

INSTALLATION

1. CHECK PISTON PROTRUSION AND SELECT CYLINDER HEAD GASKET

Check piston protrusions for each cylinder

- (1) Clean the cylinder block with solvent.
- (2) Set the piston of the cylinder to be measured to slightly before TDC.
- (3) Place a dial indicator on the cylinder block, and set the dial indicator at 0 mm (0 in.).

HINT:

- Use a dial indicator measuring tip as shown in the illustration.
- Make sure that the measuring tip is square to the cylinder block gasket surface and piston head when taking the measurements.
- (4) Find where the piston head protrudes most by slowly turning the crankshaft clockwise and counter-clockwise.
- (5) Measure each cylinder at 2 places as shown in the illustration, making a total of 12 measurements.
- (6) For the piston protrusion value of each cylinder, use the average of the 2 measurements of each cylinder.

Protrusion (P): 0.175 – 0.425 mm (0.0069 – 0.0167 in.)

When removing piston and connecting rod assembly:

If the protrusion is not as specified, remove the piston and connecting rod assembly and reinstall it.

(See page EM-102)

2. SELECT NEW CYLINDER HEAD GASKET

HINT:

There are 5 types of gasket (cutout number 1 to 5) installed at factory, but only 3 types for supply parts (cutout number 1, 3 and 5), so when replacing the gasket select from one of 3 types above.

New installed cylinder head gasket thickness:

Cutout number 1: 1.15 – 1.25 mm (0.0453 – 0.0492 in.)

Cutout number 3: 1.25 – 1.35 mm (0.0492 – 0.0531 in.)

Cutout number 5: 1.35 – 1.45 mm (0.0531 – 0.0571 in.)

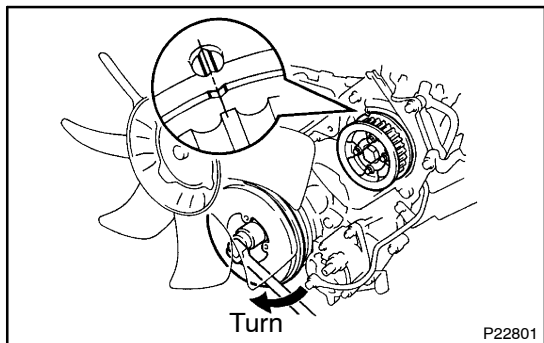
Select the largest piston protrusion value from the measurements made, then select a new appropriate gasket according to the table below.

1HZ:

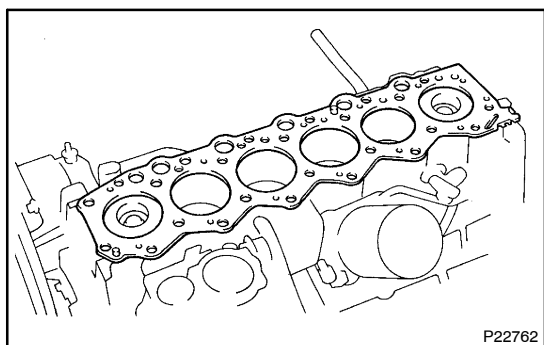
Piston protrusion	Gasket size
0.455 mm (0.0179 in.) or less	Use 1
0.456 – 0.555 mm (0.0180 – 0.0219 in.)	Use 3
0.556 mm (0.0219 in.) or more	Use 5

1HD-T:

Piston protrusion	Gasket size
0.525 mm (0.0207 in.) or less	Use 1
0.526 – 0.625 mm (0.0207 – 0.0246 in.)	Use 3
0.626 mm (0.0246 in.) or more	Use 5

**3. SET NO. 1 CYLINDER TO BDC/COMPRESSION**

Turn the crankshaft pulley, and align the timing mark of the No.2 camshaft timing pulley, with the BDC mark of the timing gear cover.

**4. INSTALL CYLINDER HEAD**

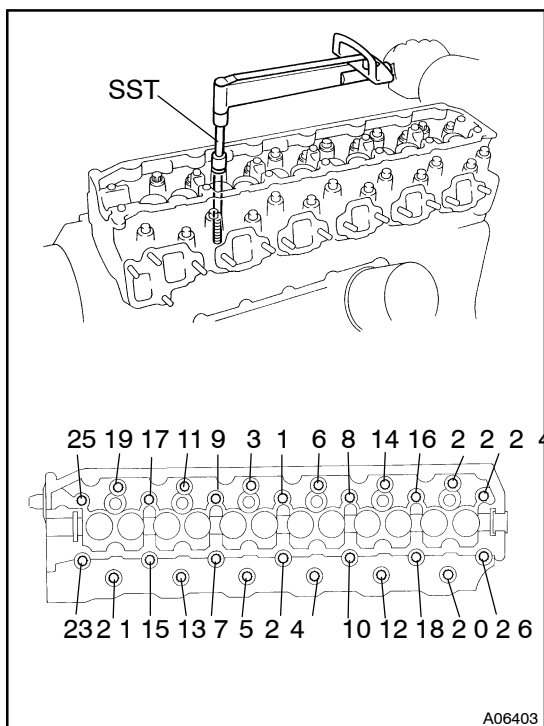
(a) Place cylinder on cylinder block

- (1) Place a new cylinder head gasket in position on the cylinder block.

NOTICE:

Be careful of the installation direction.

- (2) Place the cylinder head in position on the cylinder head gasket.



(b) Install cylinder head bolts

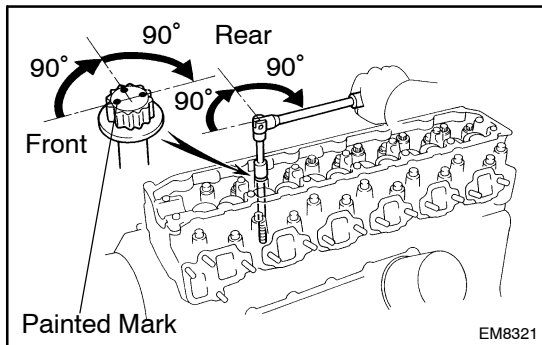
HINT:

- The cylinder head bolts are tightened in 3 progressive steps (steps (b), (d) and (e)).
- If any bolts is broke or deformed, replace it.
 - (1) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
 - (2) Install and uniformly tighten the 26 cylinder head bolts in several passes, in the sequence shown.

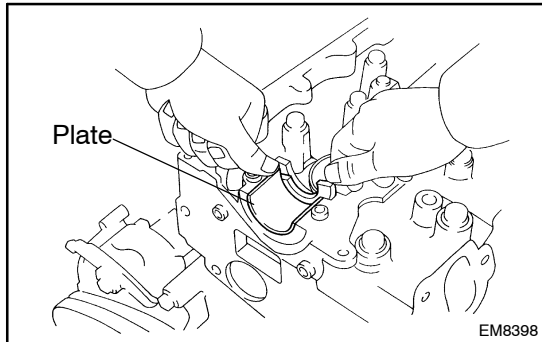
SST090 11-38121

Torque: 68.6 N · m (700 kgf · cm, 5 1 ft·lbf)

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

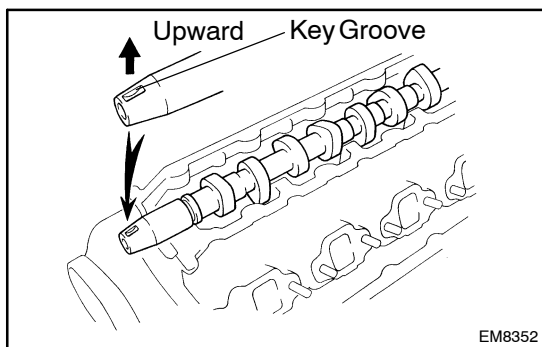


- (c) Mark the front of the cylinder head bolt with paint.
- (d) Retighten the cylinder head bolts 90° in the numerical order shown.
- (e) Retighten cylinder head bolts by an additional 90°.
- (f) Check that the painted mark is now facing rearward.
- (g) Connect the water bypass hose (from the injection pump) to the cylinder head.

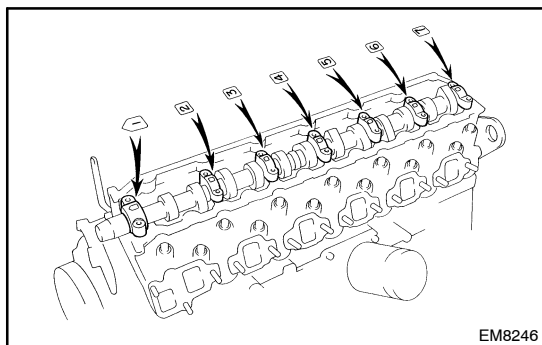


5. INSTALL CAMSHAFT

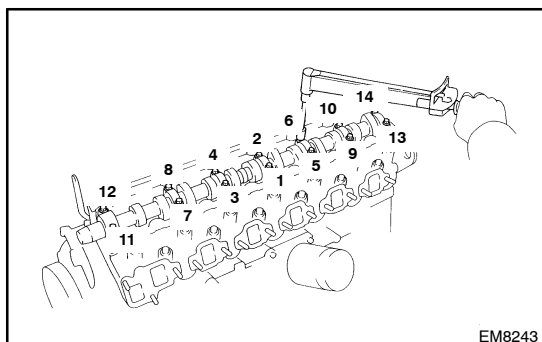
- (a) Install the camshaft thrust plate to the cylinder head.
- (b) Install the camshaft bearings to the No. 1 bearing cap and No.1 journal of the cylinder head.



- (c) Place the camshaft on the cylinder head, facing the key groove upward.



- (d) Install the 7 bearing caps in their proper locations.



- (e) Install and uniformly tighten the 14 bearing cap bolts in several passes in the sequence shown.

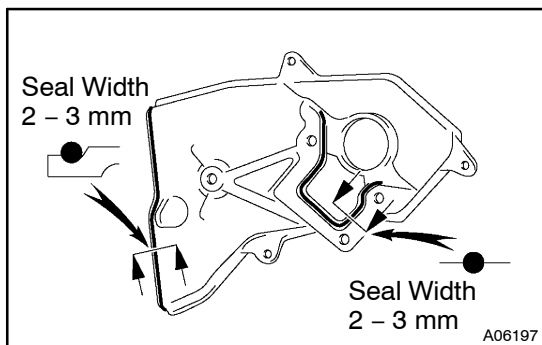
Torque:

No.1 Bearing cap 25 N·m (250 kgf·cm, 18 ft·lbf)

Other 18 N·m (185 kgf·cm, 13 ft·lbf)

6. INSTALL CAMSHAFT OIL SEAL RETAINER

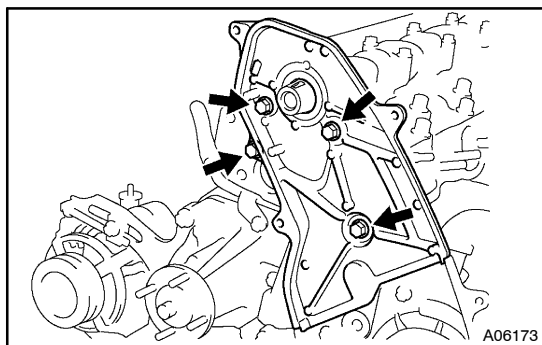
- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil seal retainer and cylinder head.
- Using a razor blade and gasket scraper, remove all the oil packing (FIPG) material from the gasket surfaces and sealing groove.
 - Thoroughly clean all components to remove all the loose material.



- Using a non-residue solvent, clean both sealing surfaces.
- (b) Apply seal packing to the oil seal retainer as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 2-3 mm (0.08 - 0.12 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.

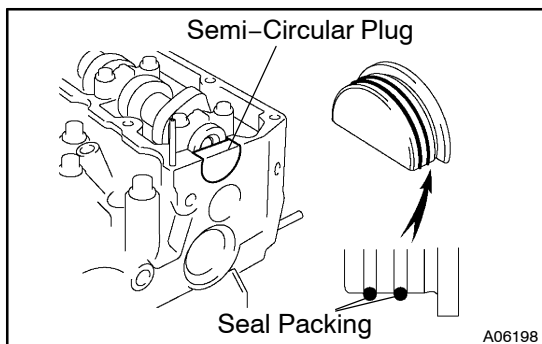


- (c) Install the oil seal retainer with the 4 bolts. Uniformly tighten the bolts in several passes.

Torque: 19.6 N · m (200 kgf · cm, 14 ft · lbf)

7. INSTALL TIMING BELT AND PULLEYS

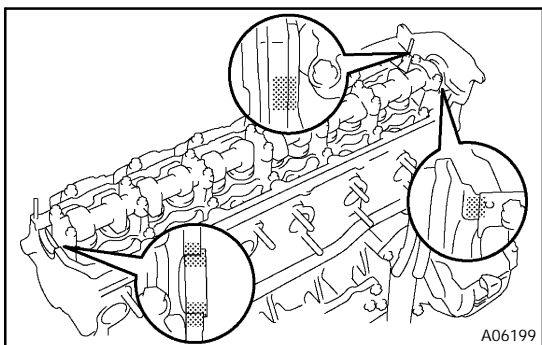
(See page EM-31)

**8. INSTALL SEMI -CIRCULAR PLUG**

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

Seal packing: Part No. 08826 -00080 or equivalent

- (c) Install the semi -circular plug to the cylinder head.

**9. INSTALL CYLINDER HEAD COVER**

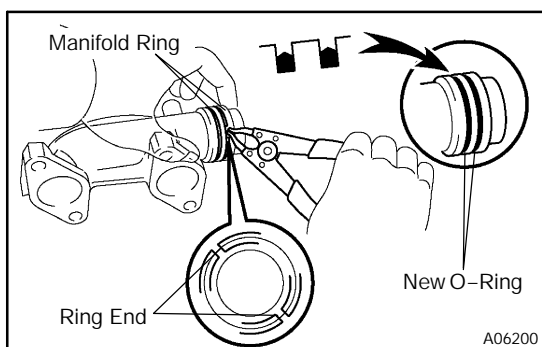
- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing: Part No. 08826-00080 or equivalent

- (c) Install the gasket to the cylinder head cover, 14 bolts and 2 nuts .

Torque: 6.4 N·m (65 kgf·cm, 57 ft·lbf)

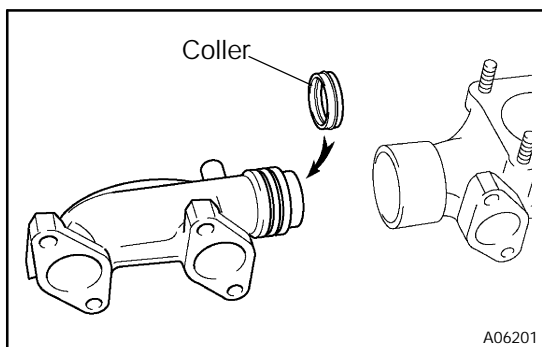
- (d) 1HD – T:
Install the PCV pipe.

10. INSTALL 2 ENGINE HANGERS**11. ASSEMBLE EXHAUST MANIFOLDS**

- (a) Install 2 new O-rings to the rear exhaust manifold.
- (b) Using snap ring pliers, install the 2 rings to the rear exhaust manifold.
- (c) Position the rings so that the ring ends are as shown.

NOTICE:

Do not align the ring ends.



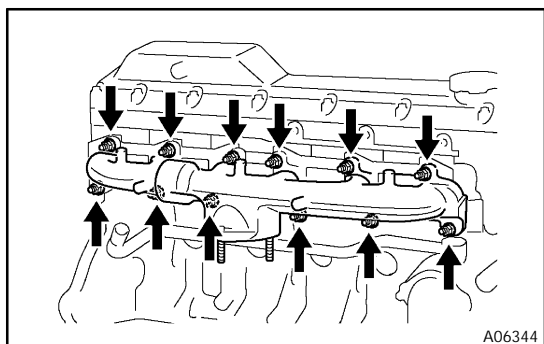
- (d) Install the collar the rear exhaust manifold.
- (e) Assemble the front and rear exhaust manifolds.

12. 1HD-T:

INSTALL EXHAUST MANIFOLD TO TURBOCHARGER
(See page TC-15)

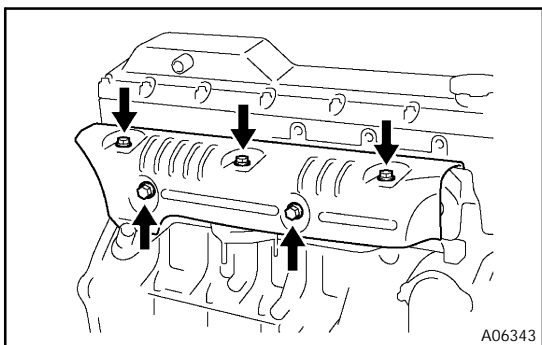
13. 1HD-T:

INSTALL TURBOCHARGER AND EXHAUST MANIFOLDS ASSEMBLY
(See page TC-15)

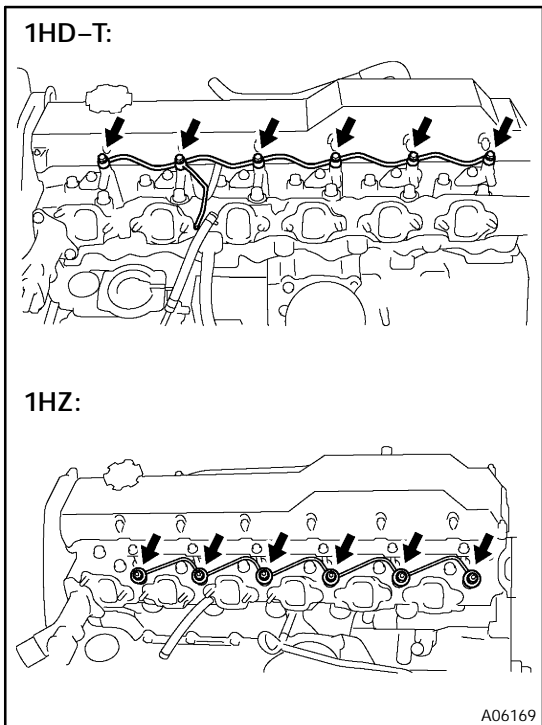
**14. 1HZ:**

INSTALL EXHAUST MANIFOLDS ASSEMBLY

Install the 12 bolts, exhaust manifold and 2 gaskets.

**15. 1HZ:****INSTALL HEAT INSULATOR**

Install the 5 bolts and heat insulator.

**16. INSTALL NOZZLE LEAKAGE PIPE****(a) 1HZ:**

Install the 6 nuts, 6 gaskets and nozzle leakage pipe.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

(b) 1HD – T:

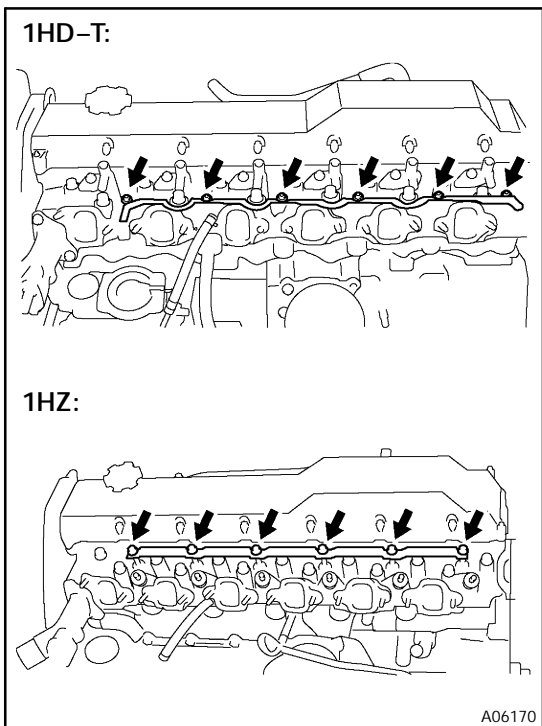
Install the 6 bolts, 12 gaskets and nozzle leakage pipe.

Torque: 12.3 N·m (125 kgf·cm, 9 ft·lbf)

17. INSTALL INJECTION NOZZLES

1HZ: (See page FU-13)

1HD-T: (See page FU-30)

**18. INSTALL GLOW PLUG AND GLOW PLUG CONNECTOR**

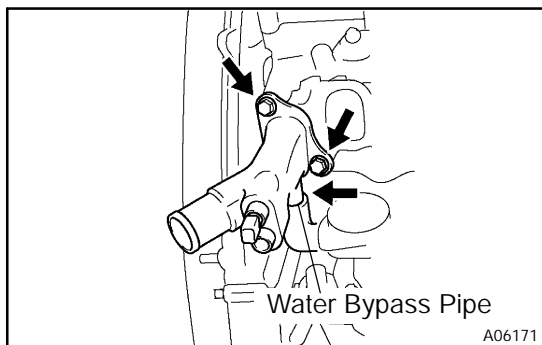
(a) Install 6 glow plugs.

(b) Install glow plug connector, 6 nuts and 6 screw grommets.

Torque:

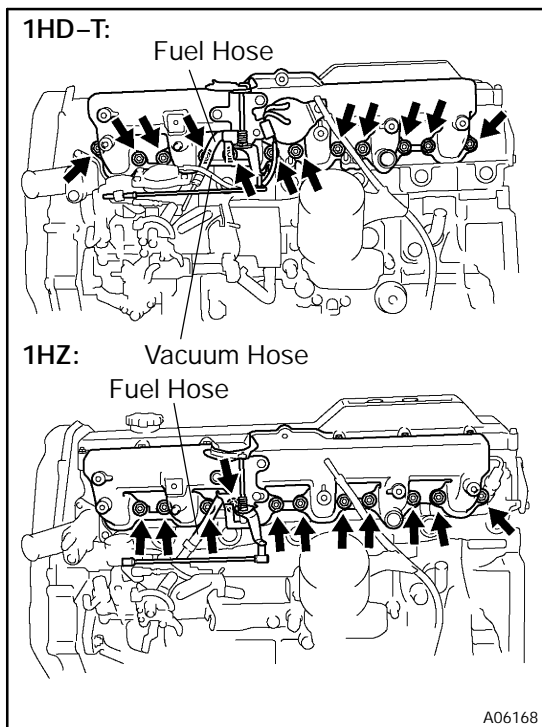
6 nuts: 22 N·m (224 kgf·cm, 16 ft·lbf)

Glow plug: 12.7 N·m (130 kgf·cm, 9 ft·lbf)

**19. INSTALL WATER OUTLET**

- (a) Install a new gasket to the intake manifold.
- (b) 1HD - T:
Connect the water bypass hose to the water outlet.
- (c) Install the water outlet with the 2 nuts.

Torque: 19.6 N·m (200 kgf·cm, 14 ft·lbf)

**20. INSTALL INTAKE MANIFOLD**

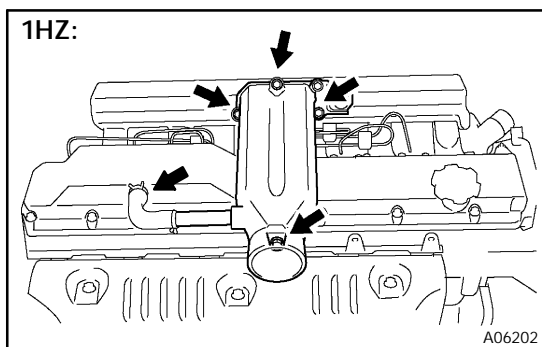
- (a) Install 6 new gaskets and the intake manifold with the 12 seals and 12 nuts.

Torque: 19.6 N·m (200 kgf·cm, 15 ft·lbf)

- (b) Install the accelerator linkage.
- (c) 1HD - T:
Connect the vacuum hose to the injection pump, and the fuel hose to the fuel pipe, and install the 2 clips.
- (d) 1HZ:
Connect the fuel hose to the fuel pipe.

21. INSTALL INJECTION PIPES

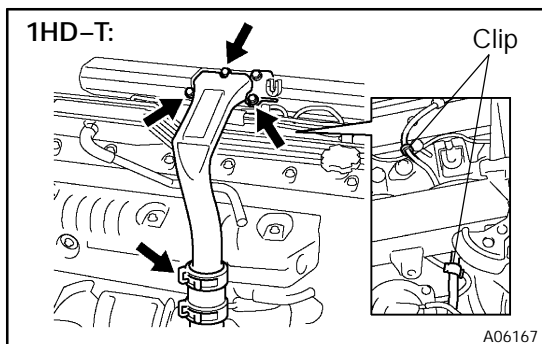
(See page FU-13)

**22. 1HZ: INSTALL INTAKE PIPE ASSEMBLY**

- (a) Install the insulator, gasket and the intake pipe assembly to the intake manifold with the 3 bolts.

Torque: 19.6 N·m (200 kgf·cm, 15 ft·lbf)

- (b) Connect the PCV hose to the cylinder head cover.

**23. 1HD - T: INSTALL INTAKE PIPE ASSEMBLY**

- (a) Connect the intake pipe assembly to the air hose.
- (b) Install a new gasket and the intake pipe to the intake manifold with the 3 bolts.

Torque: 19.6 N·m (200 kgf·cm, 15 ft·lbf)

- (c) Install the 2 clips and vacuum hose.

24. FILL WITH ENGINE COOLANT
25. START ENGINE AND CHECK FOR LEAKS
26. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL