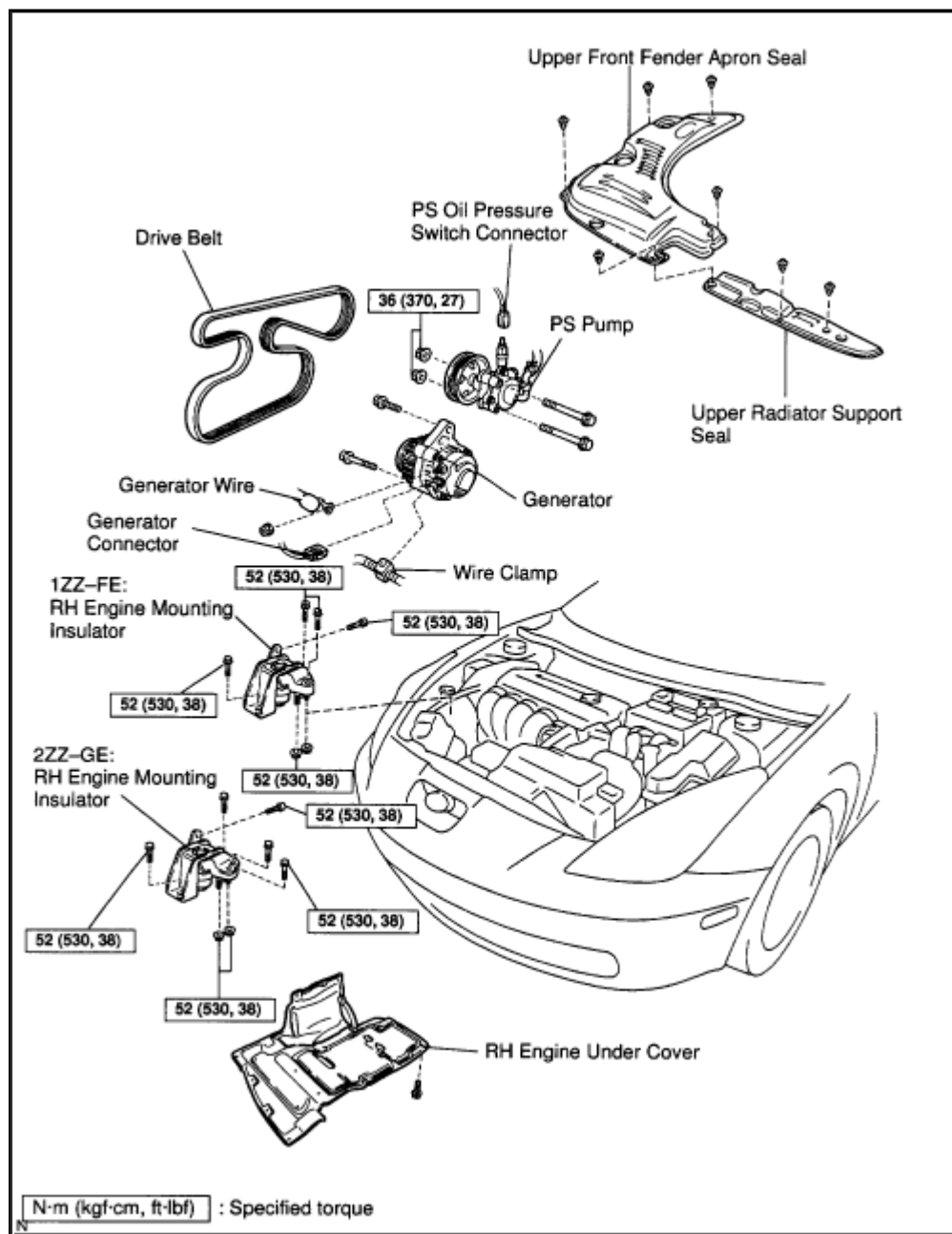


REMOVAL

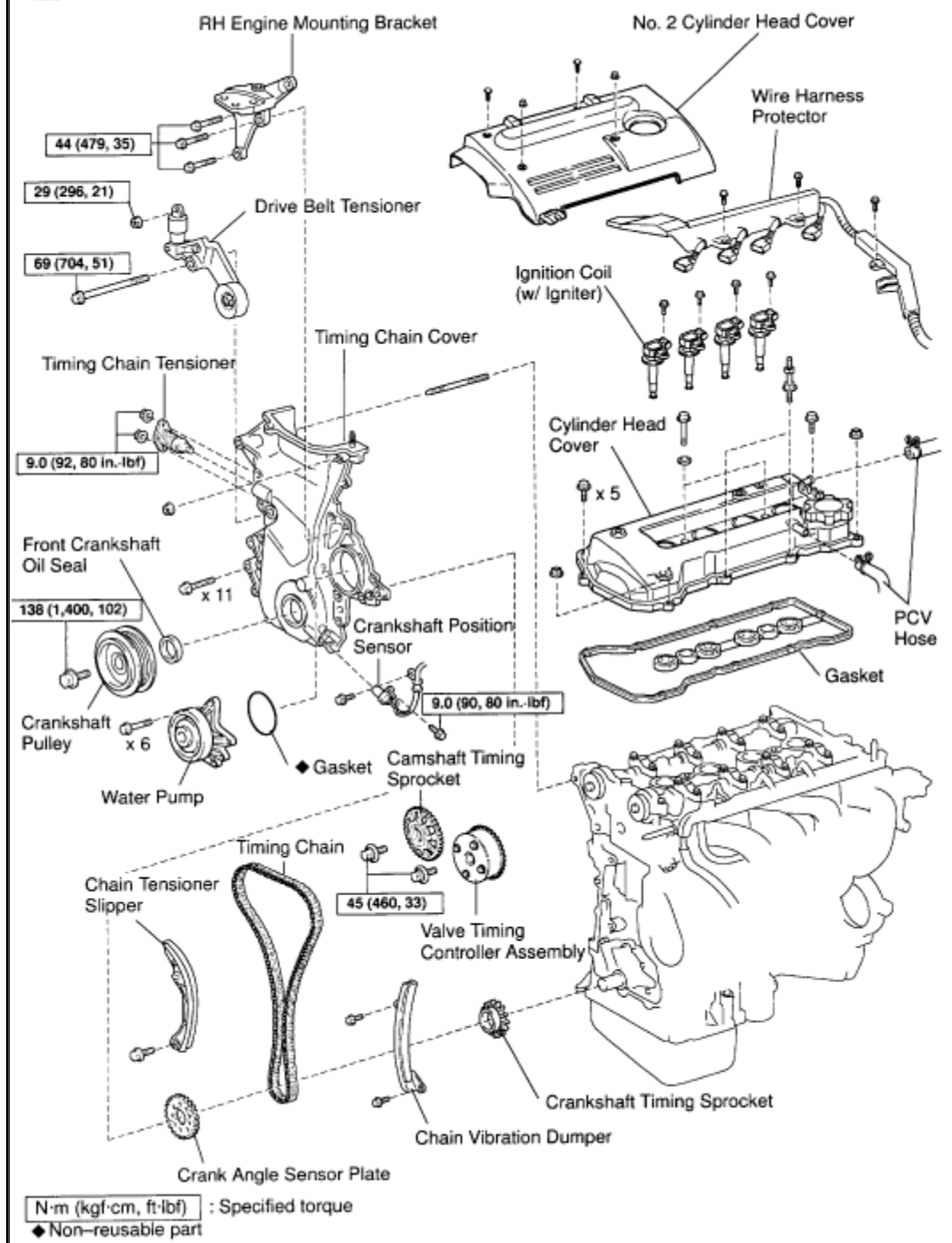


ZOOM

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Related Components

1ZZ-FE:

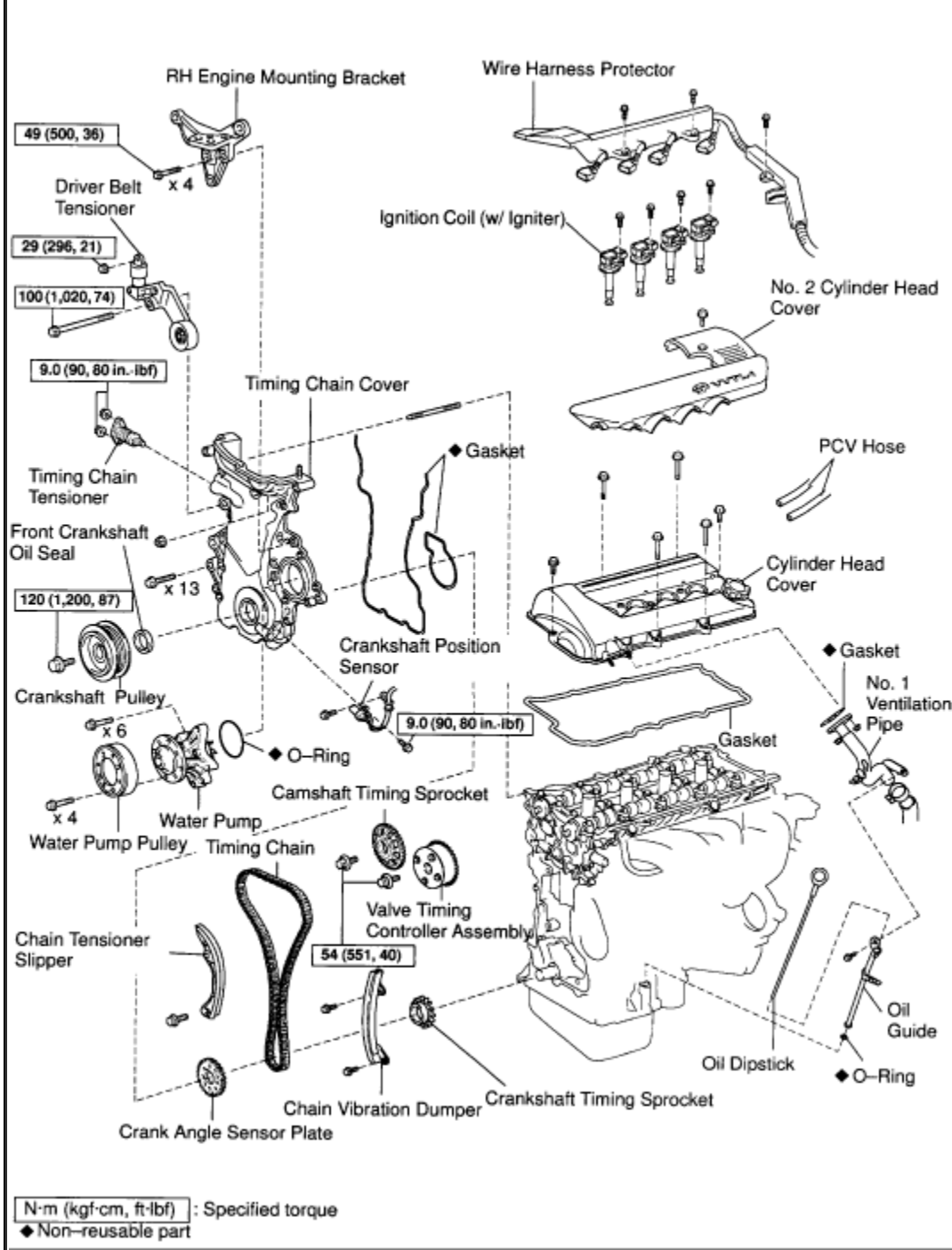


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1ZZ-FE

2ZZ-GE:



ZOOM

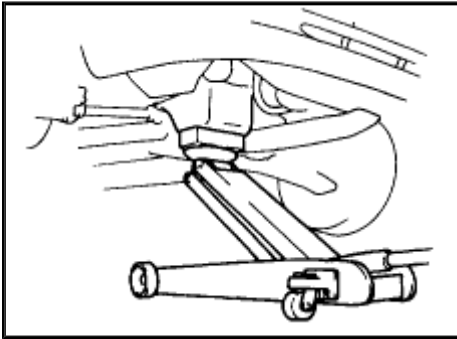
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2ZZ-GE

1. REMOVE UPPER FRONT FENDER APRON SEAL AND UPPER RADIATOR SUPPORT SEAL
2. DRAIN ENGINE COOLANT
3. REMOVE RIGHT-HAND FRONT WHEEL
4. REMOVE RIGHT-HAND ENGINE UNDER COVER
5. REMOVE [DRIVE BELT](#) AND GENERATOR
6. DISCONNECT PS PUMP FROM ENGINE
 - a. Disconnect the PS oil pressure switch connector.
 - b. Remove the 2 nuts and through bolts, and disconnect the PS pump from the engine. **HINT:** Put aside the pump and

suspend it to the cowl with a string.

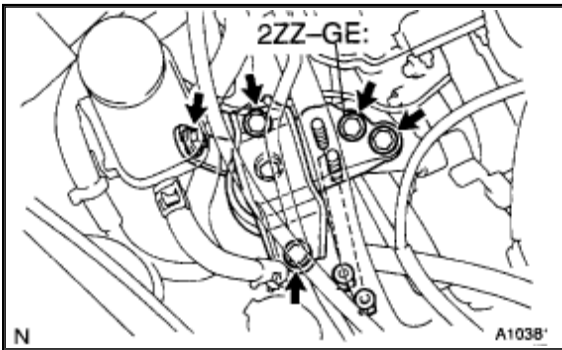
7. REMOVE RIGHT-HAND ENGINE MOUNTING INSULATOR



ZOOM

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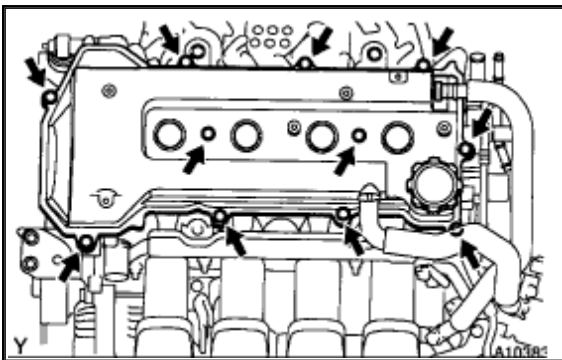
- Set the jack to the engine. **HINT:** Place a wooden block between the jack and engine.
- 1ZZ-FE: Remove the 4 bolts, 2 nuts and Right-Hand engine mounting insulator.



ZOOM

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- 2ZZ-GE: Remove the 5 bolts, 2 nuts and Right-Hand engine mounting insulator.



ZOOM

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8. 1ZZ-FE: REMOVE CYLINDER HEAD COVER

- Remove the 4 bolts and No. 2 cylinder head cover.
- Remove the 4 ignition coils.
- Disconnect the 2 PCV hoses from the cylinder head.
- Remove the 9 bolts, 2 seal washers, 2 nuts, cylinder head cover and gasket.

9. 2ZZ-GE: REMOVE CYLINDER HEAD COVER

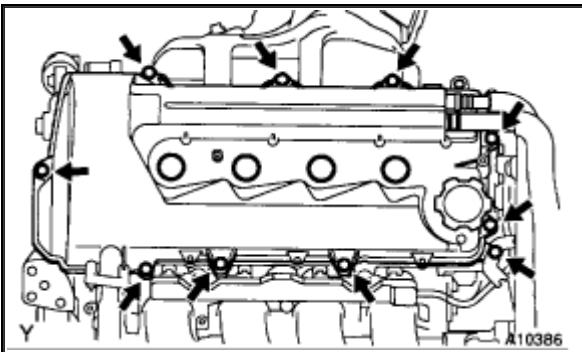
- a. Remove the 4 bolts and No. 2 cylinder head cover.
- b. Remove the ignition coils.
- c. Disconnect the 2 PCV hoses from the cylinder head cover.



ZOOM

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- d. Remove the 2 nuts, bolt and disconnect the No. 3 ventilation hose from the No. 1 ventilation pipe.
- e. Remove the No. 1 ventilation pipe and gasket.

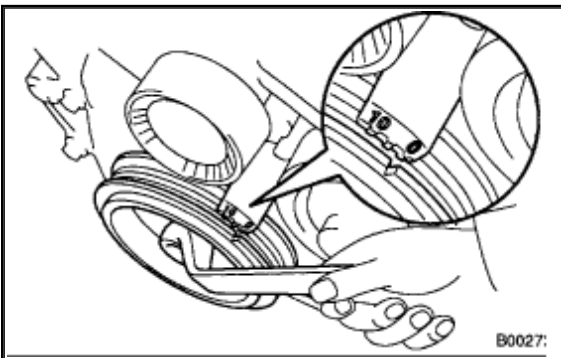


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- f. Remove the 9 bolts, wire harness protector, cylinder head cover and gasket.

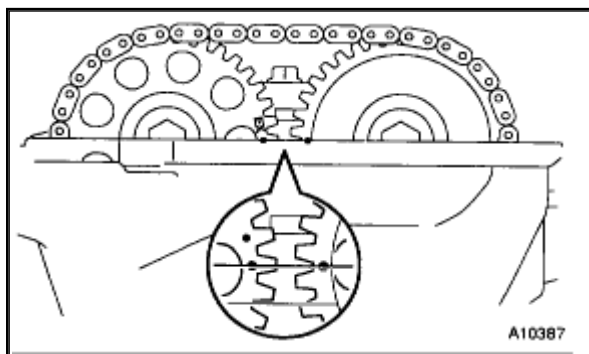
10. SET NO. 1 CYLINDER TO TDC/COMPRESSION



ZOOM

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- a. Turn the crankshaft pulley, and align its groove with timing mark "0" of the timing chain cover.

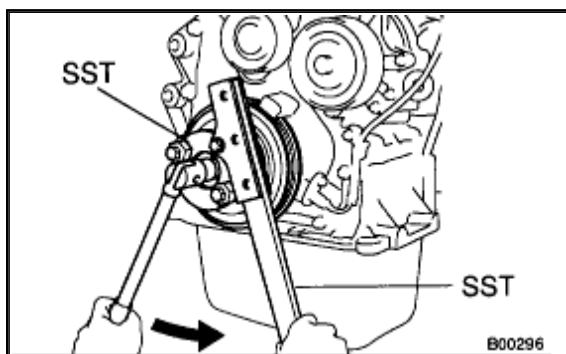


ZOOM

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- b. Check that the point marks of the [camshaft](#) timing sprockets are in straight line on the timing chain cover surface as shown in the illustration. If not, turn the [crankshaft](#) **1 revolution (360°)** and align the marks as above.

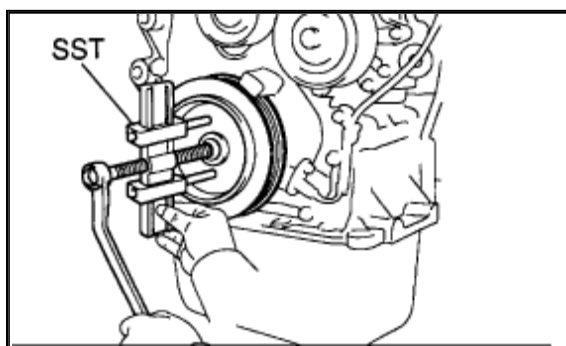
11. REMOVE CRANKSHAFT PULLEY



ZOOM

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- a. Using Special Service Tool (**SST**) and 2 nuts (width: 10 mm (0.25 inch)), remove the [pulley](#) bolt. (SST) 09213-70010, 09330-00021

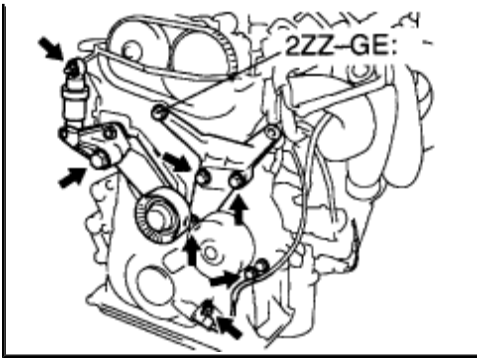


ZOOM

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- b. Remove the crankshaft pulley. **HINT:** If necessary, remove the [pulley](#) with SST. SST 09950-50012 (09951-05010, 09952-05010, 09953-05020, 09954-05020)

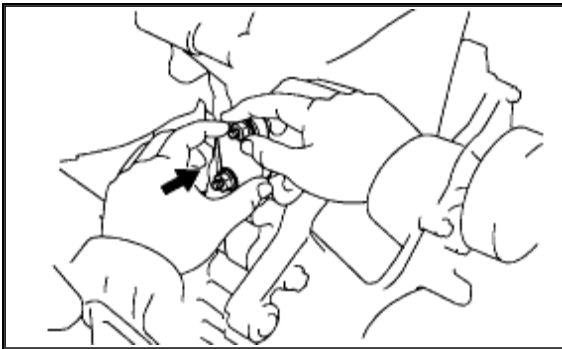




ZOOM

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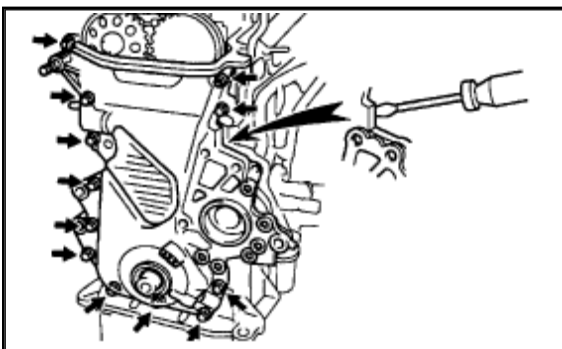
12. DISCONNECT CRANKSHAFT POSITION SENSOR FROM TIMING CHAIN COVER Remove the 2 bolts and crankshaft position sensor.
13. REMOVE DRIVE BELT TENSIONER Remove the bolt, nut and drive belt tensioner.
14. REMOVE RIGHT-HAND ENGINE MOUNTING BRACKET
 - a. 1ZZ-FE: Remove the 3 bolts and mounting bracket.
 - b. 2ZZ-GE: Remove the 4 bolts and mounting bracket.



ZOOM

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15. REMOVE CHAIN TENSIONER Remove the 2 nuts and chain tensioner.
16. REMOVE WATER PUMP [See: Cooling System](#)

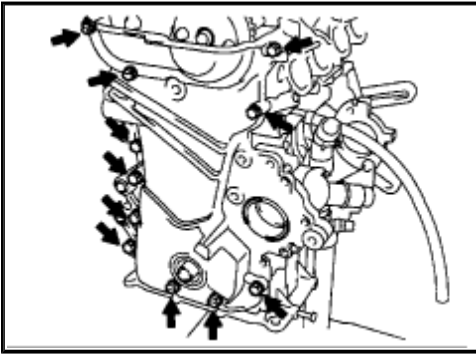


ZOOM

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17. 1ZZ-FE: REMOVE TIMING CHAIN COVER
 - a. Remove the 11 bolts and nut.
 - b. Using a torx wrench socket (E8), remove the stud bolt.

- c. Remove the timing chain cover by prying the portions between the cylinder head and cylinder block with a screwdriver. **NOTICE:** Be careful not to damage the contact surfaces of the timing chain cover, cylinder head and cylinder block.



ZOOM

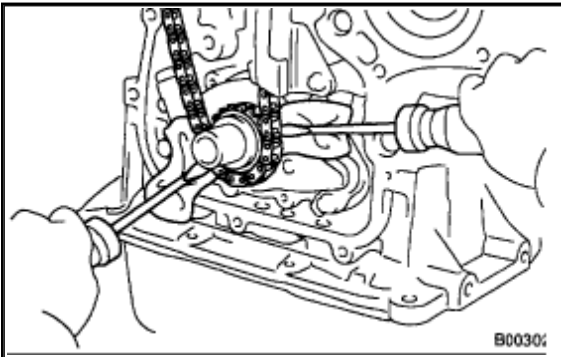
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18. 2ZZ-GE: REMOVE TIMING CHAIN COVER

- a. Remove the 12 bolts.
- b. Using a torx wrench socket (E8), remove the stud bolt.
- c. Remove the timing chain cover and 2 gaskets.

19. REMOVE CRANK ANGLE SENSOR PLATE

20. REMOVE CHAIN TENSIONER SLIPPER Remove the bolt and slipper.

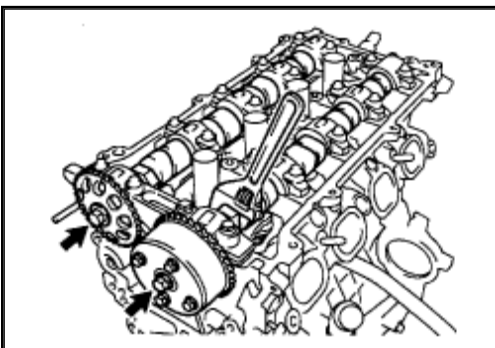


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21. REMOVE TIMING CHAIN AND CRANKSHAFT TIMING SPROCKET If the crankshaft timing sprocket cannot be removed by hand, use 2 screwdrivers. **NOTICE:** Position shop rags as shown to prevent damage.

22. REMOVE CHAIN VIBRATION DAMPER Remove the 2 bolts and damper.



ZOOM

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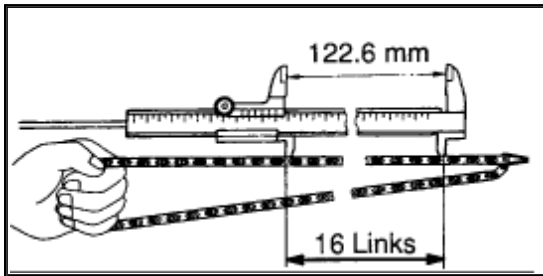
23. REMOVE VALVE TIMING CONTROL ASSEMBLY AND [CAMSHAFT](#) TIMING SPROCKET Hold the hexagonal head wrench portion of the camshaft with a wrench, and remove the bolt, valve timing controller assembly and timing sprocket.

NOTICE:

- Be careful not to damage the cylinder head and valve lifter with the wrench.
- Do not disassemble the valve timing controller assembly.

INSPECTION

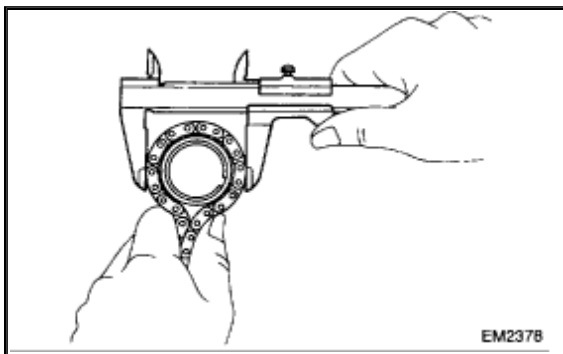
1. INSPECT TIMING CHAIN AND TIMING SPROCKETS



ZOOM

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- a. Using a vernier calipers, measure the length of 16 links with the chain dully stretched. Maximum chain elongation: **122.6 mm (4.827 inch)** If the elongation is greater than maximum, replace the chain. **HINT:** Make the same measurements pulling at 3 or more places selected at random.

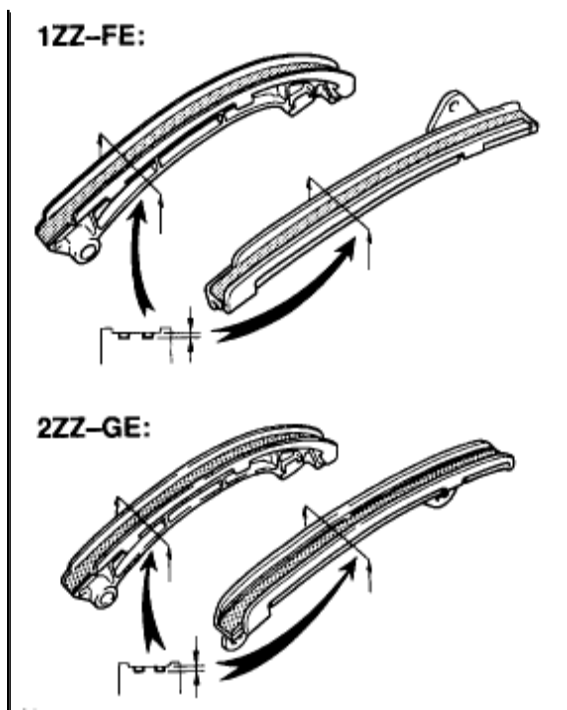


ZOOM

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- b. Wrap the chain around the timing sprocket.
- c. Using a vernier calipers, measure the timing sprocket diameter with the chain. **NOTICE:** Vernier calipers must contact the chain rollers for measuring. Minimum sprocket diameter (w/ Chain): [Camshaft](#): **97.3 mm (3.831 inch)** [Crankshaft](#): **51.6 mm (2.031 inch)** If the diameter is less than minimum, replace the chain and sprockets.

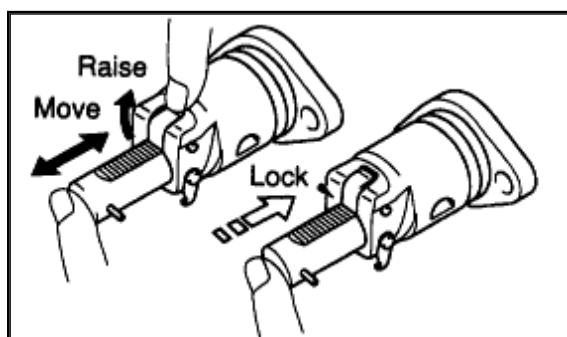




ZOOM

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2. INSPECT CHAIN TENSIONER SLIPPER AND VIBRATION DAMPER Measure the chain tensioner slipper and vibration damper wears. Maximum wear: **1.0 mm (0.039 inch)** If the wear is greater than maximum, replace the slipper and/or damper.



ZOOM

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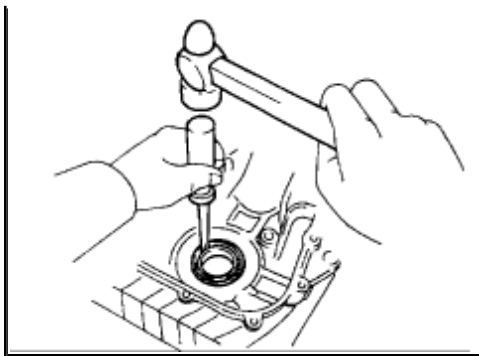
3. INSPECT CHAIN TENSIONER

- Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.
- Release the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.

4. INSPECT OIL JET [See: Engine Lubrication](#)

REPLACEMENT



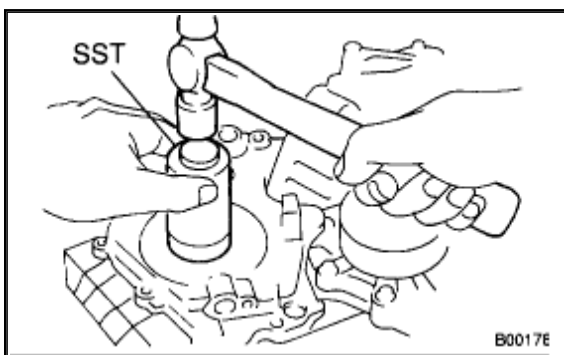


ZOOM

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HINT: There are 2 methods (A and B) to replace the oil seal which are as follows:

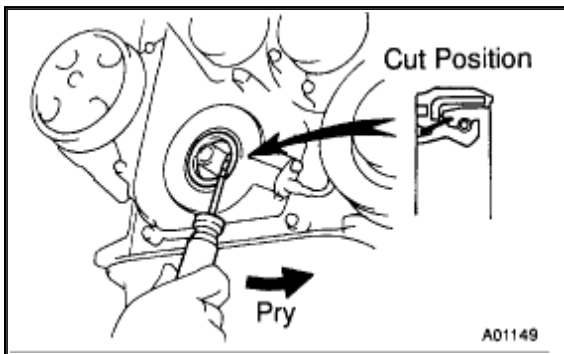
Replace Crankshaft Front Oil Seal



ZOOM

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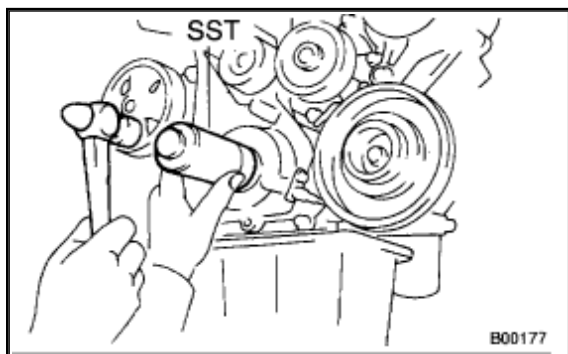
- a. If timing chain cover is removed from cylinder block.
 1. Using a screwdriver and a hammer, tap out the oil seal.
 2. Using Special Service Tool (SST) and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge. (SST) 09309-37010
 3. Apply MP grease to the oil seal lip.
- b. If timing chain cover is installed to the cylinder block.



ZOOM

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1. Using a knife, cut off the oil seal lip.
2. Using a screwdriver, pry out the oil seal. **NOTICE:** Be careful not to damage the [crankshaft](#). Tape the screwdriver tip.



ZOOM

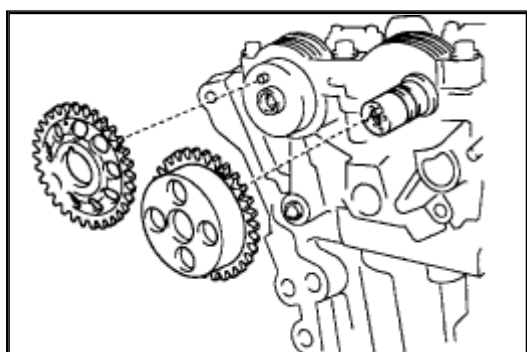
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3. Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge. SST 09309-37010

INSTALLATION

1. INSTALL VALVE TIMING CONTROLLER ASSEMBLY AND [CAMSHAFT](#) TIMING SPROCKET

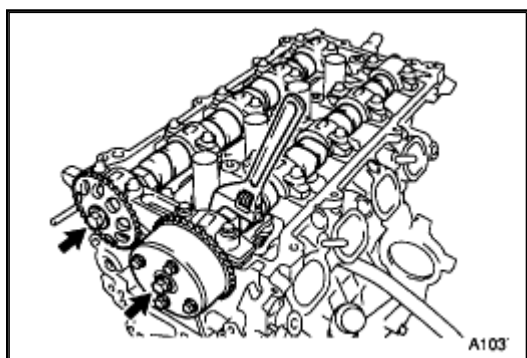
- a. Apply engine oil in the range from the tip of the intake camshaft to 16 mm from that tip.



ZOOM

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- b. Align the timing mark on the valve timing controller assembly with the knock pin, and install the valve timing controller assembly to the cam shaft. **NOTICE:** Do not push valve timing controller assembly to the cam shaft forcibly when installing it.
- c. Align the knock pin hole in the cam shaft timing sprocket with the knock pin of the cam shaft, and exhaust the sprocket to the cam shaft.



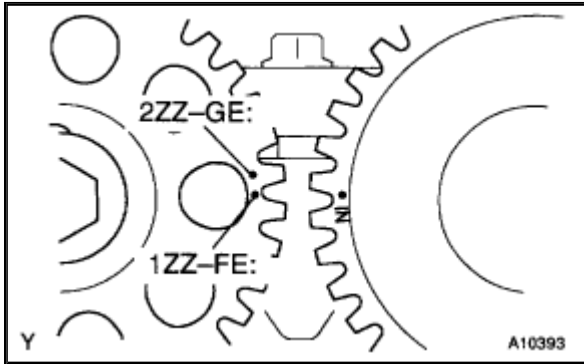
ZOOM

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- d. Temporarily install the timing sprocket bolt.

- e. Hold the hexagon wrench head portion of the [camshaft](#) with a wrench, and tighten the timing sprocket bolt. Torque:
1ZZ-FE: **45 Nm (460 kgf-cm, 33 ft. lbs.)** 2ZZ-GE: **54 Nm (551 kgf-cm, 40 ft. lbs.)**

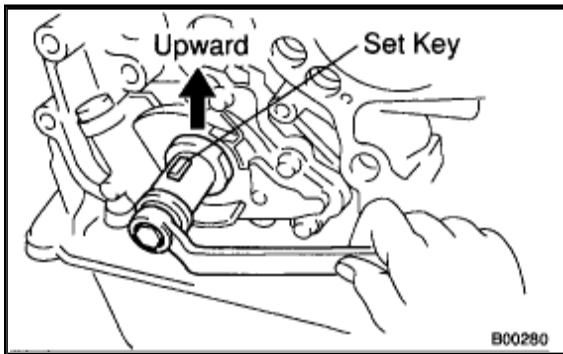
2. SET NO. 1 CYLINDER TO TDC/COMPRESSION



ZOOM

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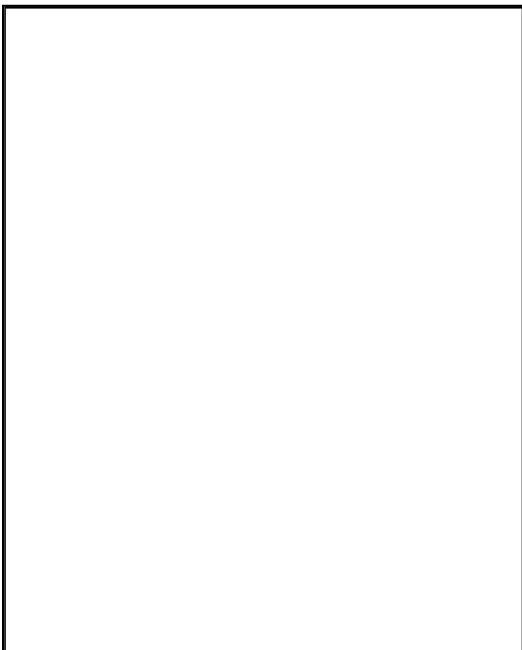
- a. Turn the hexagonal wrench head portion of the camshafts, and align the point marks of the [camshaft](#) timing sprockets.



ZOOM

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- b. Using a crankshaft pulley bolt, Turn the [crankshaft](#) and set the set key on the crankshaft upward.



1ZZ-FE:



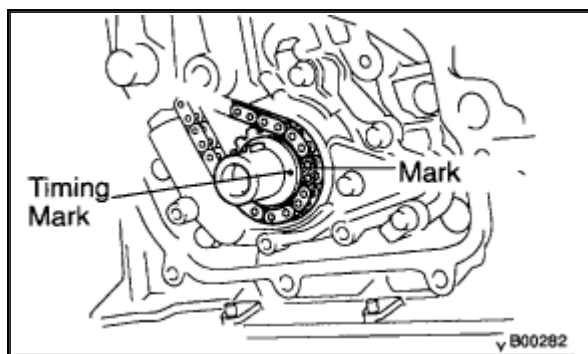
2ZZ-GE:



ZOOM

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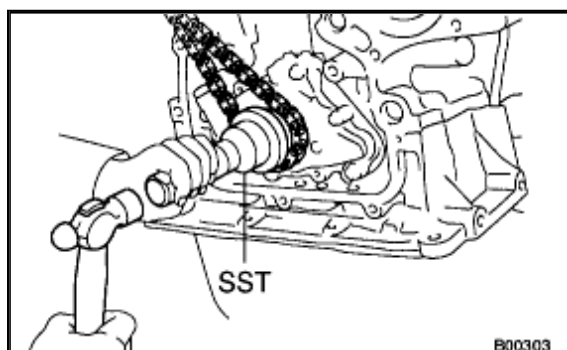
3. **INSTALL CHAIN VIBRATION DAMPER** Install the damper with the 2 bolts. Torque: 1ZZ-FE: **11 Nm (113 kgf-cm, 8 ft. lbs.)** 2ZZ-GE: **20.5 Nm (209 kgf-cm, 15 ft. lbs.)**
4. **INSTALL TIMING CHAIN AND CRANKSHAFT TIMING SPROCKET**



ZOOM

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- a. Install the timing chain on the crankshaft timing sprocket with the yellow color link aligned with the timing mark on the crankshaft timing sprocket.

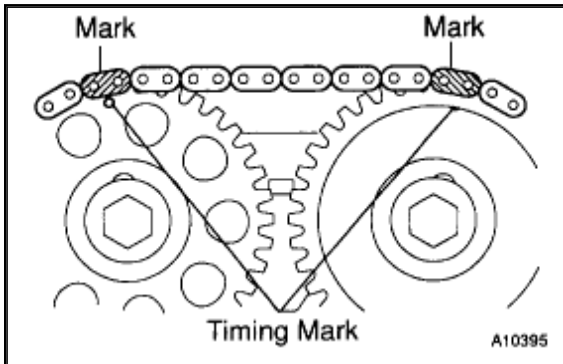


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HINT: If necessary, install the sprocket with Special Service Tool (SST) .

(SST) 09223-22010



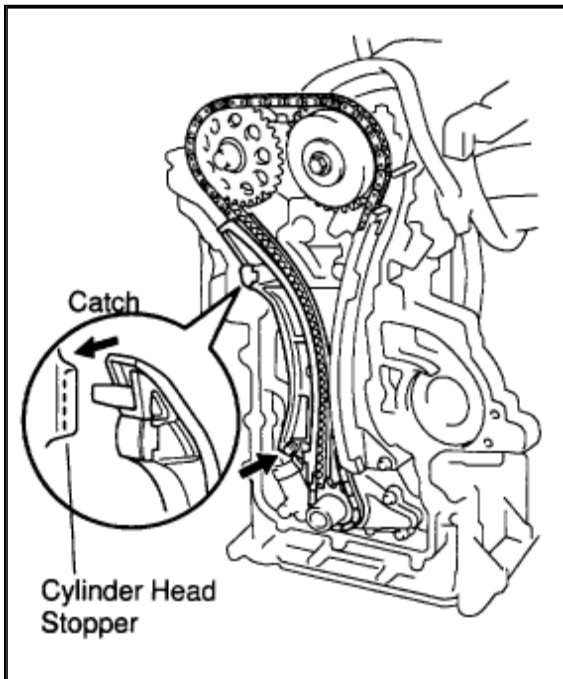
ZOOM

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- b. 1ZZ-FE: Install the timing chain on the [camshaft](#) timing sprockets with the yellow color links aligned with the timing marks on the camshaft timing sprockets.
- c. 2ZZ-GE: Install the timing chain on the [camshaft](#) timing sprockets with the orange color links aligned with the timing marks on the camshaft timing sprockets.
- d. Check that the tension between the intake [camshaft](#) timing sprocket and crankshaft timing sprocket.

5. INSTALL CHAIN TENSIONER SLIPPER

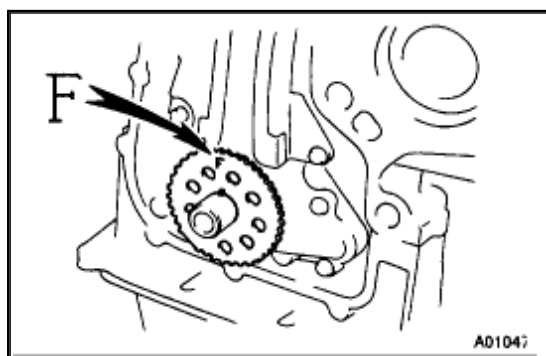
- a. Install the slipper with the bolt. Torque: 1ZZ-FE: **18.5 Nm (189 kgf-cm, 14 ft. lbs.)** 2ZZ-GE: **20.5 Nm (209 kgf-cm, 15 ft. lbs.)**



ZOOM

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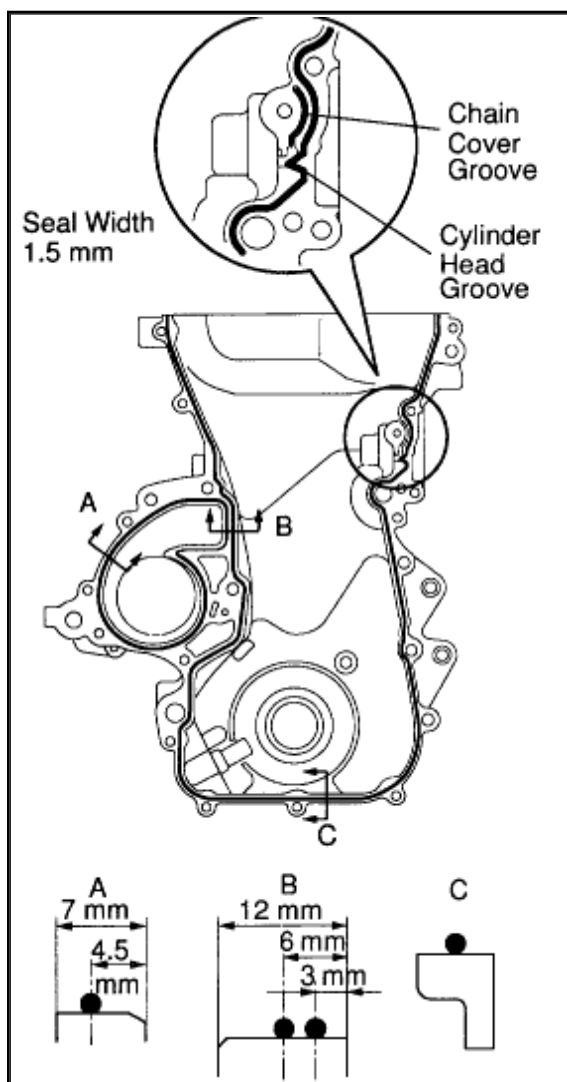
- b. Check that the slipper moves is caught on the cylinder head stopper. **NOTICE:** DO not turn the [crankshaft](#).



ZOOM

SIZED FOR PRINT

6. INSTALL CRANK ANGLE SENSOR PLATE Install the plate with the "F" mark facing forward.
7. 1ZZ-FE: INSTALL TIMING CHAIN COVER AND WATER PUMP
 - 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.
 - Using a razor blade and a gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
 - Thoroughly clean all components to remove all the loose material.
 - Using a non-residue solvent, clean both sealing surfaces.



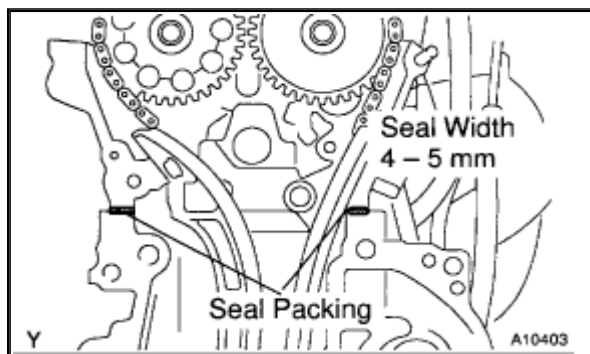
ZOOM

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- b. Apply seal packing to the timing chain cover as shown in the illustration. Seal packing: Part No. 08826-00100 or equivalent
 - o Install a nozzle that has been cut to a **1.5 mm (0.16 - 0.20 inch)** opening.

HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



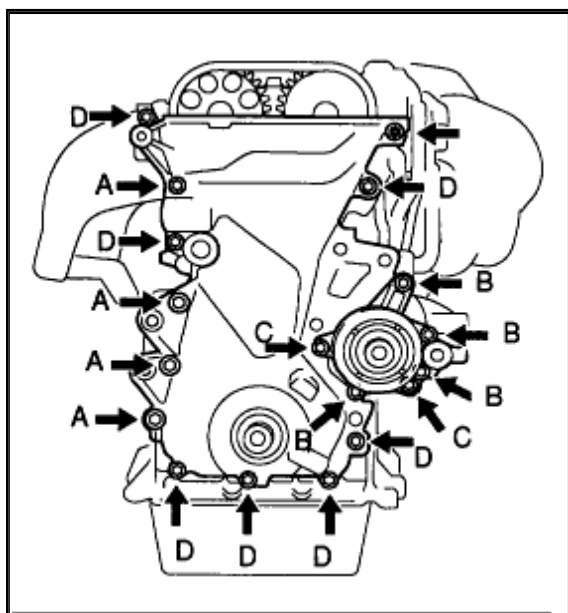
ZOOM

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- c. Apply seal packing to 2 locations as shown in the illustration. Seal packing: Part No. 08826-00080 or equivalent
 - o Install a nozzle that has been cut to a **1.5 mm (0.16 - 0.20 inch)** opening.

HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



ZOOM

SIZED FOR PRINT

- d. Install the timing chain cover, O-ring water pump with the 17 bolts and nut. Uniformly tighten the bolts and nut in several passes. Torque: 10 mm head:

9 Nm (92 kgf-cm, 80 inch lbs.) for C
13 Nm (133 kgf-cm, 10 ft. lbs.) for A
11 Nm (113 kgf-cm, 8 ft. lbs.) for others
12 mm head: **18.5 Nm (189 kgf-cm, 14 ft. lbs.)**

NOTICE:

- Pay attention not to wrap the chain and slipper over the chain cover seal line.
- After installing the chain cover, must install the mounting bracket and water pump within 15 minutes.

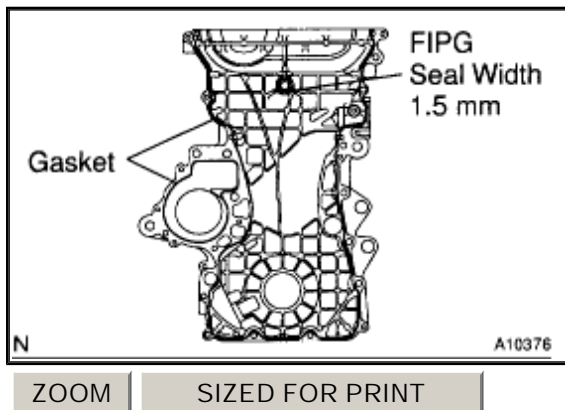
HINT: Each bolt length is indicated in the illustration.

A 45 mm (1.77 inch)
B 35 mm (1.38 inch)
C 30 mm (1.18 inch)
D 25 mm (0.98 inch)

- e. Using a torx wrench socket (E8), install the stud bolt. Torque: **9.3 Nm (95 kgf-cm, 82 inch lbs.)**

8. 2ZZ-GE: INSTALL TIMING CHAIN COVER AND WATER PUMP

- 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.
 - Using a razor blade and a gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
 - Thoroughly clean all components to remove all the loose material.
 - Using a non-residue solvent, clean both sealing surfaces.

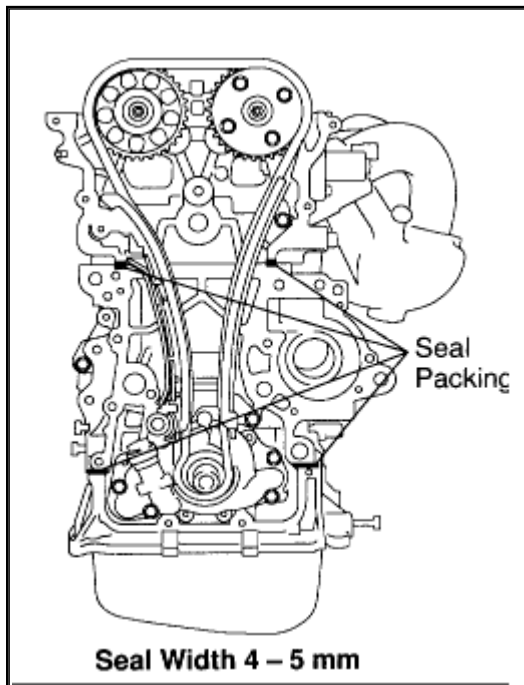


- b. Apply seal packing to the timing chain cover as shown in the illustration. Seal packing: Part No. 08826-00100 or equivalent
 - Install a nozzle that has been cut to a 1.5 mm opening.

HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

- c. Install the 2 gasket to the timing chain cover as shown in the illustration.



ZOOM

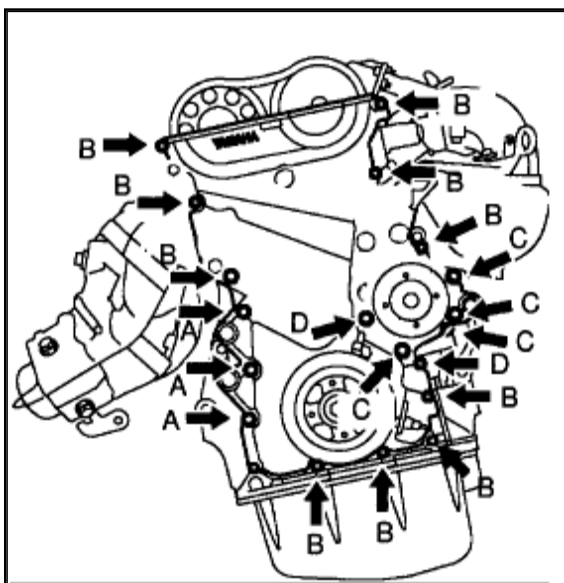
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d. Apply seal packing to 4 locations as shown in the illustration. Seal packing: Part No. 08826-00080 or equivalent

- o Install a nozzle that has been cut to a **4 - 5 mm (0.16 - 0.20 inch)** opening.

HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



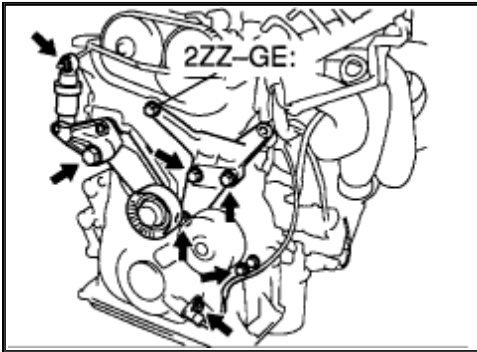
ZOOM

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e. Install the timing chain cover, O-ring and water pump with the 19 bolts. Uniformly tighten the bolts in several passes. Torque: A: **21 Nm (214 kgf-cm, 15 ft. lbs.)** B: **11 Nm (113 kgf-cm, 8 ft. lbs.)** C: **9.0 Nm (92 kgf-cm, 80 inch lbs.)** D: **9.0 Nm (92 kgf-cm, 80 inch lbs.)** NOTICE:

- Pay attention not to wrap the chain and slipper over the chain cover seal line.
- After install the chain cover, must install the mounting bracket and water pump within 15 minutes.

f. Using a torx wrench socket (E8), install the stud bolt. Torque: **9.3 Nm (95 kgf-cm, 82 inch lbs.)**



ZOOM

SIZED FOR PRINT

9. 1ZZ-FE: INSTALL RIGHT-HAND ENGINE MOUNTING BRACKET

- a. Apply seal packing to threads of the mounting bolt. Seal packing: Part No. 08826-00080 or equivalent **HINT:** Do not apply seal packing to 2 or 3 threads of the bolt end.
- b. Install the mounting bracket with the 3 bolts. Torque: **47 Nm (479 kgf-cm, 35 ft. lbs.)**

10. 2ZZ-GE: INSTALL RIGHT-HAND ENGINE MOUNTING BRACKET Install the mounting bracket with the 4 bolts. Torque: **49 Nm (500 kgf-cm, 36 ft. lbs.)**

11. INSTALL DRIVE BELT TENSIONER

- a. Check the appearance before installing the drive belt tensioner. If in case of having the oil leakage, crack, and etc., replace the drive belt tensioner.
- b. Install the drive belt tensioner. Torque: Bolt:

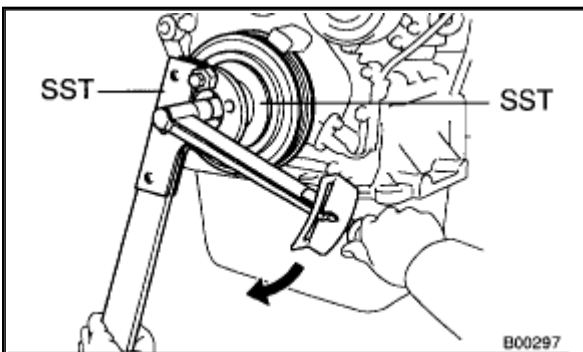
1ZZ-FE: **690 Nm (704 kgf-cm, 51 ft. lbs.)**

2ZZ-GE: **100 Nm (1,020 kgf-cm, 74 ft. lbs.)**

Nut: **29 Nm (296 kgf-cm, 21 ft. lbs.)**

- c. Hook the tool on the hexagonal portion of the drive belt tensioner bracket and operate drive belt tensioner 3 times with full stroke. **HINT:** Take 3 seconds or more for 1 full stroke.

12. INSTALL CRANKSHAFT POSITION SENSOR Torque: **9.0 Nm (92 kgf-cm, 80 inch lbs.)**



ZOOM

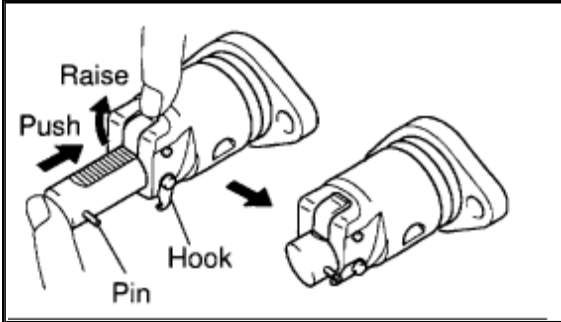
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13. INSTALL CRANKSHAFT PULLEY

- a. Clean the crankshaft pulley inside.
- b. Align the [pulley](#) set key with the key groove of the pulley, and slide on the pulley.
- c. Using SST and 2 nuts (width: 10 mm (0.25 inch)), install the [pulley](#) bolt. SST 09213-70010, 09330-00021
Torque: 1ZZ-FE **138 Nm (1,409 kgf-cm, 102 ft. lbs.)** 2ZZ-GE **120 Nm (1,200 kgf-cm, 87 ft. lbs.)**

14. INSTALL CHAIN TENSIONER

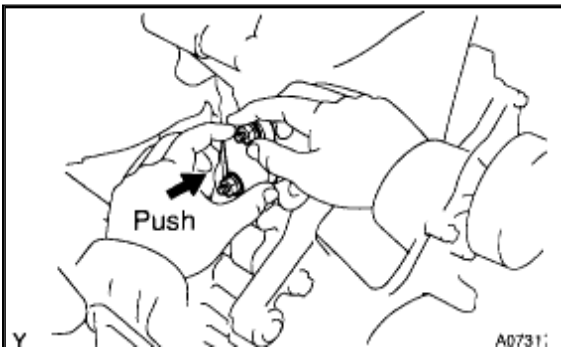
- a. Check the chain tensioner.



ZOOM

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- b. Release the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out.



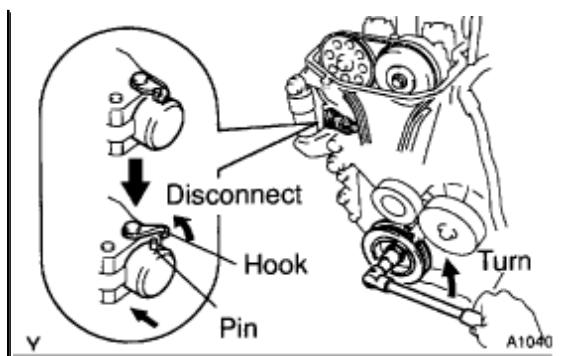
ZOOM

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- c. Insert the O-ring with your hand until it reaches to the chamfering position and install nut temporarily. Then, by tightening the nut, insert the chain tensioner to the installation position. **HINT:**
 - In the case that the hook is released while pushing in, apply the hook again and push the tensioner in.
 - Pay attention not to catch the O-ring as it is built in the chain tensioner previously.
- d. Tighten the 2 nuts. Torque: **9.0 Nm (92 kgf-cm, 80 inch lbs.)**

15. SET CHAIN TENSION

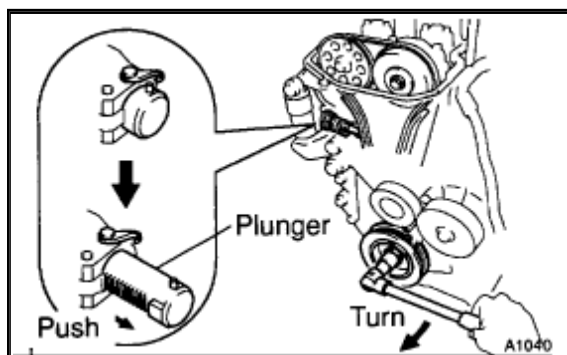




ZOOM

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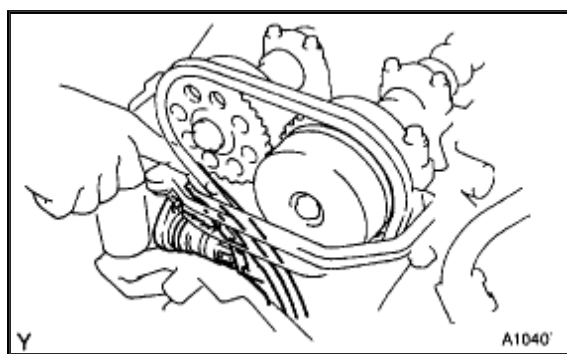
- a. Turn the [crankshaft](#) counterclockwise, and disconnect the plunger knock pin from the hook.



ZOOM

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- b. Turn the [crankshaft](#) clockwise, and check that the slipper is pushed by the plunger.

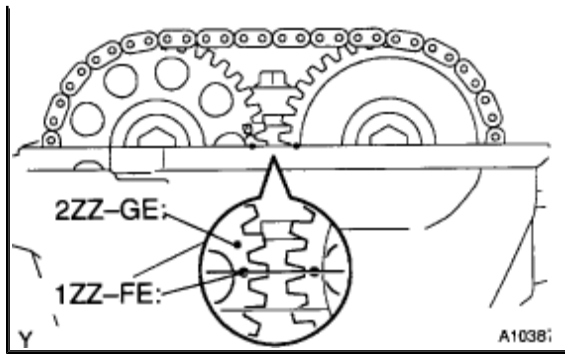


ZOOM

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HINT: If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver or your finger so that the hook is released from the knock pin and the plunger springs out.





ZOOM

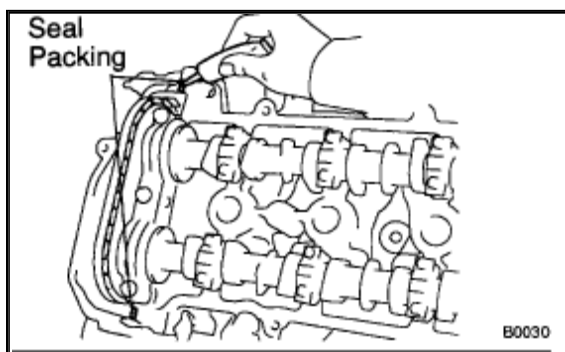
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16. CHECK VALVE TIMING

- Turn the crankshaft pulley, and align its groove with timing mark "0" of the timing chain cover. **NOTICE:** Always turn the [crankshaft](#) clockwise.
- Check that the point marks of the [camshaft](#) timing sprockets are in straight line on the timing chain cover surface as shown in the illustration. If not, turn the [crankshaft](#) **1 revolution (360°)** and align the marks as above.

17. 1ZZ-FE: INSTALL CYLINDER HEAD COVER

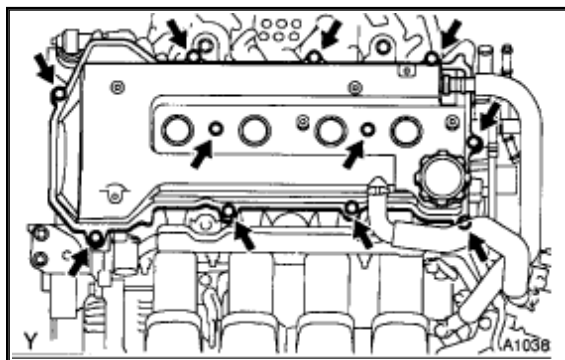
- Remove any old packing (FIPG) material.



ZOOM

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- Apply seal packing to 2 locations as shown in the illustration. Seal packing: Part No. 08826-00080 or equivalent
- Install the gasket to the cylinder head cover. **HINT:** Part must be assembled within 3 minutes of application. Otherwise the material must be remove and reapplied.



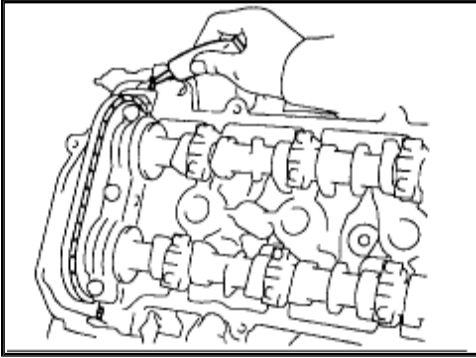
ZOOM

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- d. Install the cylinder head cover with the 9 bolts, 2 seal washers and 2 nuts. Uniformly tighten the bolts and nuts, in the several passes, in the sequence shown. Torque: w/o washer: **11 Nm (113 kgf-cm, 8 ft. lbs.)** w/ washer: **9.0 Nm (92 kgf-cm, 80 inch lbs.)**
- e. Connect the 2 PCV hoses to the cylinder head cover.
- f. Install the ignition coil.

18. 2ZZ-GE: INSTALL CYLINDER HEAD COVER

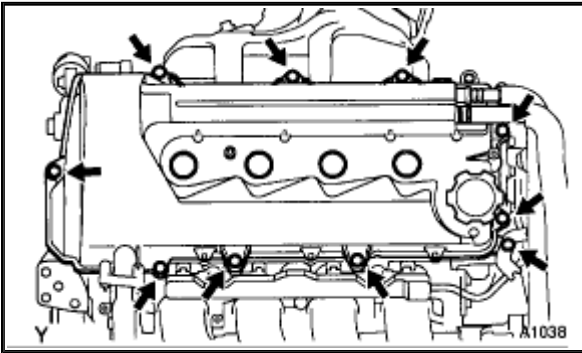
- a. Remove any old packing (FIPG) material. **HINT:** When FIPG on the head cover gasket side cannot be eliminated completely, replace the gasket.



ZOOM

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- b. Apply seal packing to 2 locations as shown in the illustration. Seal packing: Part No. 08826-00080 or equivalent
- c. Install the gasket to the cylinder head cover. **HINT:** Part must be assembled within 3 minutes of application. Otherwise the material must be remove and reapplied.



ZOOM

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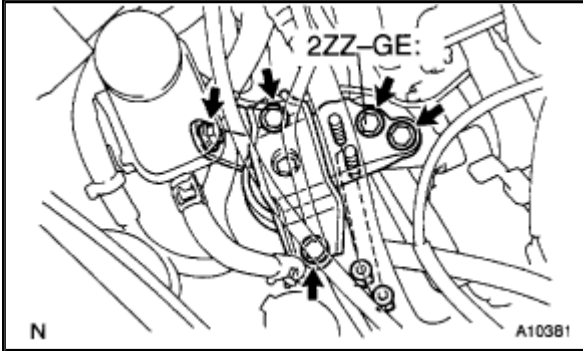
- d. Install the cylinder head cover and wire harness protector with the bolts. Uniformly tighten the bolts, in the several passes, in the sequence shown. Torque: **10 Nm (100 kgf-cm, 7 ft. lbs.)**
- e. Connect the 2 PCV hoses to the cylinder head cover.



ZOOM

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- f. Install a new gasket and No.1 ventilation pipe with 2 nuts and bolt. Torque: Nut: **10 Nm (100 kgf-cm, 7 ft. lbs.)** Bolt: **25 Nm (255 kgf-cm, 18 ft. lbs.)**
- g. Connect the No. 3 ventilation hose to the No.1 ventilation pipe.
- h. Install the ignition coil.



ZOOM

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19. INSTALL RIGHT-HAND ENGINE MOUNTING INSULATOR

- a. 1ZZ-FE: Install the Right-Hand engine mounting insulator with the 4 bolts and 2 nuts. Torque: **52 Nm (530 kgf-cm, 38 ft. lbs.)**
- b. 2ZZ-GE: Install the Right-Hand engine mounting insulator with the 5 bolts and 2 nuts. Torque: **52 Nm (530 kgf-cm, 38 ft. lbs.)**

20. INSTALL PS PUMP

- a. Install the PS pump with the 2 through bolts and nuts. Torque: **36 Nm (370 kgf-cm, 27 ft. lbs.)**
- b. Install the PS pump [pulley](#) with the pulley nut.
- c. Connect the PS oil pressure switch connector.

21. INSTALL GENERATOR AND [DRIVE BELT](#)

22. INSTALL RIGHT-HAND ENGINE UNDER COVER

23. INSTALL RIGHT-HAND FRONT WHEEL

24. FILL WITH ENGINE COOLANT

25. INSTALL FRONT FENDER APRON SEAL AND UPPER RADIATOR SUPPORT SEAL

26. START ENGINE AND CHECK FOR COOLANT LEAKS