

2009 ENGINE**Mechanical - 2.5L - Tribute****ENGINE - 2.5L**

The 2.5L (153 CID) 4-cylinder engine has the following features:

- Dual overhead camshaft
- Four valves per cylinder
- Sequential multiport fuel injection (SFI)
- Aluminum cylinder head
- Aluminum cylinder block
- Electronic ignition system with coil-on-plug 4 ignition coils

The 2.5L engine is a 4 valve-per-cylinder, dual overhead camshaft engine. The engine uses a coil-on-plug ignition system. The cylinder block is made of aluminum and the bearing caps are integrated into the ladder assembly. An aluminum oil pan bolts to the bottom of the lower cylinder block and to the transmission to provide greater strength. The camshafts are mounted in the cylinder heads and act against valve tappets to open and close the valves. The camshafts are driven off the front of the cylinder head by one timing chain. The chain is driven by a sprocket that is located on the crankshaft. The piston assembly is an aluminum piston with a cast iron connecting rod. The oil pump is driven by the crankshaft via a dedicated chain that is driven by the same sprocket that drives the timing chain.

IDENTIFICATION

Always refer to these labels when installation of new parts is necessary, or when checking engine calibrations. The engine parts often differ within a CID family. Verification of the identification codes will make sure that the correct parts are obtained. These codes contain all the pertinent information relating to the dates, optional equipment and revisions. The Mazda Master Parts Catalog contains a complete listing of the codes and their application.

CODE INFORMATION

The engine code information label, located on the side of the valve cover and the front side of the valve cover, contains the following:

- Engine build date
- Engine plant code
- Engine code

EXHAUST EMISSION CONTROL SYSTEM

Operation and necessary maintenance of the exhaust emission control devices used on this engine are covered in the Powertrain Control/Emissions Diagnosis (PC/ED) Service Information.

INDUCTION SYSTEM

The sequential multiport fuel injection (SFI) provides the fuel/air mixture needed for combustion in the cylinders. The 4 solenoid-operated fuel injectors:

- are mounted in the intake manifold.
- meter fuel into the air intake stream in accordance with engine demand.
- are positioned so that their tips direct fuel just ahead of the engine intake valves.
- are connected in series with the fuel pressure sensor.
- supply fuel from the fuel tank with a fuel pump mounted in the fuel tank.

A constant fuel pressure is maintained across the fuel injectors by the fuel pressure sensor:

- is positioned upstream from the fuel injectors on the fuel injection supply manifold.

LUBRICATION SYSTEM

The engine lubrication system operates as follows:

- Oil is drawn into the oil pump through the oil pump screen cover and tube in the sump of the oil pan.
- Oil is pumped through the oil filter on the left front side of the cylinder block.
- Oil enters the main gallery where it is distributed to the crankshaft main journals and to the cylinder head.
- From the main journals, the oil is routed through cross-drilled passages in the crankshaft to lubricate the connecting rod bearings. Controlled leakage through the crankshaft main bearings and connecting rod bearings is slung radially outward to cool and lubricate the cylinder walls as well as the entire connecting rod, piston and piston ring assembly.

ENGINE CYLINDER IDENTIFICATION

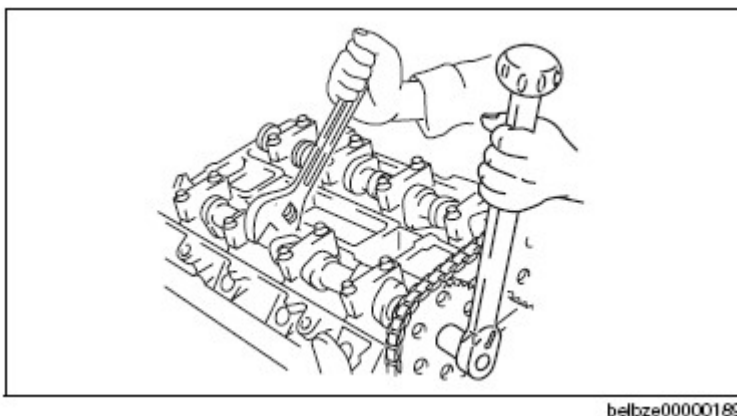


Fig. 1: Identifying Engine Cylinder Identification
Courtesy of MAZDA MOTORS CORP.

ACCESSORY DRIVE - 2.5L

ACCESSORY DRIVE

The accessory drive:

- has a single serpentine belt with 6 ribs.
- has automatic tensioning.
- is not adjustable.

The accessory drive system provides power to operate components which power other systems. These could include components such as the generator, power steering pump and A/C compressor. Each of these components is equipped with a pulley which is driven by the accessory drive belt. The accessory drive belt is driven by the engine crankshaft pulley. One or more idler pulleys may be provided to facilitate belt routing and alignment. The automatic belt tensioner maintains correct belt tension and compensates for component wear and changes in system load. System load changes can be caused by the A/C compressor clutch engaging or disengaging, or demand changes on other systems powered by the accessory drive belt. To maintain correct operation of this system, it is critical that the correct length drive belt be installed. The pulleys must also be correctly aligned and kept clean.

ACCESSORY DRIVE BELT ROUTING

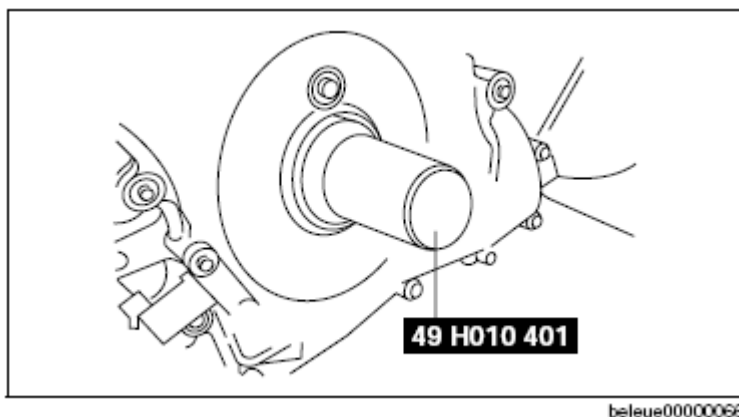


Fig. 2: Identifying Accessory Drive Belt Routing
Courtesy of MAZDA MOTORS CORP.

BELT TENSIONER

NOTE: • The accessory drive belt tensioner must be replaced as a complete unit.

Automatic tensioners are calibrated to provide the correct amount of tension to the belt for a given accessory drive system. Unless a spring or damping band within the tensioner assembly breaks, or some other mechanical part of the tensioner fails, there is no need to check the tensioner for correct tension.

FRONT END ACCESSORY DRIVE (FEAD) EXPLODED VIEW - 2.5L

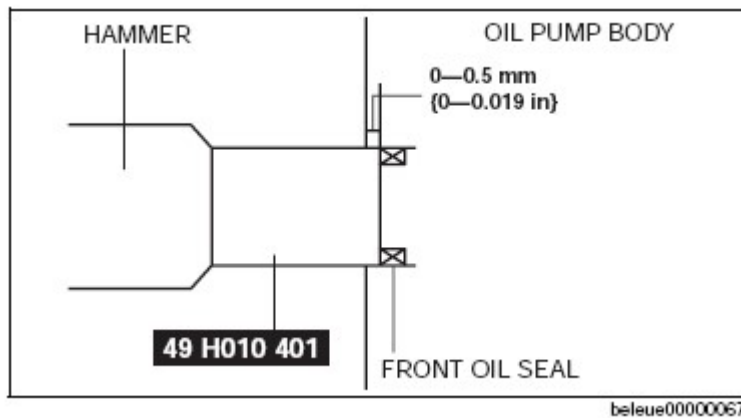


Fig. 3: Exploded View Of Front End Accessory Drive - 2.5L
Courtesy of MAZDA MOTORS CORP.

1. For additional information, see the procedures in this service information.

ACCESSORY DRIVE BELT REMOVAL/INSTALLATION - 2.5L

1. With the vehicle in NEUTRAL, position it on a hoist. See **LIFTING**.
2. Remove the pin-type retainer, 5 bolts and the RH splash shield.
 - To install, tighten to 9 N.m {0.9 kgf.m, 80 in.lbf}.
3. Using the hex feature, rotate the accessory drive belt tensioner clockwise and remove the accessory drive belt from the water pump pulley.
 - Remove the accessory drive belt from the engine.

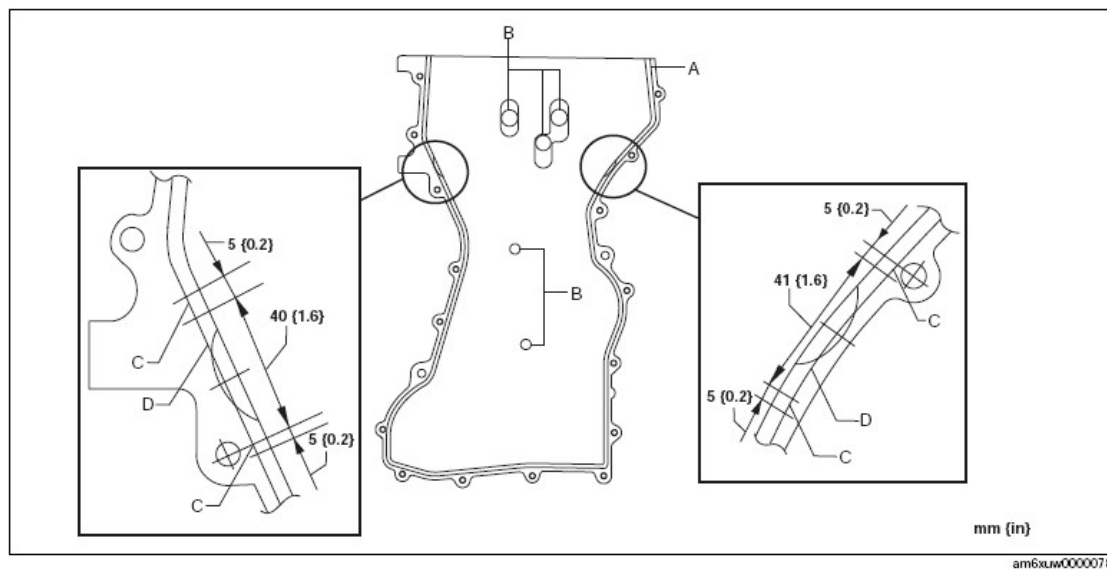


Fig. 4: Identifying Accessory Drive Belt Tensioner Rotating Direction - Clockwise
Courtesy of MAZDA MOTORS CORP.

4. To install, reverse the removal procedure.

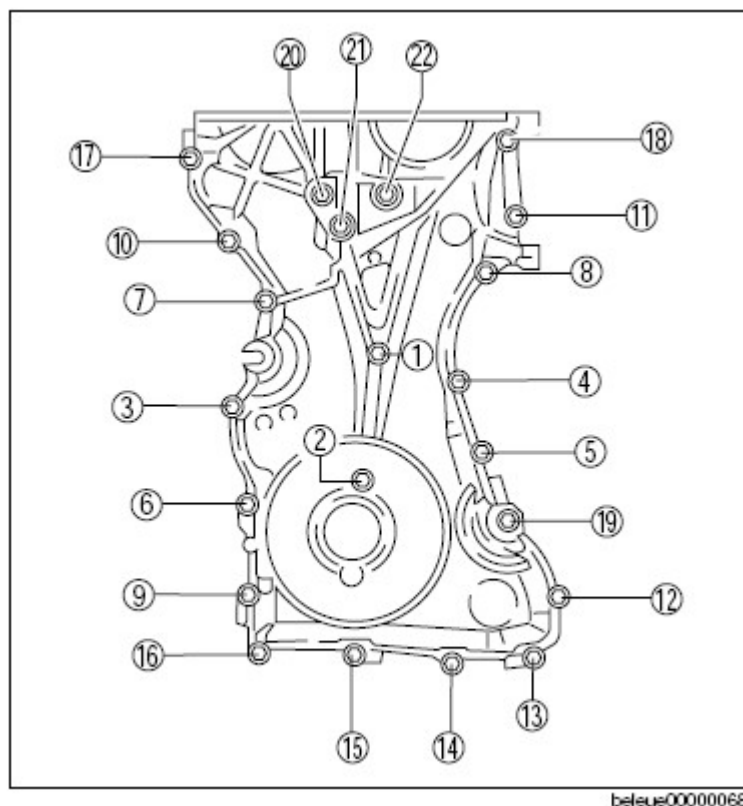
ACCESSORY DRIVE BELT TENSIONER REMOVAL/INSTALLATION - 2.5L

1. With the vehicle in NEUTRAL, position it on a hoist. See **LIFTING**.
2. Remove the pin-type retainer, 5 bolts and the RH splash shield.
 - To install, tighten to 9 N.m {0.9 kgf.m, 80 in.lbf}.

NOTE:

- The accessory drive belt tensioner must be replaced as a complete unit.

3. Using the hex feature, rotate the accessory drive belt tensioner clockwise and remove the accessory drive belt from the water pump pulley and remove the accessory drive belt from the pulley.



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Fig. 5: Identifying Accessory Drive Belt Tensioner Rotating Direction - Clockwise
Courtesy of MAZDA MOTORS CORP.

4. Remove the 2 bolts and the accessory drive belt tensioner.
 - To install, tighten to 25 N.m {2.5 kgf.m, 18 ft.lbf}.

NOTE:

- The accessory drive belt tensioner must be replaced as a complete unit.

5. To install, reverse the removal procedure.

ACCESSORY DRIVE BELT IDLER PULLEY REMOVAL/INSTALLATION - 2.5L

REMOVAL/INSTALLATION

All idler pulleys

1. With the vehicle in NEUTRAL, position it on a hoist. See **LIFTING** .
2. Remove the pin-type retainer, 5 bolts and the RH splash shield.
 - To install, tighten to 9 N.m {0.9 kgf.m, 80 in.lbf}.
3. Using the hex feature, rotate the accessory drive belt tensioner clockwise and remove the accessory drive belt from the idler pulley.

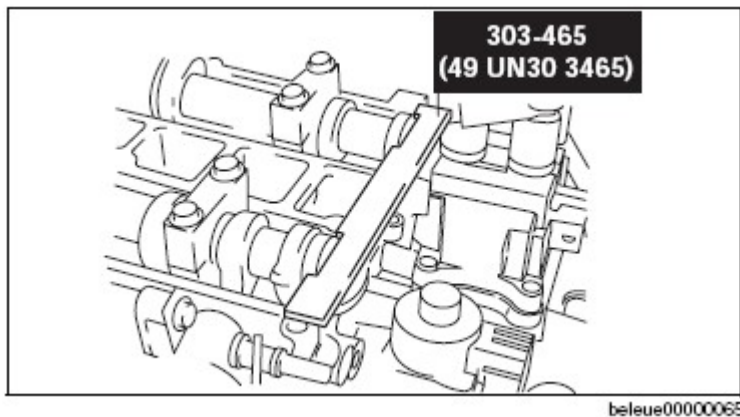


Fig. 6: Identifying Accessory Drive Belt Tensioner Rotating Direction - Clockwise
Courtesy of MAZDA MOTORS CORP.

Smooth idler pulley

4. Loosen the bolt and remove the smooth accessory drive belt idler pulley.
 - To install, tighten to 25 N.m {2.5 kgf.m, 18 ft.lbf}.

Grooved idler pulleys

5. Remove the 3 bolts and the grooved accessory drive belt idler pulley and bracket.
 - To install, tighten to 25 N.m {2.5 kgf.m, 18 ft.lbf}.
6. To install, reverse the removal procedure.

VALVE COVER REMOVAL/INSTALLATION - 2.5L

Valve Cover (View 1 of 2)

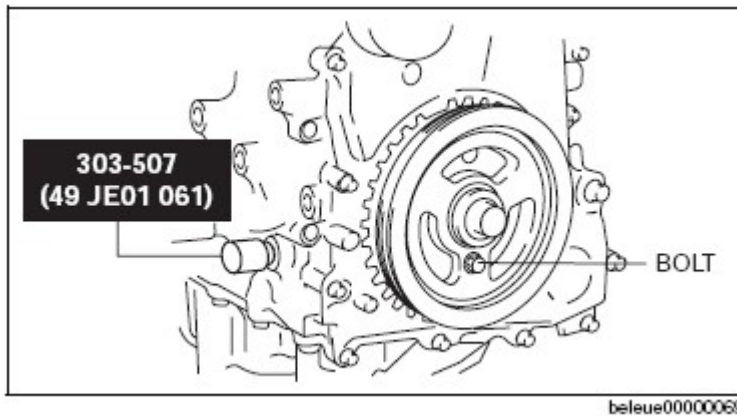


Fig. 7: Identifying Valve Cover Removal/Installation - 2.5L (1 Of 2)
Courtesy of MAZDA MOTORS CORP.

Valve Cover (View 2 of 2)

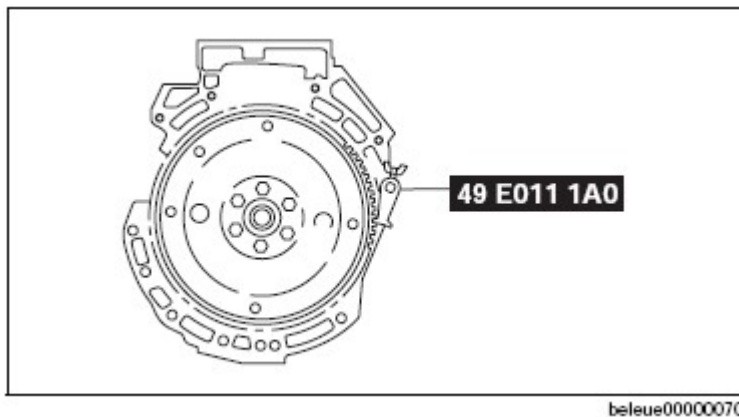


Fig. 8: Identifying Valve Cover Removal/Installation - 2.5L (2 Of 2)
Courtesy of MAZDA MOTORS CORP.

REMOVAL

CAUTION:

- During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.

1. With the vehicle in NEUTRAL, position it on a hoist. See **LIFTING**.
2. Remove the ignition coil-on-plugs. See **IGNITION COIL-ON-PLUG REMOVAL/INSTALLATION - 2.5L**.
3. Disconnect the crankcase vent hose from the valve cover.
4. Remove the 4 engine cover studs.
5. Detach the 3 wire harness retainers from the valve cover stud bolts.

6. Disconnect the camshaft position (CMP) sensor electrical connector.
7. Disconnect the cylinder head temperature (CHT) sensor electrical connector.
8. Disconnect the Variable Camshaft Timing (VCT) solenoid electrical connector.
9. Remove the oil level indicator.
10. Remove the 14 valve cover retainers, the valve cover and the gasket.

INSTALLATION

Clean and inspect the sealing surfaces.

CAUTION:

- Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths.

2. Apply silicone gasket and sealant to the locations shown in the figure.

NOTE:

- The valve cover must be secured within 4 minutes of silicone gasket application. If the valve cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with metal surface prep.

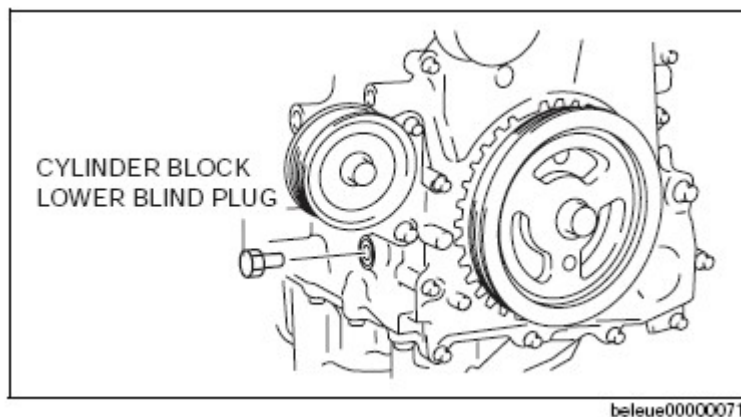


Fig. 9: Locating Silicone Gasket And Sealant Applying Locations
Courtesy of MAZDA MOTORS CORP.

3. Install the valve cover, gasket and retainers.
 - Tighten in the sequence shown in the figure to 10 N.m {1.0 kgf.m, 89 in.lbf}.

NOTE:

- Clean and inspect the gasket. Install a new gasket, if necessary.

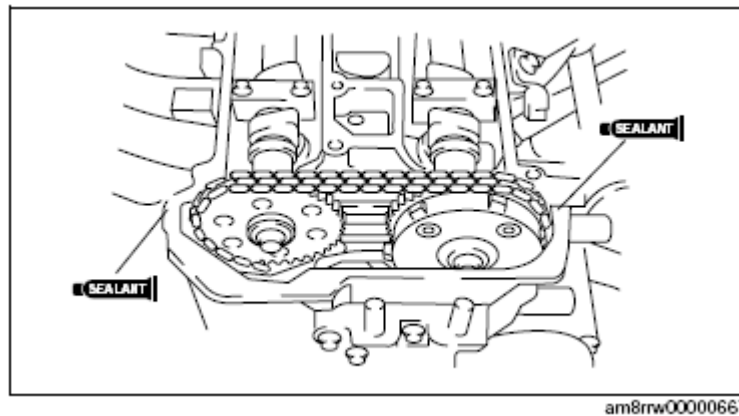


Fig. 10: Identifying Valve Cover Retainers Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

4. Install the oil level indicator.
5. Connect the VCT solenoid electrical connector.
6. Connect the CHT sensor electrical connector.
7. Connect the CMP sensor electrical connector.
8. Attach the 3 wire harness retainers to the valve cover stud bolts.
9. Install the 4 engine cover studs.
10. Connect the crankcase vent hose to the valve cover.
11. Install the ignition coil-on-plugs. See **IGNITION COIL-ON-PLUG REMOVAL/INSTALLATION - 2.5L**.

VALVE TRAIN COMPONENTS EXPLODED VIEW - 2.5L

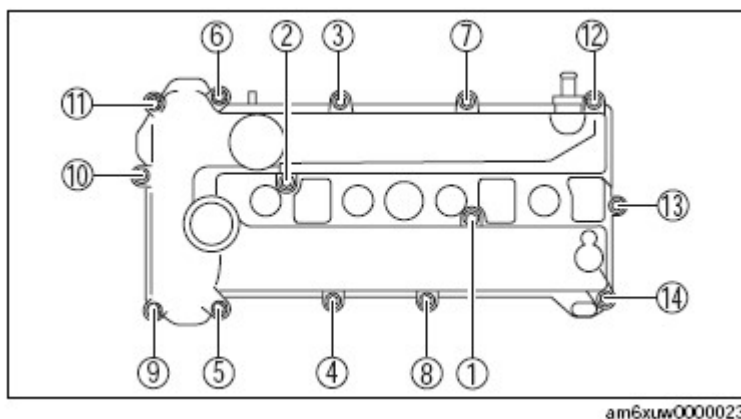


Fig. 11: Identifying Valve Train Components - 2.5L
Courtesy of MAZDA MOTORS CORP.

1. For additional information, see the procedures in this service information.

CAMSHAFTS REMOVAL/INSTALLATION - 2.5L

REMOVAL

CAUTION:

- During engine repair procedures, cleanliness is extremely important. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages, coolant passages or the oil pan can cause engine failure.

CAUTION:

- Do not rotate the camshafts unless instructed to in this procedure. Rotating the camshafts or crankshaft with timing components loosened or removed can cause serious damage to the valves or pistons.

1. With the vehicle in NEUTRAL, position it on a hoist. See LIFTING .
2. Disconnect the battery ground cable.
3. Remove the degas bottle. See DEGAS BOTTLE REMOVAL/INSTALLATION - 2.5L .
4. Remove the valve cover. See VALVE COVER REMOVAL/INSTALLATION - 2.5L .
5. Remove the front RF wheel and tire. See WHEEL AND TIRE REMOVAL/INSTALLATION .
6. Remove the accessory drive belt. See ACCESSORY DRIVE BELT REMOVAL/INSTALLATION - 2.5L .
7. Using the crankshaft pulley bolt, turn the crankshaft sprocket to position the No. 1 piston at top dead center (TDC).
 - The hole in the crankshaft pulley should be in the 6 o'clock position.

CAUTION:

- Failure to position the No. 1 piston at top dead center (TDC) can result in damage to the engine. Turn the engine in the normal direction of rotation only.

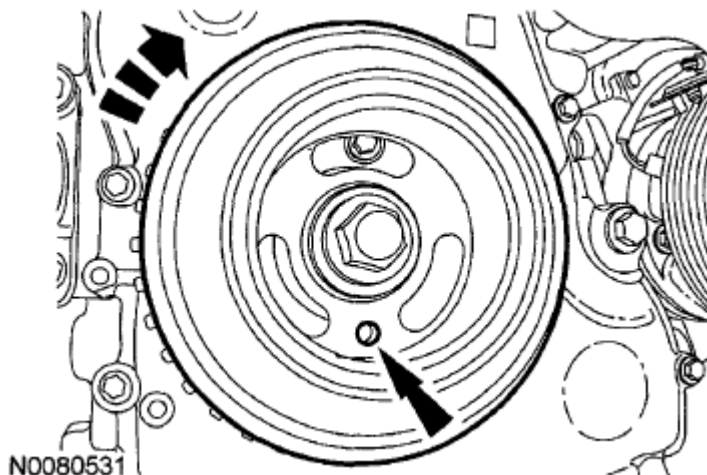


Fig. 12: Locating Hole In Crankshaft Pulley
Courtesy of MAZDA MOTORS CORP.

8. Install the special tool in the slots on the rear of both camshafts.

CAUTION:

- The Camshaft Alignment Plate 303-465 is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

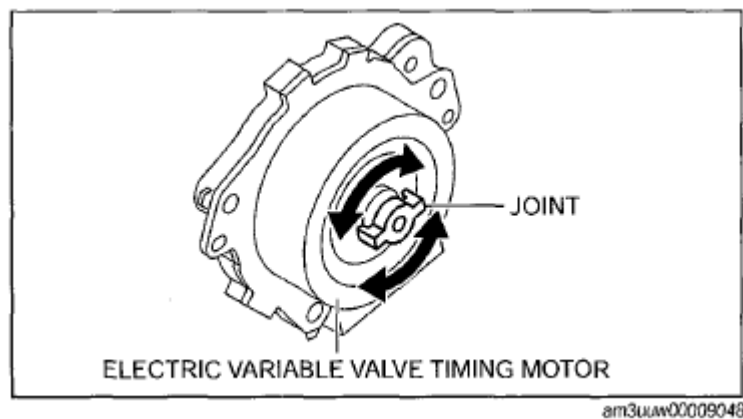


Fig. 13: Identifying Camshaft Alignment Plate 303-465
Courtesy of MAZDA MOTORS CORP.

NOTE:

- The camshaft timing slots are offset. If the special tool cannot be installed, rotate the crankshaft one complete revolution clockwise to correctly position the camshafts.

9. Remove the engine bolt plug.

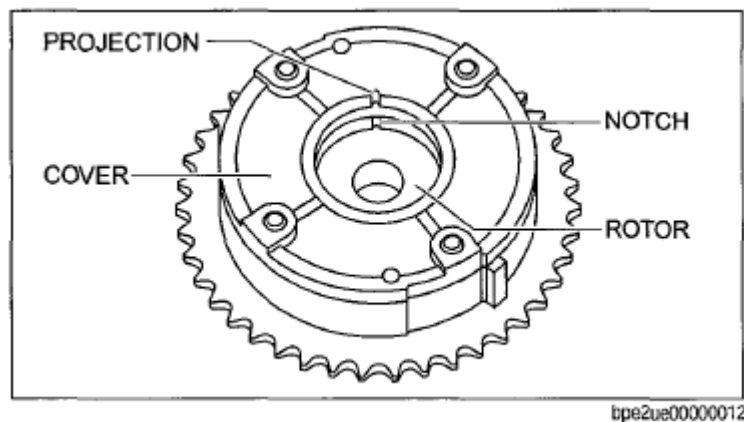


Fig. 14: Locating Engine Bolt Plug
Courtesy of MAZDA MOTORS CORP.

10. Install the crankshaft timing peg and turn the crankshaft clockwise until the crankshaft contacts the crankshaft timing peg.

NOTE:

- The special tool will contact the crankshaft and prevent it from turning past TDC. However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position during the camshaft removal and installation.

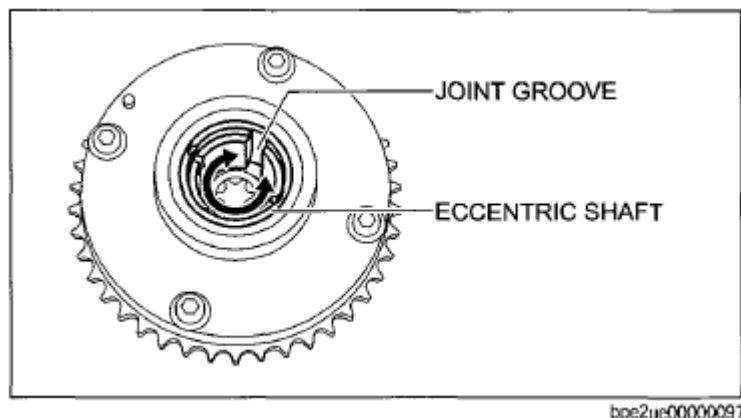


Fig. 15: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

11. Install a standard 6 mm bolt (0.23 in) x 18 mm (0.7 in) bolt through the crankshaft pulley and thread it into the front cover.

CAUTION:

- Only hand-tighten the bolt or damage to the front cover can occur.

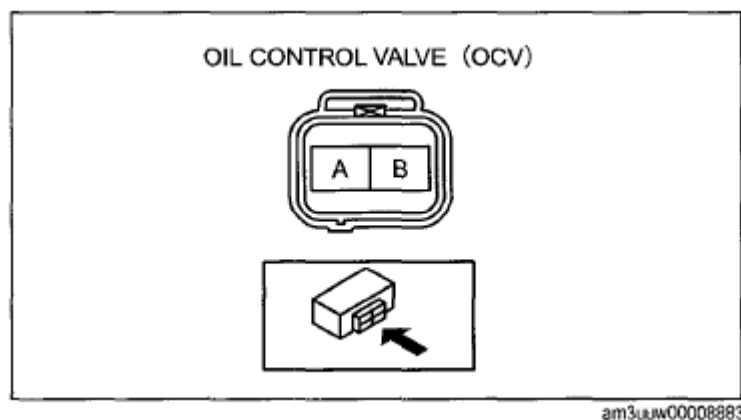


Fig. 16: Locating Standard Bolt 6 x 18 mm (0.23 x 0.7 in)
Courtesy of MAZDA MOTORS CORP.

12. Remove the front cover timing hole plug from the engine front cover.

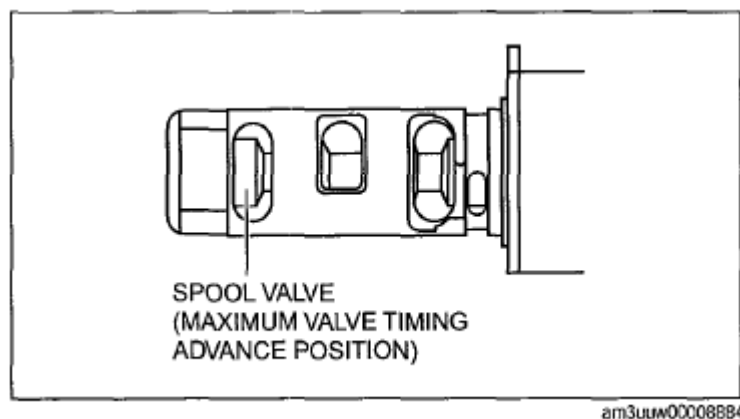


Fig. 17: Locating Front Cover Timing Hole Plug
Courtesy of MAZDA MOTORS CORP.

13. Remove the upper front cover timing hole plug from the engine front cover.

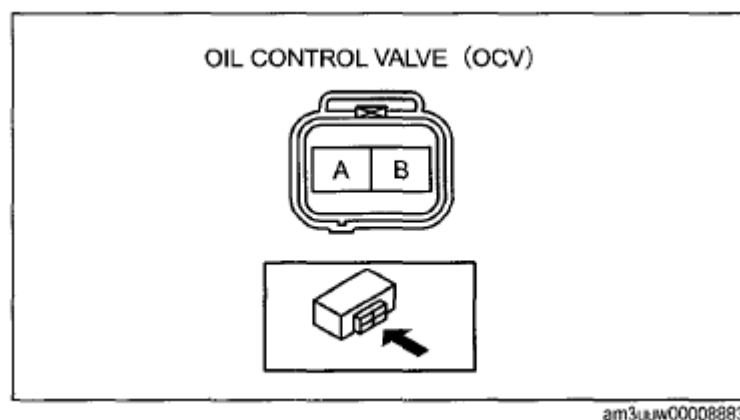


Fig. 18: Locating Upper Front Cover Timing Hole Plug
Courtesy of MAZDA MOTORS CORP.

14. Reposition the special tool to the slot on the rear of the intake camshaft only.

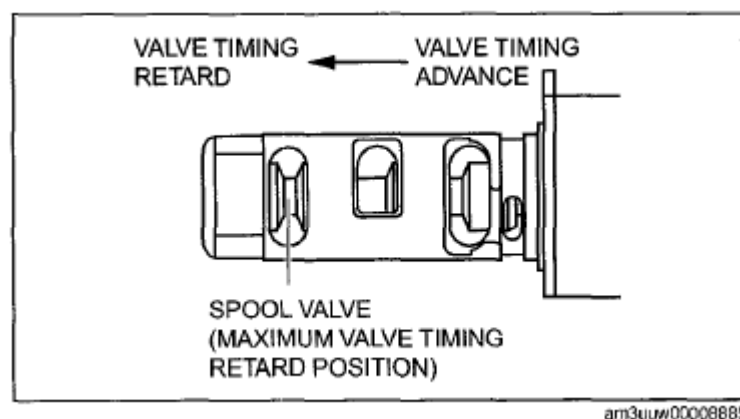
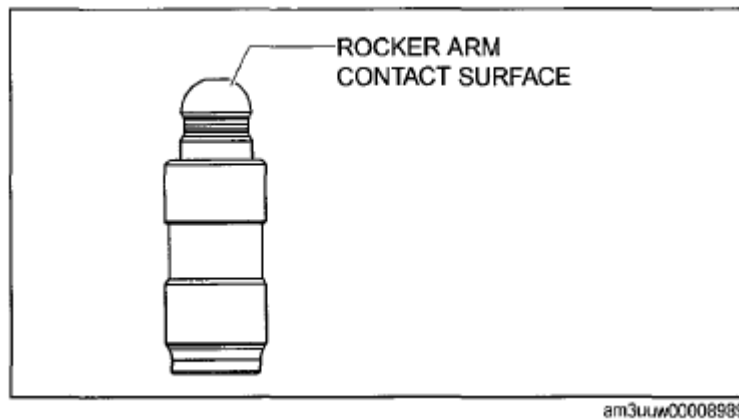


Fig. 19: Identifying Special Tool (303-465)

Courtesy of MAZDA MOTORS CORP.

**Fig. 20: Unlocking Chain Tensioner Ratchet Through Lower Front Cover Timing Hole**

Courtesy of MAZDA MOTORS CORP.

15. Using a small pick tool, unlock the chain tensioner ratchet through the lower front cover timing hole.
 - Using the flats of the camshaft, have an assistant rotate the exhaust camshaft clockwise to collapse the timing chain tensioner plunger.
 - Insert an M6 x 30 mm (1.18 in) bolt into the upper front cover timing hole to hold the tensioner arm in the retracted position.

NOTE:

- Releasing the ratcheting mechanism in the timing chain tensioner allows the plunger to collapse and create slack in the timing chain. Installing an M6 x 18mm (1.18 in) bolt into the upper front cover timing hole will hold the tensioner arm in a retracted position and allow enough slack in the timing chain for removal of the exhaust camshaft gear.

16. Remove the special tool.

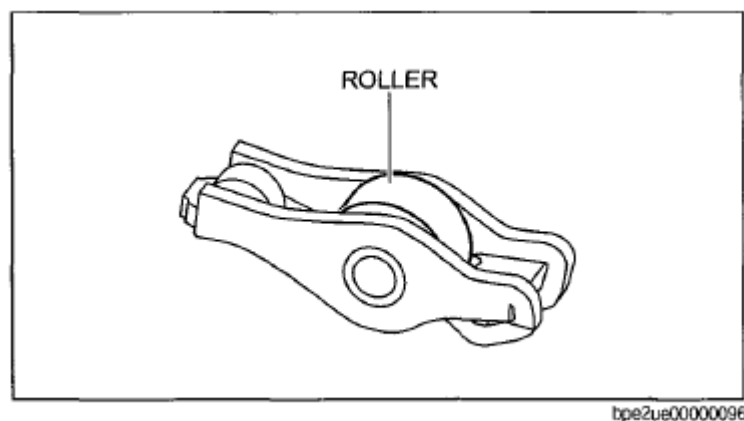
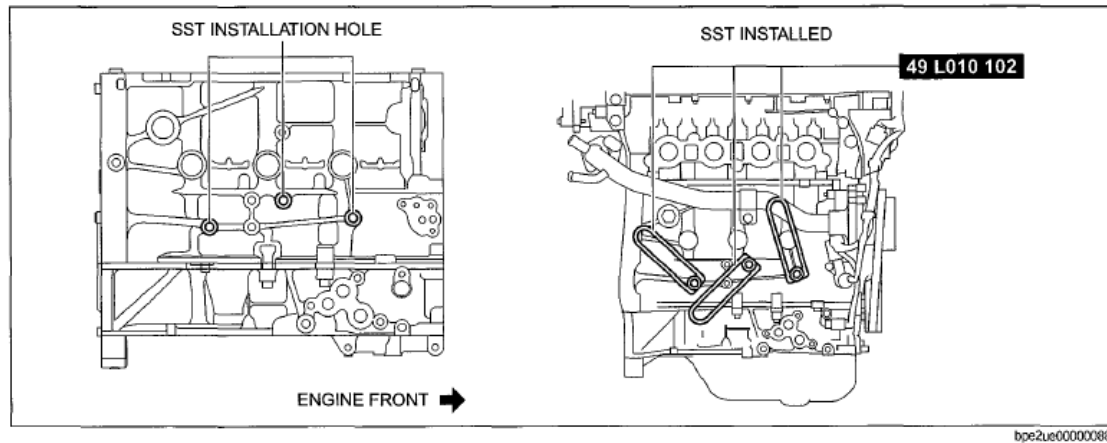


Fig. 21: Identifying Special Tool (303-465)

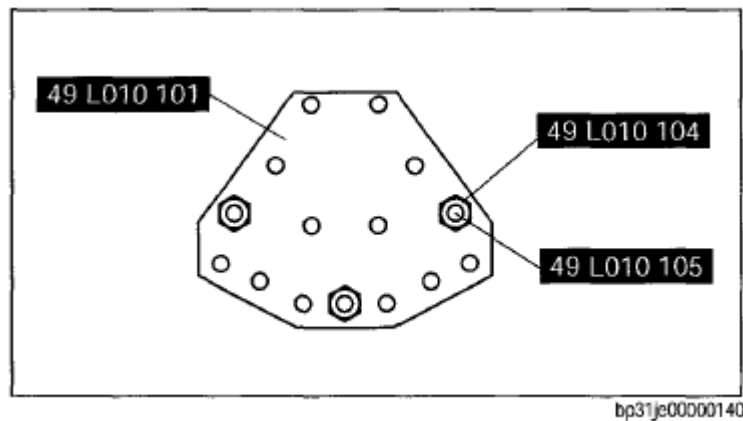
Courtesy of MAZDA MOTORS CORP.

17. Using the flats of the camshaft to prevent camshaft rotation, remove the bolt and exhaust camshaft drive gear.

**Fig. 22: Locating Flats Of Camshaft, Bolt And Exhaust Camshaft Drive Gear**

Courtesy of MAZDA MOTORS CORP.

18. Remove the timing chain from the camshaft phaser and sprocket.

**Fig. 23: Locating Timing Chain**

Courtesy of MAZDA MOTORS CORP.

19. Mark the position of the camshaft lobes on the No. 1 cylinder for installation reference.

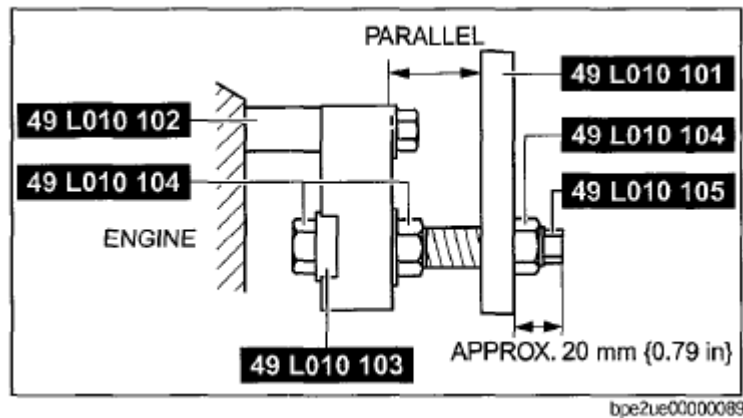


Fig. 24: Locating Camshaft Lobe
Courtesy of MAZDA MOTORS CORP.

20. Remove the camshafts from the engine.

- Loosen the camshaft bearing cap bolts, in sequence, one at a time until all tension is released from the camshaft bearing caps.
- Remove the bolts and the camshaft bearing caps.
- Remove the camshafts.

CAUTION:

- Failure to follow the camshaft loosening procedure can result in damage to the camshafts.

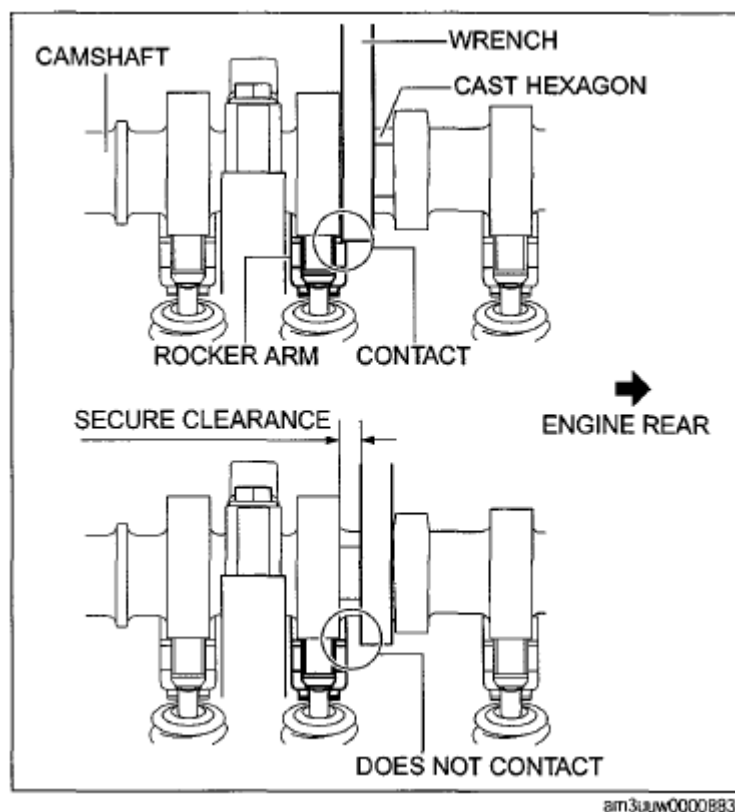


Fig. 25: Identifying Camshaft Bearing Cap Bolts Loosening Sequence
Courtesy of MAZDA MOTORS CORP.

NOTE:

- Mark the location and orientation of each camshaft bearing cap.

21. If removal of the camshaft phaser and sprocket is necessary, mark the sprocket and camshaft for reference during installation.
 - If necessary, place the camshaft in a soft-jawed vise. Remove the bolt and the camshaft phaser and sprocket.

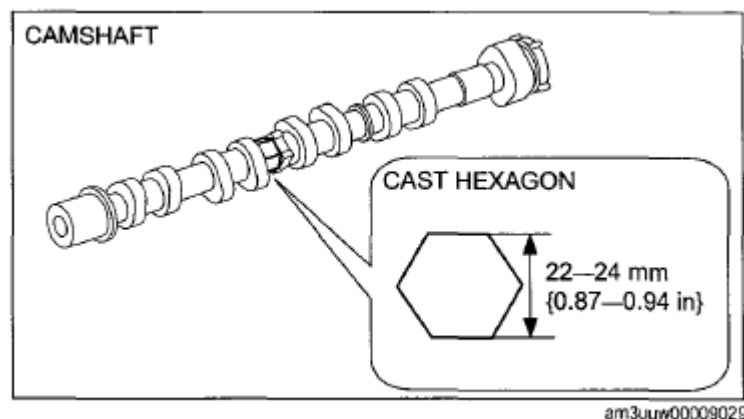


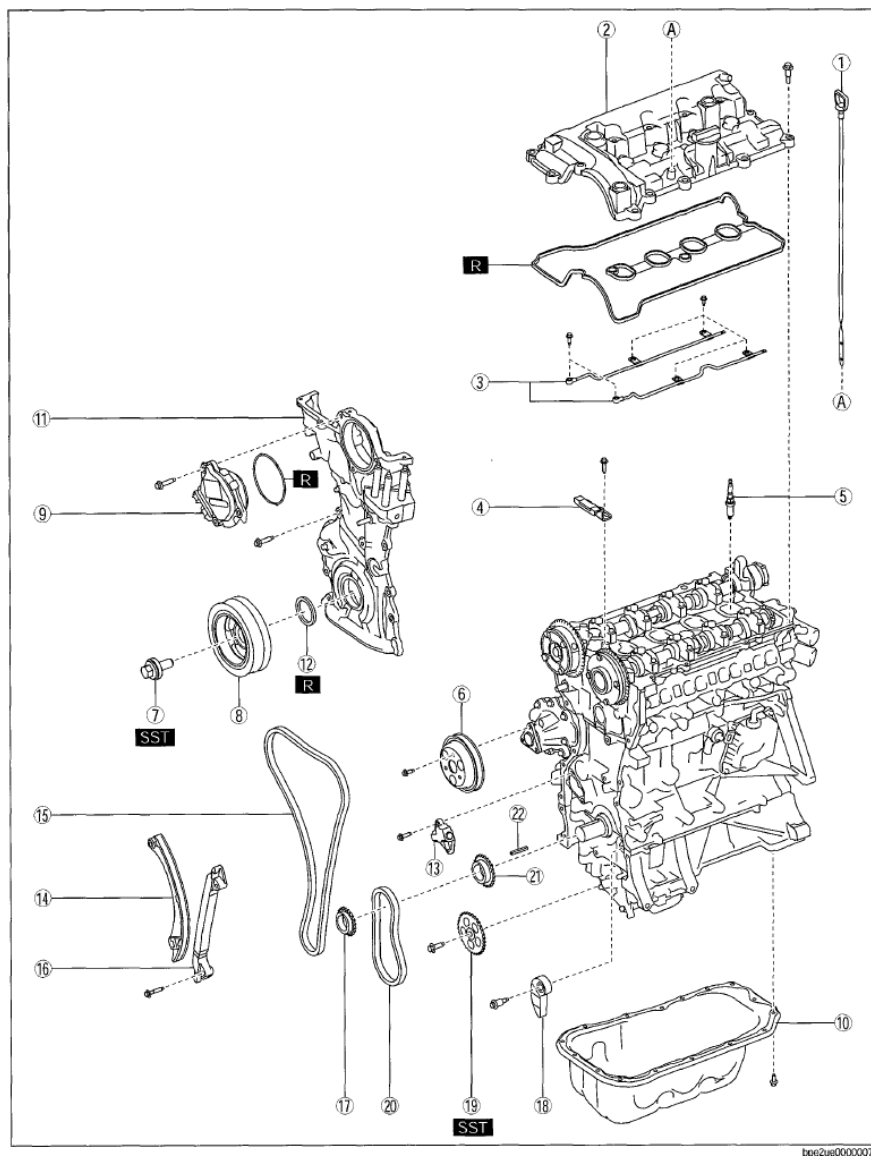
Fig. 26: Locating Sprocket And Camshaft Mark Reference
Courtesy of MAZDA MOTORS CORP.

INSTALLATION

1. If necessary, position the camshaft in a soft-jawed vise and install the camshaft phaser and sprocket and the bolt.
 - Align the reference marks on the camshaft phaser and sprocket and the camshaft. Tighten the bolt to 72 N.m {7.2 kgf.m, 53 ft.lbf}.

NOTE:

- If new parts are installed, transfer the reference marks made during disassembly to the new parts.



1	Dipstick
2	Cylinder head cover
5	Spark plug
6	Water pump pulley (See Water Pump Pulley Disassembly Note.)
7	Crankshaft pulley lock bolt (See Crankshaft Pulley Lock Bolt Disassembly Note.)
8	Crankshaft pulley
9	Electric variable valve timing motor/driver
10	Oil pan (See Oil Pan Disassembly Note.)
11	Engine front cover (See Engine Front Cover Disassembly Note.)
12	Front oil seal (See Front Oil Seal Disassembly Note.)

3	Oil shower pipe
4	Chain guide (No.1)
13	Chain tensioner (See Chain Tensioner Removal Note.)
14	Tensioner arm
15	Timing chain
16	Chain guide (No.2)
17	Crankshaft sprocket
18	Oil pump chain tensioner
19	Oil pump driven sprocket (See Oil Pump Driven Sprocket Disassembly Note.)
20	Oil pump chain
21	Oil pump drive sprocket
22	Key

Fig. 27: Locating Sprocket And Camshaft Mark Reference
Courtesy of MAZDA MOTORS CORP.

2. Install the camshafts and bearing caps in their original location and orientation. Tighten the bolts in the sequence shown in the figure in 3 stages.

- Stage 1: Tighten the camshaft bearing bolt caps one turn at a time until tight.
- Stage 2: Tighten the bolts to 7 N.m {0.7 kgf.m, 62 in.lbf}.
- Stage 3: Tighten the bolts to 16 N.m {1.6 kgf.m, 141 in.lbf}.

CAUTION:

- Install the camshafts with the alignment slots in the camshafts lined up so the camshaft alignment plate can be installed without rotating the camshafts. Make sure the lobes on the No. 1 cylinder are in the same position as noted in the removal procedure. Rotating the camshafts when the timing chain is removed, or installing the camshafts 180 degrees out of position can cause severe damage to the valves and pistons.

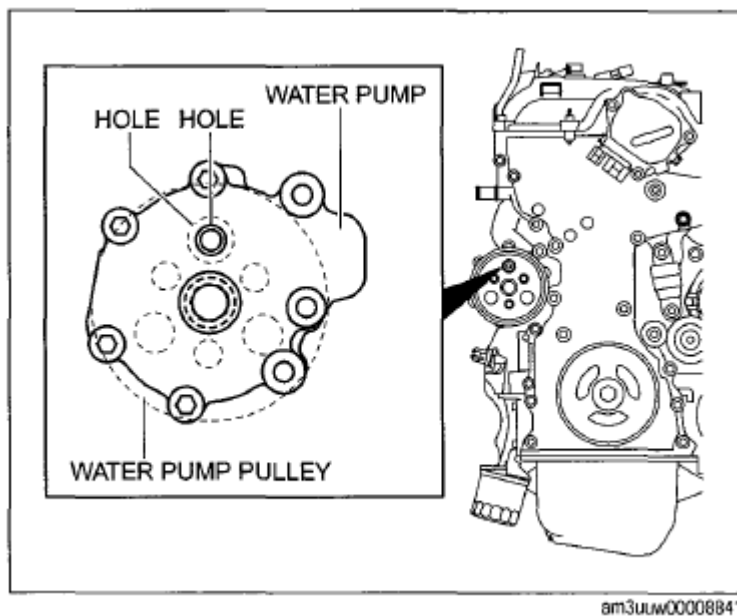


Fig. 28: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

NOTE:

- Lubricate the camshaft journals and bearing caps with clean engine oil.

3. Install the special tool.

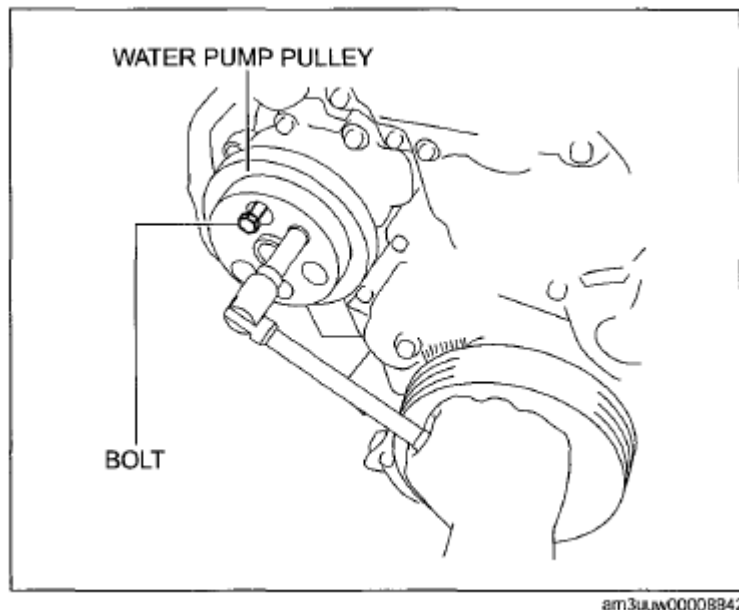


Fig. 29: Identifying Camshaft Alignment Plate 303-465
Courtesy of MAZDA MOTORS CORP.

4. Install the timing chain on the camshaft phaser and sprocket.

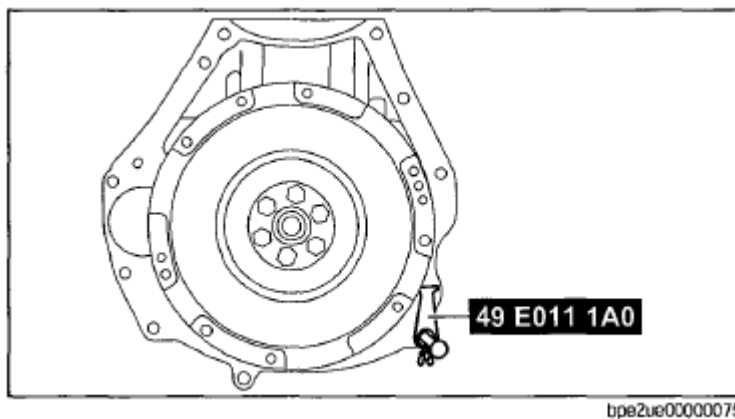


Fig. 30: Locating Timing Chain
Courtesy of MAZDA MOTORS CORP.

5. Position the exhaust camshaft drive gear in the timing chain and install the gear and bolt on the exhaust camshaft.
 - Hand-tighten the bolt.

NOTE:

- The timing chain must be correctly engaged on the teeth of the crankshaft timing sprocket and the intake camshaft drive gear in order to install the exhaust camshaft drive gear onto the exhaust camshaft.

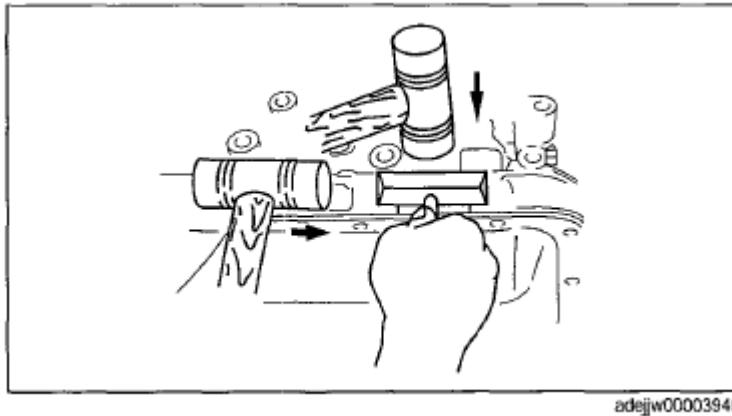


Fig. 31: Locating Exhaust Camshaft Drive Gear And Bolt On Exhaust Camshaft
Courtesy of MAZDA MOTORS CORP.

6. Remove the M6 x 30 mm bolt from the upper front cover timing hole to release the tensioner arm.

NOTE:

- Releasing the tensioner arm will remove the slack from the timing chain release.

7. Using the flats on the camshaft to prevent camshaft rotation, tighten the bolts.

- Tighten to 72 N.m {7.3 kgf.m, 53 ft.lbf}.

NOTE:

- The special tool 303-465 is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

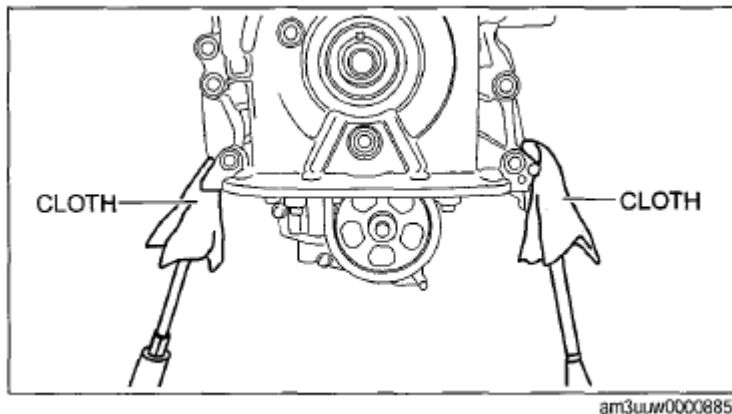


Fig. 32: Locating Flats On Camshaft And Camshaft Bolts
Courtesy of MAZDA MOTORS CORP.

8. Remove the special tool.

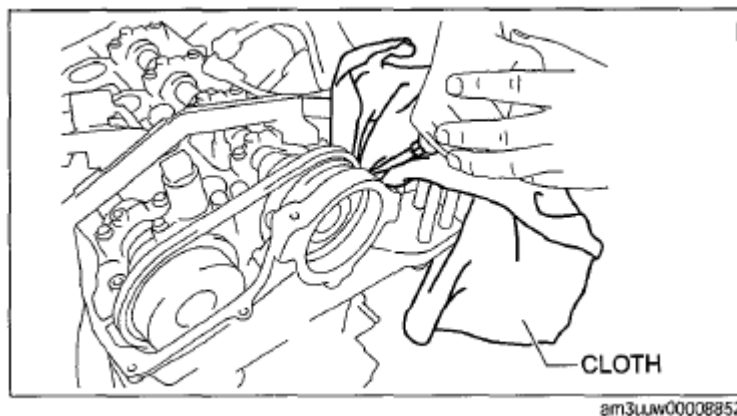


Fig. 33: Identifying Camshaft Alignment Plate 303-465
Courtesy of MAZDA MOTORS CORP.

9. Remove the 6 mm (0.23 in) x 18 mm (0.7 in) bolt.

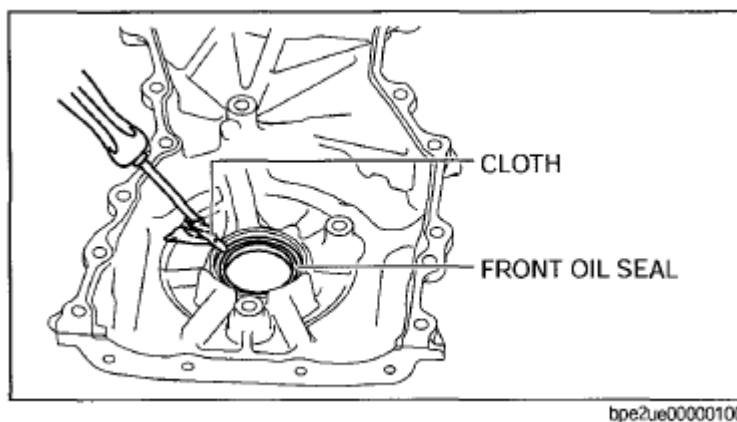


Fig. 34: Locating Standard Bolt 6 x 18 mm (0.23 x 0.7 in)
Courtesy of MAZDA MOTORS CORP.

10. Remove the special tool.

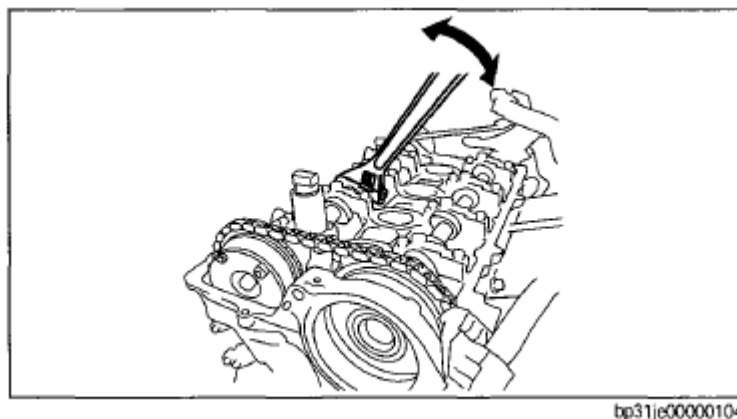


Fig. 35: Identifying Special Tool 303-507
 Courtesy of MAZDA MOTORS CORP.

11. Install the upper front cover timing hole plug.
 - Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

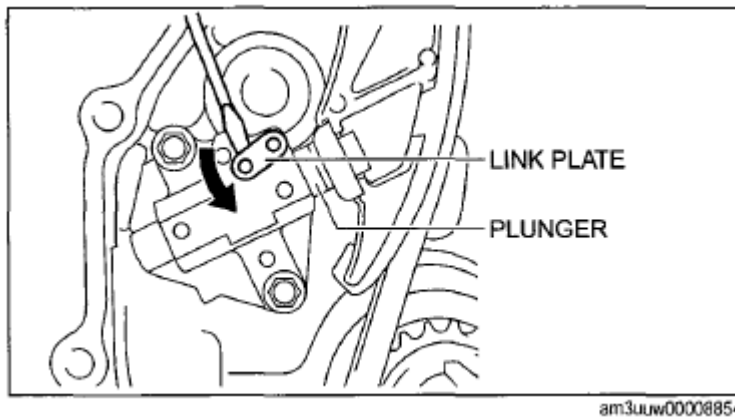


Fig. 36: Locating Upper Front Cover Timing Hole Plug
 Courtesy of MAZDA MOTORS CORP.

12. Apply silicone gasket and sealant to the threads of the lower front cover timing hole plug.
 - Install the plug and tighten to 12 N.m {1.2 kgf.m, 106 in.lbf}.

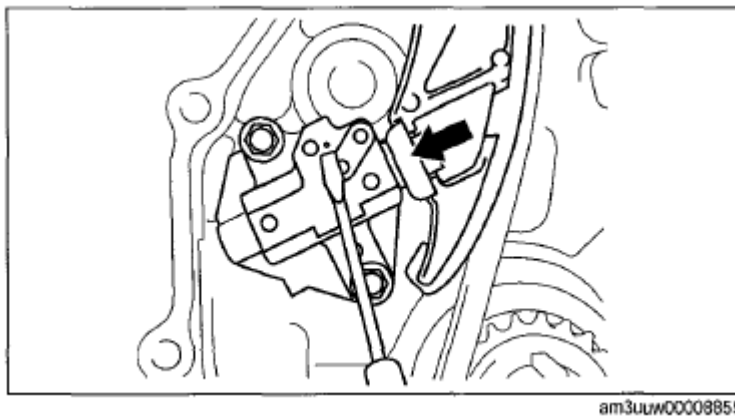


Fig. 37: Locating Lower Front Cover Timing Hole Plug
 Courtesy of MAZDA MOTORS CORP.

13. Install the engine plug bolt.
 - Tighten to 20 N.m {2.0 kgf.m, 177 in.lbf}.

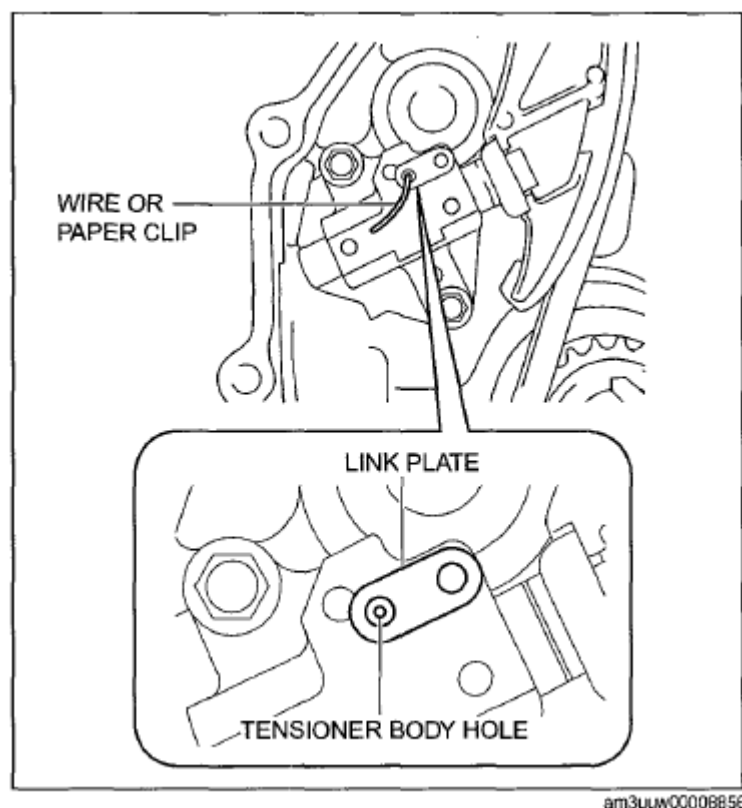


Fig. 38: Locating Engine Plug Bolt
Courtesy of MAZDA MOTORS CORP.

14. Install the accessory drive belt. See **ACCESSORY DRIVE BELT REMOVAL/INSTALLATION - 2.5L** .
15. Install the front RF wheel and tire. See **WHEEL AND TIRE REMOVAL/INSTALLATION** .
16. Install the valve cover. See **VALVE COVER REMOVAL/INSTALLATION - 2.5L** .
17. Install the degas bottle. See **DEGAS BOTTLE REMOVAL/INSTALLATION - 2.5L** .
18. Connect the battery ground cable.

VALVE TAPPETS REMOVAL/INSTALLATION - 2.5L

CAUTION:

- During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.

1. With the vehicle in NEUTRAL, position it on a hoist. See **LIFTING** .
2. Remove the camshafts. See **CAMSHAFTS REMOVAL/INSTALLATION - 2.5L** .
3. Remove and inspect the valve tappets. See **VALVE TAPPETS REMOVAL/INSTALLATION - 2.5L** .

- CAUTION:**
- If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original locations.

- NOTE:**
- The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number of 0.650 has the thickness of 3.650 mm.

4. To install, reverse the removal procedure.
 - Coat the valve tappets with clean engine oil prior to installation.

VALVE SPRING REMOVAL/INSTALLATION - 2.5L

REMOVAL

- CAUTION:**
- During engine repair procedures, cleanliness is extremely important. Any foreign material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan may cause engine failure.

1. With the vehicle in NEUTRAL, position it on a hoist. See **LIFTING**
2. Remove the camshafts. See **CAMSHAFTS REMOVAL/INSTALLATION - 2.5L** .
3. Remove and inspect the valve tappets. See **VALVE TAPPETS REMOVAL/INSTALLATION - 2.5L**.

- NOTE:**
- If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

- NOTE:**
- The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

4. Remove the spark plugs. See **SPARK PLUGS REMOVAL/INSTALLATION - 2.5L** .
5. Connect the compressed air supply to the No. 1 cylinder.

- CAUTION:**
- Use compressed air at 7 to 10 bars (100-150 psi). Do not disconnect the compressed air from the cylinder until the valve spring, valve spring retainer and valve collet is installed.

6. Apply compressed air to the cylinder and remove the valve spring.
 - Using the special tools, compress the valve spring and remove the valve collet, using some multi-purpose grease and a small screwdriver.

- Remove the valve spring retainer and the valve spring.

NOTE:

- Place all parts in order to one side.

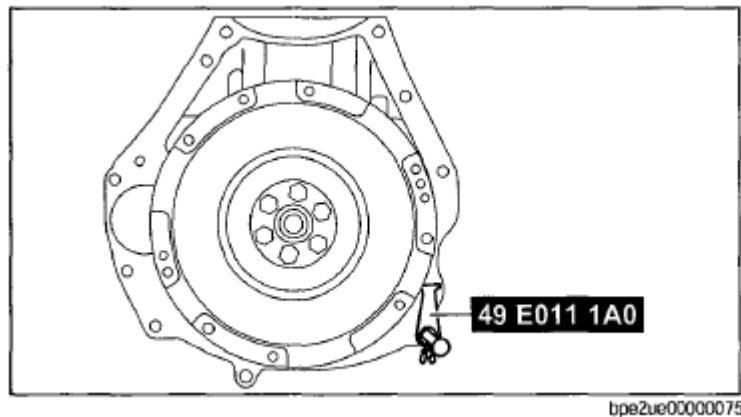


Fig. 39: Illustrating Removing/Installing Valve Spring Retainer And Valve Spring
Courtesy of MAZDA MOTORS CORP.

INSTALLATION

1. Using the special tools, install the valve spring.
 - Insert the valve spring and the valve spring retainer.
 - Compress the valve spring and install the valve collet using some multi-purpose grease and a small screwdriver.

NOTE:

- Check the seating of the valve collet.

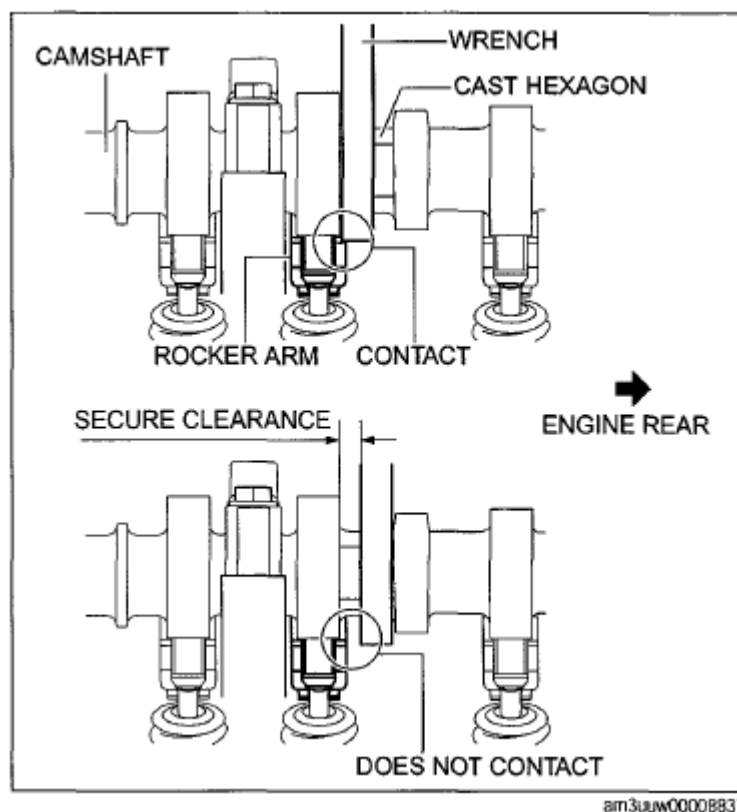


Fig. 40: Illustrating Removing/Installing Valve Spring Retainer And Valve Spring
Courtesy of MAZDA MOTORS CORP.

2. Disconnect the compressed air supply.
3. Repeat the appropriate removal and installation steps for all the cylinders.
4. Install the spark plugs. See **SPARK PLUGS REMOVAL/INSTALLATION - 2.5L** .
5. Coat the valve tappets with clean engine oil and insert them.
6. Install the camshafts. See **CAMSHAFTS REMOVAL/INSTALLATION - 2.5L** .

VALVE SEALS REMOVAL/INSTALLATION - 2.5L

REMOVAL

CAUTION:

- During engine repair procedures, cleanliness is extremely important. Any foreign material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan may cause engine failure.

1. With the vehicle in NEUTRAL, position it on a hoist. See **LIFTING** .
2. Remove the camshafts. See **CAMSHAFTS REMOVAL/INSTALLATION - 2.5L** .
3. Remove and inspect the valve tappets. See **VALVE TAPPETS REMOVAL/INSTALLATION - 2.5L**.

NOTE:

- If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

NOTE:

- The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

4. Remove the spark plugs. See **SPARK PLUGS REMOVAL/INSTALLATION - 2.5L**.
5. Connect the compressed air supply to the No. 1 cylinder.

CAUTION:

- Use compressed air at 7 to 10 bars (100-150 psi). Do not disconnect the compressed air from the cylinder until the valve spring, valve spring retainer and valve collet is installed.

6. Apply compressed air to the cylinder and remove the valve spring.
 - Using the special tools, compress the valve spring and remove the valve collet, using some multi-purpose grease and a small screwdriver.
 - Remove the valve spring retainer and the valve spring.

NOTE:

- Place all parts in order to one side.

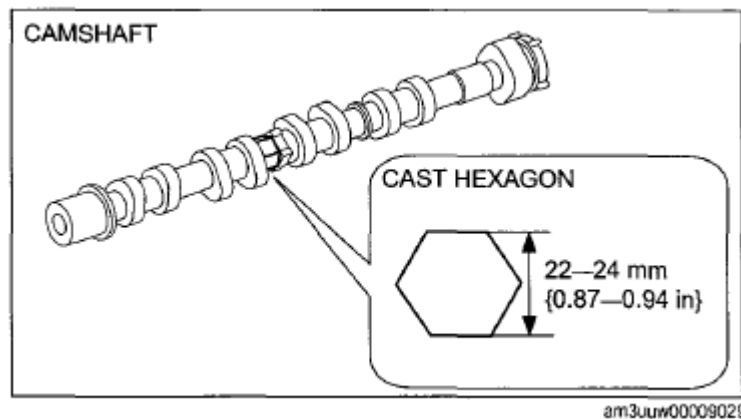
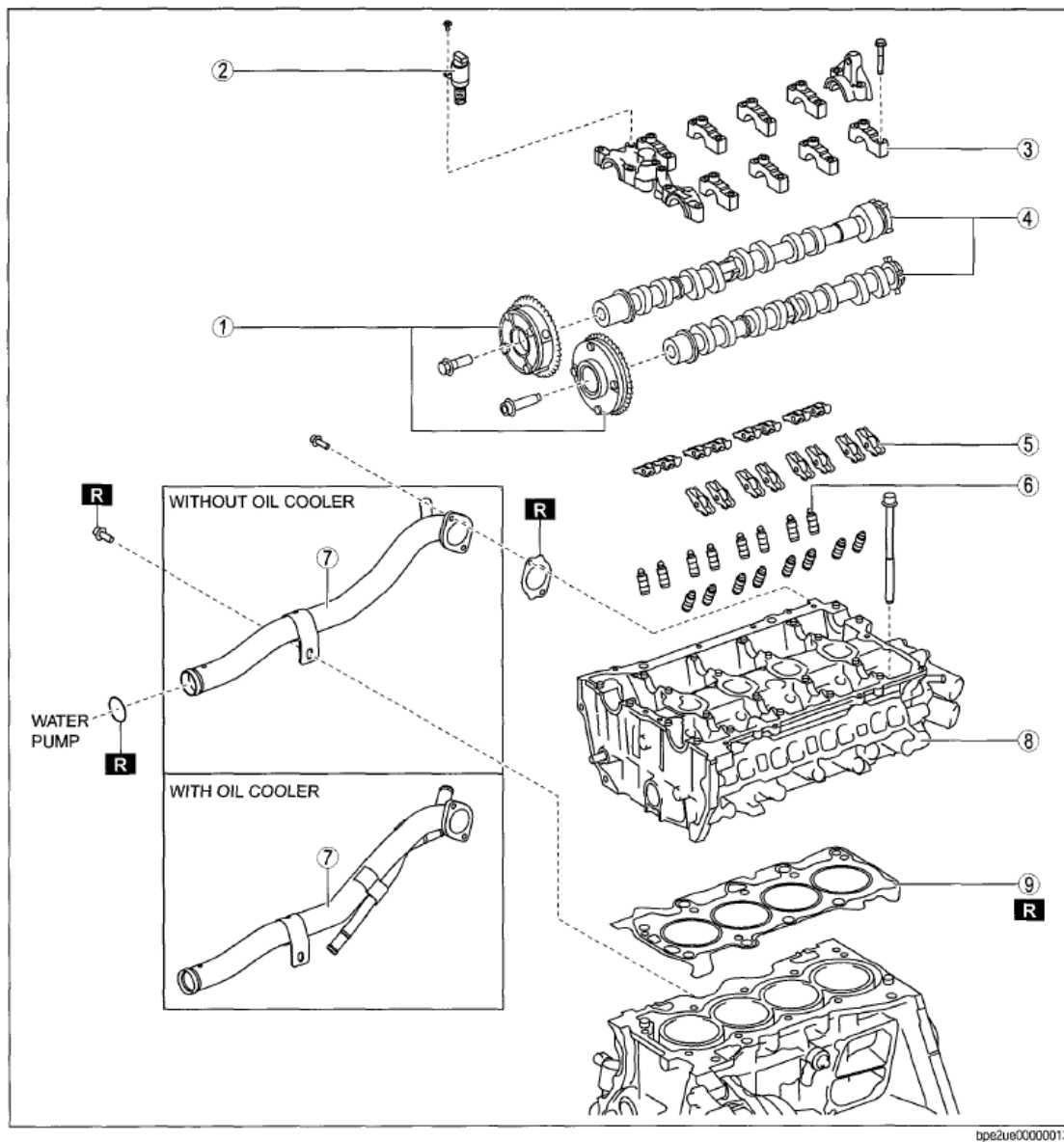


Fig. 41: Illustrating Removing/Installing Valve Spring Retainer And Valve Spring
Courtesy of MAZDA MOTORS CORP.

7. Using the special tool, remove and discard the valve seal.



bpe2ue00000013

1	Electric variable valve timing actuator, hydraulic variable valve timing actuator (See Electric Variable Valve Timing Actuator, Hydraulic Variable Valve Timing Actuator Disassembly Note.)
2	OCV
3	Camshaft cap (See Camshaft Cap Disassembly Note.)
4	Camshaft

5	Rocker arm (See Rocker Arm Disassembly Note.)
6	HLA (See HLA Disassembly Note.)
7	Water inlet pipe
8	Cylinder head (See Cylinder Head Disassembly Note.)
9	Cylinder head gasket

Fig. 42: Identifying Special Tool (303-468, 303-005)
Courtesy of MAZDA MOTORS CORP.

INSTALLATION

1. Install the valve stem seal installation sleeve.

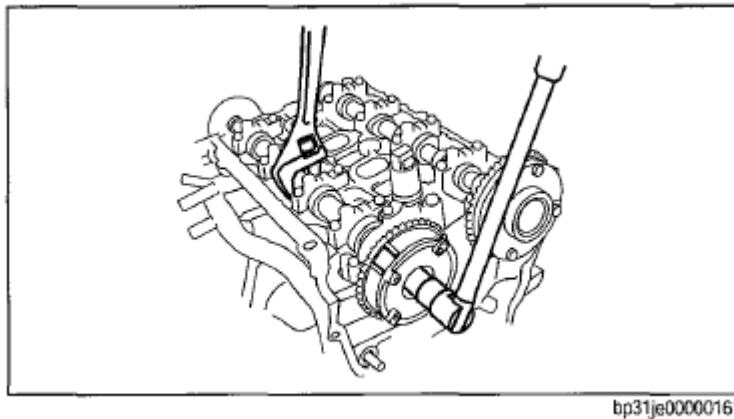


Fig. 43: Identifying Valve Stem Seal Installation Sleeve
Courtesy of MAZDA MOTORS CORP.

2. Using the special tool, install the valve seal.

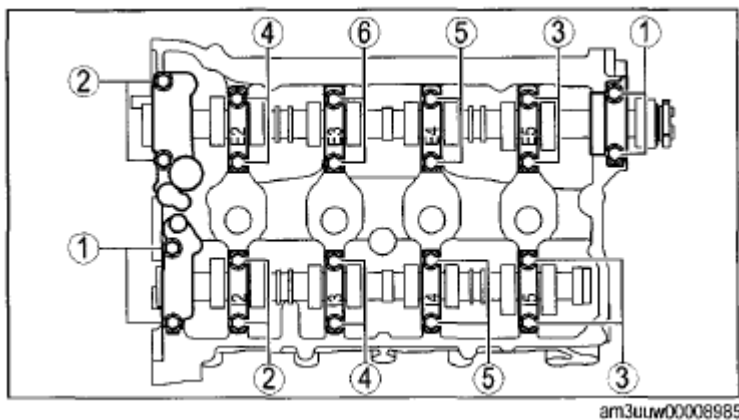


Fig. 44: View Of Installing Valve Seal
Courtesy of MAZDA MOTORS CORP.

3. Using the special tools, install the valve spring.
 - Insert the valve spring and the valve spring retainer.
 - Compress the valve spring and install the valve collet using some multi-purpose grease and a small screwdriver.

NOTE:

- Check the seating of the valve collet.

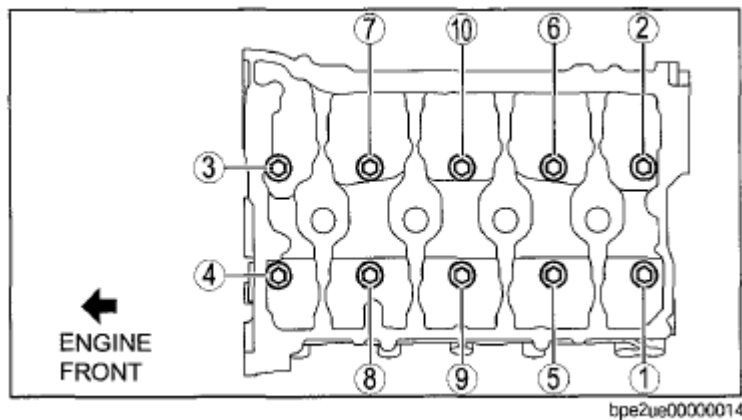
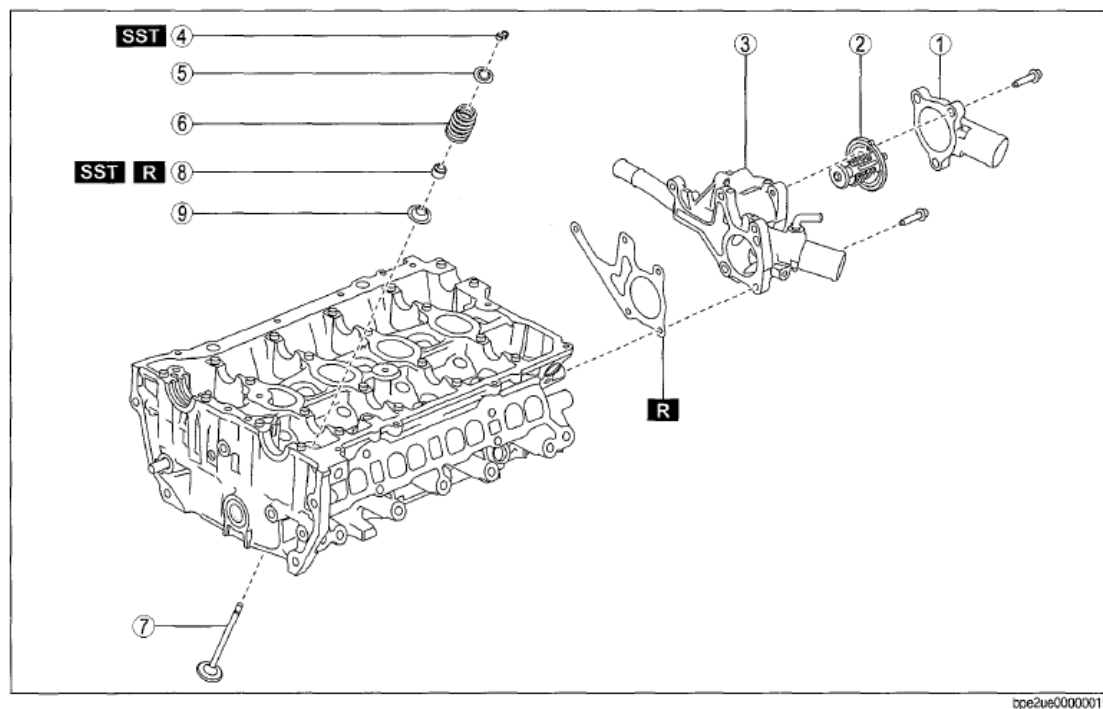


Fig. 45: Illustrating Removing/Installing Valve Spring Retainer And Valve Spring
Courtesy of MAZDA MOTORS CORP.

4. Disconnect the compressed air supply and install the spark plug.
5. Install the spark plugs. See **SPARK PLUGS REMOVAL/INSTALLATION - 2.5L** .
6. Repeat the appropriate removal and installation steps for all of the other cylinders.
7. Coat the valve tappets with clean engine oil and insert them.
8. Install the camshafts. See **CAMSHAFTS REMOVAL/INSTALLATION - 2.5L** .

LOWER END COMPONENTS EXPLODED VIEW - 2.5L

CRANKSHAFT PULLEY AND CRANKSHAFT FRONT OIL SEAL



tpe2ue00000015

1	Thermostat cover
2	Thermostat
3	Water outlet
4	Valve keeper (See Valve Keeper Disassembly Note.)
5	Upper valve spring seat

6	Valve spring
7	Valve
8	Valve seal (See Valve Seal Disassembly Note.)
9	Lower valve spring seat

Fig. 46: Identifying Crankshaft Pulley And Crankshaft Front Oil Seal
Courtesy of MAZDA MOTORS CORP.

FLEXPLATE, FLYWHEEL AND CRANKSHAFT REAR OIL SEAL

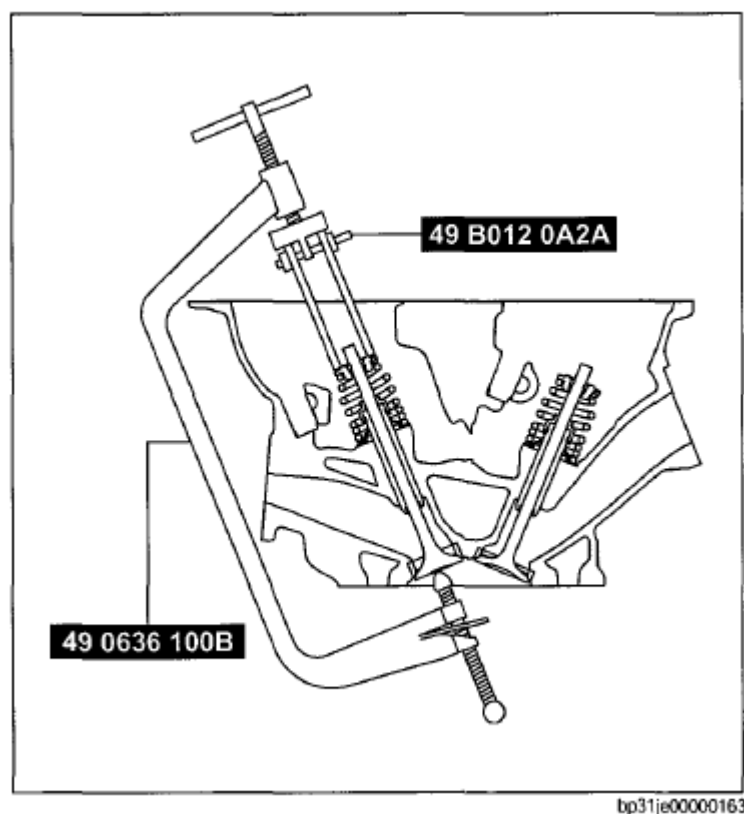


Fig. 47: Identifying Flexplate, Flywheel And Crankshaft Rear Oil Seal
Courtesy of MAZDA MOTORS CORP.

1. For additional information, see the procedures in this service information.

CRANKSHAFT PULLEY REMOVAL/INSTALLATION - 2.5L

REMOVAL

CAUTION:

- Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if you loosen the pulley bolt. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

CAUTION:

- During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning

gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.

1. With the vehicle in NEUTRAL, position it on a hoist. See **LIFTING** .
2. Remove the front RH wheel and tire. See **WHEEL AND TIRE REMOVAL/INSTALLATION** .
3. Remove the accessory drive belt. See **ACCESSORY DRIVE BELT REMOVAL/INSTALLATION - 2.5L** .
4. Remove the valve cover. See **VALVE COVER REMOVAL/INSTALLATION - 2.5L** .
5. Using the crankshaft pulley bolt, turn the crankshaft clockwise to position the No. 1 piston at top dead center (TDC).
 - The hole on the crankshaft pulley should be in the 6 o'clock position.

CAUTION:

- Failure to position the No. 1 piston at top dead center (TDC) can result in damage to the engine. Turn the engine in the normal direction of rotation only.

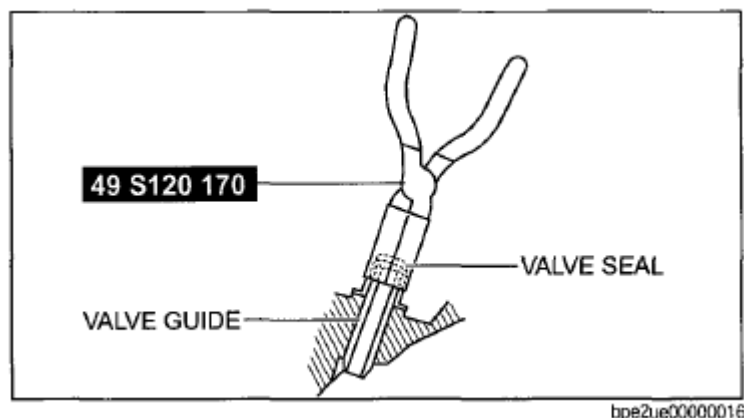


Fig. 48: Locating Hole On Crankshaft Pulley
 Courtesy of MAZDA MOTORS CORP.

6. Install the special tool in the slots on the rear of both camshafts.

CAUTION:

- The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

NOTE:

- The camshaft timing slots are offset. If the special tool cannot be installed, rotate the crankshaft one complete revolution clockwise to correctly position the camshafts.

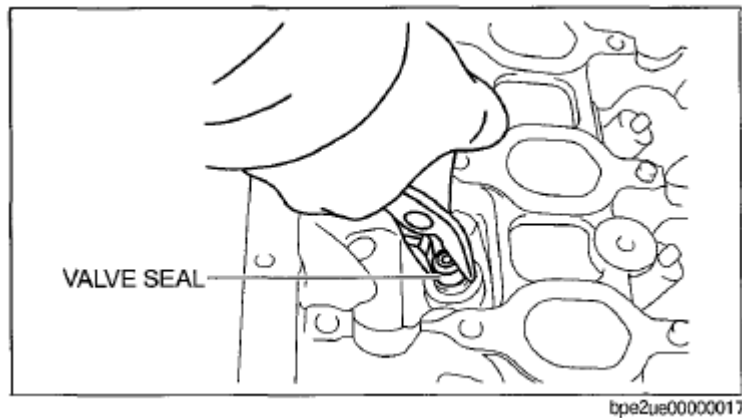
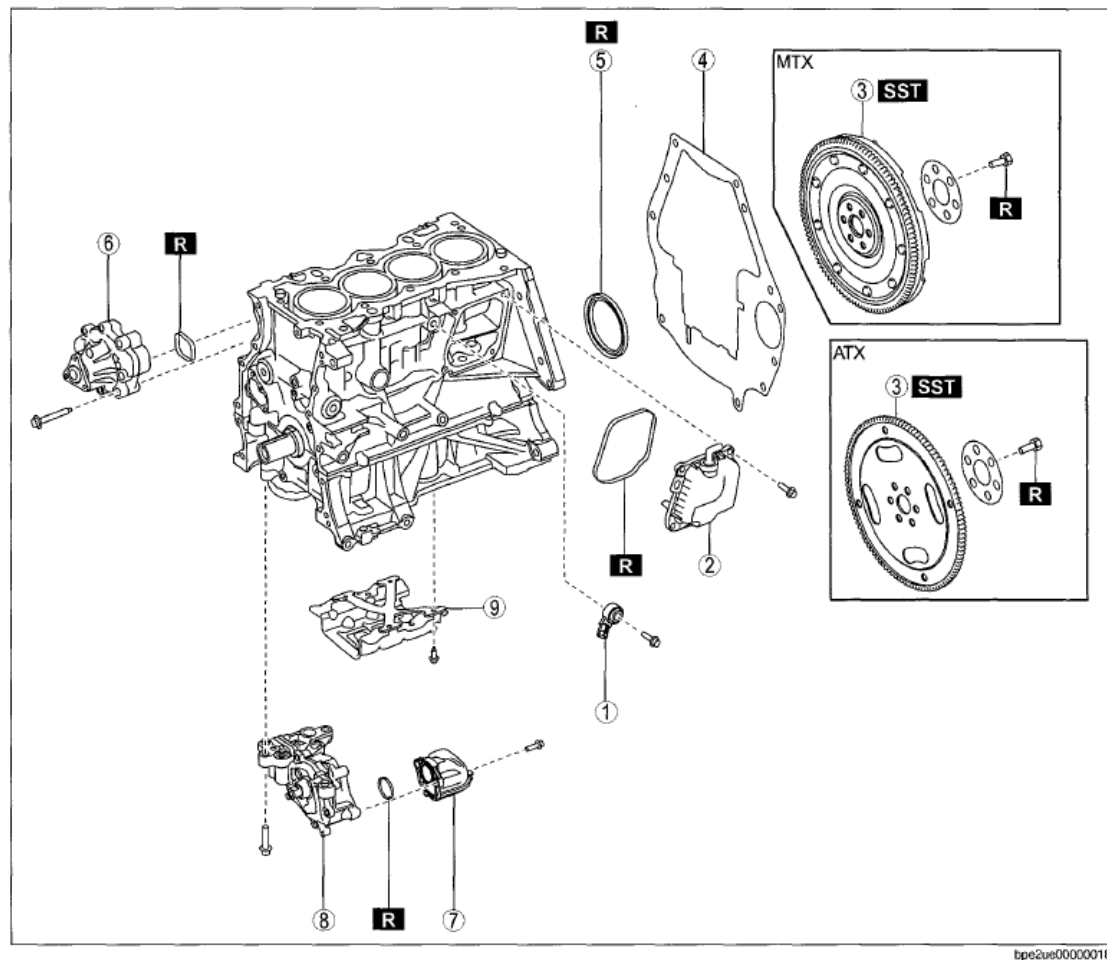


Fig. 49: Identifying Camshaft Alignment Plate 303-465
Courtesy of MAZDA MOTORS CORP.

7. Remove the engine plug bolt.



1	Knock sensor
2	Oil separator
3	Flywheel (MTX), Drive plate (ATX) (See Flywheel (MTX), Drive Plate (ATX) Disassembly Note.)
4	End plate

5	Rear oil seal (See Rear Oil Seal Removal Note.)
6	Water pump
7	Oil strainer
8	Oil pump
9	Oil baffle plate

Fig. 50: Locating Engine Plug Bolt
Courtesy of MAZDA MOTORS CORP.

8. Install the special tool.

NOTE:

- The special tool will contact the crankshaft and prevent it from turning past TDC. However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain in the TDC position during the crankshaft pulley removal and installation.

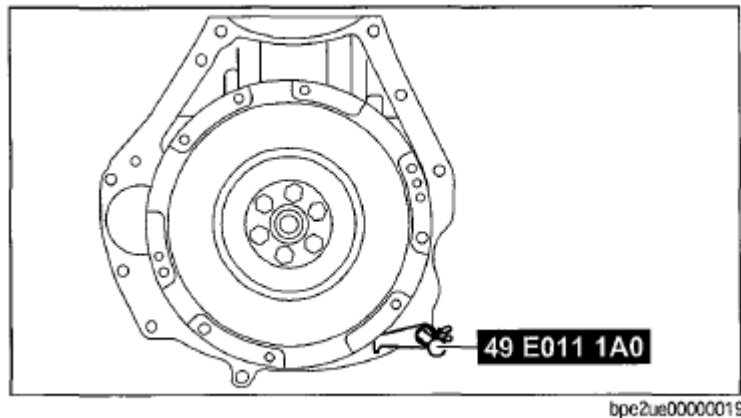


Fig. 51: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

9. Use the Crankshaft Damper Holding Tool and a suitable 1/2-in drive hand tool to hold the crankshaft pulley. Use an air impact wrench to remove the crankshaft pulley bolt.
- Remove and discard the crankshaft pulley, bolt and washer.
 - Remove the crankshaft pulley.
 - Remove the diamond washer and discard.

CAUTION:

- The crankshaft must remain in the TDC position during removal of the pulley bolt or damage to the engine can occur. Therefore, the crankshaft pulley must be held in place with the special tool and the bolt should be removed using an air impact wrench (1/2 in drive minimum).

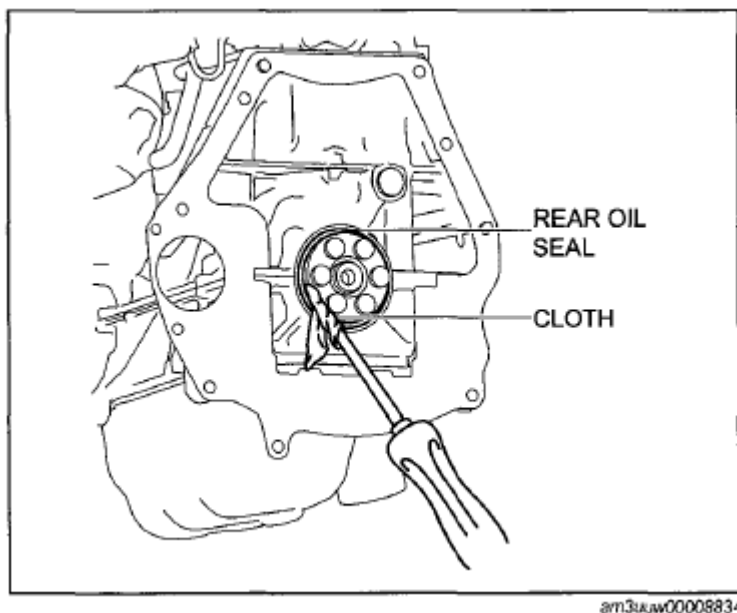


Fig. 52: Locating Crankshaft Pulley Bolt

Courtesy of MAZDA MOTORS CORP.

- CAUTION:**
- The crankshaft sprocket diamond washer may come off with the crankshaft pulley. The diamond washer must be replaced. Remove and discard the diamond washer. If the diamond washer is not installed, engine damage may occur.

INSTALLATION

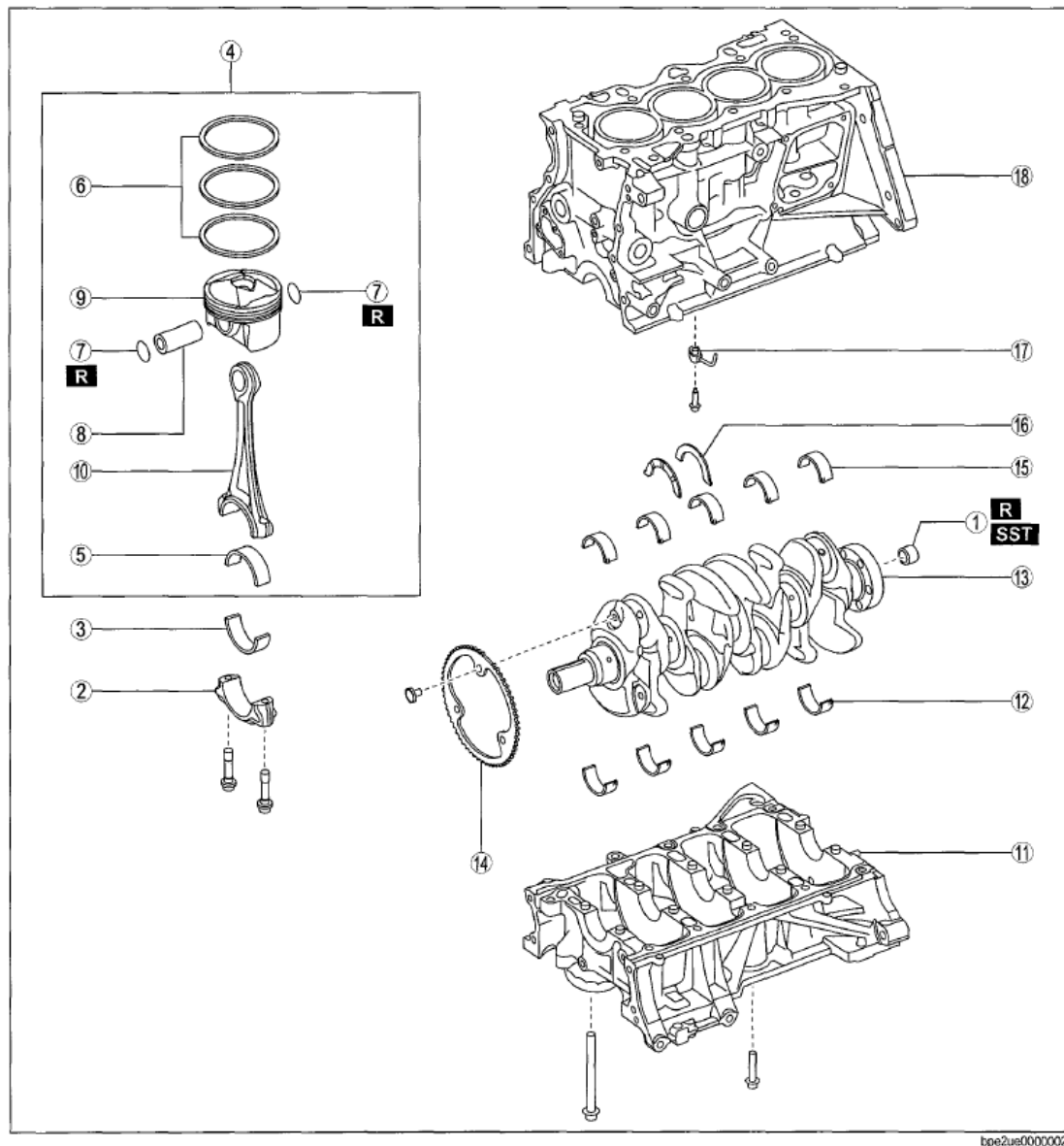
1. Install a new diamond washer.
2. Position the crankshaft pulley onto the crankshaft with the hole in the pulley at the 6 o'clock position.

- CAUTION:**
- Do not install the crankshaft pulley bolt at this time.

- NOTE:**
- Apply clean engine oil on the seal area before installing.

2009 Mazda Tribute Hybrid Grand Touring

2009 ENGINE Mechanical - 2.5L - Tribute



bpe2us00000020

1	Pilot bearing (MTX) (See Pilot Bearing Disassembly Note.)
2	Connecting rod cap (See Connecting Rod Cap Disassembly Note.)
3	Lower connecting rod bearing (See Connecting Rod Bearing Disassembly Note.)
4	Piston, connecting rod (See Piston, Connecting Rod Disassembly Note.)
11	Lower cylinder block (See Lower Cylinder Block Disassembly Note.)
12	Lower main bearing (See Thrust Bearing And Main Bearing Disassembly Note.)
13	Crankshaft (See Crankshaft Disassembly Note.)
14	Plate

5	Upper connecting rod bearing (See Connecting Rod Bearing Disassembly Note.)
6	Piston ring
7	Snap ring (See Snap Ring Disassembly Note.)
8	Piston pin
9	Piston
10	Connecting rod
15	Upper main bearing (See Thrust Bearing And Main Bearing Disassembly Note.)
16	Thrust bearing (See Thrust Bearing And Main Bearing Disassembly Note.)
17	Oil jet valve
18	Upper cylinder block

Fig. 53: Positioning Crankshaft Pulley Hole
Courtesy of MAZDA MOTORS CORP.

3. Install a standard 6 mm (0.23 in) x 18 mm (0.7 in) bolt through the crankshaft pulley and thread it into the front cover.

CAUTION:

- Only hand-tighten the 6 mm (0.23 in) bolt or damage to the front cover can occur.

NOTE:

- This step will correctly align the crankshaft pulley to the crankshaft.

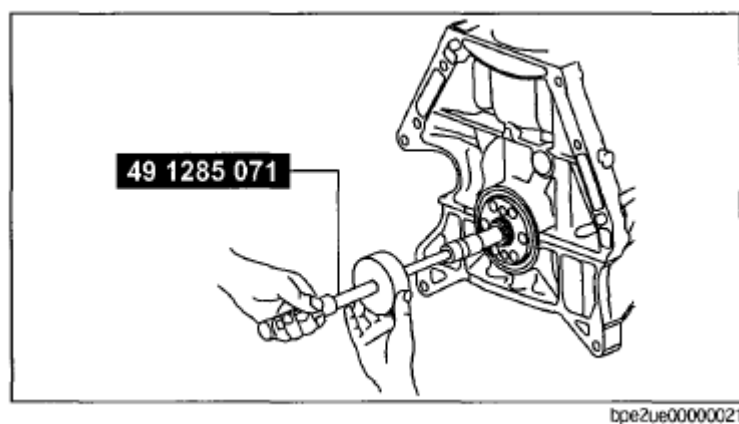


Fig. 54: Locating 6 mm (0.23 in) Bolt
Courtesy of MAZDA MOTORS CORP.

4. Install a new crankshaft pulley bolt. Use the Crankshaft Damper Holding Tool and a suitable 1/2-in drive hand tool to hold the crankshaft pulley, tighten the crankshaft pulley bolt in 2 stages:
 - Stage 1: Tighten to 100 N.m {10.2 kgf.m, 74 ft.lbf}.
 - Stage 2: Tighten an additional 90 degrees (1/4 turn).

CAUTION:

- The crankshaft must remain in the TDC position during installation of the pulley bolt or damage to the engine can occur. Therefore, the crankshaft pulley must be held in place with the special tool and the bolt should be installed using hand tools only.

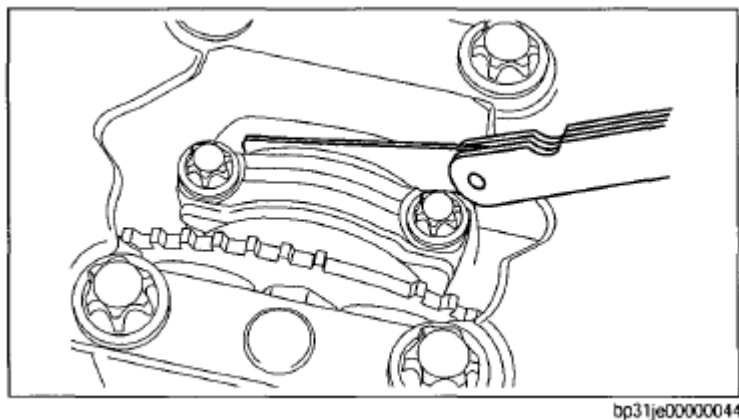


Fig. 55: Locating Crankshaft Pulley Bolt
Courtesy of MAZDA MOTORS CORP.

CAUTION: • Do not reuse the crankshaft pulley bolt.

5. Remove the 6 mm (0.23 in) x 18 mm (0.7 in) bolt.

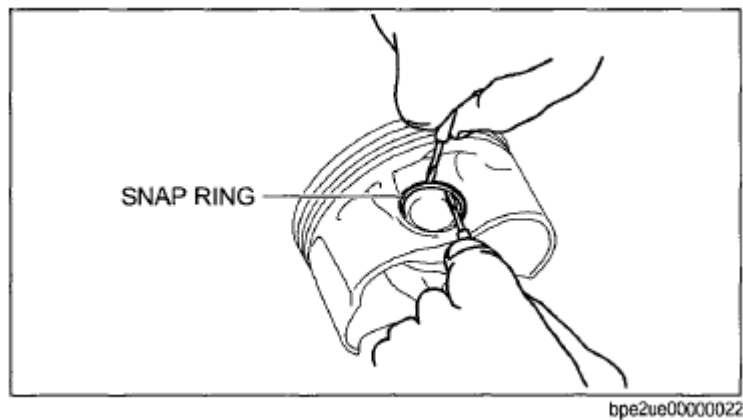


Fig. 56: Locating Crankshaft Pulley Bolt
Courtesy of MAZDA MOTORS CORP.

6. Remove the special tool.

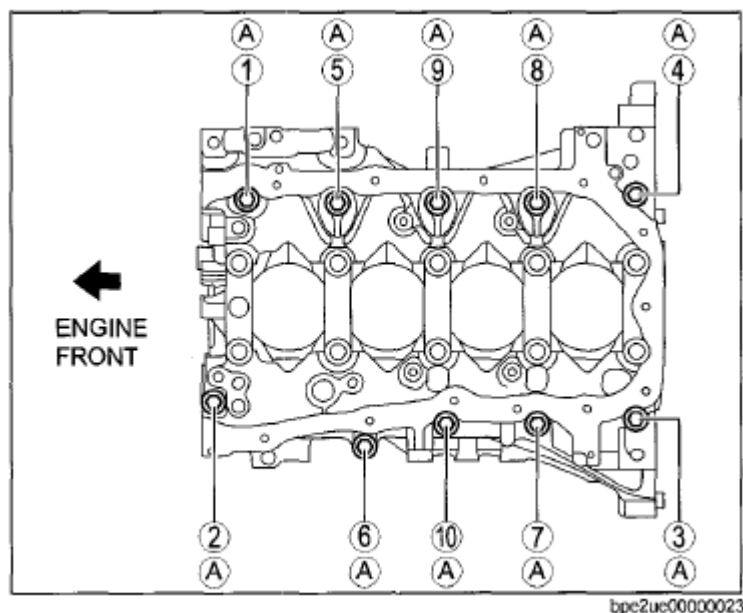


Fig. 57: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

7. Remove the special tool.

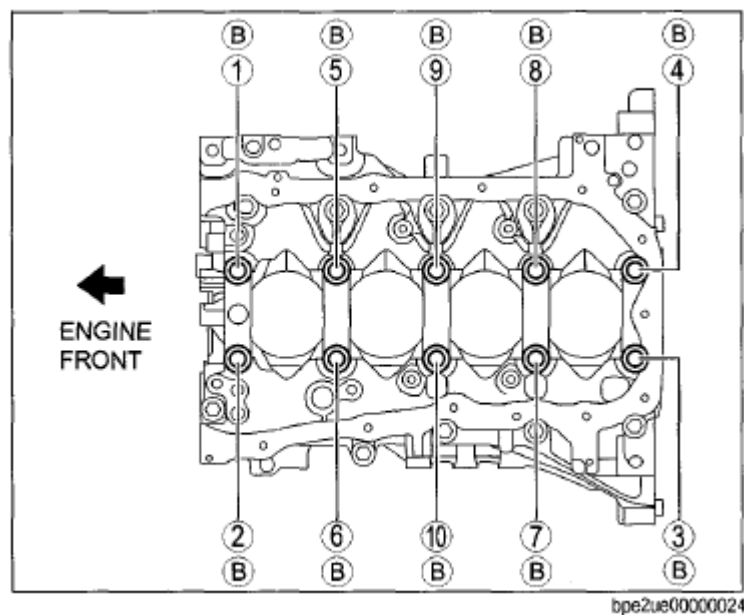


Fig. 58: Identifying Camshaft Alignment Plate 303-465
Courtesy of MAZDA MOTORS CORP.

8. Turn the crankshaft 1-3/4 turns.

NOTE:

- Only turn the engine in the normal direction of rotation.

9. Install the special tool.

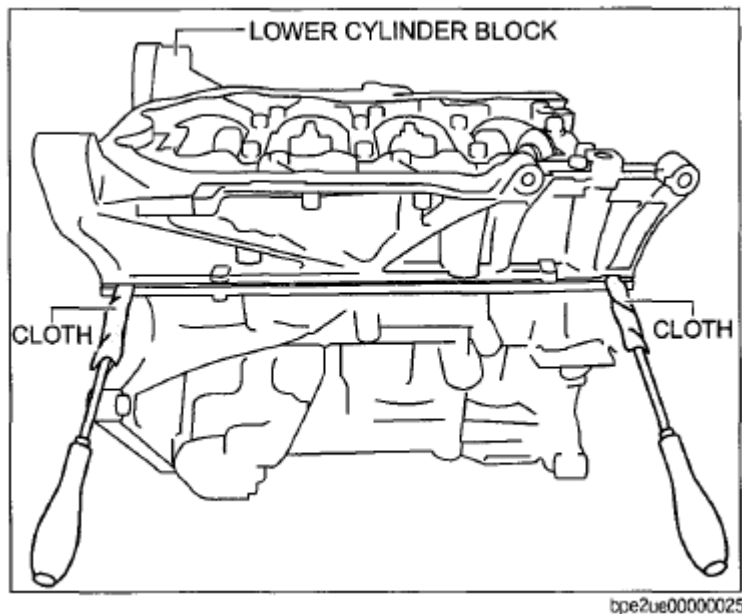


Fig. 59: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

10. Turn the crankshaft clockwise until the crankshaft contacts the special tool.

NOTE: • Only turn the engine in the normal direction of rotation.

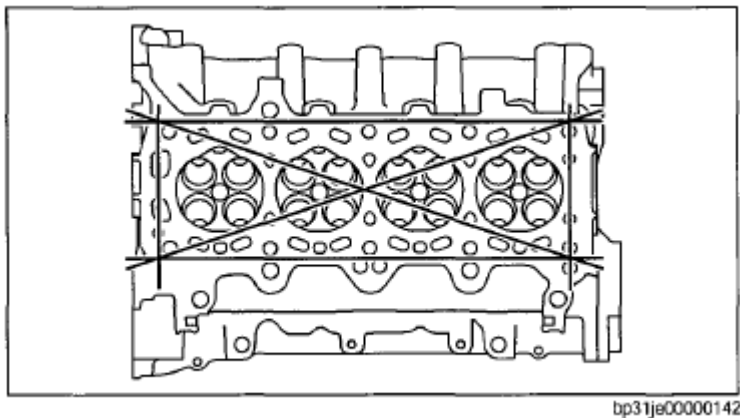


Fig. 60: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

11. Using the 6 mm (0.23 in) x 18 mm (0.7 in) bolt, check the position of the crankshaft pulley.
- If it is not possible to install the bolt, the engine valve timing must be corrected by repeating this procedure.

- CAUTION:**
- Only hand-tighten the bolt or damage to the front cover can occur.

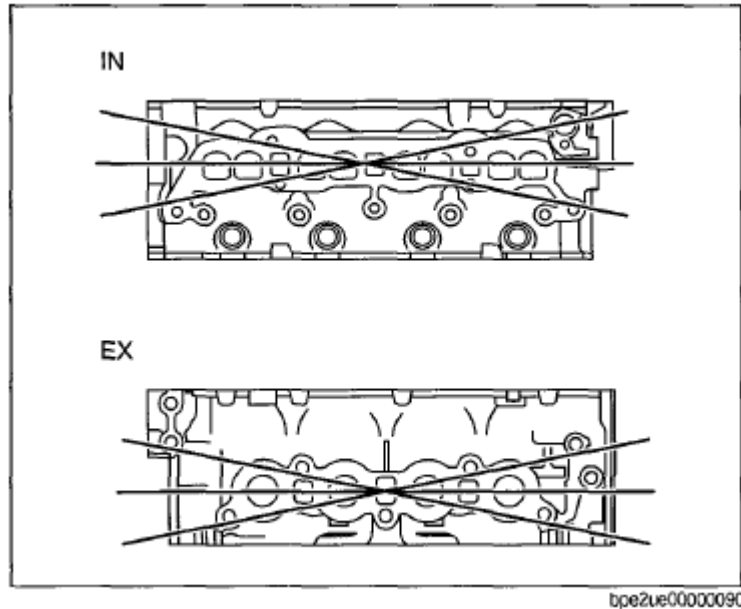


Fig. 61: Locating 6 mm (0.23 in) x 18 mm (0.7 in) Bolt
Courtesy of MAZDA MOTORS CORP.

12. Install the special tool to check the position of the camshafts.
 - If it is not possible to install the special tool, the engine valve timing must be corrected by repeating this procedure.

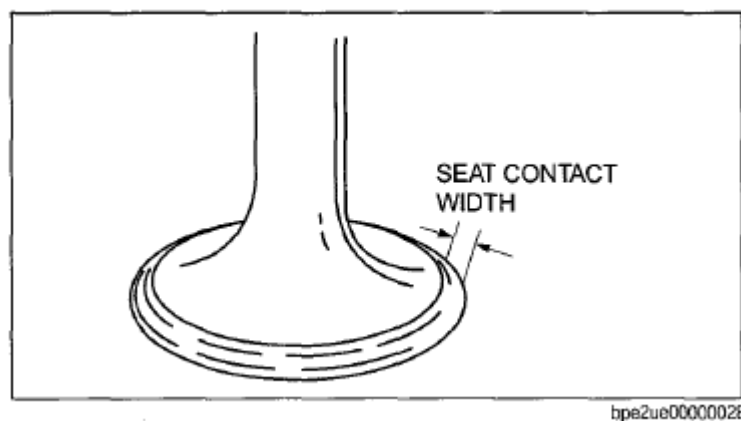


Fig. 62: Identifying Camshaft Alignment Plate 303-465
Courtesy of MAZDA MOTORS CORP.

13. Remove the special tool.

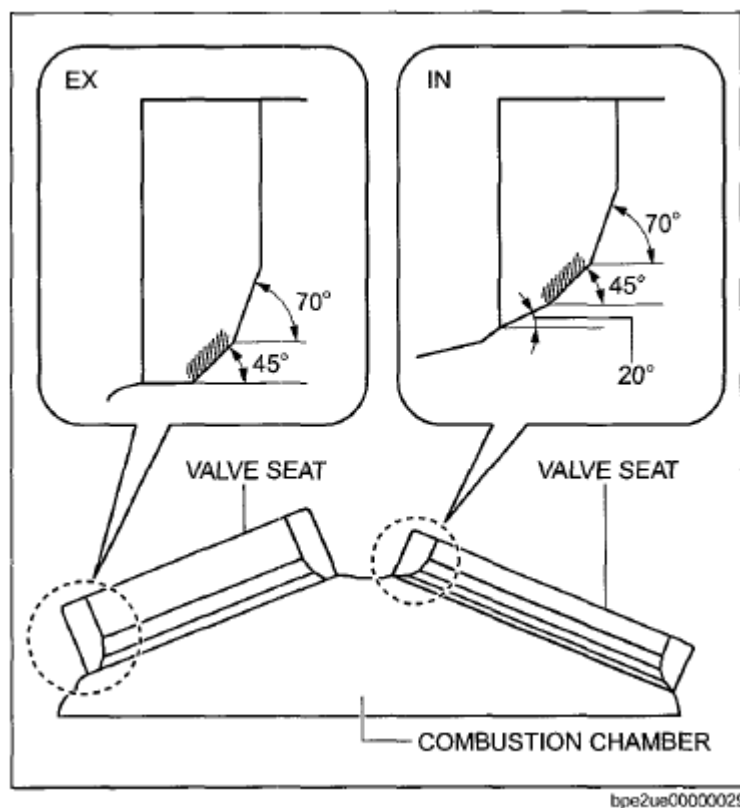


Fig. 63: Identifying Camshaft Alignment Plate 303-465
Courtesy of MAZDA MOTORS CORP.

14. Remove the 6 mm (0.23 in) x 18 mm (0.7 in) bolt.

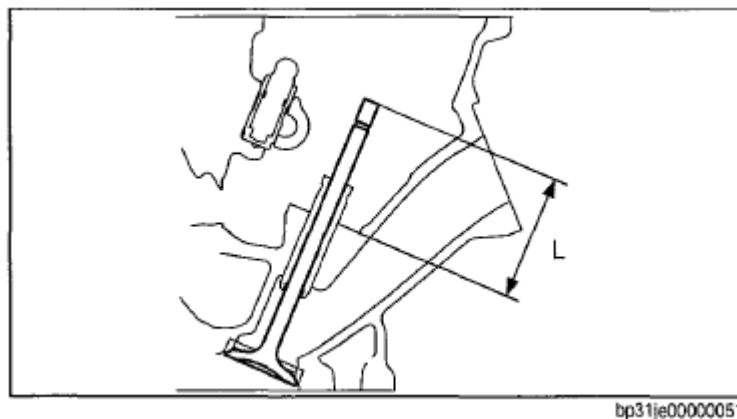


Fig. 64: Locating 6 mm (0.23 in) x 18 mm (0.7 in) Bolt
Courtesy of MAZDA MOTORS CORP.

15. Remove the special tool.

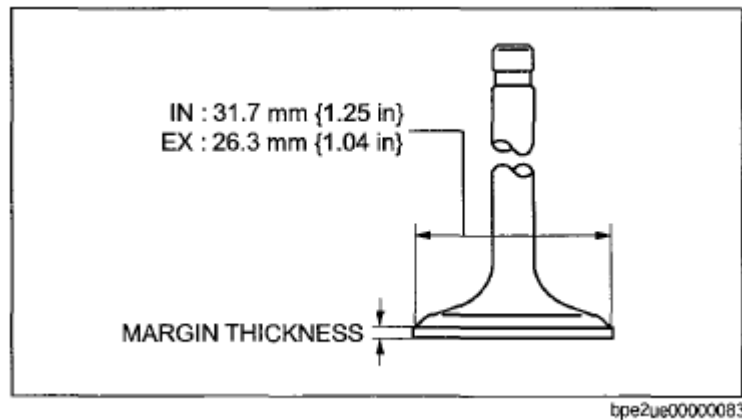


Fig. 65: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

16. Install the engine plug bolt.
 - Tighten to 20 N.m {2.0 kgf.m, 177 in.lbf}.

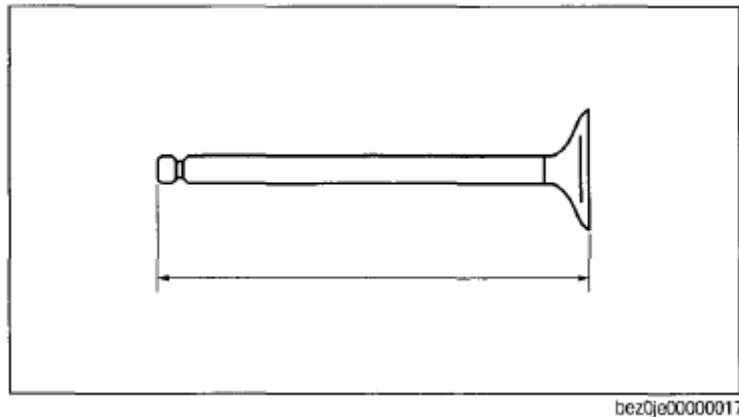


Fig. 66: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

17. Install the accessory drive belt. See ACCESSORY DRIVE BELT REMOVAL/INSTALLATION - 2.5L.
18. Install the front RH wheel and tire. See WHEEL AND TIRE REMOVAL/INSTALLATION.
19. Install the valve cover. See VALVE COVER REMOVAL/INSTALLATION - 2.5L.

CRANKSHAFT FRONT OIL SEAL REMOVAL/INSTALLATION - 2.5L

REMOVAL

- CAUTION:**
- Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The

crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if you loosen the pulley bolt. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshafts and camshafts must be locked in place by the special tools, otherwise severe damage can occur.

CAUTION:

- During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enter the oil passages, coolant passages or the oil pan can cause failure.

1. Remove the crankshaft pulley. See CRANKSHAFT PULLEY REMOVAL/INSTALLATION - 2.5L.
2. Using the special tool, remove the crankshaft front oil seal.

CAUTION:

- Use care not to damage the engine front cover or the crankshaft when removing the seal.

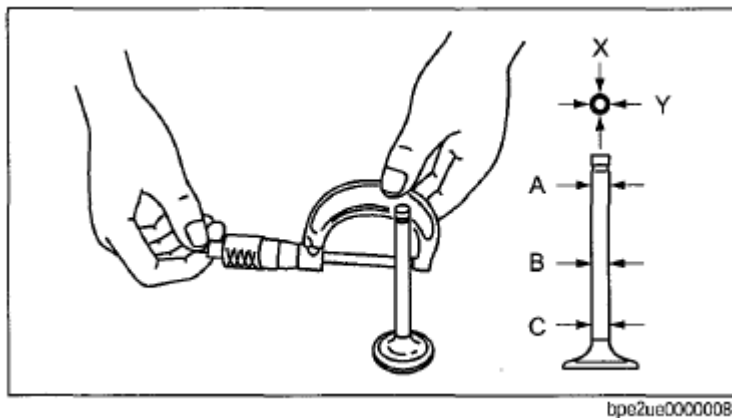


Fig. 67: Illustrating Removing Crankshaft Front Oil Seal
Courtesy of MAZDA MOTORS CORP.

INSTALLATION

1. Using the special tool, install the crankshaft front oil seal.

NOTE:

- Remove the through bolt from the special tool.

NOTE:

- Lubricate the oil seal with clean engine oil.

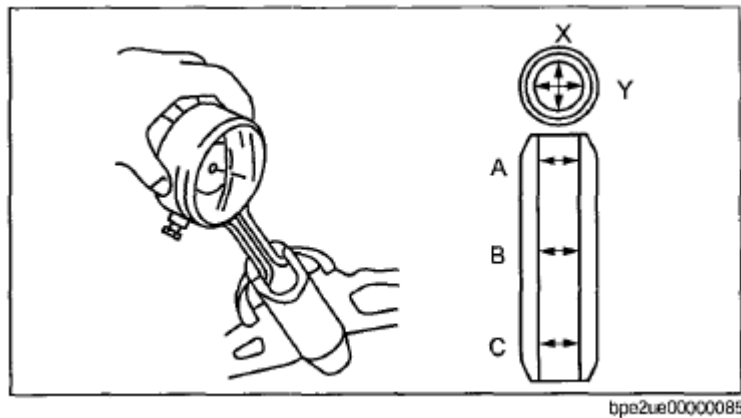


Fig. 68: Identifying Special Tool 303-096
Courtesy of MAZDA MOTORS CORP.

2. Install the crankshaft pulley. See CRANKSHAFT PULLEY REMOVAL/INSTALLATION - 2.5L .

FLEXPLATE REMOVAL/INSTALLATION - 2.5L

REMOVAL

1. With the vehicle in NEUTRAL, position it on a hoist. See LIFTING .
2. If equipped, remove the automatic transaxle. See TRANSAXLE INSTALLATION .
3. Remove the 6 bolts and the flexplate.

INSTALLATION

1. Install the flexplate and tighten the bolts in the sequence shown in the figure in 3 stages.
 - Stage 1: Tighten to 50 N.m {5.1 kgf.m, 37 ft.lbf}.
 - Stage 2: Tighten to 80 N.m {8.2 kgf.m, 59 ft.lbf}.
 - Stage 3: Tighten to 112 N.m {11.4 kgf.m, 83 ft.lbf}.

NOTE:

- **Special bolts are used for installation. Do not use standard bolts.**

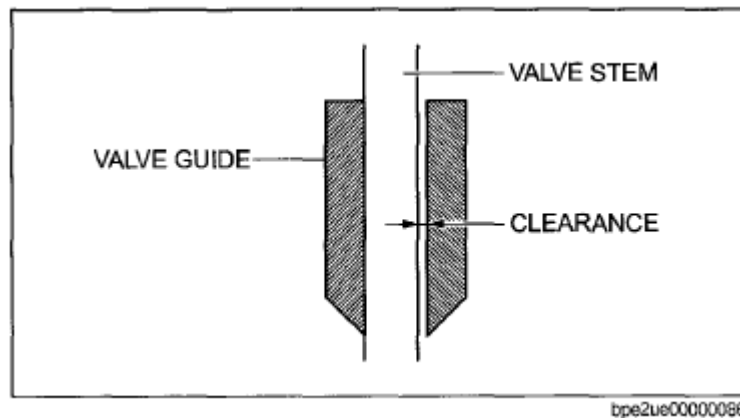


Fig. 69: Identifying Flexplate Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

2. Install the automatic transaxle. See ENGINE REMOVAL - AUTOMATIC TRANSAXLE .

FLYWHEEL REMOVAL/INSTALLATION - 2.5L

REMOVAL

1. With the vehicle in NEUTRAL, position it on a hoist. See LIFTING .
2. Remove the manual transaxle and clutch. See ENGINE INSTALLATION - MANUAL TRANSAXLE .
3. Remove the 6 bolts and the flywheel.

INSTALLATION

1. Install the flywheel and tighten the bolts in the sequence shown in the figure in 3 stages.
 - Stage 1: Tighten to 50 N.m {5.1 kgf.m, 37 ft.lbf}.
 - Stage 2: Tighten to 80 N.m {8.2 kgf.m, 59 ft.lbf}.
 - Stage 3: Tighten to 112 N.m {11.4 kgf.m, 83 ft.lbf}.

NOTE: • **Special bolts are used for installation. Do not use standard bolts.**

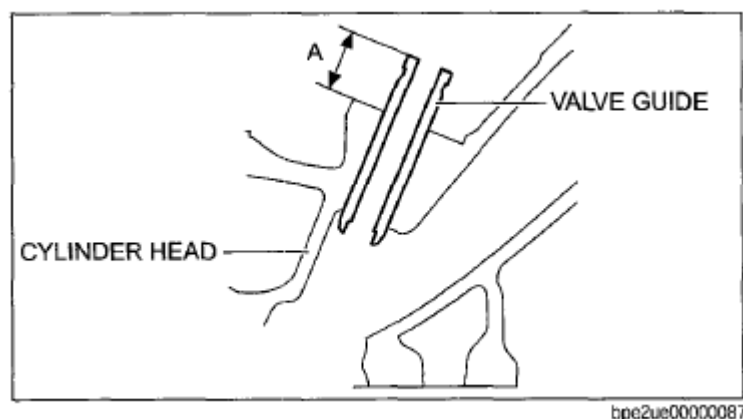


Fig. 70: Identifying Flexplate Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

2. Install the manual transaxle and clutch. See TRANSAXLE INSTALLATION .

CRANKSHAFT REAR SEAL REMOVAL/INSTALLATION - 2.5L

REMOVAL

1. With the vehicle in NEUTRAL, position it on a hoist. See LIFTING .
2. Remove the flexplate or flywheel. See FLEXPLATE REMOVAL/INSTALLATION - 2.5L or FLYWHEEL REMOVAL/INSTALLATION - 2.5L .
3. Drain the engine oil.
 - Install the drain plug and.
 - Tighten to 28 N.m {2.8 kgf.m, 21 ft.lbf}.
4. Remove the 17 bolts and the oil pan.

CAUTION: • If the oil pan is not removed damage to the rear oil seal retainer joint can occur.

Remove the 6 bolts and the crankshaft rear oil seal with retainer plate.

INSTALLATION

1. Using the special tool, position the crankshaft rear oil seal with retainer plate onto the crankshaft.

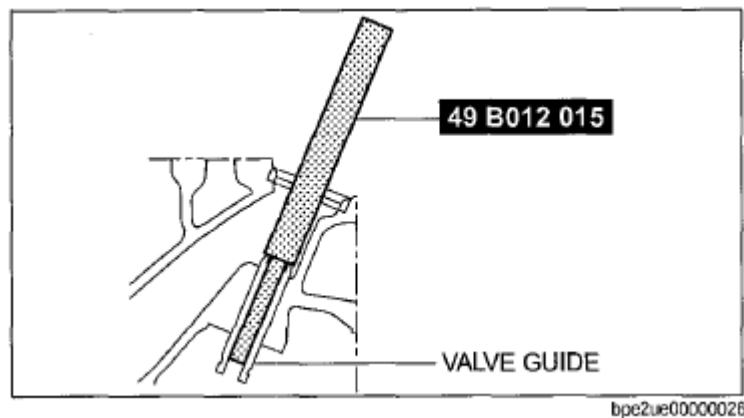


Fig. 71: Identifying Special Tool 303-328
Courtesy of MAZDA MOTORS CORP.

2. Install the crankshaft rear oil seal with retainer plate and bolts.
 - Tighten the bolts in the sequence shown in the figure to 10 N.m {1.0 kgf.m, 89 in.lbf}.

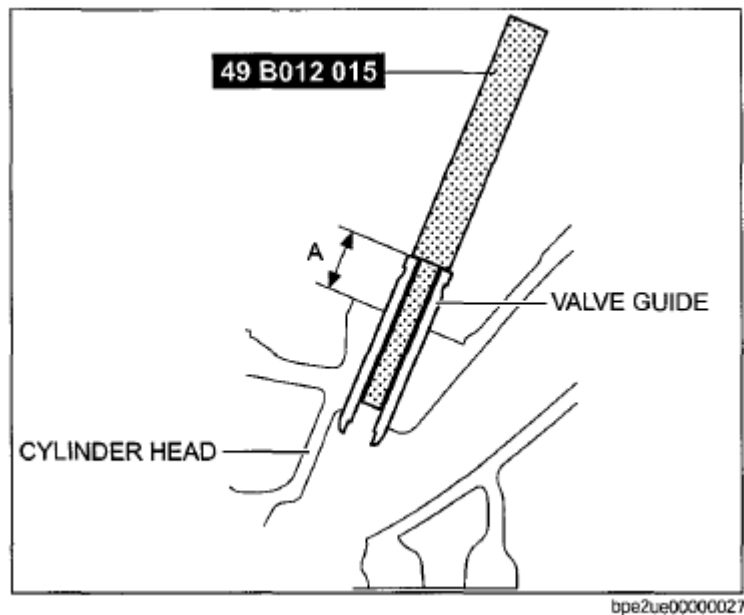


Fig. 72: Identifying Retainer Plate Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

3. Clean and inspect all the oil pan and cylinder block mating surfaces.

CAUTION:

- Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove traces of sealant.

4. Apply a 2.5 mm (0.098 in) bead of silicone gasket and sealant to the oil pan. Install the oil pan. Install the 2 oil pan bolts finger-tight.

NOTE:

- If the oil pan is not secured within 4 minutes of sealant application, the sealant must be removed and the sealing area cleaned with metal surface cleaner. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

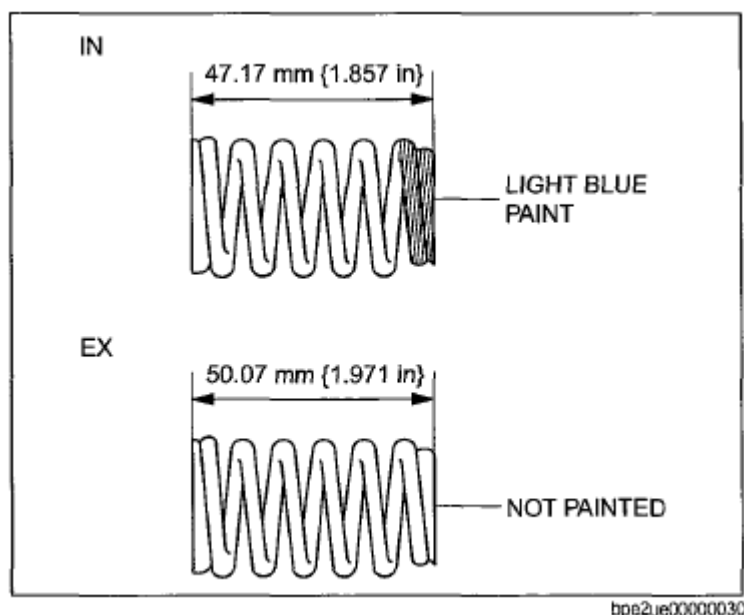


Fig. 73: Locating Oil Pan And Bolts
Courtesy of MAZDA MOTORS CORP.

5. Install the 4 bolts.
 - To install, tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

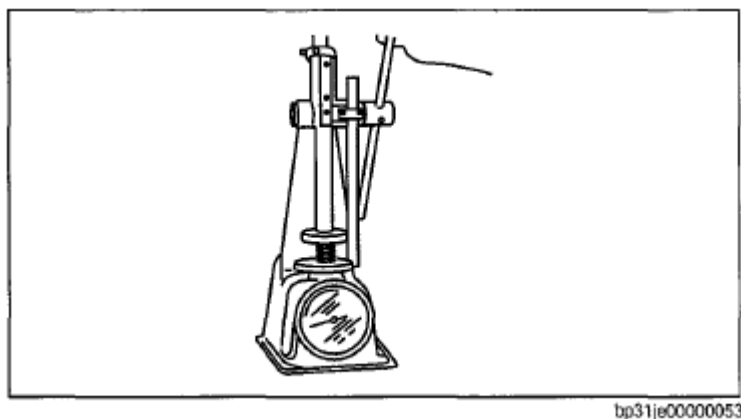


Fig. 74: Identifying Oil Pan Bolts Tightening Torque

Courtesy of MAZDA MOTORS CORP.

6. Install the remaining oil pan bolts and tighten the oil pan bolts in the sequence shown in the figure to 25 N.m {2.5 kgf.m, 18 ft.lbf}.

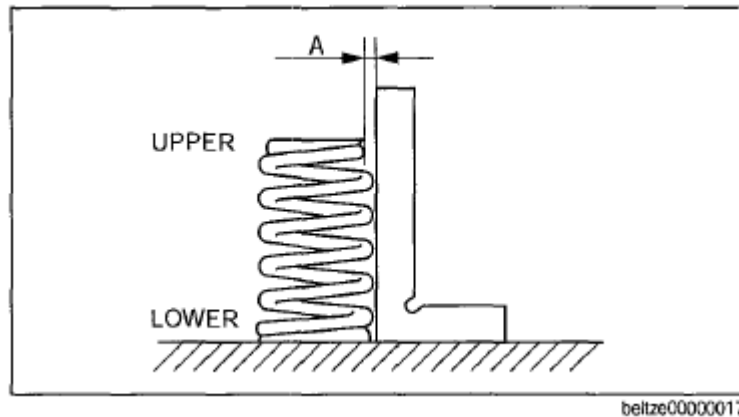


Fig. 75: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

7. Install the flexplate or flywheel. See **FLEXPLATE REMOVAL/INSTALLATION - 2.5L** or **FLYWHEEL REMOVAL/INSTALLATION - 2.5L**.
8. Fill the engine with clean engine oil.

ENGINE FRONT COVER REMOVAL/INSTALLATION - 2.5L

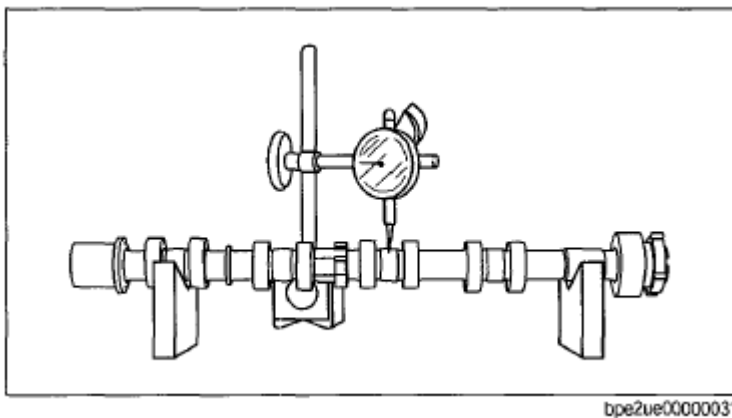


Fig. 76: Identifying Engine Front Cover Removal/Installation - 2.5L
Courtesy of MAZDA MOTORS CORP.

REMOVAL

- CAUTION:**
- Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The

crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if you loosen the pulley bolt. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

CAUTION:

- During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.

1. With the vehicle in NEUTRAL, position it on a hoist. See LIFTING .
2. Remove the accessory drive belt and idler pulleys. See ACCESSORY DRIVE BELT REMOVAL/INSTALLATION - 2.5L and ACCESSORY DRIVE BELT TENSIONER REMOVAL/INSTALLATION - 2.5L .
3. Remove the crankshaft pulley. See CRANKSHAFT PULLEY REMOVAL/INSTALLATION - 2.5L .
4. Remove the engine mount. See ENGINE MOUNT REMOVAL/INSTALLATION - 2.5L .
5. Using the special tool, remove the crankshaft front oil seal.

CAUTION:

- Use care not to damage the engine front cover or the crankshaft when removing the seal.

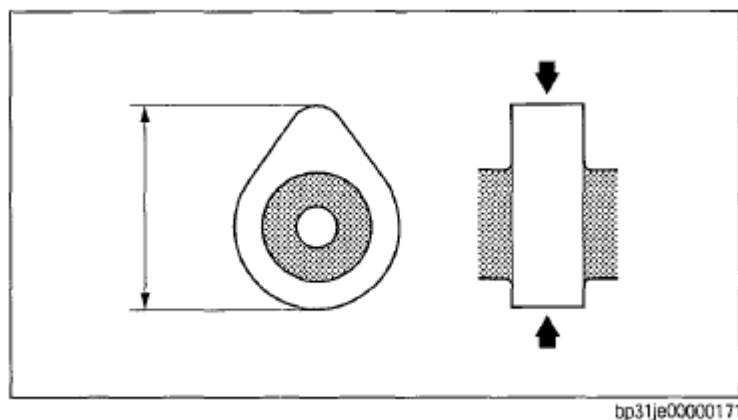


Fig. 77: Illustrating Removing Crankshaft Front Oil Seal
Courtesy of MAZDA MOTORS CORP.

6. Remove the 3 bolts and the coolant pump pulley.
7. Remove the 2 bolts and the accessory drive belt idler pulley and bracket.
8. Disconnect the crankshaft position (CKP) sensor electrical connector.

9. Remove and the 2 bolts and the CKP sensor.
10. Remove the bolts and the engine front cover.

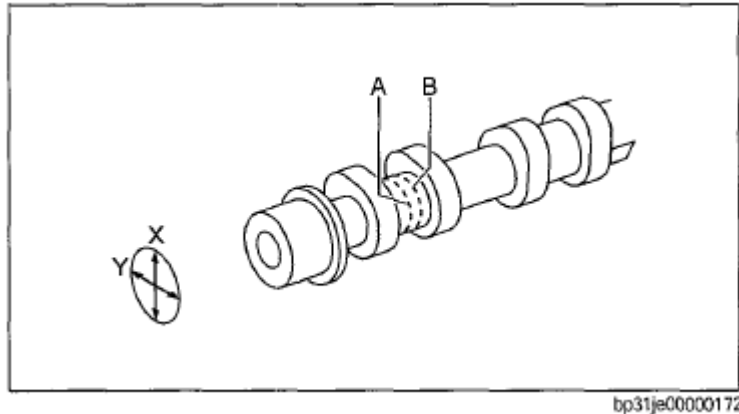


Fig. 78: Locating Engine Front Cover Bolts
Courtesy of MAZDA MOTORS CORP.

INSTALLATION

1. Clean and inspect the mounting surfaces of the engine and the front cover.

CAUTION:

- Do not use metal scrapers, wire brushes, power abrasive disks or other abrasive means to clean sealing surfaces. These tools cause scratches and gouges which make leak paths.

2. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the cylinder head and oil pan joint areas. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the front cover.

NOTE:

- The engine front cover must be installed and the bolts tightened within 4 minutes of applying the silicone gasket and sealant.

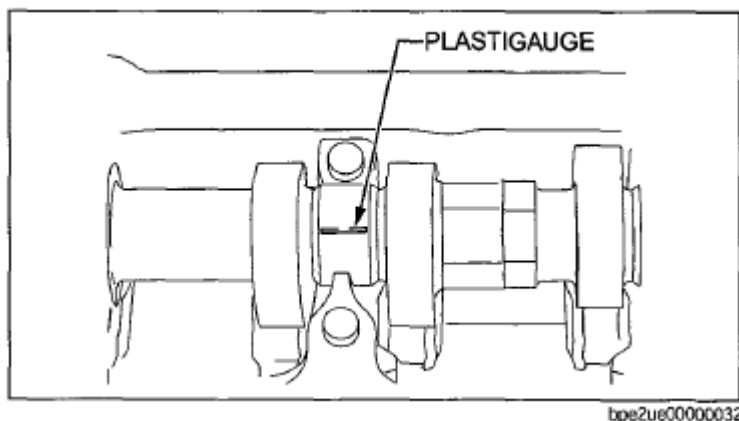


Fig. 79: Locating Bead Of Silicone Gasket And Sealant On Front Cover
Courtesy of MAZDA MOTORS CORP.

3. Install the engine front cover. Tighten the bolts in the sequence shown in the figure, to the following specifications:
 - Tighten the 8 mm bolts to 10 N.m {1.0 kgf.m, 89 in.lbf}.
 - Tighten the 13 mm bolts to 48 N.m {4.9 kgf.m, 35 ft.lbf}.

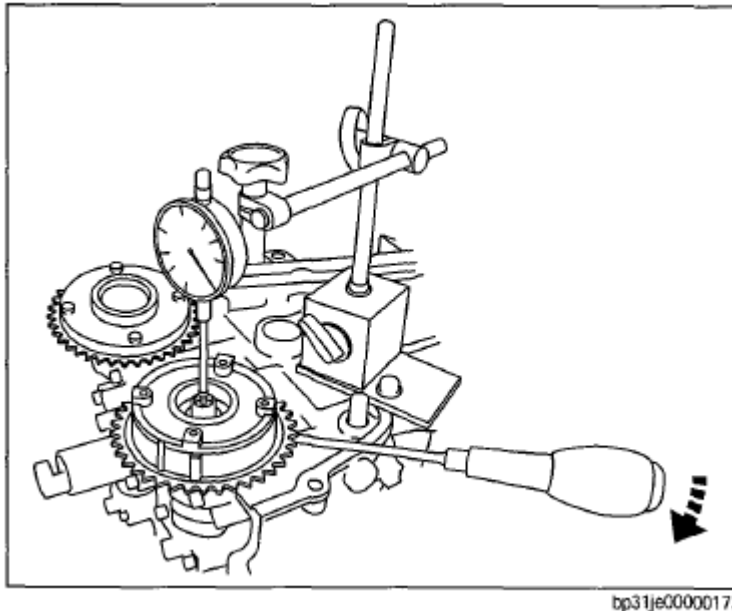


Fig. 80: Identifying Engine Front Cover Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

4. Install the accessory drive belt idler pulley and bracket and the 3 bolts.
 - Tighten to 25 N.m {2.5 kgf.m, 18 ft.lbf}.
5. Install the water pump pulley and bolts.
 - Tighten to 20 N.m {2.0 kgf.m, 177 in.lbf}.
6. Using the special tool, install the crankshaft front oil seal.

NOTE: • Remove the through-bolt from the special tool.

NOTE: • Lubricate the oil seal with clean engine oil.

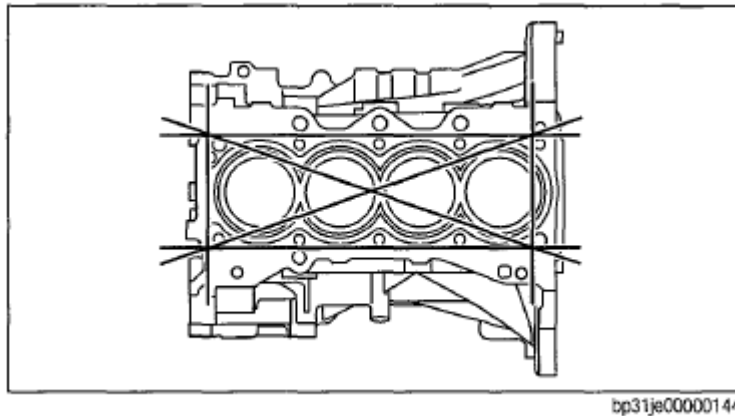


Fig. 81: Identifying Special Tool 303-096
Courtesy of MAZDA MOTORS CORP.

7. Install the engine mount. See **ENGINE MOUNT REMOVAL/INSTALLATION - 2.5L** .
8. Install the crankshaft pulley. See **CRANKSHAFT PULLEY REMOVAL/INSTALLATION - 2.5L** .
9. Install a standard 6 mm (0.23 in) x 18 mm (0.7 in) bolt through the crankshaft pulley and thread it into the front cover.

CAUTION:

- Only hand-tighten the bolt or damage to the front cover can occur.

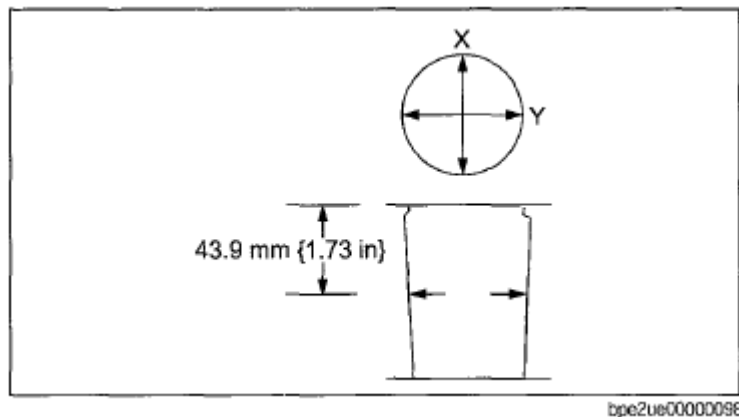


Fig. 82: Locating 6 mm (0.23 in) x 18 mm (0.7 in) Bolt
Courtesy of MAZDA MOTORS CORP.

10. Install a new CKP sensor and the 2 bolts.
 - Do not tighten the bolts at this time.

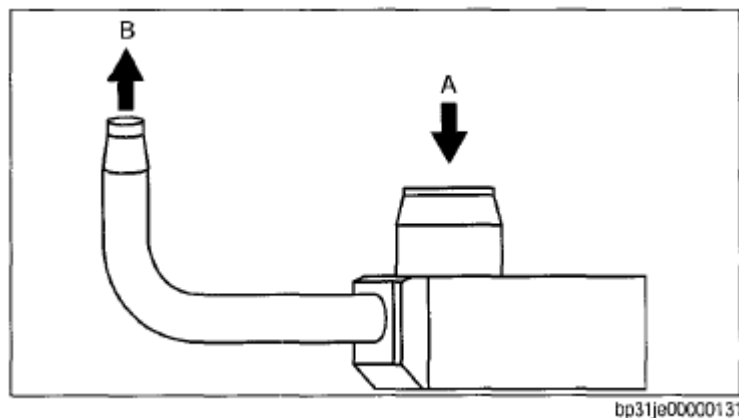


Fig. 83: Locating CKP Sensor And Bolts
Courtesy of MAZDA MOTORS CORP.

11. Adjust the CKP sensor with the alignment tool.
 - Tighten the 2 CKP bolts to 7 N.m {0.7 kgf.m, 62 in.lbf}.

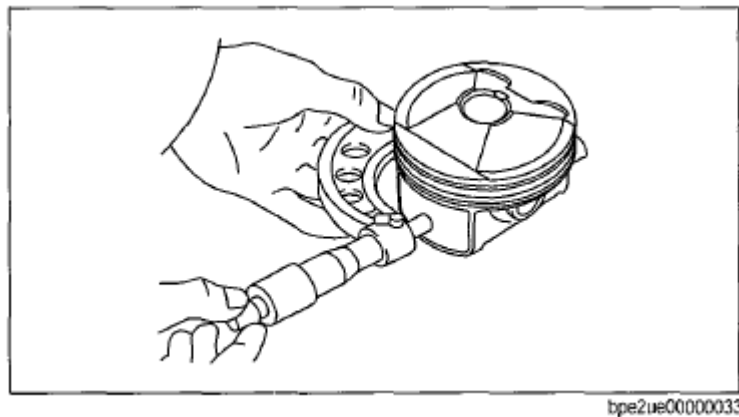


Fig. 84: Identifying CKP Sensor And Alignment Tool 303-1417
Courtesy of MAZDA MOTORS CORP.

12. Connect the CKP sensor electrical connector.
13. Remove the 6 mm (0.23 in) x 18 mm (0.7 in) bolt.

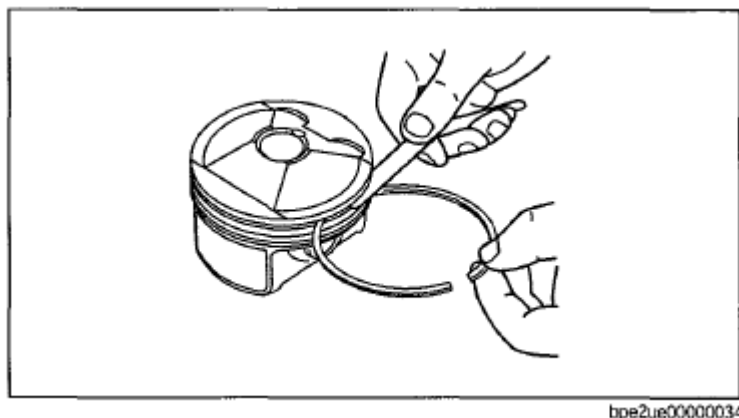


Fig. 85: Locating 6 mm (0.23 in) x 18 mm (0.7 in) Bolt
Courtesy of MAZDA MOTORS CORP.

14. Install the accessory drive belt and idler pulleys. See ACCESSORY DRIVE BELT TENSIONER REMOVAL/INSTALLATION - 2.5L and ACCESSORY DRIVE BELT REMOVAL/INSTALLATION - 2.5L.

TIMING DRIVE COMPONENTS REMOVAL/INSTALLATION - 2.5L

REMOVAL

CAUTION:

- Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if you loosen the pulley bolt. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by special service tools, otherwise severe engine damage can occur.

CAUTION:

- During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.

1. With vehicle in NEUTRAL, position it on a hoist. See LIFTING.
2. Remove the engine front cover. See TIMING DRIVE COMPONENTS REMOVAL/INSTALLATION - 2.5L.
3. Remove the timing chain tensioner.
 1. Compress the timing chain tensioner, and insert a paper clip into the hole to retain the tensioner.

2. Remove the bolts and timing chain tensioner.

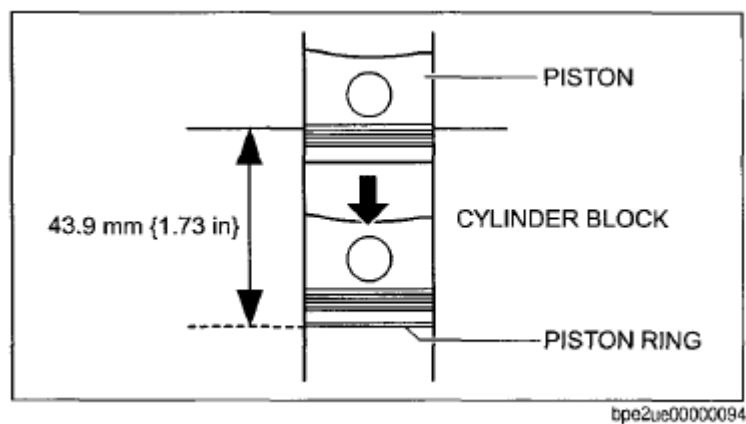


Fig. 86: Locating Paper Clip And Timing Chain Tensioner Bolts
Courtesy of MAZDA MOTORS CORP.

4. Remove the timing chain tensioner arm.

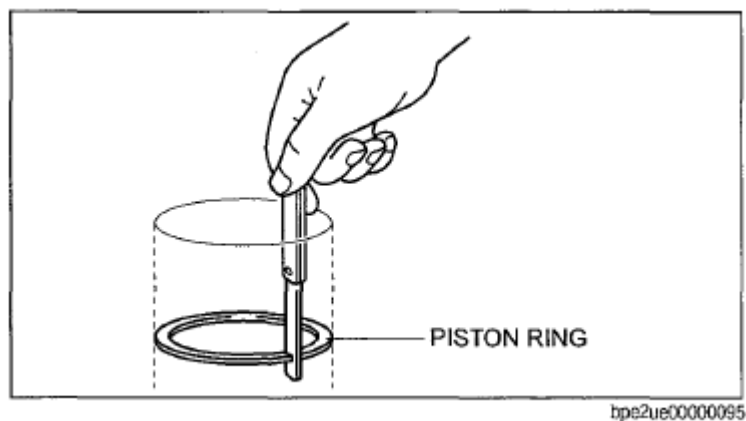


Fig. 87: Locating Timing Chain Tensioner Arm
Courtesy of MAZDA MOTORS CORP.

5. Remove the timing chain.

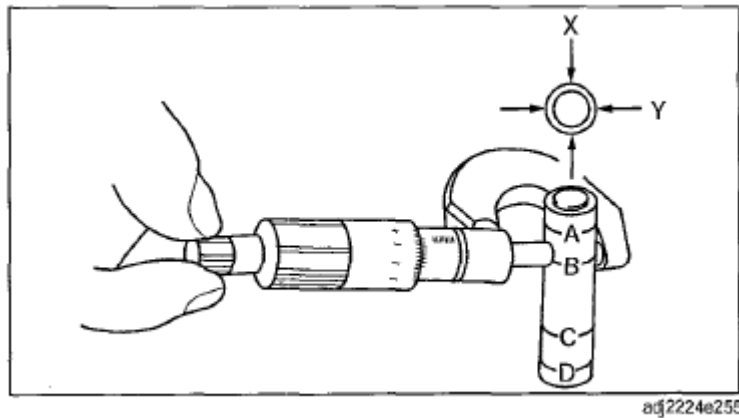


Fig. 88: Locating Timing Chain
Courtesy of MAZDA MOTORS CORP.

6. Remove the 2 bolts and the timing chain guide.

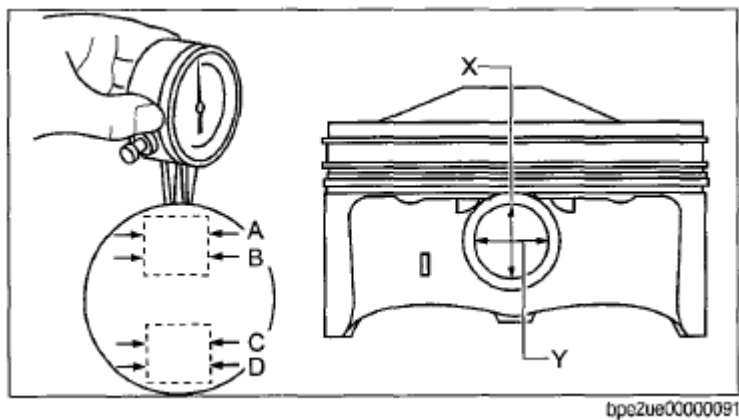


Fig. 89: Locating Timing Chain Guide Bolts
Courtesy of MAZDA MOTORS CORP.

7. Using the flats on the camshaft to prevent camshaft rotation, remove the bolt and the exhaust camshaft sprocket.

CAUTION:

- The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

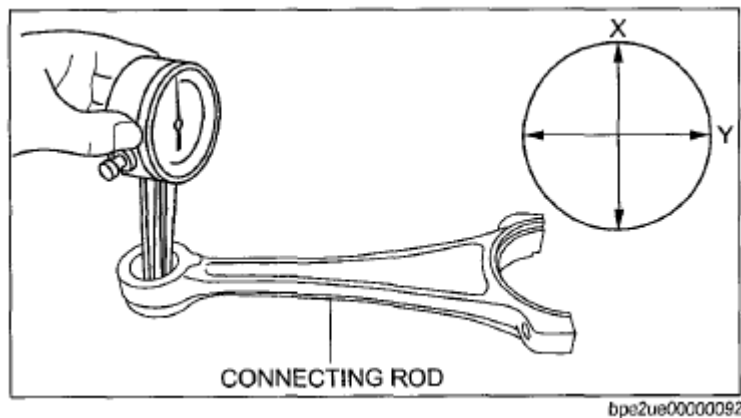


Fig. 90: Locating Flats On Camshaft And Exhaust Camshaft Sprocket Bolt
Courtesy of MAZDA MOTORS CORP.

8. Using the flats on the camshaft to prevent camshaft rotation, remove the bolt and the camshaft phaser and sprocket.

CAUTION:

- The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

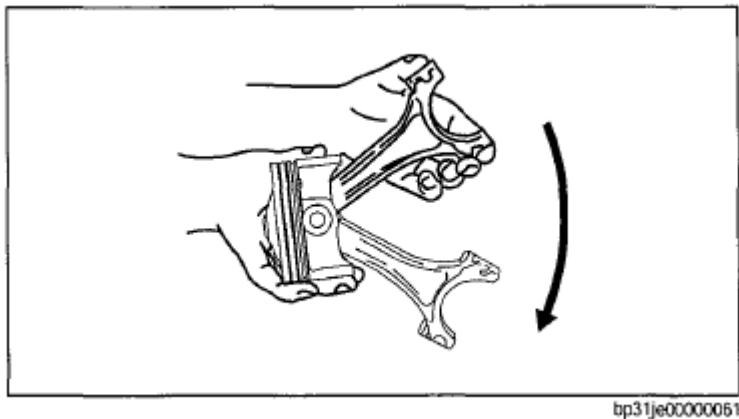


Fig. 91: Locating Flats On Camshaft, Bolt And Camshaft Phaser And Sprocket
Courtesy of MAZDA MOTORS CORP.

INSTALLATION

1. Install the camshaft sprockets and the bolts. Do not tighten the bolts at this time.

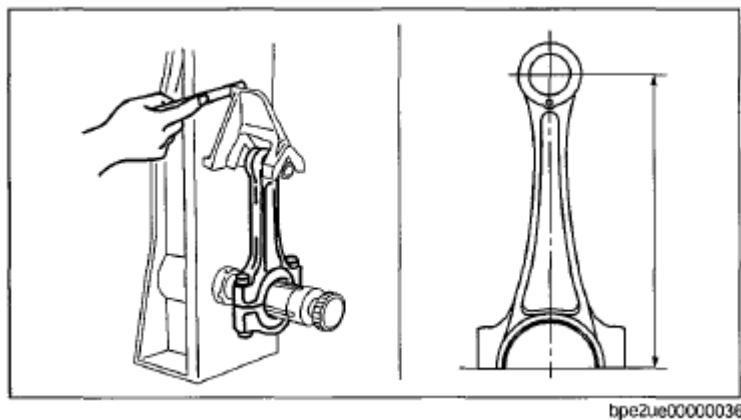


Fig. 92: Locating Camshaft Sprockets And Bolts
Courtesy of MAZDA MOTORS CORP.

2. Install the timing chain guide and the 2 bolts.
 - To install, tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

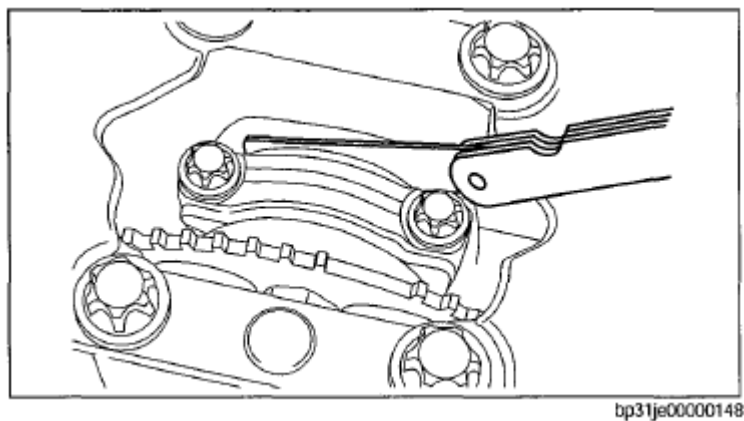


Fig. 93: Identifying Timing Chain Guide Bolts Tightening Torque
Courtesy of MAZDA MOTORS CORP.

3. Install the timing chain.

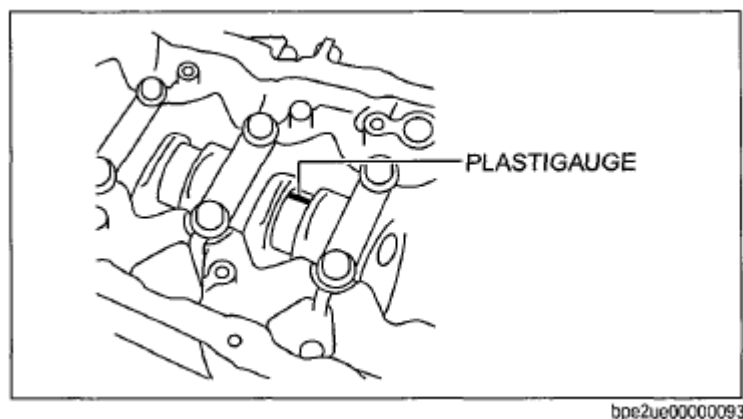


Fig. 94: Locating Timing Chain
Courtesy of MAZDA MOTORS CORP.

4. Install the timing chain tensioner arm.

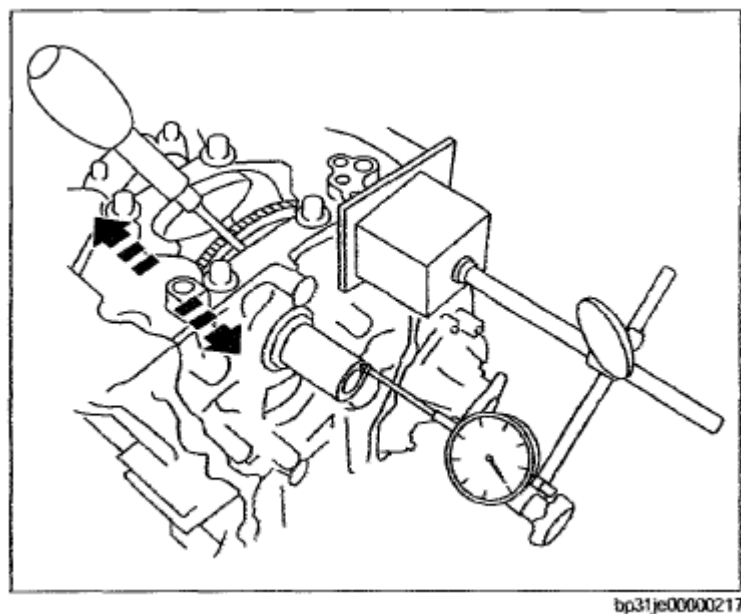


Fig. 95: Locating Timing Chain Tensioner Arm
Courtesy of MAZDA MOTORS CORP.

5. Install the timing chain tensioner and the 2 bolts. Remove the paper clip to release the piston.
 - Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

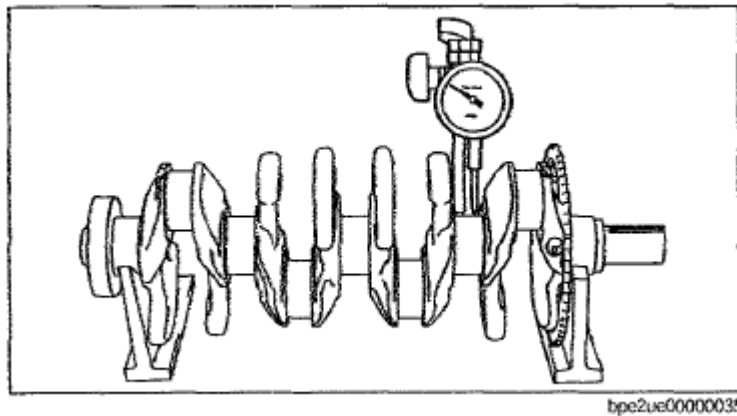


Fig. 96: Locating Timing Chain Tensioner, Bolts And Paper Clip
Courtesy of MAZDA MOTORS CORP.

6. Using the flats on the camshaft to prevent camshaft rotation, tighten the bolts.
 - Tighten to 72 N.m {7.3 kgf.m, 53 ft.lbf}.

CAUTION:

- The special tool 303-465 is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

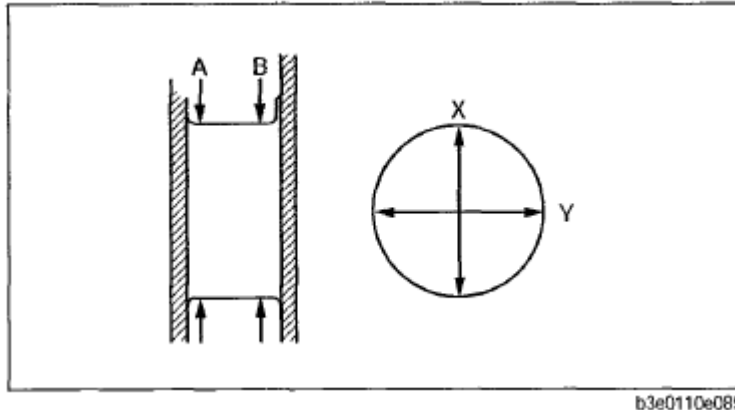


Fig. 97: Locating Camshaft Bolts
Courtesy of MAZDA MOTORS CORP.

7. Install the engine front cover. See **TIMING DRIVE COMPONENTS REMOVAL/INSTALLATION - 2.5L**.

ENGINE MOUNT REMOVAL/INSTALLATION - 2.5L

1. With the vehicle in NEUTRAL, position it on a hoist. See **LIFTING**.

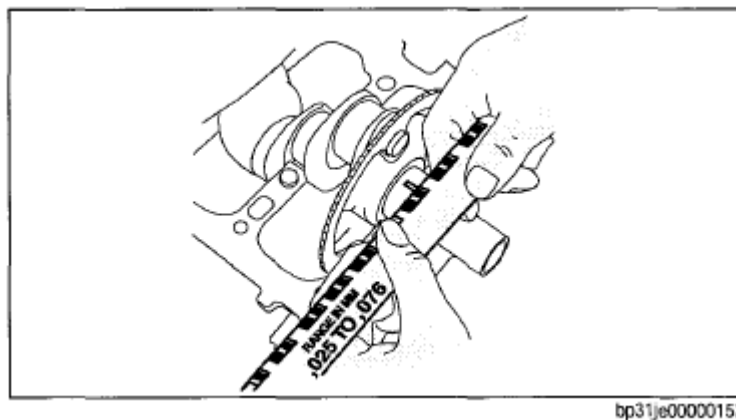


Fig. 98: Identifying Engine Mount Removal/Installation - 2.5L
Courtesy of MAZDA MOTORS CORP.

2. Install the special tool.

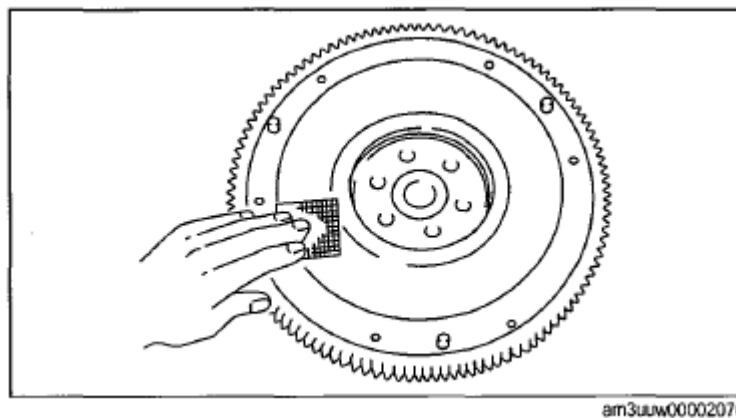


Fig. 99: Identifying Special Tool 303-F072
Courtesy of MAZDA MOTORS CORP.

3. Remove the engine mount bracket bolt.
 - To install, tighten to 115 N.m {11.7 kgf.m, 85 ft.lbf}.
4. Use the special tool to raise the engine 25 mm (9.98 in).

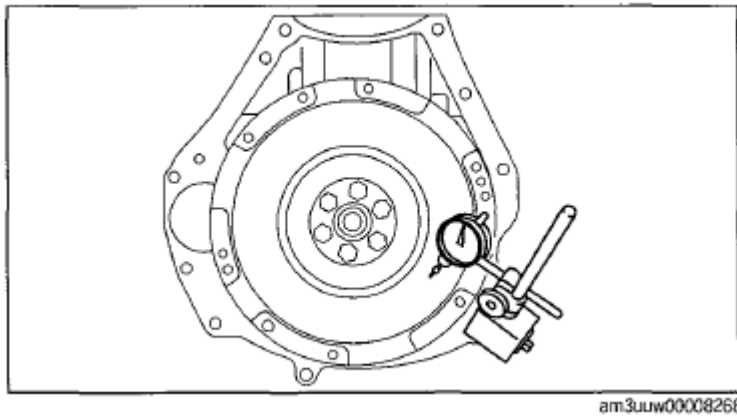


Fig. 100: Identifying Special Tool 303-F072
 Courtesy of MAZDA MOTORS CORP.

5. Remove the 3 nuts and the engine mount bracket.
 - To install, tighten to 115 N.m {11.7 kgf.m, 85 ft.lbf}.
6. Remove the 3 bolts and the engine mount.
 - To install, tighten to 55 N.m {5.6 kgf.m, 41 ft.lbf}.
7. To install, reverse the removal procedure.

CYLINDER HEAD REMOVAL/INSTALLATION - 2.5L

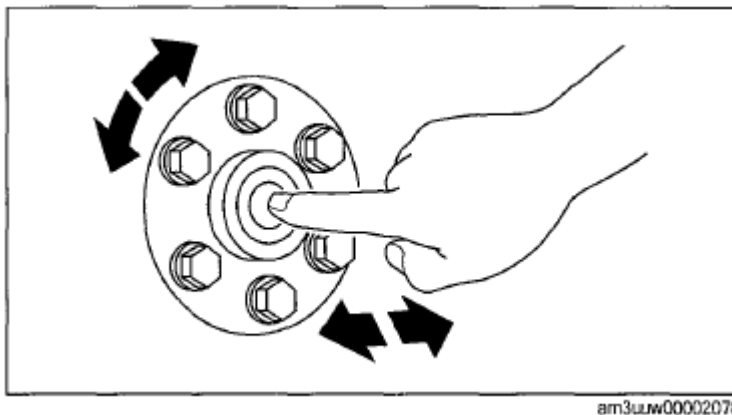


Fig. 101: Identifying Cylinder Head Removal/Installation - 2.5L
 Courtesy of MAZDA MOTORS CORP.

REMOVAL

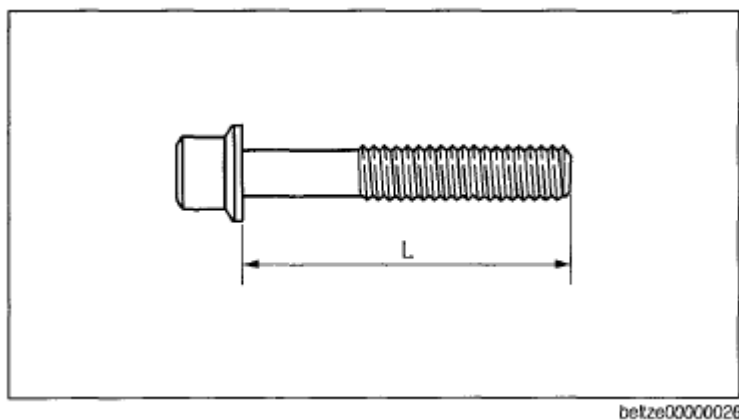
- CAUTION:**
- Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the

pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if you loosen the pulley bolt. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

CAUTION:

- During engine repair procedures, cleanliness is extremely important. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages, coolant passages or the oil pan can cause engine failure.

1. With the vehicle in NEUTRAL, position it on a hoist. See LIFTING .
2. Release the fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE .
3. Drain the engine coolant. See COOLING SYSTEM DRAINING, FILLING AND BLEEDING - 2.5L .
4. Remove the timing drive components. See TIMING DRIVE COMPONENTS REMOVAL/INSTALLATION - 2.5L.
5. Remove the special tool.



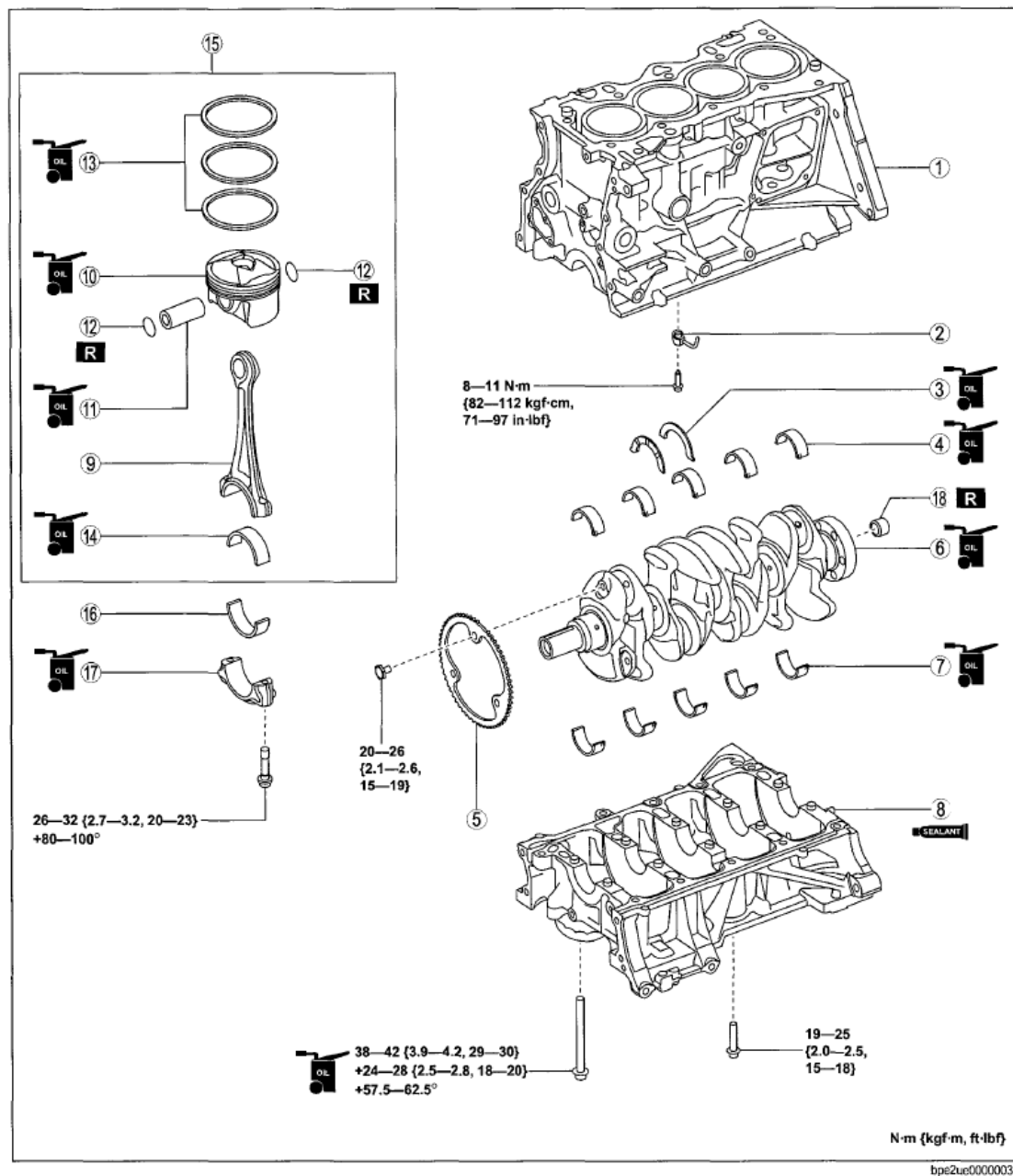
betze00000026

Fig. 102: Identifying Camshaft Alignment Plate 303-465
Courtesy of MAZDA MOTORS CORP.

6. Mark the position of the camshaft lobes on the No. 1 cylinder for installation reference.

2009 Mazda Tribute Hybrid Grand Touring

2009 ENGINE Mechanical - 2.5L - Tribute



1	Upper cylinder block
2	Oil jet valve
3	Thrust bearing (See Thrust Bearing And Main Bearing Assembly Note.)
7	Lower main bearing (See Thrust Bearing And Main Bearing Assembly Note.)
8	Lower cylinder block (See Lower Cylinder Block Assembly Note.)
9	Connecting rod
10	Piston
11	Piston pin (See Piston Pin Assembly Note.)
12	Snap ring (See Snap Ring Assembly Note.)

4	Upper main bearing (See Thrust Bearing And Main Bearing Assembly Note.)
5	Plate (See Plate Assembly Note.)
6	Crankshaft
14	Upper connecting rod bearing (See Connecting Rod Bearing Assembly Note.)
15	Piston, connecting rod (See Piston, Connecting Rod Assembly Note.)
16	Lower connecting rod bearing (See Connecting Rod Bearing Assembly Note.)
17	Connecting rod cap (See Connecting Rod Cap Assembly Note.)

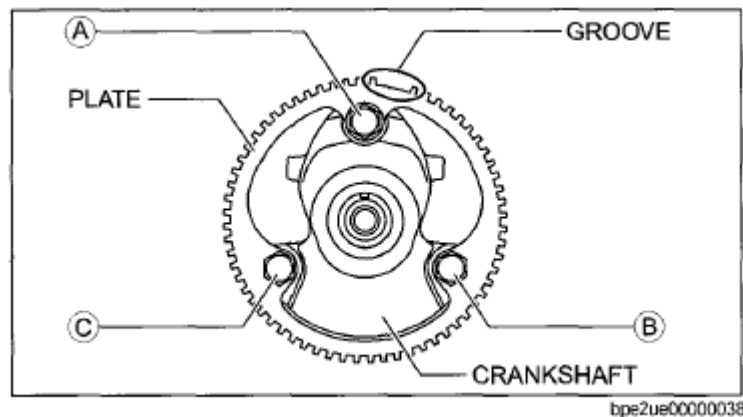
Fig. 103: Locating Camshaft Lobes

Courtesy of MAZDA MOTORS CORP.

7. Remove the camshafts from the engine.
 - Loosen the camshaft bearing cap bolts, in sequence, one turn at a time until all tension is released from the bearing cap bolts.
 - Remove the bolts and the camshaft bearing caps.
 - Remove the camshafts.

CAUTION: • Failure to follow the camshaft loosening procedure can result in damage to the camshafts.

NOTE: • Mark the location and orientation of each camshaft bearing cap.

**Fig. 104: Identifying Camshaft Bearing Cap Bolts Loosening Sequence**

Courtesy of MAZDA MOTORS CORP.

8. Remove the valve tappets.

NOTE: • If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

9. Inspect the valve tappets. See VALVE TAPPET INSPECTION - 2.5L .
10. Remove the intake manifold. See INTAKE MANIFOLD REMOVAL/INSTALLATION - 2.5L .
11. Remove the generator. See GENERATOR REMOVAL/INSTALLATION - 2.5L .
12. Remove the catalytic converter exhaust manifold. See CATALYTIC CONVERTER AND EXHAUST MANIFOLD REMOVAL/INSTALLATION - 2.5L .
13. Disconnect the upper radiator hose, coolant bypass hose, EGR coolant hose, heater hose and coolant vent hose from the engine coolant outlet and the EGR valve.
14. Remove the bolts and the cylinder head.

- Discard the bolts and the cylinder head gasket.

INSTALLATION

1. Clean the cylinder head-to-cylinder block mating surface of both the cylinder head and the cylinder block in the following sequence.
 1. Remove any large deposits of silicon or gasket material with a plastic scraper.
 2. Apply silicon gasket remover, following package directions, and allow to set for several minutes.
 3. Remove silicone gasket remover with a plastic scraper. A second application of silicon gasket remover may be required if residual traces of silicon or gasket material remain.
 4. Apply metal surface prep, following package directions to remove any traces of oil or coolant, and to prepare the surfaces to bond with the new gasket. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.

CAUTION:

- **Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.**

NOTE:

- **Observe all warnings or cautions and follow all application directions contained on the packaging of the silicone gasket remover and the metal surface prep.**

NOTE:

- **If there is no residual gasket material present, metal surface prep can be used to clean and prepare the surfaces.**

2. Support the cylinder head on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion. See **CYLINDER HEAD DISTORTION CHECK**.
3. Clean the cylinder head bolt holes in the cylinder block. Make sure all coolant, oil or other foreign material is removed.
4. Apply silicone gasket and sealant to the locations shown in the figure.

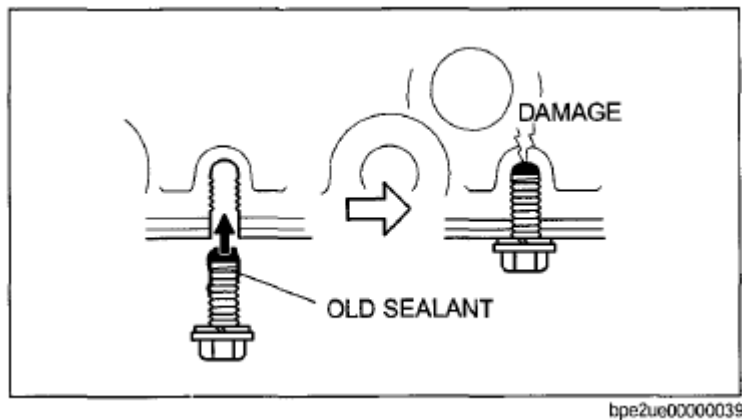


Fig. 105: Locating Silicone Gasket And Sealant Applying Locations
Courtesy of MAZDA MOTORS CORP.

5. Install a new head gasket.
6. Install the cylinder head and 10 new bolts. Tighten the bolts in the sequence shown in the figure in 5 stages.
 - Stage 1: Tighten the bolts to 5 N.m {0.5 kgf.m, 44 in.lbf}.
 - Stage 2: Tighten the bolts to 15 N.m {1.5 kgf.m, 97 in.lbf}.
 - Stage 3: Tighten the bolts to 45 N.m {4.5 kgf.m, 33 ft.lbf}.
 - Stage 4: Turn the bolts 90 degrees.
 - Stage 5: Turn the bolts an additional 90 degrees.

NOTE:

- **The cylinder head bolts are torque-to-yield and must not be reused. New cylinder head bolts must be installed.**

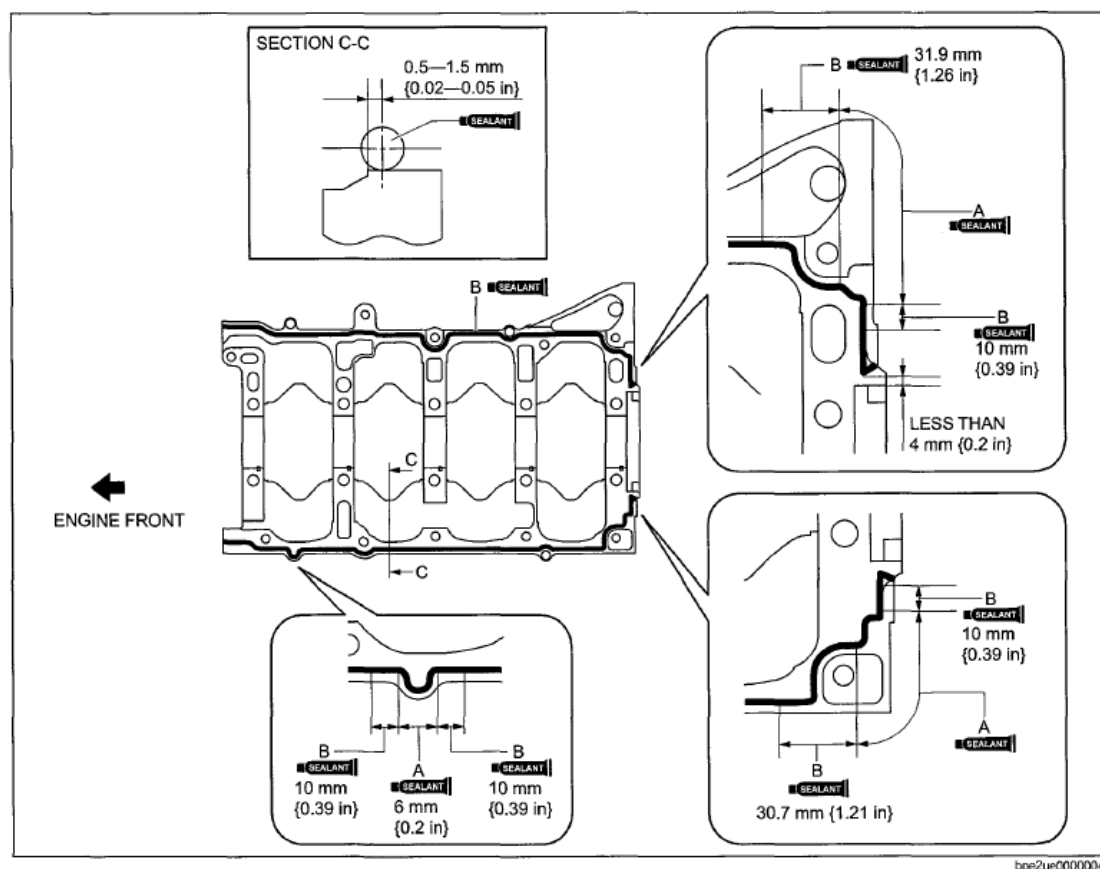


Fig. 106: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

NOTE:

- Lubricate the bolts with clean engine oil prior to installation.

7. Connect the upper radiator hose, coolant bypass hose, heater hose and coolant vent hose to the engine coolant outlet.
8. Connect the EGR coolant hose to the EGR valve.
9. Connect the EGR valve electrical connector.
10. Install the catalytic converter and exhaust manifold. See **CATALYTIC CONVERTER AND EXHAUST MANIFOLD REMOVAL/INSTALLATION - 2.5L**.
11. Install the generator. See **GENERATOR REMOVAL/INSTALLATION - 2.5L**.
12. Install the intake manifold. See **INTAKE MANIFOLD REMOVAL/INSTALLATION - 2.5L**.
13. Install the valve tappets in their original positions.

NOTE:

- Lubricate the valve tappets with clean engine oil.

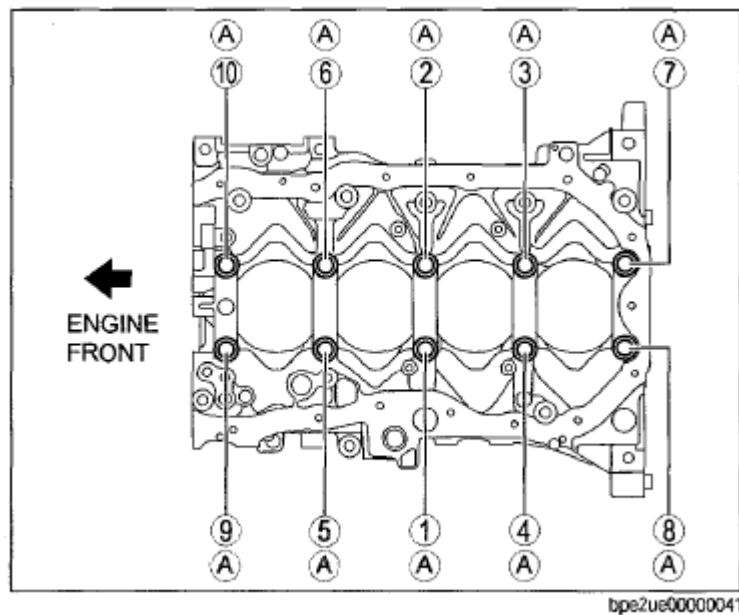


Fig. 107: Locating Valve Tappets Positions
 Courtesy of MAZDA MOTORS CORP.

14. Install the camshaft and bearing caps in their original location and orientation. Tighten the bearing caps in the sequence shown in the figure in 3 stages.
 - Stage 1: Tighten the camshaft bearing cap bolts, one turn at a time, until finger tight.
 - Stage 2: Tighten to 7 N.m {0.7 kgf.m, 62 in.lbf}.
 - Stage 3: Tighten to 16 N.m {1.6 kgf.m, 142 in.lbf}.

CAUTION:

- Install the camshafts with the alignment notches in the camshafts lined up so the camshaft alignment plate can be installed. Make sure the lobes on the No. 1 cylinder are in the same position as noted in the removal procedure. Failure to follow this procedure can cause severe damage to the valves and pistons.

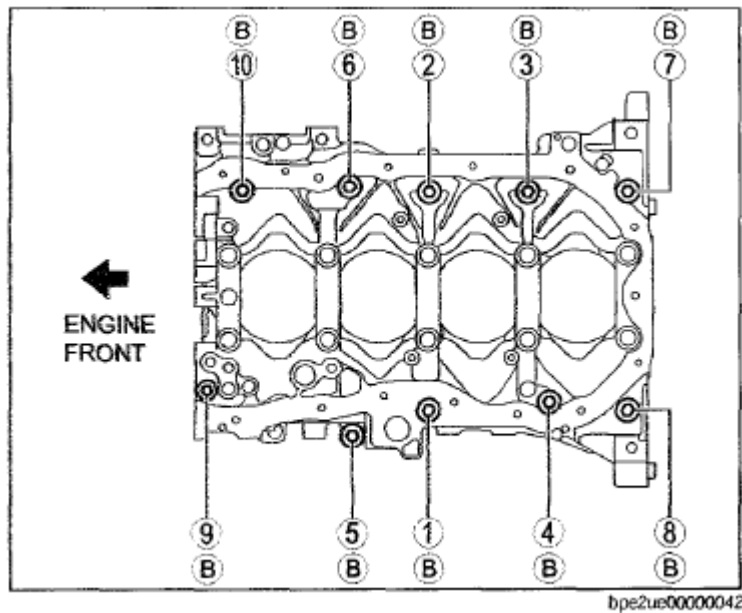


Fig. 108: Identifying Bearing Cap Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

NOTE:

- Lubricate the camshaft journals and bearing caps with clean engine oil.

15. Install the special tool.

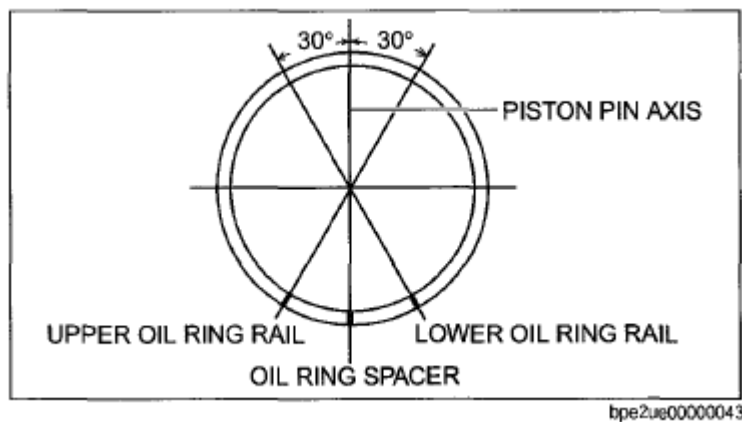


Fig. 109: Identifying Camshaft Alignment Plate 303-465
Courtesy of MAZDA MOTORS CORP.

16. Install the timing drive components. See **TIMING DRIVE COMPONENTS REMOVAL/INSTALLATION - 2.5L**.
17. Fill and bleed the engine cooling system. See **COOLING SYSTEM DRAINING, FILLING AND BLEEDING - 2.5L**.

ENGINE REMOVAL - MANUAL TRANSAXLE

WARNING:

- Do not smoke, or carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. See LIFTING.
2. Release the fuel system pressure. See FUEL SYSTEM PRESSURE RELEASE.
3. Remove the engine air cleaner and air cleaner outlet pipe. See AIR CLEANER REMOVAL/INSTALLATION - 3.0L.
4. Remove the battery tray. See BATTERY TRAY REMOVAL/INSTALLATION.
5. Drain the engine oil.
 - Install the drain plug.
 - To install, tighten to 28 N.m {2.8 kgf.m, 21 ft.lbf}.
6. Remove the LH halfshaft and the intermediate shaft.
7. Drain the cooling system. See COOLING SYSTEM DRAINING, FILLING AND BLEEDING - 2.5L.
8. Remove the bolts and the lateral support crossmember.

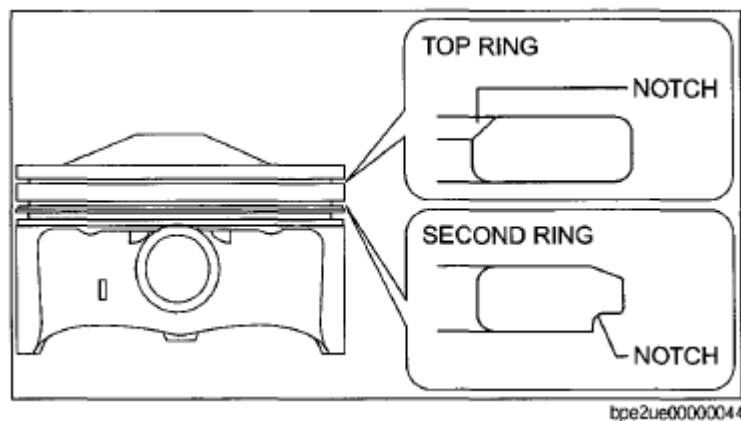


Fig. 110: Locating Lateral Support Crossmember Bolts
Courtesy of MAZDA MOTORS CORP.

9. Remove the exhaust downpipe and exhaust intermediate pipe. See EXHAUST INTERMEDIATE PIPE REMOVAL/INSTALLATION.
10. Remove the accessory drive belt. See ACCESSORY DRIVE BELT REMOVAL/INSTALLATION - 2.5L.
11. Press the locking tab to release the generator air duct and remove.

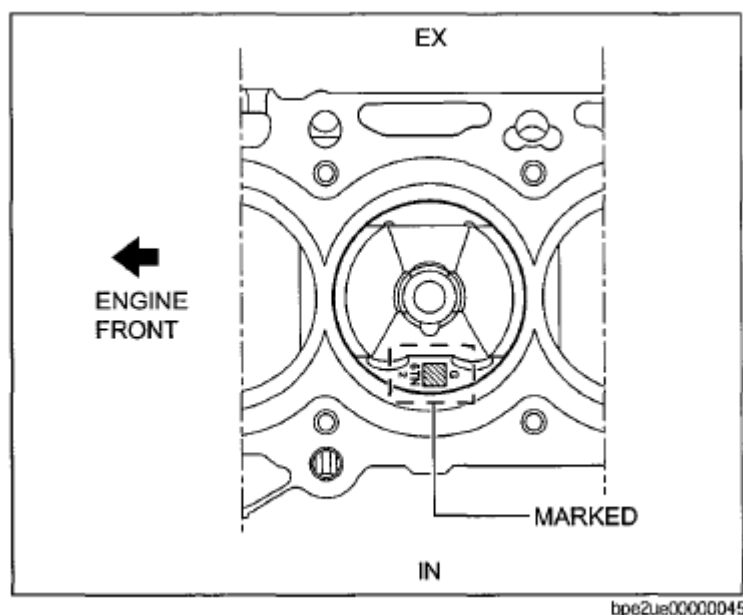


Fig. 111: Locating Locking Tab And Generator Air Duct
Courtesy of MAZDA MOTORS CORP.

12. If equipped, remove the bolt and ground eyelet.

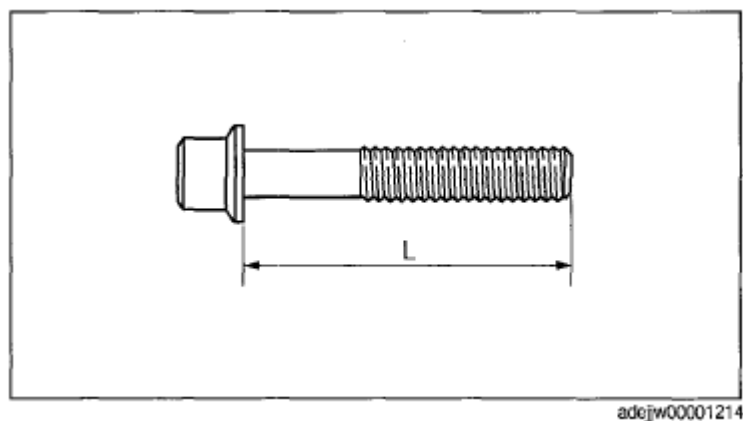


Fig. 112: Locating Bolt And Ground Eyelet
Courtesy of MAZDA MOTORS CORP.

13. Remove the power distribution box (PDB) cover.

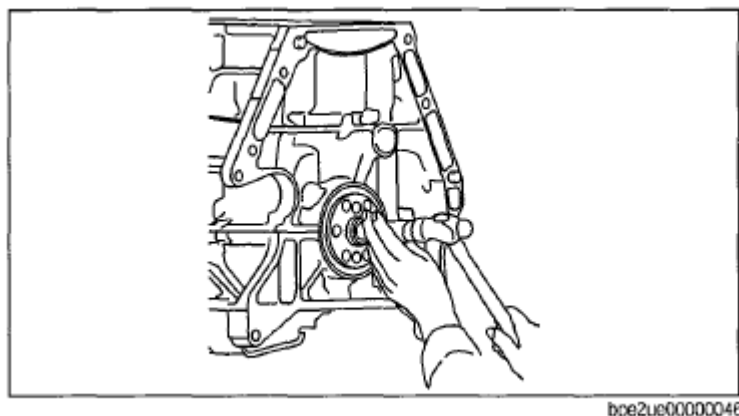


Fig. 113: Locating Power Distribution Box Cover
Courtesy of MAZDA MOTORS CORP.

14. Remove the nut and cable from the PDB.

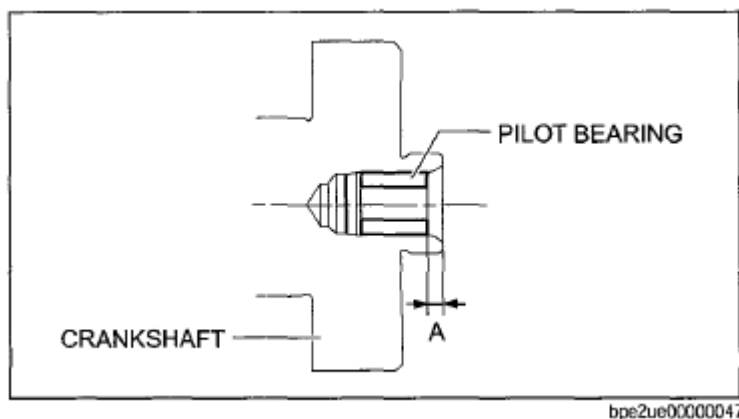
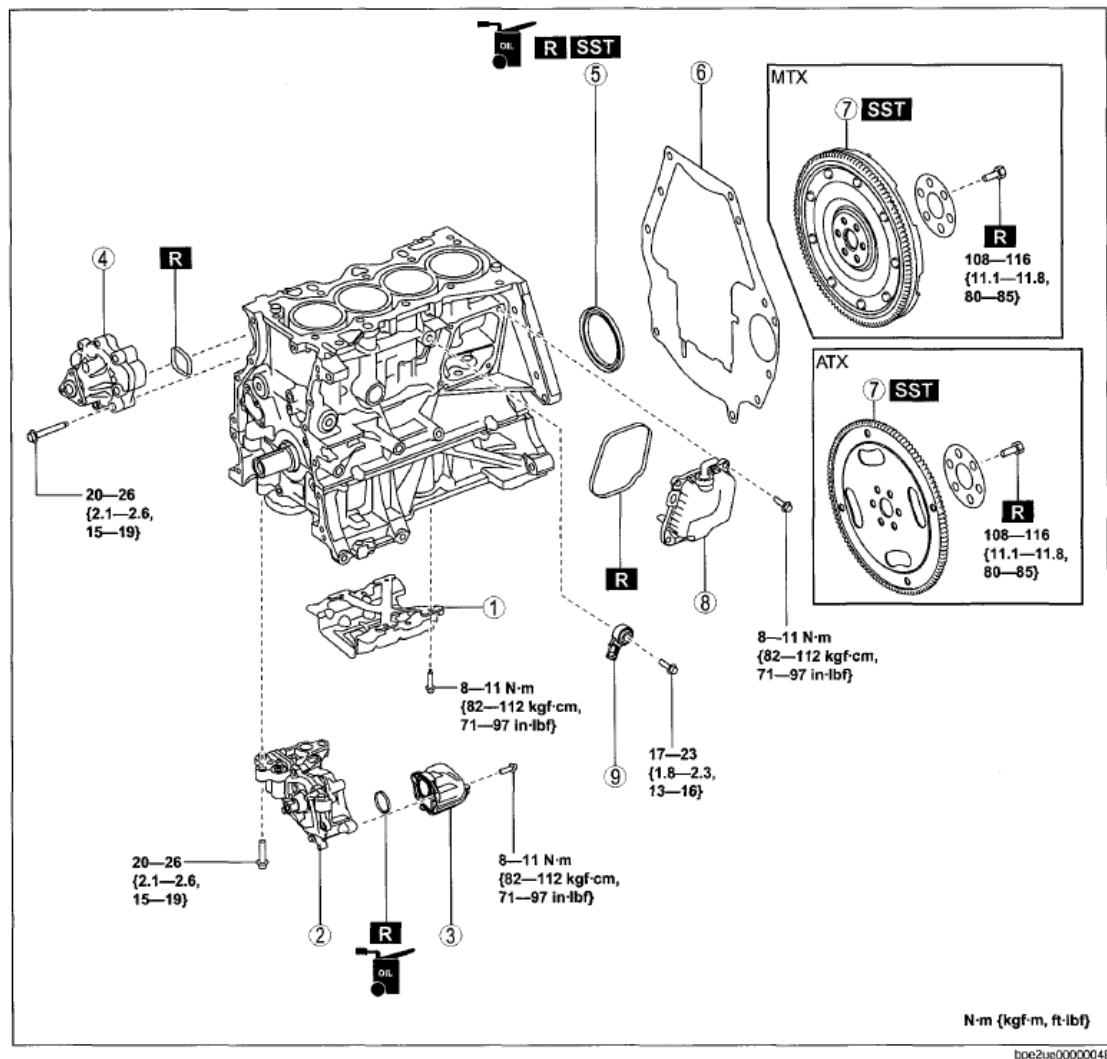


Fig. 114: Locating Cable Nut
Courtesy of MAZDA MOTORS CORP.

15. Disconnect the electrical connector from the PDB.



1	Oil baffle plate (See Oil Baffle Plate Assembly Note.)
2	Oil pump (See Oil Pump Assembly Note.)
3	Oil strainer
4	Water pump (See Water Pump Assembly Note.)
5	Rear oil seal (See Rear Oil Seal Assembly Note.)

6	End plate (See End Plate Assembly Note.)
7	Flywheel (MTX), drive plate (ATX) (See Flywheel (MTX), Drive Plate (ATX) Assembly Note.)
8	Oil separator
9	Knock sensor

Fig. 115: Locating PDB Electrical Connector
 Courtesy of MAZDA MOTORS CORP.

16. Remove the bolt and ground strap.

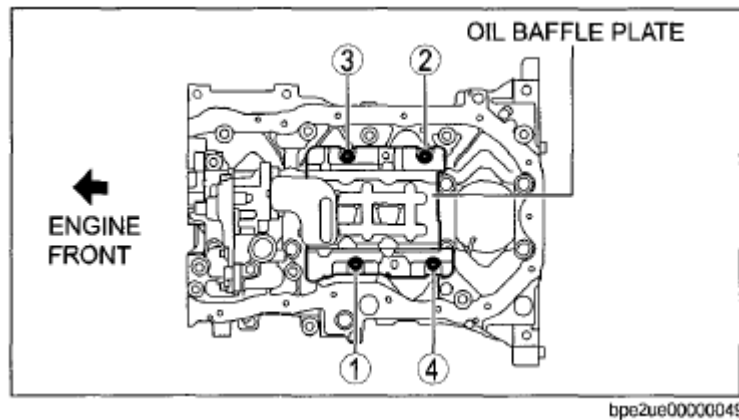


Fig. 116: Locating Bolt And Ground Strap
Courtesy of MAZDA MOTORS CORP.

17. Detach the 2 wiring harness retainers from the battery tray bracket and position the wiring harness aside.

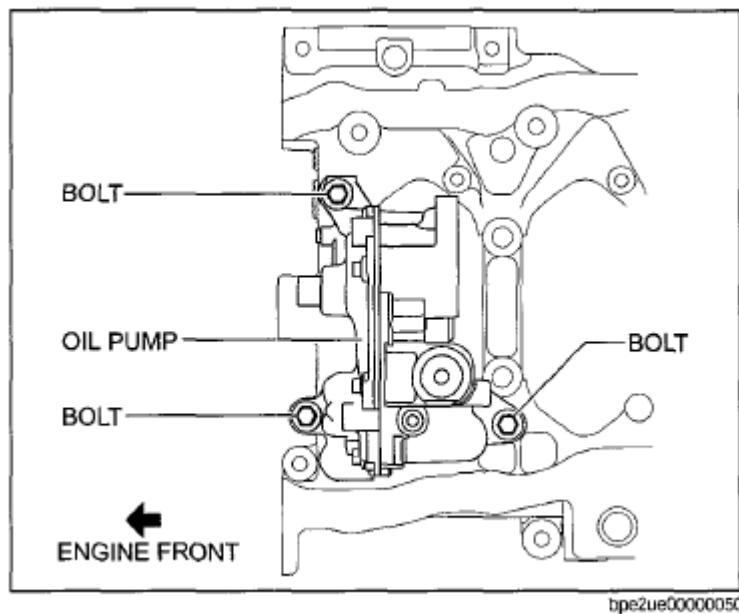


Fig. 117: Locating Wiring Harness Retainers
Courtesy of MAZDA MOTORS CORP.

18. Position the clutch hydraulic line aside.
 1. Remove the clutch hydraulic line bracket-to-transaxle bolt.
 2. Disconnect the clutch hydraulic line from the clutch slave cylinder.
 1. Plug the hydraulic line.
 3. Position the clutch hydraulic line aside.

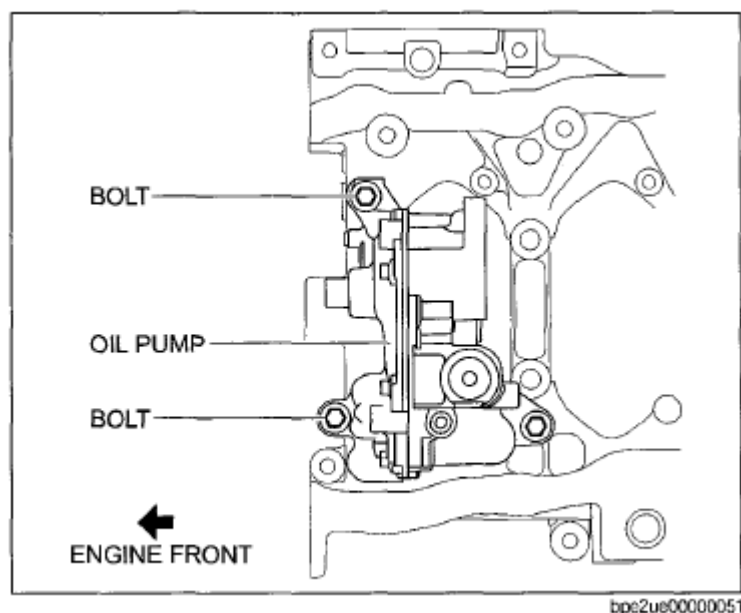


Fig. 118: Identifying Clutch Hydraulic Line
Courtesy of MAZDA MOTORS CORP.

19. Disconnect the vehicle speed sensor (VSS) electrical connector and the 2 pin-type retainers.

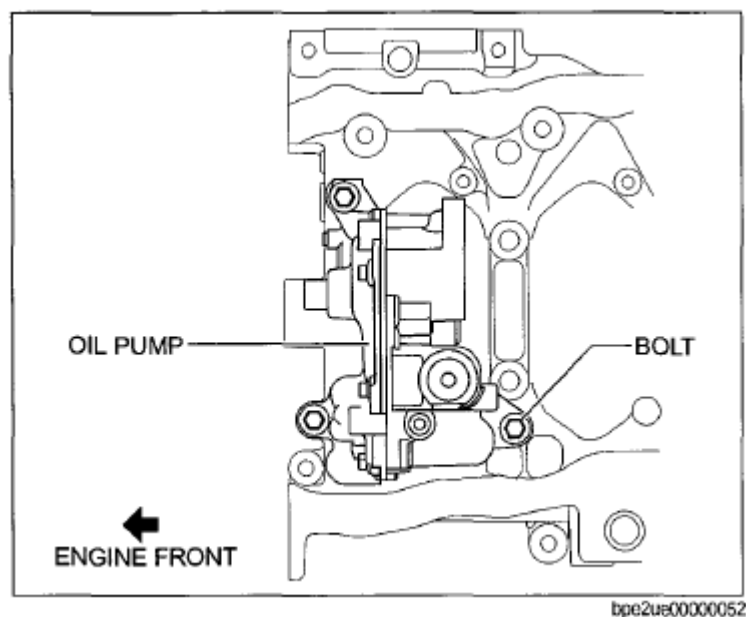


Fig. 119: Locating Vehicle Speed Sensor Electrical Connector And Pin-Type Retainers
Courtesy of MAZDA MOTORS CORP.

20. Detach the 2 wiring harness retainers and disconnect the reversing lamp indicator switch electrical connector.

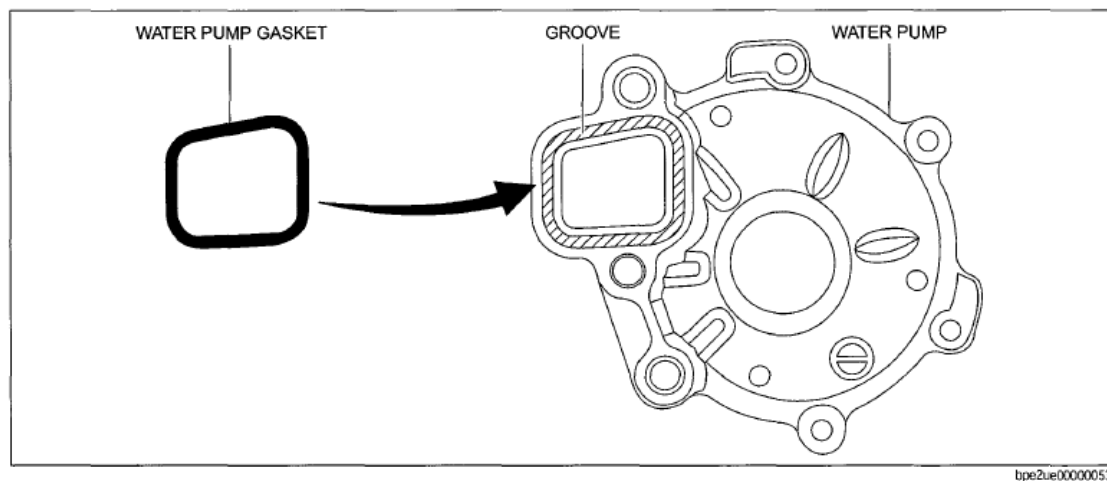


Fig. 120: Locating Wiring Harness Retainers And Reversing Lamp Indicator Switch Electrical Connector
Courtesy of MAZDA MOTORS CORP.

21. Disconnect the shift cables.

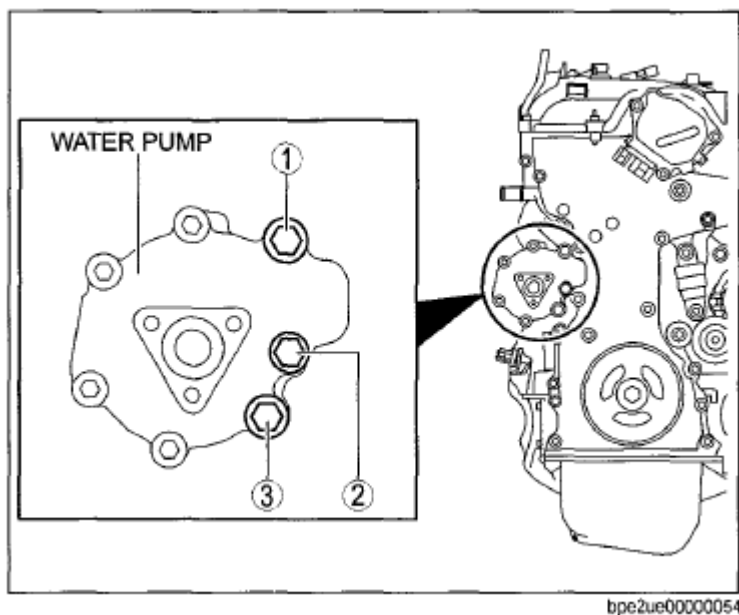


Fig. 121: Locating Shift Cables
Courtesy of MAZDA MOTORS CORP.

22. Remove the 3 shift cable bracket bolts.
- Position the bracket aside.

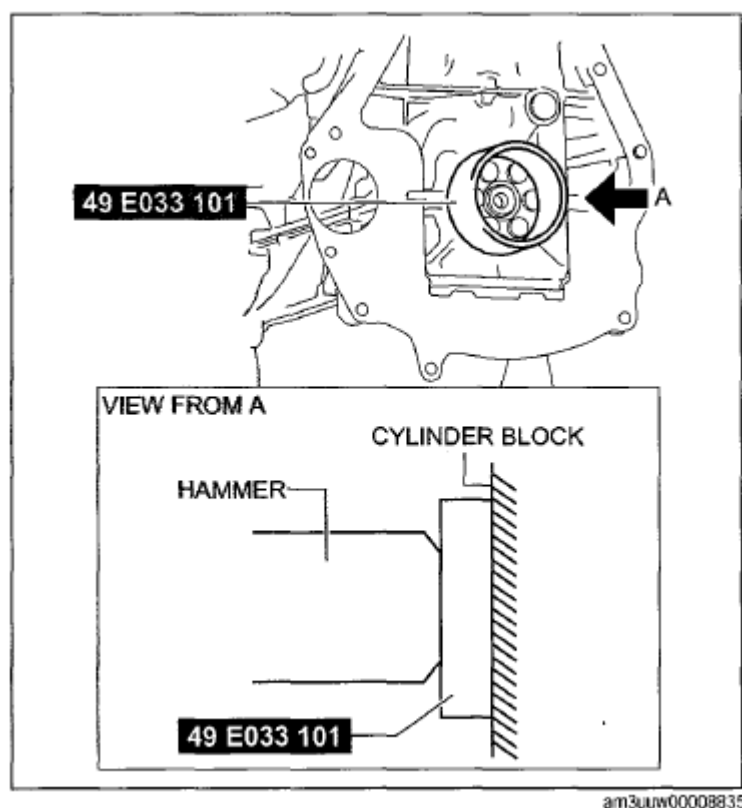


Fig. 122: Locating Shift Cable Bracket Bolts
Courtesy of MAZDA MOTORS CORP.

23. If equipped, disconnect the block heater electrical connector.
 - Detach all the block heater wiring harness retainers and position the wiring harness aside.

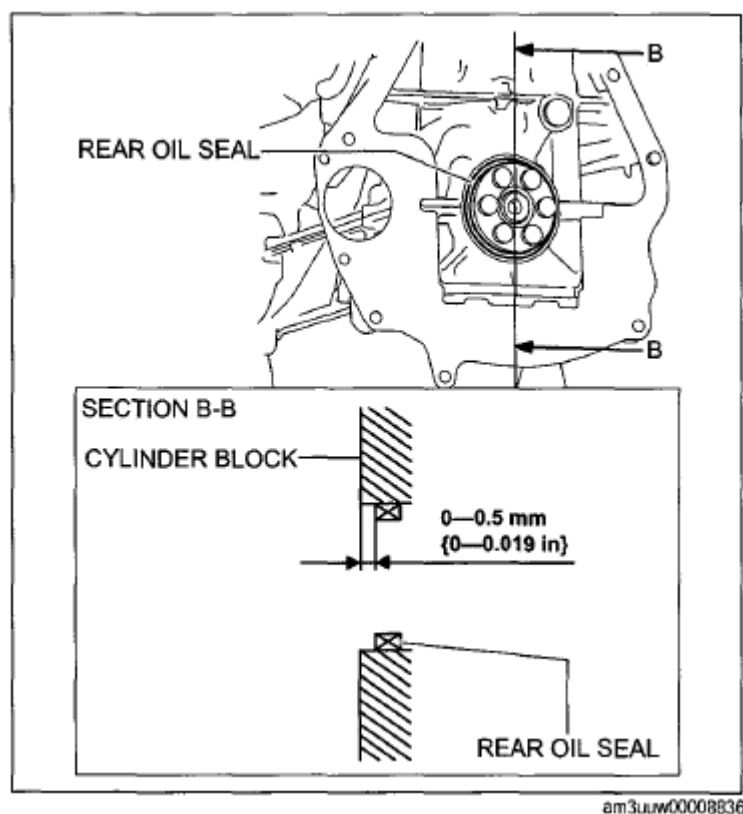


Fig. 123: Locating Block Heater Electrical Connector
Courtesy of MAZDA MOTORS CORP.

24. Disconnect the upper radiator hose.

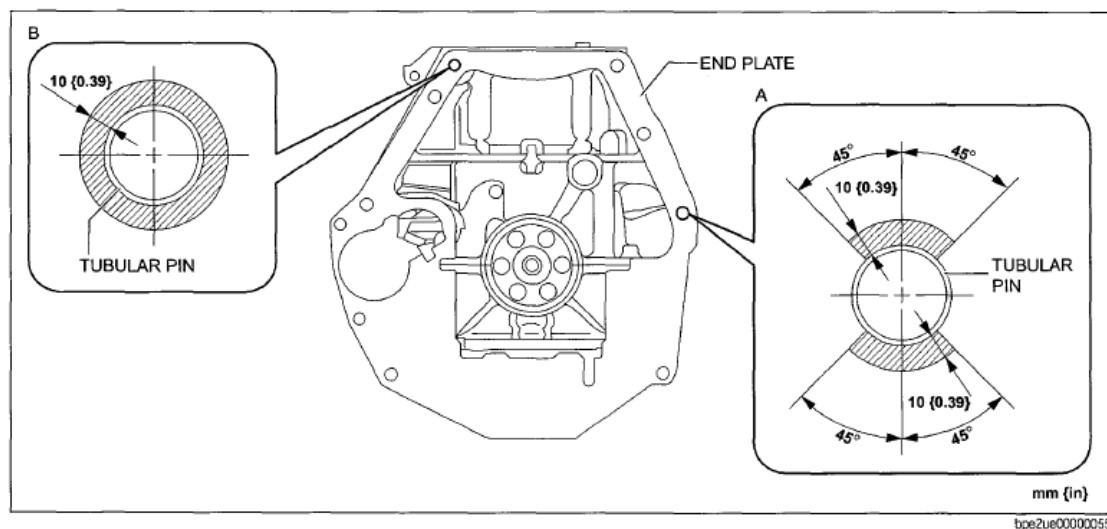


Fig. 124: Locating Upper Radiator Hose
Courtesy of MAZDA MOTORS CORP.

25. Detach the heater hose support strap from the stud.

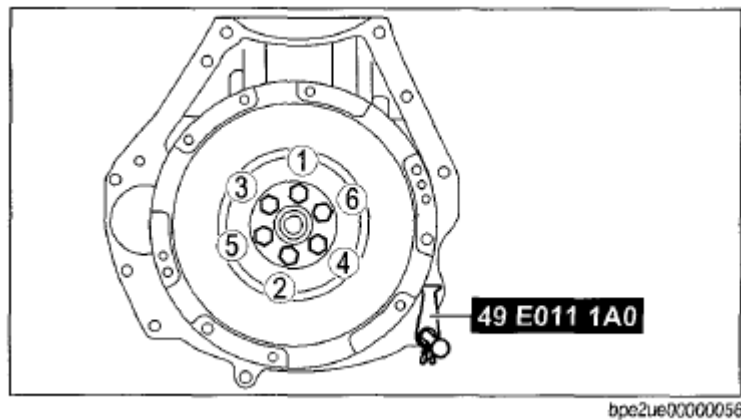
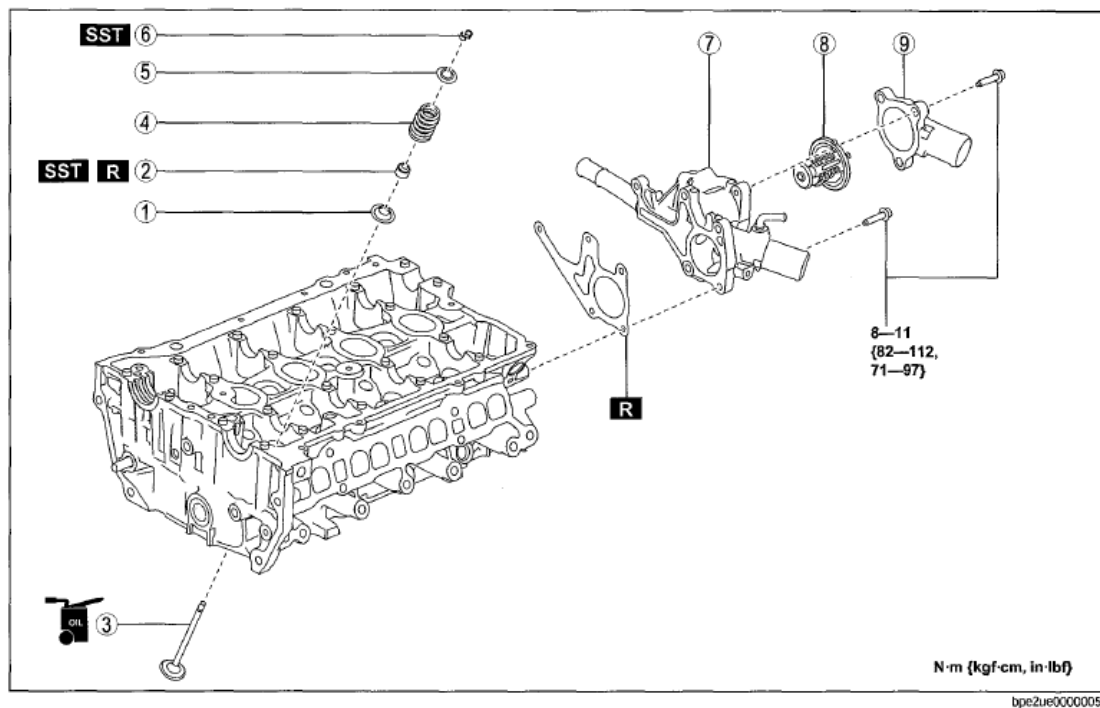


Fig. 125: Locating Heater Hose Support Strap
Courtesy of MAZDA MOTORS CORP.

26. Disconnect the heater hoses from the heater core.



1	Lower valve spring seat
2	Valve seal (See Valve Seal Assembly Note.)
3	Valve
4	Valve spring (See Valve Spring Assembly Note.)
5	Upper valve spring seat

6	Valve keeper (See Valve Keeper Assembly Note.)
7	Water outlet (See Water Outlet Assembly Note.)
8	Thermostat (See Thermostat Assembly Note.)
9	Thermostat cover

Fig. 126: Locating Heater Hoses
Courtesy of MAZDA MOTORS CORP.

27. Disconnect the vacuum supply tube and position aside.

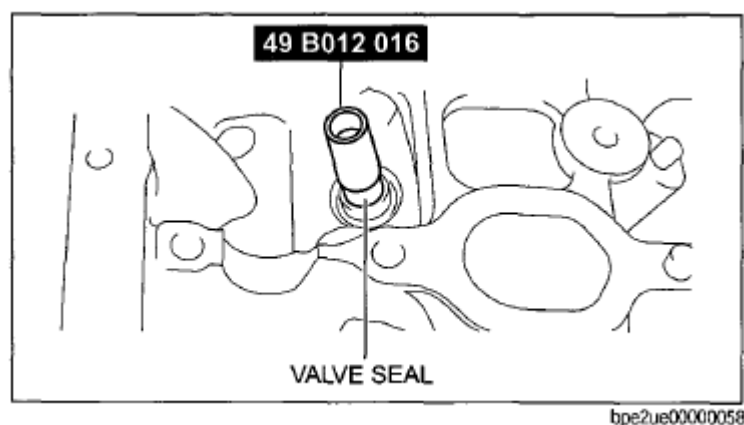


Fig. 127: Locating Vacuum Supply Tube
Courtesy of MAZDA MOTORS CORP.

28. Disconnect the fuel vapor return tube.
 - Detach the fuel vapor tube retainer from the wire harness.

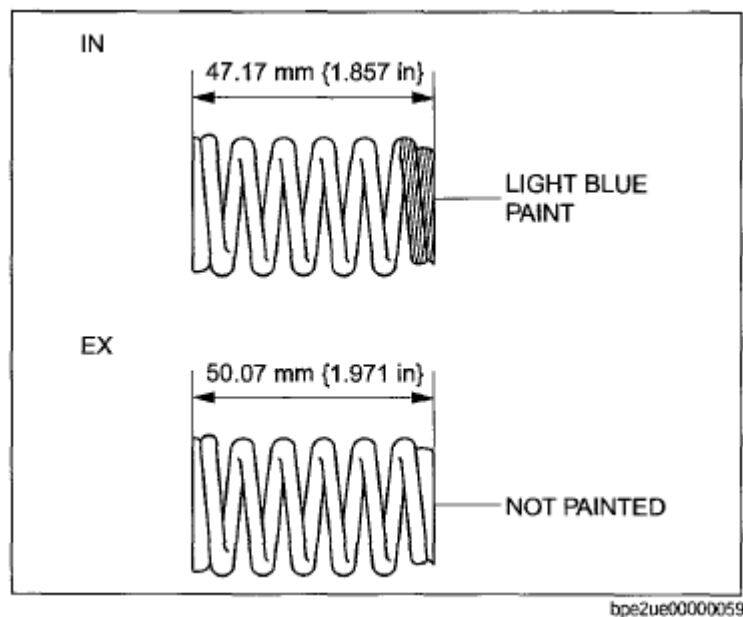


Fig. 128: Locating Fuel Vapor Return Tube
Courtesy of MAZDA MOTORS CORP.

29. Disconnect the fuel supply tube. See **QUICK RELEASE COUPLING - DOUBLE LOCKING**.

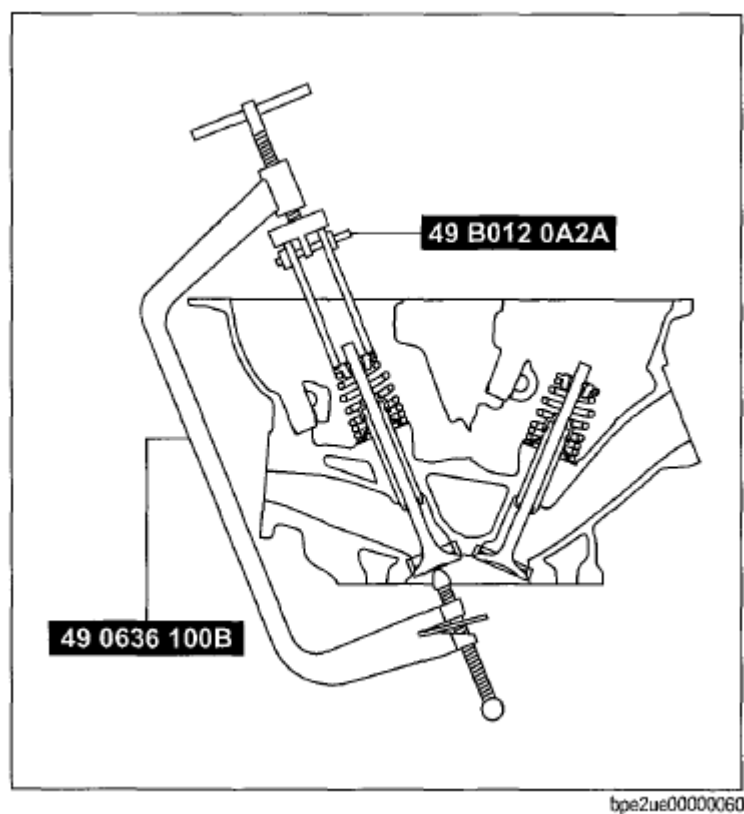


Fig. 129: Locating Fuel Supply Tube
Courtesy of MAZDA MOTORS CORP.

30. Disconnect the PCM electrical connector and the wire harness retainer.

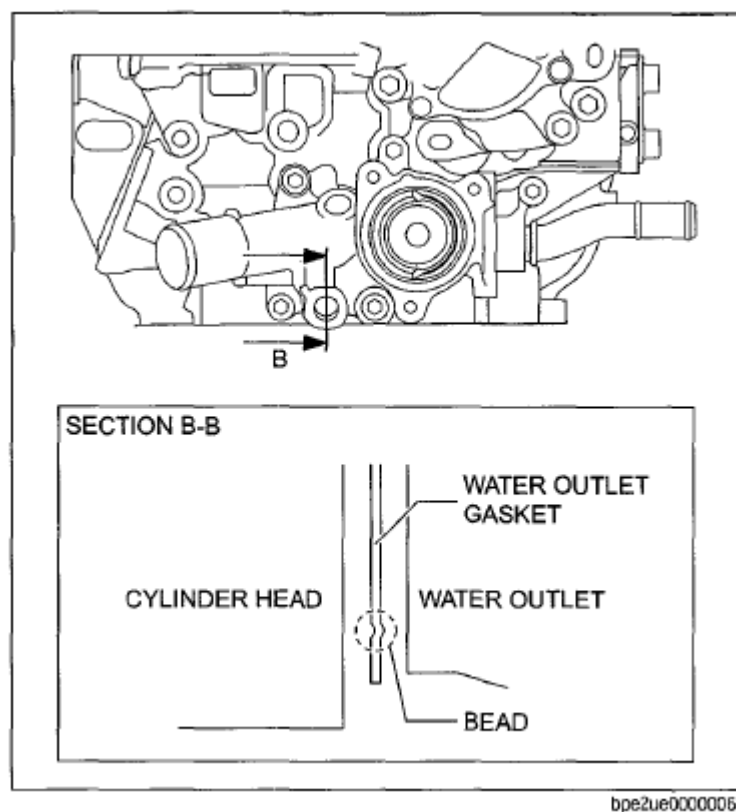


Fig. 130: Locating PCM Electrical Connector And Wire Harness Retainer
Courtesy of MAZDA MOTORS CORP.

31. Disconnect the engine control harness electrical connector.

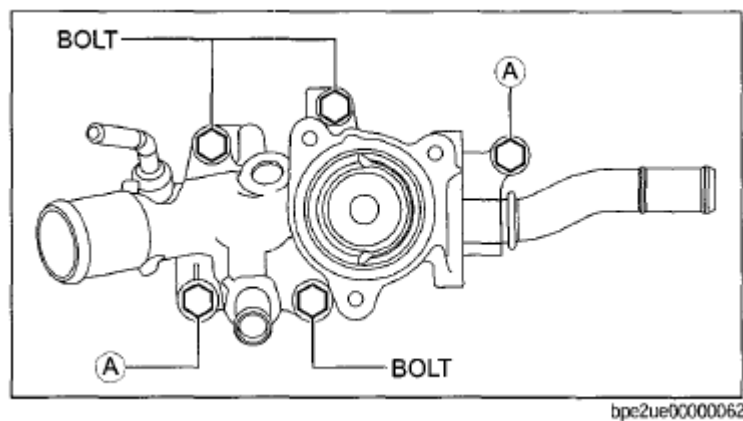


Fig. 131: Locating Engine Control Harness Electrical Connector
Courtesy of MAZDA MOTORS CORP.

32. Disconnect the generator electrical connector and the 2 retainers.

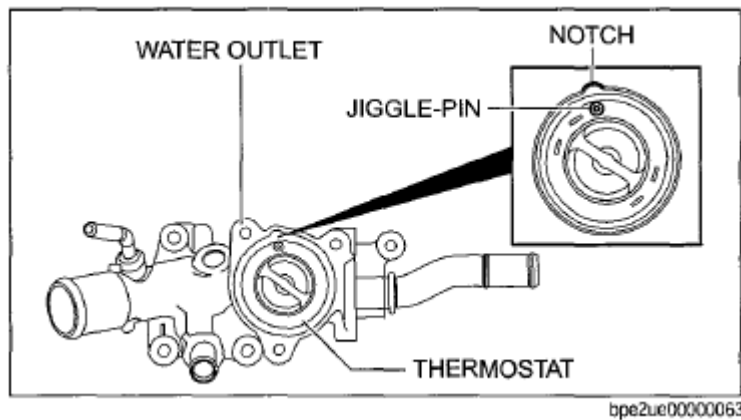


Fig. 132: Locating Generator Electrical Connector And Retainers
Courtesy of MAZDA MOTORS CORP.

33. Disconnect the A/C compressor electrical connector and remove the 3 bolts. Position the A/C compressor aside and support the compressor with a length of mechanic's wire.

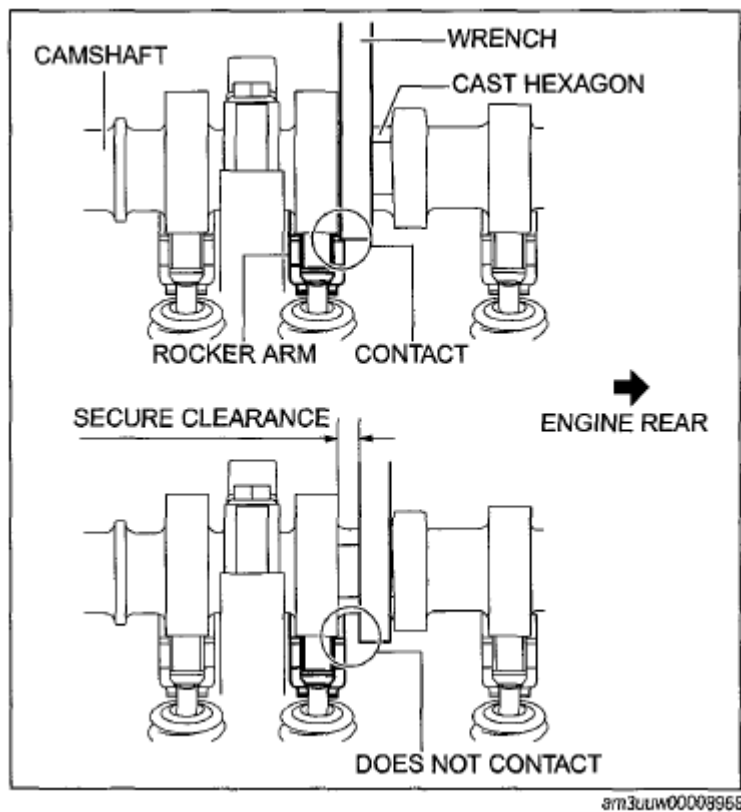


Fig. 133: Locating A/C Compressor Electrical Connector And Bolts
Courtesy of MAZDA MOTORS CORP.

34. Disconnect the lower radiator hose from the radiator.

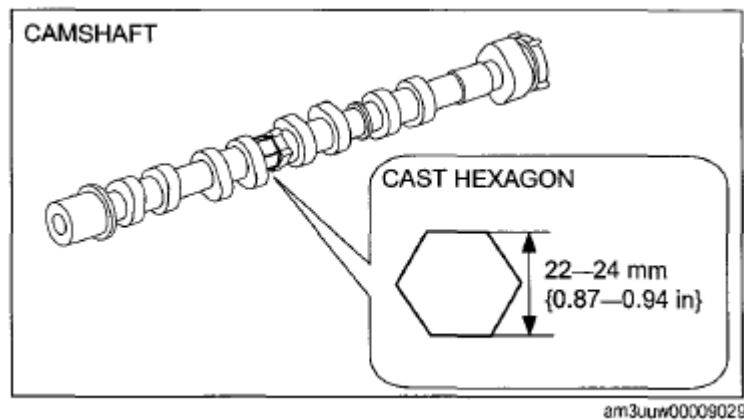
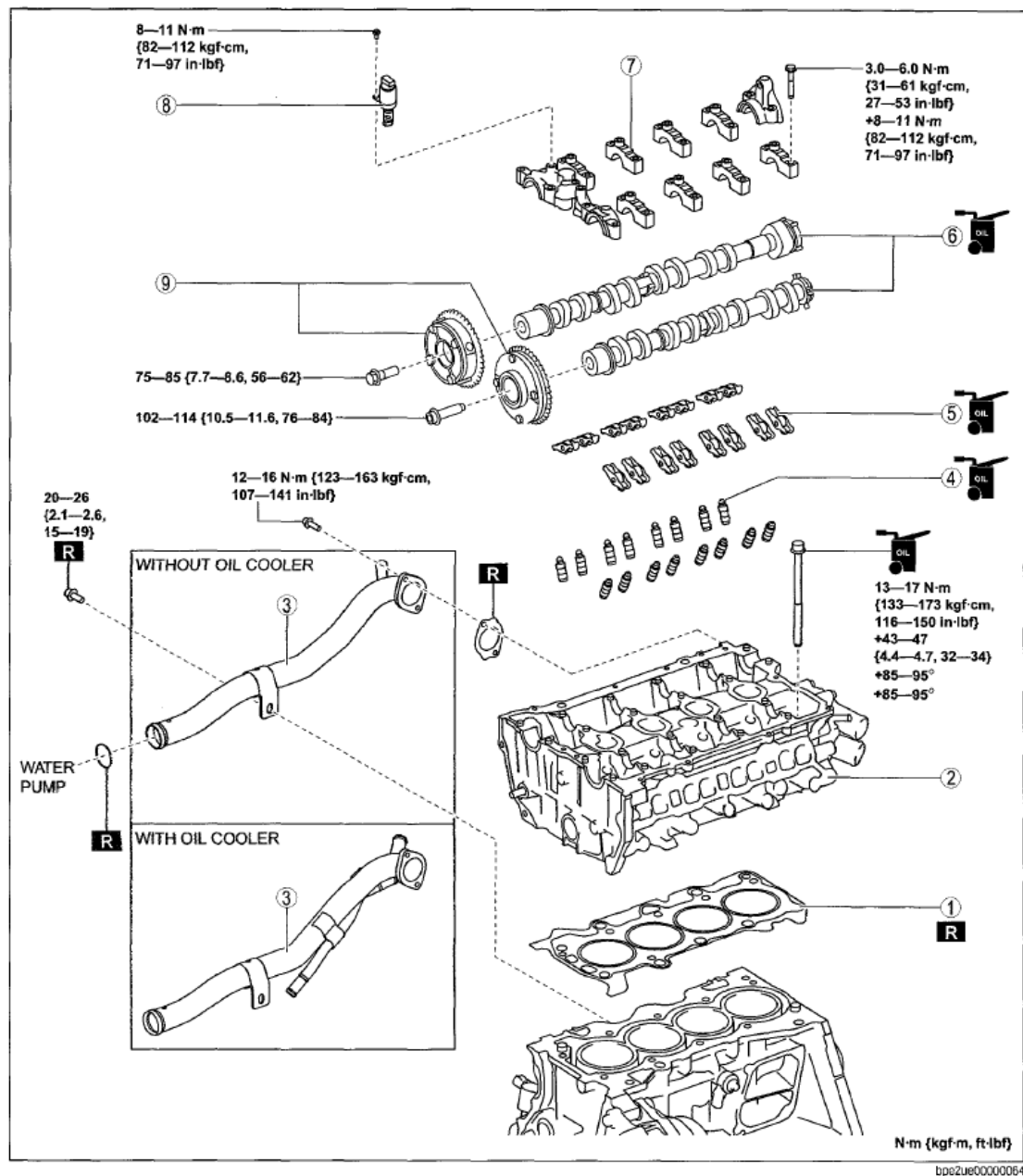


Fig. 134: Locating Lower Radiator Hose
Courtesy of MAZDA MOTORS CORP.

35. Remove the front roll restrictor bolt and the 2 bolts for the engine support crossmember.



1	Cylinder head gasket
2	Cylinder head (See Cylinder Head Assembly Note.)
3	Water inlet pipe (See Water Inlet Pipe Assembly Note.)
4	HLA (See HLA Assembly Note.)
5	Rocker arm (See Rocker Arm Assembly Note.)

6	Camshaft (See Camshaft Assembly Note.)
7	Camshaft cap (See Camshaft Assembly Note.)
8	OCV
9	Electric variable valve timing actuator, hydraulic variable valve timing actuator (See Electric Variable Valve Timing Actuator, Hydraulic Variable Valve Timing Actuator Assembly Note.)

Fig. 135: Locating Front Roll Restrictor Bolt And Engine Support Crossmember Bolts
Courtesy of MAZDA MOTORS CORP.

36. Remove the rear nut and the engine support crossmember.

- Discard the nut.

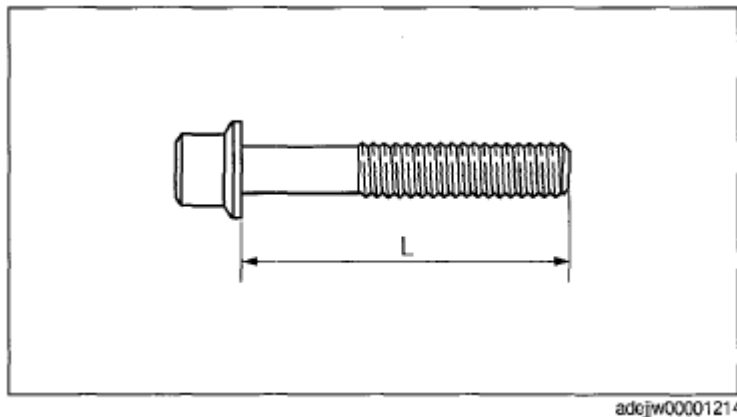


Fig. 136: Locating Rear Nut And Engine Support Crossmember
Courtesy of MAZDA MOTORS CORP.

37. Remove the 2 transaxle-to-engine bolts.

NOTE:

- The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

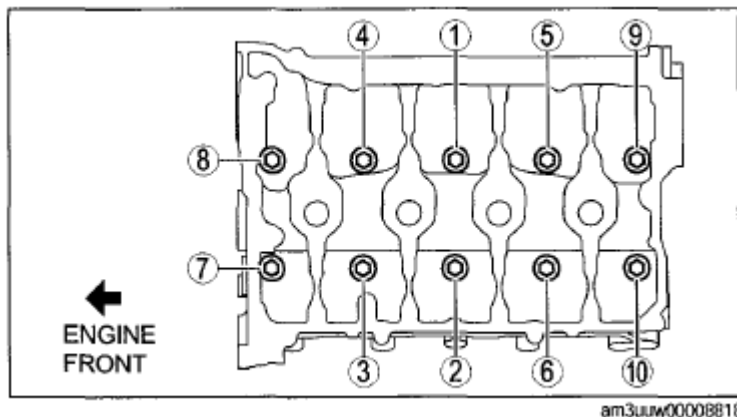


Fig. 137: Locating Transaxle-To-Engine Bolts
Courtesy of MAZDA MOTORS CORP.

38. Remove the 2 engine-to-transaxle bolts.

NOTE:

- The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

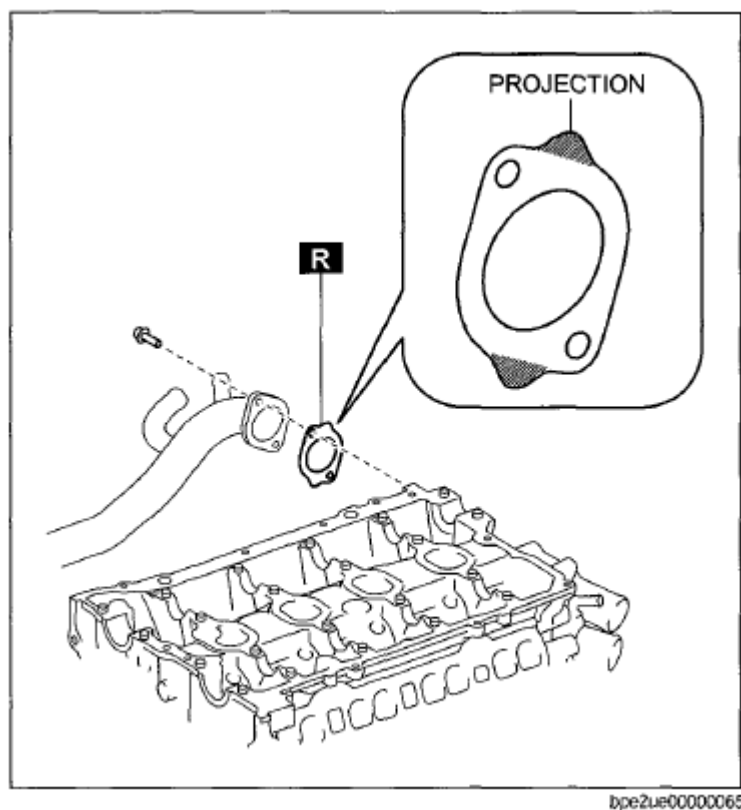


Fig. 138: Locating Engine-To-Transaxle Bolts
Courtesy of MAZDA MOTORS CORP.

39. If equipped, remove the spin on engine oil filter.

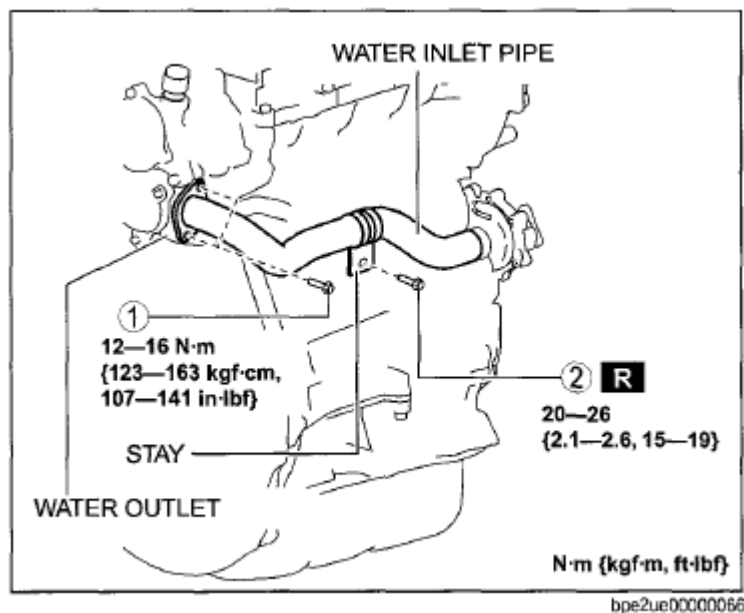


Fig. 139: Locating Engine Oil Filter

Courtesy of MAZDA MOTORS CORP.

40. If equipped, remove the oil filter element.
41. Using the special tools, secure the engine to the lift table.

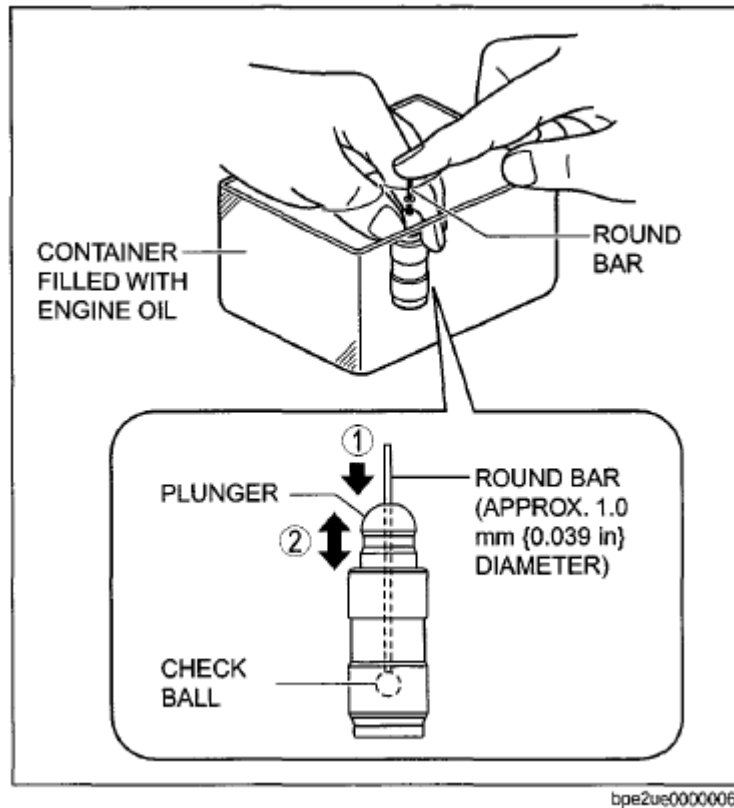


Fig. 140: Identifying Special Tools (014-0001 - 014-00765)
Courtesy of MAZDA MOTORS CORP.

42. Remove the engine mount bracket bolt.

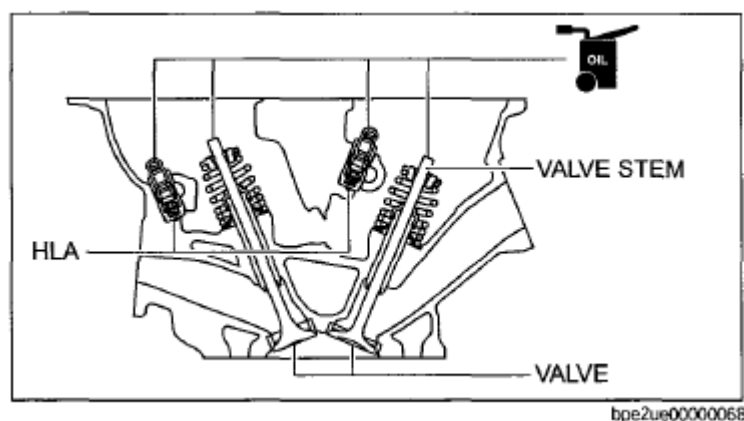


Fig. 141: Locating Engine Mount Bracket Bolt

Courtesy of MAZDA MOTORS CORP.

43. Remove the nuts and the engine mount bracket.

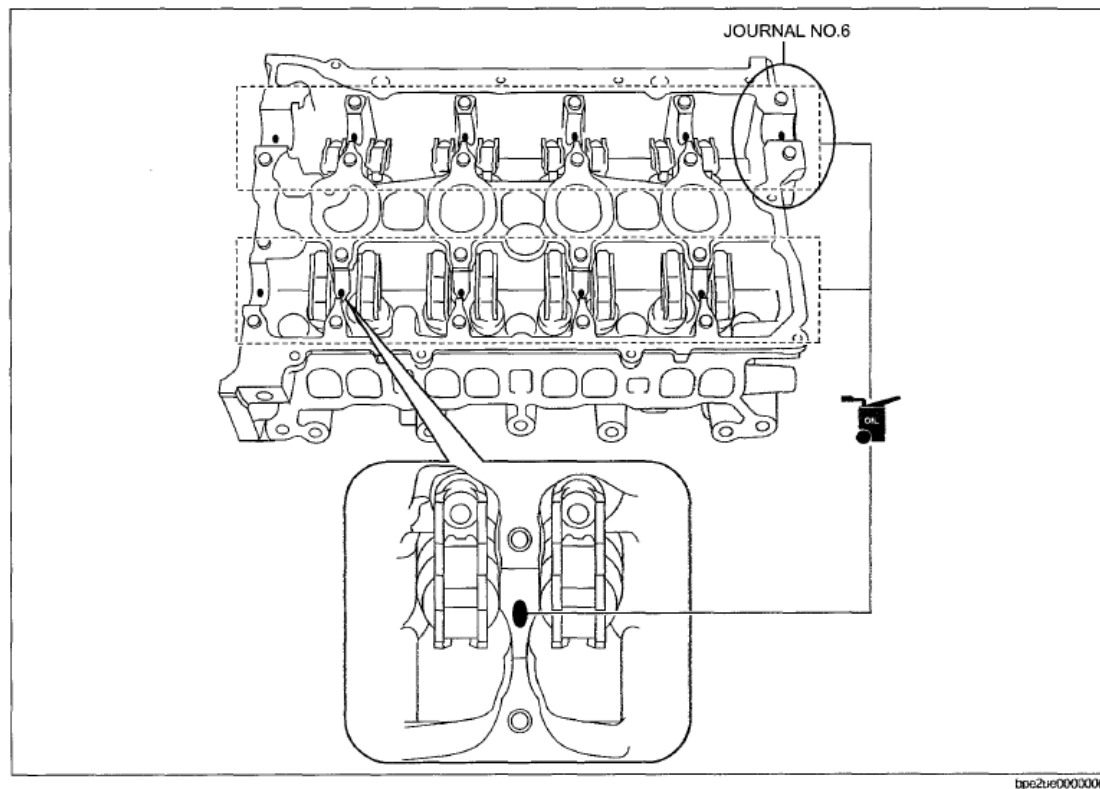


Fig. 142: Locating Engine Mount Bracket Nuts
Courtesy of MAZDA MOTORS CORP.

44. Remove the bolt from the transaxle rear mount.

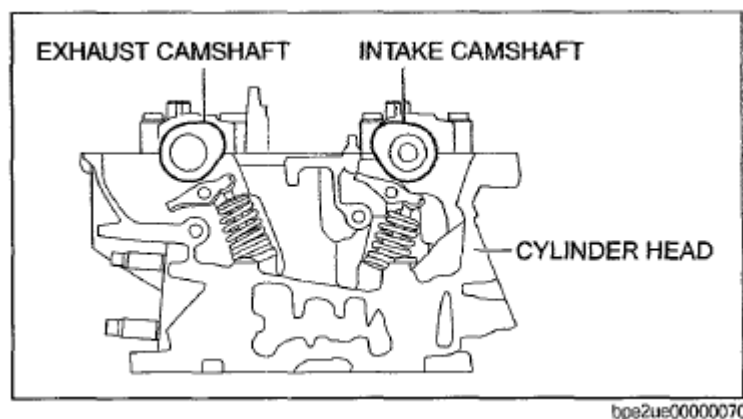


Fig. 143: Locating Transaxle Rear Mount Bolt
Courtesy of MAZDA MOTORS CORP.

45. Remove bolt from LH transaxle mount.

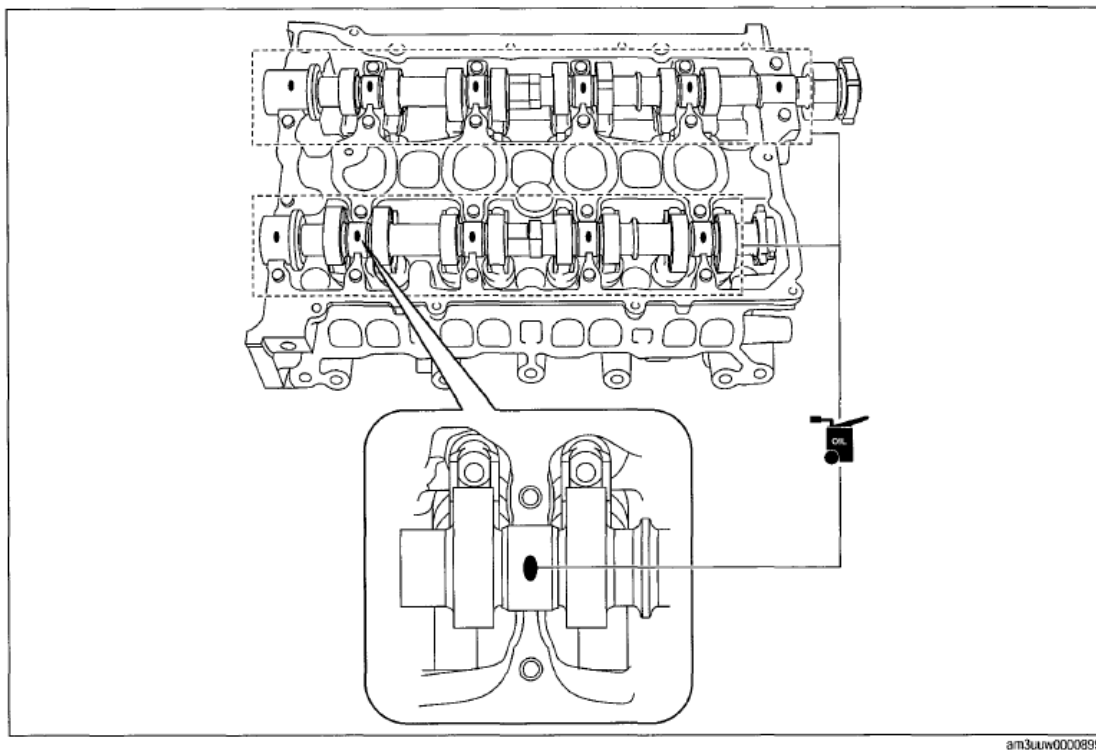


Fig. 144: Locating LH Transaxle Mount Bolt
Courtesy of MAZDA MOTORS CORP.

46. Lower the engine and transaxle from the vehicle.
47. Disconnect the starter terminals.
1. Remove the battery cable nut.
 2. Remove the starter solenoid terminal nut.

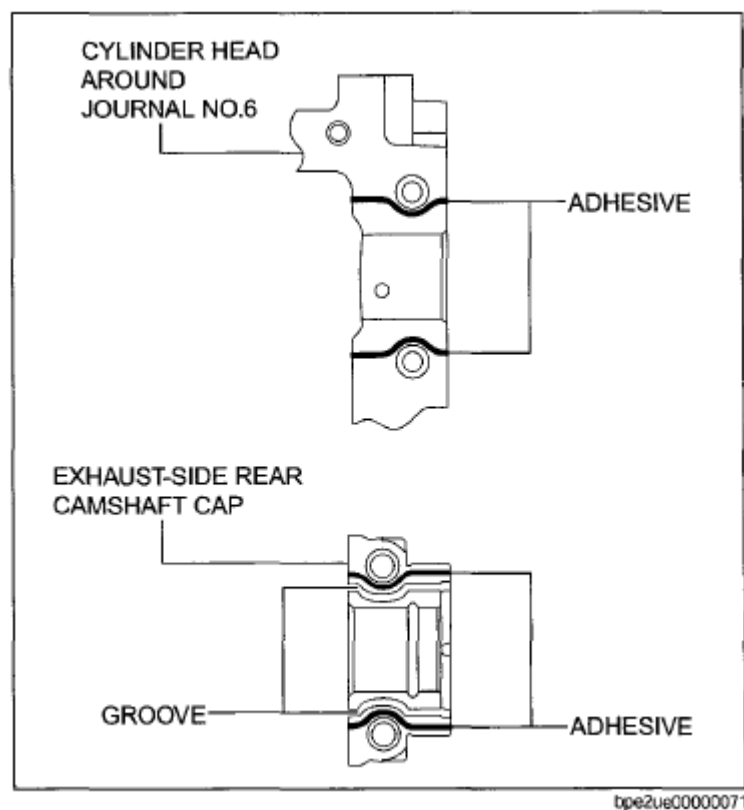


Fig. 145: Identifying Battery Cable Nut And Starter Solenoid Terminal Nut
Courtesy of MAZDA MOTORS CORP.

48. Remove the nut and the ground wire.

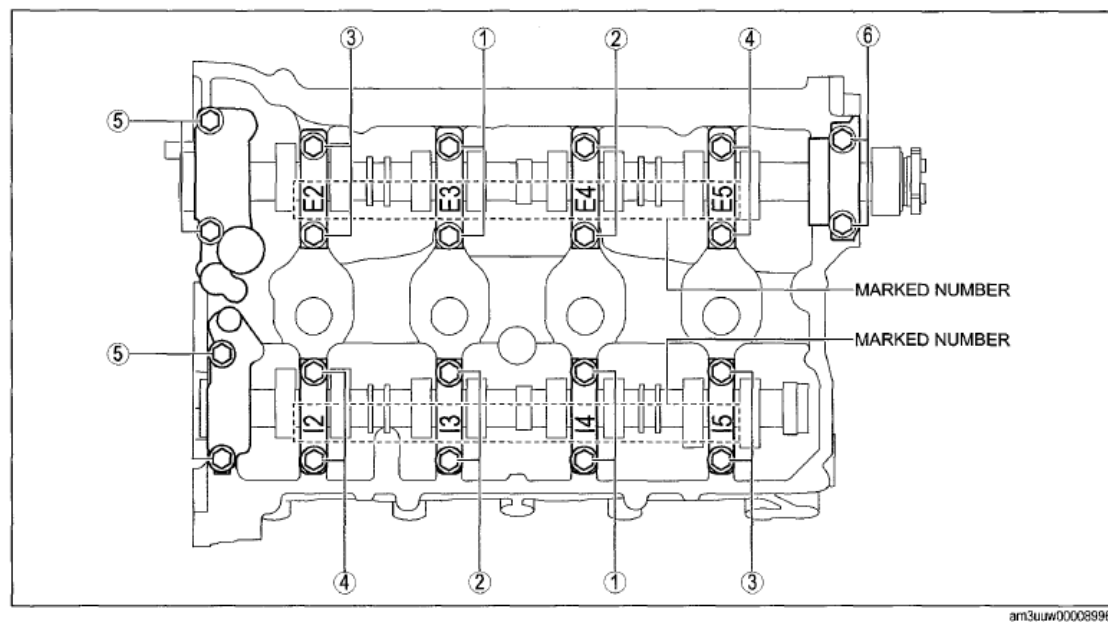


Fig. 146: Locating Ground Wire Nut

Courtesy of MAZDA MOTORS CORP.

49. Remove the 2 stud bolts and remove the starter.

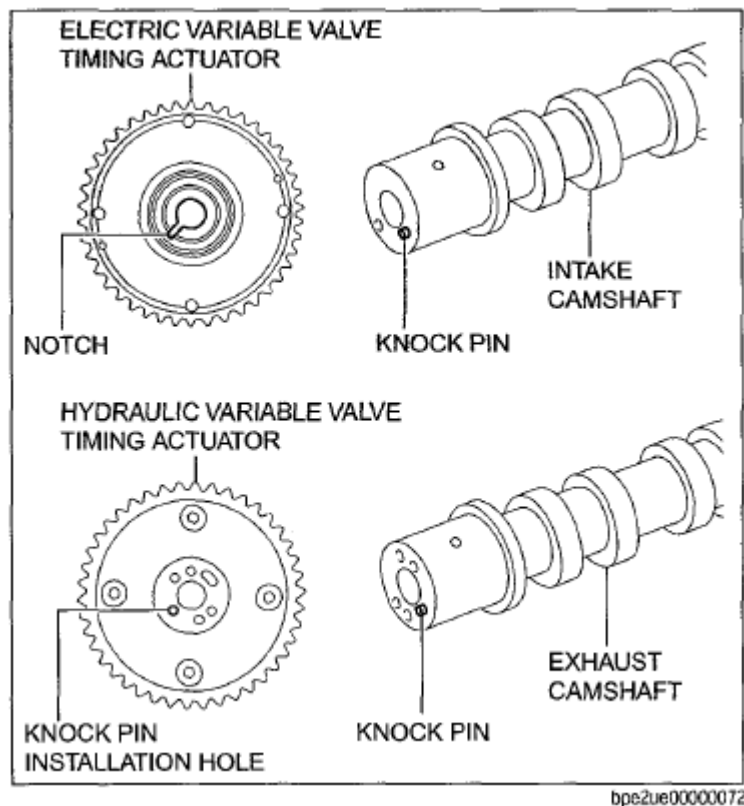


Fig. 147: Locating Starter Stud Bolts
Courtesy of MAZDA MOTORS CORP.

50. Using the Heavy Duty Floor Crane and Spreader Bar, remove the engine and transaxle from the lift table.

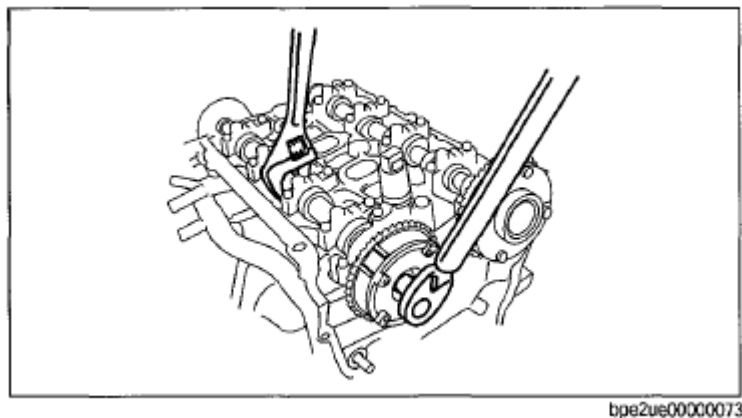


Fig. 148: Locating Starter Motor Isolator
Courtesy of MAZDA MOTORS CORP.

51. Remove the remaining 5 engine-to-transaxle bolts and separate the engine and transaxle.

NOTE:

- The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

ENGINE INSTALLATION - MANUAL TRANSAXLE**WARNING:**

- Do not smoke, or carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

1. Using the Engine Crane and Spreader Bar, position the engine and transaxle together. Install the 5 transaxle-to-engine bolts.

Using the Engine Crane and Spreader Bar, position the engine and transaxle onto the lift table.

3. Using the special tools, secure the engine to the lift table.

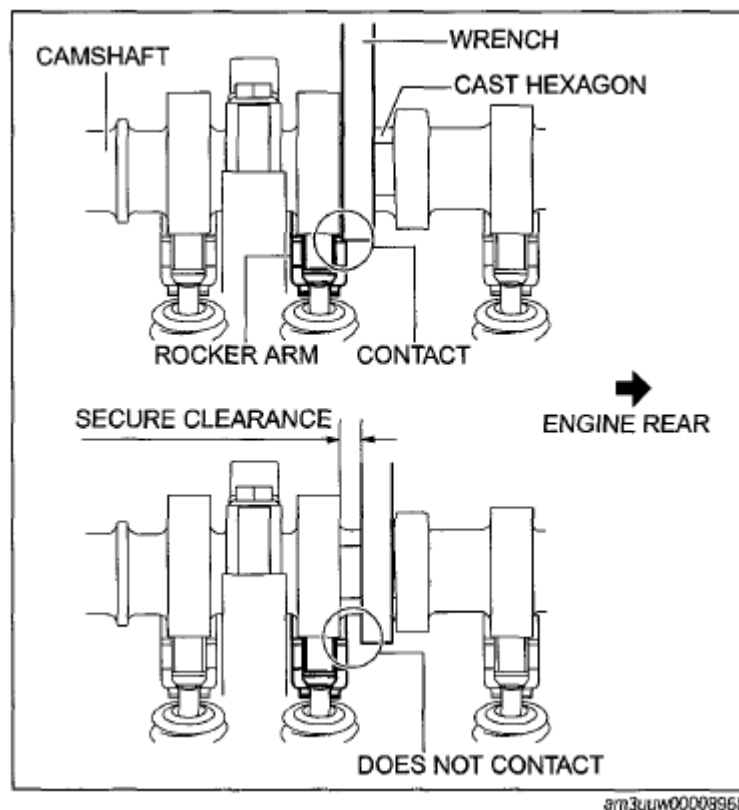


Fig. 149: Identifying Special Tools (014-0001 - 014-00765)
Courtesy of MAZDA MOTORS CORP.

4. Install the starter motor isolator.

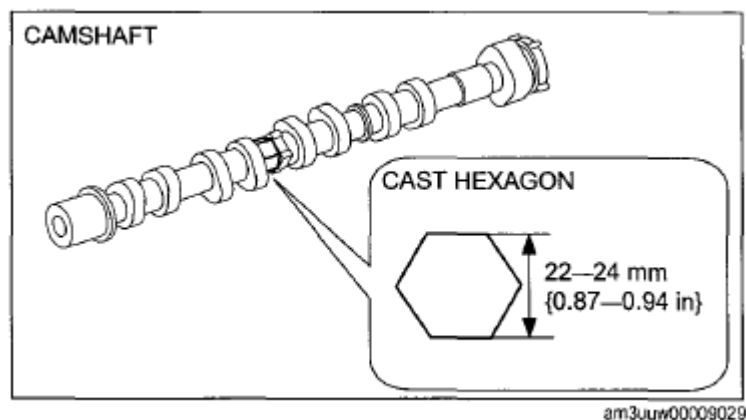
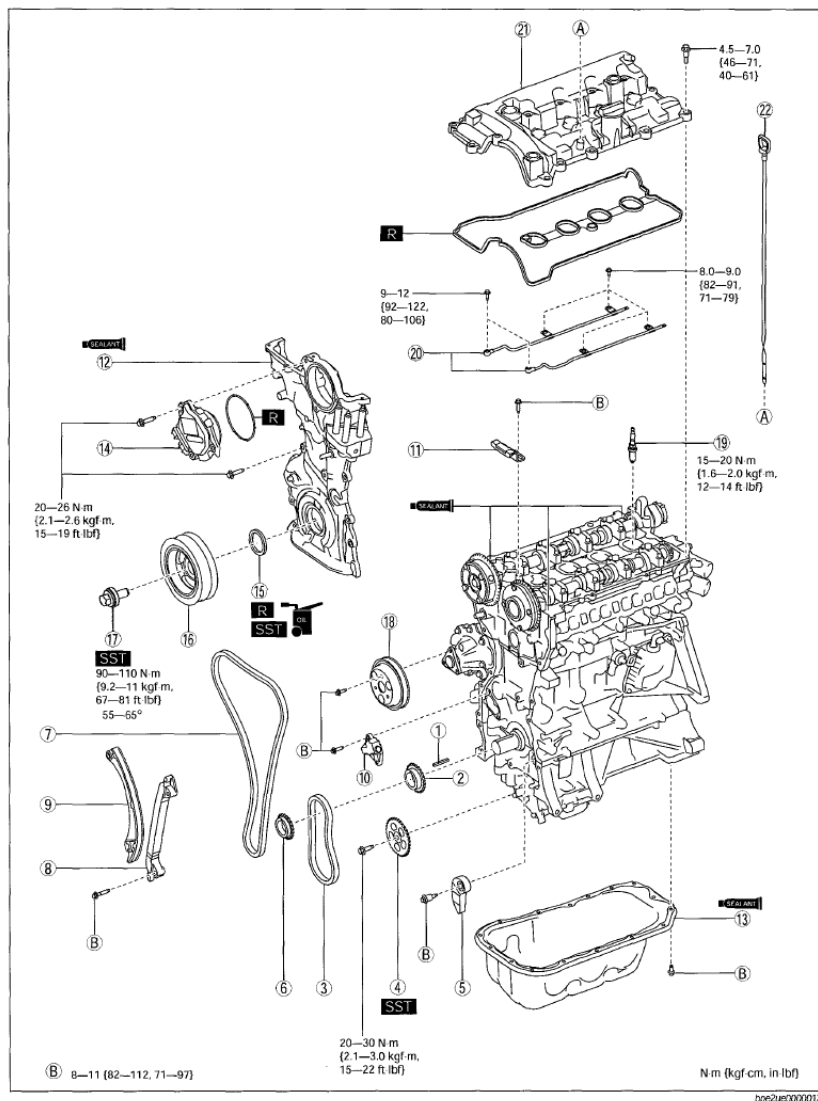


Fig. 150: Locating Starter Motor Isolator
Courtesy of MAZDA MOTORS CORP.

5. Install the starter motor and the 2 stud bolts.

- Tighten to 35 N.m {3.5 kgf.m, 26 ft.lbf}.



1	Key
3	Oil pump chain
4	Oil pump driven sprocket (See Oil Pump Driven Sprocket Assembly Note.)
5	Oil pump chain tensioner
6	Crankshaft sprocket
7	Timing chain (See Timing Chain Assembly Note.)
8	Chain guide (No.2) (See Timing Chain Assembly Note.)
9	Tensioner arm (See Timing Chain Assembly Note.)
10	Chain tensioner (See Timing Chain Assembly Note.)
11	Chain guide (No.1) (See Timing Chain Assembly Note.)
12	Engine front cover (See Engine Front Cover Assembly Note.)
13	Oil pan (See Oil Pan Assembly Note.)

2	Oil pump drive sprocket
14	Electric variable valve timing motor/driver (See Electric Variable Valve Timing Motor/Driver Assembly Note.)
15	Front oil seal (See Front Oil Seal Assembly Note.)
16	Crankshaft pulley
17	Crankshaft pulley lock bolt (See Crankshaft Pulley Lock Bolt Assembly Note.)
18	Water pump pulley (See Water Pump Pulley Assembly Note.)
19	Spark plug
20	Oil shower pipe (See Oil Shower Pipe Installation Note.)
21	Cylinder head cover (See Cylinder Head Cover Installation Note.)
22	Dipstick

Fig. 151: Locating Starter Motor Stud Bolts
Courtesy of MAZDA MOTORS CORP.

6. Install the ground wire and the nut.

- Tighten to 25 N.m {2.5 kgf.m, 18 ft.lbf}.

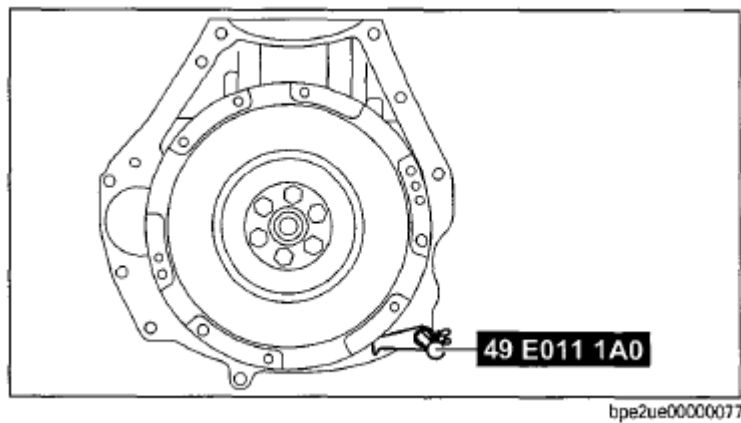


Fig. 152: Locating Ground Wire Nut
Courtesy of MAZDA MOTORS CORP.

7. Install the starter motor harness connector.
 1. Install the starter motor solenoid battery nut.
 1. Tighten to 12 N.m {1.2 kgf.m, 106 in.lbf}.
 2. Install the starter motor solenoid nut.
 1. Tighten to 5 N.m {0.5 kgf.m, 44 in.lbf}.

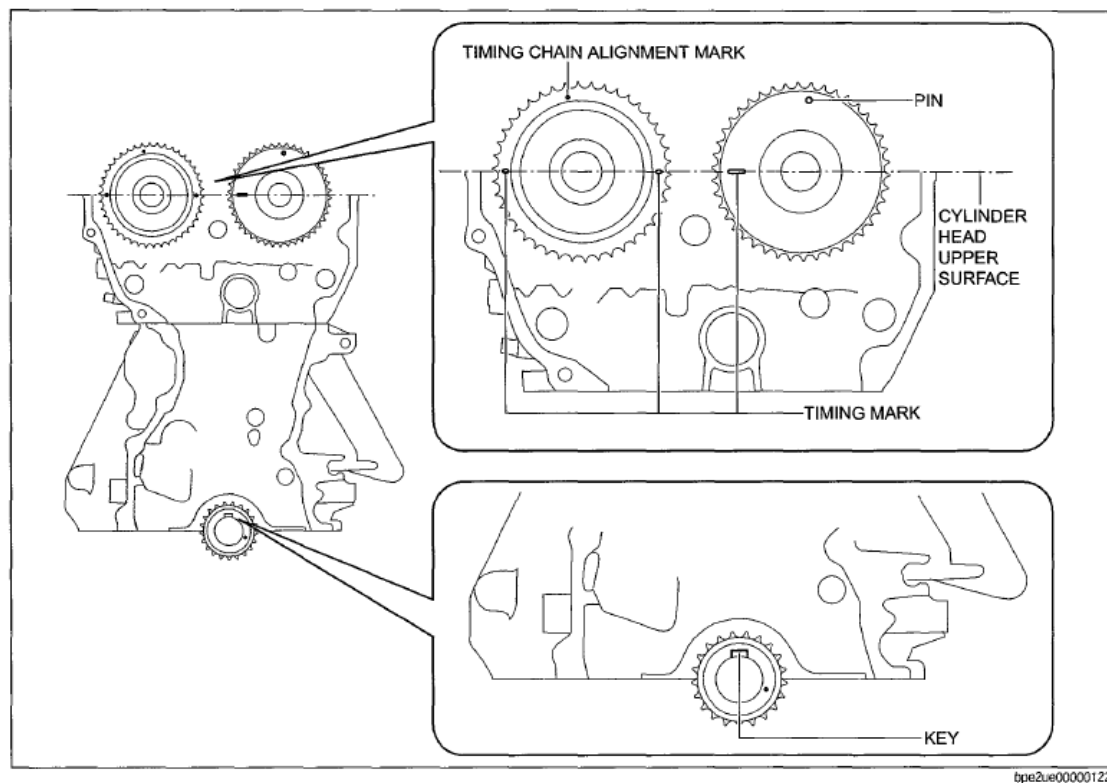


Fig. 153: Identifying Battery Cable Nut And Starter Solenoid Terminal Nut
Courtesy of MAZDA MOTORS CORP.

8. Raise the engine and transaxle into the vehicle.
9. Install the bolt in the LH transaxle mount.
 - Tighten to 103 N.m {10.5 kgf.m, 76 ft.lbf}.

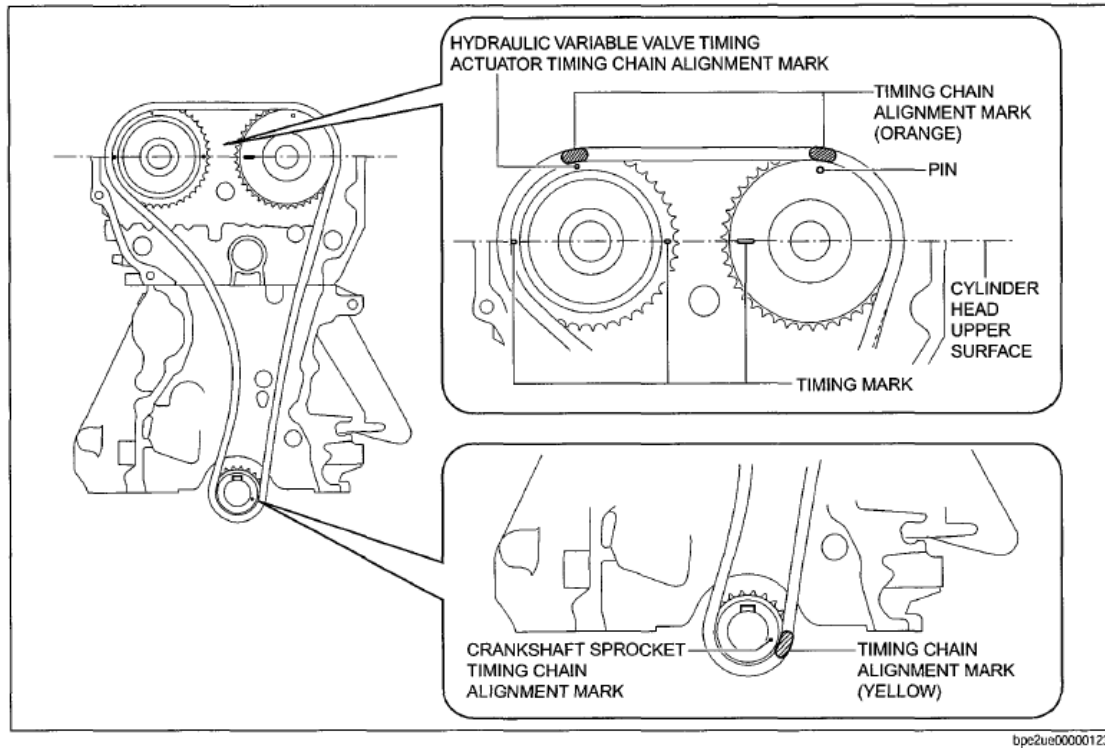


Fig. 154: Locating LH Transaxle Mount Bolt
Courtesy of MAZDA MOTORS CORP.

10. Install the bolt in the rear transaxle mount.
 - Tighten to 115 N.m {11.7 kgf.m, 85 ft.lbf}.

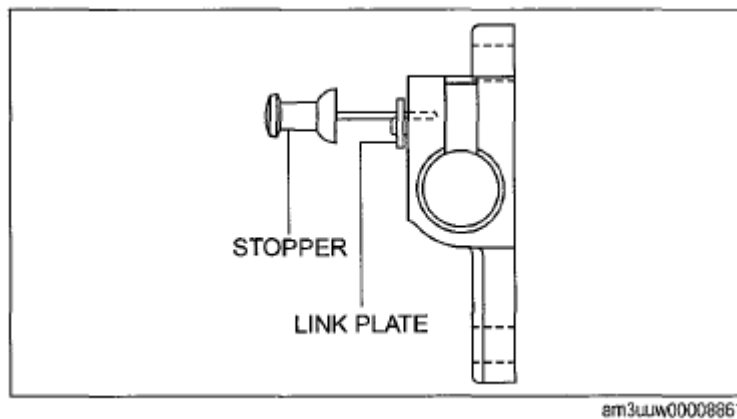


Fig. 155: Locating Rear Transaxle Mount Bolt
Courtesy of MAZDA MOTORS CORP.

11. Install the engine mount bracket and nuts.

- Tighten to 115 N.m {11.7 kgf.m, 85 ft.lbf}.

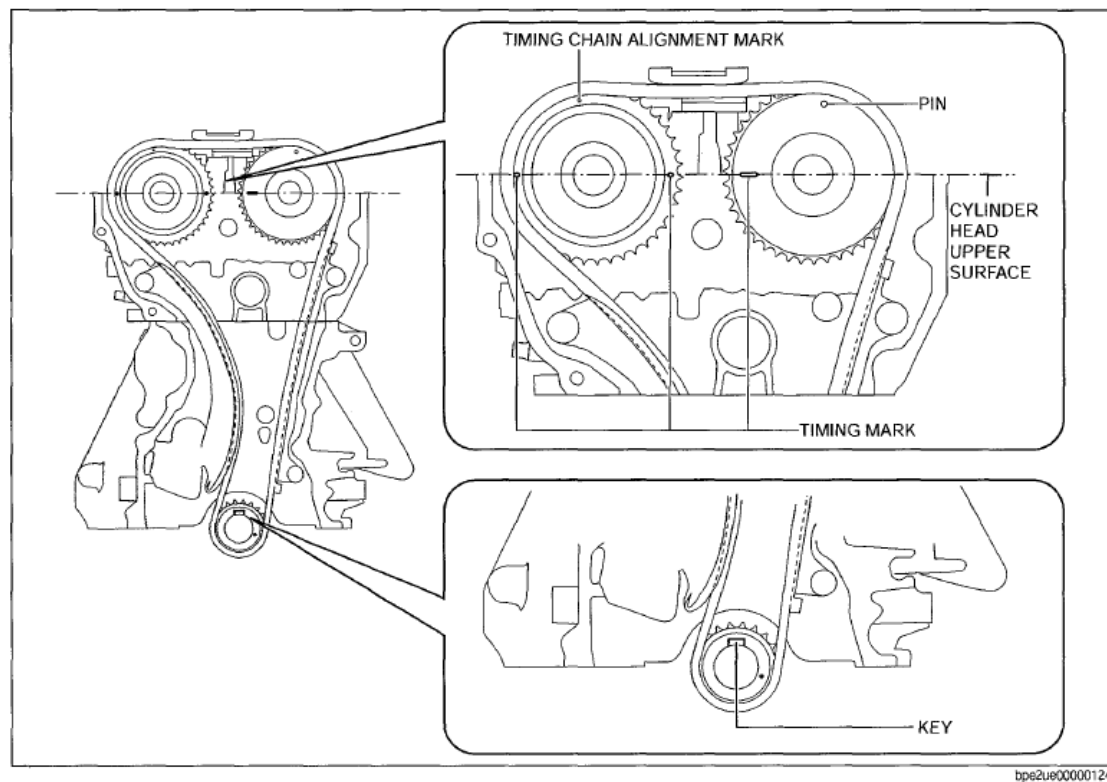
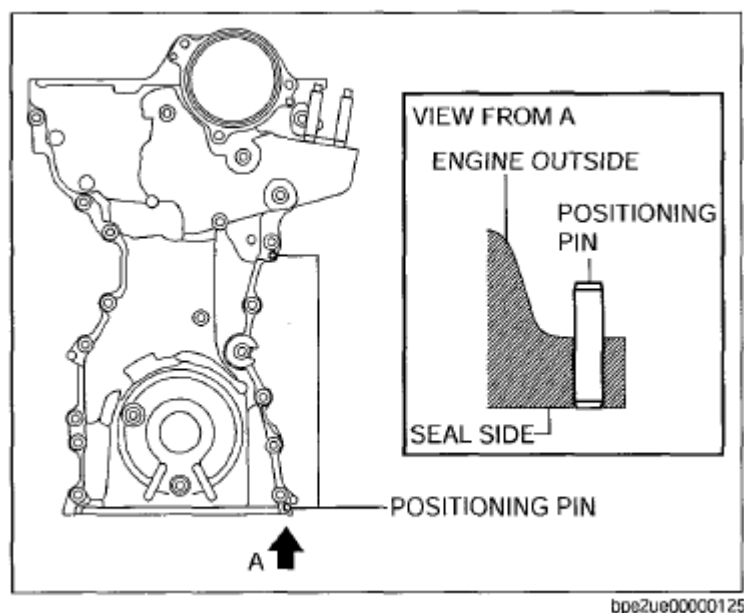


Fig. 156: Locating Engine Mount Bracket Nuts
Courtesy of MAZDA MOTORS CORP.

12. Install the engine mount bracket bolt.

- Tighten to 115 N.m {11.7 kgf.m, 85 ft.lbf}.



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Fig. 157: Locating Engine Mount Bracket Bolt
 Courtesy of MAZDA MOTORS CORP.

13. If equipped, install a new oil filter element.
14. If equipped, install a new spin on engine oil filter.
 - Lubricate the spin on oil filter gasket with clean engine oil and tighten the oil filter three-quarters turn after the oil filter gasket makes contact with the oil filter adapter.

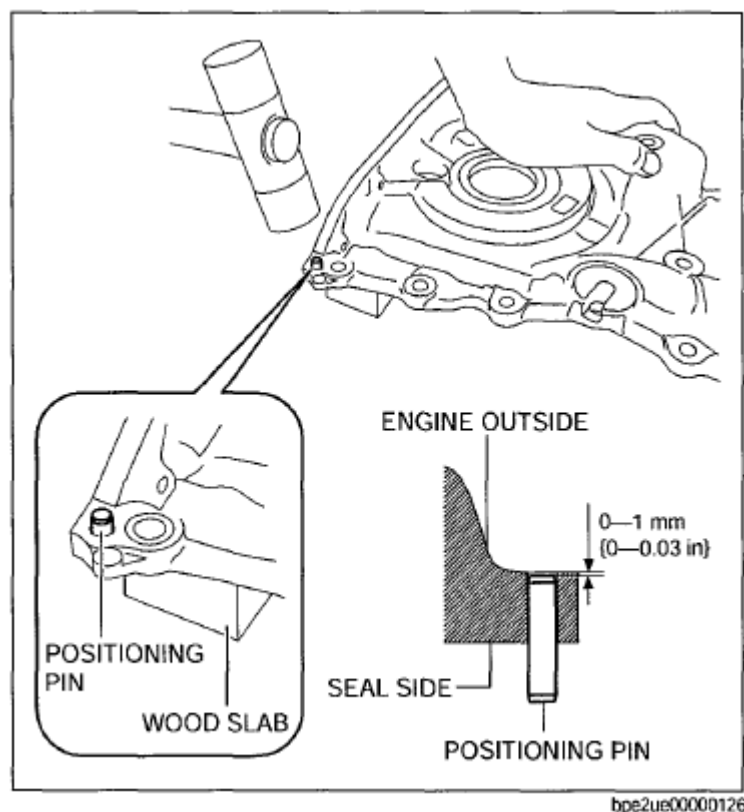


Fig. 158: Locating Spin On Engine Oil Filter
Courtesy of MAZDA MOTORS CORP.

15. Install the 2 engine-to-transaxle bolts.
 - Tighten to 48 N.m {4.9 kgf.m, 35 ft.lbf}.

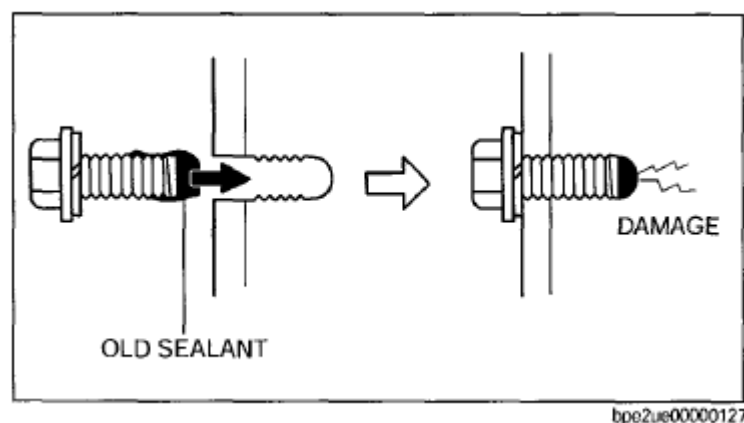


Fig. 159: Identifying Engine-To-Transaxle Bolts Tightening Torque
Courtesy of MAZDA MOTORS CORP.

16. Install the 2 transaxle-to-engine bolts.
 - Tighten to 48 N.m {4.9 kgf.m, 35 ft.lbf}.

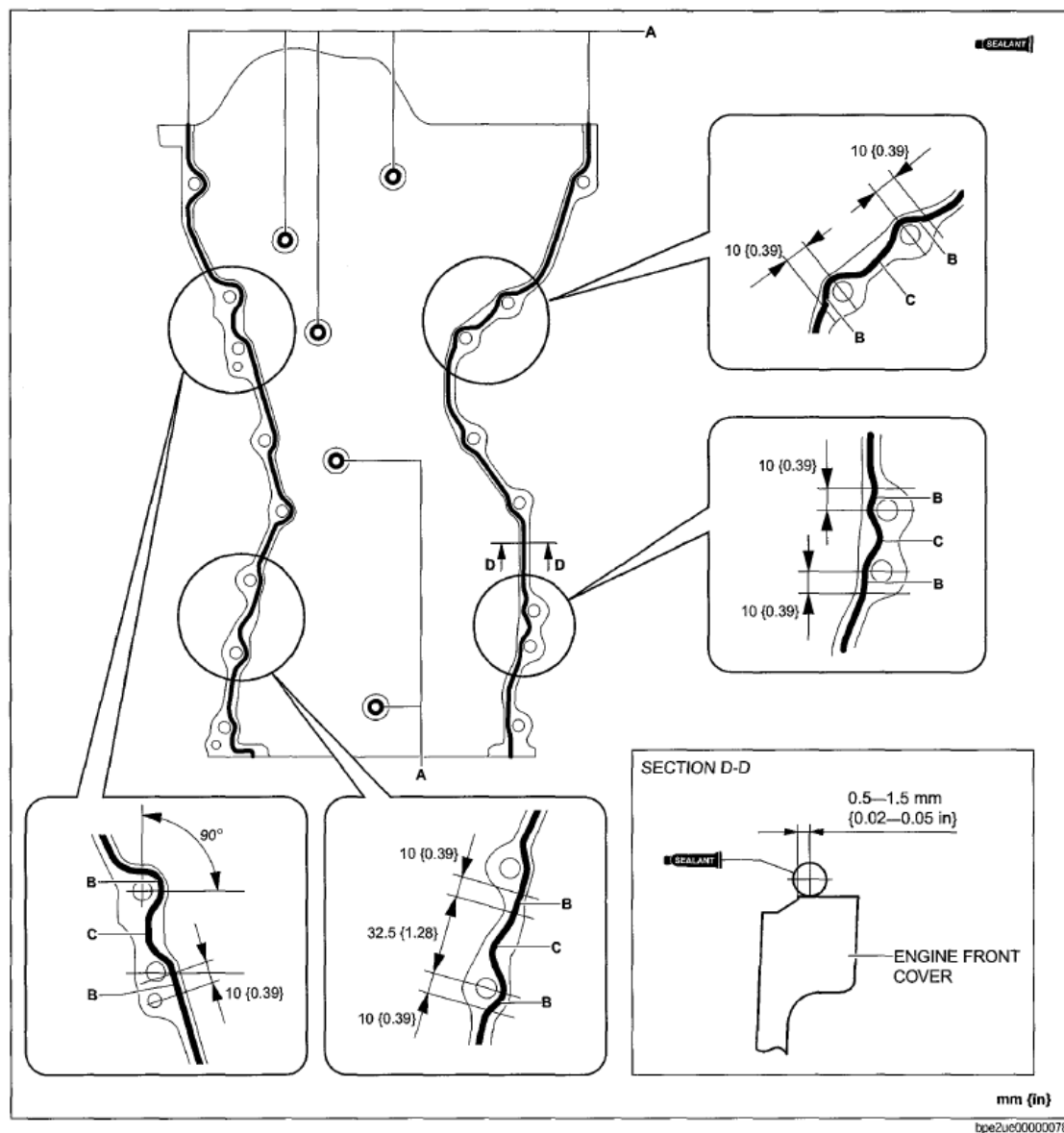


Fig. 160: Identifying Transaxle-To-Engine Bolts Tightening Torque
 Courtesy of MAZDA MOTORS CORP.

17. Install the engine support crossmember and new nut.

- Tighten to 175 N.m {18.4 kgf.m, 129 ft.lbf}.

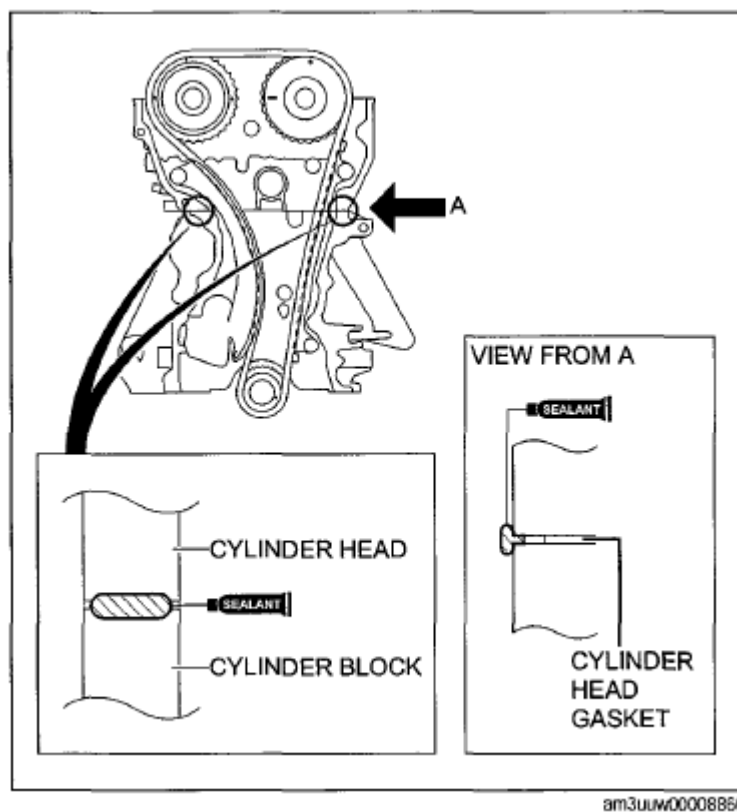


Fig. 161: Locating Engine Support Crossmember And Nut
Courtesy of MAZDA MOTORS CORP.

18. Install the 2 bolts for the engine support cross-member and the front roll restrictor bolt.

- Tighten the engine support crossmember bolts to 90 N.m {9.1 kgf.m, 66 ft.lbf}.
- Tighten the front roll restrictor bolt to 115 N.m {11.7 kgf.m, 85 ft.lbf}.

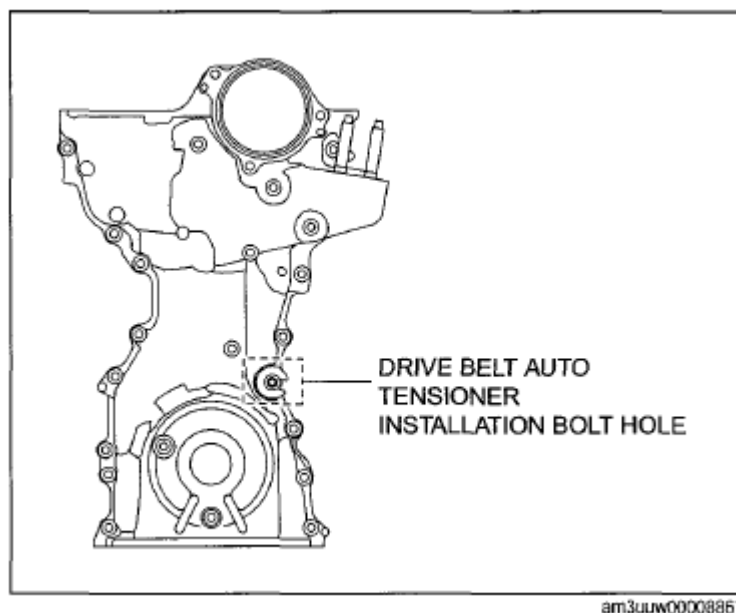


Fig. 162: Locating Engine Support Cross-Member Bolts And Front Roll Restrictor Bolt
Courtesy of MAZDA MOTORS CORP.

19. Connect the lower radiator hose to the radiator.

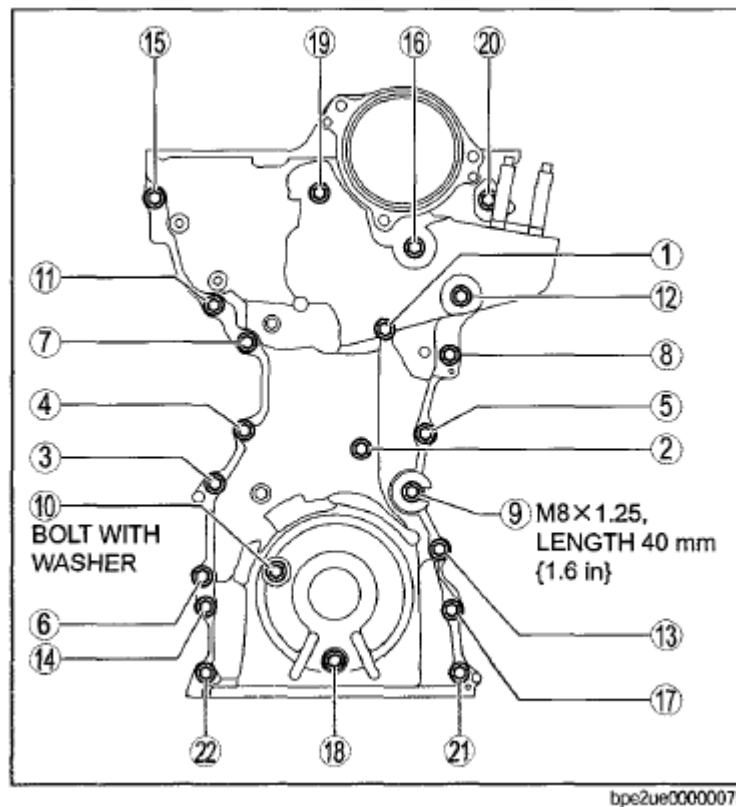
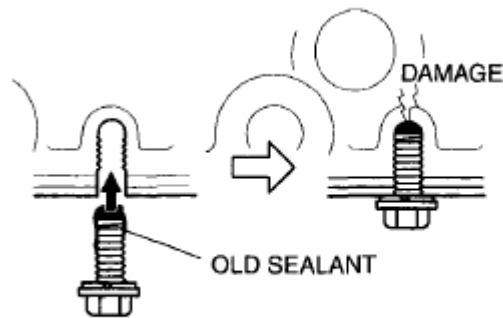


Fig. 163: Locating Lower Radiator Hose

Courtesy of MAZDA MOTORS CORP.

20. Position the A/C compressor and install the bolts

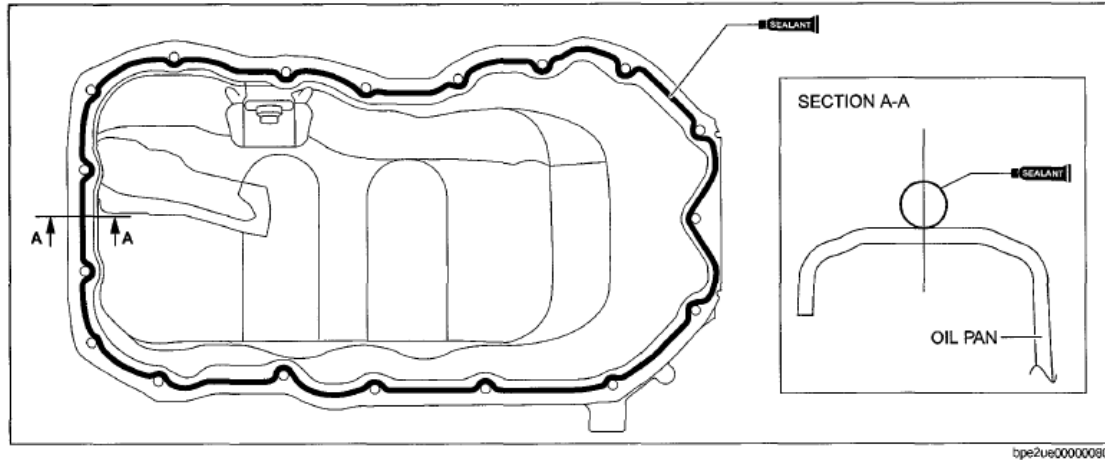
- Tighten the bolts to 25 N.m {2.5 kgf.m, 18 ft.lbf}.
- Connect the A/C compressor electrical connector.



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Fig. 164: Locating A/C Compressor Electrical Connector
Courtesy of MAZDA MOTORS CORP.

21. Connect the generator electrical connector and attach the 2 retainers.



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Fig. 165: Locating Generator Electrical Connector And Retainers
Courtesy of MAZDA MOTORS CORP.

22. Connect the engine control harness electrical connector.

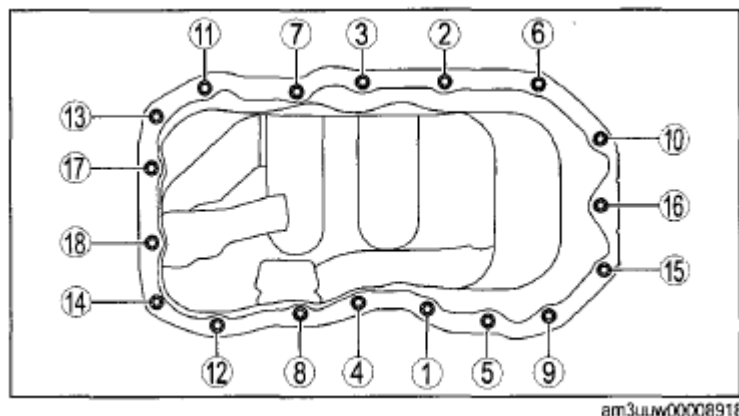


Fig. 166: Locating Engine Control Harness Electrical Connector
Courtesy of MAZDA MOTORS CORP.

23. Connect the PCM electrical connector and attach the wire harness retainer.

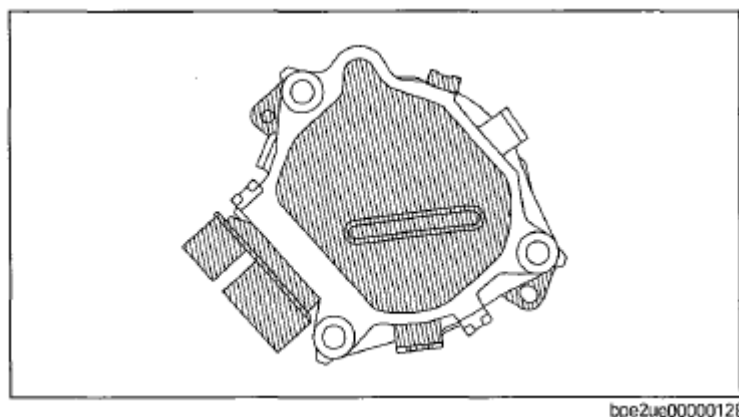


Fig. 167: 23Locating PCM Electrical Connector And Wire Harness Retainer
Courtesy of MAZDA MOTORS CORP.

24. Connect the fuel supply quick connect coupling. See **QUICK RELEASE COUPLING - DOUBLE LOCKING**.

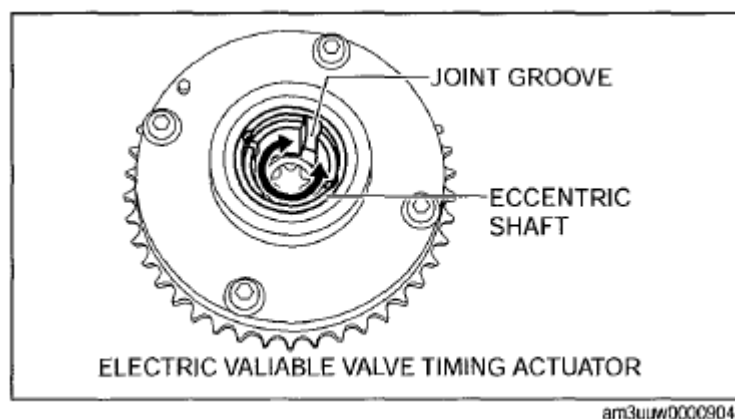


Fig. 168: Locating Fuel Supply Quick Connect Coupling
Courtesy of MAZDA MOTORS CORP.

25. Connect the fuel vapor return tube and retainer.

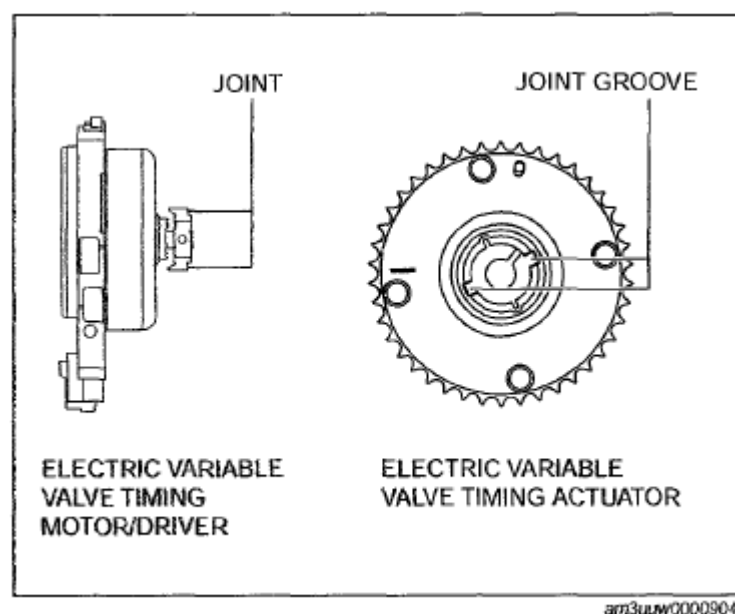


Fig. 169: Locating Fuel Vapor Return Tube And Retainer
Courtesy of MAZDA MOTORS CORP.

26. Connect the vacuum supply tube.

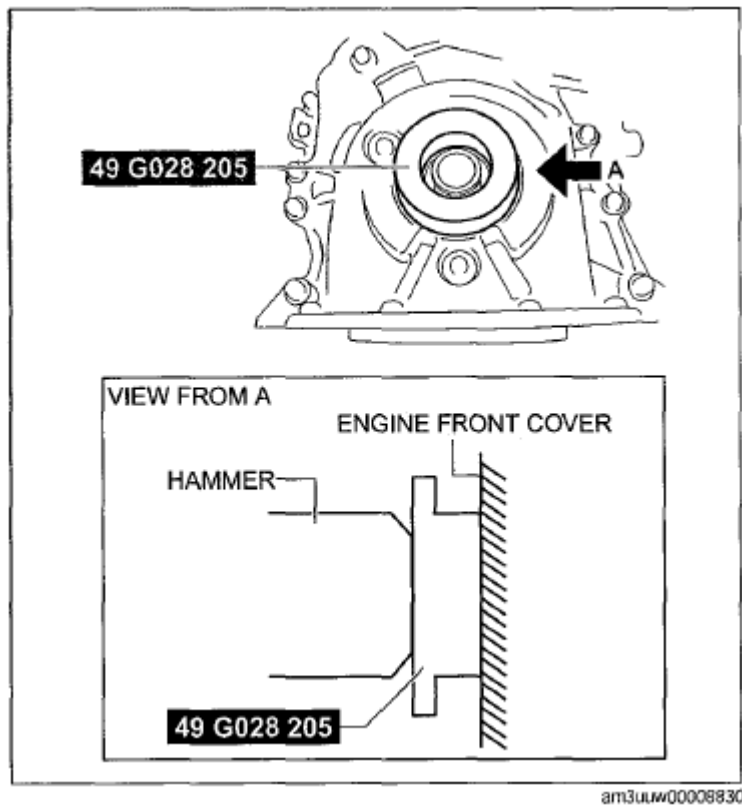


Fig. 170: Locating Vacuum Supply Tube
Courtesy of MAZDA MOTORS CORP.

27. Connect the heater hoses to the heater core.

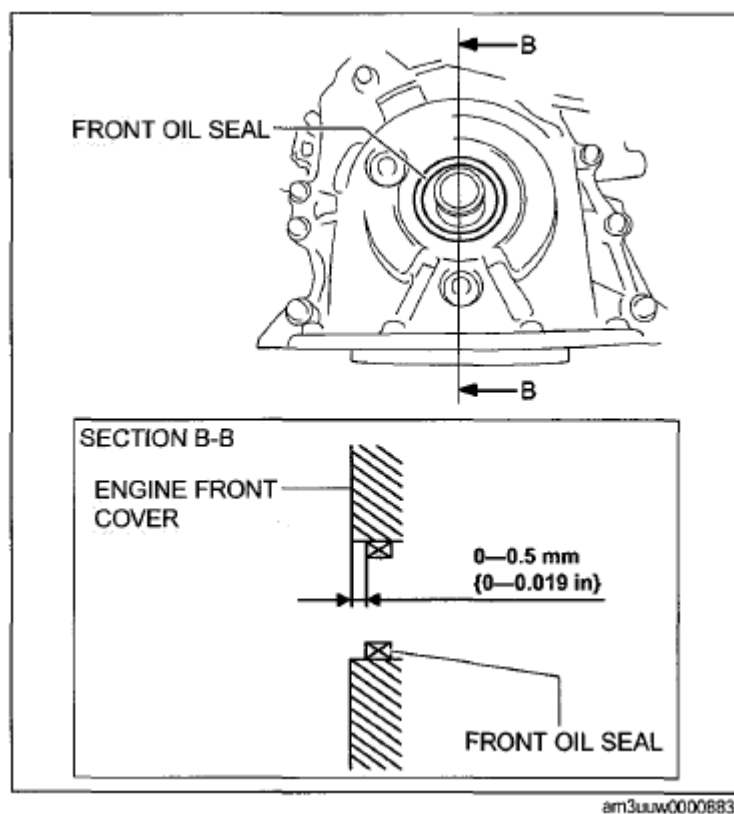


Fig. 171: Locating Heater Hoses
Courtesy of MAZDA MOTORS CORP.

28. Attach the heater hose support strap to the stud.

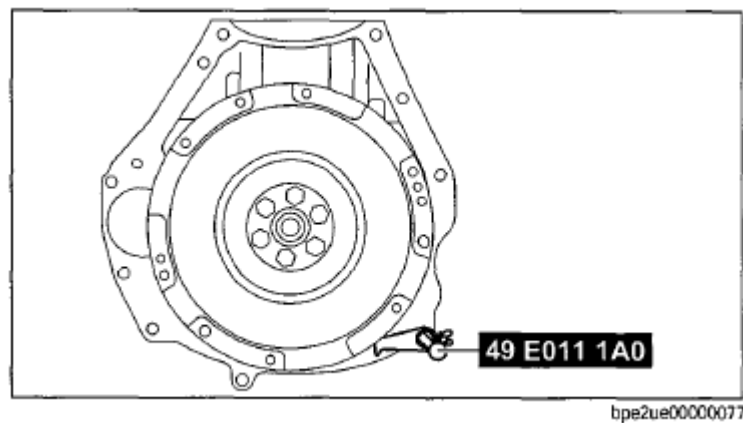


Fig. 172: Identifying Heater Hose Support Strap
Courtesy of MAZDA MOTORS CORP.

29. Connect the upper radiator hose.

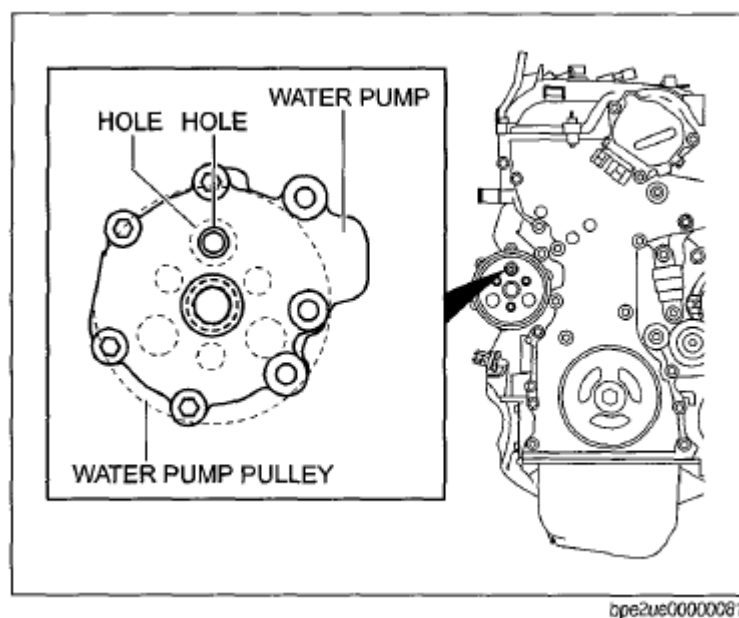


Fig. 173: Locating Upper Radiator Hose
Courtesy of MAZDA MOTORS CORP.

30. If equipped, route the block heater wiring harness and attach all the retainers.
- Connect the block heater electrical connector.

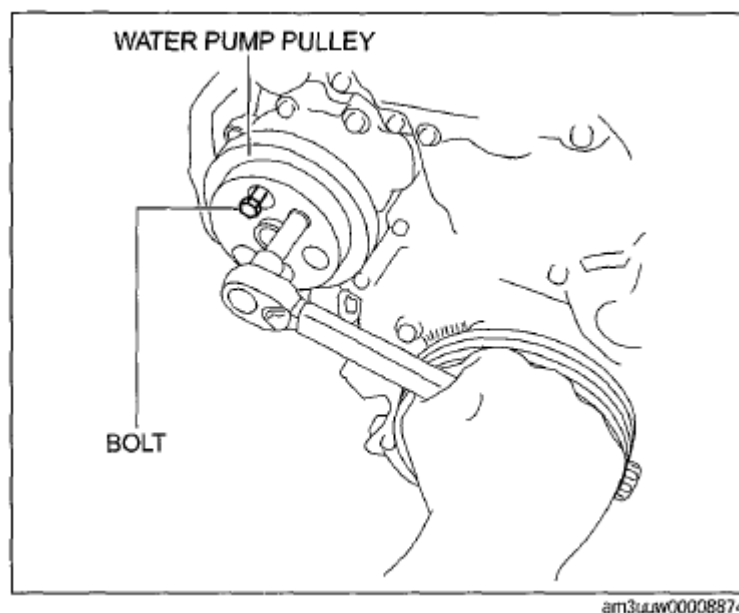


Fig. 174: Locating Block Heater Electrical Connector
Courtesy of MAZDA MOTORS CORP.

31. Install the shift cable bracket.
1. Position the shift cable bracket.

2. Install the 3 bolts.
 1. Tighten to 22 N.m {2.2 kgf.m, 16 ft.lbf}.

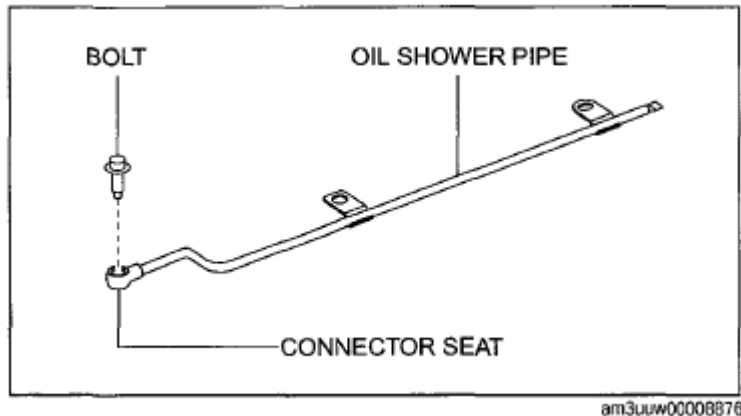


Fig. 175: Identifying Shift Cable Bracket And Bolts
Courtesy of MAZDA MOTORS CORP.

32. Connect the shift cables.

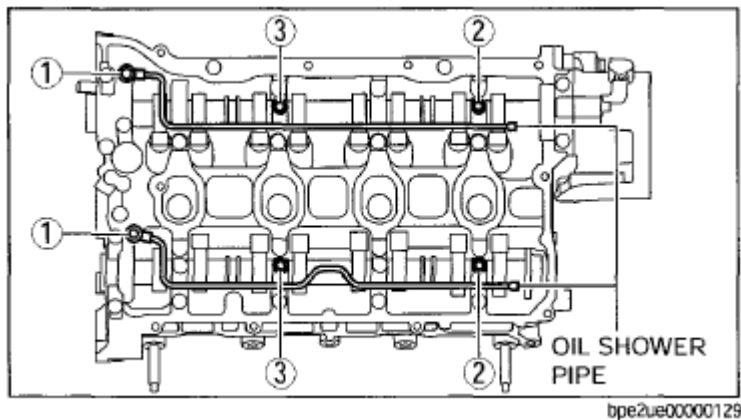


Fig. 176: Locating Shift Cables
Courtesy of MAZDA MOTORS CORP.

33. Connect the reversing lamp indicator switch electrical connector and attach the 2 wiring harness retainers.

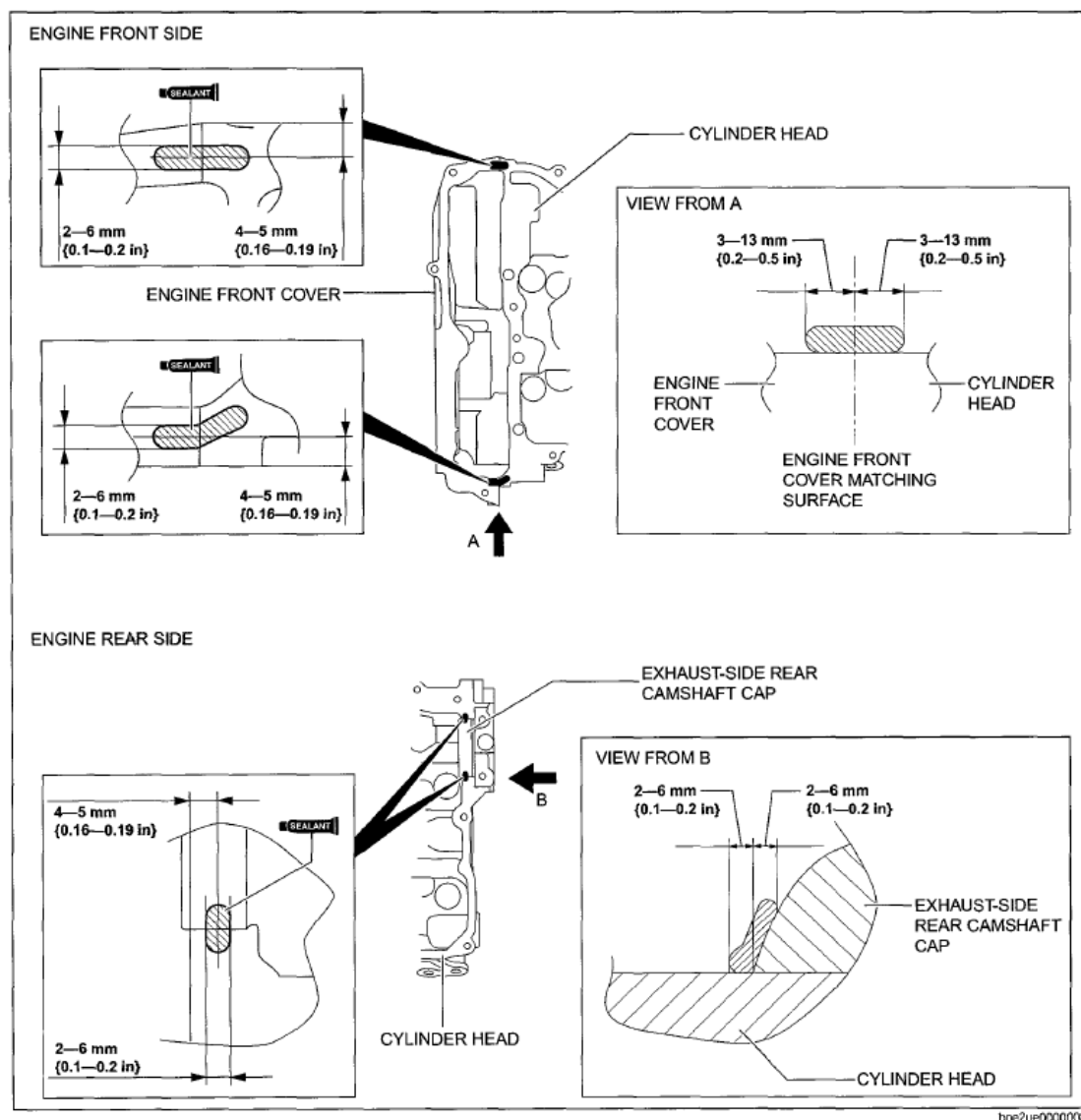


Fig. 177: Locating Reversing Lamp Indicator Switch Electrical Connector And Wiring Harness Retainers

Courtesy of MAZDA MOTORS CORP.

34. Connect the vehicle speed sensor (VSS) electrical connector and attach the 2 pin-type retainers.

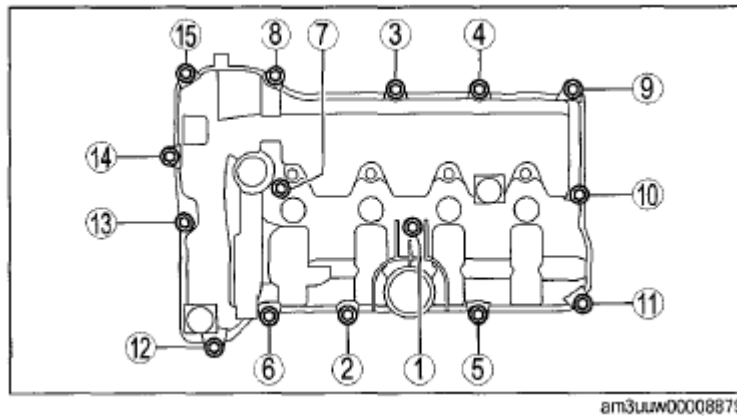


Fig. 178: Locating Vehicle Speed Sensor Electrical Connector And Pin-Type Retainers
Courtesy of MAZDA MOTORS CORP.

35. Connect the clutch hydraulic line.
 1. Position the clutch hydraulic line.
 2. Connect the clutch hydraulic line to the clutch slave cylinder.
 1. Tighten to 25 N.m {2.5 kgf.m, 18 ft.lbf}.
 3. Install the clutch hydraulic line bracket-to-transaxle bolt.
 1. Tighten to 3 N.m {0.3 kgf.m, 27 in.lbf}.

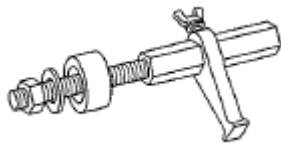


Fig. 179: Identifying Clutch Hydraulic Line
Courtesy of MAZDA MOTORS CORP.

36. Position the wiring harness and attach the 2 wiring harness retainers to the battery tray bracket.

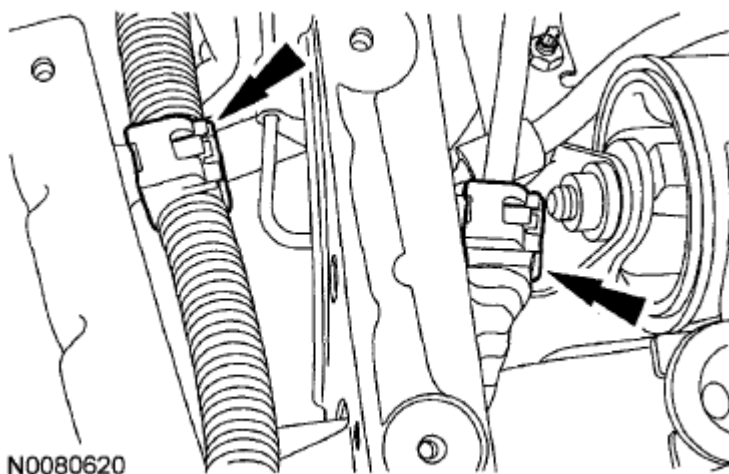


Fig. 180: Locating Wiring Harness Retainers
Courtesy of MAZDA MOTORS CORP.

37. Install the ground strap and bolt.
- Tighten to 10 N.m {0.1 kgf.m, 89 in.lbf}.

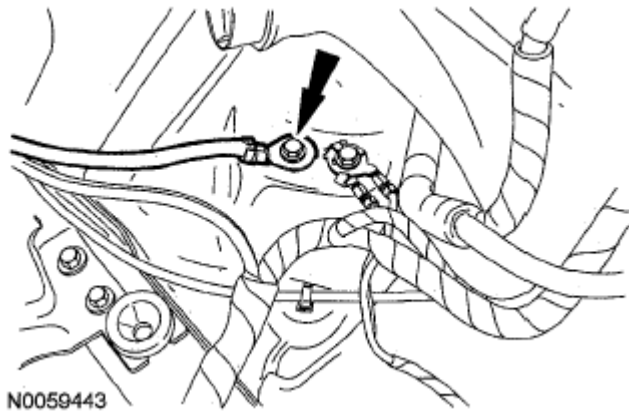


Fig. 181: Locating Ground Strap Bolt
Courtesy of MAZDA MOTORS CORP.

38. Connect the electrical connector to the power distribution box (PDB).

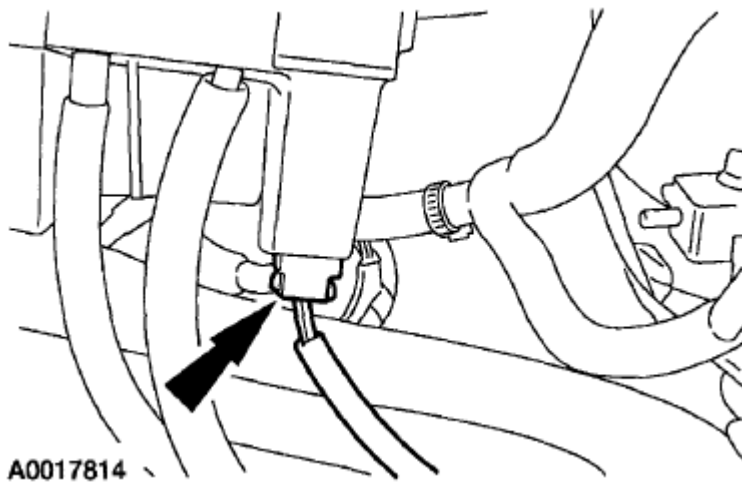


Fig. 182: Locating Power Distribution Box Electrical Connector
Courtesy of MAZDA MOTORS CORP.

39. Connect the cable to the PDB and install the nut.
- Tighten to 12 N.m {1.2 kgf.m, 106 in.lbf}.

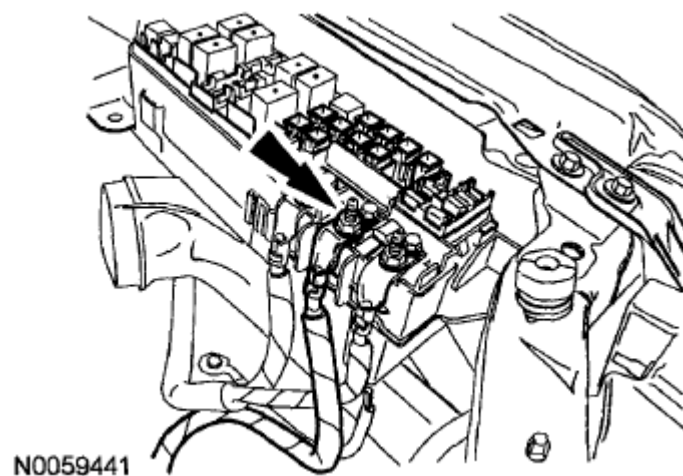


Fig. 183: Locating PDB Cable Nut
Courtesy of MAZDA MOTORS CORP.

40. Install the PDB cover.

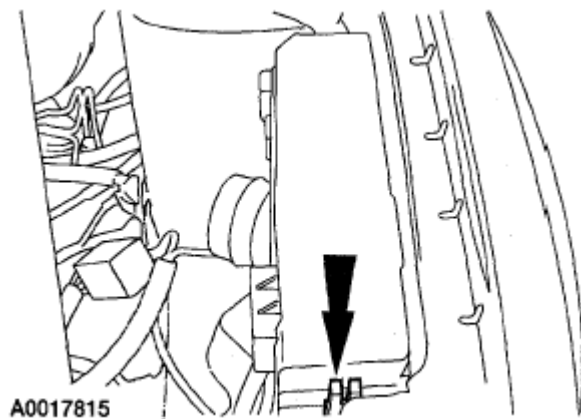


Fig. 184: Locating PDB Cover
Courtesy of MAZDA MOTORS CORP.

41. If equipped, install the ground eyelet and bolt.

- Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

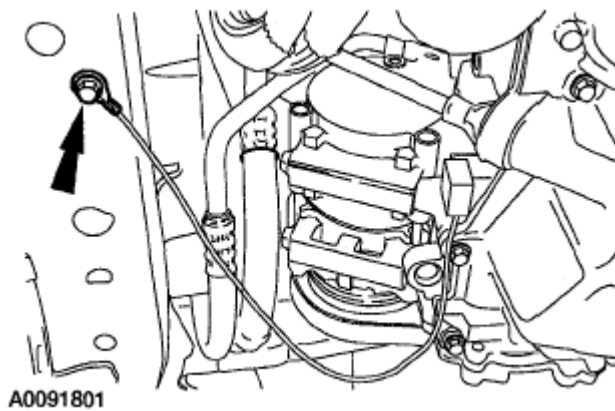


Fig. 185: Locating Ground Eyelet Bolt
Courtesy of MAZDA MOTORS CORP.

42. Install the generator air duct and make sure the tab is latched.

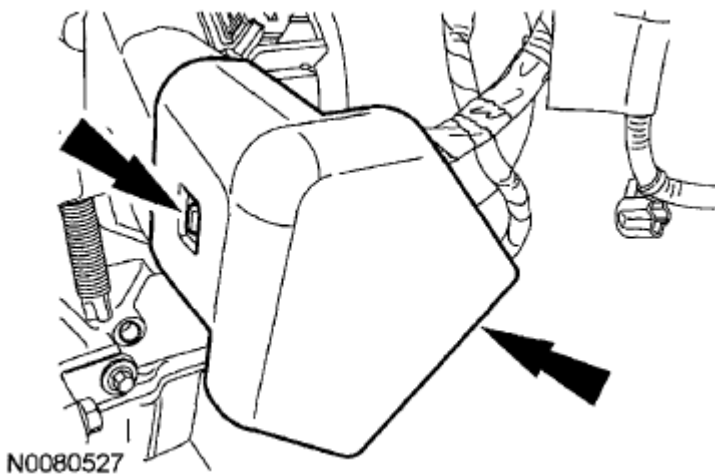


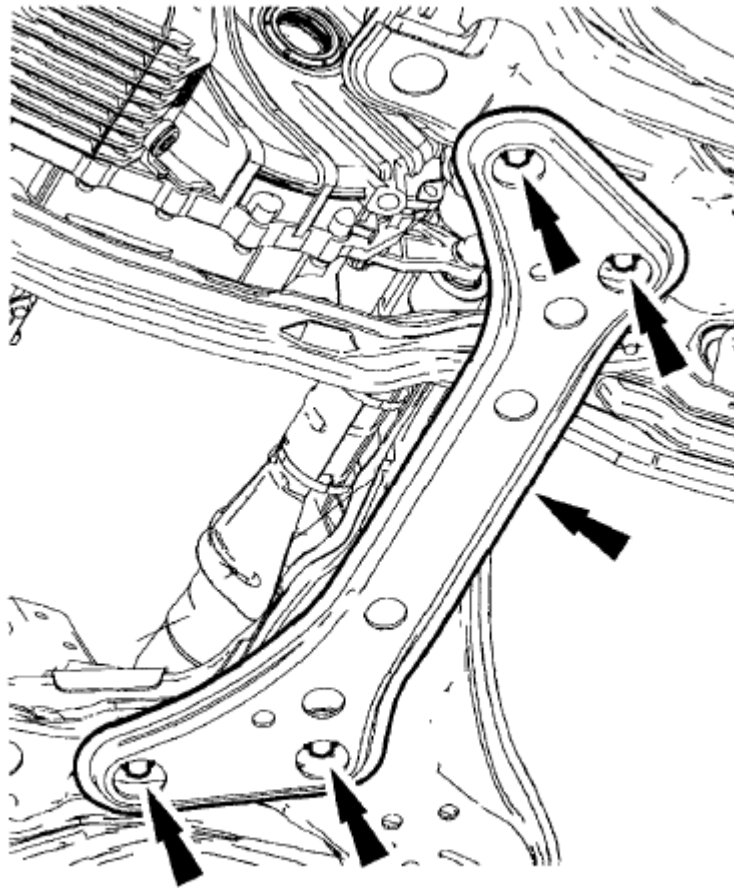
Fig. 186: Locating Locking Tab And Generator Air Duct
Courtesy of MAZDA MOTORS CORP.

43. Install the accessory drive belt tensioner. See **ACCESSORY DRIVE BELT TENSIONER REMOVAL/INSTALLATION - 2.5L**.

44. Install the exhaust downpipe and exhaust intermediate pipe.

45. Install the lateral support crossmember and bolts.

- Tighten to 115 N.m {11.5 kgf.m, 85 ft.lbf}.



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Fig. 187: Locating Lateral Support Crossmember Bolts
Courtesy of MAZDA MOTORS CORP.

46. Install the LH halfshaft and the intermediate shaft.
47. Install the battery tray and battery. See **BATTERY TRAY REMOVAL/INSTALLATION** .
48. Install the engine air cleaner and air cleaner outlet pipe. See **AIR CLEANER REMOVAL/INSTALLATION - 3.0L** .
49. Fill the engine with clean engine oil.
50. Fill and bleed the cooling system. See **COOLING SYSTEM DRAINING, FILLING AND BLEEDING - 2.5L** .
51. Bleed the clutch system. See **CLUTCH SYSTEM BLEEDING** .

ENGINE REMOVAL - AUTOMATIC TRANSAXLE

WARNING:

- Do not smoke, or carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

REMOVAL

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. See **LIFTING** .
2. Release the fuel system pressure. See **FUEL SYSTEM PRESSURE RELEASE** .
3. Remove the engine air cleaner and air cleaner outlet pipe. See **AIR CLEANER REMOVAL/INSTALLATION - 3.0L** .

Remove the battery tray. See **BATTERY TRAY REMOVAL/INSTALLATION** .

Drain the engine oil.

- Install the drain plug.
 - To install, tighten to 28 N.m {2.8 kgf.m, 21 ft.lbf}.
6. Remove the 2 front wheels and tires. See **WHEEL AND TIRE REMOVAL/INSTALLATION** .
 7. Drain the cooling system. See **COOLING SYSTEM DRAINING, FILLING AND BLEEDING - 2.5L** .
 8. Remove the exhaust flexible pipe. See **EXHAUST INTERMEDIATE PIPE REMOVAL/INSTALLATION** .
 9. Disconnect the heated oxygen sensor (H02S) and the catalyst monitor sensor electrical connectors.

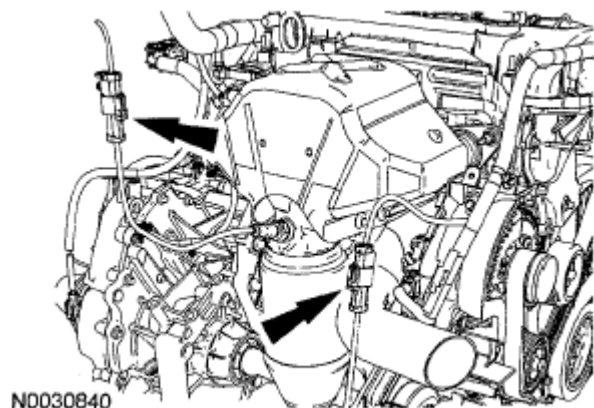


Fig. 188: Locating Heated Oxygen Sensor And Catalyst Monitor Sensor Electrical Connectors
Courtesy of MAZDA MOTORS CORP.

10. Remove the accessory drive belt and tensioner. See **ACCESSORY DRIVE BELT REMOVAL/INSTALLATION - 2.5L** and **ACCESSORY DRIVE BELT TENSIONER REMOVAL/INSTALLATION - 2.5L** .
11. Press the 2 (1 shown in the figure) locking tabs to release the lower air duct from the upper air duct.

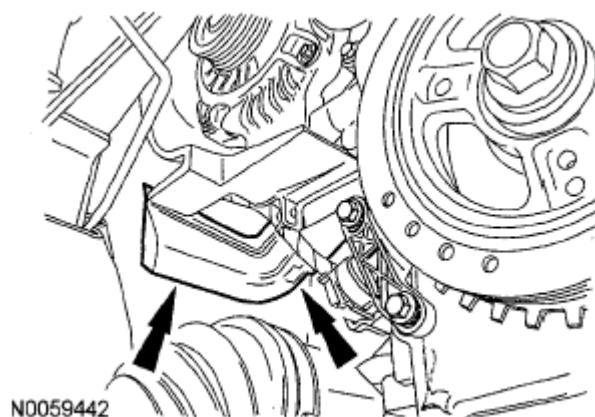


Fig. 189: Locating Locking Tabs Of Lower Air Duct
Courtesy of MAZDA MOTORS CORP.

12. Detach the wire retainers from the generator shield and remove the nut and pin-type retainer.
 - Remove the generator shield.

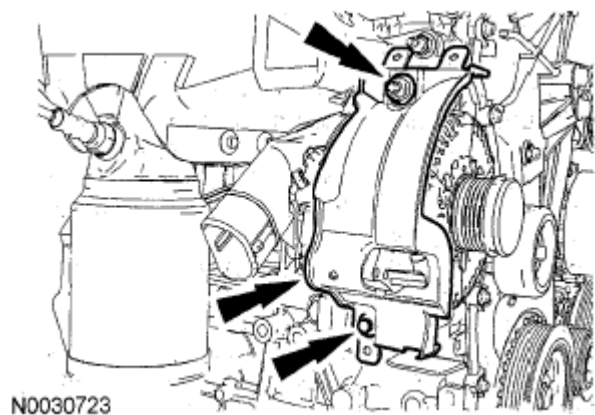
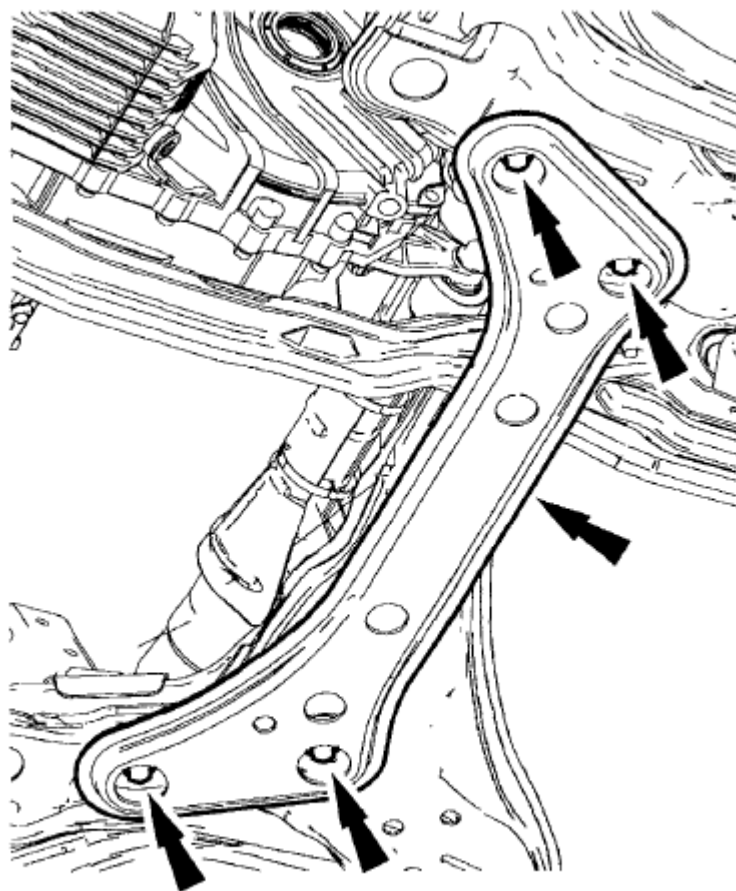


Fig. 190: Locating Generator Shield, Nut And Pin-Type Retainer
Courtesy of MAZDA MOTORS CORP.

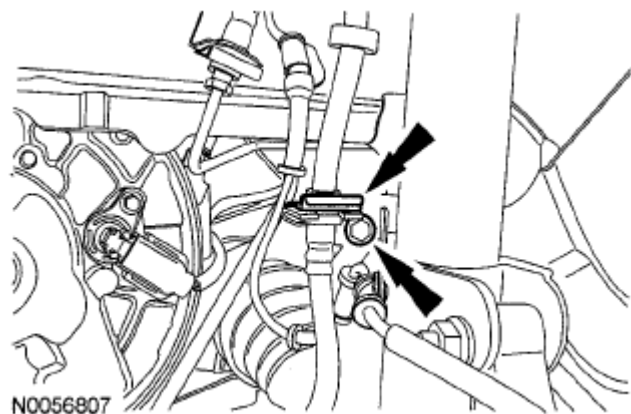
13. Remove the bolts and the lateral support crossmember.



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Fig. 191: Locating Lateral Support Crossmember Bolts
Courtesy of MAZDA MOTORS CORP.

14. Remove the brake hose retainer and the ABS sensor retaining bolt from the LH strut.



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Fig. 192: Locating Brake Hose Retainer And ABS Sensor Retaining Bolt
Courtesy of MAZDA MOTORS CORP.

15. Disconnect the LH suspension.

1. Disconnect the stabilizer bar link.
2. Remove the tie rod end retaining nut.
3. Remove the lower control arm knuckle bolt.

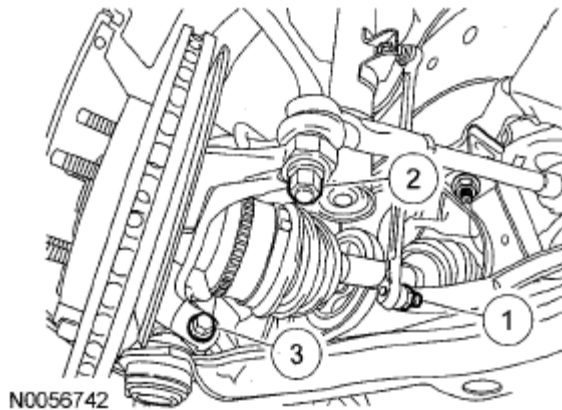


Fig. 193: Identifying Stabilizer Bar Link, Tie Rod End Retaining Nut And Lower Control Arm Knuckle Bolt

Courtesy of MAZDA MOTORS CORP.

16. Remove the brake hose retainer and the ABS sensor retaining bolt from the RH strut.

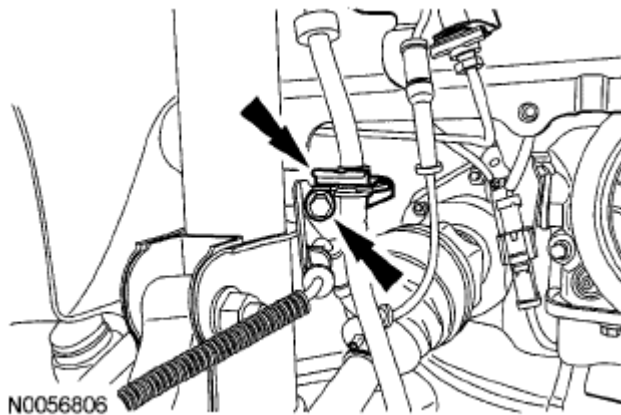


Fig. 194: Locating Brake Hose Retainer And ABS Sensor Retaining Bolt

Courtesy of MAZDA MOTORS CORP.

17. Disconnect the RH suspension.

1. Disconnect the stabilizer bar link.
2. Remove the tie rod end retaining nut.
3. Remove the lower control arm knuckle bolt.

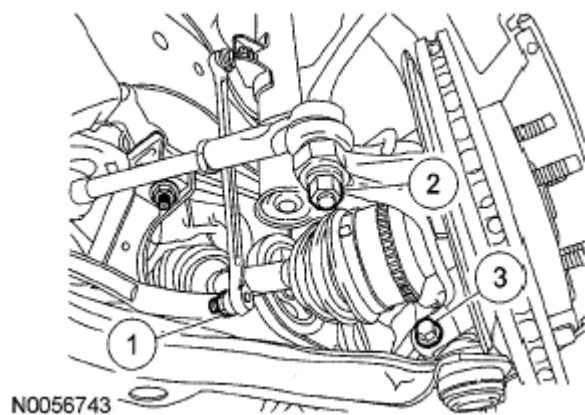


Fig. 195: Identifying Stabilizer Bar Link, Tie Rod End Retaining Nut And Lower Control Arm Knuckle Bolt
 Courtesy of MAZDA MOTORS CORP.

18. Using the special tool, disconnect the LH and RH tie rod end from the steering knuckle.

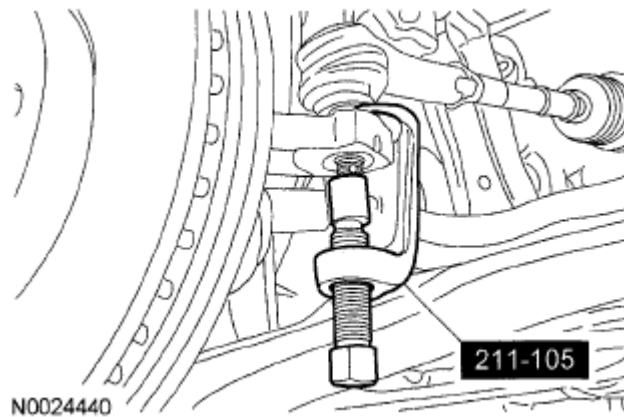


Fig. 196: Identifying Special Tool For Removing Tie-Rod End
 Courtesy of MAZDA MOTORS CORP.

19. Separate the LH and RH lower control arms from the lower ball joints and position the steering knuckles aside.

20. Using a suitable tool, separate the LH halfshaft from the transaxle and secure the halfshaft aside.

21. Using the special tools, remove the RH half-shaft from the intermediate shaft and secure the halfshaft aside.

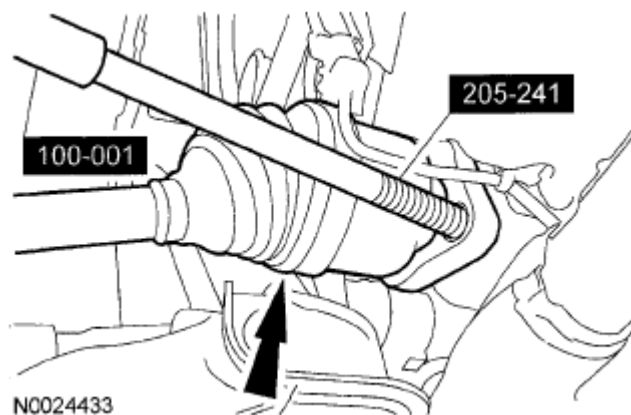


Fig. 197: Locating Halfshaft
Courtesy of MAZDA MOTORS CORP.

22. Remove the 2 intermediate shaft retaining nuts.

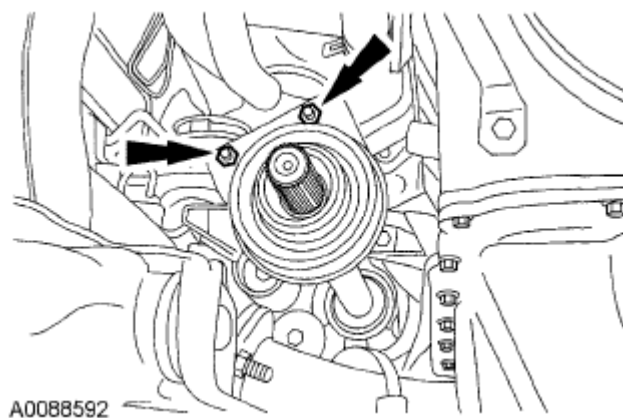


Fig. 198: Locating Intermediate Shaft Retaining Nuts
Courtesy of MAZDA MOTORS CORP.

23. Remove the intermediate shaft.

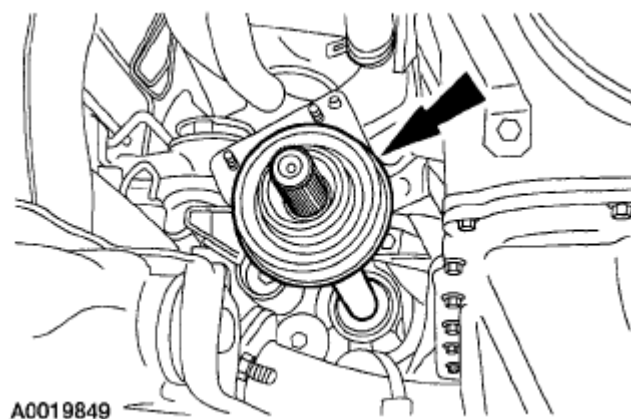


Fig. 199: Locating Intermediate Shaft
Courtesy of MAZDA MOTORS CORP.

All wheel drive (AWD) vehicles

24. Remove the 6 bolts holding the driveshaft to the PTU and position aside with mechanic's wire.

NOTE: • Index-mark the driveshaft to the yoke for installation.

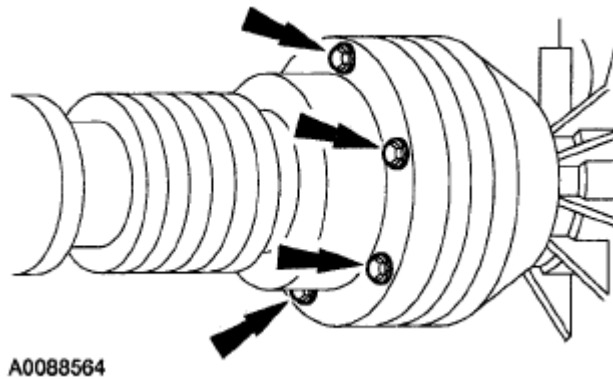


Fig. 200: Locating Driveshaft To PTU Bolts
Courtesy of MAZDA MOTORS CORP.

All vehicles

25. If equipped, remove the bolt and ground eyelet.

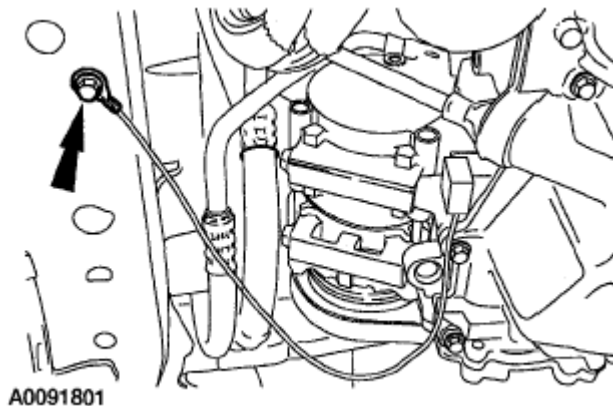


Fig. 201: Locating Ground Eyelet Bolt
Courtesy of MAZDA MOTORS CORP.

26. Remove the power distribution box (PDB) cover.

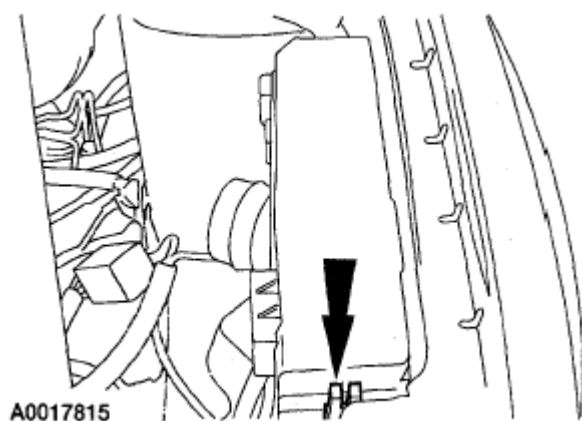


Fig. 202: Locating Power Distribution Box Cover
Courtesy of MAZDA MOTORS CORP.

27. Remove the nut and disconnect the cable from the PDB.

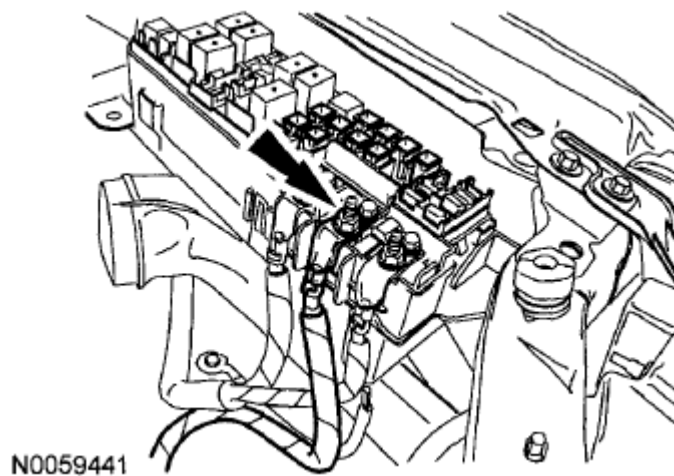


Fig. 203: Locating PDB Cable Nut
Courtesy of MAZDA MOTORS CORP.

28. Disconnect the electrical connector from the PDB.

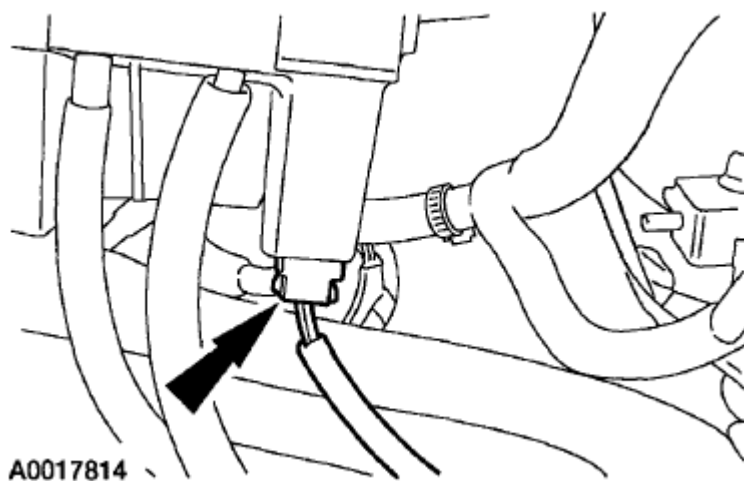


Fig. 204: Locating PDB Electrical Connector
Courtesy of MAZDA MOTORS CORP.

29. Remove the bolt and disconnect the ground strap.

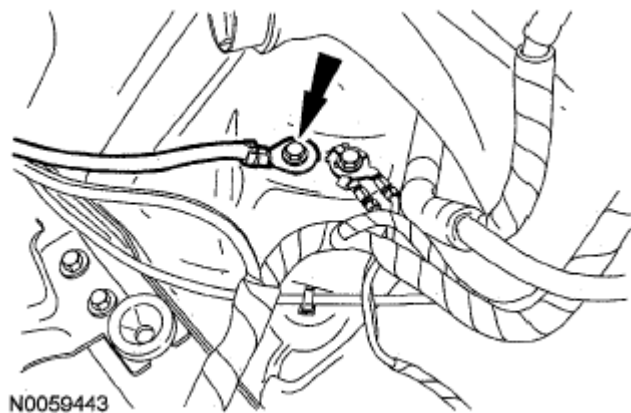


Fig. 205: Locating Ground Strap Bolt
Courtesy of MAZDA MOTORS CORP.

30. Disconnect the 34-pin electrical connector.

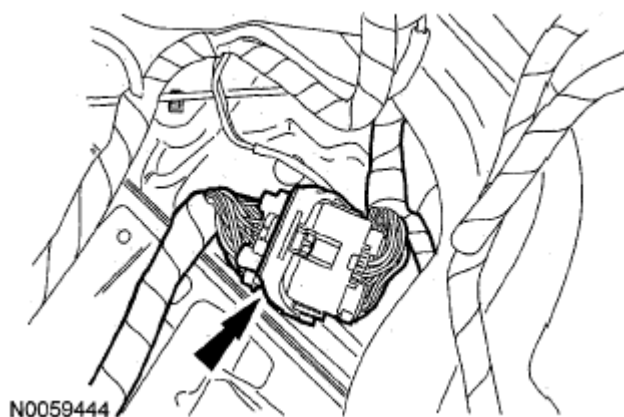


Fig. 206: Locating 34-Pin Electrical Connector
Courtesy of MAZDA MOTORS CORP.

31. Detach the wiring harness retainers from the battery tray bracket.

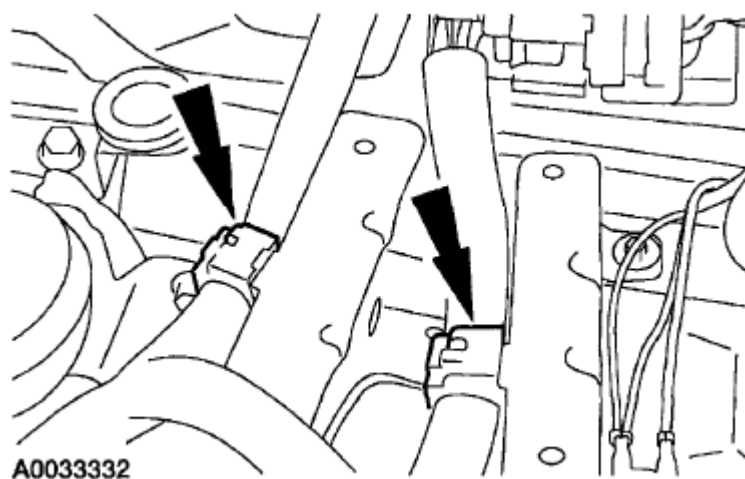


Fig. 207: Locating Wiring Harness Retainers
Courtesy of MAZDA MOTORS CORP.

32. Detach the transaxle vent tube retaining clip from the engine wiring harness.

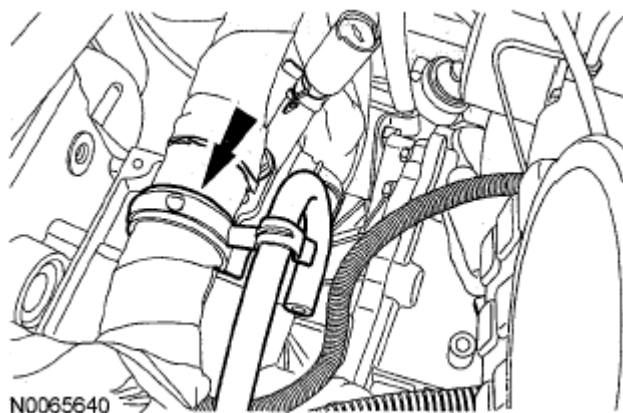


Fig. 208: Locating Transaxle Vent Tube Retaining Clip
Courtesy of MAZDA MOTORS CORP.

33. Remove the nut holding the wiring harness bracket and unplug the transaxle electrical connector.

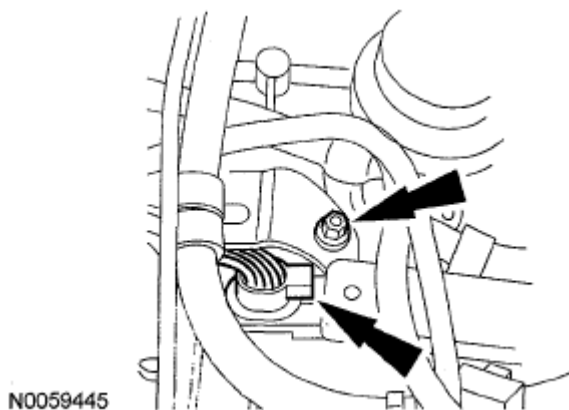


Fig. 209: Locating Wiring Harness Bracket Nut And Transaxle Electrical Connector
Courtesy of MAZDA MOTORS CORP.

34. Disconnect the shift cable from the transaxle manual lever.

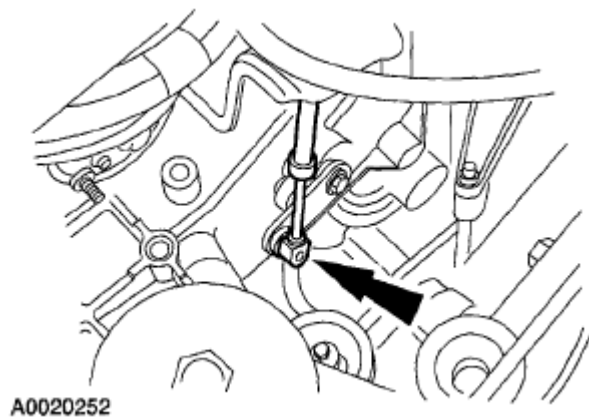
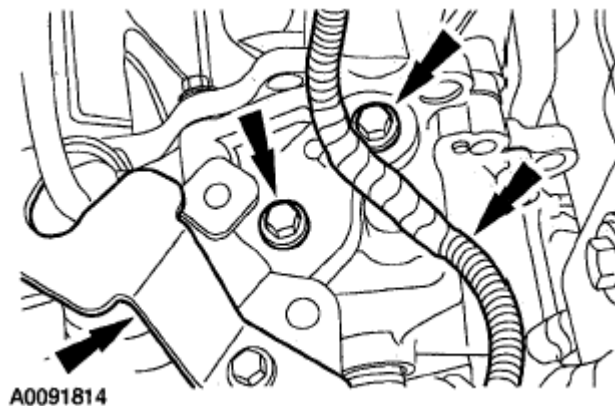


Fig. 210: Locating Shift Cable

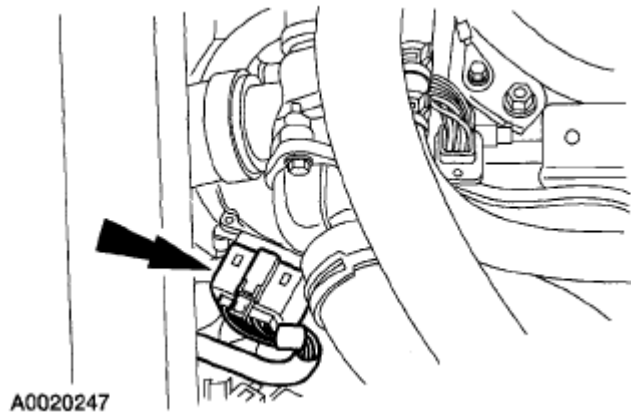
Courtesy of MAZDA MOTORS CORP.

35. Detach the wiring harness pin-type retainer and remove the 2 bolts.
- Position the transaxle control cable and bracket aside.

**Fig. 211: Locating Wiring Harness Pin-Type Retainer And Bolts**

Courtesy of MAZDA MOTORS CORP.

36. Disconnect the transaxle range sensor electrical connector.

**Fig. 212: Locating Transaxle Range Sensor Electrical Connector**

Courtesy of MAZDA MOTORS CORP.

37. Disconnect the front transaxle fluid cooler tube.

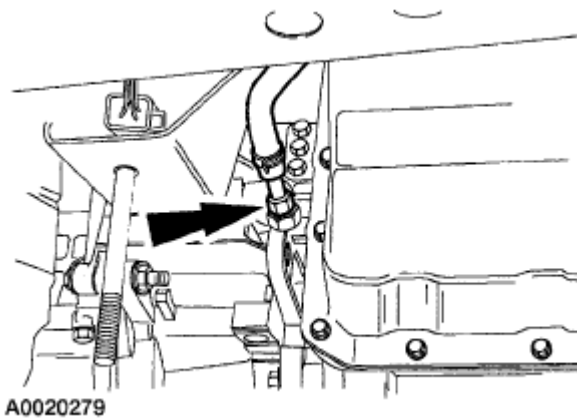


Fig. 213: Locating Front Transaxle Fluid Cooler Tube
 Courtesy of MAZDA MOTORS CORP.

38. Disconnect the rear transaxle fluid cooler tube.

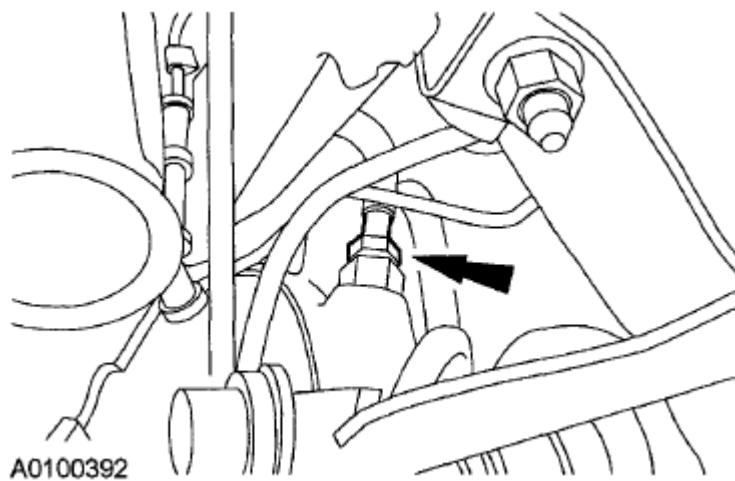


Fig. 214: Locating Rear Transaxle Fluid Cooler Tube
 Courtesy of MAZDA MOTORS CORP.

39. Disconnect the transaxle fluid cooler tube.

1. Disconnect the output shaft speed (OSS) sensor electrical connector (black).
2. Disconnect the turbine shaft speed (TSS) sensor electrical connector (white).
 1. Disconnect the wiring harness retainer from the transaxle case and position the harness aside.
3. Remove the transaxle fluid cooler retaining bracket bolt.
4. Position the fluid cooler tube aside.

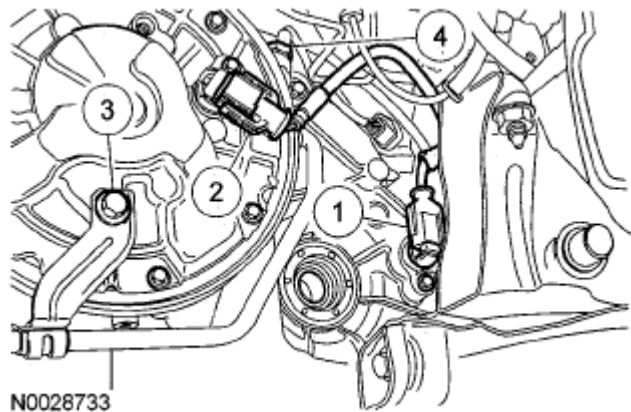


Fig. 215: Identifying Transaxle Fluid Cooler Tube
Courtesy of MAZDA MOTORS CORP.

40. Remove the bolt and the OSS sensor.

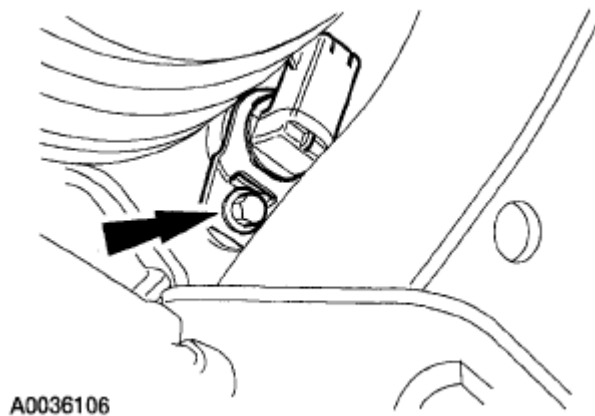


Fig. 216: Locating OSS Sensor Bolt
Courtesy of MAZDA MOTORS CORP.

41. If equipped, disconnect the block heater electrical connector.

- Detach all the block heater wiring harness retainers and position the wiring harness aside.

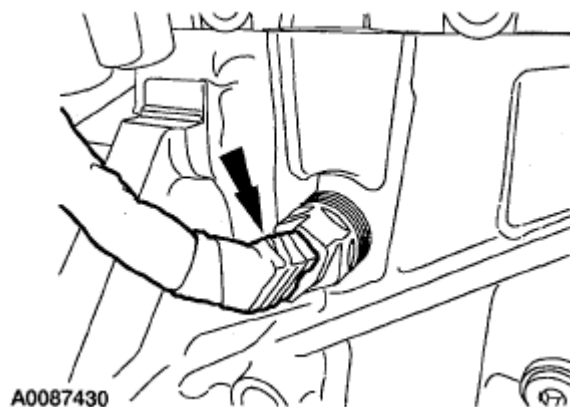


Fig. 217: Locating Block Heater Electrical Connector
Courtesy of MAZDA MOTORS CORP.

42. Disconnect the upper radiator hose.

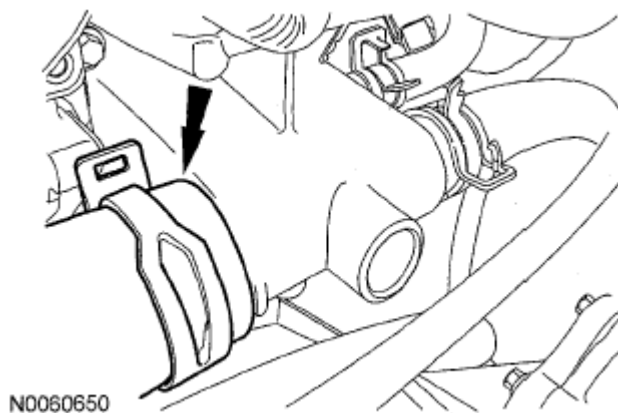
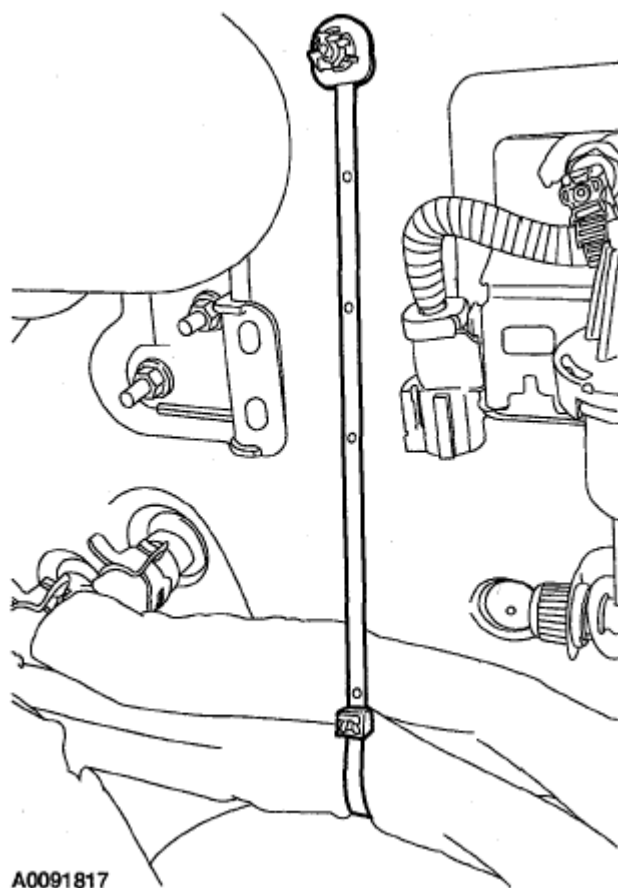


Fig. 218: Locating Upper Radiator Hose
Courtesy of MAZDA MOTORS CORP.

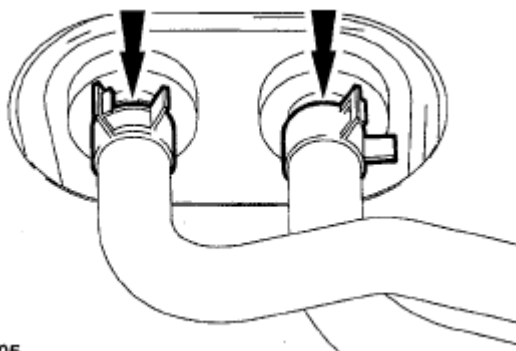
43. Detach the heater hose support strap from the heater core.



A0091817

Fig. 219: Identifying Heater Hose Support Strap
Courtesy of MAZDA MOTORS CORP.

44. Disconnect the heater hoses from the heater core.



A0085705

Fig. 220: Locating Heater Hoses
Courtesy of MAZDA MOTORS CORP.

45. Remove the retainers and the accelerator cable snow shield.

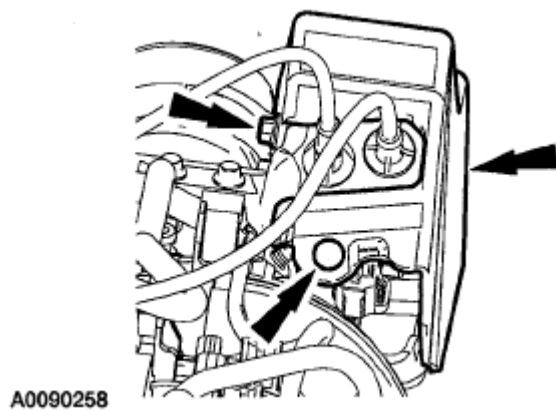


Fig. 221: Locating Retainers And Accelerator Cable Snow Shield
Courtesy of MAZDA MOTORS CORP.

46. Disconnect the accelerator cable and speed control cable (if equipped).
 1. Disconnect the accelerator and speed control cable (if equipped) from the throttle body.
 2. Remove the bolts from the accelerator cable bracket.

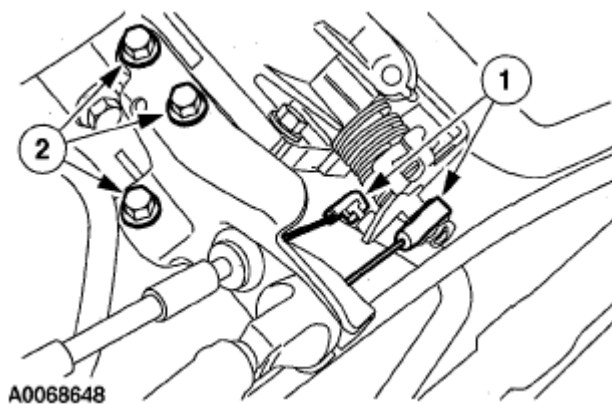


Fig. 222: Identifying Accelerator And Speed Control Cable And Accelerator Cable Bracket Bolts
Courtesy of MAZDA MOTORS CORP.

47. Remove the nut from the accelerator control cable bracket.

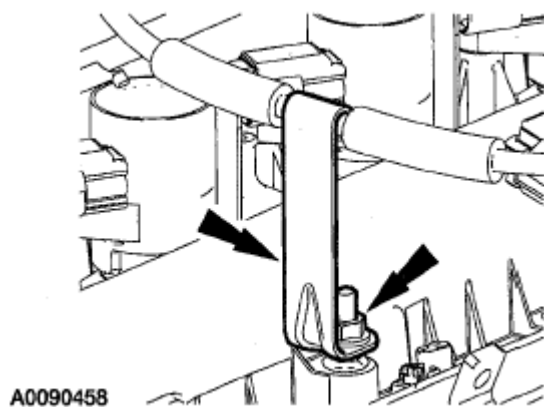


Fig. 223: Locating Accelerator Control Cable Bracket And Nut
Courtesy of MAZDA MOTORS CORP.

48. Remove the nut from the accelerator control cable bracket.
- Position the accelerator control cable and bracket assembly aside.

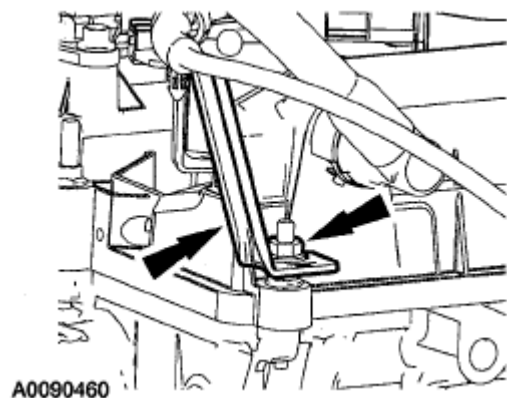


Fig. 224: Locating Accelerator Control Cable Bracket And Nut
Courtesy of MAZDA MOTORS CORP.

49. Disconnect the vacuum supply tube and position aside.

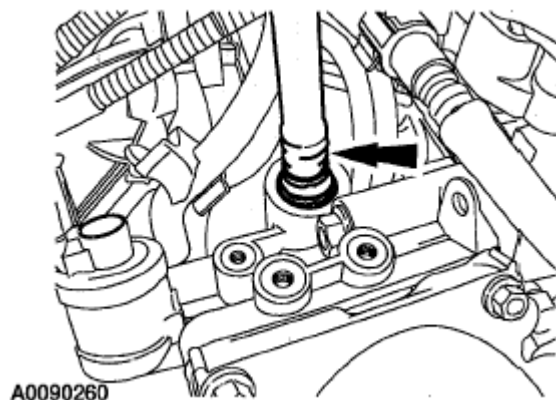


Fig. 225: Locating Vacuum Supply Tube
Courtesy of MAZDA MOTORS CORP.

50. Disconnect the fuel vapor return tube and retainer and position aside.

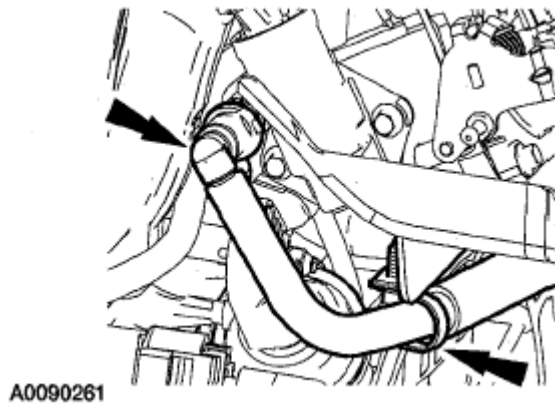


Fig. 226: Locating Fuel Vapor Return Tube And Retainer
Courtesy of MAZDA MOTORS CORP.

51. Disconnect the fuel supply tube quick connect coupling. See **QUICK RELEASE COUPLING - DOUBLE LOCKING** .

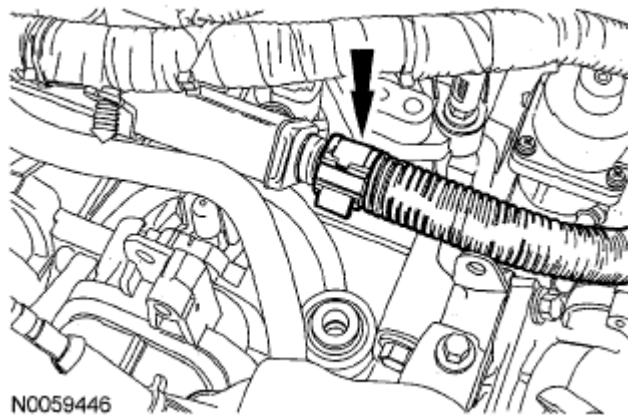


Fig. 227: Locating Fuel Supply Tube Quick Connect Coupling
Courtesy of MAZDA MOTORS CORP.

52. Detach the electrical connector retainers.

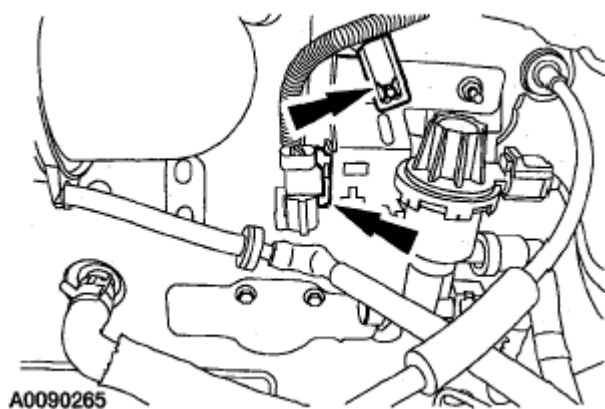


Fig. 228: Locating Electrical Connector Retainers
Courtesy of MAZDA MOTORS CORP.

53. Remove the bolt and detach the ground wire.

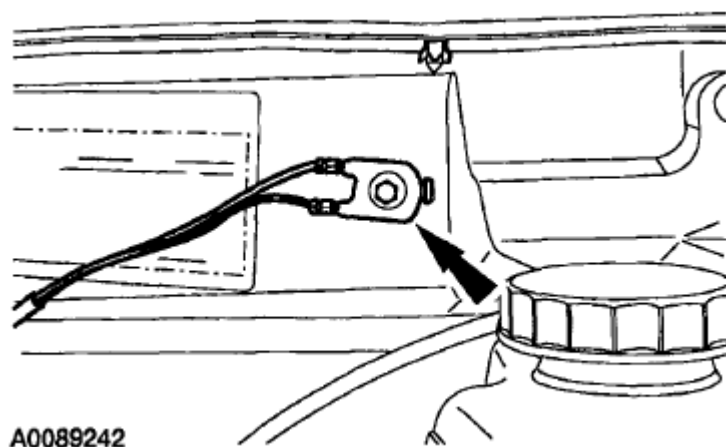


Fig. 229: Locating Ground Wire Bolt
Courtesy of MAZDA MOTORS CORP.

54. Disconnect the PCM electrical connectors.

- Remove the wiring harness retainer nut.

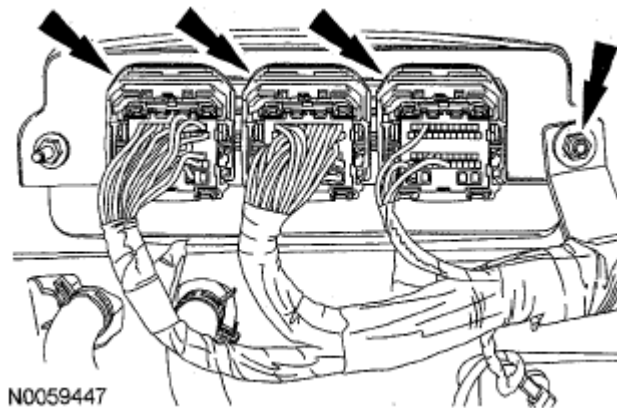


Fig. 230: Locating PCM Electrical Connectors
Courtesy of MAZDA MOTORS CORP.

55. Disconnect the lower radiator hose from the radiator.

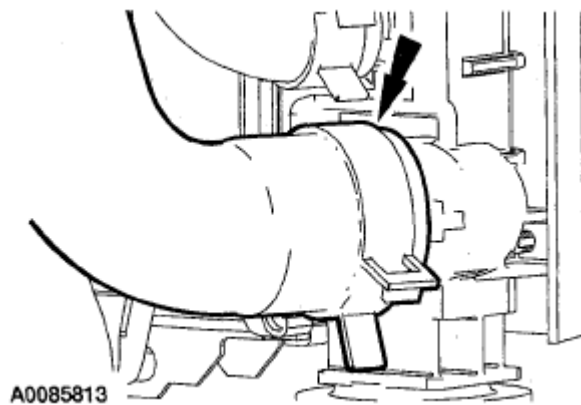


Fig. 231: Locating Lower Radiator Hose
Courtesy of MAZDA MOTORS CORP.

56. Disconnect the A/C compressor electrical connector and remove the 4 bolts.

- Position the A/C compressor aside and support the compressor with a length of mechanic's wire.

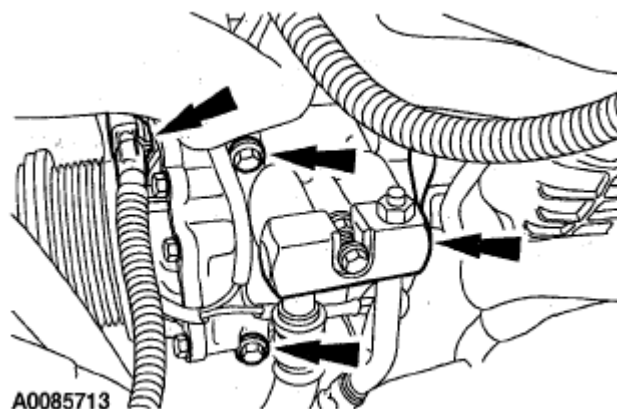


Fig. 232: Locating A/C Compressor Electrical Connector And Bolts
Courtesy of MAZDA MOTORS CORP.

57. Remove the front roll restrictor bolt and the 2 bolts for the engine support crossmember.

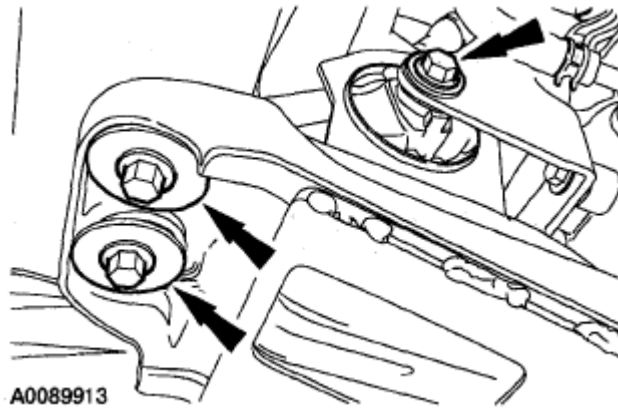


Fig. 233: Locating Front Roll Restrictor Bolt And Engine Support Crossmember Bolts
Courtesy of MAZDA MOTORS CORP.

58. Remove the rear nut and the engine support crossmember.

- Discard the nut.

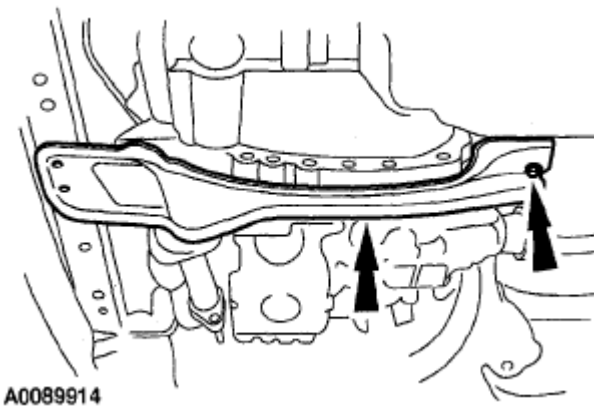


Fig. 234: Locating Rear Nut And Engine Support Crossmember
Courtesy of MAZDA MOTORS CORP.

Front wheel drive (FWD) vehicles

59. Remove the 3 bolts and the dampener.

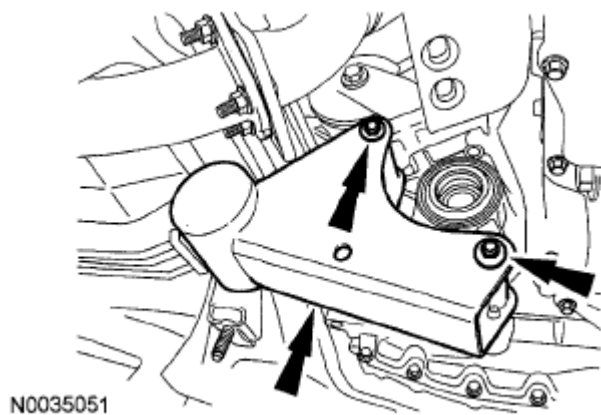


Fig. 235: Locating Bolts And Dampener
Courtesy of MAZDA MOTORS CORP.

All vehicles

60. Remove the 2 transaxle-to-engine bolts.

NOTE:

- The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

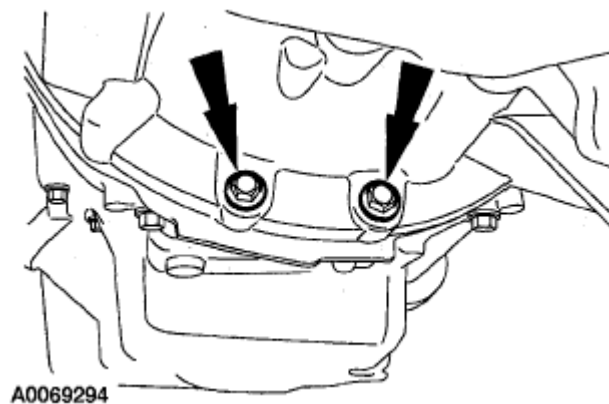


Fig. 236: Locating Transaxle-To-Engine Bolts
Courtesy of MAZDA MOTORS CORP.

61. Remove the 2 transaxle-to-engine bolts.

NOTE:

- The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

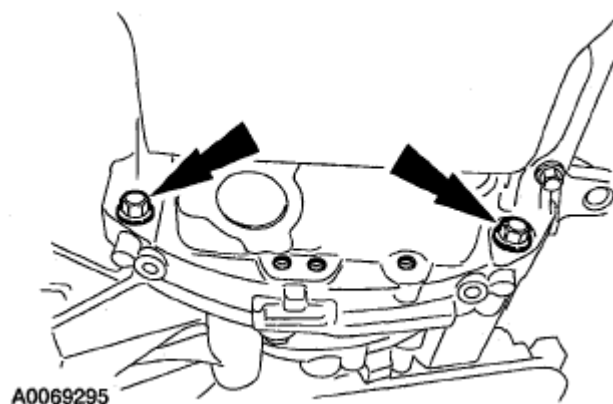


Fig. 237: Locating Transaxle-To-Engine Bolts
Courtesy of MAZDA MOTORS CORP.

62. Using the special tools, secure the engine to the lift table.

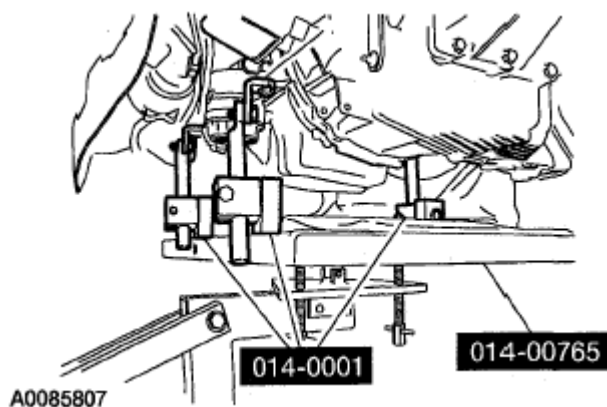


Fig. 238: Identifying Special Tools (014-0001 - 014-00765)
Courtesy of MAZDA MOTORS CORP.

63. Remove the engine mount bracket bolt.

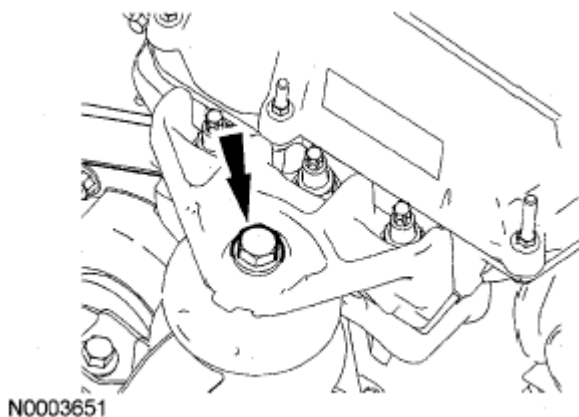


Fig. 239: Locating Engine Mount Bracket Bolt

Courtesy of MAZDA MOTORS CORP.

64. Remove the nuts and the engine mount bracket.

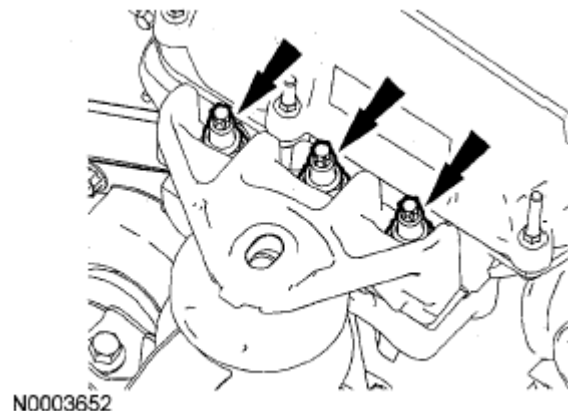


Fig. 240: Locating Engine Mount Bracket Nuts
Courtesy of MAZDA MOTORS CORP.

65. Remove the bolt from the transaxle rear mount.

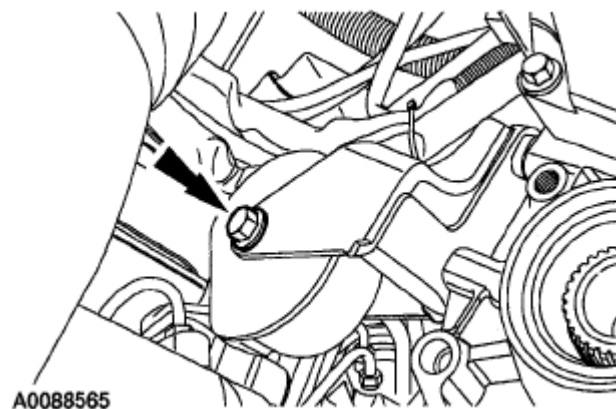


Fig. 241: Locating Rear Transaxle Mount Bolt
Courtesy of MAZDA MOTORS CORP.

66. Remove the bolt from the LH transaxle mount.

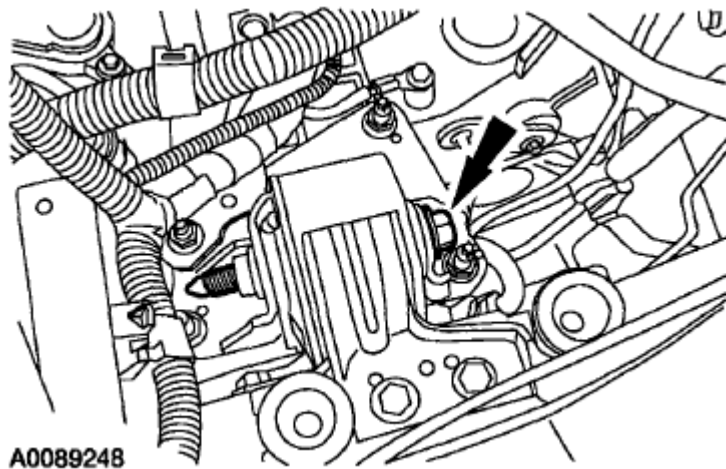


Fig. 242: Locating LH Transaxle Mount Bolt
Courtesy of MAZDA MOTORS CORP.

67. Lower the engine and transaxle from the vehicle.
68. Disconnect the starter terminals.
 1. Remove the battery cable nut.
 2. Remove the starter solenoid terminal nut.

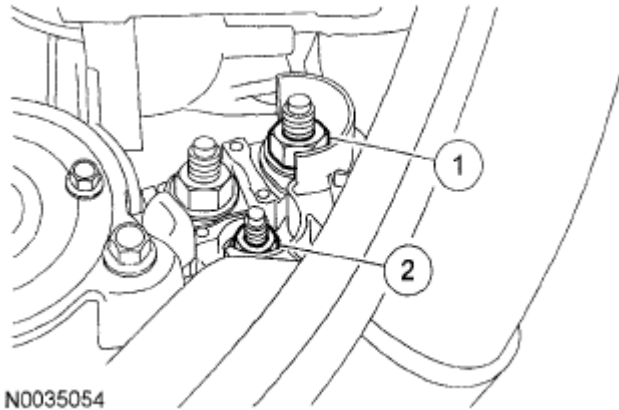


Fig. 243: Identifying Battery Cable Nut And Starter Solenoid Terminal Nut
Courtesy of MAZDA MOTORS CORP.

69. Remove the wire harness clip retainer and the ground wire from the starter bolts.

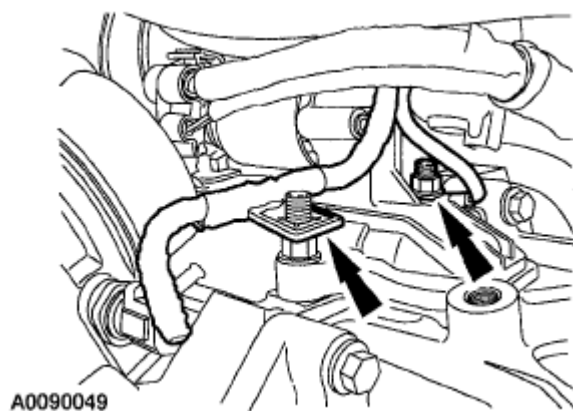


Fig. 244: Locating Wire Harness Clip Retainer And Ground Wire
Courtesy of MAZDA MOTORS CORP.

70. Remove the 2 stud bolts and remove the starter.

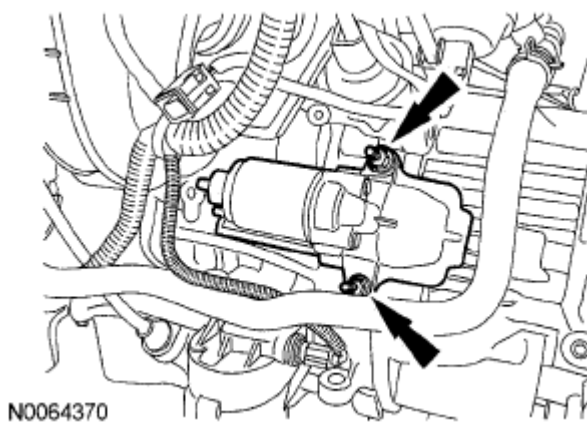


Fig. 245: Locating Starter Motor Stud Bolts
Courtesy of MAZDA MOTORS CORP.

71. Remove the starter motor isolator.

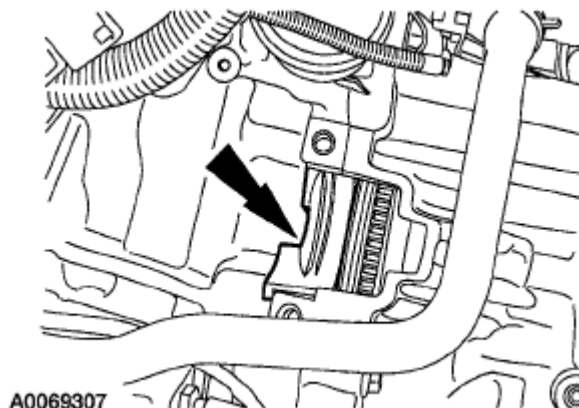


Fig. 246: Locating Starter Motor Isolator
Courtesy of MAZDA MOTORS CORP.

AWD vehicles

72. Remove the 2 lower catalytic converter bolts.

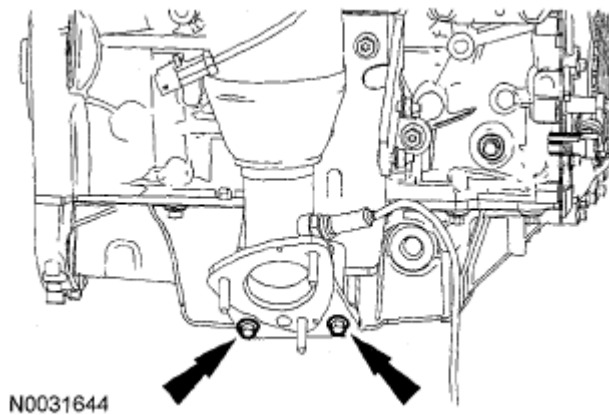


Fig. 247: Locating Lower Catalytic Converter Bolts
Courtesy of MAZDA MOTORS CORP.

73. Remove the 6 bolts and the catalytic converter heat shield.

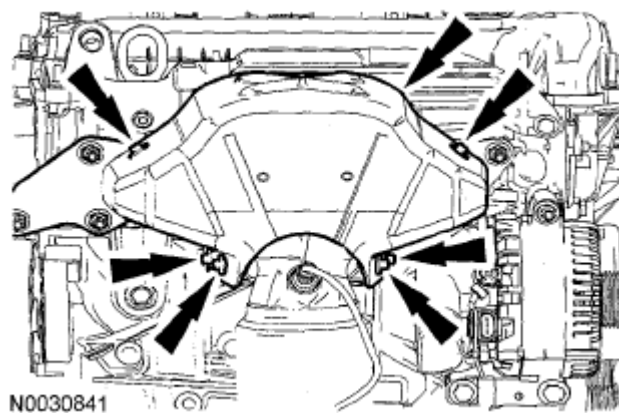


Fig. 248: Locating Catalytic Converter Heat Shield Bolts
Courtesy of MAZDA MOTORS CORP.

74. Remove and discard the 7 exhaust manifold nuts.

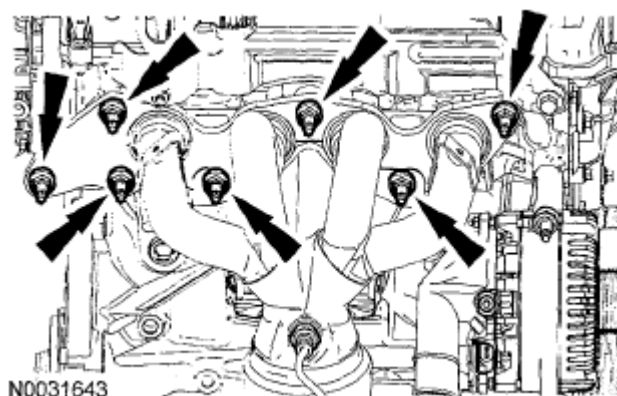


Fig. 249: Locating Exhaust Manifold Nuts
Courtesy of MAZDA MOTORS CORP.

- 75. Remove the catalytic converter and discard the exhaust manifold gasket
- 76. Remove and discard the 7 exhaust manifold studs.
- 77. Remove the 3 PTU bracket-to-engine bolts.

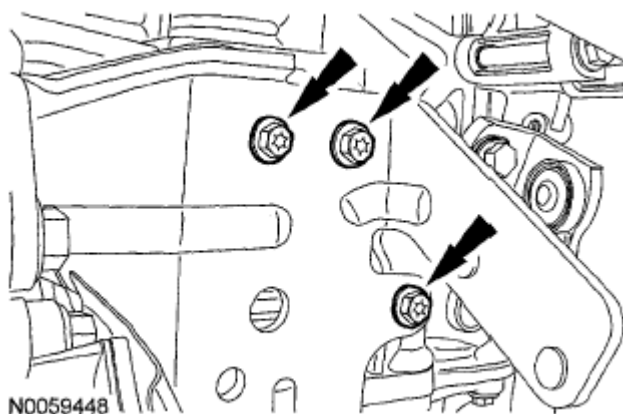


Fig. 250: Locating PTU Bracket-To-Engine Bolts
Courtesy of MAZDA MOTORS CORP.

- 78. Remove the 2 PTU bracket-to-PTU bolts and remove the bracket.

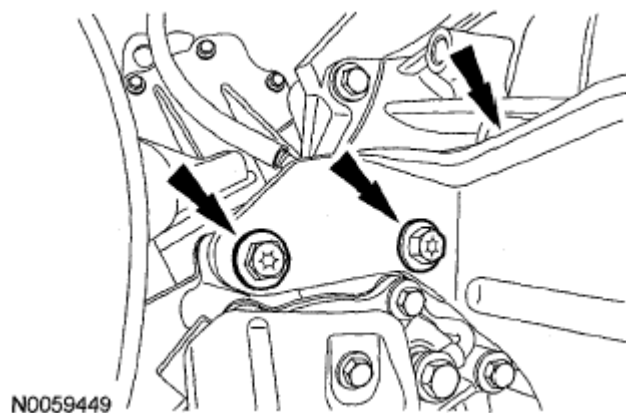


Fig. 251: Locating PTU Bracket-To-PTU Bolts And Bracket
Courtesy of MAZDA MOTORS CORP.

79. Detach the PTU vent hose retainer.

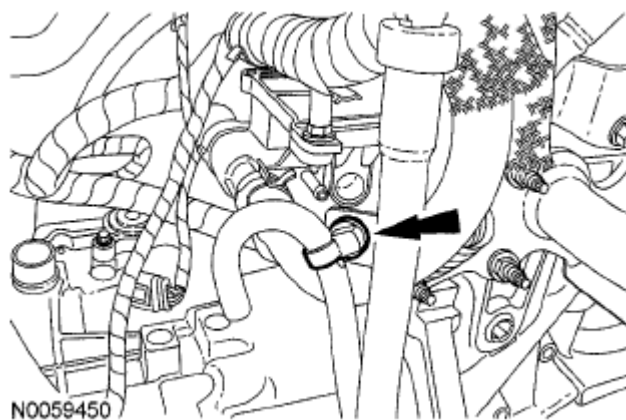


Fig. 252: Locating PTU Vent Hose Retainer
Courtesy of MAZDA MOTORS CORP.

80. Remove the transaxle-to-PTU bolt.

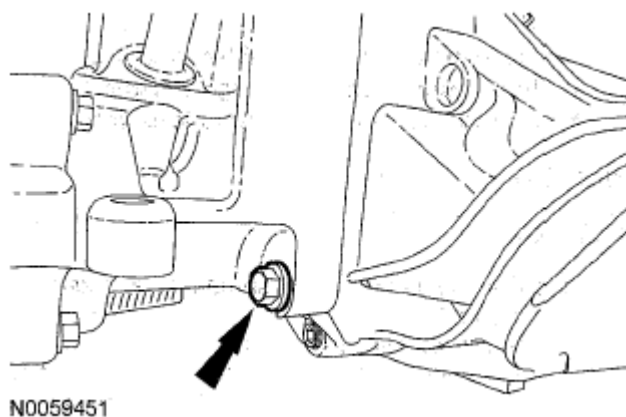


Fig. 253: Locating Transaxle-To-PTU Bolt
Courtesy of MAZDA MOTORS CORP.

81. Remove the 3 PTU-to-transaxle bolts and the PTU.

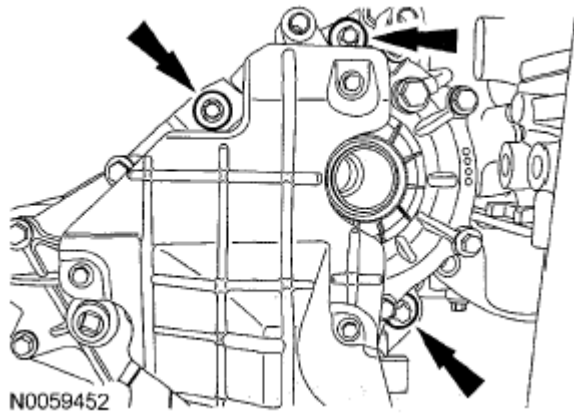


Fig. 254: Locating PTU-To-Transaxle Bolts And PTU
Courtesy of MAZDA MOTORS CORP.

All vehicles

82. Remove and discard the 4 torque converter nuts.

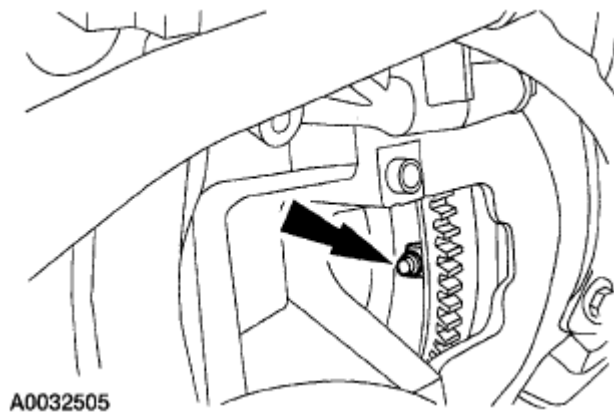


Fig. 255: Locating Torque Converter Nuts
Courtesy of MAZDA MOTORS CORP.

83. Using the engine crane and spreader bar remove the engine and transaxle from the lift table.

84. Remove the remaining 6 engine-to-transaxle bolts and separate the engine and transaxle.

NOTE:

- The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

ENGINE INSTALLATION - AUTOMATIC TRANSAXLE

WARNING:

- Do not smoke, or carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

INSTALLATION

All vehicles

1. Using the engine crane and spreader bar, position the engine and transaxle together. Install the 6 transaxle-to-engine bolts.
 - Tighten to 48 N.m {4.9 kgf.m, 35 ft.lbf}.
2. Install the 4 new torque converter nuts.
 - Tighten to 35 N.m {3.5 kgf.m, 26 ft.lbf}.

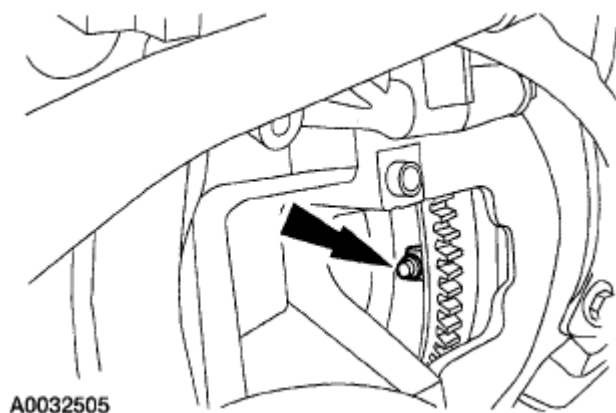


Fig. 256: Locating Torque Converter Nuts
Courtesy of MAZDA MOTORS CORP.

3. Using the Powertrain Lift and Universal Adapter Brackets, position the engine and transaxle onto the Powertrain Lift.

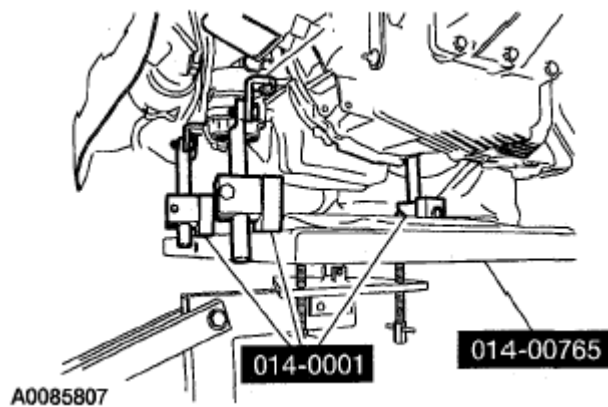


Fig. 257: Identifying Special Tools (014-0001 - 014-00765)
Courtesy of MAZDA MOTORS CORP.

All wheel drive (AWD) vehicles

4. Install the power transfer unit (PTU) and the 3 PTU-to-transaxle bolts.
 - Tighten to 70 N.m {7.1 kgf.m, 52 ft.lbf}.

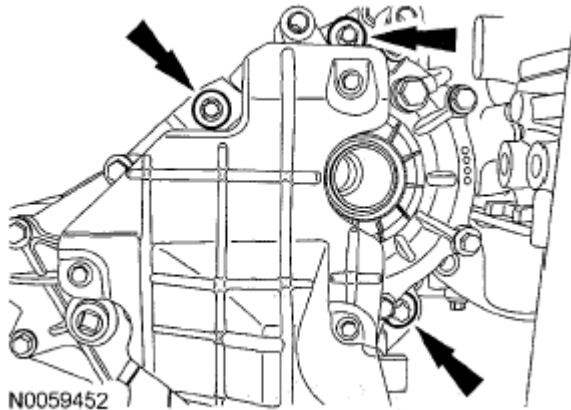


Fig. 258: Locating Power Transfer Unit And PTU-To-Transaxle Bolts
Courtesy of MAZDA MOTORS CORP.

5. Install the transaxle-to-PTU bolt.
 - Tighten to 48 N.m {4.9 kgf.m, 35 ft.lbf}.

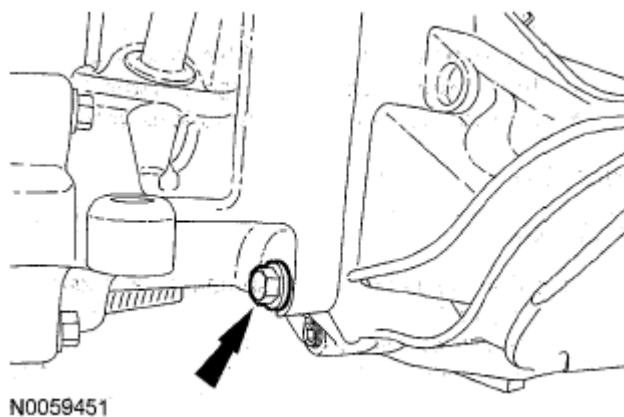


Fig. 259: Locating Transaxle-To-PTU Bolt
Courtesy of MAZDA MOTORS CORP.

6. Attach the PTU vent hose.

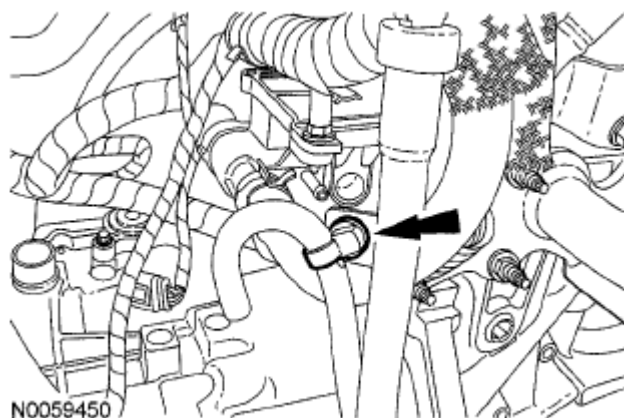


Fig. 260: Locating PTU Vent Hose
Courtesy of MAZDA MOTORS CORP.

All vehicles

7. Install the starter motor isolator.

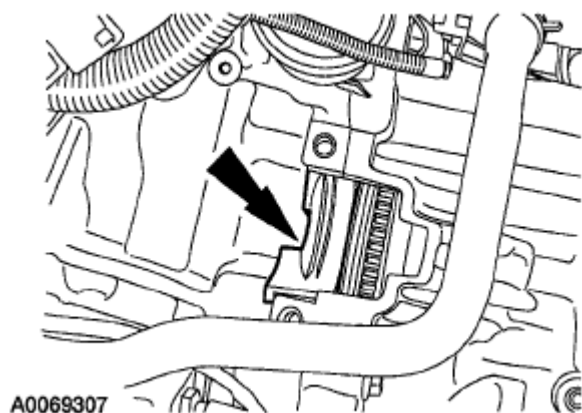


Fig. 261: Locating Starter Motor Isolator
Courtesy of MAZDA MOTORS CORP.

8. Install the starter motor.
 - Tighten to 35 N.m {3.5 kgf.m, 26 ft.lbf}.

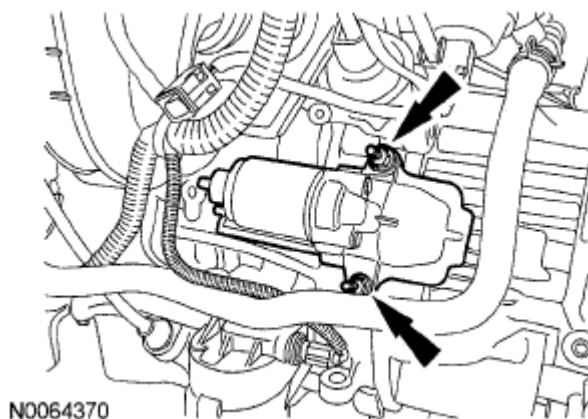


Fig. 262: Locating Starter Motor Stud Bolts
Courtesy of MAZDA MOTORS CORP.

9. Install the ground wire and the nut.
 - Tighten to 25 N.m {2.5 kgf.m, 18 ft.lbf}.

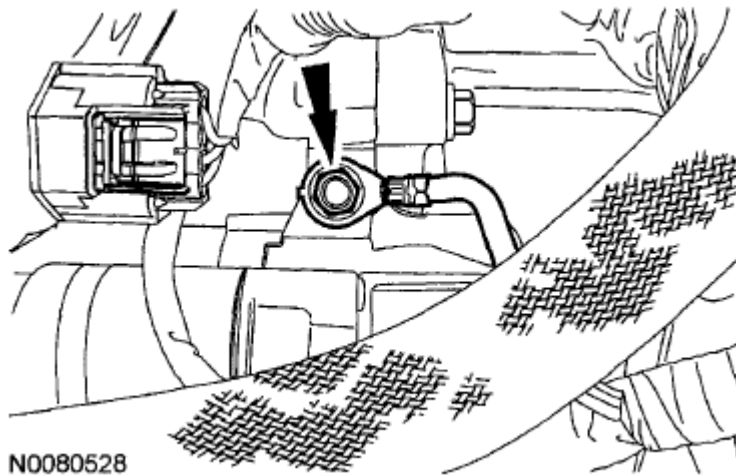


Fig. 263: Locating Ground Wire Nut
Courtesy of MAZDA MOTORS CORP.

10. Install the starter motor harness connector.
 1. Install the starter motor solenoid battery nut.
 1. Tighten to 12 N.m {1.2 kgf.m, 106 in.lbf}.
 2. Install the starter motor solenoid nut.
 1. Tighten to 5 N.m {0.5 kgf.m, 44 in.lbf}.

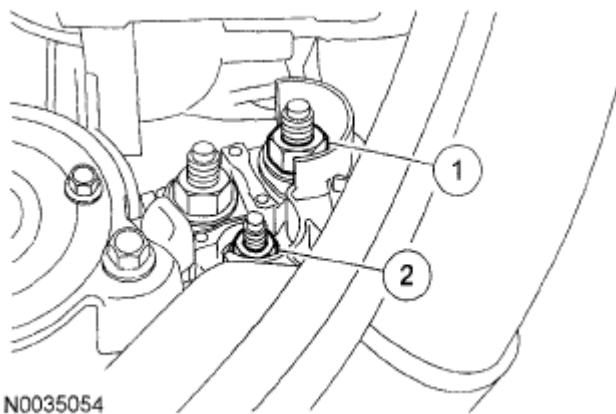


Fig. 264: Identifying Battery Cable Nut And Starter Solenoid Terminal Nut
Courtesy of MAZDA MOTORS CORP.

11. Raise the engine and transaxle into the vehicle.
12. Install the bolt in the LH transaxle mount.
 - Tighten to 103 N.m {10.5 kgf.m, 76 ft.lbf}.

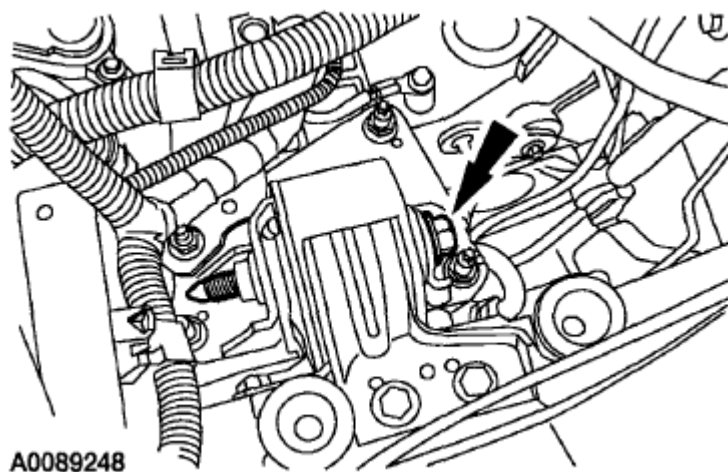


Fig. 265: Locating LH Transaxle Mount Bolt
Courtesy of MAZDA MOTORS CORP.

13. Install the bolt in the rear transaxle mount.
 - Tighten to 115 N.m {11.7 kgf.m, 85 ft.lbf}.

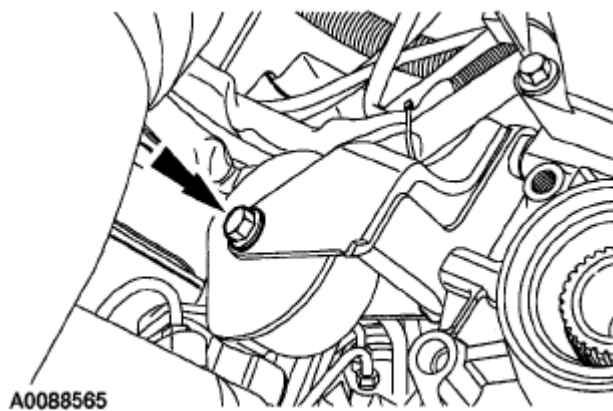


Fig. 266: Locating Rear Transaxle Mount Bolt
Courtesy of MAZDA MOTORS CORP.

14. Install the engine mount bracket and nuts.
 - Tighten to 115 N.m {11.7 kgf.m, 85 ft.lbf}.

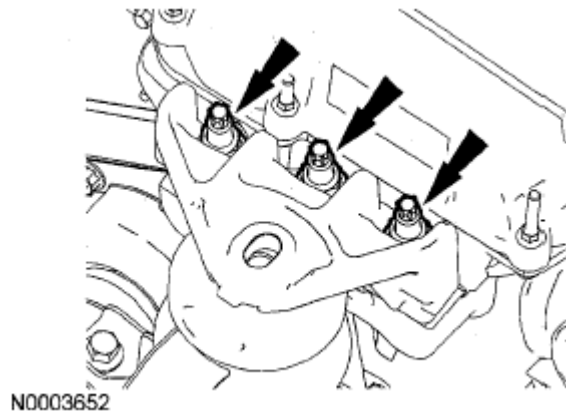


Fig. 267: Locating Engine Mount Bracket Nuts
Courtesy of MAZDA MOTORS CORP.

15. Install the engine mount bracket bolt.
 - Tighten to 115 N.m {11.7 kgf.m, 85 ft.lbf}.

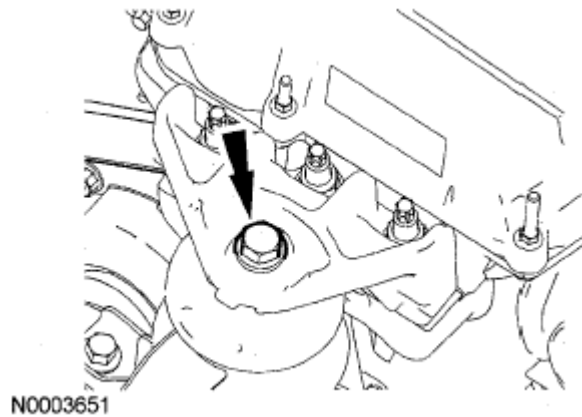


Fig. 268: Locating Engine Mount Bracket Bolt
Courtesy of MAZDA MOTORS CORP.

16. If equipped, install a new oil filter element.
17. If equipped, install a new spin on engine oil filter.
 - Lubricate the spin on oil filter gasket with clean engine oil and tighten the oil filter three-fourths turn after the oil filter gasket makes contact with the oil filter adapter.

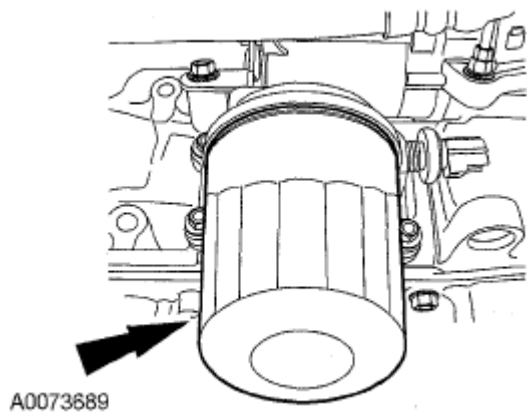


Fig. 269: Locating Spin On Engine Oil Filter
Courtesy of MAZDA MOTORS CORP.

AWD vehicles

18. Install the PTU bracket and the 2 PTU bracket-to-PTU bolts.
 - Tighten to 45 N.m {4.5 kgf.m, 33 ft.lbf}.

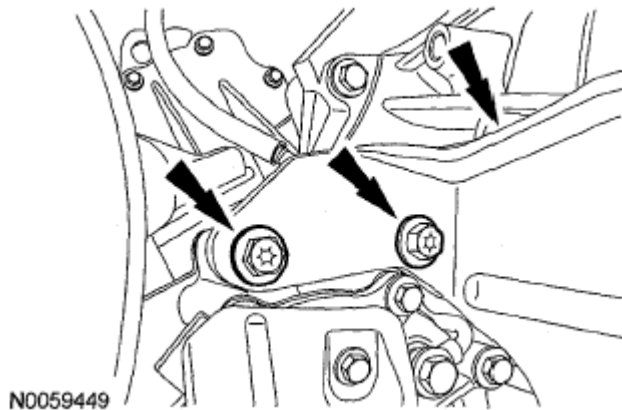


Fig. 270: Locating PTU Bracket And PTU Bracket-To-PTU Bolts
Courtesy of MAZDA MOTORS CORP.

19. Install the PTU bracket-to-engine bolt.
 - Tighten to 40 N.m {4.0 kgf.m, 30 ft.lbf}.

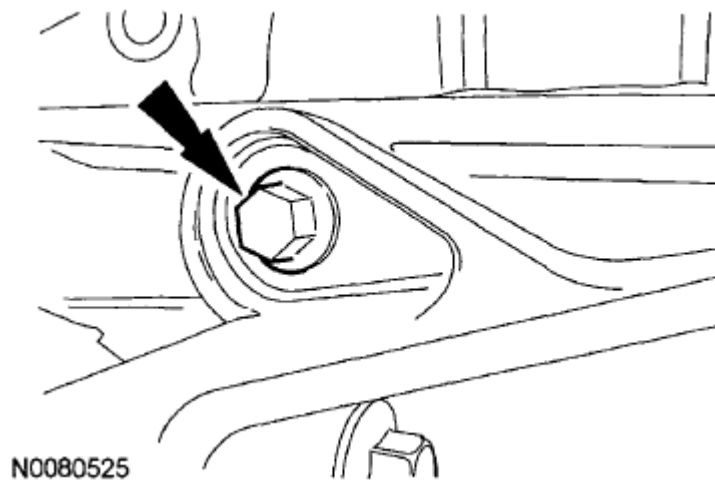


Fig. 271: Locating PTU Bracket-To-Engine Bolt
Courtesy of MAZDA MOTORS CORP.

20. Install the 4 PTU bracket-to-engine bolts.
 - Tighten to 40 N.m {4.0 kgf.m, 30 ft.lbf}.

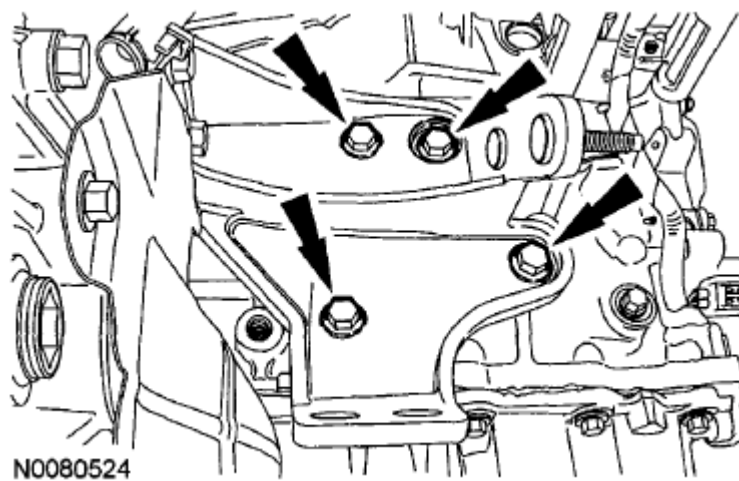


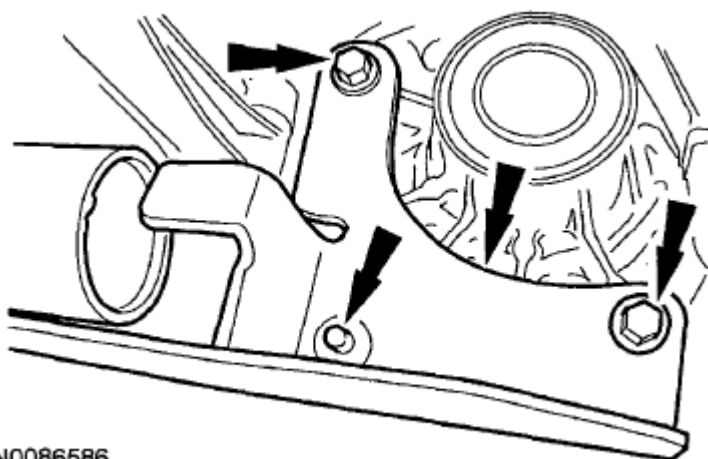
Fig. 272: Locating PTU Bracket-To-Engine Bolts
Courtesy of MAZDA MOTORS CORP.

21. Install a new intermediate shaft seal and deflector.

CAUTION:

- A new Power Transfer Unit (PTU) intermediate shaft seal must be installed whenever the intermediate shaft or PTU is removed from the vehicle.

22. If equipped, install the dampener and the 3 bolts.
 - Tighten to 40 N.m {4.0 kgf.m, 30 ft.lbf}.



N0086586

Fig. 273: Locating Damper And Bolts
 Courtesy of MAZDA MOTORS CORP.

23. Install the 2 transaxle-to-engine bolts.
 - Tighten to 48 N.m {4.8 kgf.m, 35 ft.lbf}.

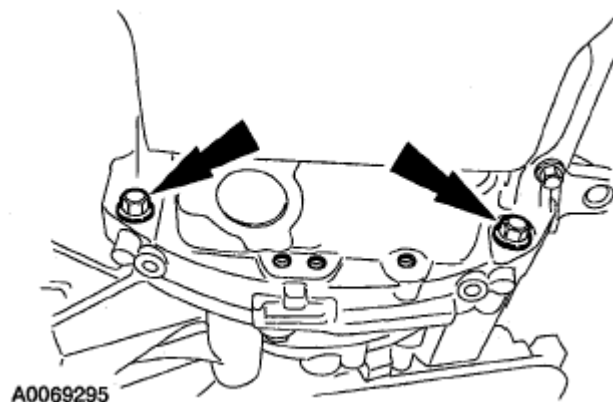


Fig. 274: Locating Transaxle-To-Engine Bolts
 Courtesy of MAZDA MOTORS CORP.

24. Install the 2 transaxle-to-engine bolts.
 - Tighten to 48 N.m {4.8 kgf.m, 35 ft.lbf}.

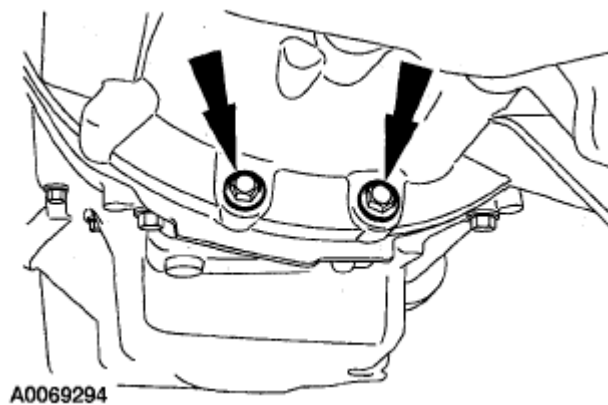


Fig. 275: Locating Transaxle-To-Engine Bolts
Courtesy of MAZDA MOTORS CORP.

25. Install the engine support crossmember and new nut.
 - Tighten to 175 N.m {17.5 kgf.m, 129 ft.lbf}.

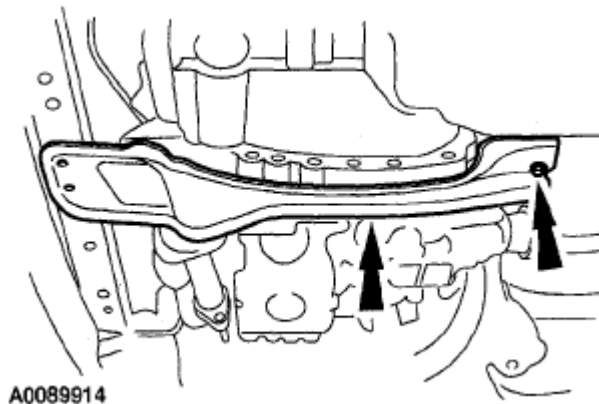


Fig. 276: Locating Engine Support Crossmember And Nut
Courtesy of MAZDA MOTORS CORP.

26. Install the 2 bolts for the engine support cross-member and the front roll restrictor bolt.
 - Tighten the engine support crossmember bolts to 90 N.m {9.0 kgf.m, 66 ft.lbf}.
 - Tighten the engine support crossmember bolts to 115 N.m {11.5 kgf.m, 85 ft.lbf}.

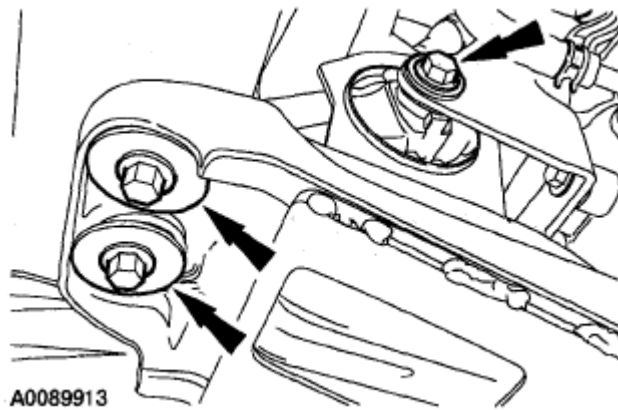


Fig. 277: Locating Engine Support Cross-Member Bolts And Front Roll Restrictor Bolt
Courtesy of MAZDA MOTORS CORP.

27. Connect the lower radiator hose to the radiator.

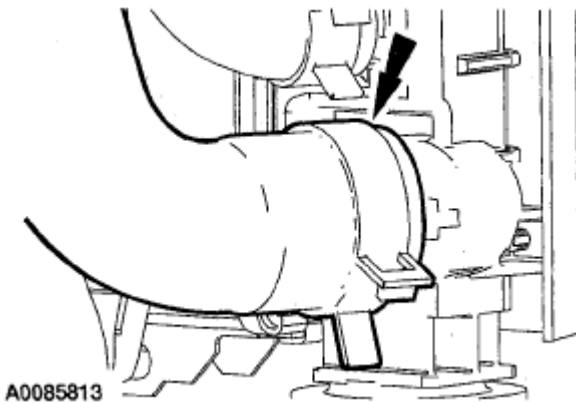


Fig. 278: Locating Lower Radiator Hose
Courtesy of MAZDA MOTORS CORP.

28. Install the A/C compressor and connect the A/C compressor electrical connector.
- Attach the wire harness retainer.
 - Tighten the bolts to 25 N.m {2.5 kgf.m, 18 ft.lbf}.

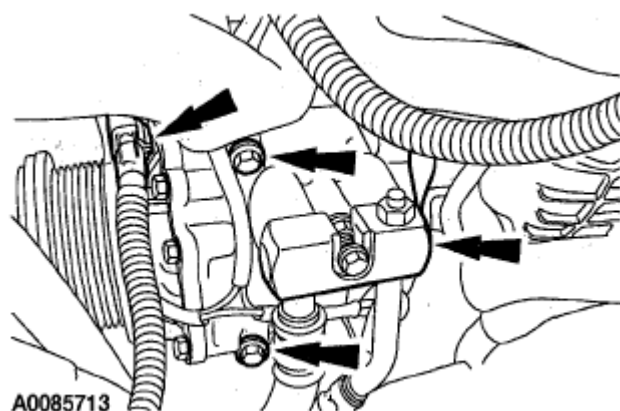


Fig. 279: Locating A/C Compressor And A/C Compressor Electrical Connector
Courtesy of MAZDA MOTORS CORP.

29. Attach the 2 retainers and connect the generator electrical connector.

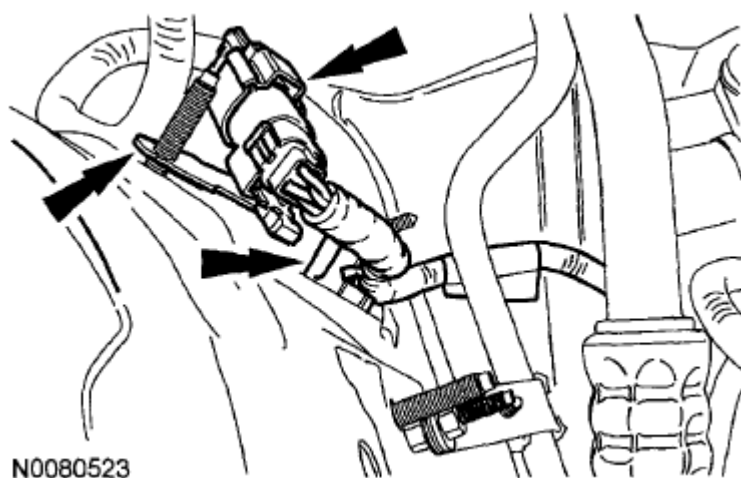


Fig. 280: Locating Retainers And Generator Electrical Connector
Courtesy of MAZDA MOTORS CORP.

30. Connect the engine control harness electrical connector.

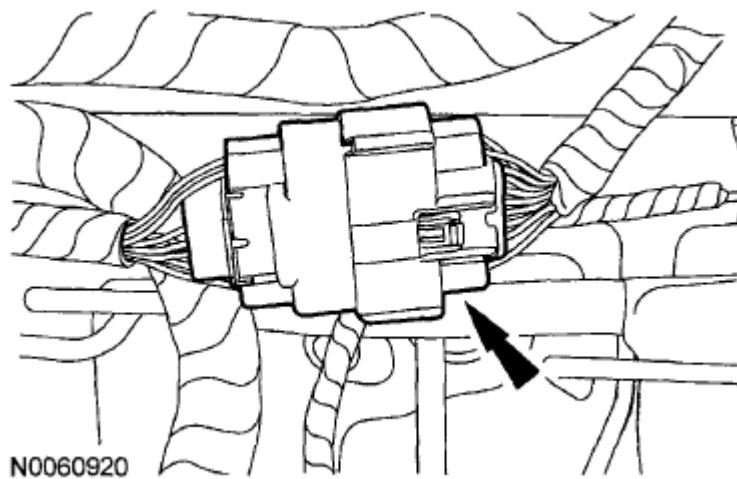


Fig. 281: Locating Engine Control Harness Electrical Connector
Courtesy of MAZDA MOTORS CORP.

31. Connect the PCM electrical connector and attach the wire harness retainer.

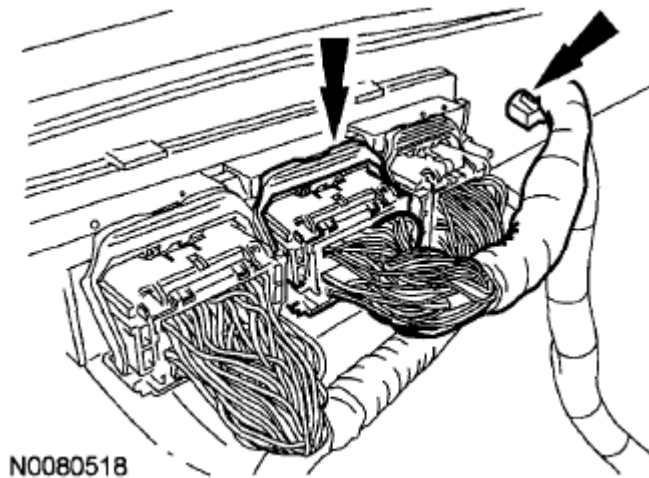


Fig. 282: Locating PCM Electrical Connector And Wire Harness Retainer
Courtesy of MAZDA MOTORS CORP.

32. Connect the fuel supply quick connect coupling. See **QUICK RELEASE COUPLING - DOUBLE LOCKING**.

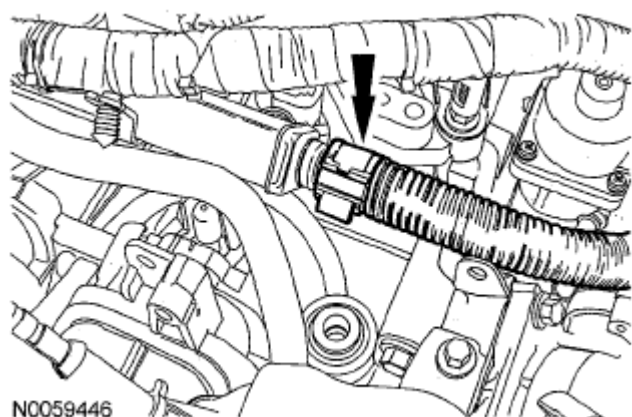


Fig. 283: Locating Fuel Supply Quick Connect Coupling
Courtesy of MAZDA MOTORS CORP.

33. Connect the fuel vapor return tube.
 - Attach the fuel vapor tube retainer to the wire harness.

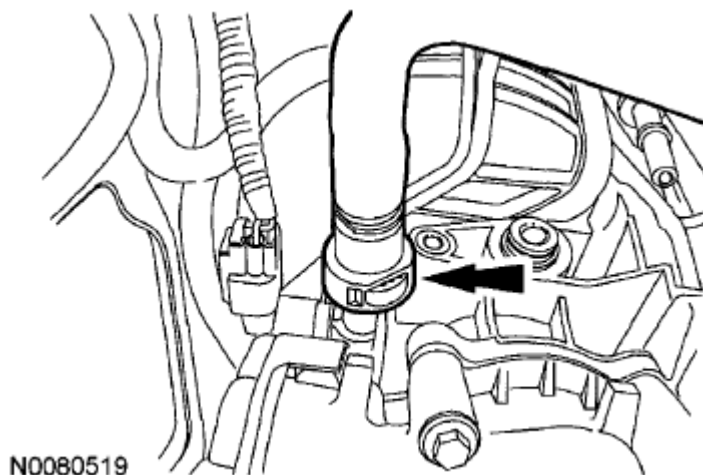


Fig. 284: Locating Fuel Vapor Return Tube
Courtesy of MAZDA MOTORS CORP.

34. Connect the vacuum supply tube.

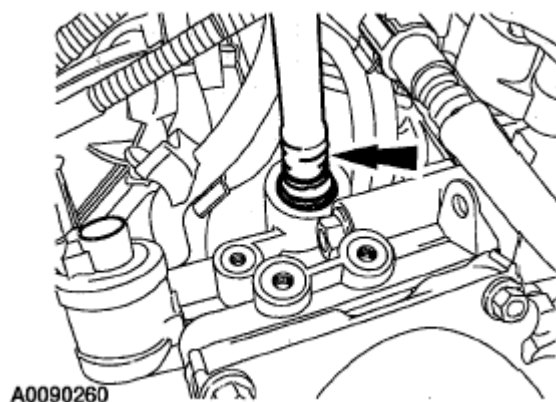


Fig. 285: Locating Vacuum Supply Tube
Courtesy of MAZDA MOTORS CORP.

35. Connect the heater hoses to the heater core.

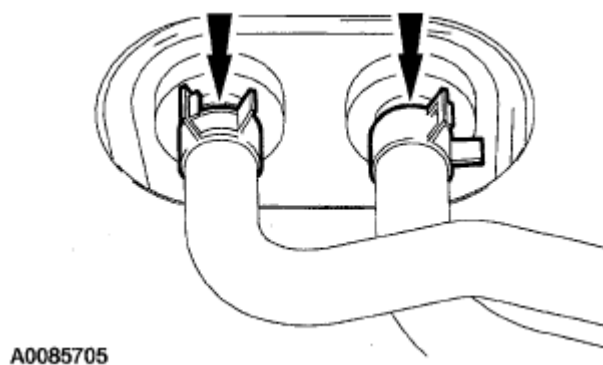


Fig. 286: Locating Heater Hoses
Courtesy of MAZDA MOTORS CORP.

36. Attach the heater hose support strap to the stud.

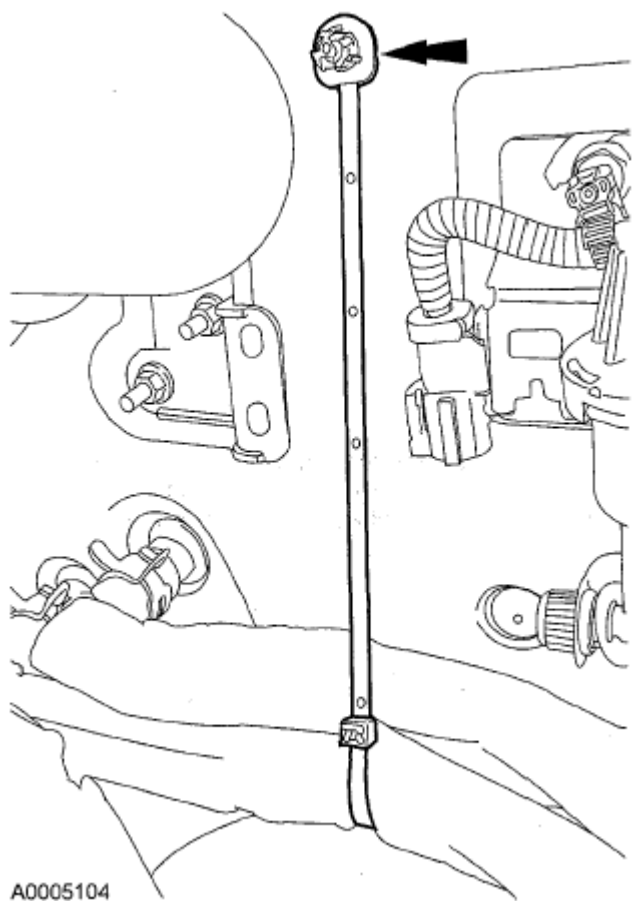


Fig. 287: Locating Heater Hose Support Strap Stud
Courtesy of MAZDA MOTORS CORP.

37. Connect the upper radiator hose.

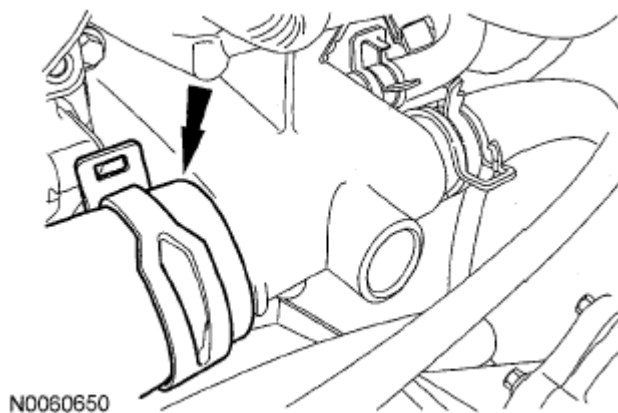


Fig. 288: Locating Upper Radiator Hose
Courtesy of MAZDA MOTORS CORP.

38. If equipped, route the block heater wiring harness and attach all retainers.

- Connect the block heater electrical connector.

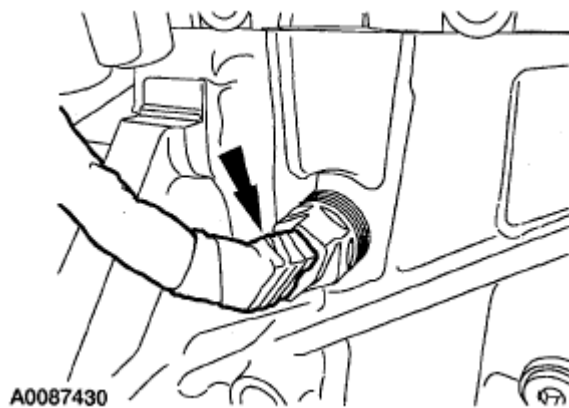


Fig. 289: Locating Block Heater Electrical Connector
Courtesy of MAZDA MOTORS CORP.

39. Attach the shift cable pin-type retainer.

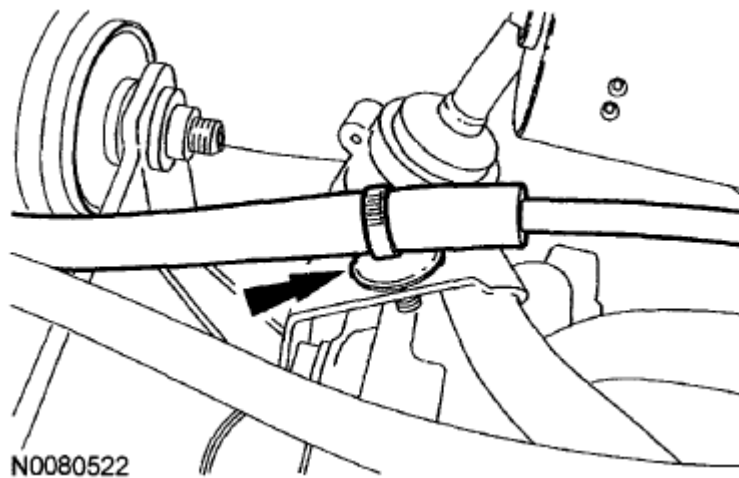


Fig. 290: Locating Shift Cable Pin-Type Retainer
Courtesy of MAZDA MOTORS CORP.

40. Attach the shift cable to the shift cable bracket.

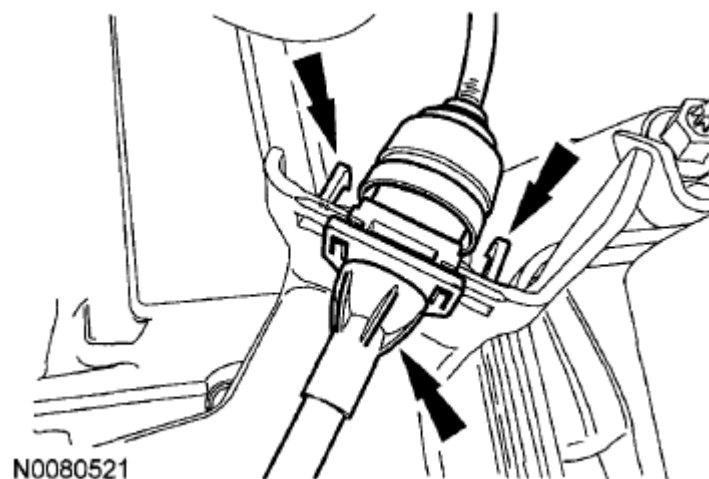


Fig. 291: Locating Shift Cable And Shift Cable Bracket
Courtesy of MAZDA MOTORS CORP.

41. Connect the shift cable to the transaxle manual lever.

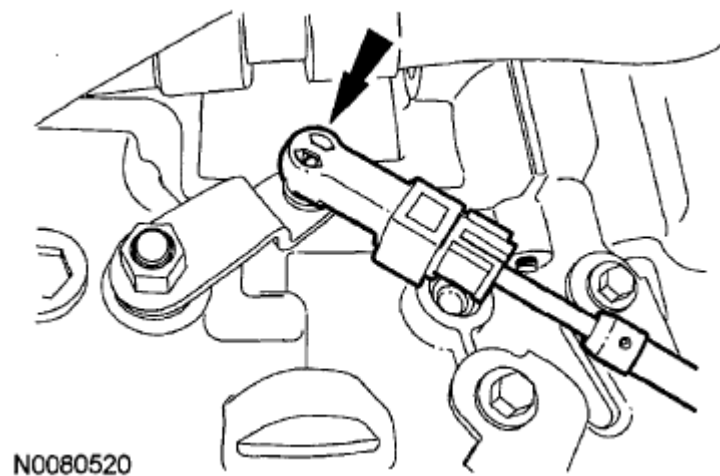


Fig. 292: Locating Shift Cable
Courtesy of MAZDA MOTORS CORP.

42. Attach the 2 wiring harness retainers to the battery tray bracket.

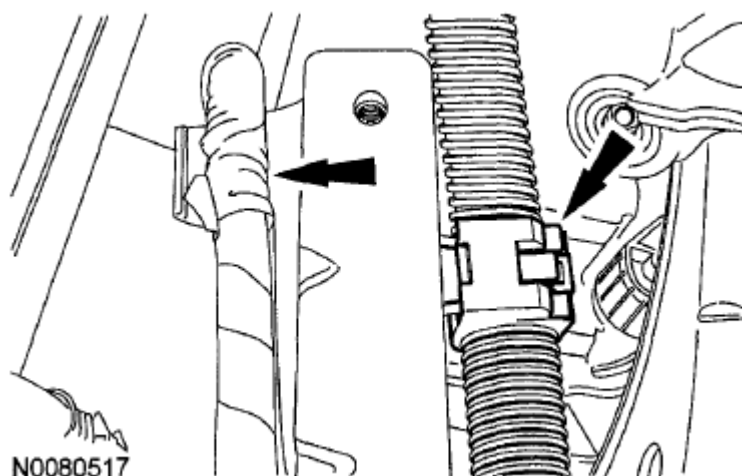


Fig. 293: Locating Wiring Harness Retainers
Courtesy of MAZDA MOTORS CORP.

43. Install the ground strap and bolt.
 - Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

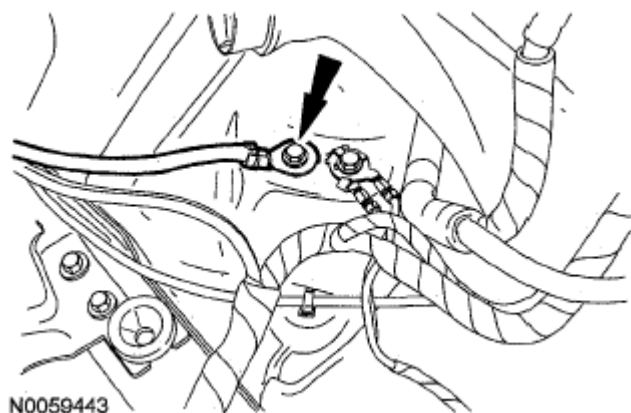


Fig. 294: Locating Ground Strap Bolt
Courtesy of MAZDA MOTORS CORP.

44. Connect the electrical connector to the power distribution box (PDB).

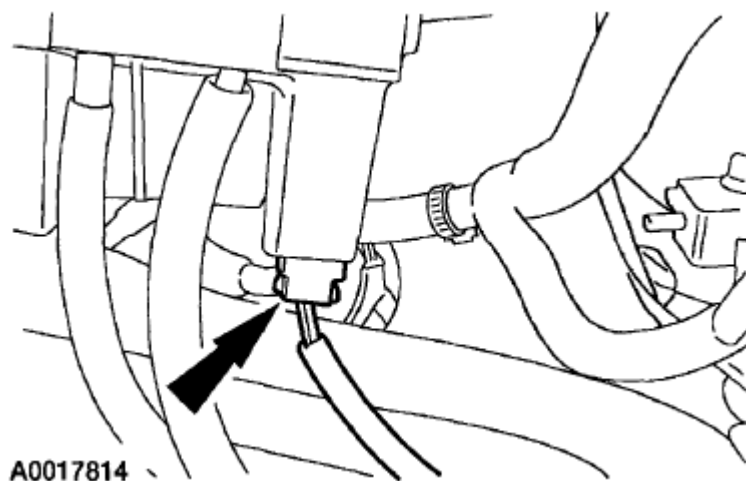


Fig. 295: Locating Power Distribution Box Electrical Connector
Courtesy of MAZDA MOTORS CORP.

45. Connect the cable to the PDB and install the nut.
 - Tighten to 12 N.m {1.2 kgf.m, 106 in.lbf}.

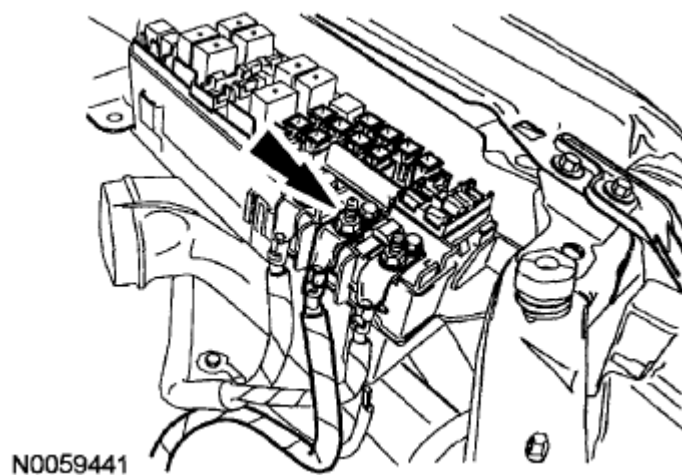


Fig. 296: Locating PDB Cable Nut
Courtesy of MAZDA MOTORS CORP.

46. Install the PDB cover.

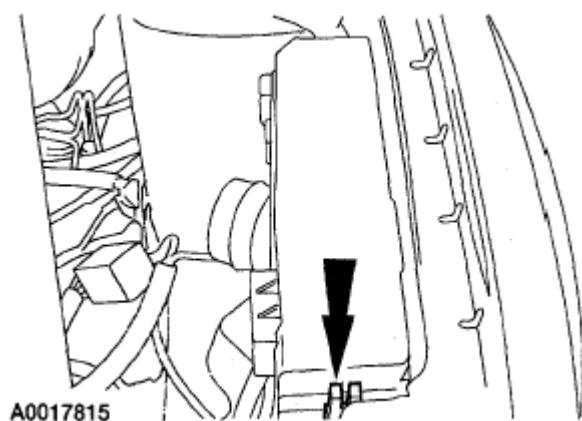


Fig. 297: Locating PDB Cover
Courtesy of MAZDA MOTORS CORP.

47. Connect the 2 transaxle fluid cooler tubes.

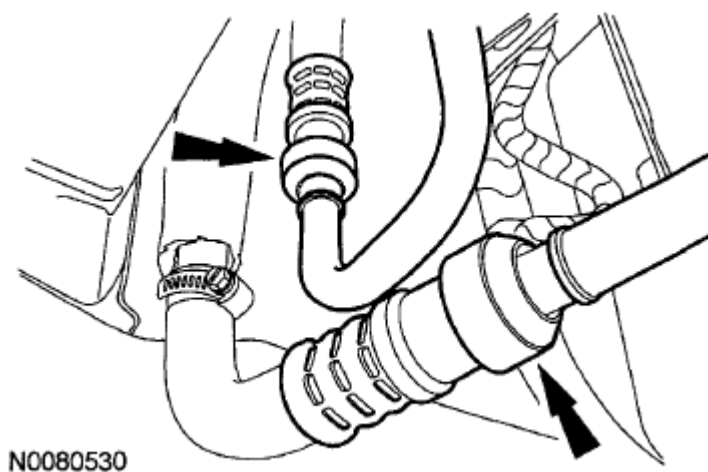


Fig. 298: Locating Transaxle Fluid Cooler Tubes
Courtesy of MAZDA MOTORS CORP.

48. Install the 2 secondary latches to the transaxle fluid cooler tubes.

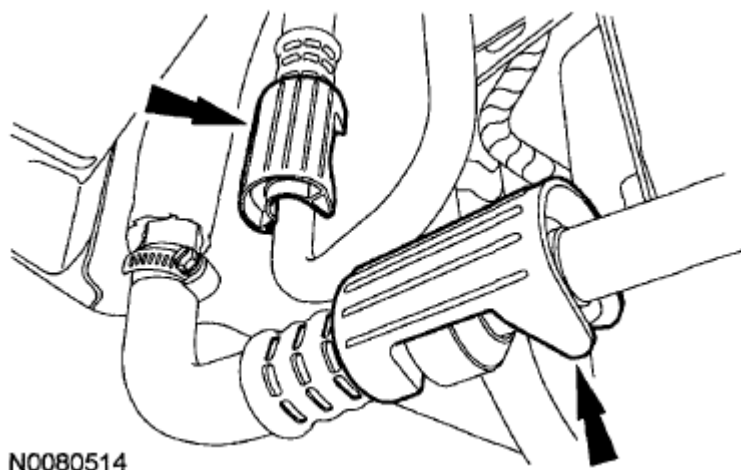


Fig. 299: Locating Transaxle Fluid Cooler Tubes Secondary Latches
Courtesy of MAZDA MOTORS CORP.

49. Connect the Turbine Shaft Speed (TSS) sensor electrical connector.

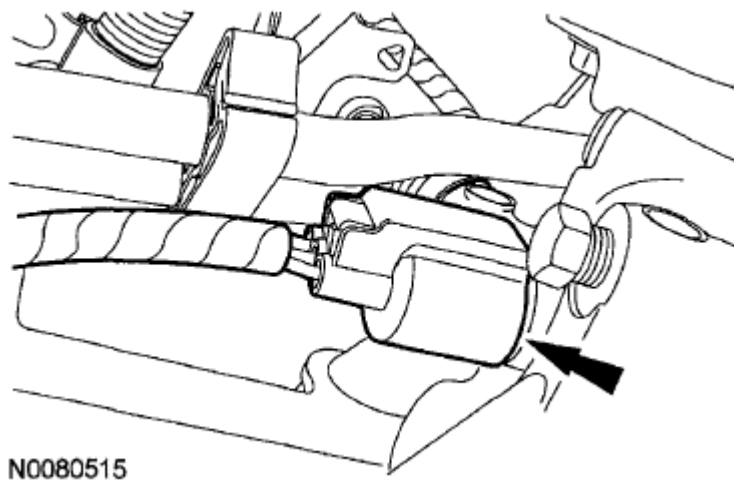


Fig. 300: Locating Turbine Shaft Speed Sensor Electrical Connector
Courtesy of MAZDA MOTORS CORP.

50. Attach the wiring harness retainer to the trans-axle stud bolt.

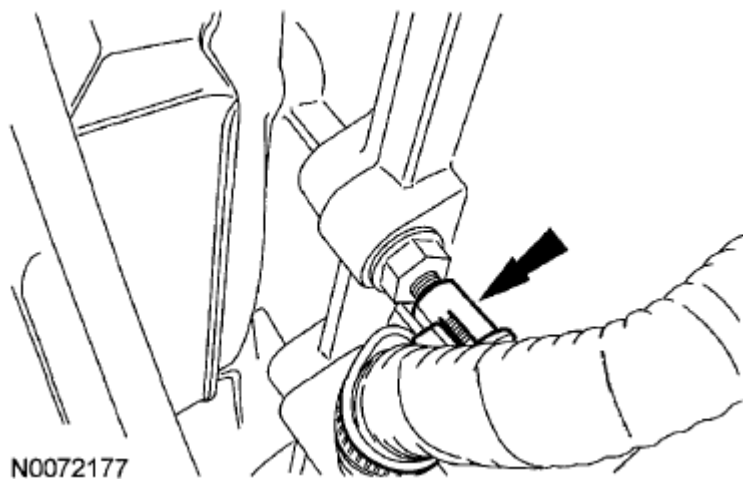


Fig. 301: Locating Wiring Harness Retainer
Courtesy of MAZDA MOTORS CORP.

51. Connect the transaxle electrical connector.

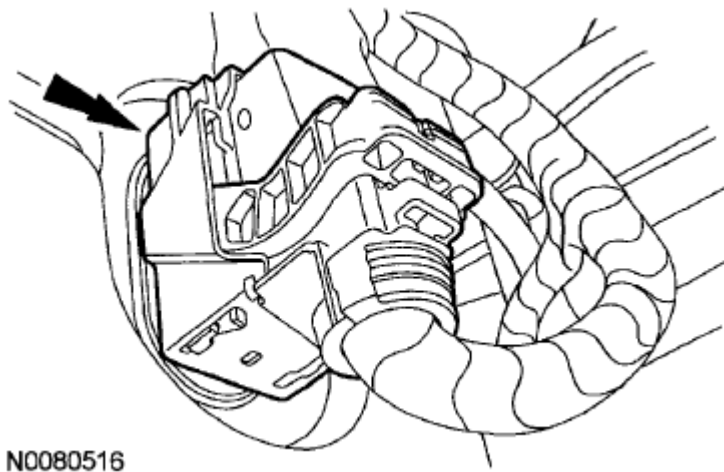


Fig. 302: Locating Transaxle Electrical Connector
Courtesy of MAZDA MOTORS CORP.

52. If equipped, install the ground eyelet and bolt.
- Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

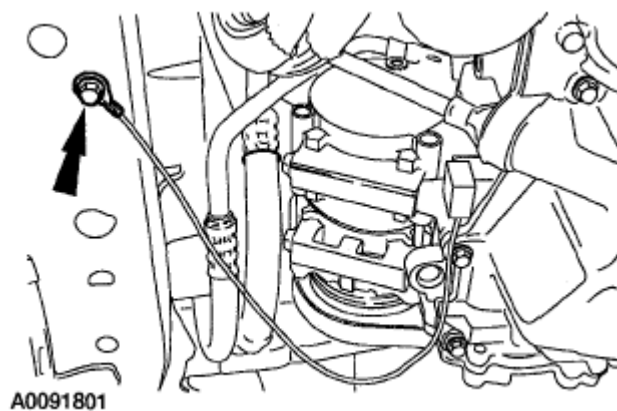


Fig. 303: Locating Ground Eyelet Bolt
Courtesy of MAZDA MOTORS CORP.

All wheel drive (AWD) vehicles

53. Position the driveshaft to the PTU and install the 6 bolts.
- Tighten to 37 N.m {3.7 kgf.m, 27 ft.lbf}.

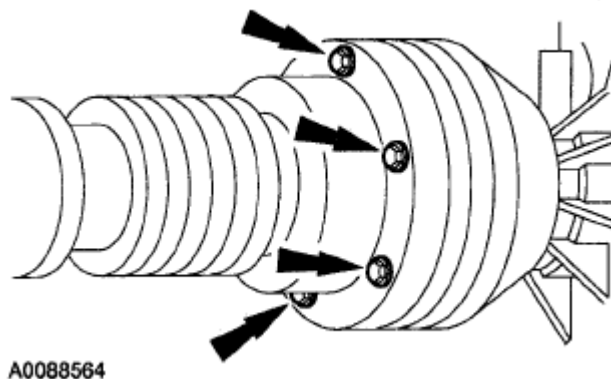


Fig. 304: Locating Driveshaft To PTU Bolts
Courtesy of MAZDA MOTORS CORP.

All vehicles

54. Install the generator air duct and make sure the tab is latched.

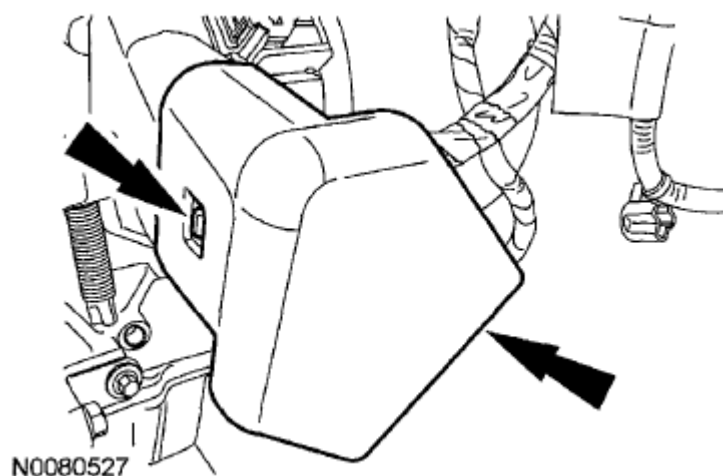
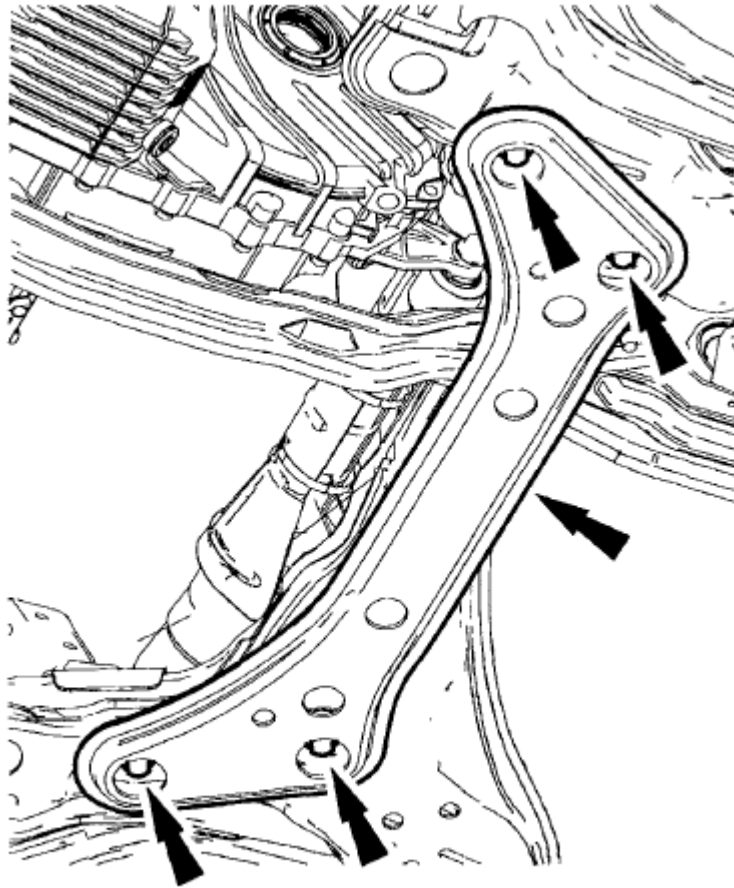


Fig. 305: Locating Locking Tab And Generator Air Duct
Courtesy of MAZDA MOTORS CORP.

55. Install the accessory drive belt.
56. Install the exhaust downpipe and exhaust intermediate pipe.
57. Install the lateral support crossmember and bolts.
 - Tighten to 115 N.m {11.5 kgf.m, 85 ft.lbf}.



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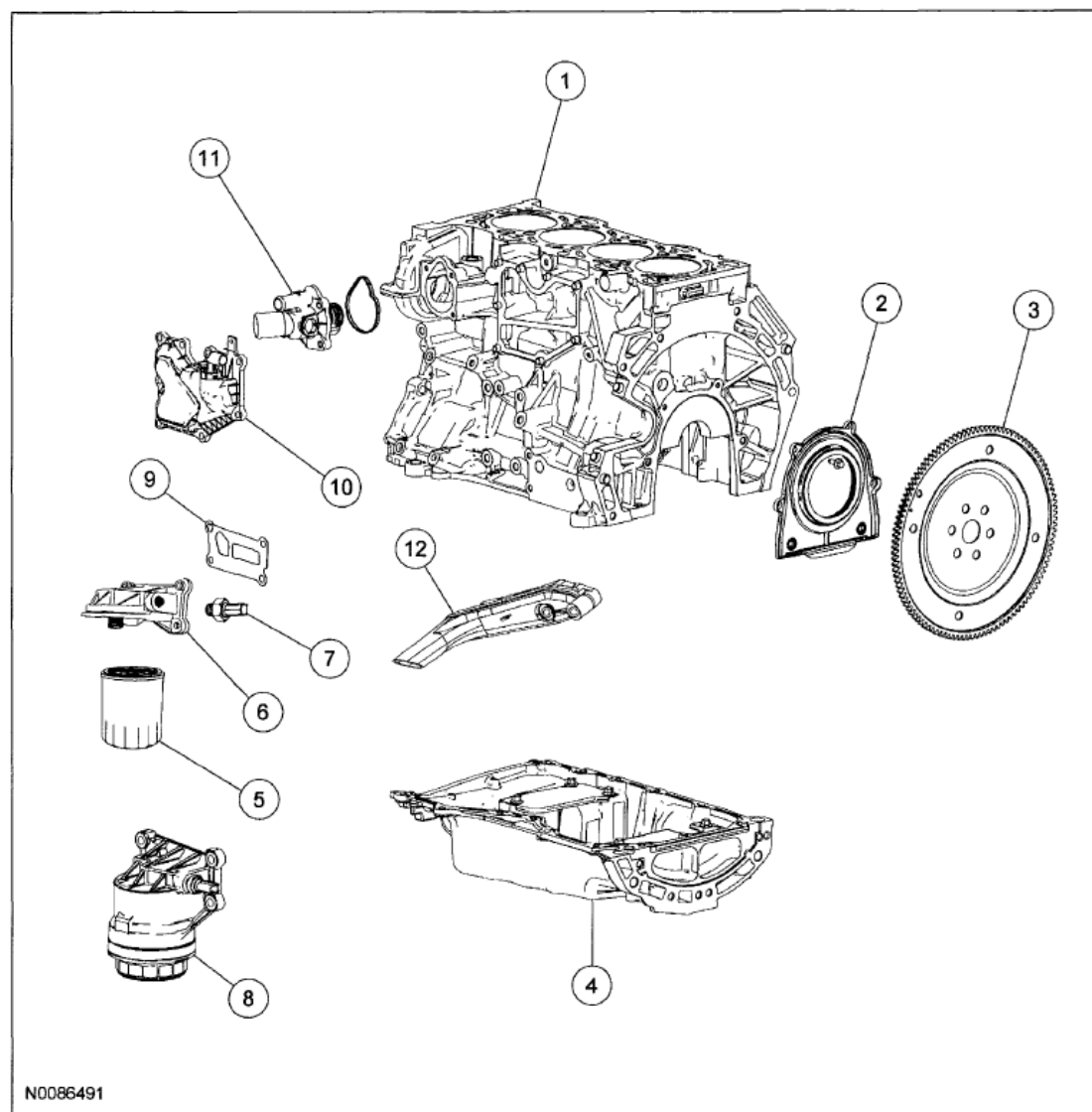
Fig. 306: Locating Lateral Support Crossmember Bolts
Courtesy of MAZDA MOTORS CORP.

58. Install the LH halfshaft and the intermediate shaft.
59. Install the battery tray and battery. See **BATTERY TRAY REMOVAL/INSTALLATION** .
60. Install the engine air cleaner and air cleaner outlet pipe. See **AIR CLEANER OUTLET PIPE REMOVAL/INSTALLATION - 2.5L** .
61. Fill the engine with clean engine oil.
62. Fill and bleed the cooling system. See **COOLING SYSTEM DRAINING, FILLING AND BLEEDING - 2.5L** .
63. Check and fill the transmission fluid as necessary.

AWD vehicles

64. Check and fill the PTU fluid as necessary.

LOWER ENGINE BLOCK EXPLODED VIEW - 2.5L



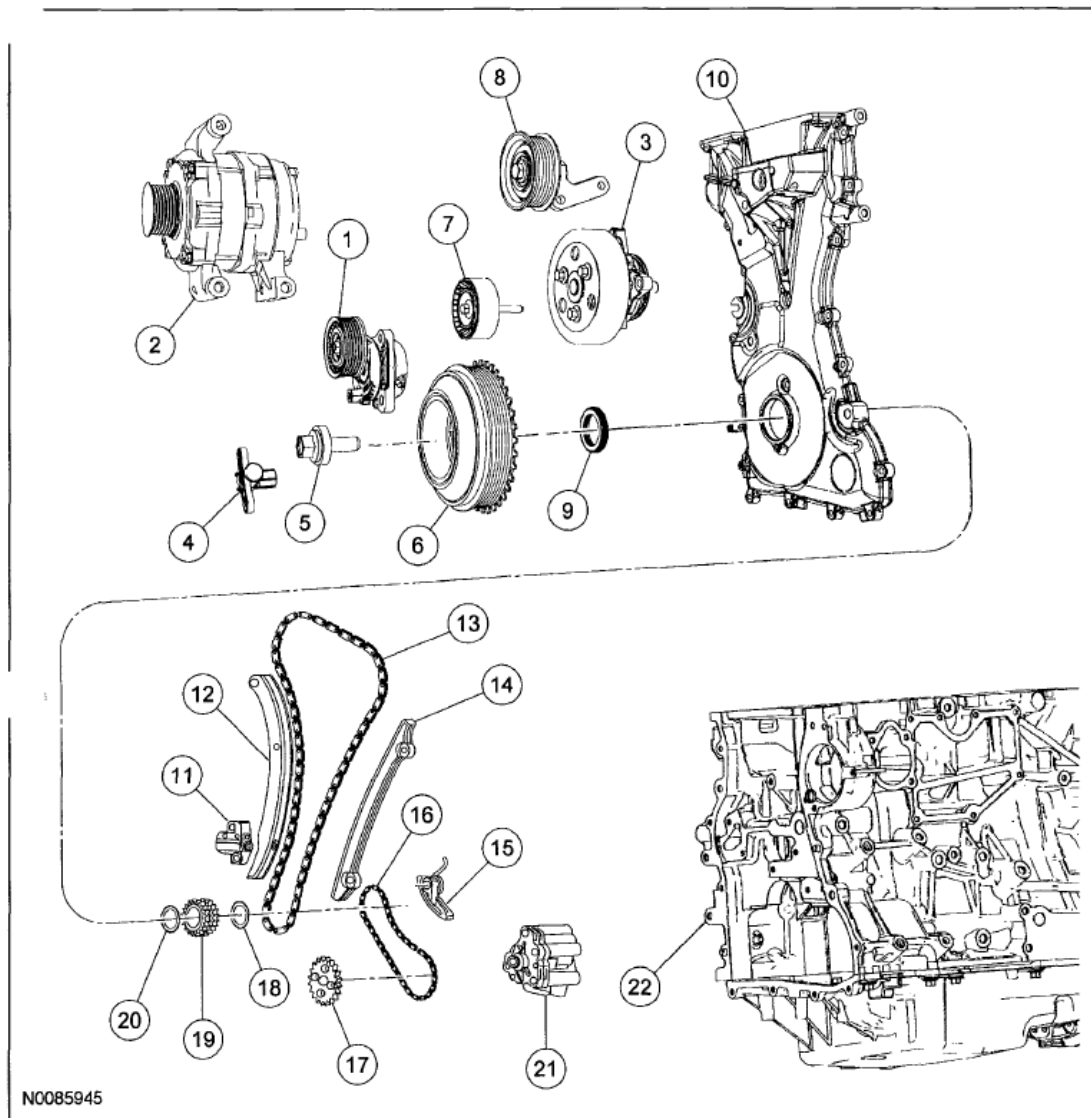
1	Cylinder block
2	Crankshaft rear oil seal and retainer
3	Flywheel/flexplate
4	Oil pan
5	Oil filter
6	Spin on oil filter adapter

7	Engine oil pressure (EOP) switch
8	Element oil filter adapter
9	Oil filter adapter gasket
10	Crankcase vent oil separator
11	Thermostat assembly
12	Oil pump screen and pickup tube

Fig. 307: Exploded View Of Lower Engine Block - 2.5L
 Courtesy of MAZDA MOTORS CORP.

1. For additional information, see the procedures in this service information.

FRONT ENGINE BLOCK EXPLODED VIEW - 2.5L



1	Accessory drive belt tensioner
2	Generator
3	Water pump and pulley
4	Crankshaft position (CKP) sensor
5	Crankshaft pulley bolt
6	Crankshaft pulley
7	Smooth idler pulley
8	Idler pulley and bracket
9	Crankshaft front seal
10	Engine front cover
11	Timing chain tensioner

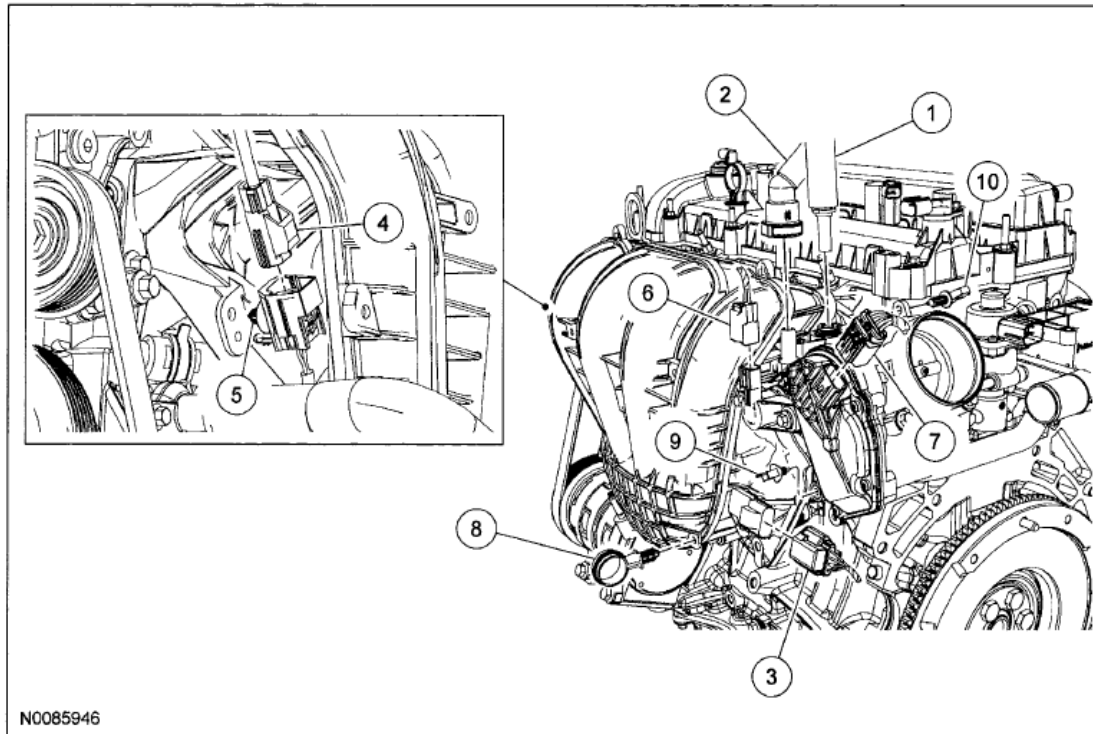
12	Timing chain tensioner arm
13	Timing chain
14	Timing chain guide
15	Oil pump chain tensioner
16	Oil pump chain
17	Oil pump drive gear
18	Diamond washer
19	Crankshaft sprocket
20	Diamond washer
21	Oil pump
22	Cylinder block

Fig. 308: Exploded View Of Front Engine Block - 2.5L
 Courtesy of MAZDA MOTORS CORP.

1. For additional information, see the procedures in this service information.

INTAKE MANIFOLD EXPLODED VIEW - 2.5L

Intake Manifold (View 1 of 2)

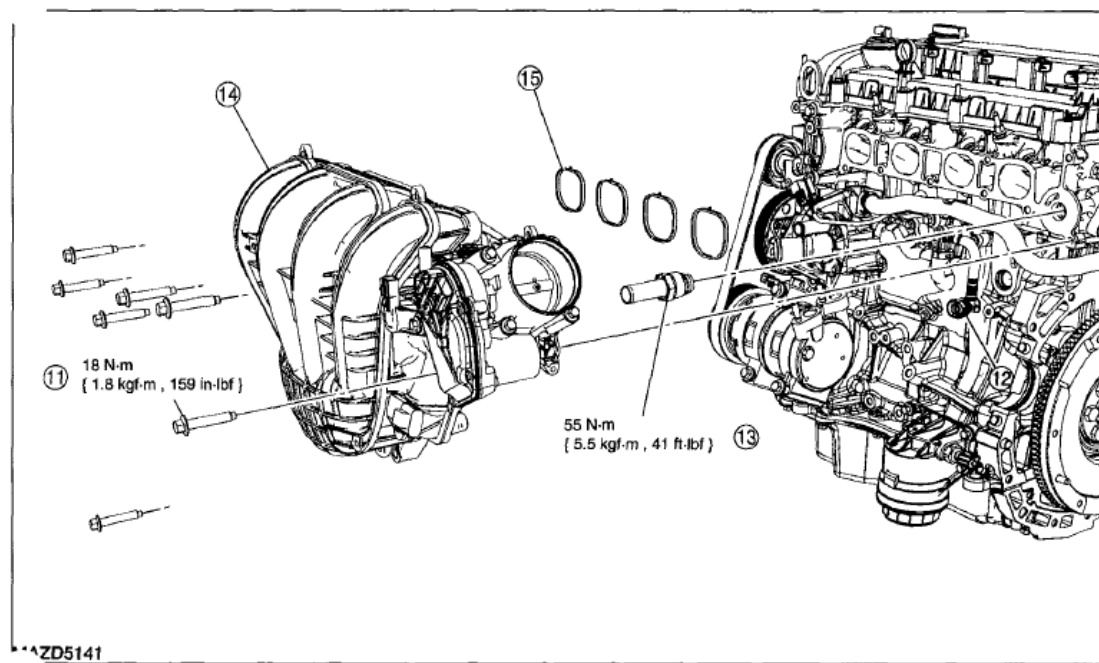


1	Vacuum supply hose
2	Fuel vapor return hose
3	Manifold Absolute Pressure (MAP) sensor electrical connector
4	Knock Sensor (KS) electrical connector
5	Wire harness pin-type retainer

6	Evaporative Emission (EVAP) canister purge valve electrical connector
7	Electronic throttle control electrical connector
8	Heater hose retainer
9	Wire harness pin-type retainer
10	Wire harness pin-type retainer

Fig. 309: Identifying Intake Manifold - 2.5L (1 Of 2)
 Courtesy of MAZDA MOTORS CORP.

Intake Manifold (View 2 of 2)



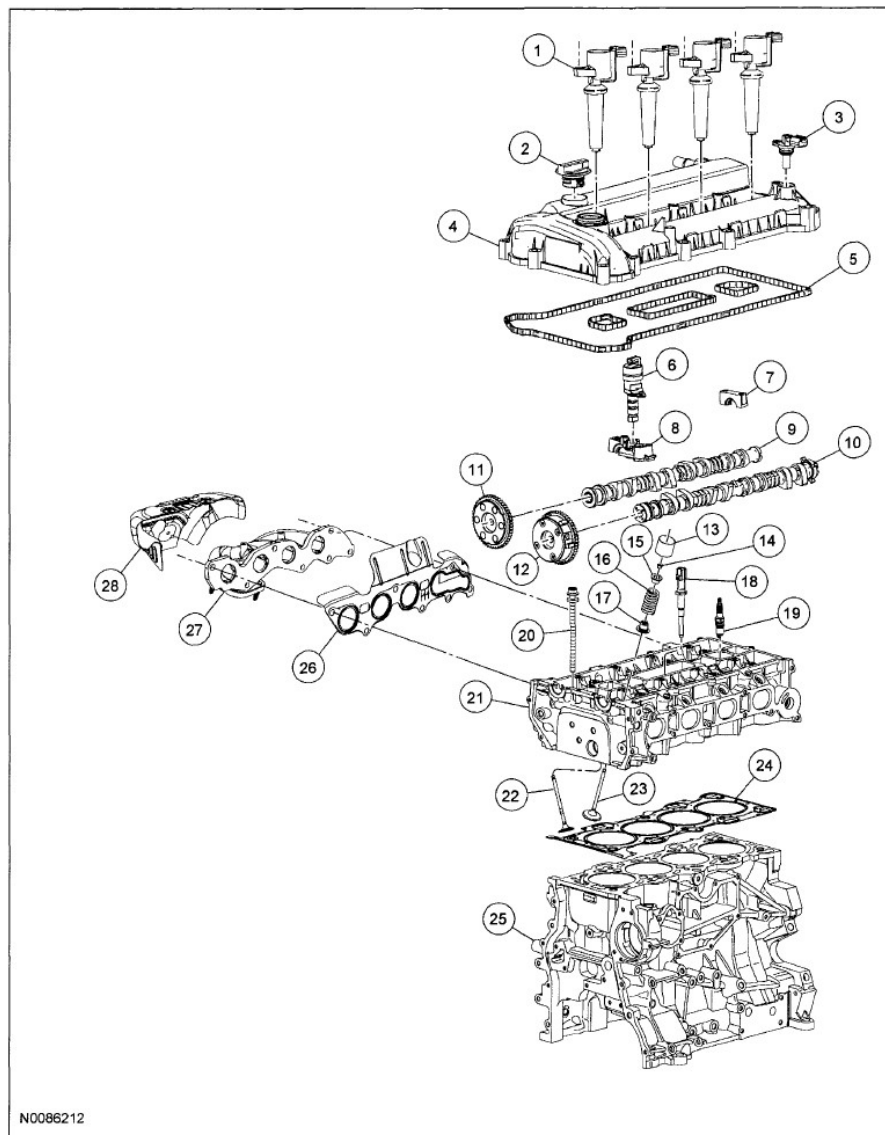
11	Intake manifold bolts (7 required)
12	Crankcase vent oil separator tube
13	EGR tube

14	Intake manifold
15	Intake manifold gasket

Fig. 310: Identifying Intake Manifold - 2.5L (2 Of 2)
Courtesy of MAZDA MOTORS CORP.

1. For additional information, see the procedures in this service information.

CYLINDER HEAD EXPLODED VIEW - 2.5L



N0086212

1	Coil-on-plug assemblies (4 required)
2	Oil filler cap
3	Camshaft position (CMP) sensor
4	Valve cover
5	Valve cover gasket
6	Variable Camshaft Timing (VCT) oil control solenoid
7	Camshaft bearing caps (9 required)
8	Camshaft bearing cap
9	Camshaft (exhaust)
10	Camshaft (intake)
11	Camshaft sprocket
12	VCT actuator
13	Valve tappets (16 required)
14	Valve collets (16 required)

15	Valve spring retainers (16 required)
16	Valve springs (16 required)
17	Valve stem seals (16 required)
18	Cylinder Head Temperature (CHT) sensor
19	Spark plugs (4 required)
20	Cylinder head bolts (10 required)
21	Cylinder head
22	Exhaust valves (8 required)
23	Intake valves (8 required)
24	Head gasket
25	Cylinder block
26	Exhaust manifold gasket
27	Exhaust manifold
28	Exhaust manifold heat shield

Fig. 311: Exploded View Of Cylinder Head - 2.5L
Courtesy of MAZDA MOTORS CORP.

1. For additional information, see the procedures in this service information.

ENGINE DISASSEMBLY - 2.5L

DISASSEMBLY

- CAUTION:**
- Do not loosen or remove the crankshaft pulley without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if you loosen the pulley bolt. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshafts and camshafts must be locked in place by special service tools, otherwise severe engine damage can occur.

- CAUTION:**
- During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces that enters the oil passages, coolant passages or the oil pan, can cause engine failure.

- NOTE:**
- Due to the precision fit and timing of the balancer shaft assembly, it cannot be removed from the engine block.

- NOTE:**
- For additional information, see the exploded views in this service information.

Vehicles with manual transaxles

1. Remove the bolts, clutch pressure plate and clutch disc.

- WARNING:**
- The clutch disc and clutch pressure plate are heavy and may fall if not held when the bolts are removed. Failure to follow this instruction may result in serious personal injury.

- CAUTION:**
- Loosen the bolts evenly to prevent pressure plate damage.

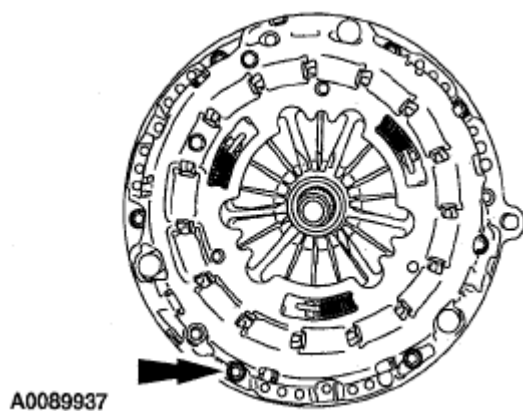


Fig. 312: Locating Clutch Pressure Plate To Clutch Disc Bolts
Courtesy of MAZDA MOTORS CORP.

2. Remove the starter motor isolator.

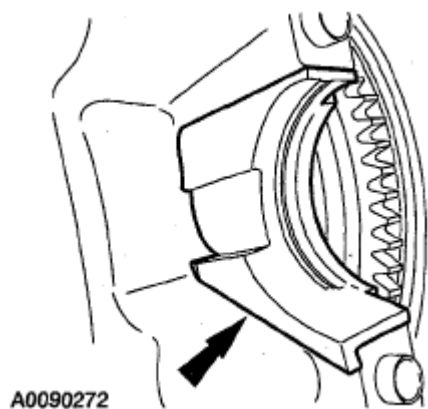


Fig. 313: Locating Starter Motor Isolator
Courtesy of MAZDA MOTORS CORP.

3. Remove the bolts and the flywheel.

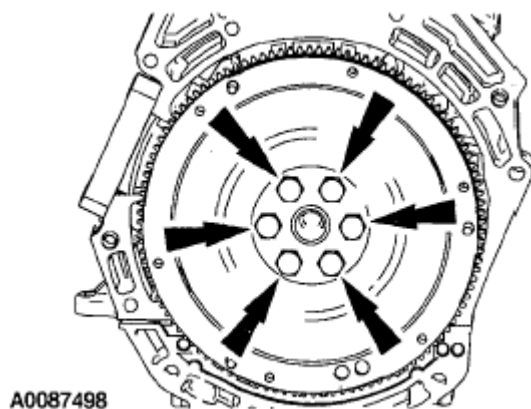


Fig. 314: Locating Flywheel Bolts

Courtesy of MAZDA MOTORS CORP.

Vehicles with automatic transaxles

4. Remove the bolts and the flexplate.

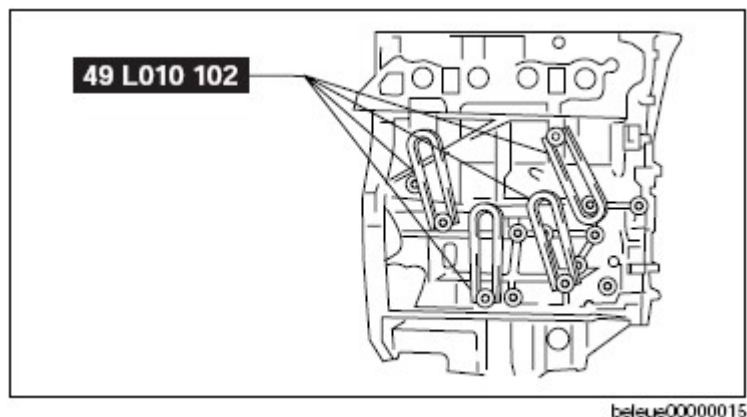


Fig. 315: Locating Flexplate Bolts
Courtesy of MAZDA MOTORS CORP.

All vehicles

5. Mount the engine on a suitable stand.
6. Disconnect the crankshaft position (CKP) sensor electrical connector.

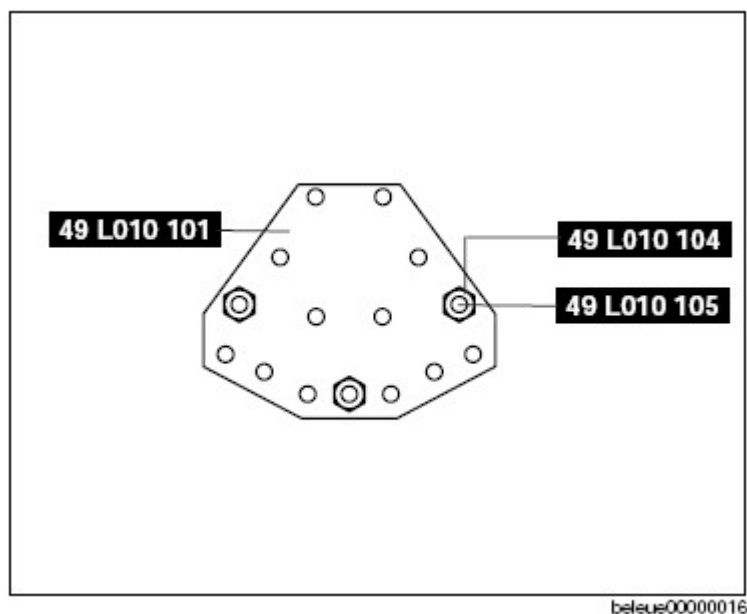
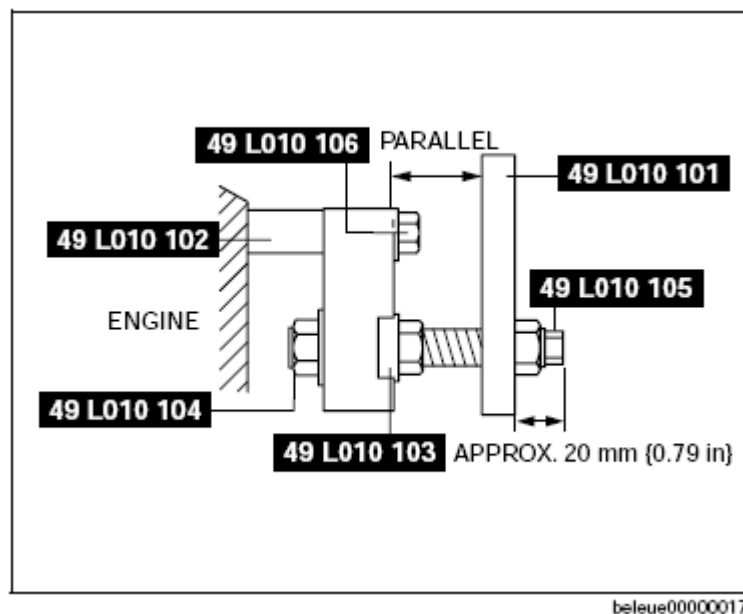


Fig. 316: Locating Crankshaft Position Sensor Electrical Connector
Courtesy of MAZDA MOTORS CORP.

7. Remove the nut and disconnect the generator electrical connections.

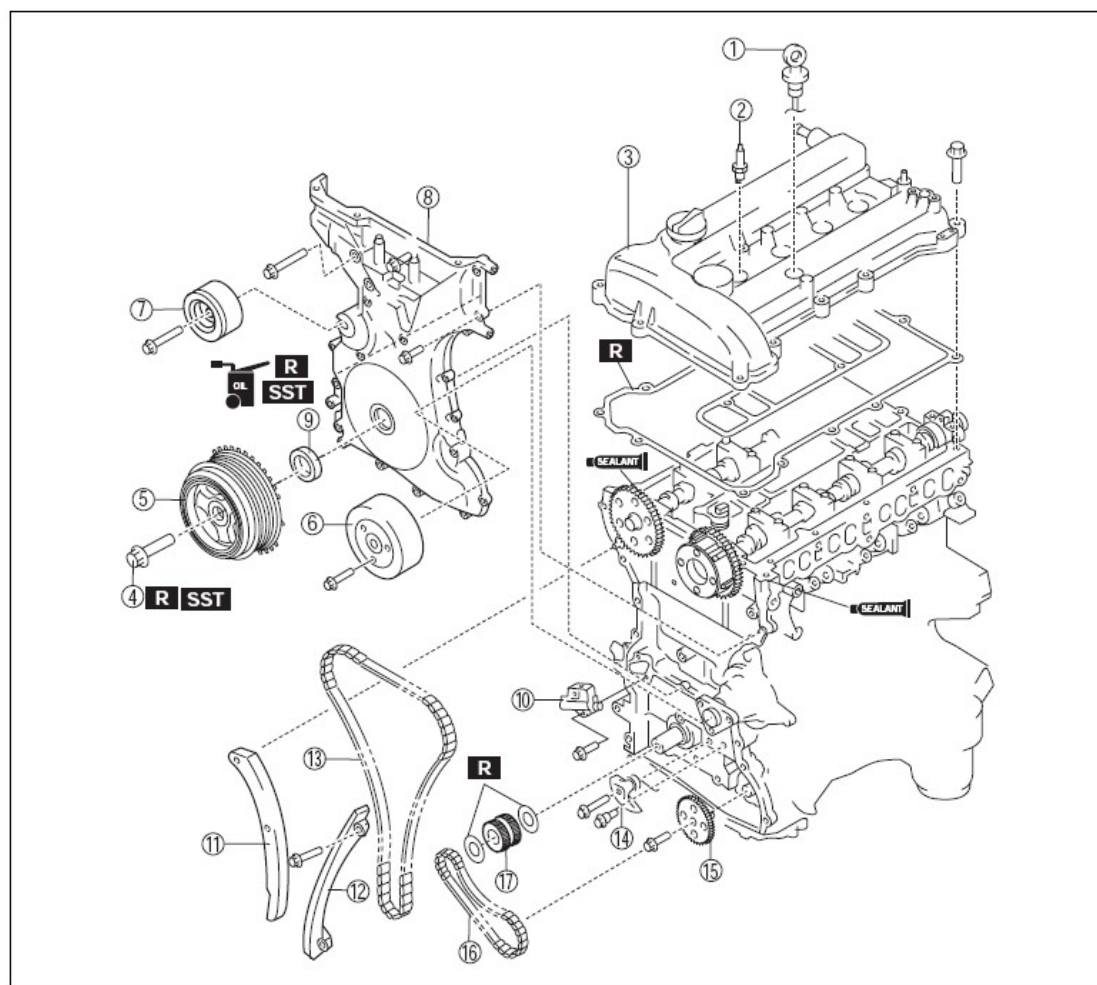


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Fig. 317: Locating Nut And Generator Electrical Connections
 Courtesy of MAZDA MOTORS CORP.

Front wheel drive (FWD) vehicles

8. Remove the 2 lower catalytic converter bolts.



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1	Dipstick
2	Spark plug
3	Cylinder head cover
4	Crankshaft pulley lock bolt (See Crankshaft Pulley Lock Bolt Disassembly Note.)
5	Crankshaft pulley
6	Water pump pulley
7	Drive belt idler pulley
8	Engine front cover
9	Front oil seal (See Front Oil Seal Disassembly Note.)

10	Chain tensioner (See Chain Tensioner Disassembly Note.)
11	Tensioner arm
12	Chain guide
13	Timing chain
14	Oil pump chain tensioner
15	Oil pump sprocket (See Oil Pump Sprocket Disassembly Note.)
16	Oil pump chain
17	Crankshaft sprocket

Fig. 318: Locating Lower Catalytic Converter Bolts
Courtesy of MAZDA MOTORS CORP.

9. Remove the 6 heat shield bolts and the heat shield.

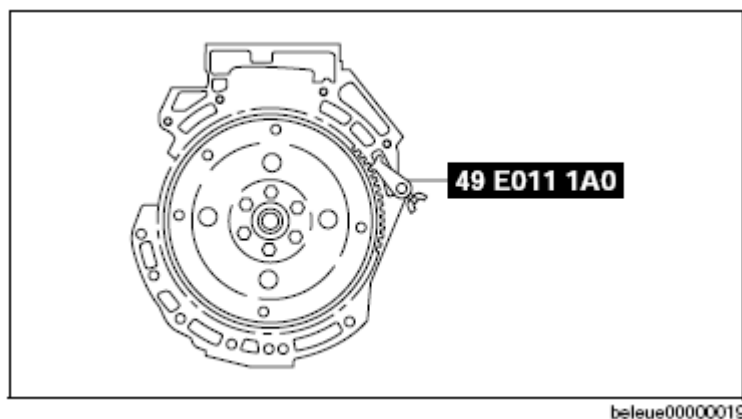


Fig. 319: Locating Heat Shield Bolts And Heat Shield
Courtesy of MAZDA MOTORS CORP.

10. Remove and discard the 7 exhaust manifold nuts.

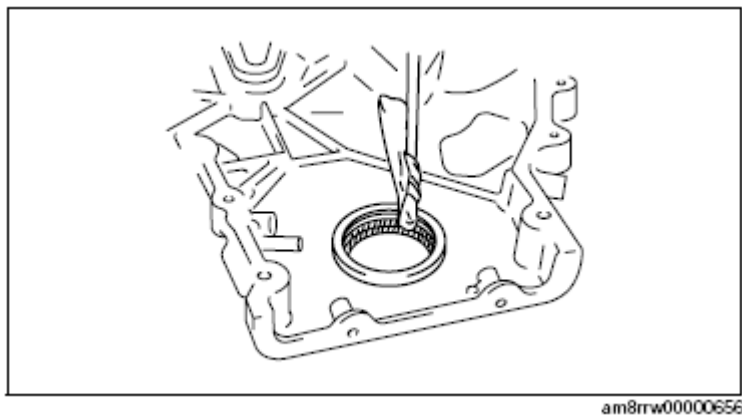


Fig. 320: Locating Exhaust Manifold Nuts
Courtesy of MAZDA MOTORS CORP.

11. Remove the catalytic converter and discard the exhaust manifold gasket.
12. Remove and discard the 7 exhaust manifold studs.

All vehicles

13. 13. Remove the nut, bolts and the generator.

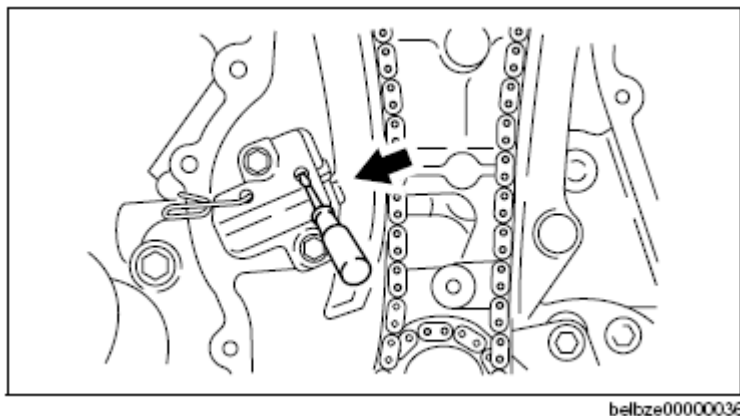


Fig. 321: Locating Generator Nut And Bolts
Courtesy of MAZDA MOTORS CORP.

14. Loosen the bolt and remove the accessory drive belt idler pulley.

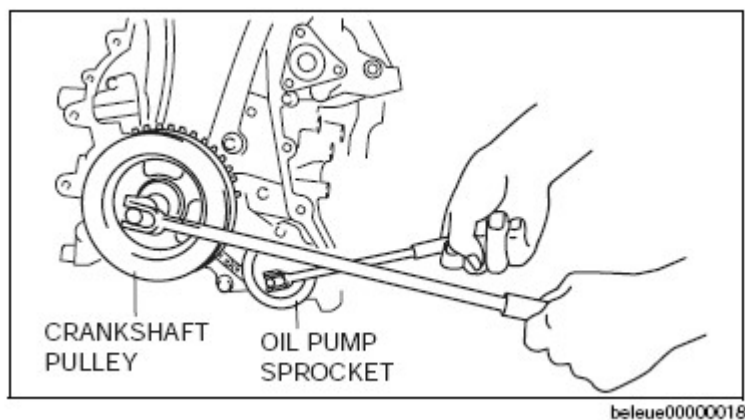
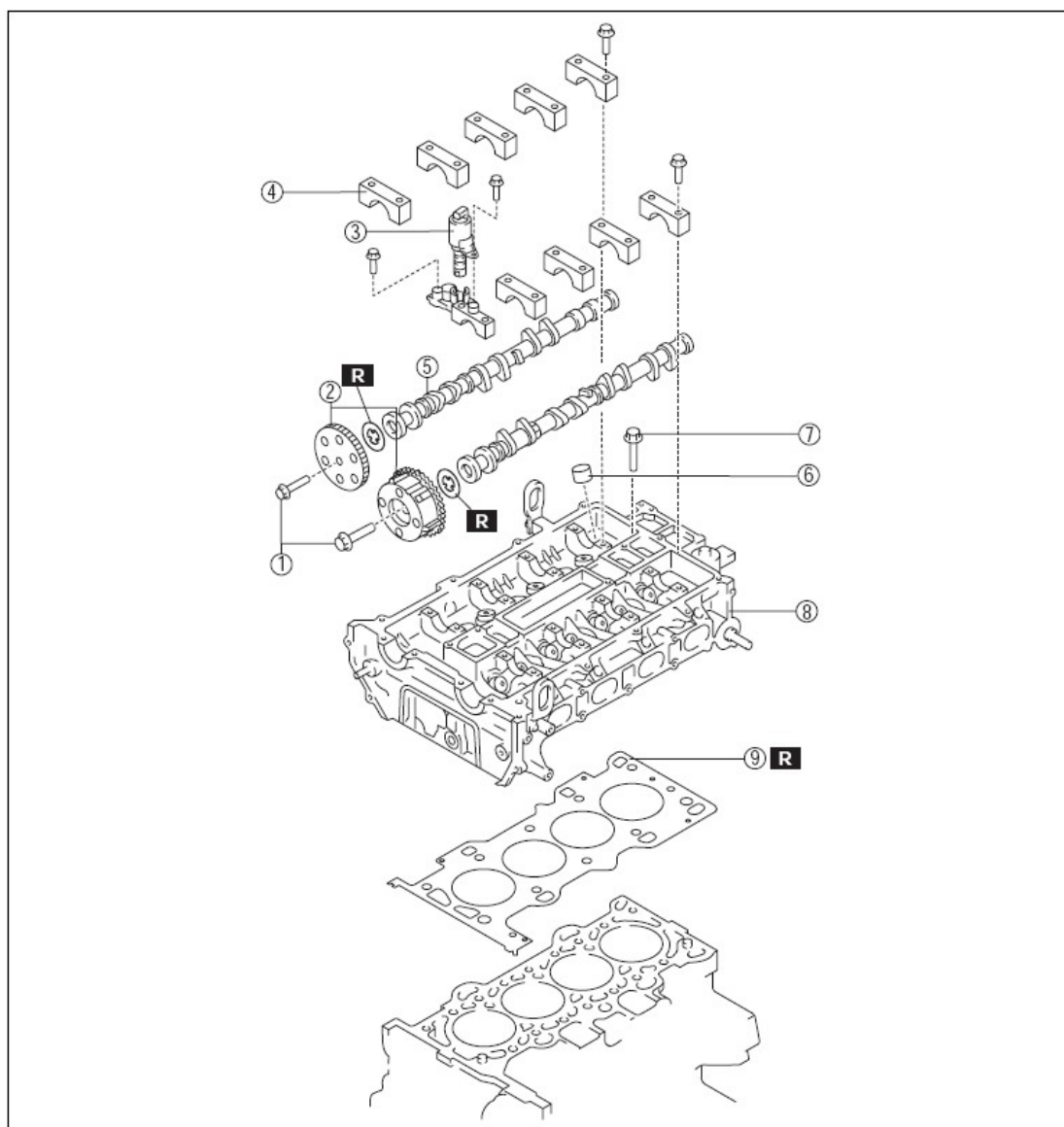


Fig. 322: Locating Accessory Drive Belt Idler Pulley And Bolt
Courtesy of MAZDA MOTORS CORP.

15. Remove the 3 bolts and the accessory drive belt idler pulley and bracket.



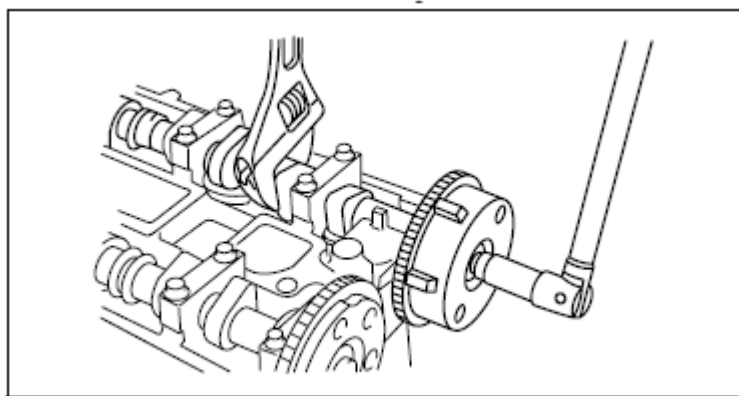
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1	Camshaft sprocket lock bolt, variable valve timing actuator lock bolt (See Camshaft Sprocket Lock Bolt, Variable Valve Timing Actuator Lock Bolt Disassembly Note.)
2	Camshaft sprocket, variable valve timing actuator
3	OCV
4	Camshaft cap (See Camshaft Cap Disassembly Note.)
5	Camshaft

6	Tappet (See Tappet Disassembly Note.)
7	Cylinder head bolt (See Cylinder Head Bolt Disassembly Note.)
8	Cylinder head
9	Cylinder head gasket

Fig. 323: Locating Accessory Drive Belt Idler Pulley Bracket And Bolts
Courtesy of MAZDA MOTORS CORP.

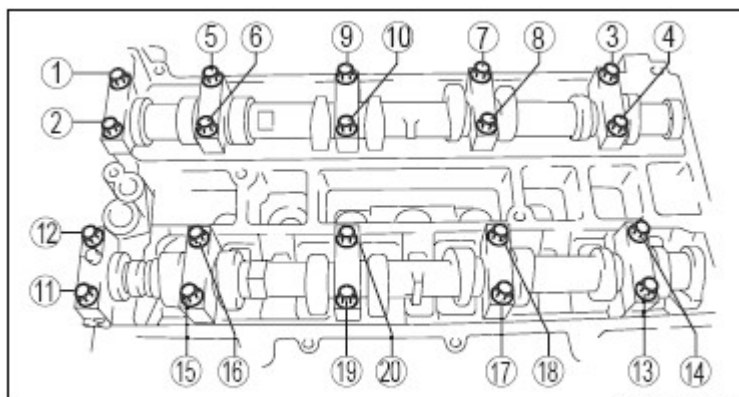
16. Remove the bolts and the coolant pump pulley.



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Fig. 324: Locating Coolant Pump Pulley Bolts
Courtesy of MAZDA MOTORS CORP.

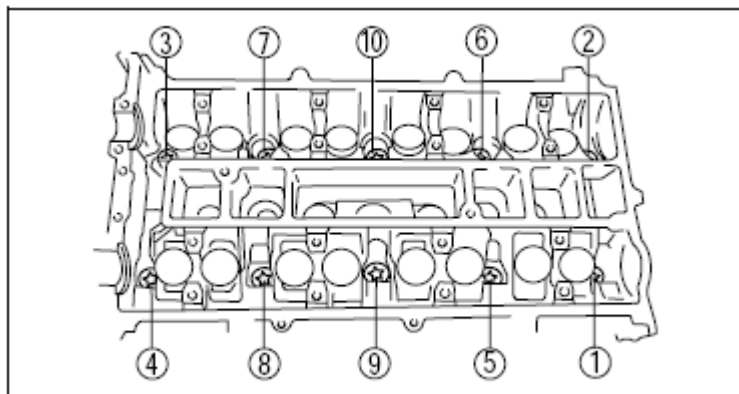
17. Remove the bolts and the coolant pump.



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Fig. 325: Locating Coolant Pump Bolts
Courtesy of MAZDA MOTORS CORP.

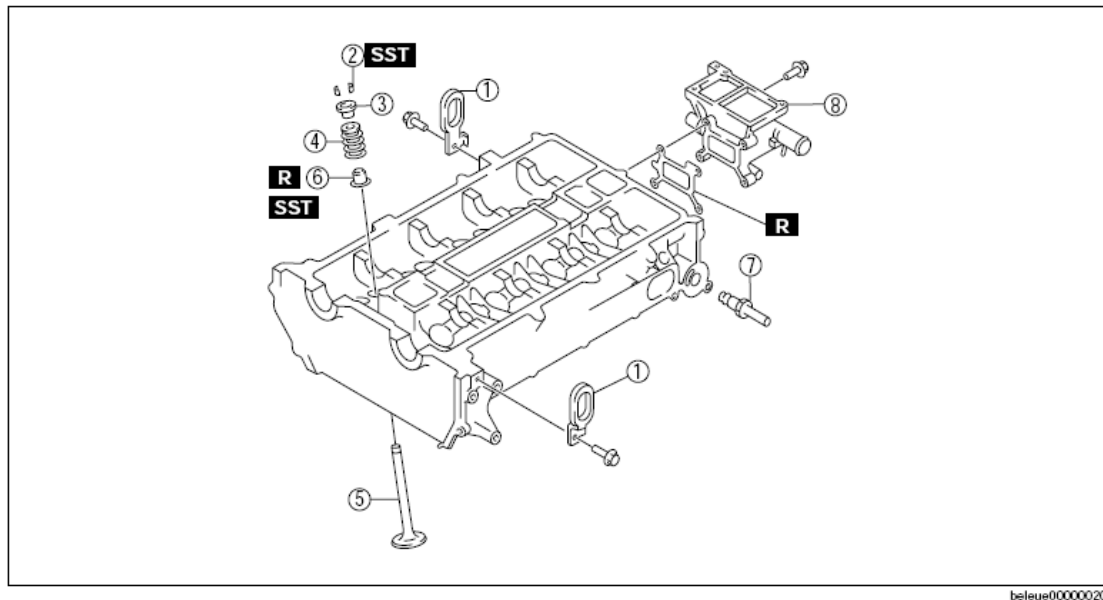
18. Detach the 2 wiring harness retainers.



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Fig. 326: Locating Wiring Harness Retainers
Courtesy of MAZDA MOTORS CORP.

19. Remove the 3 bolts and the thermostat housing assembly.



1	Engine hanger
2	Valve keeper (See Valve Keeper Disassembly Note.)
3	Upper valve spring seat
4	Valve spring

5	Valve
6	Valve seal (See Valve Seal Disassembly Note.)
7	EGR pipe
8	Water outlet case

Fig. 327: Locating Bolts And Thermostat Housing Assembly
Courtesy of MAZDA MOTORS CORP.

20. Remove the bolt and the oil level indicator.

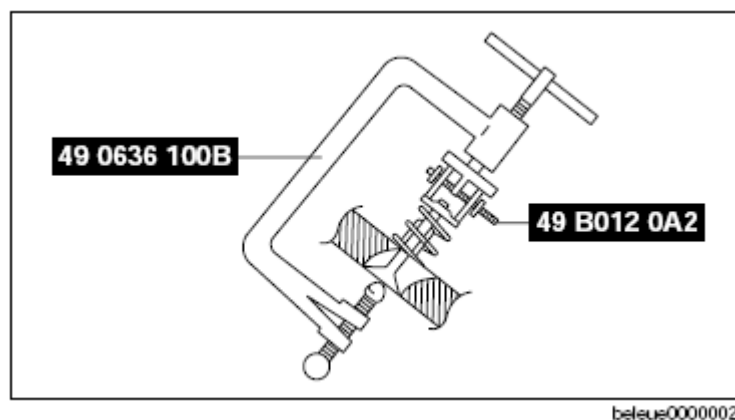


Fig. 328: Locating Bolt And Oil Level Indicator
Courtesy of MAZDA MOTORS CORP.

21. Disconnect the engine oil pressure (EOP) switch electrical connector.

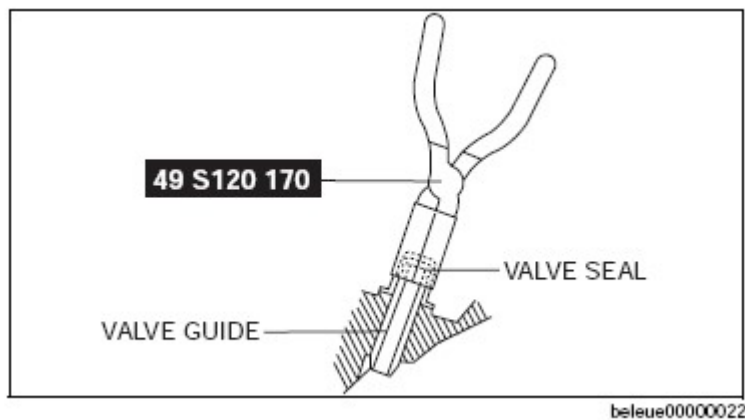
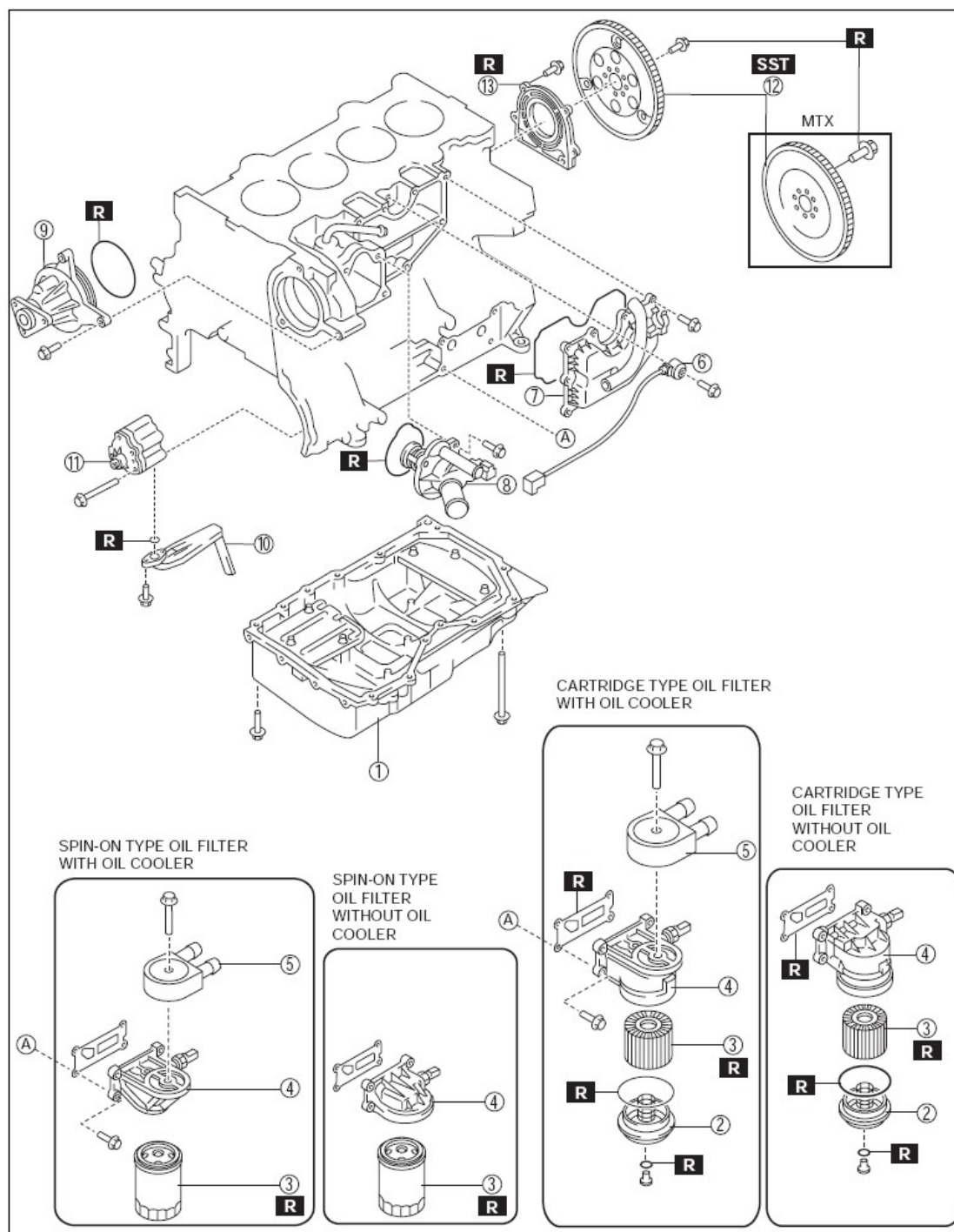


Fig. 329: Locating Engine Oil Pressure Switch Electrical Connector
Courtesy of MAZDA MOTORS CORP.

22. Remove the engine oil filter.

2009 Mazda Tribute Hybrid Grand Touring

2009 ENGINE Mechanical - 2.5L - Tribute



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1	Oil pan
2	Oil filter cover
3	Oil filter
4	Oil filter adapter
5	Oil cooler (If equipped)
6	KS
7	Oil separator
8	Thermostat

9	Water pump
10	Oil strainer
11	Oil pump
12	Flywheel (MTX), Drive plate (ATX) (See Drive Plate (ATX), Flywheel (MTX) Disassembly Note)
13	Rear oil seal

Fig. 330: Locating Engine Oil Filter
Courtesy of MAZDA MOTORS CORP.

23. Remove the 4 bolts and the oil filter adapter.
 - Discard the gasket.

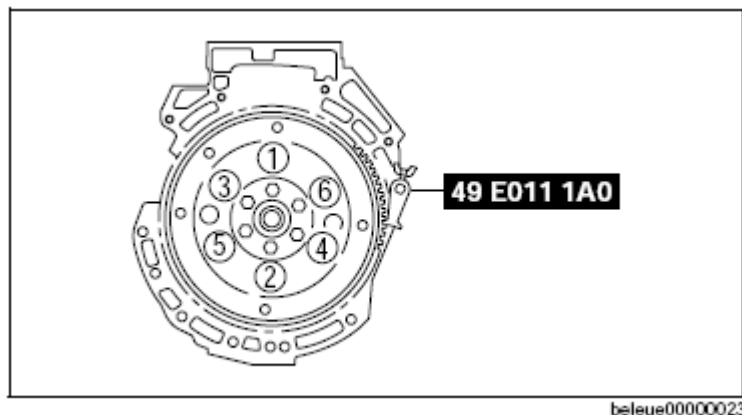
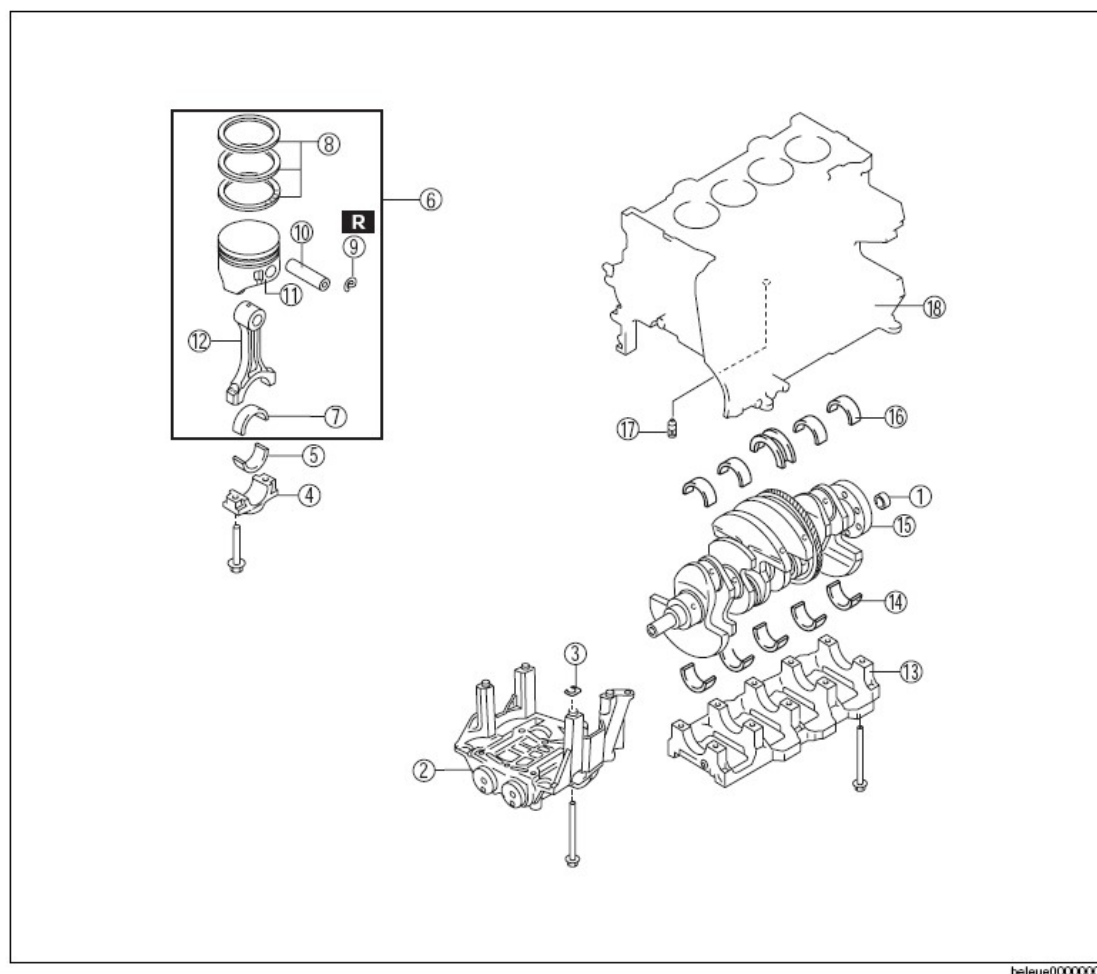


Fig. 331: Locating Bolts And Oil Filter Adapter
Courtesy of MAZDA MOTORS CORP.

24. If equipped, remove the bolt and capacitor.



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1	Pilot bearing (MTX) (See Pilot Bearing Disassembly Note.)
2	Balancer unit
3	Adjustment shim
4	Connecting rod cap (See Connecting Rod Cap Disassembly Note.)
5	Lower connecting rod bearing
6	Connecting rod, piston component
7	Upper connecting rod bearing
8	Piston ring

9	Snap ring
10	Piston pin
11	Piston
12	Connecting rod
13	Main bearing cap (See Main Bearing Cap Disassembly Note.)
14	Lower main bearing, thrust bearing
15	Crankshaft
16	Upper main bearing, thrust bearing
18	Cylinder block
17	Oil jet valve

Fig. 332: Locating Bolt And Capacitor
Courtesy of MAZDA MOTORS CORP.

25. Detach the 2 wiring harness retainers.

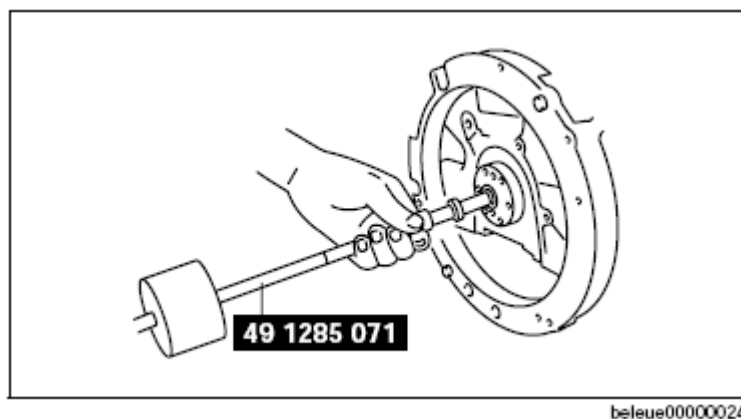


Fig. 333: Locating Wiring Harness Retainers
Courtesy of MAZDA MOTORS CORP.

26. Disconnect the knock sensor (KS) and detach the 2 wiring harness retainers.

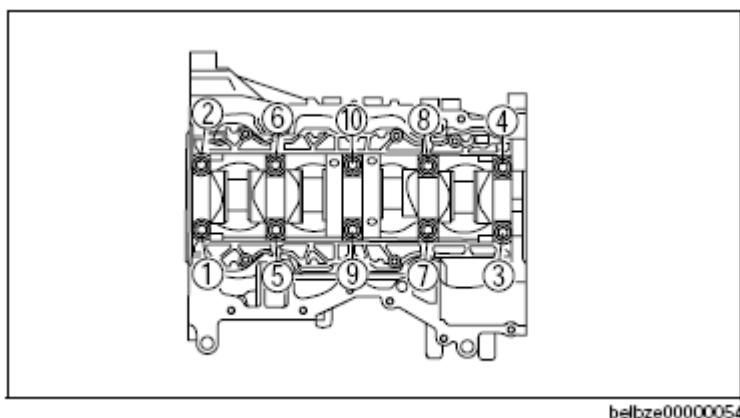


Fig. 334: Locating Knock Sensor And Wiring Harness Retainers
Courtesy of MAZDA MOTORS CORP.

27. Disconnect the temperature manifold absolute pressure (TMAP) sensor electrical connector.

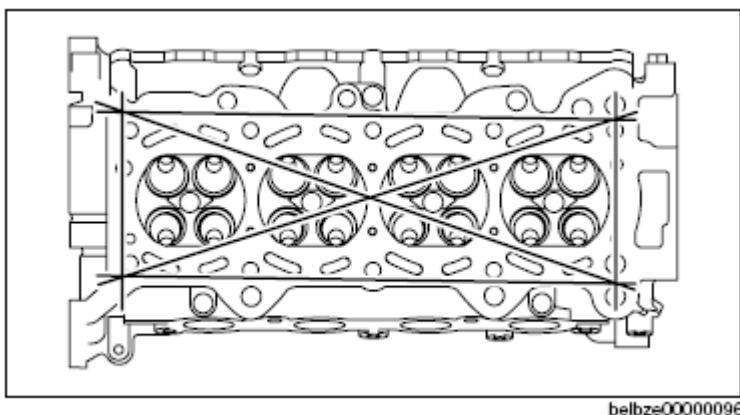


Fig. 335: Locating Temperature Manifold Absolute Pressure Sensor Electrical Connector
Courtesy of MAZDA MOTORS CORP.

28. Disconnect the idle air control (IAC) motor electrical connector.

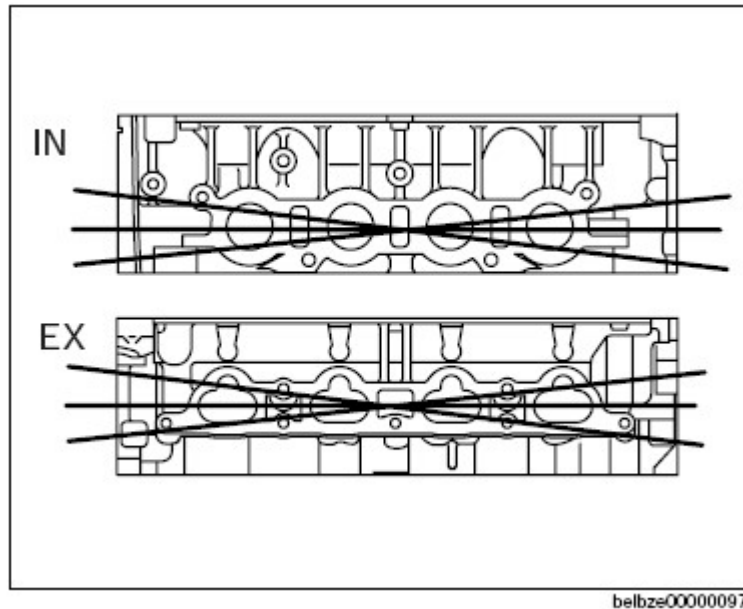


Fig. 336: Locating Idle Air Control Motor Electrical Connector
Courtesy of MAZDA MOTORS CORP.

29. Disconnect the swirl control valve electrical connector.

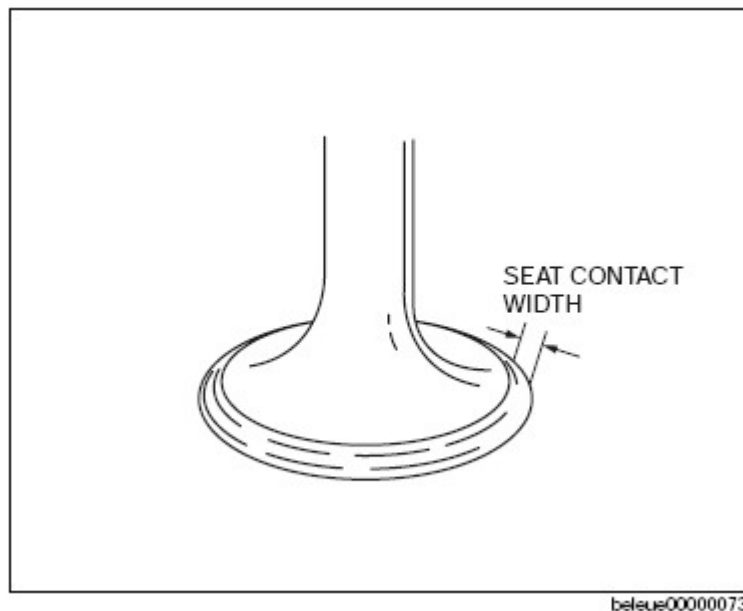


Fig. 337: Locating Swirl Control Valve Electrical Connector
Courtesy of MAZDA MOTORS CORP.

30. Disconnect the fuel rail pressure and temperature sensor electrical connector and vacuum tube.

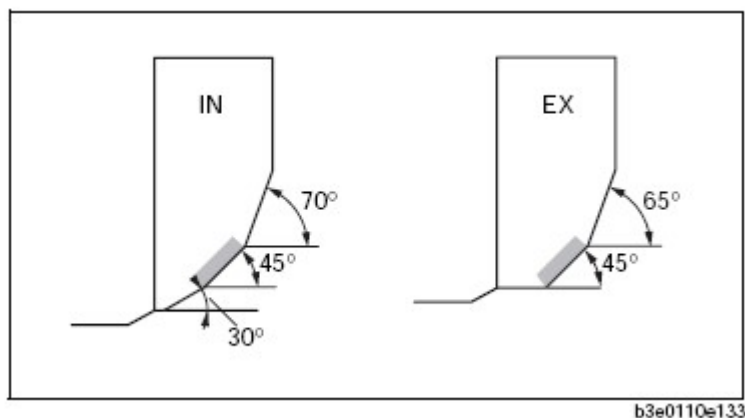


Fig. 338: Locating Fuel Rail Pressure And Temperature Sensor Electrical Connector And Vacuum Tube
Courtesy of MAZDA MOTORS CORP.

31. Disconnect the radio capacitor electrical connector.

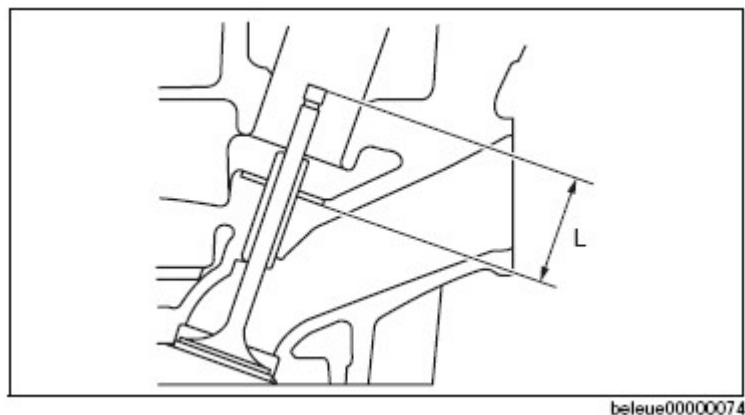


Fig. 339: Locating Radio Capacitor Electrical Connector
Courtesy of MAZDA MOTORS CORP.

32. Disconnect the throttle position (TP) sensor electrical connector.

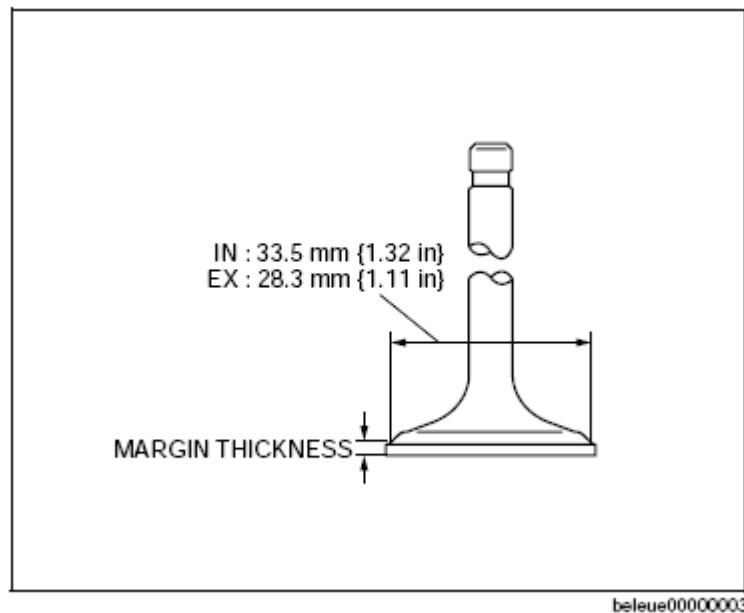


Fig. 340: Locating Throttle Position Sensor Electrical Connector
Courtesy of MAZDA MOTORS CORP.

33. Remove the bolts and position the intake manifold aside.

NOTE:

- There are 2 different size bolts used. Mark the location of the bolts to make sure of installation in the correct locations.

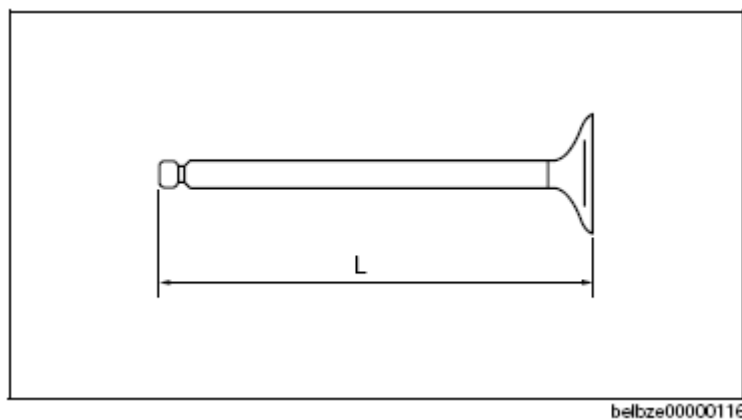
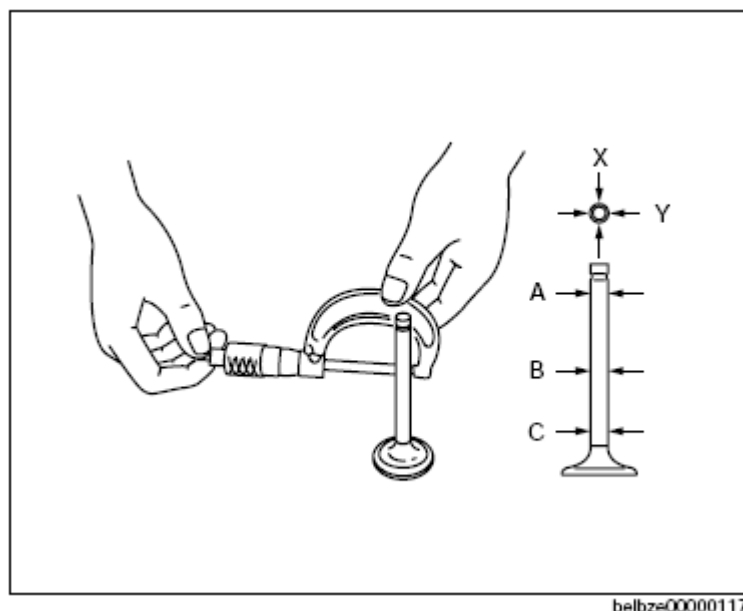


Fig. 341: Locating Bolts And Intake Manifold
Courtesy of MAZDA MOTORS CORP.

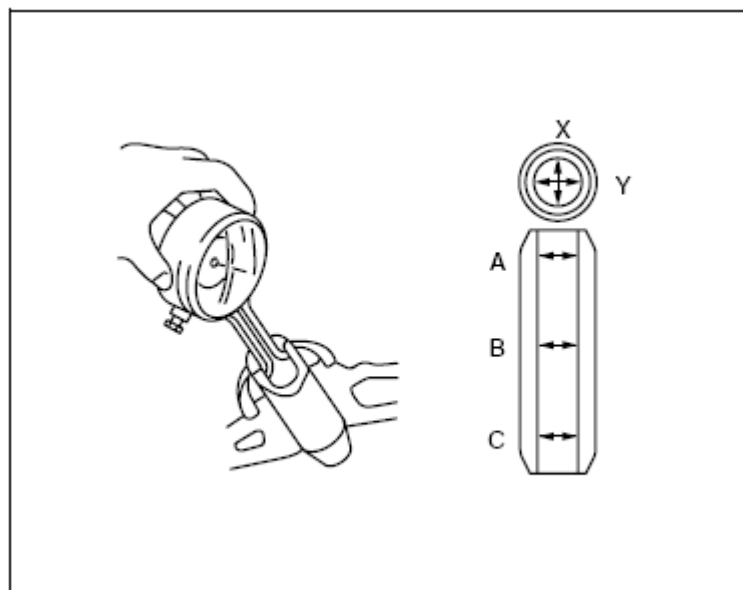
34. Disconnect the positive crankcase ventilation (PCV) hose and remove the intake manifold.



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Fig. 342: Locating Positive Crankcase Ventilation Hose And Intake Manifold
Courtesy of MAZDA MOTORS CORP.

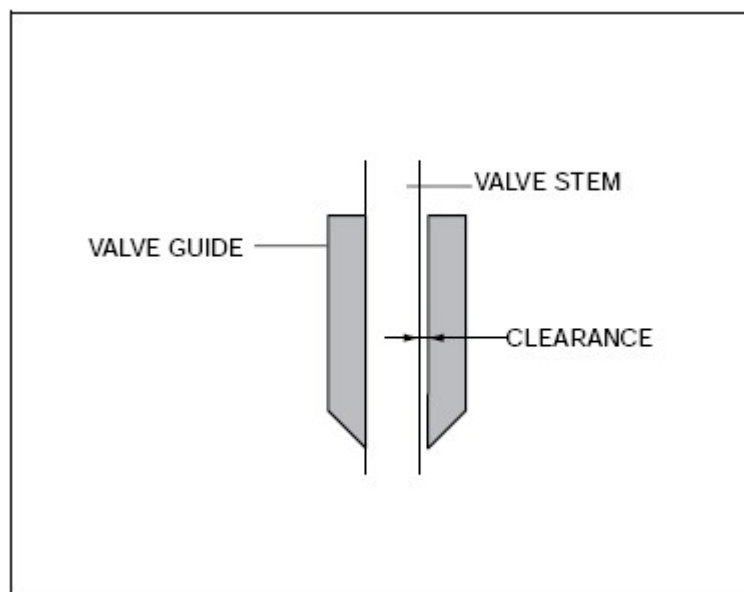
35. Remove the exhaust gas recirculation (EGR) tube.



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Fig. 343: Locating Exhaust Gas Recirculation Tube
Courtesy of MAZDA MOTORS CORP.

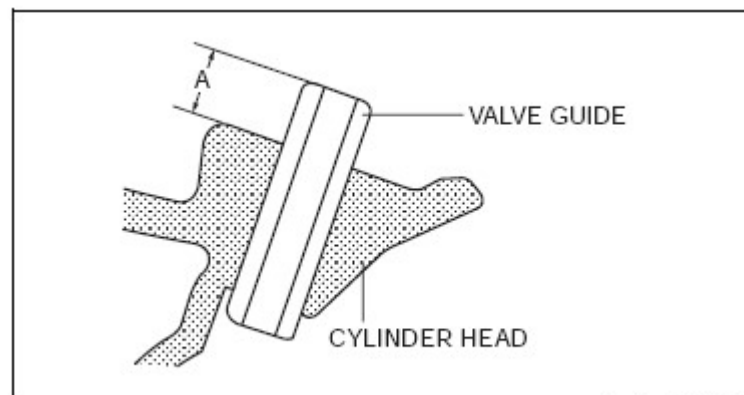
36. Disconnect the 4 fuel injector electrical connectors.
 - Detach the 2 wiring harness retainers.



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Fig. 344: Locating Fuel Injector Electrical Connectors
 Courtesy of MAZDA MOTORS CORP.

37. Remove the nut and the radio capacitor.



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Fig. 345: Locating Nut And Radio Capacitor
 Courtesy of MAZDA MOTORS CORP.

38. Remove the 2 stud bolts and the fuel rail with the fuel injectors.

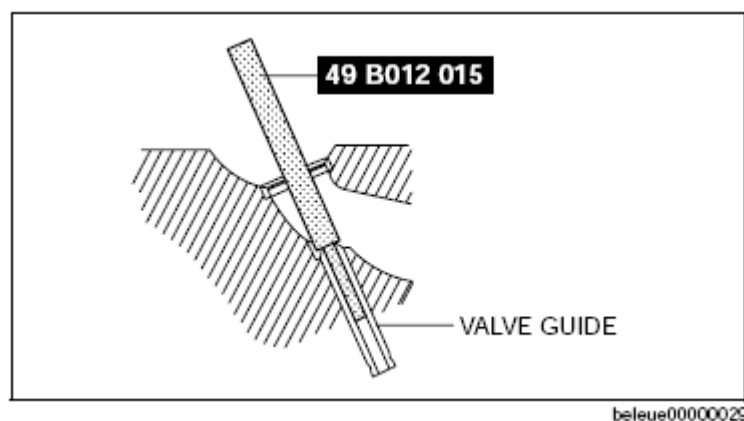


Fig. 346: Locating Stud Bolts And Fuel Rail With Fuel Injectors
Courtesy of MAZDA MOTORS CORP.

39. Detach the wiring harness retainer.

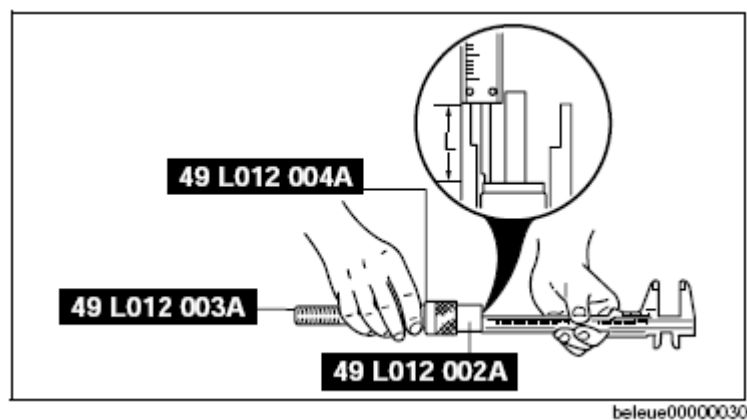


Fig. 347: Locating Wiring Harness Retainer
Courtesy of MAZDA MOTORS CORP.

40. Disconnect the EGR valve electrical connectors.
- Detach the wiring harness retainer.

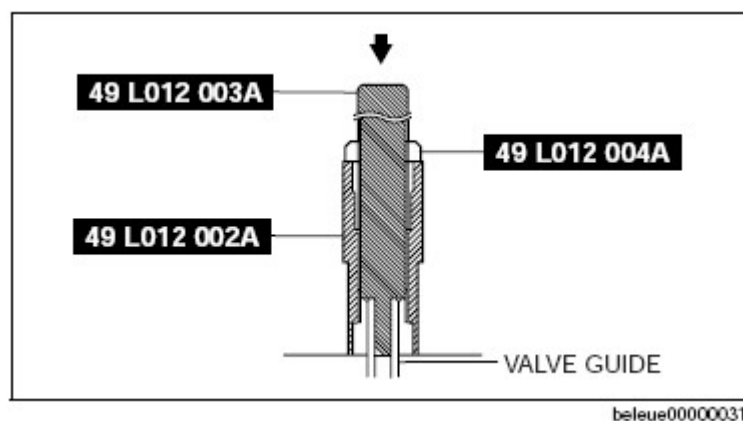


Fig. 348: Locating EGR Valve Electrical Connectors
Courtesy of MAZDA MOTORS CORP.

41. Disconnect the coil-on-plug and camshaft position (CMP) sensor electrical connectors.

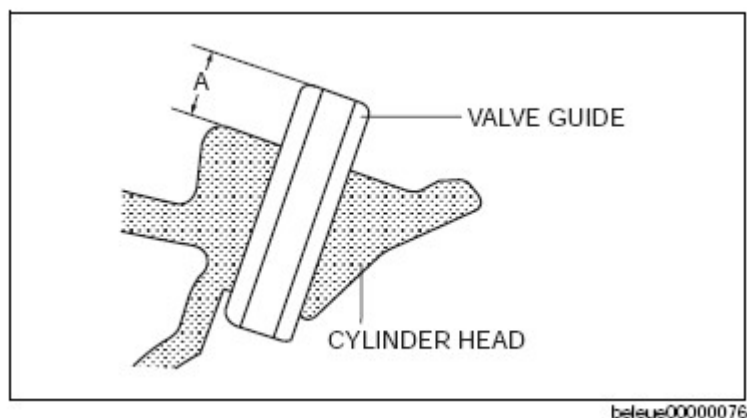
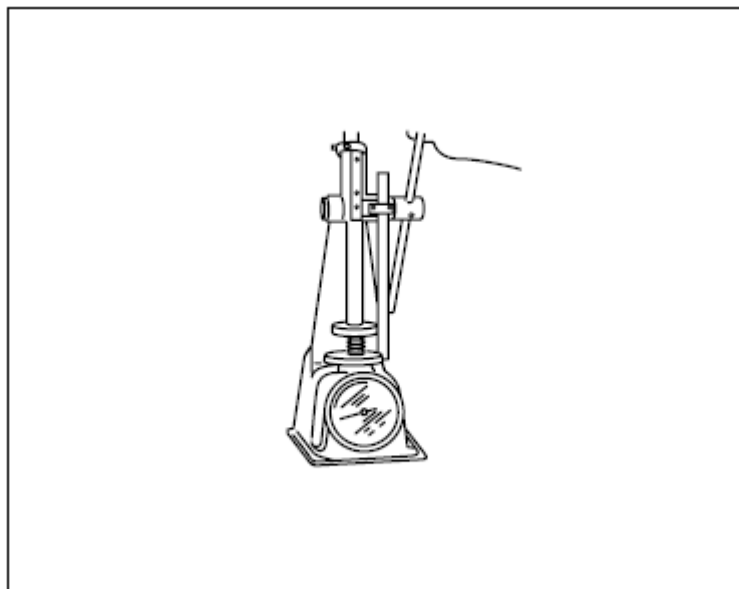


Fig. 349: Locating Coil-On-Plug And Camshaft Position Sensor Electrical Connectors
Courtesy of MAZDA MOTORS CORP.

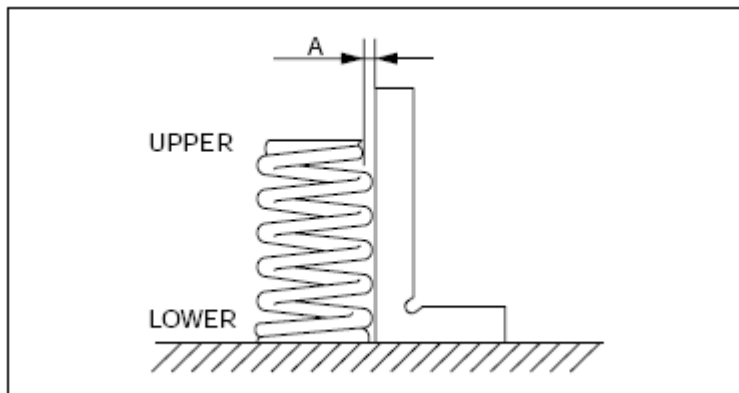
42. Detach the wiring harness retainer.



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Fig. 350: Locating Wiring Harness Retainer
Courtesy of MAZDA MOTORS CORP.

43. Position the rubber boot aside and disconnect the cylinder head temperature (CHT) sensor electrical connector.
 - Remove the wiring harness from the engine.



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Fig. 351: Locating Rubber Boot And Cylinder Head Temperature Sensor Electrical Connector
Courtesy of MAZDA MOTORS CORP.

44. Disconnect the coolant hose.

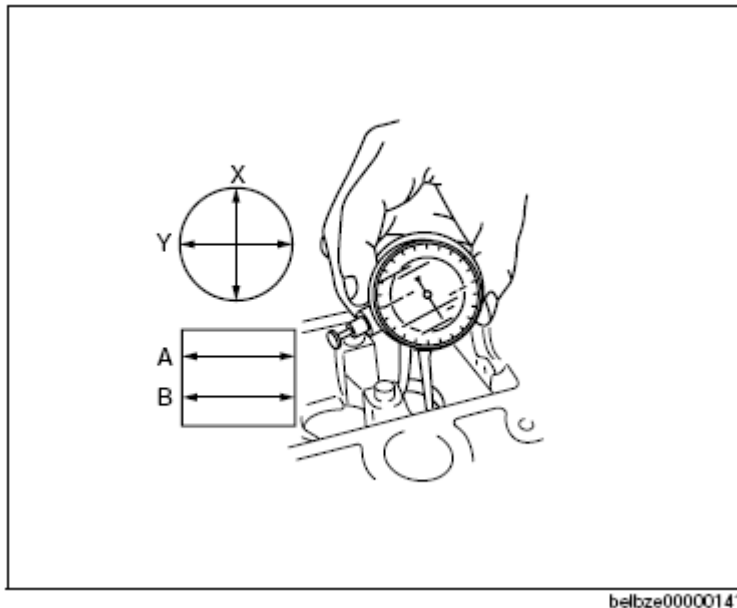


Fig. 352: Locating Coolant Hose
Courtesy of MAZDA MOTORS CORP.

45. Disconnect and remove the coolant hose.

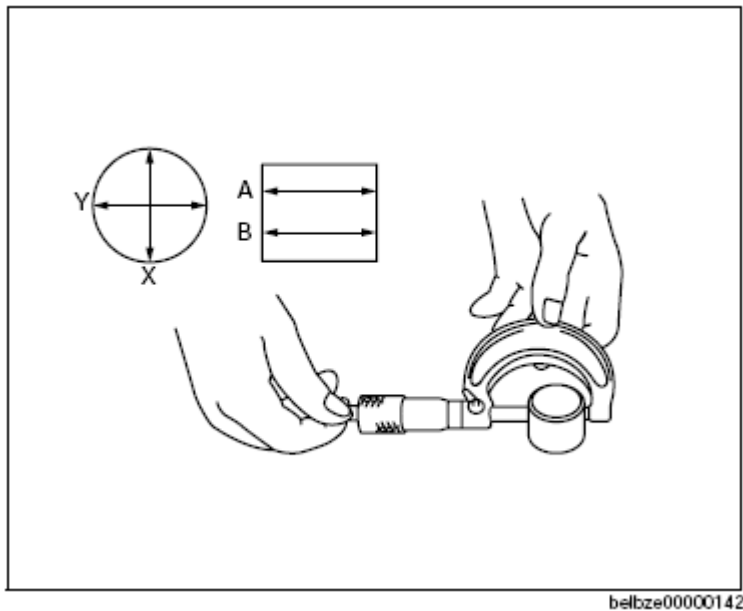


Fig. 353: Locating Coolant Hose
Courtesy of MAZDA MOTORS CORP.

46. Disconnect and remove the coolant hoses.

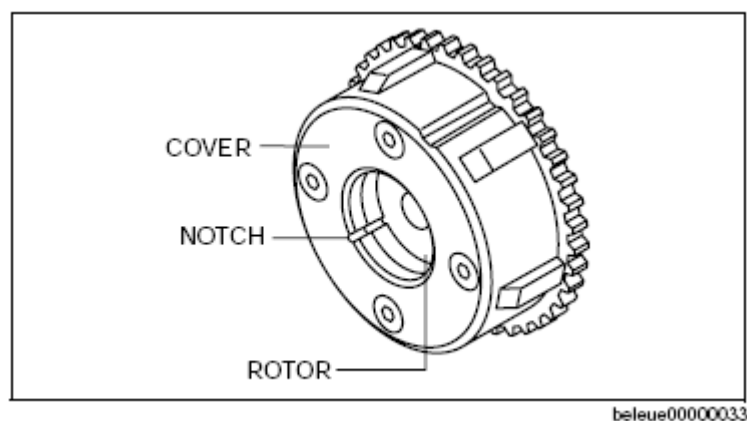


Fig. 354: Locating Coolant Hoses
Courtesy of MAZDA MOTORS CORP.

47. Remove the bolt and the KS.

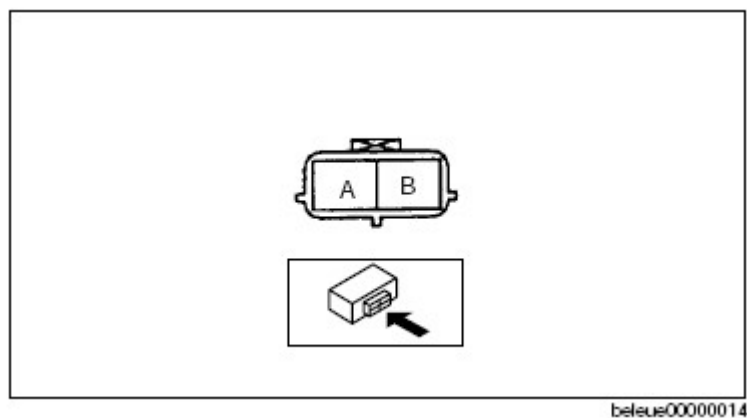


Fig. 355: Locating Bolt And KS
Courtesy of MAZDA MOTORS CORP.

48. Remove the bolts and the crankcase vent oil separator.

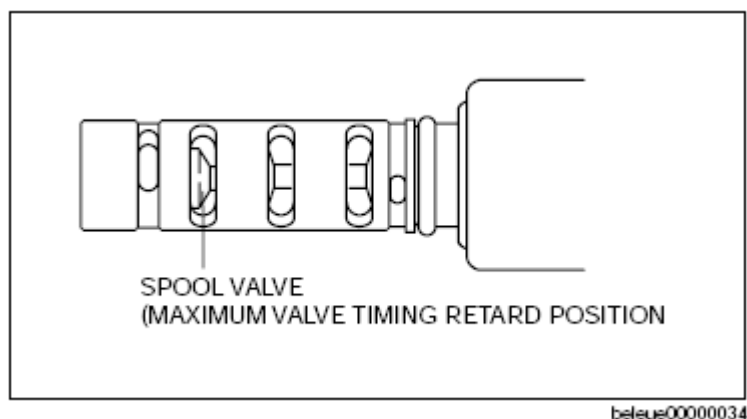


Fig. 356: Locating Bolts And Crankcase Vent Oil Separator
 Courtesy of MAZDA MOTORS CORP.

49. If equipped, remove the block heater.

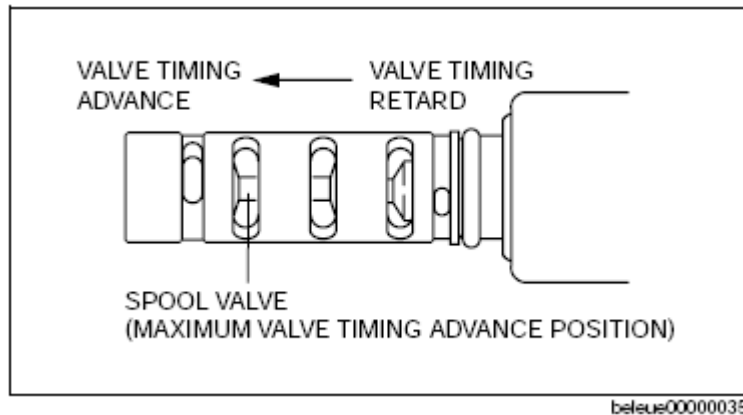


Fig. 357: Locating Block Heater
 Courtesy of MAZDA MOTORS CORP.

50. Remove the crankcase vent tube and the coil-on-plugs.

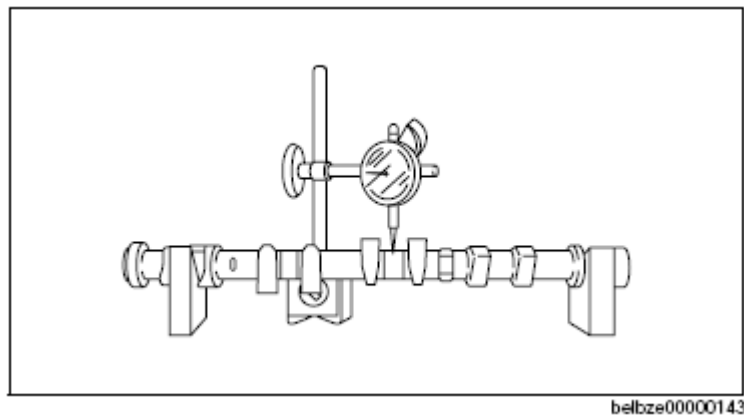


Fig. 358: Locating Crankcase Vent Tube And Coil-On-Plugs
 Courtesy of MAZDA MOTORS CORP.

51. Remove the spark plugs and the CHT sensor.
- Discard the CHT.

CAUTION:

- Only use hand tools when removing or installing the spark plugs or damage can occur to the cylinder head or spark plug.

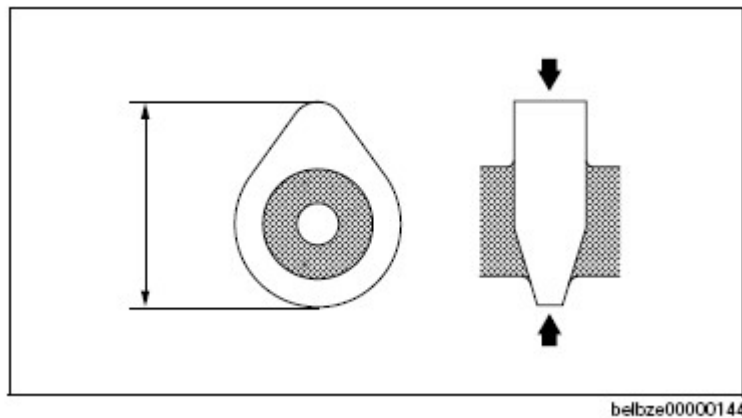


Fig. 359: Locating Spark Plugs And CHT Sensor
Courtesy of MAZDA MOTORS CORP.

52. Remove the bolts and the valve cover.

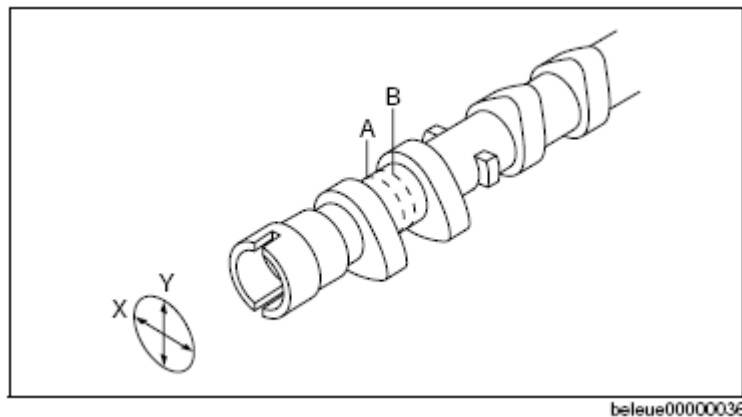


Fig. 360: Locating Bolts And Valve Cover
Courtesy of MAZDA MOTORS CORP.

53. Using the crankshaft pulley bolt, turn the crankshaft clockwise to position the No. 1 piston at top dead center (TDC).
 - The hole in the crankshaft pulley should be in the 6 o'clock position.

CAUTION:

- Failure to position the No. 1 piston at TDC can result in damage to the engine. Turn the engine in the normal direction of rotation only.

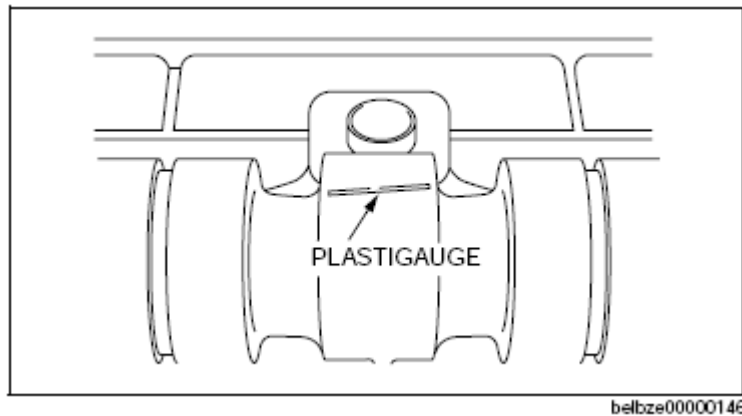


Fig. 361: Locating Crankshaft Pulley Hole
 Courtesy of MAZDA MOTORS CORP.

54. Install the special tool in the slots on the rear of both camshafts.

CAUTION:

- The special tool 303-465 is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

NOTE:

- The camshaft timing slots are offset. If the special tool cannot be installed, rotate the crankshaft one complete revolution clockwise to correctly position the camshafts.

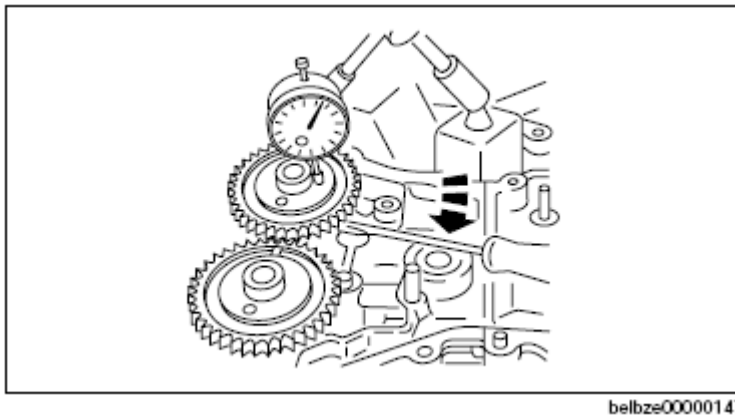


Fig. 362: Identifying Camshaft Alignment Plate 303-465
 Courtesy of MAZDA MOTORS CORP.

55. Remove the engine plug bolt.

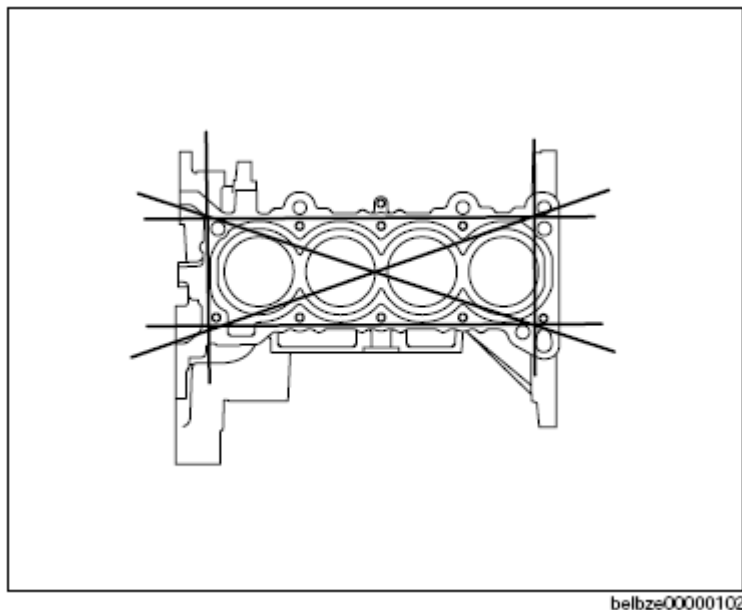


Fig. 363: Locating Engine Plug Bolt
Courtesy of MAZDA MOTORS CORP.

56. Install the special tool.

NOTE:

- The special tool will contact the crankshaft and prevent it from turning past TDC. However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position during disassembly.

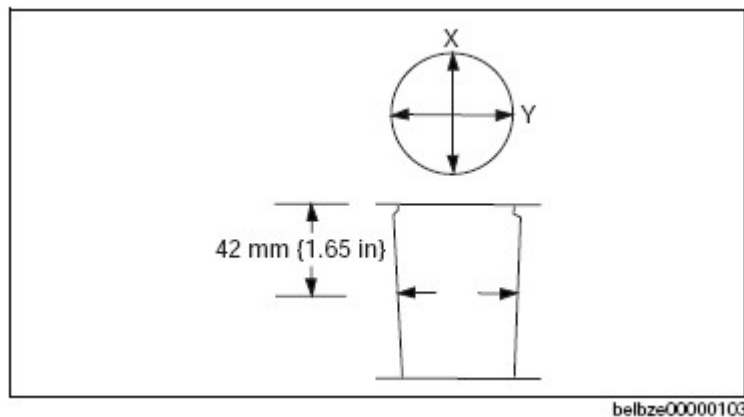


Fig. 364: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

57. Assemble the special tools using 4 hardened washers in the locations shown in the figure.

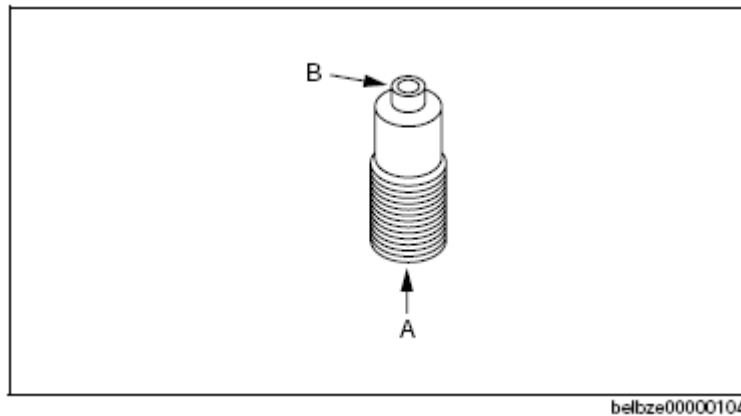


Fig. 365: Locating Special Tools And Hardened Washers
Courtesy of MAZDA MOTORS CORP.

58. Using special tools and an air impact wrench, remove the crankshaft pulley.

- Remove and discard the crankshaft pulley bolt and washer.
- Remove the crankshaft pulley.
- Remove the diamond washer and discard.

CAUTION:

- The crankshaft must remain in the TDC position during removal of the pulley bolt or damage to the engine can occur. Therefore, the crankshaft pulley must be held in place with the special tool and the bolt should be removed using an air impact wrench (1/2-in drive minimum).

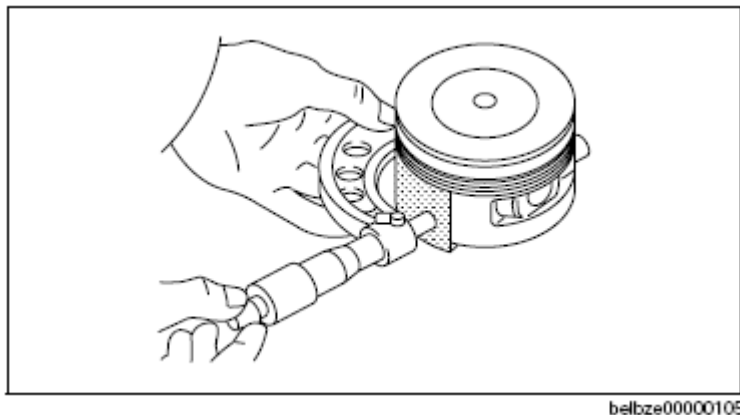


Fig. 366: Holding Crankshaft Pulley
Courtesy of MAZDA MOTORS CORP.

CAUTION:

- The crankshaft sprocket diamond washer may come off with the crankshaft pulley. The diamond washer must be replaced. Remove and discard the diamond washer. If the diamond

washer is not installed, engine damage may occur.

59. Using the special tool, remove the crankshaft front oil seal.

CAUTION:

- Use care not to damage the engine front cover or the crankshaft when removing the seal.

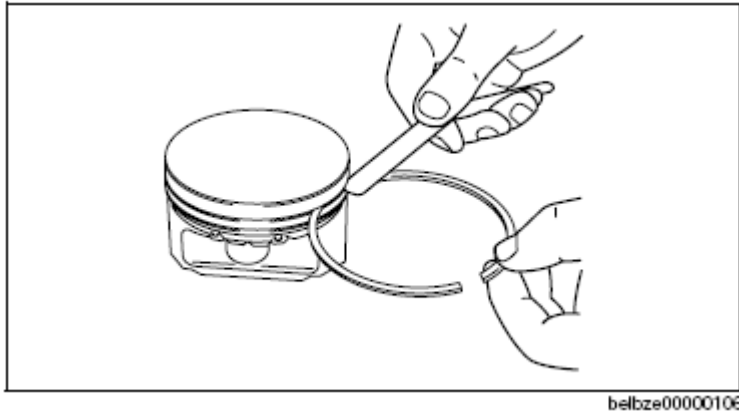


Fig. 367: Removing Crankshaft Front Oil Seal
Courtesy of MAZDA MOTORS CORP.

60. Remove and discard the CKP sensor.

NOTE:

- Whenever the CKP sensor is removed, a new one must be installed using the alignment tool supplied with the new part.

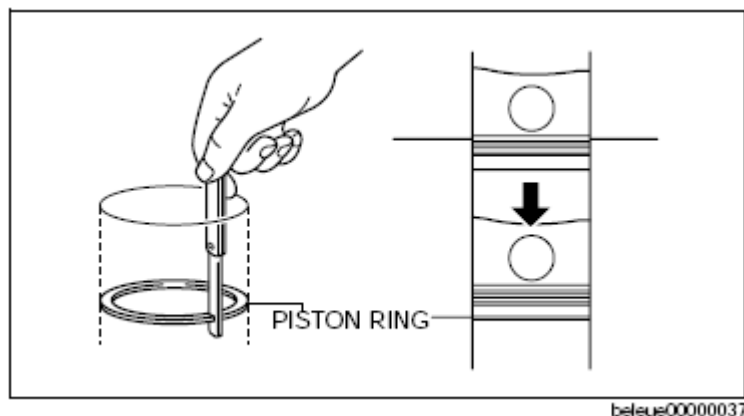
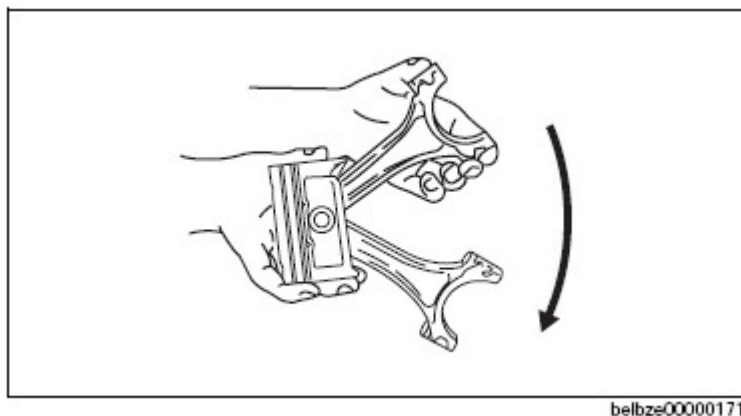


Fig. 368: Locating CKP Sensor
Courtesy of MAZDA MOTORS CORP.

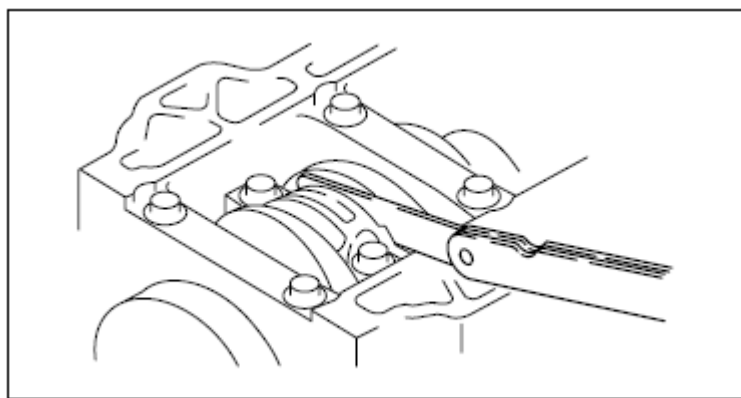
61. Remove the bolts and the engine front cover.



belbze00000171

Fig. 369: Locating Engine Front Cover Bolts
Courtesy of MAZDA MOTORS CORP.

62. Remove the timing chain tensioner.
 1. Compress the timing chain tensioner, and insert a paper clip into the hole to retain the tensioner.
 2. Remove the bolts and timing chain tensioner.



belbze00000108

Fig. 370: Identifying Timing Chain Tensioner Bolts And Paper Clip
Courtesy of MAZDA MOTORS CORP.

63. Remove the RH timing chain guide.

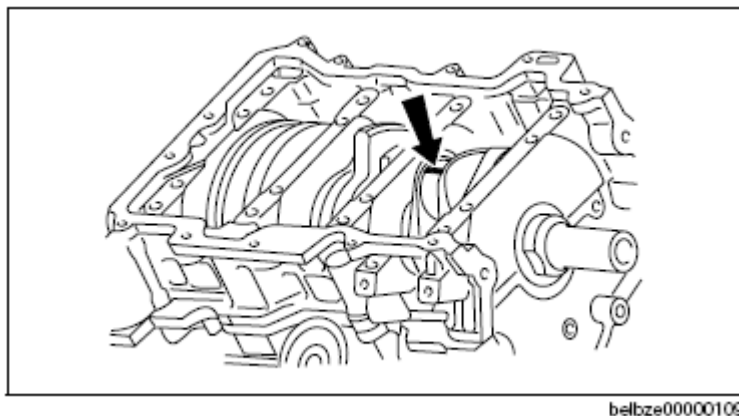


Fig. 371: Locating Timing Chain Tensioner Arm
Courtesy of MAZDA MOTORS CORP.

64. Remove the timing chain.

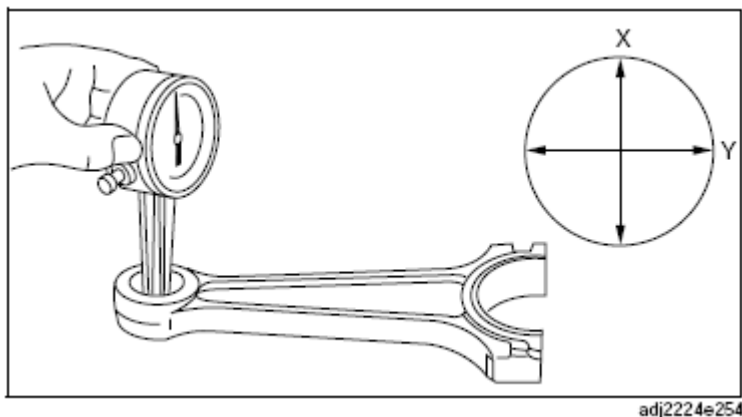


Fig. 372: Locating Timing Chain
Courtesy of MAZDA MOTORS CORP.

65. Remove the bolts and the LH timing chain guide.

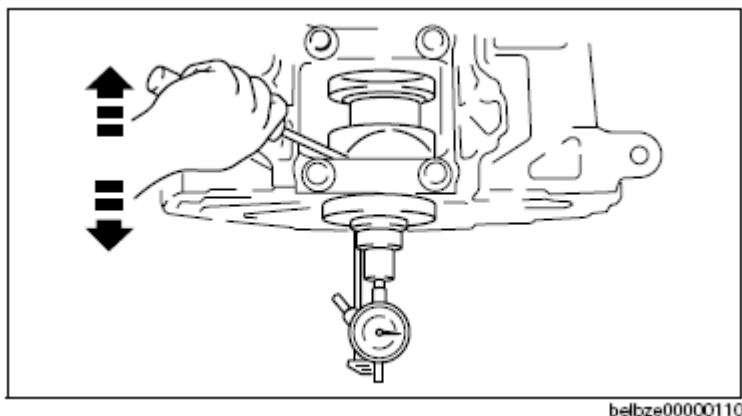


Fig. 373: Locating Timing Chain Guide Bolts
 Courtesy of MAZDA MOTORS CORP.

66. Using the flats on the camshaft to prevent camshaft rotation, remove the bolts and the camshaft sprockets.

CAUTION:

- Do not rely on the camshaft alignment plate to prevent camshaft rotation. Damage to the tool or the camshaft can occur.

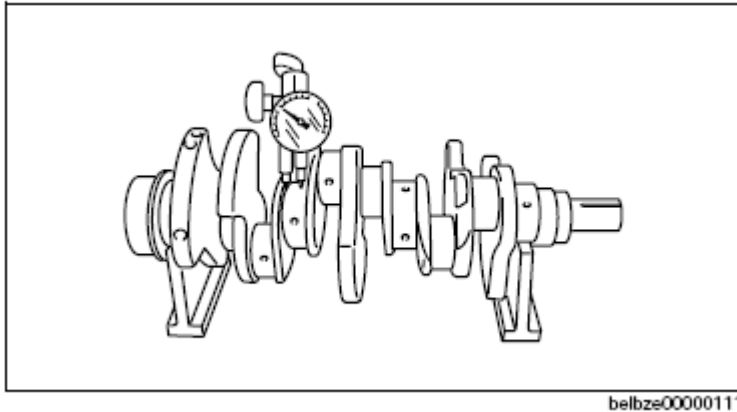


Fig. 374: Locating Flats On Camshaft And Exhaust Camshaft Sprocket Bolt
 Courtesy of MAZDA MOTORS CORP.

67. Remove the oil pump drive chain tensioner.
1. Release the tension on the tensioner spring.
 2. Remove the tensioner and the shoulder bolt.

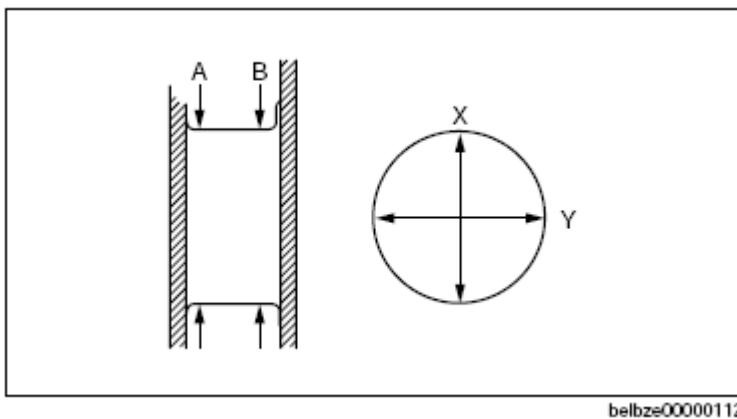


Fig. 375: Identifying Tensioner Spring, Tensioner And Shoulder Bolt
 Courtesy of MAZDA MOTORS CORP.

68. Remove the oil pump chain and sprockets.
1. Remove the bolt.
 2. Remove the chain and sprockets.

NOTE:

- Remove and discard the crankshaft sprocket diamond washer located behind the crankshaft sprocket.

NOTE:

- The oil pump chain sprocket must be held in place.

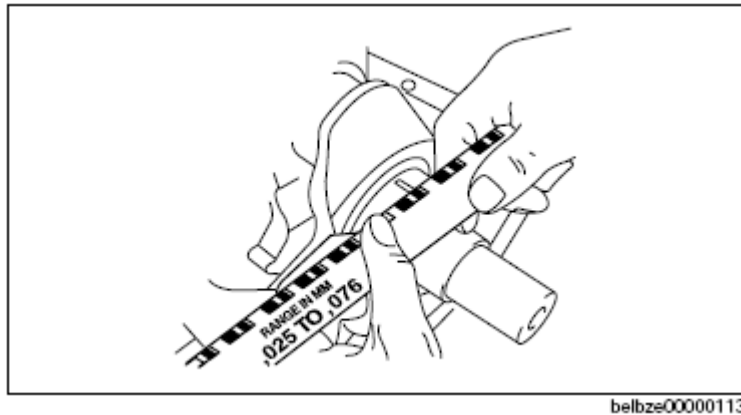


Fig. 376: Identifying Bolt And Sprocket
Courtesy of MAZDA MOTORS CORP.

69. Mark the position of the camshaft lobes on the No. 1 cylinder for assembly reference.

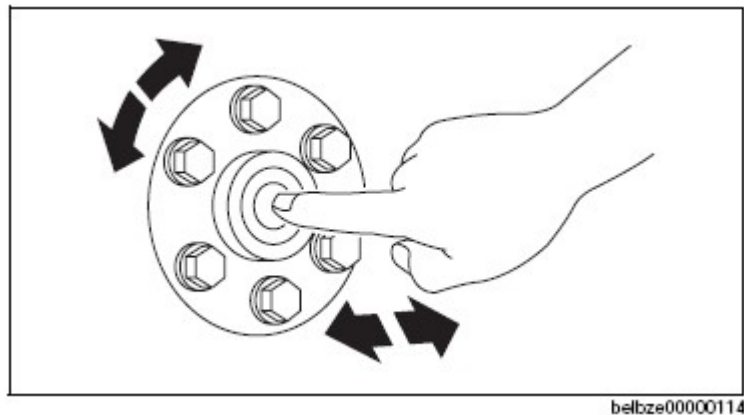


Fig. 377: Locating Camshaft Lobes
Courtesy of MAZDA MOTORS CORP.

70. Remove the camshafts from the engine.
- Loosen the camshaft bearing bolts in the sequence shown in the figure, one turn at a time. Repeat until all the tension is released.
 - Remove the camshaft bearing caps.
 - Remove the camshafts.

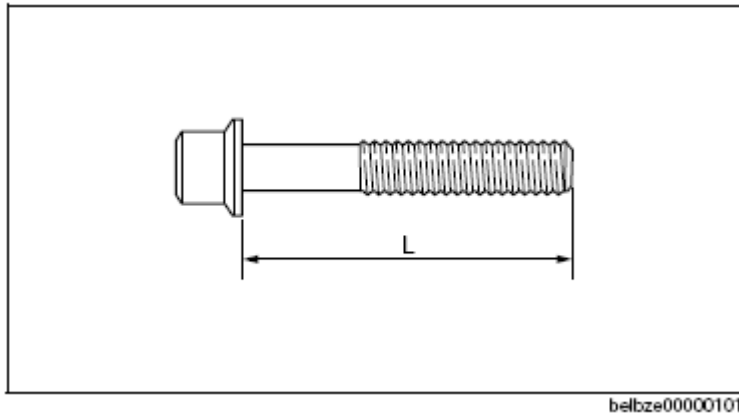
CAUTION:

- Failure to follow the camshaft loosening procedure can result in

damage to the camshafts.

NOTE:

- Mark the location and orientation of each camshaft bearing cap.

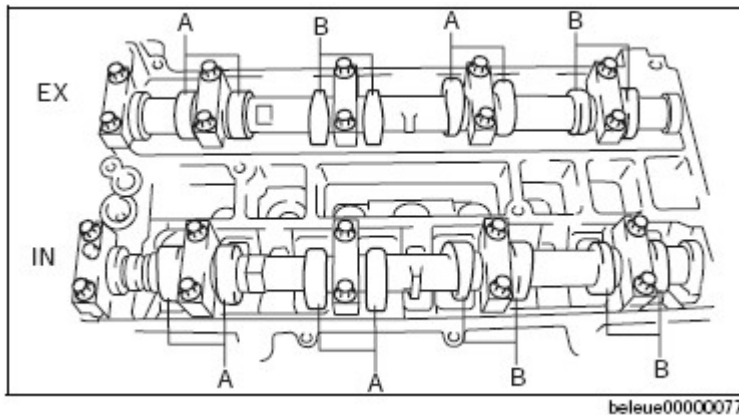


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Fig. 378: Identifying Camshaft Bearing Cap Bolts Loosening Sequence
Courtesy of MAZDA MOTORS CORP.

71. Remove the cylinder head.

- Remove and discard the cylinder head bolts.
- Remove the cylinder head.
- Remove and discard the cylinder head gasket.



beleue00000077

Fig. 379: Locating Cylinder Head Bolts
Courtesy of MAZDA MOTORS CORP.

72. Remove the cylinder head alignment dowels.

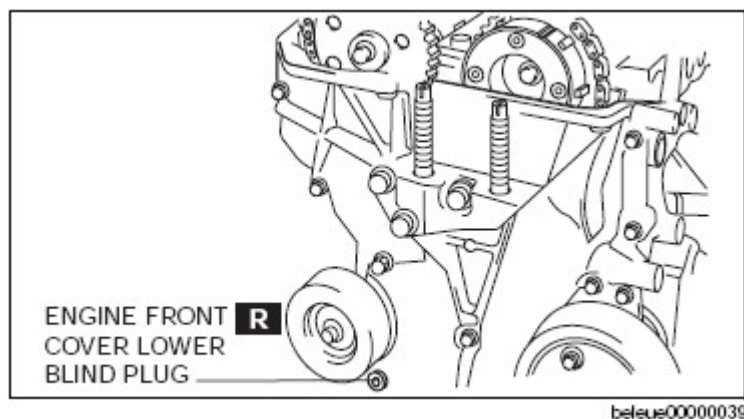


Fig. 380: Locating Cylinder Head Alignment Dowels
Courtesy of MAZDA MOTORS CORP.

73. Remove the bolts and the oil pan.

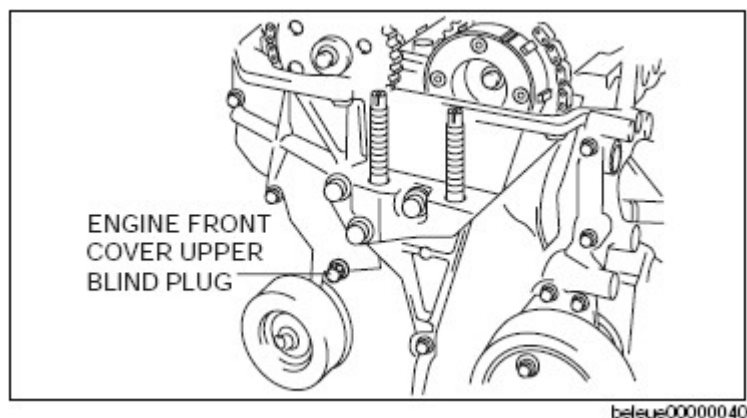


Fig. 381: Locating Oil Pan Bolts
Courtesy of MAZDA MOTORS CORP.

74. Remove the bolts and the rear crankshaft seal.

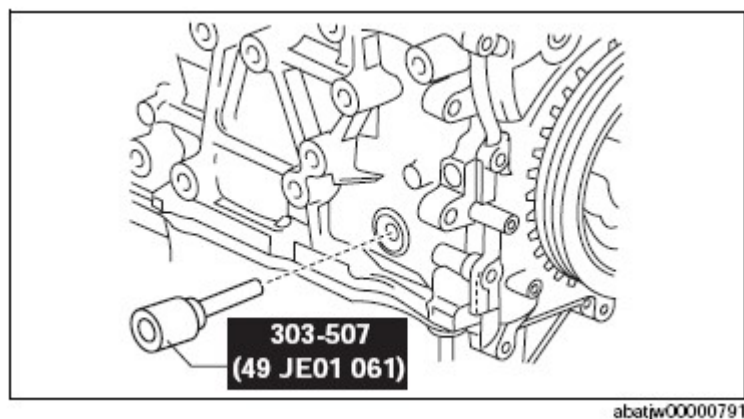


Fig. 382: Locating Rear Crankshaft Seal Bolts
Courtesy of MAZDA MOTORS CORP.

75. Remove the bolts, oil pump pickup tube and gasket.

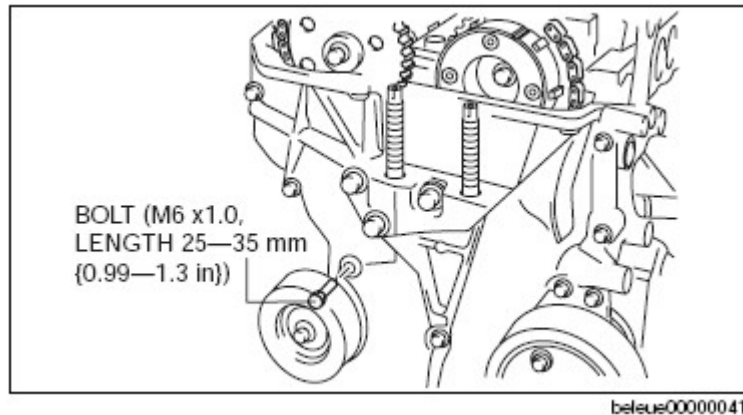


Fig. 383: Locating Oil Pump Pickup Tube Bolts
Courtesy of MAZDA MOTORS CORP.

76. Remove the bolts and the oil pump.

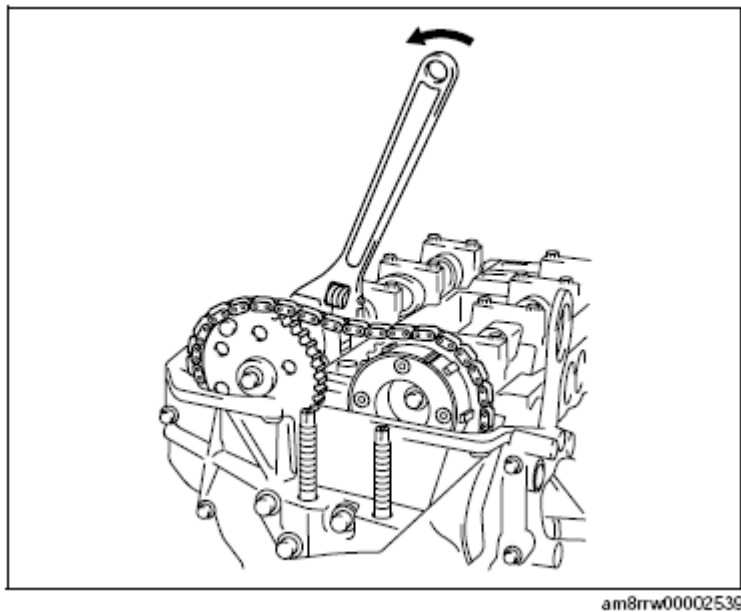


Fig. 384: Locating Oil Pump Bolts
Courtesy of MAZDA MOTORS CORP.

ENGINE ASSEMBLY - 2.5L

ASSEMBLY

CAUTION:

- Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if you loosen the pulley bolt. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshafts and the camshafts must be locked in place by the special tools, otherwise, severe engine damage may occur.

CAUTION:

- During engine repair procedures, cleanliness is extremely important. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages coolant passages or the oil pan, may cause engine failure.

All vehicles

1. Turn the crankshaft clockwise to position the No. 1 piston at top dead center (TDC).

CAUTION:

- Failure to position the No. 1 piston at TDC can result in damage to the engine. Turn the engine in the normal direction of rotation only.

2. Remove the engine plug bolt.

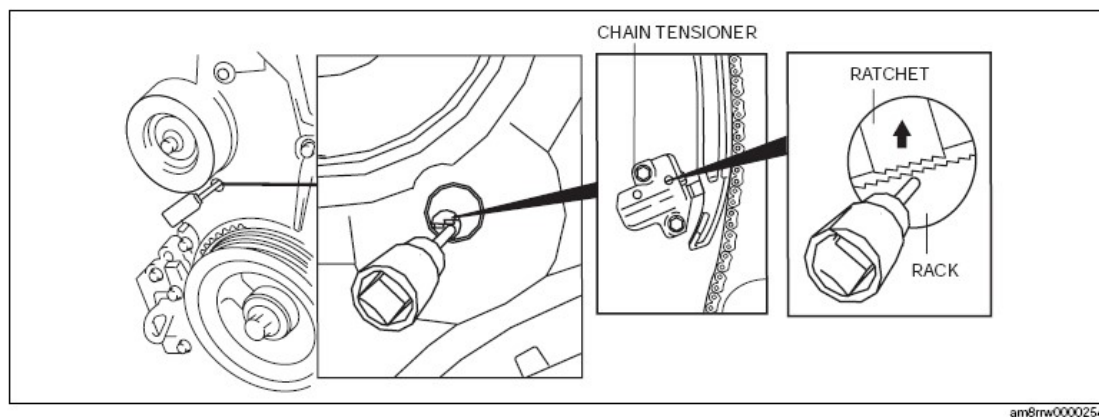


Fig. 385: Locating Engine Plug Bolt
Courtesy of MAZDA MOTORS CORP.

3. Install the special tool.

NOTE:

- The special tool will contact the crankshaft and prevent it from turning past TDC. However, the crankshaft can still be rotated in the

counterclockwise direction. The crankshaft must remain at the TDC position until the timing drive components and crankshaft pulley are installed.

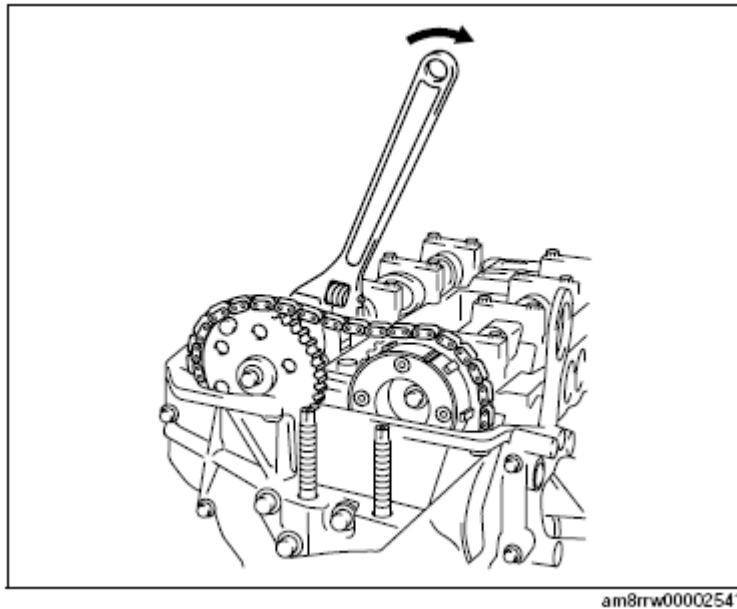


Fig. 386: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

4. Install the oil pump assembly. Tighten the bolts in the sequence shown in the figure in 2 stages.
 - Stage 1: Tighten the bolts to 10 N.m {1.0 kgf.m, 89 in.lbf}.
 - Stage 2: Tighten the bolts to 20 N.m {1.5 kgf.m, 177 in.lbf}.

NOTE:

- Clean the oil pump and cylinder block mating surfaces with metal surface cleaner.

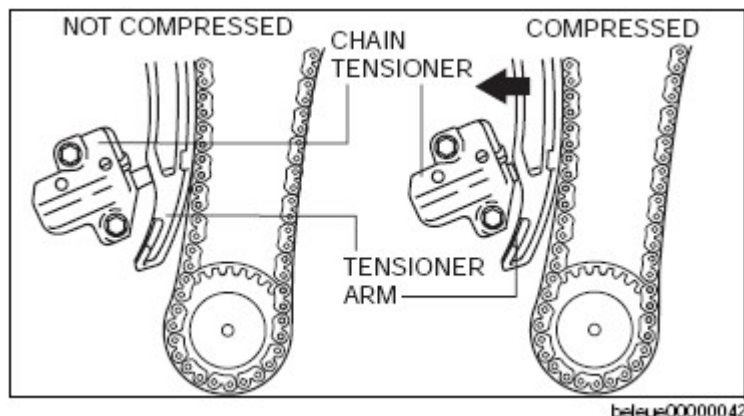


Fig. 387: Identifying Oil Pump Assembly Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

5. Install a new oil pump pickup tube gasket and the pickup tube.
 - Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

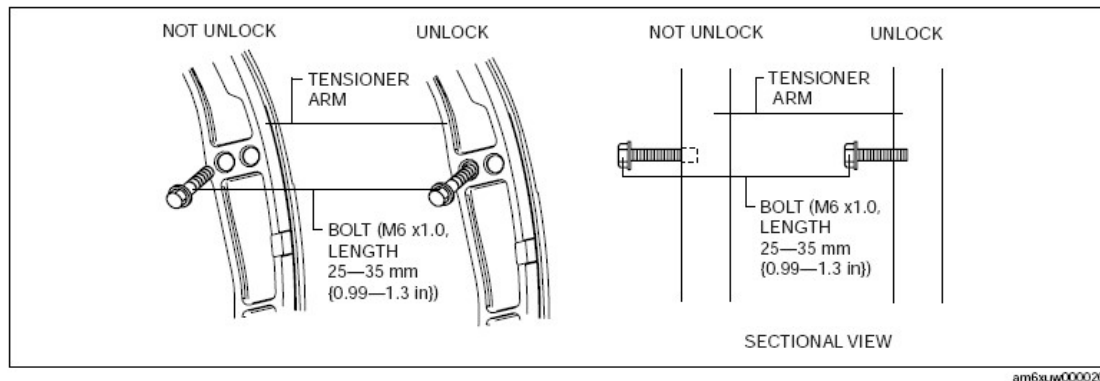


Fig. 388: Locating Oil Pump Pickup Tube Bolts
Courtesy of MAZDA MOTORS CORP.

6. Using the special tool, install the crankshaft rear main oil seal.

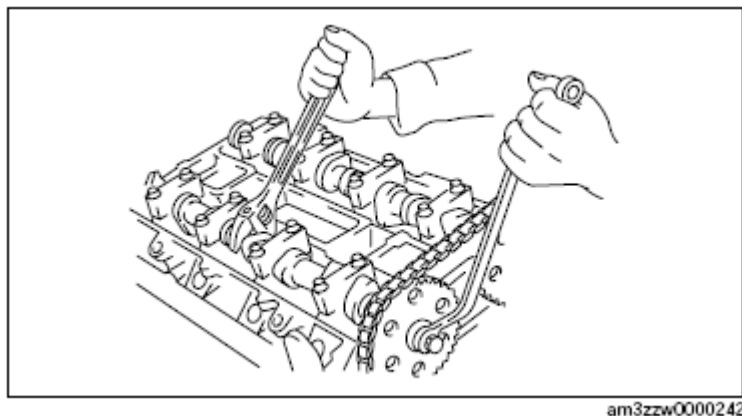


Fig. 389: Identifying Special Tool 303-328
Courtesy of MAZDA MOTORS CORP.

7. Tighten the crankshaft rear oil seal retainer bolts in the sequence shown in the figure.
 - To install, tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

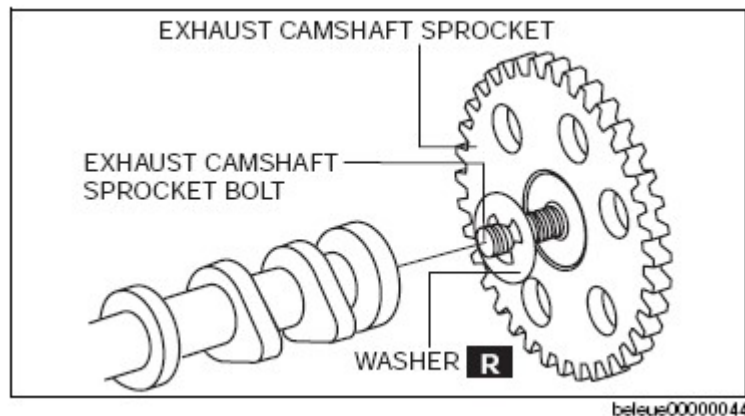


Fig. 390: Identifying Crankshaft Rear Oil Seal Retainer Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

8. Clean and inspect all mating surfaces.

CAUTION:

- Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove traces of sealant.

9. Apply a 2.5 mm (0.098 in) bead of silicone gasket and sealant to the oil pan. Install the oil pan. Install the 2 oil pan bolts finger-tight.

NOTE:

- If the oil pan is not secured within 4 minutes of sealant application, the sealant must be removed and the sealing area cleaned with metal surface cleaner. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

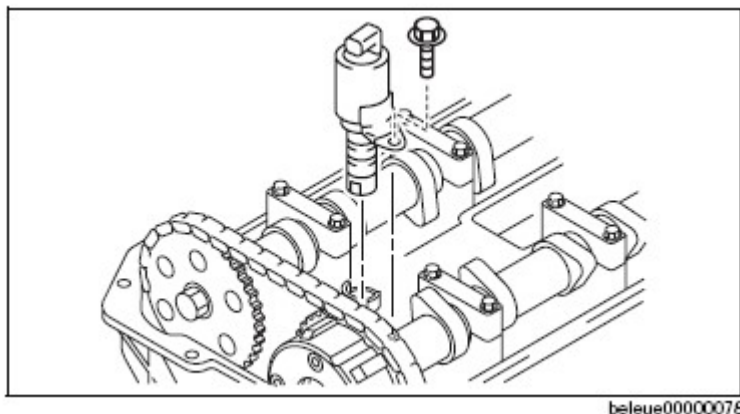


Fig. 391: Locating Oil Pan And Bolts
Courtesy of MAZDA MOTORS CORP.

10. Using a suitable straightedge, align the front surface of the oil pan flush with the front surface of the engine block.

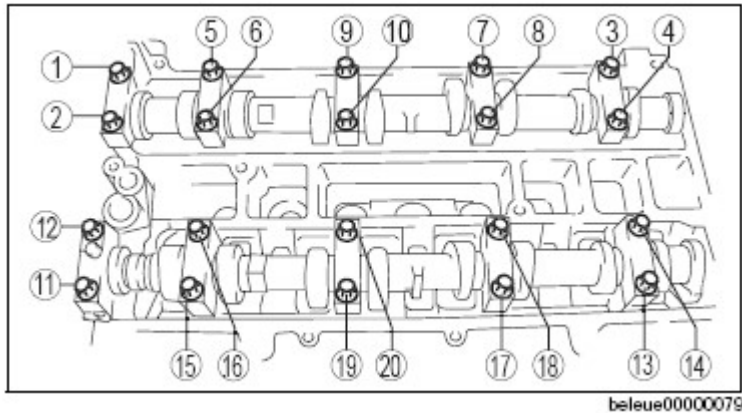


Fig. 392: Aligning Front Surface Of Oil Pan Flush With Front Surface Of Engine Block
Courtesy of MAZDA MOTORS CORP.

11. Install the remaining oil pan bolts and tighten the oil pan bolts in the sequence shown in the figure.
 - Tighten to 25 N.m {2.5 kgf.m, 18 ft.lbf}.

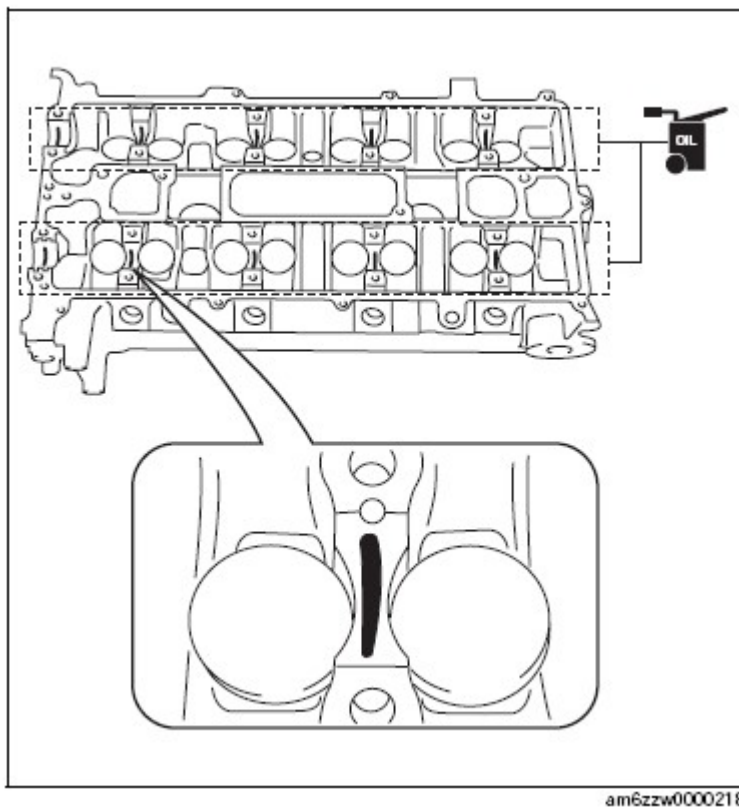


Fig. 393: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

12. Install the cylinder head alignment dowels.
 - Dowels must be fully seated in the cylinder block.

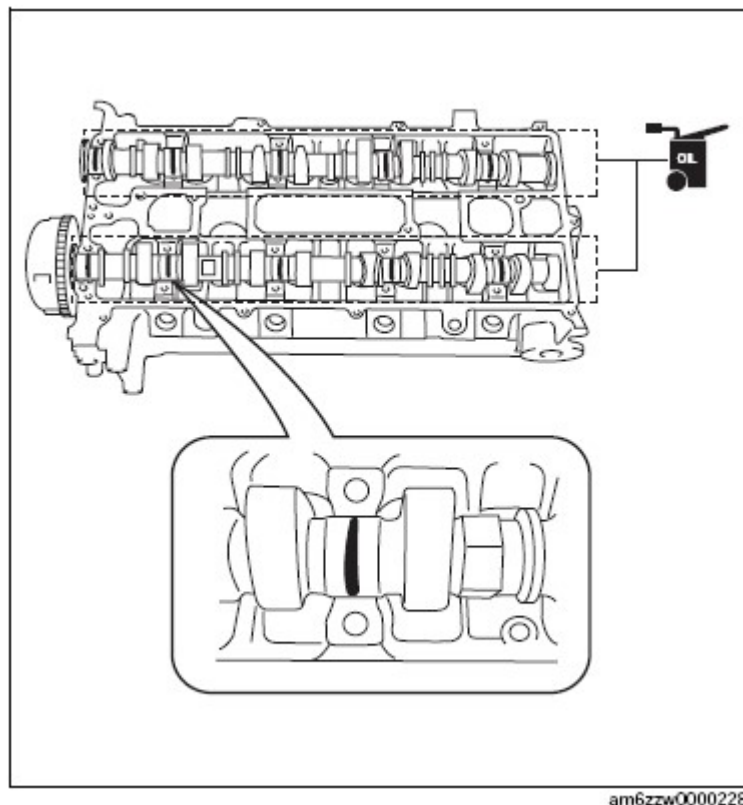


Fig. 394: Locating Cylinder Head Alignment Dowels
Courtesy of MAZDA MOTORS CORP.

13. Clean the cylinder head-to-cylinder block mating surface of both the cylinder head and the cylinder block.
 1. Remove any large deposits of silicone or gasket material with a plastic scraper.
 2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
 3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal surface prep, following package directions, to remove any traces of oil or coolant, and to prepare the surfaces to bond with the new gasket. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.

CAUTION:

- Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

NOTE:

- Observe all warnings and cautions and follow all application

directions contained on the packaging of the silicone gasket remover and the metal surface prep.

NOTE:

- If there is no residual gasket material present, metal surface prep can be used to clean and prepare the surfaces.

14. Apply silicone gasket and sealant to the locations shown in the figure.

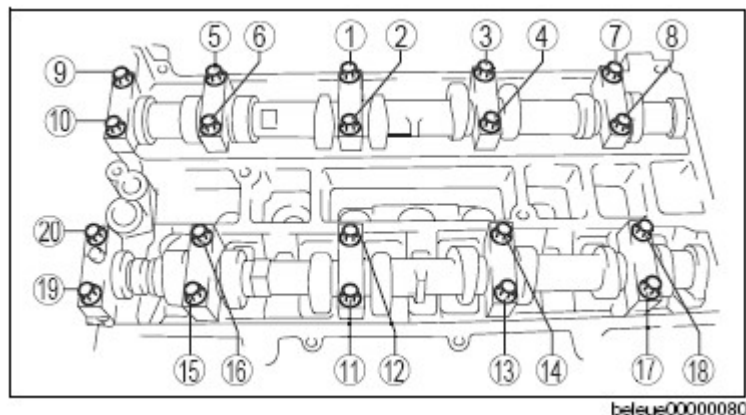


Fig. 395: Locating Silicone Gasket And Sealant Applying Locations
Courtesy of MAZDA MOTORS CORP.

15. Install a new head gasket.

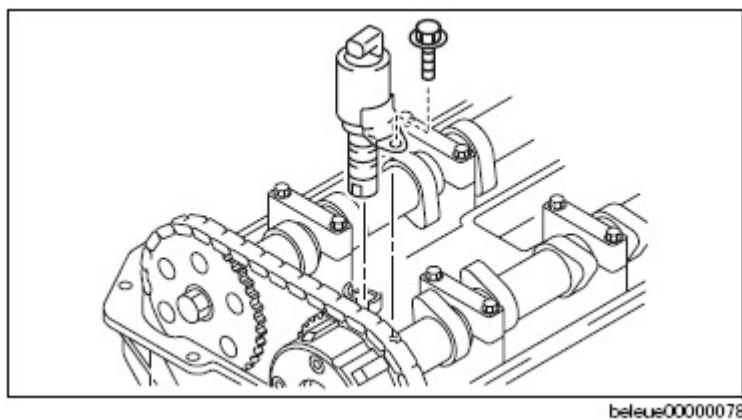


Fig. 396: Locating Head Gasket
Courtesy of MAZDA MOTORS CORP.

16. Install the cylinder head and 10 new bolts. Tighten the bolts in the sequence shown in the figure in 5 stages.
- Stage 1: Tighten the bolts to 5 N.m {0.51 kgf.m, 44 in.lbf}.
 - Stage 2: Tighten the bolts to 15 N.m {1.5 kgf.m, 132 in.lbf}.
 - Stage 3: Tighten the bolts to 45 N.m {4.6 kgf.m, 33 ft.lbf}.

- Stage 4: Turn the bolts 90 degrees.
- Stage 5: Turn the bolts an additional 90 degrees.

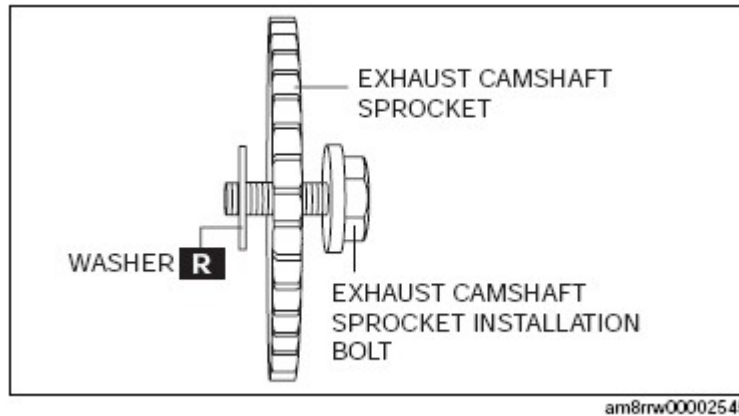


Fig. 397: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

NOTE:

- The cylinder head bolts are torque-to-yield and must not be reused. New cylinder head bolts must be installed.

NOTE:

- Lubricate the bolts with clean engine oil prior to installation.

17. Install the camshafts and bearing caps in their original location and orientation. Tighten the bearing caps in the sequence shown in the figure in 3 stages.
 - Stage 1: Tighten the camshaft bearing bolt caps one turn at a time until finger-tight.
 - Stage 2: Tighten the bolts to 7 N.m {0.71 kgf.m, 62 in.lbf}.
 - Stage 3: Tighten the bolts to 16 N.m {1.6 kgf.m, 141 in.lbf}.

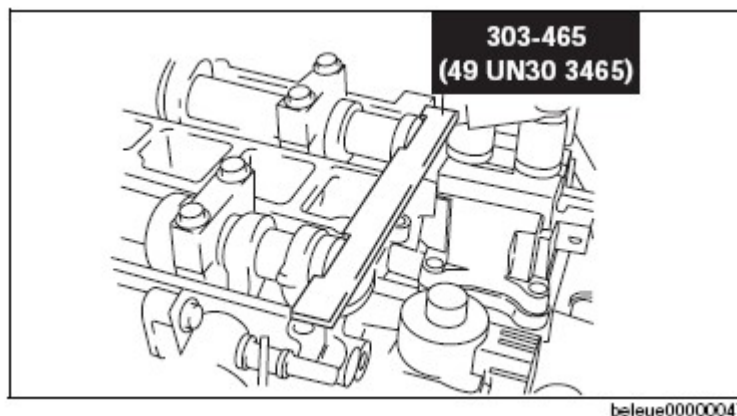


Fig. 398: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

CAUTION:

- Install the camshafts with the alignment slots in the camshafts lined up so the camshaft alignment plate can be installed without rotating the camshafts. Make sure the lobes on the No. 1 cylinder are in the same position as noted in the disassembly procedure. Rotating the camshafts when the timing chain is removed, or installing the camshafts 180 degrees out of position, can cause severe damage to the valves and pistons.

NOTE:

- Lubricate the camshaft journals and bearing caps with clean engine oil.

18. Install the VCT system oil filter and the plug in the intake camshaft thrust cap.
- Tighten the bolts to 17 N.m {1.7 kgf.m, 150 in.lbf}.

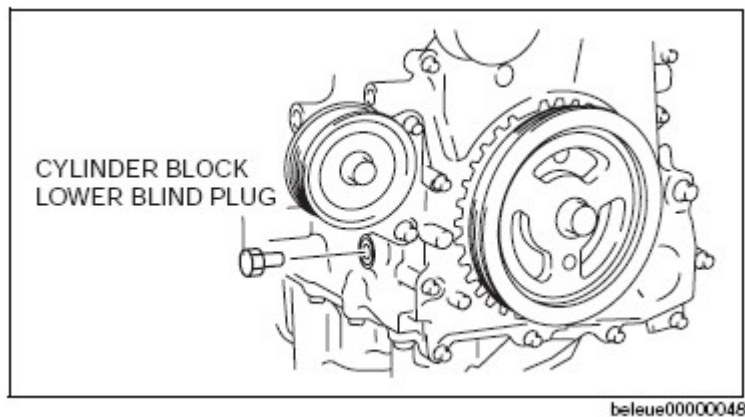


Fig. 399: Locating VCT System Oil Filter And Plug
Courtesy of MAZDA MOTORS CORP.

19. Install the Variable Camshaft Timing (VCT) solenoid and the bolt.
- Tighten the bolts to 10 N.m {1.0 kgf.m, 89 in.lbf}.

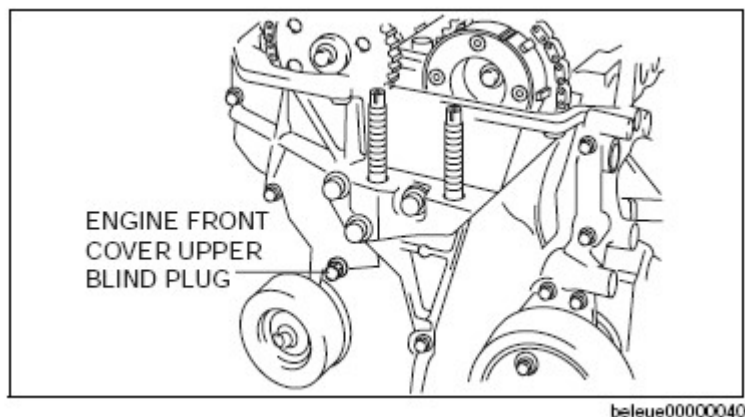


Fig. 400: Locating Variable Camshaft Timing Solenoid And Bolt

Courtesy of MAZDA MOTORS CORP.

20. Install a new crankshaft sprocket, crankshaft sprocket diamond washers, oil pump chain and oil pump sprocket.
- The crankshaft sprocket flange must be facing away from the engine block.

NOTE:

- **Install a new crankshaft sprocket diamond washer on both sides of the crankshaft sprocket.**

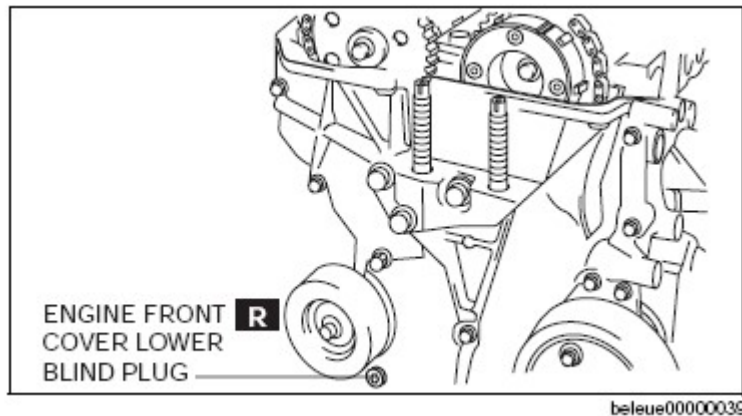
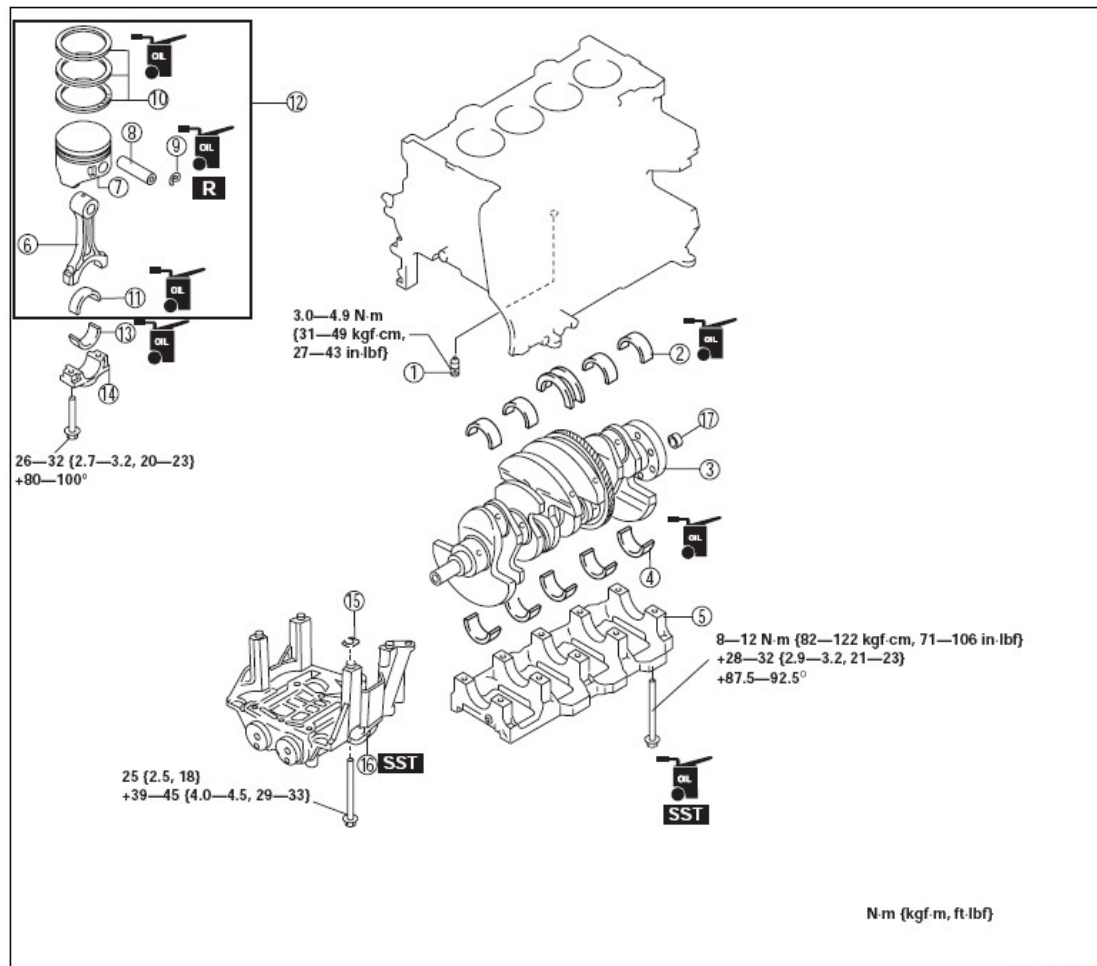


Fig. 401: Locating Crankshaft Sprocket
Courtesy of MAZDA MOTORS CORP.

21. Install the oil pump chain, sprocket and bolt.
- Tighten to 25 N.m {2.5 kgf.m, 18 ft.lbf}.



1	Oil jet valve
2	Upper main bearing, thrust bearing
3	Crankshaft
4	Lower main bearing, thrust bearing
5	Main bearing cap (See Main Bearing Cap Assembly Note)
6	Connecting rod
7	Piston
8	Piston pin
9	Snap ring
10	Piston ring (See Piston Ring Assembly Note)
11	Upper connecting rod bearing (See Connecting Rod Bearing Assembly Note)

12	Connecting rod, piston component (See Piston Assembly Note)
13	Lower connecting rod bearing (See Connecting Rod Bearing Assembly Note)
14	Connecting rod cap (See Connecting Rod Cap Assembly Note)
15	Adjustment shim (See Balancer Unit Assembly Note)
16	Balancer unit (See Balancer Unit Assembly Note)
17	Pilot bearing (MTX) (See Pilot Bearing Assembly Note.)

Fig. 402: Locating Oil Pump Chain, Sprocket And Bolt
Courtesy of MAZDA MOTORS CORP.

22. Install the oil pump chain tensioner shoulder bolt.
 - Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

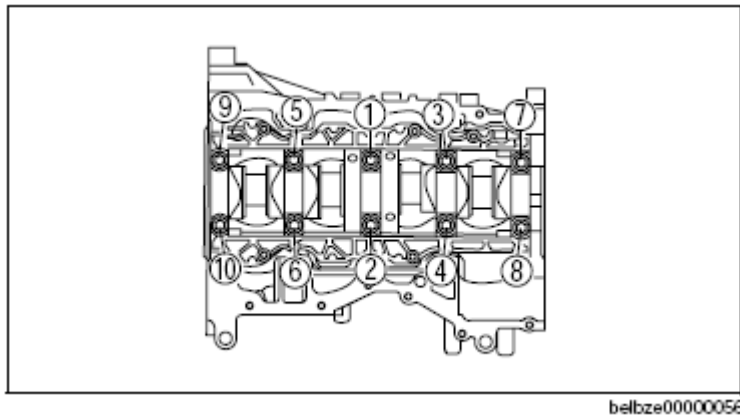


Fig. 403: Locating Oil Pump Chain Tensioner Shoulder Bolt
Courtesy of MAZDA MOTORS CORP.

23. Install the oil pump chain tensioner. Hook the tensioner spring around the shoulder bolt.
 - Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

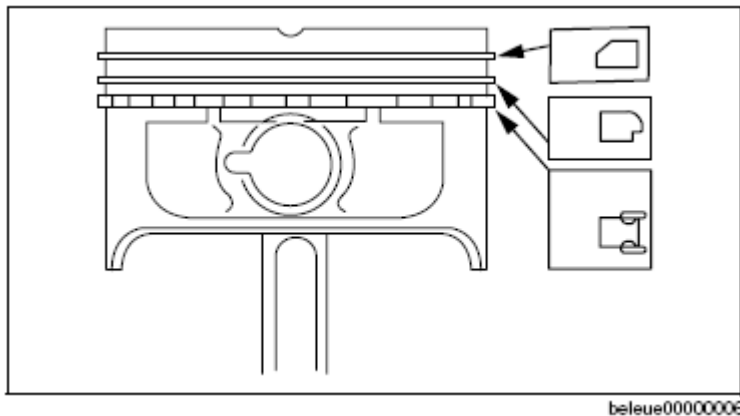


Fig. 404: Locating Oil Pump Chain Tensioner, Tensioner Spring And Shoulder Bolt
Courtesy of MAZDA MOTORS CORP.

24. Install the special tool in the slots on the rear of both camshafts.

CAUTION:

- The special tool 303-465 is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

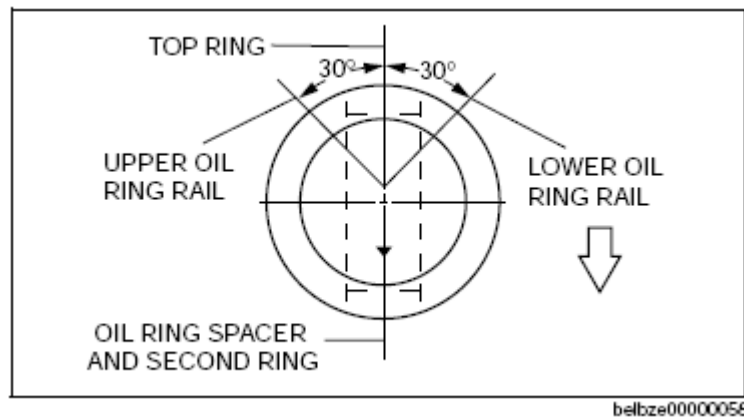


Fig. 405: Identifying Camshaft Alignment Plate 303-465
Courtesy of MAZDA MOTORS CORP.

25. Install the camshaft sprockets and the bolts. Do not tighten the bolts at this time.

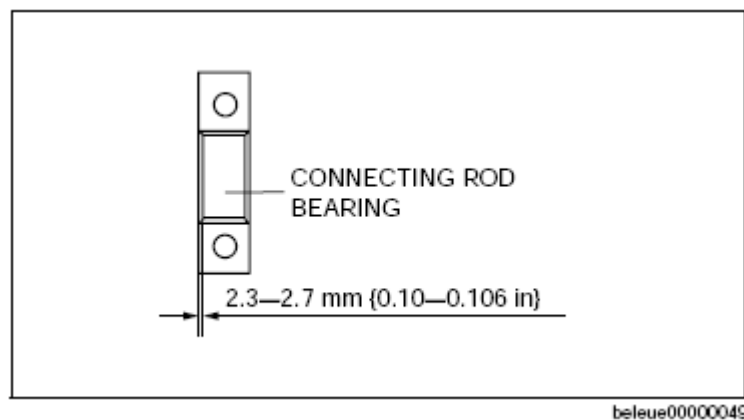


Fig. 406: Locating Camshaft Sprockets And Bolts
Courtesy of MAZDA MOTORS CORP.

26. Install the LH timing chain guide and the bolts.
 - Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

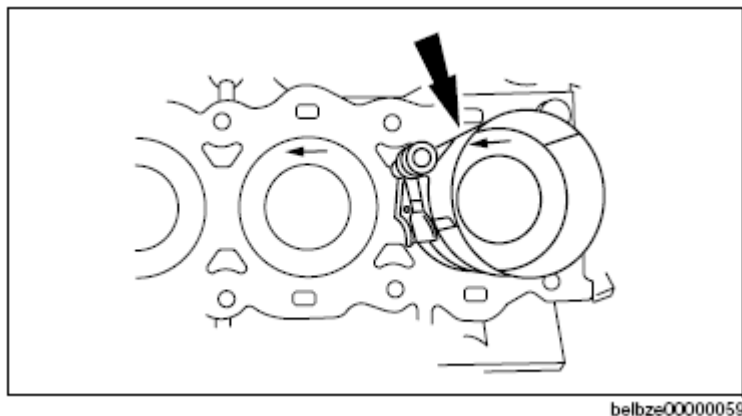


Fig. 407: Locating Timing Chain Guide Bolts
Courtesy of MAZDA MOTORS CORP.

27. Install the timing chain.

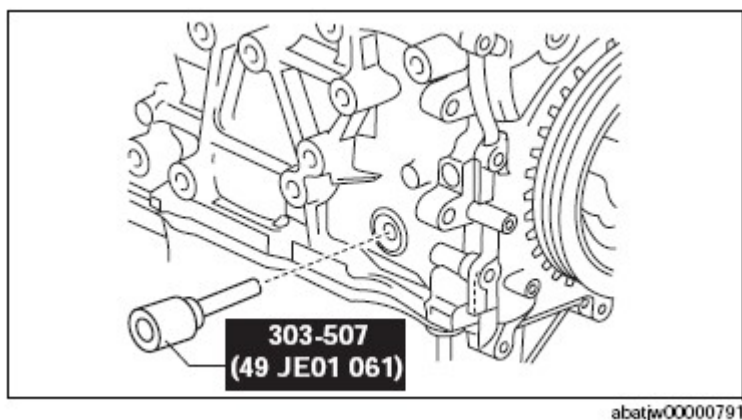


Fig. 408: Locating Timing Chain
Courtesy of MAZDA MOTORS CORP.

28. Install the RH timing chain guide.

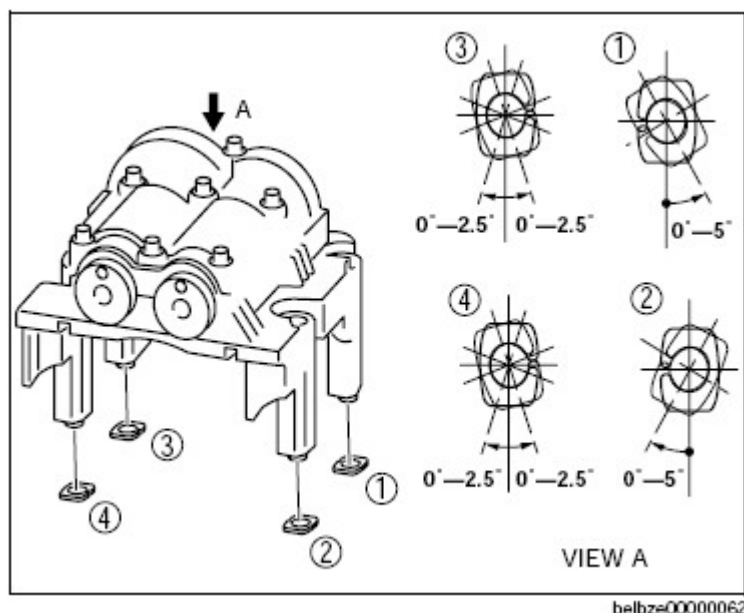


Fig. 409: Locating Timing Chain Tensioner Arm
Courtesy of MAZDA MOTORS CORP.

29. Using the edge of a vise, compress the timing chain tensioner plunger.

CAUTION:

- Do not compress the ratchet assembly. This will damage the ratchet assembly.

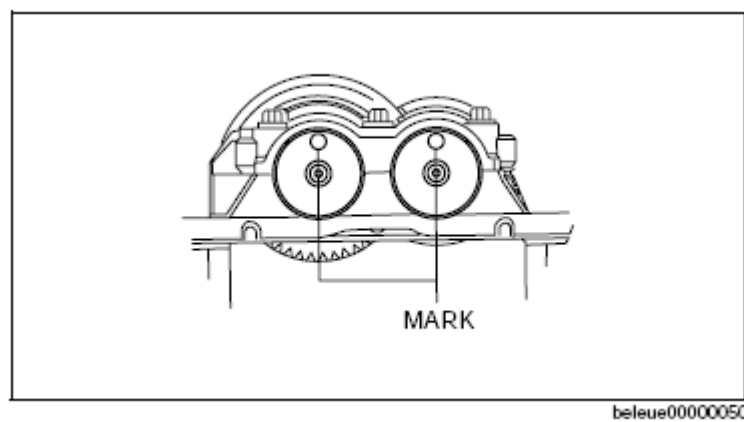


Fig. 410: Compressing Timing Chain Tensioner Plunger
Courtesy of MAZDA MOTORS CORP.

30. Using a small pick, push back and hold the ratchet mechanism.

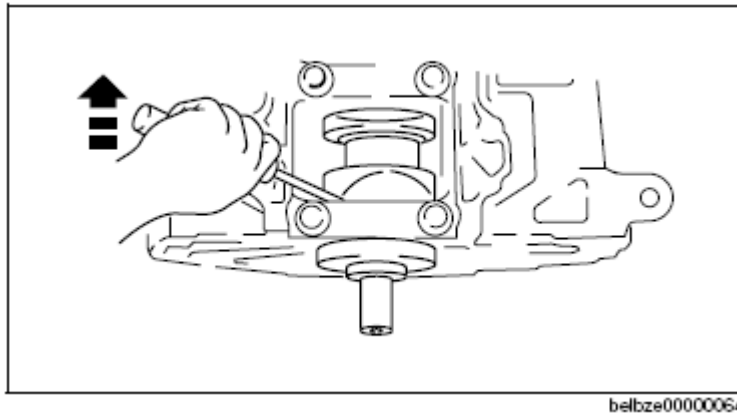


Fig. 411: Pushing Back And Hold Ratchet Mechanism Using Small Pick
Courtesy of MAZDA MOTORS CORP.

31. While holding the ratchet mechanism, push the ratchet arm back into the tensioner housing.

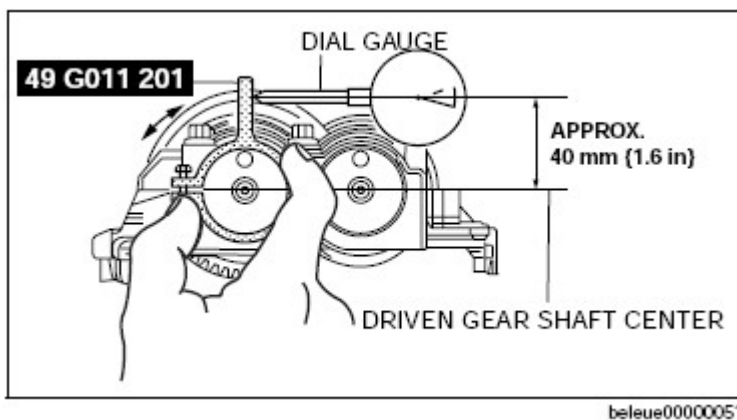


Fig. 412: Pushing Ratchet Arm Back Into Tensioner Housing
Courtesy of MAZDA MOTORS CORP.

32. Install a paper clip into the hole in the tensioner housing to hold the ratchet assembly and the plunger in during installation.

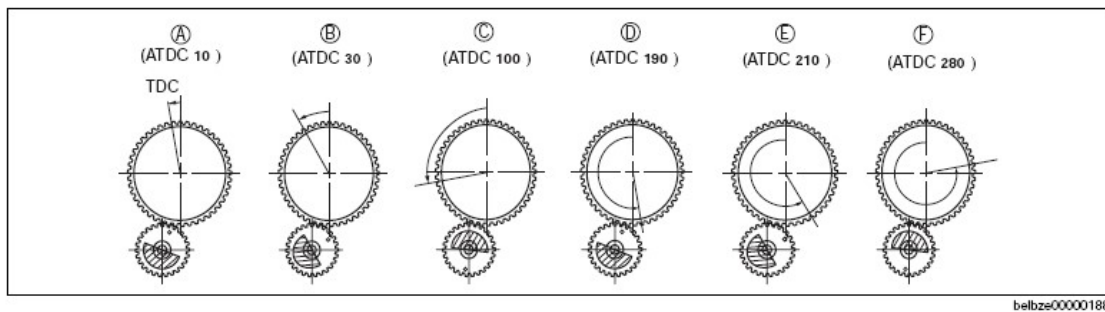


Fig. 413: Holding Ratchet Assembly And Plunger
Courtesy of MAZDA MOTORS CORP.

33. Install the timing chain tensioner and the bolts. Remove the paper clip to release the piston.
- Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

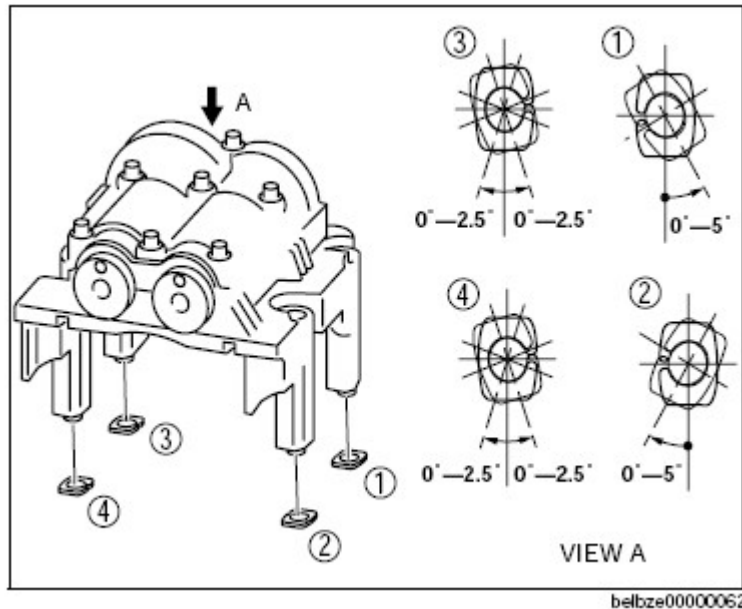


Fig. 414: Locating Timing Chain Tensioner Bolts And Paper Clip
Courtesy of MAZDA MOTORS CORP.

34. Using the flats on the camshafts to prevent camshaft rotation, tighten the bolts.
- Tighten to 72 N.m {7.3 kgf.m, 53 ft.lbf}.

CAUTION:

- The special tool 303-465 is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

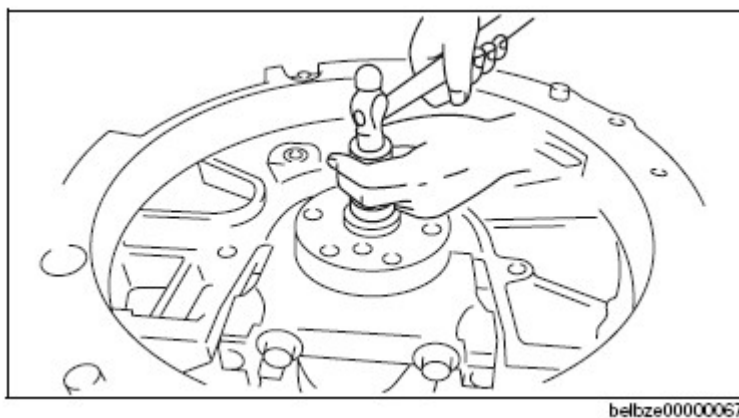


Fig. 415: Locating Camshaft Bolts
Courtesy of MAZDA MOTORS CORP.

35. Clean and inspect the mounting surfaces of the engine and the front cover.

CAUTION:

- Do not use metal scrapers, wire brushes, power abrasive disks or other abrasive means to clean sealing surfaces. These tools cause scratches and gouges which make leak paths.

36. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the cylinder head and oil pan joint areas.
Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the front cover.

NOTE:

- The engine front cover must be installed and the bolts tightened within 4 minutes of applying the silicone gasket and sealant.

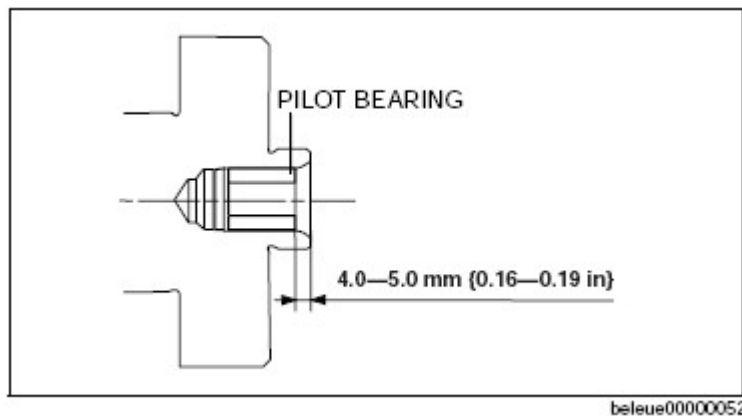
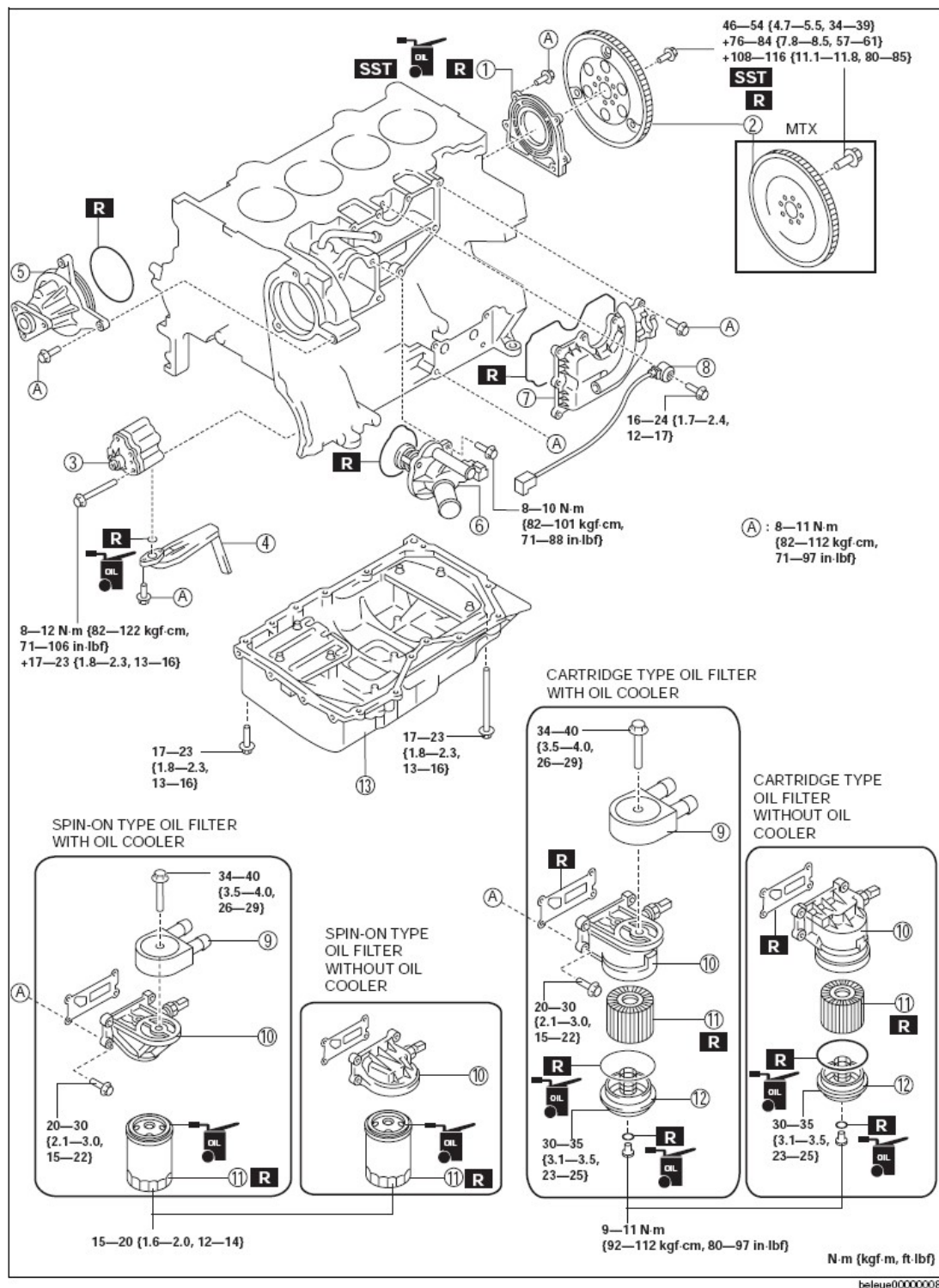


Fig. 416: Locating Bead Of Silicone Gasket And Sealant On Front Cover
Courtesy of MAZDA MOTORS CORP.

37. Install the engine front cover. Tighten* the bolts in the sequence shown in the figure, to the following specifications:
- Tighten the 8 mm bolts to 10 N.m {1.0 kgf.m, 89 in.lbf}.
 - Tighten the 13 mm bolts to 48 N.m {4.9 kgf.m, 35 ft.lbf}.

2009 Mazda Tribute Hybrid Grand Touring

2009 ENGINE Mechanical - 2.5L - Tribute



1	Rear oil seal (See Rear Oil Seal Assembly Note)
2	Flywheel (MTX), Drive plate (ATX) (See Drive Plate (ATX), Flywheel (MTX) Assembly Note)
3	Oil pump
4	Oil strainer

7	Oil separator
8	KS
9	Oil cooler
10	Oil filter adapter
11	Oil filter
12	Oil filter cover

Fig. 417: Identifying Engine Front Cover Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

38. Using the special tool, install a new crankshaft front oil seal.

NOTE: • Remove the throughbolt from the special tool.

NOTE: • Lubricate the oil seal with clean engine oil.

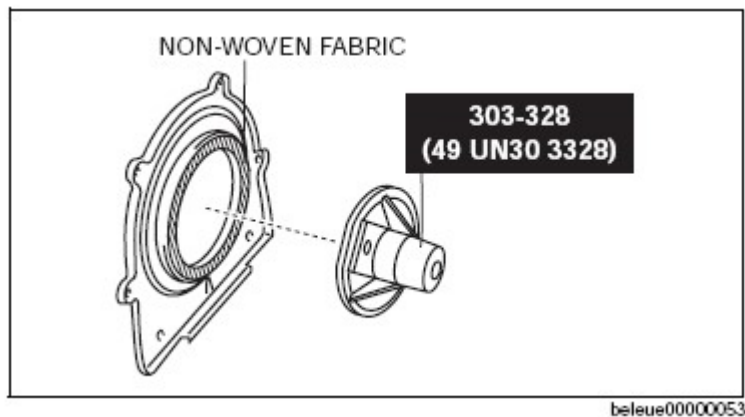


Fig. 418: Identifying Special Tool 303-096
Courtesy of MAZDA MOTORS CORP.

39. Position the crankshaft pulley onto the crankshaft with the hole in the pulley at the 6 o'clock position.

CAUTION: • Do not install the crankshaft pulley bolt at this time.

NOTE: • Apply clean engine oil on the seal area before installing.

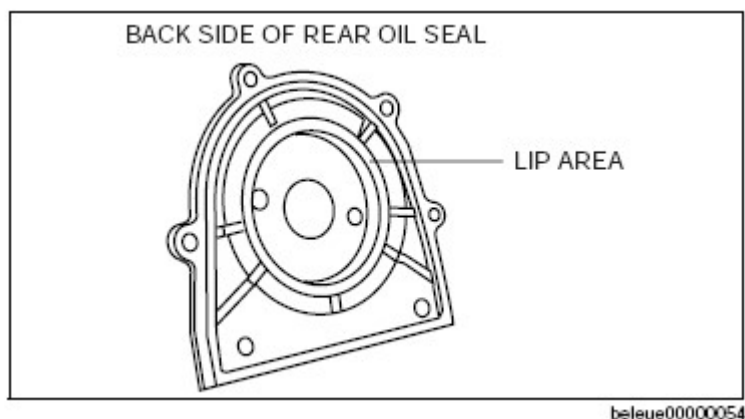


Fig. 419: Positioning Crankshaft Pulley Hole

Courtesy of MAZDA MOTORS CORP.

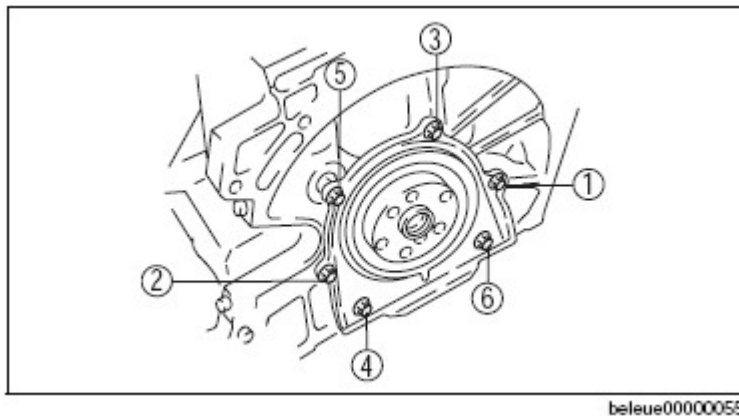
40. Install a standard 6 mm (0.23 in) x 18 mm (0.7 in) bolt through the crankshaft pulley and thread it into the front cover.

CAUTION:

- Only hand-tighten the 6 mm (0.23 in) bolt or damage to the front cover can occur.

NOTE:

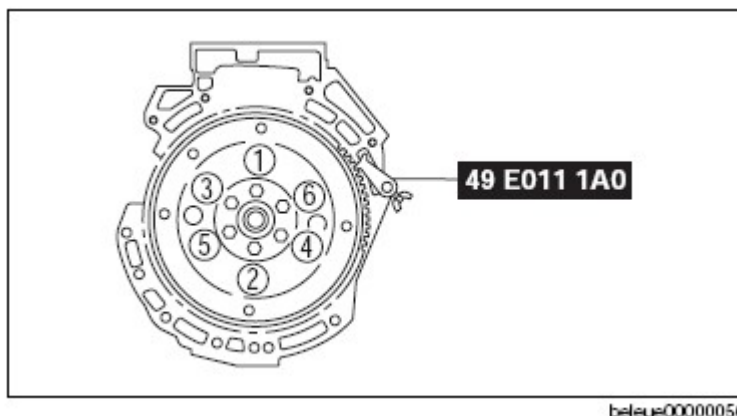
- This step will correctly align the crankshaft pulley to the crankshaft.



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Fig. 420: Locating 6 mm (0.23 in) x 18 mm (0.7 in) Bolt In Crankshaft Pulley
Courtesy of MAZDA MOTORS CORP.

41. Install a new crankshaft pulley bolt. Using the special tools to hold the crankshaft pulley in place, tighten the crankshaft pulley bolt in 2 stages:
 - Stage 1: Tighten to 100 N.m {10.2 kgf.m, 74 ft.lbf}.
 - Stage 2: Tighten an additional 90 degrees (1/4 turn).



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Fig. 421: Locating Crankshaft Pulley Bolt
Courtesy of MAZDA MOTORS CORP.

- CAUTION:**
- The crankshaft must remain in the TDC position during installation of the pulley bolt or damage to the engine can occur. Therefore, the crankshaft pulley must be held in place with the special tool and the bolt should be installed using hand tools only.
- CAUTION:**
- Do not reuse the crankshaft pulley bolt.

42. Remove the 6 mm (0.23 in) x 18 mm (0.7 in) bolt.

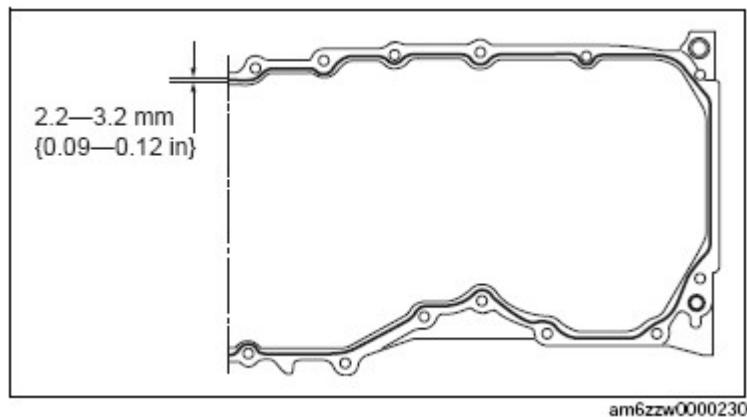


Fig. 422: Locating 6 mm (0.23 in) x 18 mm (0.7 in) Bolt
Courtesy of MAZDA MOTORS CORP.

43. Remove the special tool.

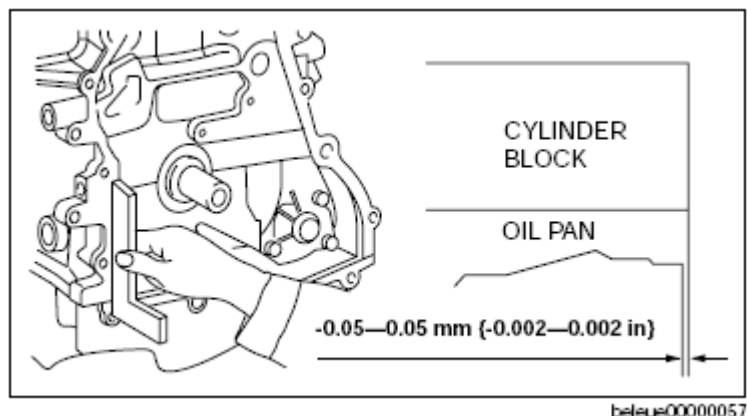


Fig. 423: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

44. Remove the special tool.

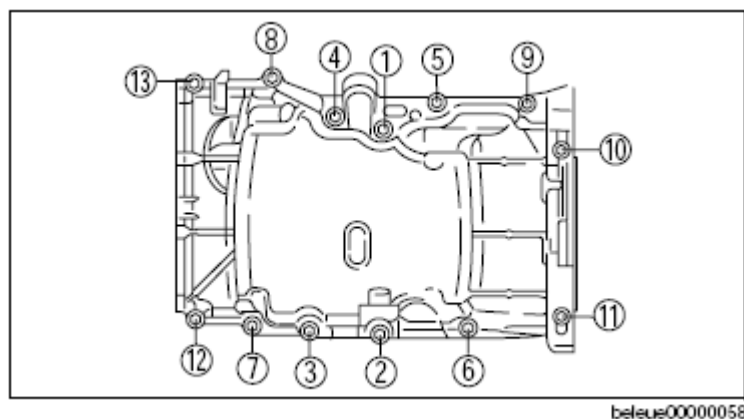


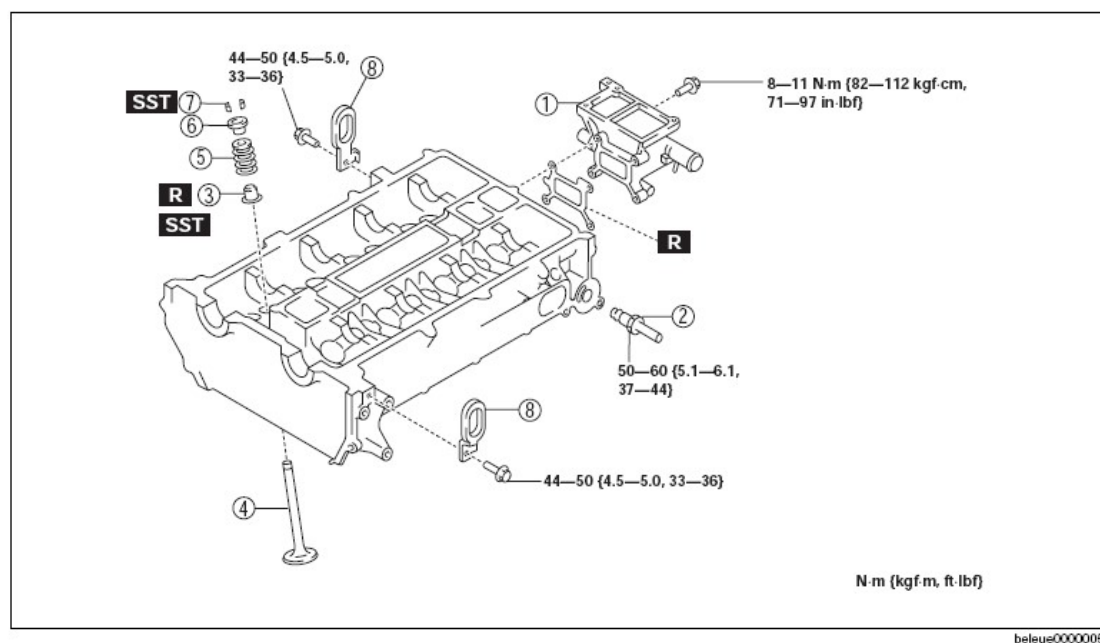
Fig. 424: Identifying Camshaft Alignment Plate 303-465
Courtesy of MAZDA MOTORS CORP.

45. Turn the crankshaft clockwise 1 and 3/4 turns.

NOTE:

- Only turn the engine in the normal direction of rotation.

46. Install the special tool.



1	Water outlet case
2	EGR pipe
3	Valve seal (See Valve Seal Assembly Note)
4	Valve

5	Valve spring
6	Upper valve spring seat
7	Valve keeper (See Valve Keeper Assembly Note)
8	Engine hanger

Fig. 425: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

47. Turn the crankshaft clockwise until the crankshaft contacts the special tool.

NOTE:

- Only turn the engine in the normal direction of rotation.

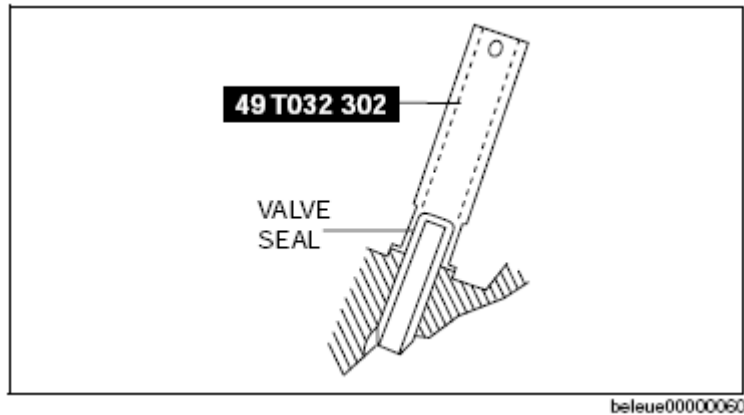


Fig. 426: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

48. Using the 6 mm (0.23 in) x 18 mm (0.7 in) bolt, check the position of the crankshaft pulley.
- If it is not possible to install the bolt, the engine valve timing must be corrected.

CAUTION:

- Only hand-tighten the bolt or damage to the front cover can occur.

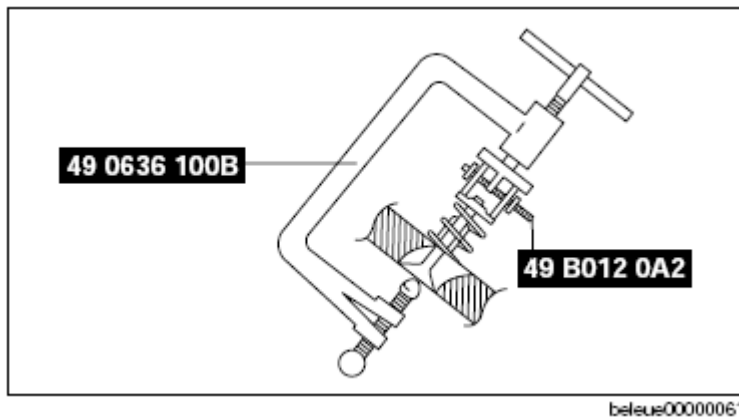
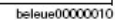


Fig. 427: Locating 6 mm (0.23 in) x 18 mm (0.7 in) Bolt
Courtesy of MAZDA MOTORS CORP.

49. Install the special tool to check the position of the camshafts.
- If it is not possible to install the special tool, the engine valve timing must be corrected.

2009 ENGINE Mechanical - 2.5L - Tribute



4	Tappet
5	Camshaft (See Camshaft Assembly Note)
6	Camshaft cap
8	OCV

50. Remove the special tool.

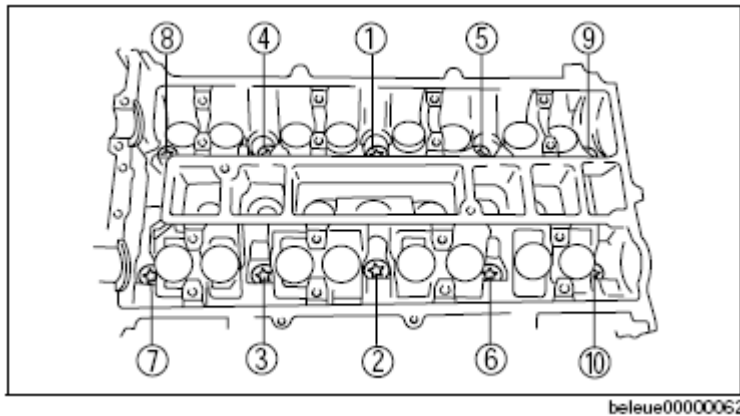


Fig. 429: Identifying Camshaft Alignment Plate 303-465
Courtesy of MAZDA MOTORS CORP.

51. Install a new crankshaft position (CKP) sensor and the 2 bolts.
 - Do not tighten the bolts at this time.

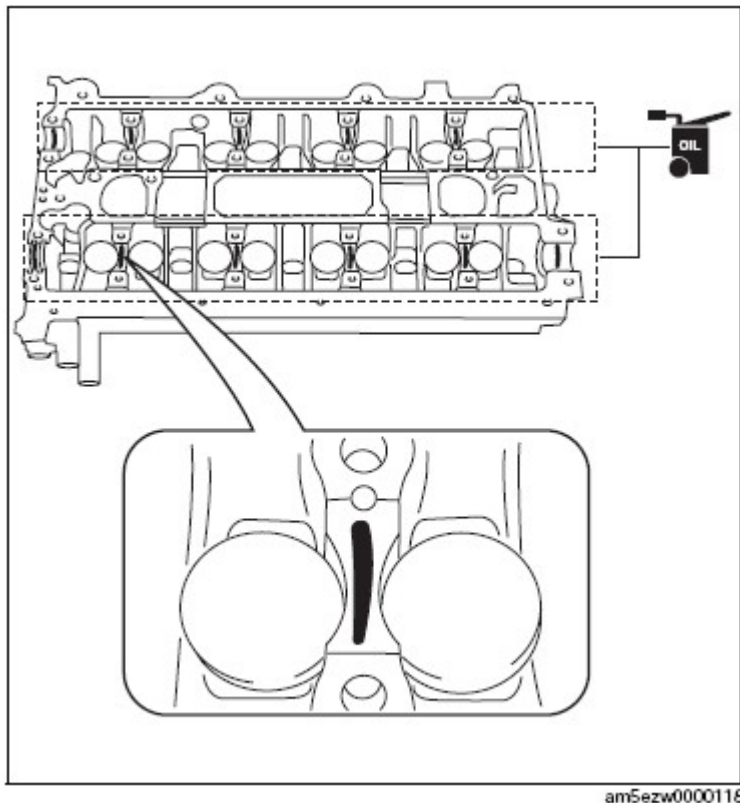
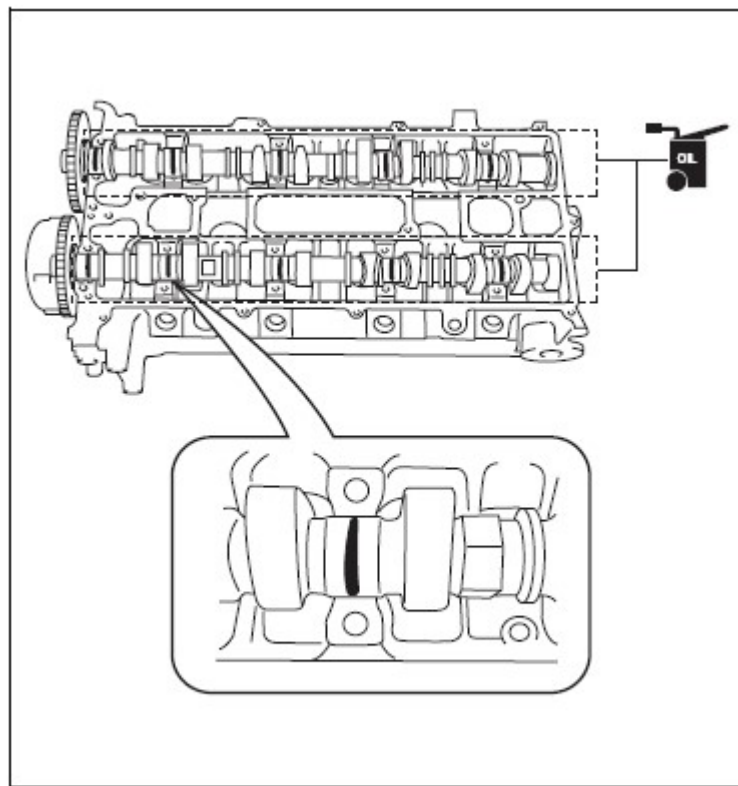


Fig. 430: Locating CKP Sensor And Bolts
Courtesy of MAZDA MOTORS CORP.

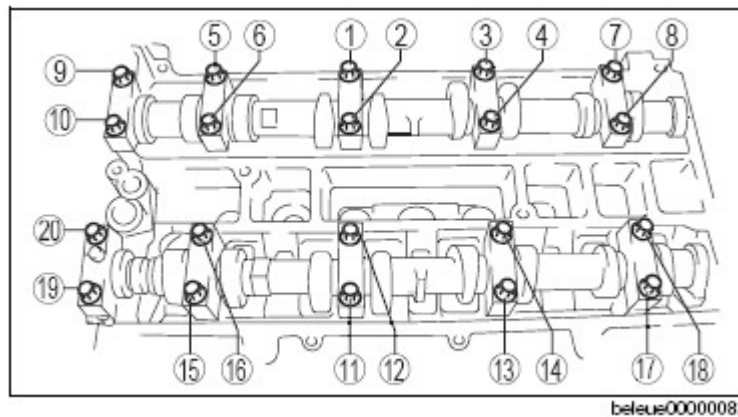
52. Adjust the CKP sensor with the alignment tool.
 - Tighten the 2 CKP bolts to 7 N.m {0.7 kgf.m, 62 in.lbf}.



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Fig. 431: Identifying CKP Sensor And Alignment Tool 303-1417
Courtesy of MAZDA MOTORS CORP.

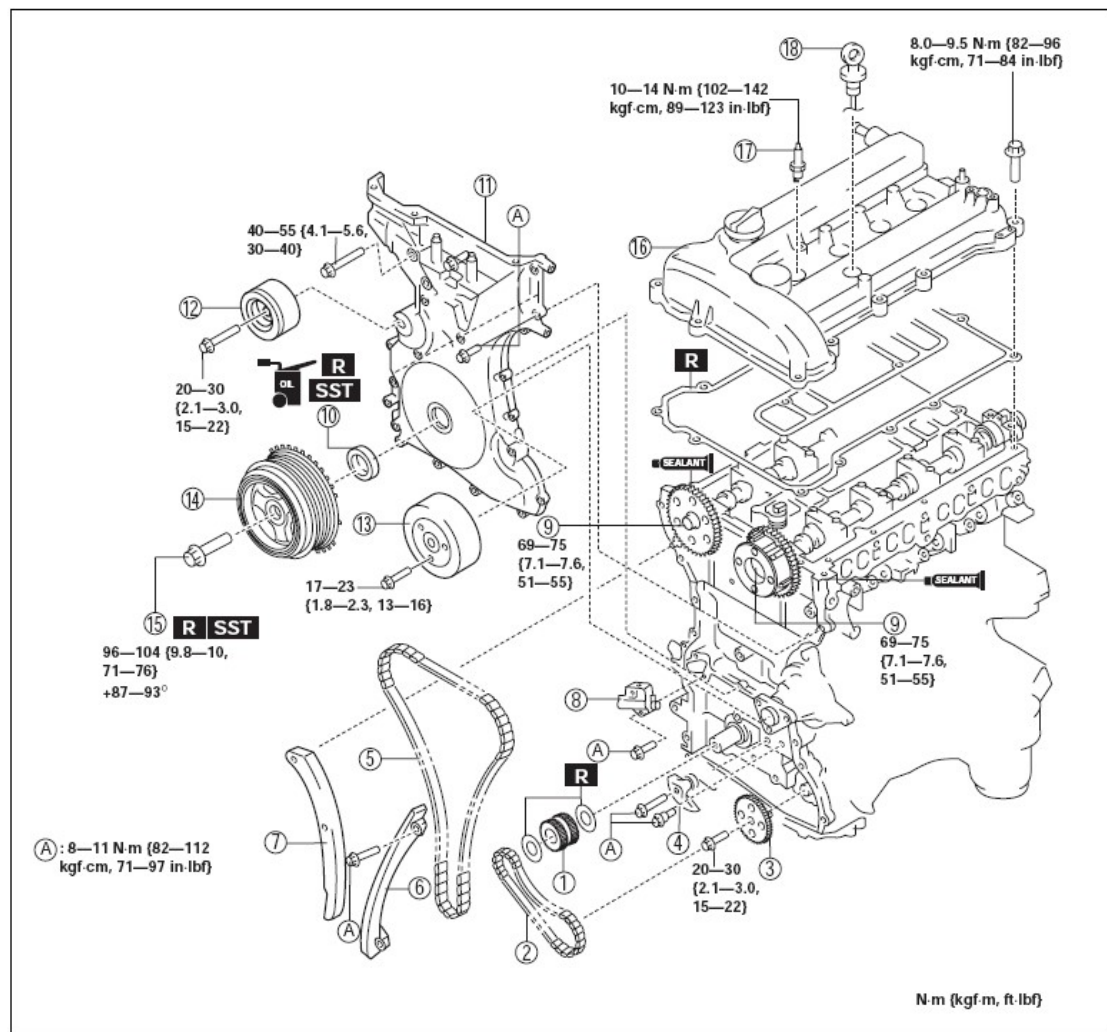
53. Remove the 6 mm (0.23 in) x 18 mm (0.7 in) bolt.



belcus00000082

Fig. 432: Locating 6 mm (0.23 in) x 18 mm (0.7 in) Bolt
Courtesy of MAZDA MOTORS CORP.

54. Remove the special tool.



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1	Crankshaft sprocket
2	Oil pump chain
3	Oil pump sprocket (See Oil Pump Sprocket Assembly Note.)
4	Oil pump chain tensioner
5	Timing chain (See Timing Chain Assembly Note.)
6	Chain guide
7	Tensioner arm
8	Chain tensioner
9	Camshaft sprocket, variable valve timing actuator (See Camshaft Sprocket, Variable Valve Timing Actuator Assembly Note.)
10	Front oil seal (See Front Oil Seal Assembly Note.)

11	Engine front cover (See Engine Front Cover Assembly Note.)
12	Drive belt idler pulley
13	Water pump pulley
14	Crankshaft pulley
15	Crankshaft pulley lock bolt (See Crankshaft Pulley Lock Bolt Assembly Note.)
16	Cylinder head cover (See Cylinder Head Cover Assembly Note)
17	Spark plug
18	Oil level gauge

Fig. 433: Identifying Special Tool 303-507
Courtesy of MAZDA MOTORS CORP.

55. Install the engine plug bolt.

- Tighten to 20 N.m {2.0 kgf.m, 177 in.lbf}.

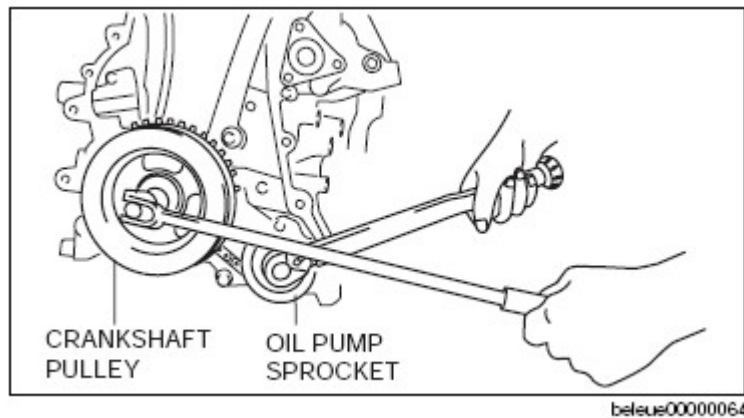


Fig. 434: Locating Engine Plug Bolt
Courtesy of MAZDA MOTORS CORP.

56. Clean the valve cover gasket surface with metal surface cleaner. Caution

CAUTION:

- Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths.

57. Apply silicone gasket and sealant to the locations shown in the figure.

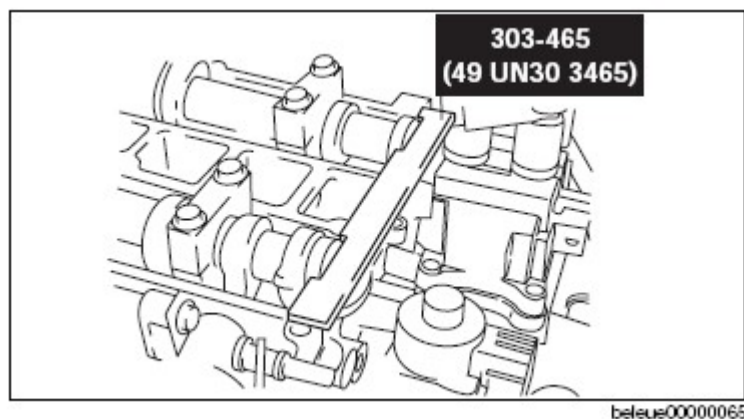


Fig. 435: Locating Silicone Gasket And Sealant Applying Locations
Courtesy of MAZDA MOTORS CORP.

58. Install the valve cover.

- Tighten the bolts in the sequence shown in the figure to 10 N.m {1.0 kgf.m, 89 in.lbf}.

NOTE:

- The valve cover must be secured within 4 minutes of silicone gasket application. If the valve cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with metal surface cleaner.

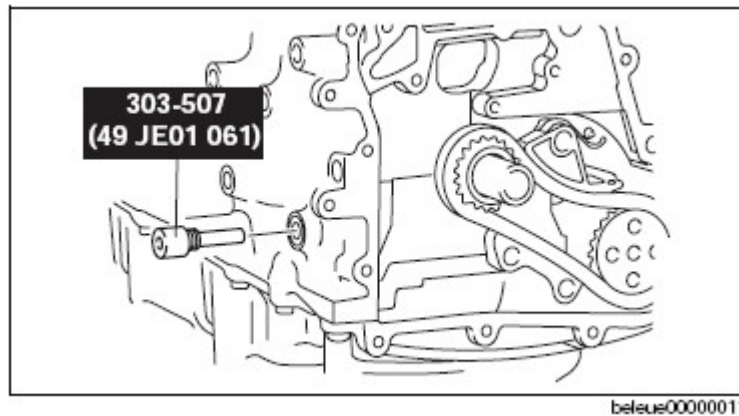


Fig. 436: Identifying Valve Cover Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

59. Install a new cylinder head temperature (CHT) sensor and the spark plugs.
 - Tighten the CHT sensor to 12 N.m {1.2 kgf.m, 106 in.lbf}.
 - Tighten the spark plugs to 12 N.m {1.2 kgf.m, 106 in.lbf}.

CAUTION:

- Only use hand tools when removing or installing the spark plugs or damage may occur to the cylinder head or spark plug.

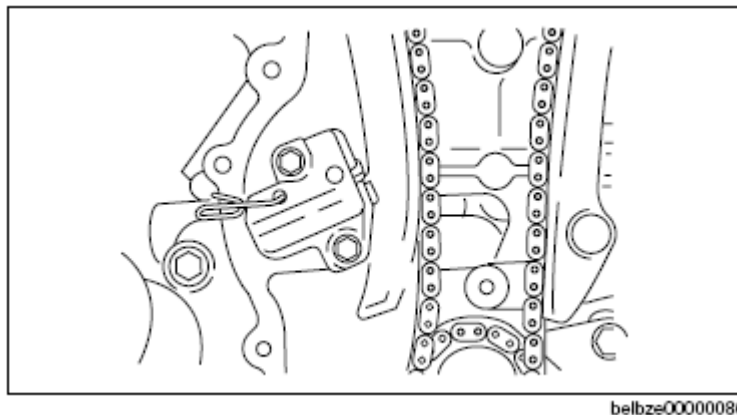


Fig. 437: Locating Cylinder Head Temperature Sensor And Spark Plugs
Courtesy of MAZDA MOTORS CORP.

60. Install the coil-on-plugs, bolts and the crank-case vent tube.
 - Tighten to 8 N.m {0.8 kgf.m, 71 in.lbf}.

NOTE:

- Apply dielectric compound to the inside of the coil-on-plug boots.

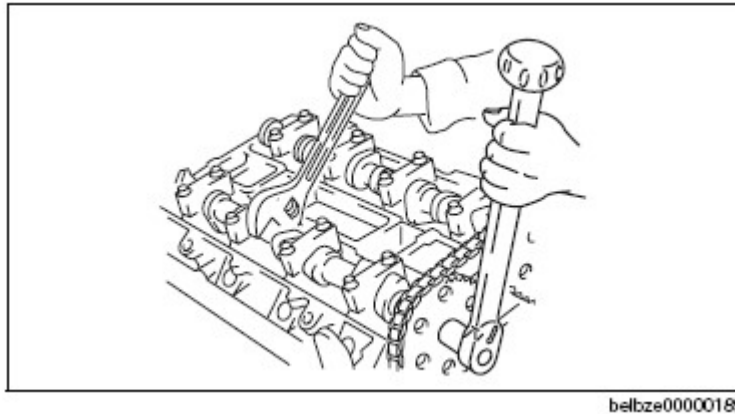


Fig. 438: Locating Coil-On-Plugs, Bolts And Crank-Case Vent Tube
Courtesy of MAZDA MOTORS CORP.

61. Install the oil level indicator.

NOTE:

- Make sure the notch on the oil level indicator is aligned with the V-shaped boss on the valve cover and fully engaged into the valve cover.

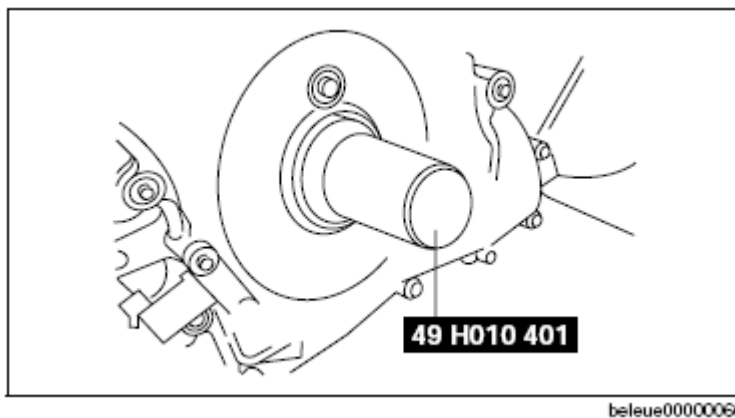


Fig. 439: Locating Oil Level Indicator
Courtesy of MAZDA MOTORS CORP.

62. If equipped, install the block heater.

- Tighten to 21 N.m {2.1 kgf.m, 15 ft.lbf}.

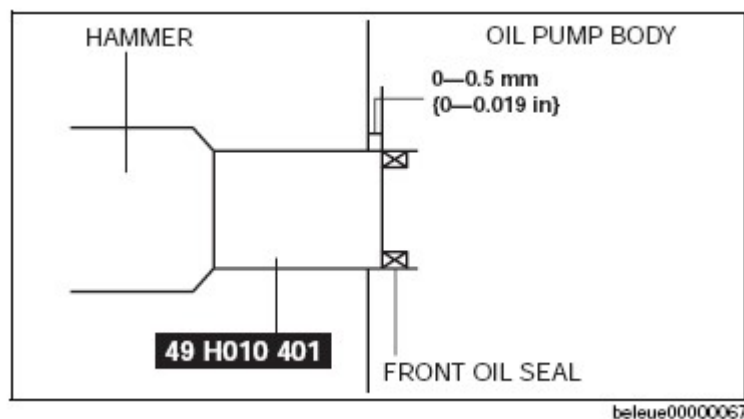


Fig. 440: Locating Block Heater
Courtesy of MAZDA MOTORS CORP.

63. Install the crankcase vent oil separator and the 8 bolts.
 - Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

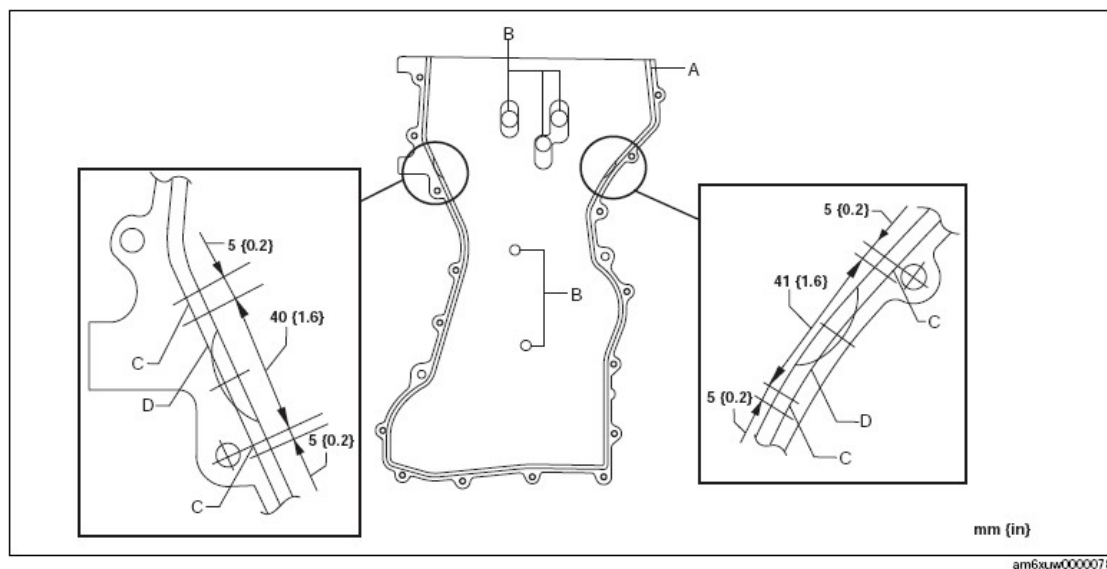
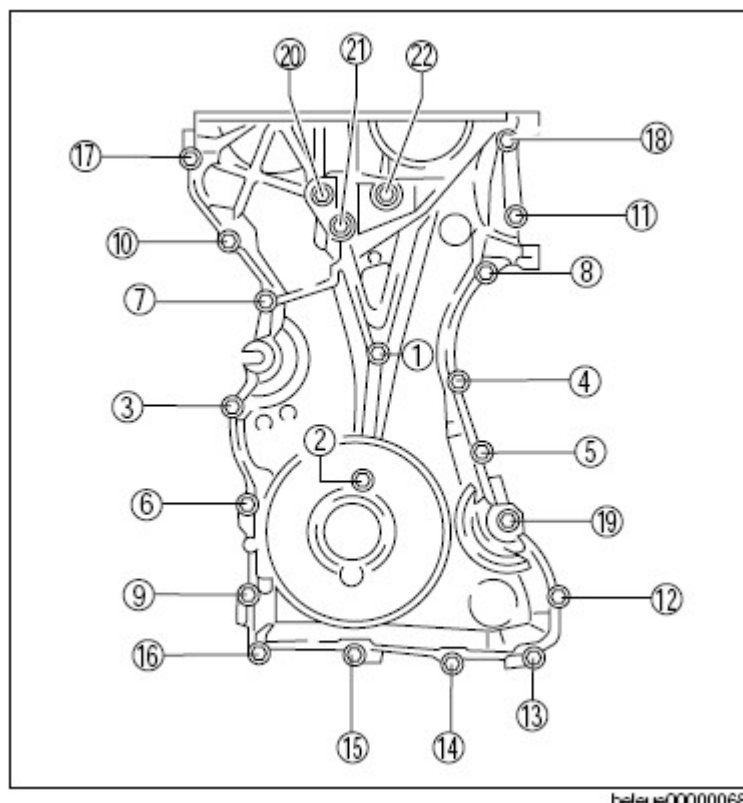


Fig. 441: Locating Crankcase Vent Oil Separator And Bolts
Courtesy of MAZDA MOTORS CORP.

64. Install the Knock Sensor (KS) and the bolt.
 - Tighten to 20 N.m {2.0 kgf.m, 177 in.lbf}.

NOTE:

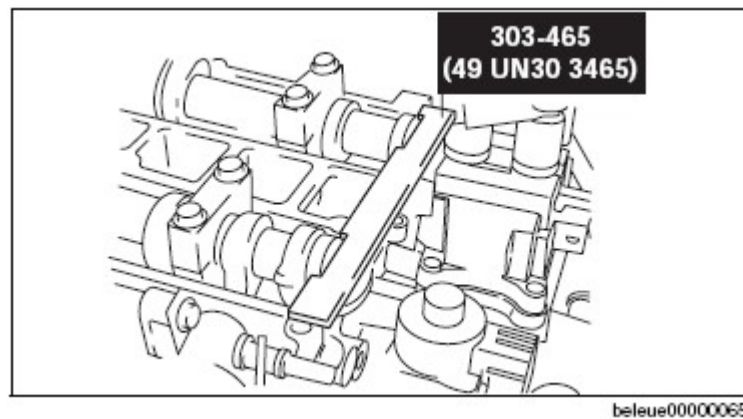
- The KS must not touch the crankcase vent oil separator.



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Fig. 442: Locating Knock Sensor And Bolt
Courtesy of MAZDA MOTORS CORP.

65. Install the 2 coolant hoses.



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Fig. 443: Locating Coolant Hoses
Courtesy of MAZDA MOTORS CORP.

66. Install the coolant hose.

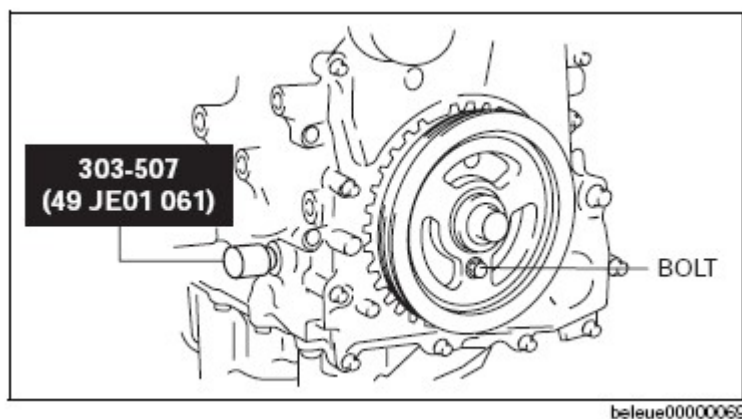


Fig. 444: Locating Coolant Hose
Courtesy of MAZDA MOTORS CORP.

67. Install the coolant hose.

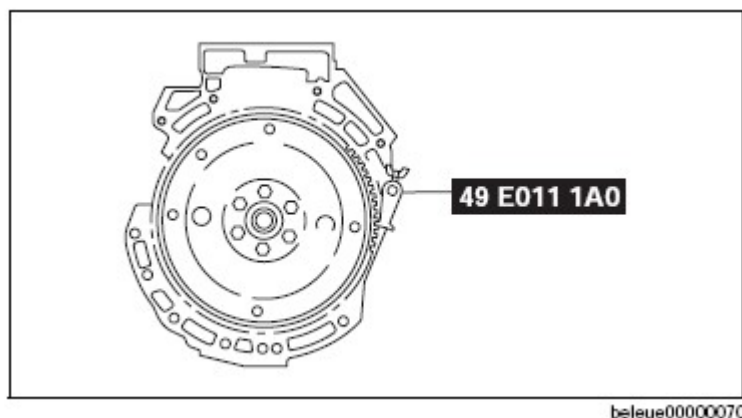


Fig. 445: Locating Coolant Hose
Courtesy of MAZDA MOTORS CORP.

68. Install the EGR tube.
- Tighten to 55 N.m {5.5 kgf.m, 41 ft.lbf}.

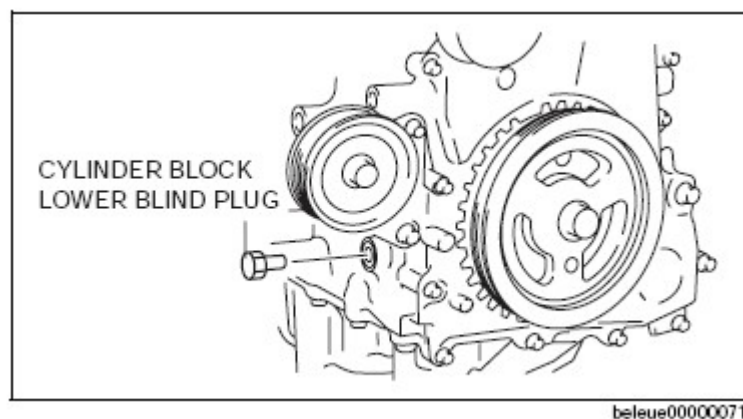


Fig. 446: Locating EGR Tube
Courtesy of MAZDA MOTORS CORP.

69. Position the intake manifold and connect the crankcase vent oil separator tube.

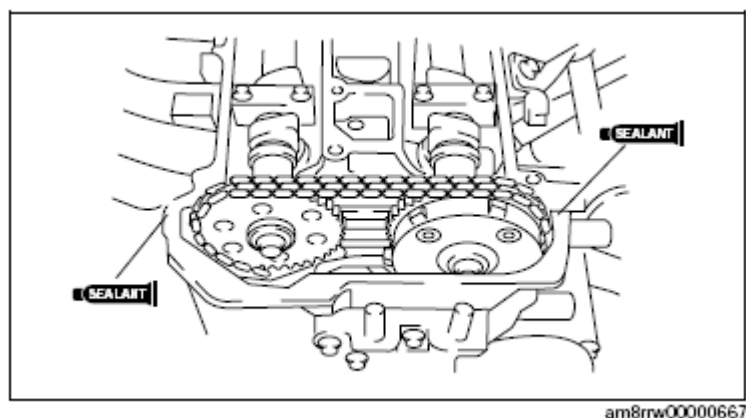
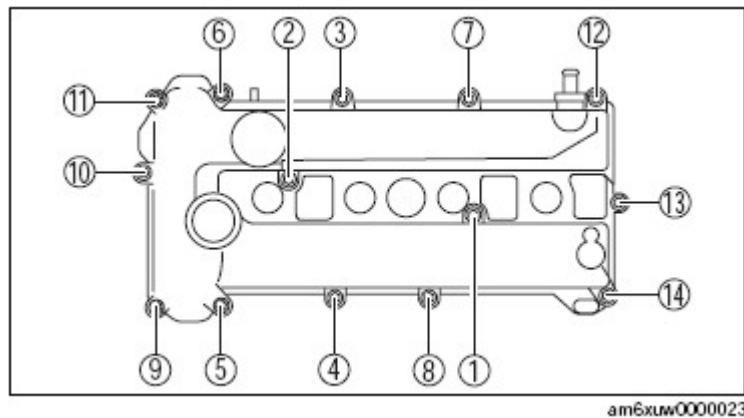


Fig. 447: Locating Crankcase Vent Oil Separator Tube
Courtesy of MAZDA MOTORS CORP.

70. Install the intake manifold gaskets, intake manifold and the 8 bolts.
- Tighten to 18 N.m {1.8 kgf.m, 159 in.lbf}.

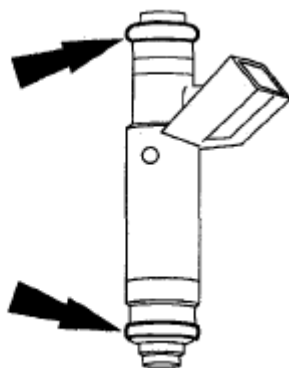


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Fig. 448: Locating Intake Manifold And Bolts
Courtesy of MAZDA MOTORS CORP.

71. Install new fuel injector O-rings.
 - Separate the fuel injectors from the fuel rail.
 - Remove and discard the fuel injector O-rings.
 - Install new O-rings and lubricate with clean engine oil.
 - Install the fuel injectors onto the fuel rail.

CAUTION: • Use O-ring seals that are made of special fuel-resistant material. Use of ordinary O-rings can cause the fuel system to leak. Do not reuse the O-ring seals.



AV1418-A

Fig. 449: Locating Fuel Injector O-Rings
Courtesy of MAZDA MOTORS CORP.

72. Install the fuel rail with the fuel injectors and stud bolts.
 - Tighten to 23 N.m {2.3 kgf.m, 17 ft.lbf}.

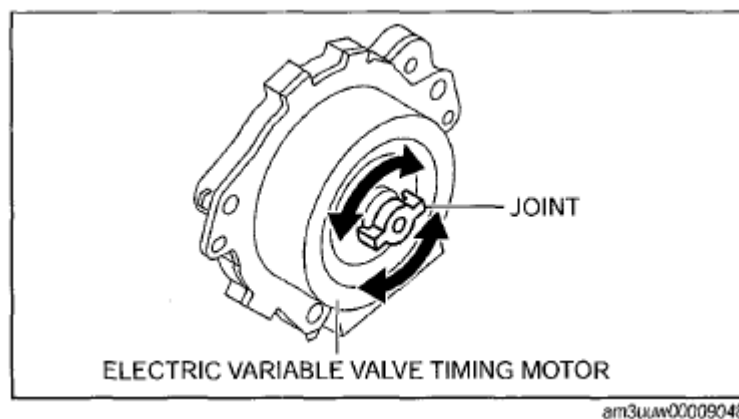


Fig. 450: Locating Fuel Rail With Fuel Injectors And Stud Bolts
 Courtesy of MAZDA MOTORS CORP.

73. Install the radio capacitor and nut.
 - Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

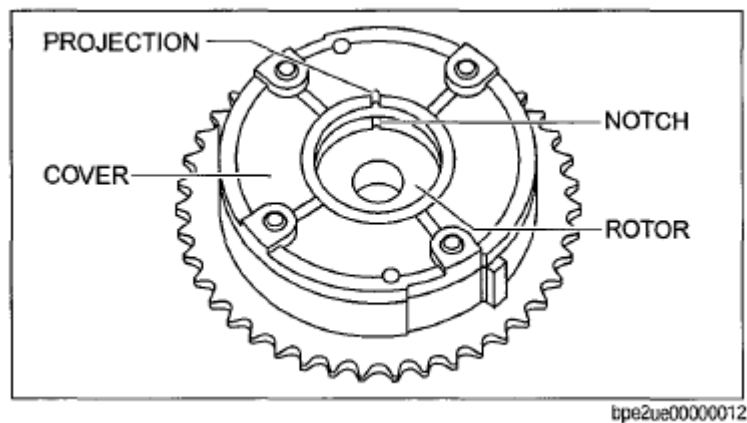


Fig. 451: Locating Radio Capacitor And Nut
 Courtesy of MAZDA MOTORS CORP.

74. Install the fuel rail insulator.

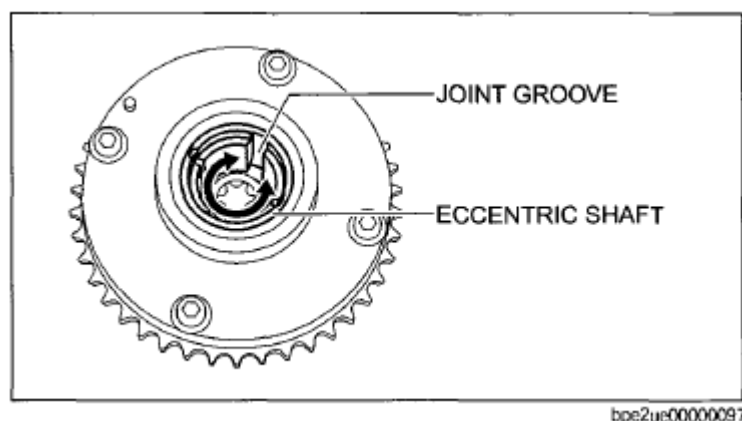


Fig. 452: Locating Fuel Rail Insulator
 Courtesy of MAZDA MOTORS CORP.

75. Connect the 4 fuel injector electrical connectors. Attach the 2 wiring harness retainers.

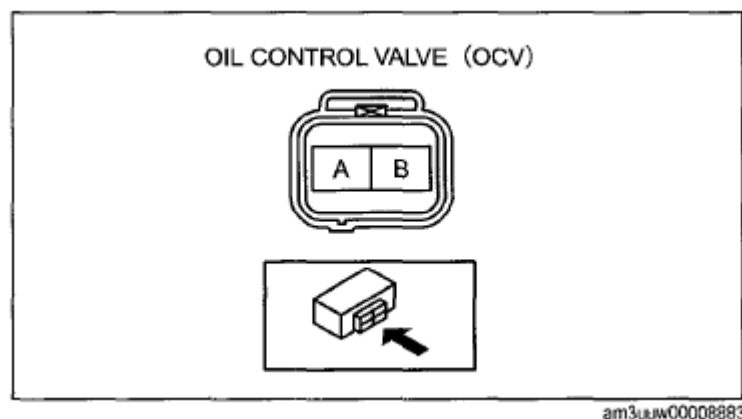


Fig. 453: Locating Fuel Injector Electrical Connectors And Wiring Harness Retainers
 Courtesy of MAZDA MOTORS CORP.

76. Connect the radio capacitor electrical connector.
77. Position the engine control wiring harness on the engine and connect the CHT sensor and install the rubber boot.

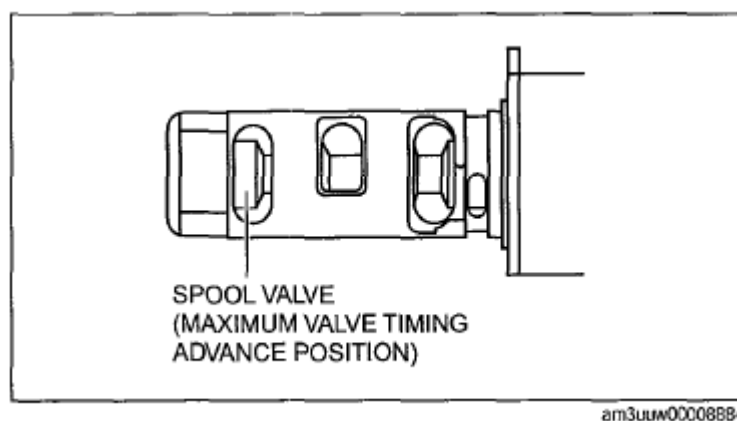


Fig. 454: Locating Radio Capacitor Electrical Connector
Courtesy of MAZDA MOTORS CORP.

78. Connect the 4 coil-on-plugs and Camshaft Position (CMP) sensor electrical connectors.

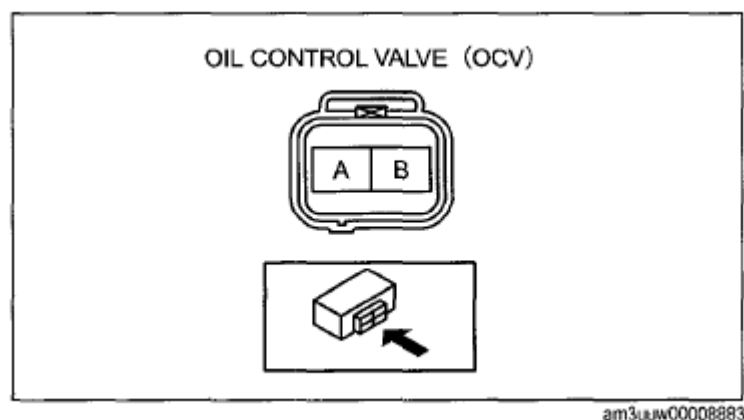


Fig. 455: Locating Coil-On-Plugs And Camshaft Position Sensor Electrical Connectors
Courtesy of MAZDA MOTORS CORP.

79. Attach all the wiring harness retainer to the intake manifold.

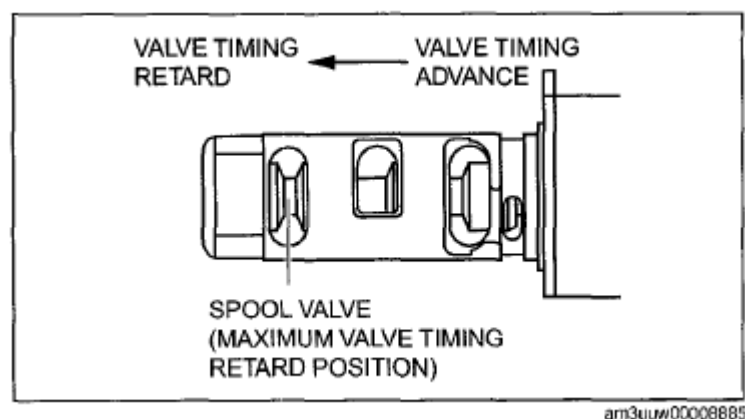


Fig. 456: Locating Wiring Harness Retainer
Courtesy of MAZDA MOTORS CORP.

80. Connect the KS and attach the 2 wiring harness retainers.

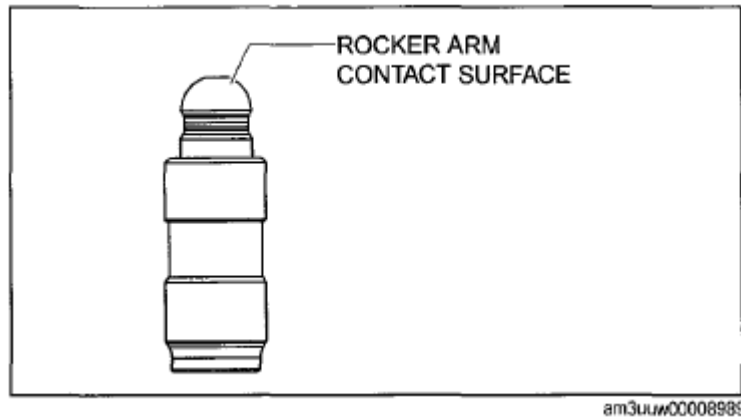


Fig. 457: Locating KS And Wiring Harness Retainers
Courtesy of MAZDA MOTORS CORP.

81. Connect the EGR valve electrical connector.

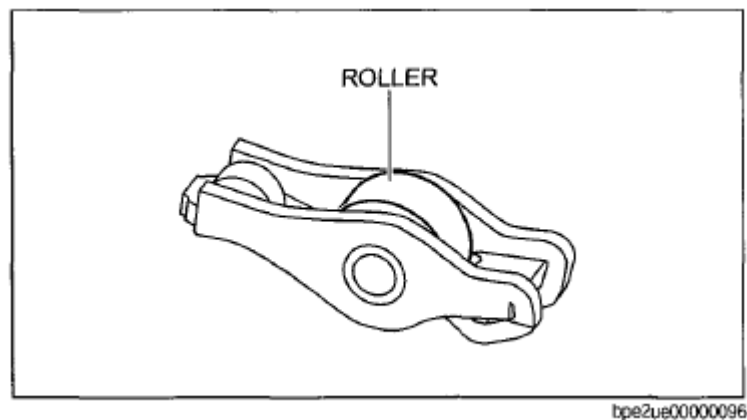


Fig. 458: Locating EGR Valve Electrical Connector
Courtesy of MAZDA MOTORS CORP.

82. Connect the electronic throttle control and Evaporative Emission (EVAP) canister purge valve electrical connectors.

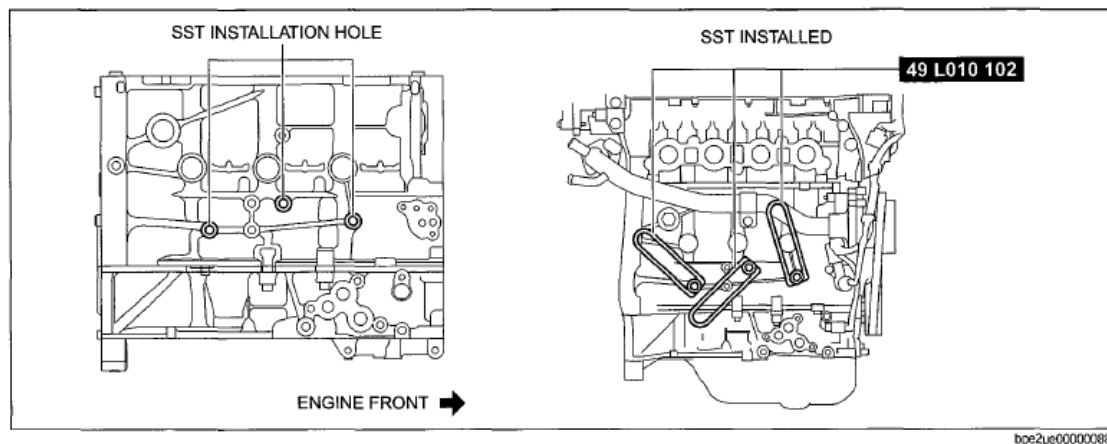


Fig. 459: Locating Electronic Throttle Control And Evaporative Emission Canister Purge Valve Electrical Connectors

Courtesy of MAZDA MOTORS CORP.

83. Connect the Manifold Absolute Pressure (MAP) sensor electrical connector.

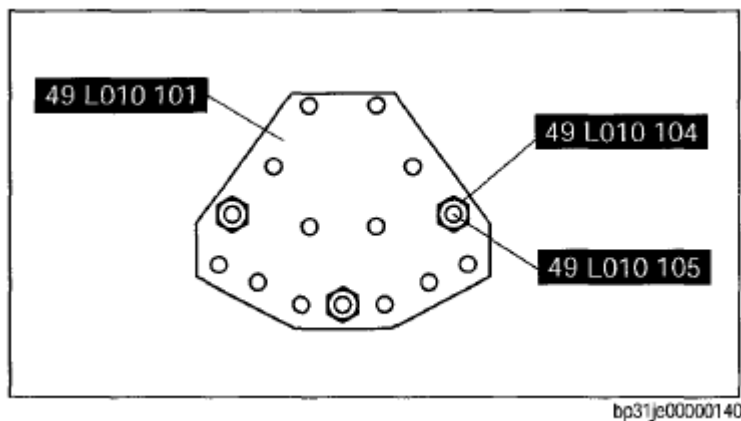


Fig. 460: Locating Manifold Absolute Pressure Sensor Electrical Connector

Courtesy of MAZDA MOTORS CORP.

84. Attach the wiring harness retainers to the LH side valve cover stud bolts.

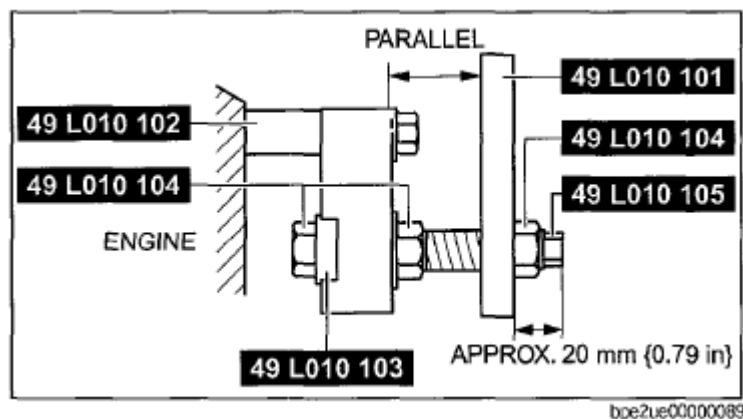


Fig. 461: Locating Wiring Harness Retainers
Courtesy of MAZDA MOTORS CORP.

85. Connect the crankcase vent hose to the valve cover.

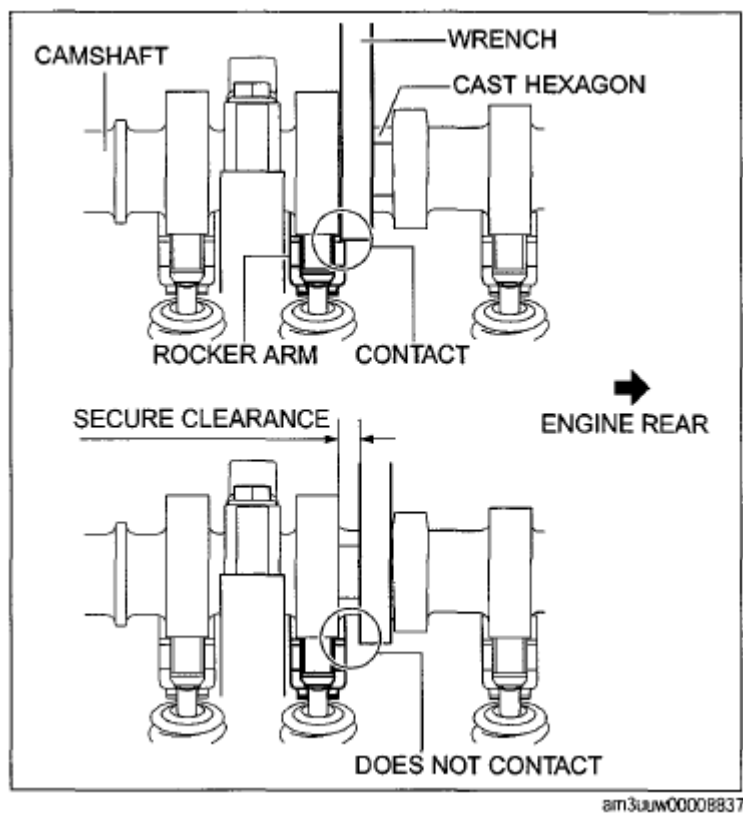


Fig. 462: Locating Crankcase Vent Hose
Courtesy of MAZDA MOTORS CORP.

86. Attach the wiring harness retainers to the RH side valve cover stud bolts.

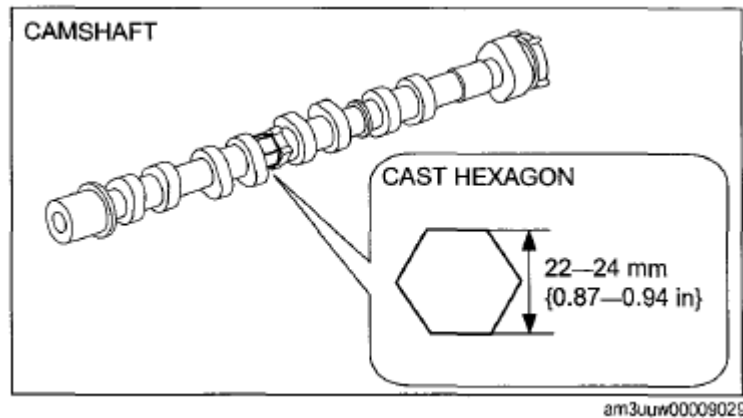
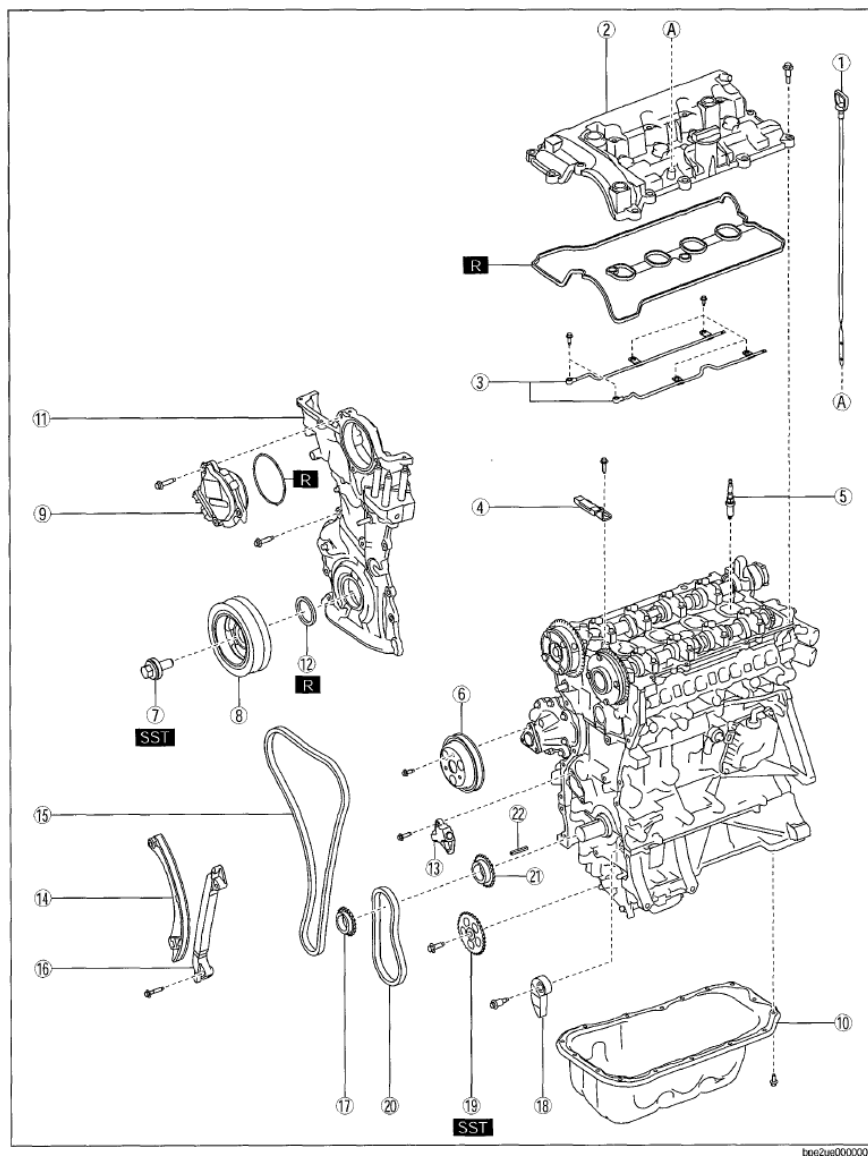


Fig. 463: Locating Wiring Harness Retainers Of RH Side Valve Cover Stud Bolts
Courtesy of MAZDA MOTORS CORP.

87. Connect the VCT electrical connector.



1	Dipstick
2	Cylinder head cover
5	Spark plug
6	Water pump pulley (See Water Pump Pulley Disassembly Note.)
7	Crankshaft pulley lock bolt (See Crankshaft Pulley Lock Bolt Disassembly Note.)
8	Crankshaft pulley
9	Electric variable valve timing motor/driver
10	Oil pan (See Oil Pan Disassembly Note.)
11	Engine front cover (See Engine Front Cover Disassembly Note.)
12	Front oil seal (See Front Oil Seal Disassembly Note.)

3	Oil shower pipe
4	Chain guide (No.1)
13	Chain tensioner (See Chain Tensioner Removal Note.)
14	Tensioner arm
15	Timing chain
16	Chain guide (No.2)
17	Crankshaft sprocket
18	Oil pump chain tensioner
19	Oil pump driven sprocket (See Oil Pump Driven Sprocket Disassembly Note.)
20	Oil pump chain
21	Oil pump drive sprocket
22	Key

Fig. 464: Locating VCT Electrical Connector
Courtesy of MAZDA MOTORS CORP.

88. If removed, install the capacitor and bolt.

- Tighten to 20 N.m {2.0 kgf.m, 177 in.lbf}.

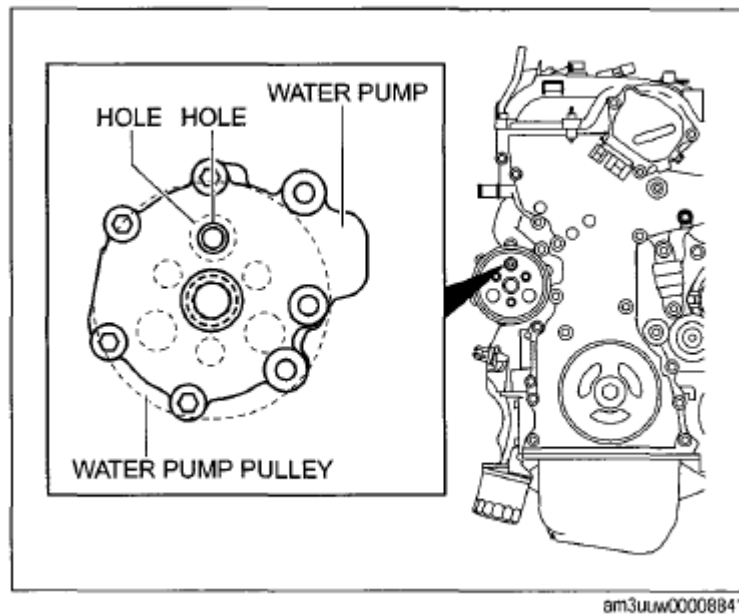


Fig. 465: Locating Capacitor And Bolt
Courtesy of MAZDA MOTORS CORP.

89. Install the oil filter adapter with a new gasket.
 - Tighten to 25 N.m {2.5 kgf.m, 18 ft.lbf}.

NOTE: • Clean the gasket mating surfaces with metal surface prep.

NOTE: • Spin on oil filter adapter shown in the figure, element oil filter adapter similar.

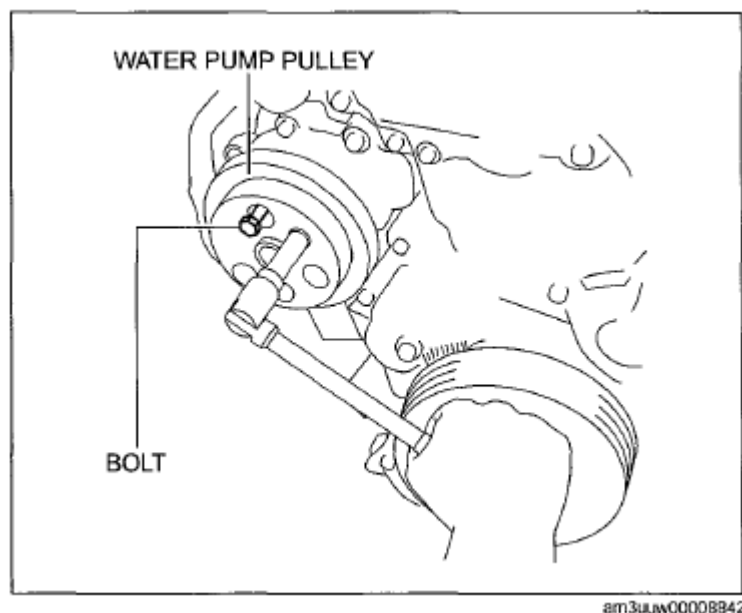


Fig. 466: Locating Oil Filter Adapter And Bolts
Courtesy of MAZDA MOTORS CORP.

90. Connect the Engine Oil Pressure (EOP) switch electrical connector.

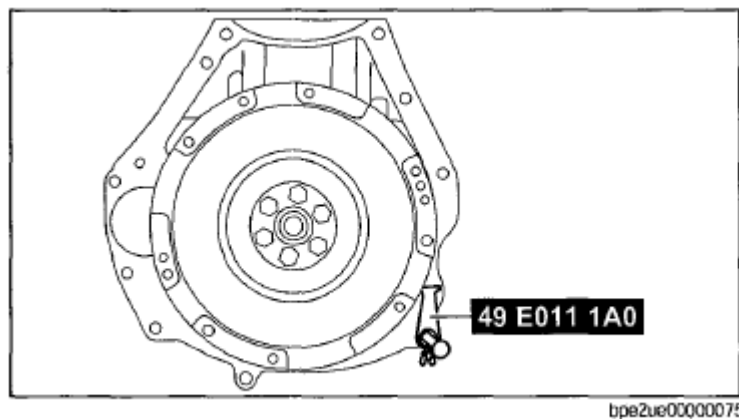


Fig. 467: Locating Engine Oil Pressure Switch Electrical Connector
Courtesy of MAZDA MOTORS CORP.

91. Install the coolant tube retainer to the intake manifold.

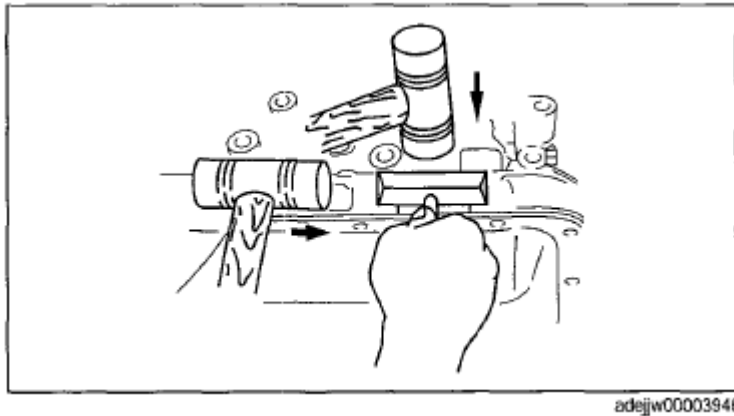


Fig. 468: Locating Coolant Tube Retainer
Courtesy of MAZDA MOTORS CORP.

92. Install the thermostat housing and bolts.
 - Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

NOTE:

- Clean and inspect the thermostat housing gasket. Install a new gasket, if necessary.

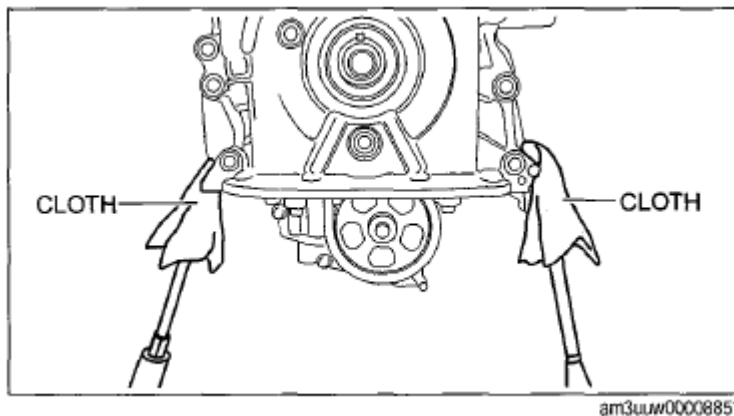


Fig. 469: Locating Thermostat Housing And Bolts
Courtesy of MAZDA MOTORS CORP.

93. Install the coolant pump and bolts.
 - Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

NOTE:

- Clean the coolant pump mating surface with metal surface prep.

NOTE:

- Lubricate the coolant pump O-ring with clean engine coolant.

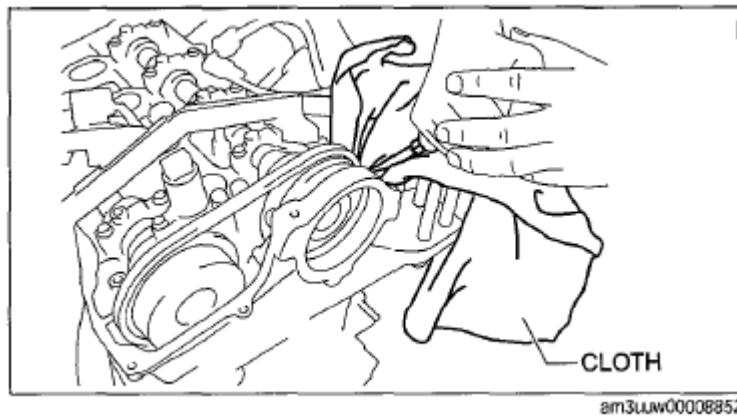


Fig. 470: Locating Coolant Pump And Bolts
Courtesy of MAZDA MOTORS CORP.

94. Install the 3 coolant pump pulley and bolts.
- Tighten to 20 N.m {2.0 kgf.m, 177 in.lbf}.

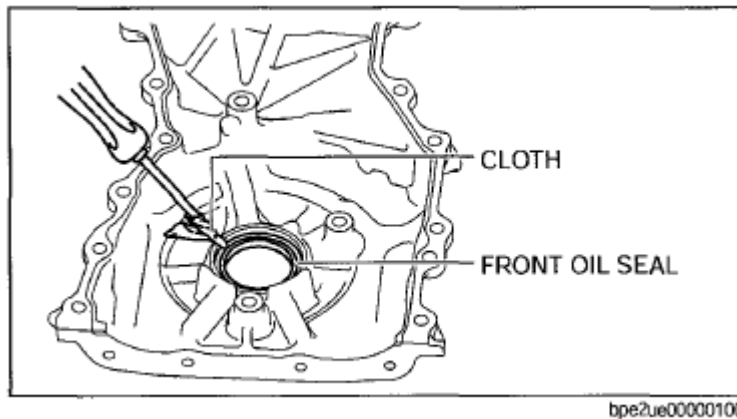


Fig. 471: Locating Coolant Pump Pulley And Bolts
Courtesy of MAZDA MOTORS CORP.

95. Install the accessory drive belt idler pulley and bracket and the 2 bolts.
- Tighten to 25 N.m {2.0 kgf.m, 18 ft.lbf}.

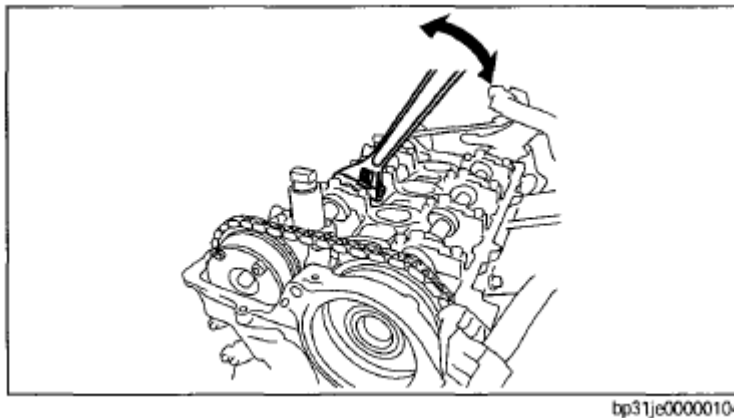


Fig. 472: Locating Accessory Drive Belt Idler Pulley Bracket And Bolts
Courtesy of MAZDA MOTORS CORP.

96. Install the accessory drive belt idler pulley.
- Tighten to 25 N.m {2.5 kgf.m, 18 ft.lbf}.

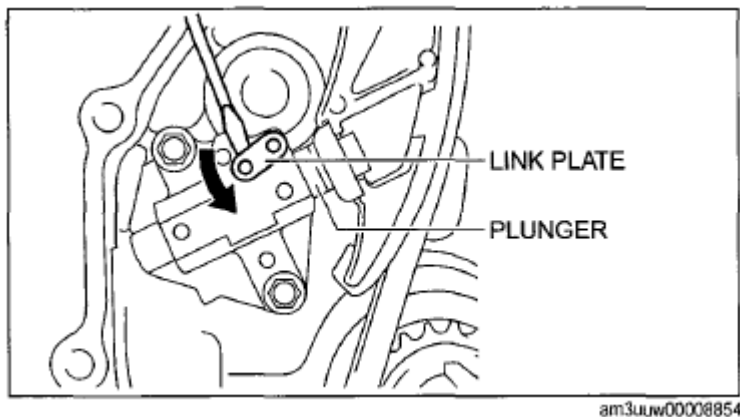


Fig. 473: Locating Accessory Drive Belt Idler Pulley
Courtesy of MAZDA MOTORS CORP.

97. Install the accessory drive belt tensioner and the 2 bolts.
- Tighten to 25 N.m {2.5 kgf.m, 18 ft.lbf}.

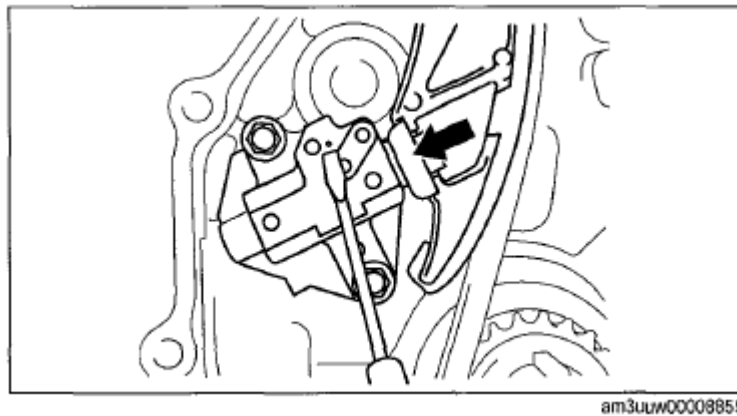


Fig. 474: Locating Accessory Drive Belt Tensioner And Bolts
Courtesy of MAZDA MOTORS CORP.

98. Install 7 new exhaust manifold studs in the cylinder head.
 - Tighten to 17 N.m {1.7 kgf.m, 150 in.lbf}.

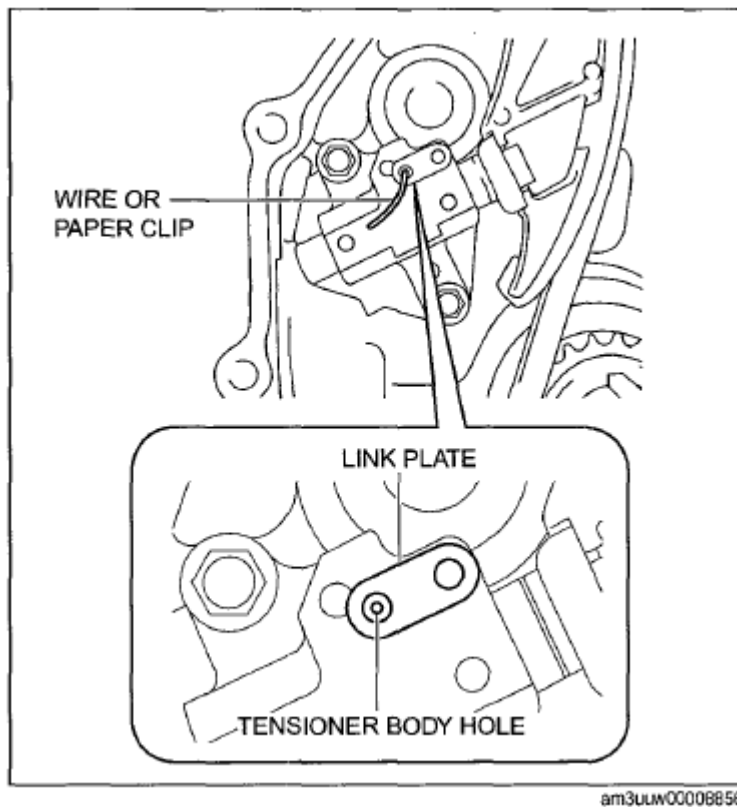


Fig. 475: Locating Exhaust Manifold Studs In Cylinder Head
Courtesy of MAZDA MOTORS CORP.

99. Install the new exhaust manifold gasket on the engine
100. Position the catalytic converter and tighten the 7 new exhaust manifold nuts in the sequence shown in the

figure in 2 stages.

- Stage 1: Tighten to 48 N.m {4.8 kgf.m, 35 ft.lbf}.
- Stage 2: Tighten to 48 N.m {4.8 kgf.m, 35 ft.lbf}.

CAUTION:

- Failure to tighten the catalytic converter nuts to specification before installing the converter bracket bolts will cause the converter to develop an exhaust leak.

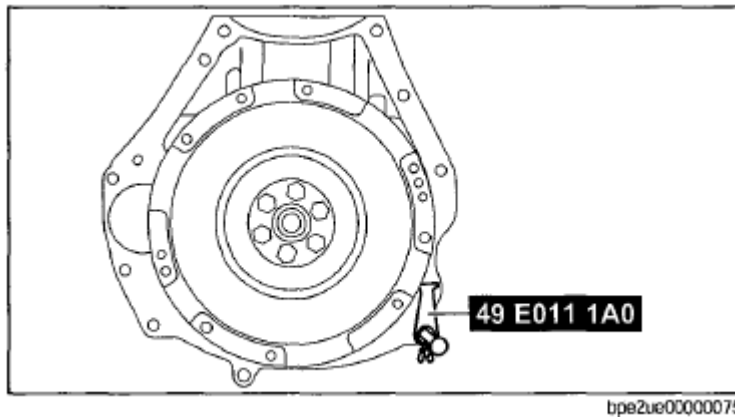


Fig. 476: Identifying Exhaust Manifold Nuts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

NOTE:

- Make sure to tighten the nuts in the sequence in 2 stages.

101. Install the heat shield and the 6 bolts.

- Tighten to Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.

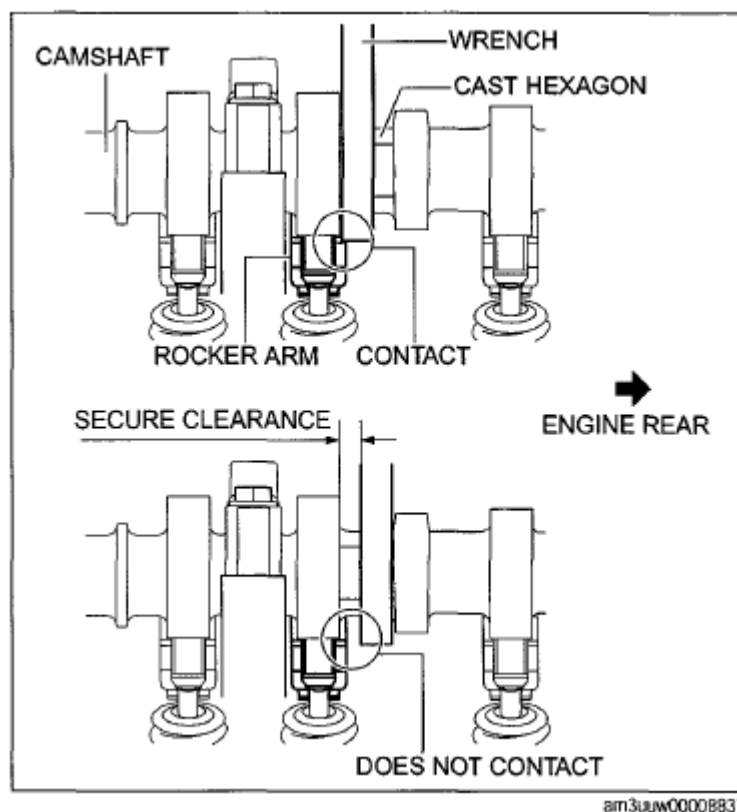


Fig. 477: Locating Heat Shield And Bolts
Courtesy of MAZDA MOTORS CORP.

102. Connect the Heated Oxygen Sensor (H02S) electrical connector.

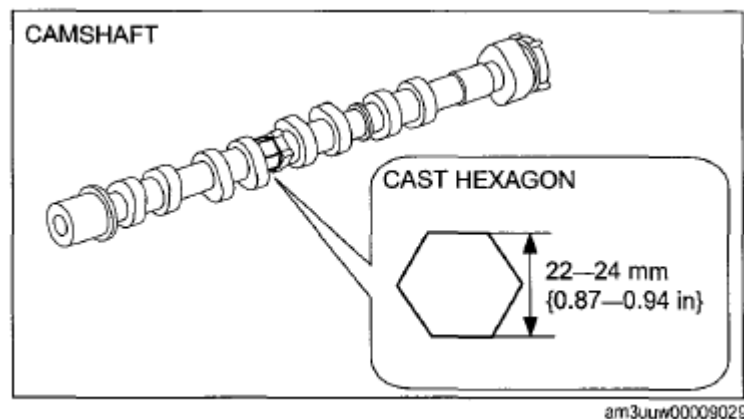
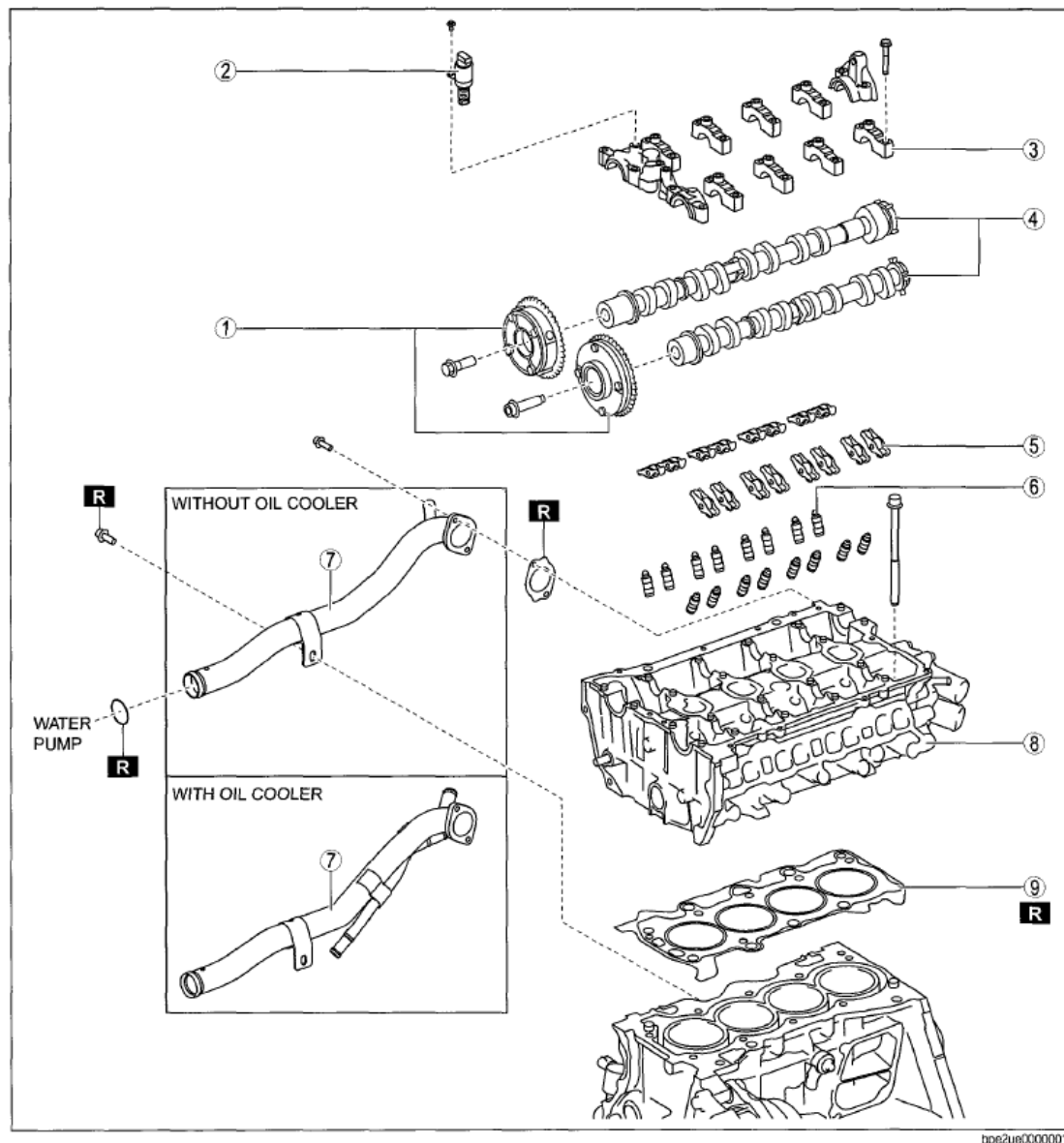


Fig. 478: Locating Heated Oxygen Sensor Electrical Connector
Courtesy of MAZDA MOTORS CORP.

103. Install the generator, 2 nuts and 1 bolt.
- Tighten to Tighten to 47 N.m {4.7 kgf.m, 35 in.lbf}.

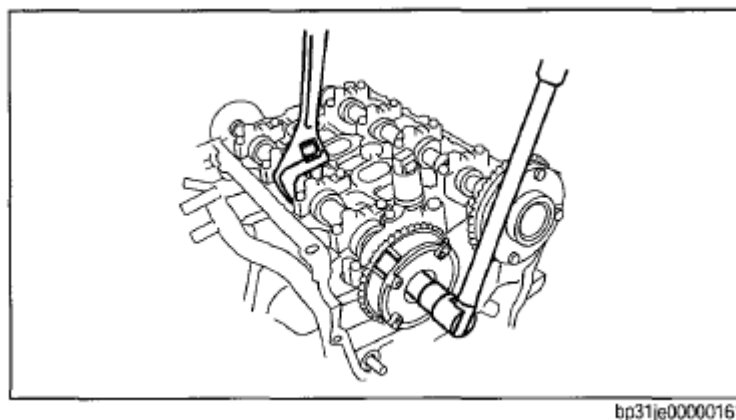


1	Electric variable valve timing actuator, hydraulic variable valve timing actuator (See Electric Variable Valve Timing Actuator, Hydraulic Variable Valve Timing Actuator Disassembly Note.)
2	OCV
3	Camshaft cap (See Camshaft Cap Disassembly Note.)
4	Camshaft

5	Rocker arm (See Rocker Arm Disassembly Note.)
6	HLA (See HLA Disassembly Note.)
7	Water inlet pipe
8	Cylinder head (See Cylinder Head Disassembly Note.)
9	Cylinder head gasket

Fig. 479: Locating Generator, Nuts And Bolt
Courtesy of MAZDA MOTORS CORP.

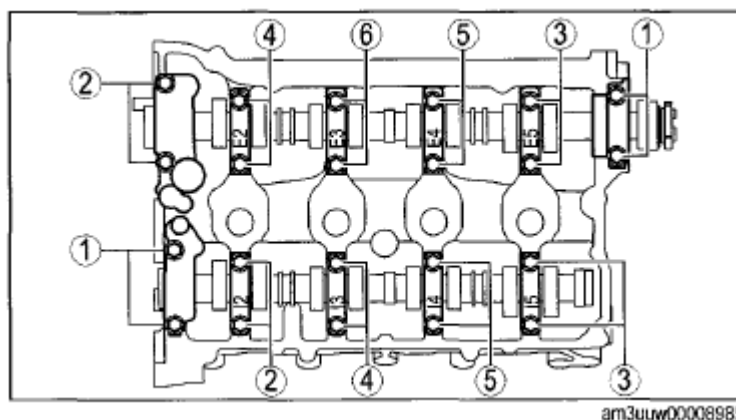
104. Connect the generator electrical connection and install the nut.
- Tighten to Tighten to 6 N.m {0.6 kgf.m, 53 in.lbf}.



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Fig. 480: Locating Generator Electrical Connection And Nut
Courtesy of MAZDA MOTORS CORP.

105. Connect the generator electrical connection and attach the 2 wiring harness retainers.



am3uuw00008985

Fig. 481: Locating Generator Electrical Connection And Wiring Harness Retainers
Courtesy of MAZDA MOTORS CORP.

106. Connect the CKP sensor electrical connector.
- Attach the wiring harness-to-engine retainer.

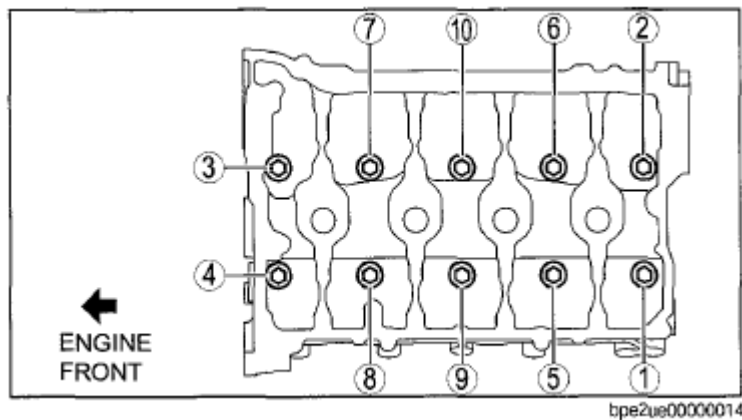
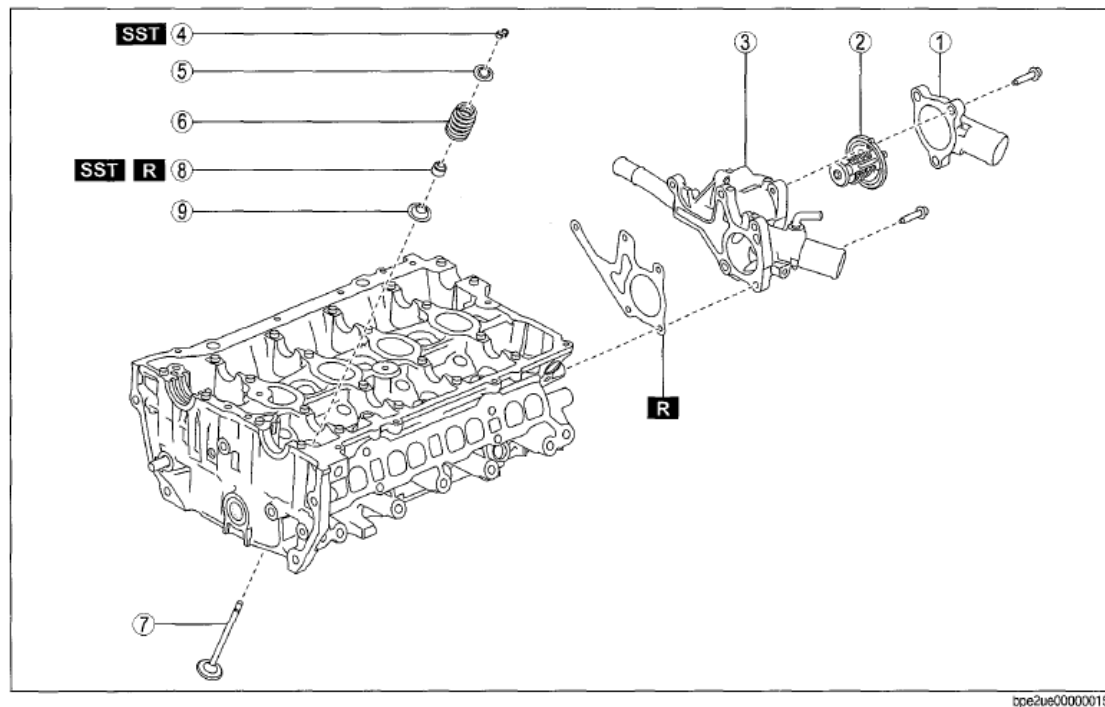


Fig. 482: Locating CKP Sensor Electrical Connector
Courtesy of MAZDA MOTORS CORP.

107. Using the Heavy Duty Floor Crane and Spreader Bar, remove the engine from the engine stand.

Vehicles with automatic transaxles

108. Install the flexplate and the bolts. Tighten the bolts in the sequence shown in the figure in 3 stages.
- Stage 1: Tighten to 50 N.m {5.1 kgf.m, 37 ft.lbf}.
 - Stage 2: Tighten to 80 N.m {8.2 kgf.m, 59 ft.lbf}.
 - Stage 3: Tighten to 112 N.m {11.4 kgf.m, 83 ft.lbf}.



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1	Thermostat cover
2	Thermostat
3	Water outlet
4	Valve keeper (See Valve Keeper Disassembly Note.)
5	Upper valve spring seat

6	Valve spring
7	Valve
8	Valve seal (See Valve Seal Disassembly Note.)
9	Lower valve spring seat

Fig. 483: Identifying Flexplate Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

Vehicles with manual transaxles

109. Install the flywheel and the bolts. Tighten the bolts in the sequence shown in the figure in 3 stages.
- Stage 1: Tighten to 50 N.m {5.1 kgf.m, 37 ft.lbf}.
 - Stage 2: Tighten to 80 N.m {8.2 kgf.m, 59 ft.lbf}.
 - Stage 3: Tighten to 112 N.m {11.4 kgf.m, 83 ft.lbf}.

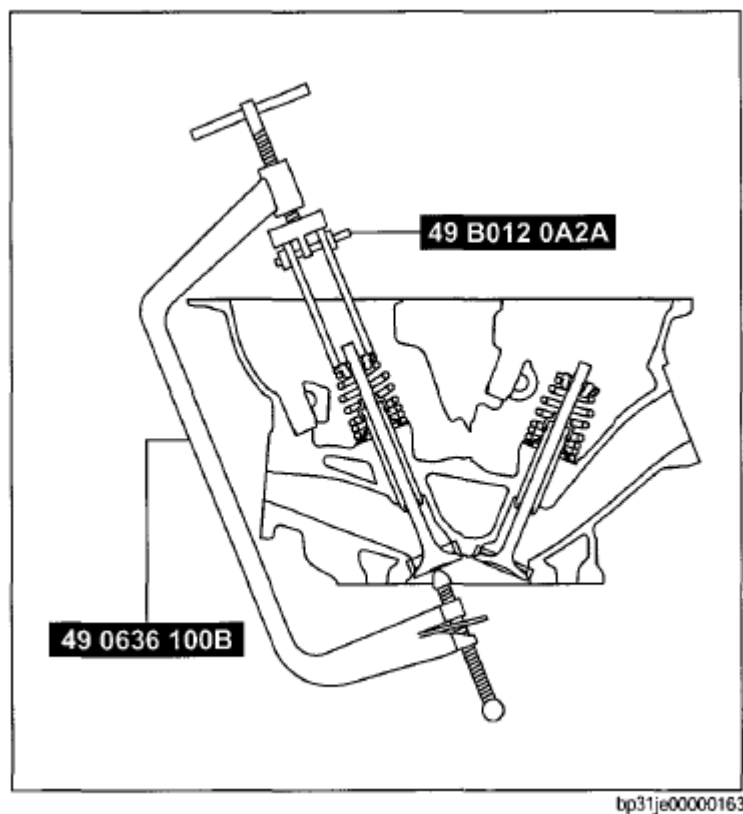


Fig. 484: Identifying Flexplate Bolts Tightening Sequence
Courtesy of MAZDA MOTORS CORP.

110. Lubricate the transaxle input shaft pilot bearing with front axle grease.

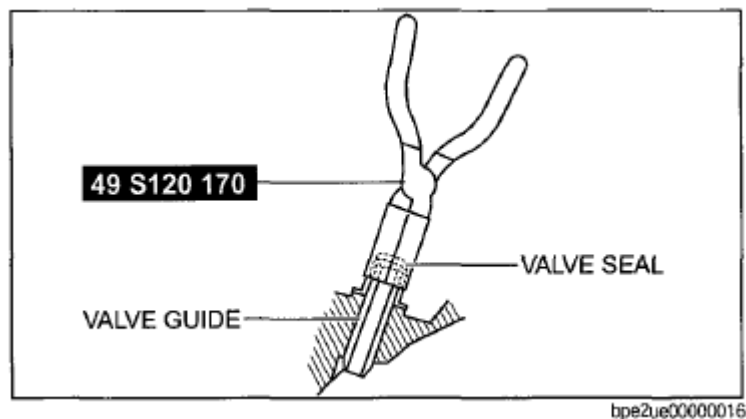


Fig. 485: Locating Transaxle Input Shaft Pilot Bearing
Courtesy of MAZDA MOTORS CORP.

111. Using the special tool, position the clutch disc on the flywheel.

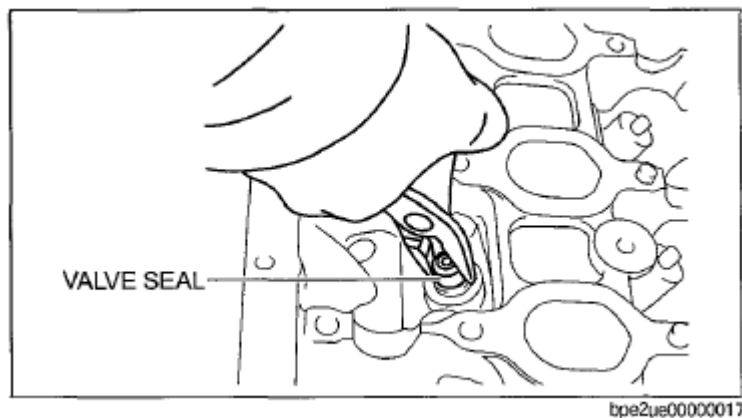


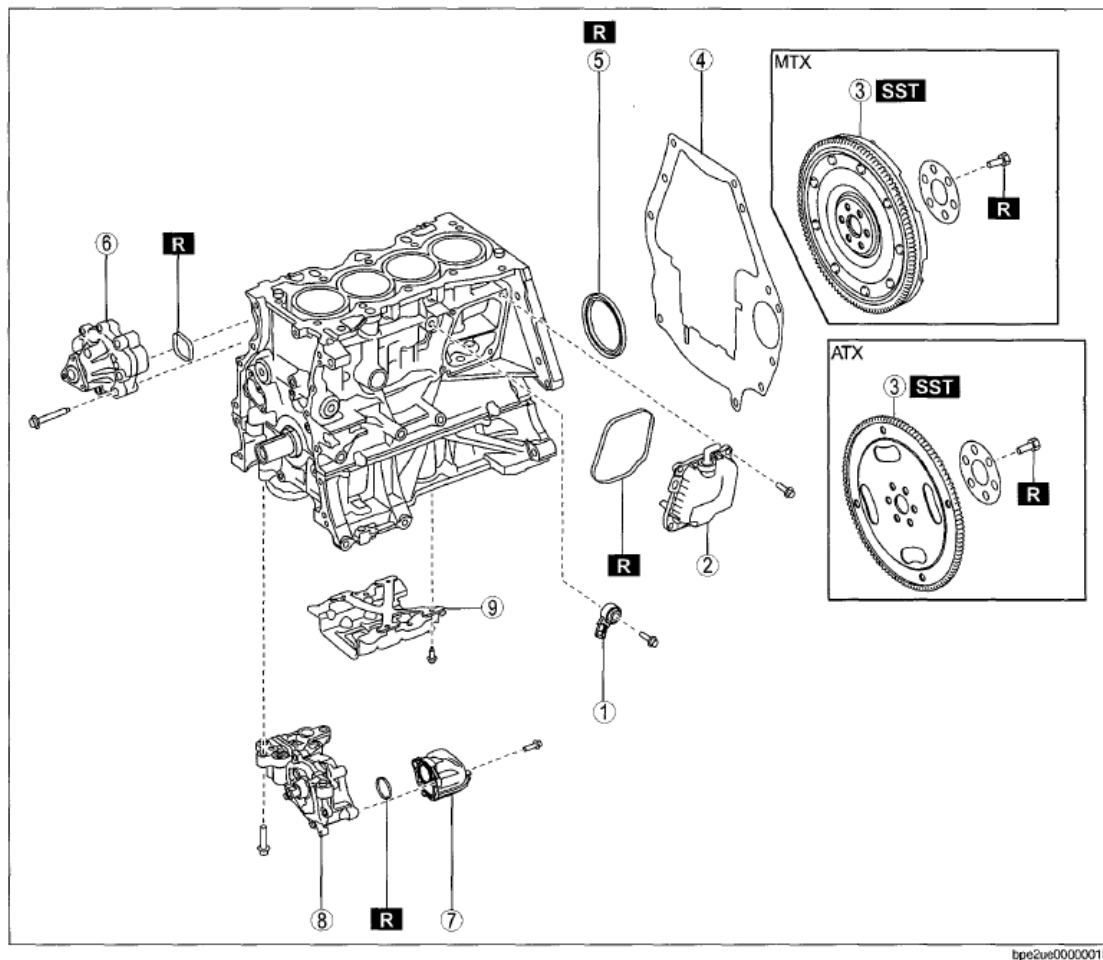
Fig. 486: Positioning Clutch Disc On Flywheel
Courtesy of MAZDA MOTORS CORP.

112. Position the clutch pressure plate and install the bolts.
- Tighten to 29 N.m {2.9 kgf.m, 21 ft.lbf} in a star pattern sequence.

NOTE:

- If reusing the clutch pressure plate and flywheel, align the marks made during removal.

CYLINDER HEAD DISASSEMBLY/ASSEMBLY - 2.5L



bpe2ue00000018

1	Knock sensor
2	Oil separator
3	Flywheel (MTX), Drive plate (ATX) (See Flywheel (MTX), Drive Plate (ATX) Disassembly Note.)
4	End plate

5	Rear oil seal (See Rear Oil Seal Removal Note.)
6	Water pump
7	Oil strainer
8	Oil pump
9	Oil baffle plate

Fig. 487: Identifying Cylinder Head Disassembly/Assembly - 2.5L
 Courtesy of MAZDA MOTORS CORP.

DISASSEMBLY

NOTE:

- If the components are to be reinstalled, they must be installed in the same positions. Mark the components removed for locations.

1. Remove the 4 bolts and the coolant outlet.
 - Discard the gasket.
2. Remove the 2 bolts and the exhaust gas recirculation (EGR) valve.
 - Discard the gasket.
3. Remove and discard the cylinder head temperature (CHT) sensor.

- Remove the spark plugs.

CAUTION:

- Only use hand tools when removing or installing the spark plugs or damage can occur to the cylinder head or spark plugs.

5. Remove the valve tappets.

6. Using the special tools, compress the valve springs and remove the valve collets, valve spring retainers and the valve springs.

NOTE:

- Use a small screwdriver and grease to remove the valve collets.

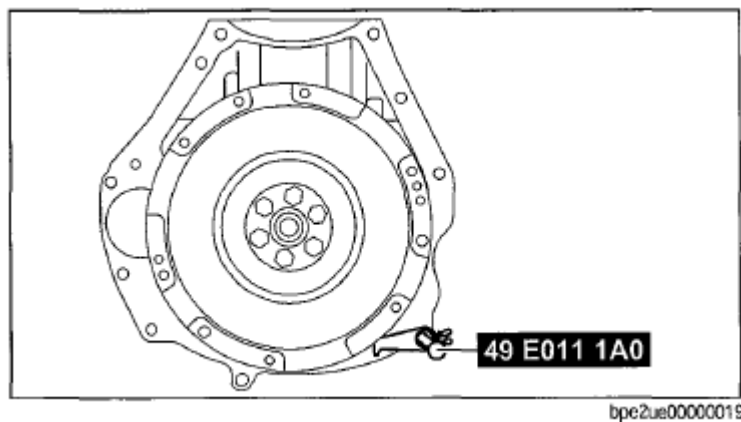


Fig. 488: Illustrating Removing/Installing Valve Spring Retainer And Valve Spring
Courtesy of MAZDA MOTORS CORP.

7. Inspect the components, if necessary. See SPECIFICATIONS .
8. Remove the valves.
9. Using the special tools, remove and discard the valve seals.

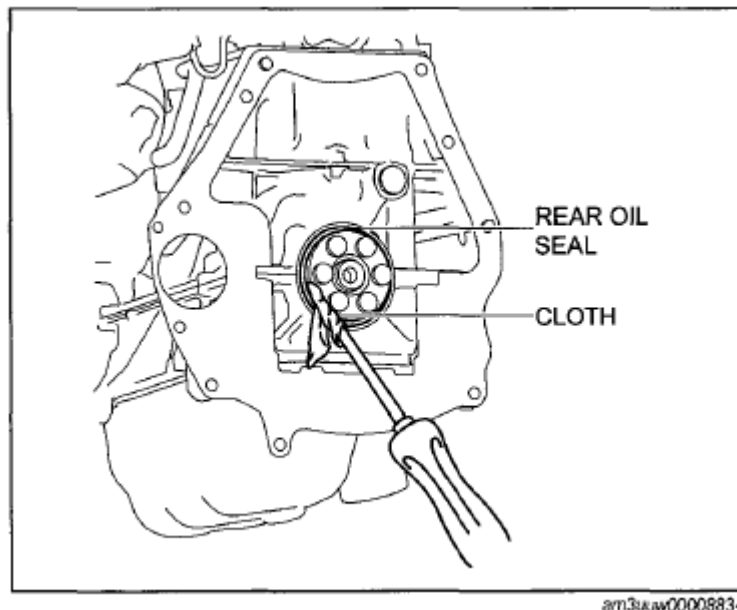


Fig. 489: Identifying Special Tool (303-468, 303-005)
 Courtesy of MAZDA MOTORS CORP.

10. Inspect the valves. See VALVE INSPECTION . Install new parts, as necessary.

ASSEMBLY

1. Install the valves.

NOTE:

- Coat the valve stems with clean engine oil.

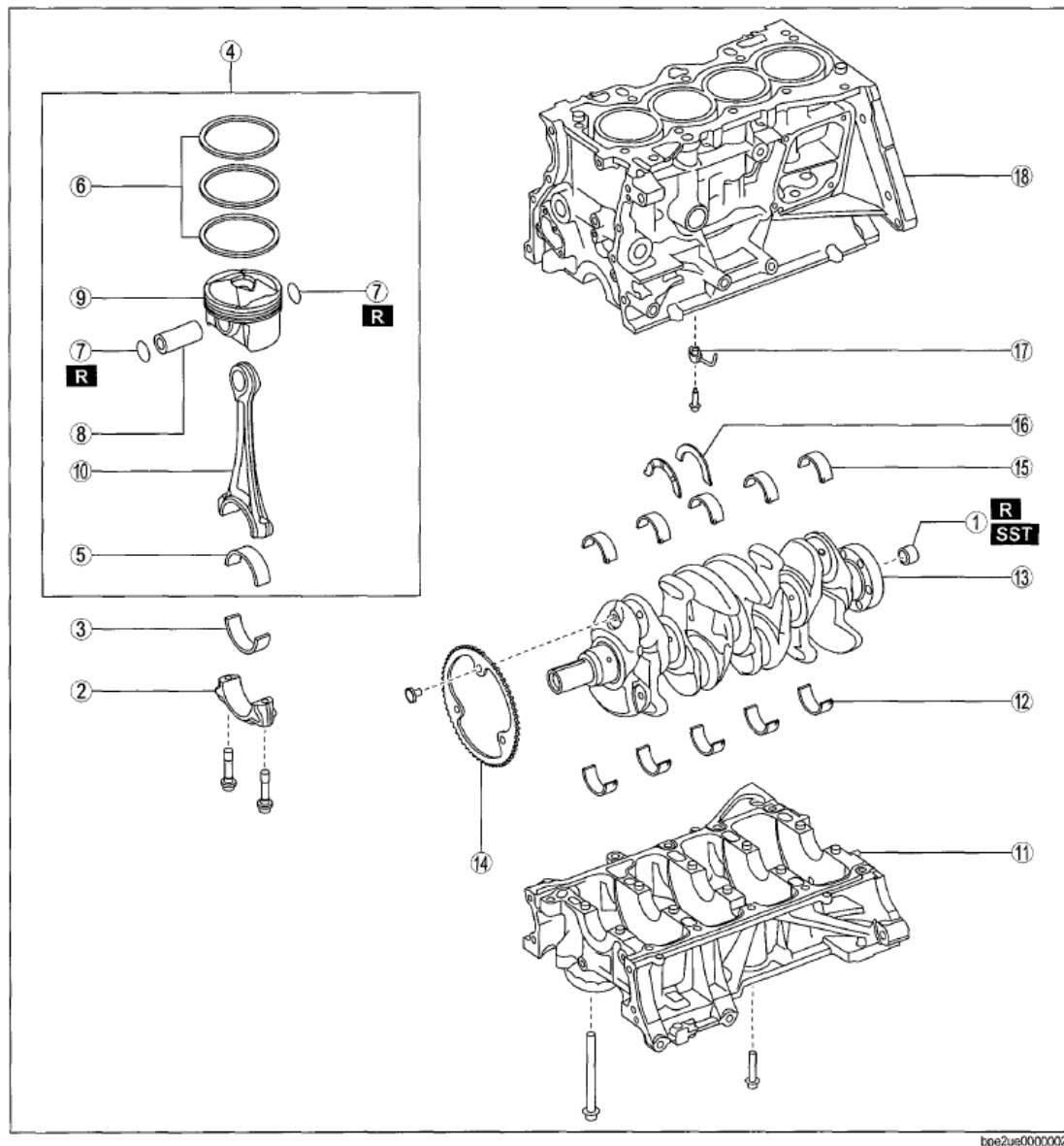
2. Using the special tool, install the valve seals.

NOTE:

- Use the protector provided with the replacement kit to prevent damage to the valve seals. Lubricate the valve stems and guides with clean engine oil.

2009 Mazda Tribute Hybrid Grand Touring

2009 ENGINE Mechanical - 2.5L - Tribute



bpe2us00000020

1	Pilot bearing (MTX) (See Pilot Bearing Disassembly Note.)
2	Connecting rod cap (See Connecting Rod Cap Disassembly Note.)
3	Lower connecting rod bearing (See Connecting Rod Bearing Disassembly Note.)
4	Piston, connecting rod (See Piston, Connecting Rod Disassembly Note.)
11	Lower cylinder block (See Lower Cylinder Block Disassembly Note.)
12	Lower main bearing (See Thrust Bearing And Main Bearing Disassembly Note.)
13	Crankshaft (See Crankshaft Disassembly Note.)
14	Plate

5	Upper connecting rod bearing (See Connecting Rod Bearing Disassembly Note.)
6	Piston ring
7	Snap ring (See Snap Ring Disassembly Note.)
8	Piston pin
9	Piston
10	Connecting rod
15	Upper main bearing (See Thrust Bearing And Main Bearing Disassembly Note.)
16	Thrust bearing (See Thrust Bearing And Main Bearing Disassembly Note.)
17	Oil jet valve
18	Upper cylinder block

Fig. 490: View Of Installing Valve Seal
Courtesy of MAZDA MOTORS CORP.

3. Using the special tools, install the valve springs.
 - Insert the valve springs and the valve spring retainers.
 - Compress the valve springs and install the valve collets, using grease and a small screwdriver.

NOTE: • **Check the seating of the valve collets.**

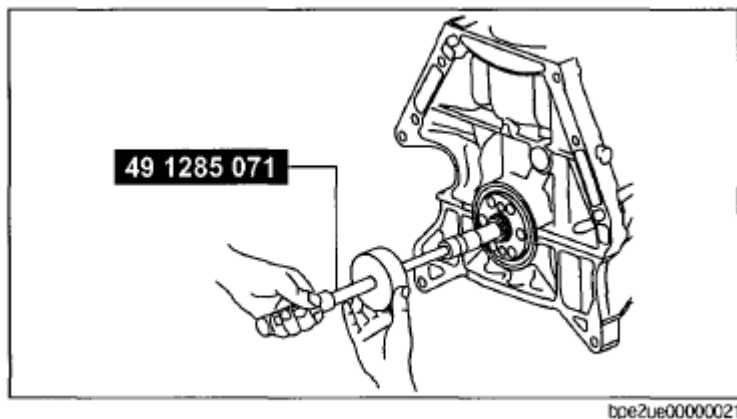


Fig. 491: Illustrating Removing/Installing Valve Spring Retainer And Valve Spring
Courtesy of MAZDA MOTORS CORP.

4. Install the valve tappets.

NOTE: • **Coat the valve tappets with clean engine oil.**

5. Install the spark plugs.
 - Tighten to 12 N.m {1.2 kgf.m, 106 in.lbf}.
6. Install a new CHT sensor.
 - Tighten to 12 N.m {1.2 kgf.m, 106 in.lbf}.
7. Using a new gasket, install the EGR valve and 2 bolts
 - Tighten to 20 N.m {2.0 kgf.m, 177 in.lbf}.
8. Using a new gasket, install the coolant outlet and bolts.
 - Tighten to 10 N.m {1.0 kgf.m, 89 in.lbf}.