

01-11 LUBRICATION

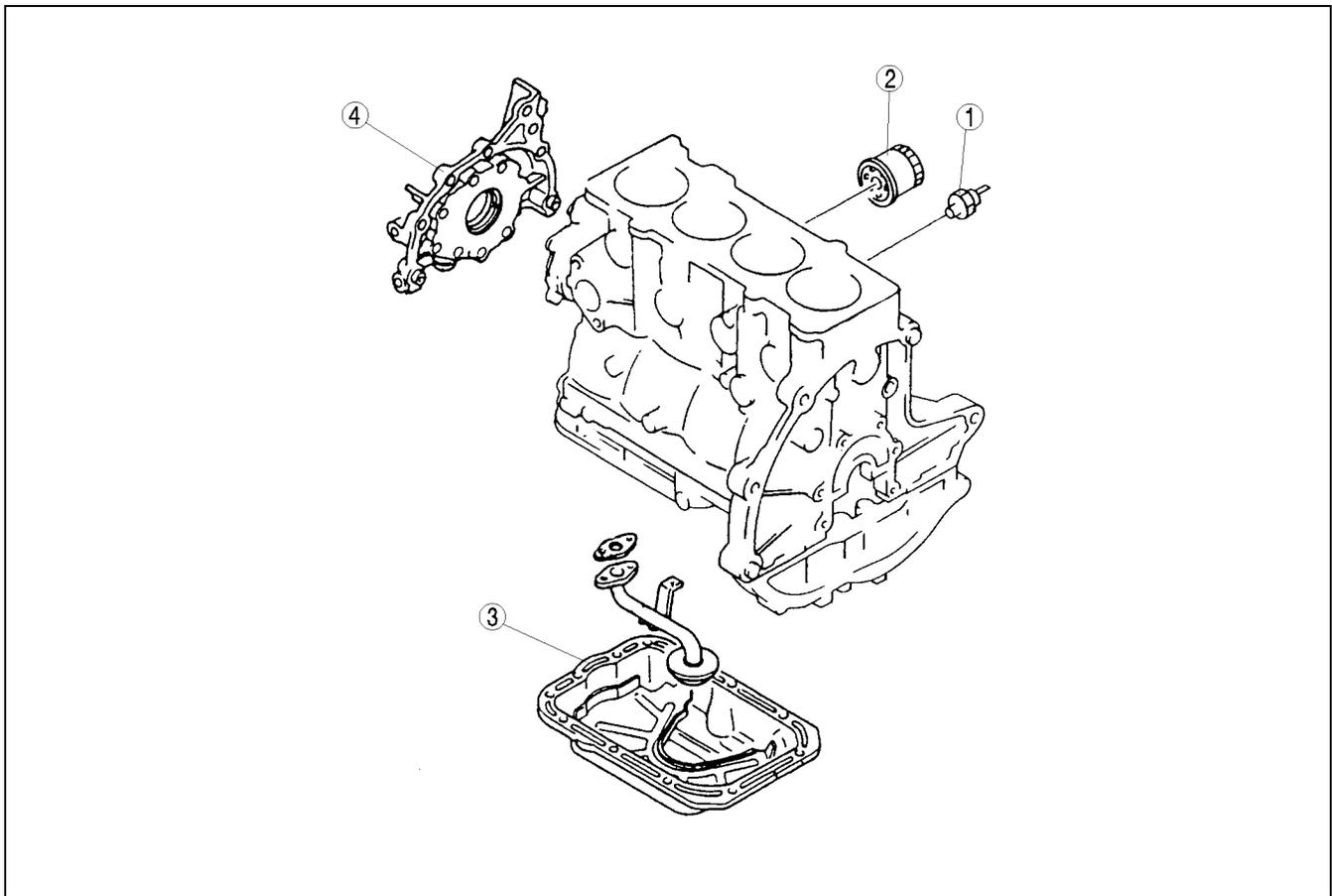
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01-11

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A3U011101003W01



Z3U0111W100

1	Oil pressure switch (See 01-11-2 OIL PRESSURE INSPECTION)
2	Oil filter (See 01-11-3 OIL FILTER REPLACEMENT)
3	Oil pan (See 01-11-4 OIL PAN REMOVAL/ INSTALLATION)

4	Oil pump (See 01-11-10 OIL PUMP REMOVAL/ INSTALLATION) (See 01-11-14 OIL PUMP DISASSEMBLY/ ASSEMBLY) (See 01-11-15 OIL PUMP INSPECTION)
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LUBRICATION

OIL PRESSURE INSPECTION

A3U01110200W01

Warning

- Continuous exposure with USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after this work.
- When the engine and the oil are hot, they can cause severe burns. Turn off the engine and wait until it and oil are cool.

1. Remove the intake manifold bracket. (FS model)
2. Remove the oil pressure switch. (ZM model)
3. Screw the **SST** into the oil pressure switch installation hole.
4. Warm up the engine to normal operating temperature.
5. Run the engine at the specified speed, and note the gauge readings.
 - If the pressure is not as specified, inspect for the cause and repair or replace as necessary.

Note

- The oil pressure can vary with oil viscosity and temperature.

Oil pressure

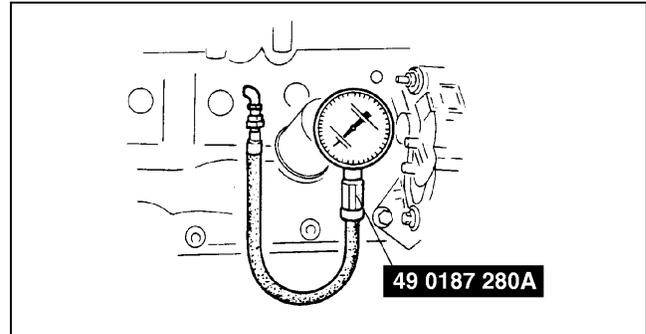
ZM: 300—390 kPa {3.0—4.0 kgf/cm², 43—56 psi} [3,000 rpm]
FS: 400—490 kPa {4.0—5.0 kgf/cm², 57—71 psi} [3,000 rpm]

6. Stop the engine and wait until it is cool.
7. Remove the **SST**.
8. Apply silicone sealant to the oil pressure switch threads as shown.
9. Install the oil pressure switch.

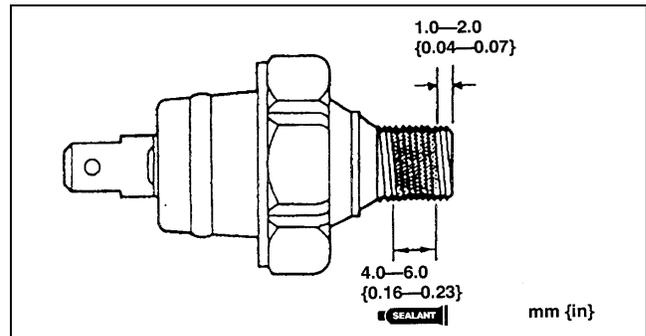
Tightening torque

12—17 N·m {1.2—1.8 kgf·m, 9—13 ft·lbf}

10. Install the intake manifold bracket. (FS model)
11. Start the engine and inspect for oil leakage.



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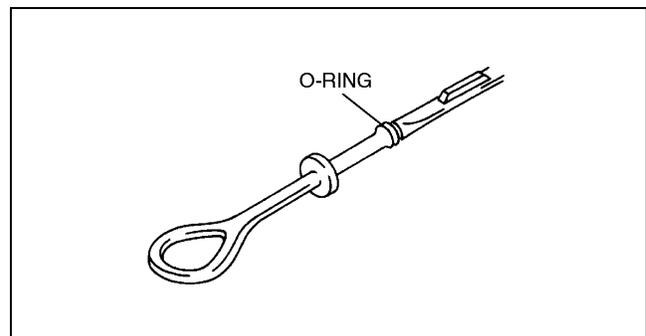


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ENGINE OIL INSPECTION

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1. Position the vehicle on level ground.
2. Warm up the engine to normal operating temperature and stop it.
3. Wait for **5 min**.
4. Remove the dipstick and inspect for oil level and condition. Verify that the oil level is within the F and L marks on the dipstick.
 - Add or replace oil if necessary.
5. Verify that the dipstick O-ring is installed as shown, then reinstall the dipstick.



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Warning

- When the engine and the engine oil are hot, they can cause severe burns. Do not burn yourself with either.
- 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 with USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after this work.

1. Position the vehicle on level ground.
2. Remove the oil filler cap and the oil pan drain plug.
3. Drain the oil into a container.
4. Install the drain plug with new washer.

Tightening torque

30—41 N·m {3.0—4.2 kgf·m, 22—30 ft·lbf}

5. Refill the engine with the specified type and amount of engine oil.
6. Refit the oil filler cap.
7. Run the engine and inspect for oil leakage.
8. Inspect the oil level.
 - Add oil if necessary. (See 01-11-2 ENGINE OIL INSPECTION.)

Note

- The actual oil level may vary from the specified capacity in some cases.

Oil capacity

L {US qt, Imp qt}

Item	Engine	
	ZM	FS
Oil replacement*	3.0 {3.2, 2.6}	3.3 {3.5, 2.9}
Oil and oil filter replacement*	3.2 {3.4, 2.8}	3.5 {3.7, 3.1}
Total (dry engine)*	3.4 {3.6, 3.0}	3.7 {3.9, 3.3}

* : Approximate quantity

Engine oil grade

API service SG (Energy Conserving II), SH (Energy Conserving II) or ILSAC (GF-I) SJ or ISLAC (GF-II)

Engine oil viscosity

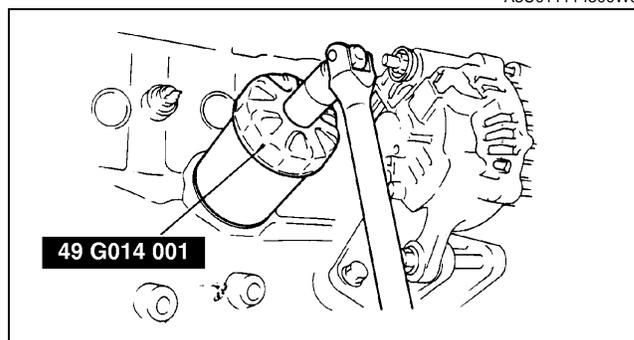
Above -25 °C {-13 °F}: SAE 10W-30

-30 °C—37 °C {-22 °F—98 °F}: SAE 5W-30

OIL FILTER REPLACEMENT

1. Remove the oil filter using the **SST**.
2. Use a clean rag to wipe off the mounting surface on the oil filter body.
3. Tighten the filter according to the installation direction on the side of it or packing box using the **SST**.
4. Start the engine and inspect for oil leakage.
5. Inspect the oil level.
 - Add oil if necessary. (See 01-11-2 ENGINE OIL INSPECTION.)

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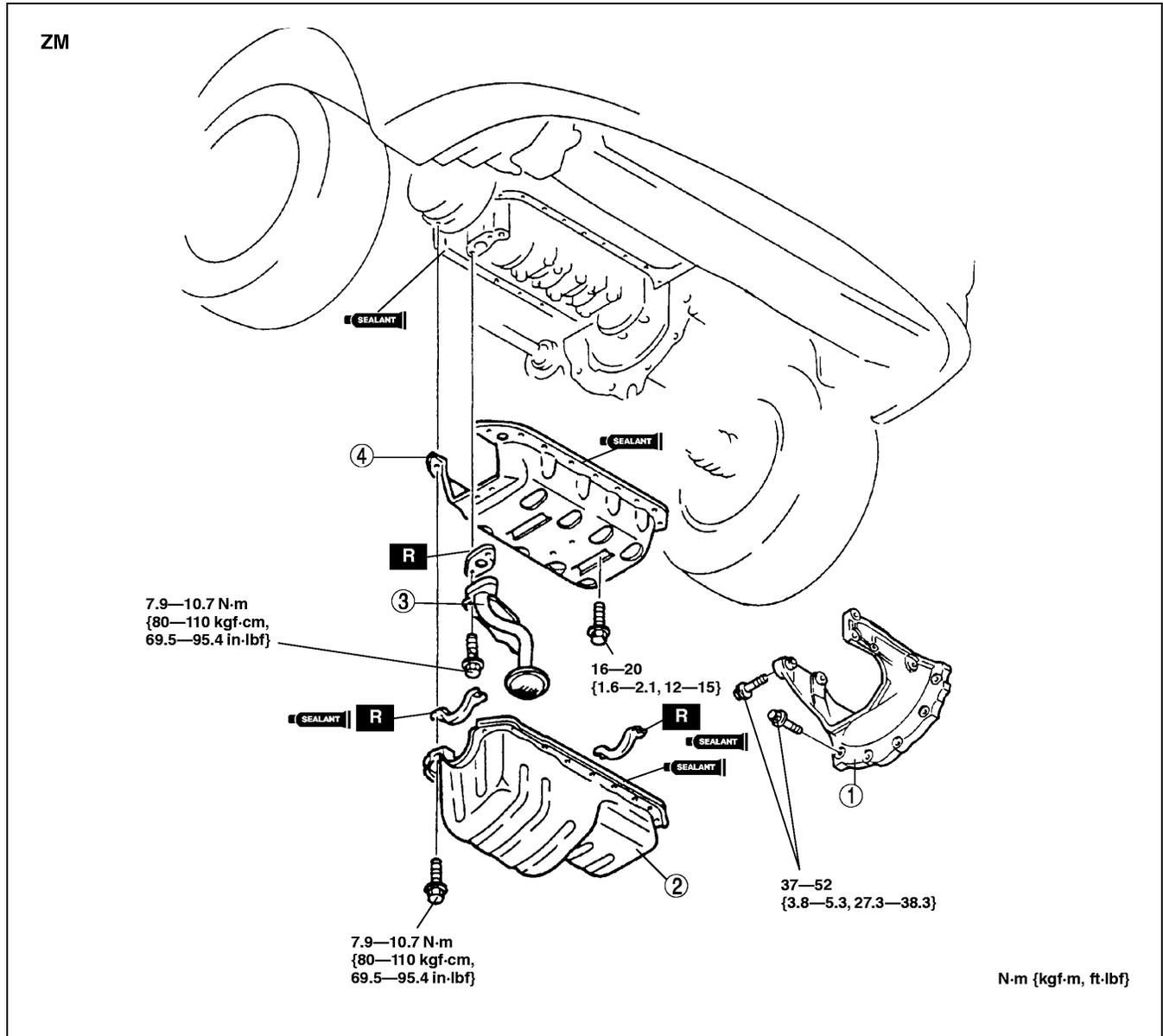
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LUBRICATION

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OIL PAN REMOVAL/INSTALLATION

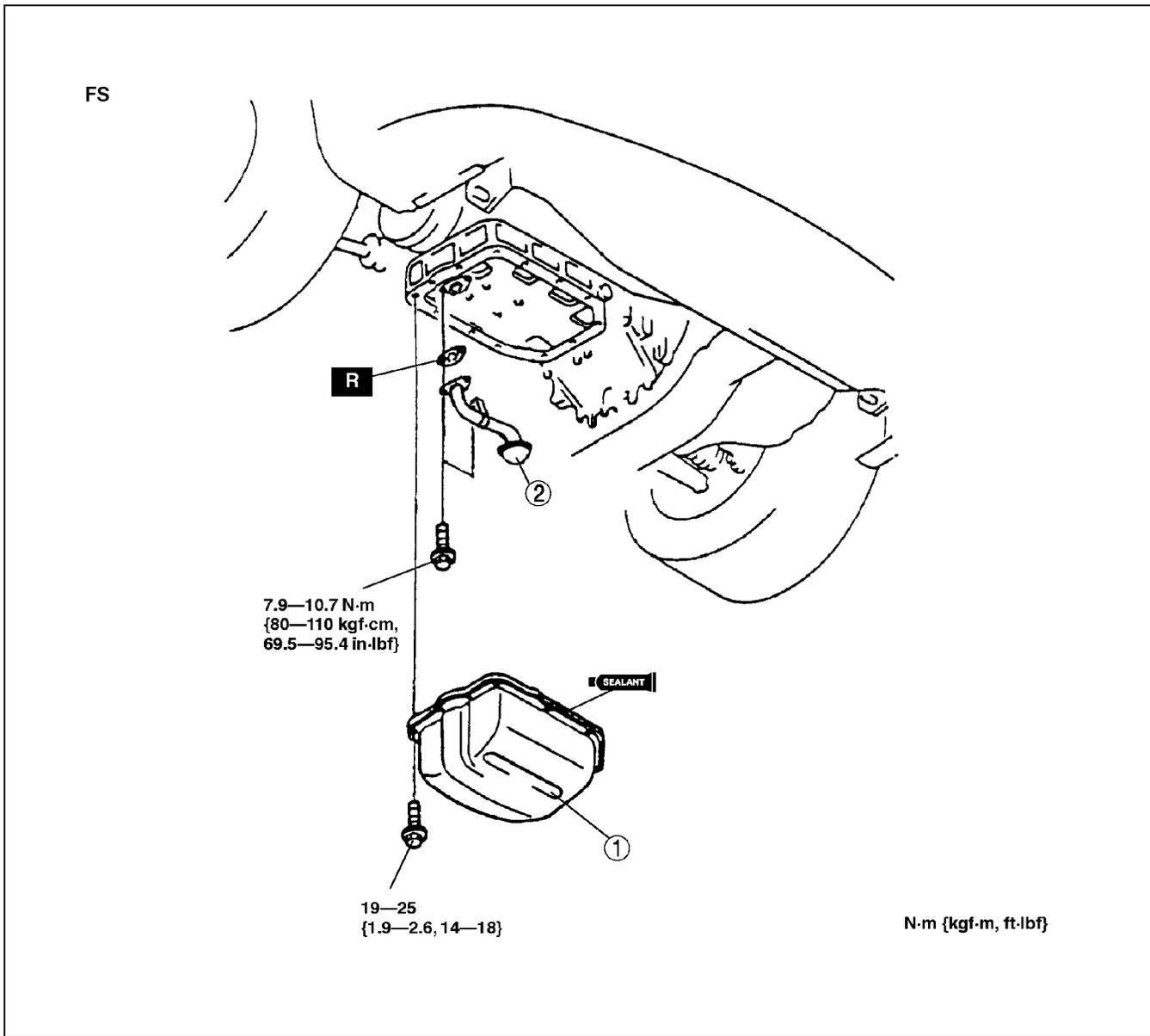
1. Disconnect the negative battery cable.
2. Drain the engine oil. (See 01-11-3 ENGINE OIL REPLACEMENT.)
3. Remove the front pipe.
4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.
6. Start the engine and inspect for engine oil leakage.



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1	Integrated stiffener (See 01-11-8 Integrated Stiffener Installation Note)
2	Oil pan (See 01-11-5 Oil Pan Removal Note) (See 01-11-7 Oil Pan Installation Note)

3	Oil strainer
4	MBSP (Main bearing support plate) (See 01-11-6 MBSP (Main bearing support plate) Removal Note) (See 01-11-6 MBSP (Main bearing support plate) Installation Note)



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1	Oil pan (See 01-11-5 Oil Pan Removal Note) (See 01-11-7 Oil Pan Installation Note)
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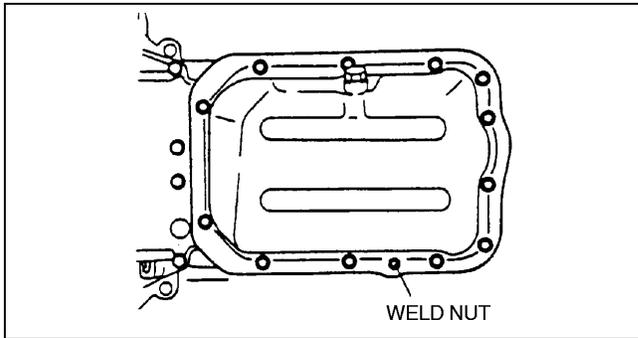
2	Oil strainer (See 01-11-7 Oil Strainer Installation Note)
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Oil Pan Removal Note

1. Remove the oil pan mounting bolts.
2. Screw in a oil pan bolt in a weld nut hole to make a small gap between the oil pan upper block and the oil pan. (FS model)

Caution

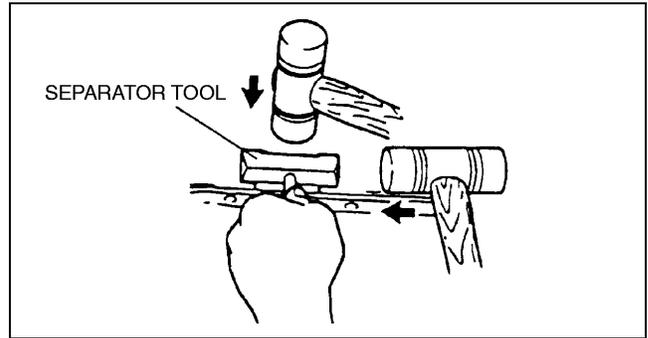
- Pry tools can easily scratch the cylinder block and MBSP contact surfaces. Prying off the MBSP can also easily bend the MBSP flange. (ZM model)



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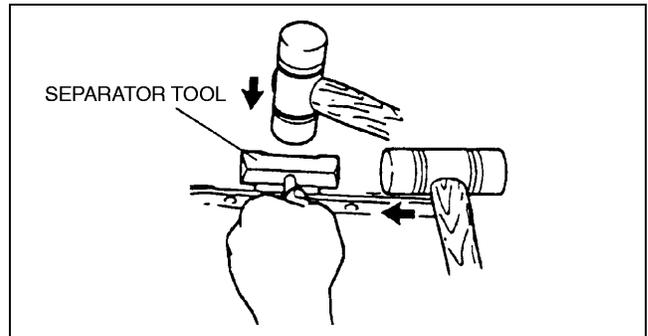
3. Remove the oil pan using a separator tool.



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MBSP (Main bearing support plate) Removal Note ZM

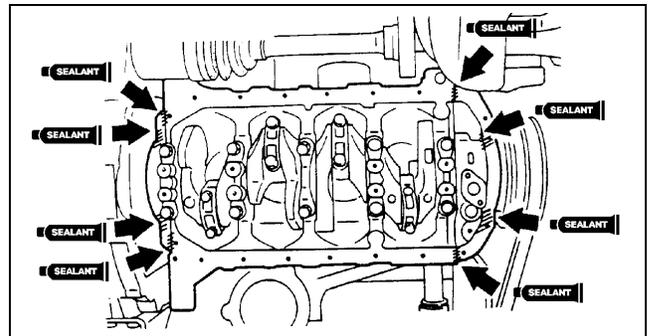
1. Using a separator tool, separate the MBSP.



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MBSP (Main bearing support plate) Installation Note ZM

1. Apply silicon sealant to the shaded areas as shown.

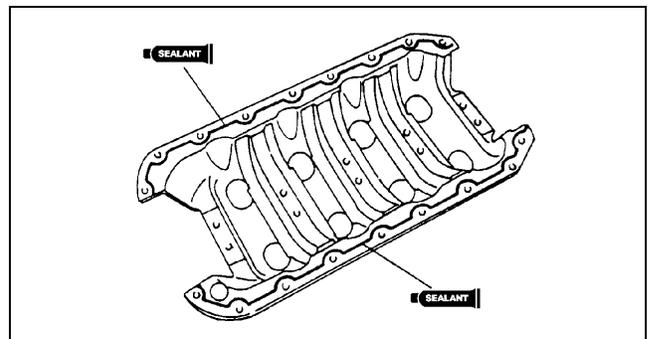


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2. Apply silicone sealant to the MBSP along the inside of the bolt holes.

Thickness

2.5—3.5 mm {0.099—0.137 in}



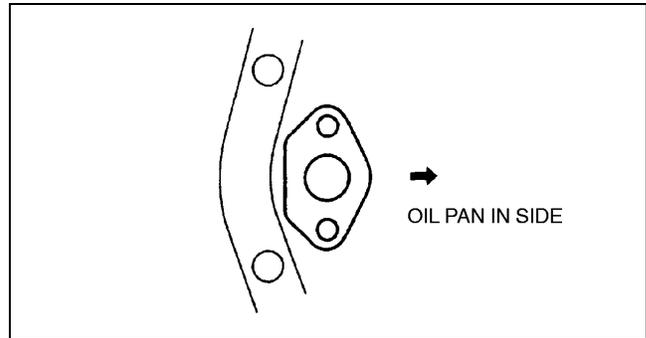
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LUBRICATION

Oil Strainer Installation Note

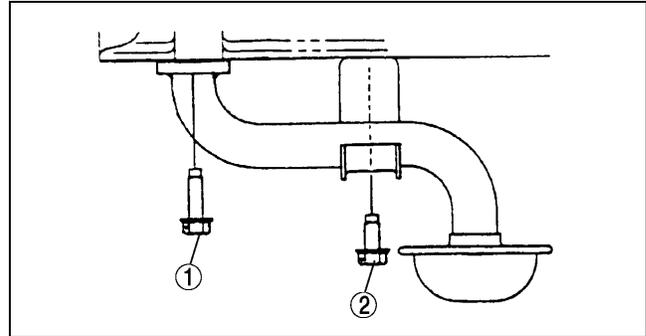
FS

1. Install the oil strainer gasket as shown.



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2. Tighten the bolts in the order shown.

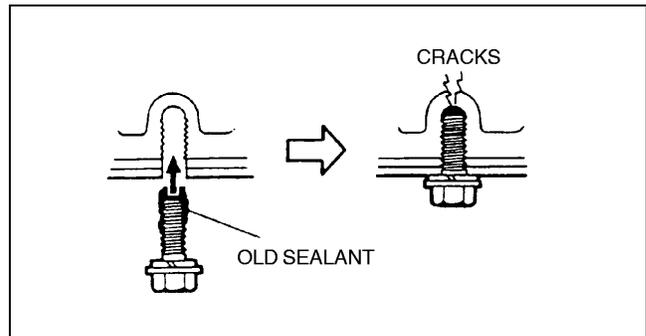


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Oil Pan Installation Note

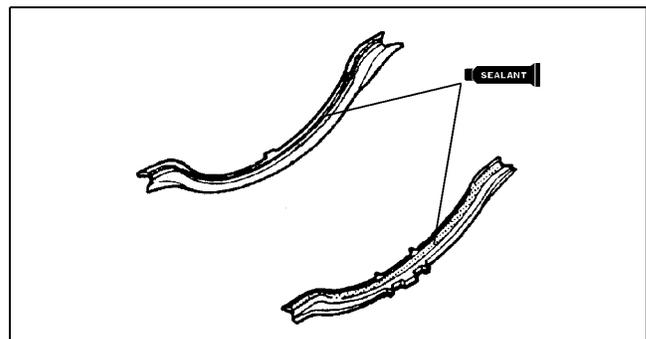
Caution

- If the bolts are reused, remove the old sealant from the bolt threads. Tightening a bolt that has old sealant on it can cause bolt hole damage.



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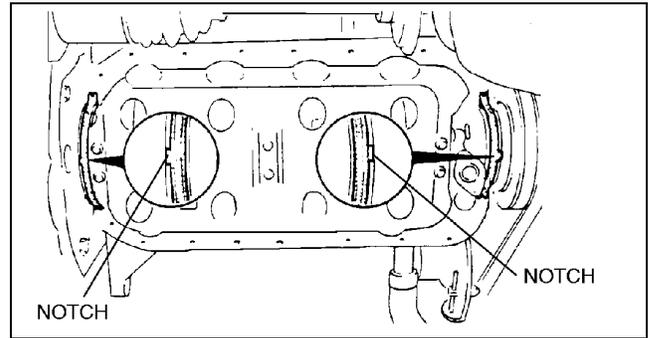
1. Apply silicone sealant to the contact surfaces of new oil pan gaskets as shown. (ZM model)



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2. Install the new gaskets onto the oil pump body and the rear cover with the projections in the notches as shown. (ZM model)

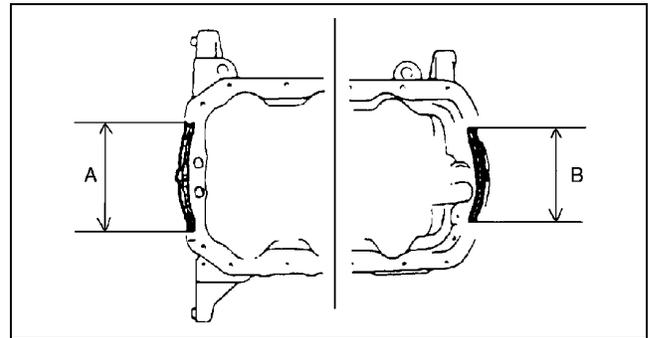


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3. Apply silicone sealant onto the area of oil pan gasket indicated by A and B. (ZM model)

Thickness

2.0 mm {0.079 in}



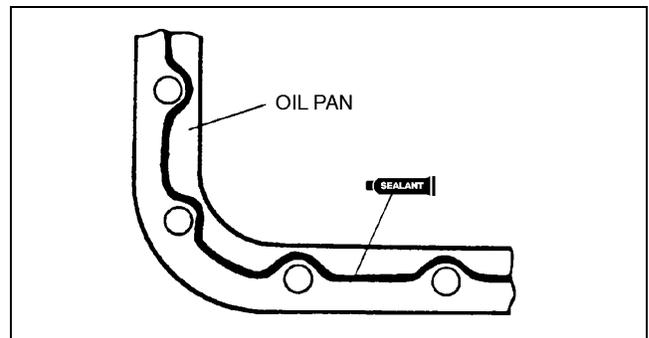
X3U111WAJ

4. Apply silicone sealant to the oil pan along the inside of the bolt holes and overlap the ends.

Thickness

ZM: 2.5—3.5 mm {0.099—0.137 in}

FS: 2.0—3.0 mm {0.079—0.118 in}

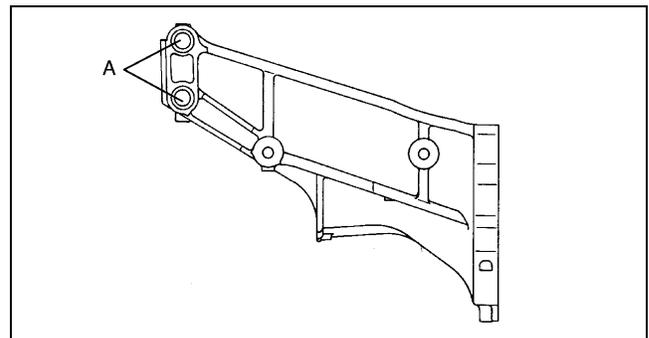


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Integrated Stiffener Installation Note

ZM

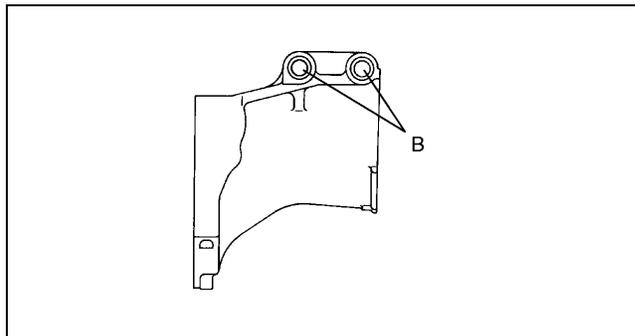
1. Hand-tighten the lock bolt A.



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2. Hand-tighten the lock bolt B.



X3U111WAM

3. Tighten the lock bolt C.

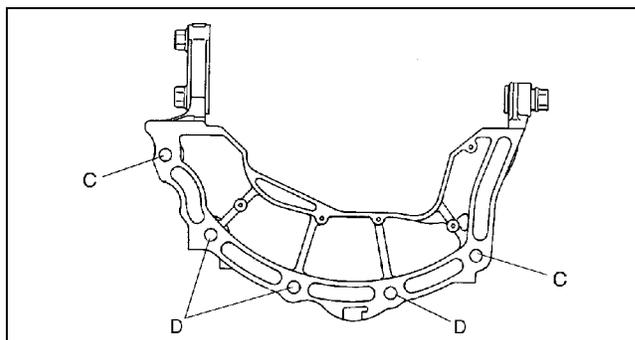
Tightening torque

37—52 N·m {3.8—5.3 kgf·m, 27.3—38.3 ft·lbf}

4. Tighten the lock bolt D.

Tightening torque

37—52 N·m {3.8—5.3 kgf·m, 27.3—38.3 ft·lbf}

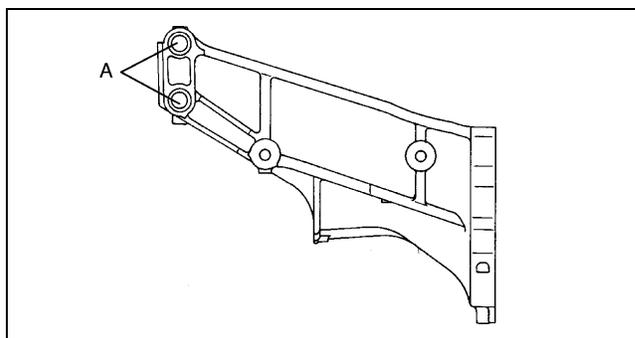


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5. Tighten the lock bolt A .

Tightening torque

37—52 N·m {3.8—5.3 kgf·m, 27.3—38.3 ft·lbf}

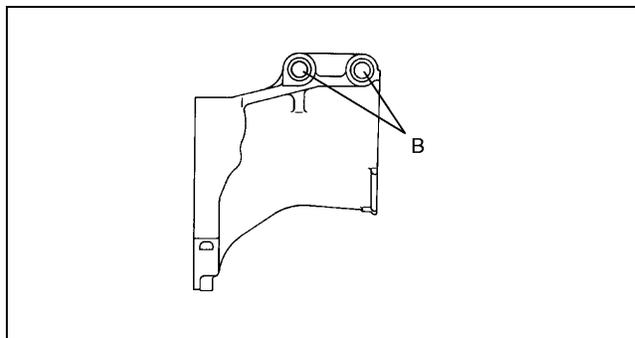


X3U111WAL

6. Tighten the lock bolt B.

Tightening torque

37—52 N·m {3.8—5.3 kgf·m, 27.3—38.3 ft·lbf}



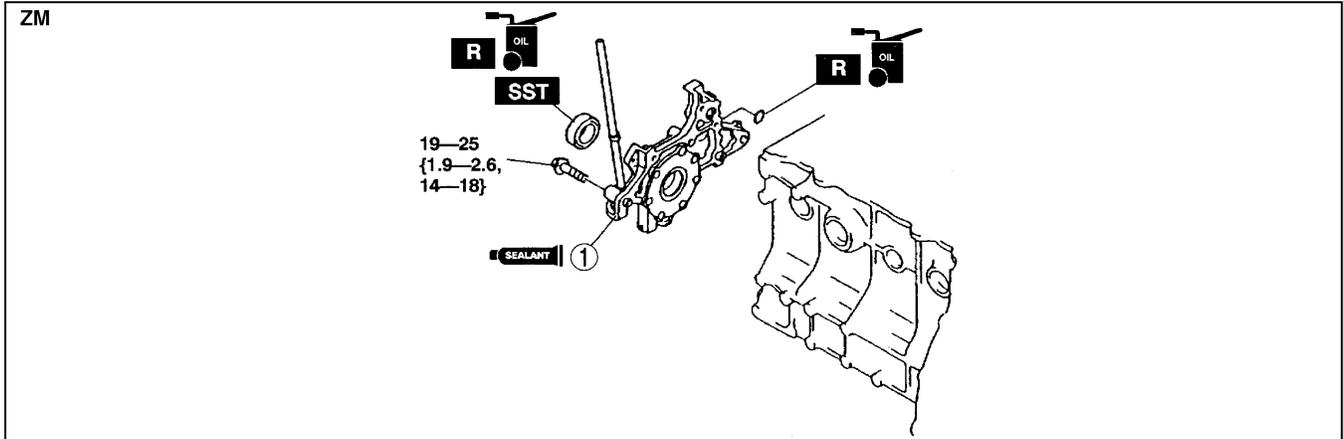
X3U111WAM

LUBRICATION

OIL PUMP REMOVAL/INSTALLATION

A3U011119220W01

1. Remove the timing belt. (See 01-10A-9 TIMING BELT REMOVAL/INSTALLATION [ZM].) (See 01-10B-8 TIMING BELT REMOVAL/INSTALLATION [FS].)
2. Remove the timing belt pulley.
3. Remove the oil pan. (See 01-11-4 OIL PAN REMOVAL/INSTALLATION.)
4. Remove the A/C compressor with the pipe still connected.
5. Remove the A/C compressor bracket.
6. Remove the generator. (ZM)
7. Remove the transaxle (FS) (See 05-15B-4 MANUAL TRANSAXLE (MTX) REMOVAL/INSTALLATION [G15M-R].) (See 05-17-31 AUTOMATIC TRANSAXLE (ATX) REMOVAL/INSTALLATION.)
8. Remove in the order indicated in the table.
9. Install in the reverse order of removal.



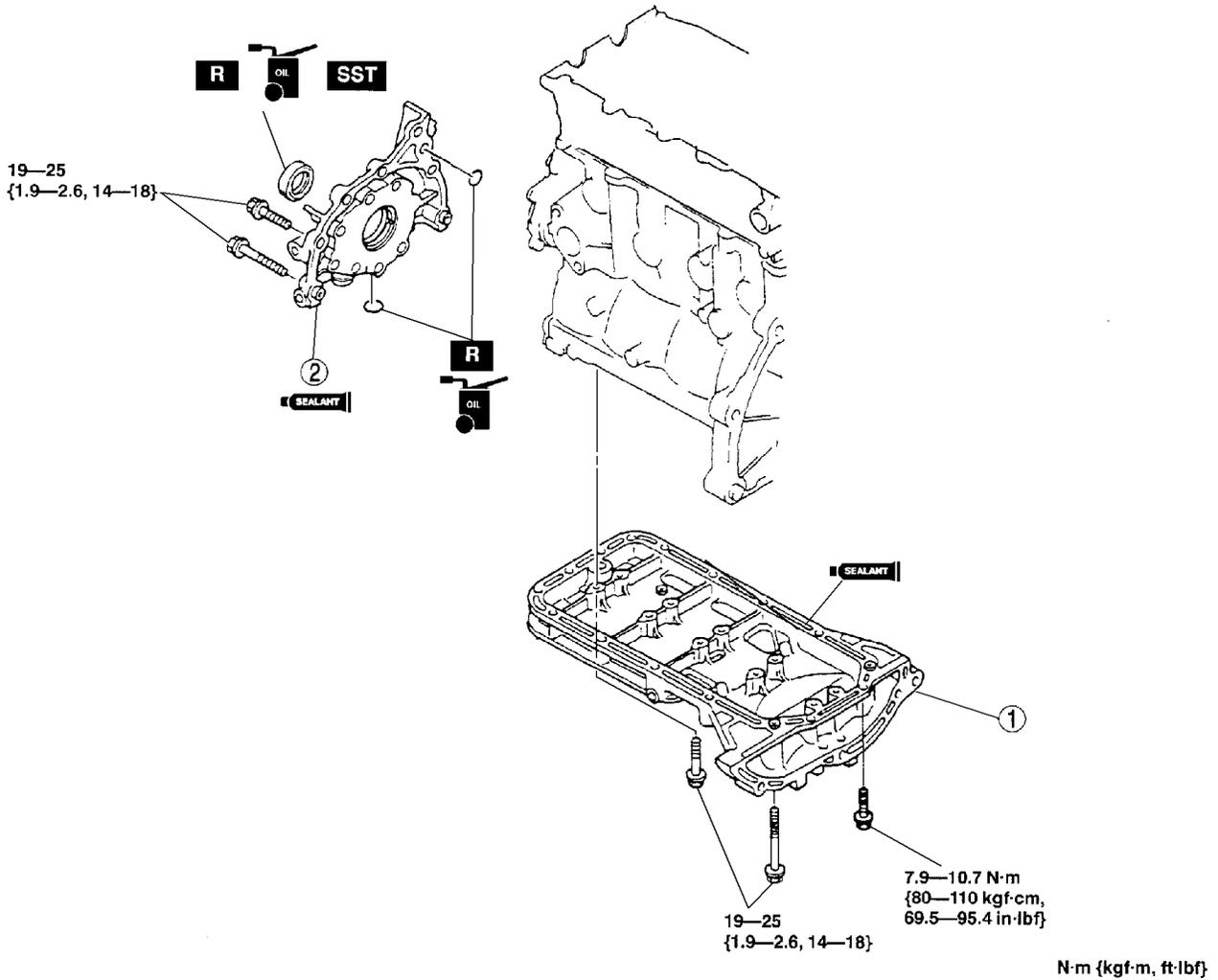
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1	Oil pump (See 01-11-12 Oil Pump Removal Note) (See 01-11-12 Oil Pump Installation Note)
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LUBRICATION

01-11

FS



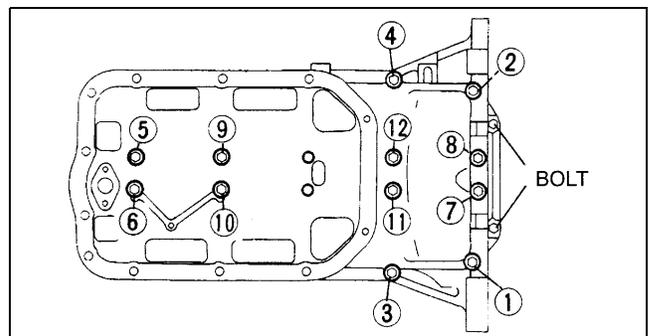
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1	Oil pan upper block (See 01-11-11 Oil Pan Upper Block Removal Note) (See 01-11-13 Oil Pan Upper Block Installation Note)
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2	Oil pump (See 01-11-12 Oil Pump Removal Note) (See 01-11-12 Oil Pump Installation Note)
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Oil Pan Upper Block Removal Note

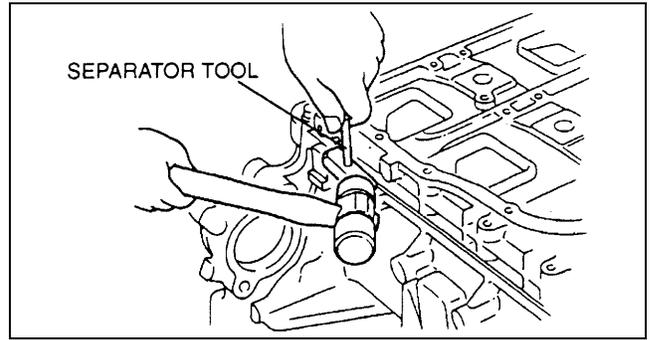
1. Remove the two bolts at the rear of the cylinder block.
2. Loosen the oil pan upper block bolts in 2 or 3 steps in the order shown.



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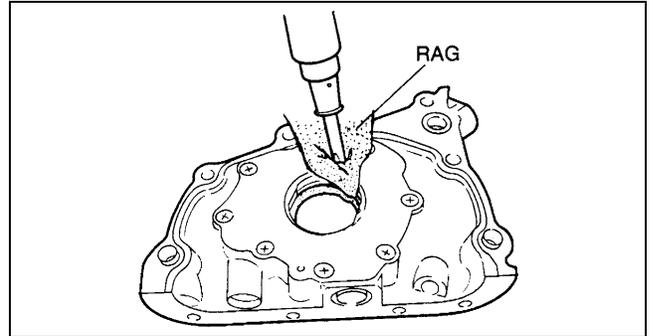
3. Remove the oil pan upper block using the separator tool.



Y3U111WA4

Oil Pump Removal Note

1. Remove the front oil seal using a screwdriver protected with a rag.

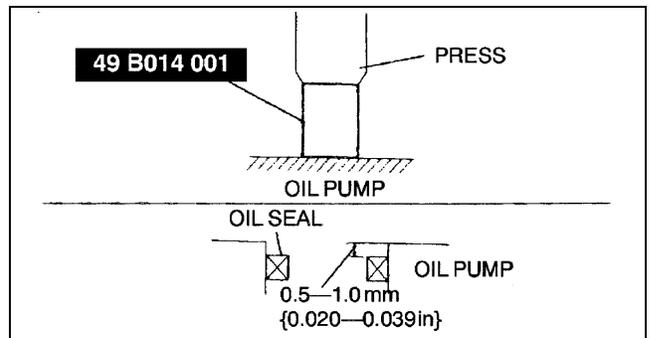


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Oil Pump Installation Note

ZM

1. Apply clean engine oil to the oil seal.
2. Push the oil seal slightly in by hand.
3. Press the oil seal evenly using the SST.

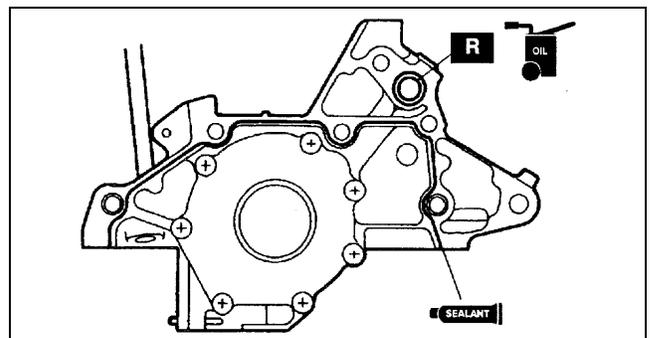


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4. Apply silicone sealant to the oil pump as shown.

Thickness

1.0—2.0 mm {0.040—0.078 in}

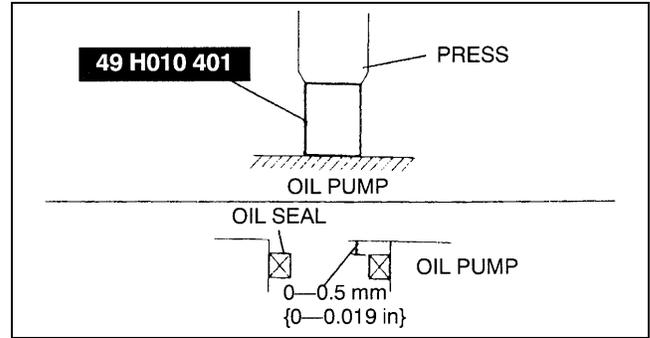


Y3U111WA7

LUBRICATION

FS

1. Apply clean engine oil to the oil seal.
2. Push the oil seal slightly in by hand.
3. Press the oil seal evenly using the **SST**.

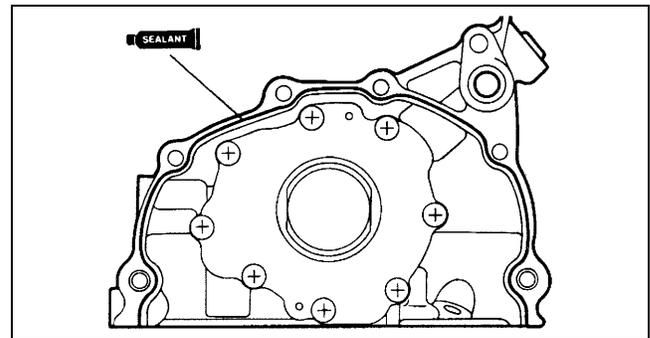


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4. Apply silicone sealant to the oil pump as shown.

Thickness

1.0—2.0 mm {0.040—0.078 in}



Y3U111WA9

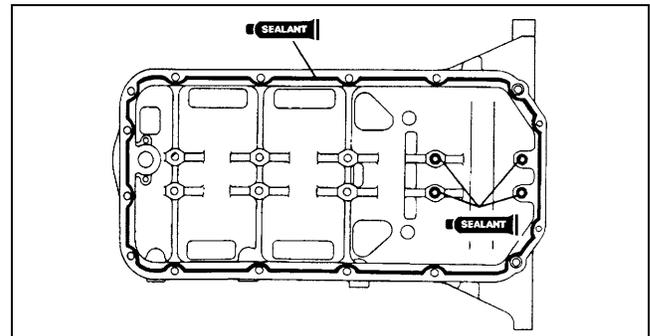
Oil Pan Upper Block Installation Note

1. Apply silicone sealant to the oil pan upper block as shown.

Thickness

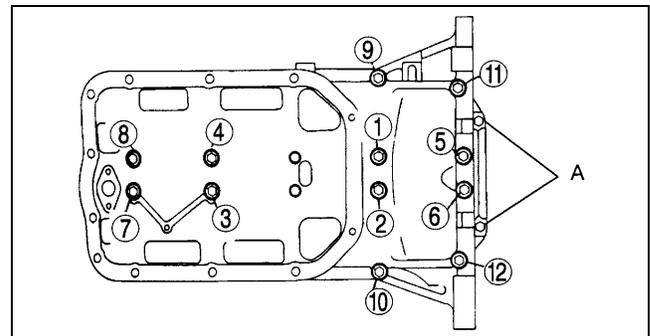
2.0—3.0 mm {0.08—0.11 in}

2. Tighten the bolts A.



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3. Tighten the oil pan upper block bolts in 2 or 3 steps in the order shown.



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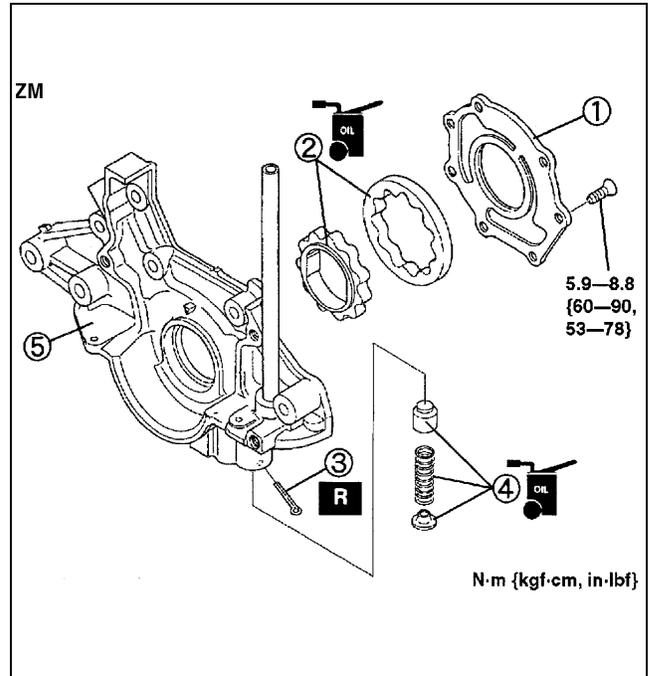
LUBRICATION

OIL PUMP DISASSEMBLY/ASSEMBLY

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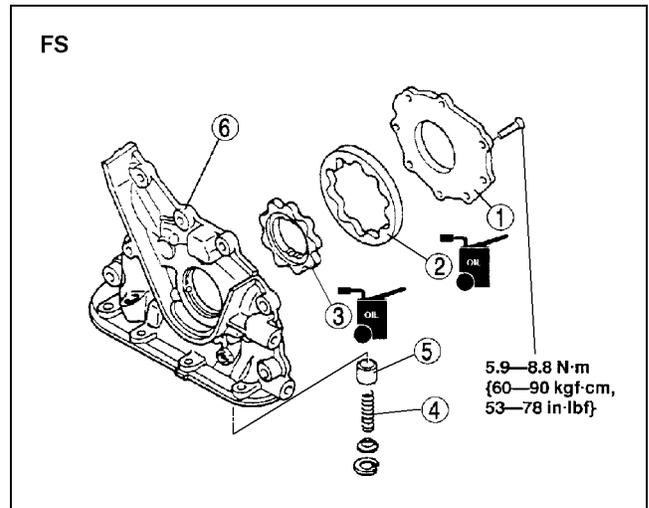
1. Remove the oil pump. (See 01-11-10 OIL PUMP REMOVAL/INSTALLATION.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.

1	Oil pump cover
2	Inner rotor, Outer rotor (See 01-11-15 Inner Rotor, Outer Rotor Assembly Note)
3	Cotter pin (See 01-11-14 Cotter Pin Assembly Note)
4	Plunger
5	Oil pump body



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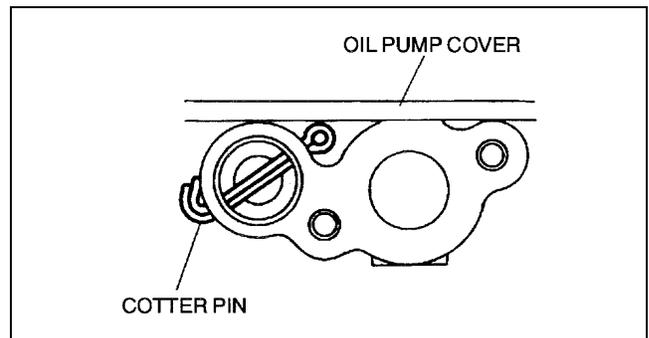
1	Oil pump cover
2	Outer rotor
3	Inner rotor
4	Pressure spring
5	Control plunger
6	Oil pump body



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Cotter Pin Assembly Note

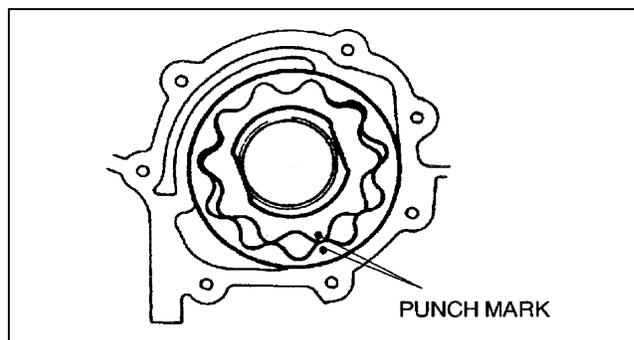
1. Bend the cotter pin so that its tip does not project from the oil pump cover mounting surface.



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Inner Rotor, Outer Rotor Assembly Note

- Match the punch marks on the inner and outer rotor before installing the inner and outer rotor.



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OIL PUMP INSPECTION

Rotor Clearance Inspection

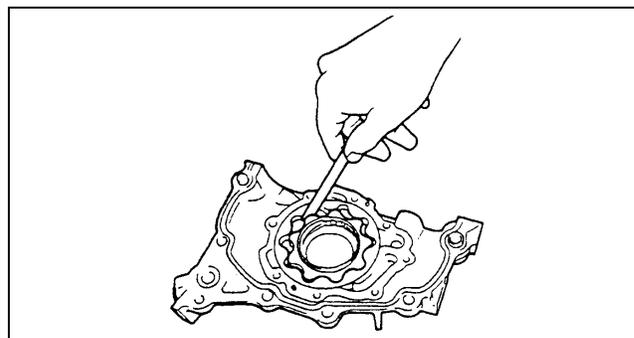
- Measure the following clearance.
 - Replace the rotor and/or pump body if necessary.

ZM

Standard tip clearance
0.02—0.18 mm {0.0008—0.0070 in}
Maximum tip clearance
0.22 mm {0.0087 in}

FS

Standard tip clearance
0.130—0.206 mm {0.00512—0.00811 in}
Maximum tip clearance
0.30 mm {0.012 in}



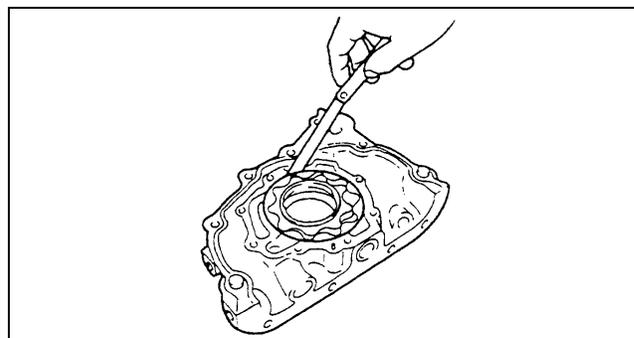
Y3U111WAG

ZM

Standard tip clearance
0.09—0.18 mm {0.0036—0.0070 in}
Maximum tip clearance
0.22 mm {0.0087 in}

FS

Standard tip clearance
0.113—0.186 mm {0.00445—0.00732 in}
Maximum tip clearance
0.22 mm {0.0087 in}



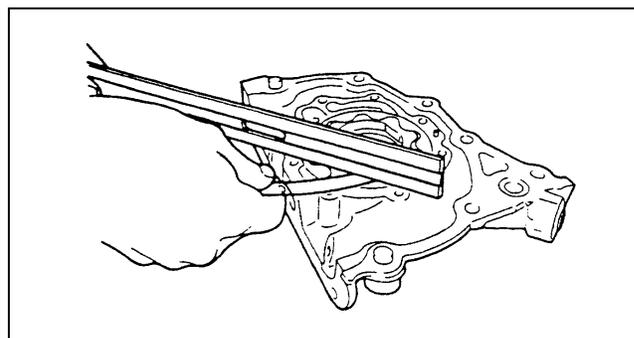
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ZM

Standard tip clearance
0.03—0.11 mm {0.0012—0.0043 in}
Maximum tip clearance
0.14 mm {0.0055 in}

FS

Standard tip clearance
0.035—0.095 mm {0.0014—0.0037 in}
Maximum tip clearance
0.14 mm {0.0055 in}



Y3U111WAJ

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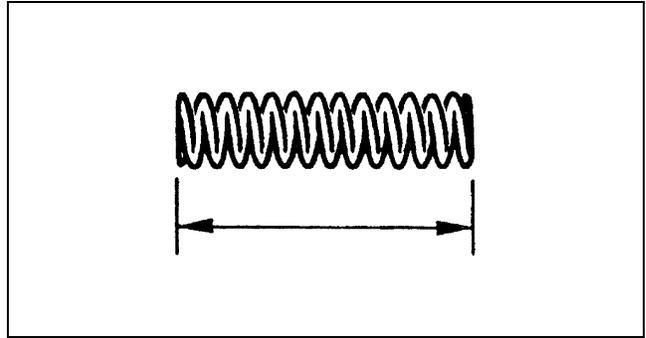
Pressure Spring Inspection

ZM

1. Measure the free length of the pressure spring.
 - Replace the pressure spring if necessary.

Free length

45.94 mm {1.809 in}



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FS

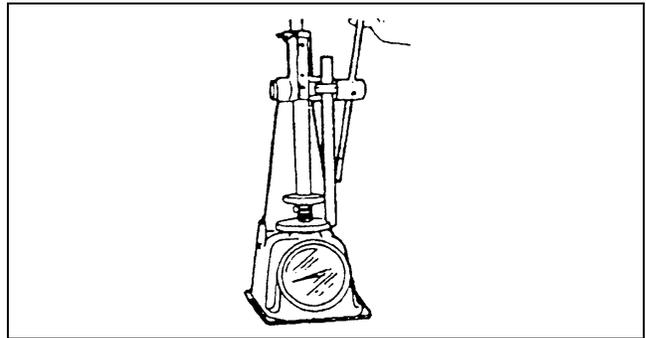
1. Apply pressing force to the pressure spring and check the spring height.
 - Replace the plunger spring if necessary.

Pressing force

97.7—107.4 N {9.96—10.96 kgf, 21.92—24.11 lbf}

Standard height

33.50 mm {1.319 in}



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