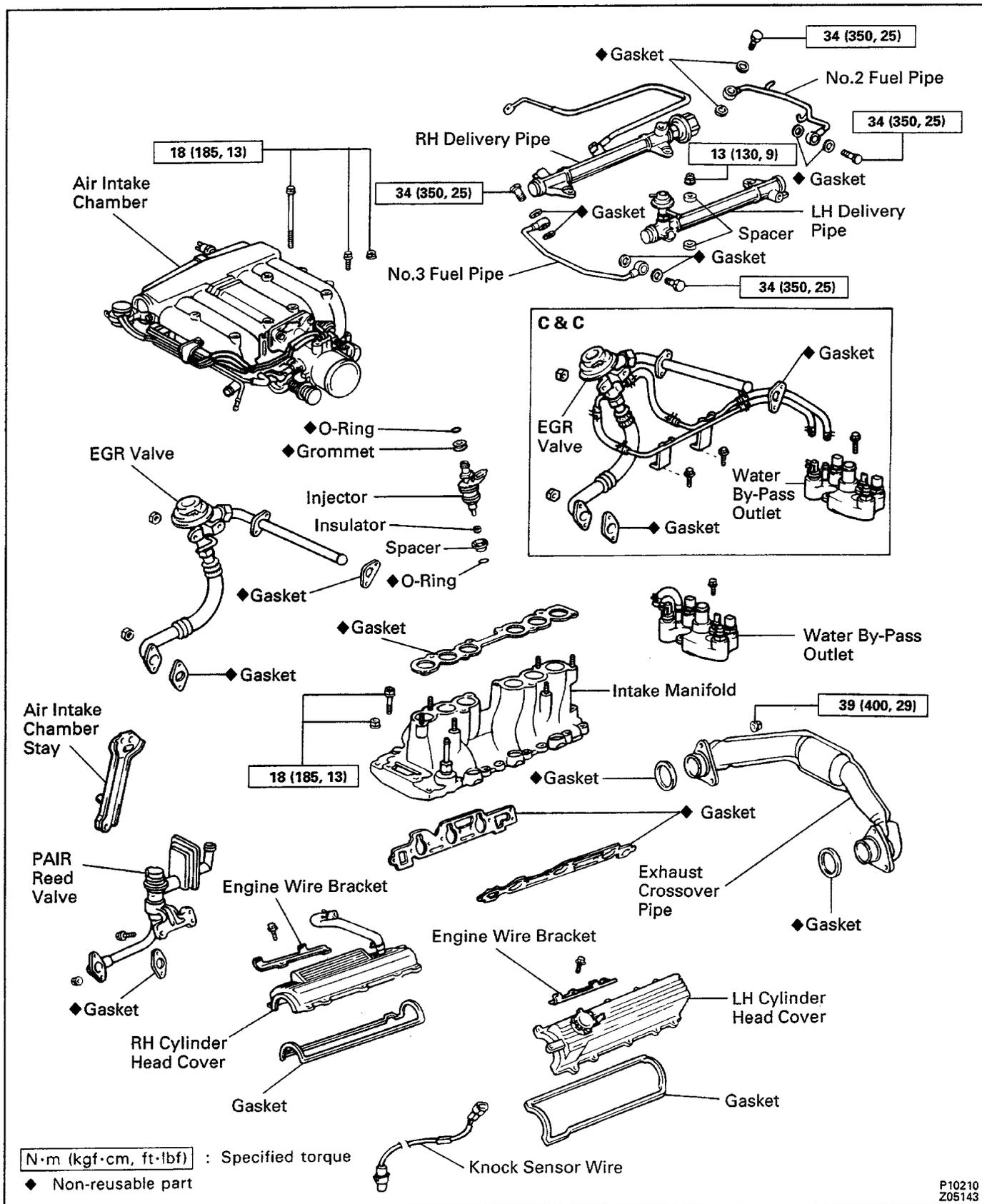
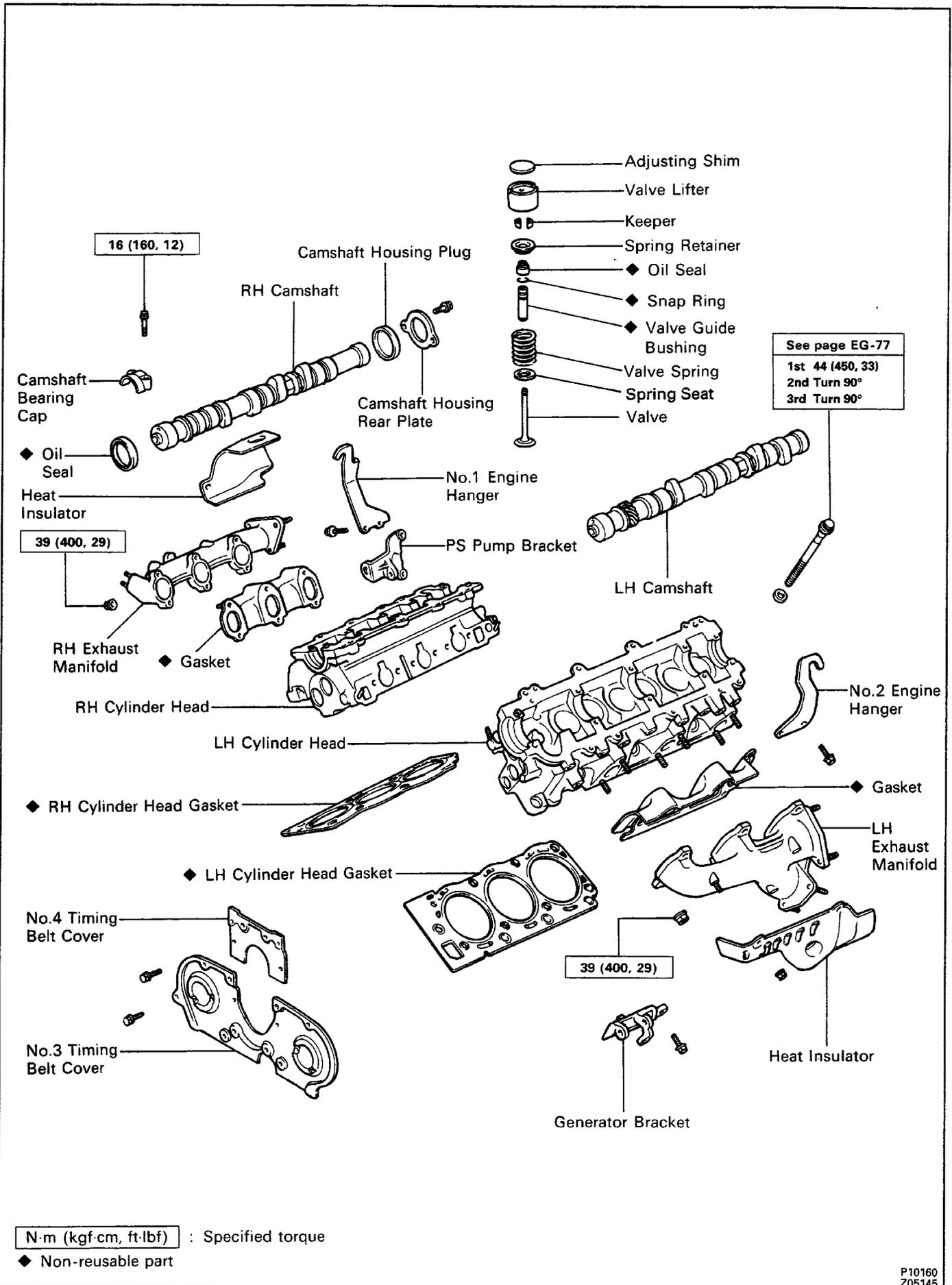


# CYLINDER HEAD COMPONENTS

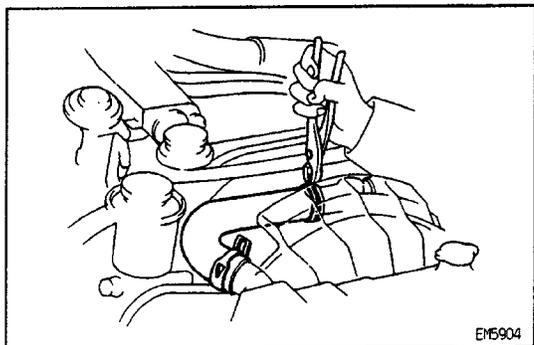
EG1E9-03





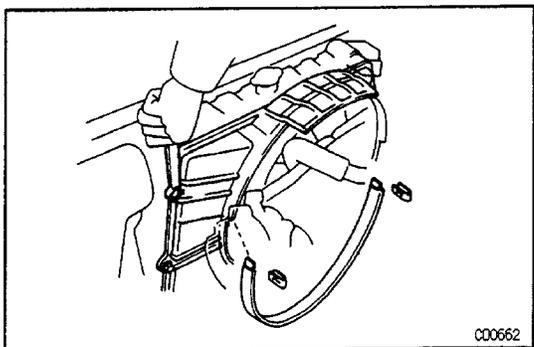
## CYLINDER HEADS REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. REMOVE AIR CLEANER AND HOSE
3. DRAIN ENGINE COOLANT

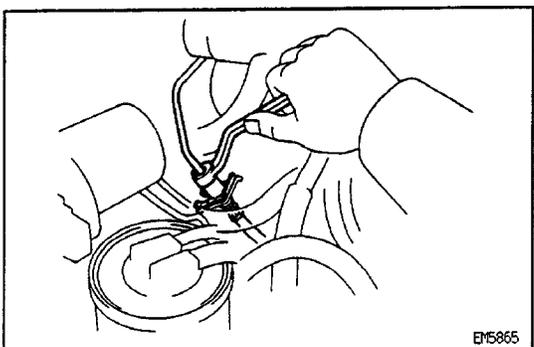


### 4. REMOVE RADIATOR

- (a) Disconnect the reservoir hose.
- (b) (A/T only)  
Disconnect the oil cooler hoses.
- (c) Remove the radiator hoses.

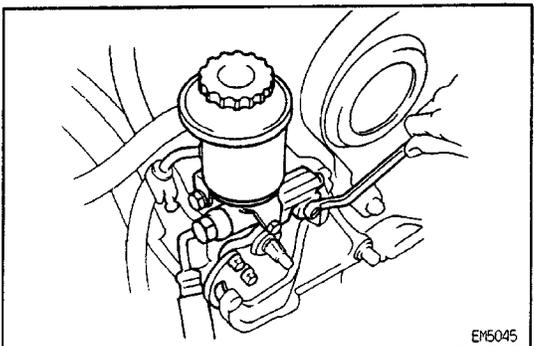


- (d) Remove the two clips and No.2 fan shroud.
- (e) Remove the four bolts and No.1 fan shroud.
- (f) Remove the four bolts and radiator.

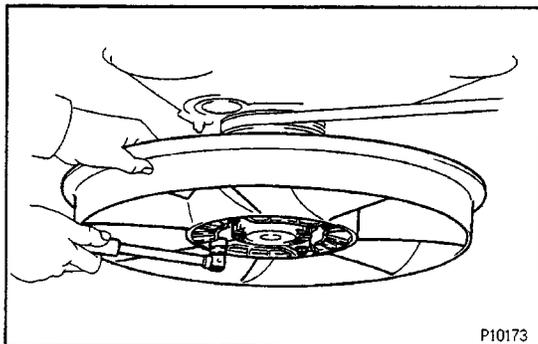


### 5. (M/T only)

DISCONNECT CLUTCH RELEASE CYLINDER HOSE



6. REMOVE PS DRIVE BELT AND PUMP PULLEY
7. DISCONNECT PS PUMP FROM ENGINE
8. REMOVE A/C DRIVE BELT

**9. REMOVE COOLING FAN**

Remove the four nuts and cooling fan.

**10. REMOVE GENERATOR DRIVE BELT****11. DISCONNECT STRAP, WIRES, CONNECTORS.  
HOSES AND CABLES**

(a) Disconnect the following strap, wires and connectors:

- Ground strap from LH fender apron
- Generator connector and wire
- Igniter connector
- Oil pressure sender gauge connector
- Ground strap from engine rear side
- ECM connectors
- VSV connectors
- A/C compressor connector
- (M/T only)  
Starter relay connector
- Solenoid resistor connector
- Data link connector 1  
(w/ ADD)

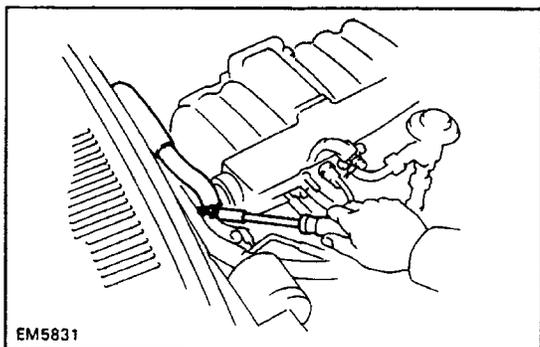
ADD switch connector

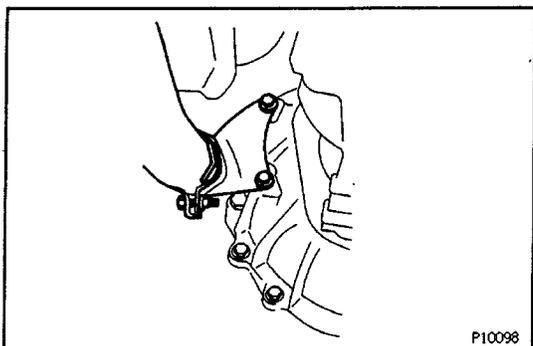
(b) Disconnect the following hoses:

- PS air hoses from gas filter and air pipe
- Brake booster hose
- (w/ Cruise Control System)  
Cruise control vacuum hose
- Charcoal canister hose from canister
- VSV vacuum hoses

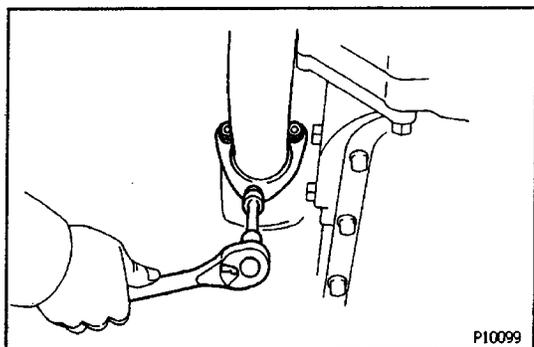
(c) Disconnect the following cables:

- Accelerator cable
- (A/T only)  
Throttle cable
- (w/ Cruise Control System)  
Cruise control cable

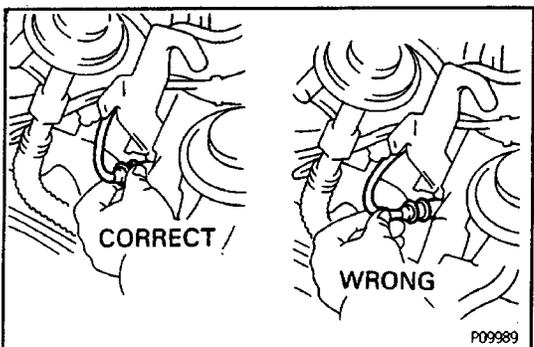
**12. DISCONNECT HEATER HOSES****13. DISCONNECT FUEL INLET AND OUTLET HOSES**

**14. REMOVE FRONT EXHAUST PIPE**

- (a) Disconnect the heated oxygen sensor connector.
- (b) Loosen the pipe clamp bolt. w
- (c) Remove the two, bolts and pipe bracket.



- (d) Remove the three nuts, and disconnect the exhaust pipe from the exhaust manifold. Remove the gasket.
- (e) Remove the two bolts, joint retainer, exhaust pipe and gasket from the catalytic converter.

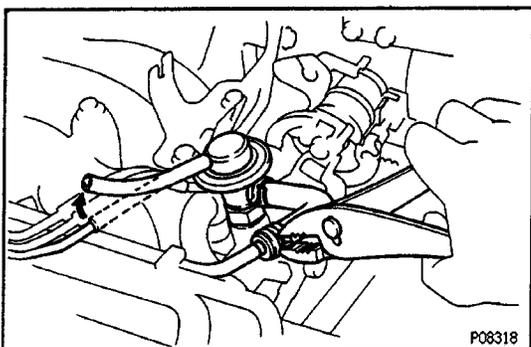
**15. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS**

Disconnect the high - tension cords at the rubber boot. Do not pull on the cords.

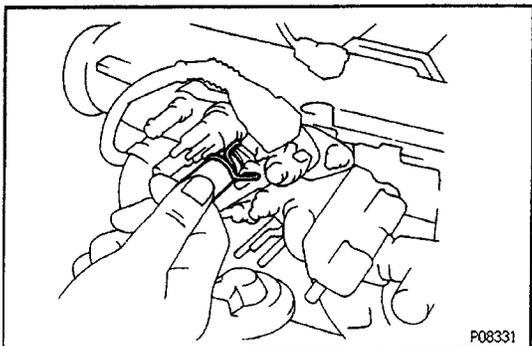
**NOTICE:** Pulling on or bending the cords may damage the conductor inside.

**16. REMOVE DISTRIBUTOR****17. REMOVE TIMING BELT**

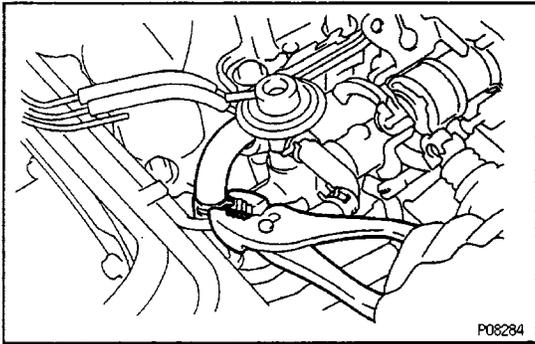
(See steps 5 to 7, 13 to 20 and 25 on pages [EG2-33](#) to 36 and 38)

**18. REMOVE AIR INTAKE CHAMBER**

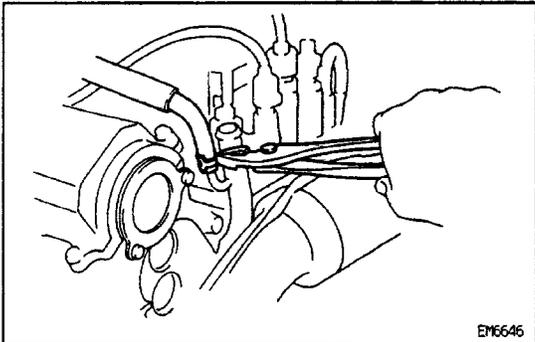
- (a) Disconnect the throttle position sensor connector.
- (b) Disconnect the charcoal canister vacuum hose from the throttle body.
- (c) Disconnect the vacuum and fuel hoses from the pressure regulator.



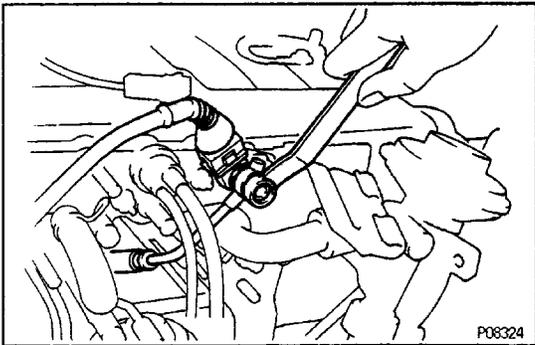
- (d) Disconnect the PCV hose from the union.



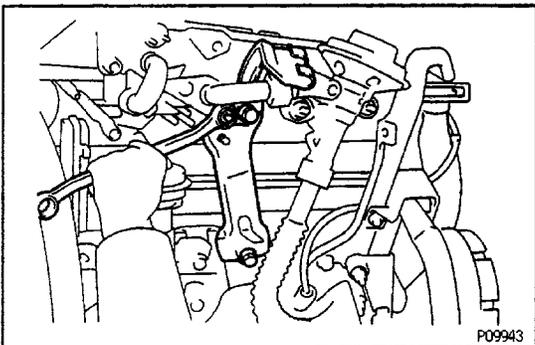
- (e) Disconnect the No.4 water by-pass hose from the union of intake manifold.



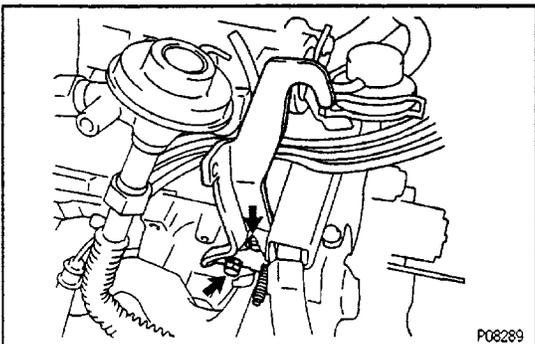
- (f) Remove the No.5 water by-pass hose from the water by-pass pipe.



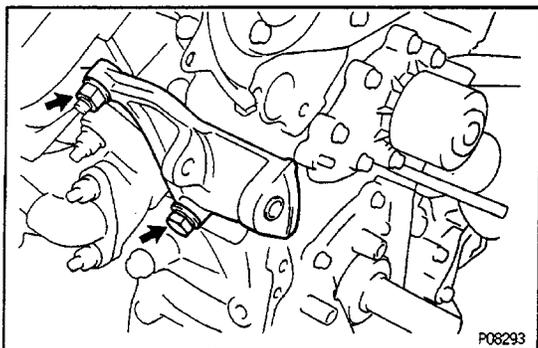
- (g) Disconnect the cold start injector connector.  
 (h) Disconnect the vacuum hose from the gas filter.  
 (i) Remove the union bolt, two gaskets and cold start injector tube.  
 (j) (Calif. and C & C)  
 Disconnect the EGR gas temperature sensor connector.  
 (k) Disconnect the EGR vacuum hoses from the air pipe and EGR vacuum modulator.



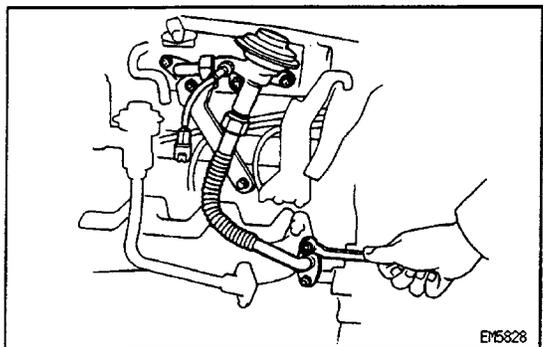
- (i) Remove the nut, two bolts, intake chamber stay and throttle cable bracket.



- (m) Remove the two bolts and No. 1 engine hanger.



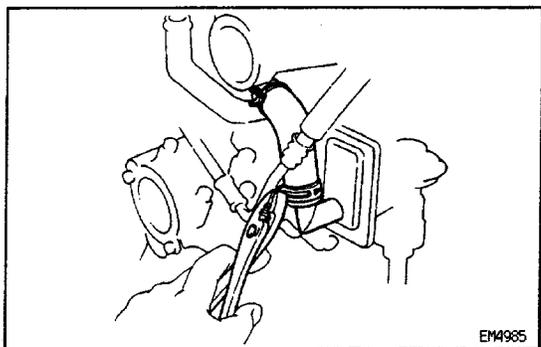
(n) Remove the nut, bolt and PS pump bracket.



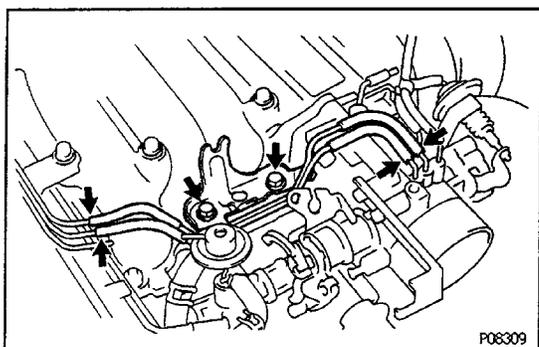
(o) (C & C only)

Disconnect the two water by-pass hoses from the EGR valve.

(p) Remove the five nuts, the EGR valve and pipes assembly and two gaskets.

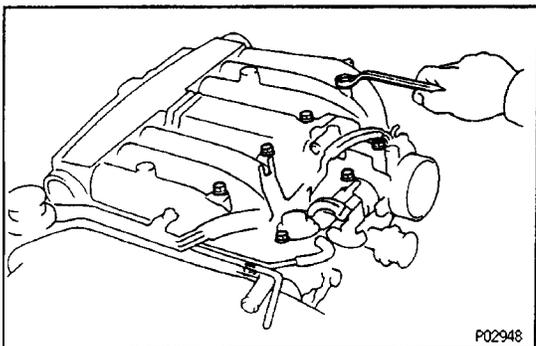


(q) Disconnect the No.1 air hose from the PAIR reed valve.



(r) Disconnect the four vacuum hoses from the air pipes.

(s) Remove the two bolts and accelerator cable bracket.



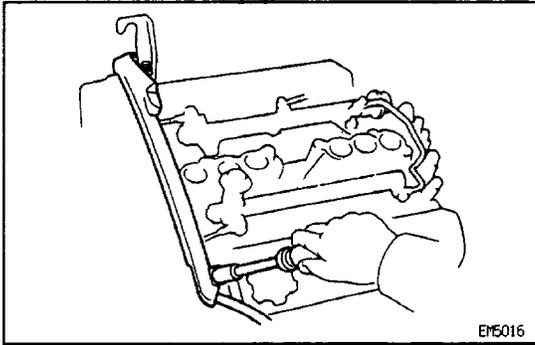
(t) Remove the six bolts, two nuts, intake chamber and gasket.

**19. REMOVE ENGINE WIRE**

(a) Disconnect the following:

- Knock sensor connector
- Cold start injector time switch connector
- ECT sensor connector
- ECT sender gauge connector
- No.1 ECT switch connector
- RH ground strap from No.3 camshaft bearing cap
- Injector connectors

(b) Remove the two bolts and engine wire.

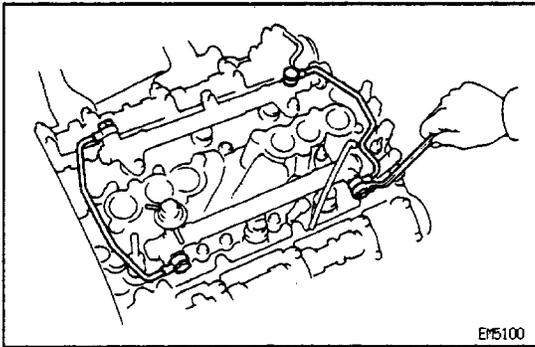


EM5016

**20. REMOVE NO.2 AND NO.3 FUEL PIPES**

(a) Disconnect the vacuum hose from the TVV.

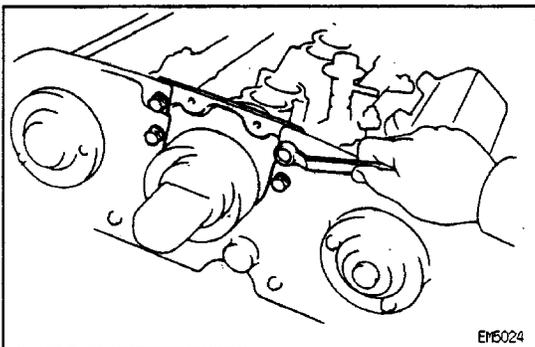
(b) Remove the four union bolts, eight gaskets, No.2 and No.3 fuel pipes.



EM5100

**21. REMOVE NO.4 TIMING BELT COVER**

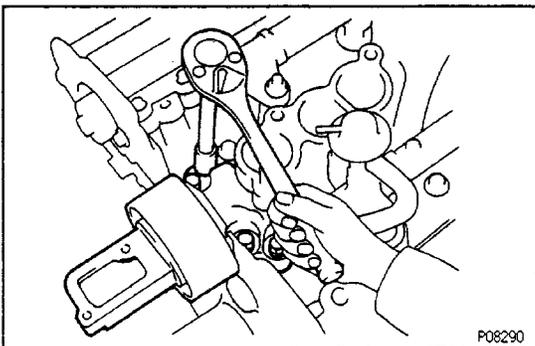
Remove the four bolts and timing belt cover.



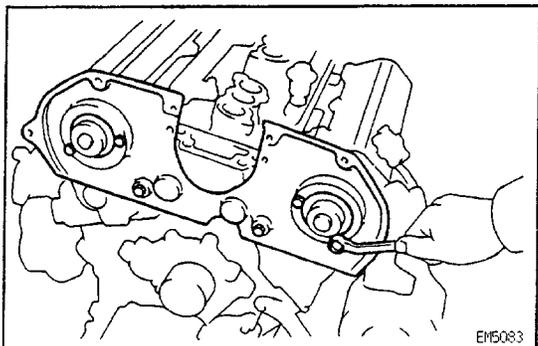
EM5024

**22. REMOVE NO.2 IDLER PULLEY**

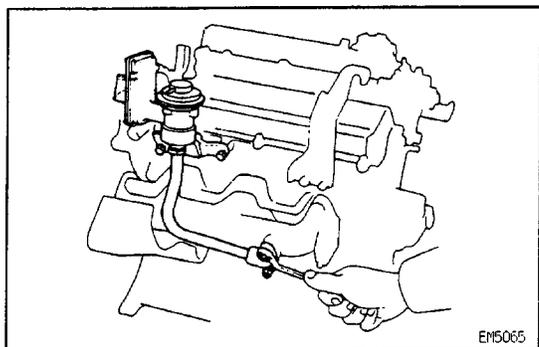
Remove the four bolts and idler pulley.



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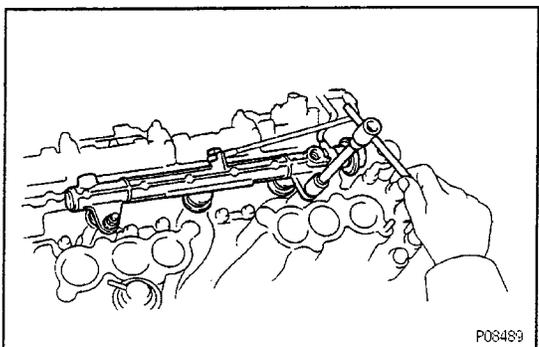
- 23. REMOVE No.3 TIMING BELT COVER**  
Remove the six bolts and timing belt cover.



- 24. REMOVE VSV BRACKET AND VSV FROM PAIR REED VALVE**

- 25. REMOVE PAIR REED VALVE AND NO.1 AIR INJECTION MANIFOLD**

Remove the two bolts, two nuts, the PAIR reed valve, injection manifold assembly and gasket.



- 26. REMOVE DELIVERY PIPES AND INJECTORS**

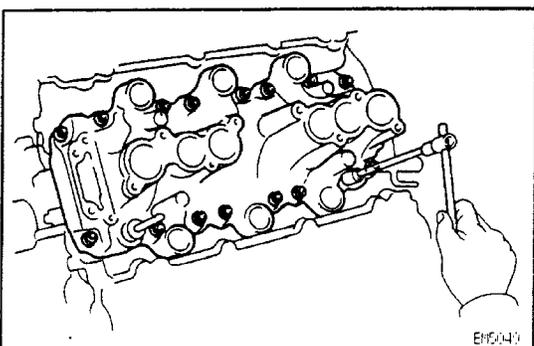
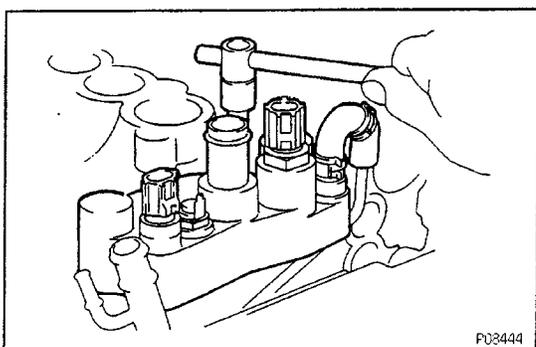
- (a) Remove the four nuts holding the delivery pipes to the intake manifold.
- (b) Remove the the two delivery pipes and six injectors assemblies.

**NOTICE:** Be careful not to drop the injectors when removing the delivery pipes.

- (c) Remove the four insulators, ten spacers and four O-rings from the cylinder head.
- (d) Pull out the six injectors from the delivery pipes.
- (e) Remove the O-ring and grommet from each injector.

- 27. REMOVE WATER BY-PASS OUTLET**

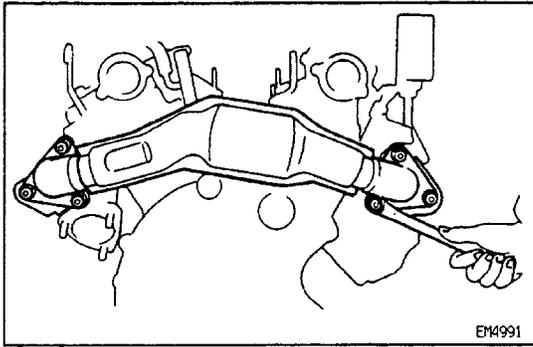
- (a) Disconnect the No.3 water hose from the No. 1 water by-pass pipe.
- (b) Remove the two nuts, water by-pass outlet and gasket.



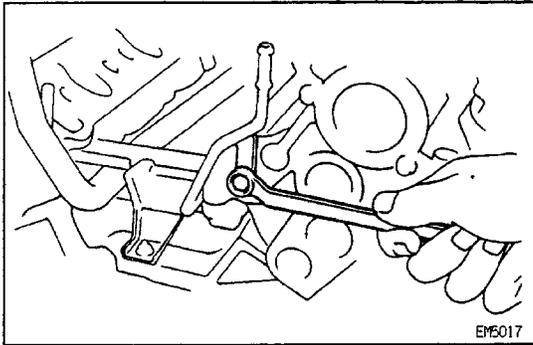
- 28. REMOVE INTAKE MANIFOLD**

Remove the twelve bolts, four nuts, intake manifold and two gaskets.

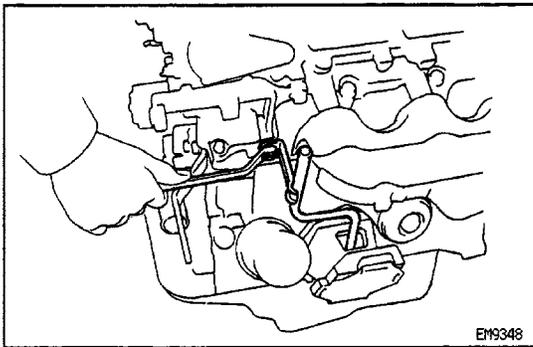
- 29. REMOVE KNOCK SENSOR WIRE**

**30. REMOVE EXHAUST CROSSOVER PIPE**

Remove the six nuts, crossover pipe and two gaskets.

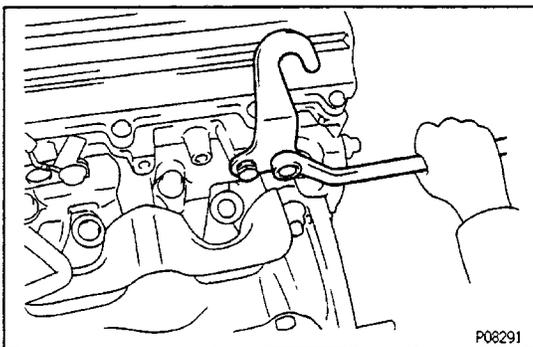
**31. DISCONNECT WATER BY-PASS PIPE FROM RH CYLINDER HEAD**

Remove the bolt, and disconnect the water by-pass pipe from the RH cylinder head.

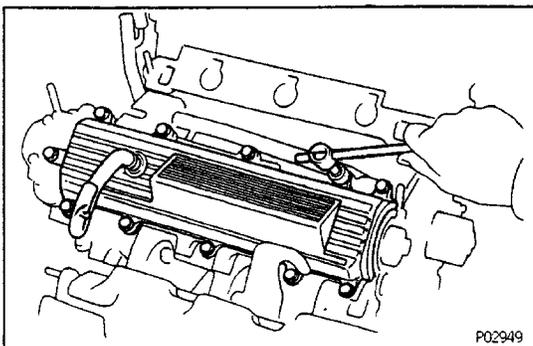
**32. REMOVE GENERATOR****33. REMOVE OIL DIPSTICK GUIDE AND DIPSTICK**

(a) Remove the oil dipstick.

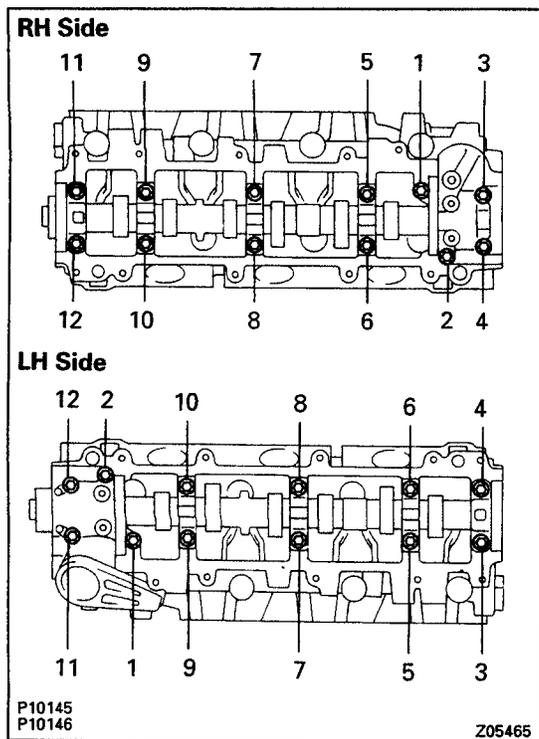
(b) Remove the bolt and oil dipstick guide.

**34. REMOVE NO.2 ENGINE HANGER FROM LH CYLINDER HEAD**

Remove the two bolts and engine hanger.

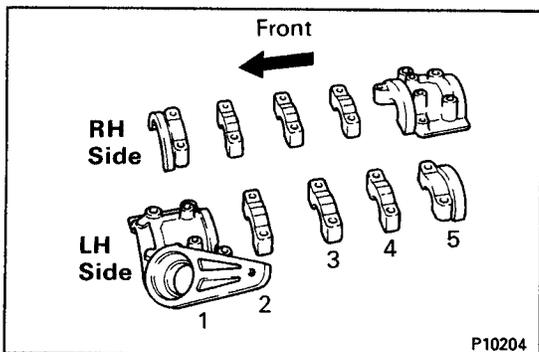
**35. REMOVE CYLINDER HEAD COVERS**

Remove the eleven bolts, engine wire bracket, cylinder head cover and gasket. Remove the two cylinder head covers.

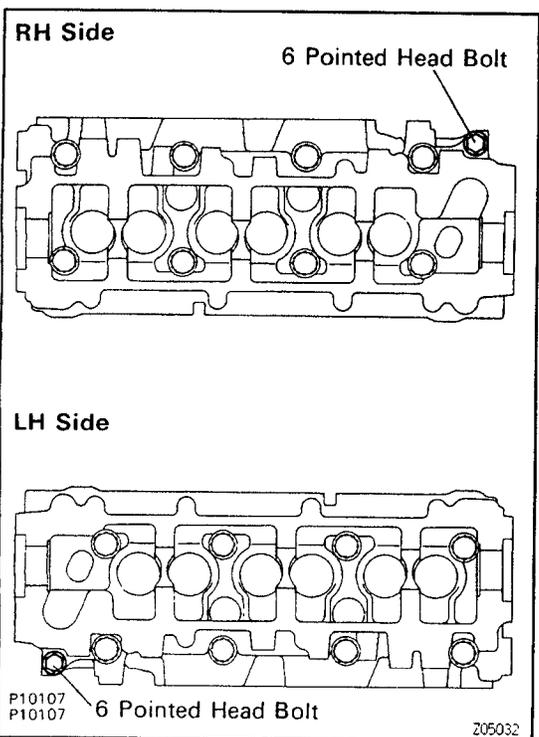


### 36. REMOVE CAMSHAFTS

- Uniformly loosen and remove the twelve bearing cap bolts one side of each cylinder head in several passes, in the sequence shown, then do the other side as shown.
- Remove the ten camshaft bearing caps, two oil seals and two camshafts.

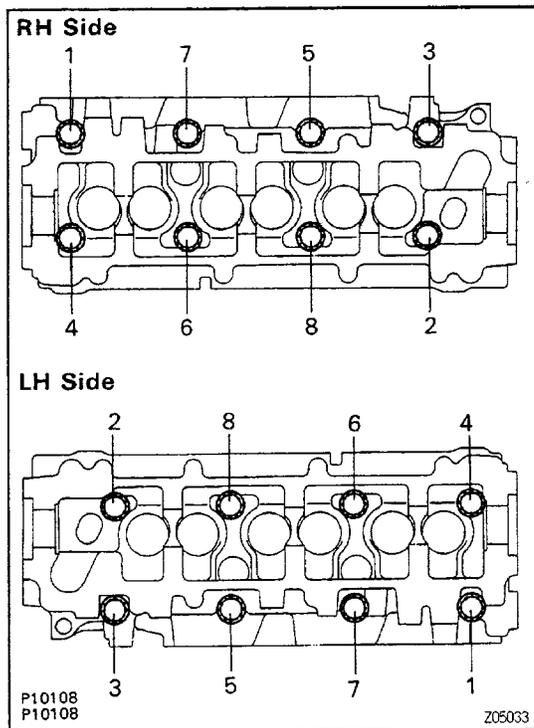


HINT: Arrange the bearing caps in correct order.



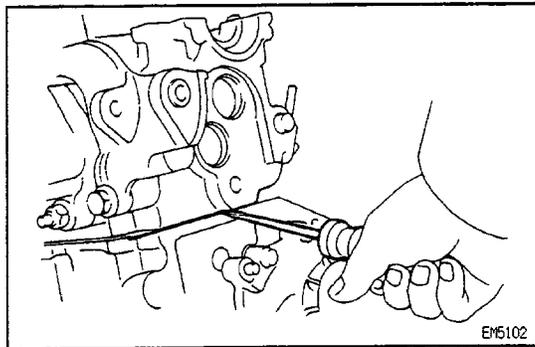
### 37. REMOVE CYLINDER HEADS

- Remove the cylinder head (6 pointed head) bolt from each cylinder head.



- (b) Uniformly loosen the eight cylinder head bolts one side of each cylinder head in several passes, in the sequence shown, then do the other side as shown. Remove the eighteen cylinder head bolts and plate washers.

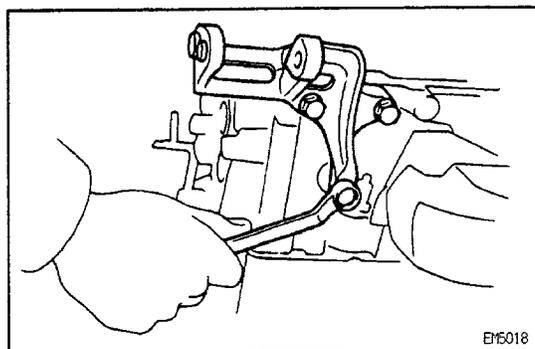
**NOTICE:** Head warpage or cracking could result from removing bolts in incorrect order.



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

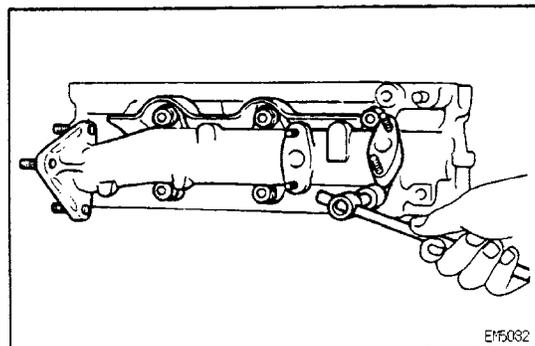
If the cylinder head is off, pry between the cylinder head and cylinder block with a screwdriver.

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



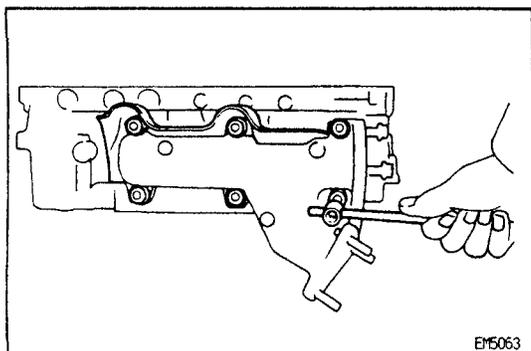
### 38. REMOVE GENERATOR BRACKET

Remove the three bolts and brackets.



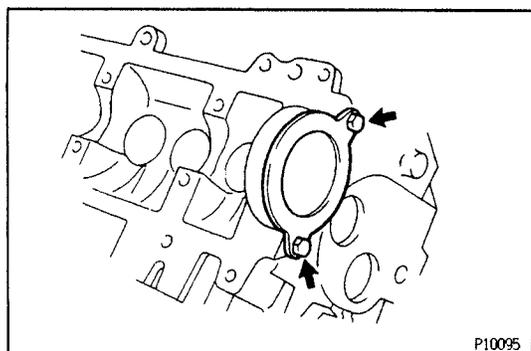
### 39. REMOVE EXHAUST MANIFOLD FROM RH CYLINDER HEAD

- (a) Remove the bolt, nut and exhaust manifold heat insulator.
- (b) Remove the six nuts, exhaust manifold and gasket.



#### 40. REMOVE EXHAUST MANIFOLD FROM LH CYLINDER HEAD

- (a) Remove the three nuts and exhaust manifold heat insulator.
- (b) Remove the six nuts, exhaust manifold and gasket.



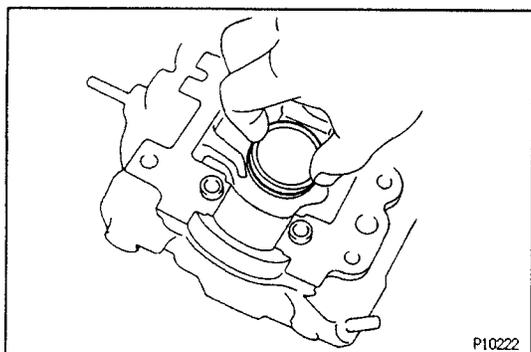
### CYLINDER HEADS DISASSEMBLY

E012X-01

(See Components)

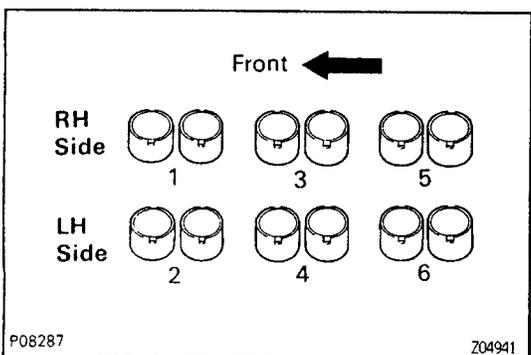
#### 1. REMOVE CAMSHAFT HOUSING PLUGS

- (a) Remove the two bolts and housing rear cover.
- (b) Remove the housing plug.

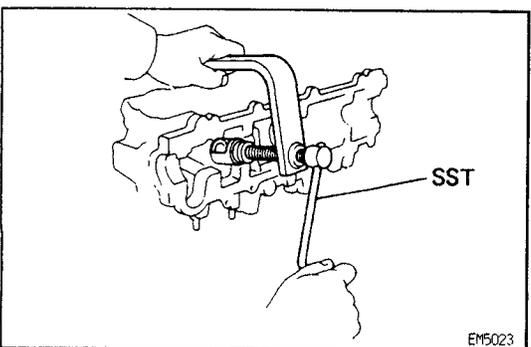


#### 2. REMOVE VALVE LIFTERS AND SHIMS

Pull out the valve lifter and shim by hand.

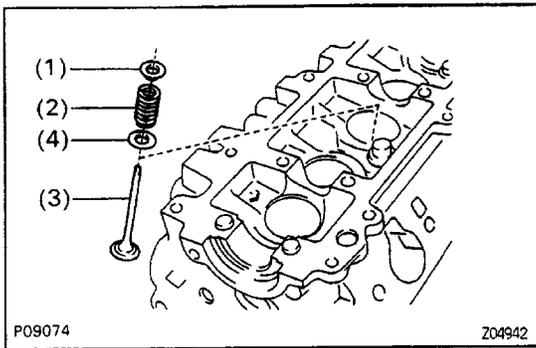


HINT: Arrange the valve lifters and shims in correct order.



#### 3. REMOVE VALVES

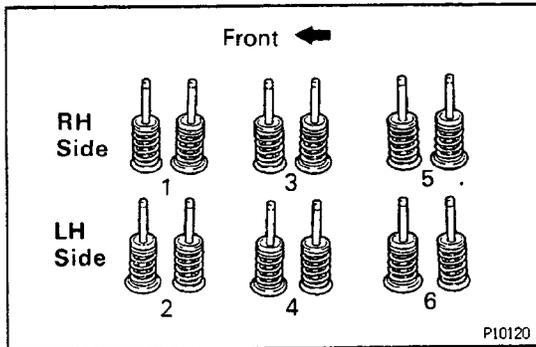
- (a) Using SST, compress the valve spring and remove the two keepers.  
SST 09202-43013



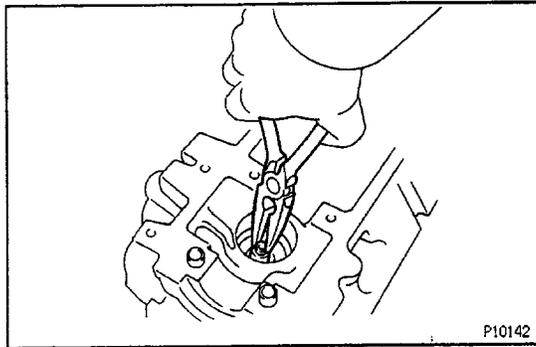
(b) Remove the following parts:

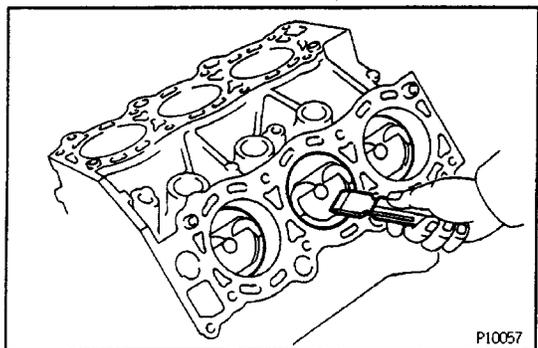
- (1) Spring retainer
- (2) Valve spring
- (3) Valve
- (4) Spring seat

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



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

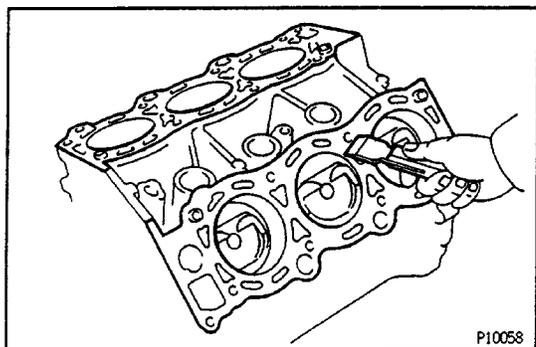




## CYLINDER HEAD COMPONENTS INSPECTION AND REPAIR

### 1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

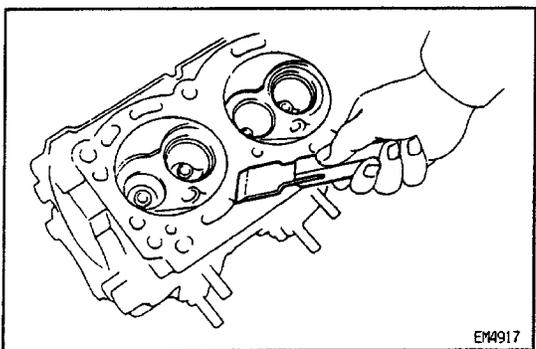
(a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.



(b) Using a gasket scraper, remove all the gasket material from the cylinder block surface.

(c) Using compressed air, blow carbon and oil from the bolt holes.

**CAUTION:** Protect your eyes when using high compressed air.

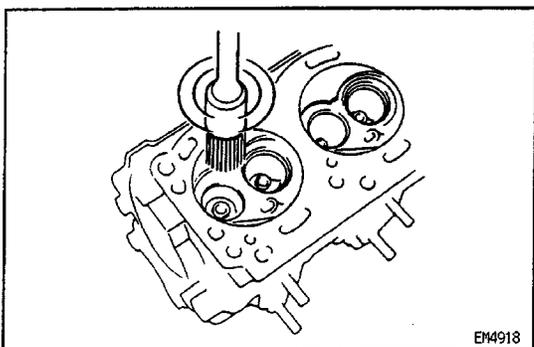


### 2. CLEAN CYLINDER HEAD

#### A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

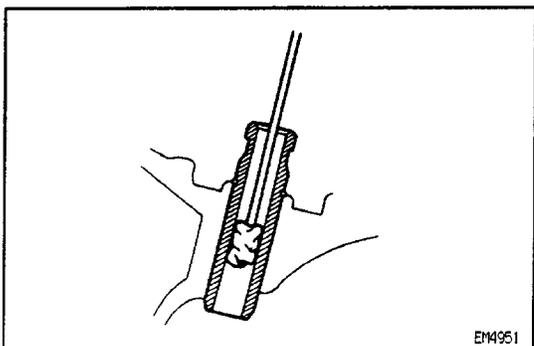
**NOTICE:** Be careful not to scratch the cylinder block contact surface.



#### B. Clean combustion chambers

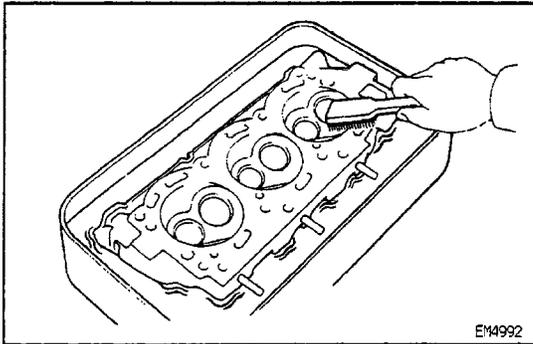
Using a wire brush, remove all the carbon from the combustion chambers.

**NOTICE:** Be careful not to scratch the cylinder block contact surface.



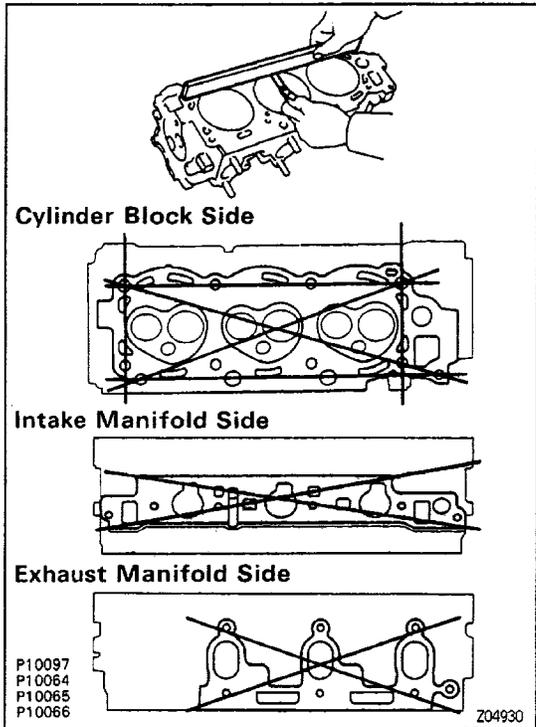
#### C. Clean valve guide bushings

Using a valve guide bushing brush and solvent, clean all the guide bushings.



### D. Clean cylinder head

Using a soft brush and solvent, thoroughly clean the cylinder head.



## 3. INSPECT CYLINDER HEAD

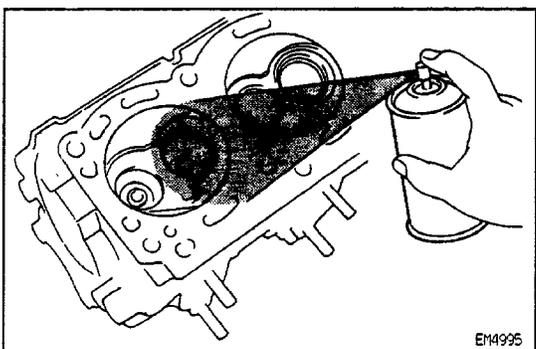
### A. Inspect for flatness

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and the manifolds for warpage.

**Maximum warpage:**

**0.10 mm (0.0039 in.)**

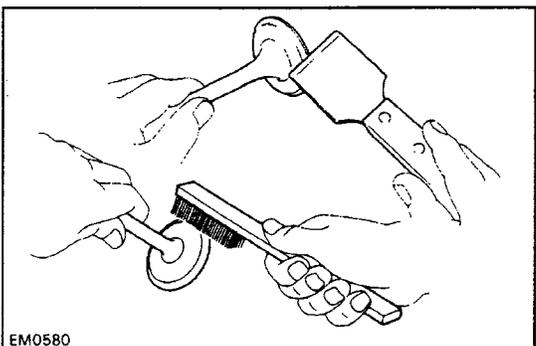
If warpage is greater than maximum, replace the cylinder head.



### B. Inspect for cracks

Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

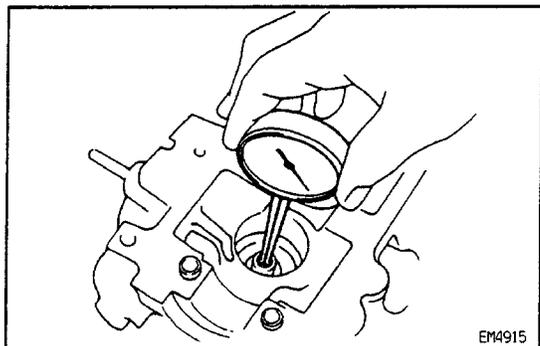
If cracked, replace the cylinder head.



## 4. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

(b) Using a wire brush, thoroughly clean the valve.



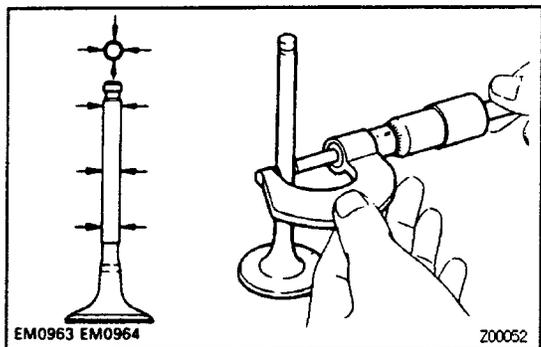
EM4915

## 5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

- (a) Using a caliper gauge, measure the inside diameter of the guide bushing.

**Bushing inside diameter:**

**8.010–8.030mm(0.3154–0.3161 in.)**



EM0963 EM0964

Z00052

- (b) Using a micrometer, measure the diameter of the valve stem.

**Valve stem diameter:**

**Intake**

**7.970 – 7.985 mm (0.3138 – 0.3144 in.)**

**Exhaust .**

**7.965 – 7.980 mm (0.3136 – 0.3142 in.)**

- (c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

**Standard oil clearance:**

**Intake**

**0.025 – 0.060 mm (0.0010 – 0.0024 in.)**

**Exhaust**

**0.030 – 0.065 mm (0.0012 – 0.0026 in.)**

**Maximum oil clearance:**

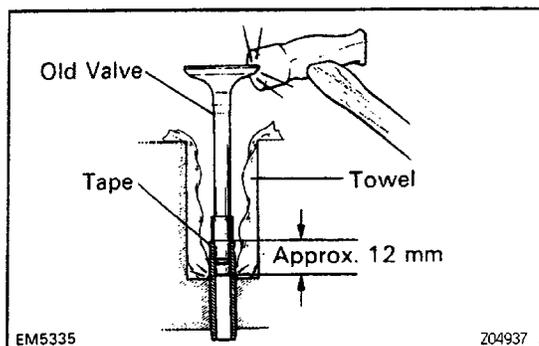
**Intake**

**0.08 mm (0.0031 in.)**

**Exhaust**

**0.10 mm (0.0039 in.)**

If the clearance is greater than maximum, replace the valve and guide bushing.



EM5335

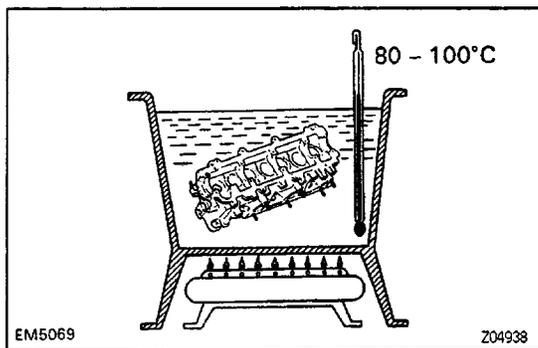
Z04937

## 6. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

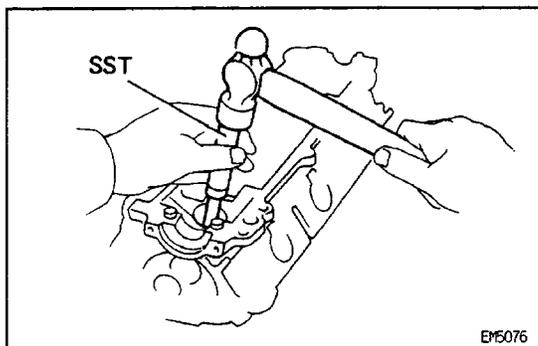
- (a) Insert an old valve wrapped with tape into the valve guide bushing, and break off the valve guide bushing by hitting it with a hammer. Remove the snap ring.

**HINT:** Wrap the tape approx. 12 mm (0.47 in.) from the valve stem end.

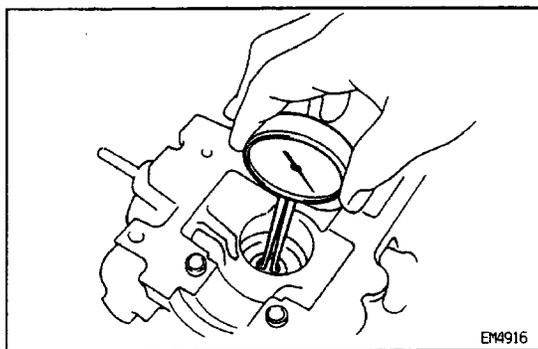
**NOTICE:** Be careful not to damage the valve lifter hole.



(b) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).



(c) Using SST and a hammer, tap out the guide bushing. SST 09201-60011

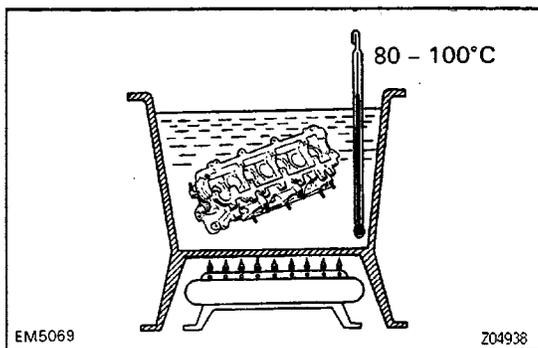


(d) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

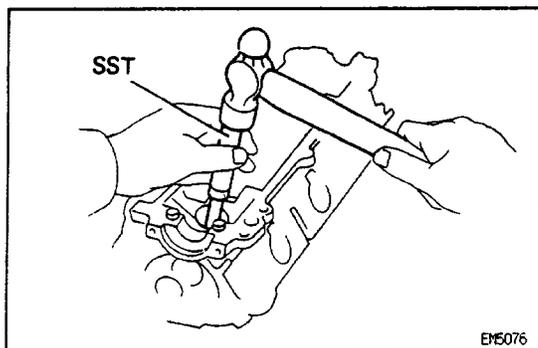
Both intake and exhaust

Bushing bore mm (in.)	Bushing size
13.000–13.027 (0.5118–0.5129)	Use STD
13.050 – 13.077 (0.5138 – 0.5148)	Use O/S 0.05

V02465

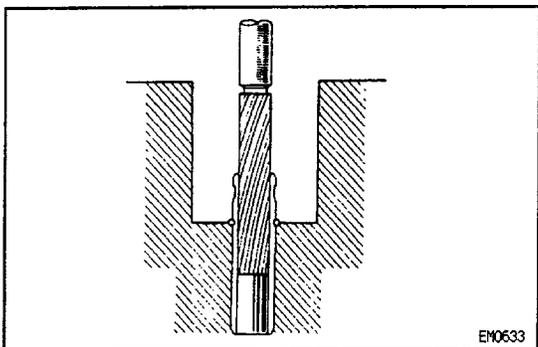


(f) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).

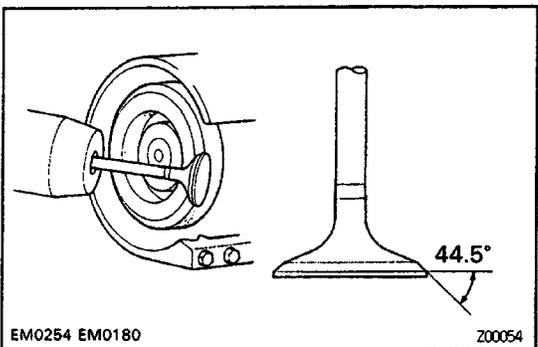


- (g) Using SST and a hammer, tap in a new guide bushing until the snap ring makes contact with the cylinder head.

SST 09201-60011



- (h) Using a sharp 8 mm reamer, ream the guide bushing to obtain standard specified clearance (See step 5 above) between the guide bushing and valve stem.

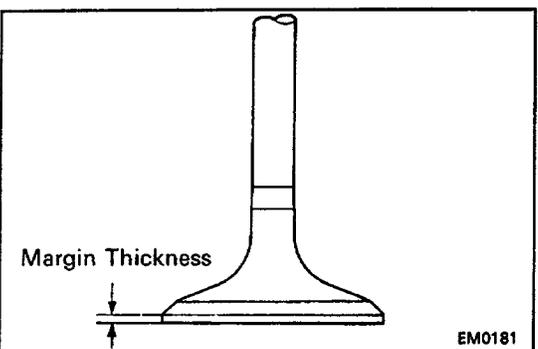


## 7. INSPECT AND GRIND VALVES

- (a) Grind the valve enough to remove pits and carbon.  
 (b) Check that the valve is ground to the correct valve face angle.

**Valve face angle:**

**44.5°**



- (c) Check the valve head margin thickness.

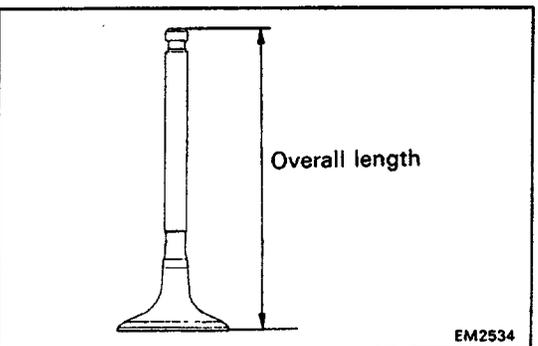
**Standard margin thickness:**

**1.3 – 1.7 mm (0.051 – 0.067 in.)**

**Minimum margin thickness:**

**1.0 mm (0.039 in.)**

If the margin thickness is less than minimum, replace the valve.



- (d) Check the valve overall length.

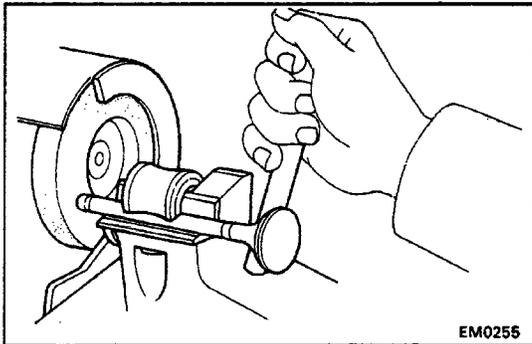
**Standard overall length:**

**104.3 mm (4.106 in.)**

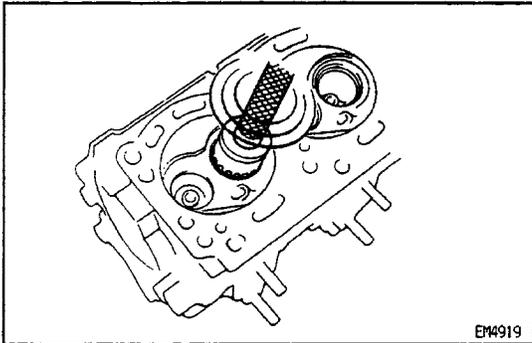
**Minimum overall length:**

**103.8 mm (4.087 in.)**

If the overall length is less than minimum, replace the valve.

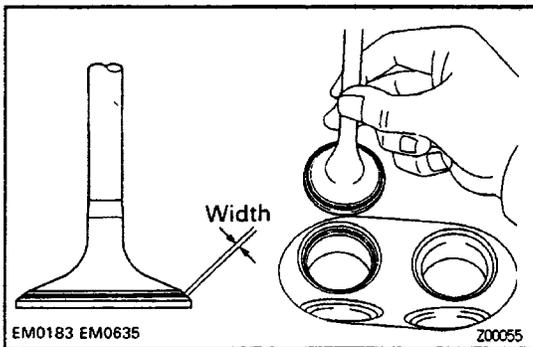


- (e) Check the surface of the valve stem tip for wear.  
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.  
**NOTICE: Do not grind off more than minimum.**

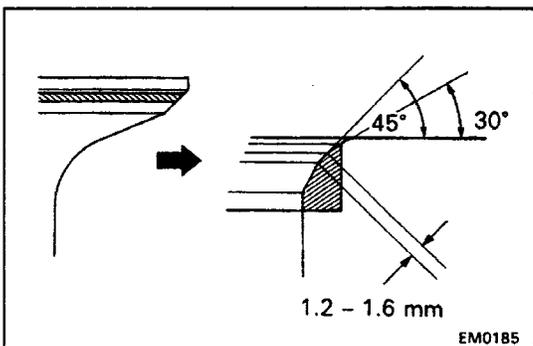


## 8. INSPECT AND CLEAN VALVE SEATS

- (a) Using a 45° carbide cutter, resurface the valve seats.  
Remove only enough metal to clean the seats.

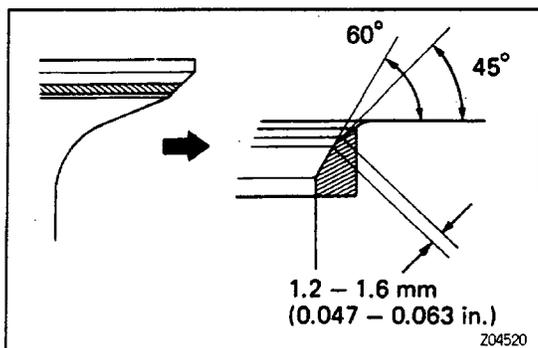


- (b) Check the valve seating position.  
Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.
- (c) Check the valve face and seat for the following:
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
  - If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
  - Check that the seat contact is in the middle of the valve face with the following width:  
**1.2 – 1.6 mm (0.047 – 0.063 in.)**

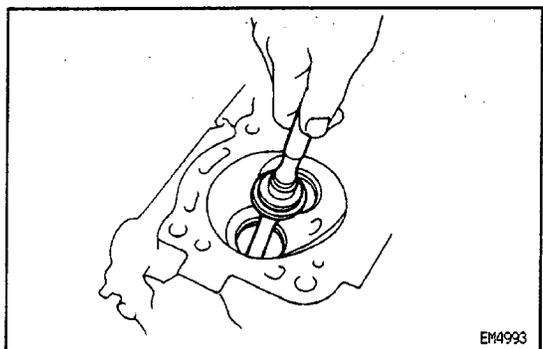


If not, correct the valve seats as follows:

- (1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

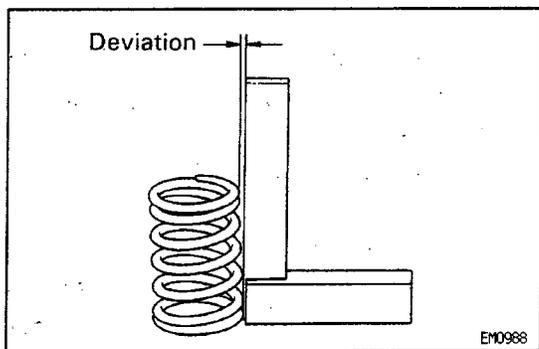


- (2) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



- (d) Hand-lap the valve and valve seat with an abrasive compound.

- (a) After hand-lapping, clean the valve and valve seat.



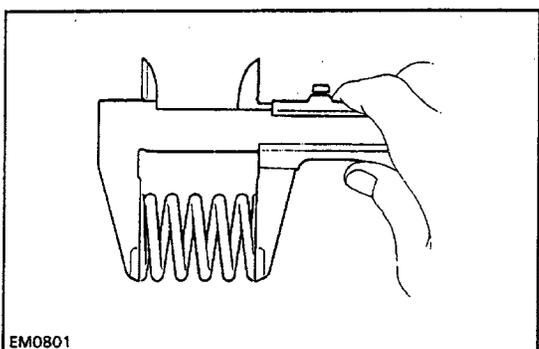
### 9. INSPECT VALVE SPRINGS

- (a) Using a steel square, measure the deviation of the valve spring.

**Maximum deviation:**

**1.23 mm (0.0484 in.)**

- If the deviation is greater than maximum, replace the valve spring.



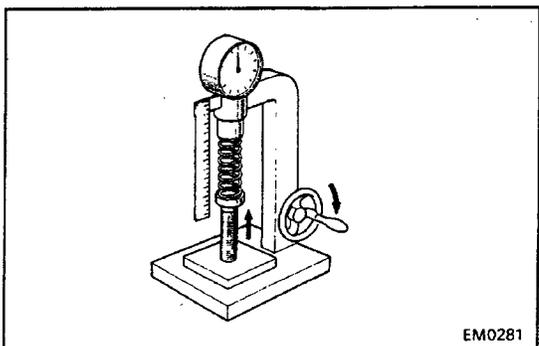
- (b) Using a vernier caliper, measure the free length of the valve spring.

**Free length:**

**46.50 mm (1.8307 in.) for white painted mark**

**47.01 mm (1.8508 in.) for green painted mark**

- If the free length is not as specified, replace the valve spring.



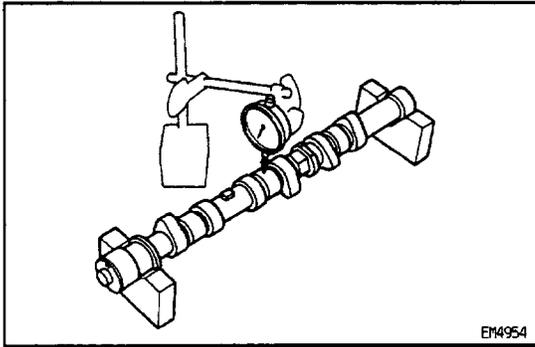
- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

**Installed tension:**

**242 - 268 N (24.7 - 27.3 kgf, 54.5 - 60.2 lbf)**

**at 40.0 mm (1.575 in.)**

- If the installed tension is not as specified, replace the valve spring.



EM4954

## 10. INSPECT CAMSHAFTS AND BEARINGS

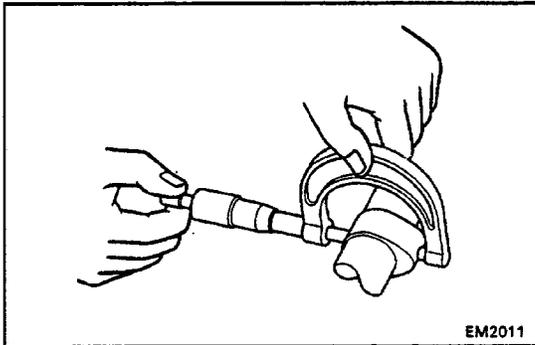
### A. Inspect camshaft for runout

- Place the camshaft on V – blocks.
- Using a dial indicator, measure the circle runout at the center journal.

#### Maximum circle runout:

**0.06 mm (0.0024 in.)**

If the circle runout is greater than maximum, replace the camshaft.



EM2011

### B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

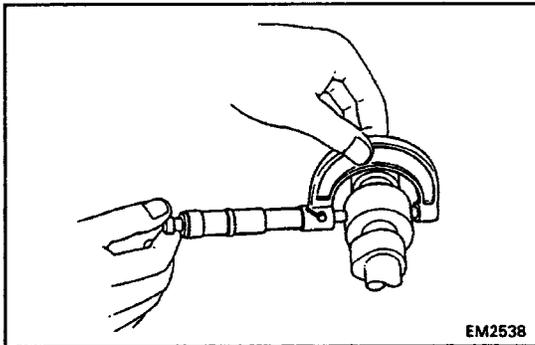
#### Standard cam lobe height:

**47.830 – 47.930 mm (1.8830 – 1.8870 in.)**

#### Minimum cam lobe height:

**47.50 mm (1.8701 in.)**

If the cam lobe height is less than minimum, replace the camshaft.



EM2538

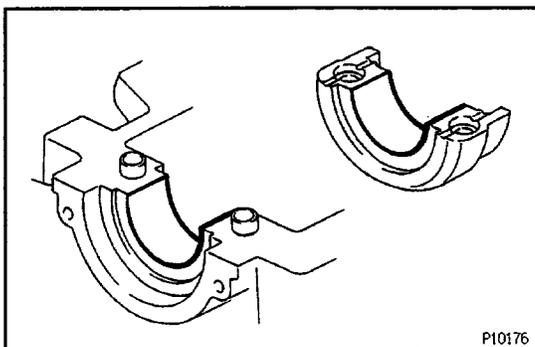
### C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

#### Journal diameter:

**33.959 – 33.975 mm (1.3370 – 1.3376 in.)**

If the journal diameter is not as specified, check the oil clearance.

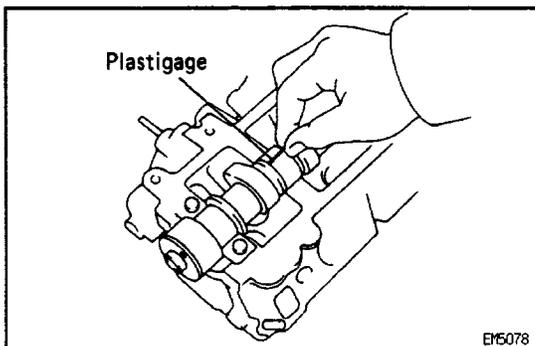


P10176

### D. Inspect camshaft bearings

Check that bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.

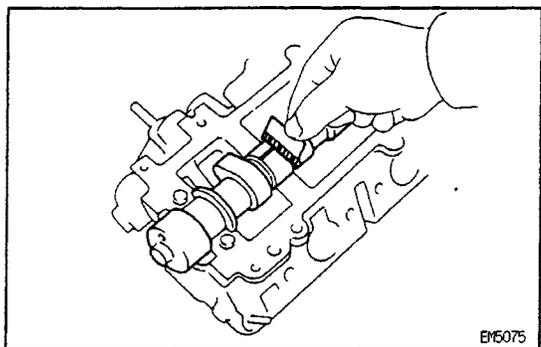


EM5078

### E. Inspect camshaft journal oil clearance

- Clean the bearing caps and camshaft journals.
- Place the camshafts on the cylinder head.
- Lay a strip of Plastigage across each of the camshaft journals.

- (d) Install the bearing caps.  
 (See step 5 on pages [EG2-78](#) and 79)  
**Torque: 16 N-m (160 kgf-cm, 12 ft-lbf)**  
**NOTICE: Do not turn the camshaft.**
- (e) Remove the bearing caps.



- (f) Measure the Plastigage at its widest point.

**Standard oil clearance:**

**0.025 – 0.066 mm (0.0010 – 0.0026 in.)**

**Maximum oil clearance:**

**0.10 mm (0.0039 in.)**

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

- (g) Completely remove the Plastigage.

- (h) Remove the camshafts.

**F. Inspect camshaft thrust clearance**

- (a) Install the camshaft.

(See step 5 on pages [EG2-78](#) and 79)

- (b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

**Standard thrust clearance:**

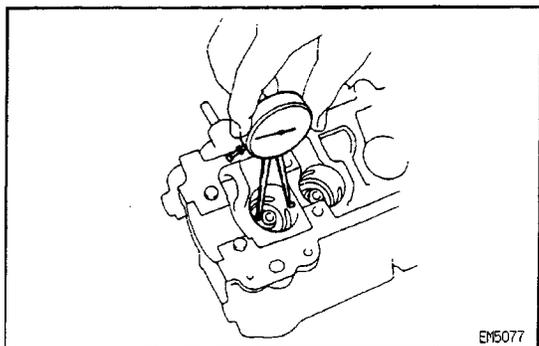
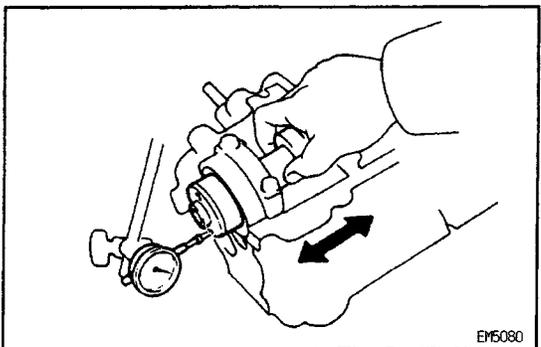
**0.080 – 0.190 mm (0.0031 – 0.0075 in.)**

**Maximum thrust clearance:**

**0.25 mm (0.0098 in.)**

If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

- (c) Remove the camshafts.

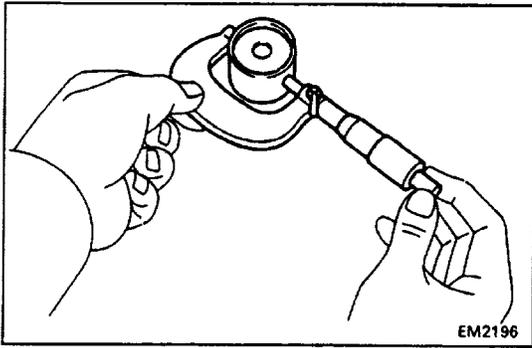


**11. INSPECT VALVE LIFTERS AND LIFTER BORES**

- (a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

**Lifter bore diameter:**

**37.960 – 37.975 mm (1.4945 – 1.4951 in.)**



(b) Using a micrometer, measure the lifter diameter.

**Lifter diameter:**

**37.922 – 37.832 mm (1.4930 – 1.4934 in.)**

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

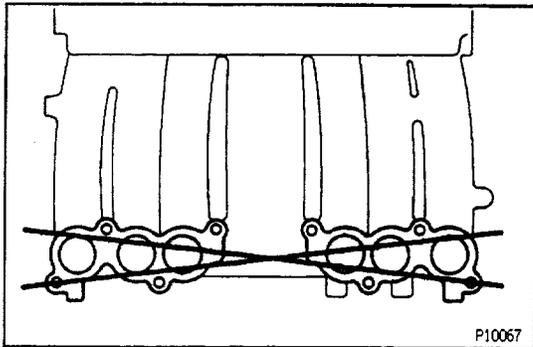
**Standard oil clearance:**

**0.028 – 0.053 mm (0.0011 – 0.0021 in.)**

**Maximum oil clearance:**

**0.10 mm (0.0039 in.)**

If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.



## 12. INSPECT AIR INTAKE CHAMBER

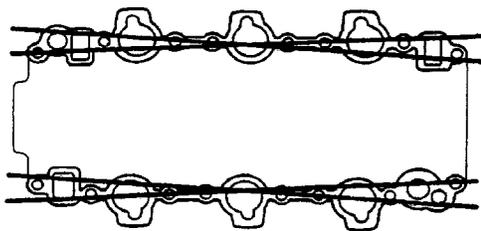
Using a precision straight edge and feeler gauge, measure the surface contacting the intake manifold for warpage.

**Maximum warpage:**

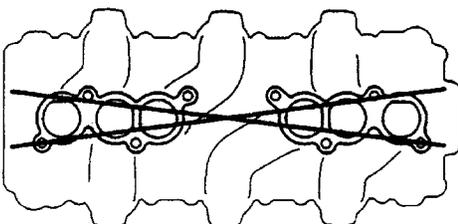
**0.10 mm (0.0039 in.)**

If warpage is greater than maximum, replace the chamber.

Cylinder Head Side



Air Intake Chamber Side



P10068  
P10069

Z04931

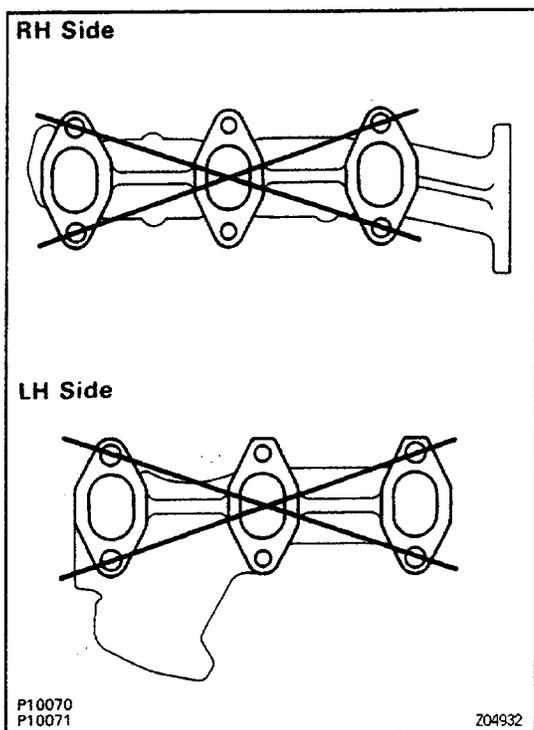
## 13. INSPECT INTAKE MANIFOLD

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head and air intake chamber for warpage.

**Maximum warpage:**

**0.10 mm (0.0039 in.)**

If warpage is greater than maximum, replace the manifold.



#### 14. INSPECT EXHAUST MANIFOLD

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage. ,

**Maximum warpage:**

**0.70 mm (0.0276 in.)**

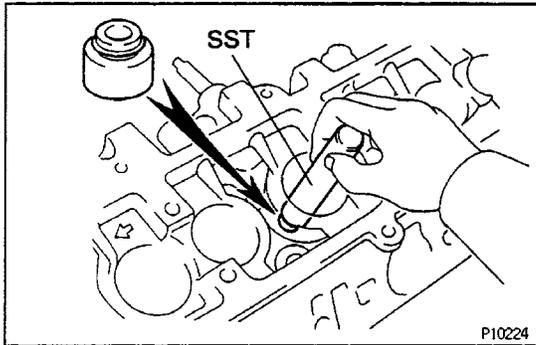
If warpage is greater than maximum, replace the manifold.

# CYLINDER HEADS ASSEMBLY

(See Components)

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.

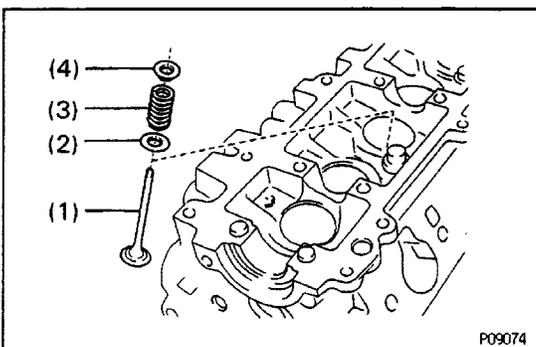
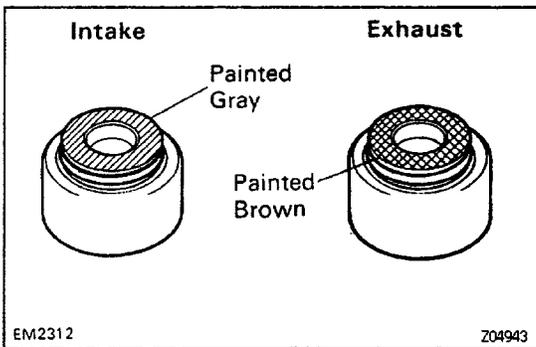


## 1. INSTALL VALVES

(a) Using SST, push in a new oil seal.

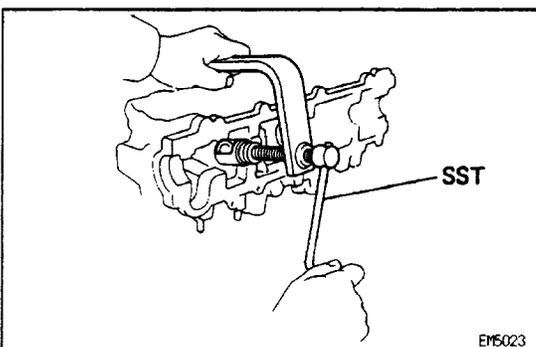
SST 09201 -41020

HINT: The intake valve oil seal is gray and the exhaust valve oil seal is brown.



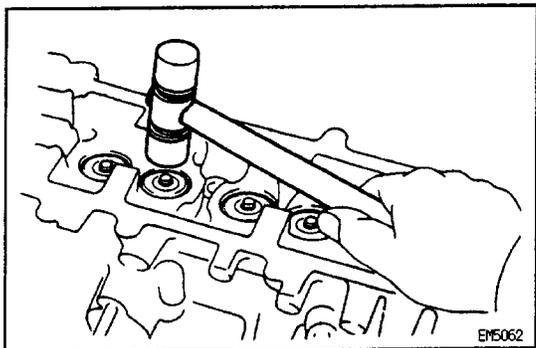
(b) Install the following parts:

- (1) Valve
- (2) Spring seat
- (3) Valve spring
- (4) Spring retainer

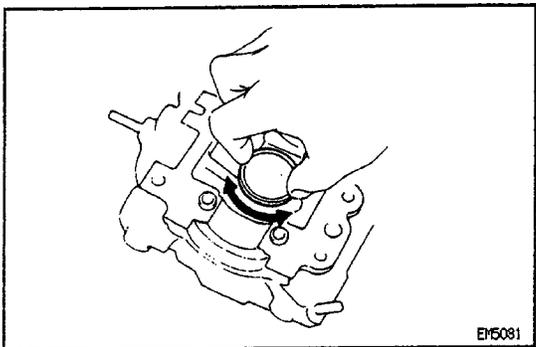


(c) Using SST, compress the valve spring and place the two keepers around the valve stem.

SST 09202-43013

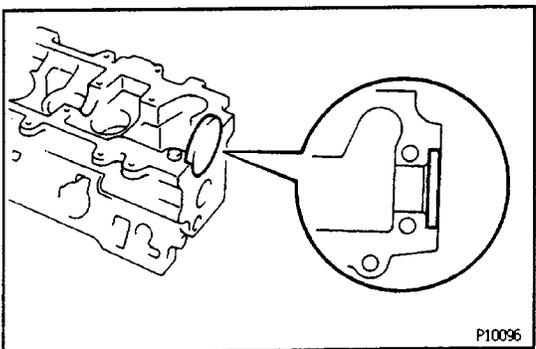


- (d) Using a plastic-faced hammer, lightly tap the valve stem tip to assure proper fit.



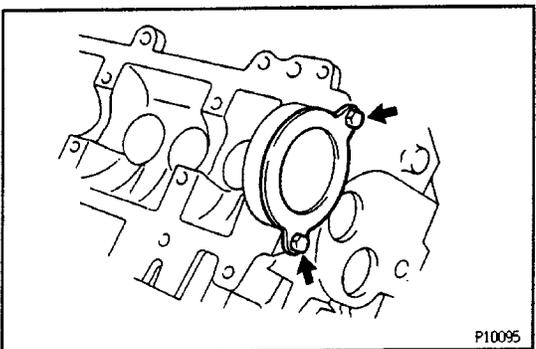
## 2. INSTALL VALVE LIFTERS AND SHIMS

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

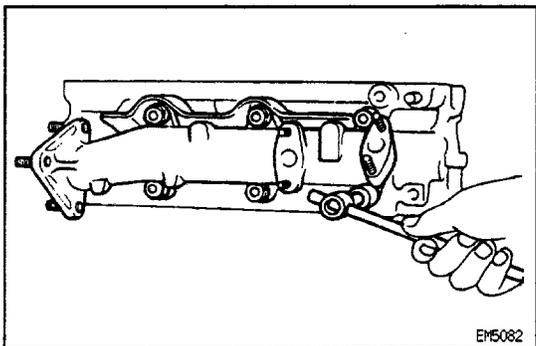


## 3. INSTALL CAMSHAFT HOUSING PLUGS

- (a) Place a new housing plug in position on the cylinder head, facing the cup side inward.



- (b) Install the housing rear plate with the two bolts.  
**Torque: 4.9 N–m (50 kgf–cm, 43 in.–lbf)**



## CYLINDER HEADS INSTALLATION

(See Components)

### 1. INSTALL RH EXHAUST MANIFOLD TO RH CYLINDER HEAD

- (a) Install a new gasket and the exhaust manifold with the six nuts.

**Torque: 38 N-m (400 kgf-cm, 29 ft-lbf)**

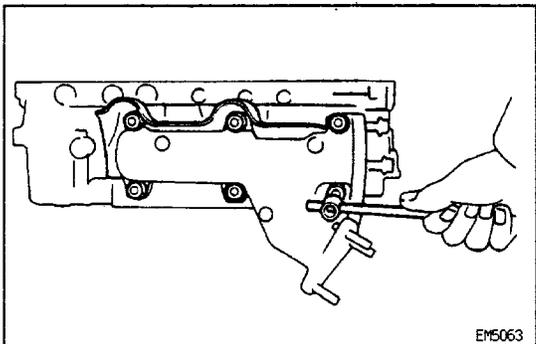
- (b) Install the exhaust manifold heat insulator with the bolt and nut.

### 2. INSTALL RH EXHAUST MANIFOLD TO LH CYLINDER HEAD

- (a) Install a new gasket and the exhaust manifold with the six nuts.

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

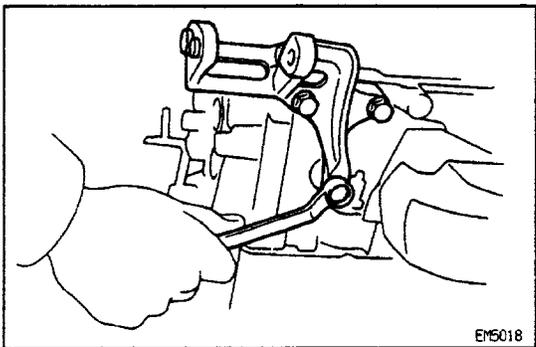
- (b) Install the exhaust manifold heat insulator with the three bolts.



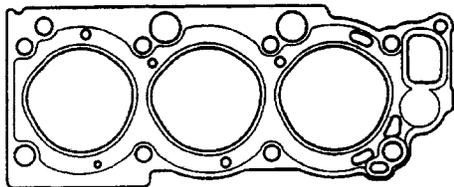
### 3. INSTALL GENERATOR BRACKET

Install the bracket with the three bolts.

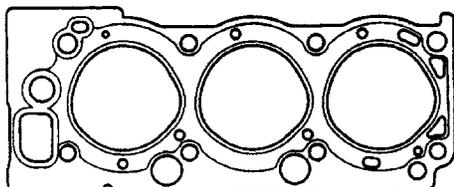
**Torque: 37 N-m (380 kgf-cm, 27 ft-lbf)**



RH Side



LH Side



Front ←

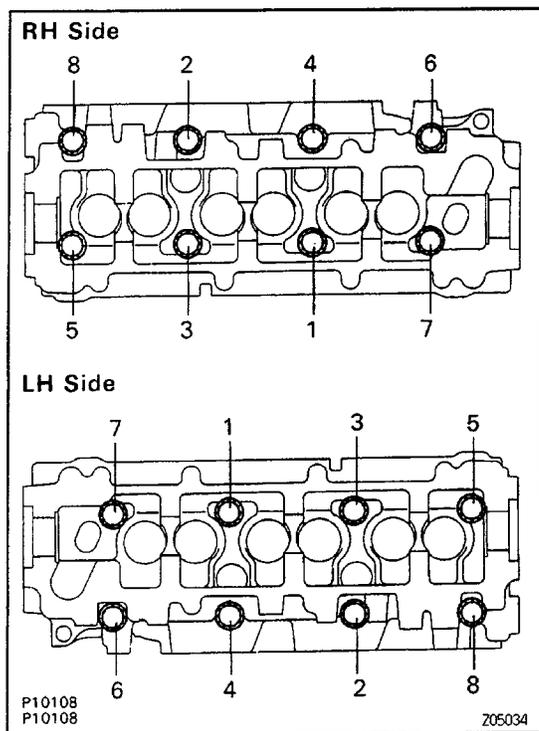
### 4. INSTALL CYLINDER HEADS

#### A. Place cylinder head on cylinder block

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

**NOTICE: Be careful of the installation direction.**

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



## B. Install cylinder head (12 pointed head) bolts

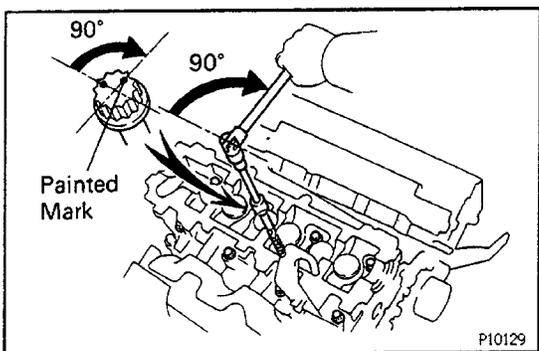
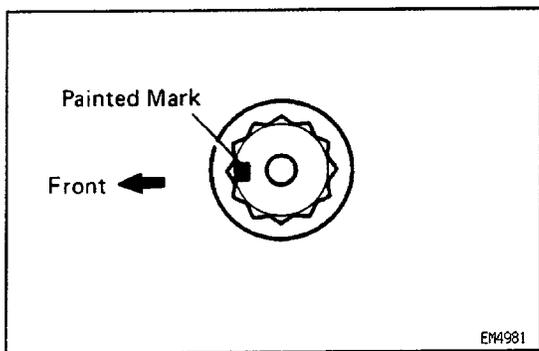
### HINT:

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

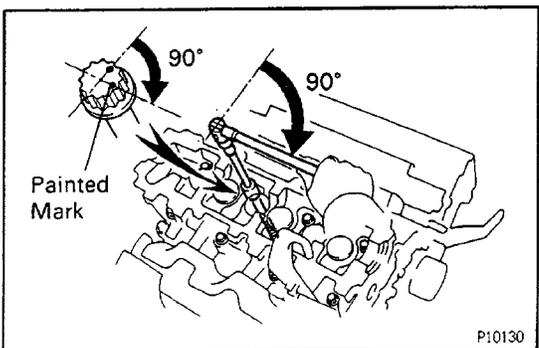
**Torque: 44 N-m (450 kgf-cm, 33 ft-lbf)**

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

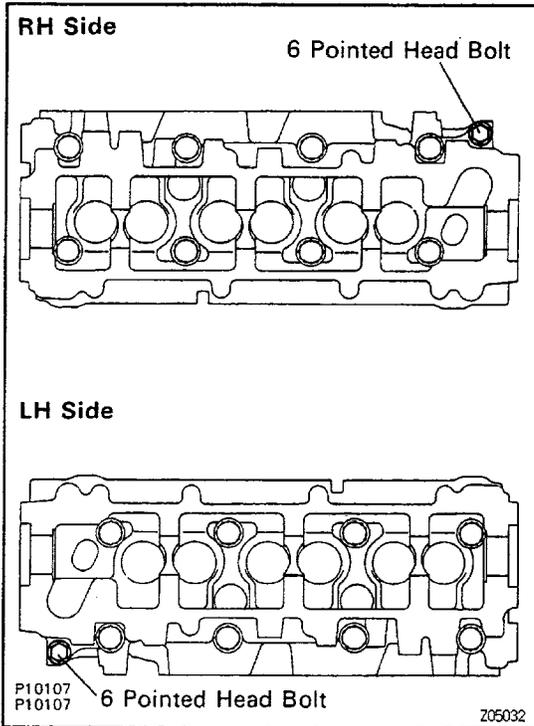
- (d) Mark the front of the cylinder head bolt head with paint.



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



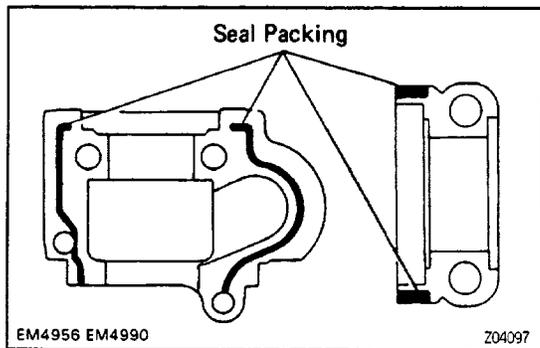
- (f) Retighten cylinder head bolts by an additional 90°.
- (g) Check that the painted mark is now facing rearward.



### C. Install cylinder head (6 pointed head) bolts

- Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
- Install the cylinder head bolt to each cylinder head.

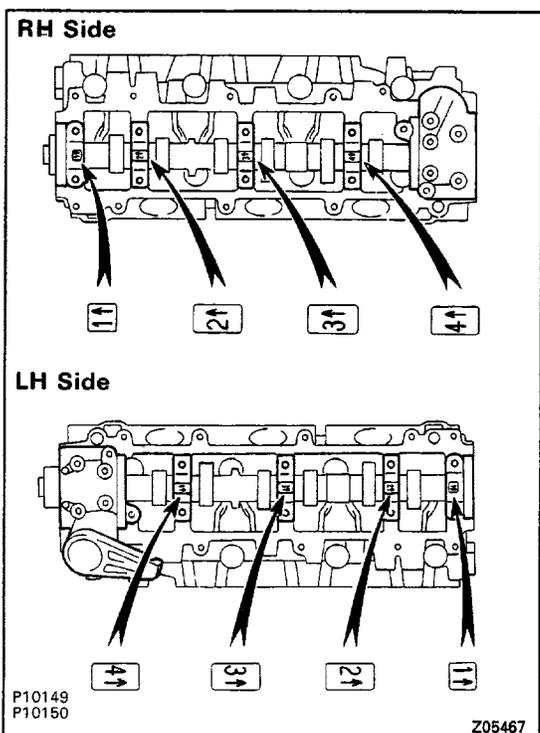
**Torque: 41 N-m (420 kgf-cm, 30 ft-lbf)**



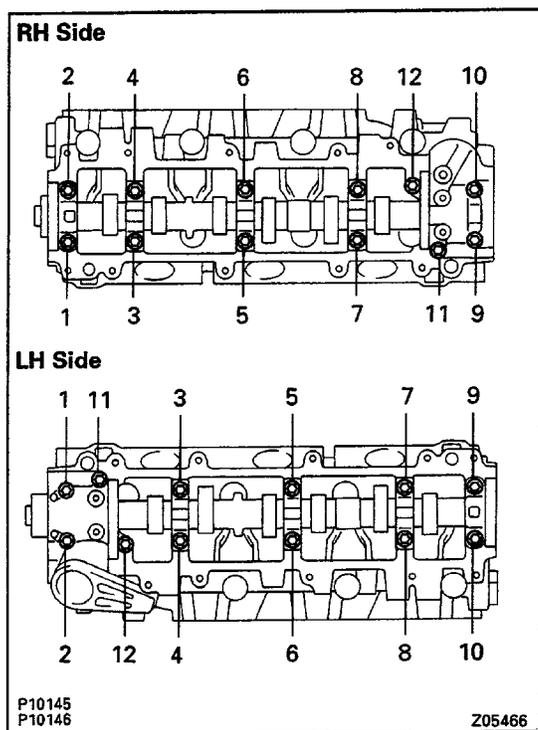
### 5. INSTALL CAMSHAFTS

- Place the camshaft on the cylinder head.
- Apply seal packing to the No.1 and No.5 bearing caps as shown.

Seal packing: Part No. 08826-00080 or equivalent

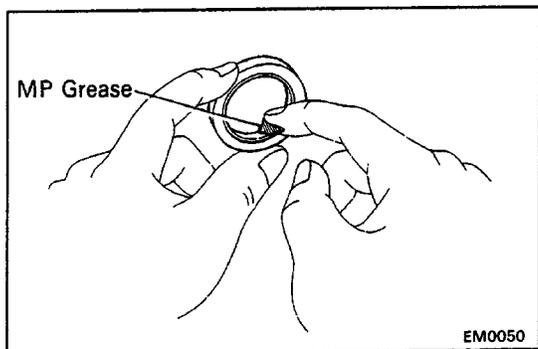


- Install the bearing caps in their proper locations.

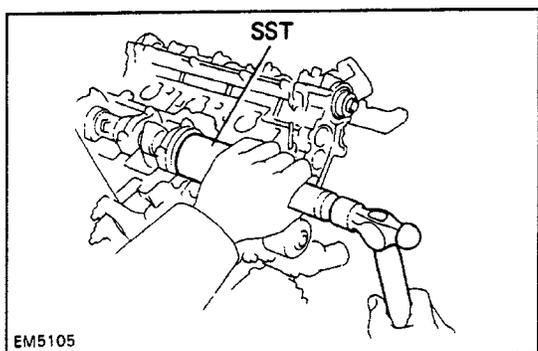


- (d) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
- (e) Install and uniformly tighten the twelve bearing cap bolts on one side in several passes, in the sequence shown, then do the other side as shown.

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



- (f) Apply MP grease to a new oil seal lip.



- (g) Using SST, tap in the two camshaft oil seals.  
SST 09214-60010

## 6. CHECK AND ADJUST VALVE CLEARANCE

(See Tune – Up, steps 7 and 8 on pages EG –19 to 21)

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

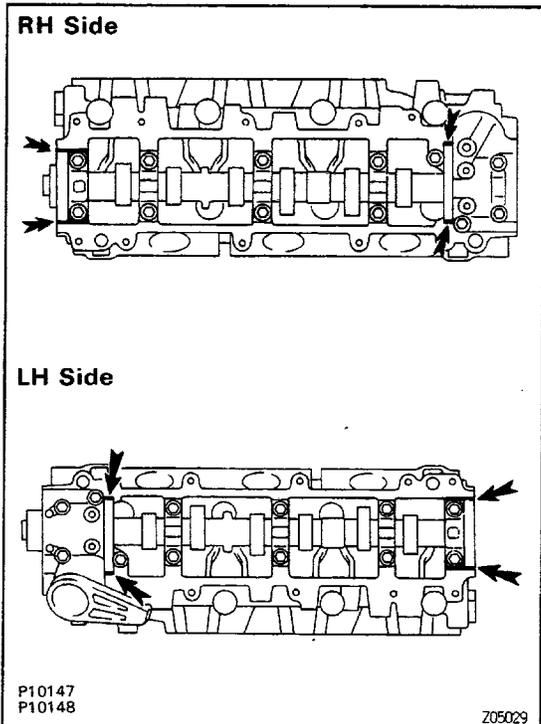
**Valve clearance (Cold):**

**Intake**

0.18 – 0.28 mm (0.007 – 0.011 in.)

**Exhaust**

0.22 – 0.32 mm (0.009 – 0.013 in.)

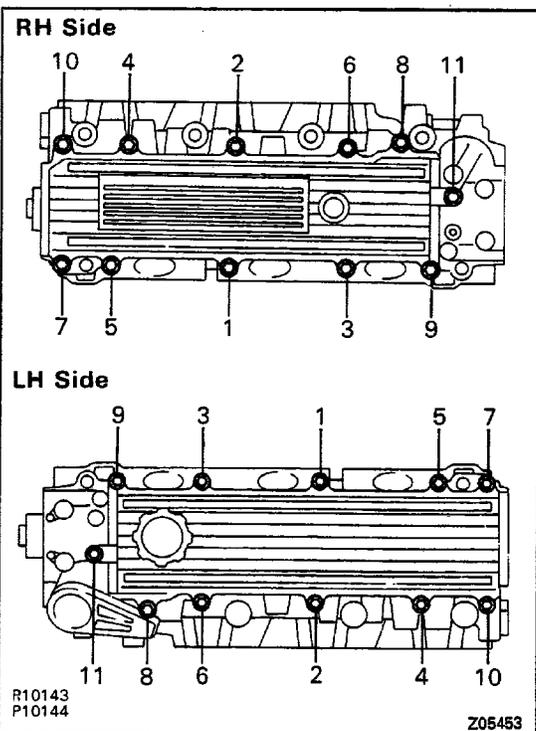


## 7. INSTALL CYLINDER HEAD COVERS

- Remove the old packing (FIPG) material.
- Apply seal packing to the cylinder head as shown in the illustration.

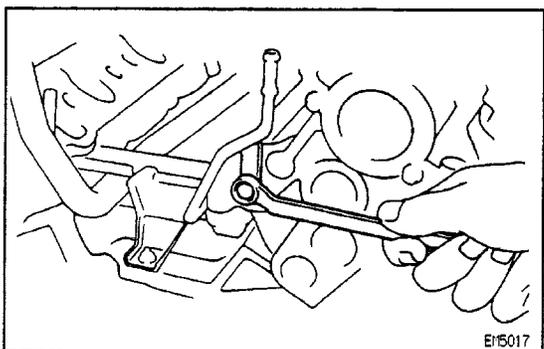
### Seal packing:

**Part No. 08826-00080 or equivalent**



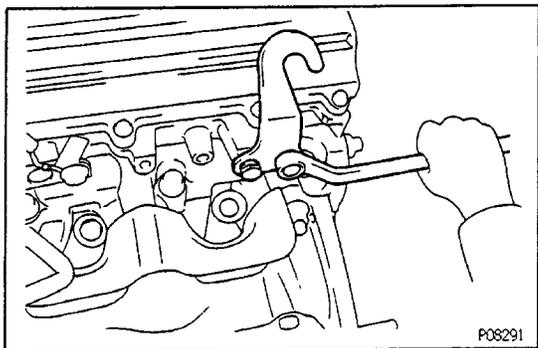
- Install the gasket to the head cover.
- Install the cylinder head cover with the eleven bolts. Uniformly tighten the bolts one side of the cylinder head cover in several passes, in the sequence shown, then do the other side as shown. Install the two cylinder head covers.

**Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)**



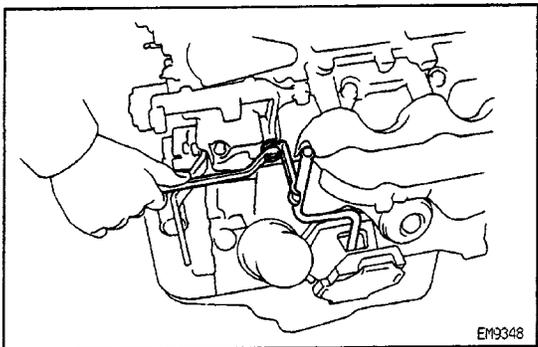
## 8. INSTALL WATER BY-PASS PIPE TO RH CYLINDER HEAD .

Install the water by- pass pipe with the bolt.

**9. INSTALL NO.2 ENGINE HANGER**

Install the engine hanger with the two bolts.

**Torque: 40 N-m (410 kgf-cm, 30 ft-lbf)**

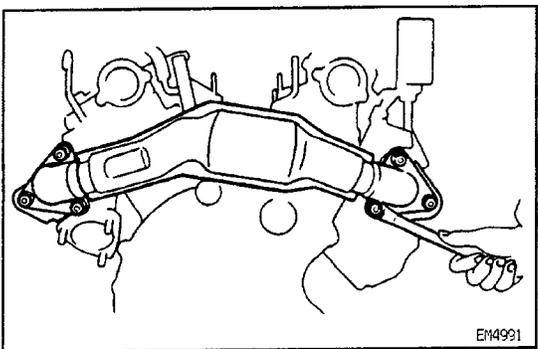
**10. INSTALL OIL DIPSTICK GUIDE AND DIPSTICK**

(a) Install a new O-ring on the oil dipstick:

(b) Install the oil dipstick guide with the bolt.

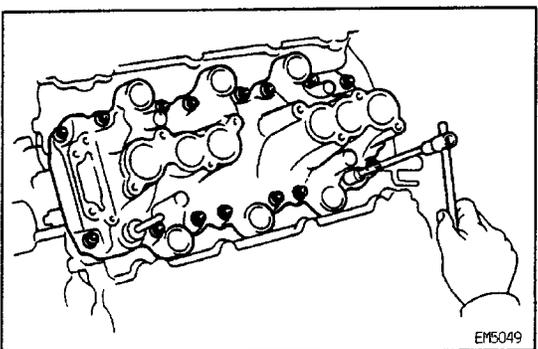
**Torque: 37 N-m (380 kgf-cm, 27 ft-lbf)**

(c) Install the oil dipstick.

**11. INSTALL GENERATOR****12. INSTALL EXHAUST CROSSOVER PIPE**

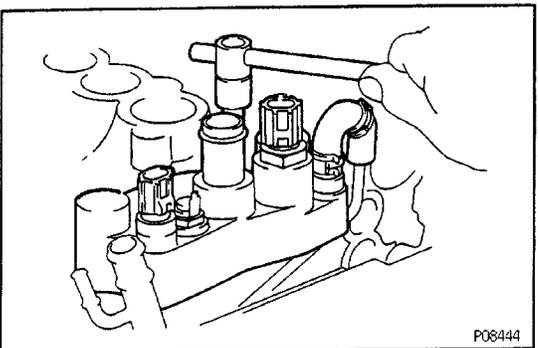
Install two new gaskets and the crossover pipe with the six nuts.

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

**13. INSTALL KNOCK SENSOR WIRE****14. INSTALL INTAKE MANIFOLD**

install two new gaskets and the intake manifold with the twelve bolts and four nuts.

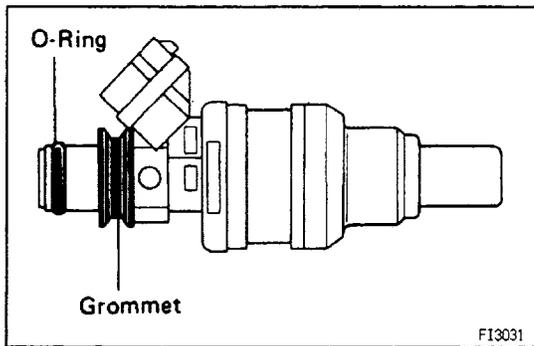
**Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)**

**15. INSTALL WATER BY-PASS OUTLET**

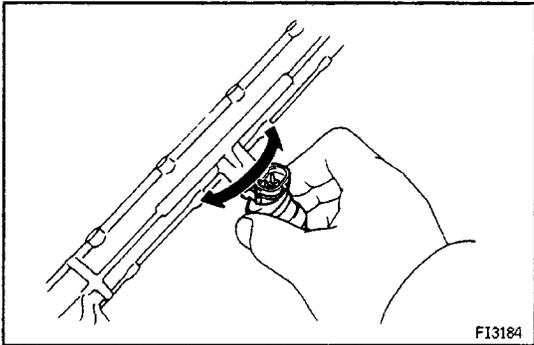
(a) Install a new gasket and the water by-pass outlet with the two nuts.

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

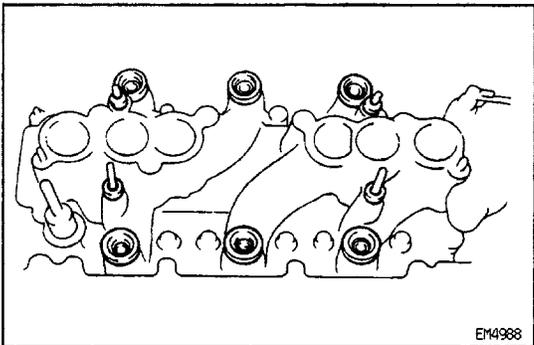
(b) Connect the No.3 water by-pass hose to the No.1 water by-pass pipe.

**16. INSTALL INJECTORS AND DELIVERY PIPE**

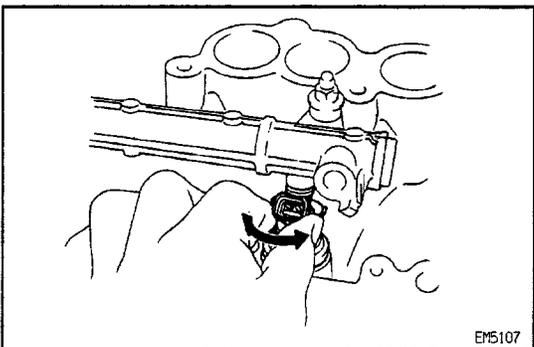
- (a) Install a new grommet to the injector.
- (b) Apply a light coat of gasoline to a new O-ring, and install it to the injector.



- (c) While turning the injector clockwise and counter-clockwise, push it to the delivery pipe. Install the eight injectors.
- (d) Position the injector connector outward.



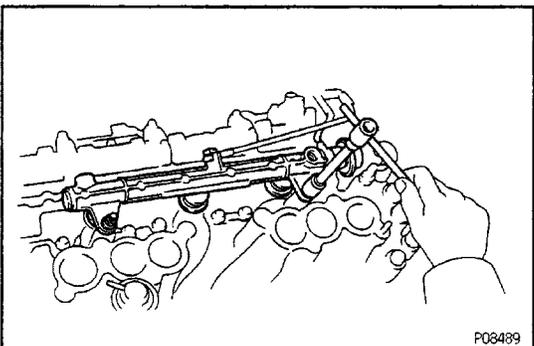
- (e) Install a O-ring to the spacer.
- (f) Place the six spacers and insulators into the injector holes.
- (g) Place the four spacers on the stud bolts.



- (h) Place the two delivery pipes together with the six injectors in position on the intake manifold.
- (i) Temporarily install the four spacers and nuts.
- (j) Check that the injectors rotate smoothly.

**HINT:** If injectors do not rotate smoothly, the probable cause is incorrect installation of O-rings. Replace the O-rings.

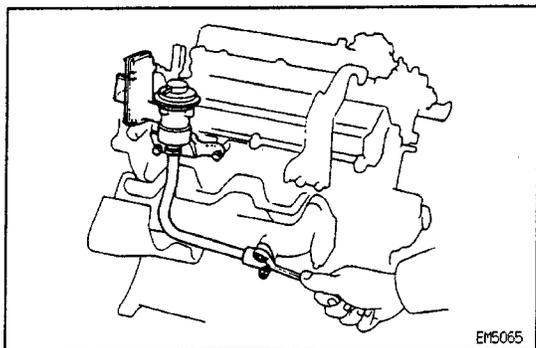
- (k) Position the injector connector upward.



- (l) Tighten the four nuts holding the delivery pipes to the intake manifold.

**Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)**

- (m) Install the No. 1 fuel pipe to the No.3 bearing cap with the bolt.



### 17. INSTALL PAIR REED VALVE AND NO.1 INJECTION MANIFOLD

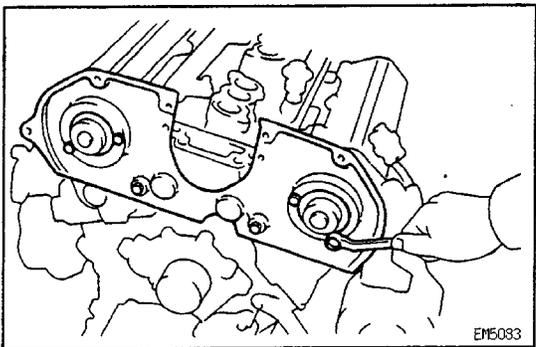
- Position a new gasket on the RH exhaust manifold.
- Install the PAIR reed valve and injection manifold assembly with the two nuts and two bolts.

**Torque:**

**37 N-m (380 kgf-cm, 27 ft-lbf) for bolt**

**29 N-m (300 kgf-cm, 22 ft-lbf) for nut**

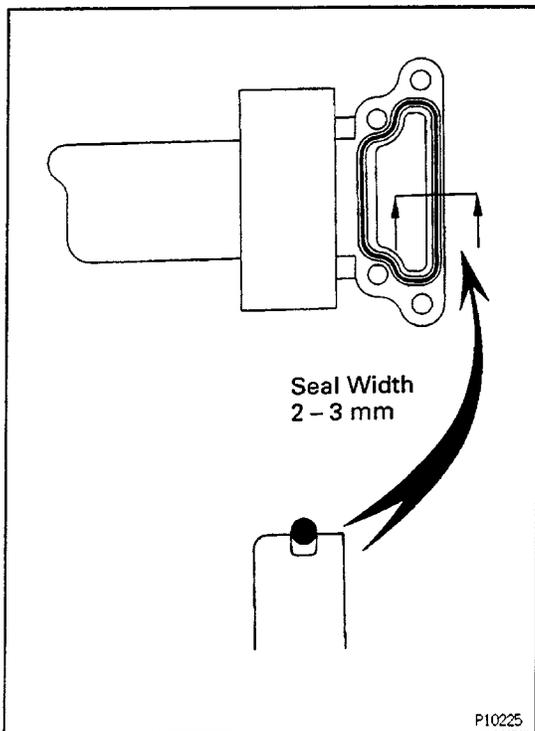
### 18. INSTALL VSV BRACKET AND VSV TO PAIR REED VALVE



### 19. INSTALL NO.3 TIMING BELT COVER

Install the timing belt cover with the six bolts.

**Torque: 8.3 N-m (85 kgf-cm, 74 in.-lbf)**



### 20. INSTALL NO.2 IDLER PULLEY

- Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water outlet housing on the No.2 idler pulley and the intake manifold.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non-residue solvent, clean both sealing surfaces.

- Apply seal packing to the sealing groove of the water outlet housing on the idler pulley as shown in the illustration.

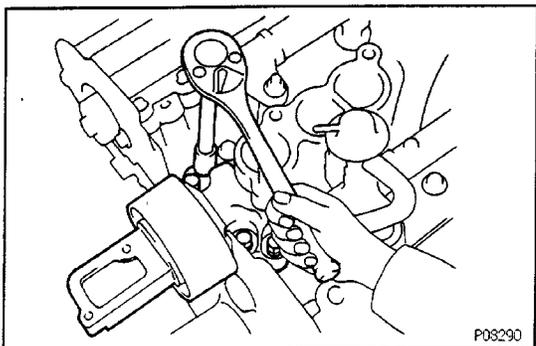
**Seal packing:**

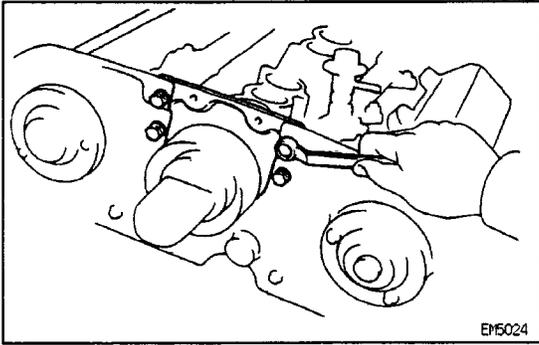
**Part No. 08826-00100 or equivalent**

- Install a nozzle that has been cut to a 2 - 3 mm (0.08 - 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

- Install the idler pulley with the four bolts. Uniformly tighten the bolts in several passes.

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



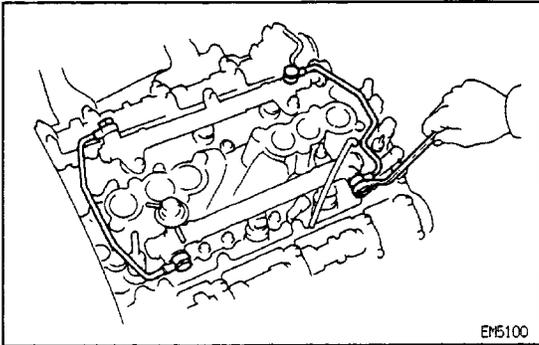


EM5024

**21. INSTALL NO.4 TIMING BELT COVER**

Install the timing belt cover with the four bolts.

**Torque: 8.3 N-m (85 kgf-cm, 74 in.-lbf)**



EM5100

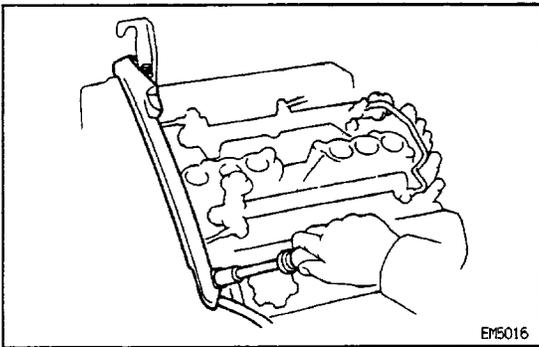
**22. INSTALL NO.2 AND NO.3 FUEL PIPES**

(a) Install the No.2 fuel pipe with four new gaskets and two union bolts.

**Torque: 34 N-m (350 kgf-cm, 25 ft-lbf)**

(b) Install the No.3 fuel pipe with four new gaskets and two union bolts.

**Torque: 34 N-m (350 kgf-cm, 25 ft-lbf)**



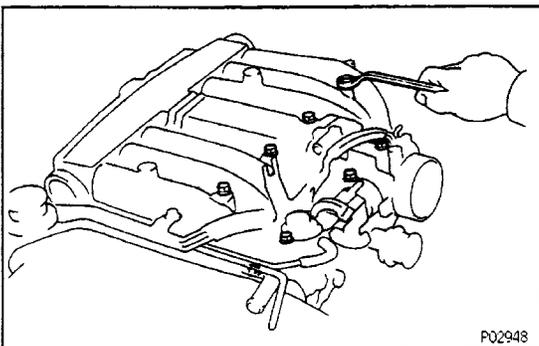
EM5016

**23. INSTALL ENGINE WIRE**

(a) Install the engine wire with the two bolts.

(b) Connect the following connectors:

- Injector connectors
- RH ground strap
- ECT sender gauge connector
- ECT sensor connector
- No.2 ECT switch connector
- Cold start injector time switch connector
- Knock sensor connector

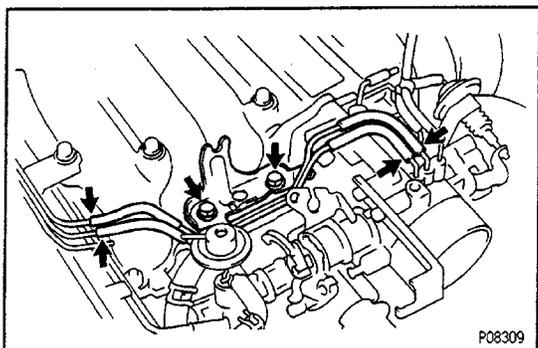


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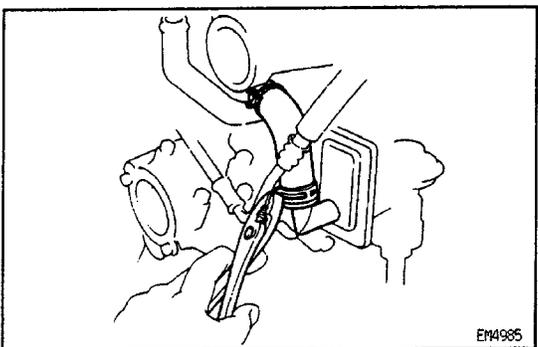
**24. INSTALL AIR INTAKE CHAMBER**

(a) Install a new gasket and the intake chamber with the six bolts and two nuts.

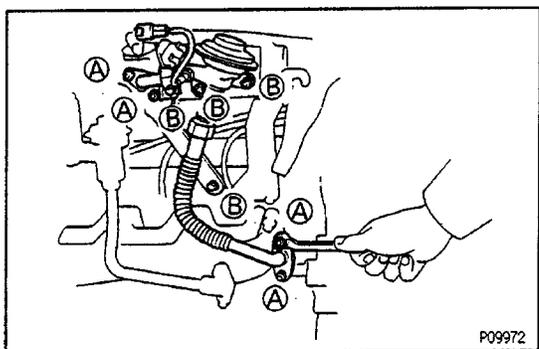
**Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)**



- (b) Install the accelerator cable bracket with the two bolts.
- (c) Connect the four vacuum hoses to the air pipes.



- (d) Connect the No.1 air hose to the reed valve.



- (e) Install two new gaskets, the EGR valve, pipes assembly, air intake chamber stay and throttle cable bracket with the six nuts and two bolts.

**Torque:**

**29 N-m (300 kgf-cm, 22 ft-lbf) for (A)**

**18 N-m (185 kgf-cm, 13 ft-lbf) for (B)**

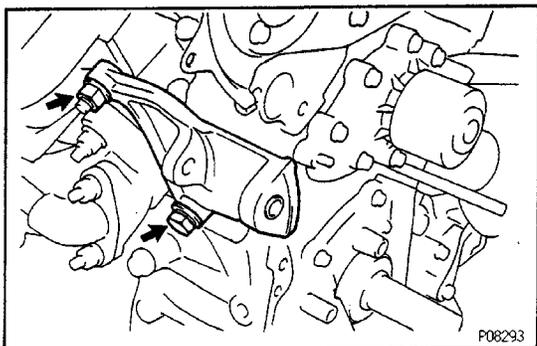
- (f) (C & C only)

Disconnect the two water by-pass hoses from the EGR valve.

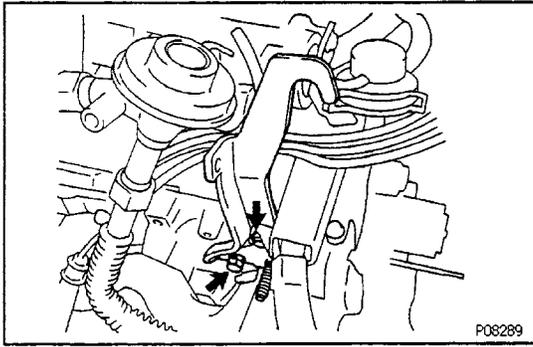
- (g) Connect the EGR hoses to the air pipe and EGR vacuum modulator.

- (h) (Calif. and C & C)

Connect the EGR gas temperature sensor connector.

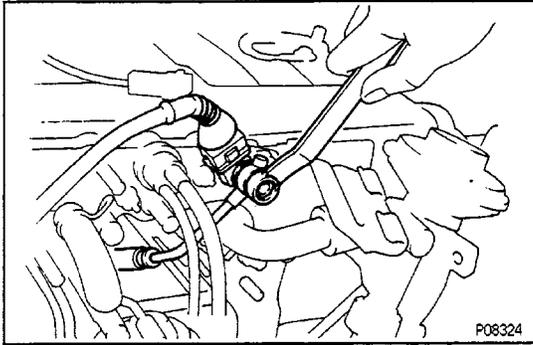


- (i) Install the PS pump bracket with the bolt and nut.



(j) Install No.1 engine hanger.

**Torque: 40 N-m (410 kgf-cm, 30 ft-lbf)**

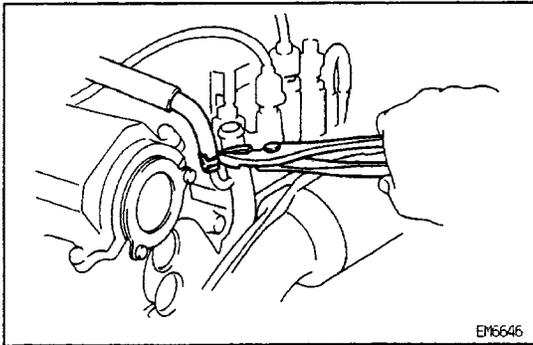


(k) Connect the cold start injector tube with two new gasket and the union bolt.

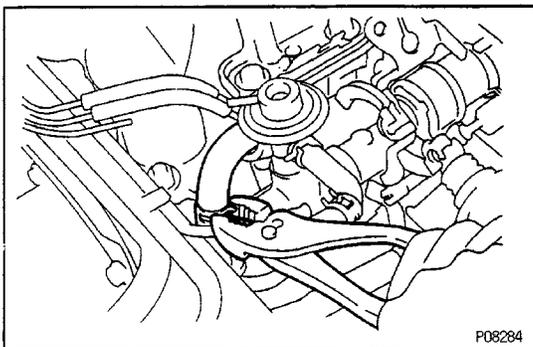
**Torque: 15 N-m (150 kgf-cm, 11 ft-lbf)**

(l) Connect the vacuum hose to the gas filter.

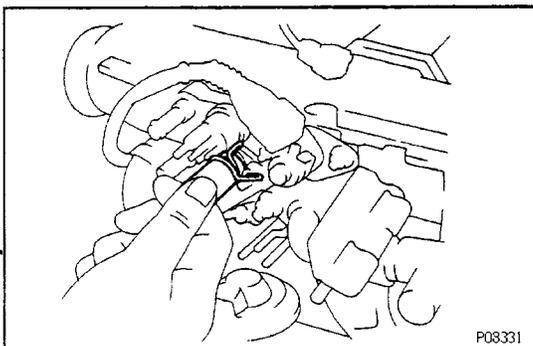
(m) Connect the cold start injector connector.



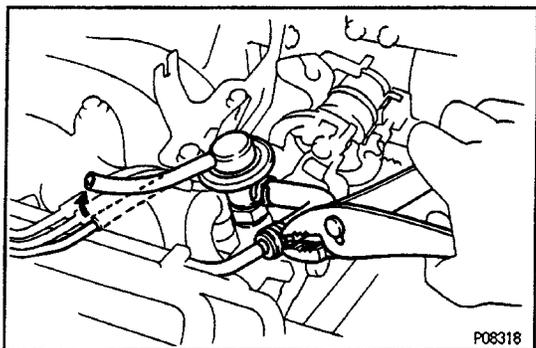
(n) Install the No.5 water by-pass hose to the water by-pass pipe.



(o) Connect the No.4 water by-pass hose to the union of intake manifold.



(p) Connect the PCV hose to the union.



- (q) Connect the vacuum and fuel hoses to the pressure regulator.
- (r) Connect the charcoal canister vacuum hose to the throttle body.
- (s) Connect the throttle position sensor connector.

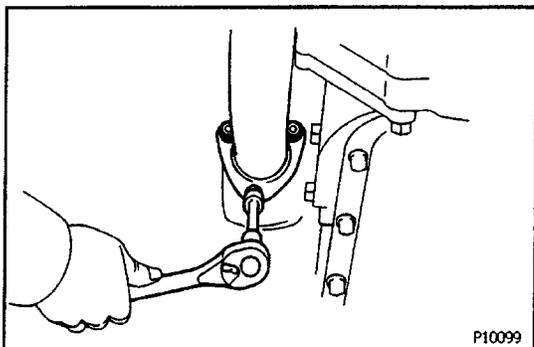
## 25. INSTALL TIMING BELT

See steps 2, 7 to 16, 22 and 24 on pages [EG2-41](#) to 48)

## 26. INSTALL DISTRIBUTOR

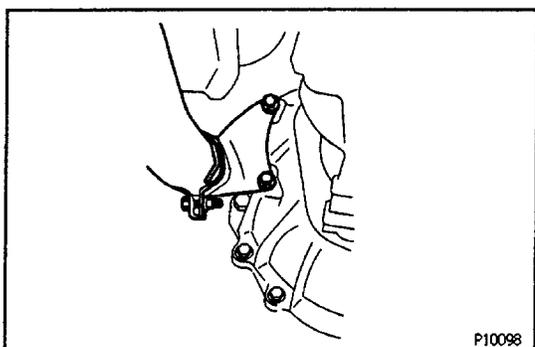
(See steps 1 and 2 on pages [IG-25](#) and 26)

## 27. CONNECT HIGH-TENSION CORDS TO SPARK PLUGS

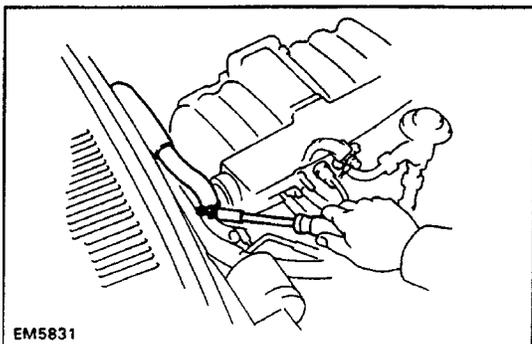


## 28. INSTALL FRONT EXHAUST PIPE

- (a) Connect the exhaust pipe to the LH exhaust manifold with new gasket and three new nuts.  
**Torque: 62 N-m (630 kgf-cm, 46 ft-lbf)**
- (b) Connect the exhaust pipe to the catalytic converter with new gasket and the two bolts.  
**Torque: 39 N-m (400 kgf-cm, 29 ft-lbf)**



- (c) Install the pipe bracket to the transmission with the two bolts.
- (d) Install the pipe bracket to the exhaust pipe with the pipe clamp.
- (e) Connect the oxygen sensor connector-.



## 29. CONNECT FUEL INLET AND OUTLET HOSES

## 30. CONNECT HEATER HOSES

### 31. CONNECT CABLES, HOSES, CONNECTORS, STRAP AND WIRES

(a) Connect the following cables:

- Accelerator cable
- (A/T only)  
Throttle cable
- (w/ Cruise Control System)

Cruise control cable

(b) Connect the following hoses:

- PS air hoses to gas filter and air pipe
- Brake booster hose  
(w/ Cruise Control System)
- Cruise control vacuum hose
- Charcoal canister hose from canister
- VSV vacuum hoses

(c) Connect the following strap, wires and connectors:

- Ground strap to LH fender apron
- Generator connector and wire
- Igniter connector
- Oil pressure sender gauge connector
- Ground strap to engine rear side
- ECM connectors
- VSV connectors
- A/C compressor connector
- (M/T only)  
Starter relay connector
- Solenoid resistor connector
- Data link connector 1  
(w/ ADD)  
ADD switch connector

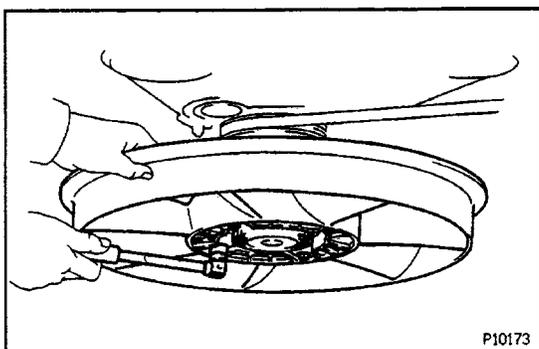
### 32. INSTALL GENERATOR DRIVE BELT

### 33. INSTALL COOLING FAN

Install the cooling fan with the four nuts.

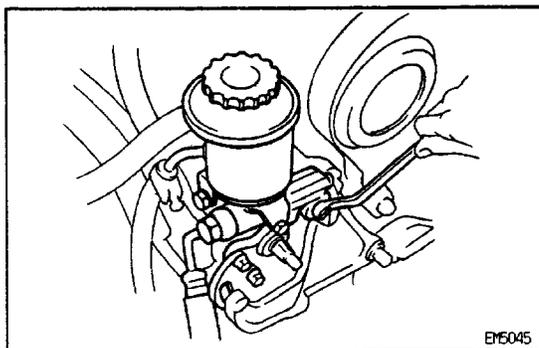
Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)

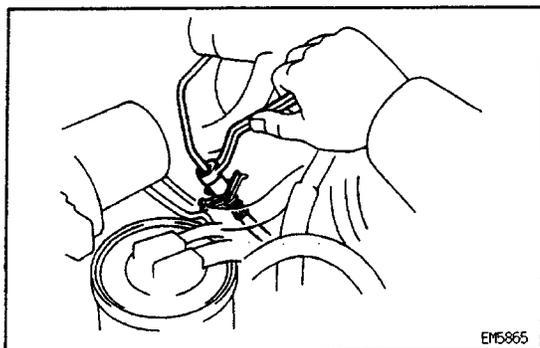
### 34. INSTALL A/C DRIVE BELT



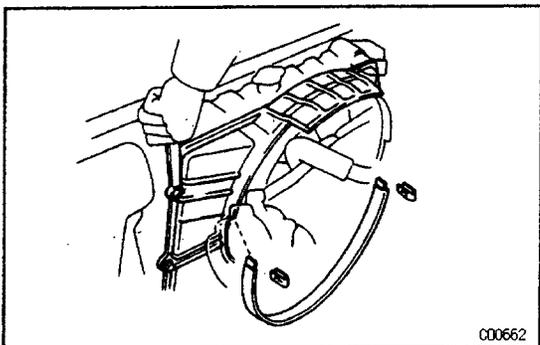
### 35. INSTALL PS PUMP

### 36. INSTALL PS PUMP PULLEY AND DRIVE BELT



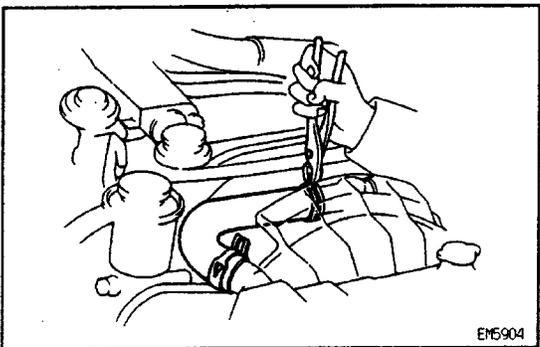


**37. (M/T only)  
CONNECT CLUTCH RELEASE CYLINDER HOSE**



**38. INSTALL RADIATOR**

- (a) Install the radiator with the four bolts.
- (b) Install the No. fan shroud with the four bolts.
- (c) Install the No.2 fan shroud with the two clips.



- (d) Install the radiator hoses.
- (e) (A/T only)  
Connect the oil cooler hoses.
- (f) Connect the reservoir tank hose.

**39. INSTALL AIR CLEANER AND HOSE**

**40. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

**41. FILL WITH ENGINE COOLANT**

**42. START ENGINE AND CHECK FOR LEAKS**

**43. PERFORM ENGINE ADJUSTMENT**

(See Tune - Up on pages [EG2-12](#) to 27)

**44. PERFORM ROAD TEST**

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

**45. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL**