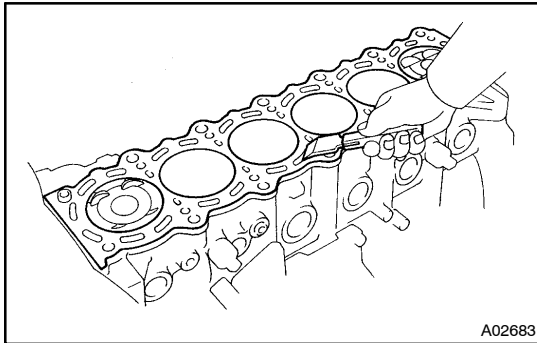


INSPECTION

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

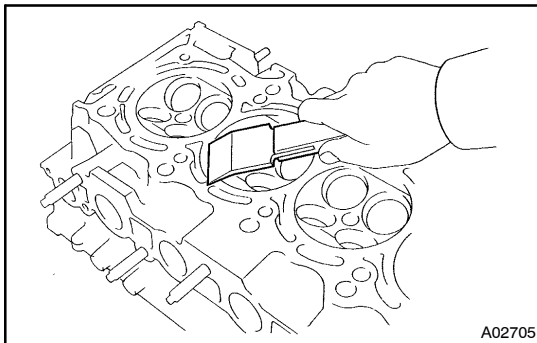
- (a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.



- (b) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.
 (c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION:

Protect your eyes when using high – pressure compressed air.

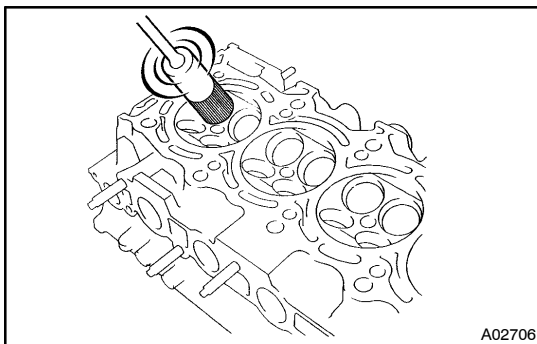


2. CLEAN CYLINDER HEAD

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

NOTICE:

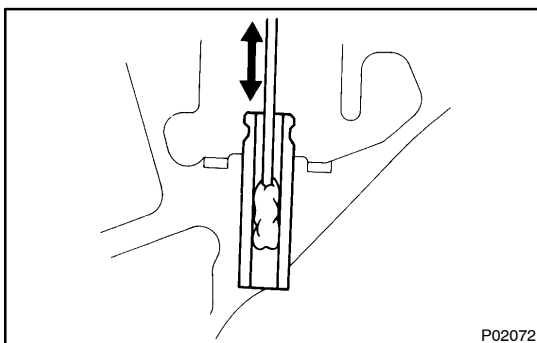
Be careful not to scratch the cylinder block contact surface.



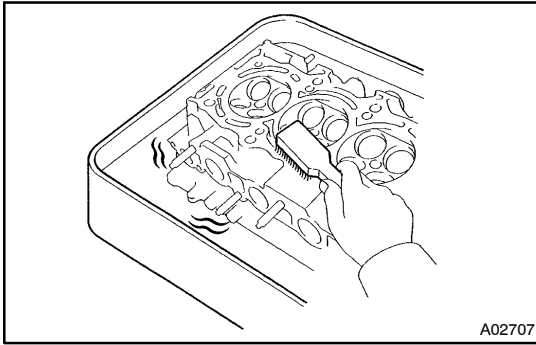
- (b) Clean the combustion chambers.
 Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE:

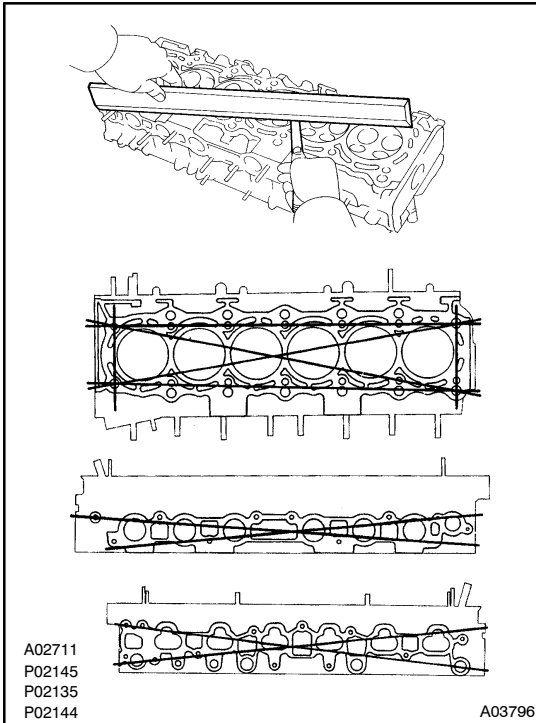
Be careful not to scratch the cylinder block contact surface.



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



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

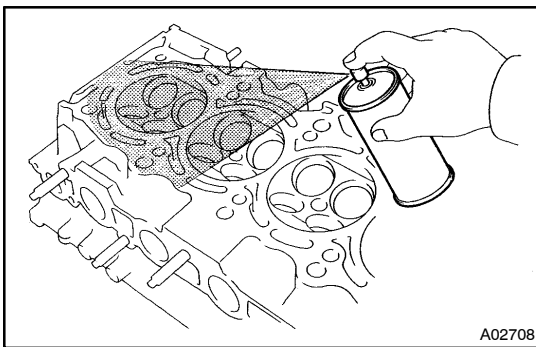


3. INSPECT CYLINDER HEAD

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

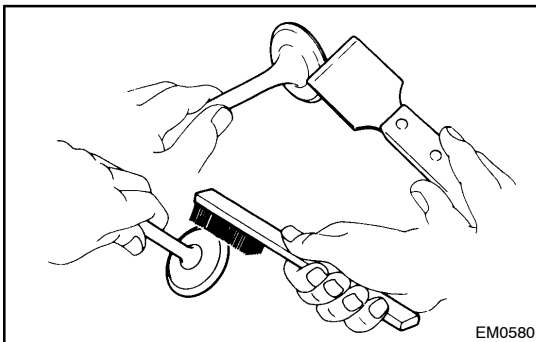
Maximum warpage: 0.10 mm (0.0039 in.)

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



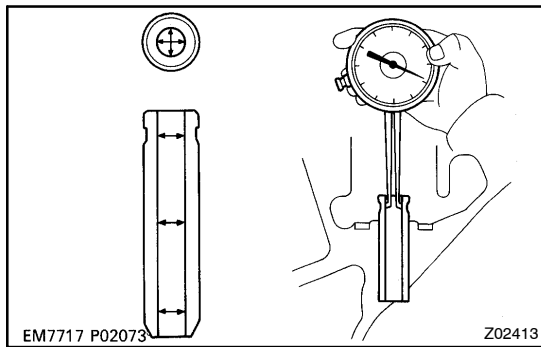
- (b) Inspect for the cracks.
Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.



4. CLEAN VALVES

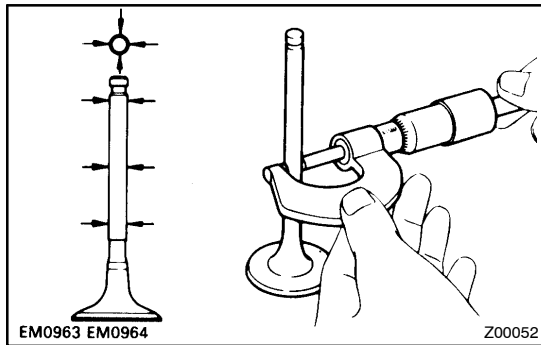
- (a) Using a gasket scraper, chip off any carbon from the valve head.
(b) Using a wire brush, thoroughly clean the valve.

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

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

Bushing inside diameter:

6.010 – 6.030 mm (0.2366 – 0.2374 in.)



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

Valve stem diameter:

| | |
|---------|----------------------------------------|
| Intake | 5.970 – 5.985 mm (0.2350 – 0.2356 in.) |
| Exhaust | 5.965 – 5.980 mm (0.2348 – 0.2354 in.) |

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

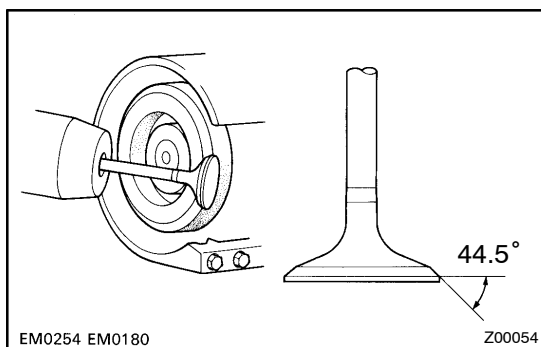
Standard oil clearance:

| | |
|---------|----------------------------------------|
| 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:

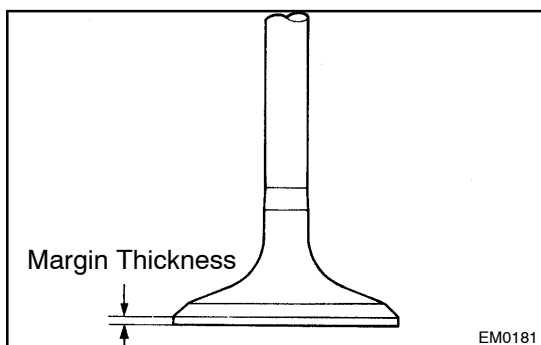
| | |
|---------|----------------------|
| Intake | 0.08 mm (0.0031 in.) |
| Exhaust | 0.10 mm (0.0039 in.) |

If the clearance is greater than maximum, replace the valve and guide bushing. (See page [EM-48](#))

**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.

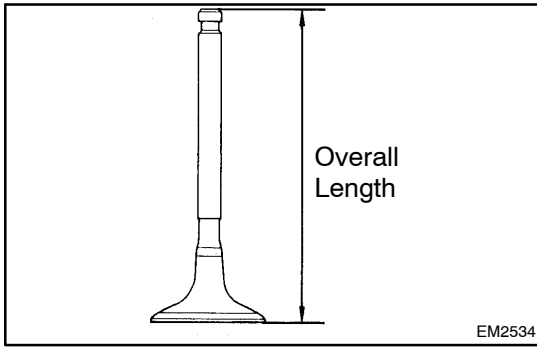
Standard margin thickness:

0.8 – 1.2 mm (0.031 – 0.047 in.)

Minimum margin thickness:

0.5 mm (0.020 in.)

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



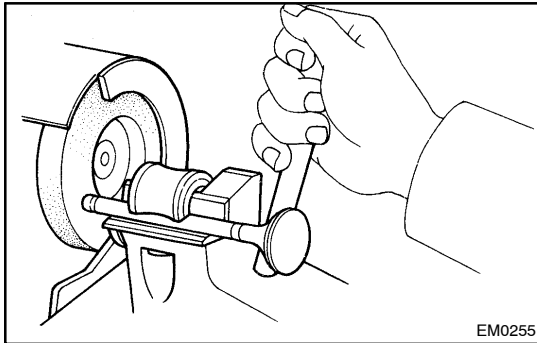
(d) Check the valve overall length.

Standard overall length:

| | |
|---------|----------------------------------------|
| Intake | 98.29 – 98.79 mm (3.8697 – 3.8894 in.) |
| Exhaust | 98.84 – 99.34 mm (3.8913 – 3.9110 in.) |

Minimum overall length:

| | |
|---------|-----------------------|
| Intake | 98.19 mm (3.8657 in.) |
| Exhaust | 98.74 mm (3.8874 in.) |



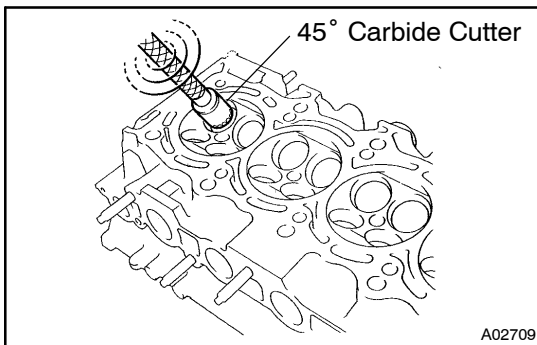
If the overall length is less than minimum, replace the valve.

(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.

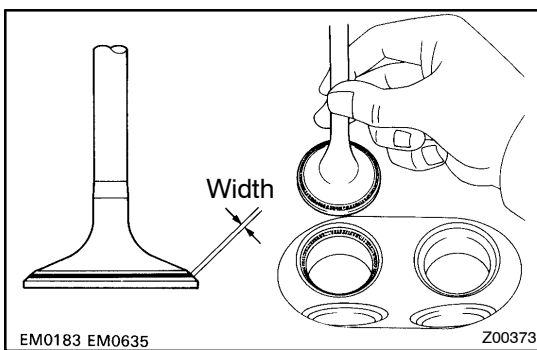
NOTICE:

Do not grind off more than the minimum overall length.



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 thin coat of Prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

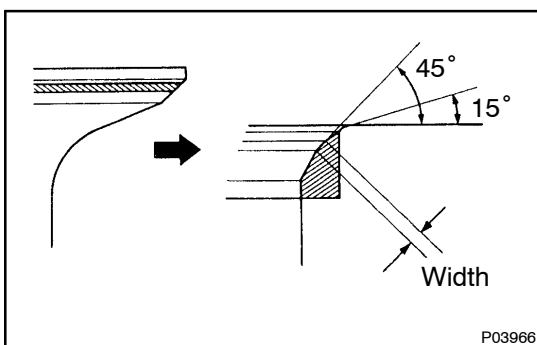
(c) Check the valve face and seat for the following:

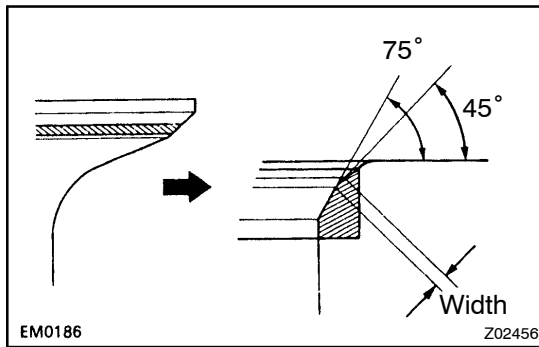
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:

If not, correct the valve seats as follows:

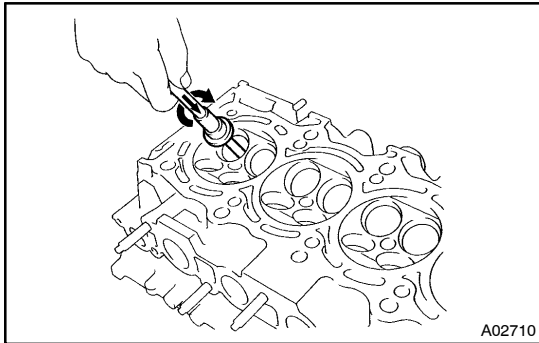
| | |
|---------|----------------------------------|
| Intake | 1.0 – 1.4 mm (0.039 – 0.055 in.) |
| Exhaust | 1.2 – 1.6 mm (0.047 – 0.063 in.) |

(1) If the seating is too high on the valve face, use 15° and 45° cutters to correct the seat.

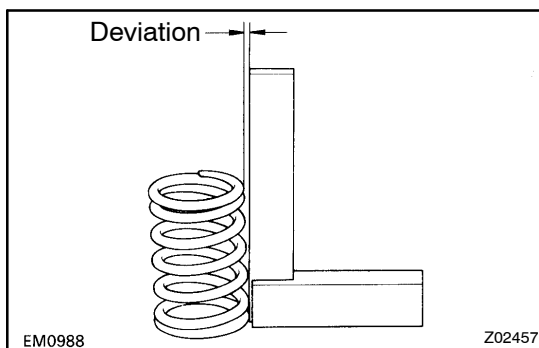




- (2) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.



- (d) Hand-lap the valve and valve seat with an abrasive compound.
(e) After hand-lapping, clean the valve and valve seat.

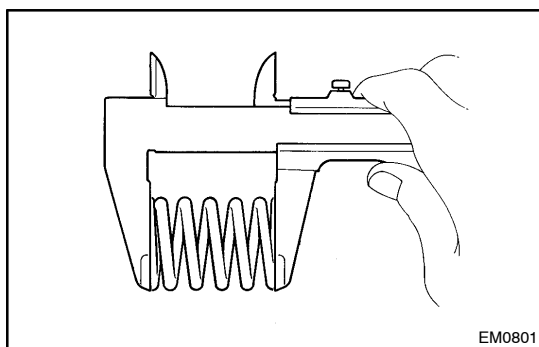


8. INSPECT VALVE SPRINGS

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

Maximum deviation: 2.0 mm (0.079 in.)

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

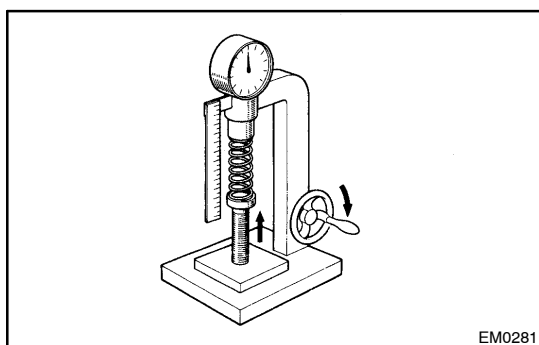


- (b) Using vernier calipers, measure the free length of the valve spring.

Free length:

| | |
|---------------------|-----------------------|
| Pink painted mark | 43.71 mm (1.7209 in.) |
| Yellow painted mark | 44.10 mm (1.7362 in.) |

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



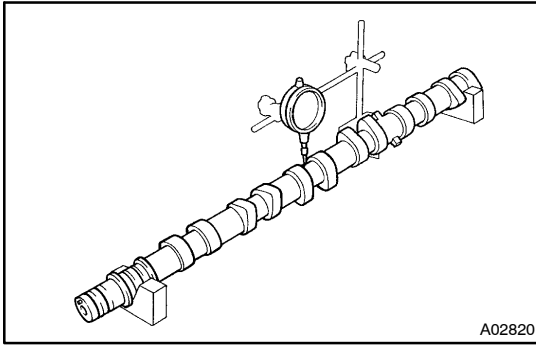
- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

186.2 – 205.8 N (19.0 – 21.0 kgf, 41.9 – 46.3 lbf)

at 34.5 mm (1.358 in.)

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

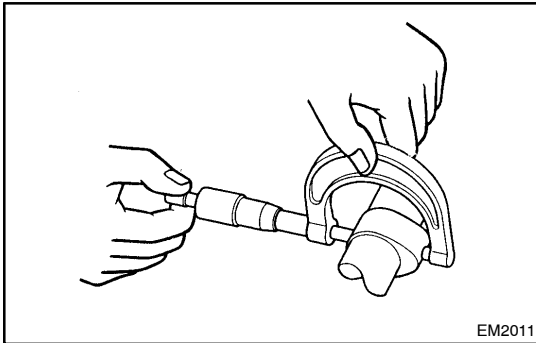


9. INSPECT CAMSHAFTS FOR RUNOUT

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

Maximum circle runout: 0.08 mm (0.0031 in.)

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



10. INSPECT CAM LOBES

Using a micrometer, measure the cam lobe height.

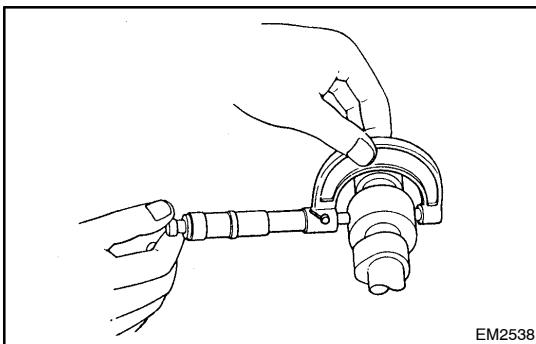
Standard cam lobe height:

| | |
|---------|------------------------------------------|
| Intake | 44.310 – 44.360 mm (1.7445 – 1.7465 in.) |
| Exhaust | 44.250 – 44.350 mm (1.7421 – 1.7461 in.) |

Minimum cam lobe height:

| | |
|---------|-----------------------|
| Intake | 44.16 mm (1.7386 in.) |
| Exhaust | 44.10 mm (1.7362 in.) |

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



11. INSPECT CAMSHAFT JOURNALS

Using a micrometer, measure the journal diameter.

Journal diameter:

28.949 – 28.965 mm (1.1397 – 1.1404 in.)

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

12. INSPECT CAMSHAFT BEARING

Check the bearings for flaking and scoring.

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

13. INSPECT CAMSHAFT JOURNAL OIL CLEARANCE

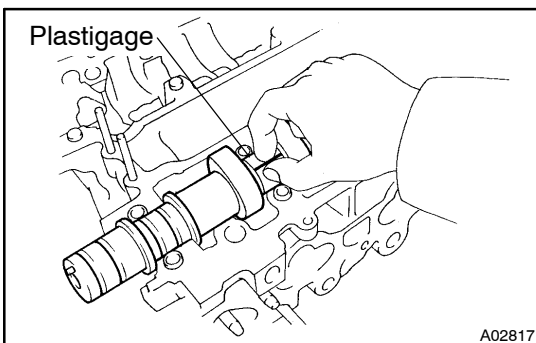
- (a) Clean the bearing caps and camshaft journals.
- (b) Place the camshafts on the cylinder head.
- (c) Lay a strip of Plastigage across each of the camshaft journals.
- (d) Install the bearing caps. (See page [EM-52](#))

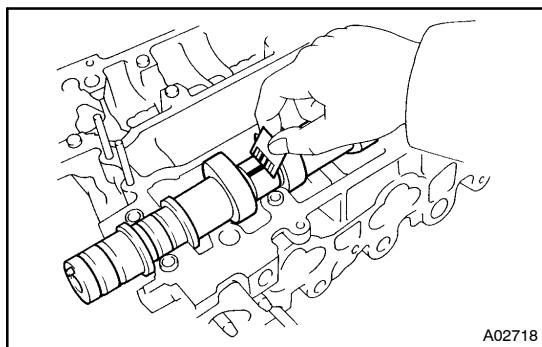
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

NOTICE:

Do not turn the camshaft.

- (e) Remove the bearing caps.





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

Standard oil clearance:

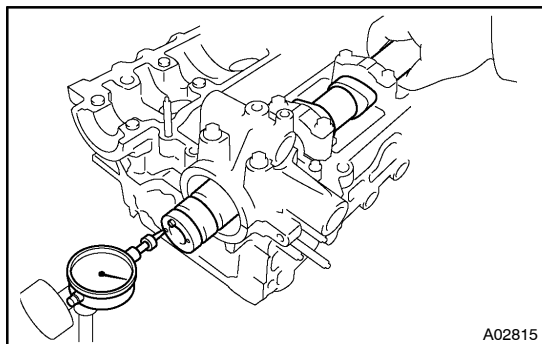
0.035 – 0.072 mm (0.0014 – 0.0028 in.)

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.



14. INSPECT CAMSHAFT THRUST CLEARANCE

- (a) Install the camshafts. (See page [EM-52](#))

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

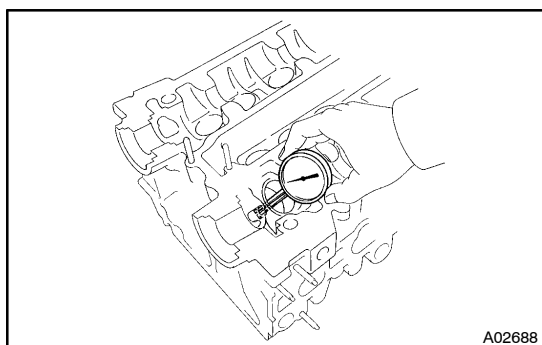
Standard thrust clearance:

0.080 – 0.190 mm (0.0031 – 0.0075 in.)

Maximum thrust clearance:

0.30 mm (0.0118 in.)

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



15. INSPECT VALVE LIFTERS AND LIFTER BORES

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

Lifter bore diameter:

31.000 – 31.016 mm (1.2205 – 1.2211 in.)

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

Lifter diameter:

30.966 – 30.976 mm (1.2191 – 1.2195 in.)

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

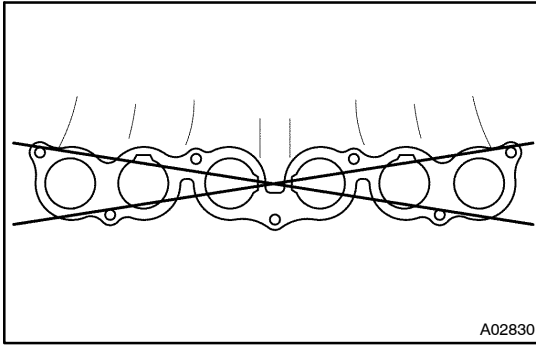
Standard oil clearance:

0.024 – 0.050 mm (0.0009 – 0.0020 in.)

Maximum oil clearance:

0.07 mm (0.0028 in.)

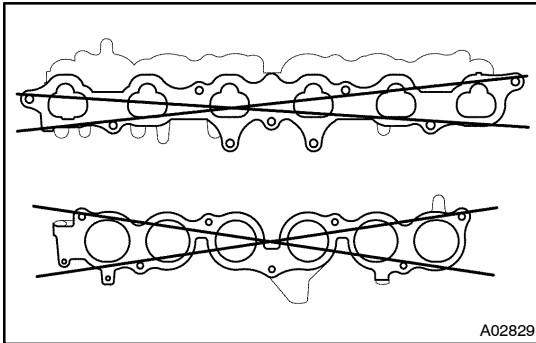
If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.

**16. INSPECT AIR INTAKE CHAMBER**

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

Maximum warpage: 0.15 mm (0.0059 in.)

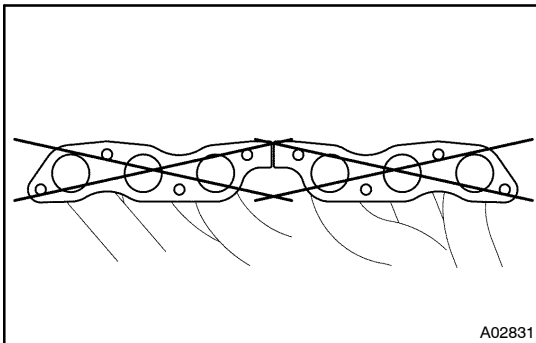
If warpage is greater than maximum, replace the chamber.

**17. INSPECT INTAKE MANIFOLD**

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

Maximum warpage: 0.15 mm (0.0059 in.)

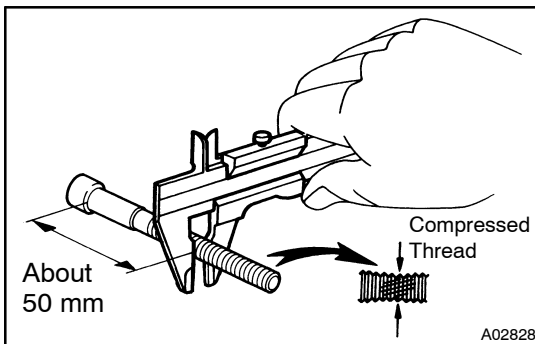
If warpage is greater than maximum, replace the manifold.

**18. INSPECT EXHAUST MANIFOLD**

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

Maximum warpage: 0.50 mm (0.0196 in.)

If warpage is greater than maximum, replace the manifold.

**19. INSPECT CYLINDER HEAD BOLTS**

Using a vernier caliper, measure the thread outside diameter of the bolt.

Standard outside diameter:

10.8 – 11.0 mm (0.425 – 0.433 in.)

Minimum outside diameter:

10.7 mm (0.421 in.)

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