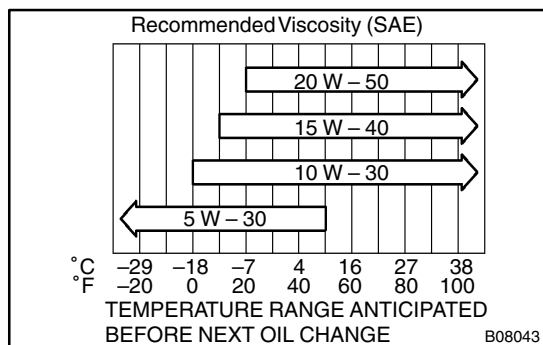

LUBRICATION

OIL AND FILTER	LU-1
OIL PUMP	LU-4
OIL COOLER	LU-18
OIL NOZZLE AND OIL JET	
PRESSURE VALVE	LU-22





OIL AND FILTER INSPECTION

LU0H8-01

1. CHECK ENGINE OIL QUALITY

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

If the quality is visibly poor, replace the oil.

Oil grade:

API grade CF-4 or CF

(You may also use API CE or CD)

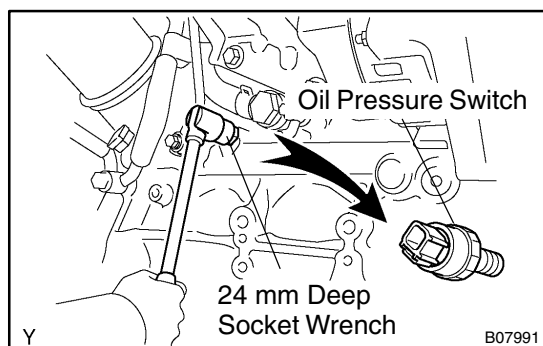
Recommended viscosity:

Refer to illustration

2. CHECK ENGINE OIL LEVEL

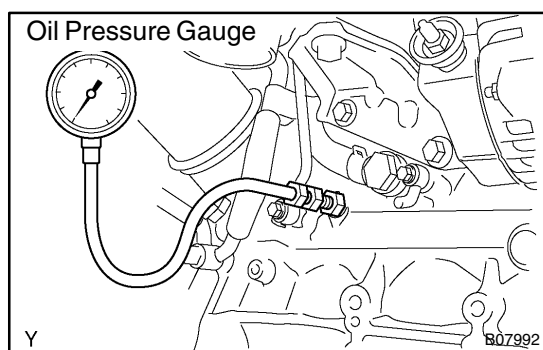
After warming up the engine, and then 5 minutes after the engine stops, oil level should be between the low level and full level marks of the dipstick.

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



3. CHECK OIL PRESSURE

- (a) Using a 24 mm deep socket wrench, remove the oil pressure switch.

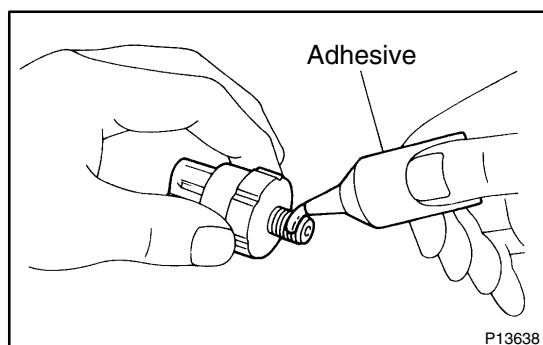


- (b) Install the oil pressure gauge.
(c) Allow the engine to warm up to normal operating temperature.
(d) Check the oil pressure.

Oil pressure:

At idle	29 kPa (0.3 kgf/cm ² , 4.2 psi) or more
At 4,500 rpm	245 – 588 kPa (2.5 – 6.0 kgf/cm ² , 36 – 85 psi)

- (e) Remove the oil pressure gauge.



- (f) Apply adhesive to 2 or 3 threads of the oil pressure switch.
Adhesive:
Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent
(g) Reinstall the oil pressure switch.
(h) Start the engine and check for oil leak.

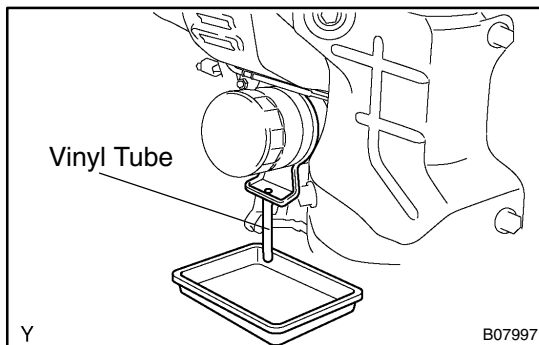
REPLACEMENT

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.
- Care should be taken, therefore, when changing engine oil to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves that cannot be penetrated by oil should be worn. The skin should be thoroughly washed 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.

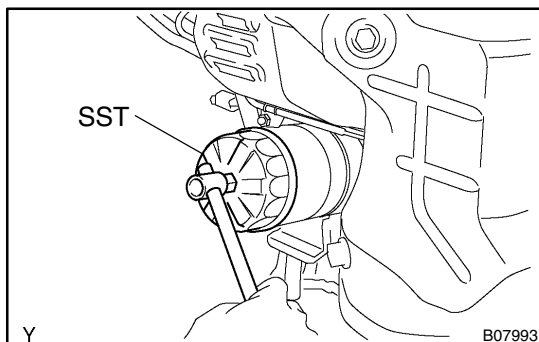
1. DRAIN ENGINE OIL

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

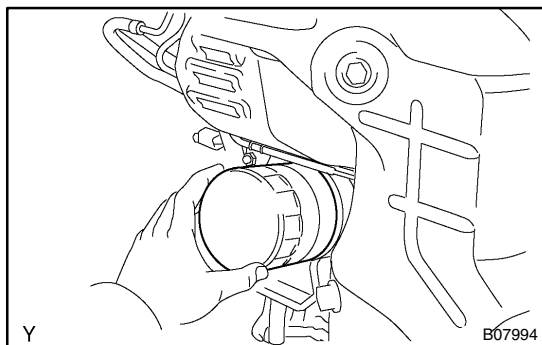


2. REPLACE OIL FILTER

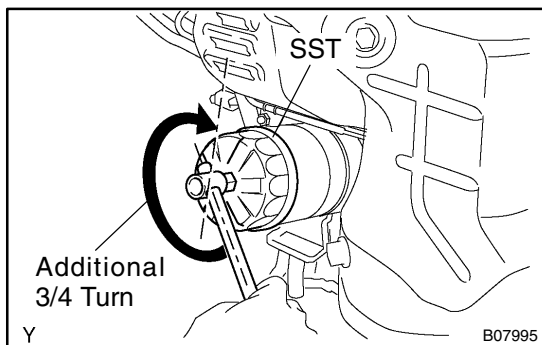
- (a) Install a vinyl tube on the pipe of the oil drain container.



- (b) Using SST, remove the oil filter.
SST 09228-10002
- (c) Clean the oil filter contacting 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, give it an additional 3/4 turn to seat the filter.
SST 09228-10002

- (g) Remove the vinyl tube.

3. FILL WITH ENGINE OIL

- (a) Clean and install the oil drain plug with a new gasket.

Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)

- (b) Fill with new engine oil.

Capacity:

Drain and refill	w/ Oil filter change	6.4 liters (6.8 US qts, 5.6 Imp. qts)
	w/o Oil filter change	5.4 liters (5.7 US qts, 4.8 Imp. qts)
Dry fill		6.5 liters (6.9 US qts, 5.7 Imp. qts)

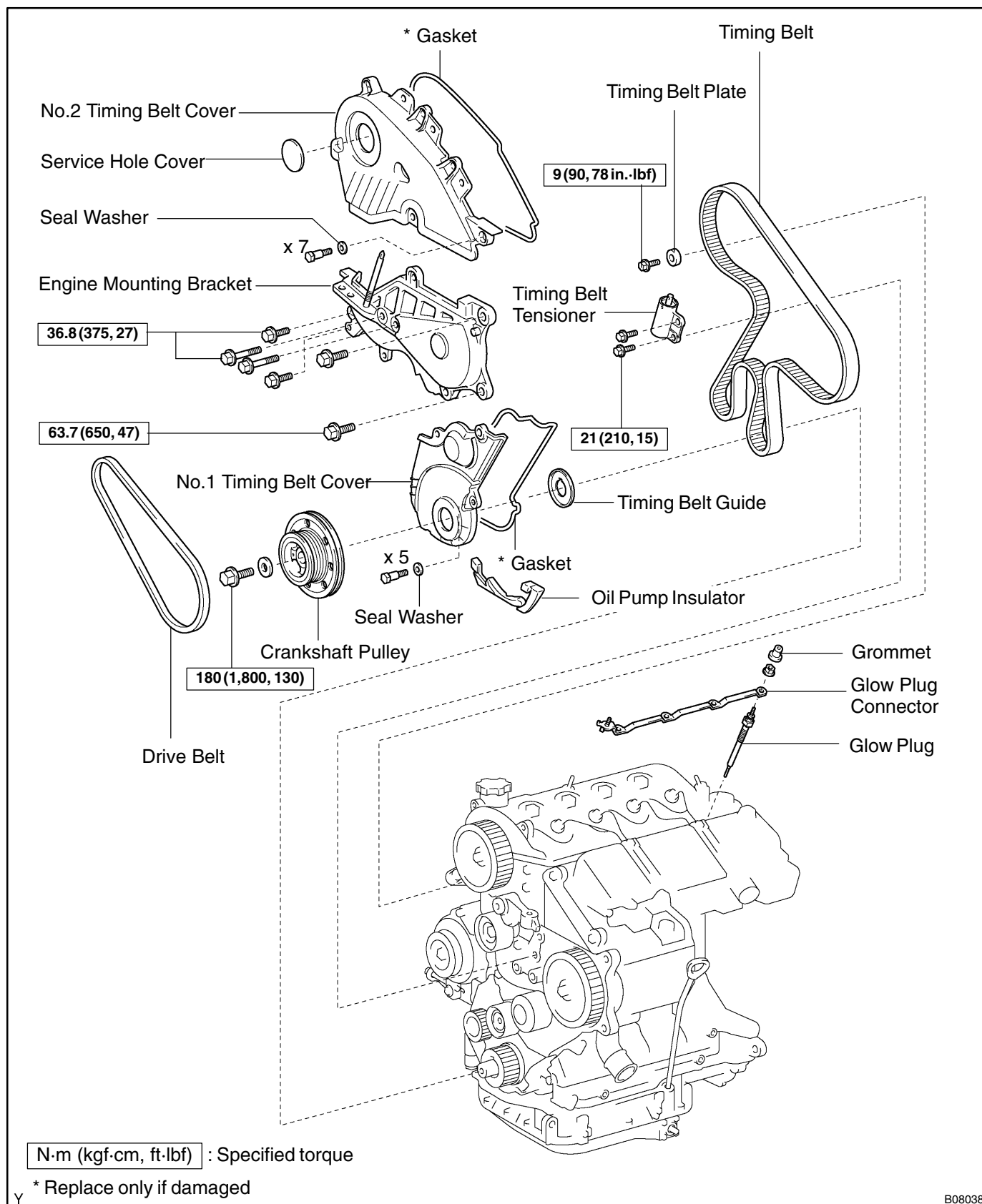
- (c) Reinstall the oil filler cap.

4. START ENGINE AND CHECK FOR OIL LEAK

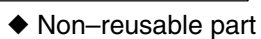
5. RECHECK ENGINE OIL LEVEL

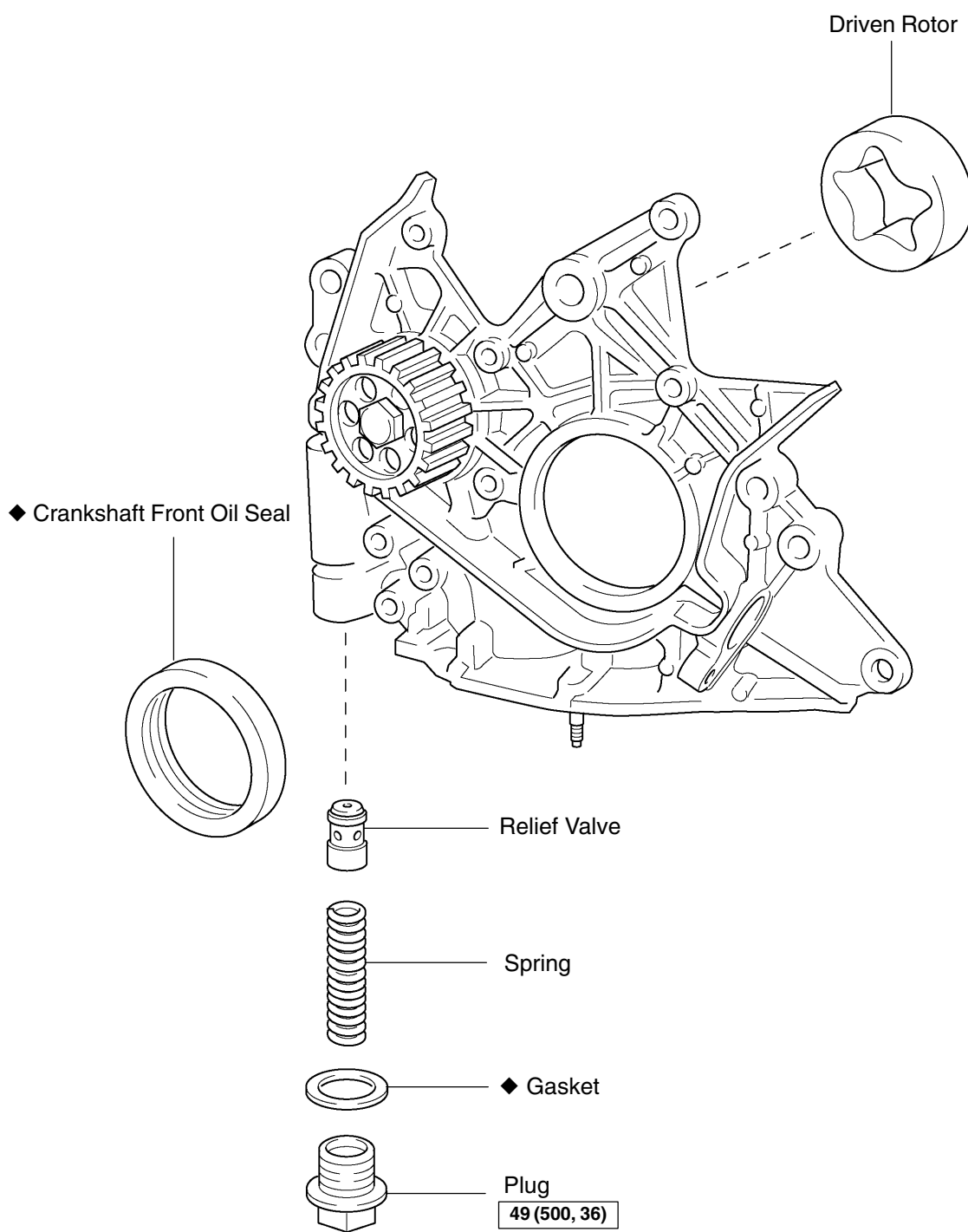
OIL PUMP COMPONENTS

LU03J-05



B08038





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

◆ Non-reusable part

REMOVAL

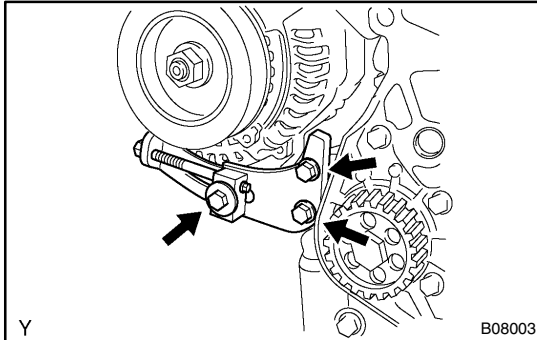
HINT:

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

1. **DRAIN ENGINE OIL**
2. **REMOVE TIMING BELT** (See page EM-12)
3. **REMOVE NO.2 IDLER AND CRANKSHAFT TIMING PULLEYS** (See page EM-12)

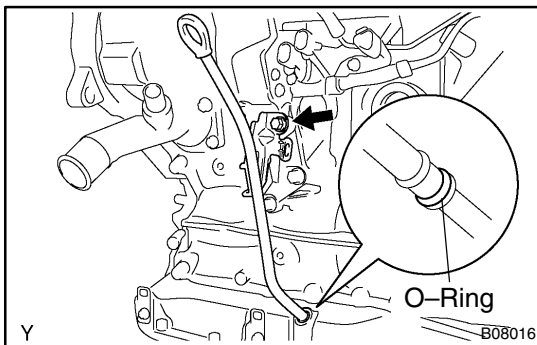
4. REMOVE DRIVE BELT ADJUSTING BAR

Remove the 3 bolts and adjusting bar.



5. REMOVE OIL DIPSTICK AND GUIDE

- (a) Remove the bolt holding the dipstick guide to the supply pump stay.
- (b) Pull out the dipstick guide together with the dipstick from the No.1 oil pan.
- (c) Remove the O-ring from the dipstick guide.

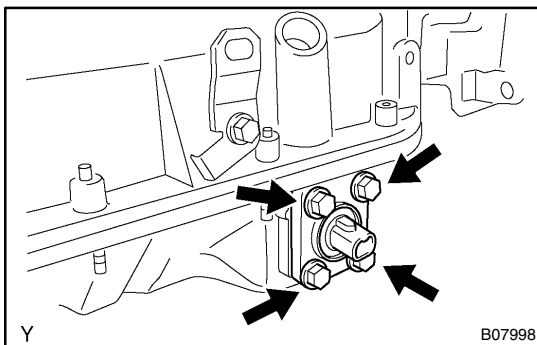


6. REMOVE OIL LEVEL SENSOR

Remove the 4 bolts and level sensor.

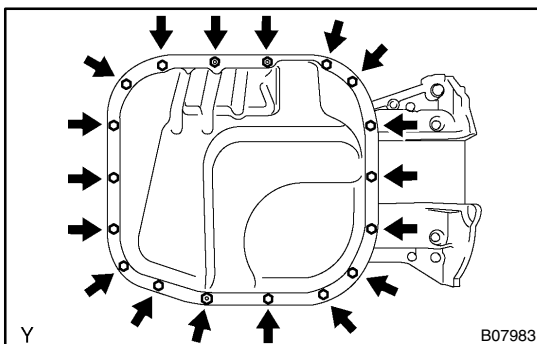
NOTICE:

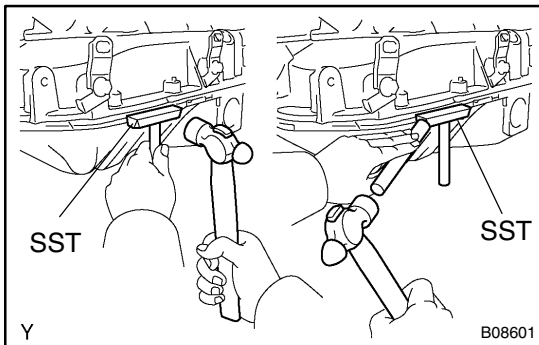
Be careful not to drop the oil level sensor when removing it.



7. REMOVE NO.2 OIL PAN

- (a) Remove the 15 bolts and 3 nuts.



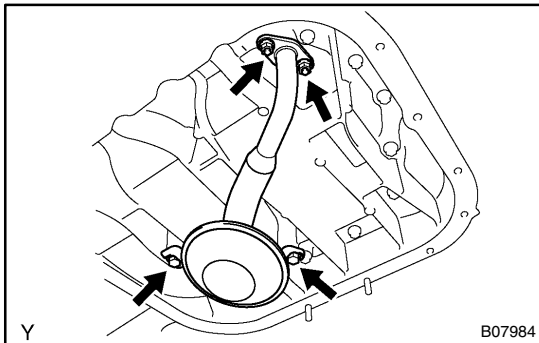


- (b) Insert the blade of SST between the No.1 and No.2 oil pans, and cut off applied sealer and remove the No.2 oil pan.

SST 09032-00100

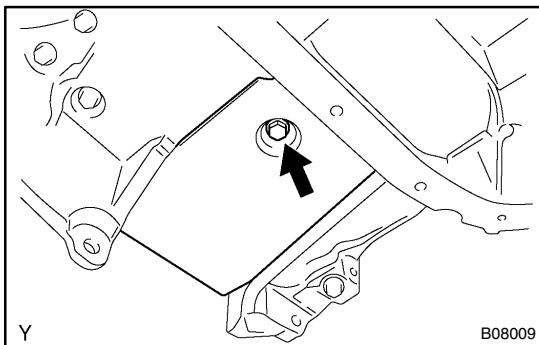
NOTICE:

Be careful not to damage the contact surfaces of the No.1 and No.2 oil pans.



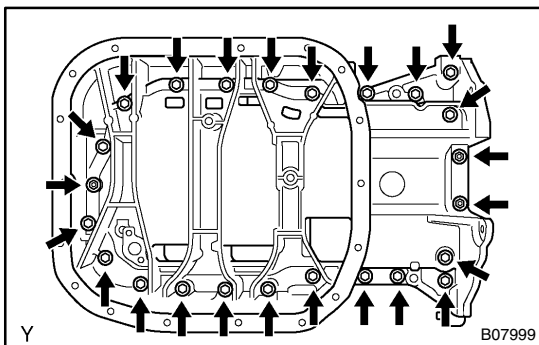
8. REMOVE OIL STRAINER

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



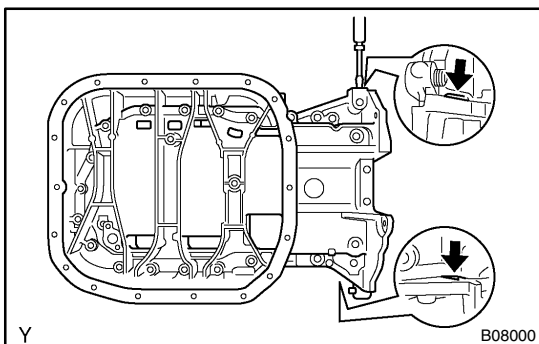
9. REMOVE OIL PAN INSULATOR

Remove the bolt and oil pan insulator.



10. REMOVE NO.1 OIL PAN

- (a) Remove the 21 bolts and 3 nuts.

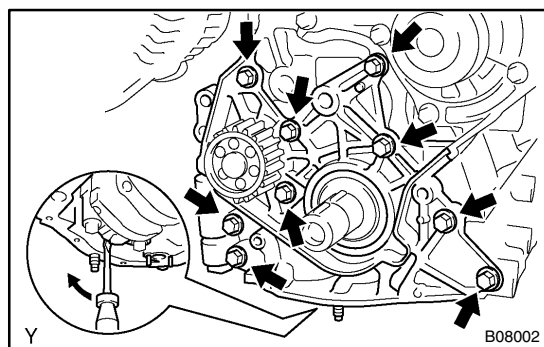


- (b) Using a screwdriver, remove the oil pan by prying the portions between the cylinder block and No.1 oil pan.

NOTICE:

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

11. REMOVE CRANKSHAFT POSITION SENSOR

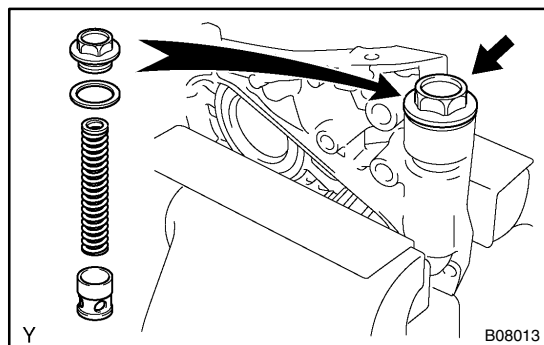
**12. REMOVE OIL PUMP**

- (a) Remove the 9 bolts.
- (b) Remove the oil pump by prying a screwdriver between the the oil pump and main bearing cap.
- (c) Remove the gasket.

DISASSEMBLY

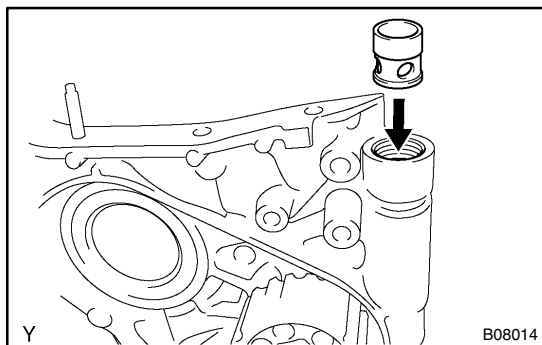
1. REMOVE DRIVEN ROTOR

Pull out the driven rotor.



2. REMOVE RELIEF VALVE

- Carefully mount the oil pump body in a soft jaw vise.
- Remove the plug, gasket, spring and relief valve.



INSPECTION

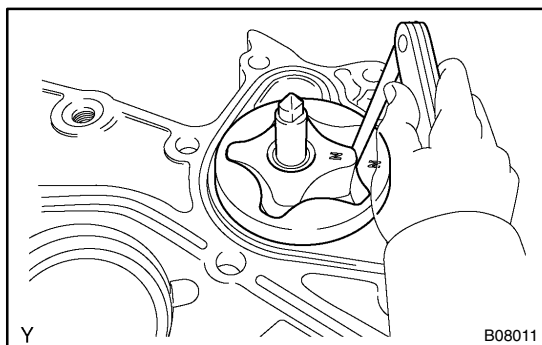
1. INSPECT RELIEF VALVE

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) Place the driven rotor into the oil pump body.
(See page LU-14)



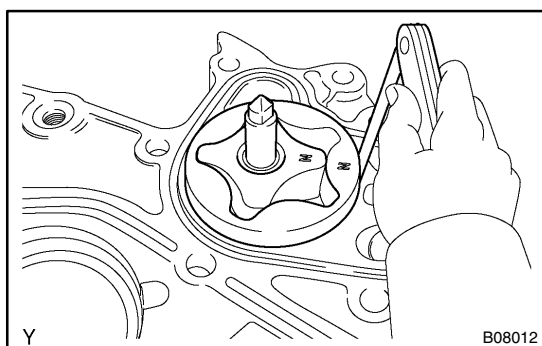
- (b) Inspect the rotors for tip clearance.
Using a feeler gauge, measure the clearance between the drive and driven rotor tips.

Standard tip clearance:

0.08 – 0.16 mm (0.0031 – 0.0063 in.)

Maximum tip clearance: 0.20 mm (0.0079 in.)

If the tip clearance is greater than maximum, replace the oil pump assembly.



- (c) Inspect the rotors for body clearance.
Using a feeler gauge, measure the clearance between the driven rotor and body.

Standard body clearance:

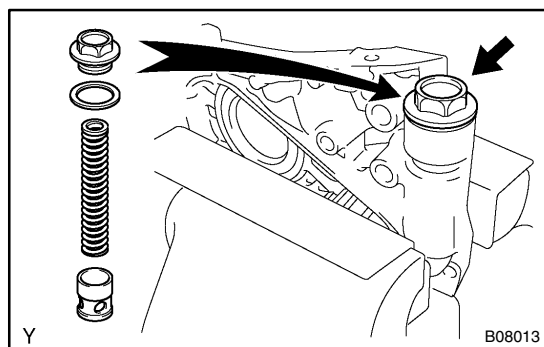
0.10 – 0.17 mm (0.0039 – 0.0067 in.)

Maximum body clearance: 0.20 mm (0.0079 in.)

If the tip clearance is greater than maximum, replace the oil pump assembly.

REPLACEMENT

REPLACE CRANKSHAFT FRONT OIL SEAL (See page EM-70)

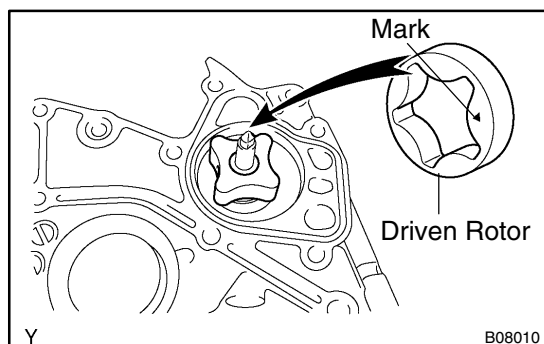


REASSEMBLY

1. INSTALL RELIEF VALVE

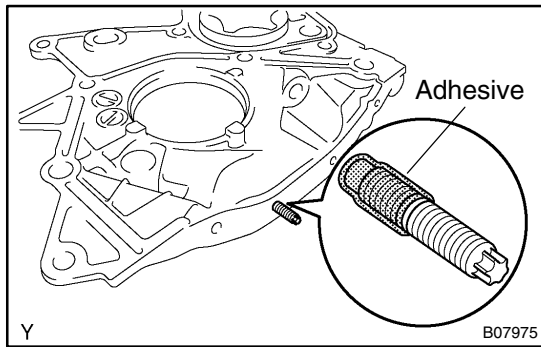
- (a) Insert the relief valve and spring into the oil pump body.
- (b) Install the plug with a new gasket.

Torque: 49 N·m (500 kgf·cm 36 ft·lbf)



2. INSTALL DRIVEN ROTOR

Install the driven rotor into pump with the mark on the driven rotor facing the pump body side.



INSTALLATION

1. INSTALL OIL PUMP STUD BOLT

HINT:

When using a new oil pump, stud bolt must be installed.

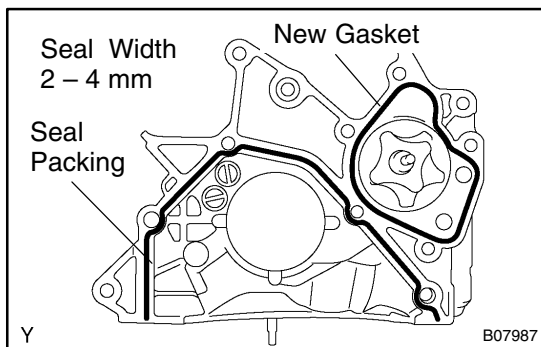
Apply adhesive to the threads of the stud bolt and install it.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent

2. INSTALL OIL PUMP

(a) 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 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.



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

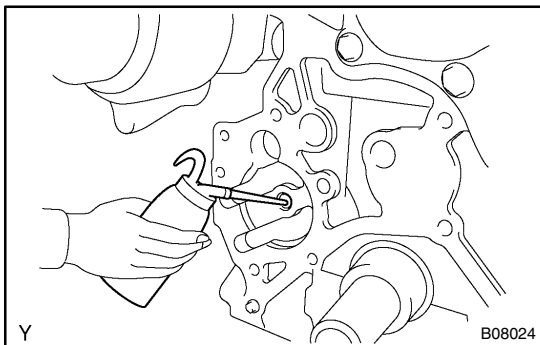
Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

Avoid applying an excessive amount to the surface.

- Install a nozzle that has been cut to a 2 – 4 mm (0.08 – 0.16 in.) opening.
- Parts must be assembled within 15 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

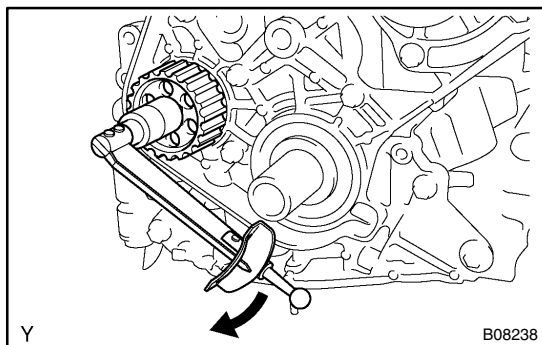
(c) Install a new gasket to the oil pump.



(d) Pour in 0.5 cm³ (0.03 cu in.) or more of engine oil into the bushing of the cylinder block.

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

Torque: 31.4 N·m (320 kgf·cm, 23 ft·lbf)



- (f) Measure the oil pump rotating torque.
- (1) Check that the pump rotates smoothly without abnormal noise.
 - (2) Using a torque wrench, check the pump rotating torque.

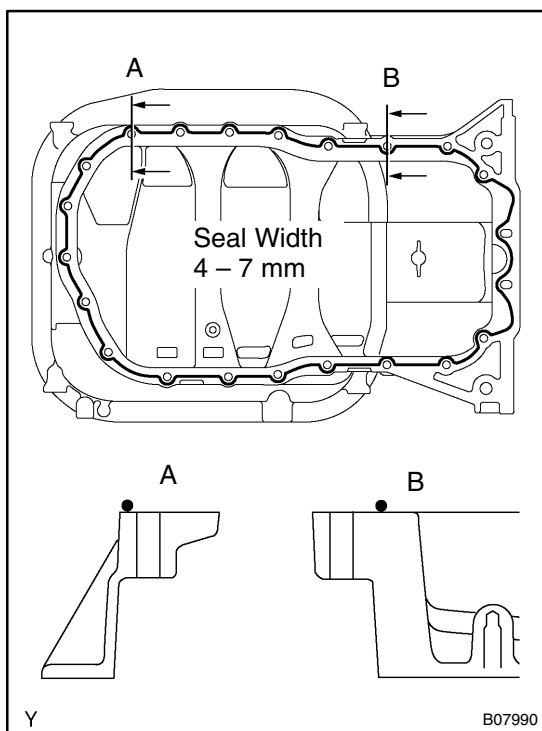
Rotating torque: 3.0 N·m (30 kgf·cm, 26 in.-lbf) or less

3. INSTALL CRANKSHAFT POSITION SENSOR

Torque: 8.8 N·m (90 kgf·cm, 78 in.-lbf)

4. INSTALL NO.1 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 oil pan, cylinder block, oil pump and rear oil seal retainer.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.
 - Thoroughly clean all components to remove all the loose material.
 - Using a non-residue solvent, clean both sealing surfaces.



- (b) 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 – 7 mm (0.16 – 0.28 in.) opening.
- Parts must be assembled within 15 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 21 bolts and 3 nuts.

Torque:

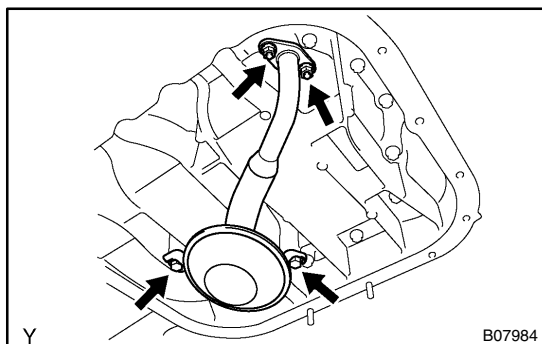
8.0 N·m (80 kgf·cm, 69 in.-lbf) for 10 mm head bolt and nut

20.5 N·m (210 kgf·cm, 15 ft.-lbf) for 12 mm head bolt

5. INSTALL OIL PAN INSULATOR

Install the oil pan insulator with the bolt.

Torque: 7.5 N·m (75 kgf·cm, 65 in.-lbf)



6. INSTALL OIL STRAINER

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

Torque:

20.5 N·m (210 kgf·cm, 15 ft.-lbf) for bolt

13.2 N·m (135 kgf·cm, 10 ft.-lbf) for nut

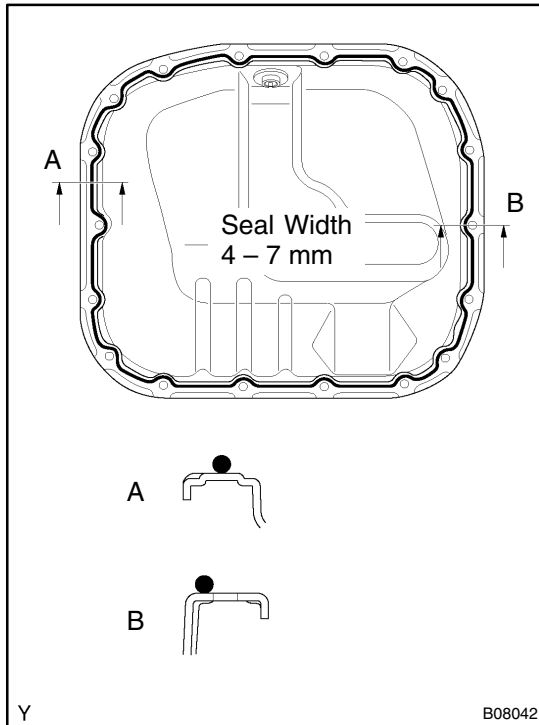
7. INSTALL NO.2 OIL PAN

- (a) Remove any old seal 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.
- Thoroughly clean all components to remove all the loose material.
- Using a non-residue solvent, clean both sealing surface.

NOTICE:

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



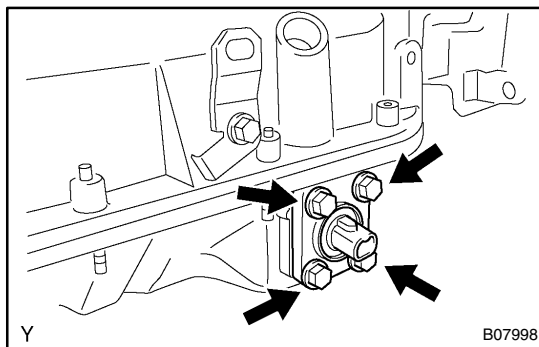
- (b) Apply a seal packing to the oil pan shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 4 – 7 mm (0.16 – 0.28 in.) opening.
- Parts must be assembled within 15 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall the cap.

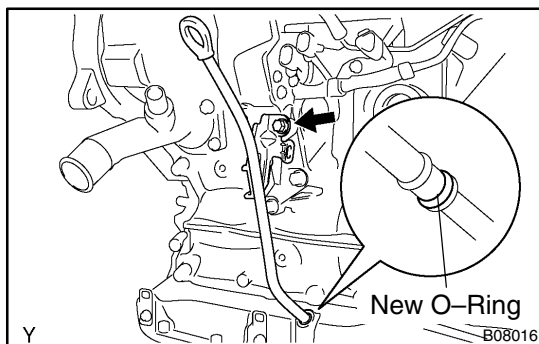
- (c) Install the oil pan with the 15 bolts and 3 nuts. Uniformly tighten the bolts and nuts in several passes.

Torque: 11.7 N·m (120 kgf·cm, 9 ft·lbf)

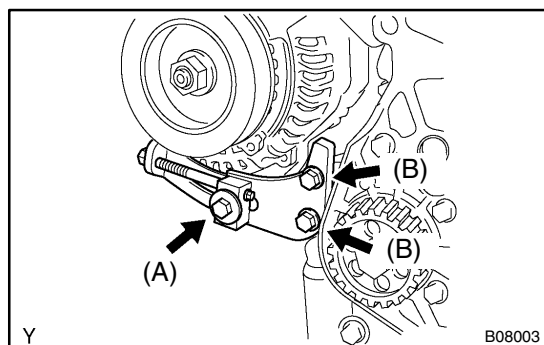
**8. INSTALL OIL LEVEL SENSOR**

Install the level sensor with the 4 bolts.

Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)

**9. INSTALL OIL DIPSTICK AND GUIDE**

- Install a new O-ring to the dipstick guide.
 - Apply engine oil to the O-ring.
 - Push in the dipstick guide end into the guide hole of the No.1 oil pan.
 - Install the dipstick guide with the bolt.
- Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**
- Apply engine oil to the O-ring on the dipstick.
 - Install the dipstick.

**10. INSTALL DRIVE BELT ADJUSTING BAR**

Install the adjusting bar with the 3 bolts.

Torque:

18.1 N·m (185 kgf·cm, 13 ft·lbf) for bolt (A)

31.4 N·m (320 kgf·cm, 23 ft·lbf) for bolt (B)

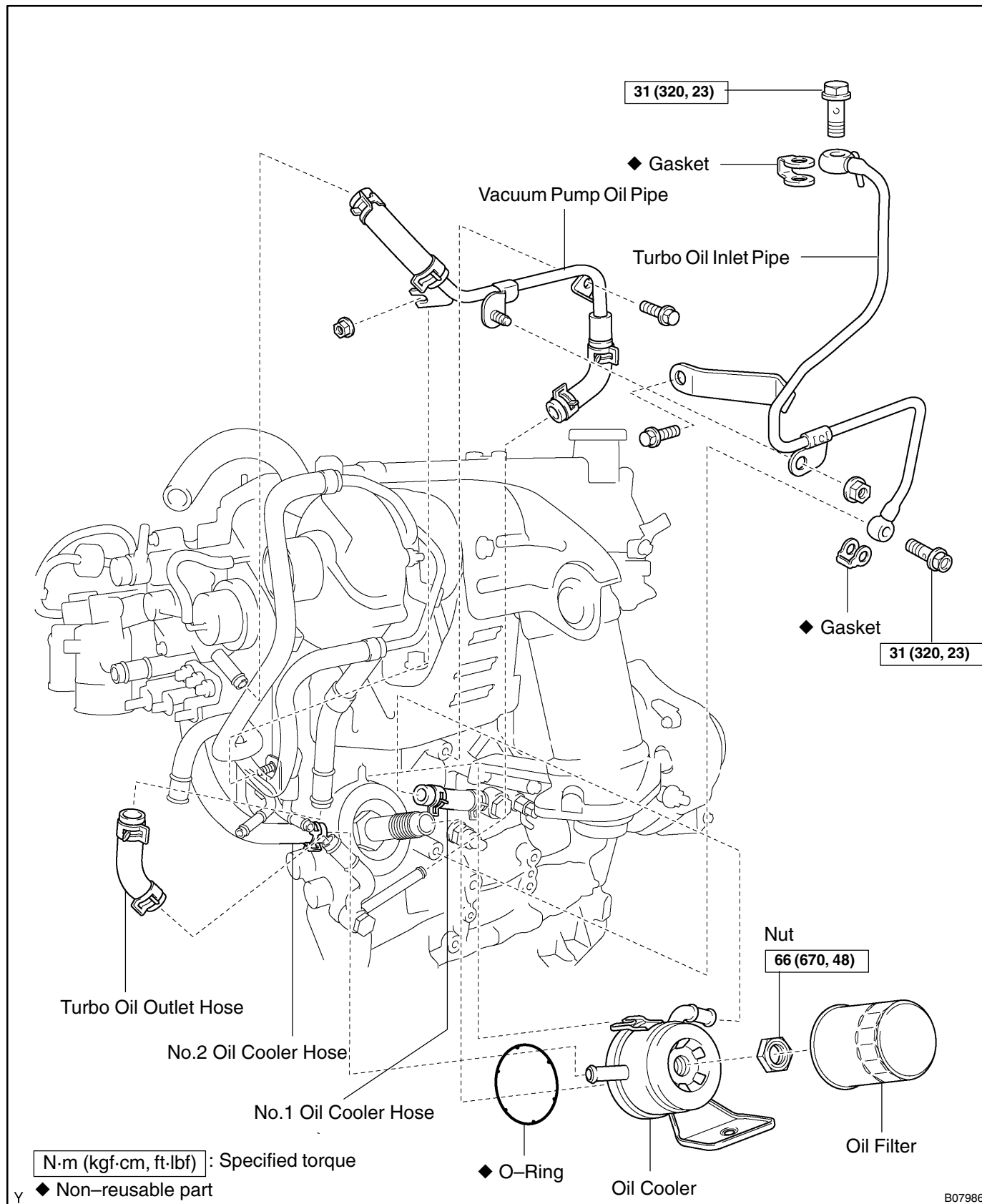
HINT:

Tighten the bolt (A) after having the drive belt installed.

11. INSTALL CRANKSHAFT TIMING AND NO.2 IDLER PULLEYS (See page EM-18)**12. INSTALL TIMING BELT (See page EM-18)****13. FILL WITH ENGINE OIL****14. START ENGINE AND CHECK FOR OIL LEAK****15. RECHECK ENGINE OIL LEVEL**

OIL COOLER COMPONENTS

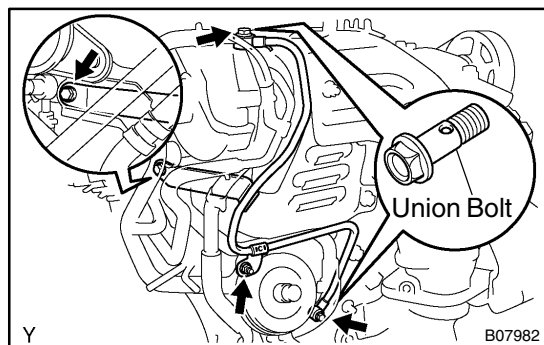
LU03Q-05



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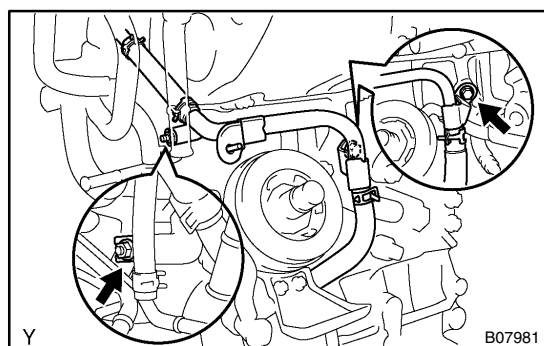
REMOVAL

1. DRAIN ENGINE COOLANT
2. REMOVE OIL FILTER (See page LU-2)



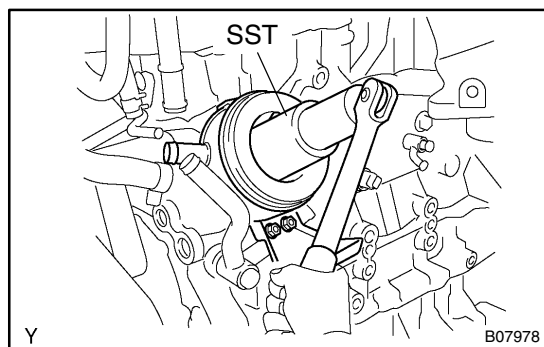
3. REMOVE TURBO OIL INLET PIPE

Remove the 2 union bolts, 2 gaskets, bolt, nut and inlet pipe.



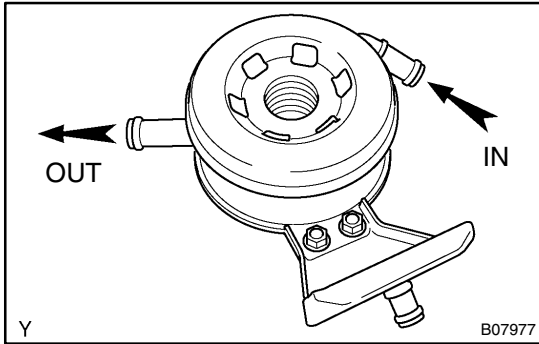
4. REMOVE VACUUM PUMP OIL PIPE

- (a) Disconnect the 2 oil hoses.
- (b) Remove the bolt, nut and oil pipe.



5. REMOVE OIL COOLER

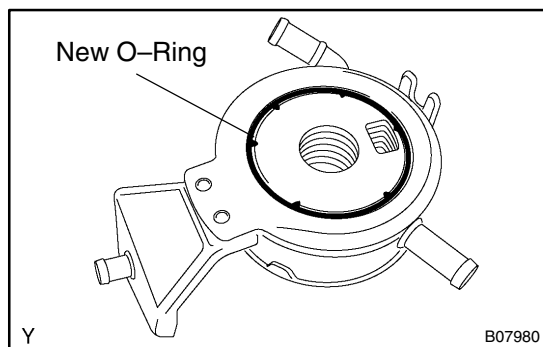
- (a) Using SST, remove the nut and oil cooler.
SST 09229-55010
- (b) Remove the O-ring from the oil cooler.



INSPECTION

INSPECT OIL COOLER

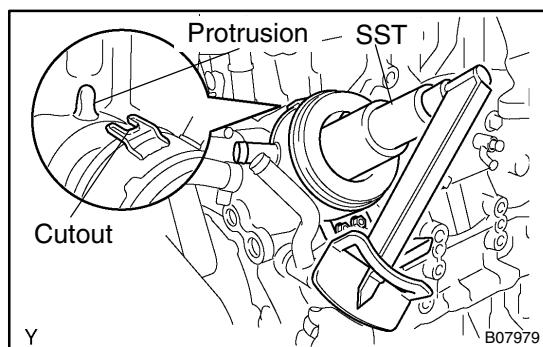
Check the oil cooler for damage or clogging.
If necessary, replace the oil cooler.



INSTALLATION

1. INSTALL OIL COOLER

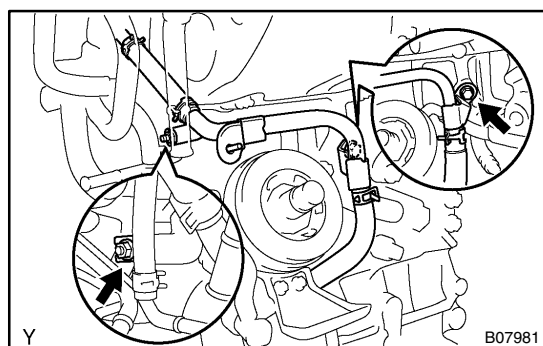
- Clean the oil cooler contact surface on the oil cooler mounting.
- Install a new O-ring to the oil cooler.



- Apply a light coat of engine oil on the threads and under the nut.
- Align the cutout of the oil cooler with the protrusion of the cylinder block.
- Using SST, install the oil cooler with the nut.

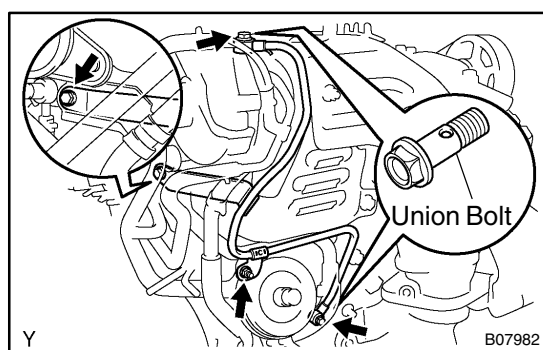
SST 0929-55010

Torque: 66 N·m (670 kgf·cm, 48 ft·lbf)



2. INSTALL VACUUM PUMP OIL PIPE

- Install the oil pipe with the bolt and nut.
Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)
- Connect the 2 oil hoses.



3. INSTALL TURBO OIL INLET PIPE

- Apply a light coat of engine oil to 2 new gaskets and on the threads and under the heads of the union bolts.
- Install the 2 gaskets and the inlet pipe with the 2 union bolts, bolt and nut.

NOTICE:

Use the new gasket by separating it into two.

HINT:

The turbocharger side union bolt is yellow and the cylinder block side union bolt is black.

Torque:

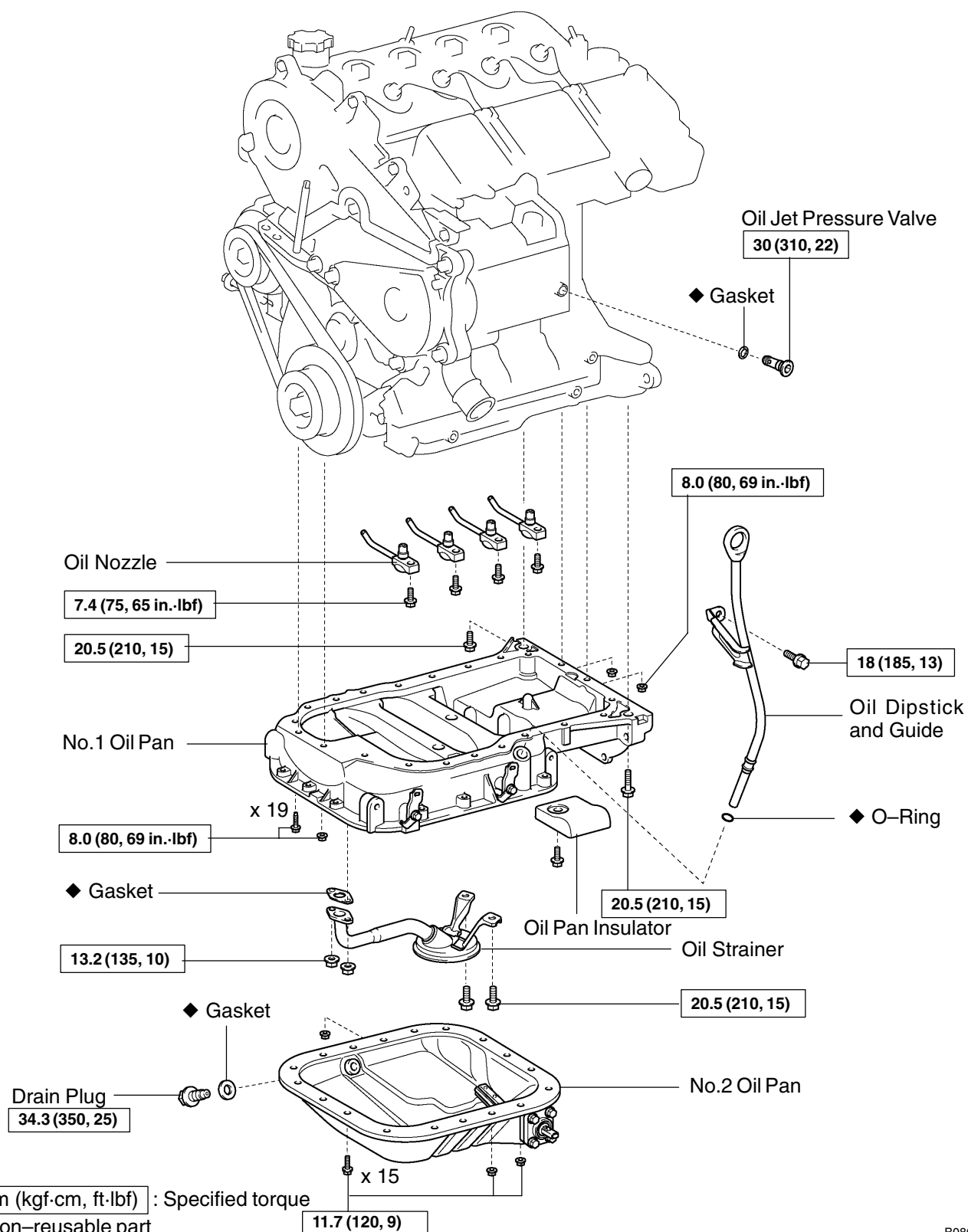
31 N·m (320 kgf·cm, 23 ft·lbf) for union bolt

8.8 N·m (90 kgf·cm, 78 in·lbf) for bolt and nut

- INSTALL OIL FILTER (See page LU-2)
- FILL WITH ENGINE COOLANT
- START ENGINE AND CHECK FOR LEAK
- CHECK ENGINE OIL LEVEL

OIL NOZZLE AND OIL JET PRESSURE VALVE COMPONENTS

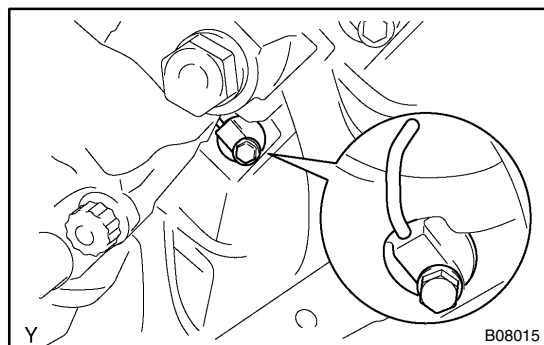
LU0HD-01



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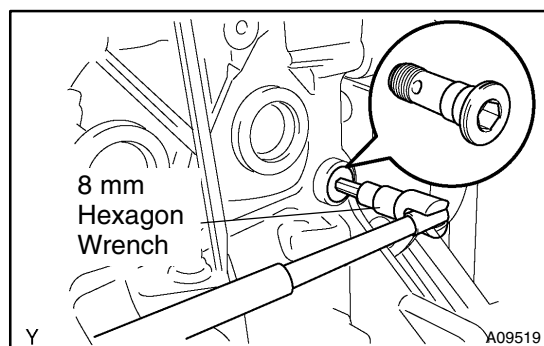
REMOVAL

1. **REMOVE NO.2 AND NO.1 OIL PANS**
(See page LU-7)



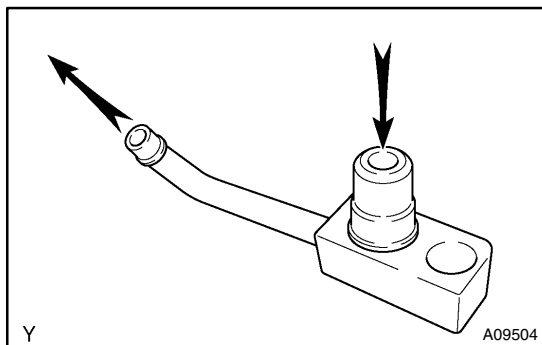
2. **REMOVE OIL NOZZLES**

Remove the bolt and oil nozzle. Remove the 4 oil nozzles.



3. **REMOVE OIL JET PRESSURE VALVE**

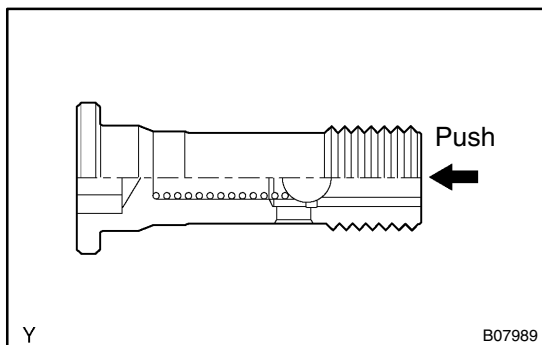
Using an 8 mm hexagon wrench, remove the pressure valve and gasket.



INSPECTION

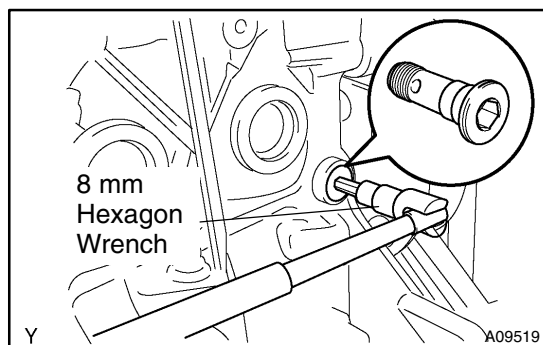
1. INSPECT OIL NOZZLES

Check the oil nozzle for damage or clogging.
If necessary, replace the oil nozzle.



2. INSPECT OIL JET PRESSURE VALVE

Push the valve with a wooden stick to check if it is stuck.
If stuck, replace the pressure valve.

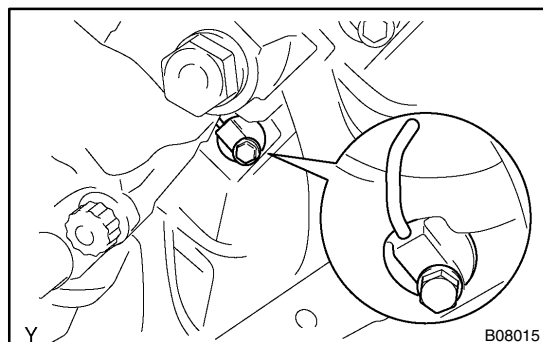


INSTALLATION

1. INSTALL OIL JET PRESSURE VALVE

Using an 8 mm hexagon wrench, install a new gasket and the pressure valve.

Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)



2. INSTALL OIL NOZZLES

Install the oil nozzle with the bolt. Install the 4 oil nozzles.

Torque: 7.4 N·m (75 kgf·cm, 65 in·lbf)

3. INSTALL NO.1 AND NO.2 OIL PANS

(See page LU-14)