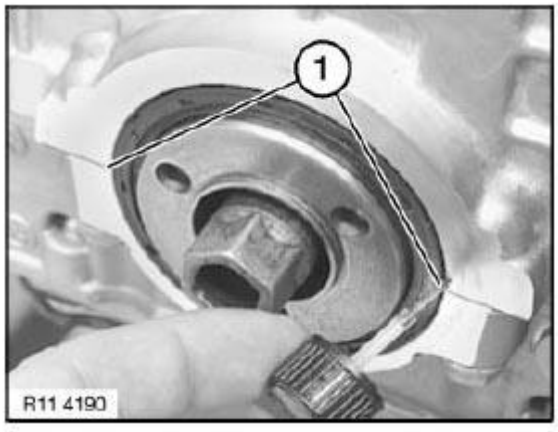


Fig. 112: Inserting Brush With Loctite Primer Into Grooves On Crankshaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

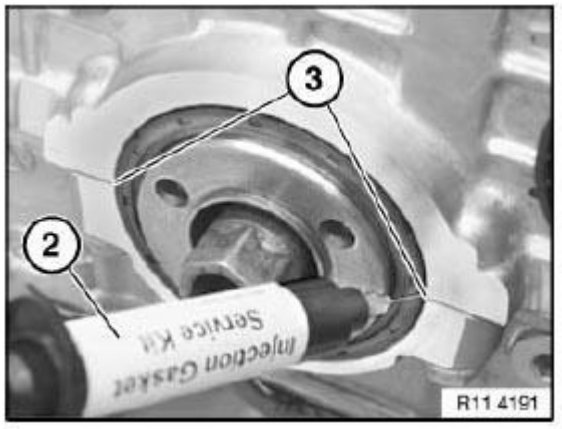


Fig. 113: Filling Grooves Flush With Sealant Using Injector/Syringe
Courtesy of BMW OF NORTH AMERICA, INC.

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.**

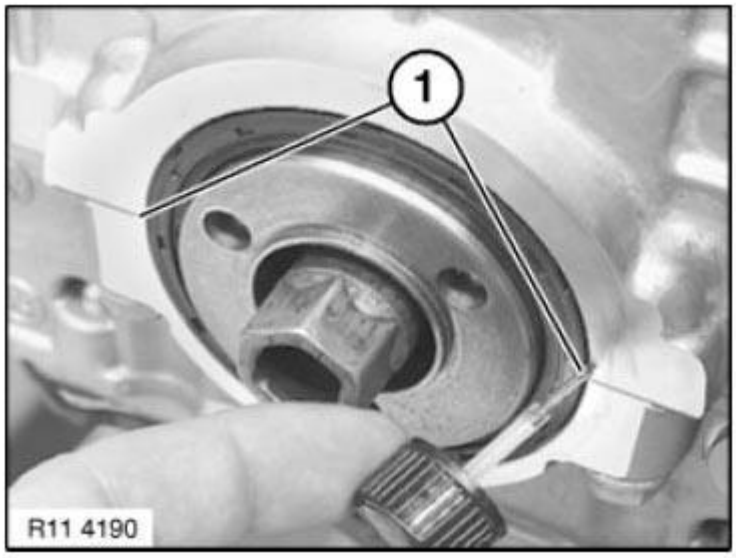


Fig. 114: Coating Surface Of Sealing Compound In Both Grooves Using Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

11 14 010 REPLACING SEALING CAP FOR VACUUM PUMP (N54, N54T)

Necessary preliminary tasks:

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

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

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

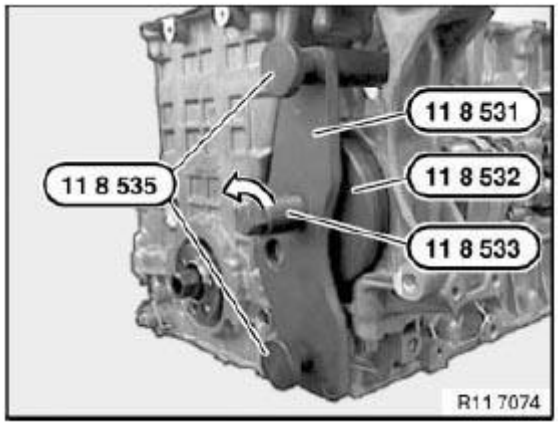


Fig. 115: Identifying Special Tools 11 8 535, 11 8 531 And 11 8 537
Courtesy of BMW OF NORTH AMERICA, INC.

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

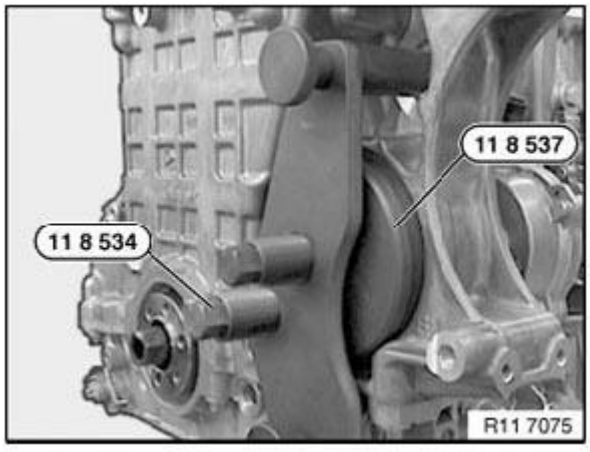


Fig. 116: Identifying Special Tools 11 8 537 And 11 8 534
Courtesy of BMW OF NORTH AMERICA, INC.

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

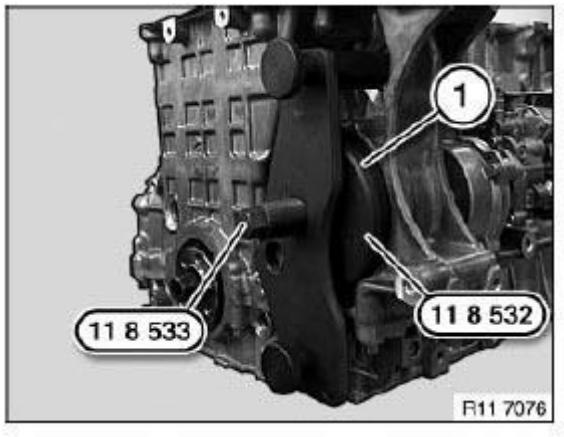


Fig. 117: Identifying Sealing Cover With Special Tools 11 8 532 And 11 8 533
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CRANKSHAFT WITH BEARING

11 22 500 REMOVING AND INSTALLING/REPLACING FLYWHEEL (N54, N54T)

Necessary preliminary tasks:

- Remove **28 00 001 REMOVING AND INSTALLING TWIN-CLUTCH GEARBOX (GS7D36SG) N54**
- Remove **CLUTCH**

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

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

Fig. 118: Identifying Slot Dimension On Special Tool 11 9 260
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles with manual gearboxes

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

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

Tightening torque **11 22 2AZ** .

Installation note:

The flywheel is secured with a dowel pin.

Fit new flywheel screws

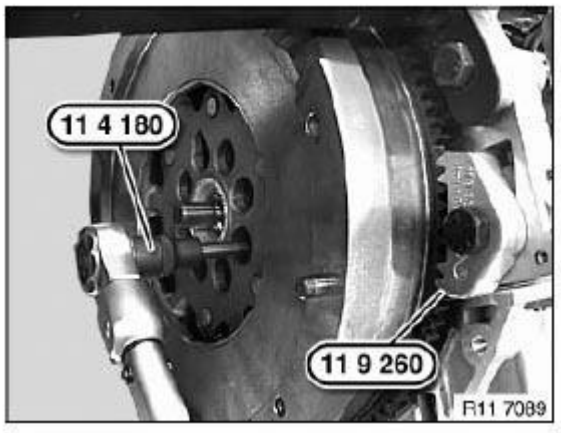


Fig. 119: Removing Flywheel Screws Using Special Tool 11 4 180
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles with automatic transmissions

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

Release flywheel screws with a suitable tool (1).

Tightening torque **11 22 1AZ** .

Installation note:

The flywheel is secured with a dowel pin.

Fit new flywheel screws

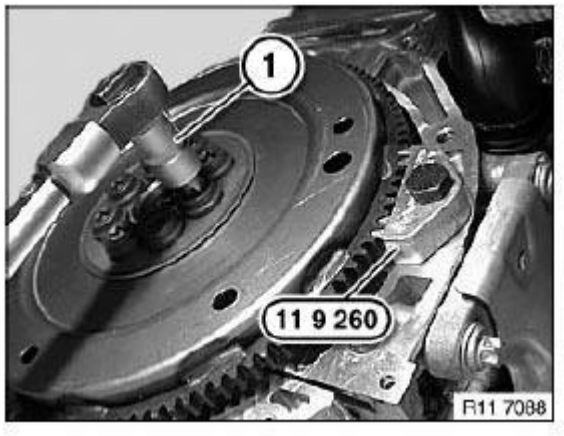


Fig. 120: Mounting Flywheel Using Special Tool 11 9 260
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 21 531 REPLACING ALL CRANKSHAFT MAIN BEARINGS (N54, N54T)

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 main bearing screw connection, secure with bolt (1).

Installation note:

The oil nozzle must be located precisely in the groove of special tool **11 8 510** .

If necessary, adjust oil nozzle.

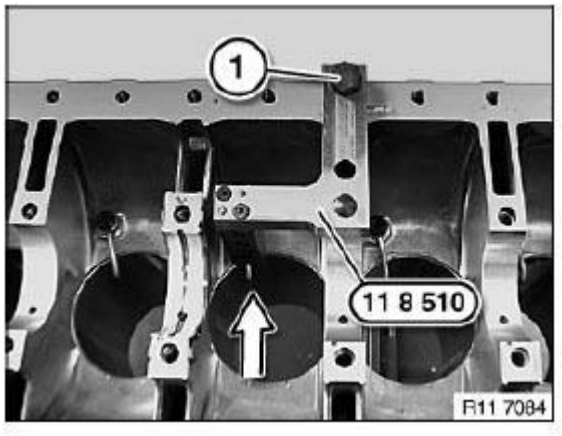


Fig. 121: Locating Oil Nozzle In Groove Of Special Tool 11 8 510
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust oil nozzle.

Release screw (1).

Tightening torque **11 11 5AZ** .

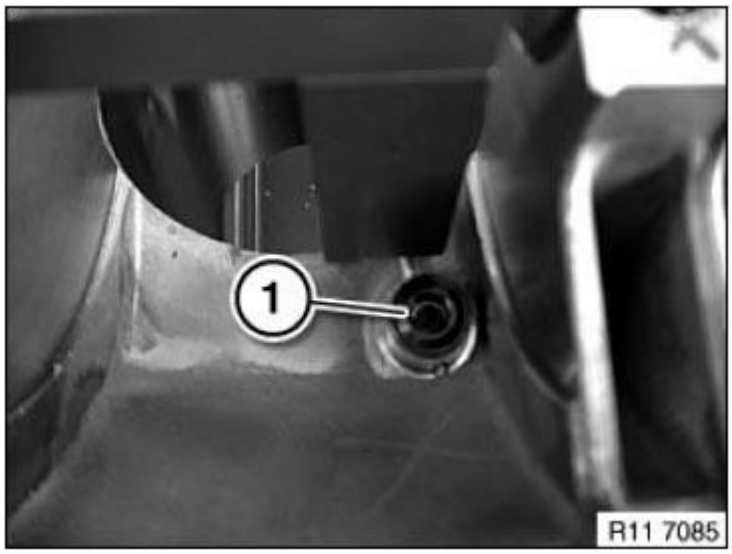


Fig. 122: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Remove bearing shells (2) and (3).

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

Observe bearing classification. See **CRANKSHAFT AND BEARINGS** ; **CRANKSHAFT AND BEARINGS N54/B30** ; **CRANKSHAFT AND BEARINGS N54/B30** or **CRANKSHAFT AND BEARINGS N54/B30** .

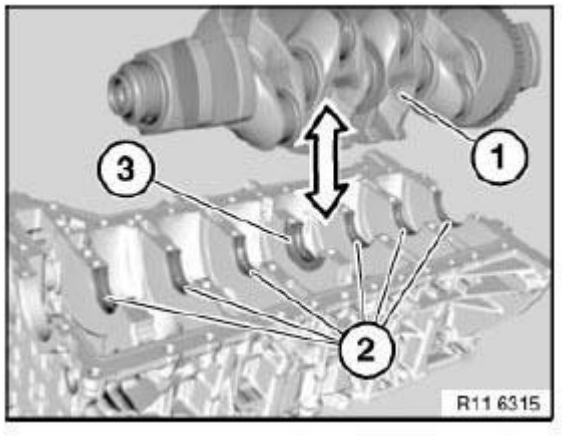


Fig. 123: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

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

IMPORTANT: Allocation of bearing points:

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

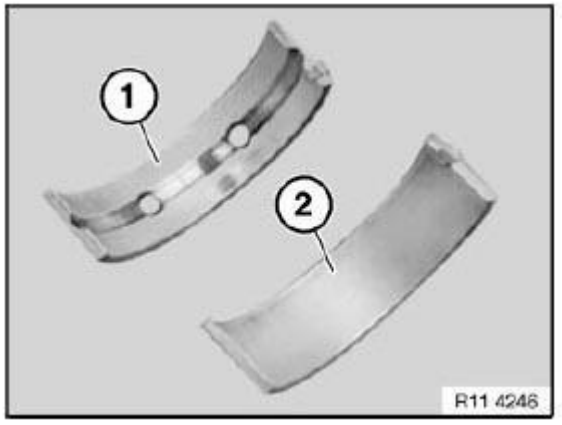


Fig. 124: Identifying Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

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

Observe bearing classification. See **CRANKSHAFT AND BEARINGS** ; **CRANKSHAFT AND BEARINGS N54/B30** ; **CRANKSHAFT AND BEARINGS N54/B30** ; **CRANKSHAFT AND BEARINGS N54/B30** .

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

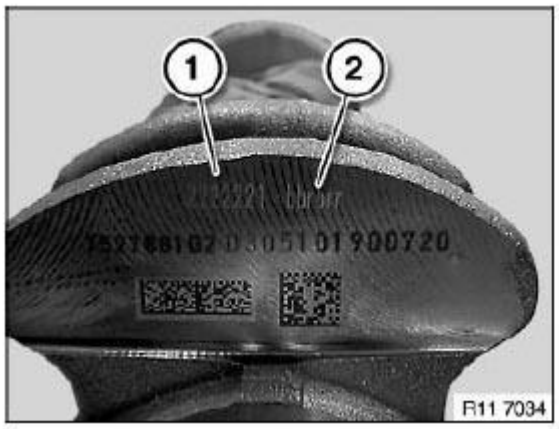


Fig. 125: Identifying Bearing Classifications
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation note:

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

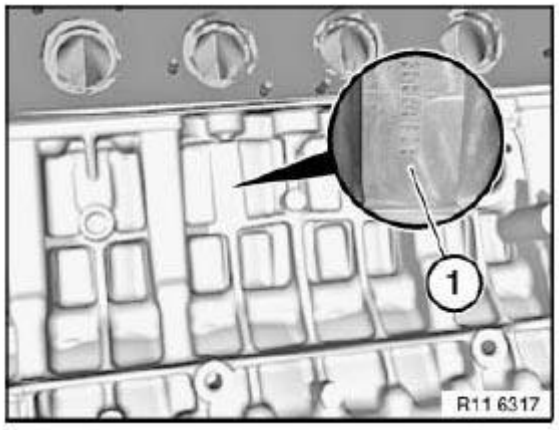


Fig. 126: Identifying Bearing Classification Of Crankcase Upper Section
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

The letter/number combination produces a bearing shell pairing.

Identification by different colors.

IMPORTANT: First bearing point is on the timing drive.

The color combination Yellow and Red must not be fitted.

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

Code letters on crankcase

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

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

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

Code numbers on crankshaft

Code number 1 = bearing shell (2) Yellow.

Code number 2 = bearing shell (2) Green.

Code number 3 = bearing shell (2) Red.

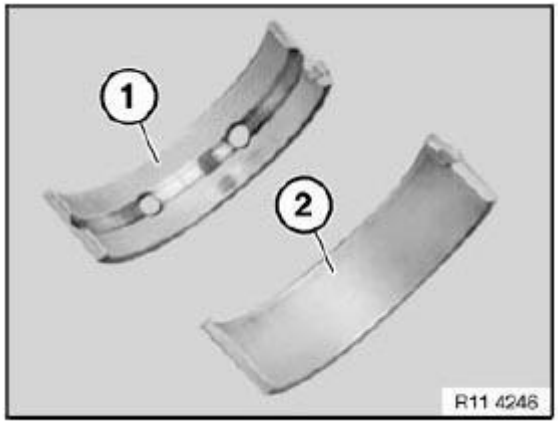


Fig. 127: Identifying Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation example

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

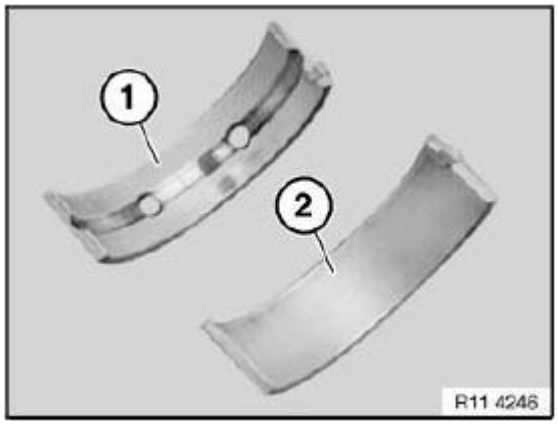


Fig. 128: Identifying Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

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

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

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

Installation note:

Possible color combinations for mounting the crankshaft in the crankcase.

CRANKCASE COLOR CODE 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**

CRANKCASE COLOR CODE REFERENCE CHART

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

Insert all bearing shells (2 and 3).

IMPORTANT: Clean sealing surfaces.

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

Only use special tool **11 4 470** to clean sealing surfaces.

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

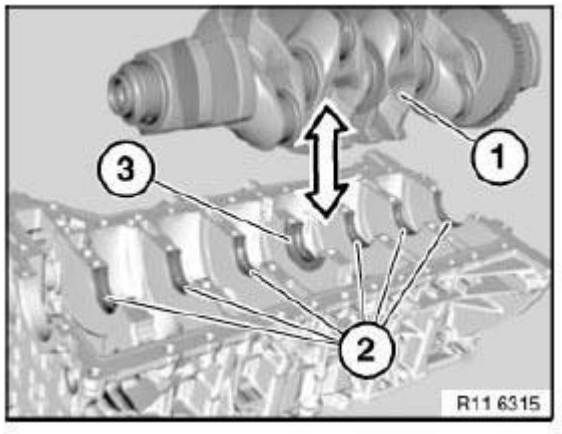


Fig. 129: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

All measuring points must be free from oil and grease.

Use used screws to determine bearing play.

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

Remove crankcase lower section (bedplate).

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

Crankshaft bearing play **radial** .

Installation note:

Remove plastic thread.

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

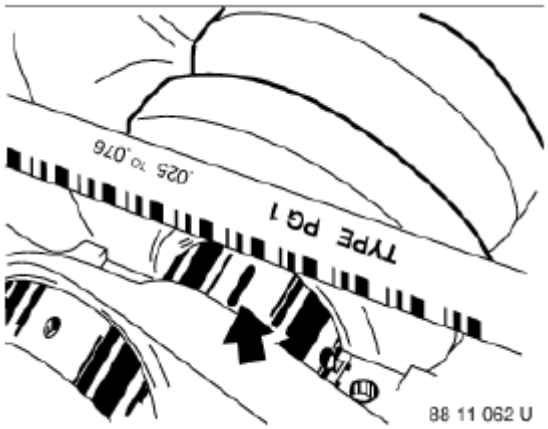


Fig. 130: Checking Radial Clearance At Width Of Flattened Plastic Thread (Plastigage)
Courtesy of BMW OF NORTH AMERICA, INC.

Install crankcase lower section (bedplate).

Assemble engine.

11 21 500 REPLACING CRANKSHAFT (N54, N54T)

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** .

Installation note:

Replace aluminum screws.

Remove oil deflector (2).

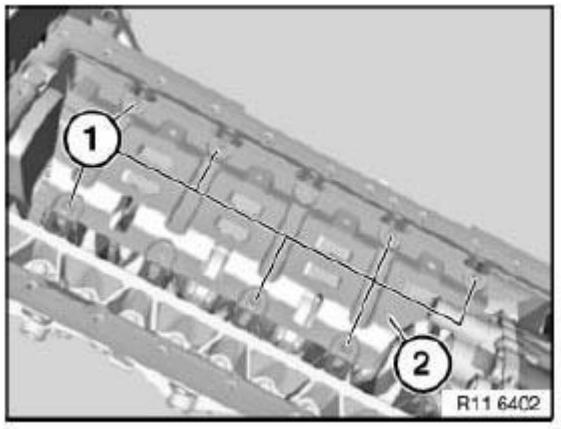


Fig. 131: Identifying Screws And Oil Deflector
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 11 2AZ** .

Unfasten screws (2).

Tightening torque **11 11 3AZ** .

Installation note:

Replace aluminum screws.

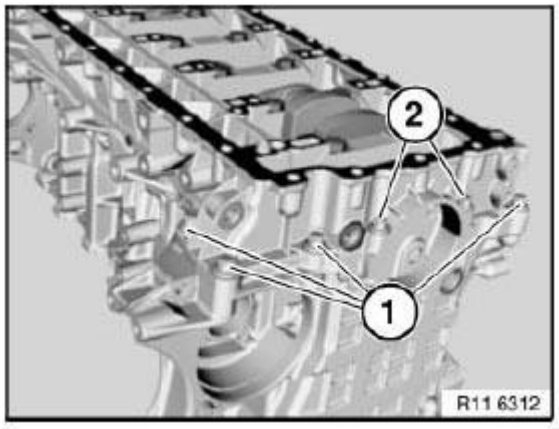


Fig. 132: Identifying Aluminum Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 11 4AZ** .

Unfasten screws (2).

Tightening torque **11 11 2AZ** .

Installation note:

Replace aluminum screws.

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

Tightening torque **11 11 1AZ** .

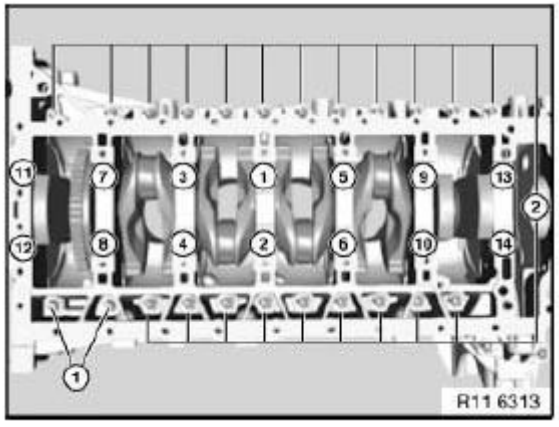


Fig. 133: Identifying Steel Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 11 3AZ** .

Installation note:

Replace aluminum screws.

Remove crankshaft lower section in upward direction.

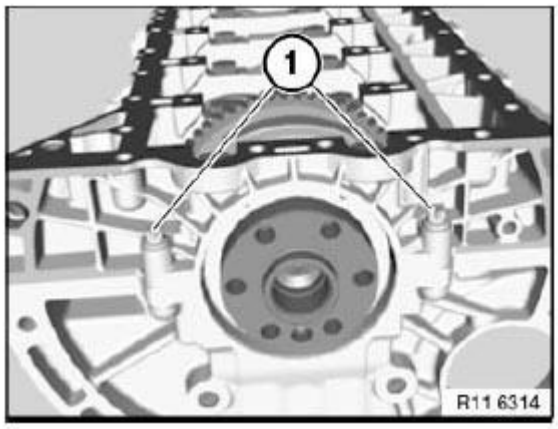


Fig. 134: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove both crankshaft seals (1).

NOTE: Graphic shows N46.

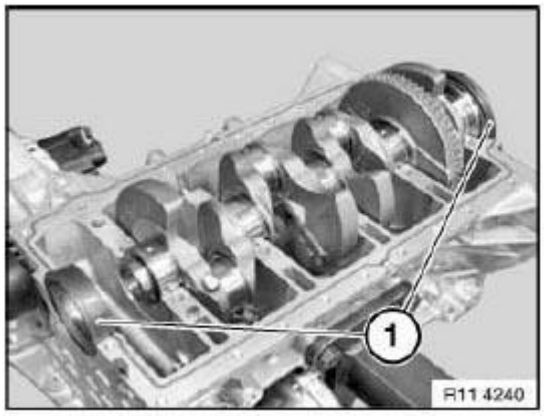


Fig. 135: Identifying Crankshaft Radial Seals
Courtesy of BMW OF NORTH AMERICA, INC.

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.

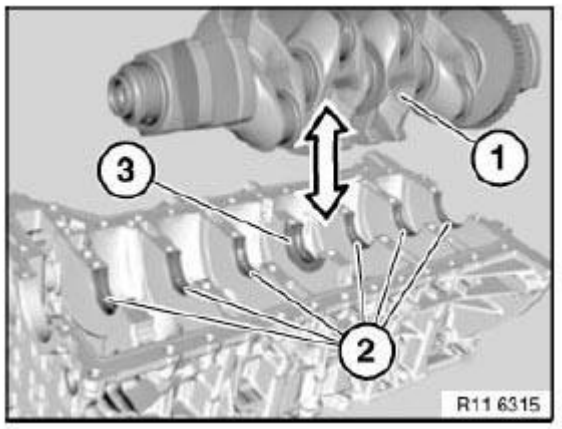


Fig. 136: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

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

Reinstall crankshaft.

Installation note:

Lubricate all bearing points with engine oil.

Clean all sealing surfaces.

NOTE: Graphic shows N46.

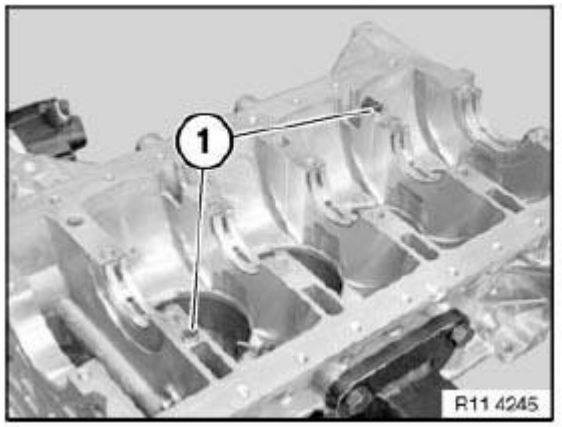


Fig. 137: Identifying Adapter Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 11 1AZ** .

Tighten screws (2) from inside outwards.

Tightening torque **11 11 2AZ** .

Tighten screws (1).

Tightening torque **11 11 4AZ** .

Installation note:

Replace aluminum screws.

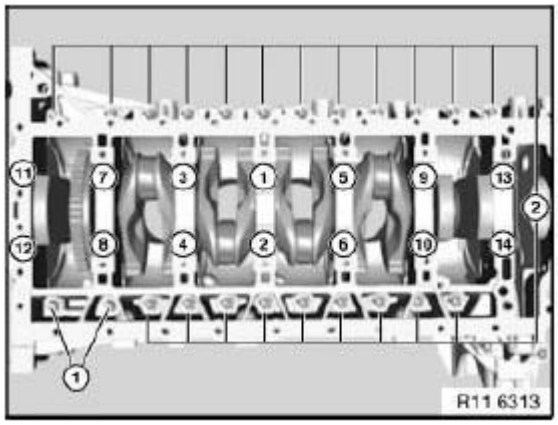


Fig. 138: Identifying Steel Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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.

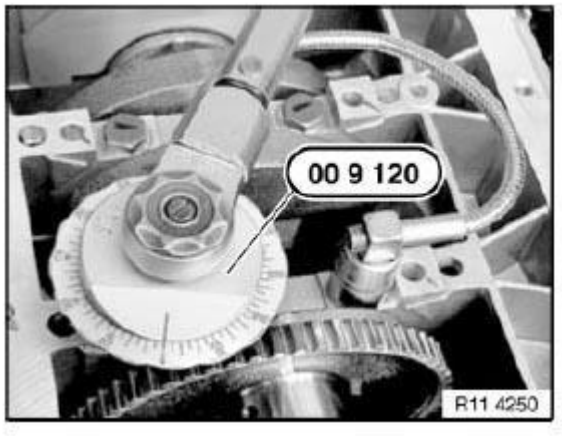


Fig. 139: Tightening Main Bearing Bolts Using Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

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. See **CRANKSHAFT AND BEARINGS** ; **CRANKSHAFT AND BEARINGS N54/B30** ; **CRANKSHAFT AND BEARINGS N54/B30** ; or **CRANKSHAFT AND BEARINGS N54/B30** .

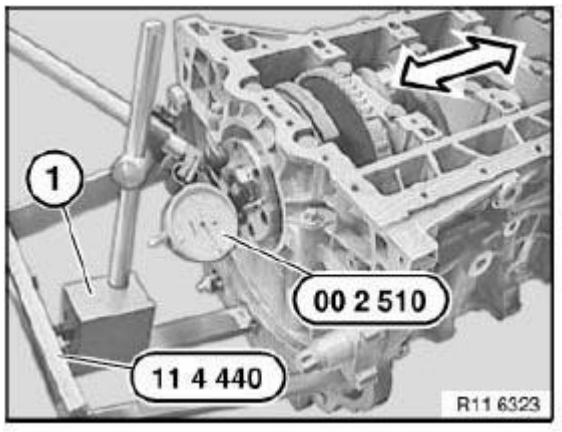


Fig. 140: Setting Up Stand With Magnetic Base On Special Tool 11 4 440
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Always replace nozzles (1).

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

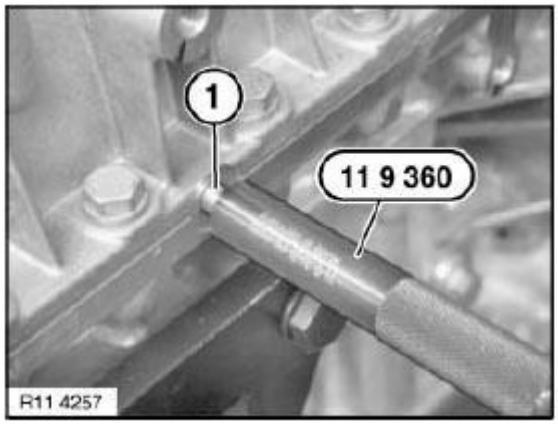


Fig. 141: Inserting Nozzles Using Special Tool 11 9 360
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

CRANKSHAFT SEAL - replace front.

CRANKSHAFT SEAL - replace rear.

Installation note:

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

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

Screw on nozzle for injecting liquid gasket.

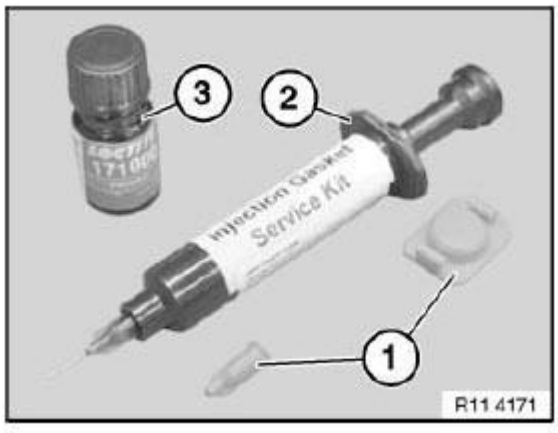


Fig. 142: Identifying Injector, Sealing Compound And Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

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

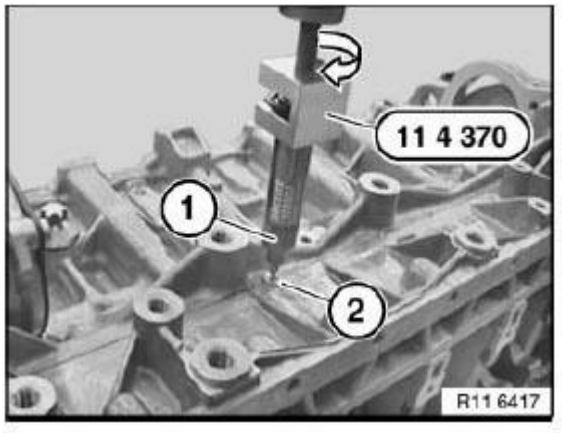


Fig. 143: Inserting Liquid Sealing Compound Using Special Tool 11 4 370
Courtesy of BMW OF NORTH AMERICA, INC.

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

(Graphic shows N40).

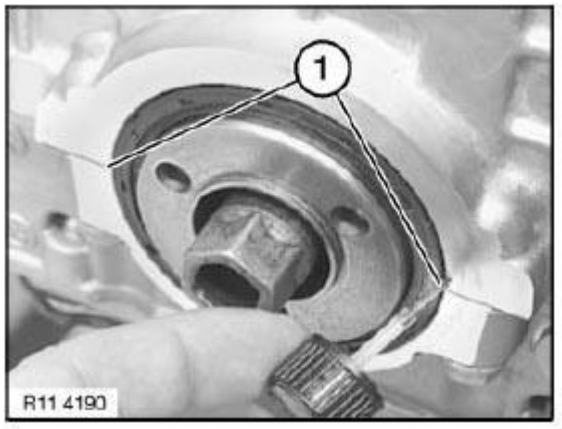


Fig. 144: Stopping Escaping Liquid Sealing Compound Using Primer
Courtesy of BMW OF NORTH AMERICA, INC.

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 **2211100 REPLACING RIGHT ENGINE SUPPORT ARM (N54)** ; or **2211110 REPLACING LEFT ENGINE SUPPORT ARM (N54)**
- Remove **OIL SUMP** .

Release screws (1).

Pull out oil pump intake pipe (2).

Tightening torque: **11 13 5AZ**

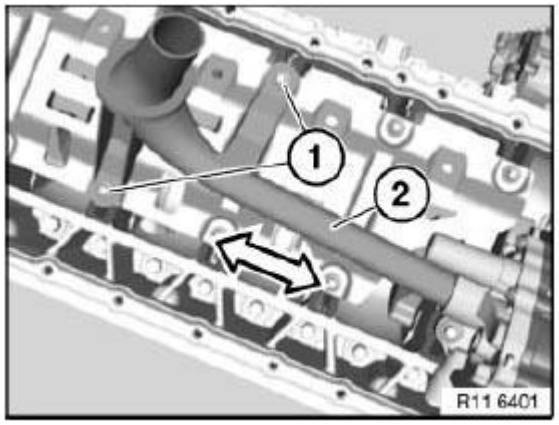


Fig. 145: Removing Pump Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

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

Installation note:

Replace aluminum screws.

Remove oil deflector (2).

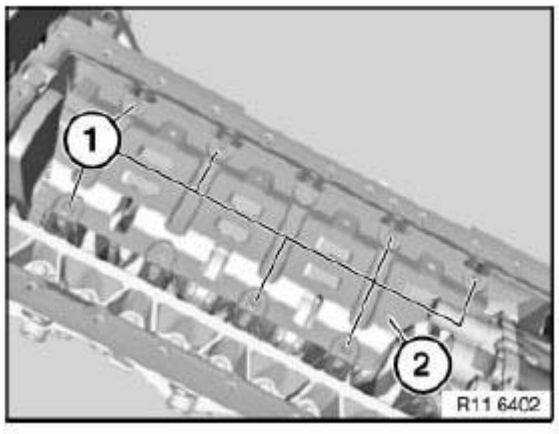


Fig. 146: Identifying Oil Deflector And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

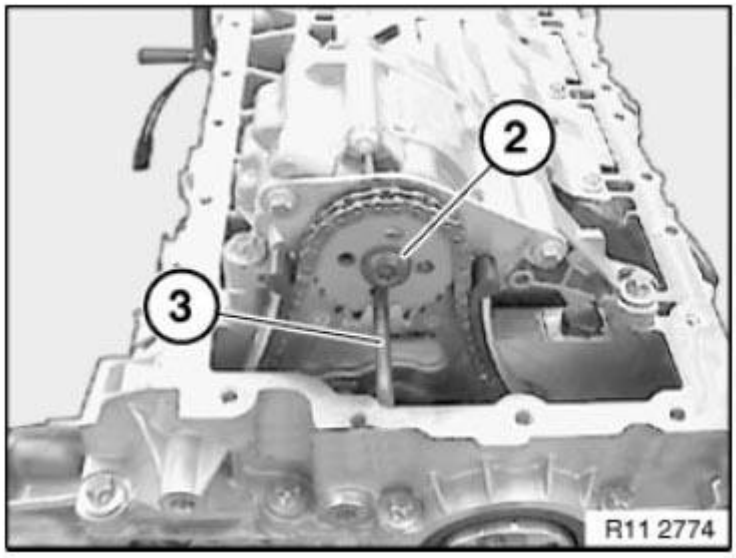


Fig. 147: Identifying Oil Pump Drive Gear And Steel Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

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

Installation note:

Replace aluminum screws.

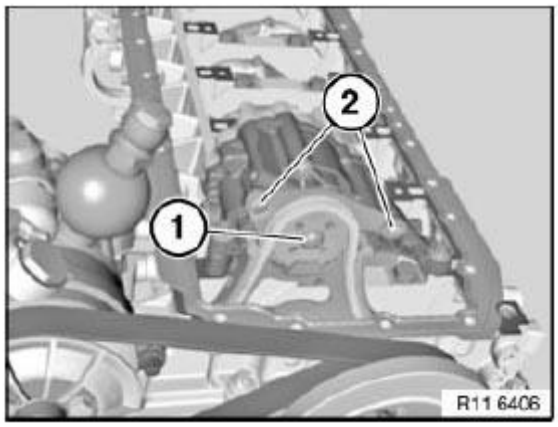


Fig. 148: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw plug (1) from crankcase at front.

NOTE: Replace gasket.

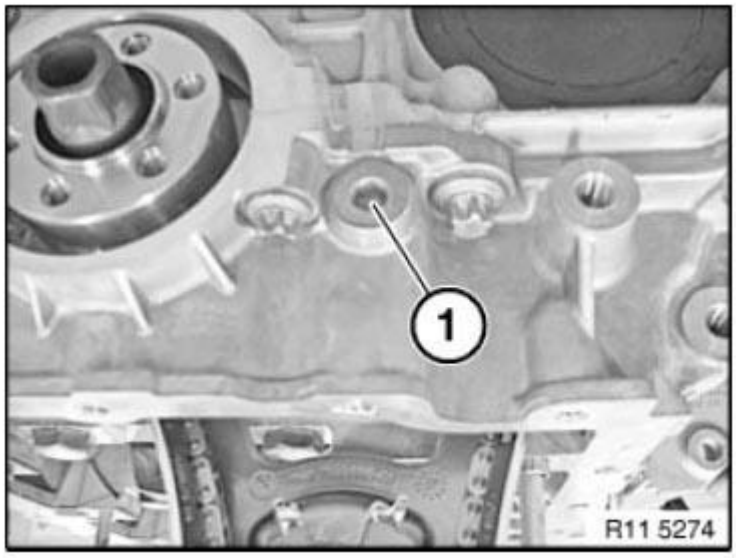


Fig. 149: Identifying Screw Plug
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

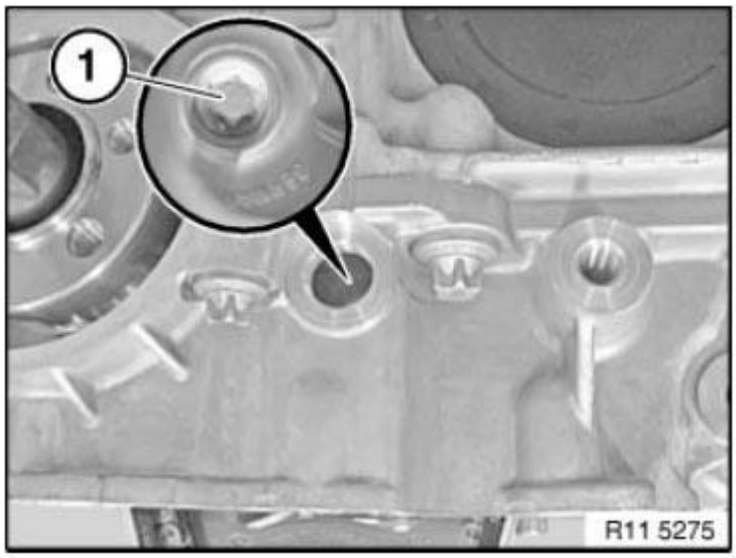


Fig. 150: Identifying Oil Pump Triangular Drive Mounting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

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.

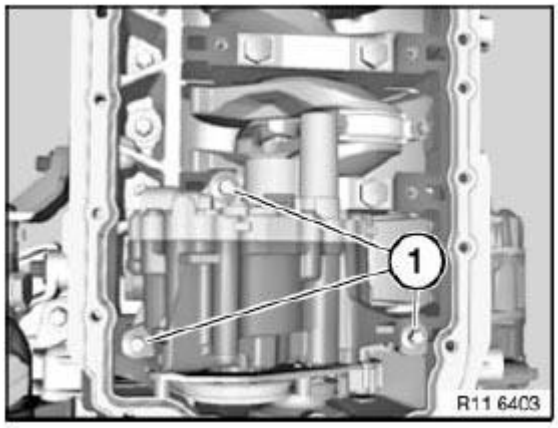


Fig. 151: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

IMPORTANT: Observe different screw lengths.

Release oil pump screws (1).

Tightening torque: 11 41 2AZ .

Installation note:

Replace aluminum screws.

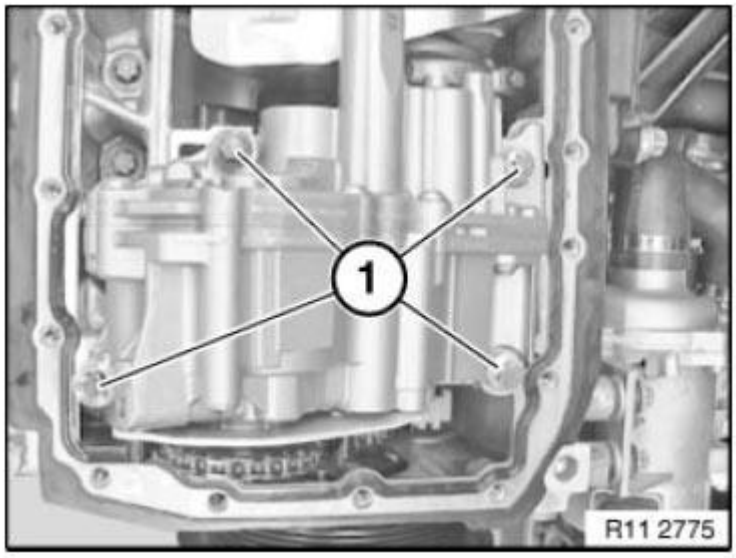


Fig. 152: Identifying Oil Pump Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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.

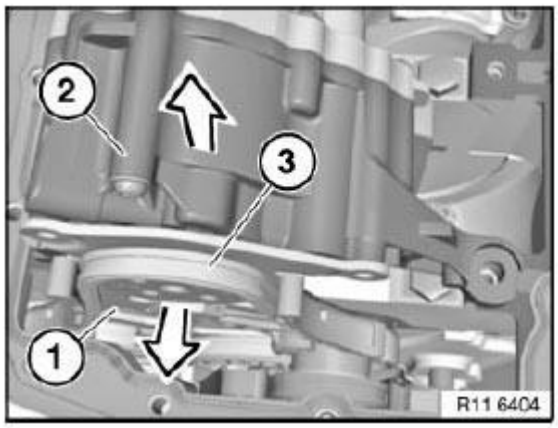


Fig. 153: Removing Sprocket
Courtesy of BMW OF NORTH AMERICA, INC.

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).

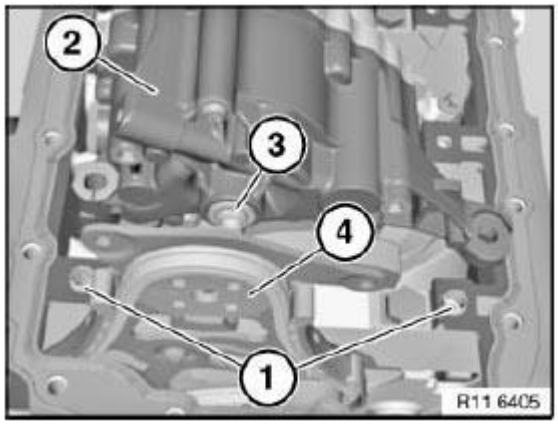


Fig. 154: Identifying Spacer Bushings And Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

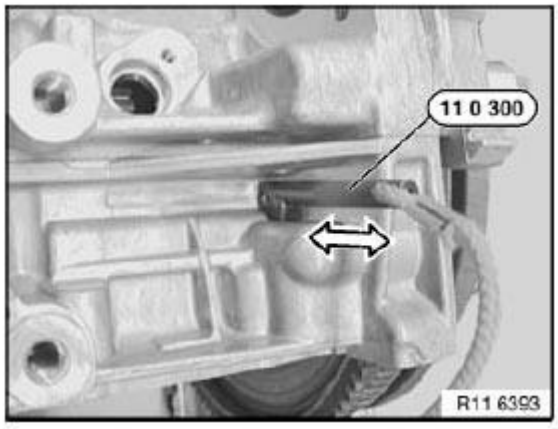


Fig. 155: Securing Flywheel In Position Using Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

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)

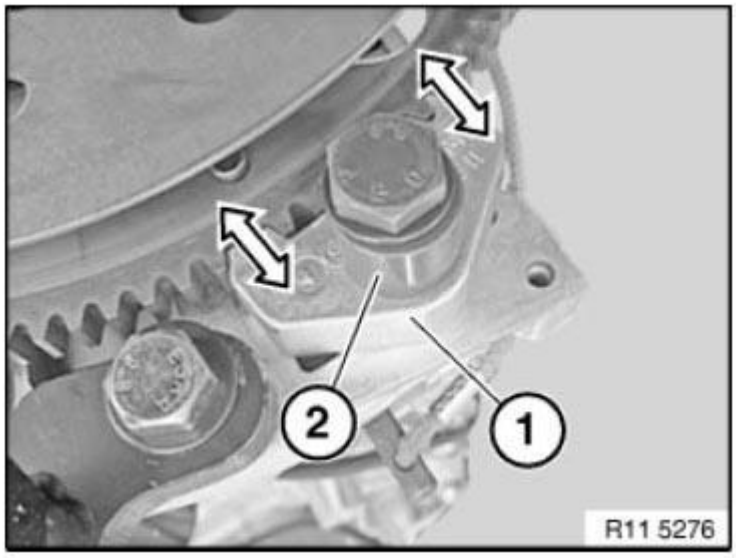


Fig. 156: Securing Flywheel Using Special Tool 11 9 260 And Special Tool 11 9 266
Courtesy of BMW OF NORTH AMERICA, INC.

Automatic transmission

Release flywheel bolts (1).

Release special tool (2).

Remove flywheel (3).

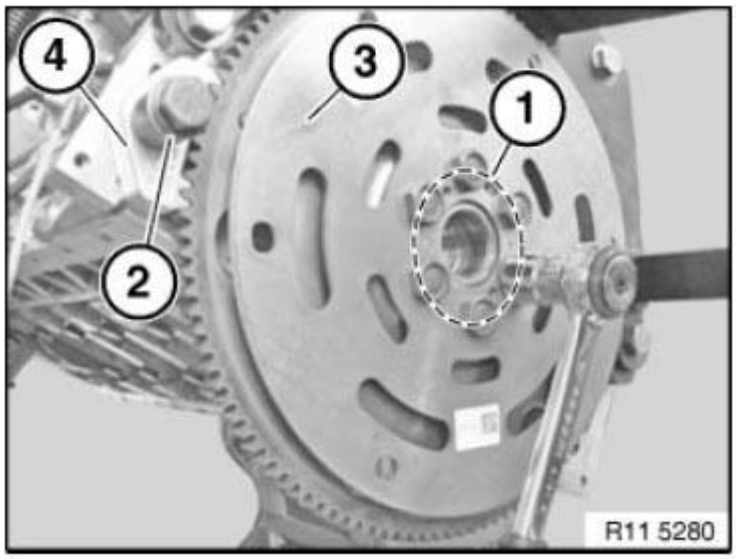


Fig. 157: Identifying Flywheel With Mounting Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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** /

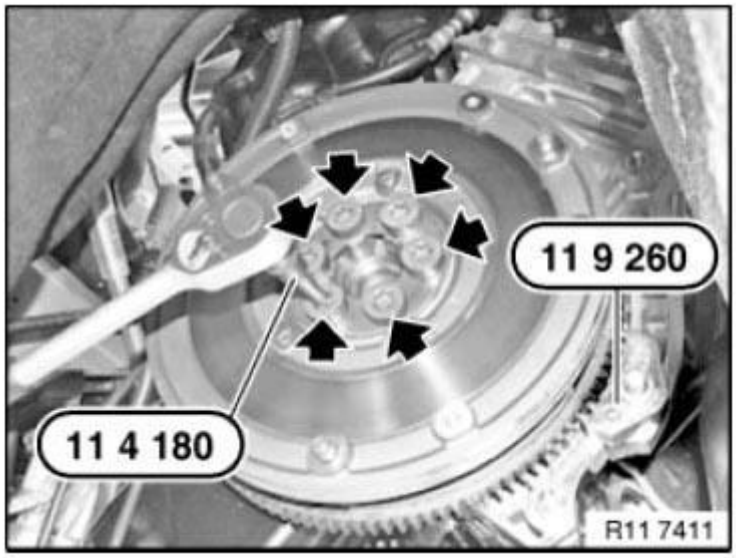


Fig. 158: Removing Flywheel Bolts Using Special Tool 11 4 180
Courtesy of BMW OF NORTH AMERICA, INC.

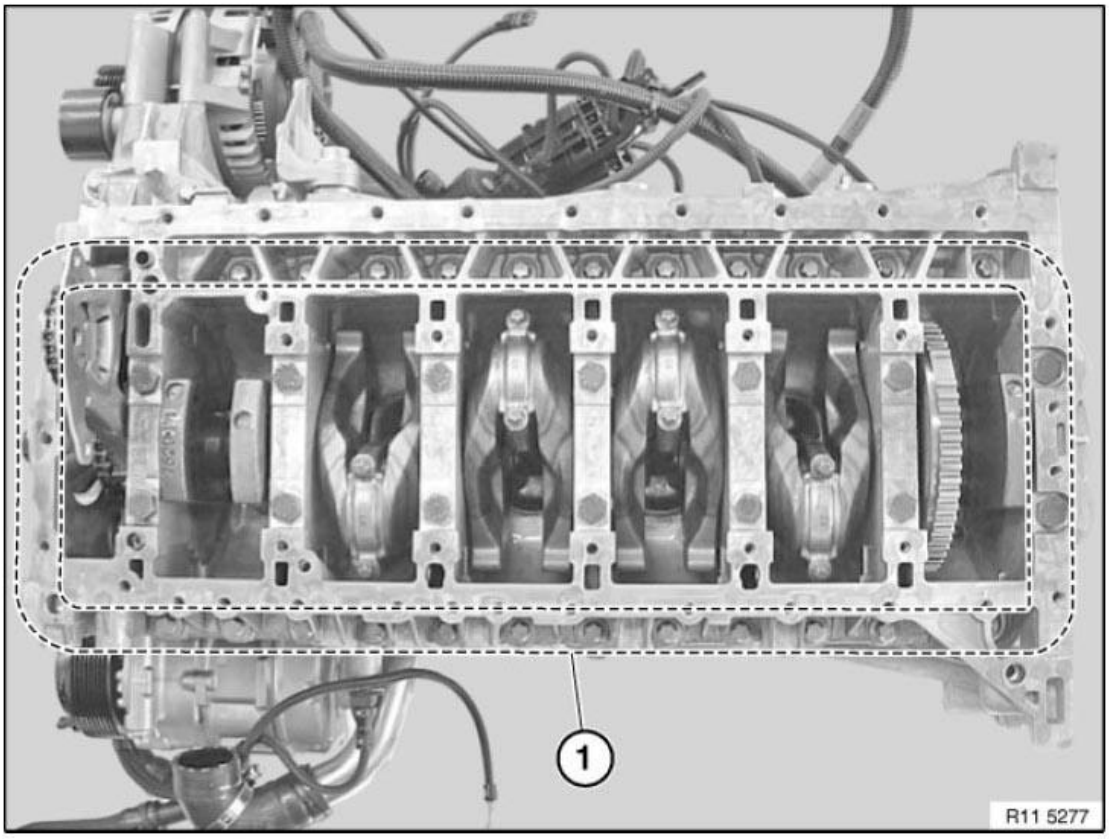


Fig. 159: Identifying Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

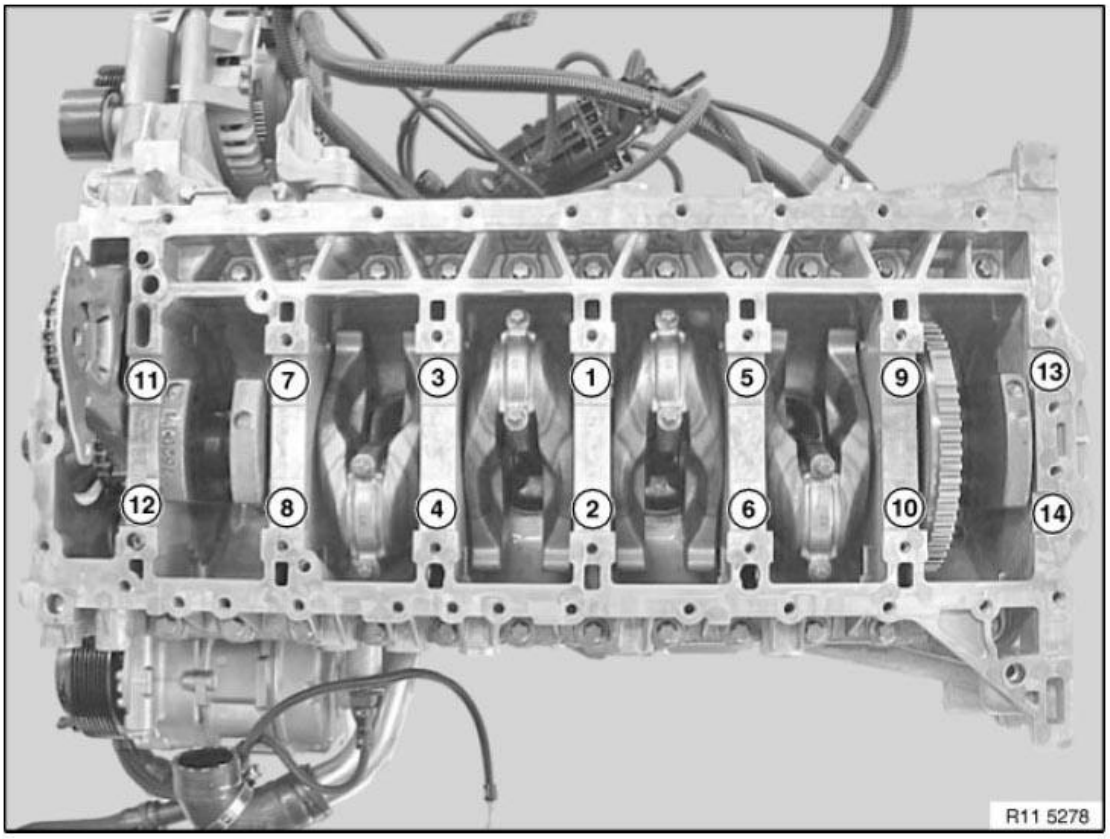


Fig. 160: Identifying Crankcase Bolt Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

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).

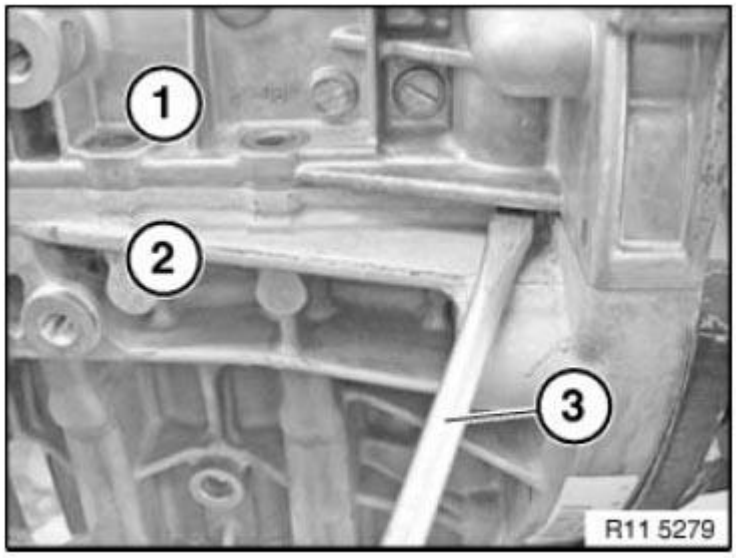


Fig. 161: Removing Crankcase Lower Section From Upper Section Using Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Timing chain is preloaded.

Do not raise crankshaft.

Carefully remove radial shaft seal (1).

Catch escaping engine oil with a cloth (2).

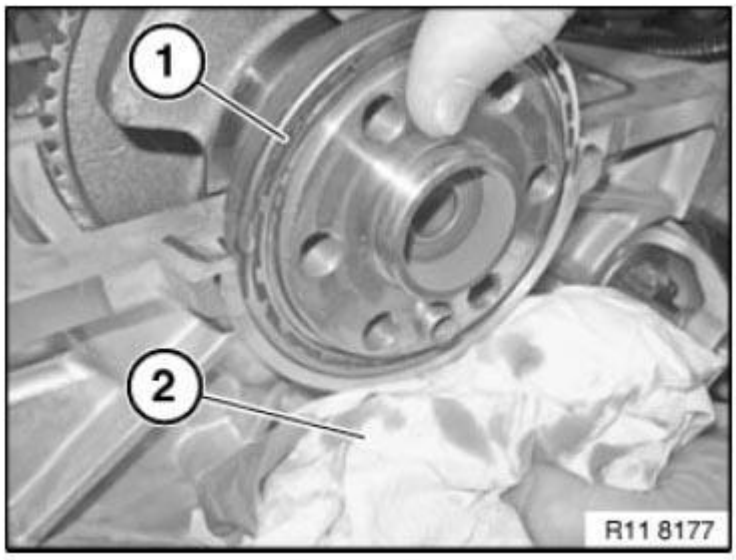


Fig. 162: Removing Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully remove radial shaft seal (1) towards front.

Catch escaping engine oil with a cloth (2).

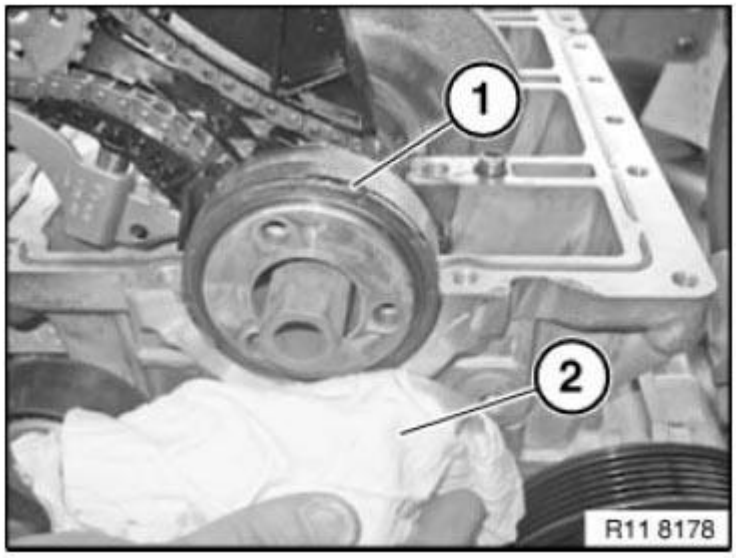


Fig. 163: Catching Escaping Engine Oil Using Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

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

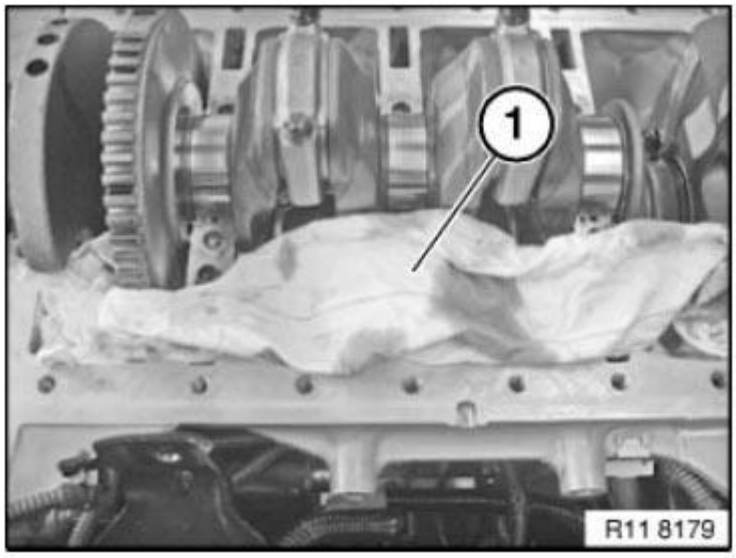


Fig. 164: Protecting Crankcase Against Sealant Residues Using Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

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.

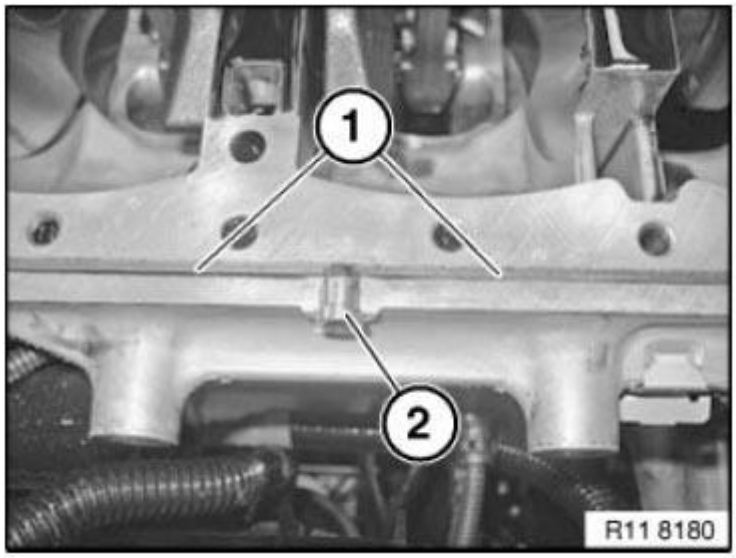


Fig. 165: Identifying Injector Nozzle And Sealing Compound Residue
Courtesy of BMW OF NORTH AMERICA, INC.

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.

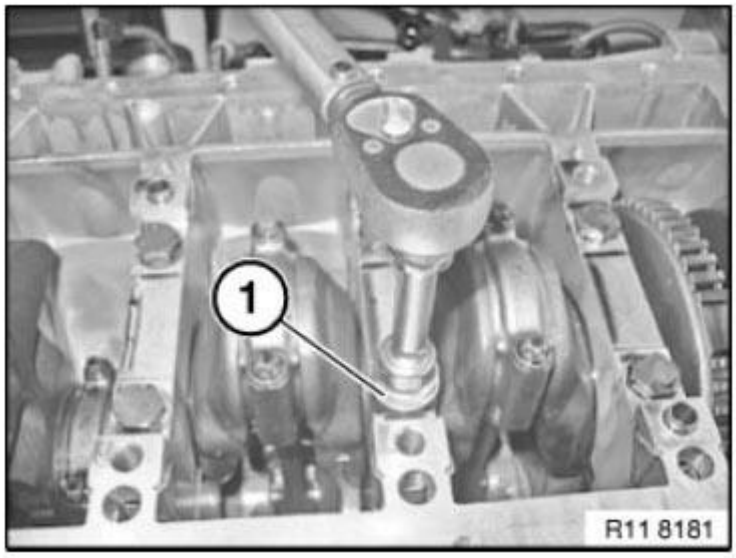


Fig. 166: Positioning Crankcase Lower Section On Crankcase Upper Section
Courtesy of BMW OF NORTH AMERICA, INC.

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

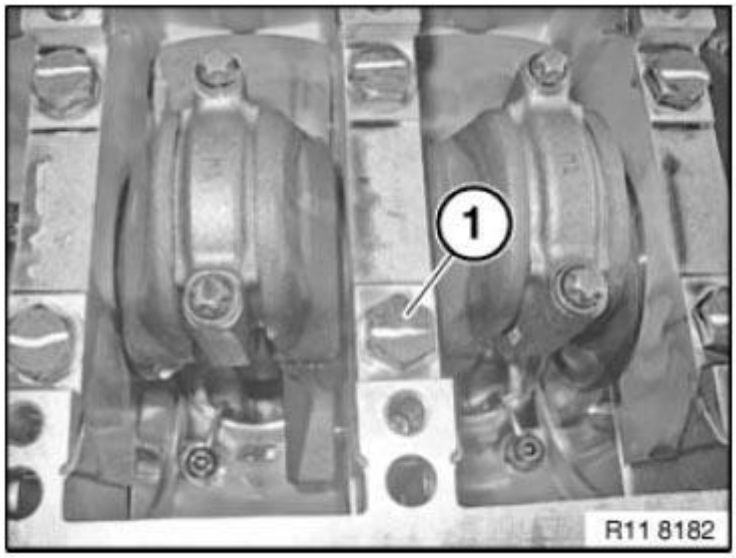


Fig. 167: Identifying M10 Crankcase Bolts With Colored Marking
Courtesy of BMW OF NORTH AMERICA, INC.

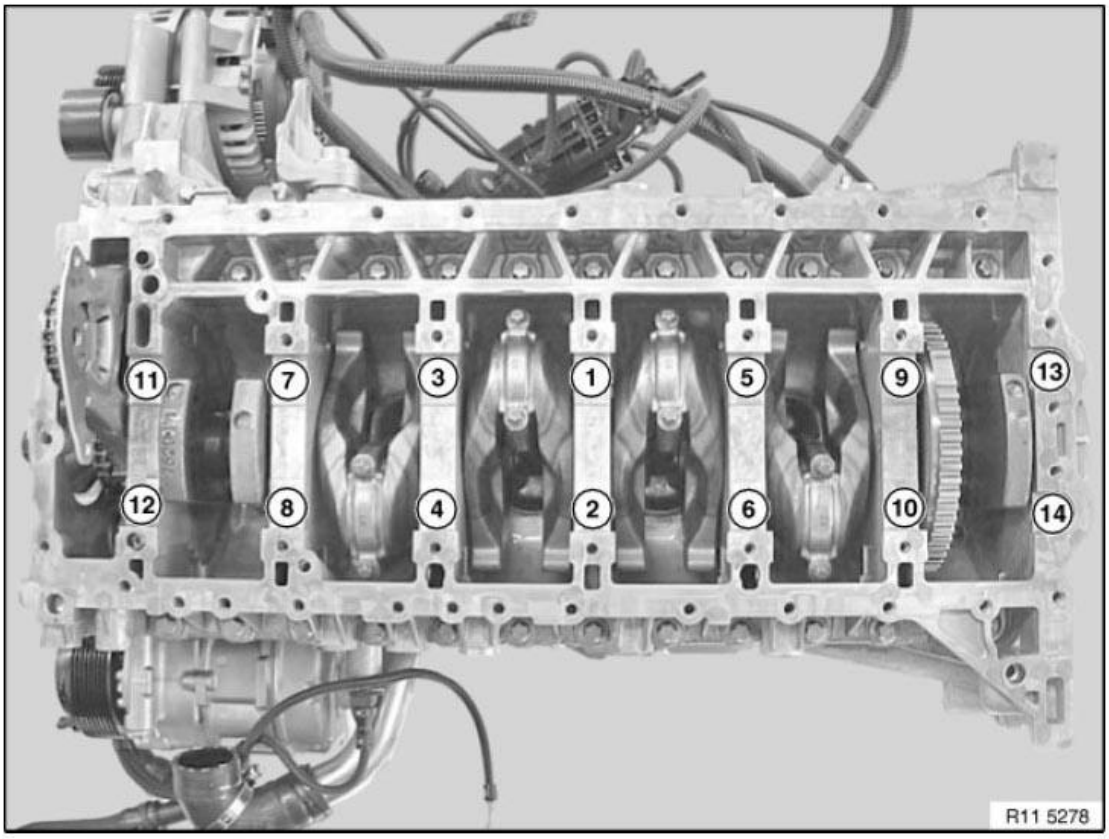


Fig. 168: Identifying M10 Crankcase Bolts Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

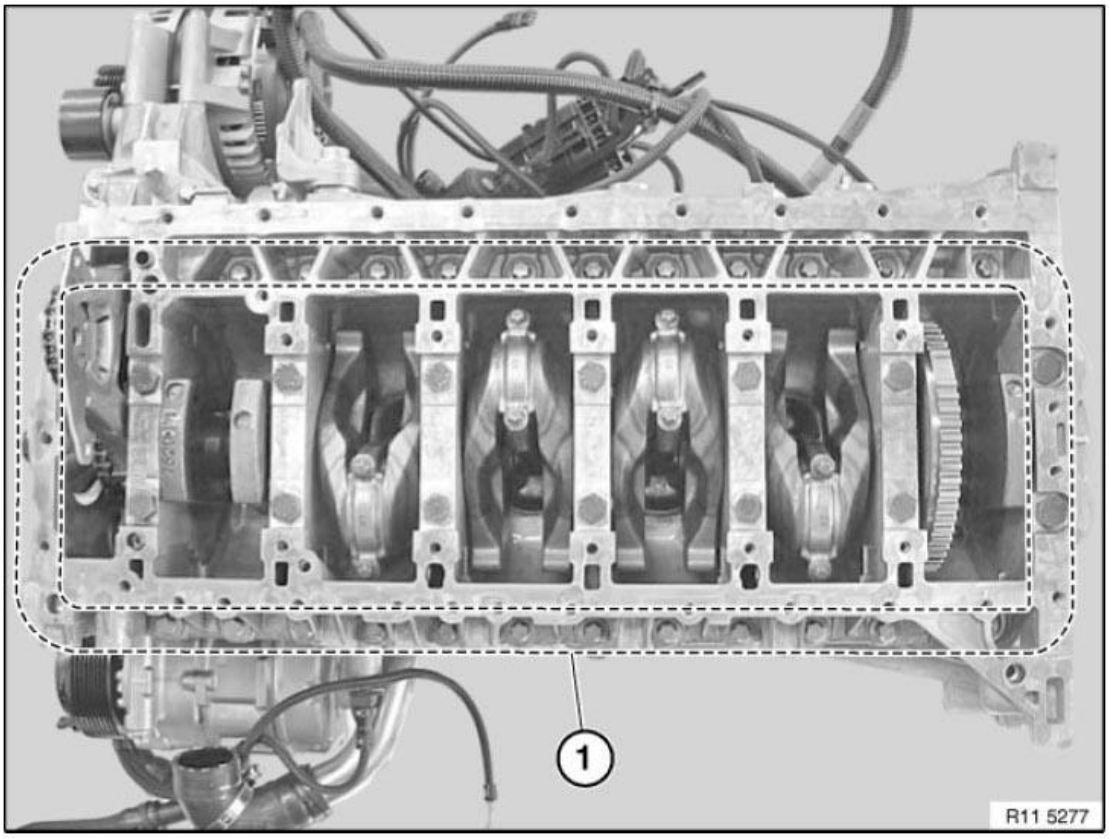


Fig. 169: Identifying Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

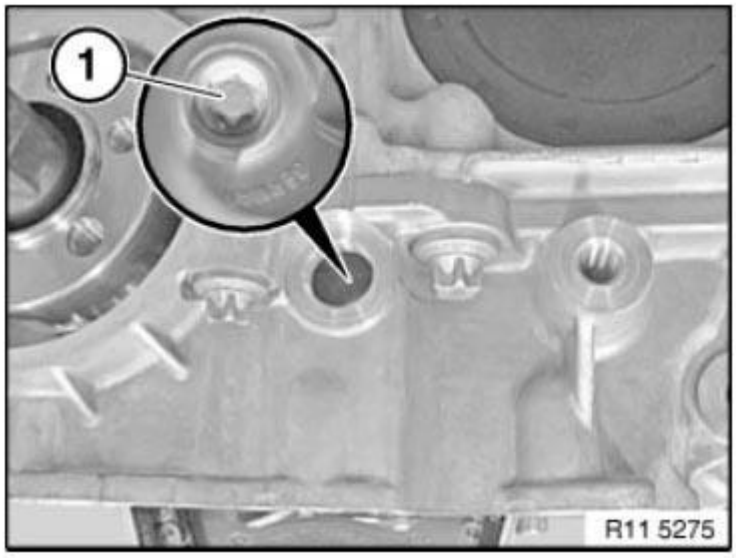


Fig. 170: Identifying Oil Pump Triangular Drive Mounting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten screw plug on front of crankcase.

Tightening torque: **11 41 8.**

Installation note:

Replace sealing ring.

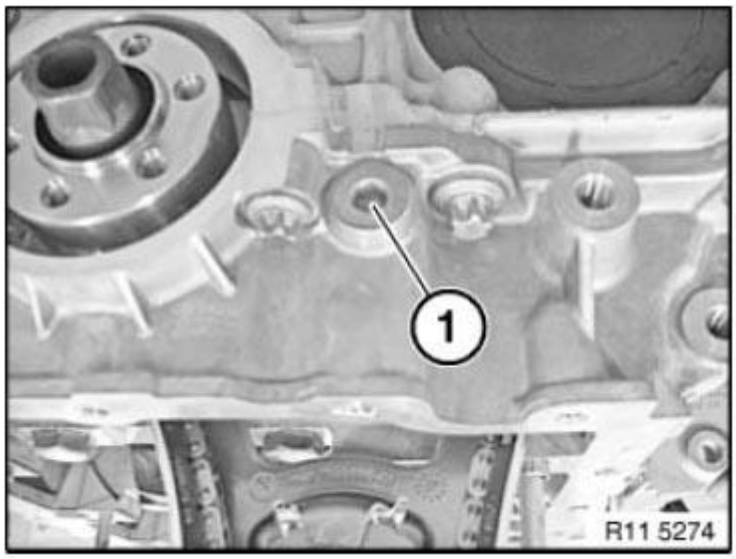


Fig. 171: Identifying Screw Plug On Front Of Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

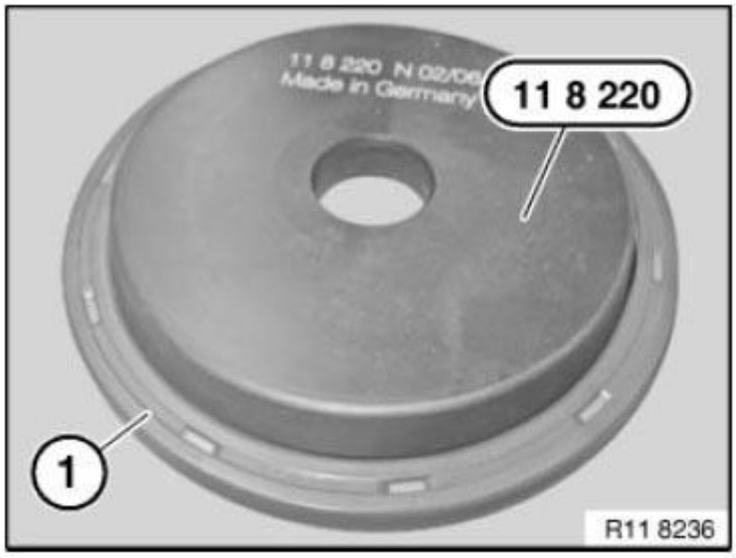


Fig. 172: Identifying Radial Shaft Seal On Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

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

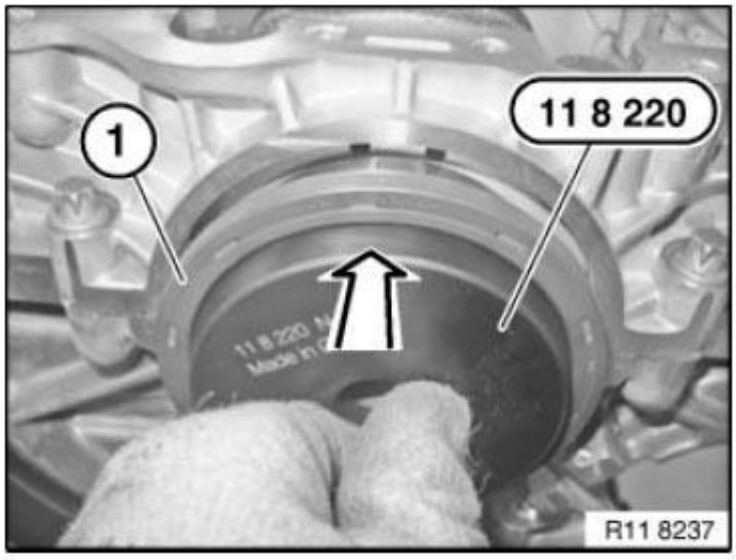


Fig. 173: Positioning Radial Shaft Seal On Crankshaft Using Special Tool 11 8 220
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

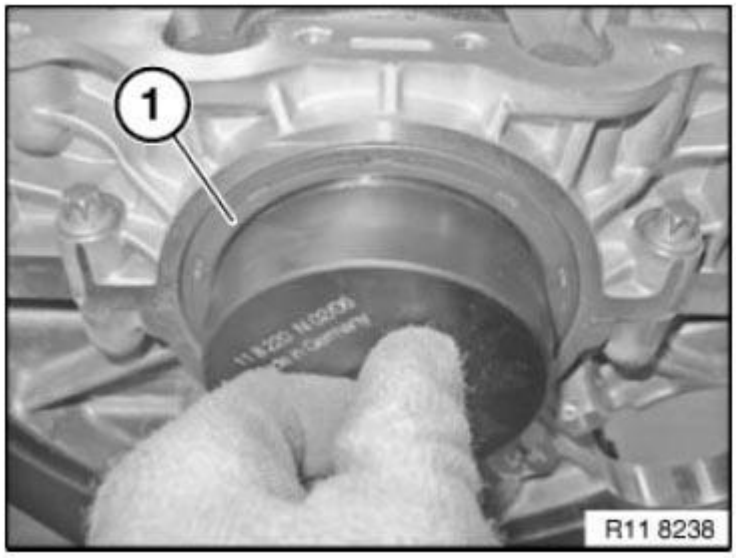


Fig. 174: Moving Radial Shaft Seal Parallel Up Against Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

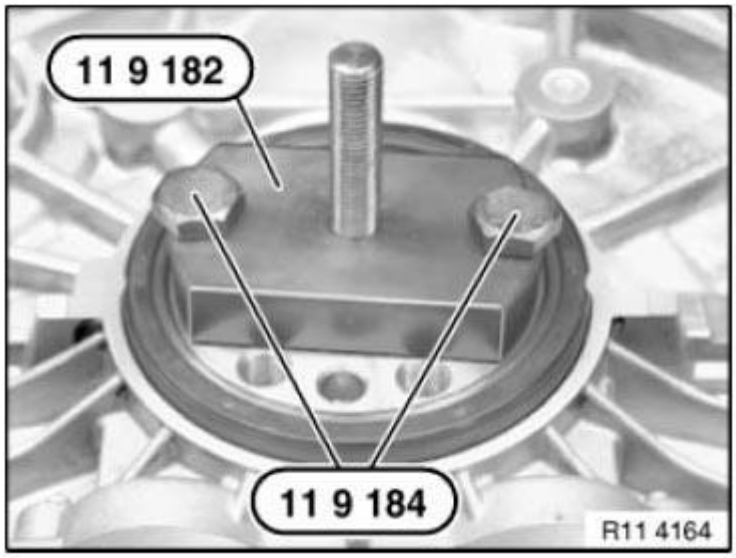


Fig. 175: Mounting Special Tool 11 9 182 Over Crankshaft Using Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

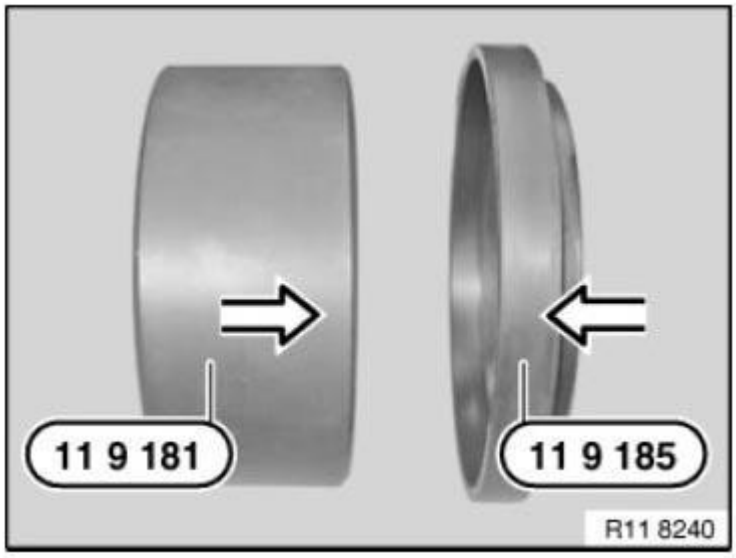


Fig. 176: Connecting Special Tool 11 9 185 To Special Tool 11 8 181
Courtesy of BMW OF NORTH AMERICA, INC.

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

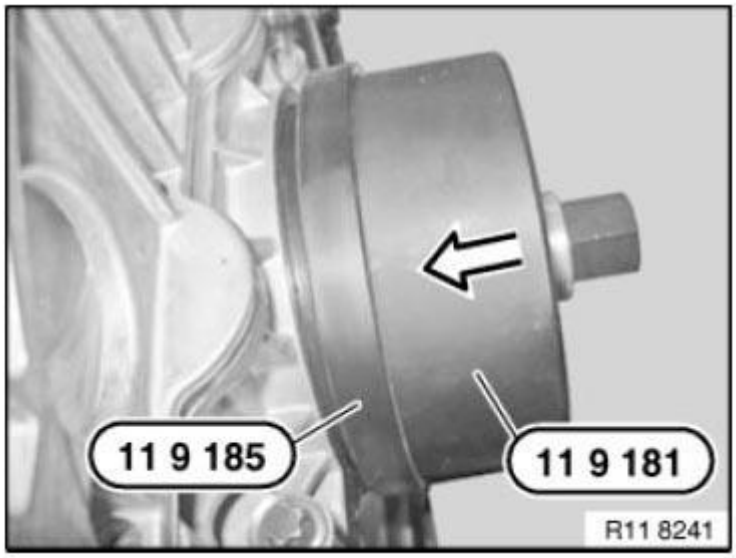


Fig. 177: Pulling Radial Shaft Seal Using Special Tool 11 9 181/11 9 185/11 9 183
Courtesy of BMW OF NORTH AMERICA, INC.

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

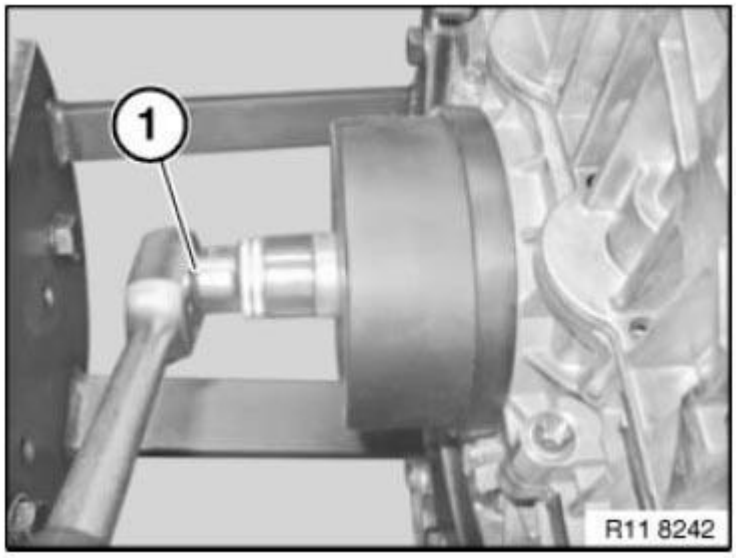


Fig. 178: Installing Radial Shaft Seal Using Special Tool 119 183
Courtesy of BMW OF NORTH AMERICA, INC.

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.

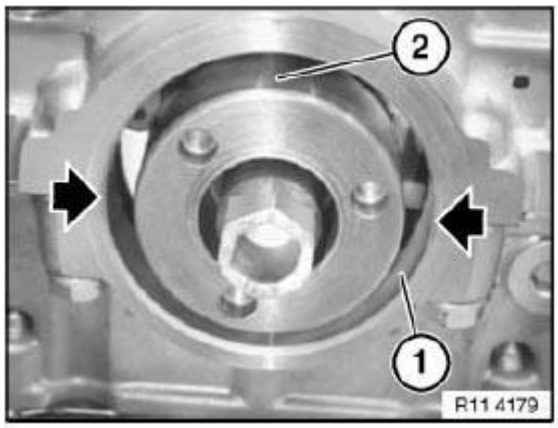


Fig. 179: Identifying Sealing Surface And Running Surface For Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

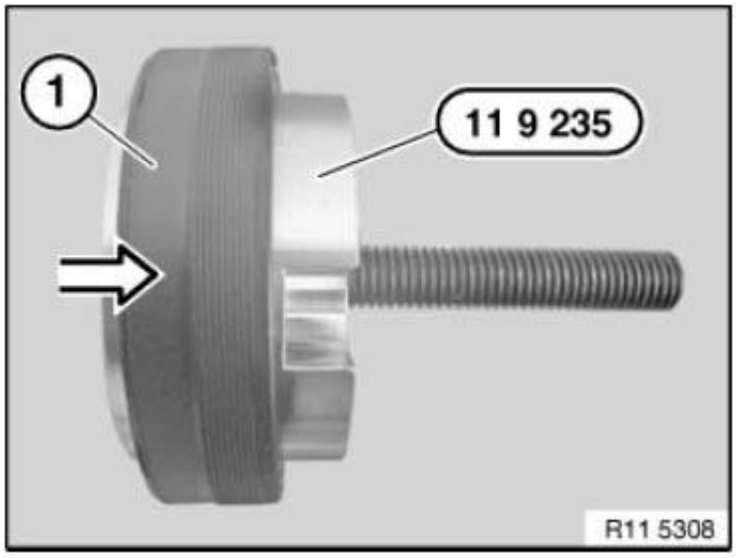


Fig. 180: Pushing Radial Shaft Seal 11 9 235 Carefully On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

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.

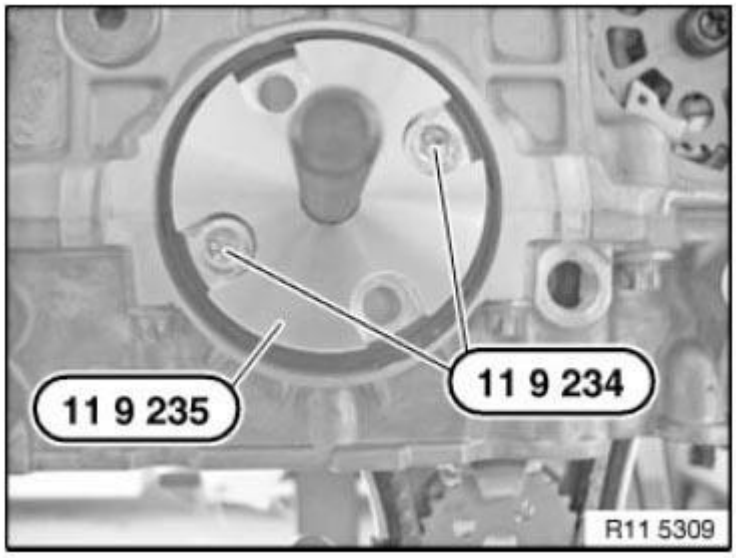


Fig. 181: Identifying Special Tools On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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.

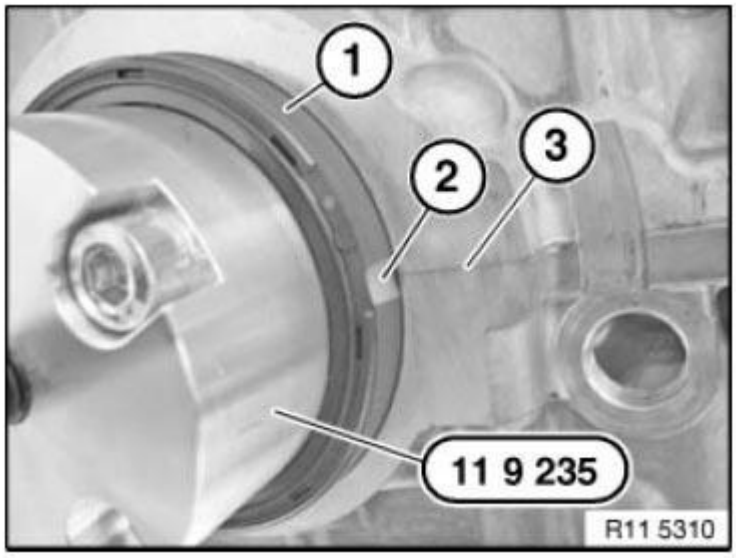


Fig. 182: Identifying Radial Shaft Seal Groove
Courtesy of BMW OF NORTH AMERICA, INC.

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

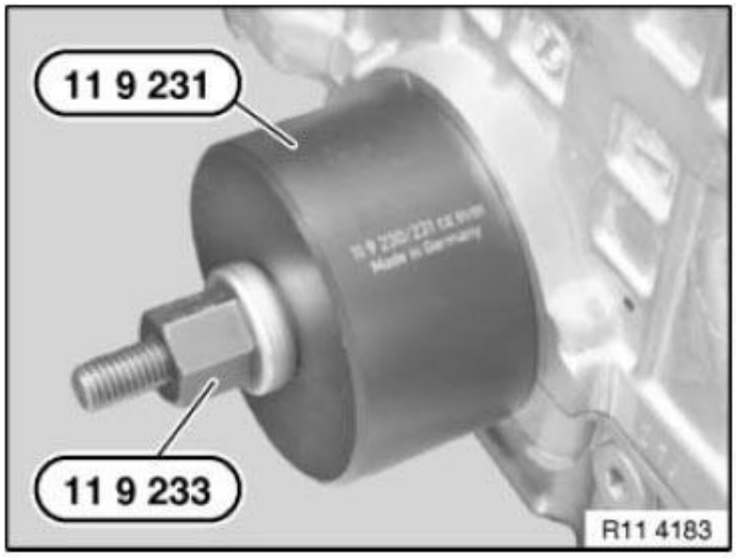


Fig. 183: Identifying Special Tools 119 231 And 11 9 233
Courtesy of BMW OF NORTH AMERICA, INC.

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

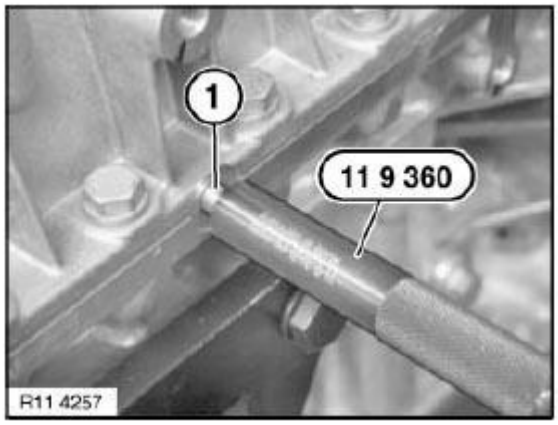


Fig. 184: Installing Nozzles Using Special Tool 11 9 360
Courtesy of BMW OF NORTH AMERICA, INC.

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.

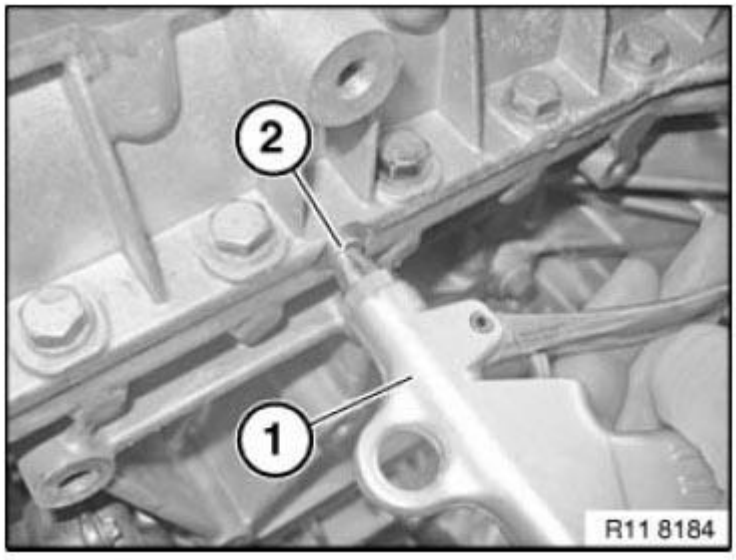


Fig. 185: Blowing Compressed Air Into Injector Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

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.

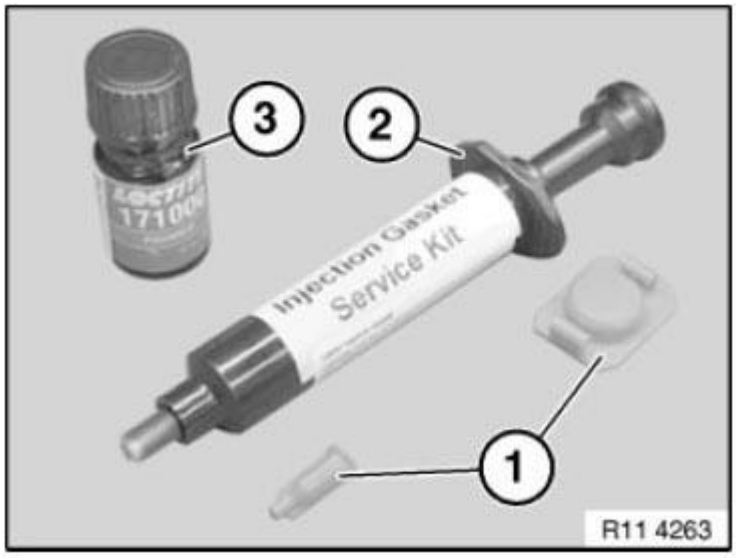


Fig. 186: Identifying Liquid Sealing Compound, Injector Nozzles And Primer Bottle
Courtesy of BMW OF NORTH AMERICA, INC.

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.

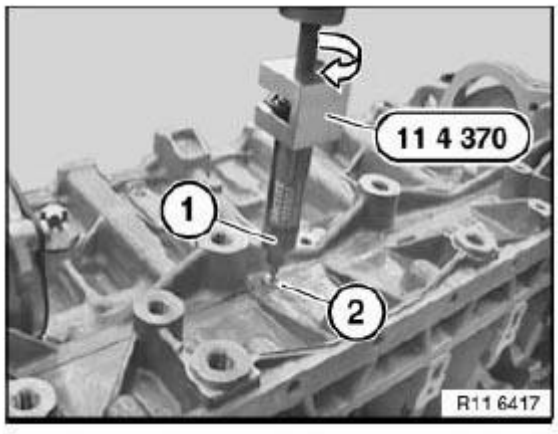


Fig. 187: Inserting Liquid Sealing Compound Using Special Tool 11 4 370
Courtesy of BMW OF NORTH AMERICA, INC.

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

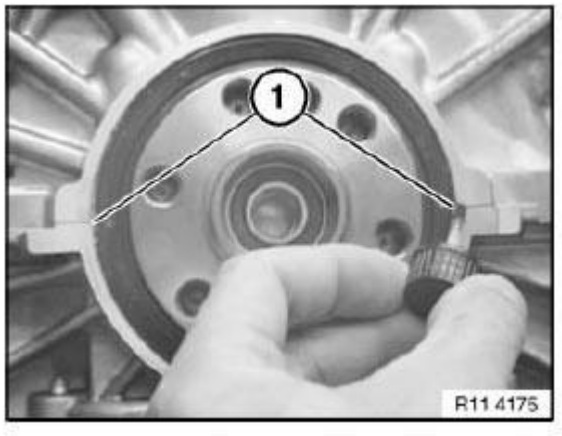


Fig. 188: Stopping Escaping Liquid Sealing Compound With Primer
Courtesy of BMW OF NORTH AMERICA, INC.

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

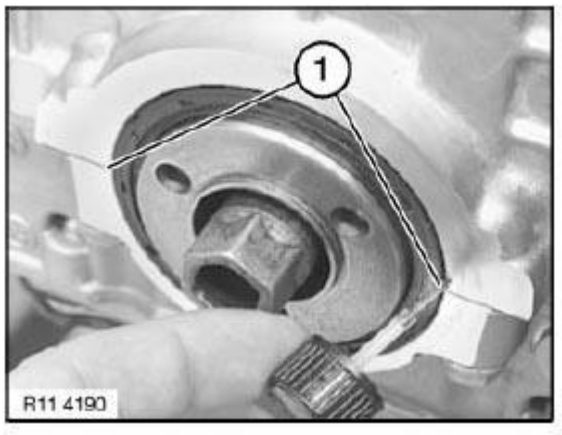


Fig. 189: Stopping Escaping Liquid Sealing Compound With Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

FLYWHEEL

11 22 500 REMOVING AND INSTALLING/REPLACING FLYWHEEL (N54, N54T)

Necessary preliminary tasks:

- Remove **TWIN-CLUTCH GEARBOX (GS7D36SG) N54**
- Remove **CLUTCH**

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

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

Fig. 190: Identifying Special Tool 11 9 260 With Elongated Hole
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles with manual gearboxes

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

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

Tightening torque **11 22 2AZ** .

Installation note:

The flywheel is secured with a dowel pin.

Fit new flywheel screws

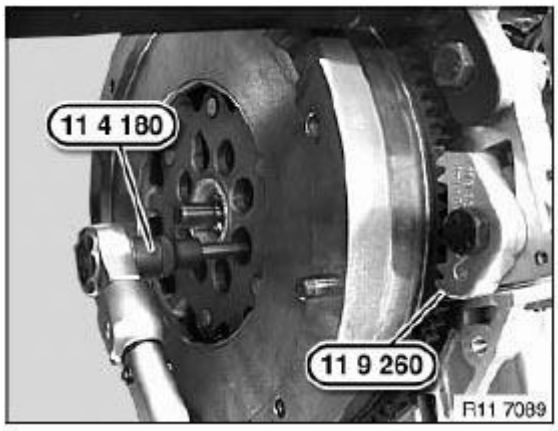


Fig. 191: Removing Flywheel Bolts Using Special Tool 11 4 180
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles with automatic transmissions

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

Release flywheel screws with a suitable tool (1).

Tightening torque **11 22 1AZ** .

Installation note:

The flywheel is secured with a dowel pin.

Fit new flywheel screws

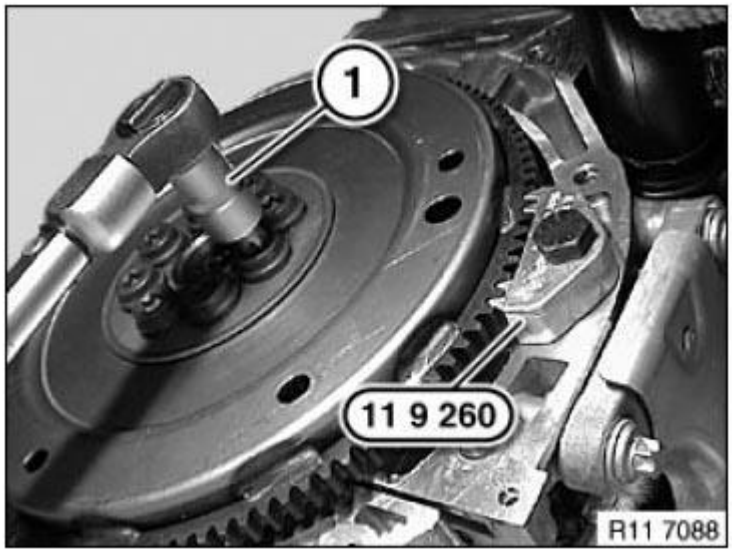


Fig. 192: Removing Flywheel Screws Using Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

Necessary preliminary tasks

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

Pressing out roller bearing

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

Screw in grease spindle 23 4 033 completely.

Brass tip must immerse fully into roller bearing.

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

When tensioning spring is compressed to full extent, release grease spindle and twist out slightly until spring is relieved.

Repeat grease press-in procedure until roller bearing has released completely.

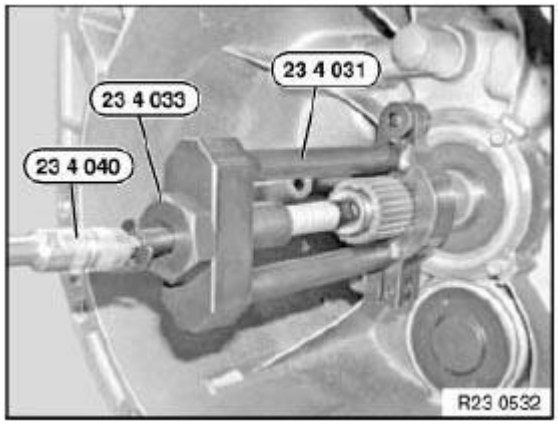


Fig. 193: Identifying Special Tools 23 4 033, 23 4 031 And 23 4 040
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 23 4 031.

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

Then reinstall special tool.

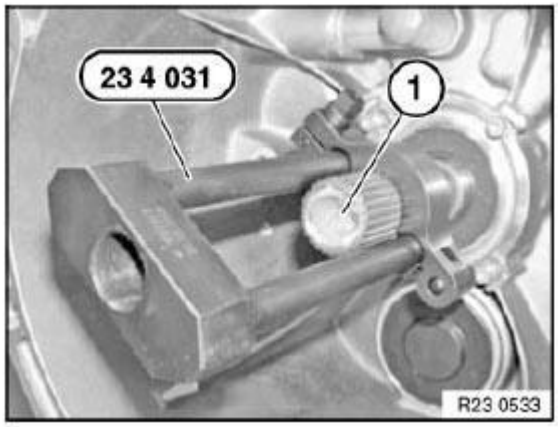


Fig. 194: Identifying Pressed-In Grease On Drive Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Pressing in roller bearing

Slide in pressure spindle 23 4 035.

Attach thrust piece 23 4 036 to pressure spindle.

Push roller bearing (1) onto thrust piece.

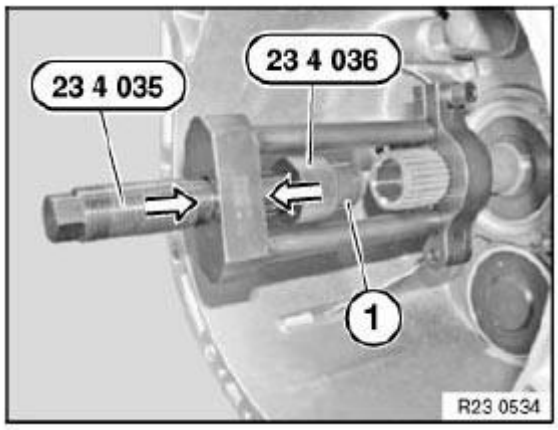


Fig. 195: Pushing Roller Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

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

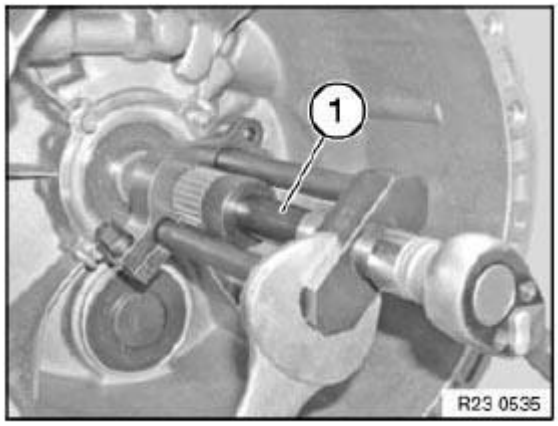


Fig. 196: Installing Pressure Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

VIBRATION DAMPER

11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (N54, N54T)

Necessary preliminary tasks:

- Remove front underbody protection

- Remove drive belt

Release screws (1).

Tightening torque **11 23 1AZ** .

Remove vibration damper (2).

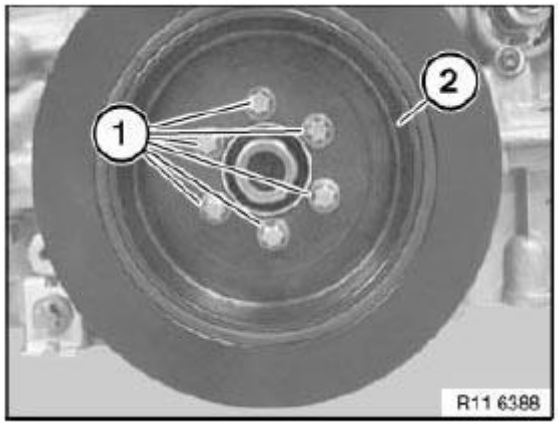


Fig. 197: Identifying Vibration Damper Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CONNECTING ROD WITH BEARING

11 24 571 REPLACING ALL CONNECTING ROD BEARINGS (N54, N54T)

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 the connecting and in the 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.

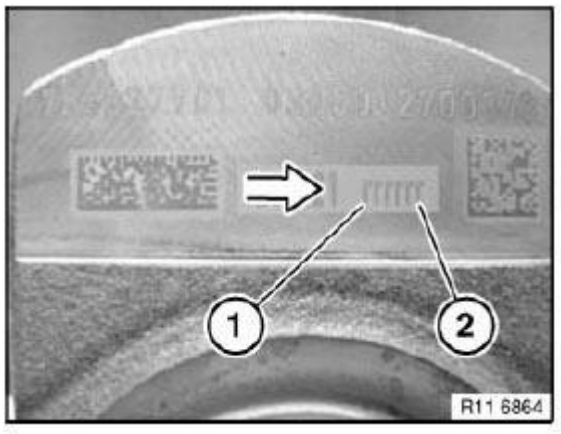


Fig. 198: Direction Of Fitting Color In Connecting Rod And Connecting Rod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

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: rbbrrb.

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

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

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

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

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

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

Install new connecting rod bearing shells.

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

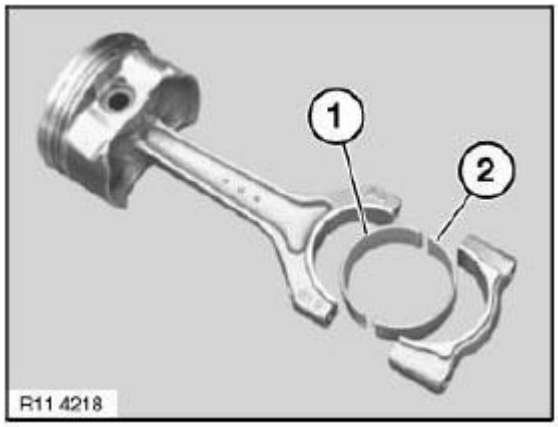


Fig. 199: Identifying Bearing Shell Colors
Courtesy of BMW OF NORTH AMERICA, INC.

Check connecting rod 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.

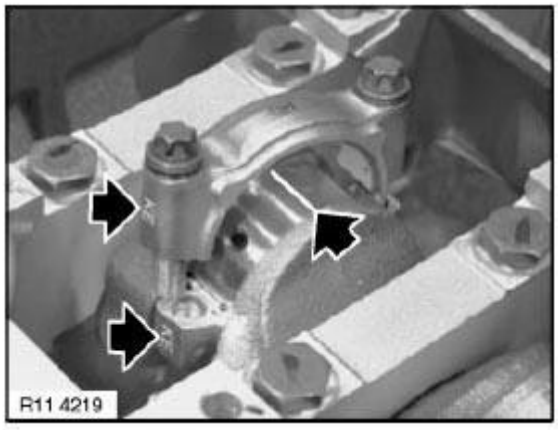


Fig. 200: Locating Bearing Cap Pairing Letters
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not distort connecting rods or crankshaft.

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

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

Tightening torque **11 24 1AZ** .

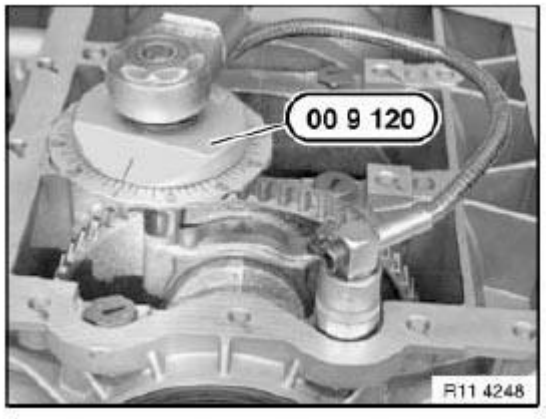


Fig. 201: Tightening Connecting Rod Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

CONNECTING ROD BEARING PLAY.

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

Tightening torque **11 24 1AZ** .

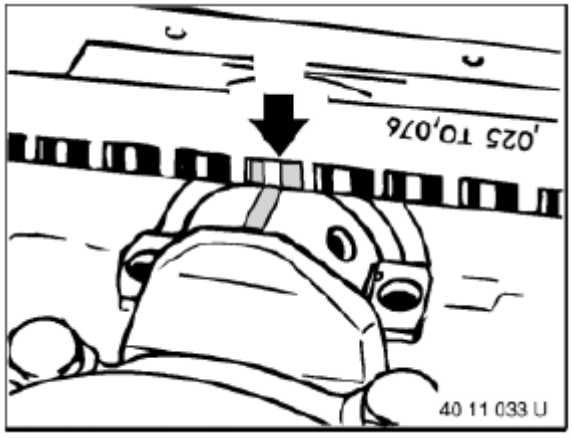


Fig. 202: Checking Connecting-Rod Bearing Play
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

PISTON WITH RINGS AND PIN

11 25 530 REMOVING AND INSTALLING OR REPLACING ALL PISTONS (N16)

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

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

Connecting rods and connecting rod bearing caps are denoted 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 plenum.
- 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: Graphic shows N46.

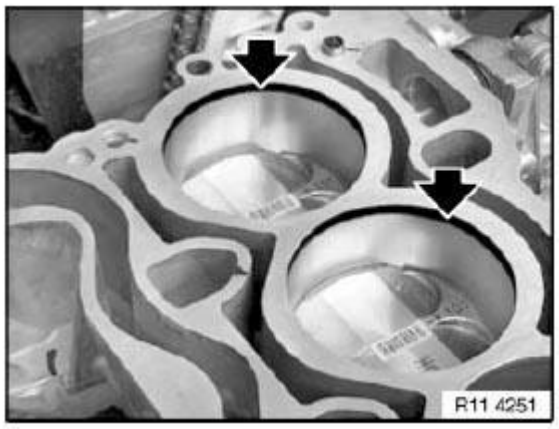


Fig. 203: Locating Oil Carbon Residue
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Mark all pistons and conrods with a pen prior to removing.

Example N14:

Direction of arrow (1) points to camshaft drive.

Cylinder allocation (2) per cylinder.

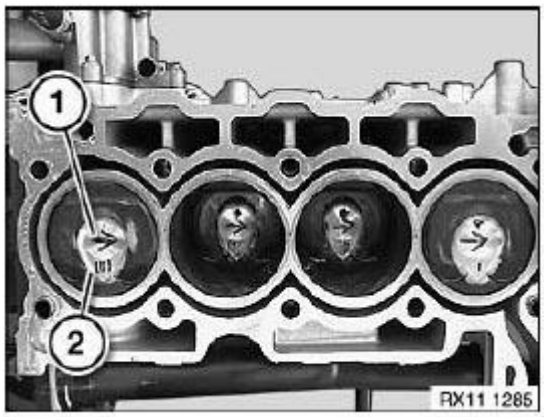


Fig. 204: Identifying Camshaft Drive Direction And Cylinder Allocation
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Mark all pistons and conrods with a pen prior to removing.

Example:

Mark cylinder assignment (1) for the respective cylinder.

Direction of arrow (2) points to timing chain drive.

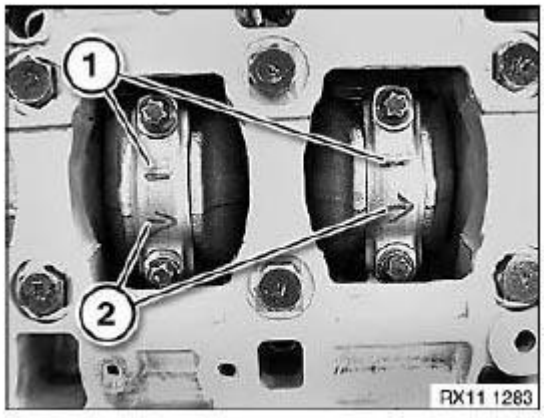


Fig. 205: Identifying Timing Chain Drive Direction And Cylinder Assignment Marks
Courtesy of BMW OF NORTH AMERICA, INC.

Release connecting rod bolts (1).

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

Remove conrod bearing cap.

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

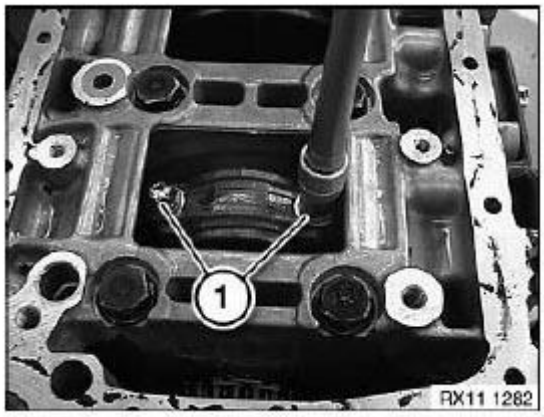


Fig. 206: Removing Connecting Rod Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

11 9 620 Attach special tool in conrod big end.

Press out connecting rod and piston to cylinder head side.

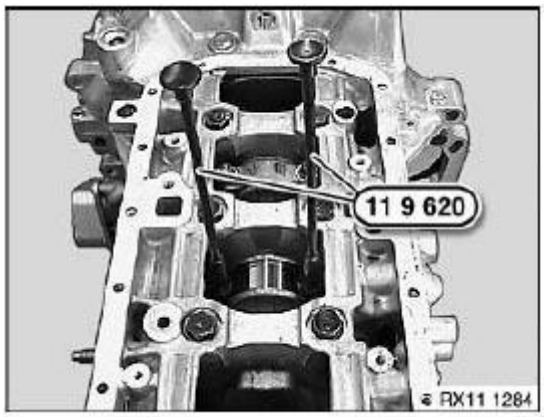


Fig. 207: Attaching Special Tool (11 9 620) In Conrod Big End
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Safety goggles must be worn for the next operation.

WARNING: Safety goggles must be worn.

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

Lever out piston pin circlip with a screwdriver in direction of arrow.

Fig. 208: Removing Piston Pin Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, replace connecting rods.

Installation note:

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

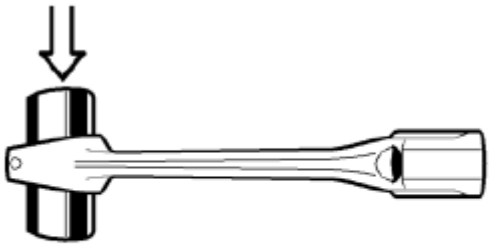


Fig. 209: Installing Gudgeon Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Measure piston installation clearance:

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

Piston diameter at measuring point A.

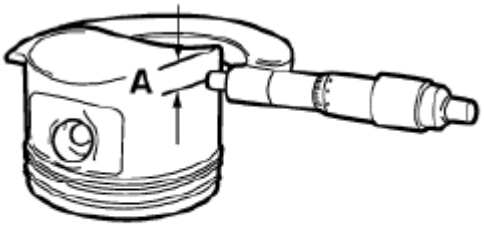


Fig. 210: Measuring Piston Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

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.

If necessary, replace piston.

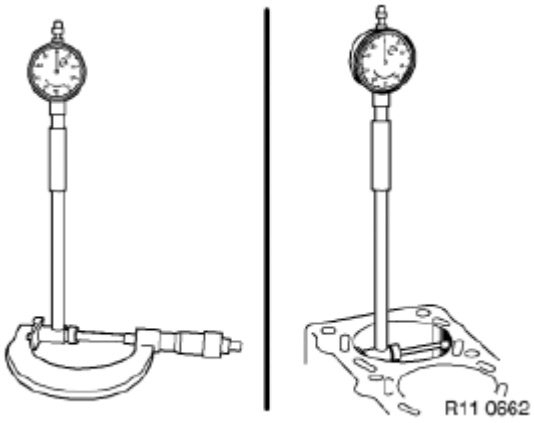


Fig. 211: Checking Cylinder Bore Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

Install all piston rings.

Install all bearing shells.

Coat piston and piston rings with oil.

11 9 670 Pre-install piston in special tool.

Screw special tool 11 9 620 into connecting rod.

Installation note:

11 9 620 Check protective lugs on special tool for correct position and damage.

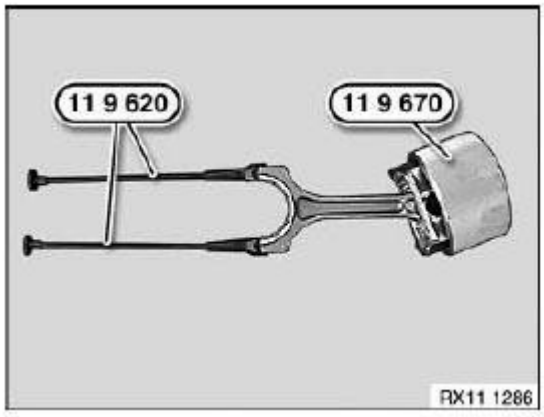


Fig. 212: Identifying Special Tool 11 9 620 And 11 9 670
Courtesy of BMW OF NORTH AMERICA, INC.

Insert piston with connecting rod in cylinder.

IMPORTANT: Risk of breakage of piston rings.

Press in piston with finger pressure only, do not drive in (see arrows).

Insert piston (1) so that arrow on piston crown points to camshaft drive.

If reusing the pistons, assign cylinder allocation (2) to correct cylinder.

Press in piston with special tool 11 9 670.

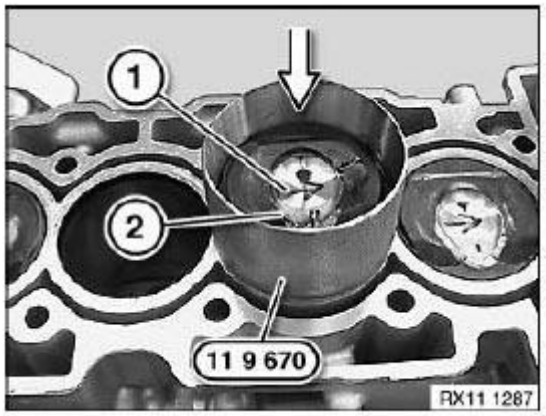


Fig. 213: Inserting Piston With Connecting Rod In Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Point of fracture (1) on conrod.

Conrod and conrod bearing cap are identified with pairing letters (2) 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.

Both pairing letters (2) must be together on one side.

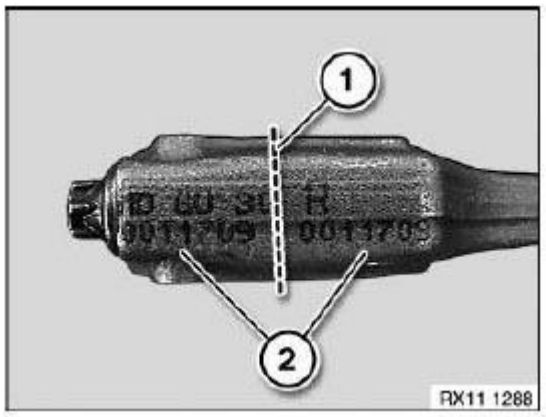


Fig. 214: Identifying Connecting Rod Pairing Letters
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a light coat of oil to crankshaft journals.

Attach connecting rod to crankshaft journal.

Remove special tool 11 9 620.

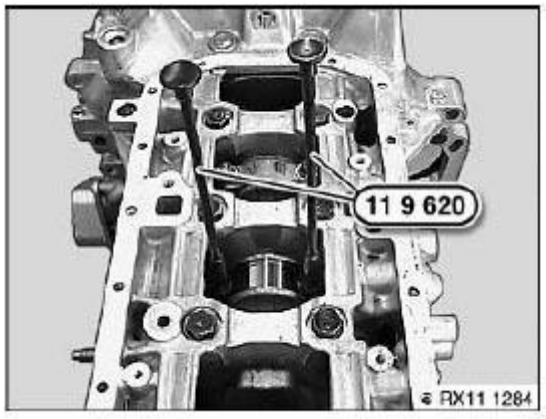


Fig. 215: Attaching Special Tool (11 9 620) In Conrod Big End
Courtesy of BMW OF NORTH AMERICA, INC.

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

Check cylinder identification markings (1).

Direction of arrow (2) points to timing chain drive.

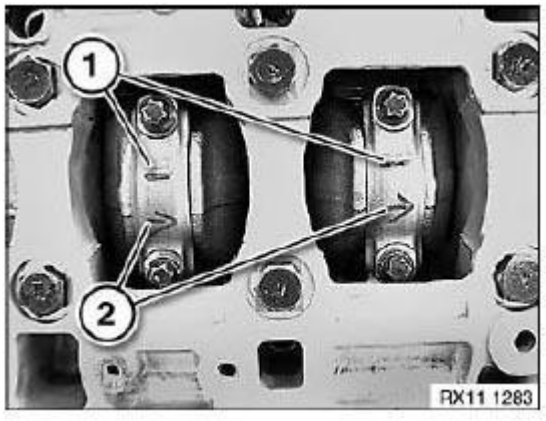


Fig. 216: Identifying Timing Chain Drive Direction And Cylinder Assignment Marks
Courtesy of BMW OF NORTH AMERICA, INC.

Install new connecting rod bolts (1).

00 9 120 Carry out torsion angle tightening of conrods with special tool.

Tightening torque: **11 24 1AZ**

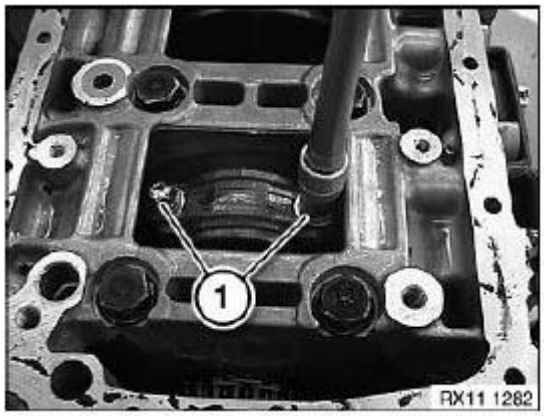


Fig. 217: Removing Connecting Rod Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 25 530 REMOVING AND INSTALLING/REPLACING ALL PISTONS (N54, N54T)

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 by weight group.

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 **PLENUM**
- 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: Graphic shows N46.

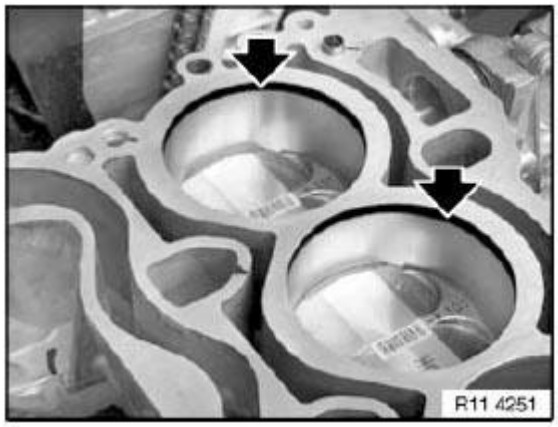


Fig. 218: Locating Oil Carbon Residue
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

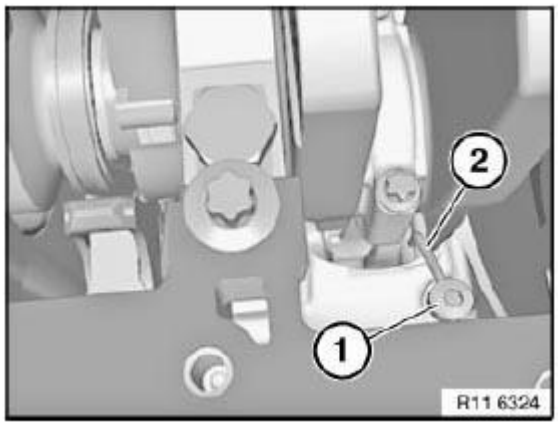


Fig. 219: Identifying Screw And Oil Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Release connecting rod bolts (1).

Tightening torque **11 24 1AZ** .

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

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

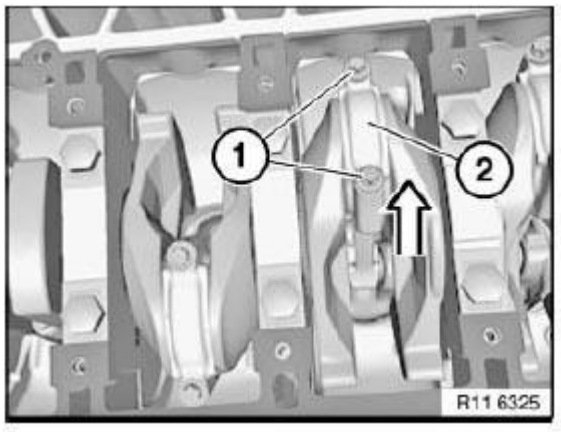


Fig. 220: Removing Connecting Rod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

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

Press out connecting rod and piston to cylinder head side.

IMPORTANT: Risk of damage to oil spray nozzle.

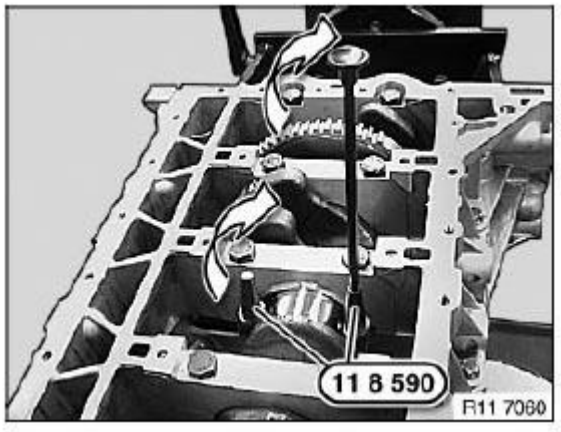


Fig. 221: Inserting Special Tool Into Big End Of Connecting Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Preliminary work

Secure special tool 11 8 561 in vice.

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

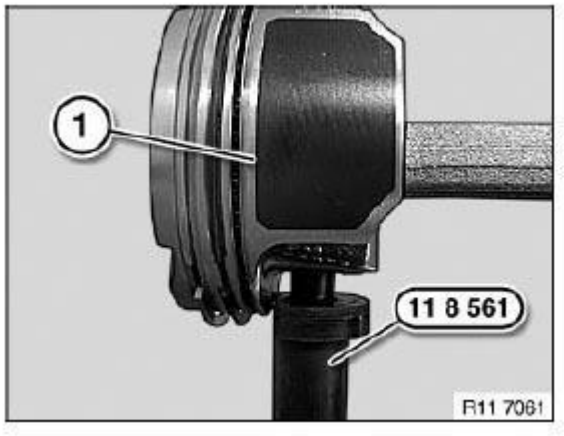


Fig. 222: Securing Piston Using Special Tool 11 8 561
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Safety goggles must be worn for the next operation.

WARNING: Safety goggles must be worn.

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

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

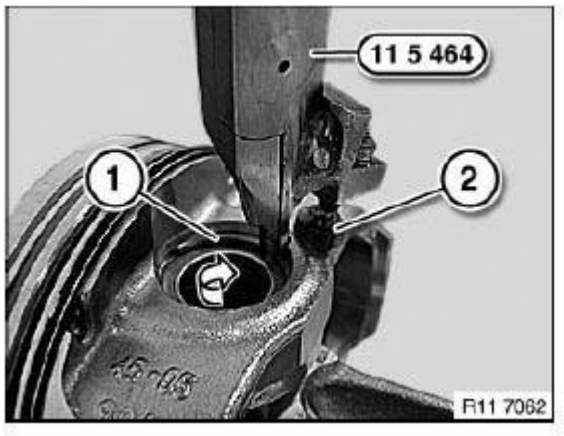


Fig. 223: Removing Piston Circlip Using Special Tool 11 5 464
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

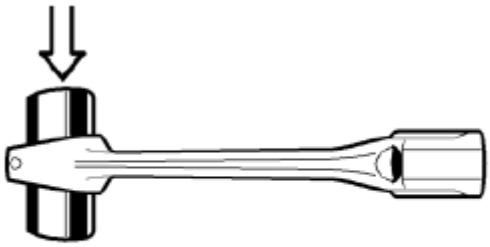
If necessary, replace connecting rods.

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

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

Installation note:

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



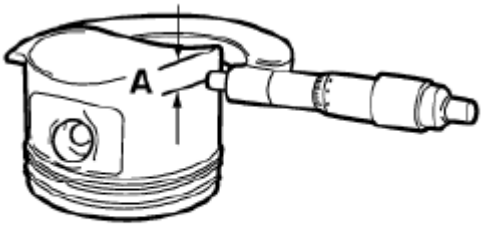
R11 4212

Fig. 224: Installing Gudgeon Pin
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.



88 11 051 U

Fig. 225: Measuring Piston Diameter
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 note:

If necessary, replace piston.

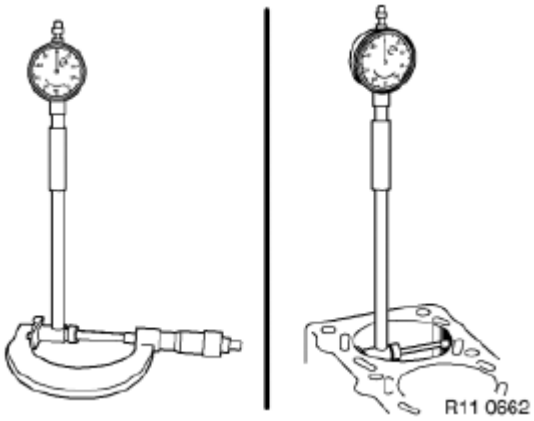


Fig. 226: Checking Cylinder Bore Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Safety goggles must be worn.

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

Risk of damage!

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

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

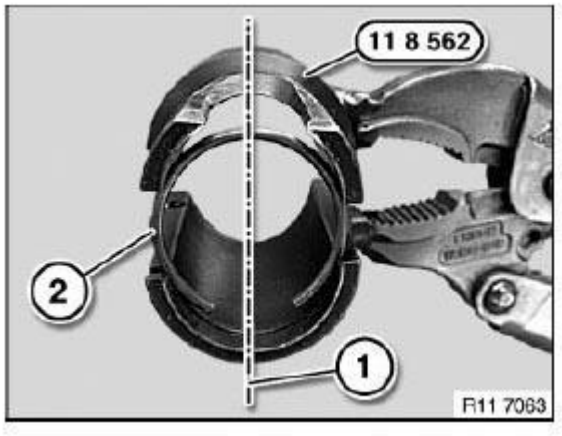


Fig. 227: Inserting Piston Circlip Into Groove Of Special Tool 11 8 562
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Safety goggles must be worn.

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

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

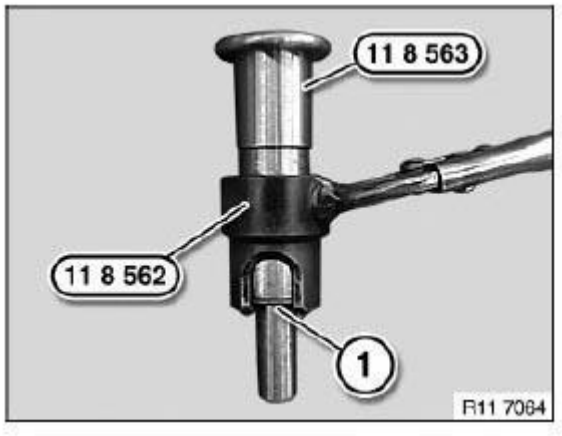


Fig. 228: Identifying Special Tools 11 8 562 And 11 8 563
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Safety goggles must be worn.

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

If the special tools 11 8 562 and 11 8 563 are not positioned correctly, the piston pin circlip must be driven in

using a plastic hammer in direction of arrow.

NOTE: See graphic.

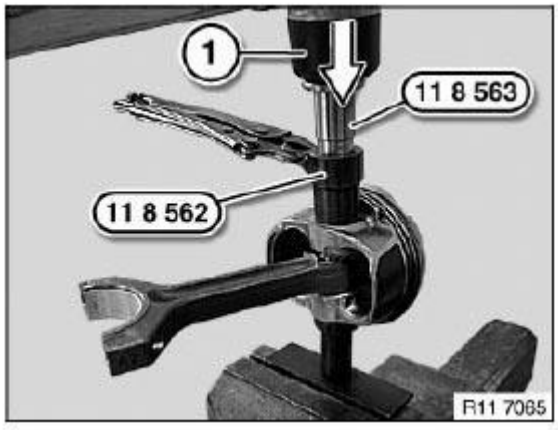


Fig. 229: Inserting Piston Pin Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

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

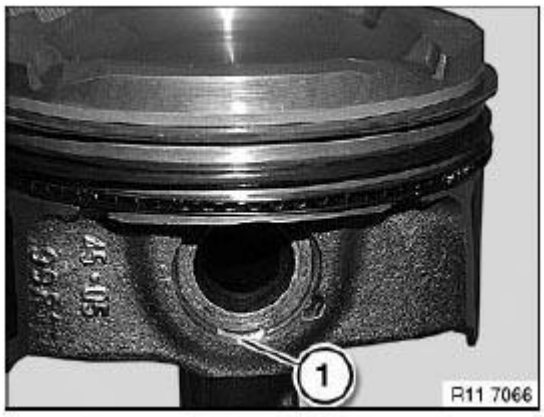


Fig. 230: Identifying Piston Pin Circlip Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

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 note:

Make sure protective lugs (1) on special tool **11 8 590** are positioned correctly and check for damage.

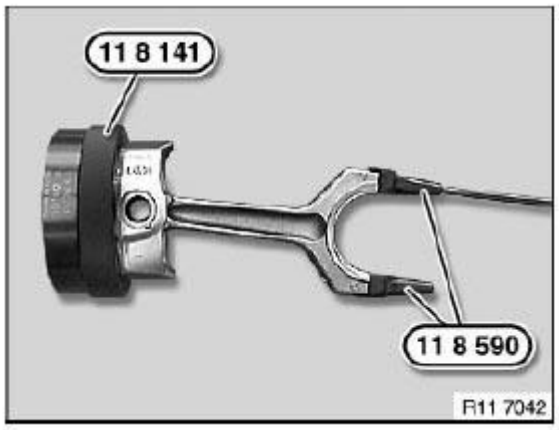


Fig. 231: Identifying Special Tools 11 8 590 And 11 8 141
Courtesy of BMW OF NORTH AMERICA, INC.

Insert piston with connecting rod in cylinder.

IMPORTANT: Risk of damage to oil spray nozzle.

Risk of breakage of piston rings.

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.

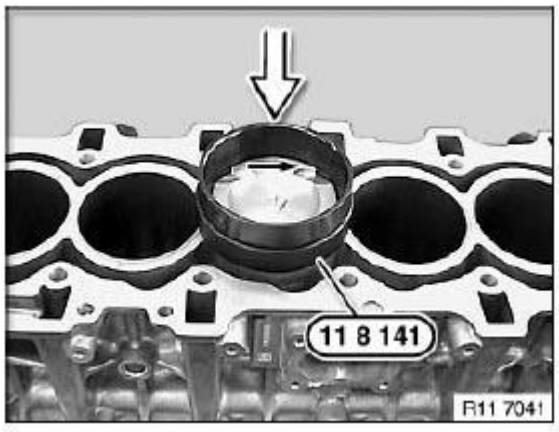


Fig. 232: Pressing Piston Using Special Tool 11 8 141
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

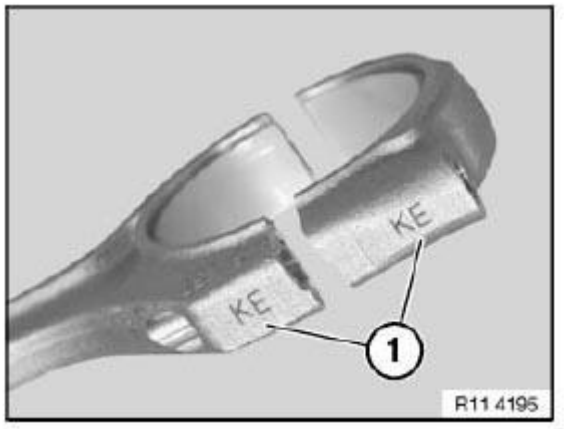


Fig. 233: Identifying Conrod Bearing Cap With Identification Marks
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a light coat of oil to crank pin.

Assemble connecting rod and crankshaft journal.

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

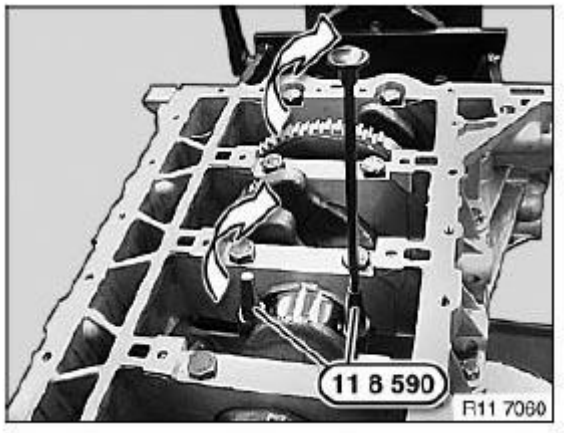


Fig. 234: Removing Special Tool In Counterclockwise Direction
Courtesy of BMW OF NORTH AMERICA, INC.

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

Install new connecting rod bolts (1).

Tightening torque **11 24 1AZ** .

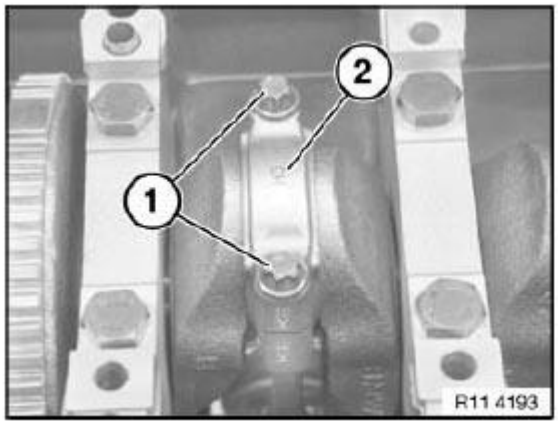


Fig. 235: Identifying Bearing Caps And Connecting Rod Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 24 1AZ** .

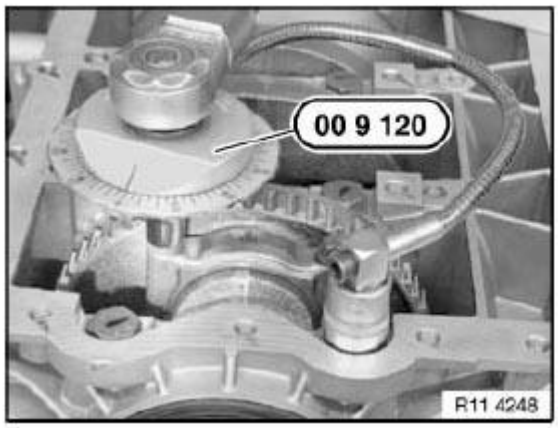


Fig. 236: Adjusting Conrod Torsion Angle Using Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 25 671 REPLACING PISTON RINGS ON ALL PISTONS (N54, N54T)

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.

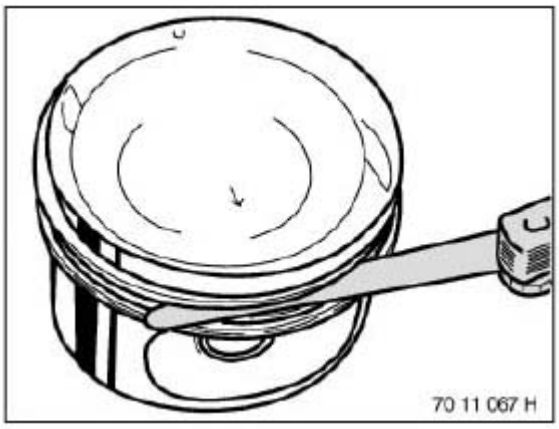


Fig. 237: Checking Piston Ring Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Installation note:

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

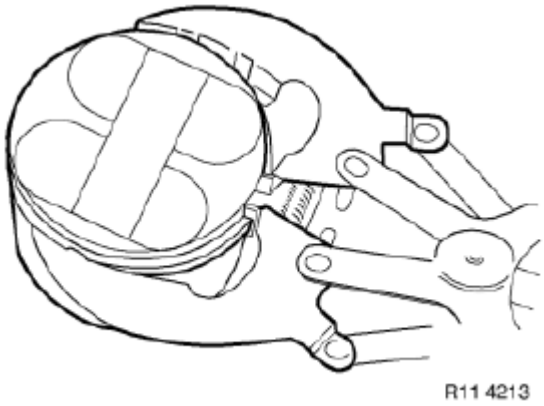


Fig. 238: Removing Compression Ring And Stepped Ring
Courtesy of BMW OF NORTH AMERICA, INC.

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

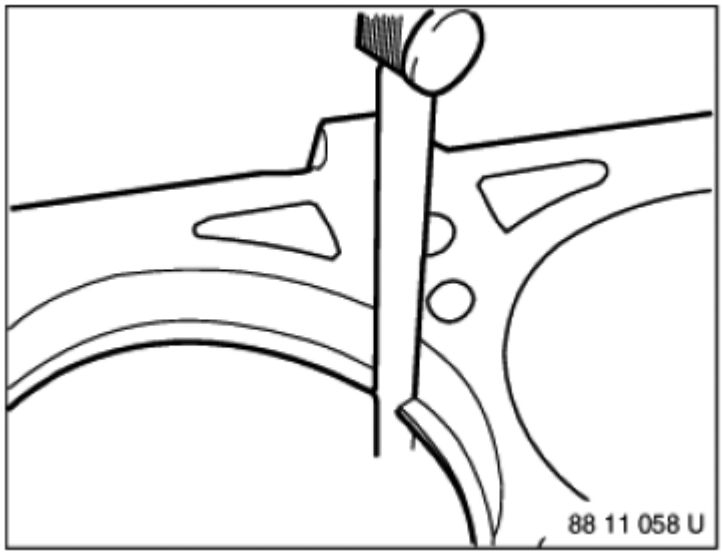


Fig. 239: Determining Piston Ring Gap Using Filler Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic diagram of piston rings.

Installation note:

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

1. Plain compression ring
2. Piston ring "top"
3. Two-part oil scraper ring

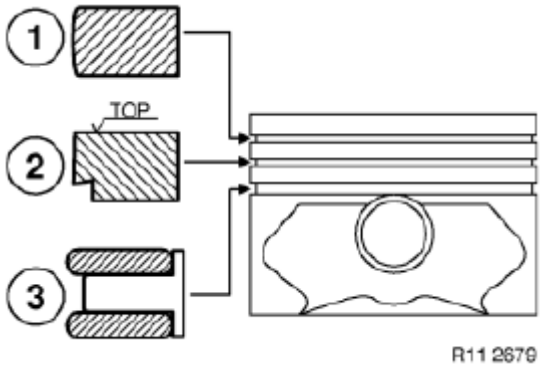


Fig. 240: Identifying Piston Rings
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation note:

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

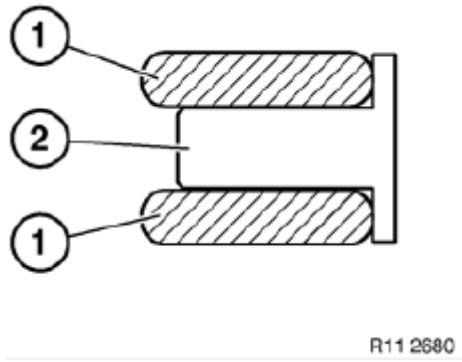


Fig. 241: Identifying Steel Band Ring And Support Spring
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: See graphic N52.

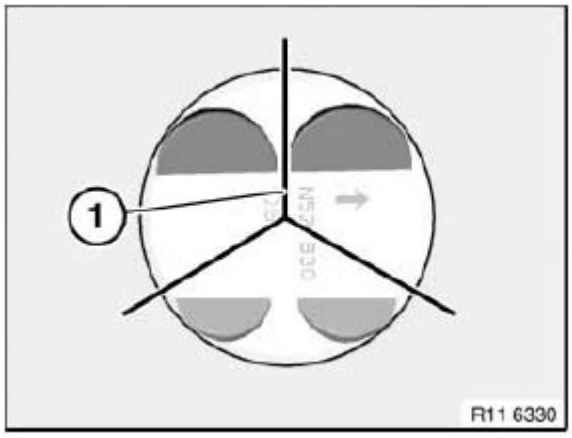


Fig. 242: Identifying Piston Rings Contact Point
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

V-RIBBED BELT WITH TENSIONER AND DEFLECTION ELEMENT

11 28 010 REPLACING DRIVE BELT FOR ALTERNATOR (N54, N54T)

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

Depending on the build date (version), the idler pulleys can be fitted with and without grooves.

Necessary preliminary tasks:

- Remove **FAN COWL**

Unfasten hose clip (1).

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

Pull off air hose (2).

Installation note:

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

Recirculated air hose must audibly snap into place.

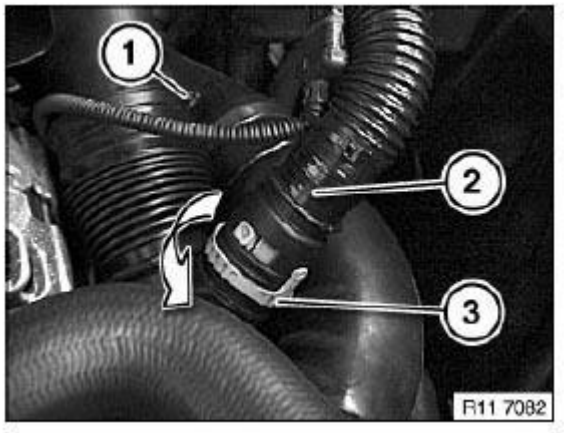


Fig. 243: Removing Quick-Connect Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

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

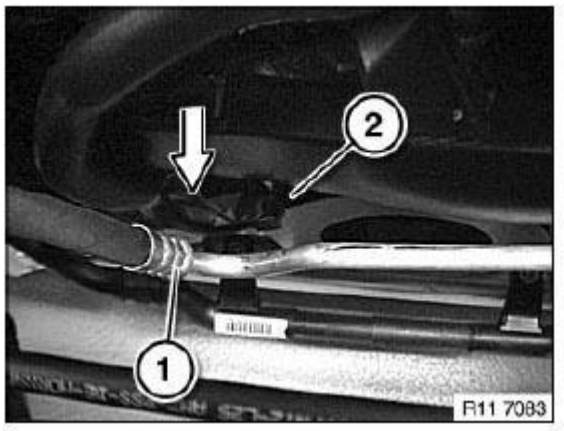


Fig. 244: Unclipping Line From Holder
Courtesy of BMW OF NORTH AMERICA, INC.

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

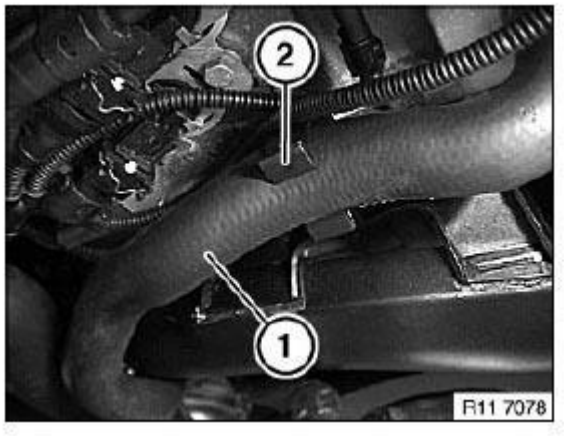


Fig. 245: Identifying Coolant Hose And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Fold air duct (2) down.

NOTE: Do not remove air duct (2).

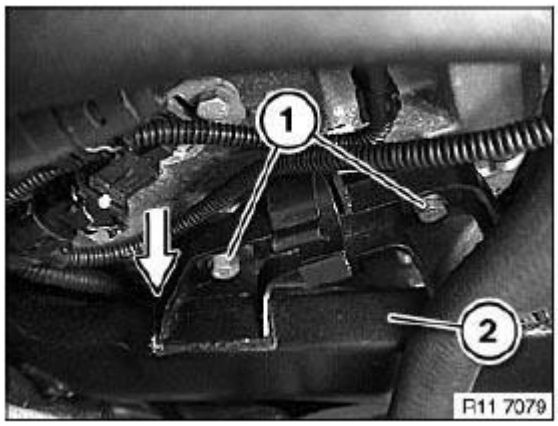


Fig. 246: Folding Air Duct Down
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

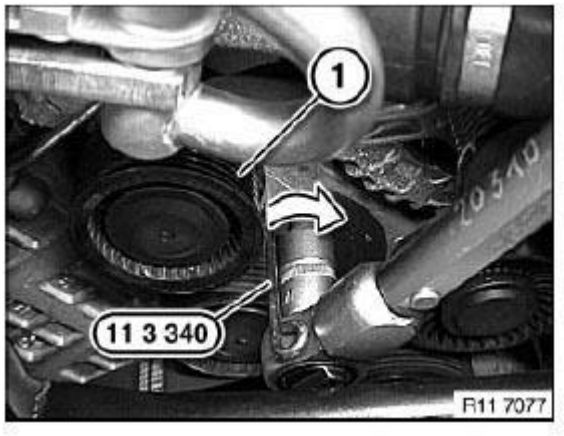


Fig. 247: Turning Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Remove drive belt (1).

Installation note:

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

Pretension tensioning pulley (1) in direction of arrow.

Remove special tool **11 3 340** .

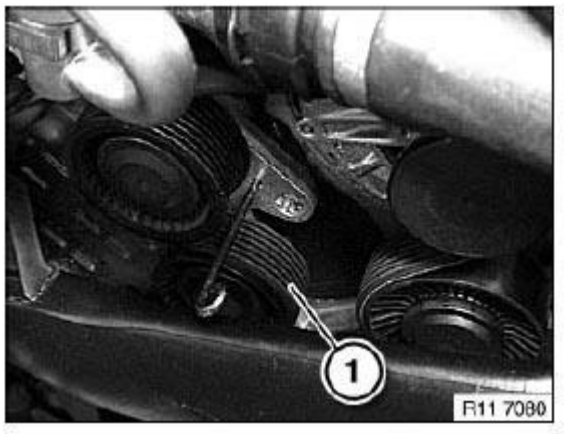


Fig. 248: Identifying Drive Belt
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Note arrangement of drive belt

Arrow shows the direction of rotation.

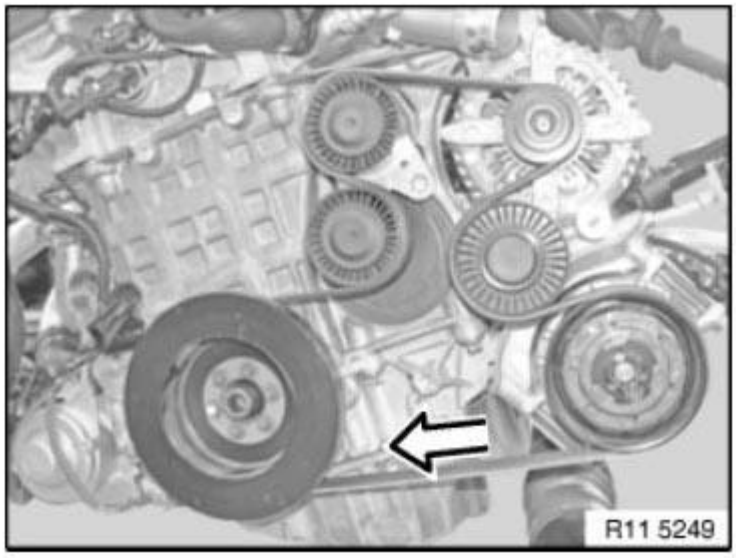


Fig. 249: Identifying Drive Belt Rotation Direction
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Installation note:

Risk of damage!

Check that drive belt is in correct installation position.

11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N54, N54T)

Necessary preliminary tasks:

- Remove **DRIVE BELT**

Remove protective cap on deflection pulley.

Remove special tool **11 3 340** .

Release screw (1) on belt tensioner.

Tightening torque **11 28 1AZ** .

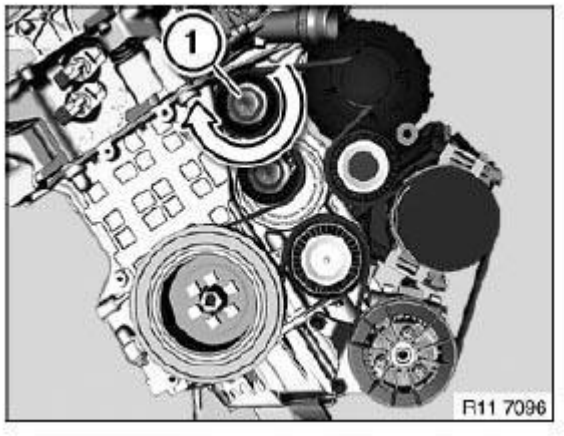


Fig. 250: Removing Screw On Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement and direction of rotation of drive belt.

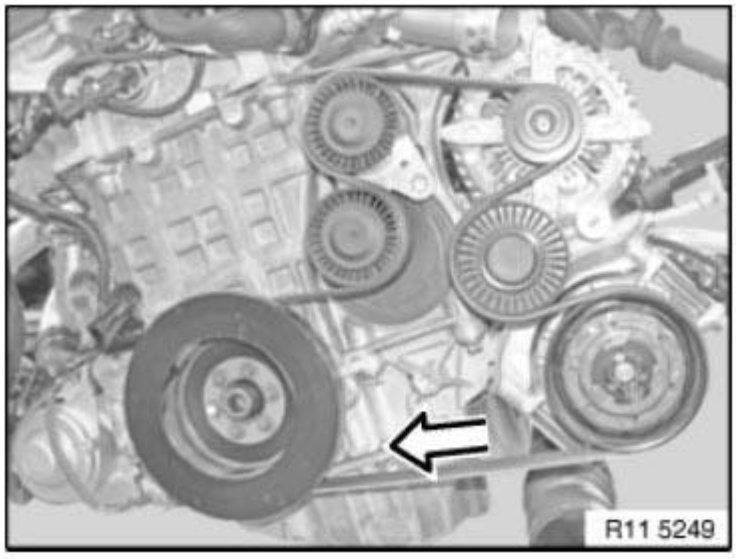


Fig. 251: Identifying Drive Belt Rotation Direction
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CAMSHAFT

11 31 505 ADJUSTING CAMSHAFT TIMING (N54, N54T)

IMPORTANT: Risk of damage!

To open the central bolt at the camshaft, grip hexagon on rear of camshaft.

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER**

Remove fastener (1) in direction of arrow.

Installation note:

Install fastener (1) with bore facing outwards.

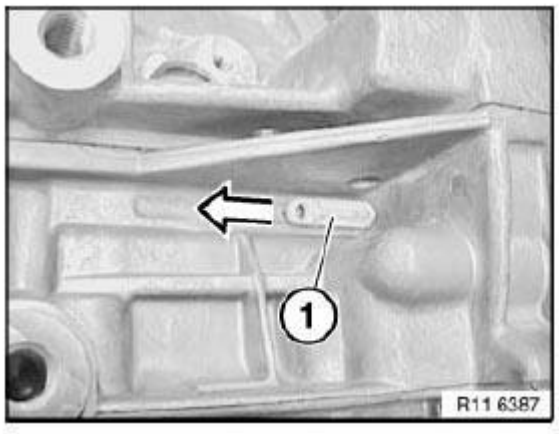


Fig. 252: Removing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

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

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

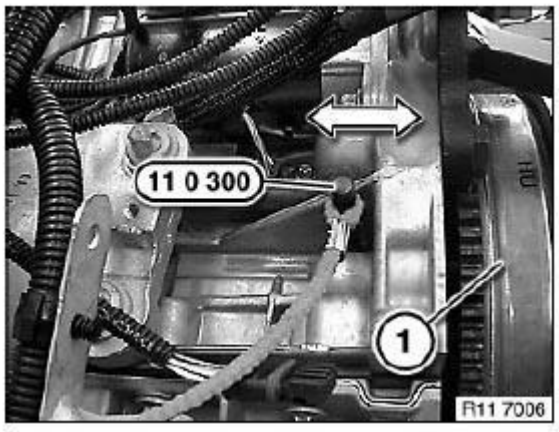


Fig. 253: Sliding In Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

IMPORTANT: If special tool 11 4 281 cannot be installed, the camshaft must be rotated at the hexagon head at the rear.

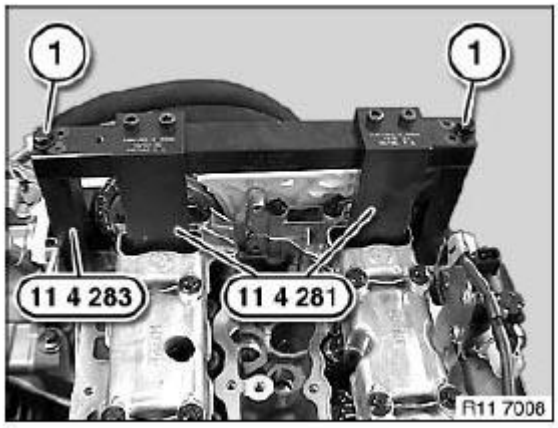


Fig. 254: Identifying Special Tool 11 4 280
Courtesy of BMW OF NORTH AMERICA, INC.

With cylinder No. 1 in ignition TDC position, cams of exhaust camshaft (2) and intake camshaft (1) at 6th cylinder 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.

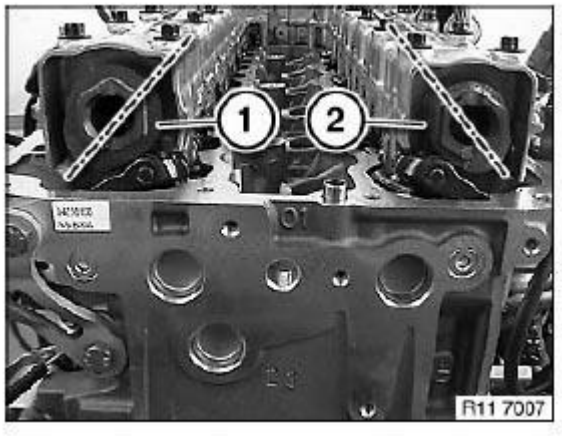


Fig. 255: Identifying Inlet And Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Release central bolt (1) of exhaust camshaft.

Installation note:

Replace screw (1).

Tightening torque **11 36 1AZ** .

Release central bolt (2) of inlet camshaft.

Installation note:

Replace screw (2).

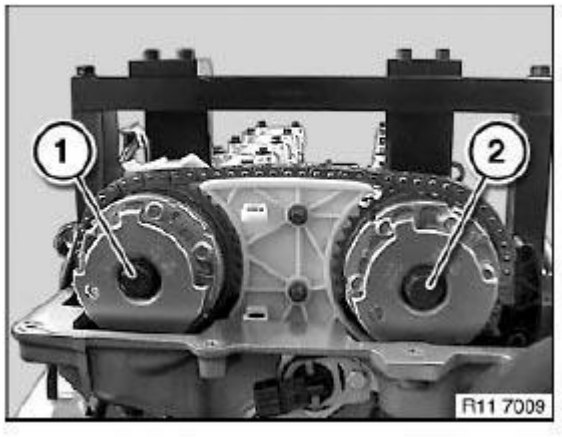


Fig. 256: Identifying Central Bolt Of Inlet And Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque **11 36 1AZ** .

Rotate increment wheels until retaining pins on special tool **11 8 520** match up.

Push special tool **11 8 520** onto cylinder head.

Secure special tool **11 8 520** with bolts (1 and 2).

NOTE: Bolts M6 x 45 (1 and 2) with captive washer.

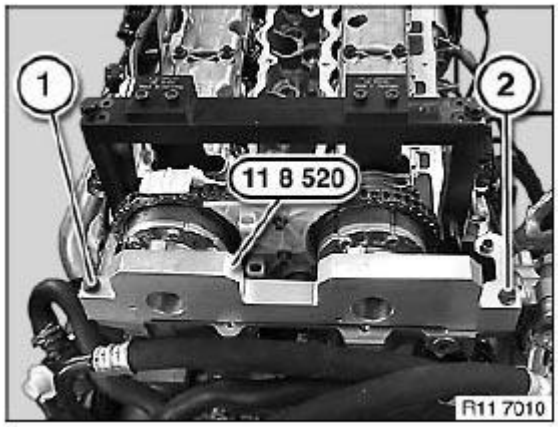


Fig. 257: Identifying Special Tool 11 8 520 With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

REMOVE CHAIN TENSIONER (1).

Screw special tool **11 9 340** into cylinder head.

Pre-tension timing chain with special tool 00 9 250 **to 0.6 Nm.**

Tighten central bolts (2 and 3) with special tool 00 9 120 .

Tightening torque 11 36 1AZ .

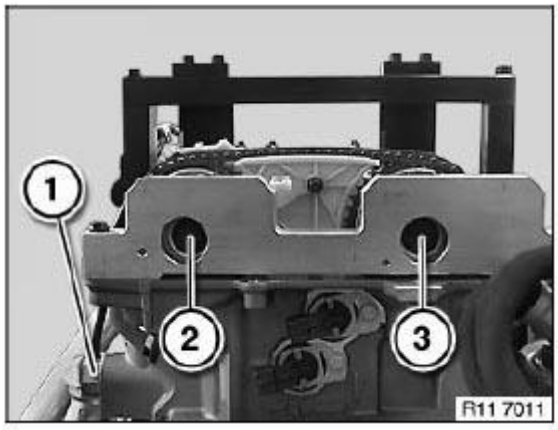


Fig. 258: Identifying Chain Tensioner And Central Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

11 31 005 CHECKING CAMSHAFT TIMING (N54, N54T)

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER**
- Remove front **UNDERBODY PROTECTION**

Remove fastener (1) in direction of arrow.

Installation note:

Install fastener (1) with bore facing outwards.

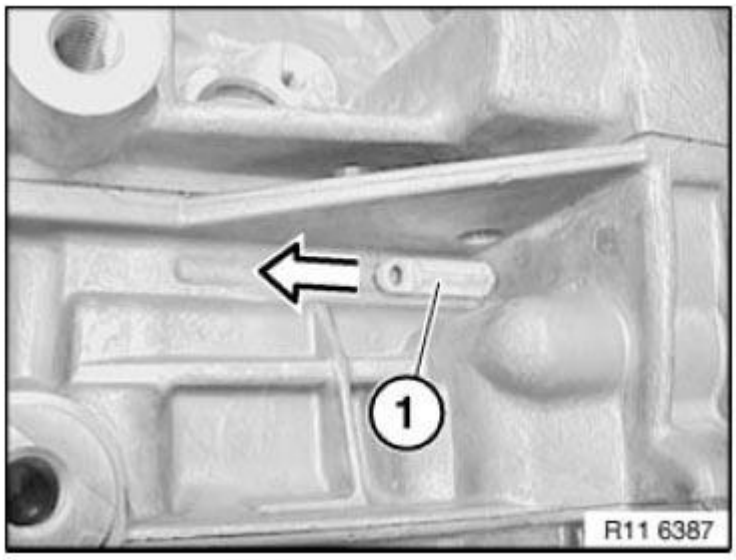


Fig. 259: Identifying Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

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

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

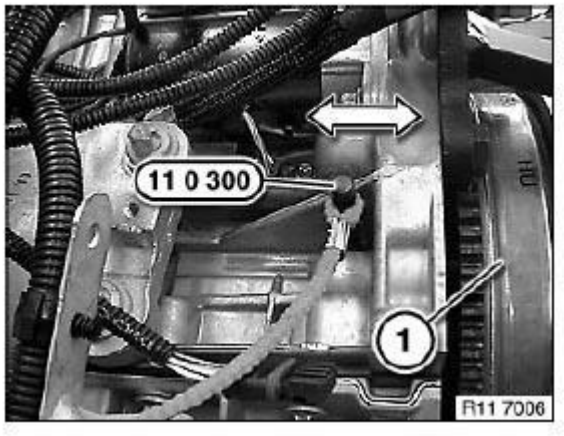


Fig. 260: Sliding In Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

With 1st cylinder in ignition 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.

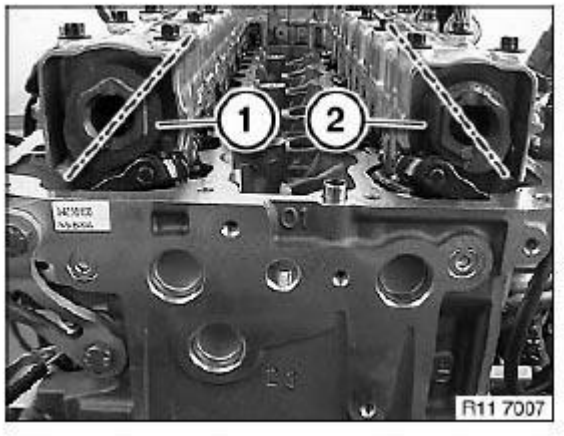


Fig. 261: Identifying Inlet And Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

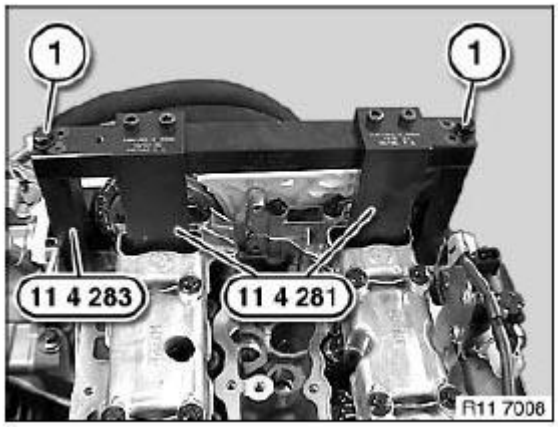


Fig. 262: Identifying Special Tool 11 4 280
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

11 31 090 INSTALLING AND REMOVING/REPLACING CHAIN TENSIONER PISTON (N54, N54T)

Necessary preliminary tasks

Remove **COOLANT EXPANSION TANK** (E89 only)

Release chain tensioner (1).

Tightening torque: **11 31 5AZ** .

IMPORTANT: Have a cleaning cloth ready. A small quantity of engine oil will emerge after the screw connection has been released.

Make sure no oil runs onto the belt drive.

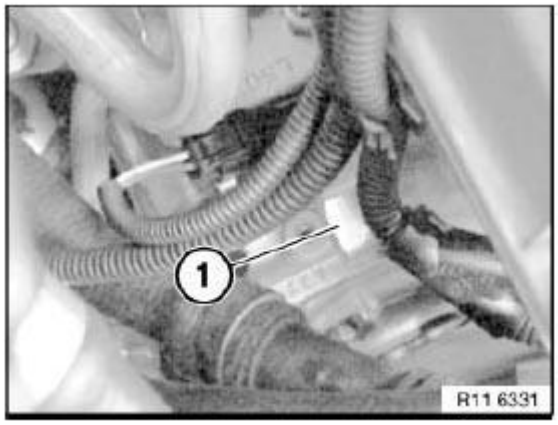


Fig. 263: Identifying Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

No sealing ring is fitted during series-production assembly.

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

If the chain tensioner is reused, its oil chamber must be drained. Place chain tensioner on a level working surface and slowly compress.

Repeat procedure twice.

Fig. 264: Compressing Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 028 REMOVING AND INSTALLING/REPLACING EXHAUST CAMSHAFT (N54/N54T)

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 strips must be preloaded 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 strips (1) with camshaft.

NOTE: Graphic shows N52.

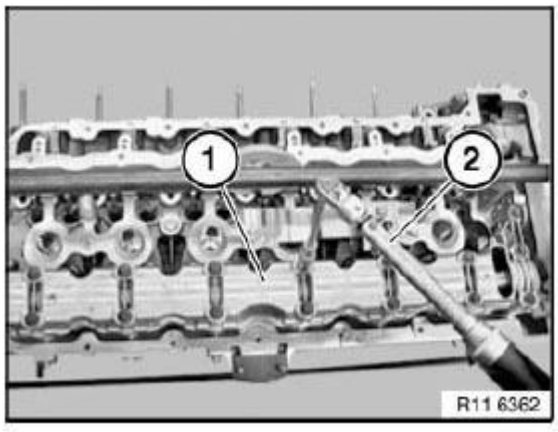


Fig. 265: Lifting Lower And Upper Bearing Strips With Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Both camshafts have different markings.

Mixing up the two camshafts will result in engine damage.

A Exhaust camshaft.

E Intake camshaft

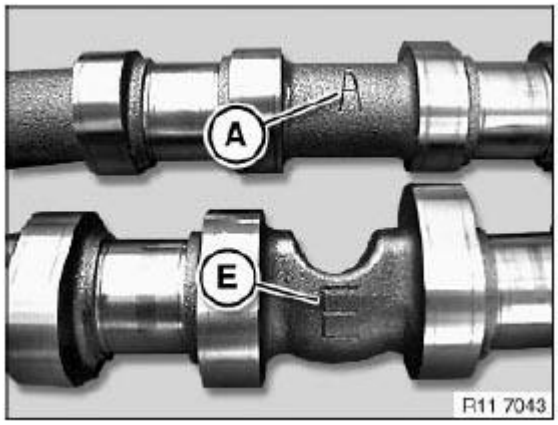


Fig. 266: Identifying Exhaust And Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Plain compression rings (1) are engaged at joint.

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

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

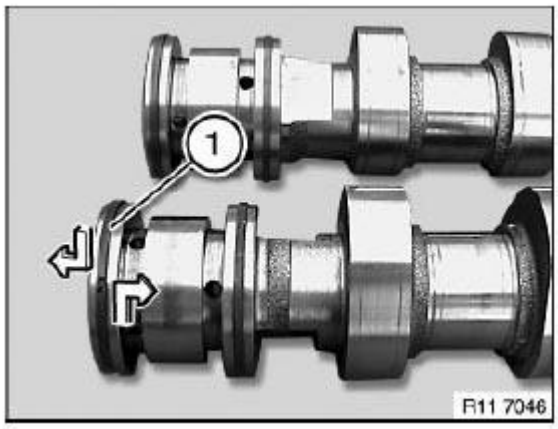


Fig. 267: Pressing Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

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 strip.

Installation note:

Before installing the exhaust camshaft, make sure the roller cam follower is correctly seated on the hydraulic valve clearance compensating element and the valve.

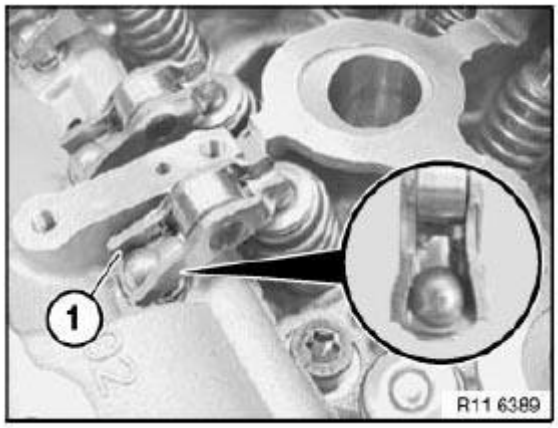


Fig. 268: Identifying Cam Follower Seat
Courtesy of BMW OF NORTH AMERICA, INC.

Installing camshaft bearing strip

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

Observe markings E and A

E: Intake side

A: Exhaust side

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

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

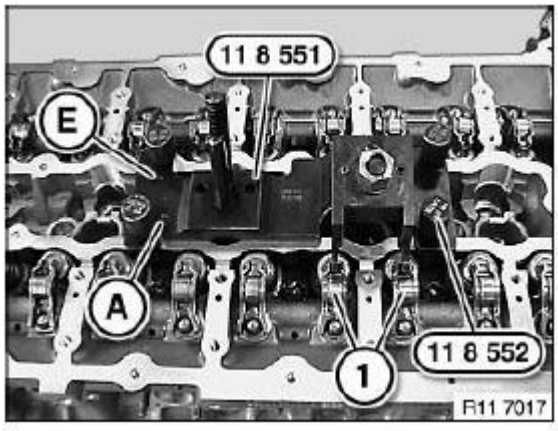


Fig. 269: Identifying Special Tools 11 8 551 And 11 8 552
Courtesy of BMW OF NORTH AMERICA, INC.

Lay lower bearing strip (1) on cylinder head.

Installation note:

Lubricate all bearing points with engine oil.

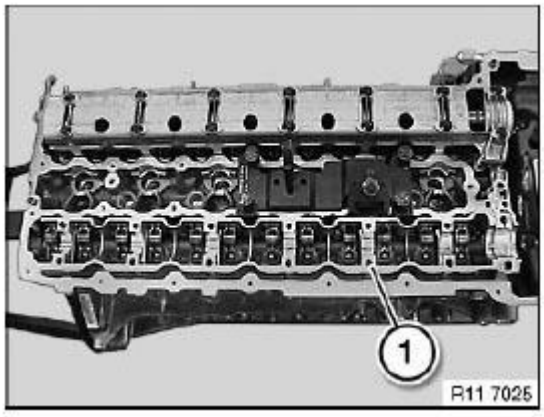


Fig. 270: Identifying Lower Bearing Strip On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Insert exhaust camshaft (1) in lower bearing strip.

Installation note:

Lubricate all bearing positions and cams with engine oil.

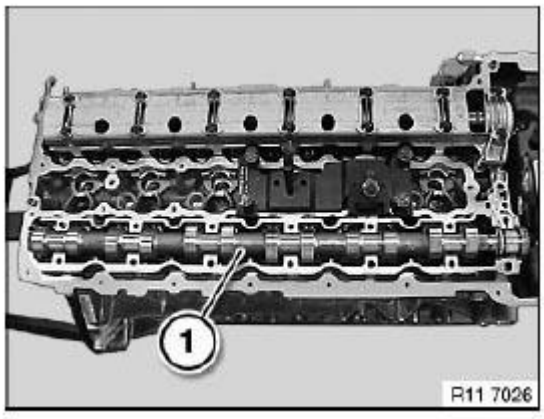


Fig. 271: Identifying Exhaust Camshaft In Lower Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

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

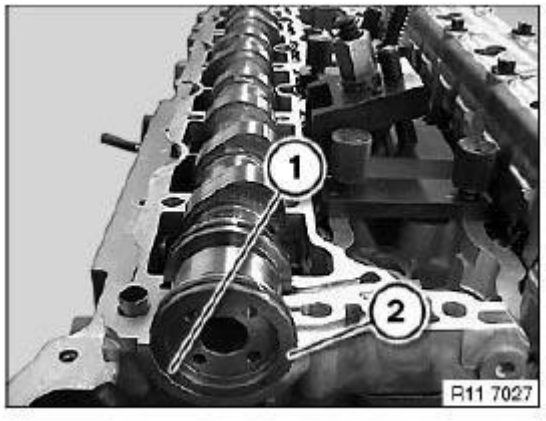


Fig. 272: Identifying Installation Position Of Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Check position of exhaust camshaft (2) at cylinder no. 6.

Roller cam follower (1) is not actuated.

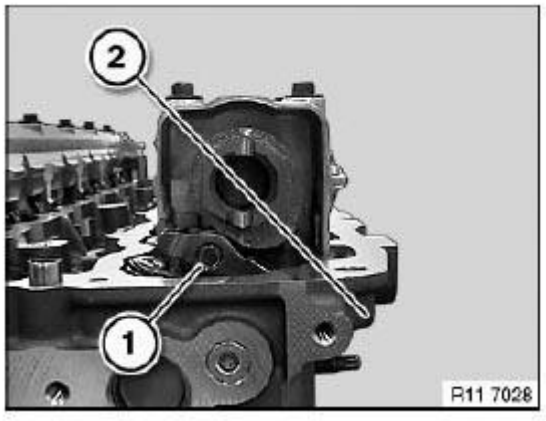


Fig. 273: Identifying Exhaust Camshaft Position And Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

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

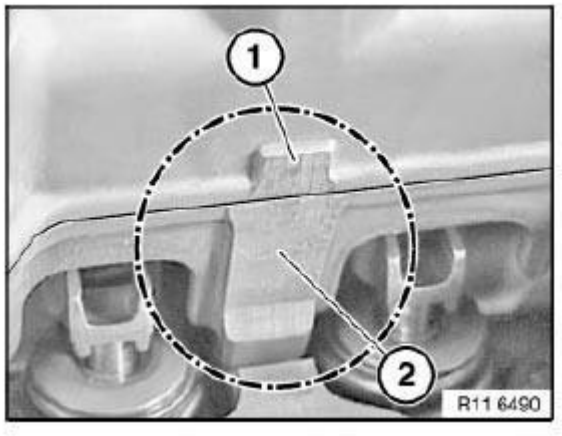


Fig. 274: Identifying Bearing Strips
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

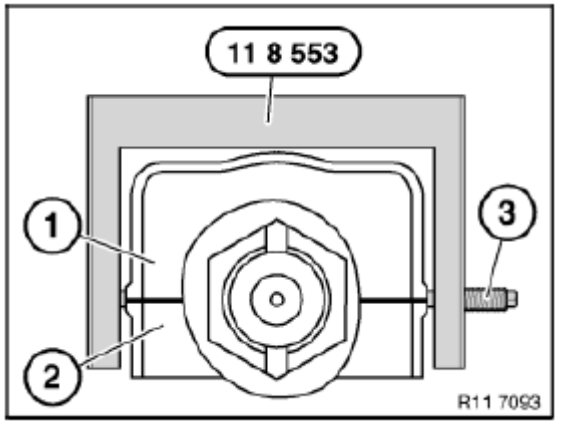


Fig. 275: Identifying Special Tool 11 8 553 Schematic Depiction On Bearing Strips
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

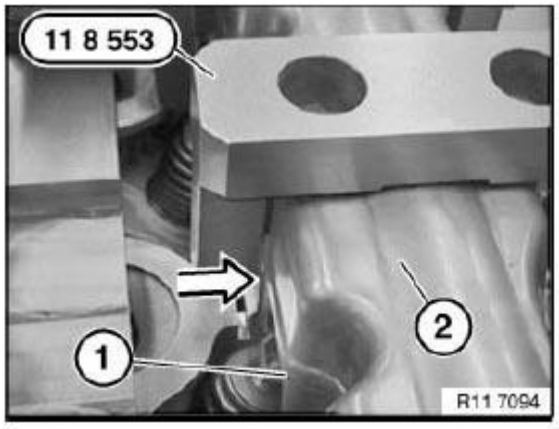


Fig. 276: Positioning Special Tool 11 8 553 Over Bearing Banks Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Tighten screws on thrust piece to 2 Nm.

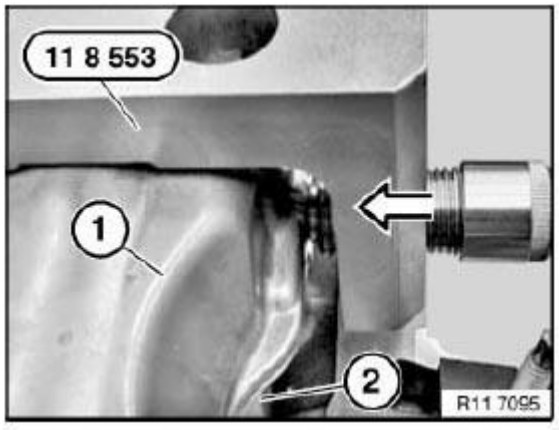


Fig. 277: Tightening Special Tool 11 8 553 Screw
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Set special tool 11 4 350 to 2 Nm.

Pre-tension all special tools 11 8 553 with special tool **11 4 350** only.

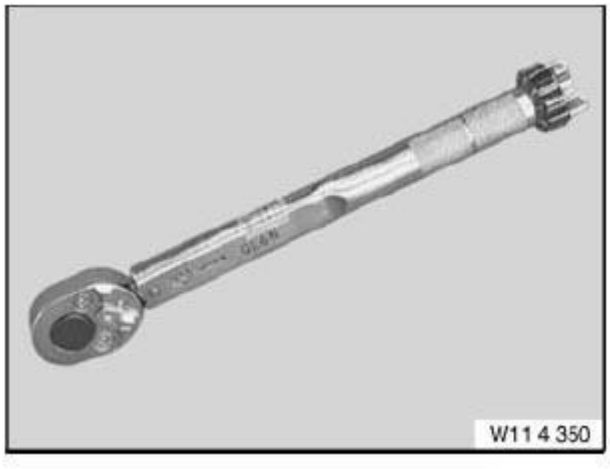


Fig. 278: Identifying 11 4 350 Torque Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

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 strip are easily accessible.

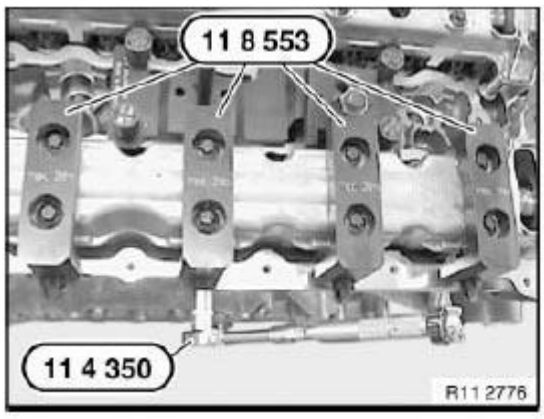


Fig. 279: Identifying Special Tools 11 8 553 And Special Tool 11 4 350
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Tightening torque **11 31 1AZ** .

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

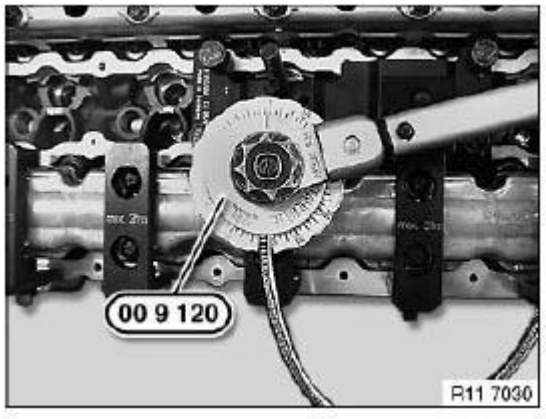


Fig. 280: Tightening Bearing Strips Using Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 31 025 REMOVING AND INSTALLING/REPLACING INTAKE CAMSHAFT (N54/N54T)

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 strips must be pre-tensioned with a total of six special tools 11 8 553.

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

Necessary preliminary tasks:

Remove **CYLINDER HEAD COVER**

- Remove **INTAKE ADJUSTER** of intake camshaft

Release bearing cap screw connections from outside inwards.

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

NOTE: Graphic shows N52.

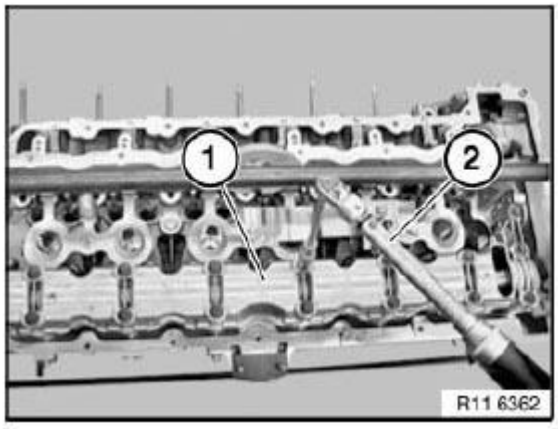


Fig. 281: Lifting Lower And Upper Bearing Strips With Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Remove upper bearing shell.

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

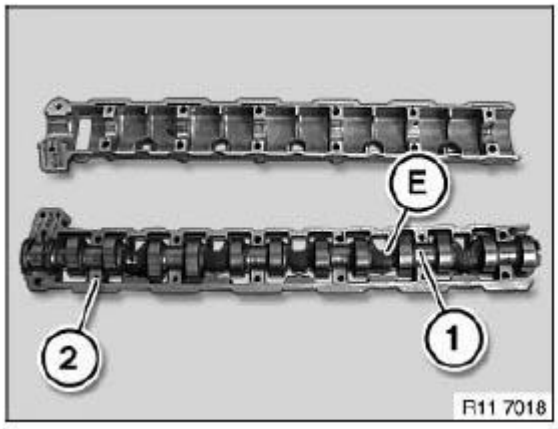


Fig. 282: Identifying Marked Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Both camshafts have different markings.

Mixing up the two camshafts will result in **engine damage.**

A Exhaust camshaft

E Intake camshaft

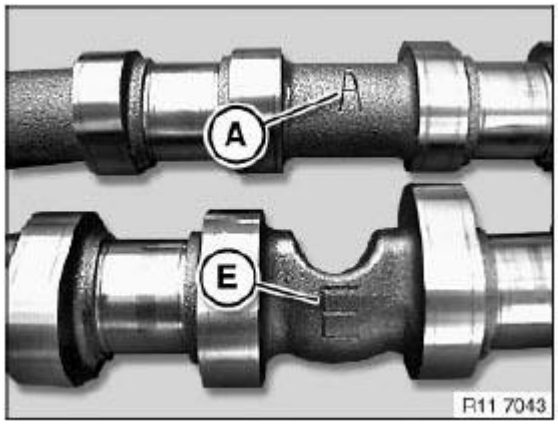


Fig. 283: Identifying Exhaust And Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

Plain rectangular compression rings (1) are engaged at joint.

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

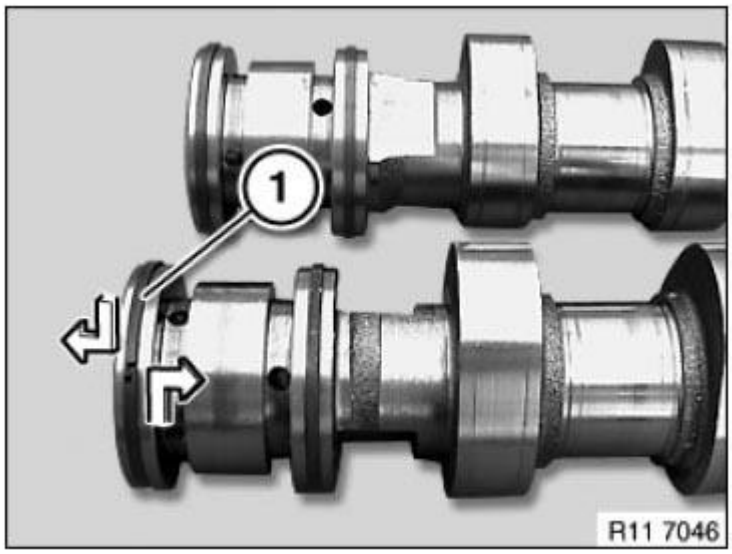


Fig. 284: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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 strip.

Installing camshaft bearing strip

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= Intake side

A= Exhaust side

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

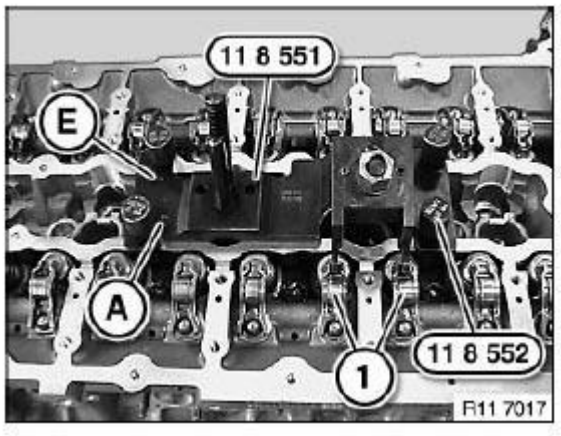


Fig. 285: Identifying Special Tools 11 8 551 And 11 8 552
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

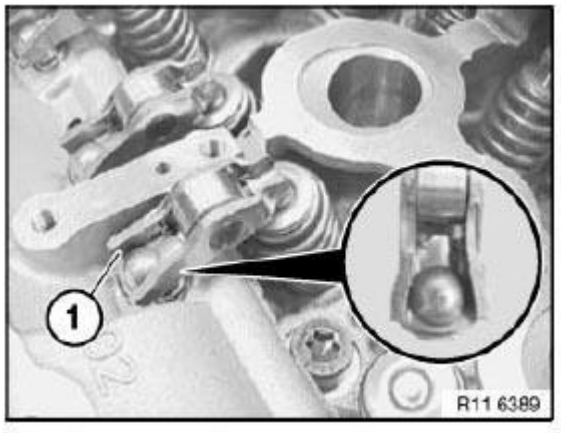


Fig. 286: Identifying Cam Follower Seat
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Pre-install bearing strip of intake camshaft.

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

Installation note:

Lay intake camshaft (1) in bearing strip.

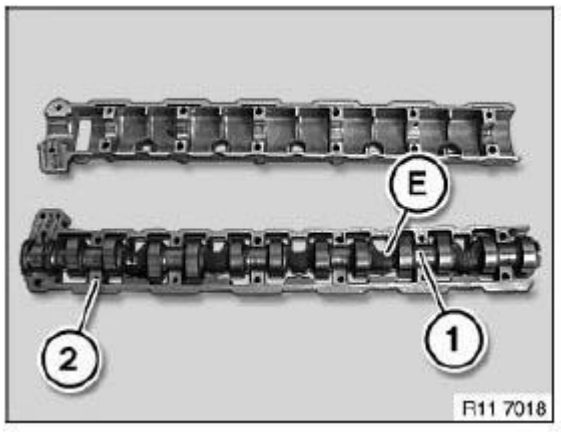


Fig. 287: Identifying Marked Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

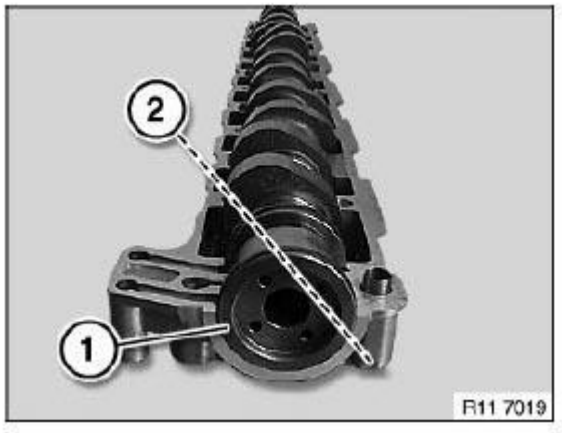


Fig. 288: Identifying Inlet Camshaft With Position
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

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

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

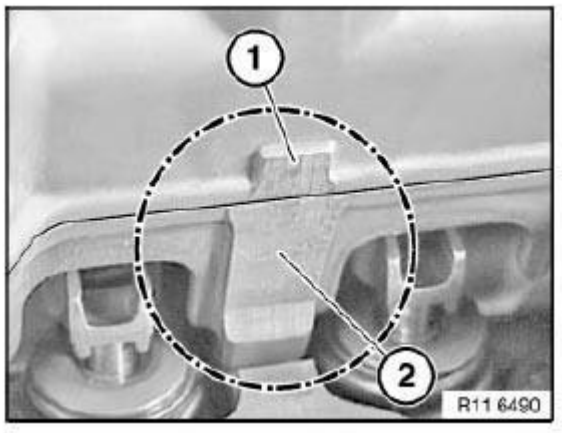


Fig. 289: Identifying Bearing Strips
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

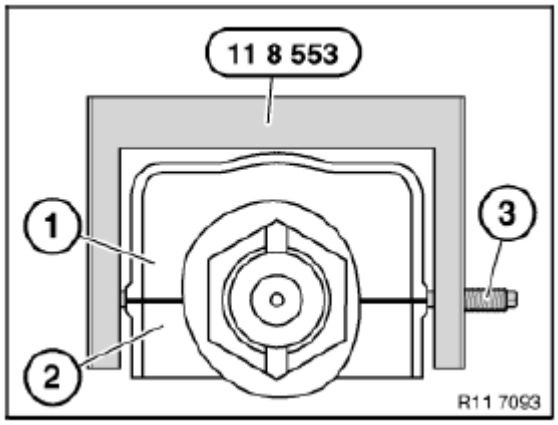


Fig. 290: Identifying Special Tool 11 8 553 Schematic Depiction On Bearing Strips
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

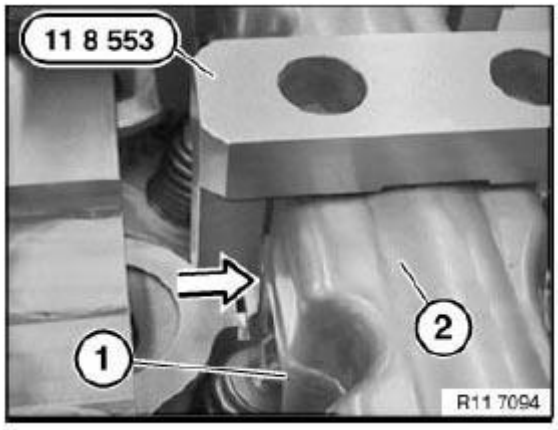


Fig. 291: Positioning Special Tool 11 8 553 Over Bearing Strips Screw Connection
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Tighten screws on thrust piece to 2 Nm.

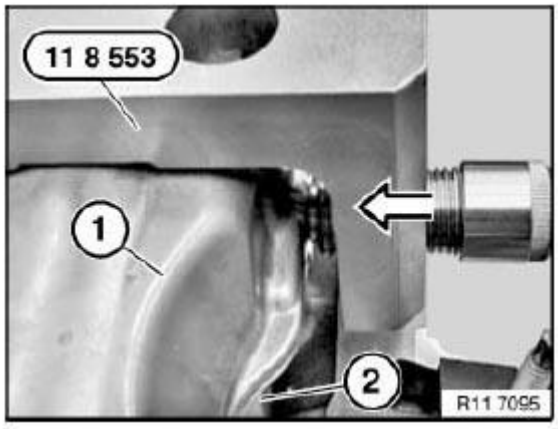


Fig. 292: Tightening Screw Of Special Tool 11 8 553
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Set special tool 11 4 350 to 2 Nm.

Pre-tension all special tools 11 8 553 with special tool 11 4 350 only.

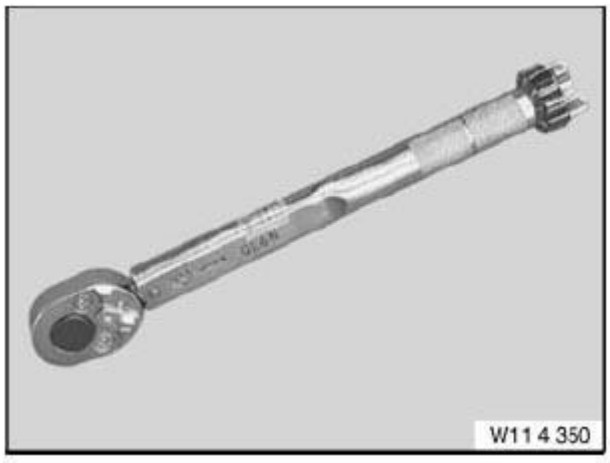


Fig. 293: Identifying 11 4 350 Torque Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

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.

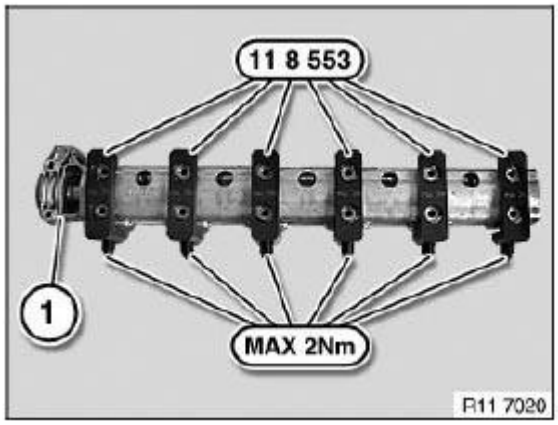


Fig. 294: Identifying Upper And Lower Bearing Strips With Special Tools 11 8 553
Courtesy of BMW OF NORTH AMERICA, INC.

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

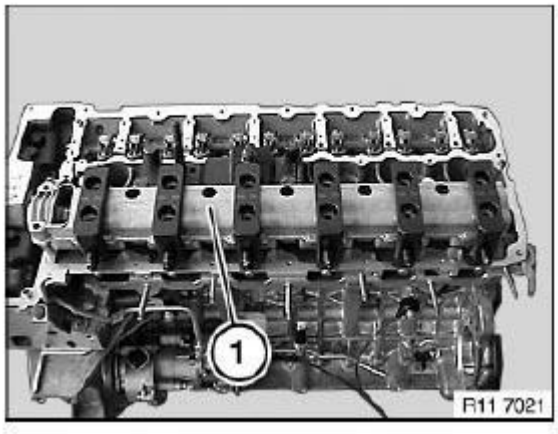


Fig. 295: Identifying Bearing Strips On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

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

Roller cam follower (2) is not actuated.

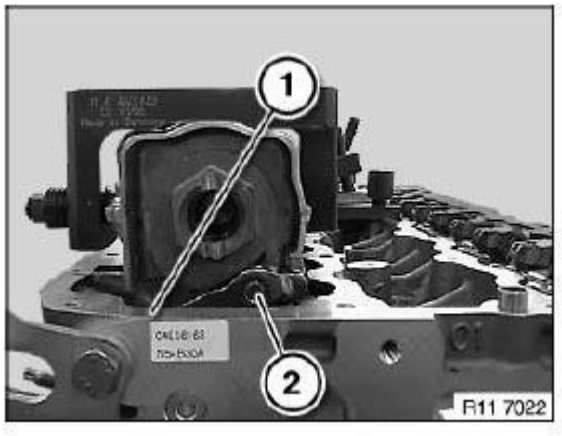


Fig. 296: Identifying Intake Camshaft And Roller Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 31 1AZ** .

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

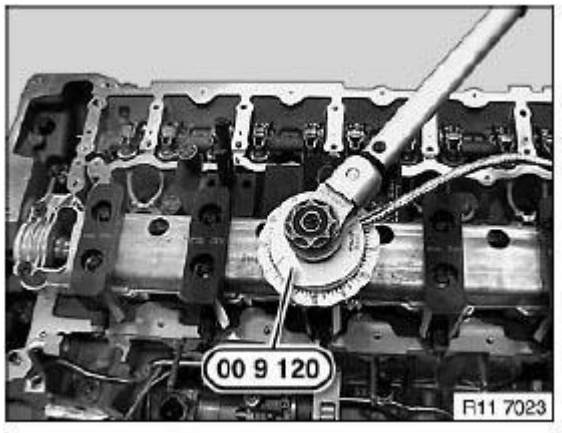


Fig. 297: Tightening Lower And Upper Bearing Strips Using Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust **VALVE TIMING** .

Assemble engine.

11 31 051 REPLACING TIMING CHAIN (N54, N54T)

Necessary preliminary tasks:

- Remove **FAN COWL**
- Remove **CYLINDER HEAD COVER**
- Remove all spark plugs
- Remove **CHAIN TENSIONER**.
- Remove **CRANKSHAFT SEAL** at front
- Remove **BELT TENSIONER**
- Remove **VIBRATION DAMPER**
- Remove **INTAKE AND EXHAUST ADJUSTERS**

Remove fastener (1) in direction of arrow.

Installation note:

Install fastener (1) with bore facing outwards.

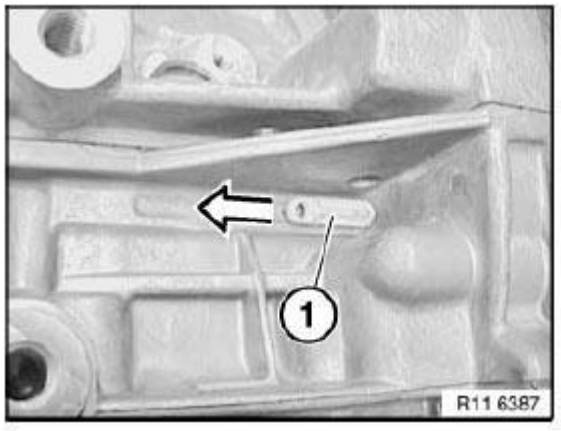


Fig. 298: Installing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

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

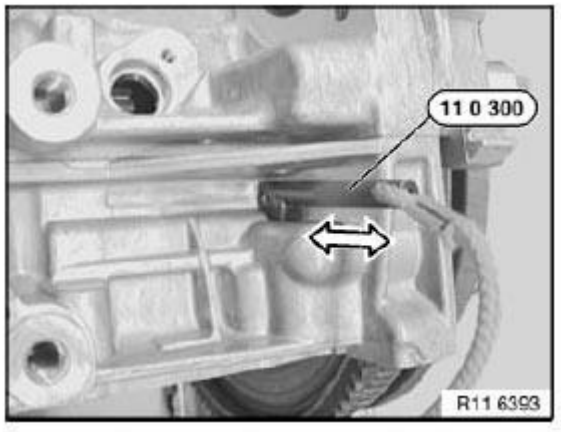


Fig. 299: Securing Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: Graphic shows automatic transmission.

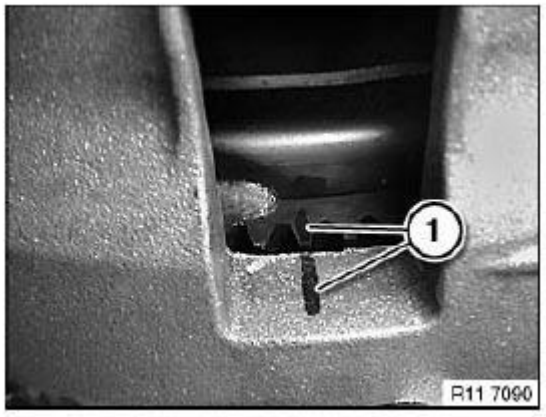


Fig. 300: Identifying Line On Flywheel And Transmission Housing
Courtesy of BMW OF NORTH AMERICA, INC.

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

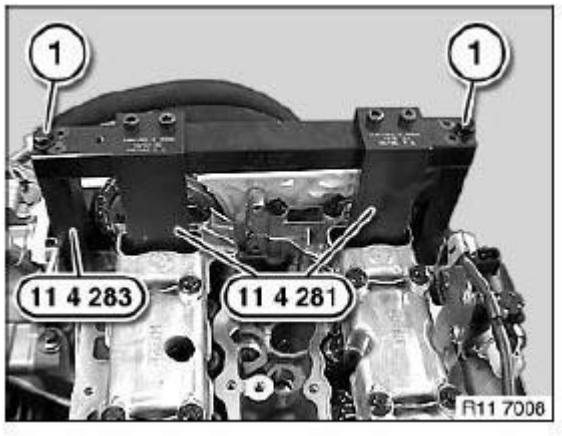


Fig. 301: Identifying Special Tool 11 4 280
Courtesy of BMW OF NORTH AMERICA, INC.

Procedure, transmission removed

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

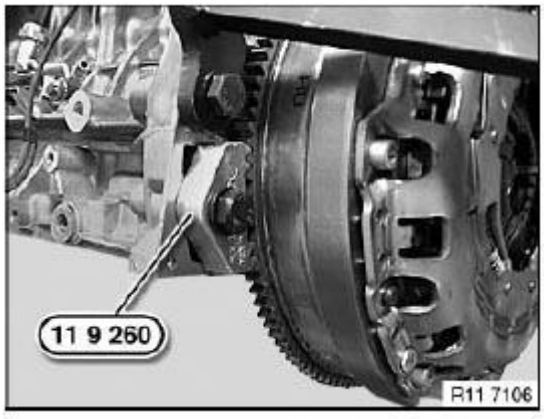


Fig. 302: Securing Flywheel (Crankshaft) Using Special Tool 11 9 260
Courtesy of BMW OF NORTH AMERICA, INC.

Block flywheel (crankshaft) with special tool **11 8 660** on gearbox.

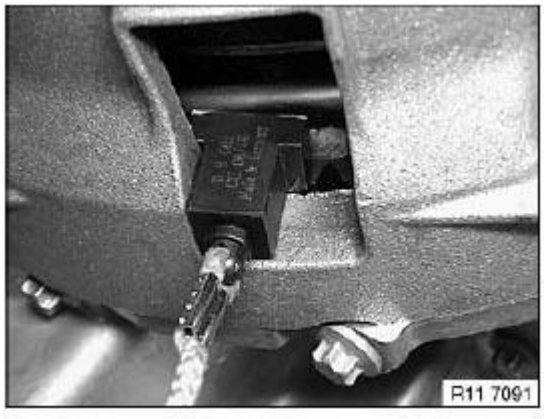


Fig. 303: Securing Flywheel (Crankshaft) Using Special Tool 11 8 660
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool **11 8 180** with screws (1).

Secure flywheel in direction of arrow.

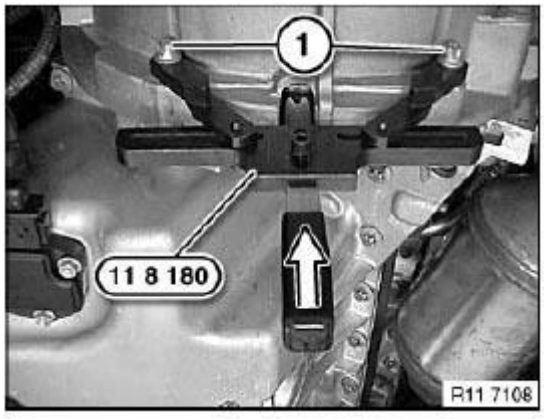


Fig. 304: Securing Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Tightening torque **11 21 1AZ** .

Remove central bolt with hub towards front.

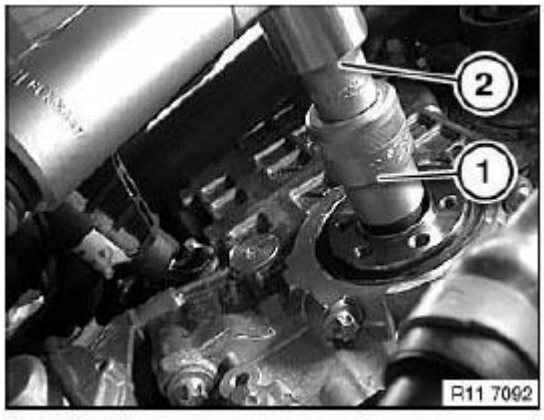


Fig. 305: Removing Central Bolt Using Socket
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque **11 31 6AZ** .

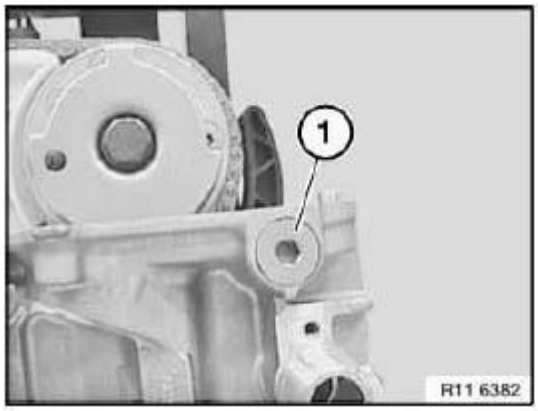


Fig. 306: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

Tightening torque **11 31 6AZ** .

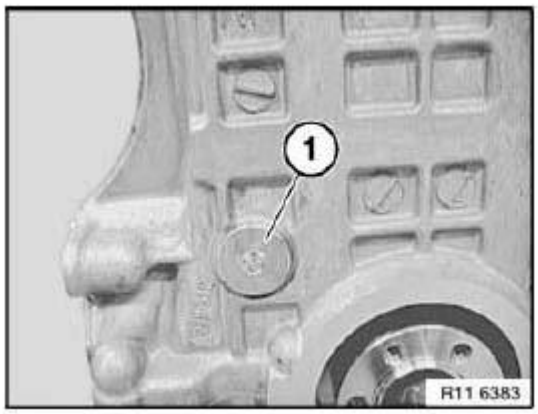


Fig. 307: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on chain drive at top.

Tightening torque **11 31 2AZ** .

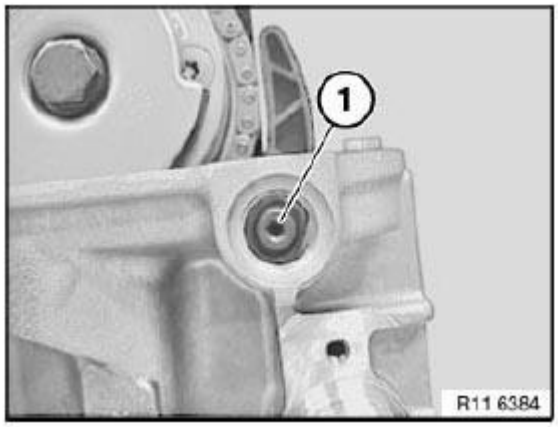


Fig. 308: Identifying Screw On Chain Drive At Top
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on chain drive at bottom.

Tightening torque **11 31 3AZ** .

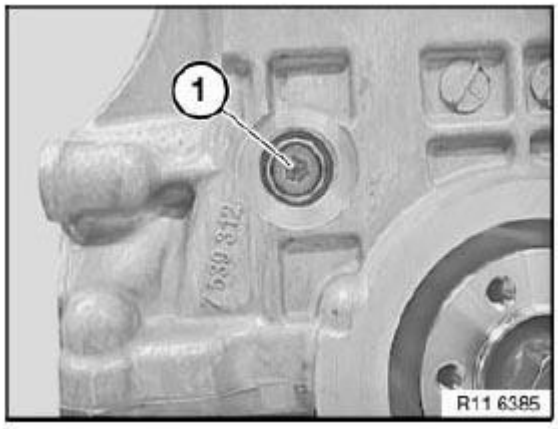


Fig. 309: Identifying Screw On Chain Drive At Bottom
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 31 2AZ** .

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

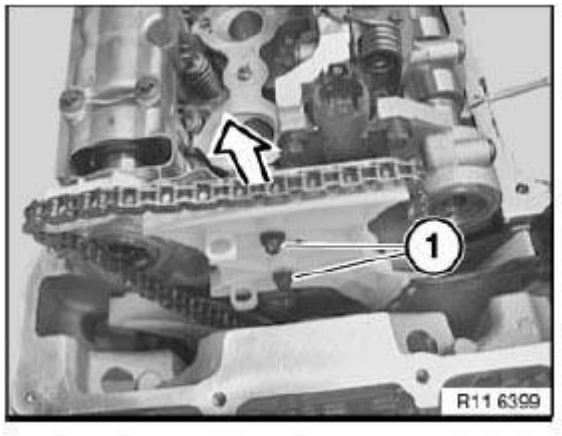


Fig. 310: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket (2).

Collar (see arrow) on sprocket (2) points to crankshaft.

Incorrect assembly will result in engine damage.

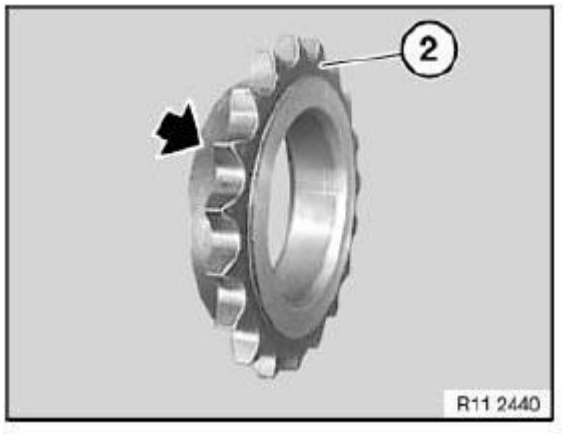


Fig. 311: Identifying Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Installation note:

Always hold timing chain under tension.

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

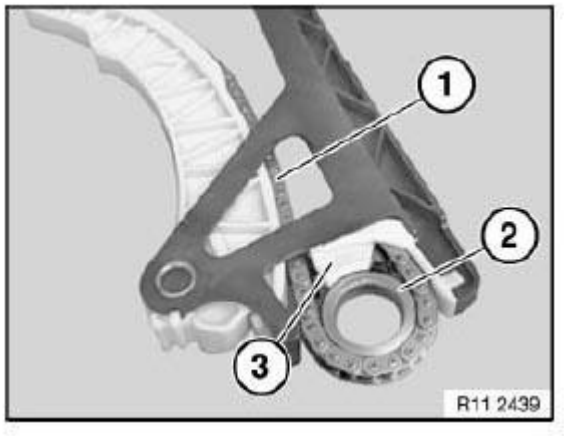


Fig. 312: Identifying Timing Chain And Chain Module
Courtesy of BMW OF NORTH AMERICA, INC.

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.

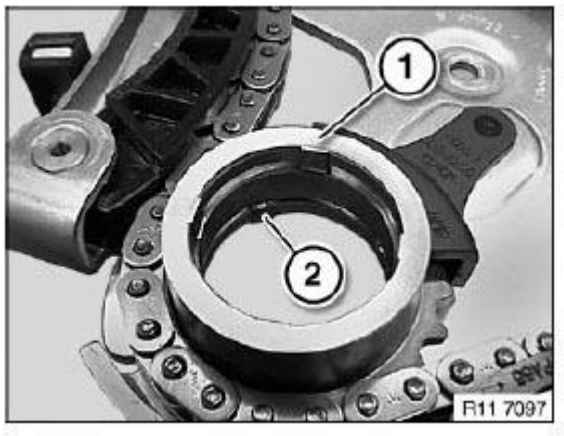


Fig. 313: Identifying Friction Plates
Courtesy of BMW OF NORTH AMERICA, INC.

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

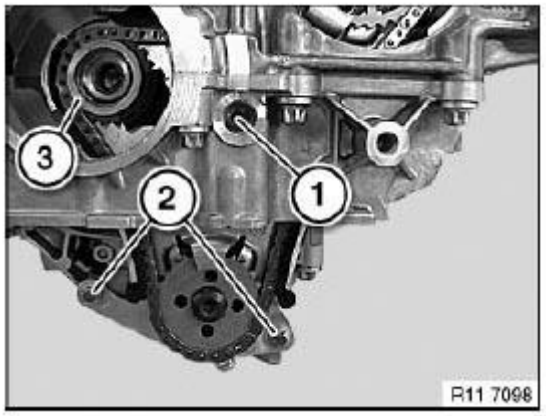


Fig. 314: Identifying Friction Plate Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Push on friction plate (1) without retainers.

IMPORTANT: The N54 engine requires special friction plates between the friction surfaces.

The engine will incur damage if the friction plates are damaged or are not fitted.

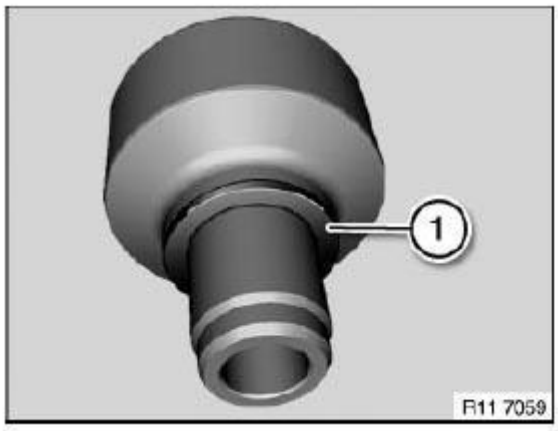


Fig. 315: Identifying Friction Plate Without Retainers
Courtesy of BMW OF NORTH AMERICA, INC.

Insert chain module from above and secure with bolt (1).

Make sure gear wheels (2) are in correct installation position.

Insert hub (3) with friction plate.

Tightening torque **11 21 1AZ** .

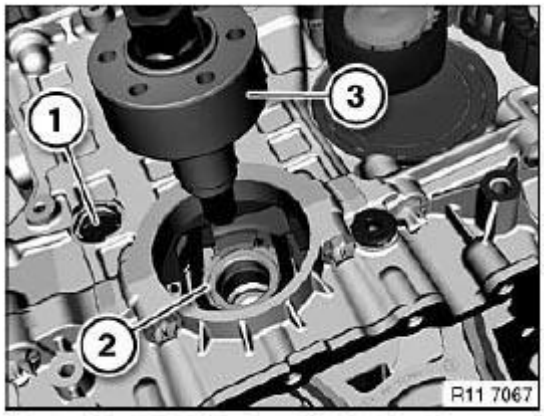


Fig. 316: Identifying Gear Wheels Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

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

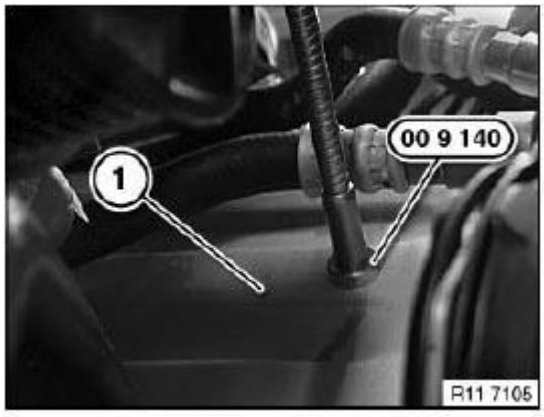


Fig. 317: Securing Special Tool 00 9 140 With Magnet To Engine Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

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

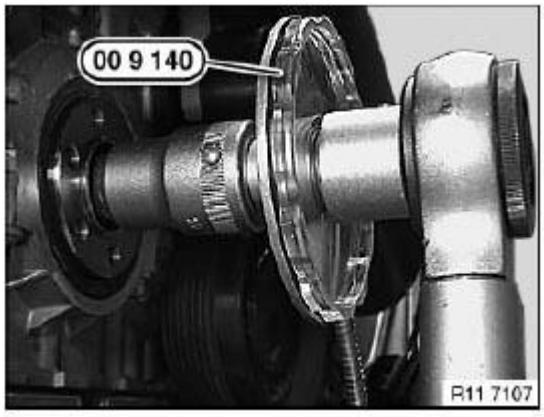


Fig. 318: Securing Central Bolt Using Special Tool 00 9 140
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **CRANKSHAFT SEAL** at front

Install **INTAKE AND EXHAUST ADJUSTERS**.

Install **CHAIN TENSIONER**.

Crank engine twice.

Check **TIMING**.

Assemble engine.

ROCKER ARM WITH BEARING MOUNT

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

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 **INTAKE CAMSHAFT**
- Remove **EXHAUST CAMSHAFT**.

Detach roller cam followers (1) from hydraulic valve clearance compensating element and remove.

Set down roller cam followers in tidy and orderly fashion; if necessary, set down in special tool **11 4 480** .

Installation note:

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

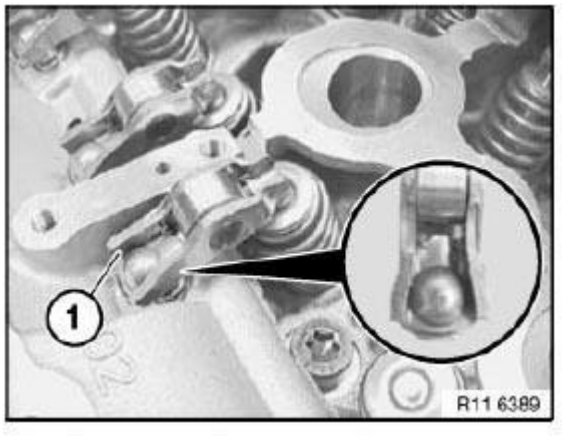


Fig. 319: Identifying Cam Follower Seat
Courtesy of BMW OF NORTH AMERICA, INC.

Remove hydraulic valve clearance compensating element in direction of arrow.

Installation note:

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

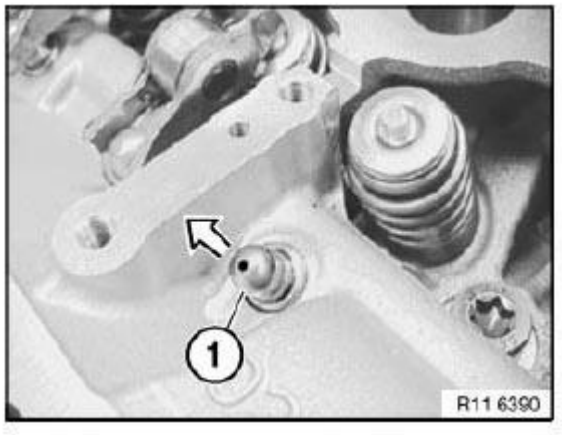


Fig. 320: Removing HVCA Element
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

VALVES WITH SPRINGS

11 34 552 REMOVING AND INSTALLING OR REPLACING ALL VALVES (N54, N54T)

Necessary preliminary tasks:

- Remove **CYLINDER HEAD**.

- Remove **INTAKE 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 keys

If the valves are to be reused, set them down in special tool **11 4 480** in a tidy and orderly fashion.

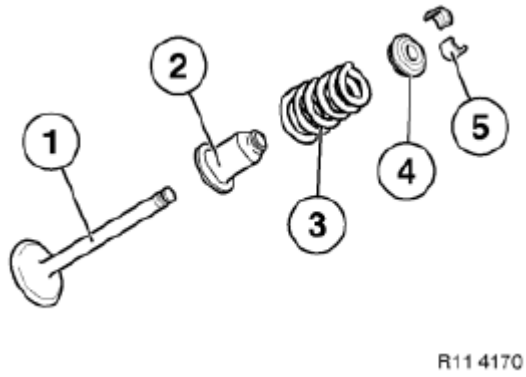


Fig. 321: Exploded View Of Valve Assembly
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

11 34 715 REPLACING ALL VALVE SPRINGS (N54, N54T)

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 **INTAKE CAMSHAFT**
- Remove **ROLLER CAM FOLLOWERS**

Intake valves

Fit cylinder head on special tool **11 9 000** .

Press valve spring down on spring cup with special tools 11 0 009 and 11 9 017.

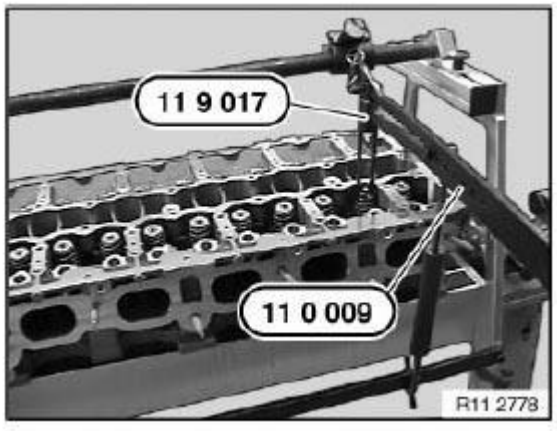


Fig. 322: Pressing Valve Spring Down On Spring Retainer Using Special Tools 11 0 009 And 11 9 017
Courtesy of BMW OF NORTH AMERICA, INC.

Exhaust valves

Fit cylinder head on special tool **11 9 000** .

Press valve spring down on spring cup with special tools 11 0 009 and 11 0 346.

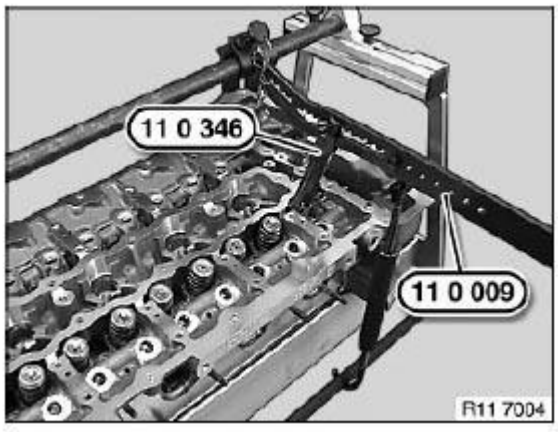


Fig. 323: Pressing Valve Spring Down On Spring Retainer Using Special Tools 11 0 009 And 11 0 346
Courtesy of BMW OF NORTH AMERICA, INC.

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.

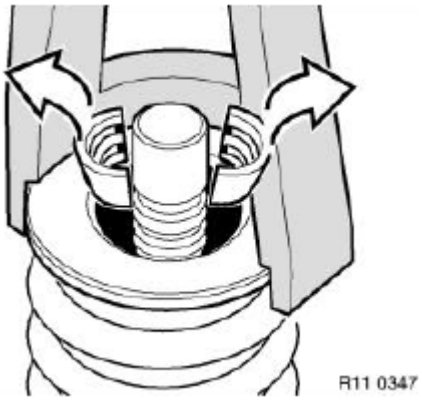


Fig. 324: Removing Valve Spring And Spring Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Incorrect installation possible.

Incorrect installation will result in valve spring breakage!

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

Installation note:

Inlet valve: Violet/green or violet/yellow

Exhaust: White/green or white/yellow

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

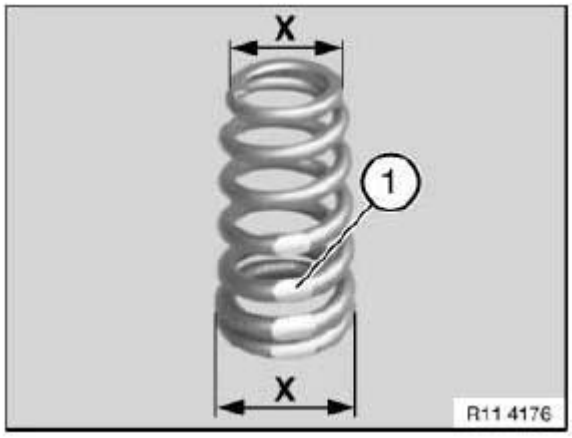


Fig. 325: Dimensions Of Valve Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement:

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

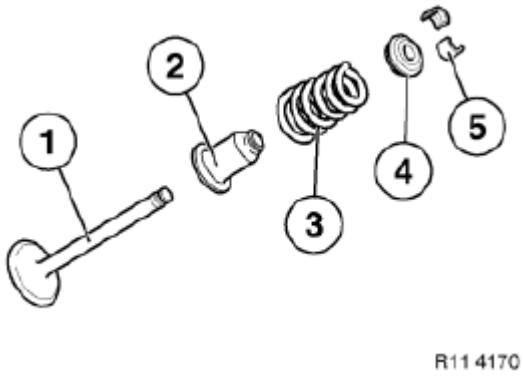


Fig. 326: Exploded View Of Valve Assembly
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME control unit.

11 34 560 REPLACING ALL VALVE STEM SEALS (N54, N54T)

Necessary preliminary tasks:

- Remove **CYLINDER HEAD**.
- Remove **INTAKE 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 note:

Insert all **VALVES**.

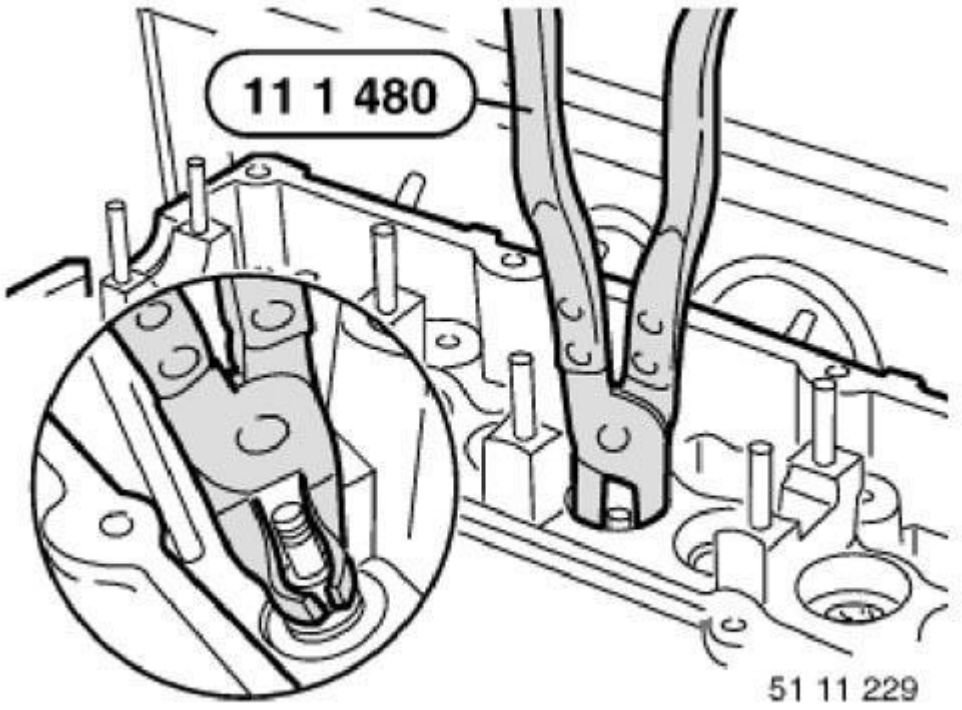


Fig. 327: Identifying Special Tool (11 1 480)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For use on the N54 engine, special tool 11 6 380 must be remachined according to the sketch with a 10 mm drill bit dia. to a depth of B = approx. 23 mm.

This modification has already been taken into account for reordering.

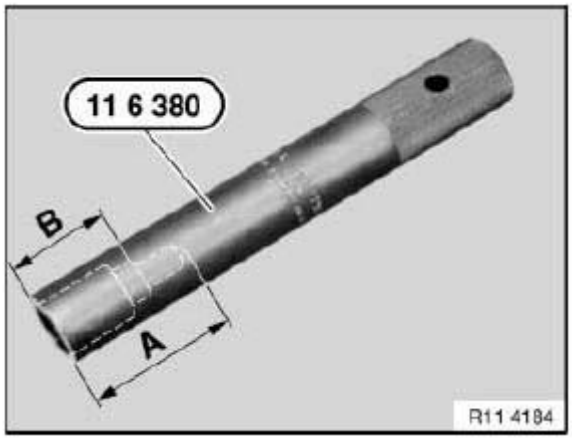


Fig. 328: Identifying Special Tool (11 6 380)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

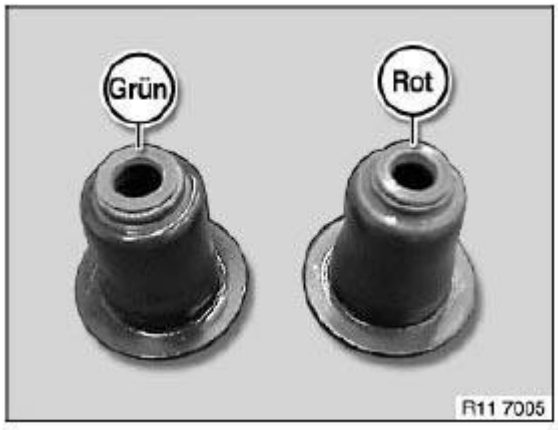


Fig. 329: Identifying Valve Stem Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Fit the mounting sleeves (plastic sleeves) supplied in the spare part on the valve stem end

Lubricate mounting sleeve.

Press on valve stem seal with special tool **11 6 380** by hand up to stop.

NOTE: Graphic shows N46.

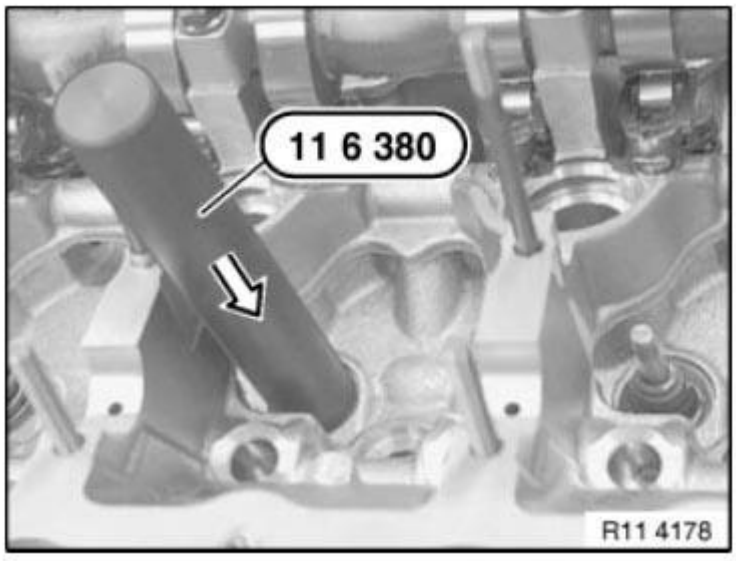


Fig. 330: Pressing Valve Stem Seal Using Special Tool 11 6 380
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

VARIABLE CAMSHAFT TIMING

11 36 655 REMOVING AND INSTALLING/REPLACING BOTH SOLENOID VALVES (N54, N54T)

IMPORTANT: Always check that the solenoid valves are clean during removal and installation.

Possible malfunctions if valves are contaminated:

- Rough running
- OBD incorrect entry
- Poor exhaust gas values
- Low engine power

IMPORTANT: Risk of damage!

Do not clean solenoid valves with compressed air.

Necessary preliminary tasks

- Read out fault memory in DME control unit
- Switch off ignition

- Remove **FAN COWL**

NOTE: Carefully press coolant hose and pressure line (not shown) to one side.

NOTE: Solenoid valve (2) controls the intake adjuster.

Solenoid valve (3) controls the exhaust adjuster.

Disconnect plug connections (1 and 4).

Installation note:

Do not mix up plug connections (1 and 4) of solenoid valves.

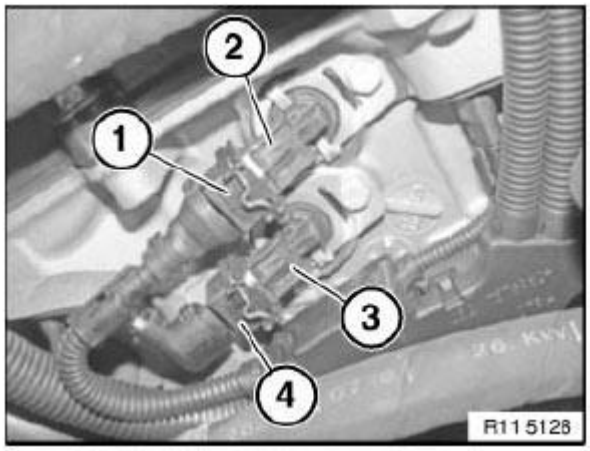


Fig. 331: Identifying Solenoid Valve Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Plug connections (1 and 4) must snap audibly into place!

Unfasten screws (3 and 4).

Tightening torque **11 36 3AZ** .

Carefully pull out solenoid valves (1 and 2).

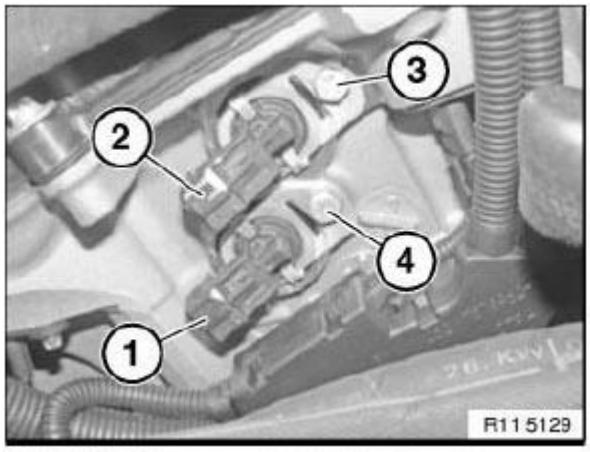


Fig. 332: Identifying Solenoid Valves
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace sealing ring (1) on solenoid valve (2).

NOTE: Moisten sealing ring (1) with engine oil.

Avoid damaging, e.g. notches or scratches, the solenoid valve (2).

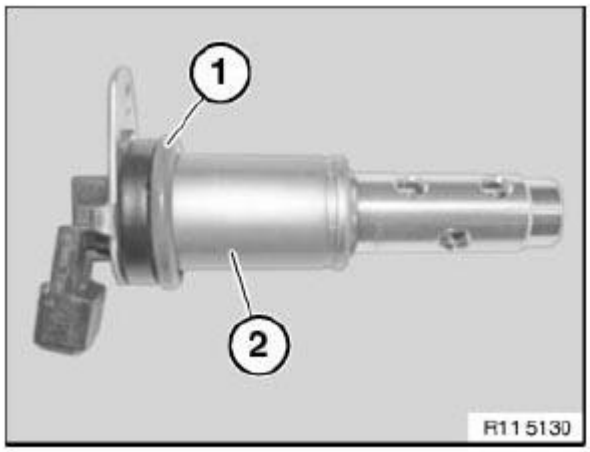


Fig. 333: Identifying Sealing Ring On Solenoid Valve
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Do not tilt solenoid valves (1 and 2) when inserting into cylinder head.

Carefully insert solenoid valves (1 and 2) up to stop.

Ensure correct installation position.

Insert screws (3 and 4) and tighten down.

Tightening torque **11 36 3AZ** .

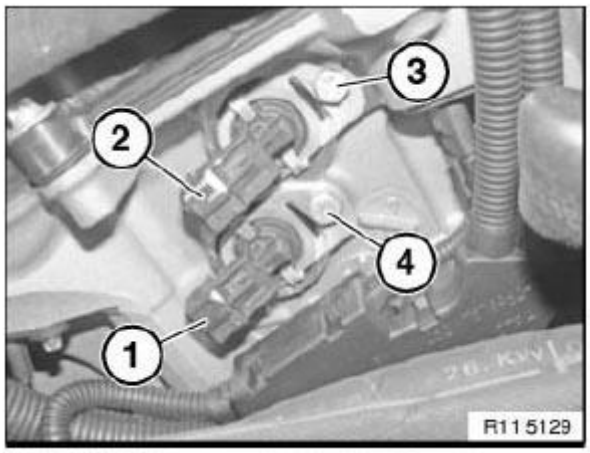


Fig. 334: Identifying Solenoid Valves
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Delete fault memory.

Check function of DME control unit.

11 36 046 REMOVING AND INSTALLING/REPLACING INTAKE AND EXHAUST CAMSHAFT ADJUSTERS (N54, N54T)

IMPORTANT: To open central bolts, release at intake and exhaust adjusters with special tool 11 4 280 only.

Necessary preliminary tasks:

- Remove cylinder head cover

Remove fastener (1) in direction of arrow.

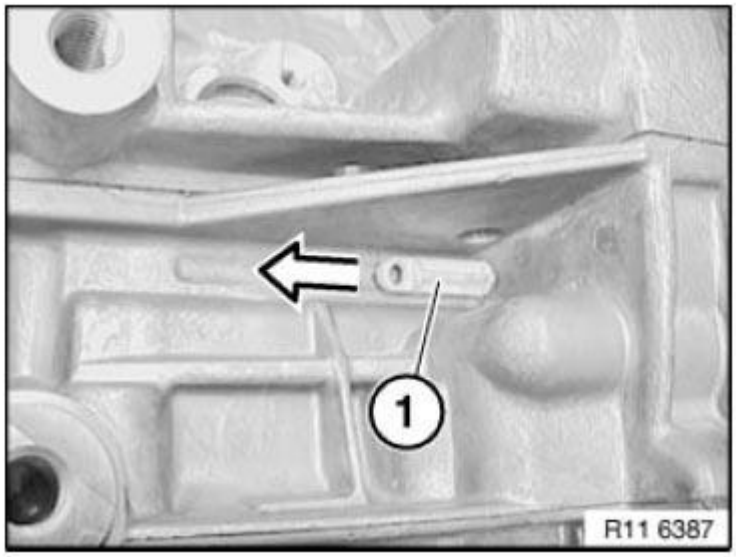


Fig. 335: Identifying Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

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.

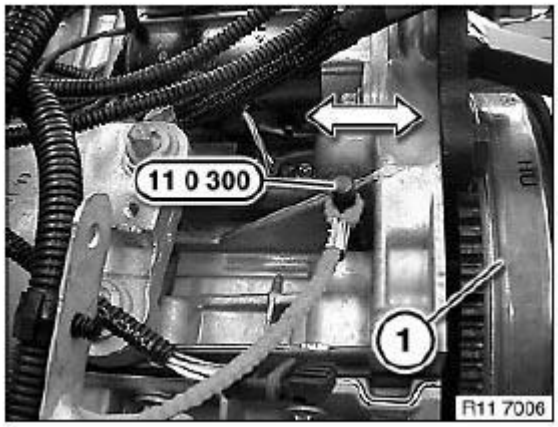


Fig. 336: Sliding Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

With cylinder No. 1 in ignition TDC position, intake camshaft (1) at 6th cylinder points downwards at an angle to the left.

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

Installation note:

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

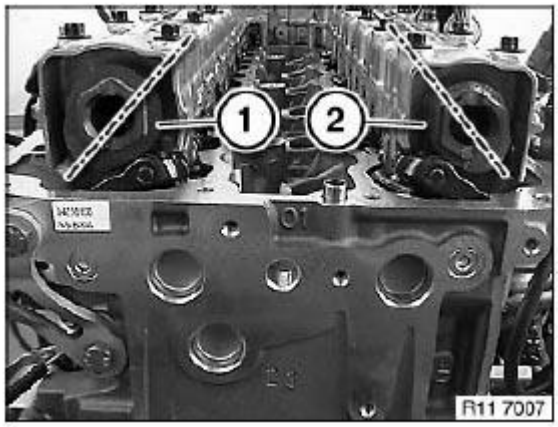


Fig. 337: Identifying Inlet And Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

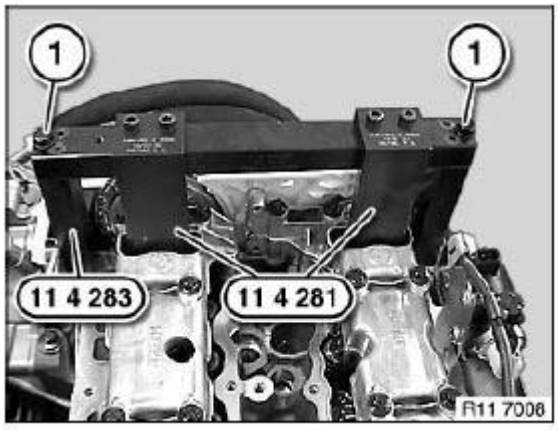


Fig. 338: Identifying Special Tool 11 4 280
Courtesy of BMW OF NORTH AMERICA, INC.

Release central bolt of exhaust camshaft adjuster (1).

Release central bolt of intake camshaft adjuster (2).

Tightening torque **11 36 1AZ** .

Release **CHAIN TENSIONER** .

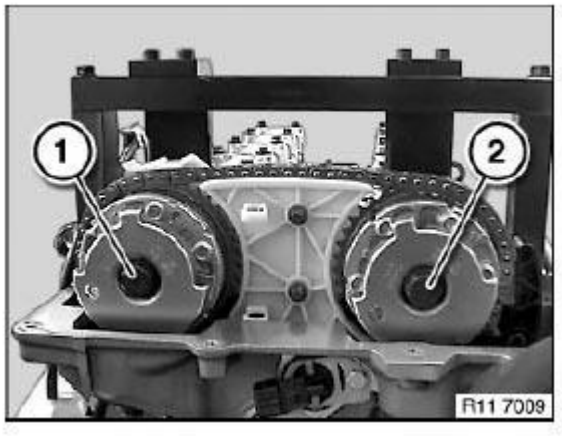


Fig. 339: Identifying Inlet And Exhaust Camshaft Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Detach exhaust camshaft adjuster (1) from exhaust camshaft.

Detach intake camshaft adjuster (2) from intake camshaft.

Installation note:

To facilitate removal and installation of the intake and exhaust adjusters, turn the increment wheels at the aperture downwards.

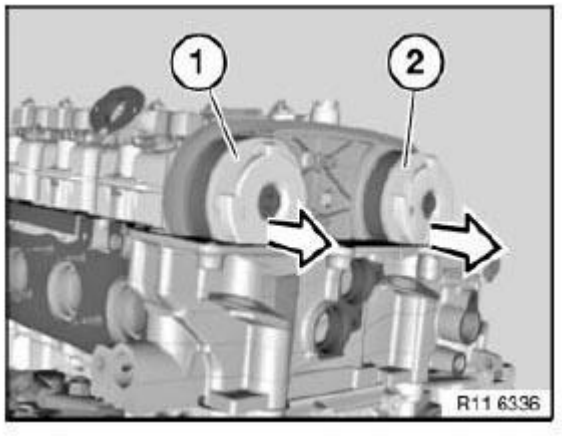


Fig. 340: Identifying Inlet/Exhaust Adjustment Unit
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT:

- **Risk of mixing up the intake and exhaust adjusters.**
- **Mixing up the intake and exhaust adjusters will cause damage to the engine.**

The intake and exhaust camshaft adjusters are different.

The variable camshaft timing control is marked with AUS and EX for the exhaust camshaft.

The variable camshaft timing control is marked with EIN and IN for the intake camshaft.

The increment wheels can be fitted alternatively.

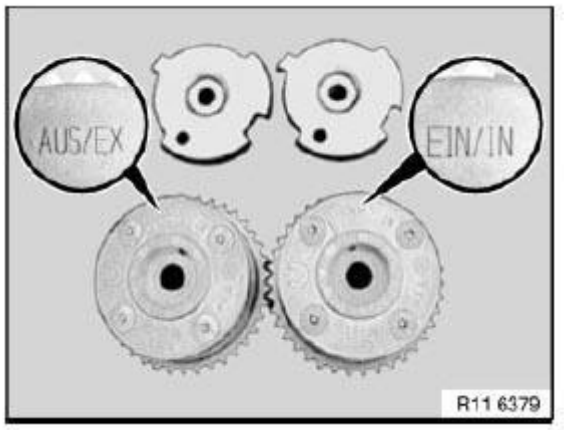


Fig. 341: Identifying AUS And EX Marks For Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Position intake and exhaust adjusters on camshafts.

Installation position of intake and exhaust adjusters can be freely selected.

Installation note:

Replace screws (1 and 2).

Insert screws (1 and 2).

Adjust **VALVE TIMING** .

Fit **CHAIN TENSIONER** .

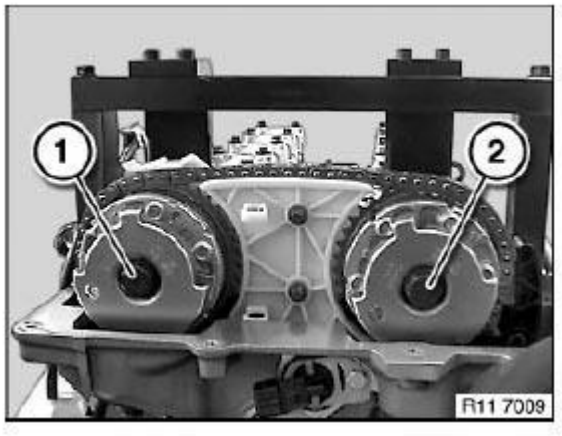


Fig. 342: Identifying Inlet And Exhaust Camshaft Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Incorrect installation possible.

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

NOTE: Schematic representation on removed chain drive.

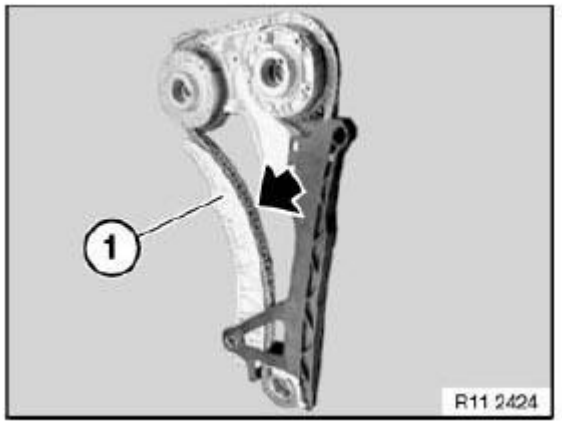


Fig. 343: Locating Tensioning Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

OIL SUPPLY

11 40 000 CHECKING ENGINE OIL PRESSURE (N54, N54T)

Necessary preliminary tasks:

- Remove front **IGNITION COIL COVER**

Disconnect plug connection (1) on oil pressure switch.

Installation note:

Plug connection (1) must snap audibly into place!

Remove oil pressure switch (2).

Tightening torque **12 61 1AZ** .

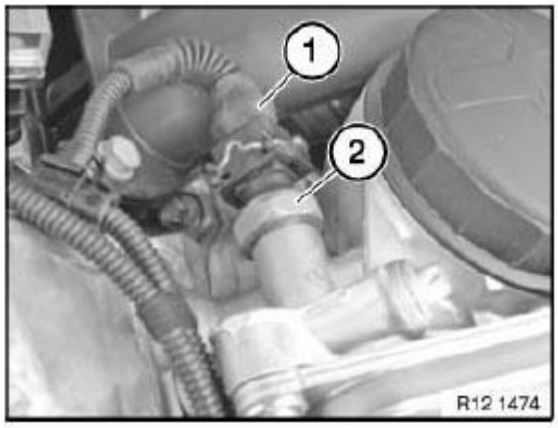


Fig. 344: Identifying Oil Pressure Sensor And Plug
Courtesy of BMW OF NORTH AMERICA, INC.

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

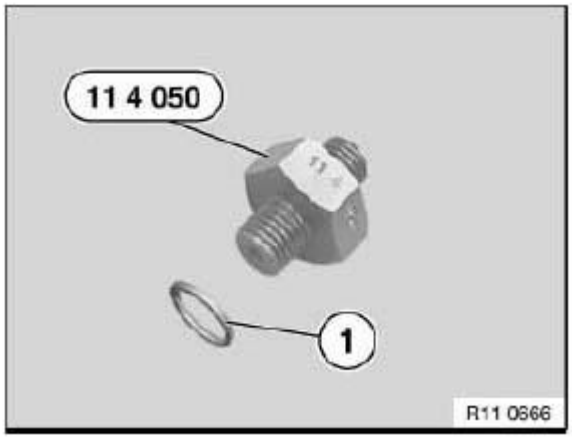


Fig. 345: Identifying Special Tool (11 4 050) And Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

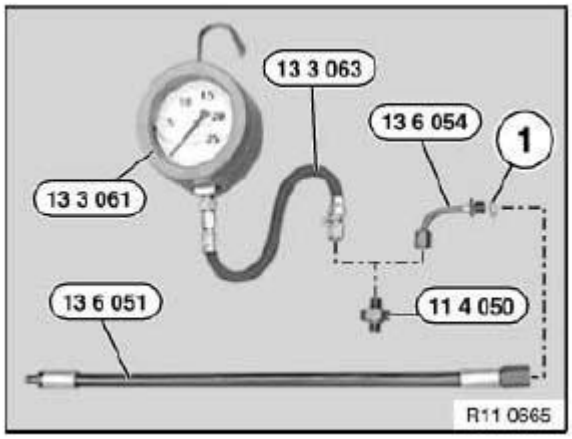


Fig. 346: Checking Engine Oil Pressure Using BMW Diagnosis System
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

OIL PUMP WITH FILTER AND DRIVE

11 41 000 REMOVING AND INSTALLING OIL PUMP (N54, N54T)

Necessary preliminary tasks:

- Remove **OIL SUMP**

Release screws (1).

Tightening torque **11 41 1AZ** .

Installation note:

Replace aluminum screws

Remove intake pipe (2) in direction of arrow.

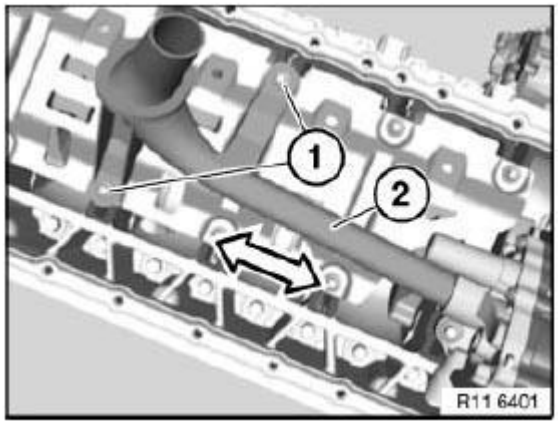


Fig. 347: Removing Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Secure oil pump drive gear with special tool **11 0 300** to oil pump.

IMPORTANT: Release central bolt (2) only with special tool 11 0 300 .

Tightening torque **11 41 4AZ** .

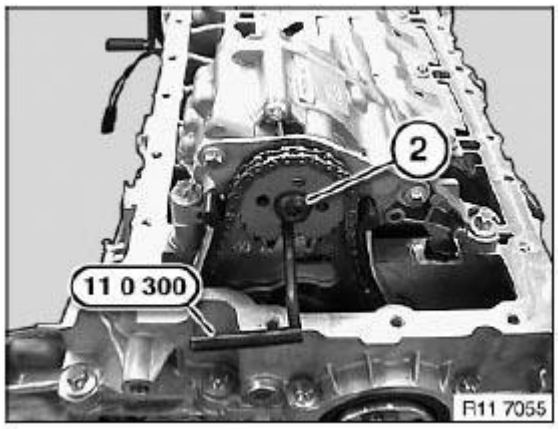


Fig. 348: Securing Oil Pump Drive Gear Using Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

Tightening torque **11 41 3AZ** .

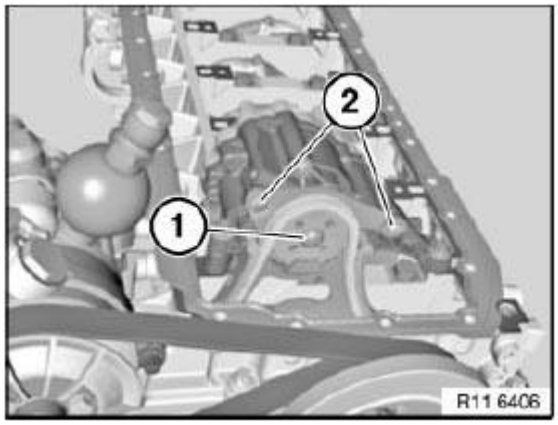


Fig. 349: Identifying Bolt And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 41 2AZ** .

Installation note:

Replace aluminum screws

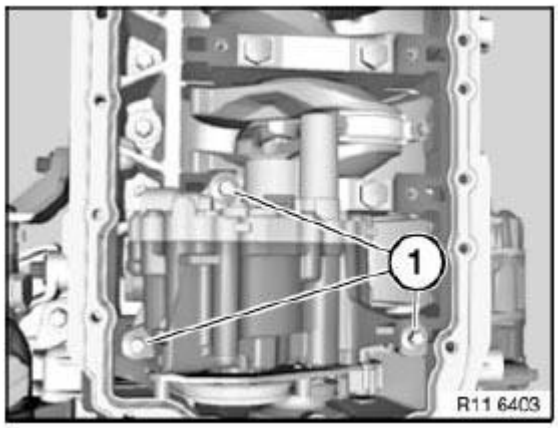


Fig. 350: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Pull of drive gear (1) in direction of arrow.

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

Do not remove drive gear.

Remove oil pump (2) in direction of arrow.

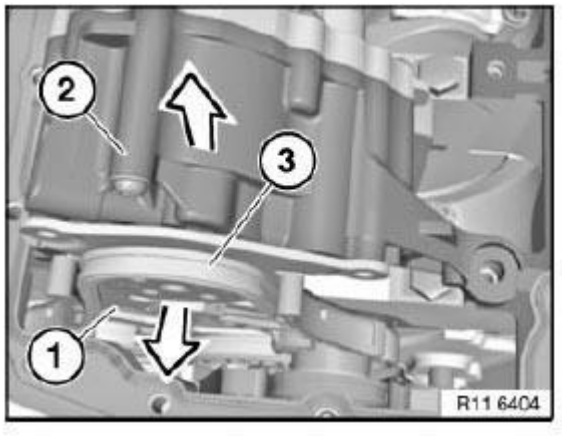


Fig. 351: Pulling Drive Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Check spacer bushes (1) for damage and firm seating.

Replace spacer bushes (1) if necessary

Align mounting flats (3) on oil pump (2) to drive gear.

Install oil pump (2).

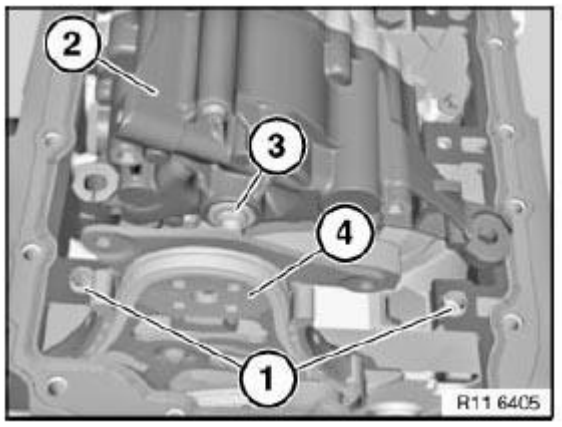


Fig. 352: Identifying Spacer Bushings And Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 66 000 REMOVING AND INSTALLING OR REPLACING VACUUM/OIL PUMP (N47 D20 O1)

IMPORTANT: It is possible to remove and install the vacuum oil pump without removing the transmission.

Necessary preliminary work:

- Removing oil sump.

Release screws (1).

Remove intake snorkel in direction of arrow.

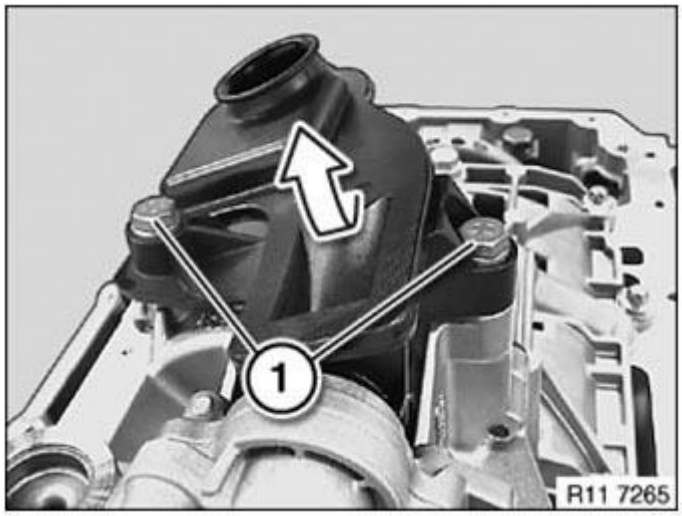


Fig. 353: Removing Intake Snorkel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

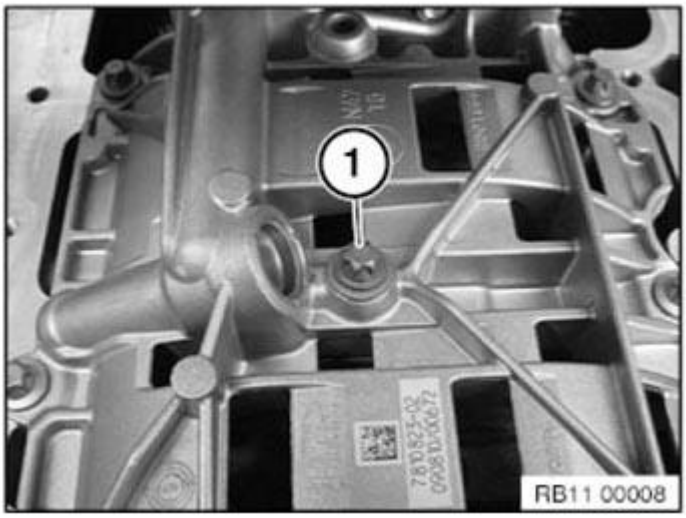


Fig. 354: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Installation note:

Clean and blow out thread

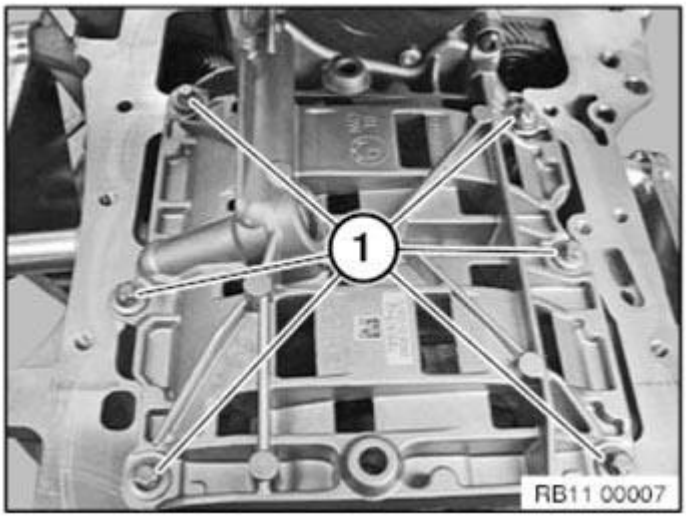


Fig. 355: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

When installed, the oil pump chain must be fed out from the sprocket wheel of the oil pump drive gear; the sprocket wheel cannot be removed.

NOTE: Illustration shows gear case cover removed.

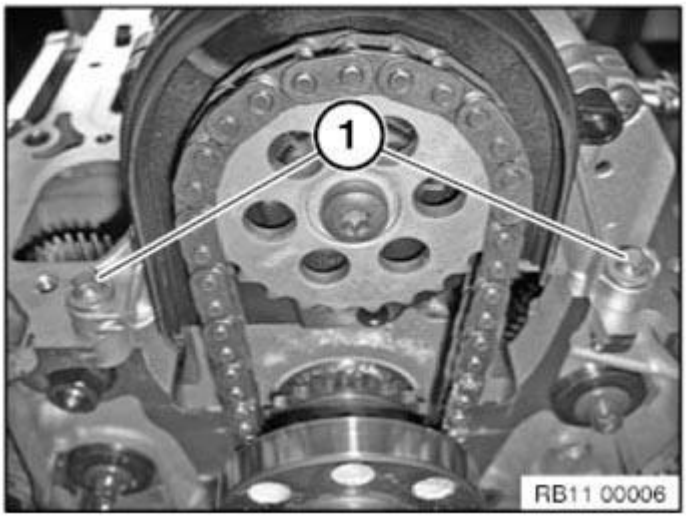


Fig. 356: Identifying Gear Case Cover Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Oil vacuum pump must be fed out at chain drive (1).

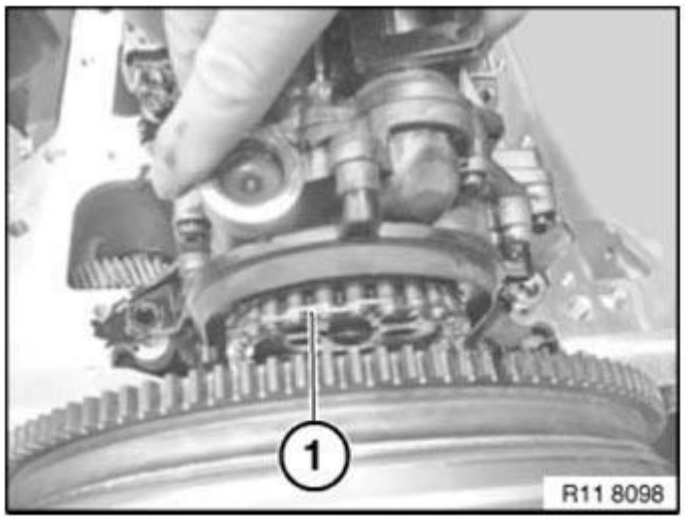


Fig. 357: Identifying Chain Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

Installation note:

Clean all sealing surfaces.

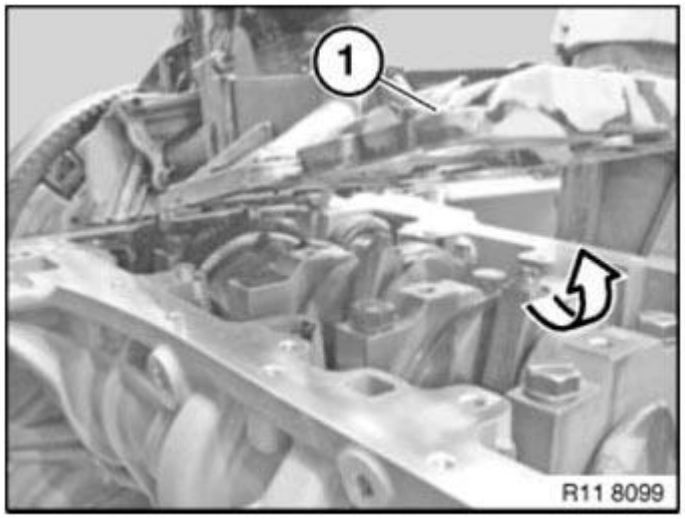


Fig. 358: Identifying Oil Vacuum Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Install all screws (1) and tighten down.

Tightening torque: **11 41 1AZ** .

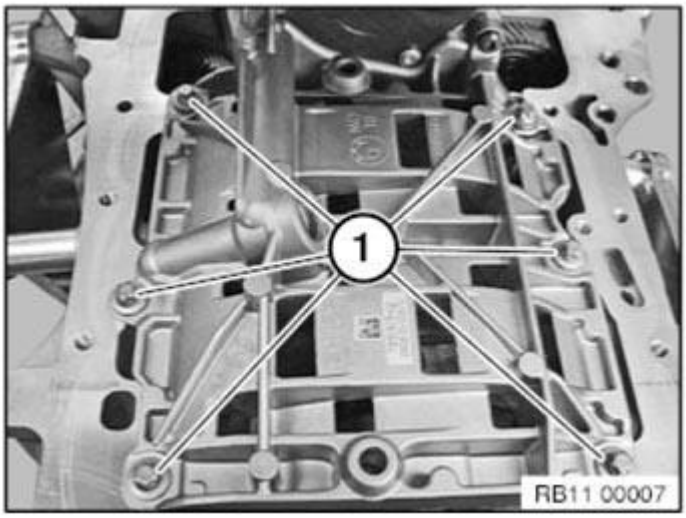


Fig. 359: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Install and tighten down screws (1).

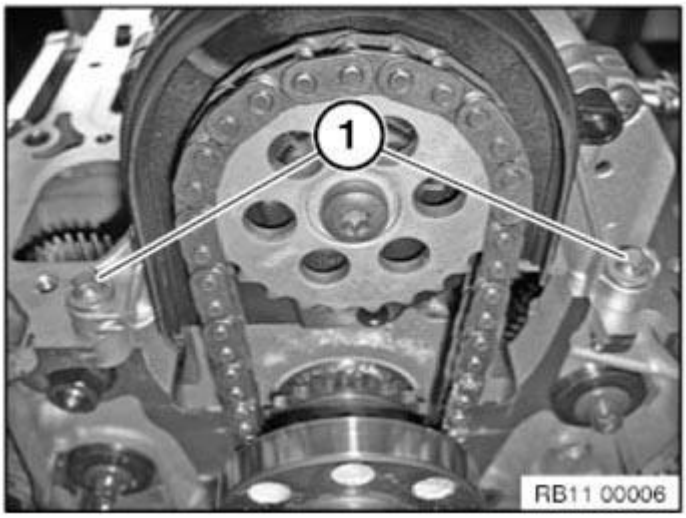


Fig. 360: Identifying Gear Case Cover Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Clean and blow out thread

Insert and secure screw (1).

Secure screw (1) with special tool **00 9 120** .

Tightening torque: **11 41 2AZ** .

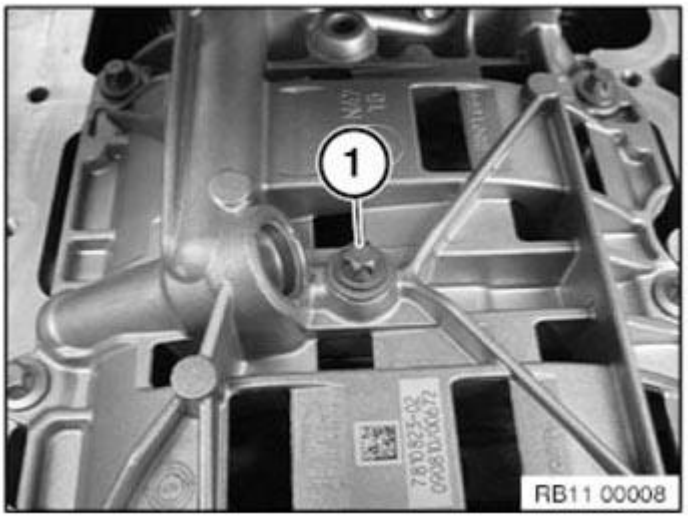


Fig. 361: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 41 010 REMOVING AND INSTALLING/REPLACING CHAIN MODULE FOR OIL PUMP/VACUUM PUMP (N54, N54T)

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 **CYLINDER HEAD COVER**
- Remove **OIL SUMP**
- Remove **DRIVE BELT**
- Remove drive belt **TENSIONER**
- Remove **VIBRATION DAMPER**
- Remove vacuum pump **SEALING CAP**
- Remove **CHAIN TENSIONER**.

Turn sprocket (3) at central bolt (crankshaft) into position.

Screw special tool **11 8 650** into crankcase.

Position special tool **11 0 290** on sprocket

and on special tool **11 8 650** .

Release screw (1).

Tightening torque **11 66 2AZ** .

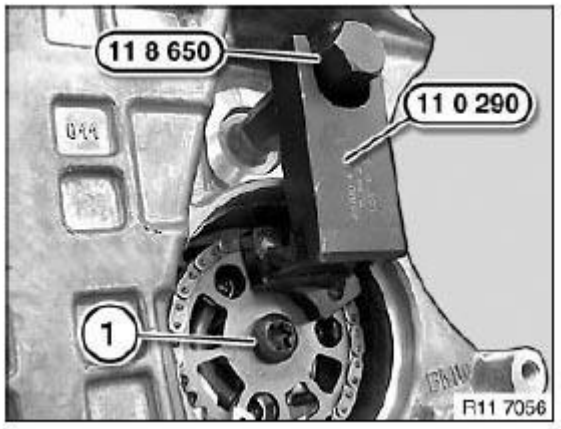


Fig. 362: Positioning Special Tool 11 0 290 On Sprocket Wheel And On Special Tool 11 8 650
Courtesy of BMW OF NORTH AMERICA, INC.

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 (3) at hexagon head (4) of vacuum pump.

Installation note:

A lock pin is pre-installed if the triangular drive is replaced.

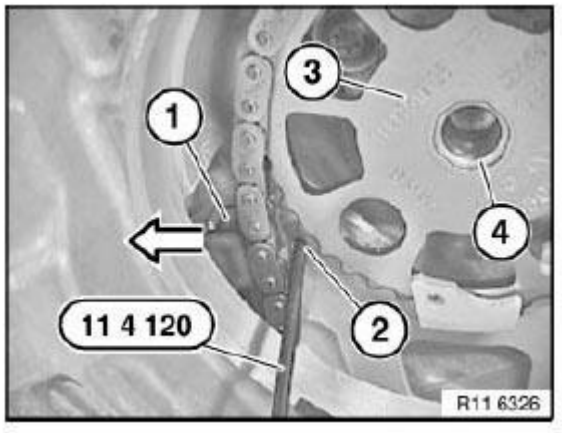


Fig. 363: Pressing Timing Chain Using Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

Tightening torque **11 41 3AZ** .

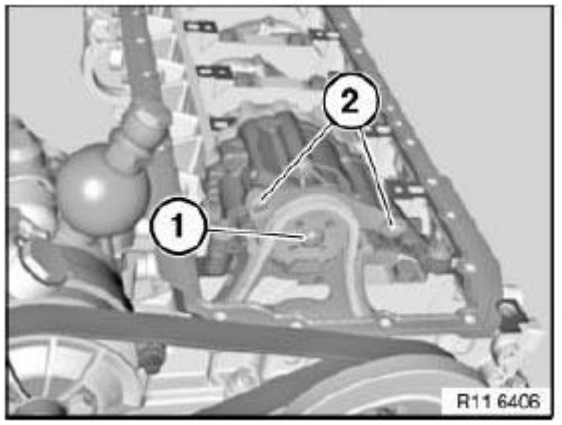


Fig. 364: Identifying Bolt And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Sprocket must be blocked in order to release central bolt (2).

Insert pin (1) with 6 mm dia. between sprocket and housing of oil pump.

Release oil pump central bolt (2).

Tightening torque **11 41 5AZ** .

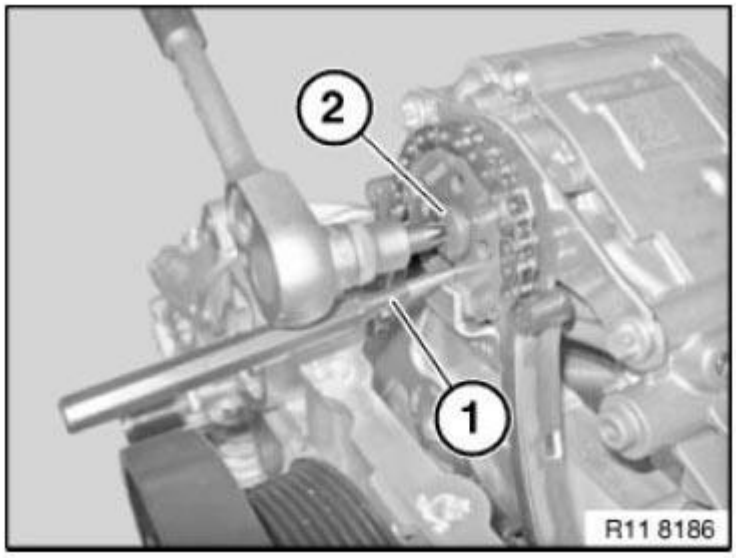


Fig. 365: Identifying Central Bolt And Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Secure **CRANKSHAFT AND CAMSHAFT** .

Do **not** remove special tools **11 0 300** and **11 4 280** .

Fit special tool 11 9 280.

Release central screw (1).

NOTE: A 3/4 inch tool is needed to release the central bolt.

A second person is required.

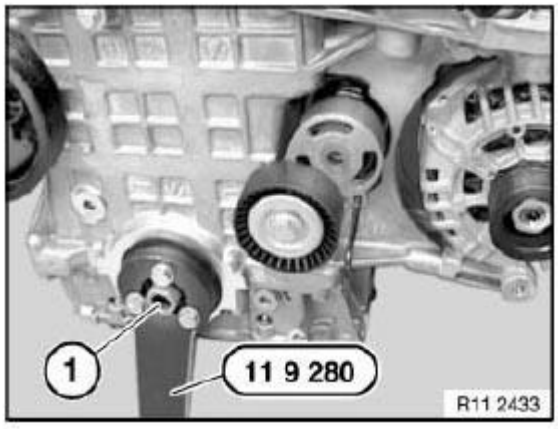


Fig. 366: Identifying Central Bolt With Special Tool (11 9 280)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove hub (2) towards front.

Installation note:

Replace front **CRANKSHAFT SEAL**.

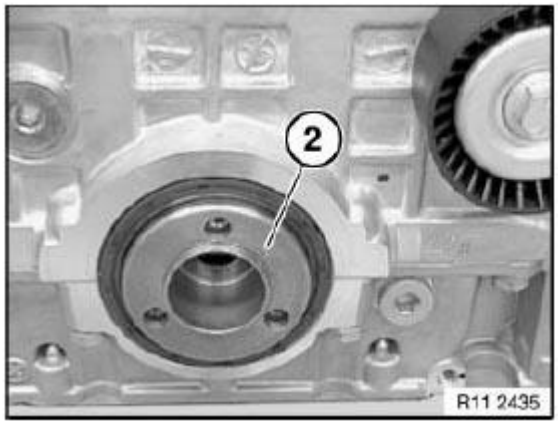


Fig. 367: Identifying Front Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Open screw plug on bedplate.

Installation note:

Replace seal.

Release screw (1) with special tool **11 8 640** on triangular drive.

Tightening torque **11 41 3AZ** .

Installation note:

Replace aluminum screws.

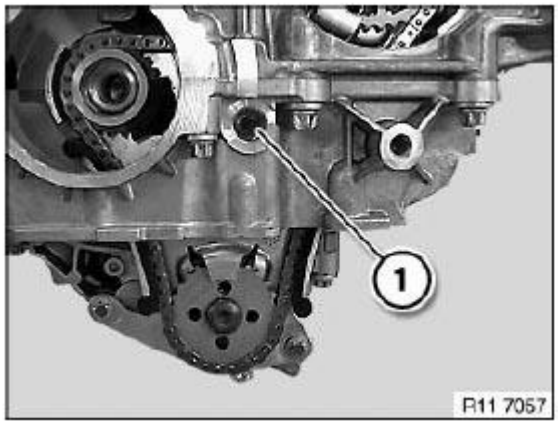


Fig. 368: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Remove triangular drive (1) in direction of arrow.

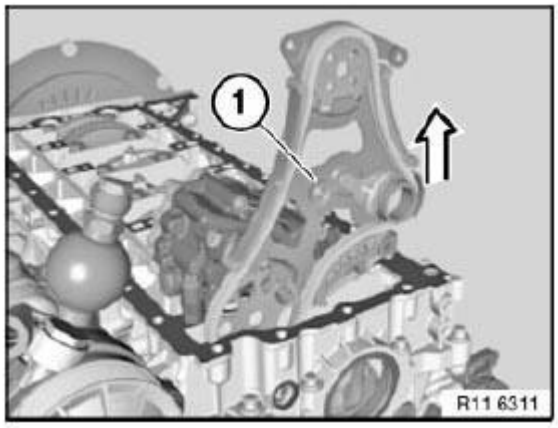


Fig. 369: Removing Chain Module
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket (2).

Collar on sprocket (2) points to **timing chain drive.**

Incorrect assembly will result in **engine damage.**

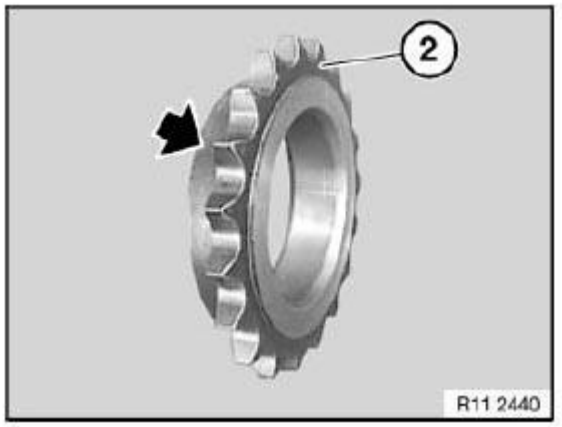


Fig. 370: Identifying Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The N54 engine requires special friction plates between the friction surfaces.

The engine will incur damage if the friction plates are damaged or are not fitted.

Friction plates (1 and 2) must be clipped into place on the oil pump module sprocket.

The third friction plate is attached to the crankshaft hub.

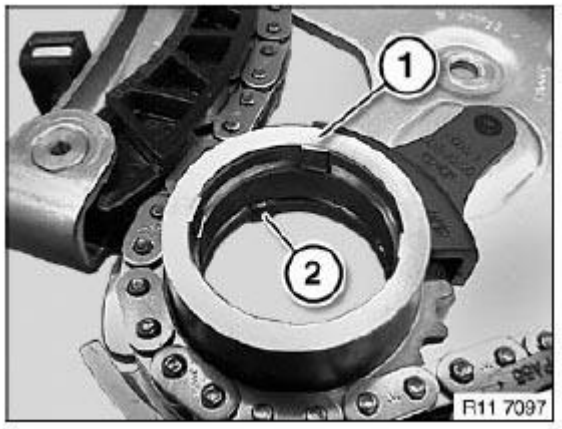


Fig. 371: Identifying Friction Plates
Courtesy of BMW OF NORTH AMERICA, INC.

Feed in oil pump chain module.

Secure oil pump chain module with screws (2).

Tightening torque **11 41 3AZ** .

Secure screw (1) with special tool **11 8 640** .

Tightening torque **11 41 3AZ** .

Installation note:

Check both friction plates (3) with retainers for correct installation position.

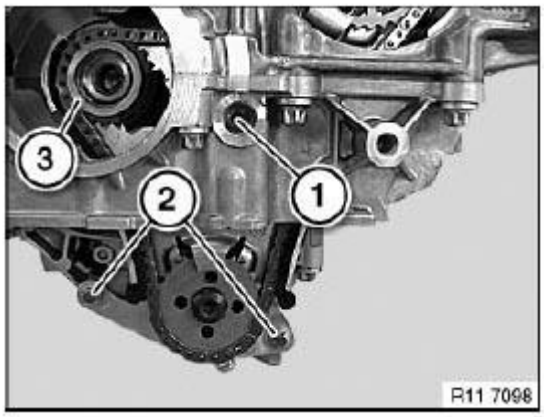


Fig. 372: Identifying Friction Plate Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Push on friction plate (1) without retainers.

IMPORTANT: The N54 engine requires special friction plates between the friction surfaces.

The engine will incur damage if the friction plates are damaged or are not fitted.

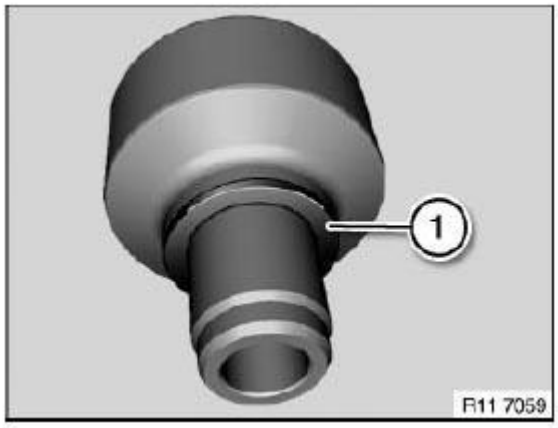


Fig. 373: Identifying Friction Plate Without Retainers
Courtesy of BMW OF NORTH AMERICA, INC.

Fit central bolt (1).

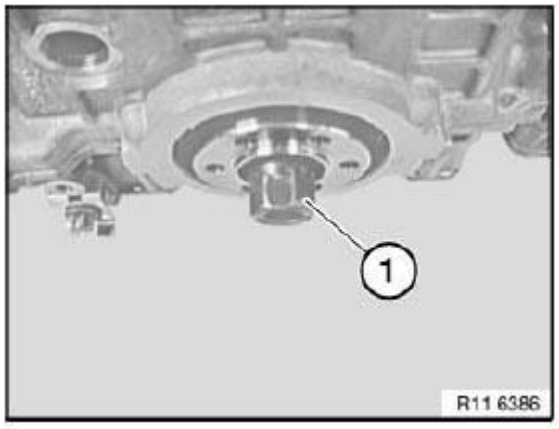


Fig. 374: Identifying Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tools **11 8 650** and **11 0 290** .

Tighten bolt (1).

Tightening torque **11 66 2AZ** .

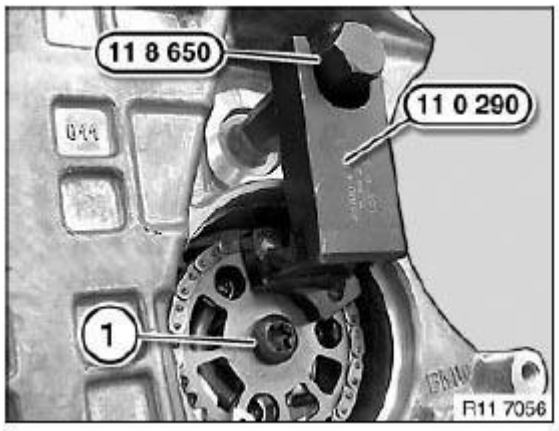


Fig. 375: Positioning Special Tool 11 0 290 On Sprocket Wheel And On Special Tool 11 8 650
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool **11 0 300** .

Tighten bolt (2).

Tightening torque **11 41 4AZ** .

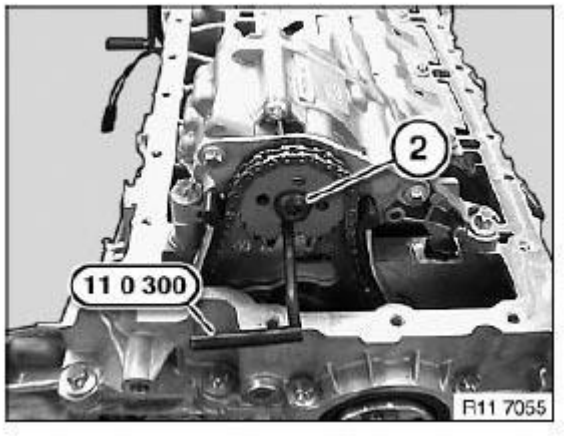


Fig. 376: Securing Oil Pump Drive Gear Using Special Tool 11 0 300
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down special tool **11 5 200** with screws (1) to hub.

Do **not** remove special tools **11 0 300** and **11 4 280** .

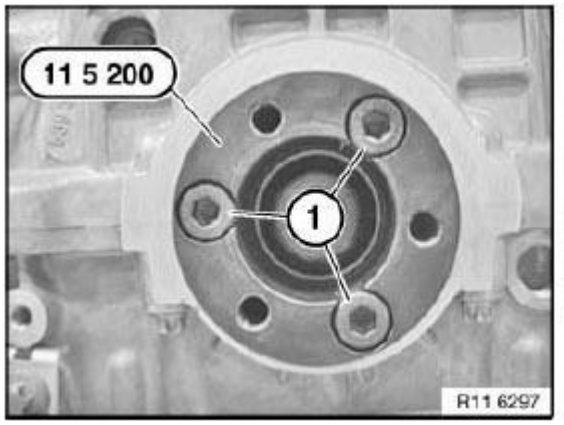


Fig. 377: Identifying Screws With Special Tool (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten central bolt to jointing torque.

Tightening torque **11 21 1AZ** .

Mark torsion angle tightening on tool with stroke of paint (1).

See graphic.

IMPORTANT: Do not remove tool from central bolt during torsion angle tightening. Risk of damage!

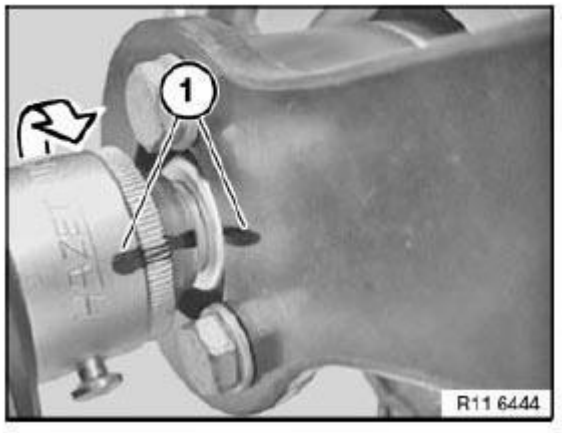


Fig. 378: Identifying Colored Line
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace front **CRANKSHAFT SEAL**.

Assemble engine.

OIL FILTER AND LINES

11 42 198 REMOVING AND INSTALLING OIL FEED LINE FOR EXHAUST TURBOCHARGER (N54)

Remove exhaust turbocharger.

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!

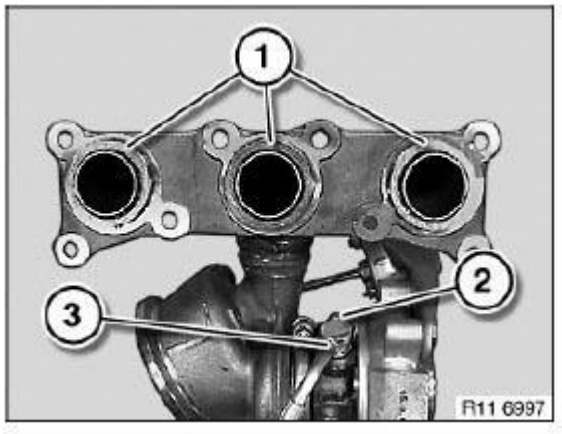


Fig. 379: Identifying Turbocharger
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, release oil feed line (3) with suitable pliers at connection and remove.

Installation note: Replace O-rings.

Assemble engine.

11 42 250 REMOVING AND INSTALLING OIL RETURN LINE FOR EXHAUST TURBOCHARGER (N54)

Remove both catalytic converters.

Remove right engine support arm.

Undo screws (1 and 2)

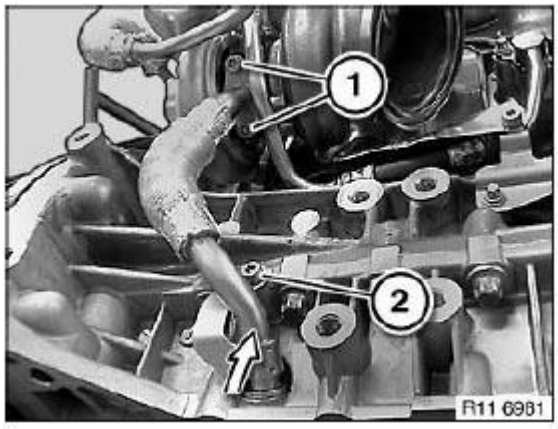


Fig. 380: Removing Oil Return Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

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).

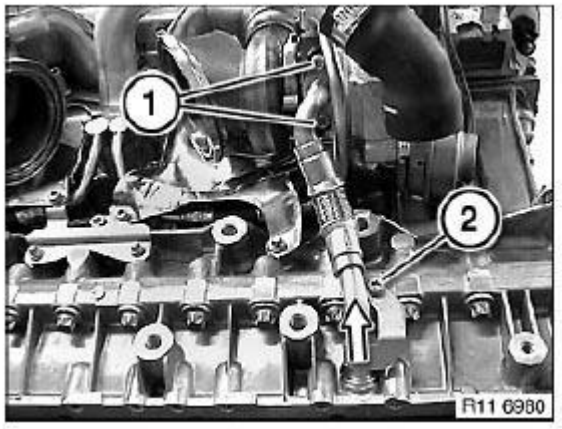


Fig. 381: Locating Oil Return Pipe Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque: **11 42 7AZ.**

Remove oil return line in direction of arrow.

Installation note: Renew O-rings and gaskets.

Assemble engine.

11 42 020 REMOVING AND INSTALLING/REPLACING FULL-FLOW OIL FILTER (N54, N54T)

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 PLENUM**
- Drain **COOLANT**
- Unlock coolant hose and detach
- Remove **OIL-TO-WATER HEAT EXCHANGER**

Release oil filter cover with special tool **11 9 240** . Tightening torque **11 42 1AZ** .

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

Installation note:

Replace sealing rings on oil filter cover.

Moisten sealing rings with engine oil.

Fig. 382: Releasing Oil Filter Cap Using Special Tool 11 9 240
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Release screw (2).

NOTE: Have cleaning cloth ready to catch residual oil.

Tightening torque: **11 42 2AZ.**

Installation note:

Replace all seals.

If necessary, replace filter element.

Modify oil pressure switch when replacing.

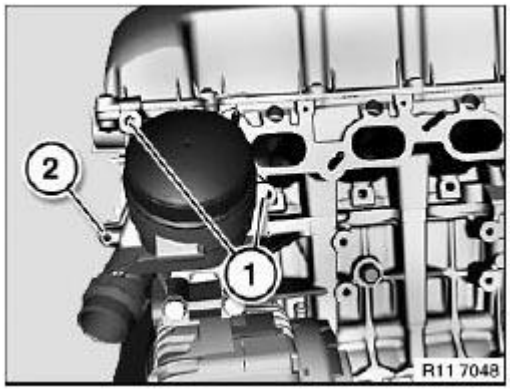


Fig. 383: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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** t.
- 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.

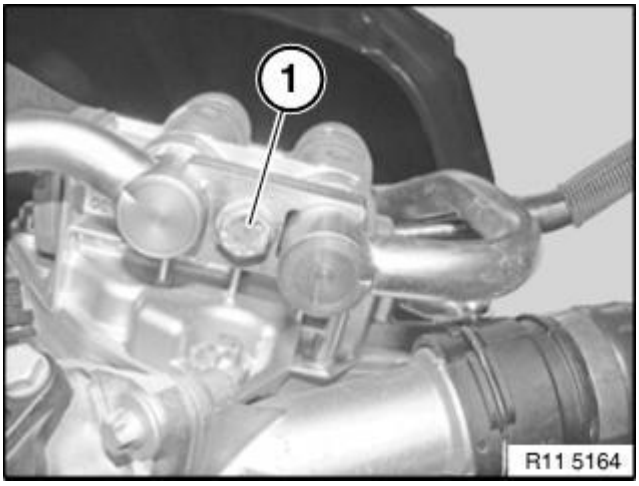


Fig. 384: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on thermostat housing. Remove oil-coolant heat exchanger towards front. Picture shows E9x
Installation note: Replace gasket.

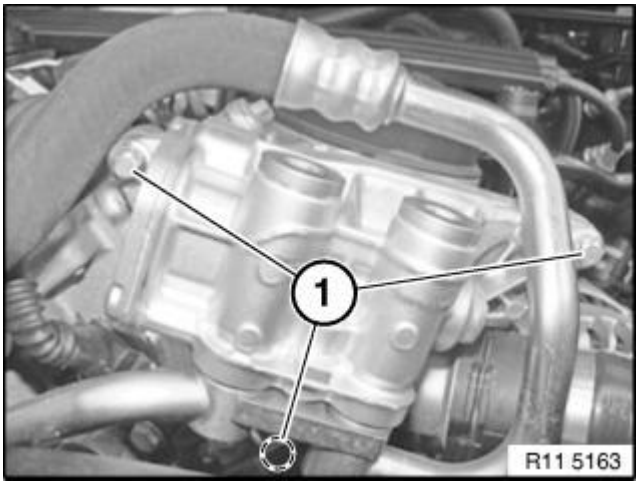


Fig. 385: Identifying Bolts On Oil-Coolant Heat Exchanger
Courtesy of BMW OF NORTH AMERICA, INC.

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-TO-WATER HEAT EXCHANGER (N54, N54T)

WARNING: Risk 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 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 apparatus.

Necessary preliminary tasks:

- Drain **COOLANT**
- Remove **FAN COWL**

Release screw (1).

Tightening torque **11 42 3AZ** .

Do not detach engine oil pipe from oil-to-water heat exchanger in downward direction.

Installation note:

Replace O-rings.

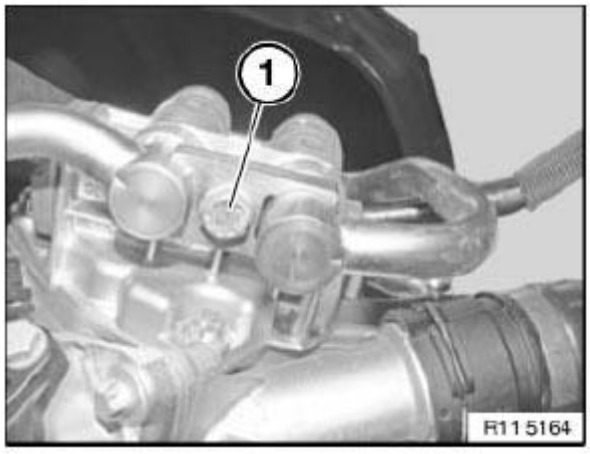


Fig. 386: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1) on oil-coolant heat exchanger.

Remove oil-coolant heat exchanger towards front.

Picture shows E9x

Installation note:

Replace seal.

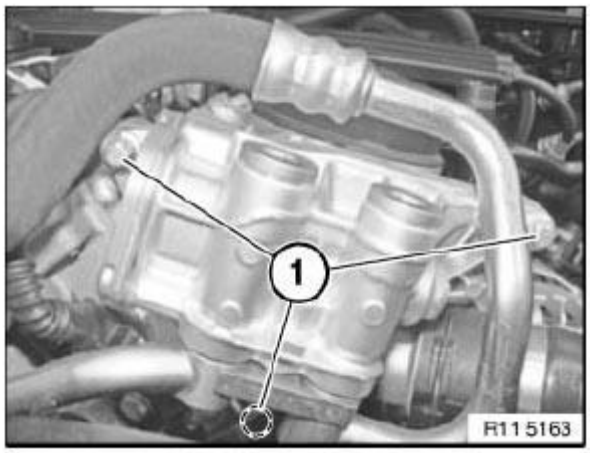


Fig. 387: Identifying Oil-Coolant Heat Exchanger Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Turn off engine.

Wait approx. 5 minutes and check oil level.

Top up engine oil if necessary.

WATER PUMP WITH DRIVE

11 51 000 REMOVING AND INSTALLING/RENEWING COOLANT PUMP (N54, N54T)

WARNING: Risk 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:

- Remove **COOLANT THERMOSTAT**
- Remove **RIGHT DIAGONAL STRUT**

Release coolant hose (1).

Release coolant hose (3).

Disconnect plug connection (2).

Release screws (5).

Installation note:

Replace aluminum screws.

Tightening torque **11 51 1AZ** .

Installation note:

If a coolant pump is reused, it must be mechanically rotated once (breakaway torque at pump gears).

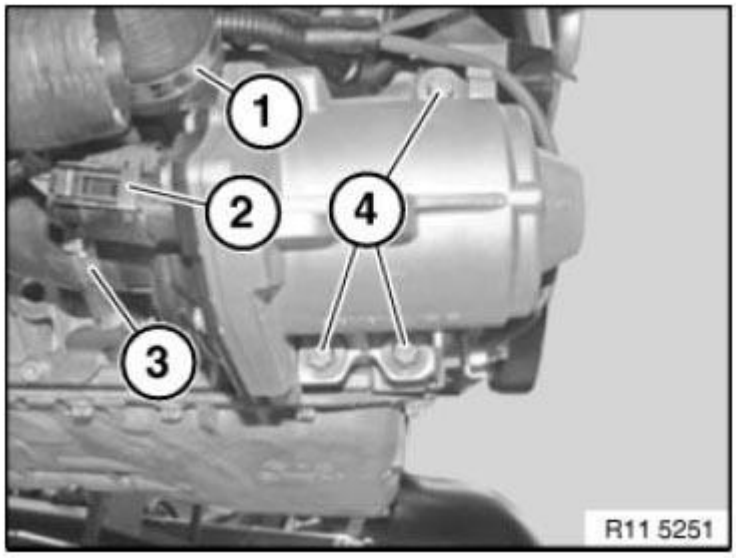


Fig. 388: Identifying Coolant Hose With Plug Connection And Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

One coolant pump rotation will be sufficient.

Assemble engine.

VENTING INSTRUCTIONS must be observed without fail.

THERMOSTAT AND CONNECTIONS

11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N54, N54T)

WARNING: Risk of scalding!

Only perform these tasks on an engine that has cooled down.

Danger of injury!

Risk of skidding due to coolant on the floor.

Recycling

Catch and dispose of drained coolant in a suitable collecting vessel.

Observe country-specific waste disposal regulations.

IMPORTANT: Read and comply with GENERAL NOTES .

Protect plug connections against coolant and dirt contamination.

Cover plug connections with suitable materials.

Necessary preliminary work:

- Remove **FAN COWL** .
- Remove front **UNDERBODY PROTECTION**
- Release **FRONT STABILIZER** on front axle.

Release screws (1) (only on front axle support)

Tightening torque **17 10 5AZ** .

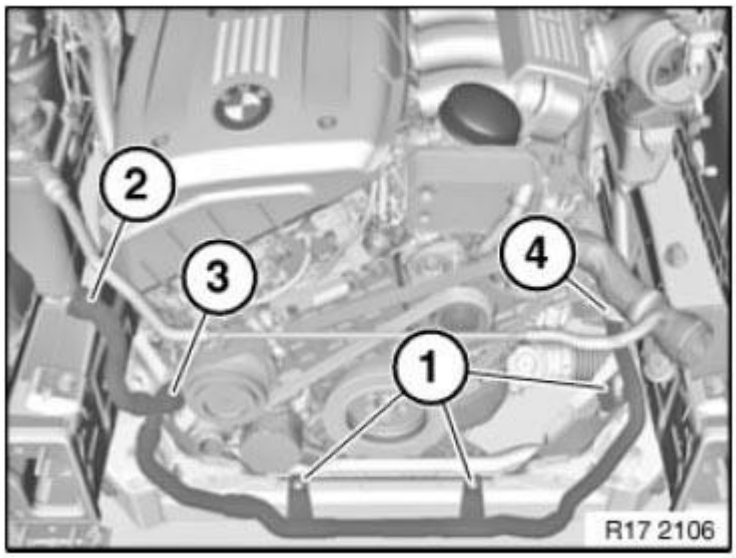


Fig. 389: Identifying Screws On Front Axle Support
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Illustration shows coolant thermostat removed.

Disconnect coolant hoses (arrows) on the thermostat (1) with clamping tongs.

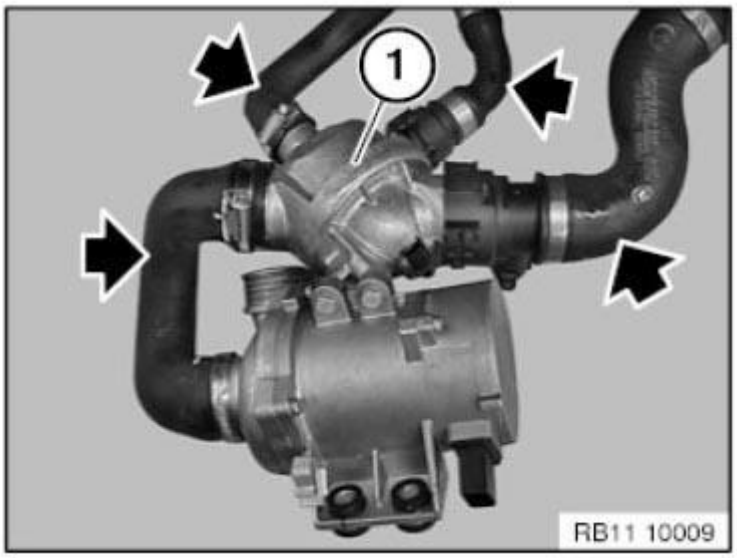


Fig. 390: Locating Coolant Hoses On Thermostat
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

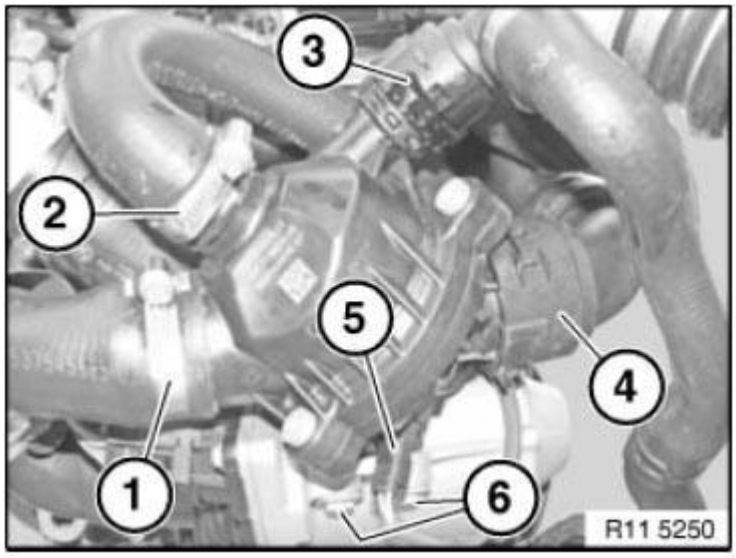


Fig. 391: Identifying Hose, Hose Clamp And Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Fill the **COOLING SYSTEM** .

Check function of cooling system.

11 53 740 REMOVING AND INSTALLING/REPLACING FEED LINE (N54, N54T)

WARNING: Risk of scalding!

Only perform this work after engine has cooled down.

Recycling

Catch and dispose of drained coolant in a suitable container.

Observe country-specific waste disposal regulations.

Necessary preliminary tasks:

- Drain **COOLANT**
- Remove both catalytic exhaust-gas converters. See **1832050 REMOVING AND INSTALLING/REPLACING CATALYTIC EXHAUST-GAS CONVERTER FOR CYLINDERS 1-3 (N54)** or **1832060 REMOVING AND INSTALLING/REPLACING CATALYTIC EXHAUST-GAS CONVERTER FOR CYLINDERS 4-6 (N54)** .

Unfasten hose clip (1).

Tightening torque **11 51 4AZ** .

Detach coolant hose of feed line in direction of arrow from coolant pump (2).

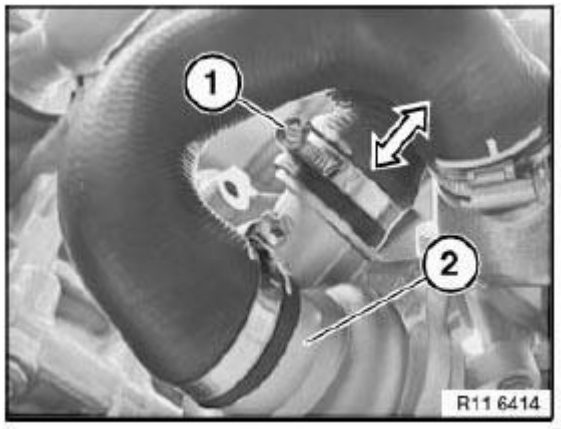


Fig. 392: Disconnecting Coolant Hose From Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Where necessary, to release the coolant feed lines (3 and 4), do not place pliers on the pipes.

Release screws (1 and 2).

Tightening torque **11 53 10AZ** .

If necessary, release coolant feed lines (3 and 4) with suitable pliers at connection.

Installation note:

Replace O-rings.

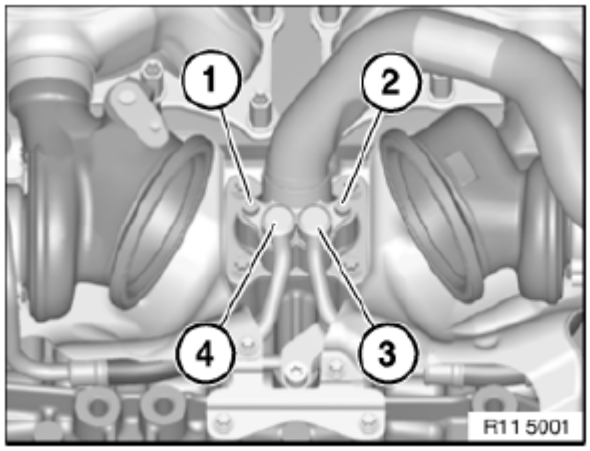


Fig. 393: Identifying Coolant Feed Lines And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For purposes of clarity, the graphic shows the released coolant feed lines removed.

Release screws (1).

Tightening torque **11 53 3AZ** .

Remove feed line (2).

Installation note:

Replace seal.

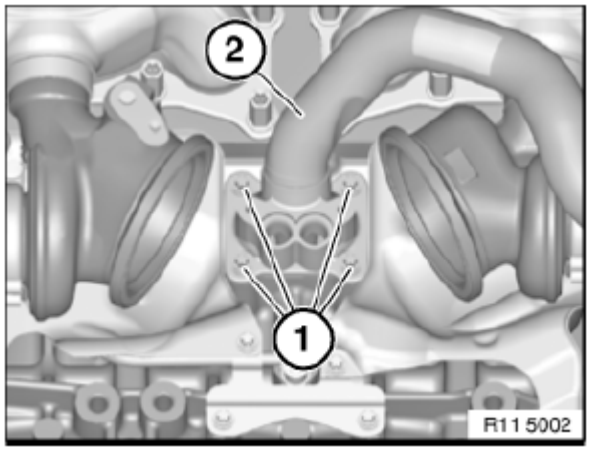


Fig. 394: Identifying Feed Line With Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Top up **COOLANT** .

BLEEDING INSTRUCTIONS must be observed without fail.

INTAKE MANIFOLD

11 61 365 REMOVING AND INSTALLING/REPLACING LEFT CHARGE AIR DUCT (N54, N54T)

Necessary preliminary tasks

- Remove **FAN COWL**
- Remove front **UNDERBODY PROTECTION**
- Remove **INTAKE SILENCER HOUSING**

IMPORTANT: Coat sealing rings of snap fasteners with lubricant.

Pressure pipes with quick-connect couplings cannot be fitted without antiseize agent.

Unlock quick-connect coupling.

Detach charge air duct (1) from charge air cooler (2).

Installation note:

- Coat sealing rings of snap fasteners with lubricant.
- Pressure pipes must audibly snap into place.

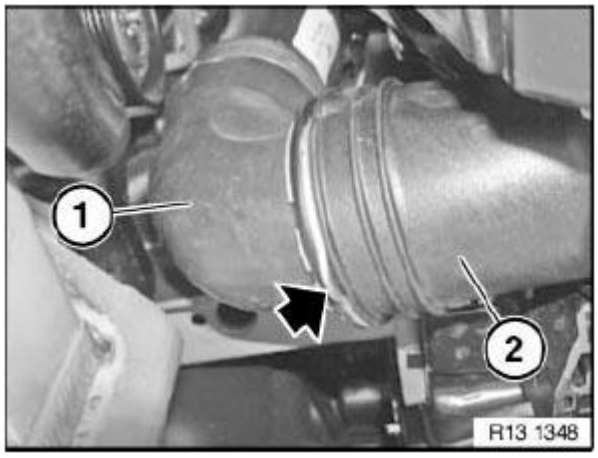


Fig. 395: Identifying Charge-Air Duct And Aircooler
Courtesy of BMW OF NORTH AMERICA, INC.

Release quick-connect couplings (1) by turning lock through 90°.

Detach recirculated-air hoses (2) and lay to one side.

Disconnect plug connection (3).

Unlock quick-connect coupling (5) and detach charge air duct (6) from throttle valve actuator.

Pull charge air duct (6) out of rubber grommet (4) and remove towards top.

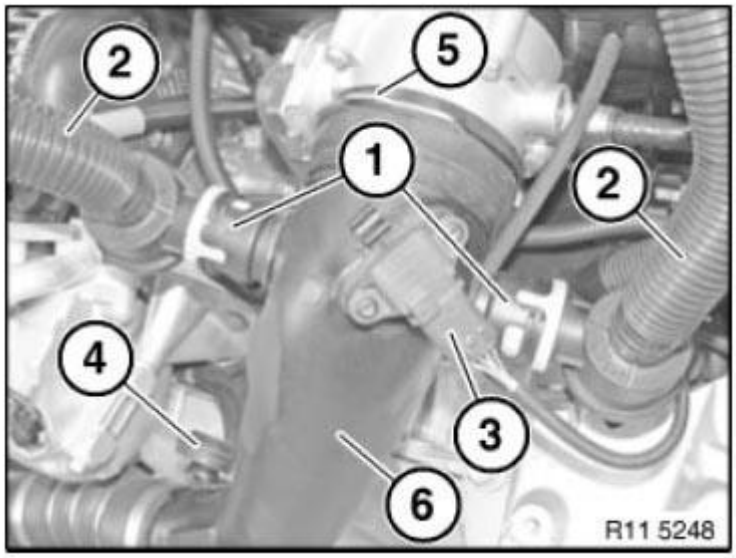


Fig. 396: Identifying Charge Air Duct, Air Hoses, Plug Connection And Grommet
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Bring lock (1) back 90° into installation position.

Pay attention to markings.

Recirculated-air hoses must snap audibly into place.

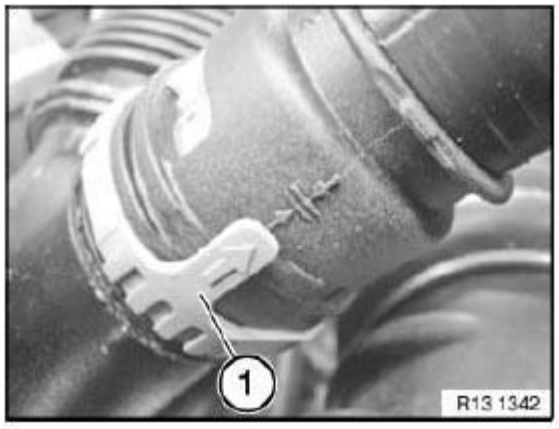


Fig. 397: Identifying Lock
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage! to sealing rings.

Special tool 11 8 670 is mandatory.

Attach charge air duct (1) with special tool **11 8 670** to charge air cooler (2).

Installation note:

Texts refer to and illustrations show the right side.

The procedure is identical for the left side.

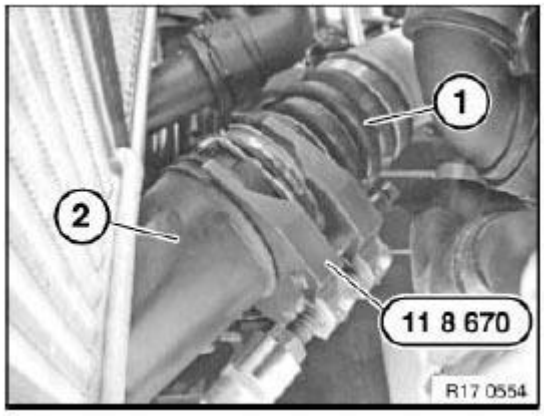


Fig. 398: Identifying Charge-Air Duct With Special Tool 11 8 670 To Intercooler
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Charge air hoses with clamp fastenings must be installed dry and free from grease!

If charge air hoses with clamp fastenings are not installed dry and free from grease, this may result in turbocharger failure!

11 61 362 REMOVING AND INSTALLING/REPLACING RIGHT CHARGE AIR DUCT (N54, N54T)

Necessary preliminary tasks

- Remove **COOLANT EXPANSION TANK**
- Remove **UNDERBODY PROTECTION**
- Remove right **TENSION STRUT**

IMPORTANT: Coat sealing rings of snap fasteners with lubricant.

Pressure pipes cannot be fitted without lubricant.

Mark vacuum hoses (1) and detach.

Mark vacuum hose (2) and detach.

Unscrew nuts (3).

Release screw (4).

Tightening torque, screw **11 65 6AZ** .

Raise bracket slightly.

Mark vacuum hose (5) on underside of pressure accumulator.

Remove vacuum accumulator with bracket.

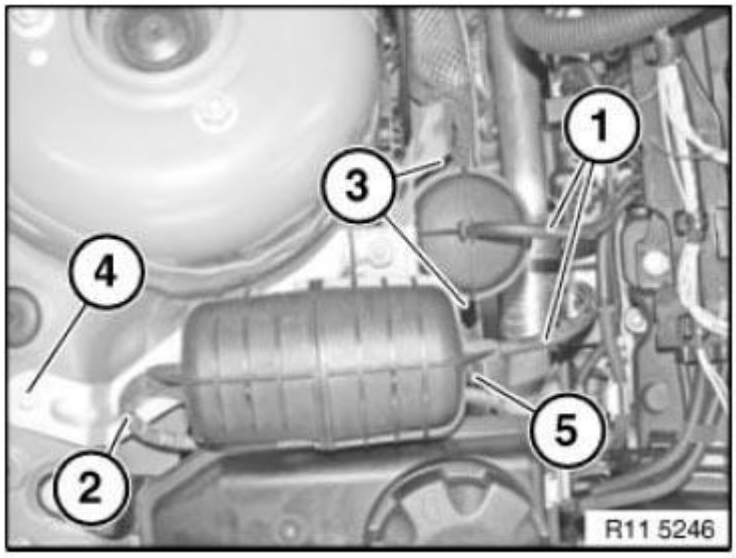


Fig. 399: Identifying Vacuum Hoses And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (1) and screws (2), remove heat shield (3).

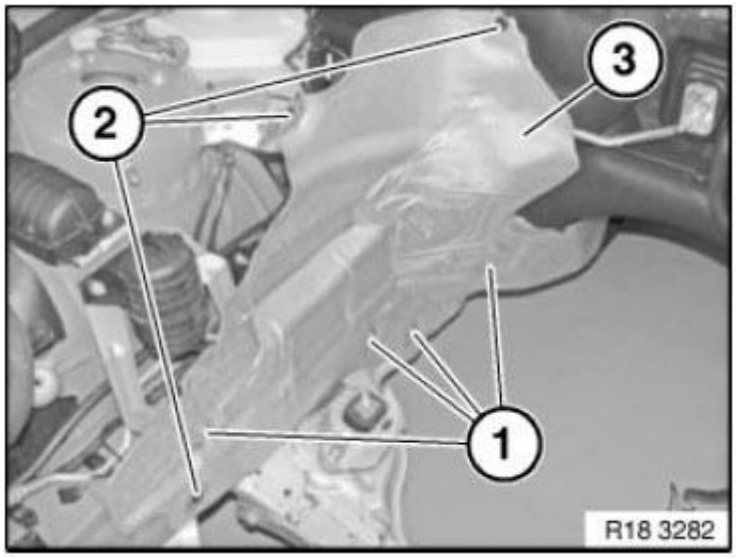


Fig. 400: Identifying Heat Shield With Mounting Nuts And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release clamps (1, 2), detach charge air duct (3).

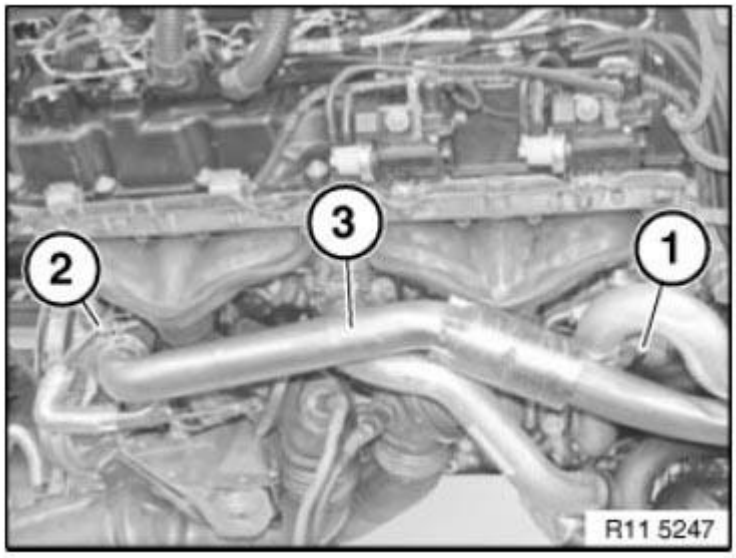


Fig. 401: Identifying Charge Air Duct With Clamps
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Faulty O-rings must be replaced.

Prior to fitting, coat O-ring with suitable antiseize agent.

Fig. 402: Locating O-Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock and detach coolant hose (1).

Unlock quick-connect coupling.

Detach charge air duct (2) from charge air cooler (3) and remove towards top.

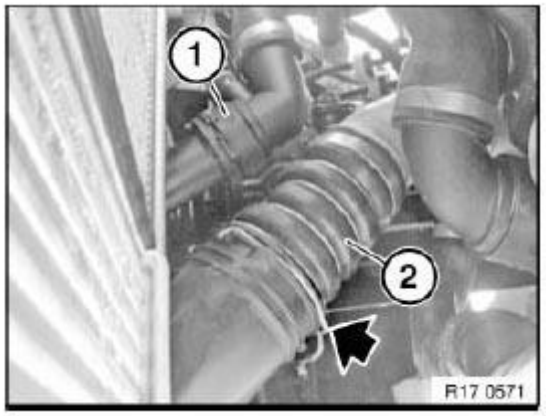


Fig. 403: Locating Coolant Hose And Charge-Air Duct From Intercooler
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage! to sealing rings!

Special tool **11 8 670** is mandatory.

Attach charge air duct (1) with special tool **11 8 670** to charge air cooler.

Installation note:

- Coat sealing rings of quick-connect couplings with antiseize agent.
- Pressure pipes must audibly snap into place

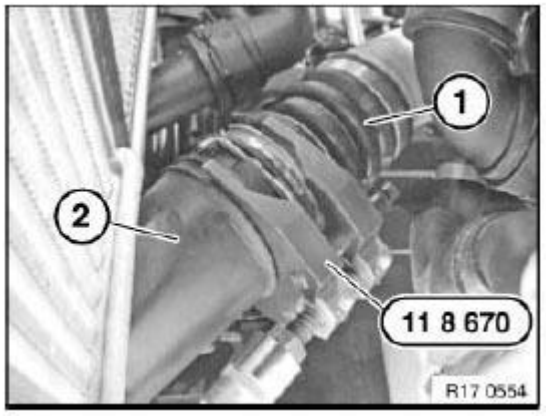


Fig. 404: Identifying Charge-Air Duct With Special Tool 11 8 670
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check DME (turbocharger) for correct operation.

11 61 050 REMOVING AND INSTALLING INTAKE PLENUM (N54, N54T)

Necessary preliminary tasks:

- Remove **INTAKE FILTER HOUSING**
- **REMOVE ENGINE COVER**
- If necessary, remove **TENSION STRUT** (risk of damage to charging pressure sensor)
- Release screws on **CHARGE AIR DUCT** at rear (do not remove)

Pull off vacuum hose (1).

Detach tank vent valve (2) from mounting.

Release hose (3) and lay to one side.

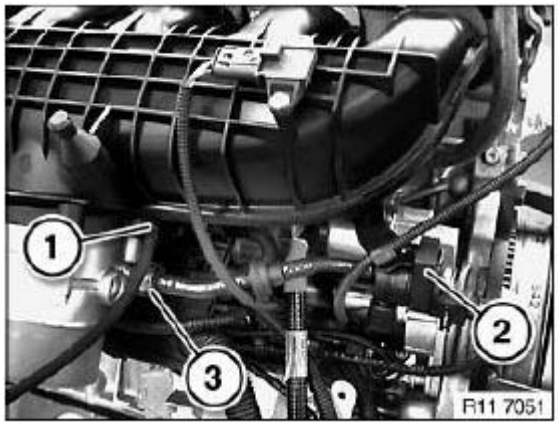


Fig. 405: Identifying Vacuum Hoses And Tank Vent Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on oil pressure switch (2).

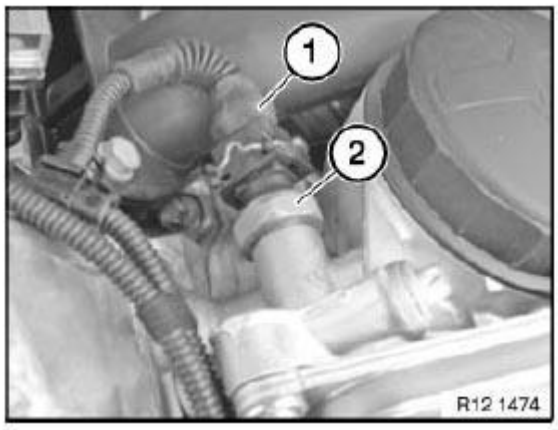


Fig. 406: Identifying Oil Pressure Sensor And Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (2).

NOTE: Do not detach fuel line.

Unscrew nuts (3).

Release screw (4).

Tightening torque 11 61 1AZ .

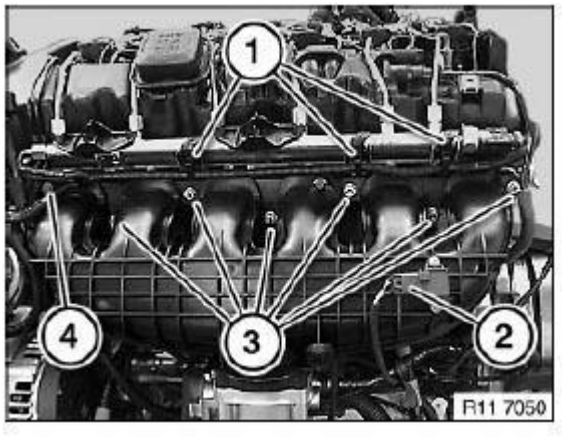


Fig. 407: Identifying Retainers, Plug Connection With Screws And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Raise intake air manifold.

Release screws (1).

Place cable duct (2) to one side.

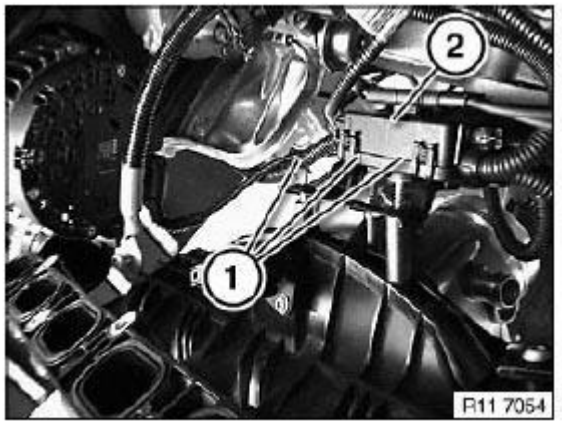


Fig. 408: Identifying Cable Duct And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Cut cable tie (1).

Installation note:

Replace all seals (3).

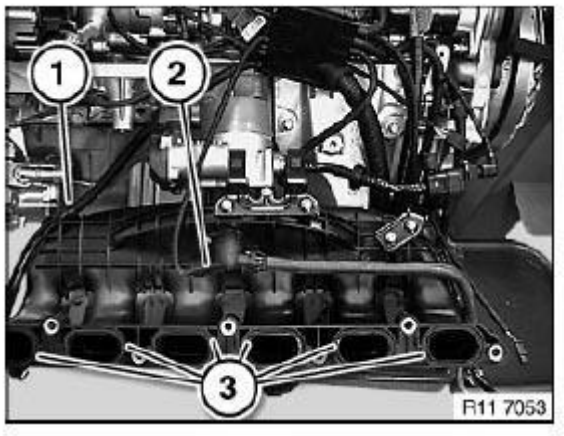


Fig. 409: Identifying Cable Tie, Plug Connection And Seals
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace all seals.

Assemble engine.

SUPERCHARGER WITH CONTROL

11 65 022 REMOVING AND INSTALLING/REPLACE EXHAUST TURBOCHARGER FOR CYLINDERS 1-3 (N54, N54T)

IMPORTANT: It is not necessary to carry out a chassis/wheel alignment check to release the steering tie rod.

Necessary preliminary tasks:

- Remove both catalytic converters. See **1832050 REMOVING AND INSTALLING/REPLACING CATALYTIC EXHAUST-GAS CONVERTER FOR CYLINDERS 1-3 (N54)** or **1832060 REMOVING AND INSTALLING/REPLACING CATALYTIC EXHAUST-GAS CONVERTER FOR CYLINDERS 4-6 (N54)**
- Release right **TIE ROD** from steering gear
- Drain **COOLANT**
- Remove coolant **EXPANSION TANK**
- Remove **COOLANT THERMOSTAT**

- Remove **COOLANT PUMP**
- Remove both vacuum accumulators with bracket
- Remove right **CHARGE-AIR DUCT**
- Drain **ENGINE OIL** and collect in a clean container, oil is reused

Release screws (1) and remove protective plate (2) above tie rod.

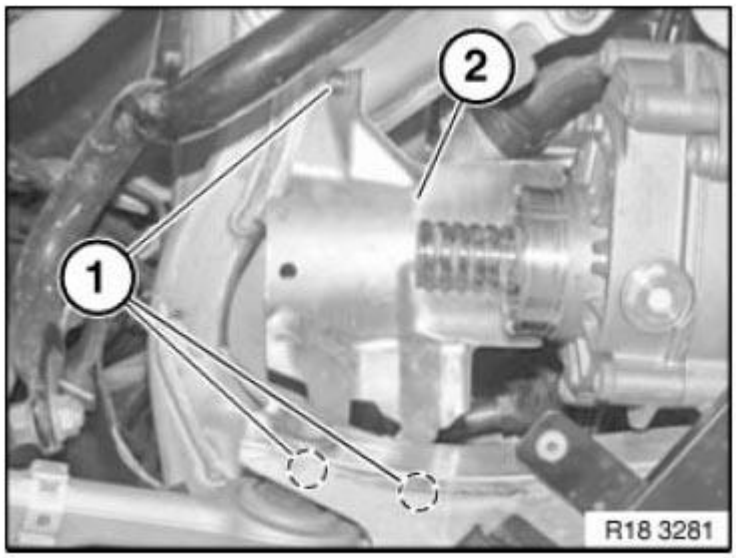


Fig. 410: Identifying Protective Plate And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 42 7AZ** .

Installation note:

Replace gasket.

Release screw (2).

Tightening torque **11 42 8AZ** .

Remove oil return pipe in direction of arrow.

Installation note:

Replace O-ring.

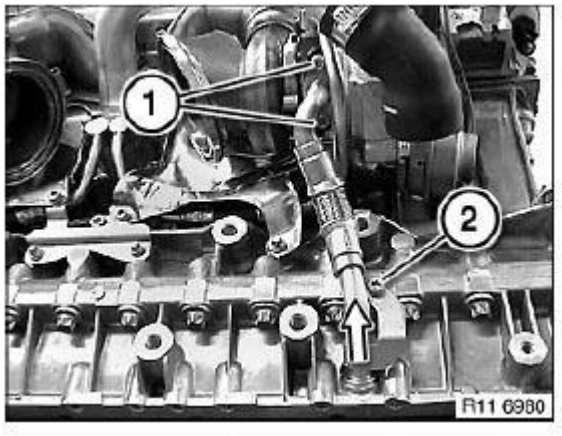


Fig. 411: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Undo screws (1 and 2)

Tightening torque **11 53 10AZ** .

Release coolant feed lines (3 and 4) if necessary with suitable pliers.

IMPORTANT: Do not place pliers on pipes. Risk of damage!

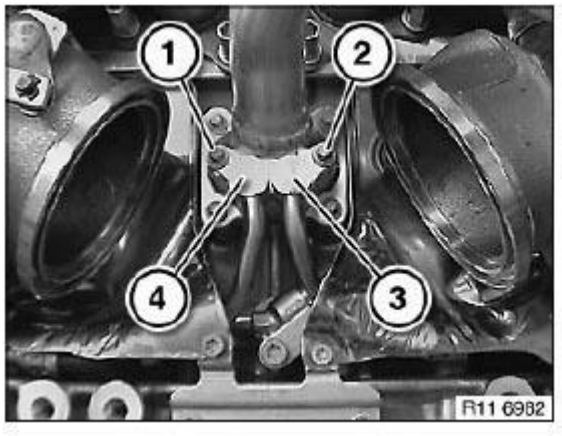


Fig. 412: Identifying Coolant Feed Line With Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 53 3AZ** .

Remove feed line (2).

Installation note:

Replace O-ring.

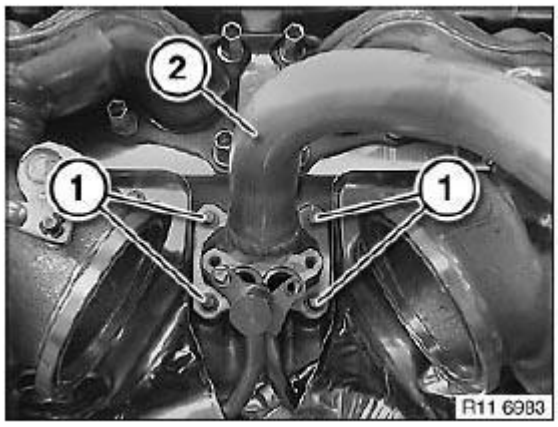


Fig. 413: Identifying Feed Line With Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 53 8AZ** .

Release coolant return pipe at connection (2) if necessary with suitable pliers.

Release screw (3).

Tightening torque **11 53 9AZ** .

Release coolant return pipe at connection (4) if necessary with suitable pliers.

Unfasten coolant return pipe.

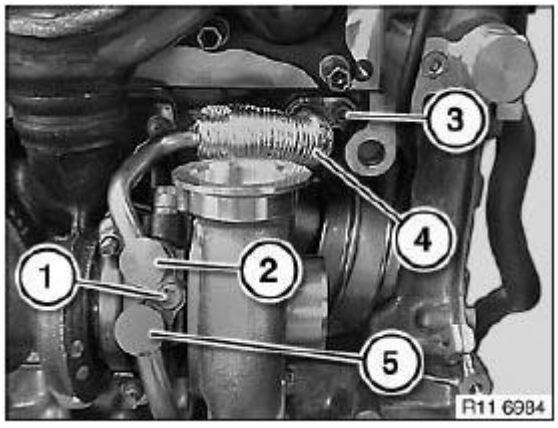


Fig. 414: Identifying Pipe Connections And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not place pliers on pipes. Risk of damage!

Release screws (1).

Tightening torque **11 65 2AZ** .

Remove retaining plate (2).

Release screws (3).

Tightening torque **11 65 2AZ** .

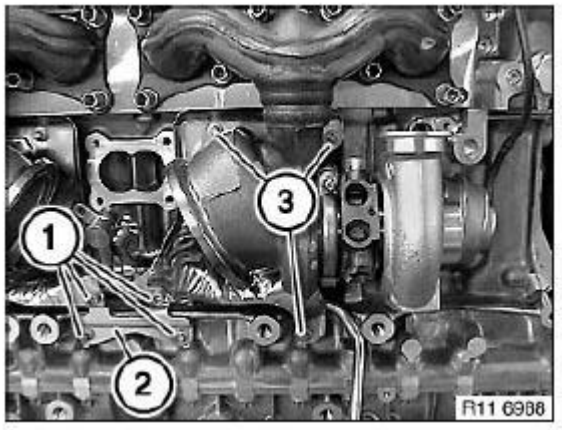


Fig. 415: Identifying Retaining Plate And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove heat shield (1) in direction of arrow.

NOTE: Carefully swing out heat shield (1) in direction of arrow.

Risk of damage!

Coolant feed pipe can be removed with heat shield (1).

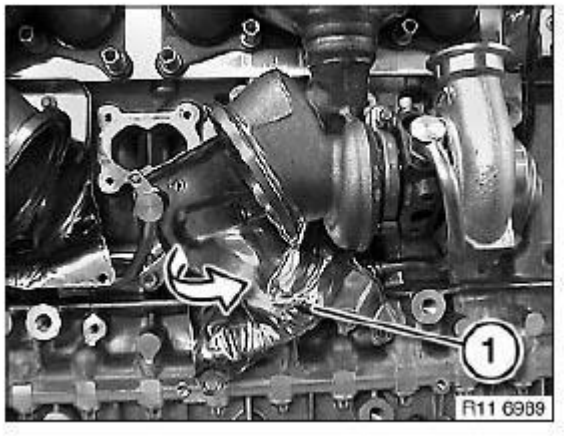


Fig. 416: Identifying Heat Shield
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 65 3AZ** .

Set holder (2) down on cylinder head cover.

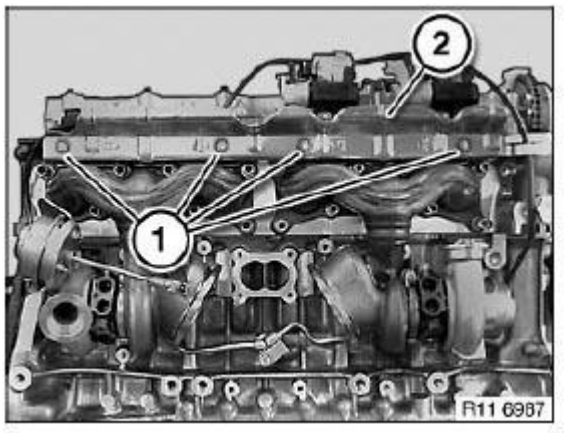


Fig. 417: Identifying Holder And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 42 4AZ** .

Detach oil feed line in direction of arrow.

Installation note:

Replace O-ring.

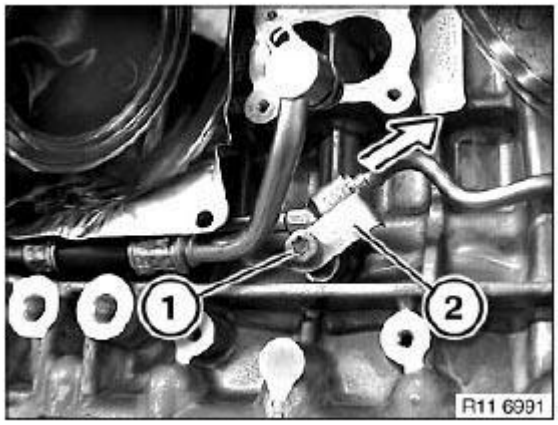


Fig. 418: Disconnecting Oil Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 42 5AZ** .

Release oil pressure line (2) if necessary with suitable pliers.

IMPORTANT: Do not place pliers on pipes. Risk of damage!

Installation note:

Replace O-rings.

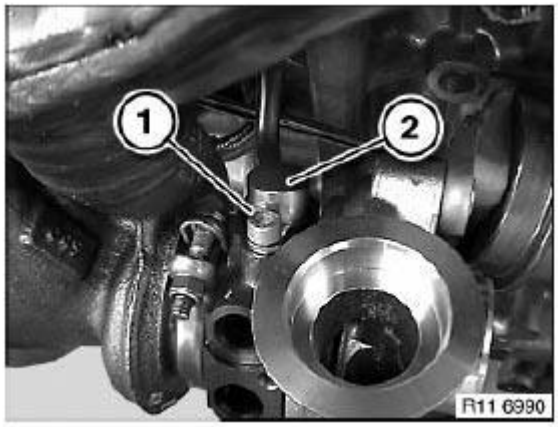


Fig. 419: Identifying Oil Pressure Line
Courtesy of BMW OF NORTH AMERICA, INC.

Detach vacuum hose from vacuum unit (wastegate valve).

Unscrew nuts (1).

Tightening torque **11 65 1AZ** .

Remove turbocharger towards top.

IMPORTANT: Do not misuse linkage of vacuum unit (wastegate valve) for transportation.

Risk of damage!

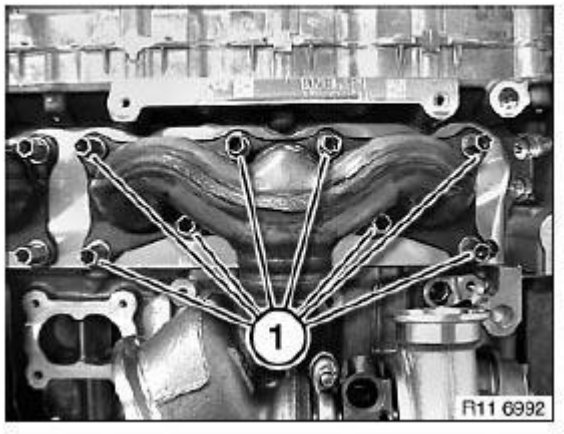


Fig. 420: Identifying Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (2).

Tightening torque **11 42 5AZ** .

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 note:

Replace O-rings.

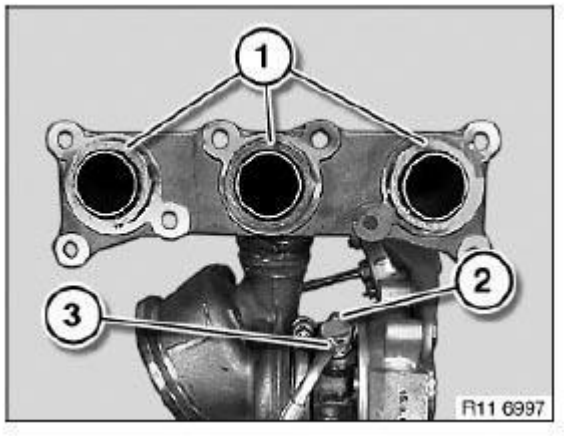


Fig. 421: Identifying Oil Feed Line And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace graphite sealing rings (1).

NOTE: Picture shows turbocharger for cylinders 4 to 6.

Assemble engine.

Delete fault memory in Digital Engine Electronics.

Check air intake system for leaks.

Observe DME instructions.

11 65 024 REMOVING AND INSTALLING/REPLACE EXHAUST TURBOCHARGER FOR CYLINDERS 4-6 (N54, N54T)

Necessary preliminary tasks:

- Remove both catalytic converters. See **1832050 REMOVING AND INSTALLING/REPLACING CATALYTIC EXHAUST-GAS CONVERTER FOR CYLINDERS 1-3 (N54)** or **1832060 REMOVING AND INSTALLING/REPLACING CATALYTIC EXHAUST-GAS CONVERTER FOR CYLINDERS 4-6 (N54)**
- Drain **COOLANT**
- Remove coolant **EXPANSION TANK**
- Remove both vacuum reservoirs
- Remove right **CHARGE AIR DUCT**
- Drain **ENGINE OIL** and collect in a clean container, oil is reused
- Remove **RIGHT ENGINE SUPPORT ARM**

Release screws (1).

Tightening torque **11 42 7AZ** .

Installation note:

Replace gasket.

Release screw (2).

Tightening torque **11 42 8AZ** .

Remove oil return pipe in direction of arrow.

Installation note:

Replace O-ring.

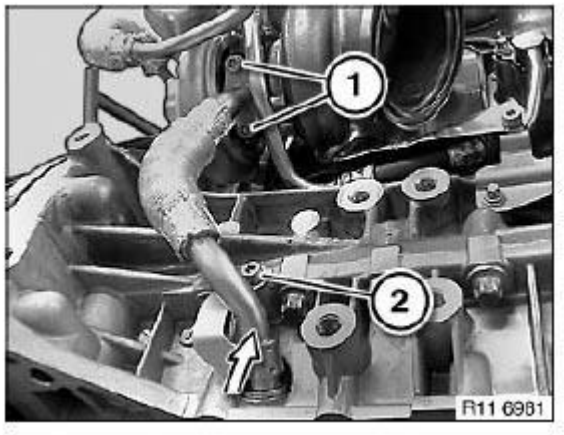


Fig. 422: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 and 2).

Tightening torque **11 53 10AZ** .

Release coolant feed lines (3 and 4) if necessary with suitable pliers.

IMPORTANT: Do not place pliers on pipes. Risk of damage!

Installation note:

Replace O-rings.

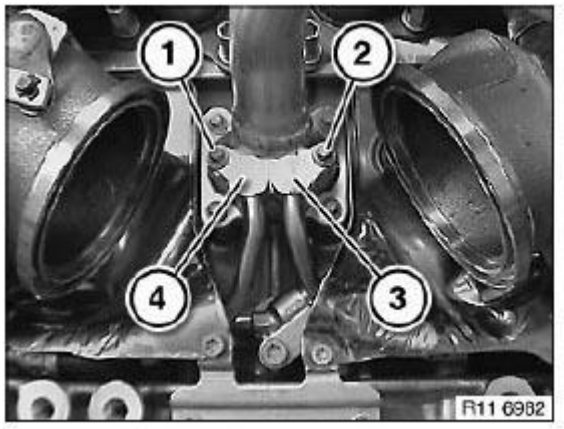


Fig. 423: Identifying Coolant Feed Line With Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 53 3AZ** .

Remove feed line (2).

Installation note:

Replace O-ring.

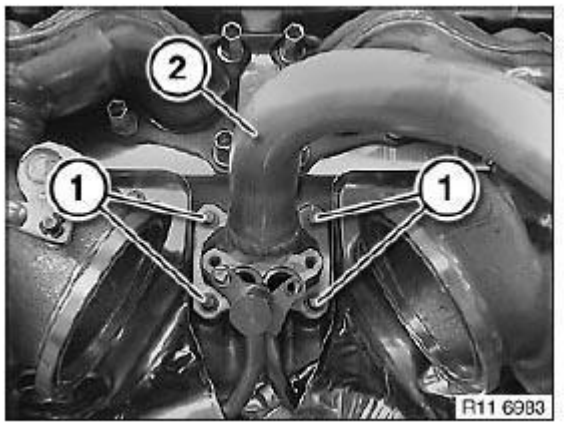


Fig. 424: Identifying Feed Line And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release snap ring (1) from linkage of wastegate valve and disengage linkage.

Release screw (5).

Tightening torque **11 53 9AZ** .

Release coolant return pipe if necessary with suitable pliers.

Release screw (4).

Tightening torque **11 53 8AZ** .

Release coolant feed pipe (2) if necessary with suitable pliers.

Release coolant return pipe (3) if necessary with suitable pliers and remove.

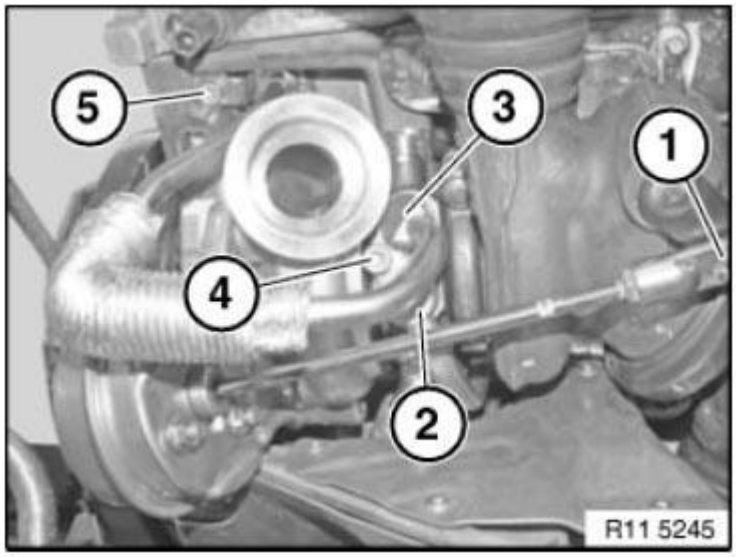


Fig. 425: Identifying Snap Ring, Coolant Return Line And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace O-rings.

IMPORTANT: Do not place pliers on pipes. Risk of damage!

Release screws (1).

Tightening torque **11 65 2AZ** .

Remove retaining plate (2).

Unfasten screws (3 and 4).

Tightening torque **11 65 2AZ** .

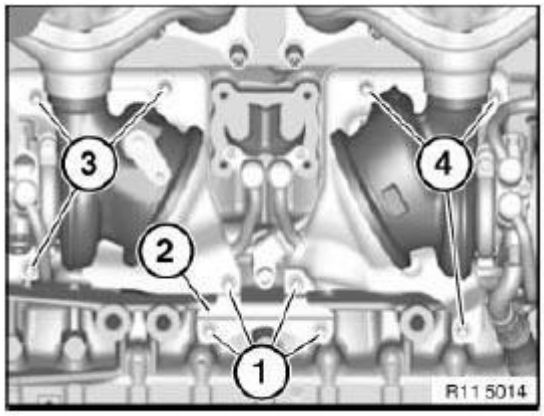


Fig. 426: Identifying Retaining Plates And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Carefully swing out heat shields (2 and 3) in direction of arrow.

Risk of damage!

Remove heat shield (3) in direction of arrow.

Remove heat shield (2) in direction of arrow.

NOTE: Coolant feed pipe (1) can be removed with heat shield (2).

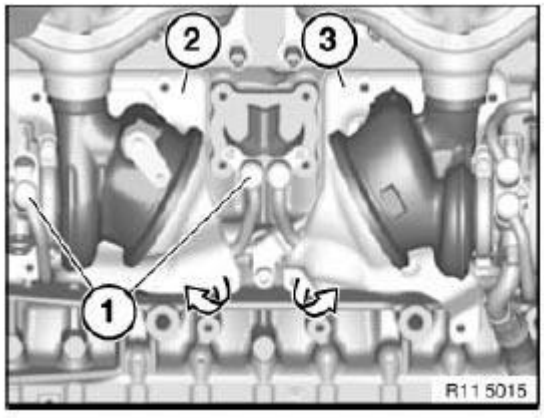


Fig. 427: Removing Heat Shield
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque **11 42 4AZ** .

Detach oil feed line in direction of arrow.

Installation note:

Replace O-ring.

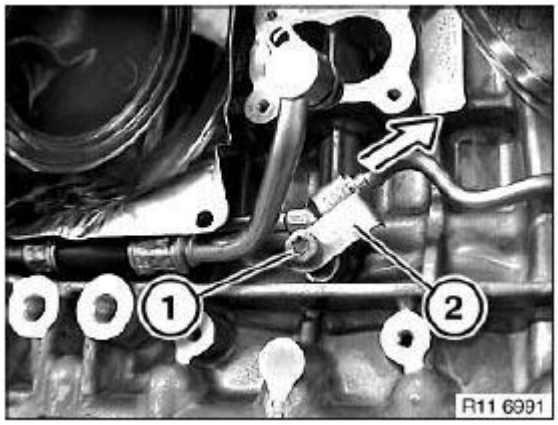


Fig. 428: Removing Oil Feed
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 65 3AZ** .

Set holder (2) down on cylinder head cover.

Picture shows E9x.

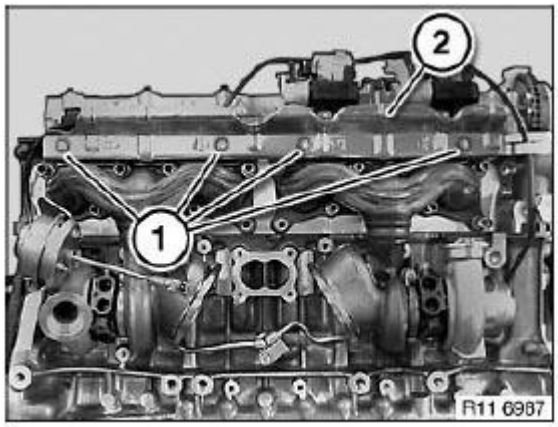


Fig. 429: Identifying Holder And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach vacuum hose from vacuum unit (wastegate valve).

Unscrew nuts (1).

Remove turbocharger towards bottom.

Tightening torque **11 65 1AZ** .

IMPORTANT: Do not misuse linkage of vacuum unit (wastegate valve) for transportation.

Risk of damage!

Picture shows E9x.

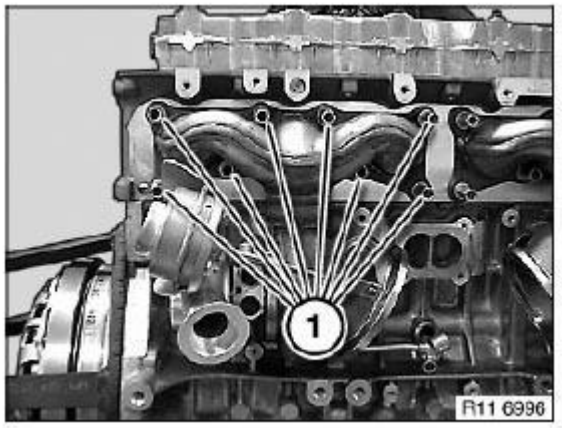


Fig. 430: Identifying Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (2).

Tightening torque **11 42 5AZ** .

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 note:

Replace O-rings.

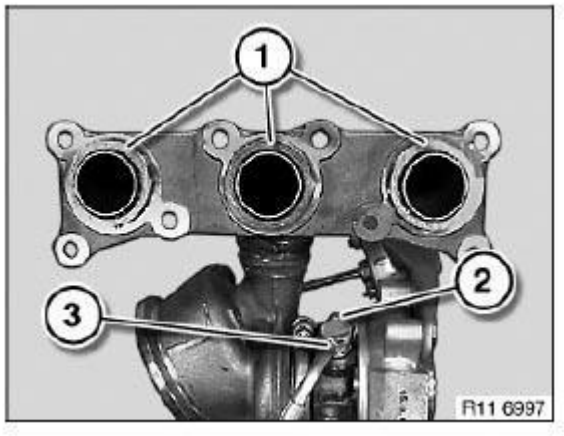


Fig. 431: Identifying Oil Feed Line And Graphite Sealing Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Replace graphite sealing rings (1).

Assemble engine.

Delete fault memory in Digital Engine Electronics.

Check air intake system for leaks.

Observe DME instructions.

11 65 580 REPLACING VACUUM UNIT (WASTEGATE VALVE) (N54, N54T)

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

Wahrnehmung:

1. Noises at exhaust turbocharger (clanking)

Or Fault entry:

1. Drive
2. Engine electronics
3. Air supply
4. Charging pressure control

- Remove both exhaust turbochargers

Release locking clip (2).

Disengage linkage of vacuum unit (wastegate valve).

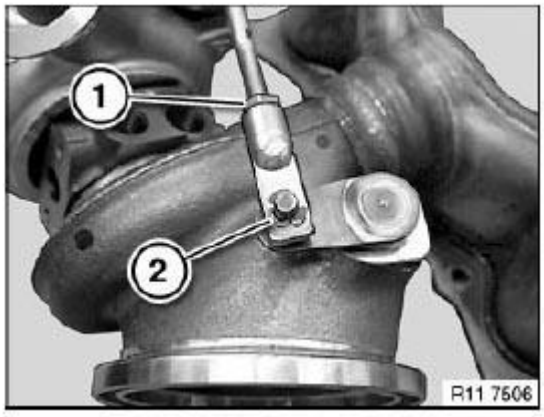


Fig. 432: Identifying Lock Nut And Locking Clip
Courtesy of BMW OF NORTH AMERICA, INC.

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.

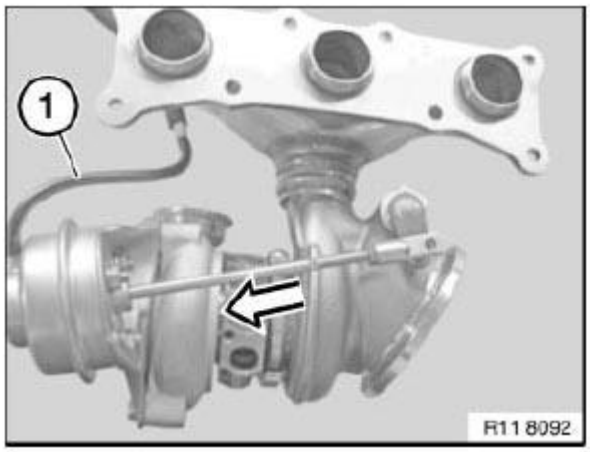


Fig. 433: Identifying Vacuum Line
Courtesy of BMW OF NORTH AMERICA, INC.

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.

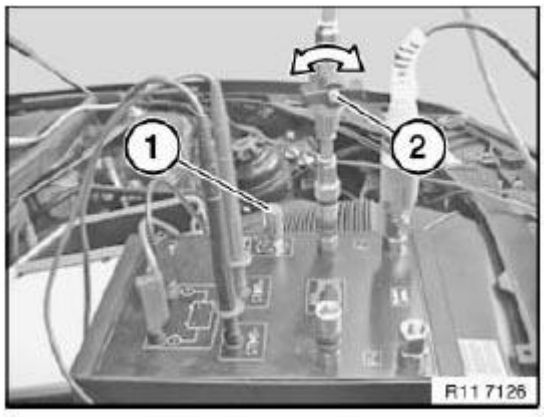


Fig. 434: Releasing Lock Nut On Controller
Courtesy of BMW OF NORTH AMERICA, INC.

Determine gap dimension.

Gap dimension between turnbuckle and adjusting lever.

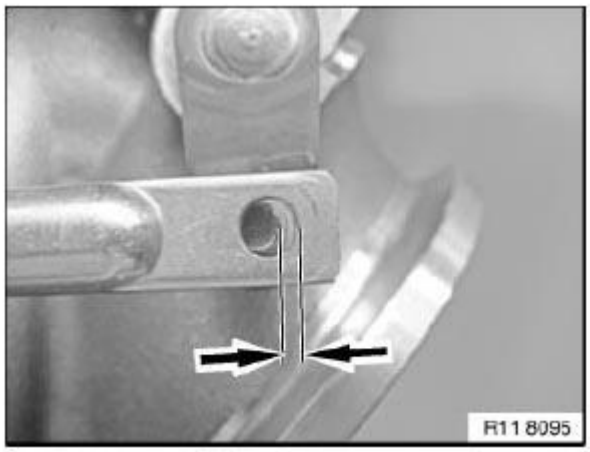


Fig. 435: Identifying Gap Dimension Between Turnbuckle And Adjusting Lever
Courtesy of BMW OF NORTH AMERICA, INC.

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 = 1.5 mm.

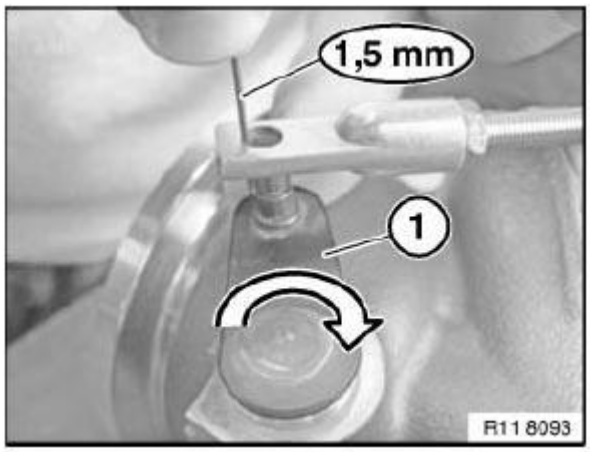


Fig. 436: Sealing Off Wastegate Valve
Courtesy of BMW OF NORTH AMERICA, INC.

The turbocharger is OK if a 1.5 mm drill bit cannot be inserted or can only be inserted at an angle as pictured.

NOTE: Gap dimension > or = 1.5 mm.

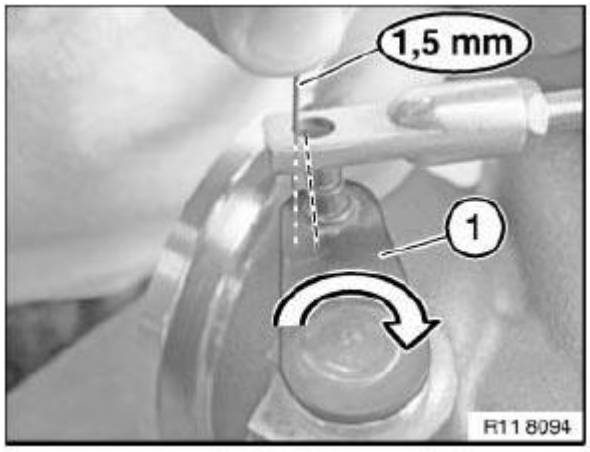


Fig. 437: Identifying Drill Bit Dimension
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1 and 3).

Tightening torque **11 65 11AZ** .

Installation note:

Replace vacuum unit 2 (wastegate valve).

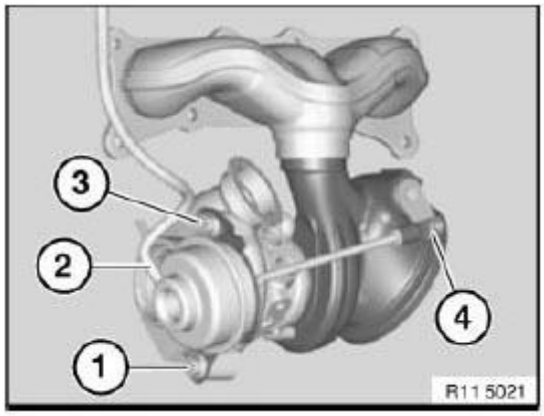


Fig. 438: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Adjusting vacuum unit (wastegate valve) linkage

Initial position of vacuum unit (wastegate valve) linkage depressurized.

Connect red vacuum line (1) to vacuum unit (wastegate valve).

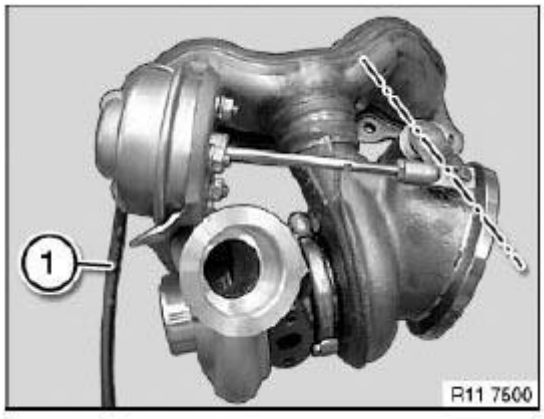


Fig. 439: Identifying Red Vacuum Line
Courtesy of BMW OF NORTH AMERICA, INC.

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).

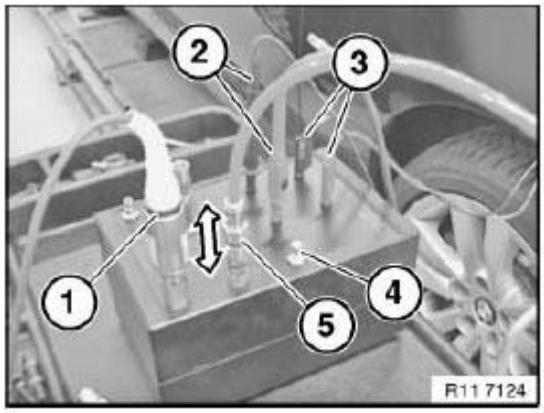


Fig. 440: Identifying Vacuum Pressure Measurement Set-Up
Courtesy of BMW OF NORTH AMERICA, INC.

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.

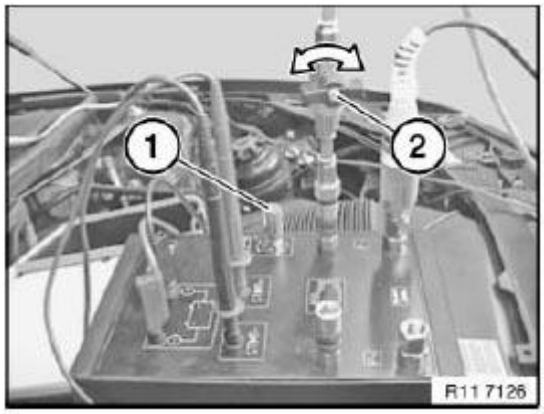


Fig. 441: Releasing Lock Nut On Controller
Courtesy of BMW OF NORTH AMERICA, INC.

Initial position (1) of wastegate linkage with preset vacuum pressure.

Wastegate valve virtually closed.

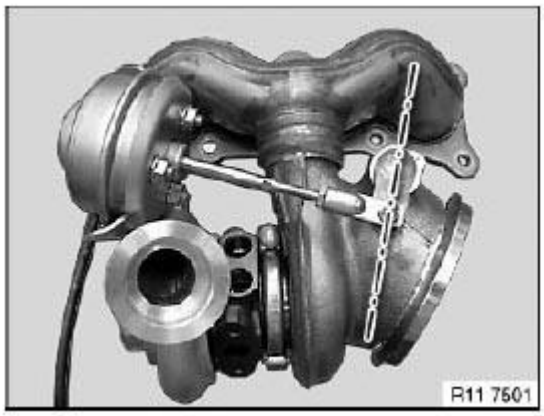


Fig. 442: Identifying Initial Position Of Wastegate Linkage With Preset Vacuum Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

Checking turnability at wastegate valve

a. Wastegate valve can be turned with minimal force.

Adjustment at wastegate valve is OK.

b. Wastegate valve has play and can be turned without resistance, wastegate valve open too far.

   Carry out adjustment at wastegate valve, **shorten** linkage.

c. Wastegate valve cannot be turned, wastegate valve closed.

Carry out adjustment at wastegate valve, **lengthen** linkage.

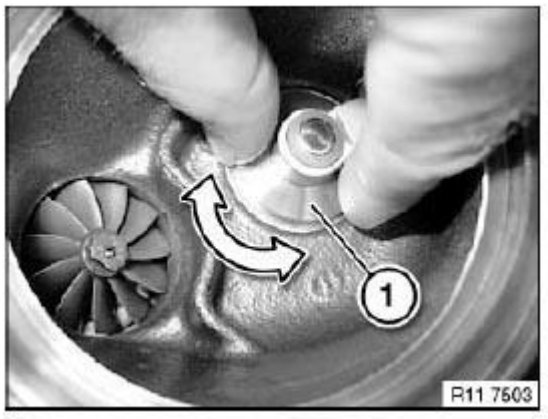


Fig. 443: Checking Wastegate Valve Turnability
Courtesy of BMW OF NORTH AMERICA, INC.

Adjustment at linkage

To **lengthen** linkage, turn turnbuckle (1) max. **180°** in **counterclockwise** direction.

To **shorten** linkage, turn turnbuckle (1) max. 180° in **clockwise** direction.

Engage turnbuckle (1) on adjusting lever in direction of arrow.

IMPORTANT: Check ease of movement between turnbuckle (1) and pin of adjusting lever (ensure rectangularity).

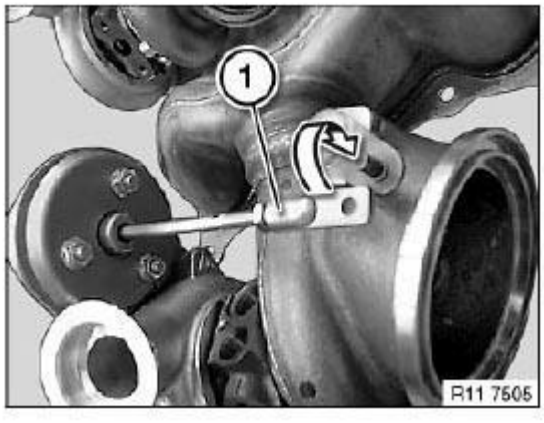


Fig. 444: Engaging Turnbuckle On Adjusting Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Check turnability at wastegate valve again.

Secure lock nut (1); to do so, secure turnbuckle against turning with a suitable tool.

Tightening torque **11 65 10AZ** .

Mount locking clip (2).

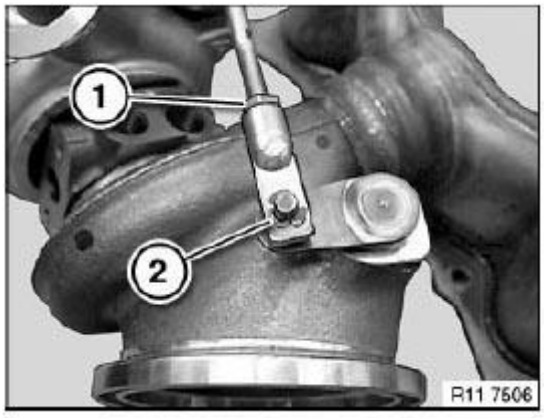


Fig. 445: Identifying Lock Nut And Locking Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Observe diagnosis instructions.

Execute test module for boost pressure control.

VACUUM PUMP

11 66 000 REMOVING AND INSTALLING OR REPLACING VACUUM/OIL PUMP (N47 D20 O1)

IMPORTANT: It is possible to remove and install the vacuum oil pump without removing the transmission.

Necessary preliminary work:

- Removing oil sump.

Release screws (1).

Remove intake snorkel in direction of arrow.

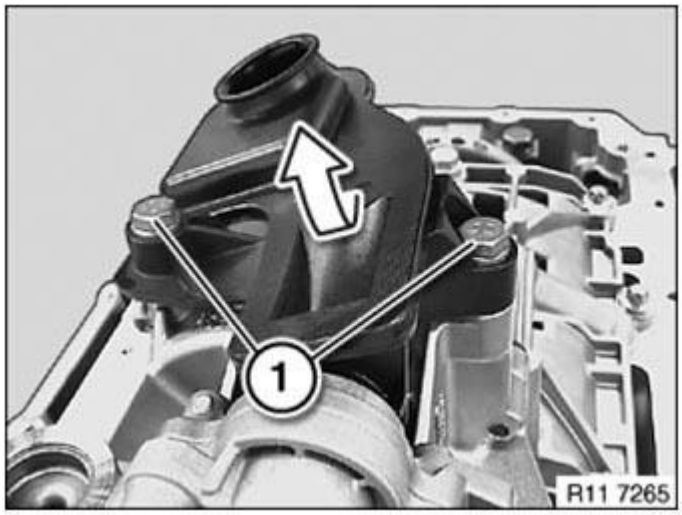


Fig. 446: Removing Intake Snorkel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

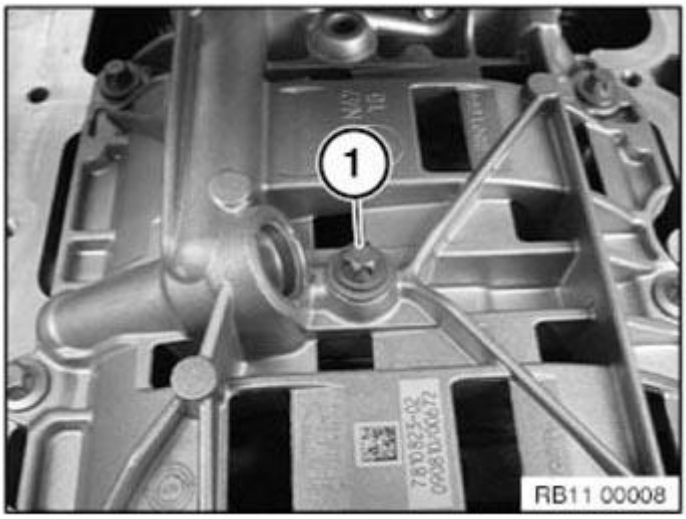


Fig. 447: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Installation note:

Clean and blow out thread

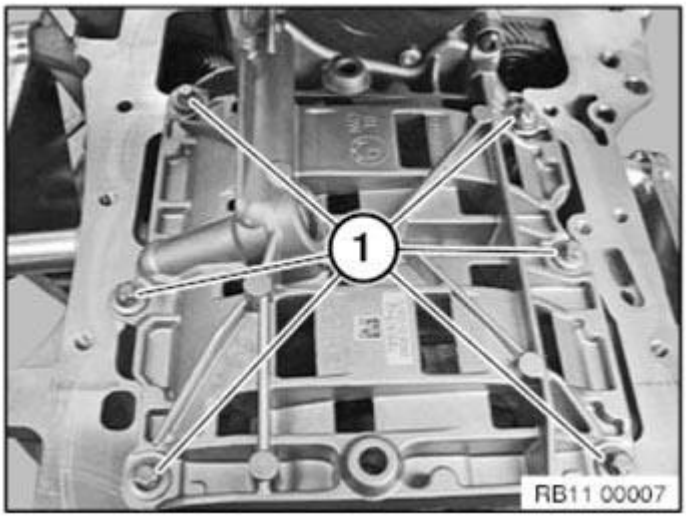


Fig. 448: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

When installed, the oil pump chain must be fed out from the sprocket wheel of the oil pump drive gear; the sprocket wheel cannot be removed.

NOTE: Illustration shows gear case cover removed.

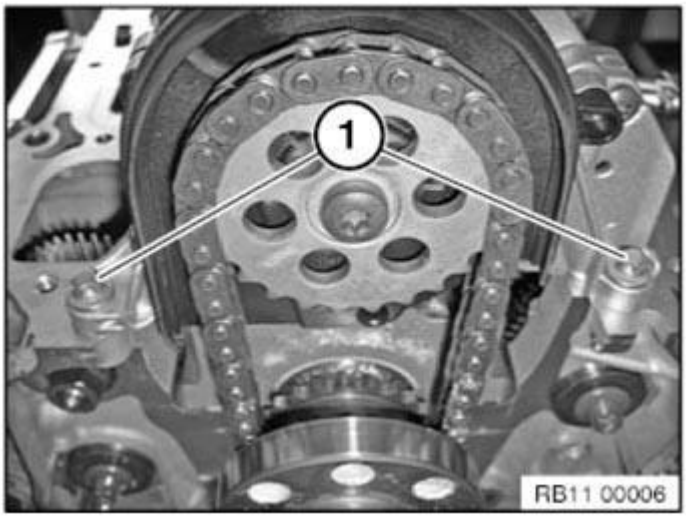


Fig. 449: Identifying Gear Case Cover Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Oil vacuum pump must be fed out at chain drive (1).

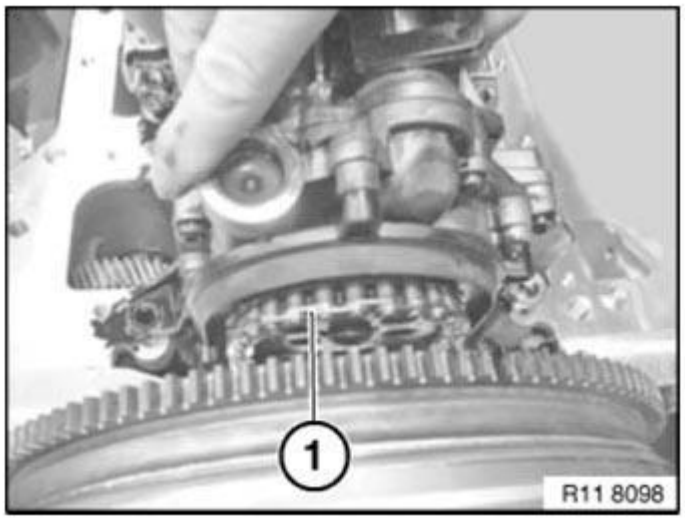


Fig. 450: Identifying Chain Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

Installation note:

Clean all sealing surfaces.

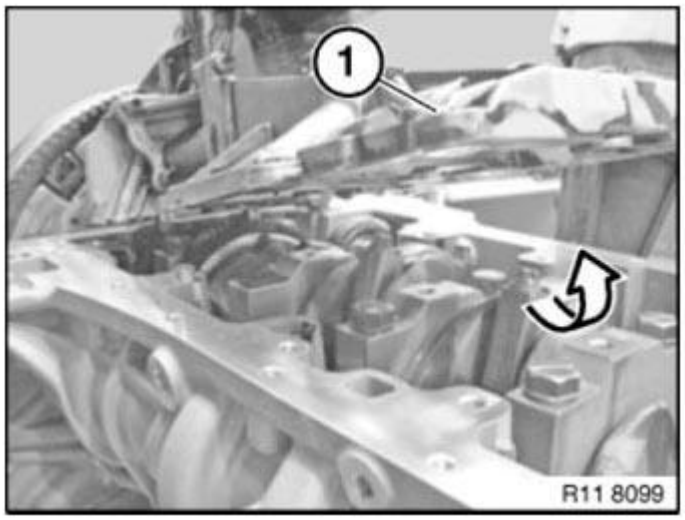


Fig. 451: Identifying Oil Vacuum Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Install all screws (1) and tighten down.

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

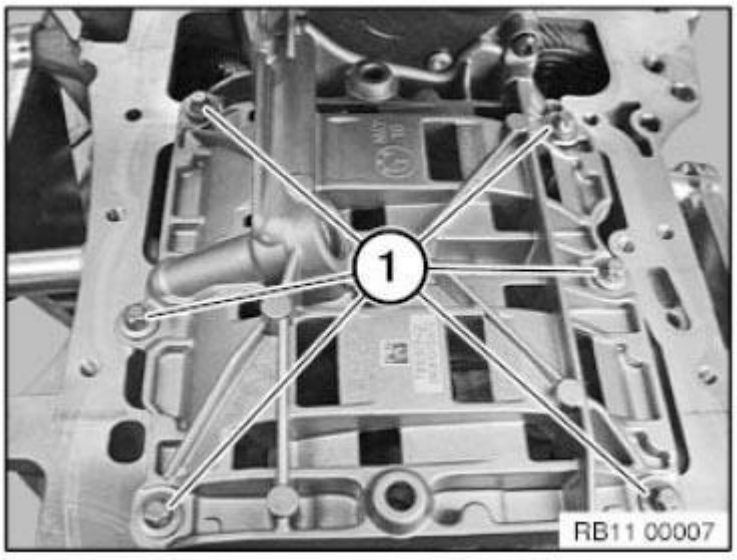


Fig. 452: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Install and tighten down screws (1).

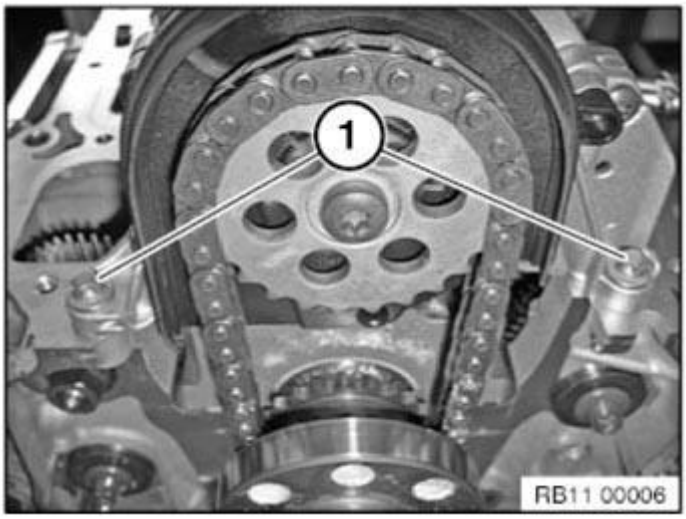


Fig. 453: Identifying Gear Case Cover Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Clean and blow out thread

Insert and secure screw (1).

Secure screw (1) with special tool **00 9 120** .

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

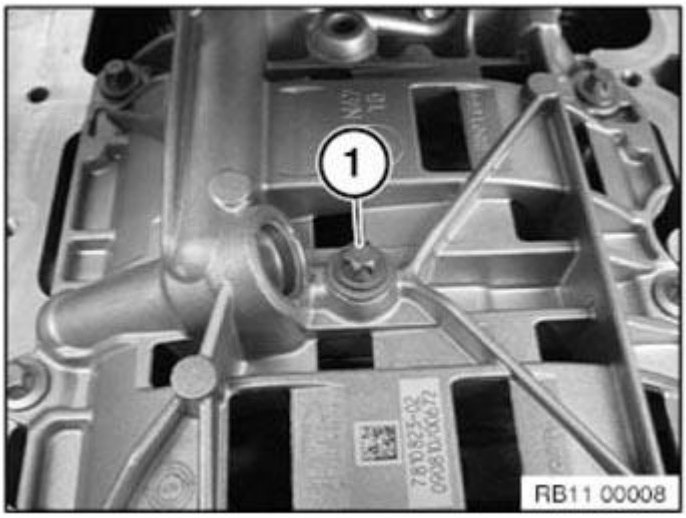


Fig. 454: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 66 000 REMOVING AND INSTALLING/REPLACING VACUUM PUMP (N54, N54T)

Necessary preliminary work:

- Remove **DRIVE BELT**.
- Remove **BELT TENSIONER** for drive belt.
- Remove **SEALING CAP** for vacuum pump.
- Remove **HIGH PRESSURE PUMP** .

Rotate crankshaft at central bolt.

Turn camshaft sprocket until drilled holes and screws of vacuum pump match up.

Screw in special tool **11 8 650**

Secure special tool **11 0 290** in camshaft sprocket and to special tool **11 8 650** .

Release screw (1).

Tightening torque **11 66 2AZ** .

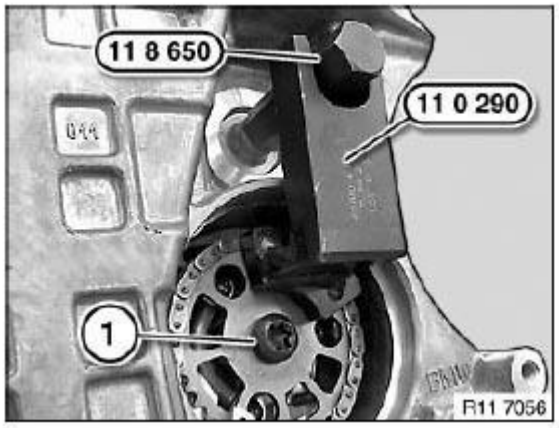


Fig. 455: Positioning Special Tool 11 0 290 On Sprocket Wheel And On Special Tool 11 8 650
Courtesy of BMW OF NORTH AMERICA, INC.

Press chain tensioner (1) with chain in direction of arrow.

Install special tool **11 4 120** .

Remove camshaft sprocket (2) in direction of arrow.

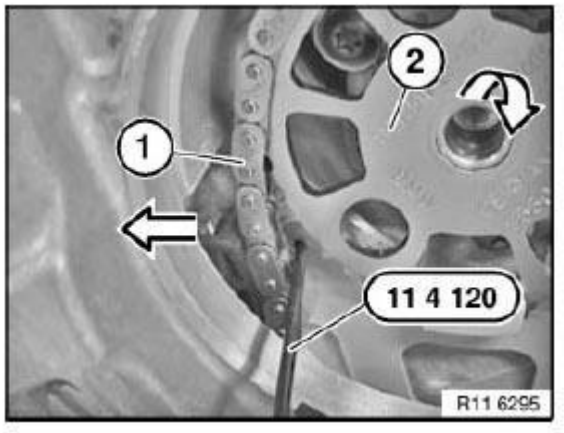


Fig. 456: Removing Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **11 66 1AZ** .

Release screws (1).

Secure screws (1) against falling.

Remove vacuum pump.

Installation note:

Replace gasket.

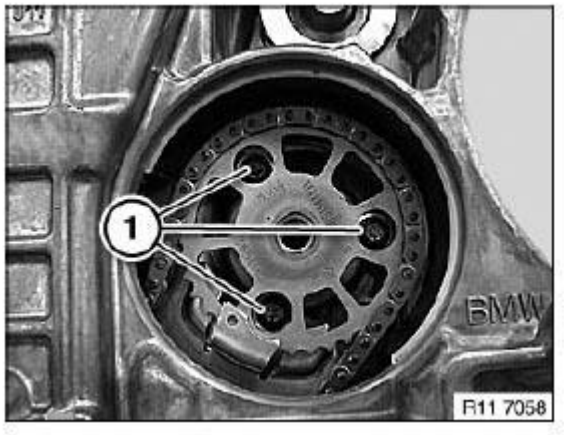


Fig. 457: Identifying Vacuum Pump Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

EMISSION CONTROL, OXYGEN SENSOR

11 78 513 REPLACING BOTH OXYGEN CONTROL SENSORS (N54, N54T)

WARNING: Risk of burning!

Work should only be carried out on an exhaust system that has cooled down.

Necessary preliminary tasks:

- Remove **ACOUSTIC COVER**
- Release right **TIE ROD** from steering gear

NOTE: It is not necessary to conduct a chassis/wheel alignment check when the track rod is released.

Installation note:

If an oxygen sensor is reused, only apply a thin and uniform coat of Never Seez Compound (refer to BMW Parts Service) 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.

Remove protective plate over steering gear.

Release screws (1) and remove protective plate (2).

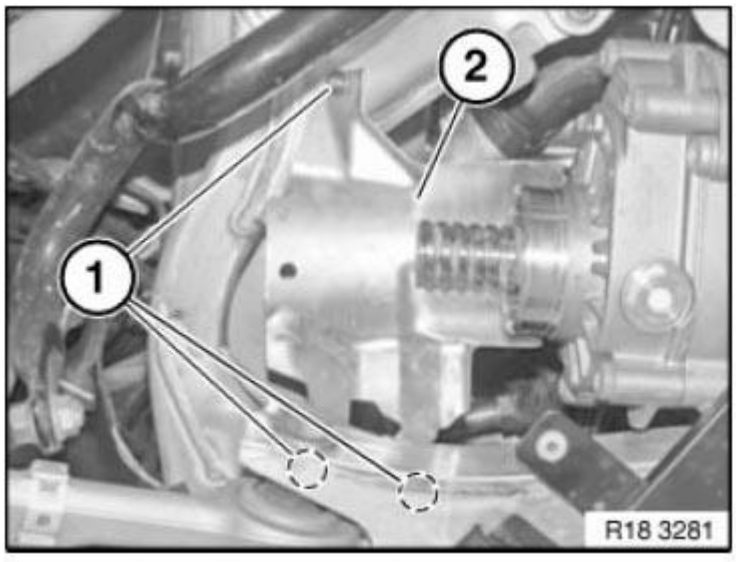


Fig. 458: Identifying Protective Plate And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

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 reduce the prescribed tightening torque by 3 Nm.

Tightening torque **11 78 1AZ** .

Installation note:

Cable color black, cylinders 1 to 3.

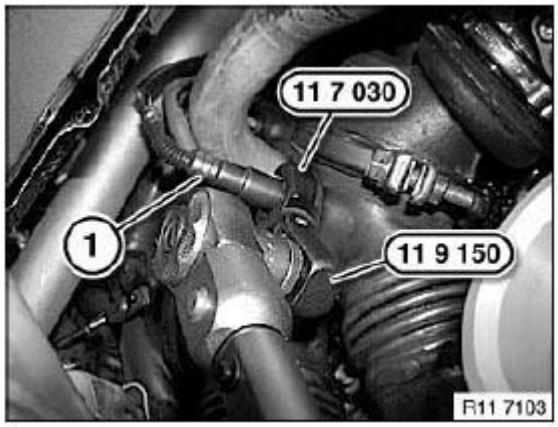


Fig. 459: Identifying Special Tool 11 7 030 And 11 9 150
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection for oxygen control sensor, cylinders 4 to 6.

Release oxygen control sensor (1) with special tools **11 7 030** and **11 9 150** .

IMPORTANT: When using special tool 11 7 030 in conjunction with special tool 11 9 150 , it is essential to reduce the prescribed tightening torque by 3 Nm.

Tightening torque **11 78 1AZ** .

Installation note:

Cable color grey, cylinders 4 to 6.

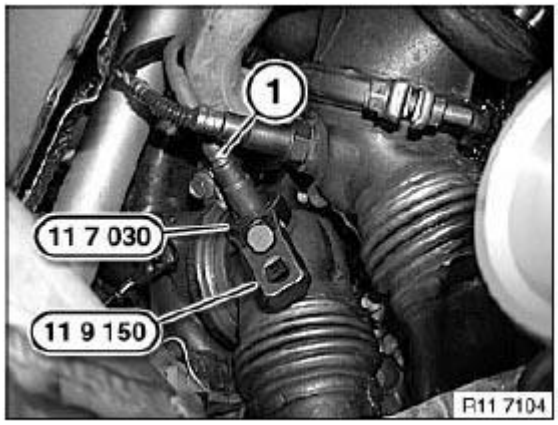


Fig. 460: Removing Oxygen Control Sensor Using Special Tools 11 7 030 And 11 9 150
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME control unit.

11 78 545 REPLACING BOTH OXYGEN MONITORING SENSORS (N54, N54T)

WARNING: Risk of burning!

Work should only be carried out on an exhaust system that has cooled down.

Necessary preliminary tasks:

- Remove rear **UNDERBODY PROTECTION**

Installation note:

If an oxygen sensor is to be reused, only apply a thin and uniform coat of Never Seez Compound (refer to BMW Parts Department) to thread.

The part of the oxygen monitoring 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 monitoring sensor.

Release monitoring 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 reduce the prescribed tightening torque by 3 Nm.

Tightening torque **11 78 1AZ** .

Installation note:

Cable color black, cylinders 1 to 3.

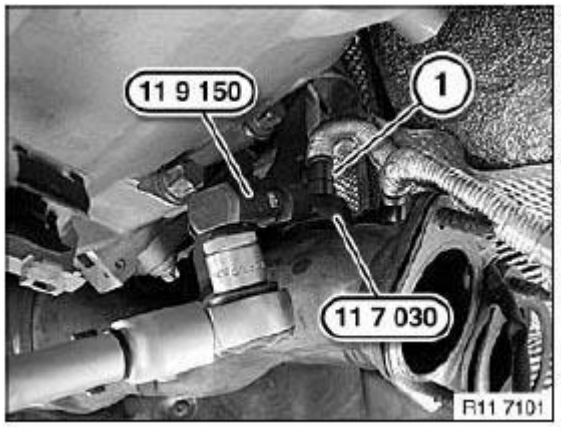


Fig. 461: Removing Monitor Sensor Using Special Tools 11 7 030 And 11 9 150
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Release insulation (2) in direction of arrow.

Disconnect plug connection for oxygen monitoring sensor.

Release monitoring sensor (1) with special tool **11 7 020** .

Tightening torque **11 78 1AZ** .

Installation note:

Cable color grey, cylinders 4 to 6.

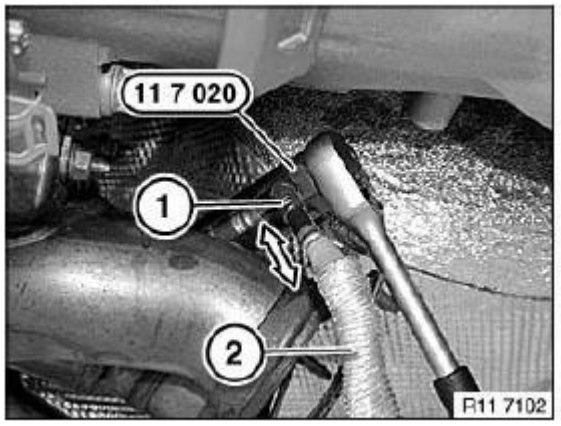


Fig. 462: Removing Insulation
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME control unit.

