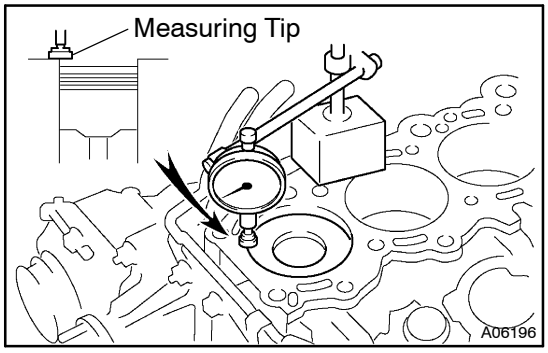
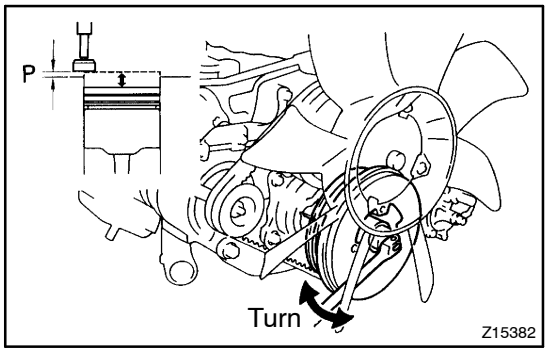
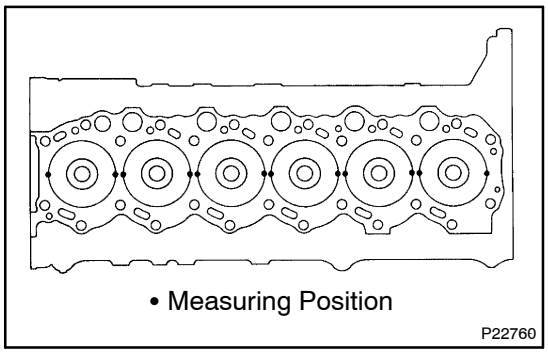
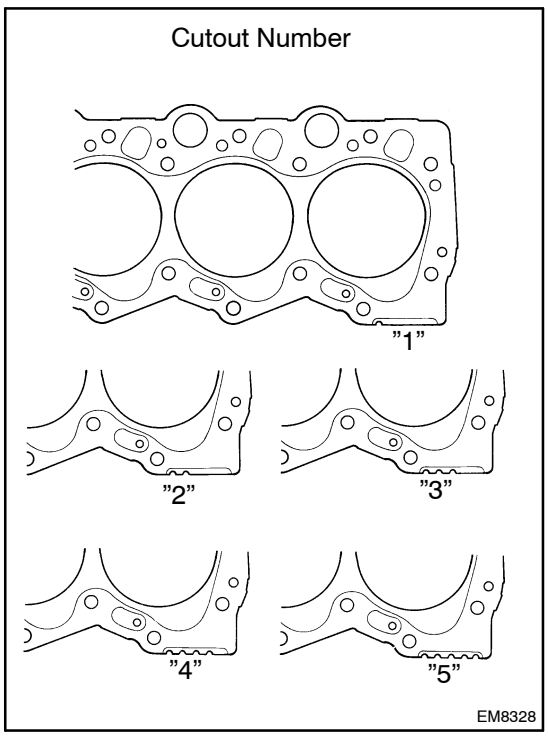








EM0WR–01

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 counterclockwise.

(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.)

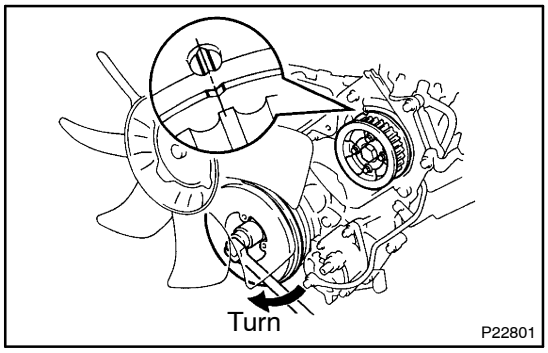
Select the largest piston protrusion value from the measurements made, then select a new appropriate gasket according to the table below.

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 (0.0246 in.) or more	Use 5

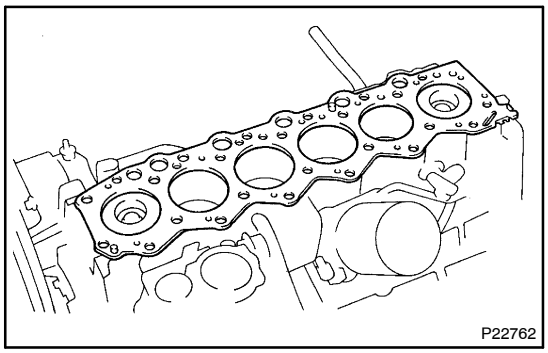
1HD–T:

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

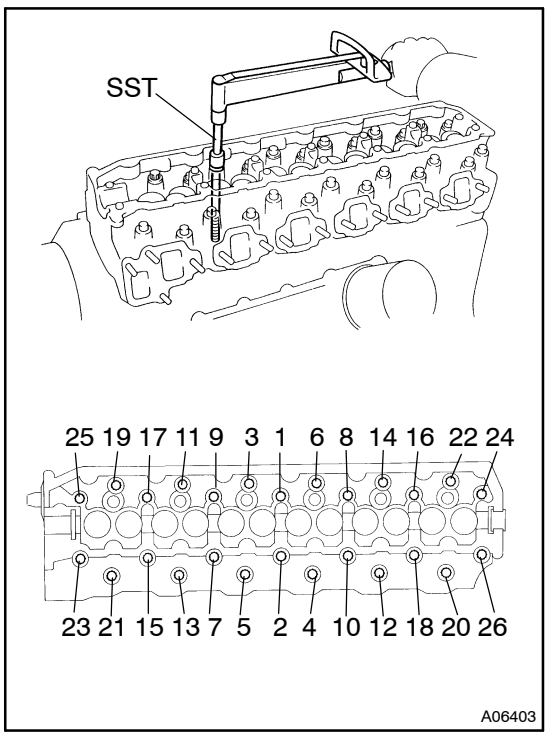
(a) Place cylinder on cylinder block

(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.

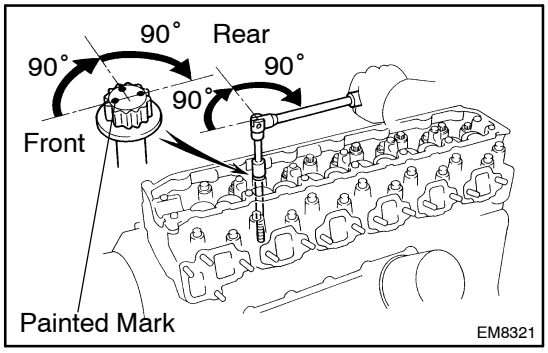
(1) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(2) Install and uniformly tighten the 26 cylinder head bolts in several passes, in the sequence shown.

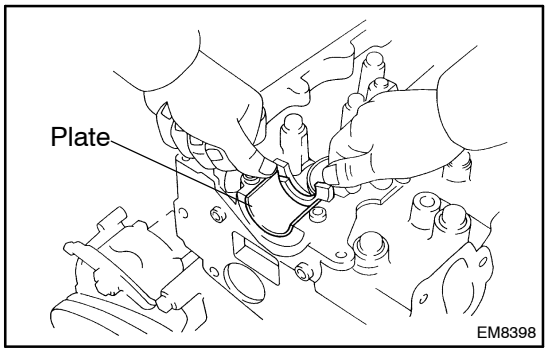
SST 09011–38121

Torque: 68.6 N·m (700 kgf·cm, 51 ft·lbf)

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

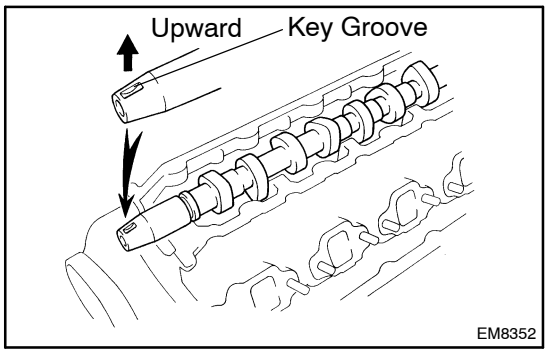


(c) Mark the front of the cylinder head bolt with paint.
(d) Retighten the cylinder head bolts 90˚ in the numerical order shown.
(e) Retighten cylinder head bolts by an additional 90˚.
(f) Check that the painted mark is now facing rearward.
(g) Connect the water bypass hose (from the injection pump)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

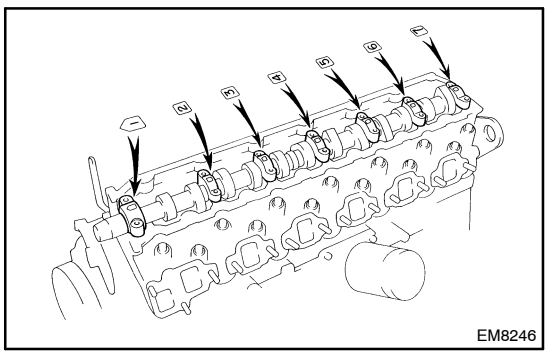


5. INSTALL CAMSHAFT

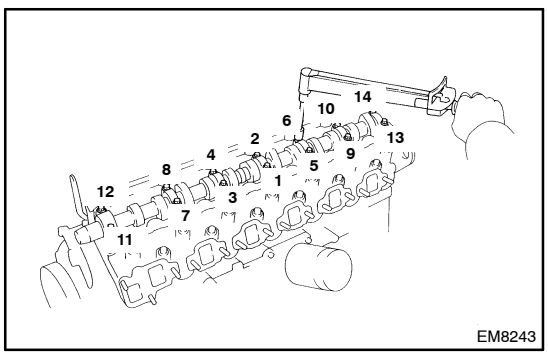
(a) Install the camshaft thrust plate to the cylinder head.
(b) Install the camshaft bearings to the No. 1 bearing cap and No.1 journal of the cylinder head.



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



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

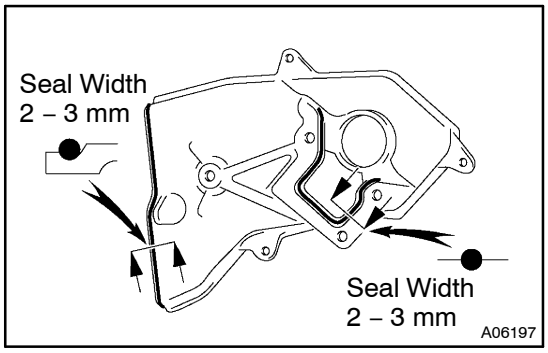


(e) Install and uniformly tighten the 14 bearing cap bolts in several passes in the sequence shown.
Torque:
No.1 Bearing cap 25 N·m (250 kgf·cm, 18 ft·lbf)
Other 18 N·m (185 kgf·cm, 13 ft·lbf)

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.

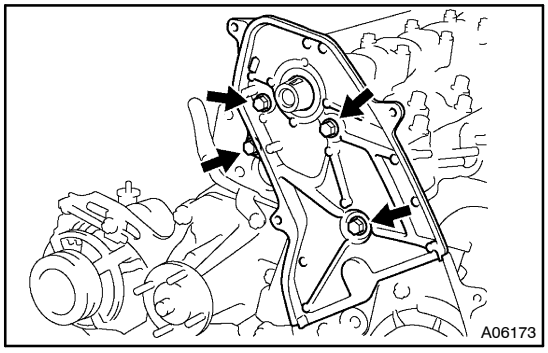
- Using a razor blade and gasket scraper, remove all the oil pacing (FIPG) material from the gasket surfaces and sealing grove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



(b) Apply seal packing to the oil seal retainer as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

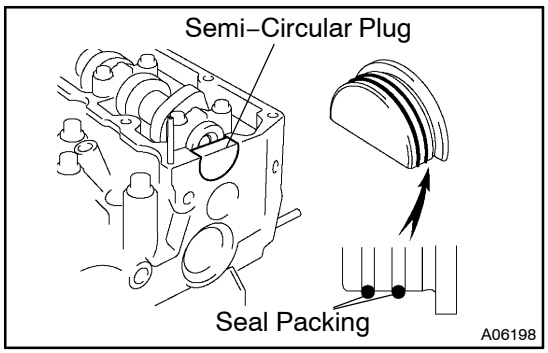
- Install a nozzle that has been cut to a 2–3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(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)



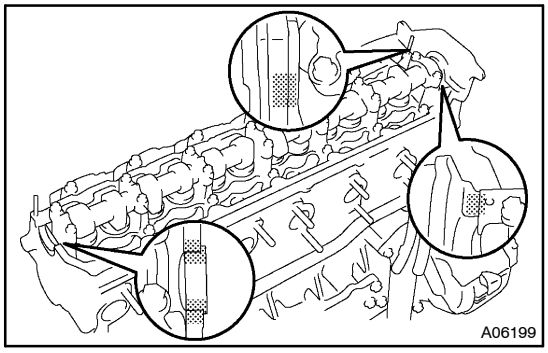
8. INSTALL SEMI–CIRCULAR PLUG

(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.

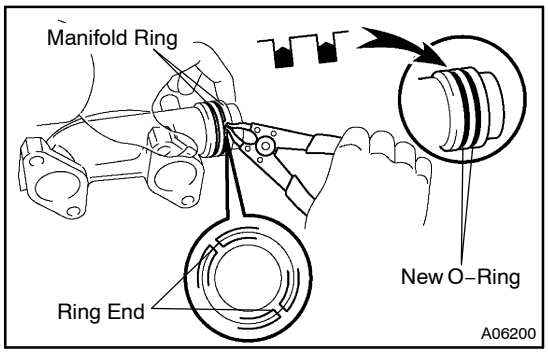
Seal packing: Part No. 08826–00080 or equivalent

(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



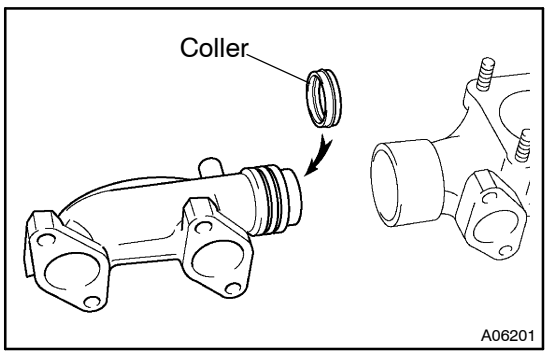
11. ASSEMBLE EXHAUST MANIFOLDS

(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.

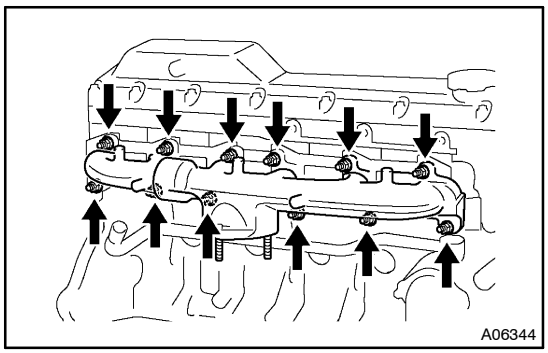


(d) Install the collar the rear exhaust manifold.

(e) Assemble the front and rear exhaust manifolds.

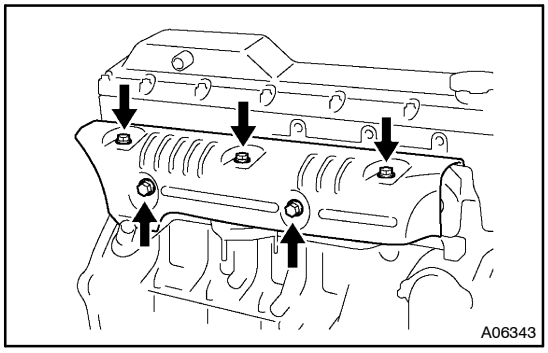
12. 1HD–T:
INSTALL EXHAUST MANIFOLD TO TURBOCHARGER
(See page TC–15)

13. 1HD–T:
INSTALL TURBOCHARGER AND EXHAUST MANIFOIDS ASSEMBLY
(See page TC–15)



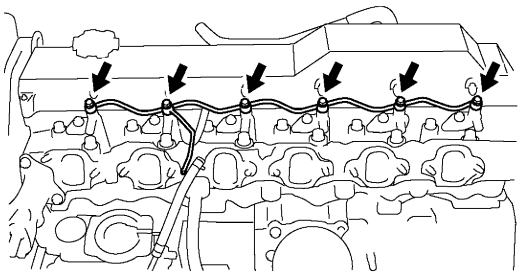
14. 1HZ:
INSTALL EXHAUST MANIFOLDS ASSEMBLY

Install the 12 bolts, exhaust manifold and 2 gaskets.

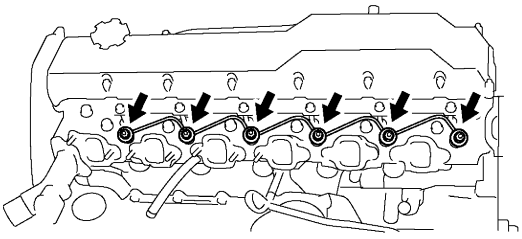


15. 1HZ:
INSTALL HEAT INSULATOR
Install the 5 bolts and heat insulator.

1HD–T:



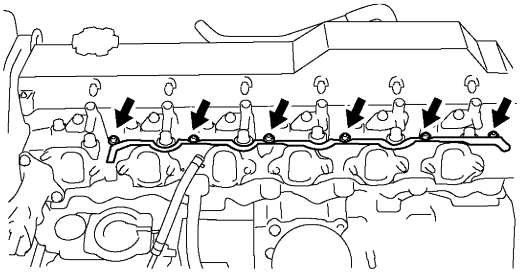
1HZ:



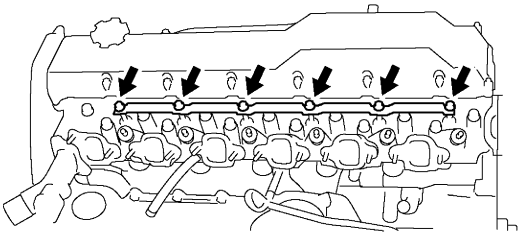
16. INSTALL NOZZLE LEAKAGE PIPE
(a) 1HZ:
Install the 6 nuts, 6 gaskets and nozzle leakage pipe.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)
(b) 1HD – T:
Install the 6 bolts, 12 gaskets and nozzle leakage pipe.
Torque: 12.3 N·m (125 kgf·cm, 9 ft·lbf)

17. INSTALL INJECTION NOZZLES
1HZ: (See page FU–13)
1HD–T: (See page FU–30)

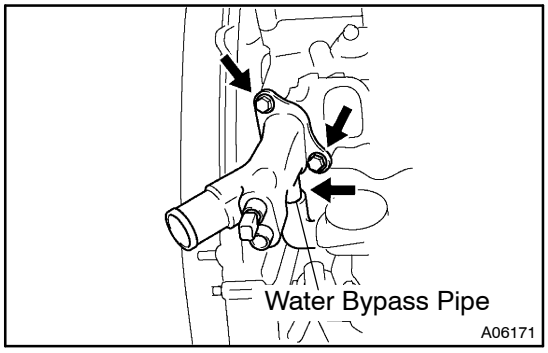
1HD–T:



1HZ:



18. INSTALL GROW 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)

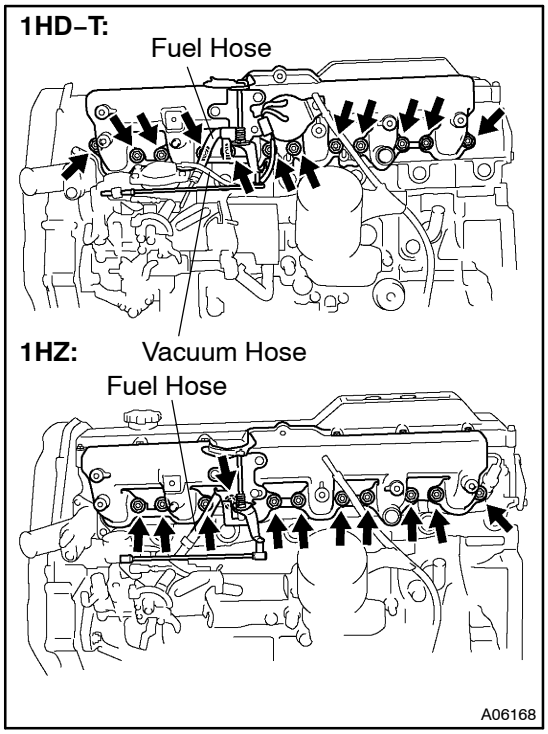


19. INSTALL WATER OUTLET

(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

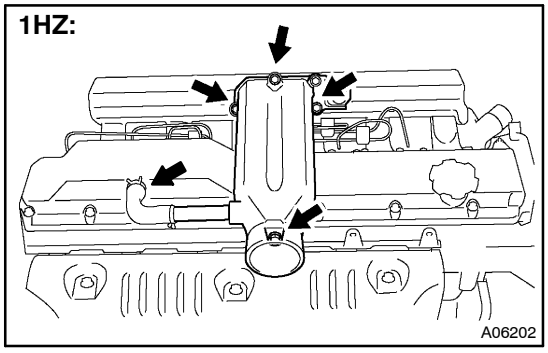
(a) Install 6 new gaskets and the intake manifold with the 12 seals and 12 nuts.
Torque: 19.6 N·m (200 kgf·cm, 15 ft·lbf)

(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.

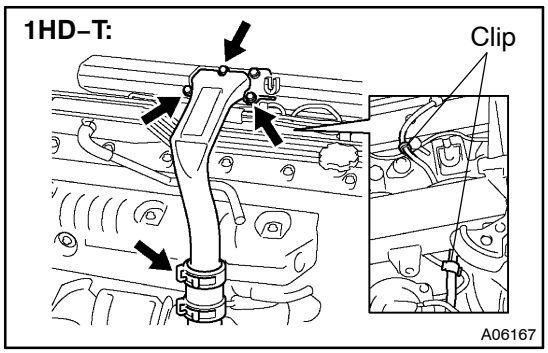
21. INSTALL INJECTION PIPES
(See page FU–13)



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