# ENGINE

## Engine - Repair - M3

# ENGINE GENERAL

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

**Danger of poisoning!**

Ingesting oil or absorbing through the skin may cause poisoning!

**Possible symptoms are:**

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

**Protective measures/rules of conduct:**

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

**First aid measures:**

- Do not induce vomiting.

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

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

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

**Danger of injury!**

Contact with eyes or skin may result in injury!

**Possible symptoms are:**

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

**Protective measures/rules of conduct:**

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

**First aid measures:**

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

**NOTE: Do not use solvents/thinners.**

**00 SAFETY INSTRUCTIONS FOR HANDLING OIL**

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

**Recycling:**

Observe country-specific waste-disposal regulations.

**Measures if oil is unintentionally released:**

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

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

**11 00 ... OVERVIEW OF CONSUMABLES (ELECTRONIC PARTS CATALOGUE - EPC)**

1.0 Sealing compound for **injection.**

**SEALING COMPOUND FOR INJECTION REFERENCE**

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

2.0 Sealing compound for **application.**

**SEALING COMPOUND FOR APPLICATION REFERENCE**

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

**11 00 ... SERVICE - ENGINE OIL (S65)**

**WARNING: Danger of scalding!**

Carry out all tasks only when wearing oil-resistant, heat-resistant protective gloves incl. underarm protection, face guard and protective apron.

**IMPORTANT: Perform engine oil service only when engine is at normal operating temperature (>70°C engine oil temperature). An exact engine oil level reading can only be obtained from an engine oil temperature > or = 70°.**
**Engine oil temperature can be read off in the instrument cluster.**
**Observe the exact engine oil filling capacity.**
**Overfilling the engine with engine oil will result in engine damage.**
**Inspection and drain-off times must be observed.**
**Determining the oil level via the BC button detects only changes > +/- 0.5 litre.**

*Recycling:*

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

Observe country-specific waste-disposal regulations.

**WARNING: Danger of scalding!**

**NOTE: The remaining engine oil can flow off into the oil sump only when the oil filter cap is opened.**
**Release oil filter cover (1).**
**Tightening torque 11 42 1AZ . See 11 42 OIL FILTER AND PIPES .**

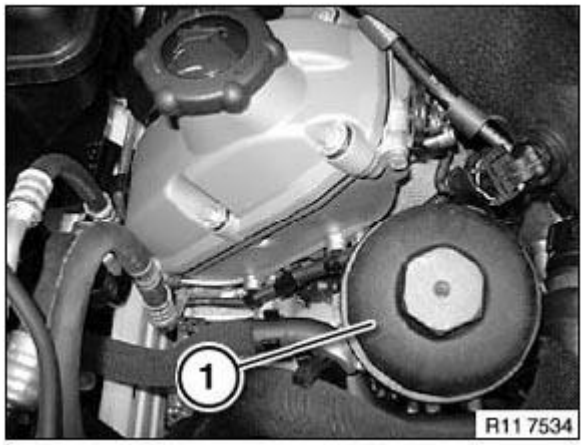



**Fig. 1: Identifying Oil Filter Cover**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

**Replace oil filter element and sealing rings.**

**WARNING: Danger of scalding!**
**Carry out all tasks only when wearing oil-resistant, heat-resistant**

**protective gloves incl. underarm protection, face guard and protective apron.**
**Open screw plug (1) with socket and a long extension (2).**

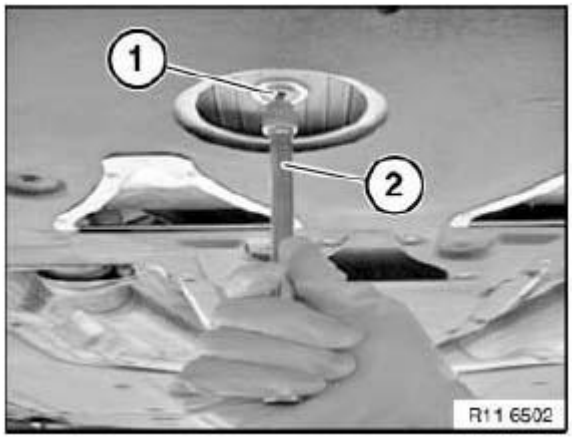



**Fig. 2: Opening Screw Plug With Socket And Long Extension**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Tilt long extension (1) with socket and screw plug in direction of arrow.

*Recycling:*

Catch and dispose of engine oil with suitable equipment.

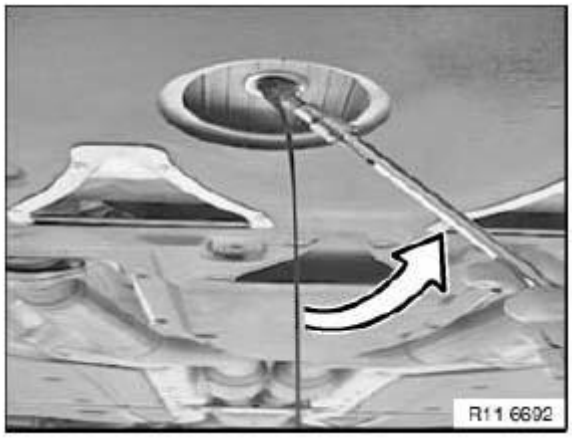



**Fig. 3: Screwing Plug Using Extension With Socket**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove oil drain plug (1).

Drain-off time of 10 minutes must be observed without fail.

Remove oil drain plug (2).

Drain-off time of 2 minutes must be observed without fail.

Tightening torque **11 13 1AZ** . See **OIL SUMP** .

*Installation:*

**Replace sealing ring.**

Assemble engine.

Pour in **engine oil.** See **11 40 OIL SUPPLY E90/E92/E93/S65 B40** .

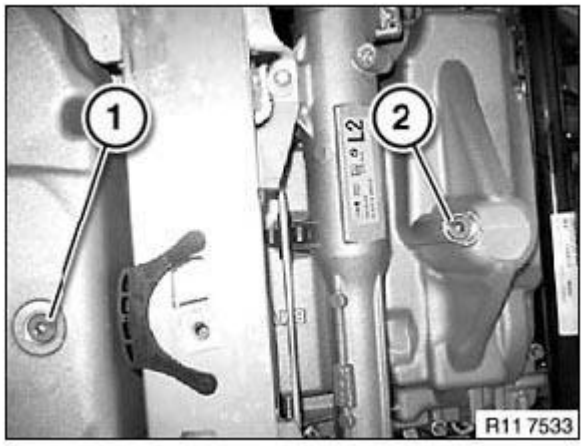



**Fig. 4: Identifying Oil Drain Plug**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Checking engine oil level:

- Park vehicle on a horizontal surface
- Start engine and run at idle until an engine oil temperature > or = 70°C is reached
- Pressing the BC button for more 3 seconds results in the oil level been determined again.
- Only changes > +/- 0.5 litre are detected.
- If necessary, perform odometer reset.
- Top up engine oil if necessary
- **Pre-delivery inspection / engine replacement**

Carry out distance travelled reset **only** with the BMW diagnosis system.

Observe vehicle-specific maintenance scopes.

**11 00 039 CHECKING COMPRESSION OF ALL CYLINDERS (S65)**

**Special tools required:**

- 11 0 224
- 11 0 235

See **ENGINE - SPECIAL TOOLS** .

**IMPORTANT: High tension - mortal danger!**
**Disconnect all supply leads from ignition coils (interrupt power supply to ignition coils).**

**IMPORTANT: Check Schrader valve on special tool 11 0 235 for correct seating (engine damage).**
**The throttle valves cannot be opened by opening the throttle.**
**The compression check is carried out exclusively by means of the idle actuators.**
**A compression check is only possible with the diagnosis tester.**
**The catalytic converter will incur damage if the fuel injectors are not switched off.**

*Necessary preliminary tasks:*

- Remove **microfilter housing.** See **MICROFILTER** .
- Remove all **spark plugs.** See **12 12 011 REPLACING ALL SPARK PLUGS (S65)** .
- Connect diagnosis tester.
    1. Service function.
    2. Drive.
    3. Engine electronics
    4. Switch off fuel injection.

        **IMPORTANT: Fuel injectors are switched off.**

    5. Actuate starter motor for 8 seconds.

Screw special tool 11 0 235 into spark plug hole.

Check that sealing ring is in perfect condition on special tool 11 0 235.

Connection (1) for diagnosis tester or special tool 11 0 224.

**NOTE: Picture shows S85.**

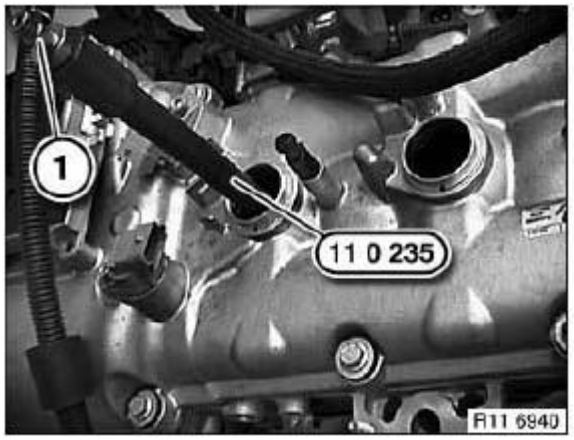



**Fig. 5: Identifying Special Tool (11 0 235)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Connect special tool 11 0 224 or 25 bar pressure adapter to diagnosis tester.

**Compression pressure.**

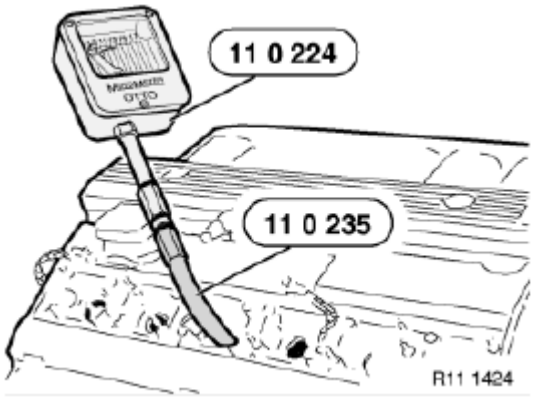



**Fig. 6: Connecting Special Tool (11 0 224) And Bar Pressure Adapter To Diagnosis Tester**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Now clear the fault memory.

**11 00 050 REMOVING AND INSTALLING ENGINE (S65)**

**Special tools required:**

- 11 0 000
- 13 5 280
- 17 2 050

See **ENGINE - SPECIAL TOOLS** .

See **FUEL SYSTEM - SPECIAL TOOLS** .

See **COOLING SYSTEM - SPECIAL TOOLS** .

*Necessary preliminary tasks:*

- Engine hood/bonnet in assembly position.
- Drain **engine oil.**
- Remove **suction filter housing.** See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (S65)** .
- Remove **intake air manifold.**
- Remove **underbody protection** at front and rear. See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** and **51 47 491 REMOVING AND INSTALLING/REPLACING REAR UNDERBODY PROTECTION** .
- Remove **transmission** (**Important** observe repair instructions). See **23 00 018 REMOVING AND INSTALLING TRANSMISSION (GS6-53BZ) (S65)** .
- Remove **electric fan.** See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (S65)** .
- Remove **radiator** with coolant hoses. See **17 11 000 REMOVING AND INSTALLING RADIATOR (N51, S65)** .
- Drain coolant.
- Remove **expansion tank** with coolant hose. See **17 11 100 REMOVING AND INSTALLING/REPLACING COOLANT EXPANSION TANK (S65)** .
- Draw off **A/C system.**
- Remove all **lines** from A/C compressor. See **64 53 660 REPLACING LINE FROM CONDENSER TO EVAPORATOR (S65)** , **64 53 670 REPLACING LINE FROM COMPRESSOR TO EVAPORATOR (S85)** and **64 53 642 REPLACING LINE FROM COMPRESSOR TO CONDENSER (S65)** .
- Remove **secondary-air pump.**
- Detach **B+ lead** in engine compartment.
- Detach **vacuum hose** from brake booster. See **34 33 071 REPLACING VACUUM HOSE FOR BRAKE BOOSTER (ON BRAKE BOOSTER)** .
- Release **suspension cross-brace** in engine compartment. See **51 71 345 REMOVING AND INSTALLING/REPLACING LEFT (OR RIGHT) SUSPENSION CROSS-BRACE** .
- Release grounding strap on engine support arm.

Release stabilizer (1) on front axle carrier at front.

Allow stabilizer (1) to hang loose.

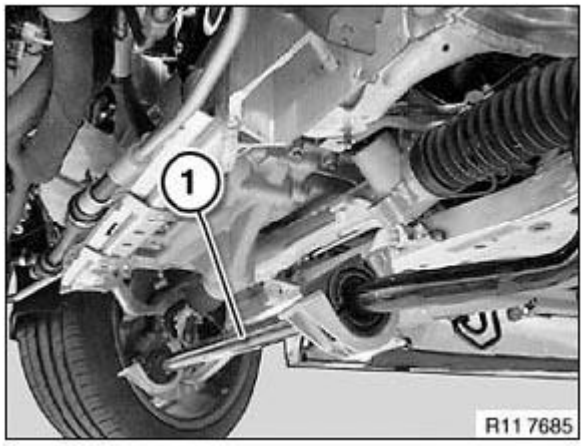



**Fig. 7: Identifying Stabilizer On Front Axle Carrier**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove complete **steering spindle.** See **32 31 070 REMOVING AND INSTALLING / REPLACING LOWER SECTION OF STEERING SPINDLE** .

Remove heat shield.

Release screws (1).

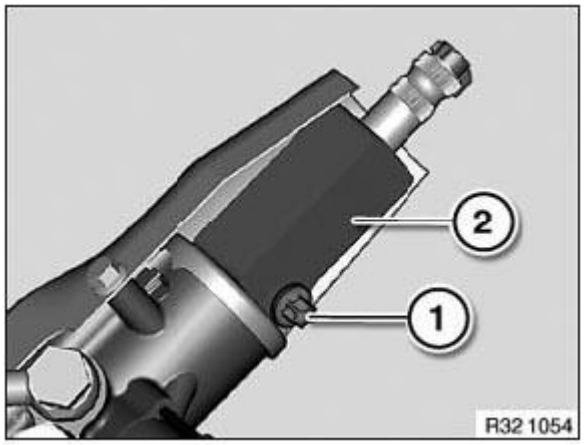



**Fig. 8: Identifying Steering Spindle Extension And Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Detach steering spindle extension (2).

Tightening torque: **32 31 1AZ** . See **32 31 STEERING COLUMN** .

Release nuts (1 and 4).

Detach oil lines (2 and 3).

*Recycling:*

Have a cloth ready to catch a residual amount of engine oil.

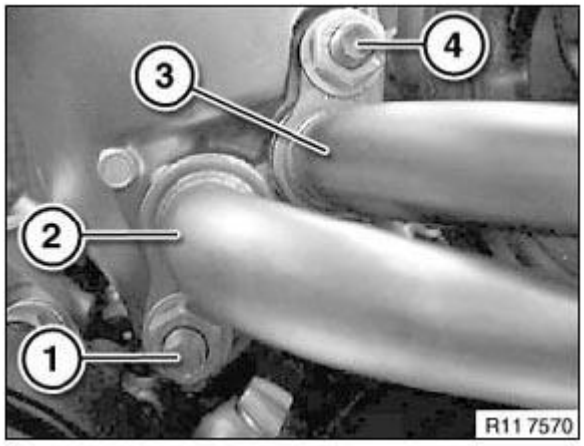



**Fig. 9: Identifying Oil Lines And Nuts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure oil lines (1) with a cable tie (2) to front panel.

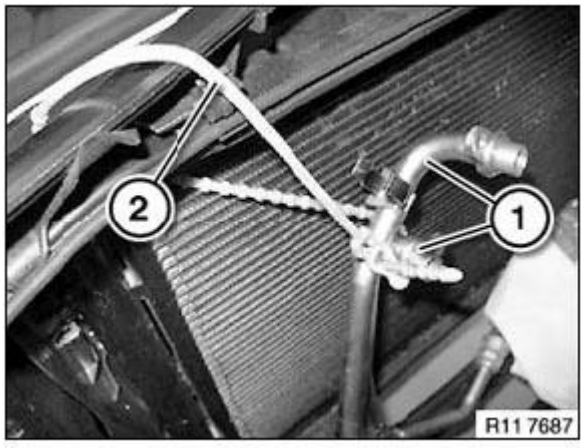



**Fig. 10: Securing Oil Lines With Cable Tie To Front Panel**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Unclip heater hose (1) and set down with heating valve on engine.

Disconnect both hoses (2) from secondary-air valves.

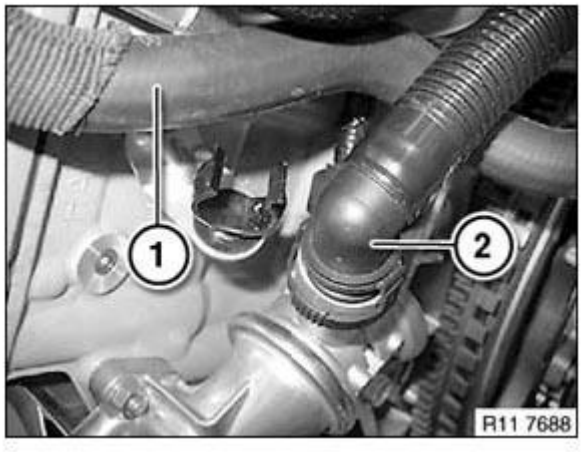



**Fig. 11: Identifying Heater Hose And Secondary-Air Valves Hose**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Risk of damage to steering gear and oil sump.**

Disconnect fuel line (1) and lock with special tool 13 5 280.

Disconnect flushing line (2).

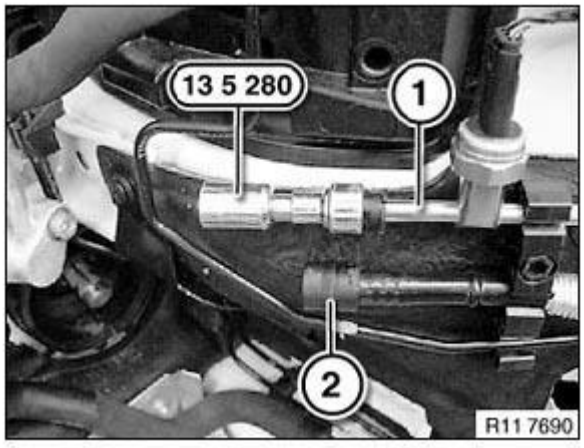



**Fig. 12: Identifying Fuel Line, Flushing Line And Special Tool (13 5 280)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Unfasten engine wiring harness (1) on engine completely.

Secure engine wiring harness (1) with a cable tie (2) to engine hood/bonnet damper.

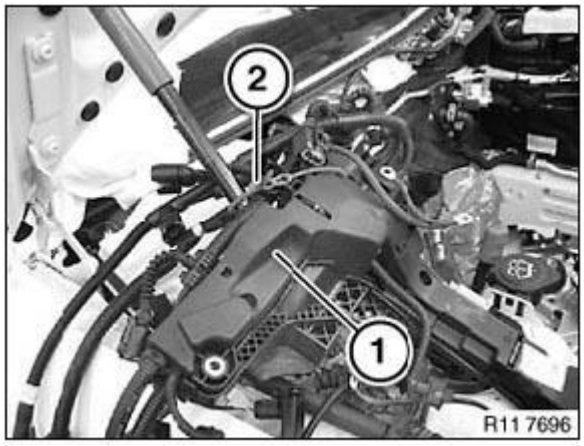



**Fig. 13: Identifying Engine Wiring Harness And Cable Tie**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release both clamps (1) with special tool 17 2 050.

Remove coolant hose (2).

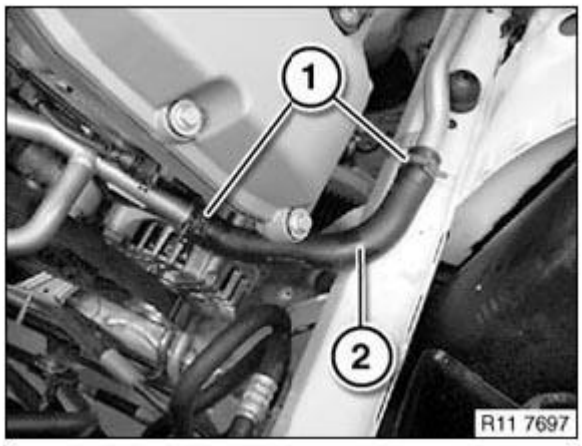



**Fig. 14: Identifying Clamp And Coolant Hose**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Do not release any hydraulic lines on the power steering pump.**

Release power steering pump (1) on engine block.

Set down power steering pump (1) on front axle carrier.

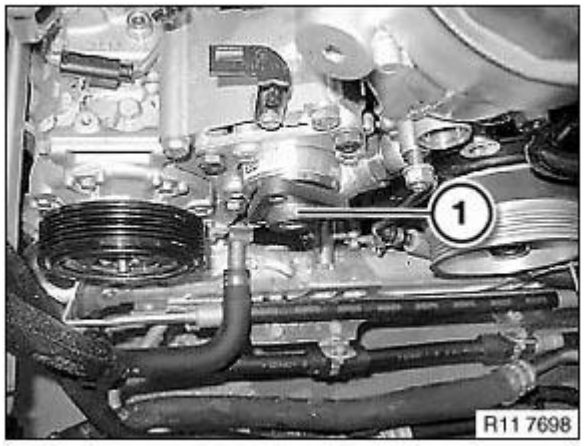



**Fig. 15: Identifying Power Steering Pump**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Unscrew left and right **engine mounts.** See **ENGINE AND GEARBOX SUSPENSION - REPAIR** .

Secure special tool 11 0 000 to suspension eyes (1).

Remove engine with 2 persons.

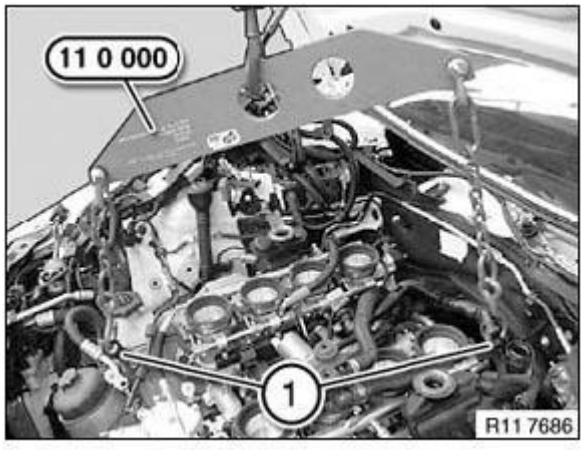



**Fig. 16: Identifying Special Tool (11 0 000) And Suspension Eyes**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

Top up **coolant** and vent cooling system. See **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR WATER LEAKS (S65)** .

Pour in **engine oil.**

Install **replacement engine.**

Correct CBS data status.

**11 00 091 INSTALLING REPLACEMENT ENGINE (S65)**

**IMPORTANT: No running-in engine oil required.
Oil grade 10W-60**

*Necessary preliminary tasks:*

- Remove and install **engine.**
- Flush cooling system.

*Installation:*

If necessary, replace following components.

- Clutch
- Drive belt.
- All outer seals.

  Replace all anti-fatigue bolts on flywheel and vibration damper.

- Change coolant.
- Fill engine with engine oil.

**11 00 670 SECURING ENGINE IN INSTALLATION POSITION (S65)**

**Special tools required:**

- 00 0 200
- **00 0 202**
- **00 0 204**
- **00 0 208**
- **11 0 020**

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

See **ENGINE - SPECIAL TOOLS** .

**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.**

*Necessary preliminary tasks:*

- Secure **engine bonnet/hood in service position** . See **51 00 ... SERVICE POSITION OF ENGINE HOOD/BONNET** .
- Remove **intake air manifold**

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

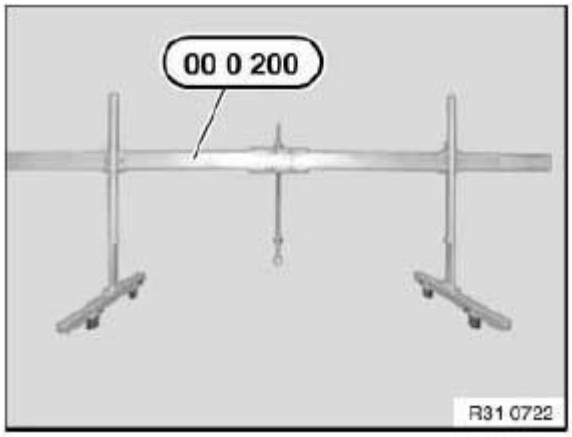



**Fig. 17: Identifying Cross Member (00 0 200)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**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.**

**IMPORTANT: Risk of damage!**
**Position transverse member 00 0 200 with a 2nd person helping by way of rests (1) on bolt connections of side panels.**

Secure special tool **11 0 020** to spindle **00 0 202** .

Attach suitable chains to special tool **11 0 020** and suspend from both engine suspension eyelets.

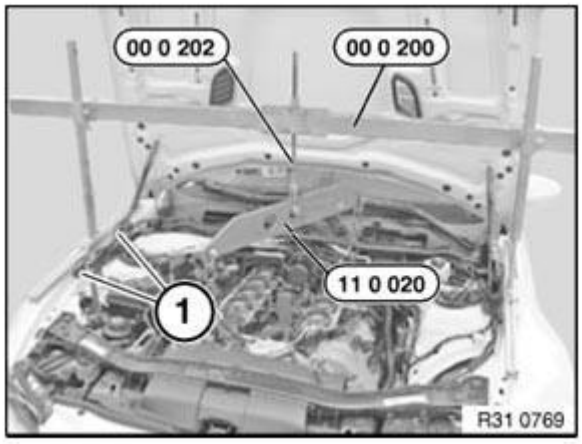



**Fig. 18: Identifying Special Tool (11 0 020) (00 0 202) And (11 0 020)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**WARNING: Risk of injury!**
**Tighten down all adjusting screws and nuts on cross member 00 0 200.**

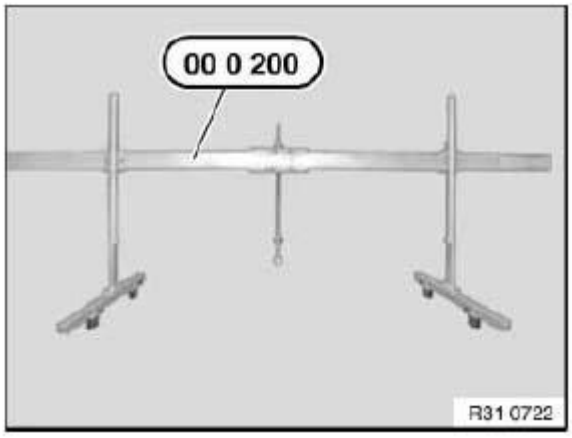



**Fig. 19: Identifying Cross Member (00 0 200)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Unscrew nuts (1).

Raise engine approx. 10 mm with cross member.

*Installation:*

Replace self-locking nuts.

Tightening torque **22 11 2AZ** . See **22 11 ENGINE SUSPENSION** .

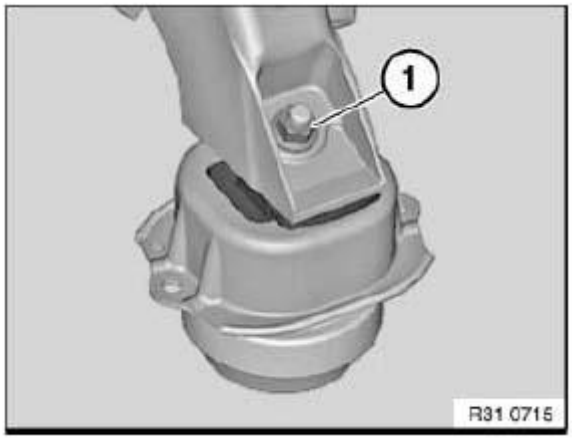



**Fig. 20: Identifying Self-Locking Nut**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**ENGINE IDENTIFICATION**

Drive in engine numbers at marked surface with impact tool.

M47 / M47TU / M47T2

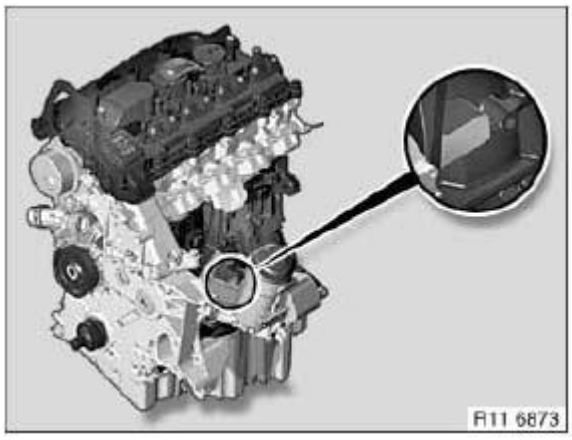



**Fig. 21: Identifying Engine Identification Label (M47 / M47TU / M47T2)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

M57 / M57TU / M57T2

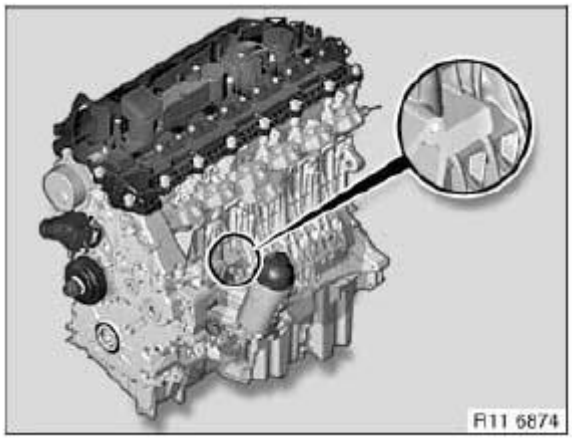



**Fig. 22: Identifying Engine Identification Label (M57 / M57TU / M57T2)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

M67 / M67TU

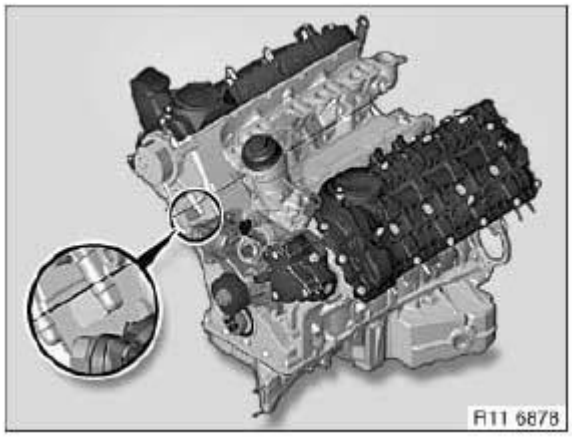



**Fig. 23: Identifying Engine Identification Label (M67 / M67TU)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

N47 / N47S

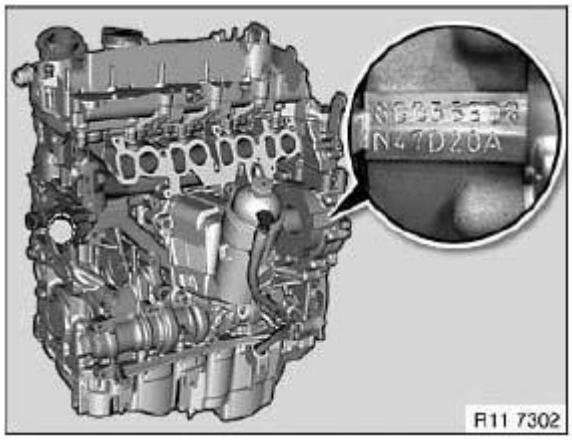



**Fig. 24: Identifying Engine Identification Label (N47 / N47S)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

M52 / M52TU

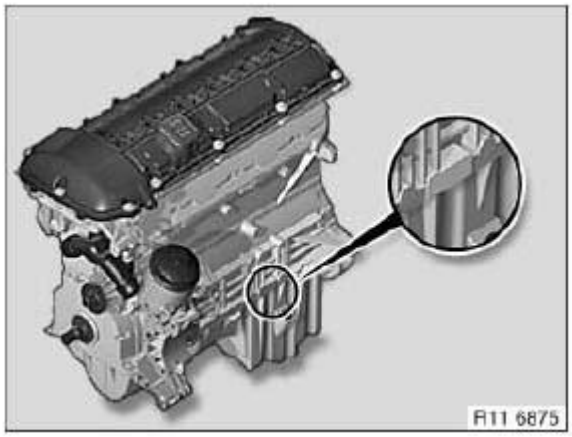



**Fig. 25: Identifying Engine Identification Label (M52 / M52TU)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

M54

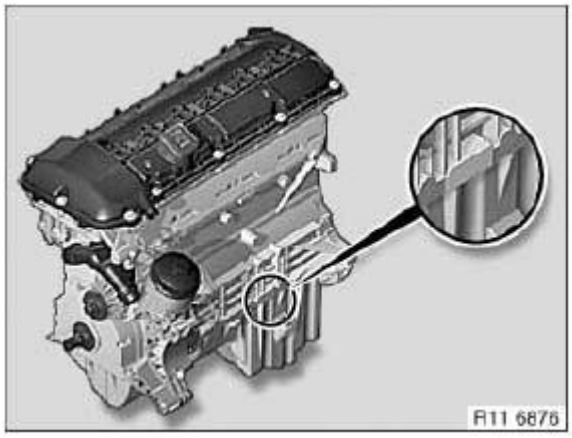



**Fig. 26: Identifying Engine Identification Label (M54)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

M56

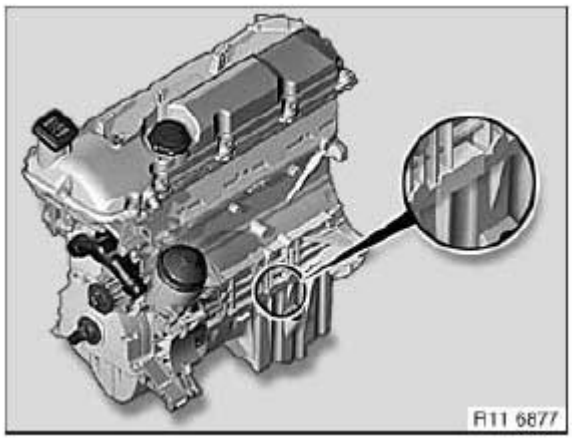



**Fig. 27: Identifying Engine Identification Label (M56)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

N40 / N45 / N45T / N43

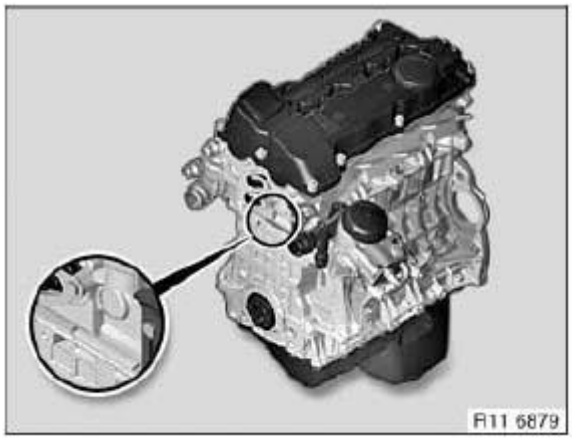



**Fig. 28: Identifying Engine Identification Label (N40 / N45 / N45T / N43)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

N42 / N46 / N46T

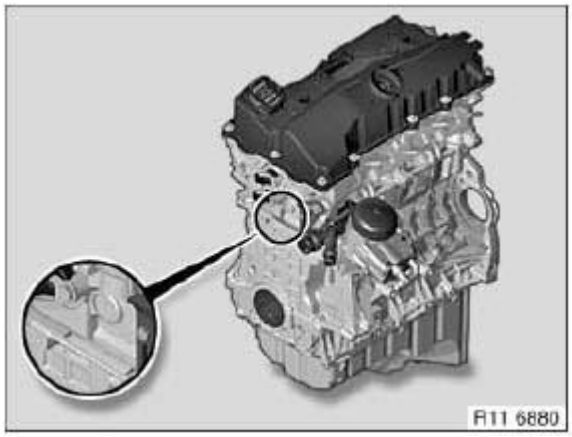



**Fig. 29: Identifying Engine Identification Label (N42 / N46 / N46T)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

N51 / N52 / N52K / N53 / N54

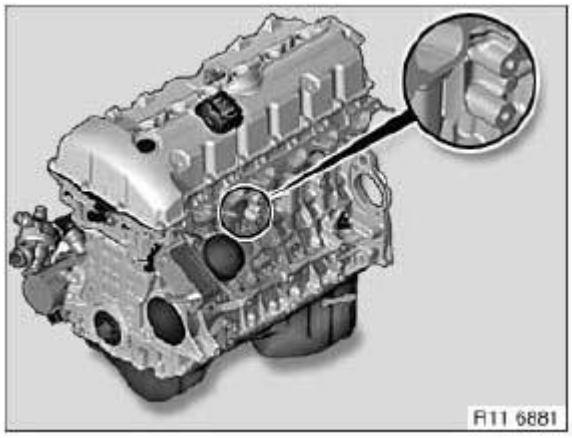



**Fig. 30: Identifying Engine Identification Label (N51 / N52 / N52K / N53 / N54)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

N62

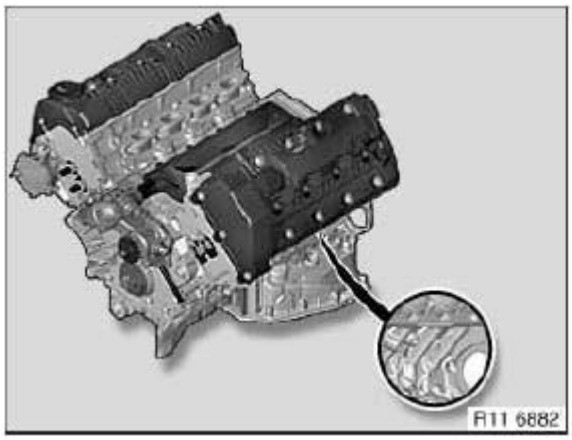



**Fig. 31: Identifying Engine Identification Label (N62)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

N73

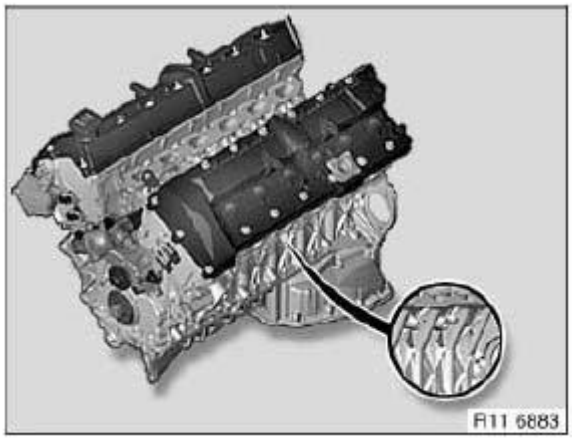



**Fig. 32: Identifying Engine Identification Label (N73)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

S54

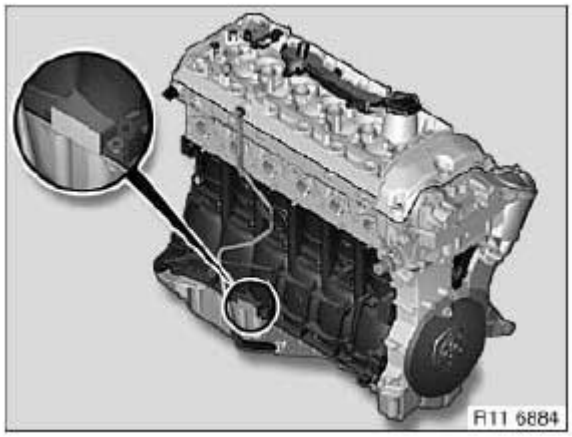



**Fig. 33: Identifying Engine Identification Label (S54)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

S85 / S65

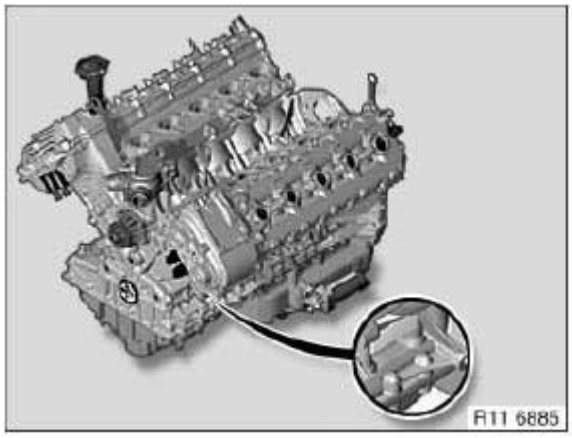



**Fig. 34: Identifying Engine Identification Label (S85 / S65)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

W10 / W11

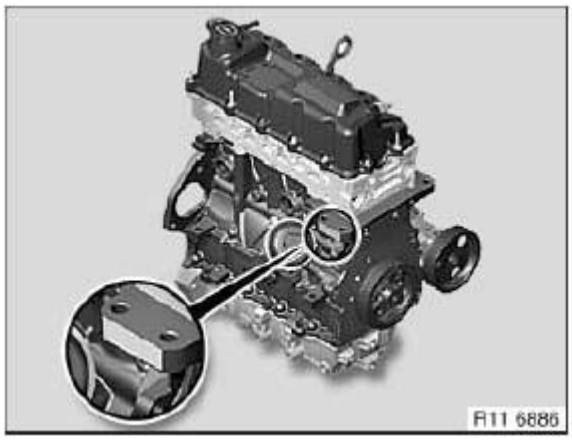



**Fig. 35: Identifying Engine Identification Label (W10 / W11)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

W17

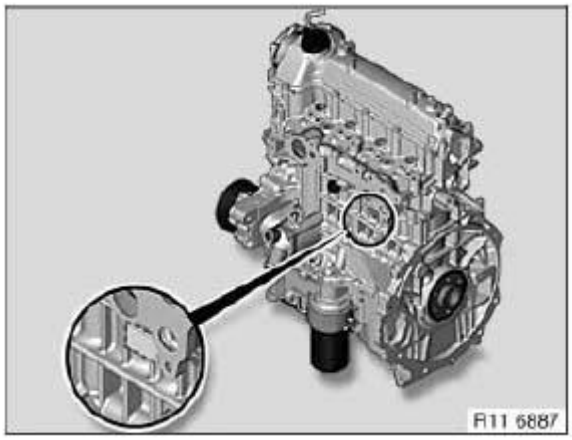



**Fig. 36: Identifying Engine Identification Label (W17)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**MOUNTING ENGINE ON ASSEMBLY STAND (S65)**

**Special tools required:**

- **00 2 300**
- **11 5 260**

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

See **ENGINE - SPECIAL TOOLS** .

*Necessary preliminary tasks:*

- Remove **engine.**
- Remove rear water pipe.

Secure special tool **11 5 260** to crankcase with bolts (2).

Tighten bolts (2) evenly.

**NOTE: Bolts (1) are not required on the S65.**

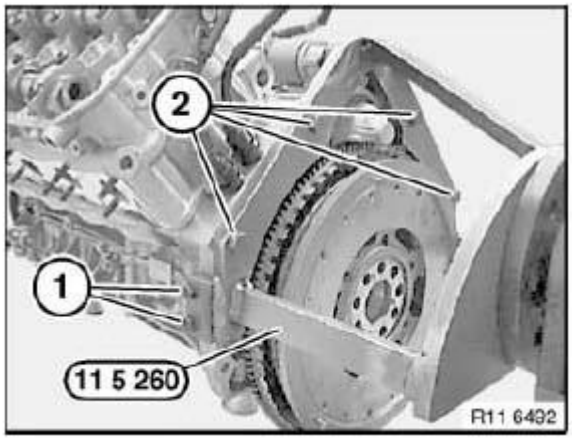



**Fig. 37: Securing Special Tool (11 5 260) To Crankcase With Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure engine with special tool **11 5 260** to special tool **00 2 300** .

**NOTE: Picture shows S85.**

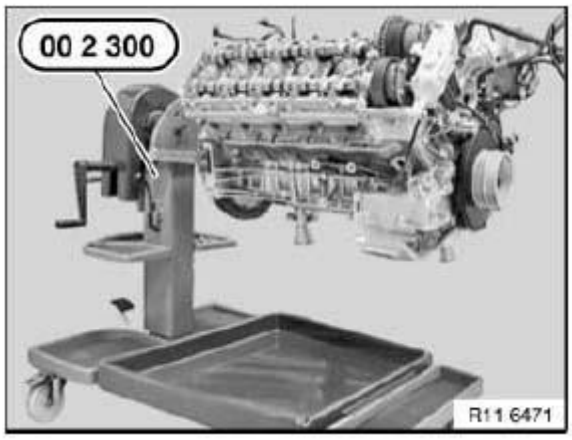



**Fig. 38: Securing Engine With Special Tool (00 2 300)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

## CYLINDER HEAD WITH COVER

### 11 12 005 REMOVING AND INSTALLING/SEALING LEFT CYLINDER HEAD COVER (S65)

**IMPORTANT: Magnesium material.**

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

A magnesium material requires aluminum screws/bolts exclusively.

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).

Scratching of the cylinder head cover is not permitted **(risk of corrosion).**

*Necessary preliminary tasks:*

- Remove **intake air manifold.**
- Remove **rod-type ignition coils.** See **12 13 512 REMOVING AND INSTALLING/REPLACING ALL IGNITION COILS (S65)** .
- Disconnect plug connection at camshaft sensors.

Release bolts along line (1).

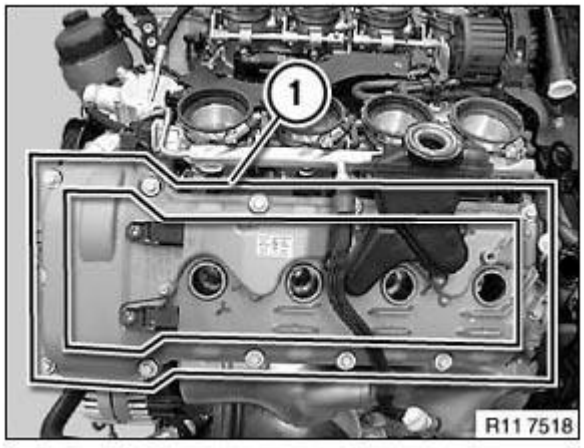



**Fig. 39: Identifying Bolts Along Line**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Replace seal (1).

Align gasket (1) on cylinder head cover groove.

Press in gasket (1) so that it is free from tension.

Release park plug tube (2).

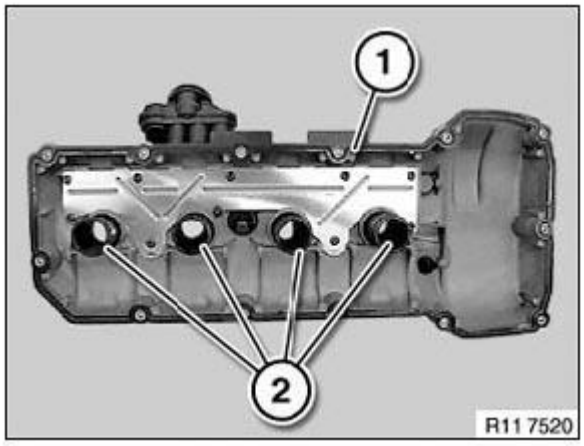



**Fig. 40: Identifying Seal And Park Plug Tube**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Check rubber on spark plug tube (2) for damage; replace spark plug tube (2) if necessary.

Apply a light coating of engine oil to spark plug tube (2) prior to installation.

*Installation:*

Clean seal residue from sealing surfaces.

Coat contact surfaces of joint (1) with Drei Bond 1209.

**NOTE: Picture shows S85.**

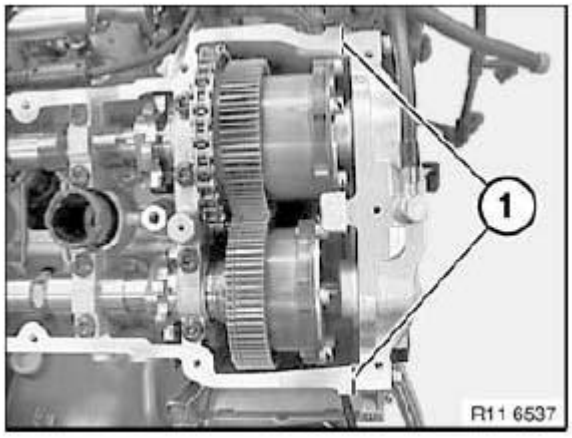



**Fig. 41: Identifying Sealing Surfaces Joint**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Check decoupling element (1) for damage and replace if necessary.

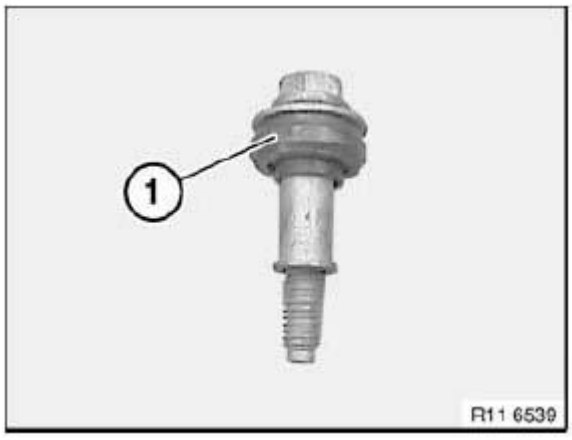



**Fig. 42: Identifying Decoupling Element**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Fit cylinder head cover.

Align spark plug tubes.

Tighten down all retaining elements diagonally from inside to outside.

Tightening torque: **11 12 8AZ** . See **CYLINDER HEAD** .

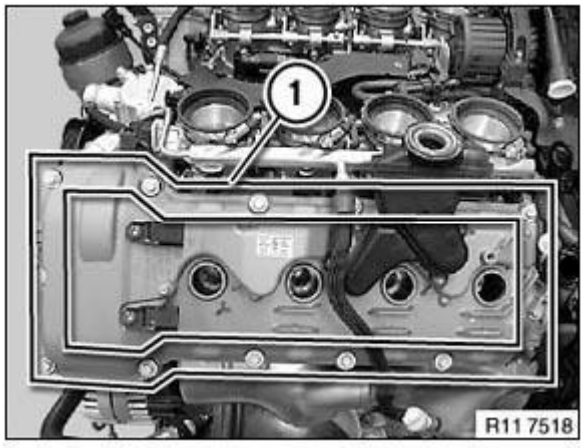



**Fig. 43: Identifying Cylinder Head Cover**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 12 006 REMOVING AND INSTALLING/SEALING RIGHT CYLINDER HEAD COVER (S65)**

**IMPORTANT: Magnesium material.**

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

A magnesium material requires aluminum screws/bolts exclusively.

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).

Scratching of the cylinder head cover is not permitted **(risk of corrosion).**

*Necessary preliminary tasks:*

- Remove **intake air manifold.**
- Remove **rod-type ignition coils.** See **12 13 512 REMOVING AND INSTALLING/REPLACING ALL IGNITION COILS (S65)** .
- Disconnect plug connection at camshaft sensors.

Release bolts along line (1).

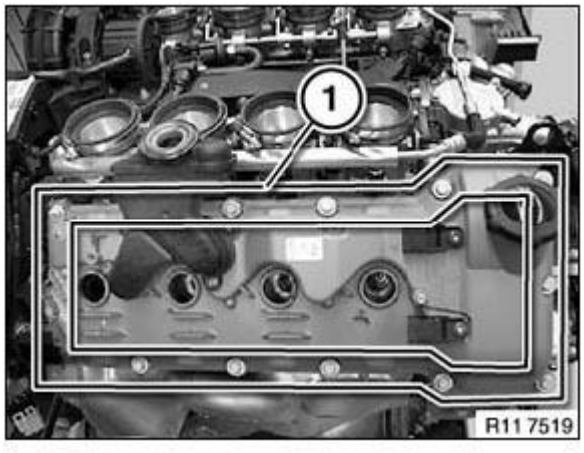



**Fig. 44: Identifying Bolts Along Line**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Replace seal (1).

Align gasket (1) on cylinder head cover groove.

Press in gasket (1) so that it is free from tension.

Release park plug tube (1).

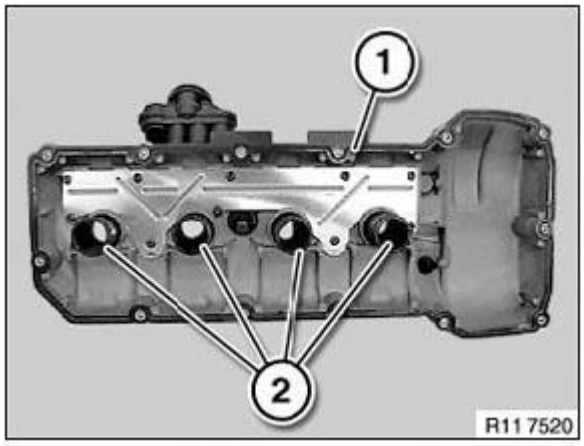



**Fig. 45: Identifying Seal And Park Plug Tube**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Check rubber on spark plug tube (2) for damage; replace spark plug tube (2) if necessary.

Apply a light coating of engine oil to spark plug tube (2) prior to installation.

*Installation:*

Clean seal residue from sealing surfaces.

Coat contact surfaces of joint (1) with Drei Bond 1209.

**NOTE: Picture shows S85.**

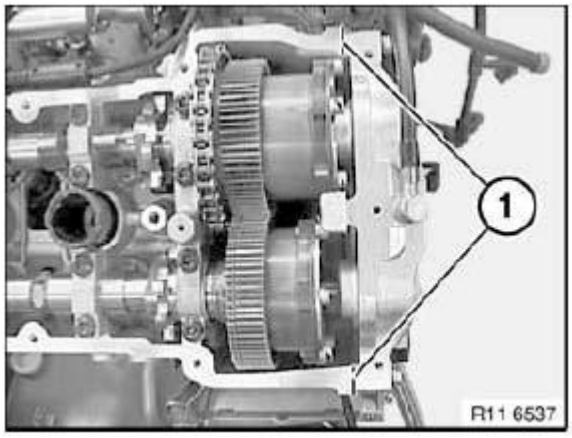



**Fig. 46: Identifying Sealing Surfaces Joint**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Check decoupling element (1) for damage and replace if necessary.

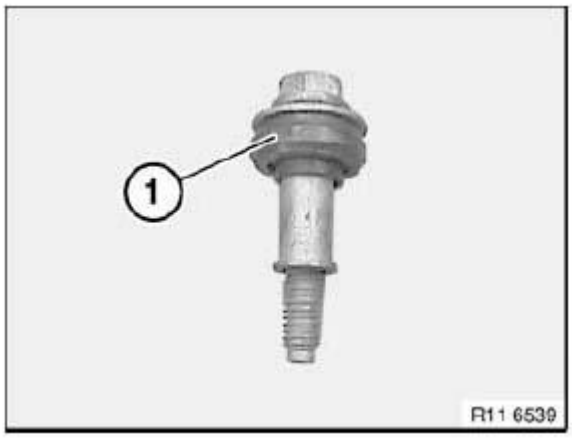



**Fig. 47: Identifying Decoupling Element**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Fit cylinder head cover.

Align spark plug tubes.

Tighten down all retaining elements diagonally from inside to outside.

Tightening torque: **11 12 8AZ** . See **CYLINDER HEAD** .

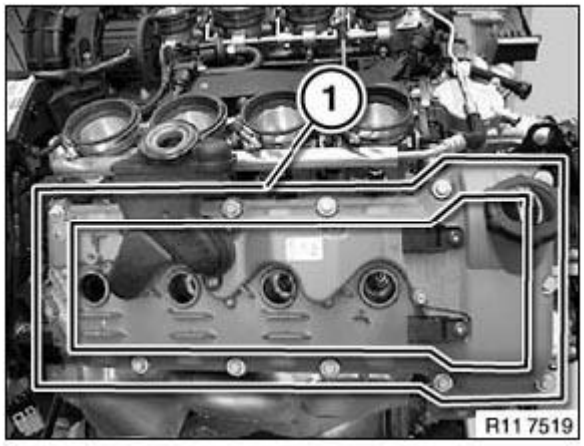



**Fig. 48: Identifying Cylinder Head Cover**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 12 105 REMOVING AND INSTALLING LEFT CYLINDER HEAD (S65)**

**Special tools required:**

- **11 2 250**

See **ENGINE - SPECIAL TOOLS** .

*Necessary preliminary tasks:*

- Remove **exhaust system.** See **18 00 018 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (S65)** .
- Remove left **exhaust manifold.** See **18 40 010 REMOVING AND INSTALLING/REPLACING LEFT EXHAUST MANIFOLD (S65)** .
- Remove left **cylinder head cover**
- Remove **left inlet camshaft.**
- Remove left **exhaust camshaft.**
- Partially unfasten **engine wiring harness** and lay to one side. See **12 51 001 REPLACING WIRING HARNESS SECTION FOR ENGINE (S65)** .
- Remove **throttle valves** from cylinders 5 to 8. See **13 54 045 REMOVING AND INSTALLING/SEALING A THROTTLE VALVE ASSEMBLY (S65)** .
- Remove **thermostat housing.**
- Remove rear water pipe from cylinder head.

Release screws (1).

Remove water fitting (2).

*Installation:*

Replace seal.

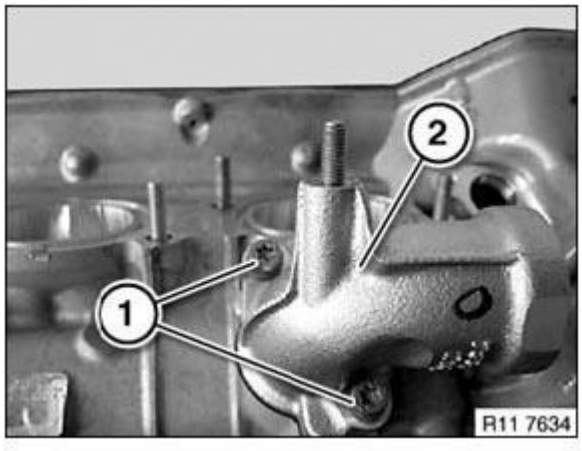



**Fig. 49: Identifying Water Fitting And Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (1).

**IMPORTANT: Screws (1) can fall into the chain drive. Risk of damage to the timing chain.**

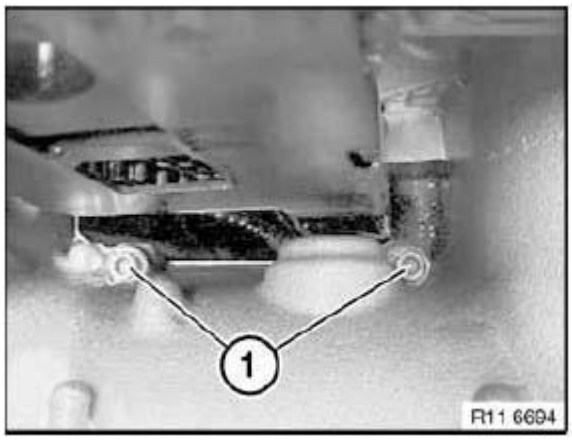



**Fig. 50: Identifying Cylinder Head Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove screw (1) with a magnet from gearcase.

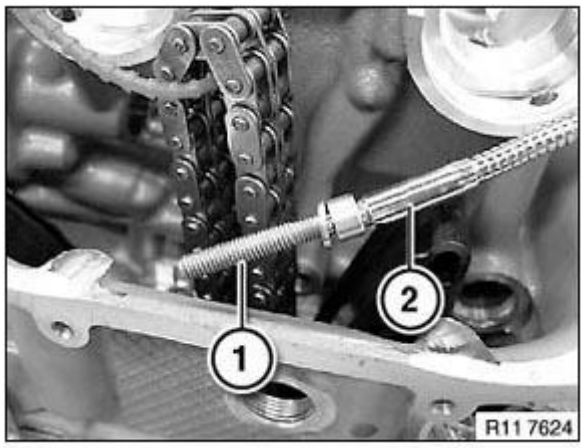



**Fig. 51: Identifying Screw And Gearcase**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release cylinder head bolt (1) with special tool **11 2 250** .

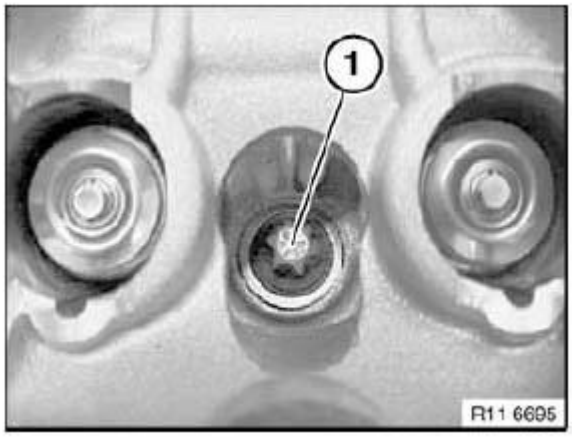



**Fig. 52: Identifying Cylinder Head Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release cylinder head bolts from outside to inside in sequence (10 to 1).

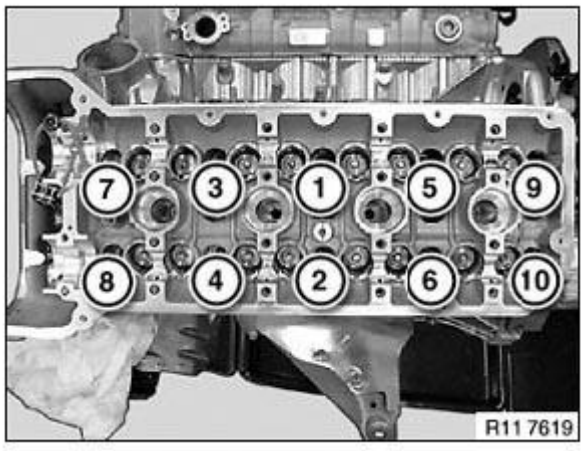



**Fig. 53: Identifying Cylinder Head Bolts Tightening Sequence**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Replace cylinder head gasket.**
**Check cylinder head for water leaks.**

*Installation:*

Fit new cylinder head screws.

Tighten down cylinder head bolts from inside to outside in sequence (1 to 10).

Tightening torque: **11 12 1AZ** . See **CYLINDER HEAD** .

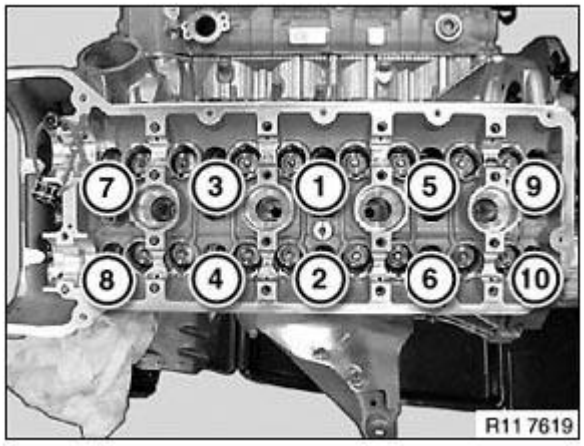



**Fig. 54: Identifying Cylinder Head Bolts Tightening Sequence**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert bolts (1).

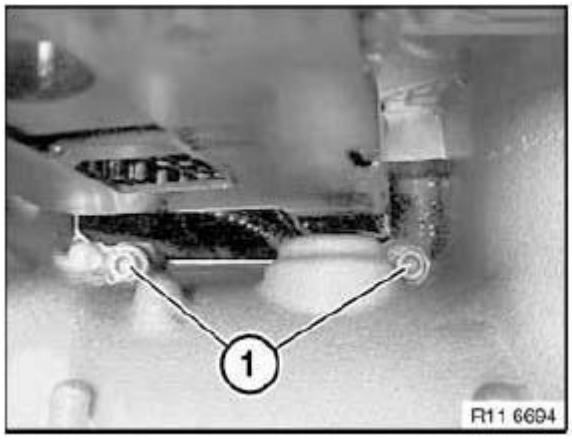



**Fig. 55: Identifying Cylinder Head Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 12 106 REMOVING AND INSTALLING RIGHT CYLINDER HEAD (S65)**

**Special tools required:**

- **11 2 250**
- **11 5 290**

See **ENGINE - SPECIAL TOOLS** .

*Necessary preliminary tasks:*

- Remove **exhaust system.** See **18 00 018 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (S65)** .
- Remove right **exhaust manifold.** See **18 40 010 REMOVING AND INSTALLING/REPLACING LEFT EXHAUST MANIFOLD (S65)** .
- Remove right **cylinder head cover.**
- Remove right **inlet camshaft.**
- Remove right **exhaust camshaft.**
- Partially unfasten **engine wiring harness** and lay to one side. See **12 51 001 REPLACING WIRING HARNESS SECTION FOR ENGINE (S65)** .
- Remove **throttle valves** from cylinders 1 to 4. See **13 54 045 REMOVING AND INSTALLING/SEALING A THROTTLE VALVE ASSEMBLY (S65)** .
- Remove **thermostat housing.**
- Remove rear water pipe from cylinder head.

Release screws (1).

Remove coolant fitting (2).

*Installation:*

Replace seal.

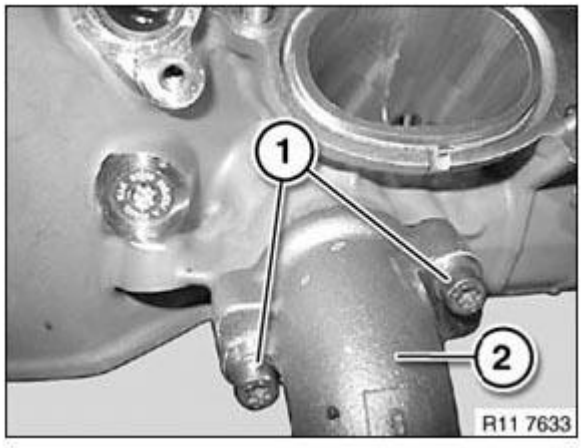



**Fig. 56: Identifying Coolant Fitting And Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screw (1).

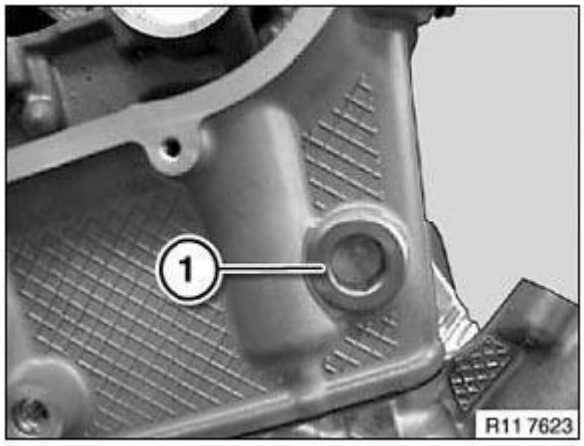



**Fig. 57: Identifying Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove bearing pin (1) with special tool **11 5 290** .

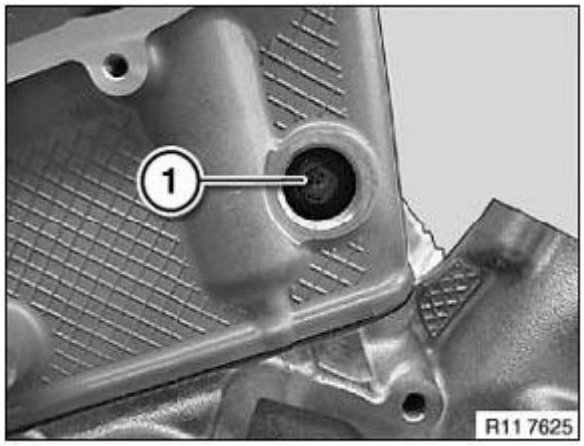



**Fig. 58: Identifying Bearing Pin**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (1).

**IMPORTANT: Screws (1) can fall into the chain drive. Risk of damage to the timing chain.**

Remove screw (1) with a magnet (2) from gearcase.

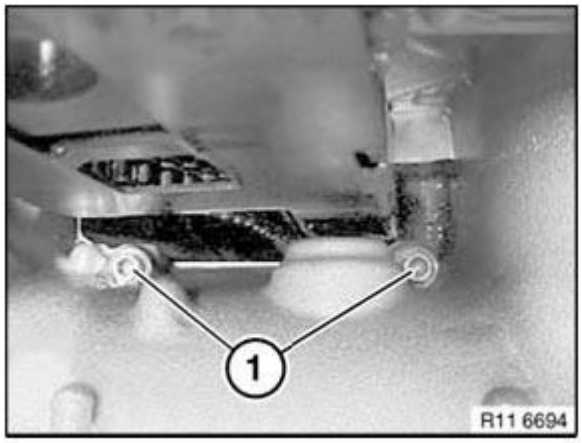



**Fig. 59: Identifying Screw And Gearcase**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release cylinder head bolt (1) with special tool **11 2 250** .

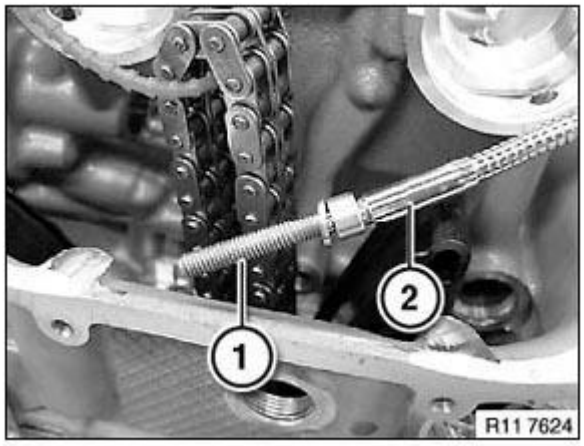



**Fig. 60: Identifying Cylinder Head Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release cylinder head bolts from outside to inside in sequence (10 to 1).

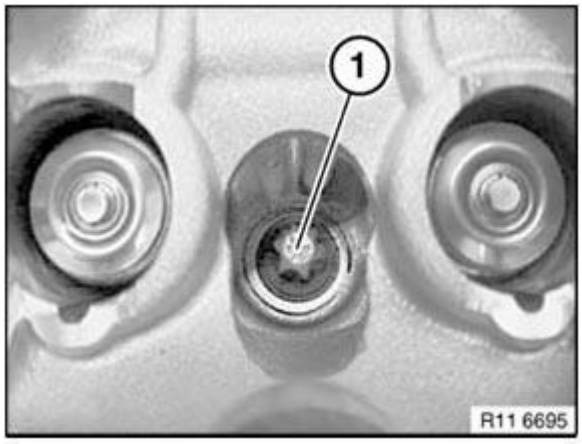



**Fig. 61: Identifying Cylinder Head Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

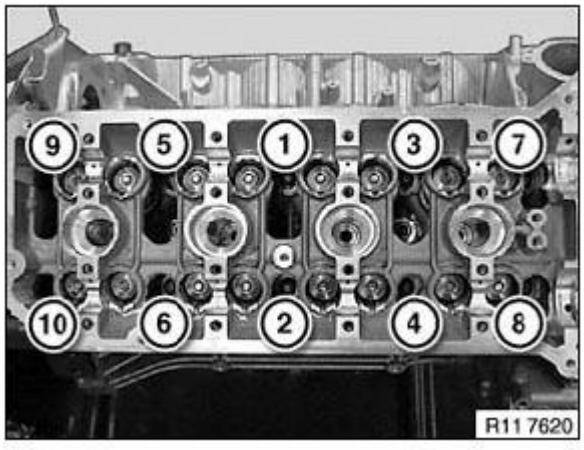



**Fig. 62: Identifying Cylinder Head Bolts Tightening Sequence**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Replace cylinder head gasket.**
**Check cylinder head for water leaks.**

*Installation:*

Fit new cylinder head screws.

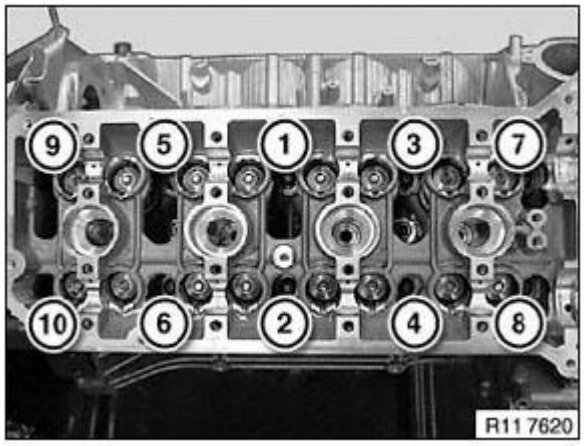



**Fig. 63: Identifying Cylinder Head Bolts Tightening Sequence**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Tighten down cylinder head bolts from inside to outside in sequence (1 to 10).

Tightening torque: **11 12 1AZ** . See **CYLINDER HEAD** .

Insert bolts (1).

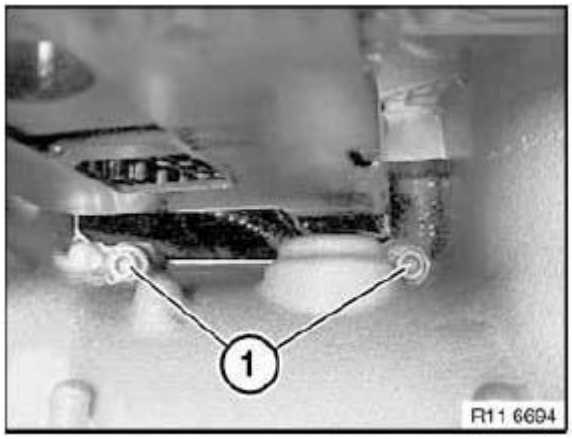



**Fig. 64: Identifying Cylinder Head Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 12 112 REPLACING BOTH CYLINDER HEAD GASKETS (S65)**

**Special tools required:**

- 11 4 470

See **ENGINE - SPECIAL TOOLS** .

*Necessary preliminary tasks:*

- Remove left cylinder head.
- Remove right cylinder head.
- Check cylinder head for leaks.

**IMPORTANT: Do not open screw plugs.**
**The screw plug must always be replaced if it is opened by mistake.**

*Installation:*

Make sure oil bore (1) is clean.

**NOTE: Picture shows S85.**

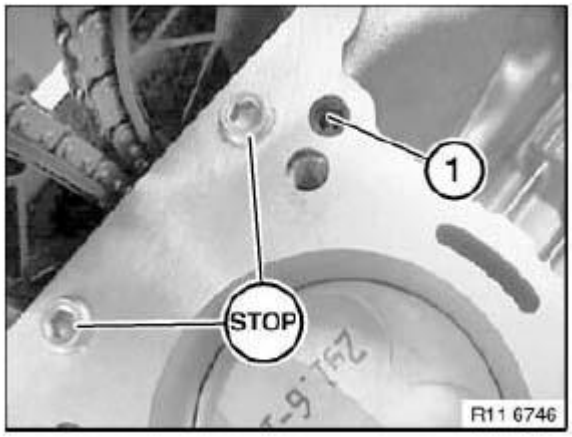



**Fig. 65: Identifying Oil Bore**
**Courtesy of BMW OF NORTH AMERICA, INC.**

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

Clean sealing faces with special tool 11 4 470.

Do not use any metal-cutting tools.

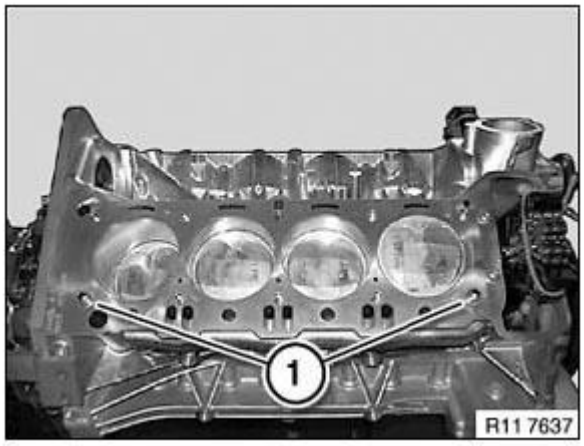



**Fig. 66: Identifying Dowel Sleeves**
**Courtesy of BMW OF NORTH AMERICA, INC.**

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

Clean sealing faces with special tool 11 4 470.

Do not use any metal-cutting tools.

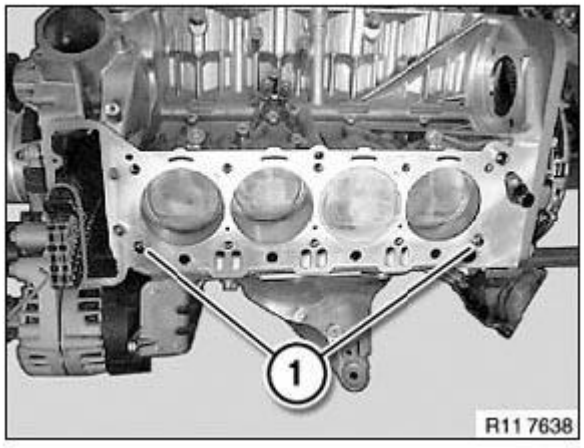



**Fig. 67: Identifying Dowel Sleeves**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove spacer sleeves (1) in direction of arrow.

**NOTE: Picture show cylinder bank 2. Procedure for cylinder bank 1 is identical.**

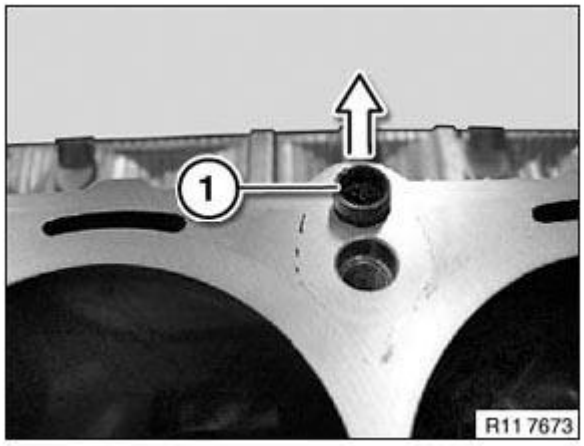



**Fig. 68: Removing Spacer Sleeves**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove non-return valves (1) in direction of arrow.

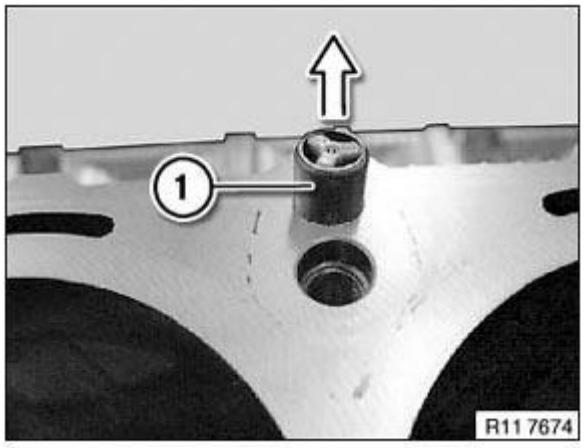



**Fig. 69: Removing Non-Return Valves**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Replace spacer sleeves (1) and non-return valves (2).

Note installation direction of non-return valves (2).

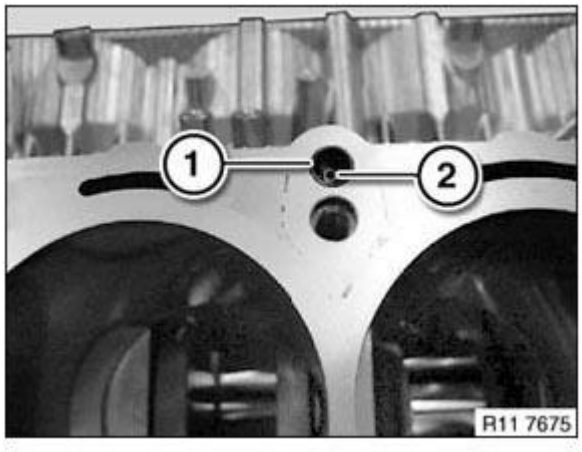



**Fig. 70: Identifying Spacer Sleeves And Non-Return Valves**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Replace head gasket (1) for cylinders 1-4.

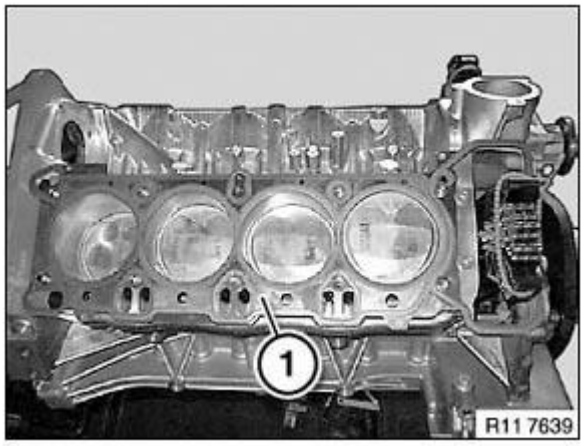



**Fig. 71: Identifying Cylinders 1-4 Head Gasket**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Replace head gasket (1) for cylinders 5-8.

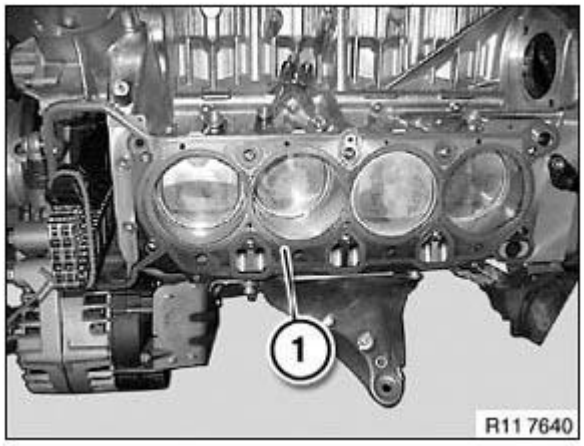



**Fig. 72: Identifying Cylinders 5-8 Head Gasket**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: There is no oversize gasket for the S65 engine.**

Assemble engine.

**11 12 729 CHECKING CYLINDER HEAD FOR WATERTIGHTNESS (S65)**

**Special tools required:**

- **11 5 230**
- **11 5 231**
- **11 5 235**
- **11 5 237**
- **11 9 961**

See **ENGINE - SPECIAL TOOLS** .

**NOTE: Special tool 11 5 230 can be used for both cylinder heads.**

*Necessary preliminary tasks:*

- Remove **left cylinder head** or **11 12 106 Removing and installing right cylinder head (S65).**
- Disassemble **cylinder head.**

Secure special tool **11 5 231** with old cylinder head bolts.

Secure special tool **11 5 235** with special tool **11 5 237** .

**NOTE: Picture shows S85.**

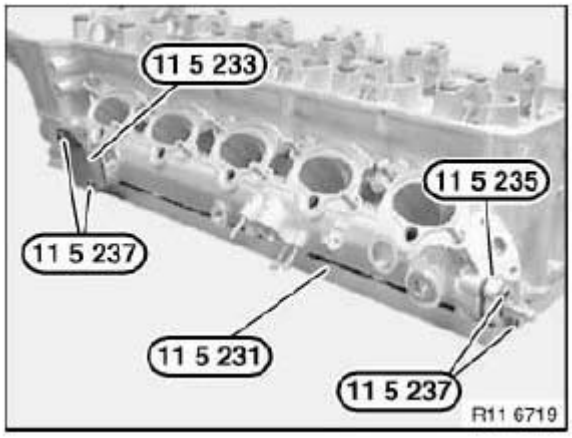



**Fig. 73: Identifying Special Tools (11 5 231), (11 5 235) And (11 5 233)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure special tool 11 9 961 with special tool **11 5 237** to 10 Nm.

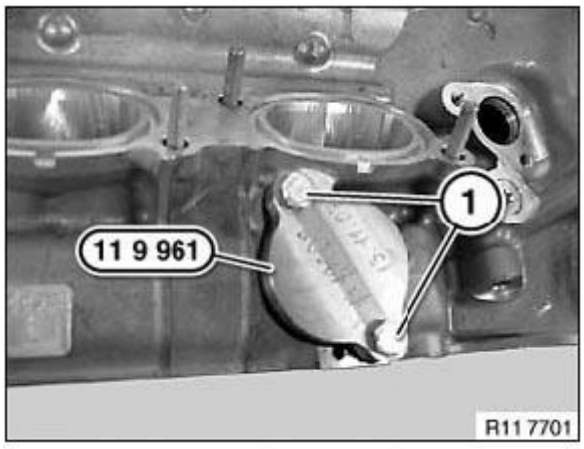



**Fig. 74: Identifying Special Tool 11 9 961 And Cylinder Head Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Immerse cylinder head in a water bath.**
**Test pressure: 4.5 bar.**
**Check cylinder head for escaping air (cracks).**
**If necessary, add cleaning agent to water bath.**

Assemble engine.

## OIL SUMP

### 11 13 000 REMOVING AND INSTALLING OR REPLACING OIL SUMP (S65)

*Recycling:*

Catch and dispose of used oil in a suitable container.

Observe country-specific waste-disposal regulations.

*Necessary preliminary tasks:*

- Drain **engine oil.**
- Secure **engine in installation position.**
- Lower **front axle.** See **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (M3, UNIVERSAL LIFTER)** .
- Remove **ribbed V-belt.**
- Release 4x transmission bolts.

Release screws (1).

Take off holder (2).

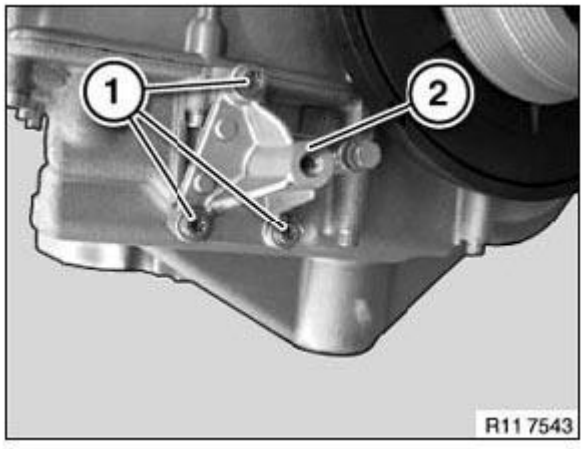
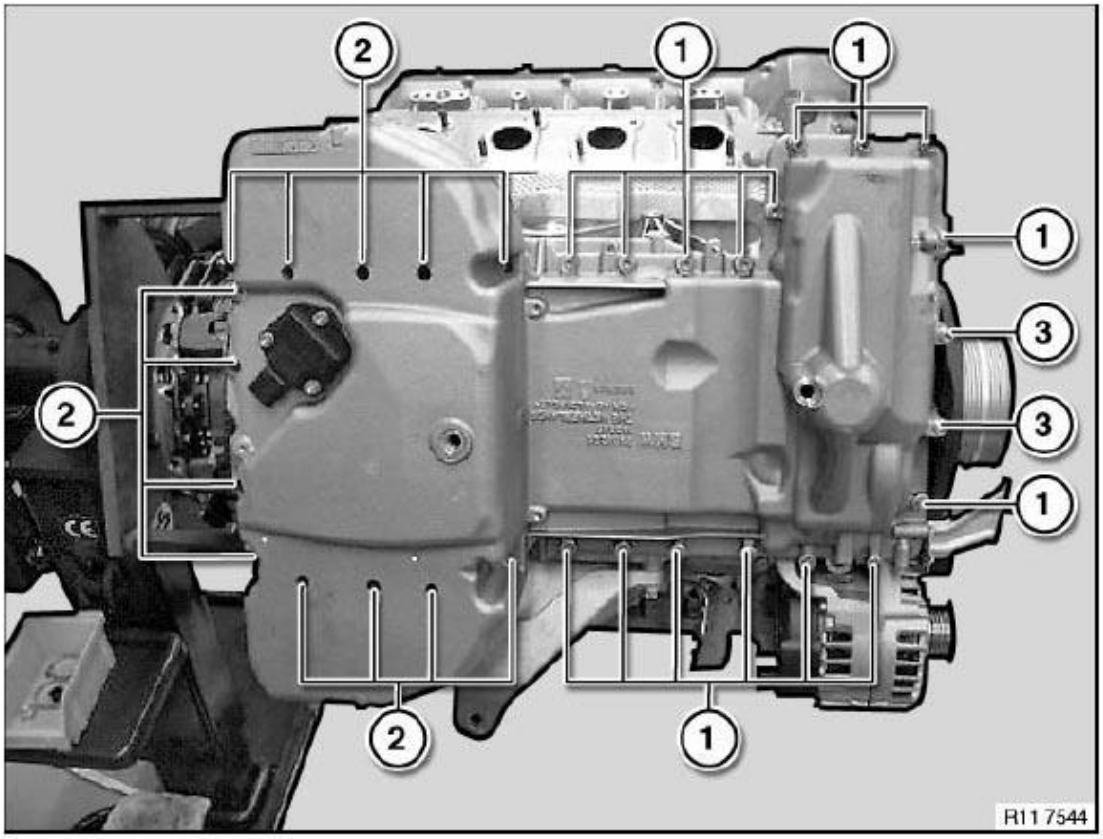



**Fig. 75: Identifying Screws And Holder**
**Courtesy of BMW OF NORTH AMERICA, INC.**




Overview of oil sump screw/bolt connections

1 Torx bolt M6x30 (16 x)
2 Torx bolt M6x50 (12 x)
3 Torx bolt M6x75 (2 x)

**Fig. 76: Overview Of Oil Sump Screw/Bolt Connections**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Overview of oil sump screw/bolt connections

1. Torx bolt M6x30 (16 x)
2. Torx bolt M6x50 (12 x)
3. Torx bolt M6x75 (2 x)

Tightening torque. **11 13 2AZ** . See **OIL SUMP** .

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

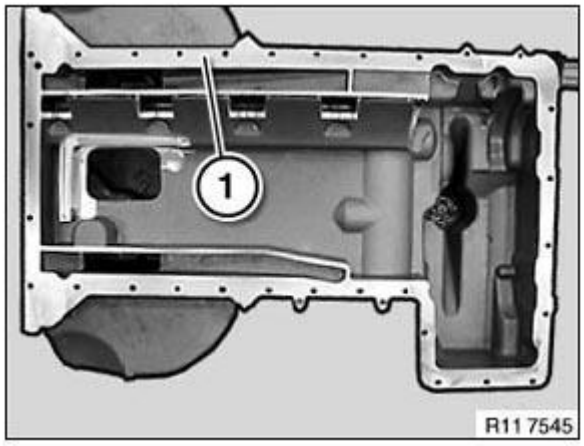



**Fig. 77: Identifying Sealing Faces**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Replace oil sump gasket (1).

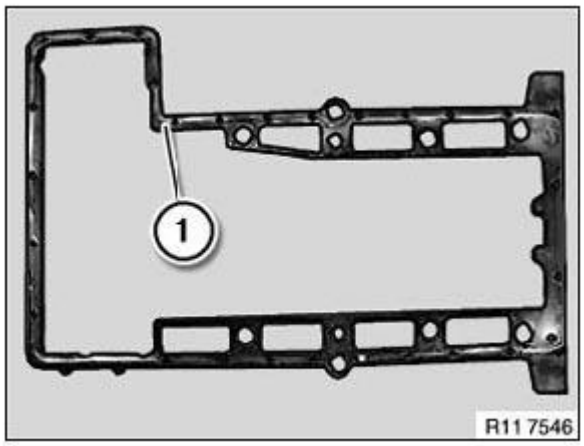



**Fig. 78: Identifying Oil Sump Gasket**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

## HOUSING COVER

### 11 14 005 REPLACING FRONT CRANKSHAFT SEAL (S65)

**Special tools required:**

- **11 2 386**
- **11 5 331**

- **11 5 332**
- **11 5 333**
- **11 6 360**
- **11 7 231**

See **ENGINE - SPECIAL TOOLS** .

*Necessary preliminary tasks:*

- Remove **fan cowl** with electric fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (S65)** .
- Remove **radiator.** See **17 11 000 REMOVING AND INSTALLING RADIATOR (N51, S65)** .
- Remove **vibration damper.**

Lay special tool **11 2 386** on crankshaft.

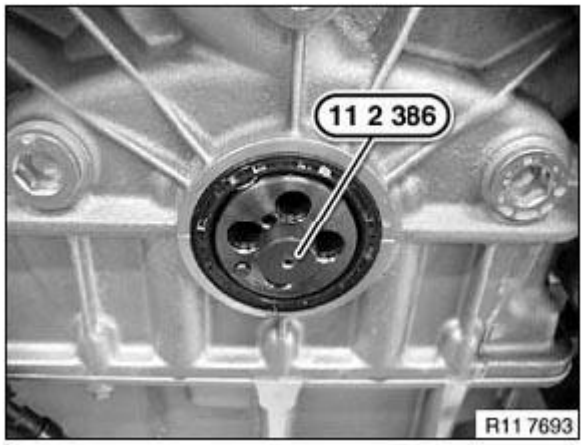



**Fig. 79: Identifying Special Tool (11 2 386) On Crankshaft**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Screw special tool **11 6 360** to 80 Nm into radial seal.

Release radial seal from housing.

Repeat the operation several times if necessary.

**NOTE: Carefully saw open old radial shaft seal with an iron saw from special tool 11 6 360 .**

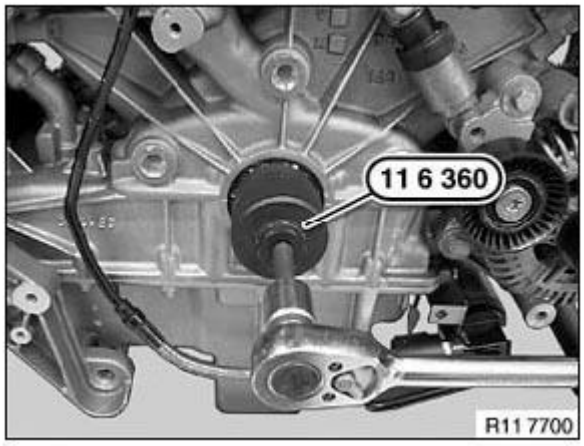



**Fig. 80: Screwing Special Tool (11 6 360) Into Radial Seal**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove remnants of sealant from sealant outlet (1) on left and right.

Apply Drei Bond sealant to sealant outlet (1) on left and right.

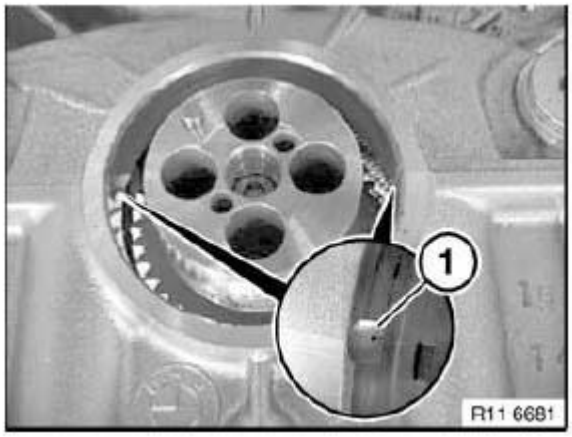



**Fig. 81: Identifying Sealant Outlet On Left And Right**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure special tool **11 5 331** with bolts (1).

**IMPORTANT: Pay attention to dowel pin.**

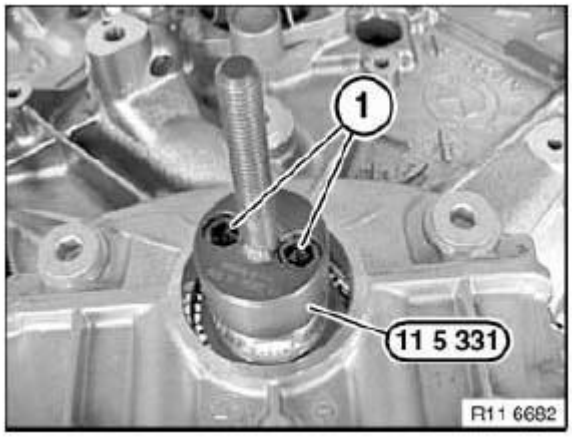



**Fig. 82: Securing Special Tool (11 5 331) With Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Push special tool **11 7 231** onto special tool **11 5 331** in direction of arrow.

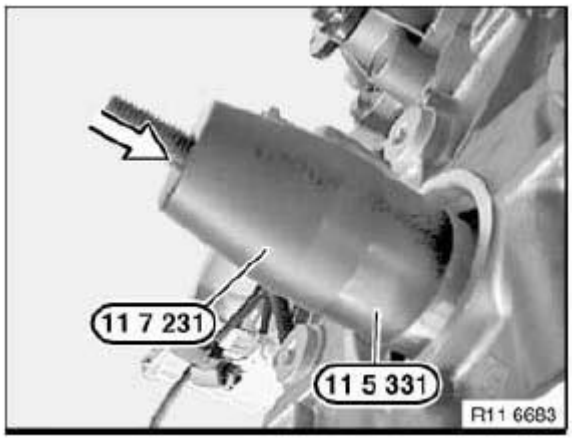



**Fig. 83: Pushing Special Tool (11 7 231) Onto Special Tool (11 5 331)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Remove support ring from shaft seal.

Push shaft seal (1) uniformly by way of fitting aid **11 7 231** onto special tool **11 5 331** .

Position shaft seal approx. 5 mm before crankcase.

Remove special tool **11 7 231** .

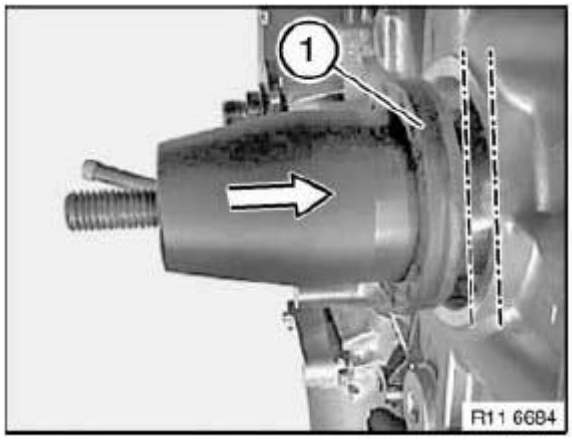



**Fig. 84: Pushing Shaft Seal (11 7 231) Onto Special Tool (11 5 331)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Press in shaft seal (1) with special tools **11 5 332** and **11 5 333** .

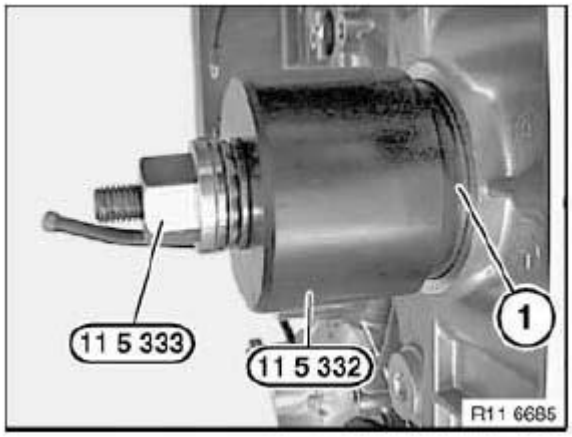



**Fig. 85: Pressing Shaft Seal With Special Tools (11 5 332) And (11 5 333)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

Setting time of shaft seal approx. 1 hour.

**Correct** engine oil level if necessary.

**11 14 151 REPLACING CRANKSHAFT SEAL (S65)**

**Special tools required:**

- **11 5 311**
- **11 5 312**
- **11 5 313**

- **23 0 490**

See **ENGINE - SPECIAL TOOLS** .

See **MANUAL TRANSMISSION - SPECIAL TOOLS** .

*Necessary preliminary tasks:*

- Remove **transmission.** See **23 00 018 REMOVING AND INSTALLING TRANSMISSION (GS6-53BZ) (S65)** .
- Remove **clutch.** See **21 21 500 REMOVING AND INSTALLING/REPLACING CLUTCH (GS6-53BZ) S65** .
- Remove **flywheel.** .

Drill a 3 mm hole into shaft seal.

**IMPORTANT: Risk of damage! Remove chips/shavings immediately.**

Screw in special tool **23 0 490** .

Drive out radial shaft seal with impact weight.

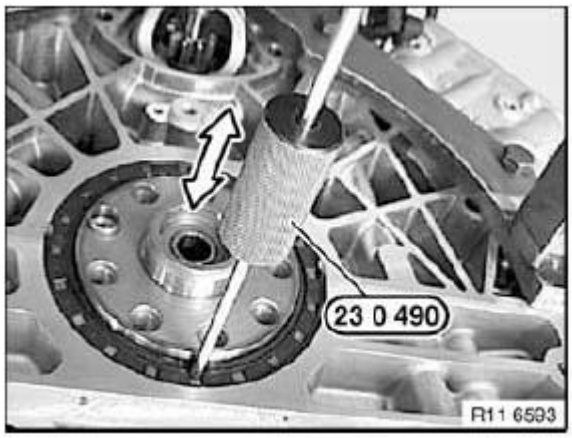



**Fig. 86: Drilling Hole Into Shaft Seal**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Risk of damage! Remove chips/shavings immediately.**

Remove remnants of sealant from sealant outlet (1) on left and right.

Apply Drei Bond sealant 1209 to sealant outlet (1) on left and right.

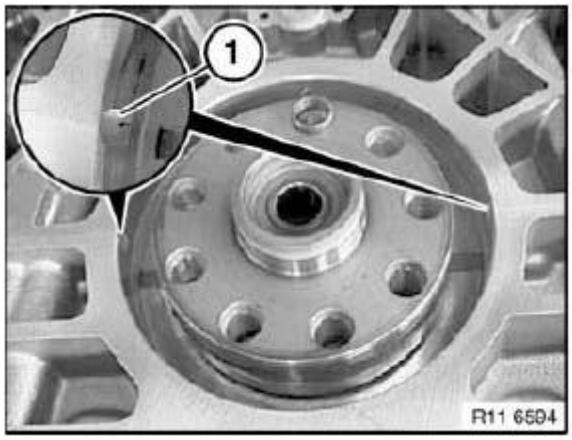



**Fig. 87: Identifying Sealant Outlet**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Pay attention to adapter sleeve.**
**Special tool 11 5 311 must rest flat on crankshaft (pay attention to adapter sleeve).**

Mount special tool **11 5 311** with bolts (1).

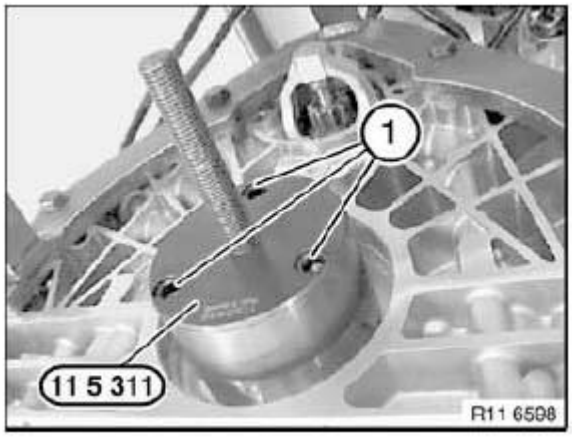



**Fig. 88: Identifying Special Tool (11 5 311) On Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position support ring (1) with shaft seal (2) on special tool **11 5 311** .

Push shaft seal (2) uniformly in direction of arrow over support ring onto special tool **11 5 311** .

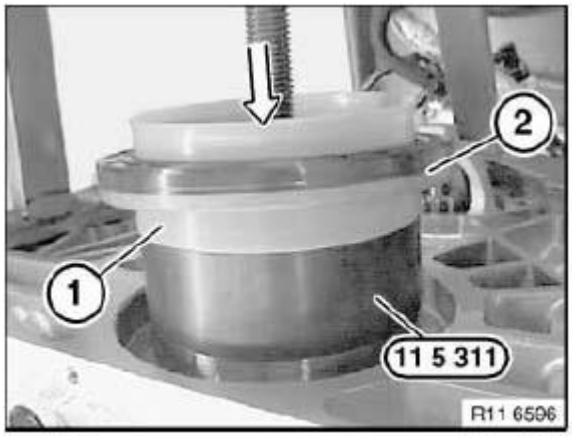



**Fig. 89: Pushing Shaft Seal Over Support Ring Onto Special Tool (11 5 311)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position shaft seal (1) approx. 5 mm before crankcase.

Remove support ring (2).

**NOTE: Support ring (2) is no longer needed.**

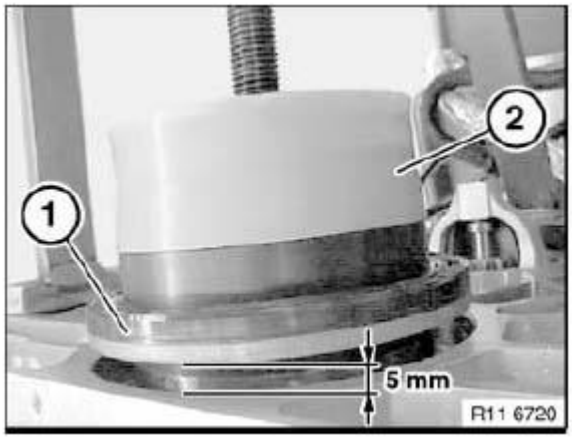



**Fig. 90: Identifying Shaft Seal And Support Ring**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Press in shaft seal (1) with special tools **11 5 312** and **11 5 313** .

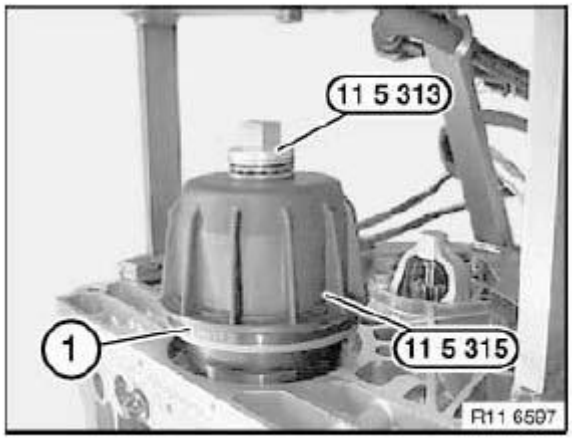



**Fig. 91: Identifying Shaft Seal And Special Tools (11 5 312) And (11 5 313)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

Settling time of radial shaft seal approx. 1 hour.

Correct **engine oil level** if necessary.

## CRANKSHAFT WITH BEARING

### 11 21 500 REPLACING CRANKSHAFT (S65)

**Special tools required:**

- **00 9 120**
- **00 9 130**
- **11 4 370**
- 11 4 470
- **11 9 360**

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

See **ENGINE - SPECIAL TOOLS** .

**IMPORTANT: Unscrew all M9 fit bolts first before releasing the crankshaft lower section.
Altered settling behavior at the crankcase!
If the main bearing channel is opened after engine operation, all main bearing shells must be replaced with special repair bearing shells marked with an (R).
There are two different groups of main bearing shells.**

*Necessary preliminary tasks:*

- Remove **engine.**
- Mount engine on **assembly stand.**
- Remove **flywheel.**
- Remove **vibration damper.**
- Removing **oil sump.**
- Remove **engine oil pump.**
- Remove **oil return pump.**
- Remove **cylinder head** on **left** and **right**.
- Remove all **pistons.**
- Remove both **timing chains.**

Release screws (1).

Remove holder for oil intake pipe.

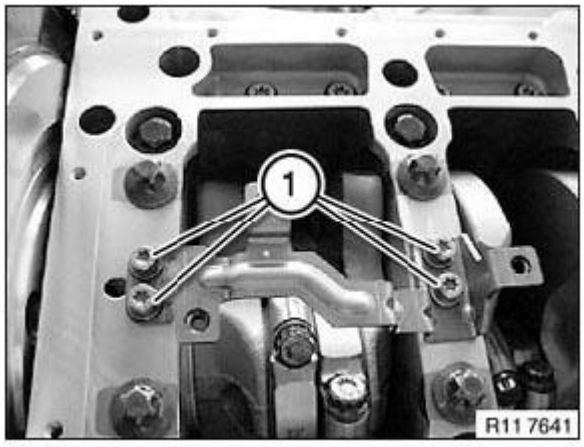



**Fig. 92: Identifying Oil Intake Pipe Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Unscrew all M9 fit bolts (2) first before releasing the crankshaft lower section - risk of damage!**

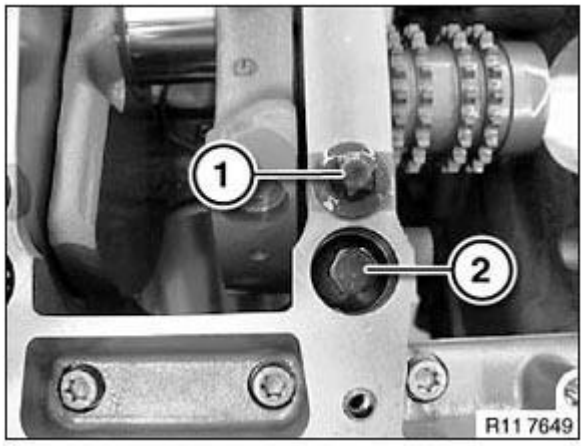



**Fig. 93: Identifying Bearing Seat Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Bearing seat bolts (1) M11.

**IMPORTANT: Release all M9 fit bolts and remove.**

Release fit bolts (M9) in sequence 1-10 and remove.

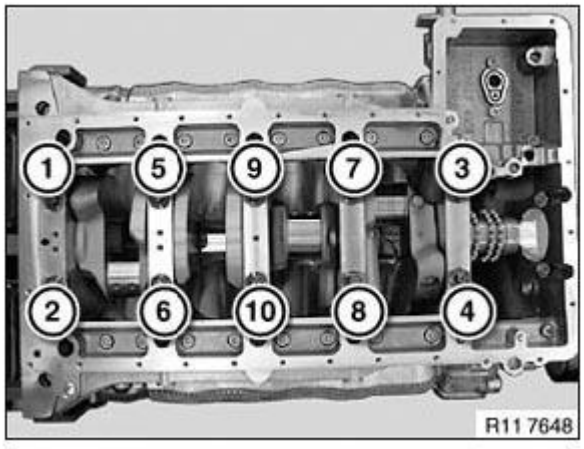



**Fig. 94: Identifying Fit Bolts (M9) Tightening Sequence**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release M11 bearing seat bolts in sequence 1-10.

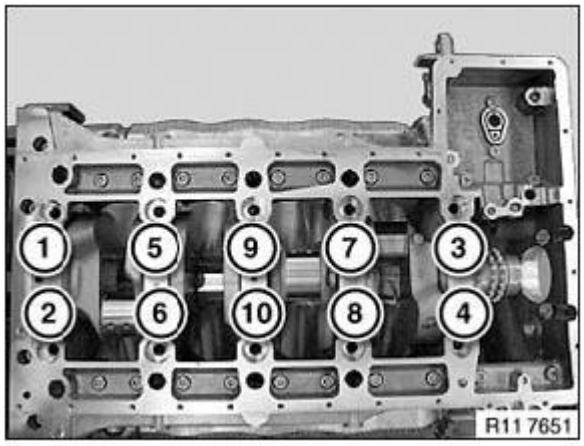



**Fig. 95: Identifying M11 Bearing Seat Bolts Tightening Sequence**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (3).

Unfasten screws (2).

Bolts (1) from inside outwards.

Remove bedplate upwards.

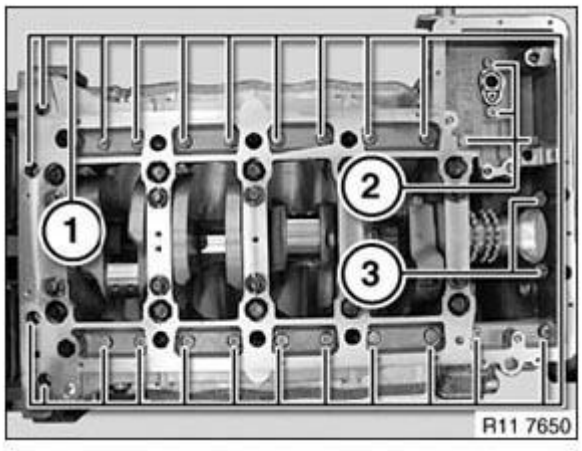



**Fig. 96: Identifying Bedplate Bolts And Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Lever out crankshaft (1) with aid of a second person in direction of arrow.

**NOTE: Weight of crankshaft approx. 22 kg.**
**Picture shows S85.**

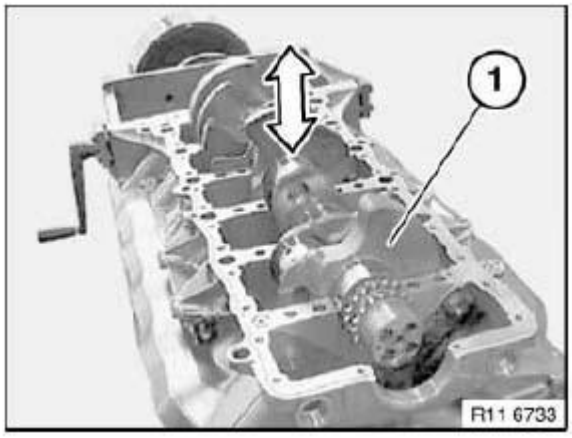



**Fig. 97: Removing Crankshaft**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: If the bedplate is opened and closed again, fit special main bearing shells marked with (R) on the bearing backs.**

Replace all bearing shells (2).

Replace guide bearing (3).

*Installation:*

Clean sealing face (1) with special tool 11 4 470.

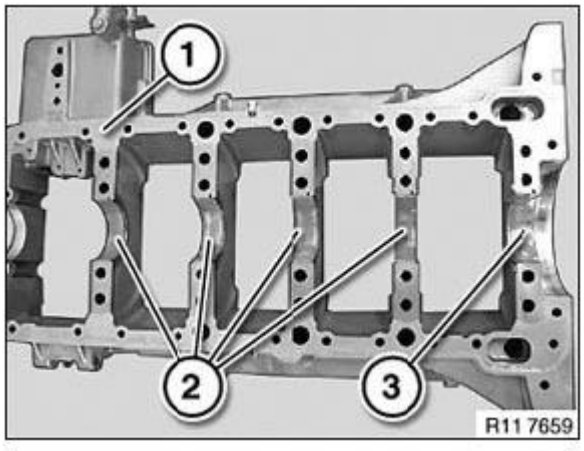



**Fig. 98: Identifying Bearing Shells And Guide Bearing**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove sealing compound from joint (1).

Carefully clean threads and contact faces in upper and lower sections of crankcase.

*Installation:*

Replace nozzles (2).

Clean sealing face (1) with special tool 11 4 470.

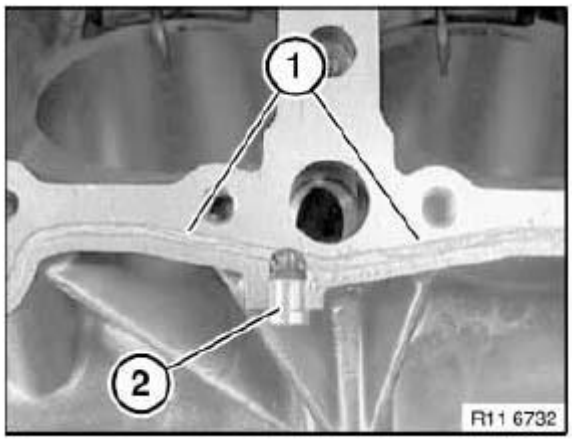



**Fig. 99: Identifying Sealing Face And Nozzles**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Replace main bearing shells.

Apply a light coating of engine oil to bearing shells.

Lay crankshaft (1) with a second person helping in direction of arrow into crankcase.

**NOTE: Weight of crankshaft approx. 22 kg.**
**Picture shows S85.**

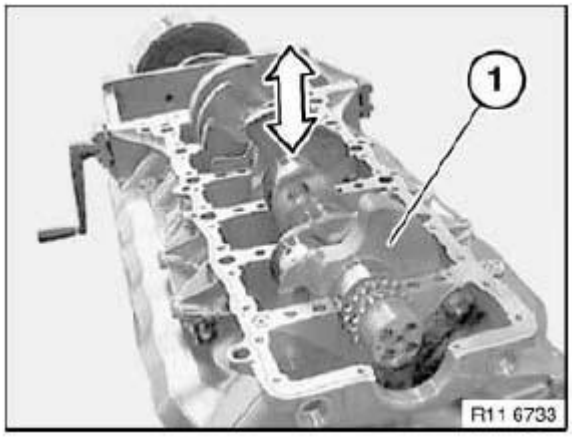



**Fig. 100: Removing Crankshaft**

**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert seal (1).

**IMPORTANT: Make sure oil bore is clean.**

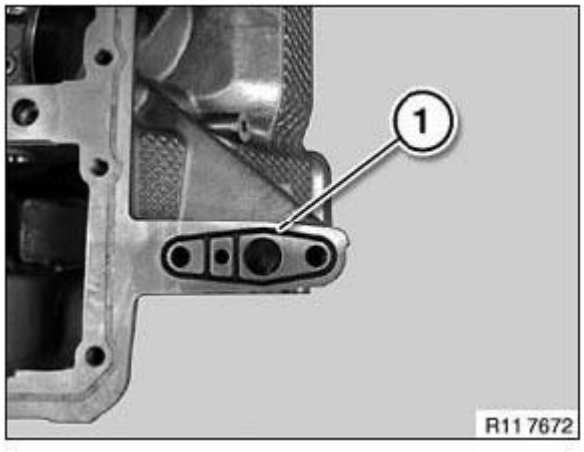



**Fig. 101: Identifying Seal**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Adhere without fail to the specified sequence of bedplate bolt connections.**
**Risk of damage to crankshaft.**
**Leaks at bedplate/crankcase.**

**IMPORTANT: There are no more dowel sleeves in the crankcase.**
**Do not use new bolts.**
**If new bolts are used, observe special tightening/torque specifications.**

Position bedplate on crankcase.

Position lower section diagonally on bearing seats (1 and 5) using two fit bolts (1 and 2).

Join fit bolts (1 and 2) to **8 Nm.**

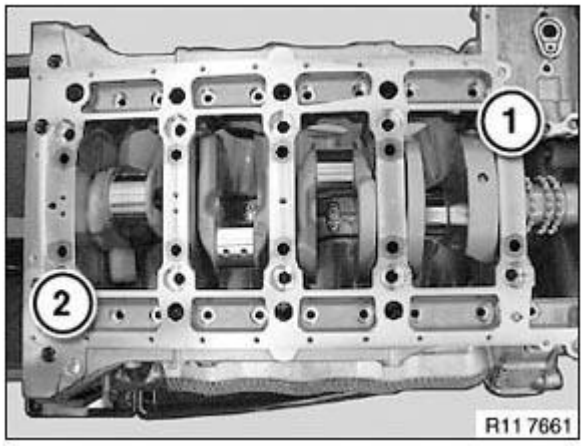



**Fig. 102: Identifying Dowel Sleeves And Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert fit bolts (1-8).

Join fit bolts (1-8) to **8 Nm.**

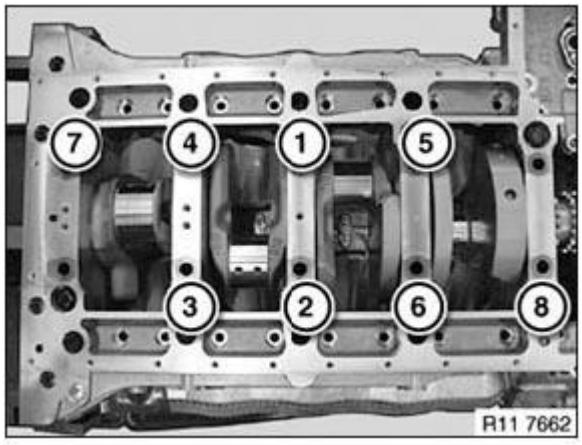



**Fig. 103: Identifying Fit Bolts Tightening Sequence (1-8)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert all M11 bolts (1).

Joint bearing seat bolts in sequence (1-10) to **30 Nm.**

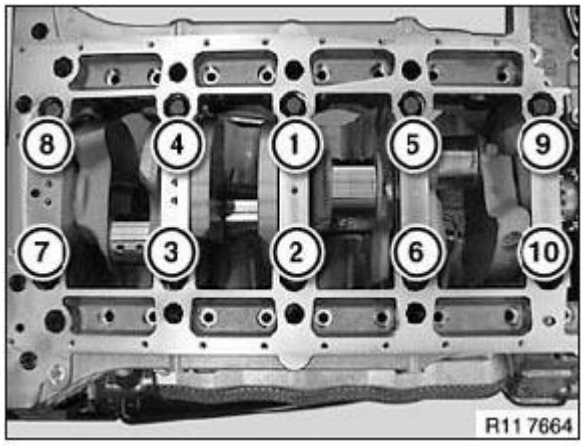



**Fig. 104: Identifying Joint Bearing Seat Bolts Tightening Sequence**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Mark all M11 bearing seat bolts with a colored line (1).

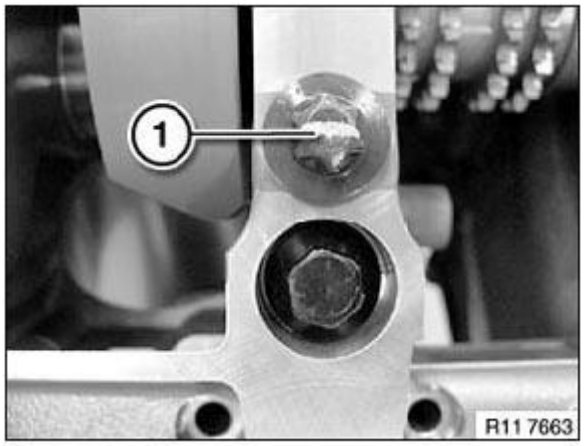



**Fig. 105: Identifying M11 Bearing Seat Bolts With Colored Line**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure M11 bearing seat bolts with special tools **00 9 120** and **00 9 130** .

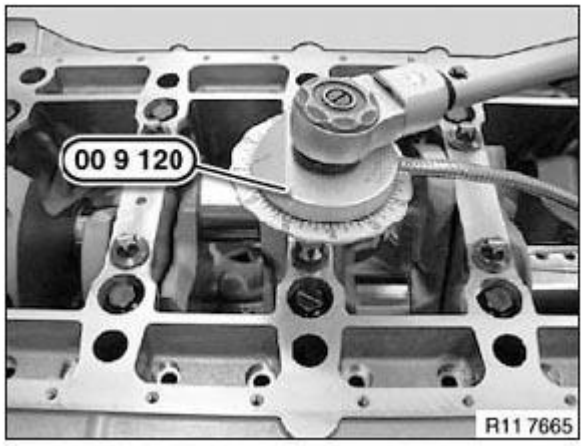



**Fig. 106: Identifying Special Tools (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Tighten M11 bolts to **130° angle of rotation.**

Tightening torque: **11 11 1AZ** . See **11 11 ENGINE BLOCK** .

**IMPORTANT: Observe bolting sequence when using new bolts.**

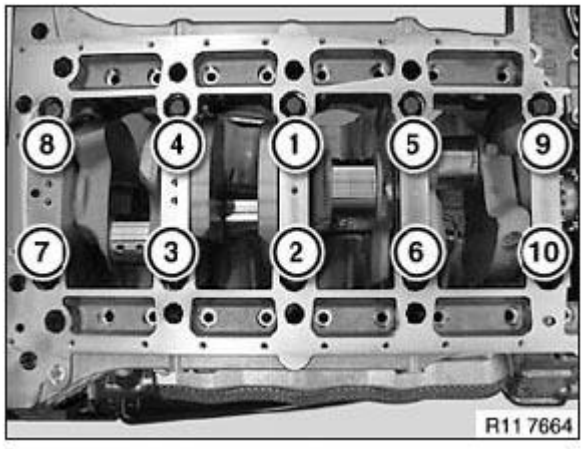



**Fig. 107: Identifying M11 Bolts Tightening Sequence**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Mark all fit bolts with a colored line (1).

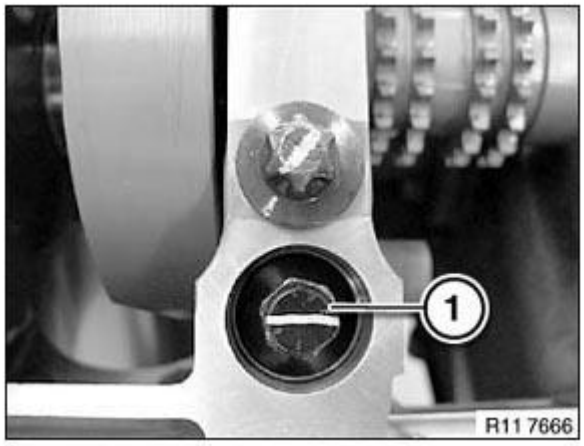



**Fig. 108: Identifying Bolts With Colored Line**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Tighten fit bolts with special tools **00 9 120** and **00 9 130** .

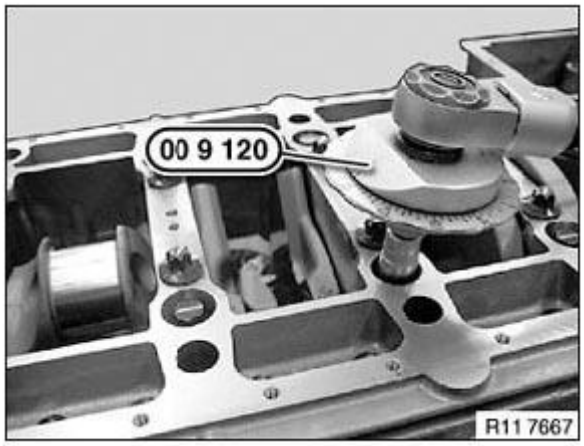



**Fig. 109: Identifying Special Tools (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure all fit bolts (1-10) to **130° angle of rotation.**

Tightening torque: **11 11 2AZ** . See **11 11 ENGINE BLOCK** .

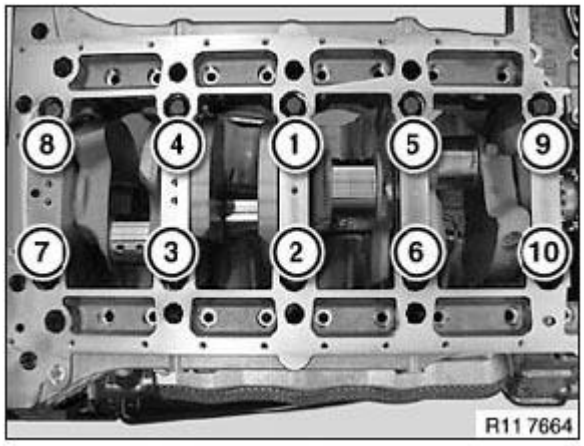



**Fig. 110: Identifying M11 Bolts Tightening Sequence**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert bolts (1).

Insert bolts (2).

Insert bolts (3).

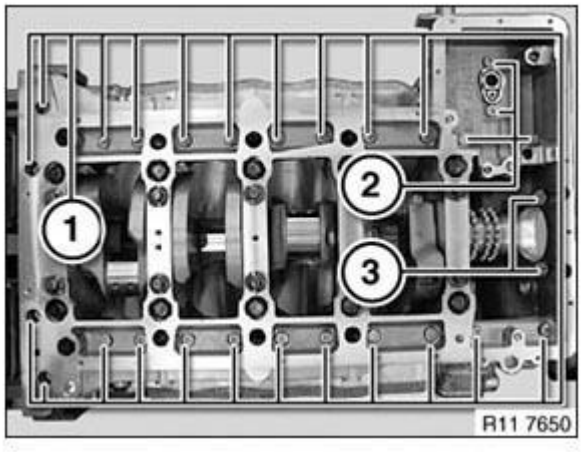



**Fig. 111: Identifying Bedplate Bolts And Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure bolts (1) M8x65 (22 x) with special tools **00 9 120** and **00 9 130** .

Tightening torque: 11 11 3AZ. See **11 11 ENGINE BLOCK** .

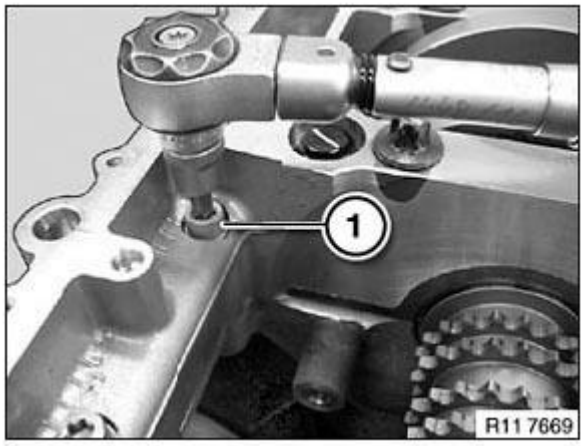



**Fig. 112: Tightening Bolts Using Special Tool**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure bolts (1) M8x40 (4 x) with special tools **00 9 120** and **00 9 130** .

Tightening torque: **11 11 4AZ** . See **11 11 ENGINE BLOCK** .

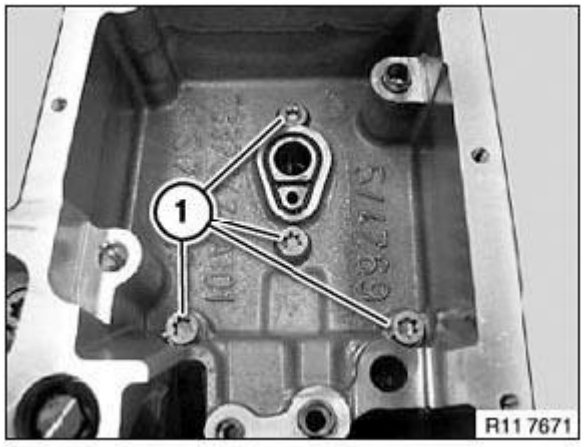



**Fig. 113: Identifying Bolts M8x40 (4 X)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure bolts (1) M6x30 (2 x).

Tightening torque: 11 11 5AZ. See **11 11 ENGINE BLOCK** .

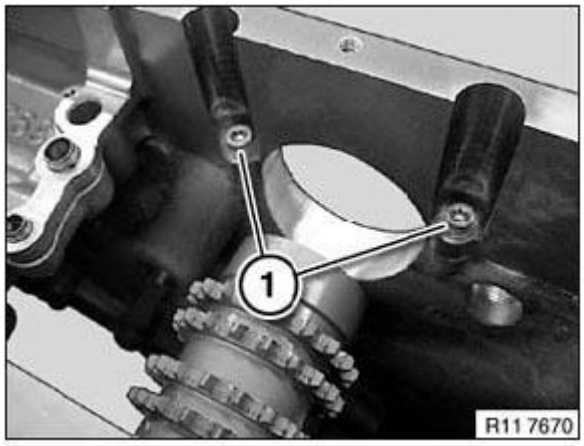



**Fig. 114: Identifying Bolts M6x30 (2 X)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

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

*Installation:*

Always replace nozzles.

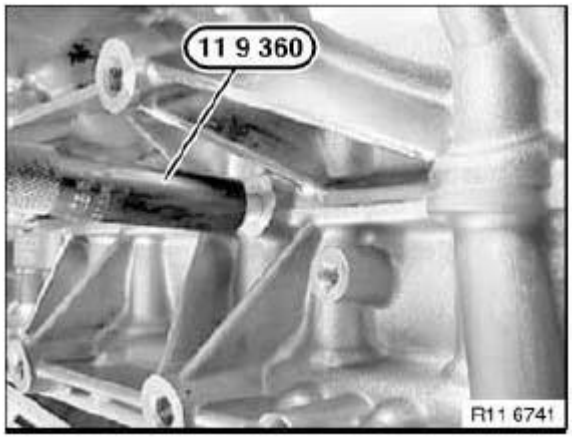



**Fig. 115: Driving Nozzles Special Tool (11 9 360)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Use **primer 1.5 and liquid gasket 1.6** .

Prepare liquid gasket (2) in special tool **11 4 370** .

Screw on nozzle (1) for injecting liquid gasket.

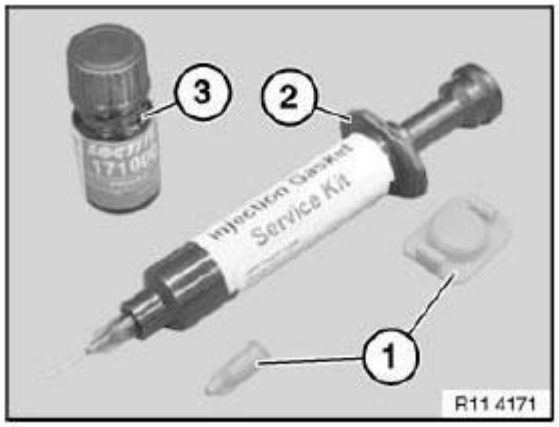



**Fig. 116: Identifying Liquid Gasket And Nozzle**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Press sealing compound nozzle in direction of arrow onto nozzle at 90°.

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

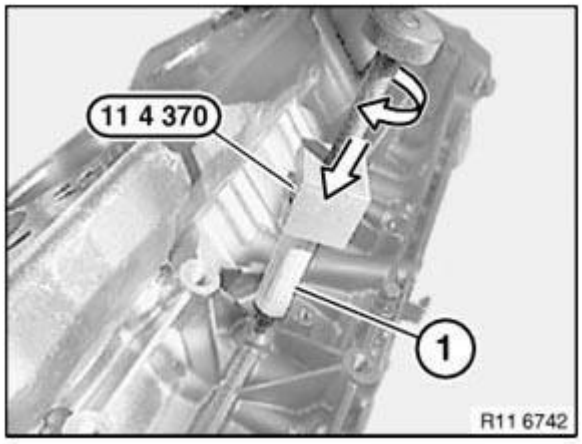



**Fig. 117: Pressing Sealing Compound Nozzle Onto Nozzle**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Stop (seal off) escaping liquid gasket with primer 1.5 at outlet bore (1).

Install radial shaft seal at **front.**

Install radial shaft seal at **rear.**

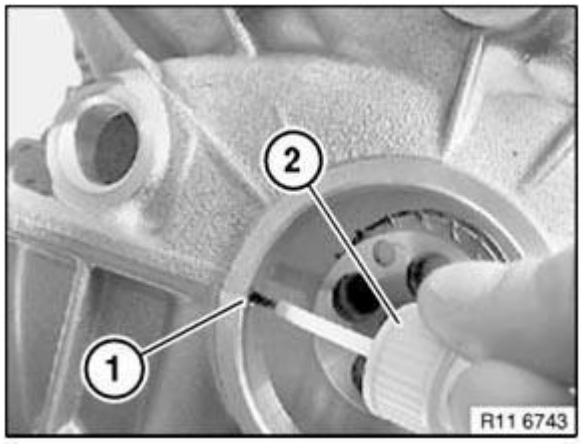



**Fig. 118: Applying Liquid Gasket With Primer At Outlet Bore**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 21 531 REPLACING ALL CRANKSHAFT MAIN BEARINGS (S65)**

**Special tools required:**

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

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

See **ENGINE - SPECIAL TOOLS** .

**IMPORTANT:**

1. **Repair crankcase worn St.0 or 1 / crankshaft worn St.0 .**

   **If the bearing channel is opened and closed again after engine operation, all main bearing shells must be replaced with special repair bearing shells.**

   **Altered settling behavior at the crankcase.**

   **Repair bearing shells are marked with an (R) on their backs.**

2. **Repair crankcase worn St.0 or 1 / crankshaft new St.0 .**

   **Repair bearing shells marked with (R) must be used.**

   **The crankshaft comes as a set together with the bearing shells. The bearing shells for the bedplate are provided in accordance with the crankshaft classification. For the crankcase bearing shells, the green**

**bearing shells are always provided. The half classification is retained.**

3. **Repair crankcase new St.0 or 1 / crankshaft worn St.0 .**

   **The bearing shells also designated for initial installation must be used.**

   **The crankcase comes as a set together with the bearing shells. The bearing shells for the crankcase are provided in accordance with the crankcase classification. For the bedplate, the green bearing shells are always provided.**

   **The half classification is retained.**

4. **Repair crankcase new St.0 or 1 / crankshaft new St.0 .**

   **The bearing shells also designated for initial installation must be used.**

   **The bearing shells provided with the crankcase must be used.**

   **The crankcase comes as a set together with the bearing shells. The bearing shells for the crankcase are provided in accordance with the crankcase classification. For the bedplate, the green bearing shells are always provided.**

   **The half classification is retained.**

*Necessary preliminary tasks:*

- **Engine** removed
- Remove **crankshaft.**

*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).

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

Insert crankshaft without engine oil, bolt crankcase upper and lower sections together.

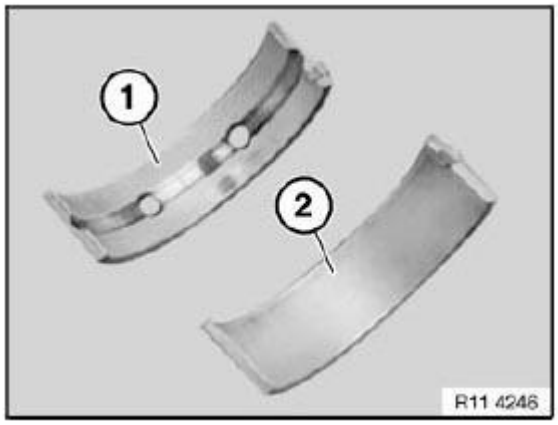



**Fig. 119: Identifying Bearing Shell**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Lay plastic thread (Plastigage) on crankshaft.

Fit crankcase upper section on lower section and bolt together.

**NOTE: Do not twist crankshaft.**

Remove crankshaft.

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

Crankshaft bearing clearance **radial.** See **CRANKSHAFT WITH BEARING** .

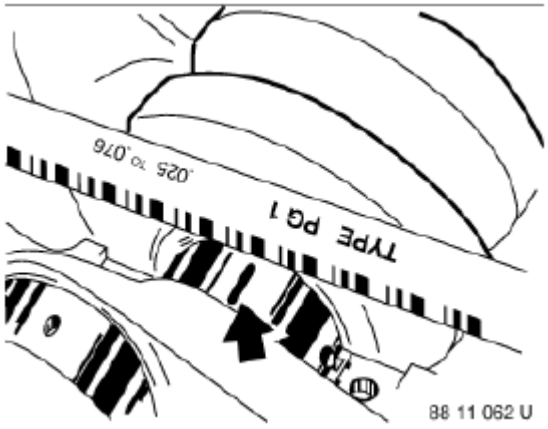



**Fig. 120: Laying Plastic Thread (Plastigage) On Crankshaft**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**Crankcase upper half:**

*Installation:*

Bearing shell (2) is a guide bearing.

Pay attention to guide lugs on bearing shells (see arrow).

Remove all bearing shells with lubricant groove.

Observe **bearing classification.** See **CRANKSHAFT WITH BEARING** .

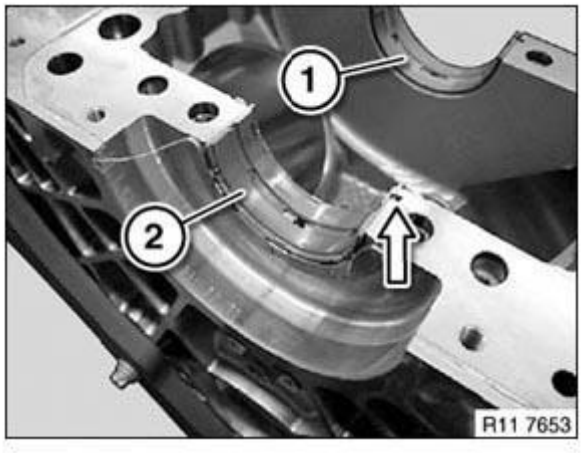



**Fig. 121: Removing Bearing Shells**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**Crankcase lower half:**

*Installation:*

Bearing shell (2) is a guide bearing.

Pay attention to guide lugs on bearing shells (see arrow).

Remove all bearing shells without lubricant groove.

Observe **bearing classification.** See **CRANKSHAFT WITH BEARING** .

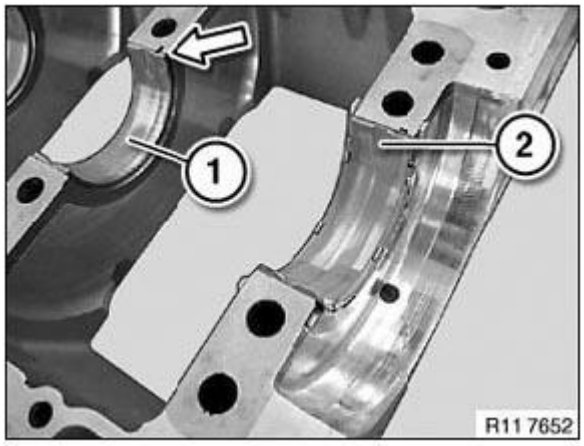



**Fig. 122: Removing Bearing Shells Without Lubricant Groove**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Clean sealing face (1) with special tool 11 4 470.

Insert bearing shells (2) without lubricant groove.

Insert guide bearing (3) without lubricant groove on bearing seat 5.

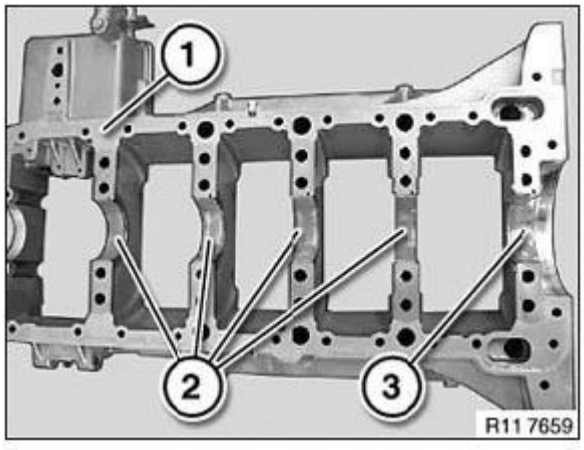



**Fig. 123: Identifying Bearing Shells And Guide Bearing**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (1).

Remove oil nozzle (2) towards top.

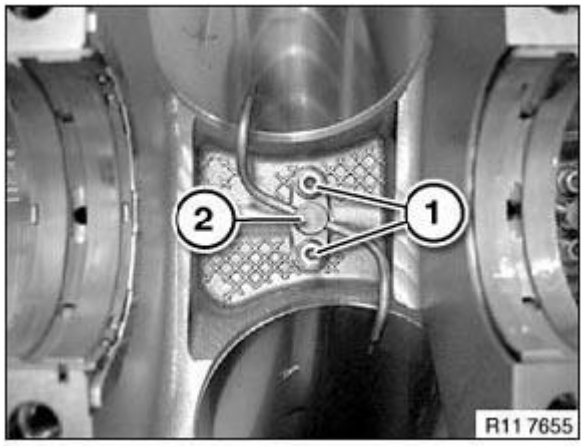



**Fig. 124: Identifying Oil Nozzle And Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Bearing classification on bedplate bearing seat.

Observe color allocation on crankshaft (1 to 5).

V= Violet.

G = Green.

Y = Yellow.

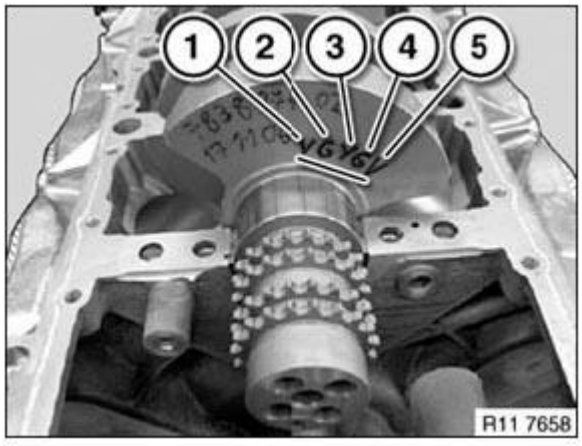



**Fig. 125: Identifying Color Allocation On Crankshaft**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Bearing classification on crankcase bearing seat.

Observe color allocation in crankcase (1 to 5).

V= Violet.

G = Green.

Y = Yellow.

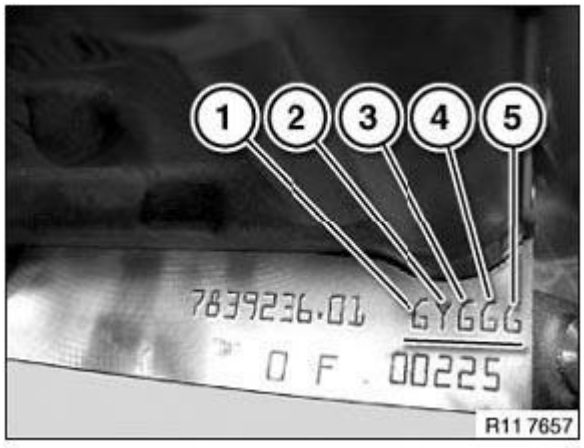



**Fig. 126: Identifying Color Allocation In Crankcase**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 21 571 REPLACING GROOVED BALL BEARINGS IN CRANKSHAFT (S65)**

**Special tools required:**

- **00 5 500**
- **11 2 016**
- **11 2 340**
- **11 2 350**

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

See **ENGINE - SPECIAL TOOLS** .

*Necessary preliminary tasks:*

- Remove **clutch.** See **21 21 500 REMOVING AND INSTALLING/REPLACING CLUTCH (GS6-53BZ) S65** .

Remove grooved ball bearing with special tool **11 2 340** in conjunction with special tool **11 2 016** .

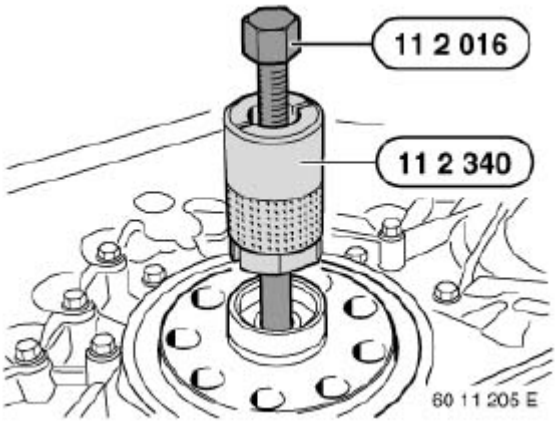



**Fig. 127: Removing Grooved Ball Bearing With Special Tool (11 2 340) And (11 2 016)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Replace guide bearing.

Drive in guide bearing as far as it will go with special tools **11 2 350** and **00 5 500** .

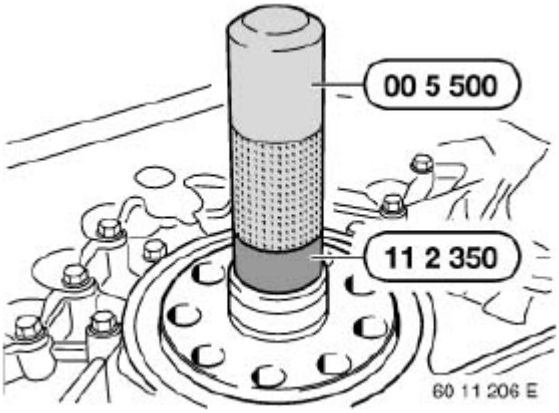



**Fig. 128: Driving Guide Bearing With Special Tools (11 2 350) And (00 5 500)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

## FLYWHEEL

### 11 22 500 REMOVING AND INSTALLING/REPLACING FLYWHEEL (S65)

**Special tools required:**

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

- **11 9 263**

See **ENGINE - SPECIAL TOOLS** .

*Necessary preliminary tasks:*

- Remove **transmission.** See **23 00 018 REMOVING AND INSTALLING TRANSMISSION (GS6-53BZ) (S65)**
- Remove **clutch.** See **21 21 500 REMOVING AND INSTALLING/REPLACING CLUTCH (GS6-53BZ) S65** .

Secure flywheel (1) with special tools **11 9 263** and **11 9 260** .

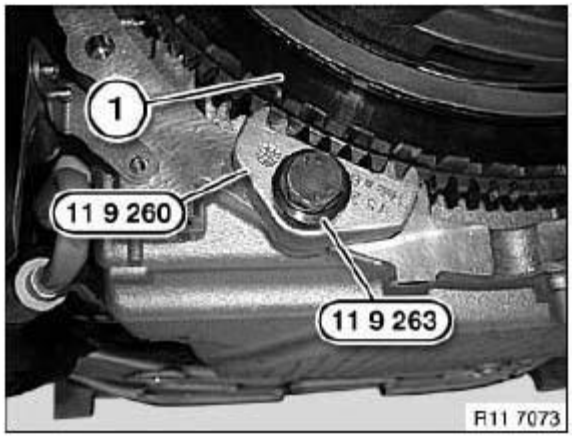



**Fig. 129: Securing Flywheel With Special Tools (11 9 263) And (11 9 260)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

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

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

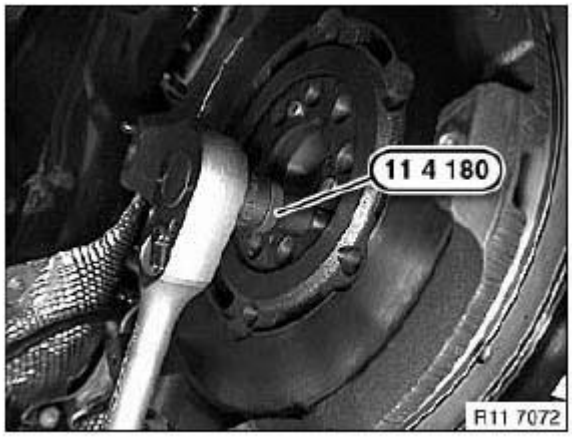



**Fig. 130: Releasing Flywheel Screws With Special Tool (11 4 180)**

**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL**

**Special tools required:**

- **21 2 051**
- **21 2 052**

See **CLUTCH - SPECIAL TOOLS** .

**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:**
**Roller bearing must not be driven out.**

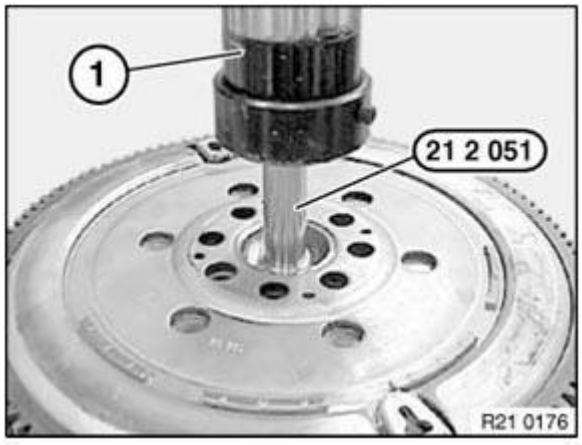



**Fig. 131: Pressing Out Dual-Mass Flywheel Using Hydraulic Press And Special Tool (21 2 051)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

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.**

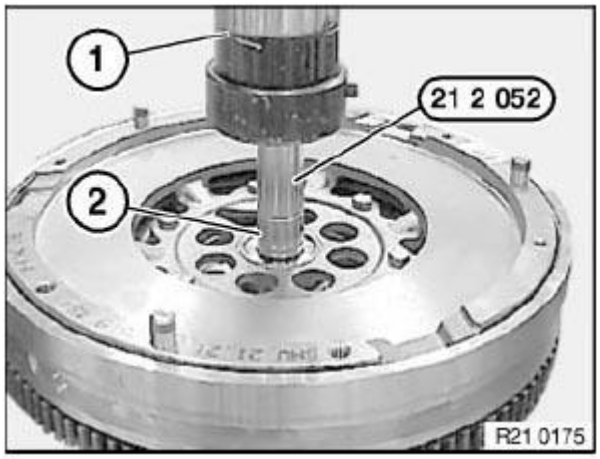



**Fig. 132: Pressing Roller Bearing Into Dual-Mass Flywheel Using Hydraulic Press**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL**

**Special tools required:**

- **00 5 500**
- **11 2 010**
- **11 2 343**
- **11 2 350**

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

See **ENGINE - SPECIAL TOOLS** .

**NOTE: flywheel removed!**

Position special tool **11 2 010** in roller bearing.

Twist out roller bearing with special tool **11 2 343** .

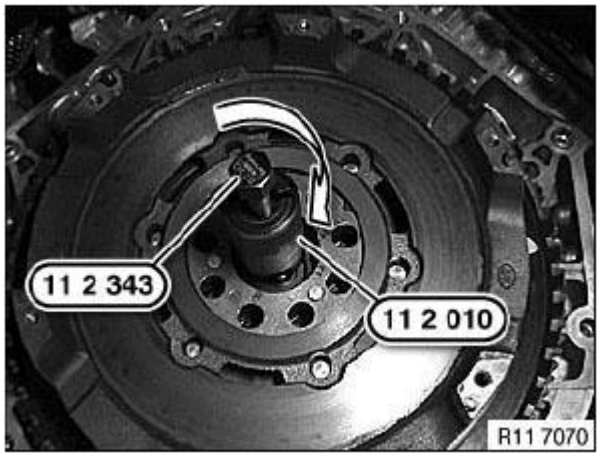



**Fig. 133: Twisting Out Roller Bearing With Special Tool (11 2 343)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

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.

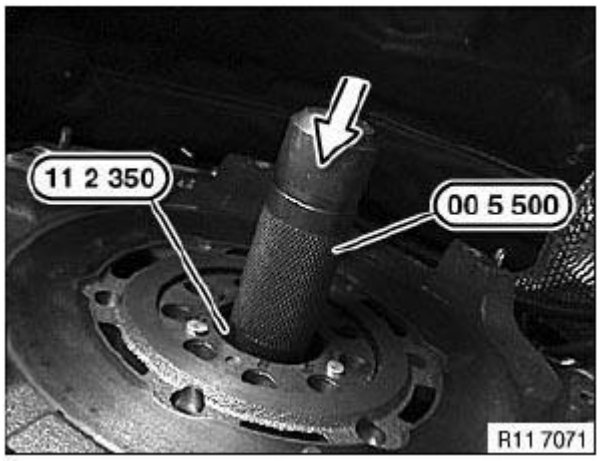



**Fig. 134: Driving Roller Bearing With Special Tools (11 2 350) And (00 5 500)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

## VIBRATION DAMPER

### 11 23 010 REMOVING AND INSTALLING/REPLACING VIBRATION DAMPER (S65)

**Special tools required:**

- **00 9 120**
- **11 0 280**

- **11 9 260**
- **11 9 263**

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

See **ENGINE - SPECIAL TOOLS** .

*Necessary preliminary tasks:*

- Remove **fan cowl with electric fan.** See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (S65)** .
- Remove A/C compressor **drive belt.**
- Remove alternator **drive belt.**

Release screws (1).

Remove cover (2) with belt pulley (3).

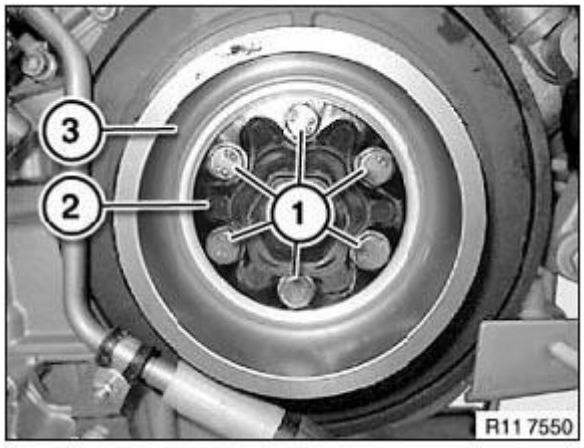



**Fig. 135: Identifying Screws, Cover And Belt Pulley**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Engine or transmission removed.**

Secure special tool **11 9 260** to flywheel (1).

Screw in special tool **11 9 263** with bolt (2) on crankcase.

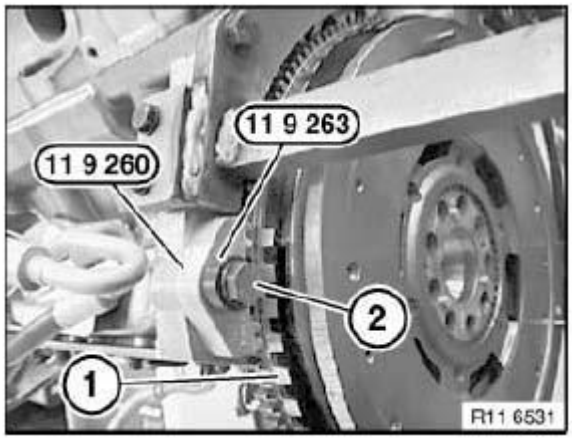



**Fig. 136: Identifying Flywheel, Special Tool (11 9 260) And (11 9 263)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (2).

Remove **vibration damper** (1).

Tightening torque: **11 23 1AZ** . See **VIBRATION DAMPER** .

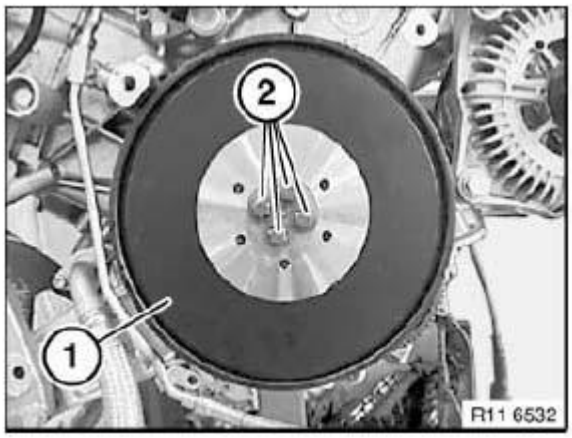



**Fig. 137: Identifying Vibration Damper And Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Engine or transmission installed.**

Attach special tool **11 0 280** to vibration damper.

Support special tool **11 0 280** on holder (1).

Release all anti-fatigue bolts (2).

*Installation:*

Replace stress bolts.

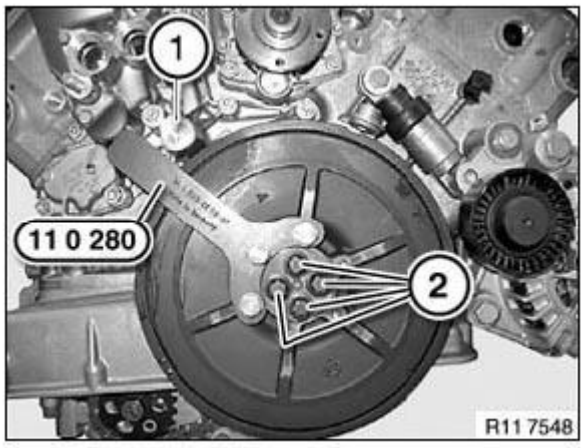



**Fig. 138: Identifying Special Tool (11 0 280) On Holder**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Support special tool **11 0 280** on holder (2).

Tighten anti-fatigue bolts (1) with special tool **00 9 120** .

Tightening torque: **11 23 1AZ** . See **VIBRATION DAMPER** .

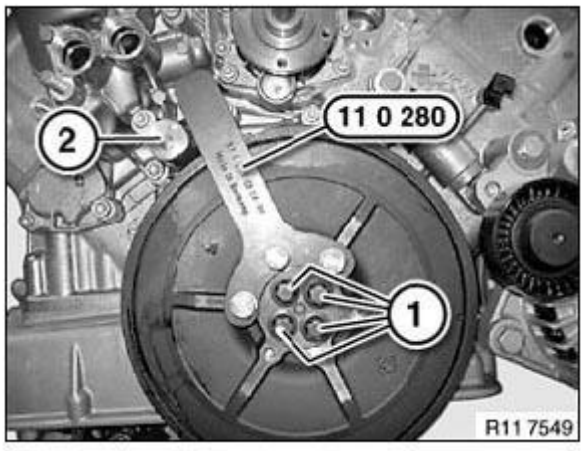



**Fig. 139: Tightening Anti-Fatigue Bolts With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

## CONNECTING ROD WITH BEARINGS

### 11 24 571 REPLACING ALL CONNECTING ROD BEARINGS (S65)

**Special tools required:**

- **00 9 120**

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

**IMPORTANT: Note grinding stages on crankshaft. See ENGINE - TECHNICAL DATA .**

*Necessary preliminary tasks:*

- Remove all **pistons.**

Install new conrod bearing shells.

*Installation:*

Install one blue (1) and one red (2) bearing shell in each conrod.

Install all **pistons.**

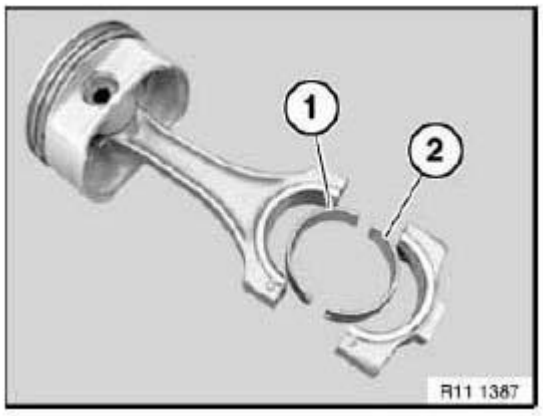



**Fig. 140: Identifying Blue And Red Bearing Shell In Conrod**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Check connecting rod bearing clearance.**

Piston in BDC position.

Place special tool 00 2 590 (Plastigage model PG 1) on oil-free crankshaft.

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

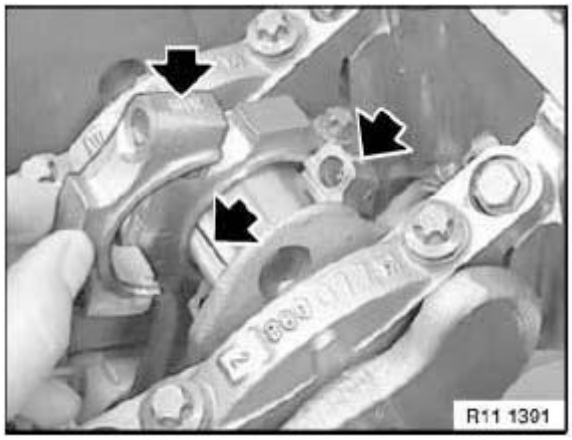



**Fig. 141: Checking Connecting Rod Bearing Clearance**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Do not distort connecting rods or crankshaft.**

Use the old conrod bearing bolts to check conrod clearance.

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

Tightening torque: **11 24 1AZ** . See **11 24 CONNECTING RODS AND BEARINGS** .

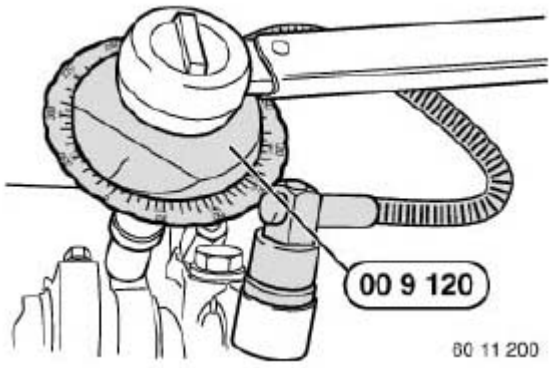



**Fig. 142: Tightening Down Conrod Bolts With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove conrod bearing cap and read off bearing clearance at width of pinched plastic thread on measuring scale.

Conrod bearing clearance: Refer to **ENGINE - TECHNICAL DATA** .

- Remove plastic thread.
- Lubricate crankshaft and bearing shells.
- Install new conrod bolts and tighten down.

Tightening torque: **11 24 1AZ** . See **11 24 CONNECTING RODS AND BEARINGS** .

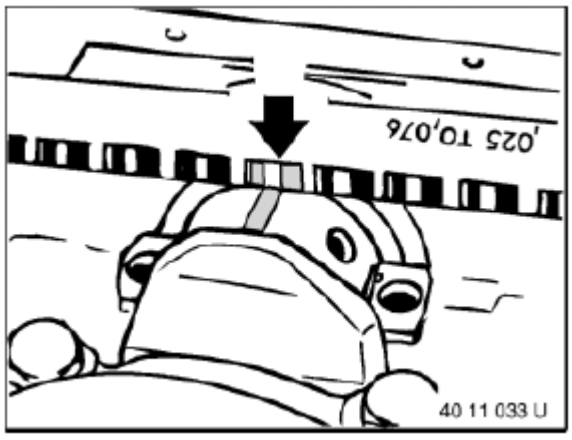



**Fig. 143: Checking Bearing Clearance At Width Of Pinched Plastic Thread On Measuring Scale**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

## PISTON WITH RINGS

**11 25 530 REMOVING AND INSTALLING/REPLACING ALL PISTONS (S65)**

**Special tools required:**

- **00 9 120**
- **11 4 492**
- **11 5 250**
- **11 5 341**
- **11 5 342**
- **11 5 343**
- **11 5 344**
- **11 9 500**
- **12 2 100**

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

See **ENGINE - SPECIAL TOOLS** .

See **ENGINE ELECTRICAL SYSTEM - SPECIAL TOOLS** .

**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.**
**Piston and piston pin are matched to each other and can only be replaced as a pair.**
**Connecting rod and connecting rod bearing cap are cracked.**
**Identification is effected by means of identical pairing letters on the connecting rod big end.**
**Mixing up the components will result in engine damage.**
**Setting of special tool 11 5 343 must not be altered.**

*Necessary preliminary tasks:*

- Remove **engine**.
- Mount engine on **assembly stand.**
- Remove **intake air manifold**.
- Remove **cylinder head on left and right.**
- Remove **engine oil sump.**
- Remove **oil pump.**
- Remove **oil suction pump.**

Do not bend oil nozzle (2) at outlets.

It is not possible to adjust the nozzles.

Oil nozzle (2) must be replaced if it is maladjusted or bent.

Remove **crankshaft.**

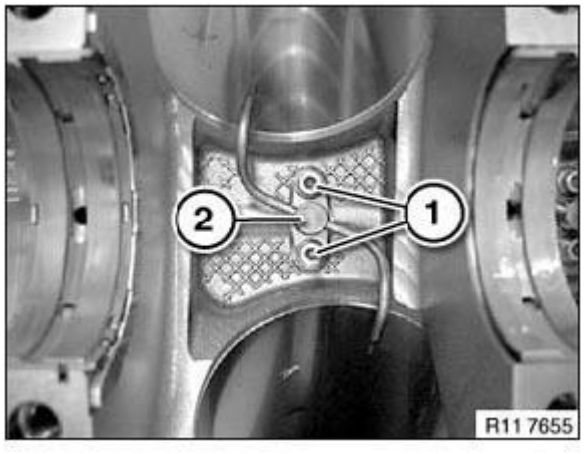



**Fig. 144: Identifying Oil Nozzle And Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release connecting rod bolts (1) with special tool **12 2 100** .

Remove connecting rod bearing cap with bearing shell.

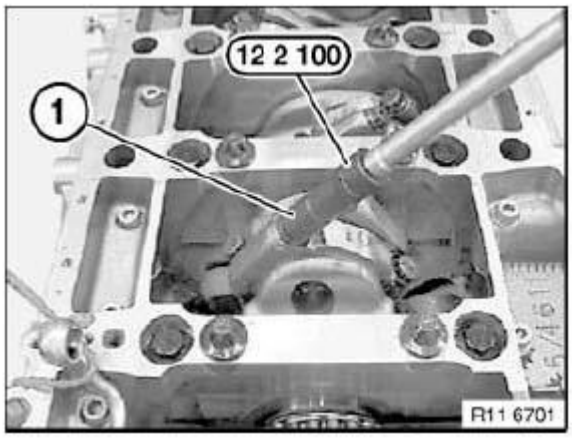



**Fig. 145: Releasing Connecting Rod Bolts With Special Tool (12 2 100)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Special tool **11 5 250 without** locating rod must be screwed in on the connecting rod at the bottom.

Special tool **11 5 250 with** locating rod must be screwed in on the connecting rod at the top.

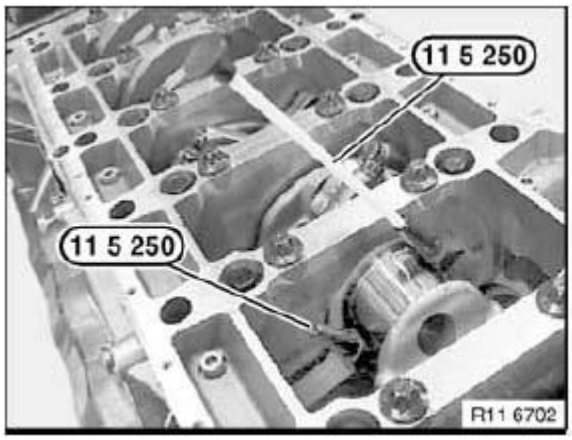



**Fig. 146: Identifying Special Tool (11 5 250)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Rotate crankshaft (1) in direction of arrow, **risk of damage** to special tool **11 5 250** .

Remove piston with connecting rod and special tool **11 5 250** .

Depiction of function on cylinders 1-4.

**IMPORTANT: Risk of damage to oil nozzle.**

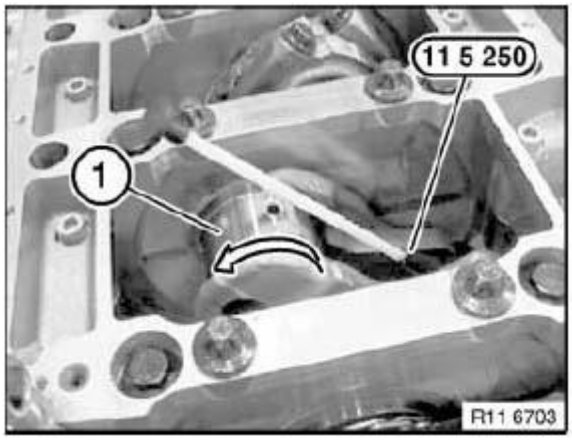



**Fig. 147: Rotating Crankshaft**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Clamp special tool **11 5 341** in a vice.

**NOTE: Piston and piston pin are optimized to each other. There are two different inside diameters on the piston pin.**

Screw matching special tool **11 5 342** into special tool **11 5 341** .

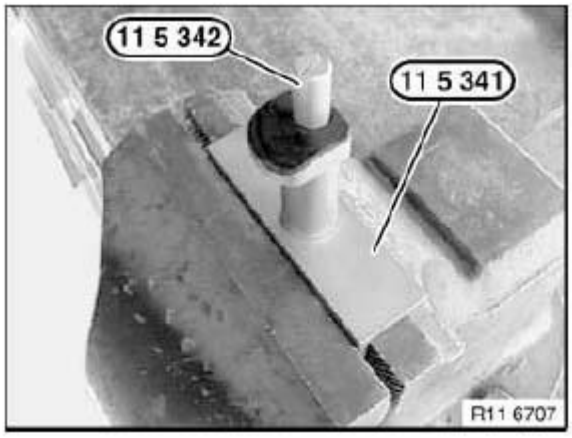



**Fig. 148: Identifying Special Tools (11 5 342) And (11 5 341)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure piston (1) with connecting rod to special tool **11 5 341** .

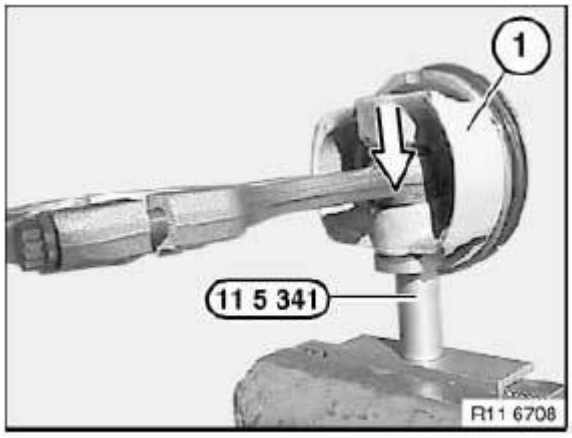



**Fig. 149: Securing Piston With Connecting Rod To Special Tool (11 5 341)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**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.

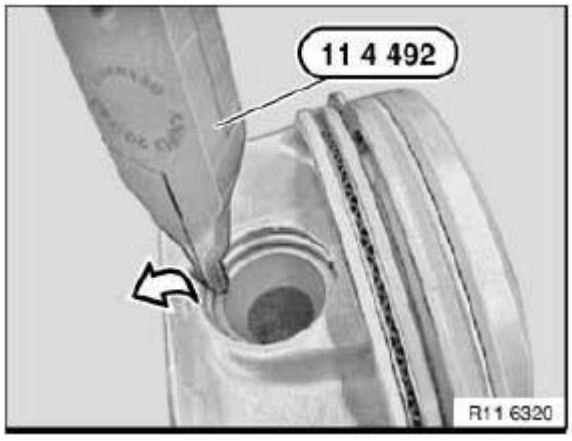



**Fig. 150: Removing Piston Circlip With Special Tool (11 4 492)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

If necessary, replace connecting rods.

*Installation:*

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

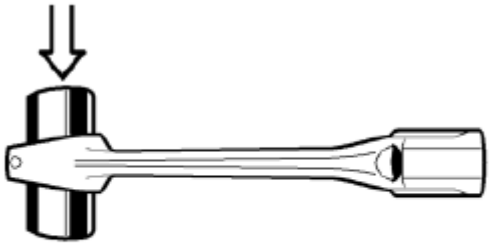


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**Fig. 151: Pressing Gudgeon Pin**
**Courtesy of BMW OF NORTH AMERICA, INC.**

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 gudgeon pin.

Piston diameter at measuring point A.

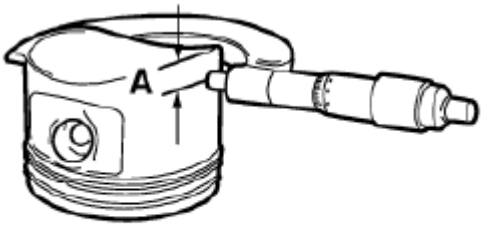


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**Fig. 152: Measuring Piston Diameter With Micrometer**
**Courtesy of BMW OF NORTH AMERICA, INC.**

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.

 

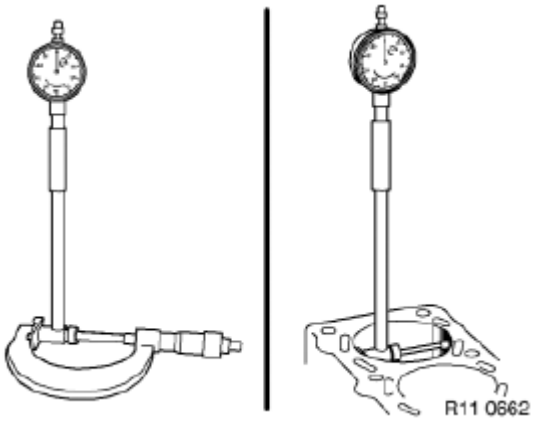


**Fig. 153: Measuring Cylinder Bore Diameter**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: The connecting rods are not symmetrical.**

Pay attention to elevation to direction of travel arrow.

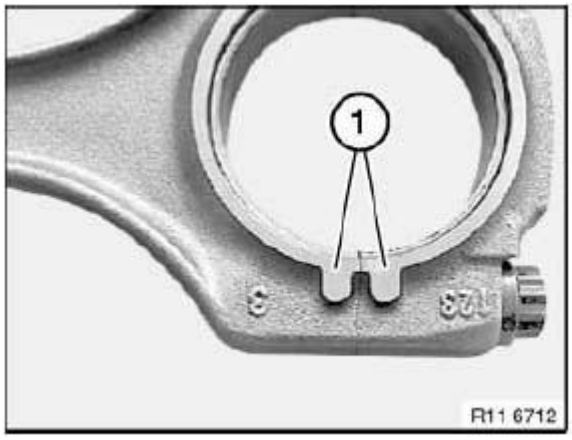


**Fig. 154: Identifying Connecting Rod**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Make sure the connecting rod is in the correct installation position during preliminary installation.

On cylinders 6-10 the elevation (2) must point forwards **with** the arrow.

On cylinders 1-4 the elevation (1) must point rearwards **against** the arrow.

Valve pockets (E) point to inlet side.

Arrow direction is identical to direction of travel.

 

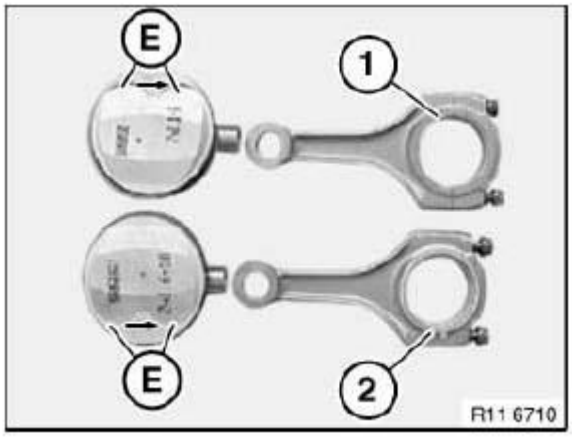


**Fig. 155: Identifying Correct Installation Position Of Connecting Rod**
**Courtesy of BMW OF NORTH AMERICA, INC.**

On cylinders 5-8 the elevation must point forwards **with** the arrow.

On cylinders 1-4 the elevation (1) must point rearwards **against** the arrow.

**IMPORTANT: No elevations on the connecting rod big end are permitted to point to each other during installation, risk of damage to connecting rod.**

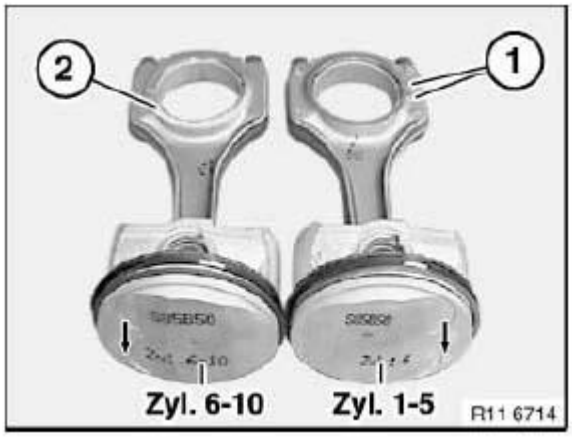


**Fig. 156: Identifying Cylinder Elevation**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

When installed, the two lugs on connecting rods (1 and 2) must point outwards.

 

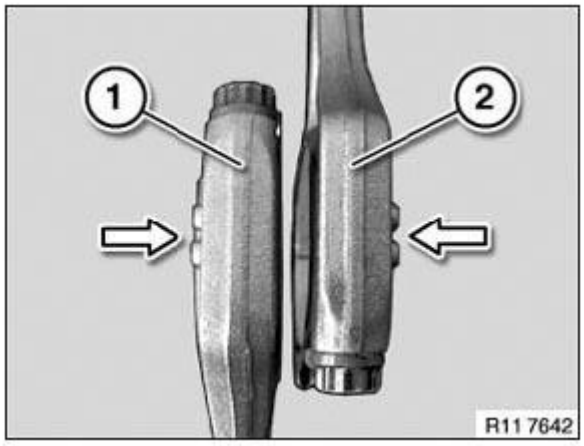


**Fig. 157: Identifying Connecting Rods**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure piston (1) with connecting rod to special tool **11 5 341** .

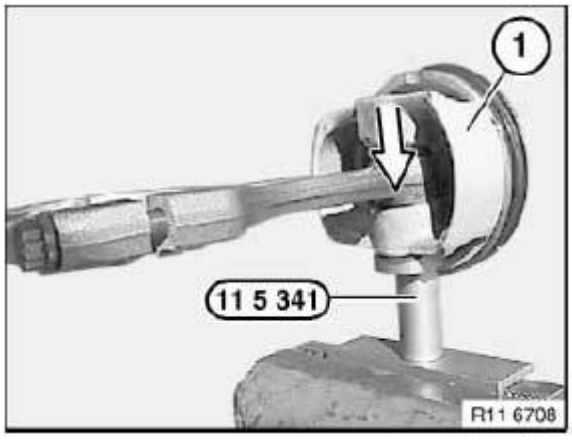


**Fig. 158: Securing Piston With Connecting Rod To Special Tool (11 5 341)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

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

**IMPORTANT: Setting of special tool 11 5 343 must not be altered.**

*Installation:*

Insert piston circlip (2) so that opening points to window.

Insert piston circlip (2) into groove (1) of special tool **11 5 343** .

**NOTE: Illustration shows N52.**

 

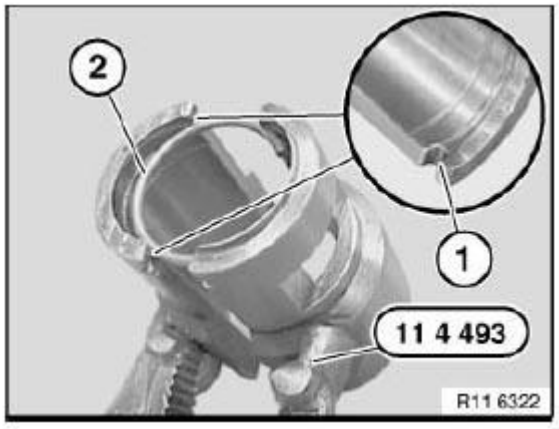


**Fig. 159: Inserting Piston Circlip Into Groove Of Special Tool (11 5 343)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position special tool **11 5 343** with window to opening on piston (see arrow).

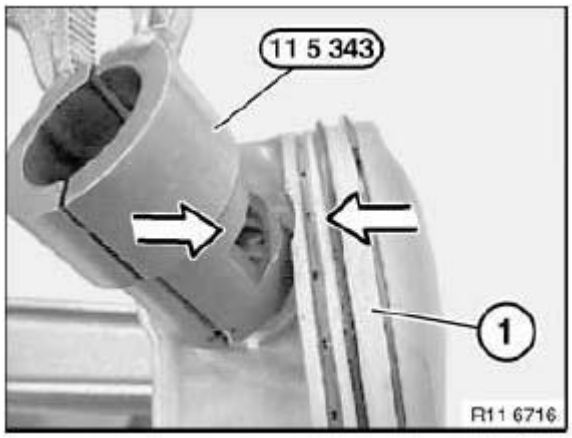


**Fig. 160: Identifying Special Tool (11 5 343) And Piston**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position special tool **11 5 343** with window to opening on piston (see arrow).

 

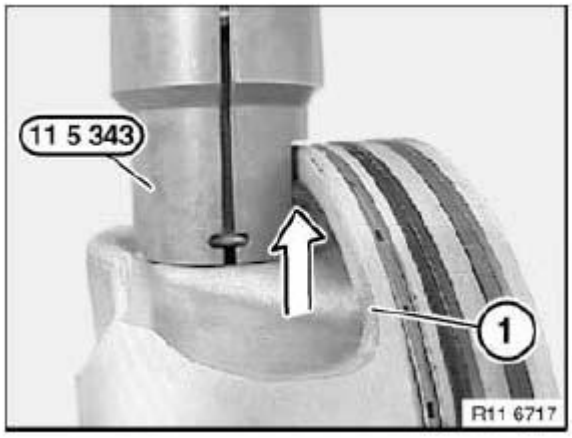


**Fig. 161: Positioning Special Tool (11 5 343) On Piston**
**Courtesy of BMW OF NORTH AMERICA, INC.**

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

Guide lug and cutout on special tool **11 5 343** must point to piston crown.

When special tools **11 5 343** and **11 5 344** are correctly positioned, the piston circlip must be driven in with a plastic hammer in the direction of the arrow.

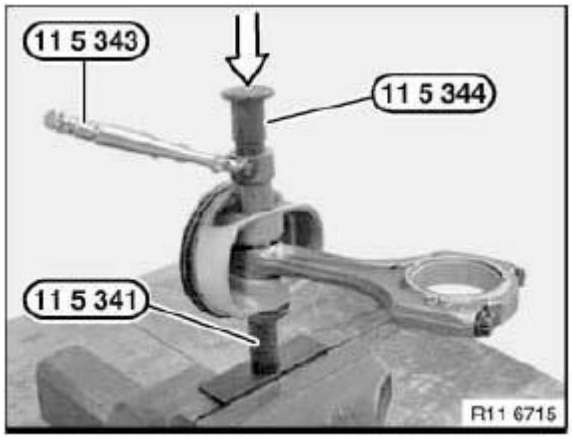


**Fig. 162: Driving Piston Circlip With Plastic Hammer And Special Tools**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: See illustration.**

*Installation:*

Piston circlip (1) is correctly installed when the opening points upwards.

 

See illustration.

It must still be possible for piston pin to moved easily.

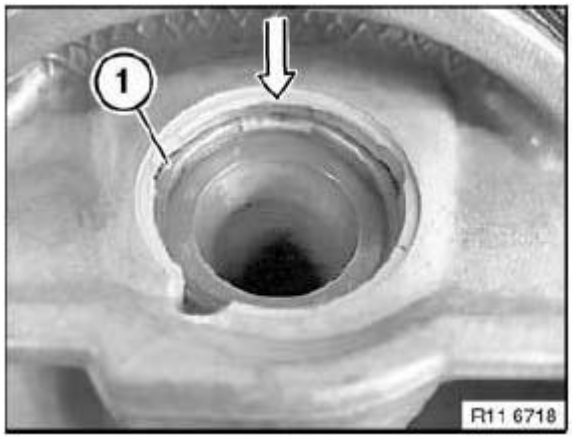


**Fig. 163: Installing Piston Circlip**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Install all **piston rings.**

Install all **bearing shells.**

Screw special tool **11 5 250** into conrod.

Always screw in special tool **11 5 250** with rod to exhaust side.

Preinstall piston with piston rings in special tool **11 9 500** .

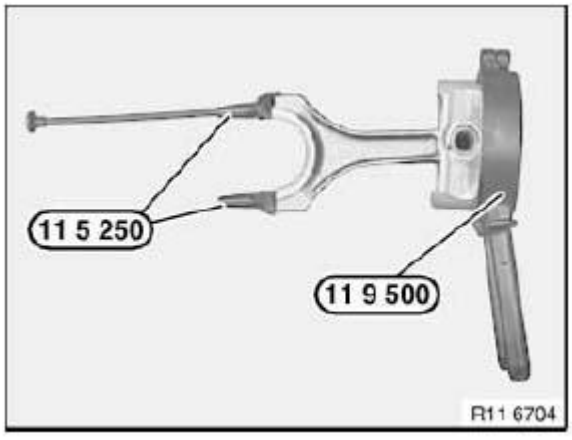


**Fig. 164: Screwing Special Tool (11 5 250) Into Conrod**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert piston with connecting rod in cylinder.

 

**IMPORTANT: Risk of damage to oil spray nozzle.
Danger of piston ring failure.**

Insert piston so that arrow (direction of travel pointing forwards) on piston crown points to camshaft drive.

Piston cyl. 1-4 right side, cyl. 5-8 left side.

Press in piston with special tool **11 9 500** .

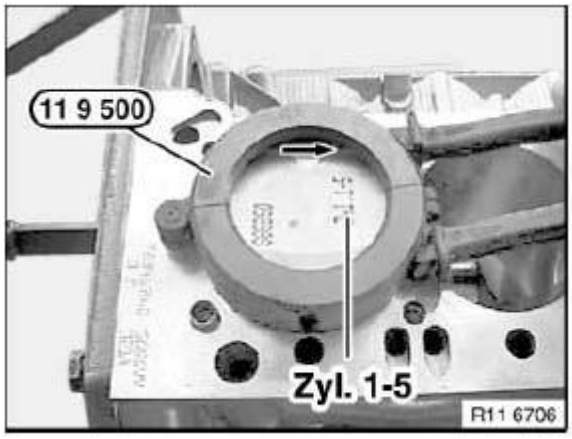


**Fig. 165: Inserting Piston On Piston Crown Points To Camshaft Drive**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Arrow on piston crown must point to camshaft drive (direction of travel towards front).

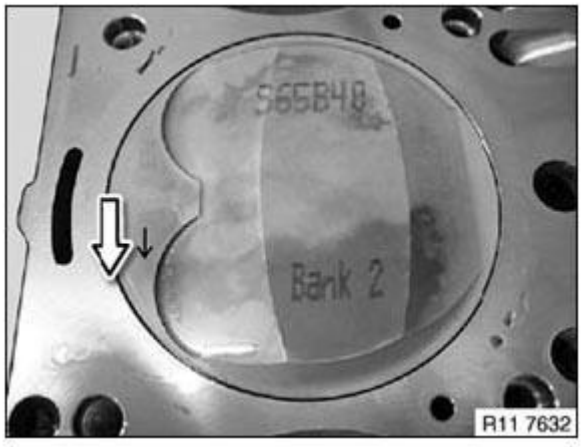


**Fig. 166: Installing Piston Crown To Camshaft Drive**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: connecting rod and connecting rod 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.**

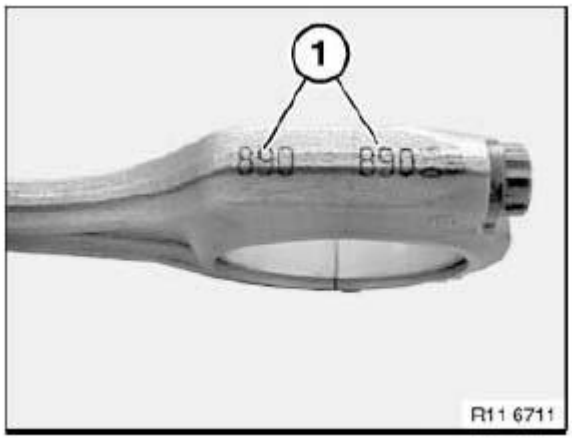


**Fig. 167: Identifying Connecting Rod And Connecting Rod Bearing Cap Identification Pairing Letters**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Risk of damage to oil nozzle.**

Rotate crankshaft (1) in direction of arrow, **risk of damage** to special tool **11 5 250** .

Insert piston with connecting rod and special tool **11 5 250** .

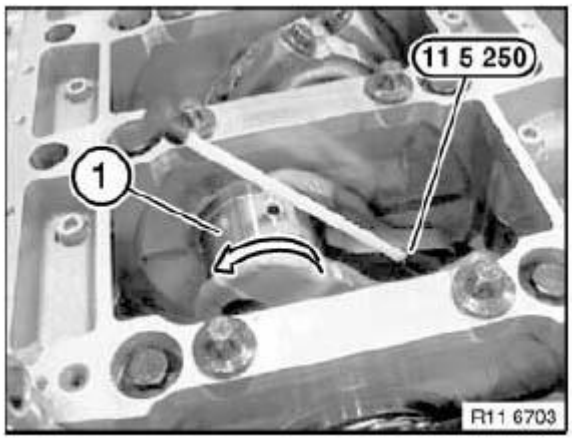


**Fig. 168: Rotating Crankshaft**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Moisten conrod bearing shell and crank pin slightly with engine oil.

Assemble connecting rod and crank pin.

Remove special tool **11 5 250** .

 

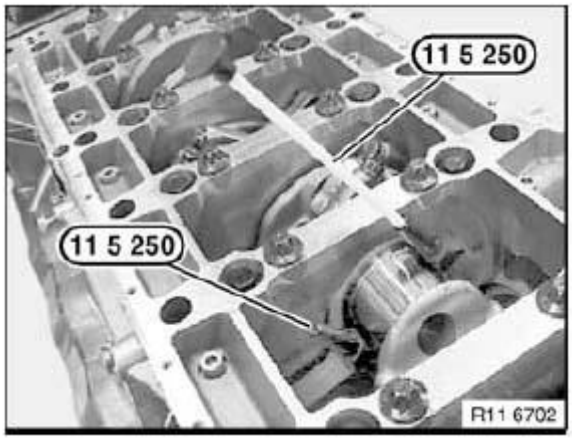


**Fig. 169: Identifying Special Tool (11 5 250) On Connecting Rod And Crank Pin**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Install connecting rod bearing cap with bearing shell.

Secure connecting rod bolts (1) with special tools **12 2 100** and **00 9 120** .

Tightening torque: **11 24 1AZ** . See **11 24 CONNECTING RODS AND BEARINGS** .

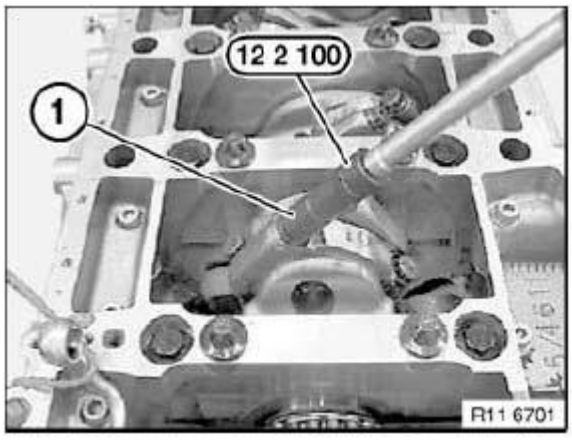


**Fig. 170: Securing Connecting Rod Bolts With Special Tools (12 2 100)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 25 671 REPLACING PISTON RINGS ON ALL PISTONS (S65)**

*Necessary preliminary tasks:*

- Removing all **pistons**

Remove piston rings with a piston-ring compressing pliers.

 

**NOTE: It might not be possible to find the identification on used piston rings. Put aside piston rings in correct sequence and installation position.**

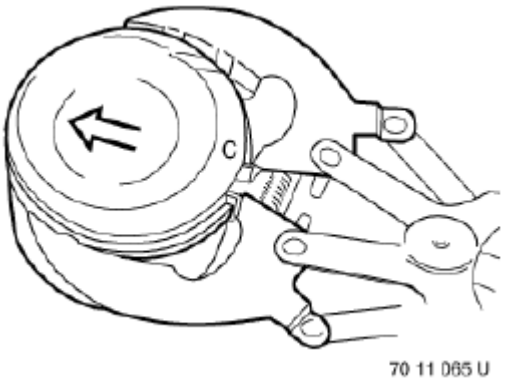


**Fig. 171: Removing Piston Rings With Piston-Ring Compressing Pliers**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Piston rings marked with "R" must point to piston crown.

Groove (2), plain compression ring.

Groove (3), stepped ring.

Groove (4), bevel-edged oil control ring.

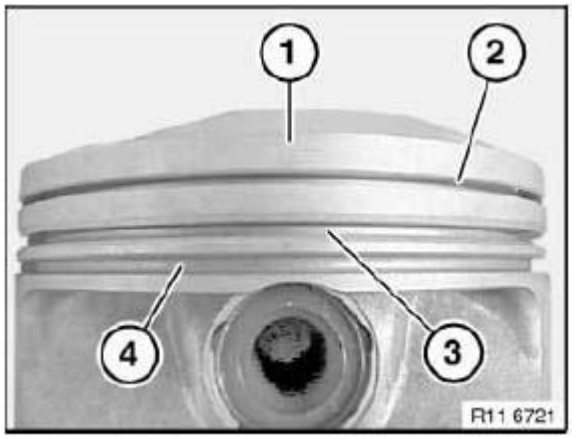


**Fig. 172: Identifying Piston Rings Groove**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Piston ring (1), bevel-edged oil control ring.

Piston ring (2), stepped ring.

 

Piston ring (3), plain compression ring.

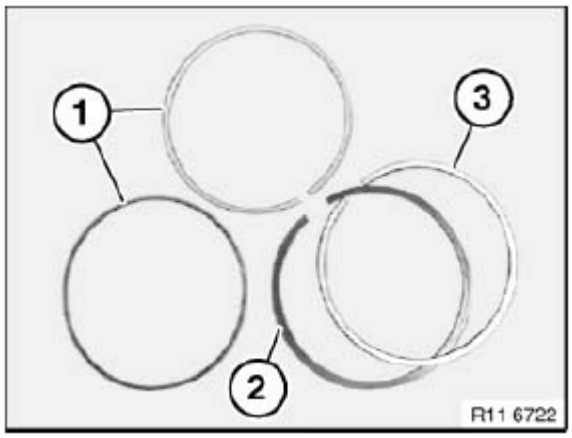


**Fig. 173: Identifying Bevel-Edged Oil Control Ring And Stepped Ring, Plain Compression Ring**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Piston rings marked with "R" must point to piston crown.

Plain compression ring is marked with (R).

Stepped ring is marked with (R1).

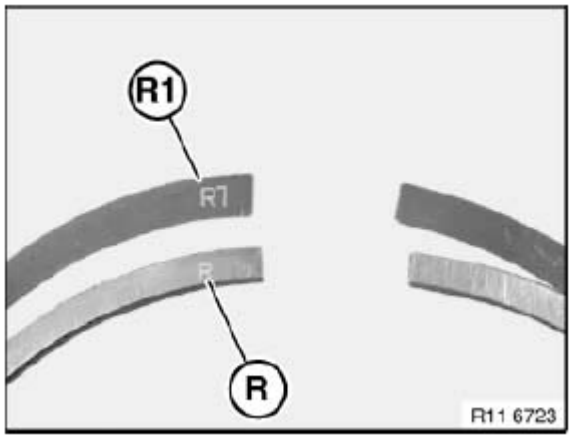


**Fig. 174: Identifying (R) Marks On Plain Compression Ring And (R1) Marks On Stepped Ring**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Measure **axial play.** See **ENGINE - TECHNICAL DATA** .

 

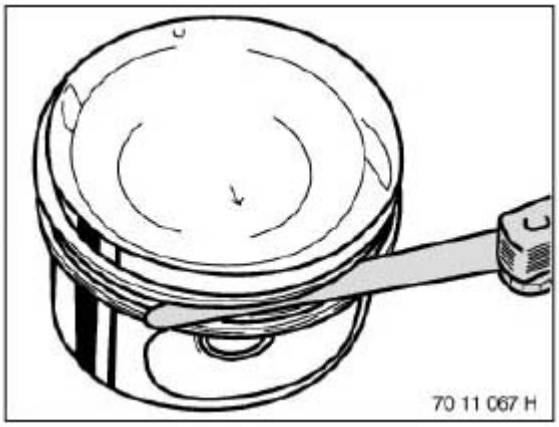


**Fig. 175: Measuring Axial Play**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Measure **end clearance.** See **ENGINE - TECHNICAL DATA** .

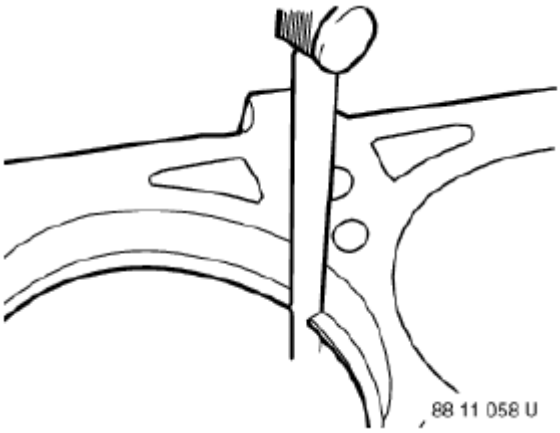


**Fig. 176: Measuring End Clearance**
**Courtesy of BMW OF NORTH AMERICA, INC.**

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

**NOTE: See picture S85.**

 

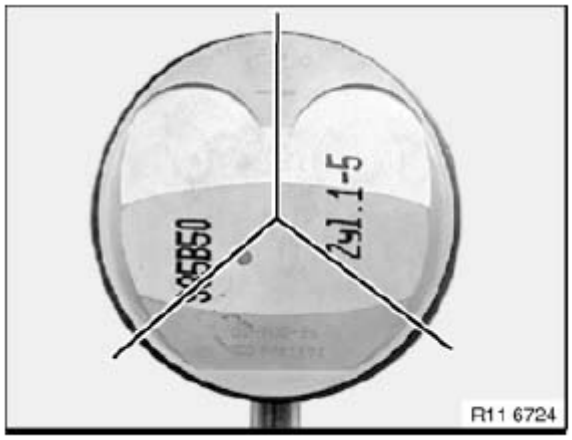


**Fig. 177: Identifying Offset Contact Points Of Piston Rings**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

## V-RIBBED BELT WITH TENSIONER

### 11 28 010 REPLACING ALTERNATOR DRIVE BELT (S65)

**IMPORTANT: Mark the direction of rotation of the drive belt if it is to be reused. Replace the drive belt if it is fouled with coolant or engine oil.**

*Necessary preliminary tasks:*

- Remove drive belt for A/C system.

Release cover (1) with a screwdriver.

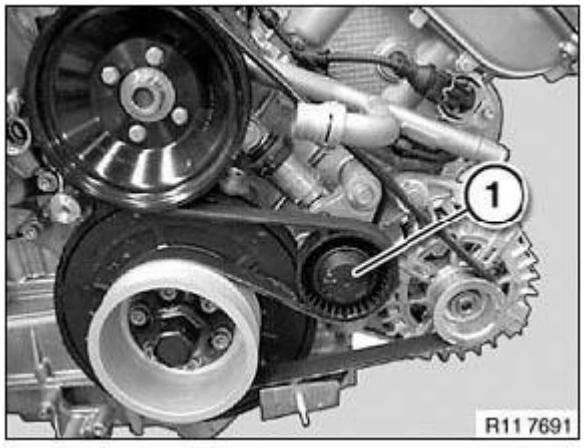


**Fig. 178: Identifying Drive Belt Cover**
**Courtesy of BMW OF NORTH AMERICA, INC.**

 

Press down tensioning device (1) with standard tool in direction of arrow.

Remove drive belt.

*Installation:*

Observe direction of rotation if reusing the drive belt.

Make sure drive belt is installed in correct position.

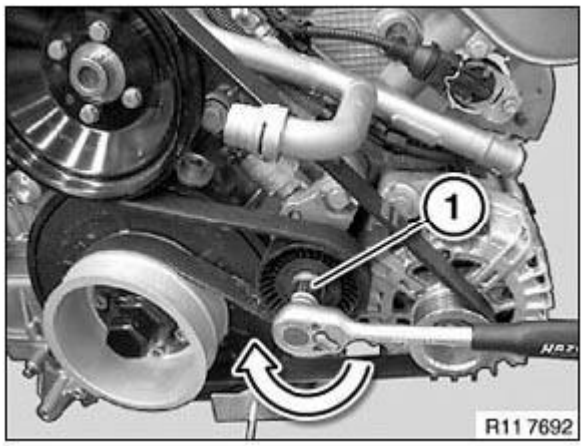


**Fig. 179: Pressing Down Tensioning Device With Tool**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 28 020 REPLACING TENSIONING DEVICE FOR ALTERNATOR DRIVE BELT (S65)**

**IMPORTANT: Mark the direction of rotation of the drive belt if it is to be reused. Replace the drive belt if it is fouled with coolant or engine oil.**

*Necessary preliminary tasks:*

- Remove fan cowl with electric fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (S65)** .
- Remove A/C compressor drive belt.

Release screws (1).

Remove alternator drive belt.

Remove belt pulley (2) from coolant pump.

 

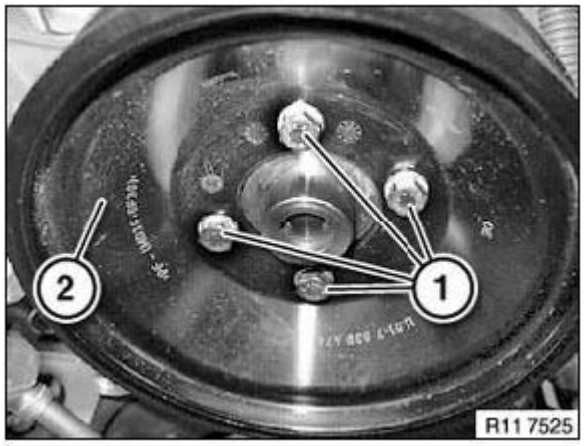


**Fig. 180: Identifying Alternator Drive Belt Screws And Belt Pulley**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (1 and 2).

Remove belt tensioner (3) with tensioning pulley.

*Installation:*

Observe the installation direction if the belt tensioner is replaced individually.

The lettering TOP must point upwards.

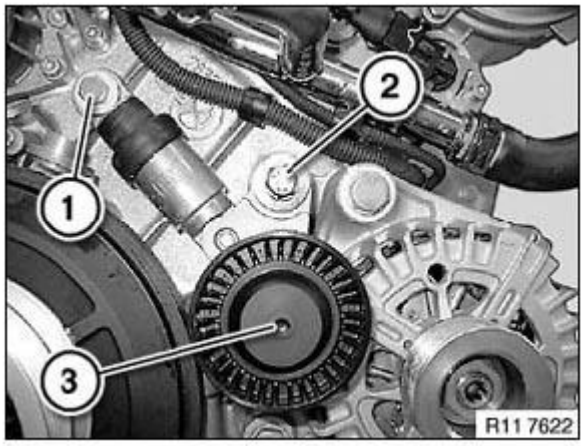


**Fig. 181: Identifying Belt Tensioner And Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 28 050 REPLACING A/C COMPRESSOR DRIVE BELT (S65)**

 

**IMPORTANT: Mixed installation of the assemblies is not permitted. Mixed installation will result in failure of the steering assistance.**
**Mark the direction of rotation of the drive belt if it is to be reused.**
**Replace the drive belt if it is fouled with coolant or engine oil.**
**Different idler pulleys for c.c.w.- and c.w.-rotating power steering pumps.**
**Tightening torque: 11 28 1-2AZ . See 11 28 DRIVE BELT .**

*Necessary preliminary tasks:*

- Remove **fan cowl with electric fan.** See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (S65)** .

**IMPORTANT: Belt routing of clockwise-rotating power steering pump (see arrow).**

Press down tensioning device (1) on damper in direction of arrow and hold.

Take off ribbed V-belt.

*Installation:*

Observe direction of rotation if reusing the drive belt.

Ensure drive belt is in correct installation position.

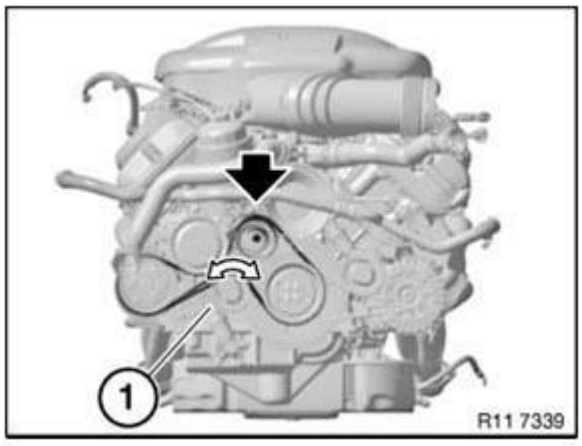


**Fig. 182: Pressing Down Tensioning Device On Damper**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Belt routing of counterclockwise-rotating power steering pump (see arrow). Double-sided ribbed V-belt.**

Press down tensioning device (1) on damper in direction of arrow and hold.

Take off ribbed V-belt.

 

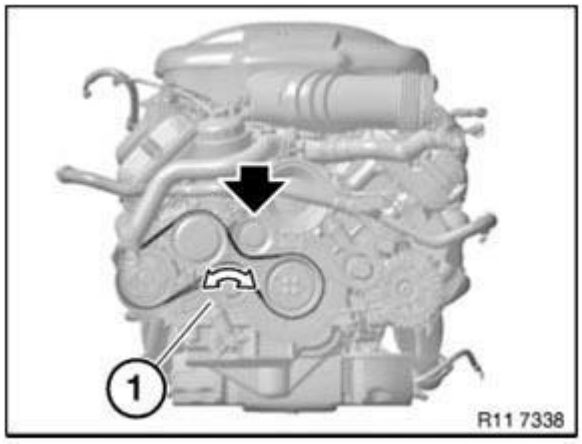


**Fig. 183: Pressing Down Tensioning Device On Damper**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Observe direction of rotation if reusing the drive belt.

Ensure drive belt is in correct installation position.

Assemble engine.

**11 28 060 REMOVING AND INSTALLING/REPLACING BELT TENSIONER FOR A/C COMPRESSOR (S65)**

**IMPORTANT: Mixed installation of the assemblies is not permitted. Mixed installation will result in failure of the steering assistance.**
**Mark the direction of rotation of the drive belt if it is to be reused.**
**Replace the drive belt if it is fouled with coolant or engine oil.**

*Necessary preliminary tasks:*

- Remove **fan cowl with electric fan.** See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (S65)** .
- Remove **A/C compressor drive belt.**

Release screw (1).

Release screw for power steering high-pressure line.

Release screws (2).

Remove belt tensioner (3) with fixture.

 

*Installation:*

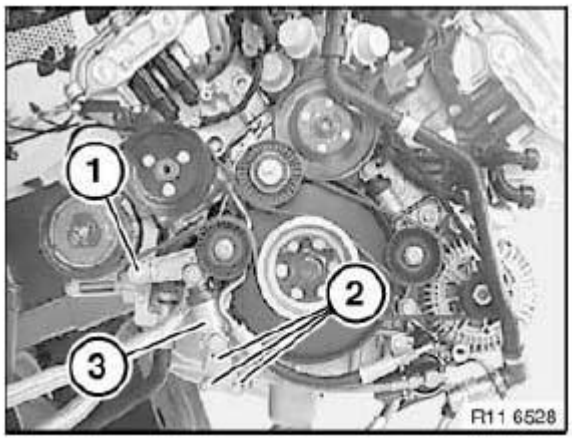


**Fig. 184: Identifying Belt Tensioner And Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Observe the installation direction if the belt tensioner is replaced individually.

The lettering TOP must point upwards.

Different idler pulleys for c.c.w.- and c.w.-rotating power steering pumps.

Tightening torque: **11 28 1-2AZ** . See **11 28 DRIVE BELT** .

Assemble engine.

## CAMSHAFT

### 11 31 032 REMOVING AND INSTALLING OR REPLACING LEFT INLET CAMSHAFTS (S65)

*Necessary preliminary tasks:*

- Remove **left cylinder head cover.**
- Remove left **VANOS exhaust gear**
- Remove left **VANOS inlet gear**

Release screws (1).

Tightening torque: **11 12 2AZ** . See **CYLINDER HEAD** .

E Intake camshaft

A Exhaust camshaft.

 

**IMPORTANT: Risk of mix-up with cylinder bank 1-5.**
**Arrow (2) must point in direction of travel to chain drive.**

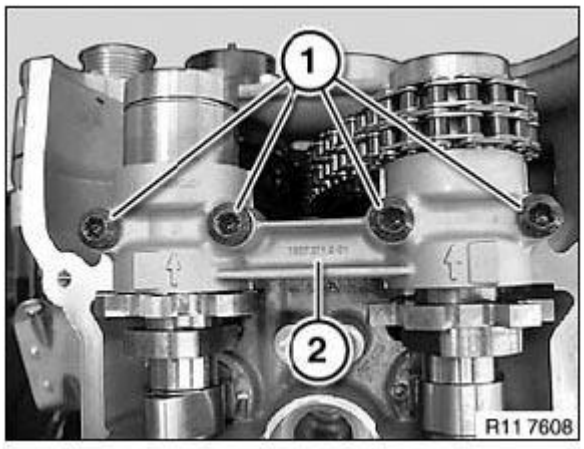


**Fig. 185: Identifying Screws And Bearing Cap**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Lubricate all bearing points with engine oil.

Release screws (1) from outside inwards in 1/2 turns.

Tightening torque: **11 12 2AZ** . See **CYLINDER HEAD** .

Remove inlet camshaft for cylinders 5 to 8.

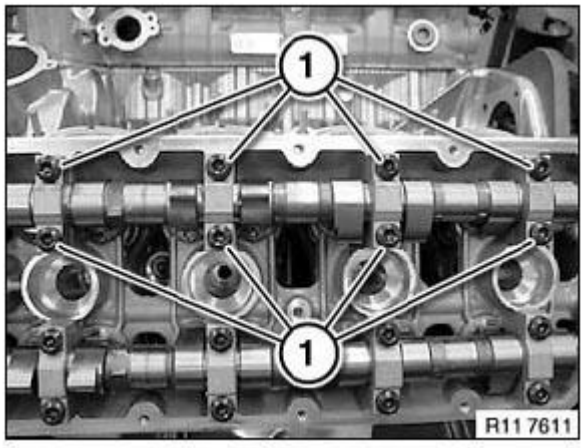


**Fig. 186: Identifying Camshaft Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Do not place timing chain in gearcase.

 

Secure timing chain (1) against falling down with a cable tie (3) to one screw (2).

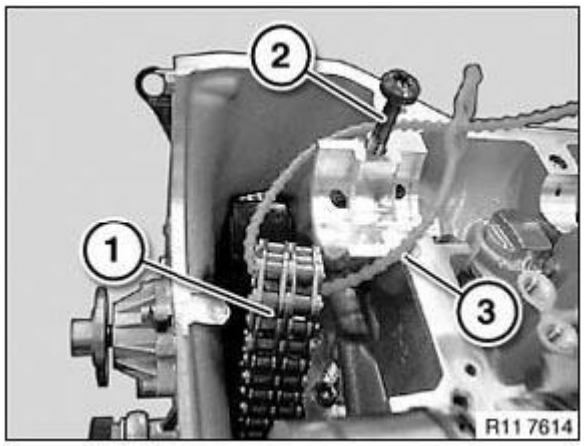


**Fig. 187: Securing Timing Chain With Cable Tie To Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Check plain compression rings for damage and replace if necessary.

The plain compression rings have catches at the joint.

Press plain compression rings apart upwards and downwards and remove towards front.

**IMPORTANT: Plain compression rings can break easily.**

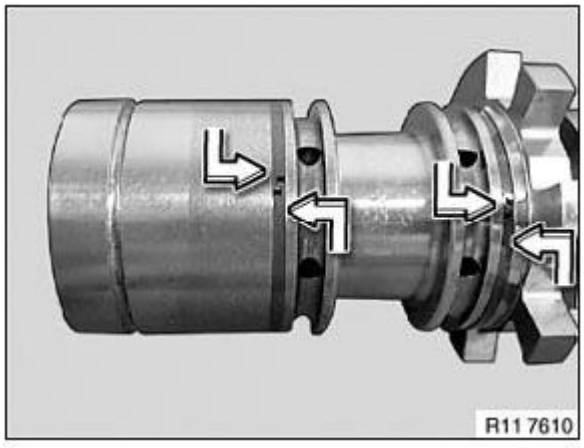


**Fig. 188: Pressing Plain Compression Rings Upwards And Downwards**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert inlet camshaft for cylinders 5 to 8.

Designation (E2) on dihedron points upwards.

 

Cams on cylinder no. 6 point upwards.

*Installation:*

Lubricate all bearing points with engine oil.

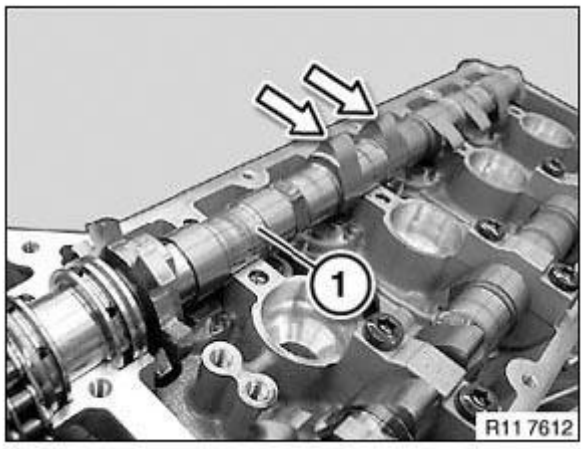


**Fig. 189: Locating Inlet Camshaft For Cylinders 5 To 8**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

All bearing shells are assigned to one cylinder.

E and A from (1 to 8), e.g. E 5= inlet side on cylinder no. 5.

Arrow must point in direction of travel to chain drive.

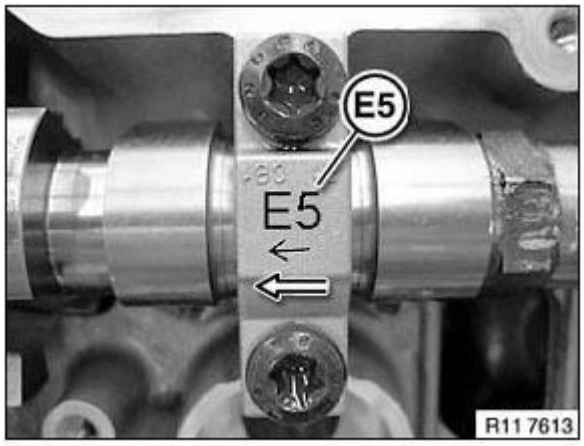


**Fig. 190: Identifying Bearing Shells Mark**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (1) from inside outwards in 1/2 turns.

 

Tightening torque: **11 12 2AZ** . See **CYLINDER HEAD** .

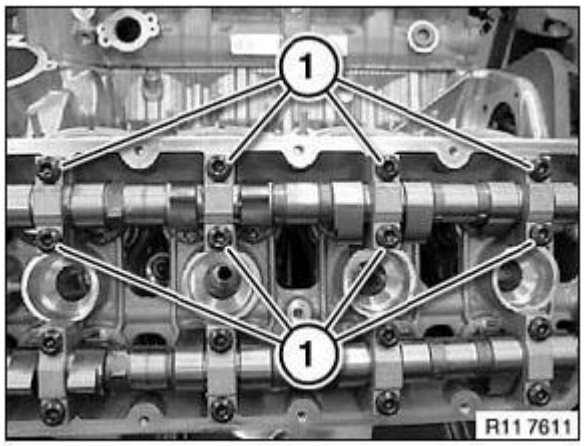


**Fig. 191: Identifying Camshaft Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Adjust **valve timing.**

Assemble engine.

**11 31 034 REMOVING AND INSTALLING/REPLACING RIGHT INLET CAMSHAFT (S65)**

*Necessary preliminary tasks:*

- Remove right **cylinder head cover.**
- Remove right **VANOS exhaust gear.**
- Remove right **VANOS inlet gear**

Release screws (1).

Tightening torque: **11 12 2AZ** . See **CYLINDER HEAD** .

E Intake camshaft

A Exhaust camshaft.

**IMPORTANT: Risk of mix-up with cylinder bank 5-8.**
**Arrow must point in direction of travel to chain drive.**

 

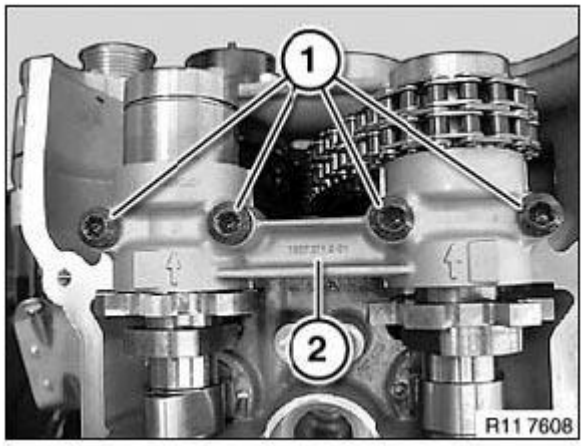


**Fig. 192: Identifying Inlet Camshaft Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Lubricate all bearing points with engine oil.

**NOTE: Illustration shows cylinders 5-8.**

Release screws (1) from outside inwards in 1/2 turns.

Tightening torque: **11 12 2AZ** . See **CYLINDER HEAD** .

*Installation:*

Lubricate all bearing points with engine oil.

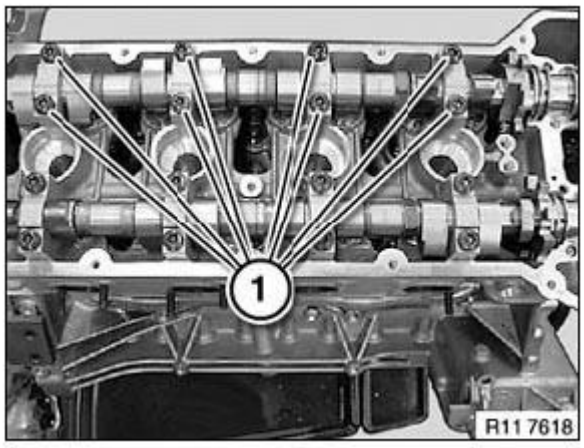


**Fig. 193: Identifying Bearing Cap Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

 

Check plain compression rings for damage and replace if necessary.

The plain compression rings have catches at the joint.

Press plain compression rings apart upwards and downwards and remove towards front.

**IMPORTANT: Plain compression rings can break easily.**

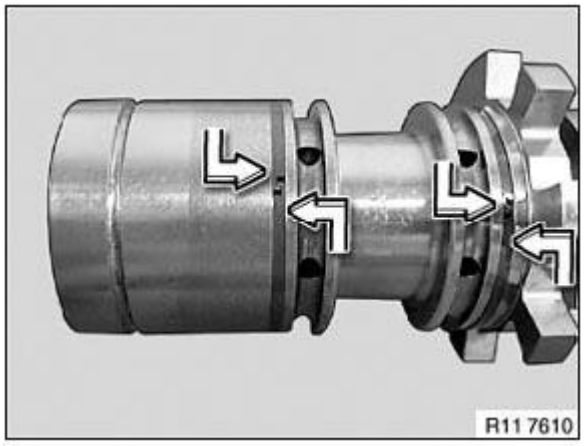


**Fig. 194: Pressing Plain Compression Rings Upwards And Downwards**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert inlet camshaft (1) for cylinders 1 to 4.

Designation (E1) on dihedron points upwards.

Cams on cylinders (1 and 3) point upwards at an angle.

*Installation:*

Lubricate all bearing points with engine oil.

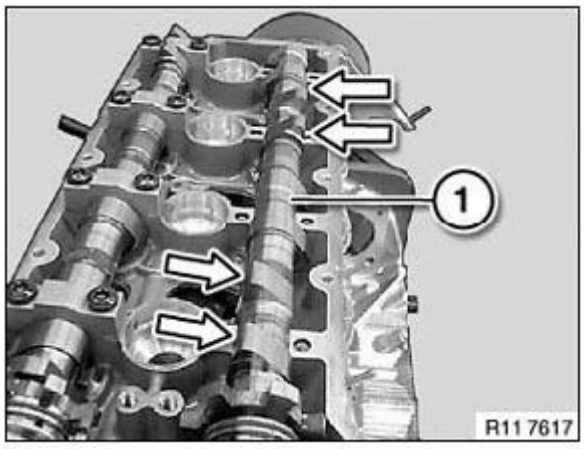


 

**Fig. 195: Identifying Cams On Cylinders**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

All bearing shells are assigned to one cylinder.

E and A from (1 to 8), e.g. E 1= inlet side on 1st cylinder.

Arrow (1) must point in direction of travel to chain drive.

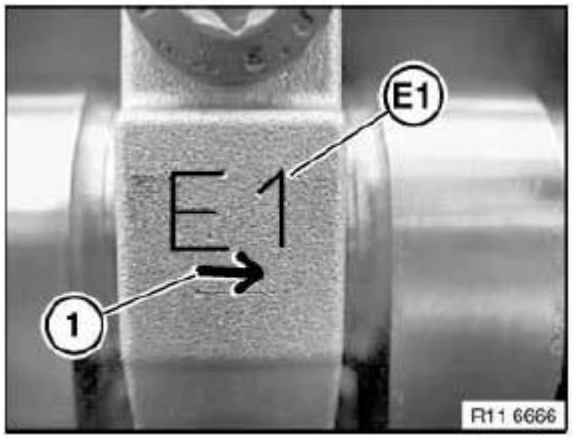


**Fig. 196: Identifying Bearing Shells Mark**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (1) from inside outwards in 1/2 turns.

Tightening torque: **11 12 2AZ** . See **CYLINDER HEAD** .

*Installation:*

Lubricate all bearing points with engine oil.

 

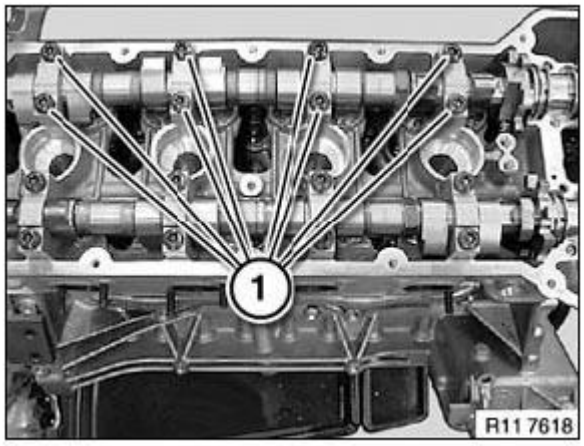


**Fig. 197: Identifying Bearing Cap Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Adjust valve timing.

Assemble engine.

**11 31 036 REMOVING AND INSTALLING/REPLACING LEFT EXHAUST CAMSHAFT (S65)**

*Necessary preliminary tasks:*

- Remove **left cylinder head cover.**
- Remove left **VANOS exhaust gear**

Release screws (1).

Tightening torque: **11 12 2AZ** . See **CYLINDER HEAD** .

E Intake camshaft

A Exhaust camshaft.

**IMPORTANT: Risk of mix-up with cylinder bank 1-4.**
**Arrow must point in direction of travel to chain drive.**

 

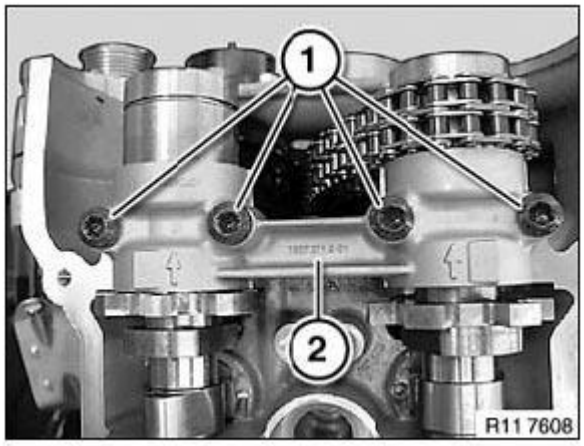


**Fig. 198: Identifying Screws And Bearing Cap**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove bearing cap (2).

*Installation:*

Lubricate all bearing points with engine oil.

Release screws (1) from outside inwards in 1/2 turns.

Tightening torque: **11 12 2AZ** . See **CYLINDER HEAD** .

*Installation:*

Lubricate all bearing points with engine oil.

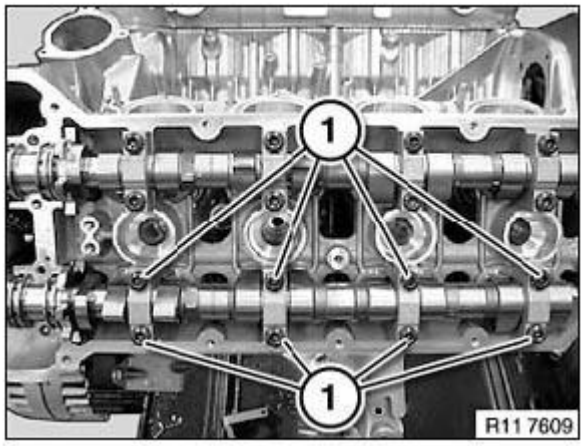


**Fig. 199: Identifying Exhaust Camshaft Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Check plain compression rings for damage and replace if necessary.

 

The plain compression rings have catches at the joint.

Press plain compression rings apart upwards and downwards and remove towards front.

**IMPORTANT: Plain compression rings can break easily.**

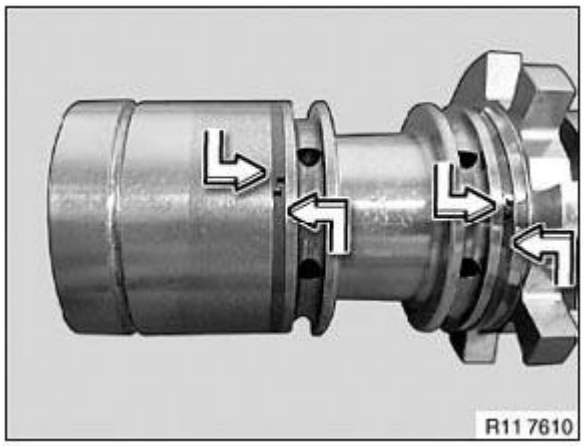


**Fig. 200: Pressing Plain Compression Rings Upwards And Downwards**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert exhaust camshaft for cylinders 5 to 8.

Designation (A 2) on dihedron points upwards.

Cams (1) on cylinder no. 5 point upwards.

*Installation:*

Lubricate all bearing points with engine oil.

**NOTE: Picture shows S85.**

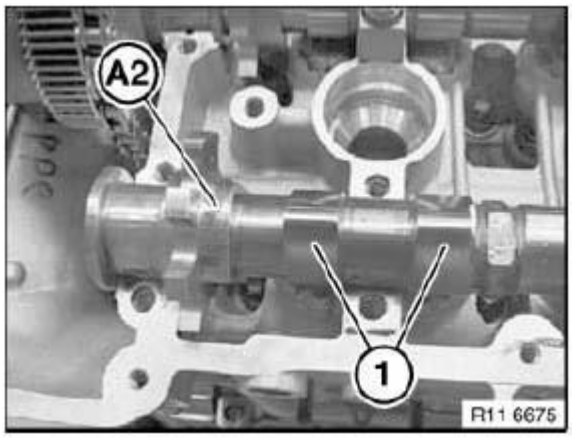


 

**Fig. 201: Identifying Cylinder No. 5 Cams**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

All bearing shells are assigned to one cylinder.

E and A from (1 to 8), e.g. E 5= inlet side on cylinder no. 5.

Arrow must point in direction of travel to chain drive.

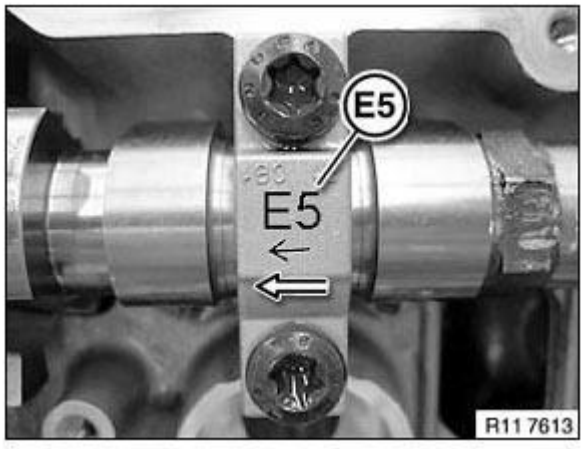


**Fig. 202: Identifying Bearing Shells Mark**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (1) from inside outwards in 1/2 turns.

Tightening torque: **11 12 2AZ** . See **CYLINDER HEAD** .

*Installation:*

Lubricate all bearing points with engine oil.

 

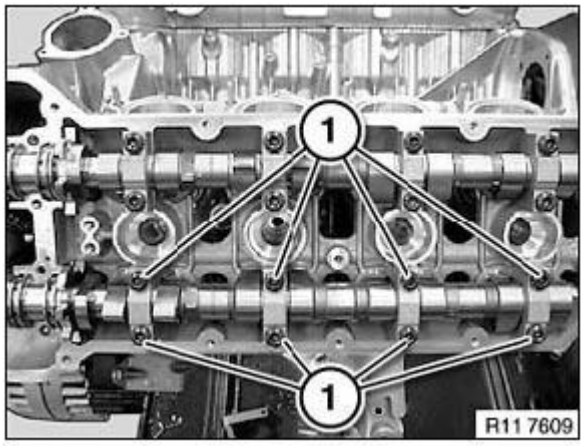


**Fig. 203: Identifying Exhaust Camshaft Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Adjust **valve timing.**

Assemble engine.

**11 31 038 REMOVING AND INSTALLING/REPLACING RIGHT EXHAUST CAMSHAFT (S65)**

*Necessary preliminary tasks:*

- Remove right **cylinder head cover.**
- Remove right **VANOS exhaust gear**

Release screws (1).

Tightening torque: **11 12 2AZ** . See **CYLINDER HEAD** .

E Intake camshaft

A Exhaust camshaft.

**IMPORTANT: Risk of mix-up with cylinder bank 5-8.**
**Arrow must point in direction of travel to chain drive.**

 

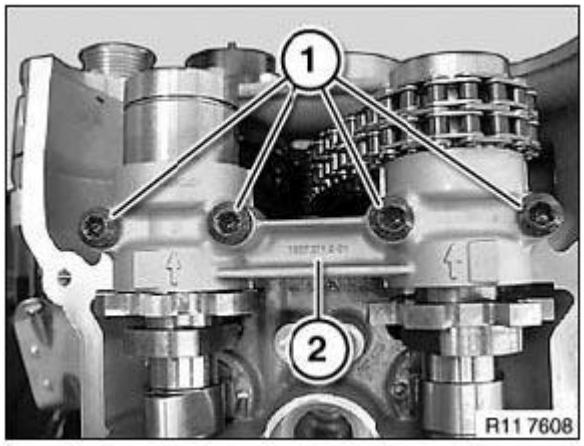


**Fig. 204: Identifying Screws And Bearing Cap**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove bearing caps.

*Installation:*

Lubricate all bearing points with engine oil.

Release screws (1) from outside inwards in 1/2 turns.

Tightening torque: **11 12 2AZ** . See **CYLINDER HEAD** .

Remove exhaust camshaft for cylinders 1 to 4.

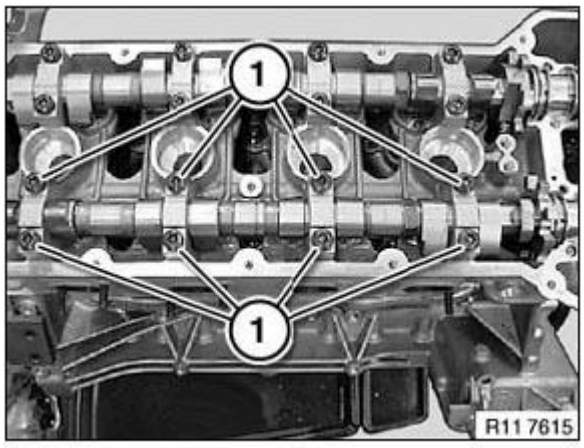


**Fig. 205: Identifying Exhaust Camshaft Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Check plain compression rings for damage and replace if necessary.

The plain compression rings have catches at the joint.

 

Press plain compression rings apart upwards and downwards and remove towards front.

**IMPORTANT: Plain compression rings can break easily.**

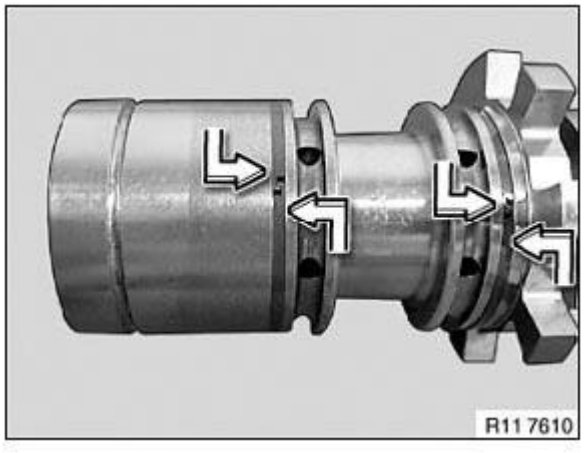


**Fig. 206: Pressing Plain Compression Rings Upwards And Downwards**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert exhaust camshaft for cylinders 1 to 4.

Designation (A1) on dihedron points upwards.

Cams on cylinder no. 4 point upwards.

*Installation:*

Lubricate all bearing points with engine oil.

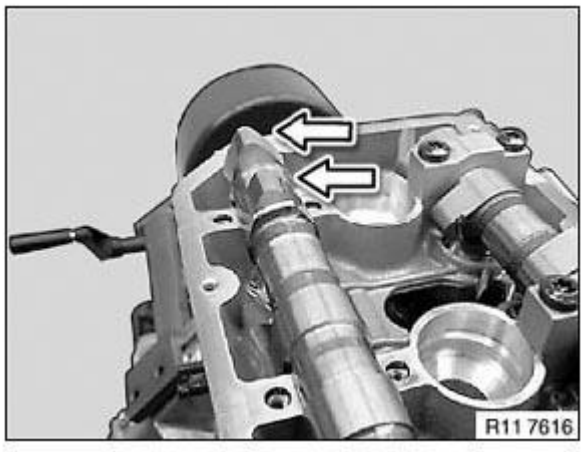


**Fig. 207: Identifying Cylinder No. 4 Cams**
**Courtesy of BMW OF NORTH AMERICA, INC.**

 

*Installation:*

All bearing shells are assigned to one cylinder.

E and A from (1 to 8), e.g. A 1= exhaust side on 1st cylinder.

Arrow (1) must point in direction of travel to chain drive.

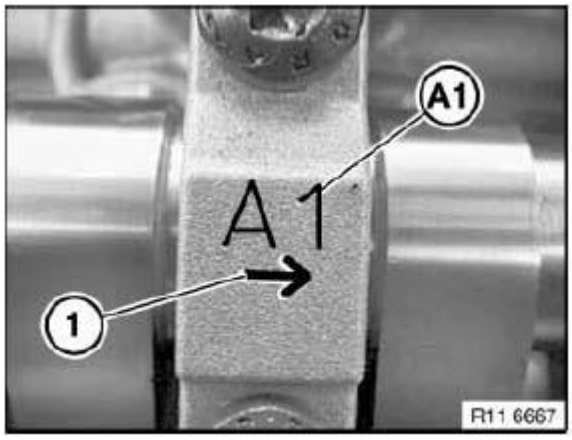


**Fig. 208: Identifying Bearing Shells Marks**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (1) from inside outwards in 1/2 turns.

Tightening torque: **11 12 2AZ** . See **CYLINDER HEAD** .

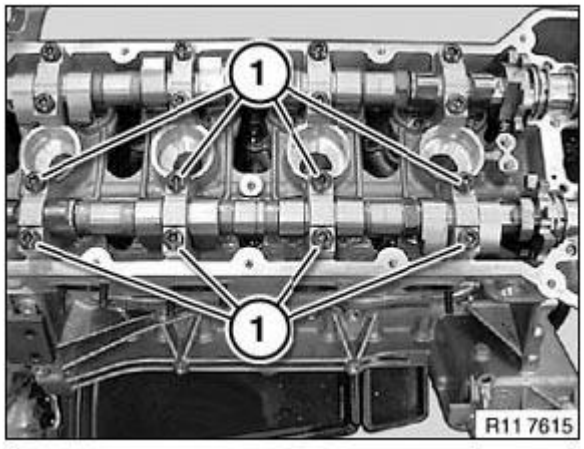


**Fig. 209: Identifying Exhaust Camshaft Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Adjust valve timing.

Assemble engine.

 

**11 31 051 REPLACING BOTH TIMING CHAINS (S65)**

**Special tools required:**

- **11 5 290**
- **11 5 292**

See **ENGINE - SPECIAL TOOLS** .

*Necessary preliminary tasks:*

- Remove all **VANOS gears.** See **11 36 142 Removing and installing/replacing left inlet VANOS gear (S65)**, **11 36 144 Removing and installing/replacing left exhaust VANOS gear (S65)**, **11 36 148 Removing and installing/replacing right inlet VANOS gear (S65)** and **11 36 150 Removing and installing/replacing right exhaust VANOS gear (S65)**.
- Remove **radial shaft seal** at front.
- Remove **oil pump.**
- Remove **oil return pump.**
- Remove **oil filter housing.**

Release screw plug (1) on bank 1.

Tightening torque: **11 12 4AZ** . See **CYLINDER HEAD** .

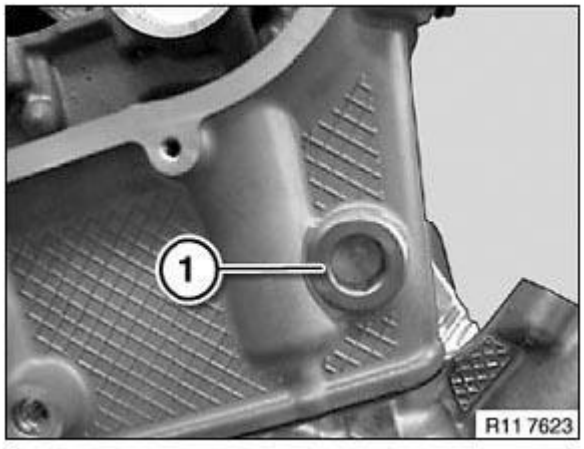


**Fig. 210: Identifying Screw Plug**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screw plugs (1).

Tightening torque: **11 11 6AZ** . See **11 11 ENGINE BLOCK** .

Release screw (2).

 

Remove intermediate piece (3) without gearwheel towards front.

**IMPORTANT: Gearwheel can fall out.**

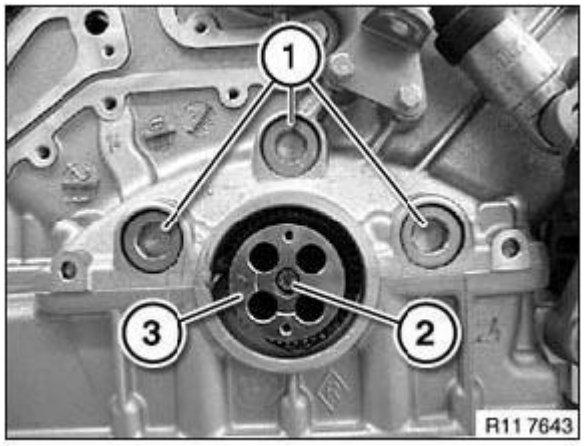


**Fig. 211: Identifying Screw Plugs, Screw And Intermediate Piece**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**Arrangement of gearwheel and intermediate piece:**

Gearwheel (1) with dowel pin.

Intermediate piece (2).

Central bolt (3).

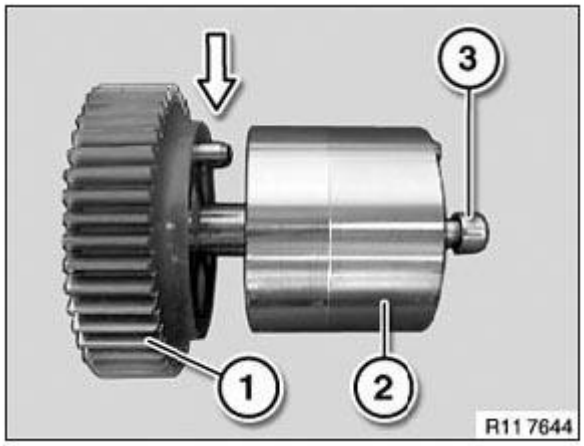


**Fig. 212: Identifying Gearwheel, Intermediate Piece And Central Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Bearing pin (1) is only inserted.**
**Bearing pin (2) for two tensioning rails.**

 

Remove bearing pin with special tool **11 5 290** .

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

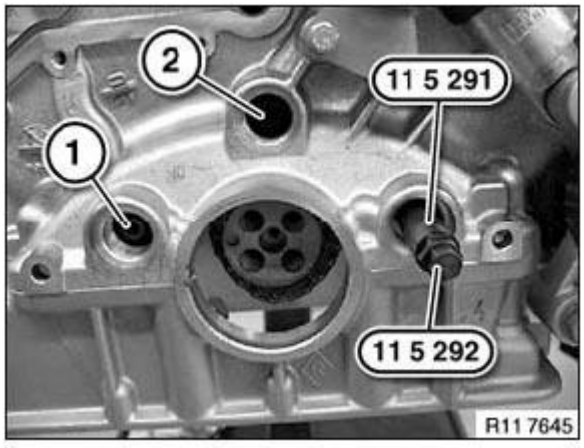


**Fig. 213: Identifying Bearing Pin And Special Tool (11 5 290)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Bearing pin (1) is only inserted.**

Screw in special tool **11 5 292** at bearing pin (1) and pull out.

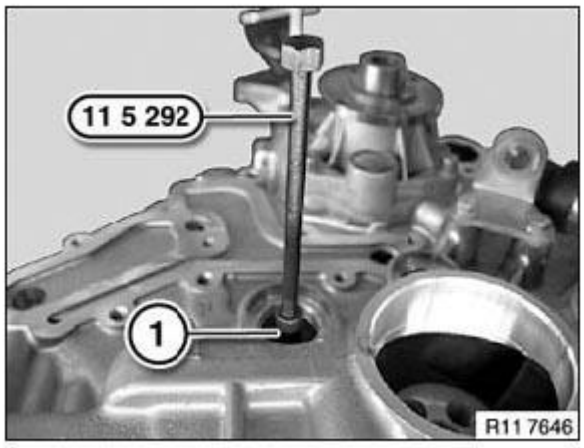


**Fig. 214: Screwing Special Tool (11 5 292) At Bearing Pin**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove bearing pin with special tool **11 5 290** .

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

 

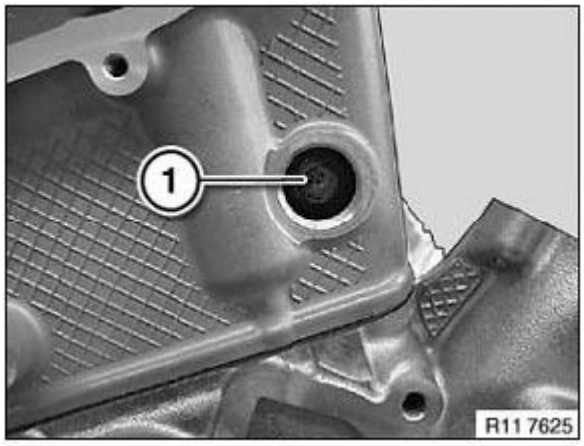


**Fig. 215: Identifying Bearing Pin**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**Arrangement of both timing chains:**

1. Timing chain, bank 2.
2. Timing chain, bank 2.
3. Guide rail, bank 1.
4. Timing chain, bank 1.
5. Tensioning rail, bank 1.
6. Bearing pin, inserted type.
7. Bearing pin for two tensioning and guide rails.
8. Bearing pin, screwed type.
9. Guide rail, bank 2.

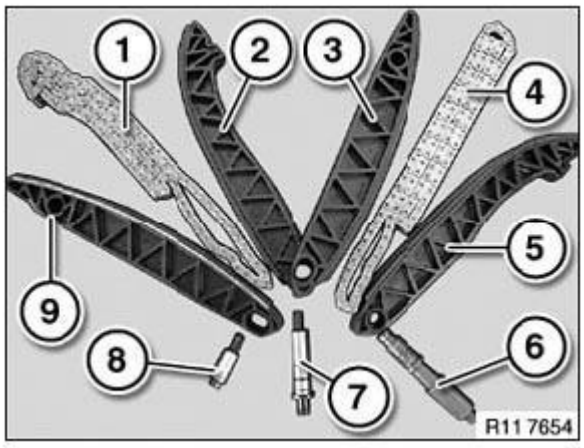


**Fig. 216: Identifying Arrangement Of Timing Chains**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove timing chain, bank 2.

 

Remove timing chain, bank 1.

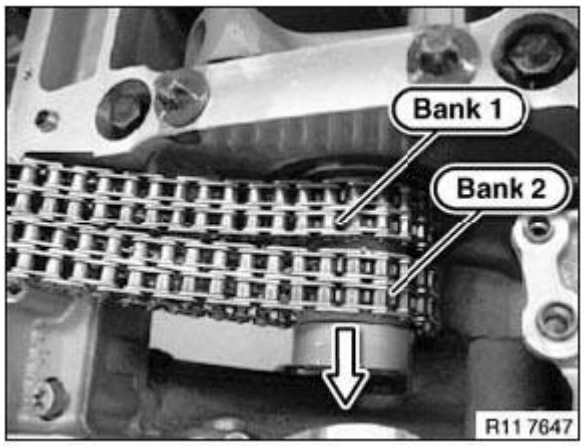


**Fig. 217: Removing Timing Chain (Bank 1 And Bank 2)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 31 072 CHECKING CAMSHAFT TIMING (S65)**

**Special tools required:**

- **11 0 480**
- **11 5 320**
- **11 9 970**
- **11 9 971**
- **11 9 972**

See **ENGINE - SPECIAL TOOLS** .

**IMPORTANT: Bank (2), cylinders (5 - 8), is checked first.**
**The timing of bank (1) at cylinders (1-4) can only be checked at overlap TDC.**
**The lettering (E1 and A1) must point downwards.**

*Necessary preliminary tasks:*

- Remove **fan cowl** with electronic fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (S65)** .
- Remove left **cylinder head cover.**
- Remove right **cylinder head cover.**
- Remove all **spark plugs.** See **12 12 011 REPLACING ALL SPARK PLUGS (S65)** .

**IMPORTANT: Danger of mixing up both special tool bores.**

 

10° 10° **before** TDC (top dead center)

OT Top dead center


**Fig. 218: Identifying Timing Marks**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Only bank 2, cylinders (5 - 8), can be checked in cylinder no. 1 firing TDC position.**
**The 10° position is required only to adjust the timing.**

Crank engine at central bolt until the firing TDC position appears on the vibration damper.

Engine installed: Secure vibration damper in position with special tool **11 0 480** .

Engine removed: Secure vibration damper in position with special tool **11 5 320** .

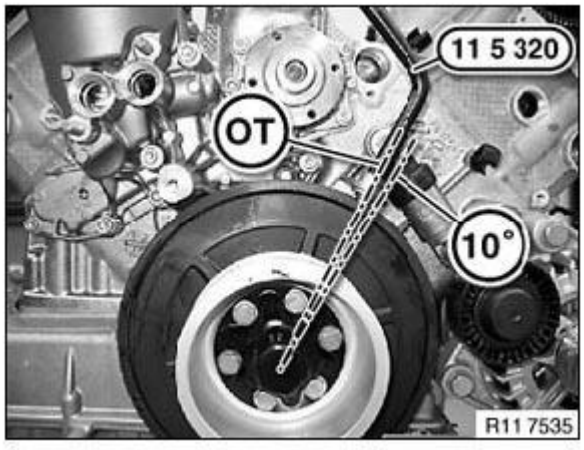


**Fig. 219: Identifying Special Tool (11 5 320) On Vibration Damper**
**Courtesy of BMW OF NORTH AMERICA, INC.**

 

**IMPORTANT: Bank 2 is checked first.**

The lettering (A2 and E2) points upwards.

The positions of the cams on the exhaust camshaft point vertically upwards (see picture).

The positions of the cams on the inlet camshaft point at an angle downwards (see picture).

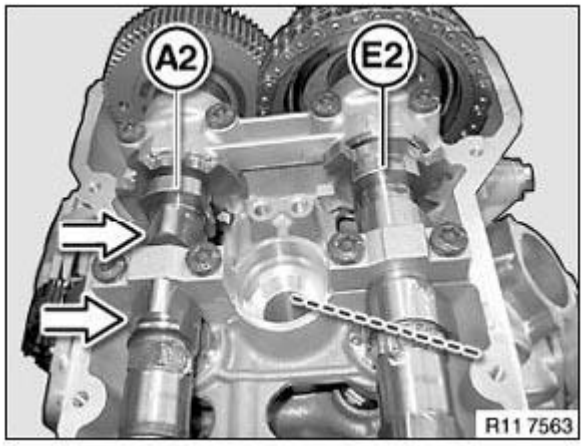


**Fig. 220: Identifying Letters (A2 And E2) On Cam**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position special tool **11 9 972** on twin surface of exhaust camshaft (A2).

Position special tool **11 9 971** on twin surface of inlet camshaft (E2).

The timings are correctly set when special tool **11 9 970** rests without a gap on the cylinder head.

Permissible tolerance: A maximum gap of 1.0 mm is permitted on the non-contacting side of special tool **11 9 970** .

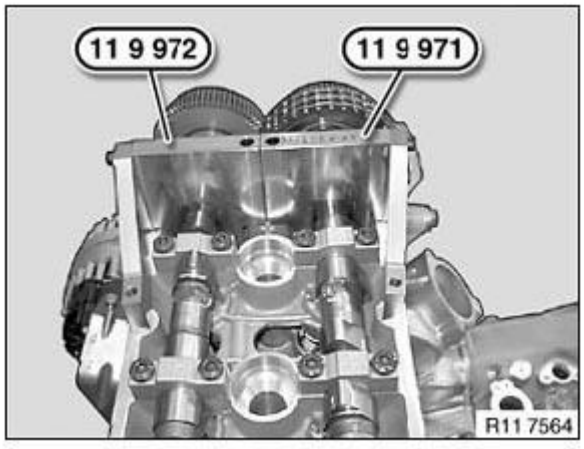


 

**Fig. 221: Identifying Special Tools (11 9 972) And (11 9 971)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Remove special tools 11 9 970 and 11 5 320 .**
**Crank engine at central bolt 360° in direction of rotation.**
**The timing of bank 1 at cylinders (1-4) can only be checked at overlap TDC.**

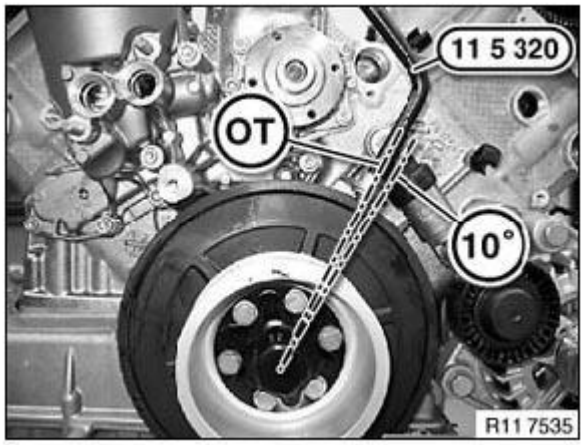


**Fig. 222: Identifying Special Tool (11 5 320) On Vibration Damper**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Crank engine at central bolt until the firing TDC position appears on the vibration damper.

Engine installed: Secure vibration damper in position with special tool **11 0 480** .

Engine removed: Secure vibration damper in position with special tool **11 5 320** .

**IMPORTANT: Position of camshaft at overlap TDC**
**The lettering (E1 and A1) points downwards.**

The cams on cylinder no. 1 on the inlet camshaft point at an angle downwards (see picture).

The cams on cylinder no. 1 on the exhaust camshaft point at an angle downwards (see picture).

Position special tool **11 9 971** on twin surface of inlet camshaft (E1).

Position special tool **11 9 972** on twin surface of exhaust camshaft (A1).

 

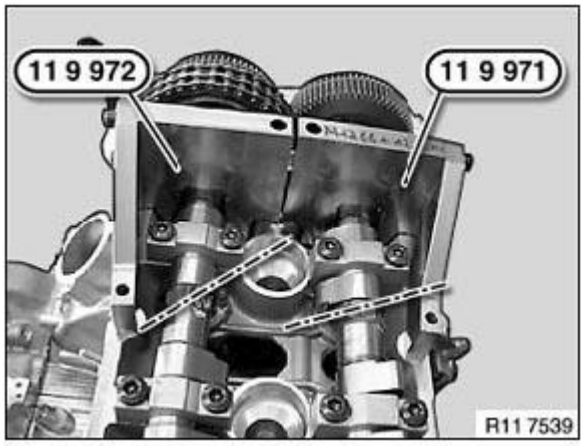


**Fig. 223: Identifying Special Tools On Inlet Camshaft And Exhaust Camshaft**
**Courtesy of BMW OF NORTH AMERICA, INC.**

The timings are correctly set when special tool **11 9 970** rests without a gap on the cylinder head.

Permissible tolerance: A maximum gap of 1.0 mm is permitted on the non-contacting side of special tool **11 9 970** .

Adjust **valve timing.**

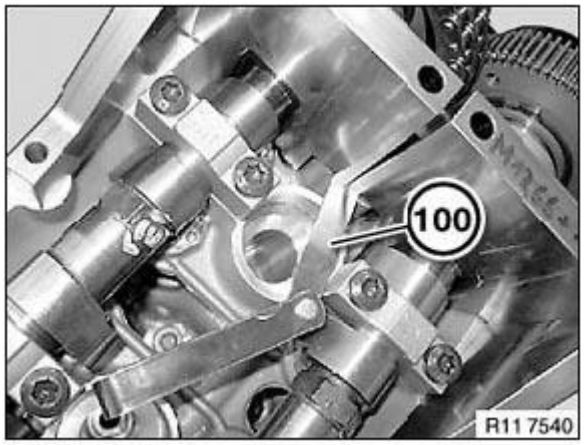


**Fig. 224: Identifying Gap Between Timings Chain And Cylinder Head**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove all special tools.

Assemble engine in reverse sequence to its disassembly.

**11 31 094 REMOVING AND INSTALLING/REPLACING LEFT HYDRAULIC CHAIN TENSIONER (S65)**

*Necessary preliminary tasks:*

 

- Remove left **intake filter housing** . See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (S65)** .
- Remove **intake air manifold.**

Release chain tensioner (1).

*Installation:*

Replace sealing ring.

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

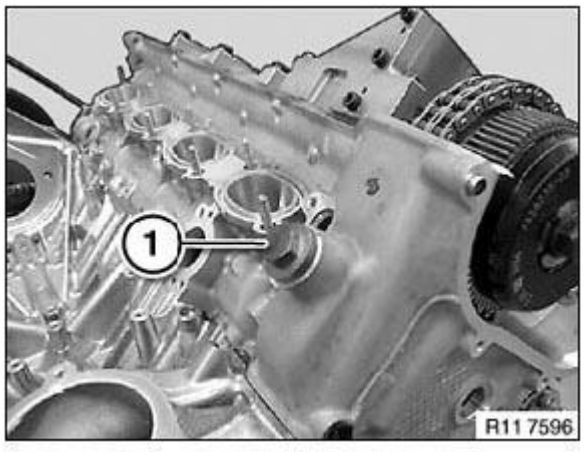


**Fig. 225: Identifying Left Hydraulic Chain Tensioner Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 31 095 REMOVING AND INSTALLING/REPLACING RIGHT HYDRAULIC CHAIN TENSIONER (S65)**

*Necessary preliminary tasks:*

- Remove **expansion tank.** See **17 11 100 REMOVING AND INSTALLING/REPLACING COOLANT EXPANSION TANK (S65)** .
- Unfasten both **A/C lines** on A/C compressor.

Release chain tensioner (1).

*Installation:*

Replace sealing ring.

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

 

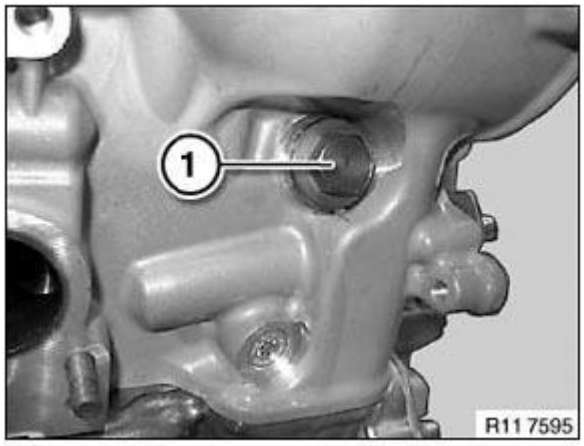


**Fig. 226: Identifying Right Hydraulic Chain Tensioner Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 31 575 ADJUSTING CAMSHAFT TIMING (S65)**

**Special tools required:**

- **00 9 120**
- **11 5 320**
- **11 9 970**
- **11 9 971**
- **11 9 972**

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

See **ENGINE - SPECIAL TOOLS** .

**IMPORTANT: Central bolts on VANOS gears have left-hand threads.**

**IMPORTANT: The procedure for adjusting the timing is different from that for checking the timing.**
**The letters/numbers on the camshafts (E1 and A1) and (E2 and A2) must point upwards.**
**Do not release the central bolts of the adjustment units without the special tool 11 9 970 (risk of damage!).**
**If the special tool 11 9 970 cannot be positioned on the dihedron of the camshafts, bar the engine at the central bolt until the special tool 11 9 970 can be secured on the cylinder head.**

Release bolts (1) on cylinder bank 1.

 

Remove timing case cover (2).

*Installation:*

Replace seal.

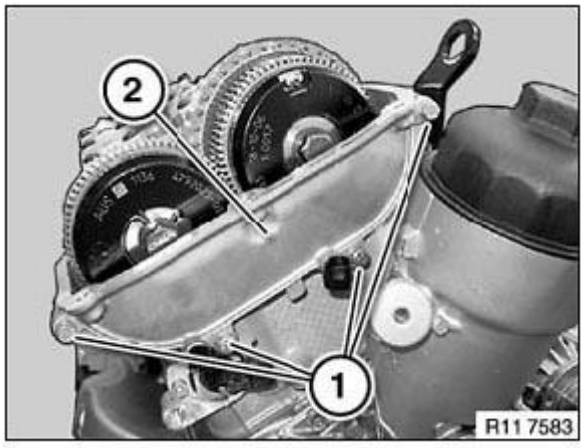


**Fig. 227: Identifying Cylinder Bank 1 Bolts And Timing Case Cover**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release bolts (1) on cylinder bank 2.

Remove timing case cover (2).

*Installation:*

Replace seal.

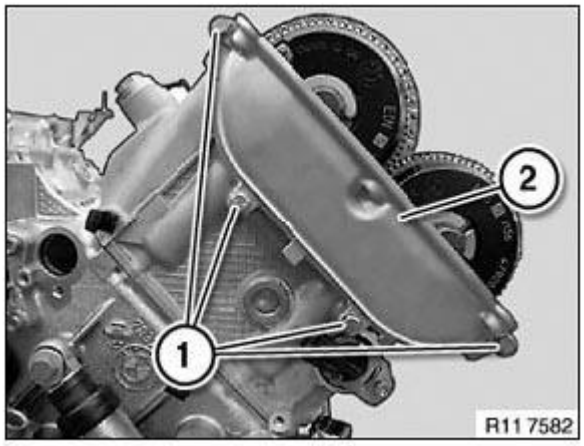


**Fig. 228: Identifying Cylinder Bank 2 Bolts And Timing Case Cover**
**Courtesy of BMW OF NORTH AMERICA, INC.**

 

**IMPORTANT: Both inlet and exhaust camshafts can be adjusted in the 1st cylinder firing TDC position.**

Danger of mixing up both special tool bores.

- 10° before TDC
- TDC= top dead center.

Before the crankshaft can be secured, the gauges **11 9 970** must be positioned on the camshafts.

Rotate crankshaft at central bolt.


**Fig. 229: Identifying Timing Marks**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Always start timing with bank 1 (cylinders 1-4).**

Position of inlet camshaft, cylinders 1-4.

Designation (E1) on dihedron points upwards.

 

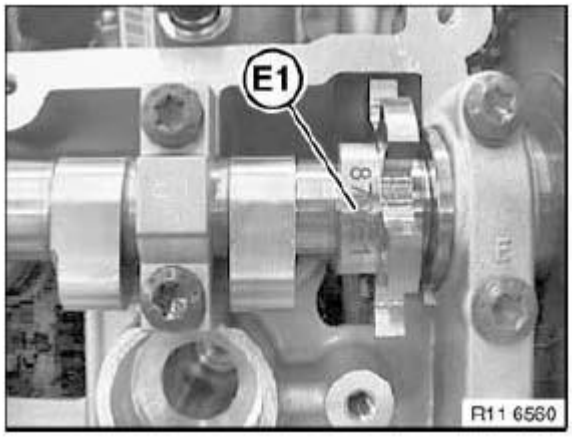


**Fig. 230: Identifying Letters/Numbers On Camshafts Point (E1)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position of exhaust camshaft, cylinders 1-4.

Designation (A1) on dihedron (1) points upwards.

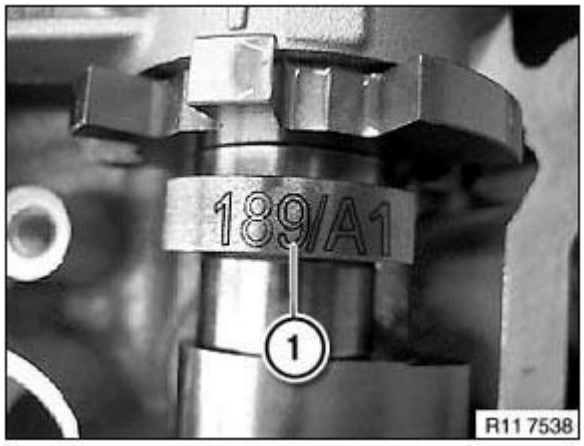


**Fig. 231: Identifying Letters/Numbers (A1) On Camshafts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Rotate inlet camshaft with open-end wrench (1) with minimal effort at hexagon head in direction of arrow until special tool **11 9 972** can be attached.

Designation (E1) on dihedron points upwards.

Secure special tool **11 9 972** with bolts (2) on cylinder head to **10 Nm.**

 

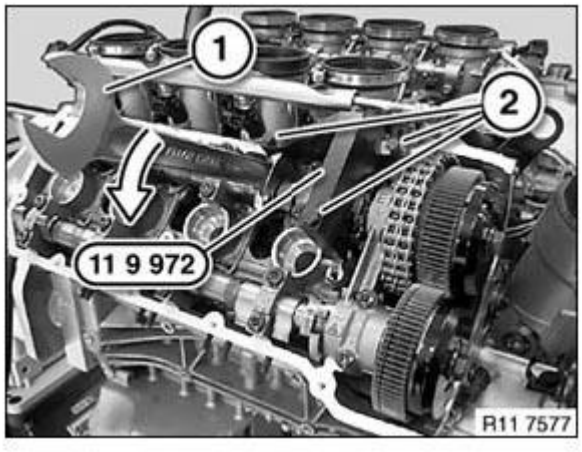


**Fig. 232: Rotating Inlet Camshaft With Open-End Wrench**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Rotate exhaust camshaft with open-end wrench with minimal effort in direction of arrow until special tool **11 9 971** can be attached.

Designation (A1) on dihedron points upwards.

Secure special tool **11 9 971** with bolts (1) on cylinder head to **10 Nm.**

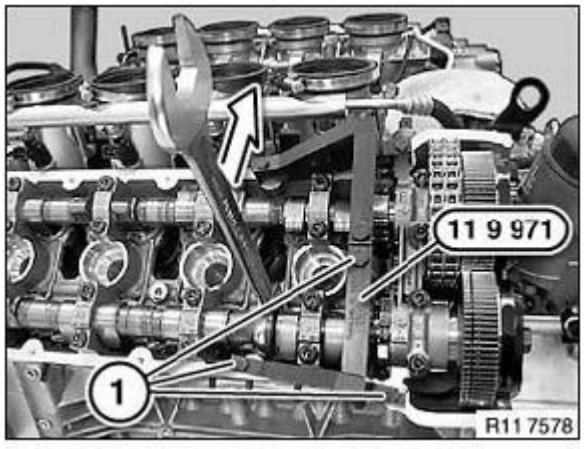


**Fig. 233: Identifying Special Tool (11 9 971) On Cylinder Head Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: CCW thread!**

Release central bolt (1).

Release central bolt (2).

*Installation:*

 

Replace central bolts (1 and 2).

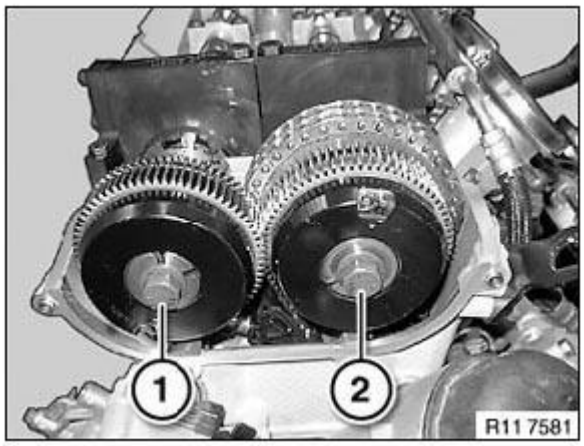


**Fig. 234: Identifying Central Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Rotate crankshaft at central bolt back until special tool 11 5 320 can be secured in the 10° position.**

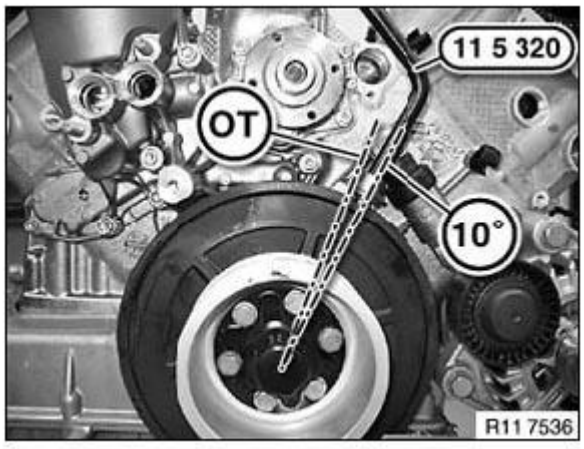


**Fig. 235: Rotating Crankshaft At Central Bolt With Special Tool (11 5 320)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Replace central bolts of adjustment units. Central bolts must be fully screwed once.**

**Cylinders 1 to 4:**

Always start screwing on the inlet side.

Secure central bolt (1) with special tool **00 9 120** .

 

**IMPORTANT: Screw central bolt fully once.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**
4. **Unscrew central bolt.**
5. **Preload central bolt to 10 Nm.**

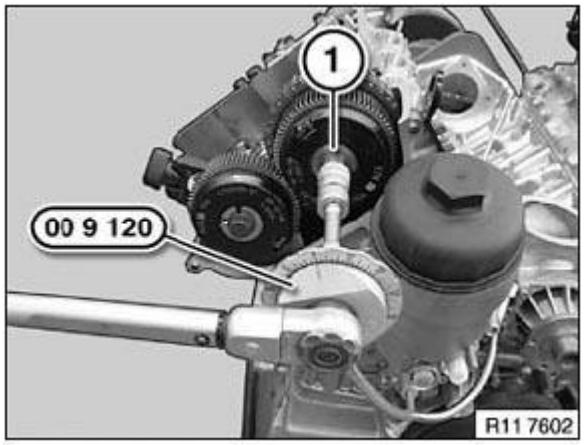


**Fig. 236: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Screw central bolt fully once.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**
4. **Unscrew central bolt.**
5. **Preload central bolt to 10 Nm.**

 

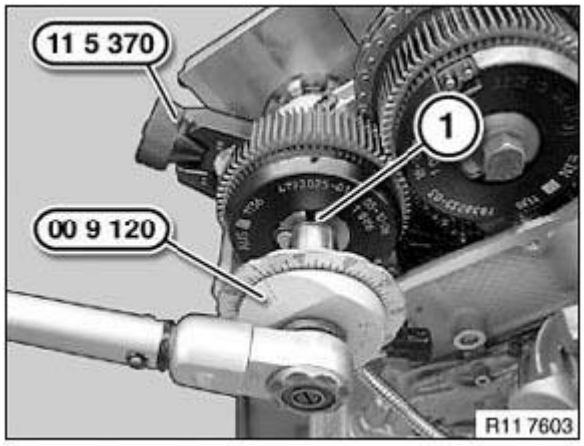


**Fig. 237: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Camshafts, cylinders 1-4, **remain secured with special tool 11 9 970** .

Release special tool **11 5 320** and continue barring engine at central bolt **10°** to **firing TDC position of cylinder no. 1** .

*Installation:*

This minimizes timing chain play.

Secure crankshaft with special tool **11 5 320** .

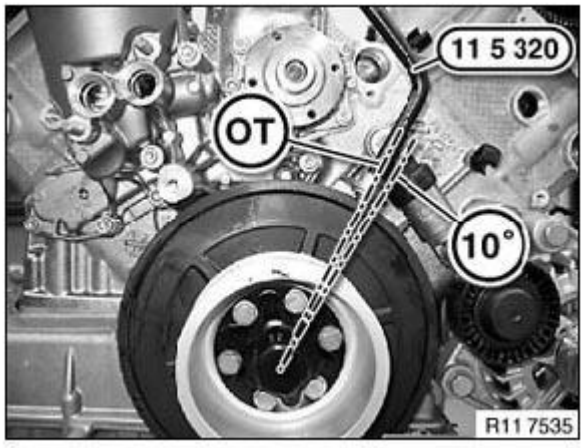


**Fig. 238: Identifying Special Tool (11 5 320) On Vibration Damper**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**Cylinders 1 to 4:**

Always start screwing on the inlet side.

 

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Central bolt final tightening.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**

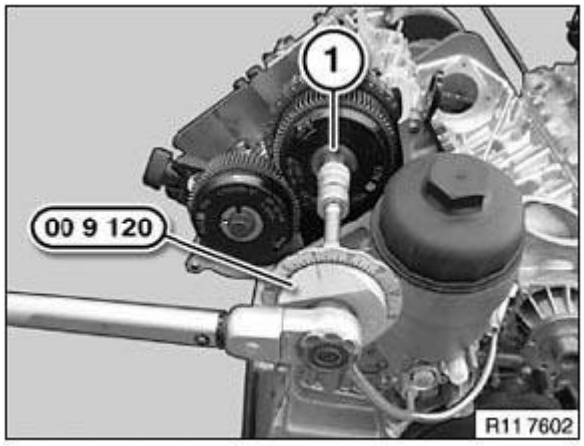


**Fig. 239: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Central bolt final tightening.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**

**IMPORTANT: Remove all special tools.**

 

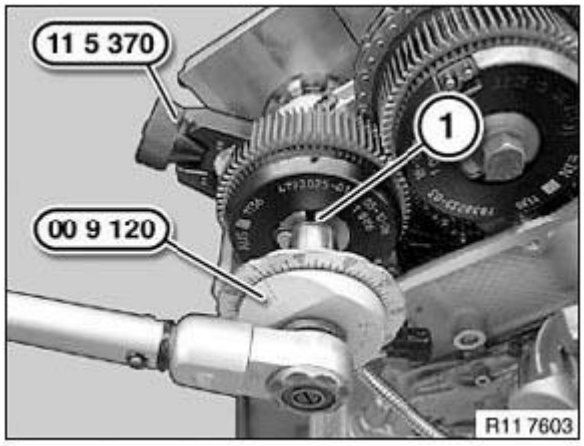


**Fig. 240: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position of inlet camshaft, cylinders 5-8.

Designation (E2) on dihedron points upwards.

*Installation:*

If necessary, crank at crankshaft central bolt.

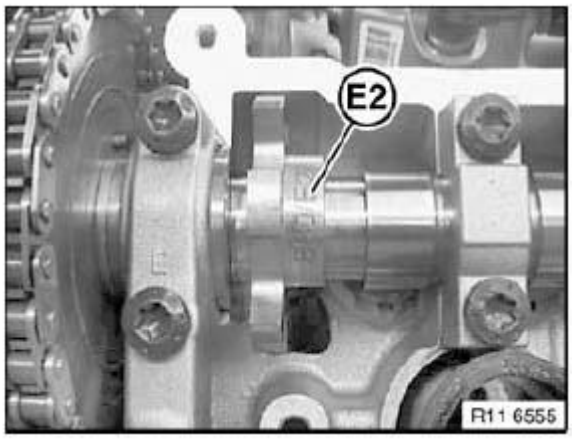


**Fig. 241: Identifying Letters/Numbers On Camshafts Point Upwards (E2)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position of exhaust camshaft, cylinders 5-8.

Designation (A2) on dihedron points upwards.

 

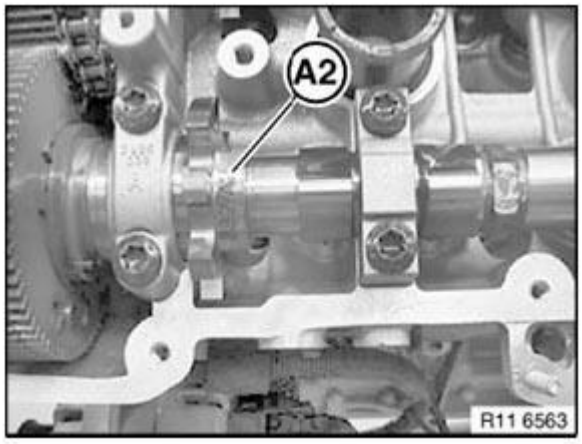


**Fig. 242: Identifying Letters/Numbers On Camshafts Point Upwards (A2)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure inlet camshaft with special tool **11 9 971** .

Secure exhaust camshaft with special tool **11 9 972** .

Secure special tools **11 9 971** and **11 9 972** with bolts (1) on cylinder head to **10 Nm.**

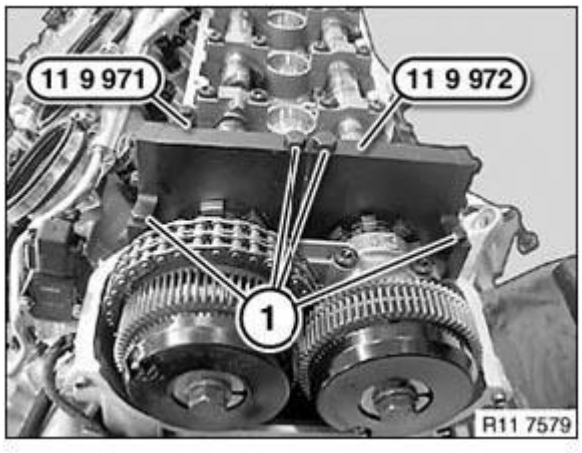


**Fig. 243: Identifying Special Tools (11 9 971) And (11 9 972)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: CCW thread!**

Release central bolt (1).

Release central bolt (2).

*Installation:*

Replace central bolts (1 and 2).

 

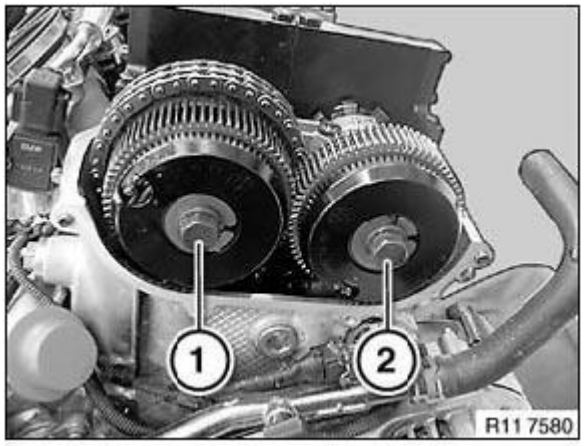


**Fig. 244: Identifying Central Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Rotate crankshaft at central bolt back until special tool 11 5 320 can be secured in the 10° position.**

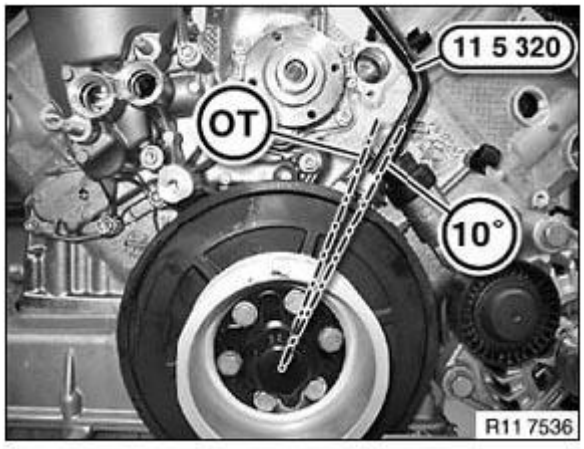


**Fig. 245: Identifying Special Tool (11 5 320)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Replace central bolts of adjustment units. Central bolts must be fully screwed once.**

**Cylinders 5 to 8:**

Always start screwing on the inlet side.

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Screw central bolt fully once.**

 

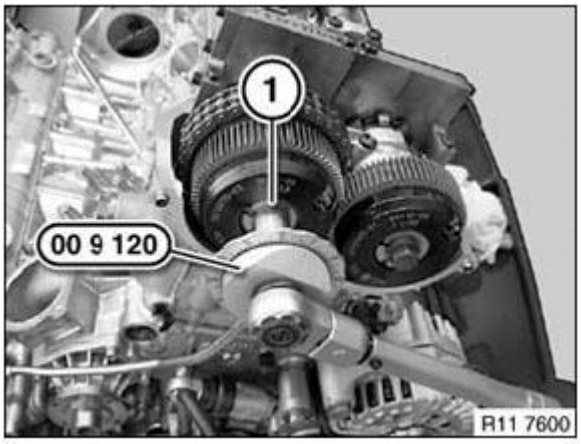


**Fig. 246: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**
4. **Unscrew central bolt.**
5. **Preload central bolt to 10 Nm.**

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Screw central bolt fully once.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**
4. **Unscrew central bolt.**
5. **Preload central bolt to 10 Nm.**

 

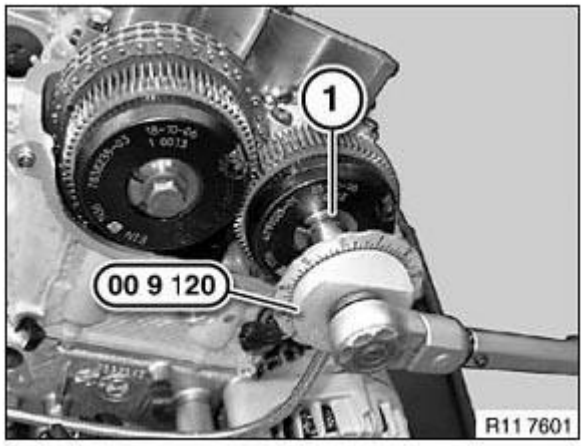


**Fig. 247: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Camshafts, cylinders 5-8, **remain secured with special tool 11 9 970** .

Release special tool **11 5 320** and continue barring engine at central bolt **10°** to **firing TDC position of cylinder no. 1** .

*Installation:*

This minimizes timing chain play.

Secure crankshaft with special tool **11 5 320** .

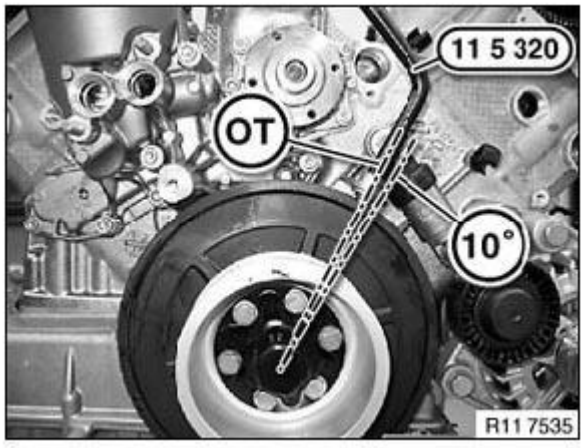


**Fig. 248: Identifying Special Tool (11 5 320) On Vibration Damper**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**Cylinders 5 to 8:**

Always start screwing on the inlet side.

 

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Central bolt final tightening.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**

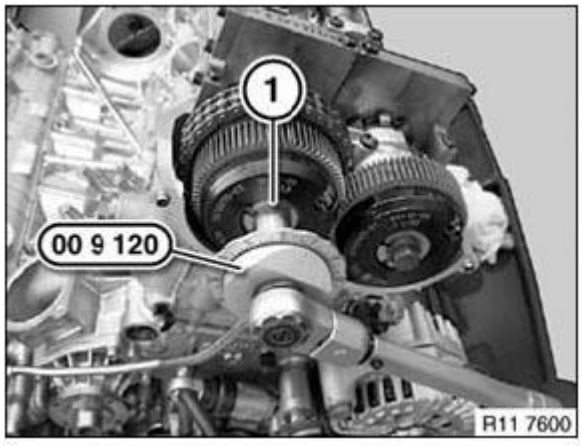


**Fig. 249: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Central bolt final tightening.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**

Remove all special tools.

 

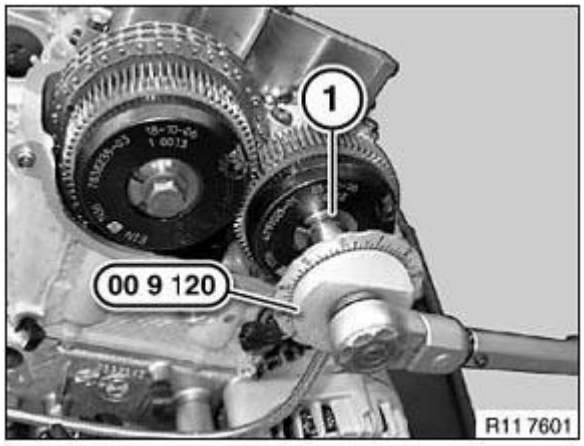


**Fig. 250: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove all special tools.

Check **timing.**

Assemble engine.

## ROCKER ARM WITH BEARING

### 11 33 062 REMOVING AND INSTALLING/REPLACING ALL HVCA (HYDRAULIC VALVE CLEARANCE ADJUSTMENT) ELEMENTS (S65)

**IMPORTANT: Used HVCA elements may only be reused in the same position. Set HVCA elements down in a clean and orderly manner.**

*Necessary preliminary tasks:*

- Remove **inlet camshaft.** See **11 31 032 Removing and installing or replacing left inlet camshafts (S65)** and **11 31 034 Removing and installing/replacing right inlet camshaft (S65)**.
- Remove **exhaust camshaft.** See **11 31 036 Removing and installing/replacing left exhaust camshaft (S65)** and **11 31 038 Removing and installing/replacing right exhaust camshaft (S65)**.

Remove HVCA element (1) in upward direction.

*Installation:*

Turning lock (2) on cylinder head.

 

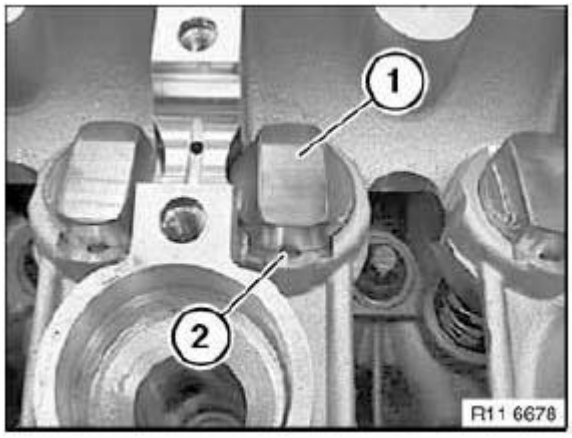


**Fig. 251: Identifying HVCA Element And Cylinder Head Lock**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Check surface (1) of HVCA element for damage.

*Installation:*

Turning lock (2) on HVCA element.

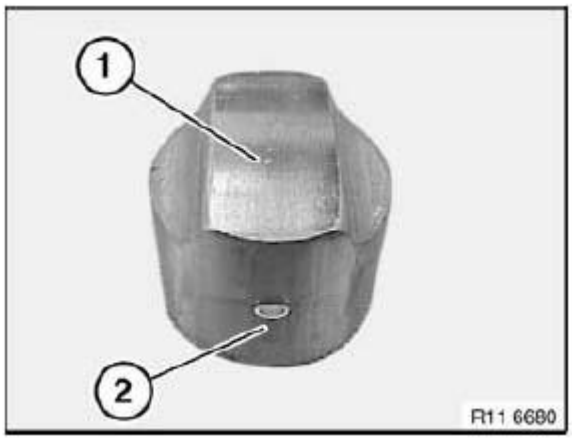


**Fig. 252: Identifying Surface Of HVCA Element And HVCA Element Lock**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Check valve keys (1) for correct seating.

Check turning lock (2) on cylinder head for damage.

 

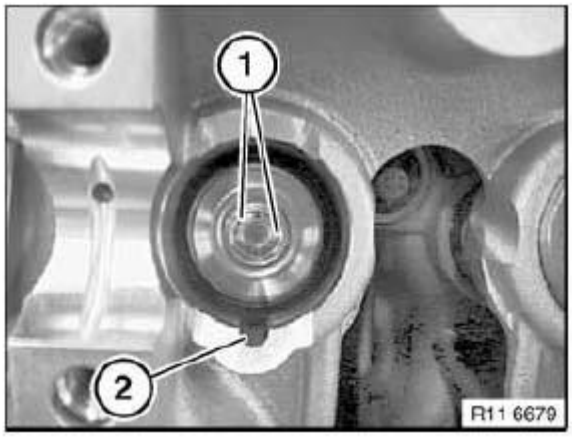


**Fig. 253: Identifying Valve Keys And Turning Lock**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

## VALVES WITH SPRINGS

**11 34 552 REMOVING AND INSTALLING/REPLACING ALL VALVES (S65)**

**Special tools required:**

- **11 5 281**
- **11 5 282**
- **11 5 283**
- **11 9 001**
- **11 9 006**
- **11 9 008**
- **11 9 009**
- **11 9 951**
- **11 9 952**
- **11 9 953**

See **ENGINE - SPECIAL TOOLS** .

**IMPORTANT: Risk of damage to cylinder head.**
**Use only the approved special tools.**
**Plastic rings on the special tools must not be damaged.**

*Necessary preliminary tasks:*

- Remove intake air **manifold.**

 

- Remove **left cylinder head cover** and **right cylinder head cover**.
- Remove **cylinder head** on **left** and **right**.
- Remove all **spark plugs.** See **12 12 011 REPLACING ALL SPARK PLUGS (S65)** .
- If necessary, remove and install **engine.**

**NOTE: Place cylinder head (1) on special tool 11 9 001 .**

Prepare special tool **11 9 006** with special tool **11 9 008** .

**NOTE: Picture shows S85.**

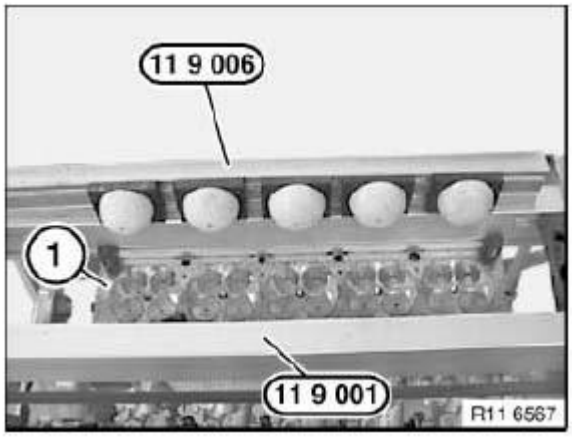


**Fig. 254: Identifying Cylinder Head, Special Tool (11 9 001) And (11 9 006)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert aluminum profile rail (1) and align.

Secure eccentric clamping levers (2 and 3).

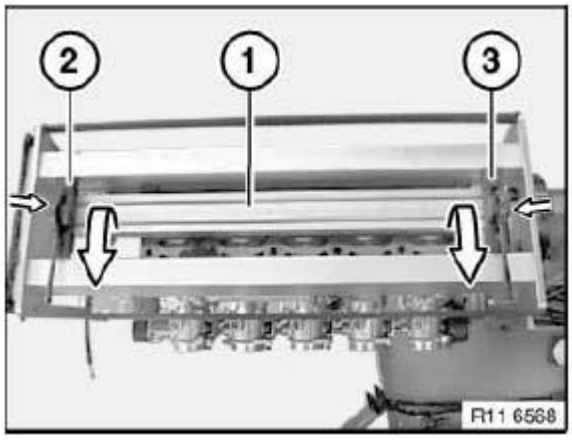


**Fig. 255: Inserting Aluminum Profile Rail**

 

**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Special tools S85 11 5 281 and 11 5 282 must be modified to S65.**

Special tool **11 5 281** for **removing** valve keys.

Special tool **11 5 282** for **installing** valve keys.

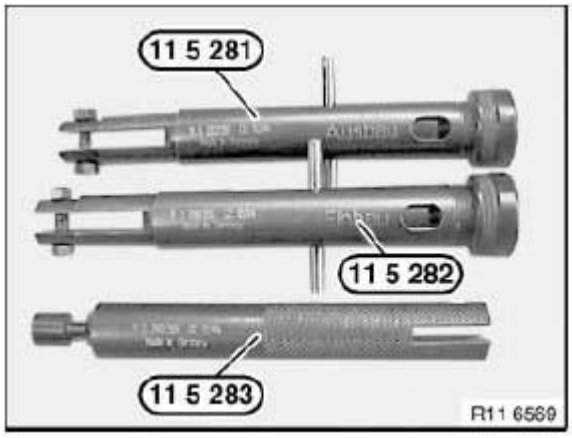


**Fig. 256: Identifying Special Tools (11 5 282), (11 5 281) And (11 5 283)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Unscrew valve cage from special tool **11 5 281** .

Special tool **11 9 951** (1 to 3) must be replaced.

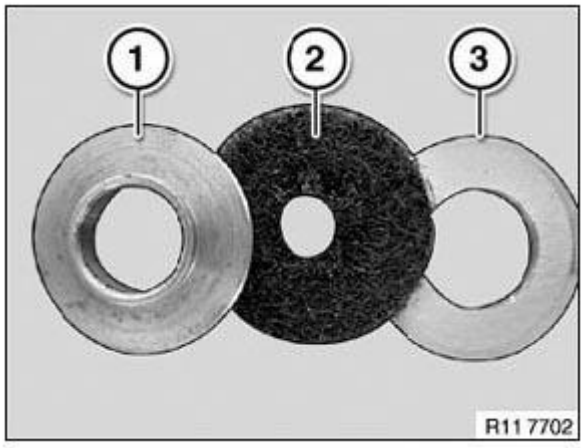


**Fig. 257: Identifying Valve Cage**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove all washers of special tool **11 5 281** (S85).

Insert special tool **11 9 951** in correct order.

 

Insert washer (1) with collar facing down in valve cage (2).

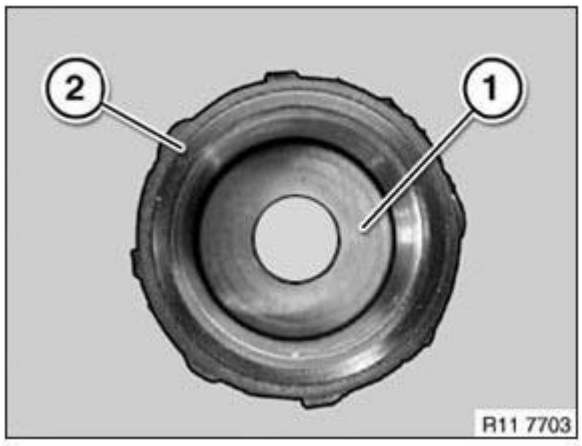


**Fig. 258: Identifying Washer And Valve Cage**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert felt washer (2) with smooth side facing down in valve cage (1).

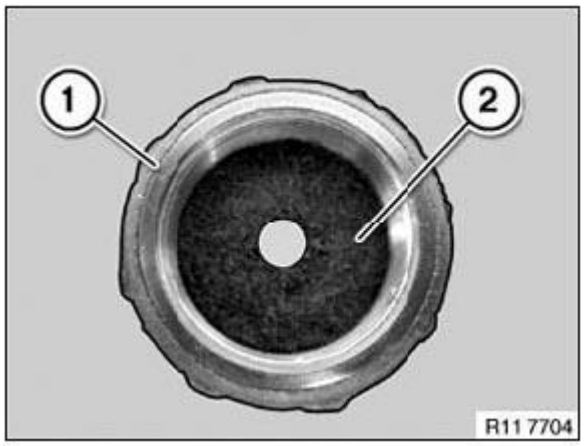


**Fig. 259: Identifying Valve Cage And Felt Washer**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert washer (3) in valve cage (1).

Screw down special tool **11 5 281** with inserted special tool **11 9 951** again.

 

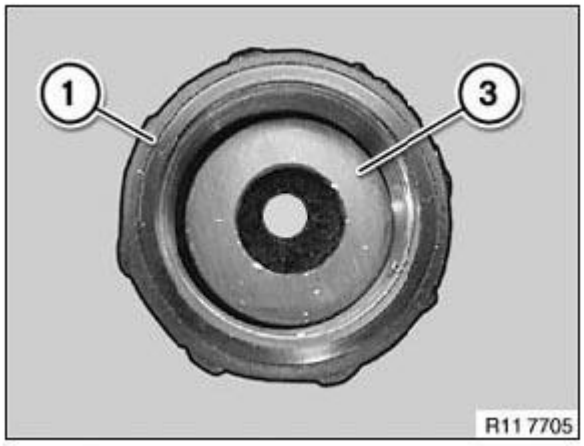


**Fig. 260: Identifying Washer And Valve Cage**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Modify special tool **11 5 281** with special tool **11 9 951** .

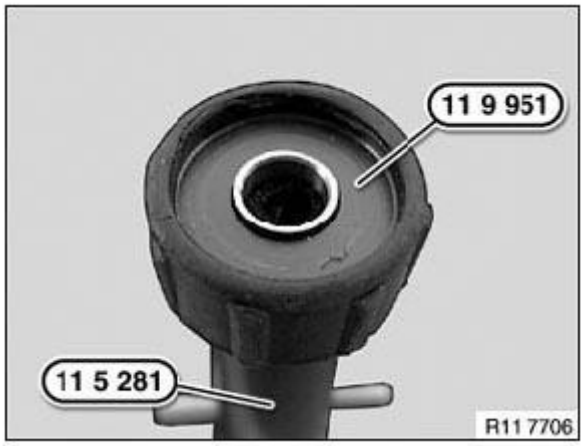


**Fig. 261: Identifying Special Tools (11 5 281) And (11 9 951)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: In order to avoid damaging the HVCA guide, use only the designated special tools.**

Adjust special tool **11 9 009** so that special tool **11 5 281** can press vertically onto the valve spring.

 

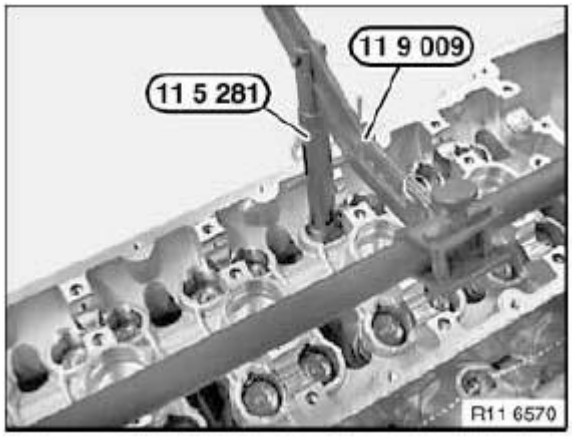


**Fig. 262: Identifying Special Tools (11 5 281) And (11 9 909)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Special tool 11 5 281 incorporates a lever (1) which is tensioned with a spring.**

Press down valve spring with special tool **11 9 009** and keep pressed.

Pretension lever (1) in direction of arrow.

Release lever (1) in tensioned position.

The valve keys still installed are thus forced out and drop into the working chamber of special tool **11 5 281** .

Repeat the operation several times if necessary until all the valve keys are forced out.

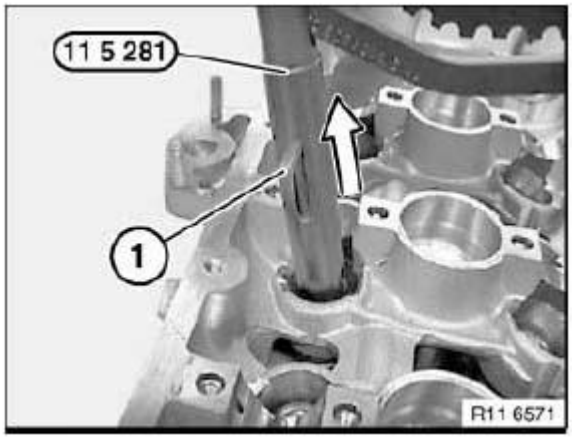


**Fig. 263: Releasing Lever**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Pull back lever on special tool **11 5 281** .

Valve keys (1) can now be ejected from the working chamber (2).

 

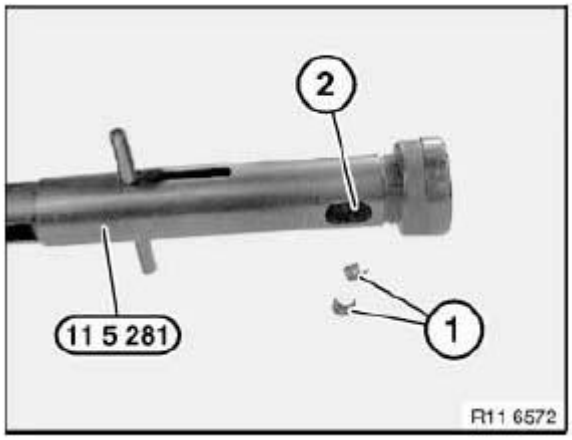


**Fig. 264: Identifying Keys, Working Chamber And Special Tool (11 5 281)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove special tool **11 9 006** .

All the engine valves are now accessible.

*Installation:*

Set the engine valves down in neat and tidy order if they are to be reused.

Check valve seat for damage.

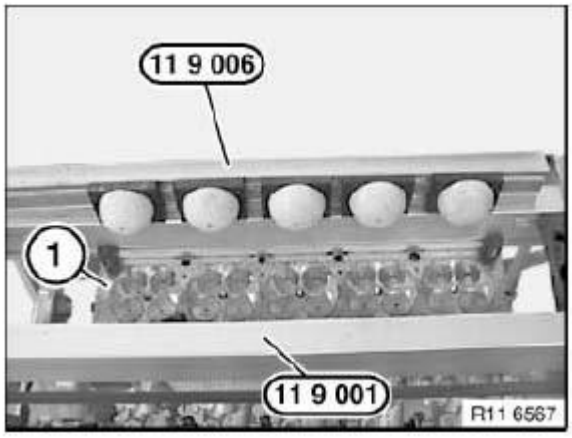


**Fig. 265: Identifying Cylinder Head, Special Tool (11 9 001) And (11 9 006)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: The cylinder head must be replaced if the valve seat is damaged. Remachining the valve seat ring is not permitted.**

**NOTE: Picture shows S85.**

 

**IMPORTANT: Use only special tool 11 9 953 to install the valve keys - risk of damage!**

Press valve key (1) in direction of arrow into special tool **11 9 953** .

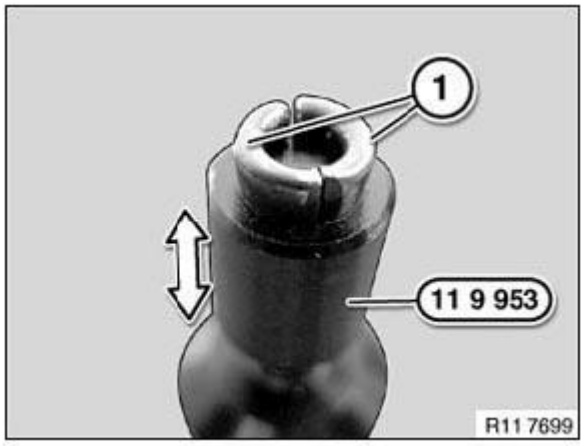


**Fig. 266: Pressing Valve Key Into Special Tool (11 9 953)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure valve keys (1).

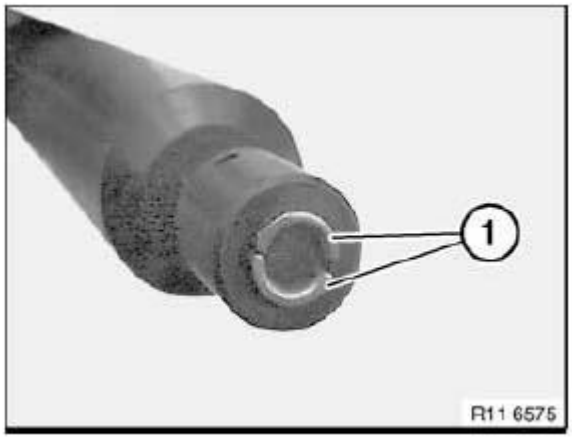


**Fig. 267: Identifying Valve Keys**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Unscrew valve cage from special tool **11 5 282** .

Special tool **11 9 952** must be replaced.

 

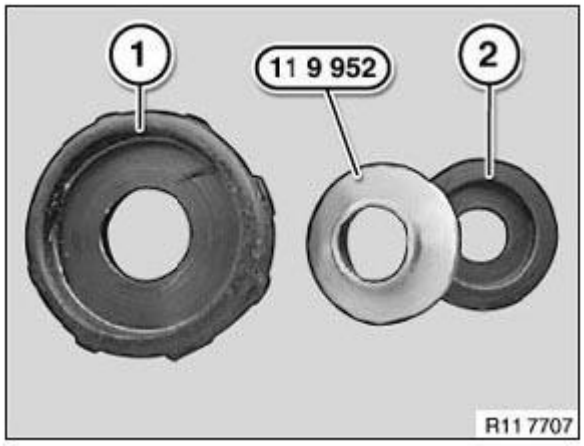


**Fig. 268: Identifying Valve Cage And Special Tool (11 5 952)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove insert washer of special tool **11 5 282** (S85).

Insert special tool **11 9 952** in correct order.

Insert special tool **11 9 952** with taper facing up in valve cage (1) (see arrow).

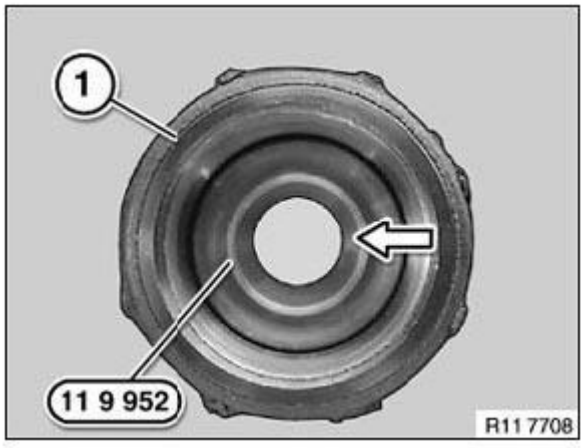


**Fig. 269: Inserting Special Tool (11 9 952) In Valve Cage**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Press valve keys into special tool **11 9 953** with special tool **11 5 283** .

**NOTE: Picture shows S85.**

 

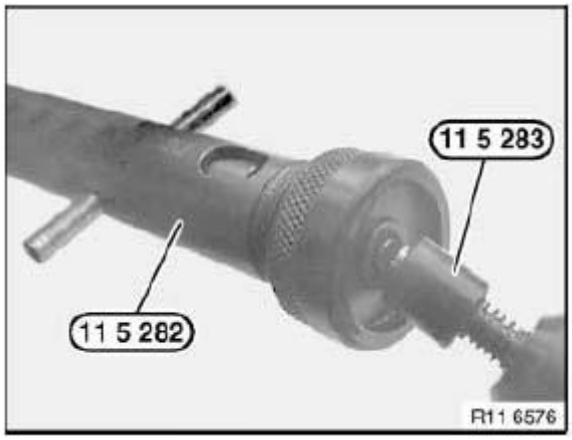


**Fig. 270: Pressing Valve Keys Into Special Tool (11 9 953) With (11 5 283)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Press valve keys in direction of arrow into special tool **11 5 282** with special tool **11 9 953** .

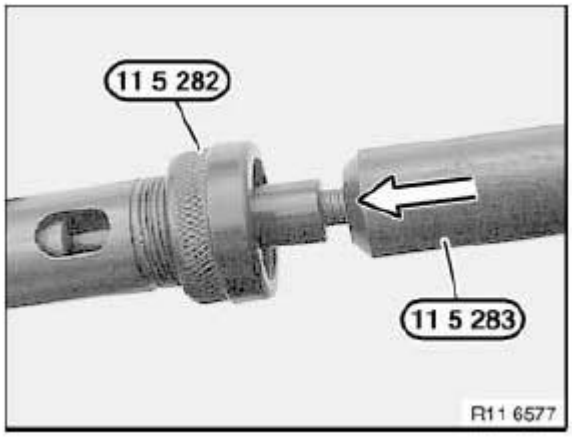


**Fig. 271: Pressing Valve Keys Into Special Tool (11 5 282) With (11 9 953)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Make sure valve keys (1) are correctly positioned.

Special tool **11 5 282** is prepared.

 

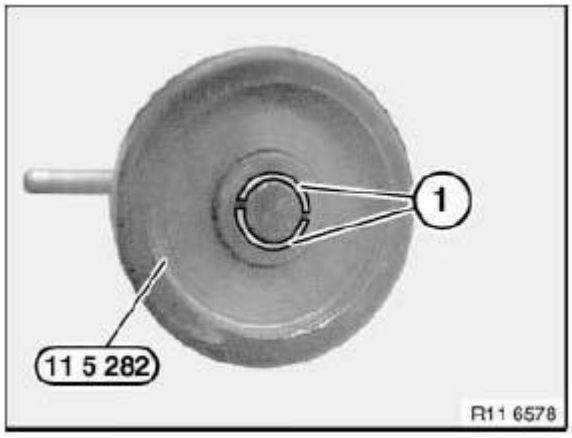


**Fig. 272: Identifying Valve Keys And Special Tool (11 5 282)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Press down special tool **11 5 282** with special tool **11 9 009** in direction of arrow.

*Installation:*

Both valve keys are now pressed into their initial positions.

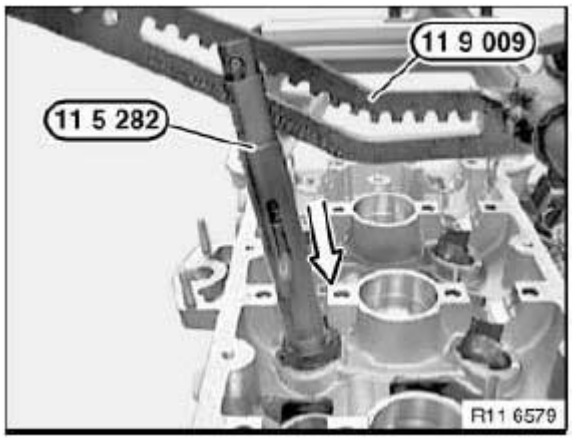


**Fig. 273: Pressing Down Special Tool (11 5 282) With (11 9 909)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Check that valve keys are in correct installation position.

 

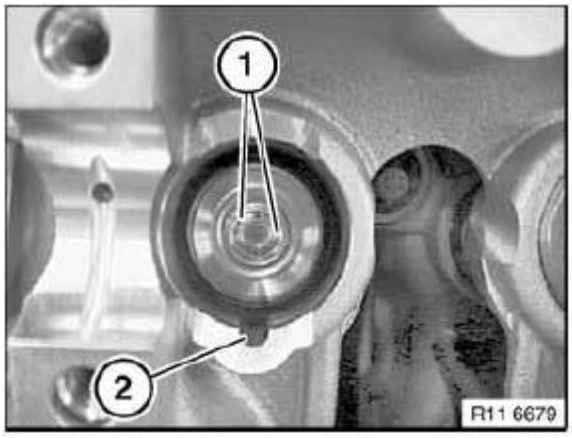


**Fig. 274: Identifying Valve Keys And Turning Lock**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 34 560 REPLACING ALL VALVE STEM SEALS (S65)**

**Special tools required:**

- **11 1 480**
- **11 5 270**

See **ENGINE - SPECIAL TOOLS** .

*Necessary preliminary tasks:*

- Remove **cylinder head.** See **left** and **right**.
- Remove all **valve springs.**

Remove valve stem seal with special tool **11 1 480** in direction of arrow.

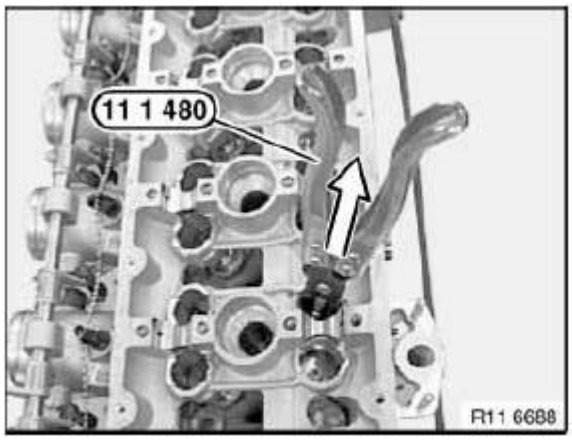


 

**Fig. 275: Removing Valve Stem Seal With Special Tool (11 1 480)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Attach the mounting sleeve (1) supplied with the new part to the valve stem.

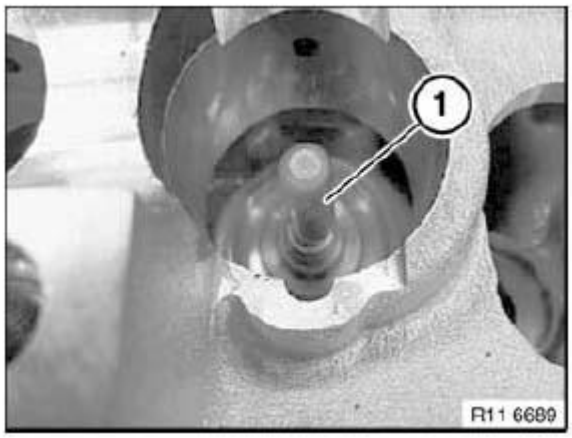


**Fig. 276: Identifying Mounting Sleeve**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Attach valve stem seal (2) over mounting sleeve (1).

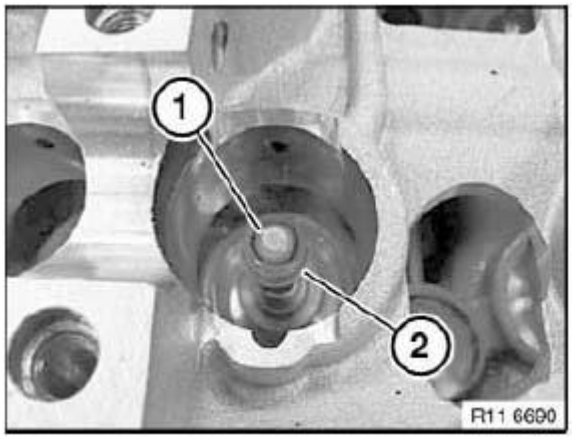


**Fig. 277: Identifying Valve Stem Seal And Mounting Sleeve**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Press on valve stem seal with special tool **11 5 270** in direction of arrow as far as it will go.

 

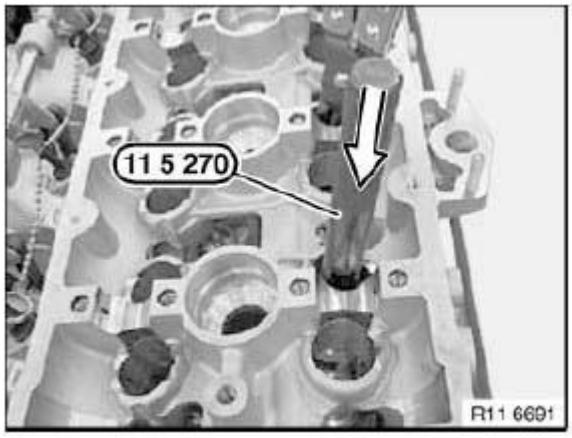


**Fig. 278: Pressing On Valve Stem Seal With Special Tool (11 5 270)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 34 715 REPLACING ALL VALVE SPRINGS (S65)**

**Special tools required:**

- **11 5 281**
- **11 5 282**
- **11 5 821**
- **11 9 001**
- **11 9 006**
- **11 9 008**
- **11 9 009**
- **11 9 950**
- **11 9 951**
- **11 9 953**

See **ENGINE - SPECIAL TOOLS** .

**IMPORTANT: Risk of damage to cylinder head.**
**Use only the approved special tools.**
**Plastic rings on the special tools must not be damaged.**
**Special tools 11 5 821 and 11 5 282 must be modified to special tool 11 9 950 .**

*Necessary preliminary tasks:*

- Remove **cylinder head.** See **left** and **right**.
- Remove all **HVCA elements.**

 

**NOTE: Place cylinder head (1) with cylinder head bolts on special tool 11 9 001 .**

Prepare special tool **11 9 006** with special tool **11 9 008** .

**NOTE: Picture shows S85.**

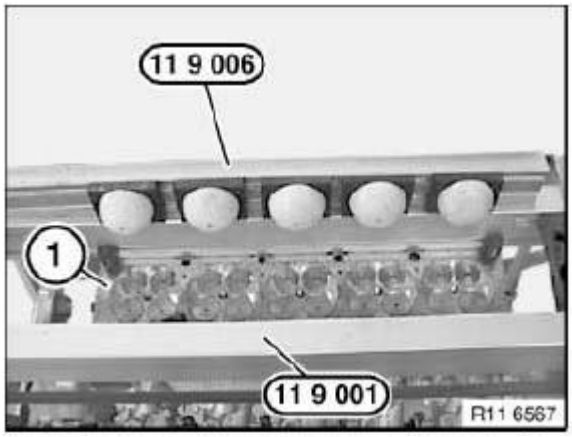


**Fig. 279: Identifying Cylinder Head, Special Tools (11 9 001) And (11 9 006)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert aluminum profile rail (1) and align.

Secure eccentric clamping levers (2 and 3) in direction of arrow.

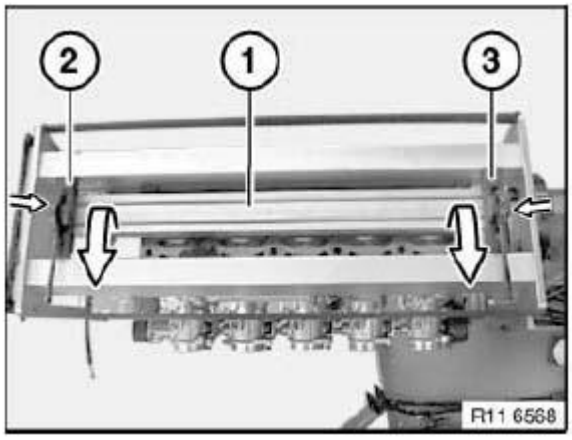


**Fig. 280: Inserting Aluminum Profile Rail**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Special tools S85 11 5 281 and 11 5 282 must be modified to S65 11 9 950 .**

Special tool **11 5 281** for **removing** valve keys.

 

Special tool **11 5 282** for **installing** valve keys.

Special tool **11 9 953** for **securing** valve keys.

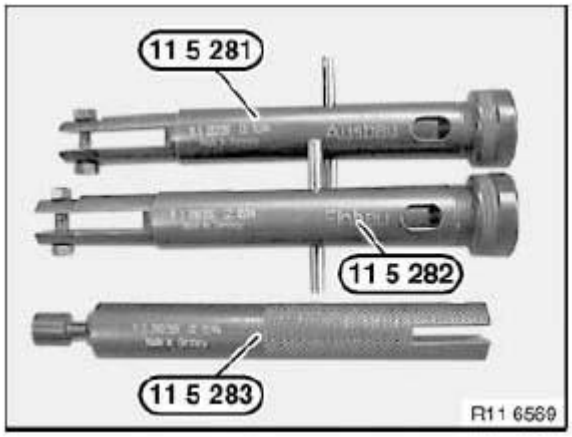


**Fig. 281: Identifying Special Tools (11 5 282), (11 5 281) And (11 5 283)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Unscrew valve cage from special tool **11 5 281** .

Special tool 11 9 951 (1 to 3) must be replaced.

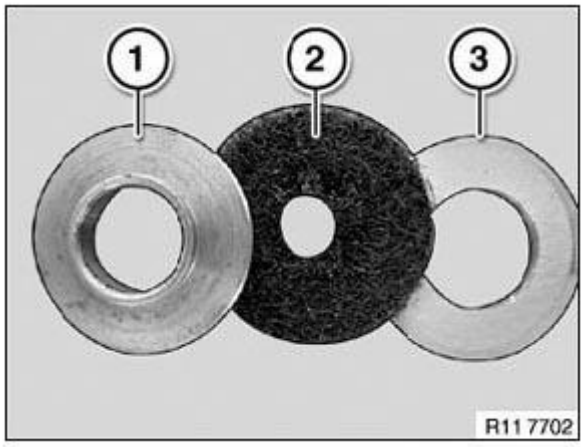


**Fig. 282: Identifying Valve Cage**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove all washers of special tool **11 5 281** (S85).

Insert special tool **11 9 951** in correct order.

Insert washer (1) with collar facing down in valve cage (2).

 

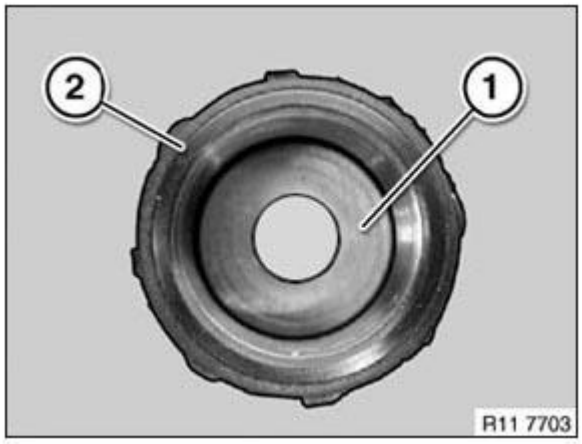


**Fig. 283: Identifying Washer And Valve Cage**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert felt washer (2) with smooth side facing down in valve cage (1).

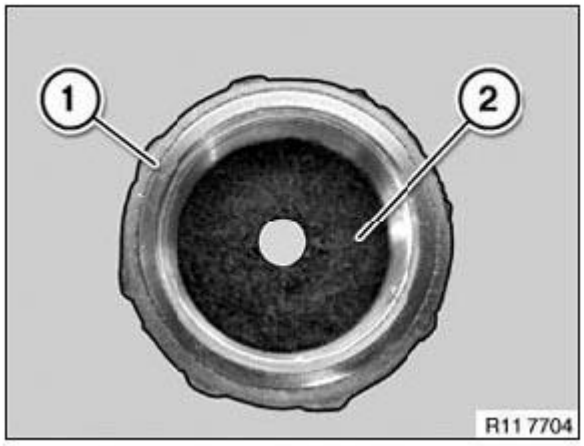


**Fig. 284: Identifying Valve Cage And Felt Washer**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert washer (3) in valve cage (1).

Screw down special tool **11 5 281** with inserted special tool **11 9 951** again.

 

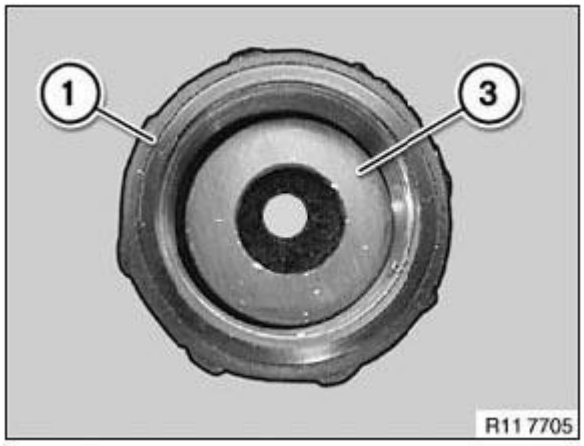


**Fig. 285: Identifying Washer And Valve Cage**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Modify special tool **11 5 281** with special tool **11 9 951** .

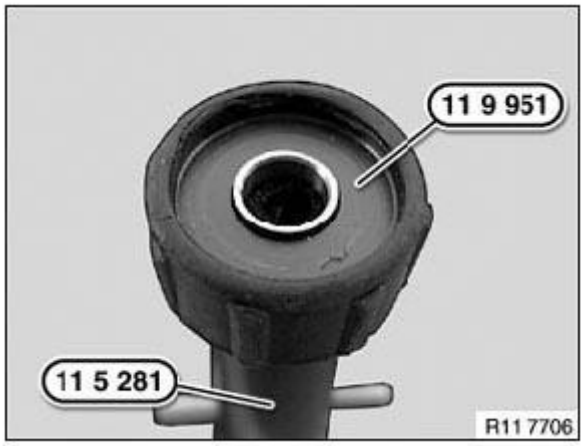


**Fig. 286: Identifying Special Tools (11 5 281) And (11 9 951)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Use only approved special tools.**
**Risk of damage to the HVCA guide.**

Adjust special tool **11 9 009** so that special tool **11 5 281** can press vertically onto the valve spring.

 

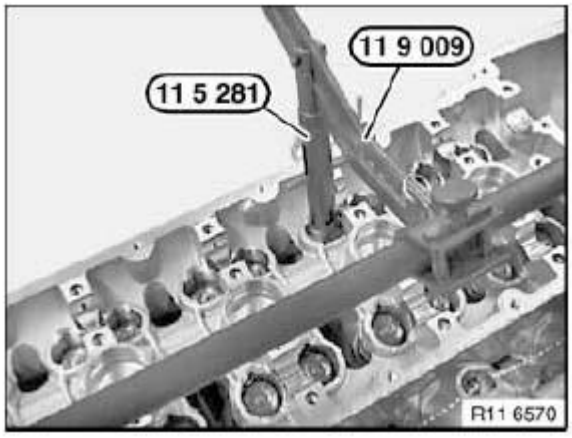


**Fig. 287: Identifying Special Tools (11 5 281) And (11 9 909)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Lever (1) on special tool 11 5 281 is tensioned with a spring.**

Press down valve spring with special tool **11 5 281** and keep pressed.

Pretension lever (1) in direction of arrow.

Release lever (1) in tensioned position.

The valve keys still installed are thus forced out and drop into the working chamber of special tool **11 5 281** .

Repeat the operation several times if necessary until all the valve keys are forced out.

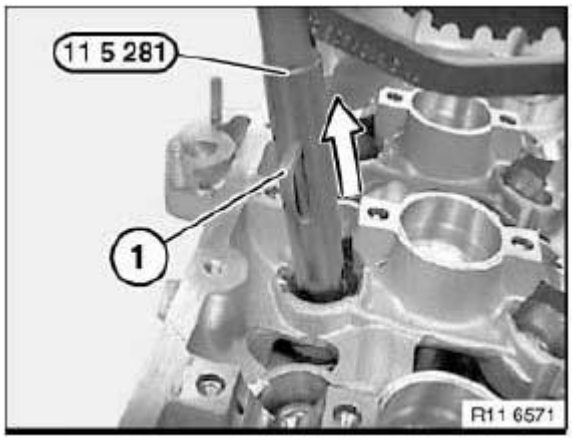


**Fig. 288: Releasing Lever**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Pull back lever on special tool **11 5 281** .

Valve keys (1) can now be ejected from the working chamber (2).

 

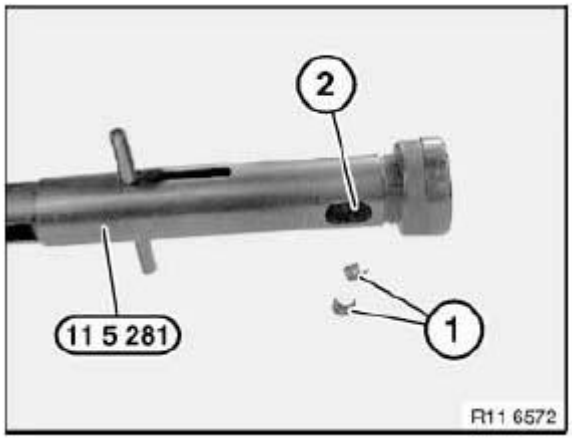


**Fig. 289: Identifying Keys, Working Chamber And Special Tool (11 5 281)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Lower spring plate (1).**
**Progressive valve spring (2).**
**Upper spring plate (3).**

*Installation:*

Incorrect installation is not possible.

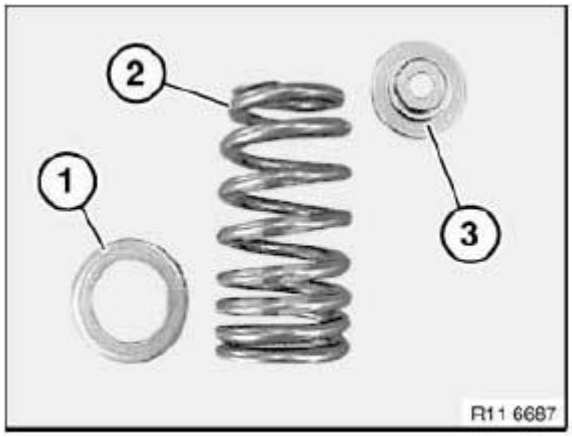


**Fig. 290: Identifying Lower Spring Plate, Progressive Valve Spring And Upper Spring Plate**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert lower spring plate (1).

 

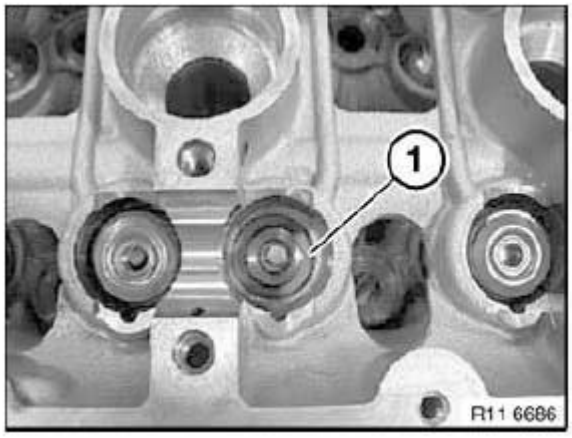


**Fig. 291: Identifying Lower Spring Plate**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Use only special tool 11 9 953 to install the valve keys - risk of damage!**

Press valve key (1) in direction of arrow into special tool **11 9 953** .

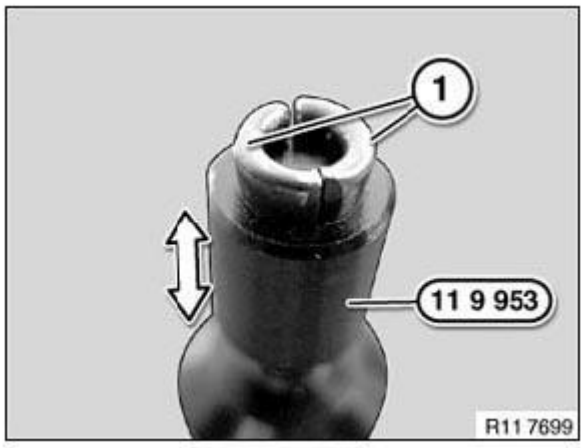


**Fig. 292: Pressing Valve Key Into Special Tool (11 9 953)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure valve keys (1).

 

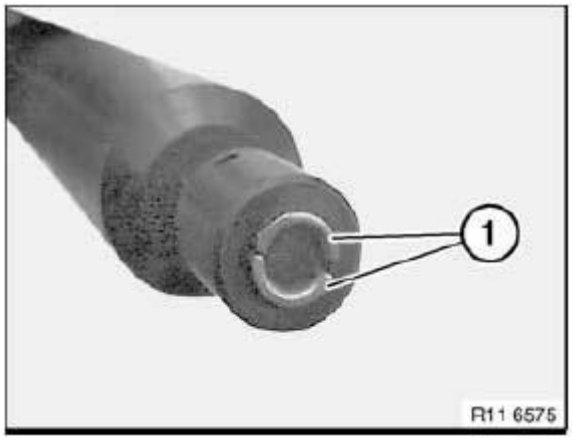


**Fig. 293: Identifying Valve Keys**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Press valve keys into special tool **11 5 282** with special tool **11 9 953** .

**NOTE: Picture shows S85.**

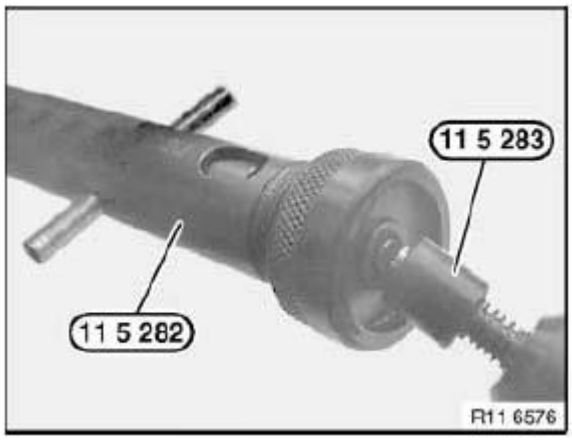


**Fig. 294: Pressing Valve Keys Into Special Tool (11 9 953) With (11 5 283)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Press valve keys into special tool **11 5 282** with special tool **11 9 953** .

 

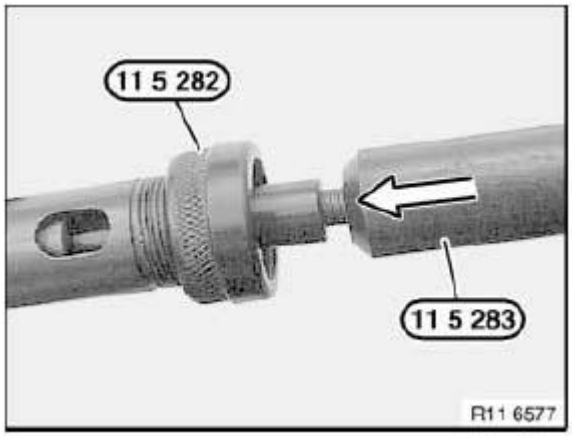


**Fig. 295: Pressing Valve Keys Into Special Tool (11 5 282) With (11 9 953)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Special tool **11 5 282** is prepared for installation.

*Installation:*

Positioning of valve keys (1).

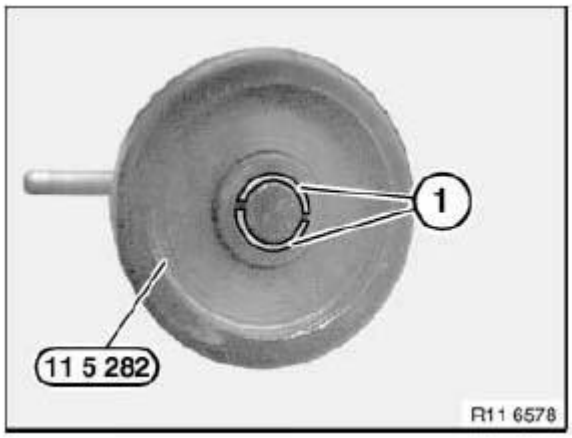


**Fig. 296: Identifying Valve Keys And Special Tool (11 5 282)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Press down special tool **11 5 282** with special tool **11 9 009** in direction of arrow.

*Installation:*

Both valve keys are now pressed into their initial positions.

 

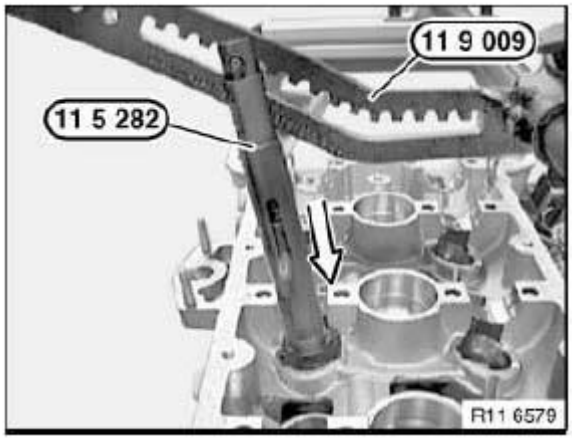


**Fig. 297: Pressing Down Special Tool (11 5 282) With (11 9 909)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Check that valve keys (1) are in correct installation position.

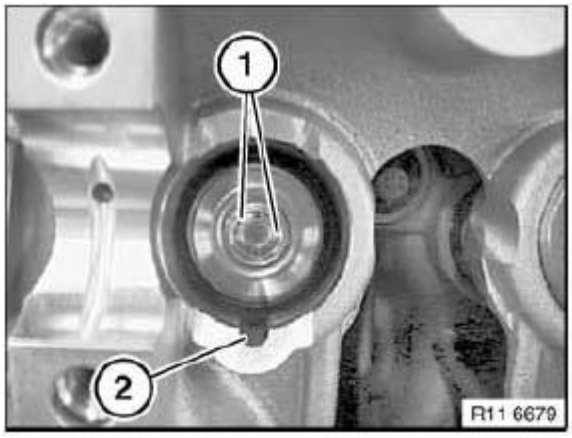


**Fig. 298: Identifying Valve Keys And Turning Lock**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

## VARIABLE CAMSHAFT TIMING

### 11 36 142 REMOVING AND INSTALLING/REPLACING LEFT INLET VANOS GEAR (S65)

**Special tools required:**

- **00 9 120**
- **11 5 291**

- **11 5 292**
- **11 5 320**
- **11 5 370**
- **11 9 970**
- **11 9 971**
- **11 9 972**

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

See **ENGINE - SPECIAL TOOLS** .

**IMPORTANT: Central bolts on VANOS gears have left-hand threads.**
**Do not release the central bolt of the adjustment units without the special tool 11 9 970 .**
**Grease contact surfaces of central bolts with copper paste.**

*Necessary preliminary tasks:*

- Remove left **cylinder head cover.**

Release bolts (1) on cylinder bank 2.

Remove timing case cover (2).

*Installation:*

Replace seal.

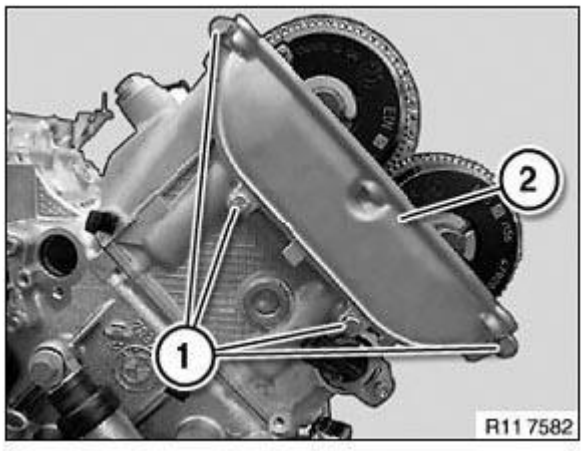


**Fig. 299: Identifying Cylinder Bank 2 Bolts And Timing Case Cover**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Both inlet and exhaust camshafts can be adjusted in the 1st cylinder firing TDC**

 

**position.**
**Danger of mixing up both special tool bores.**
**The procedure for checking timing is different from that for adjusting.**

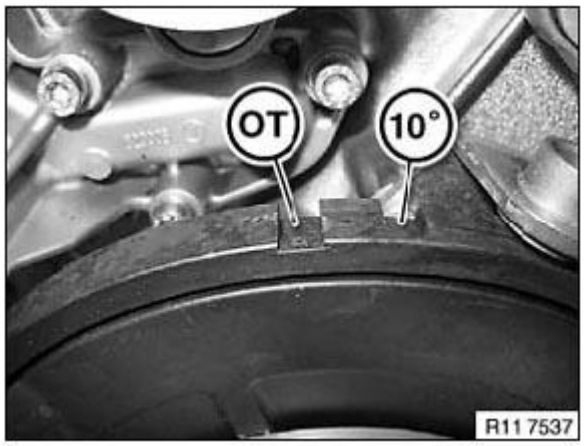


**Fig. 300: Identifying Timing Marks**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Crank engine at central bolt.

Secure crankshaft with special tool **11 5 320** in **firing TDC position of cylinder no. 1** .

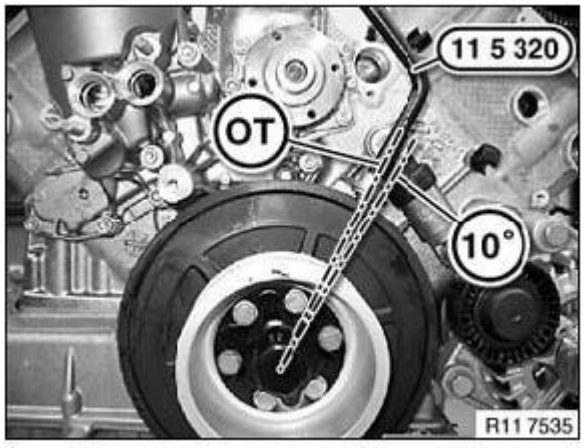


**Fig. 301: Identifying Special Tool (11 5 320) On Vibration Damper**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position of inlet camshafts, cyl. 5-8, in firing TDC position of cylinder no. 1.

Dihedron of inlet camshafts is vertical to cylinder axis, letters/numbers on camshafts point upwards (E2).

 

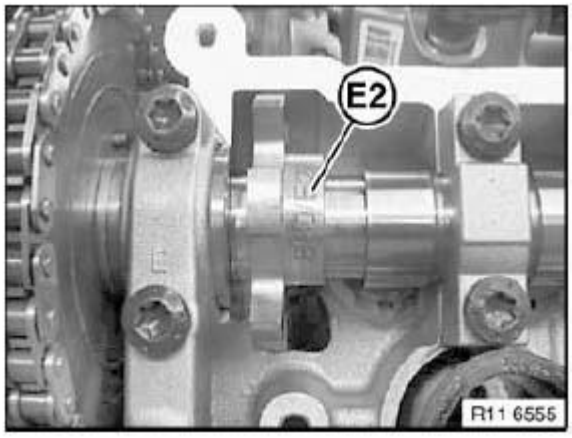


**Fig. 302: Identifying Letters/Numbers On Camshafts Point Upwards (E2)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position of exhaust camshafts, cyl. 5-8, in firing TDC position of cylinder no. 1.

Dihedron of camshafts is vertical to cylinder axis,

letters/numbers on camshafts point upwards (A2).

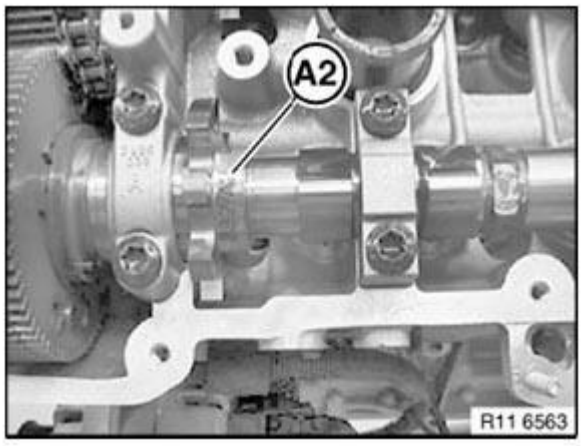


**Fig. 303: Identifying Letters/Numbers On Camshafts Point Upwards (A2)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Place special tool **11 9 971** on inlet camshaft.

Designation (E2) on dihedron points upwards.

Place special tool **11 9 972** on exhaust camshaft.

Designation (A2) on dihedron points upwards.

Secure special tools **11 9 971** and **11 9 972** with bolts (1) on cylinder head to **10 Nm.**

 

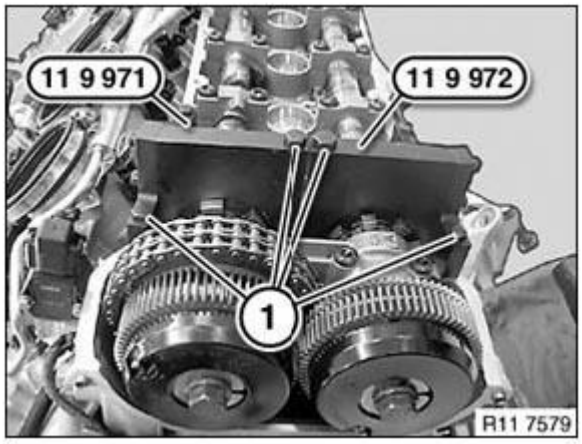


**Fig. 304: Identifying Special Tools (11 9 971) And (11 9 972)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Align gearwheels on exhaust adjustment unit with special tool **11 5 370** .

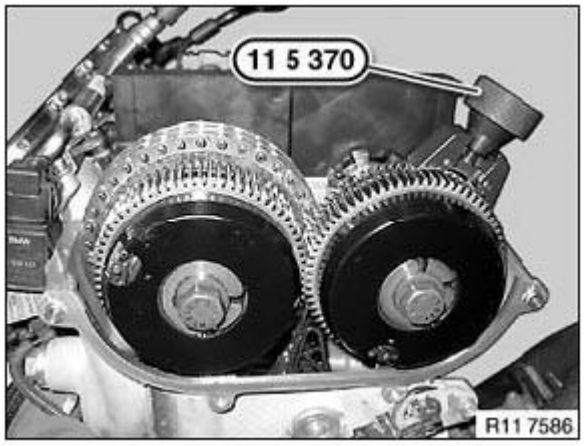


**Fig. 305: Identifying Special Tool (11 5 370) On Gearwheels**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Removal/installation is not possible without hexagon socket screw (2). Hexagon socket screw (1) must not be longer than 10 mm. Gearwheels of exhaust VANOS gear are pretensioned with a spring.**

Insert M5x10 hexagon socket screw on VANOS gear.

**NOTE: Picture shows cylinders 1-4.**

 

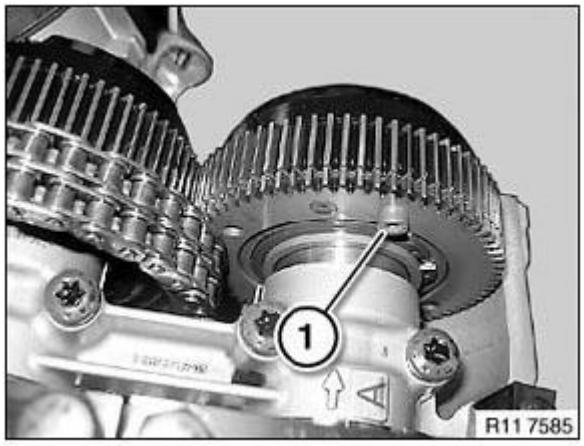


**Fig. 306: Identifying Socket Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: CCW thread!**
**Release central bolt (2).**

*Installation:*

Replace central bolt (2).

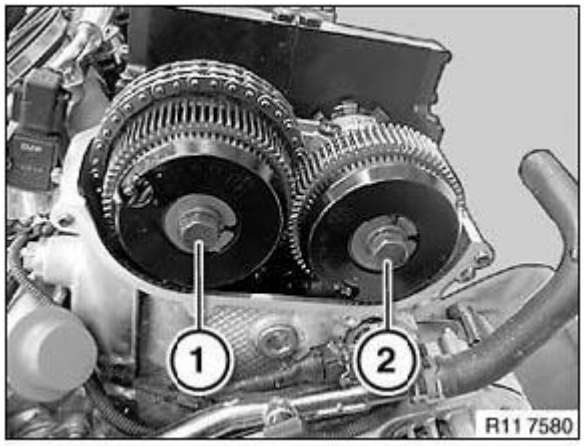


**Fig. 307: Identifying Central Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove exhaust adjustment unit (1).

 

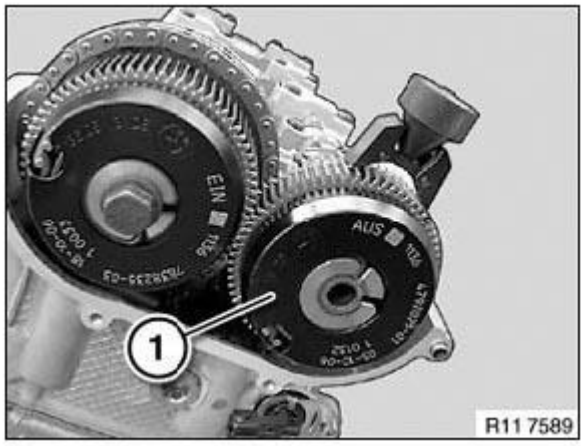


**Fig. 308: Identifying Exhaust Adjustment Unit**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

If the hexagon socket screw is released or forgotten by mistake, the gear teeth can be readjusted with special tool **11 5 370** .

Screw in knurled screw on special tool **11 5 370** until gearwheel (1) lines up with bore (see arrow) on thread.

Failure to tension the exhaust VANOS gear (1) will result in rattling noises at idle.

**NOTE: Picture shows (S85).**

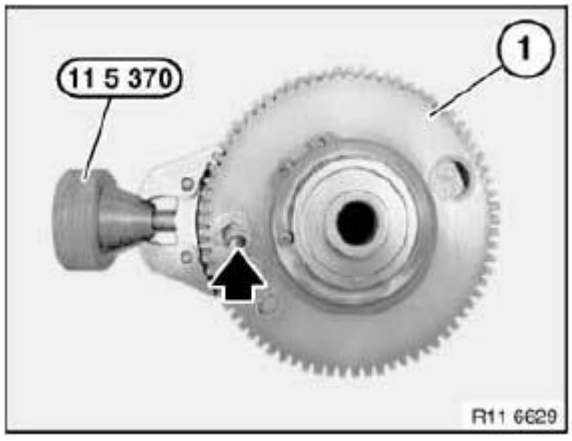


**Fig. 309: Identifying Special Tool (11 5 370) And Gearwheel**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Check O-ring (1) on VANOS gear, replace if necessary.

 


**Fig. 310: Identifying VANOS Gear O-Ring**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release chain tensioner (1).

*Installation:*

Replace sealing ring.

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

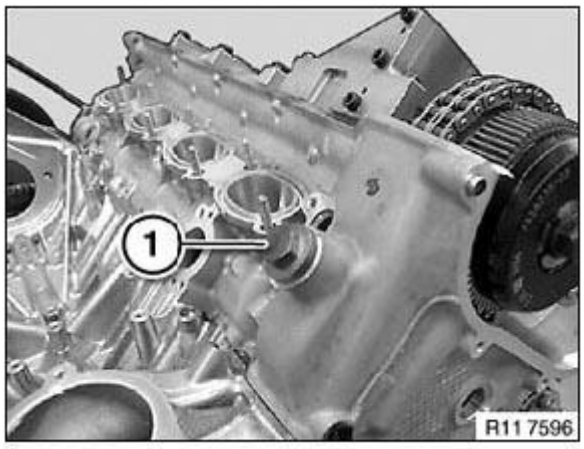


**Fig. 311: Identifying Left Hydraulic Chain Tensioner Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: CCW thread!**

Release central bolt (1).

*Installation:*

 

Replace central bolt (1).

Remove inlet adjustment unit (2).

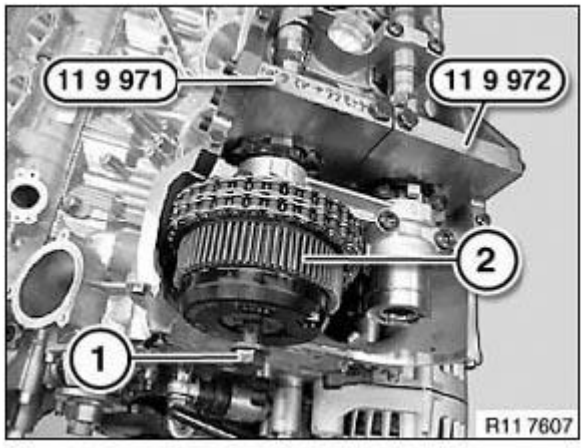


**Fig. 312: Identifying Central Bolt And Inlet Adjustment Unit**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Open plug (1).

*Installation:*

Replace seal.

Tightening torque: **11 12 4AZ** . See **CYLINDER HEAD** .

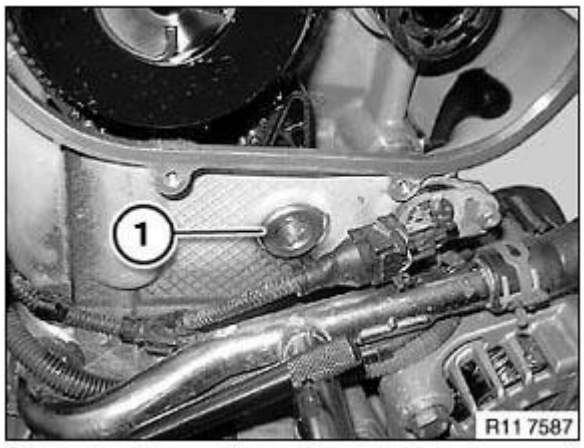


**Fig. 313: Identifying Plug**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure screw connection against falling out with special tool **11 5 292** .

Release screw connection at chain guide with special tool **11 5 291** .

 

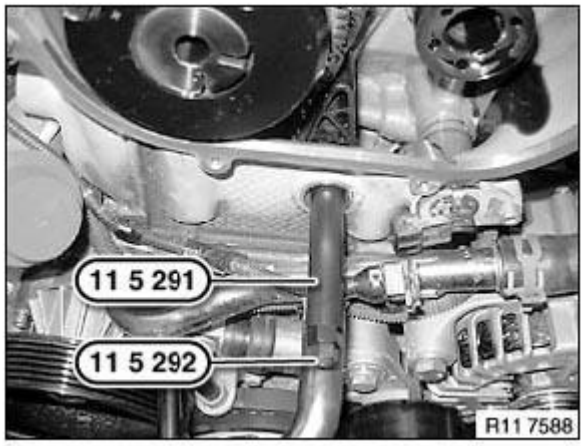


**Fig. 314: Identifying Special Tools (11 5 291) And (11 5 292)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove inlet adjustment unit.

Lay timing chain (1) on inlet camshaft.

**IMPORTANT: Do not bar engine at central bolt.**
**Risk of damage! to engine valves and timing chain.**

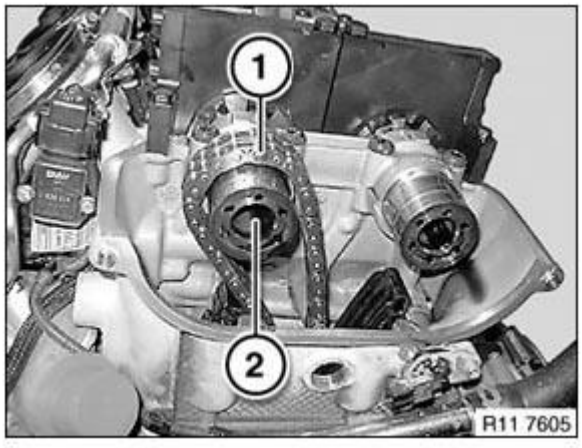


**Fig. 315: Identifying Timing Chain And Central Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

EIN Inlet adjustment unit

AUS Exhaust adjustment unit

 

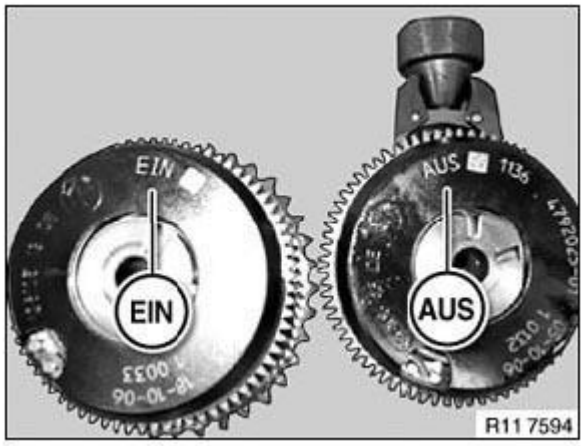


**Fig. 316: Identifying EIN Inlet Adjustment Unit And AUS Exhaust Adjustment Unit**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Replace central bolt of adjustment unit.**
**Central bolt must be fully screwed once.**

**IMPORTANT: Rotate crankshaft at central bolt back until special tool 11 5 320 can be secured in the 10° position.**

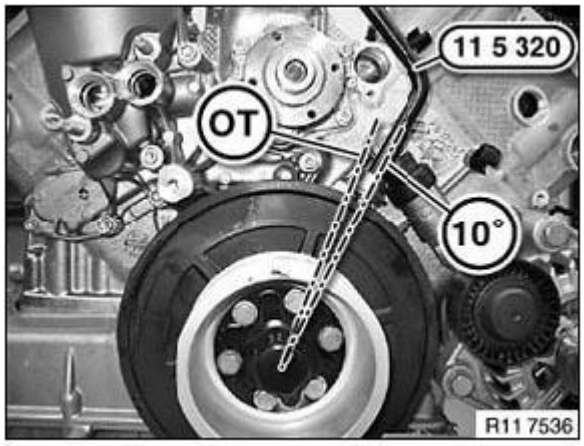


**Fig. 317: Rotating Crankshaft At Central Bolt With Special Tool (11 5 320)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Coat contact face of new central bolt (1) with copper paste.

 

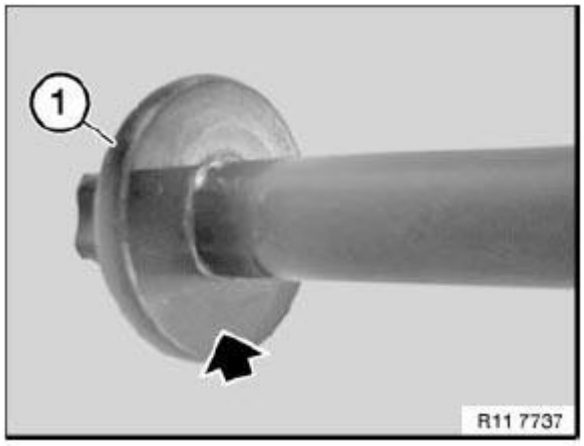


**Fig. 318: Identifying Central Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position VANOS adjustment unit on camshaft.

Hexagon socket screw points upwards.

Insert central bolts (1 and 2) without play.

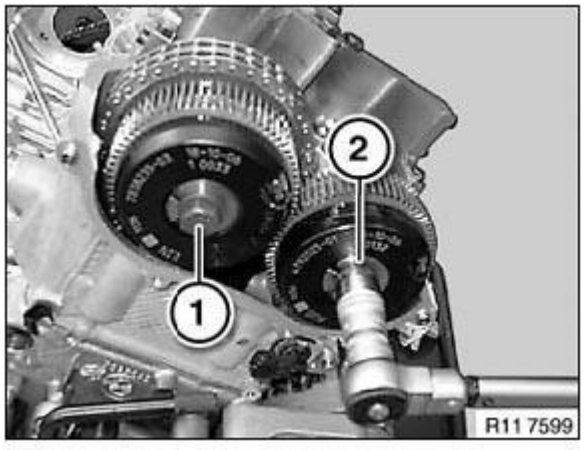


**Fig. 319: Inserting Central Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove hexagon socket screw (1) or special tool **11 5 370** .

**NOTE: Picture shows cylinders 1-4.**

 

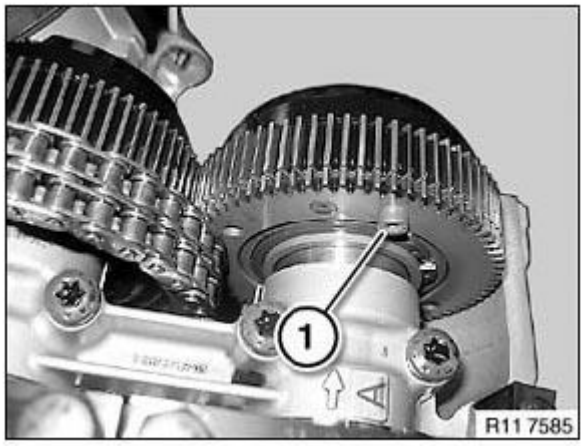


**Fig. 320: Identifying Socket Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure timing chain tensioning rail.

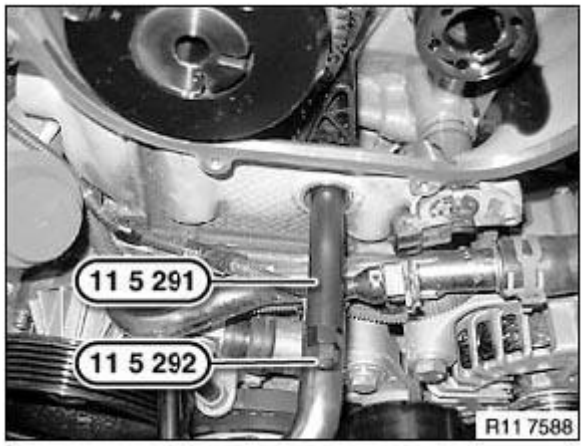


**Fig. 321: Identifying Special Tools (11 5 291) And (11 5 292)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Install chain tensioner (1).

*Installation:*

Replace sealing ring.

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

 

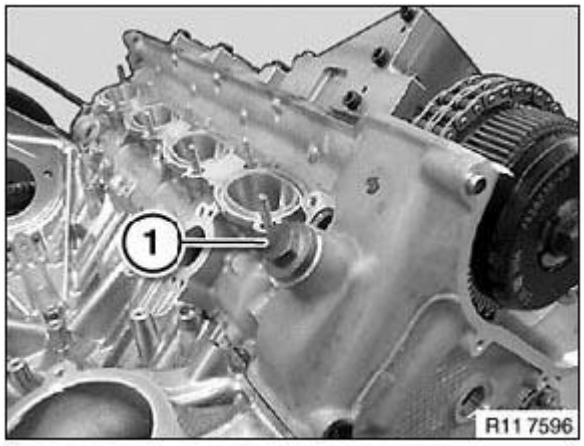


**Fig. 322: Identifying Left Hydraulic Chain Tensioner Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert central bolt (1) and screw with special tool **00 9 120** .

1. Joining 10 Nm
2. Joining 20 Nm
3. Settling torque 80 Nm
4. Torsion angle 200°
5. **Unscrew central bolt.**
6. Joining 10 Nm

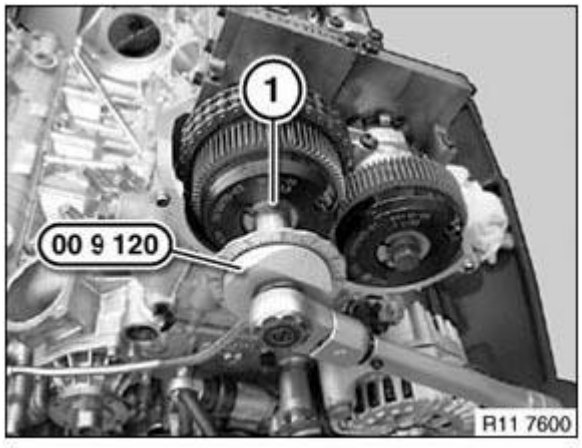


**Fig. 323: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert central bolt (2) and screw with special tool **00 9 120** .

1. Joining 10 Nm
2. Joining 20 Nm

 

3. Settling torque 80 Nm
4. Torsion angle 200°
5. **Unscrew central bolt.**
6. Joining 10 Nm

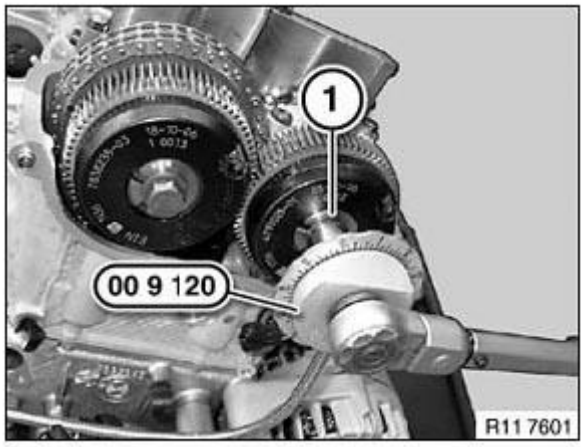


**Fig. 324: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Camshafts, cylinders 5-8, remain secured with special tool **11 9 970** .

Release special tool **11 5 320** and continue barring engine at central bolt 10° to **firing TDC position of cylinder no. 1** .

*Installation:*

This minimizes timing chain and gearwheel play.

Secure crankshaft with special tool **11 5 320** .

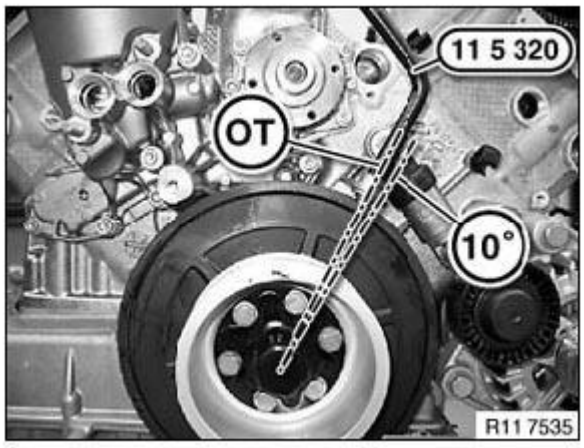


**Fig. 325: Identifying Special Tool (11 5 320) On Vibration Damper**

 

**Courtesy of BMW OF NORTH AMERICA, INC.**

**Cylinders 5 to 8:**

Always start screwing on the inlet side.

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Central bolt final tightening.**

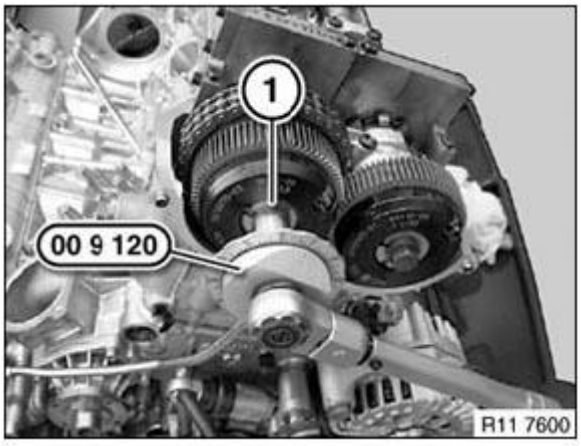


**Fig. 326: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Central bolt final tightening.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**

 

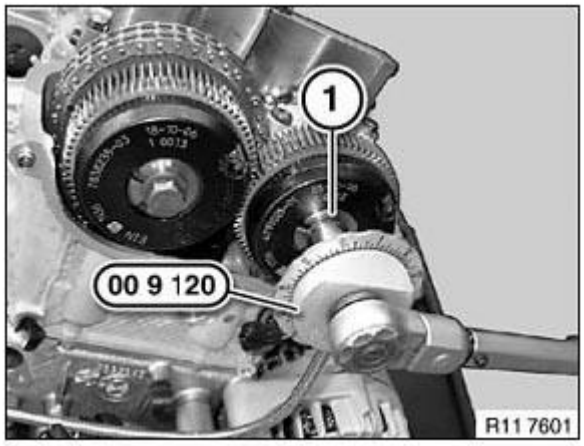


**Fig. 327: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove all special tools.

Check **timing** , cylinders (5 to 8).

Assemble engine.

**11 36 144 REMOVING AND INSTALLING/REPLACING LEFT EXHAUST VANOS GEAR (S65)**

**Special tools required:**

- **00 9 120**
- **11 5 320**
- **11 5 370**
- **11 9 970**
- **11 9 971**
- **11 9 972**

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

See **ENGINE - SPECIAL TOOLS** .

**IMPORTANT: Central bolts on VANOS gears have left-hand threads.**
**Do not release the central bolt of the adjustment units without the special tool 11 9 970 .**
**Grease contact surfaces of central bolts with copper paste.**

*Necessary preliminary tasks:*

- Remove right **cylinder head cover**

 

Release bolts (1) on cylinder bank 2.

Remove timing case cover (2).

*Installation:*

Replace seal.

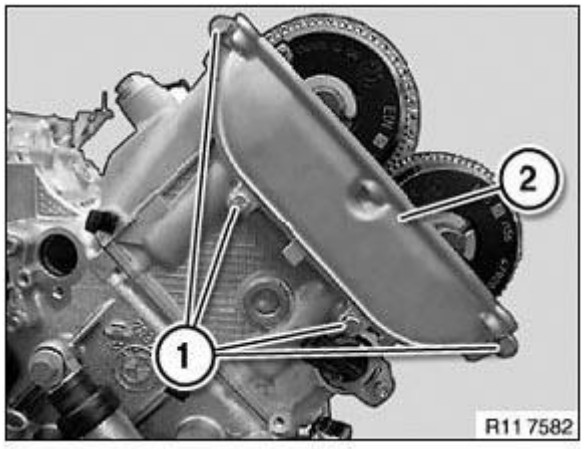


**Fig. 328: Identifying Cylinder Bank 2 Bolts And Timing Case Cover**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Both inlet and exhaust camshafts can be adjusted in the 1st cylinder firing TDC position.**
**Danger of mixing up both special tool bores.**
**The procedure for checking timing is different from that for adjusting.**

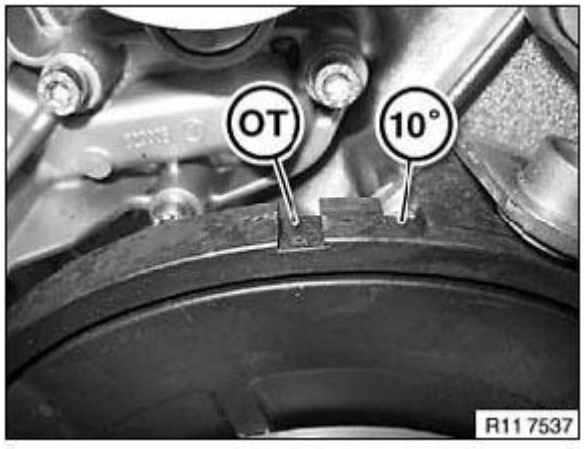


**Fig. 329: Identifying Timing Marks**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Crank engine at central bolt.

 

Secure crankshaft with special tool **11 5 320** in **firing TDC position of cylinder no. 1** .

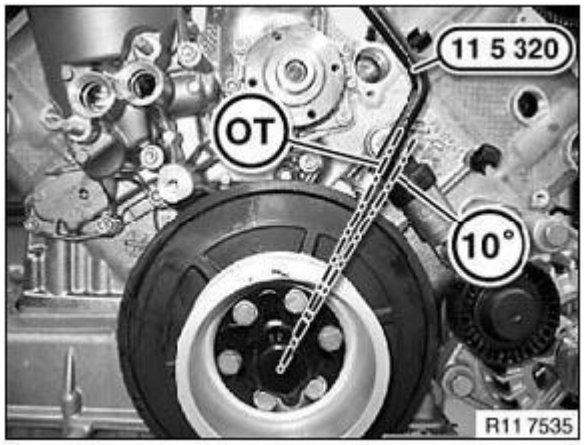


**Fig. 330: Identifying Special Tool (11 5 320) On Vibration Damper**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position of inlet camshafts, cyl. 5-8, in firing TDC position of cylinder no. 1.

Dihedron of inlet camshafts is vertical to cylinder axis, letters/numbers on camshafts point upwards (E2).

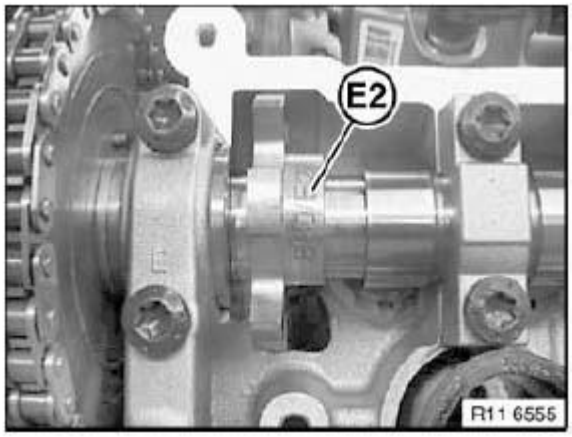


**Fig. 331: Identifying Letters/Numbers On Camshafts Point Upwards (E2)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position of exhaust camshafts, cyl. 5-8, in firing TDC position of cylinder no. 1.

Dihedron of camshafts is vertical to cylinder axis, letters/numbers on camshafts point upwards (A2).

 

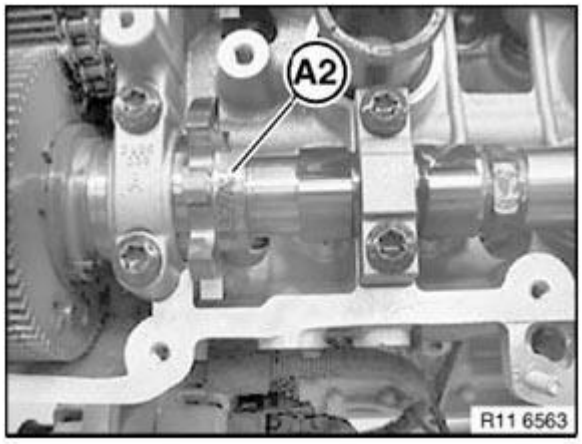


**Fig. 332: Identifying Letters/Numbers On Camshafts Point Upwards (A2)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Place special tool **11 9 971** on inlet camshaft.

Designation (E2) on dihedron points upwards.

Place special tool **11 9 972** on exhaust camshaft.

Designation (A2) on dihedron points upwards.

Secure special tools **11 9 971** and **11 9 972** with bolts (1) on cylinder head to **10 Nm.**

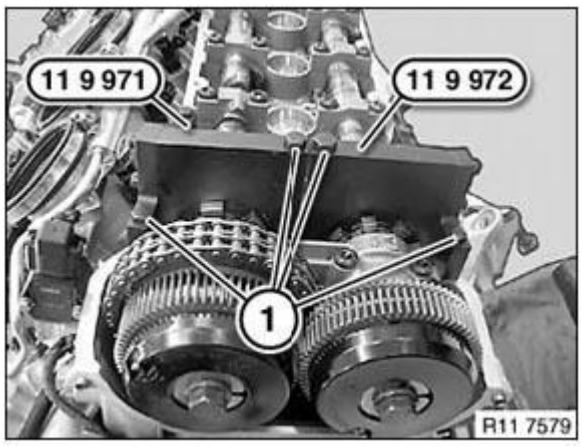


**Fig. 333: Identifying Special Tools (11 9 971) And (11 9 972)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Align gearwheels on exhaust adjustment unit with special tool **11 5 370** .

 

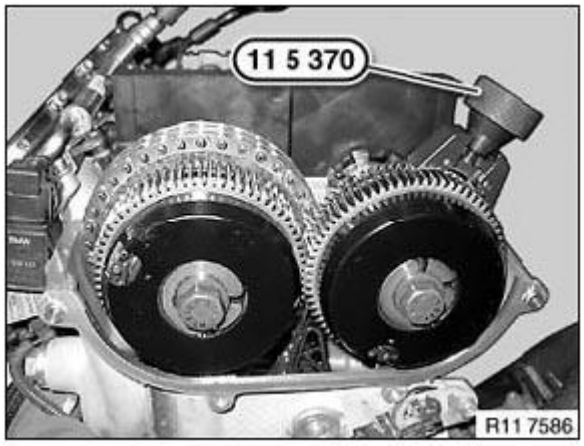


**Fig. 334: Identifying Special Tool (11 5 370) On Gearwheels**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Removal/installation is not possible without hexagon socket screw (2).**
**Hexagon socket screw (1) must not be longer than 10 mm.**
**Gearwheels of exhaust VANOS gear are pretensioned with a spring.**

Insert M5x10 hexagon socket screw on VANOS gear.

**NOTE: Picture shows cylinders 1-4.**

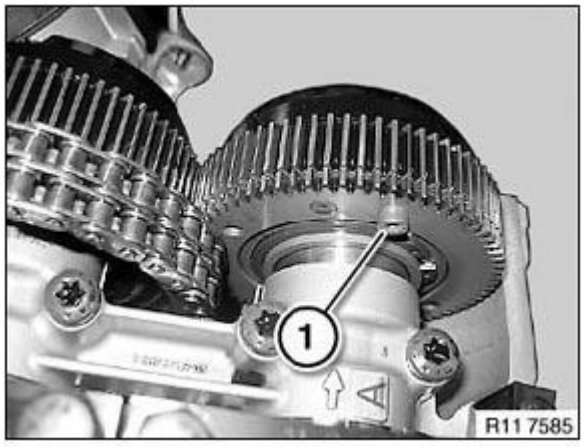


**Fig. 335: Identifying Socket Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: CCW thread!**
**Release central bolts (1 and 2).**

*Installation:*

Replace central bolts (1 and 2).

 

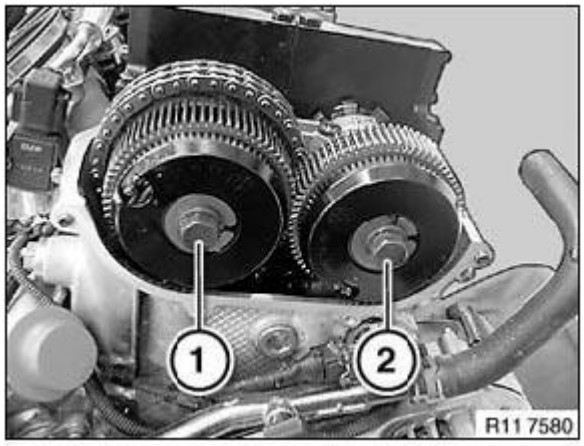


**Fig. 336: Identifying Central Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

If the hexagon socket screw is released or forgotten by mistake, the gear teeth can be readjusted with special tool **11 5 370** .

Screw in knurled screw on special tool **11 5 370** until gearwheel (1) lines up with bore (see arrow) on thread.

Failure to tension the exhaust VANOS gear (1) will result in rattling noises at idle.

**NOTE: Picture shows (S85).**

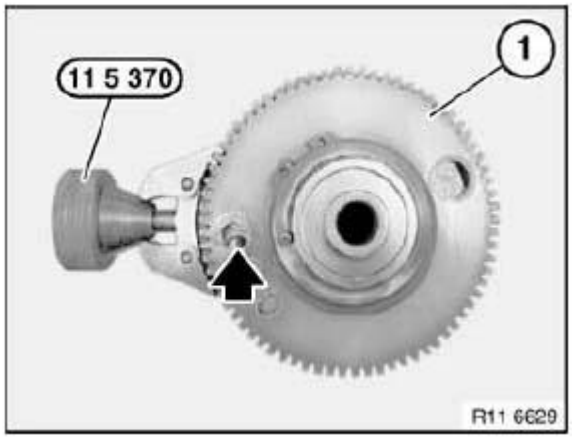


**Fig. 337: Identifying Special Tool (11 5 370) And Gearwheel**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Check O-ring (1) on VANOS gear, replace if necessary.

 


**Fig. 338: Identifying VANOS Gear O-Ring**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Replace central bolt of adjustment unit.**
**Central bolt must be fully screwed once.**

**IMPORTANT: Rotate crankshaft at central bolt back until special tool 11 5 320 can be secured in the 10° position.**

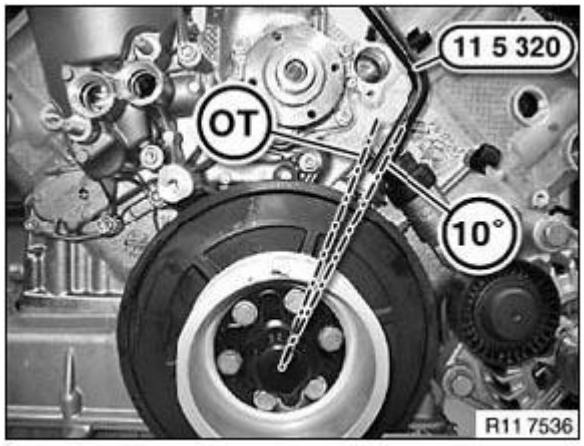


**Fig. 339: Rotating Crankshaft At Central Bolt With Special Tool (11 5 320)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Coat contact face of new central bolt (1) with copper paste.

 

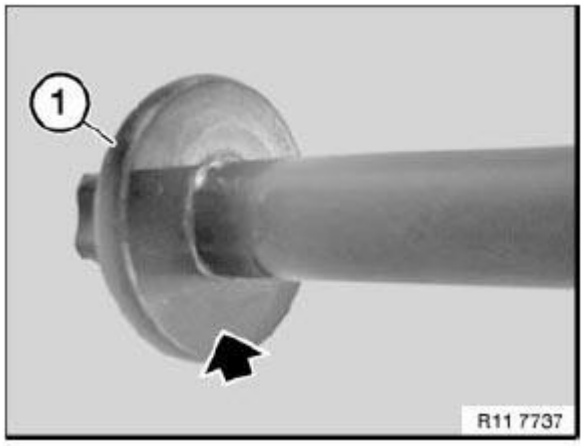


**Fig. 340: Identifying Central Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position VANOS adjustment unit on camshaft.

Hexagon socket screw points upwards.

Insert central bolts (1 and 2) and screw with special tool **00 9 120** .

1. Joining 10 Nm
2. Joining 20 Nm
3. Settling torque 80 Nm
4. Torsion angle 200°
5. **Unscrew central bolt.**
6. Joining 10 Nm

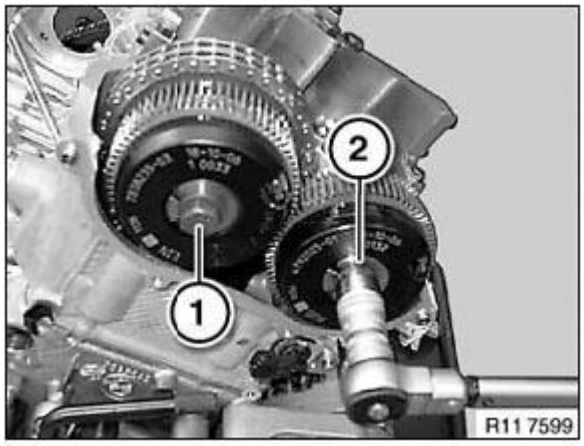


**Fig. 341: Inserting Central Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove hexagon socket screw (1) or special tool **11 5 370** .

 

**NOTE: Picture shows cylinders 1-4.**

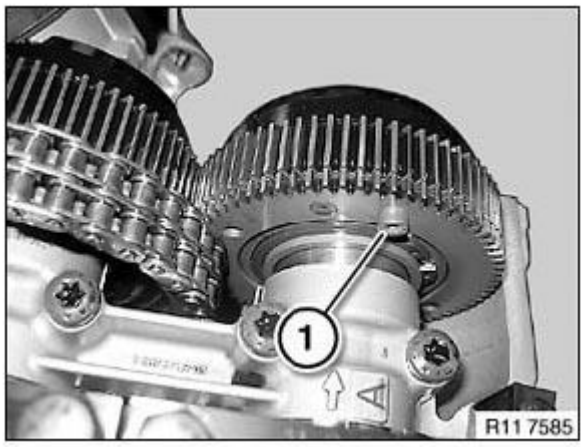


**Fig. 342: Identifying Socket Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Camshafts, cylinders 5-8, remain secured with special tool **11 9 970** .

Release special tool **11 5 320** and continue barring engine at central bolt 10° to **firing TDC position of cylinder no. 1** .

*Installation:*

This minimizes timing chain and gearwheel play.

Secure crankshaft with special tool **11 5 320** .

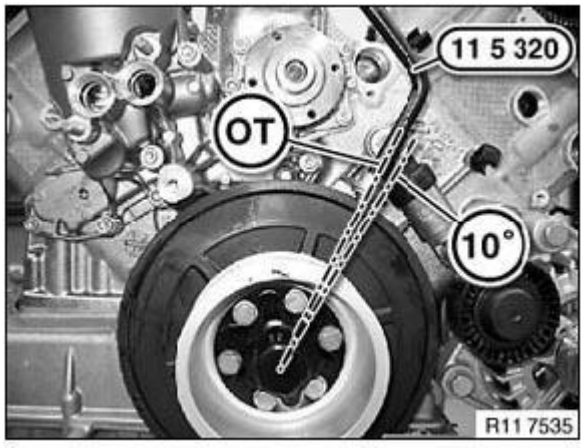


**Fig. 343: Securing Crankshaft With Special Tool (11 5 320)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**Cylinders 5 to 8:**

 

Always start screwing on the inlet side.

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Central bolt final tightening.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**

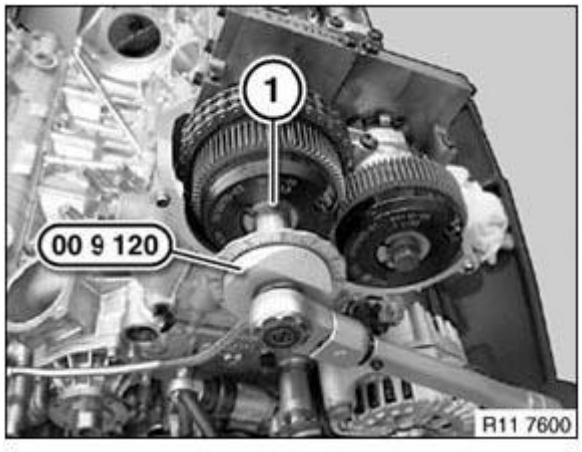


**Fig. 344: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Central bolt final tightening.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**

 

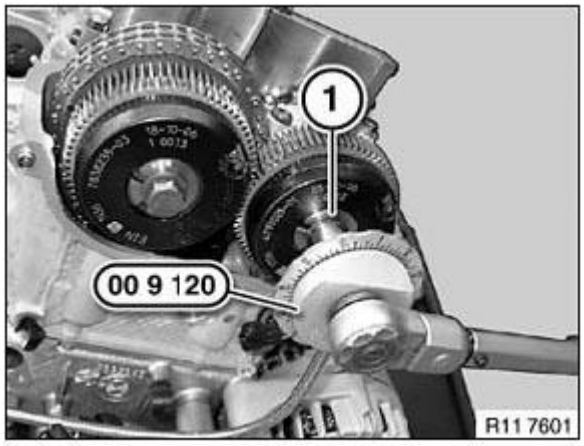


**Fig. 345: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove all special tools.

Check **timing** , cylinders (5 to 8).

Assemble engine.

**11 36 148 REMOVING AND INSTALLING/REPLACING RIGHT INLET VANOS GEAR (S65)**

**Special tools required:**

- **00 9 120**
- **11 5 320**
- **11 5 370**
- **11 9 970**
- **11 9 971**
- **11 9 972**

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

See **ENGINE - SPECIAL TOOLS** .

**IMPORTANT: Central bolts on VANOS gears have left-hand threads.**
**Do not release the central bolt of the adjustment units without the special tool 11 9 970 .**
**Grease contact surfaces of central bolts with copper paste.**

*Necessary preliminary tasks:*

- Remove right **cylinder head cover**

 

Release bolts (1) on cylinder bank 2.

Remove timing case cover (2).

*Installation:*

Replace seal.

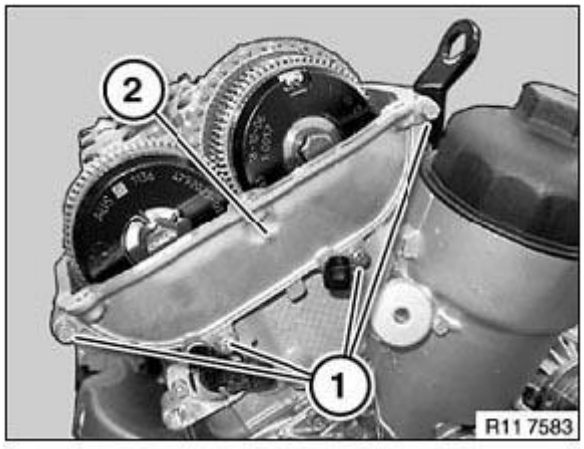


**Fig. 346: Identifying Cylinder Bank 1 Bolts And Timing Case Cover**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Both inlet and exhaust camshafts can be adjusted in the 1st cylinder firing TDC position.**
**Danger of mixing up both special tool bores.**
**The procedure for checking timing is different from that for adjusting.**

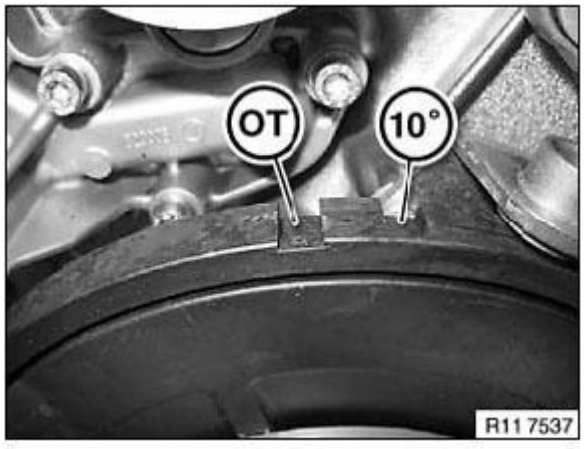


**Fig. 347: Identifying Timing Marks**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Crank engine at central bolt.

 

Secure crankshaft with special tool **11 5 320** in **firing TDC position of cylinder no. 1** .

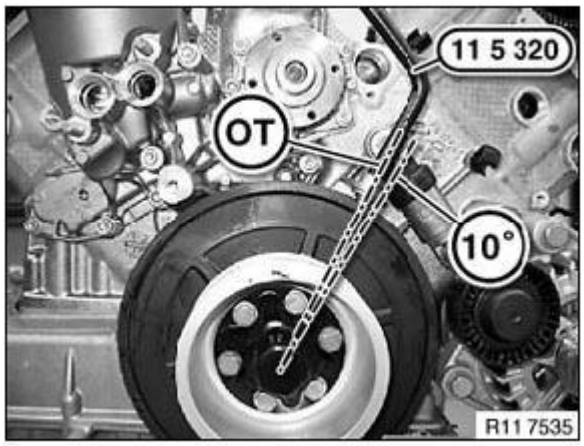


**Fig. 348: Identifying Special Tool (11 5 320) On Vibration Damper**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position of inlet camshafts, cyl. 1-4, in firing TDC position of cylinder no. 1.

Dihedron of inlet camshafts is vertical to cylinder axis, letters/numbers on camshafts point upwards (E1).

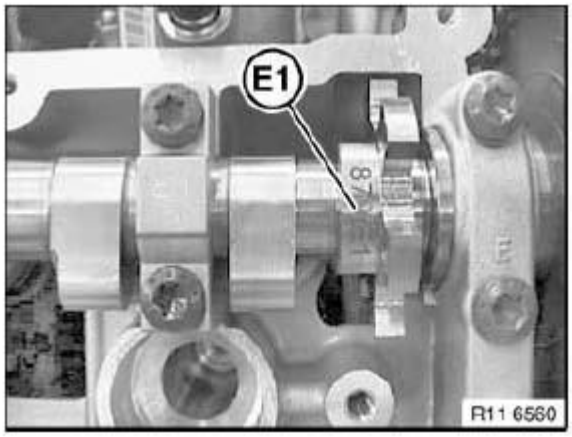


**Fig. 349: Identifying Letters/Numbers On Camshafts Point (E1)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position of exhaust camshafts, cyl. 1-4, in firing TDC position of cylinder no. 1.

Dihedron of camshafts is vertical to cylinder axis, letters/numbers (A1) on camshafts (1) point upwards.

 

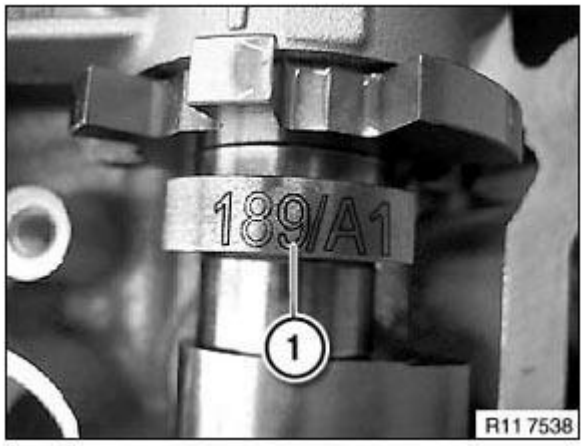


**Fig. 350: Identifying Letters/Numbers (A1) On Camshafts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Rotate inlet camshaft with open-end wrench (1) with minimal effort at hexagon head in direction of arrow until special tool **11 9 972** can be attached.

Designation (E1) on dihedron points upwards.

Secure special tool **11 9 972** with bolts (2) on cylinder head to **10 Nm.**

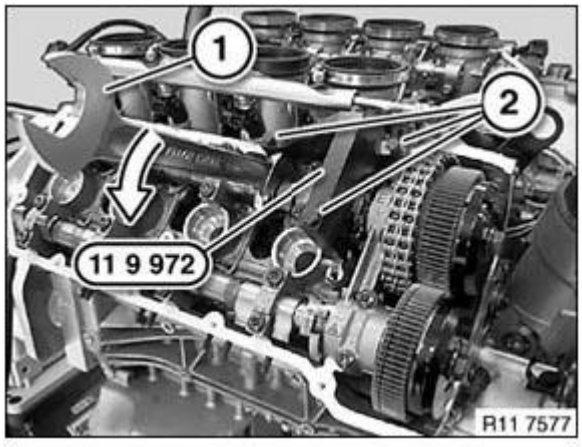


**Fig. 351: Rotating Inlet Camshaft With Open-End Wrench**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Rotate exhaust camshaft with open-end wrench (1) with minimal effort at hexagon head in direction of arrow until special tool **11 9 971** can be attached.

Designation (A1) on dihedron points upwards.

Secure special tool **11 9 972** with bolts (2) on cylinder head to **10 Nm.**

 

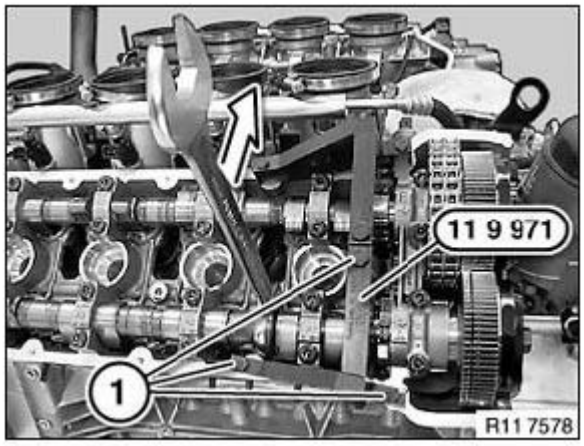


**Fig. 352: Identifying Special Tool (11 9 971) On Cylinder Head Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Align gearwheels on exhaust adjustment unit with special tool **11 5 370** .

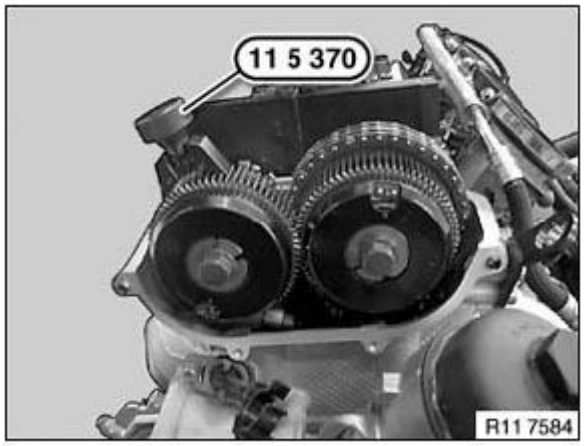


**Fig. 353: Identifying Special Tool (11 5 370)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Removal/installation is not possible without hexagon socket screw (2).**
**Hexagon socket screw (1) must not be longer than 10 mm.**
**Gearwheels of exhaust VANOS gear are pretensioned with a spring.**

Insert M5x10 hexagon socket screw on VANOS gear.

 

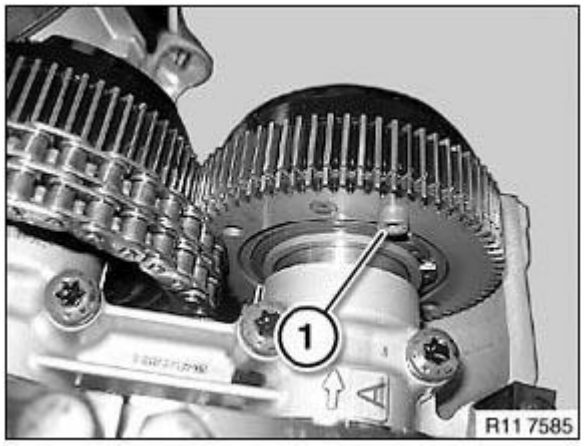


**Fig. 354: Identifying Socket Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: CCW thread!**

Release central bolt (1).

*Installation:*

Replace central bolt (1).

Remove exhaust adjustment unit

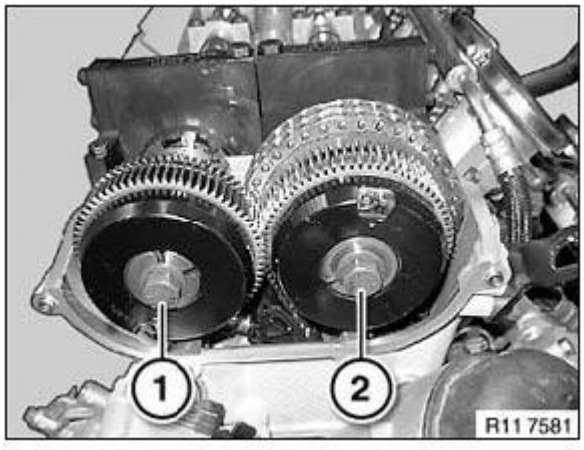


**Fig. 355: Identifying Central Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

If the hexagon socket screw is released or forgotten by mistake, the gear teeth can be readjusted with special tool **11 5 370** .

 

Screw in knurled screw on special tool **11 5 370** until gearwheel (1) lines up with bore (see arrow) on thread.

Failure to tension the exhaust VANOS gear (1) will result in rattling noises at idle.

**NOTE: Picture shows (S85).**

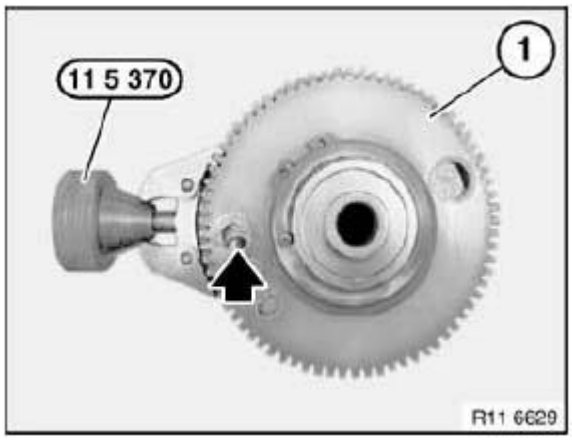


**Fig. 356: Identifying Special Tool (11 5 370) And Gearwheel**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Check O-ring (1) on VANOS gear, replace if necessary.


**Fig. 357: Identifying VANOS Gear O-Ring**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release chain tensioner (1).

*Installation:*

Replace sealing ring.

 

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

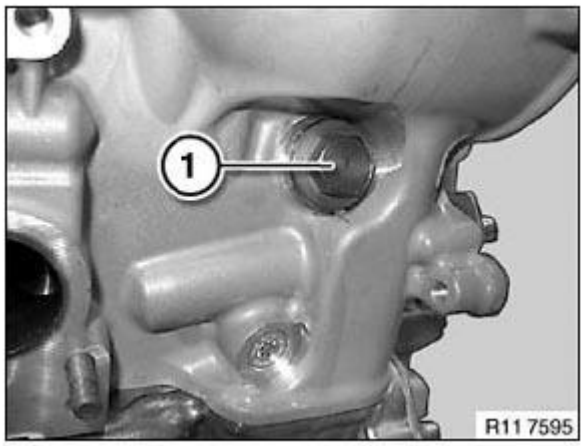


**Fig. 358: Identifying Right Hydraulic Chain Tensioner Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: CCW thread!**

Release central bolt (1).

*Installation:*

Replace central bolt (1).

Remove inlet adjustment unit (2).

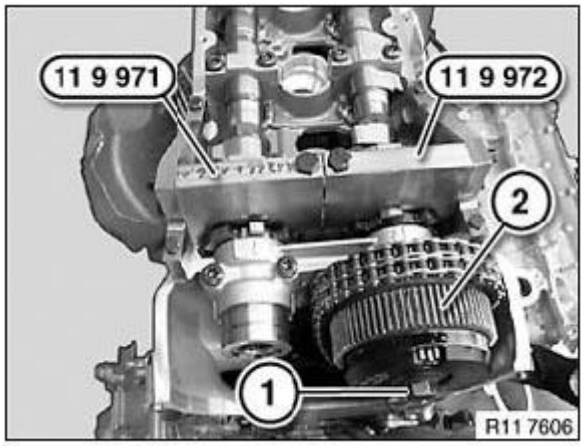


**Fig. 359: Identifying Central Bolt And Inlet Adjustment Unit**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Lay timing chain (1) on inlet camshaft (2).

 

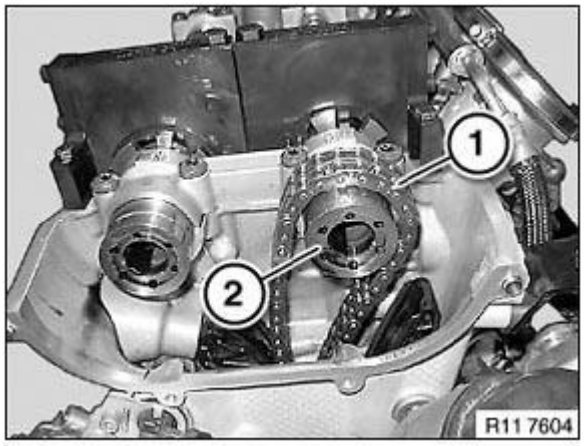


**Fig. 360: Identifying Timing Chain And Inlet Camshaft**
**Courtesy of BMW OF NORTH AMERICA, INC.**

EIN Inlet adjustment unit

AUS Exhaust adjustment unit

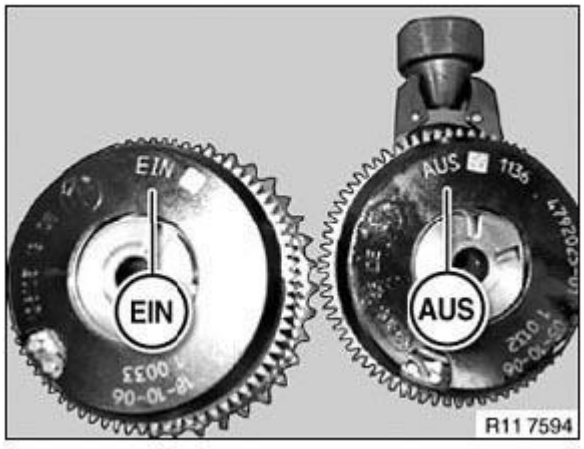


**Fig. 361: Identifying EIN Inlet Adjustment Unit And AUS Exhaust Adjustment Unit**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Replace central bolt of adjustment unit.**
**Central bolt must be fully screwed once.**

**IMPORTANT: Rotate crankshaft at central bolt back until special tool 11 5 320 can be secured in the 10° position.**

 

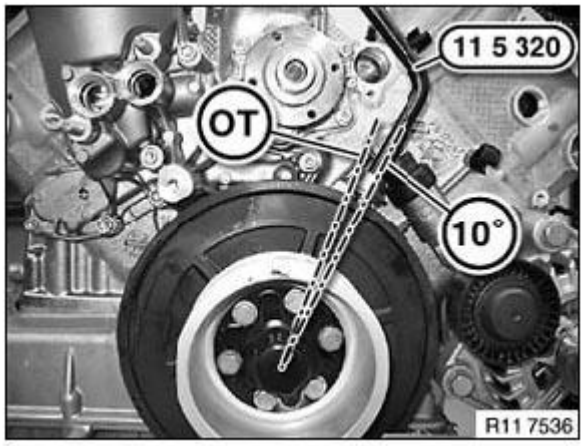


**Fig. 362: Rotating Crankshaft At Central Bolt With Special Tool (11 5 320)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Coat contact face of new central bolt (1) with copper paste.

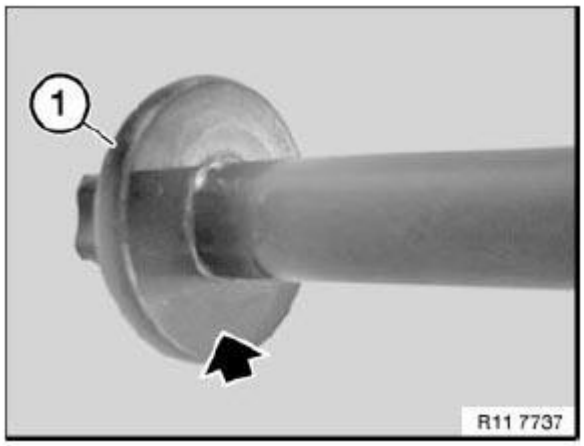


**Fig. 363: Coat Contact Face Of New Central Bolt (1) With Copper Paste**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position inlet adjustment unit with timing chain on inlet camshaft.

Screw in central bolt (2) hand-tight.

Position exhaust adjustment unit on exhaust camshaft.

Hexagon socket screw points upwards.

Screw in central bolt (1) hand-tight.

 

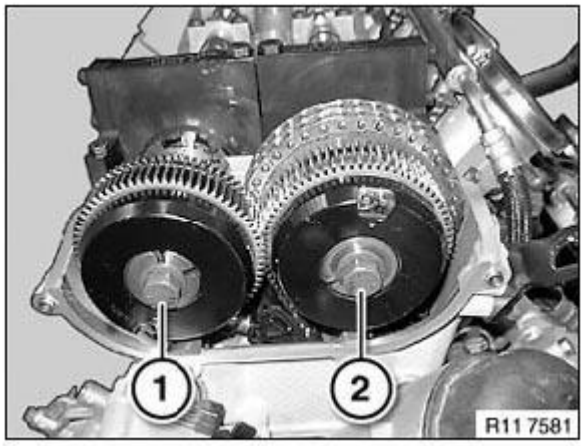


**Fig. 364: Identifying Central Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Install chain tensioner (1).

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

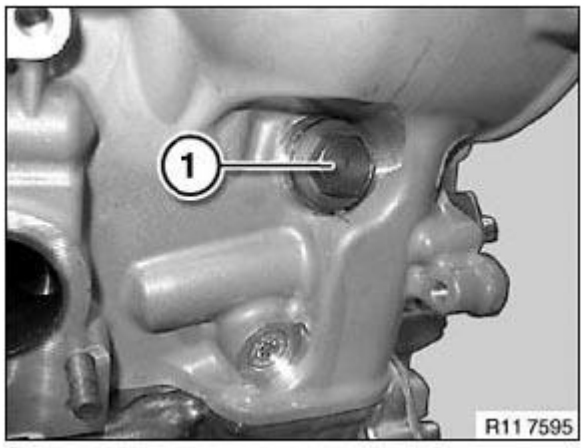


**Fig. 365: Identifying Right Hydraulic Chain Tensioner Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Screw in central bolt (1) with special tool **00 9 120** .

1. Joining 10 Nm
2. Joining 20 Nm
3. Settling torque 80 Nm
4. Torsion angle 200°
5. **Unscrew central bolt.**
6. Joining 10 Nm

 

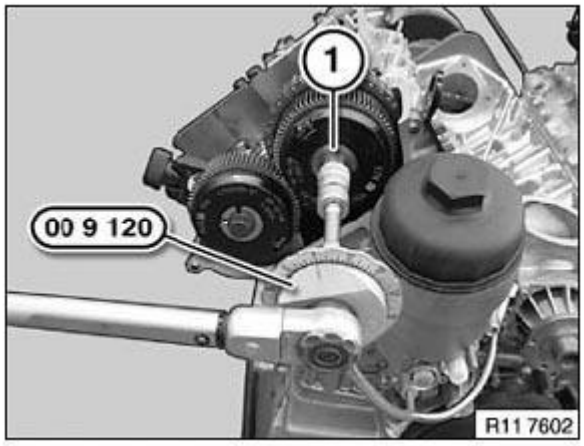


**Fig. 366: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert central bolt (1) and screw with special tool **00 9 120** .

1. Joining 10 Nm
2. Joining 20 Nm
3. Settling torque 80 Nm
4. Torsion angle 200°
5. **Unscrew central bolt.**
6. Joining 10 Nm

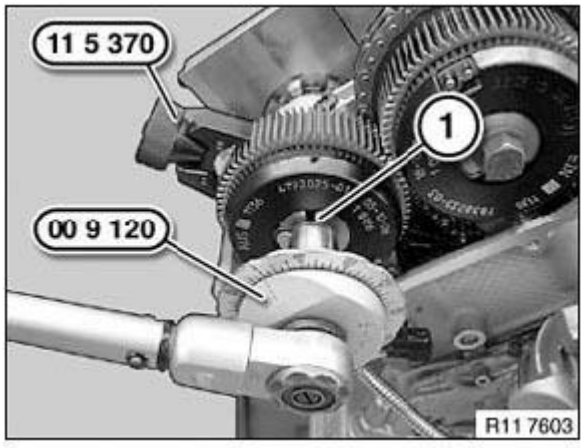


**Fig. 367: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove hexagon socket screw (1) or special tool **11 5 370** .

 

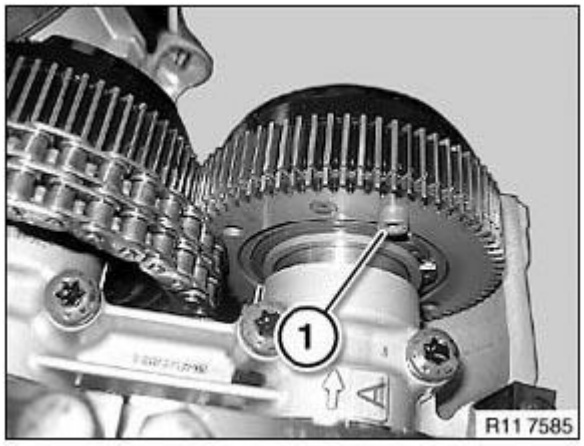


**Fig. 368: Identifying Socket Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release special tool **11 5 320** and continue barring engine at central bolt 10° to **firing TDC position of cylinder no. 1** .

*Installation:*

This minimizes timing chain and gearwheel play.

Secure crankshaft with special tool **11 5 320** .

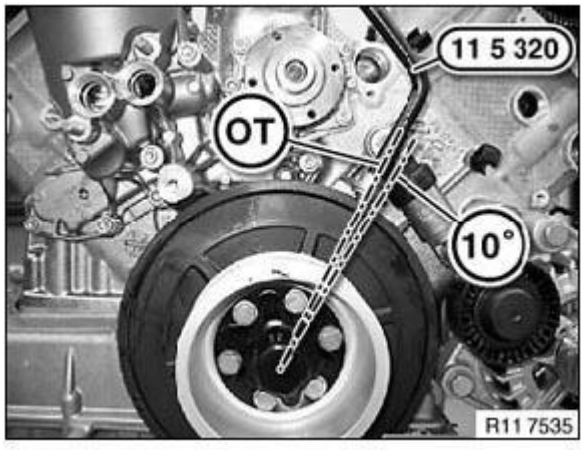


**Fig. 369: Identifying Special Tool (11 5 320) On Vibration Damper**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**Cylinders 1 to 4:**

Always start screwing on the inlet side.

Secure central bolt (1) with special tool **00 9 120** .

 

**IMPORTANT: Central bolt final tightening.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**

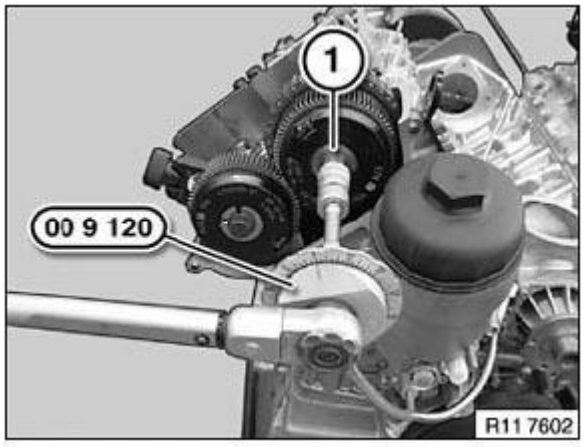


**Fig. 370: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Central bolt final tightening.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**

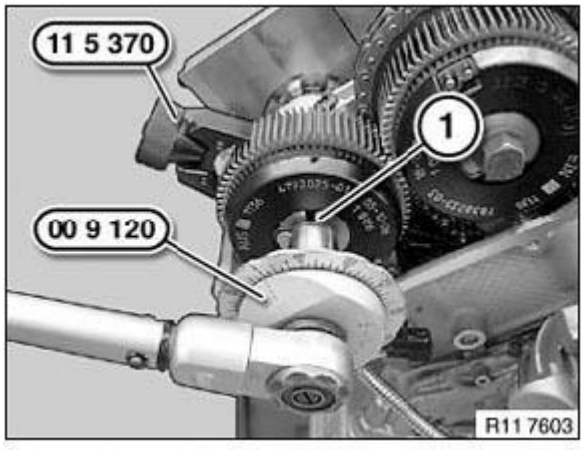


**Fig. 371: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

 

Remove all special tools.

Check **timing** , bank 1, cylinders (1 to 4).

Assemble engine.

**11 36 150 REMOVING AND INSTALLING/REPLACING RIGHT EXHAUST VANOS GEAR (S65)**

**Special tools required:**

- **00 9 120**
- **11 5 320**
- **11 5 370**
- **11 9 970**
- **11 9 971**
- **11 9 972**

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

See **ENGINE - SPECIAL TOOLS** .

**IMPORTANT: Central bolts on VANOS gears have left-hand threads.**
**Do not release the central bolt of the adjustment units without the special tool 11 9 970 .**
**Grease contact surfaces of central bolts with copper paste.**

*Necessary preliminary tasks:*

- Remove right **cylinder head cover**

Release bolts (1) on cylinder bank 2.

Remove timing case cover (2).

*Installation:*

Replace seal.

 

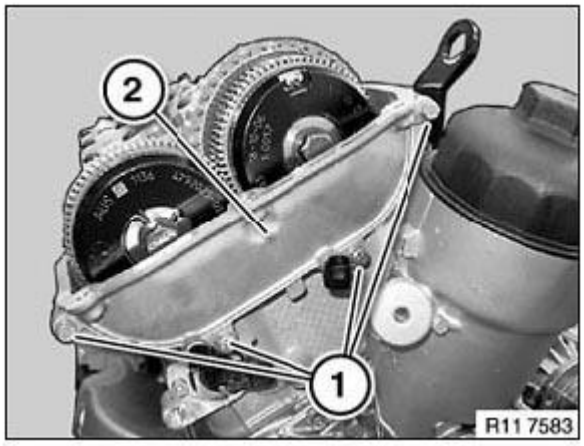


**Fig. 372: Identifying Cylinder Bank 1 Bolts And Timing Case Cover**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Both inlet and exhaust camshafts can be adjusted in the 1st cylinder firing TDC position.**
**Danger of mixing up both special tool bores.**
**The procedure for checking timing is different from that for adjusting.**

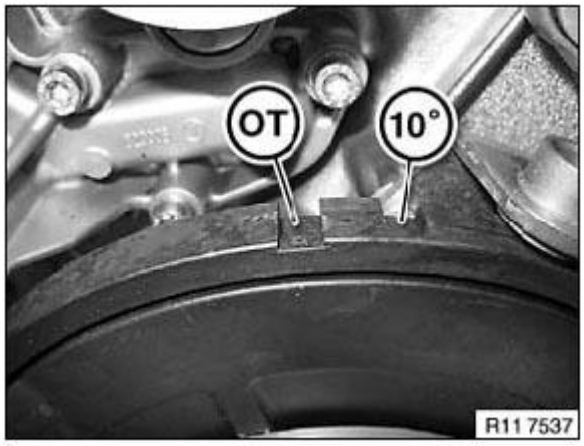


**Fig. 373: Identifying Timing Marks**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Crank engine at central bolt.

Secure crankshaft with special tool **11 5 320** in **firing TDC position of cylinder no. 1** .

 

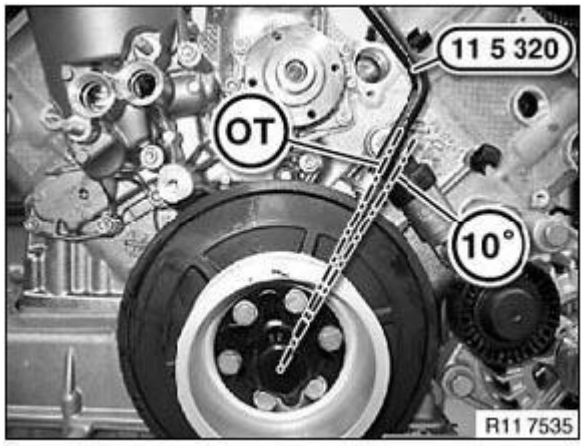


**Fig. 374: Identifying Special Tool (11 5 320) On Vibration Damper**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position of inlet camshafts, cyl. 1-4, in firing TDC position of cylinder no. 1.

Dihedron of inlet camshafts is vertical to cylinder axis, letters/numbers on camshafts point upwards (E1).

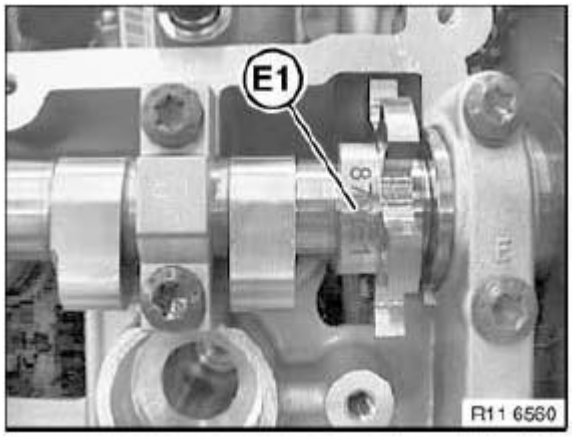


**Fig. 375: Identifying Letters/Numbers On Camshafts Point (E1)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position of exhaust camshafts, cyl. 1-4, in firing TDC position of cylinder no. 1.

Dihedron of camshafts is vertical to cylinder axis, letters/numbers (A1) on camshafts (1) point upwards.

 

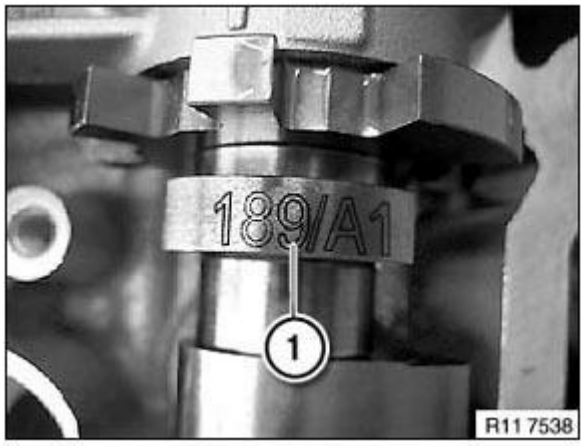


**Fig. 376: Identifying Letters/Numbers (A1) On Camshafts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Rotate inlet camshaft with open-end wrench (1) with minimal effort at hexagon head in direction of arrow until special tool **11 9 972** can be attached.

Designation (E1) on dihedron points upwards.

Secure special tool **11 9 972** with bolts (2) on cylinder head to **10 Nm.**

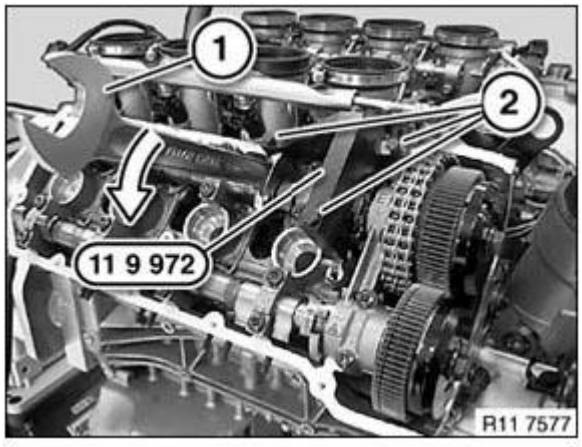


**Fig. 377: Rotating Inlet Camshaft With Open-End Wrench**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Rotate exhaust camshaft with open-end wrench (1) with minimal effort at hexagon head in direction of arrow until special tool **11 9 971** can be attached.

Designation (A1) on dihedron points upwards.

Secure special tool **11 9 972** with bolts (2) on cylinder head to **10 Nm.**

 

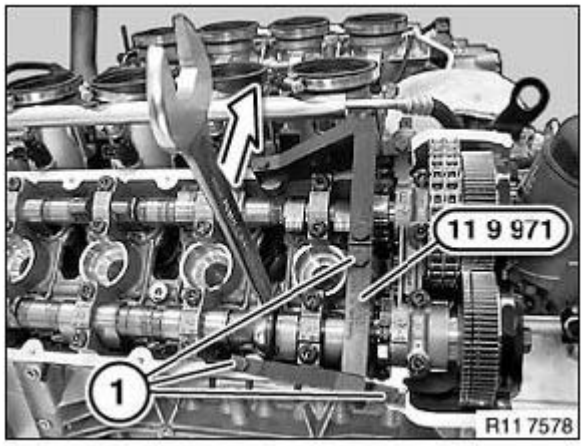


**Fig. 378: Identifying Special Tool (11 9 971) On Cylinder Head Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Align gearwheels on exhaust adjustment unit with special tool **11 5 370** .

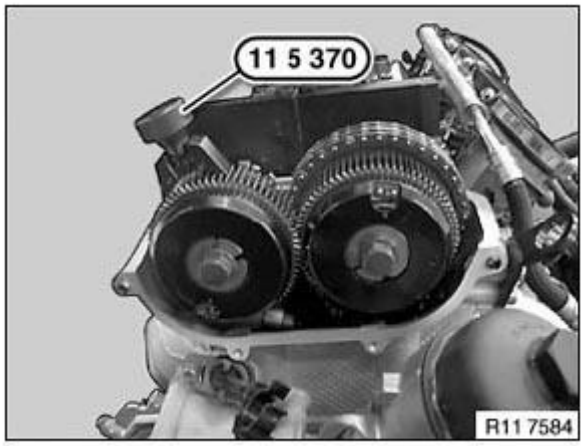


**Fig. 379: Identifying Special Tool (11 5 370)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Removal/installation is not possible without hexagon socket screw (2).**
**Hexagon socket screw (1) must not be longer than 10 mm.**
**Gearwheels of exhaust VANOS gear are pretensioned with a spring.**

Insert M5x10 hexagon socket screw on VANOS gear.

 

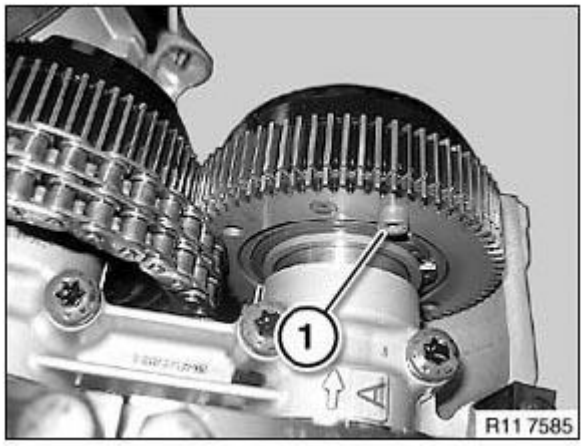


**Fig. 380: Identifying Socket Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: CCW thread!**

Release central bolts (1 and 2).

*Installation:*

Replace central bolts (1 and 2).

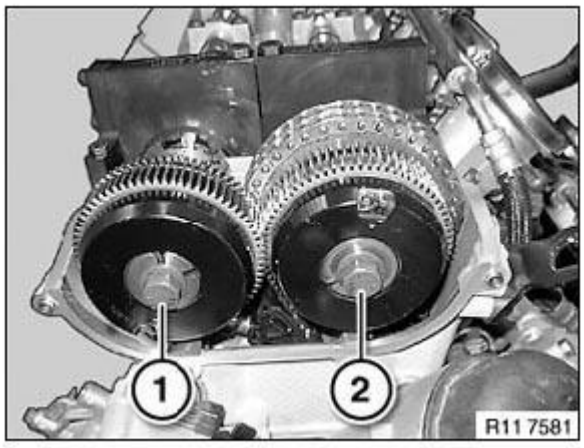


**Fig. 381: Identifying Central Bolts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

If the hexagon socket screw is released or forgotten by mistake, the gear teeth can be readjusted with special tool **11 5 370** .

Screw in knurled screw on special tool **11 5 370** until gearwheel (1) lines up with bore (see arrow) on thread.

 

Failure to tension the exhaust VANOS gear (1) will result in rattling noises at idle.

**NOTE: Picture shows (S85).**

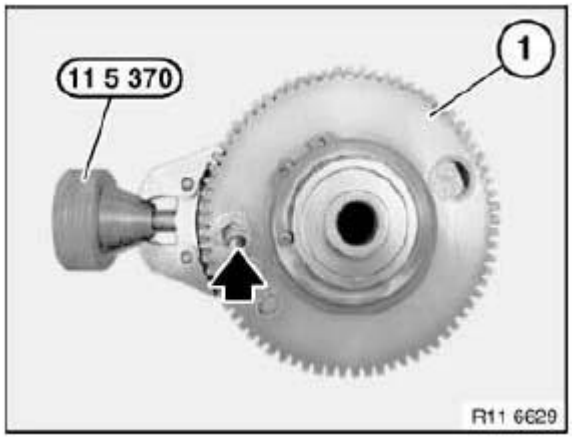


**Fig. 382: Identifying Special Tool (11 5 370) And Gearwheel**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Check O-ring (1) on VANOS gear, replace if necessary.


**Fig. 383: Identifying VANOS Gear O-Ring**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Replace central bolt of adjustment unit. Central bolt must be fully screwed once.**

**IMPORTANT: Rotate crankshaft at central bolt back until special tool 11 5 320 can be secured in the 10° position.**

 

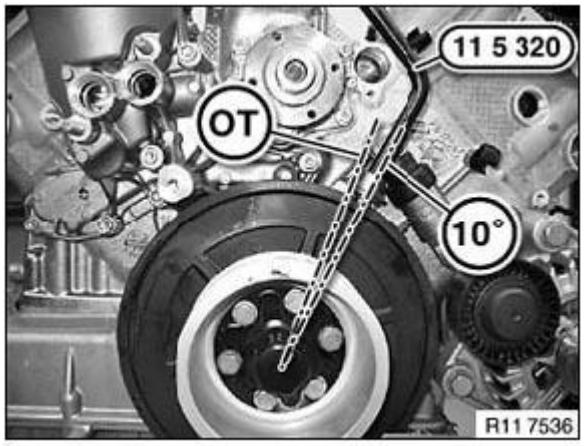


**Fig. 384: Rotating Crankshaft At Central Bolt With Special Tool (11 5 320)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Coat contact face of new central bolt (1) with copper paste.

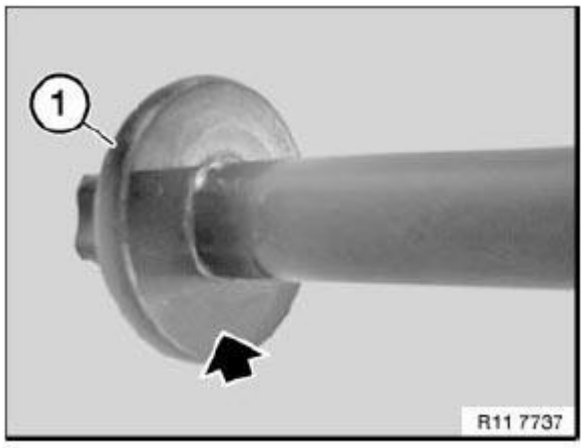


**Fig. 385: Identifying Central Bolt**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Position VANOS adjustment unit on camshaft.

Hexagon socket screw points upwards.

Insert central bolt (1) and screw with special tool **00 9 120** .

1. Joining 10 Nm
2. Joining 20 Nm
3. Settling torque 80 Nm
4. Torsion angle 200°

 

5. **Unscrew central bolt.**
6. Joining 10 Nm

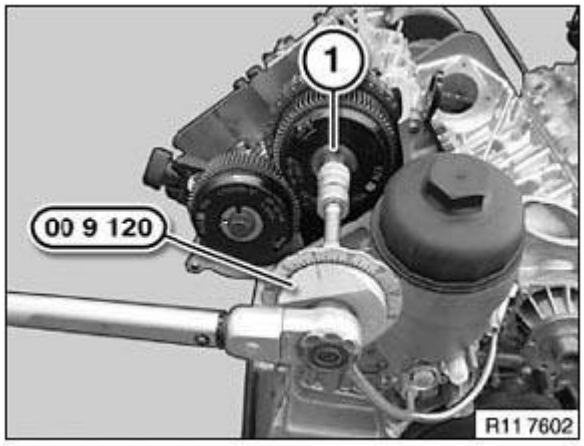


**Fig. 386: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Insert central bolt (1) and screw with special tool **00 9 120** .

1. Joining 10 Nm
2. Joining 20 Nm
3. Settling torque 80 Nm
4. Torsion angle 200°
5. **Unscrew central bolt.**
6. Joining 10 Nm

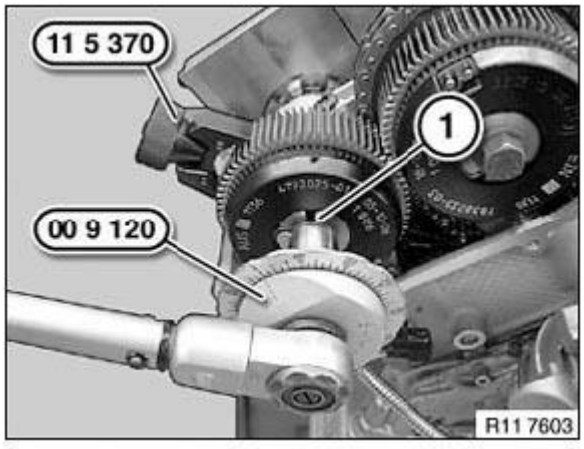


**Fig. 387: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove hexagon socket screw (1) or special tool **11 5 370** .

 

**NOTE: Picture shows cylinders 1-4.**

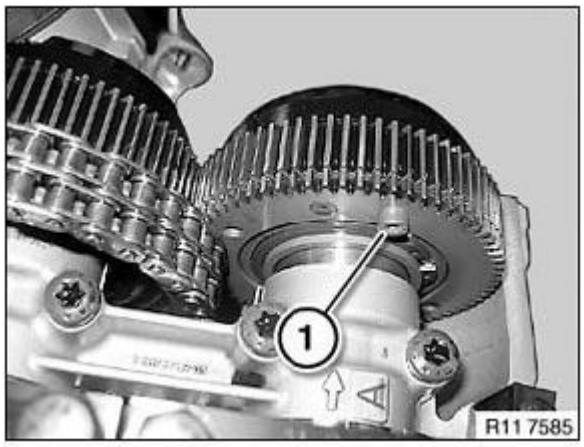


**Fig. 388: Identifying Socket Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Camshafts, cylinders 5-8, remain secured with special tool **11 9 970** .

Release special tool **11 5 320** and continue barring engine at central bolt 10° to **firing TDC position of cylinder no. 1** .

*Installation:*

This minimizes timing chain and gearwheel play.

Secure crankshaft with special tool **11 5 320** .

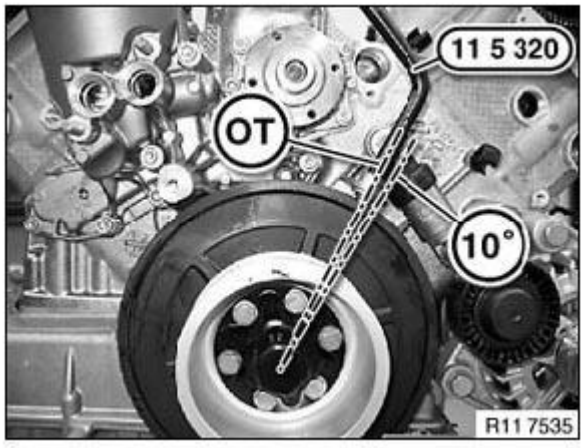


**Fig. 389: Identifying Special Tool (11 5 320) On Vibration Damper**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**Cylinders 5 to 8:**

 

Always start screwing on the inlet side.

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Central bolt final tightening.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**

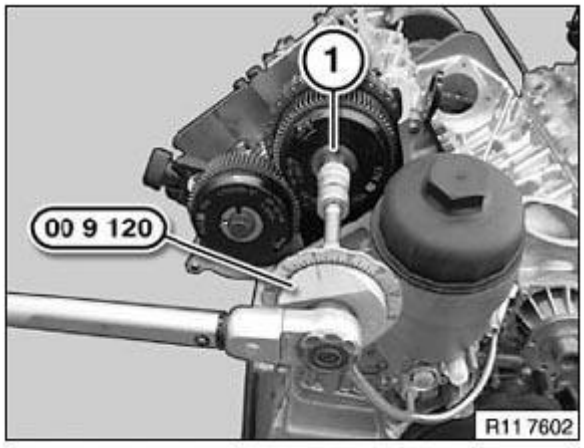


**Fig. 390: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure central bolt (1) with special tool **00 9 120** .

**IMPORTANT: Central bolt final tightening.**

1. **Joining 20 Nm**
2. **Settling torque 80 Nm**
3. **Torsion angle 200°**

 

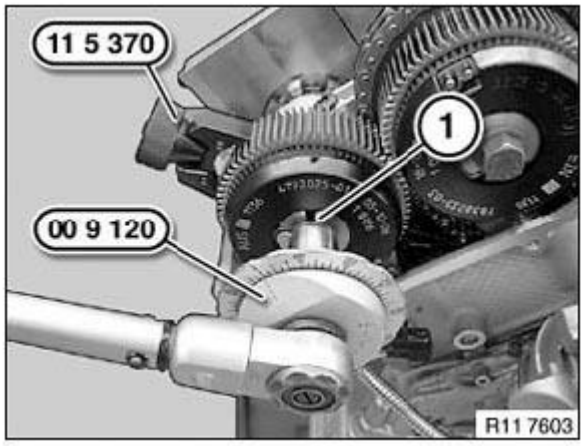


**Fig. 391: Securing Central Bolt With Special Tool (00 9 120)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove all special tools.

Check **timing** , bank 1, cylinders (1 to 4).

Assemble engine.

### 11 36 715 REMOVING AND INSTALLING/REPLACING SOLENOID VALVES ON LEFT VANOS ADJUSTMENT UNIT (S65)

*Necessary preliminary tasks:*

- Remove **intake air manifold.**

Disconnect plug connections (2).

Release screw (1).

Remove solenoid valve (3), exhaust adjustment.

*Installation:*

Replace O-rings.

 

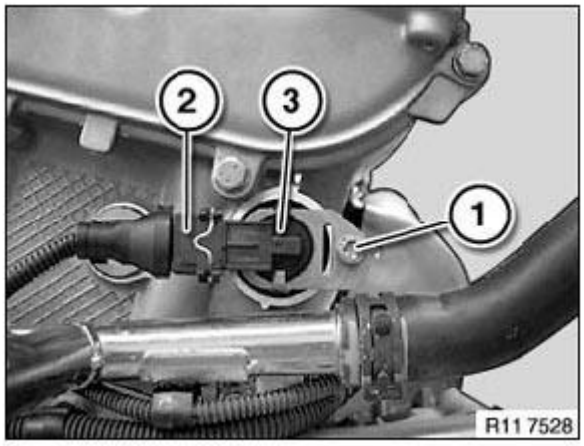


**Fig. 392: Identifying Screw, Solenoid Valve And Plug Connections**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screw (1).

Unfasten plug connection.

Remove solenoid valve (2), inlet adjustment.

*Installation:*

Replace O-ring.

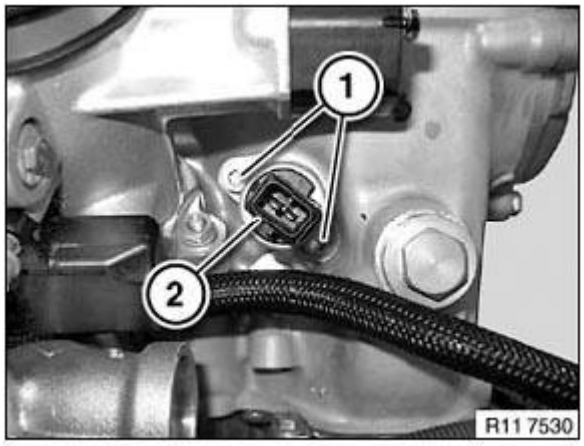


**Fig. 393: Identifying Solenoid Valve And Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

Perform VANOS test.

**11 36 720 REMOVING AND INSTALLING/REPLACING SOLENOID VALVES ON RIGHT VANOS**

 

**ADJUSTMENT UNIT (S65)**

*Necessary preliminary tasks:*

- Remove **intake manifold** (inlet solenoid valve only).

Disconnect plug connection (2) on solenoid valve for exhaust adjustment.

Release screw (1).

Remove exhaust solenoid valve.

*Installation:*

Replace O-rings.

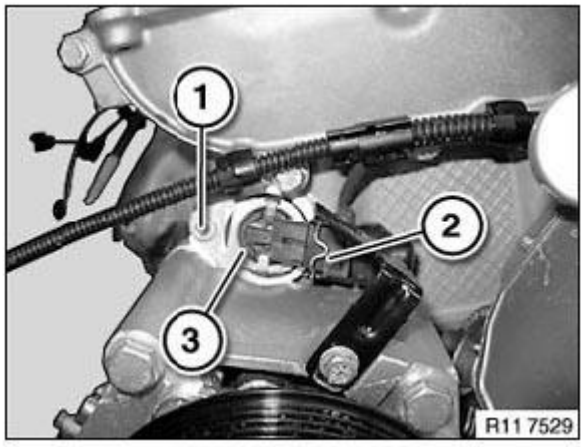


**Fig. 394: Identifying Plug Connection, Exhaust Solenoid Valve And Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Disconnect plug connection on solenoid valve for inlet adjustment.

Release screws (1).

Remove inlet solenoid valve (2).

*Installation:*

Replace O-ring.

 

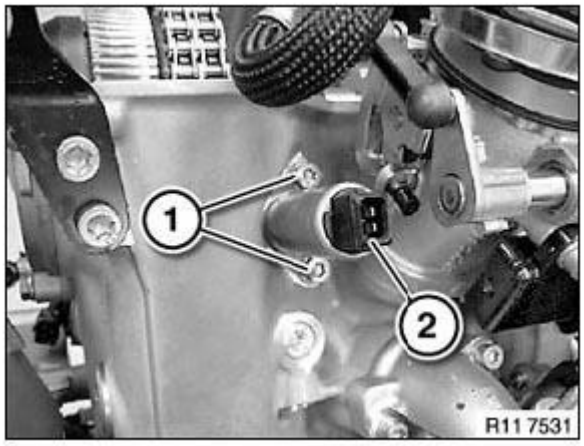


**Fig. 395: Identifying Inlet Solenoid Valve And Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

Perform VANOS test.

## OIL PUMP WITH FILTER

### 11 41 000 REMOVING AND INSTALLING/REPLACING OIL PUMP (S65)

*Necessary preliminary tasks:*

- Remove **oil pan**

Release screws (1).

Release screws (2).

*Installation:*

Replace screws.

Clean threads before installation.

 

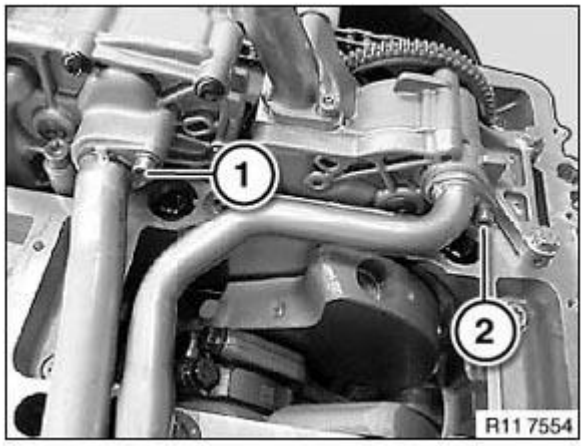


**Fig. 396: Identifying Oil Pump Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screw (1).

Release screw (2).

Detach oil pipes from oil pump.

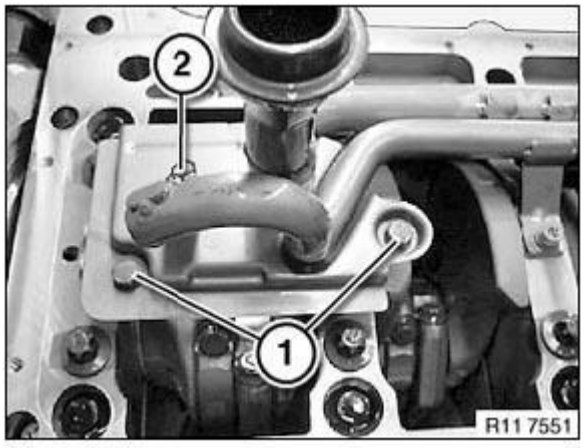


**Fig. 397: Identifying Oil Pipe Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screw (1).

Detach oil pipes from oil pump.

 

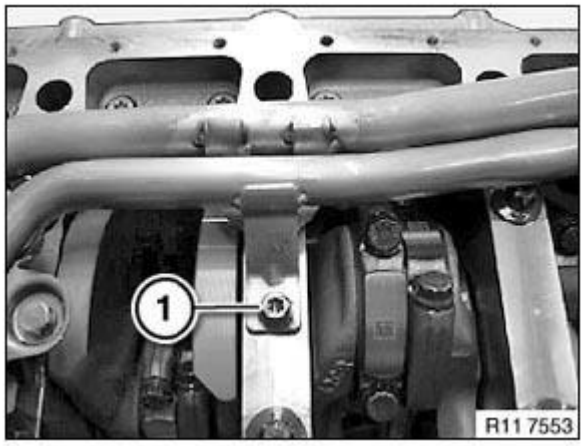


**Fig. 398: Identifying Oil Pipe Screw**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Detach oil pipes (1 and 2) from oil pump.

*Installation:*

Replace sealing rings.

To facilitate fitting, apply a light coating of engine oil to sealing rings.

Clean all sealing surfaces.

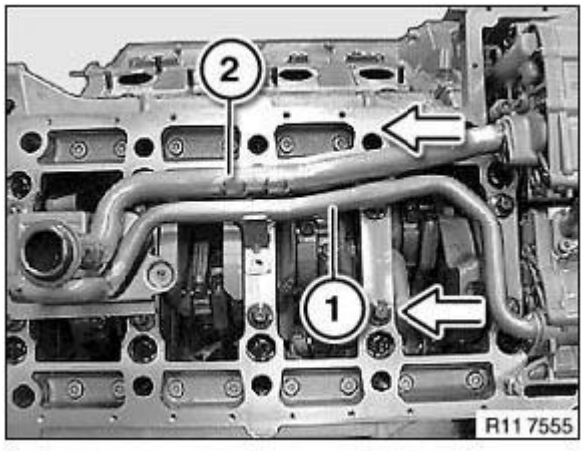


**Fig. 399: Identifying Oil Pipes**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Slacken nut (1).

*Installation:*

If reusing the sprocket wheel, check dihedron for damage and if necessary replace.

 

Replace microencapsulated nut (1).

Tightening torque:**11 41 1AZ** . See **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

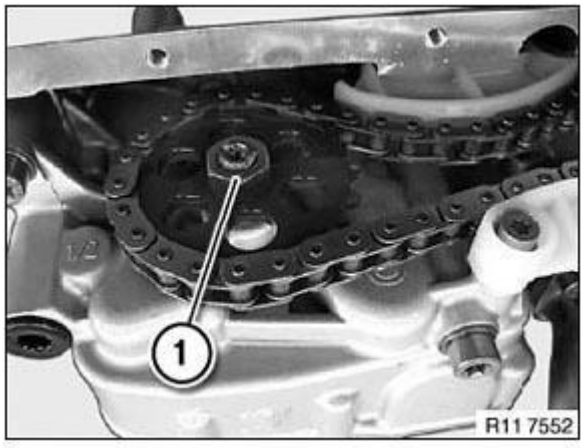


**Fig. 400: Identifying Microencapsulated Nut**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screw (1).

Release screw (2).

Fold sliding rail (3) downwards.

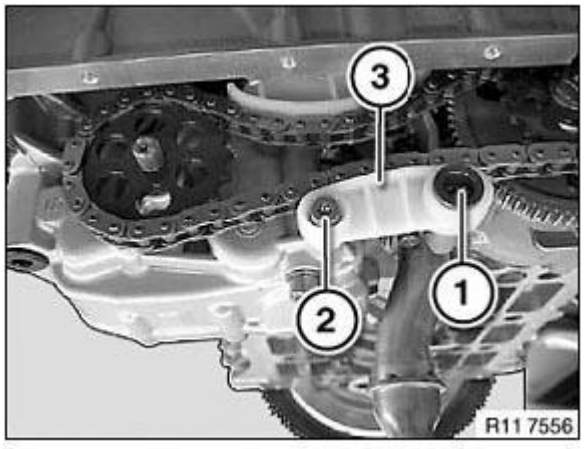


**Fig. 401: Identifying Screws And Sliding Rail**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove sprocket wheel (1) from shaft.

 

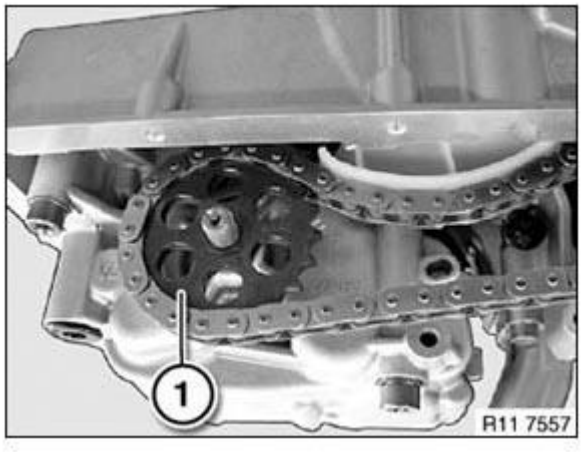


**Fig. 402: Identifying Sprocket Wheel**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Chain tensioner piston may fall out.**

Remove piston (1) in direction of arrow.

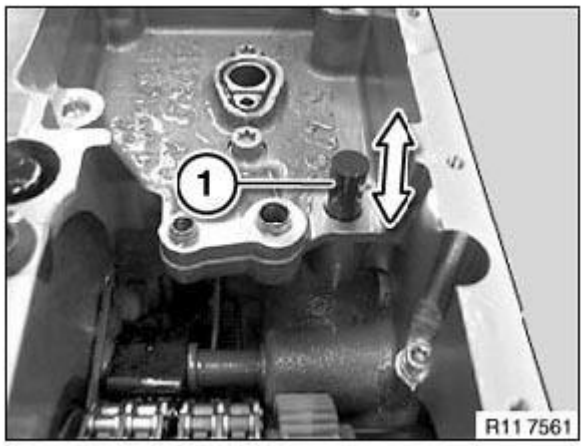


**Fig. 403: Removing Piston**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Arrangement, chain tensioner, oil pump.

1. Base valve
2. Spring
3. Piston

 

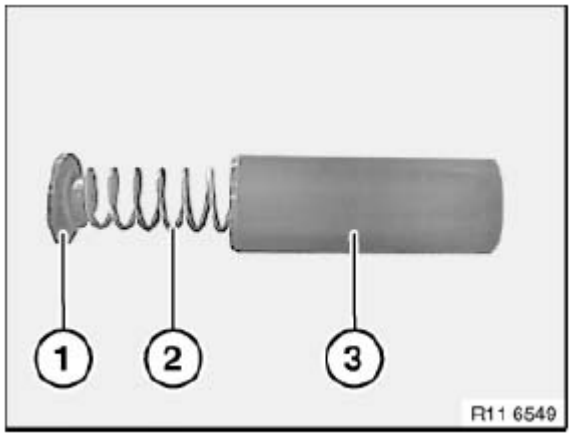


**Fig. 404: Identifying Base Valve, Spring And Piston**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (1) on oil pump (2).

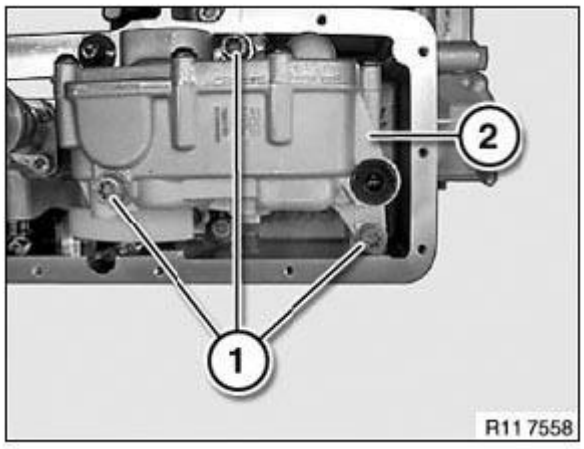


**Fig. 405: Identifying Screws And Oil Pump**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Replace sealing ring.

 

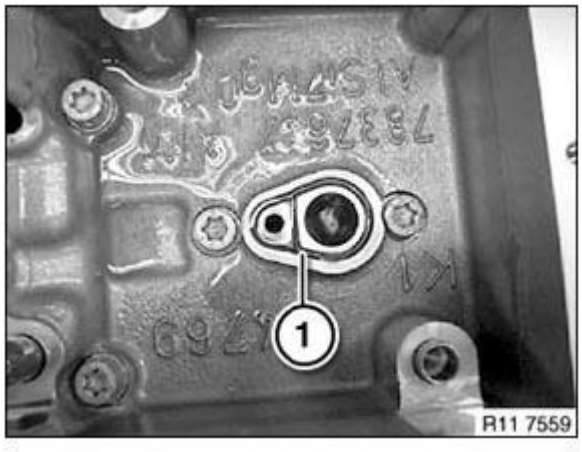


**Fig. 406: Identifying Sealing Ring**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

**11 41 050 REMOVING AND INSTALLING/REPLACING OIL SUCTION PUMP (S65)**

**Special tools required:**

- **11 6 251**
- **11 6 252**
- **11 6 254**

See **ENGINE - SPECIAL TOOLS** .

**IMPORTANT: Excessively low or high play between the gearwheel pairs results in failure of the oil supply.**

*Necessary preliminary tasks:*

- Remove **engine oil sump.**
- Remove **oil pump.**

Release screws (1).

Tightening torque. **11 41 3AZ** . See **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

Remove oil pump (2).

 

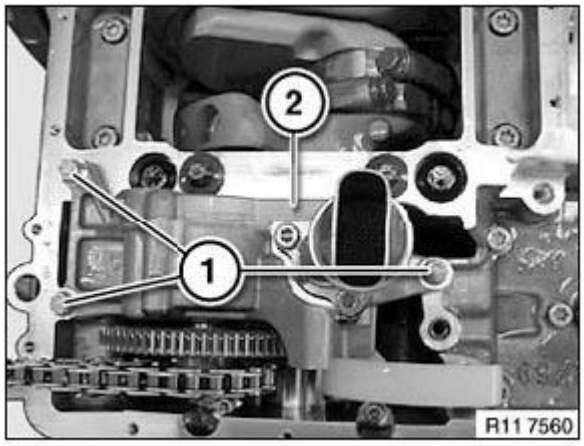


**Fig. 407: Identifying Oil Pump And Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**Replacing gear wheels**

*Necessary preliminary tasks:*

- Remove **vibration damper.**
- Remove **radial shaft seal** at front.

Mount special tool **11 6 254** on crankcase.

Secure special tool **11 6 252** with magnetic base to special tool **11 6 254** .

**NOTE: Special tool 11 6 254 can only be secured to the crankcase with one screw. Picture shows (S85).**

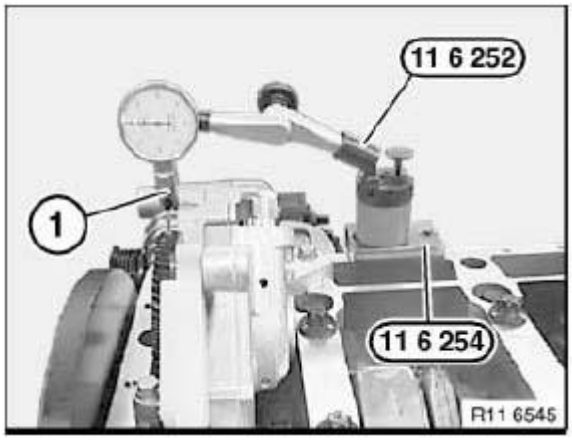


**Fig. 408: Mounting Special Tool (11 6 254) On Crankcase**
**Courtesy of BMW OF NORTH AMERICA, INC.**

 

**IMPORTANT: The oil pump chain of the oil suction pump must be removed.
The chain tensioner must not exert any tension on the oil suction pump.**

Align special tool **11 6 251** with its measuring shaft (2) vertically to gearwheel (1).

Turn oil suction pump gearwheel (1) to stop.

Set special tool **11 6 251** to zero.

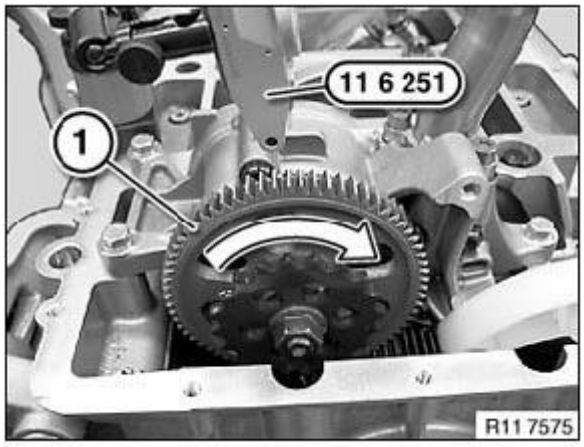


**Fig. 409: Turning Oil Suction Pump Gearwheel**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Turn oil suction pump gearwheel (1) in direction of arrow to stop.

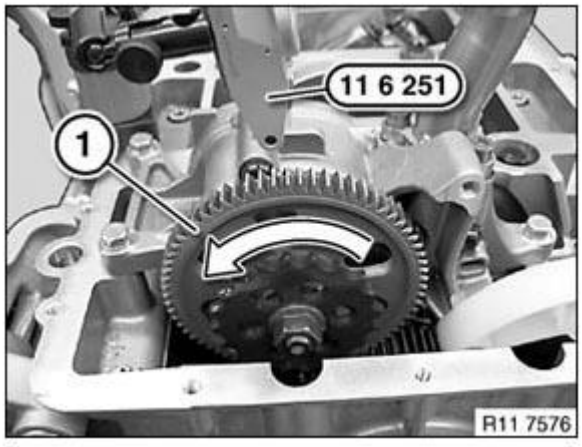


**Fig. 410: Turning Oil Suction Pump Gearwheel**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Backlash on oil suction pump **min. 0.06 to max. 0.08 mm.**

If necessary, correct oil suction pump adjustment.

 

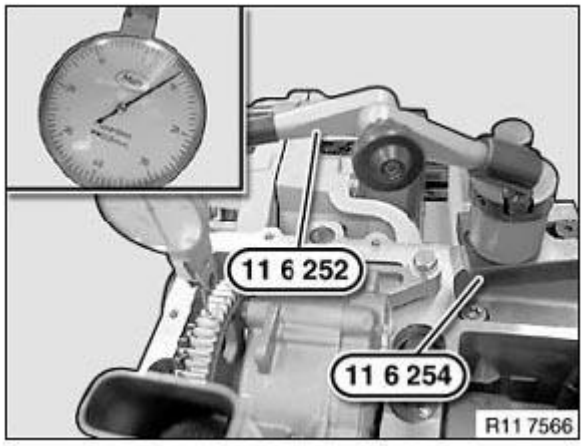


**Fig. 411: Measuring Oil Suction Pump Backlash**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Adjust oil suction pump (2) with a rubber mallet on pump housing in direction of arrow.

Tightening torque **11 41 3AZ** . See **11 41 OIL PUMP WITH STRAINER AND DRIVE** .

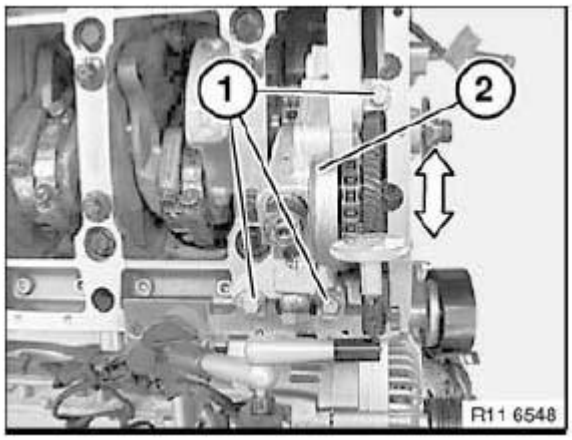


**Fig. 412: Adjusting Oil Suction Pump With Rubber Mallet On Pump Housing**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

## OIL FILTER AND LINES

### 11 42 020 REMOVING AND INSTALLING, SEALING/REPLACING MAIN FLOW OIL FILTER (S65)

**IMPORTANT: It is essential to adhere to the exact filling capacities specified. Overfilling the engine with engine oil will result in engine damage.**

 

*Recycling:*

Catch and dispose of engine oil with suitable equipment.

Note national regulations.

*Necessary preliminary tasks:*

- Remove **fan cowl** with electronic fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (S65)** .
- Remove front **underbody protection.** See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .
- Remove A/C system **drive belt.**
- Remove water pump **belt pulley.**
- Remove coolant hoses.
- Remove **vibration damper.**
- Release **power steering pump** and lay to one side (do not open pressure lines). See **32 41 060 REMOVING AND INSTALLING (REPLACING) VANE PUMP FOR POWER STEERING (S65)** .

Release oil filter cover (1).

*Installation:*

Replace sealing ring.

Tightening torque: **11 42 1AZ** . See **11 42 OIL FILTER AND PIPES** .

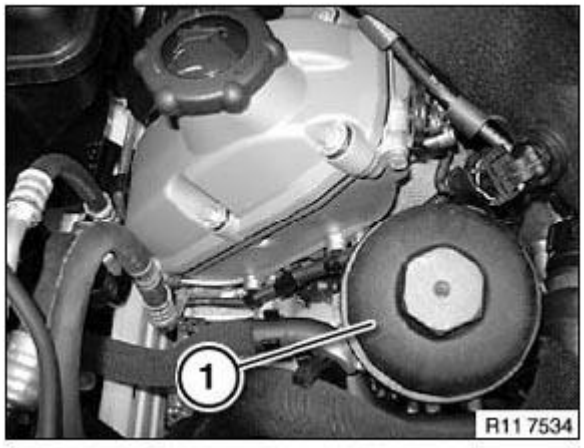


**Fig. 413: Identifying Oil Filter Cover**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release nuts (1 and 4).

 

Tightening torque: **11 42 3AZ** . See **11 42 OIL FILTER AND PIPES** .

Detach lines (2 and 3).

*Installation:*

Replace O-rings.

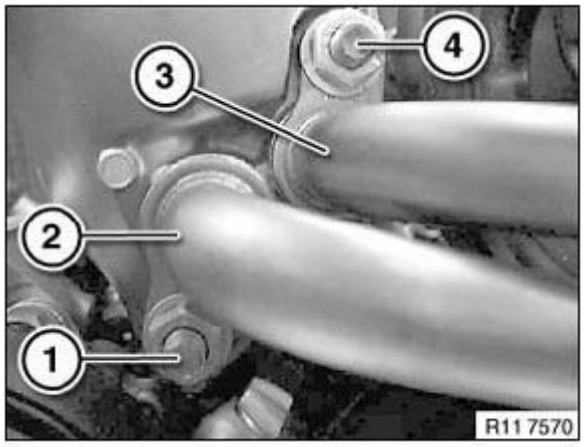


**Fig. 414: Identifying Oil Lines And Nuts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (1).

Release screws (2).

Release screws (3).

Tightening torque: **11 42 2AZ** . See **11 42 OIL FILTER AND PIPES** .

Lift out oil filter housing.

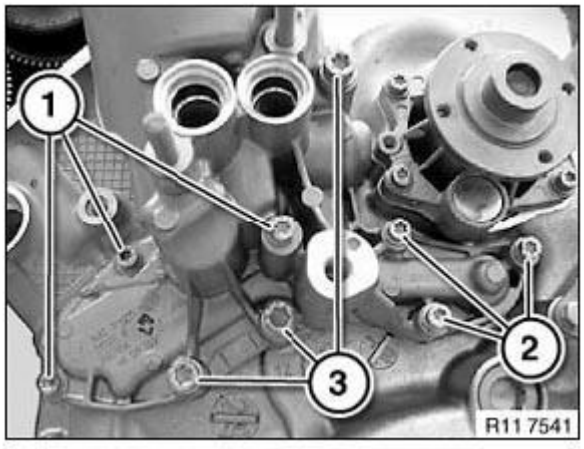


 

**Fig. 415: Identifying Oil Filter Housing Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Replace seal (1).

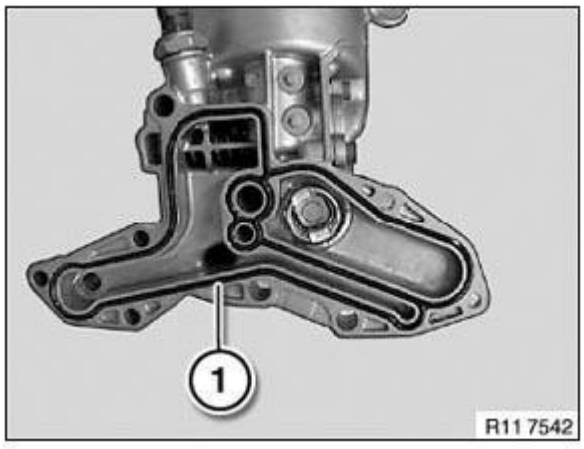


**Fig. 416: Identifying Seal**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

Park vehicle on a horizontal surface.

Allow engine at normal operating temperature to run for 3 minutes with increased revs (min. 1000 / max. 1500 RPM).

Read off engine oil level in instrument cluster or on Control Display.

Top up engine oil if necessary.

**11 42 080 REMOVING AND INSTALLING/REPLACING OIL PRESSURE HOSE - FEED - (S65)**

**IMPORTANT: It is essential to adhere to the exact filling capacities specified. Overfilling the engine with engine oil will result in engine damage.**

*Recycling:*

Catch and dispose of emerging engine oil with suitable equipment.

Note national regulations.

*Necessary preliminary tasks:*

 

- Remove **fan cowl** with electronic fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (S65)** .
- Remove front **underbody protection.** See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .

Slacken nut (1).

Disconnect oil line (2).

*Installation:*

Replace O-ring.

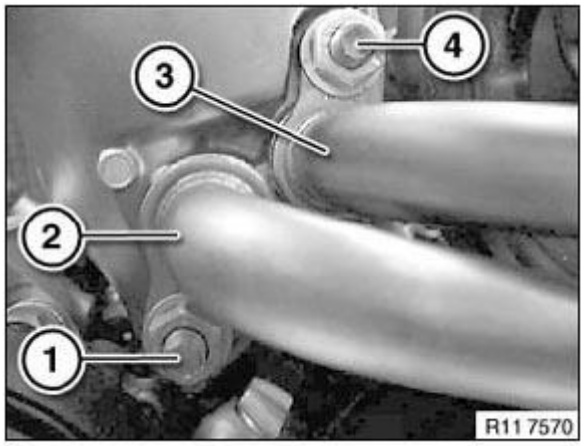


**Fig. 417: Identifying Oil Lines And Nuts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Slacken nut (1).

Unclip bracket (2).

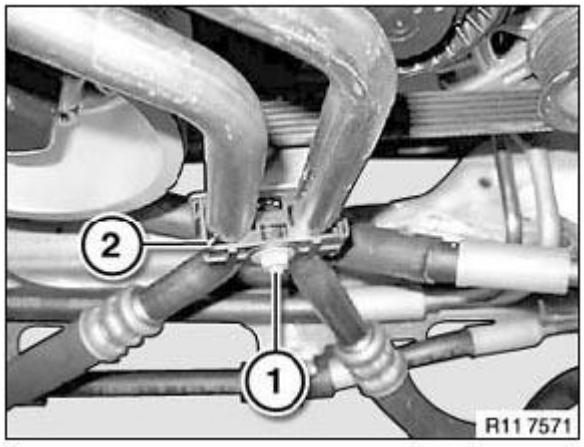


 

**Fig. 418: Identifying Nut And Bracket**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Slacken nut (1).

Disconnect oil line (2).

*Installation:*

Replace O-ring.

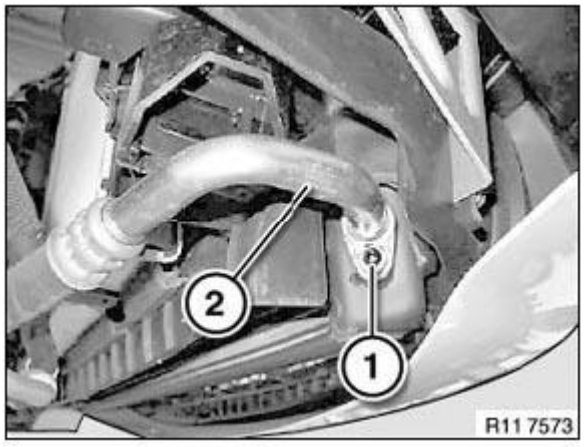


**Fig. 419: Identifying Oil Line And Nut**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

Park vehicle on a horizontal surface.

Allow engine at normal operating temperature to run for 3 minutes with increased revs (min. 1000 / max. 1500 RPM).

Read off engine oil level in instrument cluster or on Control Display.

**11 42 085 REMOVING AND INSTALLING/REPLACING OIL PRESSURE HOSE - RETURN - (S65)**

**IMPORTANT: It is essential to adhere to the exact filling capacities specified. Overfilling the engine with engine oil will result in engine damage.**

*Recycling:*

Catch and dispose of emerging engine oil with suitable equipment.

Note national regulations.

 

*Necessary preliminary tasks:*

- Remove **fan cowl** with electronic fan. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (S65)** .
- Remove front **underbody protection.** See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION** .

Slacken nut (4).

Disconnect oil line (3).

*Installation:*

Replace O-ring.

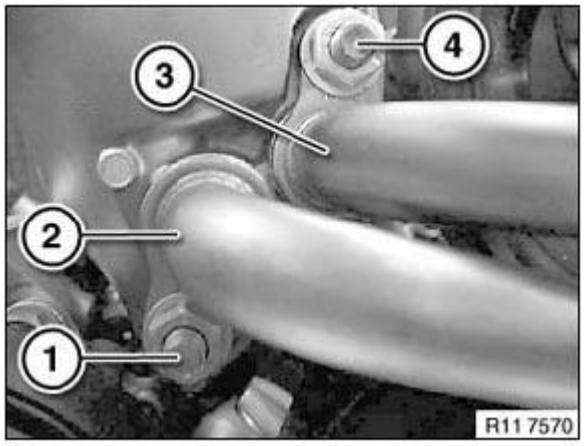


**Fig. 420: Identifying Oil Lines And Nuts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Slacken nut (1).

Unclip retainer (2).

 

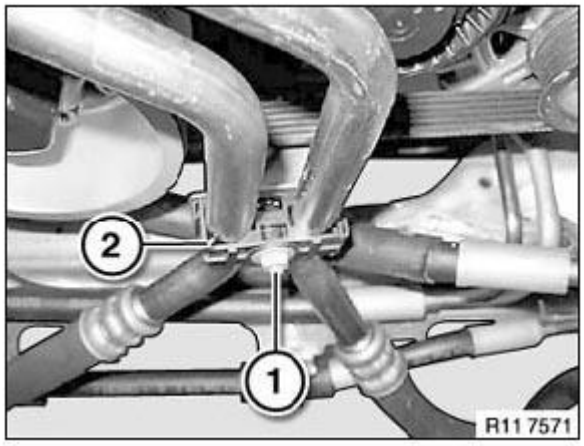


**Fig. 421: Identifying Nut And Retainer**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Slacken nut (1).

Disconnect oil line (2).

*Installation:*

Replace O-ring.

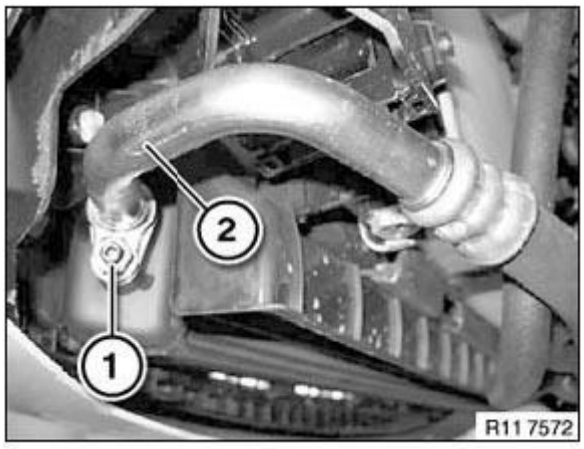


**Fig. 422: Identifying Oil Line And Nut**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

Park vehicle on a horizontal surface.

Allow engine at normal operating temperature to run for 3 minutes with increased revs (min. 1000 / max. 1500 RPM).

 

Read off engine oil level in instrument cluster or on Control Display.

## WATER PUMP WITH DRIVE

### 11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP (S65)

*Necessary preliminary tasks:*

- Remove **fan cowl with electronic fan.** See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (S65)** .
- Remove **radiator.** See **17 11 000 REMOVING AND INSTALLING RADIATOR (N51, S65)** .
- Remove A/C compressor drive belt.
- Remove upper **idler pulley** for A/C compressor.

Release screw (1).

Remove alternator **drive belt.**

Remove belt pulley (2).

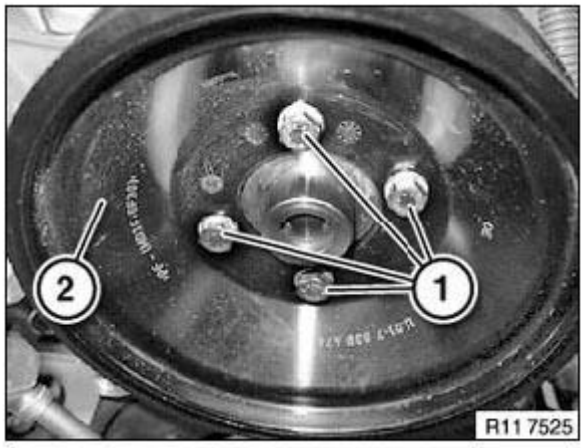


**Fig. 423: Identifying Alternator Drive Belt Screws And Belt Pulley**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release screws (1).

To facilitate removal of the coolant pump, it is possible to insert M6 screws on left and right (see arrows).

*Installation:*

Replace all sealing rings.

 

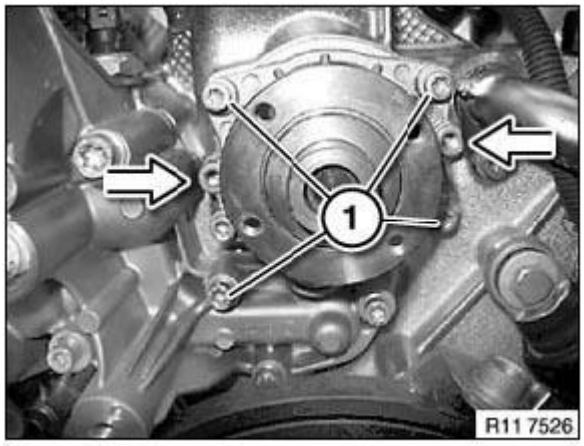


**Fig. 424: Locating M6 Screws On Left And Right**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

Vent **cooling system** and check for leaks.

## THERMOSTAT AND CONNECTOR

### 11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (S65)

*Necessary preliminary tasks:*

- Remove intake air **manifold.**
- Drain **coolant.** See **17 00 005 DRAINING AND ADDING COOLANT (S65)** .

Release unlocking element (1).

Detach vent line (2).

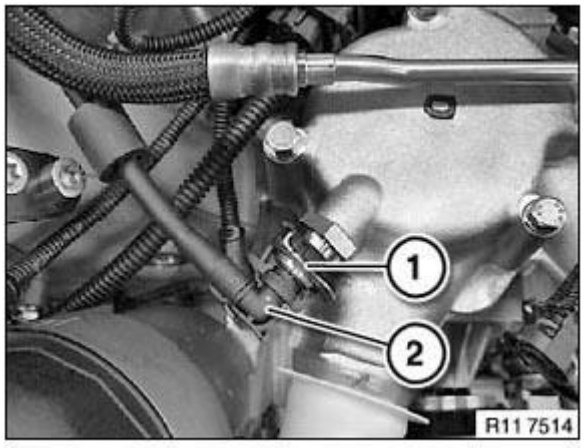


 

**Fig. 425: Identifying Unlocking Element And Vent Line**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Disconnect **fuel line** from fuel rail. See **13 53 240 REPLACING COMPLETE INJECTION PIPE (S65)** .

Release screws (2).

Unlock wiring harness of fuel injectors (1).

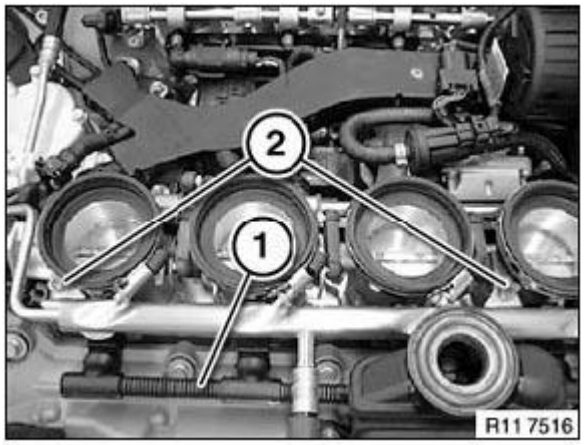


**Fig. 426: Identifying Fuel Injectors And Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Clip injection pipe (1) out of holder (2).

Lay injection pipe, cylinders 5 to 8, to one side.

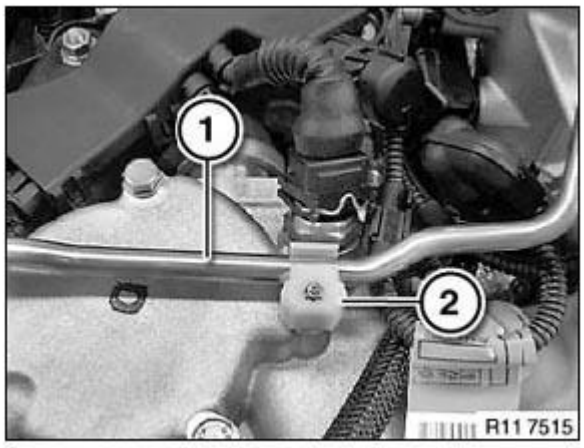


**Fig. 427: Identifying Injection Pipe And Holder**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Disconnect plug connection (1) on coolant temperature sensor.

 

Disconnect plug connection (2) on solenoid valve.

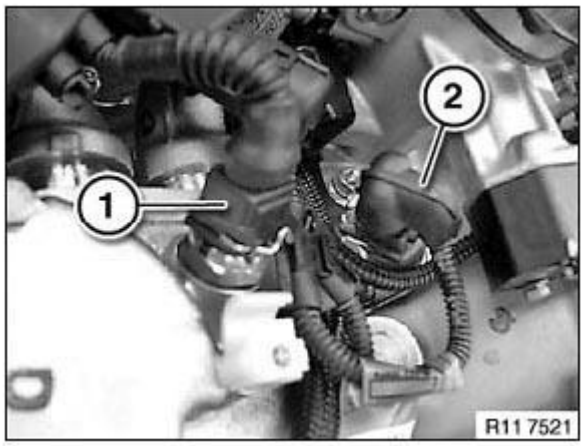


**Fig. 428: Identifying Solenoid Valve Plug Connection And Coolant Temperature Sensor Plug Connection**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Unlock coolant hoses and detach.

Release screws (1).

*Installation:*

Replace sealing rings.

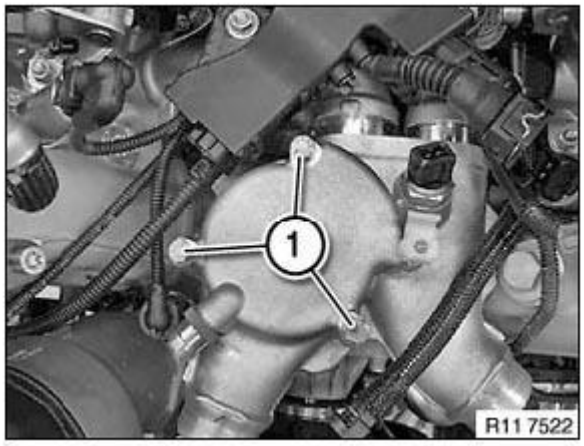


**Fig. 429: Identifying Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove thermostat housing with thermostat forwards in direction of arrow.

Clean sealing surfaces.

 

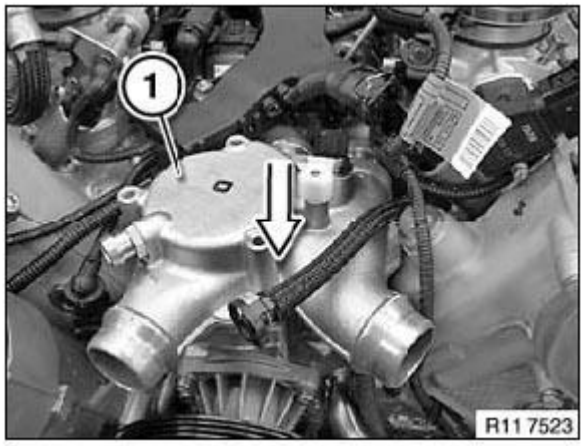


**Fig. 430: Removing Thermostat Housing With Thermostat**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove thermostat (1).

Check rubber section (2) for damage.

Remove connecting pipes (2).

*Installation:*

Replace all O-rings on connecting pipes.

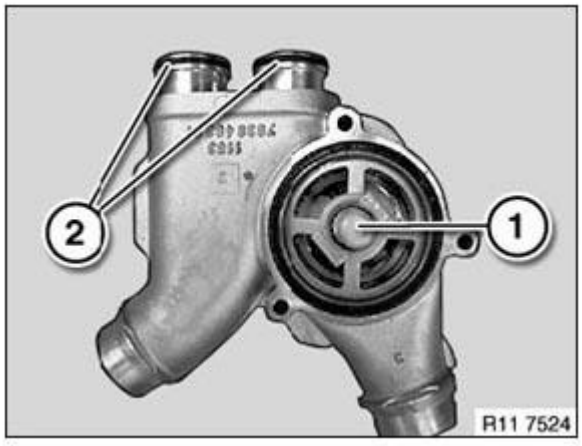


**Fig. 431: Identifying Thermostat And Rubber Section**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

Vent **cooling system** and check for leaks. See **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR WATER LEAKS (S65)** .

 

# INTAKE MANIFOLD

**11 61 050 REMOVING AND INSTALLING AIR INTAKE MANIFOLD (S65)**

**Special tools required:**

- **00 9 250**

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

**IMPORTANT: Do not use antiseize agents to install the air intake manifold.**

*Necessary preliminary tasks:*

- Remove **air cleaner housing.** See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (S65)** .

Disconnect plug connection (1) on intake air temperature sensor.

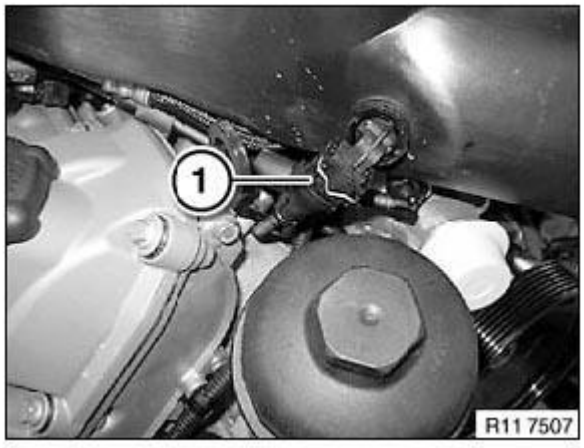


**Fig. 432: Identifying Intake Air Temperature Sensor Plug Connection**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Unlock hose (2) for idle actuator incoming air at fastener (1) and detach in direction of arrow.

 

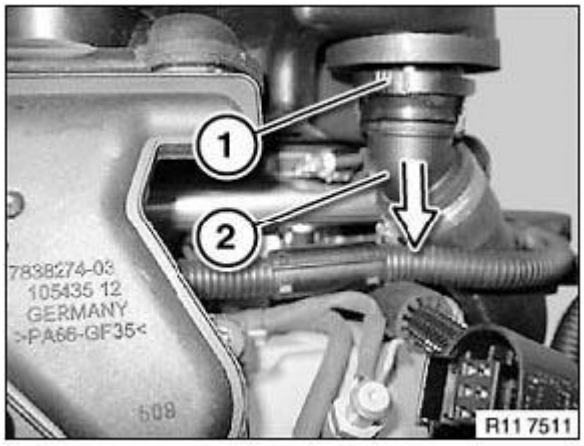


**Fig. 433: Identifying Idle Actuator Incoming Air Fastener And Hose**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Unlock hose (2) for condensate drain line at fastener (1) and detach in direction of arrow.

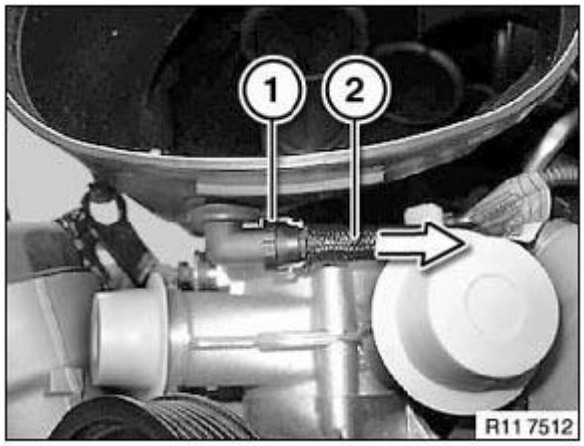


**Fig. 434: Identifying Condensate Drain Line Fastener And Hose**
**Courtesy of BMW OF NORTH AMERICA, INC.**

*Installation:*

Each hose clamp on the decoupling element is exactly positioned.

Loosen hose clamps (1).

Secure hose clamps with special tool **00 9 250** .

Tightening torque: **11 61 1AZ** . See **INTAKE MANIFOLD** .

**NOTE: Picture shows hose clamps (1 to 3).**

 

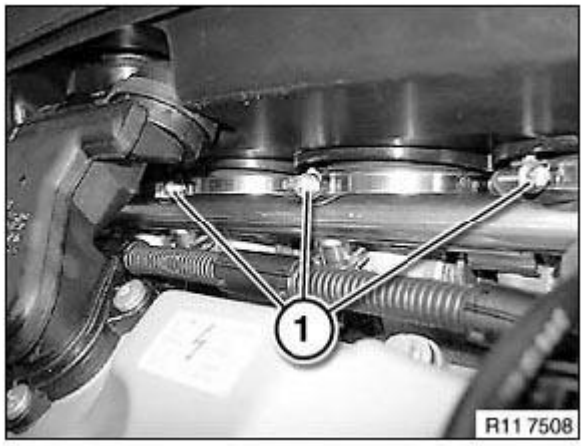


**Fig. 435: Identifying Hose Clamps**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release hose clamp (1) on cylinder 4.

Secure hose clamps with special tool **00 9 250** .

Tightening torque: **11 61 1AZ** . See **INTAKE MANIFOLD** .

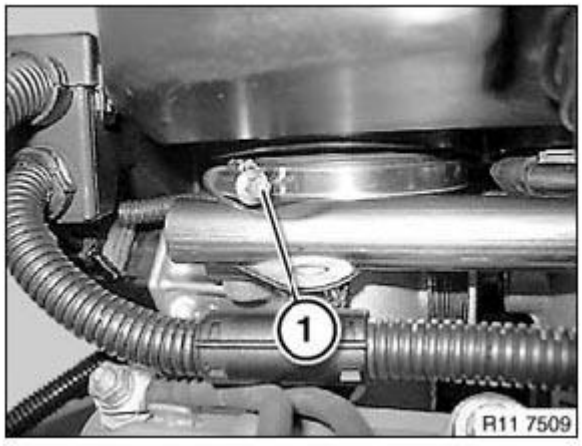


**Fig. 436: Identifying Hose Clamp On Cylinder 4**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Release hose clamp (1) on cylinders 5 to 8.

Secure hose clamps with special tool **00 9 250** .

Tightening torque: **11 61 1AZ** . See **INTAKE MANIFOLD** .

Remove intake air manifold towards top.

 

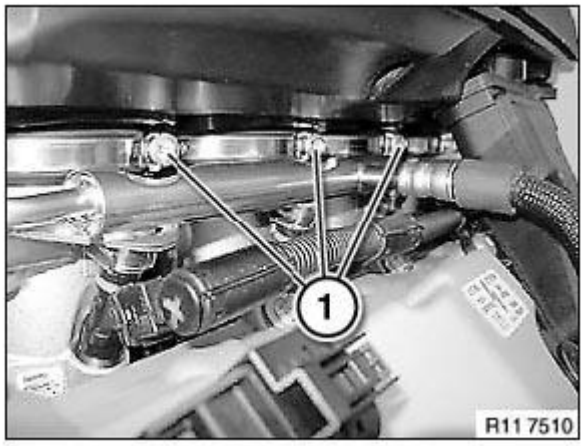


**Fig. 437: Identifying Hose Clamp (1) On Cylinders 5 To 8**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Do not lay any tools or foreign bodies in intake area. Risk of damage to throttle valves / engine.**

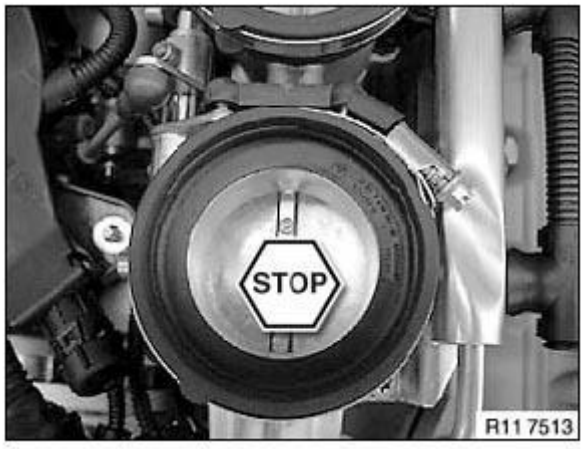


**Fig. 438: Identifying Throttle Valves**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**NOTE: Assemble engine.**

## AIR PUMP LINES

### 11 72 000 REMOVING AND INSTALLING/REPLACING SECONDARY-AIR PUMP (S65)

*Necessary preliminary tasks:*

- Remove **intake air manifold**

Release screws (arrow) on holding frame.

 

Release nuts on secondary-air pump.

Unlock and detach both air hoses.

Unlock connector and remove.

Lift out secondary-air pump.

Remove holding frame from secondary-air pump.

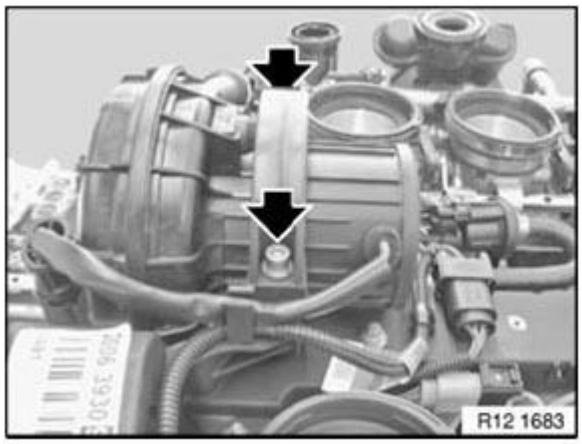


**Fig. 439: Locating Secondary-Air Pump Nuts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

Check function of DME.

**11 72 060 REMOVING AND INSTALLING/REPLACING BOTH SECONDARY-AIR VALVES (S65)**

*Necessary preliminary tasks:*

- Carry out system test: secondary air with BMW diagnosis system.
- Disconnect **battery** at negative lead. See **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD** .
- Remove left **exhaust manifold.** See **18 40 010 REMOVING AND INSTALLING/REPLACING LEFT EXHAUST MANIFOLD (S65)** .
- Remove right **exhaust manifold.** See **18 40 020 REMOVING AND INSTALLING/REPLACING RIGHT EXHAUST MANIFOLD (S65)** .
- Remove **secondary-air pump.**
- Unfasten engine wiring harness partially and lay to one side. See **12 51 001 REPLACING WIRING HARNESS SECTION FOR ENGINE (S65)** .

**Removing secondary-air valve, bank 1:**

 

Unscrew nuts (1).

Remove secondary-air valve (2).

*Installation:*

Clean sealing surfaces.

Replace seal.

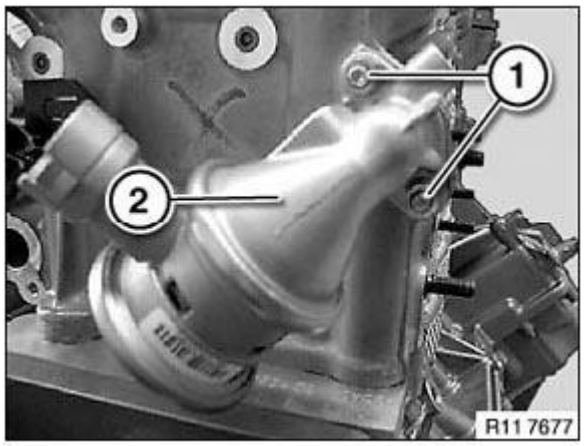


**Fig. 440: Identifying Secondary-Air Valve And Nuts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**Removing secondary-air valve, bank 2:**

Unscrew nuts (1).

Remove secondary-air valve (2).

*Installation:*

Clean sealing surfaces.

Replace seal.

 

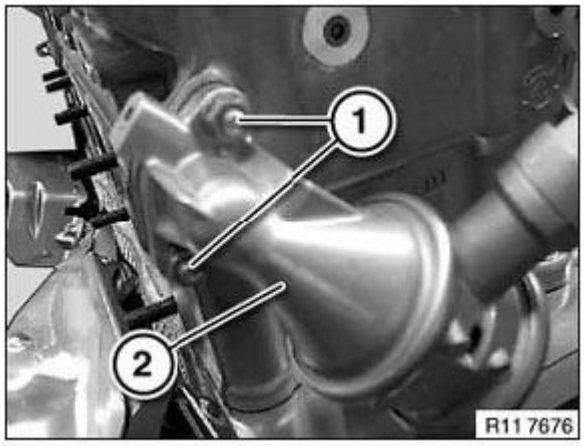


**Fig. 441: Identifying Secondary-Air Valve And Nuts**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Assemble engine.

Carry out system test: secondary air.

## EMISSION CONTROL OXYGEN SENSOR

**11 78 530 REPLACING LEFT LAMBDA OXYGEN CONTROL SENSOR (S65)**

**Special tools required:**

- **11 7 030**

See **ENGINE - SPECIAL TOOLS** .

> **WARNING: Scalding hazard!**
> **Only perform these tasks after exhaust system has cooled down.**

*Necessary preliminary tasks:*

- Read out fault memory in Digital Motor Electronics (DME).
- Remove transmission underbody protection.

Pull plug connection (1) from holder (2).

Disconnect plug connection (1).

 

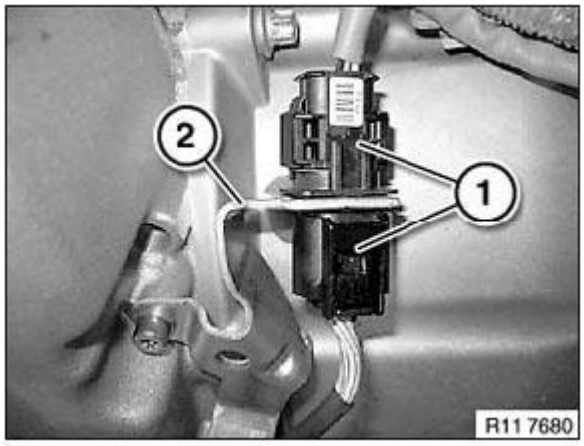


**Fig. 442: Identifying Plug Connection And Holder**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Remove oxygen control sensor with special tool **11 7 030** .

If the oxygen control sensor is reused, apply a thin and even coat of Never Seez Compound to the thread only.

The part of the oxygen control sensor which projects into the exhaust system branch (sensor ceramic) must not be cleaned or come into contact with lubricant.

Secure oxygen control sensor with special tool **11 7 030** and a torque wrench (1).

Tightening torque: **11 78 1AZ** . See **EMISSION CONTROL** .

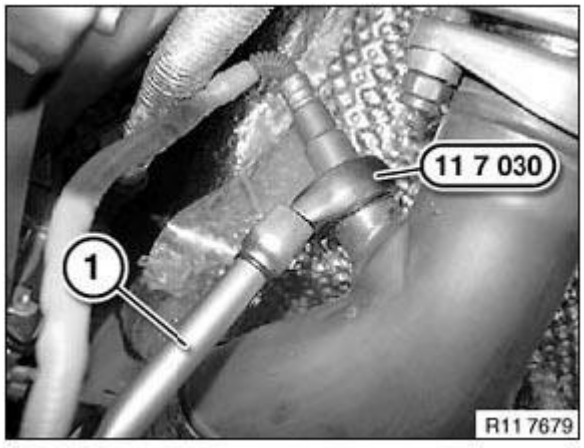


**Fig. 443: Securing Oxygen Control Sensor With Special Tool (11 7 030) And Torque Wrench**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Check function of DME.

**11 78 533 REPLACING RIGHT OXYGEN CONTROL SENSOR (S85)**

 

**Special tools required:**

- **11 7 030**

See **ENGINE - SPECIAL TOOLS** .

> **WARNING:** ***Scalding hazard!***
> **Only perform these tasks after exhaust system has cooled down.**

*Necessary preliminary tasks:*

- Read out fault memory in Digital Motor Electronics (DME).
- Remove transmission underbody protection.

Unclip oxygen sensor cable (1).

Release screws (2).

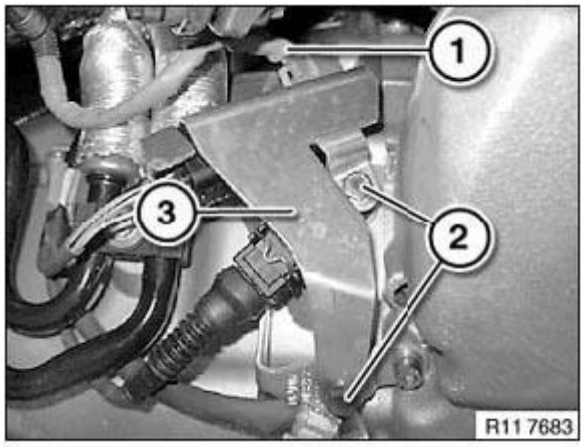


**Fig. 444: Identifying Oxygen Sensor Cable And Screws**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**11 78 540 REPLACING LEFT MONITOR SENSOR (S65)**

**Special tools required:**

- **11 7 030**

See **ENGINE - SPECIAL TOOLS** .

> **WARNING:** **Scalding hazard!**
> **Only perform these tasks after exhaust system has cooled down.**

 

*Necessary preliminary tasks:*

- Read out fault memory in Digital Motor Electronics (DME)
- Remove transmission underbody protection

Disconnect plug connection (1).

Remove monitor sensor with special tool **11 7 030** .

*Installation:*

If the monitor sensor is reused, only apply a thin and uniform coat of Never Seez Compound to thread.

The part of the oxygen monitor sensor which projects into the exhaust system branch (sensor ceramic) must not be cleaned or come into contact with lubricant.

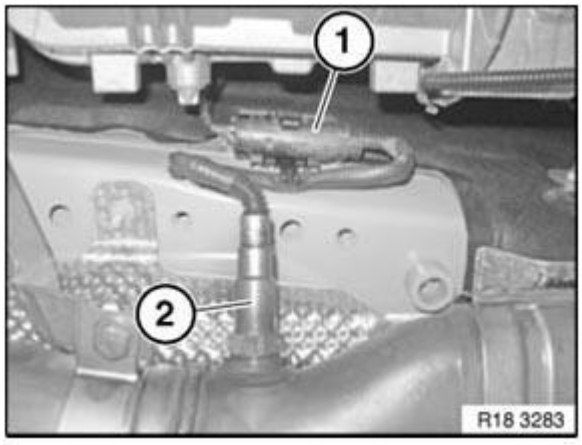


**Fig. 445: Identifying Plug Connection And Monitor Sensor**
**Courtesy of BMW OF NORTH AMERICA, INC.**

**IMPORTANT: Reinstall plug connection (1) and cable routing without fail in condition on delivery (see illustration).**
**Risk of damage if this instruction is not observed!**

Secure monitor sensor (2) with special tool **11 7 030** and a torque wrench.

Tightening torque: **11 78 1AZ** . See **EMISSION CONTROL** .

Add final details to vehicle.

Check function of DME.

**11 78 543 REPLACING RIGHT LAMBDA OXYGEN MONITOR SENSOR (S65)**

 

**Special tools required:**

- **11 7 030**

See **ENGINE - SPECIAL TOOLS** .

**WARNING: Scalding hazard!**
**Only perform these tasks after exhaust system has cooled down.**

*Necessary preliminary tasks:*

- Read out fault memory in Digital Motor Electronics (DME).
- Remove transmission underbody protection.

Disconnect plug connection (1).

Remove oxygen monitor sensor with special tool **11 7 030** .

*Installation:*

If the oxygen monitor sensor is reused, apply a thin and even coat of Never Seez Compound to the thread only.

The part of the oxygen monitor sensor which projects into the exhaust system branch (sensor ceramic) must **not** be cleaned or come into contact with lubricant.

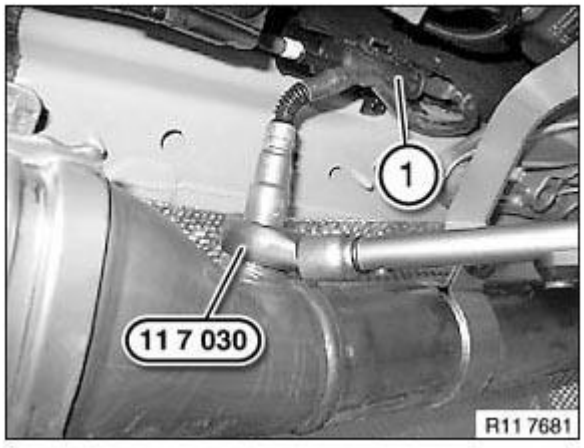


**Fig. 446: Removing Oxygen Monitor Sensor With Special Tool (11 7 030)**
**Courtesy of BMW OF NORTH AMERICA, INC.**

Secure oxygen monitor sensor with special tool **11 7 030** and a torque wrench.

Tightening torque: **11 78 1AZ** . See **EMISSION CONTROL** .

Check function of DME.

 