

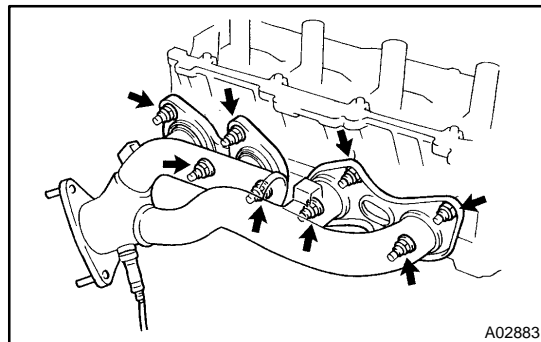
## INSTALLATION

### 1. INSTALL RH EXHAUST MANIFOLD TO CYLINDER HEAD

- (a) Place a new gasket on the cylinder head with the white painted marks facing the manifold side.

**NOTICE:**

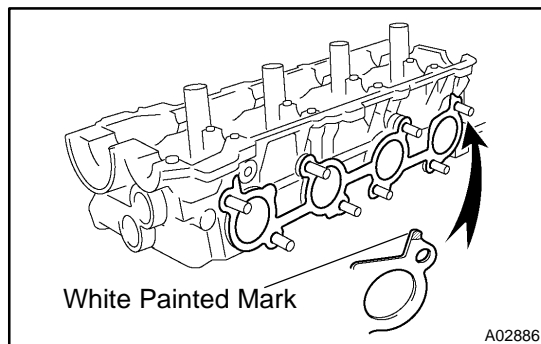
**Be careful of the installation direction.**



- (b) Install the exhaust manifold with 8 new nuts. Uniformly tighten the nuts in several passes.

**Torque: 44 N·m (450 kgf-cm, 32 ft-lbf)**

- (c) Install the heat insulator with the 3 bolts.

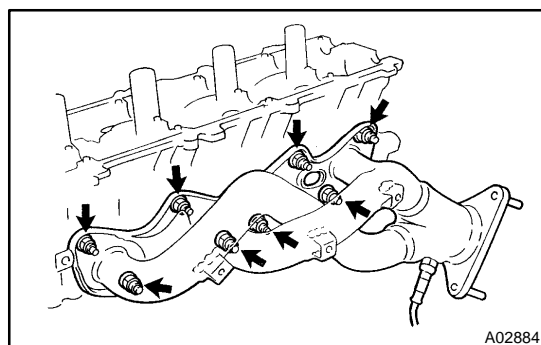


### 2. INSTALL LH EXHAUST MANIFOLD TO CYLINDER HEAD

- (a) Place a new gasket on the cylinder head with the white painted marks facing the manifold side.

**NOTICE:**

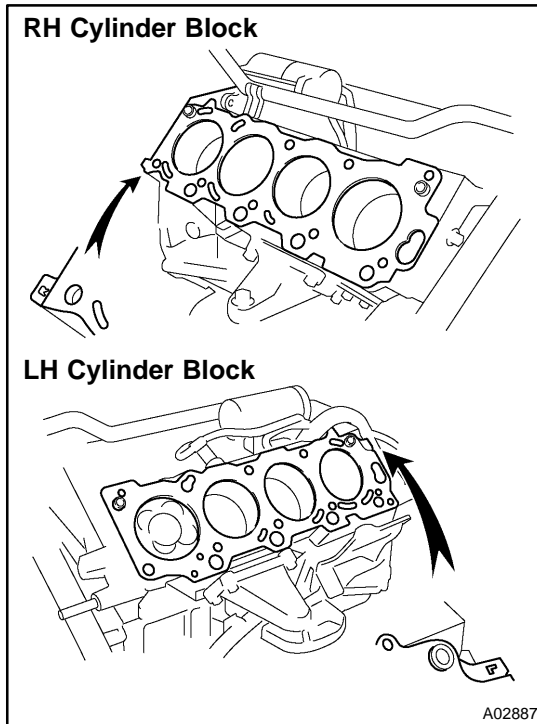
**Be careful of the installation direction.**



- (b) Install the exhaust manifold with 8 new nuts. Uniformly tighten the nuts in several passes.

**Torque: 44 N·m (450 kgf-cm, 32 ft-lbf)**

- (c) Install the heat insulator with the 3 bolts.



### 3. PLACE CYLINDER HEAD ON CYLINDER BLOCK

- (a) Place 2 new cylinder head gaskets in position on the cylinder block.

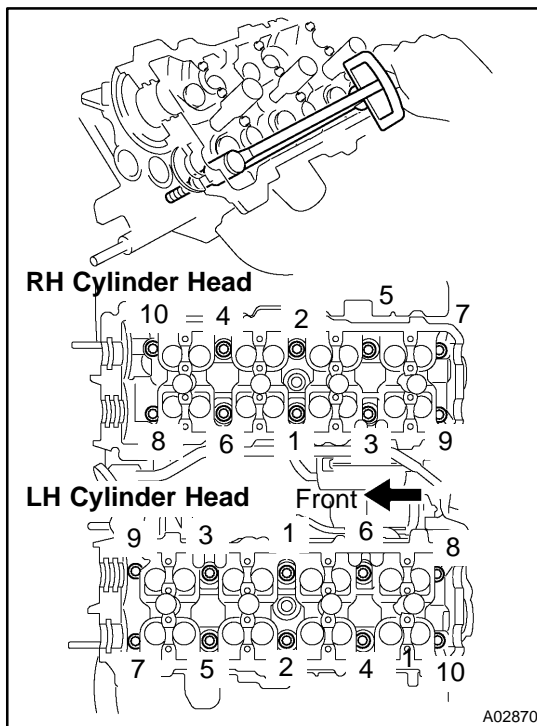
#### HINT:

On the rear side of the cylinder head gasket are marks to distinguish the LH and RH banks, a "R" mark for the RH bank and a "L" mark for the LH bank.

#### NOTICE:

**Be careful of the installation direction.**

- (b) Place the 2 cylinder heads in position on the cylinder head gaskets.



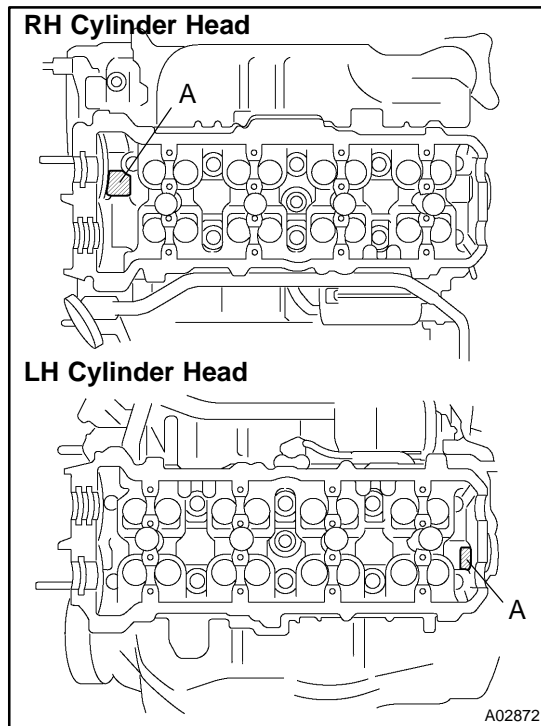
### 4. INSTALL CYLINDER HEAD BOLTS

#### HINT:

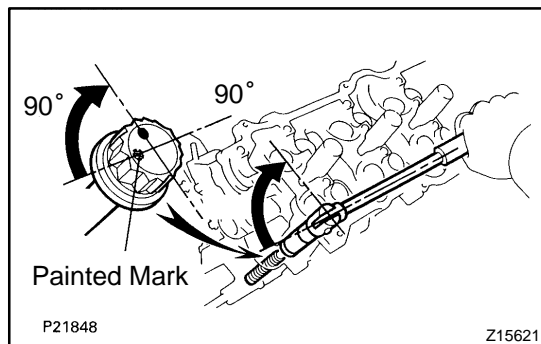
- The cylinder head bolts are tightened in 2 progressive steps (steps (c) and (e)).
  - If any cylinder head bolt is broken or deformed, replace it.
- (a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
- (b) Install the plate washer to the cylinder head bolt.
- (c) Install and uniformly tighten the 10 cylinder head bolts on one side of the cylinder head in several passes in the sequence shown, then do the other side as shown.

**Torque: 39 N·m (400 kgf-cm, 29 ft-lbf)**

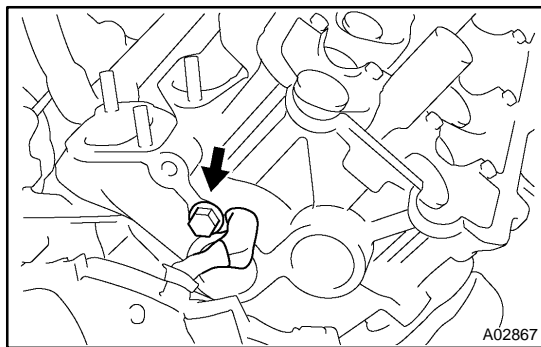
If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.

**NOTICE:**

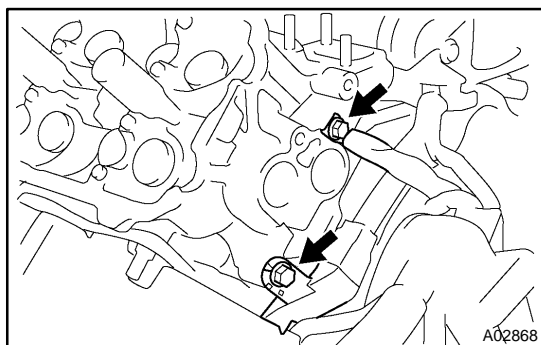
Do not drop the plate washer for cylinder head bolt into portion A of the cylinder head. If dropped into portion A, the plate washer will pass through the cylinder head and cylinder block into the oil pan.



- (d) Mark the front of the cylinder head bolt head with paint.
- (e) Retighten the cylinder head bolts by 90° in the numerical order shown.
- (f) Check that the painted mark is now at a 90° angle to front.

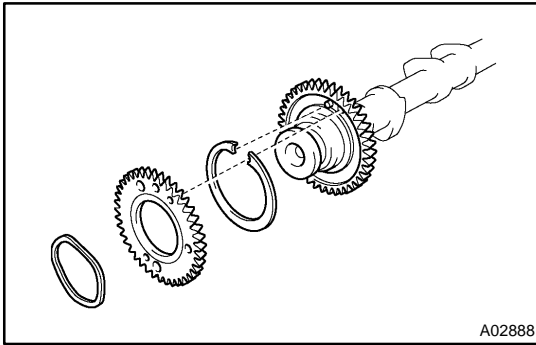
**5. INSTALL ENGINE WIRE**

- (a) Install the ground cable to RH cylinder head with the bolt.



- (b) Install the engine wire protector to the LH cylinder head with the bolt.
- (c) Install the ground cable to LH cylinder head with the bolt.
- (d) Connect the 2 heated oxygen sensor connectors.

**6. INSTALL SPARK PLUGS**



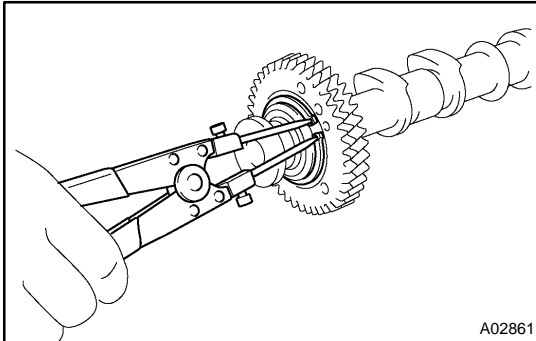
## 7. ASSEMBLE EXHAUST CAMSHAFT

- (a) Install the camshaft gear spring.
- (b) Install the camshaft sub-gear.

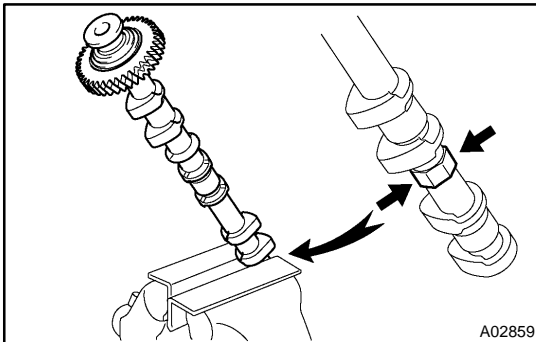
**HINT:**

Attach the pins on the gears to the gear spring ends.

- (c) Install the wave washer.



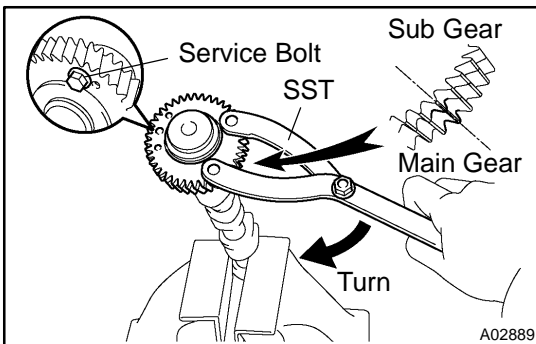
- (d) Using snap ring pliers, install the snap ring.



- (e) Mount the hexagon wrench head portion of the camshaft in a vise.

**NOTICE:**

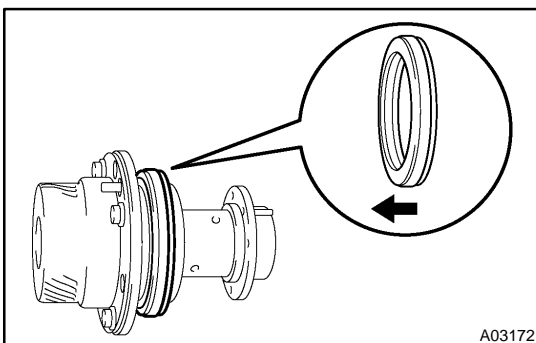
**Be careful not to damage the camshaft.**



- (f) 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)

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

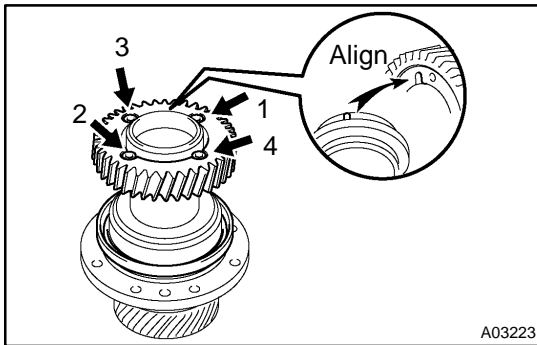


## 8. INSTALL CAMSHAFT TIMING TUBES

- (a) Place a new oil seal to the timing tube.

**NOTICE:**

**Be careful installation direction.**

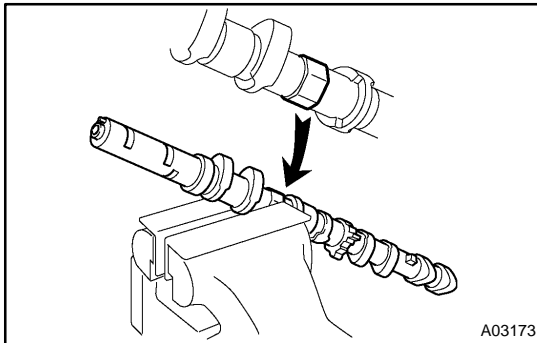


- (b) Align the timing tube knock pin with the knock pin groove of the camshaft drive gear, and temporarily install the camshaft drive gear with the 4 bolts.
- (c) Using a 5 mm hexagon wrench, uniformly tighten the 4 bolts.

**Torque: 7.5 N·m (80 kgf·cm, 66 in.-lbf)**

**NOTICE:**

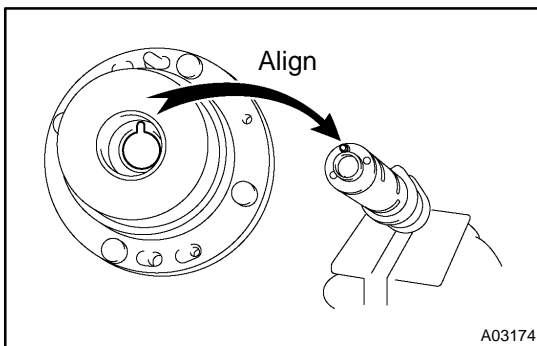
**Be careful not to damage the camshaft timing tube.**



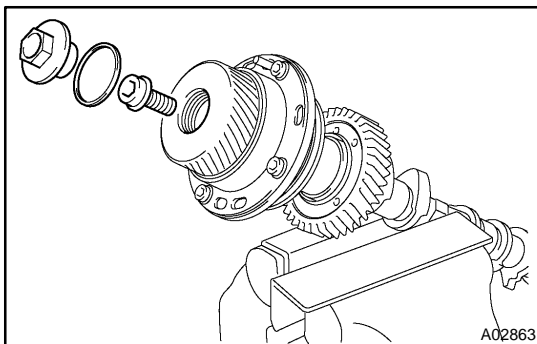
- (d) Mount the hexagon wrench head portion of the intake camshaft in a vise.

**NOTICE:**

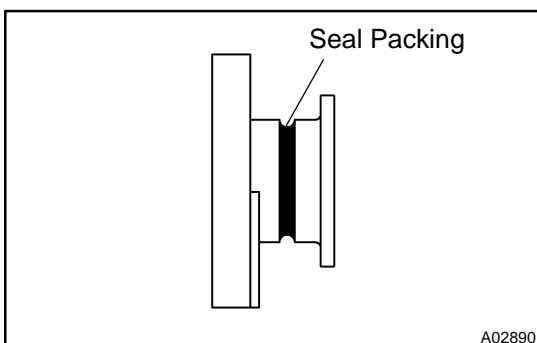
**Be careful not to damage the camshaft.**



- (e) Align the camshaft knock pin with the camshaft timing tube, and push the camshaft timing tube by hand until you feel it touch the bottom.



- (f) Using a 10 mm hexagon wrench, install the set bolt.  
**Torque: 78 N·m (790 kgf·cm, 58 ft-lbf)**
- (g) Install the seal washer and straight screw plug.  
**Torque: 15 N·m (150 kgf·cm, 11 ft-lbf)**

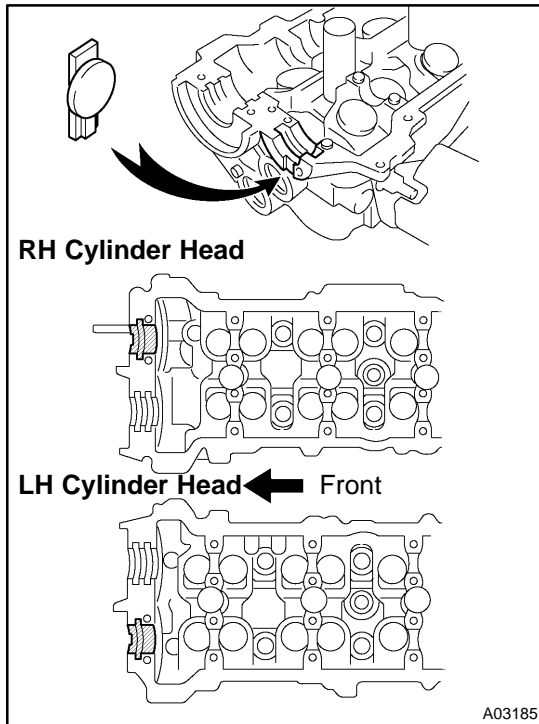


**9. INSTALL CAMSHAFT HOUSING PLUGS**

- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the camshaft housing plug grooves.

**Seal packing:**

**Part No. 08826-00080 or equivalent**

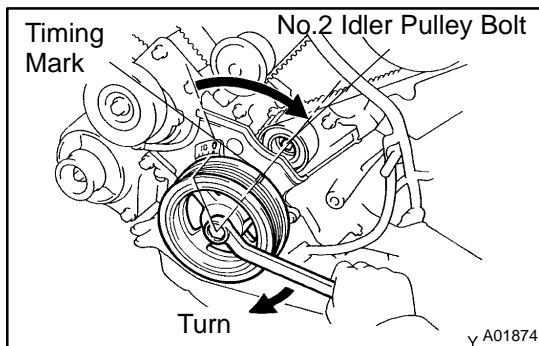


- (c) Install the 2 camshaft housing plugs to the cylinder heads.

## 10. INSTALL CAMSHAFTS

### NOTICE:

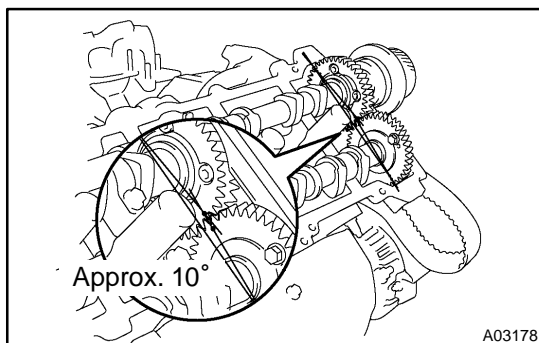
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



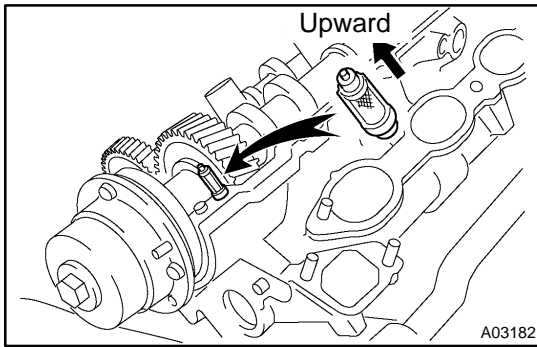
- (a) Set the crankshaft pulley position.  
Turn the crankshaft pulley clockwise or counterclockwise, and put the timing mark of the crankshaft pulley in line with the centers of the crankshaft pulley bolt and idler pulley bolt.

### NOTICE:

Having the crankshaft pulley at the wrong angle can cause the piston head and valve head to come into contact with each other when you install the camshaft, causing damage. So always set the crankshaft pulley at the correct angle.



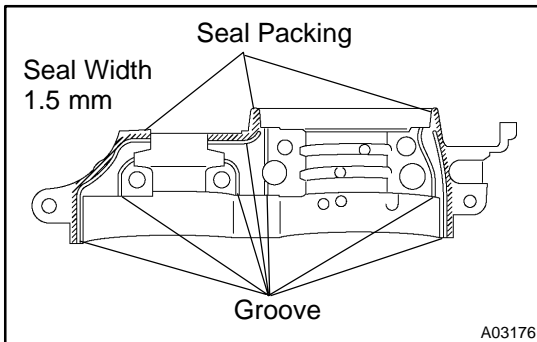
- (b) Install the RH camshafts.
- (1) Apply MP grease to the thrust portion of the intake and exhaust camshafts.
  - (2) Place the intake and exhaust camshafts.
  - (3) Set the timing mark (1 dot mark) of the camshaft main gear at approx. 10° angle.



- (4) Place the camshaft oil control valve filter to the cylinder head.

**NOTICE:**

Be careful installation direction.



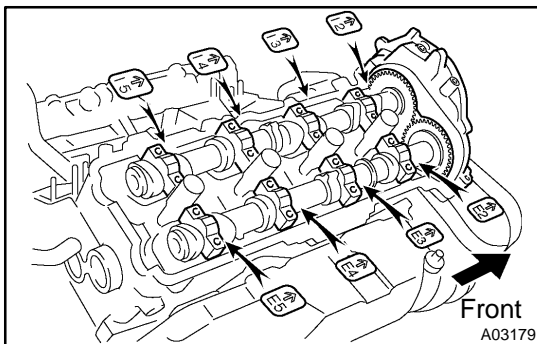
- (5) Remove any old packing (FIPG) material from front bearing cap.  
 (6) Apply seal packing to the front bearing cap as shown in the illustration.

**Seal packing:****Part No. 08826-00080 or equivalent**

- Install a nozzle that has been cut to a 1.5 mm (0.06 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

**NOTICE:**

Do not apply seal packing to the front bearing cap grooves.



- (7) Install the front bearing cap.

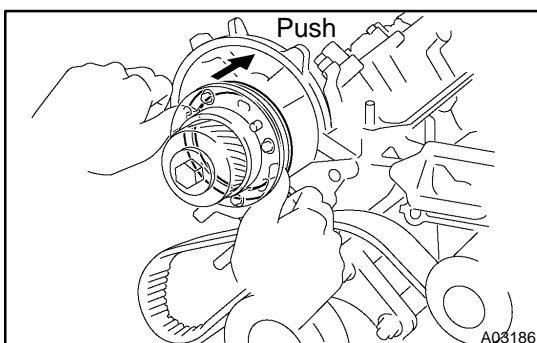
**HINT:**

Installing the front bearing cap will determine the thrust portion of the camshaft.

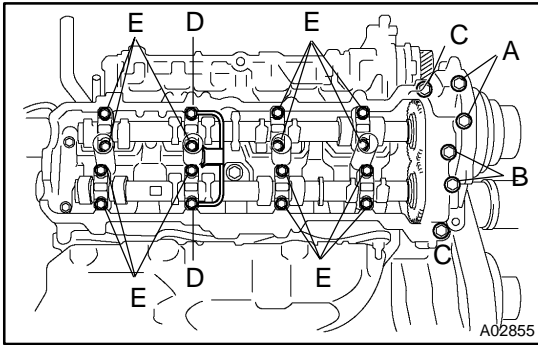
- (8) Install the other bearing cap in the sequence shown with the arrow mark facing forward.

**HINT:**

Align the arrow marks at the front and rear of the cylinder head with the mark on the bearing cap.



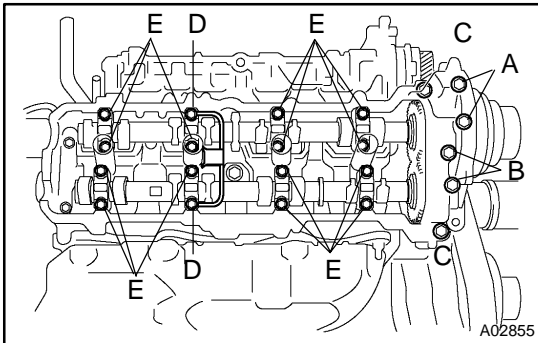
- (9) Push in the camshaft oil seal.



- (10) Apply a light coat of engine oil on the threads and under the heads (D and E) of the bearing cap bolts.

HINT:

Do not apply engine oil under the heads of the bearing cap bolt (A), (B) and (C).



- (11) Install the oil feed pipe and the 22 bearing cap bolts as shown.

HINT:

Each bolt length is indicated in the illustration.

Bolt length:

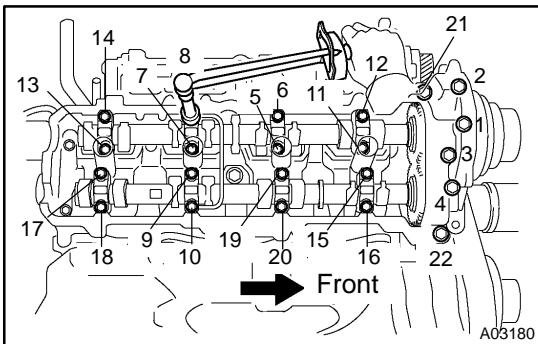
94 mm (3.70 in.) for A

72 mm (2.83 in.) for B

25 mm (0.98 in.) for C

52 mm (2.05 in.) for D

38 mm (1.50 in.) for E

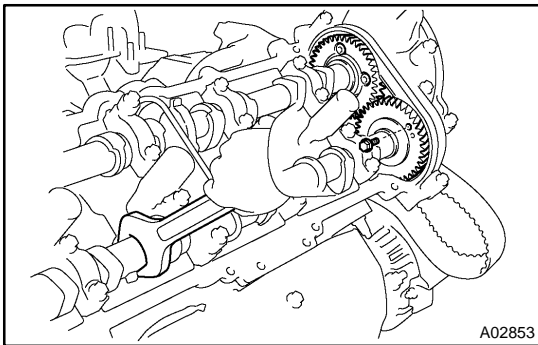


- (12) Uniformly tighten the 22 bearing cap bolts in several passes, in the sequence shown.

**Torque:**

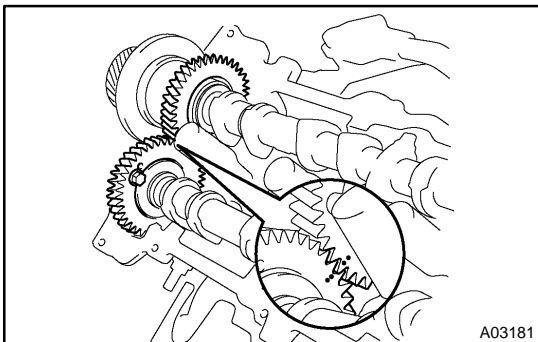
**Bolt C: 7.5 N·m (80 kgf·cm, 66 in.-lbf)**

**Others: 16 N·m (160 kgf·cm, 12 ft-lbf)**



- (13) Boring the service bolt installed in the driven sub-gear upward by turning the hexagon wrench head portion of the camshaft with a wrench.

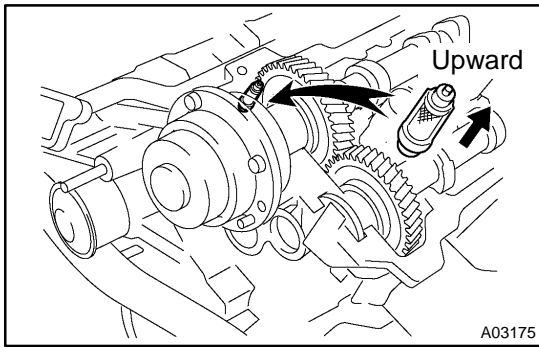
- (14) Remove the service bolt.



- (c) Install the LH camshafts.

- (1) Apply MP grease to the thrust portion of the intake and exhaust camshafts.
- (2) Place the intake and exhaust camshafts.
- (3) Engage the intake to the exhaust gear by meeting the timing marks (2 dot marks) on each gear.

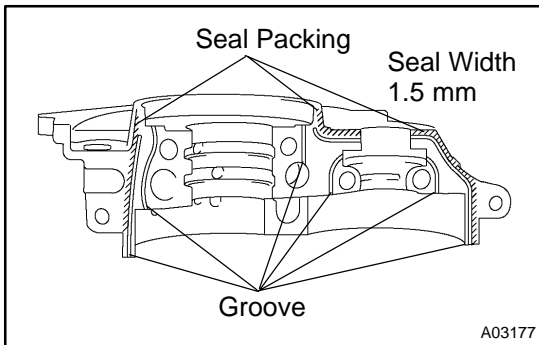




- (4) Place the camshaft oil control valve filter to the cylinder head.

**NOTICE:**

Be careful installation direction.



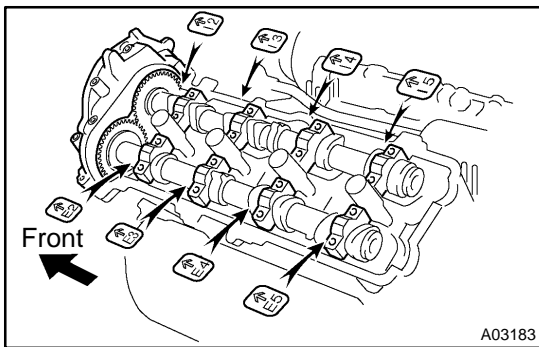
- (5) Remove any old packing (FIPG) material.  
(6) Apply seal packing to the front bearing cap.

**Seal packing:****Part No. 08826-00080 or equivalent**

- Install a nozzle that has been cut to a 1.5 mm (0.06 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

**NOTICE:**

Do not apply seal packing to the front bearing cap grooves.



- (7) Install the front bearing cap.

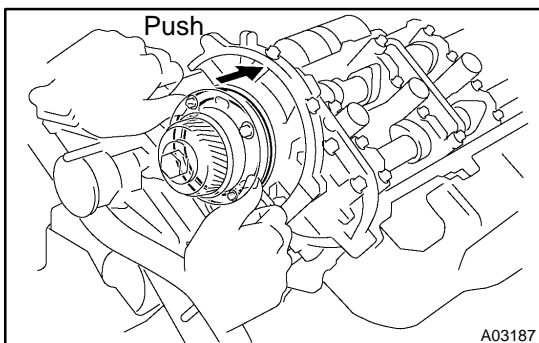
**HINT:**

Installing the front bearing cap will determine the thrust portion of the camshaft.

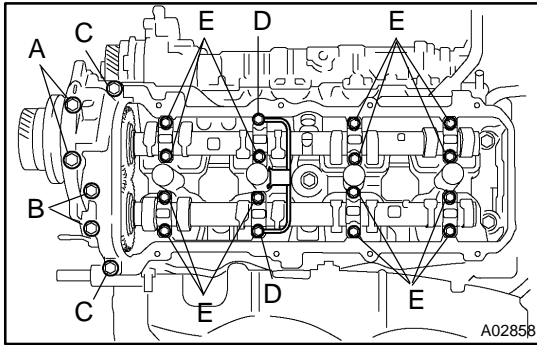
- (8) Install the other bearing cap in the sequence shown with the arrow mark facing forward.

**HINT:**

Align the arrow marks at the front and rear of the cylinder head with the mark on the bearing cap.



- (9) Push in the camshaft oil seal.



- (10) Apply a light coat of engine oil on the threads and under the heads (D and E) of the bearing cap bolts.

**HINT:**

Do not apply engine oil under the heads of the bearing cap bolt (A), (B) and (C).

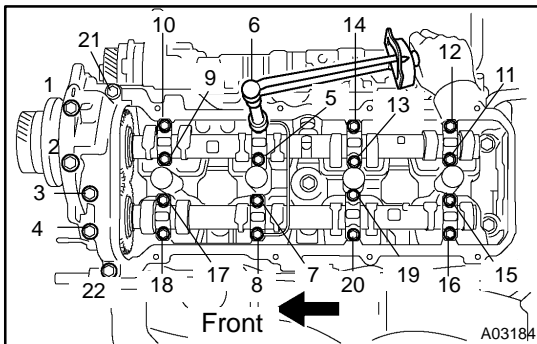
- (11) Install the oil feed pipe and the 22 bearing cap bolts as shown.

**HINT:**

Each bolt length is indicated in the illustration.

Bolt length:

- 94 mm (3.70 in.) for A
- 72 mm (2.83 in.) for B
- 25 mm (0.98 in.) for C
- 52 mm (2.05 in.) for D
- 38 mm (1.50 in.) for E

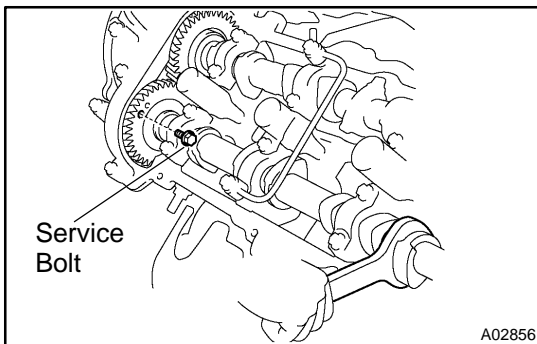


- (12) Uniformly tighten the 22 bearing cap bolts in several passes, in the sequence shown.

**Torque:**

**Bolt C: 7.5 N·m (80 kgf·cm, 66 in.-lbf)**

**Others: 16 N·m (160 kgf·cm, 12 ft-lbf)**

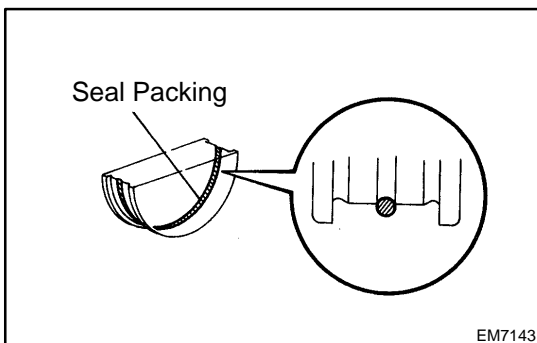


- (13) Boring the service bolt installed in the driven sub-gear upward by turning the hexagon wrench head portion of the camshaft with a wrench.

- (14) Remove the service bolt.

**11. CHECK AND ADJUST VALVE CLEARANCE**  
(See page [EM-4](#))

Turn the camshaft and position the cam lobe upward, and check and adjust the valve clearance.

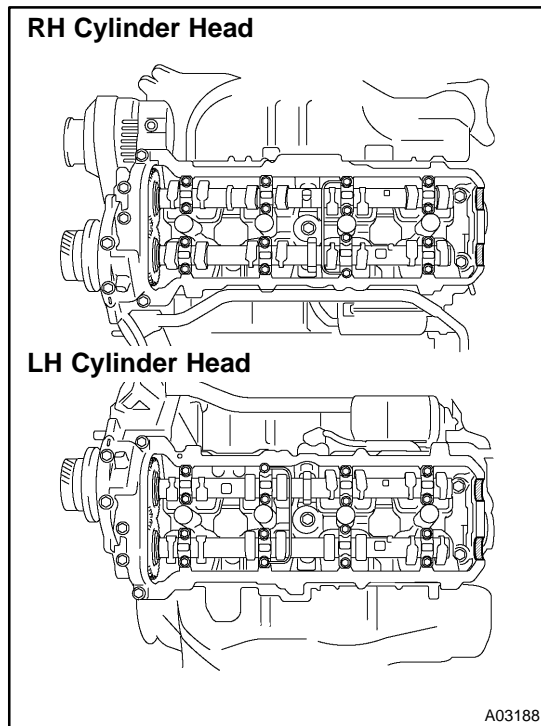


**12. INSTALL SEMI-CIRCULAR PLUGS**

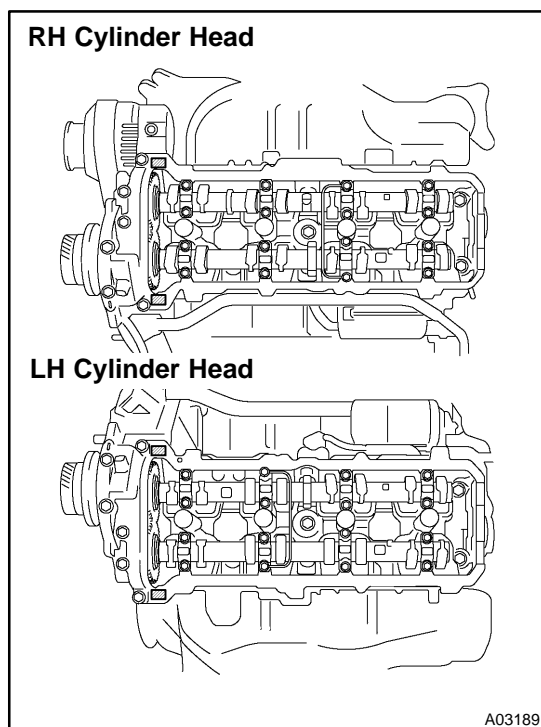
- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the semi-circular plug grooves.

**Seal packing:**

**Part No. 08826-00080 or equivalent**



- (c) Install the 4 semi-circular plugs to the cylinder heads.



### 13. INSTALL CYLINDER HEAD COVER

- (a) Remove any old packing (FIPG) material.  
 (b) Apply seal packing to the cylinder heads as shown in the illustration.

#### Seal packing:

**Part No. 08826-00080 or equivalent**

- (c) Install the gasket to the cylinder head cover.  
 (d) Install the seal washer to the bolt.  
 (e) Install the cylinder head cover with the 9 bolts. Uniformly tighten the bolts in several passes. Install the 2 cylinder head covers.

**Torque: 6.0 N·m (60 kgf·cm, 53 in.-lbf)**

### 14. INSTALL ENGINE HANGERS

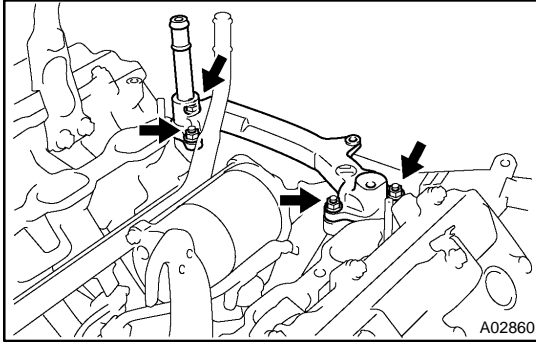
**Torque: 37 N·m (380 kgf·cm, 27 ft-lbf)**

### 15. INSTALL VVT SENSORS

### 16. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE (See page [SF-51](#))

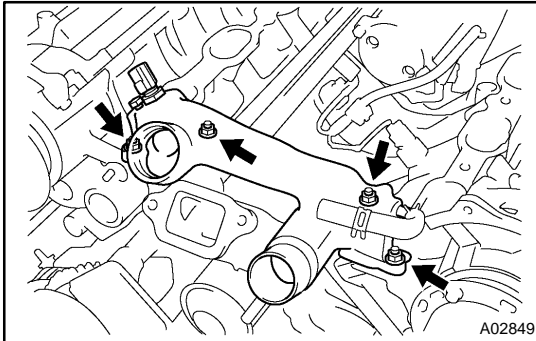
### 17. INSTALL OIL DIPSTICK AND GUIDE FOR ENGINE (See page [LU-16](#))

### 18. INSTALL OIL DIPSTICK AND GUIDE FOR A/T (See page [EM-82](#))

**19. INSTALL REAR WATER BYPASS JOINT**

- (a) Install 2 new gaskets to the cylinder head.
- (b) Install the 4 nuts holding the water bypass joint to the cylinder heads. Alternately tighten the nuts.

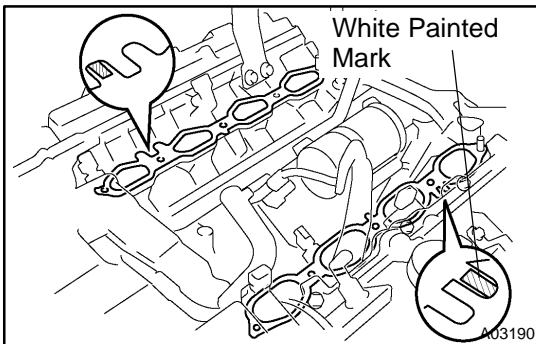
**Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)**

**20. INSTALL FRONT WATER BYPASS JOINT**

- (a) Install 2 new gaskets and the water bypass joint with the 4 nuts. Alternately tighten the nuts.

**Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)**

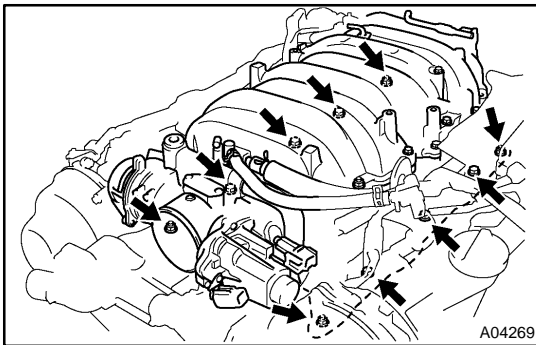
- (b) Connect ECT sensor connector.

**21. INSTALL WATER INLET AND INLET HOUSING ASSEMBLY (See page CO-10)****22. INSTALL INTAKE MANIFOLD ASSEMBLY**

- (a) Place 2 new gaskets on the cylinder heads with white painted mark facing upward.

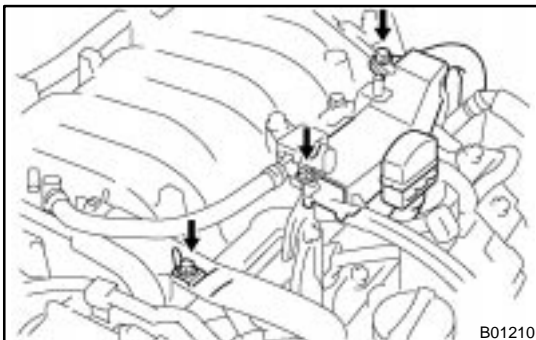
**NOTICE:**

- **Align the port holes of the gasket and cylinder head.**
- **Be careful of the installation direction.**

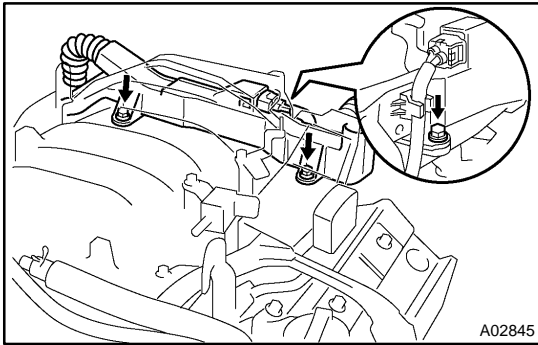


- (b) Place the intake manifold assembly on the cylinder heads.
- (c) Install and uniformly tighten the 6 bolts and 4 nuts in several passes.

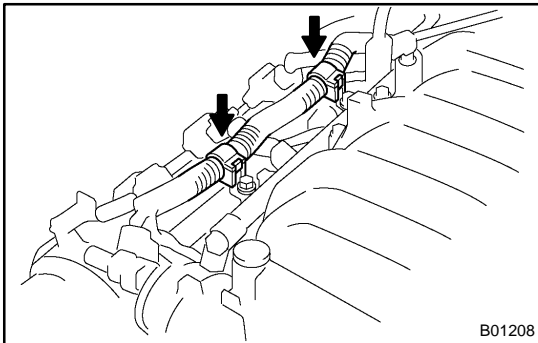
**Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)**



- (d) Connect the engine wire to the RH delivery pipe, rear water bypass joint, intake manifold and RH cylinder head.
  - (1) Connect the wire clamp bracket and wire protector to the intake manifold with the 3 bolts.

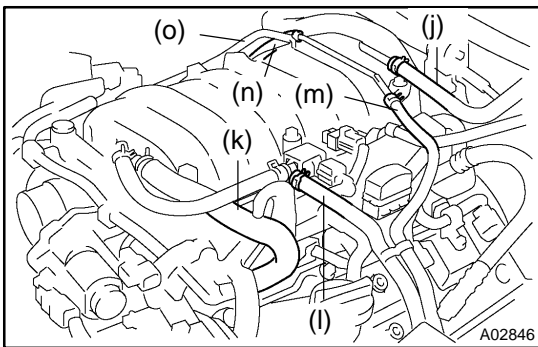
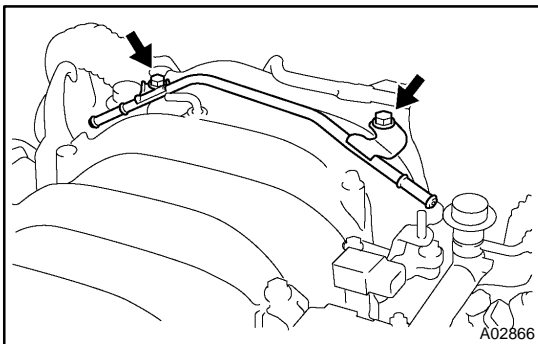


- (2) Connect the wire protector to the rear water bypass joint and RH cylinder head with the 3 bolts.

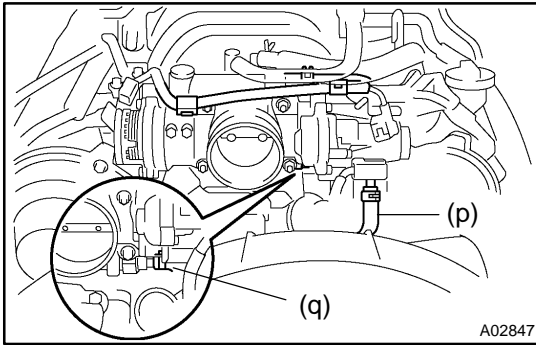


- (3) Connect the 2 wire clamp to the wire clamp bracket on the RH delivery pipe.

- (e) Install the 3 V-bank cover brackets with the 4 bolts.  
**Torque: 7.5 N·m (80 kgf·cm, 66 ft·lbf)**
- (f) Connect the VSV connector for ACIS to the No.1 V-bank cover bracket.
- (g) Install the accelerator cable bracket with the 2 nuts.  
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**
- (h) Install the VSV for EVAP with the bolt.  
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**
- (i) Install the EVAP pipe to the intake manifold with the 2 bolts.



- (j) Connect the brake booster vacuum hose to the union on the intake manifold.
- (k) Connect the PCV hose to the PCV valve on the LH cylinder head.
- (l) Connect the EVAP hose (from the charcoal canister) to the VSV for EVAP.
- (m) Connect the EVAP hose (from the charcoal canister) to the EVAP pipe on the intake manifold.
- (n) Connect the EVAP hose (from the intake air connector) to the EVAP pipe on the intake manifold.
- (o) Connect the PS air hose to the intake manifold.



- (p) Connect the No.1 water bypass hose (from the water inlet housing) to the throttle body.
- (q) Connect the No.7 water bypass hose (from the front water bypass joint) to the throttle body.
- (r) Connect the 2 wire clamp to the throttle body.
- (s) Connect the throttle position sensor connector.
- (t) Connect the accelerator pedal position sensor connector.
- (u) Connect the throttle motor connector.
- (v) Connect the VSV connector for EVAP.
- (w) Connect the VSV connector for ACIS.
- (x) Connect the 8 injector connectors.
- (y) Connect the noise filter connector.
- (z) Connect the accelerator cable.

**23. CONNECT FUEL INLET HOSE (See page [SF-23](#))**

**24. INSTALL TIMING BELT REAR PLATES**

- (a) Install the RH timing belt rear plates.
  - (1) Install the No.1 timing belt rear plate to the cylinder head with the bolt and stud bolt.

**Torque: 7.5 N·m (80 kgf·cm, 66 in.-lbf)**

- (2) install the No.2 timing belt rear plate to the No.1 timing belt rear plate with the 2 bolts.

**Torque: 7.5 N·m (80 kgf·cm, 66 in.-lbf)**

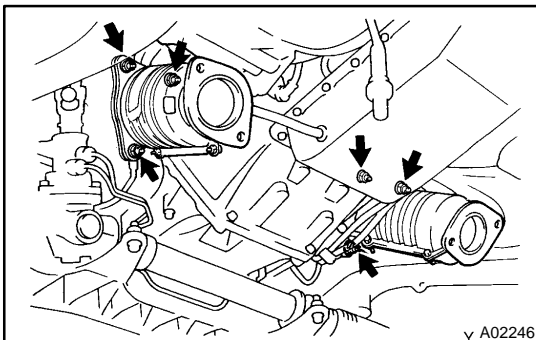
- (b) Install the LH timing belt rear plates.
  - (1) Connect the wire clamp to the No.1 timing belt rear plate.
  - (2) Install the No.1 timing belt rear plate to the cylinder head with the bolt.

**Torque: 7.5 N·m (80 kgf·cm, 66 in.-lbf)**

- (3) install the No.2 timing belt rear plate to the No.1 timing belt rear plate with the 2 bolts.

**Torque: 7.5 N·m (80 kgf·cm, 66 in.-lbf)**

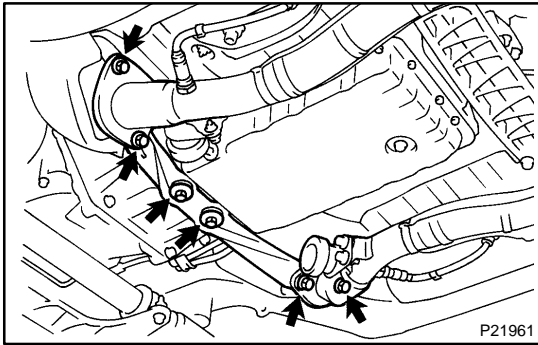
**25. INSTALL IGNITION COILS (See page [IG-7](#))**



**26. INSTALL TWC**

Install a new gasket and the TWC with 3 new nuts. Install the 2 TWC.

**Torque: 61.8 N·m (630 kgf·cm, 46 ft·lbf)**

**27. CONNECT FRONT EXHAUST PIPE TO TWC**

- (a) Temporarily install the pipe support bracket to the transmission with the 2 bolts.
- (b) Install a new gasket to each rear end of the TWC.
- (c) Connect the front exhaust pipe to the 2 front TWC and pipe support bracket with the 4 bolts and 4 new nuts.  
**Torque: 43.1 N·m (440 kgf·cm, 32 ft·lbf)**
- (d) Tighten the 2 bolts holding the pipe support bracket to the transmission.

**Torque: 43.1 N·m (440 kgf·cm, 32 ft·lbf)**

**28. INSTALL PS PUMP (See page [EM-82](#))****29. INSTALL CAMSHAFT POSITION SENSOR  
(See page [IG-11](#))****30. INSTALL CAMSHAFT TIMING PULLEYS  
(See page [EM-22](#))****31. CONNECT TIMING BELT TO CAMSHAFT TIMING PULLEYS (See page [EM-22](#))****32. CHECK ENGINE OIL LEVEL**