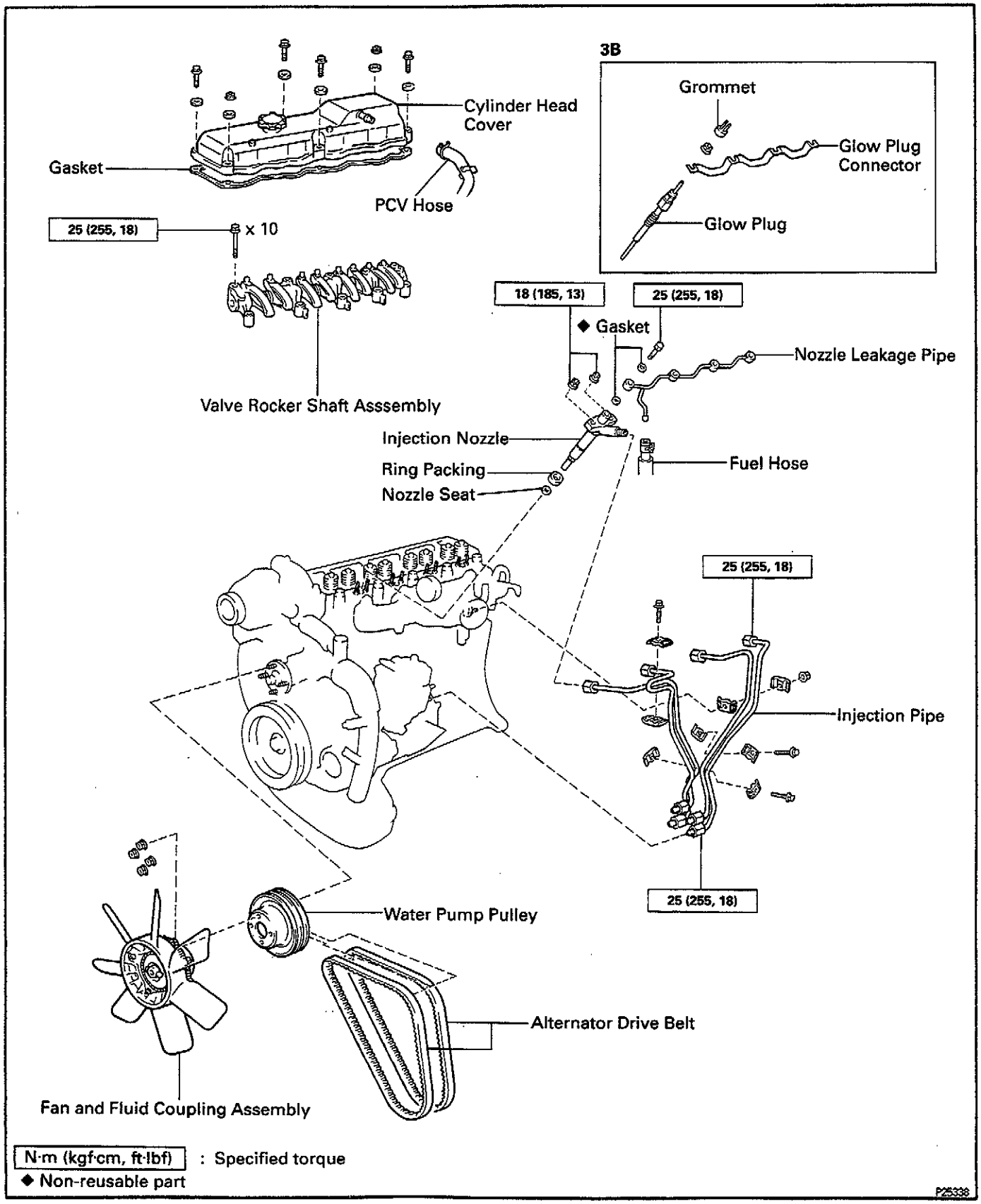
OIL PUMP

COMPONENTS FOR REMOVAL AND INSTALLATION

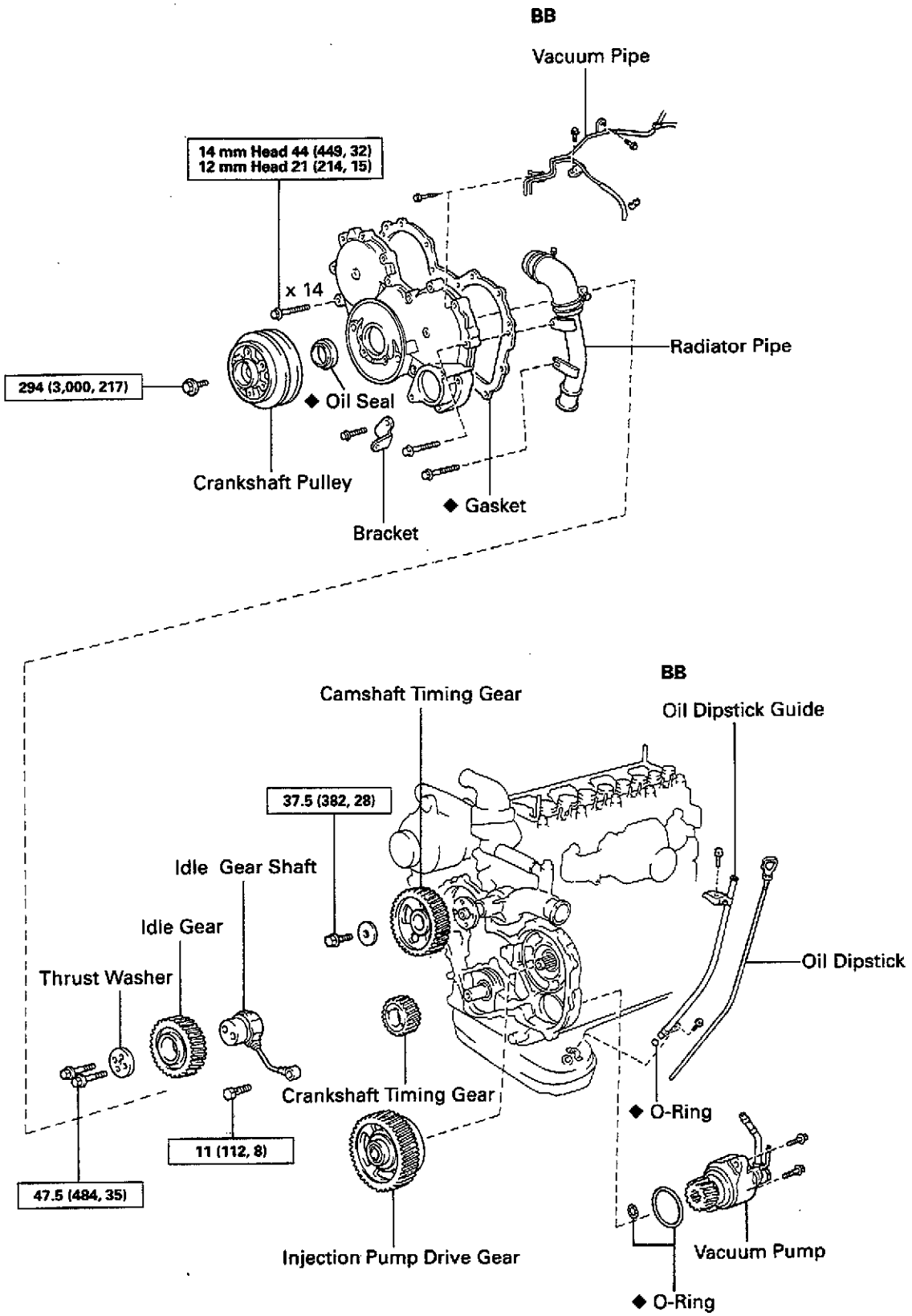


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

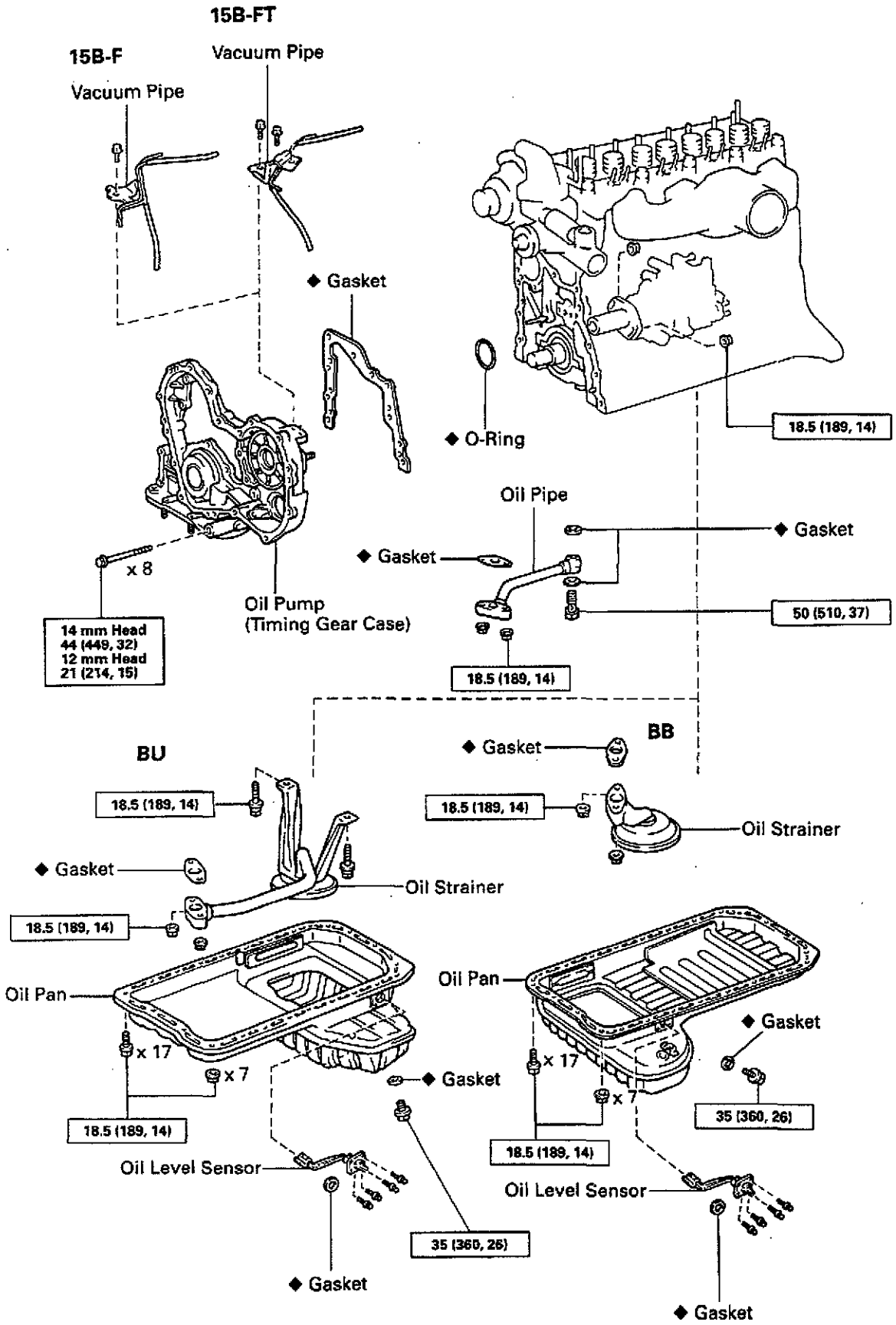
P25338

EG



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

P25436



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

P25039

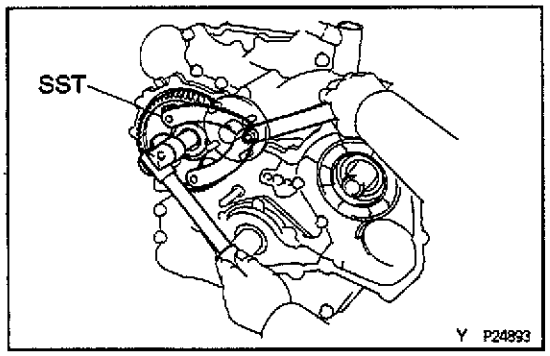
EG

OIL PUMP REMOVAL

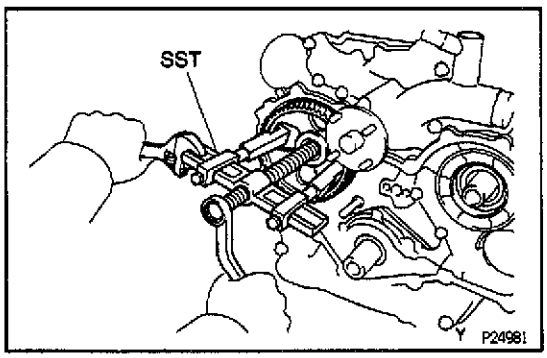
HINT: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

1. **SET NO.1 CYLINDER TO TDC/COMPRESSION**
2. **DRAIN ENGINE OIL**
3. **REMOVE DRIVE BELT(S), FAN, FLUID COUPLING ASSEMBLY (FAN AND FAN SPACER) AND WATER PUMP PULLEY**
   (See step 2 or 3 in water pump removal in Cooling System)
4. **3B:**
   REMOVE GLOW PLUGS
   (See step 4 in cylinder head removal)
5. **14B, 15B–F, 15B–FT:**
   REMOVE INJECTION NOZZLES
   (See injection nozzles removal in Fuel System)
6. **REMOVE VALVE ROCKER SHAFT ASSEMBLY**
   3B, 14B:
   (See steps 13 and 14 in cylinder head removal in Engine Mechanical)
   15B–F, 15B–FT:
   (See steps 11 to 13 in cylinder head removal in Engine Mechanical)
7. **REMOVE CRANKSHAFT PULLEY AND TIMING GEAR COVER**
   (See steps 8 to 12 in timing gears and camshaft removal in Engine Mechanical)
8. **REMOVE VACUUM PUMP AND IDLE GEAR AND CRANKSHAFT TIMING GEAR**
   (See steps 15, 17 and 18 in timing gears and camshaft removal in Engine Mechanical)
9. **REMOVE CAMSHAFT TIMING GEAR**

(a) Using SST, remove the mount bolt and plate washer.
SST 09960–10010 (09962–01000, 09963–01000)



(b) Using SST, remove the timing gear.
SST 09950–40010 (09951–04020, 09952–04010, 09953–04030, 09954–04010, 09955–04050)



10. BB:
REMOVE OIL DIPSTICK AND GUIDE

(a) Remove the 2 bolts, and pull out the dipstick guide together with the dipstick from the oil pan.

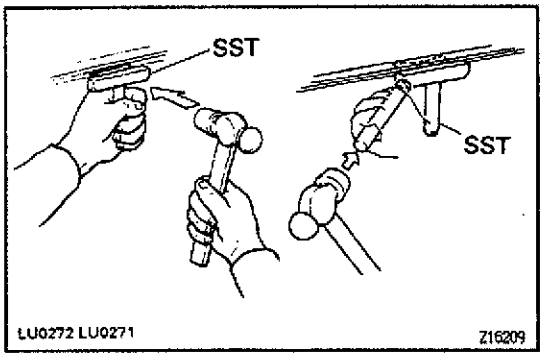
(b) Remove the O–ring from the dipstick guide

11. REMOVE OIL LEVEL SENSOR

Remove the 4 bolts, oil level sensor and gasket.

12. REMOVE OIL PAN

(a) Remove the 17 bolts and 7 nuts.

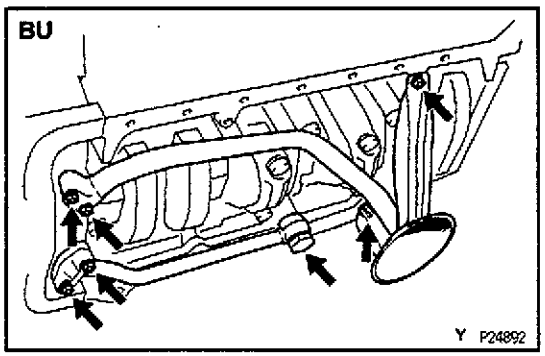


(b) Insert the blade of SST between the cylinder block and oil pan, and cut off applied sealer and remove the oil pan.

SST 09032–00100

NOTICE:

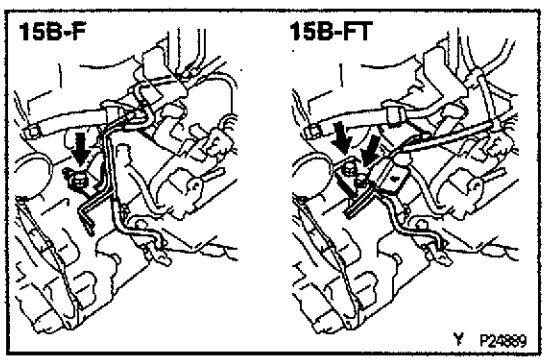
- **Do not use SST for the timing gear case side and rear oil seal retainer side.**
- **Be careful not to damage the oil pan flange.**



13. REMOVE OIL STRAINER AND OIL PIPE

(a) Remove the 2 bolts (BU), 2 nuts, oil strainer and gasket.

(b) Remove the union bolt, 2 nuts, oil pipe and 3 gasket.

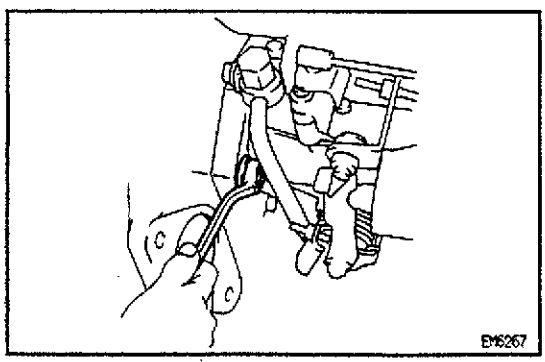


14. 15B–F, 15B–FT:
REMOVE VACUUM PIPE

(a) Disconnect these vacuum hoses.

- Vacuum hose from 3–way connector
- Vacuum hose from vacuum pump

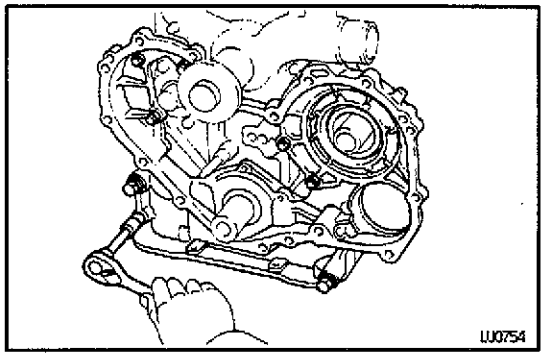
(b) Remove the bolt (15B–F) or 2 bolts (15B–FT) and vacuum pipe.



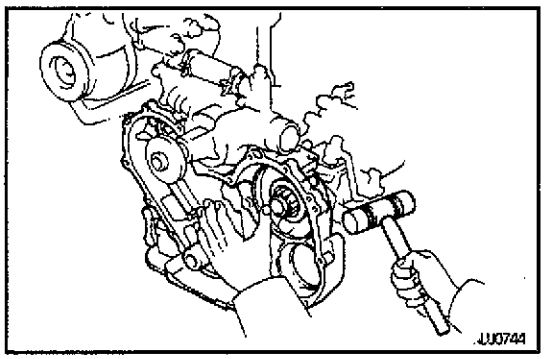
15. REMOVE OIL PUMP (TIMING GEAR CASE)

HINT: Before removing the 2 nuts holding the injection pump flange to the timing gear case, check if the matchmarks are aligned. If not, place new matchmarks for reinstallation.

(a) Remove the 2 nuts holding the injection pump to the timing gear case.

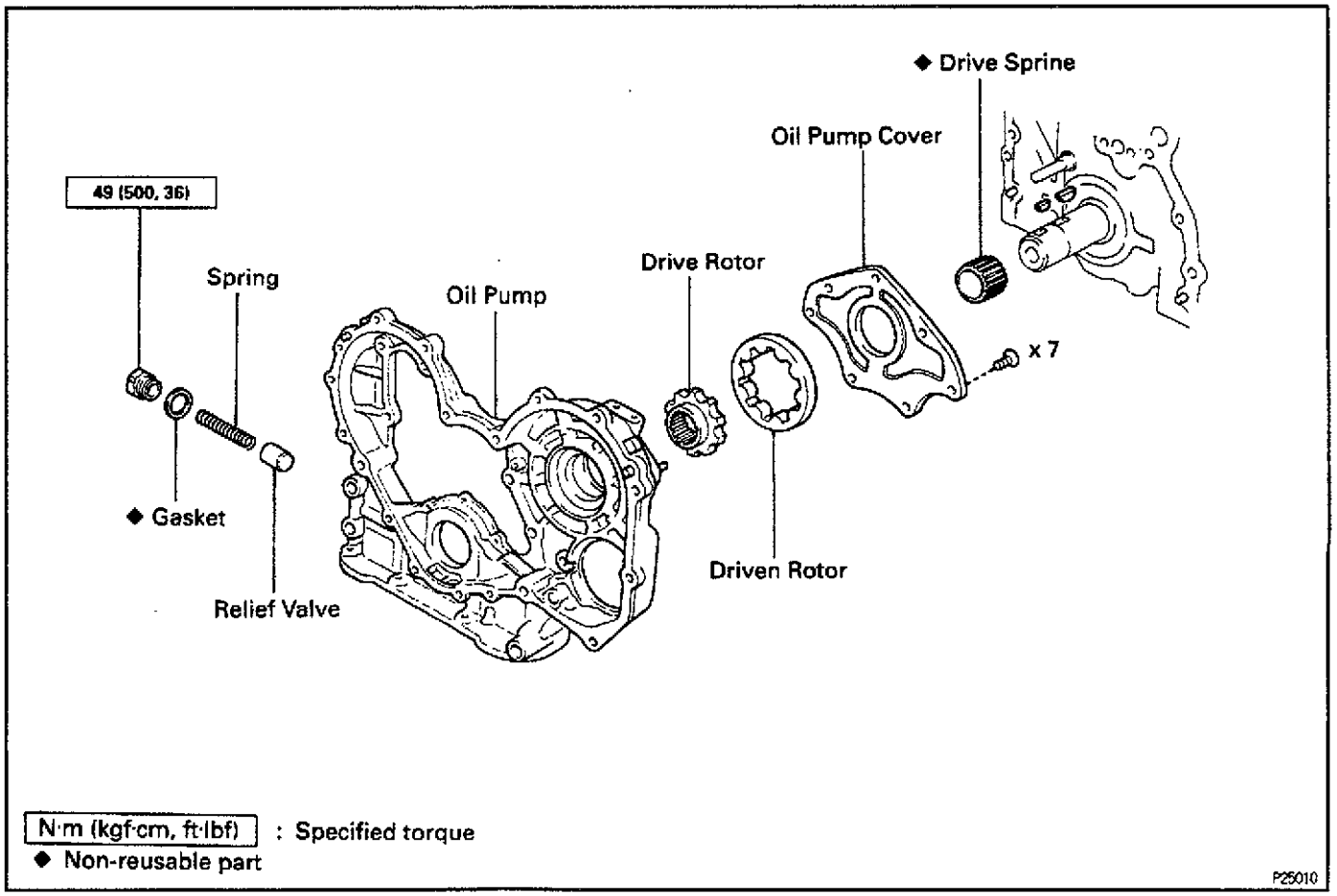


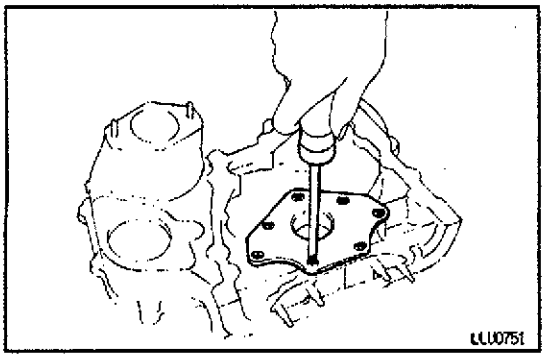
(b) Remove the 8 bolts holding the timing gear case to the cylinder block.



(c) Using a plastic–faced hammer, lightly tap out the timing gear case and gasket.

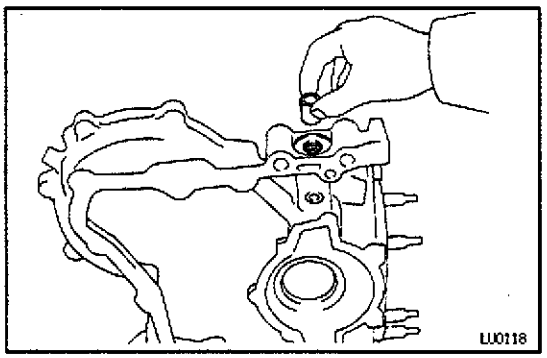
COMPONENTS FOR DISASSEMBLY AND ASSEMBLY





OIL PUMP DISASSEMBLY

1. **REMOVE RELIEF VALVE**
   Remove the plug, gasket, spring and relief valve.
2. **REMOVE DRIVE AND DRIVEN ROTORS**
(a) Remove the 7 screws and oil pump cover.
(b) Remove the rotors.



OIL PUMP INSPECTION

1. **INSPECT RELIEF VALVE**
   Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.
   If it doesn't, replace the relief valve. If necessary, replace the oil pump assembly.
2. **INSPECT DRIVE AND DRIVEN ROTORS**

A. Inspect rotor tip clearance

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

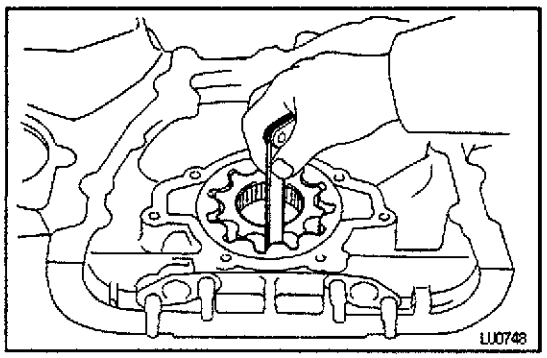
Standard tip clearance:

0.110 — 0.240 mm (0.0043 — 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.



B. Inspect rotor body clearance

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

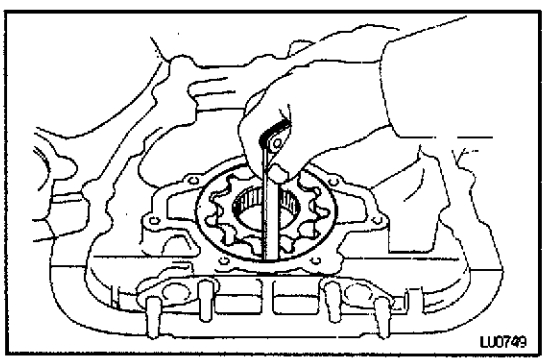
Standard body clearance:

0.144 — 0.229 mm (0.0035 — 0.0090 in.)

Maximum body clearance:

0.40 mm (0.0157 in.)

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



C. Inspect rotor side clearance

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

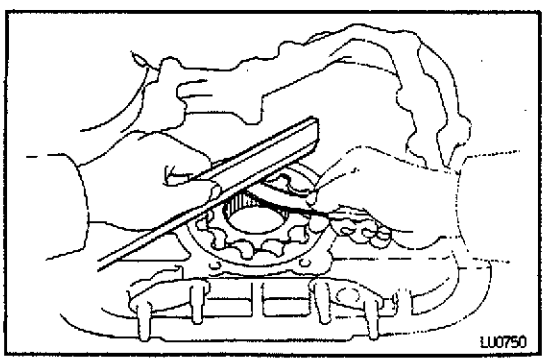
Standard side clearance:

0.035 — 0.090 mm (0.0014 — 0.0035 in.)

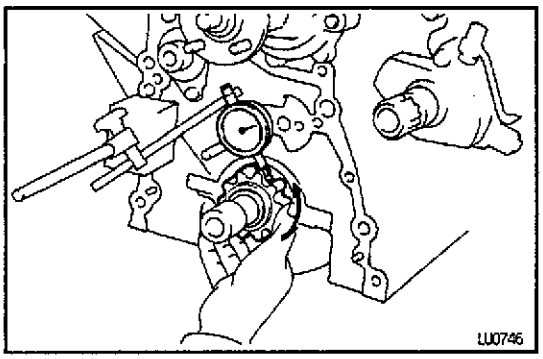
Maximum side clearance:

0.15 mm (0.0059 in.)

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



3. **INSPECT DRIVE SPLINE**



Using a dial indicator, measure the backlash while turning the drive rotor clockwise and counterclockwise in several places.

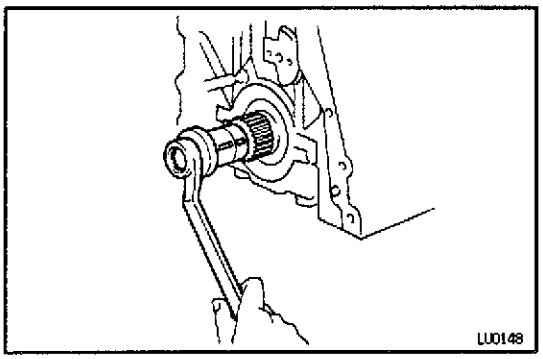
Standard backlash:

0.541 – 0.790 mm (0.0213 – 0.0311 in.)

Maximum backlash:

1.00 mm (0.0394 in.)

If the backlash is greater than maximum, replace the rotor and spline.

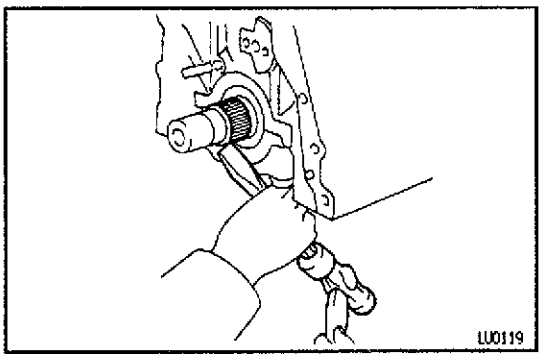


DRIVE SPLINE REPLACEMENT

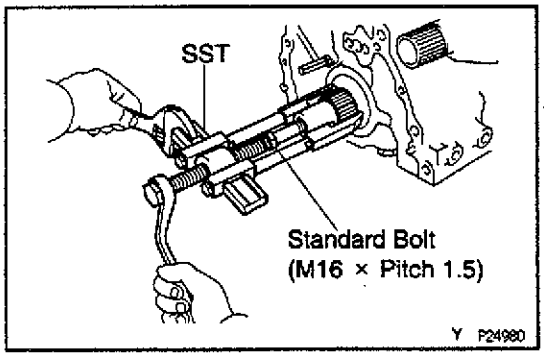
1. REMOVE DRIVE SPLINE

(a) Remove the 2 set keys.

(b) Set the drive spline with the hole facing downward by turning the crankshaft.



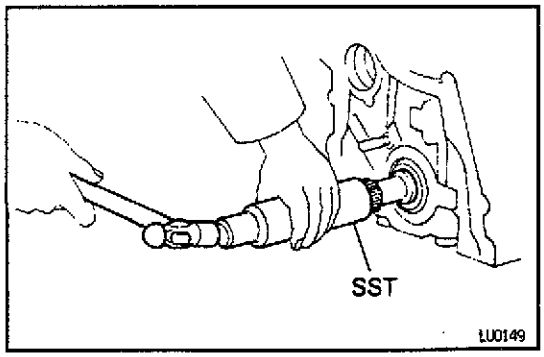
(c) Using a chisel and hammer, tap the drive spline out of the hole until SST can be hooked to spline's end.



(d) Install a standard bolt (Part No. 90101–16027: 16 mm normnal diameter, 1.5 mm pitch) to the crankshaft.

(e) Using SST, remove the drive spline.
SST 09950–40010 (09951–04010, 09952–04010, 09953–04030, 09954–04020, 09955–04060)

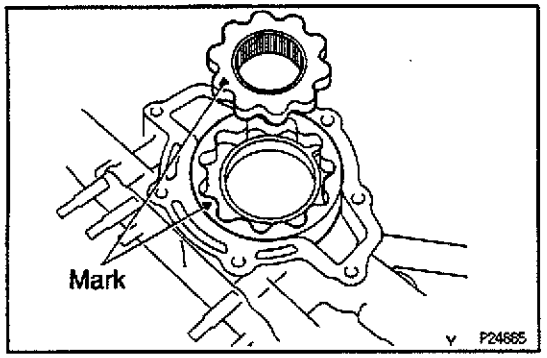
(f) Remove the standard bolt.



2. INSTALL NEW DRIVE SPLINE

(a) Using SST and a hammer, tap in the drive spline.
SST 09608–06041

(b) Install the 2 set keys.



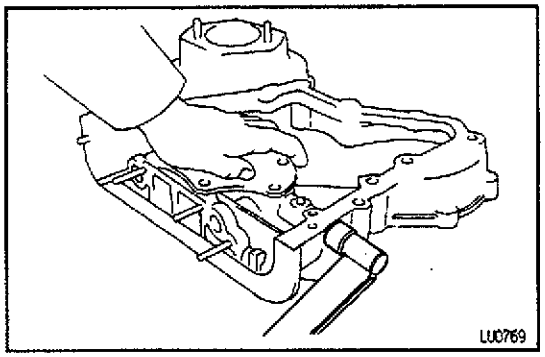
OIL PUMP ASSEMBLY

1. INSTALL DRIVE AND DRIVEN ROTORS

(a) Insert the rotors into the oil pump body.

(b) Install the oil pump cover with the 7 screws.

Toque: 10 N·m (105 kgf·cm, 8 ft·lbf)

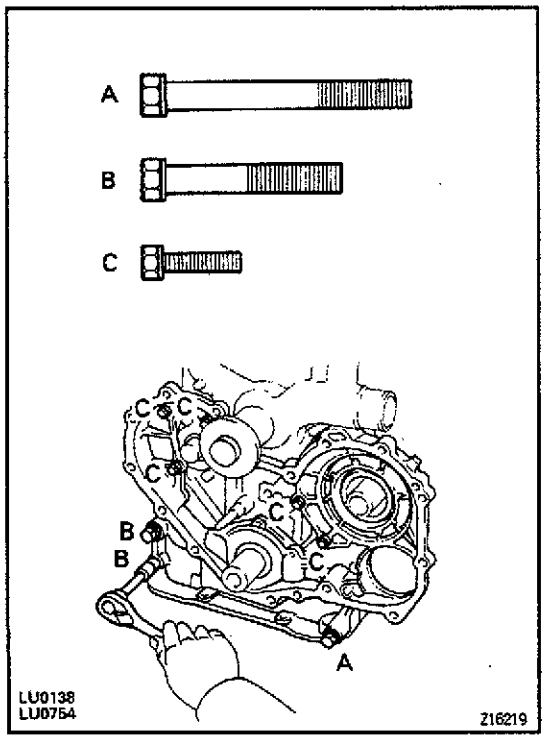


2. INSTALL RELIEF VALVE

(a) Insert the relief valve and spring into the installation hole of the timing gear case.

(b) Install a new gasket and the plug.

Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



OIL PUMP INSTALLATION

1. INSTALL OIL PUMP (TIMING GEAR CASE)

(a) Place a new gasket and the timing gear case in position.

(b) Install and uniformly tighten the 8 bolts in several passes.

Torque:

14 mm head

44 N·m (449 kgf·cm, 32 ft·lbf)

12 mm head

21 N·m (214 kgf·cm, 15 ft·lbf)

HINT: Each bolt length is indicated in the illustration.

Bolt length:

A 85 mm (3.35 in.) for 14 mm head

B 60 mm (2.36 in.) for 14 mm head

C 25 mm (0.98 in.) for 12 mm head

(c) Align the matchmarks on the injection pump and timing gear case.

(d) Install the 2 nuts holding the injection pump flange to the timing gear case.

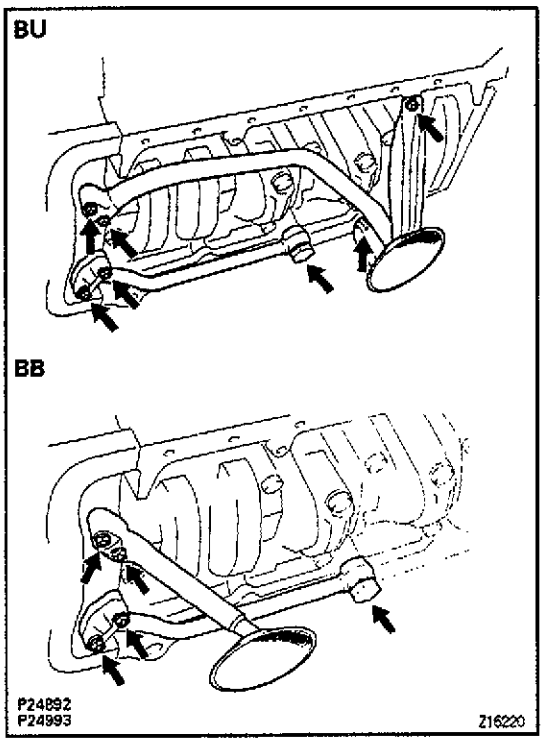
Torque: 18.5 N·m (189 kgf·cm, 14 ft·lbf)

2. 15B—F, 15B—FT: INSTALL VACUUM PIPE

(a) Install the vacuum pipe with the bolt (15B—F) or 2 bolts (15B—FT).

(b) Connect these vacuum hoses.

- Vacuum hose to 3—way connector
- Vacuum hose to vacuum pump



3. INSTALL OIL STRAINER AND OIL PIPE

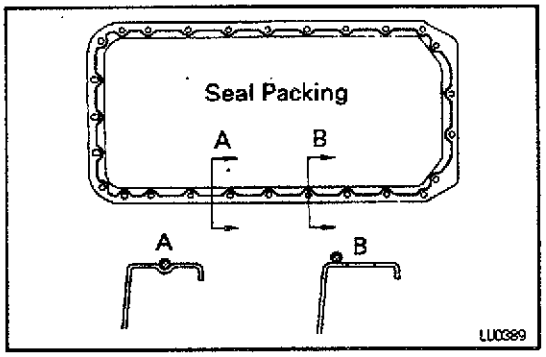
(a) Install a new gasket and the oil strainer with the 2 bolts (BU) and 2 nuts.
Torque: 18.5 N·m (189 kgf·cm, 14 ft·lbf)

(b) Install new 3 gaskets and oil pipe with the union bolt and 2 nuts.
Torque:
Union bolt
50 N·m (510 kgf·cm, 37 ft·lbf)
Nut
18.5 N·m (189 kgf·cm, 14 ft·lbf)

4. INSTALL OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the 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 loose material.
- Using a non–residue solvent, clean both sealing surfaces.

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



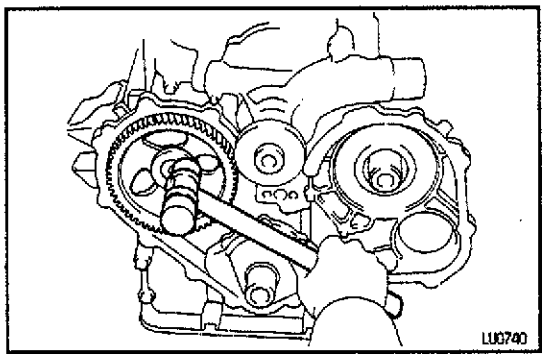
(b) Apply seal packing to the oil pan as shown in the illustration.
Seal packing:
Part No. 08826–00080 or equivalent
- Install a nozzle that has been cut to a 4 – 5 mm (0.16 – 0.20 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the oil pan with the 17 bolts and 7 nuts. Uniformly tighten the bolts and nuts in several passes.
Torque: 18.5 N·m (189 kgf·cm, 14 ft·lbf)

5. INSTALL OIL LEVEL SENSOR

(a) Install a new gasket to the oil pan.

(b) Install the level sensor with the 4 bolts.

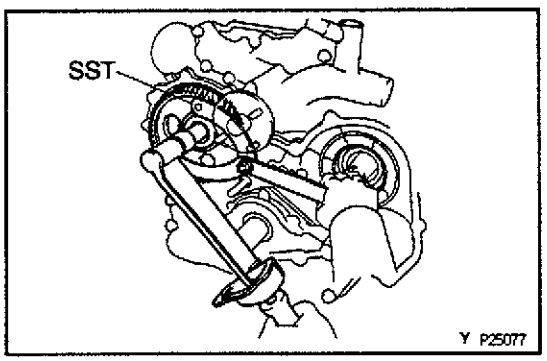


6. INSTALL CAMSHAFT TIMING GEAR

(a) Align the timing gear set key with the key groove of the timing gear.

(b) Using a plastic — faced hammer, lightly tap in the timing gear.

NOTICE: Avoid any impact to the camshaft.



(c) Using SST, install the plate washer and mount bolt.
SST 09960—10010 (09962—01000, 09963—01000)
Torque: 37.5 N·m (382 kgf·cm, 28 ft·lbf)

7. INSTALL CRANKSHAFT TIMING GEAR, IDLE GEAR, INJECTION PUMP DRIVE GEAR AND VACUUM PUMP

(See steps 1 and 3 to 7 in timing gears and camshaft installation in Engine Mechanical)

8. INSTALL TIMING GEAR COVER AND CRANKSHAFT PULLEY

(See steps 10 to 14 in timing gears and camshaft installation in Engine Mechanical)

9. INSTALL VALVE ROCKER SHAFT ASSEMBLY

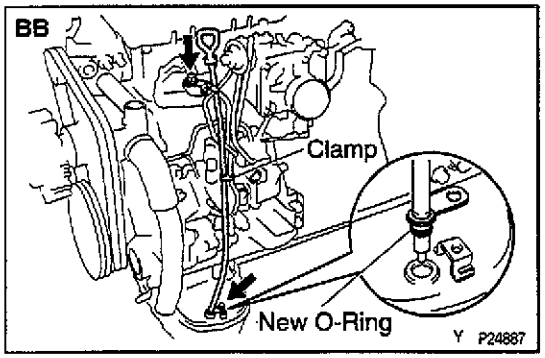
3B, 14B:

(See steps 4 to 6 in cylinder head installation in Engine Mechanical)

15B—F, 15B—FT:

(See steps 4 to 7 in cylinder head installation in Engine Mechanical)

EG



10. **3B:**
    INSTALL GLOW PLUGS
    (See step 16 in cylinder head installation)
11. **14B, 15B–F, 15B–FT:**
    INSTALL INJECTION NOZZLES
    (See injection nozzles installaion in Fuel System)
12. **INSTALL WATER PUMP PULLEY, FAN, FLUID COUPLING ASSEMBLY (FAN SPACER AND FAN) AND DRIVE BELT(S)**
    (See step 3 or 4 in water pump installation in Cooling System)
13. **BB:**
    INSTALL OIL DIPSTICK GUIDE AND OIL DIPSTICK

(a) Install a new O–ring to the dipstick guide.
(b) Apply soapy water to the O–ring.
(c) Push in the dipstick guide end into the guide hole of the oil pan.
(d) Install the oil dipstick guide with the 2 bolts.
(e) Install the dipstick.

14. **FILL WITH ENGINE OIL**
15. **START ENGINE AND CHECK FOR OIL LEAKS**
16. **RECHECK ENGINE OIL LEVEL**
17. **RECHECK VALVE CLEARANCE**
    (See valve clearance inspection and adjustment in Engine Mechanical)