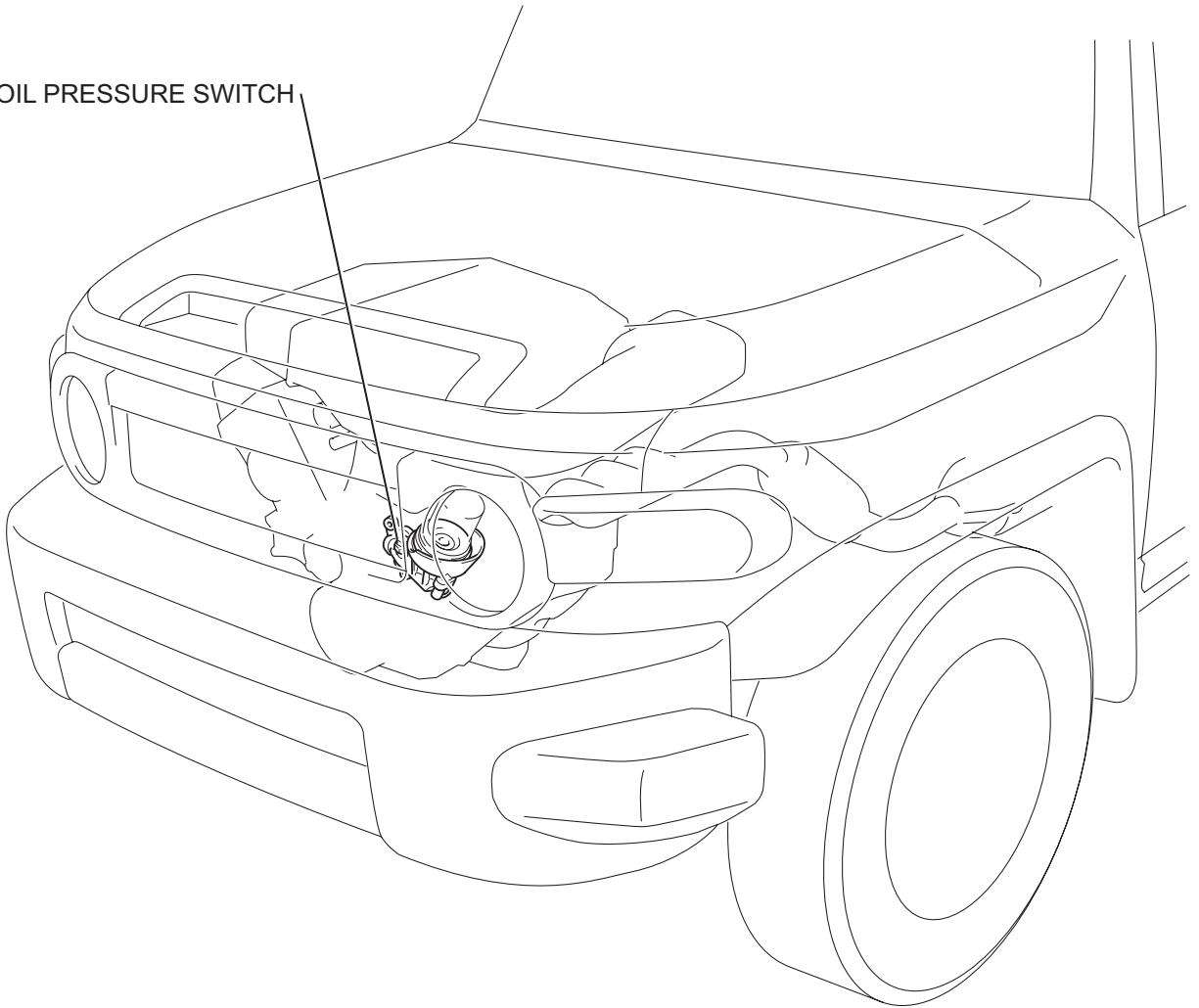


LUBRICATION SYSTEM

PARTS LOCATION

OIL PRESSURE SWITCH



ON-VEHICLE INSPECTION

1. CHECK ENGINE OIL LEVEL

- (a) Warm up the engine, then stop the engine and wait for 5 minutes.
- (b) Check that the engine oil level is between the low level and full level marks on the level gauge. If low, check for leakage and top oil up to the full level mark.

NOTICE:

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

2. CHECK ENGINE OIL QUALITY

- (a) Check the oil for deterioration, water intrusion, discoloration or thinning. If the quality is visibly poor, replace the oil.

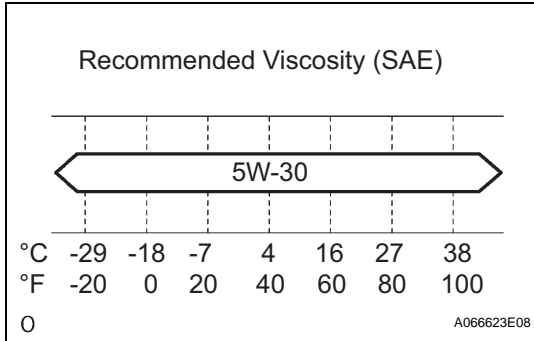
Oil grade:

Use ILSAC multigrade engine oil.

SAE 5W-30 is the best choice for good fuel economy and good starting in cold weather.

If SAE 5W-30 is not available, use SAE 10W-30.

However, it should be replaced with SAE 5W-30 at the next oil replacement.



3. INSPECT OIL PRESSURE

- (a) Disconnect the oil pressure switch connector.
- (b) Using a 24 mm deep socket wrench, remove the oil pressure switch.
- (c) Install the oil pressure gauge.
- (d) Warm up the engine.
- (e) Inspect the oil pressure.

Oil pressure

| Engine condition | Specification |
|------------------|---|
| When Idling | 29 kPa (0.3 kgf*cm ² , 4.3 psi) or more |
| At 3,000 rpm | 294 to 588 kPa (3.0 to 6.0kgf*cm ² , 43 to 85 psi) |

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

Adhesive:

Toyota Genuine Adhesive 1344, Three Bond 1344 or the equivalent

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

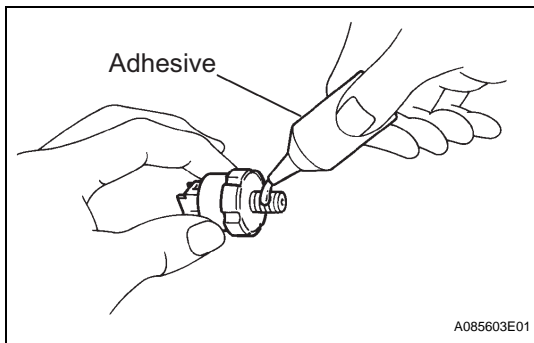
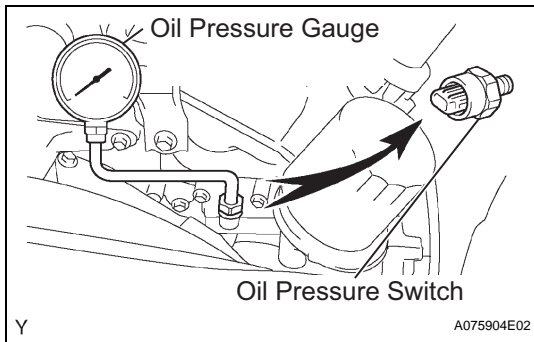
Torque: 15 N*m (153 kgf*cm, 11 ft.*lbf)

NOTICE:

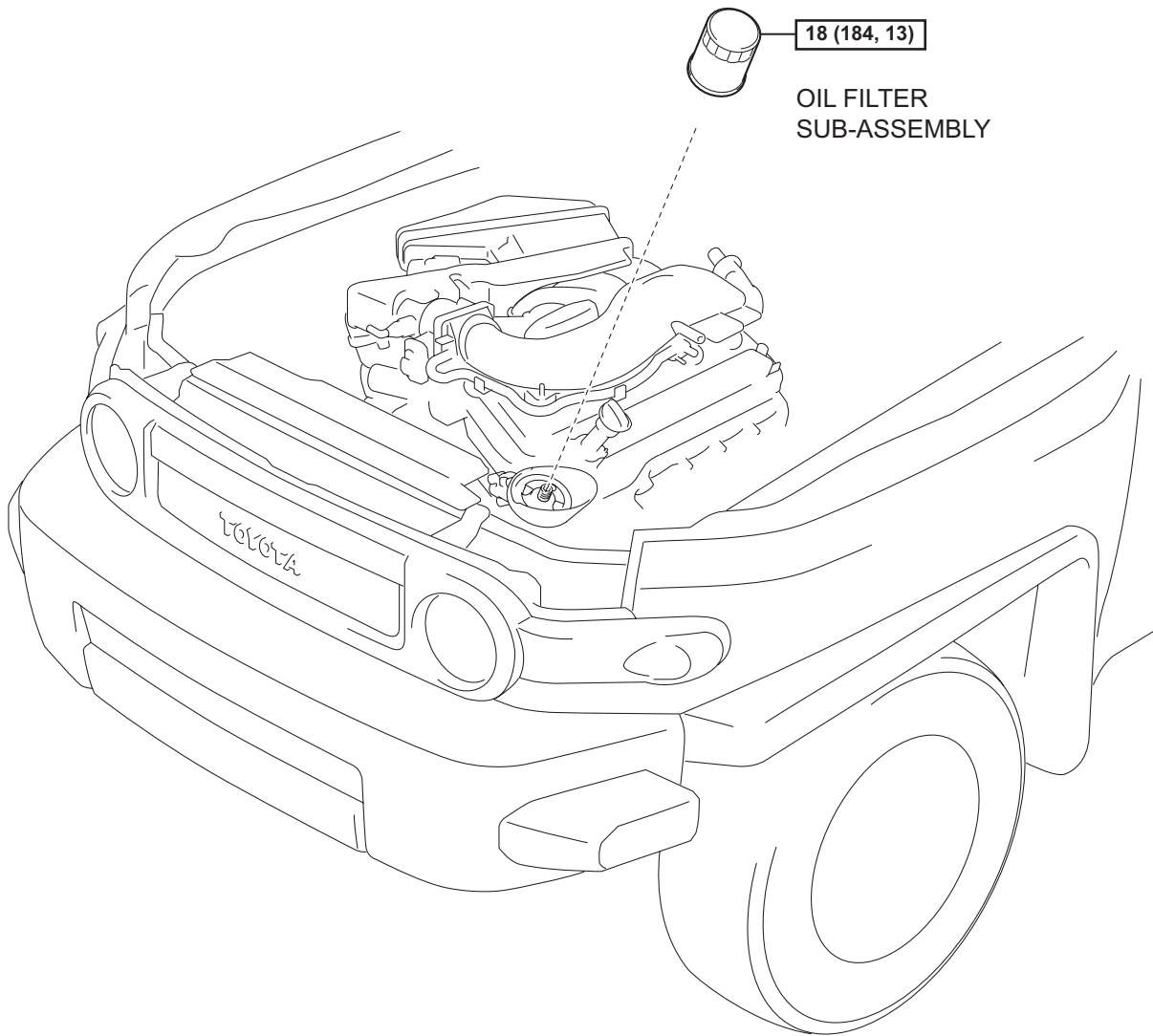
Do not start the engine within 1 hour of the installation.

- (h) Connect the oil pressure switch connector.
- (i) Check for engine oil leakage.

LU



OIL FILTER COMPONENTS



LU

$\boxed{\text{N}^*\text{m (kgf}^*\text{cm, ft}^*\text{lbf)}}$: Specified torque

REPLACEMENT

CAUTION:

- Prolonged and repeated contact with engine oil will cause the removal of natural oils from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Precautions should be taken when replacing engine oil to minimize the risk of your skin making contact with used engine oil.
- Wash your skin thoroughly with soap and water, or use waterless hand cleaner to remove any used engine oil. Do not use gasoline, thinners, or solvents.
- For environmental protection, used oil and used oil filters must be disposed of only at designated disposal sites.

1. DRAIN ENGINE OIL

- Remove engine under cover seal No. 3.
- Remove the oil pan drain plug and drain the engine oil.
- Clean the oil pan drain plug and install it with a new gasket.

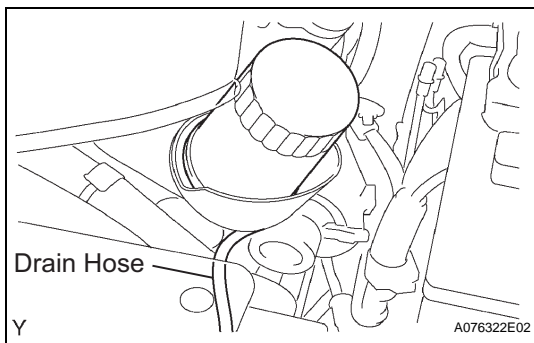
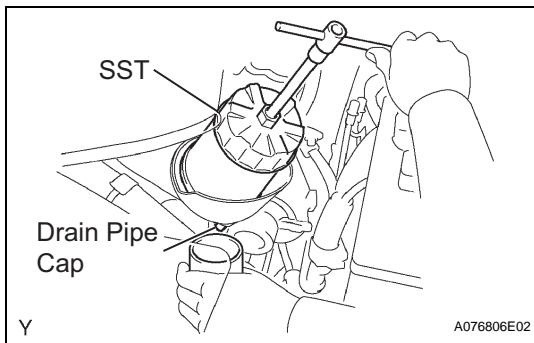
Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

2. REMOVE OIL FILTER SUB-ASSEMBLY

- Remove the drain pipe cap.
- While removing the oil filter with SST, catch the oil from the oil filter with a container.

SST 09228-07501

- Install the drain pipe cap.



- Clean the oil catch plate.

HINT:

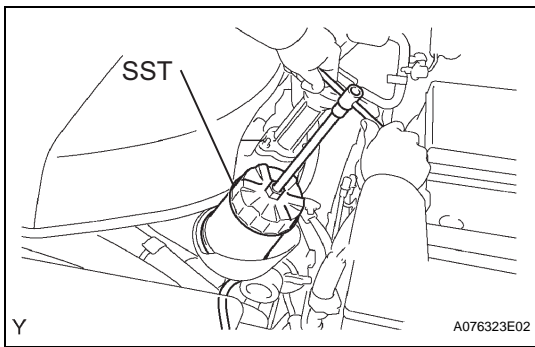
When using a drain hose, perform the following procedures.

- Remove the drain pipe cap.
- Connect a drain hose to the oil filter bracket.

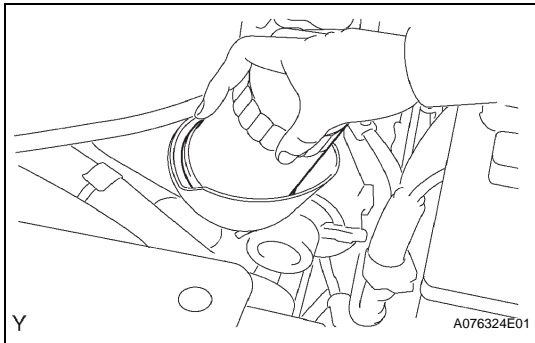
HINT:

- Drain hose inside diameter: 8 mm (0.31 in.)
- Drain hose length: 900 mm (35.43 in.)

- Feed the drain hose down through the engine under cover, and put the drain oil container beneath the drain hose to catch the oil from the oil filter.

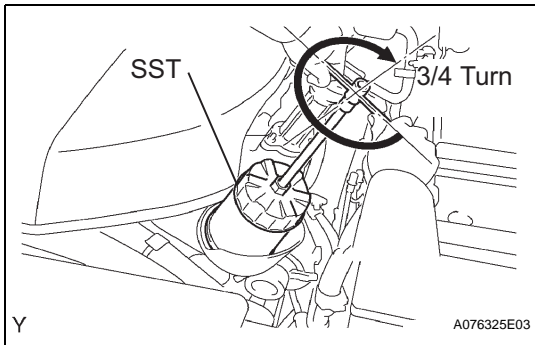


- (h) Using SST, remove the oil filter.
SST 09228-07501
- (i) Remove the drain hose and install the drain pipe cap.
- (j) Clean the oil catch plate.



3. INSTALL OIL FILTER SUB-ASSEMBLY

- (a) Clean the surface of the oil filter bracket which comes into contact with the oil filter.
- (b) Apply clean engine oil to the rubber gasket of a new oil filter.
- (c) Tighten the oil filter by hand until the rubber gasket comes into contact with the seat of the filter bracket.



- (d) Using SST, tighten it an additional 3/4 turn to set the filter.
SST 09228-07501
Torque: 18 N*m (184 kgf*cm, 13 ft.*lbf)

4. ADD ENGINE OIL

- (a) Fill with fresh engine oil.

Oil Capacity

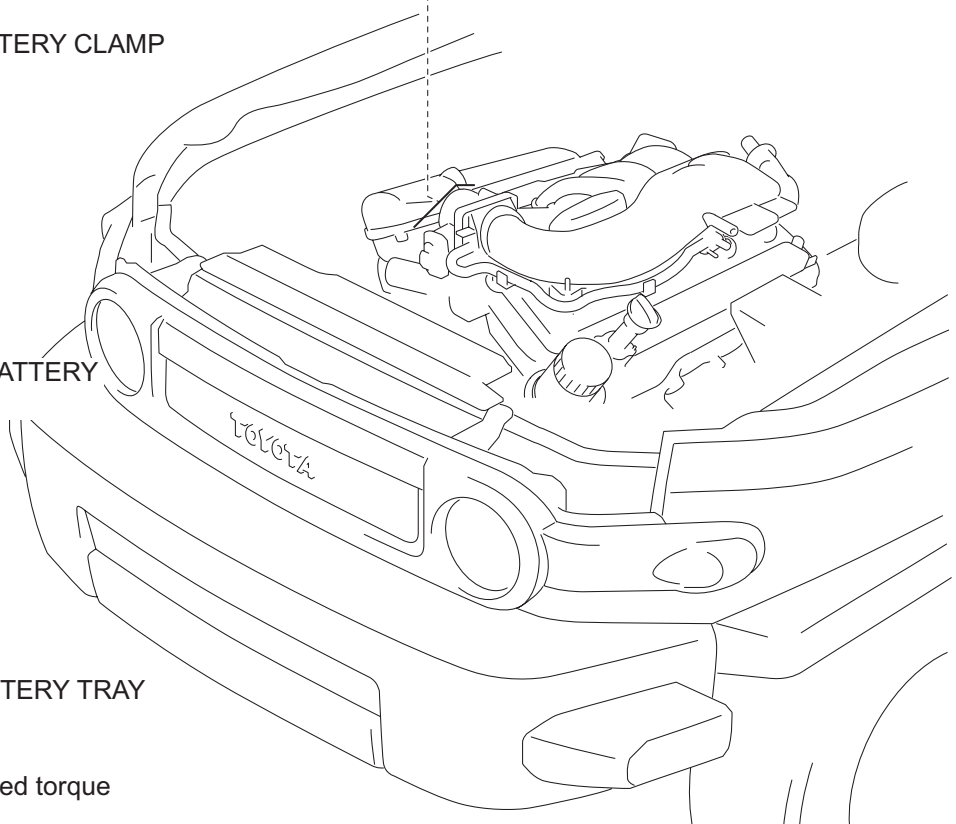
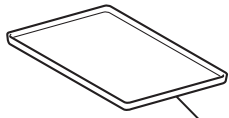
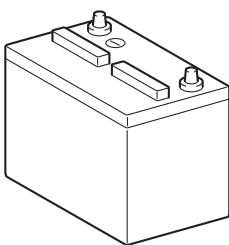
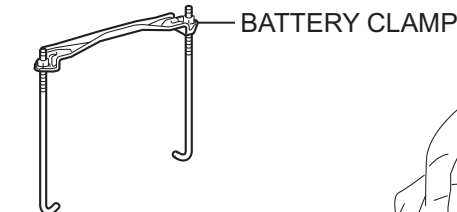
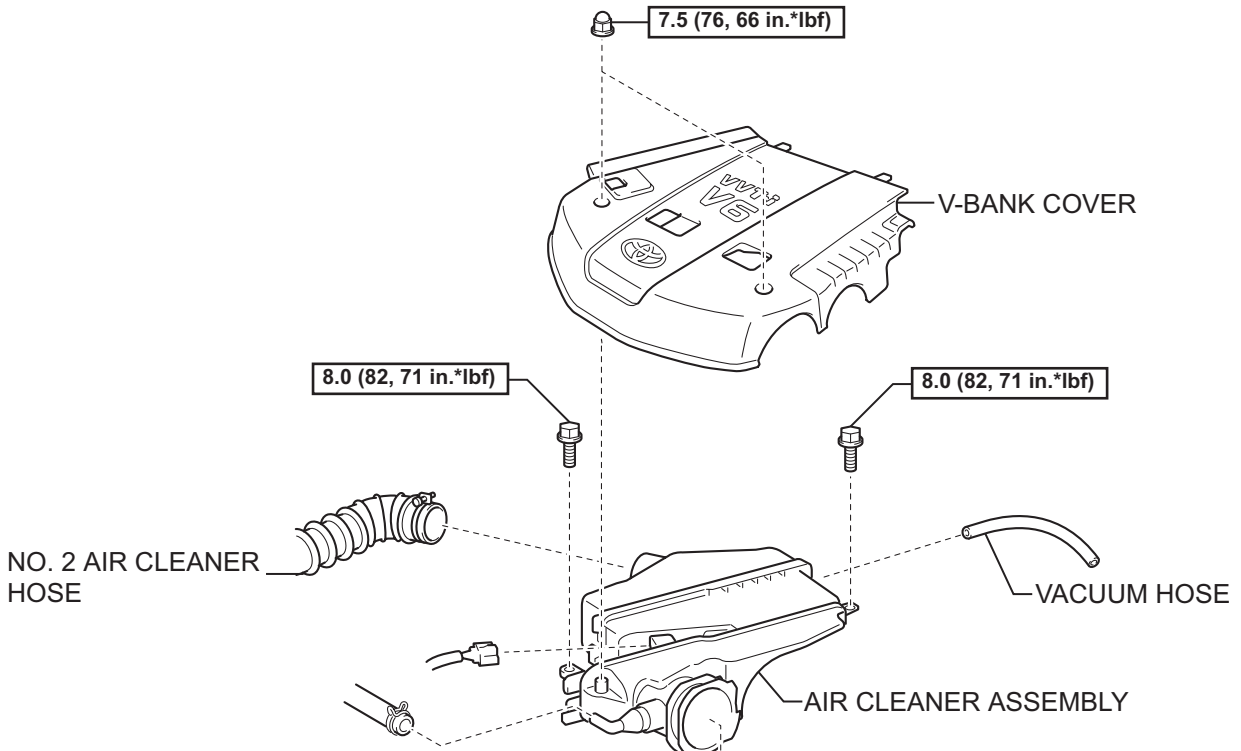
| Item | Specification |
|---------------------------|---------------------------------------|
| With oil filter change | 5.2 liters (5.5 US qts, 4.6 Imp. qts) |
| Without oil filter change | 4.9 liters (5.2 US qts, 4.3 Imp. qts) |
| Dry fill | 6.0 liters (6.3 US qts, 5.3 Imp. qts) |

- (b) Reinstall the oil filler cap.

5. CHECK FOR ENGINE OIL LEAKAGE

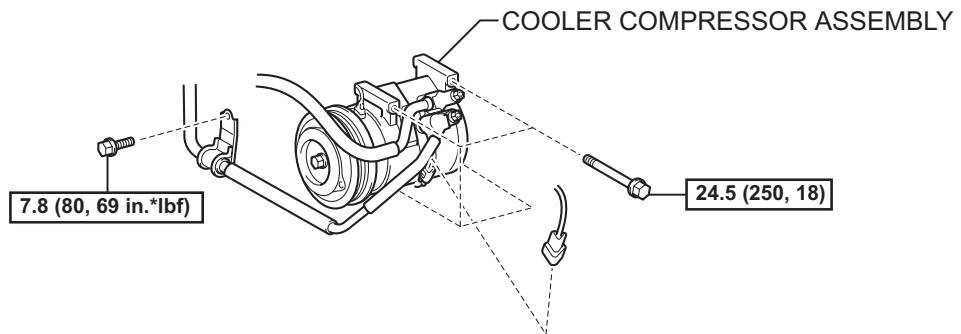
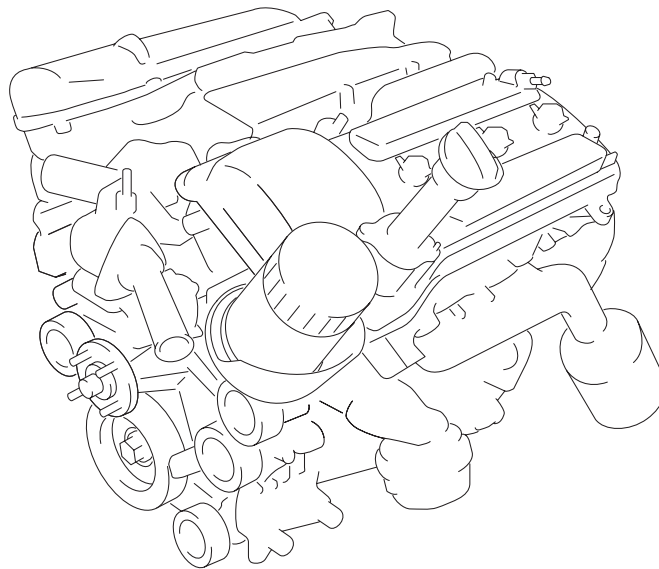
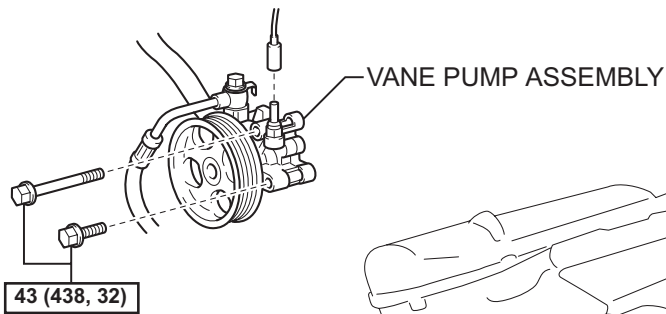
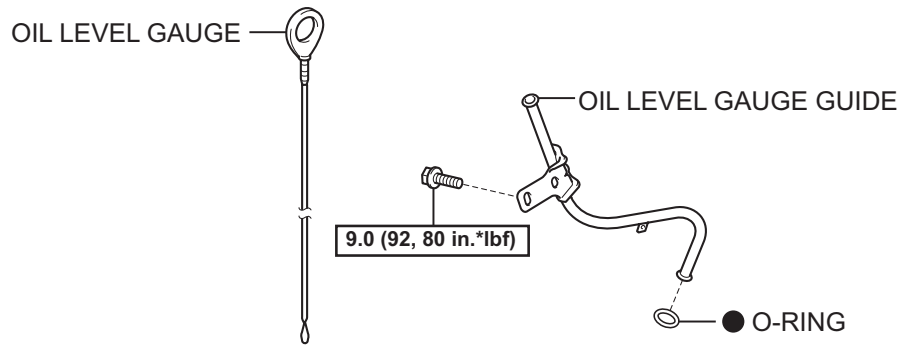
6. INSPECT ENGINE OIL LEVEL

OIL PUMP COMPONENTS



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

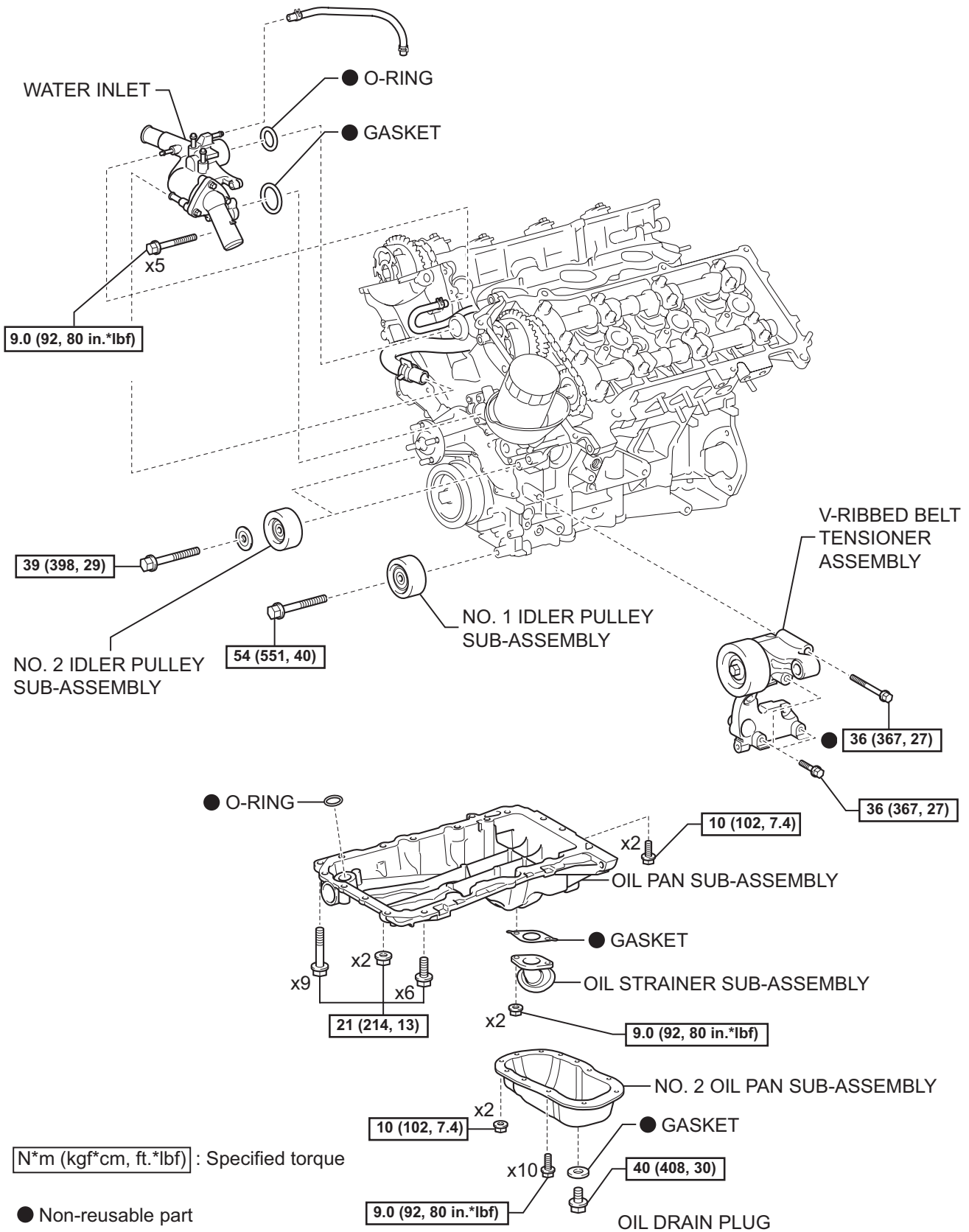
LU



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

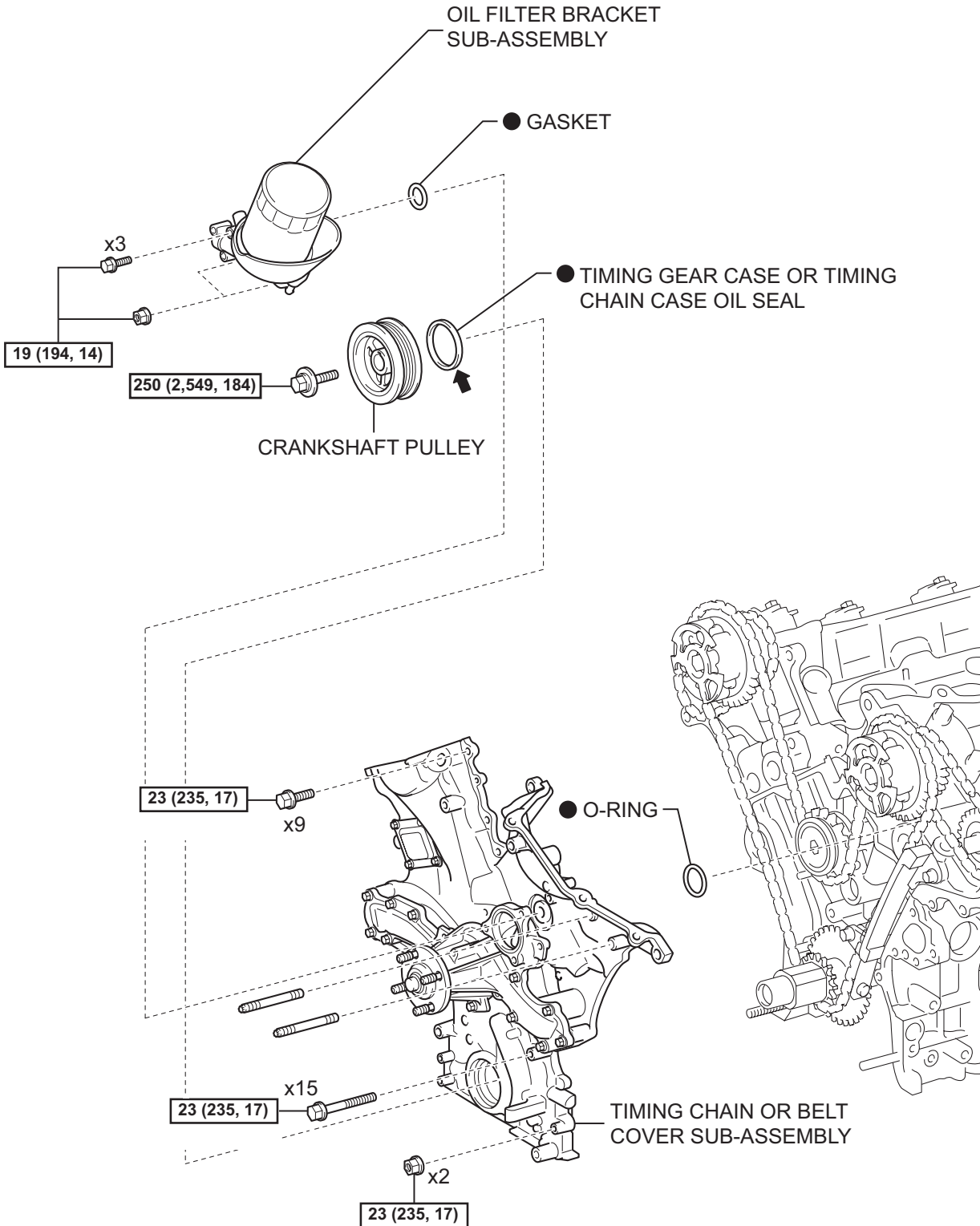
● Non-reusable part

LU



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

● Non-reusable part

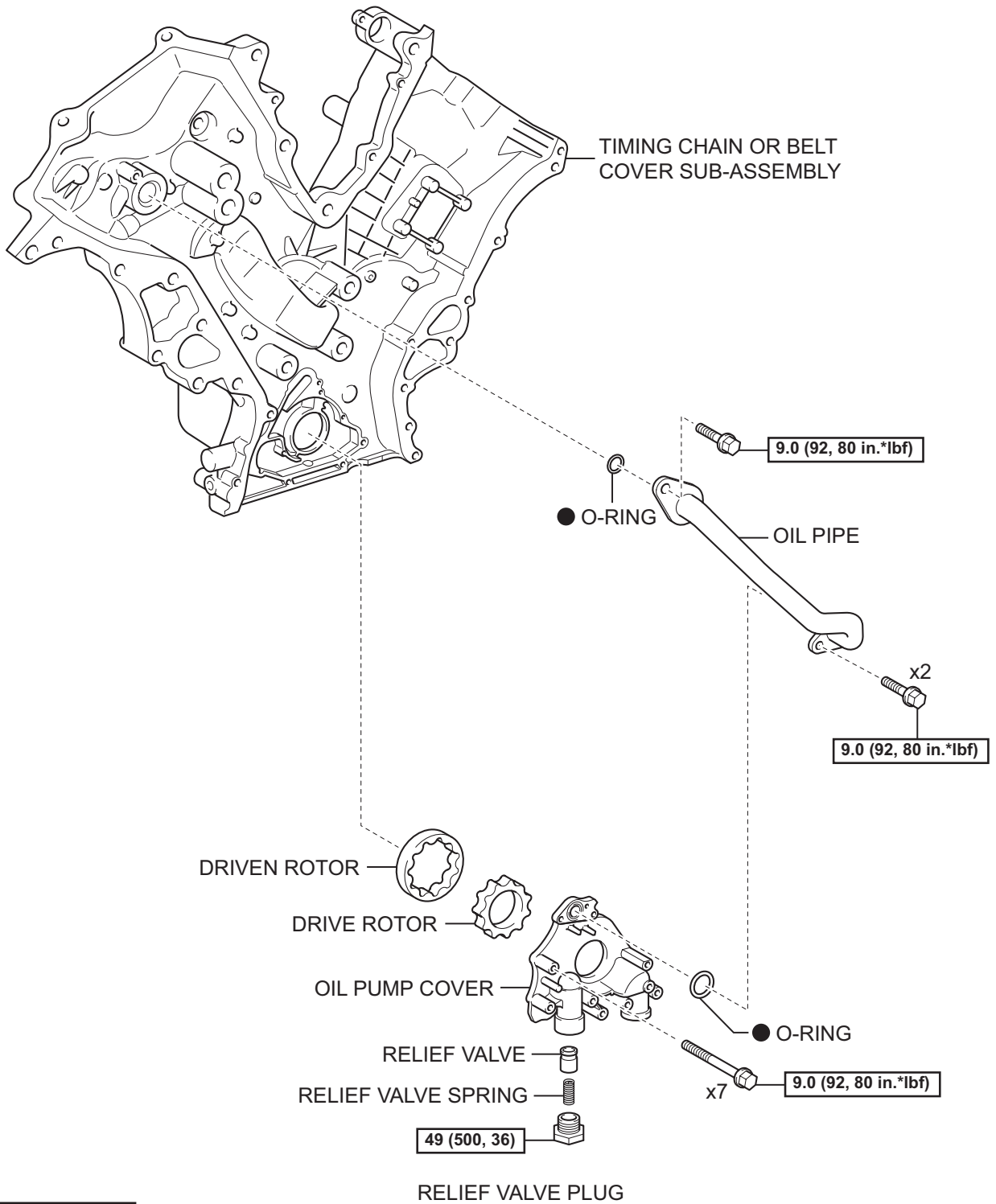


N*m (kgf*cm, ft*lbf) : Specified torque

● Non-reusable part

➡ Apply MP grease

LU



LU

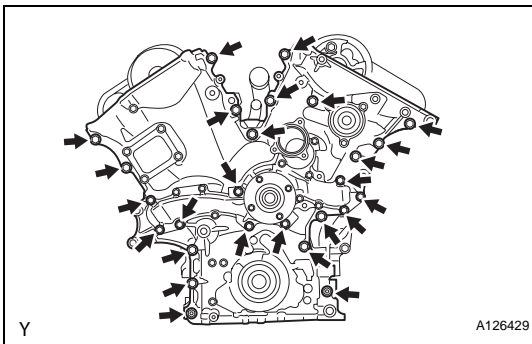
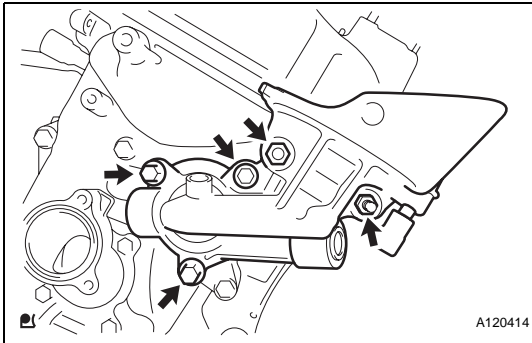
N*m (kgf*cm, ft*lbf) : Specified torque

● Non-reusable part

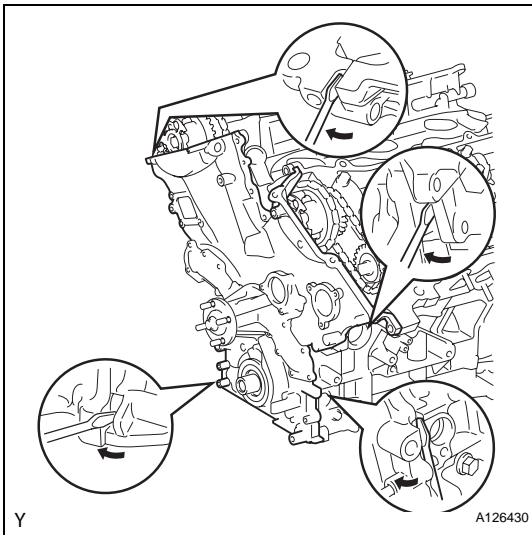
REMOVAL

1. REMOVE BATTERY
2. DRAIN ENGINE COOLANT (See page [CO-3](#))
3. DRAIN ENGINE OIL (See page [LU-4](#))
4. REMOVE POWER STEERING LINK ASSEMBLY (for 2WD)
Refer to the procedures up to "REMOVE POWER STEERING LINK ASSEMBLY" (See page [PS-18](#)).
5. REMOVE POWER STEERING LINK ASSEMBLY (for 4WD)
Refer to the procedures up to "REMOVE POWER STEERING LINK ASSEMBLY" (See page [PS-37](#)).
6. REMOVE FRONT DIFFERENTIAL CARRIER ASSEMBLY (for 4WD)
Refer to the procedures up to "REMOVE FRONT DIFFERENTIAL CARRIER ASSEMBLY" (See page [DF-20](#)).
7. REMOVE FAN
Refer to the procedures up to "REMOVE FAN" (See page [CO-17](#)).
8. REMOVE GENERATOR ASSEMBLY
Refer to the procedures up to "REMOVE GENERATOR ASSEMBLY" (See page [CH-9](#))
9. SEPARATE COOLER COMPRESSOR ASSEMBLY (See page [ES-420](#))
10. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY (See page [EM-22](#))
11. REMOVE OIL LEVEL GAUGE GUIDE (See page [EM-22](#))
12. SEPARATE VANE PUMP ASSEMBLY (See page [EM-22](#))
13. REMOVE NO. 2 IDLER PULLEY SUB-ASSEMBLY (See page [EM-23](#))
14. REMOVE NO. 1 IDLER PULLEY SUB-ASSEMBLY (See page [EM-23](#))
15. REMOVE CRANKSHAFT PULLEY (See page [EM-23](#))
16. REMOVE NO. 2 OIL PAN SUB-ASSEMBLY (See page [EM-23](#))
17. REMOVE OIL STRAINER SUB-ASSEMBLY (See page [EM-24](#))
18. REMOVE OIL PAN SUB-ASSEMBLY (See page [EM-24](#))
19. REMOVE AIR CLEANER ASSEMBLY (See page [ES-429](#))

20. REMOVE THROTTLE BODY BRACKET (See page [FU-11](#))
21. REMOVE OIL BAFFLE PLATE (See page [FU-11](#))
22. REMOVE NO. 1 SURGE TANK STAY (See page [FU-11](#))
23. REMOVE NO. 2 SURGE TANK STAY (See page [FU-12](#))
24. REMOVE INTAKE AIR SURGE TANK (See page [FU-12](#))
25. REMOVE IGNITION COIL ASSEMBLY (See page [IG-8](#))
26. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (See page [ES-414](#))
27. REMOVE VVT SENSOR (See page [ES-417](#))
28. REMOVE WATER INLET (See page [CO-8](#))
29. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY (See page [EM-40](#))
30. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH (See page [EM-40](#))
31. REMOVE OIL FILTER BRACKET SUB-ASSEMBLY
 - (a) Remove the 3 bolts, 2 nuts, oil filter bracket and gasket.



32. REMOVE TIMING CHAIN OR BELT COVER SUB-ASSEMBLY
 - (a) Remove the 24 bolts and 2 nuts.



- (b) Remove the timing chain cover by prying between the timing chain cover and cylinder head or cylinder block with a screwdriver.

NOTICE:

Be careful not to damage the contact surfaces of the timing chain cover, cylinder block and cylinder head.

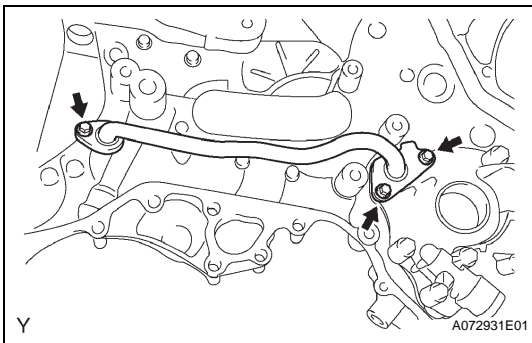
- (c) Remove the O-ring from the cylinder head LH.

33. REMOVE TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL (See page [EM-163](#))

DISASSEMBLY

1. REMOVE OIL PUMP COVER

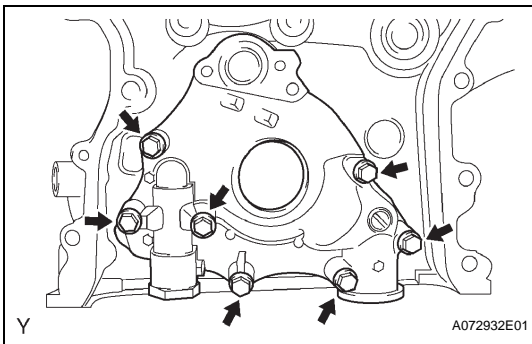
- (a) Remove the 3 bolts, then remove the oil pipe.
 (b) Remove the 2 O-rings.



- (c) Remove the 7 bolts, then remove the oil pump cover, drive rotor and driven rotor.

2. REMOVE OIL PUMP RELIEF VALVE

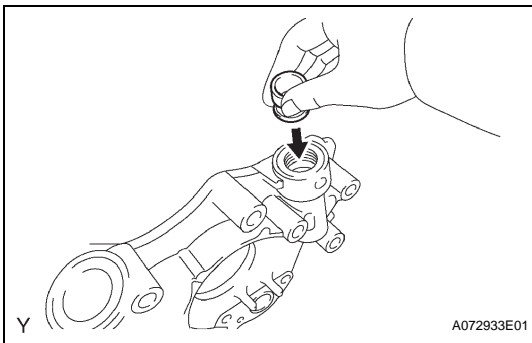
- (a) Remove the relief valve plug.
 (b) Remove the relief valve spring and relief valve.

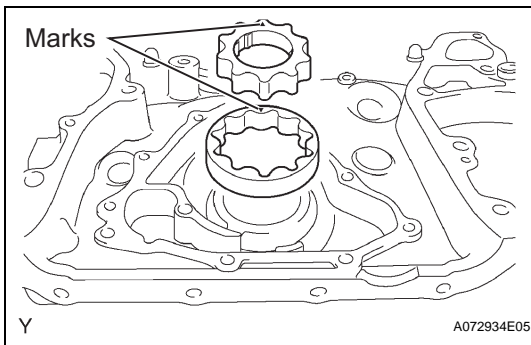


INSPECTION

1. INSPECT OIL PUMP RELIEF VALVE

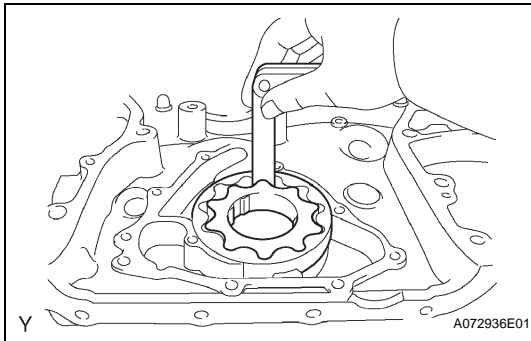
- (a) Coat the valve with engine oil, then check that it falls smoothly into the valve hole by its own weight. If not, replace the relief valve. If necessary, replace the oil pump assembly.



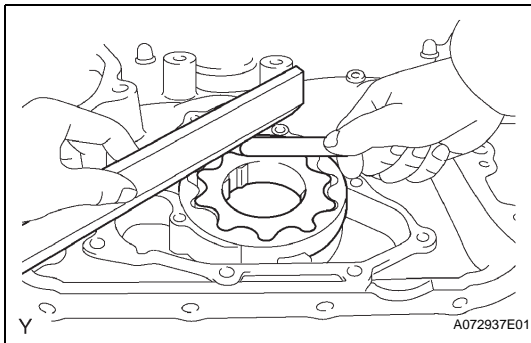


2. INSPECT OIL PUMP ROTOR SET

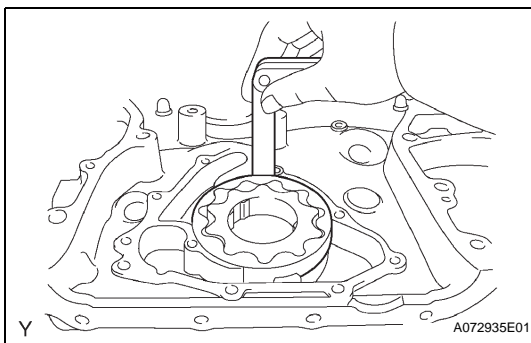
- (a) Place the drive and driven rotors into the timing chain cover with the marks facing upward.



- (b) Check the rotor tip clearance.
- (1) Using a feeler gauge, measure the clearance between the drive and driven rotor tips.
- Standard clearance:**
0.06 to 0.16 mm (0.0024 to 0.0063 in.)
- Maximum tip clearance:**
0.16 mm (0.0063 in.)
- If the clearance is greater than the maximum, replace the drive and driven rotors together.



- (c) Check the rotor side clearance.
- (1) Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.
- Standard clearance:**
0.03 to 0.09 mm (0.0012 to 0.0035 in.)
- Maximum side clearance:**
0.09 mm (0.0035 in.)
- If the clearance is greater than the maximum, replace the drive and driven rotors. If necessary, replace the timing chain cover assembly.



- (d) Check the rotor body clearance.
- (1) Using a feeler gauge, measure the clearance between the driven rotor and body.
- Standard clearance:**
0.250 to 0.325 mm (0.0098 to 0.0128 in.)
- Maximum body clearance:**
0.325 mm (0.0128 in.)
- If the clearance is greater than the maximum, replace the drive and driven rotors. If necessary, replace the timing chain cover assembly.

REASSEMBLY

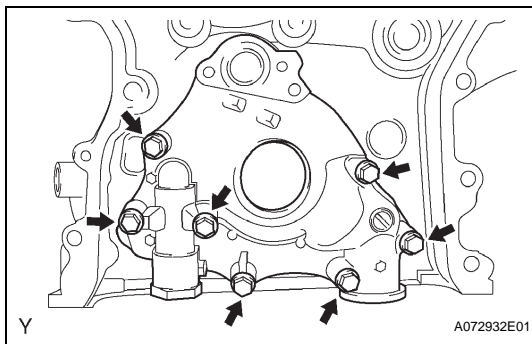
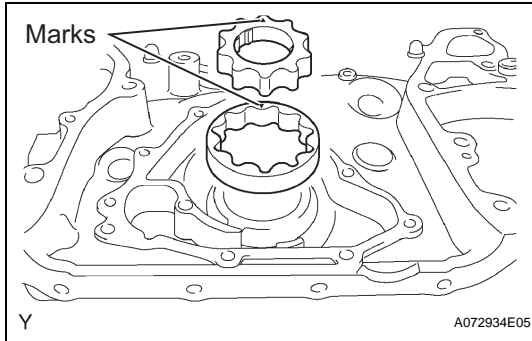
1. INSTALL OIL PUMP RELIEF VALVE

- (a) Coat the relief valve with engine oil and insert the relief valve and spring into the valve hole.
- (b) Install the relief valve plug.

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

2. INSTALL OIL PUMP COVER

- (a) Apply fresh engine oil to the drive and driven rotors.
- (b) Place the drive and driven rotors into the timing chain cover with the marks facing the oil pump cover side.

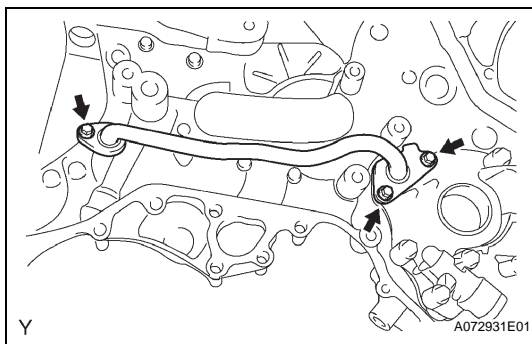


- (c) Install the oil pump cover with the 7 bolts.

Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)

- (d) Install a new O-ring onto the oil pump cover.

- (e) Install a new O-ring onto the oil pipe.



- (f) Install the oil pipe with the 3 bolts.

Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)

INSTALLATION

1. INSTALL TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL (See page EM-163)

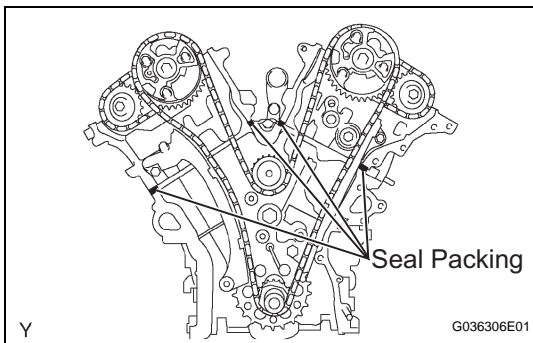
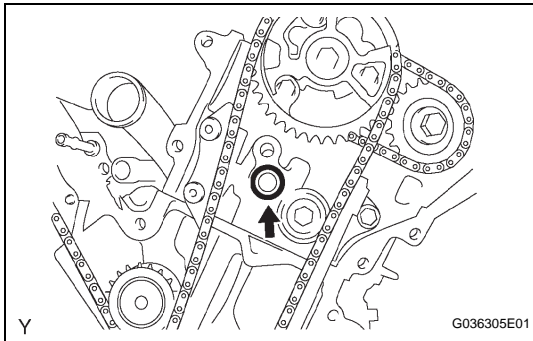
2. INSTALL TIMING CHAIN OR BELT COVER SUB-ASSEMBLY

- (a) Remove any old packing (FIPG) material.

HINT:

Do not drop any oil onto the contact surfaces of the timing chain cover, cylinder head or cylinder block.

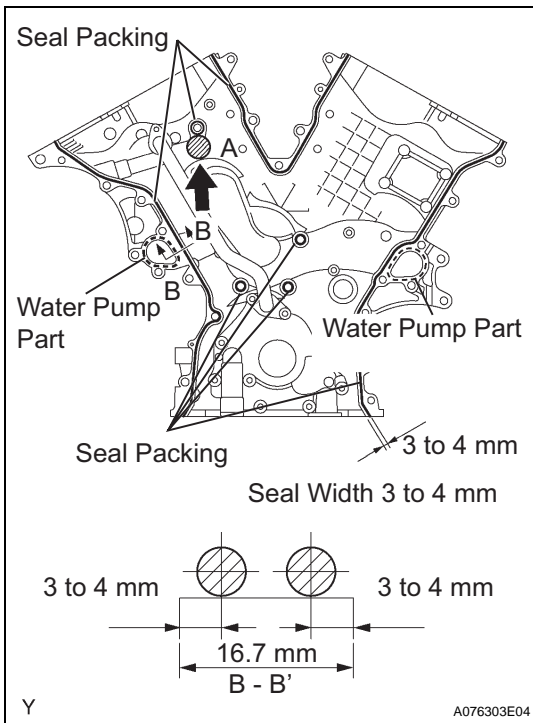
- (b) Install a new O-ring onto the LH cylinder head as shown in the illustration.



- (c) Apply continuous beads of seal packing (diameter 3 to 4 mm (0.12 to 0.16 in.)) to the 4 locations shown in the illustration.

Seal packing:

Toyota Genuine Adhesive 1344, Three Bond 1344 or the equivalent



- (d) Apply continuous beads of seal packing (diameter 3 to 4 mm (0.12 to 0.16 in.)) to the timing chain cover as shown in the illustration.

Seal packing:

Water pump part:

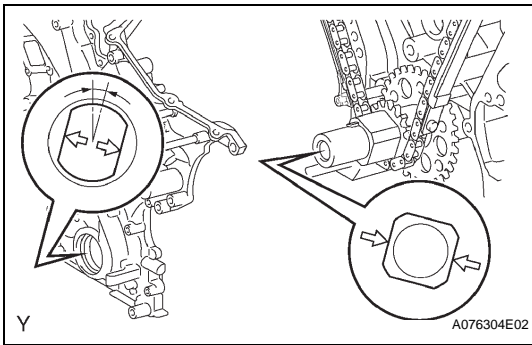
Toyota Genuine Seal Packing 1282B, Three Bond 1282B or the equivalent

Other parts:

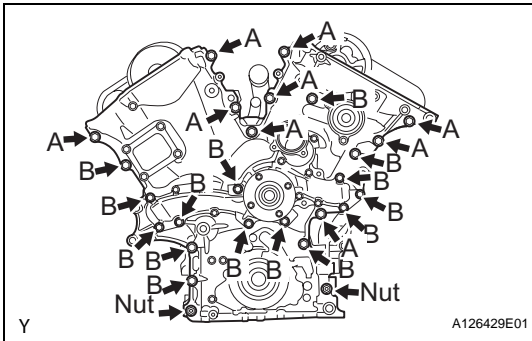
Toyota Genuine Adhesive 1344, Three Bond 1344 or the equivalent

NOTICE:

- Install the timing chain cover within 3 minutes of applying the seal packing. The timing chain cover bolts and nuts must be tightened within 15 minutes of the installation. Otherwise, the seal packing must be removed and reapplied.
- Do not apply seal packing to portion A shown in the illustration.



- (e) Align the key way of the oil pump drive rotor with the rectangular portion of the crankshaft timing gear, and slide the timing chain cover into place.



- (f) Install the timing chain cover with the 24 bolts and 2 nuts. Tighten the bolts and nuts uniformly in several steps.

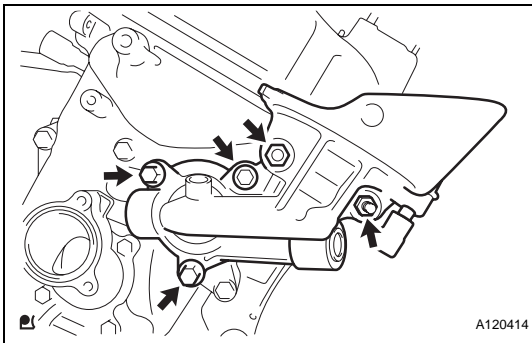
Torque: 23 N*m (235 kgf*cm, 17 ft.*lbf)

NOTICE:

Pay attention not to wrap the chain and slipper over the timing chain cover seal line.

Each bolt length is as follows

| Bolt | Length |
|------|------------------|
| A | 25 mm (0.98 in.) |
| B | 55 mm (2.17 in.) |



3. INSTALL OIL FILTER BRACKET SUB-ASSEMBLY

- (a) Install a new gasket and oil filter bracket with the 3 bolts and 2 nuts.

Torque: 19 N*m (194 kgf*cm, 14 ft.*lbf)

- 4. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH (See page EM-57)**
- 5. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY (See page EM-58)**
- 6. INSTALL WATER INLET (See page CO-9)**
- 7. INSTALL VVT SENSOR (See page ES-417)**
- 8. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (See page ES-415)**
- 9. INSTALL IGNITION COIL ASSEMBLY (See page IG-8)**
- 10. INSTALL INTAKE AIR SURGE TANK (See page FU-17)**
- 11. INSTALL NO. 2 SURGE TANK STAY (See page FU-19)**
- 12. INSTALL NO. 1 SURGE TANK STAY (See page FU-19)**
- 13. INSTALL OIL BAFFLE PLATE (See page FU-19)**
- 14. INSTALL THROTTLE BODY BRACKET (See page FU-19)**
- 15. INSTALL AIR CLEANER ASSEMBLY (See page ES-431)**
- 16. INSTALL OIL PAN SUB-ASSEMBLY (See page EM-30)**
- 17. INSTALL OIL STRAINER SUB-ASSEMBLY (See page EM-31)**

18. **INSTALL NO. 2 OIL PAN SUB-ASSEMBLY** (See page [EM-31](#))
19. **INSTALL CRANKSHAFT PULLEY** (See page [EM-32](#))
20. **INSTALL NO. 1 IDLER PULLEY SUB-ASSEMBLY** (See page [EM-32](#))
21. **INSTALL NO. 2 IDLER PULLEY SUB-ASSEMBLY** (See page [EM-33](#))
22. **INSTALL VANE PUMP ASSEMBLY** (See page [EM-33](#))
23. **INSTALL OIL LEVEL GAUGE GUIDE** (See page [EM-33](#))
24. **INSTALL V-RIBBED BELT TENSIONER ASSEMBLY** (See page [EM-33](#))
25. **INSTALL COOLER COMPRESSOR ASSEMBLY** (See page [ES-421](#))
26. **INSTALL GENERATOR ASSEMBLY**
Refer to the procedures up to "INSTALL GENERATOR ASSEMBLY" (See page [CH-17](#)).
27. **INSTALL FAN**
Refer to the procedures up to "INSTALL FAN" (See page [CO-17](#)).
28. **INSTALL FRONT DIFFERENTIAL CARRIER ASSEMBLY (for 4WD)**
Refer to the procedures up to "INSTALL FRONT DIFFERENTIAL CARRIER ASSEMBLY" (See page [DF-42](#)).
29. **INSTALL POWER STEERING LINK ASSEMBLY (for 2WD)**
Refer to the procedures up to "INSTALL POWER STEERING LINK ASSEMBLY" (See page [PS-30](#)).
30. **INSTALL POWER STEERING LINK ASSEMBLY (for 4WD)**
Refer to the procedures up to "INSTALL POWER STEERING LINK ASSEMBLY" (See page [PS-49](#)).
31. **INSTALL BATTERY**
32. **ADD ENGINE COOLANT** (See page [CO-3](#))
33. **ADD ENGINE OIL** (See page [LU-5](#))
34. **ADD POWER STEERING FLUID**
35. **BLEED POWER STEERING FLUID** (See page [PS-2](#))
36. **ADD DIFFERENTIAL OIL (for 4WD)**
37. **INSPECT DIFFERENTIAL OIL (for 4WD)** (See page [DF-3](#))
38. **CHECK FOR ENGINE COOLANT LEAKAGE** (See page [CO-4](#))
39. **CHECK FOR ENGINE OIL LEAKAGE**

- 40. CHECK FOR FUEL LEAKAGE**
- 41. CHECK FOR EXHAUST GAS LEAKAGE**
- 42. CHECK POWER STEERING FLUID LEAKAGE**
- 43. INSPECT AND ADJUST FRONT WHEEL ALIGNMENT**
(See page [SP-2](#))