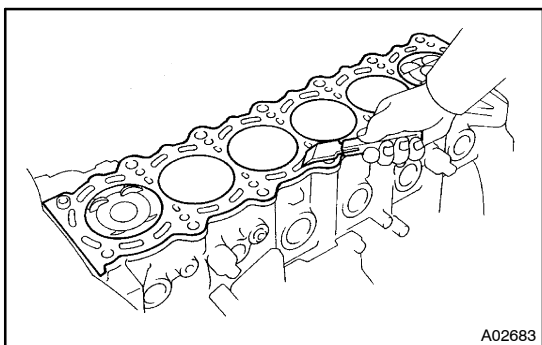


A02682

## 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.

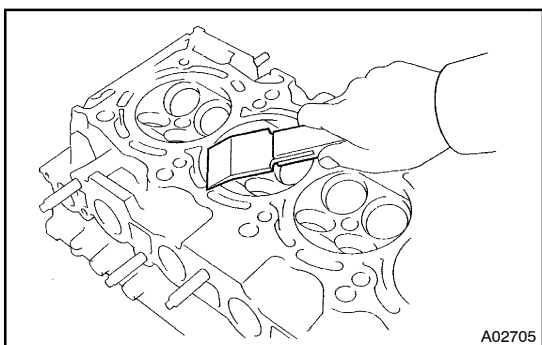


A02683

- (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.**



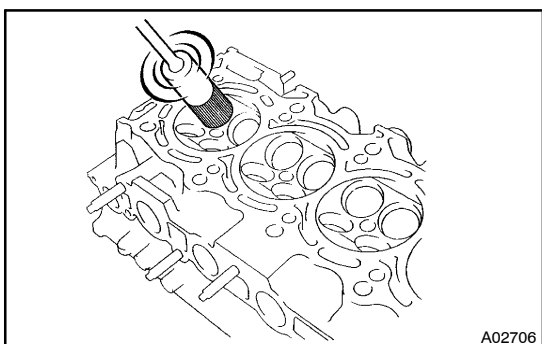
A02705

### 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.**

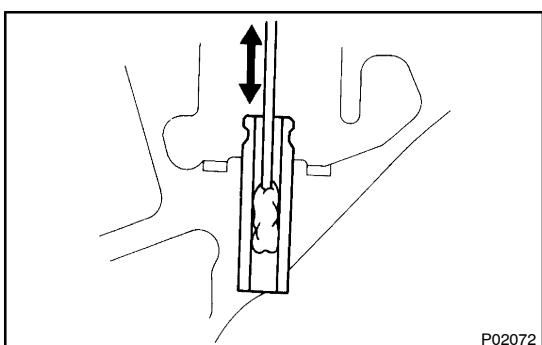


A02706

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

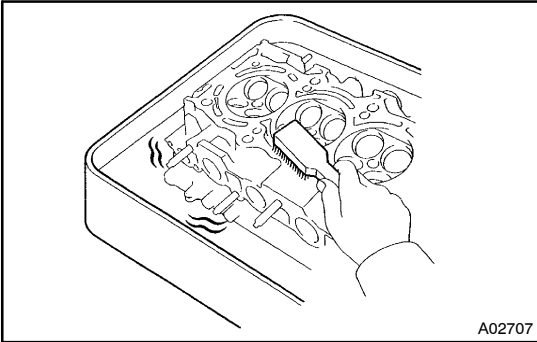
#### NOTICE:

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

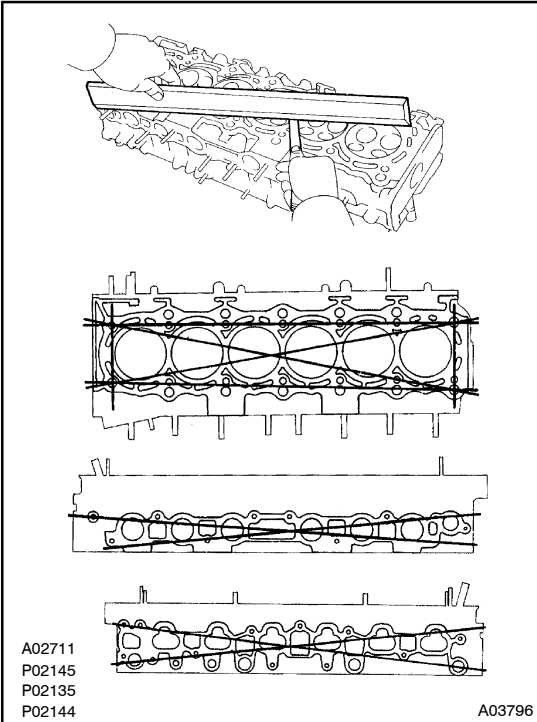


P02072

- (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.

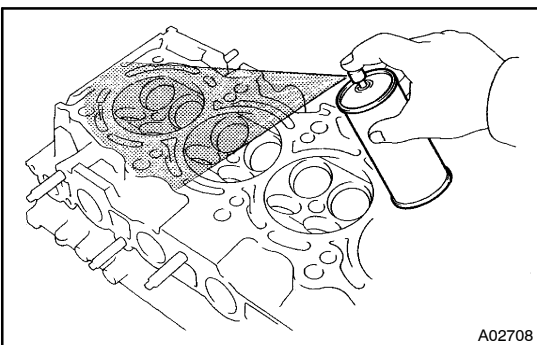


### 3. INSPECT CYLINDER HEAD

- (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.

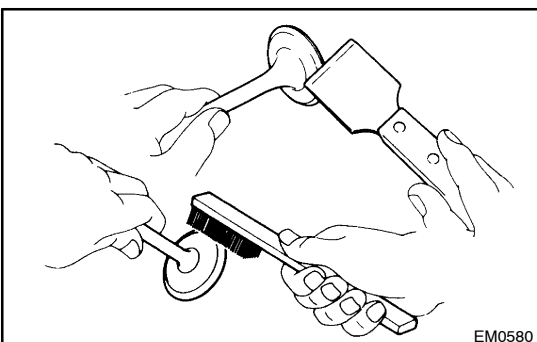
**Maximum warpage: 0.10 mm (0.0039 in.)**

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



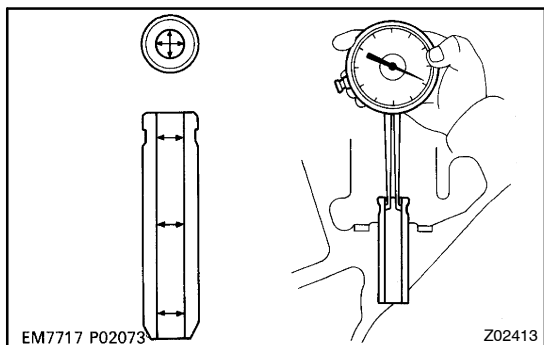
- (b) Inspect for the cracks.  
Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.



### 4. CLEAN VALVES

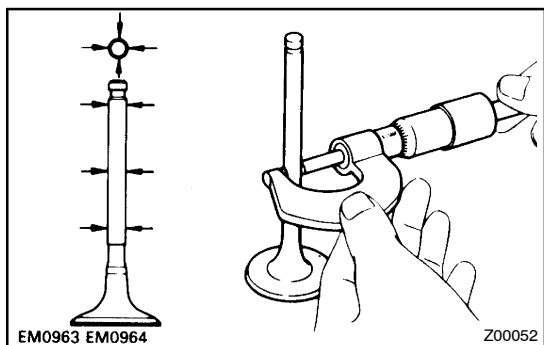
- (a) Using a gasket scraper, chip off any carbon from the valve head.  
(b) Using a wire brush, thoroughly clean the valve.

**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.

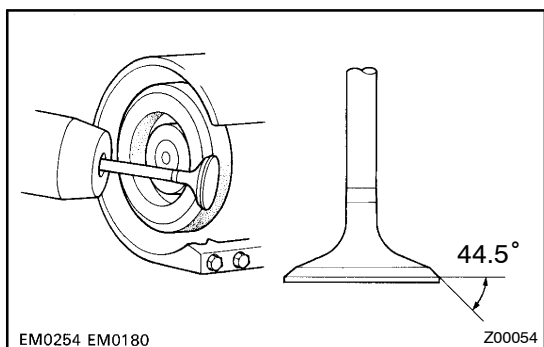
**Standard oil clearance:**

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:**

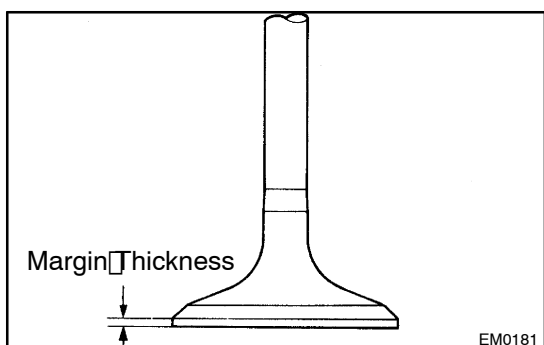
Intake	0.08 mm (0.0031 in.)
Exhaust	0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing. (See page EM-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.

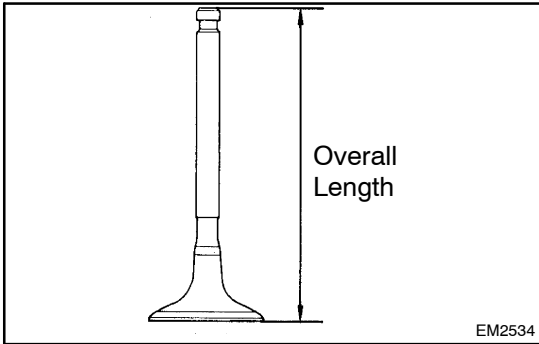
**Standard margin thickness:**

**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.



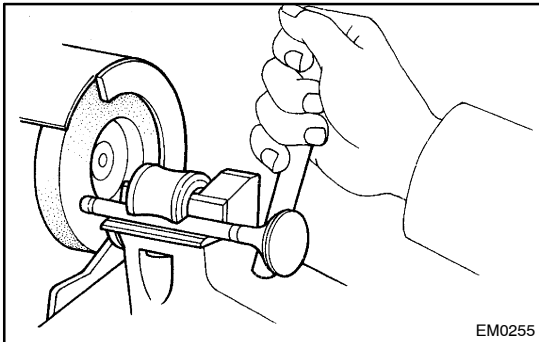
- (d) Check the valve overall length.

**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.)



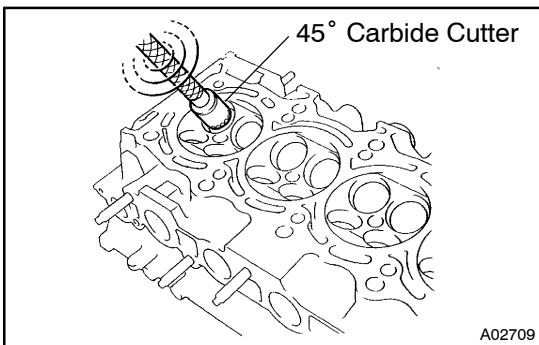
If the overall length is less than minimum, replace the valve.

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

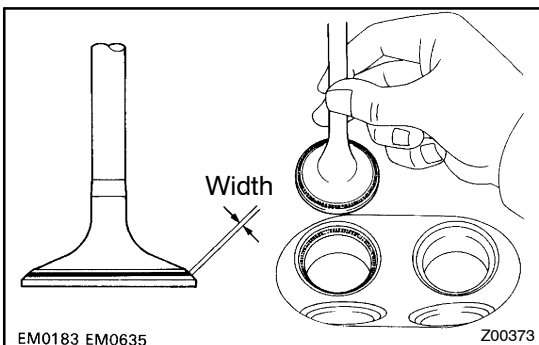
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

**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.

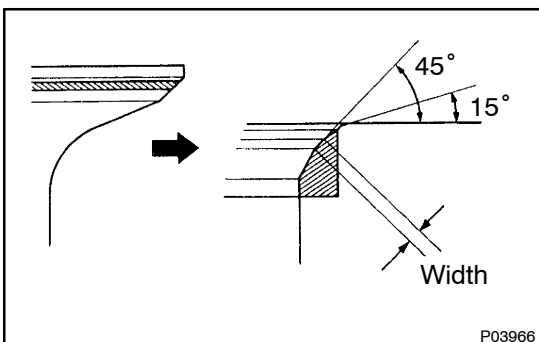
- (c) Check the valve face and seat for the following:

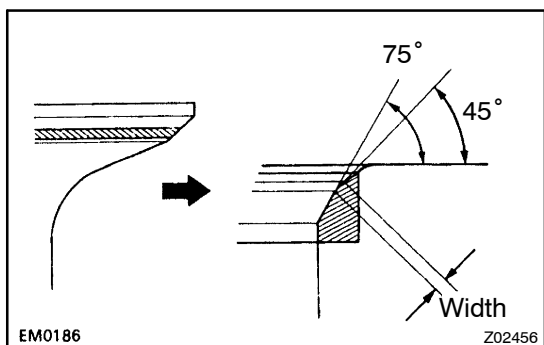
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:

If not, correct the valve seats as follows:

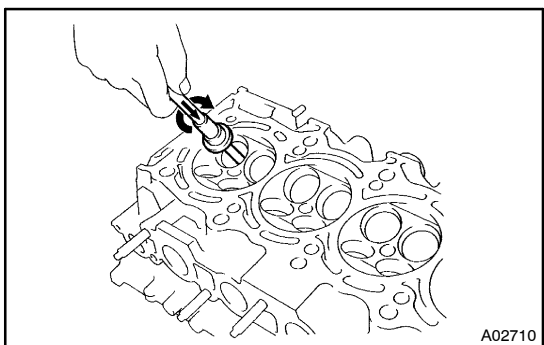
Intake	1.0 – 1.4 mm (0.039 – 0.055 in.)
Exhaust	1.2 – 1.6 mm (0.047 – 0.063 in.)

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

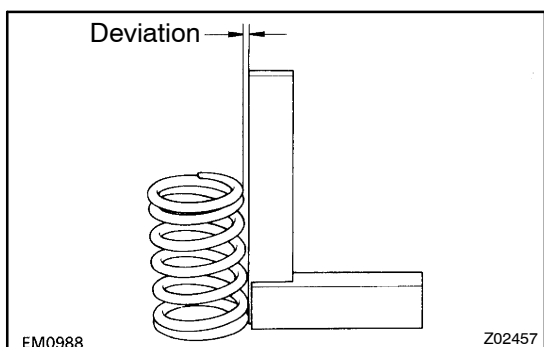




- (2) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.



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

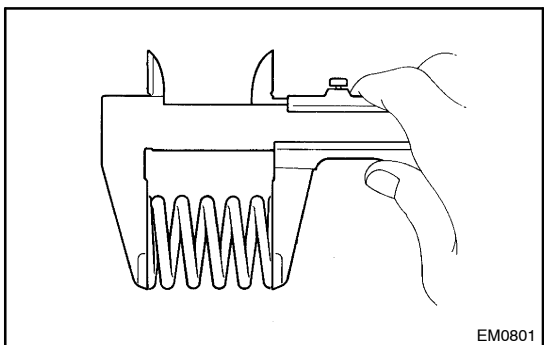


## 8. INSPECT VALVE SPRINGS

- (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.

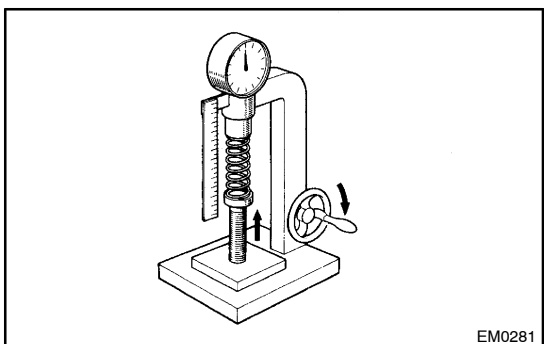


- (b) Using vernier calipers, measure the free length of the valve spring.

**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.



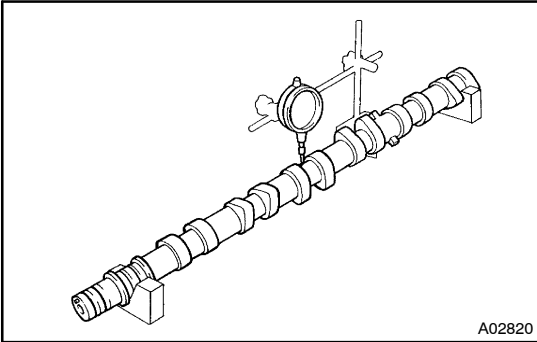
- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

**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.



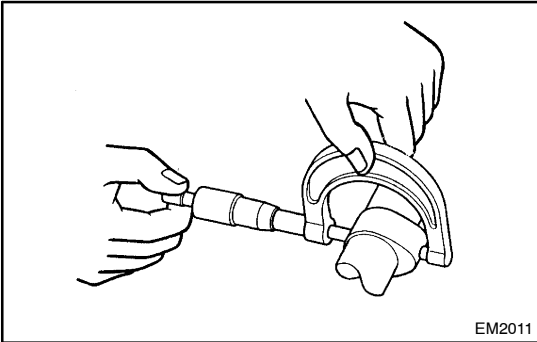
A02820

### 9. INSPECT CAMSHAFTS FOR RUNOUT

- Place the camshaft on V-blocks.
- 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.



EM2011

### 10. INSPECT CAM LOBES

Using a micrometer, measure the cam lobe height.

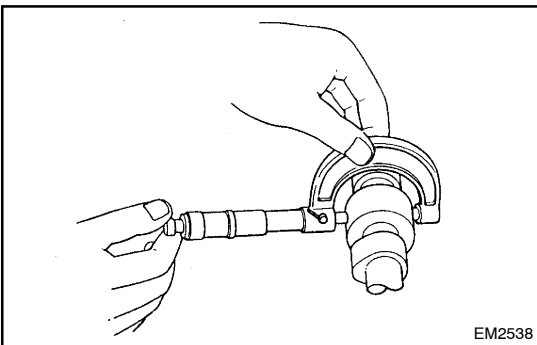
**Standard cam lobe height:**

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.



EM2538

### 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

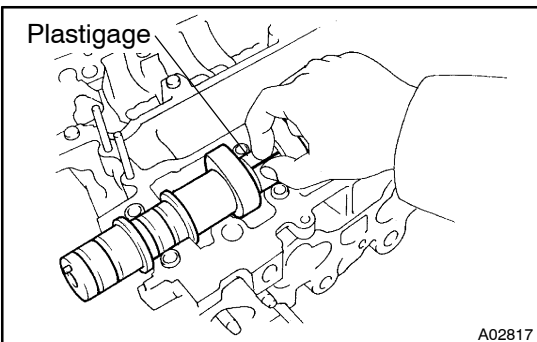
- Clean the bearing caps and camshaft journals.
- Place the camshafts on the cylinder head.
- Lay a strip of Plastigage across each of the camshaft journals.
- Install the bearing caps. (See page EM-53)

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

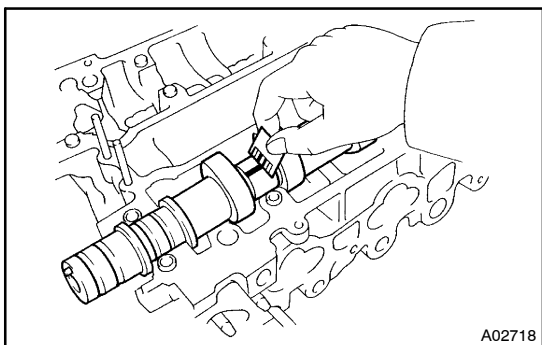
**NOTICE:**

**Do not turn the camshaft.**

- Remove the bearing caps.



A02817



(f) Measure the Plastigage at its widest point.

**Standard oil clearance:**

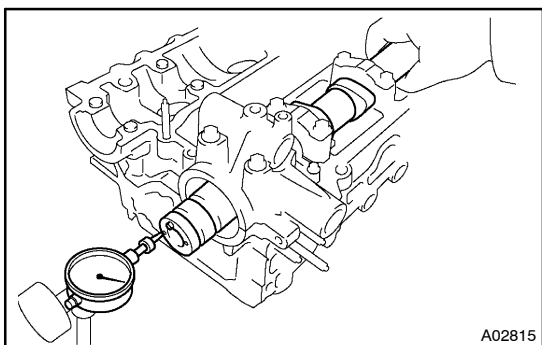
**0.035 – 0.072 mm (0.0014 – 0.0028 in.)**

**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-53)

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

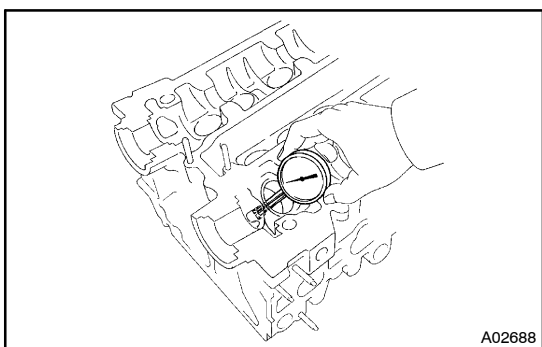
**Standard thrust clearance:**

**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.

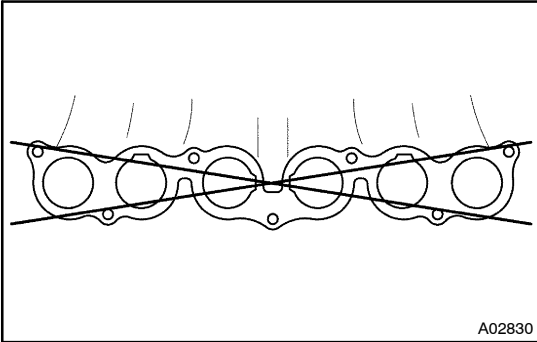
**Standard oil clearance:**

**0.024 – 0.050 mm (0.0009 – 0.0020 in.)**

**Maximum oil clearance:**

**0.07 mm (0.0028 in.)**

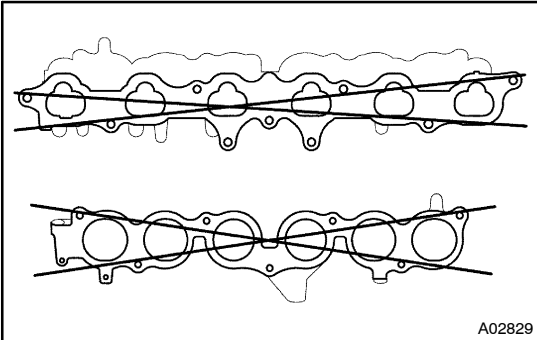
If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.

**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.)**

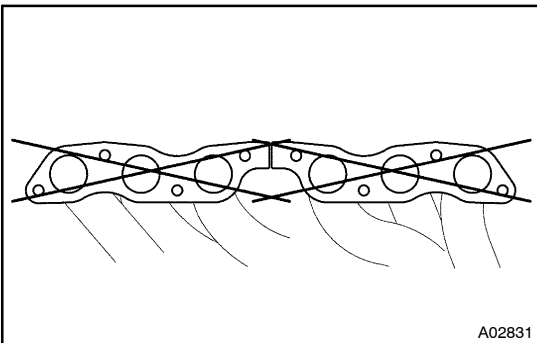
If warpage is greater than maximum, replace the chamber.

**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.)**

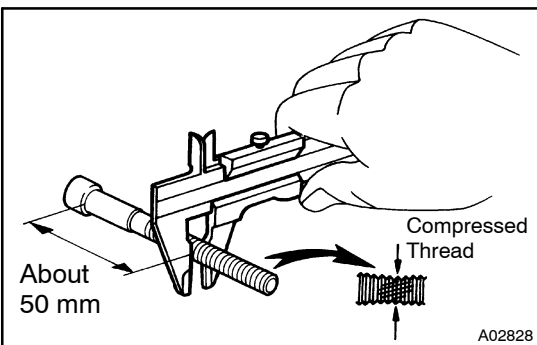
If warpage is greater than maximum, replace the manifold.

**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.