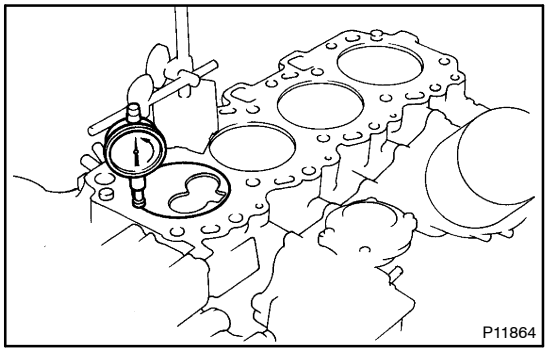
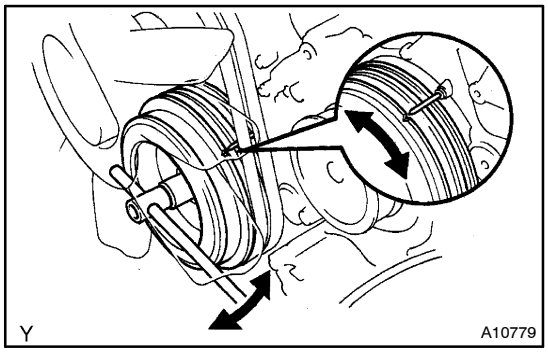
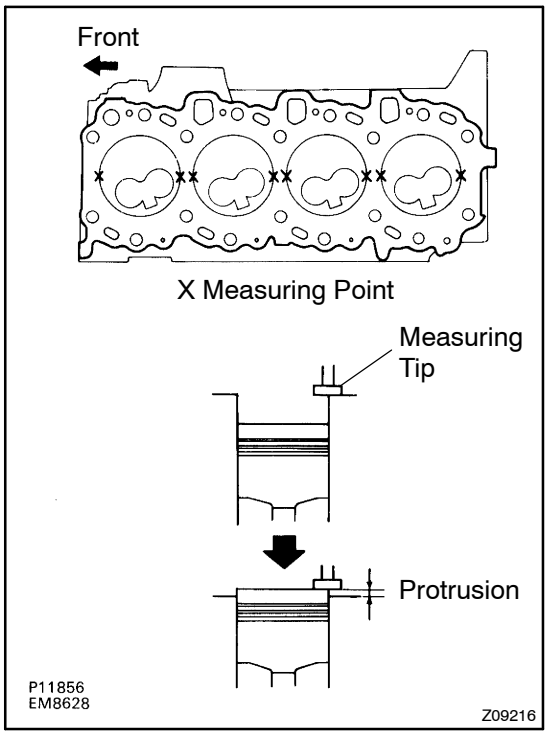






EM15I–01

INSTALLATION

1. CHECK PISTON PROTRUSION AND SELECT CYLINDER HEAD GASKET

(a) Check the piston protrusions for each cylinder.

(1) Clean the cylinder block with solvent.

(2) Sent 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 a 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.

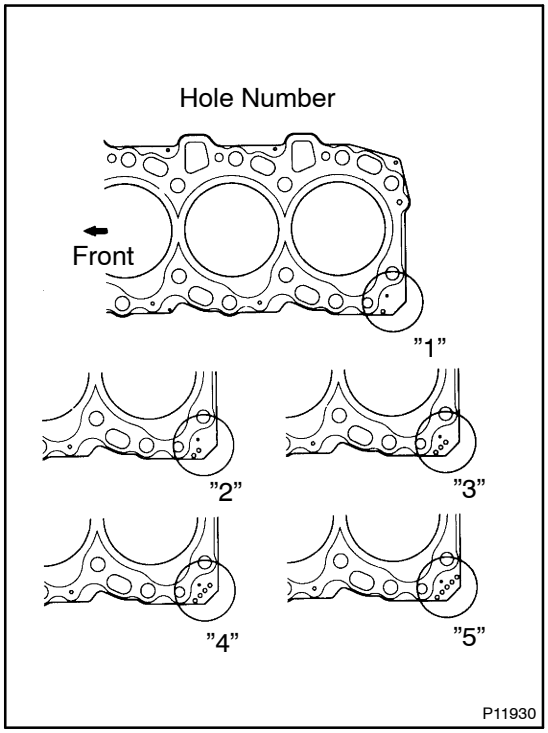
(5) Measure each cylinder at 2 places as shown in the illustration, making a total of 8 measurements.

(6) For the piston protrusion value of each cylinder, use the average of the 2 measurements of each cylinder.

Protrusion: 0.08 – 0.33 mm (0.0031 – 0.0130 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.



(b) Select a new cylinder head gasket.

HINT:

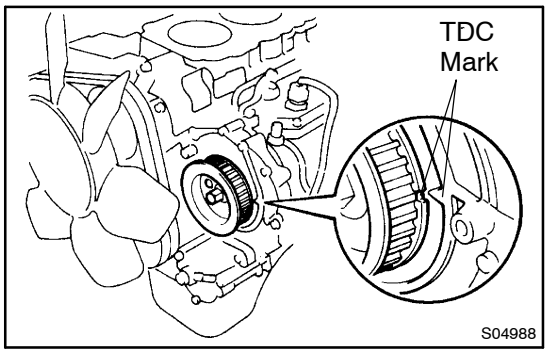
There are 5 types of cylinder head gasket (hole number 1 to 5) installed at factory, but only 3 types for supply parts (hole number "1", "3" and "5"), so when replacing the gasket select from one of 3 types above.

Installed cylinder head gasket thickness:

Hole number "1"	0.80 – 0.90 mm (0.0315 – 0.0354 in.)
Hole number "3"	0.90 – 1.00 mm (0.0354 – 0.0394 in.)
Hole number "5"	1.00 – 1.10 mm (0.0394 – 0.0433 in.)

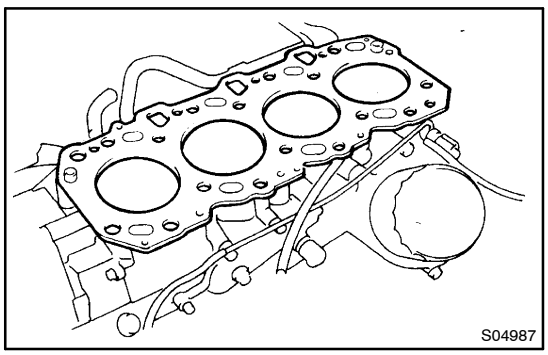
Select the largest piston protrusion value from the measurements made, then select the appropriate cylinder head gasket according to the table below.

Piston protrusion mm (in.)	Gasket size
0.08 – 0.12 (0.0031 – 0.0047)	Use "1"
0.13 – 0.22 (0.0051 – 0.0087)	Use "3"
0.23 – 0.33 (0.0091 – 0.0130)	Use "5"



2. SET NO.4 CYLINDER TO TDC / COMPRESSION

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



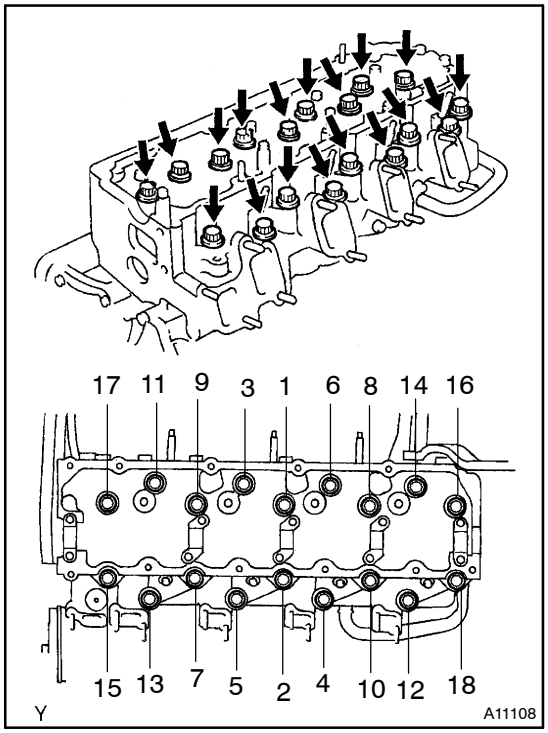
3. PLACE CYLINDER HEAD ON CYLINDER BLOCK

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

NOTICE:

Be careful of the installation direction.

(b) Place the cylinder head in position on the cylinder head gasket.



4. INSTALL CYLINDER HEAD BOLTS

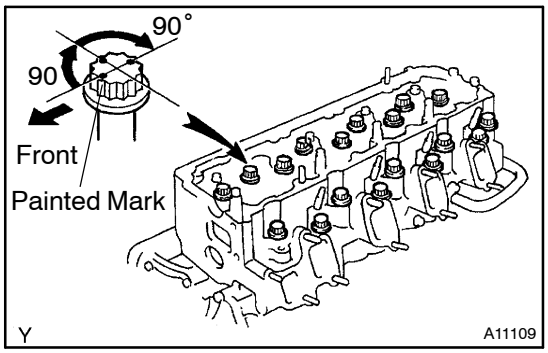
HINT:

- The cylinder head bolts are tightened in 3 progressive steps (steps (b), (d) and (e)).
- If any bolts 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 and uniformly tighten the 18 cylinder head bolts, in several passes, in the sequence shown.

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



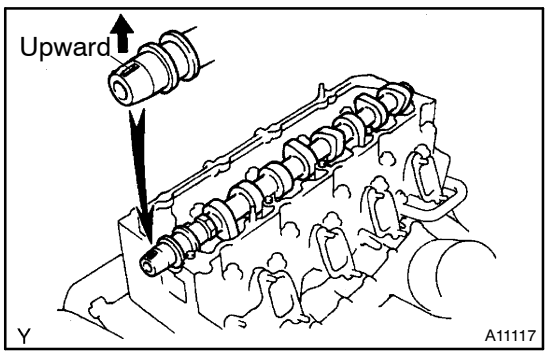
(c) Mark the front of the cylinder head bolt with paint.

(d) Retighten the cylinder head bolts 90° in the numerical order shown.

(e) Retighten cylinder head bolts by an additional 90°.

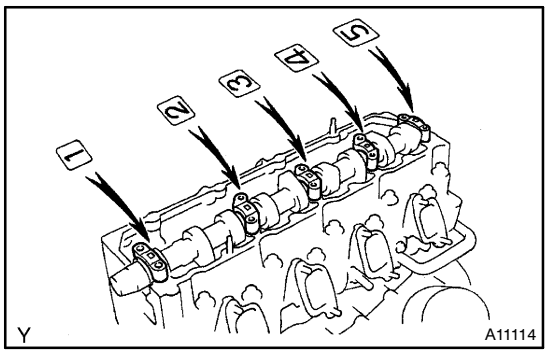
(f) Check that the painted mark is now facing rearward.

5. INSTALL GLOW PLUG AND GLOW PLUG CONNECTOR (See page ST–4)

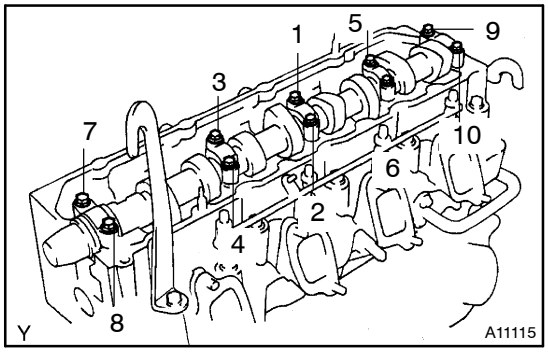


6. INSTALL CAMSHAFT

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



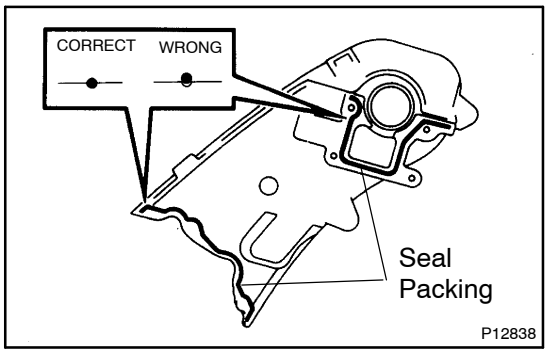
(b) Install the 5 bearing caps in their proper locations.



(c) Install and uniformly tighten the 10 bearing cap bolts in several passes in the sequence shown.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

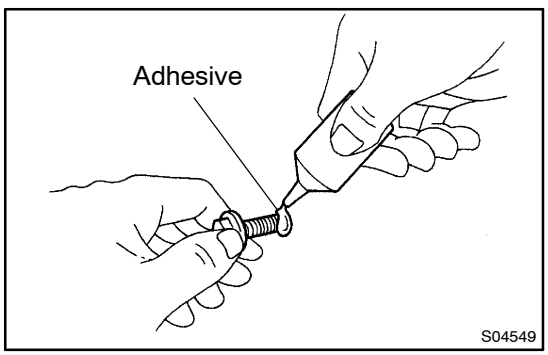
7. INSTALL CAMSHAFT OIL SEAL RETAINER

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



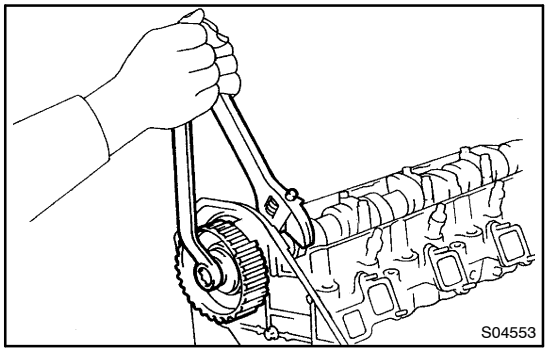
(b) Apply seal packing to the camshaft oil seal retainer as shown in the illustration.
Seal packing: Part No. 08826–00080 or equivalent
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

HINT:
Avoid applying an excessive amount to the surface.
- 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.



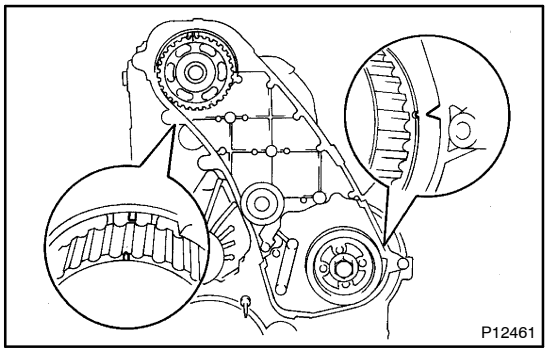
(c) Apply adhesive to 2 or 3 threads of the mounting bolt end.
Adhesive:
Part No. 08833–00070, THREE BOND 1324, or equivalent

(d) Install the retainer with the 7 bolts.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)



8. INSTALL NO.1 CAMSHAFT TIMING PULLEY

(a) Install the set key to the key groove of the camshaft.
(b) Align the pulley set key with the key groove of the camshaft timing pulley, slide the camshaft timing pulley.
(c) Temporarily install the timing pulley bolt.
(d) Hold the hexagon wrench head portion of the camshaft with a wrench, and tighten the camshaft timing pulley bolt.
Torque: 98 N·m (1,000 kgf·cm, 72 ft·lbf)



9. SET NO.4 CYLINDER TO TDC / COMPRESSION

Set the timing pulley at each position.

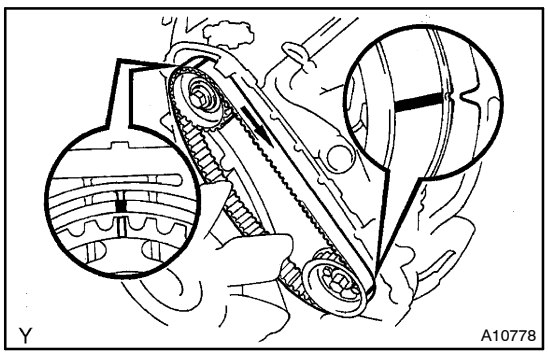
NOTICE:

When turning the crankshaft, the valve heads will hit against the piston top. So do not turn it more than necessary.

10. INSTALL TIMING BELT IDLER PULLEY

(a) Using a 10 mm hexagon wrench, install the washer and timing belt idler pulley with the bolt.
Torque: 35 N·m (350 kgf·cm, 25 ft·lbf)
(b) Check that the idler pulley moves smoothly.

If it doesn't move smoothly, check the idler pulley and washer.



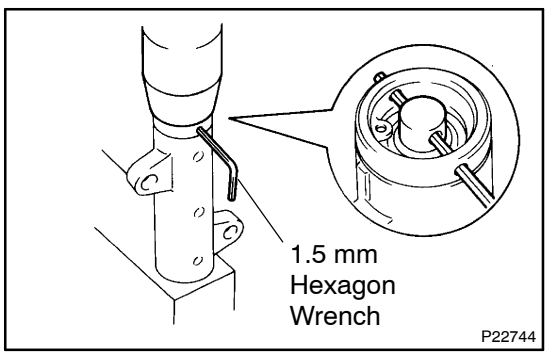
11. INSTALL TIMING BELT

NOTICE:

The engine should be cold.

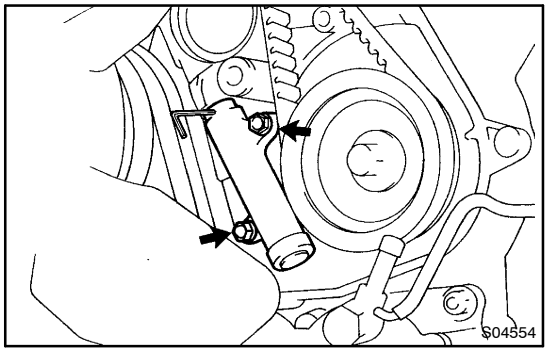
HINT:

If re–using the timing belt, align the points marked during removal, and install the belt with the arrow pointing in the direction of engine revolution.



12. SET TIMING BELT TENSIONER

(a) Using a press, slowly press in the push rod using 981 – 9,807 N (100 – 1,000 kgf, 220 – 2,205 lbf) of force.
(b) Align the holes of the push rod and housing, pass a 1.5 mm hexagon wrench through the holes to keep the setting position of the push rod.
(c) Release the press.



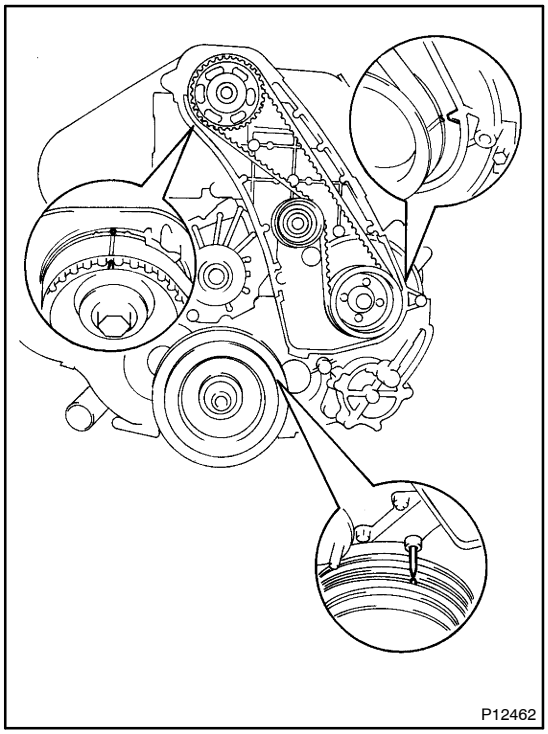
13. INSTALL TIMING BELT TENSIONER

(a) Temporarily install the timing belt tensioner with the 2 bolts while pushing the idler pulley toward the timing belt.

(b) Tighten the 2 bolts.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

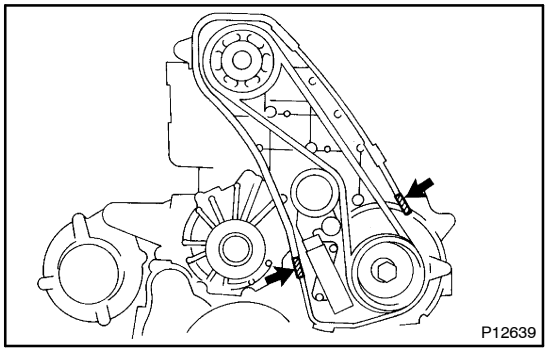
(c) Remove the 1.5 mm hexagon wrench from the tensioner.



14. CHECK VALVE TIMING

Turn the crankshaft pulley clockwise and check that each pulley aligns with the timing marks (TDC mark) as shown in the illustration.

If the marks do not align, remove the timing belt and reinstall it.



15. INSTALL TIMING BELT COVER

(a) Remove any old packing (FIPG) material.

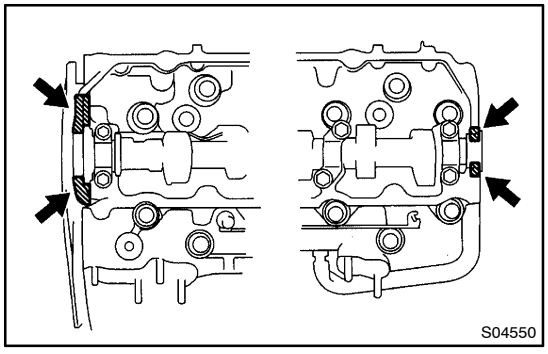
(b) Apply seal packing to the camshaft oil seal retainer and timing gear cover a shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

(c) Install the gasket to the timing belt cover.

(d) Install the timing belt cover with the 4 seal washers, bolts and 2 clips.

16. CHECK AND ADJUST VALVE CLEARANCE
(See page EM–4)



17. INSTALL CYLINDER HEAD COVER

(a) Remove any old packing (FIPG) material.

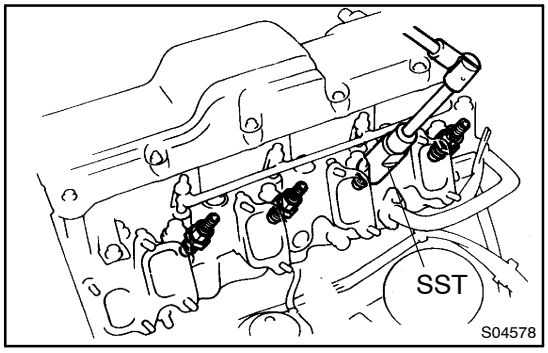
(b) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

(c) Install the gasket to the cylinder head cover.

(d) Install the cylinder head cover with the 10 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.

Torque: 9 N·m (90 kgf·cm, 78 in.·lbf)

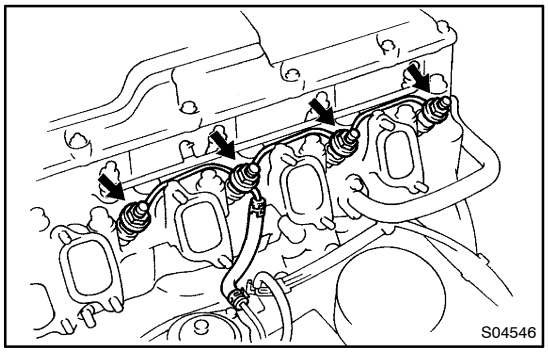


18. INSTALL INJECTION NOZZLES

(a) Place the nozzle seats and new gaskets into the injection nozzle holes of the cylinder head.

(b) Using SST, install the injection nozzles.
SST 09268–64010 (09268–64020)
Torque: 54 N·m (540 kgf·cm, 40 ft·lbf)

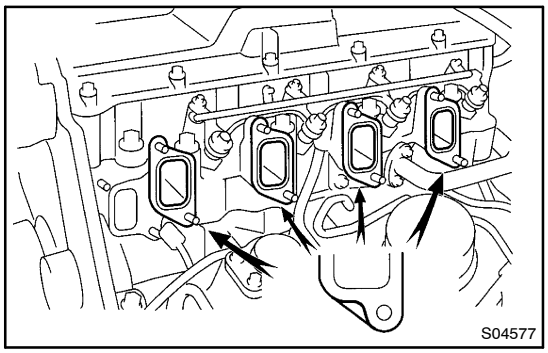
NOTICE:
Over torquing could cause nozzle deformation and needle adhesion or other defects.



19. INSTALL NOZZLE LEAKAGE PIPE

(a) Install 4 new gaskets and the leakage pipe with the 4 nuts.
Torque: 30 N·m (300 kgf·cm, 22 ft·lbf)

(b) Connect the fuel hose to the return pipe.

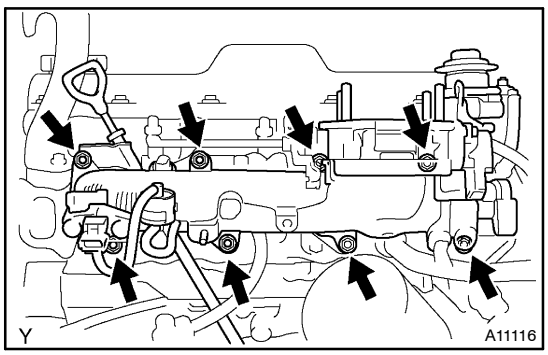


20. INSTALL INTAKE MANIFOLD

(a) Place 4 new gaskets in position on the cylinder head.

NOTICE:
Be careful of the installation direction.

(b) Connect the oil dipstick guide assembly.

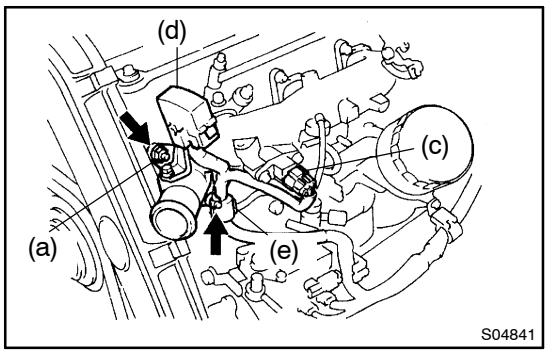


(c) Install the intake manifold with the 8 nuts and oil dipstick.
Uniformly tighten the nuts in several passes.
Torque: 29 N·m (290 kgf·cm, 21 ft·lbf)

(d) Connect the engine wire clamp to the venturi.

(e) Install the glow plug wire with the nut and grommet.

(f) Connect the throttle position sensor connector.



21. INSTALL WATER OUTLET

(a) Install a new gasket and the water outlet with the 2 nuts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(b) Connect the water temperature sender gauge connector.

(c) Connect the turbo pressure sensor connector.

(d) Connect the check connector.

(e) Connect the engine wire clamp.

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

23. INSTALL TURBOCHARGER (See page TC–15)

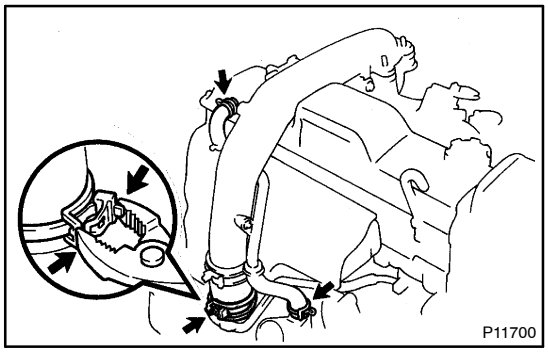
24. INSTALL INTAKE PIPE

(a) Install the VSV for the No.1 and No.2. intake constrictor control. (See page ED–13)

(b) Install the accelrator cable bracket to the intake pipe.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

(c) Place a new gasket on the venturi.

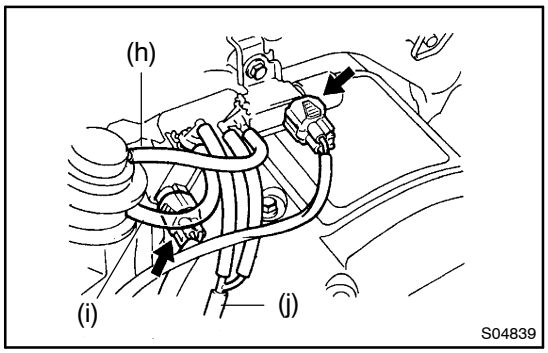
(d) Connect the intake pipe and PCV hose.



(e) Place the clamp lock together with the pliers and press down the tip of the lock plate. Carefully let the lock spread apart. Take care not to let the pliers slip.

(f) Install the 4 seal washers and nuts.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

(g) install the vacuum hose clamp with the bolt to the cylinder head.



(h) Connect the vacuum hose to the actuator of the chamber A.

(i) Connect the vacuum hose to the actuator of the chamber B.

(j) Connect the vacuum hose to the 3–way (from the vacuum pump).

(k) Connect the VSV for the No.1 and No.2 intake constrictor control connectors.

25. FILL WITH ENGINE COOLANT

26. START ENGINE AND CHECK FOR LEAKS

27. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL