

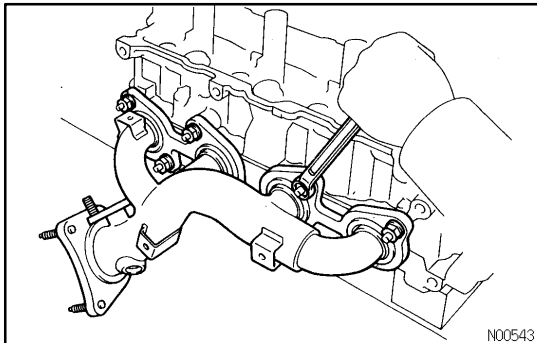
INSTALLATION

1. INSTALL RH EXHAUST MANIFOLD TO CYLINDER HEAD

- (a) Place a new gasket on the cylinder head with the white painted marks facing the manifold side.

NOTICE:

Be careful of the installation direction.

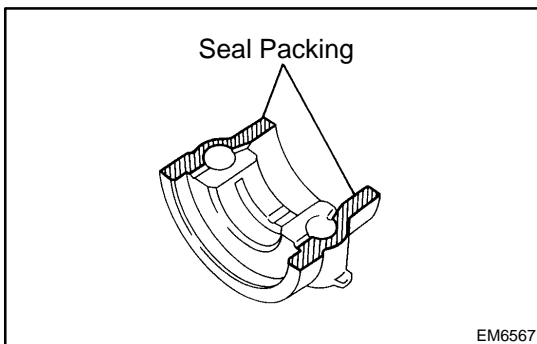


- (b) Install the exhaust manifold with 8 new nuts. Uniformly tighten the nuts in several passes.

Torque: 44 N·m (450 kgf-cm, 32 ft-lbf)

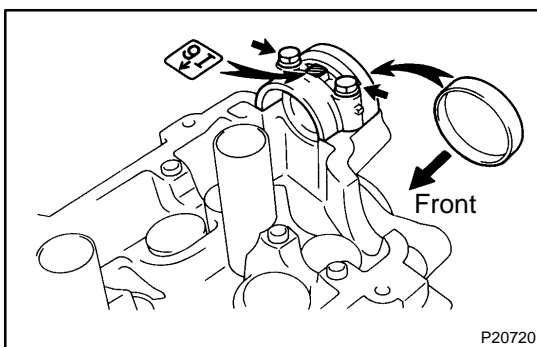
- (c) Install the heat insulator with the 3 bolts.

2. INSTALL LH EXHAUST MANIFOLD TO CYLINDER HEAD



3. INSTALL BEARING CAP TO LH CYLINDER HEAD

- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the bearing caps as shown.
Seal packing: Part No. 08826-00080 or equivalent

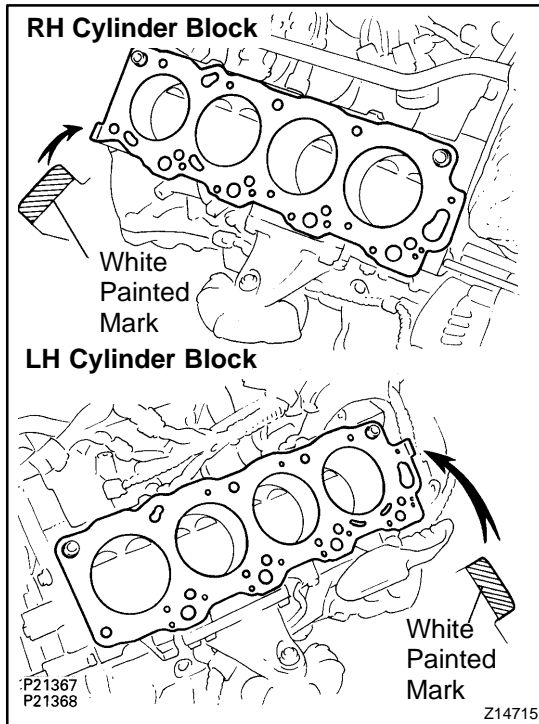


- (c) Place a new camshaft housing plug on the cylinder head, facing the cup side forward.
- (d) Install the bearing cap (mark "16") in position with the arrow mark facing forward.
- (e) Install a new seal washer to the bearing cap bolt.
- (f) Apply a light coat of engine oil on the threads of the bearing cap bolt.
- (g) Install the 2 bearing cap bolts. Alternately tighten bearing cap bolts.

Torque: 16 N·m (160 kgf-cm, 12 ft-lbf)

HINT:

Use silver colored bolts 38 mm (1.50 in.) in length.



4. INSTALL CYLINDER HEAD AND EXHAUST MANIFOLD ASSEMBLIES

- (a) Place the cylinder head on the cylinder block.
- (1) Place 2 new cylinder head gaskets in position on the cylinder block.

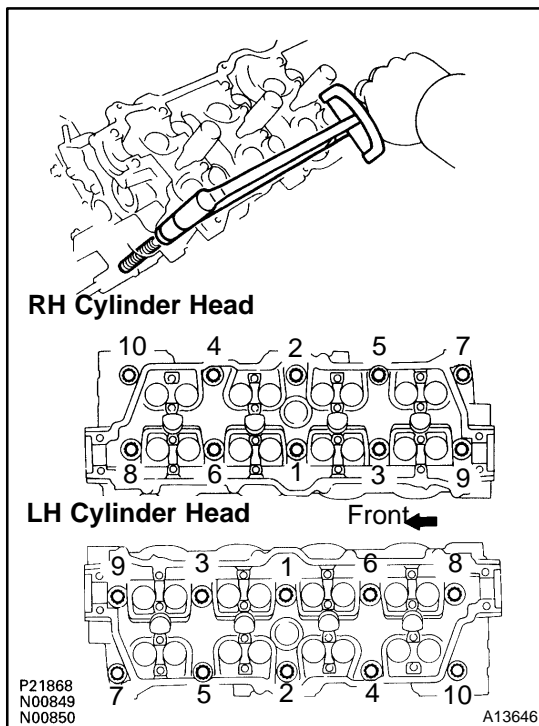
HINT:

On the rear side of the cylinder head gasket are painted marks to distinguish the LH and RH banks, a white painted mark for the RH bank and a yellow painted mark for the LH bank.

NOTICE:

Be careful of the installation direction.

- (2) Place the 2 cylinder heads in position on the cylinder head gaskets.



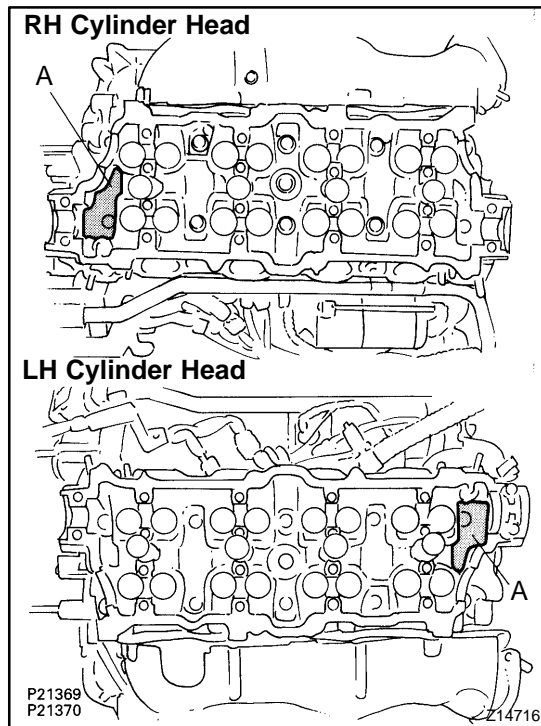
- (b) Install the cylinder head bolts.

HINT:

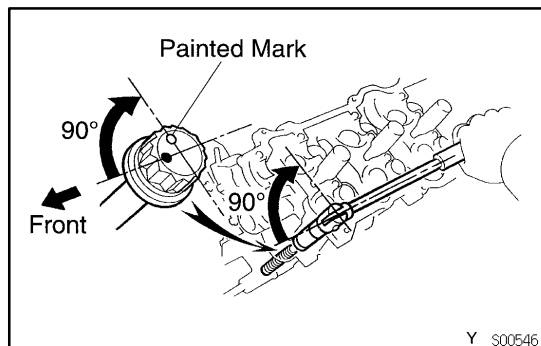
- The cylinder head bolts are tightened in 2 progressive steps (steps (c) and (e)).
 - If any cylinder head bolt is broken or deformed, replace it.
- (1) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
- (2) Install the plate washer to the cylinder head bolt.
- (3) Install and uniformly tighten the 10 cylinder head bolts on one side of the cylinder head in several passes in the sequence shown, then do the other side as shown.

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

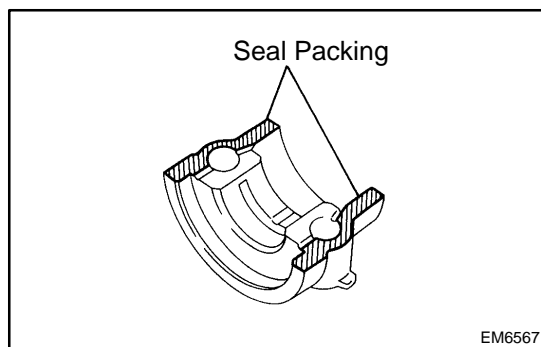
If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.

**NOTICE:**

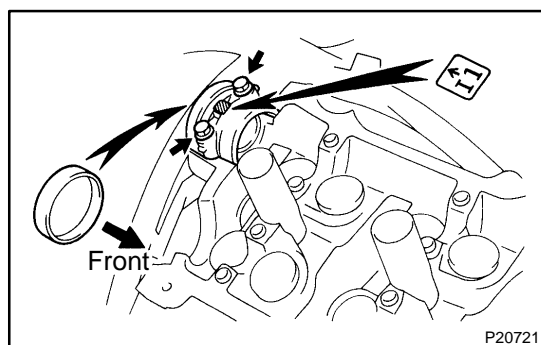
Do not drop the plate washer for cylinder head bolt into portion A of the cylinder head. If dropped into portion A, the plate washer will pass through the cylinder head and cylinder block into the oil pan.



- (4) Mark the front of the cylinder head bolt head with paint.
- (5) Retighten the cylinder head bolts by 90° in the numerical order shown.
- (6) Check that the painted mark is now at a 90° angle to front.



- (c) Install the bearing cap to RH cylinder head.
 - (1) Remove any old packing (FIPG) material.
 - (2) Apply seal packing to the bearing caps as shown.**Seal packing: Part No. 08826-00080 or equivalent**

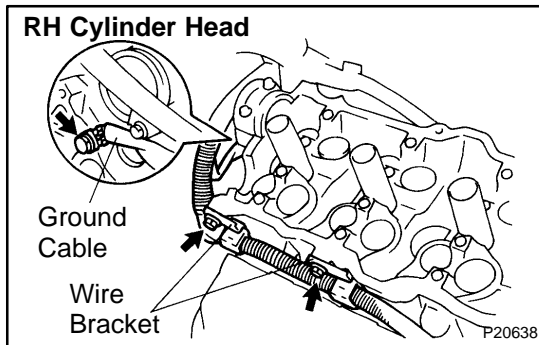


- (3) Place a new camshaft housing plug on the cylinder head, facing the cup side forward.
- (4) Install the bearing cap (mark "11") in position with the arrow mark facing rearward.
- (5) Install a new seal washer to the bearing cap bolt.
- (6) Apply a light coat of engine oil on the threads of the bearing cap bolt.
- (7) Install the 2 bearing cap bolts. Alternately tighten bearing cap bolts.

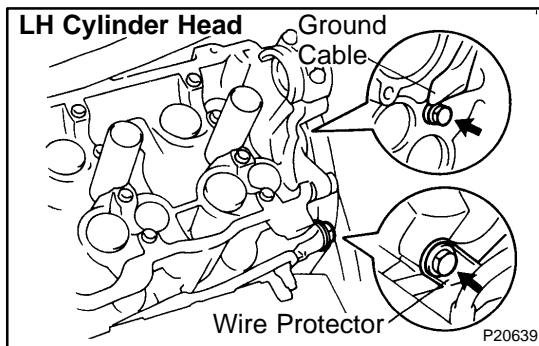
Torque: 16 N·m (160 kgf-cm, 12 ft-lbf)

HINT:

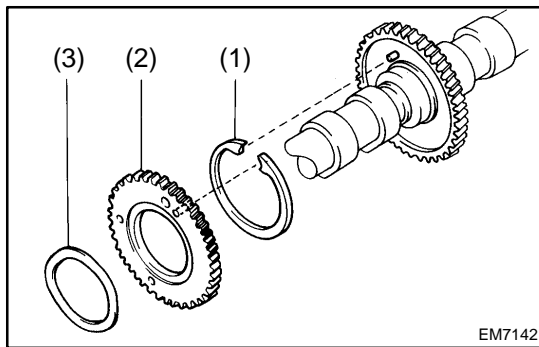
Use silver colored bolts 38 mm (1.50 in.) in length.



- (d) Install the engine wire.
- (1) Install the engine wire to the RH cylinder head with the 2 bolts.
 - (2) Install the ground cable to RH cylinder head with the bolt.



- (3) Install the engine wire protector to the LH cylinder head with the bolt.
- (4) Install the ground cable to LH cylinder head with the bolt.
- (5) Connect the 2 heated oxygen sensor connectors.



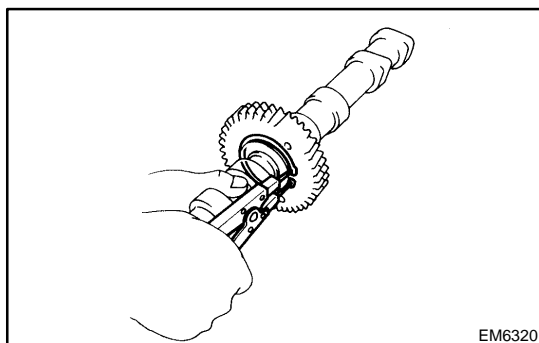
5. ASSEMBLE EXHAUST CAMSHAFT

- (a) Install these parts:
- (1) Camshaft gear spring
 - (2) Camshaft sub-gear

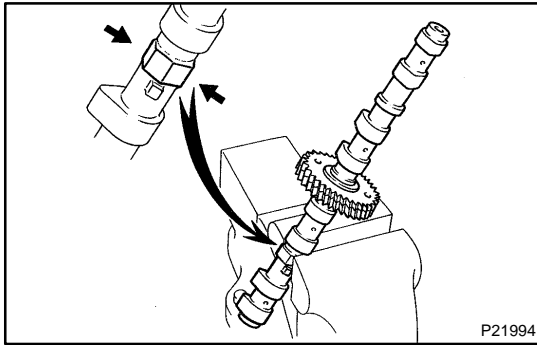
HINT:

Attach the pins on the gears to the gear spring ends.

- (3) Wave washer



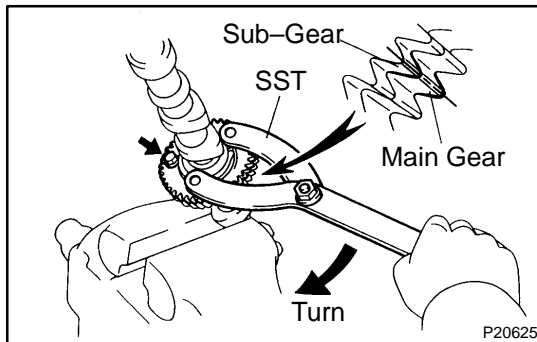
- (b) Using snap ring pliers, install the snap ring.



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

NOTICE:

Be careful not to damage the camshaft.

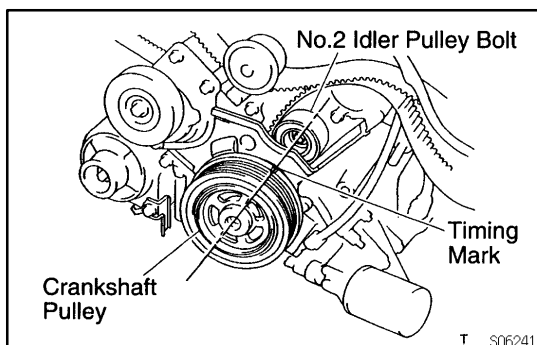


- (d) Using SST, align the holes of the camshaft main gear and sub-gear by turning camshaft sub-gear counterclockwise, and temporarily install a service bolt.
SST 09960-10010 (09962-01000, 09963-00500)
- (e) Align the gear teeth of the main gear and sub-gear, and tighten the service bolt.

6. INSTALL CAMSHAFTS

NOTICE:

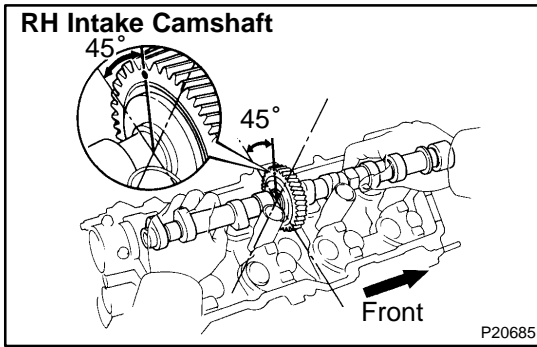
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



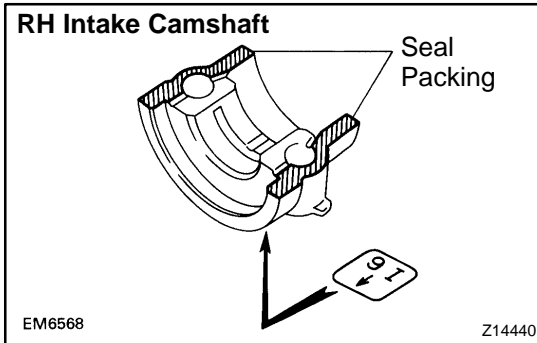
- (a) Set the crankshaft pulley position.
Turn the crankshaft pulley clockwise or counterclockwise, and put the timing mark of the crankshaft pulley in line with the centers of the crankshaft pulley bolt and the idler pulley bolt.

NOTICE:

Having the crankshaft pulley 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 pulley at the correct angle.

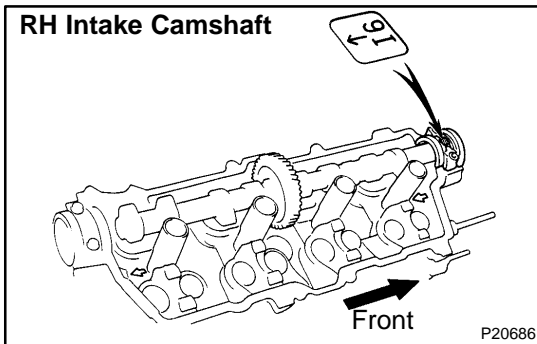


- (b) Install the RH intake camshaft.
- (1) Apply MP grease to the thrust portion of the intake camshaft.
 - (2) Place the intake camshaft at 45° angle of the timing mark (1 dot mark) on the cylinder head.



- (3) Remove any old packing (FIPG) material.
- (4) Apply seal packing to the bearing cap (mark "I6") as shown.

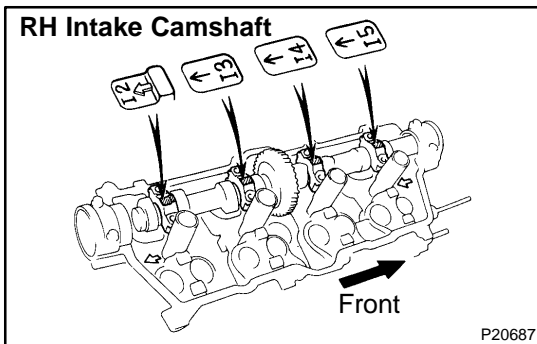
Seal packing: Part No. 08826-00080 or equivalent



- (5) Install the front bearing cap (mark "I6") with the arrow mark facing rearward.

HINT:

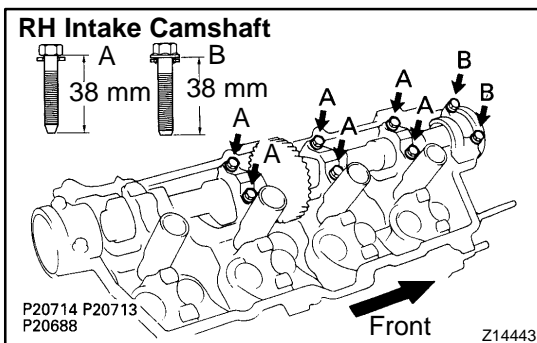
- Installing the front bearing cap will determine the thrust portion of the camshaft.
- Align the allow marks at the front and rear of the cylinder head with the mark on the bearing cap.



- (6) Install the other bearing cap in the sequence shown with the arrow mark facing rearward.

HINT:

Align the arrow marks at the front and rear of the cylinder head with the mark on the bearing cap.



- (7) Apply a light coat of engine oil on the threads and under the heads (A only) of the bearing cap bolts.

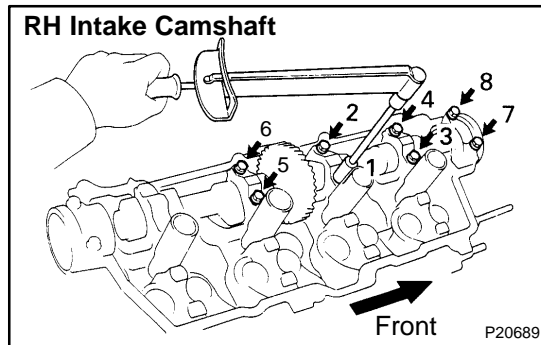
HINT:

Do not apply engine oil under the heads of the bearing cap bolt (B).

- (8) Install a new seal washer to the bearing cap bolt (B). Install the 8 bearing cap bolts as shown.

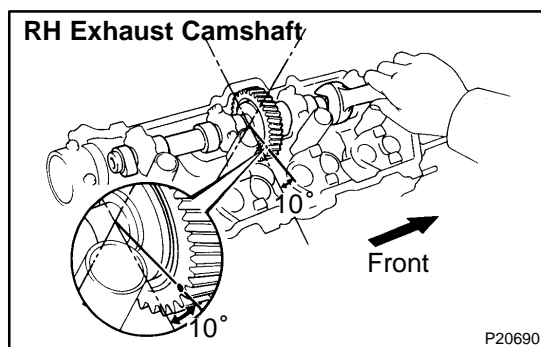
HINT:

- Use bearing cap bolts 38 mm (1.50 in.) in length. The bolts are black (A) or silver (B) in color. Install the 2 silver bolts to the front bearing cap. Install the 6 black bolts to the other positions.
- After installing the oil feed pipe, install the 2 bolts to rear bearing cap as directed in step B (i).



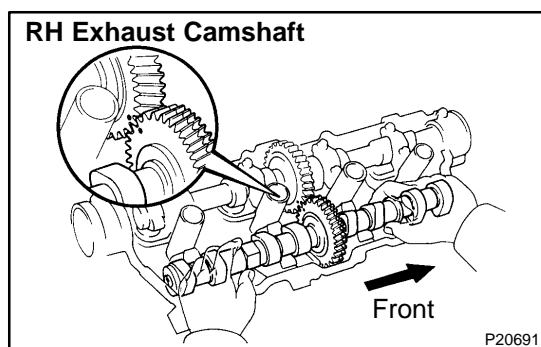
- (9) Uniformly tighten the 8 bearing cap bolts in several passes, in the sequence shown.

Torque: 16 N·m (160 kgf-cm, 12 ft-lbf)

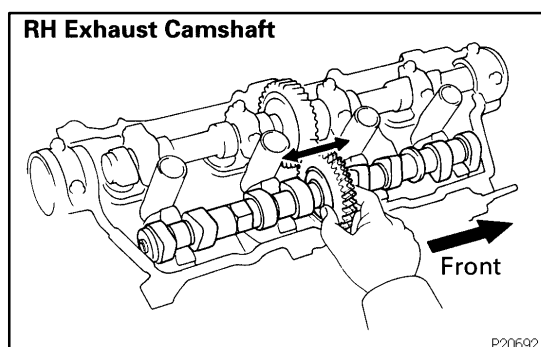


- (c) Install the RH exhaust camshaft.

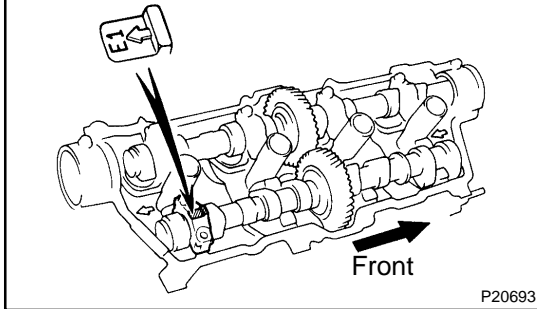
- (1) Set the timing mark (1 dot mark) of the camshaft drive gear at 10° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench.



- (2) Apply MP grease to the thrust portion of the exhaust camshaft.
- (3) Align the timing marks (1 dot mark) of the camshaft drive and driven gears.
- (4) Place the exhaust camshaft on the cylinder head.



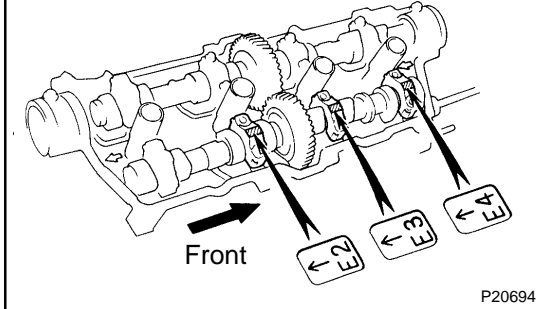
- (5) Check that the exhaust camshaft moves smoothly in the thrust direction.

RH Exhaust Camshaft

- (6) Install the rear bearing cap (mark "E1") with the arrow mark facing rearward.

HINT:

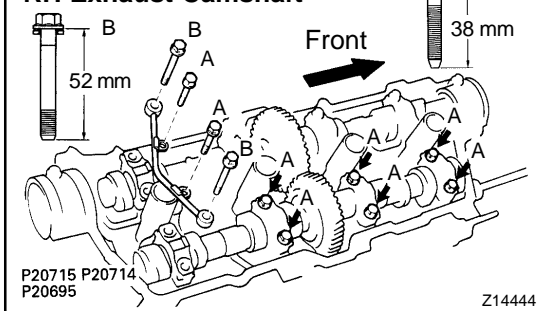
- Installing the rear bearing cap will determine the thrust portion of the camshaft.
- Align the arrow marks at the front and rear of the cylinder head with the mark on the bearing cap.

RH Exhaust Camshaft

- (7) Install the other bearing cap in the sequence shown with the arrow mark facing rearward.

HINT:

Align the arrow marks at the front and rear of the cylinder head with the mark on the bearing cap.

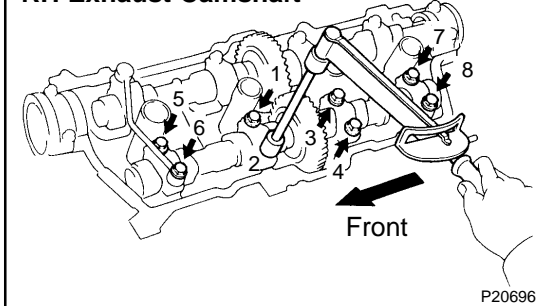
RH Exhaust Camshaft

- (8) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

- (9) Install the oil feed pipe and 10 bolts.

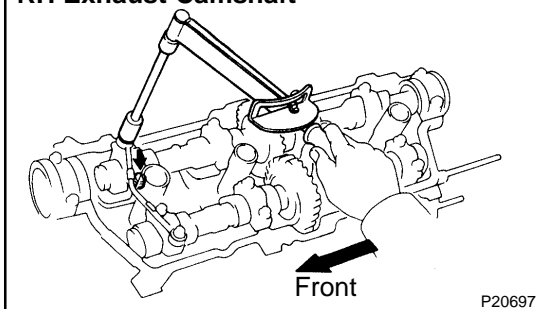
HINT:

Use bearing cap bolts 38 mm (1.50 in.) and 52 mm (2.05 in.) in length. Use black colored 38 mm (1.50 in.) bolts. Install the 2 (52 mm (2.05 in.)) bolts in outside positions of the oil feed pipe. Install the 8 (38 mm (1.50 in.)) bolts in the other positions.

RH Exhaust Camshaft

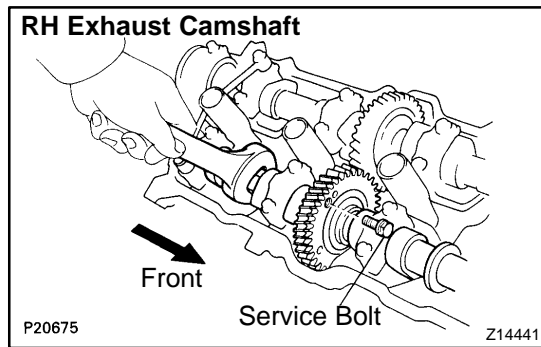
- (10) Uniformly tighten the 8 bolts on the bearing caps of the exhaust camshaft in several passes, in the sequence shown.

Torque: 16 N·m (160 kgf-cm, 12 ft-lbf)

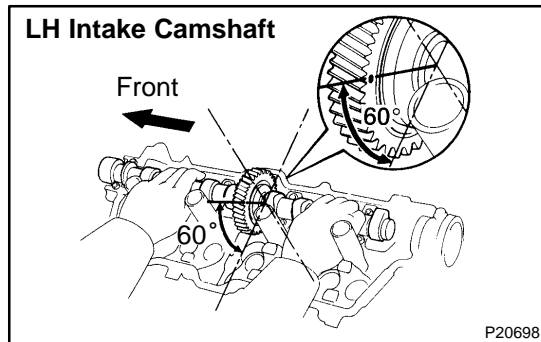
RH Exhaust Camshaft

- (11) Alternately tighten the 2 bolts on the rear bearing caps of the intake camshaft in several passes.

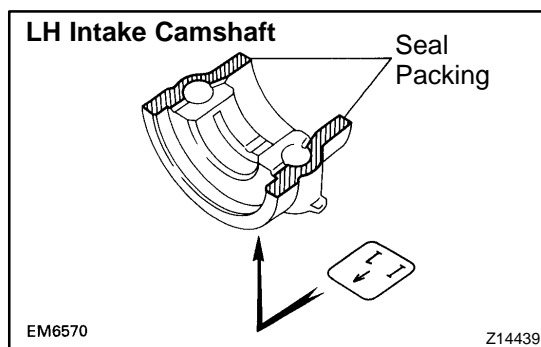
Torque: 16 N·m (160 kgf-cm, 12 ft-lbf)



- (12) Boring the service bolt installed in the driven sub-gear upward by turning the hexagon wrench head portion of the camshaft with a wrench.
- (13) Remove a service bolt.

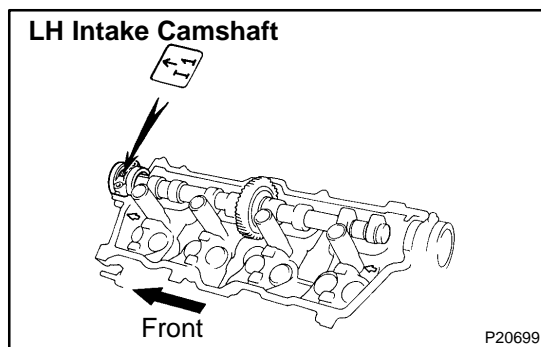


- (d) Install the LH intake camshaft.
 - (1) Apply MP grease to the thrust portion of the intake camshaft.
 - (2) Place the intake camshaft at 60° angle of the timing mark (1 dot mark) on the cylinder head.



- (3) Remove any old packing (FIPG) material.
- (4) Apply seal packing to the bearing cap (mark "I1") as shown.

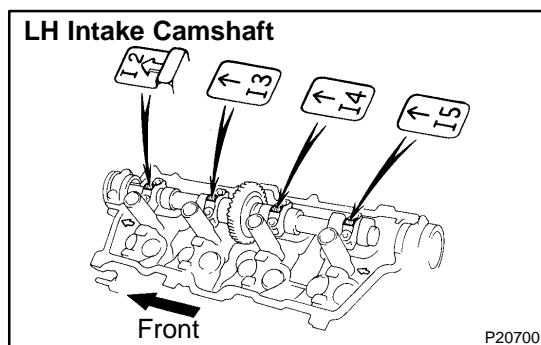
Seal packing: Part No. 08826-00080 or equivalent



- (5) Install the front bearing cap (mark "I1") with the arrow mark facing forward.

HINT:

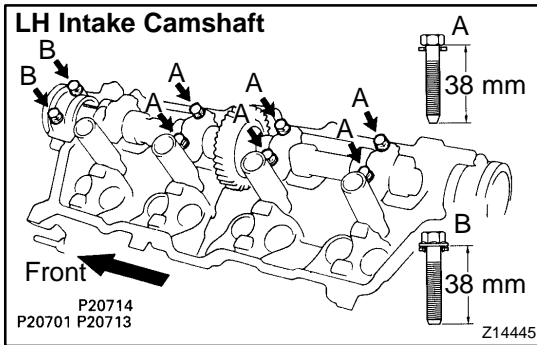
- Installing the front bearing cap will determine the thrust portion of the camshaft.
- Align the arrow marks at the front and rear of the cylinder head with the mark on the bearing cap.



- (6) Install the other bearing cap in the sequence shown with the arrow mark facing forward.

HINT:

Align the arrow marks at the front and rear of the cylinder head with the mark on the bearing cap.



- (7) Apply a light coat of engine oil on the threads and under the heads (A only) of the bearing cap bolts.

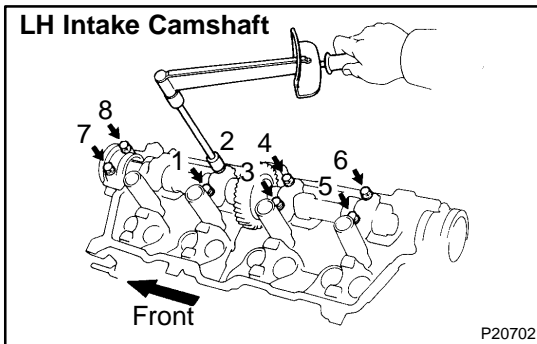
HINT:

Do not apply engine oil under the heads of the bearing cap bolt (B).

- (8) Install a new seal washer to the bearing cap bolt (B). Install the eight bearing cap bolts as shown.

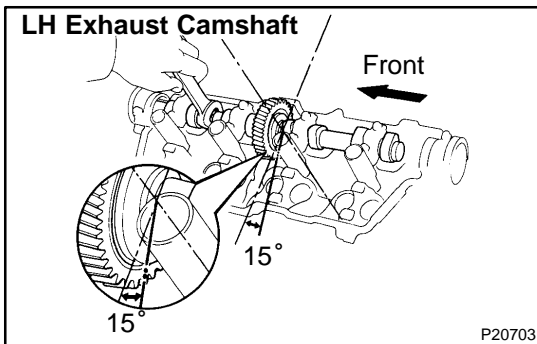
HINT:

- Use bearing cap bolts 38 mm (1.50 in.) in length. The bolts are black (A) or silver (B) in color. Install the 2 silver bolts to the front bearing cap. Install the 6 black bolts to the other positions.
- After installing the oil feed pipe, install the 2 bolts to the bearing cap second from the front as directed in step B (i).



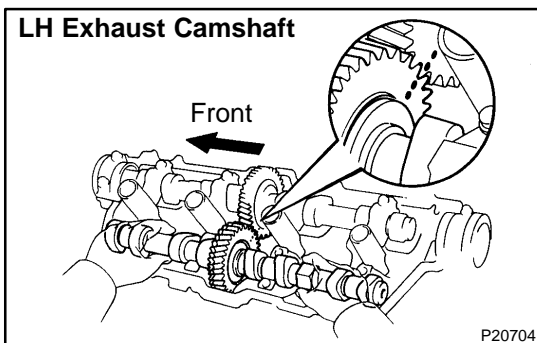
- (9) Uniformly tighten the 8 bearing cap bolts in several passes, in the sequence shown.

Torque: 16 N·m (160 kgf-cm, 12 ft-lbf)

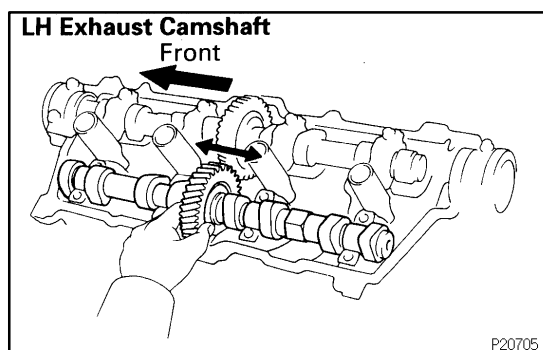


- (e) Install the LH exhaust camshaft.

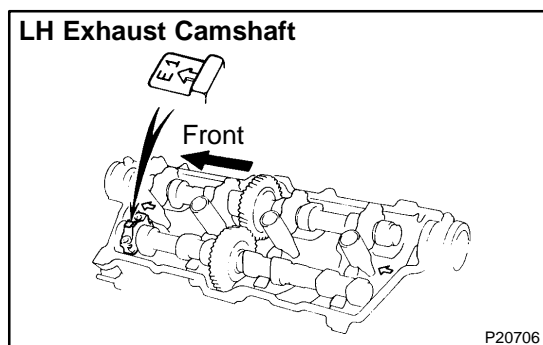
- (1) Set the timing mark (2 dot marks) of the camshaft drive gear at 15° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench.



- (2) Apply MP grease to the thrust portion of the exhaust camshaft.
- (3) Align the timing marks (2 dot marks) of the camshaft drive and driven gears.
- (4) Place the exhaust camshaft on the cylinder head.



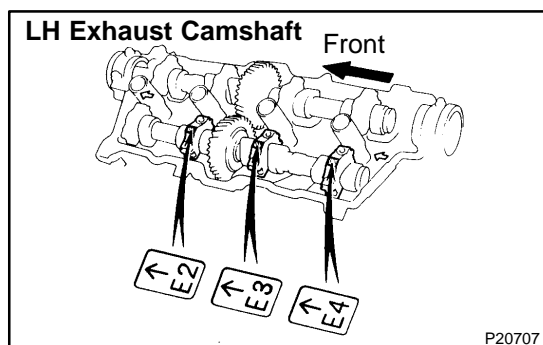
- (5) Check that the exhaust camshaft moves smoothly in the thrust direction.



- (6) Install the front bearing cap (mark "E1") with the arrow mark facing forward.

HINT:

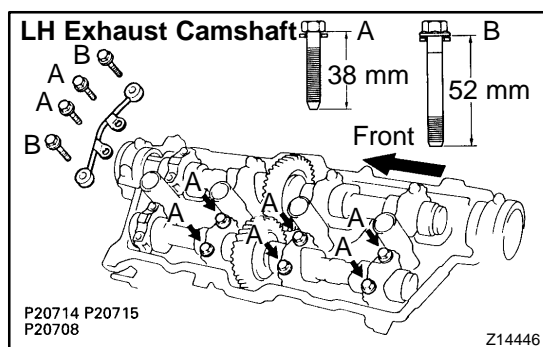
- Installing the front bearing cap will determine the thrust portion of the camshaft.
- Align the arrow marks at the front and rear of the cylinder head with the mark on the bearing cap.



- (7) Install the other bearing cap in the sequence shown with the arrow mark facing forward.

HINT:

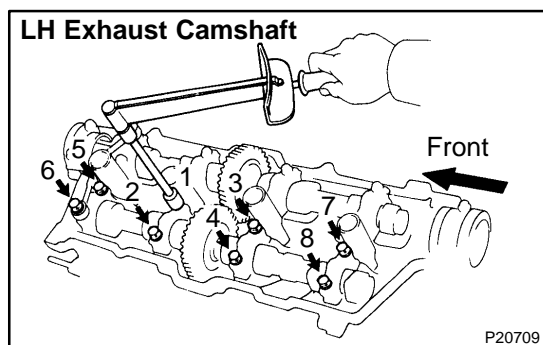
Align the arrow marks at the front and rear of the cylinder head with the mark on the bearing cap.



- (8) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
- (9) Install the oil feed pipe and 10 bolts.

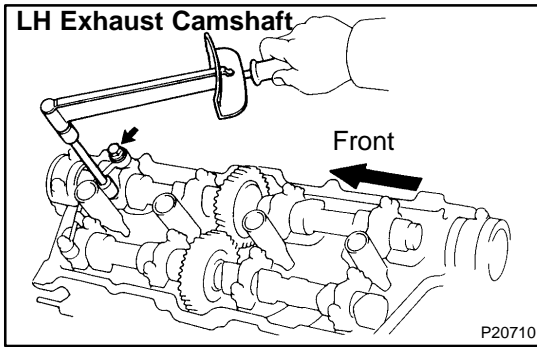
HINT:

Use bearing cap bolts 38 mm (1.50 in.) and 52 mm (2.05 in.) in length. Use black colored 38 mm (1.50 in.) bolts. Install the 2 (52 mm (2.05 in.)) bolts in outside positions of the oil feed pipe. Install the 8 (38 mm (1.50 in.)) bolts in the other positions.



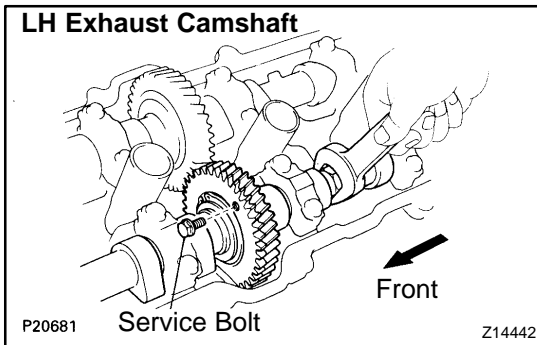
- (10) Uniformly tighten the 8 bolts on the bearing caps of the exhaust camshaft in several passes, in the sequence shown.

Torque: 16 N·m (160 kgf-cm, 12 ft-lbf)



- (11) Alternately tighten the 2 bolts on the bearing cap of the intake camshaft second from the front in several passes.

Torque: 16 N·m (160 kgf-cm, 12 ft-lbf)

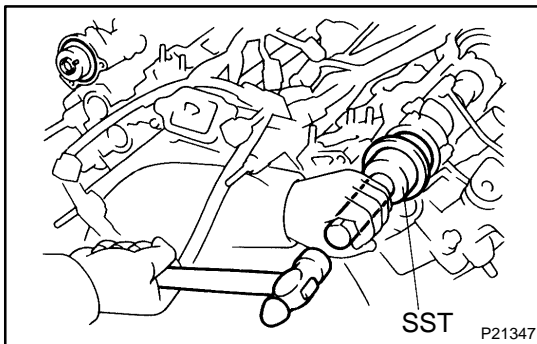


- (12) Boring a service bolt installed in the driven sub-gear upward by turning the hexagon wrench head portion of the camshaft with a wrench.

- (13) Remove a service bolt.

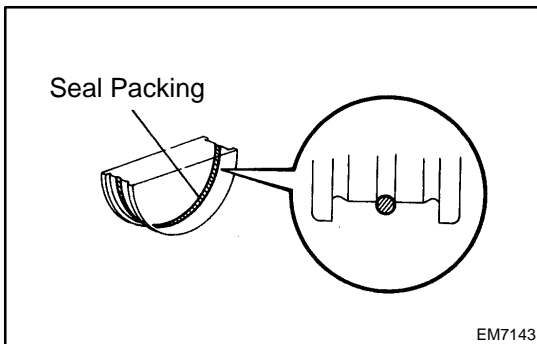
7. CHECK AND ADJUST VALVE CLEARANCE (See page EM-4)

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



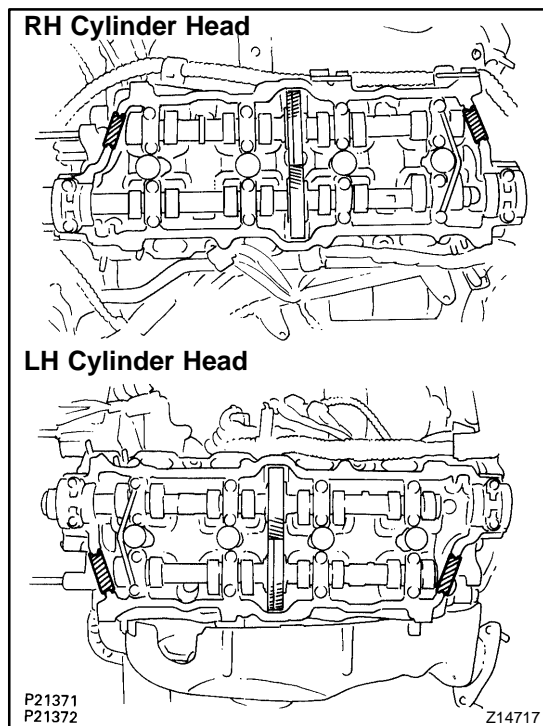
8. INSTALL CAMSHAFT OIL SEALS

- Apply MP grease to a new oil seal lip.
- Using SST and a hammer, tap in the 2 oil seals.
SST 09223-46011

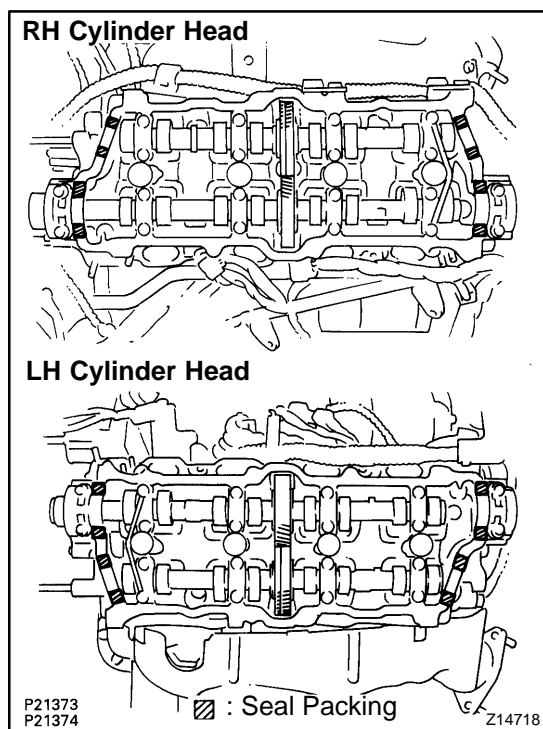


9. INSTALL SEMI-CIRCULAR PLUGS

- Remove any old packing (FIPG) material.
- Apply seal packing to the semi-circular plug grooves.
Seal packing: Part No. 08826-00080 or equivalent



- (c) Install the 4 semi-circular plugs to the cylinder heads.



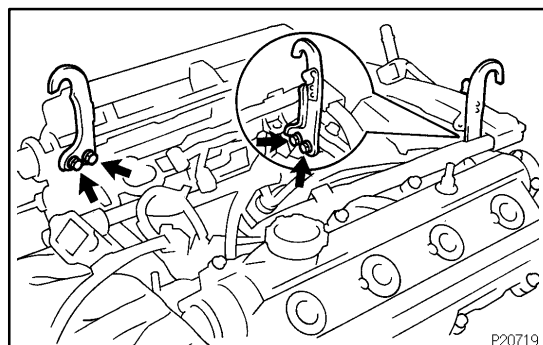
10. INSTALL CYLINDER HEAD COVER

- (a) Remove any old packing (FIPG) material.
(b) Apply seal packing to the cylinder heads 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 seal washer to the bolt.
(e) Install the cylinder head cover with the 8 bolts. Uniformly tighten the bolts in several passes. Install the 2 cylinder head covers.

Torque: 6.0 N·m (60 kgf-cm, 53 in.-lbf)



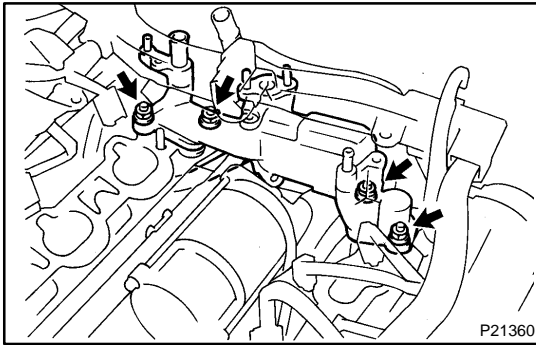
11. INSTALL ENGINE HANGERS

Install the 2 engine hangers each with 2 bolts.

Torque: 37 N·m (380 kgf-cm, 27 ft-lbf)

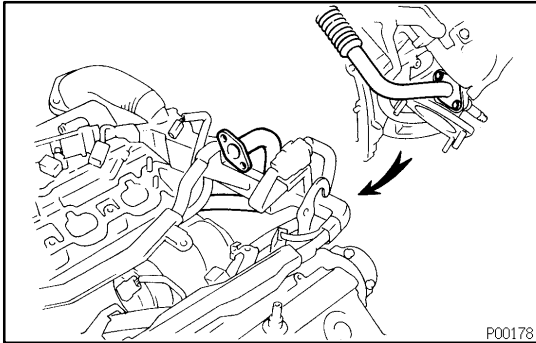
12. INSTALL OIL DIPSTICK AND GUIDE FOR ENGINE (See page [LU-16](#))

13. INSTALL OIL DIPSTICK AND GUIDE FOR A/T (See page [EM-95](#))



- 14. INSTALL REAR WATER BYPASS JOINT AND NO. 1 EGR PIPE ASSEMBLY**
- Install 2 new gaskets to the cylinder head.
 - Install a new gasket to the RH exhaust manifold.
 - Attach the water bypass joint and EGR pipe assembly to the cylinder heads and RH exhaust manifold.
 - Install the 4 nuts holding the water bypass joint to the cylinder heads. Alternately tighten the nuts.

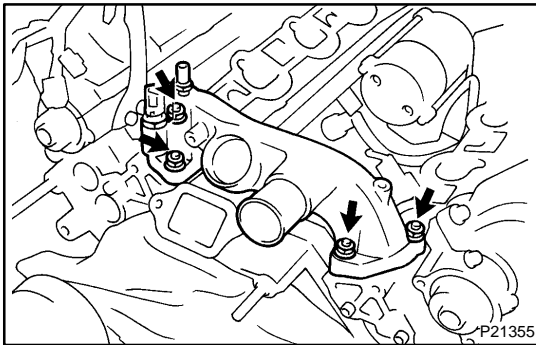
Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)



- Install 2 new nuts holding the EGR pipe to the RH exhaust manifold.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

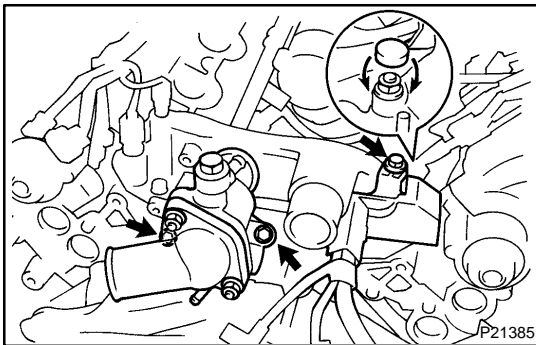
- Connect the heater hose to the water bypass joint.
- Install the RH heat insulator (for the RH front TWC) with the 2 bolts.
- Install the RH heat insulator (for the RH front side of the front exhaust pipe) with the 2 bolts and nut.



15. INSTALL FRONT WATER BYPASS JOINT

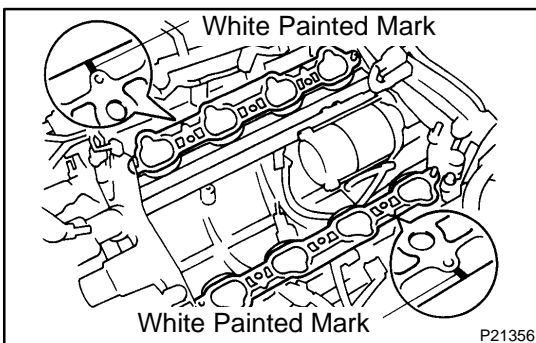
- Install 2 new gaskets and the water bypass joint with the 4 nuts. Alternately tighten the nuts.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)



- Install the engine wire protector with the bolt.
- Attach the engine wire protector to the water bypass joint nut.
- Connect these connectors:
 - ECT sensor connector
 - ECT sender gauge connector

16. INSTALL WATER INLET AND INLET HOUSING ASSEMBLY (See page CO-11)

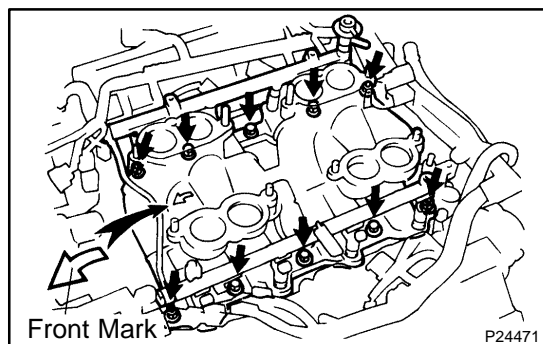


17. INSTALL INTAKE MANIFOLD ASSEMBLY

- Place 2 new gaskets on the cylinder heads with white painted mark facing upward.

NOTICE:

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



- (b) Place the intake manifold on the cylinder heads with the arrow mark facing forward.

NOTICE:

Be careful of the installation direction.

- (c) Install and uniformly tighten the 6 bolts and 4 nuts in several passes.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

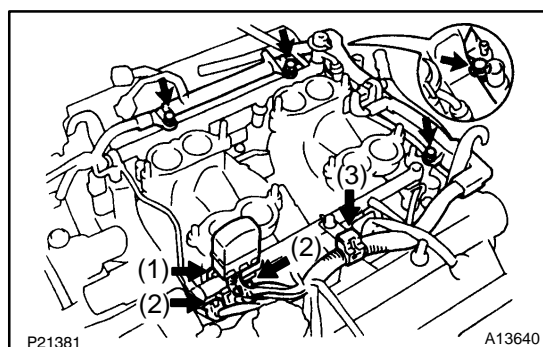
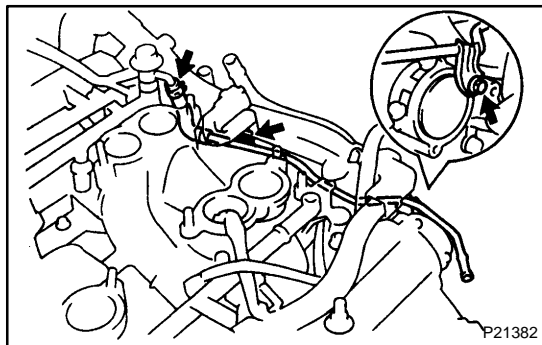
HINT:

Use a bolt 30 mm (1.18 in.) in length.

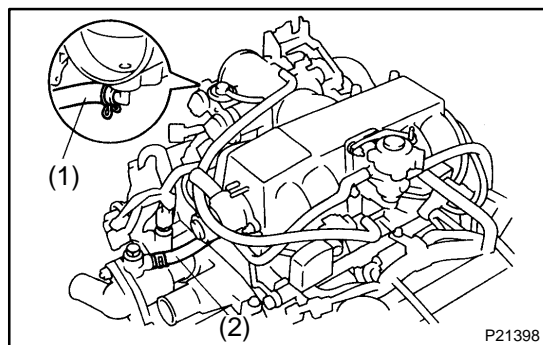
- (d) Connect the 8 injector connectors.

18. INSTALL FUEL RETURN PIPE

- (a) Install the fuel return pipe with the 2 bolts.
(b) Connect the fuel hose to the fuel pressure regulator.

**19. INSTALL ENGINE WIRE TO DELIVERY PIPE AND REAR WATER BYPASS JOINT**

- (a) Install these connectors:
- (1) DLC1 to connector bracket on LH delivery pipe
 - (2) 2 engine wire connectors to connector bracket on LH delivery pipe
 - (3) Engine wire clamp to wire bracket on LH delivery pipe
- (b) Install the engine wire protector to the RH delivery pipe with the 2 bolts.
(c) Install the engine wire protector to the rear water bypass joint with the 2 bolts.
(d) Install the A/T throttle cable to the clamps on the engine wire protector and engine hanger.

20. CONNECT FUEL RETURN HOSE TO FUEL RETURN PIPE**21. CONNECT FUEL INLET HOSE TO LH DELIVERY PIPE**
(See page [SF-26](#))**22. INSTALL AIR INTAKE CHAMBER ASSEMBLY**

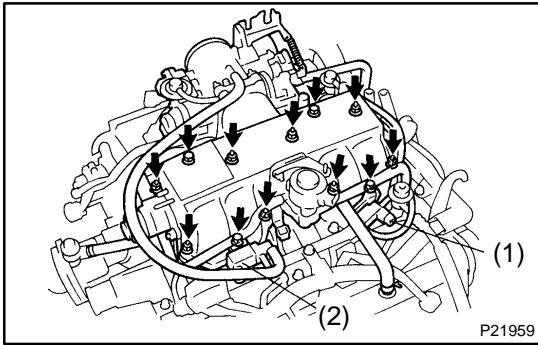
- (a) Place 4 new gaskets on the intake manifold.

HINT:

Gaskets can only be used twice before being replaced.

- (b) Connect these hoses, and place the air intake chamber assembly on the intake manifold:

- (1) PCV hose (from RH cylinder head) to throttle body
- (2) Water bypass hose (from IAC valve) to water inlet housing



- (c) Install the air intake chamber and these parts with the 4 bolts and 8 nuts: Uniformly tighten the bolts and nuts several passes.

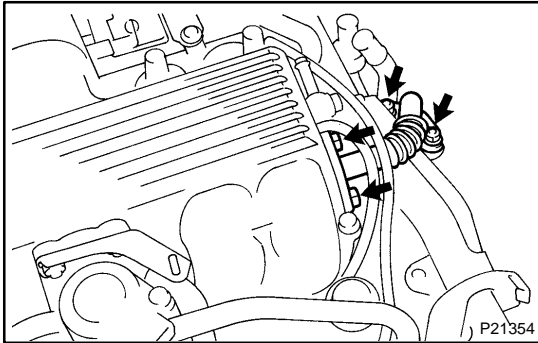
(1) VSV for fuel pressure control

(2) VSV for EVAP

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

HINT:

Use bolt 40 mm (1.57 in.) in length.



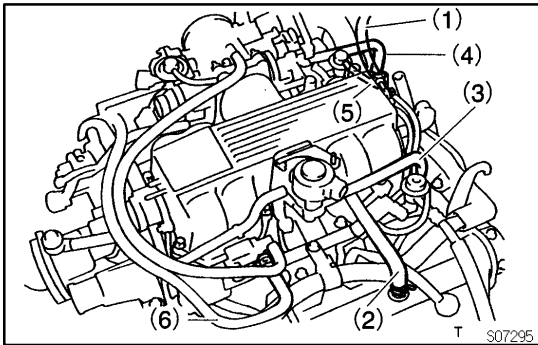
- (d) Install 2 new gaskets and No.2 EGR pipe with the 2 bolts and 2 nuts.

Torque: 22.5 N·m (230 kgf·cm, 17 ft·lbf)

HINT:

Use bolt 20 mm (0.79 in.) in length.

- (e) Connect the heater hose to the water bypass pipe.



- (f) Connect these hoses:

- (1) Brake booster vacuum hose to union on air intake chamber
- (2) PCV hose to PCV valve on LH cylinder head
- (3) Water bypass hose (from EGR valve) to rear water bypass joint
- (4) Water bypass hose (from throttle body) to rear water bypass joint
- (5) Vacuum hose (from VSV for fuel pressure control) to fuel pressure regulator
- (6) EVAP hose (from charcoal canister) to VSV for EVAP

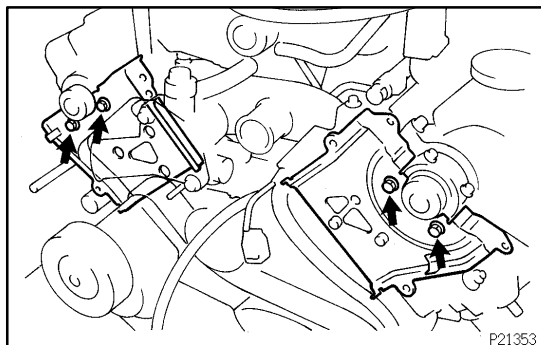
- (g) Connect these connectors:

- Throttle position sensor connector
- w/ TRAC:
Sub-throttle position sensor connector
- w/ TRAC:
Sub-throttle actuator connector
- IAC valve connector
- EGR valve connector
- EGR gas temperature sensor connector
- VSV connector for fuel pressure control
- VSV connector for EVAP

- (h) Install the accelerator bracket with the 2 bolts.

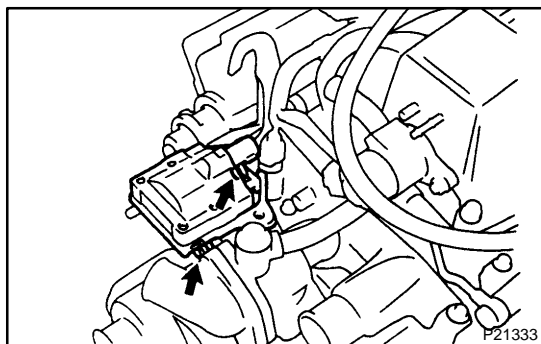
- (i) Connect these cables:

- Accelerator cable
- A/T throttle control cable
- Cruise control actuator cable

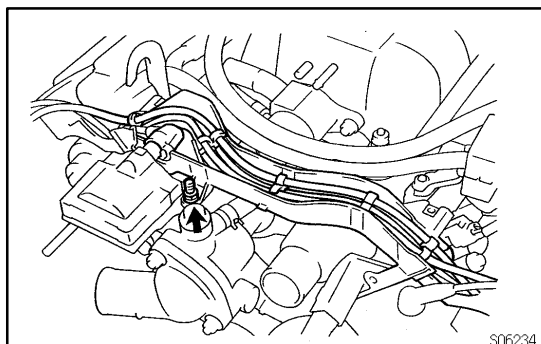
**23. INSTALL TIMING BELT REAR PLATES**

Install the rear plate with the 2 bolts. Install the 2 rear plates.

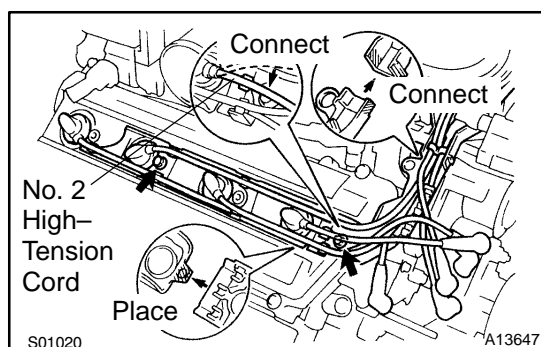
Torque: 7.5 N·m (80 kgf·cm, 66 in.-lbf)

**24. INSTALL NO. 2 IGNITION COIL**

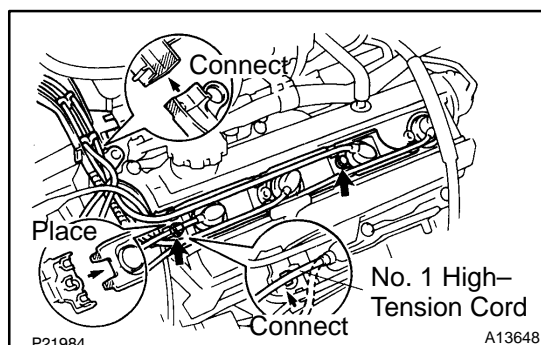
- (a) Install the ignition coil with the 2 bolts.
- (b) Connect the ignition coil connector.

**25. INSTALL HIGH-TENSION CORDS, CORD CLAMPS AND CORD COVER ASSEMBLY**

- (a) Connect the high-tension cords to the spark plugs, distributor caps and No. 2 ignition coil.
- (b) Install the lower high-tension cord cover with the stud bolt.



- (c) Connect the RH front high-tension cord clamp to the lower high-tension cord cover.
- (d) Place the RH front high-tension cord clamp to the RH rear high-tension cord clamp.
- (e) Install the 2 bolts holding the RH high-tension cord clamps to the RH cylinder head cover.
- (f) Connect the No. 2 high-tension cord to the cord clamp on the RH front high-tension cord clamp.



- (g) Connect the LH front high-tension cord clamp to the lower high-tension cord cover.
- (h) Place the LH front high-tension cord clamp to the LH rear high-tension cord clamp.
- (i) Install the 2 bolts holding the LH high-tension cord clamps to the LH cylinder head cover.
- (j) Connect the No. 1 high-tension cord to the cord clamp on the LH front high-tension cord clamp.

26. INSTALL FRONT TWC AND CONNECT FRONT EXHAUST PIPE TO FRONT TWC (See page EC-17)

27. INSTALL PS PUMP

- (a) Install the PS pump (See page [EM-95](#)).
- (b) Connect the PS air hose to the air intake chamber.

28. INSTALL CAMSHAFT TIMING PULLEYS (See page [EM-26](#))**29. CONNECT TIMING BELT TO CAMSHAFT TIMING PULLEYS (See page [EM-26](#))****30. CHECK ENGINE OIL LEVEL**