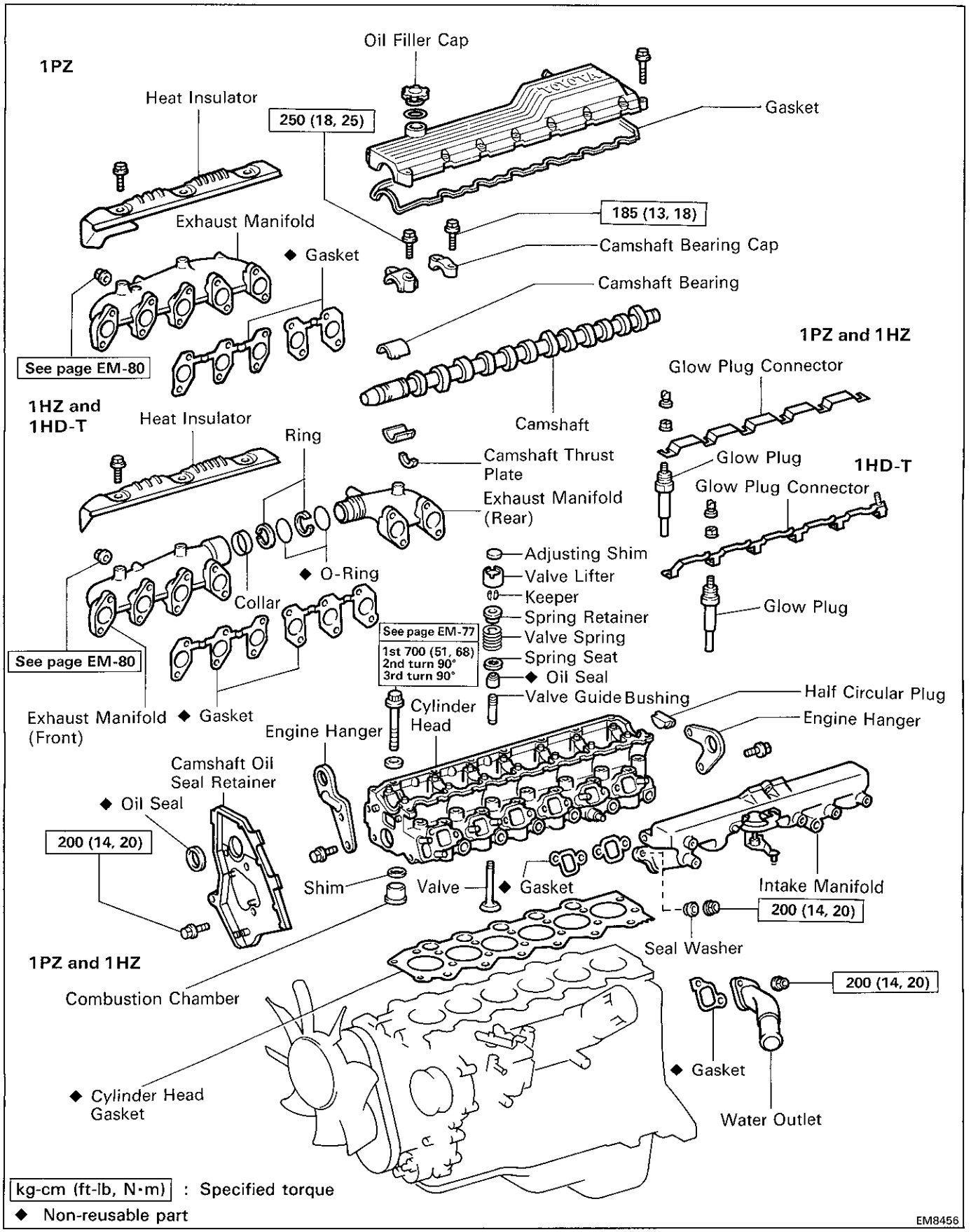
CYLINDER HEAD

COMPONENTS



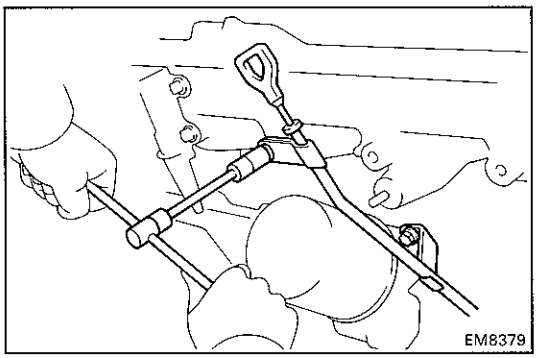
REMOVAL OF CYLINDER HEAD

(See page EM-54)

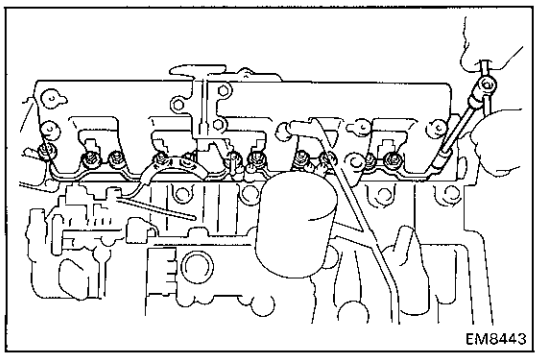
1. DRAIN ENGINE COOLANT (See page CO-4)

2. REMOVE INTAKE PIPE
(See step 6 on page EM-34)

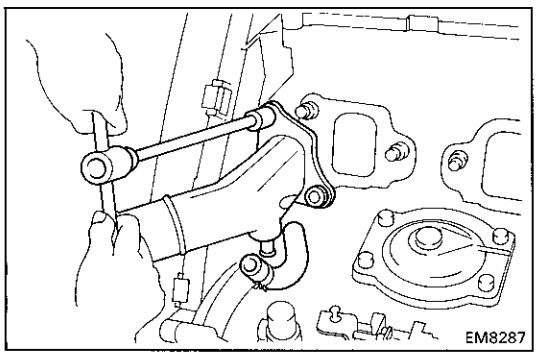
3. REMOVE INJECTION PIPES
(See step 2 on page FU-9)



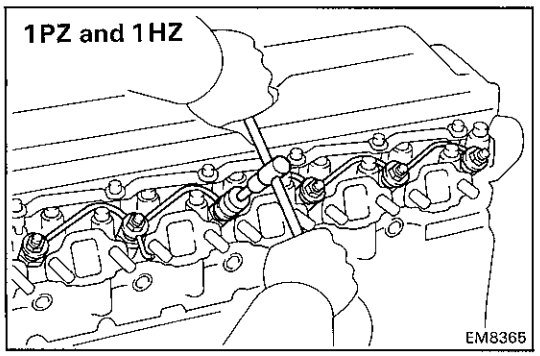
4. REMOVE OIL DIPSTICK AND OIL DIPSTICK GUIDE
   (a) Remove the two bolts, and the oil dipstick guide assembly.
   (b) Remove the O-ring from the oil dipstick guide.



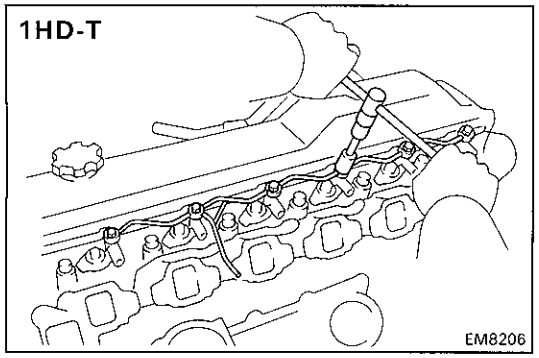
5. REMOVE INTAKE MANIFOLD
   (a) Disconnect the fuel hose from the nozzle leakage pipe.
   (b) (1PZ)
   Remove the ten bolts, seal washers, intake manifold and five gaskets.
   (c) (1HZ and 1HD-T)
   Remove the twelve bolts, seal washers, intake manifold and six gaskets.



6. REMOVE WATER OUTLET
   (a) (1HD-T)
   Disconnect the water by-pass hose.
   (b) Remove the two nuts, water outlet and gasket.

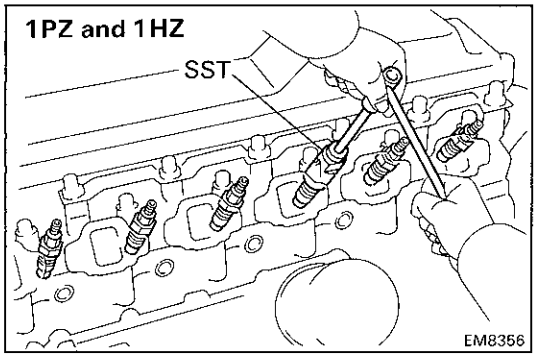


7. REMOVE NOZZLE LEAKAGE PIPE
   (1PZ and 1HZ)
   (a) (1PZ)
   Remove the five union nuts, nozzle leakage pipe and five gaskets.
   (b) (1HZ)
   Remove the six union nuts, nozzle leakage pipe and six gaskets.



(1HD-T)

Remove the six hollow bolts, nozzle leakage pipe and twelve gaskets.



8. REMOVE INJECTION NOZZLES

(1PZ and 1HZ)

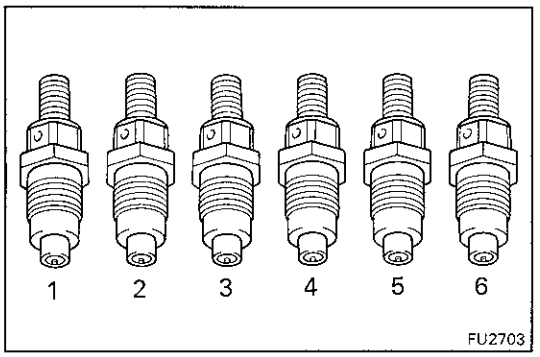
(a) (1PZ)
Using SST, remove the five injection nozzles, seats and gaskets.

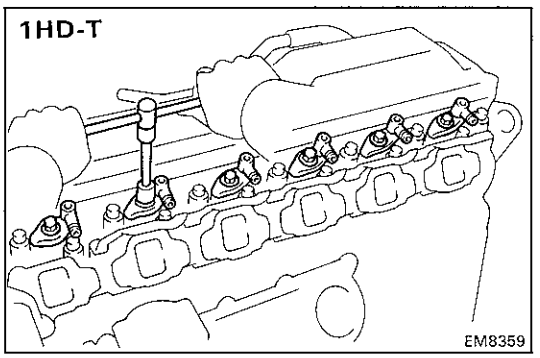
SST 09268-64010

(b) (1HZ)
Using SST, remove the six injection nozzles, seats and gaskets.

SST 09268-64010

HINT: Arrange the injection nozzles in correct order.

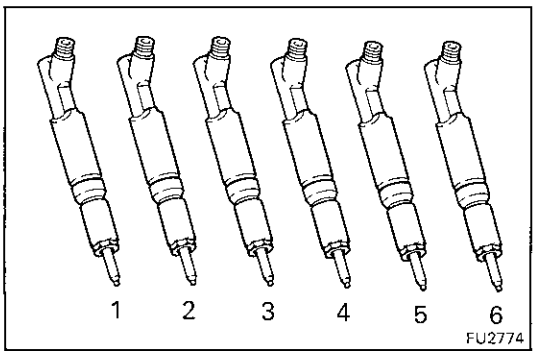




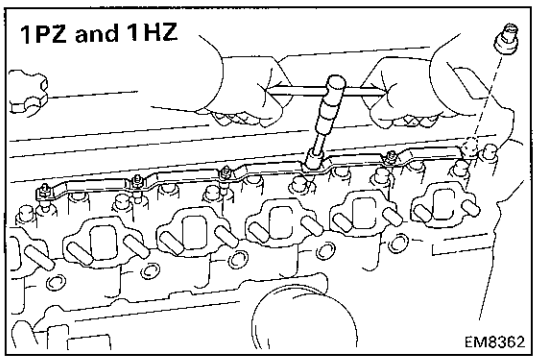
(1HD-T)

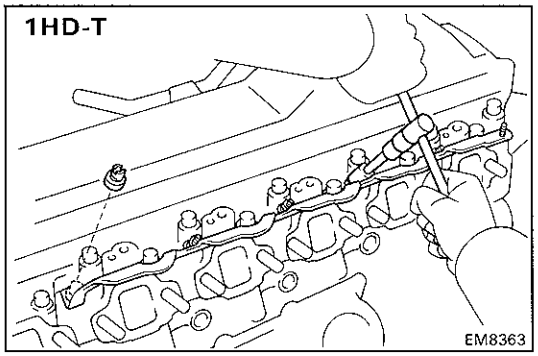
(a) Remove the bolt, washer, nozzle holder, injection nozzle and seat.

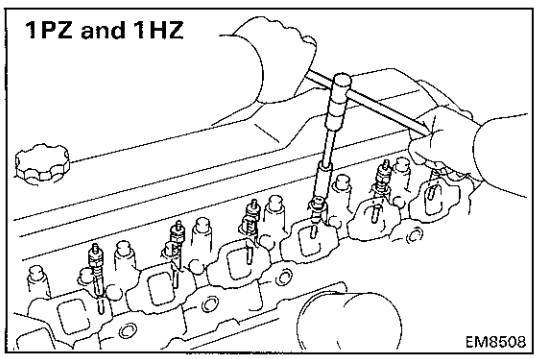
(b) Remove the O-ring from the injection nozzle.

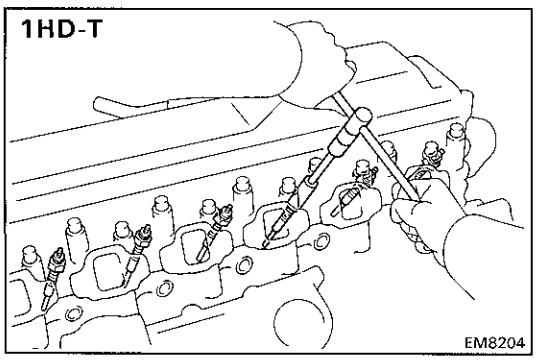


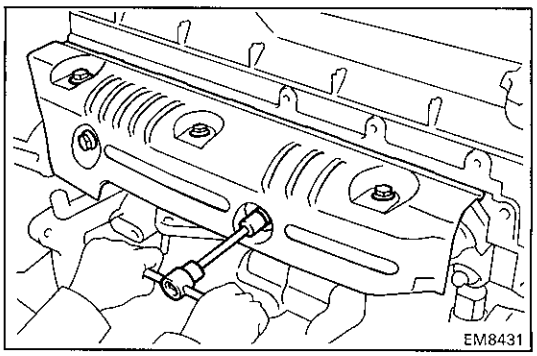
HINT: Arrange the injection nozzles in correct order.











9. REMOVE GLOW PLUGS

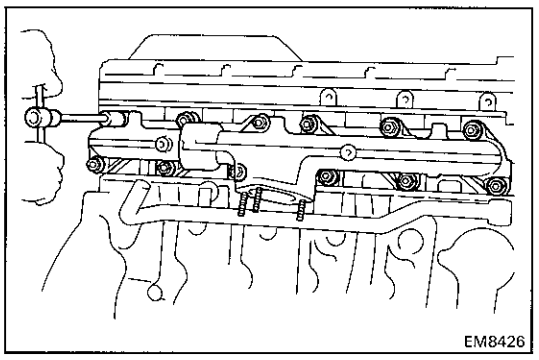
(a) Remove the five screw grommets (1PZ) or six screw grommets (1HZ and 1HD-T).

(b) Remove the five nuts (1PZ) or six nuts (1HZ and 1HD-T) and glow plug connector.

(c) Using a 12 mm deep socket wrench, remove the five glow plugs (1PZ) or six glow plugs (1HZ and 1HD-T).

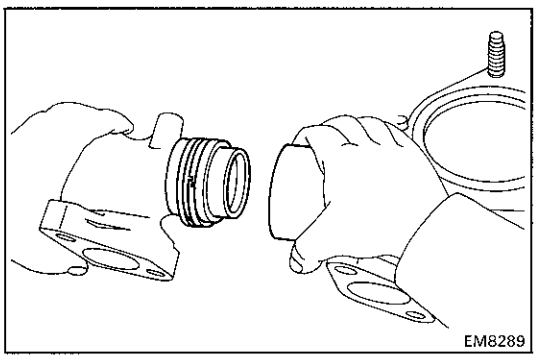
10. (1PZ and 1HZ)
REMOVE EXHAUST MANIFOLD

(a) Remove the four bolts (1PZ) or five bolts (1HZ) and heat insulator.



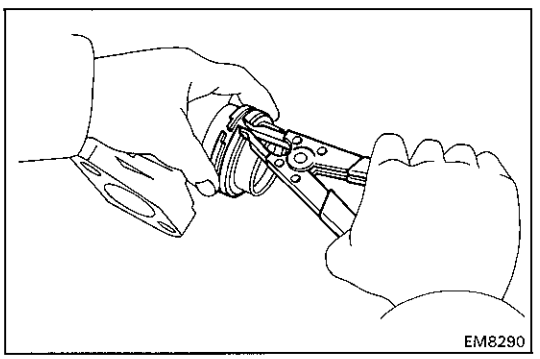
(b) Remove the ten nuts (1PZ) or twelve nuts (1HZ), exhaust manifold and two gaskets.

11. (1HD-T)
REMOVE TURBOCHARGER AND EXHAUST MANIFOLD ASSEMBLY
(See steps 3 to 8 on pages TC-9, 10)



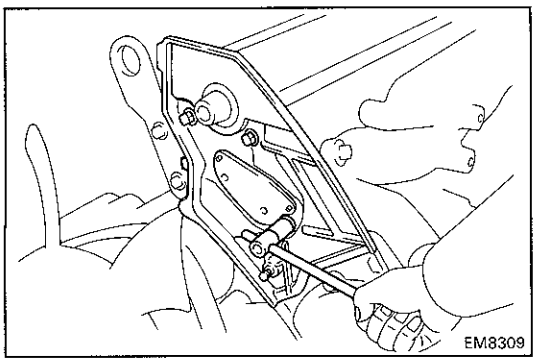
12. (1HZ and 1HD-T)
SEPARATE EXHAUST MANIFOLDS

(a) Separate the front and rear exhaust manifolds.



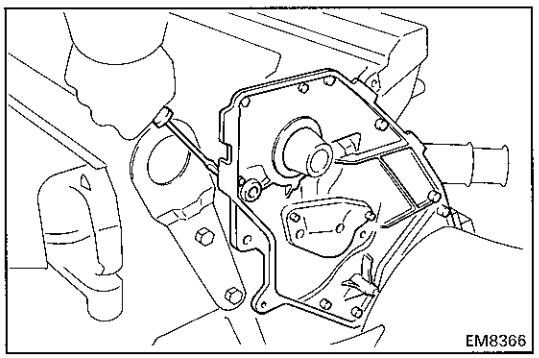
(b) Using snap ring pliers, remove the two manifold rings.

13. REMOVE TIMING BELT AND PULLEYS
(See steps 1 to 3 and 5 to 7 on pages EM-33 to 35)

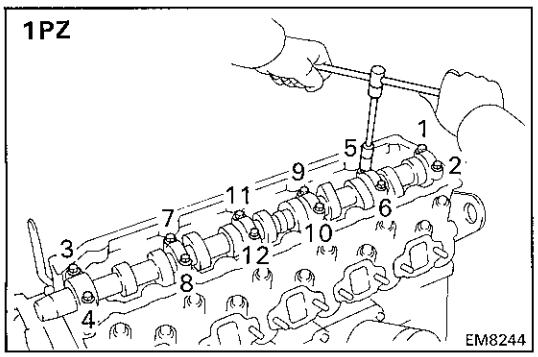


14. REMOVE CAMSHAFT OIL SEAL RETAINER

(a) Remove the four bolts holding the camshaft oil seal retainer to the cylinder head.

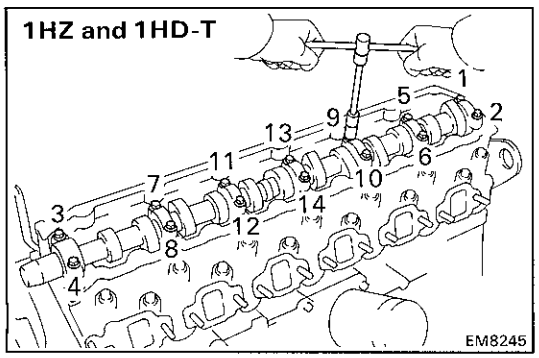


(b) Pry out the camshaft oil seal retainer.



15. REMOVE CAMSHAFT

(a) (1PZ)
Uniformly loosen and remove the twelve bearing cap bolts in several passes in the sequence shown.

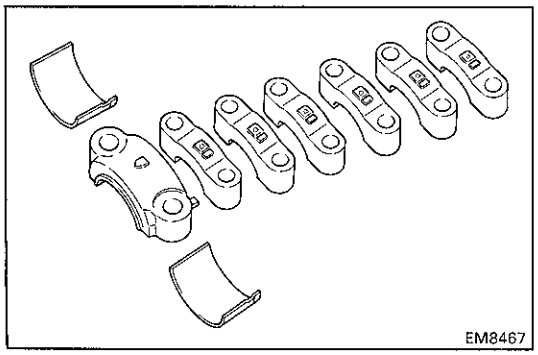


(b) (1HZ and 1HD-T)
Uniformly loosen and remove the fourteen bearing cap bolts in several passes in the sequence shown.

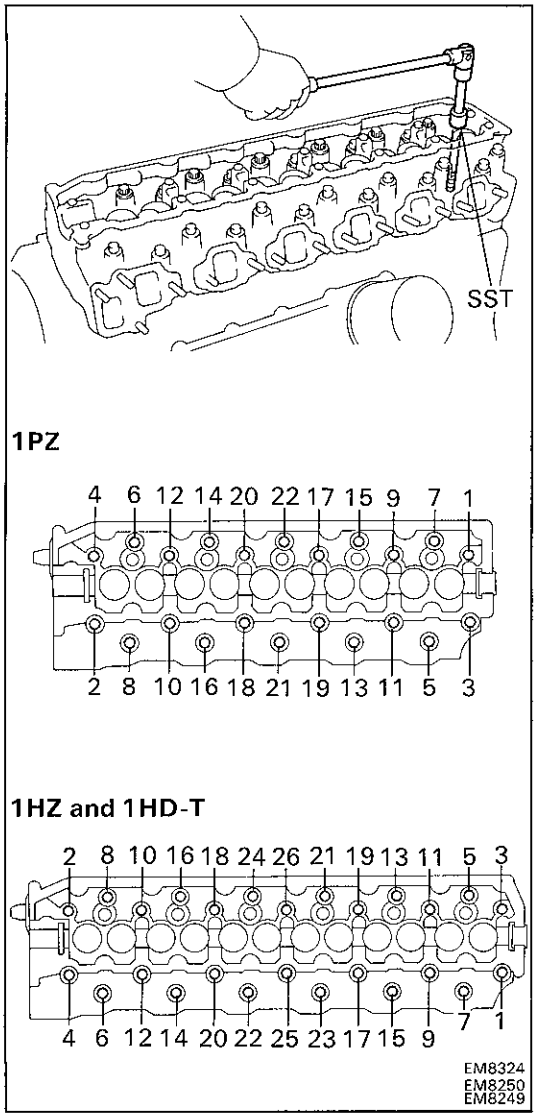
(c) Remove the six bearing caps (1PZ) or seven bearing caps (1HZ and 1HD-T) and camshaft.

(d) Remove the two bearings from the No.1 bearing cap and No.1 journal of the cylinder head.

(e) Remove the camshaft thrust plate.



HINT: Arrange the bearing caps and bearings in correct order.

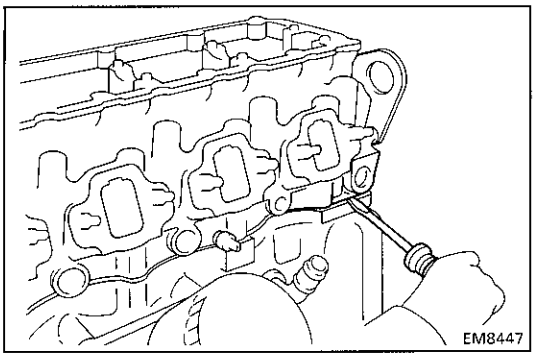


16. REMOVE CYLINDER HEAD

(a) Using SST, uniformly loosen and remove the twenty-two cylinder head bolts (1PZ) or twenty-six cylinder head bolts (1HZ and 1HD-T) in several passes in the sequence shown.

SST 09011-38121

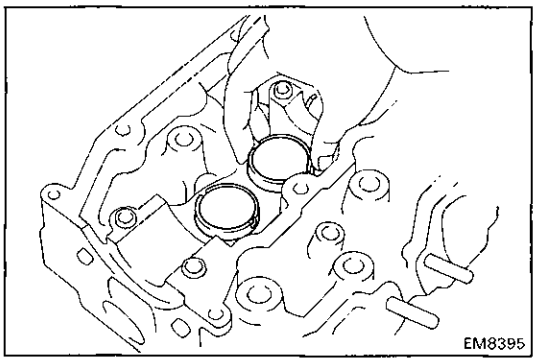
NOTICE: Head warpage or cracking could result from removing bolts in incorrect order.



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

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

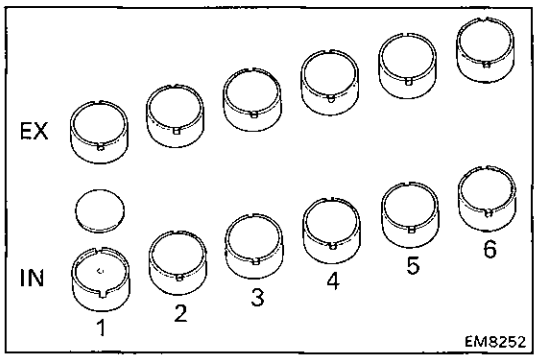
NOTICE: Be careful not to damage the cylinder head and cylinder block surfaces of cylinder head gasket side.



DISASSEMBLY OF CYLINDER HEAD

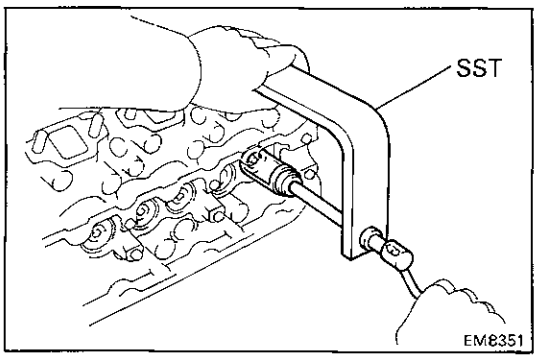
(See page EM-54)

1. REMOVE VALVE LIFTERS AND SHIMS



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

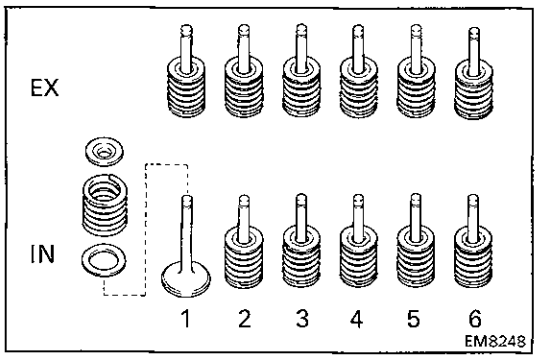
2. REMOVE VALVES



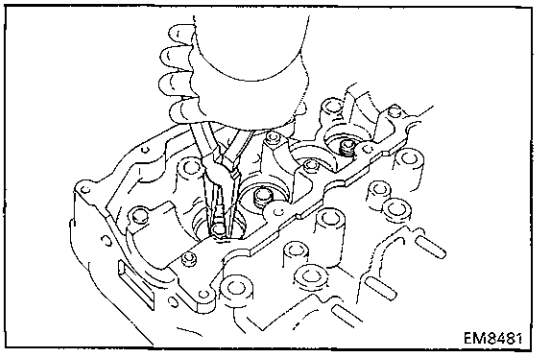
(a) Using SST, compress the valve spring and remove the two keepers.

SST 09202-43013

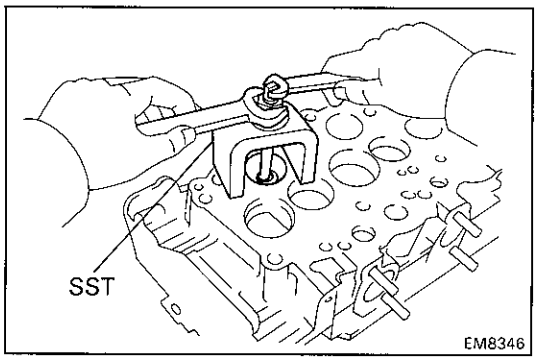
(b) Remove the spring retainer, valve spring, valve and spring seat.



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



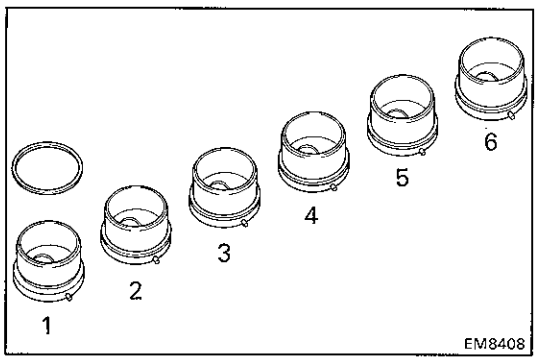
(c) Using needle-nose pliers, remove the oil seal.



3. **(1PZ and 1HZ)**
REMOVE COMBUSTION CHAMBERS

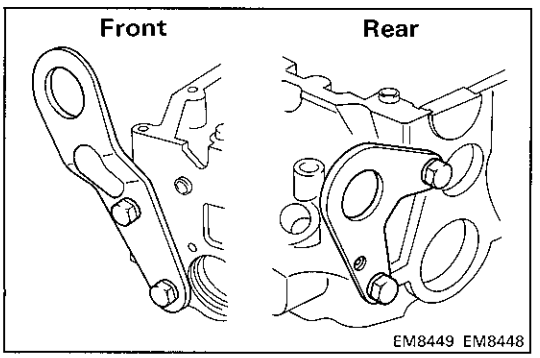
Using SST, remove the five (1PZ) and six (1HZ) combustion chambers (and shims).

SST 09208-48010

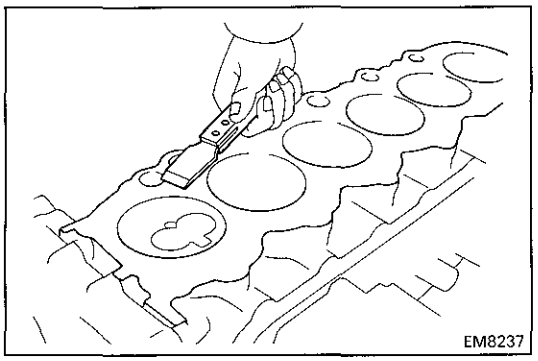


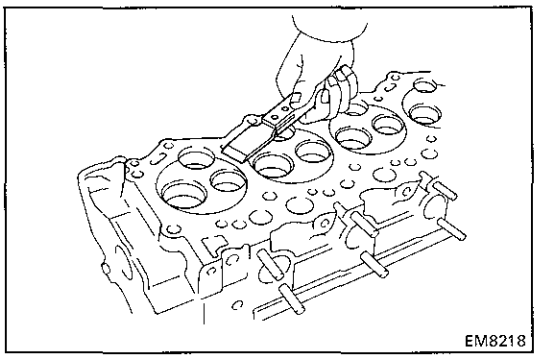
HINT: Arrange the combustion chambers (and shims) in correct order.

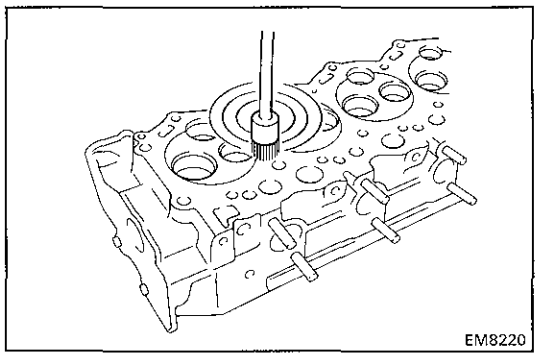
4. **REMOVE HALF CIRCULAR PLUG**

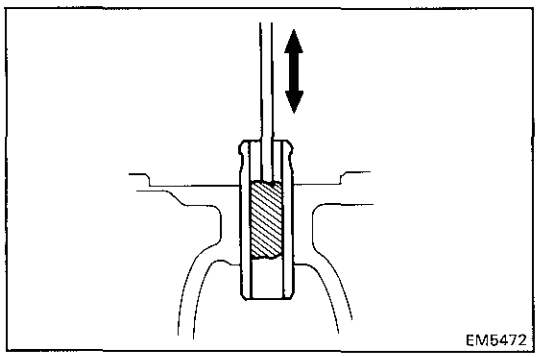


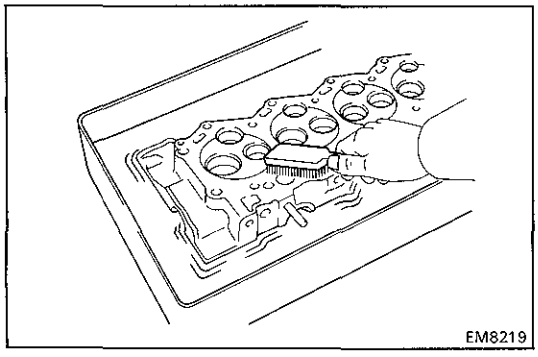
5. **REMOVE FRONT AND REAR ENGINE HANGERS**











INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

1. CLEAN TOP OF PISTONS AND TOP OF 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.

(b) Remove all the gasket material from the top of the cylinder block.

NOTICE: Be careful not to scratch the surfaces.

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

CAUTION: Protect your eyes when using high pressure air.

2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the manifold and cylinder head surface.

NOTICE: Be careful not to scratch the surfaces.

3. CLEAN COMBUSTION CHAMBERS

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

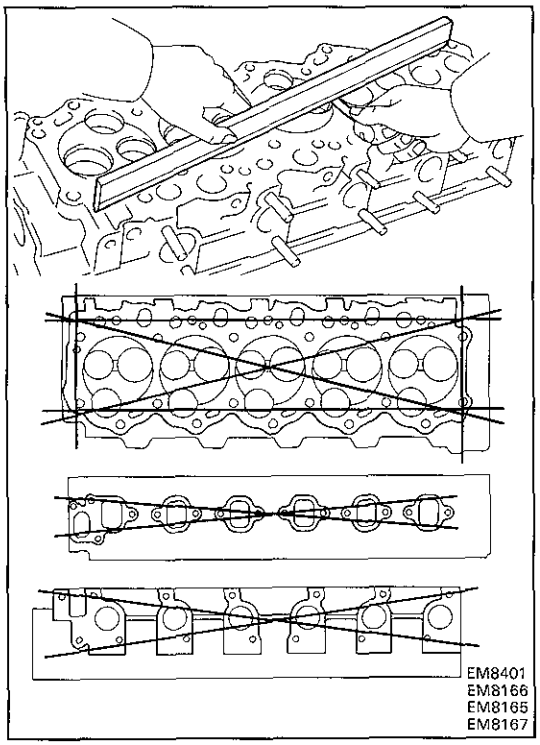
NOTICE: Be careful not to scratch the head gasket contact surface.

4. CLEAN VALVE GUIDE BUSHINGS

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

5. CLEAN CYLINDER HEAD

Using a soft brush and solvent, thoroughly clean cylinder heads.

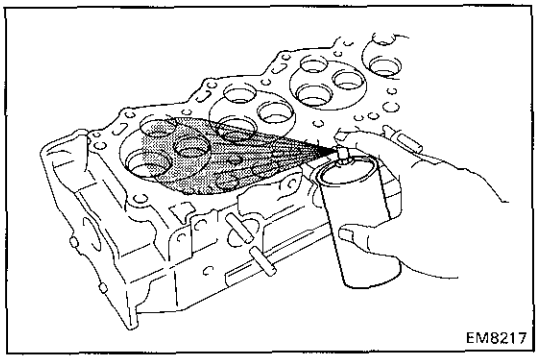


6. INSPECT CYLINDER HEAD FOR FLATNESS

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

Maximum warpage: 0.20 mm (0.0079 in.)

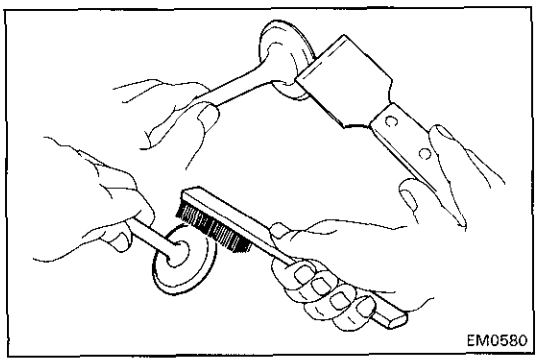
If warpage is greater than maximum, replace the cylinder head.



7. INSPECT CYLINDER HEAD FOR CRACKS

Using a dye penetrant, check the combustion chamber, intake and exhaust ports, head surface and the top of the head for cracks.

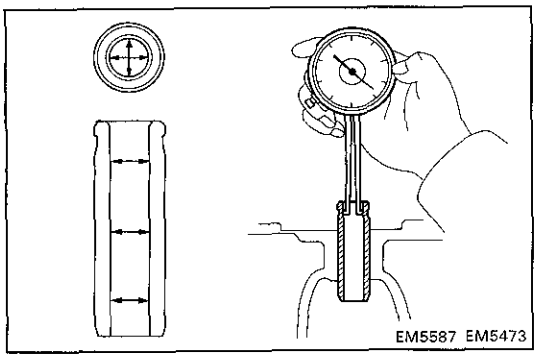
If cracked, replace the cylinder head.



8. CLEAN VALVES

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

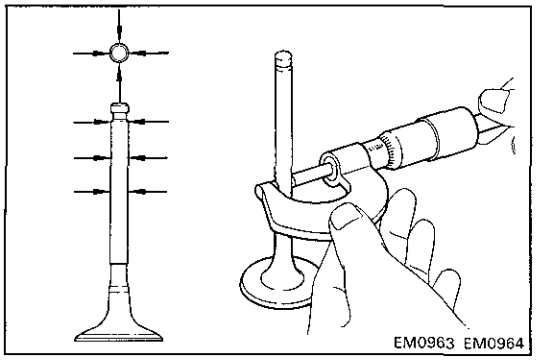
(b) Using a wire brush, thoroughly clean the valve.



9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

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

Bushing inside diameter:
8.010 – 8.030 mm (0.3154 – 0.3161 in.)



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

Valve stem diameter:

Intake	**7.975 – 7.990 mm (0.3140 – 0.3146 in.)**
Exhaust	**7.960 – 7.975 mm (0.3134 – 0.3140 in.)**

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

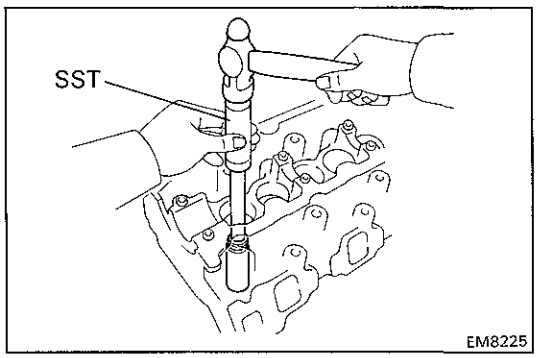
Standard oil clearance:

Intake	**0.020 – 0.055 mm (0.0008 – 0.0022 in.)**
Exhaust	**0.035 – 0.070 mm (0.0014 – 0.0028 in.)**

Maximum oil clearance:

Intake	**0.08 mm (0.0031 in.)**
Exhaust	**0.10 mm (0.0039 in.)**

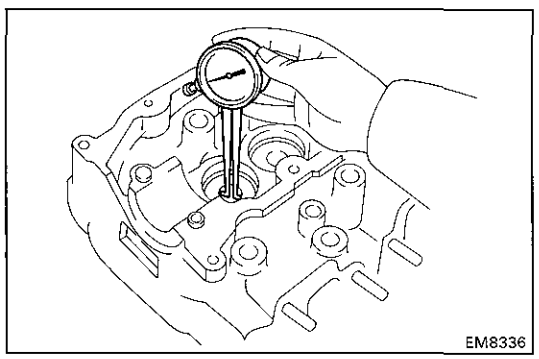
If the clearance is greater than maximum, replace the valve and guide bushing.



10. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

(a) Using SST and a hammer, tap out the guide bushing.

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

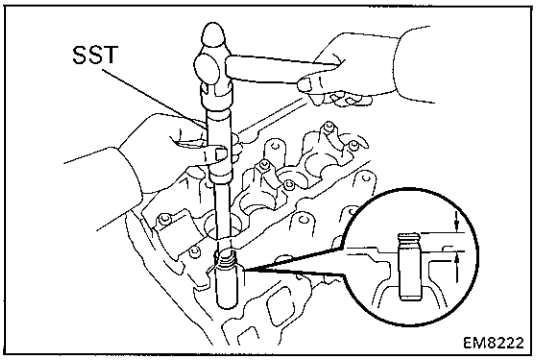
Bushing bore diameter mm (in.)	Bushing size
13.004 – 13.025 (0.5112 – 0.5128)	Use STD
13.054 – 13.075 (0.5139 – 0.5148)	Use O/S 0.05

(c) Select a new guide bushing (STD size or O/S 0.05).

If the bushing bore diameter of the cylinder head is greater than 13.025 mm (0.5128 in.), machine the bushing bore to the following dimension:

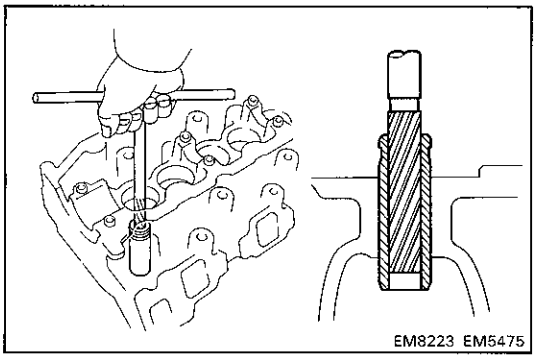
Rebored cylinder head bushing bore dimension:
13.054 – 13.075 mm (0.5139 – 0.5148 in.)

If the bushing bore diameter of the cylinder head is greater than 13.075 mm (0.5148 in.), replace the cylinder head.

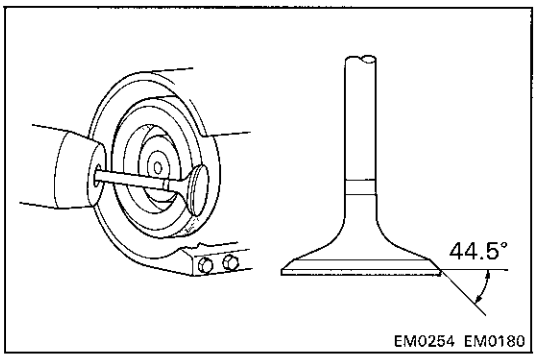


(d) Using SST and a hammer, tap in a new guide bushing to where there is 11.8 – 12.2 mm (0.465 – 0.480 in.) protruding from the cylinder head.

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(e) Using a sharp 8 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EM-65) between the guide bushing and valve stem.

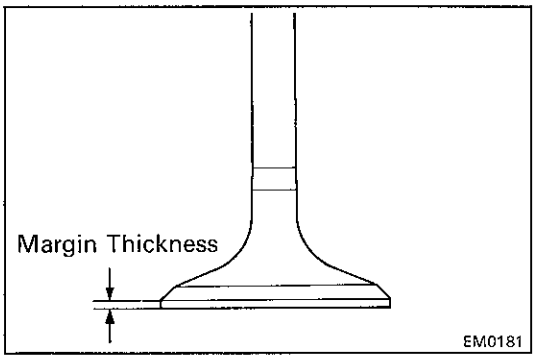


11. INSPECT AND GRIND VALVES

(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.

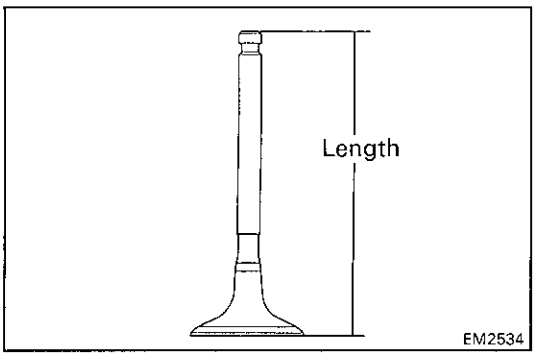
Standard margin thickness:

Intake	**1.6 mm (0.063 in.)**
Exhaust	**1.7 mm (0.067 in.)**

Minimum margin thickness:

Intake	**1.1 mm (0.043 in.)**
Exhaust	**1.2 mm (0.047 in.)**

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



(d) Check the valve overall length.

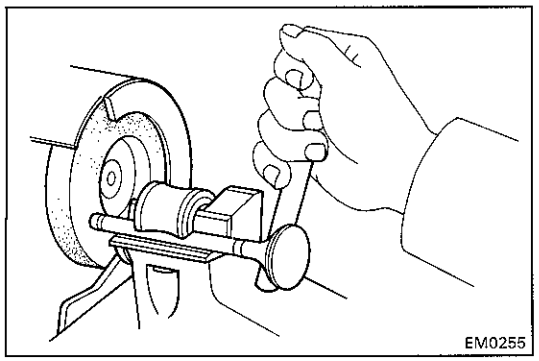
Standard overall length:

Intake	**103.29 – 103.69 mm (4.0665 – 4.0823 in.)**
Exhaust	**103.14 – 103.54 mm (4.0606 – 4.0764 in.)**

Minimum overall length:

Intake	**102.79 mm (4.0468 in.)**
Exhaust	**102.64 mm (4.0409 in.)**

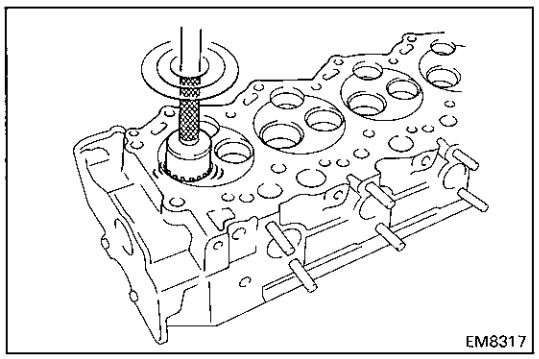
If the overall length is less than minimum, replace the valve.



(e) Check the surface of the valve stem tip for wear.

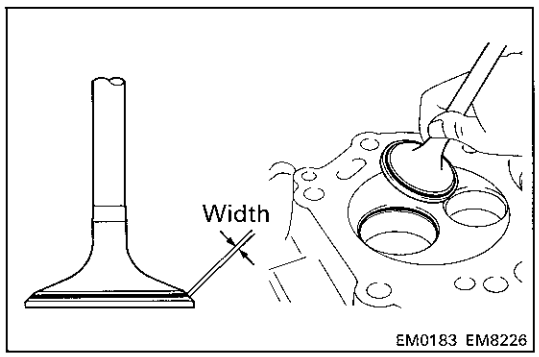
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE: Do not grind off more than the minimum overall length.



12. INSPECT AND CLEAN VALVE SEATS

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

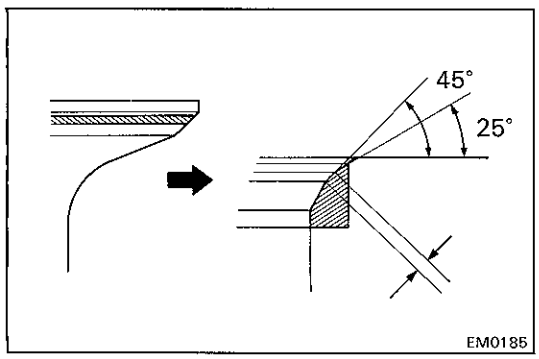


(b) Check the valve seating position. Apply a thin coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

(c) Check the valve face and seat for the following:

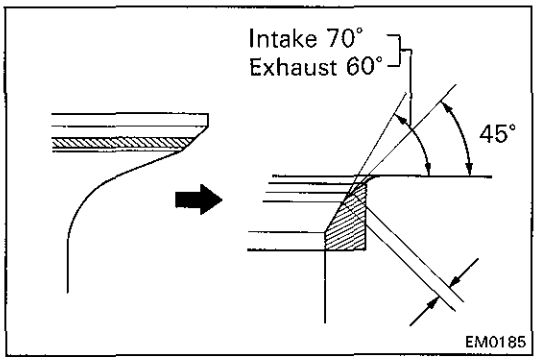
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is on the middle of the valve face with the following width:

Intake 1.5 – 1.9 mm (0.059 – 0.075 in.)
Exhaust 1.8 – 2.2 mm (0.071 – 0.087 in.)



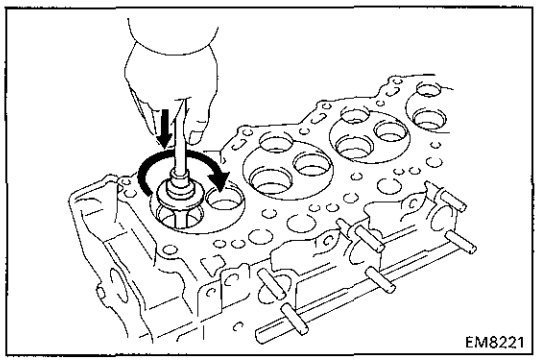
If not, correct the valve seats as follows:

(1) If the seating is too high on the valve face, use 25° and 45° cutters to correct the seat.



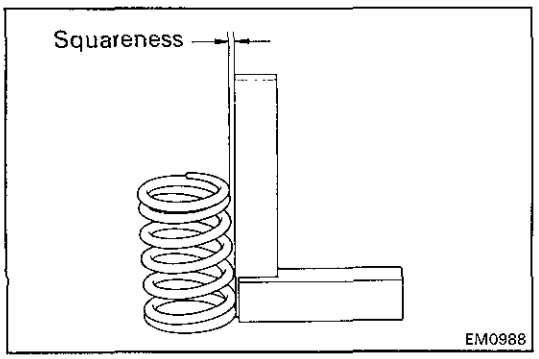
(2) (Intake)
If the seating is too low on the valve face, use 70° and 45° cutters to correct the seat.

(Exhaust)
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.

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

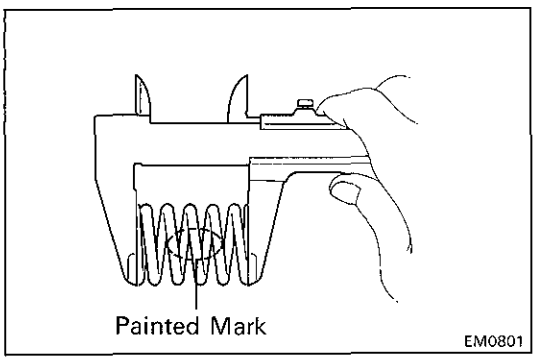


13. INSPECT VALVE SPRINGS

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

Maximum squareness: 2.0 mm (0.075 in.)

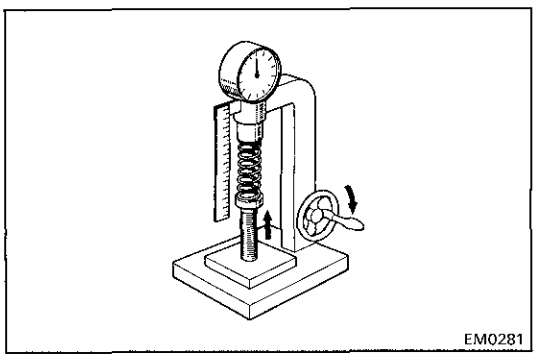
If squareness is greater than maximum, replace the valve spring.



(b) Using vernier calipers, measure the free length of the valve spring.

Free length:
Yellow painted mark 46.20 mm (1.8189 in.)
Blue painted mark 49.14 mm (1.9346 in.)

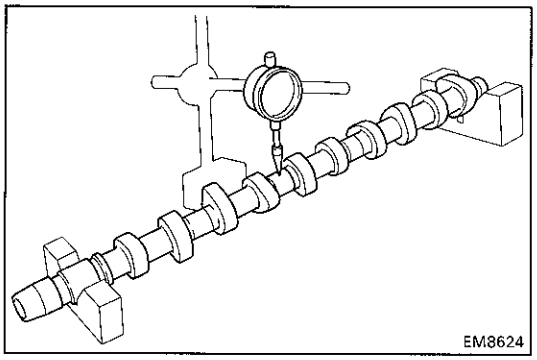
If the free length is not as specified, replace the valve spring.



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

Installed tension:
30.7 – 33.9 kg (67.7 – 74.7 lb, 301 – 332 N)
at 37.0 mm (1.457 in.)

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



14. INSPECT CAMSHAFTS AND BEARINGS

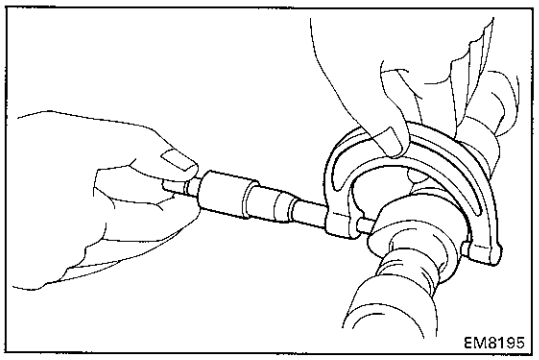
A. Inspect camshaft for runout

(a) Place the camshaft on V-blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.10 mm (0.0039 in.)

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



B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

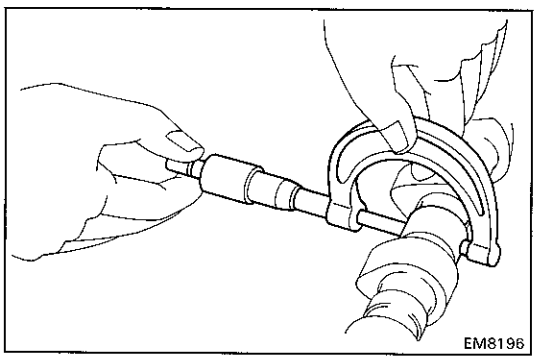
Standard cam lobe height:

Intake		
	1PZ and 1HZ	**55.090 – 55.110 mm (2.1689 – 2.1697 in.)**
	1HD-T	**54.440 – 54.460 mm (2.1433 – 2.1441 in.)**
Exhaust		**55.940 – 55.960 mm (2.2024 – 2.2031 in.)**

Minimum cam lobe height:

Intake		
	1PZ and 1HZ	**54.59 mm (2.1492 in.)**
	1H-D	**53.94 mm (2.1236 in.)**
Exhaust		**55.44 mm (2.1827 in.)**

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



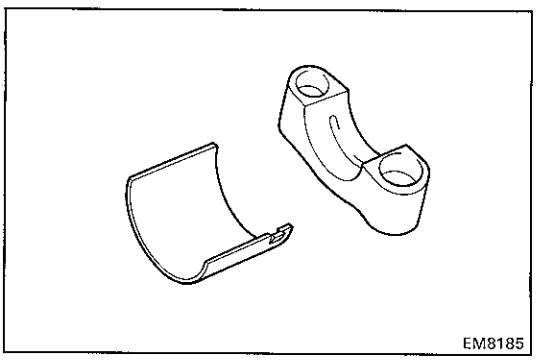
C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

Journal diameter:

No.1 journal		**34.969 – 34.985 mm (1.3767 – 1.3774 in.)**
Others		**27.986 – 27.988 mm (1.1018 – 1.1023 in.)**

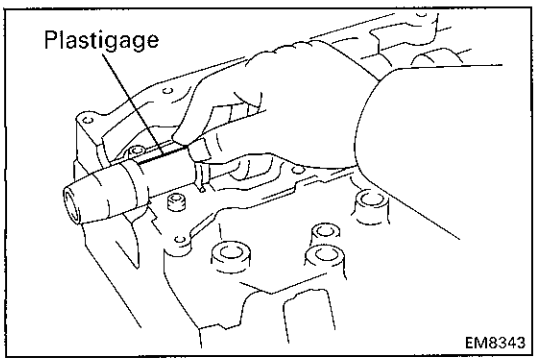
If the journal diameter is not as specified, check the oil clearance.



D. Inspect camshaft bearings

Check the bearings for flaking and scoring.

If the bearings are damaged, replace the bearings.



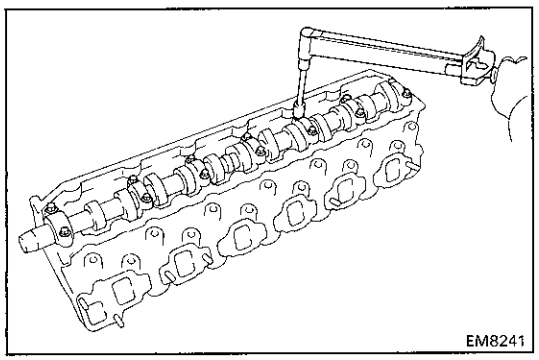
E. Inspect camshaft journal oil clearance

(a) Install the camshaft bearings to the No.1 bearing cap and No.1 journal of the cylinder head.
(See step 4 (b) on page EM-78)

(b) Clean the bearings and camshaft journals.

(c) Place the camshaft on the cylinder head.

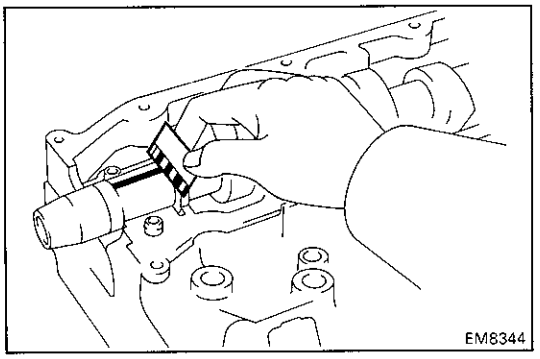
(d) Lay a strip of Plastigage across each of the camshaft journals.



(e) Install the bearing caps.
(See step 4 (c) to (e) on page EM-78)

Torque: 250 kg-cm (18 ft-lb, 25 N·m)

HINT: Do not turn the camshaft.



(f) Remove the bearing caps.

(g) Measure the Plastigage at its widest point.

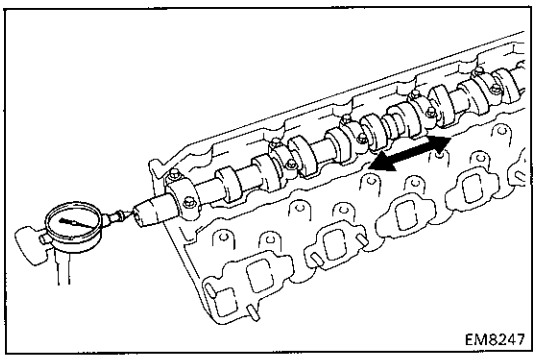
Standard oil clearance:

No.1 journal	**0.022 – 0.074 mm (0.0009 – 0.0029 in.)**
Others	**0.030 – 0.066 mm (0.0012 – 0.0026 in.)**

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the bearings or camshaft. If necessary, replace the bearing caps and cylinder head.

(h) Completely remove the Plastigage.



F. Inspect camshaft thrust clearance

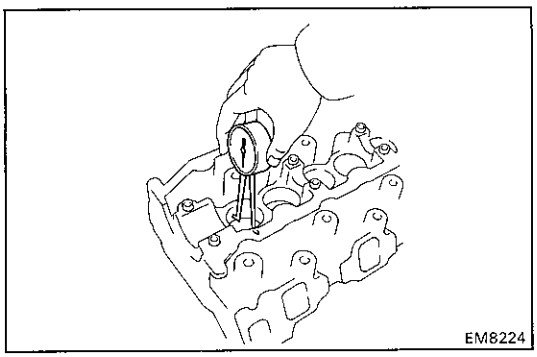
(a) Install the camshaft.
(See step 4 on page EM-78)

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

Standard thrust clearance: 0.10 – 0.20 mm (0.0039 – 0.0079 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

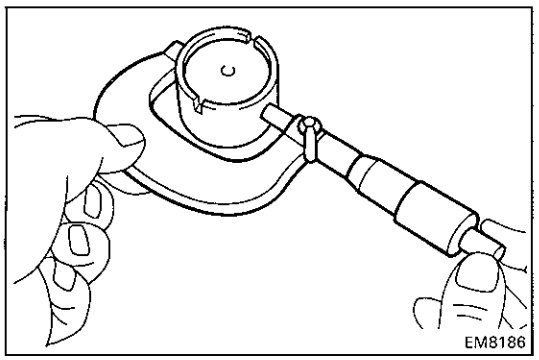
If the thrust clearance is greater than maximum, replace the thrust plate. If necessary, replace the camshaft.



15. INSPECT VALVE LIFTERS AND LIFTER BORES

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

Lifter bore diameter: 40.960 – 40.980 mm (1.6126 – 1.6134 in.)



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

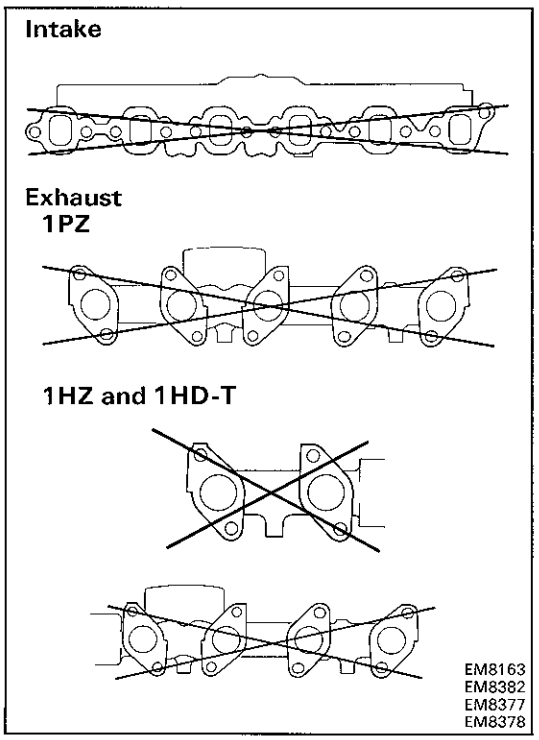
Lifter diameter: 40.892 – 40.902 mm (1.6099 – 1.6103 in.)

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

Standard oil clearance: 0.058 – 0.083 mm (0.0023 – 0.0033 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.

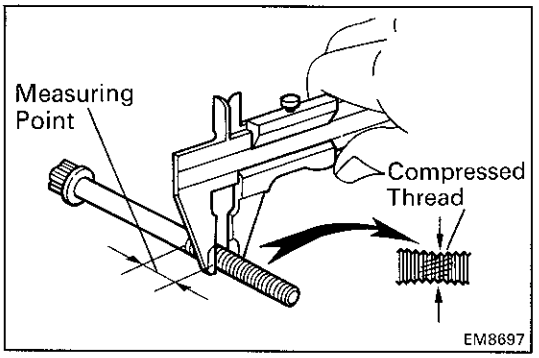


16. INSPECT INTAKE AND EXHAUST MANIFOLDS

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

Maximum warpage: 0.40 mm (0.0157 in.)

If warpage is greater than maximum, replace the manifold.



17. INSPECT CYLINDER HEAD BOLTS

Using vernier calipers, measure the minimum outer diameter of the compressed thread at the measuring point.

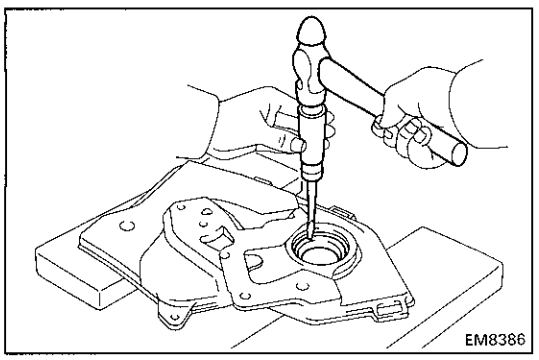
Standard outer diameter: 10.800 – 11.000 mm (0.4646 – 0.4724 in.)

Minimum outer diameter: 10.55 mm (0.4154 in.)

If the outer diameter is less than minimum, replace the bolt.

REPLACEMENT OF CAMSHAFT OIL SEAL

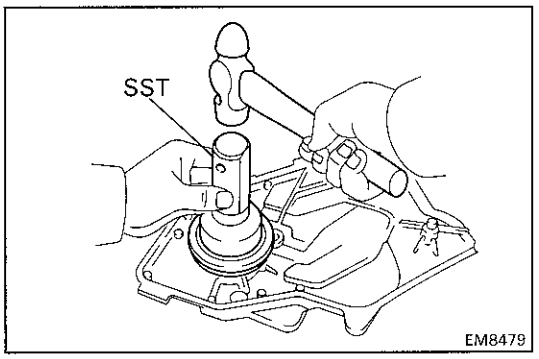
HINT: There are two methods (A and B) to replace the oil seal as follows:



REPLACE CAMSHAFT OIL SEAL

A. If camshaft oil seal retainer is removed from cylinder head:

(a) Using a screwdriver and hammer, tap out the oil seal.

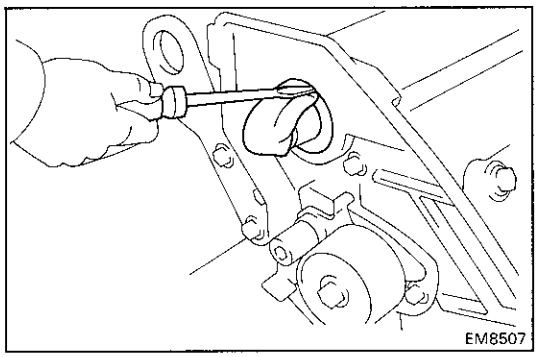


(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil seal retainer edge.

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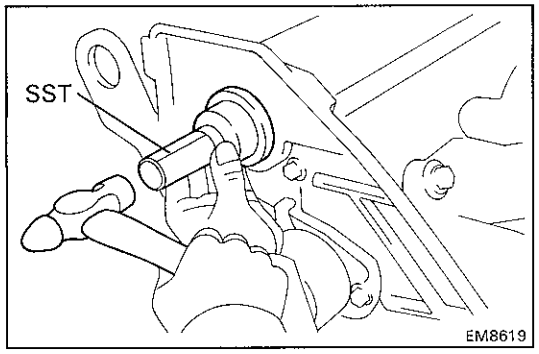
(c) Apply MP grease to the oil seal lip.

B. If camshaft oil seal retainer is installed to the cylinder head:



(a) Using a screwdriver, pry out the oil seal.

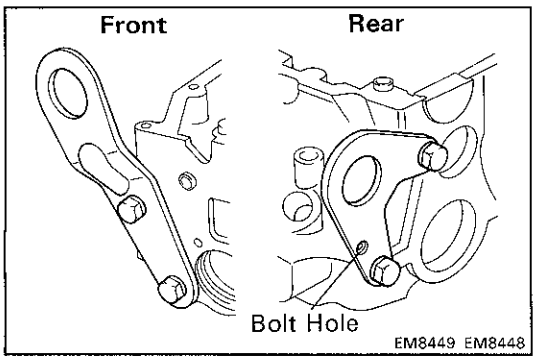
NOTICE: Be careful not to damage the camshaft. Tape the screwdriver tip.



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

(c) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil seal retainer edge.

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ASSEMBLY OF CYLINDER HEAD

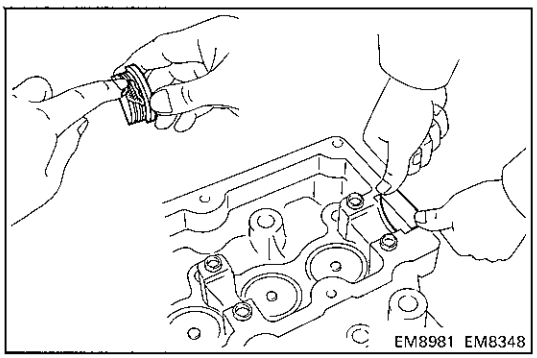
(See page EM-54)

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 FRONT AND REAR ENGINE HANGERS

Install the engine hangers as shown in the illustration.



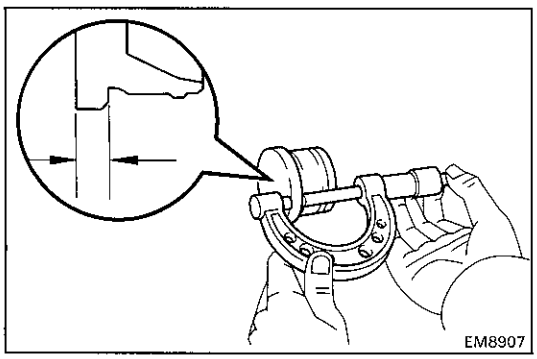
2. INSTALL HALF CIRCULAR PLUG

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

(b) Apply seal packing to the half circular plug as shown.

Seal packing: Part No. 08826-00080 or equivalent

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



3. SELECT COMBUSTION CHAMBER SHIM

A. If using new combustion chamber:

Using a micrometer, measure the thickness of each used combustion chamber at the position shown in the illustration, then select the number of shims to be used.

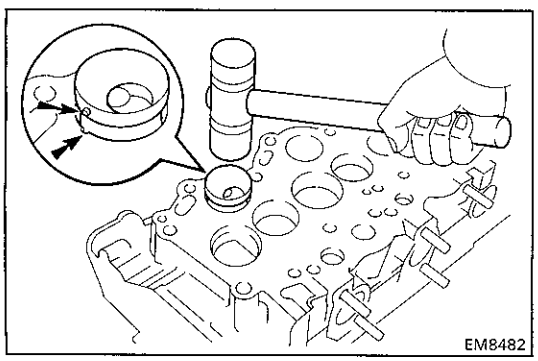
Combustion chamber thickness mm (in.)	No. of shims to be used
6.02 – 6.05 (0.2370 – 0.2382)	0
6.06 – 6.08 (0.2386 – 0.2394)	1
6.09 – 6.11 (0.2398 – 0.2406)	2

Shim thickness: 0.03 mm (0.0012 in.)

NOTICE: If combustion chamber shims were already being used, do not perform the above step; use the same number of shims as were used before.

B. If reusing combustion chamber:

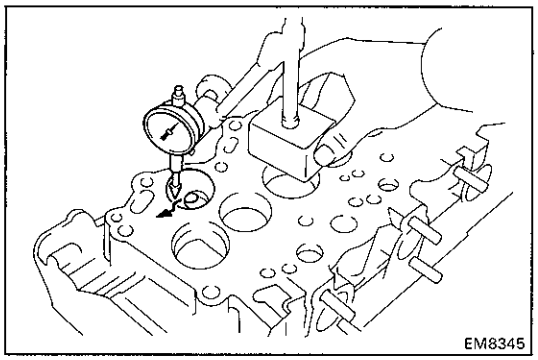
Install the combustion chamber back in the same position it was originally at.



4. (1PZ and 1HZ) INSTALL COMBUSTION CHAMBERS

(a) Align the knock pin of the combustion chamber with the notch of the cylinder head.

(b) Using a plastic-faced hammer, tap in the (shim and) combustion chamber.



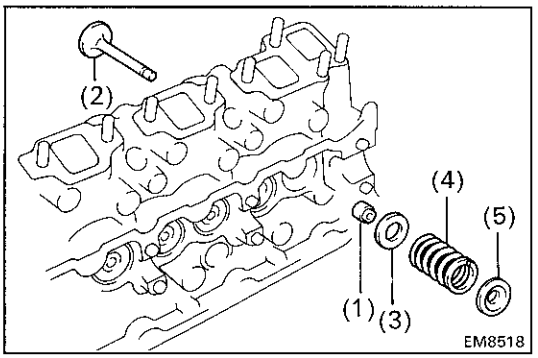
(c) Using a dial indicator, measure the protrusion of the combustion chamber from the cylinder head.

Protrusion: Minus 0.04 – Plus 0.04 mm (Minus 0.0016 – Plus 0.0016 in.)

If the protrusion is less than specified, adjust with shims.

Shim thickness: 0.03 mm (0.0012 in.)

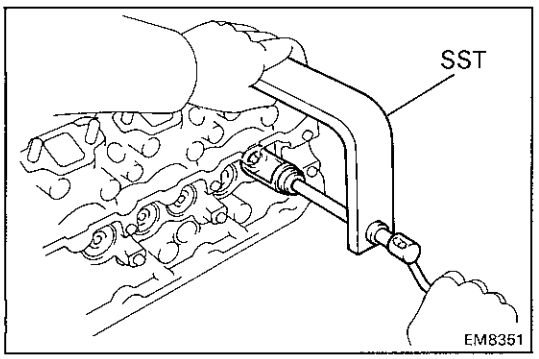
If the protrusion is greater than specification, replace the chamber and recheck the protrusion.



5. INSTALL VALVES

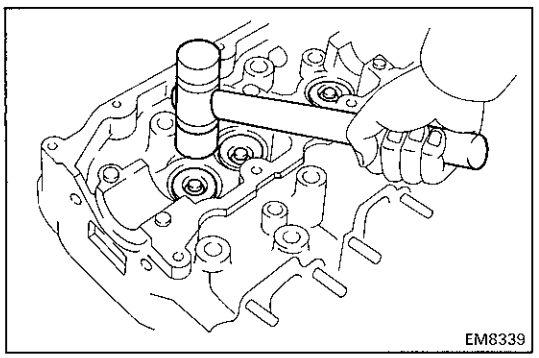
(a) Install the following parts:

(1) Oil seal
(2) Valve
(3) Spring seat
(4) Valve spring
(5) Spring retainer

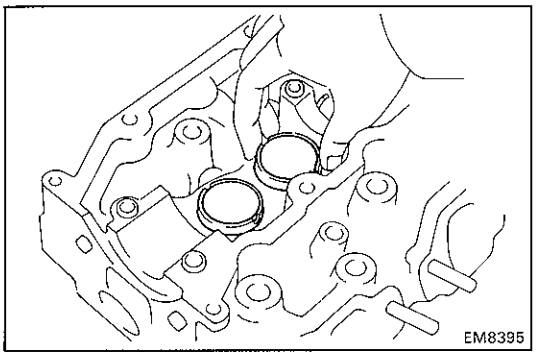


(b) Using SST, compress the valve spring and place the two keepers around the valve stem.

SST 09202-43013

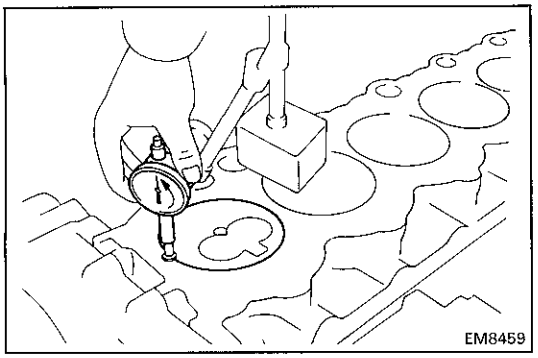


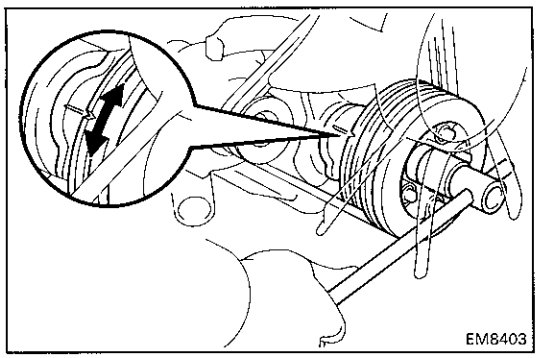
(c) Using a plastic-faced hammer, lightly tap the valve stem tip to assure proper fit.

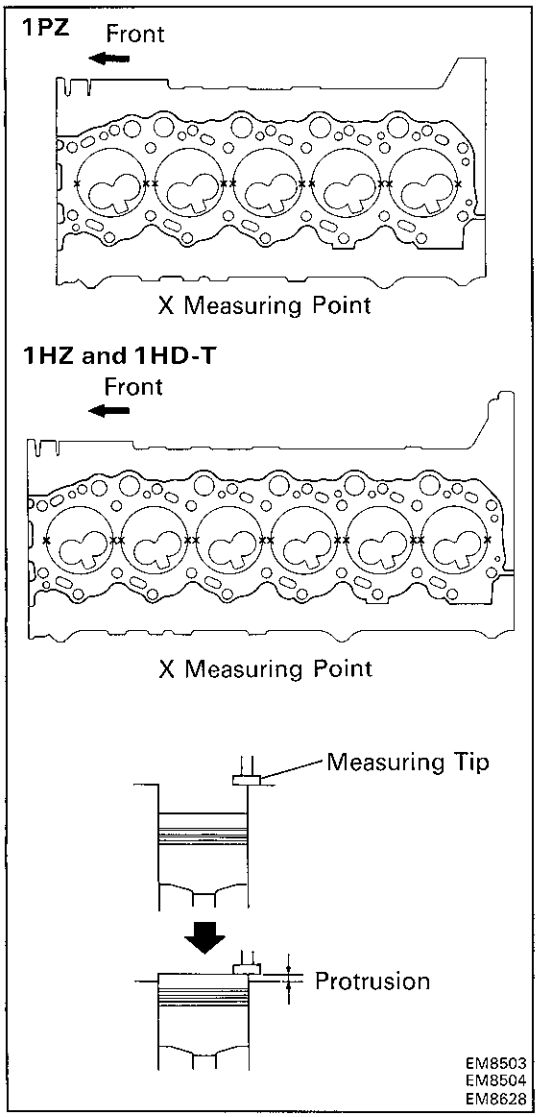


6. INSTALL VALVE LIFTERS AND SHIMS

Check the valve lifter rotates smoothly by hand.







INSTALLATION OF CYLINDER HEAD

(See page EM-54)

1. CHECK PISTON PROTRUSION AND SELECT CYLINDER HEAD GASKET

A. Check piston protrusions each cylinder

(a) Clean the cylinder block solvent.

(b) Set the piston of the cylinder to be measured to slightly befor TDC.

(c) Place a dial indicator on the cylinder block, and set the dial indicator at 0 mm (0 in.)

HINT:

- Use a dial indicator measuring tip as shown in the illustration.
- Make sure that the measuring tip is sqaure to the cylinder block gasket surface and piston head when taking the measurments.

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

(e) Measure each cylinder at two places as shown in the illustration, making a tatal of ten measurements (1PZ) or twelve measurements (1HZ and 1HD-T).

(f) For the piston protrusion value of each cylinder, use the average of the two measurements of each cylinder.

Protrusion:

1PZ and 1HZ

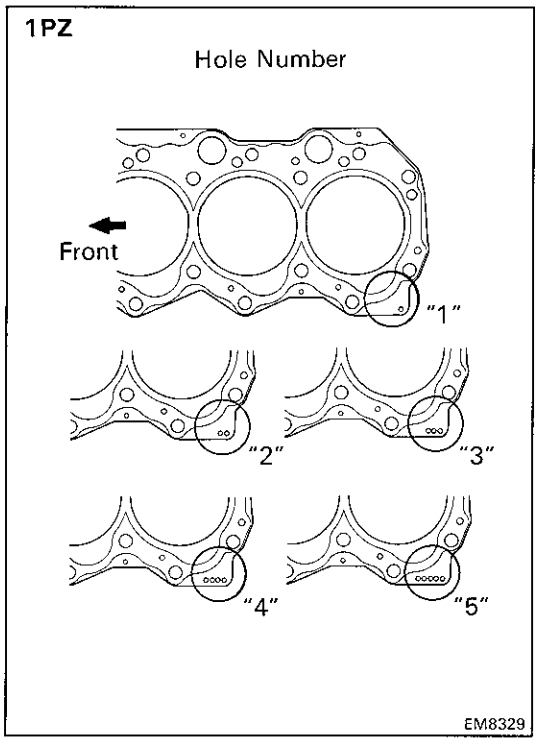
0.405 – 0.655 mm (0.0159 – 0.0258 in.)

1HD-T

0.475 – 0.725 mm (0.0187 – 0.0285 in.)

(When removing piston and connecting rod assembly)

If the protrusion is not as specified, remove the piston and connecting rod assembly (See page EM-86) and reinstall it (See page EM-108).



B. Select new cylinder head gasket (1PZ)

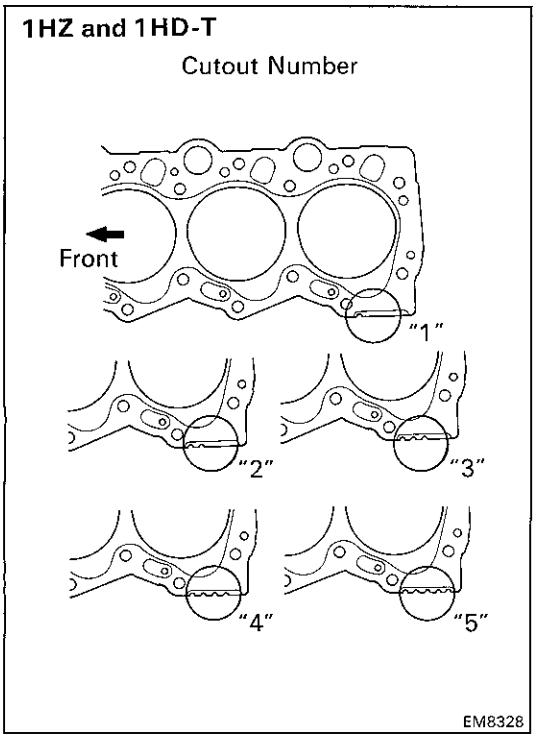
HINT: There are five types of cylinder head gasket (hole number 1 to 5) installed at factory, but only three types for supply parts (hole number "1", "3" and "5"), so when replacing the gasket select from one of three types above.

New cylinder head gasket thickness:

Hole number "1"	**1.16 – 1.24 mm (0.0457 – 0.0488 in.)**
Hole number "3"	**1.26 – 1.34 mm (0.0496 – 0.0528 in.)**
Hole number "5"	**1.36 – 1.44 mm (0.0535 – 0.0567 in.)**

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

Piston protrusion mm (in.)	Gasket size
0.455 (0.0179) or less	Use "1"
0.456 – 0.555 (0.0180 – 0.0219)	Use "3"
0.556 (0.0219) or more	User "5"



(1HZ and 1HD-T)

HINT: There are five types of cylinder head gasket (cutout number 1 to 5) installed at factory, but only three types for supply parts (cutout number "1", "3" and "5"), so when replacing the gasket select from one of three types above.

New cylinder head gasket thickness:

Cutout number "1"	**1.15 – 1.25 mm (0.0453 – 0.0492 in.)**
Cutout number "3"	**1.25 – 1.35 mm (0.0492 – 0.0531 in.)**
Cutout number "5"	**1.35 – 1.45 mm (0.0531 – 0.0571 in.)**

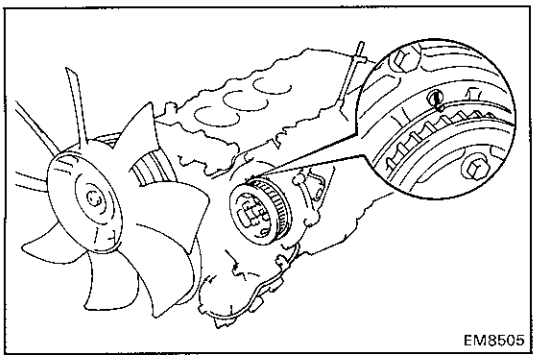
Select the largest piston protrusion value from the measurements made, then select the appropriate cylinder head gasket according to the table below.

1HZ

Poston protrusion mm (in.)	Gasket size
0.455 (0.0179) or less	Use "1"
0.456 – 0.555 (0.0180 – 0.0219)	Use "3"
0.556 (0.0246) or more	Use "5"

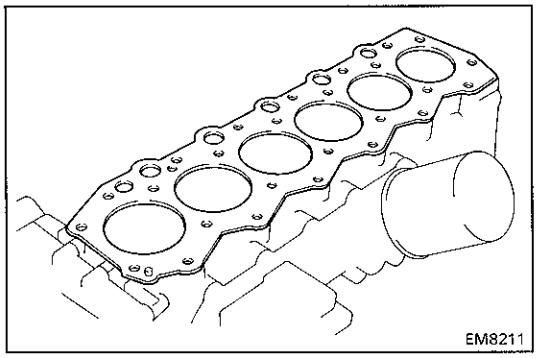
1HD-T

Piston protrusion mm (in.)	Gasket size
0.525 (0.0207) or less	Use "1"
0.526 – 0.625 (0.0207 – 0.0246)	Use "3"
0.626 (0.0246) or more	Use "5"



2. SET NO.1 CYLINDER TO BDC

Turn the crankshaft pulley, and align the BDC mark of the timing gear cover with the No.1 flange groove of the No.2 camshaft timing pulley.



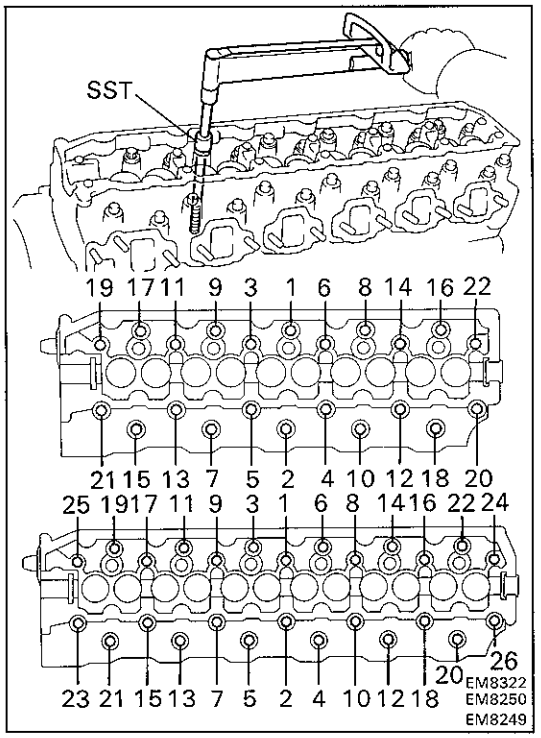
3. INSTALL CYLINDER HEAD

A. Place cylinder head on cylinder block

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

NOTICE: Be careful of the installation direction.

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



B. Install cylinder head bolts

HINT:

- The cylinder head bolts are tightened in three progressive steps.
- If any of bolts break or deform, replace them.

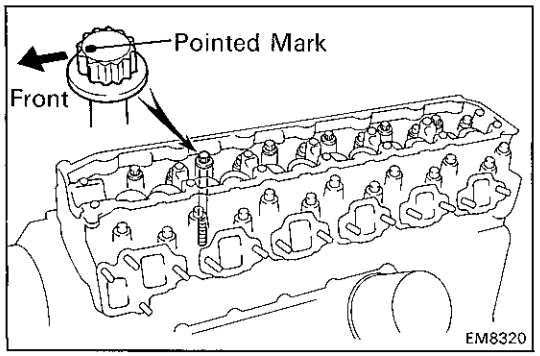
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) First, using SST, install and uniformly tighten the twenty-two cylinder head bolts (1PZ) or twenty-six cylinder head bolts (1HZ and 1HD-T) in several passes in the sequence shown.

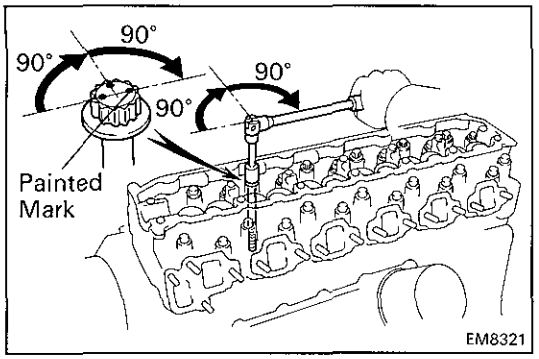
SST 09011 – 38121

Torque: 700 kg-cm (51 ft-lb, 69 N·m)

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



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

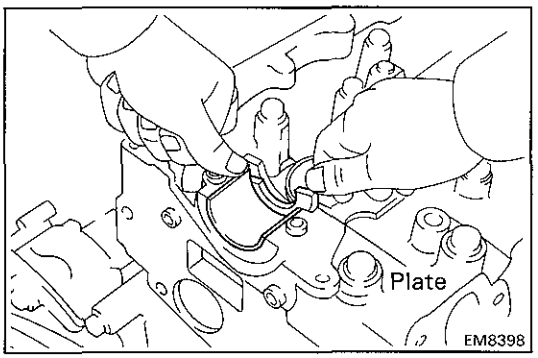


(d) 2nd, retighten the cylinder head bolts 90° in the numerical order shown above.

(e) 3rd, retighten cylinder head bolts by an additional 90°.

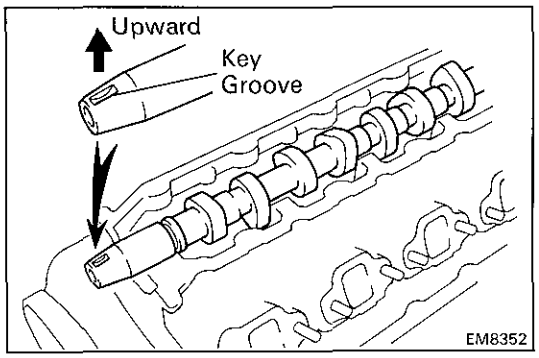
(f) Check that the painted mark is now facing rearward.

4. INSTALL CAMSHAFT

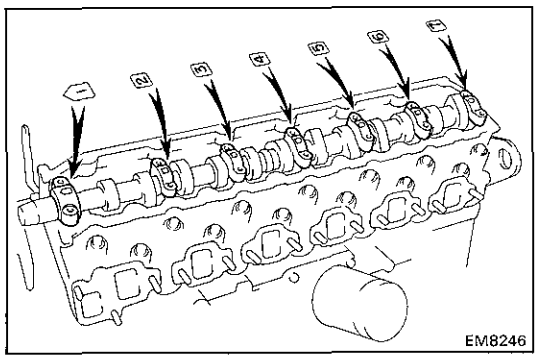


(a) Install the camshaft thrust plate to the cylinder head.

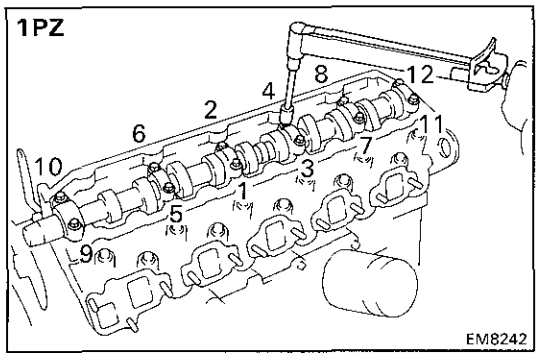
(b) Install the camshaft bearings to the No.1 bearing cap and No.1 journal of the cylinder head.



(c) Place the camshaft on the cylinder head, facing the key groove upward.



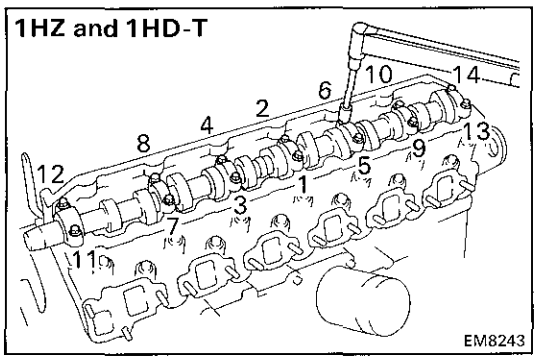
(d) Install the six (1PZ) or seven (1HZ and 1HD-T) bearing caps in their proper locations.



(e) (1PZ)
Install and uniformly tighten the twelve bearing cap bolts in several passes in the sequence shown.

Torque:

No.1 journal	**250 kg-cm (18 ft-lb, 25 N·m)**
Others	**185 kg-cm (13 ft-lb, 18 N·m)**



(f) (1HZ and 1HD-T)
Install and uniformly tighten the fourteen bearing cap bolts in several passes in the sequence shown.

Torque:
No.1 journal 250 kg-cm (18 ft-lb, 25 N·m)
Others 185 kg-cm (13 ft-lb, 18 N·m)

5. ADJUST VALVE CLEARANCE (See page EM-19)

Valve clearance (Cold):
Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust 0.35 – 0.45 mm (0.014 – 0.018 in.)

6. INSTALL CAMSHAFT OIL SEAL RETAINER

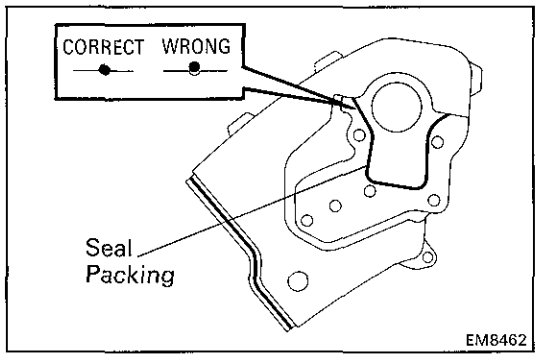
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the camshaft oil seal retainer and cylinder head.

- 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.

(b) Apply seal packing to the camshaft oil seal retainer as shown in the illustration.

Seal packing: Part No.08826-00080 or equivalent

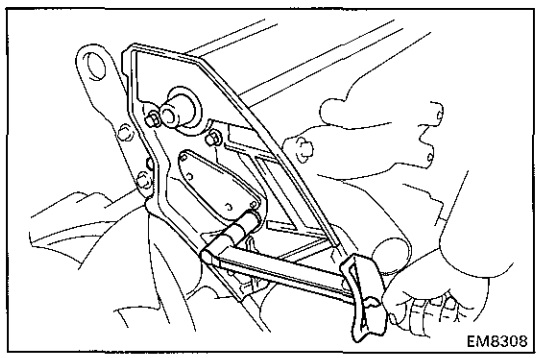
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

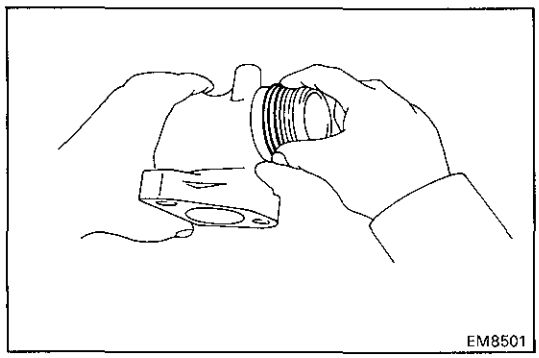


(c) Install the retainer with the four bolts.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)

7. INSTALL PULLEYS AND TIMING BELT
(See steps 2 to 4 and 6 to 11 on pages EM-38 to 41)

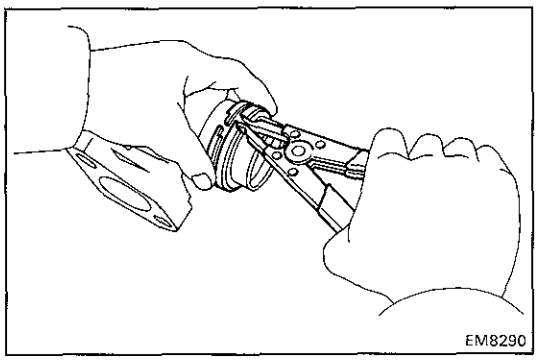




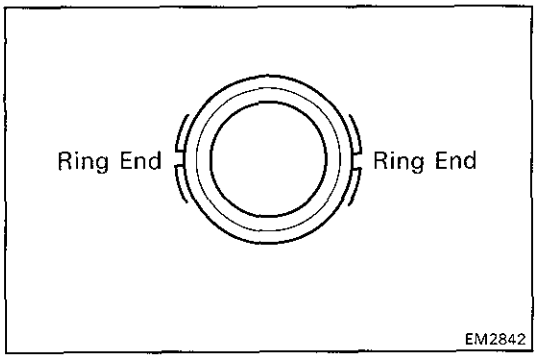
8. (1HZ and 1HD-T)
ASSEMBLY EXHAUST MANIFOLDS

(a) Remove all the O-ring material from the manifold grooves.

(b) Install new O-rings.

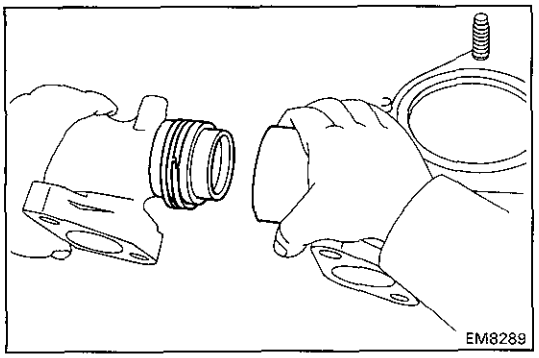


(c) Using snap ring pliers, install the two manifold rings.



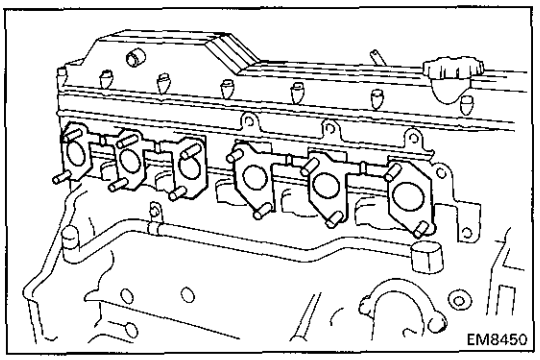
(d) Position the manifold rings so that the ring ends are as shown.

NOTICE: Do not align the ends.



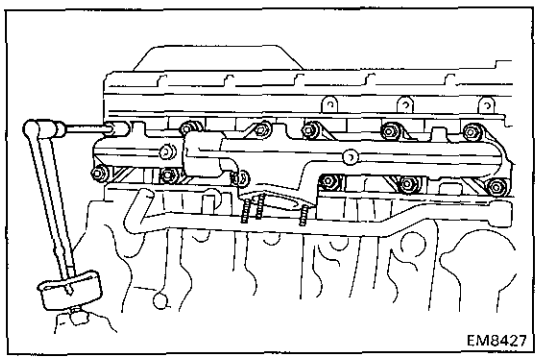
(e) Install the manifold collar.

(f) Assembly the front and rear manifolds.



9. (1PZ and 1HZ)
INSTALL EXHAUST MANIFOLD

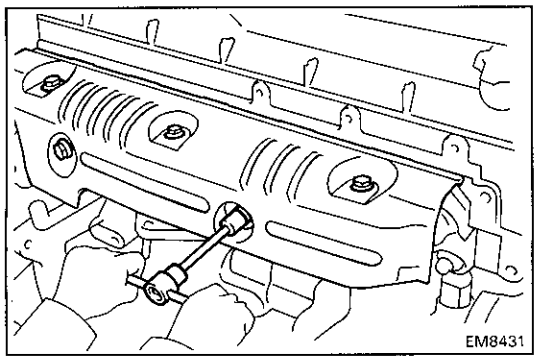
(a) Install new gaskets in direction as shown in the illustration.



(b) Install the exhaust manifold with the ten nuts (1PZ) or twelve nuts (1HZ).

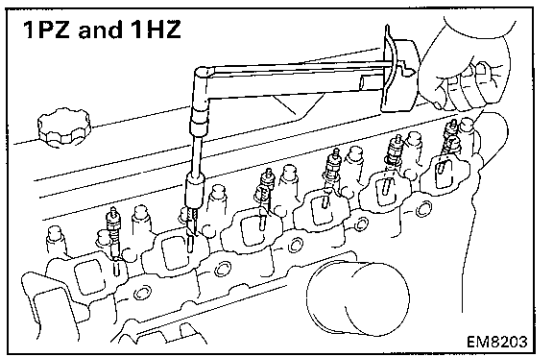
Torque: 400 kg-cm (29 ft-lb, 39 N·m)

HINT: Apply 330 kg-cm (24 ft-lb, 32 N·m) of torque when performing additional tightening of loosed nuts.



(c) Install the heat insulator with the four bolts (1PZ) or five bolts (1HZ).

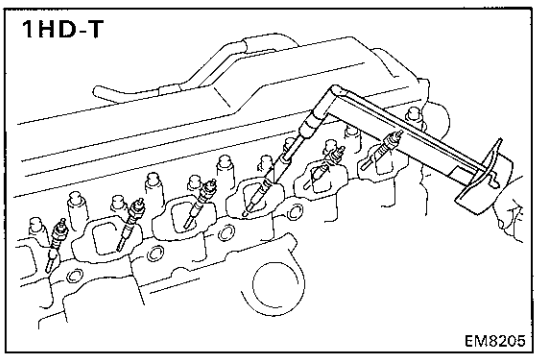
10. (1HD-T)
INSTALL TURBOCHARGER AND EXHAUST MANIFOLD
(See steps 4 to 10 on pages TC-13 to 15)

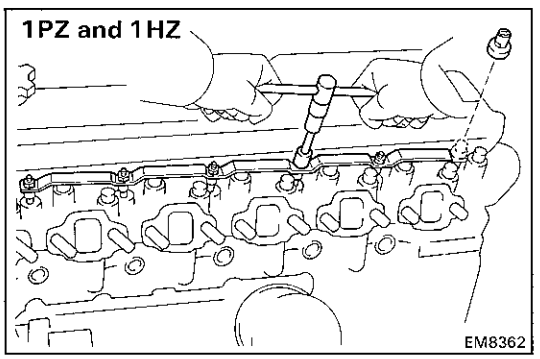


11. INSTALL GLOW PLUG

(a) Using a 12 mm deep socket wrench, install the five glow plugs (1PZ) or six glow plugs (1HZ and 1HD-T).

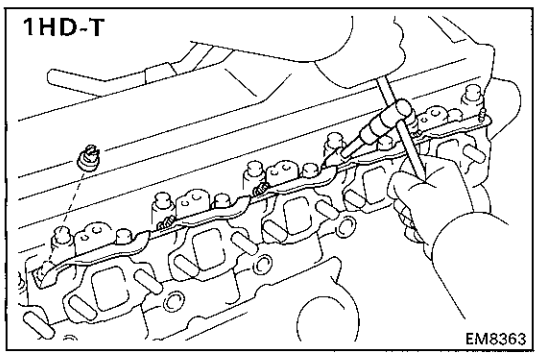
Torque: 130 kg-cm (9 ft-lb, 13 N·m)

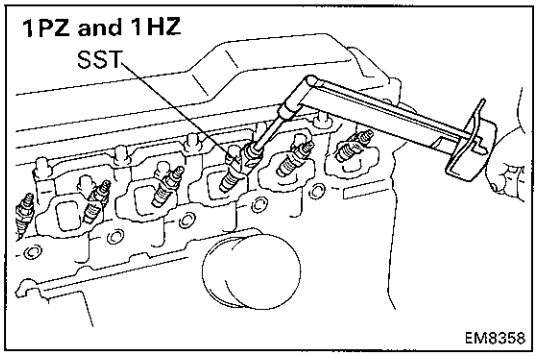




(b) Install the glow plug connector with the five nuts (1PZ) or six nuts (1HZ and 1HD-T).

(c) Install the five screw grommets (1PZ) and six screw grommets (1HZ and 1HD-T).





12. **INSTALL INJECTION NOZZLES (1PZ and 1HZ)**

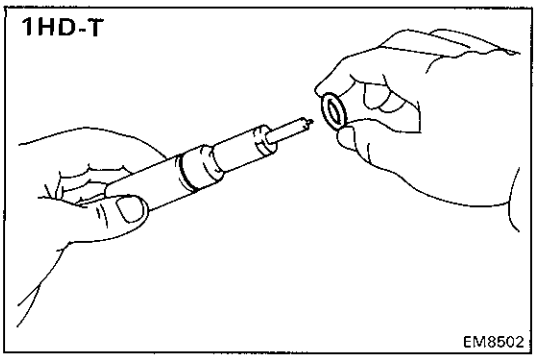
(a) Place new gaskets and the nozzle seats into the injection nozzle holes of the cylinder head.

(b) Using SST, install the injection nozzles.

SST 09268-64010

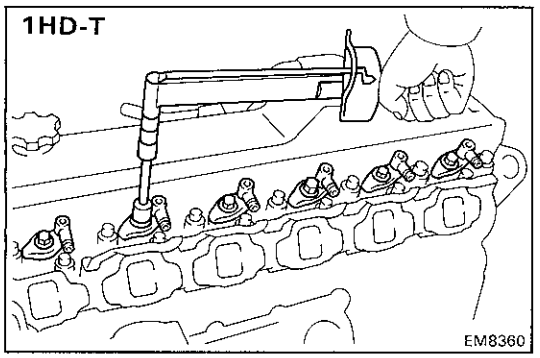
Torque: 650 kg-cm (47 ft-lb, 64 N·m)

NOTICE: Over torquing could cause nozzle deformation and needle adhesion or other defects.



(1HD-T)

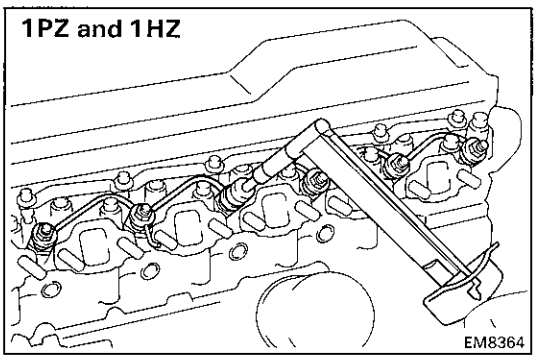
(a) Install a new O-ring to the injection nozzle.



(b) Place new nozzle seats into the injection nozzle holes of the cylinder head.

(c) Install the injection nozzles with the washer and bolt.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)



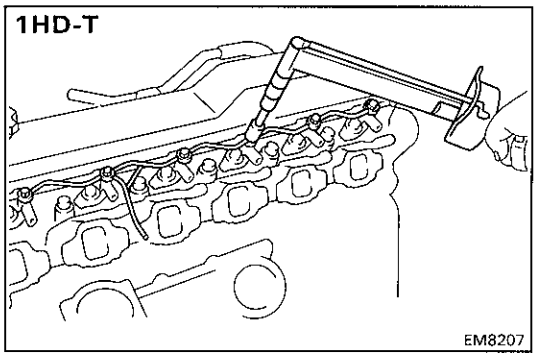
13. **INSTALL NOZZLE LEAKAGE PIPE (1PZ and 1HZ)**

(a) (1PZ)
Install five new gaskets and the leakage pipe with the five nuts.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)

(b) (1HZ)
Install six new gaskets and the leakage pipe with the six nuts.

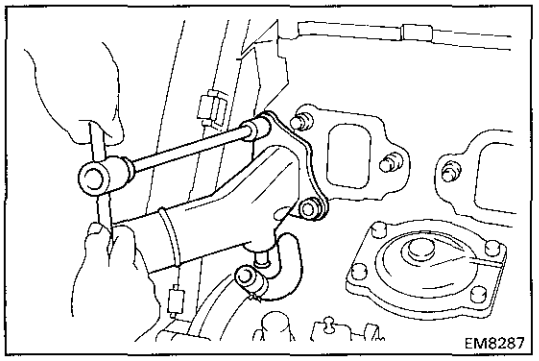
Torque: 300 kg-cm (22 ft-lb, 29 N·m)



(1HD-T)

Install twelve new gaskets and the leakage pipe with the six hollow bolts.

Torque: 125 kg-cm (9 ft-lb, 12 N·m)

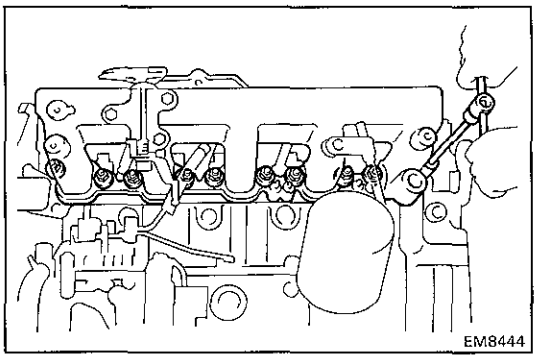


14. INSTALL WATER OUTLET

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

Torque: 200 kg-cm (14 ft-lb, 20 N·m)

(b) (1HD-T)
Connect the water by-pass hose.



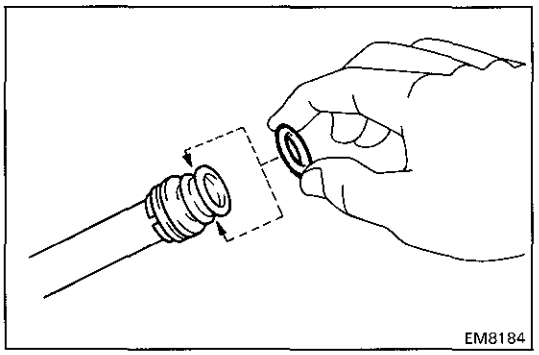
15. INSTALL INTAKE MANIFOLD

(a) (1PZ)
Install five new gaskets and the intake manifold with the ten bolts and seal washers.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)

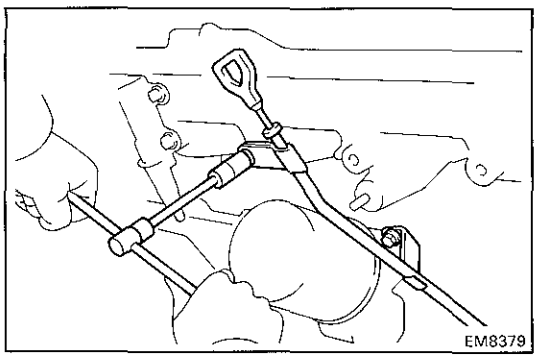
(b) (1HZ and 1HD-T)
Install six new gaskets and the intake manifold with the twelve bolts and seal washers.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)



16. INSTALL OIL DIPSTICK GUIDE AND OIL DIPSTICK

(a) Install a new O-ring to the dipstick guide.



(b) Install the oil dipstick guide assembly with the two bolts.

Torque:
Intake manifold side
200 kg-cm (14 ft-lb, 20 N·m)
Oil cooler cover side
200 kg-cm (14 ft-lb, 20 N·m)

17. INSTALL INJECTION PIPES
(See step 3 on page FU-15)

Torque:

1PZ and 1HZ	**150 kg-cm (11 ft-lb, 15 N·m)**
1HD-T	**250 kg-cm (18 ft-lb, 25 N·m)**

18. INSTALL INTAKE PIPE
(See step 2 on page EM-38)

19. FILL WIT ENGINE COOLANT (See page CO-5)

20. START ENGINE AND CHECK FOR LEAKS

21. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL