14162–04

REPLACEMENT

1. PREVENT GASOLINE FROM SPILLING OUT (SEE PUB. NO. RM1017E, PAGE 11–1)

2. REMOVE CHAIN SUB–ASSY (SEE PAGE 14–127)

3. REMOVE AIR HOSE W/PRE–CLEANER ASSY

(a) Remove the 2 bolts and air hose w/ pre–cleaner assy.

4. REMOVE TRANSMISSION OIL FILLER TUBE SUB–ASSY

(a) Remove the ATF level gauge.

(b) Remove the bolt and pull out the oil filler tube.

(c) Remove the O–ring from the oil filler tube.

5. REMOVE EXHAUST PIPE ASSY FRONT (SEE PUB. NO. RM1017E, PAGE 15–3)

6. REMOVE MANIFOLD STAY

(a) Remove the 3 bolts and manifold stay.

7. REMOVE EXHAUST MANIFOLD SUB–ASSY RH

(a) Disconnect the A/F sensor connector.

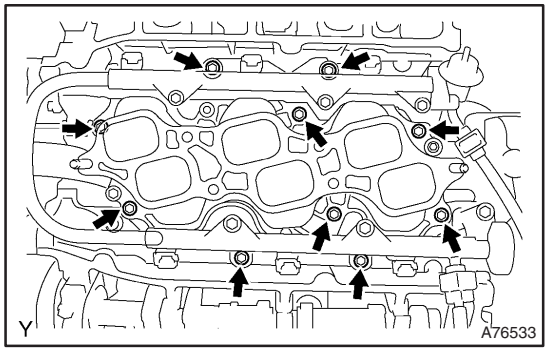
(b) Remove the 6 nuts, exhaust manifold and gasket.

8. DISCONNECT FUEL PIPE SUB–ASSY NO.1 (SEE PUB. NO. RM1017E, PAGE 11–1)

9. DISCONNECT FUEL PIPE SUB–ASSY NO.2 (SEE PUB. NO. RM1017E, PAGE 11–1)

10. REMOVE INTAKE MANIFOLD

(a) Disconnect the 6 fuel injector connectors.

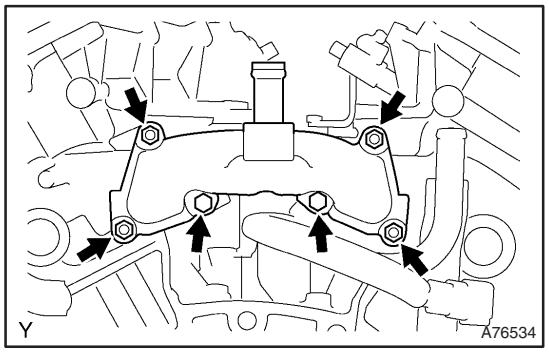


(b) Remove the 10 bolts, intake manifold and 2 gaskets.

11. REMOVE WATER BY–PASS JOINT RR

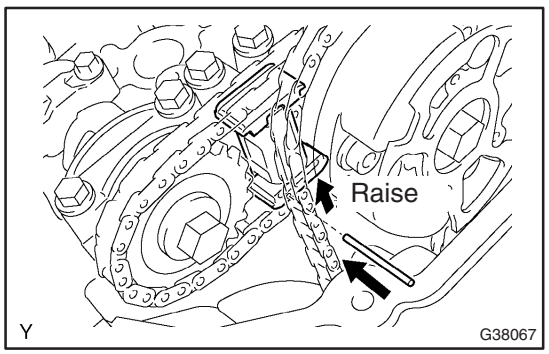
(a) Disconnect the engine coolant temperature sensor connector.

(b) Disconnect the heater hose.



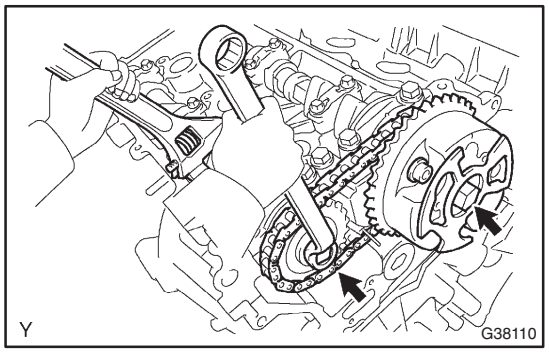
(c) Remove the 2 bolts, 4 nuts, water by–pass joint RR and 2 gaskets.

(d) Remove the O–ring from the water outlet pipe.



12. REMOVE CAMSHAFT TIMING GEARS AND NO.2 CHAIN (RH BANK)

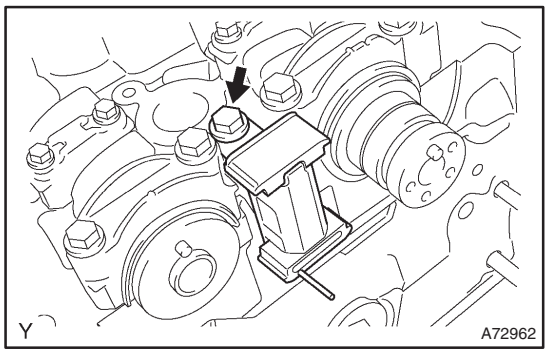
(a) While raising the chain tensioner No.2, insert a pin of ϕ1.0 mm (0.039 in.) into the hole to fix it.



(b) Hold the hexagonal portion of the camshaft with a wrench, and remove the 2 bolts, camshaft timing gear, camshaft timing gear assembly and timing chain No.2.

NOTICE:

- **Be careful not to damage the cylinder head and valve lifter with the wrench.**
- **Do not disassemble the camshaft timing gear assembly.**



13. REMOVE CHAIN TENSIONER ASSY NO.2

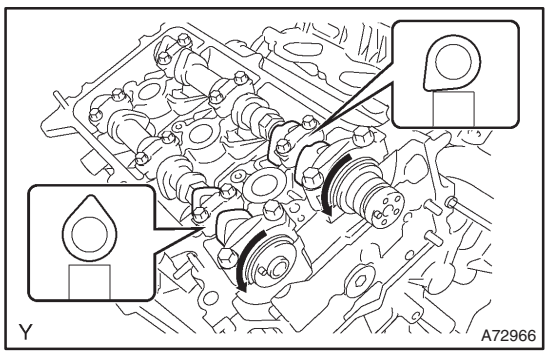
(a) Remove the bolt and chain tensioner No.2.

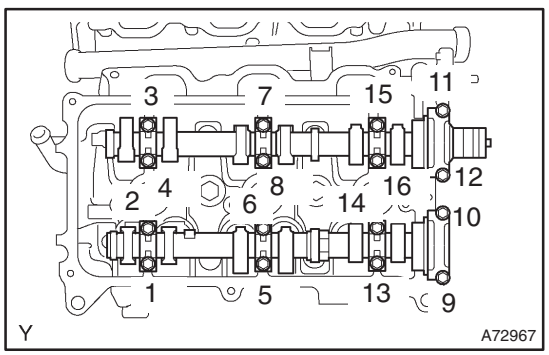
14. REMOVE CAMSHAFTS

NOTICE:

As the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head which receives 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) Rotate the camshafts counterclockwise using a wrench so that the cam lobes of the No.1 cylinder face each direction as shown in the illustration.





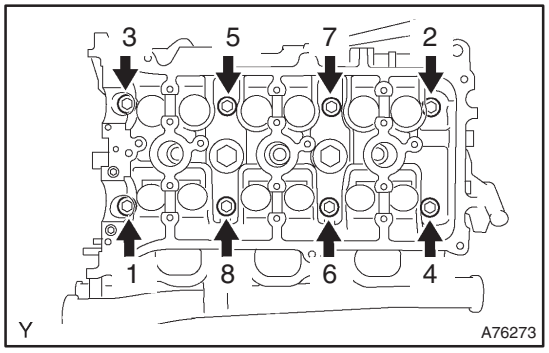
(b) Using several steps, loosen and remove the 16 bearing cap bolts uniformly in the sequence as shown in the illustration.

(c) Remove the 8 bearing caps and 2 camshafts.

15. REMOVE CAMSHAFT BEARING NO.2

16. REMOVE CYLINDER HEAD SUB–ASSY

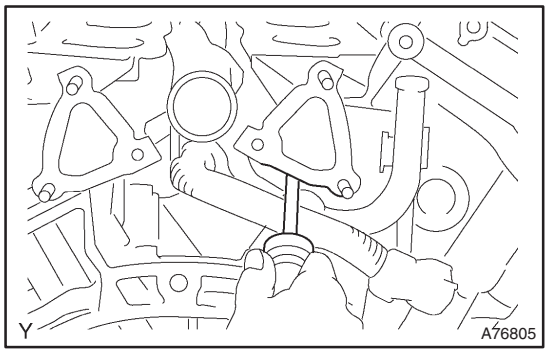
(a) Remove the 2 bolts and separate the 2 ground cables.



(b) Using several steps, loosen the 8 cylinder head bolts on the cylinder head uniformly with a 10 mm bi–hexagon wrench in the sequence as shown in the illustration. Remove the 8 cylinder head bolts and plate washers.

NOTICE:

- **Be careful not to drop the plate washers into the cylinder head.**
- **Cylinder head warpage or cracking could result from removing bolts in incorrect order.**



(c) Lift the cylinder head from the dowels on the cylinder block, and place the cylinder head on wooden blocks on a bench.

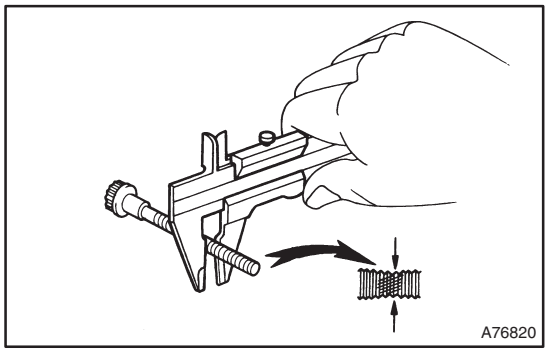
NOTICE:

Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

HINT:

If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver.

17. REMOVE CYLINDER HEAD GASKET



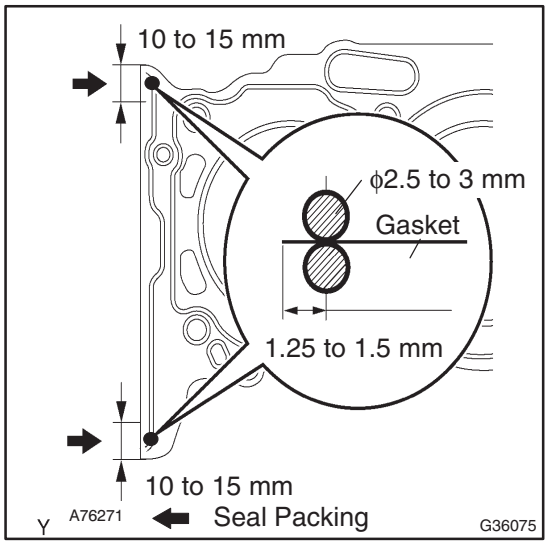
18. INSPECT CYLINDER HEAD SET BOLT

(a) Using vernier calipers, measure the outside thread diameter of the bolt.

Standard outside diameter:
10.85 to 11.00 mm (0.4272 to 0.4331 in.)
Minimum outside diameter:
10.7 mm (0.421 in.)

19. INSTALL CYLINDER HEAD GASKET

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the cylinder head and cylinder block.

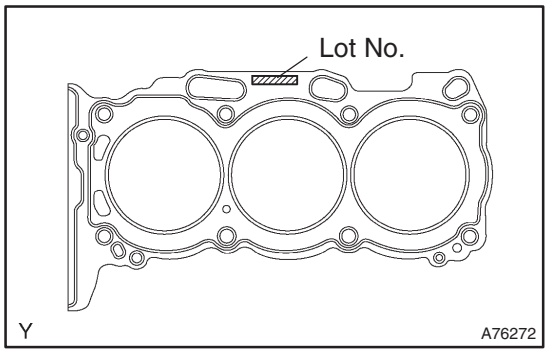


(b) Apply seal packing (diameter: 2.5 to 3 mm (0.098 to 0.118 in.)) to a new cylinder head gasket as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

Install the cylinder head within 3 minutes after applying seal packing. After installing it, cylinder head bolts must be tightened within 15 minutes. Otherwise the seal packing must be removed and reapplied.



(c) Place the cylinder head gasket on the cylinder block surface with the Lot No. stamp upper side facing upward.

NOTICE:

- **Be careful of the installation direction.**
- **Place the cylinder head carefully in order not to damage the gasket with the bottom part of the head.**

20. INSTALL CYLINDER HEAD SUB–ASSY

(a) Place the cylinder head on the cylinder head gasket.

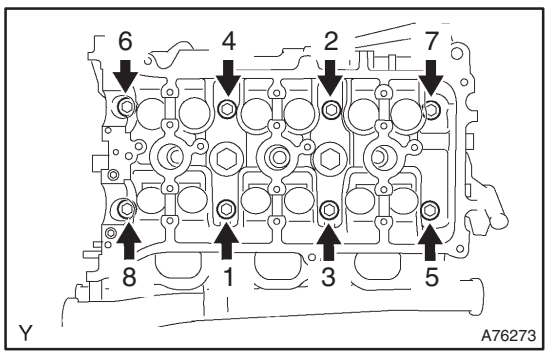
(b) Install the 8 cylinder head bolts.

HINT:

- The cylinder head bolts are tightened in 2 successive steps (steps (3) and (5)).
- If any cylinder head bolt is broken or deformed, replace it.

(1) Apply a light coat of engine oil to the threads of the cylinder head bolts.

(2) Install the plate washer to the cylinder head bolt.



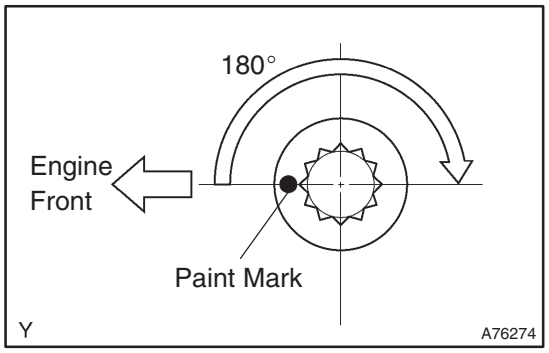
(3) Using several steps, tighten each bolt uniformly with a 10 mm bi–hexagon wrench in the sequence as shown in the illustration.

Torque: 36 N·m (367 kgf·cm, 27 ft·lbf)

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

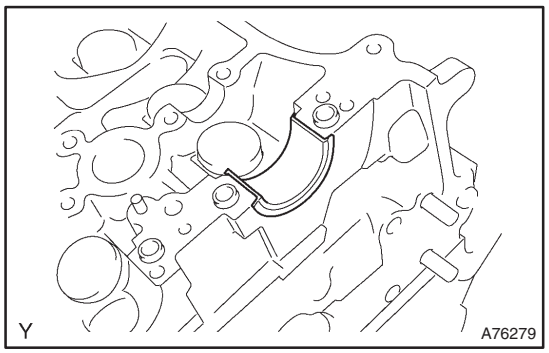
NOTICE:

Do not drop the washers into the cylinder head.



(4) Mark the front side of each cylinder head bolt with paint.
(5) Retighten the cylinder head bolts 180° as shown.
(6) Check that the painted marks are now at 180° opposite to the engine front.

(c) Install the ground cables with the 2 bolts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



21. INSTALL CAMSHAFT BEARING NO.2

(a) Install the camshaft bearing No.2 to the cylinder head.

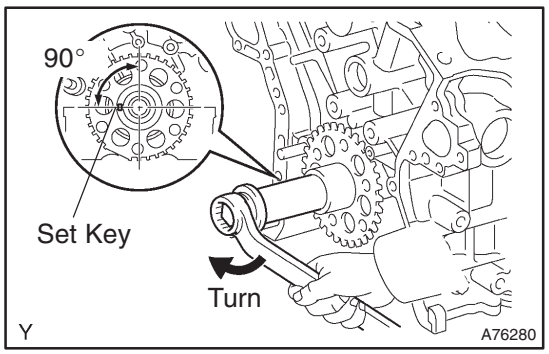
NOTICE:

Clean the backside of the bearing and the bearing surface of the cylinder head and prevent oil from adhering to them.

22. INSTALL CAMSHAFTS

NOTICE:

As 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 which receives 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.

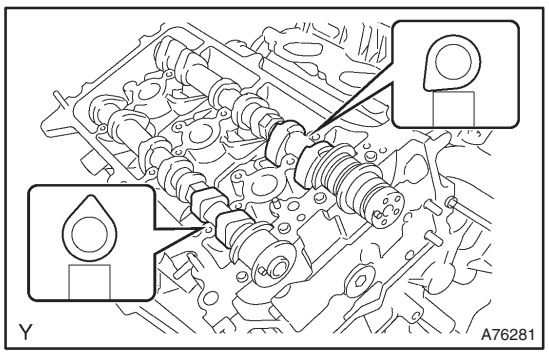


(a) Set the crankshaft position.
(1) Using the crankshaft pulley set bolt, turn the crankshaft, and set the crankshaft set key into the left horizontal position.

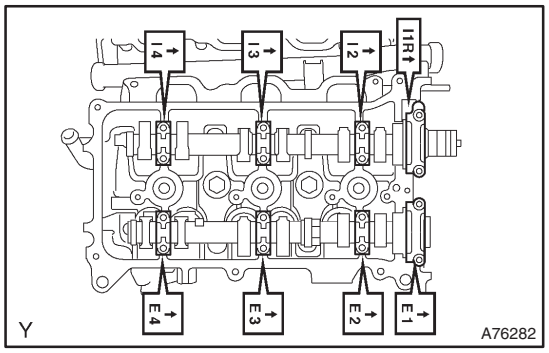
NOTICE:

Setting the crankshaft 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 at the correct angle.

(b) Apply new engine oil to the thrust portion and journal of the camshafts.

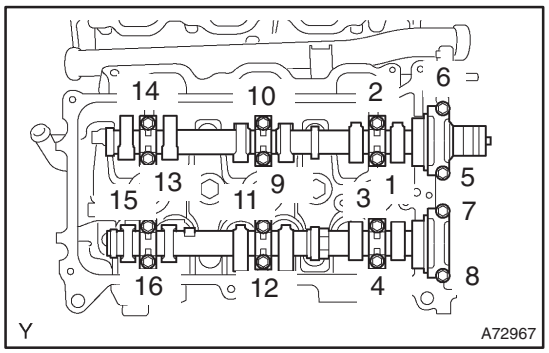


(c) Place the 2 camshafts onto the cylinder head with the cam lobes of No.1 cylinder facing each direction as shown in the illustration.



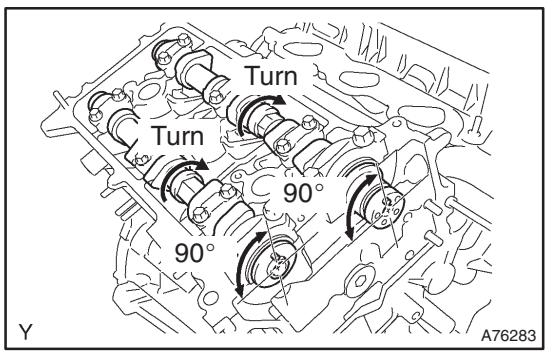
(d) Install the 8 bearing caps in their proper locations.

(e) Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.

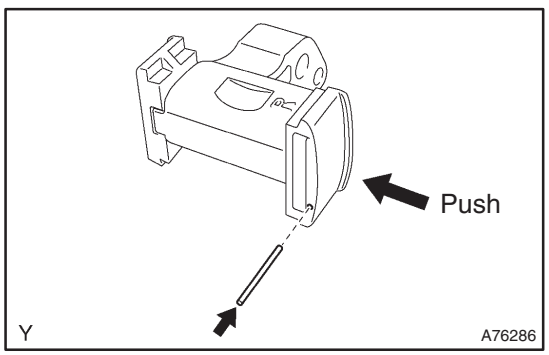


(f) Using several steps, install and tighten the 16 bearing cap bolts uniformly in the sequence as shown in the illustration.

Torque:
9.0 N·m (92 kgf·cm, 80 in.·lbf) for 10 mm (0.39 in.) head
24 N·m (245 kgf·cm, 18 ft·lbf) for 12 mm (0.47 in.) head

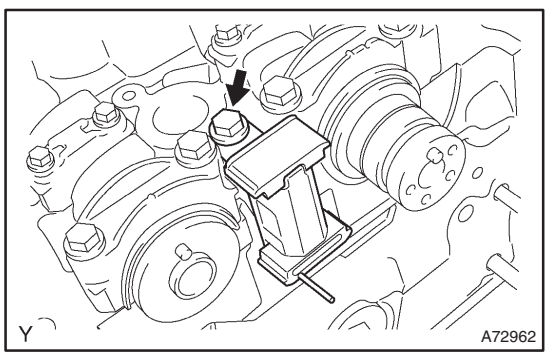


(g) Turn the camshafts clockwise until the knock pin comes to 90° position to the cylinder head.

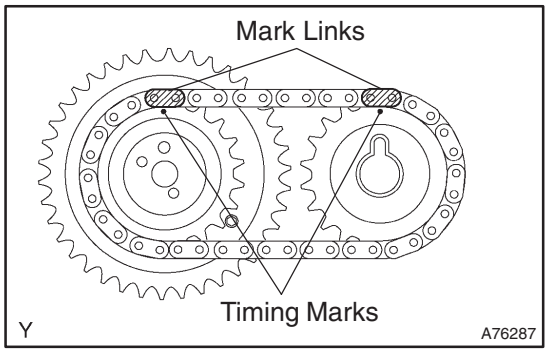


23. INSTALL CHAIN TENSIONER ASSY NO.2

(a) While pushing in the tensioner, insert a pin of ϕ1.0 mm (0.039 in.) into the hole to fix it.

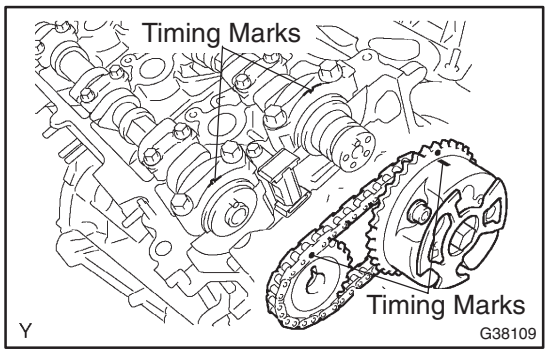


(b) Install the chain tensioner No.2 with the bolt.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)



24. INSTALL CAMSHAFT TIMING GEARS AND NO.2 CHAIN (RH BANK)

(a) Align the mark links (yellow) with the timing marks (1–dot mark) of the camshaft timing gears as shown in the illustration.

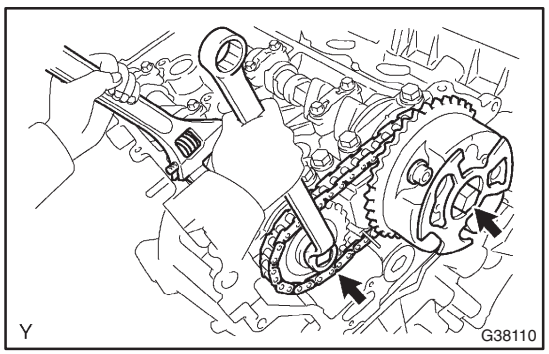


(b) Align the timing marks on the camshaft timing gears with the timing marks on the bearing caps, and install the camshaft timing gears with the chain to the RH camshafts.

(c) Temporarily install the 2 camshaft timing gear bolts.

NOTICE:

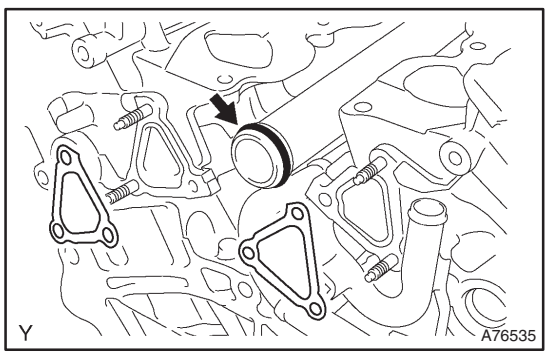
Do not push the camshaft timing gear assembly to the camshaft forcibly when installing it.



(d) Hold the hexagonal head portion of the camshaft with a wrench, and tighten the 2 bolts.

Torque: 100 N·m (1,020 kgf·cm, 74 ft·lbf)

(e) Remove the pin from the tensioner.



25. INSTALL WATER BY–PASS JOINT RR

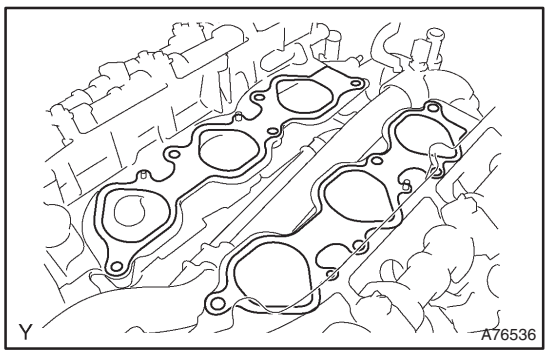
(a) Install a new O–ring to the water outlet pipe.

(b) Install 2 new gaskets and water by–pass joint RR with the 2 bolts and 4 nuts.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

(c) Connect the heater hose.

(d) Connect the engine coolant temperature sensor connector.



26. INSTALL INTAKE MANIFOLD

(a) Set a new gasket on each cylinder head.

NOTICE:

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

(b) Set the intake manifold on the cylinder heads.

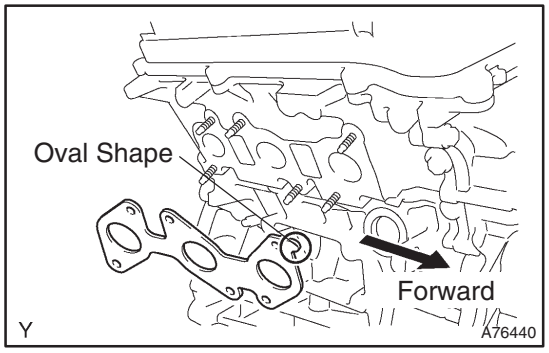
(c) Install and tighten the 10 bolts uniformly in several steps.

Torque: 26 N·m (265 kgf·cm, 19 ft·lbf)

(d) Connect the 6 fuel injector connectors.

27. CONNECT FUEL PIPE SUB–ASSY NO.2 (SEE PUB. NO. RM1017E, PAGE 11–1)

28. CONNECT FUEL PIPE SUB–ASSY NO.1 (SEE PUB. NO. RM1017E, PAGE 11–1)



29. INSTALL EXHAUST MANIFOLD SUB–ASSY RH

(a) Set a new gasket to the RH cylinder head with the oval shape facing forward.

NOTICE:

Be careful of the installation direction.

(b) Install the exhaust manifold with the 6 nuts. Tighten the nuts uniformly in several steps.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

(c) Connect the A/F sensor connector.

30. INSTALL MANIFOLD STAY

(a) Install the manifold stay with the 3 bolts.
Torque: 40 N·m (408 kgf·cm, 30 ft·lbf)

31. INSTALL EXHAUST PIPE ASSY FRONT (SEE PUB. NO. RM1017E, PAGE 15–3)

32. INSTALL TRANSMISSION OIL FILLER TUBE SUB–ASSY

(a) Coat a new O–ring with ATF, and install it to the oil filler tube.

(b) Push in the oil filler tube end into the oil pan lower tube.

(c) Install the oil filler tube with the bolt.
Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)

(d) Install the ATF level gauge.

33. INSTALL AIR HOSE W/PRE–CLEANER ASSY

(a) Install the air hose w/ pre–cleaner assy with the 2 bolts.
Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)

34. INSTALL CHAIN SUB–ASSY (SEE PAGE 14–127)

35. CHECK FOR FUEL LEAKS (SEE PUB. NO. RM1017E, PAGE 11–5)

36. CHECK FOR EXHAUST GAS LEAKS

37. INSPECT ENGINE IDLE SPEED (SEE PUB. NO. RM1017E, PAGE 14–1)
SST 09843–18030

38. INSPECT COMPRESSION (SEE PUB. NO. RM1017E, PAGE 14–1)

39. INSPECT CO/HC (SEE PUB. NO. RM1017E, PAGE 14–1)