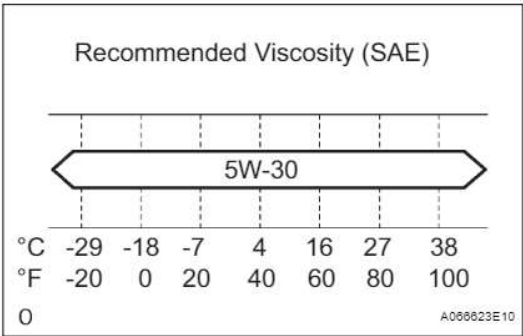


LUBRICATION SYSTEM

ON-VEHICLE INSPECTION

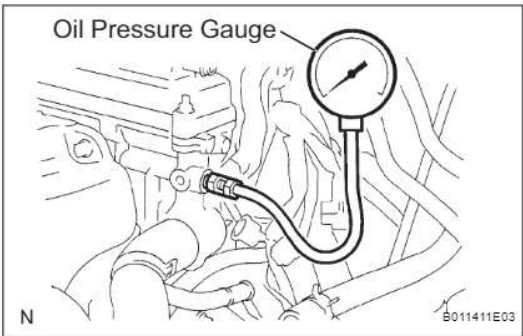
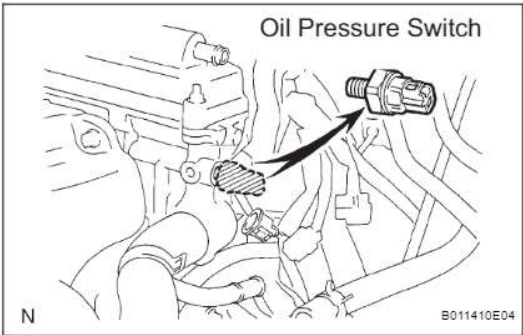
1. CHECK ENGINE OIL LEVEL
- (a) Warm up the engine, stop the engine and wait 5 minutes. The oil level should be between the dipstick's low level mark and full level mark. If the oil level is low, check for leakage and add oil up to the full level mark.

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



2. CHECK ENGINE OIL QUALITY
- (a) Check the oil for deterioration, entry of water, discoloring or thinning. If the quality is visibly poor, replace the oil.
- Oil grade:**
API grade SL, Energy-Conserving or ILSAC, multigrade engine oil is recommended. SAE 5W-30 is the best choice for your vehicle, for good fuel economy, and good starting in cold weather.

3. REMOVE OIL PRESSURE SWITCH
- (a) Disconnect the oil pressure switch connector.
- (b) Remove the oil pressure switch.



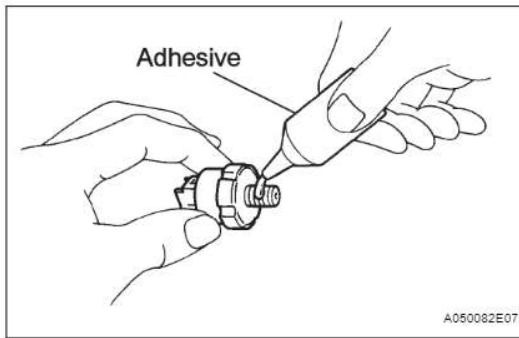
4. INSTALL OIL PRESSURE GAUGE
- (a) Install the oil pressure gage.
5. WARM UP ENGINE
6. CHECK OIL PRESSURE
- (a) Check oil pressure.

Standard

Condition	Specified Condition
Idle	29 kPa (0.3 kgf/cm ² , 4.3 psi) or more
3,000 rpm	245 to 539 kPa (2.5 to 5.5 kgf/cm ² , 36 to 78 psi) or more

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**7. INSTALL OIL PRESSURE SWITCH**

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

Adhesive:

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

- (c) Install the oil pressure switch.

Torque: 15 N*m (152 kgf*cm, 11 ft.*lbf)

NOTICE:

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

- (d) Connect the oil pressure switch connector.

8. START ENGINE AND CHECK FOR ENGINE OIL LEAKS

OIL FILTER

REMOVAL

CAUTION:

- Prolonged and repeated contact of mineral oil with the skin will deplete the skin's natural fats, leading to dryness, irritation and dermatitis. In addition, used engine oil contains harmful contaminants which may cause skin cancer.
- Wear protective clothing and gloves to minimize the length and frequency of contact between the skin and used oil. If contact does occur, wash your skin thoroughly with soap and water or waterless hand cleaner. Do not use gasoline, thinners or solvents to wash the skin.
- In order to preserve the environment, dispose of used oil and used oil filters only at designated disposal sites.

1. DRAIN ENGINE OIL

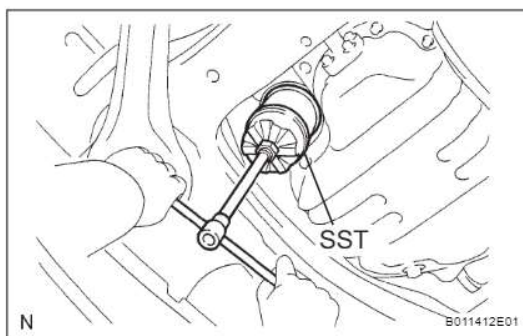
- (a) Remove the oil filler cap.
- (b) Remove the oil drain plug, and drain the oil into a container.

2. REMOVE OIL FILTER SUB-ASSEMBLY

- (a) Place the SST to the oil filter as shown in the illustration.

SST 09228-06501

- (b) Using the SST, remove the oil filter.



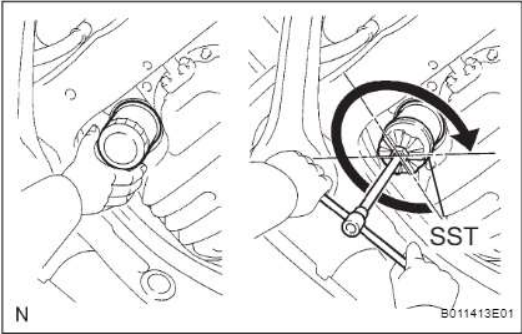
INSTALLATION

1. 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, and tighten it until the gasket contacts the seat.

(d) Using SST, tighten the oil filter an additional 3/4 turn.
- SST 09228-06501



2. 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) Fill with fresh engine oil.
- Standard

Item	Capacity
Drain and refill (w/ oil filter change)	3.8 liters (4.0 US qts, 3.3 Imp. qts)
Drain and refill (w/o oil filter change)	3.6 liters (3.8 US qts, 3.2 Imp. qts)
Dry fill	4.5 liters (4.88 US qts, 4.0 Imp. qts)

- (c) Install the oil filler cap.
3. CHECK FOR ENGINE OIL LEAKS

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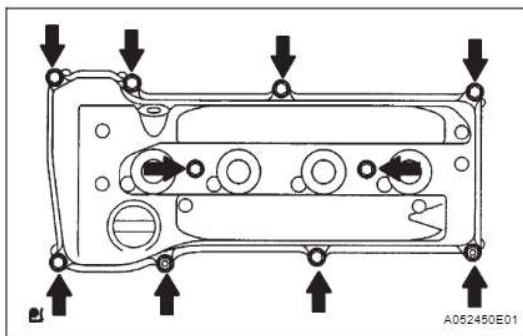
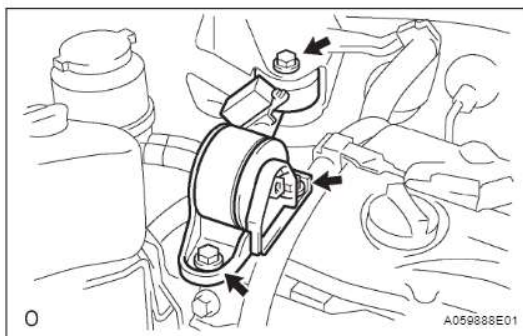
2AZ-FE LUBRICATION – OIL PUMP

REMOVAL

1. REMOVE FRONT WHEEL RH
2. REMOVE ENGINE UNDER COVER LH
3. REMOVE ENGINE UNDER COVER RH
4. REMOVE FRONT FENDER APRON SEAL RH
5. DRAIN ENGINE OIL
 - (a) Install a new gasket and the drain plug after draining engine oil.
Torque: 25 N*m (255 kgf*cm, 18 ft.*lbf)
6. REMOVE FRONT EXHAUST PIPE ASSEMBLY
7. REMOVE ENGINE MOVING CONTROL ROD W/ BRACKET
 - (a) Remove the 3 bolts and control rod.
8. REMOVE ENGINE MOUNTING STAY NO.2 RH
9. REMOVE ENGINE MOUNTING BRACKET NO.2 RH
10. REMOVE FAN AND GENERATOR V BELT (See page [EM-5](#))
11. REMOVE NO.1 ENGINE COVER SUB-ASSEMBLY
12. DISCONNECT ENGINE WIRE
13. REMOVE GENERATOR ASSEMBLY (See page [CH-8](#))
14. REMOVE VANE PUMP ASSEMBLY

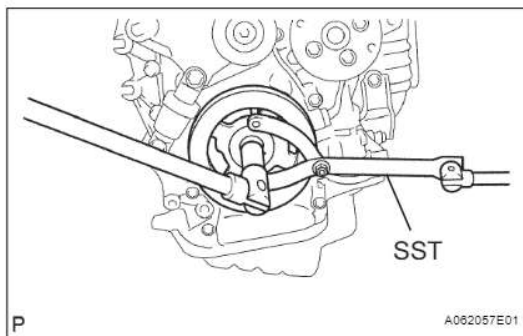
HINT:
See page [PS-8](#)

NOTICE:
Do not disconnect the hose.
15. REMOVE IGNITION COIL ASSEMBLY
16. DISCONNECT VENTILATION HOSE
17. DISCONNECT VENTILATION HOSE NO.2
18. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY
 - (a) Remove the bolt and disconnect the engine wire harness clamp.
 - (b) Remove the 8 bolts and 2 nuts, and disconnect the cylinder head cover.
19. SET NO.1 CYLINDER TO TDC/COMPRESSION (See page [EM-7](#))

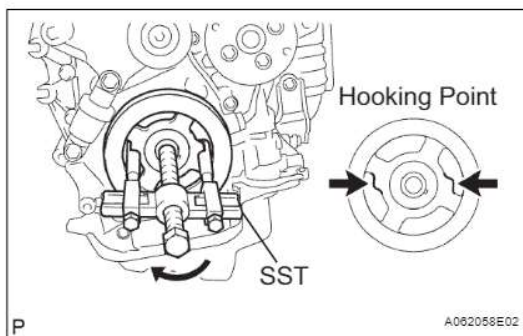


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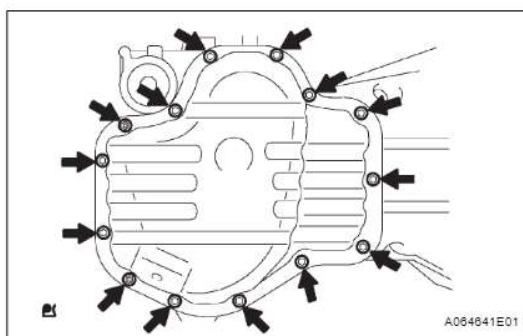
2AZ-FE LUBRICATION – OIL PUMP

**20. REMOVE CRANKSHAFT PULLEY**

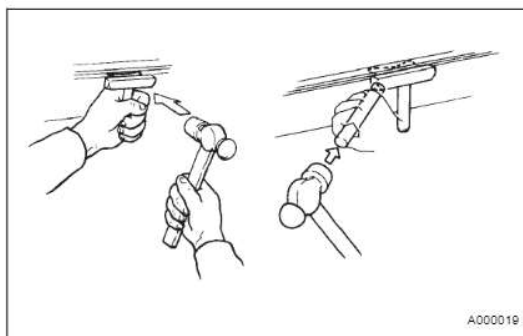
- (a) Using SST, fix the pulley and loosen the bolt.
SST 09960-10010 (09962-01000, 09963-01000)
 (b) Remove the bolt.



- (c) Using SST, remove the bolt and pulley.
SST 09950-40011 (09951-04010, 09953-04030, 09954-04010, 09955-04041, 09957-04010, 91111-51014)

21. REMOVE CRANKSHAFT POSITION SENSOR**22. REMOVE OIL PAN SUB-ASSEMBLY**

- (a) Remove the 12 bolts and 2 nuts.

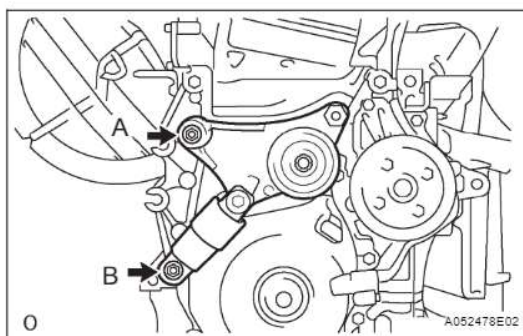


- (b) Insert the blade of SST between the cylinder block and oil pan, cut through applied sealer and remove the oil pan.

SST 09032-00100

NOTICE:

Do not damage the contact surface of the cylinder block and oil pan.

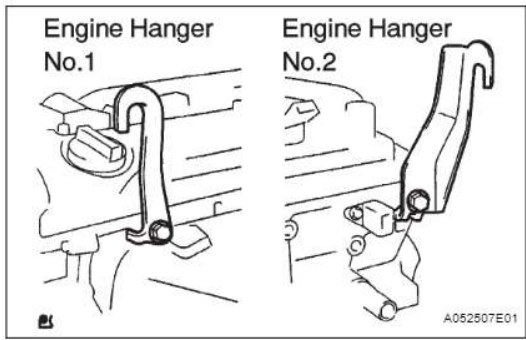
23. REMOVE NO.1 CHAIN TENSIONER ASSEMBLY**24. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY**

- (a) Remove the bolt labeled A and the bolt labeled B. Then remove the tensioner.

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2AZ-FE LUBRICATION – OIL PUMP

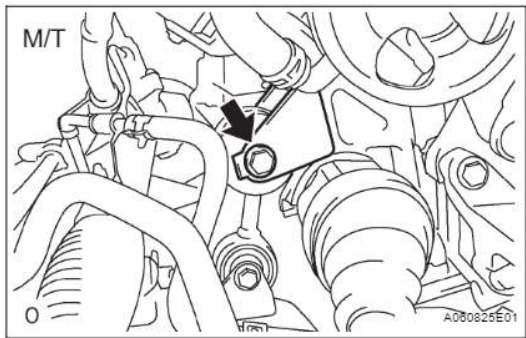
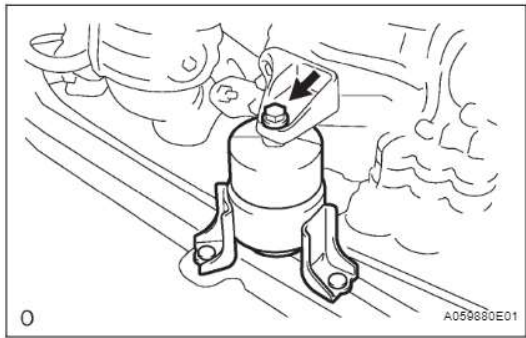


- 25. INSTALL ENGINE HANGER NO.1**
- (a) Install the engine hanger No. 1 and No. 2 with their respective bolts, as shown in the illustration.
Parts No.:

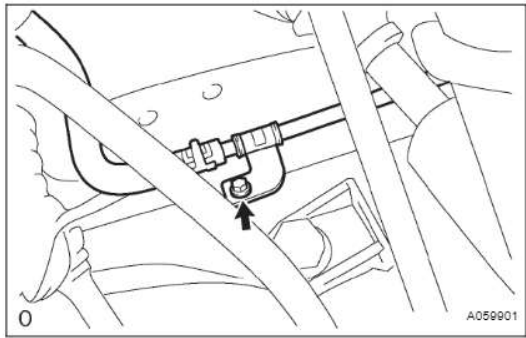
Engine hanger No. 1	12281-28010
Engine hanger No. 2	12282-28010
Bolt	91512-61020

Torque: 38 N*m (387 kgf*cm, 28 ft.*lbf)

- 26. REMOVE ENGINE MOUNTING INSULATOR RH**
- (a) Attach the engine chain hoist to the engine hangers.
CAUTION:
Do not attempt to hang the engine by hooking the chain to any other part.
- (b) Remove the bolt and disconnect the engine mounting insulator FR.

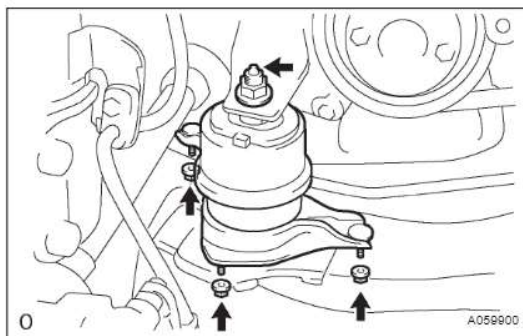


- (c) M/T:
Remove the bolt and disconnect the engine lateral control rod.
- (d) Remove the bolt and disconnect the steering gear return hose clamp from the frame.

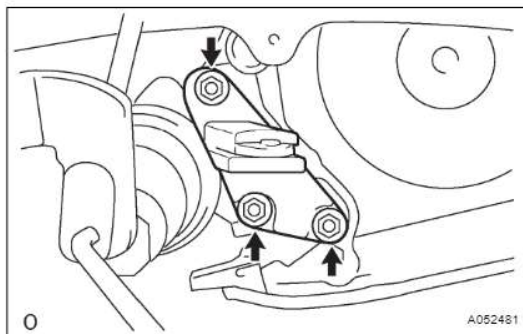


2AZ-FE LUBRICATION – OIL PUMP

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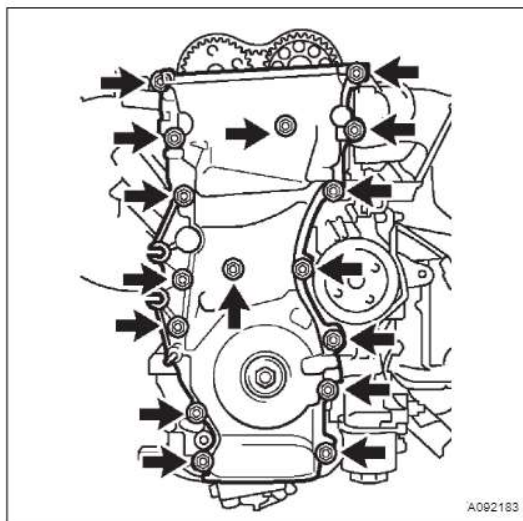
- (e) Remove the 4 nuts from the engine mounting insulator RH.
- (f) Prepare a jack. Place a wooden block on the jack and set the jack under the engine. Remove the engine mounting insulator.
- (g) Raise the jack and lift up the engine. Then remove the engine mounting insulator RH.

**27. REMOVE ENGINE MOUNTING BRACKET RH**

- (a) Remove the 3 bolts and engine mounting bracket.

28. REMOVE TIMING CHAIN OR BELT COVER SUB-ASSEMBLY

- (a) Remove the stud bolt for drive belt tensioner from the cylinder block.



- (b) Remove the 14 bolts and 2 nuts.
- (c) Pry out the timing chain cover using a screwdriver.

NOTICE:

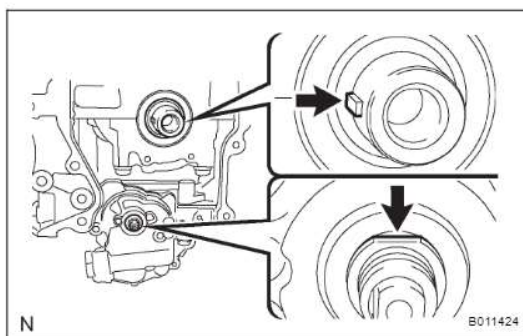
Be careful not to damage the contact surfaces of the timing chain cover, cylinder block and cylinder head.

29. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1**30. REMOVE CHAIN TENSIONER SLIPPER****31. REMOVE CHAIN VIBRATION DAMPER NO.1****32. REMOVE CHAIN SUB-ASSEMBLY****33. REMOVE CRANKSHAFT TIMING GEAR OR SPROCKET**

- (a) Remove the bolt and timing chain guide.
- (b) Remove the timing gear or sprocket.

34. REMOVE NO.2 CHAIN SUB-ASSEMBLY

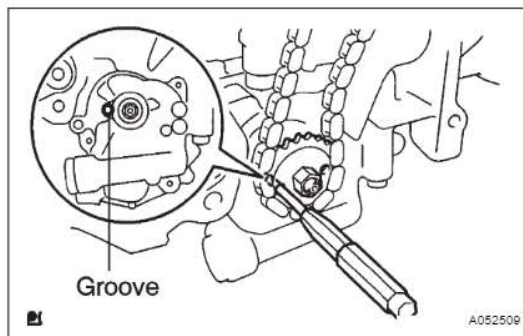
- (a) Turn the crankshaft counterclockwise 90° and turn the cutout of the oil pump drive shaft gear to the top.



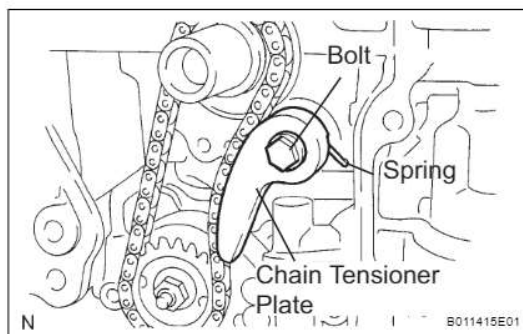
LU

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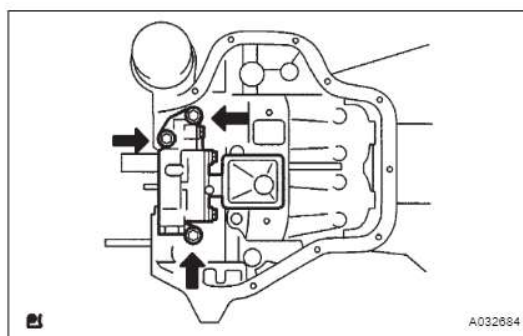
2AZ-FE LUBRICATION – OIL PUMP



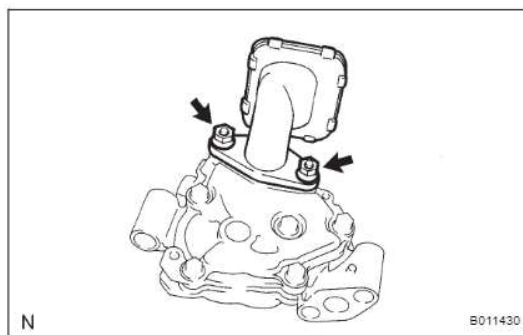
- (b) Align the adjusting hole of the oil pump drive shaft gear with the groove of the oil pump.
- (c) Put a bar (ϕ 4 mm (0.16 in.)) in the adjusting hole of the oil pump drive shaft gear to temporarily lock the gear in position. Remove the nut.



- (d) Remove the bolt, chain tensioner plate and spring.
- (e) Remove the oil pump drive shaft gear and chain.

**35. REMOVE OIL PUMP ASSEMBLY**

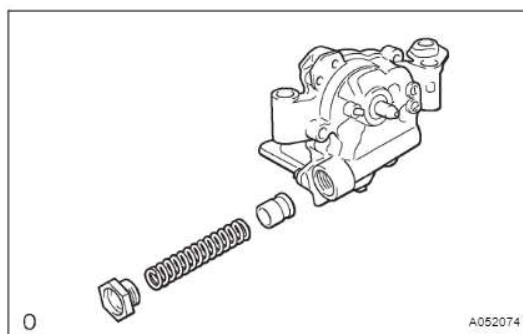
- (a) Remove the 3 bolts and pump.

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

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

2. REMOVE OIL PUMP RELIEF VALVE

- (a) Using a 27 mm socket wrench, remove the plug.

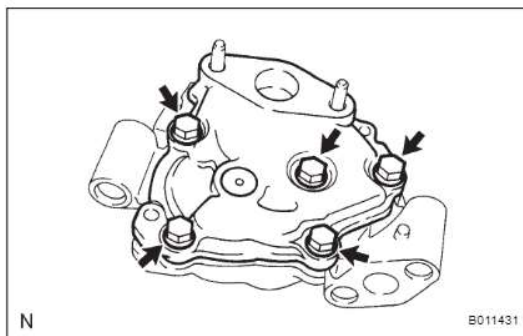


- (b) Remove the valve spring and relief valve.

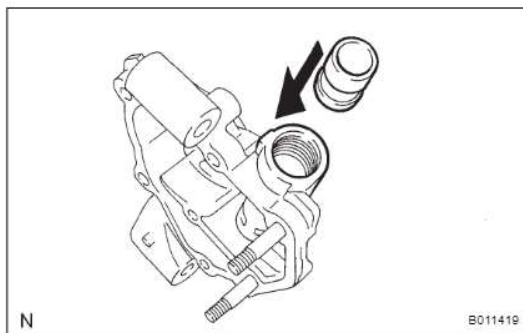
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2AZ-FE LUBRICATION – OIL PUMP

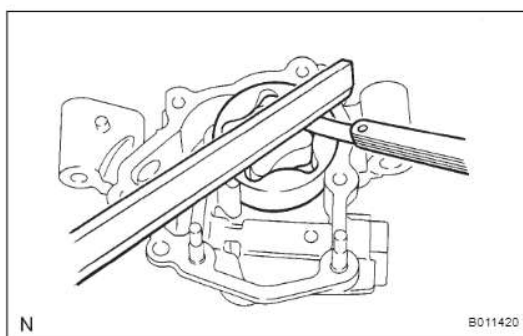
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**3. REMOVE OIL PUMP COVER**

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

4. REMOVE OIL PUMP ROTOR**INSPECTION****1. INSPECT OIL PUMP RELIEF VALVE**

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

**2. INSPECT OIL PUMP ROTOR**

- (a) Check the clearance between the body and drive/driven rotor.
(1) Place a precision straight edge on the top surface of the body. Insert a feeler gauge between the bottom edge of the precision straight edge and the top surface of the drive/driven rotor. Measure the clearance.

Specified rotor clearance:**0.030 to 0.160 mm (0.0012 to 0.0063 in.)**

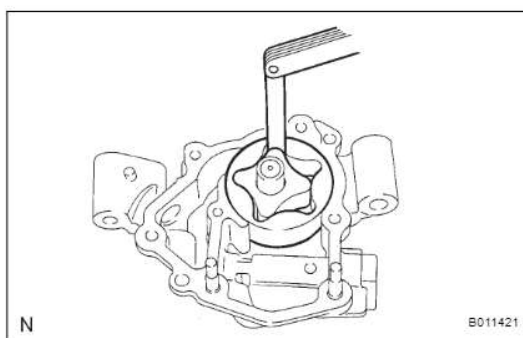
If the clearance is greater than the maximum, replace the oil pump assembly.

- (b) Check the tip clearance between the drive rotor tips and driven rotor grooves.

- (1) Insert a feeler gauge between each drive rotor tip and driven rotor groove. Measure the clearance.

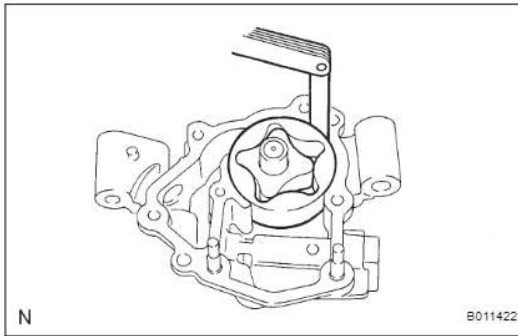
Specified tip clearance:**0.080 to 0.350 mm (0.0031 to 0.0138 in.)**

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

**LU**

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2AZ-FE LUBRICATION – OIL PUMP



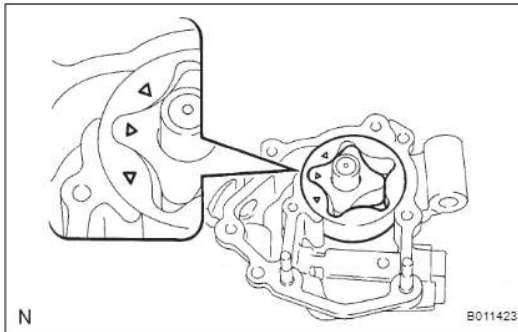
- (c) Check the clearance between the driven rotor and body.

- (1) Insert a feeler gauge between the driven rotor and body. Measure the clearance.

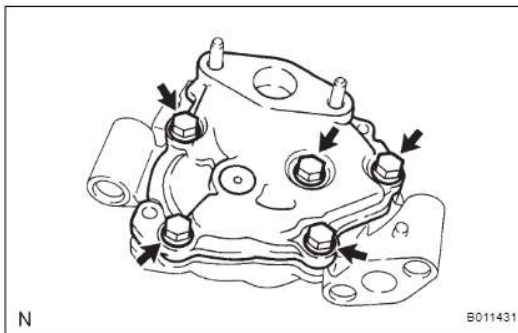
Specified body clearance:

0.100 to 0.325 mm (0.0039 to 0.0128 in.)

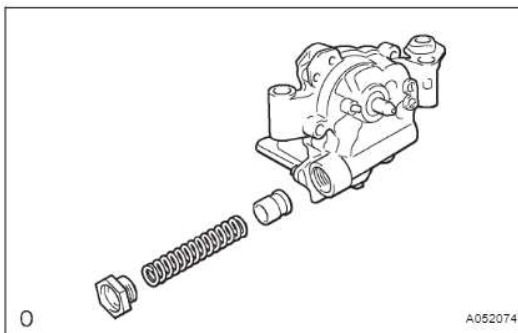
If the body clearance is greater than the maximum, replace the oil pump assembly.

**REASSEMBLY****1. INSTALL OIL PUMP ROTOR**

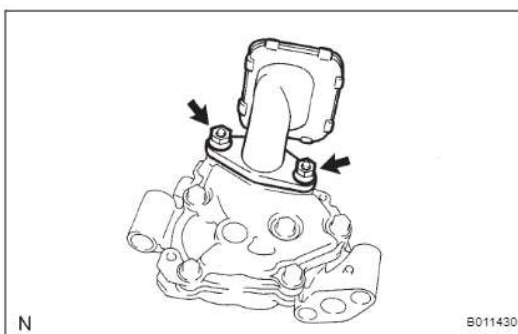
- (a) Coat the drive and driven rotors with engine oil.
(b) Place the drive and driven rotors into the pump body with the marks facing the pump body cover side.

**2. INSTALL OIL PUMP COVER**

- (a) Install the pump body cover with the 5 bolts.
Torque: 8.8 N*m (90 kgf*cm, 79 in.*lbf)

**3. 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.

**4. INSTALL OIL PUMP STRAINER SET**

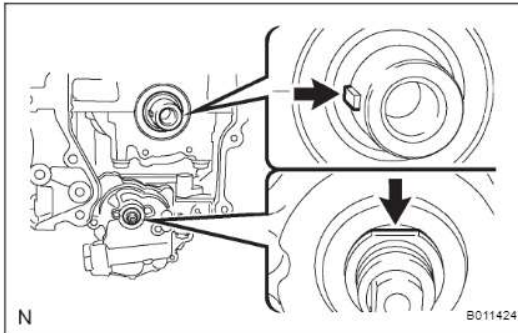
- (a) Place a new gasket on the oil pump.
(b) Install the oil strainer with the 2 nuts.
Torque: 8.8 N*m (90 kgf*cm, 79 in.*lbf)

LU

INSTALLATION

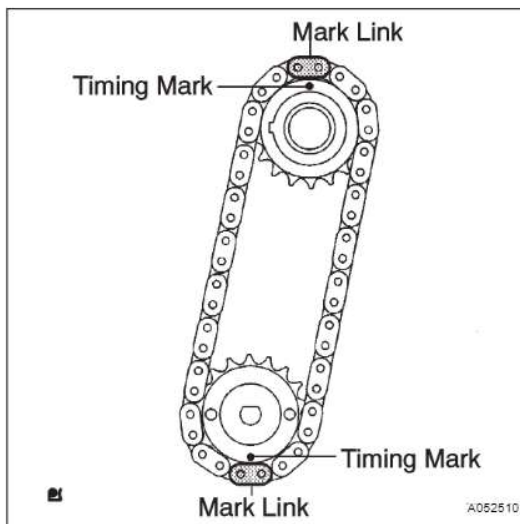
1. INSTALL OIL PUMP ASSEMBLY

- Place a new gasket on the cylinder block.
- Install the pump with the 3 bolts.
Torque: 19 N*m (194 kgf*cm, 14 ft.*lbf)

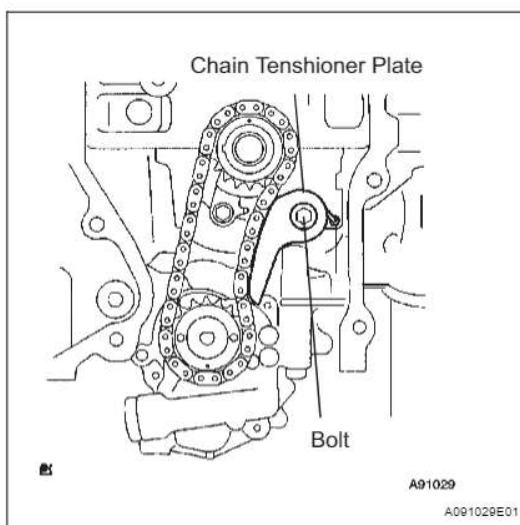


2. INSTALL NO.2 CHAIN SUB-ASSEMBLY

- Set the crankshaft key into the left horizontal position.
- Turn the cutout of the drive shaft gear to the top.



- Align the mark links (yellow colored links) with the timing marks of the gear as shown in the illustration.
- Insert the gears and chain to the crankshaft and oil pump shaft.
- Temporarily tighten the oil pump drive shaft gear with the a nut.

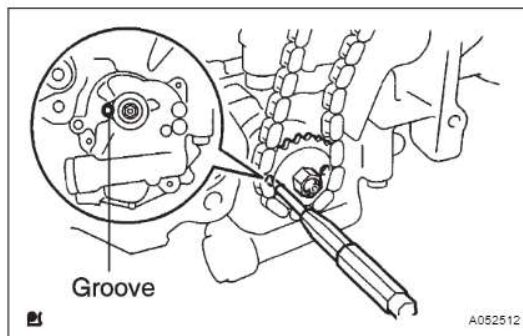


- Inset the damper spring into the adjusting hole, and install the chain tensioner plate with the bolt.
Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)

LU

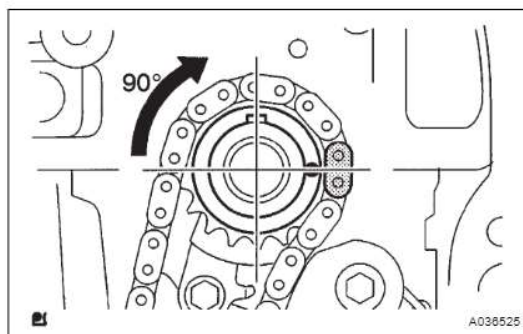
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2AZ-FE LUBRICATION – OIL PUMP



- (g) Align the adjusting hole of the oil pump drive shaft gear with the groove of the oil pump.
- (h) Put a bar ($\phi 4$ mm (0.16 in.)) in the adjusting hole of the oil pump drive shaft gear to temporarily lock the gear in position. Install the nut.

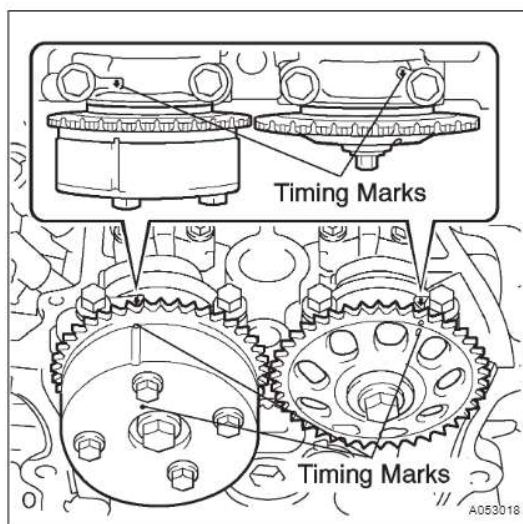
Torque: 30 N*m (306 kgf*cm, 22 ft.*lbf)



- (i) Rotate the crankshaft clockwise 90°, and align the crankshaft key to the top.

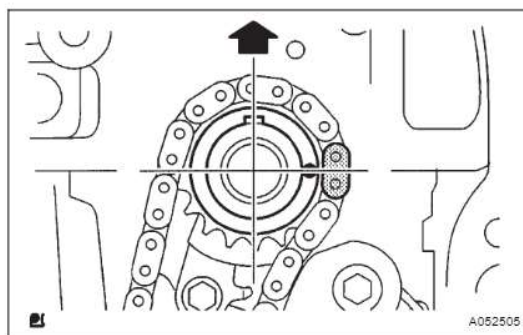
3. INSTALL CHAIN VIBRATION DAMPER NO.1

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



4. INSTALL CHAIN SUB-ASSEMBLY

- (a) Set the No.1 cylinder to TDC/compression.
 - (1) Align the timing marks of the camshaft timing gear/sprocket and bearing caps (No. 1 and No. 2).

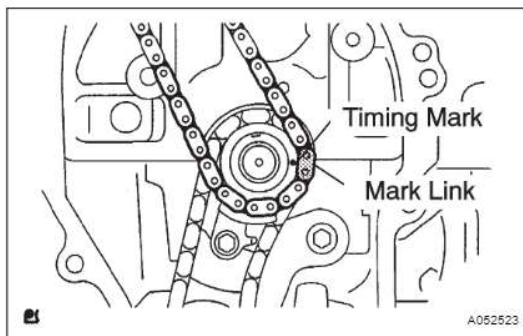


- (2) Using the crankshaft pulley bolt, turn the crankshaft and set the set key on the crankshaft upward.

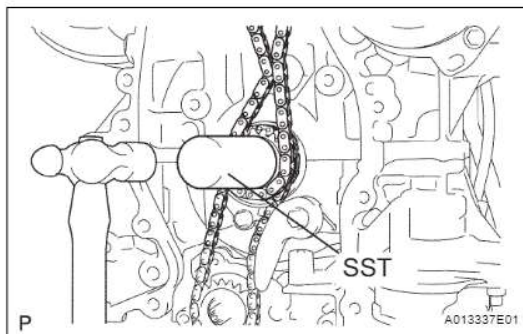
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2AZ-FE LUBRICATION – OIL PUMP

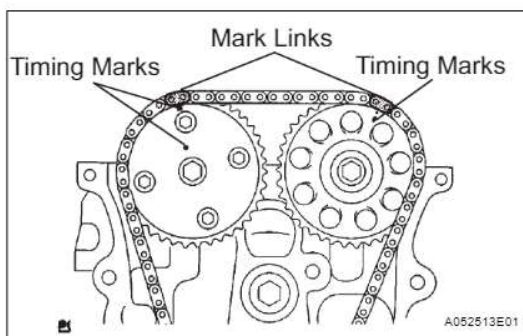
LU-17



- (b) Align the mark link (gold or orange colored link) with the timing mark of the crankshaft timing sprocket.



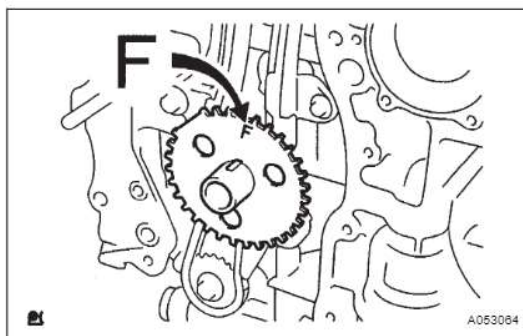
- (c) Using SST, tap in the sprocket.
SST 09309-37010



- (d) Align the mark links (gold or yellow colored links) with the timing marks of the camshaft timing gear and camshaft timing sprocket, and install the chain.

5. INSTALL CHAIN TENSIONER SLIPPER

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



6. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1

- (a) Install the sensor plate with the F mark facing outward.

7. INSTALL TIMING CHAIN OR BELT COVER SUB-ASSEMBLY

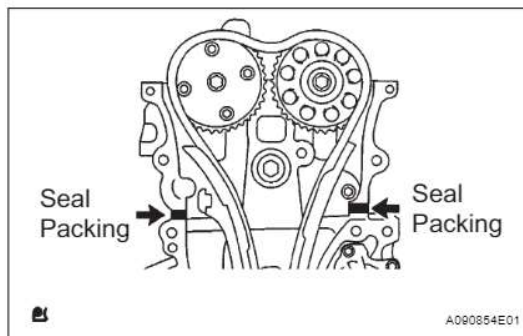
NOTICE:

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

LU

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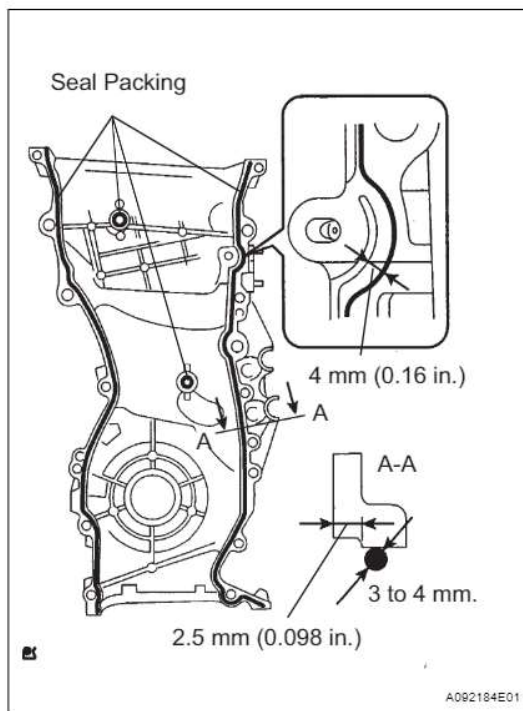
2AZ-FE LUBRICATION – OIL PUMP



- (b) Apply seal packing (diameter: 2 mm (0.08 in.)), as shown in the illustration.

Seal packing:

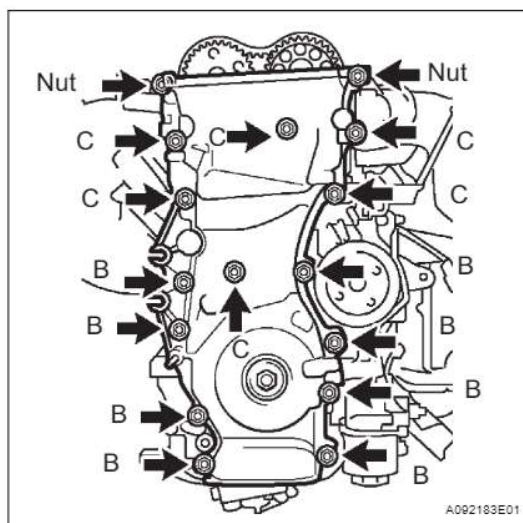
Part No. 08826-00080 or equivalent



- (c) Apply a continuous bead of seal packing (diameter: 3 to 4 mm (0.12 to 0.16 in.)) as shown in the illustration.

Seal packing:

Part No. 08826-00080 or equivalent



- (d) Install the timing chain cover with the 14 bolts and 2 nuts.

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

21 N*m (214 kgf*cm, 15 ft.*lbf) for bolt B

43 N*m (438 kgf*cm, 32 ft.*lbf) for bolt C

9.0 N*m (92 kgf*cm, 80 in.*lbf) for nut

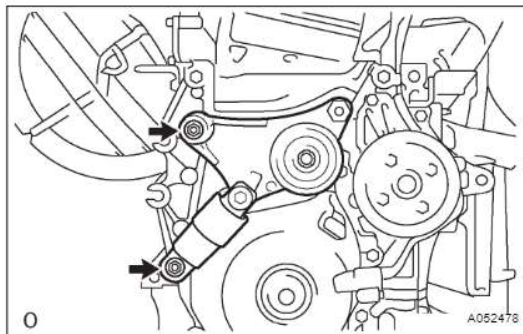
- (e) Install the stud bolt to the drive belt tensioner.

Torque: 10 N*m (102 kgf*cm, 7 ft.*lbf)

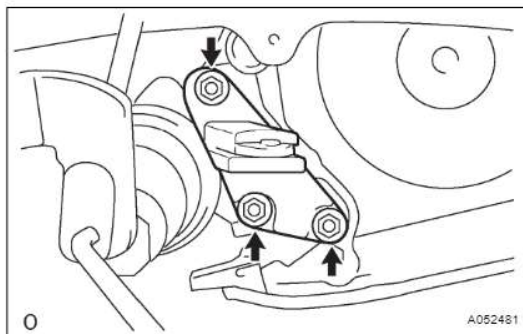
8. INSTALL NO.1 CHAIN TENSIONER ASSEMBLY (See page [EM-120](#))

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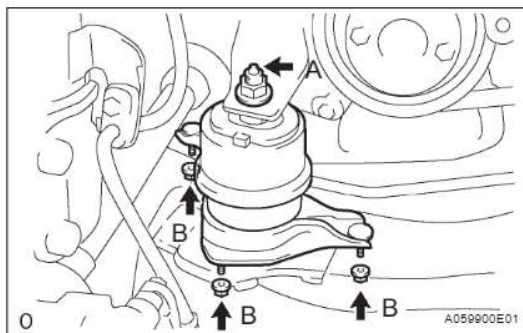
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**9. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY**

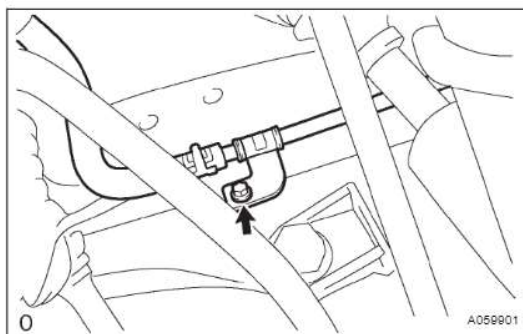
- (a) Install the tensioner with the bolt and nut.
Torque: 59.5 N*m (607 kgf*cm, 44 ft.*lbf)

**10. INSTALL ENGINE MOUNTING BRACKET RH**

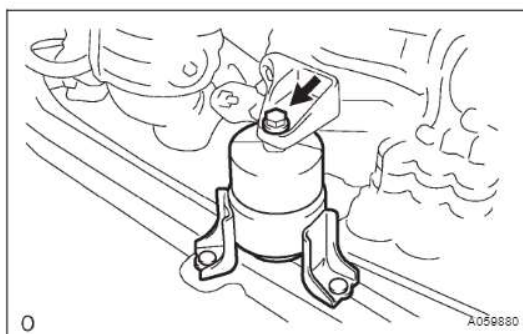
- (a) Install the engine mounting bracket with the 3 bolts.
Torque: 54 N*m (551 kgf*cm, 41 ft.*lbf)

**11. INSTALL ENGINE MOUNTING INSULATOR RH**

- (a) Raise the engine and install the engine mounting insulator RH.
 (b) Install the engine mounting insulator RH with the 4 nuts.
Torque: 95 N*m (969 kgf*cm, 70 ft.*lbf) for nut A
87 N*m (888 kgf*cm, 64 ft.*lbf) for nut B



- (c) Install the bolt and disconnect the steering gear return hose clamp from the frame.
Torque: 8.0 N*m (80 kgf*cm, 71 in.*lbf)

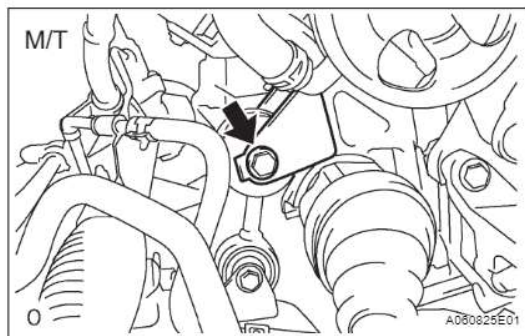


- (d) Install the engine mounting insulator FR with the bolt.
Torque: 87 N*m (888 kgf*cm, 64 ft.*lbf)

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- (e) M/T:
Install the engine lateral control rod with the bolt.
Torque: 89 N*m (910 kgf*cm, 66 ft.*lbf)

12. INSTALL OIL PAN SUB-ASSEMBLY NOTICE:

- Remove any oil from the contact surface.
- Install the oil pan within 3 minutes after applying seal packing.
- Do not start the engine for at least 2 hours after installing the oil pan.

- (a) Remove any old packing (FIPG) material and be careful not to spill any oil on the contact surface of the cylinder block and oil pan.

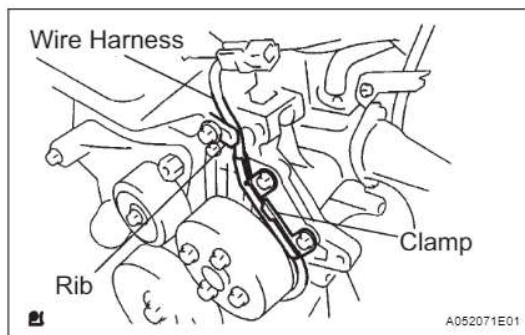
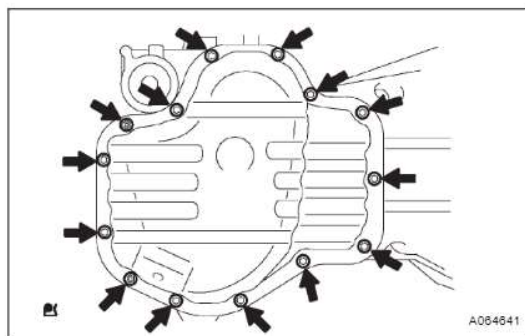
- (b) Apply a continuous bead of seal packing (diameter: 3 to 4 mm (0.12 to 0.16 in.)) as shown in the illustration, and install the oil pan.

Seal packing:

Part No. 08826-00080 or equivalent



- (c) Install the oil pan with the 12 bolts and 2 nuts.
Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)

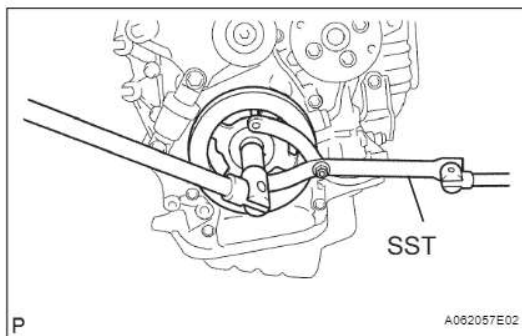


13. INSTALL CRANKSHAFT POSITION SENSOR

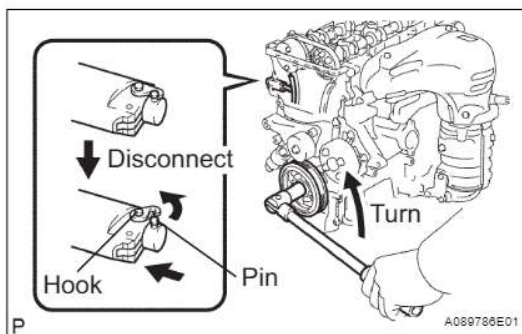
- (a) Install the sensor with the bolt.
Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)
- (b) Confirm that the wire harness of the sensor is placed as shown in the illustration.

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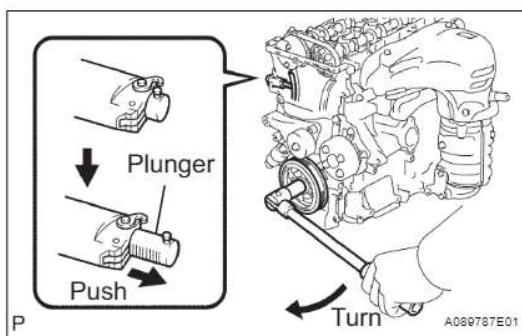
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**14. INSTALL CRANKSHAFT PULLEY**

- (a) Install the crankshaft pulley.
 - (1) Align the pulley set key with the key groove of the pulley, and side on the pulley.
 - (2) Using SST, install the pulley bolt.
SST 09960-10010 (09962-01000, 09963-01000)
Torque: 170 N*m (1,733 kgf*cm, 125 ft.*lbf)



- (b) Turn the crankshaft counterclockwise and disconnect the hook from the plunger knock pin.



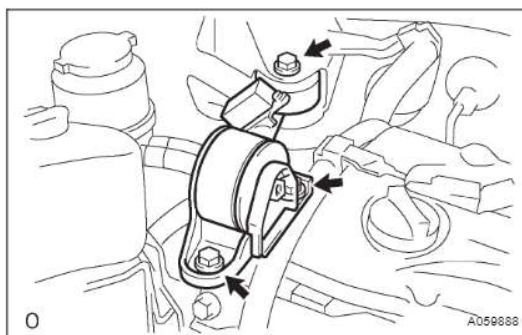
- (c) Turn the crankshaft clockwise and check that the slipper is pushed by the plunger.

15. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY
(See page [EM-121](#))**16. INSTALL IGNITION COIL ASSEMBLY**
Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)**17. INSTALL VANE PUMP ASSEMBLY**

HINT:
See page [PS-14](#)

18. INSTALL GENERATOR ASSEMBLY (See page [CH-14](#))**19. INSTALL ENGINE WIRE****20. INSTALL FAN AND GENERATOR V BELT** (See page [EM-5](#))**21. INSTALL ENGINE MOUNTING BRACKET NO.2 RH**
Torque: 52 N*m (531 kgf*cm, 38 ft.*lbf)**22. INSTALL ENGINE MOUNTING STAY NO.2 RH**
Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)**23. INSTALL ENGINE MOVING CONTROL ROD W/ BRACKET**

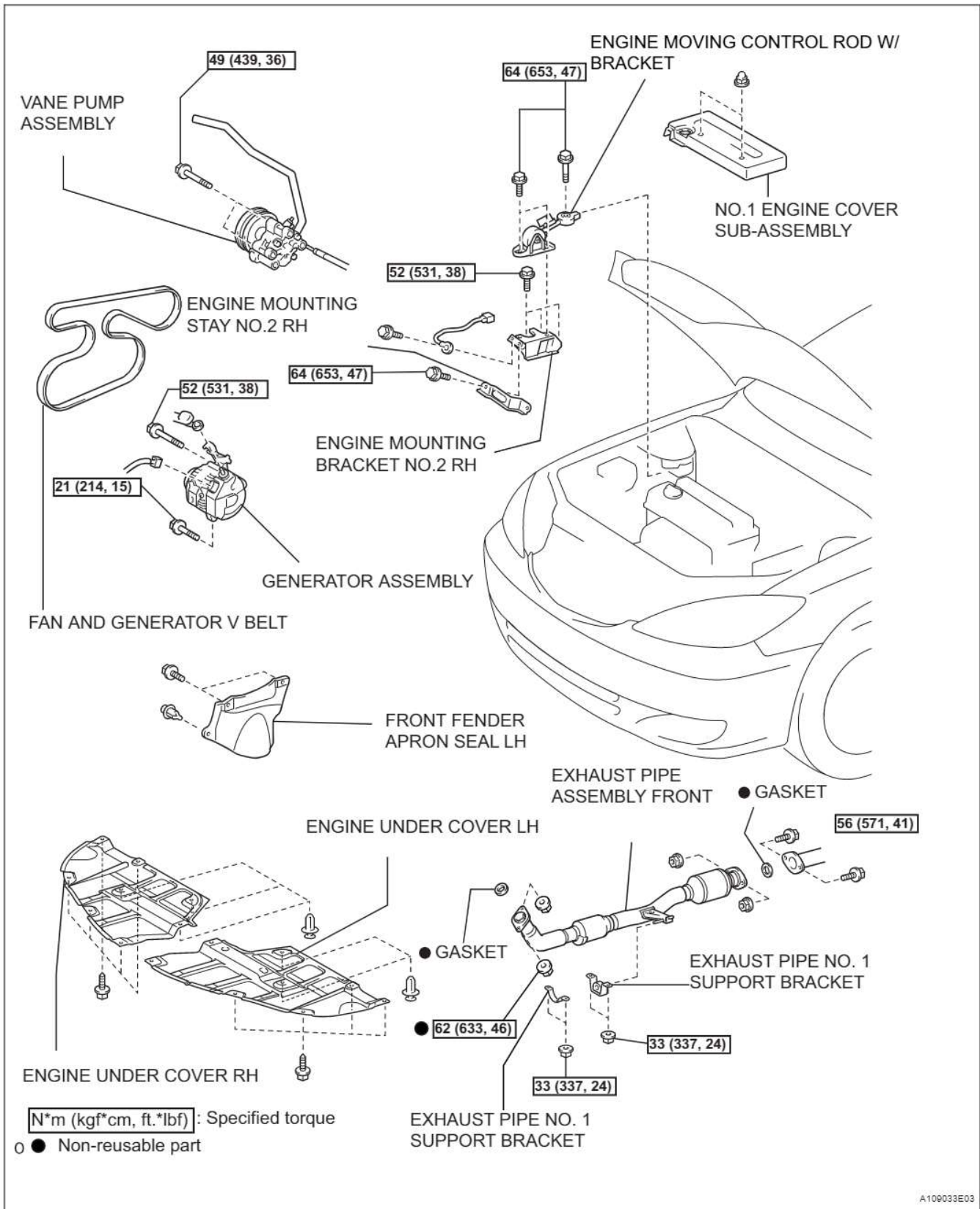
- (a) Install the engine mounting control rod with the 3 bolts.
Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)

24. INSTALL FRONT EXHAUST PIPE ASSEMBLY (See page [EX-4](#))**25. INSTALL FRONT WHEEL RH****26. ADD ENGINE OIL****27. CHECK FOR ENGINE OIL LEAKS**

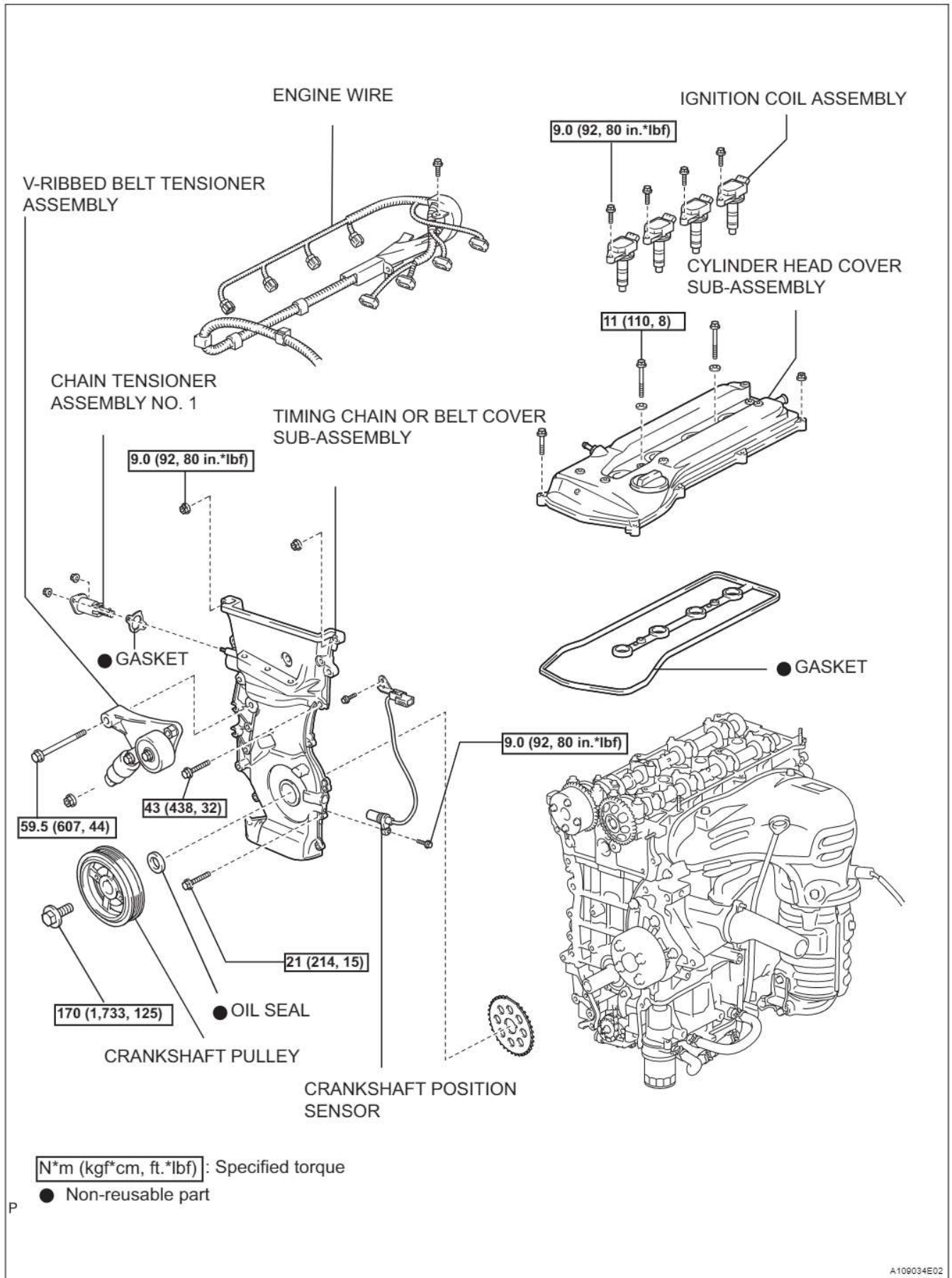
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OIL PUMP COMPONENTS

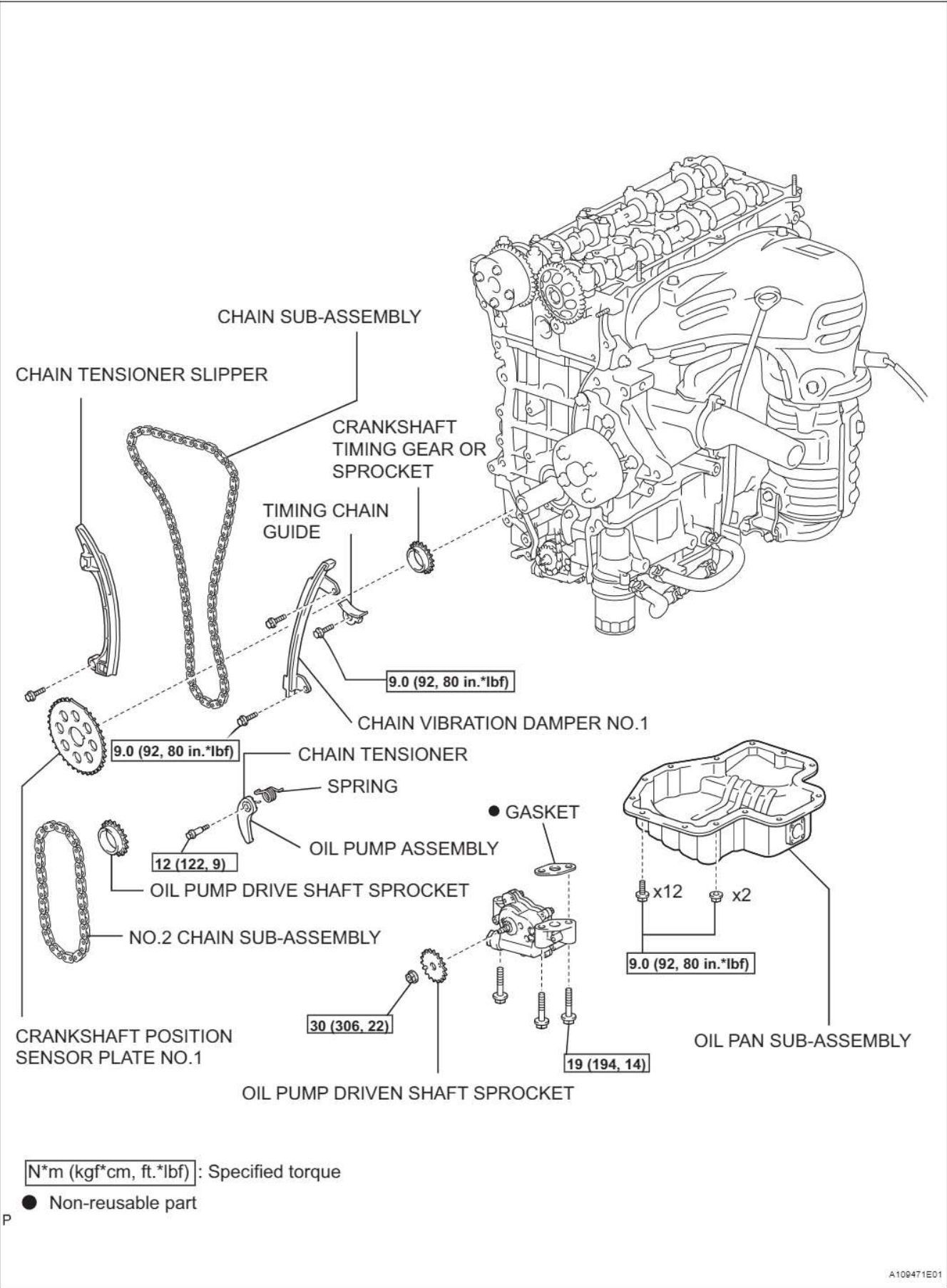


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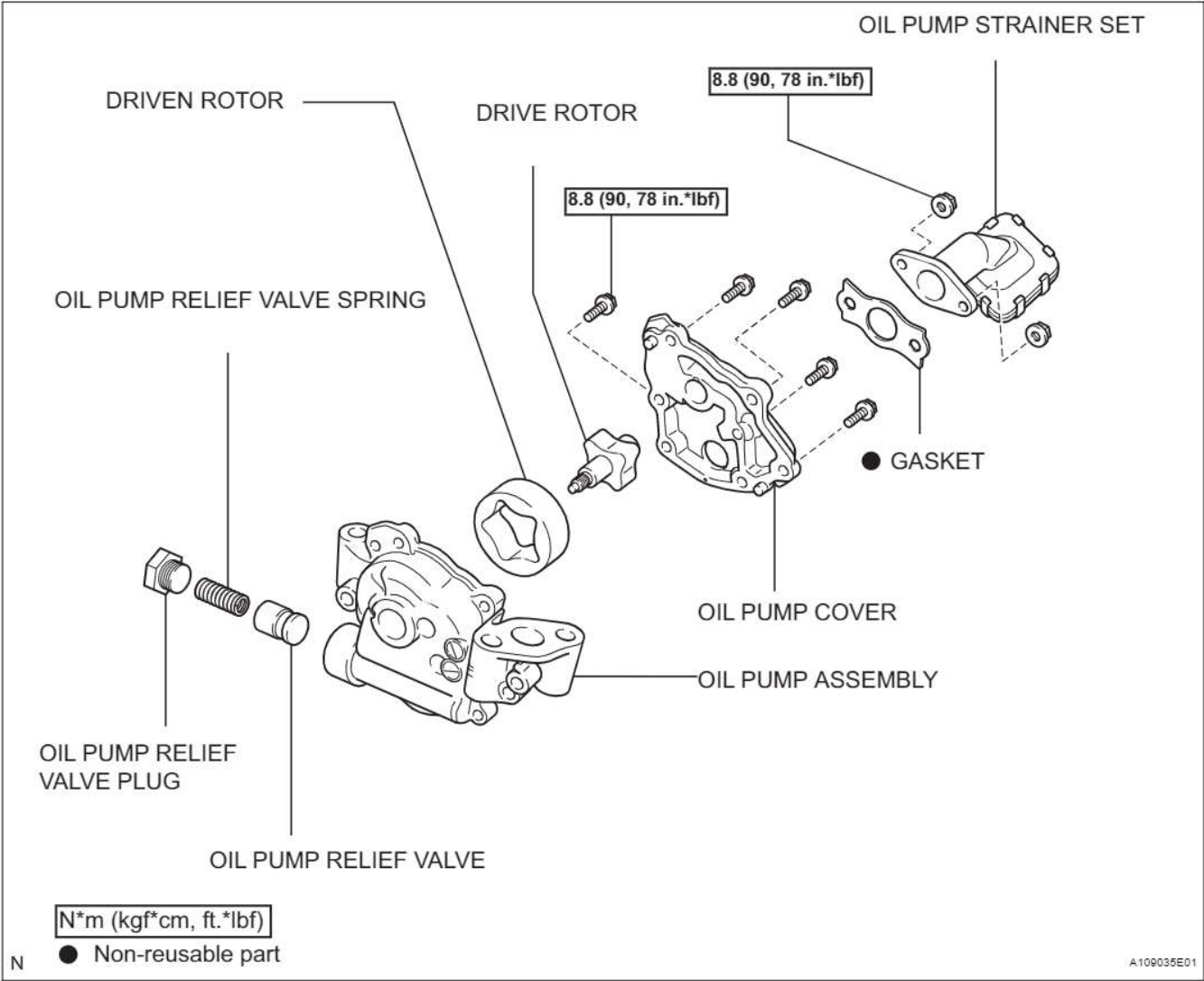
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2AZ-FE LUBRICATION – OIL PUMP

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