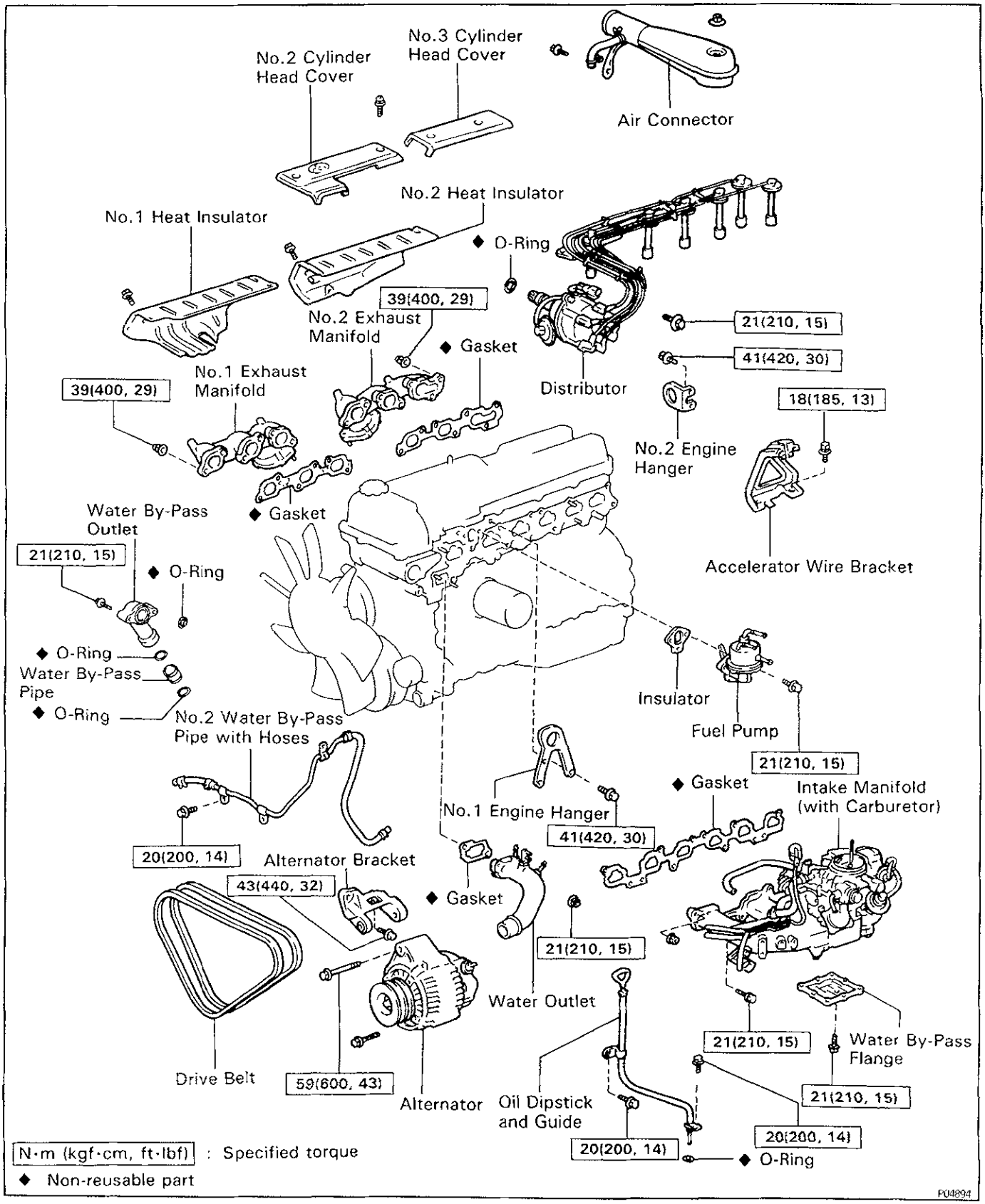
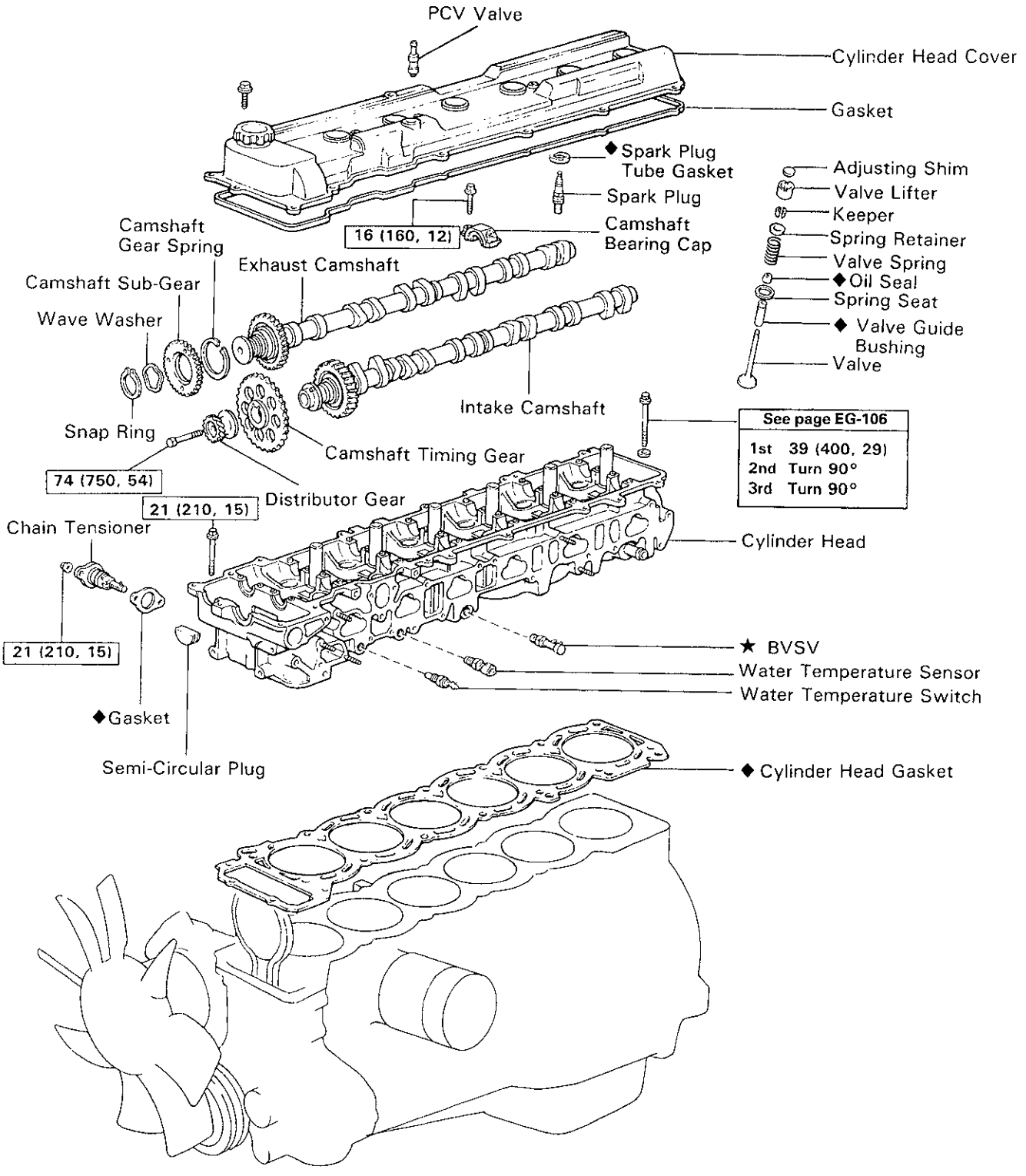
CYLINDER HEAD (1FZ–F)

COMPONENTS

EG08K–02



EG



N·m (kgf·cm, ft·lbf) : Specified torque

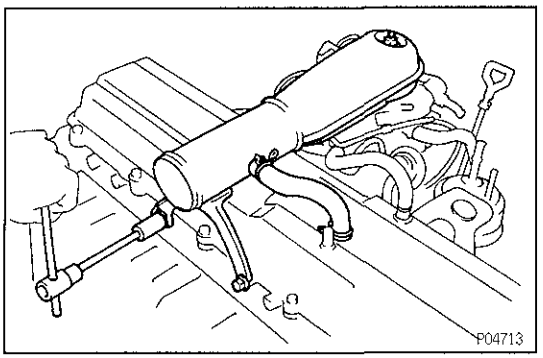
◆ Non-reusable part

★ Precoated part

P05107

EG0V8–02

CYLINDER HEAD REMOVAL

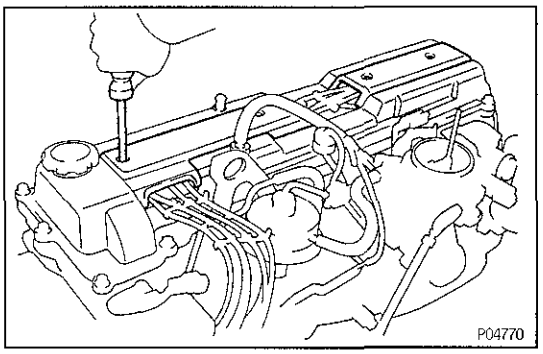


(See pages EG–89)

1. REMOVE INTAKE AIR CONNECTOR

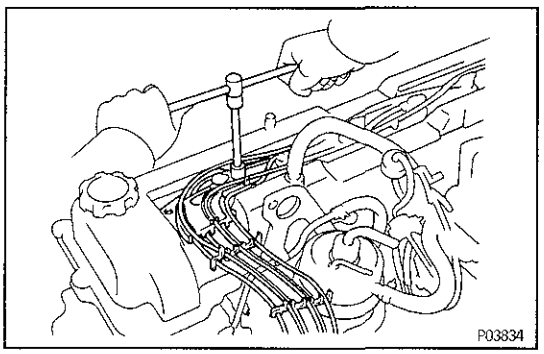
(a) Disconnect the PCV hose.

(b) Remove the two bolts, nut and air connector.



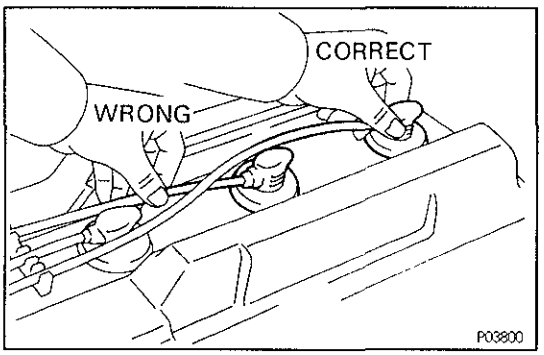
2. REMOVE NO. 2 AND NO. 3 CYLINDER HEAD COVERS

Remove the four bolts and head covers.



3. REMOVE DISTRIBUTOR

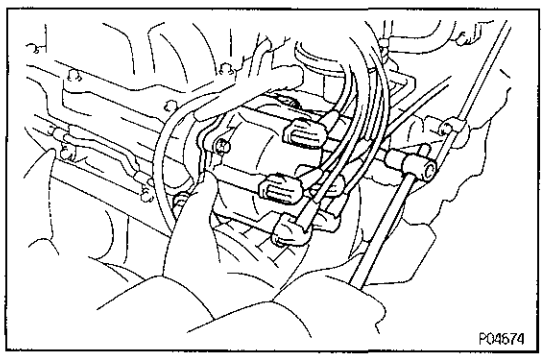
(a) Remove the No.1 cord clamp mounting bolt.



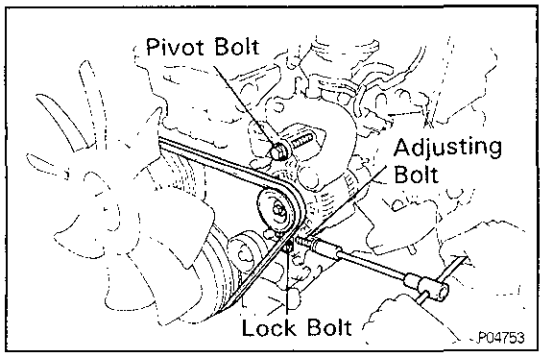
(b) Disconnect the high – tension cords at the rubber boot.

DO NOT pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.

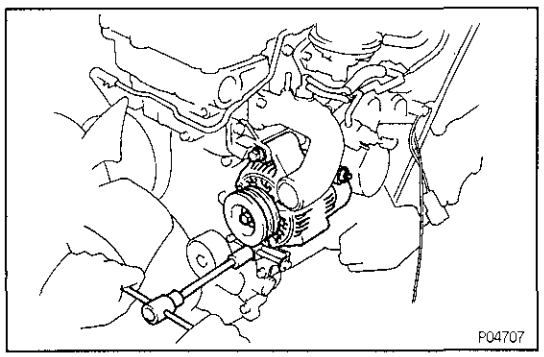


(c) Remove the bolt and distributor.

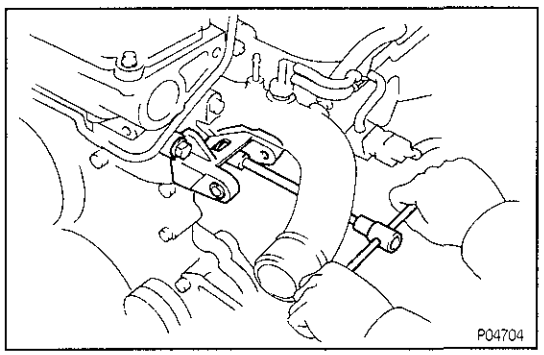


4. REMOVE ALTERNATOR

(a) Loosen the lock bolt, pivot bolt and adjusting bolt, and remove the drive belts.

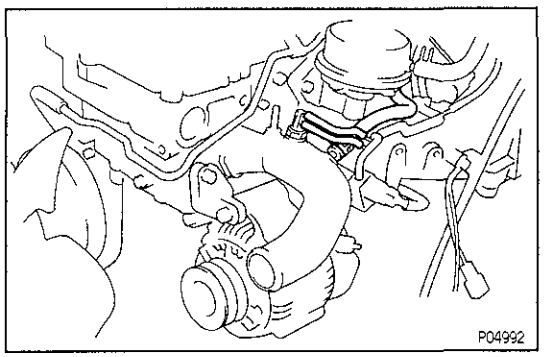


(b) Remove the pivot bolt, lock bolt and alternator.



5. REMOVE ALTERNATOR BRACKET

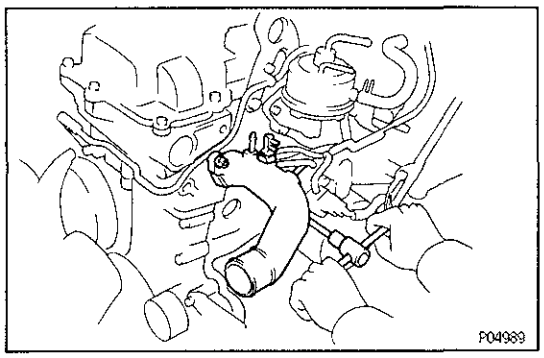
Remove the two bolts and alternator bracket.



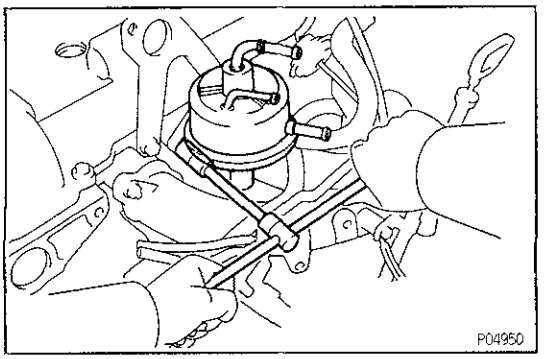
6. REMOVE WATER OUTLET

(a) Disconnect the vacuum hoses.

(b) Disconnect the No.1 water by–pass hose.



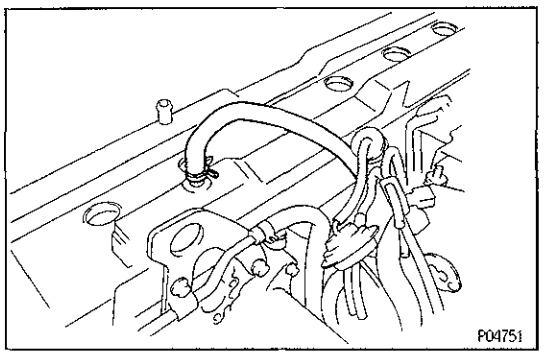
(c) Remove the two nuts, water outlet and gasket.



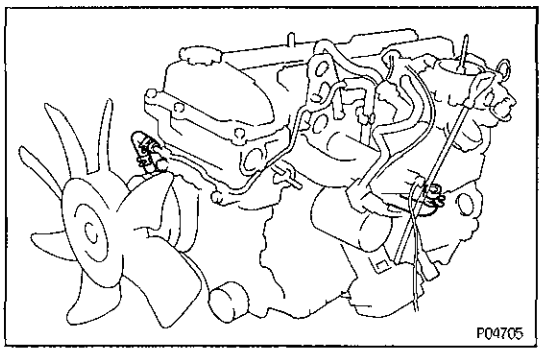
7. REMOVE FUEL PUMP

(a) Disconnect the fuel outlet hose.

(b) Remove the three bolts, fuel pump and gasket.

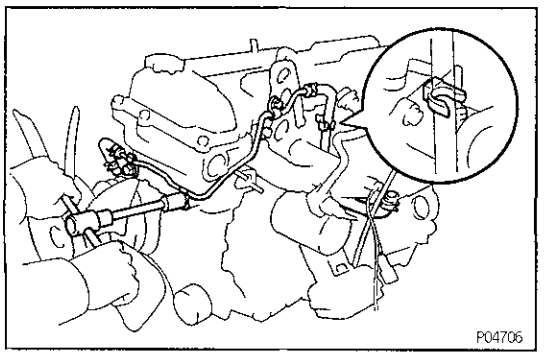


8. DISCONNECT PCV HOSE



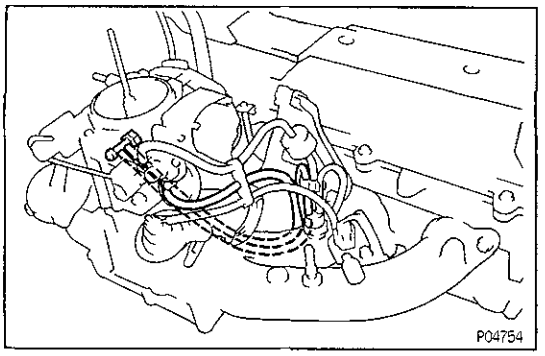
9. *REMOVE NO. 2 WATER BY – PASS PIPE WITH HOSES*

(a) Disconnect the two water hoses.

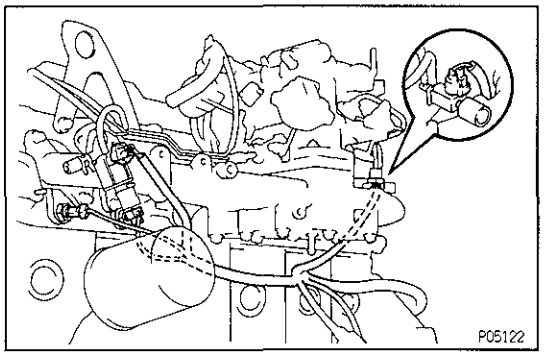


(b) Disconnect the hose clamp.

(c) Remove the three bolts and No.2 water by–pass pipe with hoses.

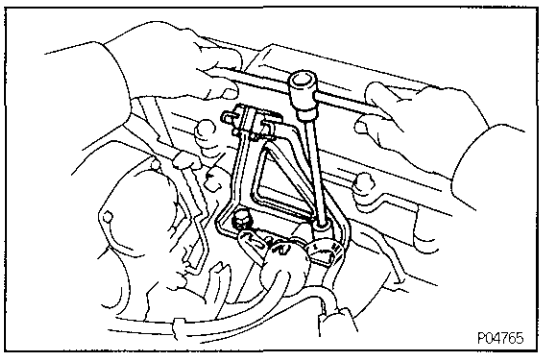


10. DISCONNECT TWO VACUUM HOSES FROM BVSV



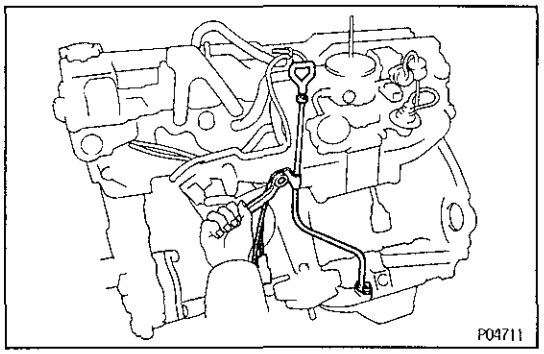
11. DISCONNECT FOLLOWING CONNETORS:

(a) Spark control VSV (for G.C.C.)
(b) Water temperature switch
(c) Water temperature sensor (for G.C.C.)
(d) TP VSV



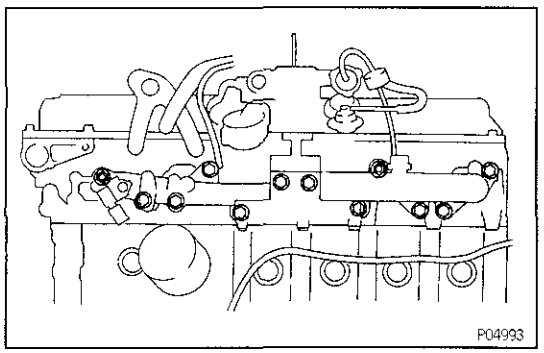
12. REMOVE ACCELERATOR CABLE BRACKET

Remove the two bolts and accelerator cable bracket.



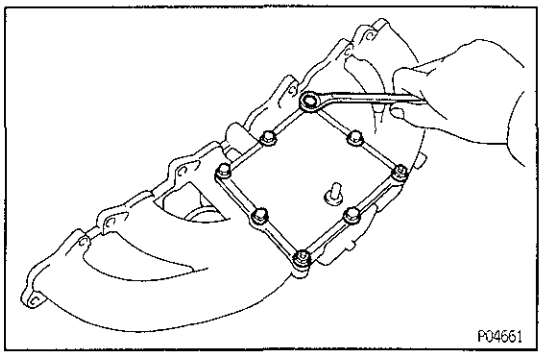
13. REMOVE OIL DIPSTICK AND GUIDE

(a) Remove the two mounting bolts and ground strap.
(b) Pull out the dipstick together with dipstick guide.
(c) Remove the O–ring from the dipstick guide.



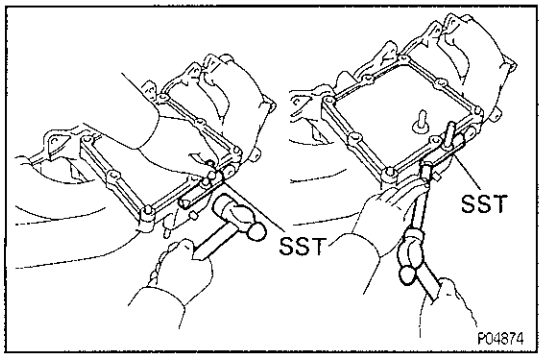
14. REMOVE INTAKE MANIFOLD WITH CARBURETOR

Remove the six bolts, two nuts, intake manifold and gasket.

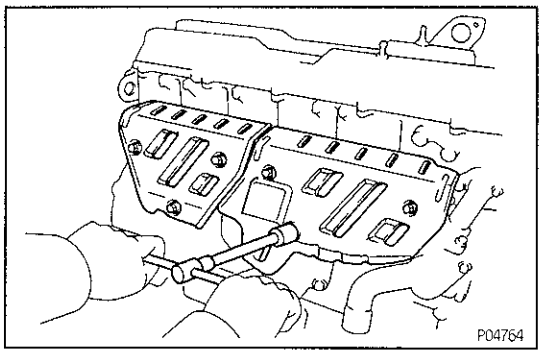


15. IF NECESSARY, REMOVE WATER BY – PASS FLANGE

(a) Remove the six bolts and two nuts.

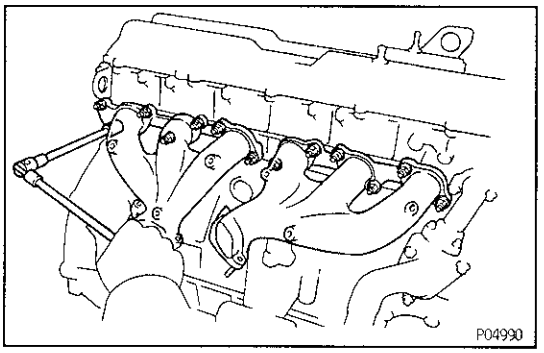


(b) Insert the blade of SST between the intake manifold and water by–pass flange, and cut off applied sealer and remove the flange.
SST 09302–00100
NOTICE: Be careful not to damage the intake manifold and flange.

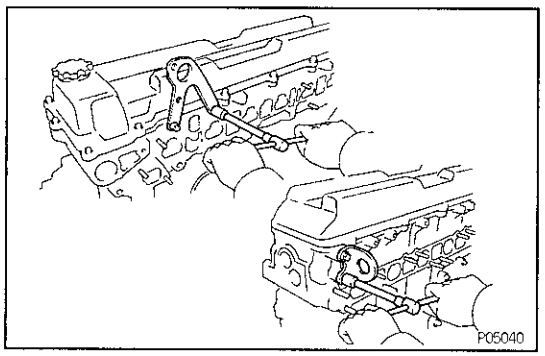


16. REMOVE NO.1 AND NO.2 EXHAUST MANIFOLDS

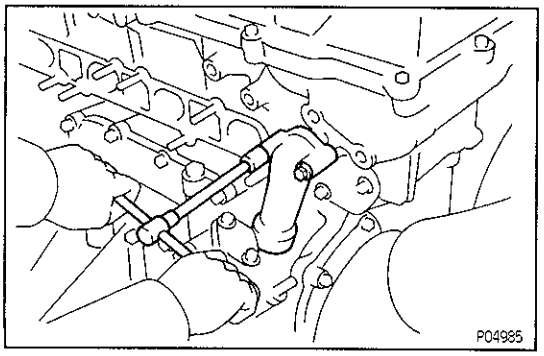
(a) Remove the six bolts, No.1 heat insulator and No.2 heat insulator.



(b) Remove the 13 nuts, No.1 exhaust manifold, No.2 exhaust manifold and two gaskets.



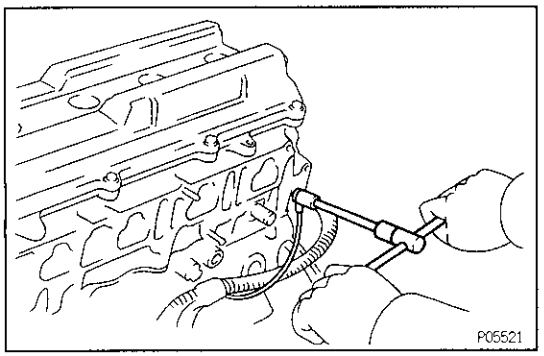
17. REMOVE NO.1 AND NO.2 ENGINE HANGERS



18. REMOVE WATER BY–PASS OUTLET AND PIPE

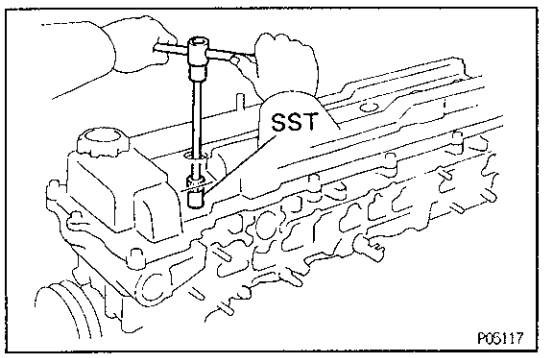
(a) Remove the two bolts and water by–pass outlet and pipe.

(b) Remove the three O–rings from the water by–pass outlet and pipe.



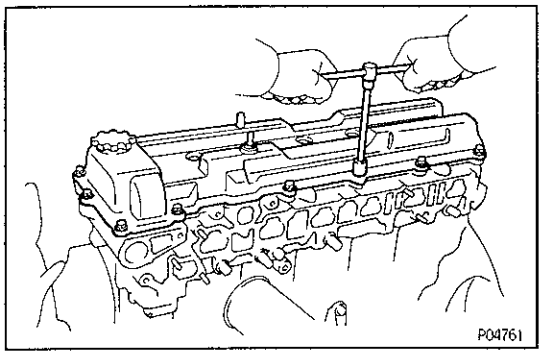
19. DISCONNECT ENGINE WIRE

Remove the bolt and disconnect the engine wire from the cylinder head.



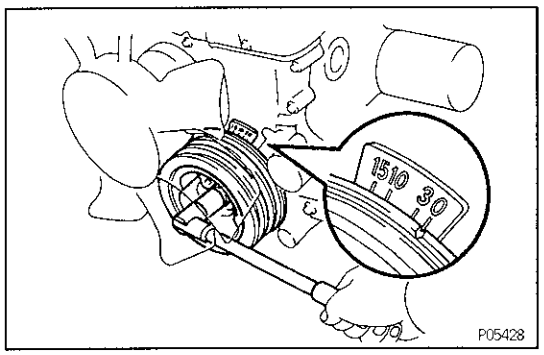
20. REMOVE SPARK PLUGS

Using SST, remove the spark plug.
SST 09155–16100



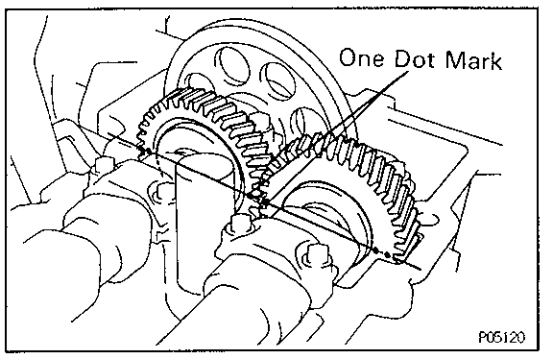
21. REMOVE CYLINDER HEAD COVER

Remove the 13 bolts, cylinder head cover and gasket.

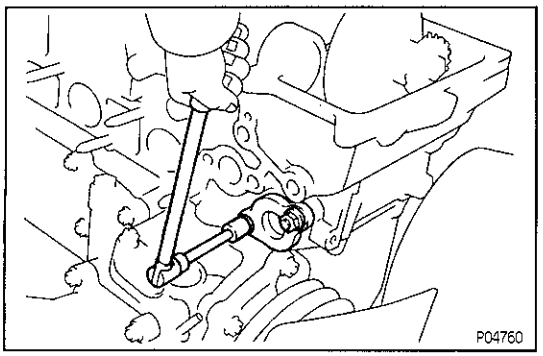


22. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley and align its groove with the "0" mark on the timing chain cover.

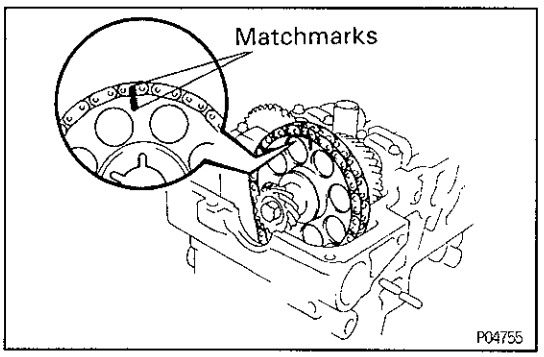


(b) Check that the timing marks (one and two dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration. If not, turn the crankshaft one revolution (360°) and align the marks as above.



23. REMOVE CHAIN TENSIONER

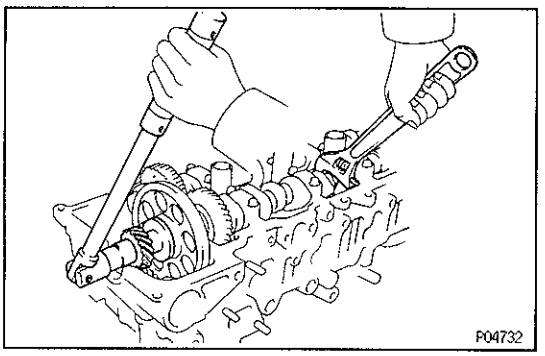
Remove the two nuts, chain tensioner and gasket.



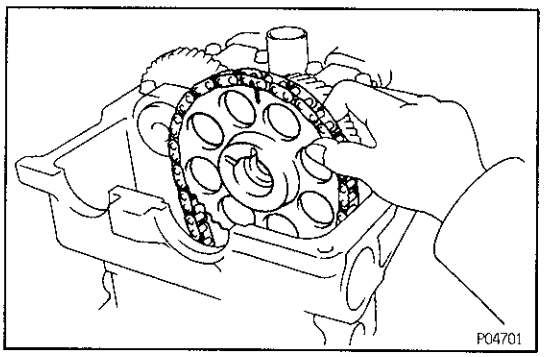
24. REMOVE CAMSHAFT TIMING GEAR

(a) Remove the harf–circular plug.

(b) Place the matchmarks on the camshaft timing gear and timing chain.



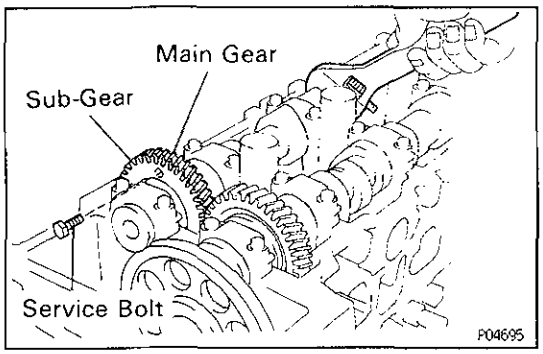
(c) Hold the intake camshaft with a wrench, remove the bolt and distributor gear.



(d) Remove the camshaft timing gear and chain from the intake camshaft and leave on the slipper and damper.

25. REMOVE CAMSHAFTS

NOTICE: Since 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 receiving 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.



EG

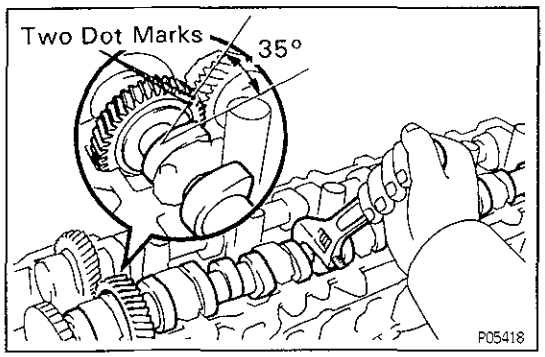
A. Remove exhaust camshaft

(a) Bring the service bolt hole of the driven sub–gear upward by turning the hexagon wrench head portion of the exhaust camshaft with a wrench.

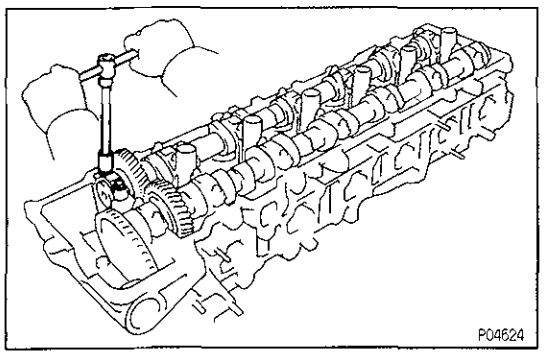
(b) Secure the exhaust camshaft sub–gear to the driven gear with a service bolt.
Recommended service bolt:

Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 – 20 mm (0.63 – 0.79 in.)

HINT: When removing the camshaft, make sure that the torsional spring force of the sub–gear has been eliminated by the above operation.

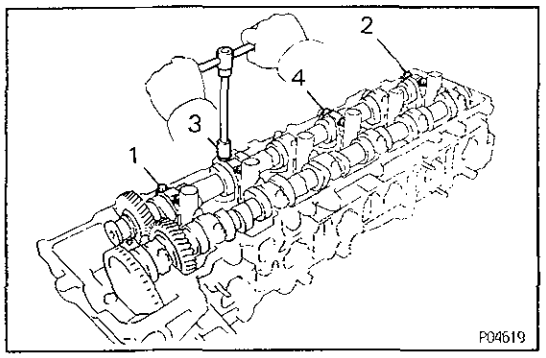


(c) Set the timing mark (two dot marks) of the camshaft driven gear at approx. 35° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench.



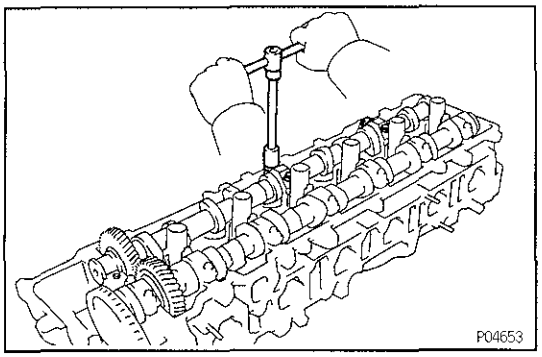
(d) Lightly push the camshaft towards the rear without applying excessive force.

(e) Loosen and remove the No.1 bearing cap bolts, alternately loosening the left and right bolts uniformly.



(f) Loosen and remove the No.2, No.3, No.5 and No.7 bearing cap bolts, alternately loosening the left and right bolts uniformly in several passes, in the sequence shown.
NOTICE: Do not remove the No.4 and No.6 bearing cap bolts at this stage.

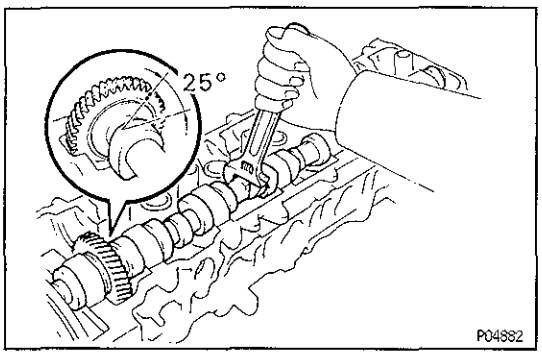
(g) Remove the four bearing caps.



(h) Alternately and uniformly loosen and remove the No.4 and No.6 bearing cap bolts.
HINT:
- As the four No.4 and No.6 bearing cap bolts are loosened, make sure that the camshaft is lifted out straight and level.
- If the camshaft is not being lifted out straight and level, retighten the four No.4 and No.6 bearing cap bolts. Then reverse the order of above steps from (g) to (a) and repeat steps from (a) to (f) once again.

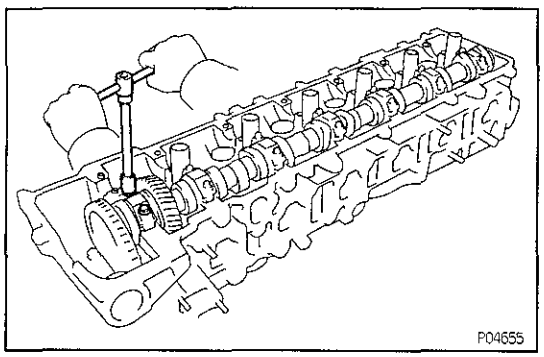
NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.

(i) Remove the two bearing caps and exhaust camshaft.



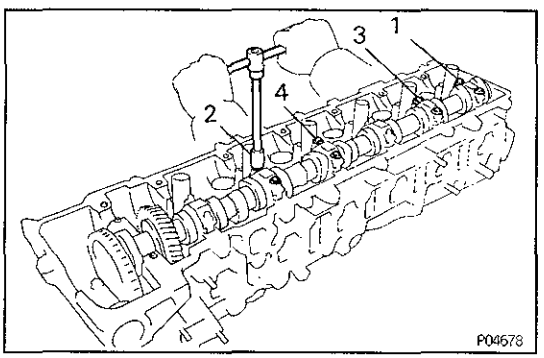
B. Remove intake camshaft

(a) Set the timing mark (two dot marks) of the camshaft drive gear at approx. 25° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench.
HINT: The above angle arrows the No.1 and No.4 cylinder cam lobes of the intake camshaft to push their valve lifters evenly.



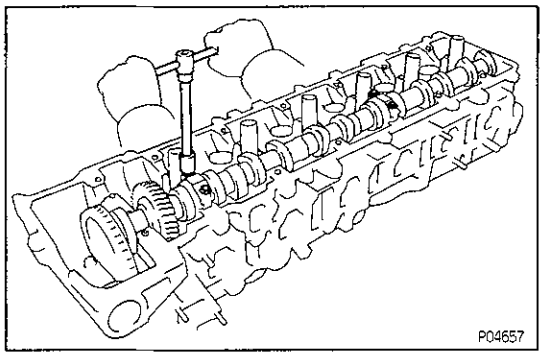
(b) Lightly push the intake camshaft towards the front without applying excessive force.

(c) Loosen and remove the No.1 bearing cap bolts, alternately loosening the left and right bolts uniformly.



(d) Loosen and remove the No.3, No.4, No.6 and No.7 bearing cap bolts, alternately loosening the left and right bolts uniformly in several passes, in the sequence shown.
NOTICE: Do not remove the No.2 and No.5 bearing cap bolts at this stage.

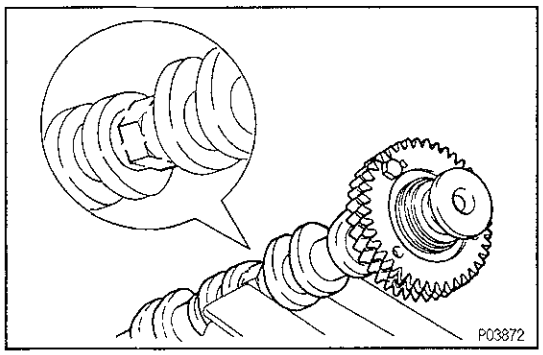
(e) Remove the four bearing caps.



(f) Alternately and uniformly loosen and remove the No.2 and No.5 bearing cap bolts.
HINT:
- As the four No.2 and No.5 bearing cap bolts are loosened, make sure that the camshaft is lifted out straight and level.
- If the camshaft is not being lifted out straight and level, retighten the four No.2 and No.5 bearing cap bolts. Then reverse the order of above steps from (f) to (a) and repeat steps from (a) to (g) once again.

NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.

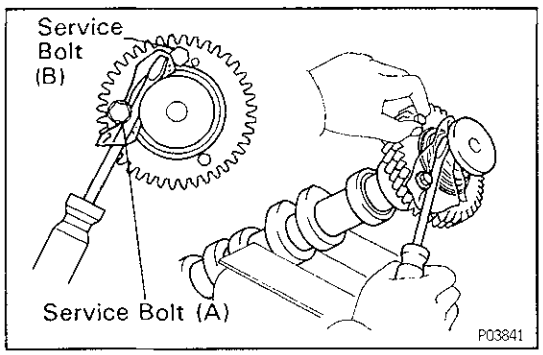
(g) Remove the two bearing caps and exhaust camshaft.



26. DISASSEMBLE EXHAUST CAMSHAFT

(a) Mount the hexagon wrench head portion of the camshaft in a vise.

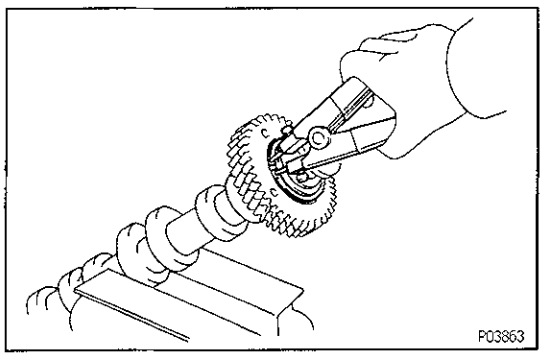
NOTICE: Be careful not to damage the camshaft.



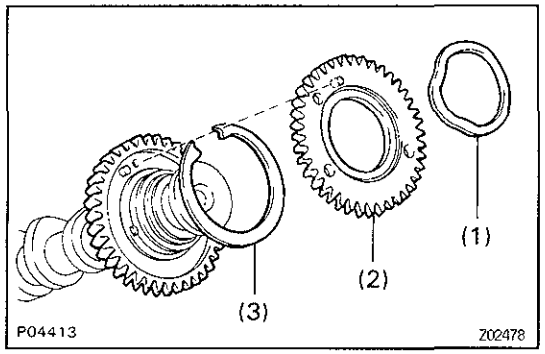
(b) Insert a service bolt (A) into the service hole of the camshaft sub–gear.

(c) Using a screwdriver, turn the sub–gear clockwise, and remove the service bolt (B).

NOTICE: Be careful not to damage the camshaft.

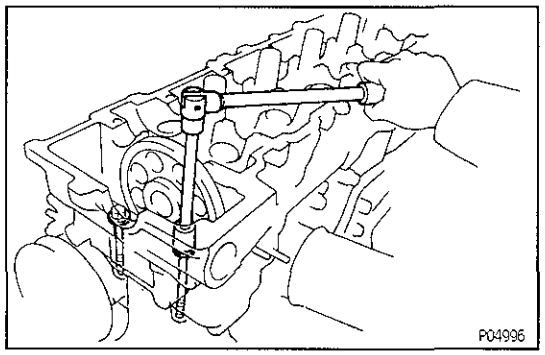


(d) Using snap ring pliers, remove the snap ring.



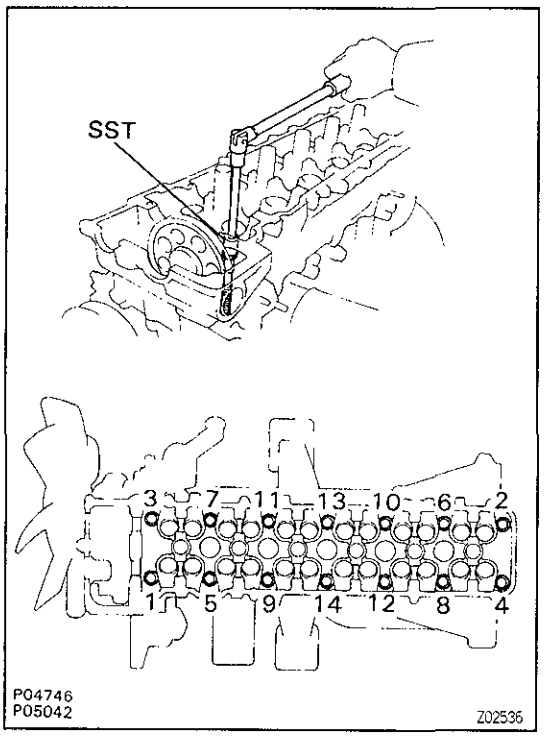
(e) Remove the following parts:
(1) Wave washer
(2) Camshaft sub–gear
(3) Camshaft gear spring

EG

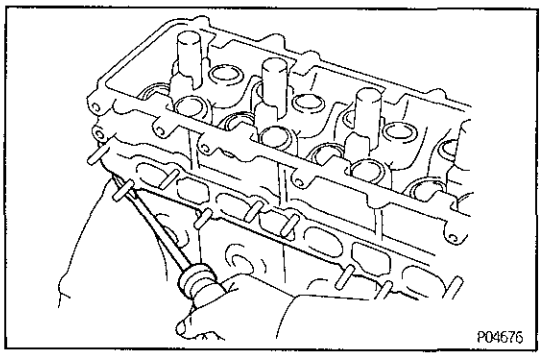


27. REMOVE CYLINDER HEAD

(a) Remove the two bolts in front of the head before the other head bolts are removed.



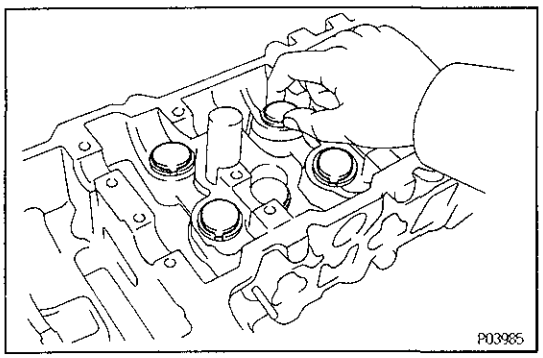
(b) Using SST, uniformly loosen and remove the 14 cylinder head bolts in several passes, in the sequence shown.
SST 09011–38121
NOTICE: Cylinder head warpage or cracking could result from removing bolts in incorrect order.



(c) Lift the cylinder head from the dowels on the cylinder block, and place the cylinder head on wooden blocks on a bench.
HINT: If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver.
NOTICE: Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

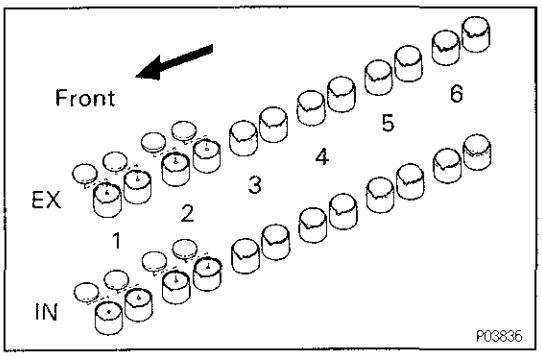
EG0VC-01

CYLINDER HEAD DISASSEMBLY

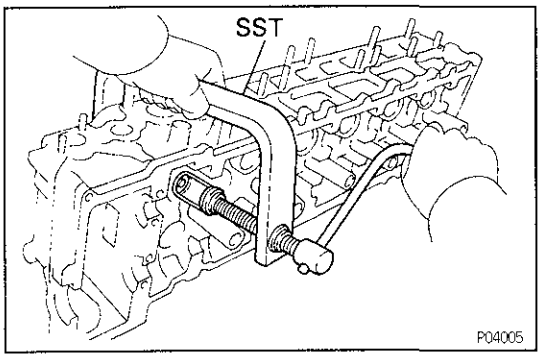


(See page EG–90)

1. REMOVE VALVE LIFTERS AND SHIMS



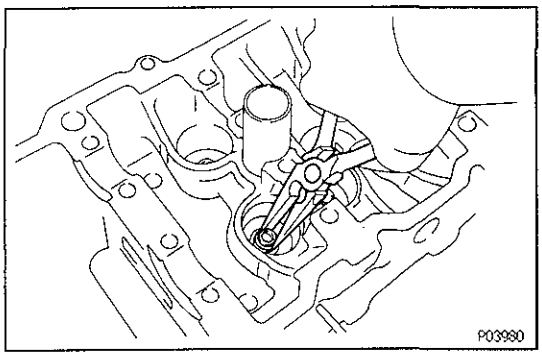
HINT: Arrange the valve lifters and shims in correct order.



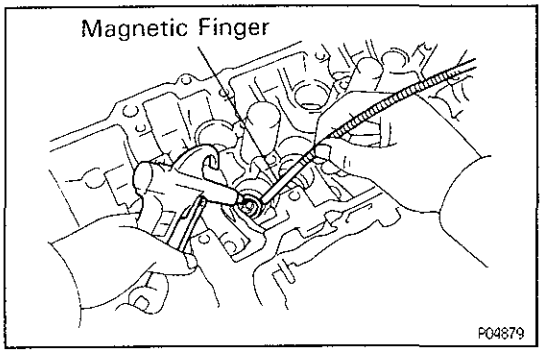
2. REMOVE VALVES

(a) Using SST, compress the valve spring and remove the two keepers.
SST 09202–70010

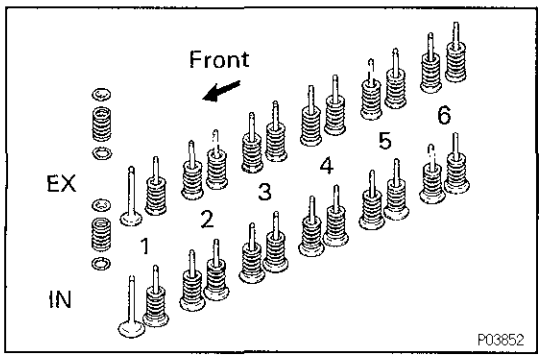
(b) Remove the spring retainer, valve spring and valve.



(c) Using needle–nose pliers, remove the oil seal.

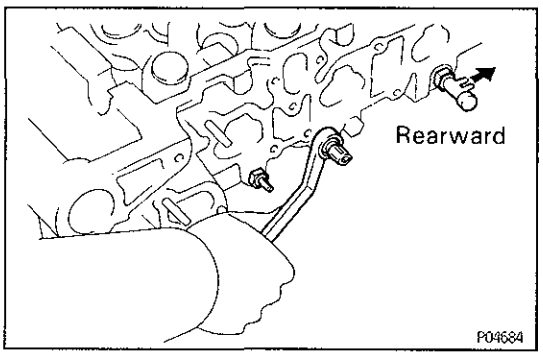


(d) Using compressed air and magnetic finger, remove the spring seat by blowing air.



HINT: Arrange the valves, valve springs, spring seats and spring retainers in correct order.

EG



3. REMOVE FOLLOWING PARTS:

(a) Water temperature switch
(b) Water temperature sensor (for G.C.C.)
(c) BVSV

EG27L–01

CYLINDER HEAD COMPONENTS INSPECTION, CLEANING AND REPAIR

(See page EG–56)

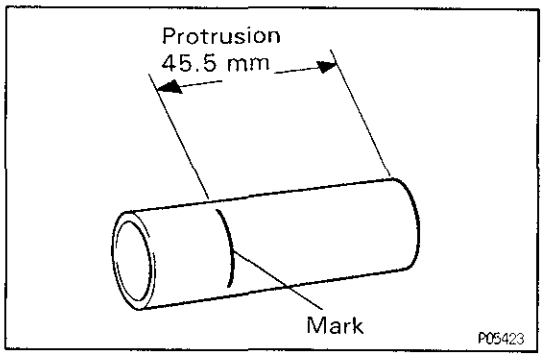
EG0VE–01

CYLINDER HEAD ASSEMBLY

(See page EG–90)

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.



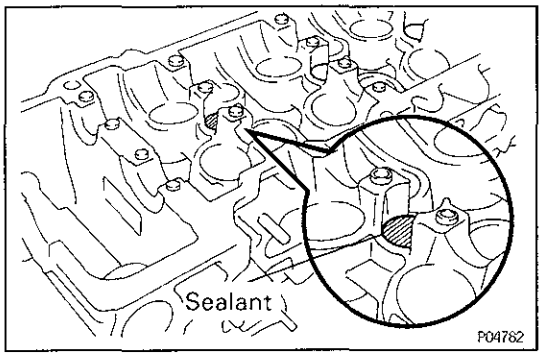
1. INSTALL SPARK PLUG TUBES

HINT: When using a new cylinder head, spark plug tubes must be installed.

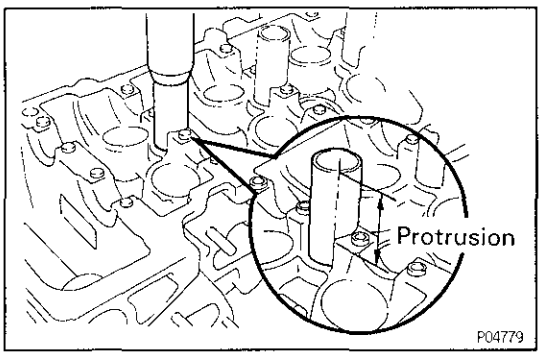
(a) Mark the standard position away from the edge, onto the spark plug tube.

Standard protrusion:

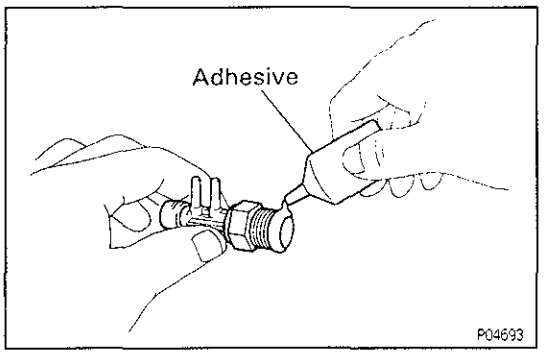
45.5 mm (1.791 in.)



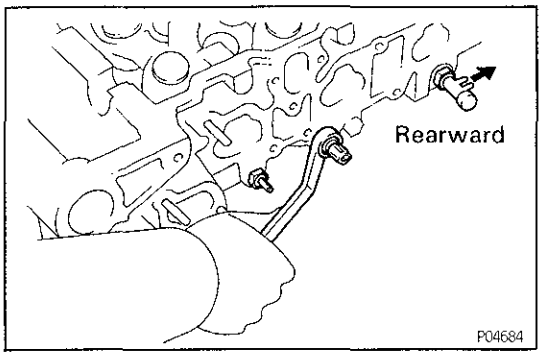
(b) Apply adhesive to the spark plug tube hole of the cylinder head.
Sealant:
Part No. 08833 – 00070, Adhesive 1324, THREE BOND 1324 or equivalent



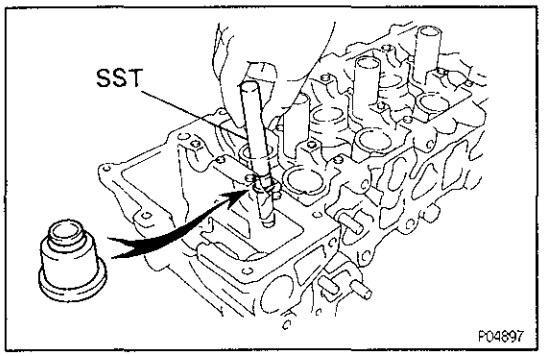
(c) Using a press, press in a new spark plug tube until there is 45.5 mm (1.791 in.) protruding from the camshaft bearing cap installation surface of the cylinder head.
NOTICE: Avoid pressing a new spark plug tube in too far by measuring the amount of protrusion while pressing.



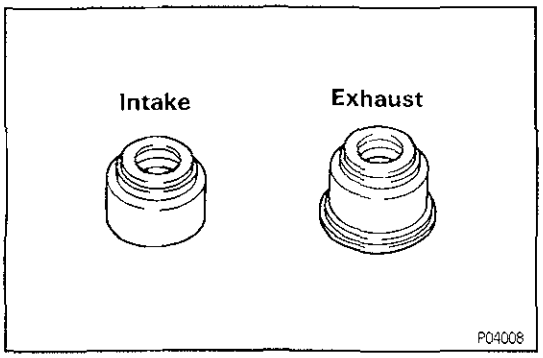
2. INSTALL FOLLOWING PARTS:
HINT: Apply adhesive to two or three threads of the BVSV.
Adhesive:
Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent



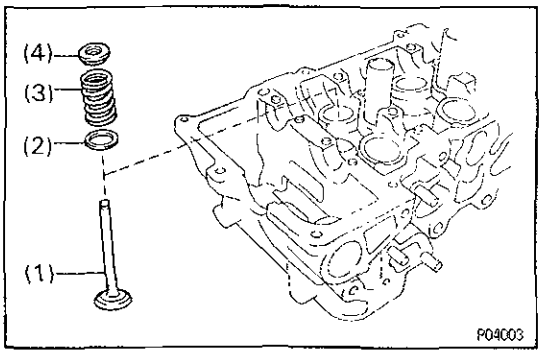
(a) Water temperature switch
(b) Water temperature sensor (for G.C.C.)
(c) BVSV



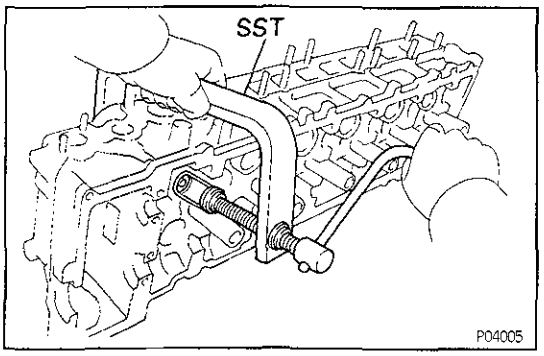
3. INSTALL VALVES
(a) Using SST, push in a new oil seal.
SST 09236–00101 (09236–15010)



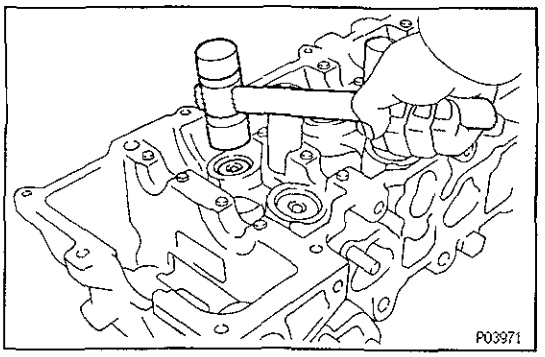
HINT: Different oil seals are used for the intake and exhaust.



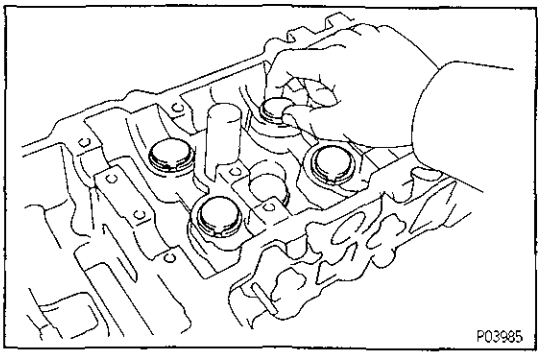
(b) Install the following parts:
(1) Valve
(2) Spring seat
(3) Valve spring
(4) Spring retainer



(c) *Using SST, compress the valve spring and place the* two keepers around the valve stem.
SST 09202–70010



(d) Using a plastic–faced hammer, lightly tap the valve stem tip to assure proper fit.

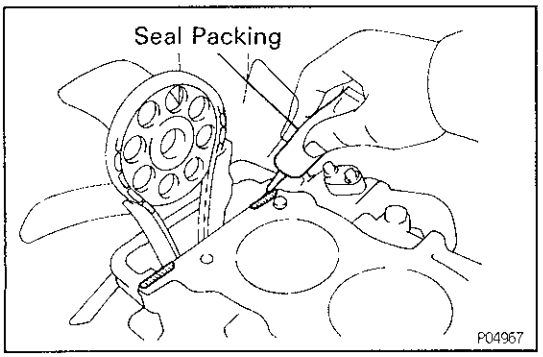


4. INSTALL VALVE LIFTERS AND SHIMS

(a) Install the valve lifter and shim.
(b) Check that the valve lifter rotates smoothly by hand.

EG0VF-04

CYLINDER HEAD INSTALLATION



(See pages EG−89)

1. INSTALL CYLINDER HEAD

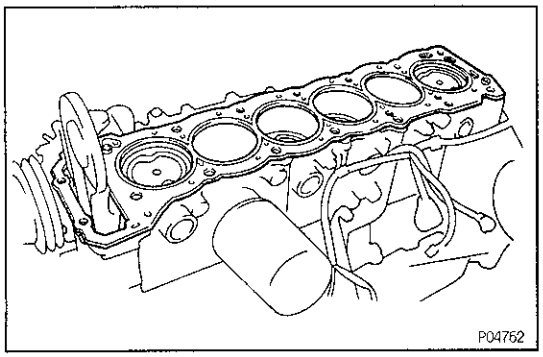
A. Place cylinder head on cylinder block

(a) Apply seal packing to two locations as shown.

Seal packing:

Part No.08826−00080 or equivalent

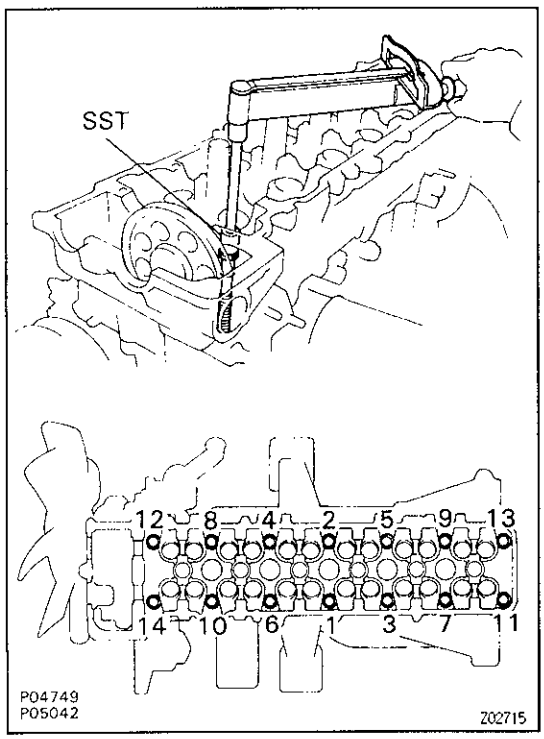
NOTICE: Do not apply too much seal packing



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

NOTICE: Be careful of the installation direction.

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



B. Install cylinder head bolts

HINT:

- The cylinder head bolts are tightened in two progressive steps (steps (b) and (d)).
- If any cylinder head bolt is broken or deformed, replace it.

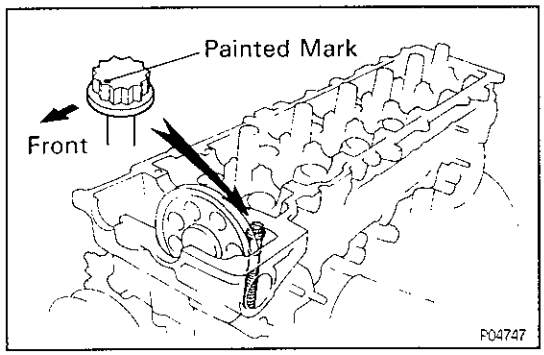
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Using SST, install and uniformly tighten the 14 cylinder head bolts and plate washers in several passes, in the sequence shown.

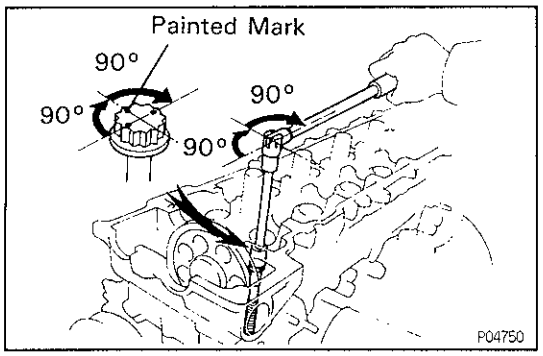
SST 09011−38121

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

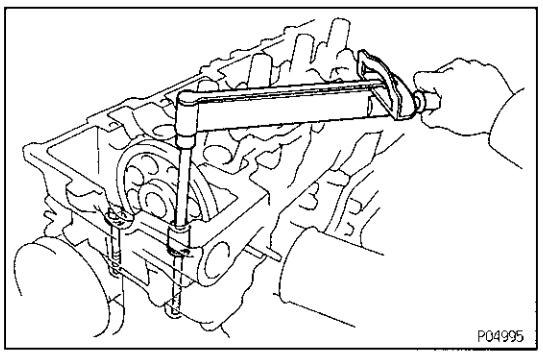
If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.



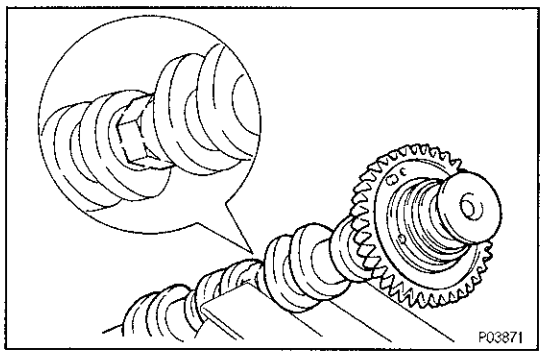
(c) Mark the front of the cylinder head bolt head with paint.



(d) Retighten the cylinder head bolts 90° in the numerical order shown.
(e) Retighten the cylinder head bolts by an additional 90°.
(f) Check that the painted mark is now facing rearward.

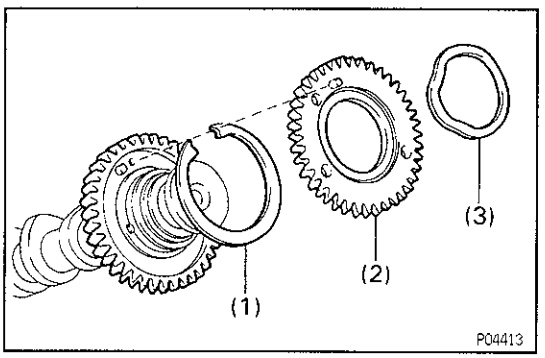


(g) Install and torque the two mounting bolts.
Torque: 21N·m (210kgf·cm, 15ft·lbf)

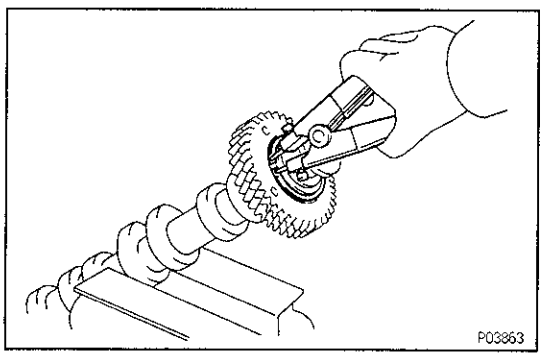


2. ASSEMBLY EXHAUST CAMSHAFT

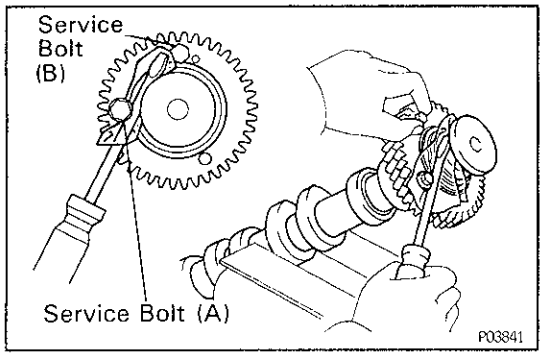
(a) Mount the hexagon wrench head portion of the camshaft in a vise.
NOTICE: Be careful not to damage the camshaft.



(b) Install the following parts:
(1) Camshaft gear spring
(2) Camshaft sub—gear
(3) Wave washer
HINT: Align the pins on the gears with the spring ends.



(c) Using snap ring pliers, install the snap ring.



(d) Insert a service bolt (A) into the service hole of the camshaft sub—gear.

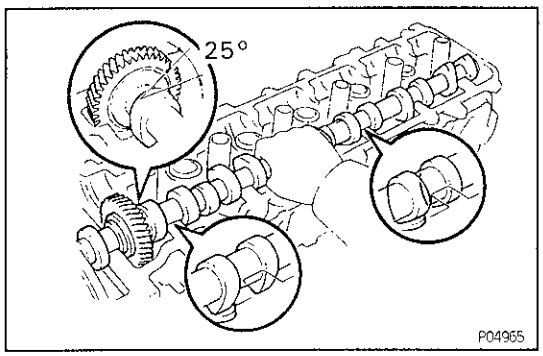
(e) Using a screwdriver, align the holes of the camshaft main gear and sub—gear by turning camshaft sub—gear clockwise, and install a service bolt (B).

NOTICE: Be careful not to damage the camshaft.

EG

3. INSTALL CAMSHAFTS

NOTICE: Since 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 receiving 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.

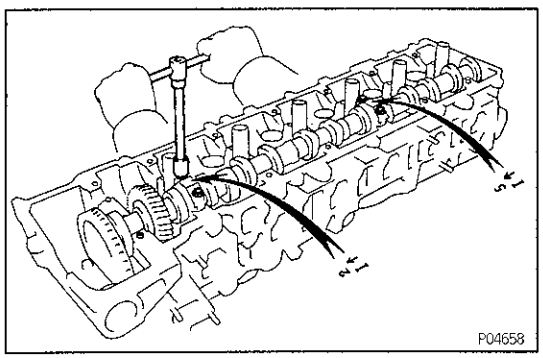


A. Install intake camshaft

(a) Apply engine oil to the thrust portion of the intake camshaft.

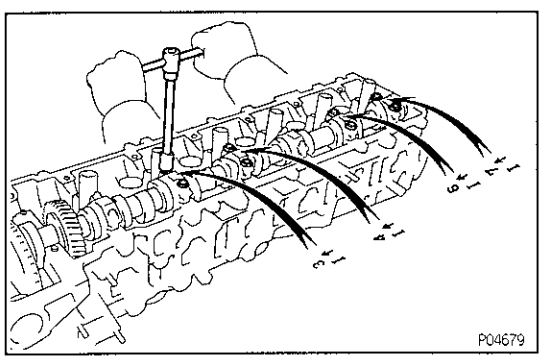
(b) Lightly place the intake camshaft on top of the cylinder head as shown in the illustration so that the No. 1 and No.4 cylinder cam lobes face downward.

(c) Lightly push the camshaft towards the front without applying excessive force.



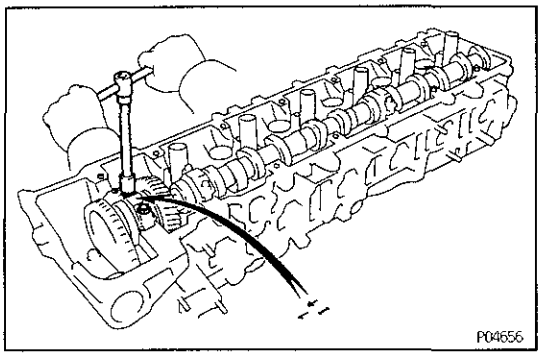
(d) Place the No.2 and No.5 bearing caps in their proper location.

(e) Temporarily tighten these bearing cap bolts uniformly and alternately in several passes until the bearing caps are snug with the cylinder head.



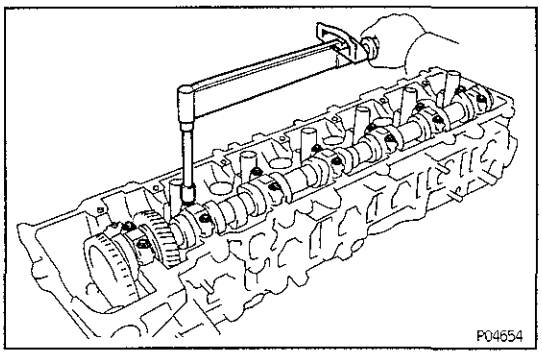
(f) Place the No.3, No.4, No.6 and No.7 bearing caps in their proper location.

(g) Temporarily tighten these bearing cap bolts, alternately tightening the left and right bolts uniformly.

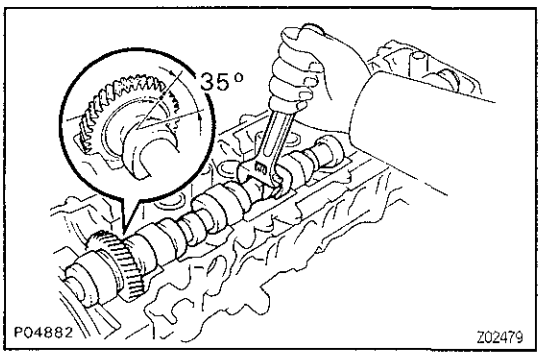


(h) Place the No.1 bearing cap in its proper location. When doing this, check that there is no gap between the cylinder head and the contact surface of bearing cap.

(i) Temporarily tighten the bearing cap bolts, alternately tightening the left and right bolts uniformly.

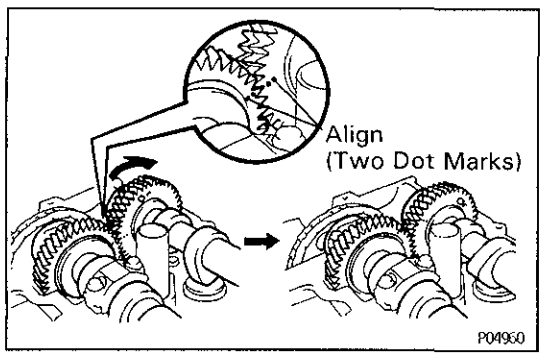


(j) Uniformly tighten the fourteen bearing cap bolts in several passes.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)



B. Install exhaust camshaft

(a) Set the timing mark (two dot marks) of the camshaft drive gear at approx. 35° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench.

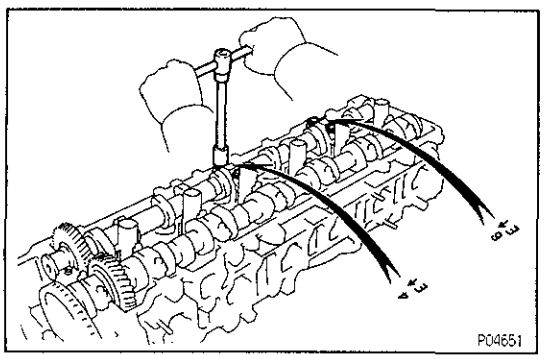


(b) Apply engine oil to thrust portion of the exhaust camshaft.

(c) Engage the exhaust camshaft gear to the intake camshaft gear by matching the timing marks (two dot marks) on each gear.

(d) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other.

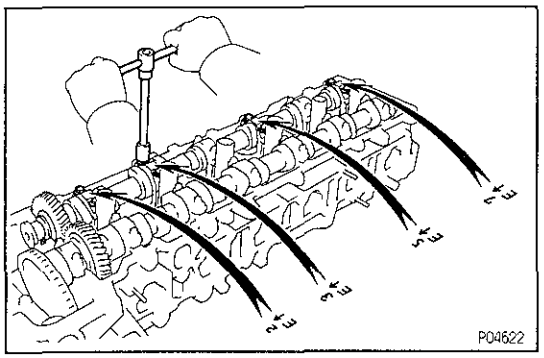
(e) Lightly push the intake camshaft towards the front without applying excessive force.



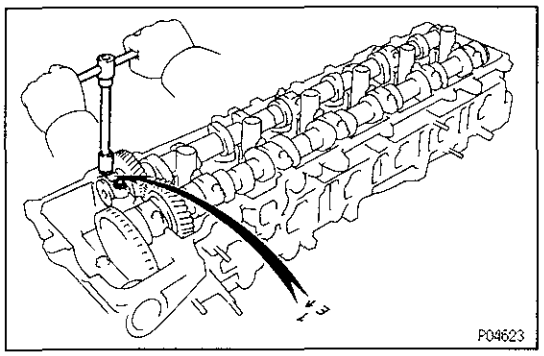
(f) Install the No.4 and No.6 bearing caps in their proper location.

(g) Temporarily tighten the bearing cap bolts uniformly and alternately in several passes until the bearing caps are snug with the cylinder head.

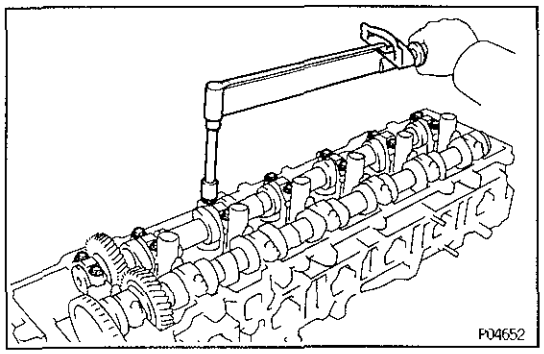
EG



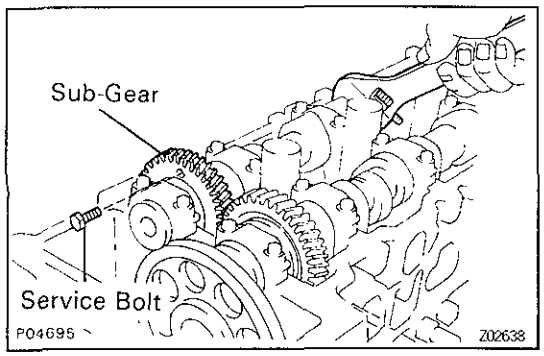
(h) Place the No.2, No.3, No.5 and No.7 bearing caps in their proper location.
(i) Temporarily tighten these bearing cap bolts, alternately tightening the left and right bolts uniformly.



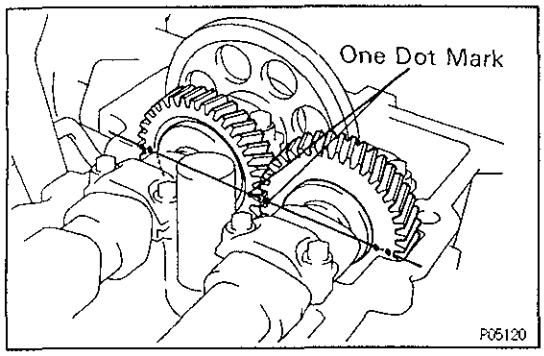
(j) Place the No.1 bearing cap in its proper location. When doing this, check that there is no gap between the cylinder head and the contact surface of bearing cap.
(k) Temporarily tighten the bearing cap bolts, alternately tightening the left and right bolts uniformly.



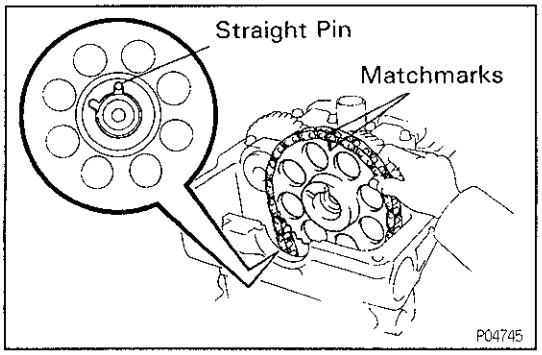
(l) Uniformly tighten the fourteen bearing cap bolts in several passes.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)



(m) Bring the service bolt installed in the driven sub—gear upward by turning the hexagon wrench head portion of the camshaft with a wrench.
(n) Remove the service bolt.
(o) Check that the intake and exhaust camshafts turn smoothly.



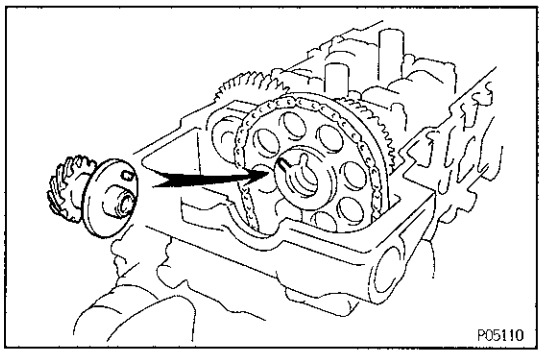
4. SET CAMSHAFTS TO FOLLOWING POSITION:
Turn the camshafts so that the timing marks with one and two dots will be in straight line on the cylinder head surface as shown in the illustration.



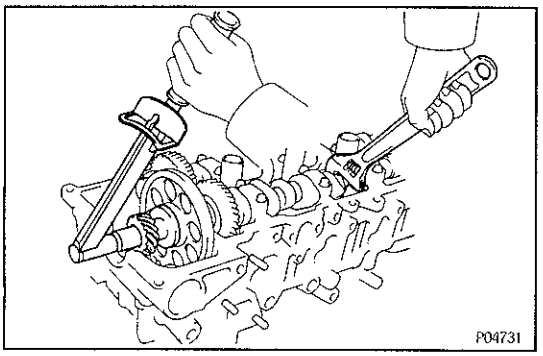
5. INSTALL CAMSHAFT TIMING GEAR

HINT: Check that the matchmarks on the camshaft timing gear and timing chain are aligned.

(a) Place the gear over the straight pin of the intake camshaft.

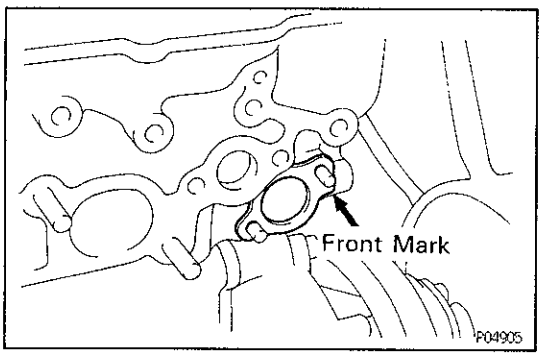


(b) Align the straight pin of distributor gear with the straight pin groove of the intake camshaft gear as shown.



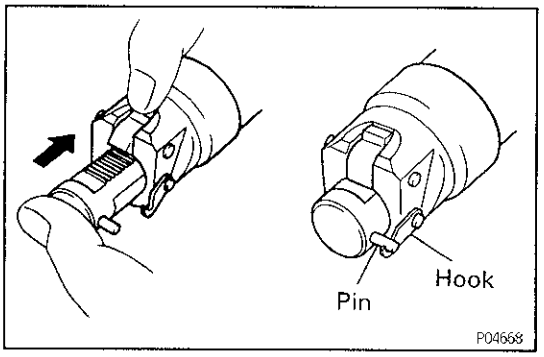
(c) Hold the intake camshaft with a wrench, install and torque the bolt.

Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)

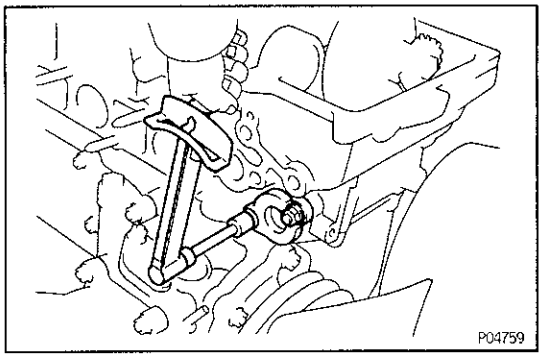


6. INSTALL CHAIN TENSIONER

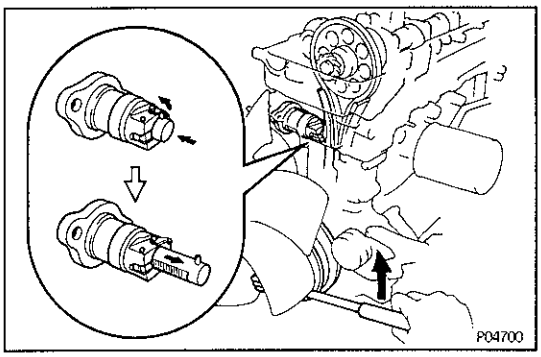
(a) Place a new gasket so that the front mark is toward the front side.



(b) Release the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out.

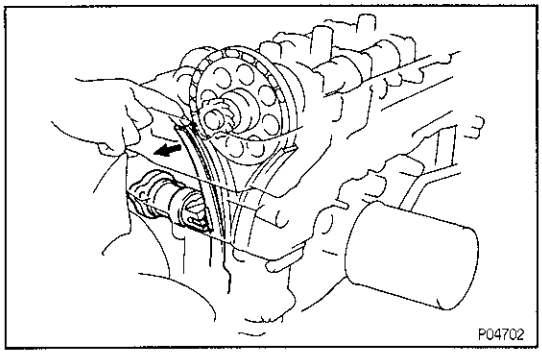


(c) Install the chain tensioner with the two nuts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)
NOTICE: If the plunger springs out during installation of the chain tensioner, repeat the operation in step (b) before installing the tensioner.

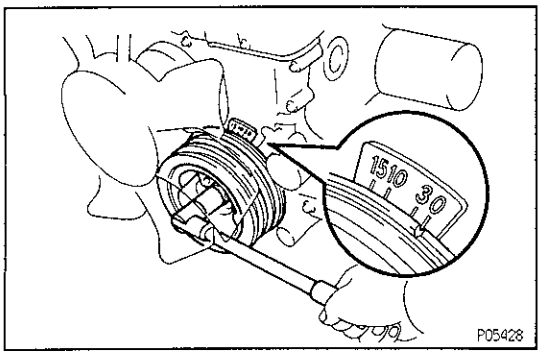


7. SET CHAIN TENSIONER

Turn the crankshaft to the left so that the hook of the chain tensioner is released from the pin of the plunger, causing the plunger to spring out and the slipper to be pushed into the chain.

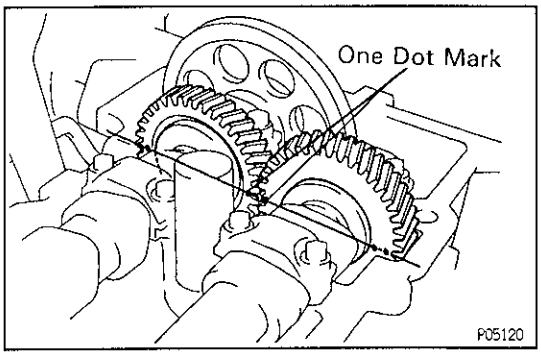


HINT: If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver or your finger so that the hook is released and the plunger springs out.



8. CHECK VALVE TIMING

(a) Turn the crankshaft pulley two revolutions from TDC to TDC.
NOTICE: Always turn the crankshaft clockwise.



(b) Check that the timing marks (one and two dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration. If not, turn the crankshaft one revolution (360°) and align the marks as above.

9. CHECK AND ADJUST VALE CLEARANCE

(See page EG–17)

Turn the camshaft and position the cam lobe upward and check and adjust the valve clearance.

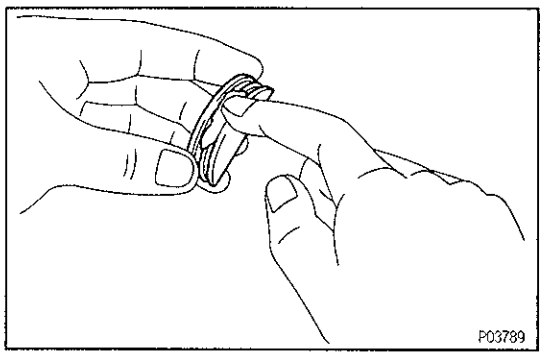
Valve clearance (Cold):

Intake

0.15 – 0.25 mm (0.006 – 0.010 in.)

Exhaust

0.25 – 0.35 mm (0.010 – 0.014 in.)



10. INSTALL SEMI–CIRCULAR PLUG

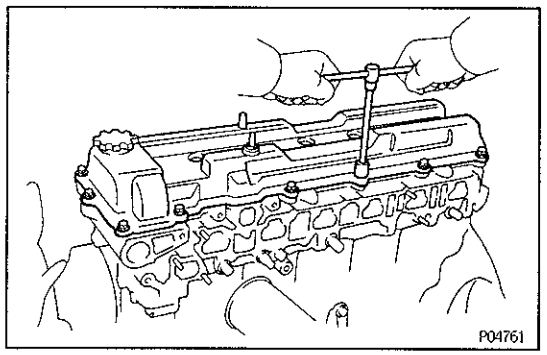
(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to the cylinder head installation surface of the half–circular plug.

Seal packing:

Part No.08826–00080 or equivalent

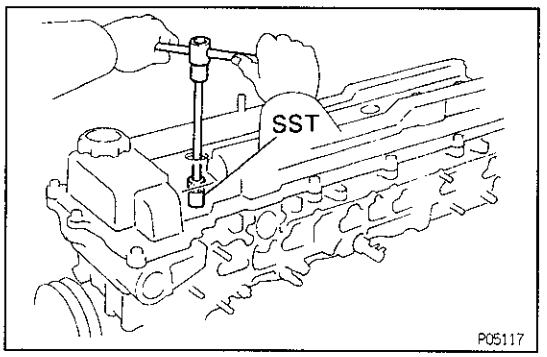
(c) Install the half–circular plug to the cylinder head.



11. INSTALL CYLINDER HEAD COVER

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

(b) Install the cylinder head cover with the 13 bolts.

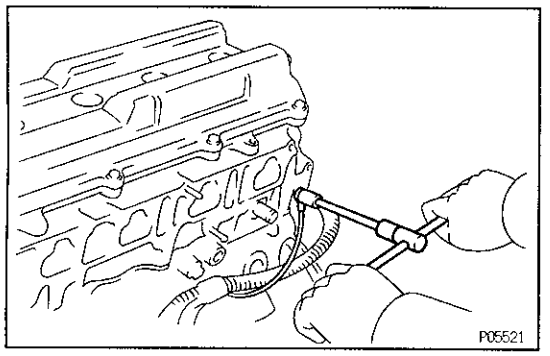


12. INSTALL SPARK PLUGS

Using SST, install the spark plug.

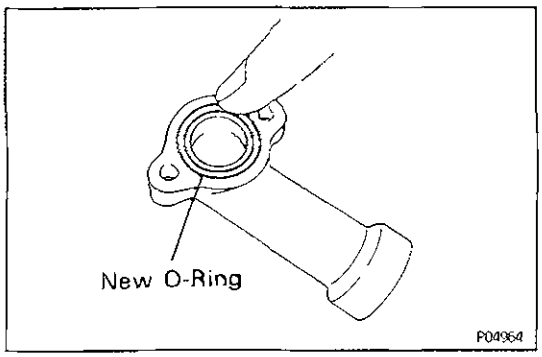
SST 09155–16100

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)



13. CONNECT ENGINE WIRE

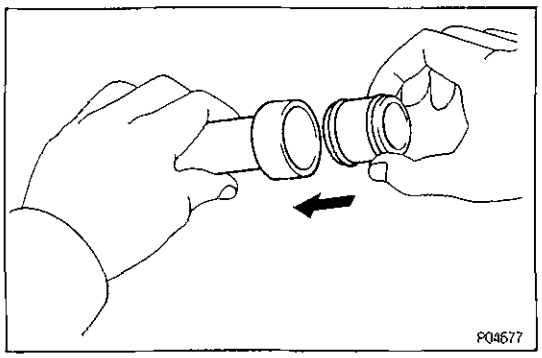
Connect the engine wire to the cylinder head with the bolt.



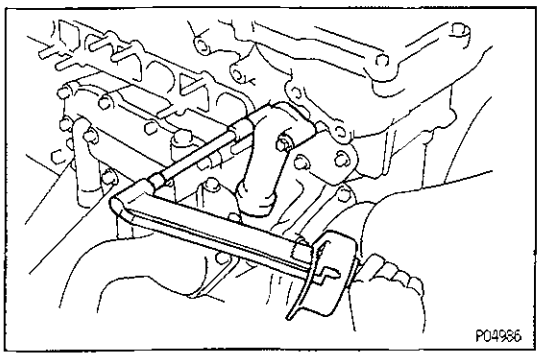
EG

14. INSTALL WATER BY–PASS OUTLET AND PIPE

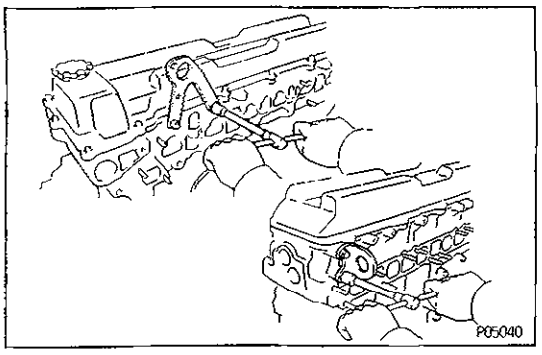
(a) Install a new O–ring to the water by–pass outlet.



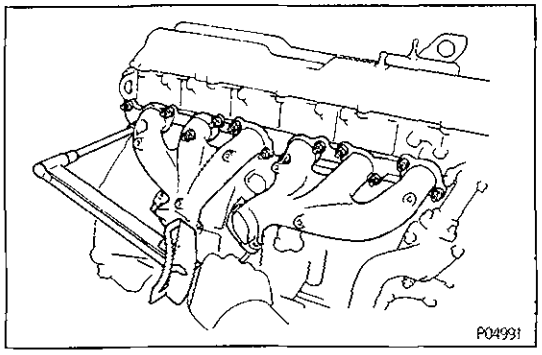
(b) Install two new O–rings to the water by–pass pipe.
(c) Apply soapy water to the O–rings.
(d) Assemble the water by–pass outlet and pipe.



(e) Install the water by–pass outlet and pipe with the two bolts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

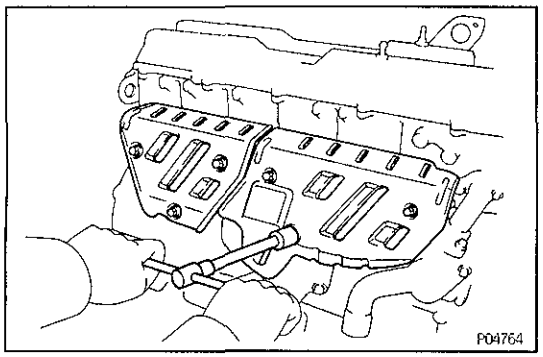


15. INSTALL NO.1 AND NO.2 ENGINE HANGERS
Torque: 41 N·m (420 kgf·cm, 30 ft·lbf)



16. INSTALL NO.1 AND NO.2 EXHAUST MANIFOLDS

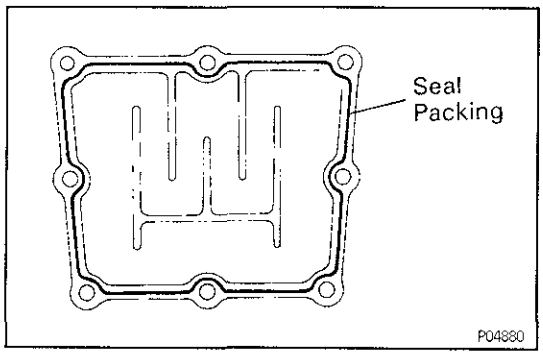
(a) Install two new gaskets, No.1 exhaust manifold and No.2 exhaust manifold with the 13 nuts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)



(b) Install the No.1 heat insulator and No.2 heat insulator with the six bolts.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

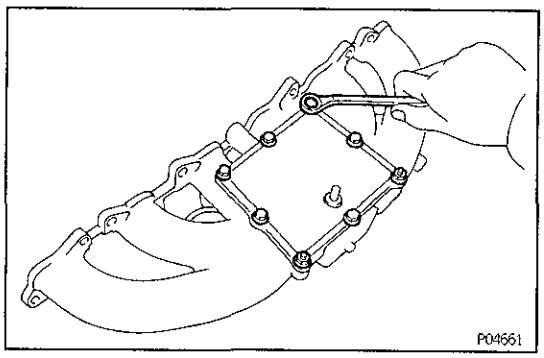
17. INSTALL WATER BY–PASS FLANGE

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water by–pass and intake manifold.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

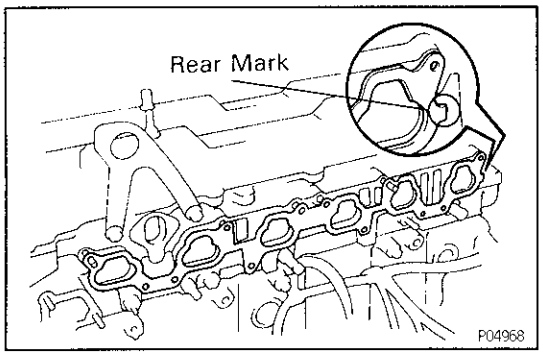


(b) Apply seal packing to the water by–pass flange as shown in the illustration.
Seal packing:
Part No.08826–00080 or equivalent
- Install a nozzle that has been cut to a 3 – 4 mm (0.12 – 0.16 in.) opening.

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.

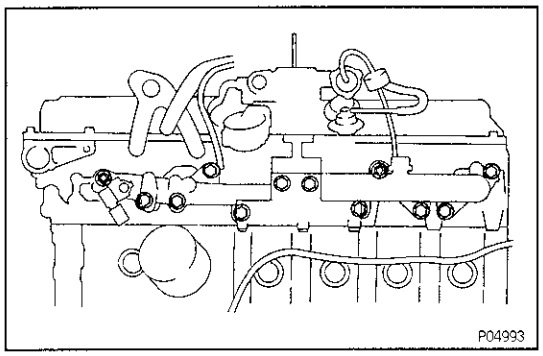


(c) Install the water by–pass flange with the six bolts and two nuts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

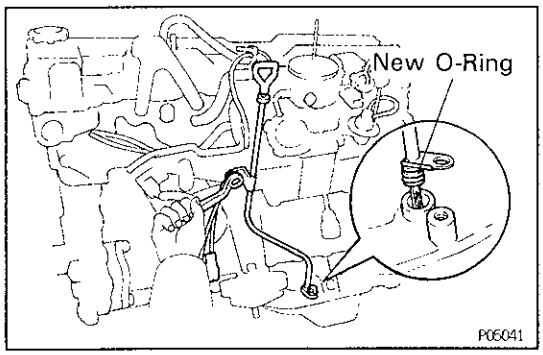


18. INSTALL INTAKE MANIFOLD WITH CARBURETOR

(a) Place a new gasket so that the rear mark is toward the rear side.

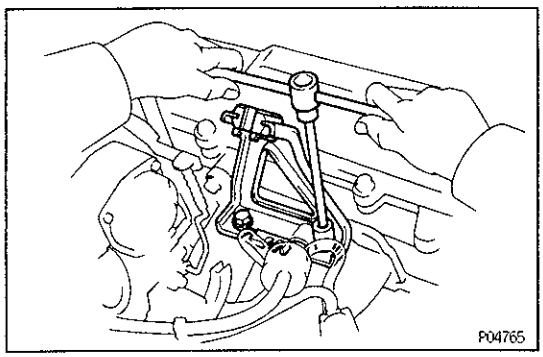


(b) Install the intake manifold and ground strap with the six bolts and two nuts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)



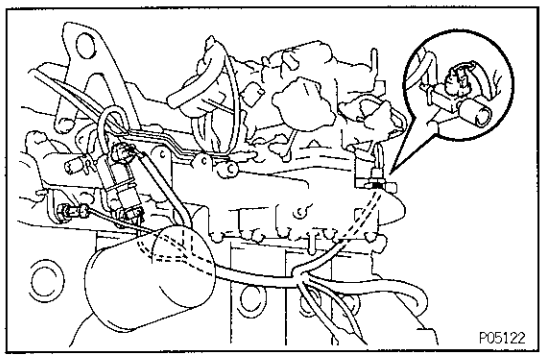
19. INSTALL OIL DIPSTICK AND GUIDE

(a) Install a new O–ring to the dipstick guide.
(b) Apply light coat of engine oil on the O–ring.
(c) Push in the dipstick guide into the guide hole of the No.1 oil pan.
(d) Install the ground strap and dipstick guide with the two bolts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)



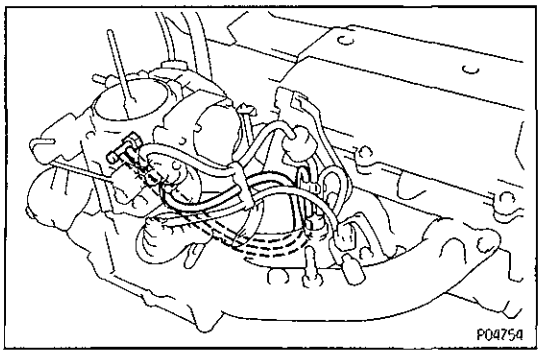
20. INSTALL ACCELERATOR CABLE BRACKET

Install the accelerator cable bracket with the two bolts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

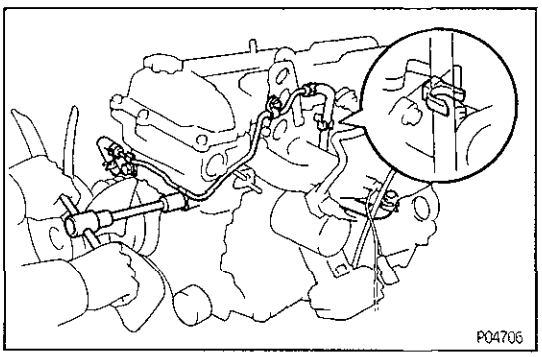


21. CONNECT FOLLOWING CONNECTORS:

(a) Spark control VSV (for G.C.C.)
(b) Water temperature switch
(c) Water temperature sensor (for G.C.C.)
(d) TP VSV



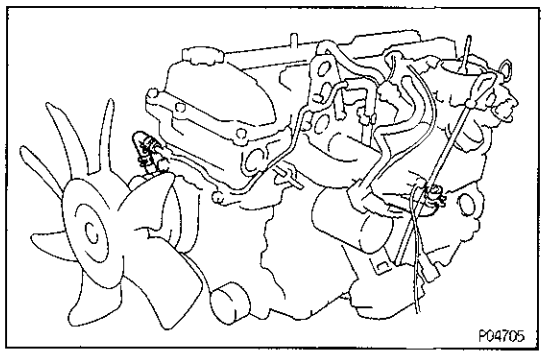
22. CONNECT TWO VACUUM HOSES TO BVSV



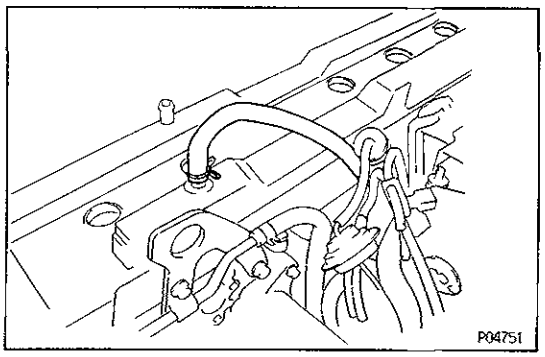
23. INSTALL NO.2 WATER BY–PASS PIPE AND HOSES

(a) Install the No.2 water by–pass pipe and hoses with the three bolts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

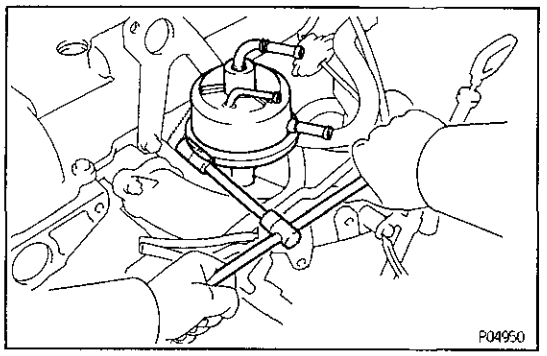
(b) Connect the hose to the hose clamp.



(c) Connect the two water hoses.



24. CONNECT PCV HOSE

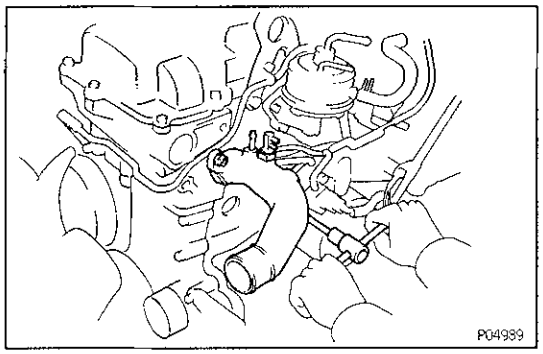


25. INSTALL FUEL PUMP

(a) Install a new insulator and fuel pump with the three bolts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

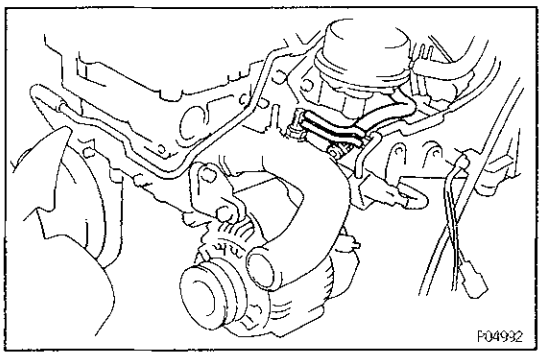
(b) Connect the fuel outlet hose.

EG

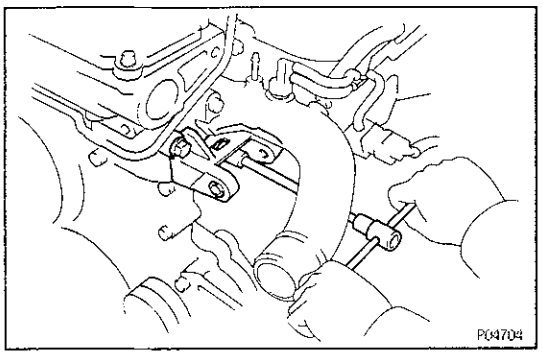


26. INSTALL WATER OUTLET

(a) Install a new gasket and water outlet with the two nuts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

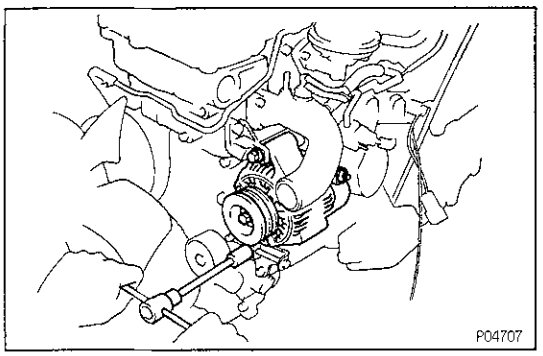


(b) Connect No.1 water by–pass hose.
(c) Connect the vacuum hoses.



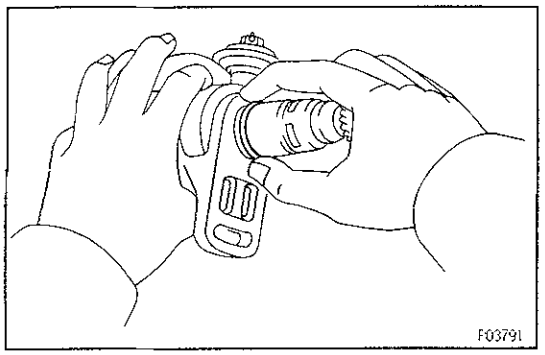
27. INSTALL ALTERNATOR BRACKET

Install the alternator bracket with the two bolts.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



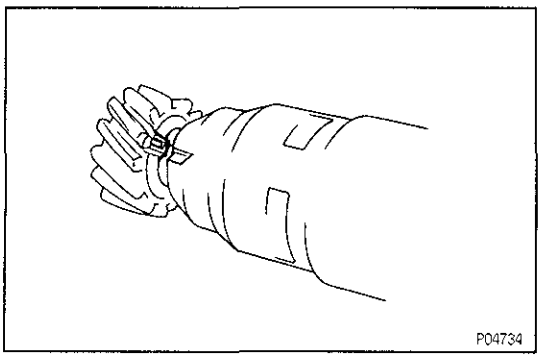
28. INSTALL ALTERNATOR AND DRIVE BELTS

(See CH section)

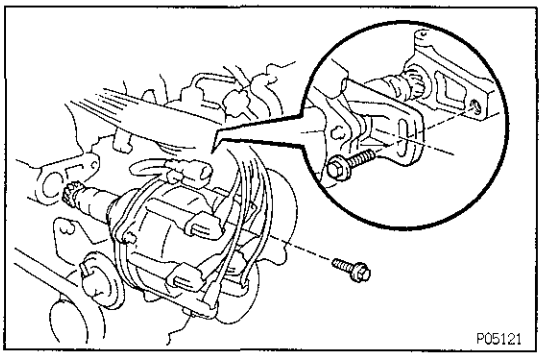


29. INSTALL DISTRIBUTOR

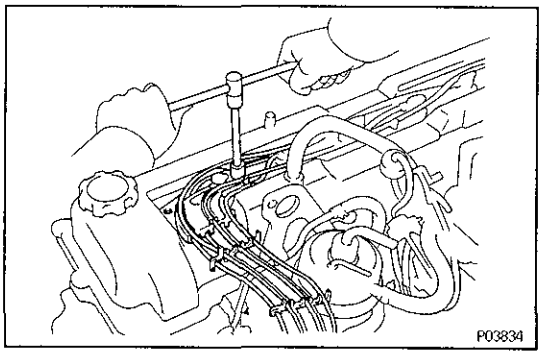
(a) Install a new O–ring to the distributor.
HINT: Always use a new O–ring when installing the distributor.



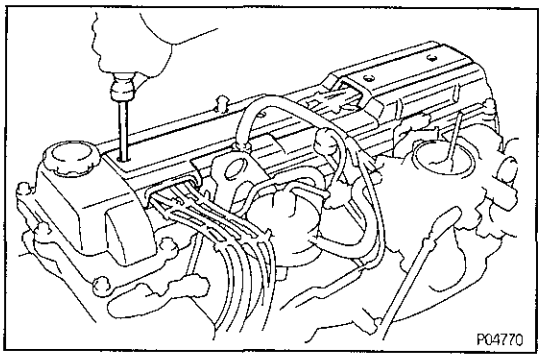
(b) Align the groove of the distributor housing with the protrusion on the driven gear.
(c) Apply a light coat of engine oil on the O—ring.



(d) Insert the distributor, aligning the center of the flange with that of the bolt hole on the cylinder head.
(e) Lightly tighten the hold—down bolts.
(f) Connect the high—tension cords.
Firing order:
1—5—3—6—2—4

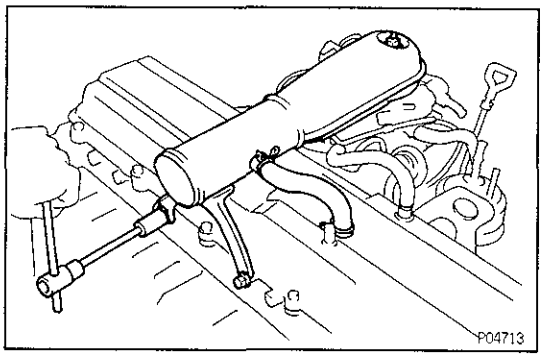


(g) Install the No.1 cord clamp mounting bolt.



30. INSTALL NO. 2 AND NO. 3 CYLINDER HEAD COVERS

Install the head covers with the four bolts.



31. INSTALL INTAKE AIR CONNECTOR

(a) Install the air connector with the two bolts and nut.
Bolt
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
Nut
Torque: 5.4 N·m (55 kgf·cm, 48 ft·lbf)
(b) Connect the PCV hose.