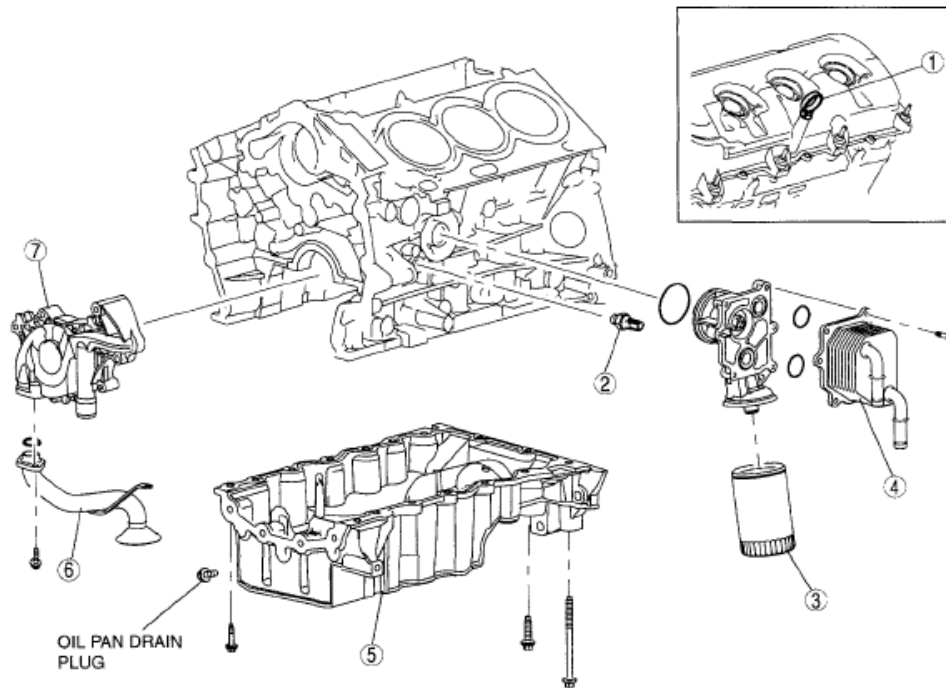


2008 ENGINE

Lubrication (MZI-3.7) - Mazda CX-9

LUBRICATION SYSTEM LOCATION INDEX [MZI-3.7]



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| | |
|---|---|
| 1 | Dipstick (See 01-11-2 ENGINE OIL LEVEL INSPECTION [MZI-3.7].) (See 01-11-2 ENGINE OIL REPLACEMENT [MZI-3.7].) |
| 2 | Oil pressure switch (See 01-11-4 OIL PRESSURE INSPECTION [MZI-3.7].) |
| 3 | Oil filter (See 01-11-3 OIL FILTER REPLACEMENT [MZI-3.7].) |

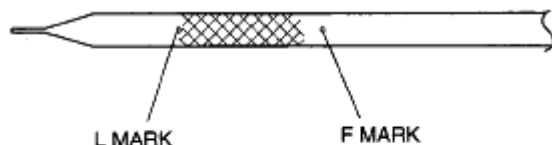
| | |
|---|--|
| 4 | Oil cooler (See 01-11-5 OIL COOLER REMOVAL/INSTALLATION [MZI-3.7].) |
| 5 | Oil pan (See 01-11-6 OIL PAN REMOVAL/INSTALLATION [MZI-3.7].) |
| 6 | Oil strainer (See 01-11-6 OIL PAN REMOVAL/INSTALLATION [MZI-3.7].) |
| 7 | Oil pump (See 01-11-10 OIL PUMP REMOVAL/INSTALLATION [MZI-3.7].) |

Fig. 1: Identifying Lubrication Components
Courtesy of MAZDA MOTORS CORP.

ENGINE OIL LEVEL INSPECTION [MZI-3.7]

1. Position the vehicle on level ground.
2. Warm up the engine.
3. Stop the engine and allow **approx. 5 min** before continuing.
4. Remove the dipstick, wipe it clean, and reinstall it fully.
5. Remove the dipstick and verify that the oil level is between the L and F marks on the dipstick.

- If the oil level is below the L mark, add engine oil.



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Fig. 2: Identifying Engine Oil Level In Dipstick
Courtesy of MAZDA MOTORS CORP.

ENGINE OIL REPLACEMENT [MZI-3.7]

WARNING:

- Hot engines and engine oil can cause severe burns. Turn off the engine and wait until it and the engine oil have cooled.
- A vehicle that is lifted but not securely supported on safety stands is dangerous. It can slip or fall, causing death or serious injury. Never work around or under a lifted vehicle if it is not securely supported on safety stands.
- Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.

CAUTION:

- If engine oil is spilled on the exhaust system, wipe it off completely. If you fail to wipe the spilled engine oil, it will produce fumes because of the heat.

1. Position the vehicle on level ground.
2. Remove the oil filler cap.
3. Remove the oil pan drain plug.
4. Drain the engine oil into a container.
5. Inspect the rubber seal of the oil pan drain plug and make sure there are no cracks, deterioration, or damage.
 - If necessary, replace the oil pan drain plug.
6. Clean the flange surface (seal rubber) on the oil pan drain plug, then install the oil pan drain plug.

Oil pan drain plug tightening torque

27 N.m {2.8 kgf.m, 20 ft.lbf}

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NOTE:

- The amount of residual oil in the engine can vary according to factors such as the replacement method and oil temperature. Verify the oil level after engine oil replacement.

7. Refill with the following type and amount of the engine oil.

Engine oil capacity (approx. quantity)



Oil replacement: 4.7 L {5.0 US qt, 4.2 Imp qt}

Oil and oil filter replacement: 5.2 L {5.5 US qt, 4.6 Imp qt}

Total (dry engine): 5.9 L {6.2 US qt, 5.2 Imp qt}

Engine oil specification

ENGINE OIL SPECIFICATION

| Item | U.S.A. and CANADA | Except U.S.A. and CANADA |
|----------------------|---|---|
| Engine oil grade |  <p>(ILSAC)</p> |  <p>API SM or ILSAC</p> |
| Engine oil viscosity | 5W-20 | |

8. Install the oil filler cap.
9. Start the engine and confirm that there is no oil leakage.
 - If there is oil leakage, repair or replace the applicable part.
10. Inspect the oil level. (See **ENGINE OIL LEVEL INSPECTION [MZI-3.7]**.)

OIL FILTER REPLACEMENT [MZI-3.7]

WARNING:

- Hot engines and engine oil can cause severe burns. Turn off the

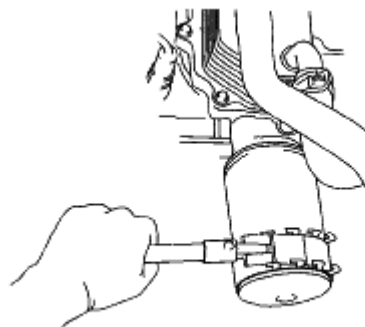
engine and wait until it and the engine oil have cooled.

- A vehicle that is lifted but not securely supported on safety stands is dangerous. It can slip or fall, causing death or serious injury. Never work around or under a lifted vehicle if it is not securely supported on safety stands.
- Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.

CAUTION:

- If engine oil is spilled on the exhaust system, wipe it off completely. If you fail to wipe the spilled engine oil, it will produce fumes because of the heat.

1. Remove the oil filter using a oil filter wrench.
2. Use a clean rag to wipe off the mounting surface on the oil filter adapter and the oil filter.
3. Apply clean engine oil to the O-ring of a new oil filter.
4. Install the oil filter until the O-ring contacts the sealing surface.
5. Tighten the oil filter **3/4 turns** by hand.
6. Start the engine and confirm that there is no oil leakage.
 - If there is oil leakage, repair or replace the applicable part.
7. Inspect the oil level. (See **ENGINE OIL LEVEL INSPECTION [MZI-3.7]**.)



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Fig. 3: Removing Oil Filter

Courtesy of MAZDA MOTORS CORP.

OIL PRESSURE INSPECTION [MZI-3.7]

WARNING:

- Hot engines and engine oil can cause severe burns. Turn off the engine and wait until it and the engine oil have cooled.
- A vehicle that is lifted but not securely supported on safety stands is dangerous. It can slip or fall, causing death or serious injury. Never work around or under a lifted vehicle if it is not securely supported

on safety stands.

- **Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.**

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Remove the fan control module No.2 with the connectors still connected. (Dual fan control module) (See **COOLING FAN COMPONENT REMOVAL/INSTALLATION [MZI-3.7]** .)
4. Remove the oil pressure switch.
5. Screw the **SSTs** into the oil pressure switch installation hole.
6. Connect the negative battery cable.
7. Warm up the engine to normal operating temperature.
8. Run the engine at the specified speed, and note the gauge readings.
 - If not within the specification, inspect for the cause and repair or replace if necessary.

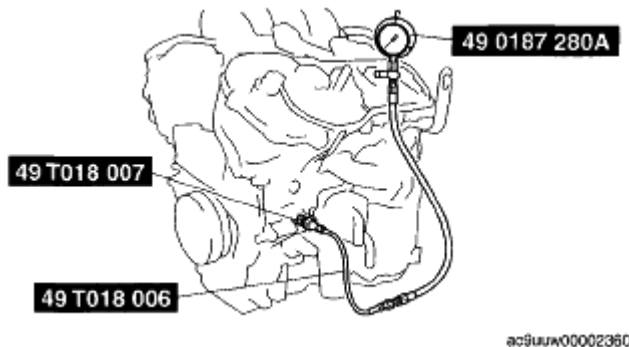


Fig. 4: Identifying Oil Pressure With SST
Courtesy of MAZDA MOTORS CORP.

NOTE: • **The oil pressure can vary with oil viscosity and temperature.**

Oil pressure (reference value) [oil temperature: 93.3°C {200°F}]

310-621 kPa {3.17-6.33 kgf/cm² , 45.0-90.0 psi} [2,000 rpm]

9. Stop the engine and wait until it is cool.
10. Disconnect the negative battery cable.
11. Remove the **SSTs**.

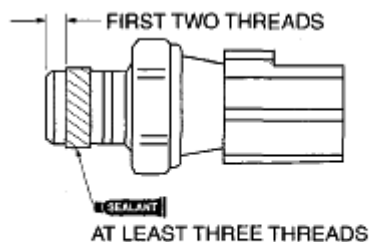
CAUTION: • **Be sure there is no sealant adhering to the first two threads from the end of the oil pressure switch to prevent a possible operation malfunction.**

12. Apply silicone sealant to the oil pressure switch threads as shown in the figure.
13. Install the oil pressure switch.

Tightening torque

10.7-24.5 N.m {1.1-2.4 kgf.m, 7.9-18.0 ft.lbf}

14. Install the fan control module No.2. (Dual fan control module) (See COOLING FAN COMPONENT REMOVAL/INSTALLATION [MZI-3.7] .)
15. Connect the negative battery cable.



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Fig. 5: Applying Silicone Sealant To Oil Pressure Switch Threads
Courtesy of MAZDA MOTORS CORP.

16. Start the engine and confirm that there is no oil leakage.
 - If there is oil leakage, repair or replace the applicable part.
17. Install the engine cover.

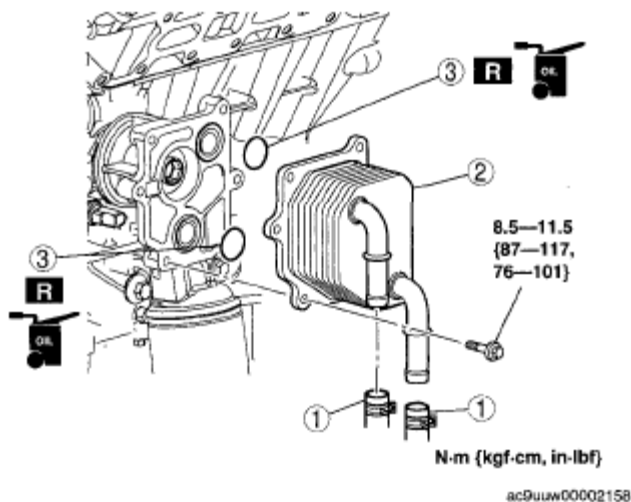
OIL COOLER REMOVAL/INSTALLATION [MZI-3.7]

WARNING:

- Hot engines and engine oil can cause severe burns. Turn off the engine and wait until it and the engine oil have cooled.
- A vehicle that is lifted but not securely supported on safety stands is dangerous. It can slip or fall, causing death or serious injury. Never work around or under a lifted vehicle if it is not securely supported on safety stands.
- Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (See ENGINE COOLANT REPLACEMENT [MZI-3.7] .)
3. Remove the air cleaner and fresh air duct component. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [MZI-3.7] .)

4. Remove the cooling fan component. (See **COOLING FAN COMPONENT REMOVAL/INSTALLATION [MZI-3.7]** .)
5. Remove the exhaust manifold insulator (LH). (See **EXHAUST SYSTEM REMOVAL/INSTALLATION [MZI-3.7]** .)
6. Remove in the order indicated in the table.
7. Use a clean rag to wipe off the mounting surface on the oil filter adapter and the oil cooler.
8. Install in the reverse order of the removal.
9. Refill the engine coolant. (See **ENGINE COOLANT REPLACEMENT [MZI-3.7]** .)
10. Start the engine and confirm that there is no oil leakage.
 - If there is oil leakage, repair or replace the applicable part.
11. Inspect the oil level. (See **ENGINE OIL LEVEL INSPECTION [MZI-3.7]**.)
12. Inspect for engine coolant leakage. (See **ENGINE COOLANT LEAKAGE INSPECTION [MZI-3.7]** .)

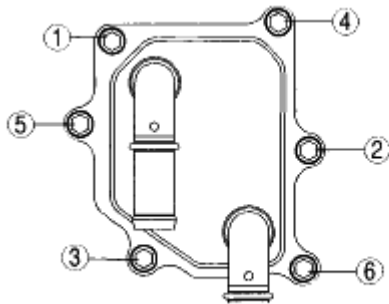


| | |
|---|---|
| 1 | Water hose |
| 2 | Oil cooler (See 01-11-5 Oil Cooler Installation Note.) |
| 3 | O-ring |

Fig. 6: Identifying Water Hose, Oil Cooler, O-Ring & Torque Specifications
 Courtesy of MAZDA MOTORS CORP.

OIL COOLER INSTALLATION NOTE

1. Tighten the oil cooler bolts in the order shown in the figure.



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Fig. 7: Identifying Oil Cooler Bolts Tighten Sequence
 Courtesy of MAZDA MOTORS CORP.

OIL PAN REMOVAL/INSTALLATION [MZI-3.7]

WARNING:

- Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.
- Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also intake skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedure". (See BEFORE SERVICE PRECAUTION [MZI-3.7] .)
- Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.

NOTE:

- The following procedure "OIL PAN REMOVAL/INSTALLATION" is performed after the engine and transaxle component is removed from the vehicle.

1. Drain the engine oil. (See ENGINE OIL REPLACEMENT [MZI-3.7].)
2. Remove the engine and transaxle component. (See ENGINE REMOVAL/INSTALLATION [MZI-3.7] .)
3. Using a hoist, lower the engine and transaxle component on a level surface.

WARNING:

- Protect and stabilize the lowered engine and transaxle component with crossies to prevent injury or damage due to roll over.

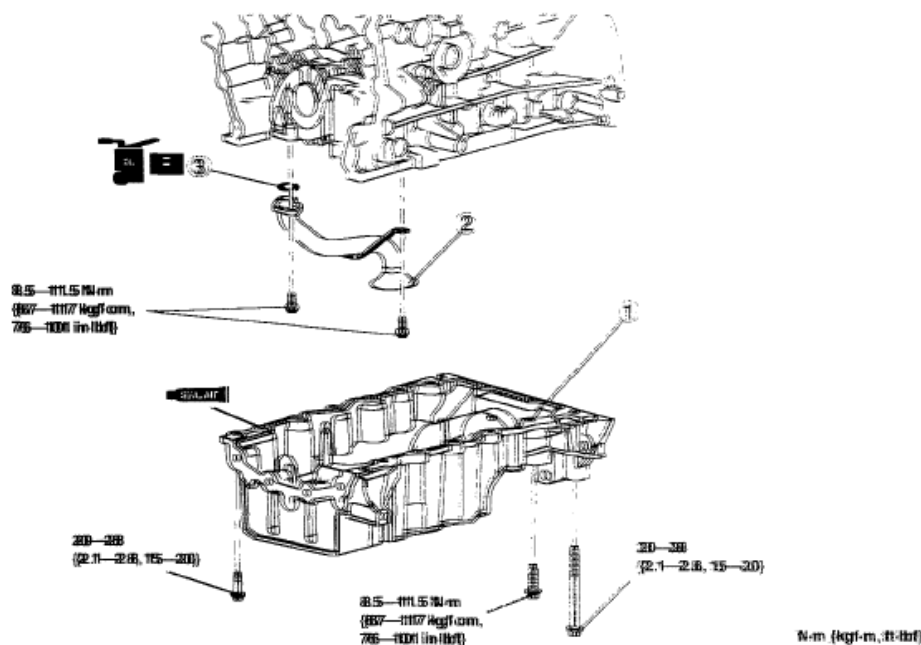
4. Remove the automatic transaxle. (See AUTOMATIC TRANSAXLE REMOVAL/INSTALLATION [AW6A-EL, AW6AX-EL] .)
5. Remove the drive plate. (See DRIVE PLATE REMOVAL/INSTALLATION [AW6A-EL, AW6AX-EL] .)
6. Remove the dynamic chamber and throttle body as a single unit. (See INTAKE-AIR SYSTEM

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REMOVAL/INSTALLATION [MZI-3.7] .)

7. Remove the ignition coils. (See **IGNITION COIL REMOVAL/INSTALLATION [MZI-3.7] .)**)
8. Remove the dipstick.
9. Remove the power steering oil pump drive belt. (See **DRIVE BELT REMOVAL/INSTALLATION [MZI-3.7] .)**)
10. Remove the power steering oil pump. (See **POWER STEERING OIL PUMP REMOVAL/INSTALLATION .)**)
11. Remove the exhaust manifold (RH). (See **EXHAUST SYSTEM REMOVAL/INSTALLATION [MZI-3.7] .)**)
12. Remove the transfer bracket. (AWD) (See **TRANSFER REMOVAL/INSTALLATION .)**)
13. Install the engine to the SST (engine stand). (See **ENGINE MOUNTING/DISMOUNTING .)**)
14. Remove the engine front cover. (See **TIMING CHAIN REMOVAL/INSTALLATION [MZI-3.7] .)**)
15. Remove in the order indicated in the table.
16. Install in the reverse order of removal.
17. Start the engine and:
 1. Inspect the runout and contact on the pulley and belt.
 2. Inspect for engine oil, engine coolant, ATF, power steering fluid and fuel leakage.
 3. Verify the ignition timing, idle speed and idle mixture. (See **ENGINE TUNE-UP [MZI-3.7] .)**)
 4. Engine accessories operation.
18. Perform a road test.



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| | |
|----|--|
| 11 | Oil pan (See 01-11-8 Oil Pan Removal Note.) (See 01-11-9 Oil Pan Installation Note.) |
|----|--|

| | |
|---|--------------|
| 2 | Oil strainer |
| 3 | O-ring |

Fig. 8: Identifying Oil Pan, Oil Stainer, Bolts & Torque Specifications
Courtesy of MAZDA MOTORS CORP.

ENGINE MOUNTING/DISMOUNTING

Mounting

1. Remove the WU-TWC (RH) bracket. (AWD)

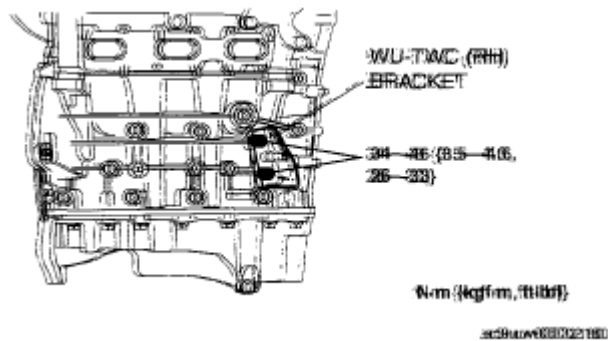


Fig. 9: Identifying WU-TWC (RH) Bracket & Torque Specifications
Courtesy of MAZDA MOTORS CORP.

2. Install the SSTs (arms) to the cylinder block four holes are shown in time figure, and hand-tighten the bolts (M10 X 1.5T length 90 mm {3.55 in}).

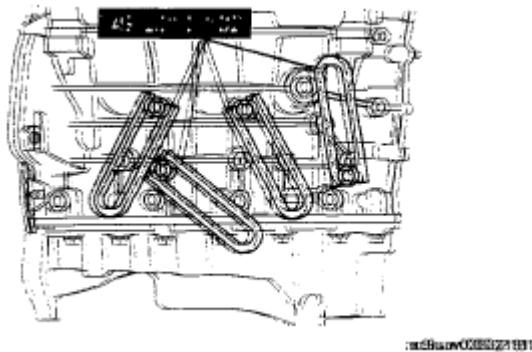


Fig. 10: Identifying Cylinder Block Four Holes With SST
Courtesy of MAZDA MOTORS CORP.

3. Assemble the SSTs (bolts, nuts, and plate) to the specified positions as shown in the figure.

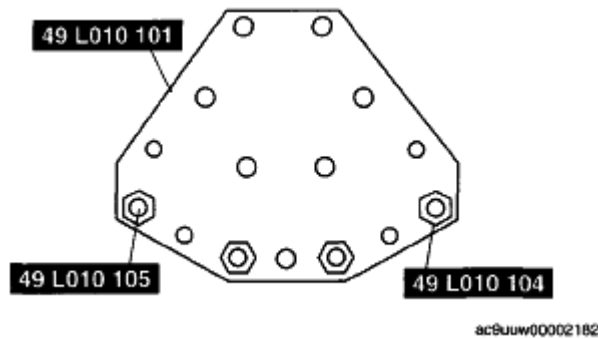


Fig. 11: Identifying Bolts, Nuts, And Plate With SST
 Courtesy of MAZDA MOTORS CORP.

4. Assemble the **SST** (bolts, nuts, and plate) set in Step 3 to the **SST** (arms) set in Step 2.
5. Adjust the **SSTs** (bolts) so that **approx. 20 mm {0.79 in}** of thread is exposed from the side of the **SST** (plate).
6. Make the **SSTs** (arms and plate) parallel by adjusting the **SSTs** (bolts and nuts).
7. Tighten the **SSTs** (bolts and nuts) to affix the **SSTs** firmly.

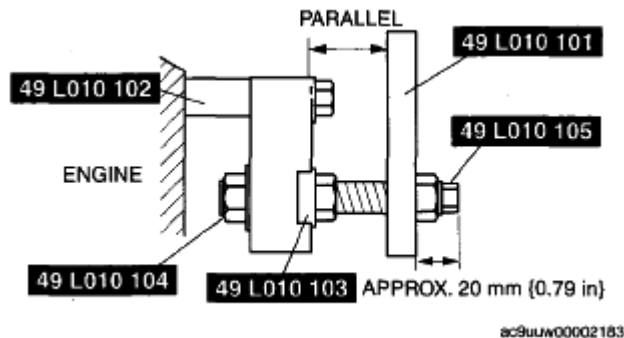


Fig. 12: Identifying Engine With SST
 Courtesy of MAZDA MOTORS CORP.

8. Mount the engine on the **SST** (engine stand).

WARNING:

- **Self-locking brake system of the engine stand may not be effective when the engine is held in an unbalanced position. This could lead to sudden, rapid movement of the engine and mounting stand handle and cause serious injury. Never keep the engine in an unbalanced position, and always hold the rotating handle firmly when turning the engine.**

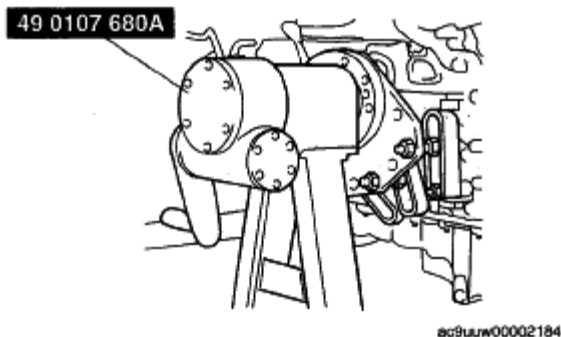


Fig. 13: Identifying Engine Mount With SST
Courtesy of MAZDA MOTORS CORP.

Dismounting

1. Dismount in the reverse order of mounting.

OIL PAN REMOVAL NOTE

1. Install two of the oil pan bolts temporarily into the two threaded holes in the oil pan.
2. Alternately tighten the two bolts one turn at a time until the oil pan-to-cylinder block seal is released.
3. Remove the oil pan.

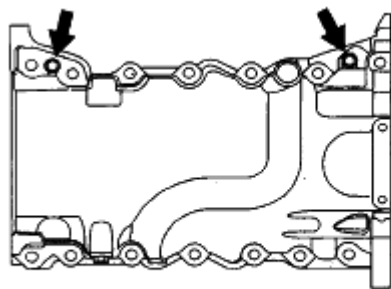


Fig. 14: Locating Oil Pan Bolts
Courtesy of MAZDA MOTORS CORP.

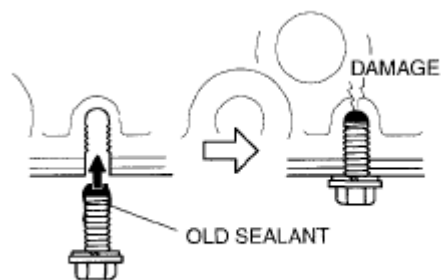
OIL PAN INSTALLATION NOTE

CAUTION:

- Apply silicon sealant in a single, unbroken line around the whole perimeter.
- The oil pan and bolts must be installed and the oil pan aligned to the cylinder block within 5 min of sealant application. Final tightening of the oil pan bolts must be carried out within 60 min of sealant application.

- **Using bolts with the old seal adhering could cause cracks in the cylinder block.**

1. Completely clean and remove any oil, dirt, sealant or other foreign material that may be adhering to the cylinder block and oil pan.
2. When reusing the oil pan installation bolts, clean any old sealant from the bolts.



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Fig. 15: Removing Old Sealant
Courtesy of MAZDA MOTORS CORP.

3. Apply silicone sealant (Loctite 5900) to the oil pan along the inside of the bolt holes as shown in the figure.

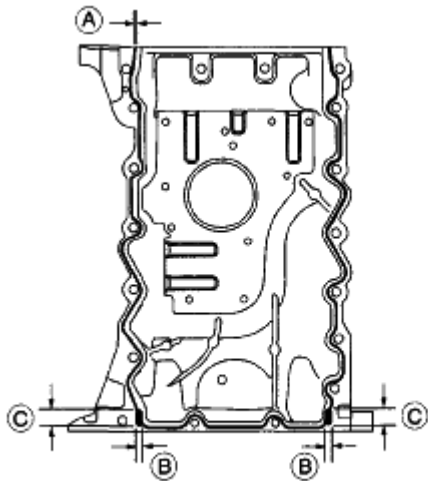
Thickness

A: Approx. 3.0 mm {0.12 in}

B: 5.0-6.0 mm {0.20-0.23 in}

C: 10.0 mm {0.39 in}

4. Install the oil pan and the bolts to the cylinder block.



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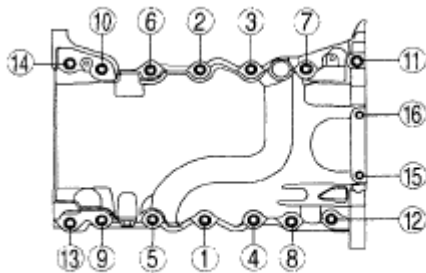
Fig. 16: Identifying Oil Pan Sealant Area
Courtesy of MAZDA MOTORS CORP.

1. Tighten the bolts in the order shown in the figure.

Tightening torque

3.0 N.m {31 kgf.cm, 27 in.lbf}

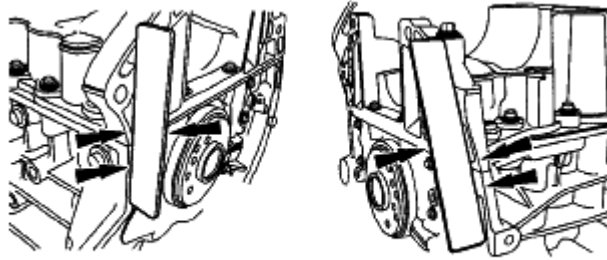
2. Loosen the bolts **180°**.



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Fig. 17: Identifying Oil Pan Tighten Sequence
Courtesy of MAZDA MOTORS CORP.

5. Using a straightedge, align the oil pan flush with the rear of the cylinder block at the two areas as shown.



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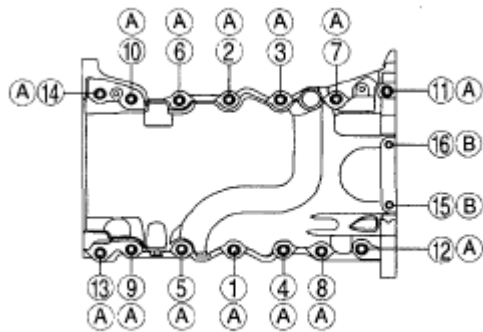
Fig. 18: Aligning Oil Pan Flush With Rear Of Cylinder Block
 Courtesy of MAZDA MOTORS CORP.

- Tighten the bolts in the order shown in the figure.

Tightening torque

Bolt A: 20-28 N.m {2.1-2.8 kgf.m, 15-20 ft.lbf}

Bolt B: 8.5-11.5 N.m {87-117 kgf.cm, 76-101 in.lbf}



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Fig. 19: Identifying Oil Pan Bolts Tighten Sequence
 Courtesy of MAZDA MOTORS CORP.

OIL PUMP REMOVAL/INSTALLATION [MZI-3.7]

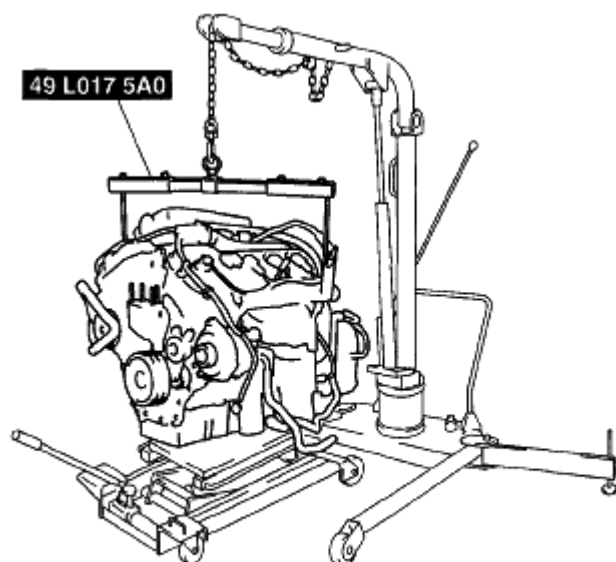
WARNING:

- Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.
- Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injures or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedure". (See **BEFORE SERVICE PRECAUTION [MZI-3.7]** .)
- Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.

NOTE:

- The following procedure "OIL PUMP REMOVAL/INSTALLATION" is performed after the engine and transaxle component is removed from the vehicle.

1. Drain the engine oil. (See ENGINE OIL REPLACEMENT [MZI-3.7].)
2. Remove the engine and transaxle component. (See ENGINE REMOVAL/INSTALLATION [MZI-3.7] .)
3. Secure the engine and transaxle component using a hoist and the SST.
4. Remove the dynamic chamber and throttle body as a single unit. (See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION [MZI-3.7] .)
5. Remove the ignition coils. (See IGNITION COIL REMOVAL/INSTALLATION [MZI-3.7] .)
6. Remove the dipstick.
7. Remove the power steering oil pump drive belt. (See DRIVE BELT REMOVAL/INSTALLATION [MZI-3.7] .)
8. Remove the power steering oil pump. (See POWER STEERING OIL PUMP REMOVAL/INSTALLATION .)
9. Remove the timing chain component. (See TIMING CHAIN REMOVAL/INSTALLATION [MZI-3.7] .)



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Fig. 20: Lifting Engine With Engine Jack
 Courtesy of MAZDA MOTORS CORP.

10. Remove in the order indicated in the table.
11. Install in the reverse order of removal.
12. Start the engine and:

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2008 ENGINE Lubrication (MZI-3.7) - Mazda CX-9

1. Inspect the runout and contact on the pulley and belt.
 2. Inspect for engine oil, engine coolant, ATF, power steering fluid and fuel leakage.
 3. Verify the ignition timing, idle speed and idle mixture. (See **ENGINE TUNE-UP [MZI-3.7]** .)
 4. Engine accessories operation.
13. Inspect the oil pressure. (See **OIL PRESSURE INSPECTION [MZI-3.7]**.)
14. Perform a road test.

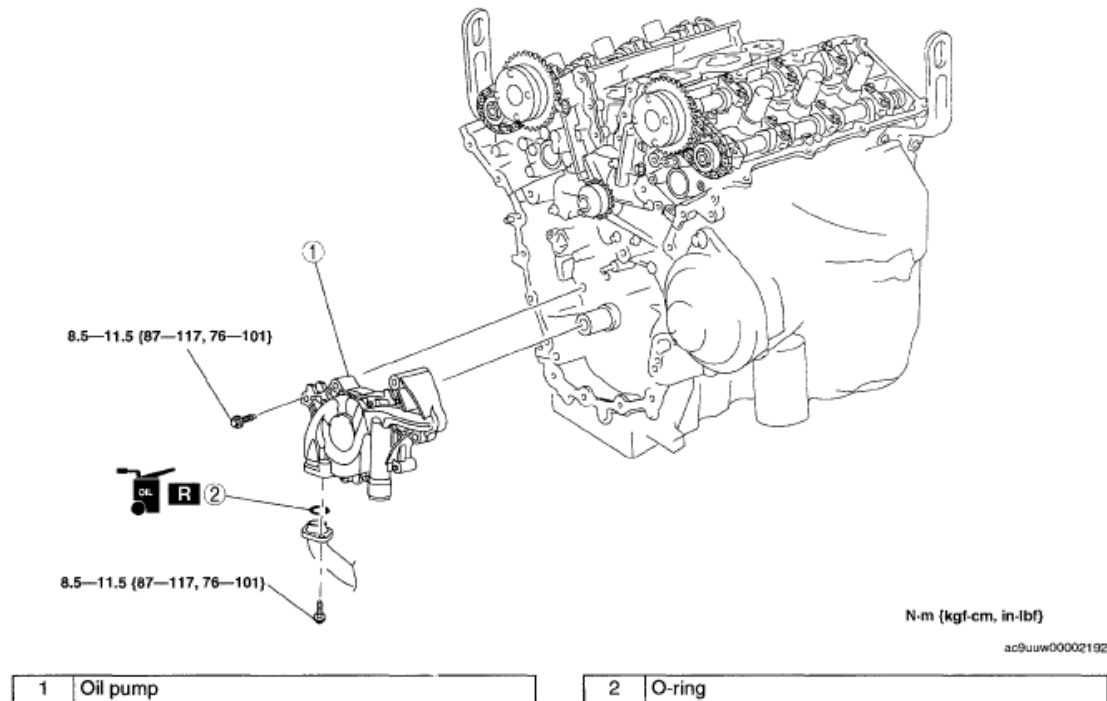


Fig. 21: Identifying Oil Pump, O-Ring & Torque Specifications
Courtesy of MAZDA MOTORS CORP.