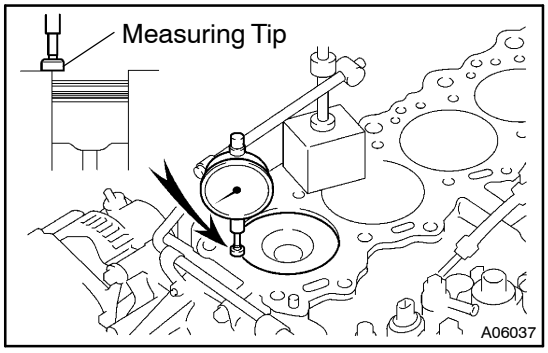
EM0WY–02

INSTALLATION

1. CHECK PISTON PROTRUSION AND SELECT CYLINDER HEAD GASKET



Check piston protrusions for each cylinder

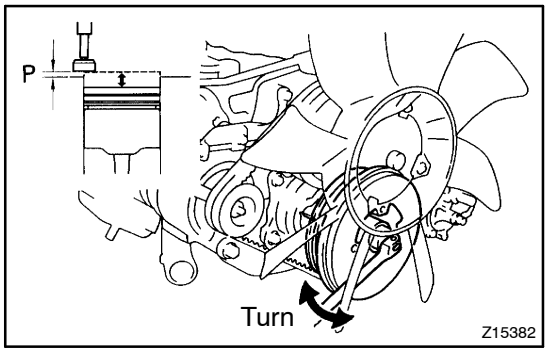
(1) Clean the cylinder block with solvent.

(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.



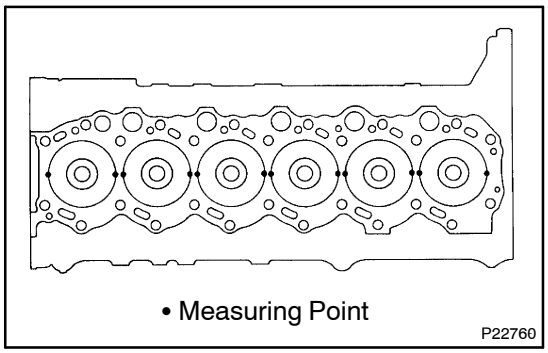
(4) Find where the piston head protrudes most by slowly turning the crankshaft clockwise and counterclockwise.

(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.)

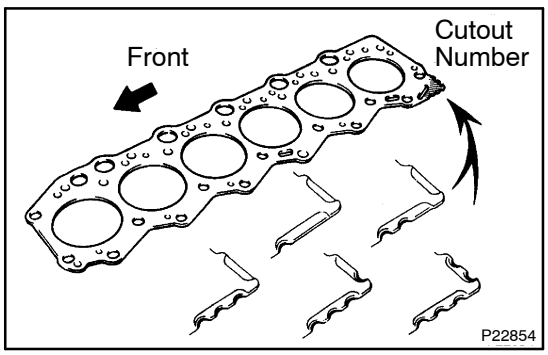
When removing piston and connecting rod assembly:



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

(See Pub. No. RM617E, on page EM–121)

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:

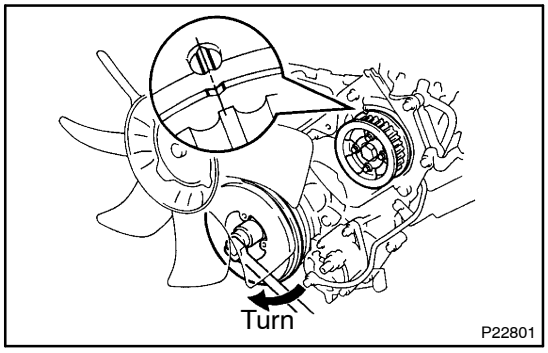
Cutout number 1: 0.85 – 0.95 mm (0.0335 – 0.0374 in.)

Cutout number 3: 0.95 – 1.05 mm (0.0374 – 0.0414 in.)

Cutout number 5: 1.05 – 1.15 mm (0.0414 – 0.0453 in.)

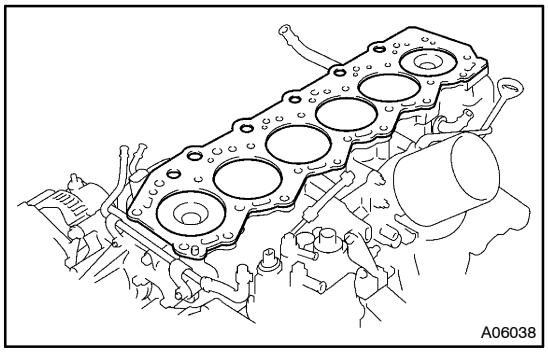
Select the largest piston protrusion value from the measurements made, then select a new appropriate gasket according to the table below.

Piston protrusion	Gasket size
0.225 mm (0.0089 in.) or less	Use 1
0.226 – 0.325 mm (0.0089 – 0.0128 in,)	Use 3
0.326 mm (0.0128 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

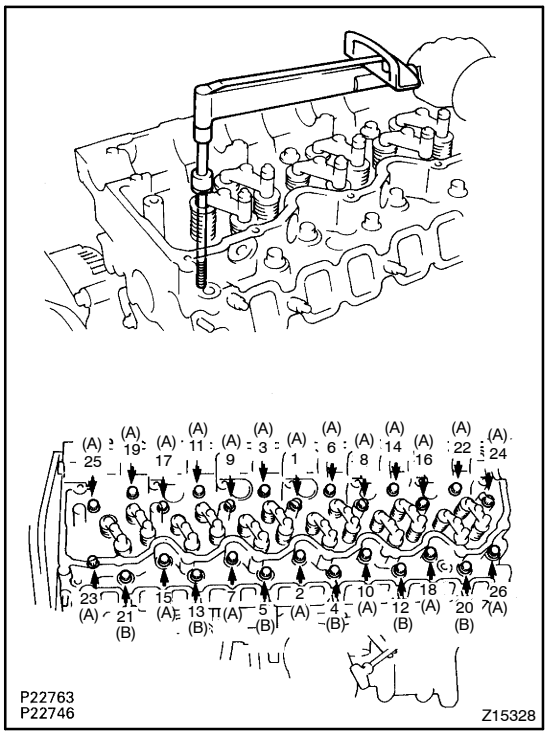
(a) Place cylinder on cylinder block

(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.

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

HINT:

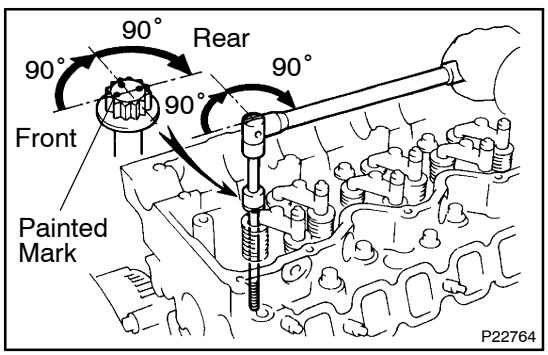
Each bolt length is indicated in the illustration.

Bolt length:

A 121.5 mm (4.783 in.)

B 133.5 mm (5.256 in.)

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



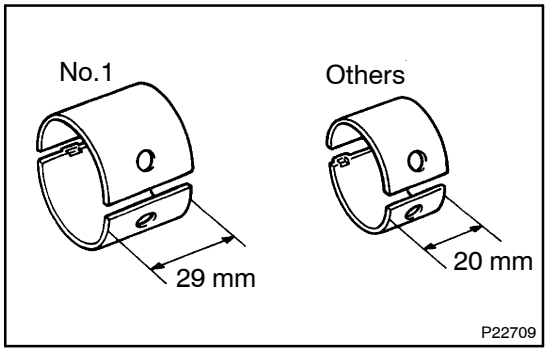
(c) Mark the front of the cylinder head bolt with paint.

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

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

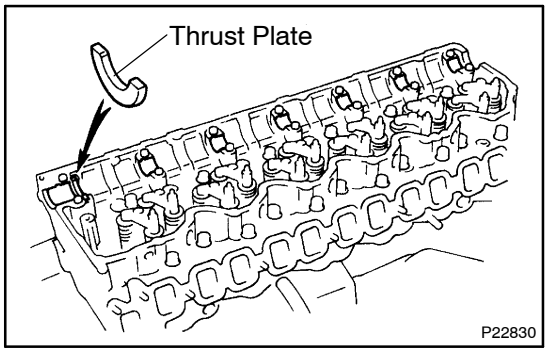
(f) Check that the painted mark is now facing rearward.

(g) Connect the water bypass hose (from the injection pump) to the cylinder head.

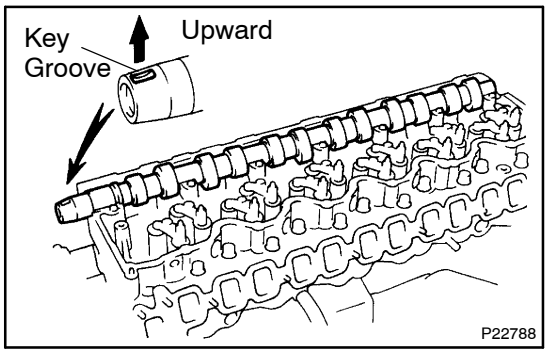


5. INSTALL CAMSHAFT, CAMSHAFT BEARING CAPS VALVE ROCKER ARMS NOZZLE HOLDER CLAMPS AND ROCKER SHAFT ASSEMBLY

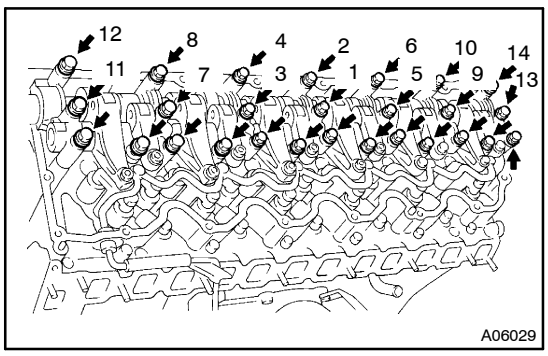
HINT:
Camshaft bearings come in widths of 20 mm (0.79 in.) and 29 mm (1.14 in.). Install the 29 mm (0.886 in.) bearings in the No.1 cylinder head journal positions with the camshaft bearing cap. Install the 20 mm(0.79 in.) bearings in the other positions.



(a) Install the 7 lower camshaft bearings and thrust plate.



(b) Place the camshaft on the cylinder head, facing the key groove upward.
(c) Install the 7 upper camshaft bearings to the bearing caps.

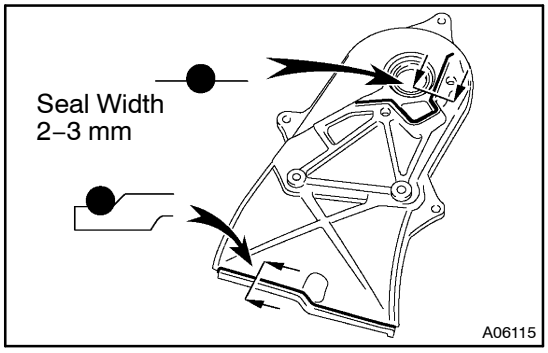


(d) Install the 7 bearing caps, 12 rocker arms, 6 holder clamps and rocker shaft assembly.
(e) Install and uniformly tighten the 14 bearing cap blots in several passes, in the sequence shown.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)
(f) Install the 13 others bolts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

6. INSTALL INJECTION NOZZLES
(See Pub. No. RM617E, on page FU–44)

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 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.

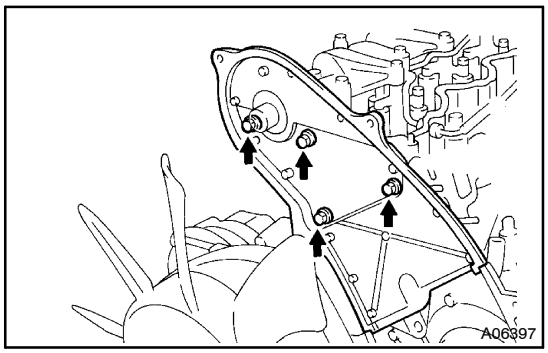


- Using a non–residue solvent, clean both sealing surfaces.

(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.

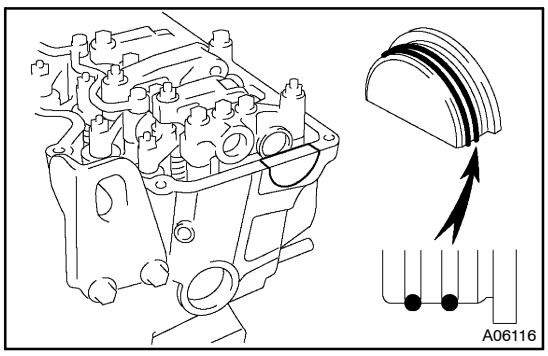


(c) Install the oil seal retainer with the 4 bolts. Uniformly tighten the bolts in several passes.

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

8. INSTALL PULLEYS AND TIMING BELT
(See page EM–5)

9. CHECK AND ADJUST VALVE CLEARANCE
(See Pub. No. RM617E, on page EM–9)



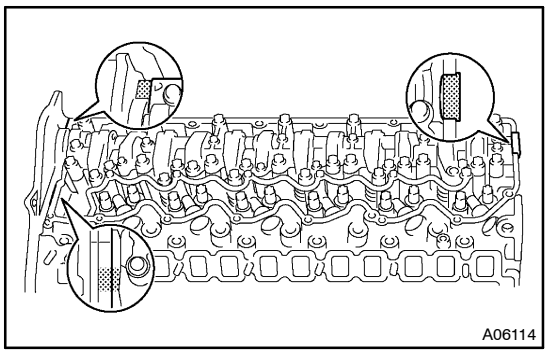
10. INSTALL SEMI–CIRCULAR PLUG

(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.



11. INSTALL NO.1 CYLINDER HEAD COVER

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

(b) Apply seal packing to the No.1 cylinder head as shown in the illustration.

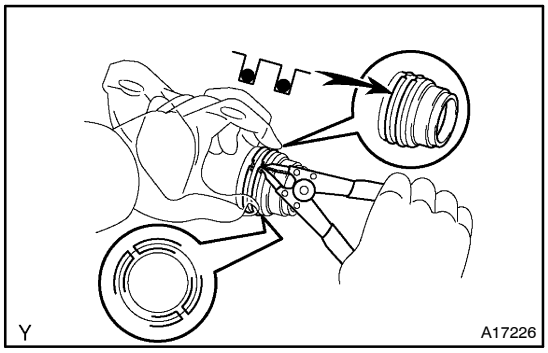
Seal packing: Part No. 08826–00080 or equivalent

(c) Install the gasket to the No.1 cylinder head cover.

(d) Install the No.1 cylinder head cover with 17 new seal washers and 17 bolts. Uniformly tighten the bolts in several passes.

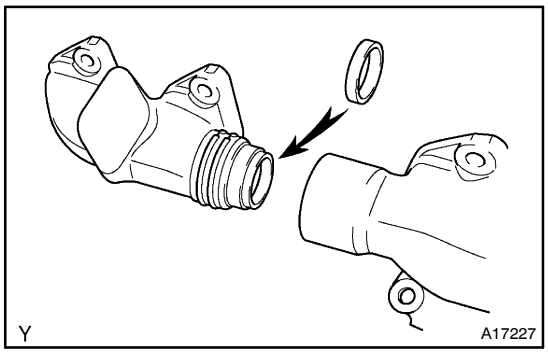
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

12. INSTALL 2 ENGINE HANGERS
Torque: 39.2 N·m (400 kgf·cm, 29 ft·lbf)



13. 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.

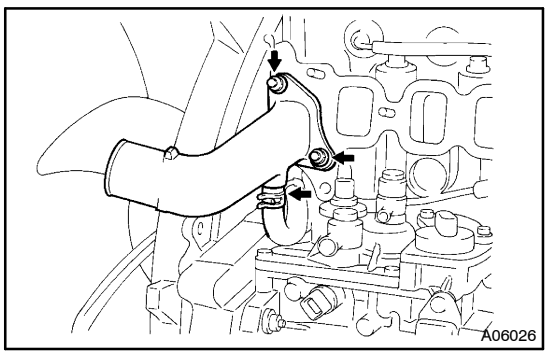
NOTICE:
Do not align the ring ends.



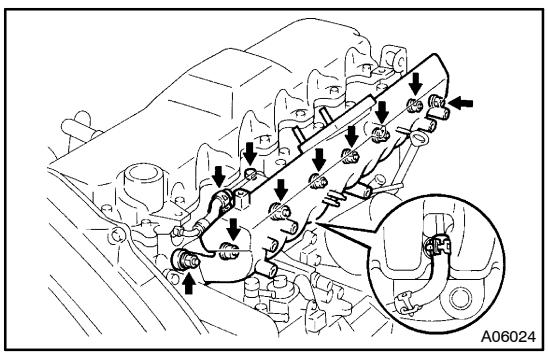
(d) Install the collar the rear exhaust manifold.
(e) Assemble the front and rear exhaust manifolds.

14. INSTALL EXHAUST MANIFOLD TO TURBOCHARGER
(See page TC–10)

15. INSTALL TURBOCHARGER AND EXHAUST MANIFOIDS ASSEMBLY
(See page TC–10)



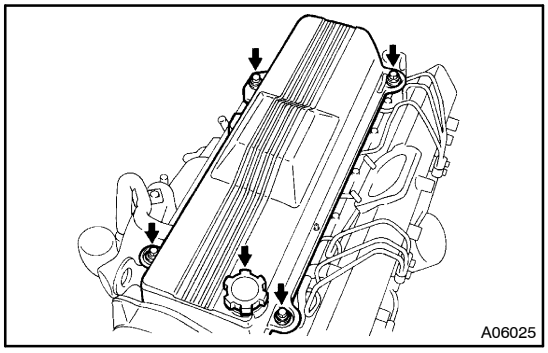
16. INSTALL WATER OUTLET
(a) Install a new gasket and the water outlet.
(b) Connect the water bypass hose to the water outlet.
(c) Install the water outlet with the 2 nuts.
Torque: 19.6 N·m (200 kgf·cm, 14 ft·lbf)



17. INSTALL INTAKE AIR CONTROL VALVE AND INTAKE MANIFOLD
(a) Install the 4 gaskets, intake air control valve and intake manifold with the 8 seal washers and 8 nuts.
Torque: 19.6 N·m (200 kgf·cm, 14 ft·lbf)
(b) Connect the fuel hose to the injection pump.

18. INSTALL 2 INTAKE MANIFOLD INSULATORS

19. INSTALL INJECTION PIPES
(See Pub. No. RM617E, on page FU–44)



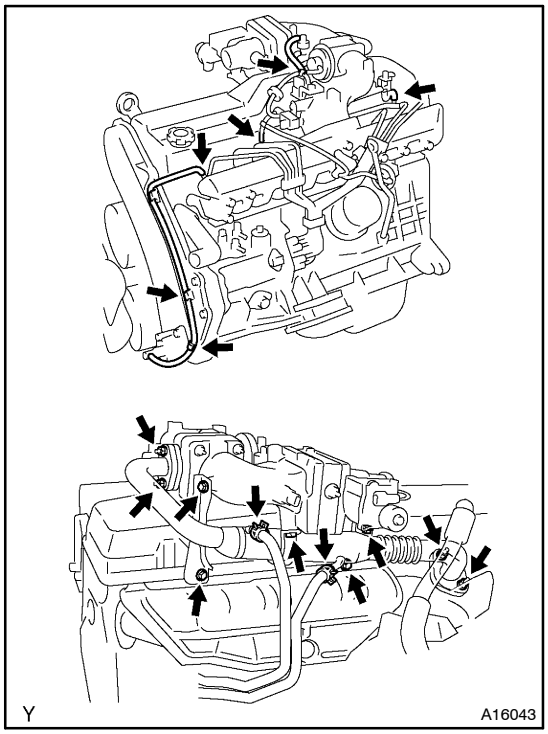
20. INSTALL NO.2 CYLINDER HEAD COVER

(a) Install the No.2 cylinder head cover with the 4 bolts.

(b) Install the oil filler cap.

21. INSTALL EGR COOLER PIPE

Install a new gasket and EGR cooler pipe with the 2 nuts to the intake pipe assembly.



22. INSTALL INTAKE PIPE ASSEMBLY

(a) Install the intake pipe assembly with the 2 bolts and 2 nuts.

(b) Install a new gasket, connect the EGR cooler pipe with the 2 nuts to the exhaust manifold.

(c) Install the 2 intake pipe assembly brackets with the 4 bolts.

(d) Connect the 2 water hoses to the EGR cooler pipe.

(e) Connect the 5 vacuum hoses to the No.2 cylinder head cover.

(f) Connect the vacuum hose to the clamp and timing belt cover.

23. FILL WITH ENGINE COOLANT

24. START ENGINE AND CHECK FOR LEAKS

25. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL