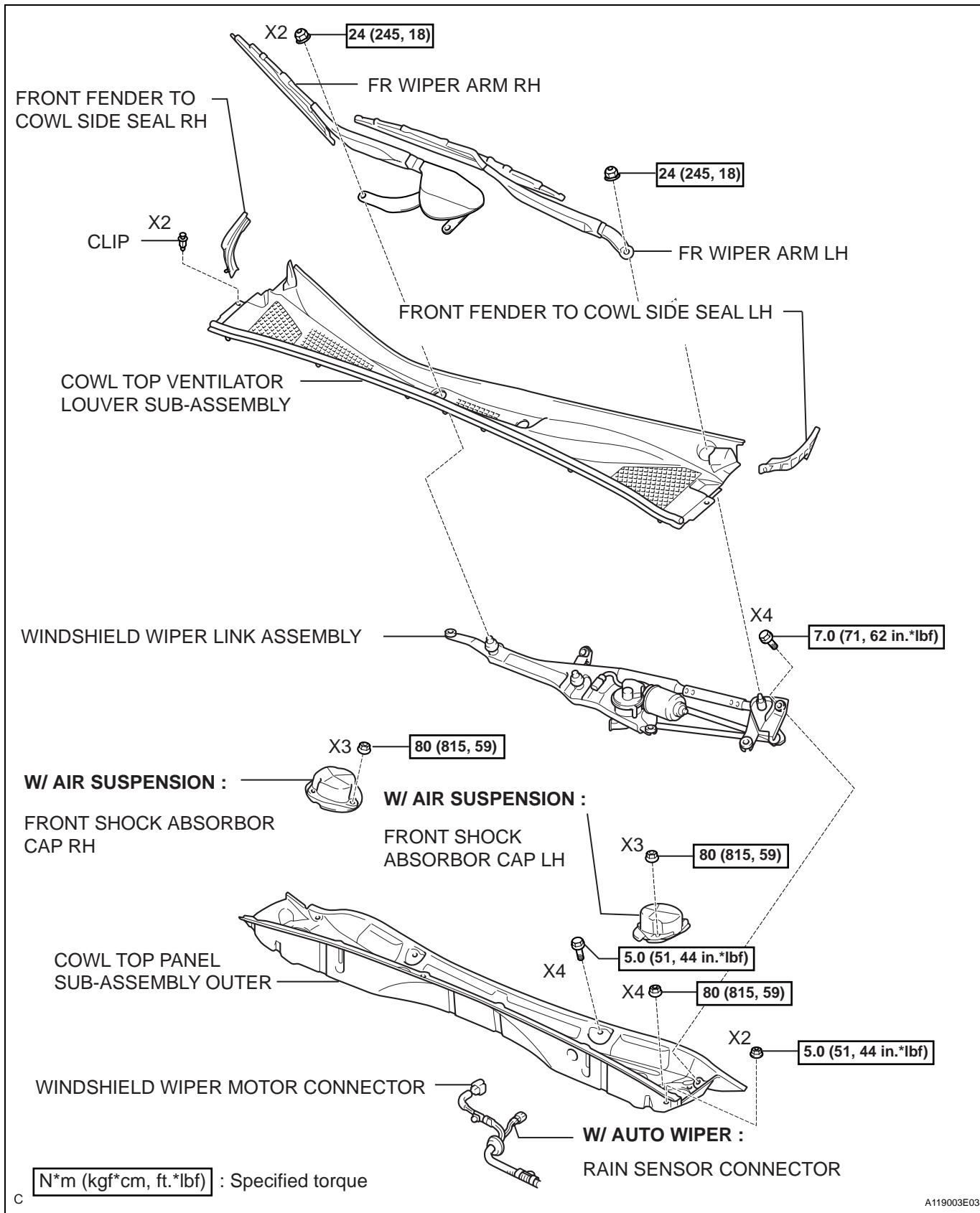
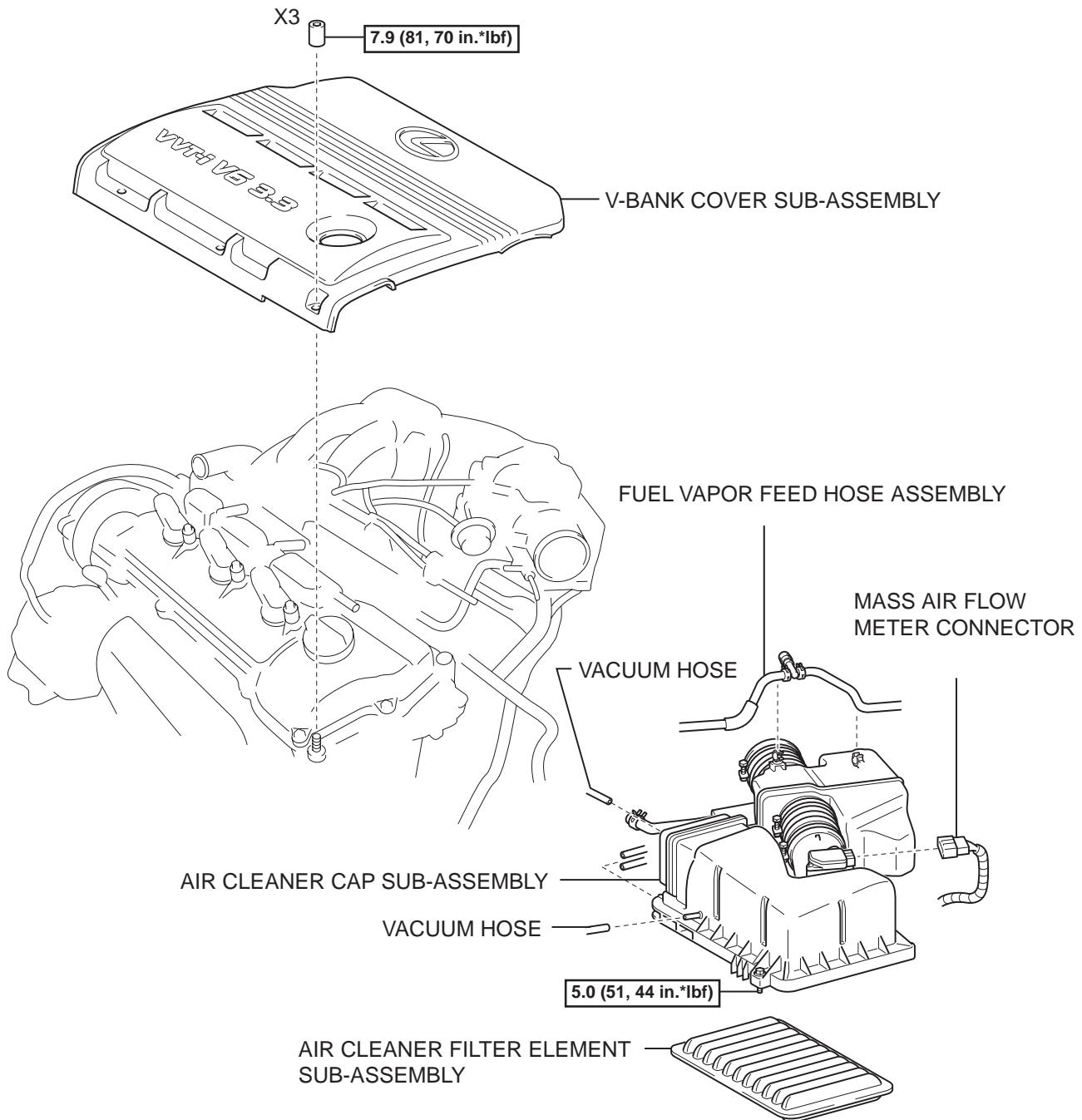


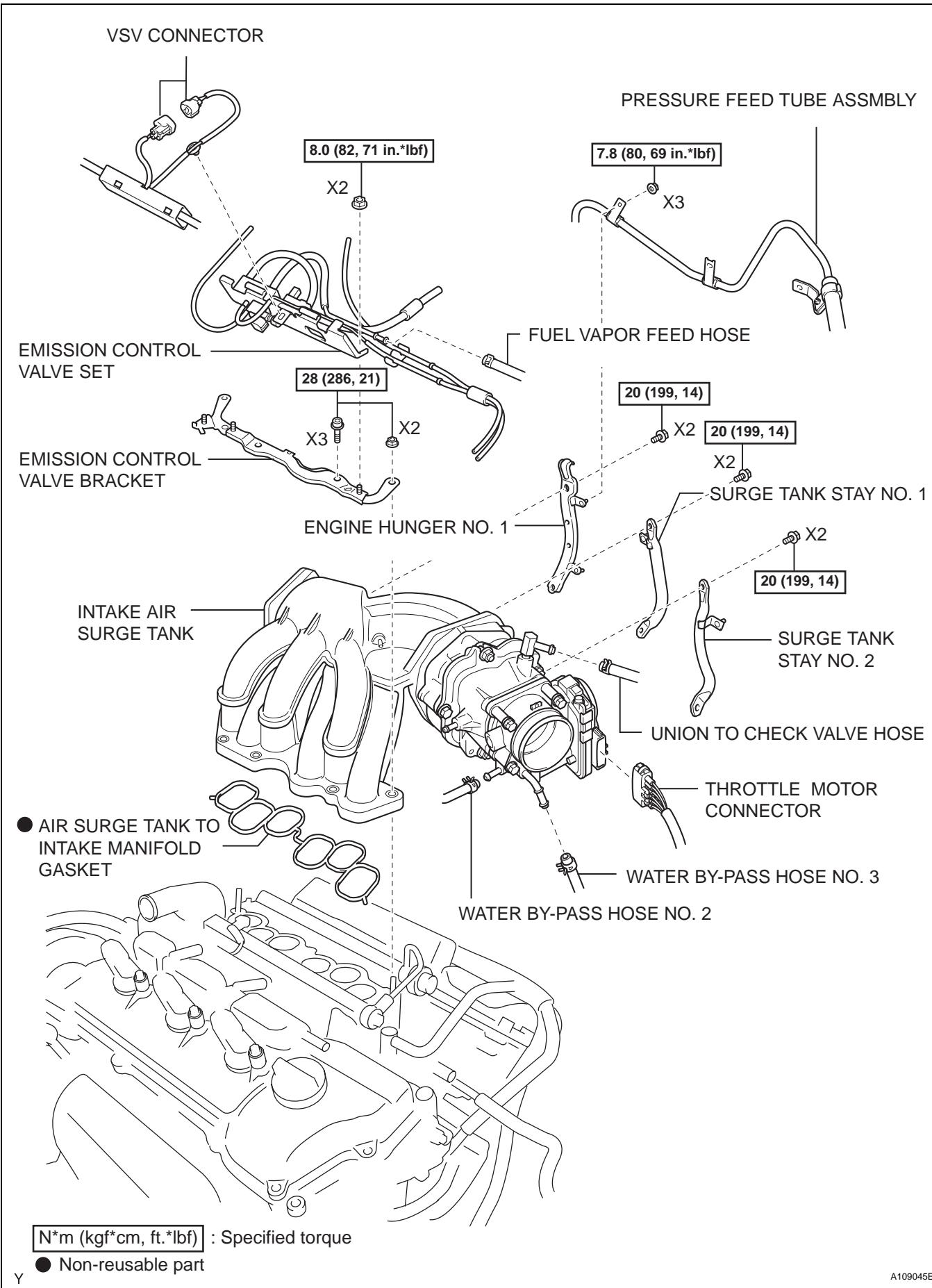
CAMSHAFT

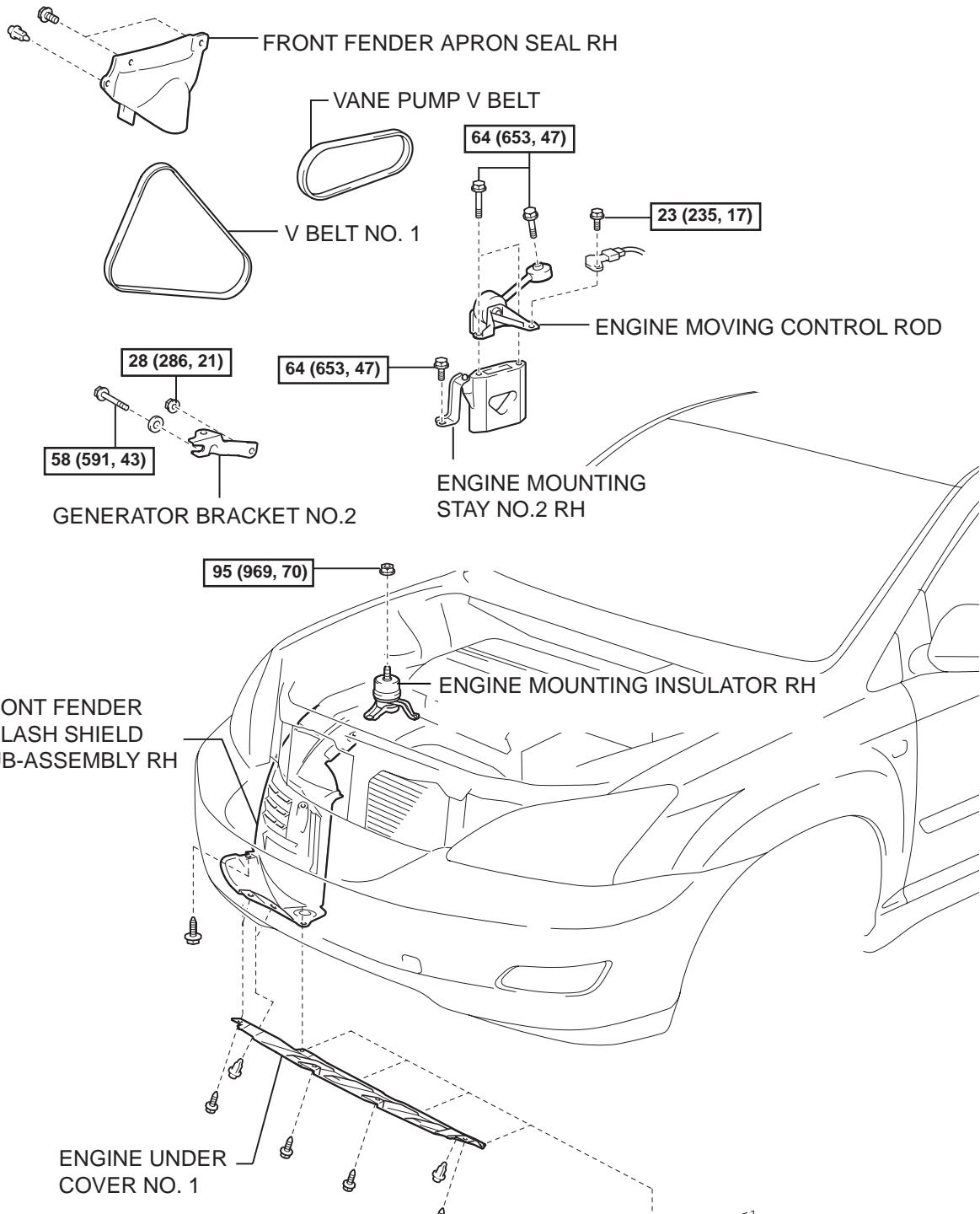
COMPONENTS



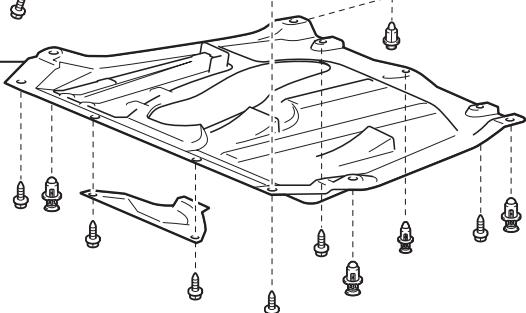


N*m (kgf*cm, ft.*lbf) : Specified torque

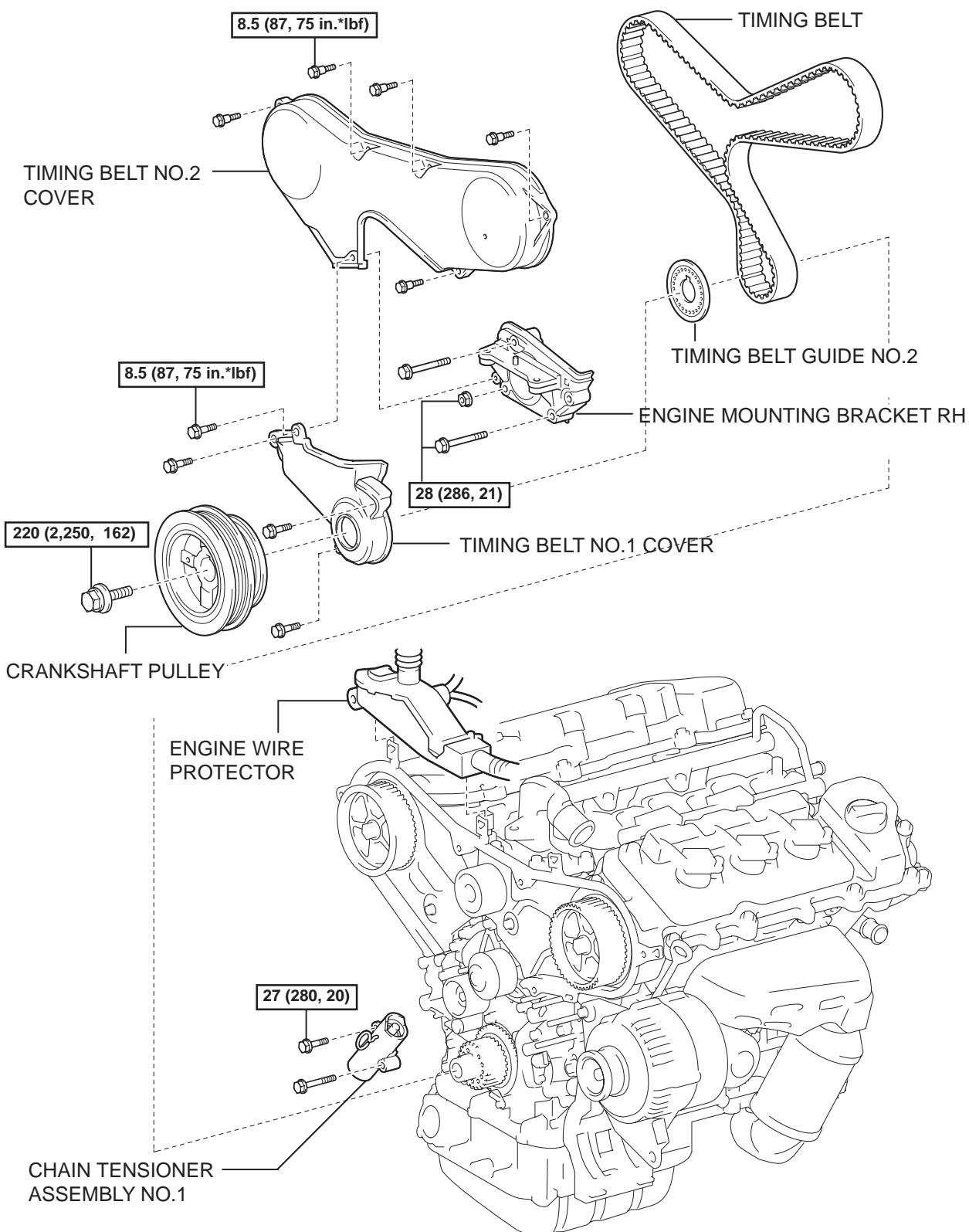


**W/ ENGINE UNDER COVER ASSEMBLY :**

ENGINE UNDER COVER ASSEMBLY



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

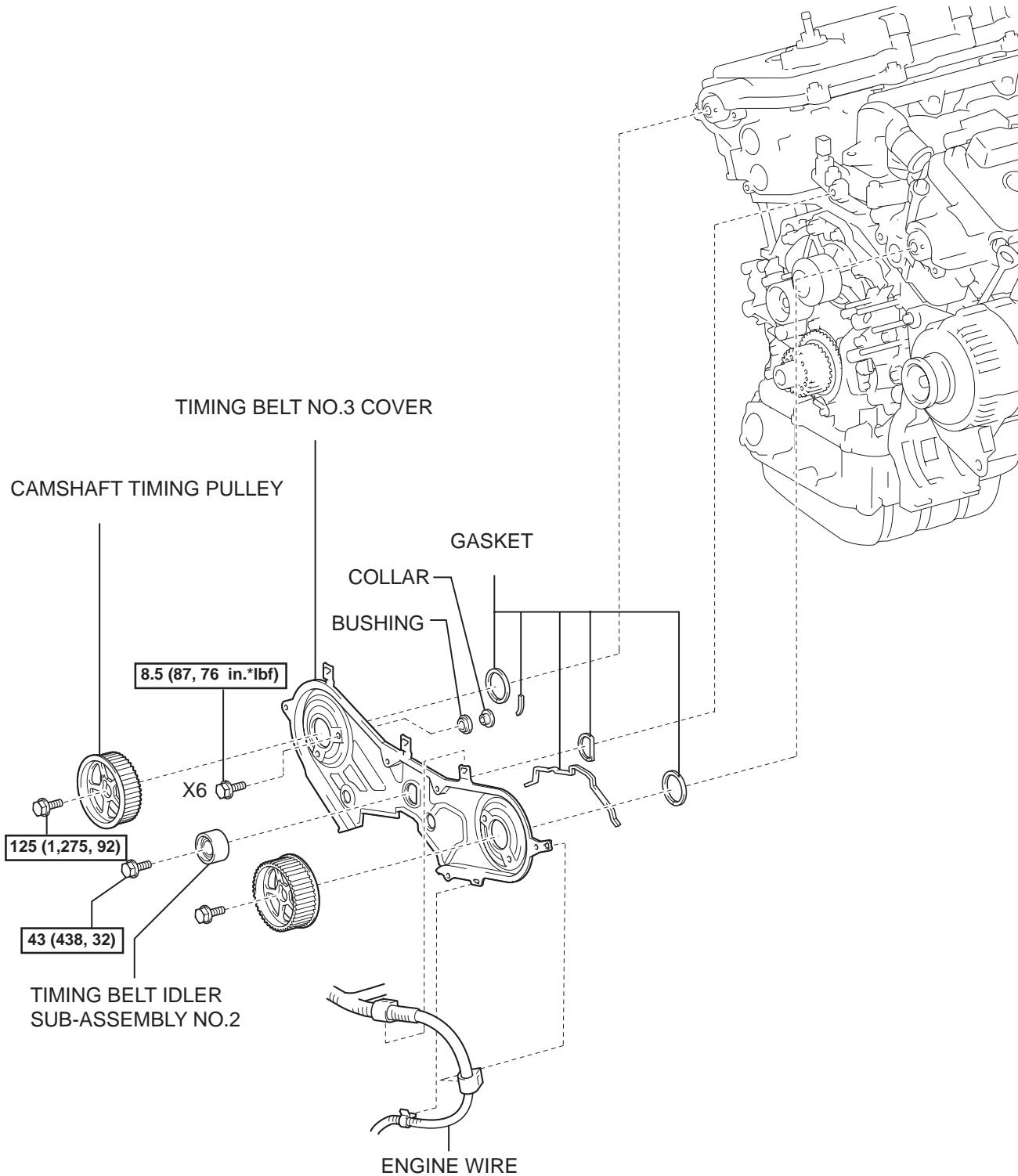


N*m (kgf*cm, ft.*lbf) : Specified torque

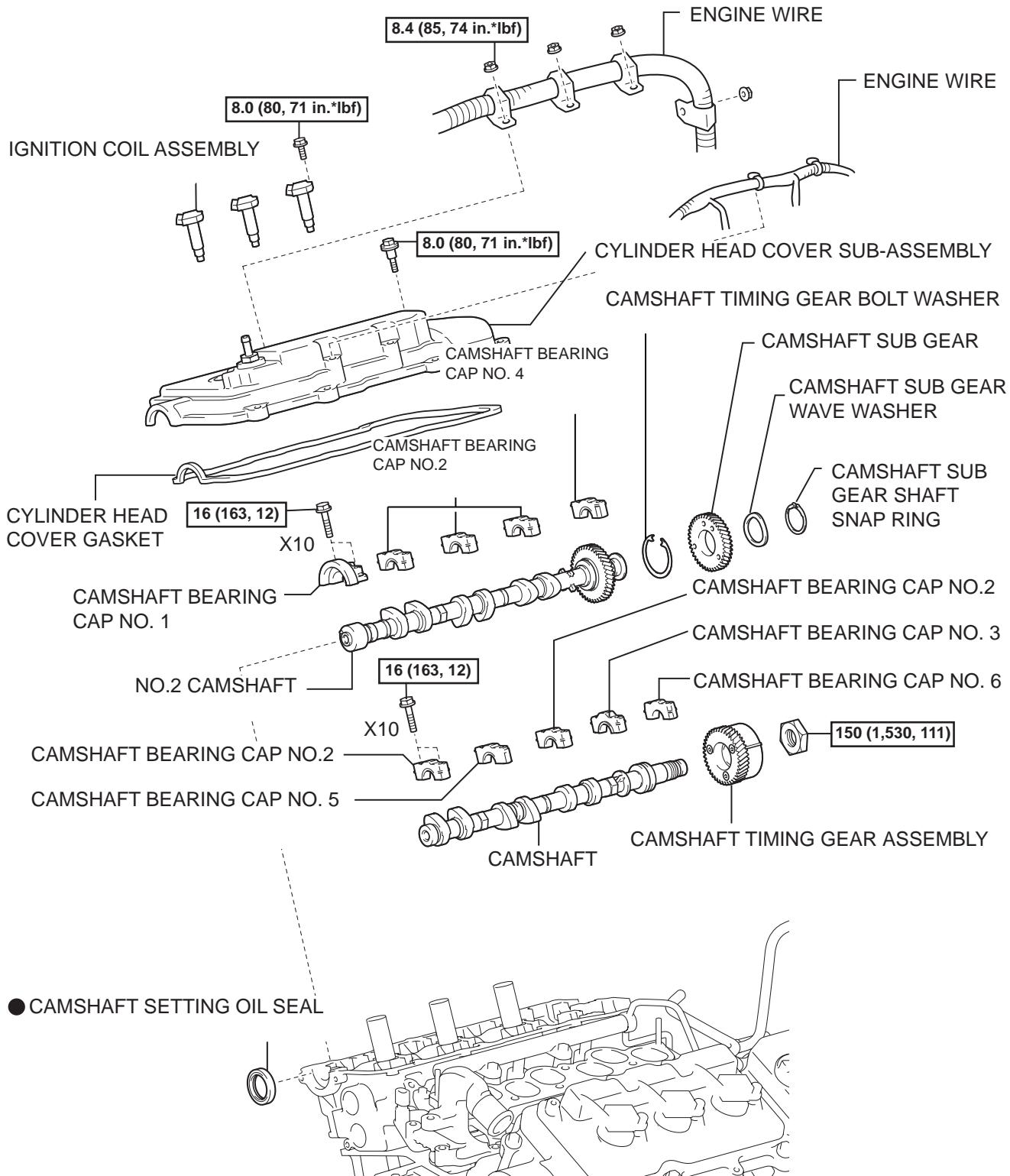
P

A119014E01

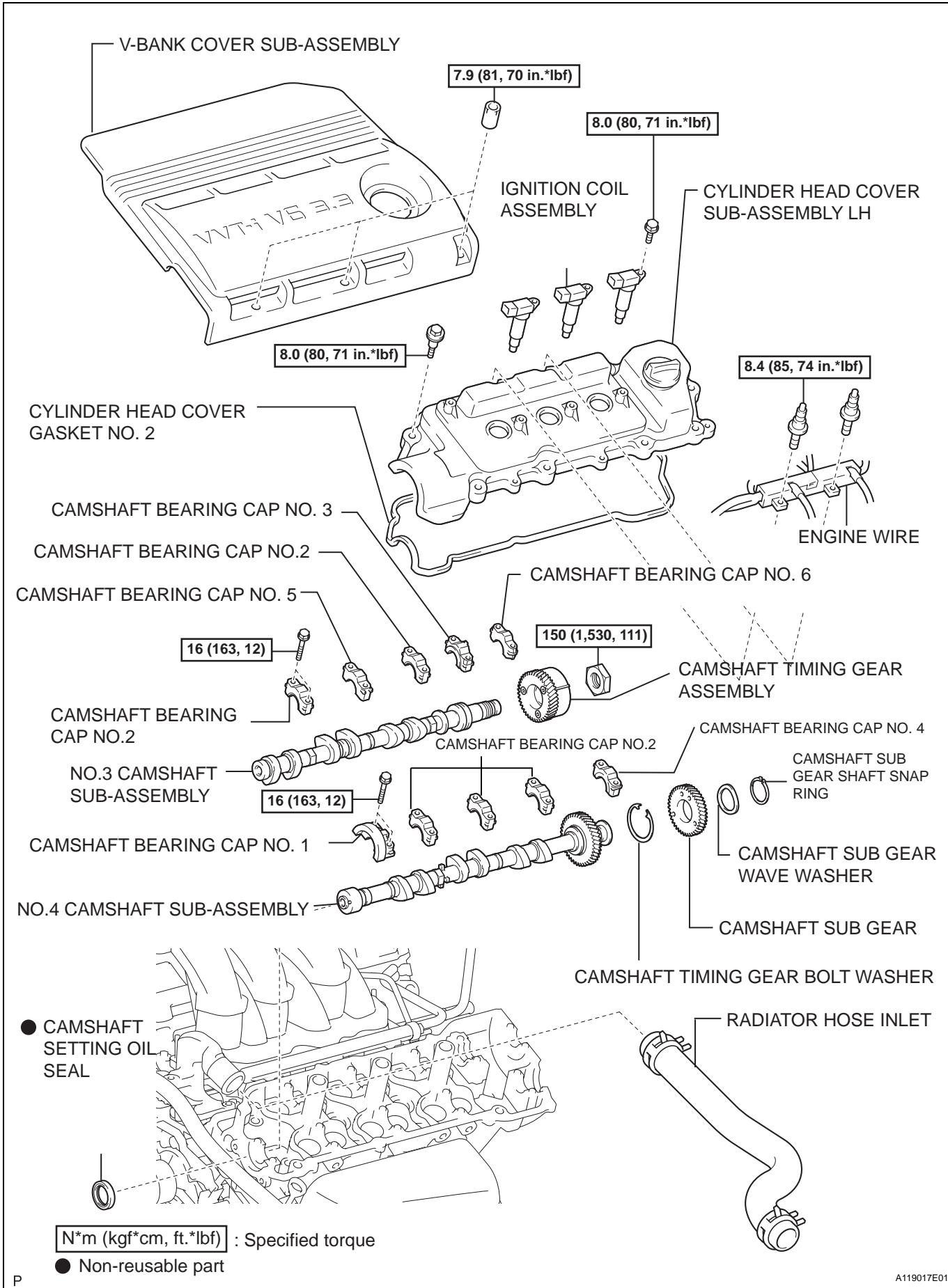
EM



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



EM

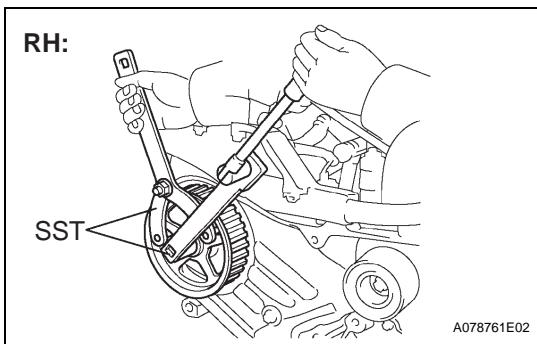


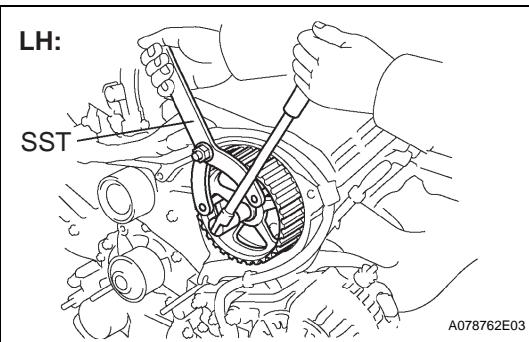
REMOVAL

- 1. DRAIN COOLANT**
(a) Drain coolant (See page [CO-7](#)).
- 2. REMOVE FRONT WHEEL RH**
- 3. REMOVE FR WIPER ARM RH**
(a) Remove the FR wiper arm RH (See page [WW-37](#)).
- 4. REMOVE FR WIPER ARM LH**
(a) Remove the FR wiper arm LH (See page [WW-37](#)).
- 5. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY**
(a) Remove the cowl top ventilator louver sub-assembly (See page [WW-37](#)).
- 6. REMOVE WINDSHIELD WIPER LINK ASSEMBLY**
(a) Remove the windshield wiper link assembly (See page [WW-37](#)).
- 7. REMOVE COWL TOP PANEL SUB-ASSEMBLY OUTER**
(a) Remove the cowl top panel sub-assembly (See page [FU-10](#)).
- 8. REMOVE V-BANK COVER SUB-ASSEMBLY**
(a) Remove the V-bank cover sub-assembly (See page [EM-8](#)).
- 9. REMOVE AIR CLEANER CAP SUB-ASSEMBLY**
(a) Remove the air cleaner cap sub-assembly (See page [FU-10](#)).
- 10. REMOVE EMISSION CONTROL VALVE SET**
(a) Remove the emission control valve set (See page [EM-8](#)).
- 11. REMOVE INTAKE AIR SURGE TANK**
(a) Remove the intake air surge tank (See page [EM-8](#)).
- 12. REMOVE RADIATOR HOSE INLET**
- 13. REMOVE IGNITION COIL ASSEMBLY**
- 14. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY**
(a) Remove the cylinder head cover sub-assembly (See page [EM-8](#)).
- 15. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH**
(a) Remove the cylinder head cover sub-assembly LH (See page [EM-8](#)).
- 16. REMOVE ENGINE UNDER COVER ASSEMBLY**
(a) w/ engine under cover assembly
- 17. REMOVE ENGINE UNDER COVER NO.1**
- 18. REMOVE FRONT FENDER APRON SEAL RH**
(a) Remove the front fender apron seal RH (See page [ES-367](#)).

EM

- 19. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1**
(a) Remove the V (cooler compressor to crankshaft pulley) belt No.1 (See page [EM-6](#)).
- 20. REMOVE VANE PUMP V BELT**
(a) Remove the vane pump V belt (See page [EM-6](#)).
- 21. REMOVE ENGINE MOVING CONTROL ROD**
(a) Remove the engine moving control rod (See page [EM-22](#)).
- 22. REMOVE ENGINE MOUNTING STAY NO.2 RH**
(a) Remove the engine mounting stay No.2 RH (See page [EM-22](#)).
- 23. REMOVE GENERATOR BRACKET NO.2**
(a) Remove the generator bracket No.2 (See page [EM-22](#)).
- 24. REMOVE CRANKSHAFT PULLEY**
SST 09213-54015 (91651-60855), 09330-00021,
09950-50013 (09951-05010, 09952-05010,
09953-05020, 09954-05031)
(a) Remove the crankshaft pulley (See page [EM-22](#)).
- 25. REMOVE TIMING BELT NO.1 COVER**
- 26. REMOVE TIMING BELT NO.2 COVER**
(a) Remove the timing belt No.2 cover (See page [EM-22](#)).
- 27. REMOVE ENGINE MOUNTING BRACKET RH**
(a) Remove the engine mounting bracket RH (See page [EM-22](#)).
- 28. REMOVE TIMING BELT GUIDE NO.2**
- 29. REMOVE TIMING BELT**
(a) Remove the timing belt (See page [EM-22](#)).
- 30. REMOVE TIMING BELT IDLER SUB-ASSEMBLY NO.2**
- 31. REMOVE CAMSHAFT TIMING PULLEY**
(a) Using SST, remove the bolt and the RH timing pulley.
SST 09960-10010 (09962-01000, 09963-01000),
09249-63010



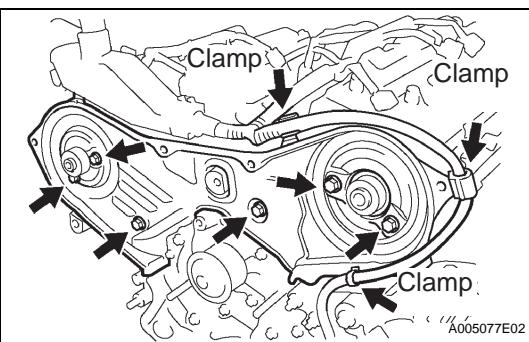


(b) Using SST, remove the bolt and the LH timing pulley.

SST 09960-10010 (09962-01000, 09963-01000)

HINT:

Arrange the camshaft timing pulleys (RH and LH sides) so that they can be returned to the original locations when re-assembling.



32. REMOVE TIMING BELT NO.3 COVER

(a) Disconnect the 3 engine wire harness clamps from the timing belt No. 3 cover.

(b) Remove the 6 bolts and the timing belt cover.

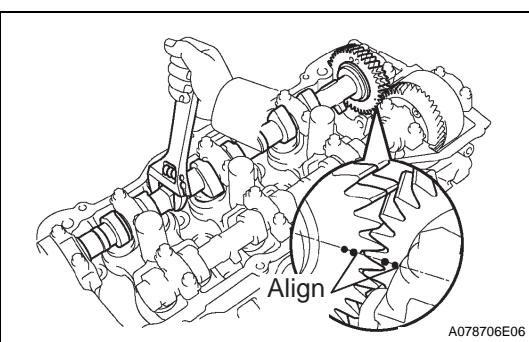
EM

33. REMOVE CAMSHAFT

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

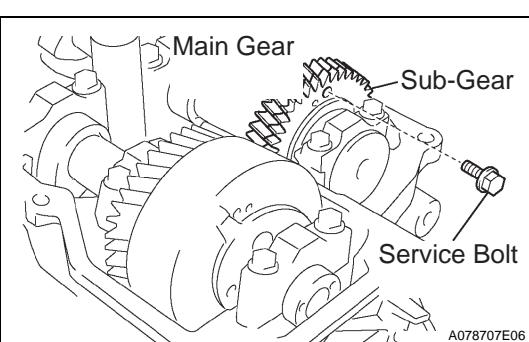
(a) Align the timing marks (2-dot marks) of the camshaft drive and the driven gears by turning the camshaft with a wrench.



(b) Secure the exhaust camshaft sub-gear to the main gear with a service bolt.

Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)

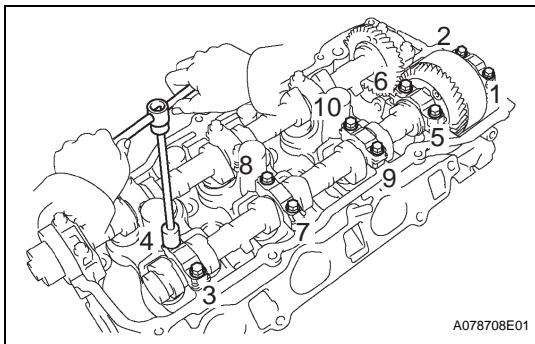
Recommended service bolt



Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 to 20 mm

HINT:

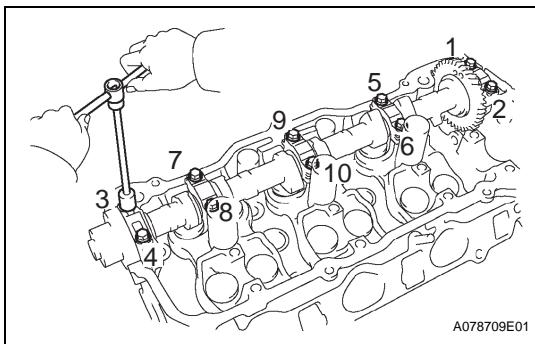
When removing the camshaft, make certain that the torsional spring force of the sub-gear has been eliminated by installation of the service bolt.



(c) Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and the camshaft.

NOTICE:

- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**



34. REMOVE NO.2 CAMSHAFT

(a) Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 2 camshaft.

NOTICE:

- **Do not pry out the camshaft.**
- **Be careful not to damage the portion of the cylinder head receiving the shaft thrust.**

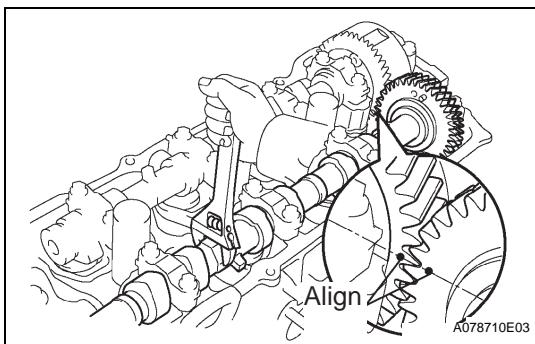
(b) Remove the oil seal from the No. 2 camshaft.

35. REMOVE NO.3 CAMSHAFT SUB-ASSEMBLY

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

(a) Align the timing marks (1 dot mark) of the camshaft drive and the driven gears by turning the camshaft with a wrench.



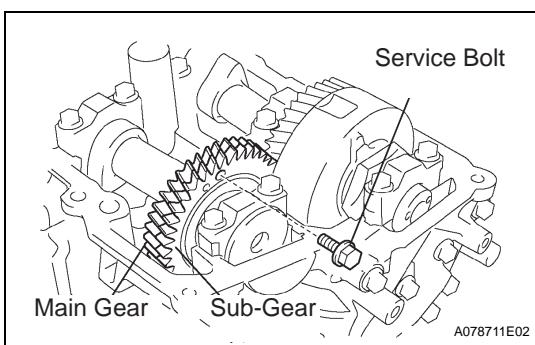
(b) Secure the exhaust camshaft sub-gear to the main gear with a service bolt.

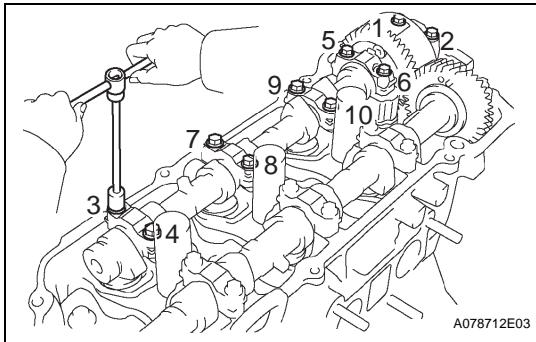
Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)
Recommended service bolt

Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 to 20 mm

HINT:

When removing the camshaft, make certain that the torsional spring force of the sub-gear has been eliminated by installation of the service bolt.

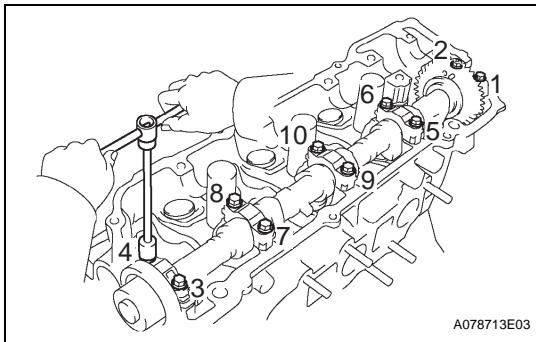




(c) Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 3 camshaft.

NOTICE:

- **Do not pry out the camshaft.**
- **Be careful not damage the portion of the cylinder head receiving the shaft thrust.**



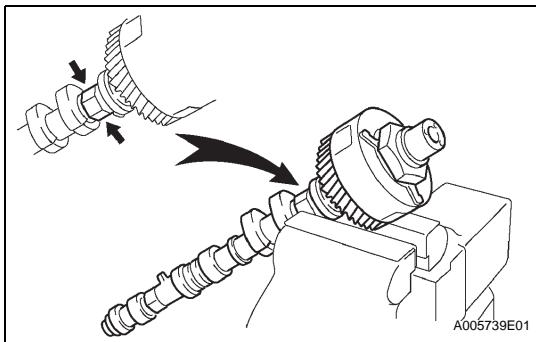
36. REMOVE NO.4 CAMSHAFT SUB-ASSEMBLY

(a) Using several steps, loosen and remove the 10 bearing cap bolts uniformly in the sequence shown in the illustration. Remove the 5 bearing caps and the No. 4 camshaft.

NOTICE:

- **Do not pry out the camshaft.**
- **Be careful not damage the portion of the cylinder head receiving the shaft thrust.**

(b) Remove the oil seal from the No. 4 camshaft.



37. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY

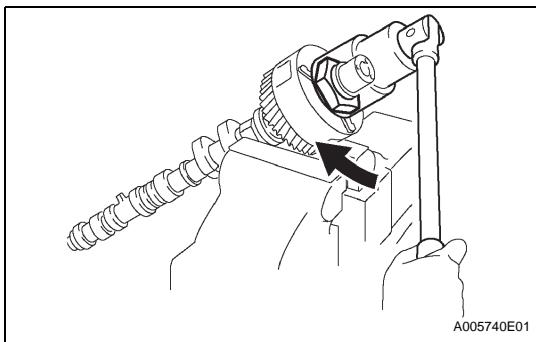
NOTICE:

Do not remove or install the camshaft timing gear (VVT-i) unless you are replacing the VVT-i or the camshaft.

(a) Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:

Be careful not to damage the camshaft.



(b) Using a 46 mm socket wrench, remove the lock nut by turning it clockwise.

NOTICE:

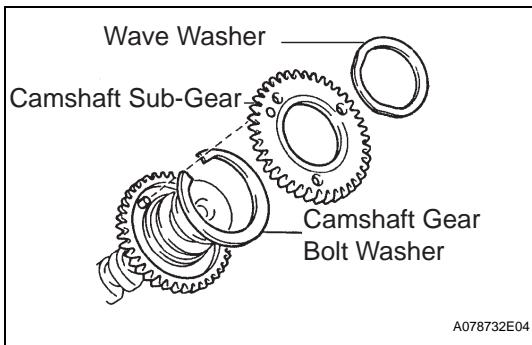
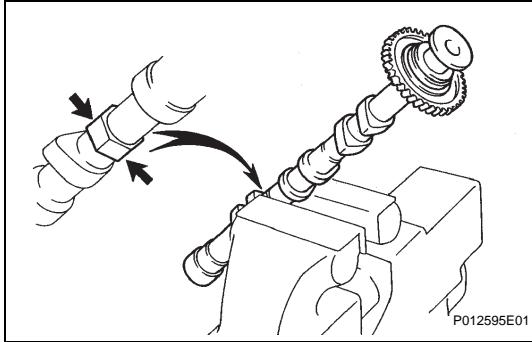
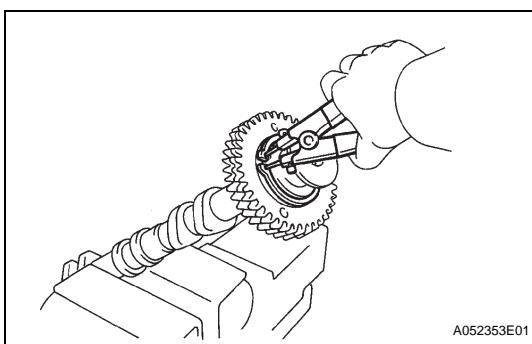
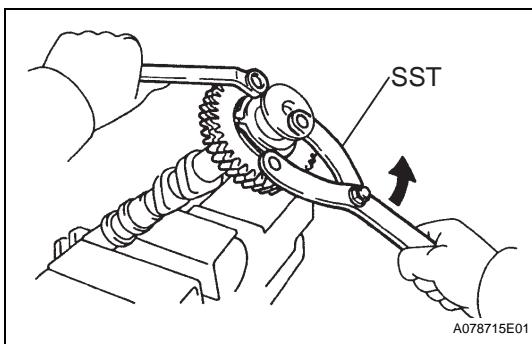
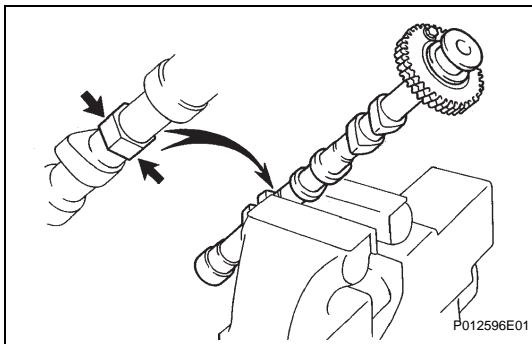
- **Remove it with the lock-pin engaged and locked at the most retard angle position.**
- **The lock nut has LH threads.**
- **Never use any tool other than the socket wrench. Other tools will deform the cam angle rotor.**

(c) Remove the camshaft VVT-i.

NOTICE:

Never remove the 3 bolts on the gear.

If it is difficult to remove the VVT-i, tap it lightly using a plastic-faced hammer and then remove it.



38. REMOVE CAMSHAFT SUB GEAR

- Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:

Be careful not to damage the camshaft.

- Using SST, turn the sub-gear counterclockwise, and remove the service bolt.

SST 09960-10010 (09962-01000, 09963-00500)

- Using snap ring pliers, remove the snap ring.
- Remove the wave washer, camshaft sub-gear and camshaft gear bolt washer.

INSTALLATION

1. INSTALL CAMSHAFT SUB GEAR

- Clamp the camshaft in a vise on the hexagonal lobe.

NOTICE:

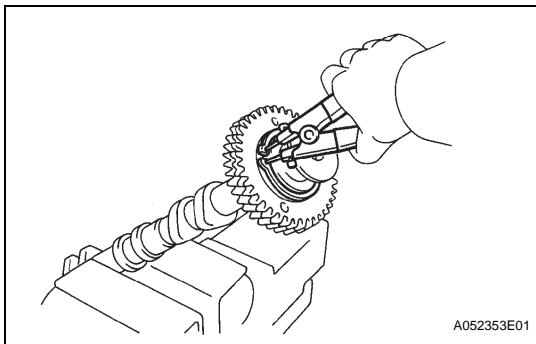
Be careful not to damage the camshaft.

- Install the camshaft gear bolt washer and the camshaft sub-gear.

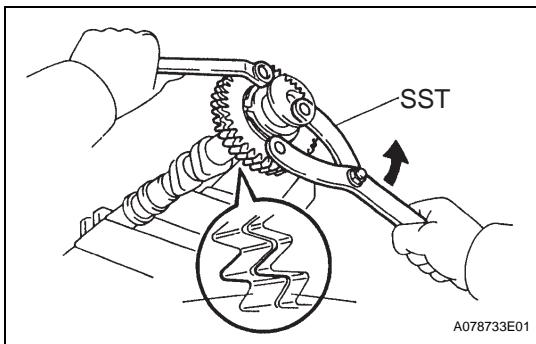
HINT:

Attach the pins on the gears to the gear bolt washer ends.

- Install the wave washer.



(d) Using snap ring pliers, install the snap ring.



(e) Using SST, align the holes of the camshaft main gear and sub-gear by turning camshaft sub-gear counterclockwise, and temporarily install a service bolt.

SST 09960-10010 (09962-01000, 09963-00500)

(f) Align the gear teeth of the main gear and sub-gear, and tighten the service bolt.

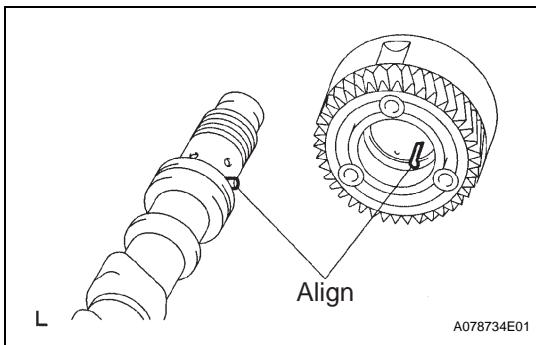
Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)

NOTICE:

Be careful not to damage the camshaft journals.

HINT:

When installing the camshaft, make certain that the torsional spring force of the sub-gear has been eliminated by installation of the service bolt.



2. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY

(a) Align the alignment pin with the groove and install the VVT-i on the camshaft.

NOTICE:

Install it with the lock-pin engaged and locked at the most retard angle position.

(b) Apply engine oil to the nut, the mounting surface of VVT-i and the screw threads.

NOTICE:

- Be sure to apply the oil, otherwise the specified torque cannot be obtained.
- New nut must be used when replacing the VVT-i unit.

(c) Using a 46 mm socket wrench, install and tighten a lock nut by turning it counterclockwise.

Torque: 150 N*m (1,530 kgf*cm, 111 ft.*lbf)

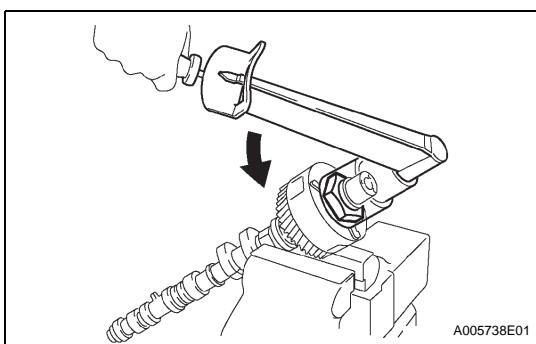
NOTICE:

- The lock nut has LH threads.
- Never use any tool other than the socket wrench. Other tools will deform the cam angle rotor.

3. INSTALL NO.4 CAMSHAFT SUB-ASSEMBLY

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

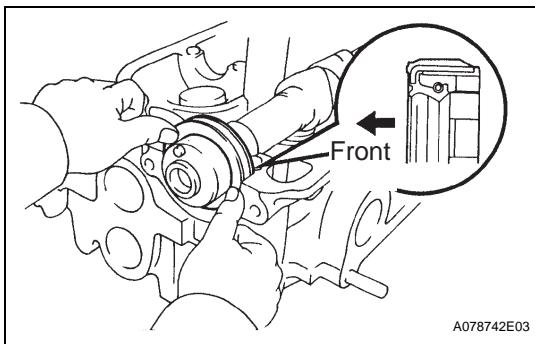
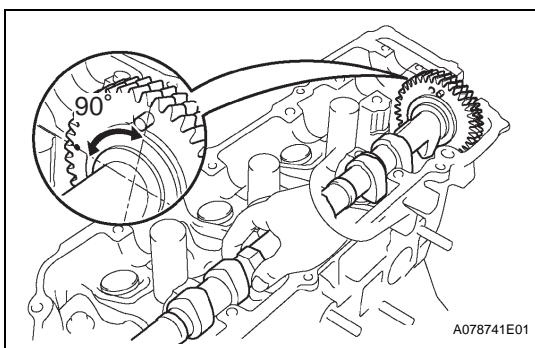


EM

(a) Apply new engine oil to the thrust portion and journal of the camshaft.

(b) Place the No. 4 camshaft at 90° angle of the timing mark (1-dot marks) on the cylinder head.

(c) Apply MP grease to a new oil seal lip.

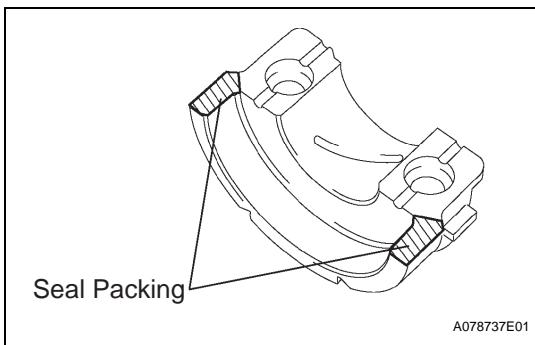


(d) Install the oil seal to the camshaft.

NOTICE:

- **Do not turn over the oil seal lip.**
- **Insert the oil seal until it stops.**

(e) Remove any old packing material from the contact surface.



(f) Apply seal packing to the No. 1 bearing cap as shown in the illustration.

Seal packing:

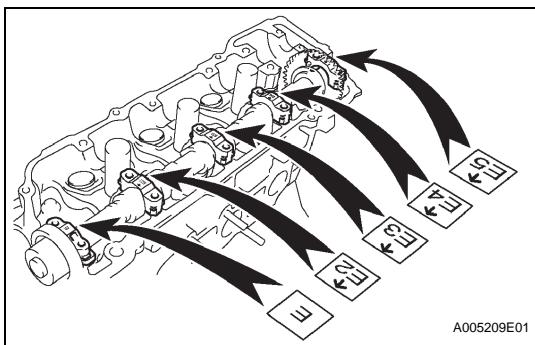
Part No. 08826-00080 or equivalent

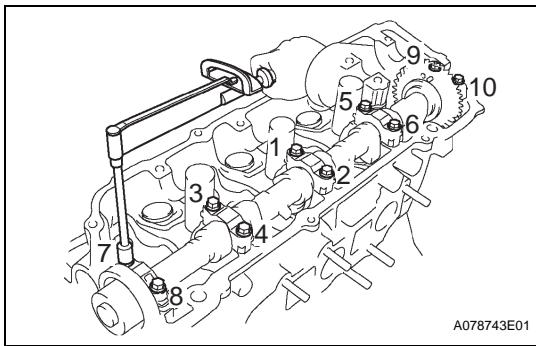
NOTICE:

- **Install the No.1 bearing cap within 5 minutes after applying seal packing.**
- **Do not expose the seal to engine oil within 2 hours after installing.**

(g) Install the 5 bearing caps in their proper locations.

(h) Apply a light coat of engine oil on the threads of the bearing cap bolts.





(i) Using several steps, install and tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

Torque: 16 N*m (163 kgf*cm, 12 ft.*lbf)

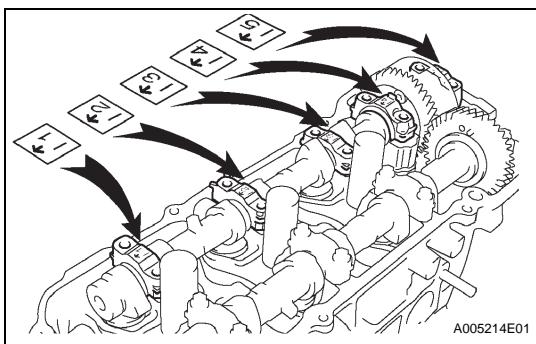
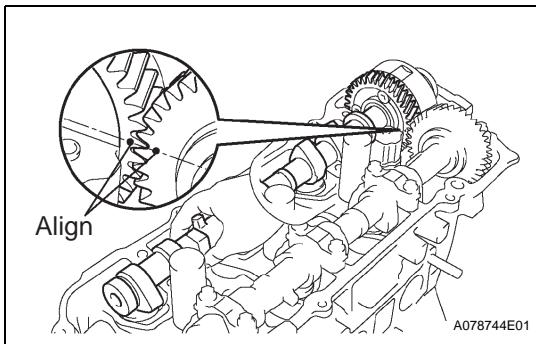
4. INSTALL NO.3 CAMSHAFT SUB-ASSEMBLY
NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

(a) Apply new engine oil to the thrust portion and journal of the camshaft.

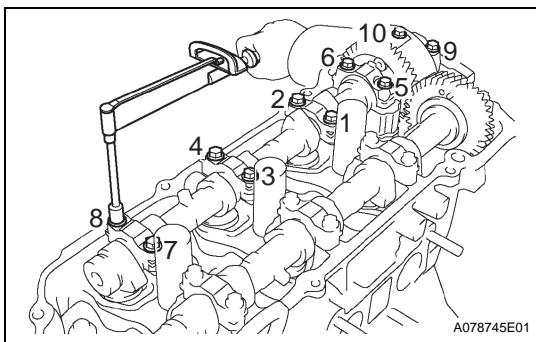
(b) Align the timing marks (1 dot mark) of the camshaft drive gear with the mark on the driven gears.

(c) Place the camshaft on the cylinder head.



(d) Install the 5 bearing caps in their proper locations.

(e) Apply a light coat of engine oil to the threads of the bearing cap bolts.



(f) Using several steps, install and tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

Torque: 16 N*m (163 kgf*cm, 12 ft.*lbf)

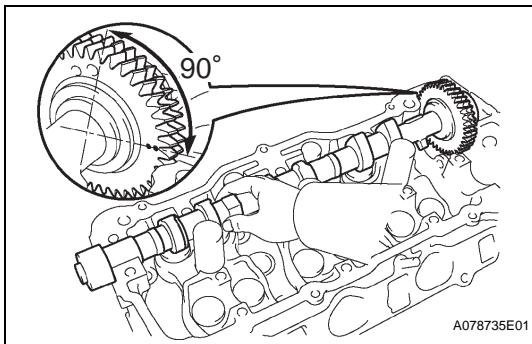
(g) Remove the service bolt.

5. INSTALL NO.2 CAMSHAFT
NOTICE:

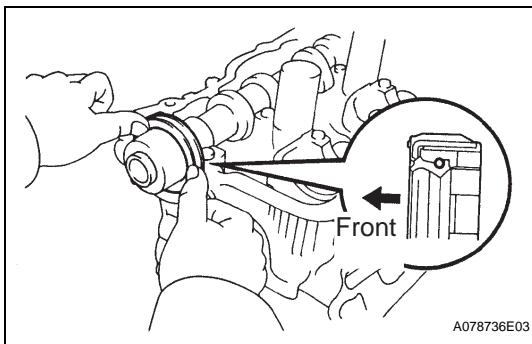
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

(a) Apply new engine oil to the thrust portion and journal of the camshaft.

EM



- (b) Place the No. 2 camshaft at 90° angle of the timing mark (2 dot marks) on the cylinder head.
- (c) Apply MP grease to a new oil seal lip.

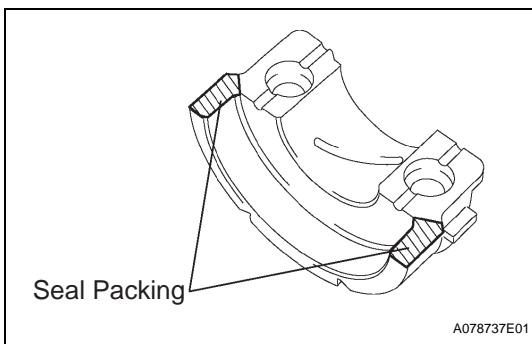


- (d) Install the oil seal to the camshaft.

NOTICE:

- Do not turn over the oil seal lip.
- Insert the oil seal until it stops.

- (e) Remove any old packing material from the contact surface.



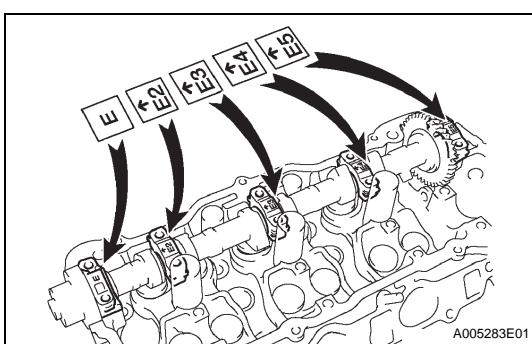
- (f) Apply seal packing to the No. 1 bearing cap as shown in the illustration.

Seal packing:

Part No.08826-00080 or equivalent

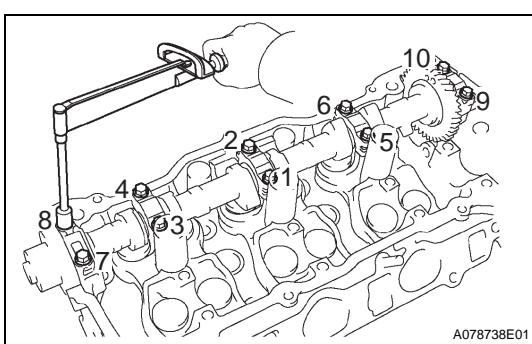
NOTICE:

- Install the No.1 bearing cap within 5 minutes after applying seal packing.
- Do not expose the seal to engine oil within 2 hours after installing.



- (g) Install the 5 bearing caps in their proper locations.

- (h) Apply a light coat of engine oil on the threads of the bearing cap bolts.



- (i) Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

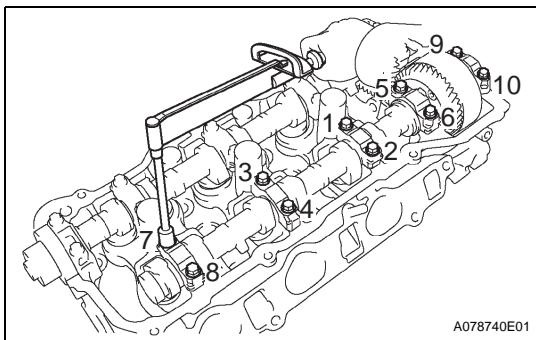
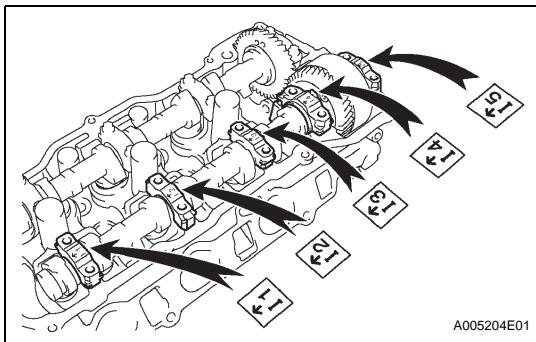
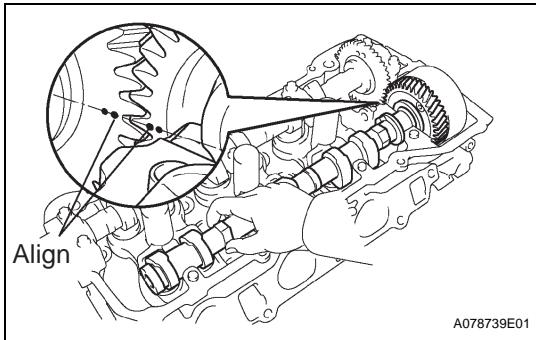
Torque: 16 N*m (163 kgf*cm, 12 ft.*lbf)

6. INSTALL CAMSHAFT

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, damage to the cylinder head or to the camshaft may result. To avoid this, the following steps should be carried out.

- Apply new engine oil to the thrust portion and journal of the camshaft.
- Align the timing marks (2 dot marks) of the camshaft drive gear with the mark on the driven gears.
- Place the camshaft on the cylinder head.



- Install the 5 bearing caps in their proper locations.
- Apply a light coat of engine oil to the threads of the bearing cap bolts.

- Using several steps, tighten the 10 bearing cap bolts uniformly in the sequence shown in the illustration.

Torque: 16 N*m (163 kgf*cm, 12 ft.*lbf)

- Remove the service bolt.

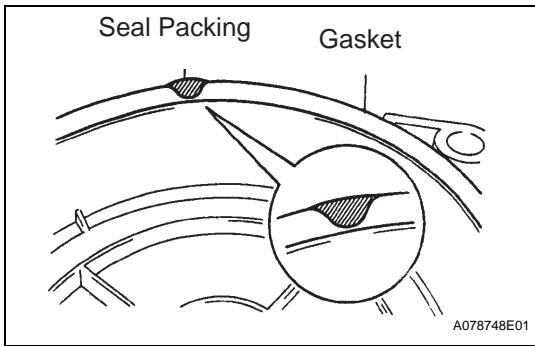
7. INSTALL TIMING BELT NO.3 COVER

- Visually check for cracks and breaks on the gasket of the timing belt cover.

HINT:

If there is a trace of water is found in the visual check, repair it with seal packing when the crack length is within 2 to 3 cm (0.79 to 1.18 in.). Replace the gasket when the crack length is 3 to 4 cm (1.18 to 1.57 in.) and more.

EM



(b) If the timing belt cover gasket is needed to repair, follow the procedure below.

(1) Repair the cracks and breaks by applying the seal packing to the damaged area.

Seal packing:

Part No.08826-00080 or equivalent

NOTICE:

When applying the seal packing, apply it as wide and high as possible to fill the surface area of the gasket.

(c) If the timing belt cover gasket is needed to replace, follow the procedure below.

(1) Using a screwdriver and gasket scraper, remove the remaining gasket.

NOTICE:

Be careful not to damage the timing belt cover.

(2) Remove the backing paper from a new gasket, and affix the gasket along the groove of the timing belt cover as shown in the illustration.

NOTICE:

- Affix the gasket in the center of the groove.**
- At the corners, try to keep the gasket thickness uniform.**

HINT:

Gasket length

Gasket	D	E	F	G
Length	335 mm (13.19 in.)	180 mm (7.09 in.)	133 mm (5.24 in.)	72 mm (2.83 in.)

(3) If there is a gap on the joint of the gasket, apply seal packing to close the gap.

Seal packing:

Part No.08826-00080 or equivalent

NOTICE:

When applying the seal packing, apply it as wide and high as the gasket.

(d) Install the timing belt cover with the 6 bolts.

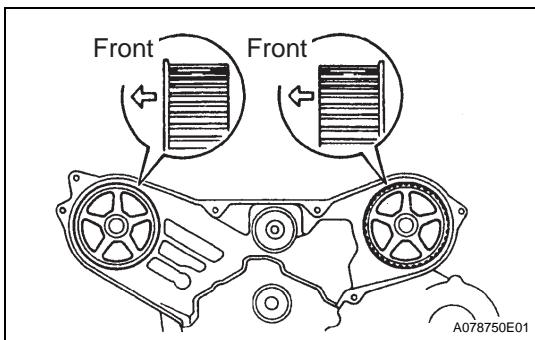
Torque: 8.5 N·m (87 kgf·cm, 76 in.·lbf)

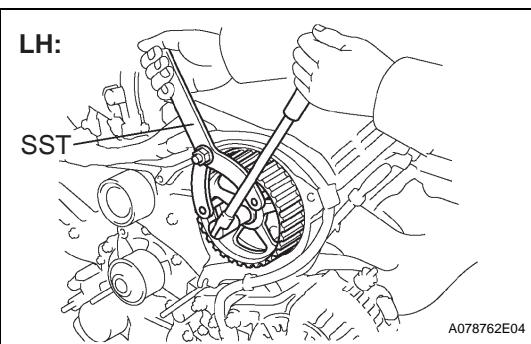
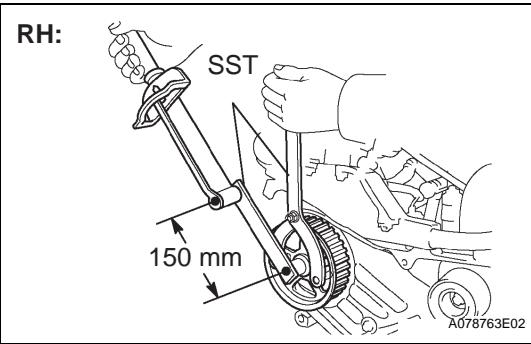
8. INSTALL CAMSHAFT TIMING PULLEY

(a) Paying attention to the orientation of the belt guide, install the camshaft timing pulley with the belt guide properly oriented and tighten the bolt temporarily.

HINT:

- Face the belt guide of the RH timing pulley toward front of the engine.
- Face the belt guide of the LH timing pulley toward rear of the engine.





(b) Using SST, tighten the RH pulley bolt.
**SST 09960-10010 (09962-01000, 09963-01000),
09249-63010**

Torque: 125 N*m (1,275 kgf*cm, 92 ft.*lbf)

NOTICE:

The torque indicated above is for use without SST on extension tool. If you are using extension tools, find the reading of the torque wrench by the formula (See page [IN-5](#)).

Extended length:

SST (09249-63010) 150 mm (5.91 in.)

(c) Using SST, tighten the LH pulley bolt.
SST 09960-10010 (09962-01000, 09963-01000)
Torque: 125 N*m (1,275 kgf*cm, 92 ft.*lbf)

9. INSTALL TIMING BELT IDLER SUB-ASSEMBLY NO.2 **EM**
Torque: 43 N*m (438 kgf*cm, 32 ft.*lbf)

10. INSPECT TIMING BELT

Inspect the timing belt (See page [EM-25](#)).

11. INSTALL TIMING BELT

SST 09960-10010 (09962-01000, 09963-01000)

(a) Install the timing belt (See page [EM-26](#)).

12. INSTALL CHAIN TENSIONER ASSEMBLY NO.1

(a) Install the chain tensioner assembly No.1 (See page [EM-26](#)).

13. INSTALL TIMING BELT GUIDE NO.2

(a) Install the timing belt guide No.2 (See page [EM-26](#)).

14. INSTALL ENGINE MOUNTING BRACKET RH

(a) Install the engine mounting bracket RH (See page [EM-26](#)).

15. INSTALL TIMING BELT NO.2 COVER

(a) Install the timing belt No.2 cover (See page [EM-26](#)).

16. INSTALL TIMING BELT NO.1 COVER

(a) Install the timing belt No.1 cover (See page [EM-26](#)).

17. INSTALL CRANKSHAFT PULLEY

SST 09213-54015 (91651-60855), 09330-00021

(a) Install the crankshaft pulley (See page [EM-26](#)).

18. INSTALL GENERATOR BRACKET NO.2

(a) Install the generator bracket No.2 (See page [EM-26](#)).

19. INSTALL ENGINE MOUNTING STAY NO.2 RH

(a) Install the engine mounting stay No.2 RH (See page [EM-26](#)).

20. INSTALL ENGINE MOVING CONTROL ROD

(a) Install the engine moving control rod (See page [EM-26](#)).

21. INSPECT VALVE CLEARANCE

(a) Inspect the valve clearance (See page [EM-8](#)).

22. ADJUST VALVE CLEARANCE
SST 09248-55040 (09248-05410, 09248-05420)
(a) Adjust valve clearance (See page [EM-8](#)).

23. INSTALL VANE PUMP V BELT
(a) Install the vane pump V belt (See page [EM-6](#)).

24. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1
(a) Install the V (cooler compressor to crankshaft pulley) belt No.1 (See page [EM-6](#)).

25. INSPECT DRIVE BELT DEFLECTION AND TENSION
(a) Inspect the drive belt deflection and tension (reference) (See page [EM-1](#)).

26. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH
(a) Install the cylinder head cover sub-assembly LH (See page [EM-8](#)).

27. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY
(a) Install the cylinder head cover sub-assembly (See page [EM-8](#)).

28. INSTALL IGNITION COIL ASSEMBLY
Torque: 8.0 N*m (80 kgf*cm, 71 in.*lbf)
(a) Install the ignition coil assembly (See page [EM-8](#)).

29. INSTALL INTAKE AIR SURGE TANK
(a) Install the intake air surge tank (See page [EM-8](#)).

30. INSTALL EMISSION CONTROL VALVE SET
(a) Install the emission control valve set (See page [EM-8](#)).

31. INSTALL AIR CLEANER CAP SUB-ASSEMBLY
(a) Install the air cleaner cap sub-assembly (See page [FU-14](#)).

32. CONNECT VACUUM HOSE
(a) Connect the vacuum hose (See page [EM-120](#)).

33. INSTALL V-BANK COVER SUB-ASSEMBLY
(a) Install the V-bank cover sub-assembly (See page [EM-8](#)).

34. INSTALL RADIATOR HOSE INLET

35. INSTALL COWL TOP PANEL SUB-ASSEMBLY OUTER
(a) Install the cowl top panel sub-assembly outer (See page [FU-14](#)).

36. INSTALL WINDSHIELD WIPER LINK ASSEMBLY
(a) Install the windshield wiper link assembly (See page [WW-38](#)).

37. INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY
(a) Install the cowl top ventilator louver sub-assembly (See page [WW-38](#)).

- 38. INSTALL FR WIPER ARM LH**
(a) Install the FR wiper arm LH (See page [WW-38](#)).
- 39. INSTALL FR WIPER ARM RH**
(a) Install the FR wiper arm RH (See page [WW-38](#)).
- 40. INSTALL FRONT WHEEL RH**
(a) Install the front wheel RH (See page [EM-6](#)).
- 41. ADD ENGINE COOLANT**
(a) Add engine coolant (See page [CO-7](#)).
- 42. CHECK FOR ENGINE COOLANT LEAKAGE**
(a) Check for engine coolant leakage (See page [CO-1](#)).

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