2007-08 ENGINE

Engine - Repair - 335i, 335xi

00 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:

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- 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! (See 00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN)

Risk of injury if oil comes into contact with eyes and skin! (See 00 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 REMOVING AND INSTALLING/REPLACING ACOUSTIC COVER (N54)

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Necessary preliminary tasks:

- Remove microfilter housing (See **64 31 092 REMOVING AND INSTALLING/REPLACING MICROFILTER HOUSING (LOWER SECTION)** and/or **64 31 092 REMOVING AND INSTALLING/REPLACING MICROFILTER HOUSING (LOWER SECTION)**)
- E60/E61 only: Remove tension strut

Release screws.

Tightening torque, see 11 12 7AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO** .

Lift off acoustic cover (1)

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

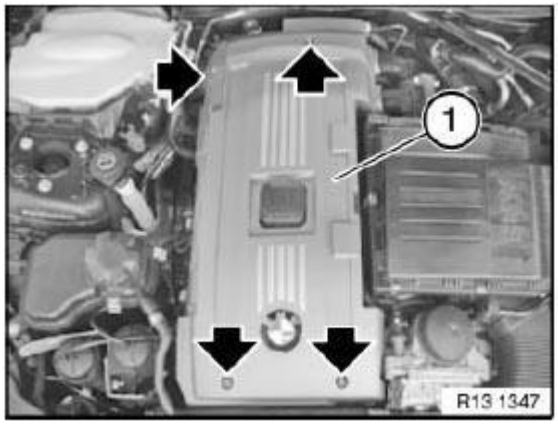


Fig. 1: Lifting Off Acoustic Cover
Courtesy of BMW OF NORTH AMERICA, INC.

11 00 050 REMOVING AND INSTALLING ENGINE (N54)

Special tools required:

- 11 0 000
- 11 5 281
- 11 5 282
- 11 7 310
- 11 8 680

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

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

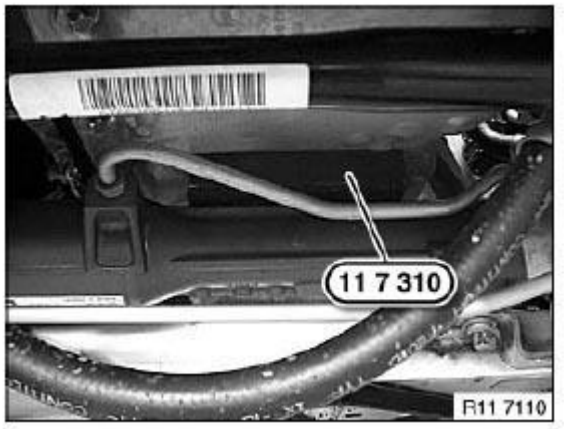
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Jointing torque and angle of rotation must be observed without fail (risk of damage) .

Necessary preliminary tasks:

- Disconnect negative battery lead.
- Lift engine hood into assembly position. (See **51 00 ... SERVICE POSITION OF ENGINE HOOD/BONNET** and/or **51 00 ... SERVICE POSITION OF ENGINE HOOD/BONNET**)
- Drain engine oil.
- Remove air cleaner housing. (See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N54)**)
- Remove fan cowl with electric fan.
- Remove radiator.
- Detach all coolant hoses from engine.
- Remove left and right fresh air duct. (See **51 71 371 REMOVING AND INSTALLING/REPLACING TENSION STRUT ON LEFT OR RIGHT SPRING STRUT DOME** and/or **51 71 371 REMOVING AND INSTALLING/REPLACING TENSION STRUT ON LEFT OR RIGHT SPRING STRUT DOME**)
- Remove intake air manifold. (See **11 61 050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (N54)**)
- Detach vacuum line from brake booster.
- Unfasten ignition wiring harness and lay to one side. (See **12 51 100 REPLACING WIRING HARNESS SECTION FOR IGNITION COIL (N54)**)
- Unfasten engine wiring harness and lay to one side. (See **12 51 100 REPLACING WIRING HARNESS SECTION FOR IGNITION COIL (N54)**)
- Remove exhaust system.
- Remove transmission.

Support engine with special tool 11 7 310 on steering gear. (See **11 7 310 SPACER**)



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Fig. 2: Identifying Special Tool (11 7 310)
Courtesy of BMW OF NORTH AMERICA, INC.

Evacuate A/C system.

Release screws (1) for A/C lines.

Disconnect plug connection (2) on A/C compressor.

Do not remove A/C compressor.

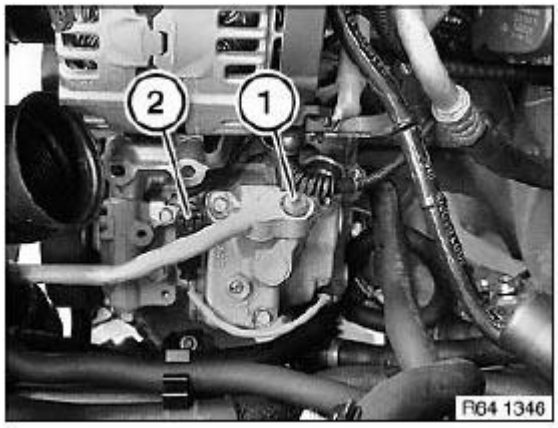


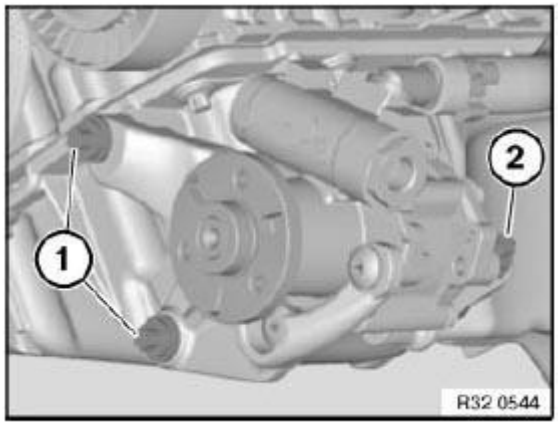
Fig. 3: Identifying Plug Connection On A/C Compressor & Screw
Courtesy of BMW OF NORTH AMERICA, INC.

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

Set power steering pump down on front axle carrier.

NOTE: Do not disconnect hydraulic lines.

If Dynamic Drive optional extra is fitted, release bracket.



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Fig. 4: Identifying Bolts From Power Steering Pump Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect fuel lines (1 and 2).

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

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

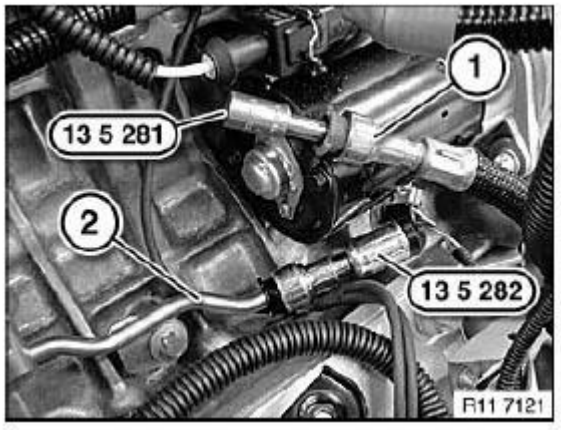


Fig. 5: Identifying Special Tool (13 5 281) & (13 5 282)
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 8 680 to lifting eye on transmission side. (See **11 8 680 ADAPTER**)

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

Secure special tool 11 8 680 to lifting eye, release locking pin (1). (See **11 8 680 ADAPTER**)

Installation:

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

Special tool 11 8 680 is firmly secured to lifting eye. (See **11 8 680 ADAPTER**)

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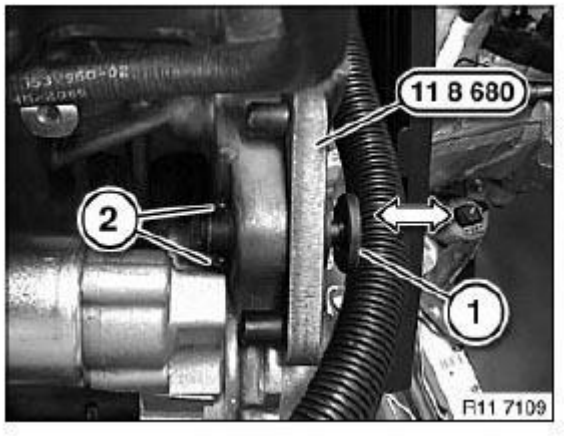


Fig. 6: Identifying Locking Pin & Locking Balls
Courtesy of BMW OF NORTH AMERICA, INC.

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

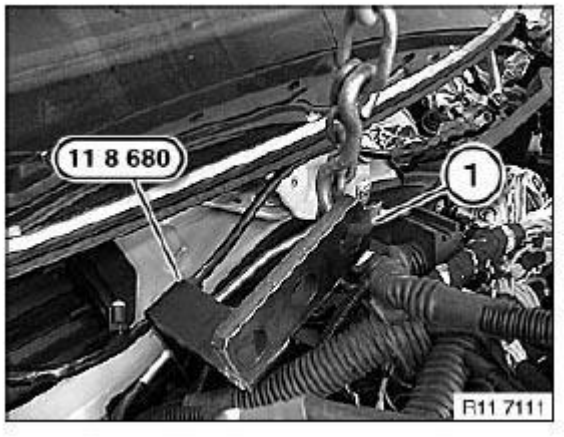


Fig. 7: Identifying Special Tool (11 8 680)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in towing hook (1).

Suspend special tool 11 0 000 from engine crane.

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

Unscrew left and right engine mounts.

Lift engine out with crane.

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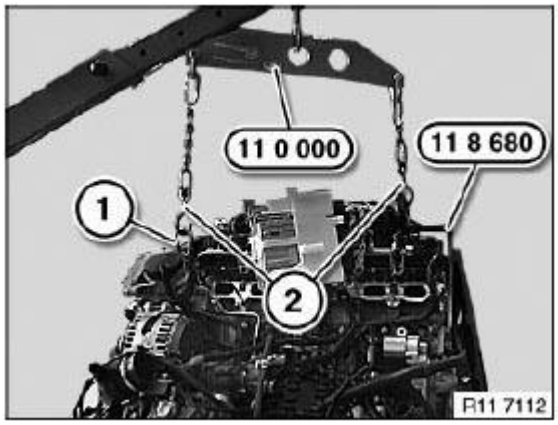


Fig. 8: Identifying Special Tool (11 0 000) & (11 8 680)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Secure special tool 11 7 310 to steering gear. (See **11 7 310 SPACER**)

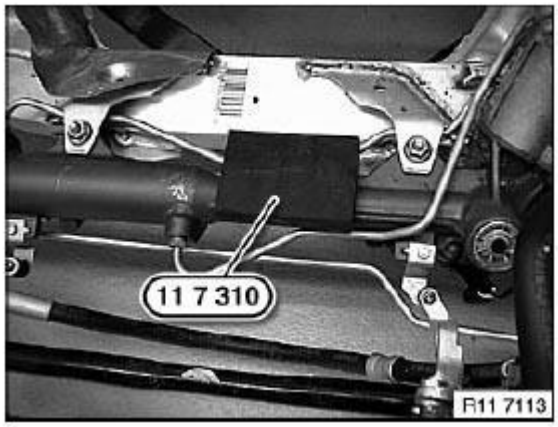


Fig. 9: Identifying Special Tool (11 7 310)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N54)

Special tools required:

- 00 0 200
- 00 0 202
- 00 0 204

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- 00 0 208
- 11 0 020
- 64 1 020

WARNING: Danger of injury!

Observe following instructions relating to special tool:

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

Necessary preliminary tasks:

- Secure engine bonnet/hood in service position (See **51 00 ... SERVICE POSITION OF ENGINE HOOD/BONNET** and/or **51 00 ... SERVICE POSITION OF ENGINE HOOD/BONNET**)
- Remove cowl panel cover (See **51 13 116 REMOVING AND INSTALLING COWL PANEL COVER**)
- Remove acoustic cover (See **51 13 116 REMOVING AND INSTALLING COWL PANEL COVER**)

Only on E92, E93:

Unclip two cover caps (1) on left and right of side panel screw connection with special tool 64 1 020. (See **64 1 020 RELEASE HOOK**)

Installation:

Replace damaged cover caps.

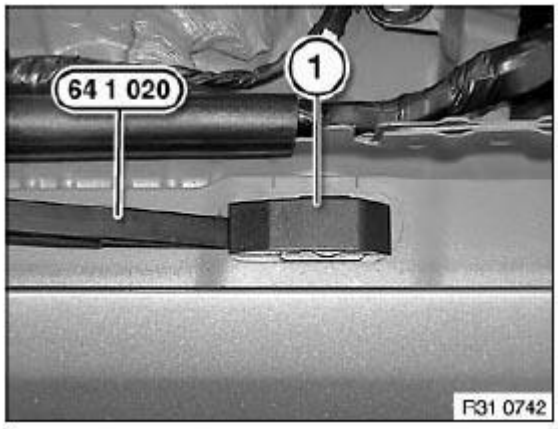


Fig. 10: Identifying Special Tool (64 1 020)

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Courtesy of BMW OF NORTH AMERICA, INC.

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

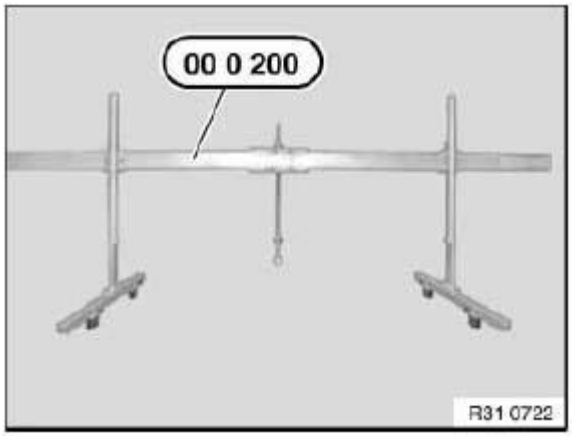


Fig. 11: Identifying Special Tool (00 0 200)
Courtesy of BMW OF NORTH AMERICA, INC.

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

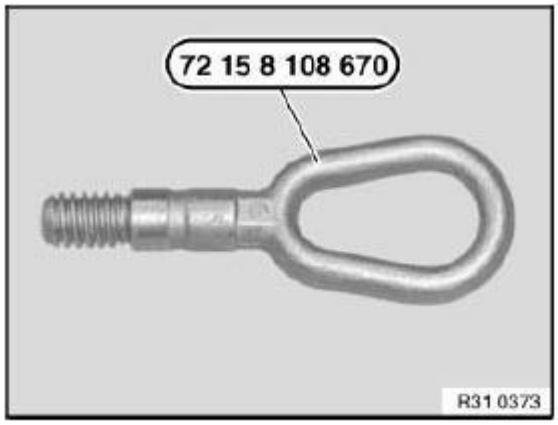


Fig. 12: Identifying Special Tool (75 15 8 108 670)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Avoid a change of engine position in the transverse or longitudinal direction.

Always make sure there is sufficient clearance between the engine (or its attachment parts) and the body.

IMPORTANT: Risk of damage!

With the aid of an assistant and the supports (2), place cross member 00 0 200 on the screw connections of the side panels.

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Screw in towing hook (1) and tighten down to approx. 30 Nm.

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

Fit suitable chains to special tool 11 0 020 and attach to towing hook (1) or engine lifting eye.

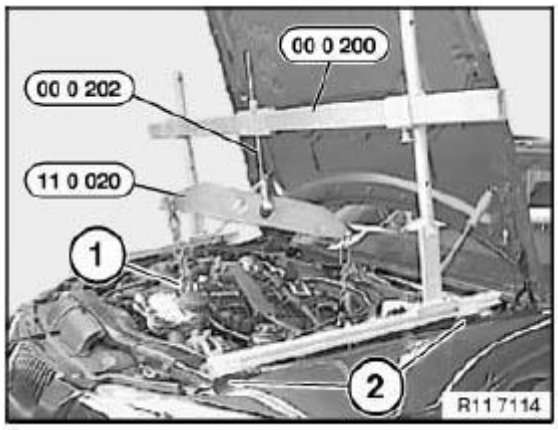


Fig. 13: Identifying Special Tool (00 0 202), (00 0 200) & (11 0 020)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

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

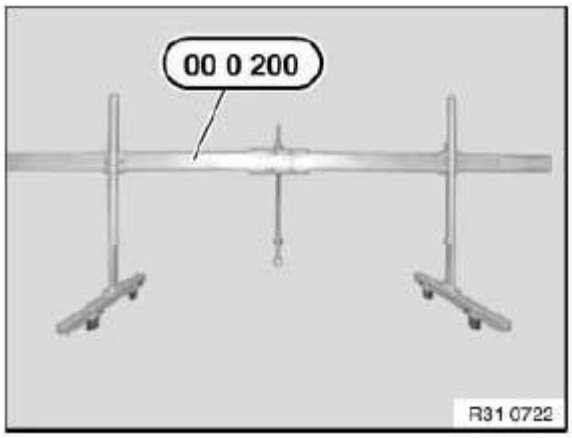


Fig. 14: Identifying Special Tool (00 0 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Raise engine approx. 10 mm with cross member.

Installation:

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Replace self-locking nuts.

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

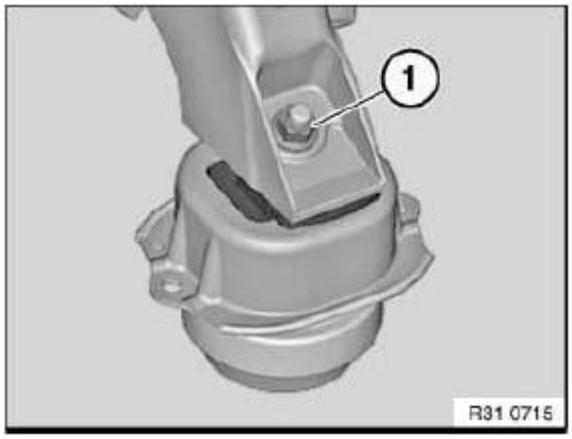


Fig. 15: Identifying Self-Locking Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

ENGINE IDENTIFICATION

Drive in engine numbers at marked surface with impact tool.

M47/M47TU/M47T2

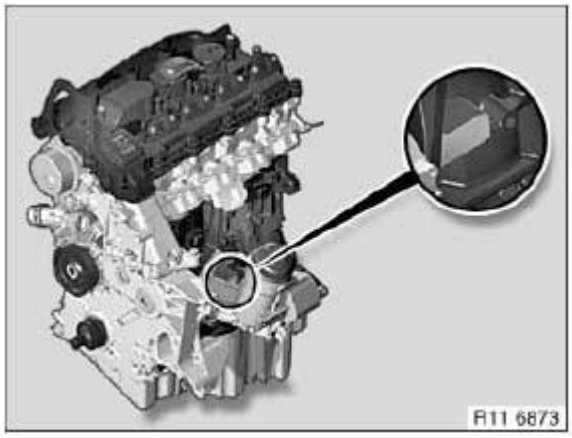


Fig. 16: Locating Engine Identification - (M47/M47TU/M47T2)
Courtesy of BMW OF NORTH AMERICA, INC.

M57/M57TU/M57T2

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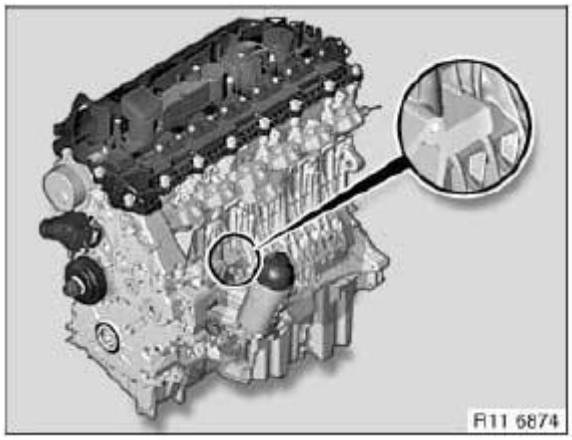


Fig. 17: Locating Engine Identification - (M57/M57TU/M57T2)
Courtesy of BMW OF NORTH AMERICA, INC.

M67/M67TU

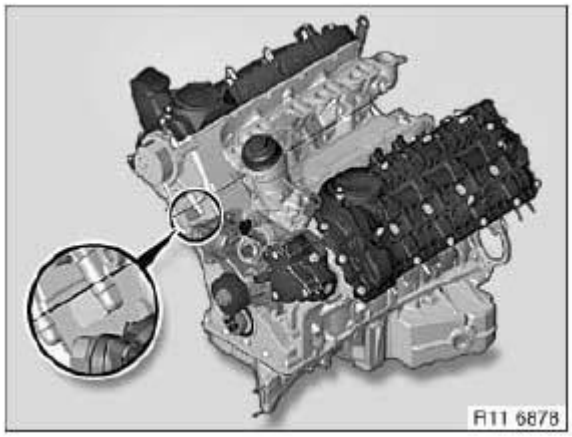


Fig. 18: Locating Engine Identification - (M67/M67TU)
Courtesy of BMW OF NORTH AMERICA, INC.

N47

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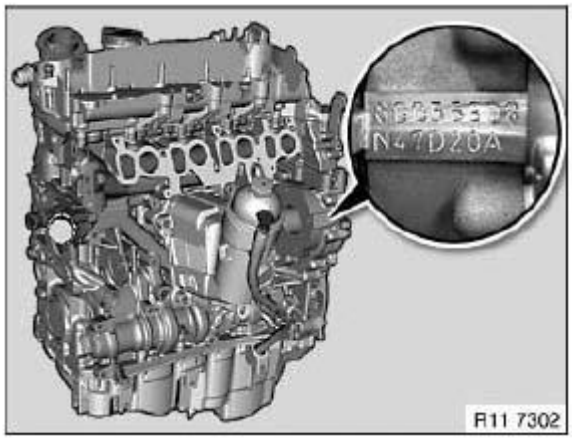


Fig. 19: Locating Engine Identification - (N47)
Courtesy of BMW OF NORTH AMERICA, INC.

M52/M52TU

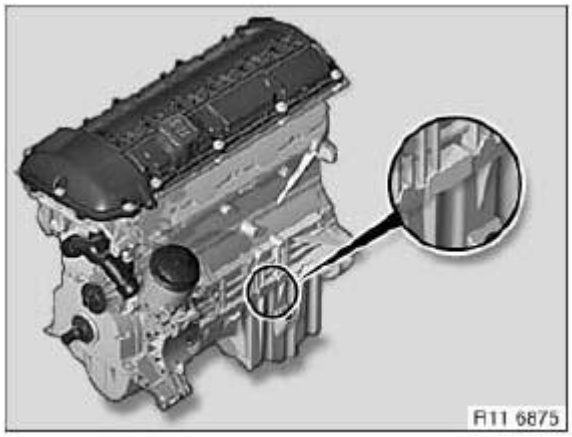


Fig. 20: Locating Engine Identification - (M52/M52TU)
Courtesy of BMW OF NORTH AMERICA, INC.

M54

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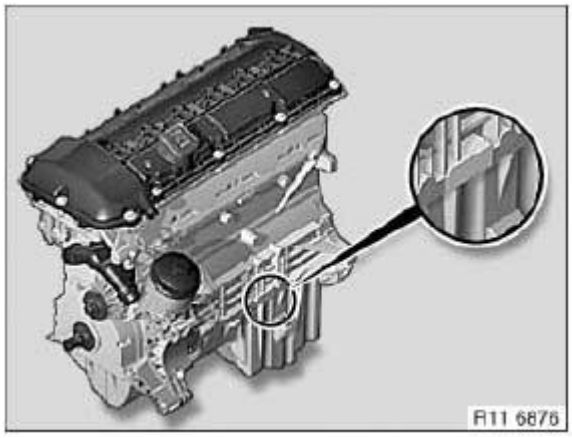


Fig. 21: Locating Engine Identification - (M54)
Courtesy of BMW OF NORTH AMERICA, INC.

M56

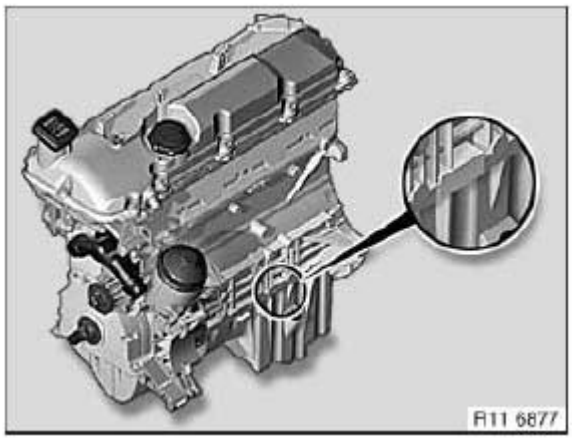


Fig. 22: Locating Engine Identification - (M56)
Courtesy of BMW OF NORTH AMERICA, INC.

N40/N45

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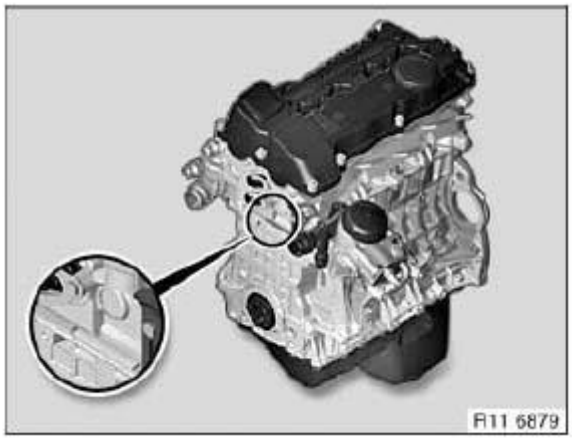


Fig. 23: Locating Engine Identification - (N40/N45)
Courtesy of BMW OF NORTH AMERICA, INC.

N42/N46/N46T

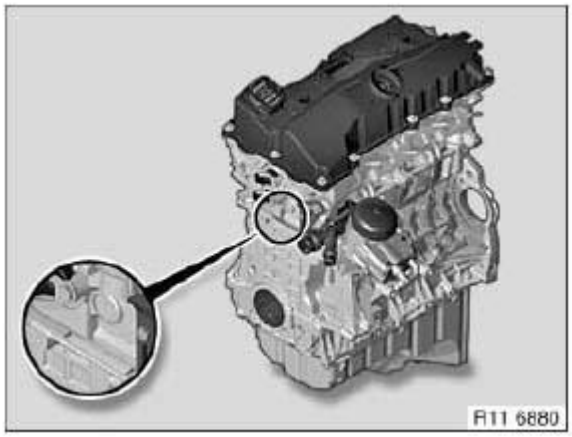


Fig. 24: Locating Engine Identification - (N42/N46/N46T)
Courtesy of BMW OF NORTH AMERICA, INC.

N51/N52/N52K/N53/N54

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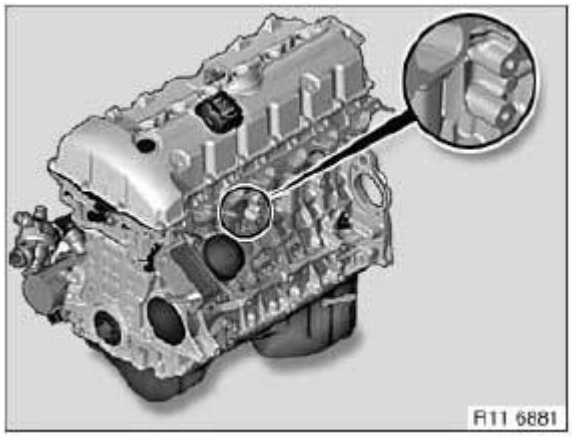


Fig. 25: Locating Engine Identification - (N51/N52/N52K/N53/N54)
Courtesy of BMW OF NORTH AMERICA, INC.

N62

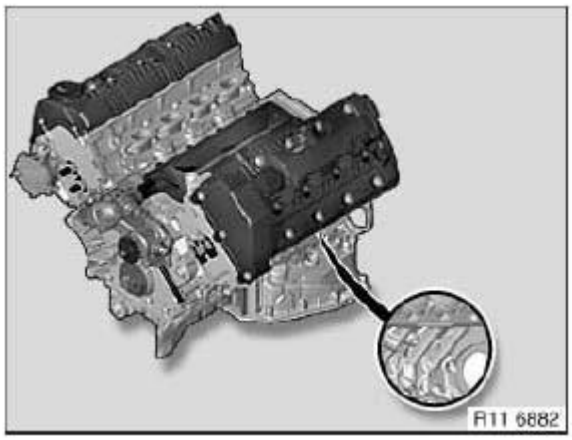


Fig. 26: Locating Engine Identification - (N62)
Courtesy of BMW OF NORTH AMERICA, INC.

N73

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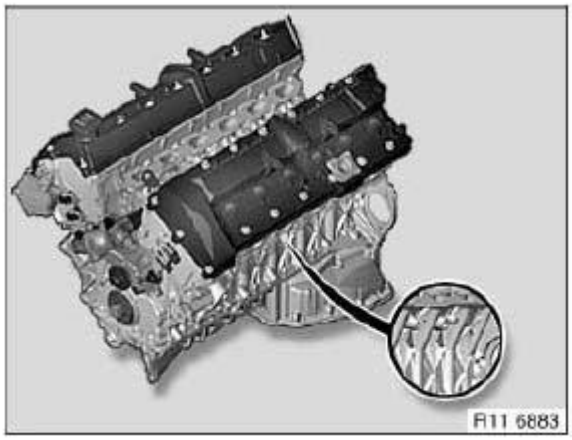


Fig. 27: Locating Engine Identification - (N73)
Courtesy of BMW OF NORTH AMERICA, INC.

S54

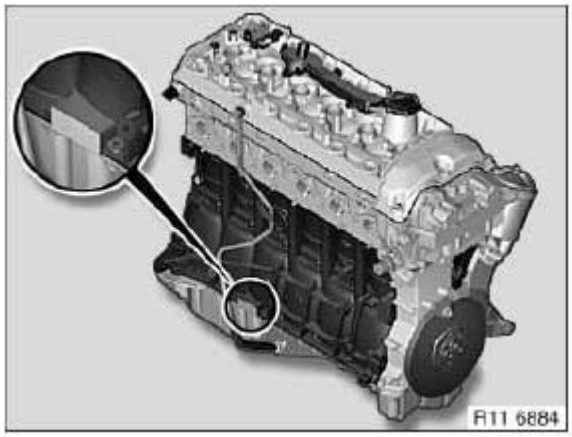


Fig. 28: Locating Engine Identification - (S54)
Courtesy of BMW OF NORTH AMERICA, INC.

S85

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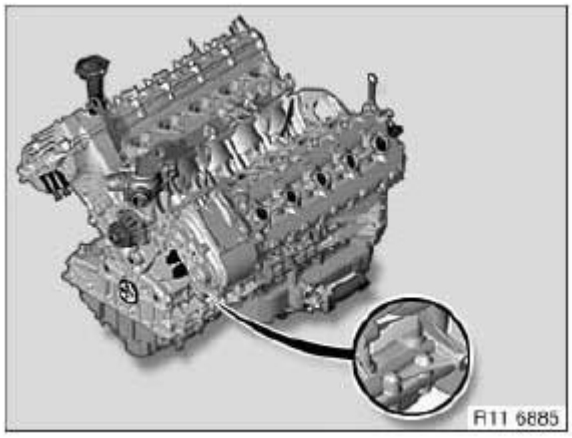


Fig. 29: Locating Engine Identification - (S85)
Courtesy of BMW OF NORTH AMERICA, INC.

W10/W11

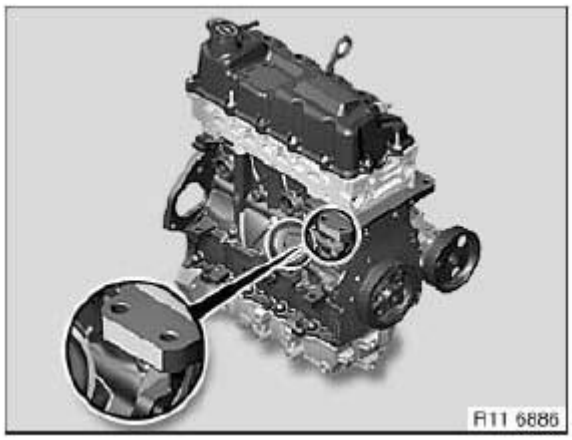


Fig. 30: Locating Engine Identification - (W10/W11)
Courtesy of BMW OF NORTH AMERICA, INC.

W17

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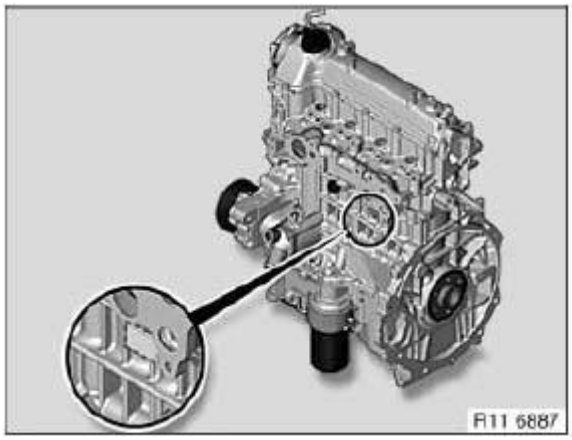


Fig. 31: Locating Engine Identification - (W17)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

MOUNTING ENGINE ON ASSEMBLY STAND (N54)

Special tools required:

- 00 1 450
- 11 8 541
- 11 8 542

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

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

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

Necessary preliminary tasks:

- Remove engine. (See **11 00 050 REMOVING AND INSTALLING ENGINE (N54)**)

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

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

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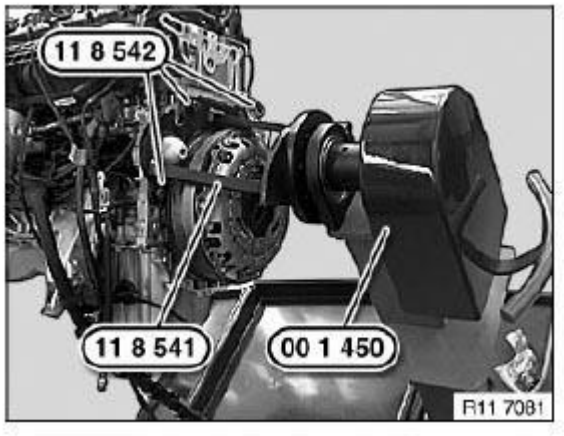


Fig. 32: Identifying Special Tool (11 8 542), (11 8 541) & (00 1 450)
Courtesy of BMW OF NORTH AMERICA, INC.

12 CYLINDER HEAD WITH COVER

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

Special tools required:

- 11 8 620

Necessary preliminary tasks:

- Disconnect negative battery lead.
- Remove acoustic cover.
- Remove rod-type ignition coils. (See **12 13 511 REPLACING SPARK PLUGS (N54, N53)**)
- Unclip wiring harness for injectors. (See **12 51 100 REPLACING WIRING HARNESS SECTION FOR IGNITION COIL (N54)**)
- Remove injectors.
- Remove tension strut. (See **51 71 371 REMOVING AND INSTALLING/REPLACING TENSION STRUT ON LEFT OR RIGHT SPRING STRUT DOME** and/or **51 71 371 REMOVING AND INSTALLING/REPLACING TENSION STRUT ON LEFT OR RIGHT SPRING STRUT DOME**)
- Remove fresh air duct. (See **51 13 116 REMOVING AND INSTALLING COWL PANEL COVER** and/or **51 13 116 REMOVING AND INSTALLING COWL PANEL COVER**)

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

Unclip vacuum lines (1).

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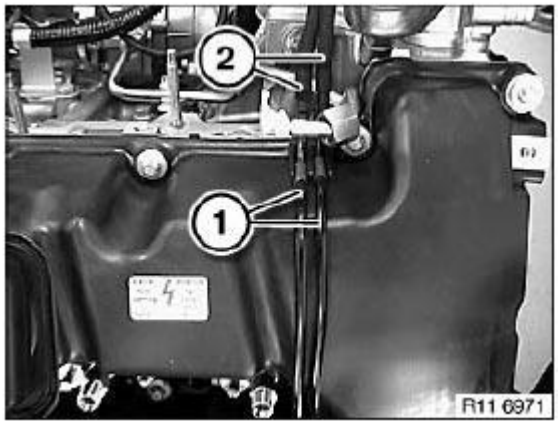


Fig. 33: Identifying Vacuum Lines
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

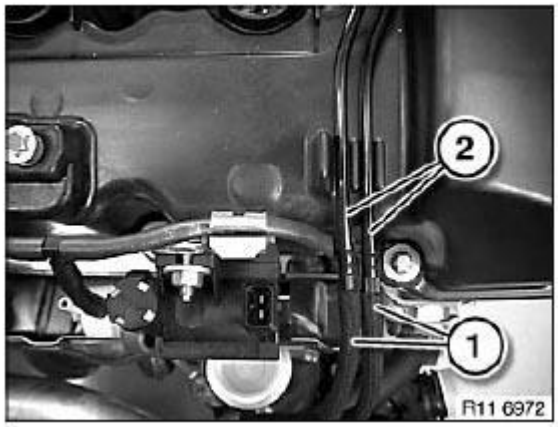


Fig. 34: Identifying Vacuum Line & Lay To Side
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) with special tool 11 8 620. (See **11 8 620 WRENCH SOCKET WAF 10**)

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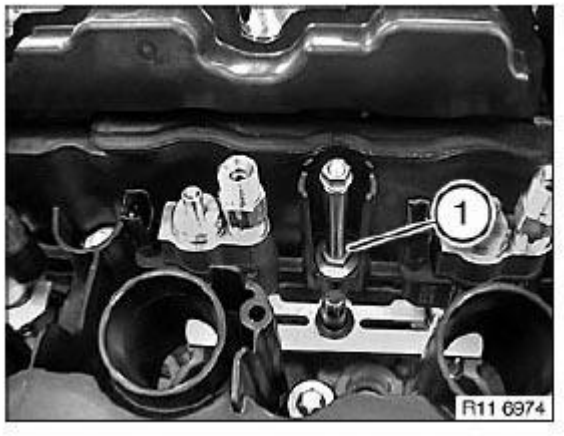


Fig. 35: Identifying Special Tool & Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on valve cover.



Fig. 36: Identifying Screws On Valve Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 and 2).

Tightening torque, see 11 12 4AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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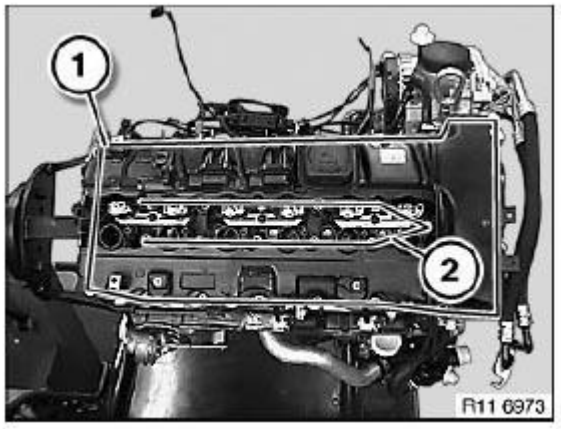


Fig. 37: Identifying Valve Cover & Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace seal (1).

Press gasket (1) into valve cover.

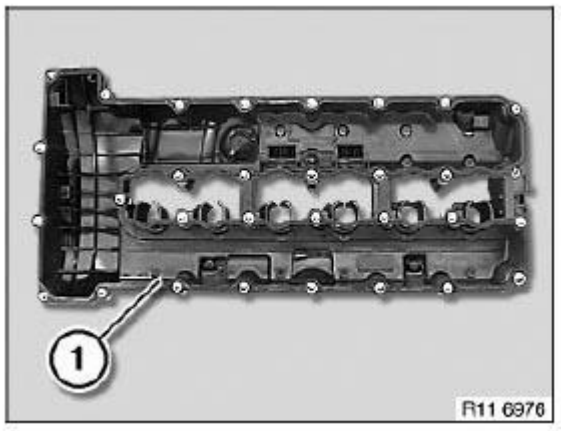


Fig. 38: Identifying Valve Cover & Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 12 100 REMOVING AND INSTALLING CYLINDER HEAD (N54)

Special tools required:

- 11 0 320
- 11 4 420
- 11 4 430

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- 11 4 471
- 11 4 472
- 11 8 580

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

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

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

Fit new cylinder head screws.

Do not wash off bolt coating.

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

Risk of corrosion and cracking!

Necessary preliminary tasks:

- Remove engine. (See **11 00 050 REMOVING AND INSTALLING ENGINE (N54)**)
- Remove inlet and exhaust adjustment unit (See **11 36 046 REMOVING AND INSTALLING/REPLACING INLET AND EXHAUST ADJUSTMENT UNITS (N54)**)

Release screws (1).

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

Set down timing chain.

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

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

Installation:

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

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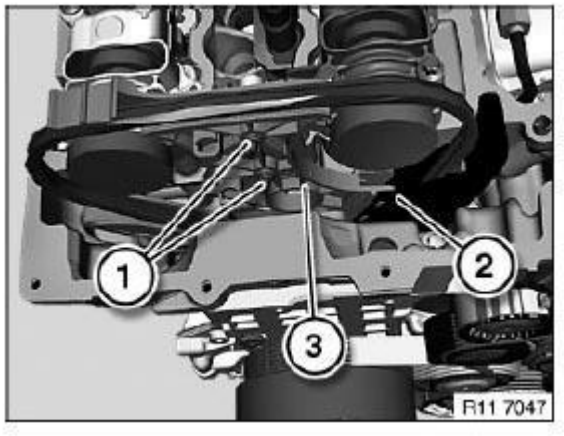


Fig. 39: Identifying Timing Chain, Junction & Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque, see 11 12 3AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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

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

Release bolt (2).

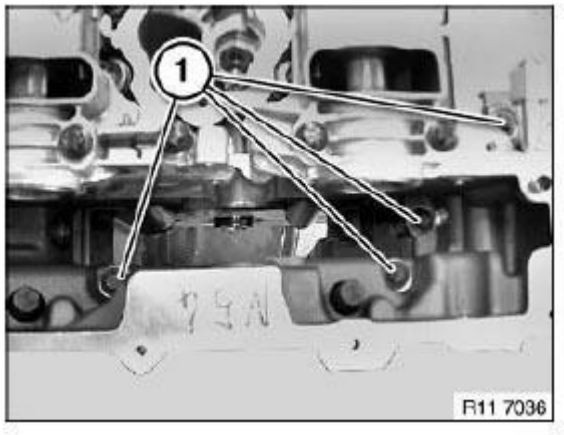


Fig. 40: Identifying Timing Chain Module Screw
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe different bolt heads.

Release M9 cylinder head bolts (1) with special tool 11 4 420. (See **11 4 420 TORX SOCKET T50**)

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Tightening torque, see 11 12 2AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

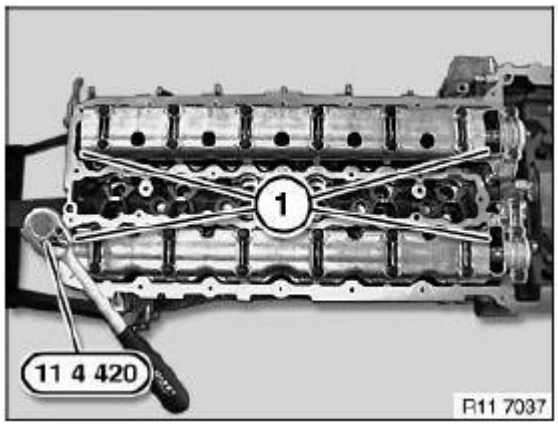


Fig. 41: Identifying Special Tool (11 4 420)
Courtesy of BMW OF NORTH AMERICA, INC.

Release M10 cylinder head bolts (1) with special tool 11 8 580 from outside inwards. (See **11 8 580 WRENCH SOCKET TORX T60**)

Tightening torque, see 11 12 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

IMPORTANT: All cylinder head bolts must be replaced.

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

Risk of damage!

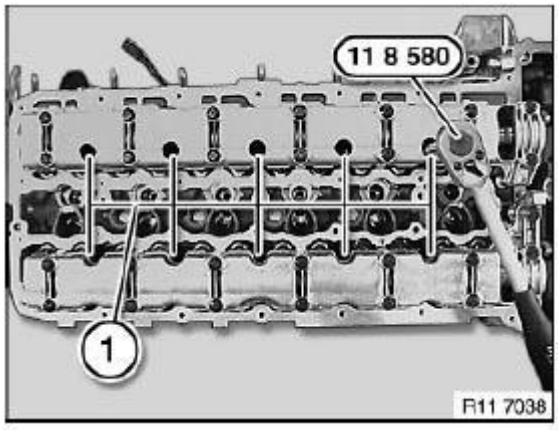


Fig. 42: Identifying Special Tool (11 8 580)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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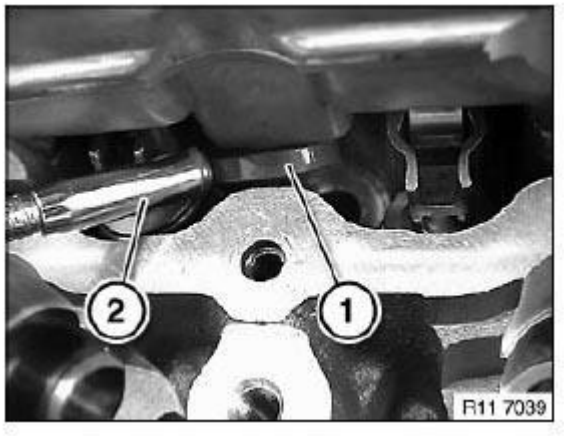


Fig. 43: Identifying Shim & Magnet
Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 11 0 320 with existing cylinder head cover bolts (1). (See **11 0 320 REMOVAL AND INSTALLATION BRACKET**)

Tightening torque, see 11 12 4AZ in **TORQUE SPECIFICATIONS -- TWIN TURBO**

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

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

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

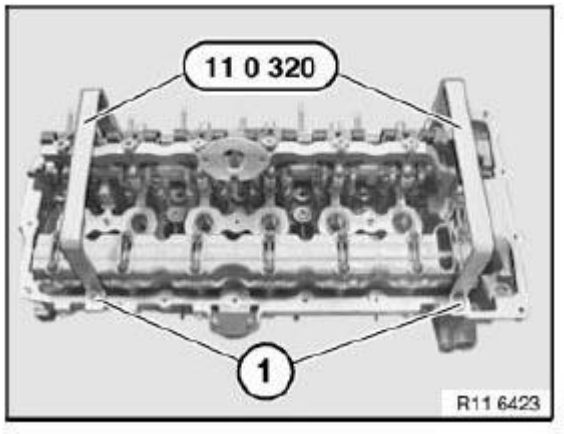


Fig. 44: Identifying Special Tool (11 0 320)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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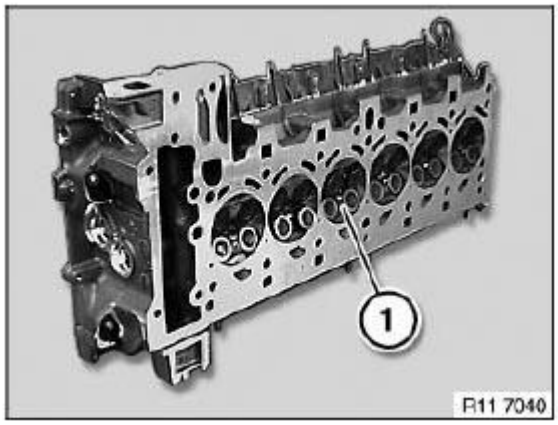


Fig. 45: Identifying Cylinder Head With Inlet & Exhaust Camshafts Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 4 430 into bores. (See **11 4 430 SEAL PLUGS (2 X)**)

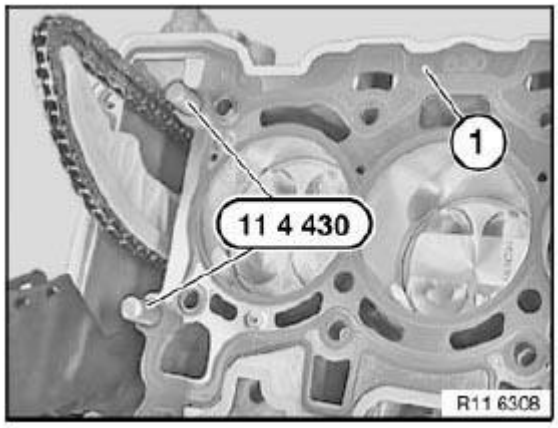


Fig. 46: Identifying Special Tool (11 4 430)
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Do not use any metal-cutting tools.

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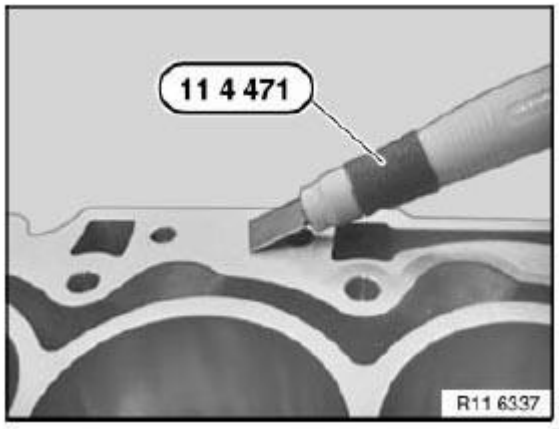


Fig. 47: Identifying Special Tool (11 4 471)
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Do not use any metal-cutting tools.

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

Risk of corrosion and cracking!

Clean all pocket holes.

Replace cylinder head gasket.

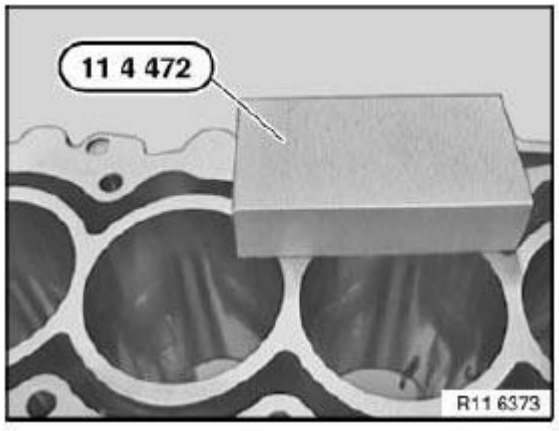


Fig. 48: Identifying Special Tool (11 4 472)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Fit new cylinder head screws.

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Insert cylinder head bolts (1 to 10) with special tool 11 8 580. (See **11 8 580 WRENCH SOCKET TORX T60**)

Tightening torque, see 11 12 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Insert cylinder head bolts (11 to 14) with special tool 11 4 420. (See **11 4 420 TORX SOCKET T50**)

Tightening torque, see 11 12 2AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

NOTE: Picture shows inlet and exhaust camshafts removed.

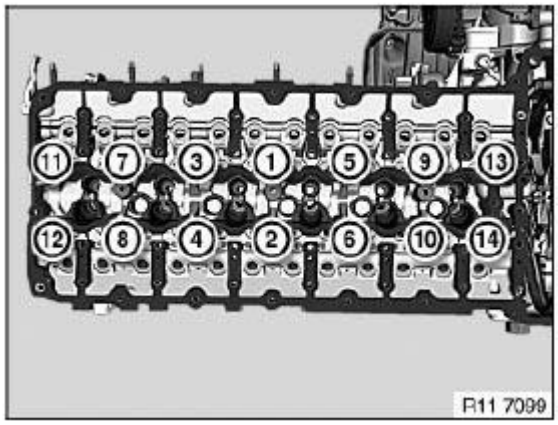


Fig. 49: Identifying Cylinder Head Bolts Tighten Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Observe sequence for tightening cylinder head bolts without fail.

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

Installation:

- Jointing torque:

  All cylinder head bolts 1 to 14 to 30 Nm

- 1st angle of rotation:

  All cylinder head bolts 1 to 14 to 90°

- 2nd angle of rotation:

  Only cylinder head bolts 1 to 10 to 90°

- 3rd angle of rotation:

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All cylinder head bolts 1 to 14 to 45°

Replace screws (1).

Tightening torque, see 11 12 3AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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

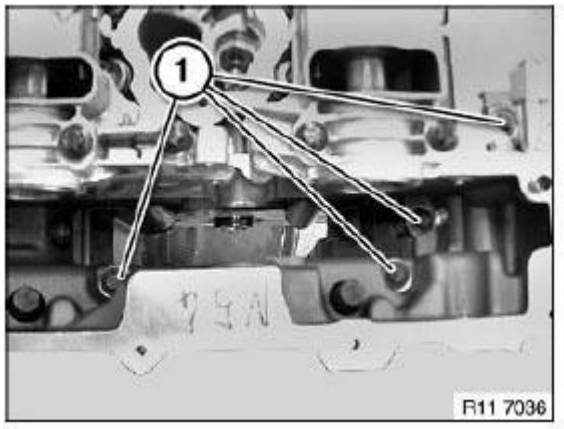


Fig. 50: Identifying Cylinder Head Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

Special tools required:

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

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

Heat cylinder head to 60°.

Check for bubble formation in a water bath.

Necessary preliminary tasks:

- Remove cylinder head. (See **11 12 100 REMOVING AND INSTALLING CYLINDER HEAD (N54)**)
- Disassemble cylinder head.

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NOTE: Observe mounting of special tool 11 4 341 on 1 cylinder.

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

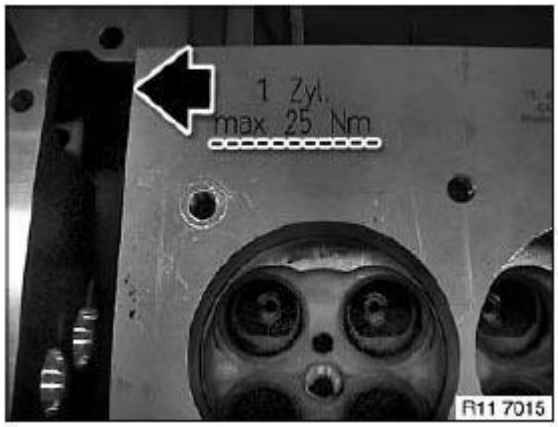


Fig. 51: Identifying Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

1 cyl is marked.

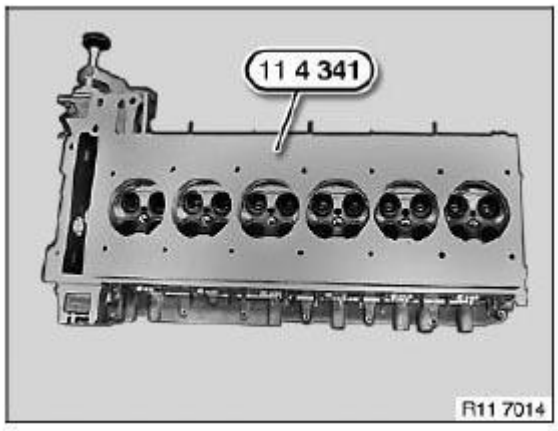


Fig. 52: Identifying Special Tool (11 4 341)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Sealing flange must rest flat.

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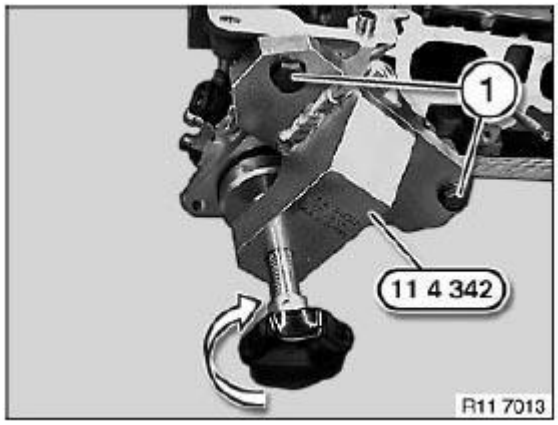


Fig. 53: Identifying Special Tool (11 4 345)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Heat cylinder head to 60°.

Check for bubble formation in a water bath.

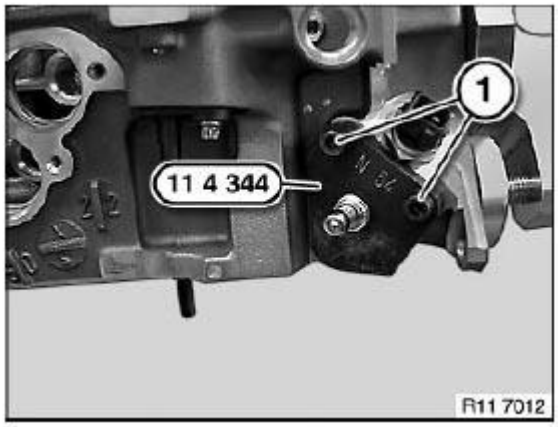


Fig. 54: Identifying Special Tool (11 4 344)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

13 OIL SUMP

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

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

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

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

Necessary preliminary tasks:

- Remove engine splash guard.
- Secure engine in installation position. (See **11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N54)**)
- Lower front axle. (See **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER** and **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER**)
- Remove vane-type pump of power steering.
- AWD optional extra: Remove front axle differential.

NOTE: If automatic transmission optional extra installed, lines must be detached from engine oil sump.

Release bolts (3) on transmission.

Detach return hose (2).

Release screws along line (1).

Tightening torque, see 11 13 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

Replace aluminum screws.

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

Installation:

Replace all seals.

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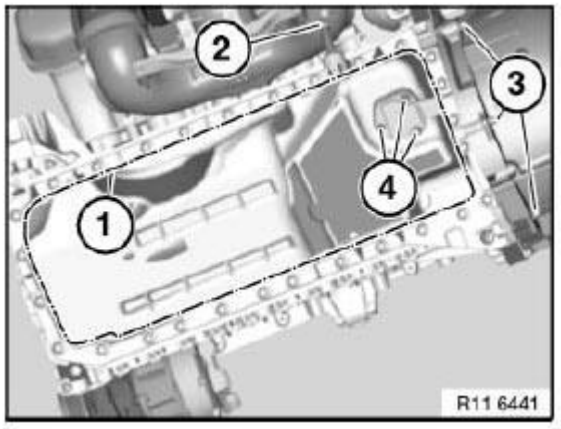


Fig. 55: Identifying Return Hose, Screw & Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

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

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

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

Necessary preliminary tasks:

- Remove engine splash guard.
- Secure engine in installation position.
- Lower front axle.
- Remove left drive shaft.
- Remove right drive shaft.
- Remove front axle differential.

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

Release return hose.

Release screws along line (1).

Tightening torque, see 11 13 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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Installation:

Replace aluminum screws.

Replace all seals.

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

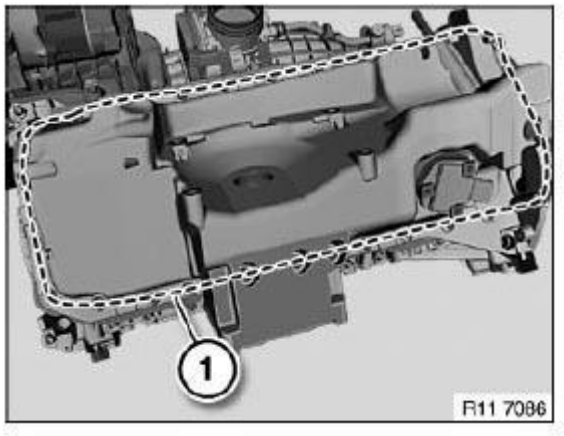


Fig. 56: Identifying Oil Level Sensor & Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

14 HOUSING COVER

11 14 005 REPLACING FRONT CRANKSHAFT RADIAL SEAL (N54)

Special tools required:

- 11 4 370
- 11 9 221
- 11 9 222
- 11 9 223
- 11 9 224
- 11 9 231
- 11 9 232
- 11 9 233

Necessary preliminary tasks:

- Remove vibration damper. (See **11 23 010 REMOVING AND INSTALLING OR REPLACING VIBRATION DAMPER (N54)**)

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IMPORTANT: Do not release central bolt.

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

The timing must be adjusted again. (See **11 31 505 ADJUSTING CAMSHAFT TIMING (N54)**)

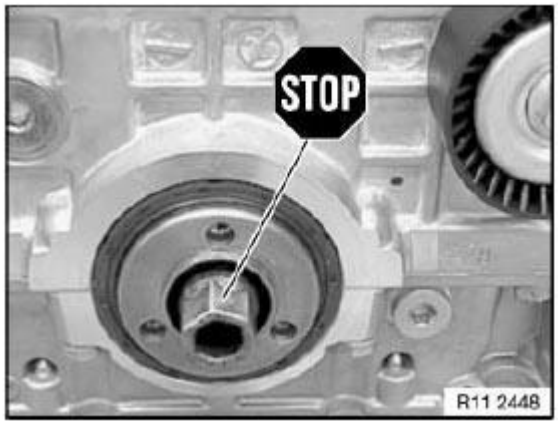


Fig. 57: Identifying Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Turn back special tool 11 9 222.

Push special tool 11 9 221 onto crankshaft.

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

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

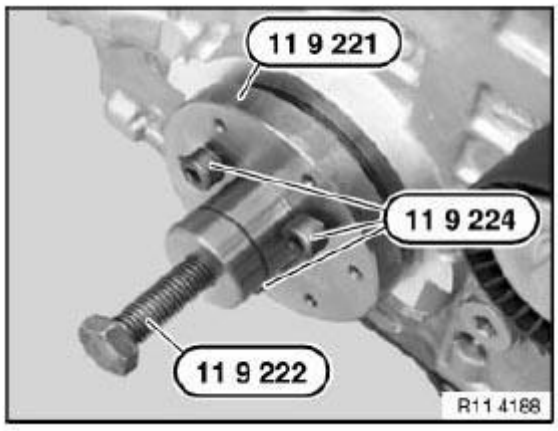


Fig. 58: Identifying Special Tool (11 9 221), (11 9 224) & (11 9 222)
Courtesy of BMW OF NORTH AMERICA, INC.

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Insert screws (special tool 11 9 223) and screw in until they make contact without play.

IMPORTANT: Do not overload special tool 11 9 223 (metal screws).

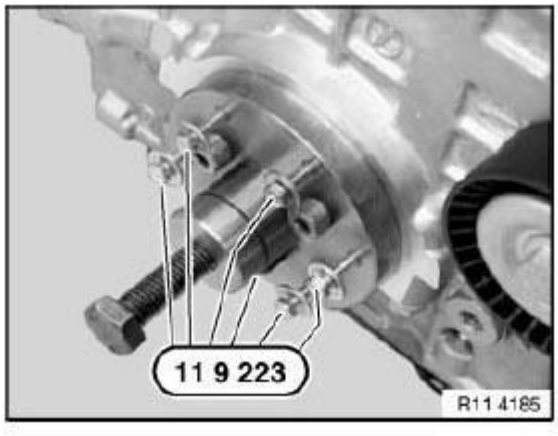


Fig. 59: Identifying Special Tool (11 9 223)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screws (special tool 11 9 224).

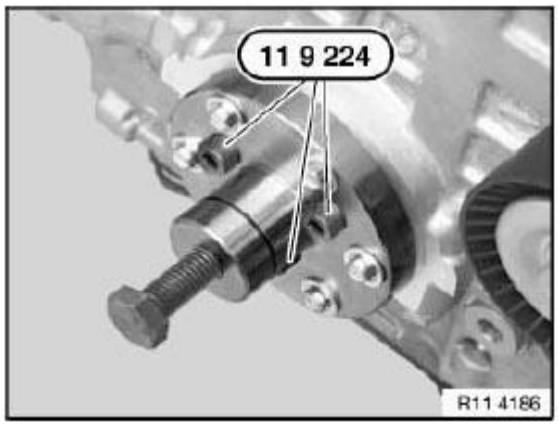


Fig. 60: Identifying Special Tool (11 9 224)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw (special tool 11 9 222) carefully and slowly and withdraw radial seal (1).

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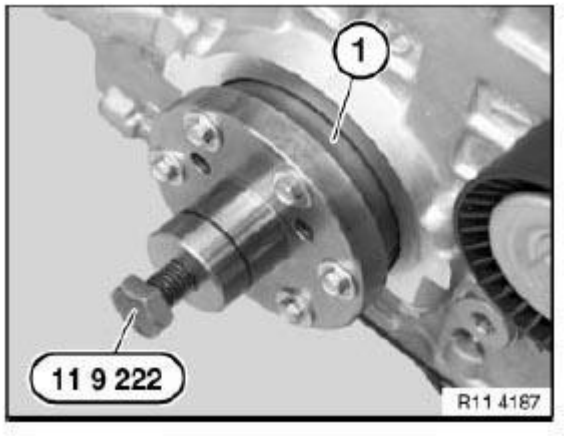


Fig. 61: Identifying Special Tool (11 9 222)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

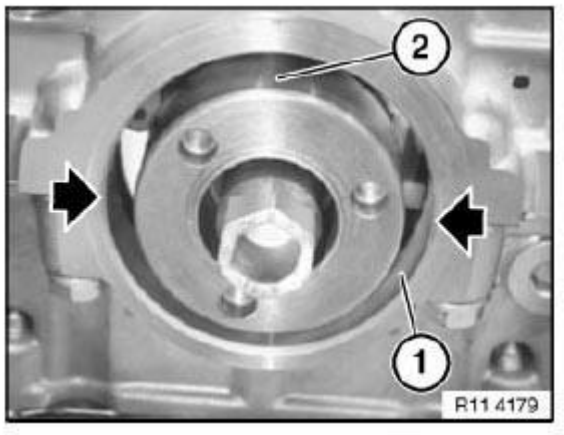


Fig. 62: Identifying Sealing Surface & Running Surface
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

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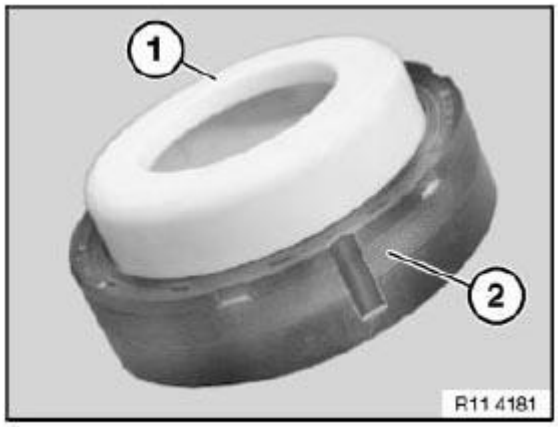


Fig. 63: Identifying Support Sleeve With Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Attach support bushing (2) with radial shaft seal (1).

Push on radial shaft seal (1) in direction of arrow.

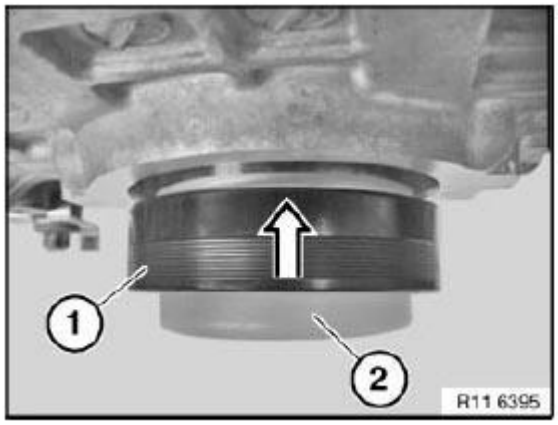


Fig. 64: Pushing On Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Pay attention to opening on radial shaft seal (1) on left and right.

Remove support bushing (2).

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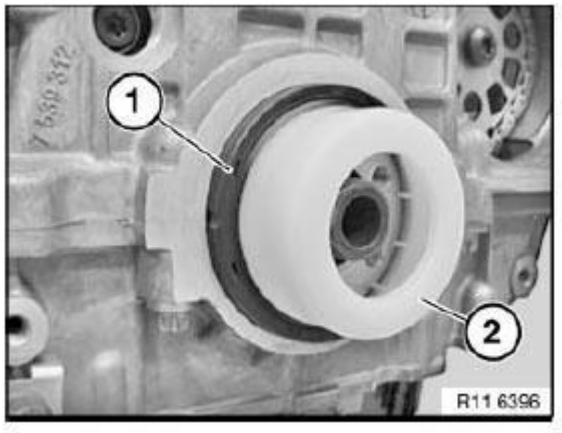


Fig. 65: Identifying Radial Shaft Seal & Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

Screw on metering needle.

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

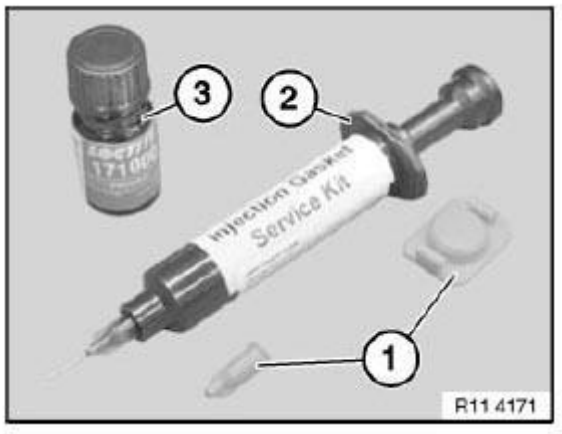


Fig. 66: Identifying Injector & Cap Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 9 232.

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

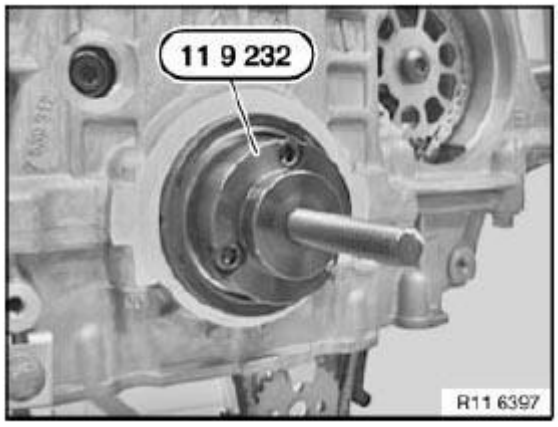


Fig. 67: Identifying Special Tool (11 9 232)
Courtesy of BMW OF NORTH AMERICA, INC.

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

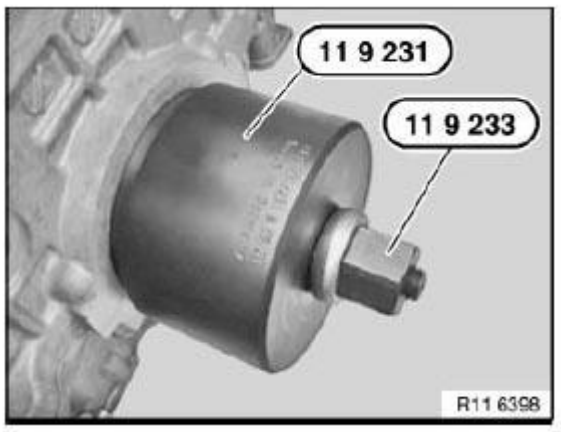


Fig. 68: Identifying Special Tool (11 9 232) & (11 9 233)
Courtesy of BMW OF NORTH AMERICA, INC.

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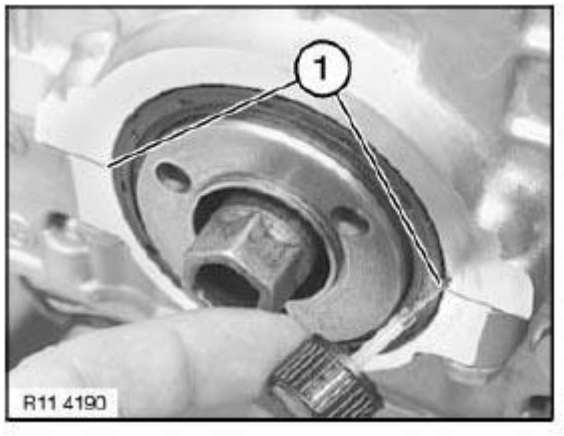


Fig. 69: Identifying Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

11 14 010 REPLACING VACUUM PUMP SEALING COVER (N54)

Special tools required:

- 11 8 531
- 11 8 532
- 11 8 533
- 11 8 535
- 11 8 544

Necessary preliminary tasks:

- Remove fan cowl.
- Remove alternator drive belt. (See **11 28 010 REPLACING ALTERNATOR DRIVE BELT (N54)**)
- Remove both drive belt tensioners. (See **11 28 020 REPLACE ALTERNATOR DRIVE BELT TENSIONER (N54)**)

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

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

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

Secure special tool 11 8 532 against falling down.

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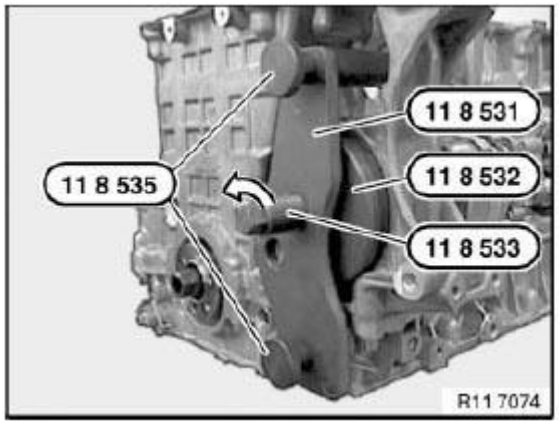


Fig. 70: Identifying Special Tool (11 8 535), (11 8 531) & (11 8 533)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Screw in special tool 11 8 544.

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

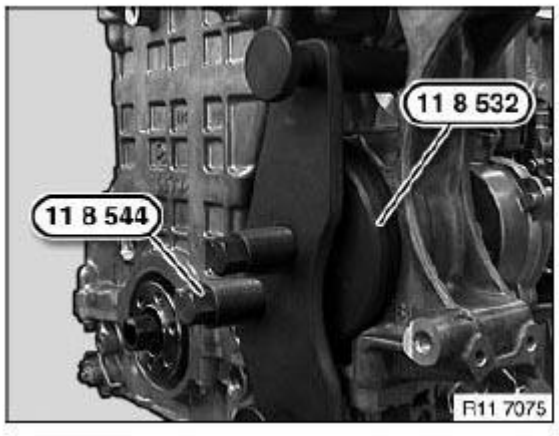


Fig. 71: Identifying Special Tool (11 8 544) & (11 8 532)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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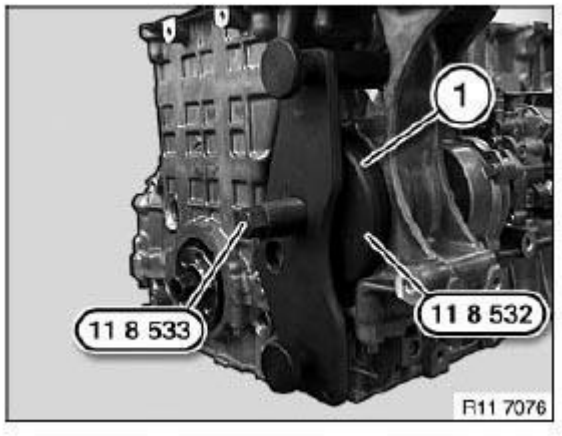


Fig. 72: Identifying Special Tool (11 8 533) & (11 8 532)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 14 151 REPLACING CRANKSHAFT RADIAL SEAL (N54)

Special tools required:

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

Necessary preliminary tasks:

- Remove transmission.
- Remove flywheel. (See **11 22 500 REMOVING AND INSTALLING OR REPLACING FLYWHEEL (N54)**)

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

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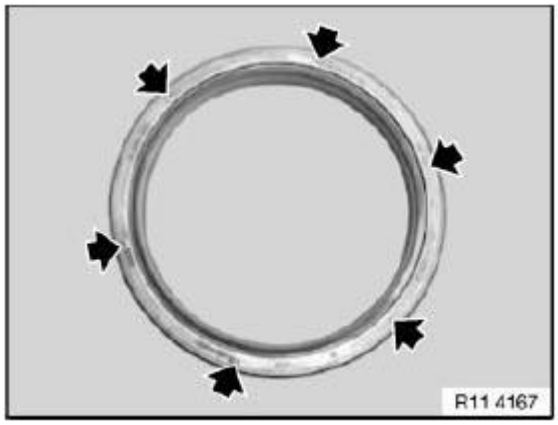


Fig. 73: Identifying Special Tool (11 9 200)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If necessary, remove rubber coating (1) on top side of radial seal and expose a removal opening (2) (see Fig. 74).

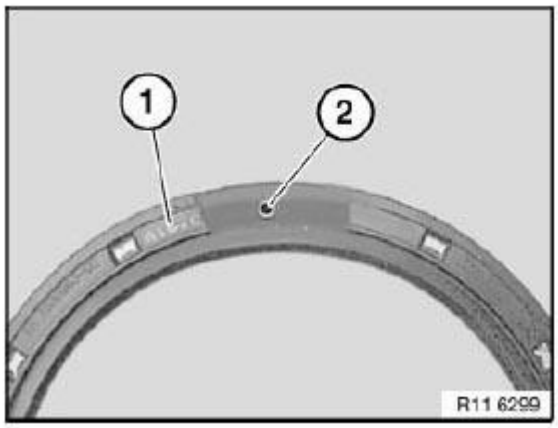


Fig. 74: Identifying Rubber Coating & Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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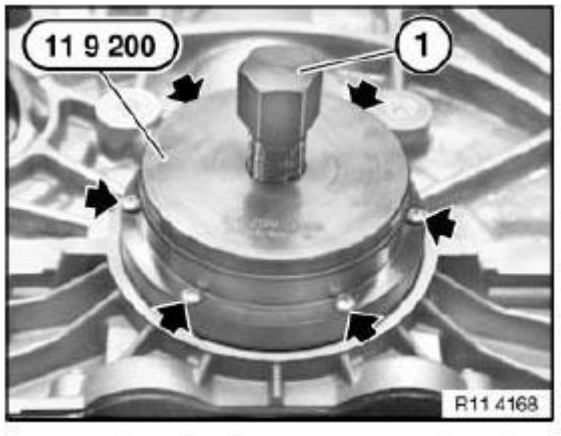


Fig. 75: Identifying Special Tool (11 9 200) With Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

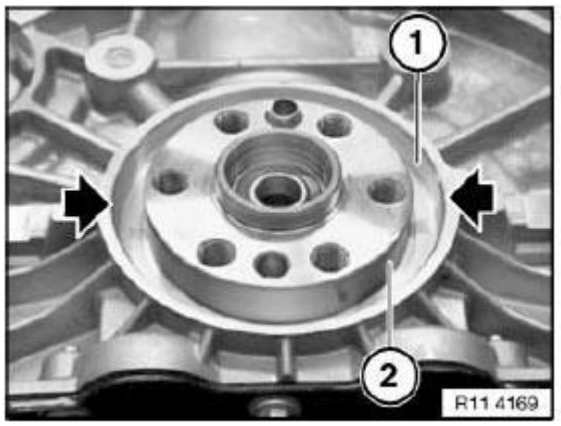


Fig. 76: Identifying Area Sealing Surface
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

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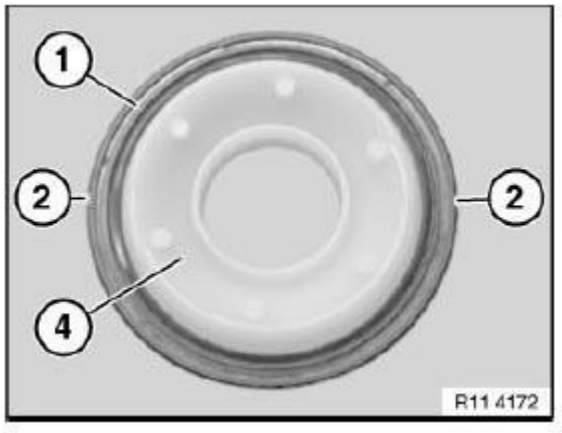


Fig. 77: Identifying Radial Shaft Seal In Groove On Both Left & Right Sides
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

Screw on metering needle.

Insert piston for pressing out.

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

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

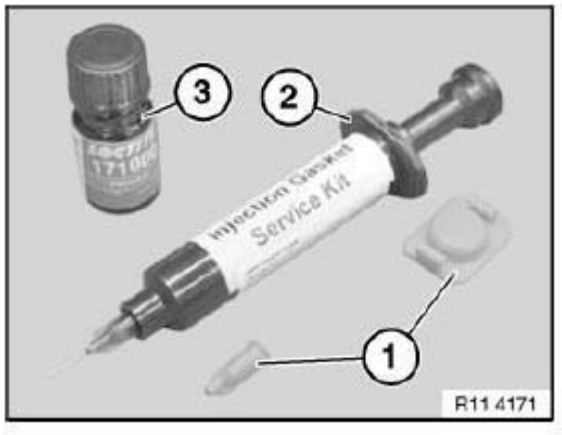


Fig. 78: Identifying Injector, Screw Caps & Bottle

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Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

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

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

Carefully remove support sleeve (4).

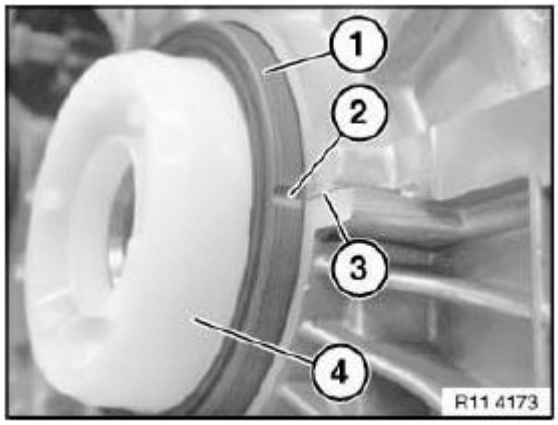


Fig. 79: Identifying Support Sleeve & Housing Partition
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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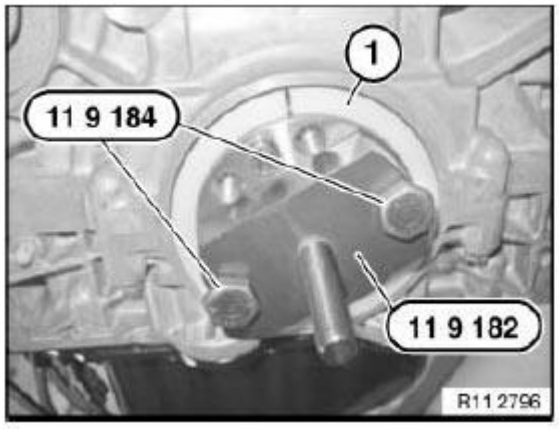


Fig. 80: Identifying Special Tool (11 9 182, 11 9 184) With Screws To Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

Then remove spacer ring again.

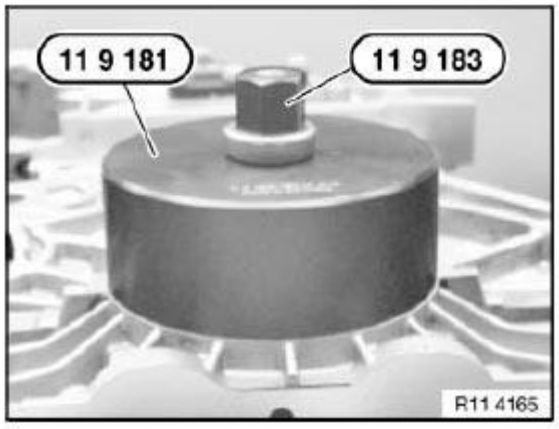


Fig. 81: Identifying Special Tool (11 9 181 & 11 9 183)
Courtesy of BMW OF NORTH AMERICA, INC.

Before filling with sealing compound:

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

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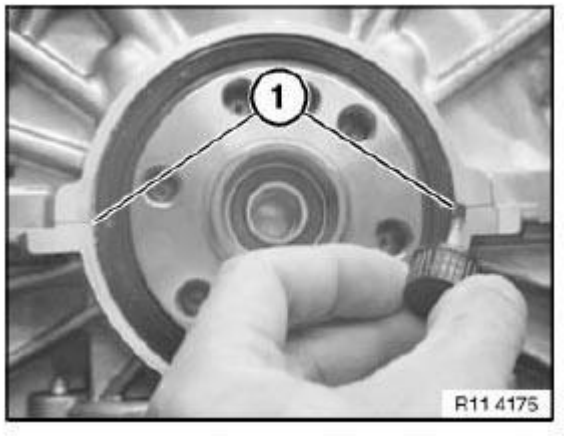


Fig. 82: Identifying Brush With Primer
Courtesy of BMW OF NORTH AMERICA, INC.

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

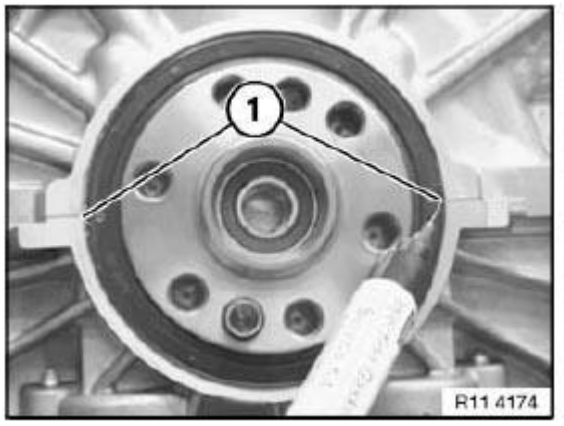


Fig. 83: Identifying Sealing Area
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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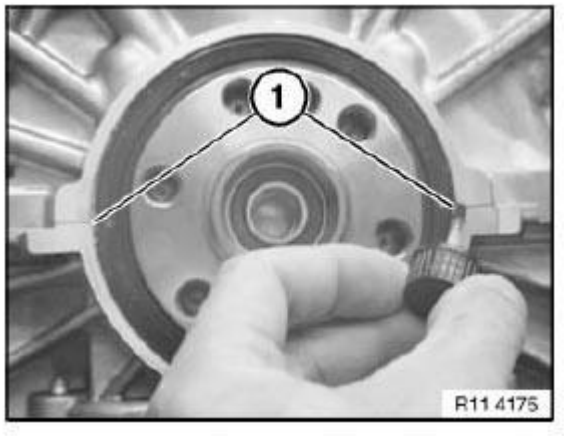


Fig. 84: Identifying Area Applying Sealing
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

21 CRANKSHAFT WITH BEARING

11 21 531 REPLACING ALL CRANKSHAFT MAIN BEARINGS (N54)

Special tools required:

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

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

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

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

Necessary preliminary tasks:

- Remove crankshaft.

Check setting of oil spray nozzles, adjusting if necessary:

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

Installation:

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Oil nozzle must be located precisely in groove of special tool 11 8 510; adjust if necessary. (See **11 8 510 GAUGE**)

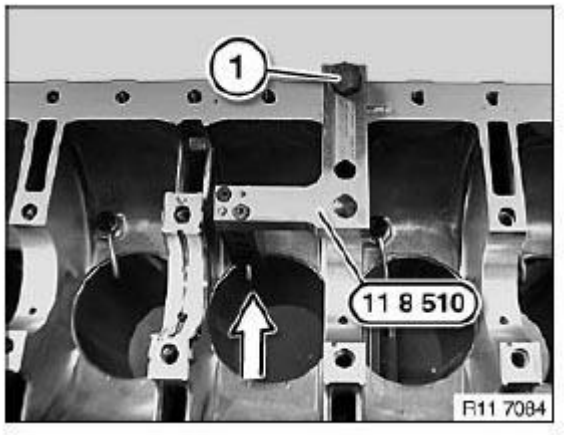


Fig. 85: Identifying Special Tool (11 8 510) On Main Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust oil nozzle.

Release screw (1).

Tightening torque, see 11 11 5AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

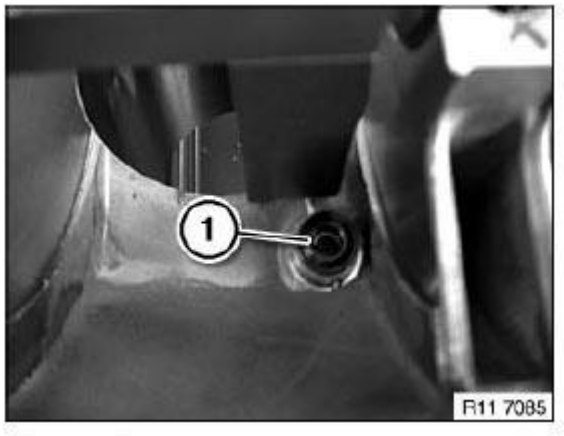


Fig. 86: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Remove bearing shells (2) and (3).

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

Observe bearing classification. (See 11 21 CRANKSHAFT AND BEARINGS N54 B30)

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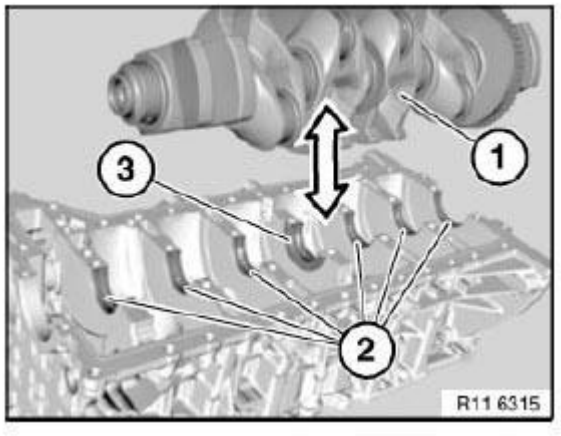


Fig. 87: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

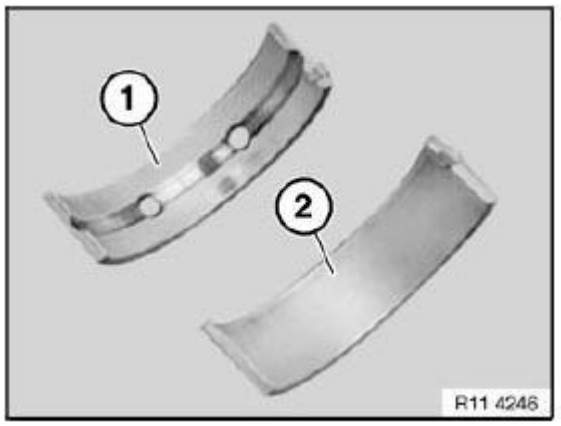


Fig. 88: Locating Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

Bearing classification (1) of crankshaft as per table (values 1 to 3).

Bearing classification (2) of connecting rods as per table (values b and r). (See **11 24 571 REPLACING ALL CONNECTING ROD BEARINGS (N54)**)

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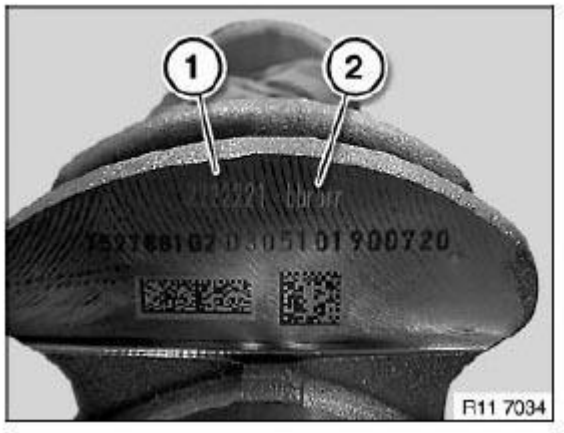


Fig. 89: Locating Bearing Classification Of Connecting Rods
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

When all the letters and number code have been determined, the bearing shell color must be allocated, see **COLOR COMBINATIONS TABLE**.

IMPORTANT: Engine damage will result if an insufficiently small bearing play is determined.

The color combination Yellow and Red must not be fitted. Possible color combinations, see COLOR COMBINATIONS TABLE.

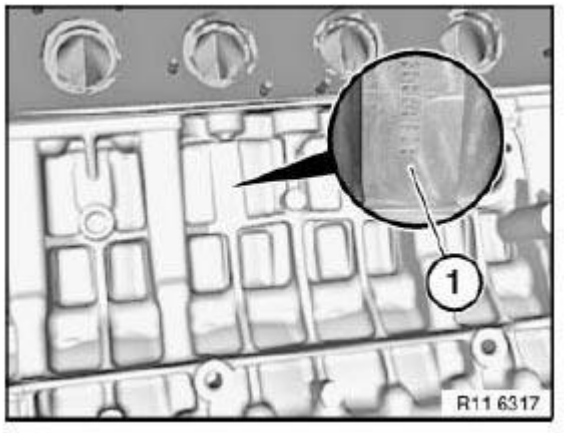


Fig. 90: Locating Bearing Classification Of Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

COLOR COMBINATIONS TABLE

(A1) Bedplate/Yellow	**(B1)** Bedplate/Yellow	**(C1)** Bedplate/Green
(A1) Crankcase/Yellow	**(B1)** Crankcase/Green	**(C1)** Crankcase/Green

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(A2) Bedplate/Green	**(B2)** Bedplate/Green	**(C2)** Bedplate/Green
(A2) Crankcase/Yellow	**(B2)** Crankcase/Green	**(C2)** Crankcase/Red
(A3) Bedplate/Green	**(B3)** Bedplate/Red	**(C3)** Bedplate/Red
(A3) Crankcase/Green	**(B3)** Crankcase/Green	**(C3)** Crankcase/Red

Insert all bearing shells (2 and 3).

IMPORTANT: Clean sealing surfaces.

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

Clean sealing faces with special tool 11 4 470 only. (See **11 4 470 CLEANING KIT**)

Determine bearing play with special tool 00 2 590.

Installation:

All measuring points must be free from oil and grease.

Use used screws to determine bearing play.

Set up crankcase lower section with bearing shells.

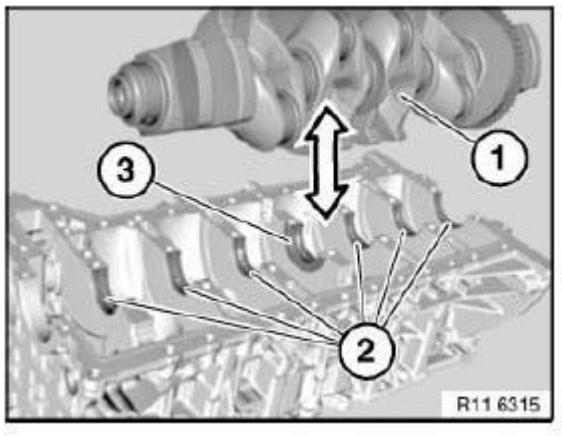


Fig. 91: Identifying Crankshaft Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

Remove lower crankcase.

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

Crankshaft bearing clearance radial.

Installation:

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Remove plastic thread.

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

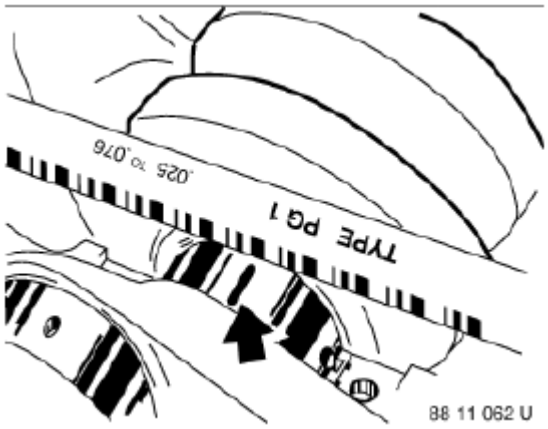


Fig. 92: Locating Bearing Shells & Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Install crankcase lower section.

Assemble engine.

22 FLYWHEEL

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

Special tools required:

- 11 4 180
- 11 9 260

Necessary preliminary tasks:

- Remove transmission.
- Remove clutch.

Enlarge special tool 11 9 260 with an elongated hole. (See **11 9 260 COUNTER SUPPORT WITH SCREW CONNECTION**)

Work out elongated hole on special tool 11 9 260 to **8 mm** . (See **11 9 260 COUNTER SUPPORT WITH SCREW CONNECTION**)

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Fig. 93: Identifying Special Tool (11 9 260) With Elongated Hole
Courtesy of BMW OF NORTH AMERICA, INC.

Manual transmission:

Block flywheel with special tool 11 9 260. (See **11 9 260 COUNTER SUPPORT WITH SCREW CONNECTION**)

Release flywheel screws with special tool 11 4 180. (See **11 4 180 SCREWDRIVER SOCKET TORX T60**)

Tightening torque, see 11 22 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

Flywheel is secured with a dowel pin.

Fit new flywheel screws.

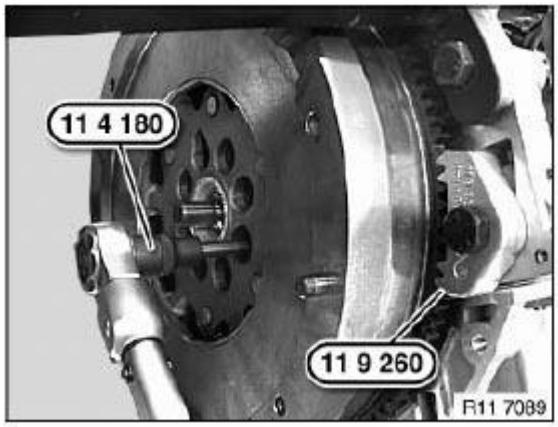


Fig. 94: Identifying Special Tool (11 9 260 & 11 4 180)
Courtesy of BMW OF NORTH AMERICA, INC.

Automatic transmission:

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Block flywheel with special tool 11 9 260. (See **11 9 260 COUNTER SUPPORT WITH SCREW CONNECTION**)

Release flywheel bolts with tool (1).

Tightening torque, see 11 22 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

Flywheel is secured with a dowel pin.

Fit new flywheel screws.

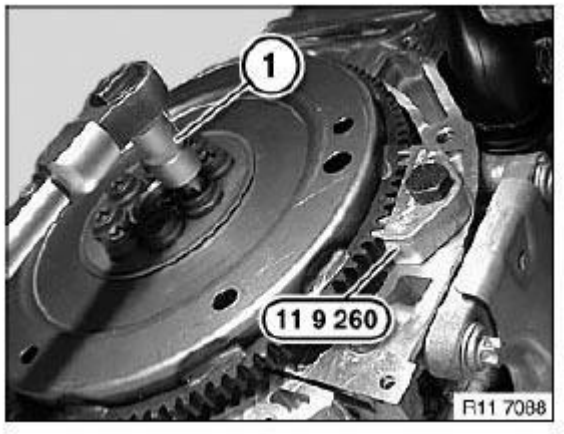


Fig. 95: Identifying Special Tool (11 9 260) On Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

Special tools required:

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

Necessary preliminary tasks:

- Transmission removed.
- Remove clutch release bearing

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Pressing out roller bearing:

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

Screw in grease spindle 23 4 033 completely.

Brass tip must immerse fully into roller bearing.

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

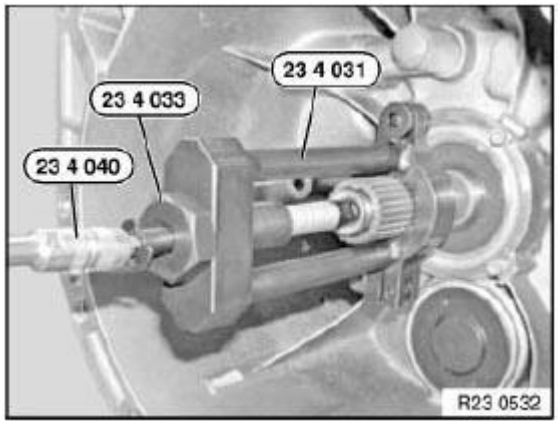


Fig. 96: Identifying Special Tool (23 4 031) On Front Of Drive Shaft Spline Teeth
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 23 4 031.

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

Then reinstall special tool.

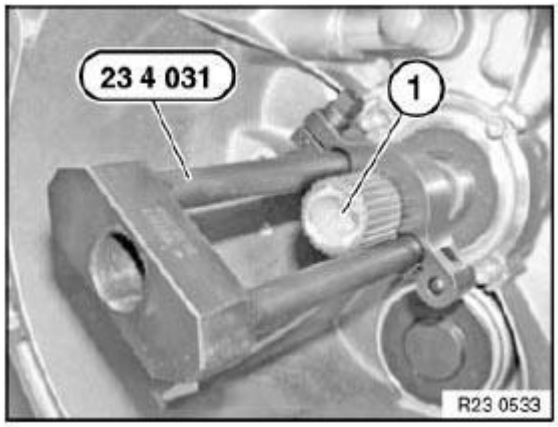


Fig. 97: Identifying Special Tool (23 4 031)
Courtesy of BMW OF NORTH AMERICA, INC.

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Pressing in roller bearing:

Slide in pressure spindle 23 4 035.

Attach thrust piece 23 4 036 to pressure spindle.

Push roller bearing (1) onto thrust piece.

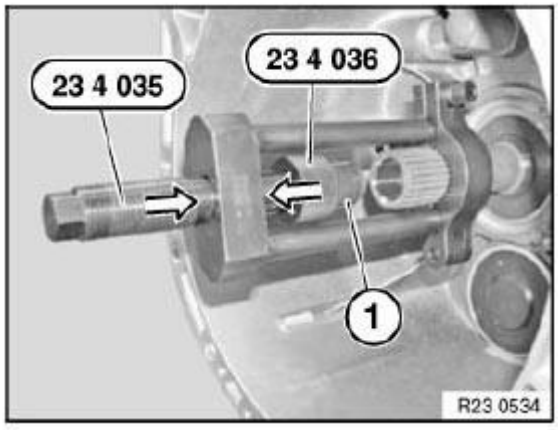


Fig. 98: Pushing Roller Bearing Onto Thrust Piece
Courtesy of BMW OF NORTH AMERICA, INC.

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

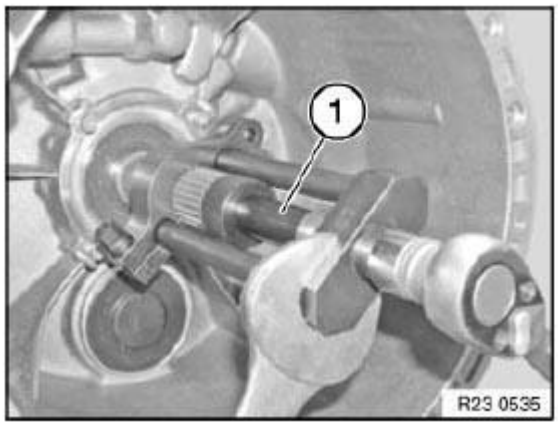


Fig. 99: Identifying Pressure Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

23 VIBRATION DAMPER

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

Necessary preliminary tasks:

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- Detach front underbody protection.
- Remove drive belt.

Release screws (1).

Tightening torque, see 11 23 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Remove vibration damper (2).

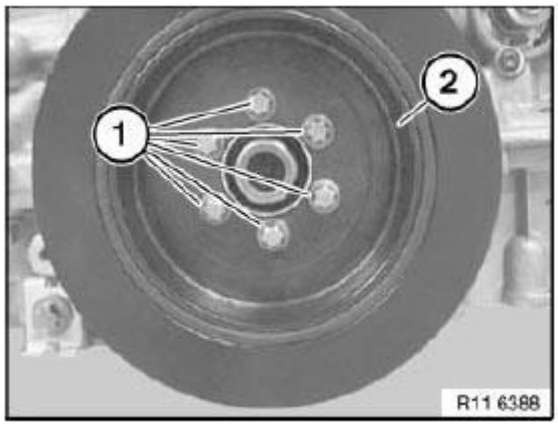


Fig. 100: Identifying Vibration Damper With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

24 CONNECTING ROD WITH BEARING

11 24 571 REPLACING ALL CONNECTING ROD BEARINGS (N54)

Special tools required:

- 00 2 590
- 00 9 120

IMPORTANT: All crank pins are connected with the crankshaft.

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

Necessary preliminary tasks:

- Remove all pistons.

IMPORTANT: All crankshaft crank pins are classified.

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

Possible classifications per connecting rod at top and bottom:

r: Connecting rod = Yellow.

Connecting rod bearing cap = Red.

b: Connecting rod = Violet.

Connecting rod bearing cap = Blue.

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

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

Example:

Possible classification: rbbrrb.

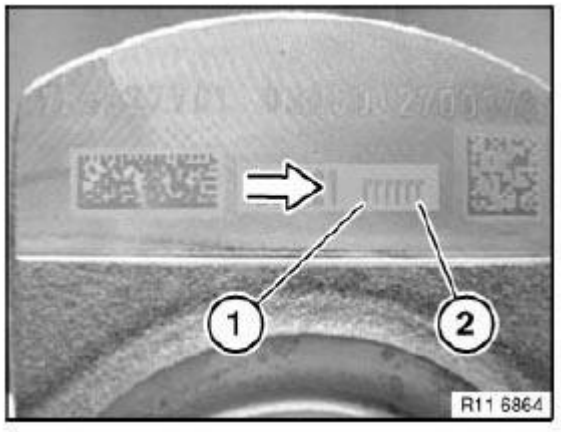


Fig. 101: Identifying Connecting Rod Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

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

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

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

Install new conrod bearing shells.

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

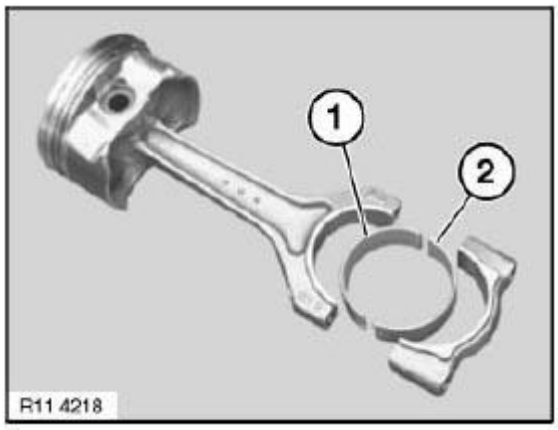


Fig. 102: Identifying Connecting Rod Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

Check conrod bearing clearance.

Piston in BDC position.

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

Fit bearing cap so that pairing letters match up.

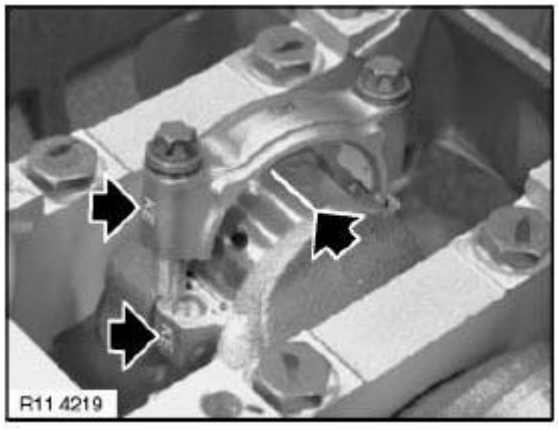


Fig. 103: Locating Plastigage Type
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not distort conrods or crankshaft.

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Use the old conrod bolts to check conrod clearance.

Tighten down conrod bolts with special tool 00 9 120.

Tightening torque, see 11 24 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

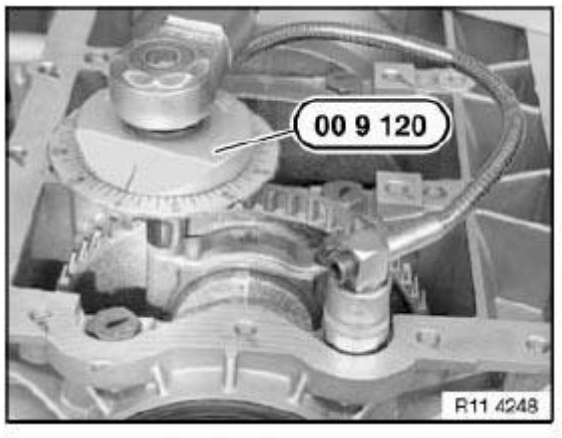


Fig. 104: Identifying Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Conrod bearing clearance.

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

Tightening torque, see 11 24 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

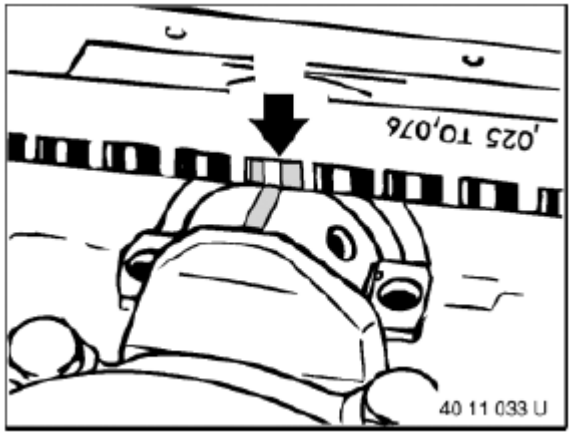


Fig. 105: Locating Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

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Assemble engine.

25 PISTON WITH RINGS AND PIN

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

Special tools required:

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

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

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

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

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

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

Necessary preliminary tasks:

- Remove engine.
- Mount engine on assembly stand.
- Remove intake air manifold.
- Remove cylinder head.
- Remove engine oil sump.
- Remove oil pump.

NOTE: In event of heavy oil carbon residue:

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Carefully remove oil carbon residue from cylinder wall.

NOTE: Illustrations show N46.

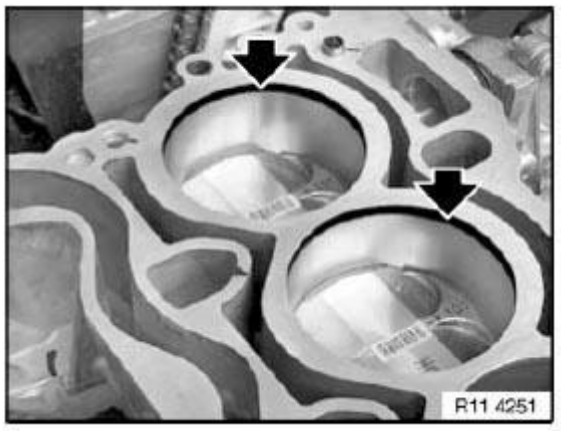


Fig. 106: Locating Cylinder Oil Carbon
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

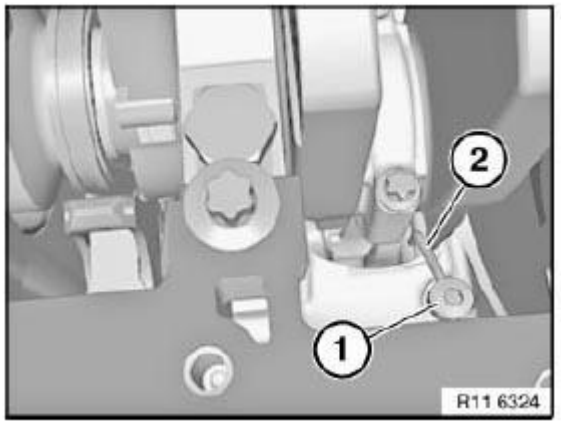


Fig. 107: Locating Oil Spray Nozzle & Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release conrod bolts (1).

Tightening torque, see 11 24 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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

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

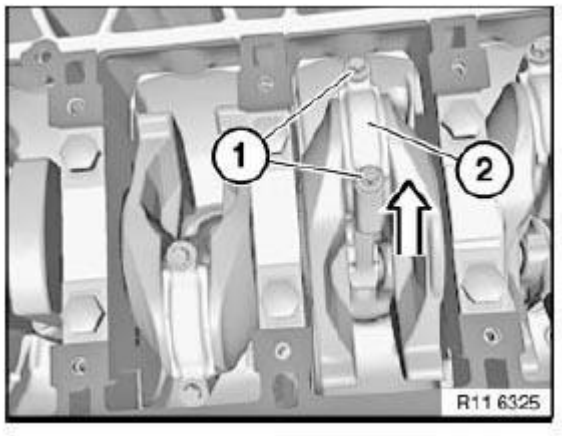


Fig. 108: Identifying Bearing Cap & Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 11 8 590 into conrod big end. See **11 8 590 INSERTION TOOL**

Press out conrod and piston to cylinder head side.

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

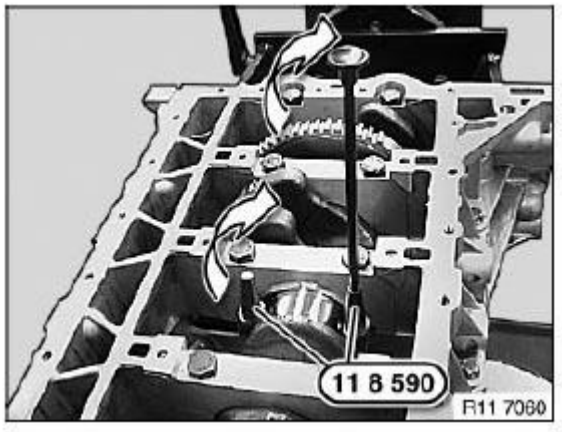


Fig. 109: Identifying Special Tool (11 8 590) Into Conrod Big
Courtesy of BMW OF NORTH AMERICA, INC.

Preliminary work:

Clamp special tool 11 8 561 in a vice.

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

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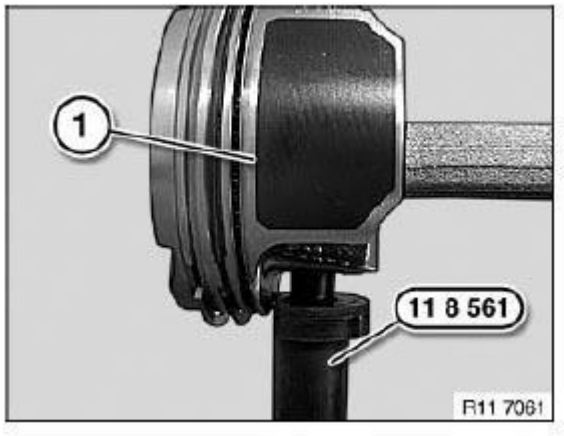


Fig. 110: Identifying Special Tool (11 8 561) With Piston
Courtesy of BMW OF NORTH AMERICA, INC.

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

***Protective goggles* must be worn.**

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

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

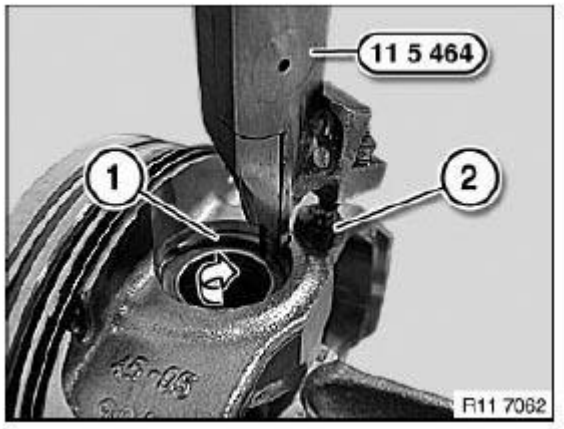


Fig. 111: Identifying Special Tool (11 5 464) With Piston Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, replace connecting rods.

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

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

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Installation:

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

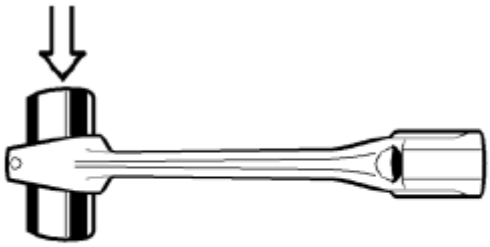


Fig. 112: Identifying Piston Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Measure piston installation clearance:

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

Piston diameter at measuring point A.

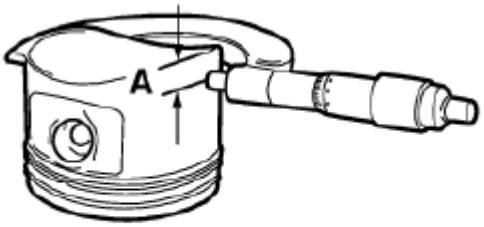


Fig. 113: Identifying Piston Diameter Measuring Point
Courtesy of BMW OF NORTH AMERICA, INC.

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

Diameter of cylinder bore.

Piston installation clearance.

Total permissible wear tolerance.

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If necessary, replace piston.

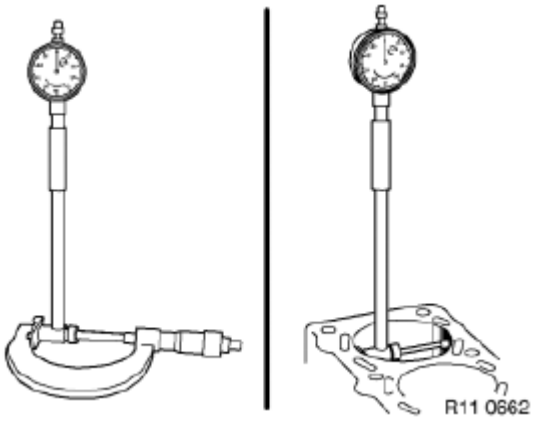


Fig. 114: Identifying Diameter Of Cylinder Bore
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: *Protective goggles* must be worn.

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

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

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

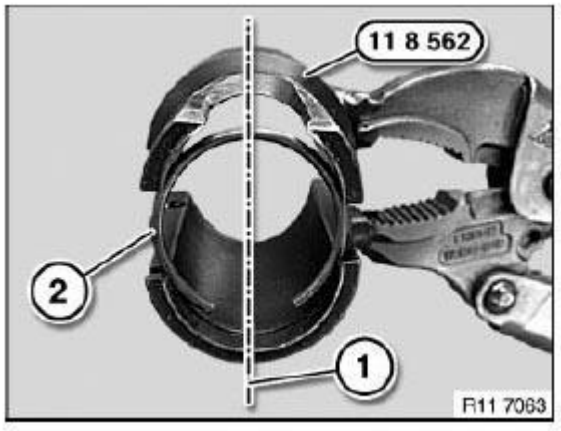


Fig. 115: Inserting Piston Circlip Into Groove Of Special Tool (11 8 562)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: *Protective goggles* must be worn.

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

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

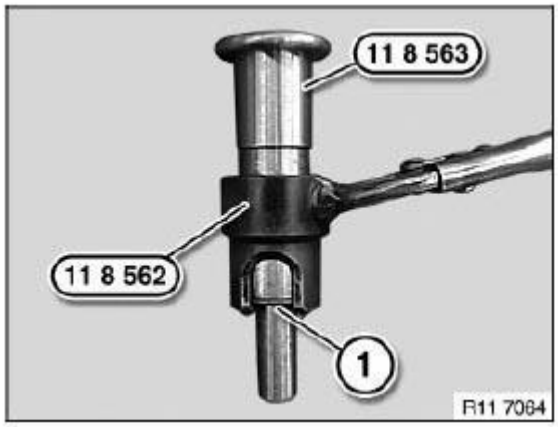


Fig. 116: Identifying Special Tools (11 8 562 & 11 8 563)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: *Protective goggles* must be worn.

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

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

NOTE: See Fig. 117 .

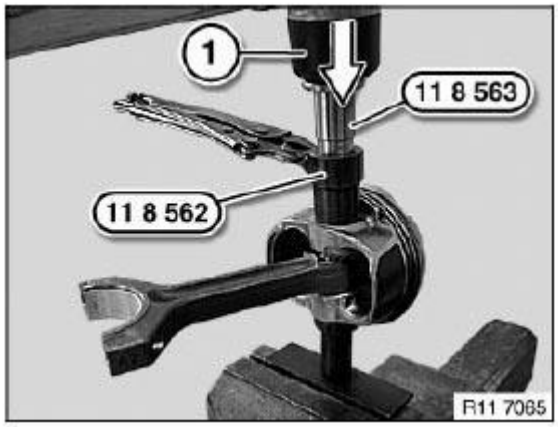


Fig. 117: Identifying Special Tool (11 8 562) To Piston Crown
Courtesy of BMW OF NORTH AMERICA, INC.

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

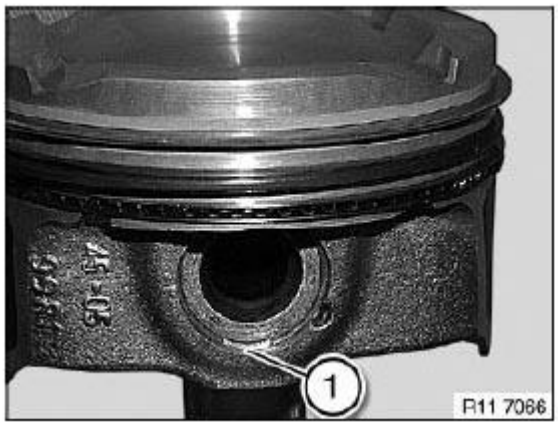


Fig. 118: Locating Piston Pin Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: B 30.

Install all piston rings.

Install all bearing shells.

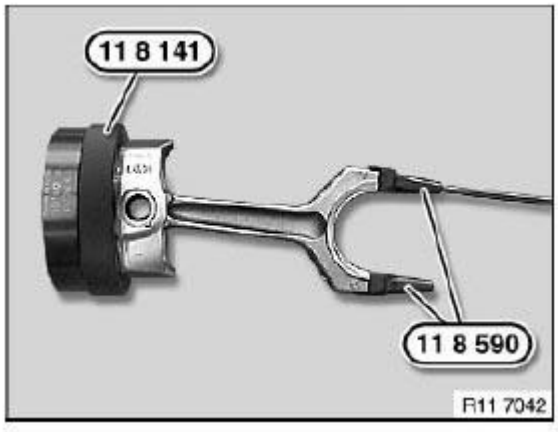
Coat piston and piston rings with oil.

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

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

Installation:

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



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Fig. 119: Identifying Piston In Special Tool (11 8 141)
Courtesy of BMW OF NORTH AMERICA, INC.

Insert piston with conrod in cylinder.

IMPORTANT: Risk of damage to oil spray nozzle.

Danger of piston ring failure.

Press in piston in direction of arrow with finger pressure only, do not drive in.

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

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

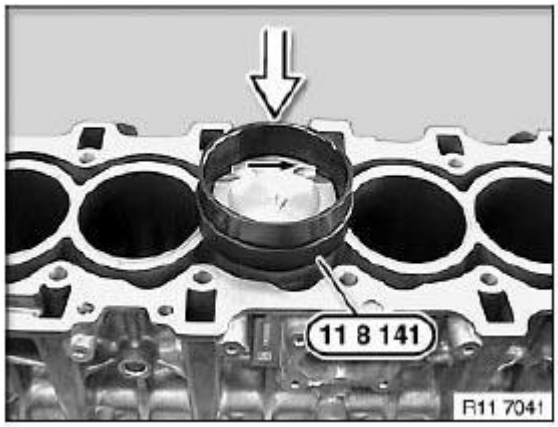


Fig. 120: Identifying Piston In Special Tool (11 8 141)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Conrod and conrod bearing cap are identified with pairing letters (1) and must not be mixed up.

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

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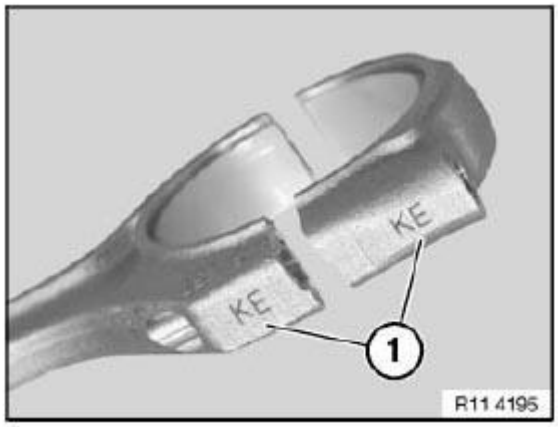


Fig. 121: Identifying Mark On Bearing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Apply a light coat of oil to crank pin.

Assemble conrod and crank pin.

Screw off special tool 11 8 560 in counterclockwise direction. See **11 8 560 REMOVAL AND INSTALLATION KIT**

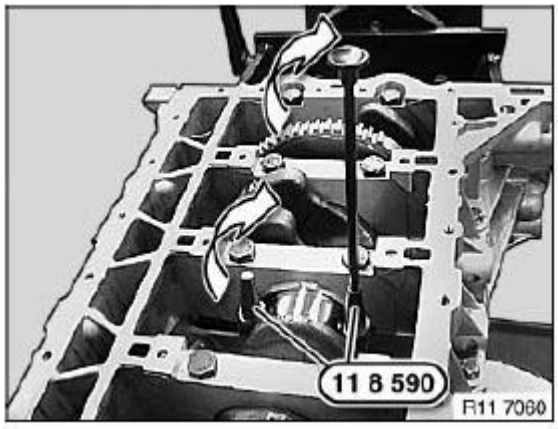


Fig. 122: Identifying Special Tool (11 8 560) On Crank Pin
Courtesy of BMW OF NORTH AMERICA, INC.

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

Install new conrod bolts (1).

Tightening torque, see 11 24 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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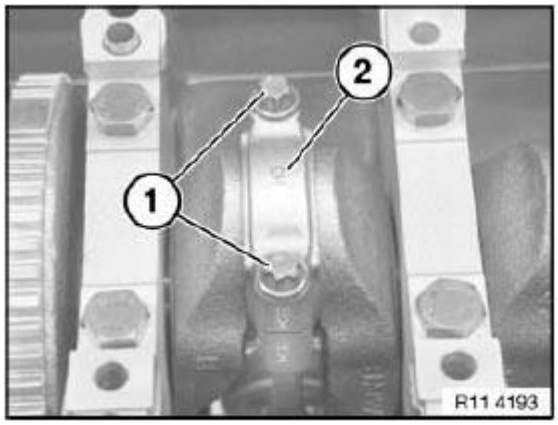


Fig. 123: Identifying Bearing Caps & Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust torsion angle of conrod with special tool 00 9 120 (see **Fig. 124**).

Tightening torque, see 11 24 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

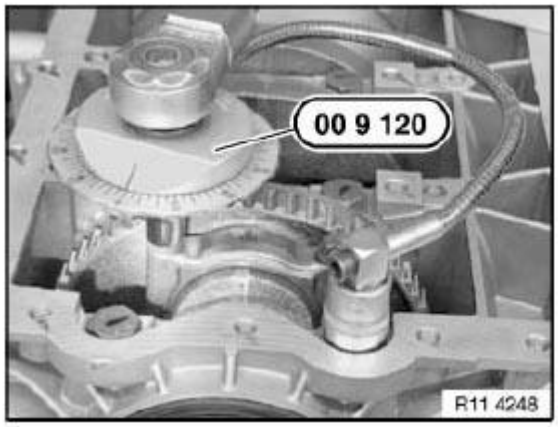


Fig. 124: Identifying Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

Necessary preliminary tasks:

- Remove all pistons.

Measuring axial clearance of piston rings in piston ring groove.

Technical Data.

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

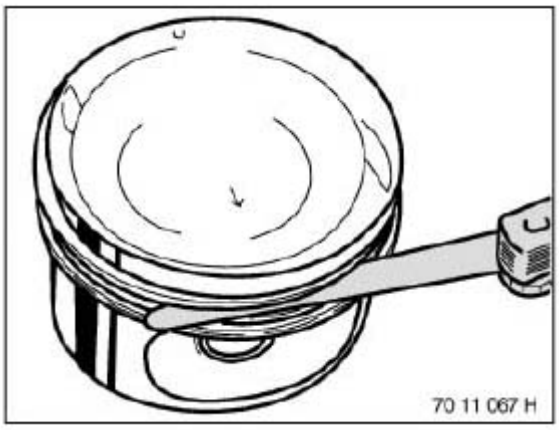


Fig. 125: Identifying Clearance Of Piston Rings In Piston Ring Groove
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

NOTE: Oil scraper ring cannot be removed with piston ring pliers.

Put aside piston rings in correct sequence and installation position.

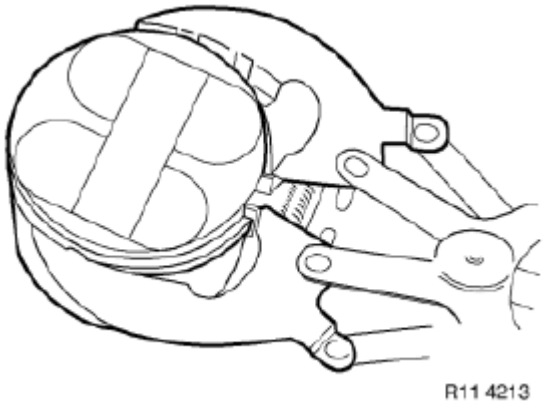


Fig. 126: Removing Piston Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

Determine gap with a feeler gauge.

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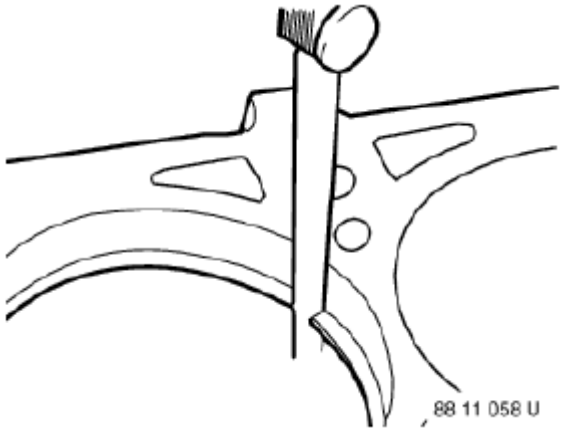


Fig. 127: Identifying Piston Rings Gap
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Schematic representation of piston rings.

Installation:

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

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

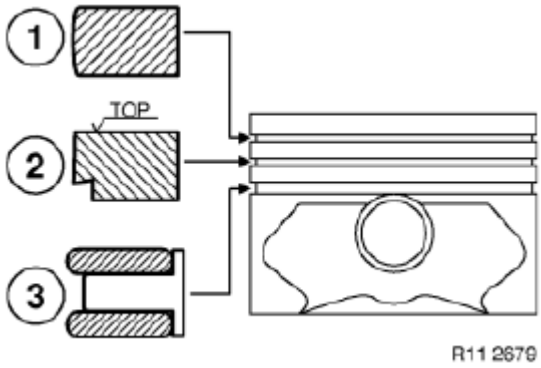


Fig. 128: Identifying Plain Compression Ring, Compression Ring & Oil Scraper Ring
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

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

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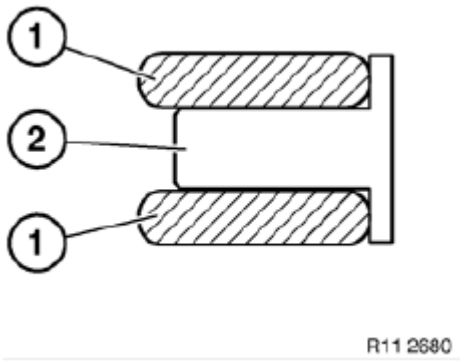


Fig. 129: Identifying Support Spring & Steel Band Rings
Courtesy of BMW OF NORTH AMERICA, INC.

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

NOTE: See N52.

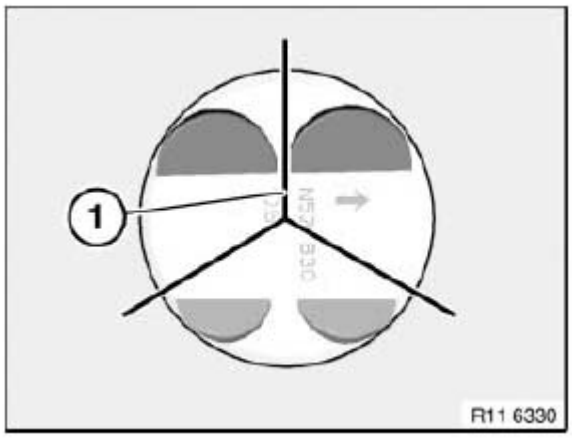


Fig. 130: Identifying Contact Points Of Piston Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

28 V-RIBBED BELT WITH TENS DEFLECT ELEMENT

11 28 010 REPLACING ALTERNATOR DRIVE BELT (N54)

Special tools required:

- 11 3 340

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

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Necessary preliminary tasks:

- Remove fan cowl.

Unfasten hose clip (1).

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

Pull off air hose (2).

Installation:

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

Recirculated air hose must audibly snap into place.

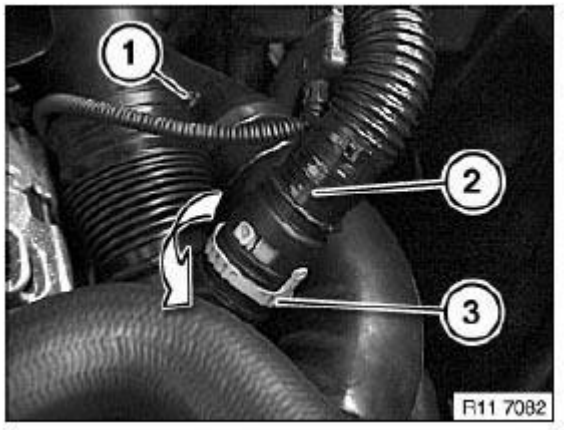


Fig. 131: Identifying Air Hose Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

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

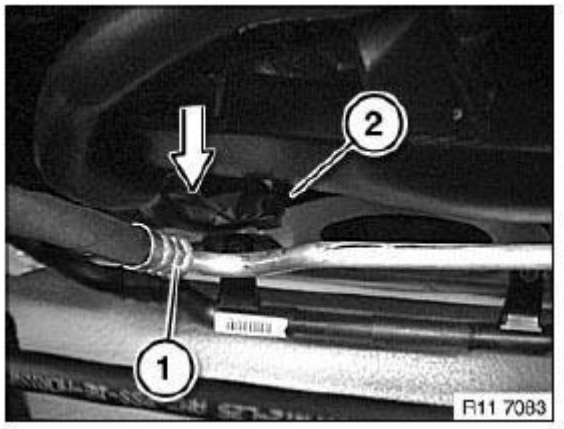


Fig. 132: Identifying Air Hose Holder

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Courtesy of BMW OF NORTH AMERICA, INC.

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

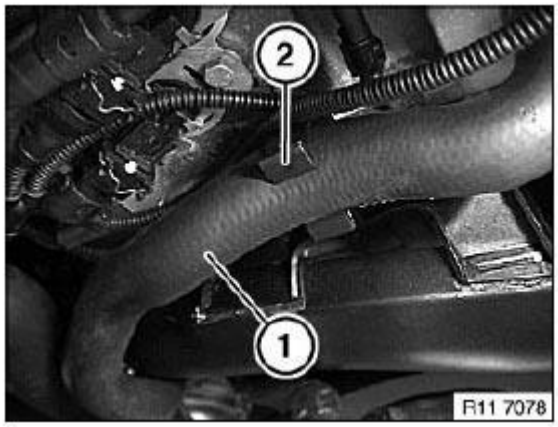


Fig. 133: Identifying Coolant Hose & Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Fold air duct (2) down.

NOTE: Do not remove air duct (2).

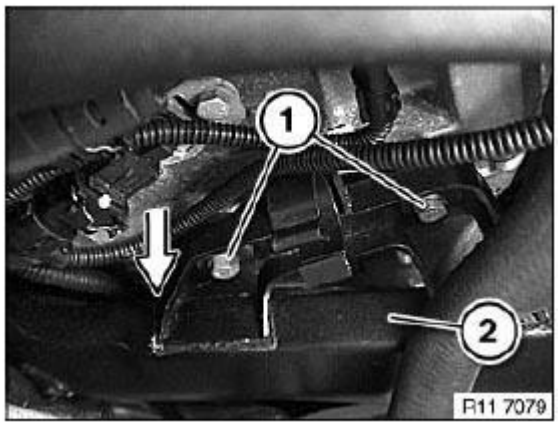


Fig. 134: Identifying Air Duct With Screw
Courtesy of BMW OF NORTH AMERICA, INC.

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

Secure belt tensioner in place with special tool 11 3 340. See **11 3 340 LOCKING PIN (2)**

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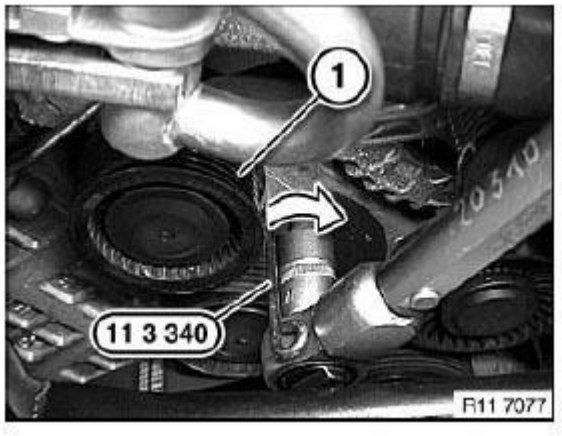


Fig. 135: Identifying Belt Tensioner With Special Tool (11 3 340)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove drive belt (1).

Installation:

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

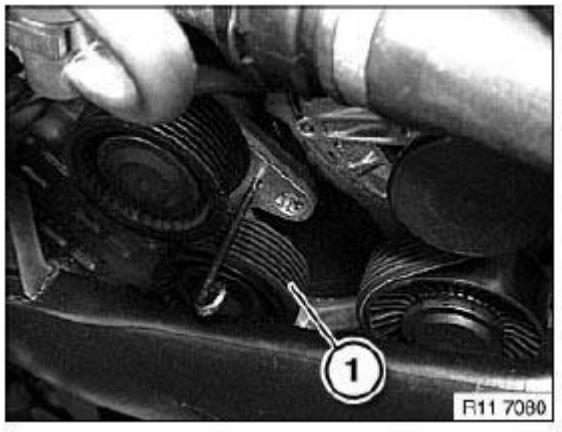


Fig. 136: Identifying Drive Belt
Courtesy of BMW OF NORTH AMERICA, INC.

Pretension tensioning pulley (1) in direction of arrow.

Remove special tool 11 3 340. See **11 3 340 LOCKING PIN (2)**

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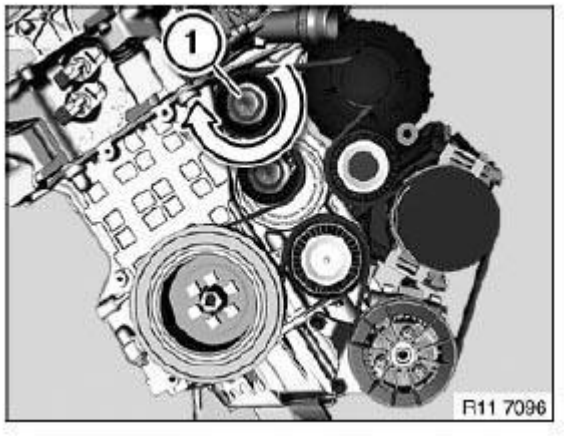


Fig. 137: Identifying Tensioning Pulley
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Note arrangement of drive belt

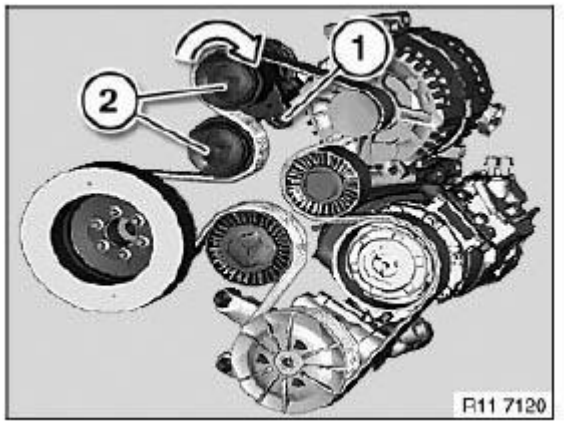


Fig. 138: Identifying Drive Belt Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Installation:

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

11 28 020 REPLACE ALTERNATOR DRIVE BELT TENSIONER (N54)

Special tools required:

- 11 3 340

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Necessary preliminary tasks:

- Remove drive belt.

Remove special tool 11 3 340. See **11 3 340 LOCKING PIN (2)**

Release screw on belt tensioner.

Tightening torque, see 11 28 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

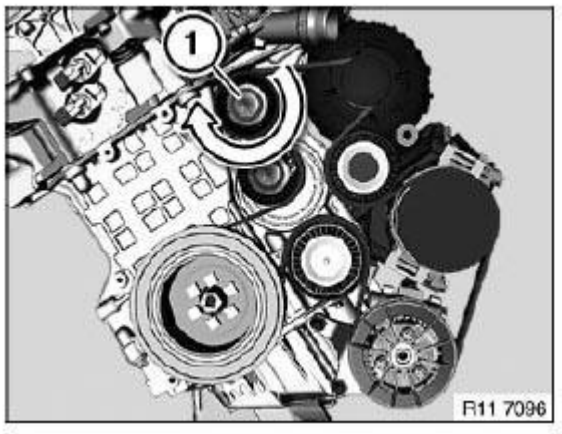


Fig. 139: Identifying Drive Belt Screw And Belt Routing
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

31 CAMSHAFT

11 31 005 CHECKING CAMSHAFT TIMING (N54)

Special tools required:

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

Necessary preliminary tasks:

- Remove cylinder head cover.
- Remove front splash guard.

Remove fastener (1) in direction of arrow.

Installation:

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Install fastener (1) with bore facing outwards.

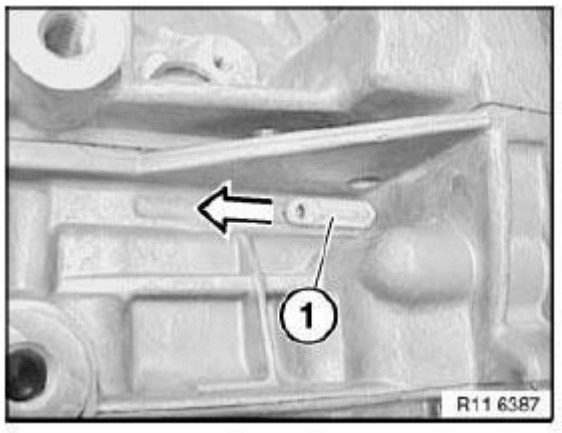


Fig. 140: Removing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

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

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

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

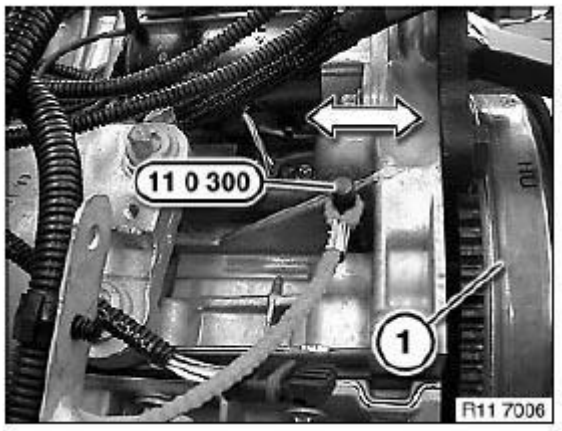


Fig. 141: Sliding In Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Roller cam follower is not actuated.

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

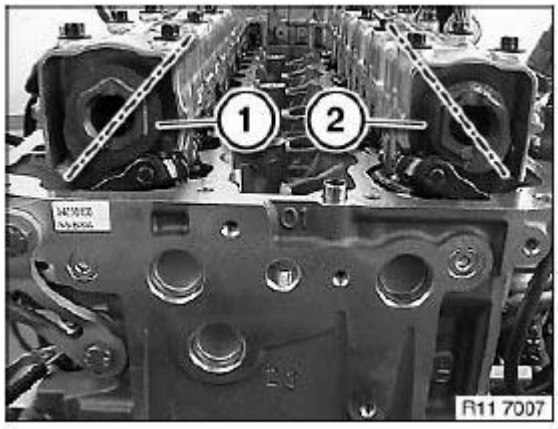


Fig. 142: Identifying 1st Cylinder In Firing TDC Position
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

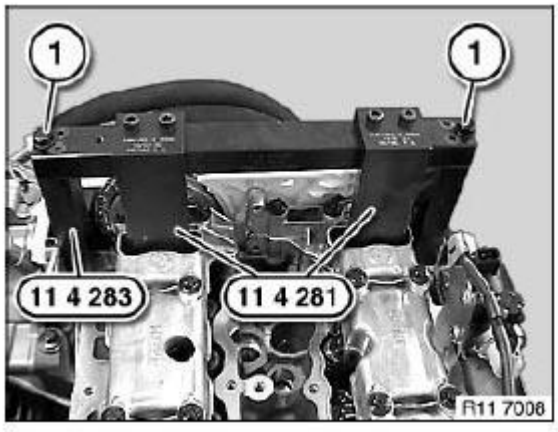


Fig. 143: Identifying Special Tool (11 4 283) On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

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Assemble engine.

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

Special tools required:

- 00 9 120
- 11 4 350
- 11 5 553
- 11 8 550
- 11 8 551
- 11 8 552
- 11 8 553
- 11 9 000

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

Risk of damage!

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

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

Necessary preliminary tasks:

- Remove cylinder head cover.
- Remove intake adjustment unit of intake camshaft

Release bearing cap screw connections from outside inwards.

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

NOTE: Illustration shows N52.

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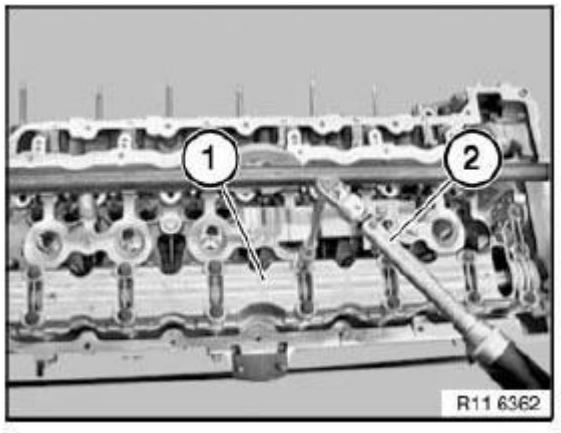


Fig. 144: Identifying Lower & Upper Bearing Banks
Courtesy of BMW OF NORTH AMERICA, INC.

Remove upper bearing shell.

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

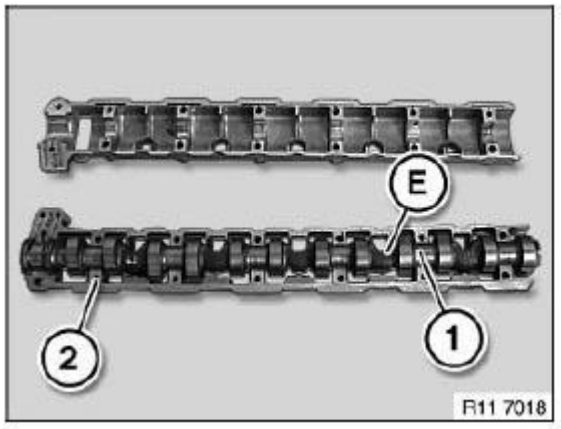


Fig. 145: Identifying Mark On Intake Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Both camshafts have different identifications.

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

A Exhaust camshaft.

E Intake camshaft

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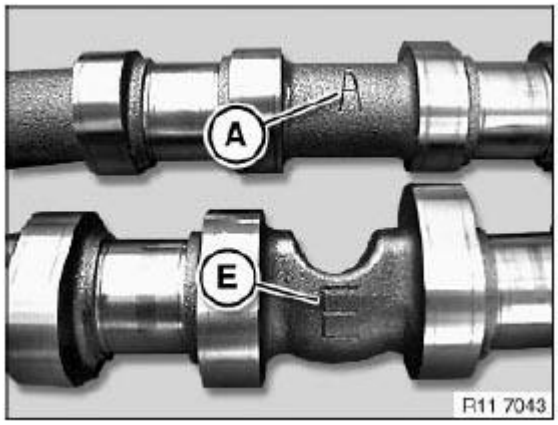


Fig. 146: Identifying Camshafts Identifications Mark
Courtesy of BMW OF NORTH AMERICA, INC.

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

Plain compression rings (1) are engaged at joint.

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

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

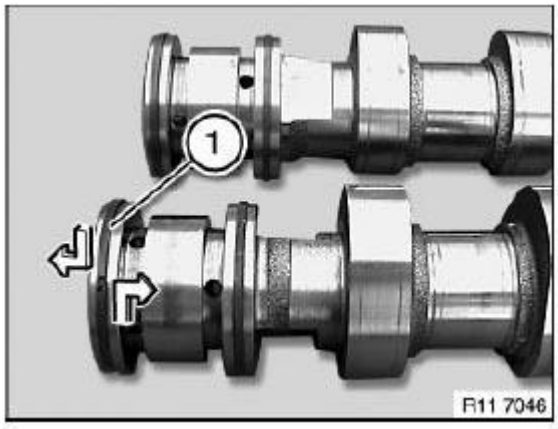


Fig. 147: Identifying Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Removal on engine:

Set engine to ignition TDC at cylinder No. 1.

Removed cylinder head:

When using special tool 11 9 000, it will be necessary to remove the aluminum

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profile insert. See 11 9 000 CYLINDER HEAD EXPANDER TOOL

Installing camshaft bearing bank:

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

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

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

E = intake side.

A = exhaust side.

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

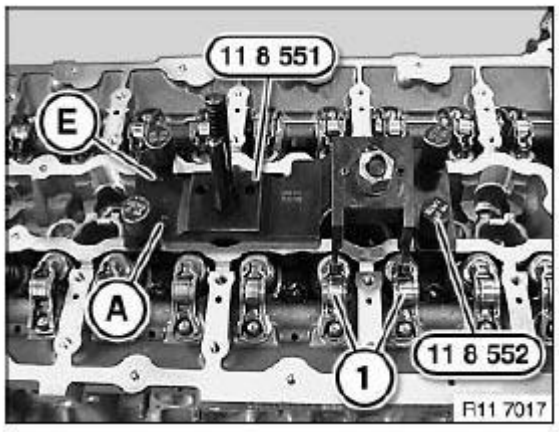


Fig. 148: Identifying Special Tool (11 8 552) In Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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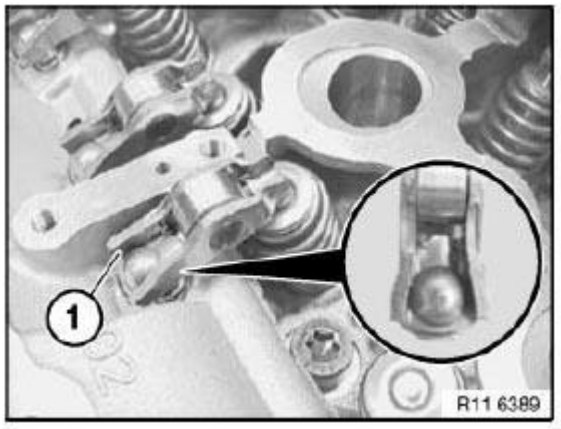


Fig. 149: Identifying Sure Roller Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Pre-install bearing strip of intake camshaft.

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

Installation:

Lay intake camshaft (1) in bearing strip.

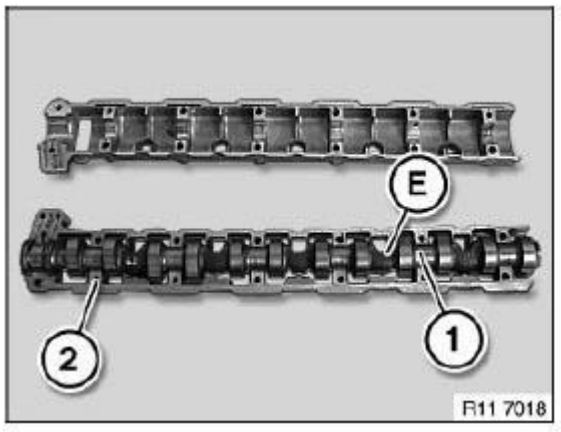


Fig. 150: Identifying Mark On Intake Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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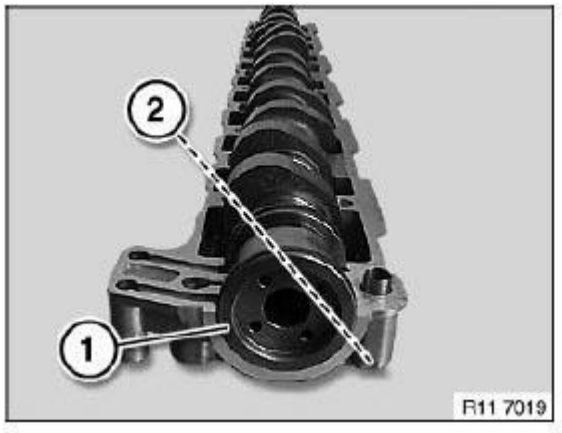


Fig. 151: Identifying Intake Camshaft Cylinder No. 1 Into Position
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

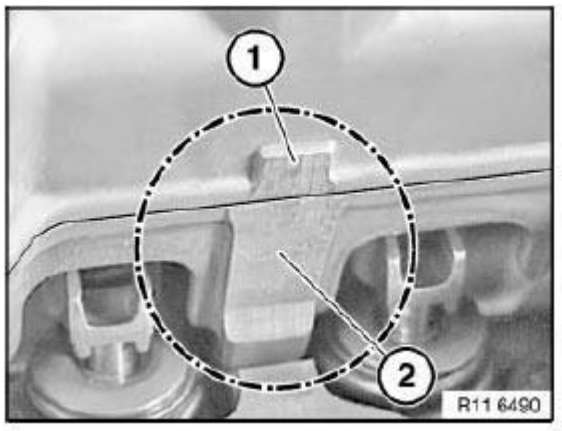


Fig. 152: Identifying Bearing Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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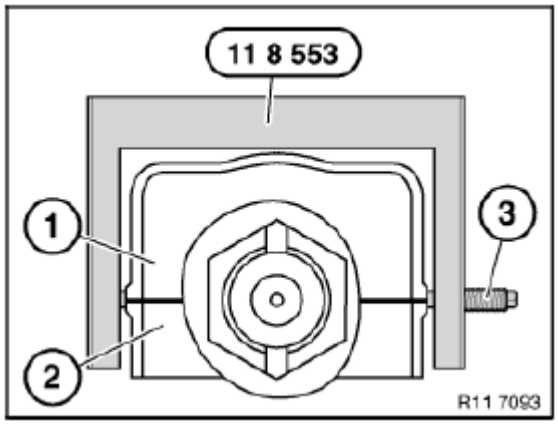


Fig. 153: Identifying Special Tool (11 8 553)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

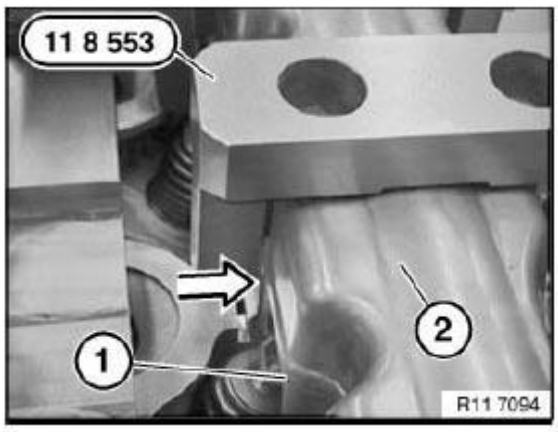


Fig. 154: Identifying Special Tool (11 8 553) Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten screw of special tool 11 5 553 to ground surfaces of lower bearing bank (1) and upper bearing bank (2).

IMPORTANT: Tighten screws on thrust piece to 2 Nm.

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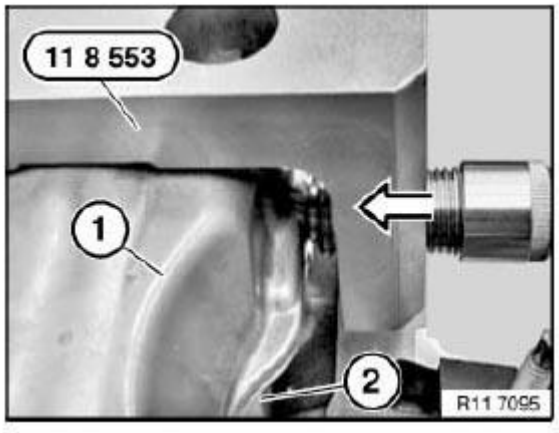


Fig. 155: Identifying Lower Bearing Bank & Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

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

Pretension all special tools 11 8 553 with special tool 11 4 350 only. See **11 4 350 TORQUE WRENCH**

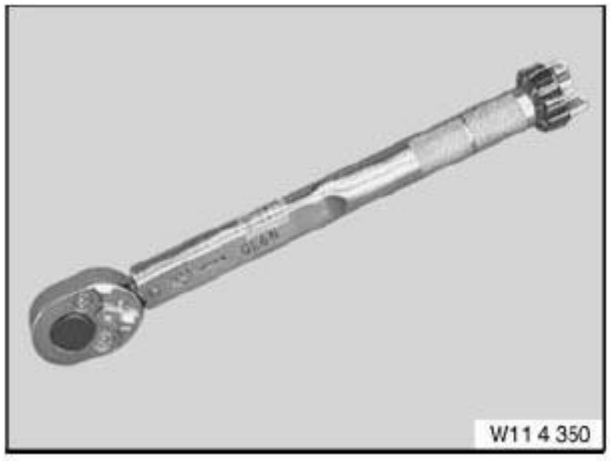


Fig. 156: Identifying Special Tool (11 4 350)
Courtesy of BMW OF NORTH AMERICA, INC.

Install upper and lower bearing strips (1).

Pre-install all special tools 11 8 553.

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

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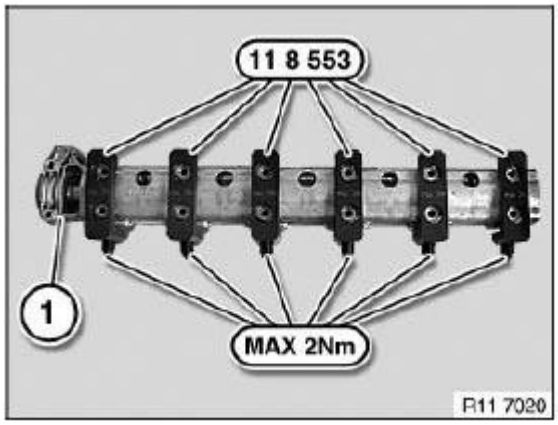


Fig. 157: Identifying Special Tools (11 8 553) With Upper & Lower Bearing Strips
Courtesy of BMW OF NORTH AMERICA, INC.

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

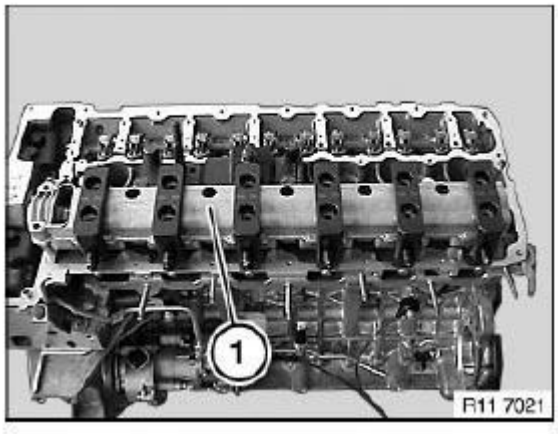


Fig. 158: Identifying Intake Camshaft With Bearing Strips
Courtesy of BMW OF NORTH AMERICA, INC.

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

Roller cam follower (2) is not actuated.

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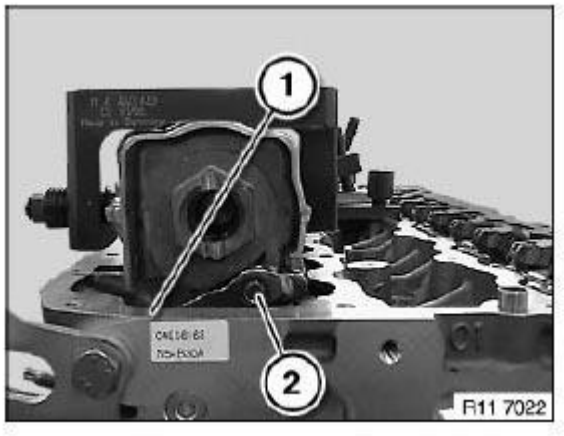


Fig. 159: Positioning Intake Camshaft 6th Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque, see 11 31 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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

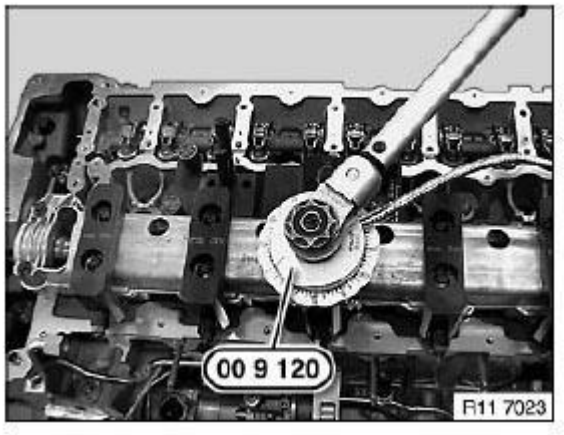


Fig. 160: Tightening Lower & Upper Bearing Banks With Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust valve timing.

Assemble engine.

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

Special tools required:

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- 00 9 120
- 11 4 350
- 11 5 553
- 11 8 550
- 11 8 551
- 11 8 552
- 11 8 553
- 11 9 000

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

Risk of damage!

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

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

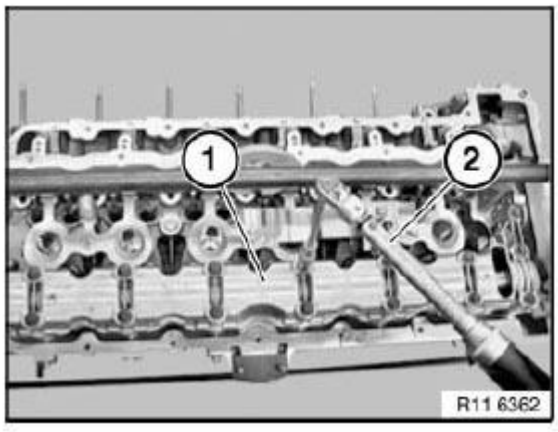
Necessary preliminary tasks:

- Remove cylinder head cover.
- Remove intake adjustment unit of intake camshaft

Release bearing cap screw connections from outside inwards.

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

NOTE: Illustration shows N52.



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Fig. 161: Identifying Lower & Upper Bearing Banks
Courtesy of BMW OF NORTH AMERICA, INC.

Remove upper bearing shell.

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

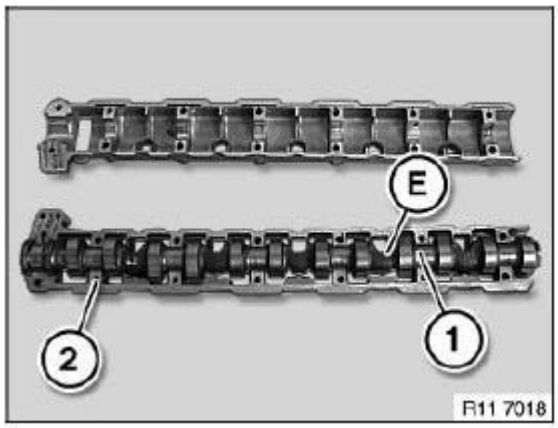


Fig. 162: Identifying Mark On Intake Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Both camshafts have different identifications.

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

A Exhaust camshaft.

E Intake camshaft

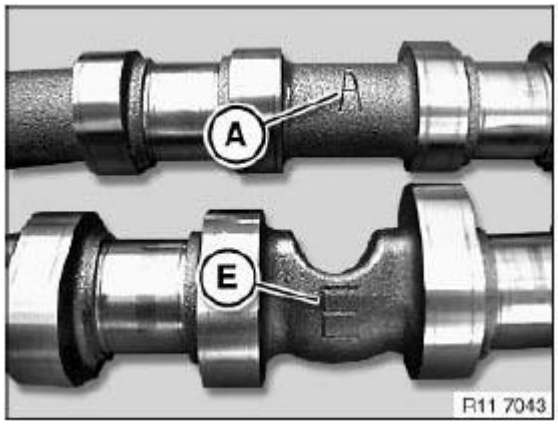


Fig. 163: Identifying Camshafts Identifications Mark
Courtesy of BMW OF NORTH AMERICA, INC.

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

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Plain compression rings (1) are engaged at joint.

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

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

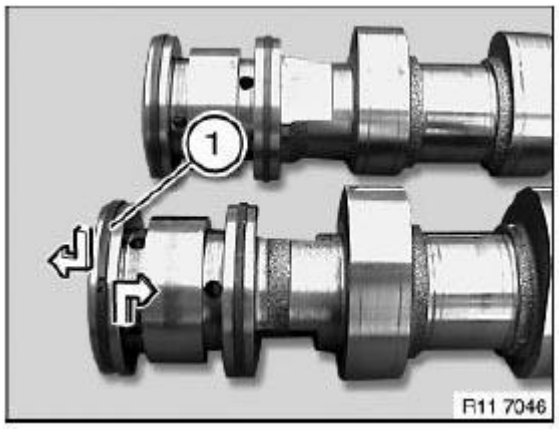


Fig. 164: Identifying Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Removal on engine:

Set engine to ignition TDC at cylinder No. 1.

Removed cylinder head:

When using special tool 11 9 000, it will be necessary to remove the aluminum profile insert. See 11 9 000 CYLINDER HEAD EXPANDER TOOL

Installing camshaft bearing bank:

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

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

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

E = intake side.

A = exhaust side.

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

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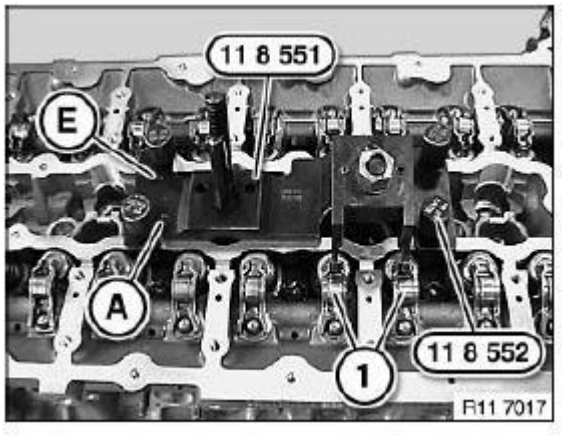


Fig. 165: Identifying Special Tool (11 8 551) With Letters E & A
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

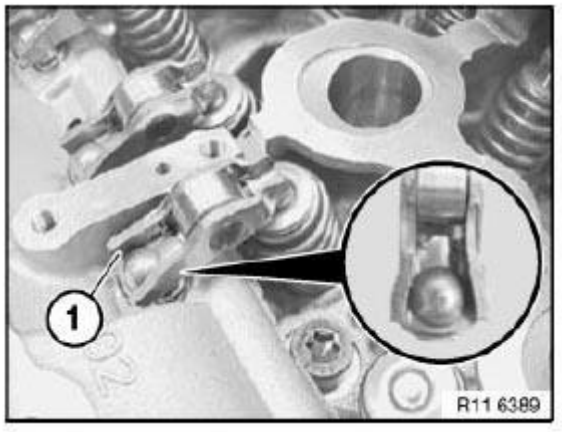


Fig. 166: Identifying Sure Roller Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Pre-install bearing strip of intake camshaft.

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

Installation:

Lay intake camshaft (1) in bearing strip.

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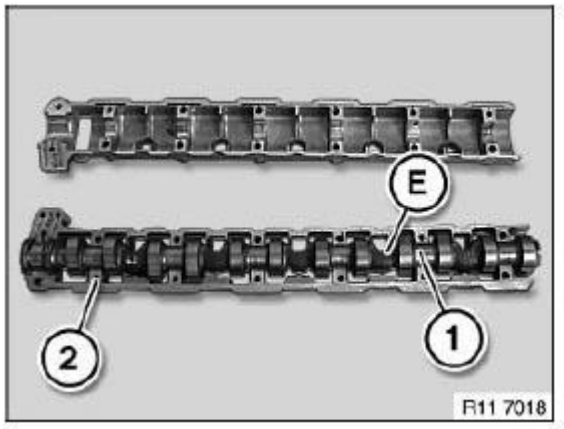


Fig. 167: Identifying Mark On Intake Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

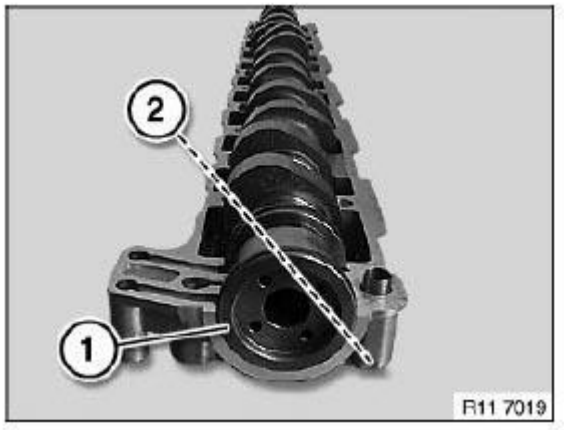


Fig. 168: Identifying Intake Camshaft Cylinder No. 1 Into Position
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

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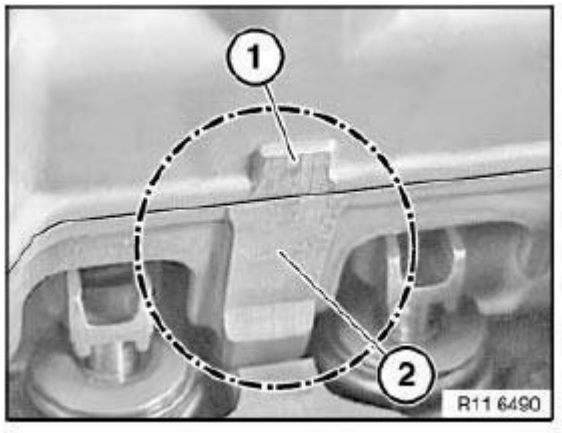


Fig. 169: Identifying Bearing Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

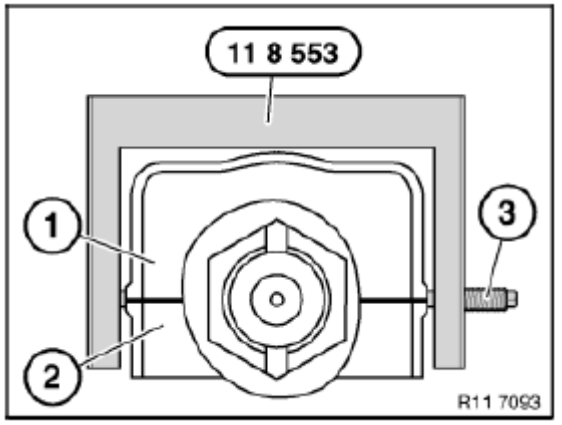


Fig. 170: Identifying Special Tool (11 8 553)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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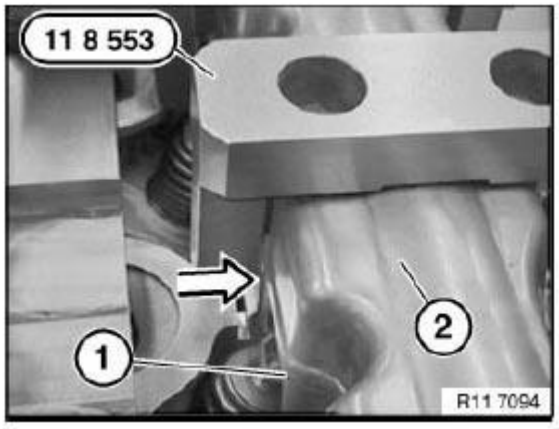


Fig. 171: Identifying Special Tool (11 8 553) Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten screw of special tool 11 5 553 to ground surfaces of lower bearing bank (1) and upper bearing bank (2).

IMPORTANT: Tighten screws on thrust piece to 2 Nm.

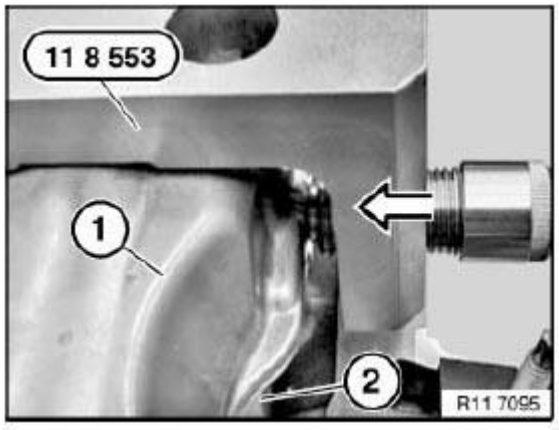


Fig. 172: Identifying Lower Bearing Bank & Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: ***Set special tool 11 4 350 to 2 Nm. See 11 4 350 TORQUE WRENCH***

Pretension all special tools 11 8 553 with special tool 11 4 350 only. See 11 4 350 TORQUE WRENCH

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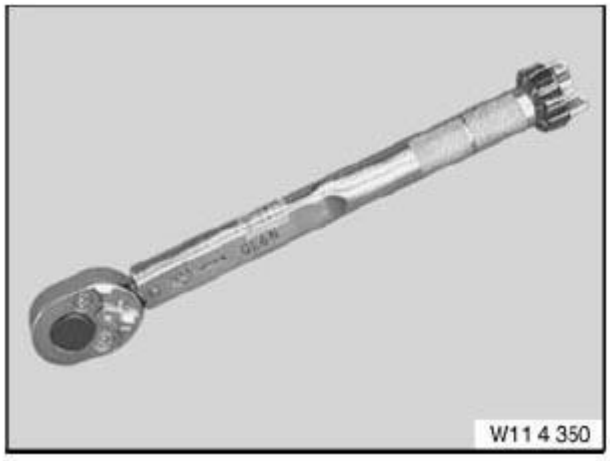


Fig. 173: Identifying Special Tool (11 4 350)
Courtesy of BMW OF NORTH AMERICA, INC.

Install upper and lower bearing strips (1).

Pre-install all special tools 11 8 553.

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

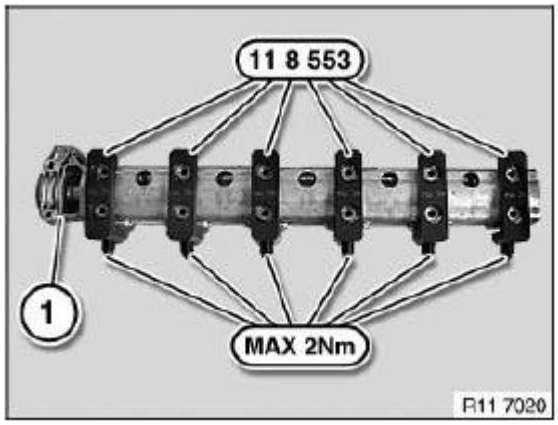


Fig. 174: Identifying Special Tools (11 8 553) With Upper & Lower Bearing Strips
Courtesy of BMW OF NORTH AMERICA, INC.

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

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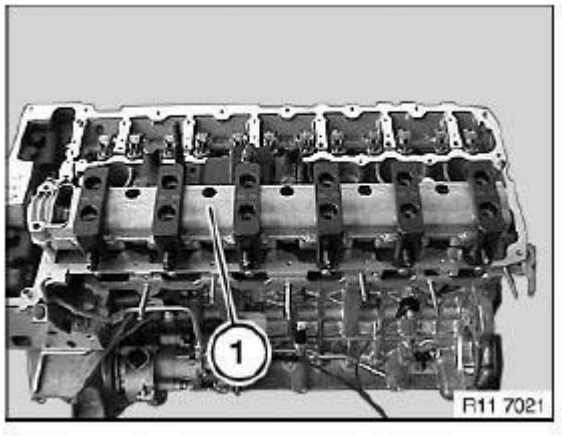


Fig. 175: Identifying Intake Camshaft With Bearing Strips
Courtesy of BMW OF NORTH AMERICA, INC.

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

Roller cam follower (2) is not actuated.

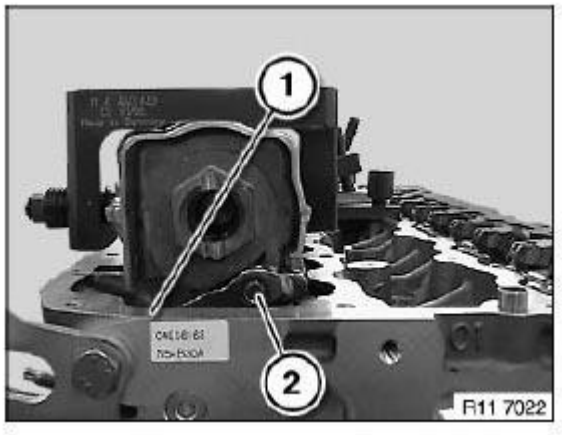


Fig. 176: Positioning Intake Camshaft 6th Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque, see 11 31 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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

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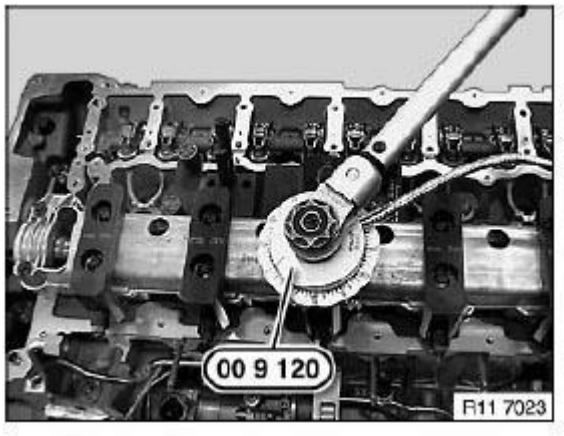


Fig. 177: Tightening Lower & Upper Bearing Banks With Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust valve timing.

Assemble engine.

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

Special tools required:

- 00 9 120
- 11 4 350
- 11 5 553
- 11 8 550
- 11 8 551
- 11 8 552
- 11 8 553
- 11 9 000

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

Risk of damage!

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

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

Necessary preliminary tasks:

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- Remove cylinder head cover.
- Remove intake adjustment unit of intake camshaft

Release bearing cap screw connections from outside inwards.

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

NOTE: Illustration shows N52.

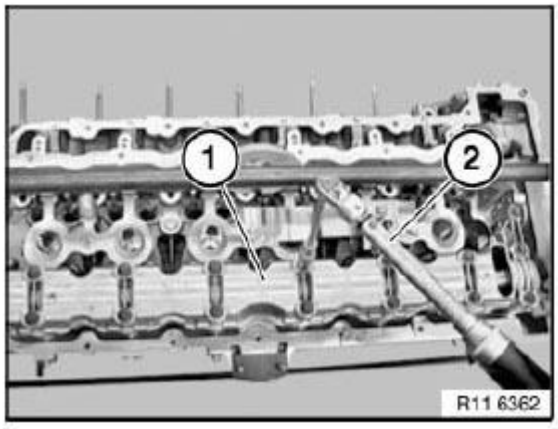


Fig. 178: Identifying Lower & Upper Bearing Banks
Courtesy of BMW OF NORTH AMERICA, INC.

Remove upper bearing shell.

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

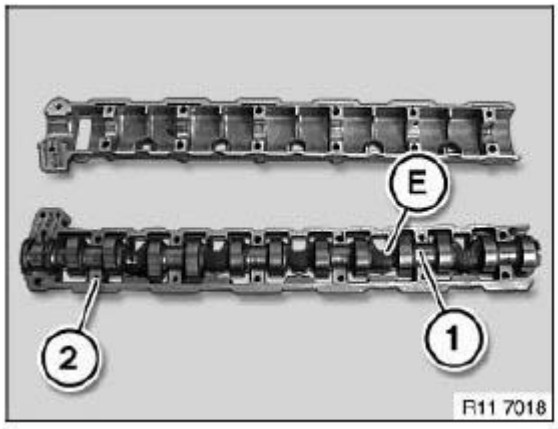


Fig. 179: Identifying Mark On Intake Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Both camshafts have different identifications.

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

A Exhaust camshaft.

E Intake camshaft

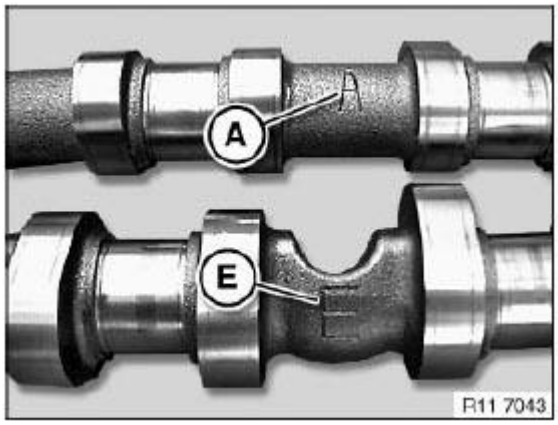


Fig. 180: Identifying Camshafts Identifications Mark
Courtesy of BMW OF NORTH AMERICA, INC.

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

Plain compression rings (1) are engaged at joint.

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

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

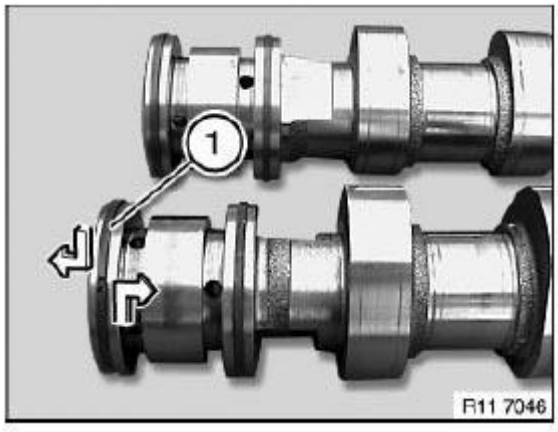


Fig. 181: Identifying Plain Compression Rings
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Removal on engine:

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Set engine to ignition TDC at cylinder No. 1.

Removed cylinder head:

When using special tool 11 9 000, it will be necessary to remove the aluminum profile insert. See 11 9 000 CYLINDER HEAD EXPANDER TOOL

Installing camshaft bearing bank:

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

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

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

E = intake side.

A = exhaust side.

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

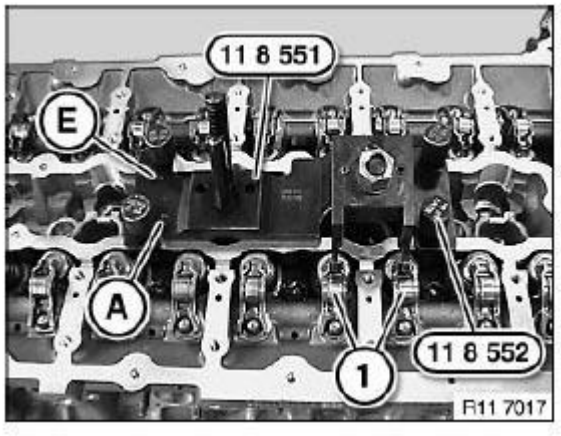


Fig. 182: Identifying Special Tool (11 8 551) With Letters E & A
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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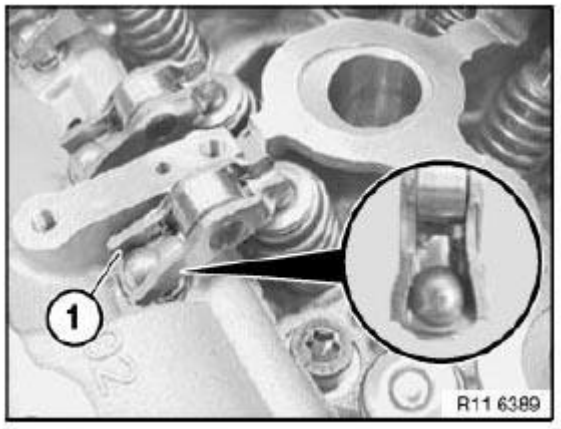


Fig. 183: Identifying Sure Roller Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Pre-install bearing strip of intake camshaft.

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

Installation:

Lay intake camshaft (1) in bearing strip.

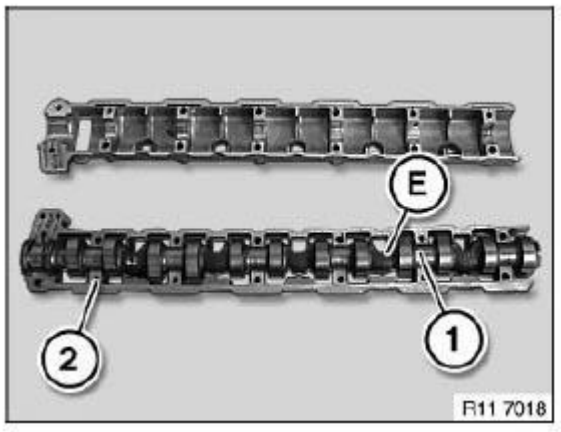


Fig. 184: Identifying Mark On Intake Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

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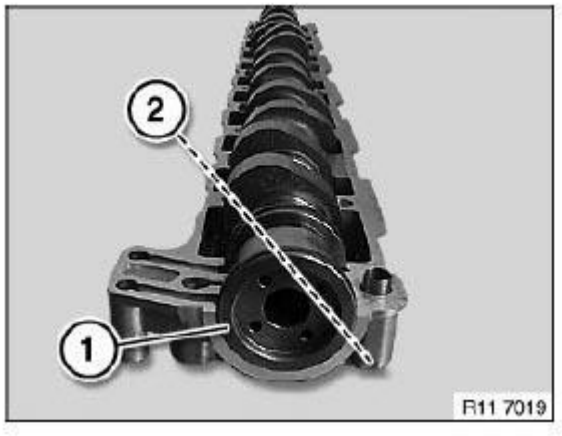


Fig. 185: Identifying Intake Camshaft Cylinder No. 1 Into Position
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

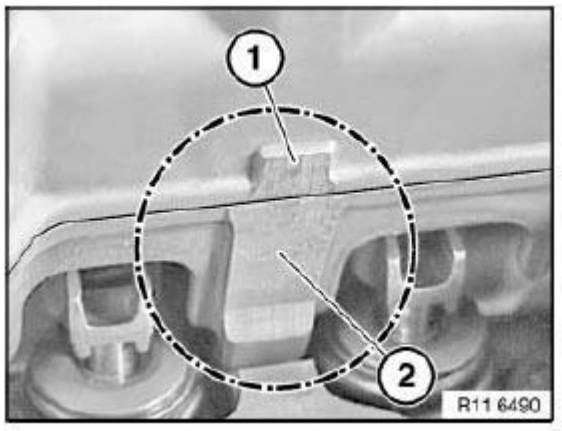


Fig. 186: Identifying Bearing Ground Surfaces
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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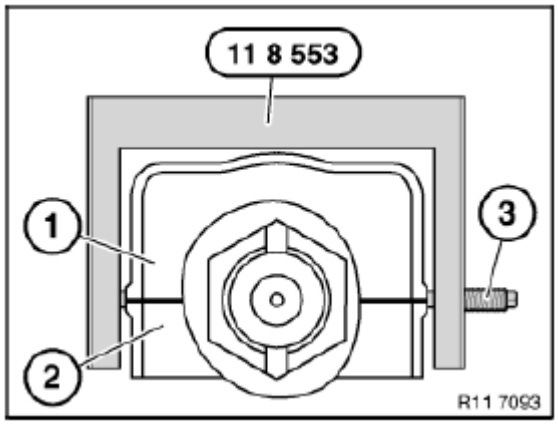


Fig. 187: Identifying Special Tool (11 8 553)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

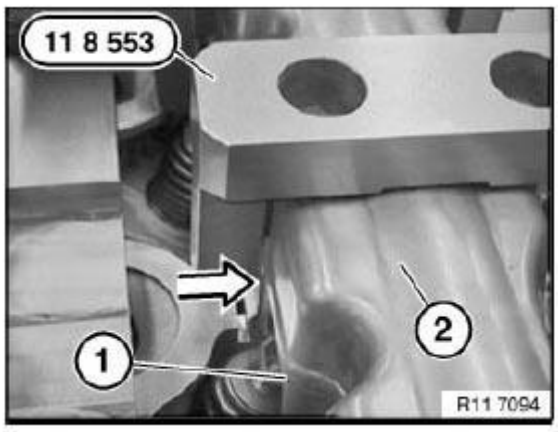


Fig. 188: Identifying Special Tool (11 8 553) Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten screw of special tool 11 5 553 to ground surfaces of lower bearing bank (1) and upper bearing bank (2).

IMPORTANT: Tighten screws on thrust piece to 2 Nm.

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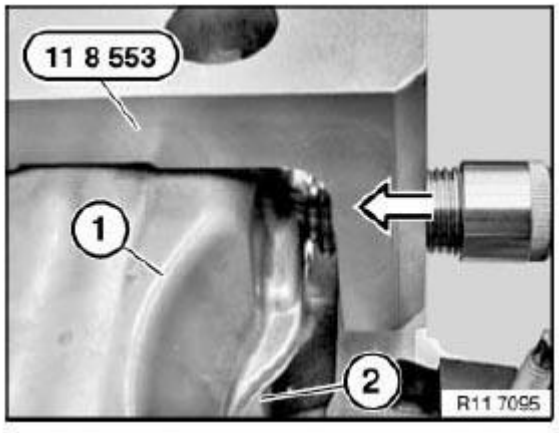


Fig. 189: Identifying Lower Bearing Bank & Upper Bearing Bank
Courtesy of BMW OF NORTH AMERICA, INC.

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

Pretension all special tools 11 8 553 with special tool 11 4 350 only.

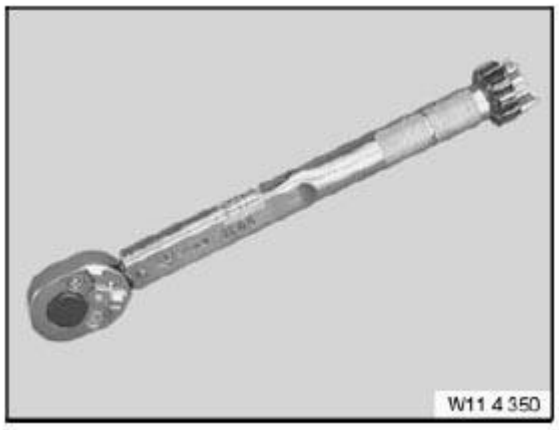


Fig. 190: Identifying Special Tool (11 4 350)
Courtesy of BMW OF NORTH AMERICA, INC.

Install upper and lower bearing strips (1).

Pre-install all special tools 11 8 553.

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

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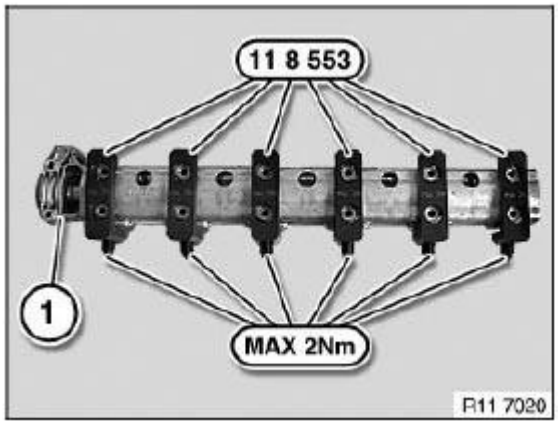


Fig. 191: Identifying Special Tools (11 8 553) With Upper & Lower Bearing Strips
Courtesy of BMW OF NORTH AMERICA, INC.

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

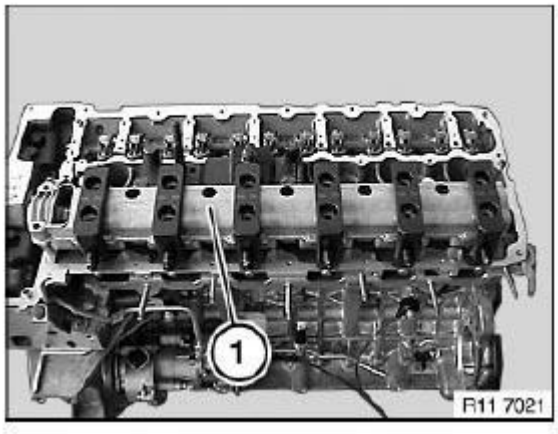


Fig. 192: Identifying Intake Camshaft With Bearing Strips
Courtesy of BMW OF NORTH AMERICA, INC.

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

Roller cam follower (2) is not actuated.

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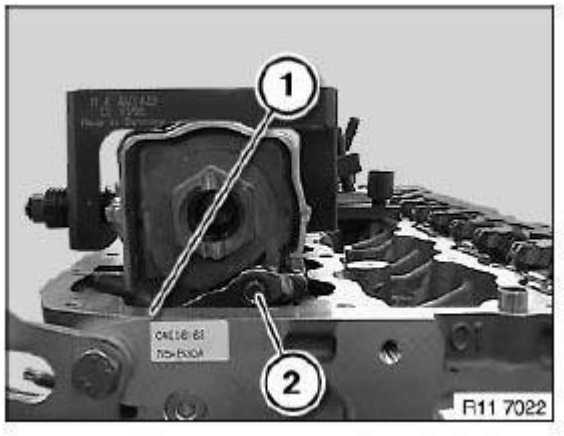


Fig. 193: Positioning Intake Camshaft 6th Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque, see 11 31 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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

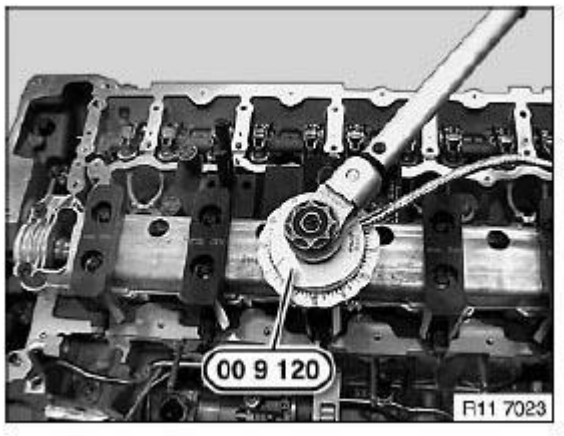


Fig. 194: Tightening Lower & Upper Bearing Banks With Special Tool (00 9 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust valve timing.

Assemble engine.

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

Release chain tensioner (1).

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Tightening torque, see 11 31 5AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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

Installation:

No sealing ring is fitted during series-production assembly.

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

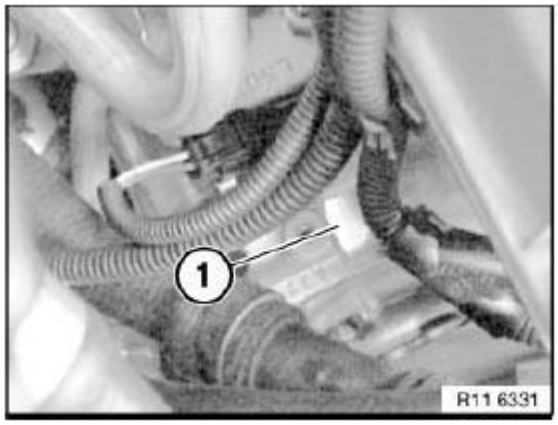


Fig. 195: Identifying Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

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

Repeat procedure twice.



Fig. 196: Placing Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

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Assemble engine.

11 31 505 ADJUSTING CAMSHAFT TIMING (N54)

Special tools required:

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

IMPORTANT: ***Risk of damage!***

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

Necessary preliminary tasks:

- Remove cylinder head cover.

Remove fastener (1) in direction of arrow.

Installation:

Install fastener (1) with bore facing outwards.

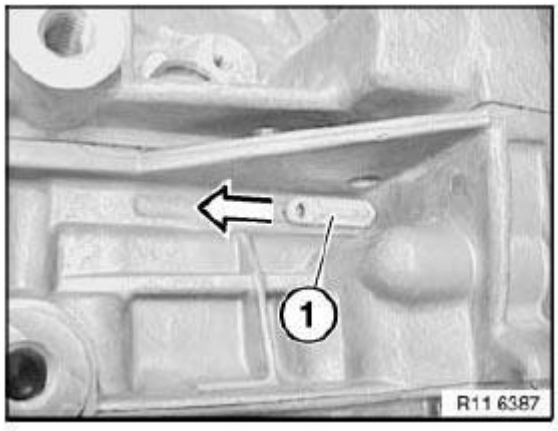


Fig. 197: Removing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate crankshaft at central bolt into TDC position.

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

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

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

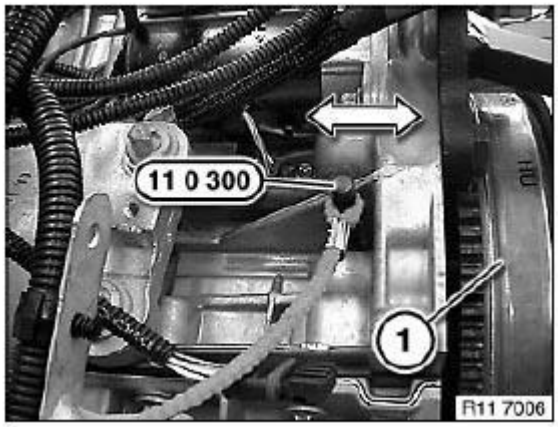


Fig. 198: Sliding In Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

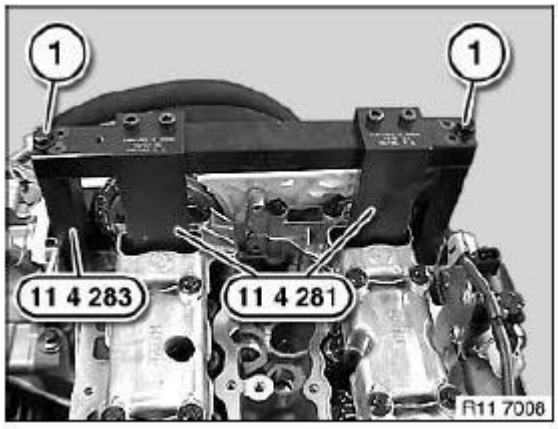


Fig. 199: Identifying Special Tool (11 4 283) On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

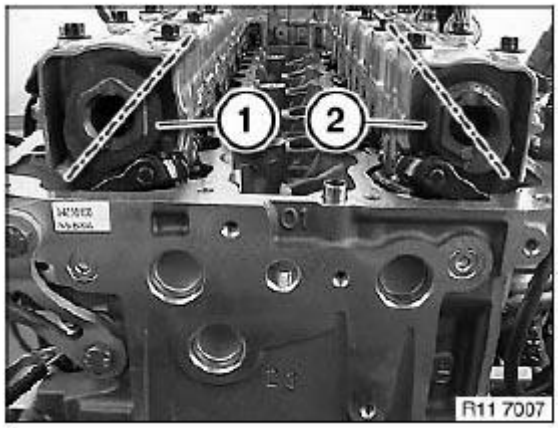


Fig. 200: Identifying 1st Cylinder In Firing TDC Position
Courtesy of BMW OF NORTH AMERICA, INC.

Release central bolt (1) of exhaust camshaft.

Installation:

Replace screw (1).

Tightening torque, see 11 36 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Release central bolt (2) of inlet camshaft.

Installation:

Replace screw (2).

Tightening torque, see 11 36 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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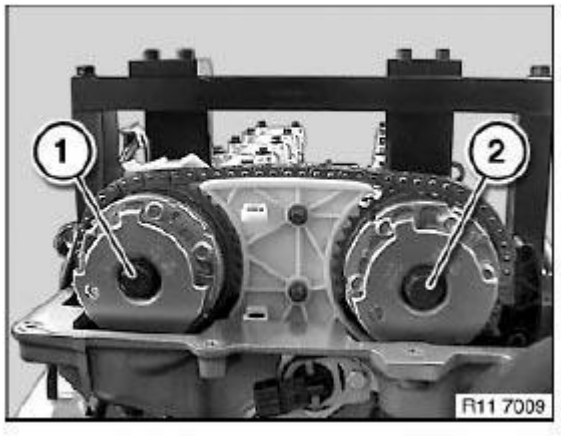


Fig. 201: Identifying Inlet & Exhaust Camshaft Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate sensor gears until locating pins on special tool 11 8 520 match up. See **11 8 520 GAUGE WITH SCREWS**

Push special tool 11 8 520 onto cylinder head. See **11 8 520 GAUGE WITH SCREWS**

Secure special tool 11 8 520 with bolts (1 and 2). See **11 8 520 GAUGE WITH SCREWS**

NOTE: Bolts (1 and 2) M6x45 with captive shim.

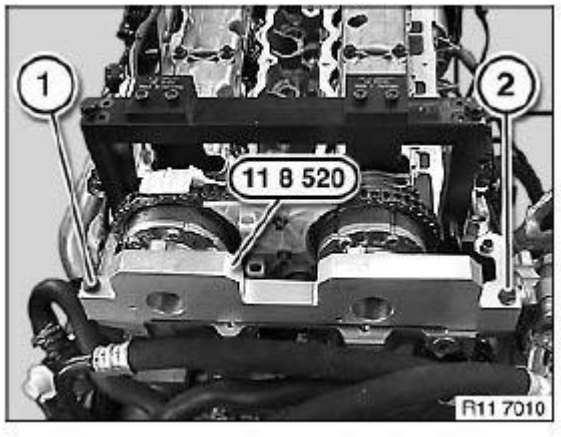


Fig. 202: Identifying Special Tool (11 8 520) Onto Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Remove chain tensioner (1).

Screw special tool 11 9 340 into cylinder head. See **11 9 340 CHAIN TENSIONER, COMPLETE**

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

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

Tightening torque, see 11 36 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

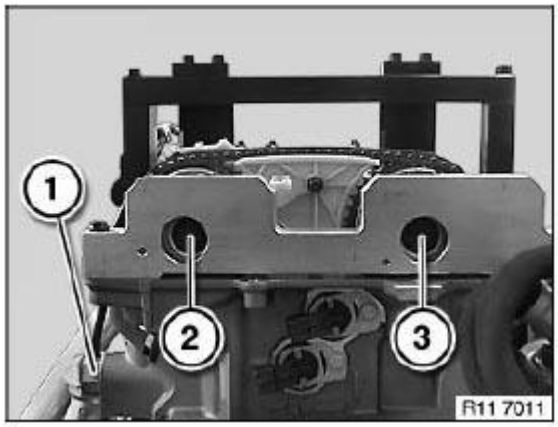


Fig. 203: Identifying Central Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

33 ROCKER ARM WITH BEARING

11 33 050 REMOVING AND INSTALLING/REPLACING ALL CAM FOLLOWERS (N54)

Special tools required:

- 11 4 480

IMPORTANT: Rocker arms (1) are divided into bearing categories.

The tolerance classes are identified in numbers from 1 to 6.

Already used rocker arms (1) may only be reused in the same position.

A classification is not necessary in the N54 engine; in the event of replacement, all numbers from 1 to 6 can alternatively be installed.

Necessary preliminary tasks:

- Remove cylinder head cover.
- Remove inlet camshaft.
- Remove exhaust camshaft.

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

Set down roller cam followers in tidy and orderly fashion; if necessary, set down in special tool 11 4 480. See **11 4 480 PLACEMENT BOARDS (2X)**

Installation:

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

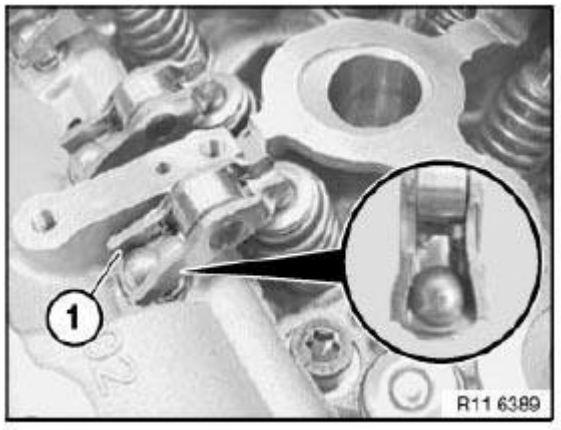


Fig. 204: Identifying Sure Roller Cam Follower
Courtesy of BMW OF NORTH AMERICA, INC.

Remove HVCA element in direction of arrow.

Installation:

If the HVCA elements are to be reused, set them down if necessary in special tool 11 4 480 in a tidy and orderly fashion with the roller cam followers. See **11 4 480 PLACEMENT BOARDS (2X)**

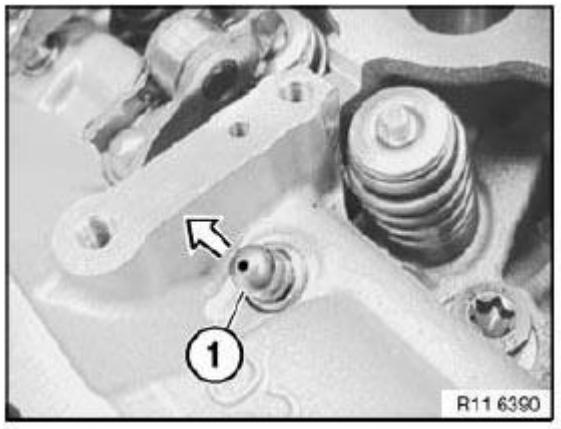


Fig. 205: Removing HVCA Element
Courtesy of BMW OF NORTH AMERICA, INC.

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Assemble engine.

34 VALVES WITH SPRINGS

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

Special tools required:

- 11 4 480

Necessary preliminary tasks:

- Remove cylinder head.
- Remove inlet camshaft.
- Remove exhaust camshaft.
- Remove roller cam follower.
- Remove valve springs.
- Remove valve stem seals.

Arrangement:

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

If the valves are to be reused, set then down in special tool 11 4 480 in a tidy and orderly fashion. See **11 4 480 PLACEMENT BOARDS (2X)**

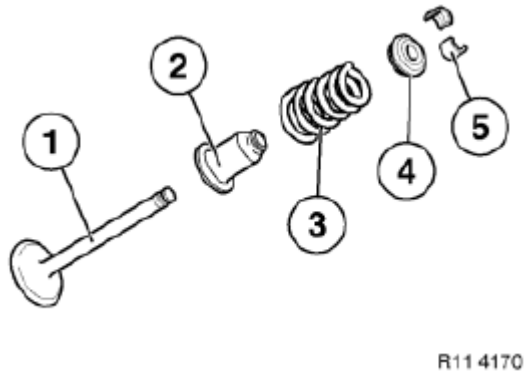


Fig. 206: Identifying Valve Arrangement Position
Courtesy of BMW OF NORTH AMERICA, INC.

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Assemble engine.

Check function of DME.

11 34 560 REPLACING ALL VALVE STEM SEALS (N54)

Special tools required:

- 11 1 480
- 11 6 380

Necessary preliminary tasks:

- Remove cylinder head.
- Remove inlet camshaft.
- Remove exhaust camshaft.
- Remove roller cam follower.
- Remove all valve springs.

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

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

Installation:

Insert all valves.

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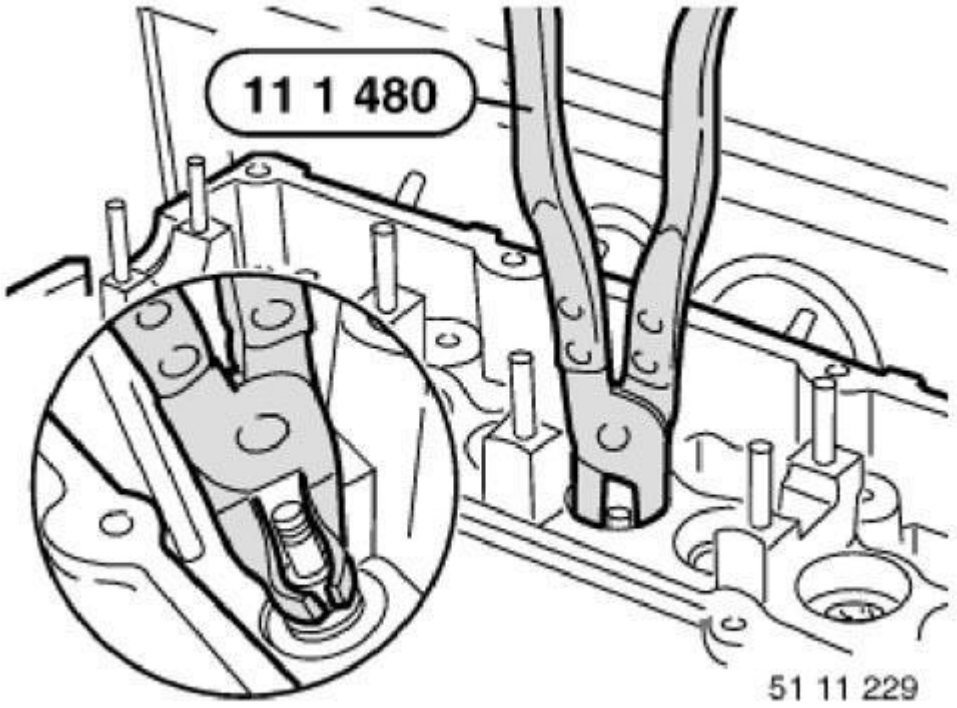


Fig. 207: Identifying Special Tool (11 1 480) Onto Old Valve Stem Seals
Courtesy of BMW OF NORTH AMERICA, INC.

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

This modification has already been taken into account for reordering.

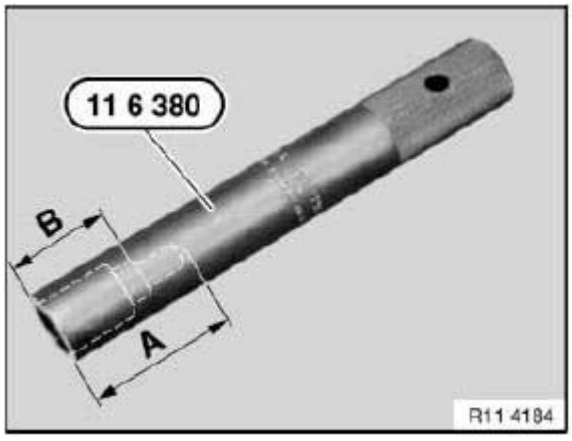


Fig. 208: Identifying Special Tool (11 6 380) Dimension

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Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Different diameters at valve stem.

All valve stem seals are color-coded.

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

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

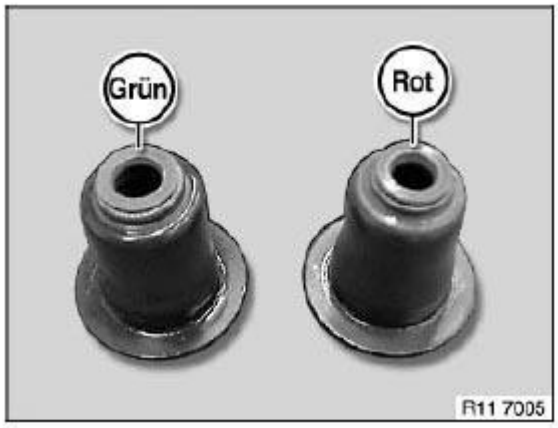


Fig. 209: Identifying Valve Stem Seals Color-Coded
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

Lubricate mounting sleeve.

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

NOTE: Illustrations show N46.

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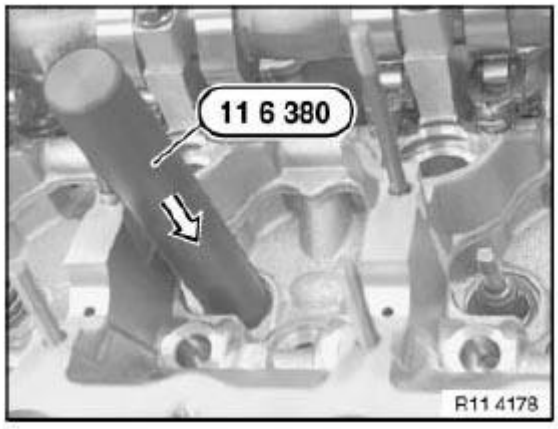


Fig. 210: Identifying Special Tool (11 6 380) On Valve Stem Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

11 34 715 REPLACING ALL VALVE SPRINGS (N54)

Special tools required:

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

IMPORTANT: Different valve stem diameters.

Mixing up the valve springs will result in damage to the engine.

Necessary preliminary tasks:

- Remove cylinder head cover.
- Remove cylinder head.
- Remove exhaust camshaft.
- Remove intake camshaft.
- Remove roller cam follower.

Inlet valves:

Place cylinder head on special tool 11 9 000. See **11 9 000 CYLINDER HEAD EXPANDER TOOL**

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

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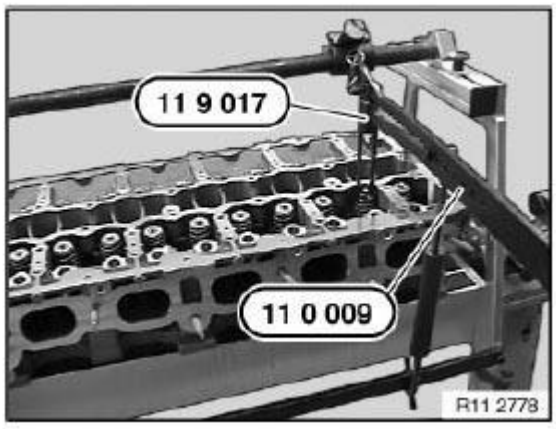


Fig. 211: Identifying Special Tool (11 9 000) On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Exhaust valves:

Place cylinder head on special tool 11 9 000. See **11 9 000 CYLINDER HEAD EXPANDER TOOL**

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

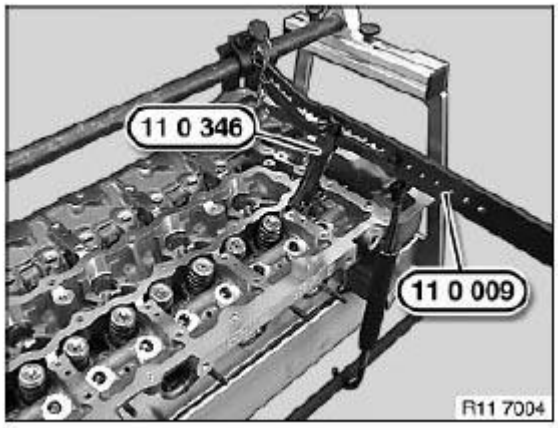


Fig. 212: Identifying Special Tools (11 0 009 & 11 0 346) On Spring Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

Remove valve tapers with a magnet.

Remove valve spring and spring retainer.

Set down on special tool 11 4 480 in a tidy and orderly fashion. See **11 4 480 PLACEMENT BOARDS (2X)**

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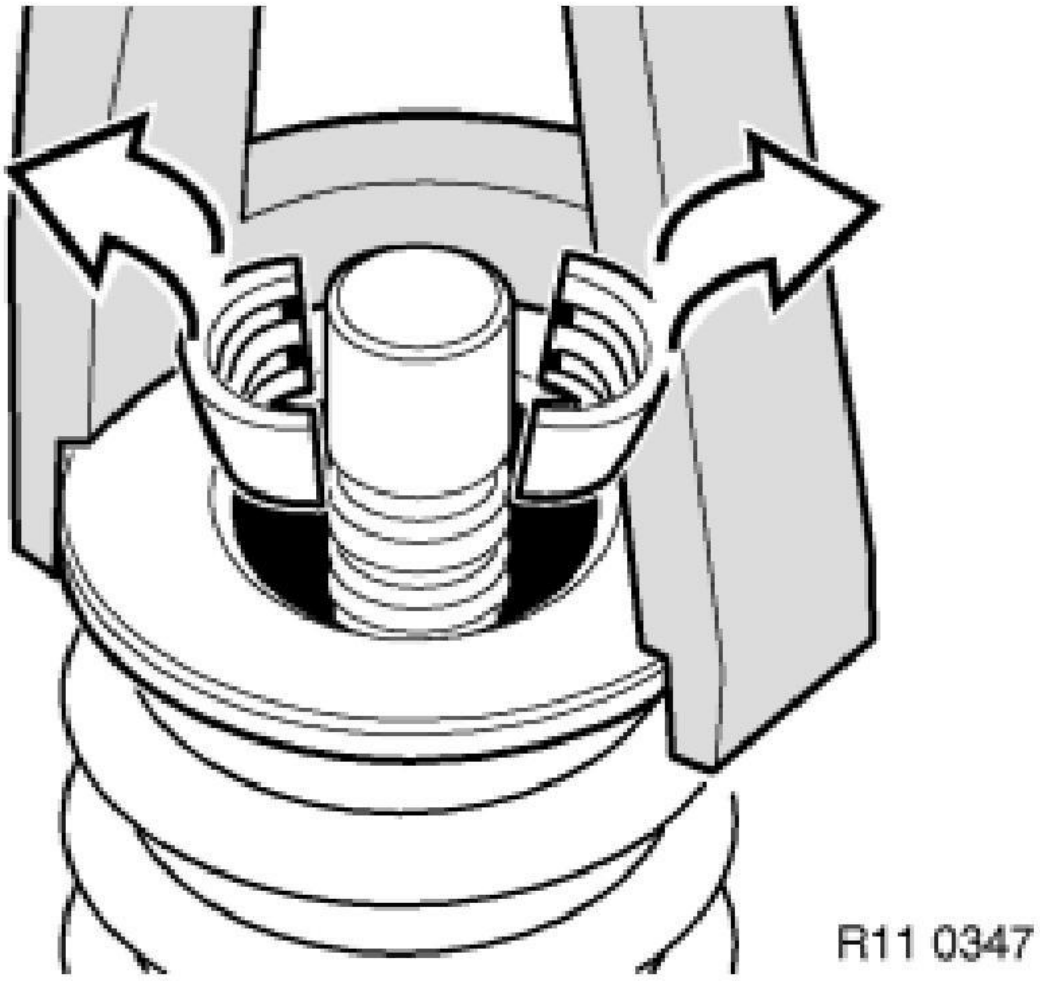


Fig. 213: Removing Valve Spring & Spring Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Incorrect installation possible.

Incorrect installation will result in valve spring breakage.

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

Installation:

Inlet valve: Violet/green or violet/yellow

Exhaust valve: White/green or white/yellow

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

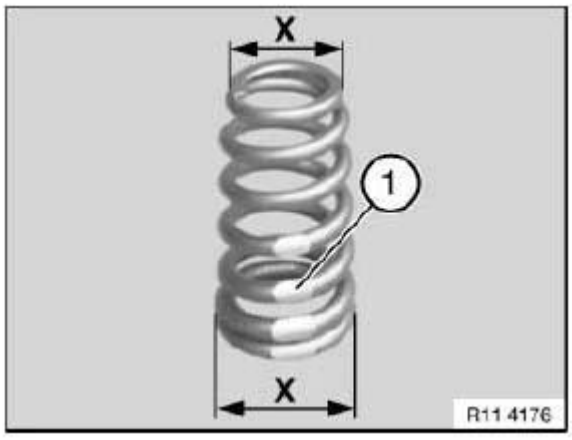


Fig. 214: Identifying Color Mark On Valve Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement:

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

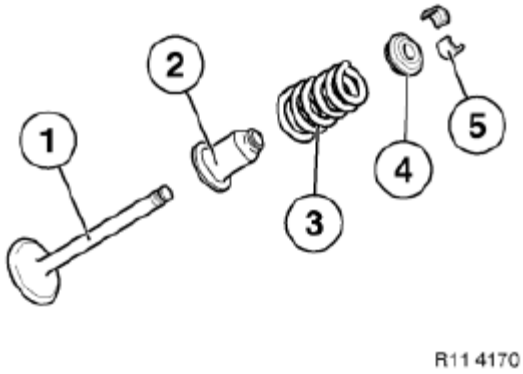


Fig. 215: Identifying Valve Arrangement Position
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

36 VARIABLE CAMSHAFT TIMING

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

Special tools required:

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

IMPORTANT: To open central bolts on adjustment units and camshafts.

Fit special tool 11 4 280. See 11 4 280 GAUGE

Necessary preliminary tasks:

- Remove cylinder head cover.

Remove fastener (1) in direction of arrow.

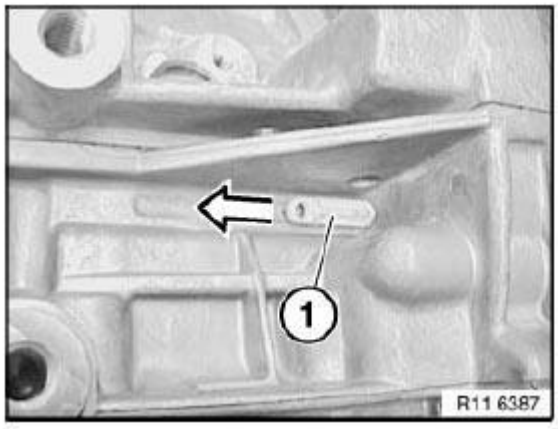


Fig. 216: Removing Fastener
Courtesy of BMW OF NORTH AMERICA, INC.

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

Rotate flywheel (1) at central bolt until firing TDC position at 1st cylinder is reached.

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

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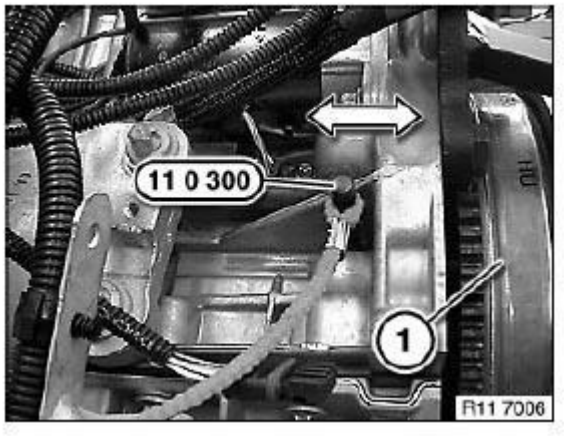


Fig. 217: Sliding In Special Tool (11 0 300)
Courtesy of BMW OF NORTH AMERICA, INC.

With 1st cylinder in firing TDC position, inlet camshaft (1) at 6th cylinder points downwards at an angle to the left.

With 1st cylinder in firing TDC position, exhaust camshaft (2) at 6th cylinder points downwards at an angle to the right.

Installation:

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

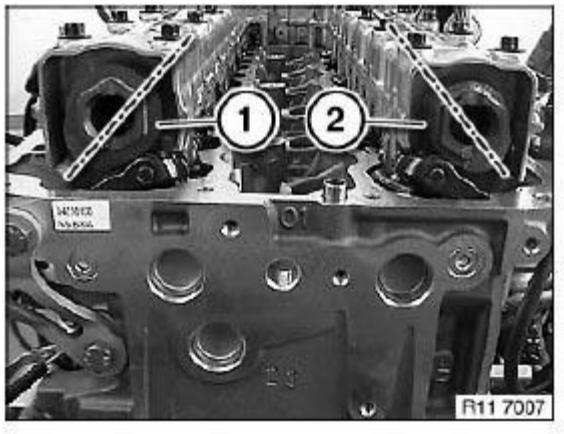


Fig. 218: Identifying 1st Cylinder In Firing TDC Position
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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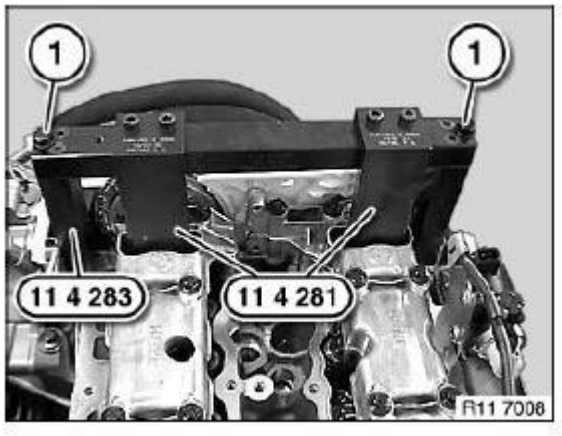


Fig. 219: Identifying Special Tool (11 4 283) On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Release central bolt of exhaust adjustment unit (1).

Release central bolt of inlet adjustment unit (2).

Tightening torque, see 11 36 1AZ im **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Release chain tensioner . See **11 31 090 INSTALLING AND REMOVING/REPLACING CHAIN TENSIONER PISTON (N54)**

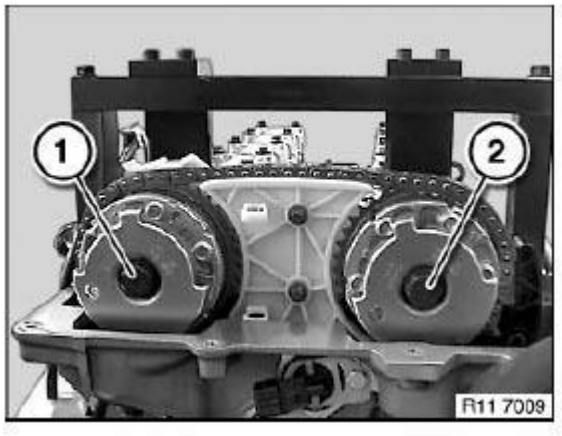


Fig. 220: Identifying Inlet & Exhaust Camshaft Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Detach exhaust adjustment unit (1) from exhaust camshaft.

Detach inlet adjustment unit (2) from inlet camshaft.

Installation:

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

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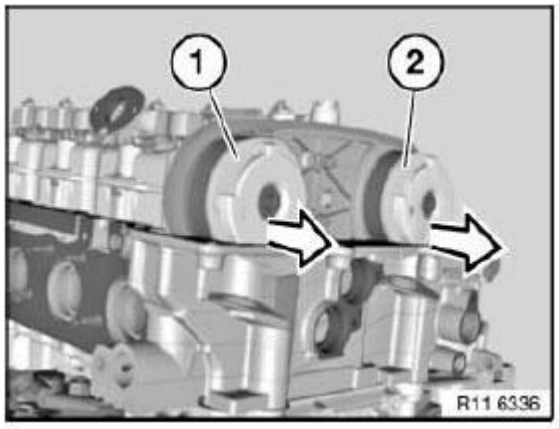


Fig. 221: Identifying Inlet & Exhaust Adjustment Unit
Courtesy of BMW OF NORTH AMERICA, INC.

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

The inlet and exhaust adjustment units are different.

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

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

Sensor gears can be fitted alternatively.

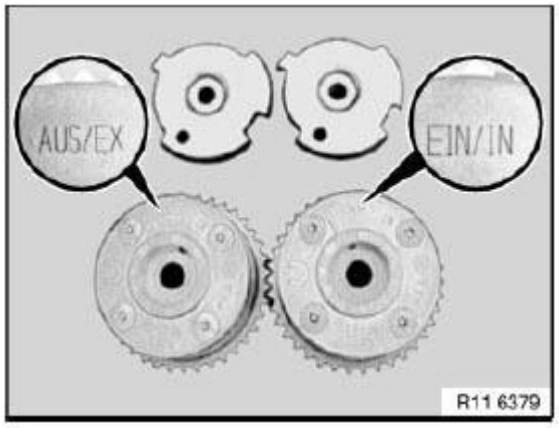


Fig. 222: Identifying Marked With AUS & EX For Exhaust Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Illustration number 1170-09

Fit both adjustment units on camshafts.

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

Installation:

Replace screws (1 and 2).

Insert screws (1 and 2).

Fit chain tensioner.

Secure screws (1 and 2).

Tightening torque, see 11 36 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

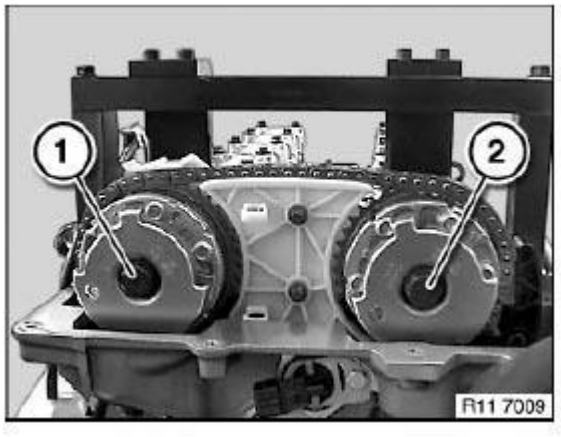


Fig. 223: Identifying Inlet & Exhaust Camshaft Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Incorrect installation possible.

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

NOTE: Schematic representation on removed chain drive.

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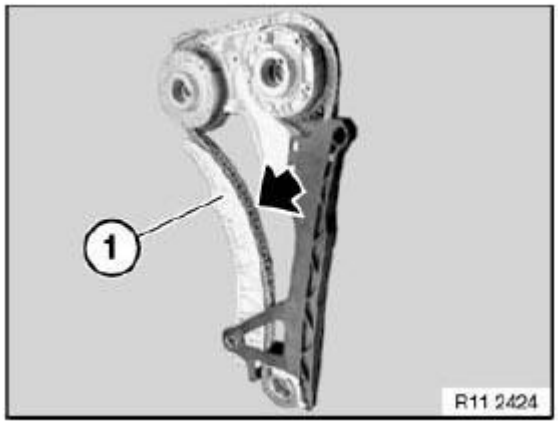


Fig. 224: Identifying Timing Chain
Courtesy of BMW OF NORTH AMERICA, INC.

Remove all special tools.

Assemble engine.

40 OIL SUPPLY

11 40 000 CHECKING ENGINE OIL PRESSURE (N54)

Special tools required:

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

Necessary preliminary tasks:

- Remove acoustic cover.

Disconnect plug connection on oil pressure switch (1)

Remove oil pressure switch (2).

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

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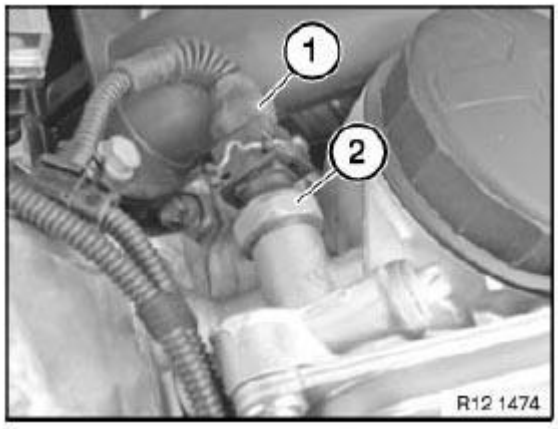


Fig. 225: Identifying Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 11 4 050 with sealing ring. See **11 4 050 REDUCER**

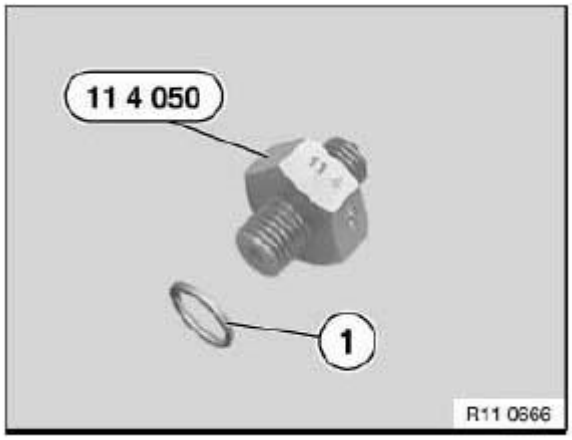


Fig. 226: Identifying Special Tool (11 4 050) With Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Check engine oil pressure with diagnosis tester.

Connect special tools 13 6 054 and 13 6 051.

Check engine oil pressure with pressure gauge.

Connect special tools 13 3 063 and 13 3 061.

Start engine and check engine oil pressure.

Specified values.

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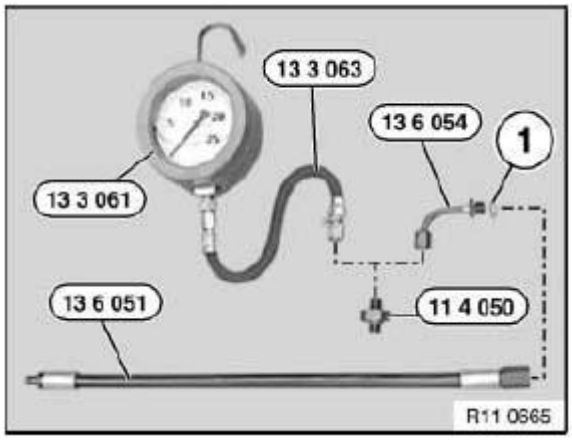


Fig. 227: Identifying Special Tools (13 3 063 & 13 3 061)
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

41 OIL PUMP WITH FILTER AND DRIVE

11 41 000 REMOVING AND INSTALLING OIL PUMP (N54)

Special tools required:

- 11 0 300

Necessary preliminary tasks:

- Removing oil pan.

Release screws (1).

Tightening torque, see 11 41 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

Replace aluminum screws.

Remove intake pipe (2) in direction of arrow.

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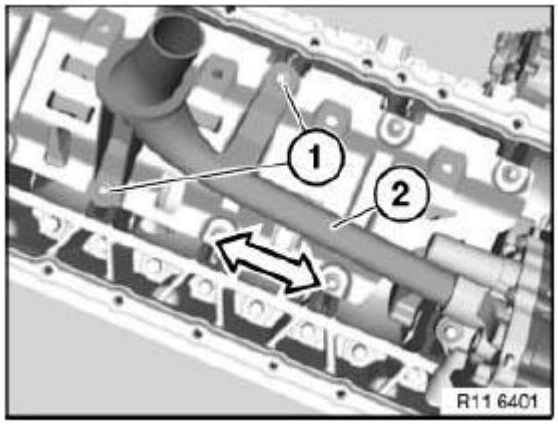


Fig. 228: Identifying Intake Pipe & Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Secure oil pump sprocket wheel with special tool 11 0 300 to oil pump. See **11 0 300 PLUG MANDREL**

IMPORTANT: Release central bolt (2) with special tool 11 0 300 only. See 11 0 300 PLUG MANDREL

Tightening torque, see 11 41 4AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

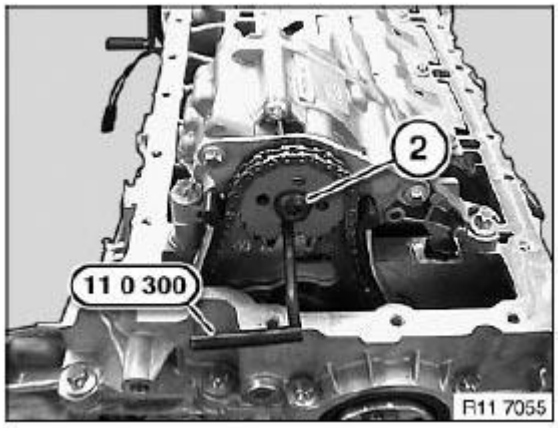


Fig. 229: Identifying Special Tool (11 0 300) On Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (2).

Tightening torque, see 11 41 3AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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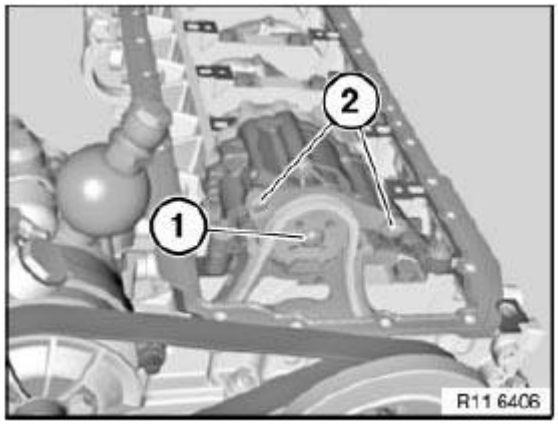


Fig. 230: Identifying Screws (2)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque, see 11 41 2AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

Replace aluminum screws.

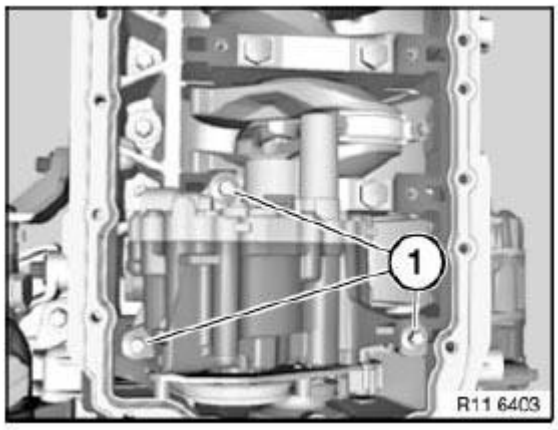


Fig. 231: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Detach sprocket wheel (1) in direction of arrow.

NOTE: Timing chain (3) of triangular drive is pressed upwards by chain tensioner.

Do not remove sprocket wheel.

Remove oil pump (2) in direction of arrow.

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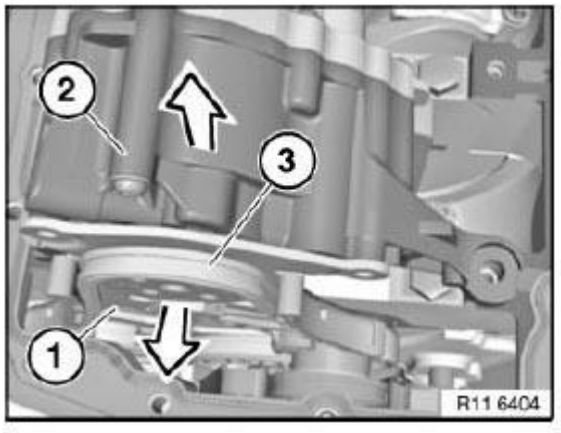


Fig. 232: Identifying Sprocket Wheel, Oil Pump & Timing Chain
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

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

Install oil pump (2).

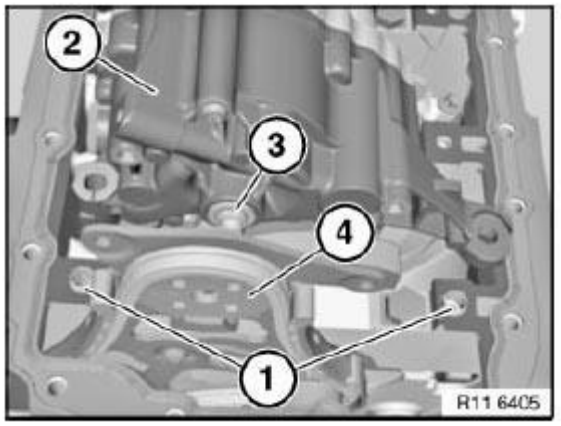


Fig. 233: Identifying Oil Pump, Sprocket Wheel With Spacer Bushings
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

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

Special tools required:

- 11 0 290

- 11 0 300
- 11 4 120
- 11 4 280
- 11 5 200
- 11 8 640
- 11 8 650
- 11 9 190
- 11 9 280

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

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

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

Necessary preliminary tasks:

- Remove cylinder head cover.
- Remove engine oil sump.
- Remove drive belt.
- Remove tensioner for drive belt.
- Remove vibration damper at front.
- Remove sealing cover for vacuum pump.
- Remove chain tensioner.

Turn sprocket wheel (3) at central bolt (crankshaft) into position.

Screw special tool 11 8 650 into crankcase. See **11 8 650 HOLDER**

Position special tool 11 0 290 on sprocket wheel and on special tool 11 8 650. See **11 8 650 HOLDER**

Release screw (1).

Tightening torque, see 11 66 2AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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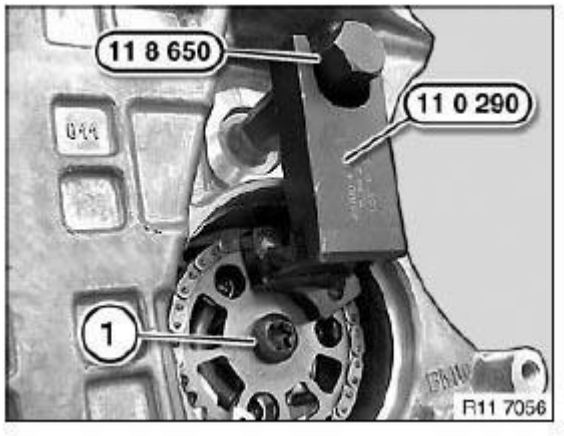


Fig. 234: Identifying Special Tool (11 0 290) On Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Press timing chain with chain tensioner (1) in direction of arrow.

Secure chain module with special tool 11 4 120 in bore (2). See **11 4 120 LOCKING PIN**

Feed out sprocket wheel (3) at hexagon head of vacuum pump (4).

Installation:

A lock pin is pre-installed if the triangular drive is replaced.

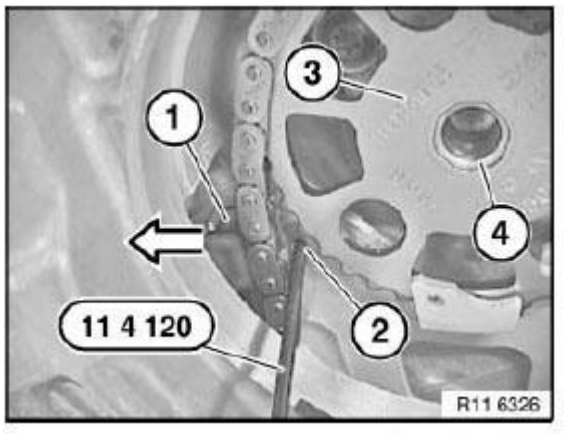


Fig. 235: Identifying Special Tool (11 4 120) In Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Secure oil pump sprocket wheel with special tool 11 9 190 to oil pump housing.

Release bolt (2) on sprocket wheel.

Tightening torque, see 11 41 4AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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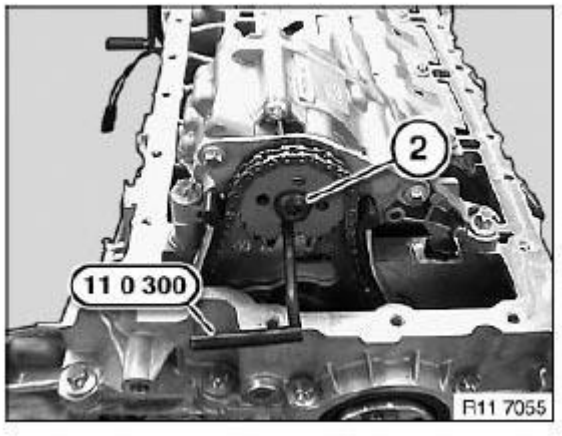


Fig. 236: Identifying Special Tool (11 9 190) To Oil Pump Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (2).

Tightening torque, see 11 41 3AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

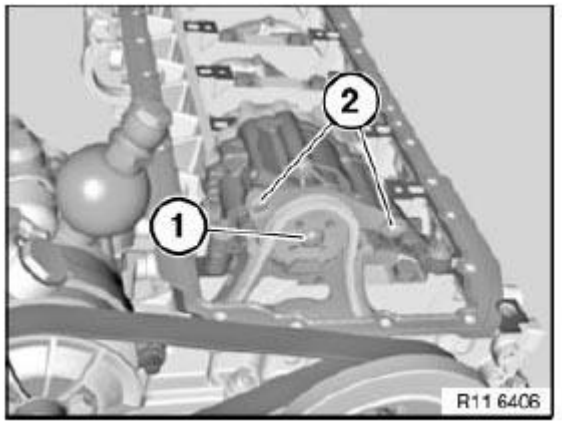


Fig. 237: Identifying Screws (2)
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft and camshaft.

Do **not** remove special tools 11 0 300 and 11 4 280. See **11 0 300 PLUG MANDREL** and **11 4 280 GAUGE**

Fit special tool 11 9 280.

Release central bolt (1).

NOTE: A 3/4 inch tool is needed to release the central bolt.

A second person is required.

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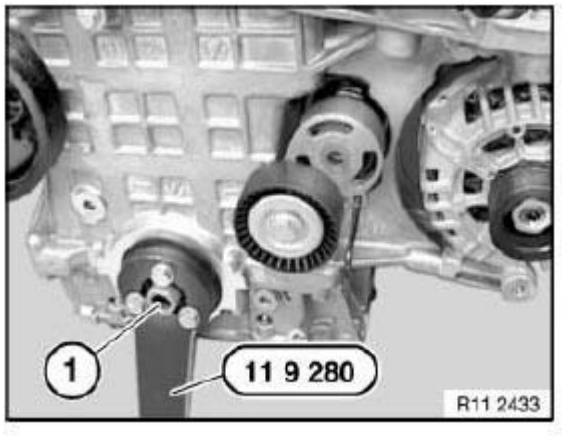


Fig. 238: Identifying Special Tool (11 9 280) On Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Remove hub (2) towards front.

Installation:

Replace radial seal at front.

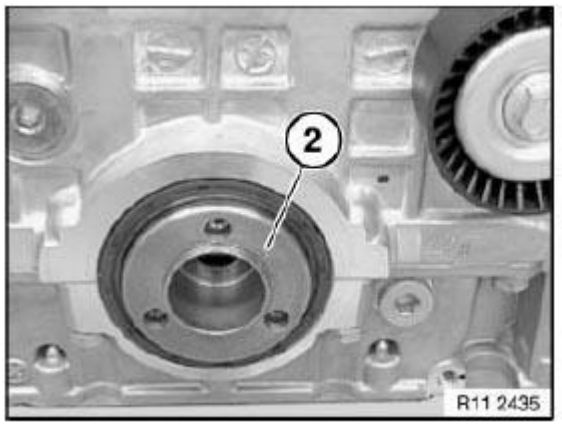


Fig. 239: Identifying Radial Seal Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Open screw plug on bedplate.

Installation:

Replace seal.

Release screw (1) with special tool 11 8 640 on triangular drive. See **11 8 640 TORX SOCKET E10**

Tightening torque, see 11 41 3AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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Installation:

Replace aluminum screws.

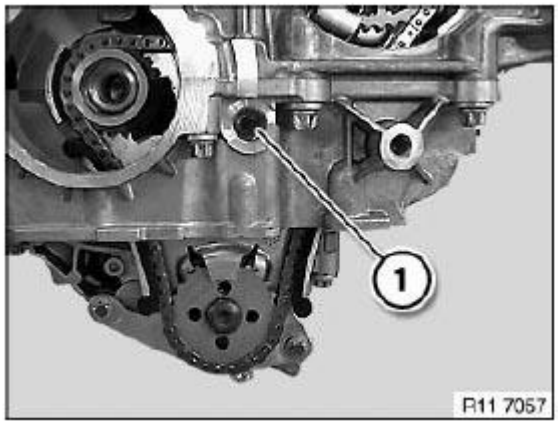


Fig. 240: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Remove triangular drive (1) in direction of arrow.

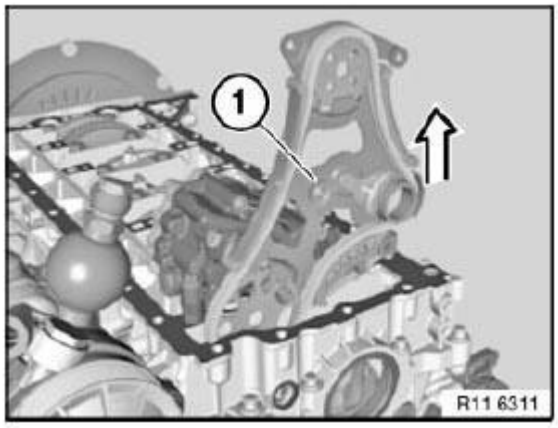


Fig. 241: Identifying Triangular Drive
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Note installation direction of sprocket wheel (2).

Collar on sprocket wheel (2) points to *timing chain drive.*

Incorrect assembly will result in *engine damage.*

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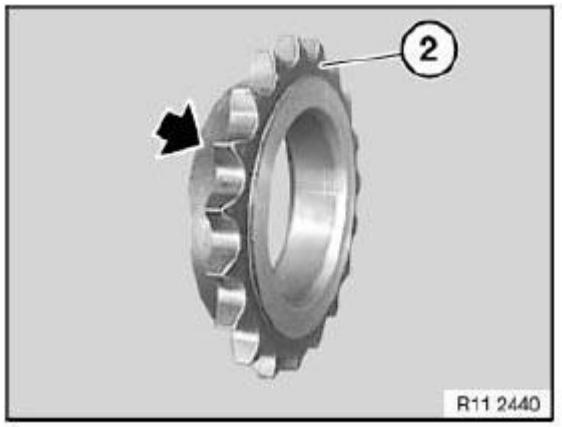


Fig. 242: Locating Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

Friction plates (1 and 2) must be clipped into place on the oil pump module sprocket wheel.

The third friction plate is attached to the crankshaft hub.

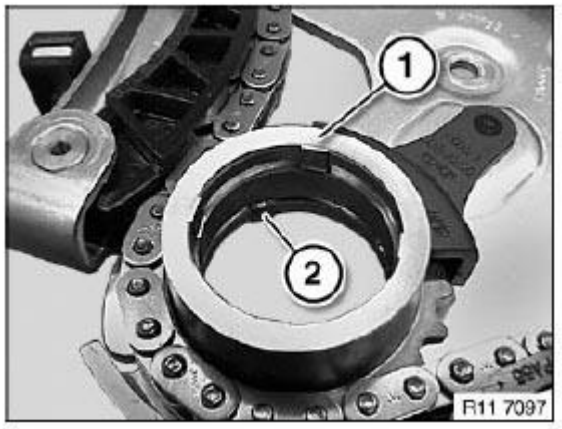


Fig. 243: Identifying Friction Plates
Courtesy of BMW OF NORTH AMERICA, INC.

Feed in oil pump chain module.

Secure oil pump chain module with screws (2).

Tightening torque, see 11 41 3AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Secure screw (1) with special tool 11 8 640. See **11 8 640 TORX SOCKET E10**

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Tightening torque, see 11 41 3AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

Check both friction plates (3) with retainers for correct installation position.

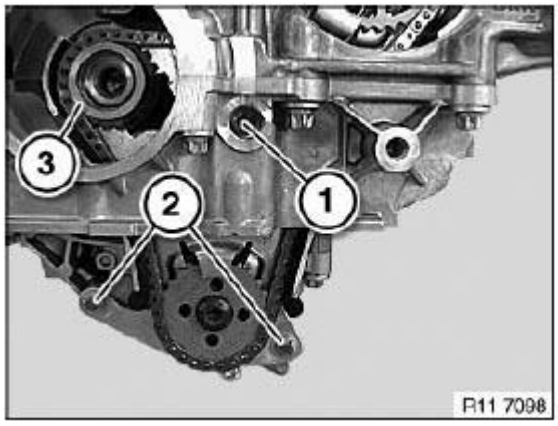


Fig. 244: Identifying Friction Plates Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Push on friction plate (1) without retainers.

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

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

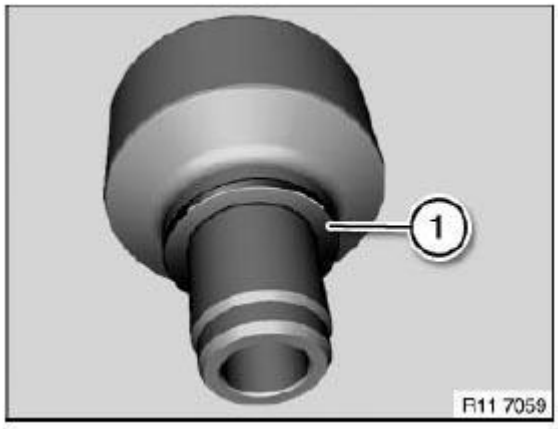


Fig. 245: Identifying Friction Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Fit central bolt (1).

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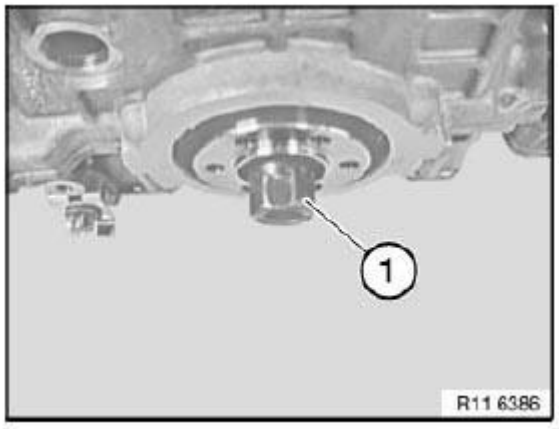


Fig. 246: Identifying Central Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tools 11 8 650 and 11 0 290. See **11 8 650 HOLDER** and **11 0 290 HOLDER**

Tighten the screw (1).

Tightening torque, see 11 66 2AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

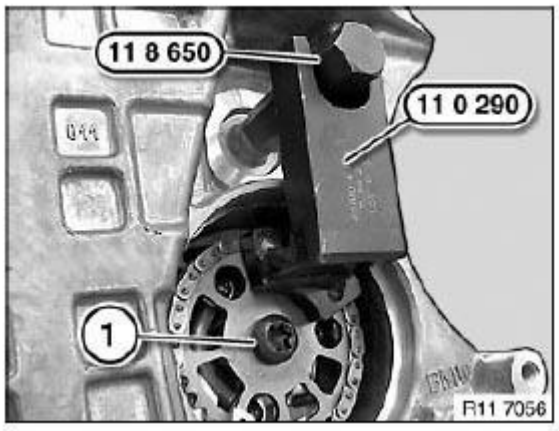


Fig. 247: Identifying Special Tools (11 8 650 & 11 0 290) On Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool 11 0 300. See **11 0 300 PLUG MANDREL**

Tighten the screw (2).

Tightening torque, see 11 41 4AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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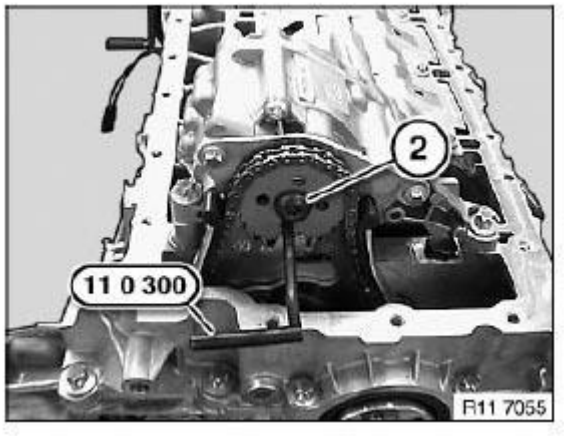


Fig. 248: Identifying Special Tool (11 9 190) To Oil Pump Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down special tool 11 5 200 with screws (1) to hub. See **11 5 200 SPACER RING**

Do **not** remove special tools 11 0 300 and 11 4 280. See **11 0 300 PLUG MANDREL** and **11 4 280 GAUGE**

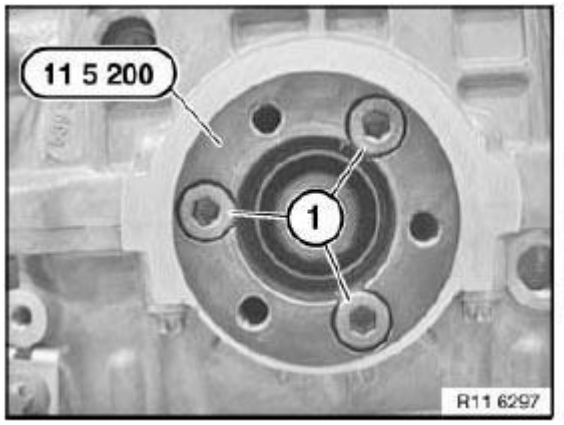


Fig. 249: Identifying Special Tool (11 5 200) With Screws To Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten central bolt to jointing torque.

Tightening torque, see 11 21 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Apply stroke of paint (1) for torsion angle tightening to tool. See **Fig. 250** .

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

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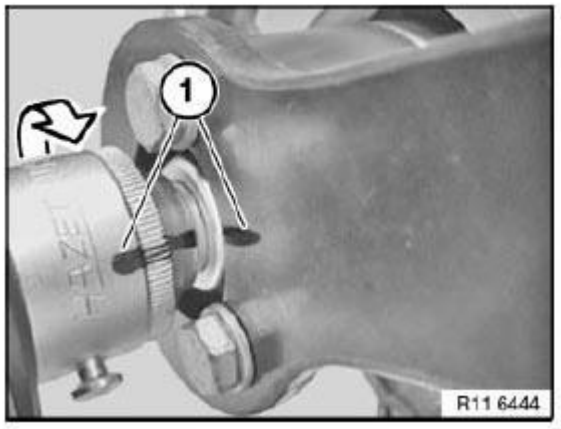


Fig. 250: Applying Stroke Of Paint For Torsion Angle
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace radial seal at front.

Assemble engine.

51 WATER PUMP WITH DRIVE

11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP (N54)

WARNING: Danger of scalding!

Only perform these tasks on an engine that has cooled down.

Recycling:

Catch and dispose of drained coolant.

Observe country-specific waste-disposal regulations.

IMPORTANT: 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).*

If a water pump which has already been operated is reused, it must be filled immediately after being removed with coolant (mixture ratio 1:1 / water: coolant).

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Necessary preliminary tasks:

- Remove coolant thermostat.

Disconnect water hose (1).

Disconnect plug connection (4).

Release screws (5).

Installation:

Replace aluminum screws.

Tightening torque, see 11 51 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

If the water pump is to be reused, it must be mechanically rotated once (breakaway torque at impellers).

One water pump rotation will be sufficient.

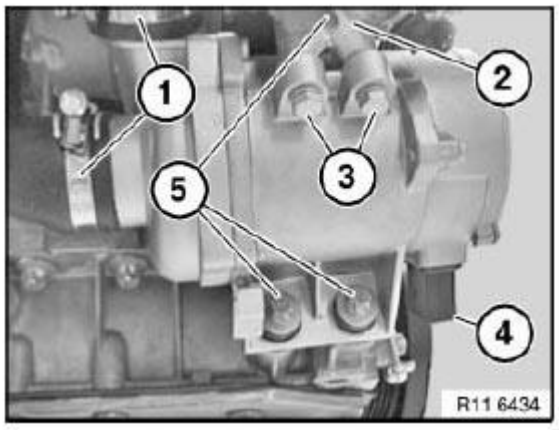


Fig. 251: Identifying Plug Connection & Water Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Venting instructions must be observed without fail.

53 THERMOSTAT AND CONNECT

11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N54)

WARNING: Danger of scalding!

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Only perform these tasks on an engine that has cooled down.

Recycling:

Catch and dispose of drained coolant.

Observe country-specific waste-disposal regulations.

Necessary preliminary tasks:

- Remove front splash guard.
- Drain coolant from radiator.

Release hose clamp (1) and detach coolant hose.

Release hose clamp (2) and detach coolant hose.

Unlock and detach coolant hose (3).

Unlock and detach coolant hose (4).

Disconnect plug connection (5).

Release screws (6).

Tightening torque, see 11 53 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Remove coolant thermostat (7).

NOTE: Illustration shows coolant thermostat removed.

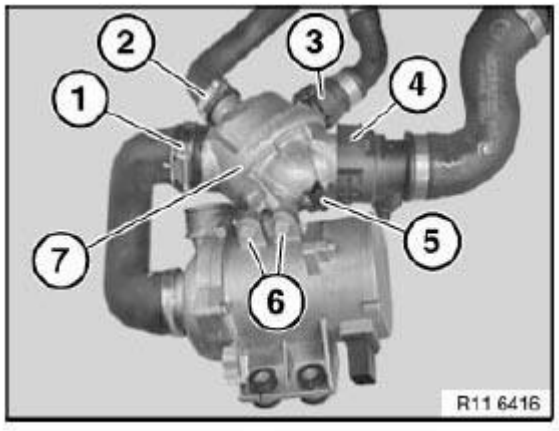


Fig. 252: Identifying Hose Clamp, Coolant Hose & Coolant Thermostat
Courtesy of BMW OF NORTH AMERICA, INC.

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Assemble engine.

11 53 740 REMOVING AND INSTALLING OR REPLACING WATER PIPE (N54)

WARNING: Danger of scalding!

Only perform these tasks on an engine that has cooled down.

Recycling:

Catch and dispose of drained coolant.

Observe country-specific waste-disposal regulations.

Necessary preliminary tasks:

- Remove front splash guard.
- Drain coolant from radiator.
- Remove both primary catalytic converters.

Unfasten hose clip (1).

Detach water pipe in direction of arrow from water pump (2).

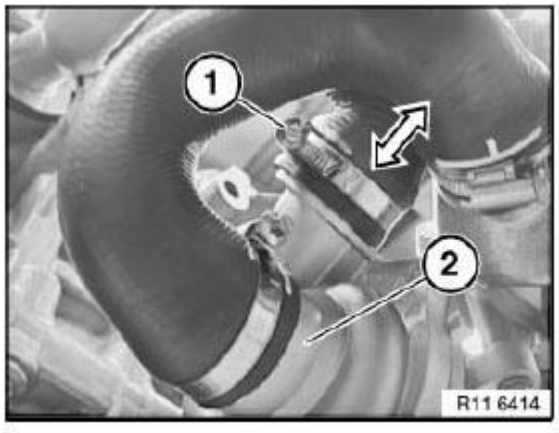


Fig. 253: Detaching Water Pipe From Water Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1 and 2).

Tightening torque, see 11 53 2AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Remove water pipe in direction of arrow.

Installation:

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Seal (1) must not show any traces of damage; check and if necessary replace.

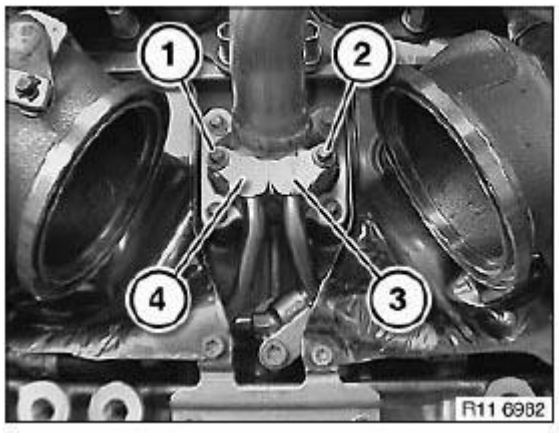


Fig. 254: Identifying Water Pipe & Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque, see 11 53 3AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Disconnect water pipe (2).

Installation:

Replace all seals.

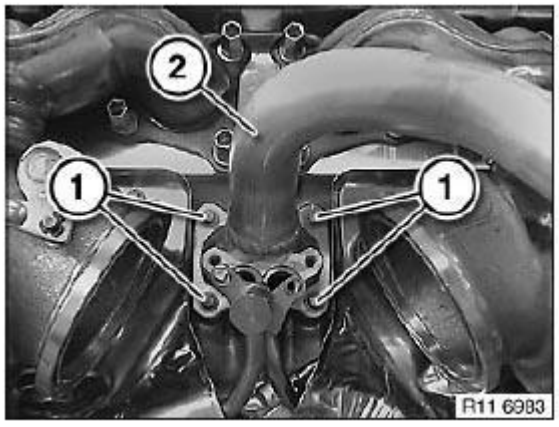


Fig. 255: Locating Water Pipe & Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Vent cooling system and check for leaks.

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61 INTAKE MANIFOLD

11 61 368 REPLACING CHARGE-AIR DUCT (N54)

Necessary preliminary tasks:

- Switch off ignition
- Remove intake filter housing. (See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N54)**)

IMPORTANT: Charge-air hoses with clamp fastenings must be installed dry and free from grease!

If charge-air hoses with clamp fastenings are not installed dry and free from grease, this may result in turbocharger failure!

Unfasten clip.

Tightening torque, see 13 71 6AZ in **13 71 AIR INTAKE SILENCER**

Installation:

Install charge-air hoses dry and free from grease.

Detach charge-air hose (1) from charge-air duct (2).

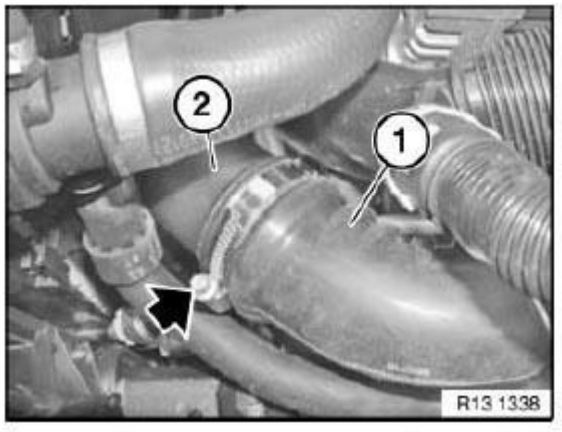


Fig. 256: Detaching Charge-Air Hose From Charge-Air Duct
Courtesy of BMW OF NORTH AMERICA, INC.

Release quick-connect couplings (1) by turning lock through 90°.

Detach recirculated air hoses (2) and lay to one side.

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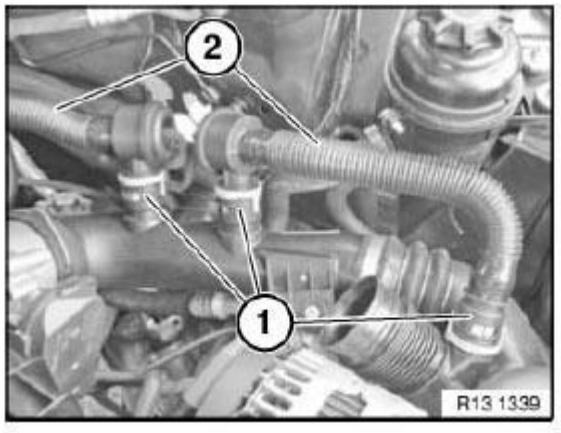


Fig. 257: Identifying Quick-Connect Couplings & Recirculated Air Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Bring lock (1) back 90° into installation position.

Pay attention to markings.

Recirculated air hoses must audibly snap into place.

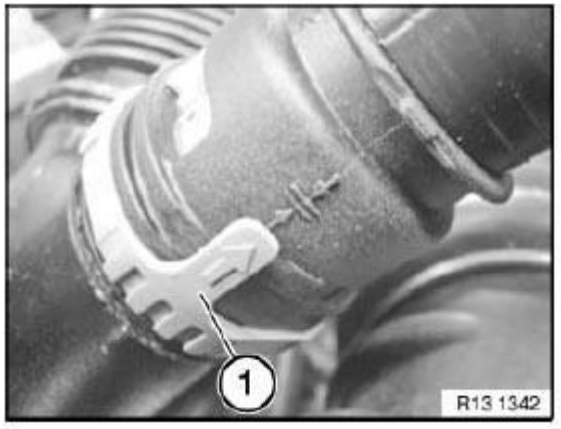


Fig. 258: Identifying Lock Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock plug (1) and remove.

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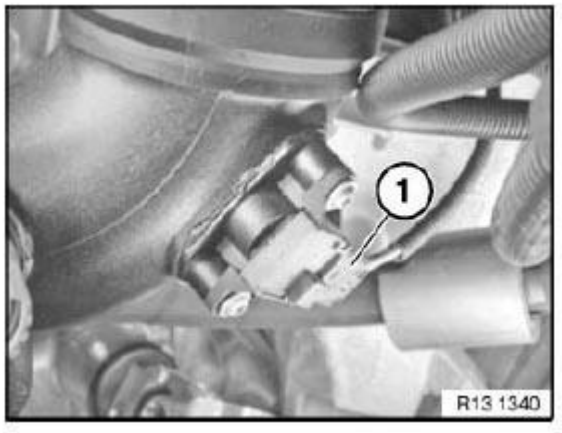


Fig. 259: Unlocking Plug
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Coat sealing rings of quick-connect couplings with antiseize agent.

Pressure pipes cannot be fitted without anti-seize agent!

Release screw.

Tightening torque, see 13 71 4AZ in **13 71 AIR INTAKE SILENCER**

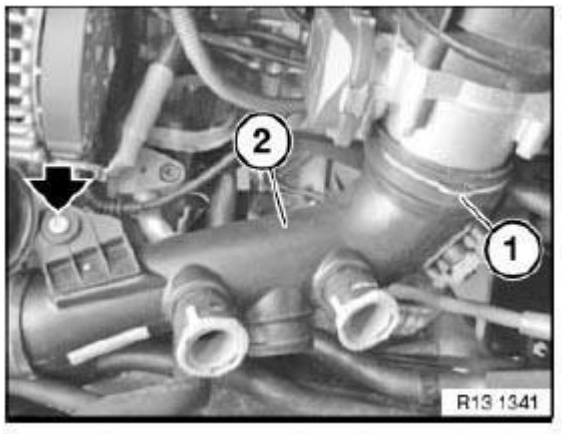
Unlock quick-connect coupling (1).

Detach charge-air duct (2) from throttle valve assembly and remove.

Installation:

Coat sealing ring of quick-connect coupling with antiseize agent.

Charge-air duct (2) must snap audibly into place.



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Fig. 260: Identifying Charge-Air Duct & Quick-Connect Coupling
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Read out fault memory of DME control unit

11 61 050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (N54)

Necessary preliminary tasks:

- Remove tension strut.
- Remove suction filter housing. (See **13 71 000 REMOVING AND INSTALLING/REPLACING INTAKE FILTER HOUSING (N54)**)
- Remove engine cover.

Detach crankcase breather at cylinder head cover (1).

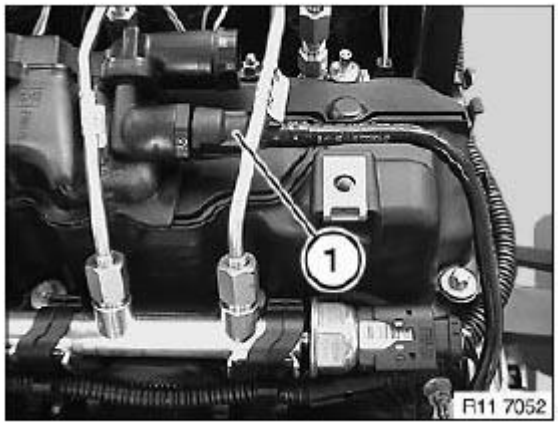


Fig. 261: Detaching Crankcase Breather Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off vacuum hose (1).

Detach tank vent valve (2) from mounting.

Release hose (3) and set down in engine compartment.

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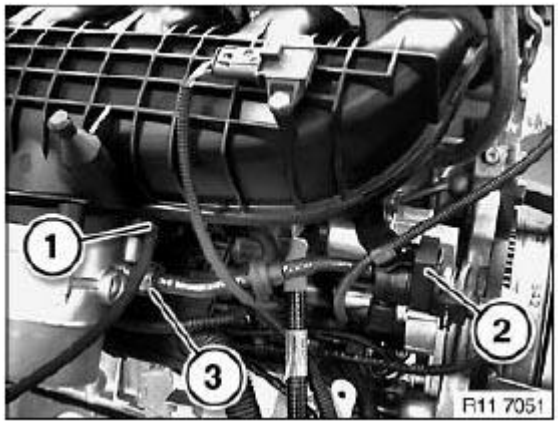


Fig. 262: Identifying Vacuum Hose, Tank Vent Valve & Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on oil pressure switch.

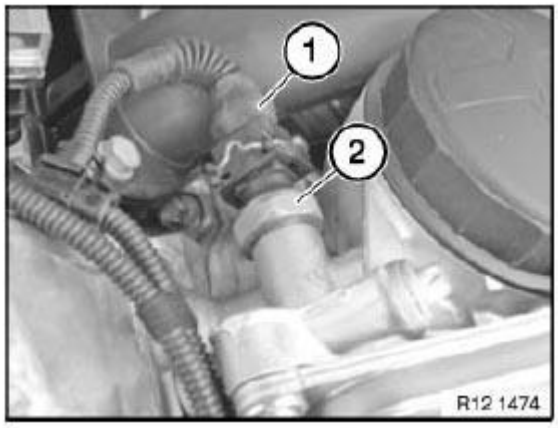


Fig. 263: Identifying Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Release retainers (1) on fuel rail and place to one side.

Disconnect plug connection (2).

NOTE: Do not detach fuel line.

Unscrew nuts (3).

Release screw (4).

Tightening torque, see 11 61 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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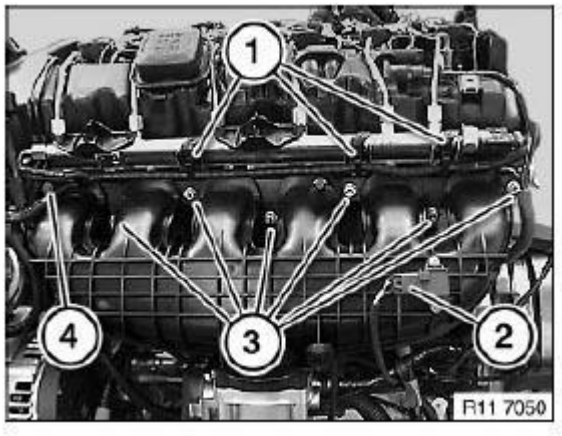


Fig. 264: Identifying Fuel Rail Retainers
Courtesy of BMW OF NORTH AMERICA, INC.

Raise intake air manifold.

Release screws (1).

Set down distributor housing (2) in engine compartment.

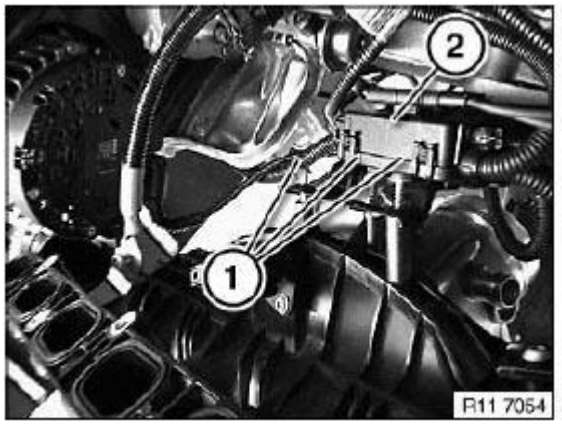


Fig. 265: Identifying Distributor Housing With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Cut cable tie (1).

Disconnect plug connection (2).

Installation:

Replace all seals (3).

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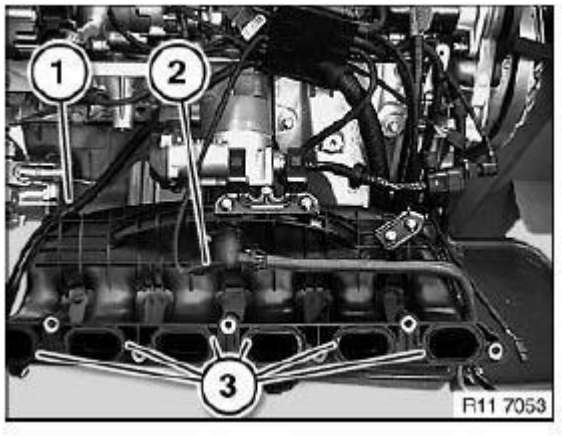


Fig. 266: Identifying Plug Connection & Seals
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace all seals.

Assemble engine.

65 SUPERCHARGER WITH CONTROL

11 65 022 REMOVING AND INSTALLING/REPLACING EXHAUST-GAS TURBOCHARGER FOR CYLINDERS 1-3 (N54)

IMPORTANT: It is not necessary to carry out a chassis/wheel alignment check to release the steering tie rod.

Necessary preliminary tasks:

- Remove both catalytic exhaust-gas converters.
- Remove intercooler.
- Drain coolant.
- Remove coolant expansion tank.
- Remove coolant thermostat. (See **11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N54)**)
- Remove coolant pump. (See **11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP (N54)**)
- Remove both vacuum reservoirs.
- Remove front pipe to turbocharger.
- Remove right charge-air duct. (See **11 61 368 REPLACING CHARGE-AIR DUCT (N54)**)
- Release tie rod from steering gear.

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Release screws (1).

Tightening torque, see 1 42 7AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

Replace seal.

Release screw (2).

Tightening torque, see 11 42 8AZv in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Remove oil return pipe in direction of arrow.

Installation:

Replace O-ring.

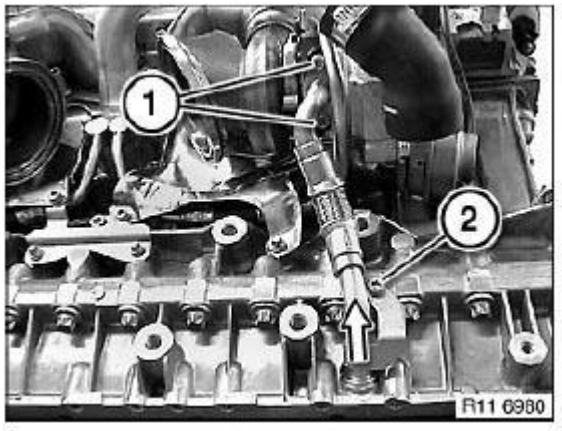


Fig. 267: Locating Oil Return Pipe Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Undo screws (1 and 2)

Tightening torque, see 11 53 3AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Release coolant feed lines (3 and 4) if necessary with suitable pliers.

IMPORTANT: Do not position pliers on pipes - risk of damage! .

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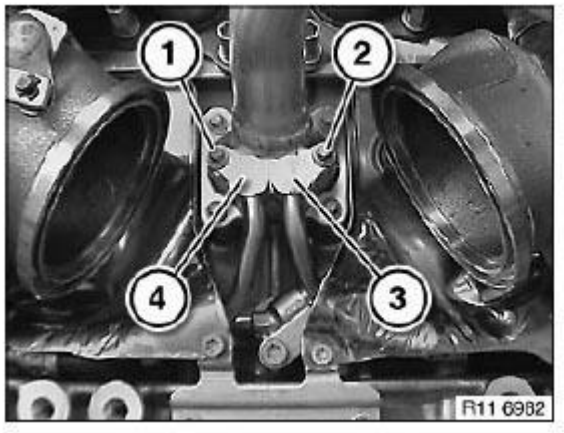


Fig. 268: Identifying Water Pipe & Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque, see 11 53 9AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Remove feed line (2).

Installation:

Replace O-ring.

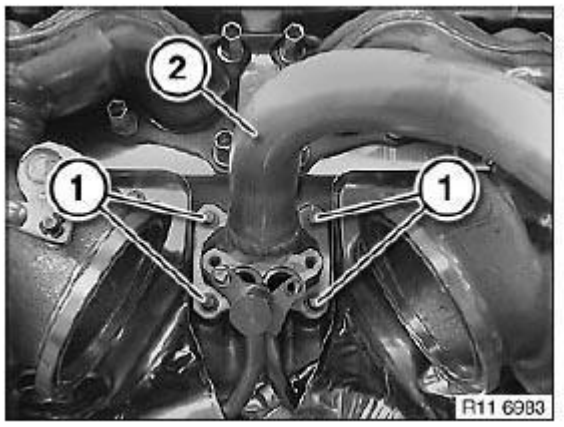


Fig. 269: Identifying Feed Line With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque, see 11 53 6AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Release coolant return pipe at connection (2) if necessary with suitable pliers.

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Release screw (3).

Tightening torque, see 11 53 8AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Release coolant return pipe at connection (4) if necessary with suitable pliers.

Unfasten coolant return pipe.

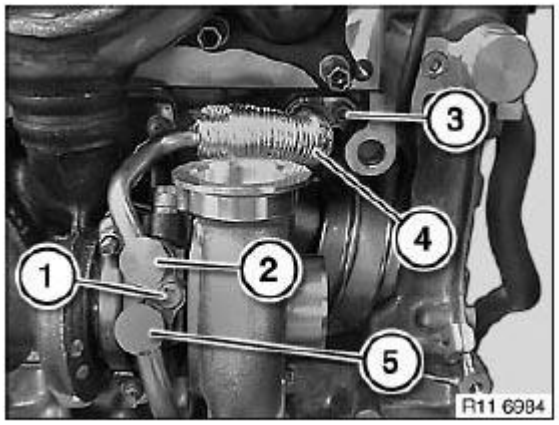


Fig. 270: Identifying Coolant Return Pipe Connection
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not position pliers on pipes - risk of damage! .

Release screws (1).

Tightening torque, see 11 65 2AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Remove retaining plate (2).

Release screws (3).

Tightening torque see 11 65 2AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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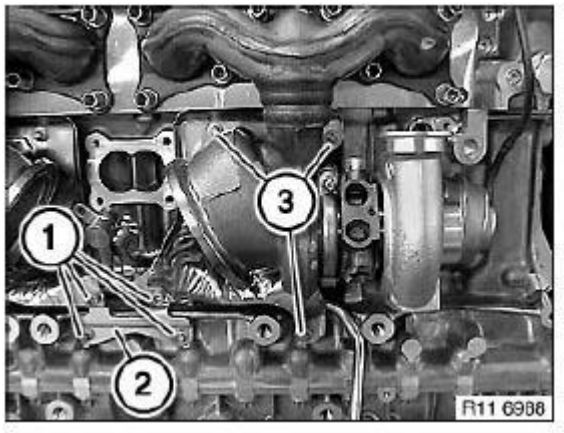


Fig. 271: Identifying Retaining Plate & Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove heat shield (1) in direction of arrow.

NOTE: Carefully swing heat shield out in direction of arrow - risk of damage!

Coolant feed pipe can be removed with heat shield.

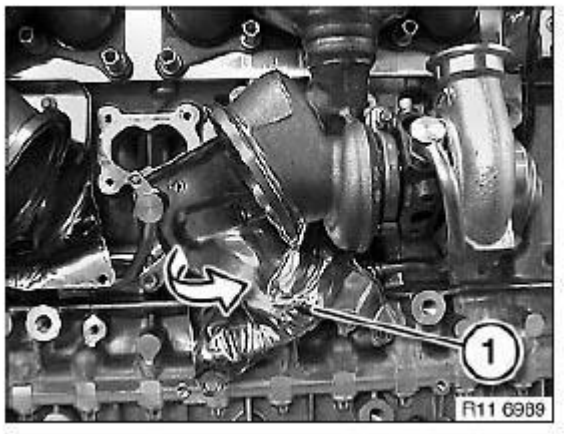


Fig. 272: Removing Heat Shield
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Place retaining plate (2) on cylinder head cover.

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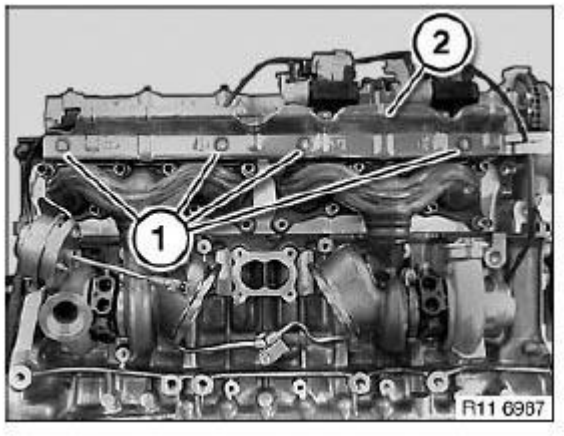


Fig. 273: Identifying Retaining Plate On Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque, see 11 42 4AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Detach oil feed line in direction of arrow.

Installation:

Replace O-ring.

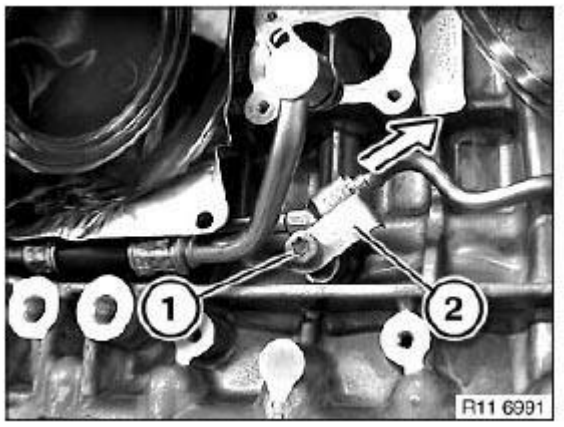


Fig. 274: Detaching Oil Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque, see 11 42 5AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Release oil pressure line (2) if necessary with suitable pliers.

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IMPORTANT: Do not position pliers on pipes - risk of damage! .

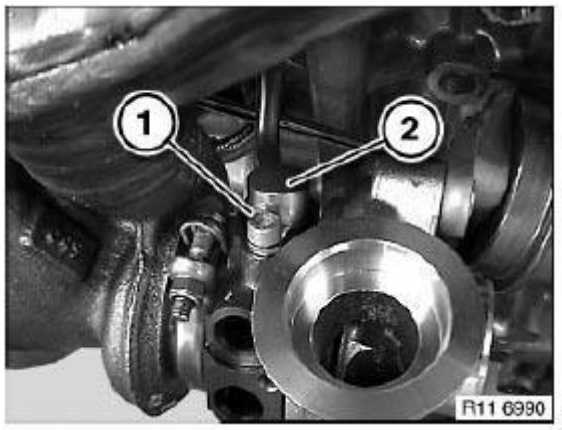


Fig. 275: Identifying Oil Pressure Line With Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Remove turbocharger towards top.

Tightening torque, see 11 65 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

IMPORTANT: Risk of damage! To wastegate linkage.

Do not misuse wastegate linkage for carrying.

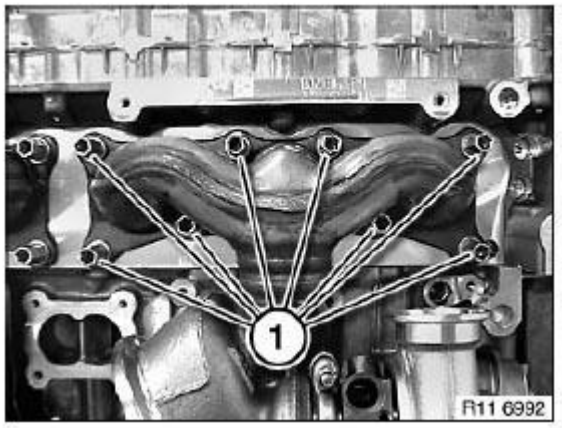


Fig. 276: Identifying Turbocharger Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Replace graphite rings (1).

NOTE: Illustration shows turbocharger (cyl. 4 to 6).

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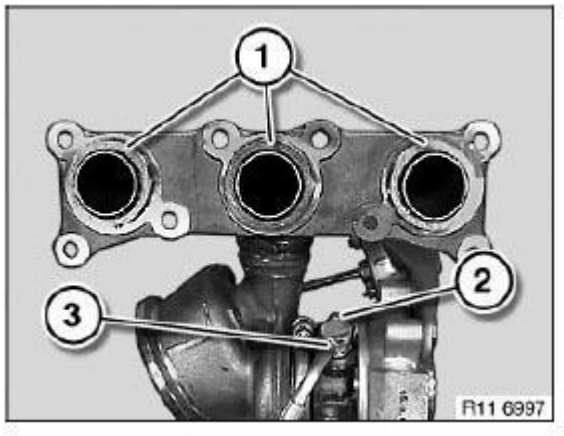


Fig. 277: Identifying Turbocharger Graphite Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Clear DME fault memory.

11 65 022 REMOVING AND INSTALLING/REPLACING EXHAUST-GAS TURBOCHARGER FOR CYLINDERS 4-6 (N54)

Necessary preliminary tasks:

- Remove both catalytic exhaust-gas converters.
- Remove intercooler.
- Drain coolant.
- Remove coolant expansion tank.
- Remove coolant thermostat. (See **11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (N54)**)
- Remove coolant pump. (See **11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP (N54)**)
- Remove both vacuum reservoirs.
- Remove front pipe to turbocharger.
- Remove right charge-air duct.

Release screws (1).

Tightening torque, see 11 42 7AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

Replace seal.

Release screw (2).

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Tightening torque, see 11 42 8AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Remove oil return pipe in direction of arrow.

Installation:

Replace O-ring.

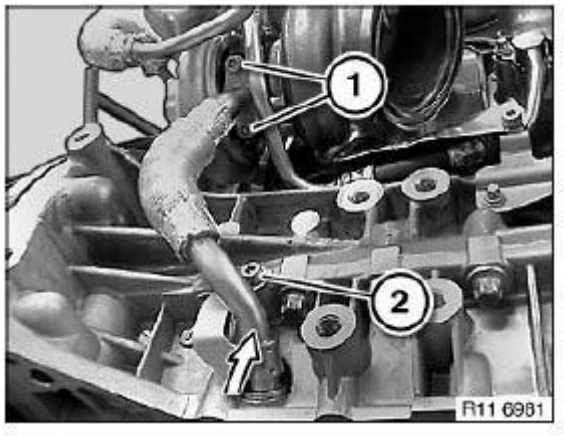


Fig. 278: Removing Oil Return Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Undo screws (1 and 2)

Tightening torque, see 11 53 3AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Release coolant feed lines (3 and 4) if necessary with suitable pliers.

IMPORTANT: Do not position pliers on pipes - risk of damage!.

Installation:

Replace O-rings.

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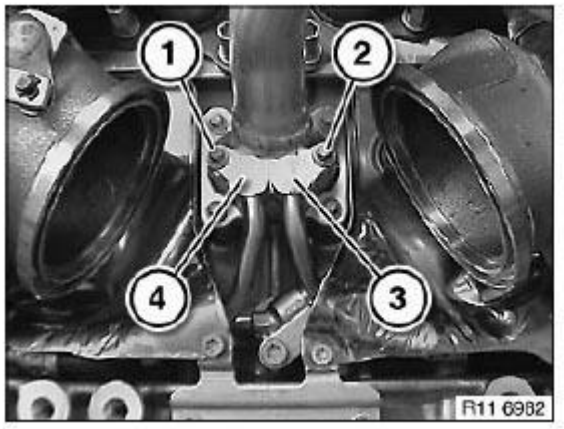


Fig. 279: Identifying Water Pipe And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque, see 11 53 9AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Remove feed line (2).

Installation:

Replace O-ring.

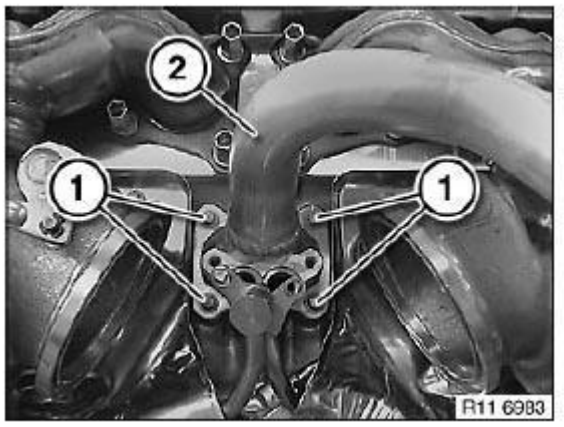


Fig. 280: Identifying Feed Line With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque, see 11 53 8AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Release coolant return pipe if necessary with suitable pliers.

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IMPORTANT: Do not position pliers on pipes - risk of damage!.

Installation:

Replace O-ring.

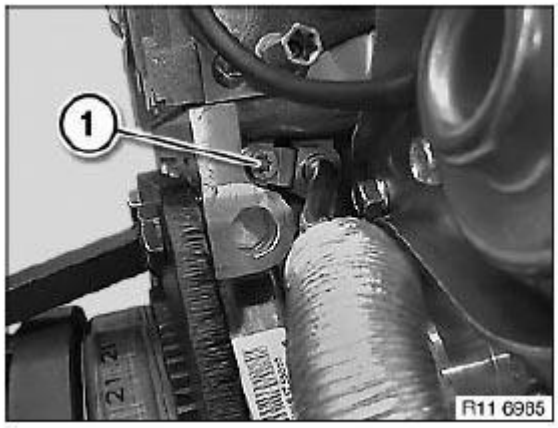


Fig. 281: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

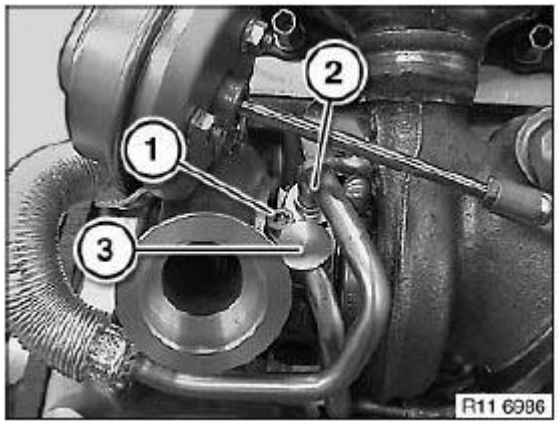
Release coolant return pipe (3) if necessary with suitable pliers.

Release coolant return pipe (2) if necessary with suitable pliers and remove.

IMPORTANT: Do not position pliers on pipes - risk of damage!.

Installation:

Replace O-ring.



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Fig. 282: Identifying Coolant Return Pipe With Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque, see 11 42 4AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Detach oil feed line in direction of arrow.

Installation:

Replace O-ring.

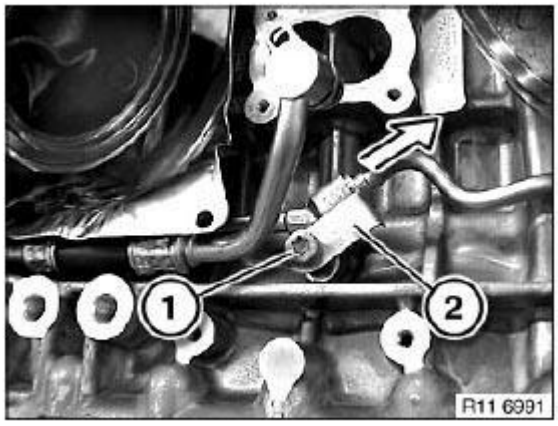


Fig. 283: Detaching Oil Feed Line
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque, see 11 65 2AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

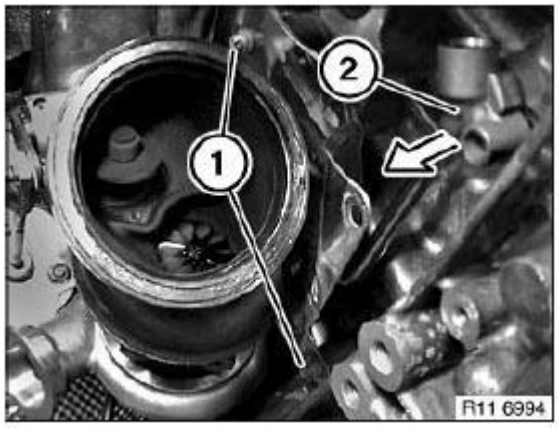


Fig. 284: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

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Release screws (1).

Tightening torque, see 11 65 2AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

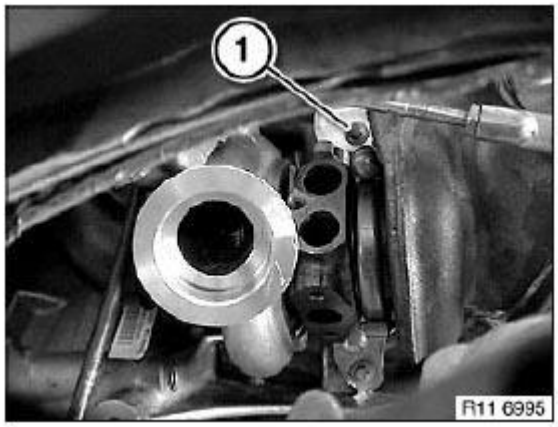


Fig. 285: Locating Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Remove heat shield (1) in direction of arrow.

NOTE: Carefully swing heat shield out in direction of arrow - risk of damage!

Coolant feed pipe can be removed with heat shield.

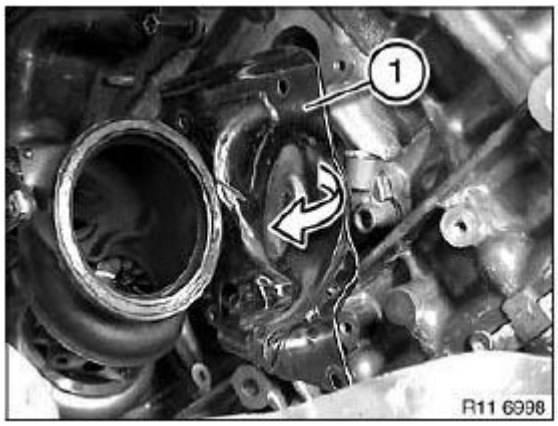


Fig. 286: Removing Heat Shield
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Place retaining plate (2) on cylinder head cover.

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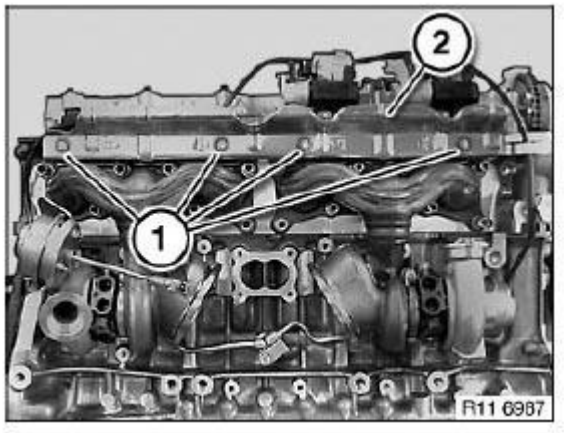


Fig. 287: Identifying Retaining Plate On Cylinder Head Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Remove turbocharger towards bottom.

Tightening torque, see 11 65 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

IMPORTANT: Risk of damage! To wastegate linkage.

Do not misuse wastegate linkage for carrying.

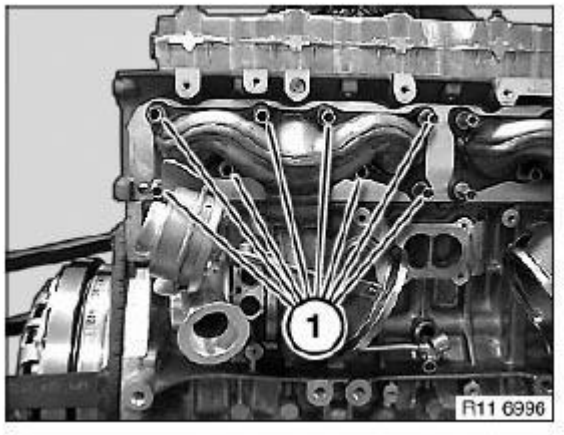


Fig. 288: Identifying Turbocharger Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Replace graphite rings (1).

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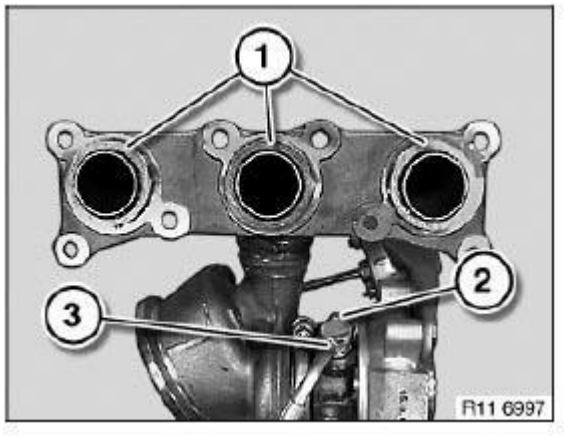


Fig. 289: Identifying Graphite Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Clear DME fault memory.

66 VACUUM PUMP

11 66 000 REMOVING AND INSTALLING/REPLACING VACUUM PUMP (N54)

Special tools required:

- 11 0 290
- 11 4 120
- 11 8 650

Necessary preliminary tasks:

- Remove drive belt. (See **11 28 010 REPLACING ALTERNATOR DRIVE BELT (N54)**)
- Remove tensioner for drive belt. (See **11 28 020 REPLACE ALTERNATOR DRIVE BELT TENSIONER (N54)**)
- Remove sealing cover for vacuum pump. (See **11 14 010 REPLACING VACUUM PUMP SEALING COVER (N54)**)
- Remove intake air manifold. (See **11 61 050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (N54)**)
- Remove H.P. pump.

Rotate crankshaft at central bolt.

Turn sprocket wheel until drilled holes and screws of vacuum pump match up.

Screw in special tool 11 8 650. (See **11 8 650 HOLDER**)

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Secure special tool 11 0 290 in sprocket wheel and to special tool 11 8 650. (See **11 0 290 HOLDER** and **11 8 650 HOLDER**)

Release screw (1).

Tightening torque, see 11 66 2AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

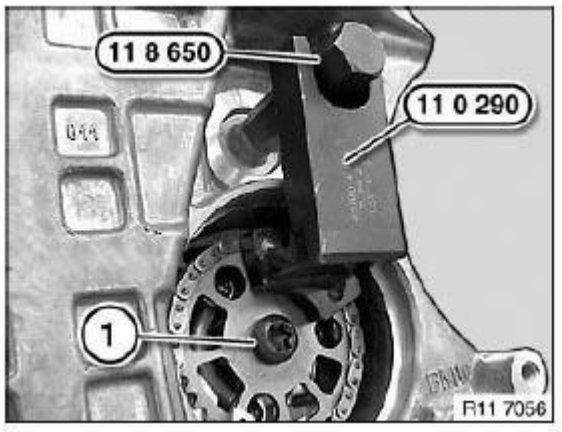


Fig. 290: Identifying Special Tool (11 0 290) In Sprocket Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

Press chain tensioner (1) with chain in direction of arrow.

Insert special tool 11 4 120. (See **11 4 120 LOCKING PIN**)

Remove sprocket wheel (2) in direction of arrow.

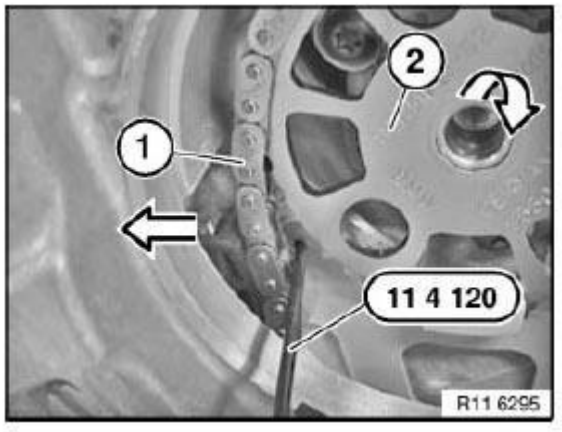


Fig. 291: Inserting Special Tool (11 4 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque, see 11 66 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

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Release screws (1), secure against falling out.

Remove vacuum pump.

Installation:

Replace seal.

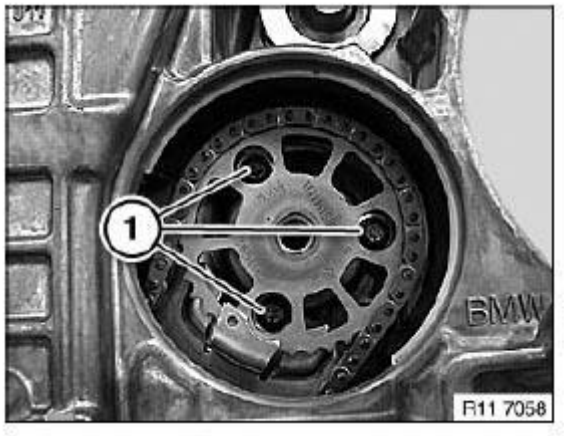


Fig. 292: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

78 EMISSION CONTROL OXYGEN

11 78 513 REMOVING AND INSTALLING/REPLACING BOTH LAMBDA OXYGEN CONTROL SENSORS (N54)

Special tools required:

- 11 7 030
- 11 9 150

WARNING: Scalding hazard!

Only perform these tasks after the exhaust system has cooled down.

Necessary preliminary tasks:

- Remove acoustic cover.
- Release right tie rod on steering gear. (See **32 21 231 REPLACING LEFT OR RIGHT TIE ROD** and/or **32 21 231 REPLACING LEFT OR RIGHT TIE ROD**)

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Chassis/wheel alignment is not required.

Installation:

If an oxygen sensor is to be reused, only apply a thin and uniform coat of Never Seez Compound (refer to BMW Parts Service) to thread.

The part of the oxygen control sensor which projects into the exhaust system branch (sensor ceramic) must not be cleaned or come into contact with lubricant.

Disconnect plug connection for oxygen control sensor, cylinders 1 to 3.

Release oxygen control sensor (1) with special tools 11 7 030 and 11 9 150. (See **11 7 030 SOCKET WRENCH SOCKET WAF 22** and **11 9 150 SPECIAL WRENCH**)

Tightening torque, see 11 78 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

Cable color black, cylinders 1 to 3.

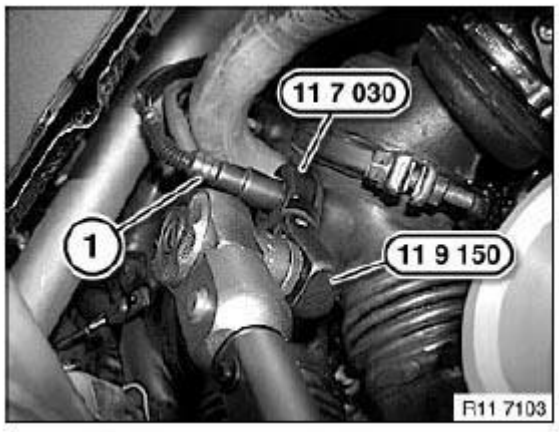


Fig. 293: Identifying Special Tools (11 7 030 & 11 9 150) On Oxygen Control Sensor Cylinders 1 To 3
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection for oxygen control sensor, cylinders 4 to 6.

Release oxygen control sensor (1) with special tools 11 7 030 and 11 9 150. (See **11 7 030 SOCKET WRENCH SOCKET WAF 22** and **11 9 150 SPECIAL WRENCH**)

Tightening torque, see 11 78 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

Cable color gray, cylinders 4 to 6.

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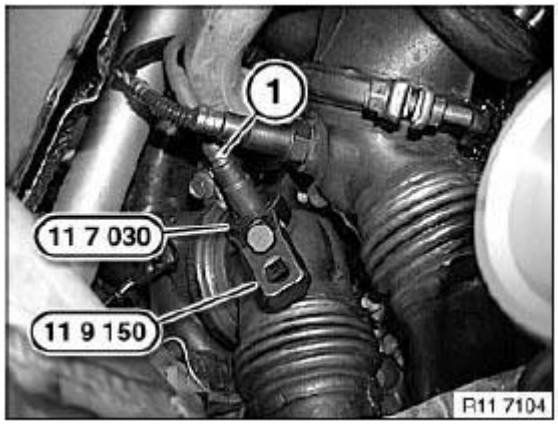


Fig. 294: Identifying Special Tools (11 7 030 & 11 9 150) On Oxygen Control Sensor Cylinders 4 To 6
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

11 78 545 REMOVING AND INSTALLING/REPLACING BOTH LAMBDA OXYGEN MONITOR SENSORS (N54)

Special tools required:

- 11 7 020
- 11 7 030
- 11 9 150

WARNING: Scalding hazard!

Only perform these tasks after the exhaust system has cooled down.

Necessary preliminary tasks:

- Remove engine splash guard.

Installation:

If an oxygen sensor is to be reused, only apply a thin and uniform coat of Never Seez Compound (refer to BMW Parts Service) to thread.

The part of the oxygen monitor sensor which projects into the exhaust system branch (sensor ceramic) must not be cleaned or come into contact with lubricant.

Disconnect plug connection for oxygen monitor sensor.

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Release monitor sensor (1) with special tools 11 7 030 and 11 9 150. (See **11 7 030 SOCKET WRENCH SOCKET WAF 22** and **11 9 150 SPECIAL WRENCH**)

Tightening torque, see 11 78 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

Cable color black, cylinders 1 to 3.

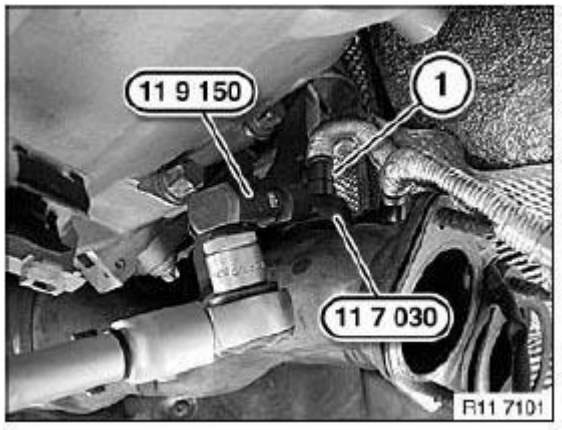


Fig. 295: Identifying Special Tools (11 7 030 & 11 9 150) On Monitor Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Release insulation (2) in direction of arrow.

Disconnect plug connection for oxygen monitor sensor.

Release monitor sensor (1) with special tool 11 7 020. (See **11 7 020 SOCKET WRENCH SOCKET WAF 22**)

Tightening torque, see 11 78 1AZ in **ENGINE -- TORQUE SPECIFICATIONS -- TWIN TURBO**

Installation:

Cable color gray, cylinders 4 to 6.

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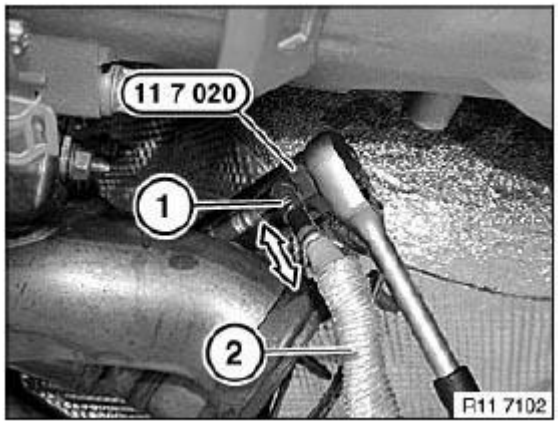


Fig. 296: Identifying Special Tools (11 7 020) On Monitor Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Check function of DME.

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