ENGINE

Engine - Repair - 328i

ENGINE, GENERAL

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

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

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

Protective measures/rules of conduct

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

First aid measures

- Do not induce vomiting.

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

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

ENGINE IDENTIFICATION

Punch engine numbers at marked surface with number punch.

Magnesium crankcase with sticker

M47/M47TU/M47T2

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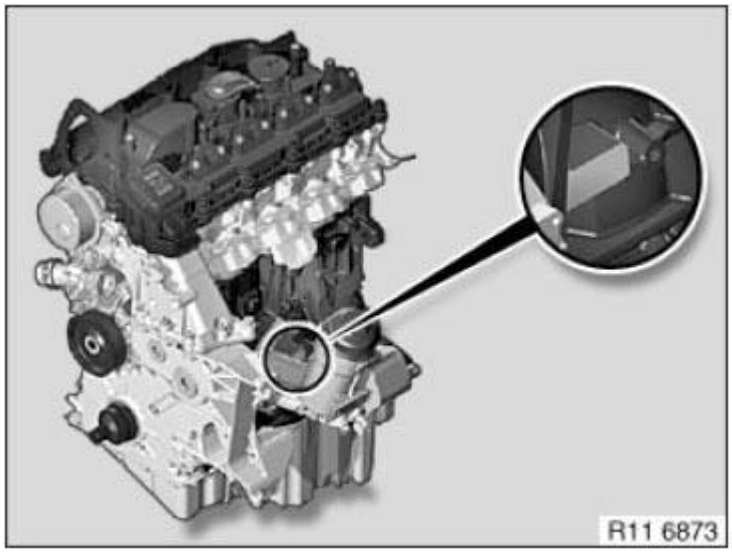

Fig. 1: Identifying Engine Identification Number - M47/M47TU/M47T2
Courtesy of BMW OF NORTH AMERICA, INC.

M57/M57TU/M57T2

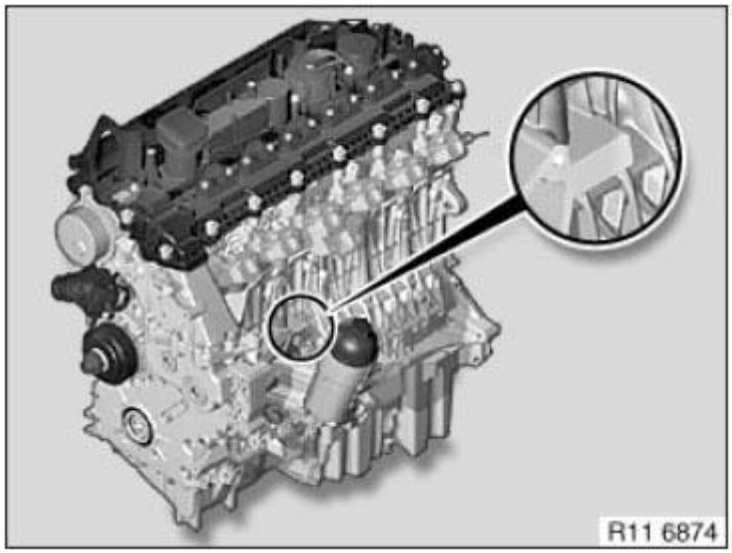

Fig. 2: Identifying Engine Identification Number - M57/M57TU/M57T2
Courtesy of BMW OF NORTH AMERICA, INC.

M67/M67TU

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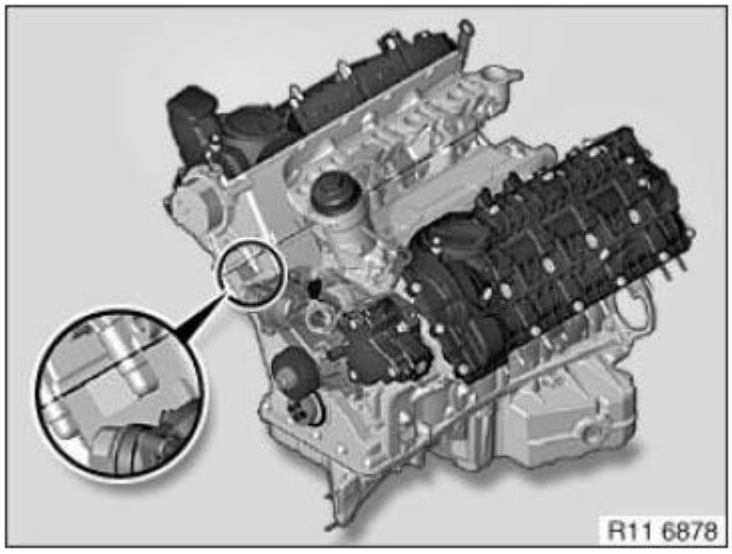

Fig. 3: Identifying Engine Identification Number - M67/M67TU
Courtesy of BMW OF NORTH AMERICA, INC.

N47/N47S/N47C/N57 N57S

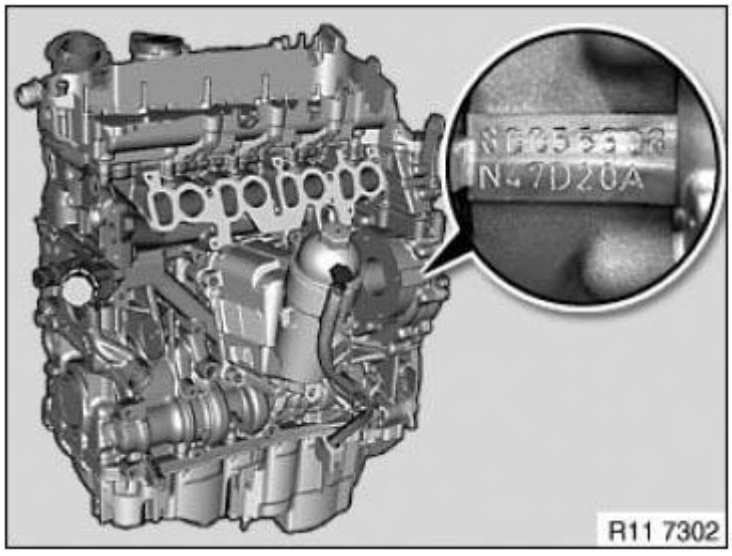

Fig. 4: Identifying Engine Identification Number - N47/N47S/N47C/N57 N57S
Courtesy of BMW OF NORTH AMERICA, INC.

M52/M52TU

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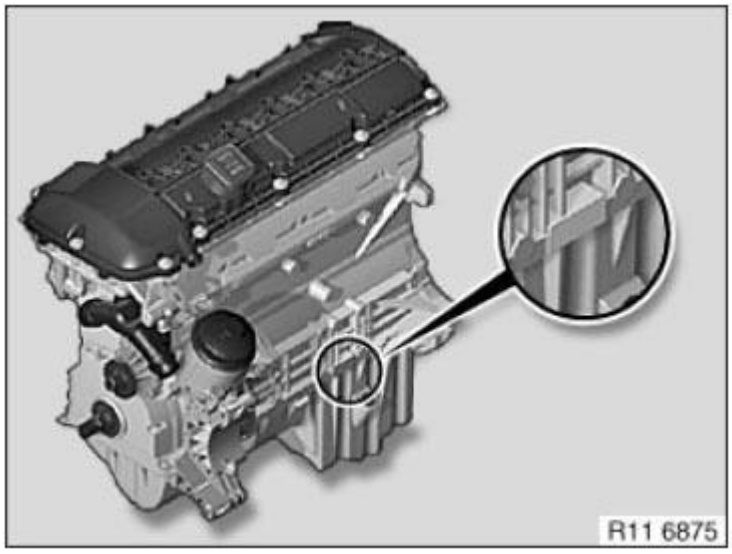

Fig. 5: Identifying Engine Identification Number - M52/M52TU
Courtesy of BMW OF NORTH AMERICA, INC.

M54

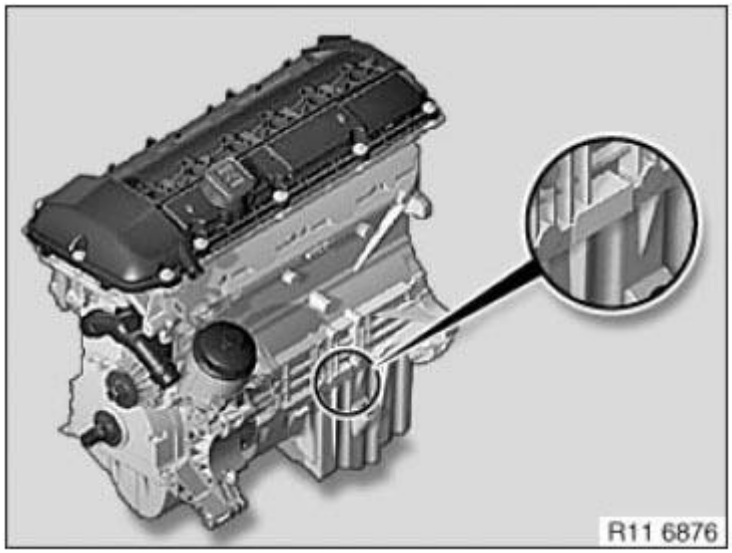

Fig. 6: Identifying Engine Identification Number - M54
Courtesy of BMW OF NORTH AMERICA, INC.

M56

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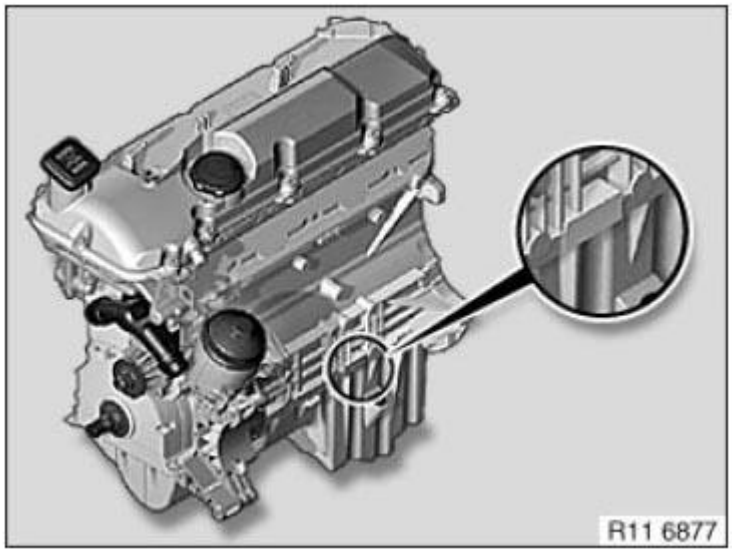

Fig. 7: Identifying Engine Identification Number - M56
Courtesy of BMW OF NORTH AMERICA, INC.

N40/N45/N45T/N43

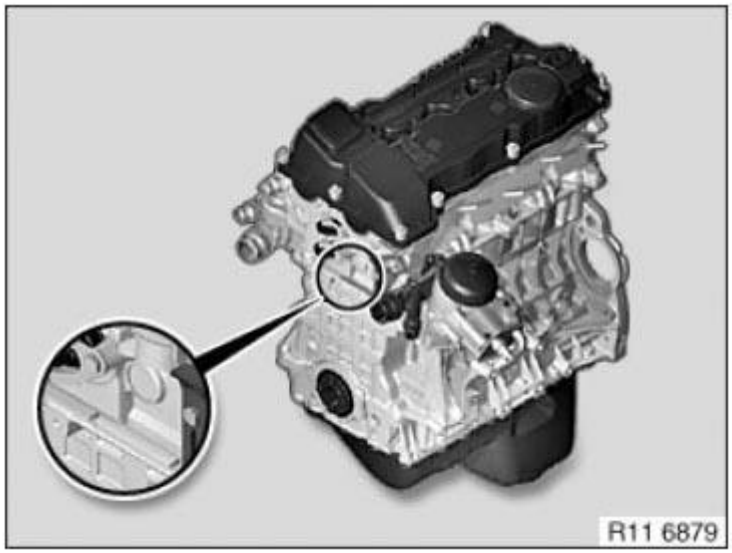

Fig. 8: Identifying Engine Identification Number - N40/N45/N45T/N43
Courtesy of BMW OF NORTH AMERICA, INC.

N42/N46/N46T

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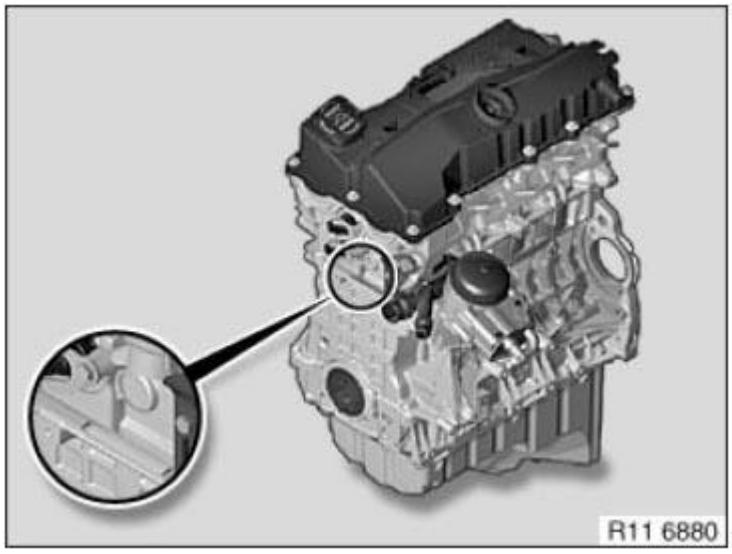

Fig. 9: Identifying Engine Identification Number - N42/N46/N46T
Courtesy of BMW OF NORTH AMERICA, INC.

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

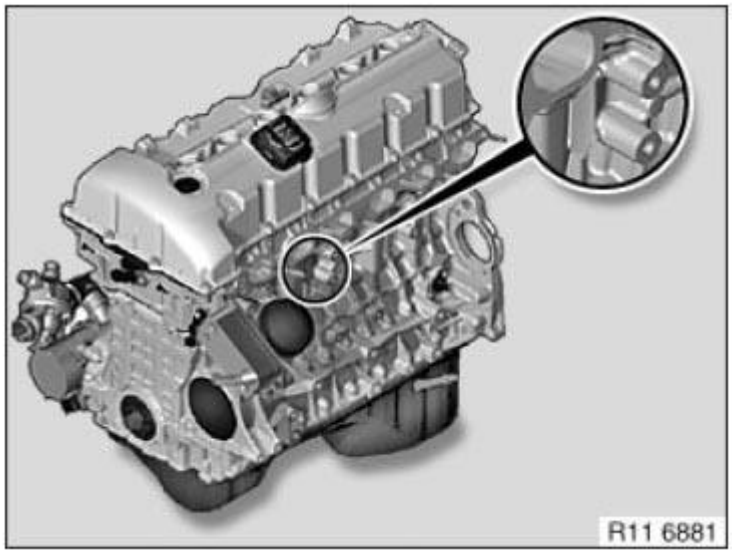

Fig. 10: Identifying Engine Identification Number - N51/N52/N52K/N52T/N53/N54/N55
Courtesy of BMW OF NORTH AMERICA, INC.

N62/N62TU

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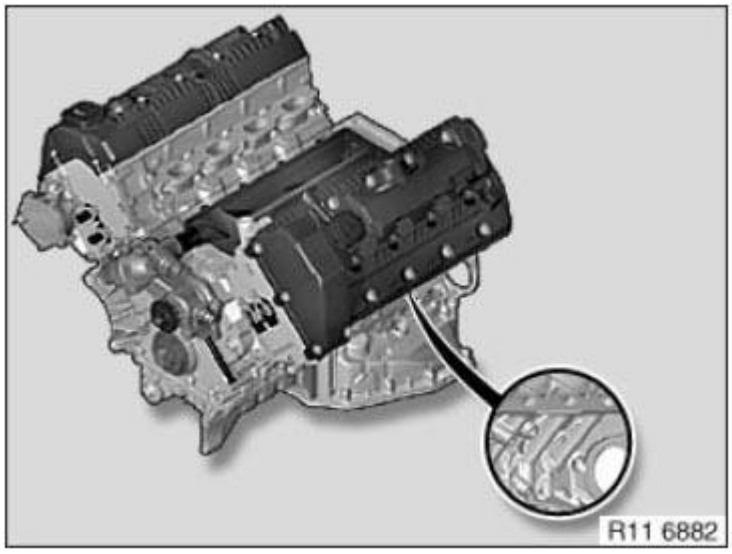

Fig. 11: Identifying Engine Identification Number - N62/N62TU
Courtesy of BMW OF NORTH AMERICA, INC.

N73

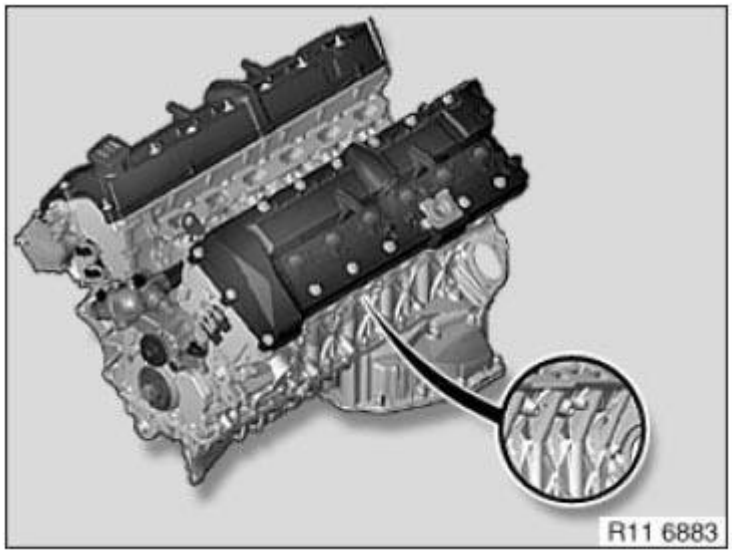

Fig. 12: Identifying Engine Identification Number - N73
Courtesy of BMW OF NORTH AMERICA, INC.

S54

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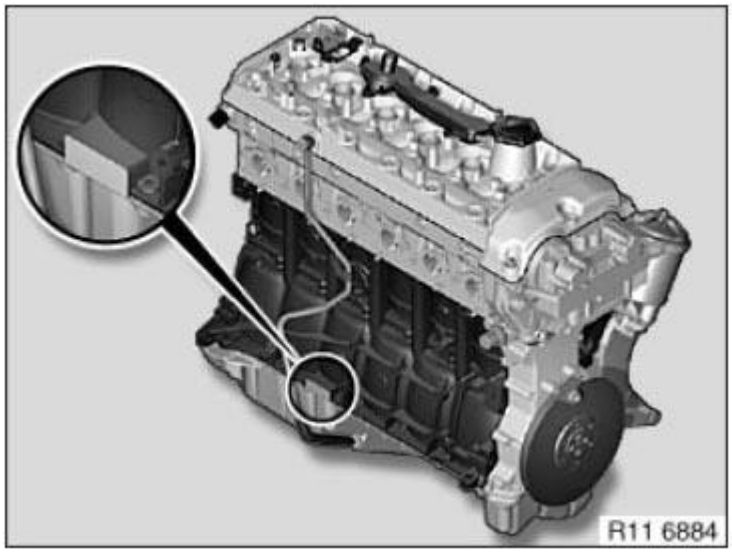

Fig. 13: Identifying Engine Identification Number - S54
Courtesy of BMW OF NORTH AMERICA, INC.

S85/S65

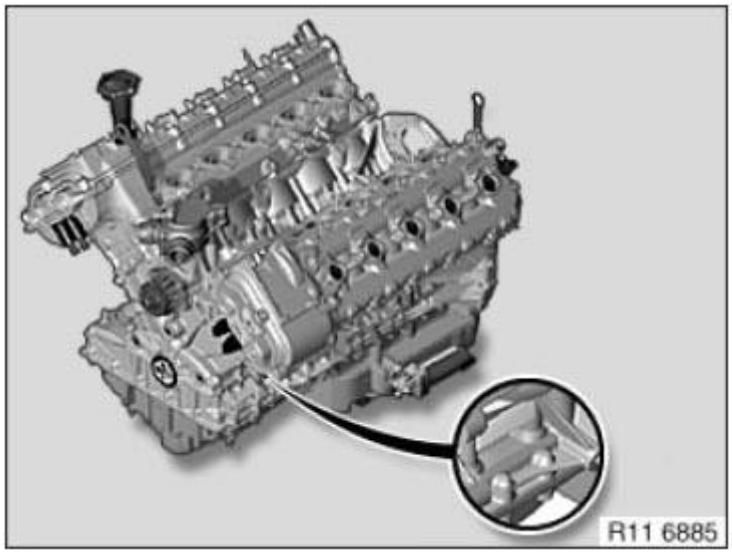

Fig. 14: Identifying Engine Identification Number - S85/S65
Courtesy of BMW OF NORTH AMERICA, INC.

W10/W11

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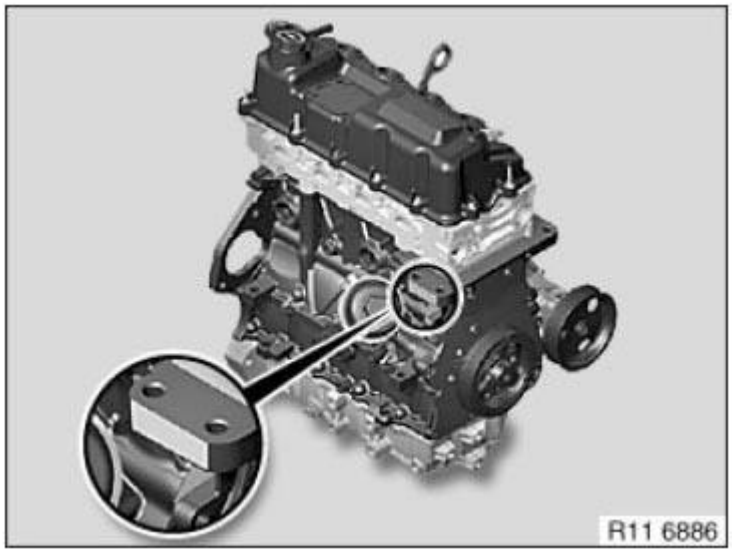

Fig. 15: Identifying Engine Identification Number - W10/W11
Courtesy of BMW OF NORTH AMERICA, INC.

N12/N14/N16/N18

Fig. 16: Identifying Engine Identification Number - N12/N14/N16/N18
Courtesy of BMW OF NORTH AMERICA, INC.

W17

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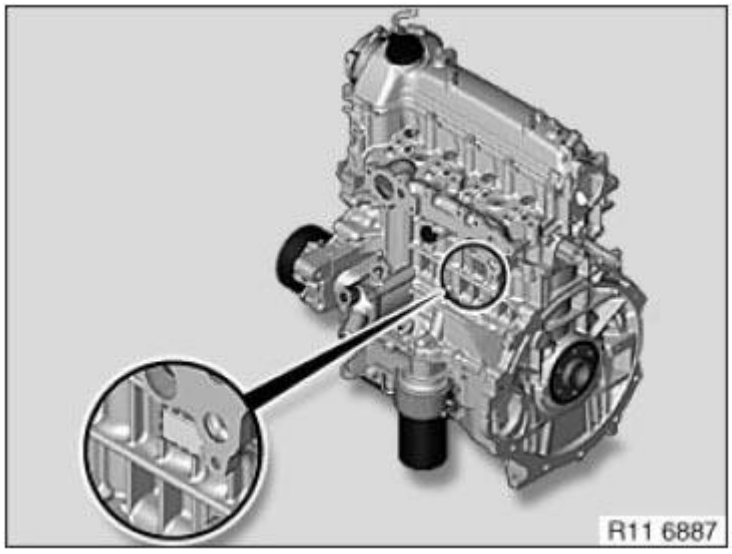

Fig. 17: Identifying Engine Identification Number - W17
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

MOUNTING ENGINE ON ASSEMBLY STAND (N51)

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released.
The end faces of aluminum screws/bolts are painted blue for the purposes of reliable identification.
Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary tasks:

- Remove engine.

Bolt engine or engine block with steel bolts (1) and aluminum bolts (2) to special tool 11 4 440.

To release central bolt, bolt on special tools 11 9 261 and 11 9 265 as well.

Mount engine with special tool 11 3 370 to **SPECIAL TOOL** 00 1 450 .

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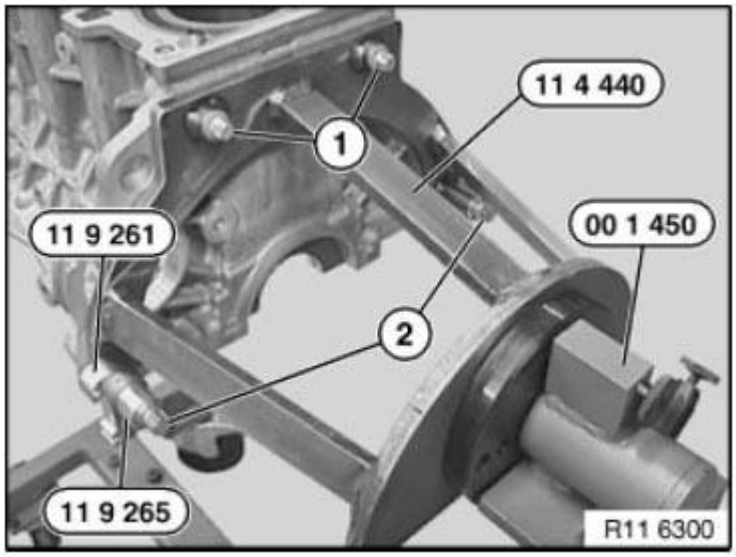

Fig. 18: Identifying Engine Block Steel And Aluminum Bolts And Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

1100... OVERVIEW OF CONSUMABLES (ELECTRONIC PARTS CATALOGUE)

1.0 Sealing compound for **injection.**

INJECTION SEALING COMPOUND REFERENCE CHART

	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.**

APPLICATION SEALING COMPOUND REFERENCE CHART

	Designation in repair instructions	Designation, Electronic Parts Catalogue	Part number, Electronic Parts Catalogue	Application examples

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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

	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.
	N12, N14, N16, N18 N40, N42, N45, N45TU			

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4.3	N46, N46TU, N43. N51, N52, N52Kp, N52TU, N53, N54, N55. N62, N62TU, N63, N73, N73H, N74. S65, S85.	High temperature paste (NEVER-SEEZ compound)	83 23 0 140 233	For greasing the threads on the oxygen sensors.
4.4	N47, N47O1 N47C1, N47T N47D1 N57 N57D1	Copper paste	81 22 9 400 794	For greasing the double hex head bolt on the exhaust turbocharger.

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

LOOSEN LOCKED SCREW CONNECTIONS LUBRICANTS REFERENCE CHART

	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

1100050 REMOVING AND INSTALLING ENGINE (N51)

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

Necessary preliminary tasks:

- Lift engine hood into **ASSEMBLY POSITION** .
- Remove **EXHAUST SYSTEM** .
- Remove **transmission** See **2300017 REMOVING AND INSTALLING TRANSMISSION (GS6-17BG) N51/N52/N52K/N53** or **2400032 REMOVING AND INSTALLING AUTOMATIC TRANSMISSION (GA6L45R)** .
- Drain **ENGINE OIL** .
- Disconnect negative battery lead.
- Remove **AIR CLEANER HOUSING** .
- Remove **FAN COWL** with electric fan.
- Remove **RADIATOR** .

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- Remove **WATER PUMP** .
- Remove **THERMOSTAT** .
- Detach all coolant hoses from engine.
- Remove left and right **FRESH AIR DUCT** .
- Remove intake air **MANIFOLD** .
- Detach vacuum line from brake booster.
- Unfasten **IGNITION WIRING HARNESS** and lay to one side.
- Unfasten **ENGINE WIRING HARNESS** and lay to one side.
- Remove **FUEL INJECTOR RAIL** and place to one side.

Release **AIR-CONDITIONING COMPRESSOR** (1) and set down on front axle carrier.

IMPORTANT: A/C lines are pressurized.
Do not disconnect A/C lines.

Do **not** disconnect coolant pipe from crankcase.

NOTE: Illustrations show E60.

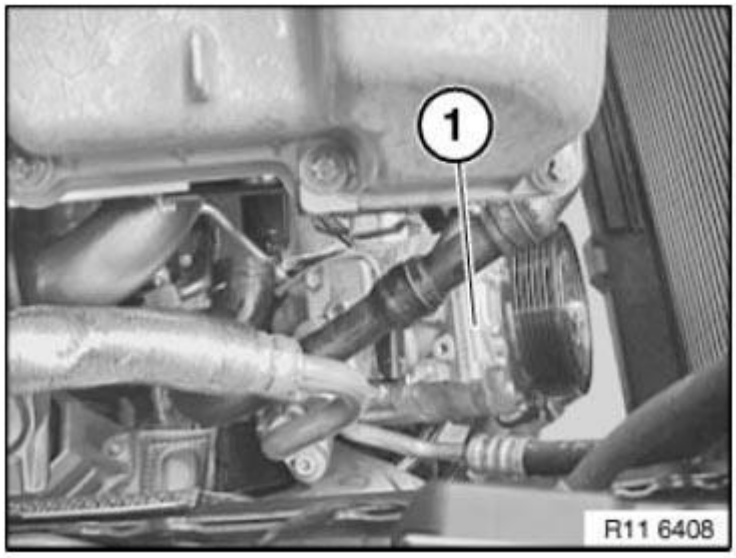

Fig. 19: Identifying Air-Conditioning Compressor
Courtesy of BMW OF NORTH AMERICA, INC.

Release power steering pump (1) and set down on front axle carrier.

NOTE: Do not disconnect hydraulic lines.

If Dynamic Drive optional equipment is fitted, release bracket.

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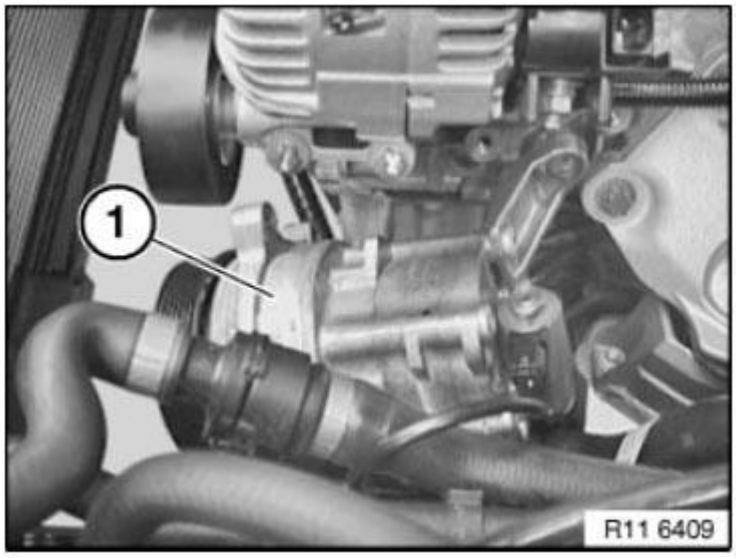

Fig. 20: Identifying Power Steering Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in towing hook (1).

Suspend special tool **11 0 020 LIFTING GEAR** from engine crane.

Suspend special tool **11 0 020 LIFTING GEAR** from the designated mounting eyelets (2) only.

Lift engine out with crane.

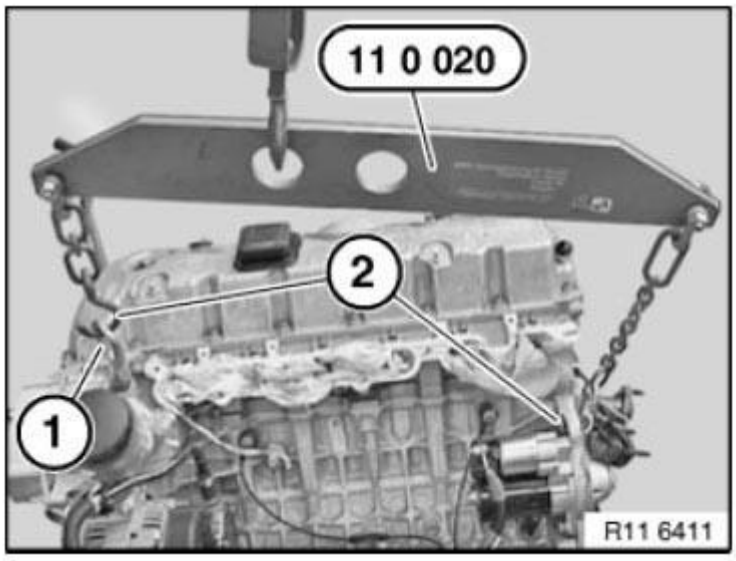

Fig. 21: Identifying Towing Hook And Mounting Eyelets And Special Tool (11 0 020)
Courtesy of BMW OF NORTH AMERICA, INC.

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NOTE: If automatic transmission optional equipment is fitted: Raise engine approx. 10 cm.

Release screws (1).

Remove lines (2) with oil-water heat exchanger in direction of arrow.

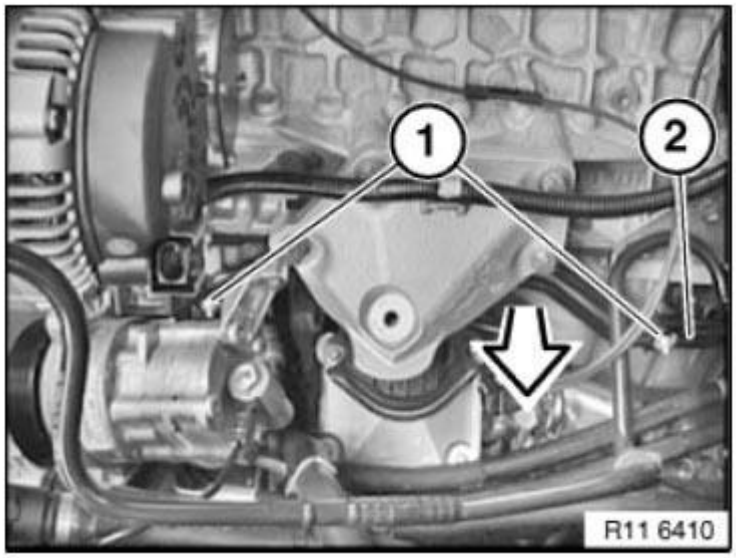

Fig. 22: Removing Lines With Oil-Water Heat Exchanger
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

1100 REMOVING AND INSTALLING/REPLACING ACOUSTIC COVER (N51)

Necessary preliminary tasks

- **REMOVE MICROFILTER HOUSING**

Unfasten screws.

Tightening torque **11 12 6AZ** .

Remove acoustic cover (1).

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

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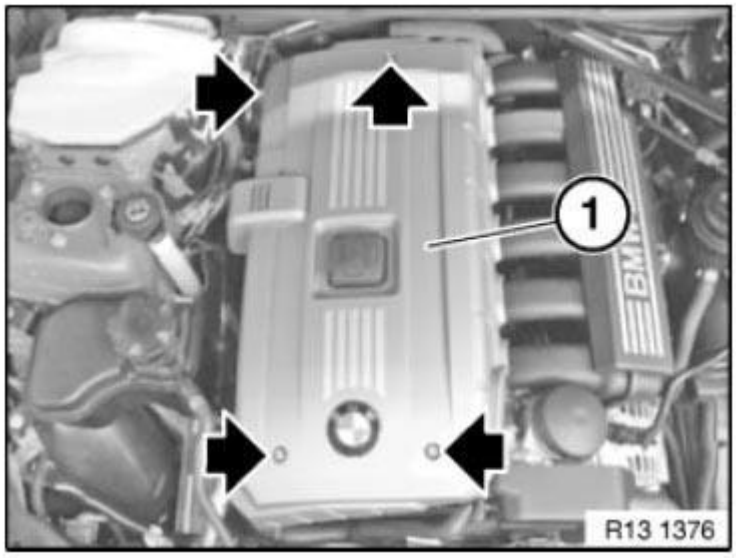

Fig. 23: Locating Acoustic Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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.

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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

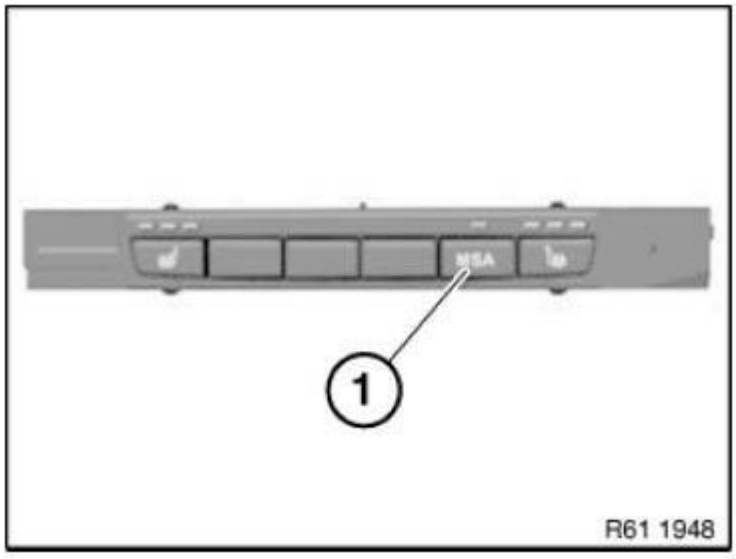

Fig. 24: Identifying MSA Button
Courtesy of BMW OF NORTH AMERICA, INC.

- 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

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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.

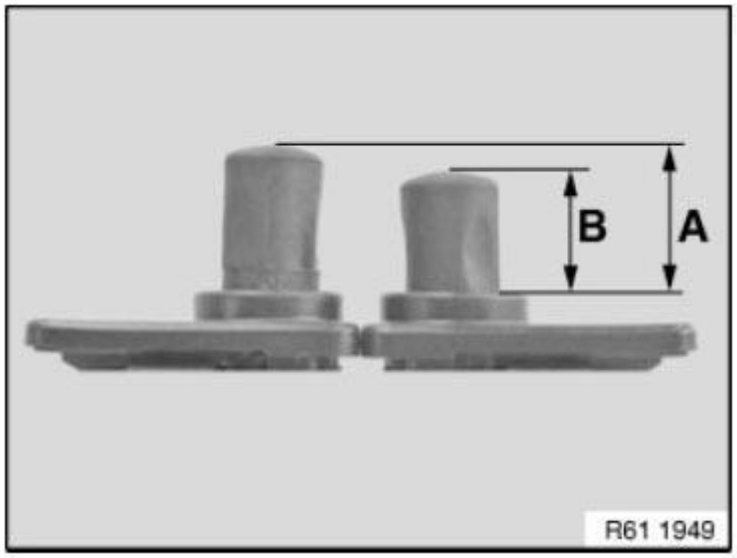

Fig. 25: Identifying Basic Setting For Engine Hood/Bonnet
Courtesy of BMW OF NORTH AMERICA, INC.

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.

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1100670 SECURING ENGINE IN INSTALLATION POSITION (N51)

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

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

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

Necessary preliminary tasks:

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

Installation:

Replace damaged cover caps.

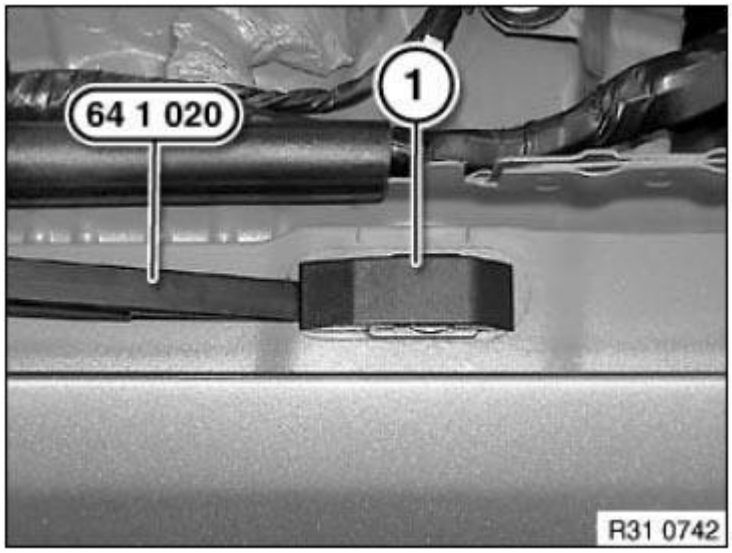

Fig. 26: Removing Cover Caps Of Side Panel Screw Connection Using Special Tool (64 1 020)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble transverse member 00 6 000 with **SPECIAL TOOLS** :

- 00 6 051 (profile strips)

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- 00 6 070 (supports)
- 00 6 052(supports)
- 00 6 031 (connections)

complete.

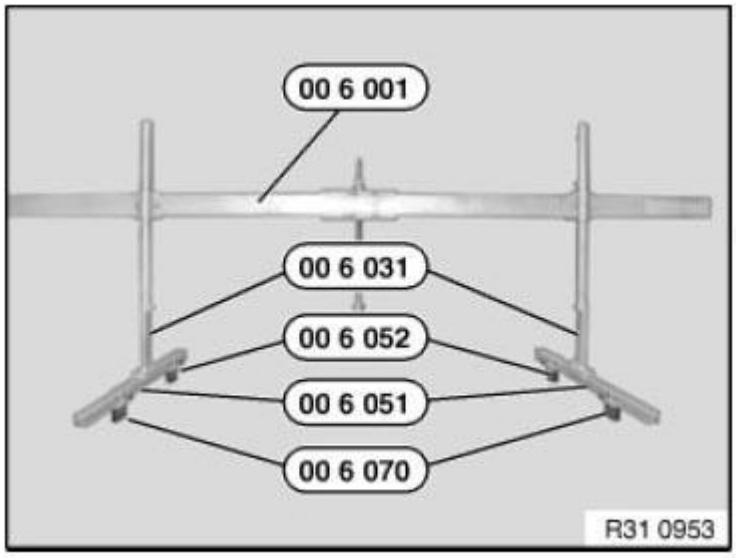

Fig. 27: Identifying Special Tools For Assembling Transverse Member
Courtesy of BMW OF NORTH AMERICA, INC.

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

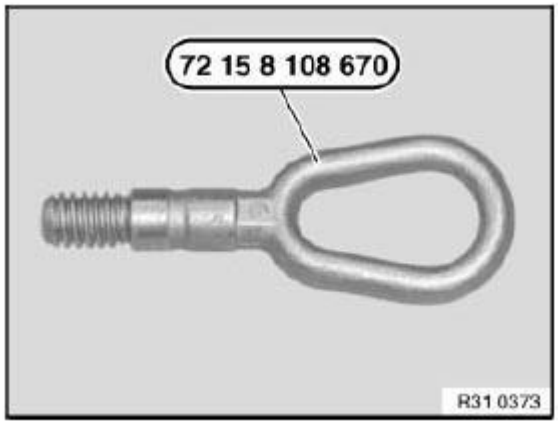

Fig. 28: Identifying Special Tool (72 15 8 108 670)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Release front screws (1) on acoustic cover (2).

Tightening torque **11 12 6AZ** .

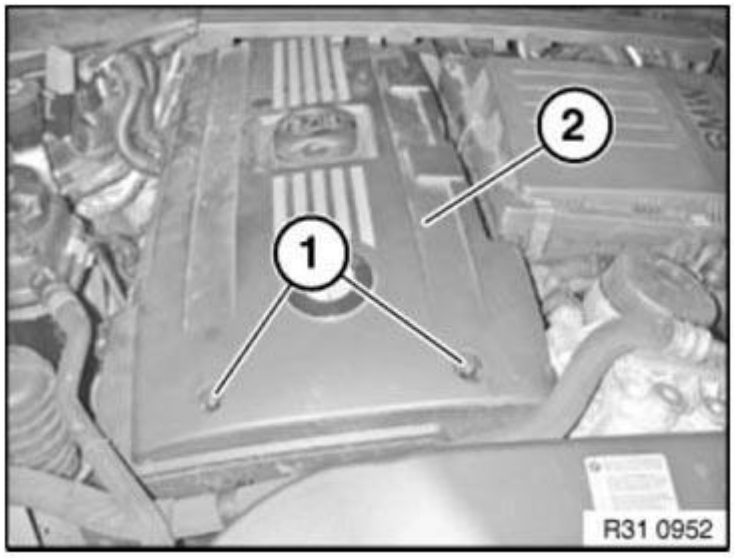

Fig. 29: Identifying Front Screws On Acoustic Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Raise acoustic cover (1) slightly.

Screw in towing hook (2) and tighten down to approx. 30 Nm.

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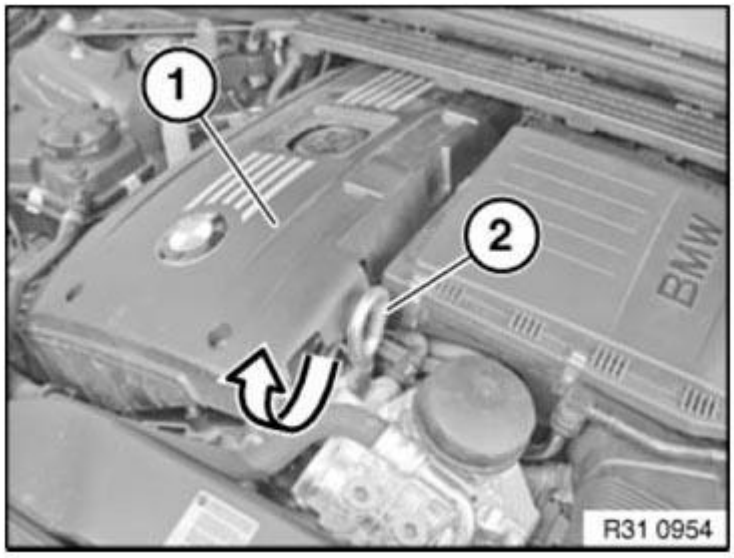

Fig. 30: Tightening Towing Hook
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on front panel (2).

Tightening torque **41 33 1AZ** .

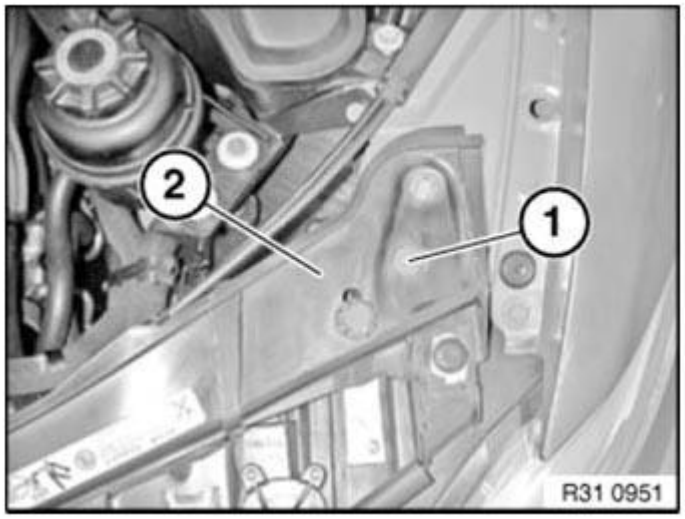

Fig. 31: Identifying Screw On Front Panel
Courtesy of BMW OF NORTH AMERICA, INC.

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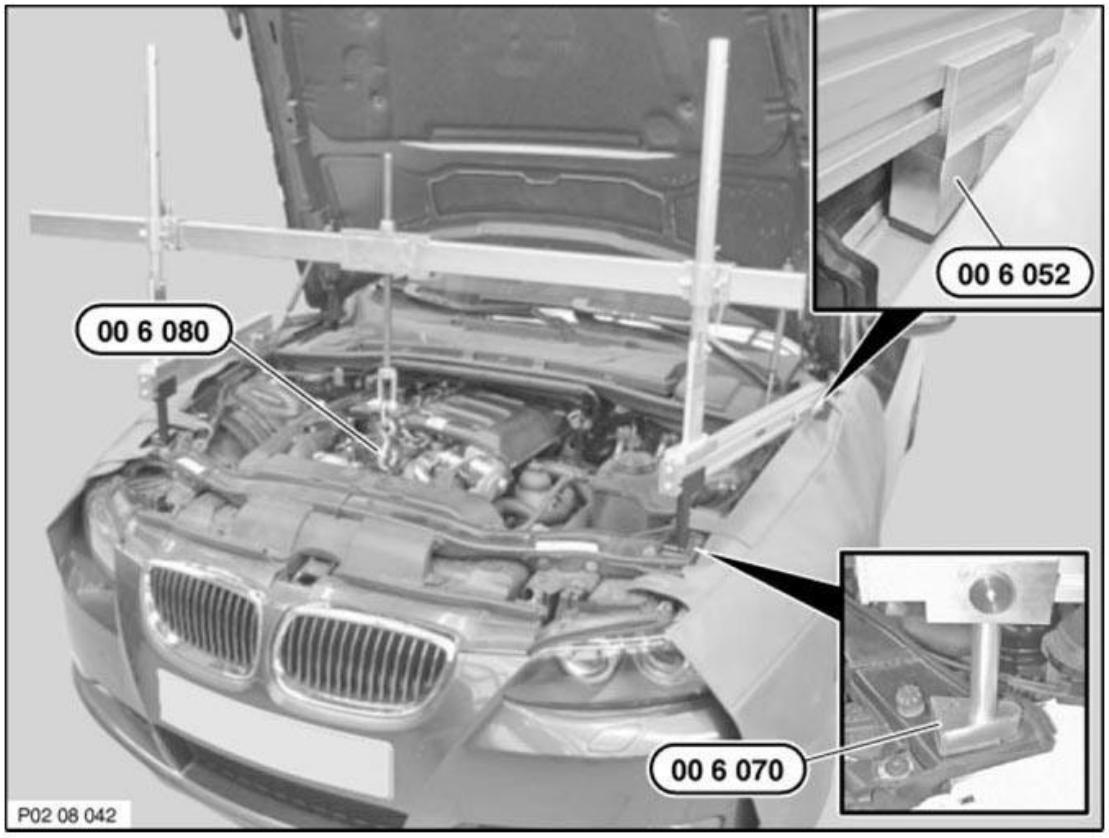

Fig. 32: Attaching Special Tool To Towing Hook
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!
Fit transverse member 00 6 000 with a second person helping.
Place supports in front in the area of front panel attachment and in the rear on the fasteners of the side panels.
Bolt connections of transverse member 00 6 001 must point to windscreen.

Adapt bevel of special tool 00 6 052 to inclination of side panels.

SPECIAL TOOL 00 6 070 consists of a left and right support.

Secure chain with coat hook 00 6 080 to spindle 00 6 002 and align centrally over towing hook.

Attach special tool to towing hook.

WARNING: Risk of injury!
Tighten down all adjusting screws and nuts on transverse member 00 6 000.

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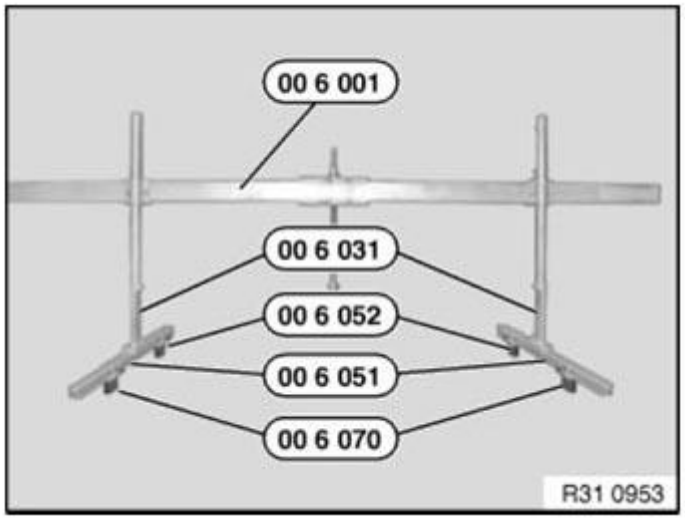

Fig. 33: Identifying Special Tools For Assembling Transverse Member
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Raise engine approx. 10 mm with transverse member.

Installation:

Replace self-locking nuts.

Tightening torque **22 11 2AZ** .

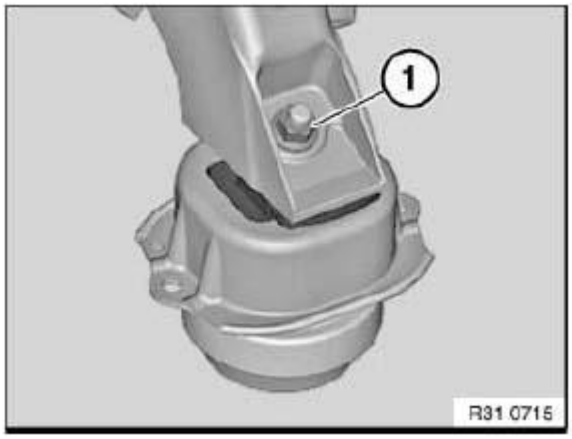

Fig. 34: Identifying Engine Mounting Nut
Courtesy of BMW OF NORTH AMERICA, INC.

1100... SERVICE - ENGINE OIL (N51)

WARNING: Danger of scalding!

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

IMPORTANT: Carry out the engine oil service only when the engine is at normal operating temperature.
Observe the exact engine oil filling capacity.
Overfilling the engine with engine oil will result in engine damage.
Checking and drop-off times (at least 10 minutes) must be observed.

IMPORTANT: Risk of damage!
Protect belt drive against dirt.
Cover with suitable materials.

Recycling

Catch and dispose of drained engine oil in a suitable container.

Observe country-specific waste-disposal regulations.

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

Tightening torque **11 42 1AZ** .

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

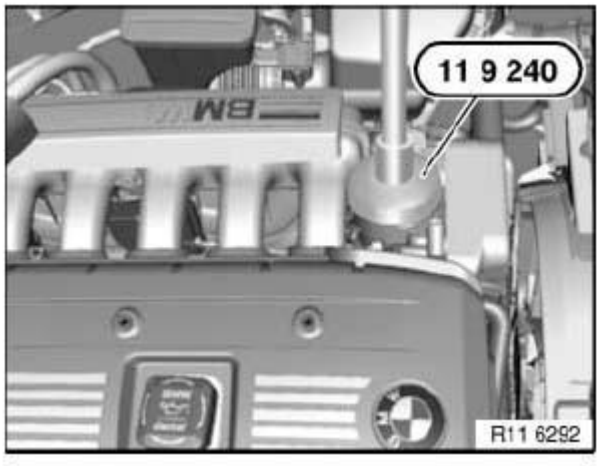

Fig. 35: Releasing Oil Filter Cap Using Special Tool (11 9 240)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Presentation: without underbody protection or reinforcement plate (AWD).

Unclip service opening on underbody protection or reinforcement plate.

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

Tightening torque **11 13 1AZ** .

Installation:

Replace sealing ring.

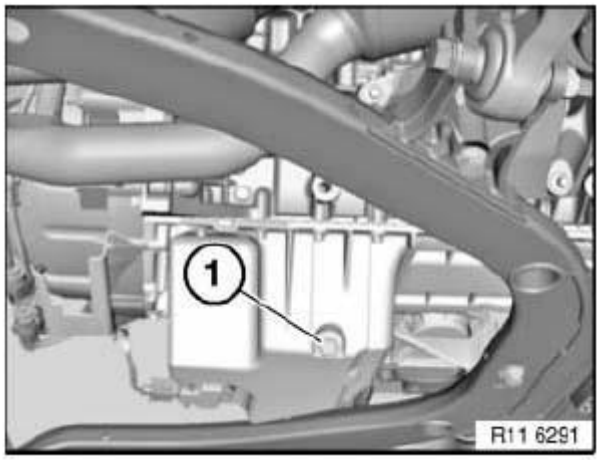

Fig. 36: Identifying Screw Plug On Oil Sump
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

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

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

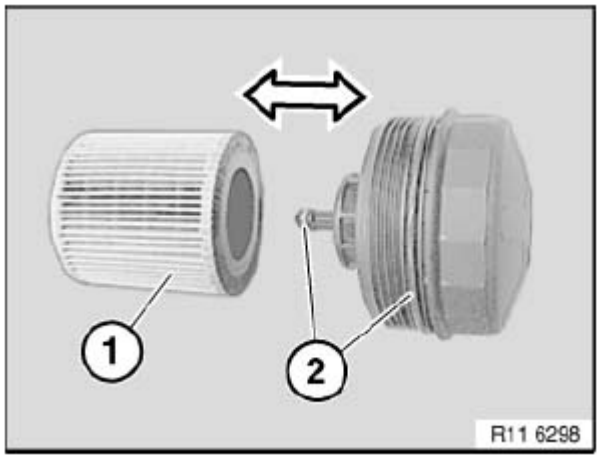

Fig. 37: Inserting Filter Element

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Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **11 42 1AZ** .

NOTE: Pour in engine oil. See ENGINE - OPERATING FLUIDS . .
Start engine and run at idle until oil pressure warning lamp goes out.
Turn off engine.
Check oil filter cap and screw plug on oil sump for leaks.
Assemble engine.

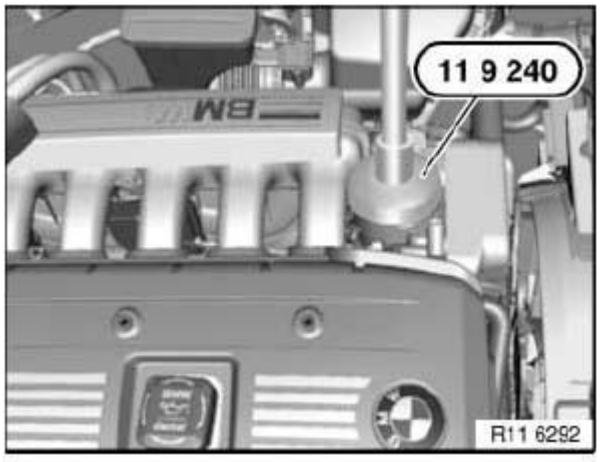

Fig. 38: Identifying Special Tool (11 9 240)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking engine oil level:

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

CYLINDER HEAD WITH COVER

1112729 CHECKING CYLINDER HEAD FOR LEAKS (N51)

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:

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- Remove **CYLINDER HEAD** .
- Remove **ALL ENGINE VALVES** .

NOTE: Observe mounting of special tool 11 4 341 on cylinder.

Secure special tool 11 4 341 with bolts 11 4 345 to 25 Nm.

Installation:

1 cyl is marked.

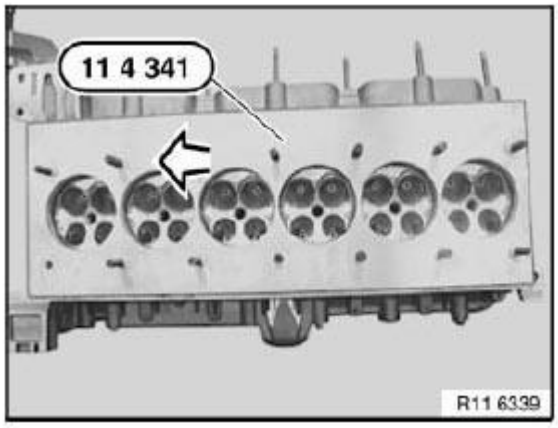

Fig. 39: Removing Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

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

Sealing flange must rest flat.

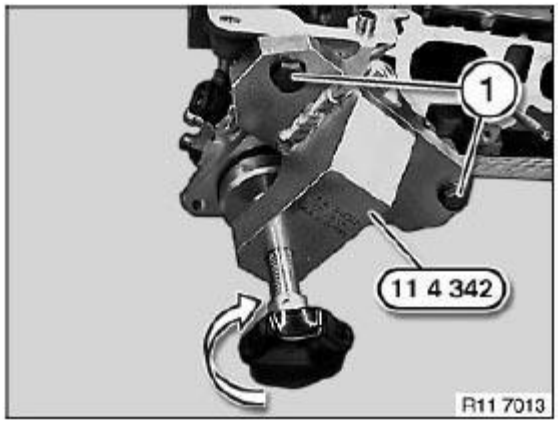

Fig. 40: Inserting Knurled Screw
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: Compressed air at valve max. 3 bar.

Heat cylinder head to 60°.

Check for bubble formation in a water bath.

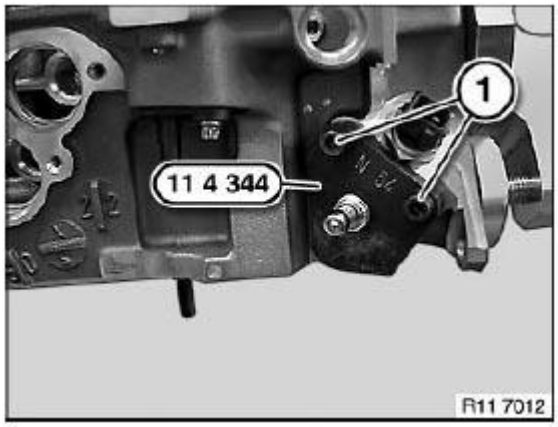

Fig. 41: Identifying Special Tool (11 4 344)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1112000 REMOVING AND INSTALLING OR SEALING CYLINDER HEAD COVER (N51)

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

Necessary preliminary tasks:

- Remove acoustic cover.
- Remove rod-type ignition coils.
- Unclip wiring harness for fuel injectors.
- Remove **TENSION STRUT** .
- Remove **CLEAN AIR DUCT** .

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Unlock and detach engine vent hose (1).

If necessary, pull off metal bracket (2) in direction of arrow.

Release screws (3).

Tightening torque: **11 37 3AZ** .

Remove servodrive (4) in direction of arrow.

If necessary, release nuts (5).

If necessary, remove secondary air valve (6).

Installation:

Replace aluminum screws.

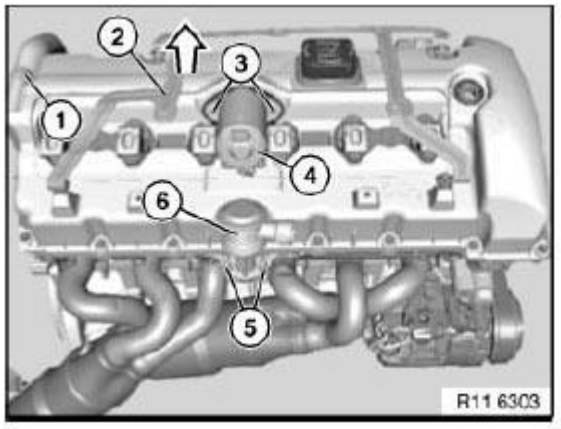

Fig. 42: Pulling Off Metal Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws in area (1).

Installation:

Replace aluminum screws.

Tightening torque **11 12 4AZ** .

Release screws (2).

Tightening torque **11 12 4AZ** .

Installation:

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Replace aluminum screws.

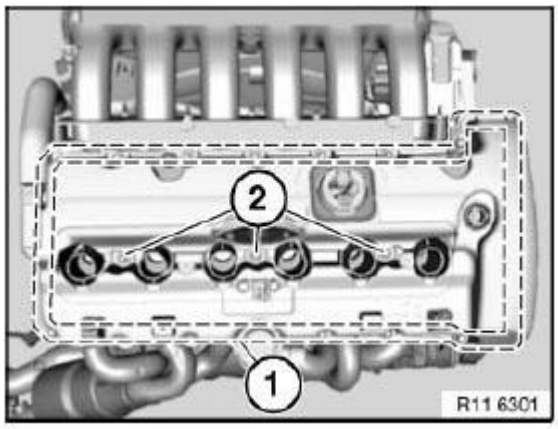

Fig. 43: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Replace seal (1).

Replace seal (2).

Installation:

Clean all sealing surfaces.

Do not clean sealing faces (1 and 2) with a metal-cutting tool.

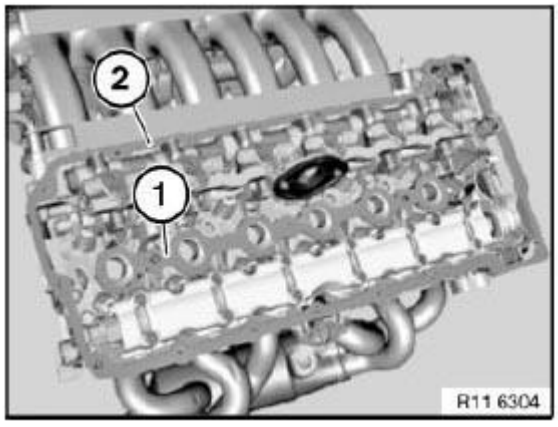

Fig. 44: Identifying Seal On Sealing Faces
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1112100 REMOVING AND INSTALLING/SEALING CYLINDER HEAD (N51)

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

Necessary preliminary tasks:

- Remove **EXHAUST SYSTEM** .
- Drain **COOLANT** .
- Drain **ENGINE OIL** .
- Remove both **exhaust manifolds** See **1840060 REMOVING AND INSTALLING/REPLACING REAR EXHAUST MANIFOLD (N51)** or **1840050 REMOVING AND INSTALLING/REPLACING FRONT EXHAUST MANIFOLD (N51)**.
- Remove intake **PLENUM** .
- Detach coolant hoses from cylinder head.
- Remove **CYLINDER HEAD COVER** .
- Remove **INTAKE AND EXHAUST CAMSHAFT ADJUSTERS** .

IMPORTANT: Fit new cylinder head screws.
Do not wash off bolt coating.
There must be no fluids or contaminants in any of the threaded holes for the cylinder head bolt connections.
(Risk of corrosion and cracking).

Release screws (1).

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

Do not allow timing chain to drop down.

Installation:

Only during assembly is the timing chain lifted out with a hook.

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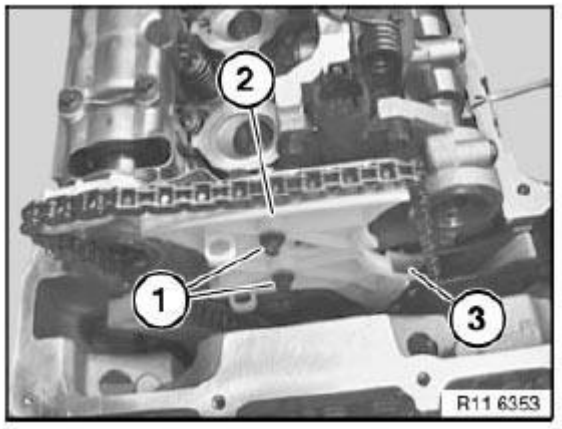

Fig. 45: Identifying Timing Chain Module With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

Remove eccentric shaft sensor (1) towards front.

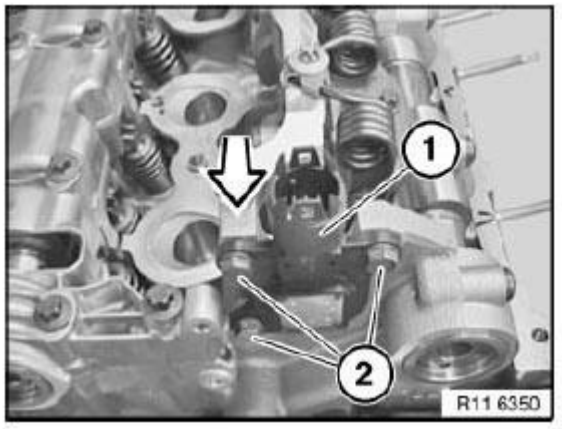

Fig. 46: Removing Eccentric Shaft Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Remove magnet wheel (2) towards front.

IMPORTANT: Magnet wheel (2) is extremely magnetic.

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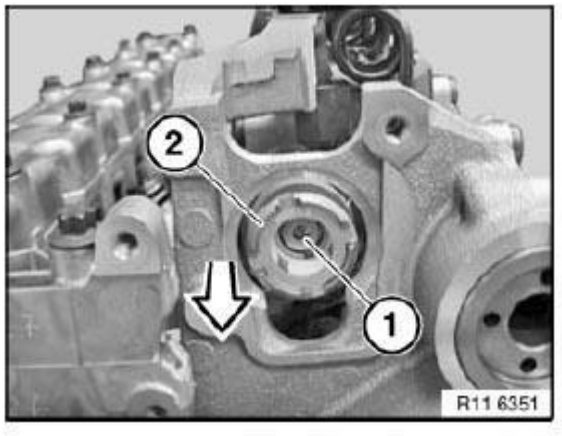

Fig. 47: Removing Magnet Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: After removing, pack magnet wheel (1) away immediately in a plastic bag (2) for safety reasons.
Magnet wheel must be protected against metal chips.

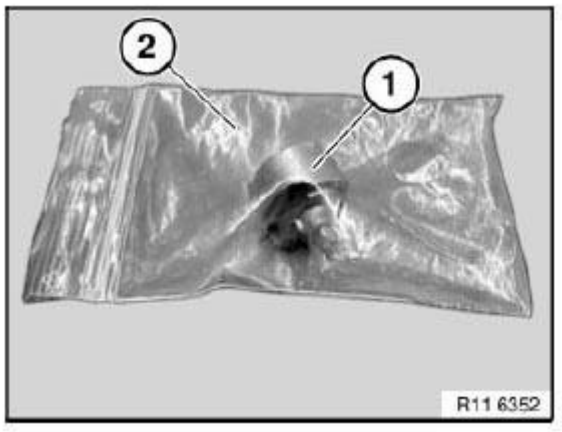

Fig. 48: Identifying Magnet Wheel In Plastic Bag
Courtesy of BMW OF NORTH AMERICA, INC.

Pre-tension eccentric shaft (1) upwards in direction of arrow.

Remove min stop screw between 1st and 2nd cylinders.

Tightening torque: **11 37 6AZ** .

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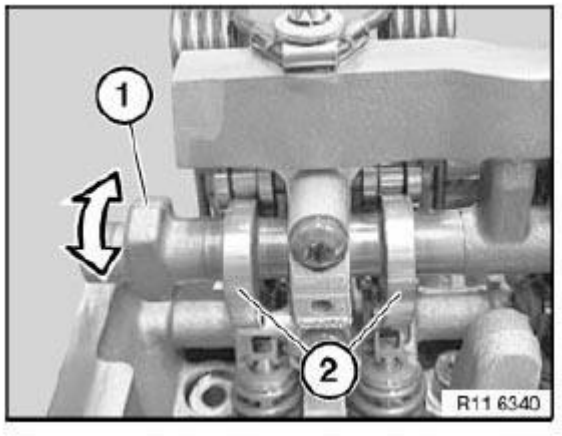

Fig. 49: Turning Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: **11 12 3AZ** .

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

IMPORTANT: Secure screw (2) with a gripper against falling out and remove.

Installation:

Replace aluminum screws.

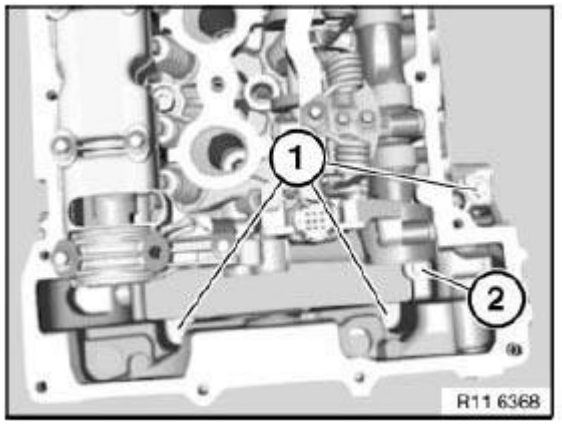

Fig. 50: Identifying Screws On Chain Module
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Different screw heads

M 10 screw (1) is released with special tool **11 8 580 SOCKET WRENCH** .

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M 9 screw (2) is released with special tool **11 4 420** .

NOTE: Graphic shows camshaft removed.

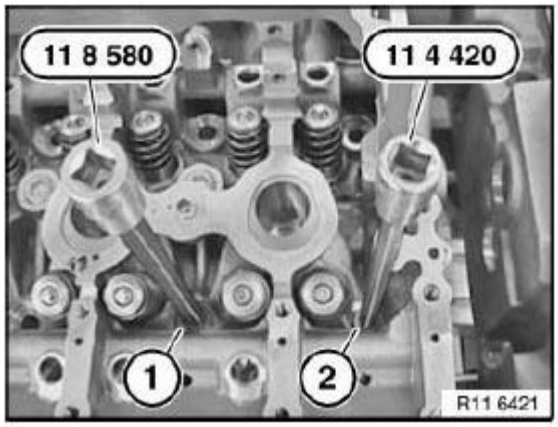

Fig. 51: Identifying Screws And Special Tool (11 8 580 And 11 4 420)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 and 3) with special tool **11 4 420** .

Tightening torque: **11 12 2AZ**

Release screws (2) with special tool **11 8 580 SOCKET WRENCH** from outside inwards.

Tightening torque: **11 12 1AZ**

IMPORTANT: All screws must be replaced.
Jointing torque and angle of rotation must be observed without fail (risk of damage).

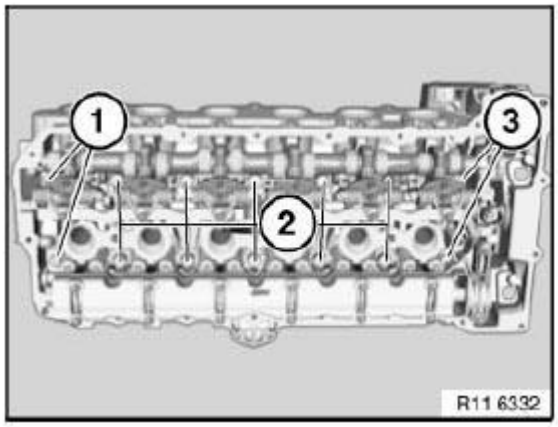

Fig. 52: Identifying Cylinder Head Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

**IMPORTANT: Weight of cylinder head with add-on parts is approx. 40 kg.
Remove and install cylinder head with two persons.
Do not set cylinder head down on sealing surface, risk of damage to engine valves.**

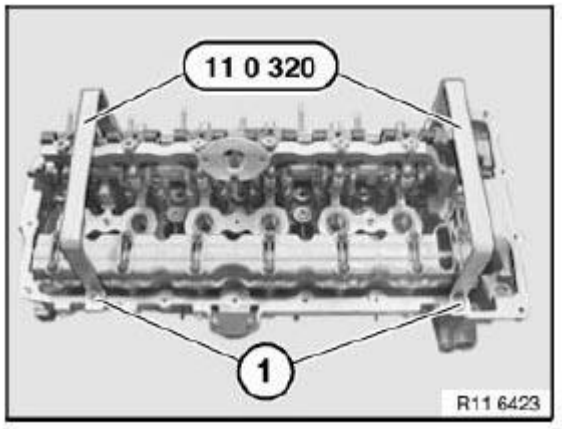

Fig. 53: Identifying Cylinder Head Cover Bolts And Special Tool (11 0 320)
Courtesy of BMW OF NORTH AMERICA, INC.

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

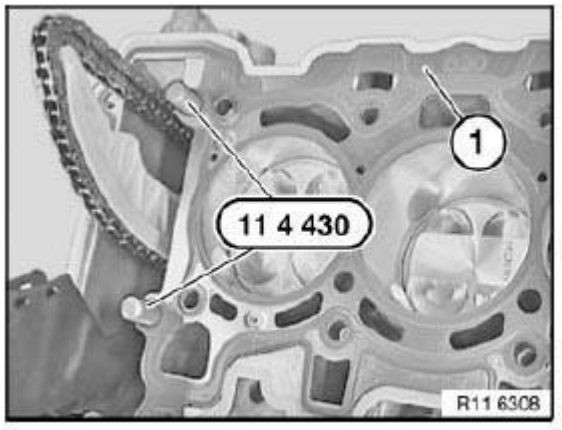

Fig. 54: Identifying Special Tool (11 4 430)
Courtesy of BMW OF NORTH AMERICA, INC.

Use special tool 11 4 471 to remove coarse gasket remnants from sealing surfaces on cylinder head and on crankcase.

IMPORTANT: Do not use any metal-cutting tools.

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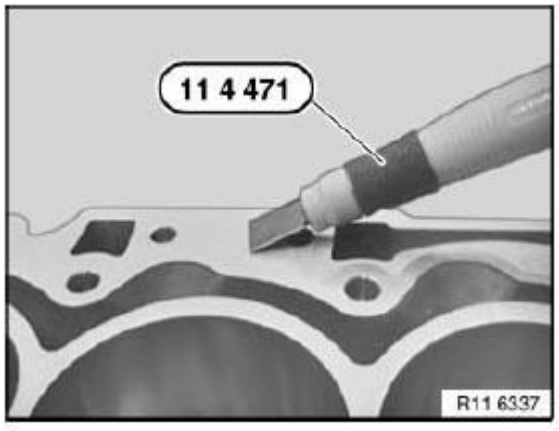

Fig. 55: Removing Coarse Gasket Remnants From Sealing Surfaces Using Special Tool (11 4 471)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove fine gasket remnants with special tool 11 4 472.

IMPORTANT: Do not use any metal-cutting tools.

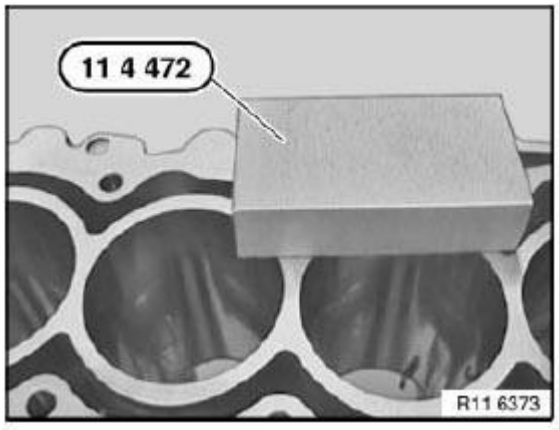

Fig. 56: Removing Fine Gasket Remnants Using Special Tool (11 4 472)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Risk of corrosion and cracking!

Clean all threaded holes.

Replace **CYLINDER HEAD GASKET** .

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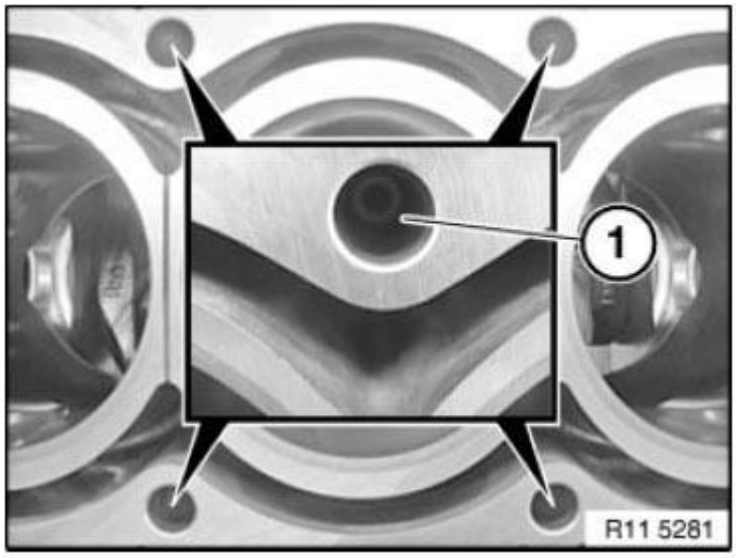

Fig. 57: Identifying Threaded Holes
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe tightening sequence.

Fit new cylinder head screws.

Insert bolts (1 to 10) with special tool **11 5 190** .

Tightening torque: **11 12 1AZ** .

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

Tightening torque: **11 12 2AZ** .

NOTE: Graphic shows camshafts removed.

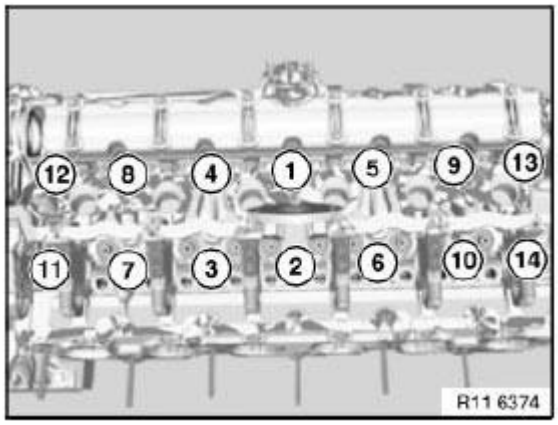

Fig. 58: Cylinder Head Bolts Installing Sequence

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Courtesy of BMW OF NORTH AMERICA, INC.

Observe tightening sequence

Installation:

- Jointing torque: Screws 1 to 14/1x 30 Nm

1. Angle of rotation: Screws 1 to 14/1x 90°
2. Angle of rotation: Screws 1 to 10/1x 90°
3. Angle of rotation: Screws 1 to 14/1x 45°

Replace screws (1).

Tightening torque: **11 12 3AZ** .

IMPORTANT: Secure screw (2) with a gripper against falling out.

Installation:

Replace aluminum screws.

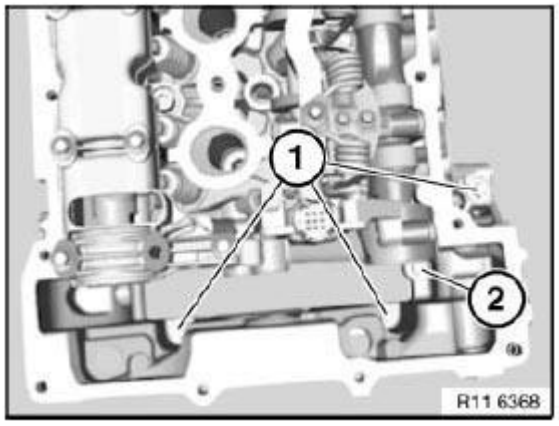

Fig. 59: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1112101 REPLACING CYLINDER HEAD GASKET (N51)

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.

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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** .

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

Remove head gasket.

IMPORTANT: Check identification (1) on cylinder head gasket (N51).

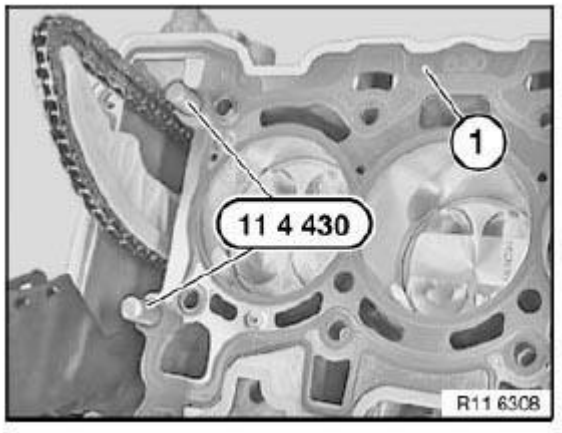

Fig. 60: Identifying Special Tool (11 4 430)
Courtesy of BMW OF NORTH AMERICA, INC.

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 TOOL only.
Do not use any metal-cutting tools.

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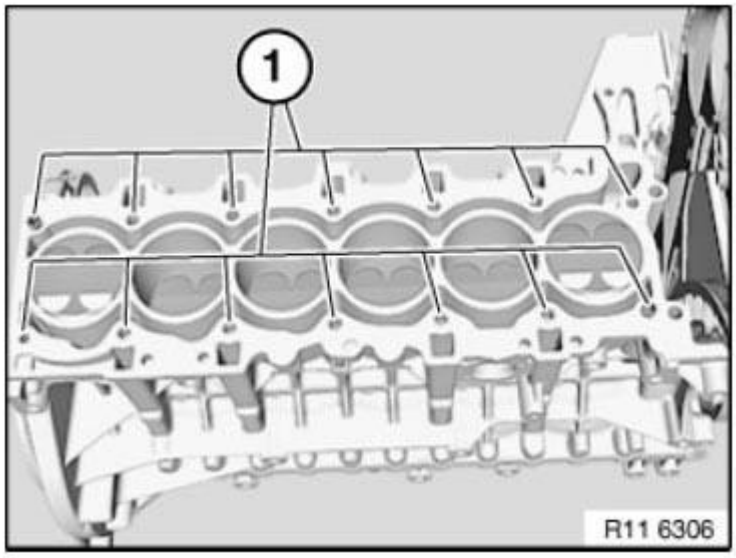

Fig. 61: Identifying Threaded Holes For Cylinder Head Bolt Connections
Courtesy of BMW OF NORTH AMERICA, INC.

Identification (1) of head gasket.

IMPORTANT: Rubber coating (2) on cylinder head gasket must not under any circumstances be damaged (electrochemical corrosion).

Gasket (3) is a beaded metal gasket

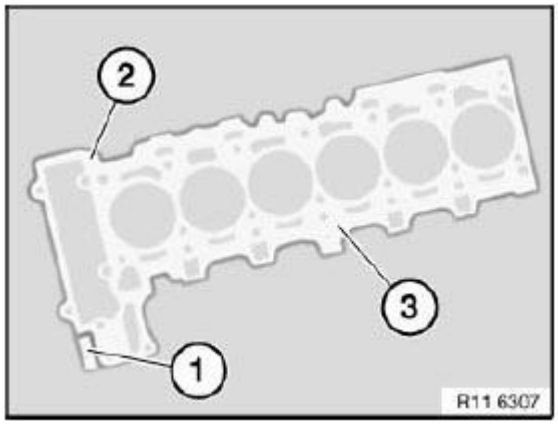

Fig. 62: Identifying Cylinder Head Gasket Identification Mark With Rubber Coating
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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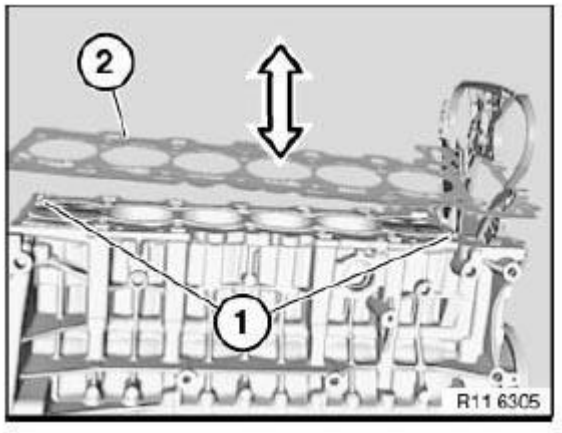

Fig. 63: Placing Head Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check cylinder head for DEVIATION FROM FLATNESS .
Check cylinder head for WATER LEAKS .

Assemble engine.

1112719 RESURFACING CYLINDER HEAD SEALING FACE (N51)

Necessary preliminary tasks:

- Remove **CYLINDER HEAD** .
- Remove **EXHAUST CAMSHAFT** .
- Remove **INTERMEDIATE LEVER** on inlet side.

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

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

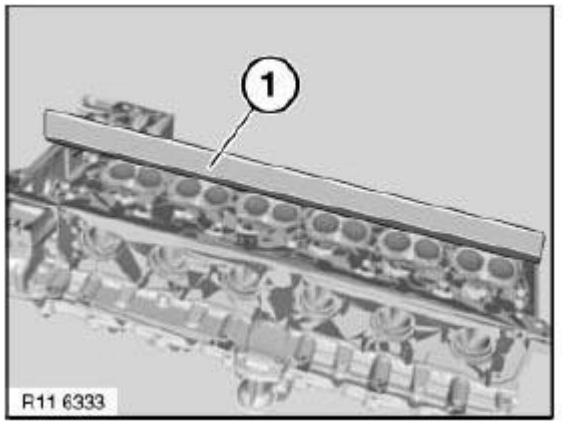

Fig. 64: Checking Evenness Of Cylinder Head Sealing Faces Using Standard Straight-Edge

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Courtesy of BMW OF NORTH AMERICA, INC.

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

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

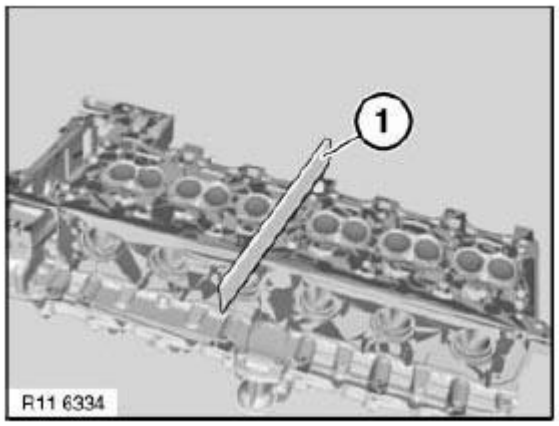

Fig. 65: Checking Evenness Of Cylinder Head Sealing Faces Using Standard Straight-Edge
Courtesy of BMW OF NORTH AMERICA, INC.

Check cylinder head for **WATER LEAKS** .

Assemble engine.

OIL SUMP

1113000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (N51)

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

Necessary preliminary tasks:

- Remove engine splash guard.
- Secure engine in **INSTALLATION POSITION** .
- Lower **FRONT AXLE** .

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- **In all-wheel-drive vehicles:**

  Remove drive shafts.

  Remove front axle differential.

NOTE: The lines must be detached from the engine oil sump in the case of the optional extra automatic transmission; if necessary, detach vane pump and place to one side.

Release bolts (3) on transmission.

Detach return hose (2).

Release bolts along line (1).

Tightening torque: **11 13 1AZ** .

Installation:

Replace aluminum screws.

If necessary, release bolts (4), remove oil level sensor.

Installation:

Replace all seals.

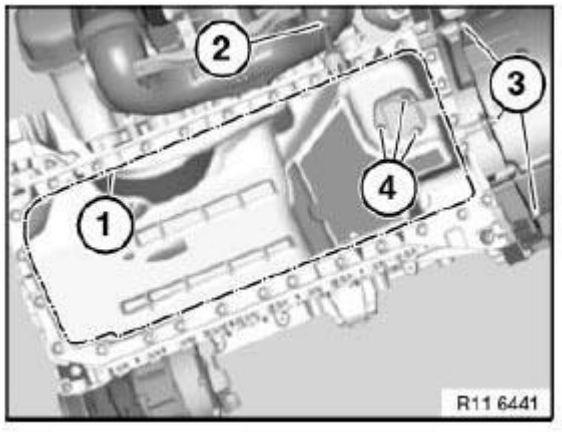

Fig. 66: Identifying Oil Level Sensor And Transmission Bolts And Return Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

HOUSING COVER

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1114151 REPLACING CRANKSHAFT RADIAL SEAL (N51)

Necessary preliminary tasks:

- Remove **transmission** See **2300017 REMOVING AND INSTALLING TRANSMISSION (GS6-17BG) N51/N52/N52K/N53** or **2400050 INSTALLING REPLACEMENT TRANSMISSION (GA6L45R)** .
- Remove **FLYWHEEL** .

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

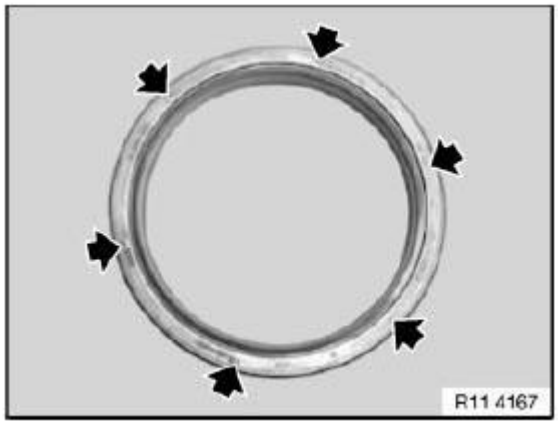

Fig. 67: Locating Crankshaft Radial Seal Openings
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If necessary, remove rubber coating (1) on top side of radial seal and expose a removal opening (2) (see Fig. 68).

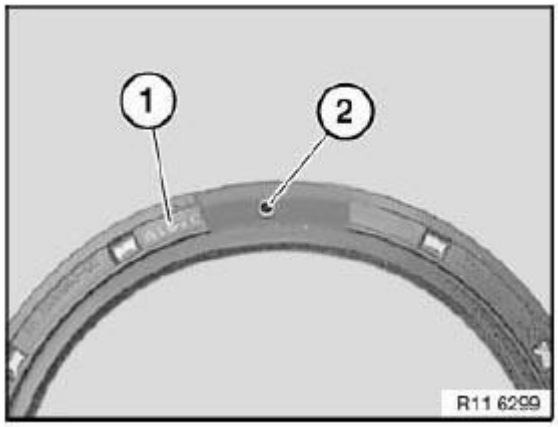

Fig. 68: Identifying Rubber Coating And Removal Opening
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

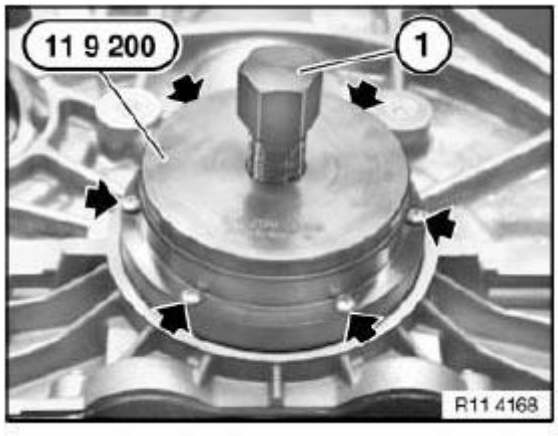

Fig. 69: Locating Metal Screws Onto Removal Opening
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

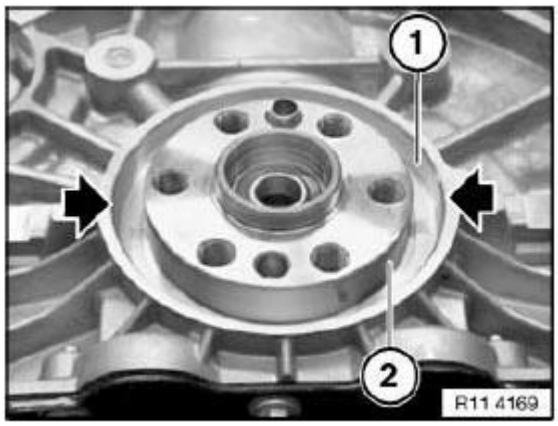

Fig. 70: Identifying Sealing Surface And Running Surface Of Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Radial shaft seal (1) has a groove (2) on both left and right sides.

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

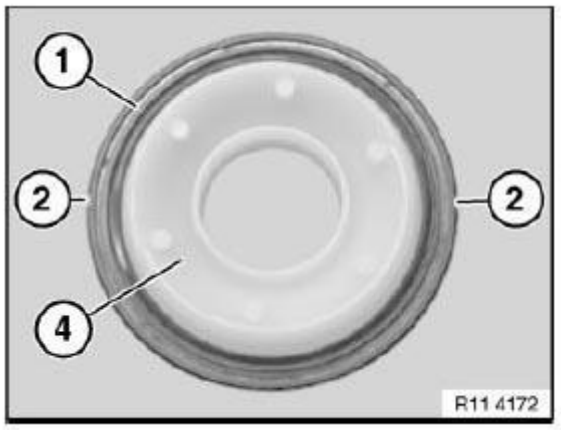

Fig. 71: Identifying Crankshaft Radial Seal With Grooves And Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: The required parts are available from the BMW Parts Service (EPC).

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 128357.

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

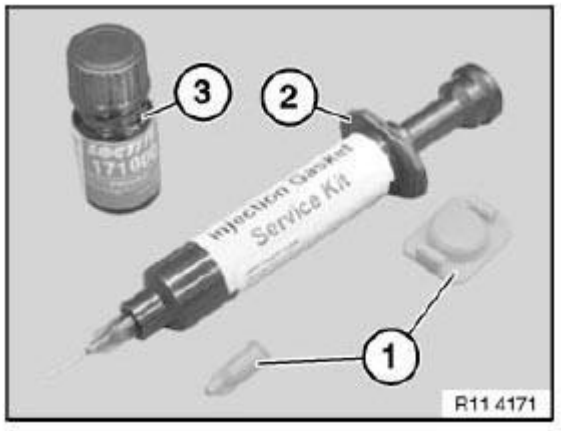

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Fig. 72: Identifying Sealing Compound And Bottle Of Injector
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

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

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

Carefully remove support sleeve (4).

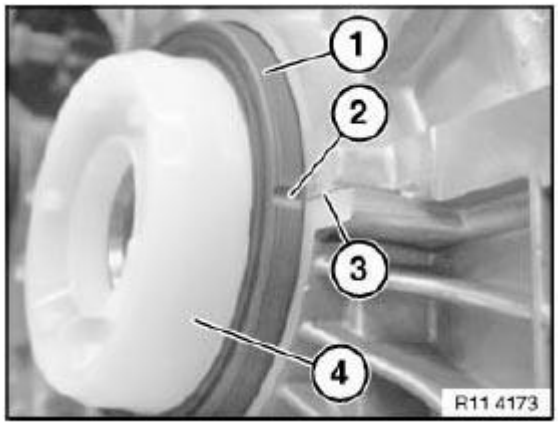

Fig. 73: Identifying Support Sleeve And Groove With Radial Shaft Seal On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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 on preassembled radial shaft seal.

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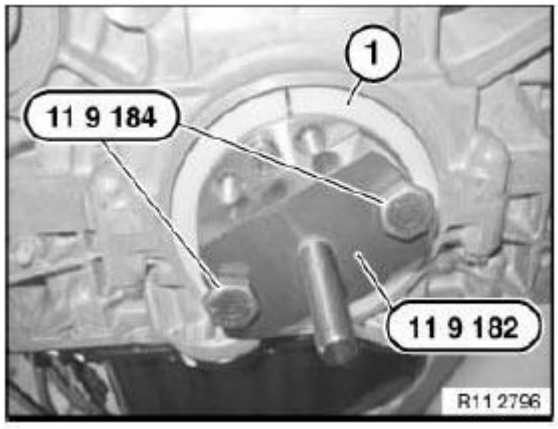

Fig. 74: Identifying Special Tools (11 9 182 And 11 9 183) On Spacer Ring
Courtesy of BMW OF NORTH AMERICA, INC.

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.

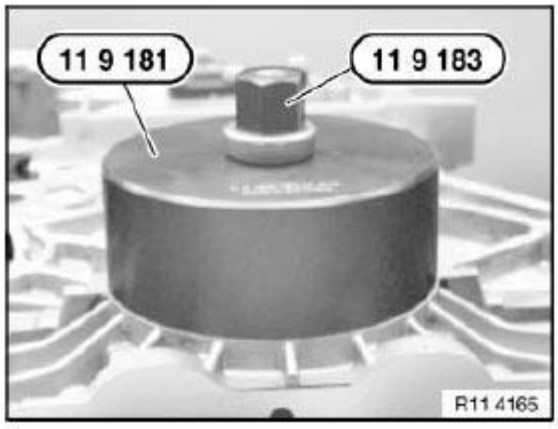

Fig. 75: Identifying Special Tools (11 9 181 And 11 9 183)
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

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

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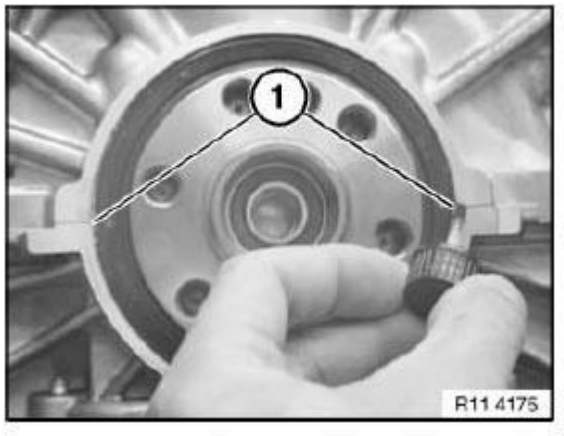

Fig. 76: Inserting Brush Into Grooves Using Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Fill both grooves (1) flush with Loctite sealing compound, manufacturer's number 128357.

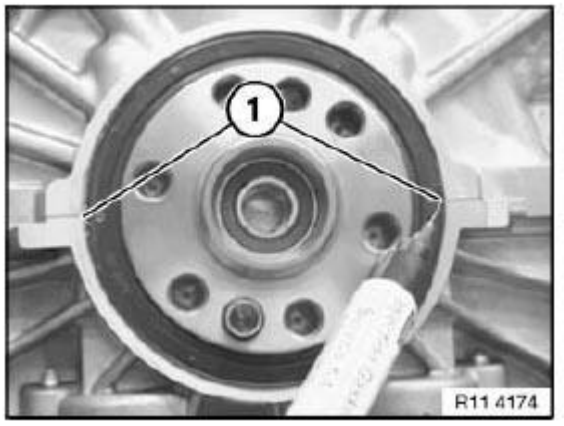

Fig. 77: Filling Grooves Flush Using Loctite Sealing Compound
Courtesy of BMW OF NORTH AMERICA, INC.

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 128357, and prevents leakage.

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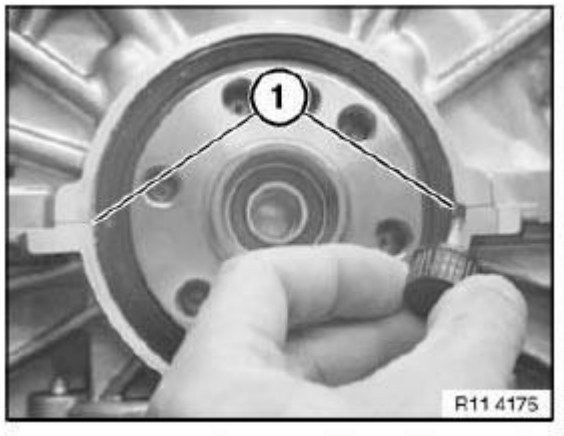

Fig. 78: Inserting Brush Into Grooves Using Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1114005 REPLACING FRONT CRANKSHAFT SEAL (N51)

Necessary preliminary tasks:

- Remove **VIBRATION DAMPER** .

IMPORTANT: Do not release central bolt.

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

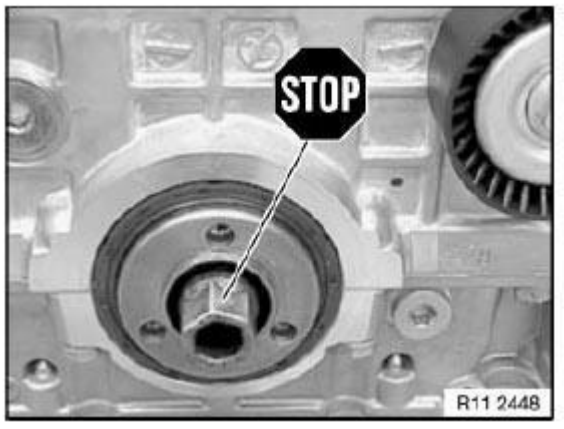

Fig. 79: Caution For Releasing Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Turn back special tool 11 9 222.

Push special tool 11 9 221 onto crankshaft.

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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.

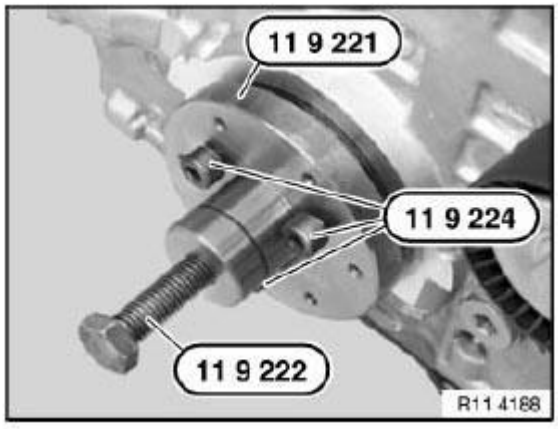

Fig. 80: Tightening Screws Using Special Tool (11 9 224)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Screw in spindle 11 0 372.

Release crankshaft seal from housing.

Repeat the operation several times if necessary.

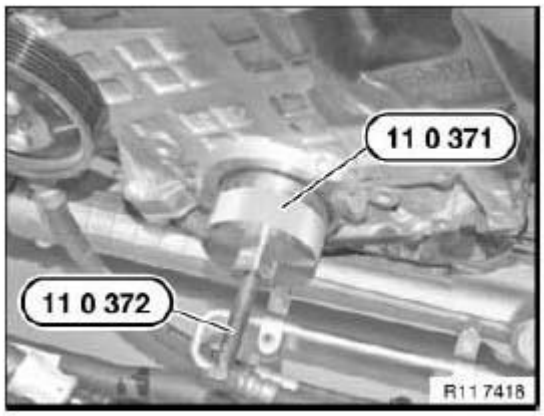

Fig. 81: Identifying Special Tools (11 0 372 And 11 0 371)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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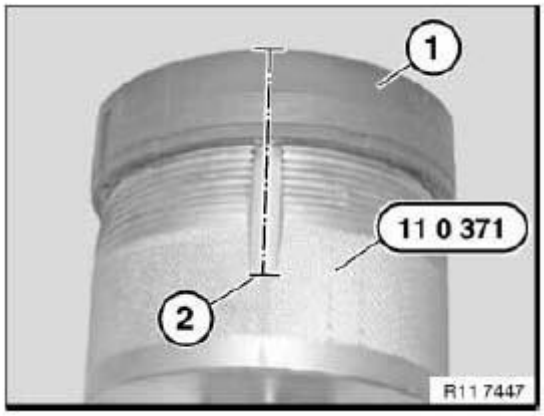

Fig. 82: Identifying Crankshaft Radial Seal At Cutting Line
Courtesy of BMW OF NORTH AMERICA, INC.

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:

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

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

Illustration N42.

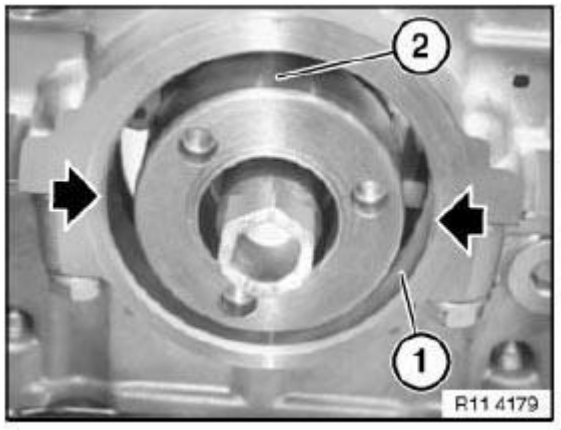

Fig. 83: Locating Sealing Surface
Courtesy of BMW OF NORTH AMERICA, INC.

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

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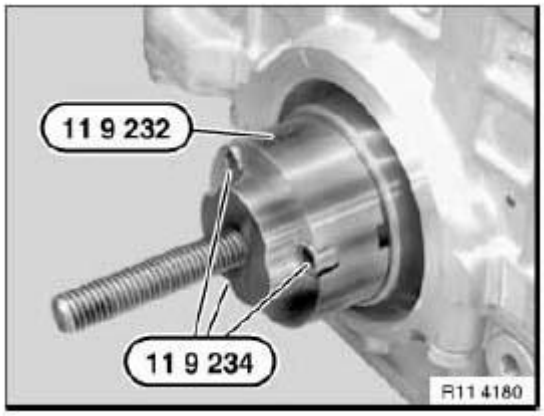

Fig. 84: Identifying Special Tools (11 9 232 And 11 9 234)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

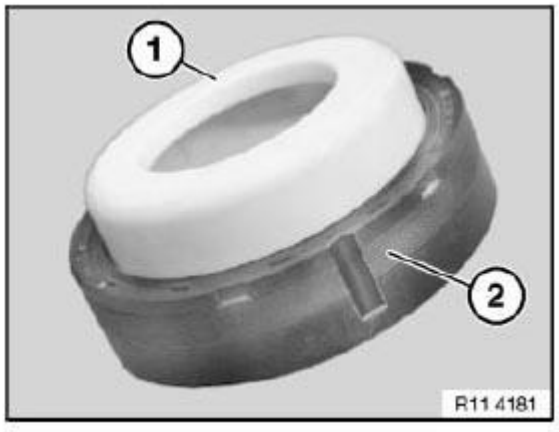

Fig. 85: Identifying Crankshaft Seal And Support Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The required parts are available from the BMW Parts Service.

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

Screw on metering needle.

Insert piston for pressing out.

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Injector (2) contains the sealing compound Loctite, manufacturer's number 128357.

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

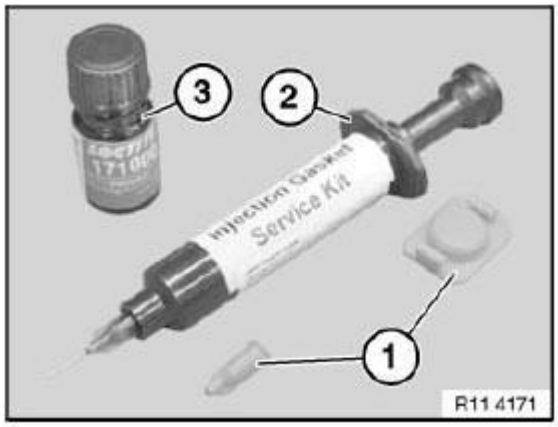

Fig. 86: Identifying Sealing Compound And Bottle Of Injector
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

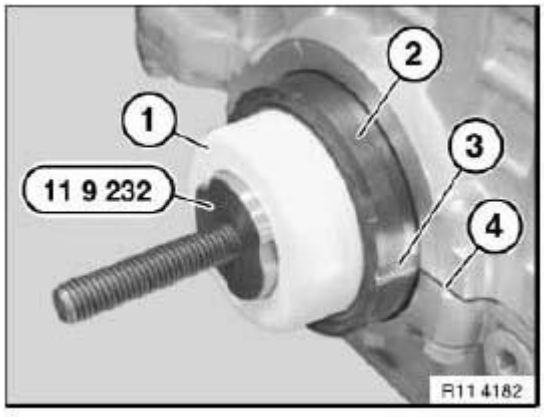

Fig. 87: Identifying Sleeve, Crankshaft Seal, Groove And Housing Partition And Special Tool (11 9 232)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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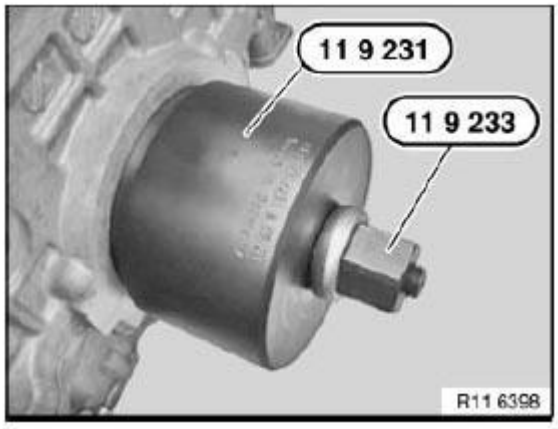

Fig. 88: Identifying Special Tools (11 9 231 And 11 9 233)
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

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

Illustration N42.

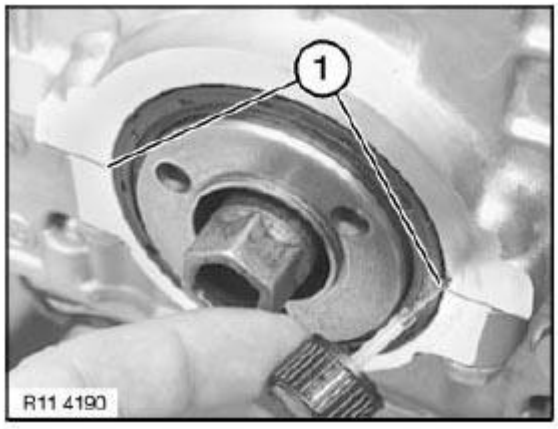

Fig. 89: Inserting Brush Into Groove
Courtesy of BMW OF NORTH AMERICA, INC.

Using injector (2), fill both grooves (3) flush with Loctite sealing compound, manufacturer's number 128357.

Illustration N42.

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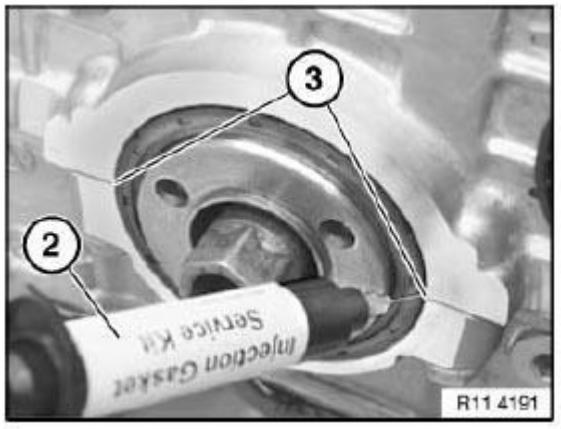

Fig. 90: Filling Grooves Flush With Sealant Using Injector
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Illustration N42.

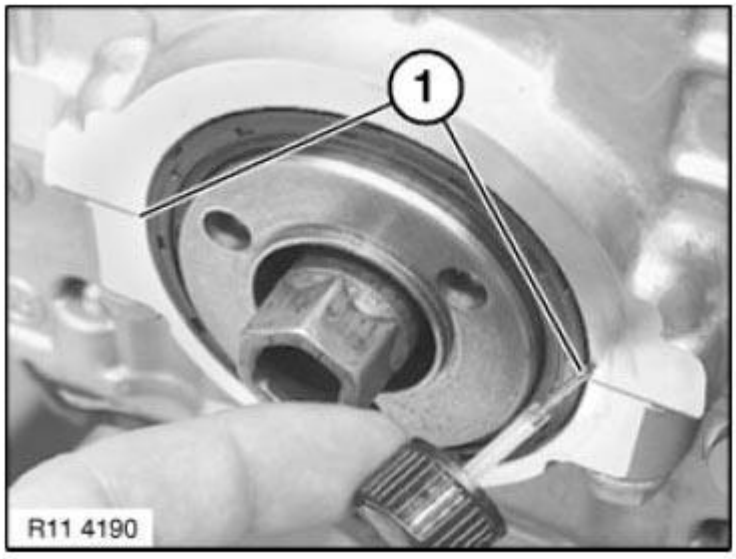

Fig. 91: Inserting Brush Into Groove
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1114010 REPLACING VACUUM PUMP SEALING COVER (N51)

Necessary preliminary tasks:

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- Remove **FAN COWL** .
- Remove alternator **DRIVE BELT** .
- Remove **TENSIONER** for drive belt.

NOTE: Procedure is identical to that for radial shaft seal.
Expose removal openings on sealing cover.

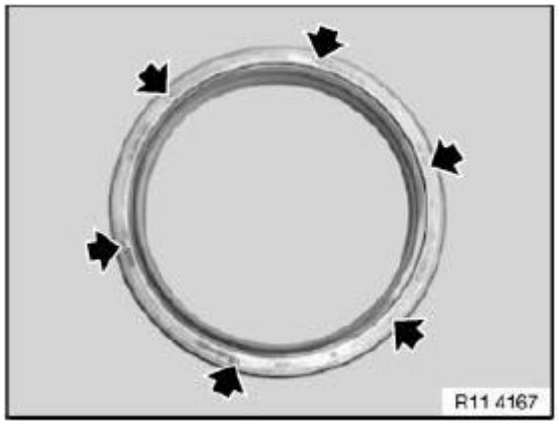

Fig. 92: Locating Crankshaft Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Convert special tool **11 9 200 EXTRACTOR** (see **Fig. 93**).

Screw special tool **11 9 200 EXTRACTOR** onto end cover.

NOTE: Insert screws until flush only with special tool 11 9 200 EXTRACTOR .

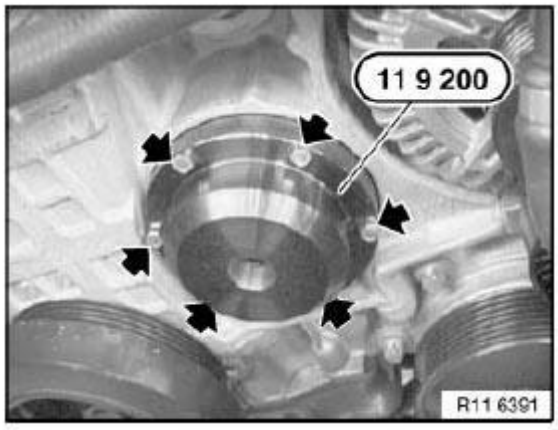

Fig. 93: Identifying Special Tool (11 9 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 11 4 362.

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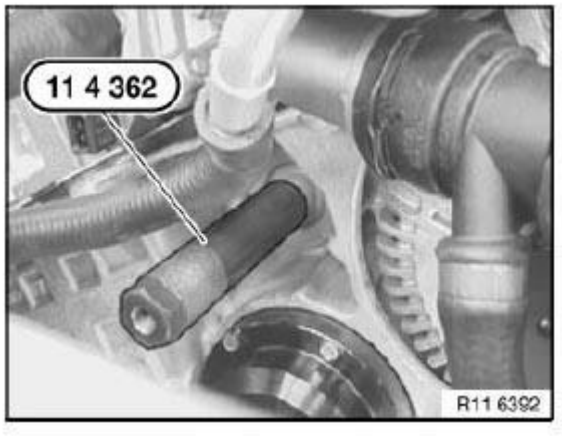

Fig. 94: Identifying Special Tool (11 4 362)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 4 361 to Bedplate screw connection (see arrow).

Secure with knurled screw (1).

Screw special tool 11 4 364 into special tool **11 9 200 EXTRACTOR** and screw out in direction of arrow.

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

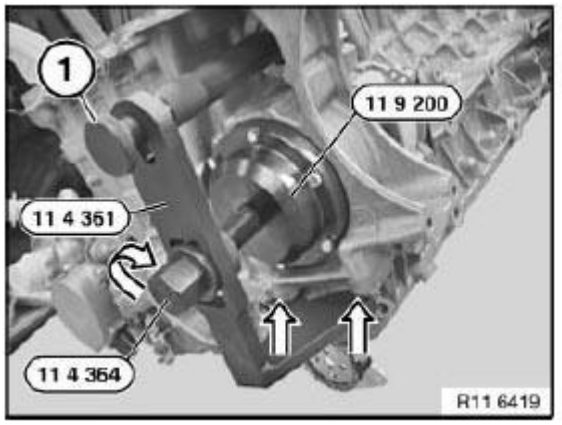

Fig. 95: Removing Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Prepare new sealing cover (1) with special tool **11 9 200 EXTRACTOR without** screws.

Screw in sealing cover with special tool 11 4 363 until it is flush.

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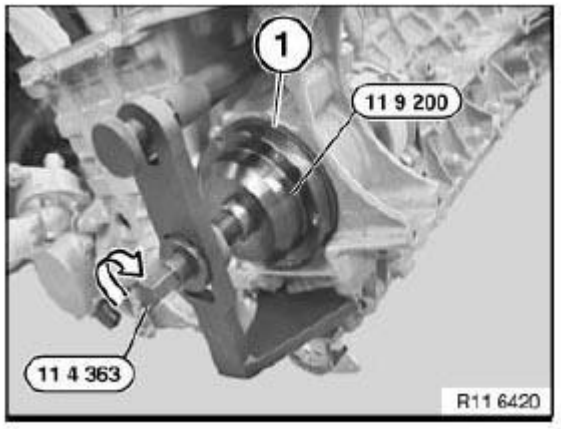

Fig. 96: Turning Sealing Cover Using Special Tool (11 4 363)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CRANKSHAFT WITH BEARING

1122500 REMOVING AND INSTALLING OR REPLACING FLYWHEEL (N51)

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

Necessary preliminary tasks:

- Remove **transmission** See **2300017 REMOVING AND INSTALLING TRANSMISSION (GS6-17BG) N51/N52/N52K/N53** or **2400032 REMOVING AND INSTALLING AUTOMATIC TRANSMISSION (GA6L45R)** .
- Remove **CLUTCH** .

Block flywheel (1) with special tool **11 9 260 HOLDER** , use an old transmission screw for this purpose.

Installation:

Replace aluminum screws.

Unfasten flywheel screws.

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

Installation:

Flywheel (1) is secured with an alignment pin.

Fit new flywheel screws.

Clean crankshaft thread for flywheel screws.

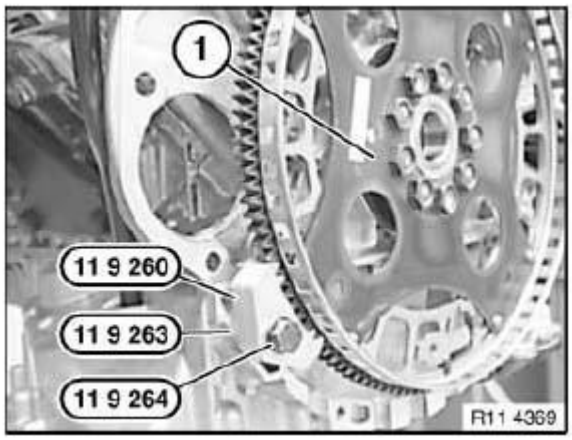

Fig. 97: Identifying Flywheel And Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Secure flywheel with an old transmission screw (1) and special tools **11 9 260 HOLDER** and 11 9 265.

Installation:

Replace aluminum screws.

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

Installation:

Flywheel is secured with a dowel pin.

Fit new flywheel screws.

Tightening torque: **11 22 2AZ** .

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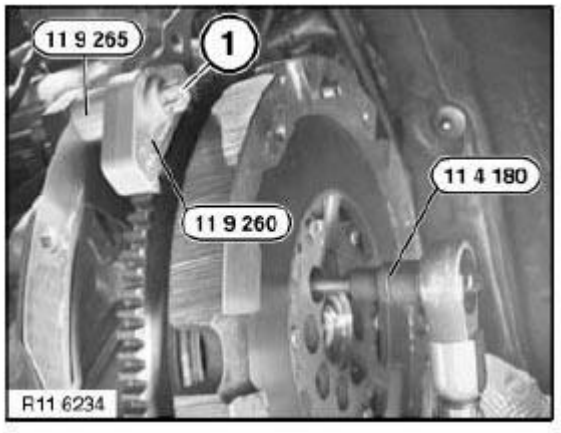

Fig. 98: Removing Flywheel Using Special Tool (11 4 180)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1121531 REPLACING ALL CRANKSHAFT MAIN BEARINGS (N51)

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.
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 4 251 to screw connection on main bearing.

Special tool 11 4 252 must be pre-installed at the seventh main bearing block.

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

NOTE: See Fig. 99.

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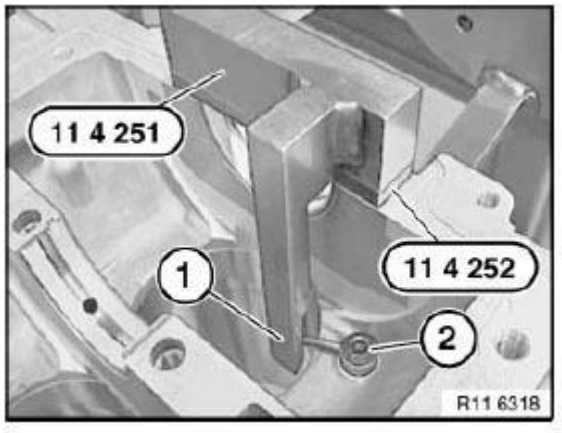

Fig. 99: Attaching Special Tool (11 4 251) To Screw Connection On Main Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Remove crankshaft (1).

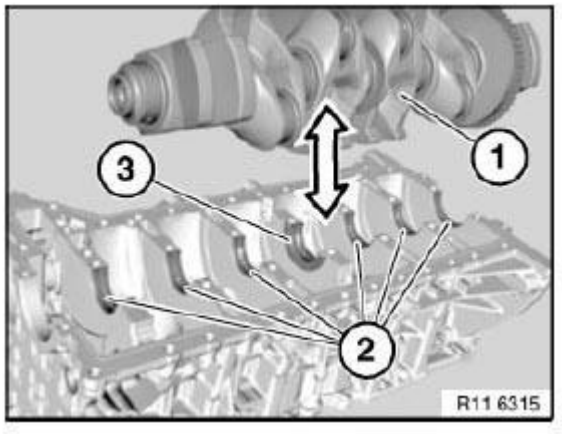

Fig. 100: Removing Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Pilot bearing shell (1) at the fourth bearing block is a thrust bearing.

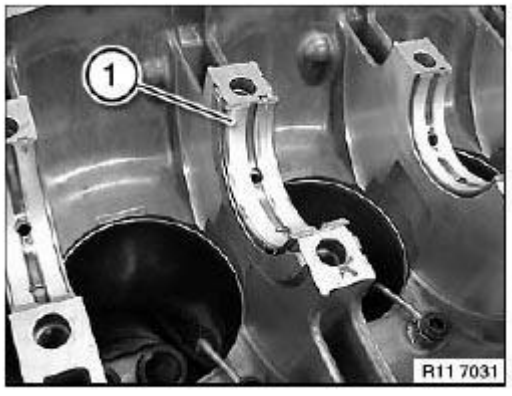

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Fig. 101: Identifying Pilot Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

Remove bearing shells (1).

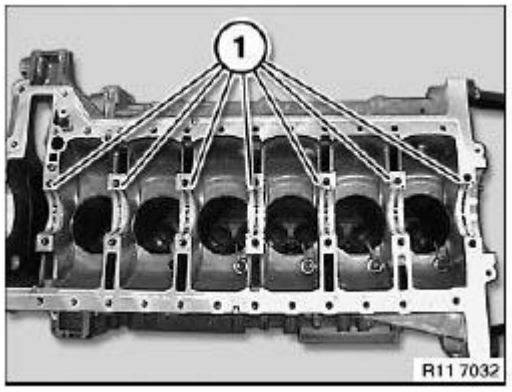

Fig. 102: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

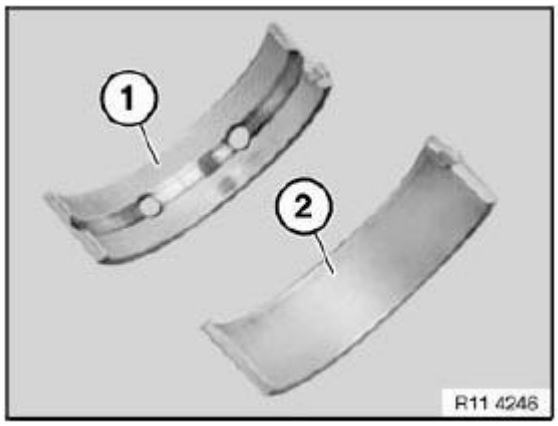

Fig. 103: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Bearing classification (1) on crankcase lower section (values from 1 to 3).

Bearing classification (2) of **CONNECTING ROD BEARINGS** (b/r).

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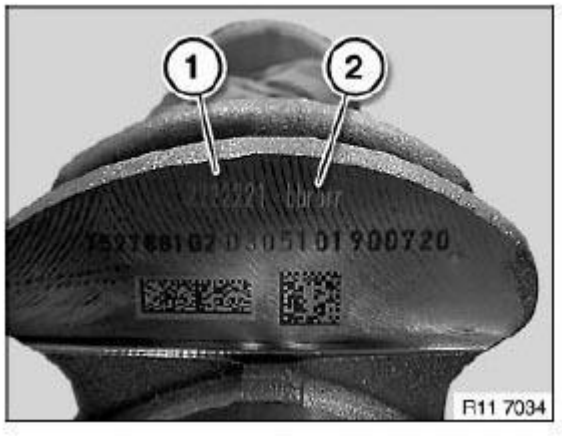

Fig. 104: Identifying Bearing Classifications On Crankcase Lower Section And Connecting Rod Bearings
Courtesy of BMW OF NORTH AMERICA, INC.

Bearing classification (1) in crankcase upper section as per table (values of A/B/C).

Installation:

When all the letters and numbers have been determined, the bearing shell color must be allocated, see table.

IMPORTANT: Engine damage will result if a small bearing play is determined.
The color combination Yellow and Red must not be fitted.
Possible color combinations, see table.

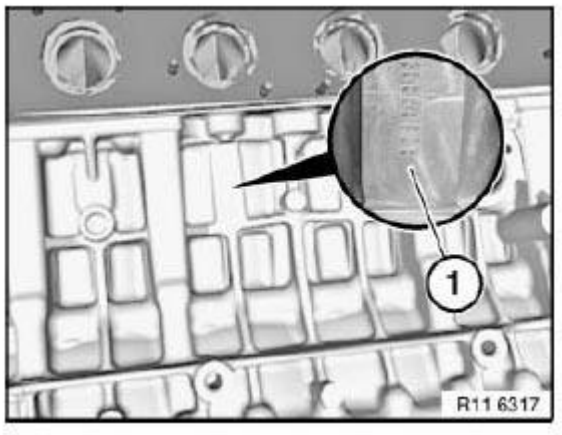

Fig. 105: Identifying Bearing Classification On Crankcase Upper Section
Courtesy of BMW OF NORTH AMERICA, INC.

COLOR COMBINATIONS REFERENCE CHART

(A1) Bedplate/Yellow	**(B1)** Bedplate/Yellow	**(C1)** Bedplate/Green
(A1) Crankcase/Yellow	**(B1)** Crankcase/Green	**(C1)** Crankcase/Green
(A2) Bedplate/Green	**(B2)** Bedplate/Green	**(C2)** Bedplate/Green
(A2) Crankcase/Yellow	**(B2)** Crankcase/Green	**(C2)** Crankcase/Red

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(A3) Bedplate/Green	**(B3)** Bedplate/Red	**(C3)** Bedplate/Red
(A3) Crankcase/Green	**(B3)** Crankcase/Green	**(C3)** Crankcase/Red

Clean sealing faces (1).

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

Clean sealing faces (1) with special tool **11 4 470 TOOL** .

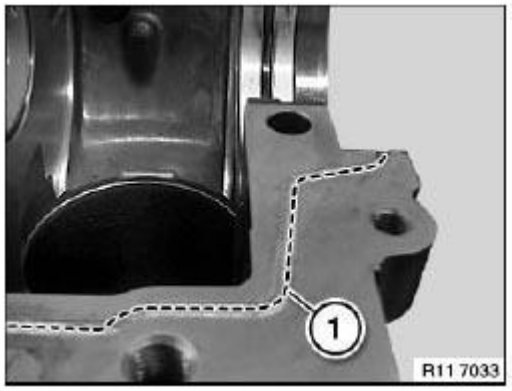

Fig. 106: Identifying Sealing Faces
Courtesy of BMW OF NORTH AMERICA, INC.

Insert all bearing shells (2 and 3).

NOTE: Bearing shell at the fourth bearing block is a thrust bearing.

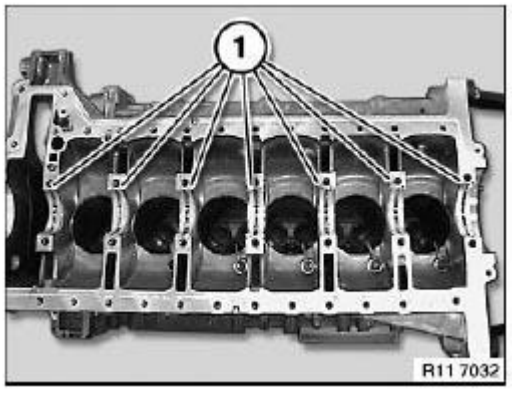

Fig. 107: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Determine bearing play with special tool 00 2 590 .

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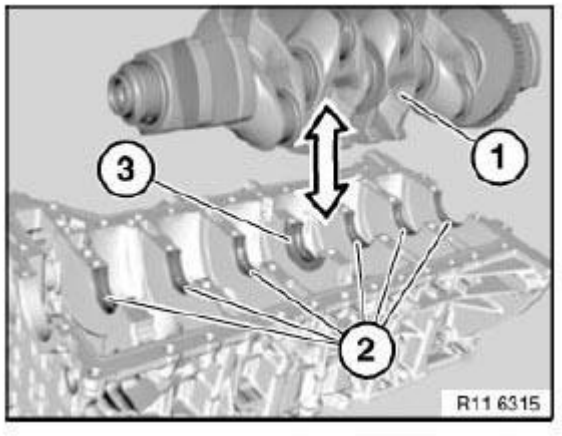

Fig. 108: Checking Bearing Play Using Special Tool (00 2 590)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

All measuring points must be free from oil and grease.

Use used screws to determine bearing play.

Set up **CRANKCASE LOWER SECTION** with bearing shells.

Remove lower crankcase.

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

Crankshaft bearing clearance radial.

Installation:

Remove plastic thread.

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

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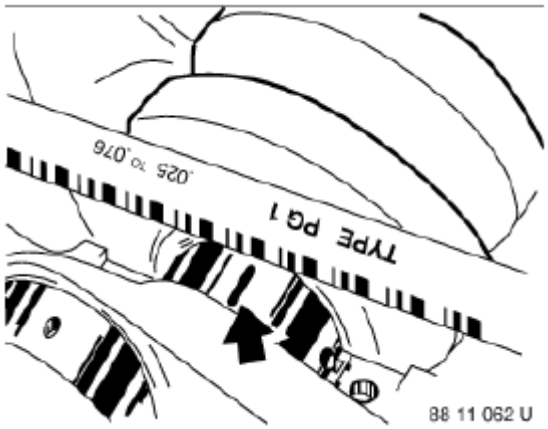

Fig. 109: Locating Bearing Play
Courtesy of BMW OF NORTH AMERICA, INC.

Install **CRANKCASE LOWER SECTION** .

Assemble engine.

1121500 REPLACING CRANKSHAFT (N51)

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.
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** .
- Removing **OIL SUMP** .
- Remove **OIL PUMP** .
- Remove oil pump/vacuum pump **CHAIN MODULE** .
- Remove **TIMING CHAIN MODULE** .
- Remove **CYLINDER HEAD** .
- Remove **FLYWHEEL** .
- Remove all **PISTONS** .

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Release screws (1).

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

Installation:

Replace aluminum screws.

Remove oil deflector (2).

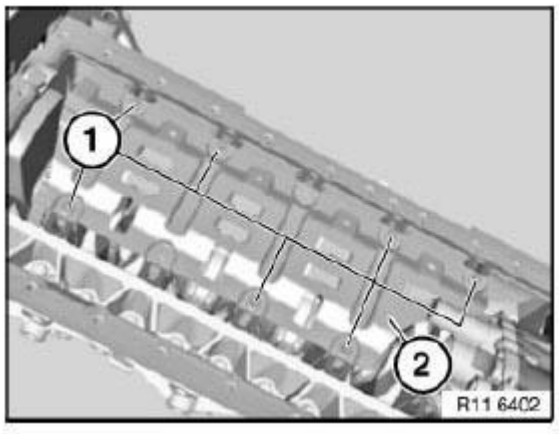

Fig. 110: Identifying Oil Deflector With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: **11 11 2AZ** .

Unfasten screws (2).

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

Installation:

Replace aluminum screws.

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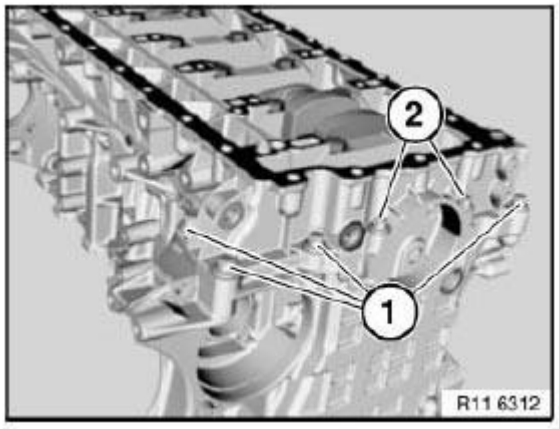

Fig. 111: Identifying Aluminum Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: **11 11 2AZ** .

Unfasten screws (2).

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

Installation:

Replace aluminum screws.

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

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

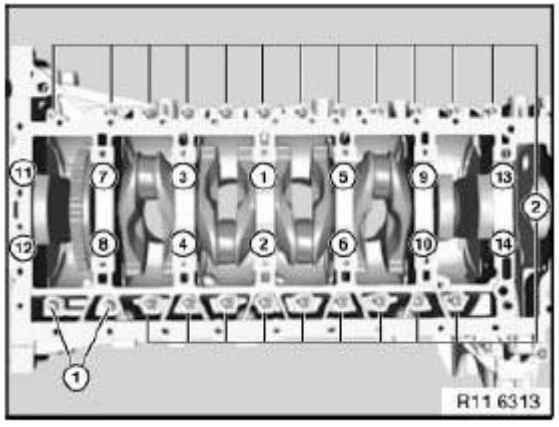

Fig. 112: Steel Screws Removing Order
Courtesy of BMW OF NORTH AMERICA, INC.

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Release screws (1).

Tightening torque **11 11 3AZ** .

Installation:

Replace aluminum screws.

Remove crankcase lower section in upward direction.

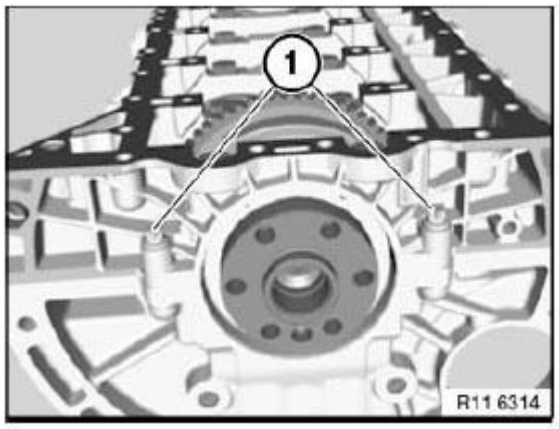

Fig. 113: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove crankshaft (1) in direction of arrow.

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

Remove **main bearing shells** See **CRANKSHAFT AND BEARINGS** ; **CRANKSHAFT AND BEARINGS N51/B30** ; **CRANKSHAFT AND BEARINGS N51/B30** or **CRANKSHAFT AND BEARINGS N51/B30** (2 and 3), replace if necessary.

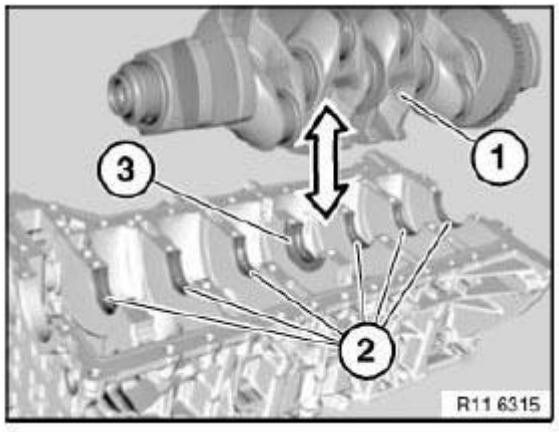

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Fig. 114: Removing Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Check adapter sleeves (1) for damage and secure seating; replace if necessary.

Insert all **crankshaft main bearing** See **CRANKSHAFT AND BEARINGS** ; **CRANKSHAFT AND BEARINGS N51/B30** ; **CRANKSHAFT AND BEARINGS N51/B30** or **CRANKSHAFT AND BEARINGS N51/B30** .

Installation:

Lubricate all bearing points with engine oil.

NOTE: Illustrations show N46.

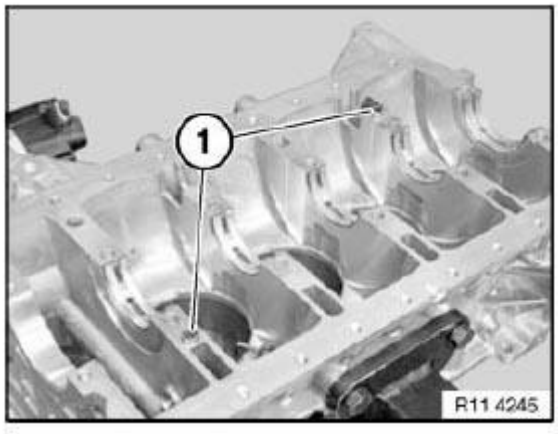

Fig. 115: Identifying Adapter Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Insert crankshaft (1).

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

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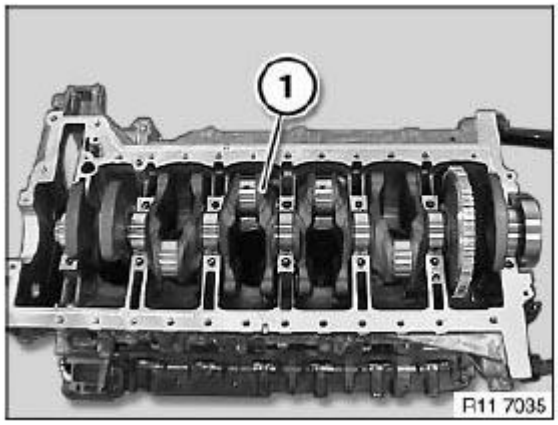

Fig. 116: Identifying Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Tighten screws (2) from inside outwards.

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

Tighten screws (1).

Tightening torque: **11 11 2AZ** .

Installation:

Replace aluminum screws.

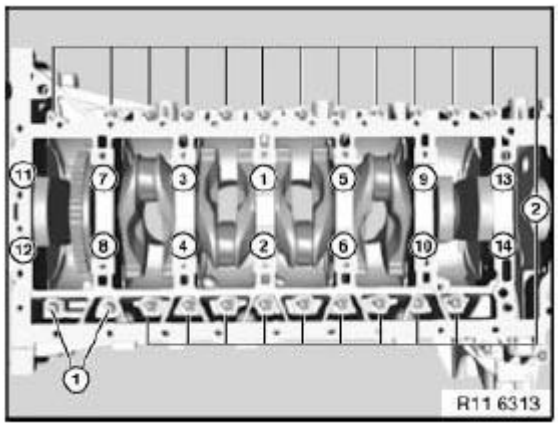

Fig. 117: Steel Screws Tightening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

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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.

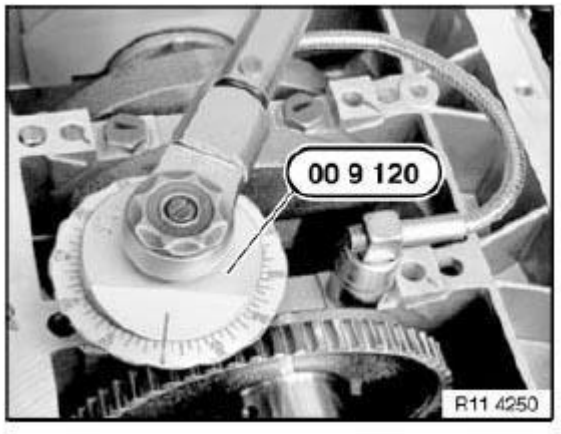

Fig. 118: Tightening Main Bearing Bolts Using Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

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 .

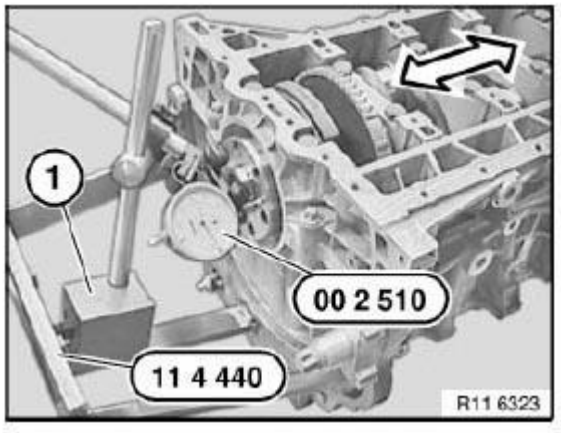

Fig. 119: Moving Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

Always replace nozzles (1).

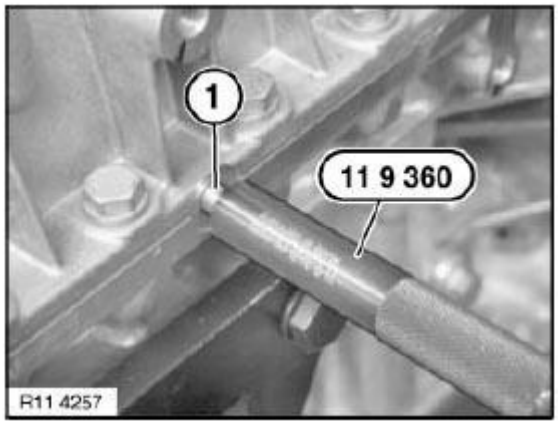

Fig. 120: Driving Nozzles Into Crankcase Using Special Tool 11 9 360
Courtesy of BMW OF NORTH AMERICA, INC.

Replace radial shaft seal at **FRONT** .

Replace radial shaft seal at **REAR** .

Installation:

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

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

Screw on nozzle for injecting liquid gasket.

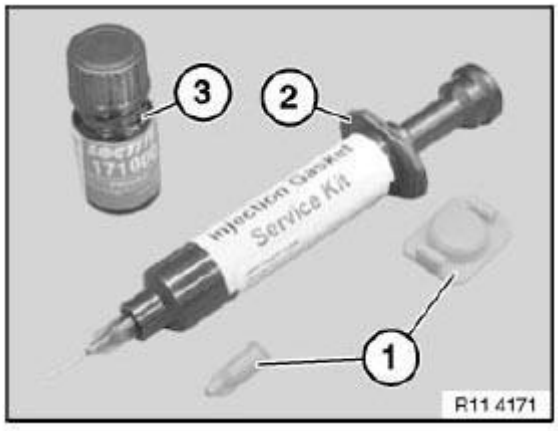

Fig. 121: Identifying Sealing Compound And Bottle Of Injector

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Courtesy of BMW OF NORTH AMERICA, INC.

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

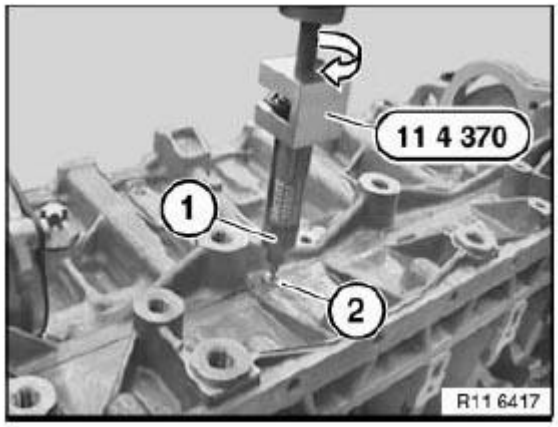

Fig. 122: Inserting Liquid Gasket Using Special Tool (11 4 370)
Courtesy of BMW OF NORTH AMERICA, INC.

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

(Picture shows N40).

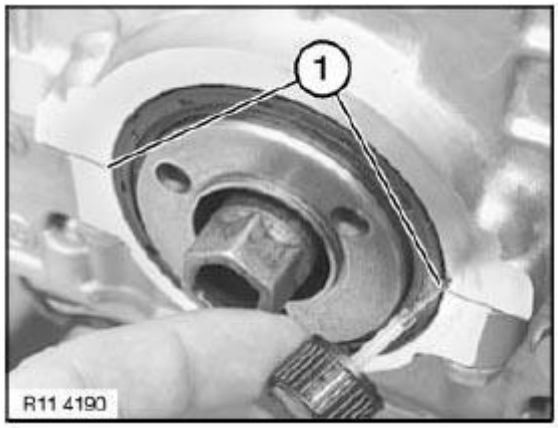

Fig. 123: Inserting Brush Into Groove
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1121505 SEALING CRANKCASE LOWER SECTION (N51)

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.

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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!
Joining 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 **2211110 REPLACING LEFT ENGINE SUPPORT ARM (N51/N52/N52K/N53)** or **2211100 REPLACING RIGHT ENGINE SUPPORT ARM (N51/N52/N52K/N53)**
- Remove **OIL SUMP** .

Release screws (1).

Pull out oil pump intake pipe (2).

Tightening torque: **11 41 1AZ**

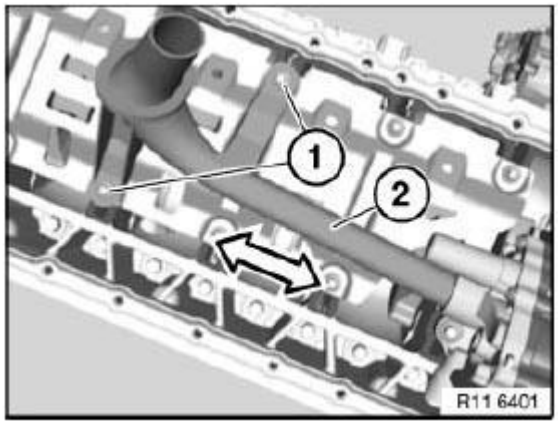

Fig. 124: Pulling Out Oil Pump Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

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

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Installation:

Replace aluminum screws

Remove oil deflector (2).

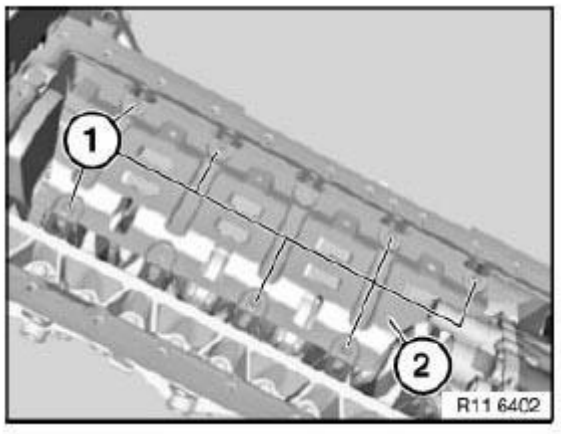

Fig. 125: Identifying Oil Deflector With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Secure oil pump sprocket with steel pin _ 6.0 mm (3) to oil pump.

IMPORTANT: Release central bolt (2) only together with steel pin 6.0 mm (3). Do not remove sprocket.

Release central bolt (2).

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

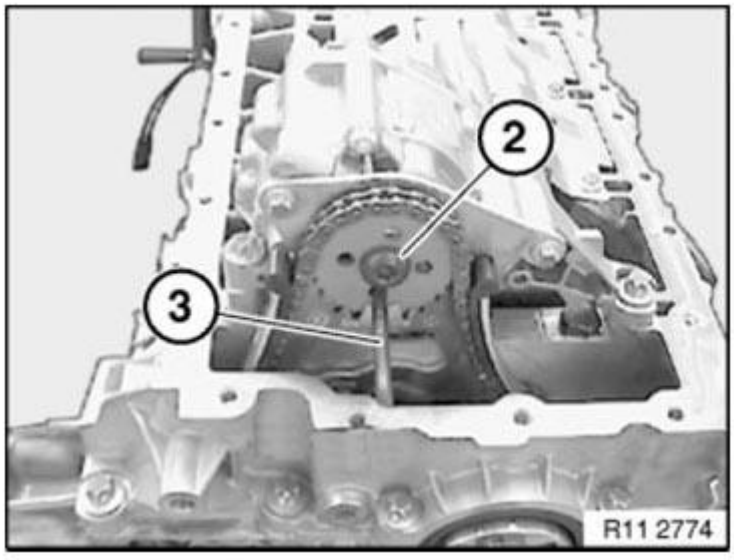

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Fig. 126: Identifying Oil Pump Sprocket Steel Pin (6.0 mm) And Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

Tightening torque: **11 41 5AZ** .

Installation:

Replace aluminum screws.

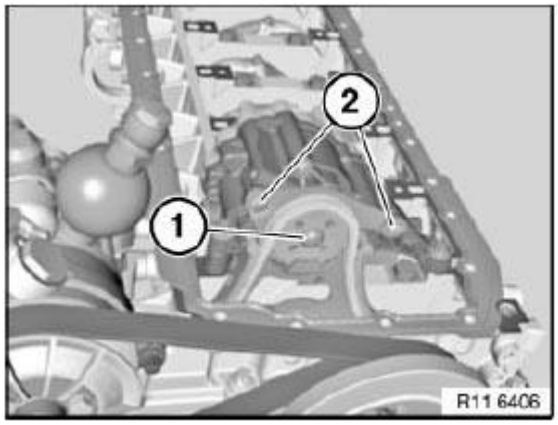

Fig. 127: Identifying Aluminum Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screw plug (1) from crankcase at front.

NOTE: Replace gasket.

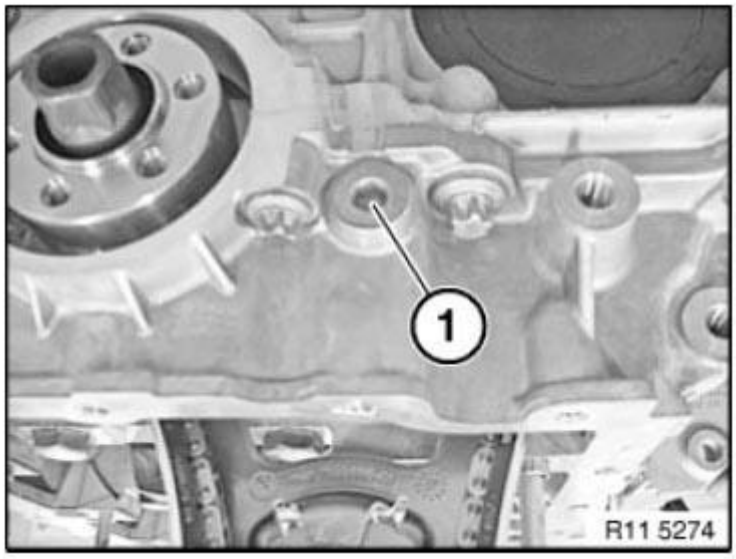

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Fig. 128: Identifying Crankcase Screws Plug
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

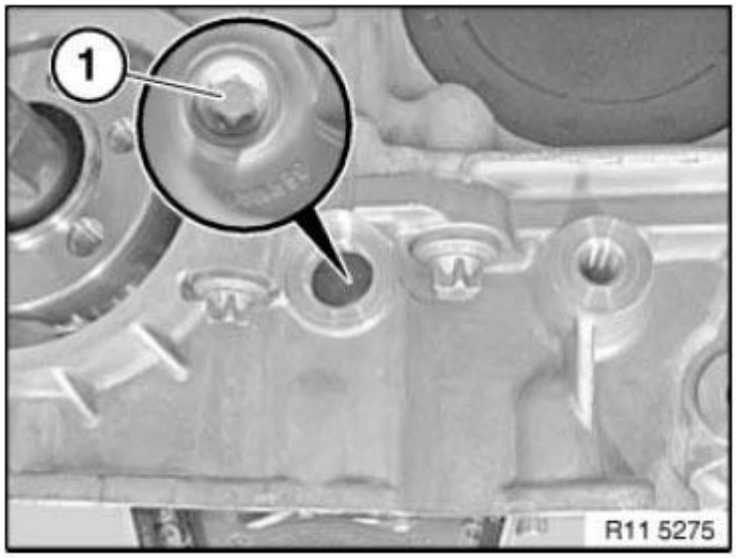

Fig. 129: Identifying Oil Pump Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Version 1:

Attention!

Observe different screw lengths.

Release screws (1).

Tightening torque **11 41 2AZ** .

Tightening torque **11 41 2AZ** .

Installation:

Replace aluminum screws.

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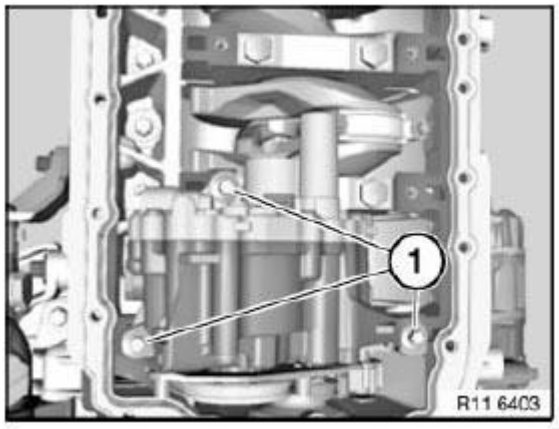

Fig. 130: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2:

Attention!

Observe different screw lengths.

Release oil pump screws (1).

Tightening torque: **11 41 2AZ** .

Installation:

Replace aluminum screws.

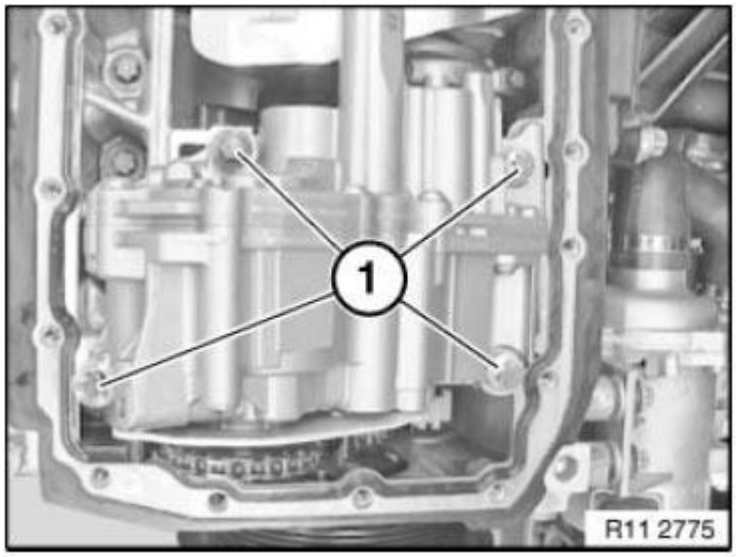

Fig. 131: Identifying Oil Pump Screws

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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.

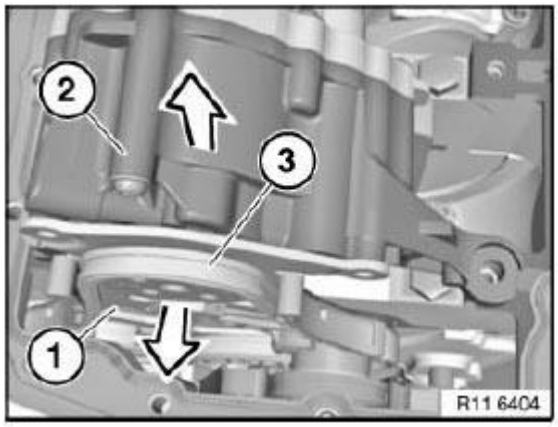

Fig. 132: Detaching Sprocket
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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).

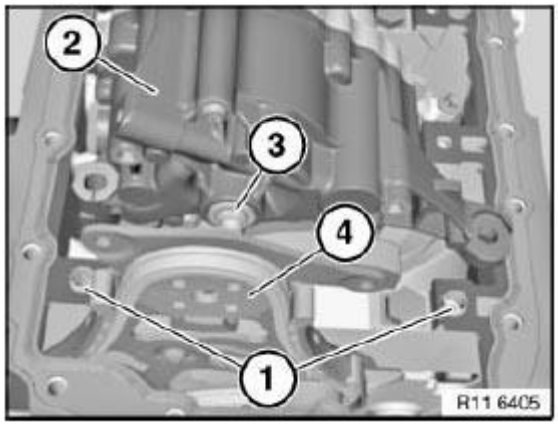

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Fig. 133: Identifying Spacer Bushings And Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The special tool bore for the TDC position is located on the inlet side underneath the starter motor.
Rotate engine at central bolt and secure flywheel in position with special tool 11 0 300 MANDREL .

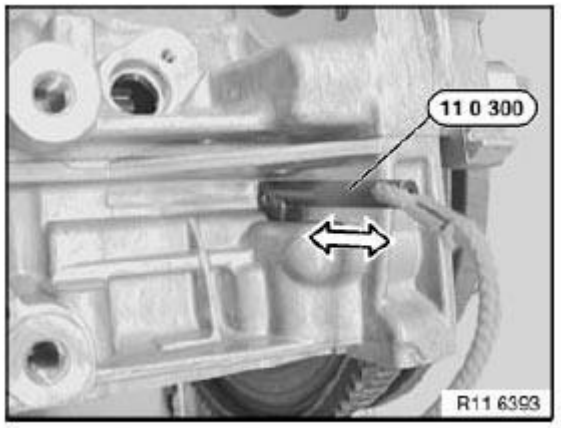

Fig. 134: Rotating Engine At Central Bolt Using Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque

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

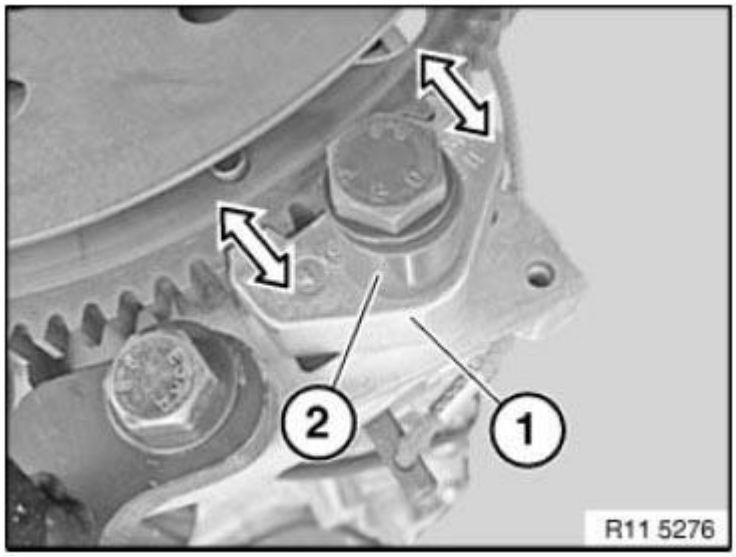

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Fig. 135: Installing Flywheel Using Special Tool (11 9 260)
Courtesy of BMW OF NORTH AMERICA, INC.

Automatic transmission

Release flywheel bolts (1).

Release special tool (2).

Remove flywheel (3).

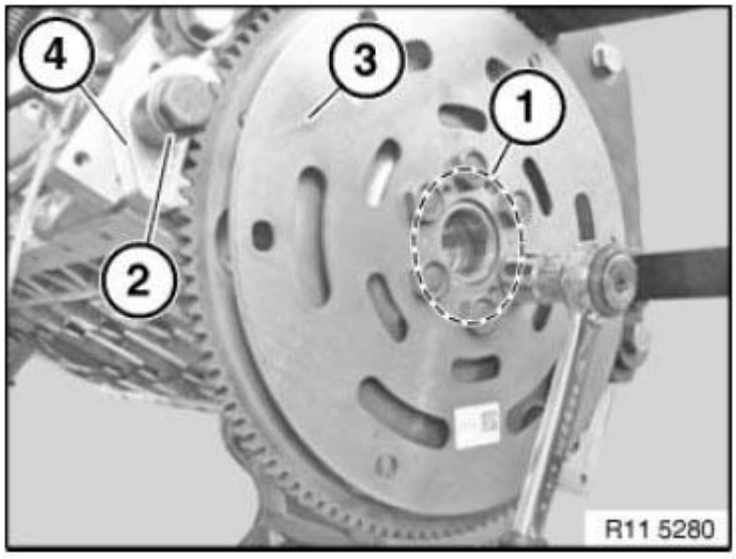

Fig. 136: Releasing Flywheel Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Manual gearbox

IMPORTANT: Position crankshaft at TDC.
Remove dual-mass flywheel.
Secure flywheel with special tool 11 9 260 HOLDER .
Remove VIBRATION DAMPER .
Release flywheel bolts with special tool 11 4 180 SCREWDRIVER INSERT /

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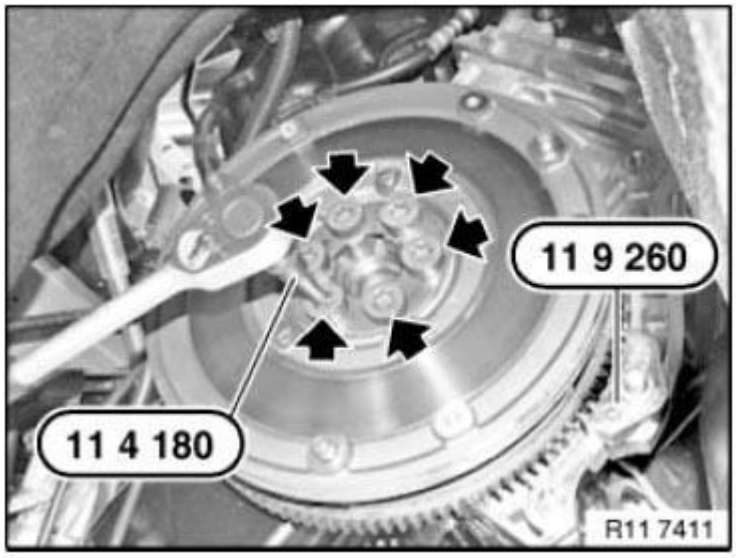

Fig. 137: Locating Flywheel Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

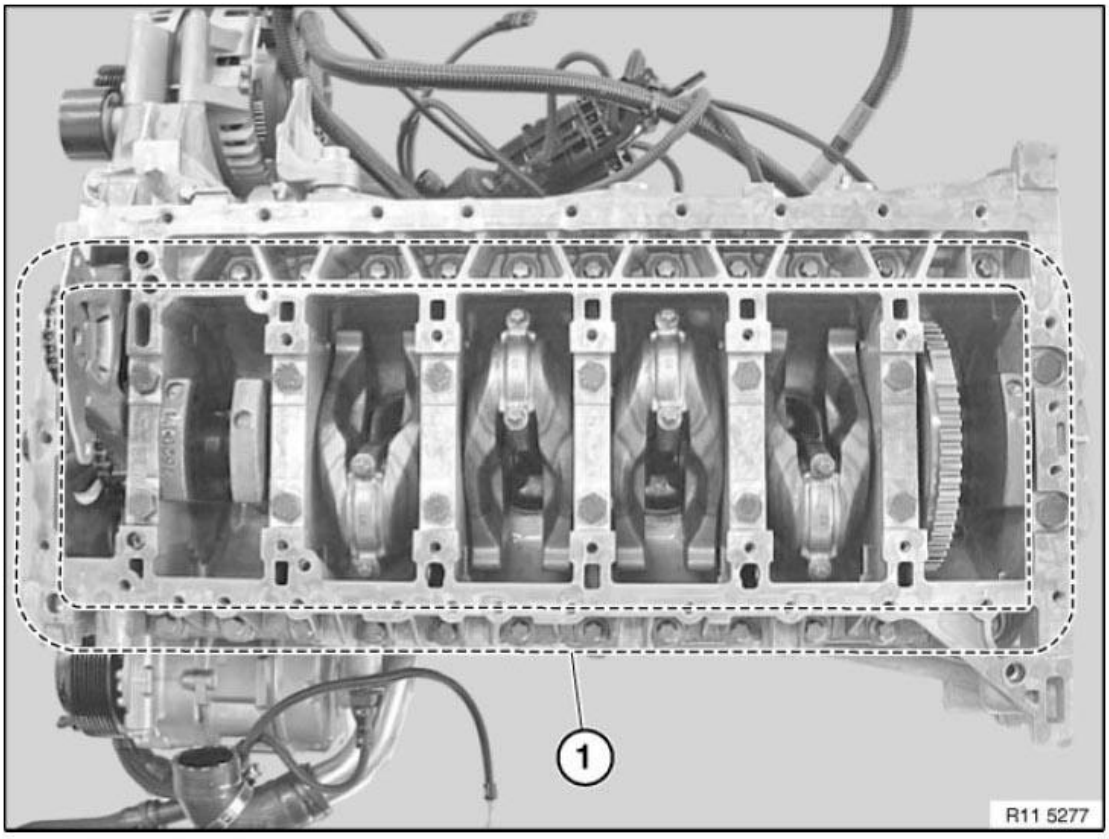

Fig. 138: Identifying Crankcase Bolts Line
Courtesy of BMW OF NORTH AMERICA, INC.

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

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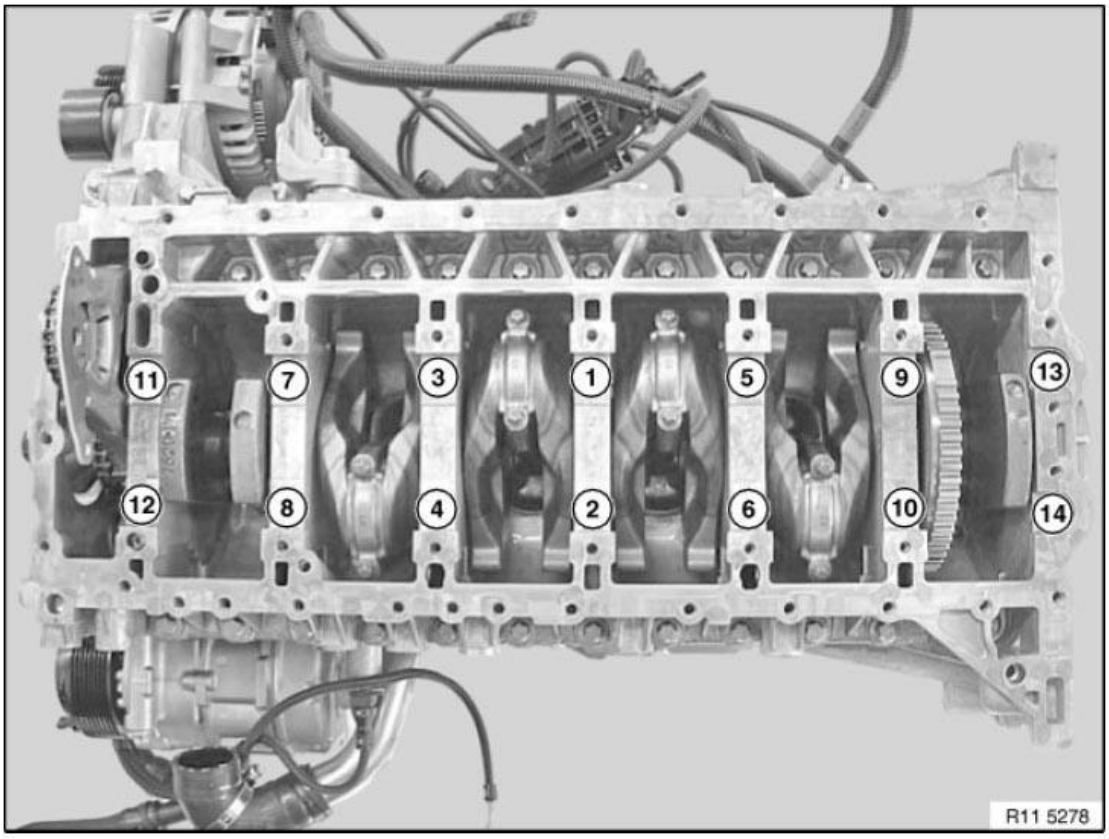

Fig. 139: Crankcase Bolts Removing Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

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).

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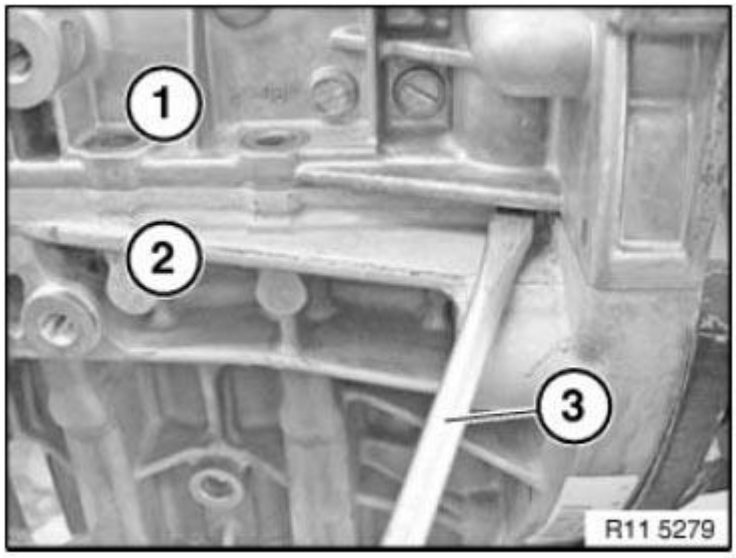

Fig. 140: Releasing Crankcase Lower Section From Crankcase Upper Section Using Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Timing chain is pre-tensioned.
Do not raise crankshaft.

Carefully remove radial shaft seal (1).

Catch escaping engine oil with a cloth (2).

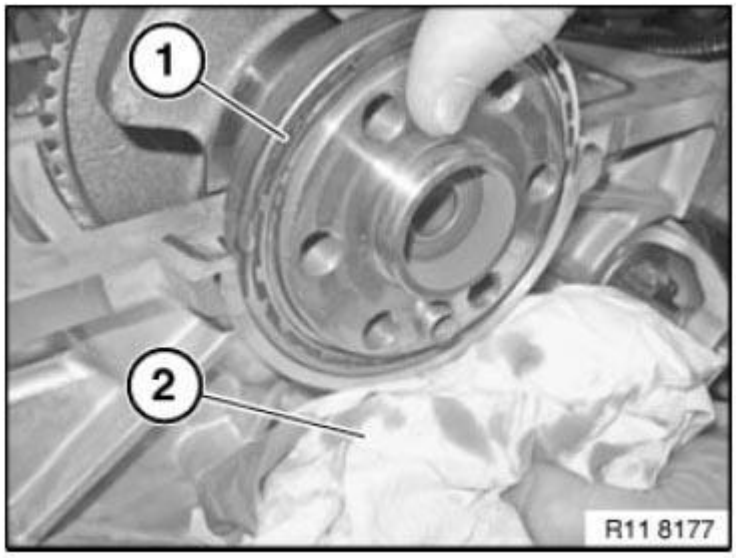

Fig. 141: Removing Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully remove radial shaft seal (1) towards front.

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Catch escaping engine oil with a cloth (2).

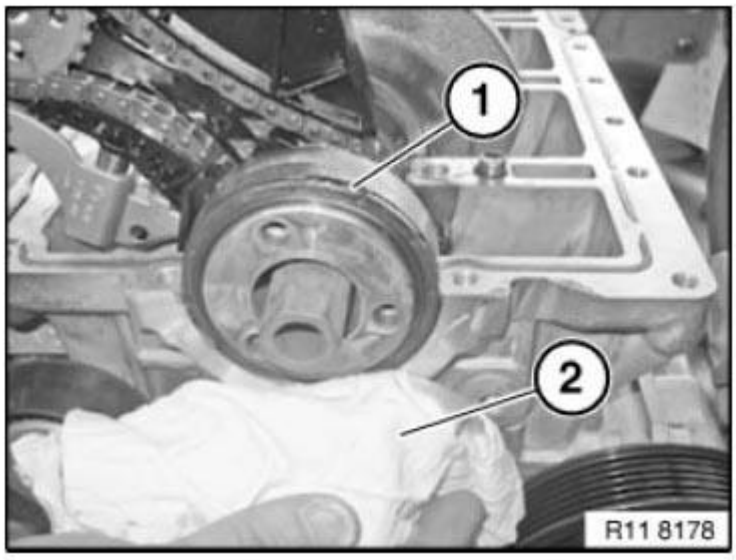

Fig. 142: Catching Escaping Engine Oil With Cloth
Courtesy of BMW OF NORTH AMERICA, INC.

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

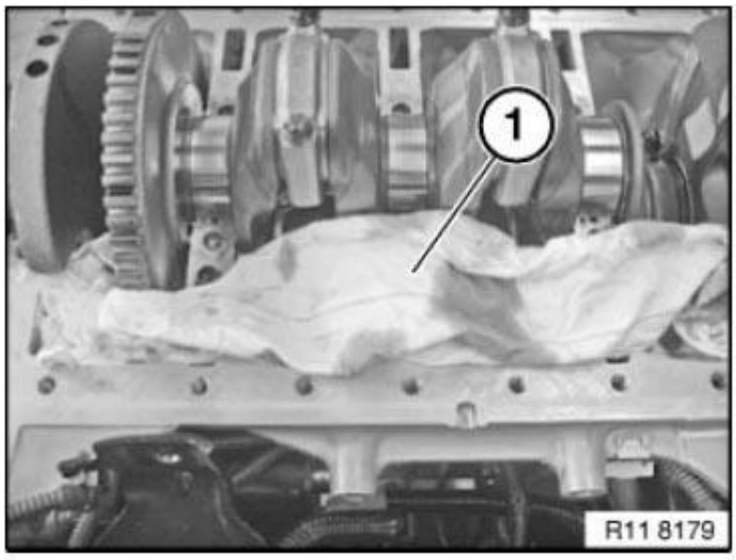

Fig. 143: Identifying Cloth For Protect Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sealant residues (1) with special tool **11 4 470 TOOL** .

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

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Installation:

Replace injector nozzles (2).

Clean all threads with compressed air.

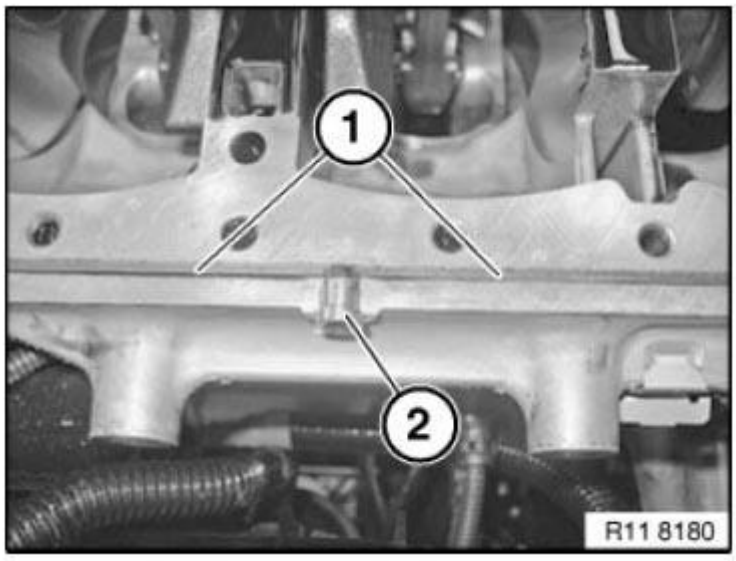

Fig. 144: Identifying Sealant Residues On Injector Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

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.

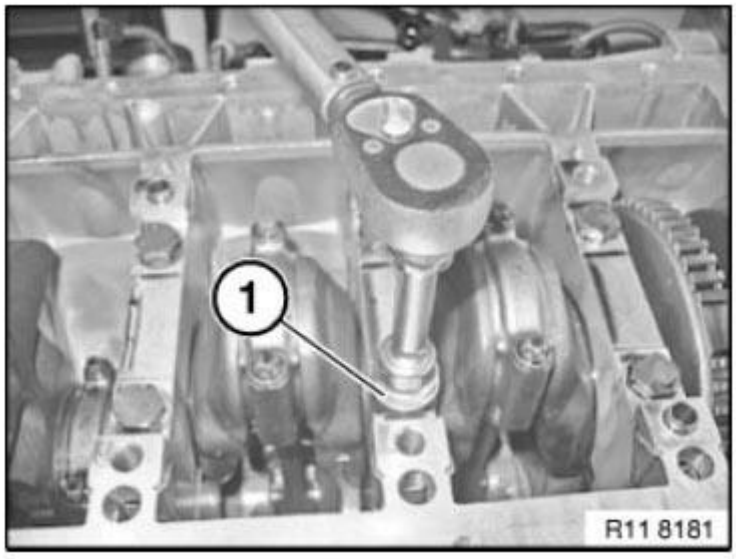

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Fig. 145: Identifying Crankcase Lower Section
Courtesy of BMW OF NORTH AMERICA, INC.

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

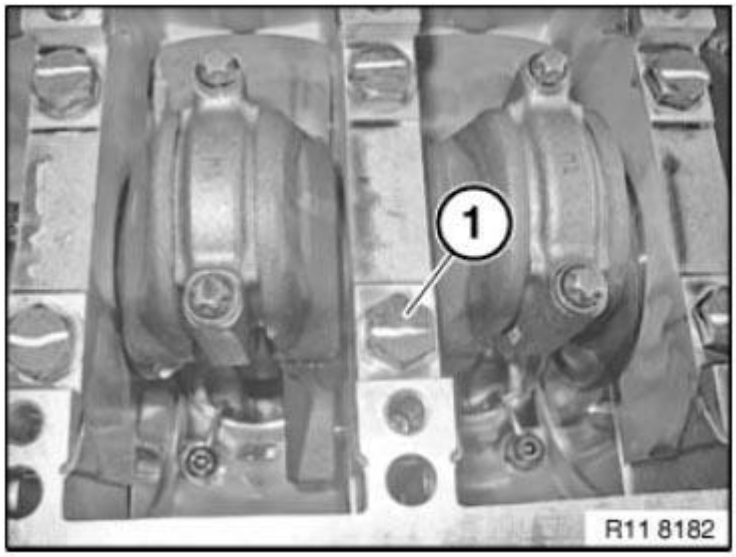

Fig. 146: Identifying M10 Crankcase Bolt Colored Marking
Courtesy of BMW OF NORTH AMERICA, INC.

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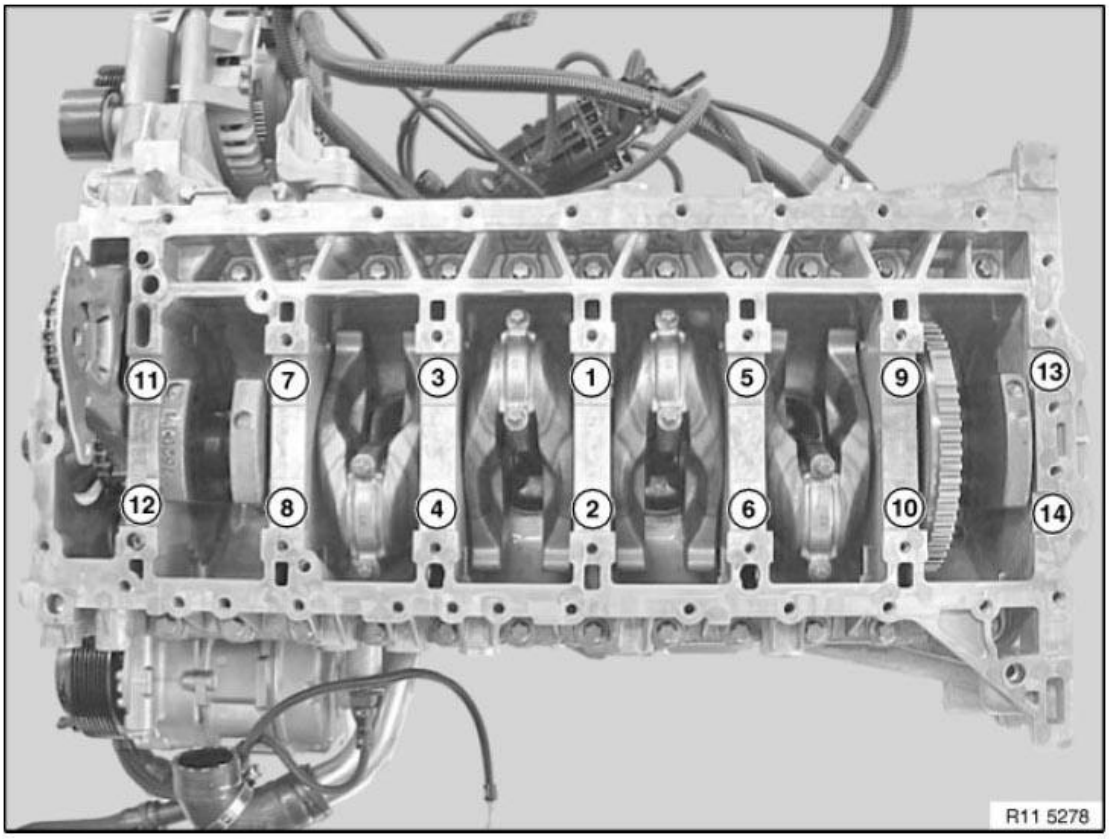

Fig. 147: Crankcase Bolts Installing Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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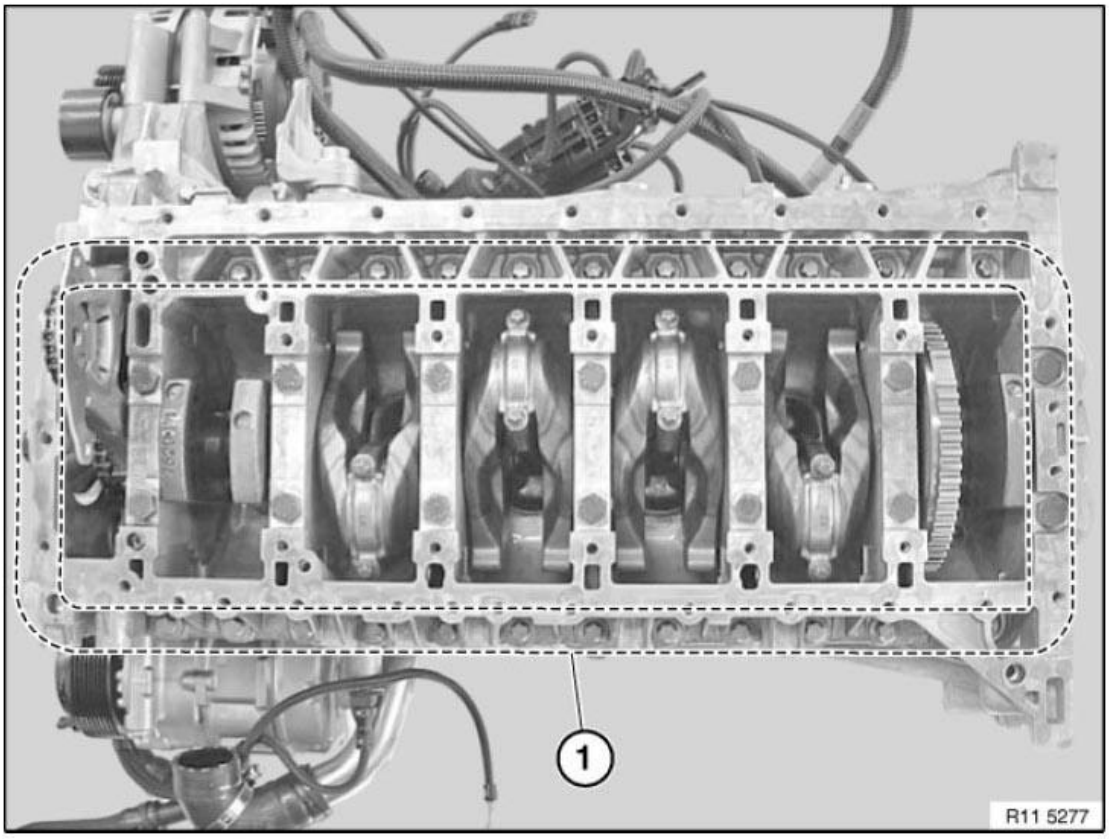

Fig. 148: Identifying Crankcase Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

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 3 AZ** .

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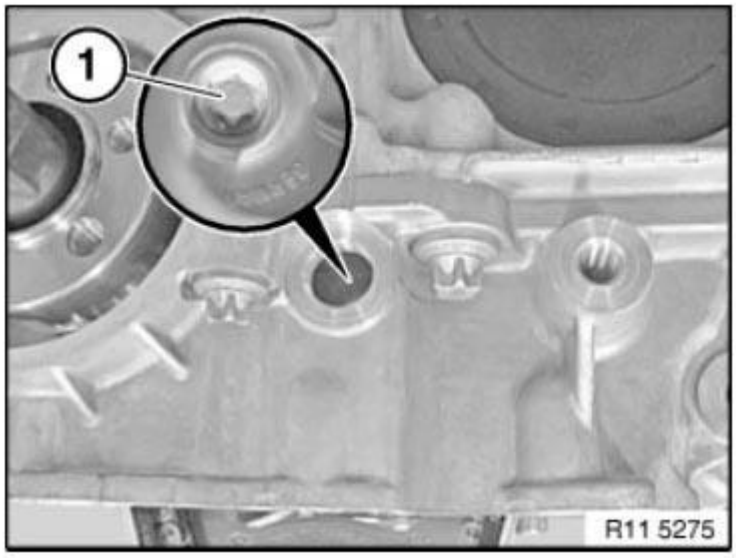

Fig. 149: Identifying Oil Pump Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten screw plug on front of crankcase.

Tightening torque: **11 11 8 AZ** .

Installation:

Replace sealing ring.

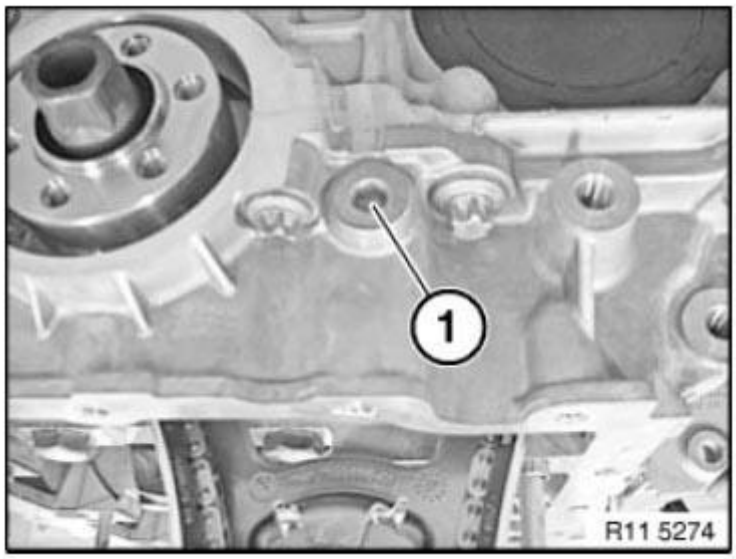

Fig. 150: Identifying Screw Plug On Crankcase
Courtesy of BMW OF NORTH AMERICA, INC.

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

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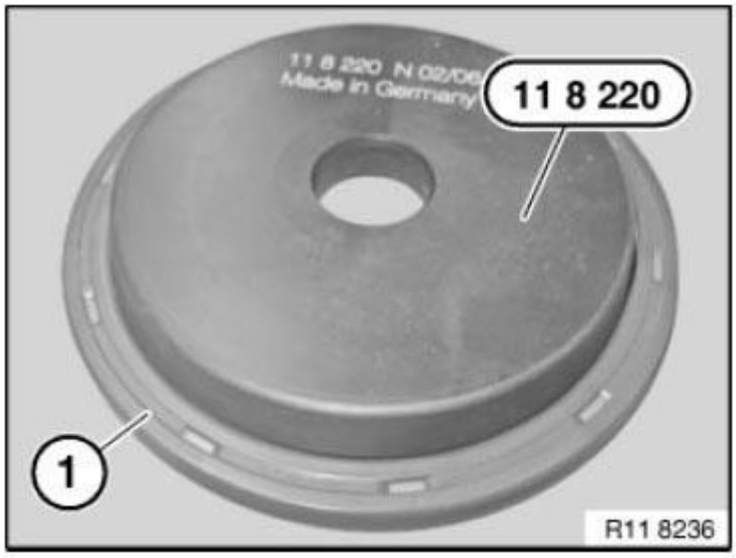

Fig. 151: Identifying Radial Shaft Seal And Special Tool (11 8 220)
Courtesy of BMW OF NORTH AMERICA, INC.

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

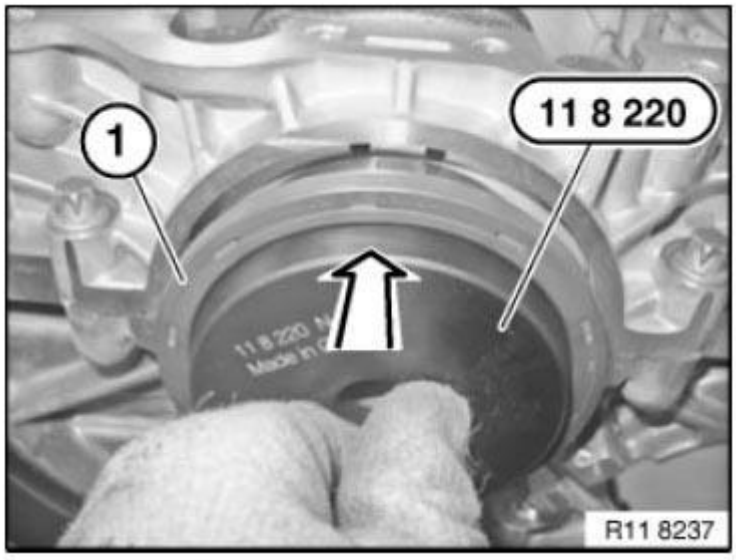

Fig. 152: Positioning Radial Shaft Seal On Crankshaft Using Special Tool (11 8 220)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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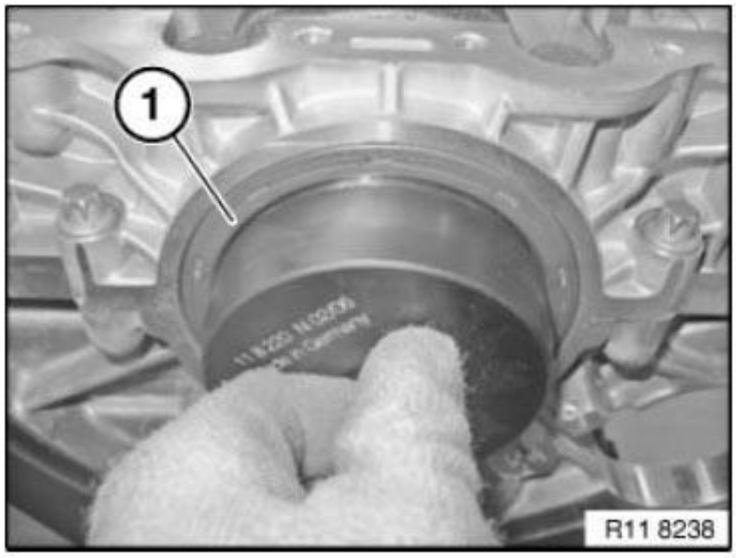

Fig. 153: Moving Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

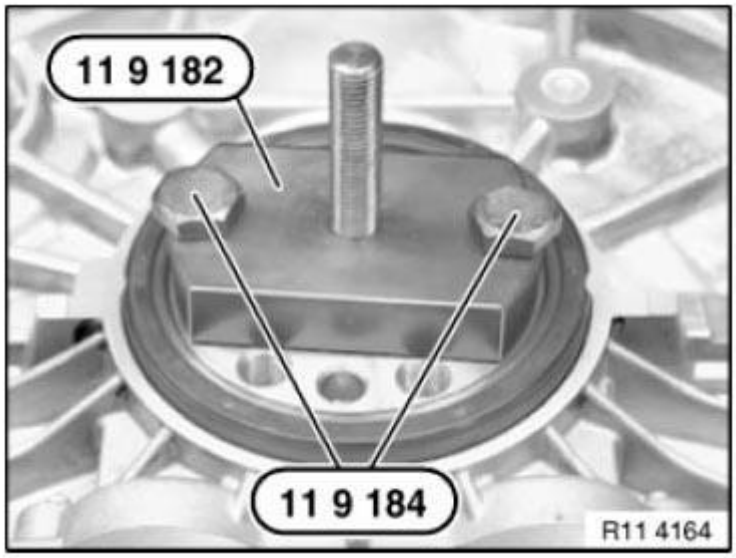

Fig. 154: Identifying Special Tools (11 9 182 And 11 9 184)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Prepare special tool 11 9 181 for installation.

Connect special tool 11 9 185 onto special tool 11 8 181.

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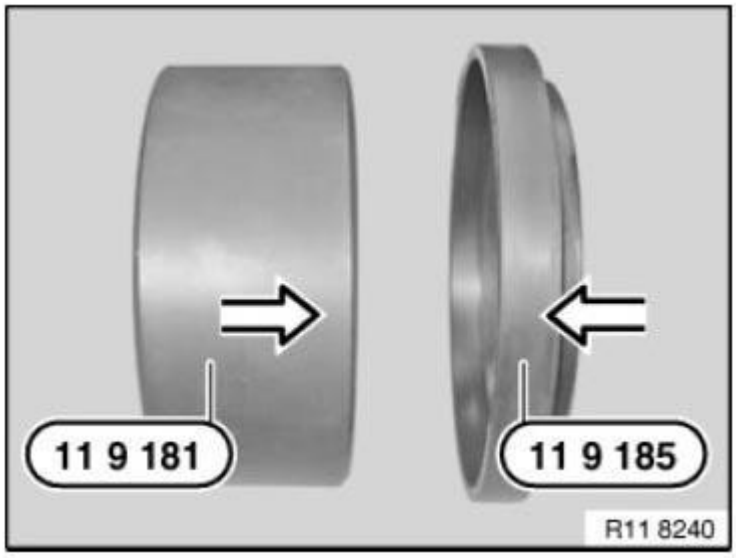

Fig. 155: Connecting Special Tool (11 9 185) Onto Special Tool (11 8 181)
Courtesy of BMW OF NORTH AMERICA, INC.

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

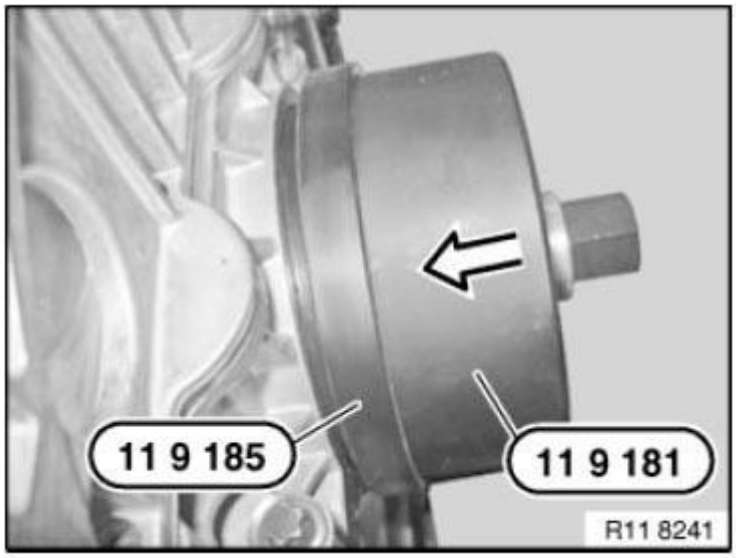

Fig. 156: Pulling On Radial Shaft Seal Using Special Tool (11 9 181)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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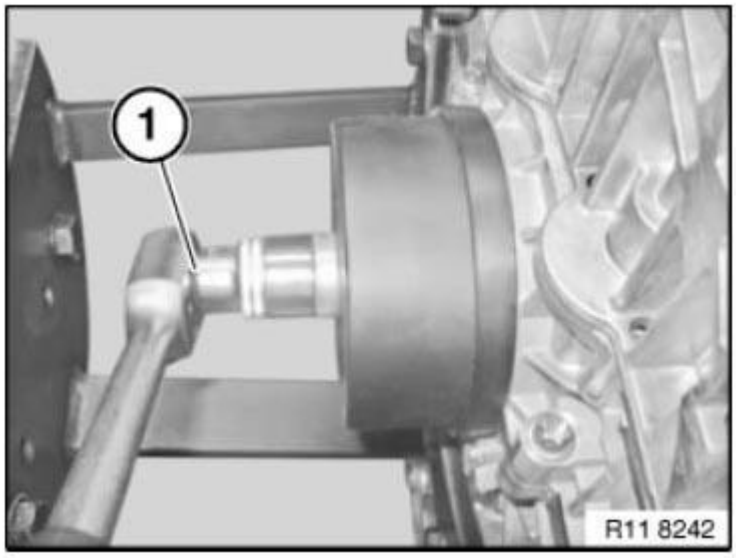

Fig. 157: Identifying Special Tool (11 9 183)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

NOTE: Graphic N42.

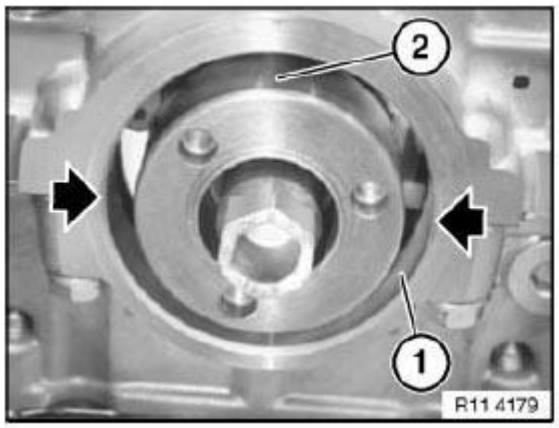

Fig. 158: Locating Sealing Surface
Courtesy of BMW OF NORTH AMERICA, INC.

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

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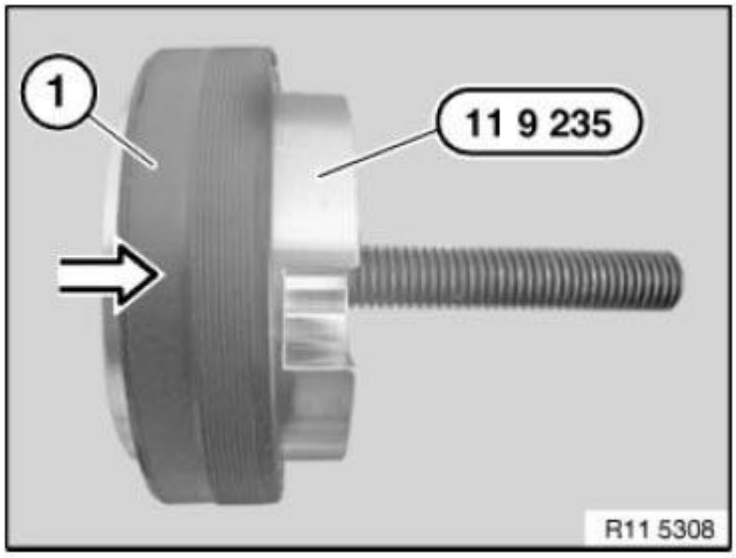

Fig. 159: Pushing Radial Shaft Seal On Special Tool (11 9 235)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Special tool 11 9 235 can only be attached with 2 opposite bolts.
Determine hole pattern on special tool.

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

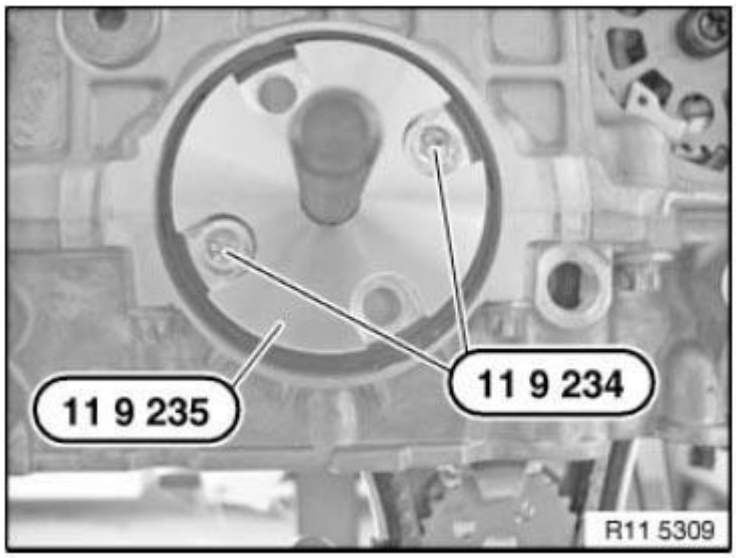

Fig. 160: Identifying Special Tools (11 9 234 And 11 9 235)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

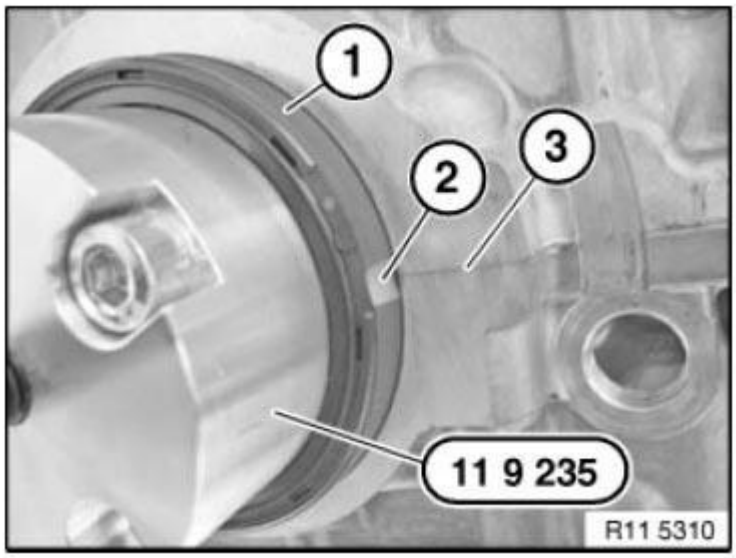

Fig. 161: Aligning Radial Shaft Seal Groove Centered To Housing Partition
Courtesy of BMW OF NORTH AMERICA, INC.

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

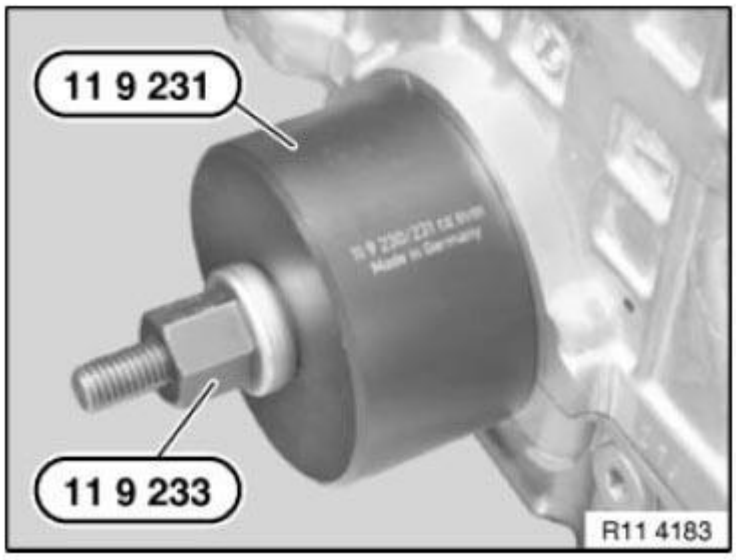

Fig. 162: Identifying Special Tools (11 9 231 And 11 9 233)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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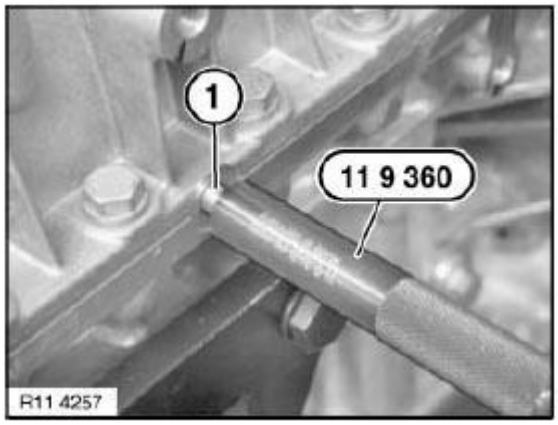

Fig. 163: Driving Nozzles Using Special Tool (11 9 360)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

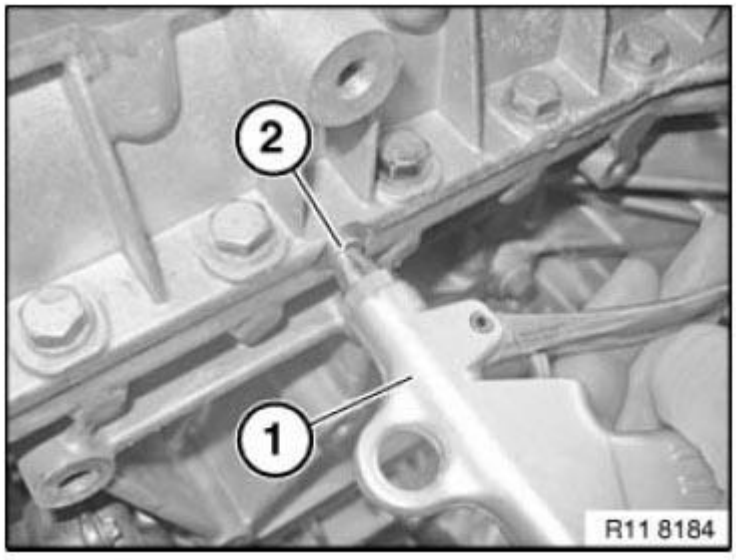

Fig. 164: Identifying Blow Compressed Air Onto Injector Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

Injector nozzles for injecting sealing compound are not required.

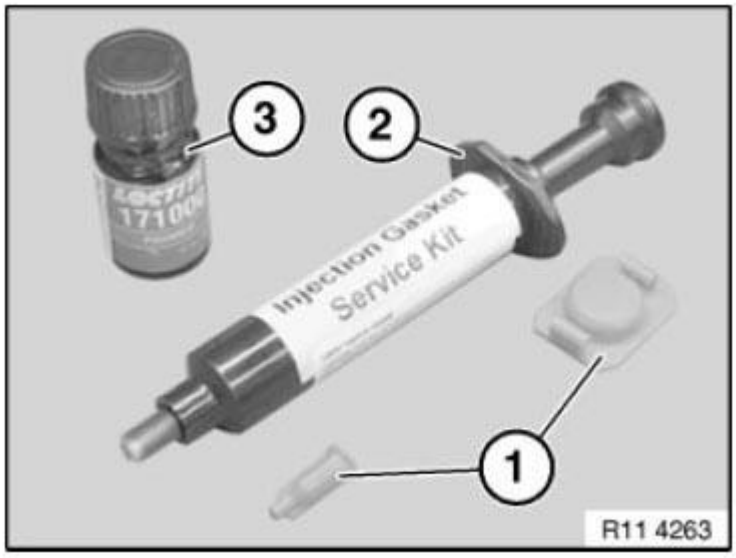

Fig. 165: Identifying Liquid Sealing Compound Of Injector Nozzles
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

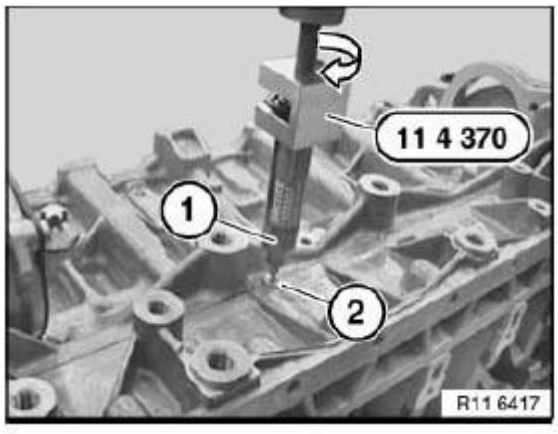

Fig. 166: Inserting Liquid Gasket Using Special Tool 11 4 370
Courtesy of BMW OF NORTH AMERICA, INC.

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

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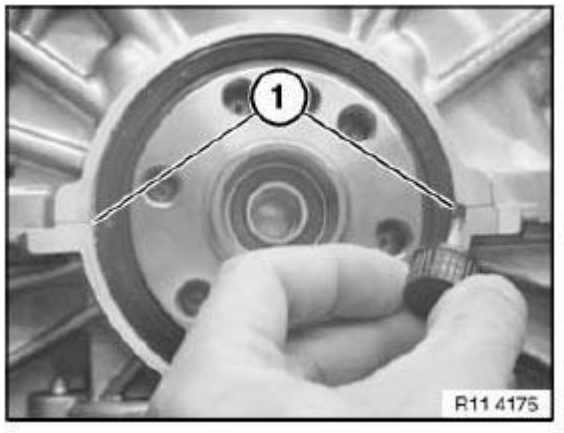

Fig. 167: Inserting Brush Into Grooves Using Loctite Primer
Courtesy of BMW OF NORTH AMERICA, INC.

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

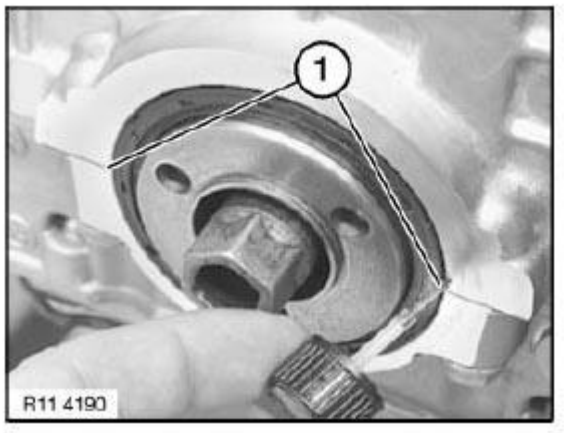

Fig. 168: Inserting Brush Into Groove
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

FLYWHEEL

1122500 REMOVING AND INSTALLING OR REPLACING FLYWHEEL (N51)

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:

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

Necessary preliminary tasks:

- Remove **transmission** See **2300017 REMOVING AND INSTALLING TRANSMISSION (GS6-17BG) N51/N52/N52K/N53** or **2400032 REMOVING AND INSTALLING AUTOMATIC TRANSMISSION (GA6L45R)** .
- Remove **CLUTCH** .

Block flywheel (1) with special tool **11 9 260 HOLDER** , use an old transmission screw for this purpose.

Installation:

Replace aluminum screws.

Unfasten flywheel screws.

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

Installation:

Flywheel (1) is secured with an alignment pin.

Fit new flywheel screws.

Clean crankshaft thread for flywheel screws.

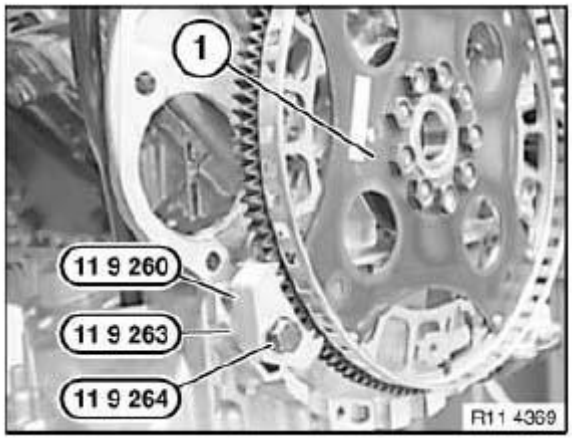

Fig. 169: Identifying Flywheel With Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Secure flywheel with an old transmission screw (1) and special tools **11 9 260 HOLDER** and 11 9 265.

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Installation:

Replace aluminum screws.

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

Installation:

Flywheel is secured with a dowel pin.

Fit new flywheel screws.

Tightening torque: **11 22 2AZ** .

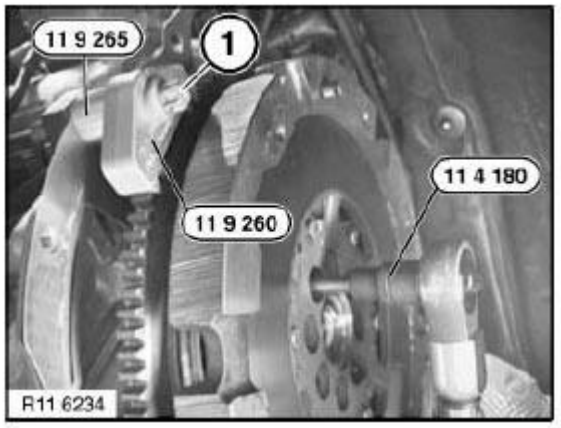

Fig. 170: Identifying Special Tools (11 9 255, 11 9 260 And 11 4 180)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1122513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

NOTE: Flywheel removed!

Position special tool 11 2 010 in roller bearing.

Twist out roller bearing with special tool 11 2 343.

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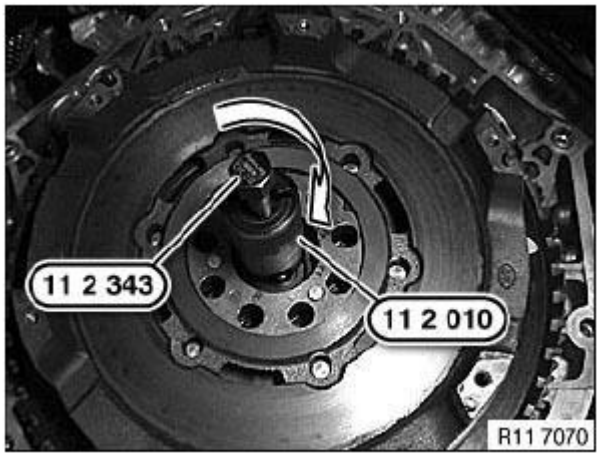

Fig. 171: Twisting Out Roller Bearing Using Special Tool (11 2 343)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble special tools 11 2 350 and 00 5 500 .

Drive in roller bearing with special tools 11 2 350 and 00 5 500 in direction of arrow as far as it will go.

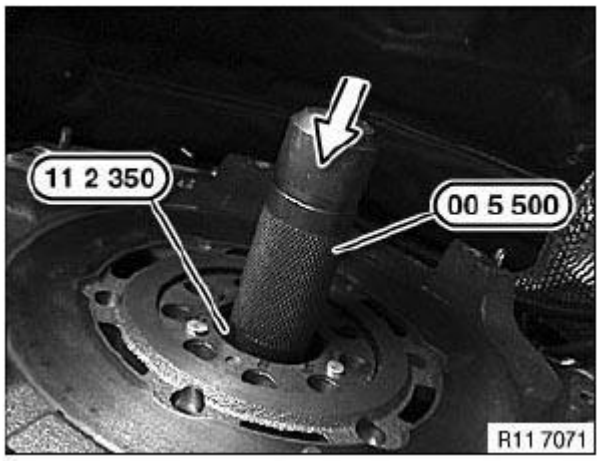

Fig. 172: Driving Roller Bearing Using Special Tools (11 2 350 And 00 5 500)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1122513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

NOTE: Flywheel removed!

Using hydraulic press (1) and special tool 21 2 051, press out dual-mass flywheel downwards on engine side.

IMPORTANT: Risk of damage:

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Roller bearing must not be driven out.

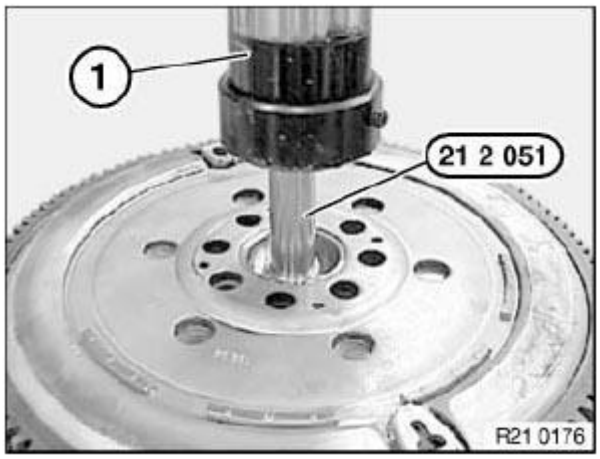

Fig. 173: Pressing Dual-Mass Flywheel Using Special Tool (21 2 051) And Hydraulic Press
Courtesy of BMW OF NORTH AMERICA, INC.

Push roller bearing (2) onto special tool 21 2 052.

Using hydraulic press (1), press roller bearing into dual-mass flywheel as far as it will go on clutch side.

IMPORTANT: Risk of damage:
Observe press-in instruction:

- **Roller bearing must not be driven in.**
- **Roller bearing mounting force/travel monitored:**

  Min. 2000N 1 mm before end of pressing in.

  Max. 15000N during entire press-in procedure.

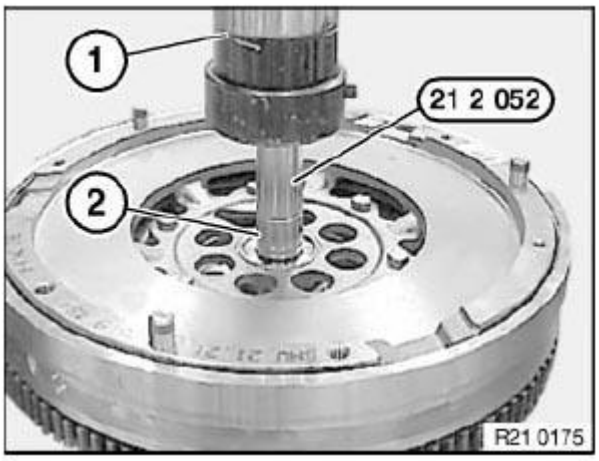

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Fig. 174: Pressing Roller Bearing Into Dual-Mass Flywheel Using Hydraulic Press
Courtesy of BMW OF NORTH AMERICA, INC.

VIBRATION DAMPER

1123010 REMOVING AND INSTALLING OR REPLACING VIBRATION DAMPER (M51)

Necessary preliminary tasks:

- Detach front underbody protection.
- Remove **DRIVE BELT** .

Release screws (1).

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

Remove vibration damper (2).

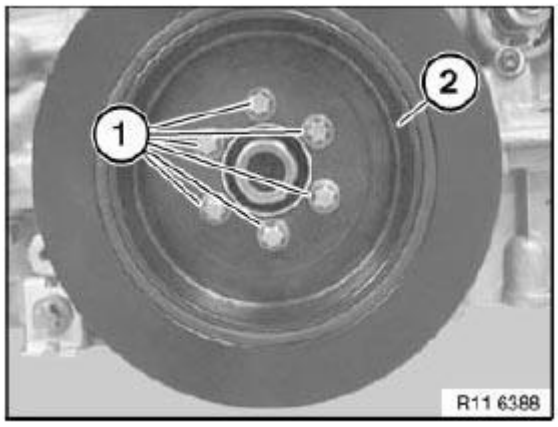

Fig. 175: Identifying Vibration Damper With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CONNECTING ROD WITH BEARING

1124571 REPLACING ALL CONNECTING ROD BEARINGS (N51)

IMPORTANT: All crank pins are connected with the crankshaft.
Modified procedure; the bearing shell colors are the same at the top and bottom.
Blue/Red bearing shell colors are no longer used in combination.

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Necessary preliminary tasks:

- Removing **OIL PAN** .

IMPORTANT: All crankshaft crank pins are classified.

Possible classifications per connecting rod at top and bottom:

r: Red

b: Blue

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

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

Example:

Possible classification: rbbrrb.

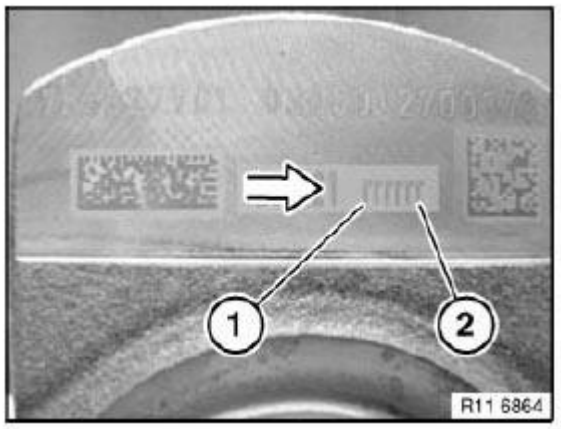

Fig. 176: Fitting Color In Connecting Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Cylinder 1: Classification Red/Red.

Cylinder 2: Classification Blue/Blue.

Cylinder 3: Classification Blue/Blue.

Cylinder 4: Classification Red/Red.

Cylinder 5: Classification Red/Red.

Cylinder 6: Classification Blue/Blue.

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Release conrod bolts (1).

Remove connecting rod bearing cap (2).

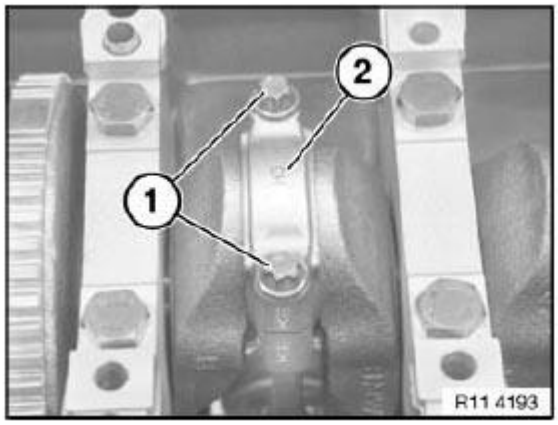

Fig. 177: Identifying Connecting Rod Bearing Caps And Connecting Rod Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage to cylinder wall and to crankshaft.

Gently release connecting rod from crankshaft.

Remove bearing shells (1 and 2).

Install new conrod bearing shells.

Installation:

Pay attention to guide lugs during installation.

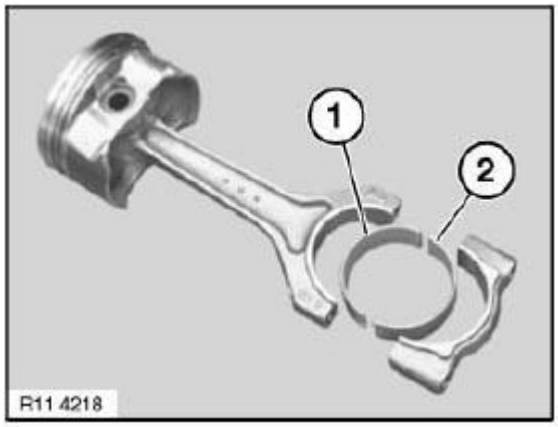

Fig. 178: Identifying Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

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IMPORTANT: All crankshaft crank pins are classified.

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

Check conrod bearing clearance.

Piston in BDC position.

Determine bearing clearance, ensure that bearing points are free from oil and grease.

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

Fit bearing cap so that pairing letters match up.

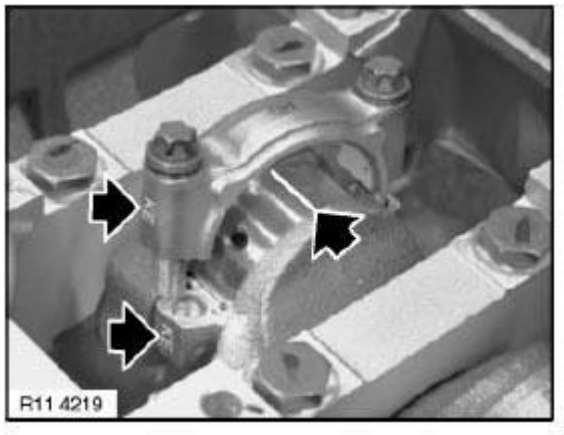

Fig. 179: Locating Bearing Cap Pairing Letters
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not distort conrods or crankshaft.
Use the old conrod bolts to check conrod clearance.
Tighten down conrod bolts with special tool 00 9 120 .
TIGHTENING TORQUE 11 24 1AZ .

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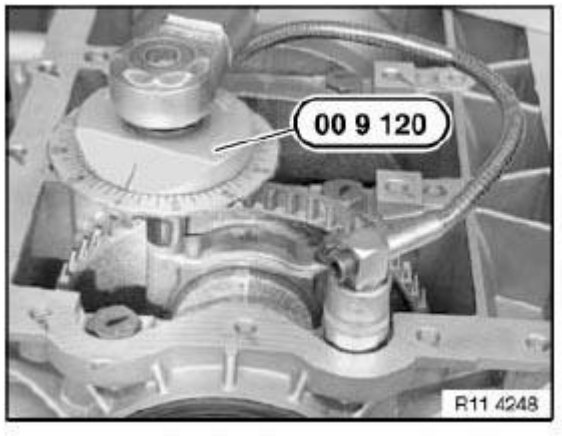

Fig. 180: Tightening Connecting Rod Bolts Using Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Conrod bearing clearance.

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

TIGHTENING TORQUE 11 24 1AZ .

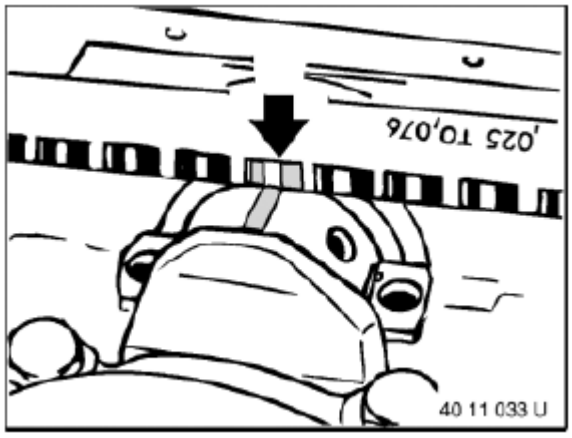

Fig. 181: Locating Connecting Rod Bearing Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

PISTON WITH RINGS AND PIN

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1125530 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.

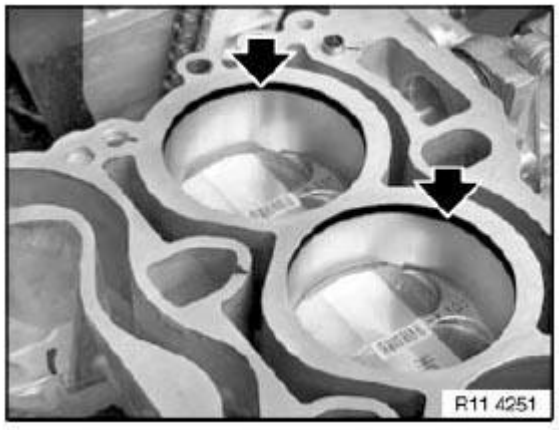

Fig. 182: Locating Oil Carbon Residue
Courtesy of BMW OF NORTH AMERICA, INC.

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

Example N14:

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Direction of arrow (1) points to camshaft drive.

Cylinder allocation (2) per cylinder.

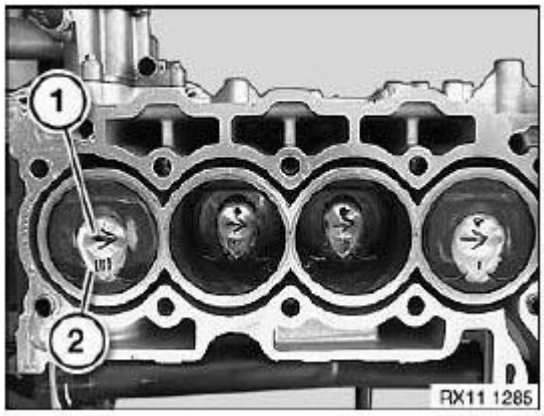

Fig. 183: Identifying Camshaft Drive Direction And Cylinder Allocation
Courtesy of BMW OF NORTH AMERICA, INC.

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.

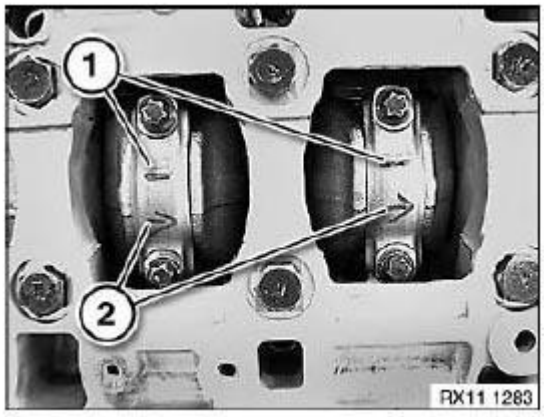

Fig. 184: Identifying Timing Chain Drive Direction And Cylinder Identification Markings
Courtesy of BMW OF NORTH AMERICA, INC.

Release connecting rod bolts (1).

Tightening torque, 11 24 1AZ.

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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.

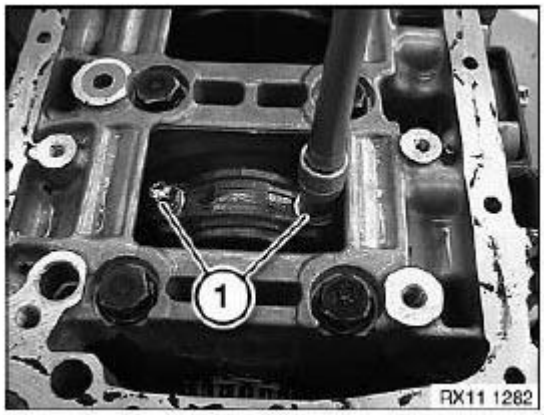

Fig. 185: Identifying Connecting Rod Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

11 9 620 Attach special tool in conrod big end.

Press out connecting rod and piston to cylinder head side.

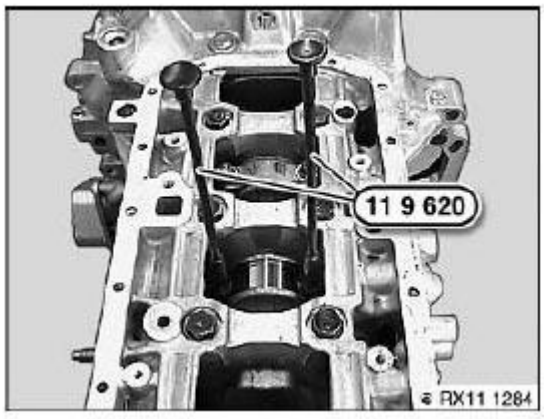

Fig. 186: Attaching Special Tool (11 9 620) On Connecting Rod Big End
Courtesy of BMW OF NORTH AMERICA, INC.

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

WARNING: Safety goggles must be worn.

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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. 187: 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.

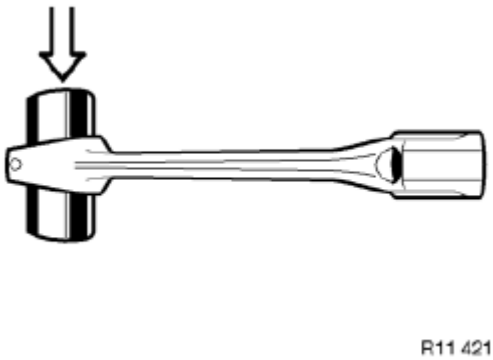

Fig. 188: Installing Gudgeon Pin
Courtesy of BMW OF NORTH AMERICA, INC.

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.

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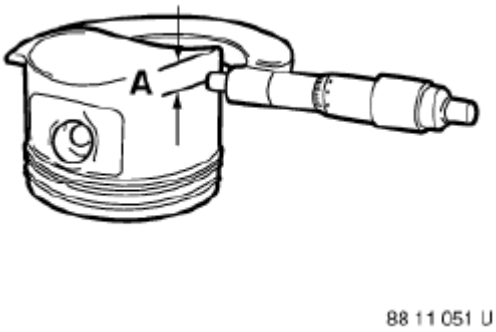

Fig. 189: Measuring Piston Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

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.

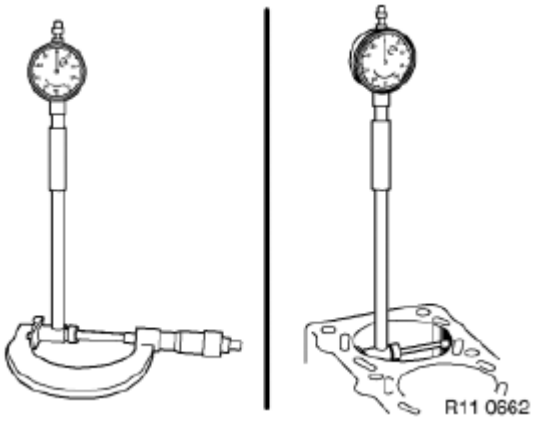

Fig. 190: Measuring Diameter Of Cylinder Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Install all piston rings.

Install all bearing shells.

Coat piston and piston rings with oil.

11 9 670 Pre-install piston in special tool.

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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.

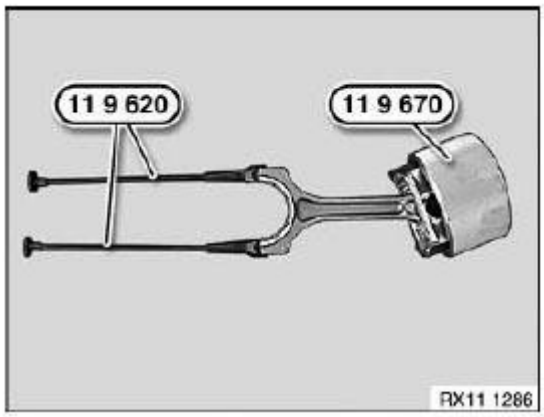

Fig. 191: Identifying Special Tools (11 9 620 And 11 9 670)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

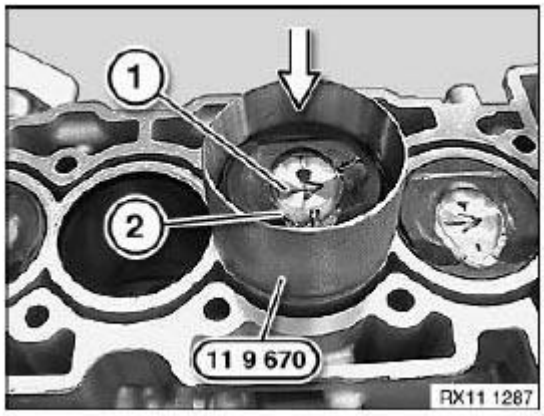

Fig. 192: Inserting Piston With Connecting Rod In Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

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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.

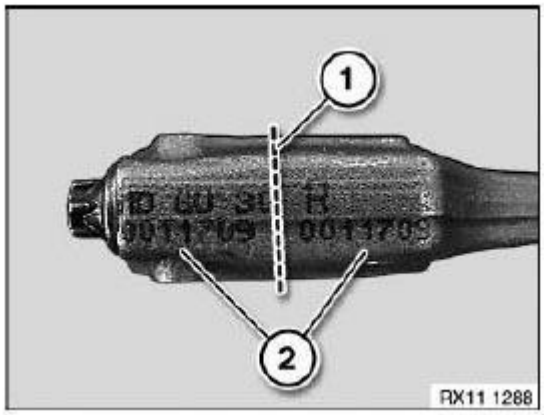

Fig. 193: Identifying Connecting Rod Point Of Fracture And Pairing Letters
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a light coat of oil to crankshaft journals.

Attach connecting rod to crankshaft journal.

Remove special tool 11 9 620.

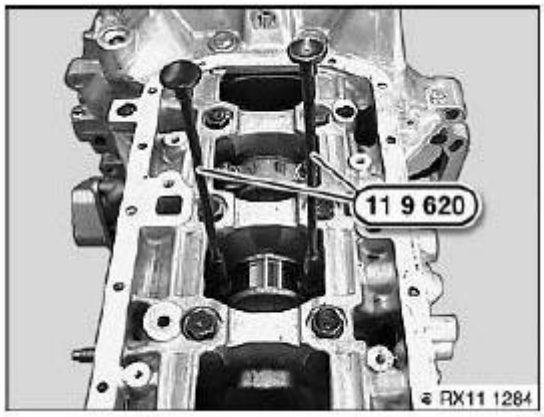

Fig. 194: Identifying Special Tool (11 9 620)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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Check cylinder identification markings (1).

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

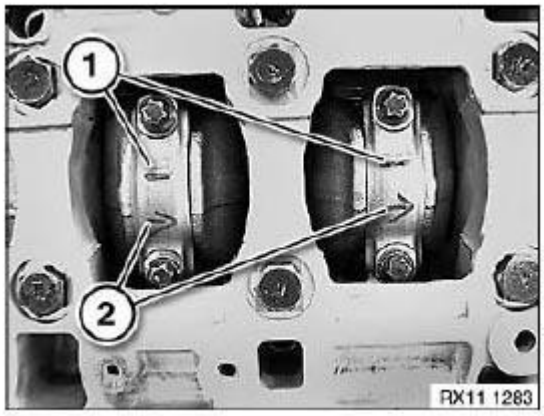

Fig. 195: Identifying Timing Chain Drive Direction And Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Install new connecting rod bolts (1).

Carry out torsion angle tightening of conrods with special tool.

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

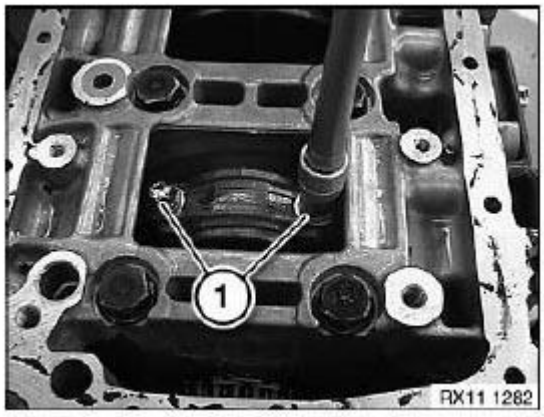

Fig. 196: Identifying Connecting Rod Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1125530 REMOVING AND INSTALLING/REPLACING ALL PISTONS (N51)

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

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IMPORTANT: If pistons, conrods and bearing shells are reused, they must be reinstalled in the same places.
Individual conrod replacement is not permitted; they are classified according to weight categories.
Conrods and conrod bearing caps are denoted with the same pairing letters; mixing them up will result in engine damage.
Piston and piston pins are paired and must not be fitted individually.

Necessary preliminary tasks:

- Remove **ENGINE** .
- Mount engine on assembly stand .
- Remove intake air manifold.
- Remove **CYLINDER HEAD** .
- Remove **ENGINE OIL SUMP** .
- Remove **OIL PUMP** .

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

NOTE: Illustrations show N46.

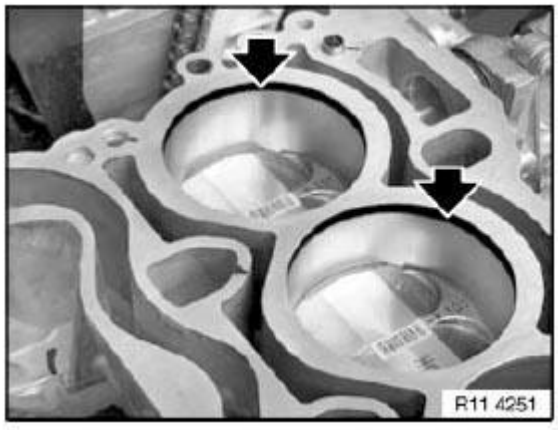

Fig. 197: Locating Oil Carbon Residue
Courtesy of BMW OF NORTH AMERICA, INC.

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

Oil spray nozzle (2) must not be maladjusted or bent **(risk of damage).**

READJUST if necessary.

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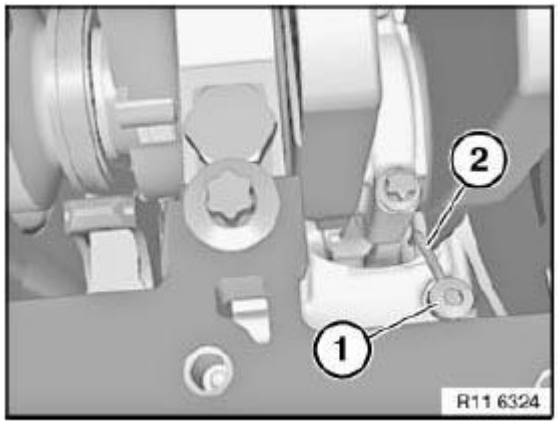

Fig. 198: Identifying Screw And Oil Spray Nozzle
Courtesy of BMW OF NORTH AMERICA, INC.

Release conrod bolts (1).

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

Remove conrod bearing cap (2) in direction of arrow.

IMPORTANT: Conrods and conrod bearing caps are denoted with the same pairing letters; mixing them up will result in engine damage.

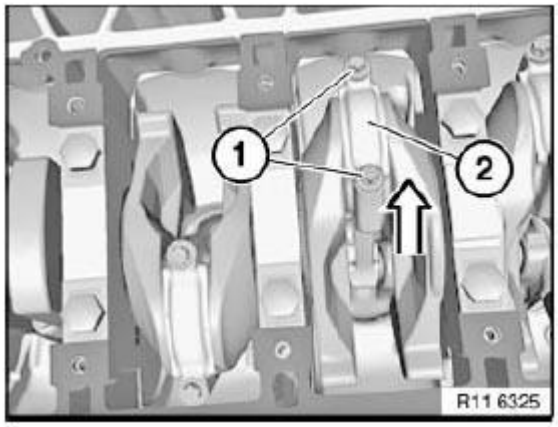

Fig. 199: Removing Connecting Rod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool **11 8 330 ASSEMBLY TOOL** in conrod big end.

Press out conrod and piston to cylinder head side.

IMPORTANT: Risk of damage to oil spray nozzle.

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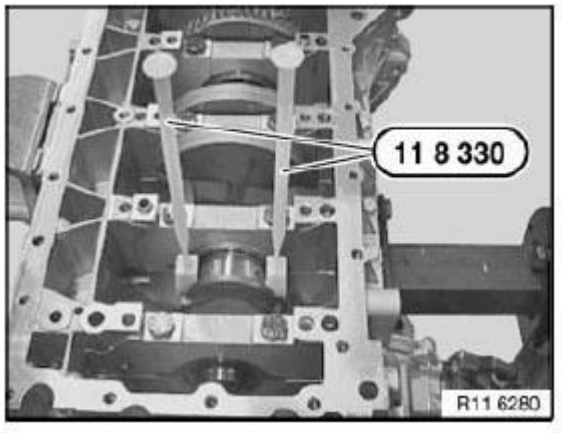

Fig. 200: Identifying Special Tool (11 8 330)
Courtesy of BMW OF NORTH AMERICA, INC.

Preliminary work

Clamp special tool 11 4 491 in a vice.

Secure piston (1) with conrod to special tool 11 4 491 .

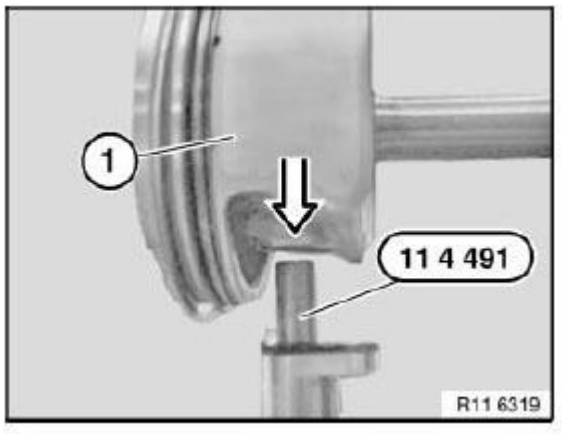

Fig. 201: Identifying Piston And Special Tool (11 4 491)
Courtesy of BMW OF NORTH AMERICA, INC.

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

WARNING: Protective goggles must be worn.

Lever out piston circlip with special tool 11 4 492 in direction of arrow.

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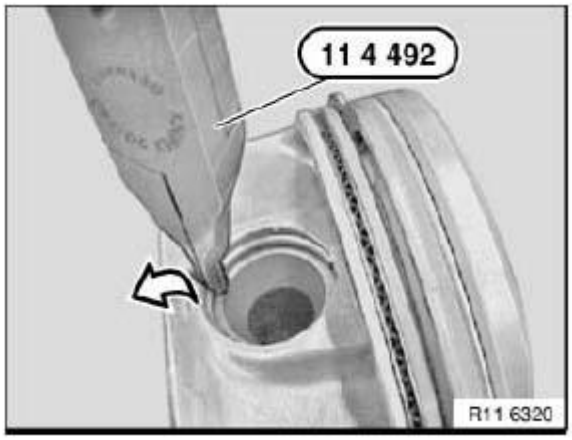

Fig. 202: Removing Piston Circlip Using Special Tool (11 4 492)
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, replace connecting rods.

IMPORTANT: Connecting rods are divided into weight categories and are only available as a set.
Old and new connecting rods must not be installed in mixed combinations.

Installation:

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

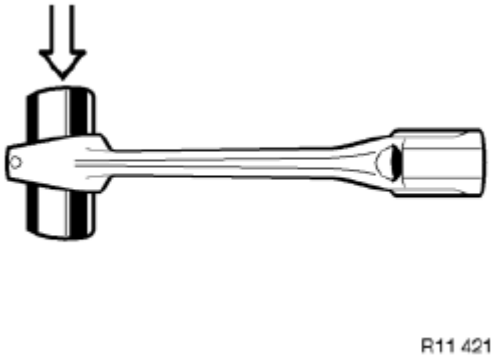

Fig. 203: Installing Gudgeon Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Measure piston installation clearance:

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

Piston diameter at measuring point A.

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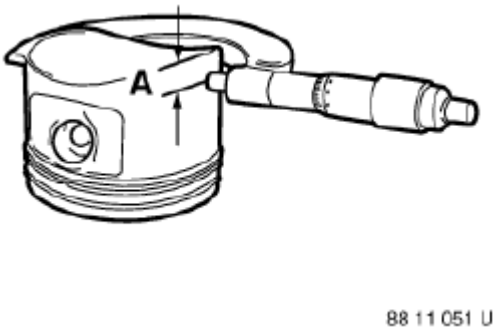

Fig. 204: Measuring Piston Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

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

Diameter of cylinder bore.

Piston installation clearance.

Total permissible wear tolerance see **1121-N51-03B1S1 CRANKSHAFT AND BEARINGS** .

If necessary, replace piston.

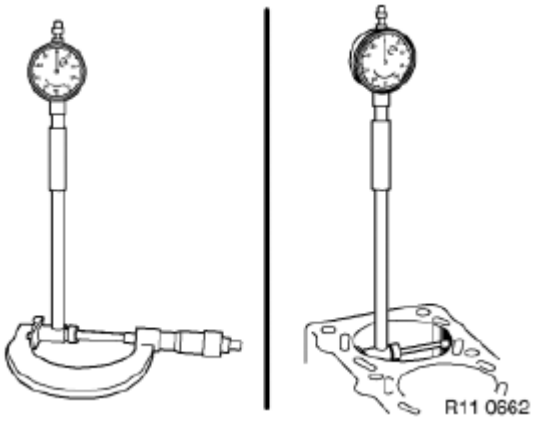

Fig. 205: Measuring Diameter Of Cylinder Bore
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Protective goggles must be worn.
Insert piston circlip (2) into groove (1) of special tool 11 4 493 PLIERS .
Bring piston circlip into assembly position.

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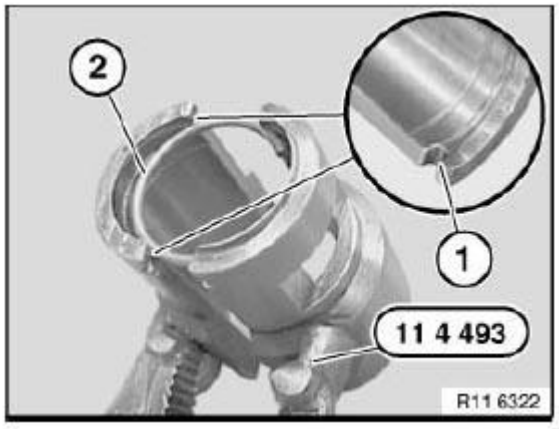

Fig. 206: Identifying Piston Circlip And Groove Of Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Protective goggles must be worn.

Guide lug and cutout on special tool **11 4 493 PLIERS** must point to the piston crown; only then can special tool **11 4 494 MANDREL** be correctly fitted.

When special tools **11 4 493 PLIERS** and **11 4 494 MANDREL** are correctly positioned, the piston pin circlip must be driven in with a plastic hammer in the direction of the arrow.

NOTE: See Fig. 207.

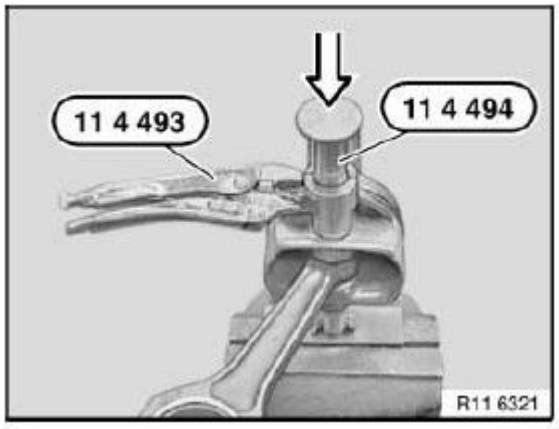

Fig. 207: Driving Piston Pin Using Plastic Hammer
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: B 30.

Install all **PISTON RINGS** .

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Install all **BEARING SHELLS** .

Coat piston and piston rings with oil.

Pre-install piston (2) in special tool 11 6 261.

Attach special tool **11 8 330 ASSEMBLY TOOL** in conrod (2).

Installation:

Check protective lugs (1) on special tool **11 8 330 ASSEMBLY TOOL** for correct position and damage.

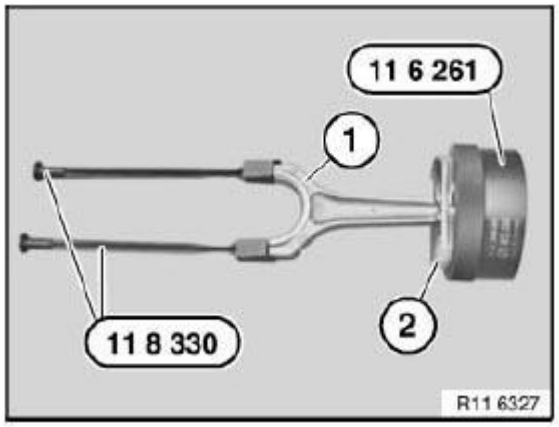

Fig. 208: Attaching Special Tool In Connecting Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Insert piston with conrod in cylinder.

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

Insert piston (1) so that arrow (2) on piston crown points to camshaft drive.

Press in piston (1) with special tool 11 6 261.

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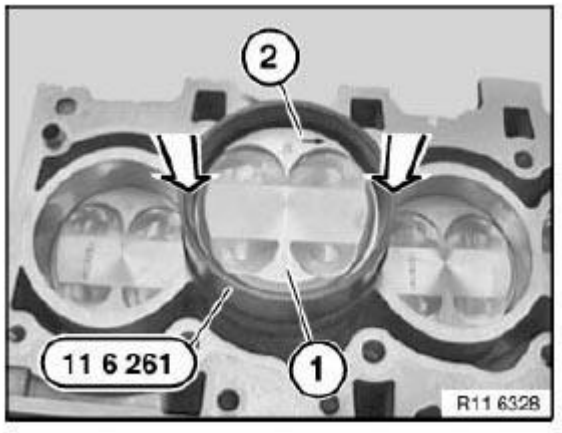

Fig. 209: Inserting Piston On Piston Crown Points
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Conrod and conrod bearing cap are identified with pairing letters (1) and must not be mixed up.
Mixing them up or incorrectly fitting the conrod bearing cap on the big end will result in engine damage.

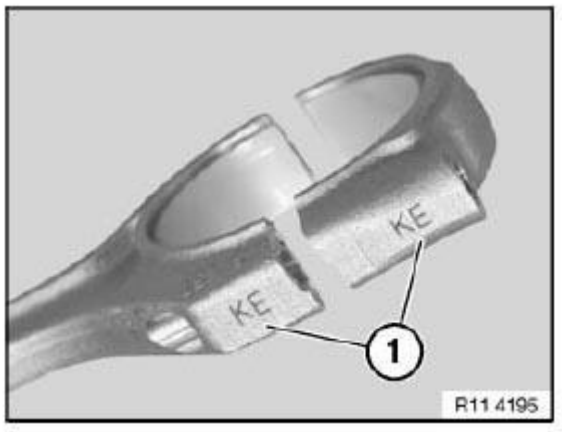

Fig. 210: Identification Pairing Letters On Conrod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a light coat of oil to crank pin.

Assemble conrod and crank pin.

Detach special tool **11 8 330 ASSEMBLY TOOL** .

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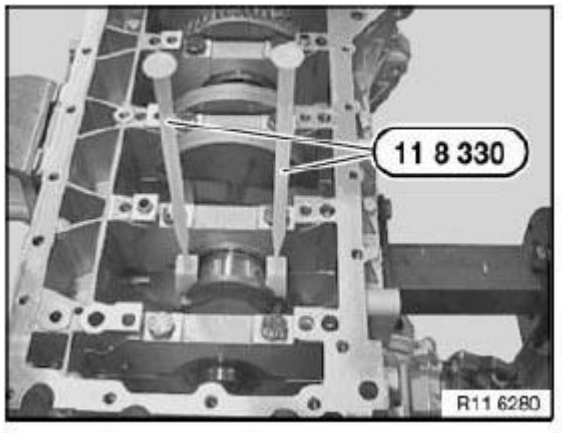

Fig. 211: Identifying Special Tool (11 8 330)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Install new conrod bolts (1).

Tightening torque: **11 24 1AZ**

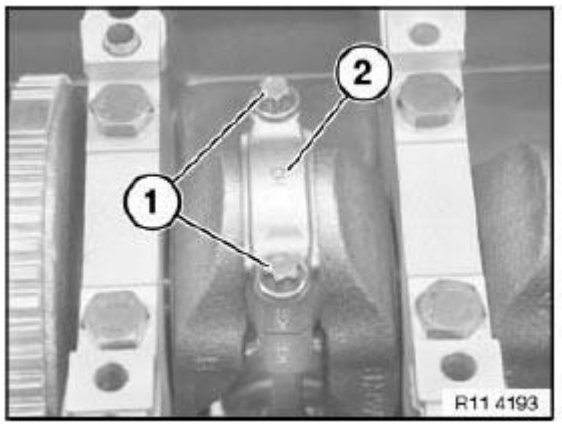

Fig. 212: Identifying Bearing Caps And Connecting Rod Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust torsion angle of conrod with special tool 00 9 120 (see **Fig. 213**).

Tightening torque: **11 24 1AZ**

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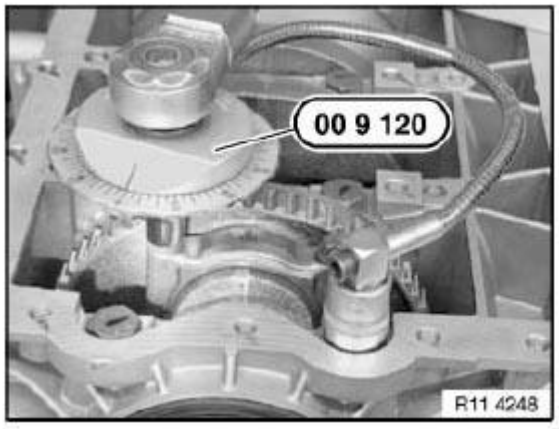

Fig. 213: Adjusting Torsion Angle Of Conrod Using Special Tool 00 9 120
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1125671 REPLACING PISTON RINGS ON ALL PISTONS (N51)

Necessary preliminary tasks:

- Remove all **PISTONS** .

Measuring axial clearance of piston rings in piston ring groove.

See **1125-N51-01B1S1 PISTONS WITH RINGS AND PINS N51/B30** .

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

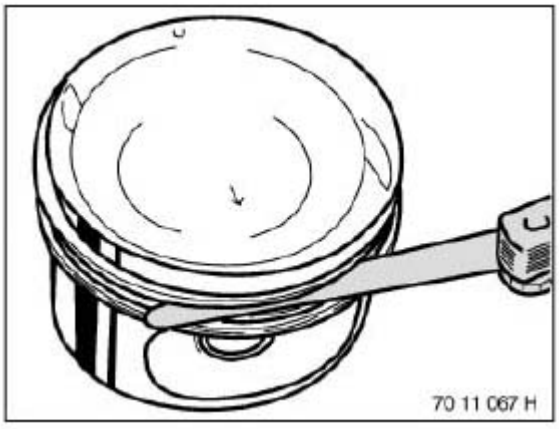

Fig. 214: Measuring Axial Clearance Of Piston Rings
Courtesy of BMW OF NORTH AMERICA, INC.

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

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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:

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

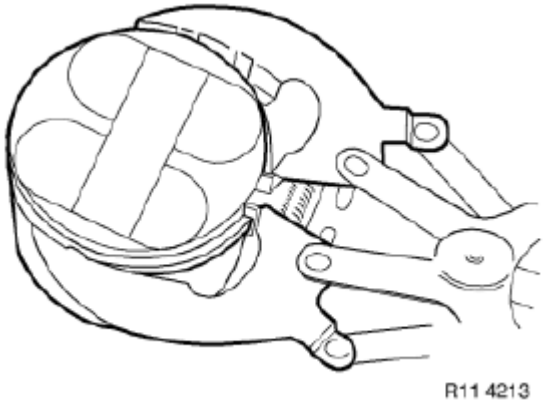

Fig. 215: Removing Compression Ring And Stepped Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Determine gap with a feeler gauge. See **1125-N51-01B1S1 PISTONS WITH RINGS AND PINS N51/B30** .

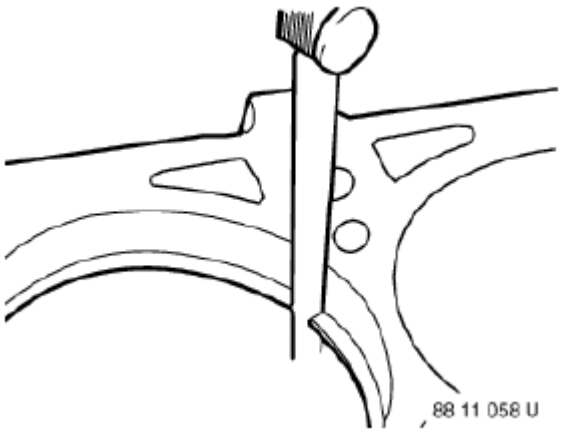

Fig. 216: Measuring Gap Using Feeler Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic representation of piston rings.

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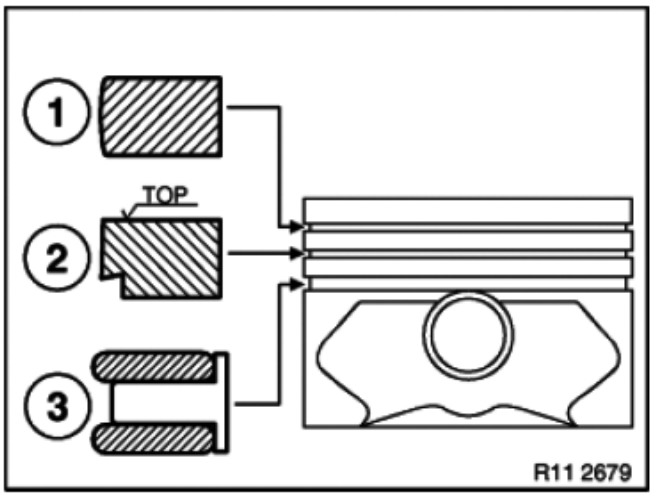
Installation:

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

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



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

Fig. 217: 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:

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

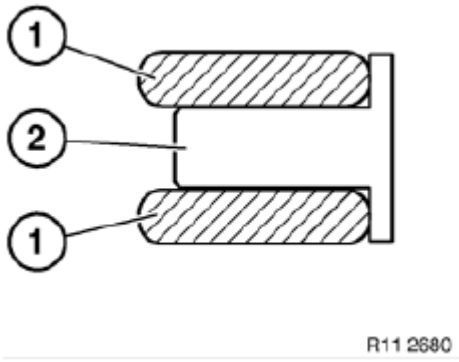


Fig. 218: Identifying Steel Band Ring And Support Spring
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: See Fig. 219 N52.

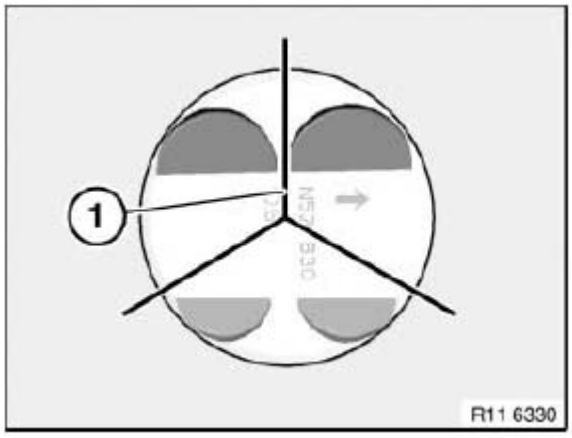

Fig. 219: Identifying Contact Points Of Piston Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

V-RIBBED BELT WITH TENSIONER DEFLECT

1128010 REPLACING ALTERNATOR DRIVE BELT (N51)

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

Necessary preliminary tasks:

- Remove **FAN COWL** .
- Mark the direction of rotation of the drive belt if it is to be reused.

Layout of drive belt.

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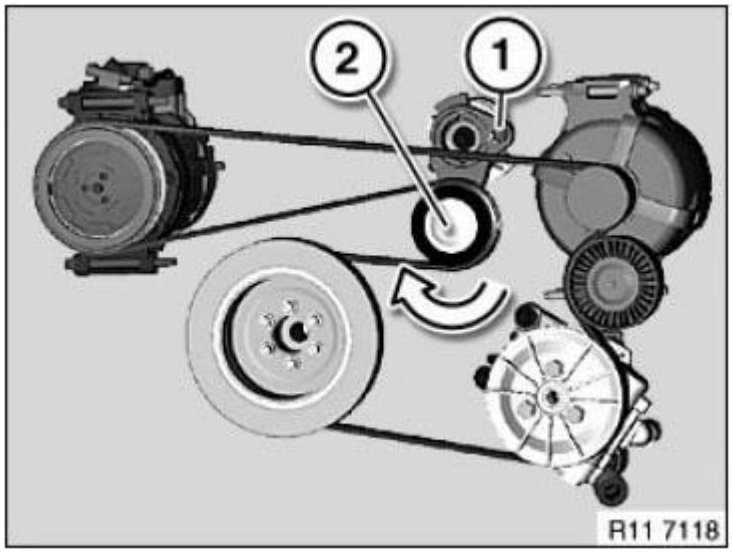

Fig. 220: Identifying Drive Belt Routing
Courtesy of BMW OF NORTH AMERICA, INC.

Turn belt tensioner (4) in direction of arrow until bore (2) is flush on housing.

Hold belt tensioner (4) under tension.

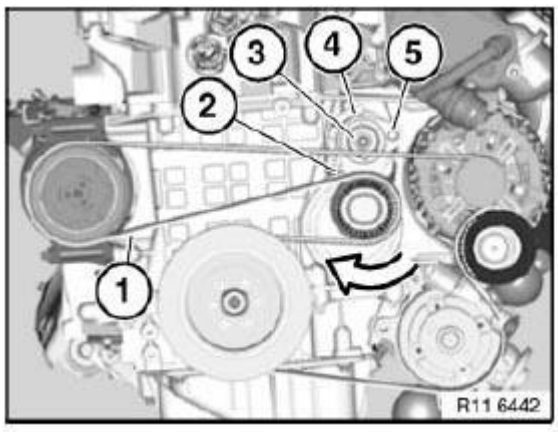

Fig. 221: Turning Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Secure belt tensioner with special tool 11 3 340 .

NOTE: Illustration N42.

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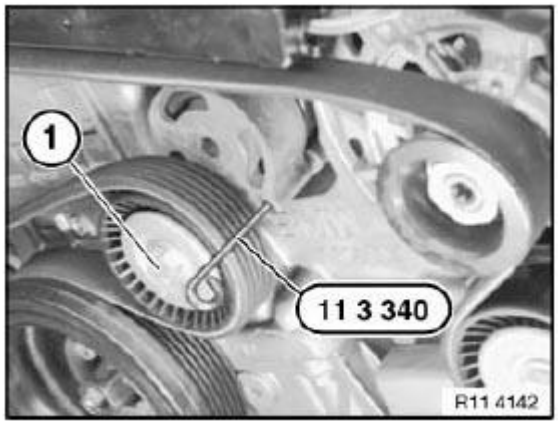

Fig. 222: Identifying Belt Tensioner And Special Tool (11 3 340)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove drive belt (1) towards top.

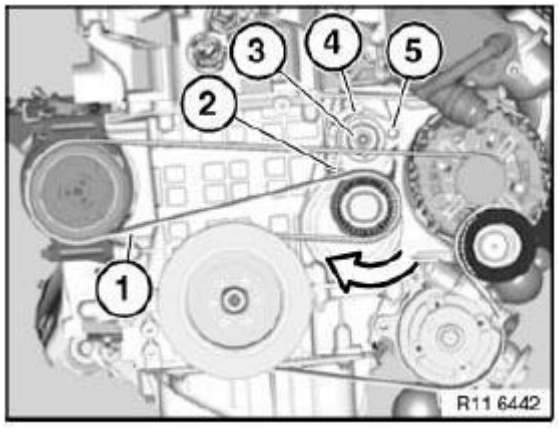

Fig. 223: Turning Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Installation:

Check that drive belt for is in correct installation position - **risk of damage.**

1128020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (N51)

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).

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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 **DRIVE BELT** .

Remove special tool **11 3 340 PIN** .

Unscrew bolt (3).

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

Installation:

Replace aluminum screws.

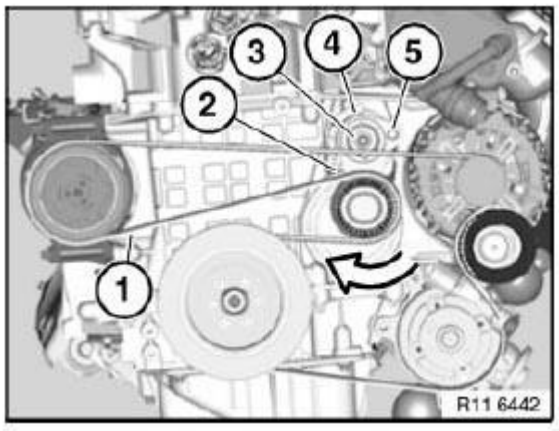

Fig. 224: Turning Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

CAMSHAFT

1131505 ADJUSTING CAMSHAFT TIMING (N51)

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER** .

Remove fastener (1) in direction of arrow.

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Installation:

Install fastener (1) with bore facing outwards.

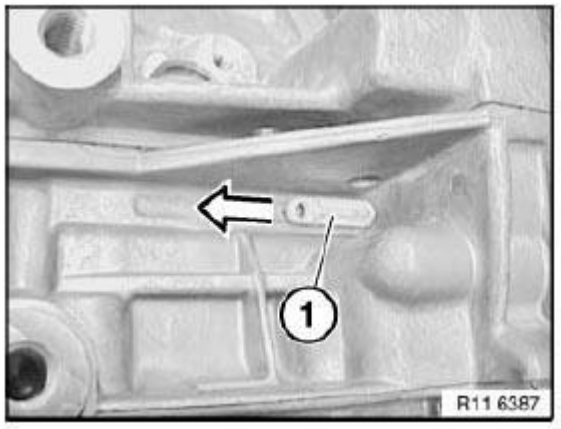

Fig. 225: Installing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

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

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

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

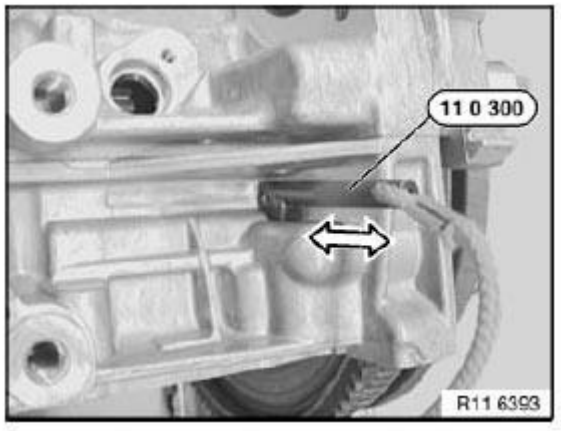

Fig. 226: Sliding Crankshaft In Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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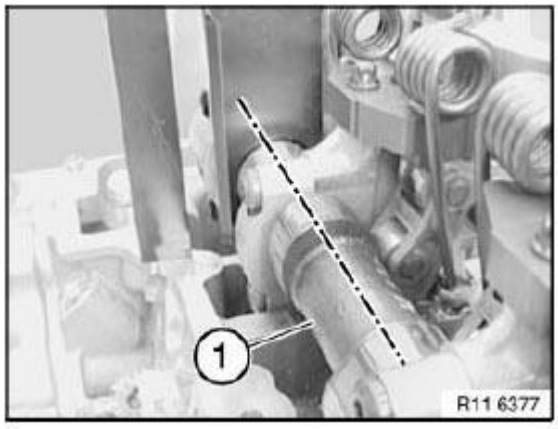

Fig. 227: Identifying Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Part numbers (2) on twin surface of inlet and exhaust camshafts (1) point upwards.

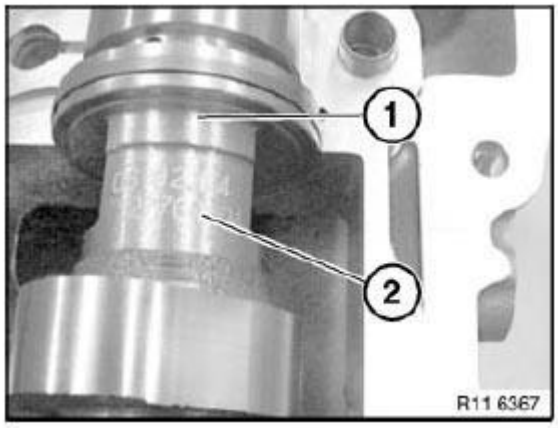

Fig. 228: Identifying Camshafts With Part Number
Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of exhaust camshaft (3) at 6th cylinder point downwards at an angle.

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

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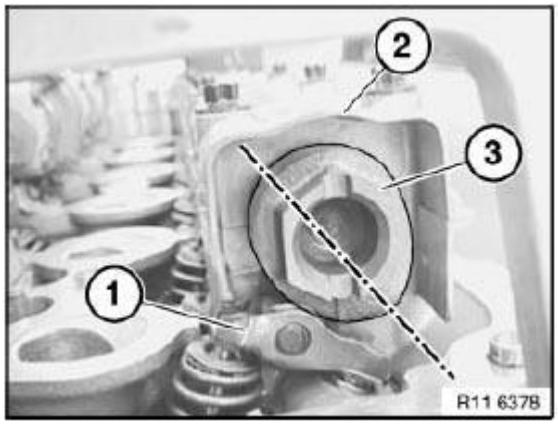

Fig. 229: Identifying Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!
To open central bolt, mount special tools 11 4 283 11 4 281 and 11 4 282 on camshaft.

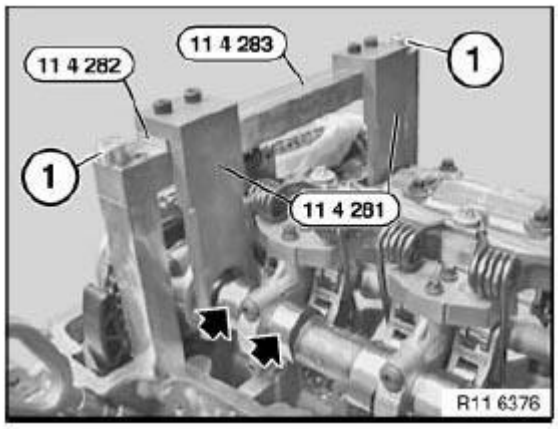

Fig. 230: Identifying Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Release central bolts (1).

Release central bolts (1) with special tool **11 4 280 GAUGE** only.

Release chain tensioner (2) (have a cleaning cloth ready).

NOTE: Illustrations in CAD do not show special tools.

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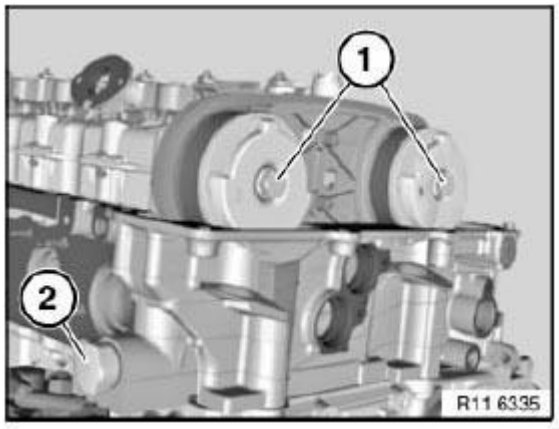

Fig. 231: Identifying Central Bolt And Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Turn sensor gears (2) in direction of arrow until locating pins (1) on special tool **11 4 290 GAUGE** match up.

Slide on special tool **11 4 290 GAUGE** in direction of arrow.

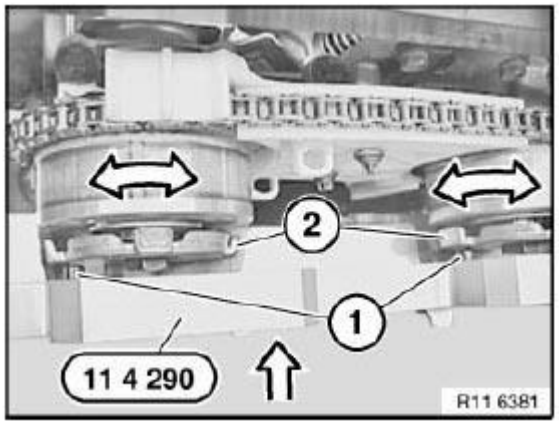

Fig. 232: Turning Sensor Gears
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool **11 4 290 GAUGE** with bolts (1).

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

Pretension timing chain with special tool 00 9 250 to **0.6 Nm.**

Secure both central bolts of adjustment units to camshafts with special tool 00 9 120 .

Tightening torque: **11 36 1AZ** .

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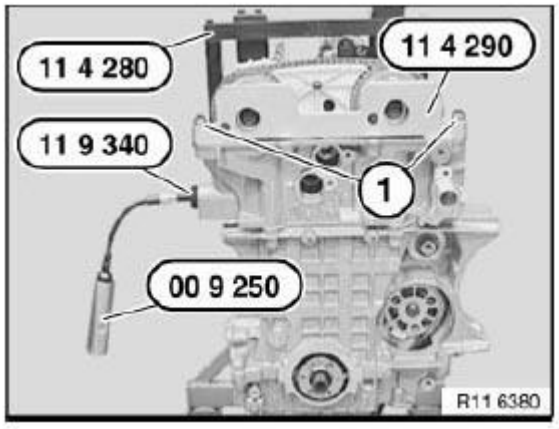

Fig. 233: Identifying Special Tools (11 4 280, 11 4 290, 11 9 340 And 00 9 250)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1131005 CHECKING CAMSHAFT TIMING

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER** .
- Remove front splash guard.

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

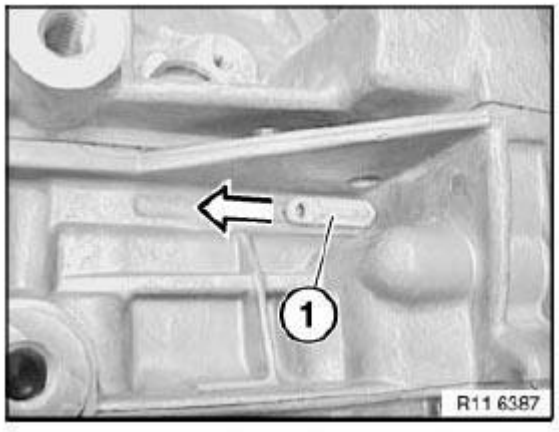

Fig. 234: Installing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

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

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

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

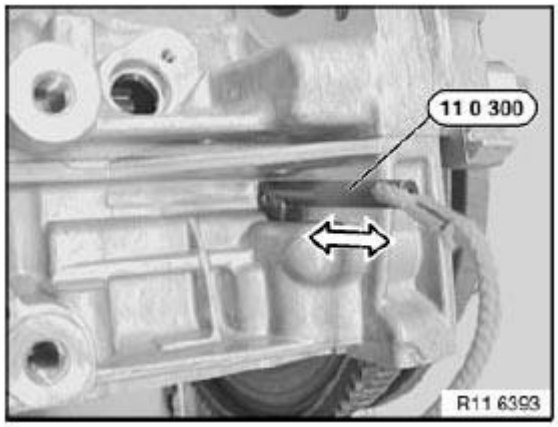

Fig. 235: Sliding Crankshaft In Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

The timings are correct when the part number (2) can be read from above on the camshafts (1).

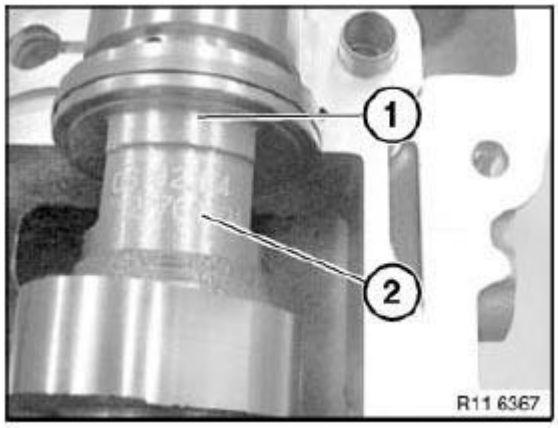

Fig. 236: Identifying Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

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

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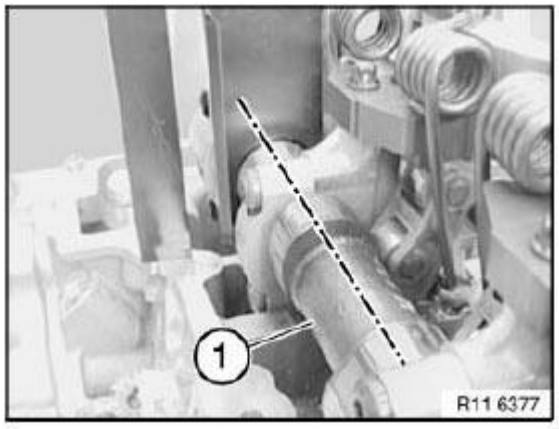

Fig. 237: Identifying Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, cams of exhaust camshaft (3) at 6th cylinder point downwards at an angle.

Roller cam follower (1) 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.

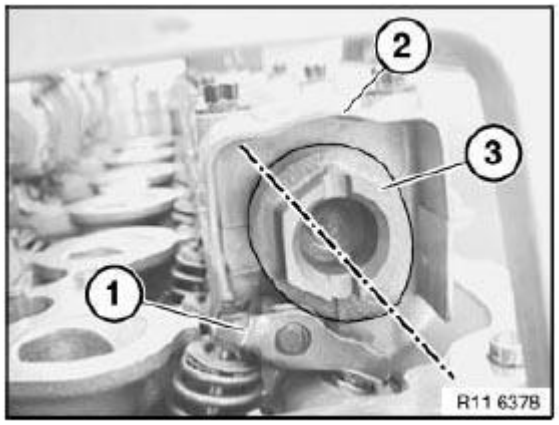

Fig. 238: Identifying Exhaust Camshaft And Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: Fit special tool 11 4 282 underneath on inlet side.

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

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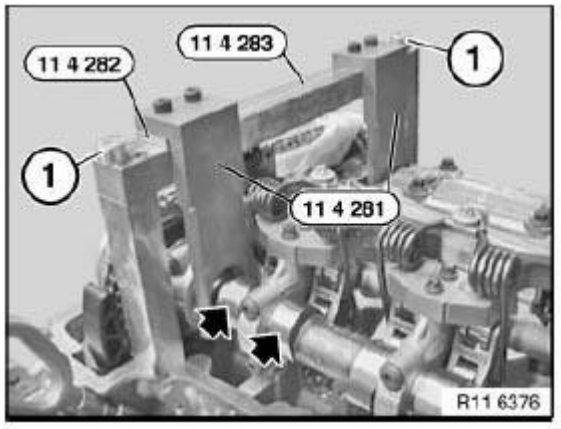

Fig. 239: Identifying Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, adjust **VALVE TIMING** .

Assemble engine.

1131090 INSTALLING AND REMOVING/REPLACING CHAIN TENSIONER PISTON (N51)

Release chain tensioner (1).

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

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

Installation:

No sealing ring is fitted during series-production assembly.

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

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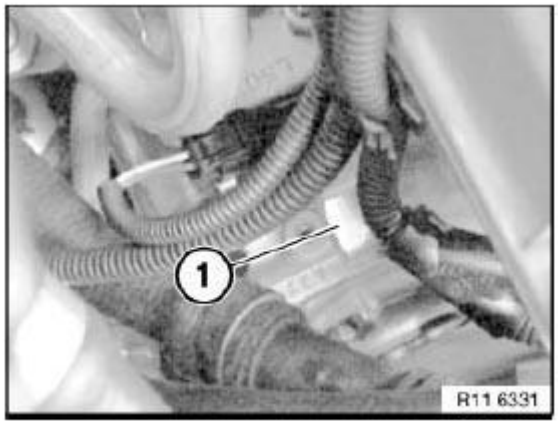

Fig. 240: Identifying Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

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

Repeat procedure twice.

Fig. 241: Compressing Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1131028 REMOVING AND INSTALLING/REPLACING EXHAUST CAMSHAFT (N51)

IMPORTANT: It is absolutely essential to follow an exact procedure for removing and installing the exhaust camshaft.
Risk of damage!
The upper and lower bearing strips must be pre-tensioned with a total of six special tools 11 4 461.

Necessary preliminary tasks:

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- 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.

Remove upper bearing strip (1).

Remove exhaust camshaft from lower bearing strip.

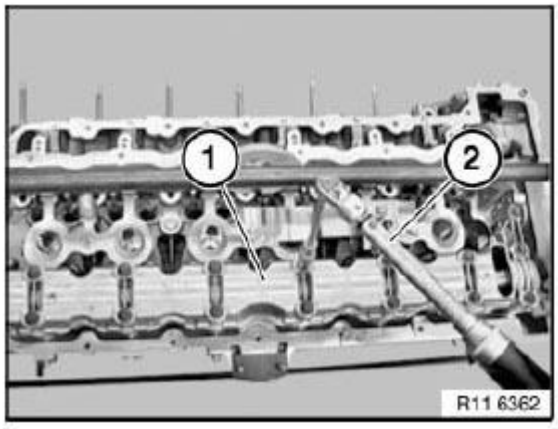

Fig. 242: Removing Upper Bearing Strip
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Both camshafts have different identifications.
Mixing up the two camshafts will result in engine damage .
A Exhaust camshaft.
E Intake camshaft

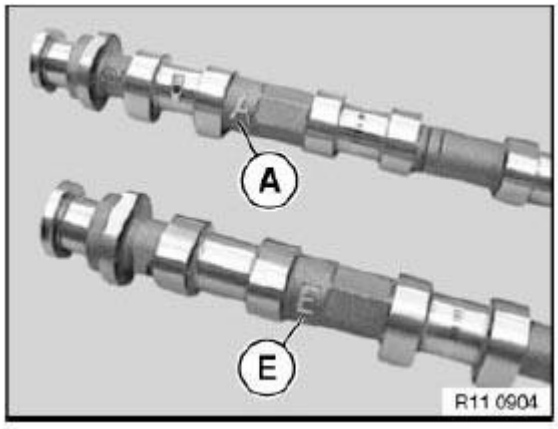

Fig. 243: Identifying Exhaust Camshaft And Intake Camshafts

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Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Plain compression rings (1) can easily break.
Plain compression rings (1) are engaged at joint.
Press plain compression rings (1) apart upwards and downwards and removed towards front.

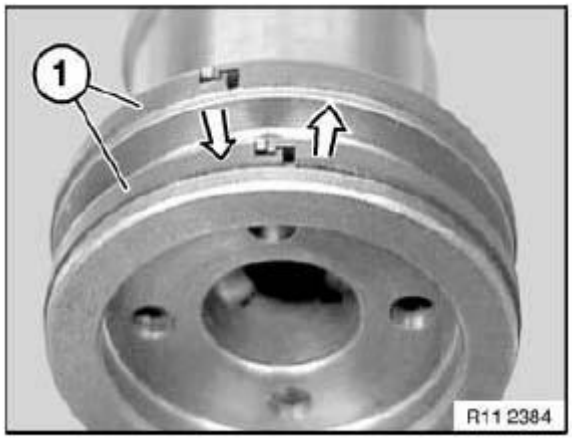

Fig. 244: Pressing Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installing camshaft bearing strip

Pre-install special tool 11 4 462 on cylinder 2.

Insert special tool 11 4 463 in screw connection of cylinder head cover.

IMPORTANT: Special tool 11 4 463 is a special screw.

Press down roller rocker arms (3) on 2nd cylinder with spindle nut (2) of special tool 11 4 462.

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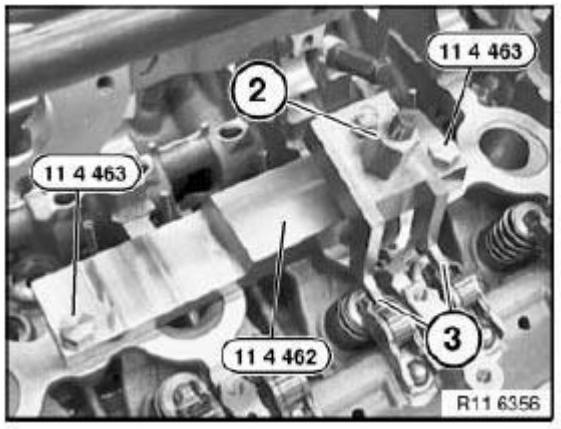

Fig. 245: Identifying Special Tools (11 4 463 And 11 4 462)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

Refer to Removing and installing **ROLLER ROCKER ARMS** .

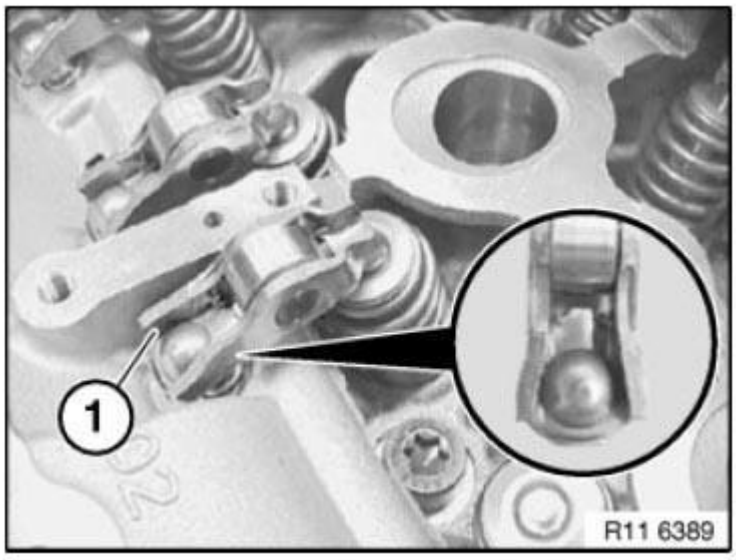

Fig. 246: Identifying Roller Rocker Arm
Courtesy of BMW OF NORTH AMERICA, INC.

Position lower bearing strip (1) with exhaust camshaft (2) on roller rocker arms.

Align exhaust camshaft (2).

Cylinders 2 and 4 are at overlap.

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Cams (3) on 1st cylinder point upwards at an angle.

Part number (4) on mounting flats points upwards.

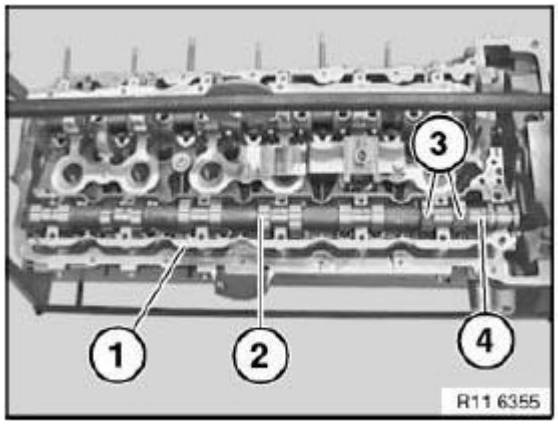

Fig. 247: Identifying Lower Bearing Strip With Exhaust Camshaft And Cams
Courtesy of BMW OF NORTH AMERICA, INC.

Join exhaust camshaft to lower and upper bearing strips (1) with torque wrench (2) from inside outwards to **8 Nm** .

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

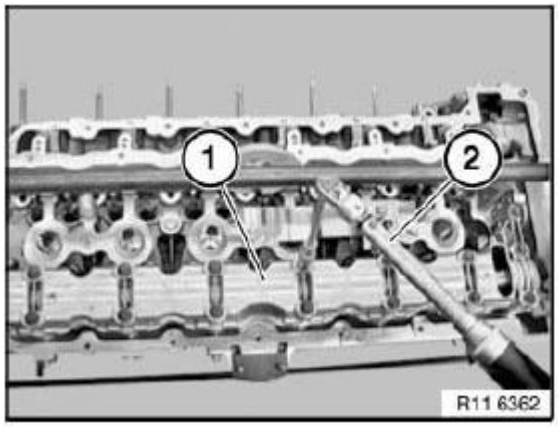

Fig. 248: Removing Upper Bearing Strip
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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 4 461 into contact at milled surfaces.

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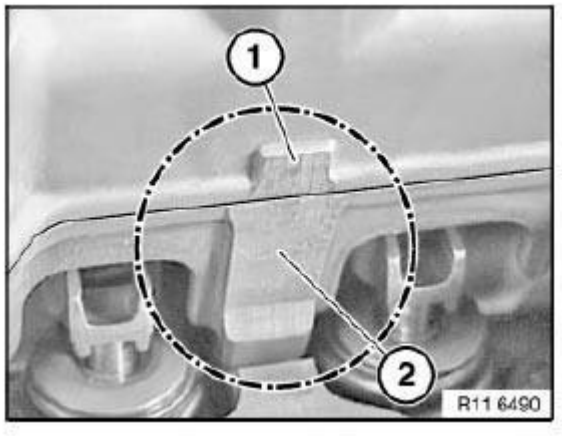

Fig. 249: Identifying Ground Surfaces For Aligning Lower And Upper Bearing Strips
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic depiction of special tool 11 4 461 at lower bearing strip (1) and upper bearing strip (2).
Pre-tension all special tools 11 4 461 with special tool 11 4 350 TORQUE WRENCH only.

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

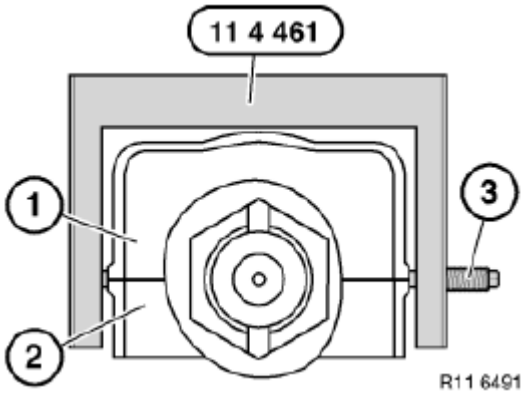

Fig. 250: Identifying Screw, Upper And Lower Bearing Bank And Special Tool (11 4 461)
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool 11 4 461 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).

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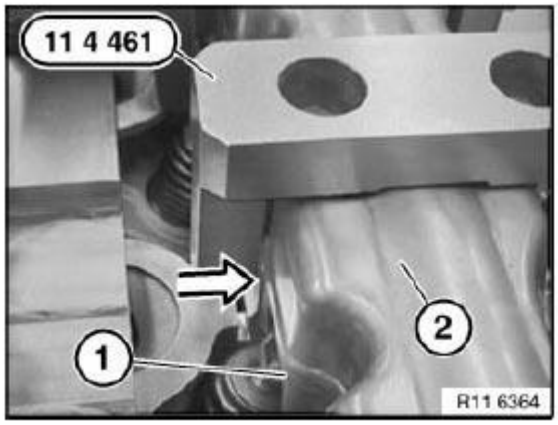

Fig. 251: Identifying Special Tool (11 4 461)
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten screw of special tool 11 4 461 to ground surfaces of lower bearing strip (1) and upper bearing strip (2).

IMPORTANT: Tighten screws on thrust piece to 2 Nm (risk of damage).

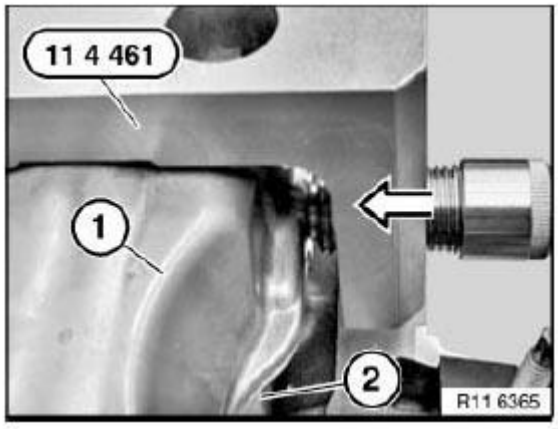

Fig. 252: Tightening Screw Of Special Tool (11 4 461) To Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Set special tool 11 4 350 TORQUE WRENCH to 2 Nm.
Pre-tension all special tools 11 4 461 with special tool 11 4 350 TORQUE WRENCH only.

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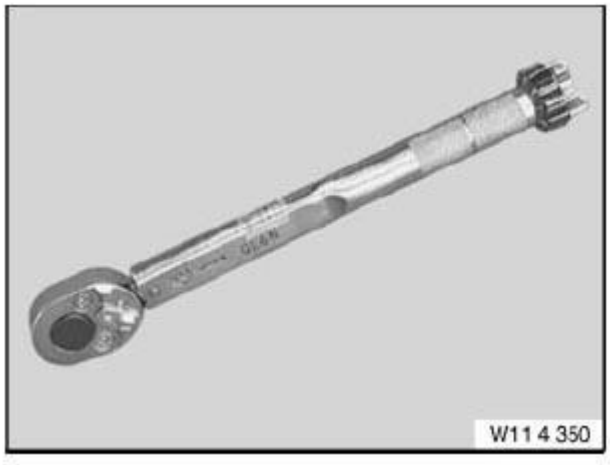

Fig. 253: Identifying Torque Wrench (11 4 350)
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tools 11 4 461 with screw (1) to inside of cylinder head.

On cylinder no. 2 mount special tool 11 4 461 with screw (1) facing outwards.

Position special tools 11 4 461 so that screw connections (2) of bearing strip are easily accessible.

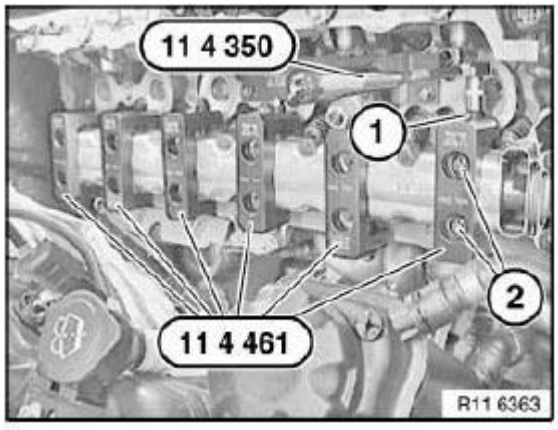

Fig. 254: Identifying Screw, Screw Connections And Special Tools (11 4 350 And 11 4 461)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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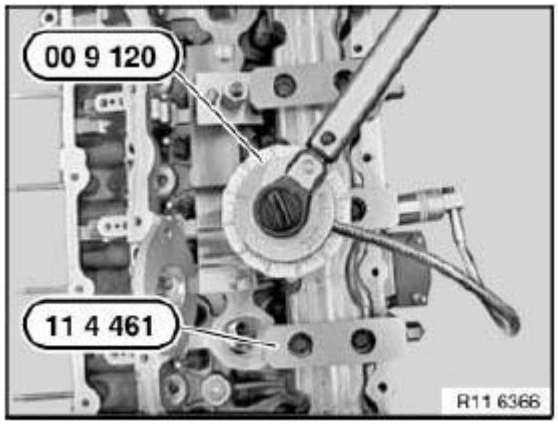

Fig. 255: Tightening Lower And Upper Bearing Strips Using Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Remove special tool 11 4 461 only when camshaft screw connection is completed.

Assemble engine.

1131025 REMOVING AND INSTALLING/REPLACING INTAKE CAMSHAFT (N51)

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

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER** .
- Remove **ADJUSTING UNIT** for intake camshaft.
- Remove **INTERMEDIATE LEVER** .
- Adjust **VALVE TIMING** .

Bearing cap (1) is a thrust bearing.

Release screws of bearing caps (1 and 2).

Set all bearing caps down in special tool 11 4 481 in a neat and orderly fashion.

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All bearing caps are identified from 1 to 6.

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

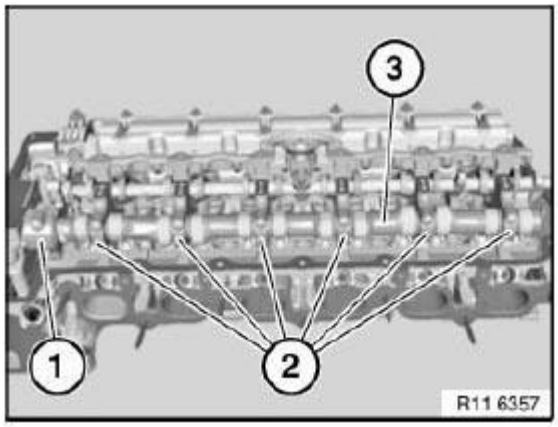

Fig. 256: Identifying Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out camshaft (2).

Installation:

Clean all bearing points and lubricate with oil.

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

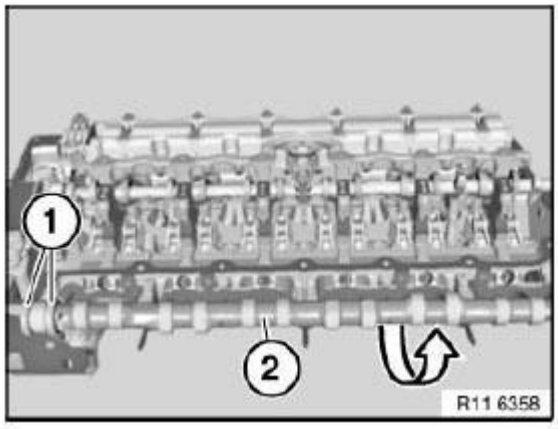

Fig. 257: Lifting Out Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Plain compression rings (1) can easily break.
The plain compression rings have catches at the joint.
Press plain compression rings (1) apart upwards and downwards and removed towards front.

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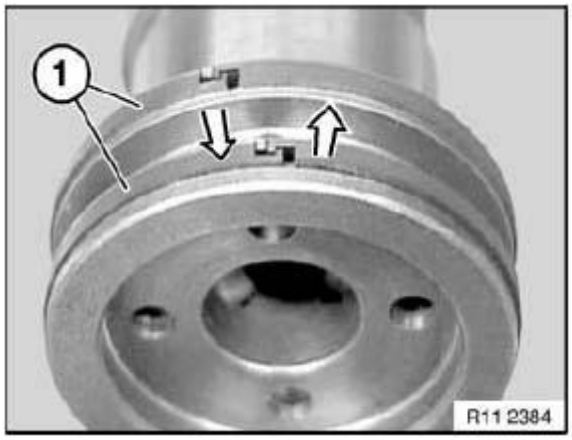

Fig. 258: Pressing Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

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

A Exhaust camshaft.
E Intake camshaft

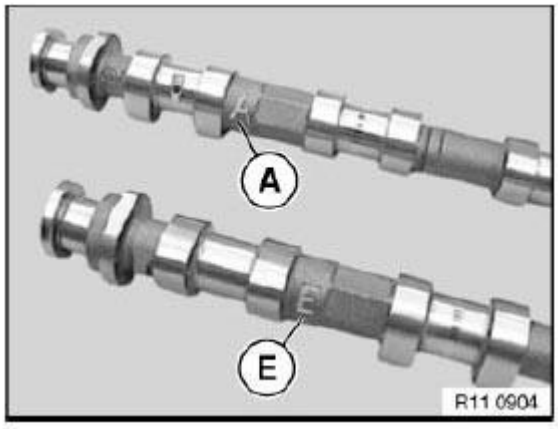

Fig. 259: Identifying Exhaust Camshaft And Intake Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Insert camshaft (1) so that part number on mounting flats points upwards.

Position intake camshaft (1) so that cams point upwards at an angle.

Attach special tool 11 4 281 to mounting flats.

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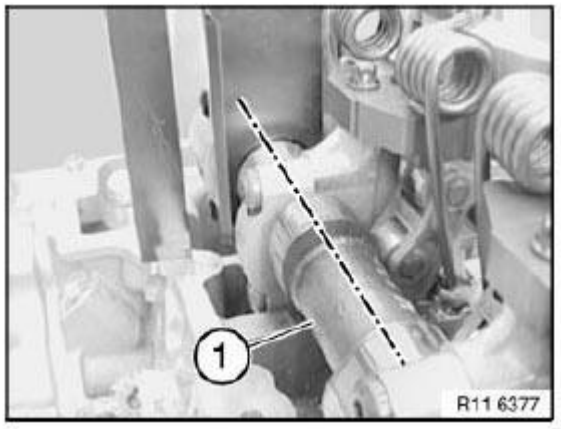

Fig. 260: Identifying Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1131051 REPLACING TIMING CHAIN (N51)

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER** .
- Remove all spark plugs.
- Remove **CHAIN TENSIONER** .
- Remove **RADIAL SHAFT SEAL** at front.
- Remove **BELT TENSIONER** .
- Remove **VIBRATION DAMPER** .

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

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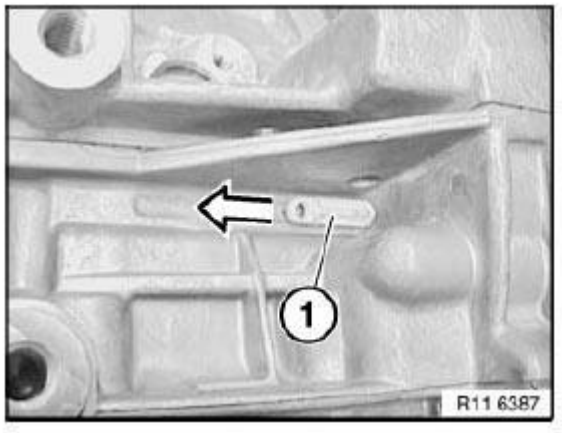

Fig. 261: Installing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft during entire repair operation with special tool **11 0 300 MANDREL** .

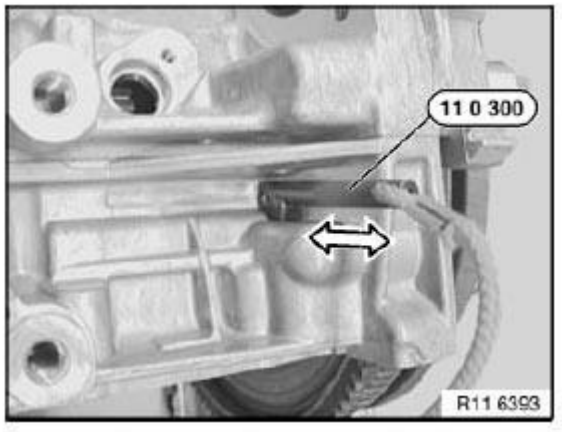

Fig. 262: Sliding Crankshaft In Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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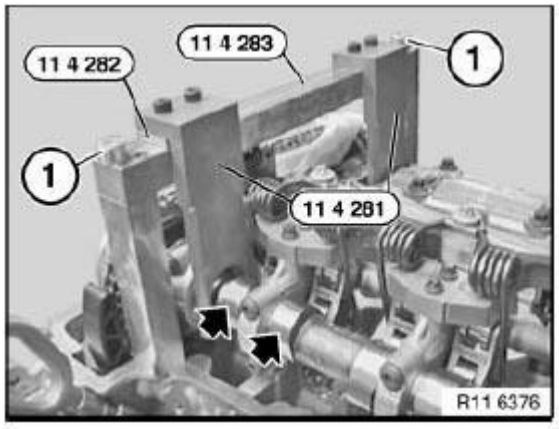

Fig. 263: Identifying Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not remove special tool 11 0 300 MANDREL to release central bolt (1).

Employ a **second** person for gripping when releasing central bolt (1).

Mount special tool **11 9 280 HOLDER** on hub for vibration damper.

Release central bolt (1).

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

Remove central bolt with hub towards front.

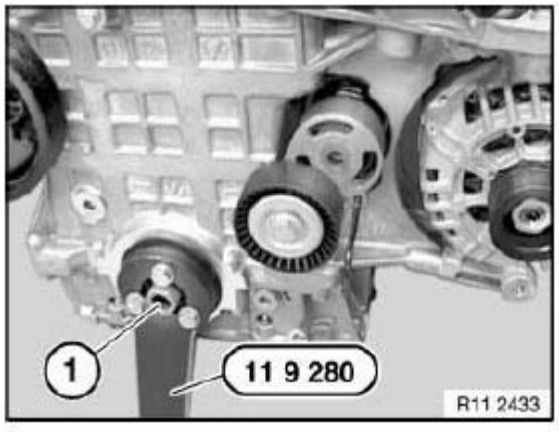

Fig. 264: Releasing Central Bolt Using Special Tool (11 9 280)
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

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

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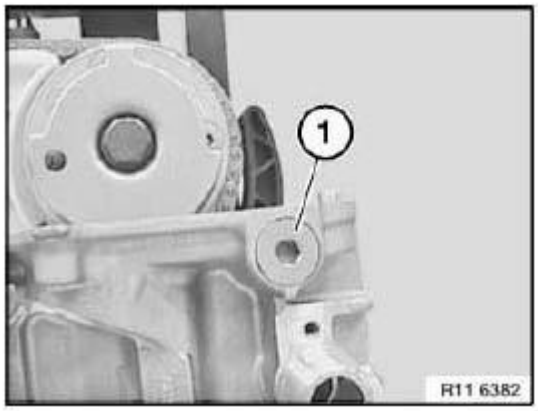

Fig. 265: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Open plug (1).

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

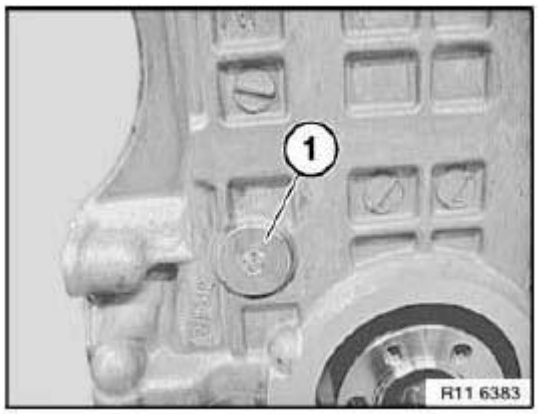

Fig. 266: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on chain drive at top.

Tightening torque: **11 31 2AZ** .

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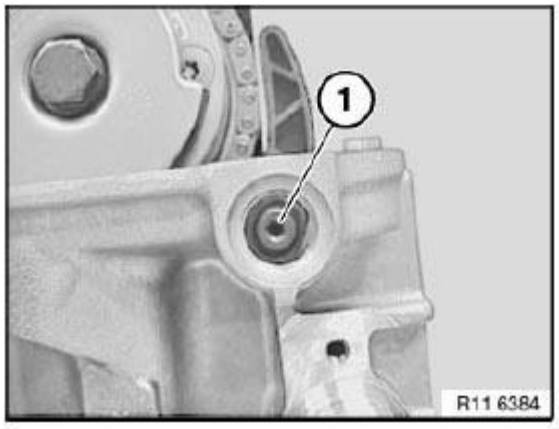

Fig. 267: Identifying Screw On Chain Drive (Top)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) on chain drive at bottom.

Tightening torque: **11 31 3AZ** .

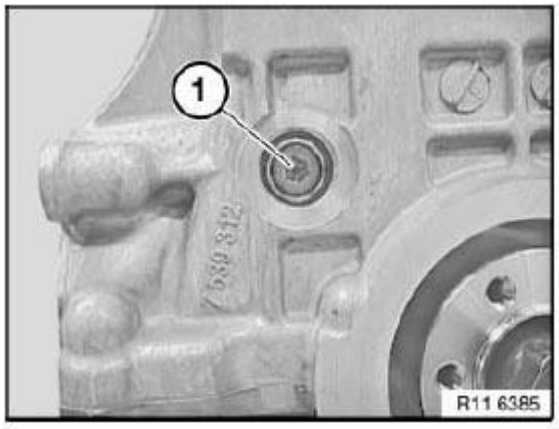

Fig. 268: Identifying Screw On Chain Drive (Bottom)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove both **ADJUSTING UNITS** .

Release screws (1).

Tightening torque: **11 31 2AZ** .

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

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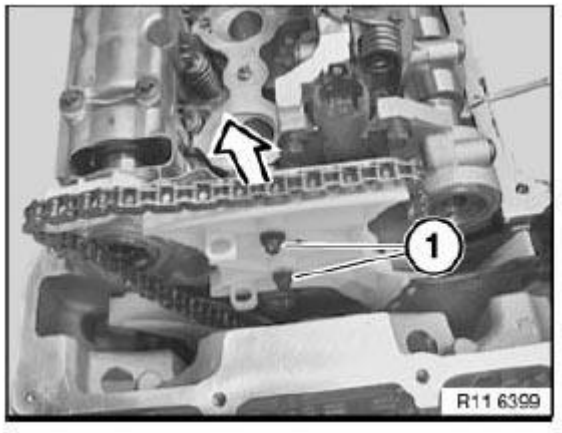

Fig. 269: Removing Timing Chain Module With Timing Chain And Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket wheel (2).
Collar (see arrow) on sprocket wheel (2) points to crankshaft.

Incorrect assembly will result in engine damage.

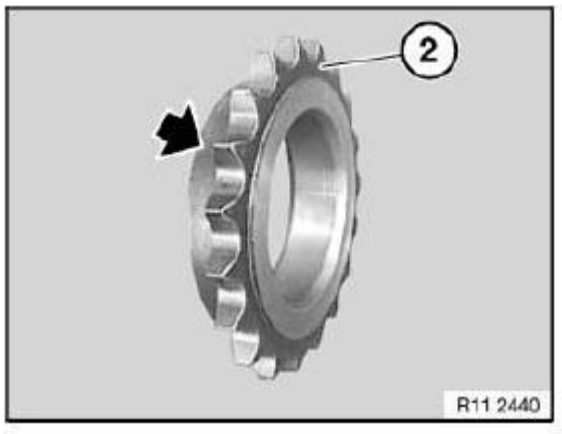

Fig. 270: Locating Collar On Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Installation:

Always keep timing chain tensioned; it is possible for timing chain (1) to jam on chain module (3).

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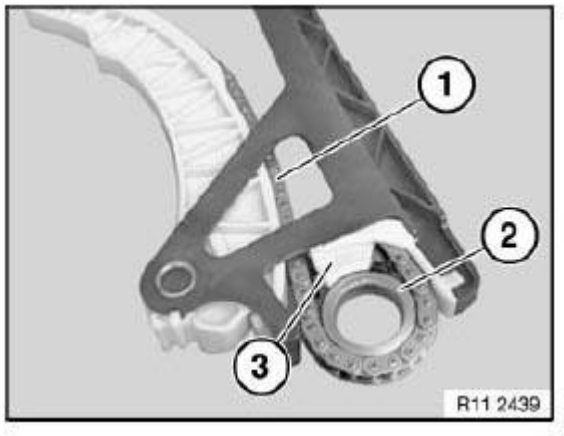

Fig. 271: Identifying Timing Chain, Chain Guide And Chain Module
Courtesy of BMW OF NORTH AMERICA, INC.

Install hub with central bolt.

Tighten down special tool **11 5 200 WASHER** with screws (1).

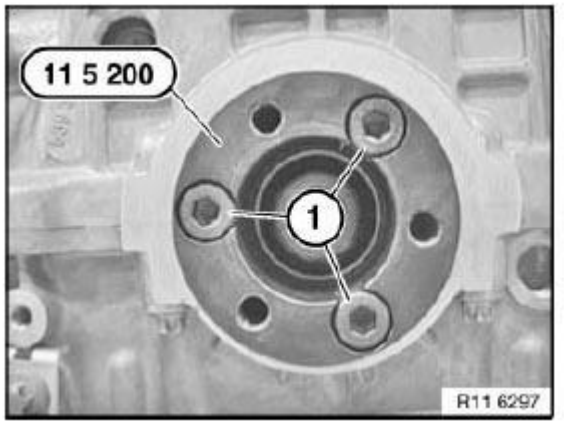

Fig. 272: Tightening Special Tool (11 5 200) With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **BELT TENSIONER** .

Screw in special tool **11 4 360 DEVICE** .

Mount special tool **11 9 280 HOLDER** on **11 5 200 WASHER** .

Support special tool **11 9 280 HOLDER** on special tool 11 4 362.

Special tool **11 0 300 MANDREL** secures crankshaft.

Tighten central bolt (1) to jointing torque.

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

Mark central bolt and hub with paint.

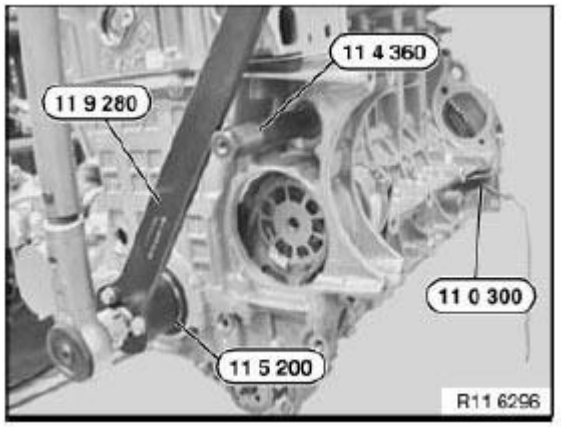

Fig. 273: Identifying Special Tools (11 9 280, 11 4 360, 11 5 200 And 11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

Apply stroke of paint (1) for torsion angle tightening to tool.

See **Fig. 274**.

IMPORTANT: Do not remove tool from central bolt during torsion angle tightening - risk of damage.

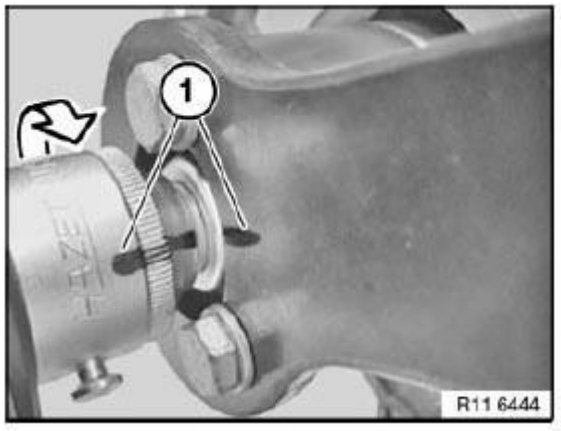

Fig. 274: Tightening Torsion Angle Of Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten central bolt with two persons.

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

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Install both **ADJUSTING UNITS** .

Install **CHAIN TENSIONER** .

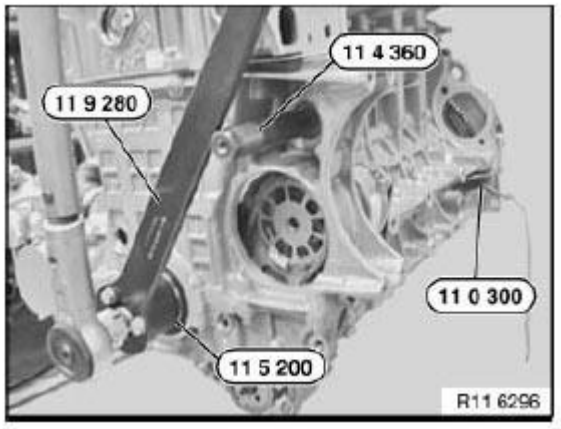

Fig. 275: Removing Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Crank engine twice.

Check **TIMING** .

Assemble engine.

ROCKER ARM WITH BEARING MOUNT

1133050 REMOVING AND INSTALLING/REPLACING ALL ROCKER ARMS (N51)

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER** .
- Remove **INTERMEDIATE LEVER** .
- Remove **EXHAUST CAMSHAFT** .

IMPORTANT: Rocker arms (1) are divided into bearing categories.
The tolerance classes are designated as illustrated with numbers from 1 to 5.
Already used rocker arms (1) may only be reused in the same position.

Detach roller cam followers (1) from HVCA element and remove.

Set all roller cam followers down in special tool **11 4 480 ODDMENTS TRAY** in a tidy and orderly fashion.

Installation:

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Before installing exhaust camshaft and intermediate lever, make sure roller cam followers are correctly seated.

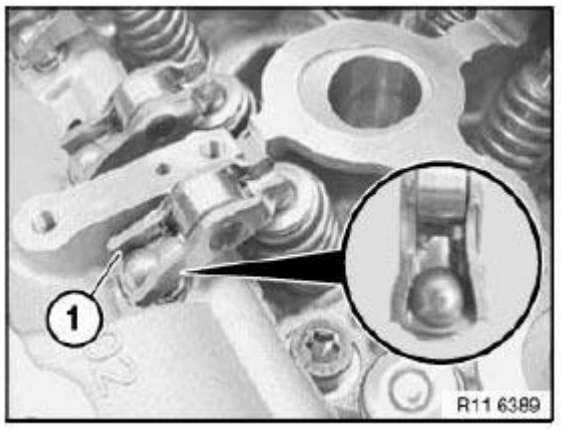

Fig. 276: Identifying Roller Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

Remove HVCA element in direction of arrow.

Installation:

If the HVC elements are to be reused, set them down in special tool **11 4 480 ODDMENTS TRAY** in a tidy and orderly fashion with the roller cam followers.

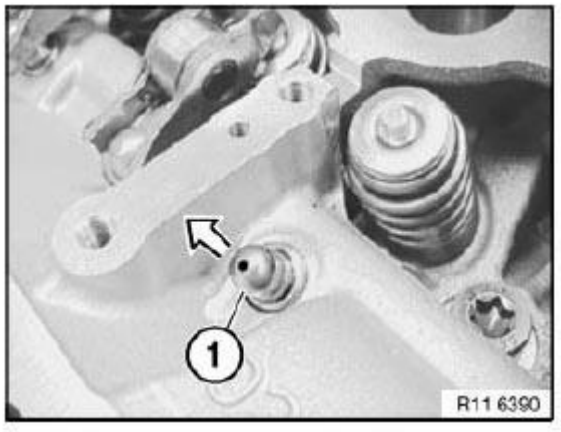

Fig. 277: Removing HVCA Element
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME; if necessary, readjust uniform mixture distribution.

VALVES WITH SPRINGS

1134552 REMOVING AND INSTALLING OR REPLACING ALL VALVES (N51)

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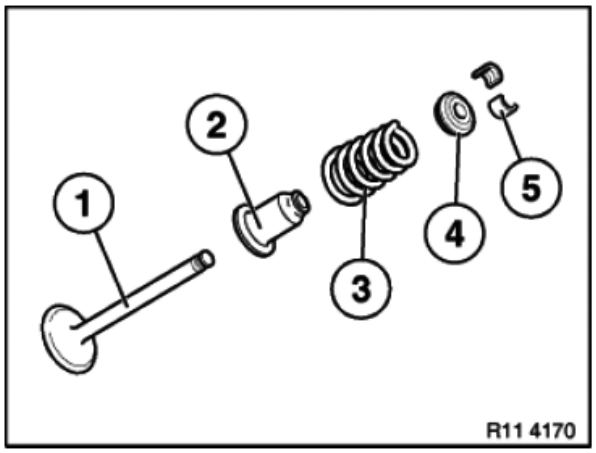
Necessary preliminary tasks:

- Remove **CYLINDER HEAD** .
- Remove **INTERMEDIATE LEVER** .
- Remove **ECCENTRIC SHAFT** .
- Remove **INLET CAMSHAFT** .
- Remove **EXHAUST CAMSHAFT** .
- Remove **ROLLER CAM FOLLOWER** .
- Remove **VALVE SPRINGS** .
- Remove **VALVE STEM SEALS** .

Arrangement:

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

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



1) Valve
2) Valve stem seal with spring plate, bottom
3) Valve spring
4) Top plate spring
5) Valve tapers

Fig. 278: Exploded View Of Valve Assembly
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME; if necessary, readjust uniform mixture distribution.

1134715 REPLACING ALL VALVE SPRINGS (N51)

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Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER** .
- Remove **CYLINDER HEAD** .
- Remove **EXHAUST CAMSHAFT** .
- Remove **INTERMEDIATE LEVER** .
- Remove **INLET CAMSHAFT** .
- Remove **ROLLER CAM FOLLOWER** .

Place cylinder head on special tool **11 9 000 DEVICE** .

Press down **inlet valves** with special tool 11 9 017.

Exhaust valves with special tool 11 0 346

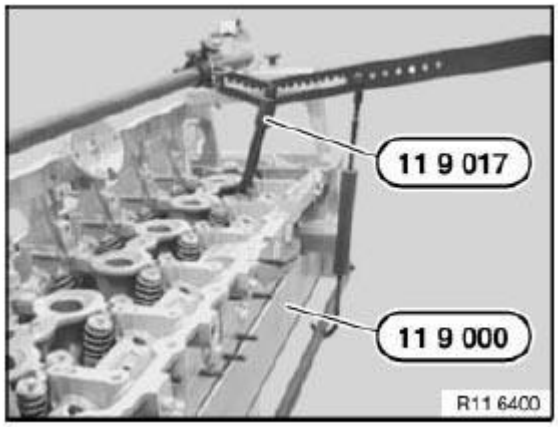

Fig. 279: Pressing Down Inlet Valves Using Special Tool (11 9 017)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove valve tapers with a magnet.

Remove valve spring and spring retainer.

Set down on special tool **11 4 480 ODDMENTS TRAY** in a tidy and orderly fashion.

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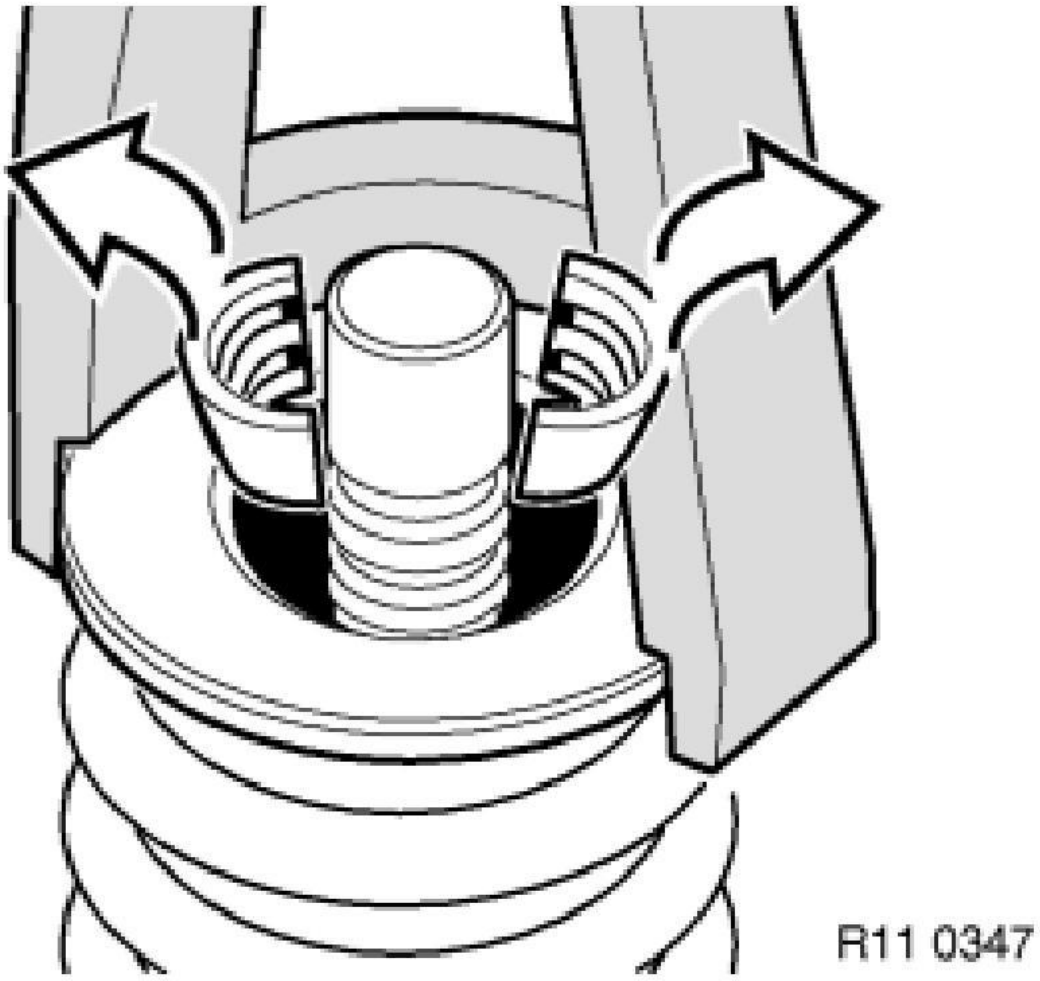

Fig. 280: Removing Valve Spring
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Incorrect installation possible.
Incorrect installation will result in valve spring breakage.
Risk of mixing up inlet and exhaust springs.

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

Only the diameter pointing to the spring retainer at the bottom is required for correct installation of the valve spring.

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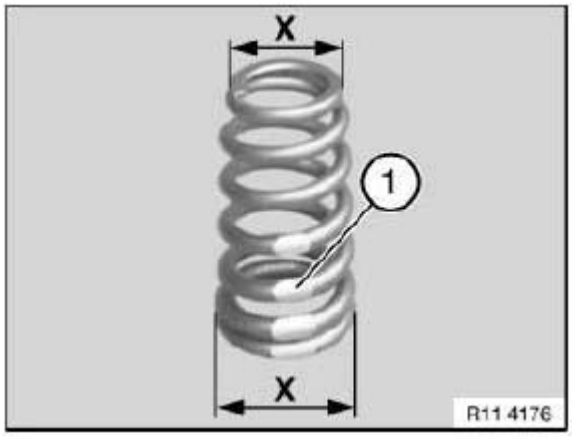
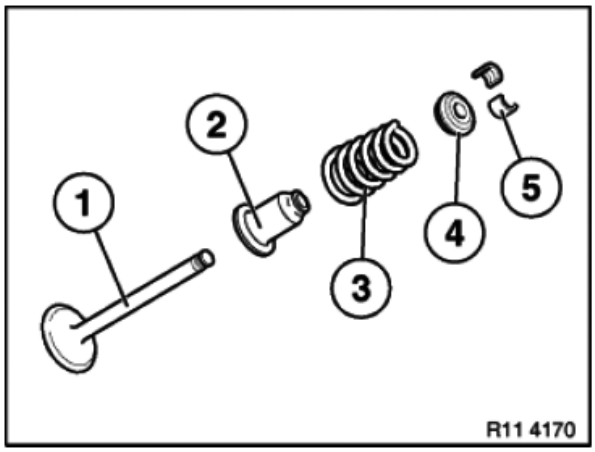


Fig. 281: Identifying Color Marking On Lower End Of Valve Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement:

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



1) Valve
2) Valve stem seal with spring plate, bottom
3) Valve spring
4) Top plate spring
5) Valve tapers

Fig. 282: Exploded View Of Valve Assembly
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME; if necessary, readjust uniform mixture distribution.

1134560 REPLACING ALL VALVE STEM SEALS (N51)

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Necessary preliminary tasks:

- Remove **CYLINDER HEAD** .
- Remove **INTERMEDIATE LEVER** .
- Remove **ECCENTRIC SHAFT** .
- Remove **INLET CAMSHAFT** .
- Remove **EXHAUST CAMSHAFT** .
- Remove **ROLLER CAM FOLLOWER** .

Firmly press special tool 11 1 480 onto old valve stem seals.

Detach valve stem seal from valve stem by turning and simultaneously pulling special tool 11 1 480.

Installation:

Insert all **VALVES** .

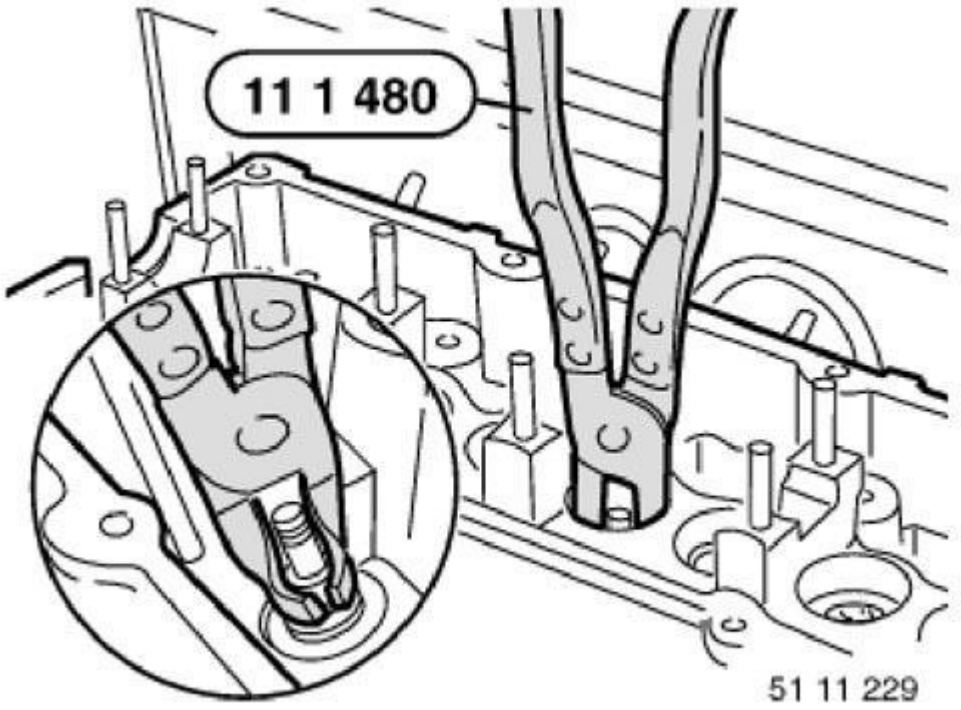

Fig. 283: Inserting Valves
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For use on the N51 engine, special tool 11 6 380 BUSH must be remachined according to the sketch with a 10mm dia. drill bit to a depth of B = approx. 23

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mm.
This modification has already been taken into account for reordering.

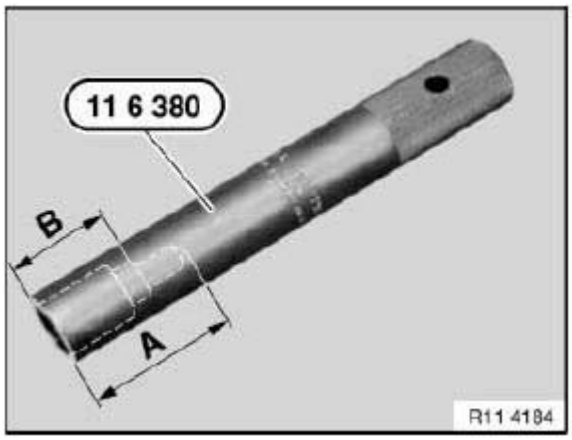

Fig. 284: Identifying Special Tool (11 6 380) With 10mm Dia.
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Different diameters at valve stem.

Valve dia. 5 mm: valve stem seal is red or brown.

Valve dia. 6 mm: valve stem seal is green or light green.

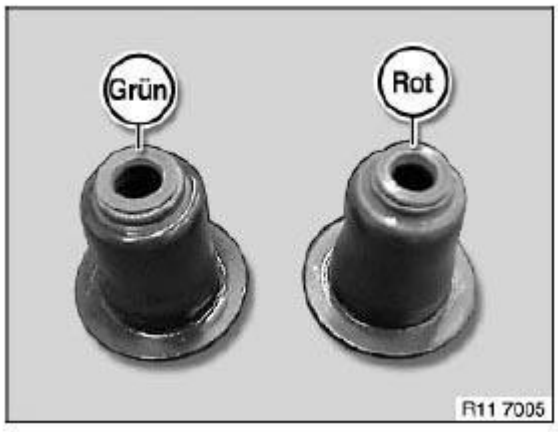

Fig. 285: Identifying Valve Stem Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

Lubricate mounting sleeve.

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Press on valve stem seal by hand with special tool **11 6 380 BUSH** as far as it will go.

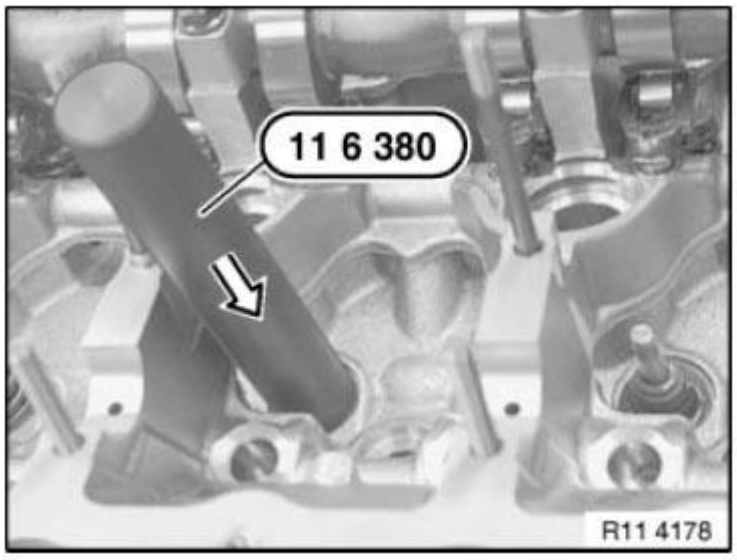

Fig. 286: Pressing Valve Stem Using Special Tool (11 6 380)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

VARIABLE CAMSHAFT TIMING

1136046 REMOVING AND INSTALLING/REPLACING INLET AND EXHAUST ADJUSTMENT UNITS (N51)

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER** .
- Check **TIMING** .

IMPORTANT: To release central bolts on adjustment units and camshafts.
Fit special tool 11 4 280 GAUGE .
Fit special tool 11 4 283 with screws (1).
Fit special tool 11 4 281 on special tool 11 4 283.

IMPORTANT: Special tool 11 4 282 must be fitted underneath on inlet camshaft.

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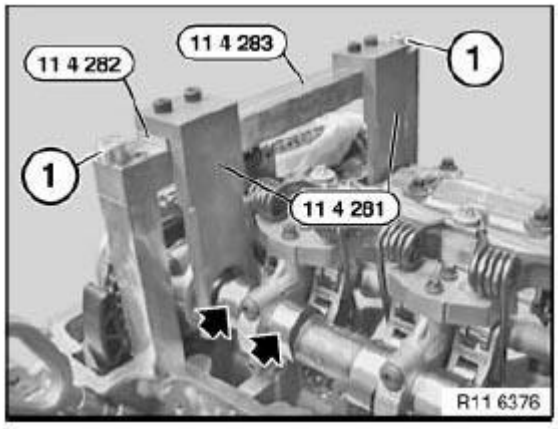

Fig. 287: Identifying Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Release chain tensioner (2).

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

Release central bolt on inlet/exhaust adjustment units (1).

Tightening torque: **11 36 1AZ** .

NOTE: Illustrations in CAD and do not show special tools.

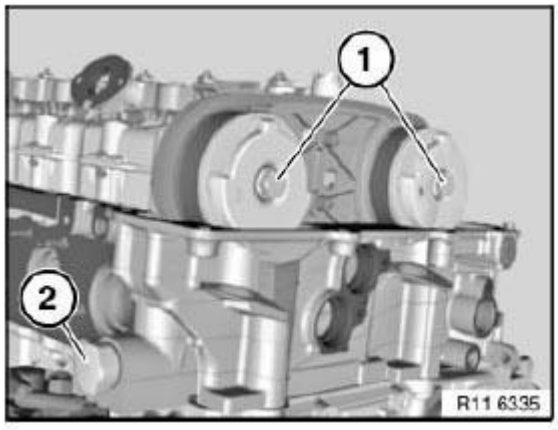

Fig. 288: Identifying Central Bolt And Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Detach exhaust adjustment unit (1) from exhaust camshaft.

Detach inlet adjustment unit (2) from inlet camshaft.

Installation:

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To facilitate removal and installation of adjustment units, turn sensor gears at cutout downwards.

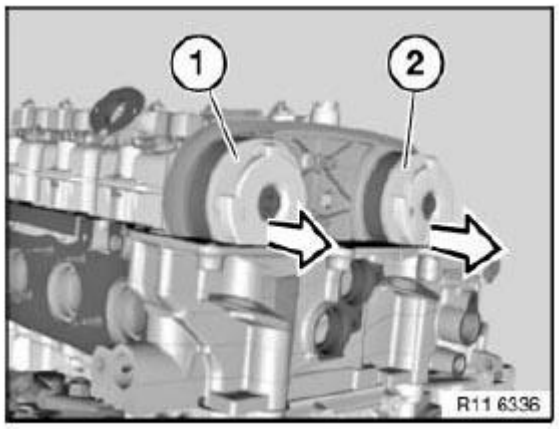

Fig. 289: Detaching Inlet And Exhaust Adjustment Units
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT:

- **Danger of mixing up adjustment units .**
- **Mixing up the adjustment units will result in engine damage.**

The inlet and exhaust adjustment units are different.

VANOS is marked with AUS and EX for the exhaust camshaft.

VANOS is marked with EIN and IN for the inlet camshaft.

Sensor gears can be fitted alternatively.

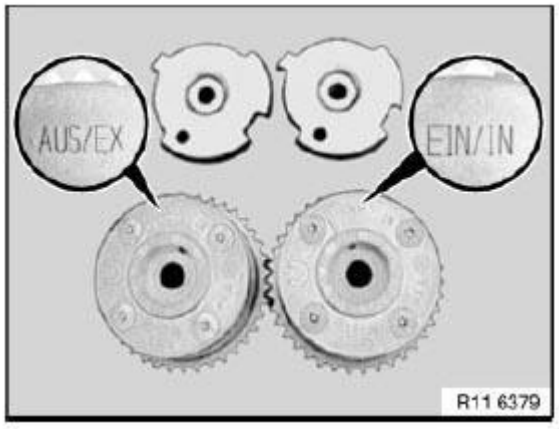

Fig. 290: Identifying AUS And EX Marks For Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Fit both adjustment units on camshafts.

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The installation position of the adjustment units can be freely selected.

Insert screws (1).

Tightening torque: **11 36 1AZ** .

IMPORTANT: To secure central bolts on adjustment units and camshafts. Fit special tool 11 4 280 GAUGE .

NOTE: Illustrations in CAD and do not show special tools.

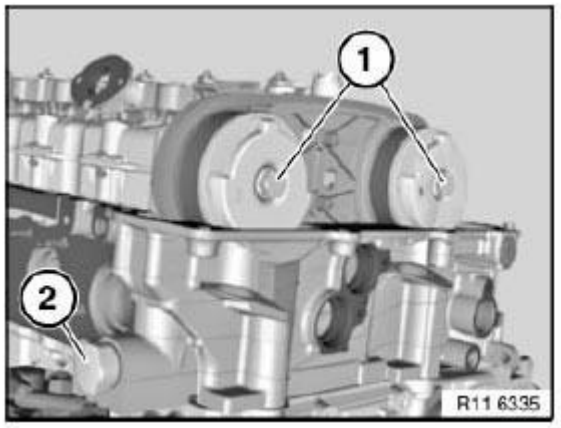

Fig. 291: Identifying Central Bolt And Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Incorrect installation possible.

Press clamping rail (1) by hand against timing chain and make sure timing chain is guided in clamping rail (1).

NOTE: Schematic representation on removed chain drive.

Adjust **VALVE TIMING** .

Fit **CHAIN TENSIONER** .

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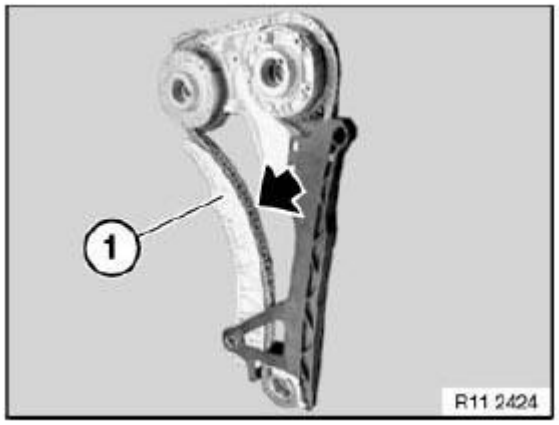

Fig. 292: Locating Chain Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

VARIABLE VALVE GEAR

1137005 REMOVING AND INSTALLING/REPLACING ECCENTRIC SHAFT (N51)

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER** .
- Remove **INTERMEDIATE LEVER** .

If necessary, move eccentric shaft (1) on twin surface to minimum lift (2).

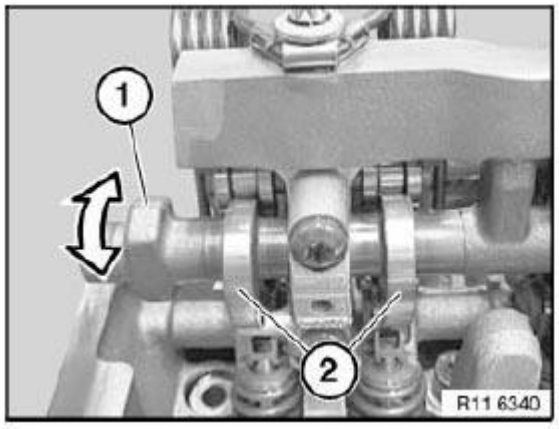

Fig. 293: Turning Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws on bearing cap number (1).

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Release screws on all bearing caps (2).

All bearing caps are identified with numbers; set caps down in special tool 11 4 481 in a tidy and orderly fashion.

Remove intermediate shaft with a light tilting and rotating motion.

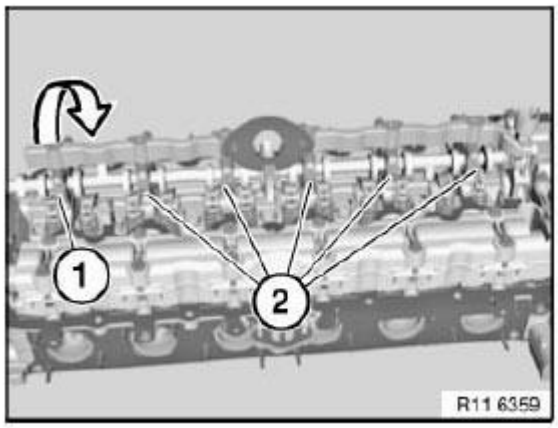

Fig. 294: Releasing Screws On Bearing Cap Number
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw and remove magnet wheel (1).

IMPORTANT: Screw is not magnetic and is secured against falling out.

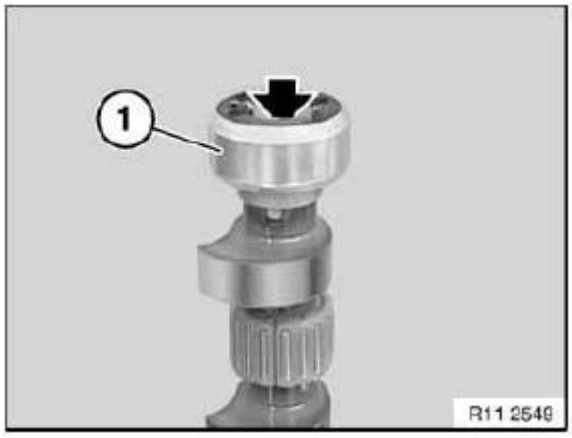

Fig. 295: Locating Magnet Wheel Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Magnet wheel (1) is extremely magnetic.
After removing, protect magnet wheel (1) against metal chips by placing it in a plastic bag (2) with a seal.

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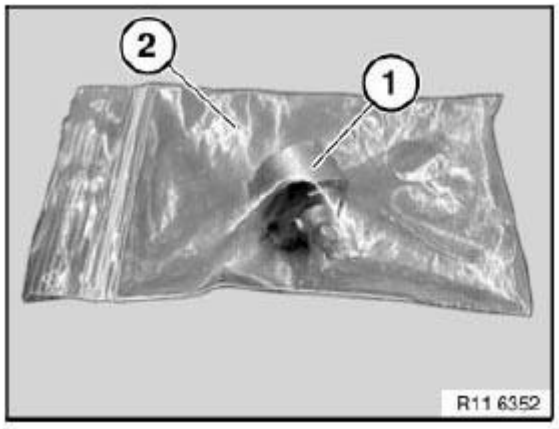

Fig. 296: Identifying Magnet Wheel In Plastic Bag
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully press needle bearing (1) apart at split position only to such an extent that it can be removed from eccentric shaft.

IMPORTANT: Needle bearing (1) can break very easily.

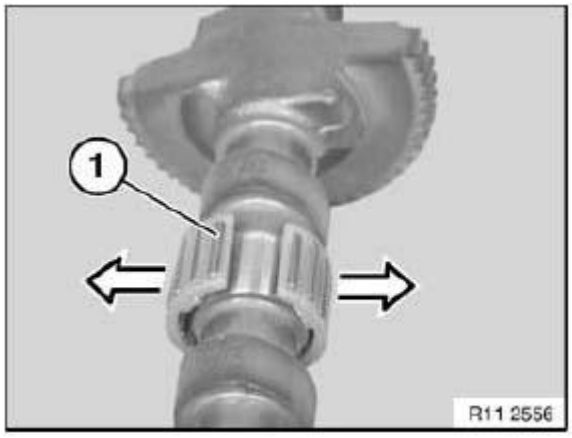

Fig. 297: Removing Needle Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Install bearing shells (1) in such a way that ends of bearing shells (1) face each other as shown in illustration.

NOTE: Always replace bearing shells and needle bearings together.

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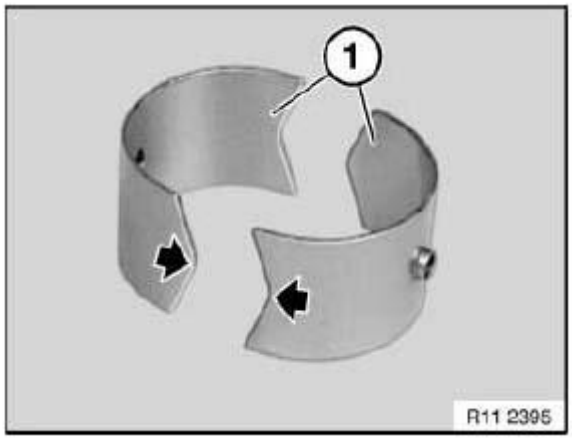

Fig. 298: Locating Bearing Shells Ends
Courtesy of BMW OF NORTH AMERICA, INC.

Install bearing shell (1) with tip facing down (see arrow) in cylinder head.

Install bearing shell (2) with tip facing up in bearing cap.

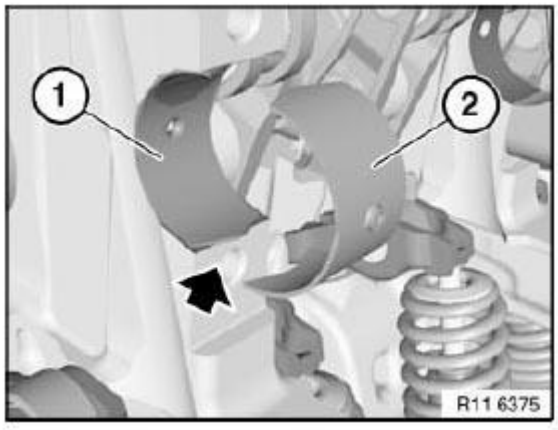

Fig. 299: Locating Bearing Shell Tip
Courtesy of BMW OF NORTH AMERICA, INC.

Install eccentric shaft and set to minimum lift.

Bearing cap number 6 (1) is provided with a stop.

All bearing caps (2) are identified with numbers from 1 to 5.

Tightening torque: **11 37 7AZ** .

Installation:

Spline teeth of eccentric shaft must be greased with **LONGTIME PD 1 (2.4)** .

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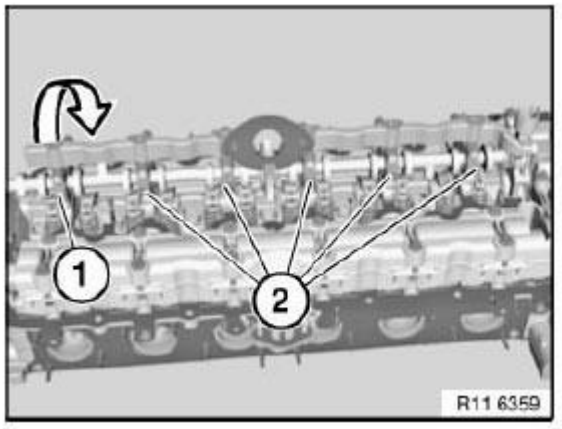

Fig. 300: Installing Bearing Cap On Bearing Cap Number
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1137030 REMOVING AND INSTALLING/REPLACING ECCENTRIC SHAFT SENSOR (N51)

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER** .

IMPORTANT: All bolts are secured against falling out, release bolts (2) on cylinder head only but do not unscrew fully.
Bolts (2) can fall out.
Risk of damage to timing chain drive.

Unfasten screws (2).

Lift out sensor (1).

NOTE: Illustrations show timing chain removed.

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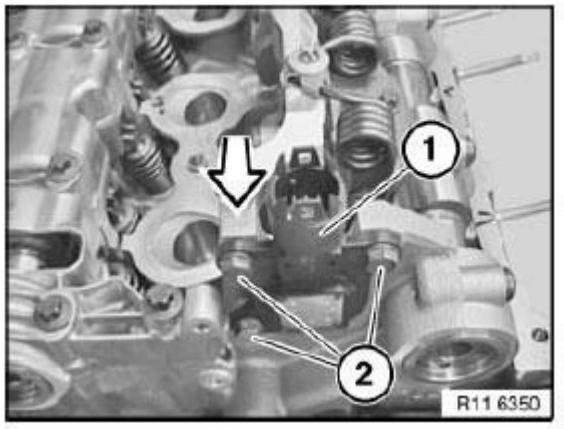

Fig. 301: Removing Timing Chain
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

1137010 REMOVING AND INSTALLING/REPLACING INTERMEDIATE LEVER (N51)

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

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER** .

If necessary, set eccentric shaft (1) on twin surface to minimum lift (2).

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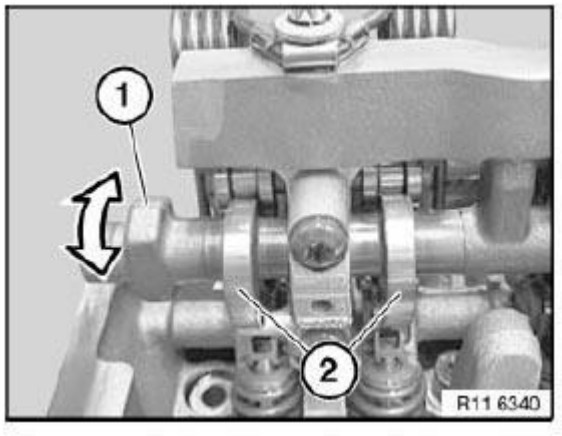

Fig. 302: Turning Eccentric Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool **11 4 270 DEVICE** with gripping pliers (3) to guide block (2).

IMPORTANT: Special tool 11 4 270 DEVICE is only secured to guide block. Adjusting the gripping pliers (3) is not permitted (risk of damage) on special tool 11 4 270 DEVICE .

NOTE: The oil nozzle must be removed beforehand from cylinder no. 3.

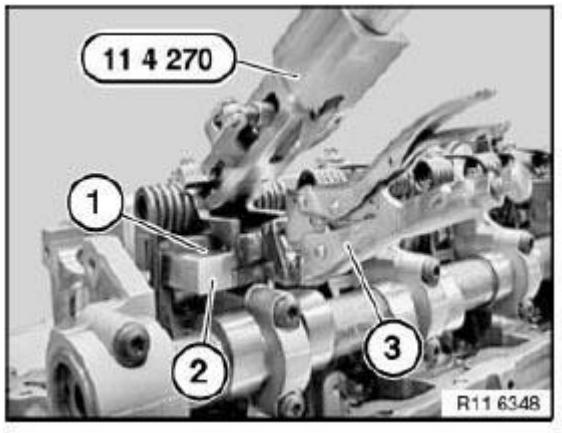

Fig. 303: Identifying Gripping Pliers, Guide Block And Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.

IMPORTANT: Incorrect handling - risk of damage!

Secure both bearing pins (2) in return spring with knurled screw (1) on special tool **11 4 270 DEVICE** .

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Press special tool **11 4 270 DEVICE** in direction of arrow as far as it will go.

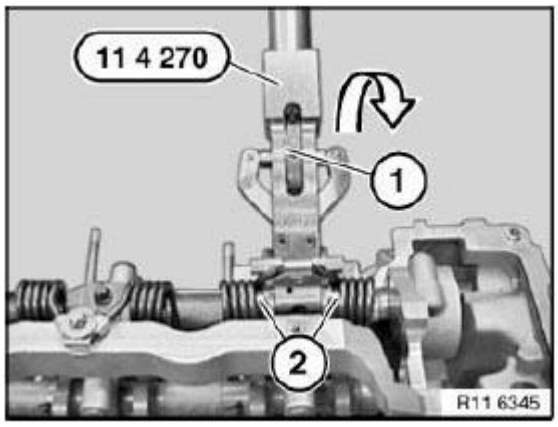

Fig. 304: Pressing Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

Release steel screw (2).

To avoid jamming with screw (2) and return spring, it is necessary when releasing screw (2) to relieve the pretension on special tool **11 4 270 DEVICE** uniformly.

IMPORTANT: Risk of damage to cylinder head thread.

Tightening torque: **11 37 2AZ** .

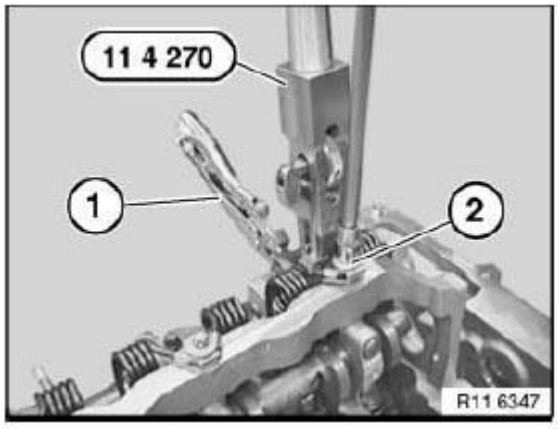

Fig. 305: Releasing Steel Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on return spring (1) with special tool **11 4 270 DEVICE** .

NOTE: Metal lug (2) cannot be disassembled and must not be removed.

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Installation:

Replace metal lug if tab washer is defective.

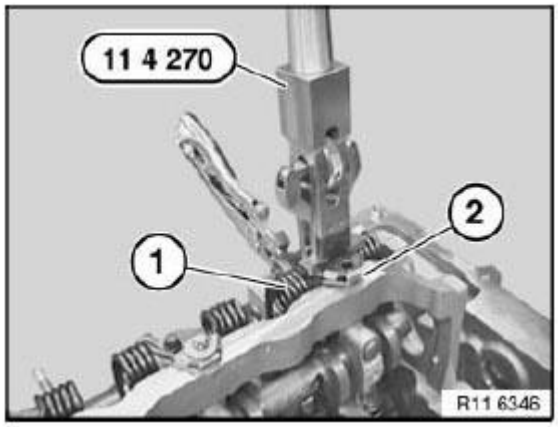

Fig. 306: Removing Metal Lugs
Courtesy of BMW OF NORTH AMERICA, INC.

Press return spring apart at position (1) and remove towards top.

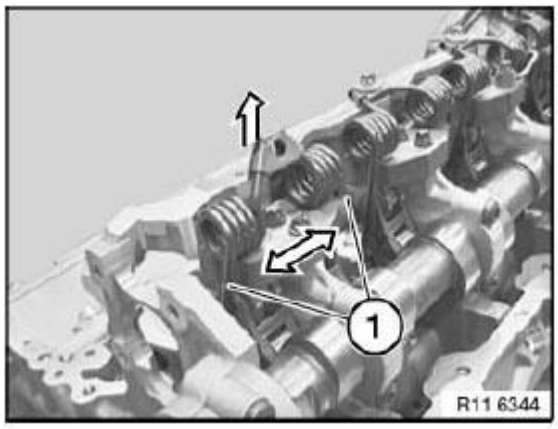

Fig. 307: Pressing Torsion Spring
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Uniform distribution must not be changed.
All components must be set down in a clean and orderly fashion.

All components must be reinstalled in the same positions in an engine which has already been in use.

1. Eccentric shaft with bearing
2. Bearing caps of eccentric shaft set out in order.
3. Inlet camshaft
4. Bearing caps of inlet camshaft set out in order.

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5. Intake valves with valve springs
6. Valve plates and valve cotters
7. Roller cam followers with HVC element set out in order.

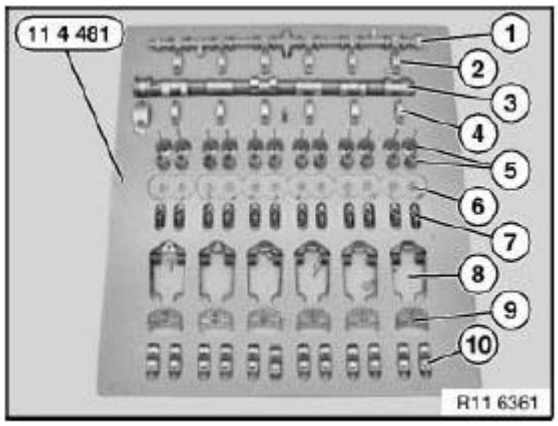

Fig. 308: Identifying Components And Special Tool (11 4 481)
Courtesy of BMW OF NORTH AMERICA, INC.

8. Return springs.
9. Guide blocks set out in order.
10. Intermediate levers set out in order.

Release screws (1).

Tightening torque: **11 37 1AZ** .

Set down guide blocks (2) in special tool 11 4 481 in neat order.

Installation:

Mixing up the guide blocks may cause the engine to demonstrate idle fluctuations.

This will result in maladjustment of **uniform distribution** .

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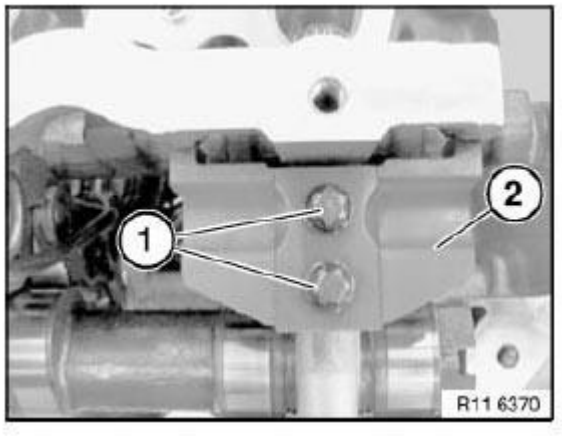

Fig. 309: Identifying Screws And Guide Block
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Contact surfaces (1) must be clean and oil-free.

Clean if necessary.

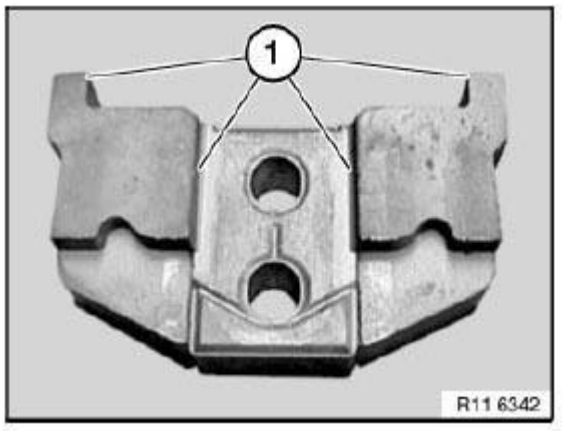

Fig. 310: Identifying Contact Surface
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out intermediate levers (2).

Intermediate levers (2) set out in special tool 11 4 481 in order.

Installation:

Mixing up the intermediate levers may cause the engine to demonstrate RPM fluctuations.

Installation:

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Contact surfaces (1) must be clean and oil-free.

Clean if necessary.

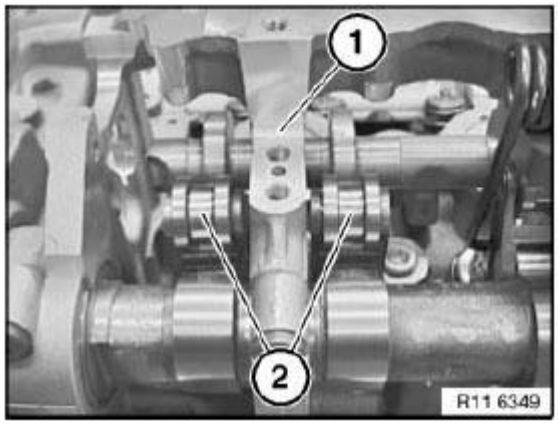

Fig. 311: Identifying Contact Surface And Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

All intermediate levers (1) are classified.

Reinstall intermediate levers which have already been used in the same positions.

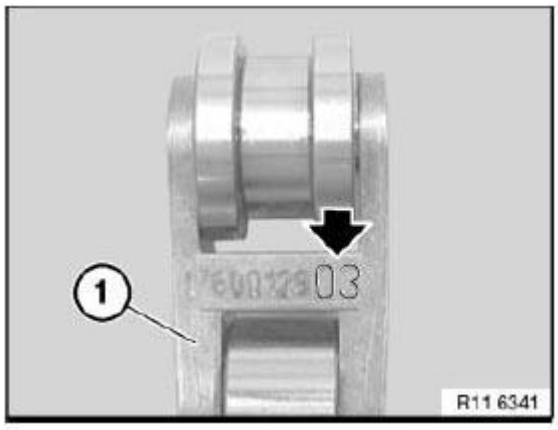

Fig. 312: Locating Marking On Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Before reinstalling the intermediate levers, make sure the roller cam followers are correctly positioned **(risk of damage).**

Install intermediate levers (2).

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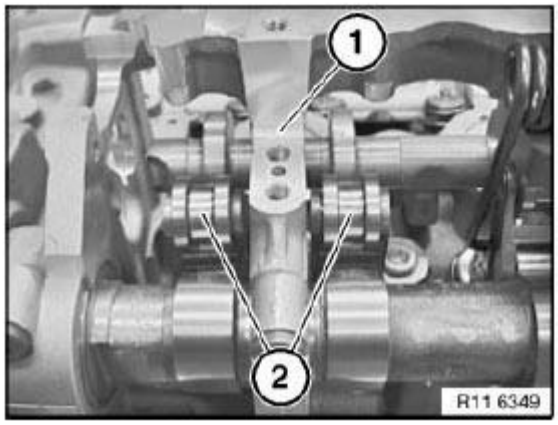

Fig. 313: Identifying Contact Surfaces And Intermediate Levers
Courtesy of BMW OF NORTH AMERICA, INC.

Fit guide block (2) cleanly into opening.

Tighten screws (1) hand-tight.

Check both intermediate levers again to ensure correct installation position.

Release bolts (1) again by a 1/4 turn.

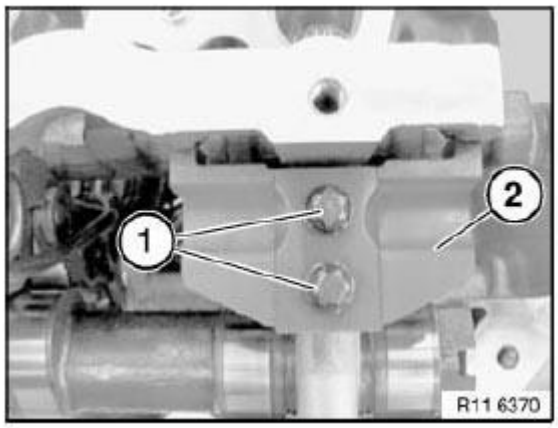

Fig. 314: Identifying Guide Block With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool **11 4 450 DEVICE** to bolt connection (1) of eccentric shaft.

Turn eccentric lever (3) on special tool **11 4 450 DEVICE** in direction of arrow.

Guide block is now tensioned.

Secure screws (2).

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Tightening torque: **11 37 1AZ** .

Installation:

At cylinder no. 3, the guide block can be preinstalled with one bolt (2) only.

Fit oil pump only after retaining spring has been fitted.

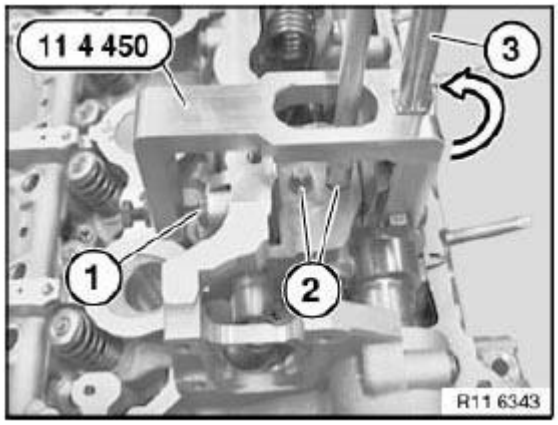

Fig. 315: Turning Eccentric Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Fit return spring on guide block.

Installation:

Insert return spring (2) in intermediate lever (1) (see arrow).

Check roller cam follow (3) again to ensure correct installation position.

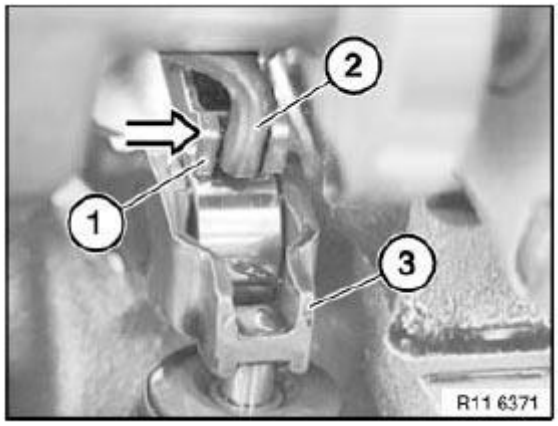

Fig. 316: Inserting Torsion Spring In Intermediate Lever
Courtesy of BMW OF NORTH AMERICA, INC.

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Secure special tool **11 4 270 DEVICE** with gripping pliers (3) to guide block (1).

IMPORTANT: Special tool 11 4 270 DEVICE is only secured to guide block. Adjusting the gripping pliers (3) is not permitted (risk of damage) on special tool 11 4 270 DEVICE .

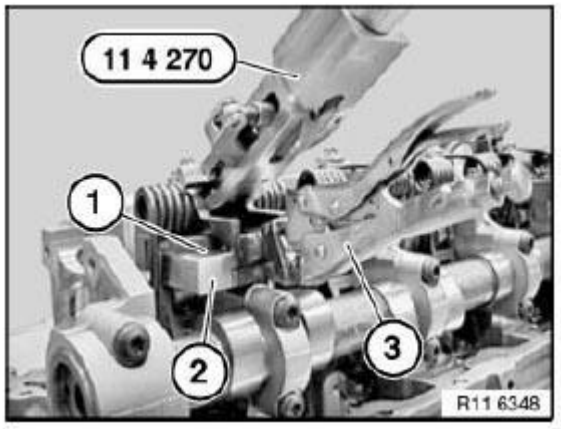

Fig. 317: Identifying Gripping Pliers, Guide Block And Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury in event of incorrect use.

IMPORTANT: Incorrect handling risk of damage.

Secure both bearing pins (2) in return spring with knurled screw (1) on special tool **11 4 270 DEVICE** .

IMPORTANT: Check return spring again on intermediate lever to ensure correct installation position.

Press special tool **11 4 270 DEVICE** in direction of arrow as far as it will go.

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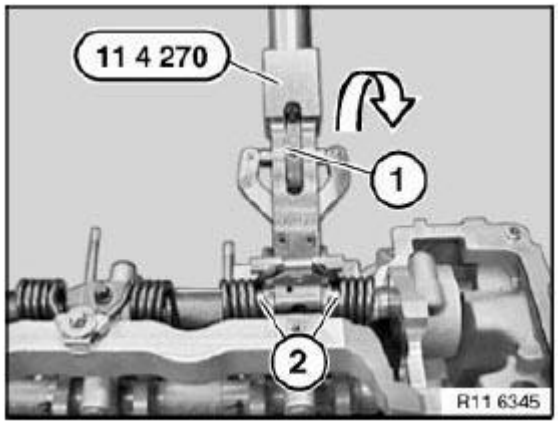

Fig. 318: Pressing Special Tool (11 4 270)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert steel screw (2).

To avoid jamming with screw (2) and return spring, it is necessary when inserting screw (2) to increase the pretension on special tool **11 4 270 DEVICE** uniformly.

IMPORTANT: Risk of damage to cylinder head thread.

Tightening torque: **11 37 2AZ** .

Remove special tool **11 4 270 DEVICE** .

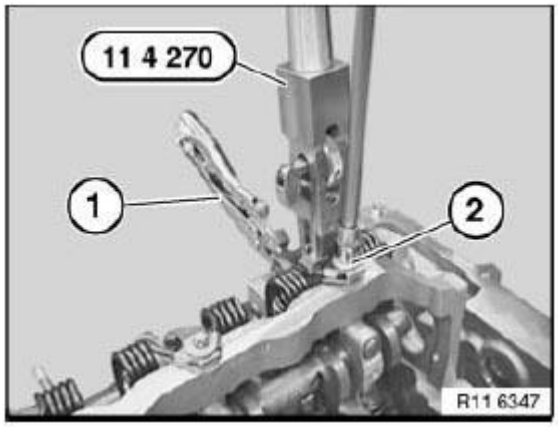

Fig. 319: Inserting Steel Screw
Courtesy of BMW OF NORTH AMERICA, INC.

At cylinder no. 3, adjust oil nozzle (2) so that oil spray (3) points precisely towards spline teeth.

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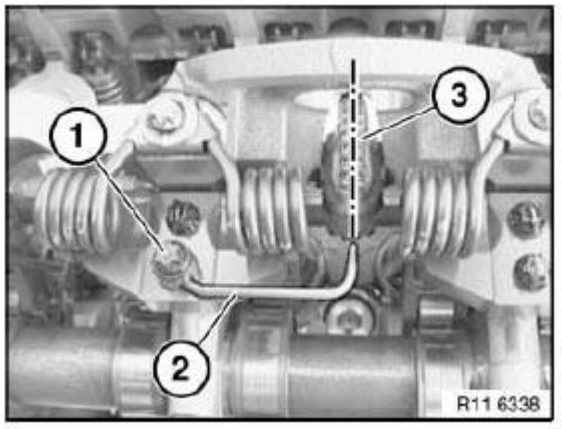

Fig. 320: Identifying Oil Spray Nozzle With Spray
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1137020 REMOVING AND INSTALLING/REPLACING POSITIONING MOTOR FOR ECCENTRIC SHAFT (N51)

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

Necessary preliminary tasks:

- Remove acoustic cover.
- Unfasten ignition wiring harness and lay to one side.
- Remove the two rod-type ignition coils next to electric motor.

IMPORTANT: The screw connection must not be released before the servodrive is in the service position.
Risk of damage to intermediate shaft.

Turn ratchet (1) with Allen key (2) clockwise in direction of arrow and relieve tension on intermediate shaft.

NOTE: Do not turn shaft (2) too far.

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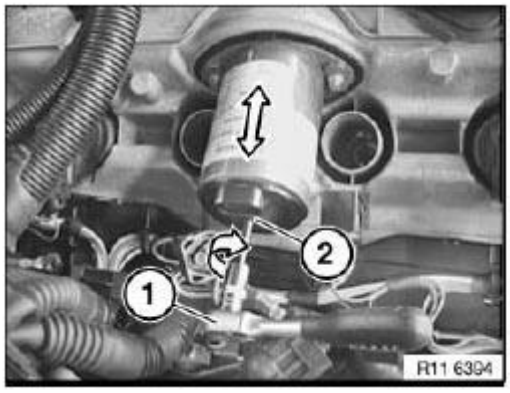

Fig. 321: Turning Ratchet With Allen Key
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (3).

Tightening torque: **11 12 8AZ** .

NOTE: Screw (4) is under servodrive.

Release screw (4).

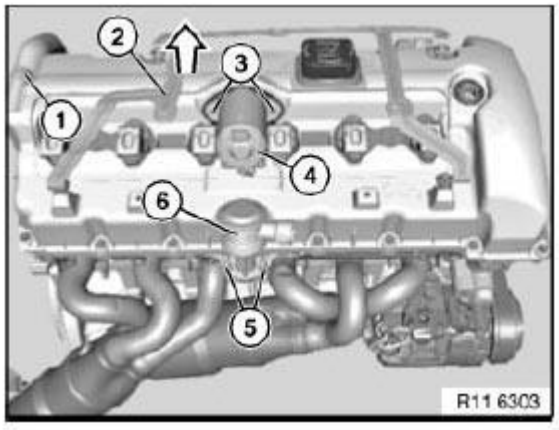

Fig. 322: Pulling Off Metal Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Turn servodrive with screw (2) counterclockwise in direction of arrow.

Servodrive can now be withdrawn in direction of arrow.

Installation:

All removed subassemblies are reinstalled in reverse sequence.

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Screw in shaft (2) in counterclockwise direction until servodrive rests on flange of cylinder head cover.

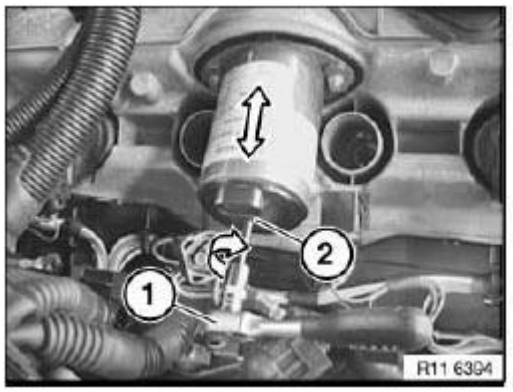

Fig. 323: Turning Ratchet With Allen Key
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

OIL SUPPLY

1140000 CHECKING ENGINE OIL PRESSURE (N51)

Necessary preliminary tasks:

- Remove acoustic cover.

Disconnect plug connection on oil pressure switch (1)

Remove oil pressure switch (2).

Tightening torque, 12 61 1AZ. See **12 61 ENGINE OIL PRESSURE, ENGINE OIL TEMPERATURE, OIL CONDITION DISPLAY** .

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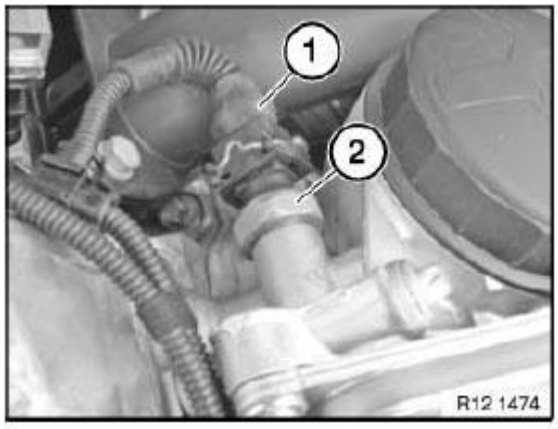

Fig. 324: Identifying Plug Connection On Oil Pressure Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

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

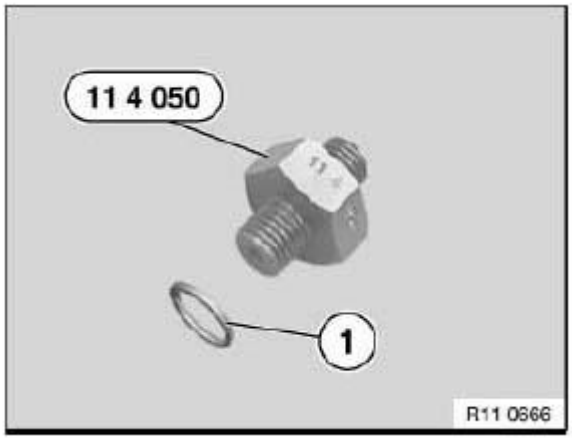

Fig. 325: Identifying Special Tool (11 4 050) And Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Check engine oil pressure with diagnosis tester

Connect special tools 13 6 054 and 13 6 051.

Check engine oil pressure with pressure gauge

Connect special tools 13 3 063 and 13 3 061.

Start engine and check engine oil pressure.

OIL PUMP WITH STRAINER AND DRIVE N51/B30 .

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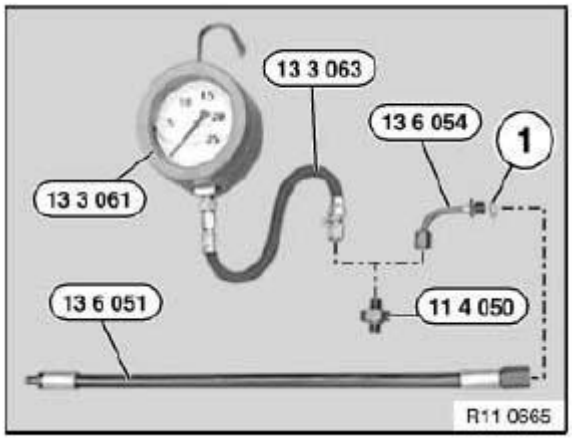

Fig. 326: Checking Engine Oil Pressure Using Pressure Gauge
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

OIL PUMP WITH FILTER AND DRIVE

1141000 REMOVING AND INSTALLING OIL PUMP (N51)

Necessary preliminary tasks:

- Removing **OIL PAN** .

Release screws (1).

Tightening torque: **11 41 1AZ** .

Installation:

Replace aluminum screws.

Remove intake pipe (2) in direction of arrow.

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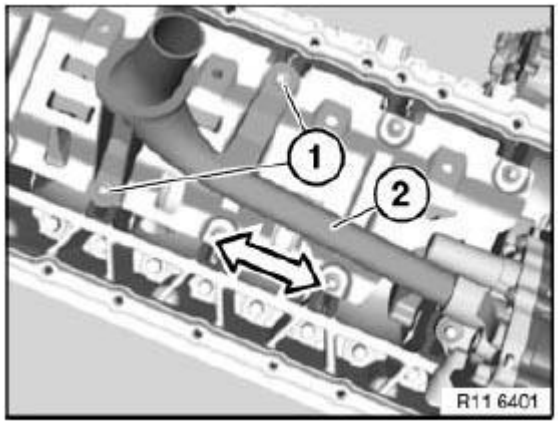

Fig. 327: Removing Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: To release bolt (1), insert a 6 mm drill bit between sprocket wheel and oil pump housing.

Release screw (1).

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

Unfasten screws (2).

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

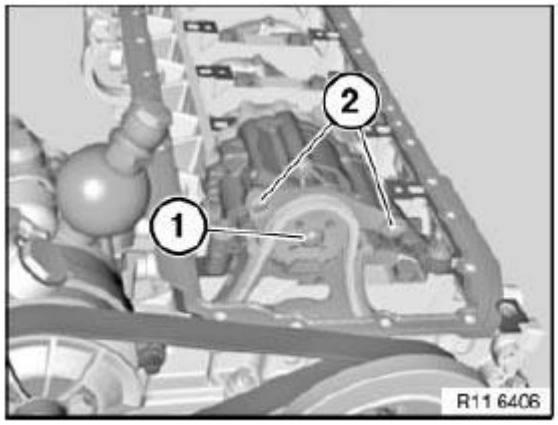

Fig. 328: Identifying Oil Pump Bolt And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: **11 41 2AZ** .

Installation:

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Replace aluminum screws.

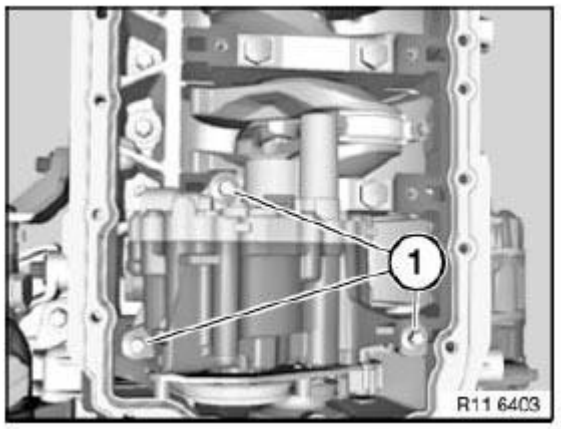

Fig. 329: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach sprocket wheel (1) in direction of arrow.

NOTE: Timing chain (3) of triangular drive is pressed upwards by chain tensioner.

Do **not** remove sprocket wheel.

Remove oil pump (2) in direction of arrow.

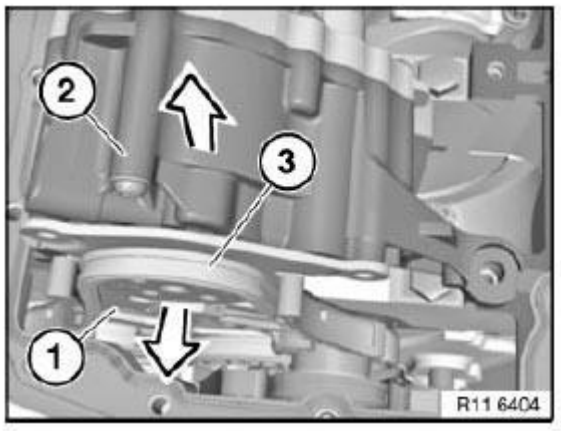

Fig. 330: Detaching Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

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Install oil pump (2).

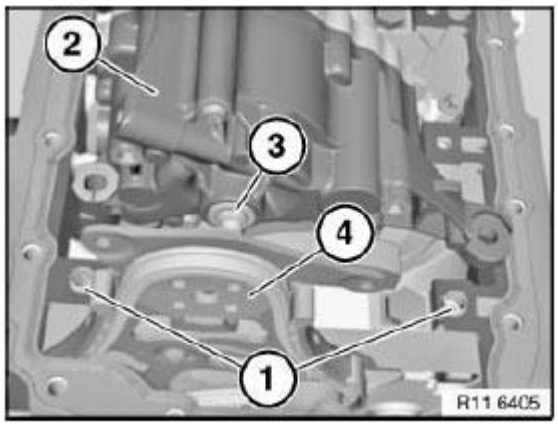

Fig. 331: Identifying Spacer Bushings And Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

1166000 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.

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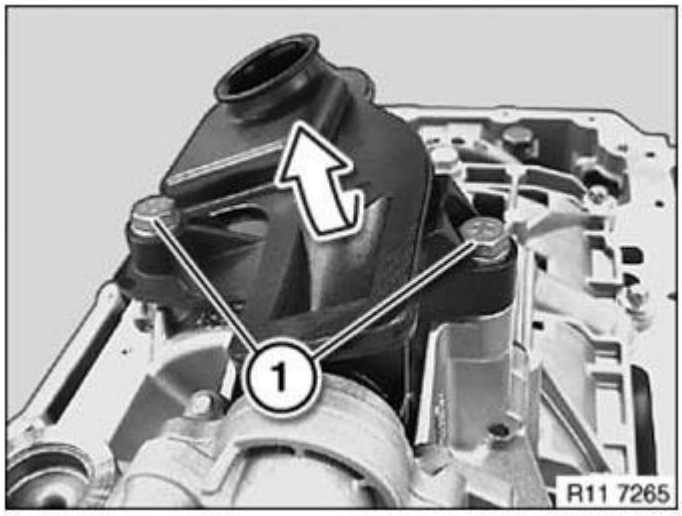

Fig. 332: Removing Intake Snorkel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

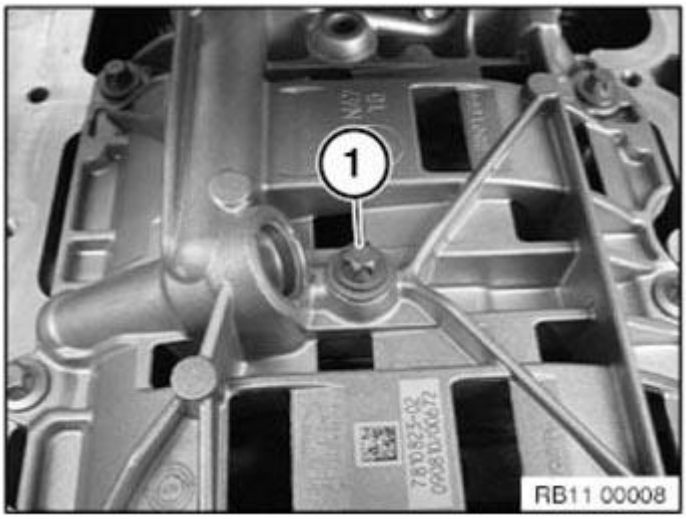

Fig. 333: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Installation note:

Clean and blow out thread

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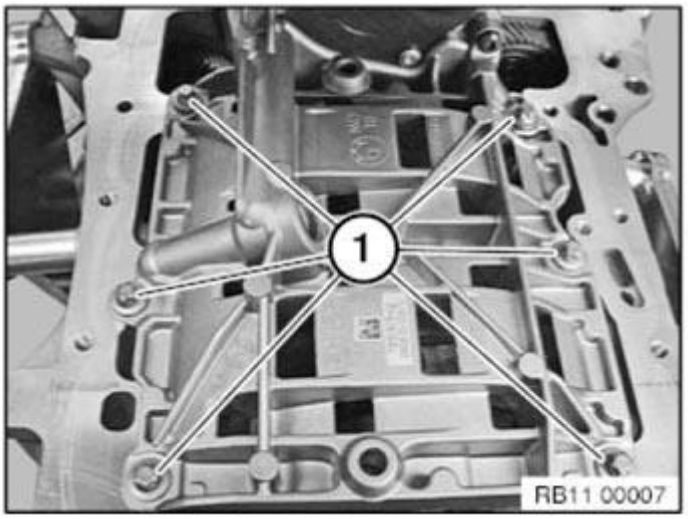

Fig. 334: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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.

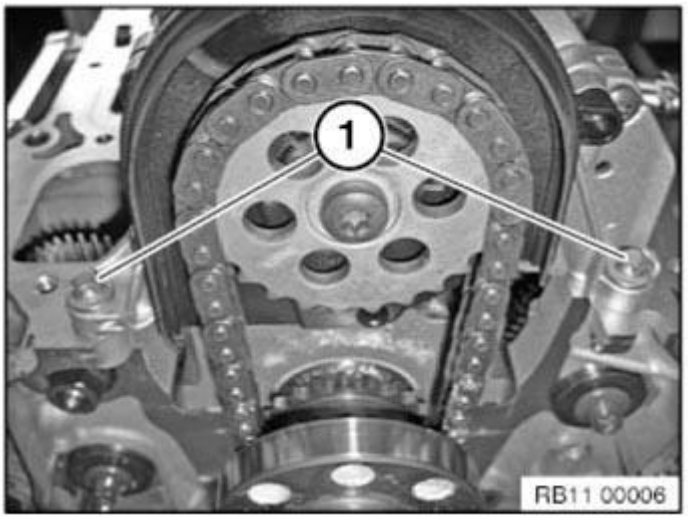

Fig. 335: Identifying Gear Case Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Oil vacuum pump must be fed out at chain drive (1).

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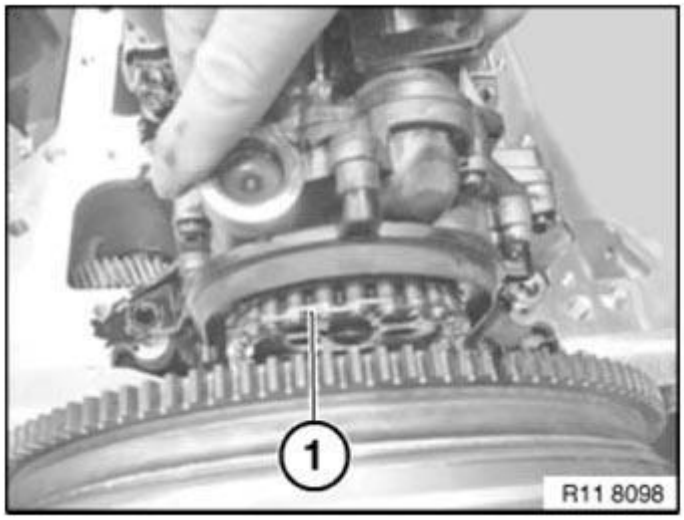

Fig. 336: Identifying Chain Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

Installation note:

Clean all sealing surfaces.

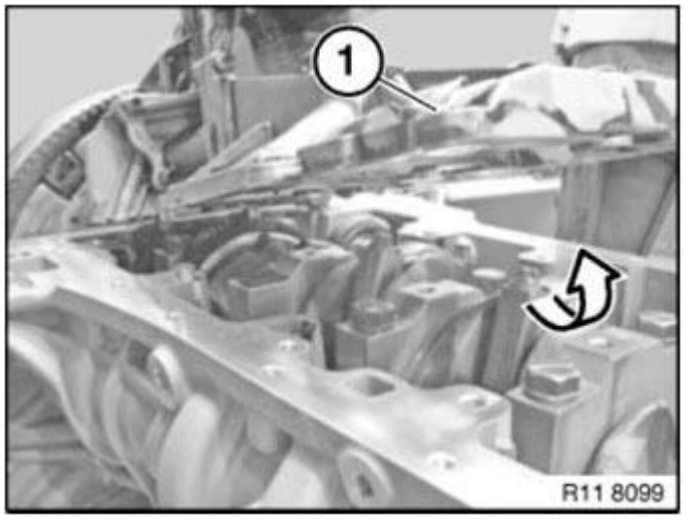

Fig. 337: Removing Oil Vacuum Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Install all screws (1) and tighten down.

Tightening torque: **11 41 1AZ** .

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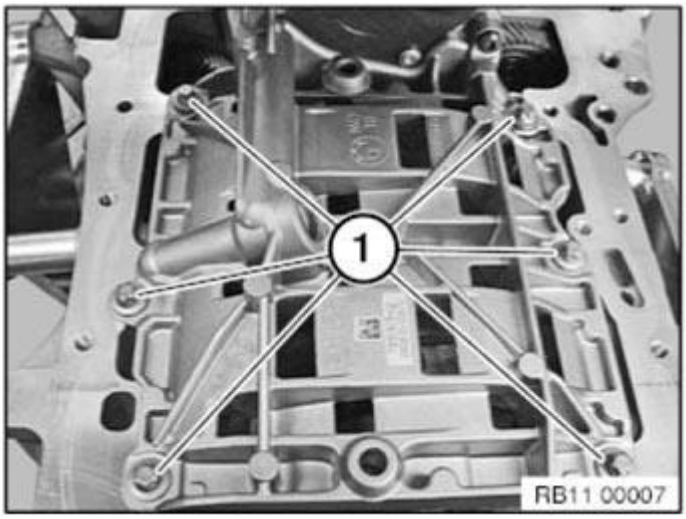

Fig. 338: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Install and tighten down screws (1).

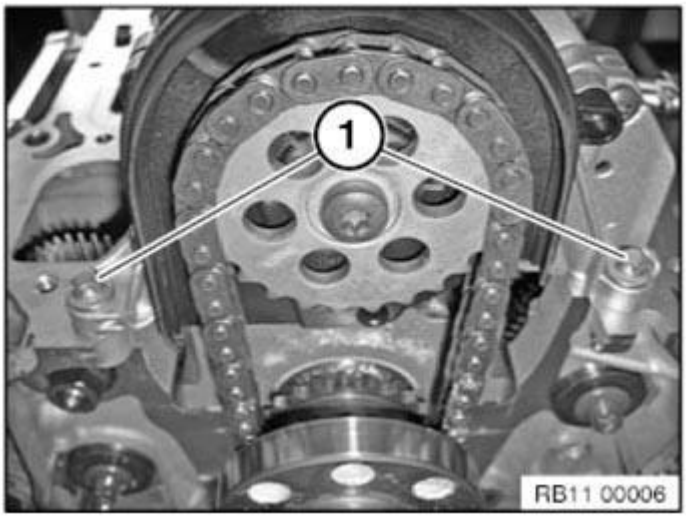

Fig. 339: Identifying Gear Case Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Clean and blow out thread

Insert and secure screw (1).

Secure screw (1) with special tool 00 9 120.

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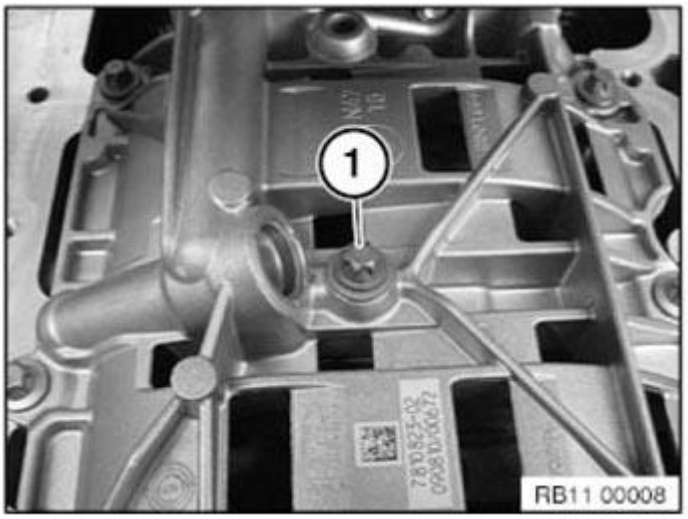

Fig. 340: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque: **11 41 2AZ** .

Assemble engine.

1141010 REMOVING AND INSTALLING/REPLACING CHAIN MODULE FOR OIL PUMP/VACUUM PUMP (N51)

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

Necessary preliminary tasks:

- Remove **CYLINDER HEAD COVER** .
- Remove **ENGINE OIL SUMP** .
- Remove **DRIVE BELT** .
- Remove **TENSIONER** for drive belt.
- Remove **VIBRATION DAMPER** at front.
- Remove **SEALING COVER** for vacuum pump.

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Turn sprocket wheel (3) at central bolt (crankshaft) into position.

Secure special tool 110290 to sprocket wheel (3) and special tool 11 4 362.

Release screw (2).

Tightening torque: **11 66 2AZ** .

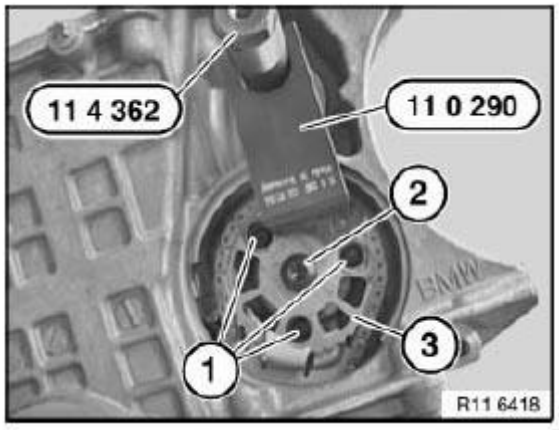

Fig. 341: Identifying Special Tools 11 0 290 & 11 4 362
Courtesy of BMW OF NORTH AMERICA, INC.

Press timing chain with chain tensioner (1) in direction of arrow.

Disconnect timing chain with special tool **11 4 120 PIN** .

Feed out sprocket wheel (3) at hexagon head of vacuum pump (4).

Installation:

A lock pin is pre-installed if the triangular drive is replaced.

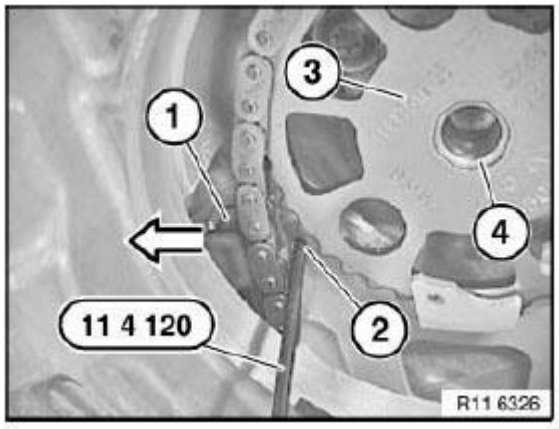

Fig. 342: Pressing Timing Chain Using Chain Tensioner

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Courtesy of BMW OF NORTH AMERICA, INC.

Release bolt (1) on sprocket wheel.

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

Release screws (2).

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

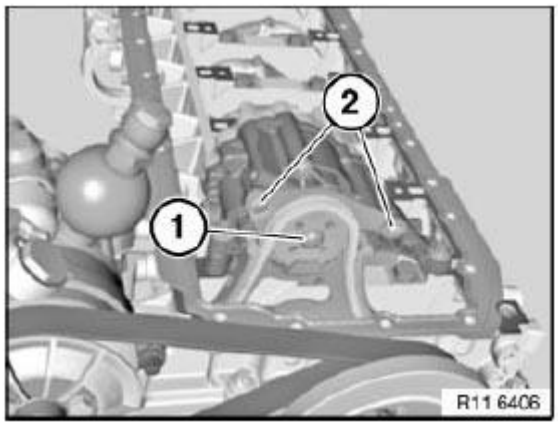

Fig. 343: Identifying Bolt On Sprocket Wheel And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Secure **CRANKSHAFT AND CAMSHAFT** .

Do **not** remove special tools **11 0 300 MANDREL** and **11 4 280 GAUGE** .

Fit special tool **11 9 280 HOLDER** .

Release central bolt (1).

NOTE: A second person is required.

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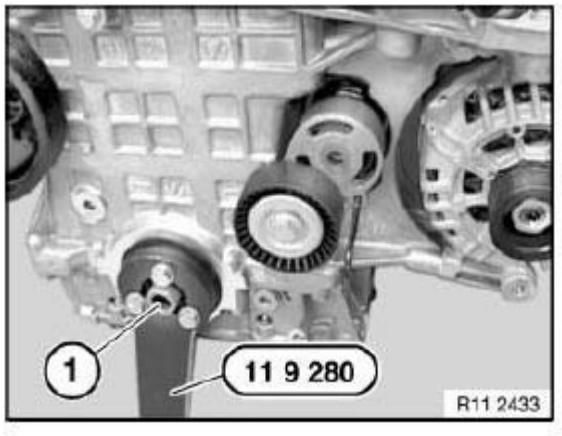

Fig. 344: Removing Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Remove hub (2) towards front.

Installation:

Replace **RADIAL SEAL** at front.

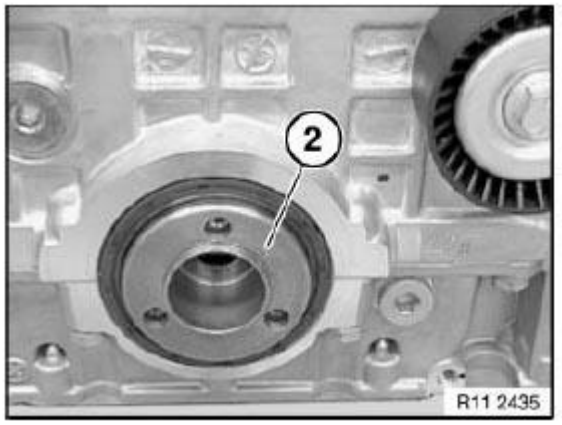

Fig. 345: Identifying Front Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Open screw plug on bedplate.

Installation:

Replace seal.

Release bolt on triangular drive.

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

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Installation:

Replace aluminum screws.

Remove triangular drive (1) in direction of arrow.

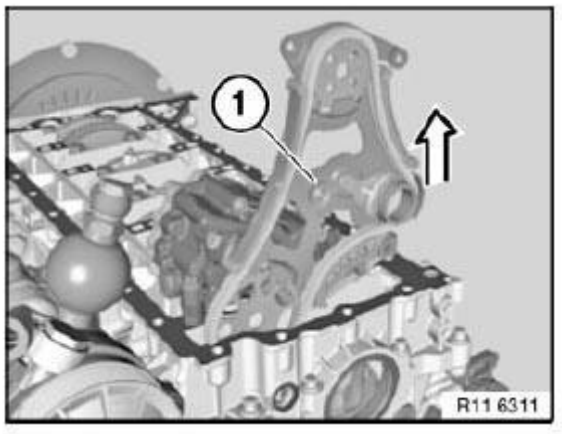

Fig. 346: Removing Triangular Drive
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket wheel (2).
Collar on sprocket wheel (2) points to timing chain drive.

Incorrect assembly will result in engine damage.

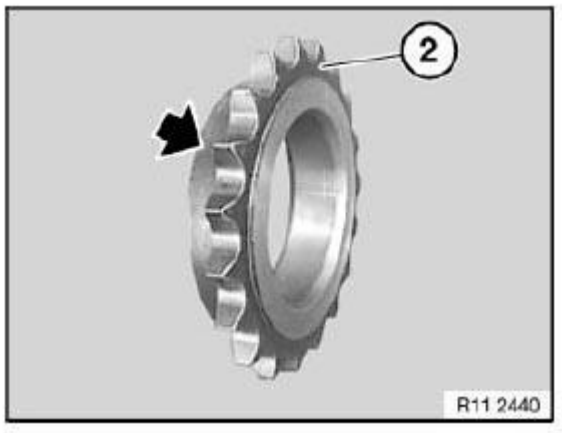

Fig. 347: Locating Collar On Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Procedure if engine is mounted on special tool 11 4 440.

Release screw (1).

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Tightening torque: **11 66 2AZ** .

Release screw (2).

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

Unscrew bolt (3).

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

Installation:

Mark screw (3) with a colored spot.

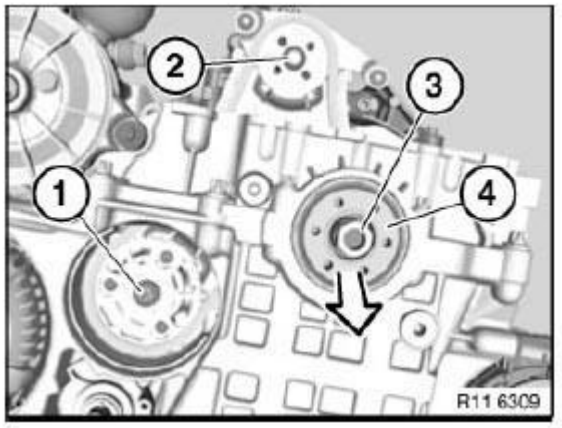

Fig. 348: Removing Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Remove hub (4) towards front.

Tighten down special tool **11 5 200 WASHER** with screws (1) to hub.

Do **not** remove special tools **11 0 300 MANDREL** and **11 4 280 GAUGE** .

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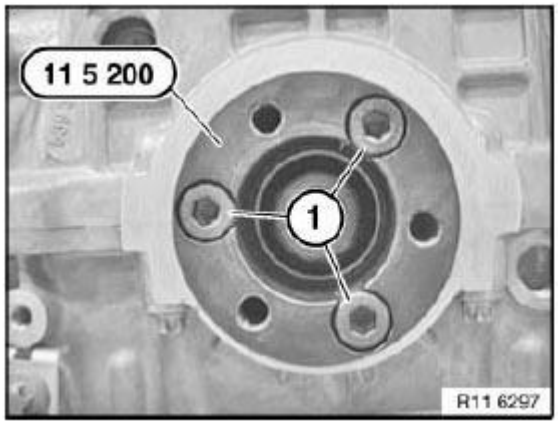

Fig. 349: Tightening Special Tool (11 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **BELT TENSIONER** .

Screw in special tool **11 4 360 DEVICE** .

Mount special tool **11 9 280 HOLDER** on **11 5 200 WASHER** .

Support special tool **11 9 280 HOLDER** on special tool **11 4 360 DEVICE** .

Special tool **11 0 300 MANDREL** secures crankshaft.

Tighten central bolt (1) to jointing torque.

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

Mark central bolt and hub with paint.

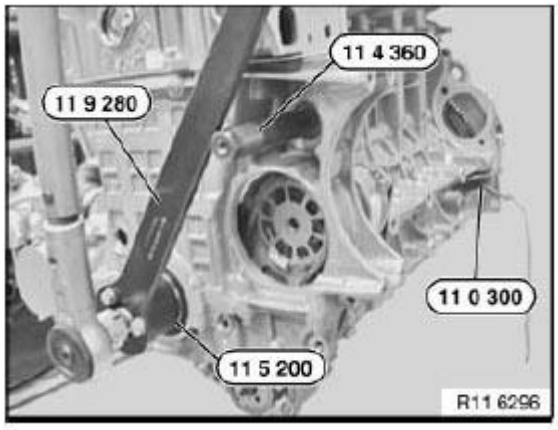

Fig. 350: Removing Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

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Apply stroke of paint (1) for torsion angle tightening to tool.

See **Fig. 351**.

IMPORTANT: Do not remove tool from central bolt during torsion angle tightening - risk of damage.

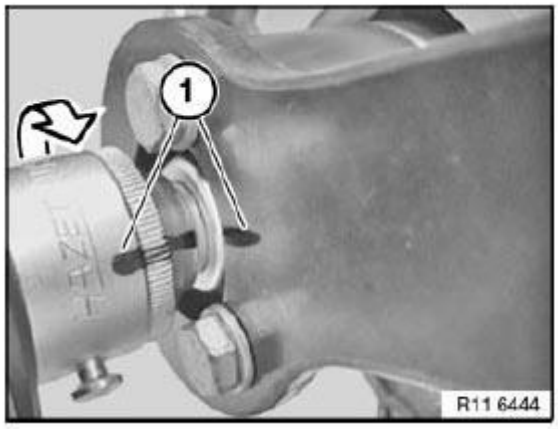

Fig. 351: Tightening Torsion Angle Of Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace **RADIAL SEAL** at front.

Assemble engine.

OIL FILTER AND LINES

1142020 REMOVING AND INSTALLING/REPLACING FULLFLOW OIL FILTER (N51)

WARNING: Danger of scalding!
Only perform these tasks on an engine that has cooled down.

Necessary preliminary tasks:

- Remove intake air **MANIFOLD** .
- Release oil filter cap and allow engine oil to drip off.
- Protect drive belt against dirt.

Release screws (1).

Release screw (2).

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NOTE: Have cleaning cloth ready to catch residual oil.

Tightening torque: **11 42 2AZ** .

Installation:

Replace all seals.

If necessary, replace filter element.

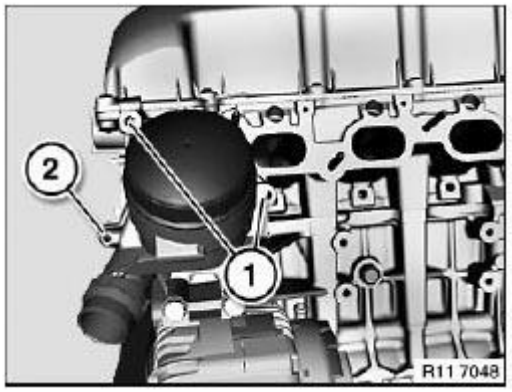

Fig. 352: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

WATER PUMP WITH DRIVE

1151000 REMOVING AND INSTALLING/REPLACING WATER PUMP (N51)

WARNING: Danger of scalding!
Only perform these tasks on an engine that has cooled down.

Recycling

Catch and dispose of drained coolant.

Observe country-specific waste-disposal regulations.

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).

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For reliable identification:
Aluminum screws/bolts are not magnetic.
Jointing torque and angle of rotation must be observed without fail (risk of damage).
If a water pump which has already been operated is reused, it must be filled immediately after being removed with coolant (mixture ratio 1:1/water: coolant).

Necessary preliminary tasks:

- Remove **COOLANT THERMOSTAT** .

Disconnect water hose (1).

Disconnect plug connection (4).

Release screws (5).

Installation:

Replace aluminum screws.

Tightening torque: **11 51 1AZ** .

Installation:

If the water pump is to be reused, it must be mechanically rotated once (breakaway torque at impellers).

One water pump rotation will be sufficient.

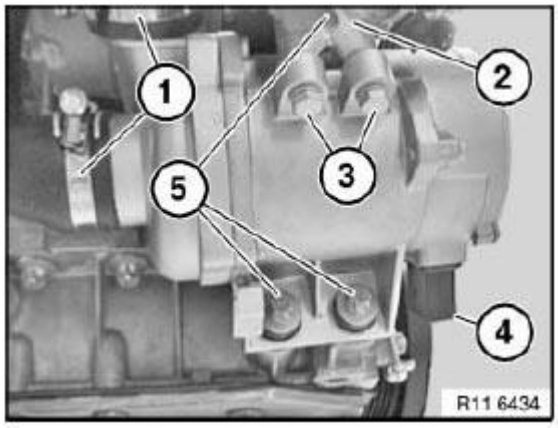

Fig. 353: Identifying Coolant Hose, Plug Connection With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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VENTING INSTRUCTIONS must be observed without fail.

THERMOSTAT AND CONNECTIONS

1153000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N51)

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.

Observe country-specific waste disposal regulations.

IMPORTANT: Read and comply with GENERAL NOTES .
Protect plug connections against coolant and dirt contamination.
Cover plug connections with suitable materials.

Necessary preliminary work:

- Remove front **UNDERBODY PROTECTION** .
- Place oil drip tray for coolant under engine compartment.

NOTE: Illustration shows coolant thermostat removed.

Disconnect coolant hoses (arrows) on the thermostat (1) with clamping tongs.

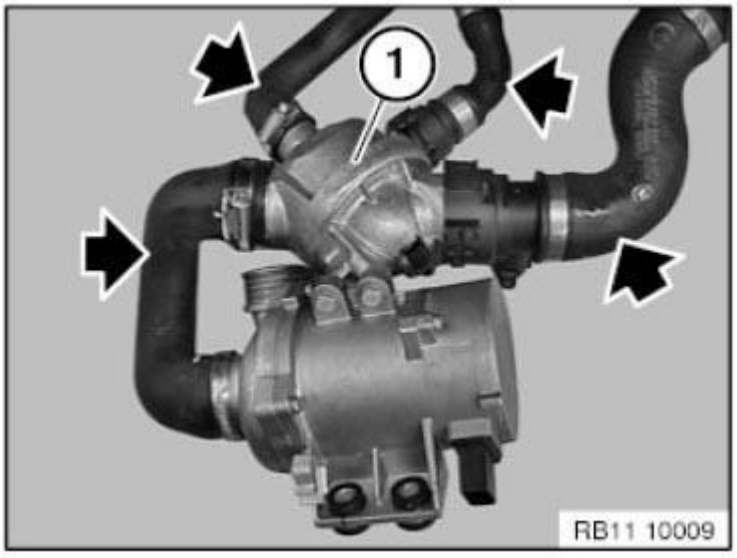

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Fig. 354: Locating Coolant Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Release hose clamp (1) and detach coolant hose.

Release hose clamp (2) and detach coolant hose.

Unlock and detach coolant hose (3).

Unlock and detach coolant hose (4).

Disconnect plug connection (5).

Release screws (6).

Tightening torque: **11 53 1AZ** .

Remove coolant thermostat (7).

NOTE: Illustration shows coolant thermostat removed.

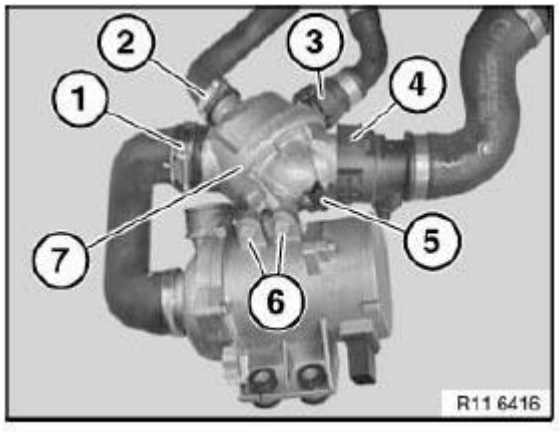

Fig. 355: Identifying Coolant Thermostat With Hose Clamps, Screws And Coolant Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Fill **COOLING SYSTEM** .

Check function of cooling system.

INTAKE MANIFOLD

1161050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (N51)

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Necessary preliminary tasks:

- Remove **TENSION STRUT** .
- Remove **SUCTION FILTER HOUSING** .
- Remove **ENGINE COVER** .

Open holder (2).

Disconnect plug connection (1) under manifold.

Release both crankcase breathers (3).

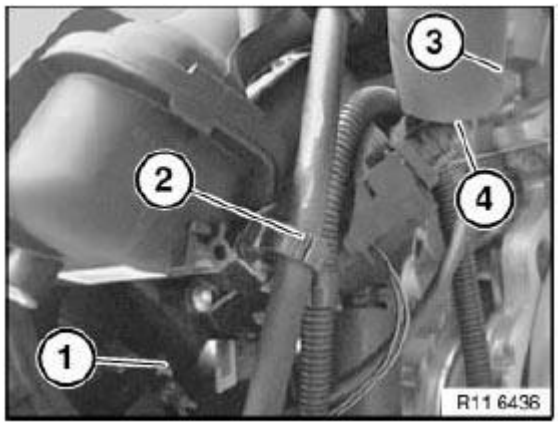

Fig. 356: Identifying Plug Connection, Holder And Crankcase Breathers
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Disconnect plug connection (3).

Release bolts (4).

Detach engine wiring harness (2) from manifold and lay to one side.

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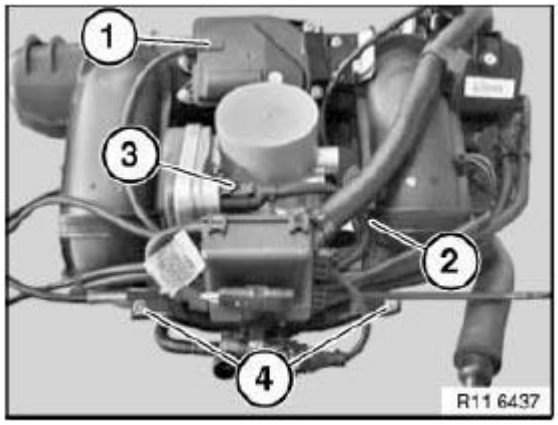

Fig. 357: Identifying Plug Connections And Engine Wiring Harness
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on oil pressure switch.

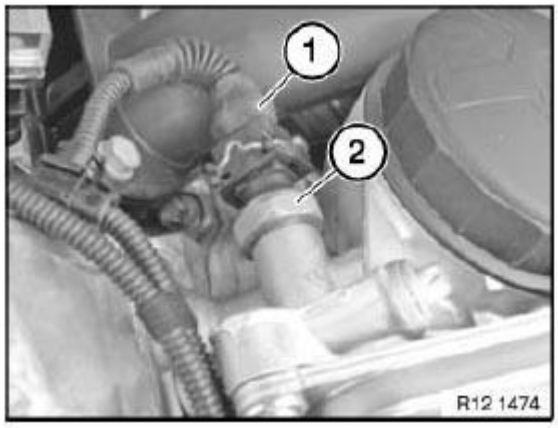

Fig. 358: Identifying Plug Connection On Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Release fuel rail (2) and lay to one side.

NOTE: Do not detach fuel line.

Release screw (1).

Unscrew nuts (3).

Tightening torque: **11 61 1AZ** .

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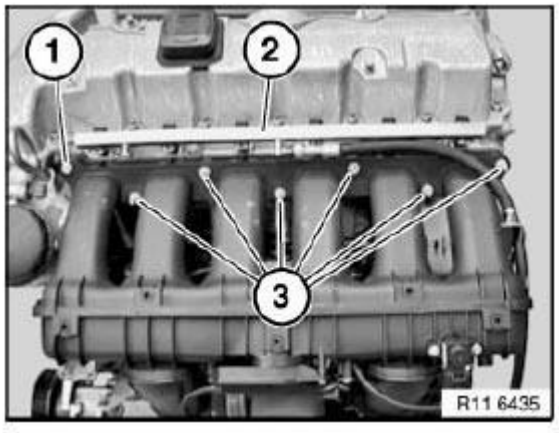

Fig. 359: Identifying Fuel Rail With Screw And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Raise intake manifold approx. 10 cm.

Disconnect plug connection (1) at bottom.

Release tank vent line behind throttle valve assembly.

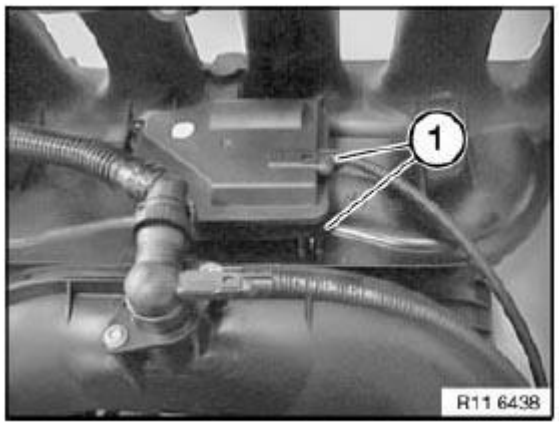

Fig. 360: Identifying Intake Manifold Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace all seals.

Assemble engine.

EXHAUST MANIFOLD

1840050 REMOVING AND INSTALLING/REPLACING FRONT EXHAUST MANIFOLD (N51)

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Necessary preliminary tasks

- Remove **REAR EXHAUST MANIFOLD**

NOTE: The oxygen sensors are in danger of being damaged when the exhaust manifolds are removed and installed.
Remove control sensor from cylinders 1 to 3.
Remove monitor sensor from cylinders 1 to 3.

Unscrew nuts.

Remove exhaust manifold (1).

Installation:

Clean sealing faces and replace seals.

Replace nuts.

Tightening torque **18 40 1AZ** .

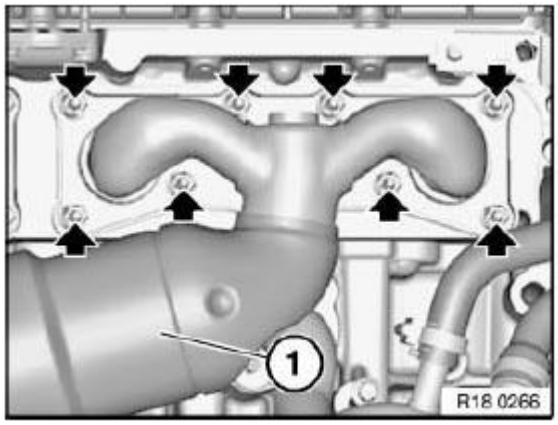

Fig. 361: Locating Exhaust Manifold Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Reassemble the vehicle.

Check exhaust system for leaks.

1840060 REMOVING AND INSTALLING/REPLACING REAR EXHAUST MANIFOLD (N51)

Necessary preliminary tasks

- Remove front **UNDERBODY PROTECTION**
- Remove rear **UNDERBODY PROTECTION**

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- Remove **COMPLETE EXHAUST SYSTEM**
- **REMOVE LOWER SECTION OF MICROFILTER HOUSING**
- **REMOVE ACOUSTIC COVER**

NOTE: The oxygen sensors are in danger of being damaged when the exhaust manifolds are removed and installed.

Remove control sensor from cylinders 4 to 6.

Remove monitor sensor from cylinders 4 to 6.

Unscrew nuts.

Remove exhaust manifold (1).

Installation:

Clean sealing faces and replace seals.

Replace nuts.

Tightening torque, **18 40 1AZ** .

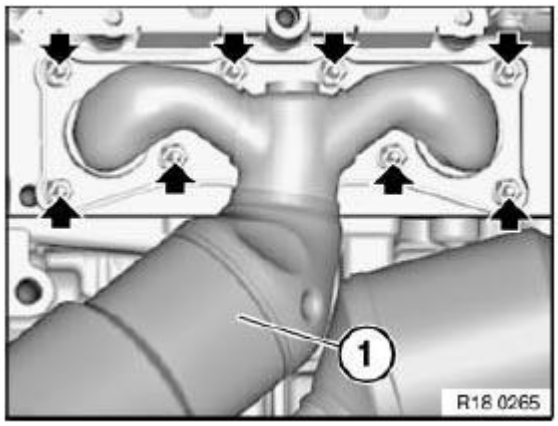

Fig. 362: Locating Exhaust Manifold Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Reassemble the vehicle.

Check exhaust system for leaks.

VACUUM PUMP

1166000 REMOVING AND INSTALLING OR REPLACING VACUUM/OIL PUMP (N47 D20 O1)

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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.

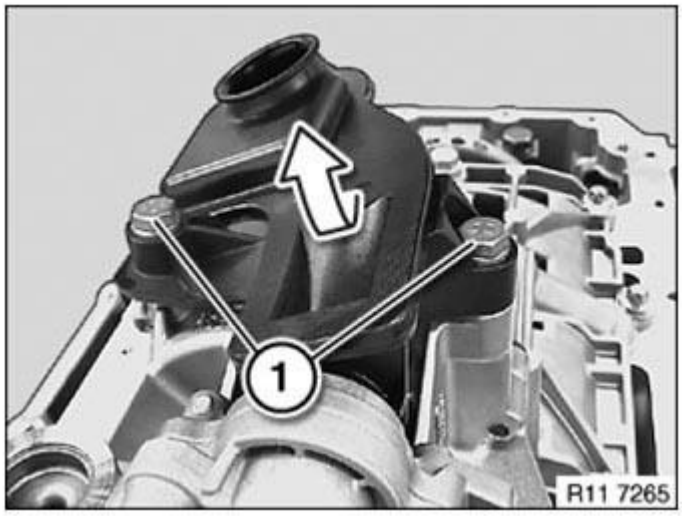

Fig. 363: Removing Intake Snorkel
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

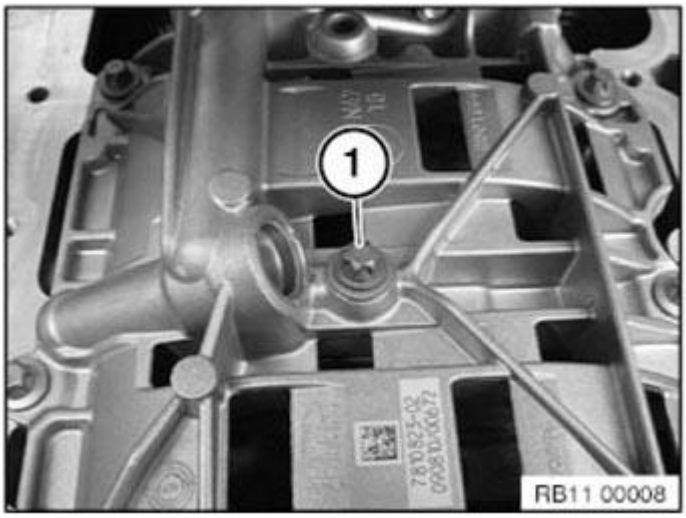

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Fig. 364: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Installation note:

Clean and blow out thread

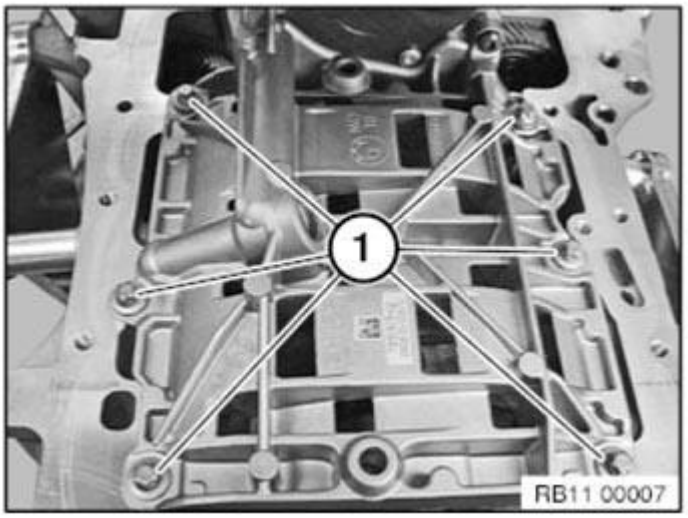

Fig. 365: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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.

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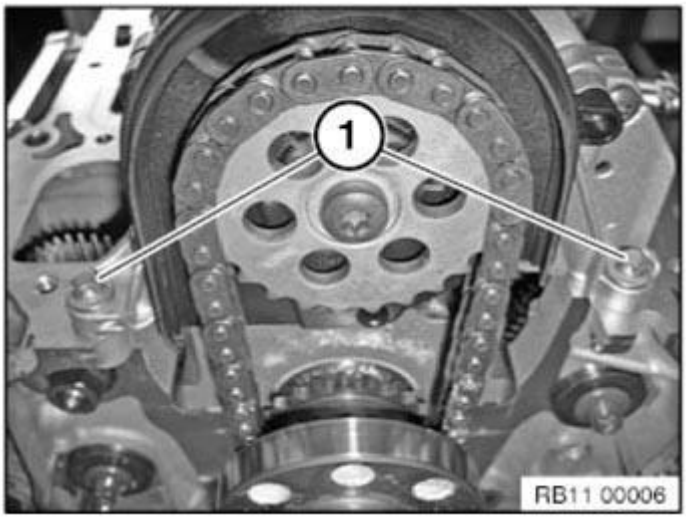

Fig. 366: Identifying Gear Case Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Oil vacuum pump must be fed out at chain drive (1).

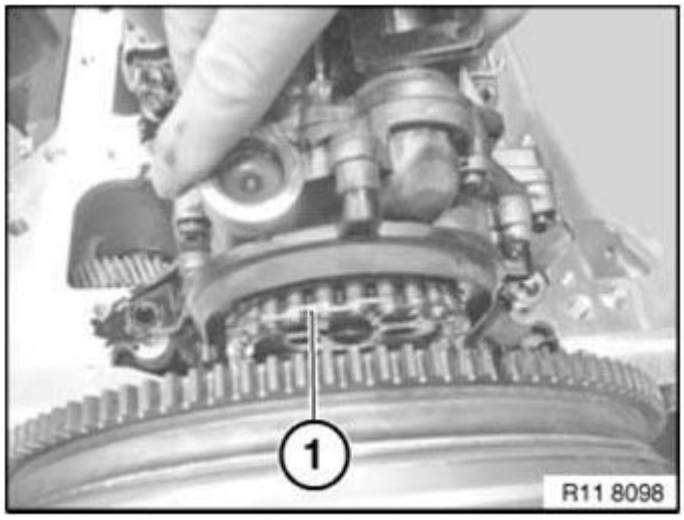

Fig. 367: Identifying Chain Drive
Courtesy of BMW OF NORTH AMERICA, INC.

Feed out oil vacuum pump (1) in direction of arrow and remove.

Installation in reverse sequence.

Installation note:

Clean all sealing surfaces.

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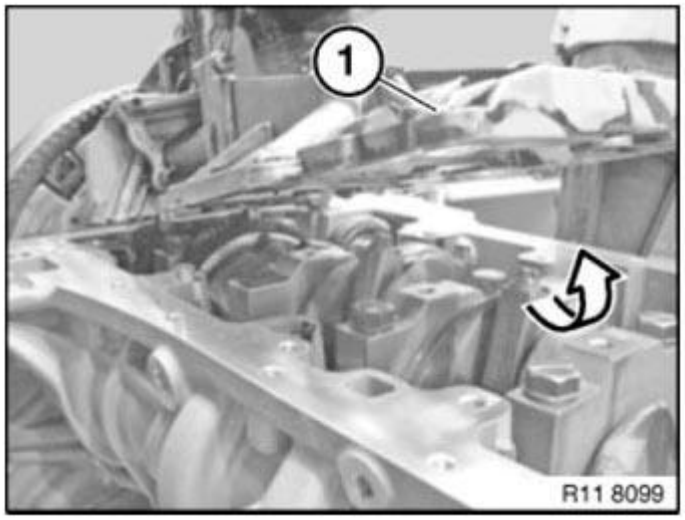

Fig. 368: Removing Oil Vacuum Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Install all screws (1) and tighten down.

Tightening torque: **11 41 1AZ** .

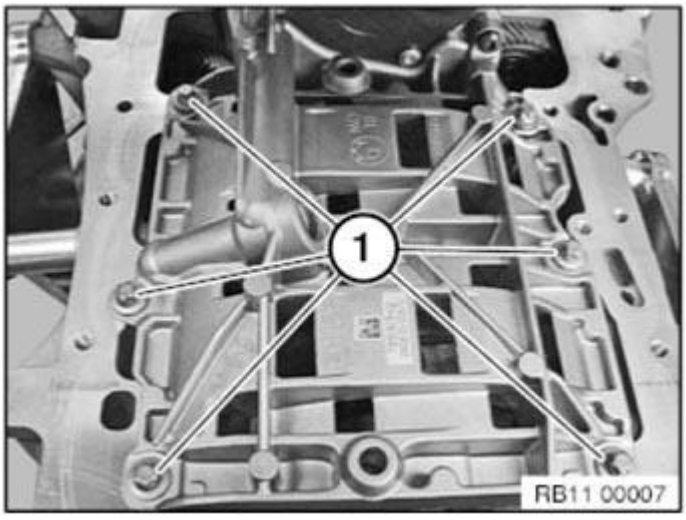

Fig. 369: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Install and tighten down screws (1).

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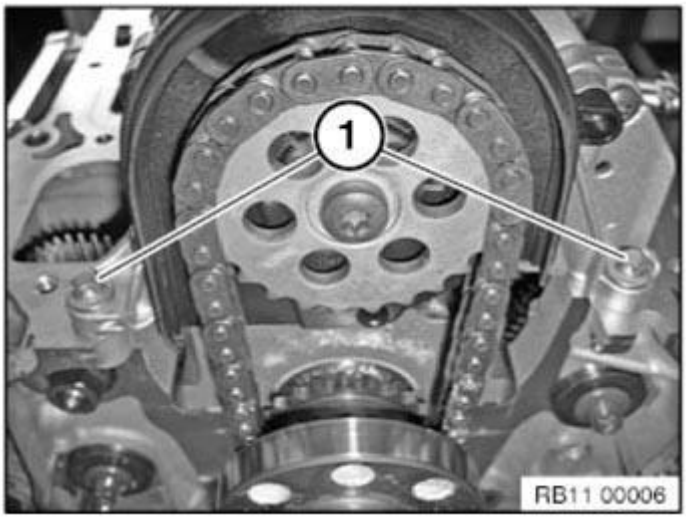

Fig. 370: Identifying Gear Case Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

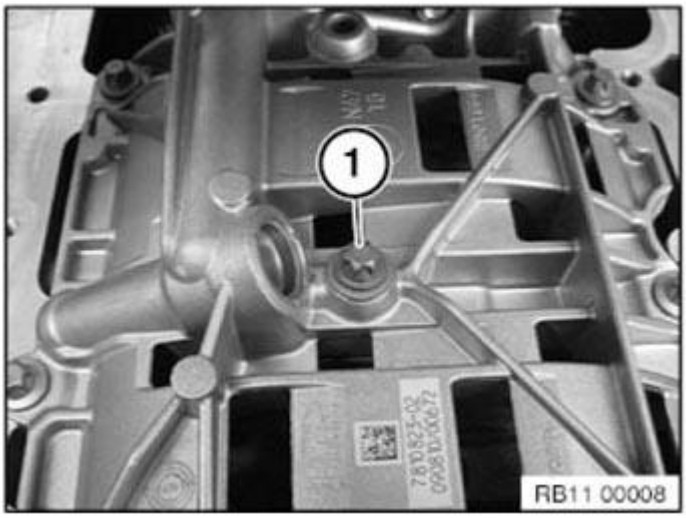

Fig. 371: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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