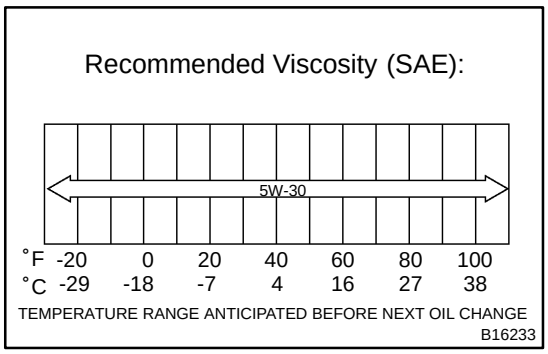


OIL AND FILTER

INSPECTION

LU05G-11

1. CHECK OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning.

If oil quality is visibly poor, replace the oil.

Oil grade:

API grade SL Energy-Conserving or ILSAC multi-grade engine oil.

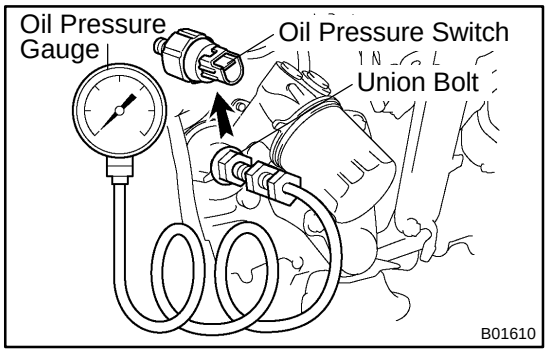
2. CHECK ENGINE OIL LEVEL

After warming up the engine and then 5 minutes after the engine stop, oil level should be between the low level and full level marks of the dipstick.

If low, check for leakage and add oil up to the full level mark.

NOTICE:

Do not fill with engine oil above the full level mark.



3. REMOVE OIL PRESSURE SWITCH AND INSTALL OIL PRESSURE GAUGE

(a) Disconnect the oil pressure switch connector.

(b) Using SST, remove the oil pressure switch.

SST 09268-46021

(c) Install an oil pressure gauge.

4. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

5. CHECK OIL PRESSURE

Oil pressure:

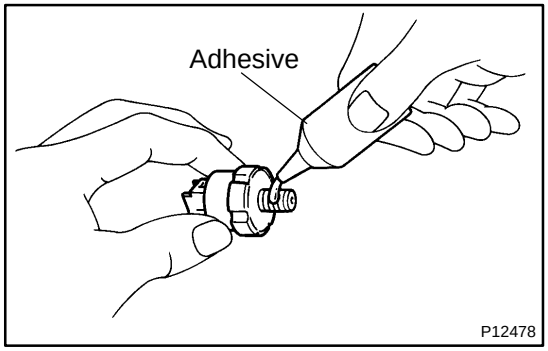
Idle	49 kPa (0.5 kgf/cm^2, 7 psi) or more
3,000 rpm	324 kPa (3.3 kgf/cm^2, 47 psi) or more

6. REMOVE OIL PRESSURE GAUGE AND REINSTALL OIL PRESSURE SWITCH

(a) Remove the oil pressure gauge.

(b) Tighten the union bolt.

Torque: 90 N·m (900 kgf·cm, 66 ft·lbf)



(c) Apply adhesive to 2 or 3 threads of the oil pressure switch.

Adhesive:

Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(d) Using SST, install the oil pressure switch.

SST 09268-46021

Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

(e) Connect the oil pressure switch connector.

7. START ENGINE AND CHECK FOR LEAKS

LU05H-11

REPLACEMENT

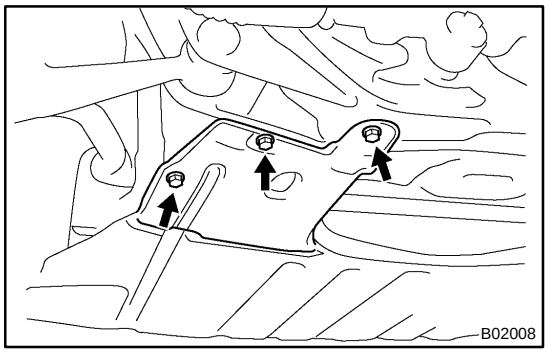
CAUTION:

- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.**
- **Exercise caution in order to minimize the length and frequency of contact of your skin to used oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use water-less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **In order to preserve the environment, used oil and used oil filters must be disposed of only at designated disposal sites.**

1. DRAIN ENGINE OIL

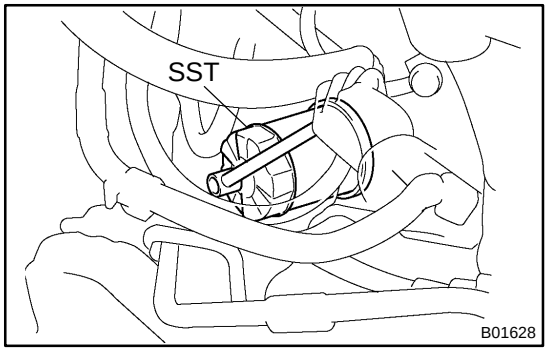
(a) Remove the oil filler cap.

(b) Remove the oil drain plug, and drain the oil into a container.



2. REPLACE OIL FILTER

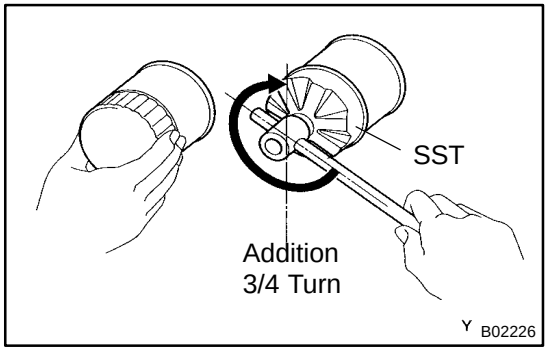
(a) Remove the 3 screws, and bend the engine under cover.



(b) Using SST, remove the oil filter.
SST 09228-07501

(c) Clean the oil filter contact surface on the oil filter mounting.

(d) Lubricate the filter rubber gasket with clean engine oil.



(e) Tighten the oil filter by hand until the rubber gasket contacts the seat of the filter mounting.

(f) Using SST, tighten it an additional 3/4 turn to seat the filter.
SST 09228-07501

(g) Reinstall the engine under cover with the 3 screws.

3. FILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.
Torque: 38 N·m (380 kgf·cm, 28 ft·lbf)

(b) Fill with fresh engine oil.

Capacity:

Drain and refill	w/ Oil filter change	5.4 liters (5.7 US qts, 4.8 Imp. qts)
	w/o Oil filter change	5.1 liters (5.4 US qts, 4.5 Imp. qts)
Dry fill		6.5 liters (6.9 US qts, 5.7 Imp. qts)

(c) Reinstall the oil filler cap.

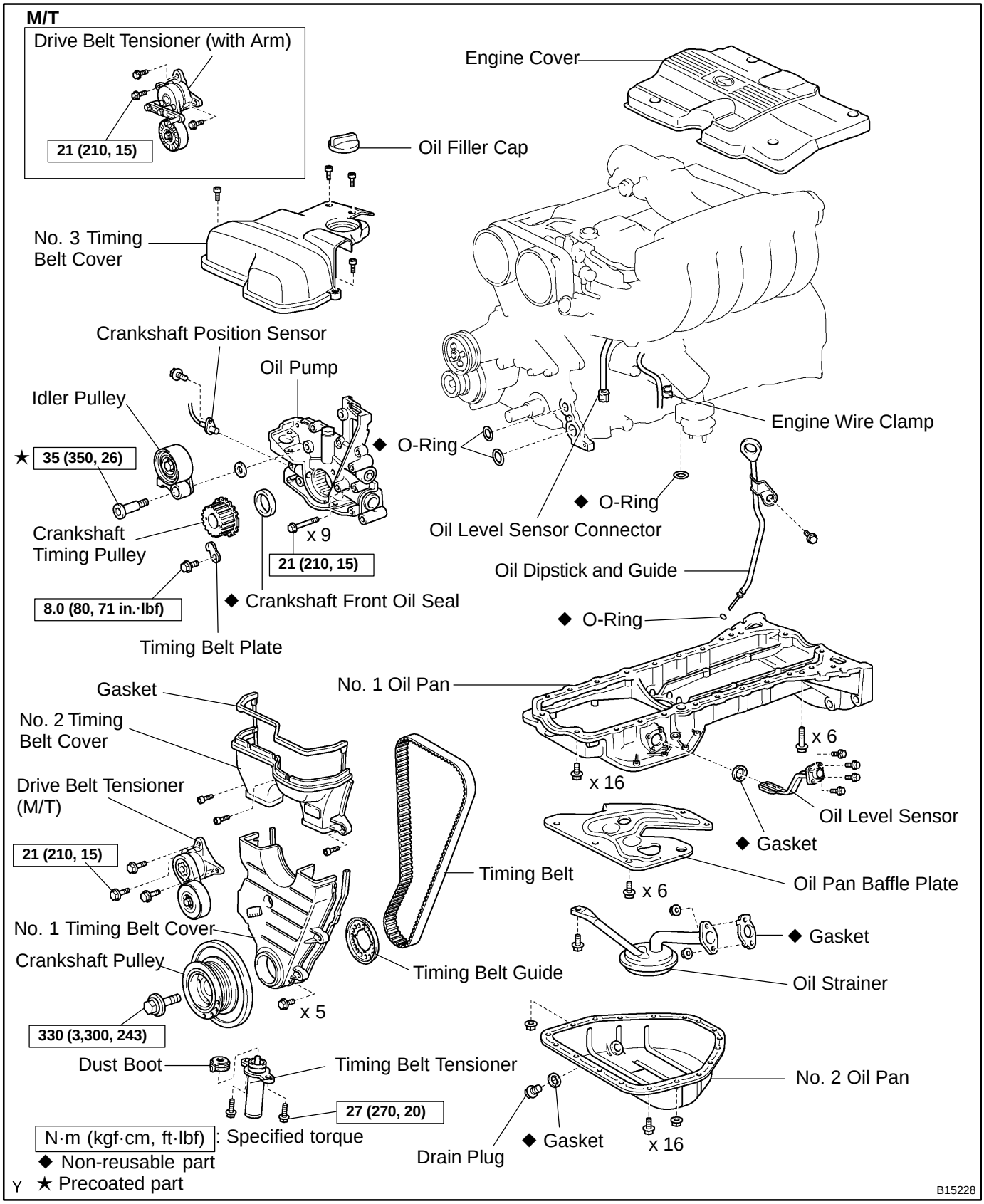
4. START ENGINE AND CHECK FOR OIL LEAKS

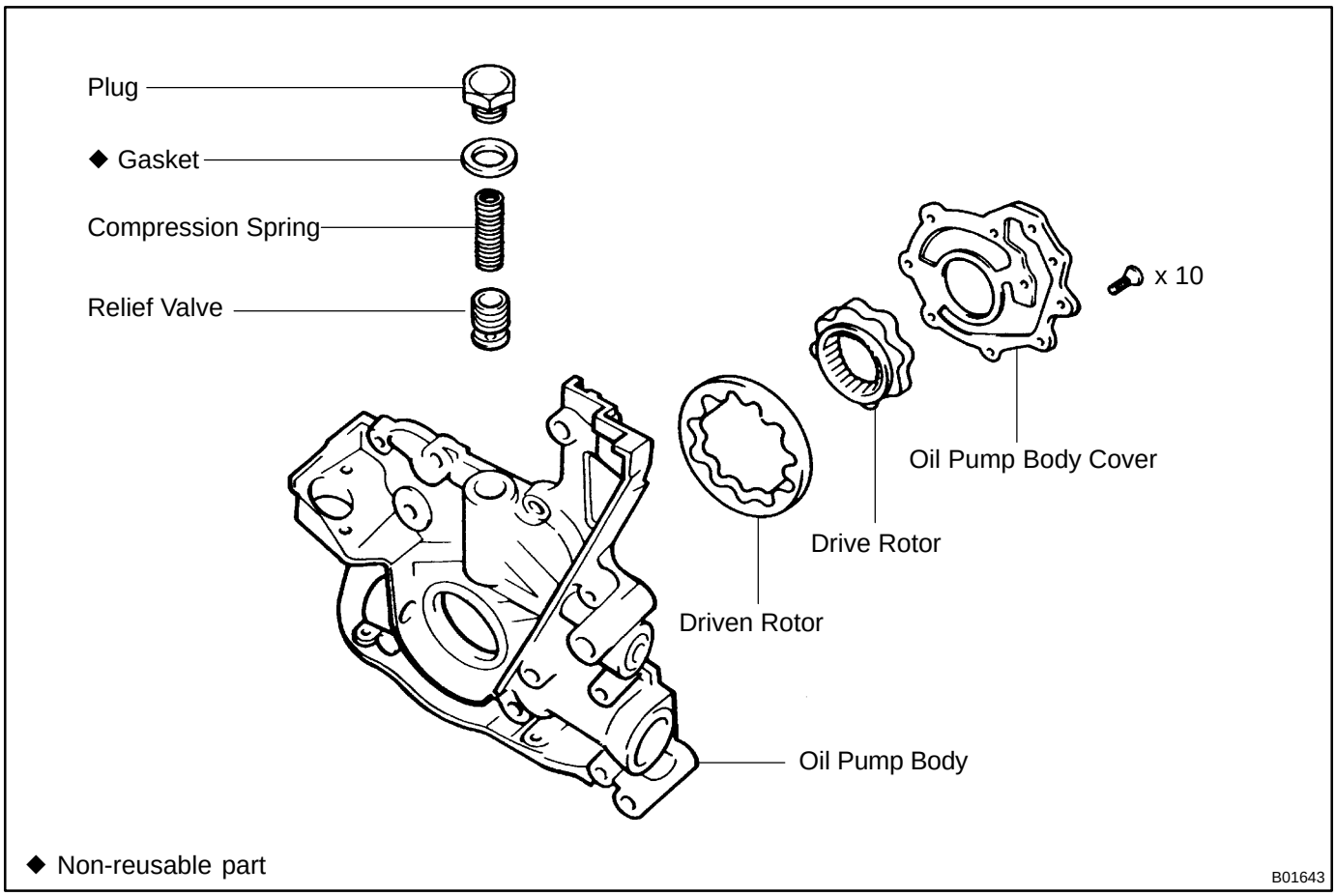
5. RECHECK ENGINE OIL LEVEL

OIL PUMP

COMPONENTS

LU05I-09




Plug
◆ Gasket
Compression Spring
Relief Valve
x 10
Oil Pump Body Cover
Drive Rotor
Driven Rotor
Oil Pump Body
◆ Non-reusable part
B01643

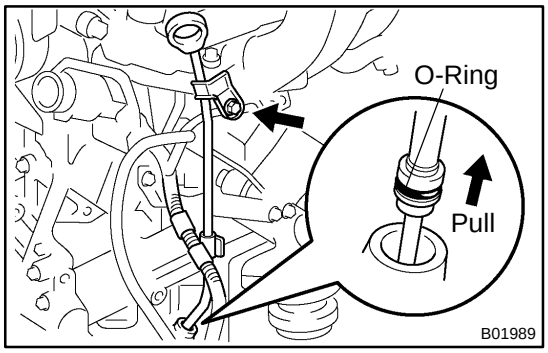
LU05J-07

REMOVAL

HINT:

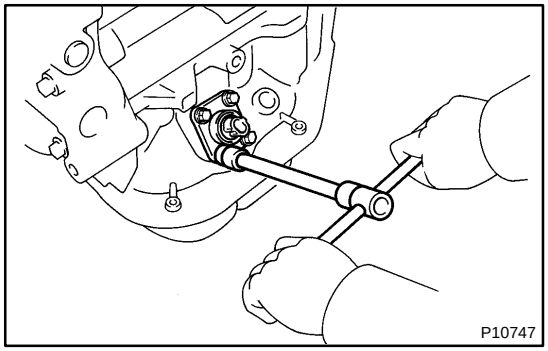
When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

1. **REMOVE ENGINE WITH TRANSMISSION (See page EM-65)**
2. **SEPARATE ENGINE AND TRANSMISSION (See page EM-65)**
3. **INSTALL ENGINE TO ENGINE STAND FOR REMOVAL**
4. **REMOVE CRANKSHAFT POSITION SENSOR**
5. **REMOVE TIMING BELT, IDLER PULLEY AND CRANKSHAFT TIMING PULLEY (See page EM-17)**



6. **REMOVE OIL DIPSTICK AND GUIDE**

(a) Disconnect the engine wire clamp from the dipstick guide.
(b) Remove the bolt.
(c) Pull out the dipstick guide together with the dipstick.
(d) Remove the O-ring from the dipstick guide.

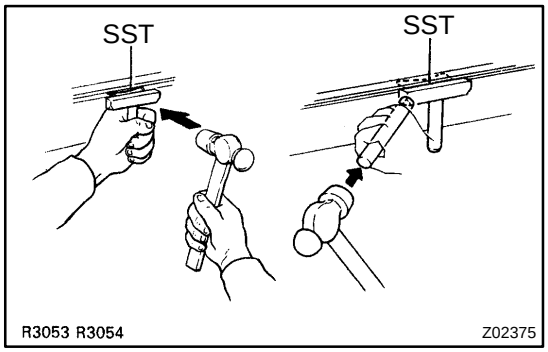


7. **REMOVE OIL LEVEL SENSOR**

(a) Disconnect the level sensor connector.
(b) Remove the 4 bolts and level sensor.
(c) Remove the gasket from the level sensor.

NOTICE:

Be careful not to drop the oil level sensor when removing it.

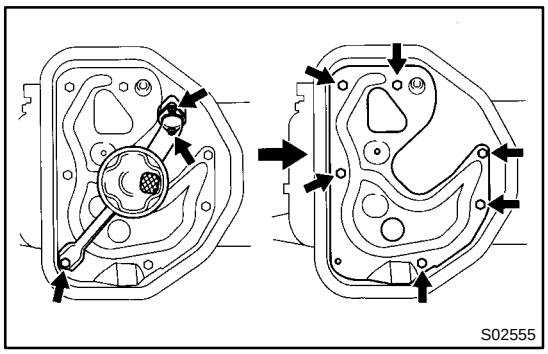


8. **REMOVE NO. 2 OIL PAN**

(a) Remove the 16 bolts and 2 nuts.
(b) Insert the blade of SST between the No. 1 and No. 2 oil pan, break the seal of the applied sealer and remove the No. 2 oil pan.
SST 09032-00100

NOTICE:

Be careful not to damage the No. 2 oil pan contact surface of the No.1 oil pan. Be careful not to damage the oil pan flange.

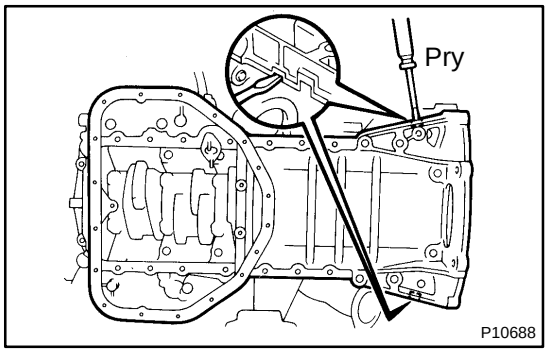


9. REMOVE OIL STRAINER

Remove the bolt, 2 nuts, oil strainer and gasket.

10. REMOVE OIL PAN BAFFLE PLATE

Remove the 6 bolts and baffle plate.



11. REMOVE NO. 1 OIL PAN

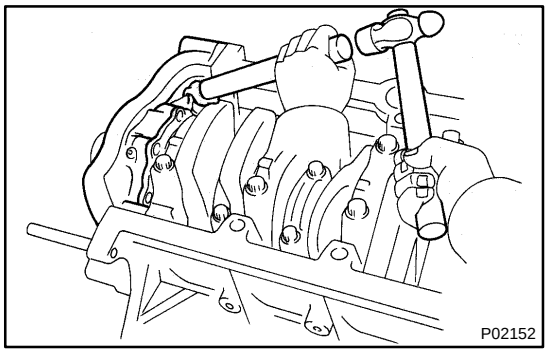
(a) Remove the 22 bolts.

(b) Remove the No. 1 oil pan by prying the portions between the cylinder block and No. 1 oil pan with a screwdriver.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder block and No. 1 oil pan.

(c) Remove the O-ring from the cylinder block.



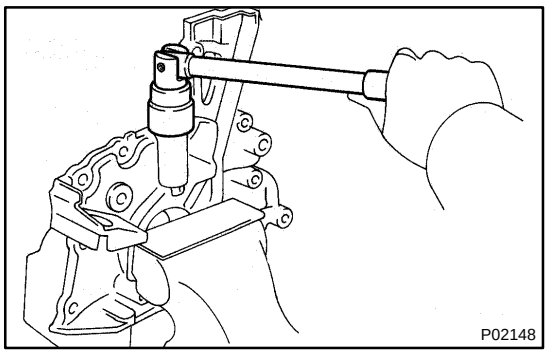
12. REMOVE OIL PUMP

(a) Remove the 9 bolts.

(b) Using a hammer and a brass bar, remove the oil pump by carefully tapping the oil pump body.

(c) Remove the 2 O-rings from the cylinder block.

LU05K-08



DISASSEMBLY

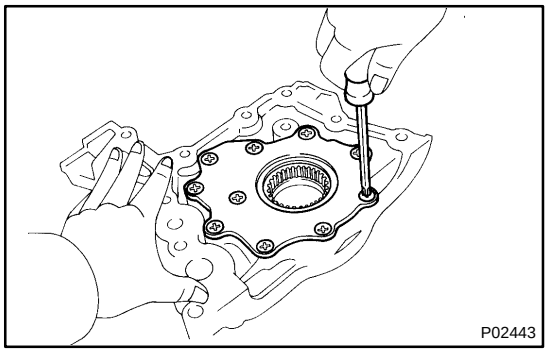
1. REMOVE RELIEF VALVE

(a) Carefully mount the pump body in a soft jaw vise.

(b) Remove the plug, gasket, compression spring and relief valve.

NOTICE:

Be careful not to damage the pump body.

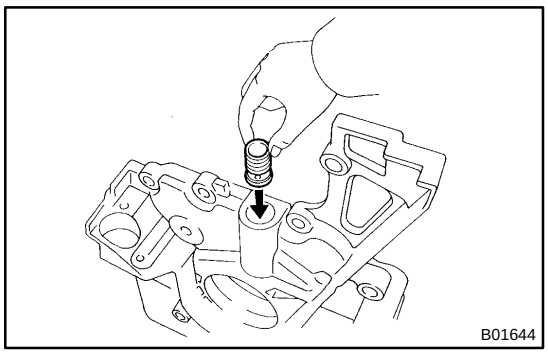


2. REMOVE DRIVE AND DRIVEN ROTORS

Remove the 10 screws, pump body cover, the drive and driven rotors.

LU05L-09

INSPECTION



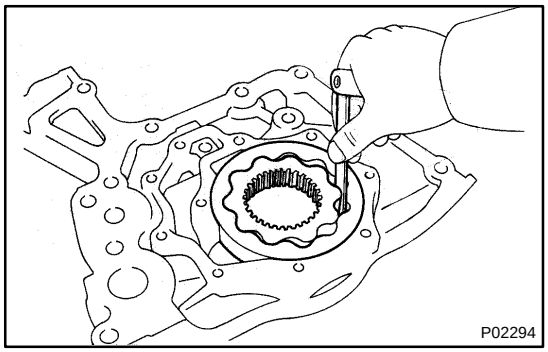
1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole under its own weight.

If it doesn't, replace the relief valve. If necessary, replace the oil pump assembly.

2. INSPECT ROTORS

(a) Place the rotors into the oil pump body (See page LU-1 1).



(b) Inspect the rotors for the tip clearance.

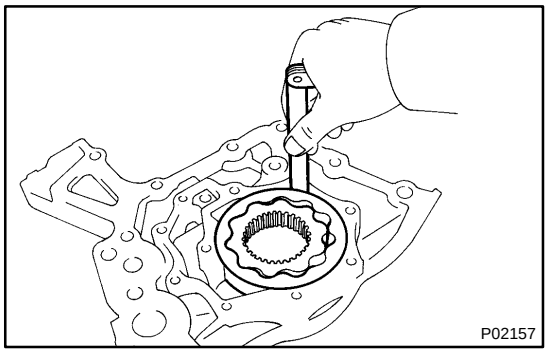
Using a feeler gauge, measure the clearance between the drive and driven rotors.

Standard tip clearance:

0.060 - 0.240 mm (0.0024 - 0.0094 in.)

Maximum tip clearance: 0.30 mm (0.0118 in.)

If the tip clearance is greater than maximum, replace the rotors as a set.



(c) Inspect the rotor for the body clearance.

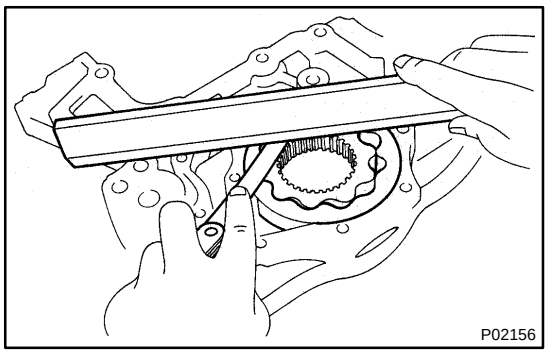
Using a feeler gauge, measure the clearance between the driven rotor and pump body.

Standard body clearance:

0.100 - 0.175 mm (0.0039 - 0.0069 in.)

Maximum body clearance: 0.20 mm (0.0079 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



(d) Inspect the rotors for the side clearance.

Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

Standard side clearance:

0.030 - 0.090 mm (0.0012 - 0.0035 in.)

Maximum side clearance: 0.12 mm (0.0047 in.)

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

(e) Remove the rotors.

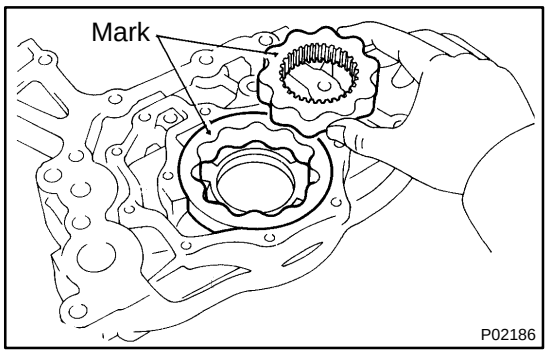
LU05M-04

REPLACEMENT

REPLACE FRONT CRANKSHAFT OIL SEAL (See page EM-92)

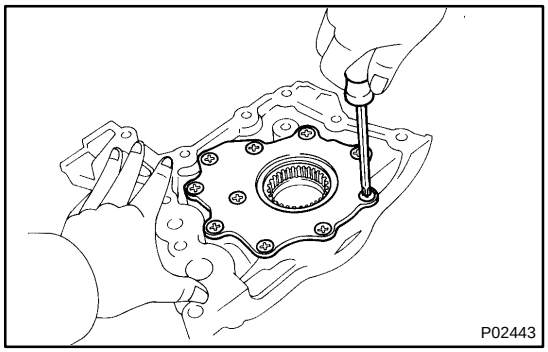
LU05N-08

REASSEMBLY

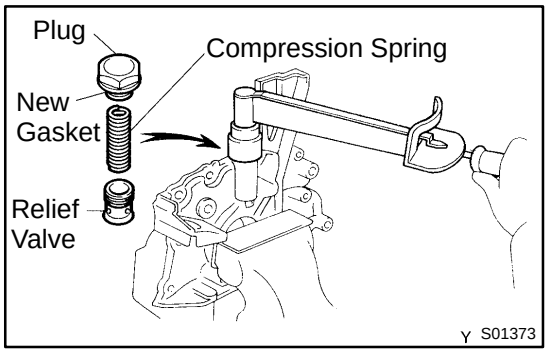


1. INSTALL DRIVE AND DRIVEN ROTORS

(a) Place the drive and driven rotors into oil pump body with the mark facing upward.



(b) Install the pump body cover with the 10 screws.
Torque: 10 N·m (105 kgf·cm, 8 ft·lbf)



2. INSTALL RELIEF VALVE

(a) Carefully mount the pump body in a soft jaw vise.

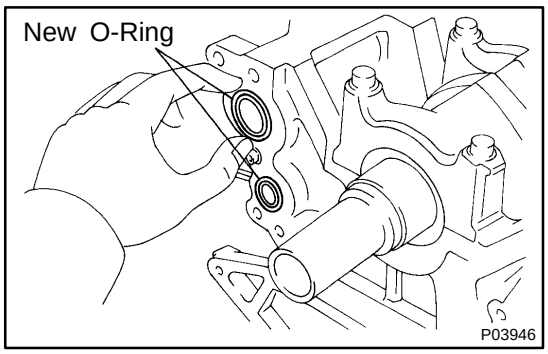
NOTICE:

Be careful not to damage the pump body.

(b) Insert the relief valve and compression spring into the oil pump body hole.

(c) Install the plug with a new gasket.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

LU05O-08



INSTALLATION

1. INSTALL OIL PUMP

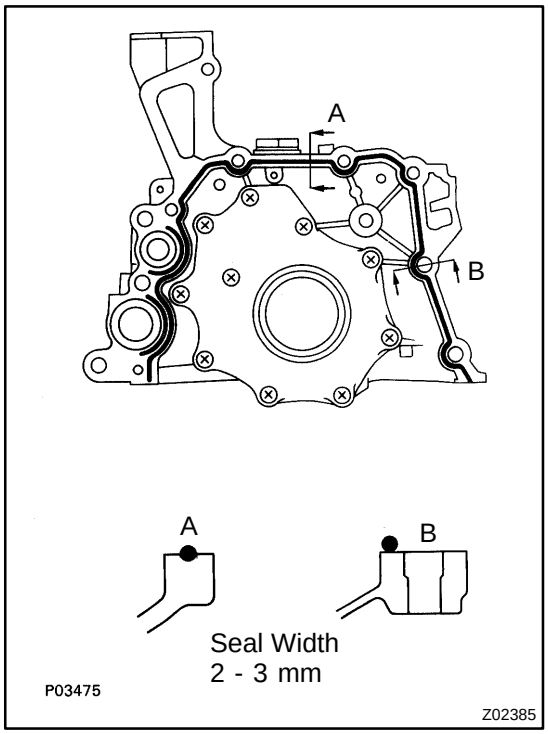
(a) Place 2 new O-rings in position on the cylinder block.

(b) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pump and cylinder block.

- Using a razor blade gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the debris.
- Using a non-residue solvent, clean both sealing surfaces.

NOTICE:

Do not use a solvent which will affect the painted surfaces.



(c) Apply seal packing to the oil pump as shown in the illustration.

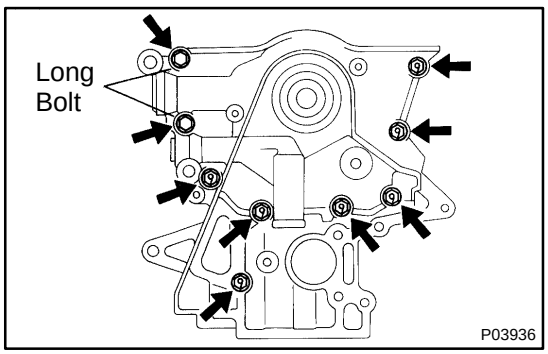
Seal packing: Part No.08826-00080 or equivalent

- Install a nozzle that has been cut to a 2 - 3 mm (0.08 - 0.12 in.) opening.

HINT:

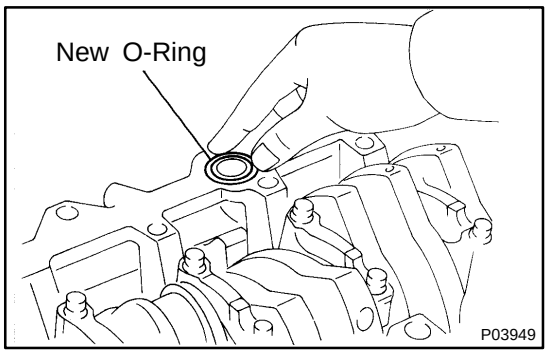
Avoid applying an excessive amount to the surface. Be particularly careful near oil passages.

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(d) Install the oil pump with the 9 bolts.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)



2. INSTALL NO. 1 OIL PAN

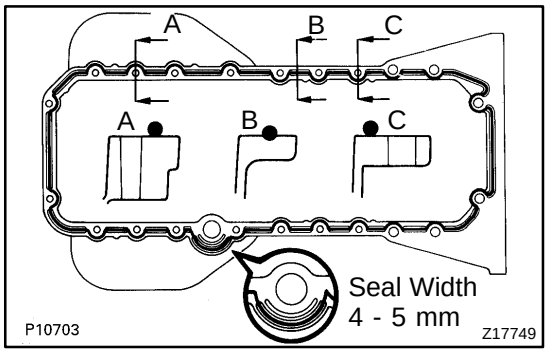
(a) Place a new O-ring in the position on the cylinder block.

(b) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the No. 1 oil pan and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the debris.
- Using a non-residue solvent, clean both sealing surfaces.

NOTICE:

Do not use a solvent which will affect the painted surfaces.



(c) Apply seal packing to the No. 1 oil pan as shown in the illustration.

Seal packing: Part No.08826-00080 or equivalent

- Install a nozzle that has been cut to a 4 - 5 mm (0.16 - 0.20 in.) opening.

HINT:

Avoid applying an excessive amount to the surface.

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(d) Install the No.1 oil pan with the 22 bolts.

Torque:

21 N·m (210 kgf·cm, 15 ft·lbf) for 12 mm head

40 N·m (400 kgf·cm, 30 ft·lbf) for 14 mm head

3. INSTALL OIL PAN BAFFLE PLATE

Torque: 9.0 N·m (90 kgf·cm, 80 in.·lbf)

4. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the bolt and 2 nuts.

Torque: 9.0 N·m (90 kgf·cm, 80 in.·lbf)

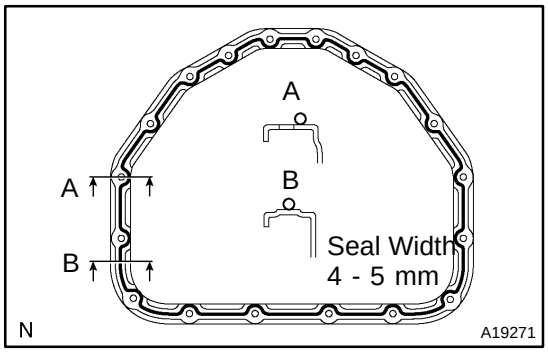
5. INSTALL NO. 2 OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the No. 1 and No. 2 oil pans.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the debris.

- Using a non-residue solvent, clean both sealing surfaces.

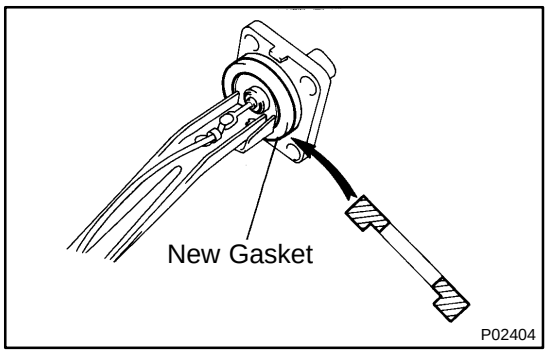
NOTICE:
Do not use a solvent which will affect the painted surfaces.



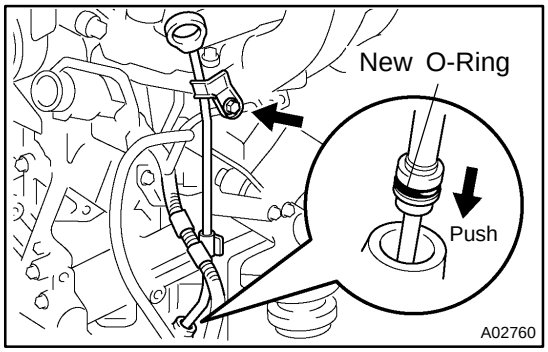
(b) Apply seal packing to the No. 2 oil pan as shown in the illustration.
Seal packing: Part No.08826-00080 or equivalent
Install a nozzle that has been cut to a 4 - 5 mm (0.16 - 0.20 in.) opening.

HINT:
Avoid applying an excessive amount to the surface.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the No. 2 oil pan with the 16 bolts and 2 nuts.
Torque: 9.0 N·m (90 kgf·cm, 80 in.·lbf)



6. INSTALL OIL LEVEL SENSOR
(a) Install a new gasket to the level sensor.
(b) Install the level sensor with the 4 bolts.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
(c) Connect the level sensor connector.



7. INSTALL OIL DIPSTICK GUIDE AND DIPSTICK
(a) Install a new O-ring on the dipstick guide.
(b) Apply soapy water on the O-ring.
(c) Push in the dipstick guide into the guide hole of the No. 1 oil pan.
(d) Install the dipstick guide with the bolt.
(e) Install the dipstick.
(f) Connect the engine wire clamp to the dipstick guide.

8. INSTALL CRANKSHAFT TIMING PULLEY, IDLER PULLEY AND TIMING BELT (See page EM-24)

9. **INSTALL CRANKSHAFT POSITION SENSOR**
   Torque: 9.0 N·m (90 kgf·cm, 80 in.·lbf)
10. **REMOVE ENGINE STAND FROM ENGINE**
11. **ASSEMBLY ENGINE AND TRANSMISSION (See page EM-71)**
12. **INSTALL ENGINE WITH TRANSMISSION (See page EM-71)**