

LU-10

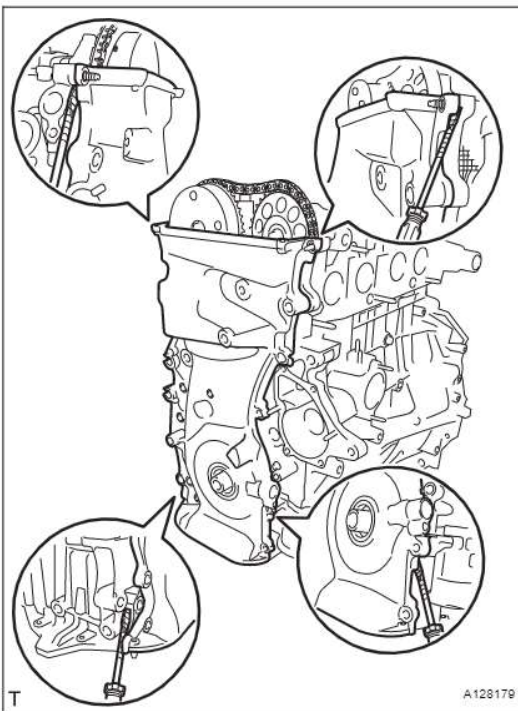
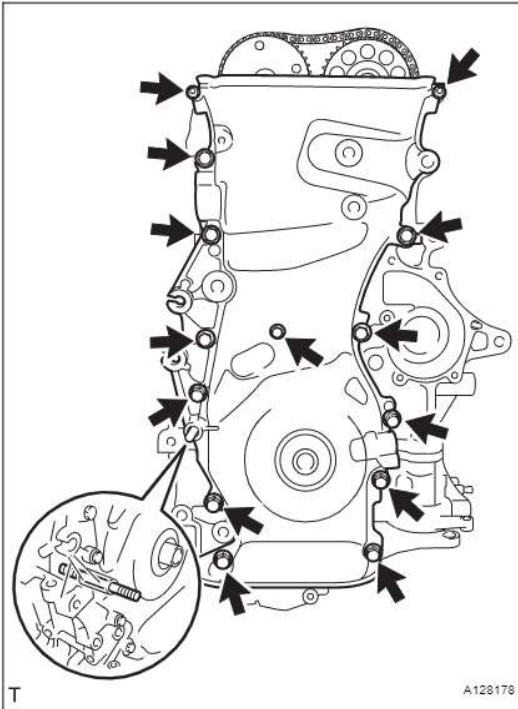
2AZ-FXE LUBRICATION – OIL PUMP

REMOVAL

1. REMOVE LUGGAGE TRIM SERVICE HOLE COVER
(See page [HB-86](#))
2. DISCONNECT CABLE FROM NEGATIVE BATTERY
TERMINAL (See page [HV-560](#))
3. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY
(See page [EM-90](#))
4. REMOVE FRONT WHEEL RH
5. REMOVE ENGINE UNDER COVER LH
6. REMOVE ENGINE UNDER COVER RH
7. REMOVE FRONT FENDER APRON SEAL RH
8. DRAIN ENGINE OIL (See page [LU-4](#))
9. REMOVE FRONT EXHAUST PIPE ASSEMBLY
(See page [EX-2](#))
10. REMOVE NO. 2 ENGINE MOUNTING STAY RH (See
page [EM-91](#))
11. REMOVE ENGINE MOVING CONTROL ROD SUB-
ASSEMBLY (See page [EM-91](#))
12. REMOVE NO. 2 ENGINE MOUNTING BRACKET RH
(See page [EM-91](#))
13. REMOVE V-RIBBED BELT TENSIONER COVER SUB-
ASSEMBLY (See page [EM-6](#))
14. REMOVE V-RIBBED BELT (See page [EM-6](#))
15. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY
(See page [EM-100](#))
16. REMOVE IDLER PULLEY BRACKET (See page [EM-
100](#))
17. REMOVE IGNITION COIL ASSEMBLY (See page [EM-
100](#))
18. DISCONNECT VENTILATION HOSE
19. DISCONNECT NO. 2 VENTILATION HOSE
20. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY
(See page [EM-22](#))
21. SET NO. 1 CYLINDER TO TDC/COMPRESSION (See
page [EM-8](#))
22. REMOVE CRANKSHAFT PULLEY (See page [EM-74](#))
23. REMOVE CRANK POSITION SENSOR (See page [ES-
388](#))
24. REMOVE OIL PAN SUB-ASSEMBLY (See page [EM-
22](#))
25. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY (See
page [EM-23](#))

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26. INSTALL ENGINE HANGERS (See page EM-23)
27. REMOVE ENGINE MOUNTING INSULATOR (See page EM-23)
28. REMOVE ENGINE MOUNTING BRACKET RH (See page EM-23)
29. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY
 - (a) Using an E10 "TORX" socket, remove the stud bolt for the drive belt tensioner from the cylinder block.
 - (b) Remove the 12 bolts and 2 nuts.



- (c) 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.

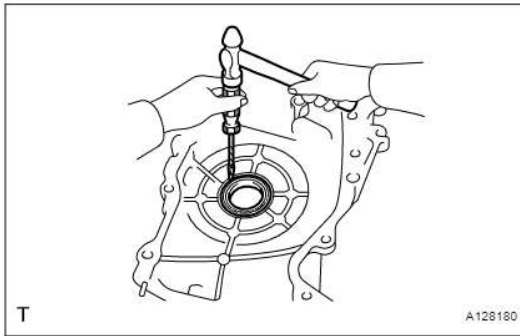
HINT:

Tape the screwdriver tip before use.

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**30. REMOVE TIMING CHAIN CASE OIL SEAL**

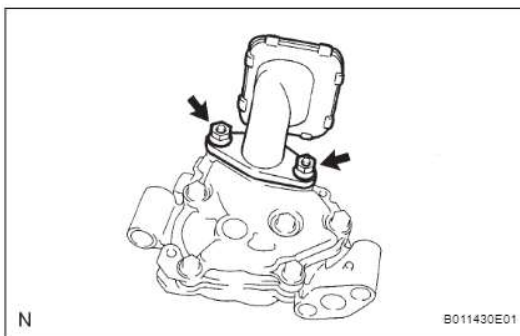
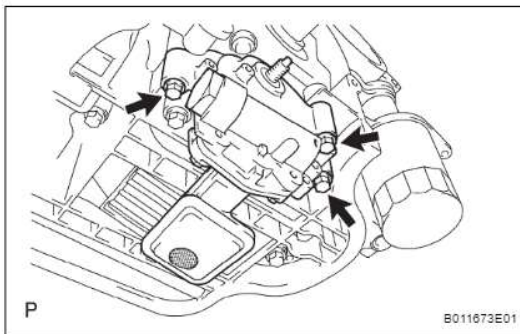
- (a) Using a screwdriver and a hammer, tap out the oil seal.

HINT:

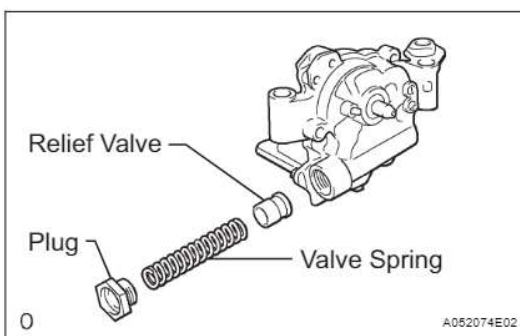
Tape the screwdriver tip before use.

31. REMOVE NO. 1 CRANKSHAFT POSITION SENSOR PLATE (See page EM-24)**32. REMOVE CHAIN TENSIONER SLIPPER (See page EM-24)****33. REMOVE NO. 1 CHAIN VIBRATION DAMPER (See page EM-24)****34. REMOVE TIMING CHAIN GUIDE (See page EM-24)****35. REMOVE CHAIN SUB-ASSEMBLY (See page EM-24)****36. REMOVE CRANKSHAFT TIMING SPROCKET (See page EM-25)****37. REMOVE NO. 2 CHAIN SUB-ASSEMBLY (See page EM-25)****38. REMOVE OIL PUMP ASSEMBLY**

- (a) Remove the 3 bolts, oil pump and gasket.

**DISASSEMBLY****1. REMOVE OIL PUMP STRAINER**

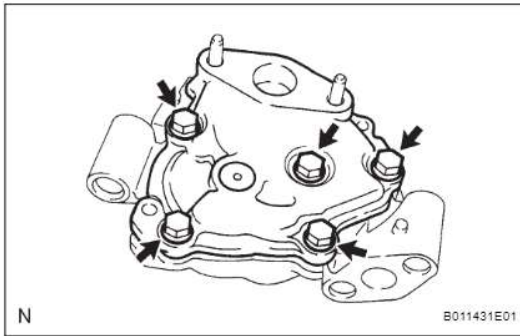
- (a) Remove the 2 nuts, oil pump strainer and gasket.

**2. REMOVE OIL PUMP RELIEF VALVE**

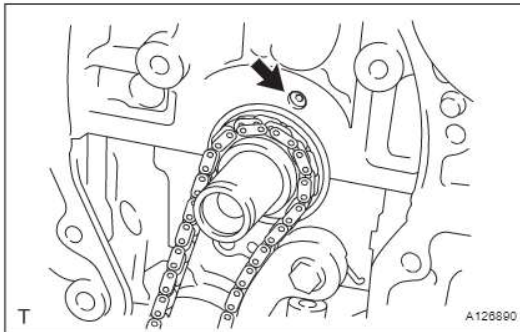
- (a) Using a 27 mm socket wrench, remove the plug.
(b) Remove the valve spring and relief valve.

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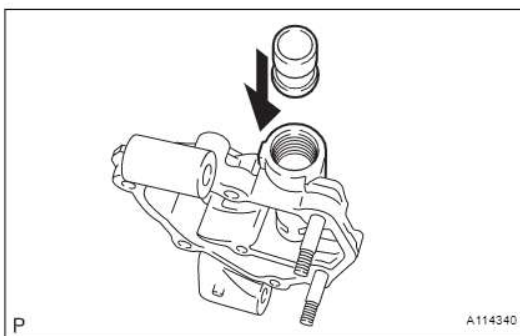
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**3. REMOVE OIL PUMP COVER**

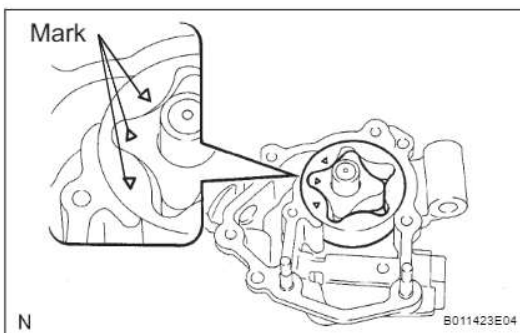
- (a) Remove the 5 bolts and oil pump cover.
- (b) Remove the oil pump rotor.

**INSPECTION****1. INSPECT OIL JET**

- (a) Check the oil jet for damage or clogging. If necessary, repair the cylinder block.

**2. INSPECT OIL PUMP RELIEF VALVE**

- (a) Check the relief valve.
 - (1) Coat the valve with engine oil, and then check that the valve falls smoothly into the valve hole under its own weight. If the valve does not fall smoothly, replace the relief valve. If necessary, replace the oil pump assembly.

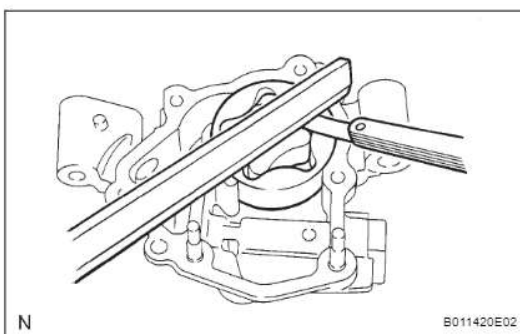
**3. INSPECT OIL PUMP ROTOR**

- (a) Install the oil pump rotor.
 - (1) Coat the drive rotor and driven rotor with engine oil.
 - (2) Place the drive and driven rotors into the oil pump with the marks facing the pump cover side.
- (b) Check the side clearance.
 - (1) Using a feeler gauge and precision straightedge, measure the clearance between the rotors and precision straightedge.

Standard clearance:
0.030 to 0.085 mm (0.0012 to 0.0033 in.)

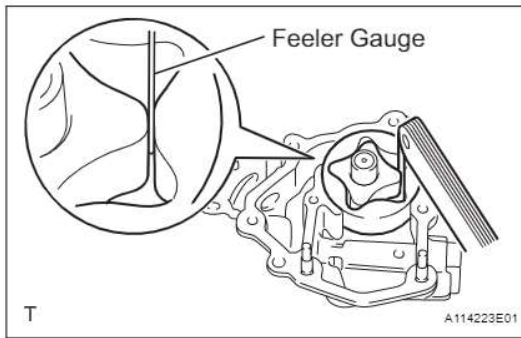
Maximum clearance:
0.16 mm (0.0063 in.)

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

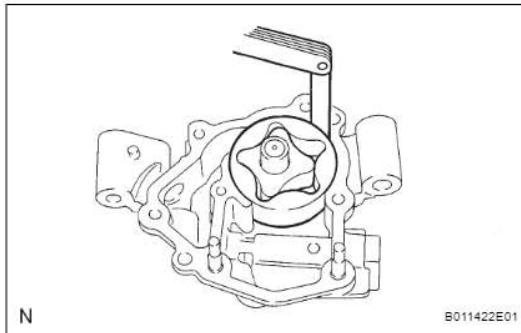


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- (c) Check the tip clearance.
- (1) Using a feeler gauge, measure the clearance between the drive and driven rotor tips.
Standard clearance:
 0.080 to 0.160 mm (0.0031 to 0.0063 in.)
Maximum clearance:
 0.35 mm (0.0138 in.)
 If the tip clearance is greater than the maximum, replace the oil pump assembly.

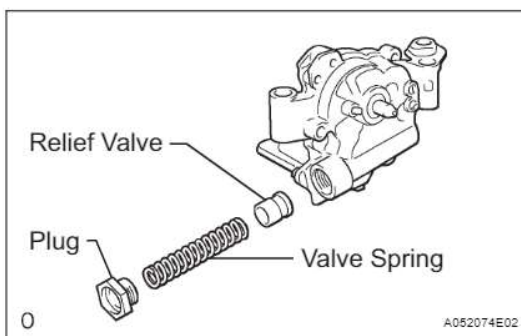
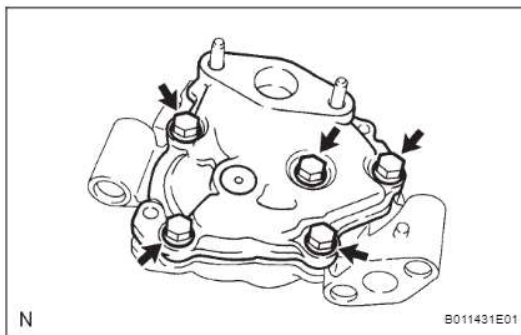


- (d) Check the body clearance.
- (1) Using a feeler gauge, measure the clearance between the driven rotor and pump body.
Standard clearance:
 0.100 to 0.170 mm (0.0039 to 0.0067 in.)
Maximum clearance:
 0.325 mm (0.0128 in.)
 If the body clearance is greater than the maximum, replace the oil pump assembly.

4. **INSPECT NO. 2 CHAIN SUB-ASSEMBLY** (See page [EM-131](#))
5. **INSPECT OIL PUMP DRIVE GEAR** (See page [EM-131](#))
6. **INSPECT OIL PUMP DRIVE SHAFT GEAR** (See page [EM-132](#))
7. **INSPECT CHAIN TENSIONER PLATE** (See page [EM-133](#))

REASSEMBLY

1. **INSTALL OIL PUMP COVER**
 - (a) Install the oil pump cover with the 5 bolts.
Torque: 8.8 N*m (90 kgf*cm, 78 in.*lbf)
2. **INSTALL OIL PUMP RELIEF VALVE**
 - (a) Coat the relief valve with engine oil.

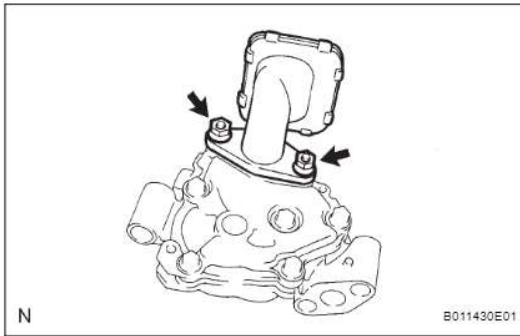


- (b) Insert the relief valve and spring into the pump body hole.
- (c) Using a 27 mm socket wrench, install the plug.
Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)

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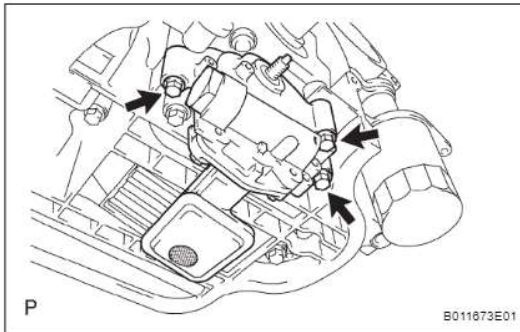
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**3. INSTALL OIL PUMP STRAINER**

- (a) Install a new gasket and the oil pump strainer with the 2 nuts.

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

**INSTALLATION****1. INSTALL OIL PUMP ASSEMBLY**

- (a) Install a new gasket and the oil pump with the 3 bolts.

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

2. INSTALL NO. 2 CHAIN SUB-ASSEMBLY (See page EM-26)**3. INSTALL CRANKSHAFT TIMING SPROCKET (See page EM-27)****4. INSTALL NO. 1 CHAIN VIBRATION DAMPER (See page EM-28)****5. INSTALL CHAIN SUB-ASSEMBLY (See page EM-28)****6. INSTALL CHAIN TENSIONER SLIPPER (See page EM-29)****7. INSTALL TIMING CHAIN GUIDE (See page EM-29)****8. INSTALL NO. 1 CRANKSHAFT POSITION SENSOR PLATE (See page EM-29)****9. INSTALL TIMING CHAIN CASE OIL SEAL**

- (a) Using SST, tap in a new oil seal until its surface is flush with the timing chain cover edge.

SST 09223-22010

- (b) Apply a light coat of MP grease to the lip of the oil seal.

NOTICE:

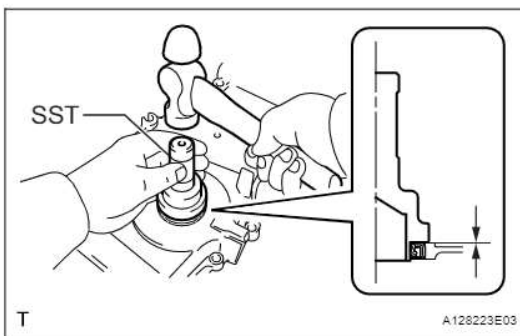
- Keep the lip free of foreign matter.
- Do not tap on the oil seal at an angle.
- Make sure that the oil seal does not stick out of the timing chain cover.

NOTICE:

Keep the gap between the timing chain cover edge and the oil seal free of foreign matter.

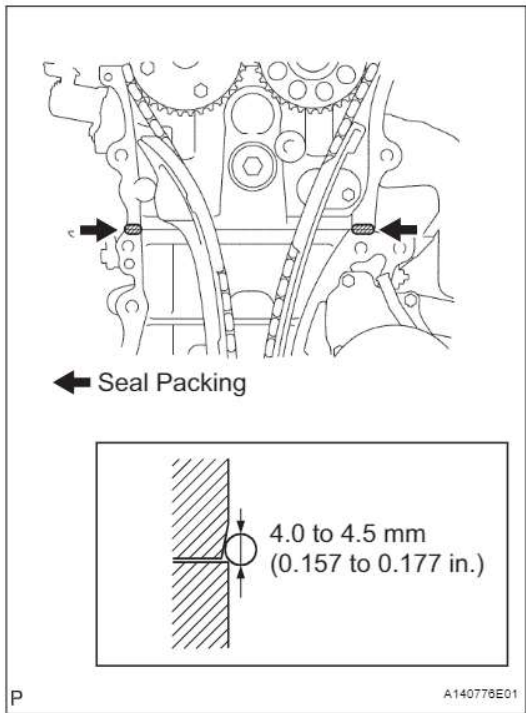
10. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY

- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the timing chain cover, cylinder head and cylinder block.

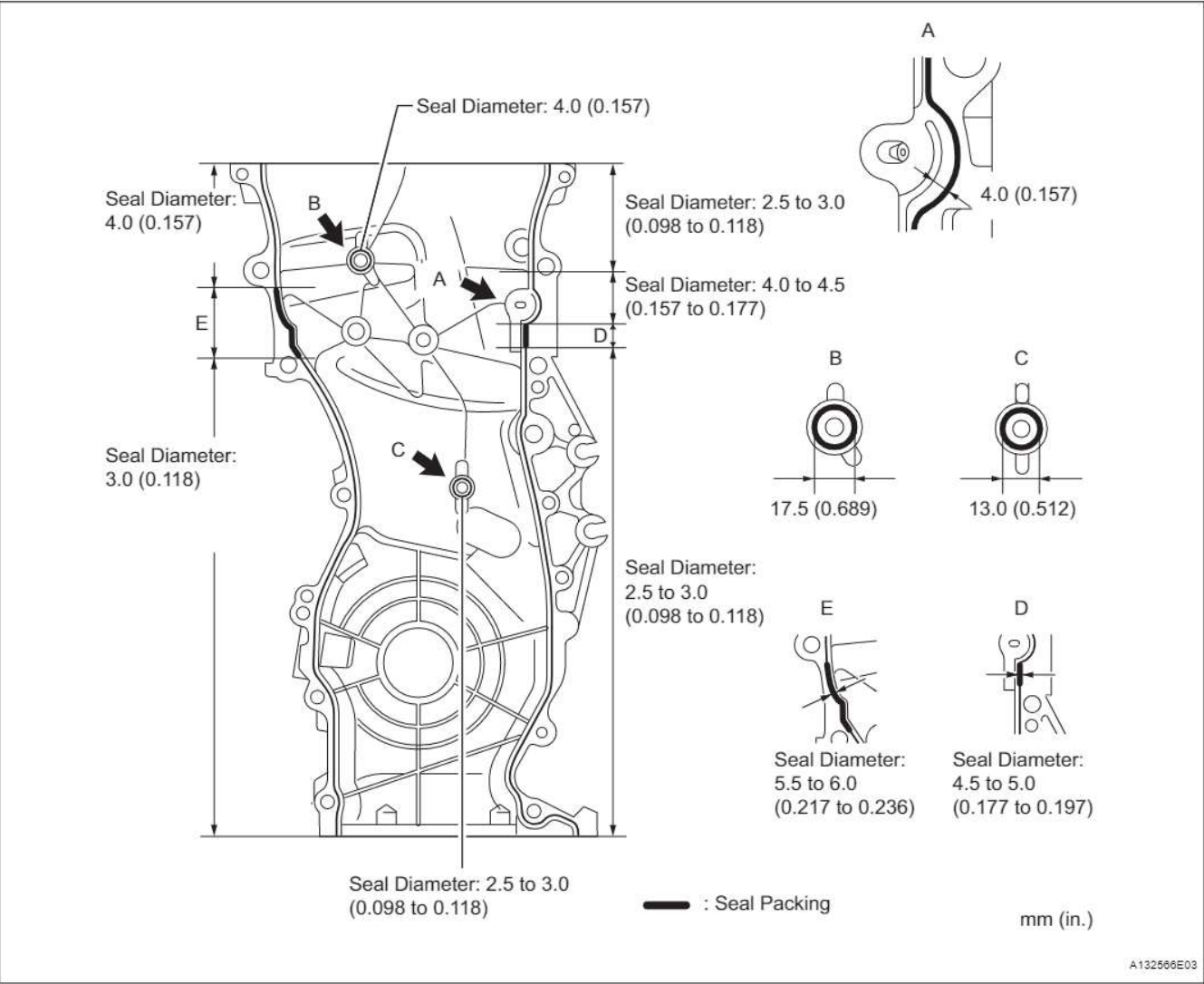


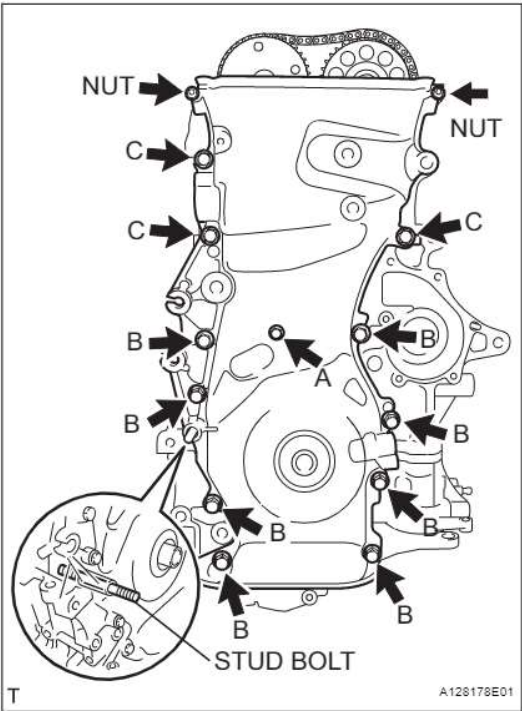
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- (b) Apply seal packing (diameter: 4.0 to 4.5 mm (0.157 to 0.177 in.)) as shown in the illustration.
- Seal packing:**
Toyota Genuine Seal Packing Black, Three Bond 1207B or Equivalent
- (c) Apply seal packing in a continuous bead as shown in the illustration.





- Seal packing:**
Toyota Genuine Seal Packing Black, Three Bond 1207B or Equivalent
- NOTICE:**
- Remove any oil from the contact surface.
 - Install the chain cover within 3 minutes after applying seal packing.
 - Do not start the engine for at least 2 hours after installing the timing chain cover.

(d) Install the timing chain cover with the 12 bolts and 2 nuts.

- Torque:** Bolt A
9.0 N*m (92 kgf*cm, 80 in.*lbf)
Bolt B
25 N*m (255 kgf*cm, 18 ft.*lbf)
Bolt C
55 N*m (561 kgf*cm, 41 ft.*lbf)
Nut
11 N*m (112 kgf*cm, 8 ft.*lbf)

Bolt length

Item	Length
Bolt A	30 mm (1.18 in.) length for 10 mm head
Bolt B	30 mm (1.18 in.) length for 12 mm head
Bolt C	40 mm (1.57 in.) length for 14 mm head

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(e) Using an E10 "TORX" socket, install the stud bolt to the drive belt tensioner.

- Torque:** 22 N*m (220 kgf*cm, 16 ft.*lbf)

11. INSTALL ENGINE MOUNTING BRACKET RH (See page EM-30)
12. INSTALL ENGINE MOUNTING INSULATOR (See page EM-30)
13. INSTALL OIL PAN SUB-ASSEMBLY (See page EM-30)
14. INSTALL CRANK POSITION SENSOR (See page ES-389)
15. INSTALL CRANKSHAFT PULLEY (See page EM-75)
16. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY (See page EM-31)
17. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY (See page EM-32)
18. INSTALL NO. 2 VENTILATION HOSE
19. INSTALL VENTILATION HOSE
20. INSTALL IGNITION COIL ASSEMBLY (See page EM-32)
21. INSTALL IDLER PULLEY BRACKET (See page EM-103)
22. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY (See page EM-103)

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23. INSTALL V-RIBBED BELT (See page [EM-6](#))
24. INSTALL V-RIBBED BELT TENSIONER COVER SUB-ASSEMBLY (See page [EM-7](#))
25. INSTALL NO. 2 ENGINE MOUNTING BRACKET RH (See page [EM-112](#))
26. INSTALL ENGINE MOVING CONTROL ROD SUB-ASSEMBLY (See page [EM-112](#))
27. INSTALL NO. 2 ENGINE MOUNTING STAY RH (See page [EM-112](#))
28. INSTALL FRONT EXHAUST PIPE ASSEMBLY (See page [EX-3](#))
29. ADD ENGINE OIL (See page [LU-4](#))
30. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL (See page [EM-113](#))
31. INSTALL LUGGAGE TRIM SERVICE HOLE COVER (See page [HB-98](#))
32. CHECK FOR ENGINE OIL LEAKS
33. CHECK FOR EXHAUST GAS LEAKS
34. CHECK IGNITION TIMING (See page [EM-1](#))
35. INSTALL FRONT FENDER APRON SEAL RH
36. INSTALL ENGINE UNDER COVER LH
37. INSTALL ENGINE UNDER COVER RH
38. INSTALL FRONT WHEEL RH (See page [EM-113](#))
39. INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY (See page [EM-114](#))
40. PERFORM INITIALIZATION
 - (a) Perform initialization procedure (See page [IN-43](#)).
HINT:
Some vehicle systems require initialization after reconnecting the cable to the negative battery terminal.

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LUBRICATION SYSTEM

ON-VEHICLE INSPECTION

1. CHECK ENGINE OIL LEVEL

- (a) Warm up the engine, stop the engine and wait for 5 minutes.
- (b) Check that the engine oil level is between the L and F marks of the oil dipstick.
If low, check for leakage and add oil up to the F mark.

NOTICE:
Do not add engine oil above the F 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-20 and SAE 0W-20 engine oil may be used.
However, SAE 0W-20 is the best choice for good fuel economy and good starting in cold weather.

3. CHECK OIL PRESSURE

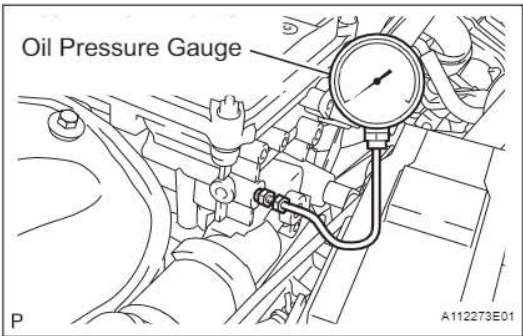
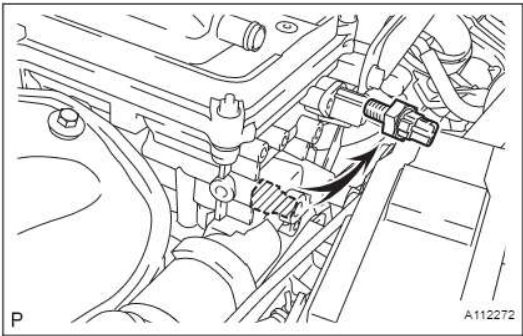
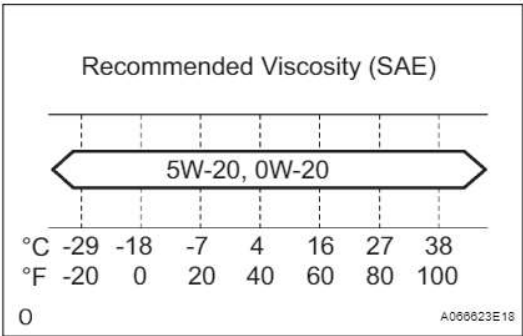
- (a) Set the vehicle to inspection mode (See page IN-5).
- (b) Warm up and stop the engine.
- (c) Disconnect the oil pressure switch connector.
- (d) Using a 24 mm deep socket wrench, remove the oil pressure switch.

- (e) Install the oil pressure gauge.
- (f) Warm up the engine.
- (g) Measure the oil pressure.

Standard oil pressure

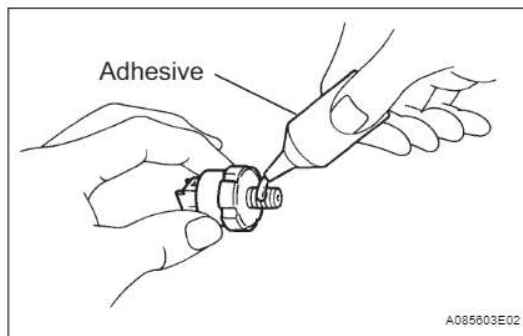
Condition	Specified Condition
Idle	29 kPa (0.3 kgf/cm ² , 4.3 psi) or more
2,500 rpm	145 to 280 kPa (1.5 to 2.9 kgf/cm ² , 18 to 34 psi)

If the oil pressure is not as specified, check the oil pump (See page LU-13).



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2AZ-FXE LUBRICATION – LUBRICATION SYSTEM



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

Adhesive:

Toyota Genuine Adhesive 1344, Three Bond 1344 or Equivalent

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

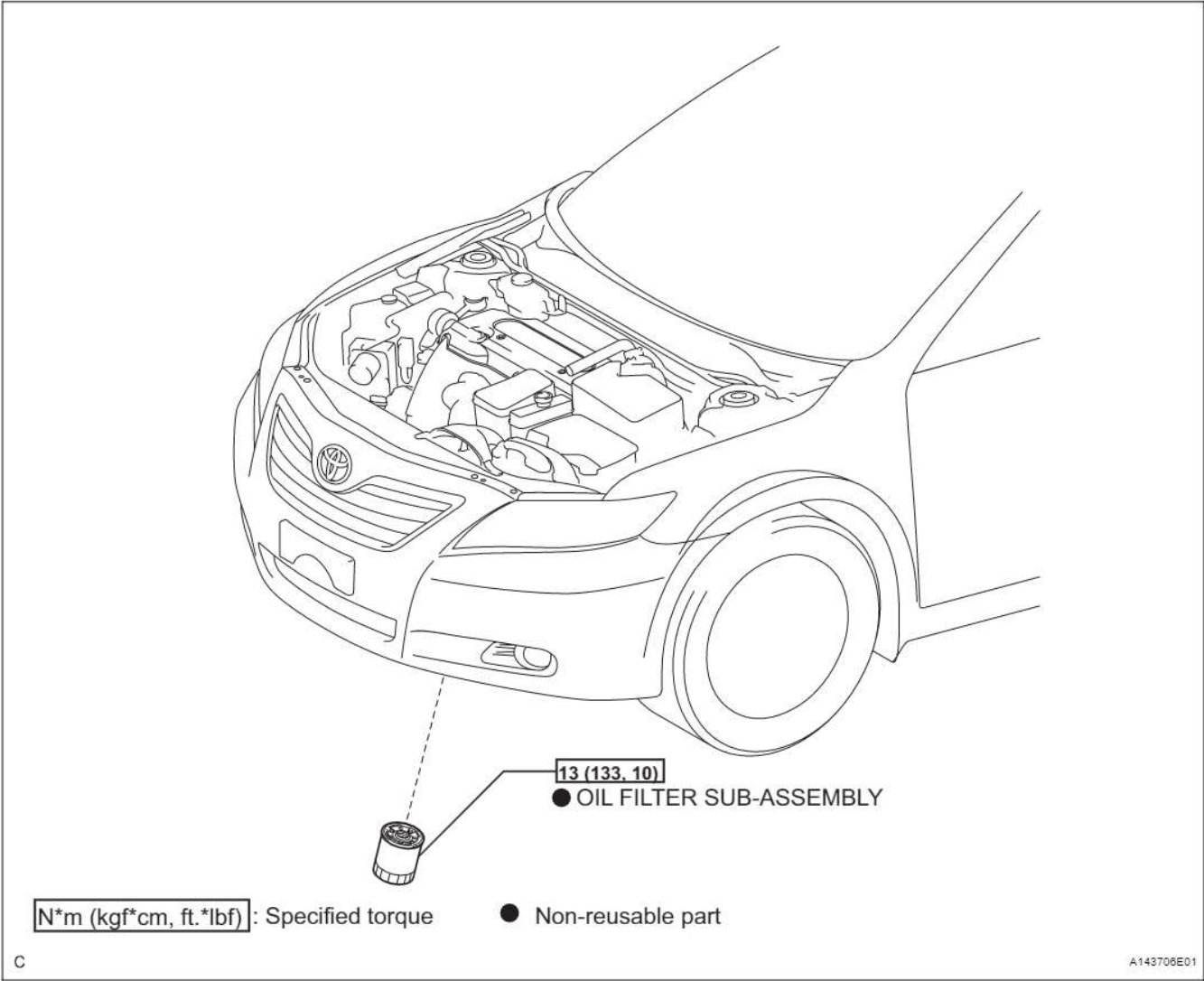
Torque: 15 N*m (153 kgf*cm, 11 ft.*lbf)

NOTICE:

Do not start the engine within 1 hour of installation.

- (j) Connect the oil pressure switch connector.
(k) Check for engine oil leaks.

OIL FILTER
COMPONENTS



LU

REPLACEMENT

CAUTION:

- Prolonged and repeated contact with engine oil will cause the loss 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. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use a 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 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. REMOVE OIL FILTER SUB-ASSEMBLY

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

3. INSTALL OIL FILTER SUB-ASSEMBLY

- (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:
 - 1. If enough space is available, use a torque wrench to tighten the oil filter.

Torque: 13 N*m (133 kgf*cm, 10 ft.*lbf)

- 2. 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.

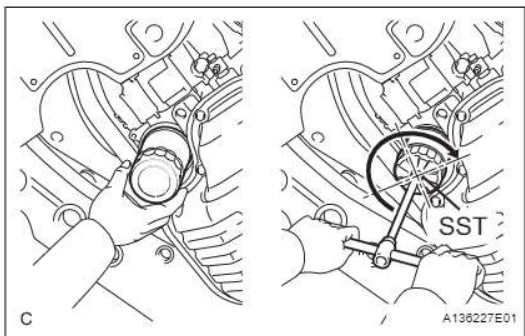
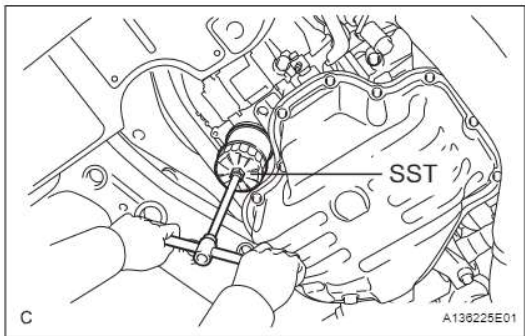
4. ADD ENGINE OIL

- (a) Clean and install the oil drain plug with a new gasket.
Torque: 25 N*m (255 kgf*cm, 18 ft.*lbf)
- (b) Add new oil.

Standard capacity

Item	Standard Condition
Drain and refill with oil filter change	4.3 liters (4.5 US qts, 3.8 Imp. qts)

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2AZ-FXE LUBRICATION – OIL FILTER

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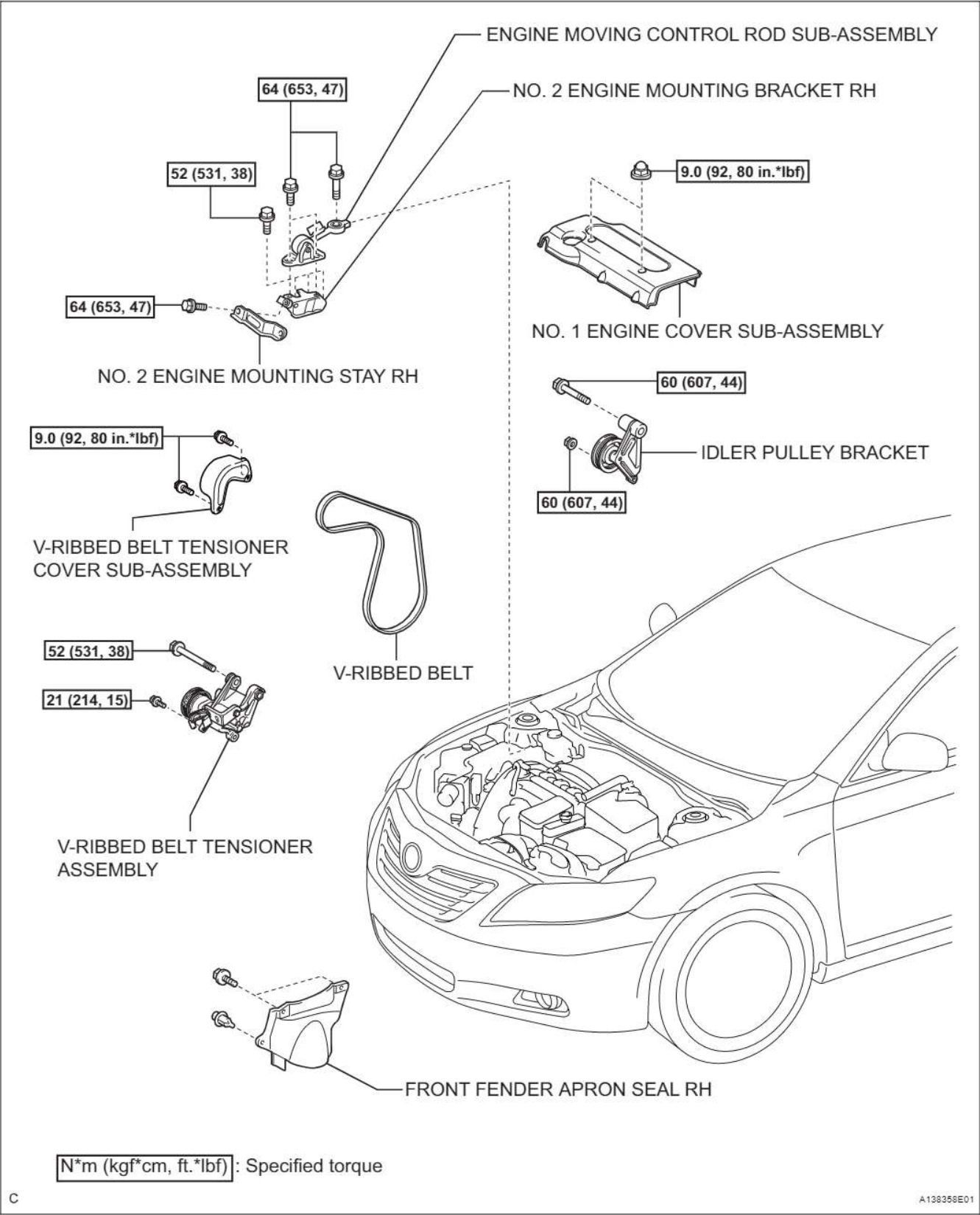
Item	Standard Condition
Drain and refill without oil filter change	4.1 liters (4.3 US qts, 3.6 Imp. qts)
Dry fill	5.0 liters (5.3 US qts, 4.4 Imp. qts)

(c) Install the oil filler cap.

5. CHECK FOR ENGINE OIL LEAKS

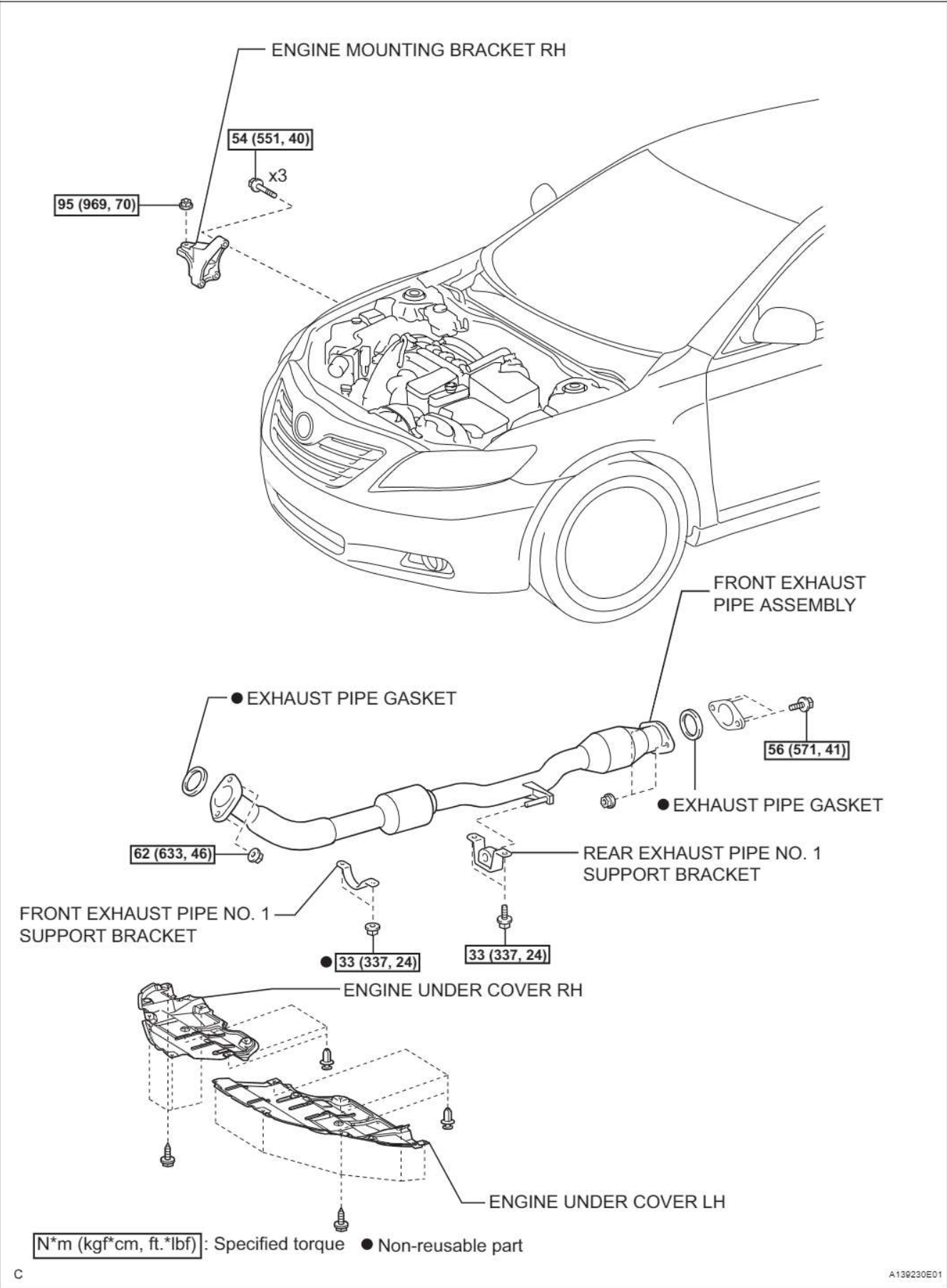
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OIL PUMP
COMPONENTS



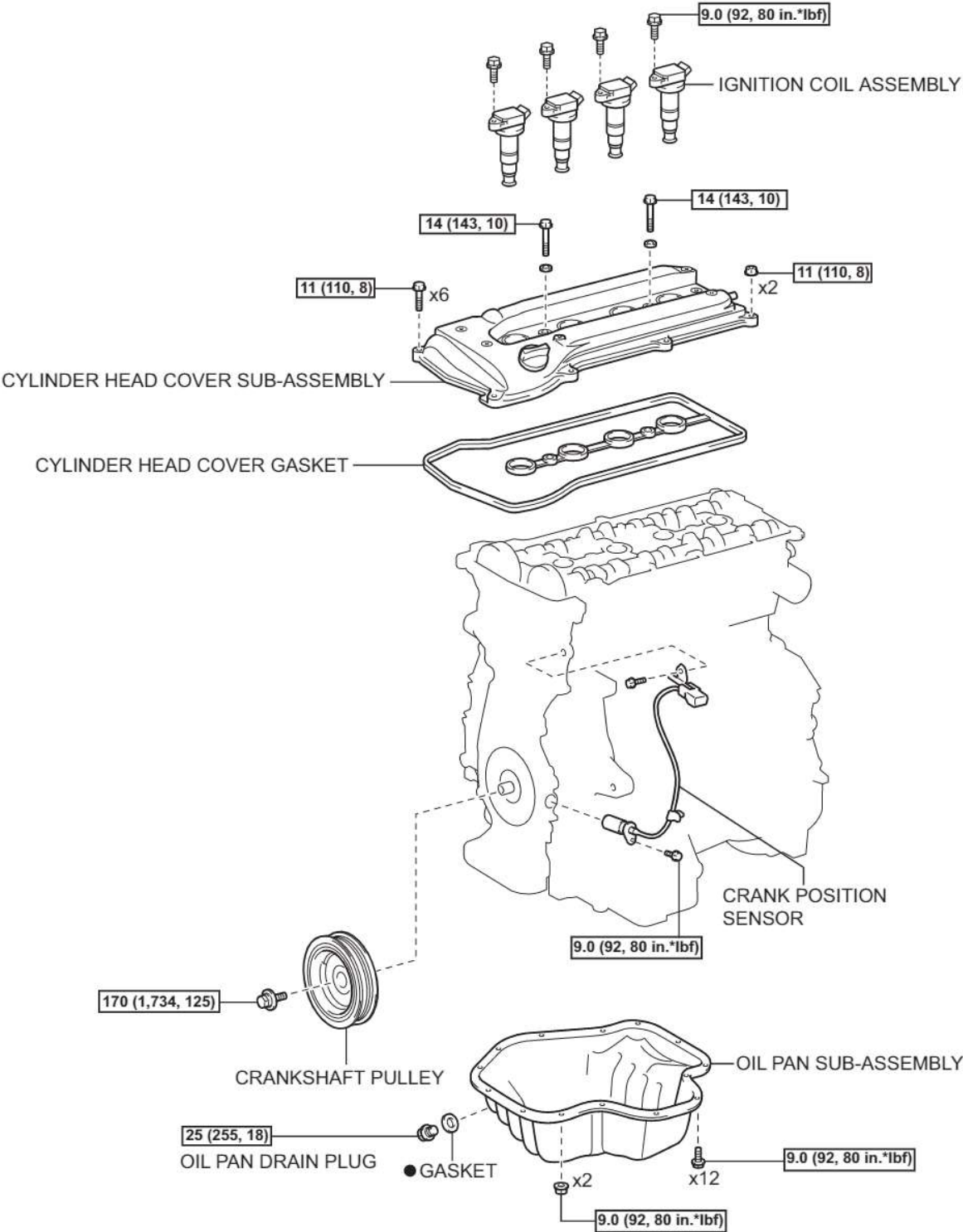
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2AZ-FXE LUBRICATION – OIL PUMP



2AZ-FXE LUBRICATION – OIL PUMP

LU-7

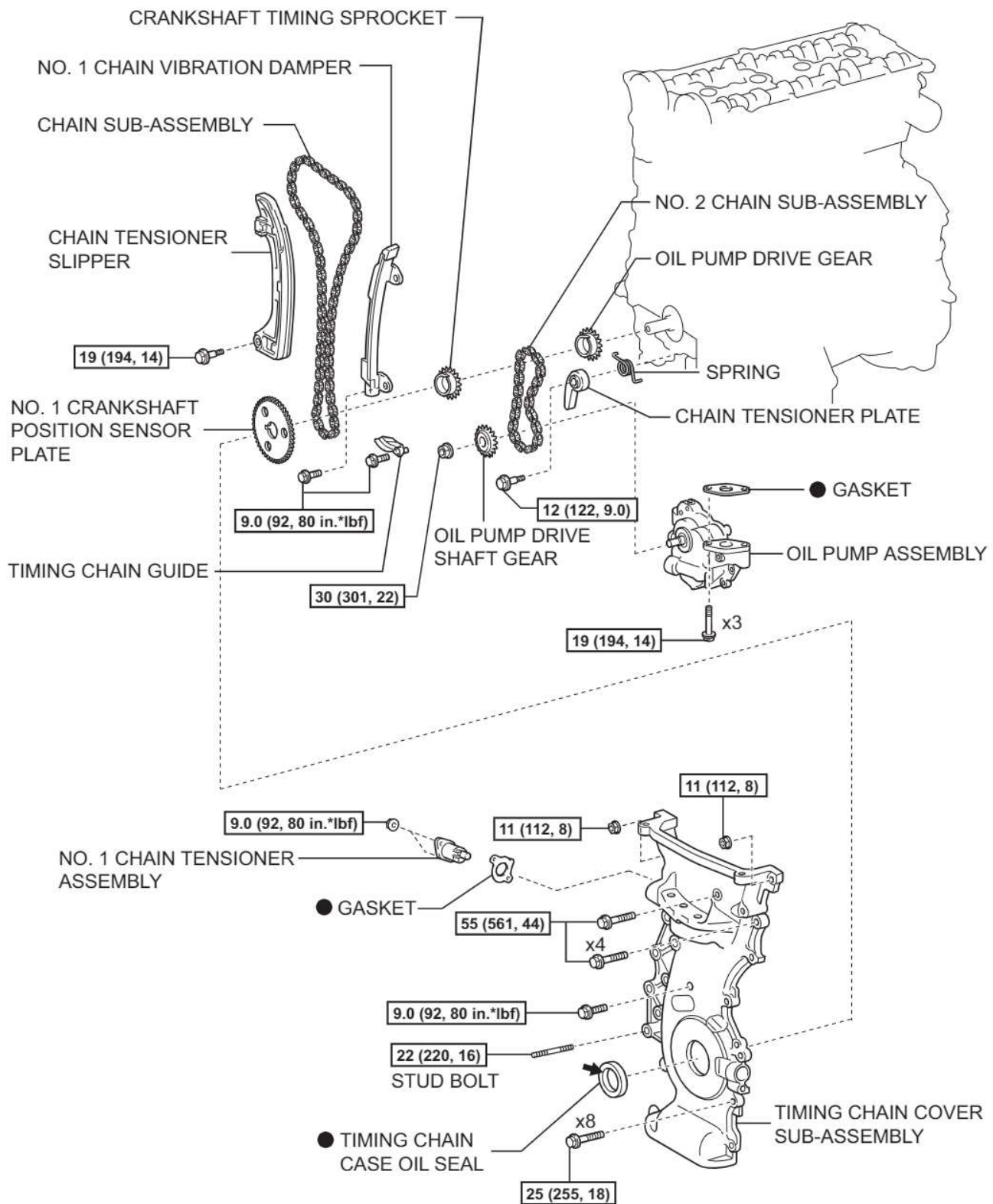


N*m (kgf*cm, ft.*lbf) : Specified torque ● Non-reusable part

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2AZ-FXE LUBRICATION – OIL PUMP



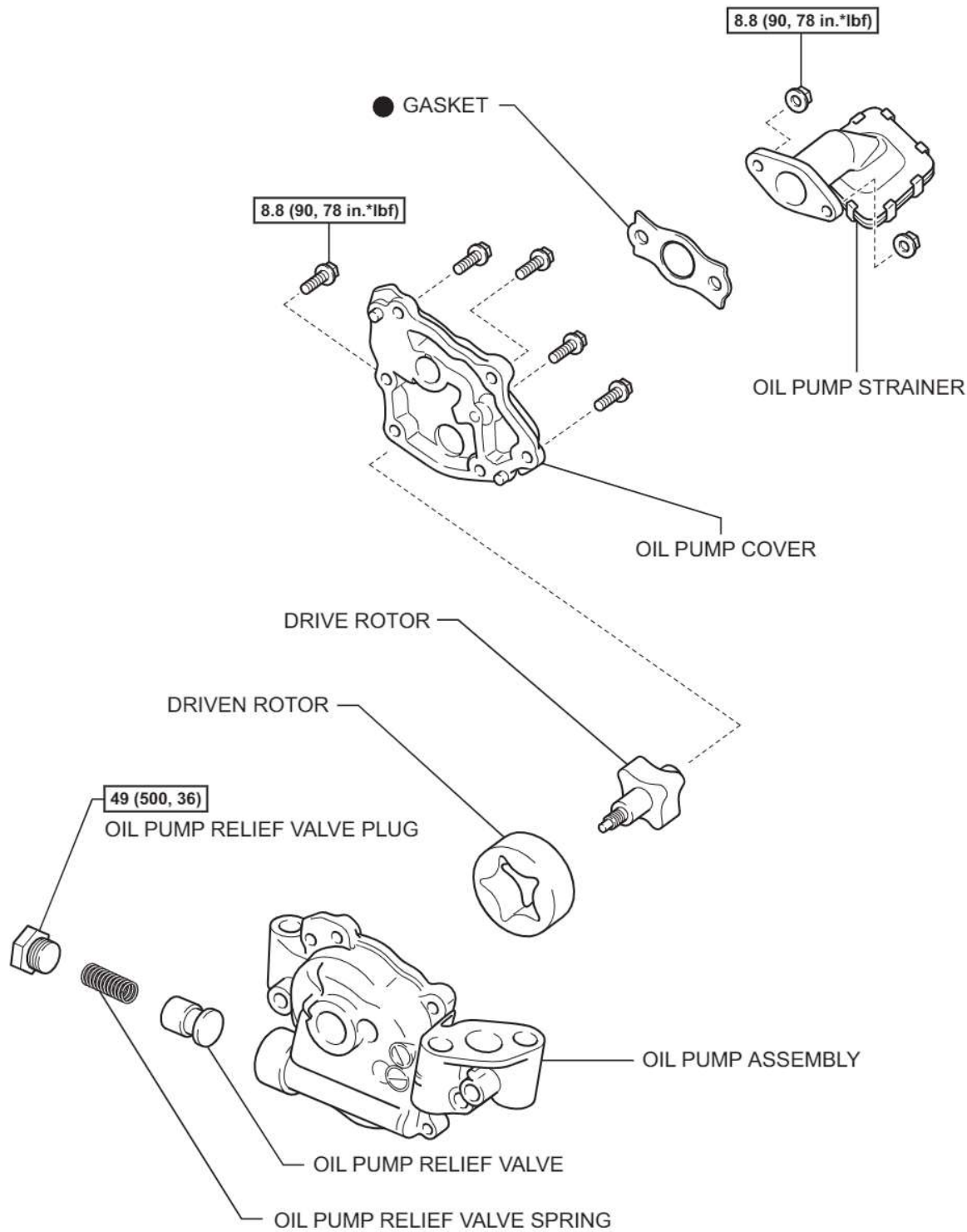
● Non-reusable part

N*m (kgf*cm, ft.*lbf) : Specified torque ← Apply MP grease

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● Non-reusable part

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

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