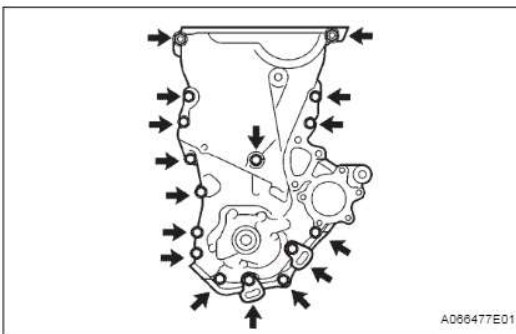


LU-8

1NZ-FE LUBRICATION – OIL PUMP

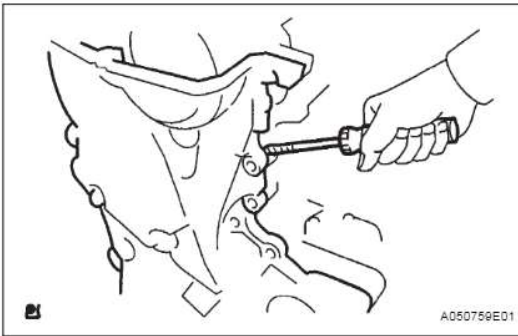
REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
CAUTION:
 Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.
2. **REMOVE FRONT WHEEL RH**
3. **REMOVE NO. 2 CYLINDER HEAD COVER** (See page [EM-73](#))
4. **REMOVE IGNITION COIL** (See page [EM-25](#))
5. **DISCONNECT VENTILATION HOSE** (See page [EM-25](#))
6. **DISCONNECT NO. 2 VENTILATION HOSE** (See page [EM-25](#))
7. **REMOVE CYLINDER HEAD COVER** (See page [EM-26](#))
8. **REMOVE GENERATOR V BELT** (See page [EM-7](#))
9. **REMOVE GENERATOR** (See page [CH-9](#))
10. **REMOVE ENGINE UNDER COVER RH**
11. **DRAIN ENGINE OIL** (See page [LU-3](#))
12. **DRAIN ENGINE COOLANT** (See page [CO-5](#))
13. **REMOVE VANE PUMP V BELT** (See page [EM-7](#))
14. **REMOVE WATER PUMP PULLEY** (See page [EM-92](#))
15. **REMOVE WATER PUMP** (See page [EM-93](#))
16. **REMOVE CRANKSHAFT PULLEY** (See page [EM-92](#))
17. **REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY** (See page [EM-92](#))
18. **REMOVE CRANKSHAFT POSITION SENSOR** (See page [ES-339](#))
19. **REMOVE ENGINE MOUNTING BRACKET INSULATOR RH** (See page [EM-27](#))
20. **REMOVE ENGINE MOUNTING BRACKET RH** (See page [EM-93](#))
21. **REMOVE TIMING CHAIN COVER (OIL PUMP)**
 (a) Remove the 15 bolts and nut.



1NZ-FE LUBRICATION – OIL PUMP

LU-9

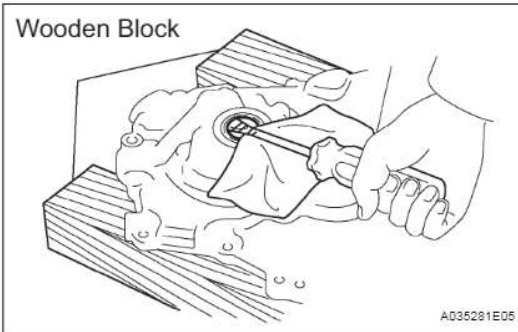


- (b) Using a screwdriver with its tip wrapped in tape, remove the oil pump by prying between the cylinder head and cylinder block.

NOTICE:

Be careful not to damage the contact surface of the oil pump, cylinder head and cylinder block.

- (c) Remove the 2 O-rings from the cylinder block and No. 1 oil pan.

**DISASSEMBLY****1. REMOVE OIL PUMP SEAL**

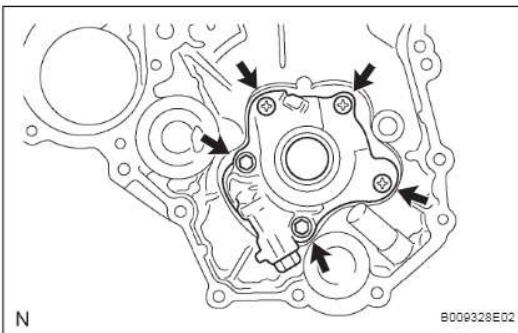
- (a) Using a screwdriver, remove the oil seal.

HINT:

Tape the screwdriver tip before use.

2. REMOVE OIL PUMP RELIEF VALVE

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

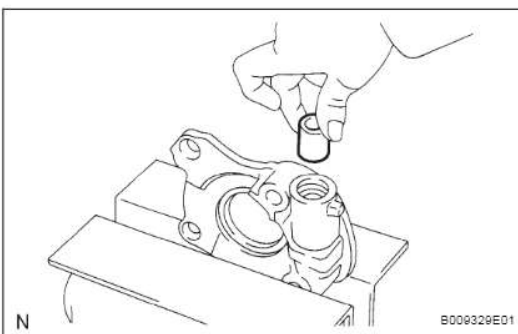
**3. REMOVE OIL PUMP**

- (a) Remove the 2 bolts, 3 screws and oil pump cover.

- (b) Remove the oil pump rotor set.

NOTICE:

Do not change the arrangement or turn over the 2 removed rotors.

**INSPECTION****1. INSPECT OIL PUMP RELIEF VALVE**

- (a) Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

2. INSPECT OIL PUMP

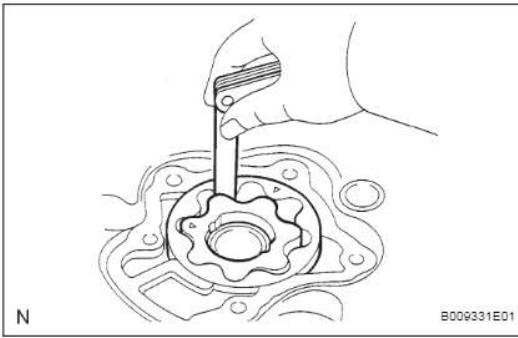
- (a) Inspect the oil pump rotor set.

- (1) Coat the oil pump rotor set with engine oil and place it into the oil pump body. Check that the rotors revolve smoothly.

If the condition is not as specified, replace the timing chain cover (oil pump).

LU-10

1NZ-FE LUBRICATION – OIL PUMP



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

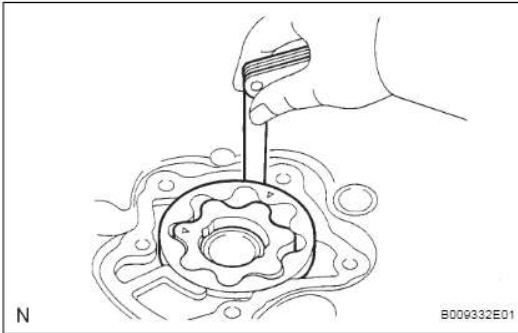
Standard tip clearance:

0.060 to 0.180 mm (0.0024 to 0.0071 in.)

Maximum tip clearance:

0.28 mm (0.0110 in.)

If the tip clearance is greater than the maximum, replace the timing chain cover (oil pump).



- (c) Inspect the rotor body clearance.
 (1) Using a feeler gauge, measure the clearance between the driven rotor and the oil pump body.

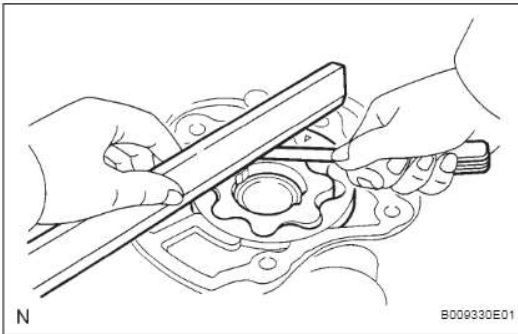
Standard body clearance:

0.250 to 0.325 mm (0.0098 to 0.0128 in.)

Maximum body clearance:

0.425 mm (0.0167 in.)

If the body clearance is greater than the maximum, replace the timing chain cover (oil pump).



- (d) Inspect the rotor side clearance.

- (1) Using a feeler gauge and precision straightedge, measure the clearance between the rotors and precision straightedge.

Standard side clearance:

0.03 to 0.09 mm (0.0012 to 0.0035 in.)

Maximum side clearance:

0.15 mm (0.0059 in.)

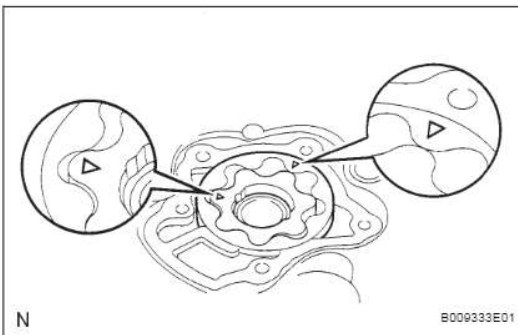
If the side clearance is greater than the maximum, replace the timing chain cover (oil pump).

REASSEMBLY

1. INSTALL OIL PUMP

- (a) Install the oil pump rotor set.

- (1) Coat the oil pump rotor set with engine oil and place it into the pump body with the marks facing the pump body cover side.



- (b) Install the oil pump cover with the 2 bolts and 3 screws.

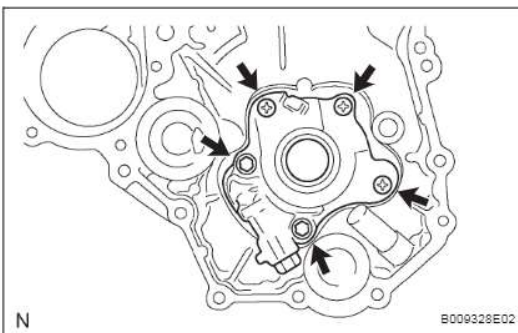
Torque: 8.8 N*m (90 kgf*cm, 78 in.*lbf) for bolt
10 N*m (102 kgf*cm, 7.6 ft.*lbf) for screw

2. INSTALL OIL PUMP RELIEF VALVE

- (a) Coat the relief valve with engine oil and insert the relief valve and spring into the pump body hole.

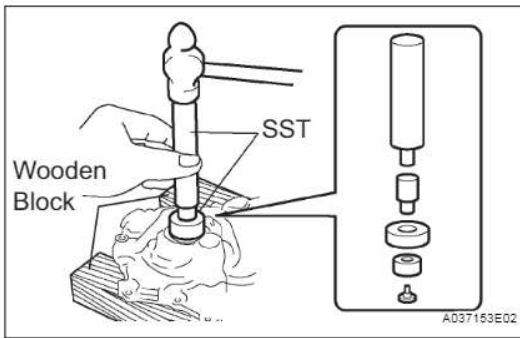
- (b) Install the relief valve plug.

Torque: 25 N*m (255 kgf*cm, 18 ft.*lbf)



1NZ-FE LUBRICATION – OIL PUMP

LU-11

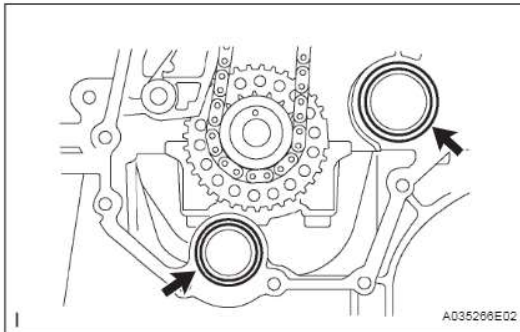


3. INSTALL OIL PUMP SEAL

- (a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.
SST 09950-60010 (09951-00250, 09951-00380, 09952-06010), 09950-70010 (09951-07100)

NOTICE:

- Be careful not to tap the oil seal at an angle.
 - Keep the lip free of foreign objects.
- (b) Apply multi-purpose grease to the lip of the oil seal.



INSTALLATION

1. INSTALL TIMING CHAIN COVER (OIL PUMP)

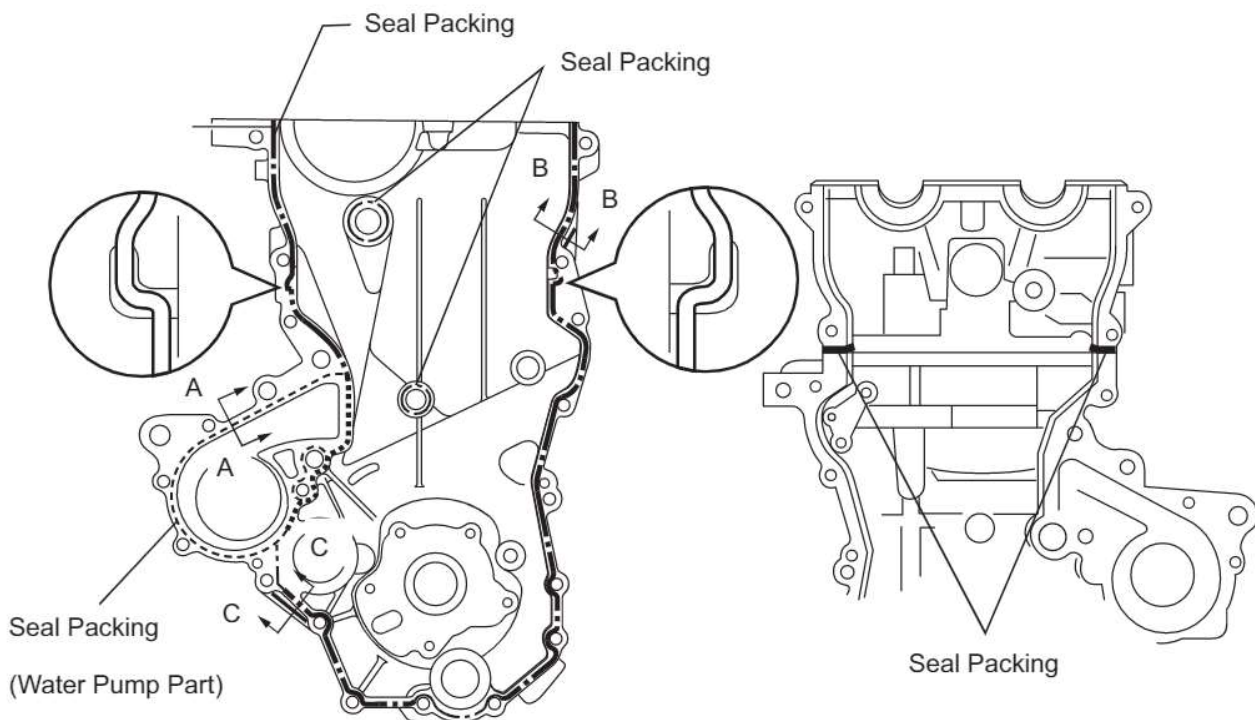
- (a) Install 2 new O-rings onto the 2 locations as shown in the illustration.
- (b) Remove any old packing material from the contact surface.

LU

LU-12

1NZ-FE LUBRICATION – OIL PUMP

- (c) Apply seal packing to the timing chain cover, cylinder head and cylinder block as shown in the illustration.



A - A

Diameter:

1.5 to 2.0 mm
(0.059 to 0.078 in.)B - B, C - C
(After Assembling)2.5 mm
(0.098 in.)5.0 mm
(0.197 in.)1.5 mm
(0.059 in.)

2.5 mm (0.098 in.) or more

B - B, C - C

2.5 mm
(0.098 in.)

Diameter:

3.5 to 4.5 mm
(0.138 to 0.177 in.)1.0 mm
(0.039 in.)1.0 mm
(0.039 in.)

Part No.

08826-00080

Seal Diameter:

— · — · — 3.5 to 4.5 mm (0.138 to 0.177 in.)

— · — · — 1.5 to 2.0 mm (0.059 to 0.078 in.)

Part No.

08826-00100

Seal Diameter:

..... 3.5 to 4.5 mm (0.138 to 0.177 in.)

----- 1.5 to 2.0 mm (0.059 to 0.078 in.)

A117400E01

Seal packing:

Water pump part: Part No. 08826-00100 or equivalent

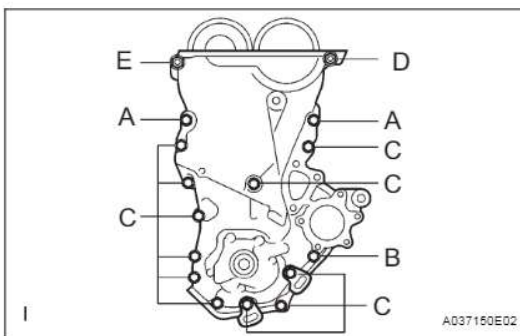
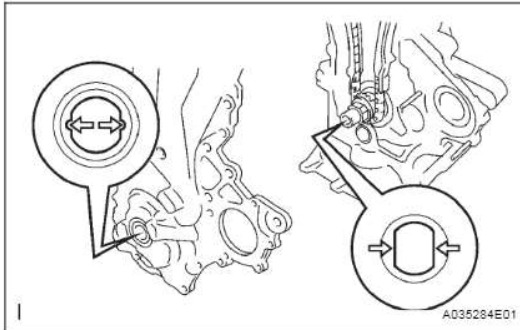
Other part: Part No. 08826-00080 or equivalent

NOTICE:

- Remove any oil from the contact surface.

1NZ-FE LUBRICATION – OIL PUMP

LU-13



- Install the oil pump within 3 minutes of applying seal packing.
- Do not expose the seal to engine oil for at least 2 hours after the installation.

(d) Align the keyway of the oil pump drive rotor with the rectangular portion of the crankshaft, and slide the oil pump into place.

(e) Install the timing chain cover with the 15 bolts and nut. Tighten the bolts and nut uniformly in several steps.

Torque: 24 N*m (245 kgf*cm, 18 ft.*lbf) for bolt A
 11 N*m (112 kgf*cm, 8.1 ft.*lbf) for bolt B
 11 N*m (112 kgf*cm, 8.1 ft.*lbf) for bolt C
 24 N*m (245 kgf*cm, 18 ft.*lbf) for bolt D
 24 N*m (245 kgf*cm, 18 ft.*lbf) for nut E

NOTICE:

After installing the oil pump assembly, the mounting bracket and water pump must be installed within 15 minutes.

HINT:

Each bolt length is as follows.

30 mm (1.18 in.) for bolt A

35 mm (1.38 in.) for bolt B

20 mm (0.79 in.) for bolt C

20 to 14 mm (0.79 to 0.55 in.) for bolt D

2. INSTALL WATER PUMP (See page [EM-121](#))
3. INSTALL ENGINE MOUNTING BRACKET RH (See page [EM-122](#))
4. INSTALL ENGINE MOUNTING BRACKET INSULATOR RH (See page [EM-30](#))
5. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (See page [EM-123](#))
6. INSTALL CRANKSHAFT POSITION SENSOR (See page [ES-340](#))
7. INSTALL WATER PUMP PULLEY (See page [EM-121](#))
8. INSTALL CRANKSHAFT PULLEY (See page [EM-122](#))
9. INSTALL CYLINDER HEAD COVER (See page [EM-123](#))
10. CONNECT NO. 2 VENTILATION HOSE (See page [EM-31](#))

LU-14

1NZ-FE LUBRICATION – OIL PUMP

11. CONNECT VENTILATION HOSE (See page [EM-31](#))
12. INSTALL IGNITION COIL (See page [EM-79](#))
13. INSTALL NO. 2 CYLINDER HEAD COVER (See page [EM-85](#))
14. INSTALL GENERATOR (See page [CH-15](#))
15. INSTALL VANE PUMP V BELT (See page [EM-7](#))
16. INSTALL GENERATOR V BELT (See page [EM-7](#))
17. ADJUST GENERATOR V BELT (See page [EM-7](#))
18. ADJUST VANE PUMP V BELT (See page [EM-7](#))
19. INSPECT DRIVE BELT TENSION (See page [EM-6](#))
20. INSTALL FRONT WHEEL RH
21. INSTALL OIL PAN DRAIN PLUG
 - (a) Clean and install the drain plug with a new gasket.
Torque: 37.5 N*m (382 kgf*cm, 28 ft.*lbf)
22. ADD ENGINE OIL (See page [LU-3](#))
23. CHECK FOR ENGINE OIL LEAKS
24. ADD ENGINE COOLANT (See page [CO-5](#))
25. CHECK FOR COOLANT LEAKS (See page [CO-1](#))
26. INSTALL ENGINE UNDER COVER RH
27. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

LU

LUBRICATION SYSTEM

ON-VEHICLE INSPECTION

1. CHECK ENGINE OIL LEVEL

- (a) Warm up the engine, stop the engine and wait for 5 minutes. The oil level should be between the dipstick's low and full level marks.
If the oil level is low, check for leakage and add oil up to the full level mark.

NOTICE:

Do not add engine oil above the full level mark.

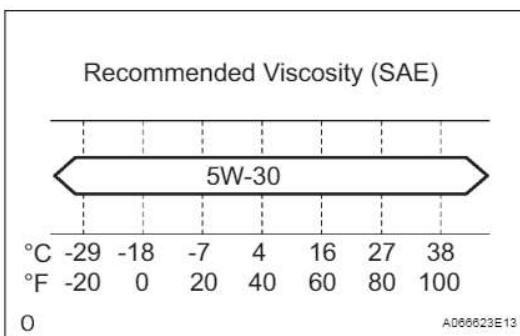
2. CHECK ENGINE OIL QUALITY

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

Oil grade:

ILSAC multigrade engine oil is recommended.
SAE 5W-30 is the best choice for this vehicle for good fuel economy and good starting in cold weather.

If SAE 5W-30 is not available, SAE 10W-30 may be used. However, it should be replaced with SAE 5W-30 at the next oil change.



3. CHECK OIL PRESSURE

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

Standard oil pressure

Condition	Specified Condition
Idle	29 kPa (0.3 kgf/cm ² , 4.2 psi) or more
3,000 rpm	150 to 550 kPa (1.5 to 5.6 kgf/cm ² , 22 to 80 psi) or more

- (f) Remove the oil pressure gauge.

4. INSTALL OIL PRESSURE SWITCH

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

Adhesive:

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

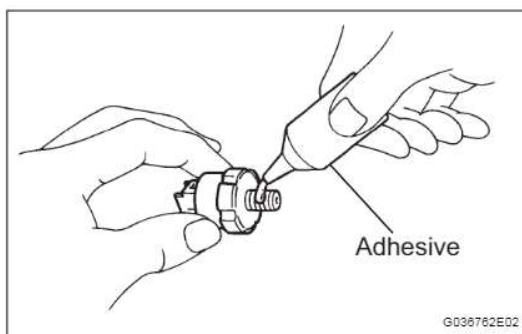
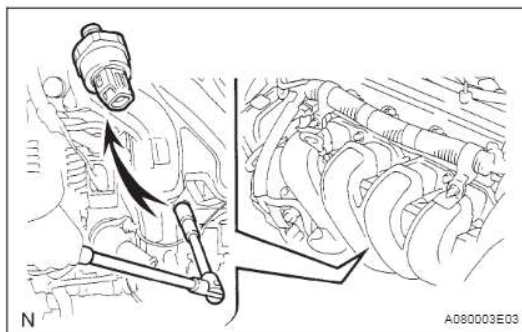
- (b) Using a 24 mm deep socket wrench, install the oil pressure switch.

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

NOTICE:

Do not start the engine for at least 1 hour after installation of the switch.

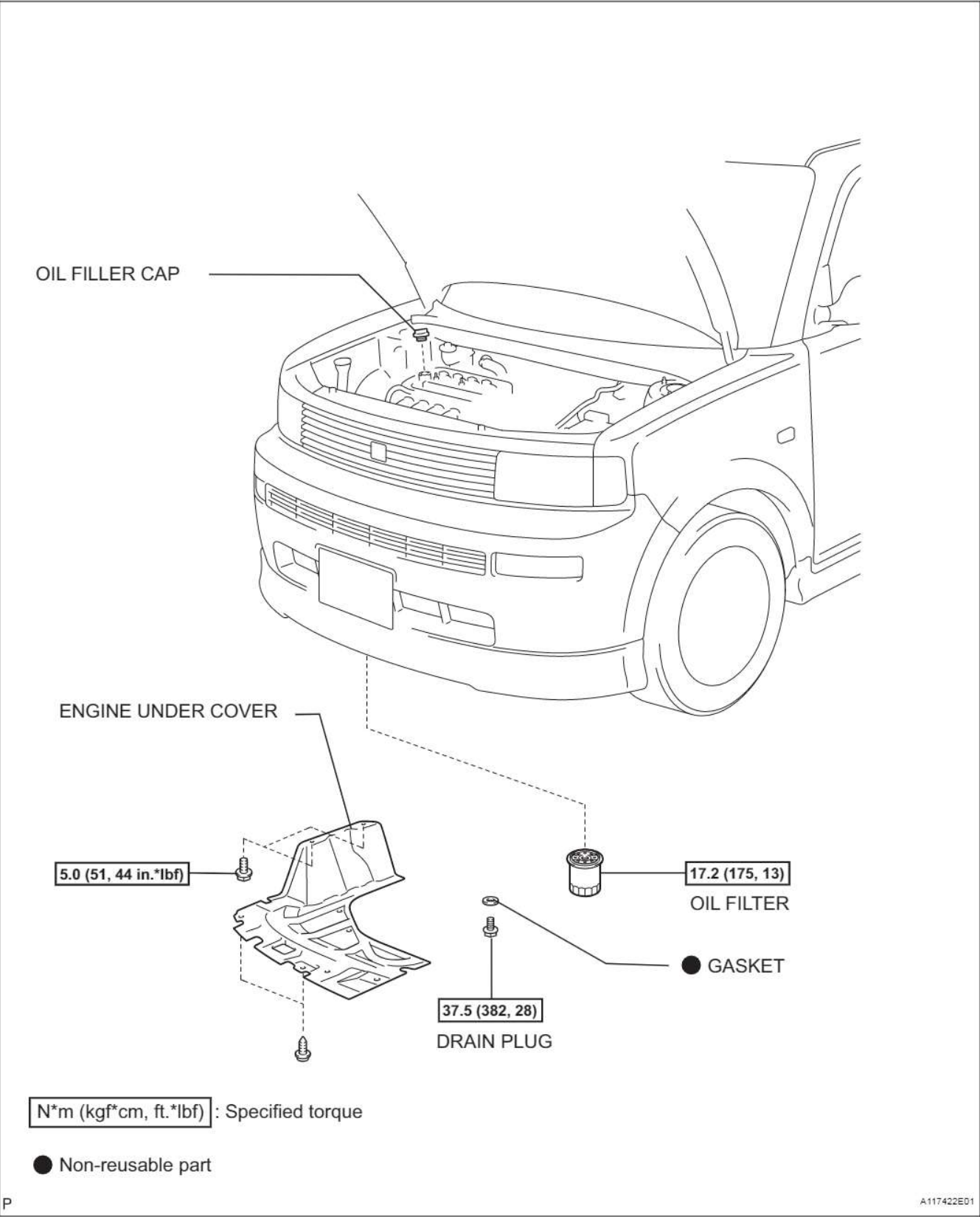
- (c) Connect the oil pressure switch connector.
(d) Start the engine and check for engine oil leaks.



LU-2

1NZ-FE LUBRICATION – OIL FILTER

OIL FILTER
COMPONENTS



REPLACEMENT

CAUTION:

- Prolonged and repeated contact with mineral oil will result in the loss of natural oil from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Wear protective clothing and gloves. Avoid contact with used oil. If contact occurs, wash the area thoroughly with soap and waterless hand cleaner. Never use gasoline, thinners, or solvents to wash the skin.
- In order to protect the environment, dispose of used oil and used oil filters at designated disposal sites only.

1. DRAIN ENGINE OIL

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

2. REMOVE OIL FILTER

- (a) Using SST, remove the oil filter.
SST 09228-06501

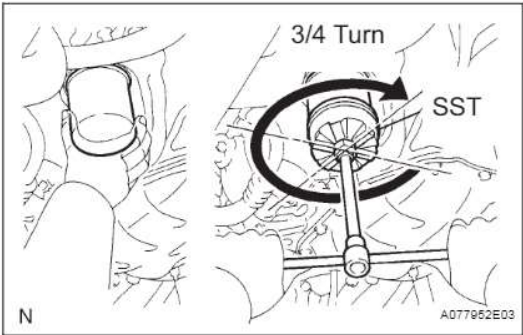
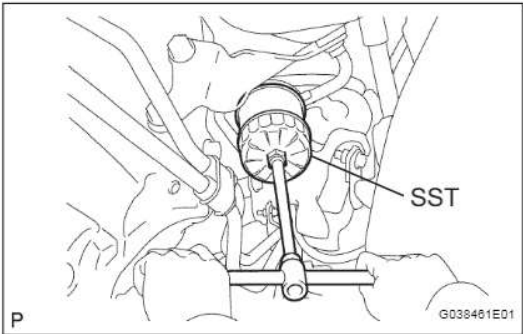
3. INSTALL OIL FILTER

- (a) Check and clean the oil filter installation surface.
- (b) Apply clean engine oil to the gasket of a new oil filter.
- (c) Lightly screw the oil filter into place by hand. Tighten it until the gasket contacts the seat.
- (d) Using SST, tighten the oil filter.
SST 09228-06501
 - (1) Depending on the work space available, choose from the following.
If enough space is available, use a torque wrench to tighten the oil filter.
Torque: 17.2 N*m (175 kgf*cm, 13 ft.*lbf)
If enough space is not available to use a torque wrench, tighten the oil filter a 3/4 turn by hand or use a common wrench.

4. ADD ENGINE OIL

- (a) Clean and install the oil drain plug with a new gasket.
Torque: 37.5 N*m (382 kgf*cm, 28 ft.*lbf)
- (b) Add fresh engine oil.
Standard capacity

Item	Specified Condition
Drain and refill with oil filter change	3.7 liters (3.9 US qts, 3.3 Imp. qts)
Drain and refill without oil filter change	3.4 liters (3.6 US qts, 3.0 Imp. qts)



LU-4

1NZ-FE LUBRICATION – OIL FILTER

Item	Specified Condition
Dry fill	4.1 liters (4.3 US qts, 3.6 Imp. qts)

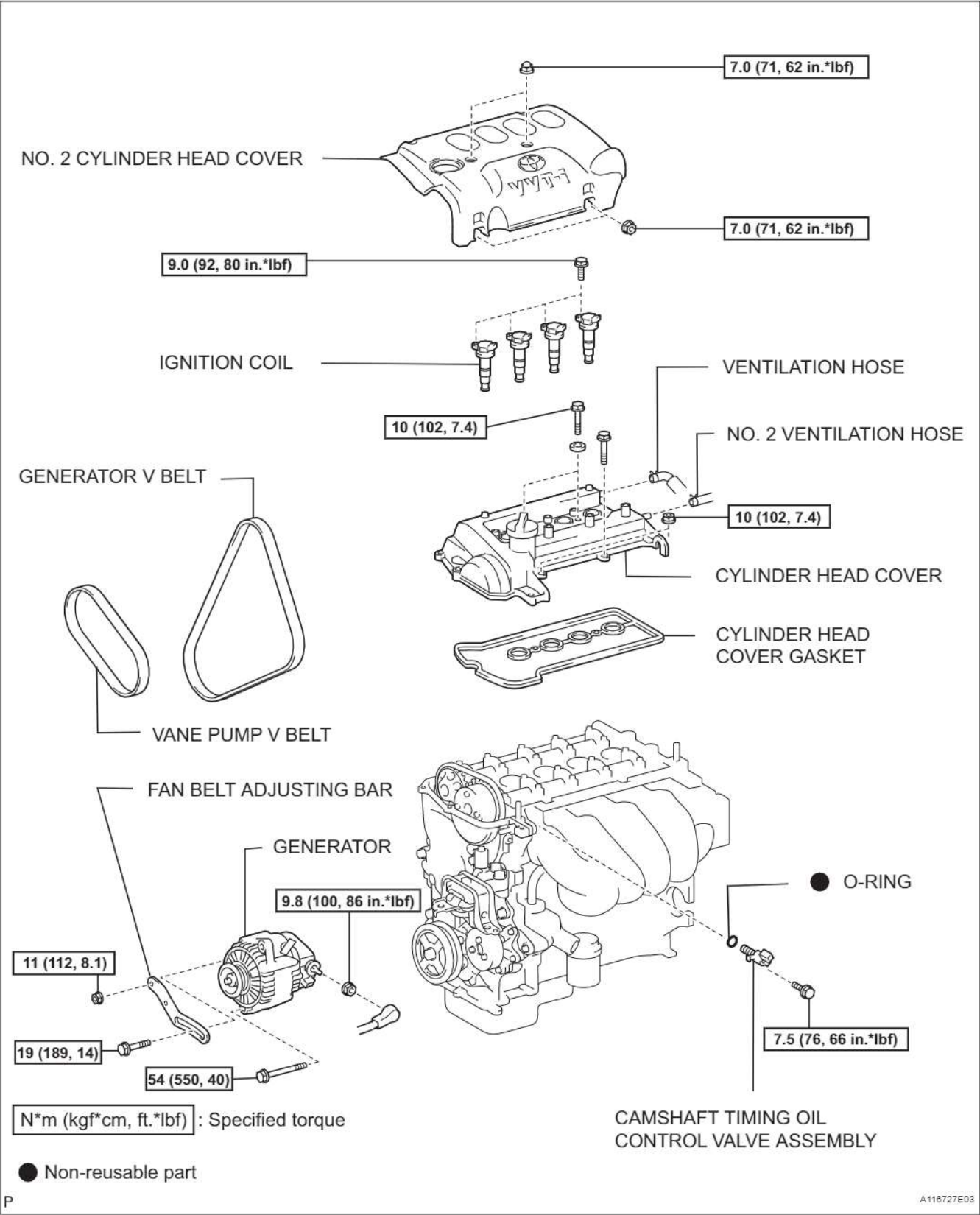
(c) Install the oil filler cap.

5. CHECK FOR ENGINE OIL LEAKS

LU

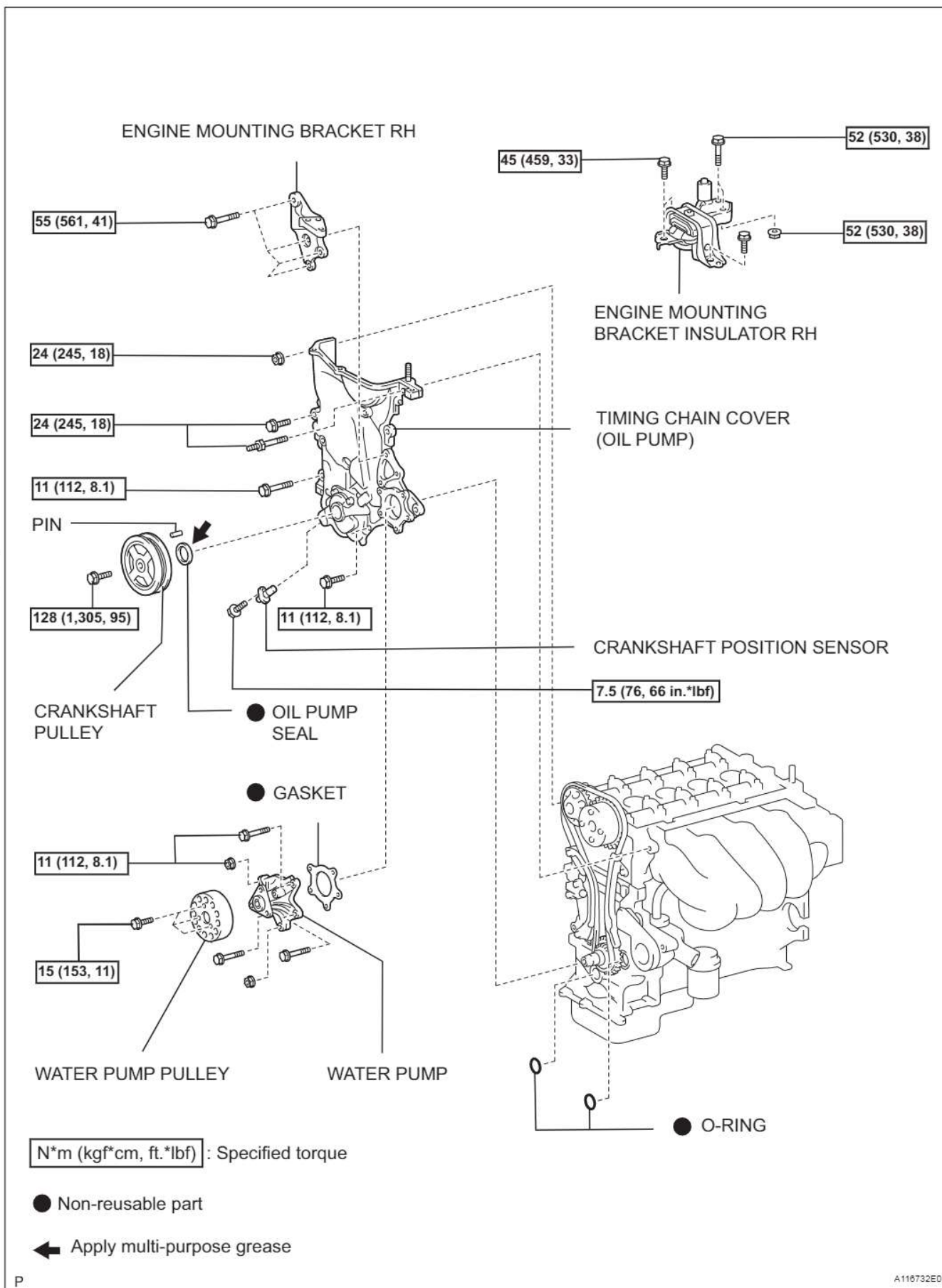
1NZ-FE LUBRICATION – OIL PUMP

OIL PUMP
COMPONENTS



LU-6

1NZ-FE LUBRICATION - OIL PUMP



1NZ-FE LUBRICATION – OIL PUMP

LU-7

TIMING CHAIN COVER
(OIL PUMP BODY)

OIL PUMP DRIVEN ROTOR

OIL PUMP DRIVE ROTOR

10 (102, 7.6)

OIL PUMP COVER

8.8 (90, 78 in.*lbf)

OIL PUMP RELIEF VALVE

OIL PUMP RELIEF VALVE SPRING

25 (255, 18)

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

Y

A116724E01