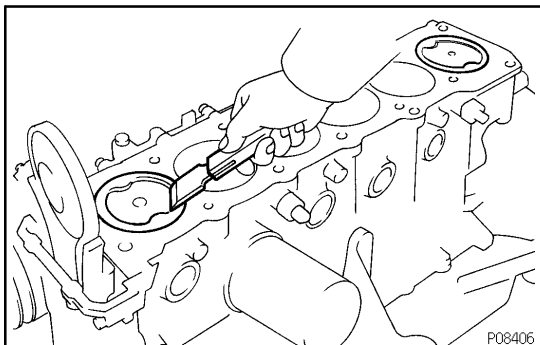
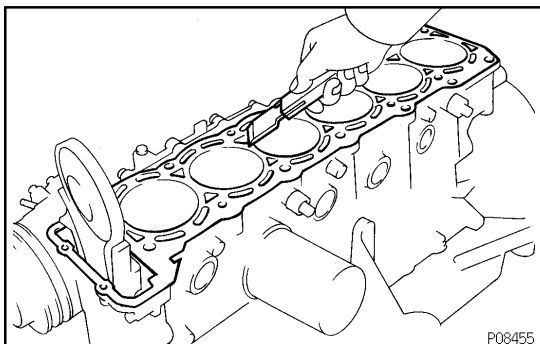




INSPECTION

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

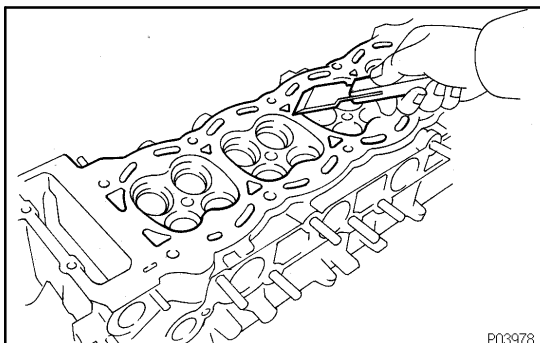
- (a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.



- (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.

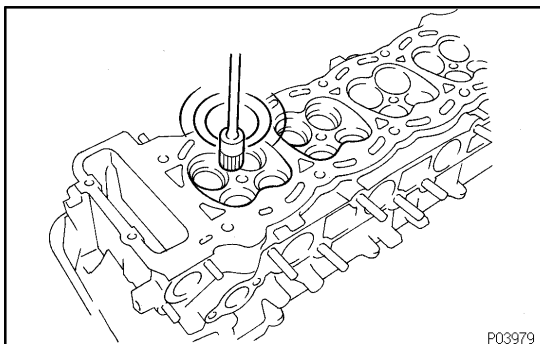


2. CLEAN CYLINDER HEAD

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

NOTICE:

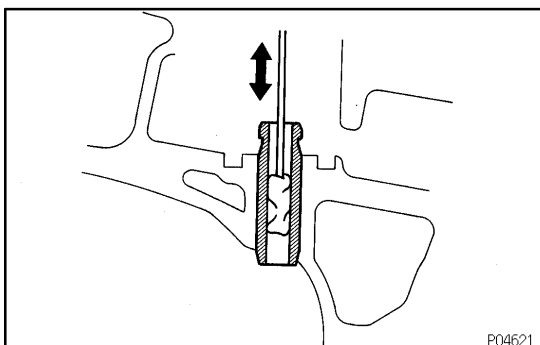
Be careful not to scratch the cylinder block contact surface.



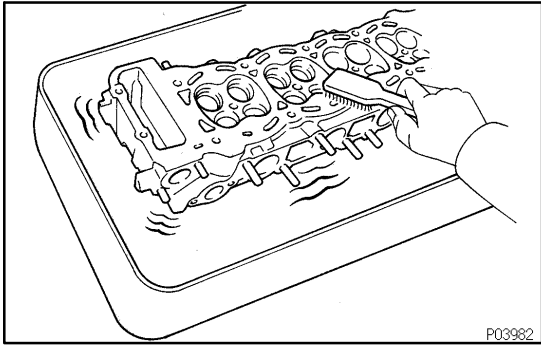
- (b) Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE:

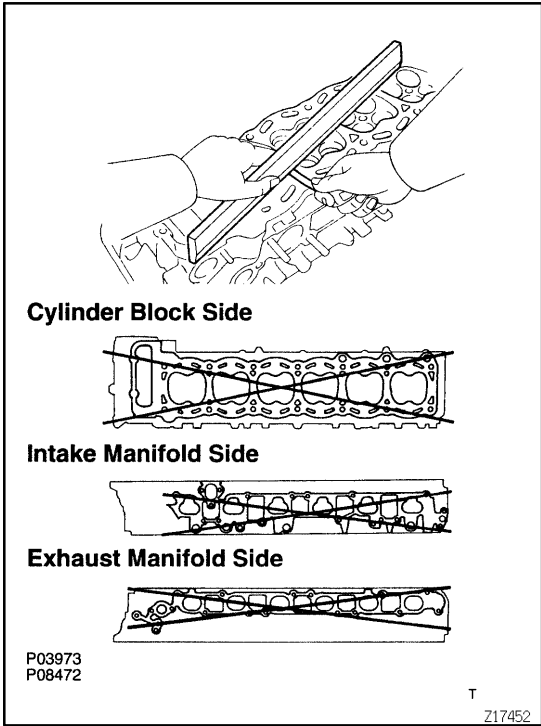
Be careful not to scratch the cylinder block contact surface.



- (c) Using a valve guide bushing brush and solvent, clean all the guide bushings.



- (d) Using a soft brush and solvent, thoroughly clean the cylinder head.



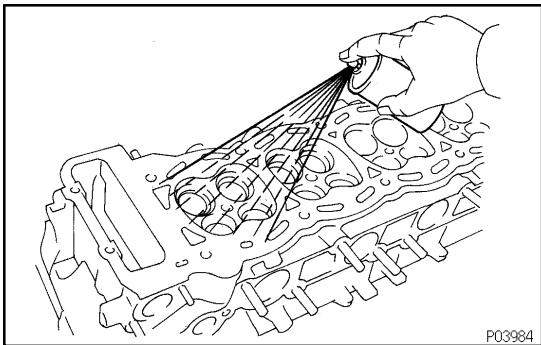
3. INSPECT CYLINDER HEAD

- (a) Inspect for flatness.
Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder block and the manifolds for warpage.

Maximum warpage:

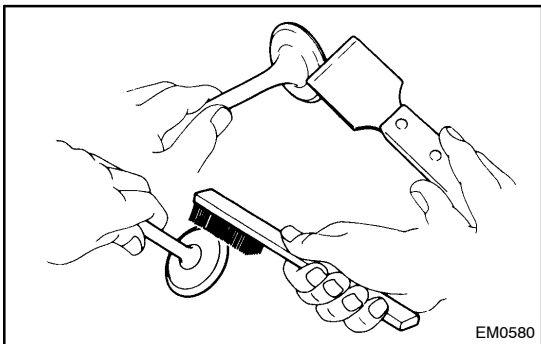
Cylinder block side	0.15 mm (0.0059 in)
Manifold side	0.10 mm (0.0039 in)

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



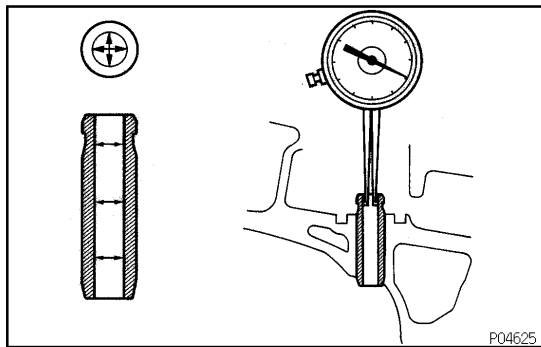
- (b) Inspect for cracks.
Using a dye penetrant, check the combustion chambers, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.



4. CLEAN VALVES

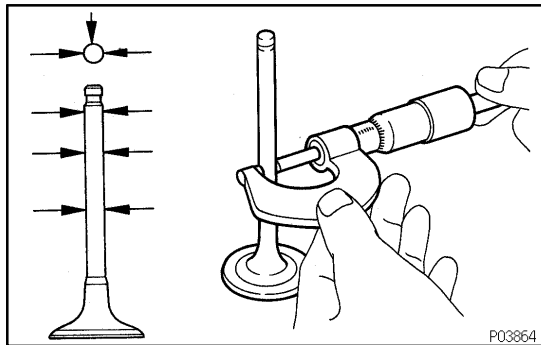
- (a) Using a gasket scraper, chip off any carbon from the valve head.
(b) Using a wire brush, thoroughly clean the valve.

**5. INSPECT VALVE STEMS AND GUIDE BUSHINGS**

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

Bushing inside diameter:

7.010 – 7.030 mm (0.2760 – 0.2768 in.)



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

Valve stem diameter:

Intake	6.970 – 6.985 mm (0.2744 – 0.2750 in.)
Exhaust	6.965 – 6.980 mm (0.2742 – 0.2748 in.)

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

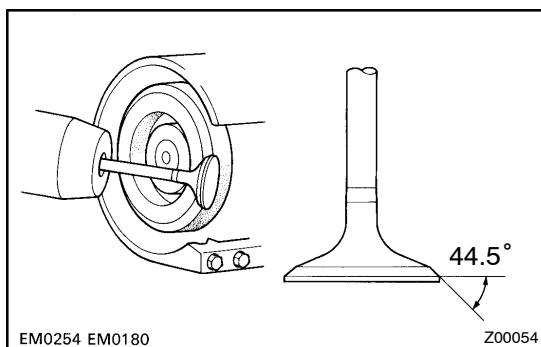
Standard oil clearance:

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:

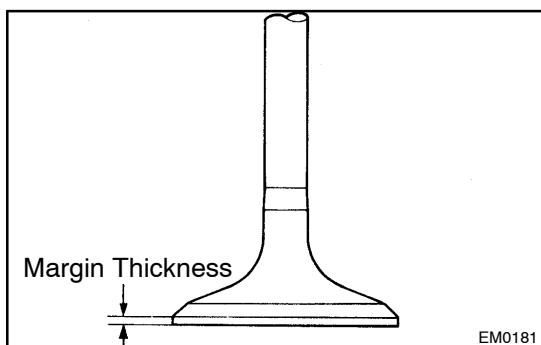
Intake	0.08 mm (0.0031 in.)
Exhaust	0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing (See page [EM-49](#)).

**6. 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°

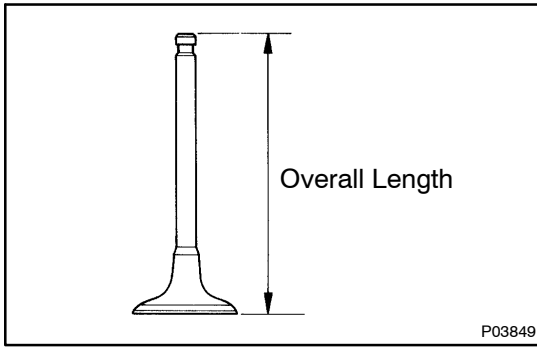


- (c) Check the valve head margin thickness.

Margin thickness:

Standard	1.2 mm (0.047 in.)
Minimum	1.0 mm (0.039 in.)

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



- (d) Check the valve overall length.

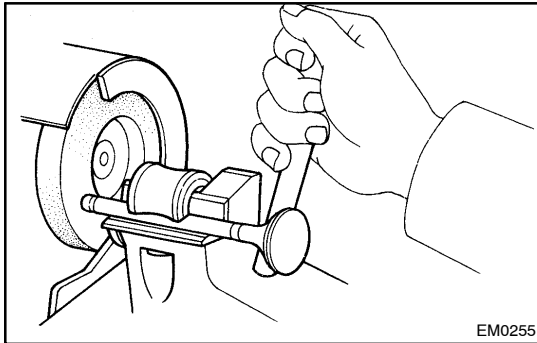
Standard overall length:

Intake	98.4 mm (3.874 in.)
Exhaust	97.4 mm (3.854 in.)

Minimum overall length:

Intake	97.9 mm (3.854 in.)
Exhaust	97.4 mm (3.835 in.)

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

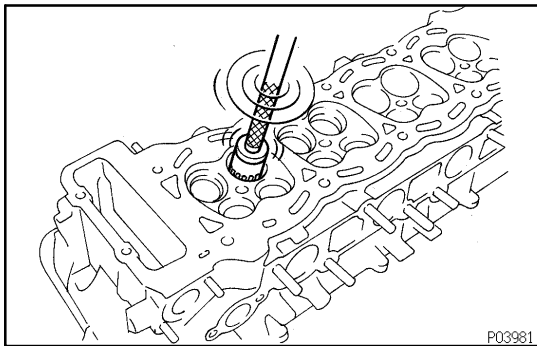


- (e) Check the surface of the valve stem tip for wear.

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.



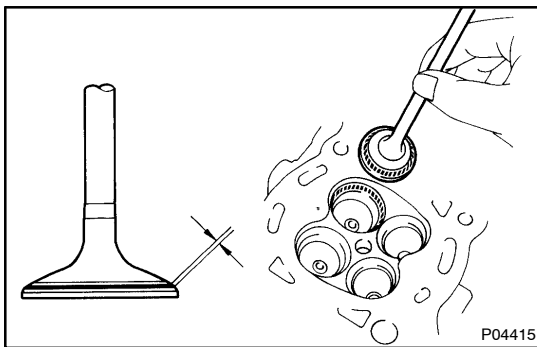
7. INSPECT AND CLEAN VALVE SEATS

- (a) Using a 45° carbide cutter, resurface the valve seats.

Remove only enough metal to clean the seats.

- (b) Check the valve seating position.

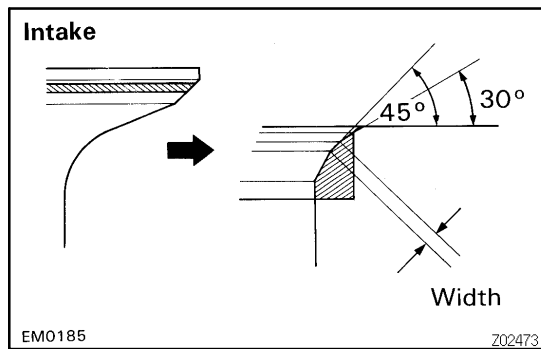
Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.



- (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 these width:

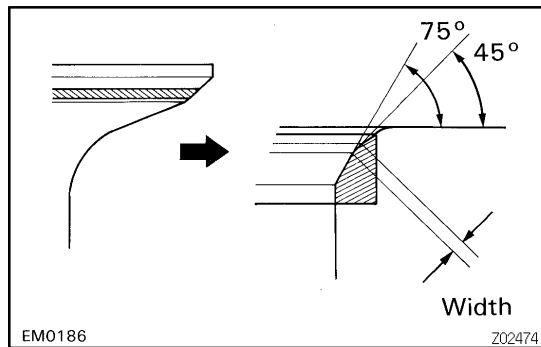
Intake	1.2 – 1.6 mm (0.047 – 0.063 in.)
Exhaust	1.0 – 1.4 mm (0.039 – 0.055 in.)



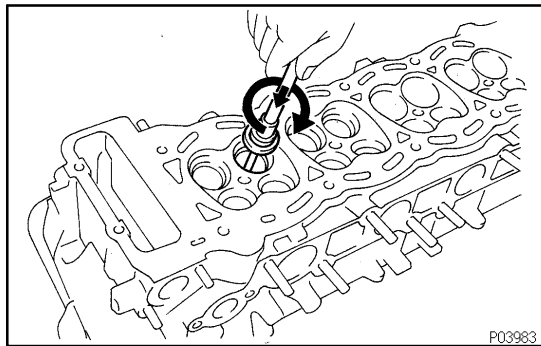
If not, correct the valve seats as follows:

(1) Intake:

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

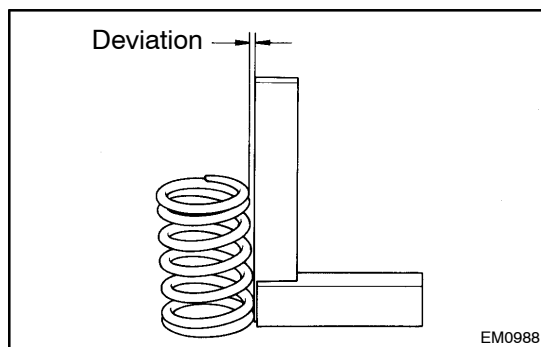


(2) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.



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

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

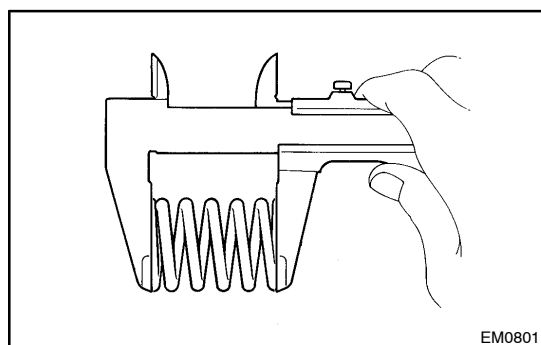


8. INSPECT VALVE SPRINGS

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

Maximum deviation: 2.0 mm (0.079 in.)

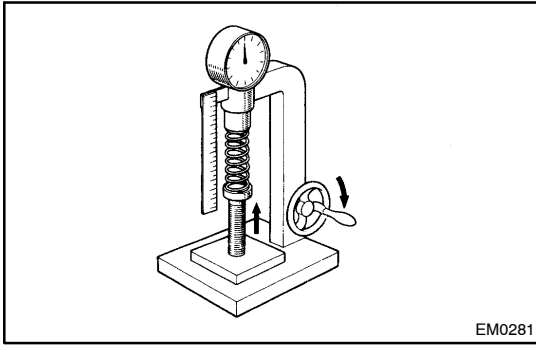
If the deviation is greater than maximum, replace the valve spring.



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

Free length: 43.94 – 45.06 mm (1.7299 – 1.7740 in.)

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



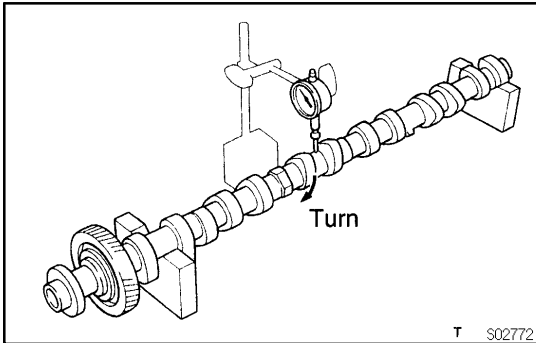
- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

214 – 238 N (21.8 – 24.2 kgf, 48.1 – 53.4 lbf)

at 36.5 mm (1.437 in.)

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



9. INSPECT CAMSHAFTS

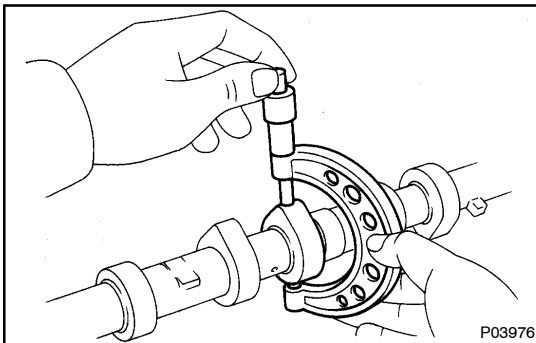
- (a) Inspect for runout.

(1) Place the camshaft on V-blocks.

(2) 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.



- (b) Inspect the cam lobes.

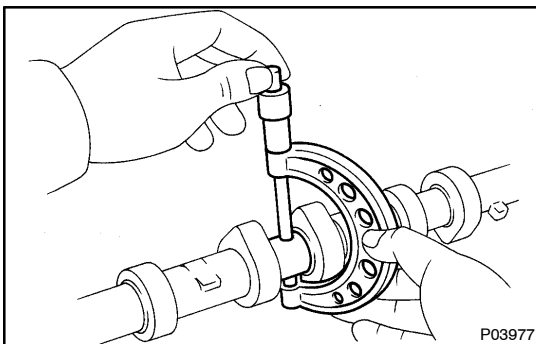
Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

50.61 – 50.71 mm (1.9925 – 1.9965 in.)

Minimum cam lobe height: 50.51 mm (1.9886 in.)

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



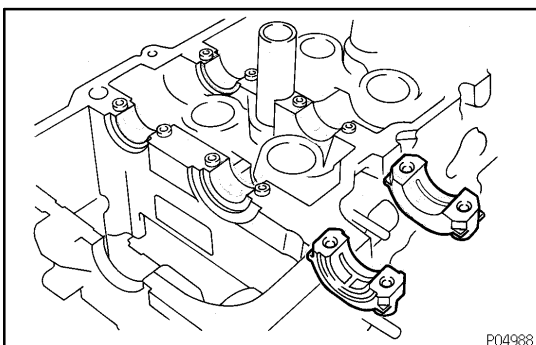
- (c) Inspect the journals.

Using a micrometer, measure the journal diameter.

Journal diameter:

26.959 – 26.975 mm (1.0614 – 1.0620 in.)

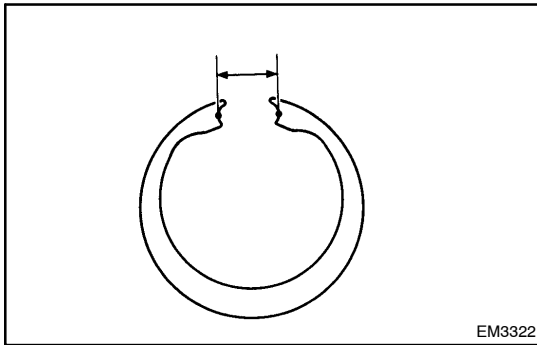
If the journal diameter is not as specified, check the oil clearance.



- (d) Inspect the camshaft bearings.

Check that bearings for flaking and scoring.

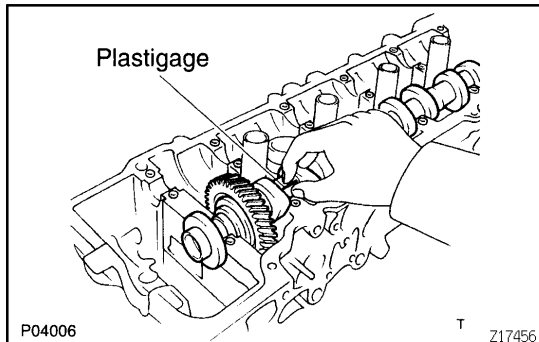
If the bearings are damaged, replace the bearing caps and cylinder head as a set.



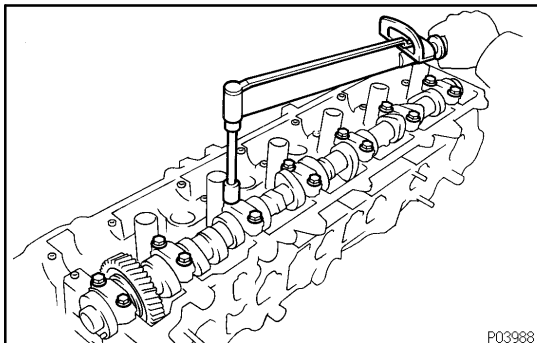
- (e) Inspect the gear spring
Using vernier calipers, measure the free distance between the spring ends.

Free distance: 18.2 – 18.8 mm (0.717 – 0.740 in.)

If the free distance is not as specified, replace the gear spring.



- (f) Inspect the journal oil clearance.
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on the cylinder head.
(3) Lay a strip of Plastigage across each of the camshaft journals.

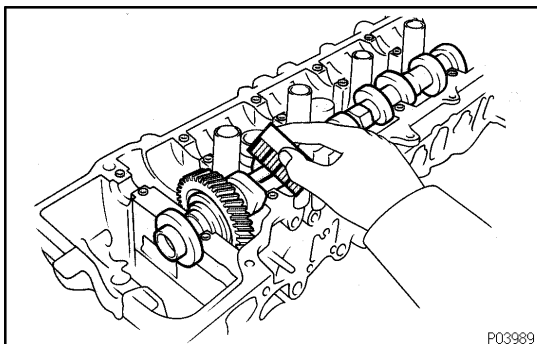


- (4) Install the bearing caps (See page [EM-54](#)).

NOTICE:

Do not turn the camshaft.

- (5) Remove the bearing caps.



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

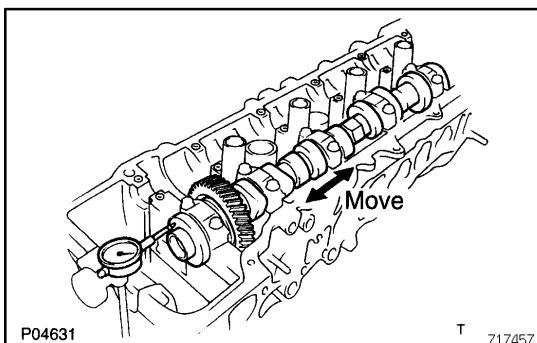
Standard oil clearance:

0.025 – 0.062 mm (0.0010 – 0.0024 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.

- (7) Completely remove the Plastigage.



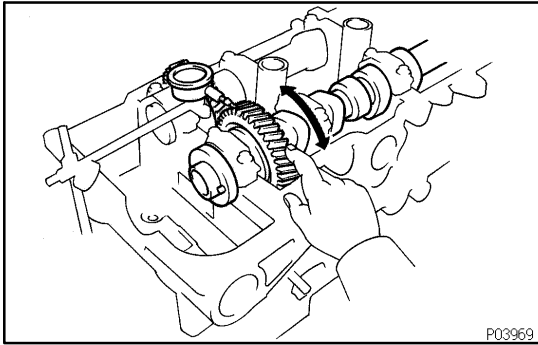
- (g) Inspect the thrust clearance.
(1) Install the camshaft (See page [EM-54](#)).
(2) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:

0.030 – 0.080 mm (0.0012 – 0.0031 in.)

Maximum thrust clearance: 0.10 mm (0.0039 in.)

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



- (h) Inspect the gear backlash.
- (1) Install the camshafts without installing the exhaust cam sub-gear (See page [EM-54](#)).
 - (2) Using a dial indicator, measure the backlash.

Standard backlash:

0.020 – 0.200 mm (0.0008 – 0.0079 in.)

Maximum backlash: 0.30 mm (0.0188 in.)

If the backlash is greater than maximum, replace the camshafts.

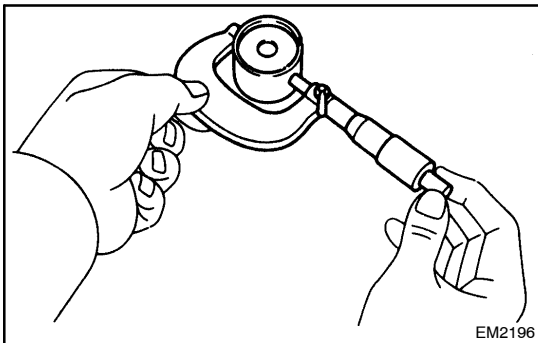


10. INSPECT VALVE LIFTER OIL CLEARANCE

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

Lifter bore diameter:

34.000 – 34.021 mm (1.3386 – 1.3394 in.)



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

Lifter diameter:

33.966 – 33.976 mm (1.3372 – 1.3376 in.)

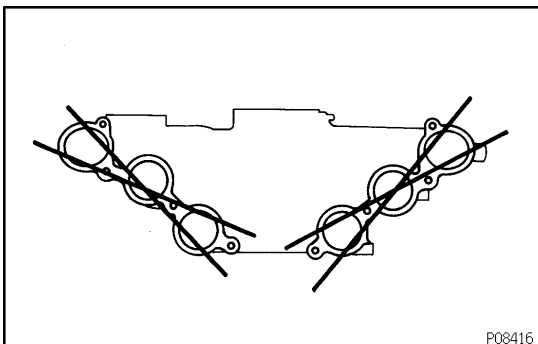
- (c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance:

0.024 – 0.055 mm (0.0009 – 0.0022 in.)

Maximum oil clearance: 0.07 mm (0.0028 in.)

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



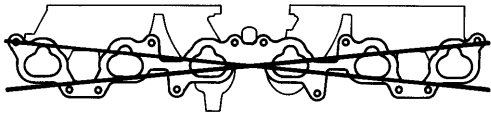
11. INSPECT AIR INTAKE CHAMBER

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

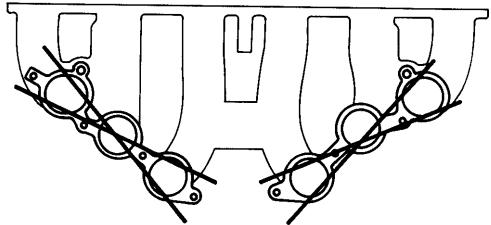
Maximum warpage: 0.30 mm (0.0118 in.)

If warpage is greater than maximum, replace the air intake chamber.

Cylinder Head Side



Air Intake Chamber Side

P08414
P08415

Z04171

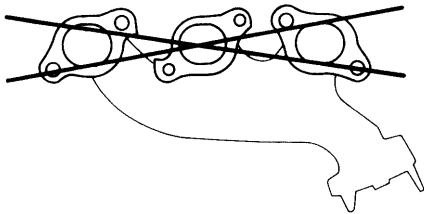
12. INSPECT INTAKE MANIFOLD

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

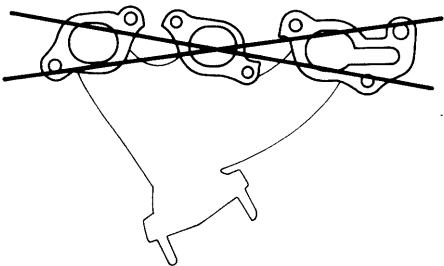
Maximum warpage: 0.30 mm (0.0118 in.)

If warpage is greater than maximum, replace the manifold.

No.1 Exhaust Manifold



No.2 Exhaust Manifold



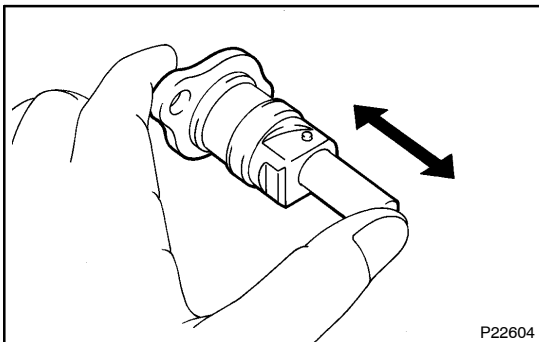
P08250

13. INSPECT EXHAUST MANIFOLDS

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

Maximum warpage: 0.30 mm (0.0118 in.)

If warpage is greater than maximum, replace the manifold.



P22604

14. INSPECT CHAIN TENSIONER

Check that the plunger moves smoothly.