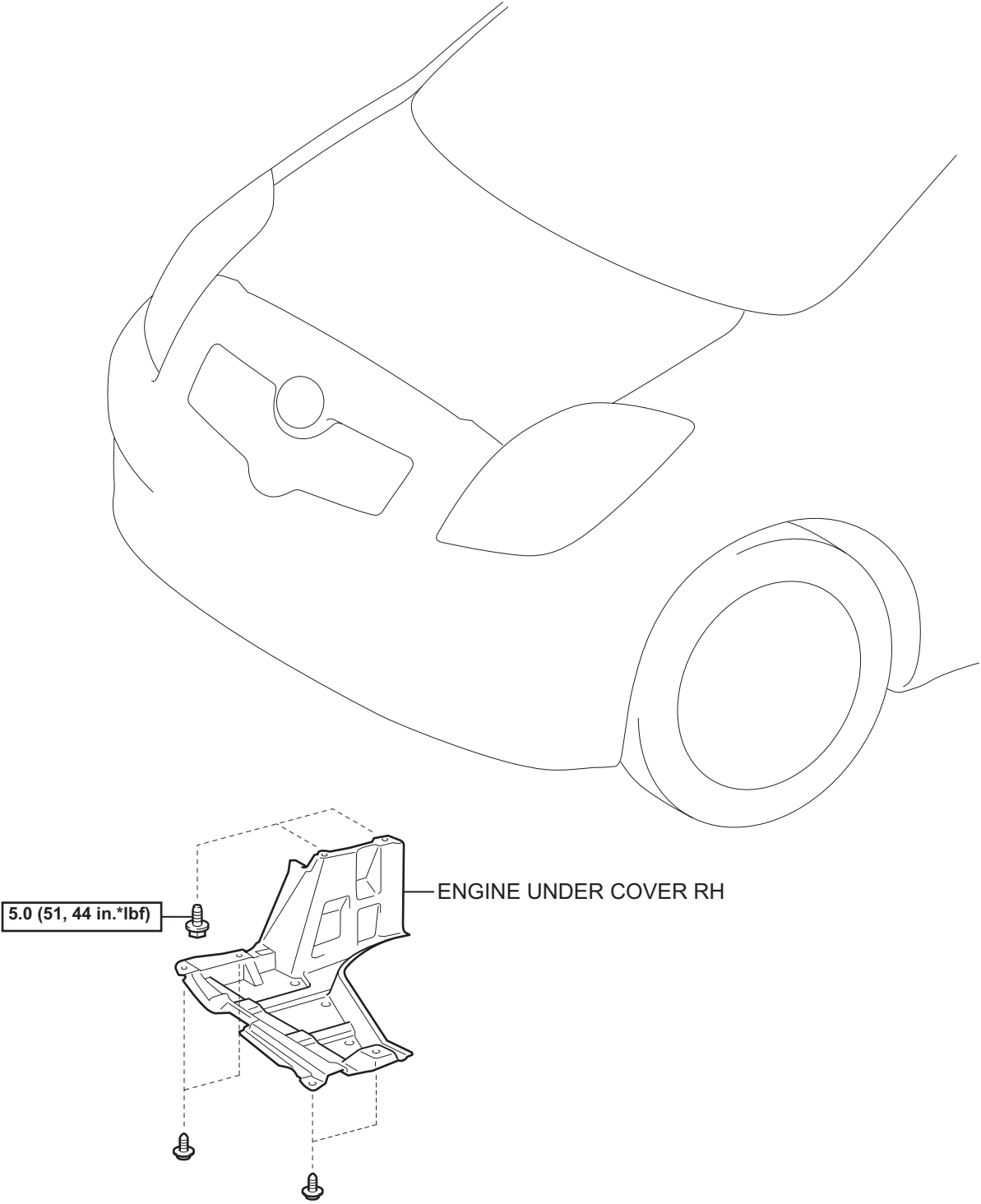


CAMSHAFT
COMPONENTS

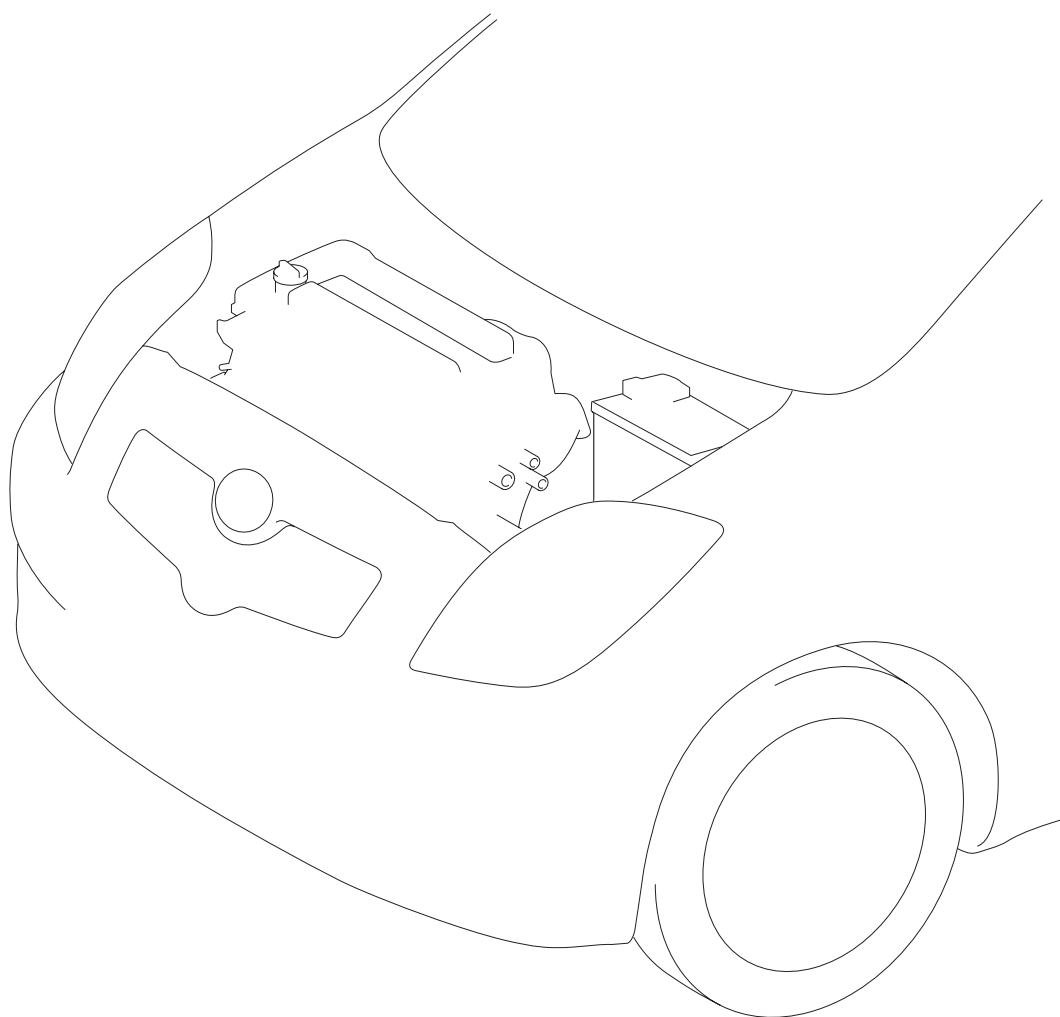
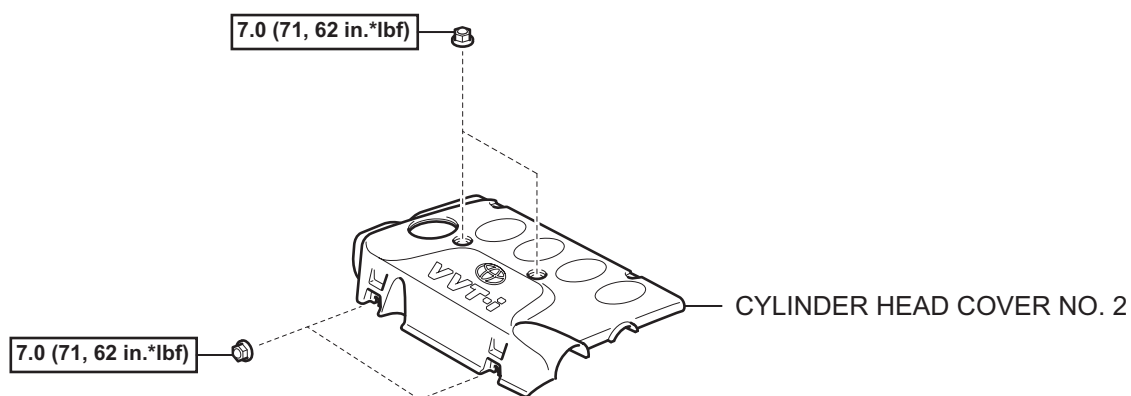
EM



5.0 (51, 44 in.*lbf)

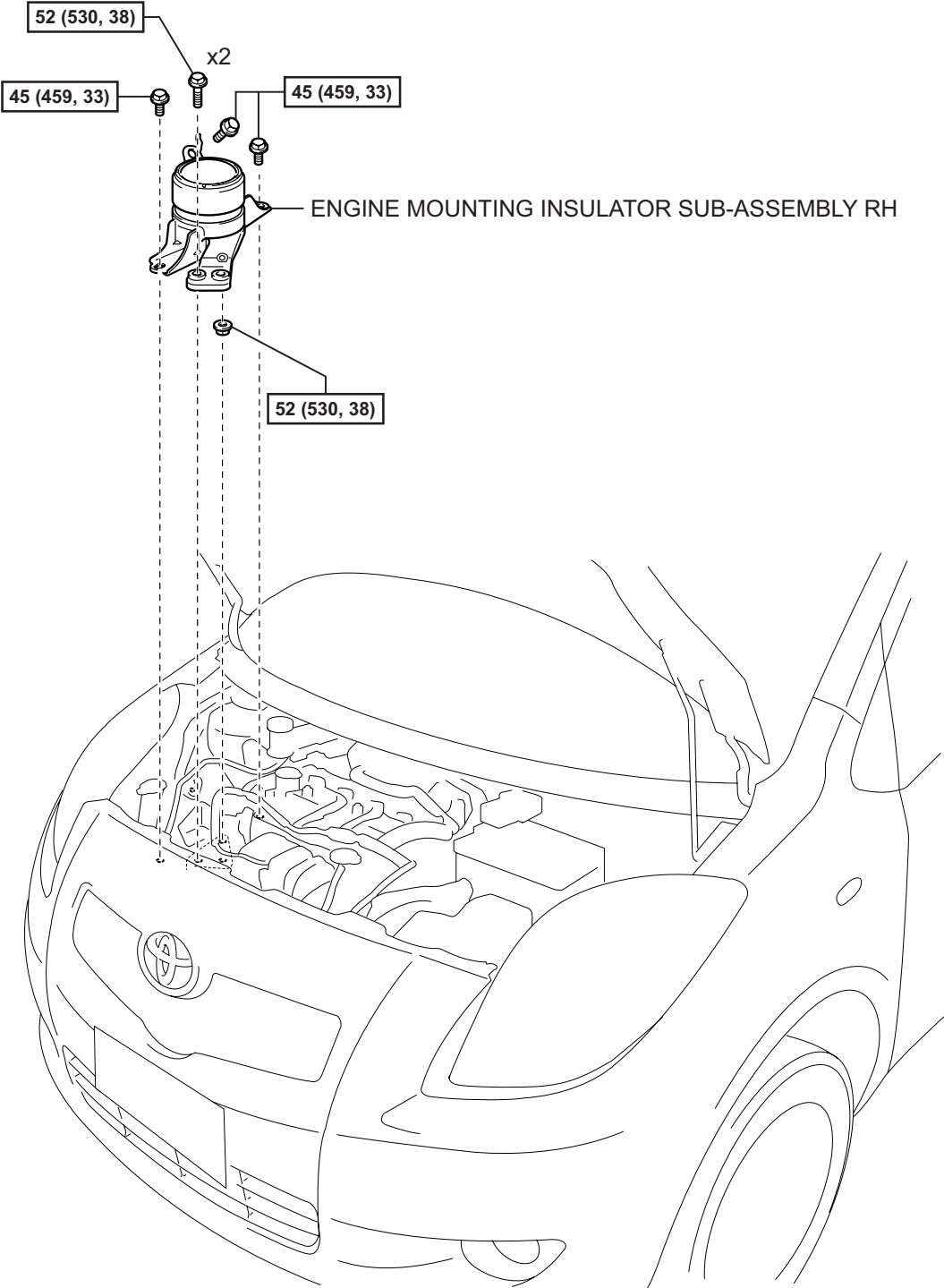
ENGINE UNDER COVER RH

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



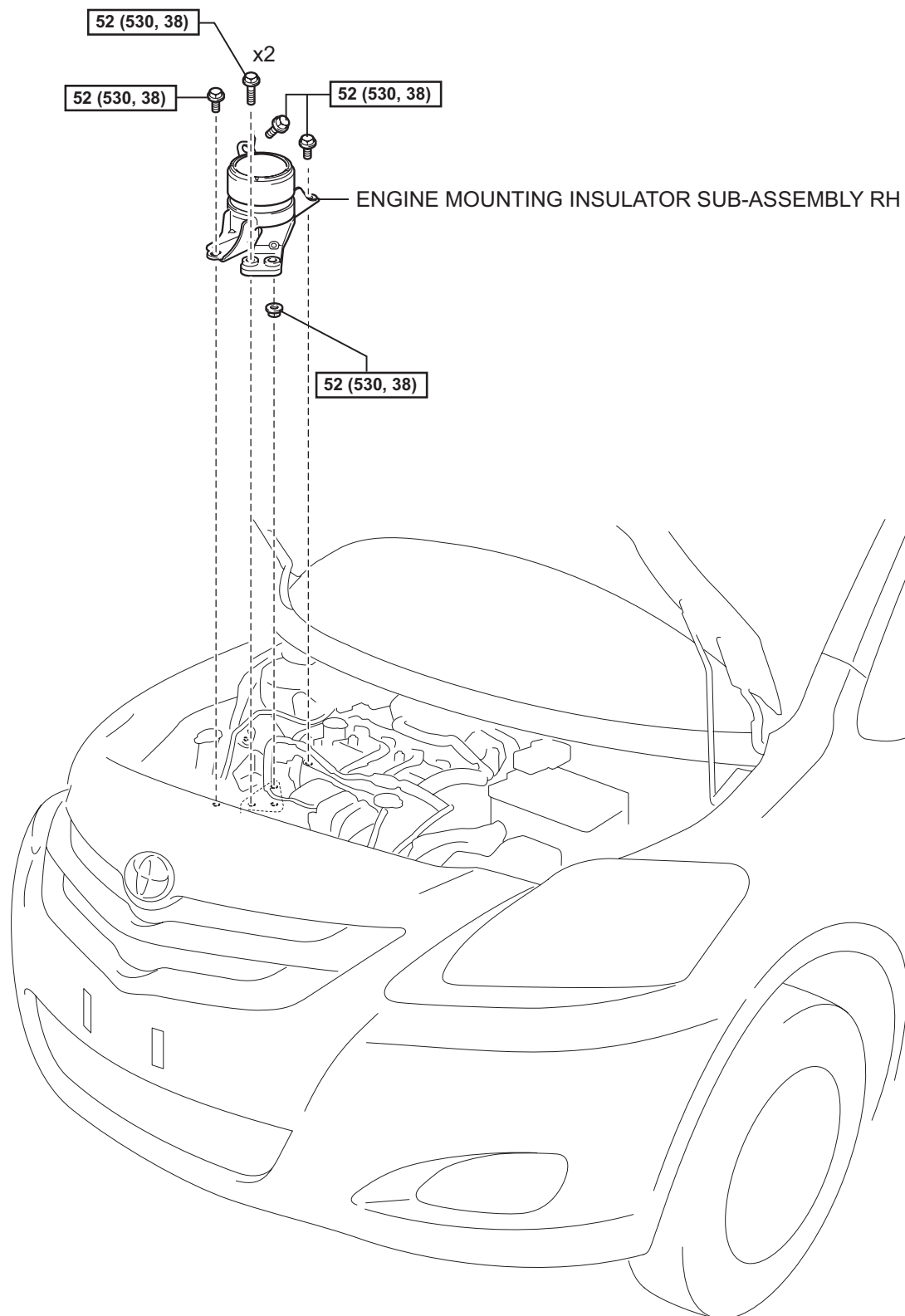
N*m (kgf*cm, ft.*lbf) : Specified torque

for Hatchback:



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

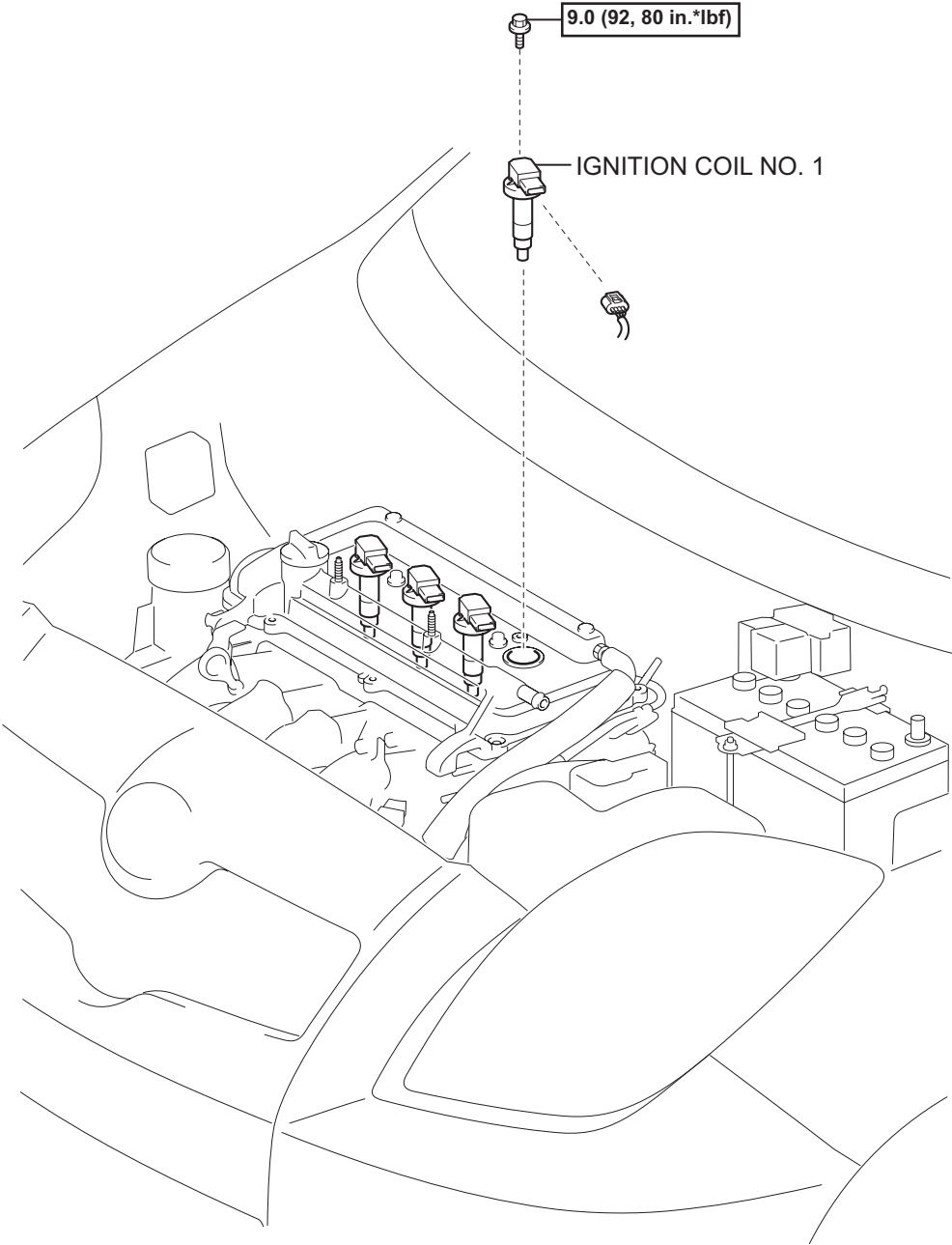
for Sedan:



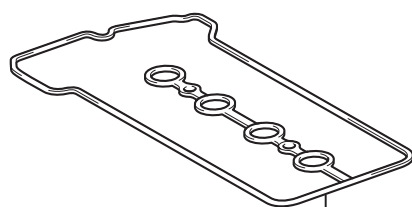
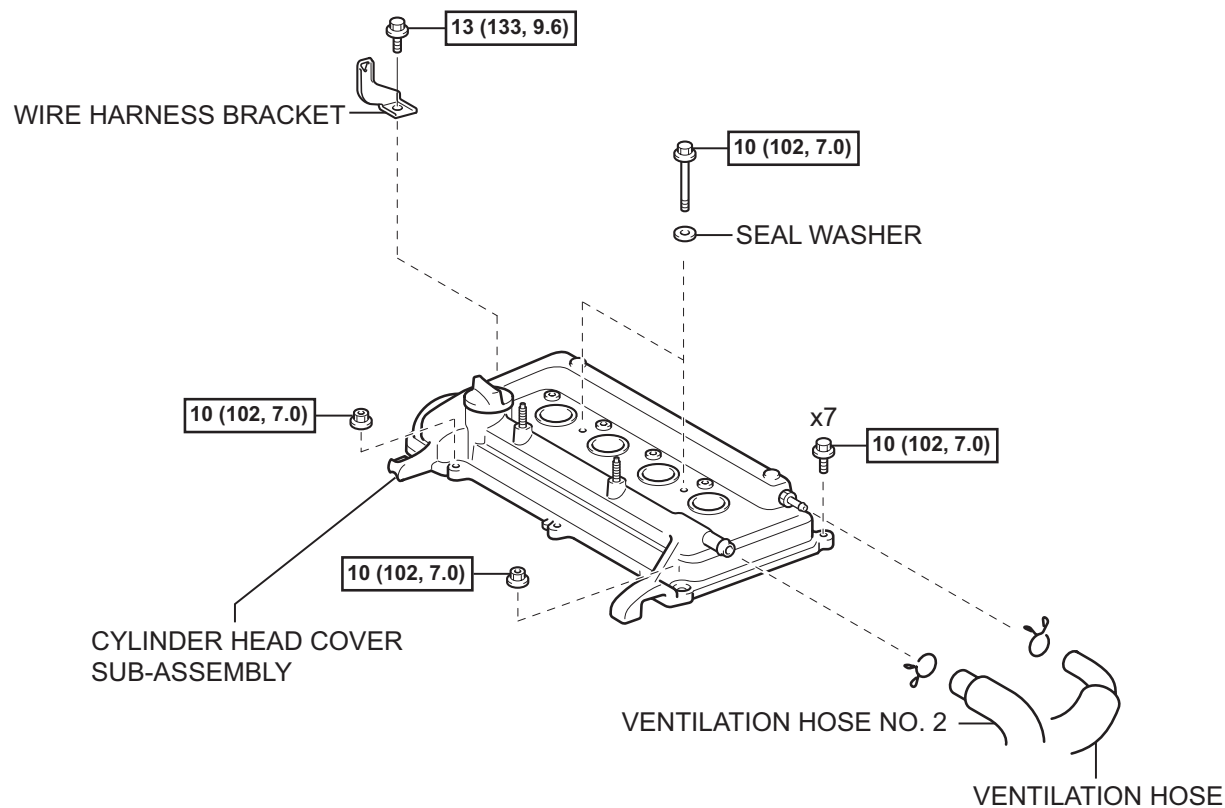
N*m (kgf*cm, ft*lbf) : Specified torque

EM

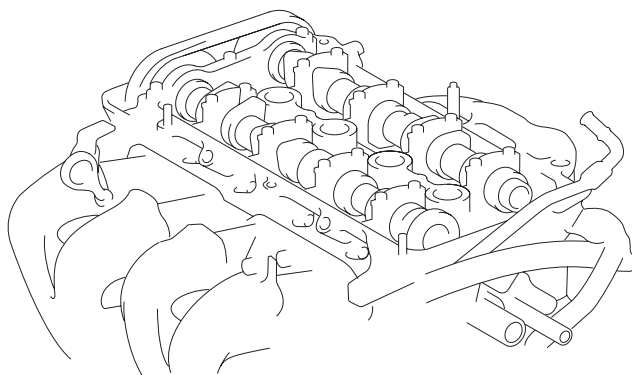
EM



$\boxed{\text{N*m (kgf*cm, ft.*lbf)}}$: Specified torque

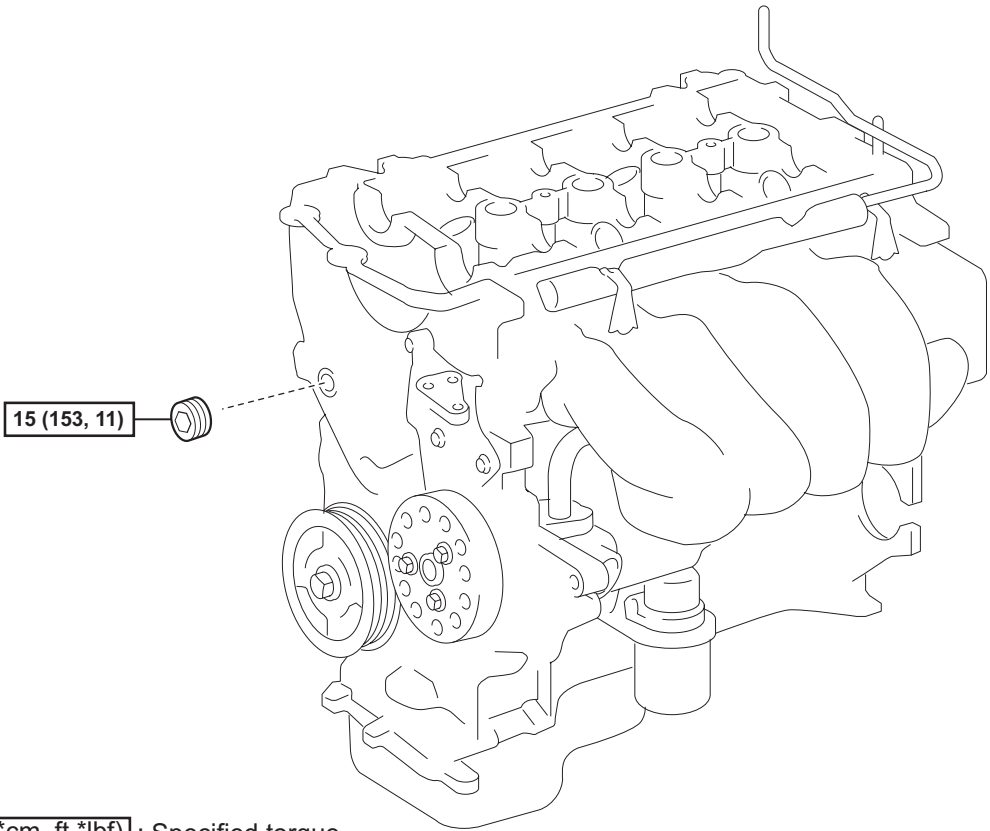
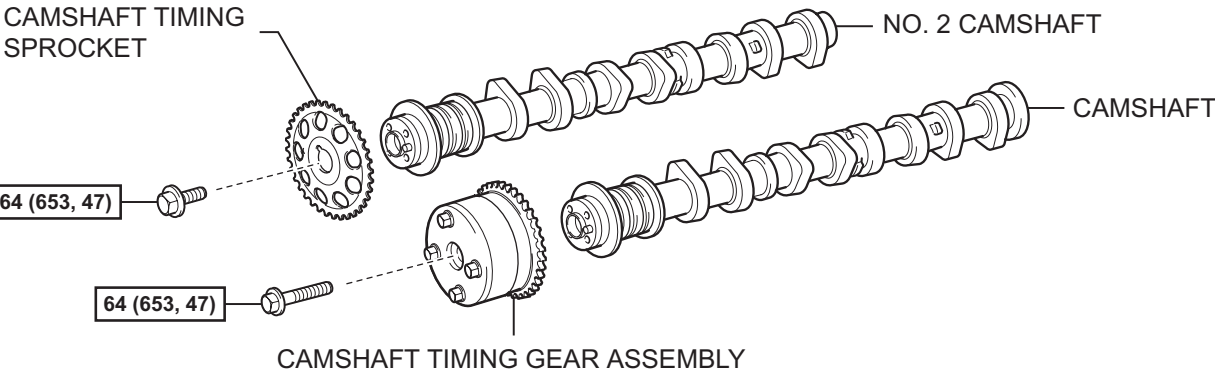
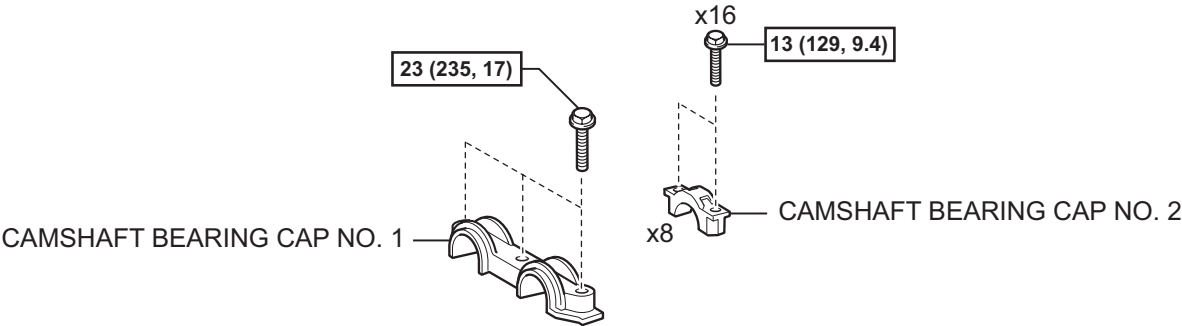


CYLINDER HEAD COVER GASKET



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

EM



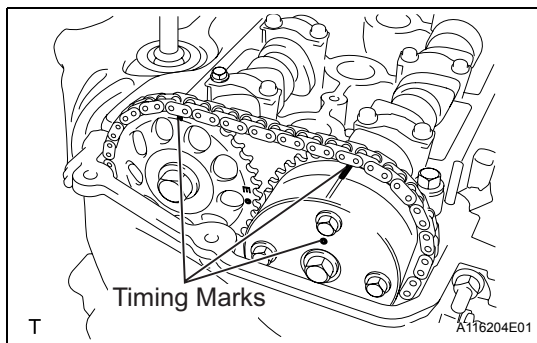
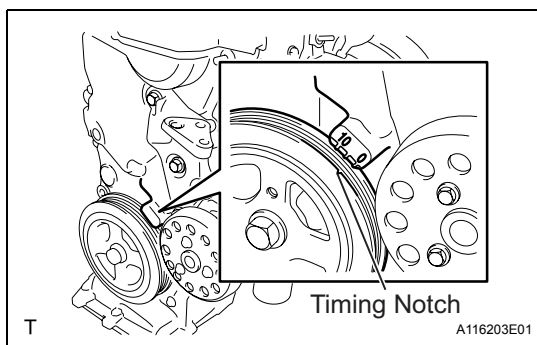
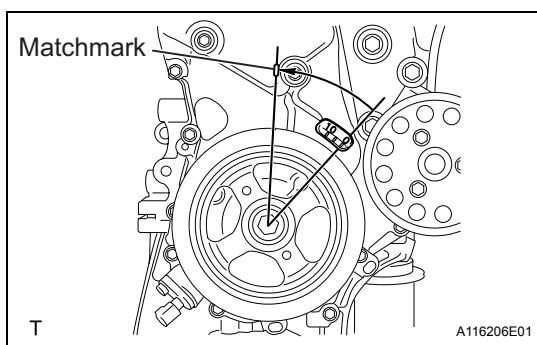
N*m (kgf*cm, ft.*lbf) : Specified torque

REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE ENGINE UNDER COVER RH
3. REMOVE CYLINDER HEAD COVER NO. 2 (See page [IG-9](#))
4. REMOVE IGNITION COIL NO. 1 (See page [IG-9](#))
5. DISCONNECT VENTILATION HOSE (See page [FU-13](#))
6. DISCONNECT VENTILATION HOSE NO. 2 (See page [FU-13](#))
7. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY (See page [FU-13](#))
8. REMOVE FAN AND GENERATOR V BELT (See page [EM-7](#))
9. REMOVE ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH (See page [LU-17](#))
10. REMOVE NO. 2 CAMSHAFT

NOTICE:

When rotating the camshaft with the timing chain removed, rotate the crankshaft damper counterclockwise 40 ° from the TDC and align its timing notch with the matchmark of the timing chain cover to prevent the pistons from coming into contact with the valves.

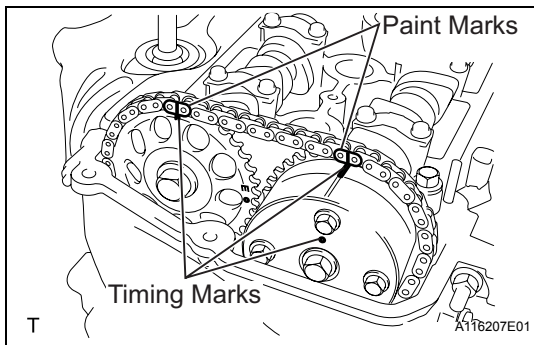


- (a) Set the No. 1 cylinder to TDC / compression.
 - (1) Turn the crankshaft damper, and align its timing notch with the timing mark "0" of the oil pump.

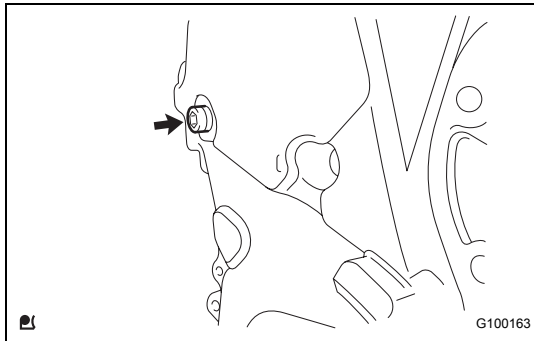
- (2) Check that the timing marks on both the camshaft timing sprocket and the camshaft timing gear are facing upward, as shown in the illustration.

HINT:

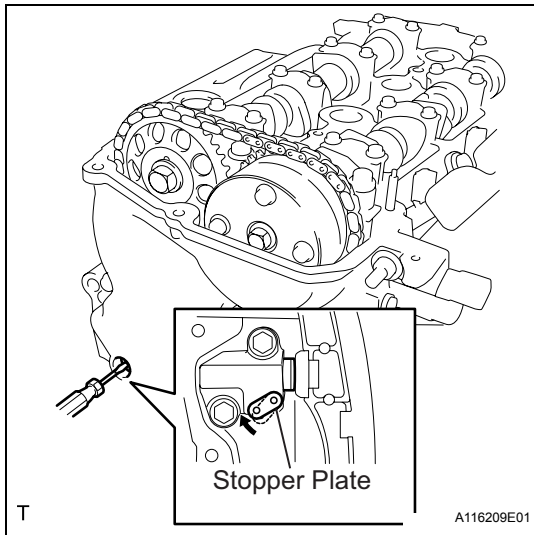
If not, turn the crankshaft 1 complete revolution (360°) and align the marks as above.



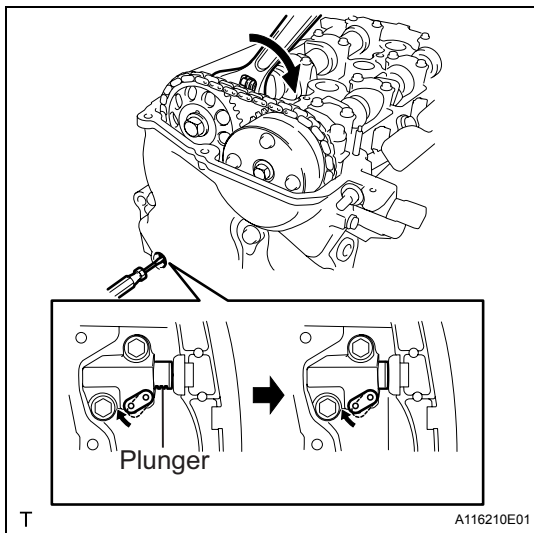
- (b) Place paint marks on the chain in the places where the timing marks of the camshaft timing sprocket and the camshaft timing gear are located.



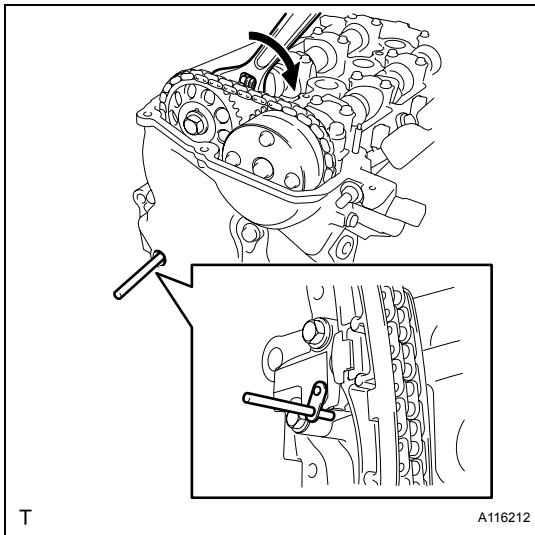
- (c) Using an 8 mm hexagon wrench, remove the screw plug.



- (d) Insert a screwdriver into the service hole in the chain tensioner to pull the stopper plate of the chain tensioner upward.



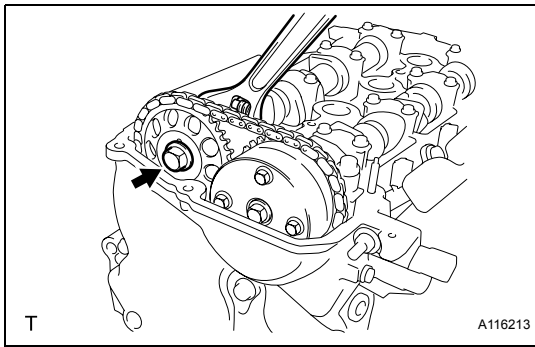
- (e) Using a wrench, rotate camshaft No. 2 clockwise to push in the plunger of the chain tensioner.



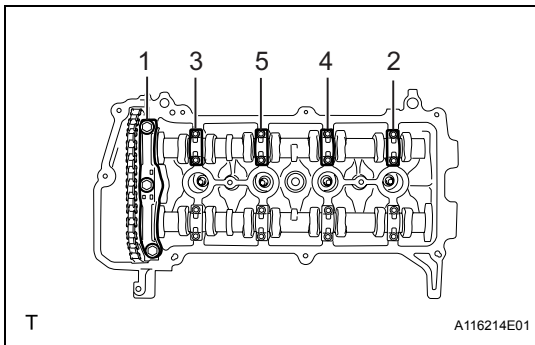
- (f) Remove the screwdriver from the service hole, then align the hole in the stopper plate with the service hole and insert a 3 mm (0.12 in.) diameter bar into the holes to hold the stopper plate.

HINT:

- Fix the stopper plate using the bar while rotating the camshaft right and left slightly.
- Hold the bar with tape so that it does not come off.



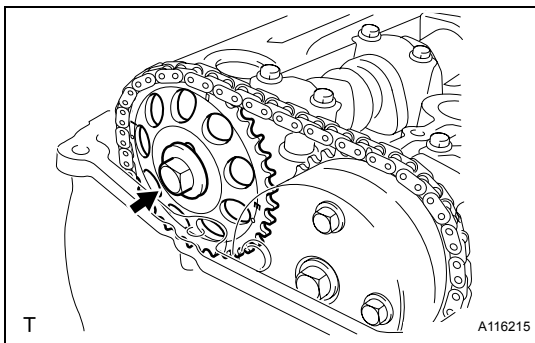
- (g) Using a wrench, hold the hexagonal lobe of camshaft No. 2 and remove the flange bolt.



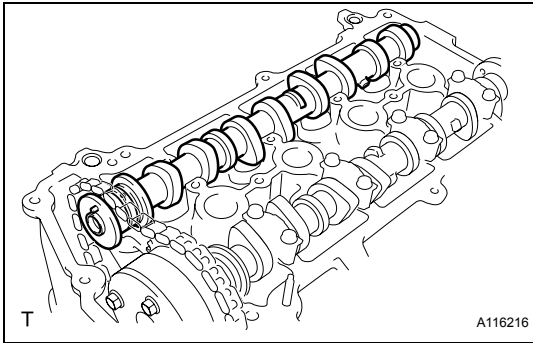
- (h) Using several steps, loosen and remove the 11 bearing cap bolts uniformly in the sequence shown in the illustration, then remove camshaft bearing caps No. 1 and No. 2.

NOTICE:

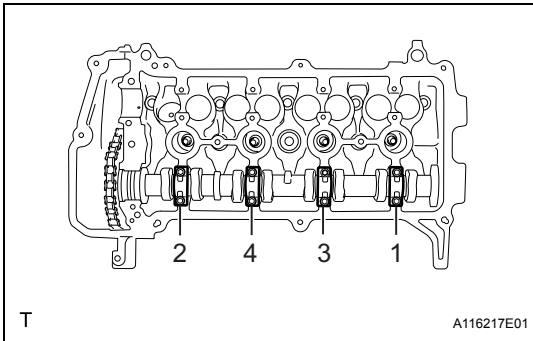
Loosen the bolts uniformly while keeping the camshaft level.



- (i) Remove the flange bolt and remove the camshaft timing sprocket.



(j) Remove camshaft No. 2.

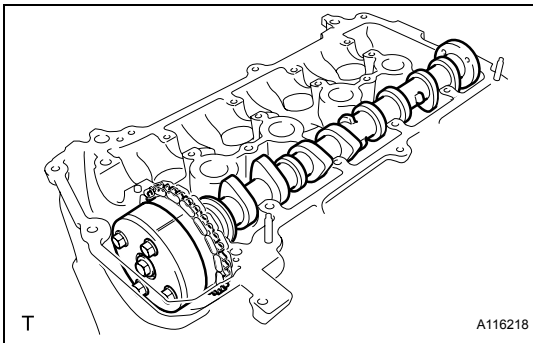


11. REMOVE CAMSHAFT

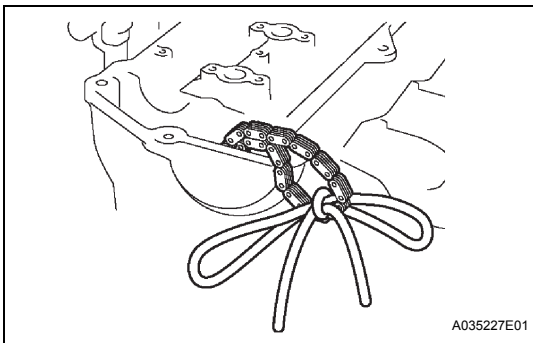
- (a) Using several steps, loosen and remove the 8 bearing cap bolts uniformly in the sequence shown in the illustration, then remove camshaft bearing cap No. 2.

NOTICE:

Loosen each bolt uniformly while keeping the camshaft level.



- (b) Hold the chain by hand, and remove the camshaft and the camshaft timing gear assembly.



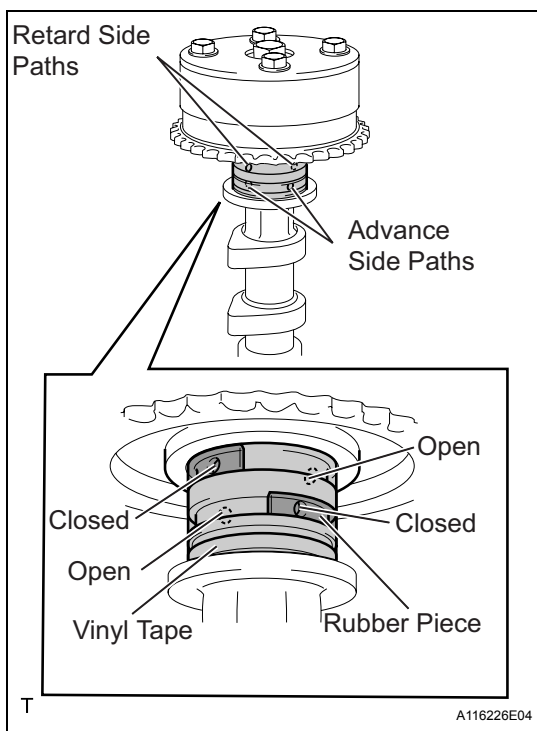
- (c) Tie the chain with a piece of string as shown in the illustration.

12. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY

- (a) Clamp the camshaft in a vise and confirm that it is locked.

NOTICE:

Do not damage the camshaft.

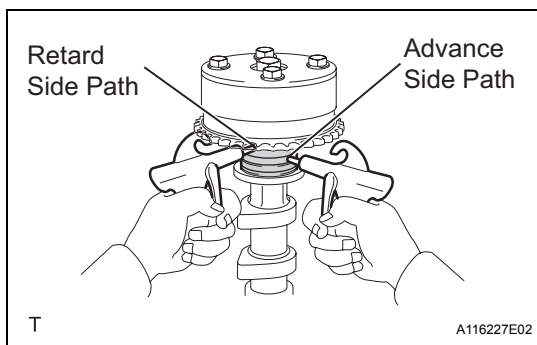


- (b) Cover the 4 oil paths of the cam journal with tape as shown in the illustration.

HINT:

One of the 2 grooves located on the cam journal is for retarding cam timing (upper) and the other is for advancing cam timing (lower). Each groove has 2 oil paths. Plug one of the oil paths for each groove with a piece of rubber before wrapping the cam journal with the tape.

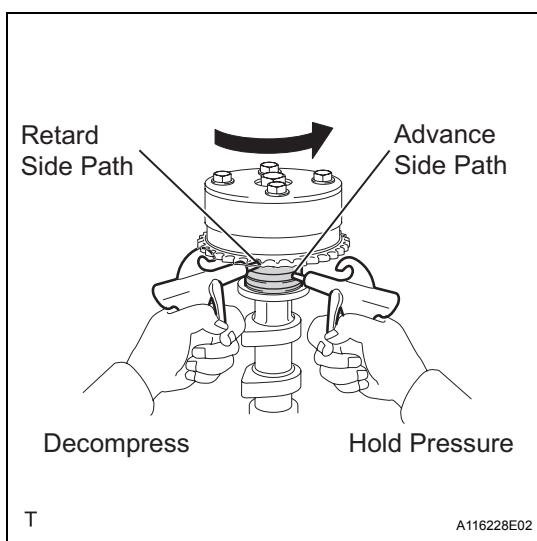
- (c) Puncture the tape covering the advance oil path and the retard oil path on the opposite side from the advance oil path.



- (d) Apply air at about 150 kPa (1.5 kgf*cm²) pressure into the 2 broken paths (the advance side path and the retard side path).

NOTICE:

Cover the paths with a shop rag or piece of cloth to prevent oil splashes.



- (e) Confirm that the camshaft timing gear assembly revolves in the timing advance direction when the air pressure on the timing retard path is reduced.

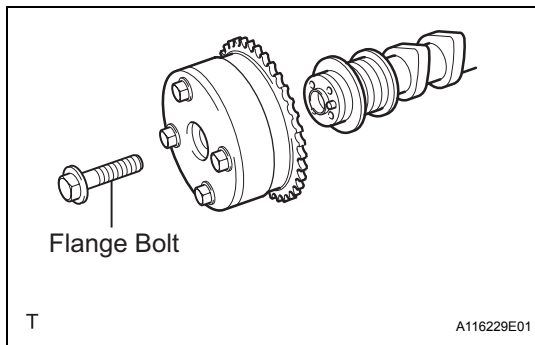
HINT:

The lock pin is released, and the camshaft timing gear revolves in the advance direction.

- (f) When the camshaft timing gear reaches the most advanced position, release the air pressure on the timing retard side path, and then release the air pressure on the timing advance side path.

NOTICE:

The camshaft timing gear assembly occasionally shifts to the retard side abruptly, if the air pressure on the advance side path is released first. This often results in breakage of the lock pin.



- (g) Remove the flange bolt and remove the camshaft timing gear assembly.

NOTICE:

- Do not remove the other 4 bolts.
- When reusing the camshaft timing gear, unlock the lock pin inside the camshaft timing gear first.

INSPECTION

1. INSPECT CAMSHAFT TIMING GEAR ASSEMBLY

(a) Check the lock of camshaft timing gear.

- (1) Clamp the camshaft in a vice, and check that the camshaft timing gear is locked.

NOTICE:

Do not damage the camshaft.

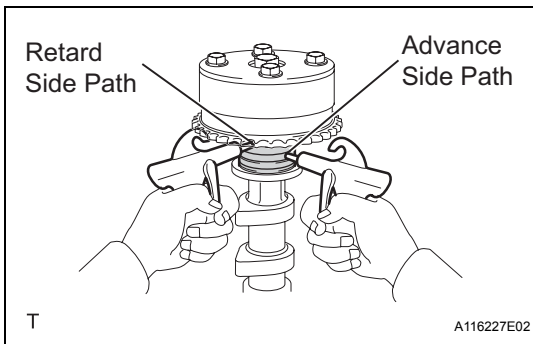
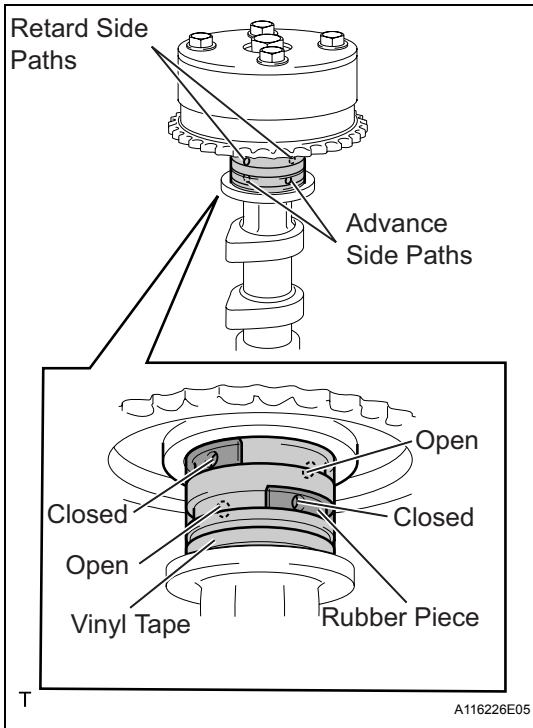
(b) Release the lock pin.

- (1) Cover the 4 oil paths of the cam journal with tape as shown in the illustration.

HINT:

One of the 2 grooves located on the cam journal is for retarding cam timing (upper) and the other is for advancing cam timing (lower). Each groove has 2 oil paths. Plug one of the oil paths for each groove with a piece of rubber before wrapping the cam journal with the tape.

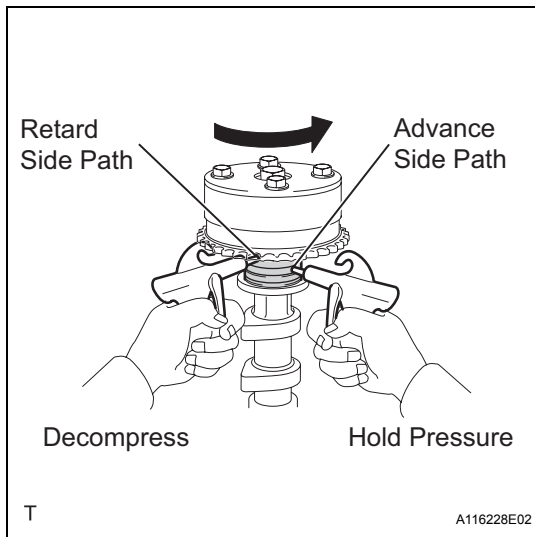
- (2) Puncture the tape covering the advance oil path and the retard oil path on the opposite side from the advance oil path.



- (3) Apply air at about 150 kPa (1.5kgf*cm²) pressure into the 2 broken paths (the advance side path and the retard side path).

NOTICE:

Cover the paths with a shop rag or piece of cloth to prevent oil splashes.



- (4) Confirm that the camshaft timing gear assembly revolves in the timing advance direction when the air pressure on the timing retard path is reduced.

HINT:

The lock pin is released and the camshaft timing gear revolves in the advance direction.

- (5) When the camshaft timing gear reaches the most advanced position, release the air pressure on the timing retard side path, and then release the air pressure on the timing advance side path.

NOTICE:

Camshaft timing gear assembly occasionally shifts to the retard side abruptly if the air pressure on the advance side path is released first. This often results in breakage of the lock pin.

- (c) Check the revolution.
 - (1) Rotate the valve timing assembly back and forth several times, except where the lock pin meets it at the most retarded angle. Check the movable range and that it rotates smoothly.

Standard:

Smooth movable range is about 22.5°

NOTICE:

Perform this check by hand, instead of using air pressure.

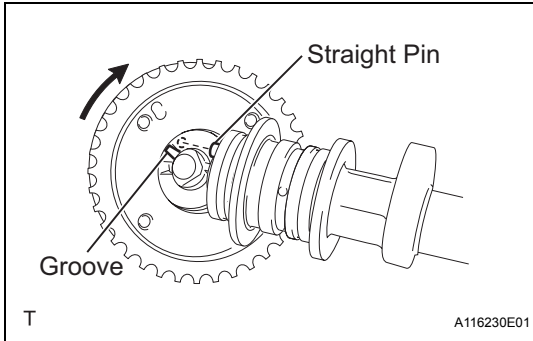
- (d) Check that the gear locks in the most retarded position.
 - (1) Confirm that the camshaft timing gear assembly is locked in the most retarded position.

INSTALLATION

1. INSTALL CAMSHAFT TIMING GEAR ASSEMBLY

NOTICE:

Install the camshaft timing gear assembly onto the camshaft with the lock pin of the camshaft timing gear assembly released.



- Put the camshaft timing gear assembly and camshaft together with the straight pin of the groove.
- Turn the camshaft timing gear assembly clockwise while pushing it gently toward the camshaft. When the pin fits the groove, push to ensure a good fit.

NOTICE:

Do not turn the camshaft timing gear in the retard direction (clockwise).

- Check that there is no clearance between the gear flange and the camshaft.
- Tighten the flange bolt with the camshaft timing gear fixed.

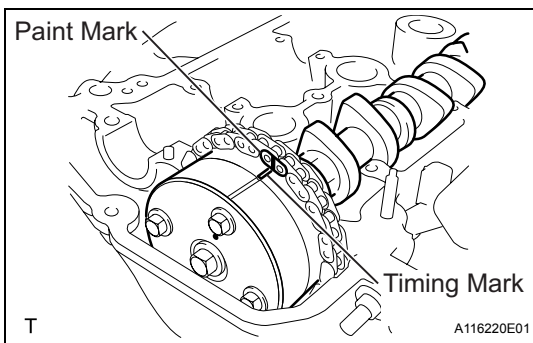
Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)

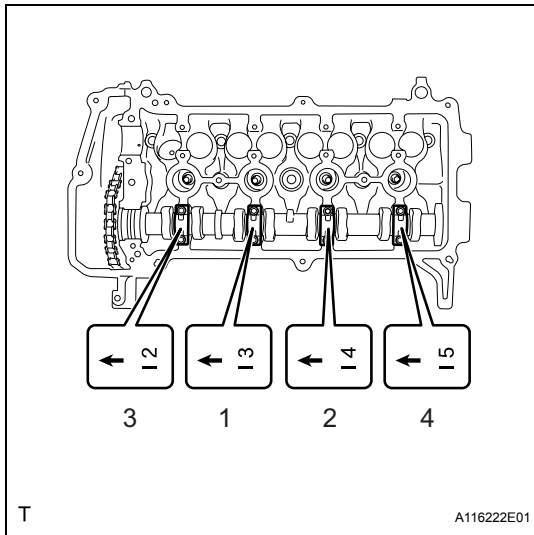
NOTICE:

- Do not lock the camshaft timing gear assembly when tightening the bolt.
 - Release the lock pin of the camshaft timing gear assembly first, and tighten the bolt when the lock pin is locked in the most retarded position.
 - Tightening the bolts with the lock pin locked could cause breakage of the lock pin.
- Check that the camshaft timing gear assembly moves smoothly in the retard direction (clockwise) and is locked in the most retarded position.

2. INSTALL CAMSHAFT

- Apply a light coat of engine oil to the camshaft and camshaft journals.
- Install the chain onto the camshaft timing gear with the paint mark and the timing mark aligned as shown in the illustration.





- (c) Examine the front marks and numbers on camshaft bearing cap No. 2 and check that the sequence is as shown in the illustration. Then uniformly tighten the bolts, in several steps, in the sequence shown in the illustration.

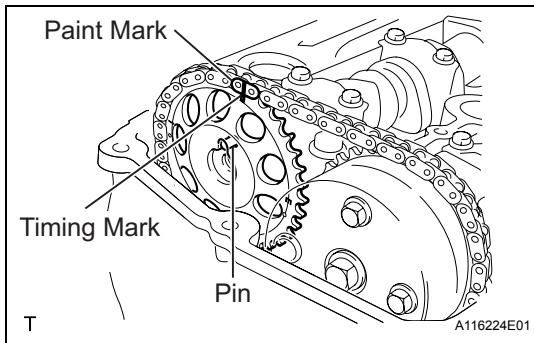
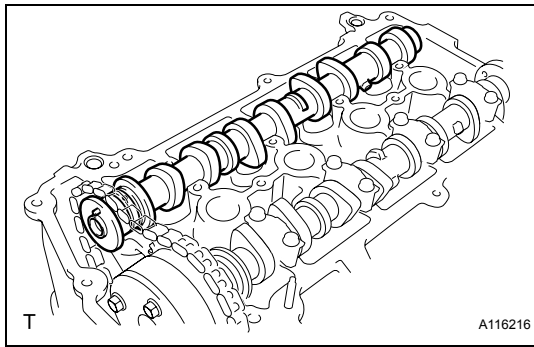
Torque: 13 N*m (129 kgf*cm, 9.4 ft.*lbf)

NOTICE:

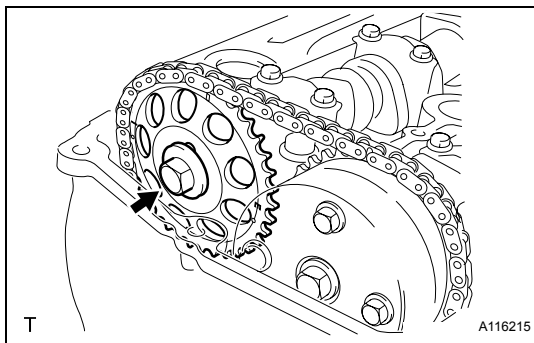
Tighten each bolt uniformly while keeping the camshaft level.

3. INSTALL NO. 2 CAMSHAFT

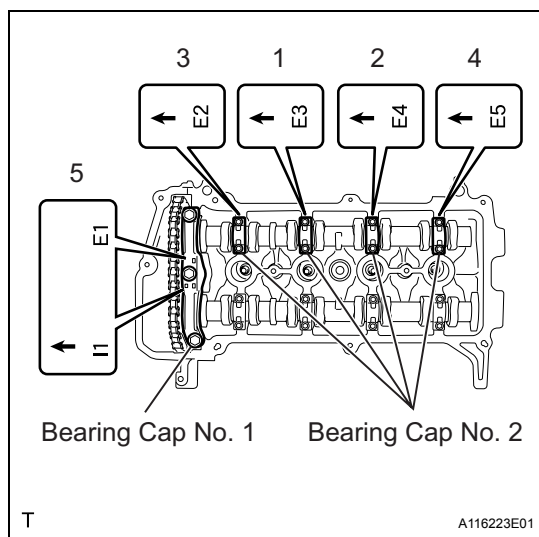
- (a) Install camshaft No. 2.



- (b) Hold the chain and align the timing mark on the camshaft timing sprocket with the paint mark of the chain.
- (c) Align the alignment pin hole in the camshaft timing sprocket with the alignment pin of the camshaft, and install the sprocket onto the camshaft.



- (d) Provisionally install the flange bolt.



- (e) Examine the front marks and numbers on camshaft bearing caps No. 1 and No. 2 and check that the sequence is as shown in the illustration. Then uniformly tighten the bolts, in several steps, in the sequence shown in the illustration.

Torque: for bearing cap No. 2

13 N*m (129 kgf*cm, 9.4 ft.*lbf)

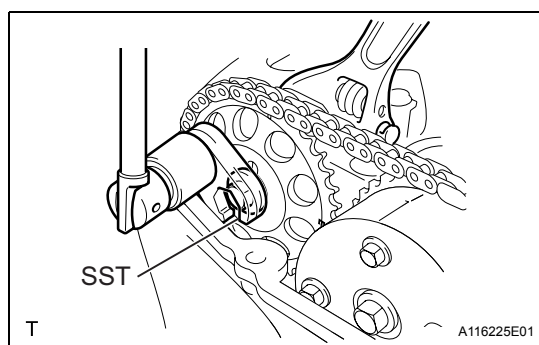
for bearing cap No. 1

23 N*m (235 kgf*cm, 17 ft.*lbf)

NOTICE:

Tighten each bolt uniformly while keeping the camshaft level.

EM

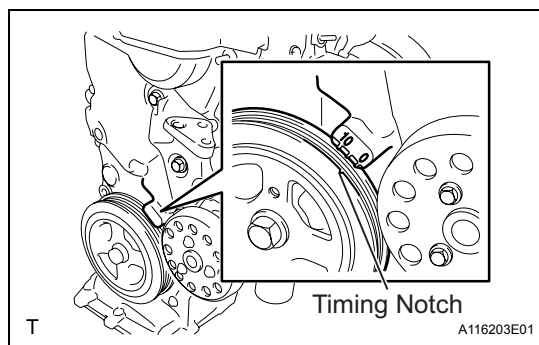


- (f) Using a wrench, hold the hexagonal lobe of camshaft No. 2 and install the flange bolt.

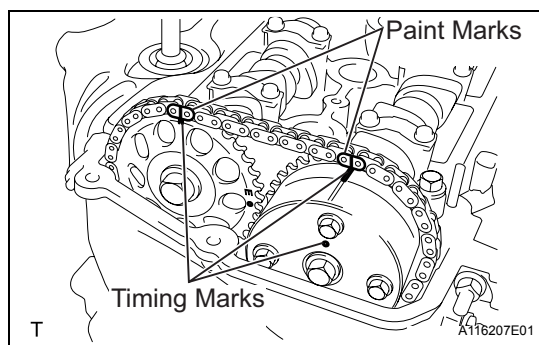
SST 09023-38400

Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)

- (g) Remove the bar from the timing chain tensioner.



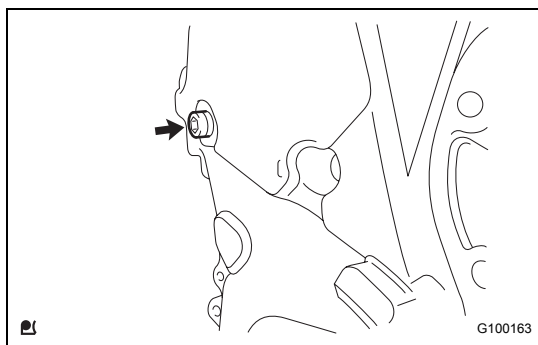
- (h) Turn the crankshaft damper and align its timing notch with the timing mark "0" of the oil pump.



- (i) Check that all the pairs of timing marks are aligned.
- (j) Apply adhesive to the end 2 or 3 threads of the screw plug.

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or Equivalent



(k) Using an 8 mm hexagon wrench, install the screw plug.

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

4. **INSPECT VALVE CLEARANCE** (See page [EM-9](#))
5. **ADJUST VALVE CLEARANCE** (See page [EM-10](#))
6. **INSTALL ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH** (See page [LU-26](#))
7. **INSTALL FAN AND GENERATOR V BELT** (See page [EM-7](#))
8. **ADJUST FAN AND GENERATOR V BELT** (See page [EM-7](#))
9. **INSPECT FAN AND GENERATOR V BELT** (See page [EM-8](#))
10. **INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY** (See page [FU-19](#))
11. **CONNECT VENTILATION HOSE NO. 2** (See page [FU-20](#))
12. **CONNECT VENTILATION HOSE** (See page [FU-20](#))
13. **INSTALL IGNITION COIL NO. 1** (See page [IG-9](#))
14. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)
15. **CHECK FOR ENGINE OIL LEAKAGE**
16. **INSTALL CYLINDER HEAD COVER NO. 2** (See page [IG-10](#))
17. **INSTALL ENGINE UNDER COVER RH**