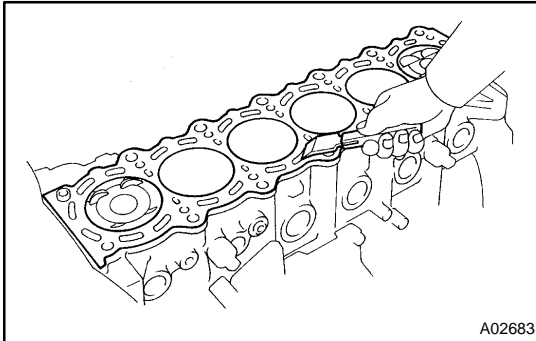


## INSPECTION

### 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.

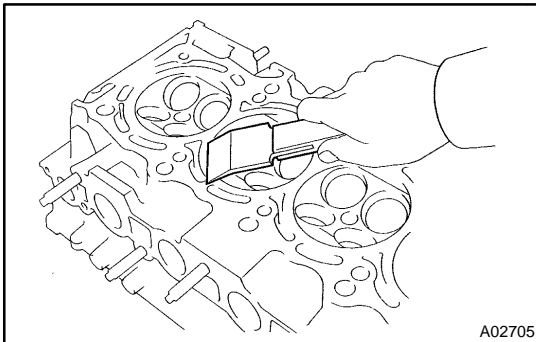


- (b) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.  
 (c) Using compressed air, blow carbon and oil from the bolt holes.

#### CAUTION:

Protect your eyes when using high - pressure compressed air.

### 2. INSPECT CYLINDER BLOCK FOR FLATNESS (See page [EM-87](#) )

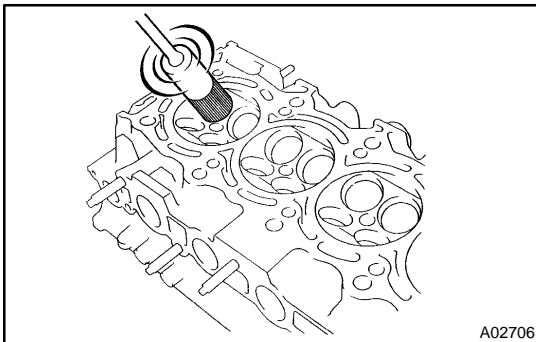


### 3. CLEAN CYLINDER HEAD

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

#### NOTICE:

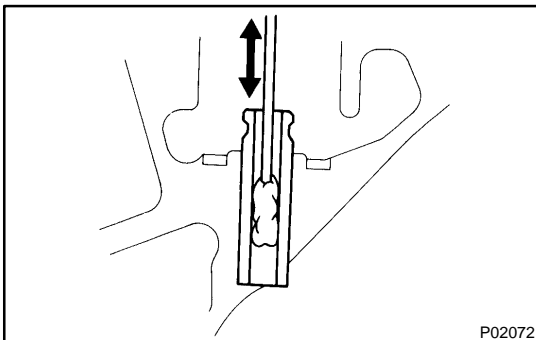
Be careful not to scratch the cylinder block contact surface.



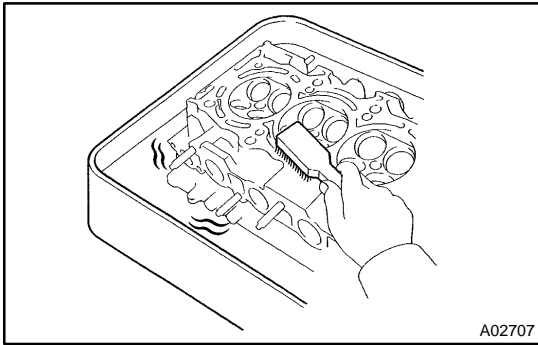
- (b) Clean the combustion chambers.  
 Using a wire brush, remove all the carbon from the combustion chambers.

#### NOTICE:

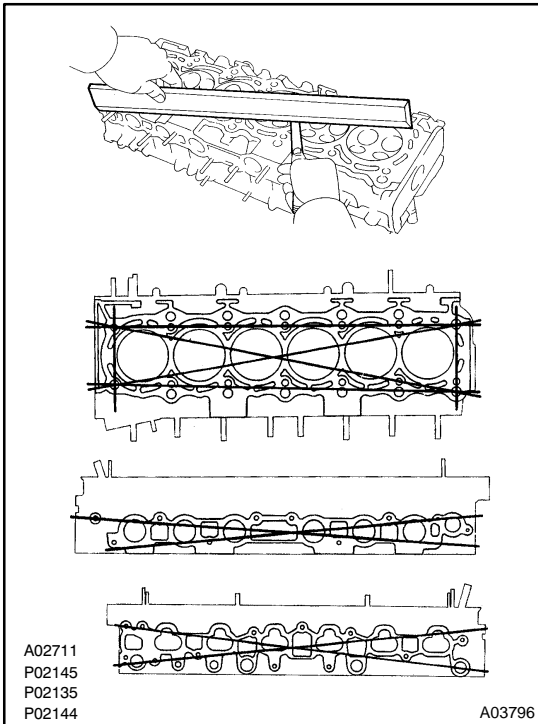
Be careful not to scratch the cylinder block contact surface.



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

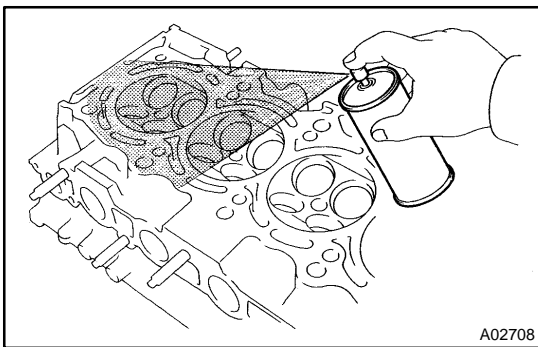


- (d) Clean the cylinder head.  
Using a soft brush and solvent, thoroughly clean the cylinder head.

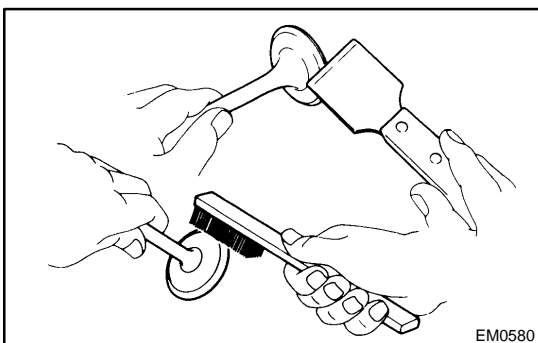


#### 4. INSPECT CYLINDER HEAD

- (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.

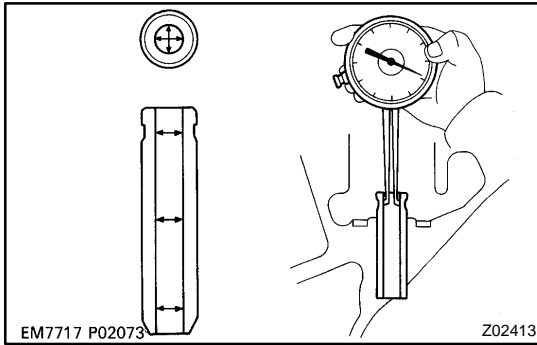


- (b) Inspect for the cracks.  
Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.  
If cracked, replace the cylinder head.



#### 5. CLEAN VALVES

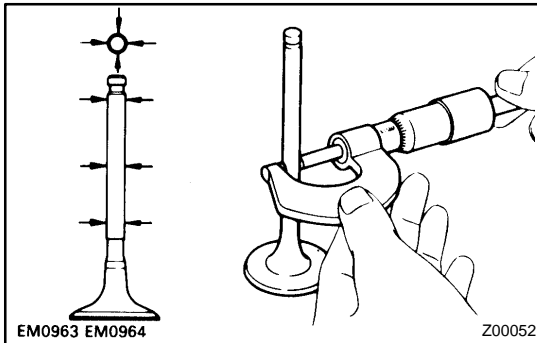
- (a) Using a gasket scraper, chip off any carbon from the valve head.  
(b) Using a wire brush, thoroughly clean the valve.

**6. 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.

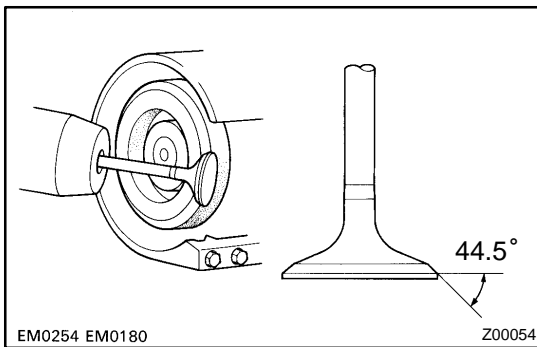
**Standard oil clearance:**

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:**

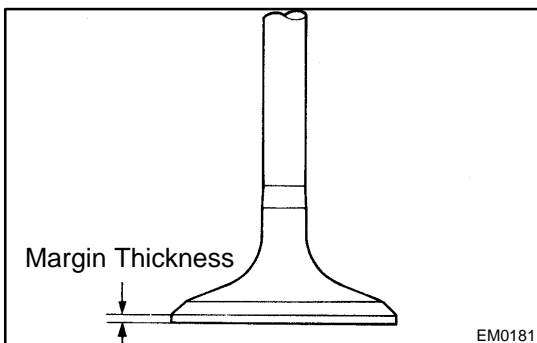
Intake	0.08 mm (0.0031 in.)
Exhaust	0.10 mm (0.0039 in.)

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

**7. INSPECT AND GRIND VALVES**

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

**Valve face angle: 44.5°**



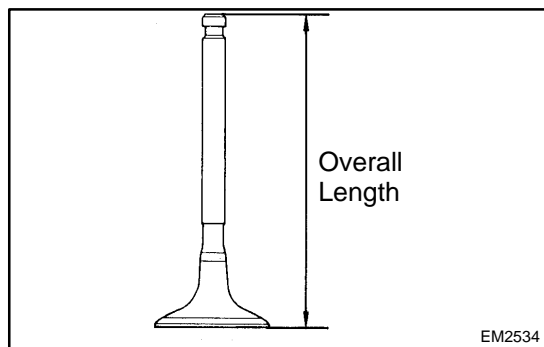
- (c) Check the valve head margin thickness.

**Standard margin thickness:**

**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.



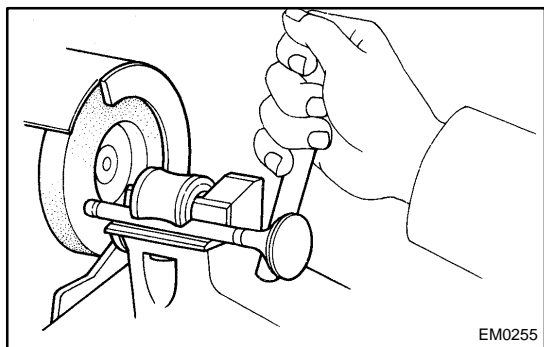
- (d) Check the valve overall length.

**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.)



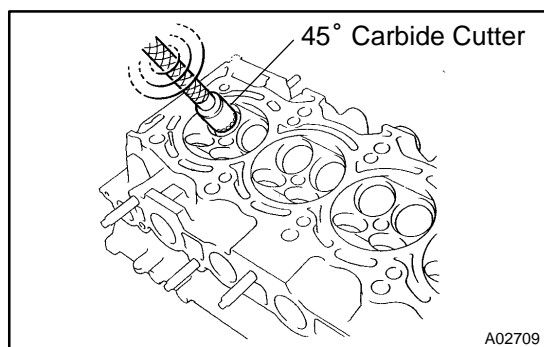
If the overall length is less than minimum, replace the valve.

- (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.

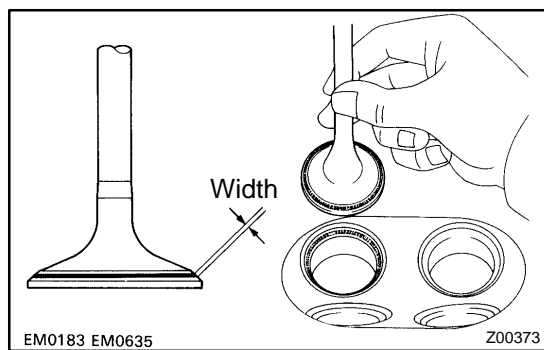
**NOTICE:**

**Do not grind off more than the minimum overall length.**



**8. INSPECT AND CLEAN VALVE SEATS**

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

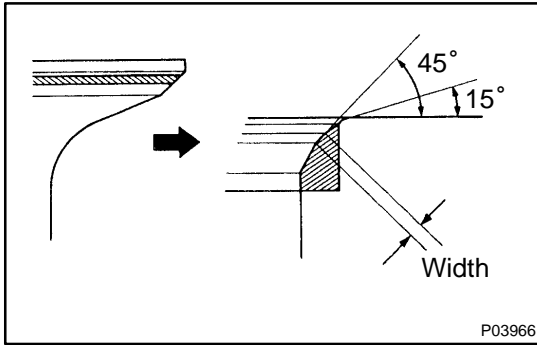


- (b) Check the valve seating position. Apply a thin coat of Prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

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

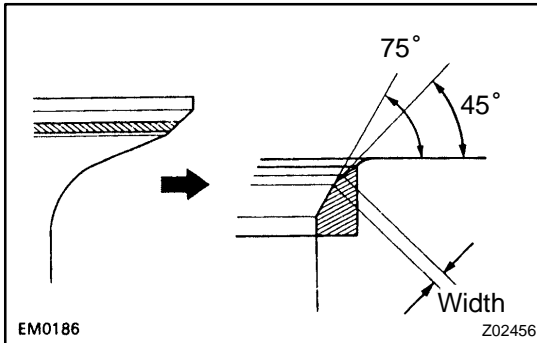
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:

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

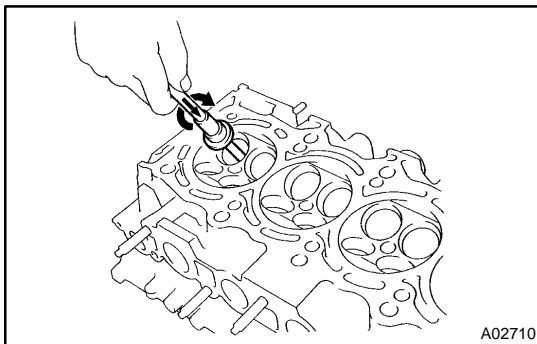


If not, correct the valve seats as follows:

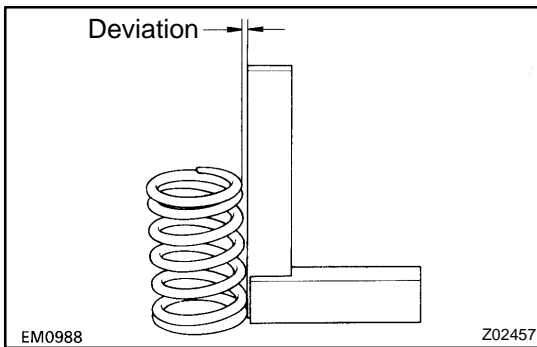
- (1) If the seating is too high on the valve face, use 15° and 45° cutters to correct the seat.



- (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.

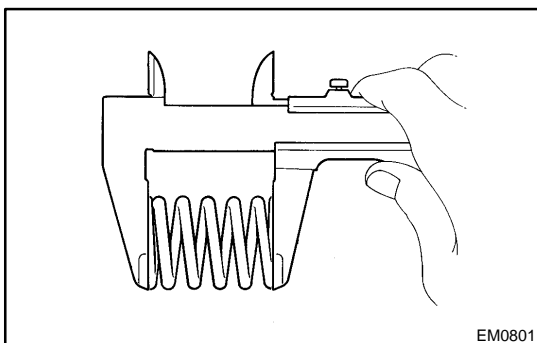


## 9. INSPECT VALVE SPRINGS

- (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.

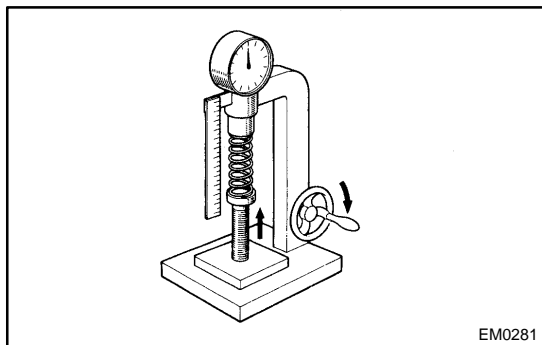


- (b) Using vernier calipers, measure the free length of the valve spring.

**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.



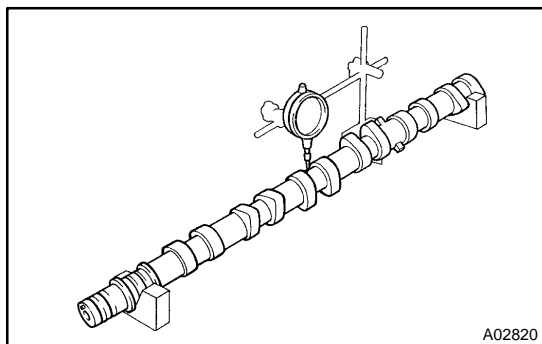
EM0281

- (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.



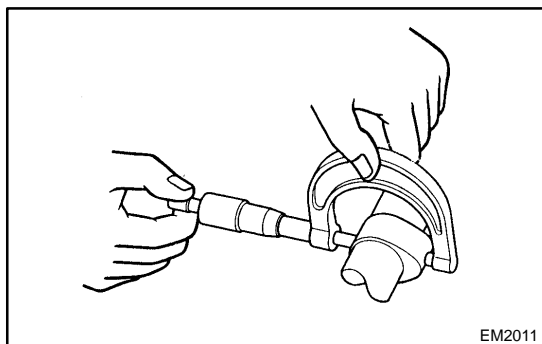
A02820

## 10. 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.



EM2011

## 11. INSPECT CAM LOBES

Using a micrometer, measure the cam lobe height.

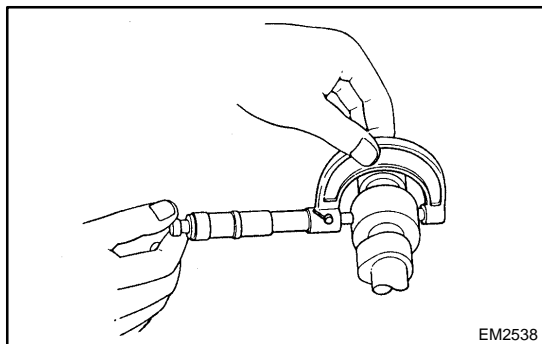
**Standard cam lobe height:**

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 lobe height is less than minimum, replace the camshaft.



EM2538

## 12. 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.

## 13. 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.

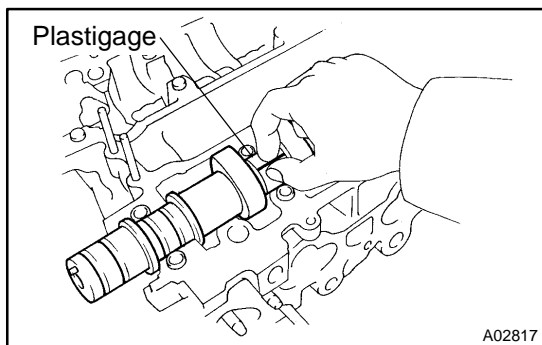
## 14. INSPECT CAMSHAFT JOURNAL OIL CLEARANCE

- (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-53](#) ).

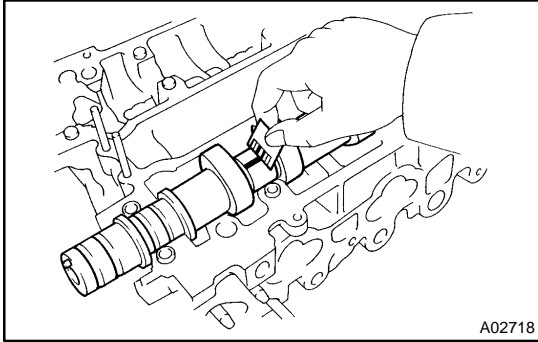
**NOTICE:**

**Do not turn the camshaft.**

- (e) Remove the bearing caps.



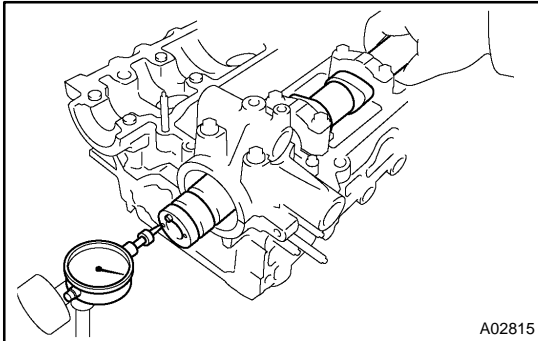
A02817



- (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.

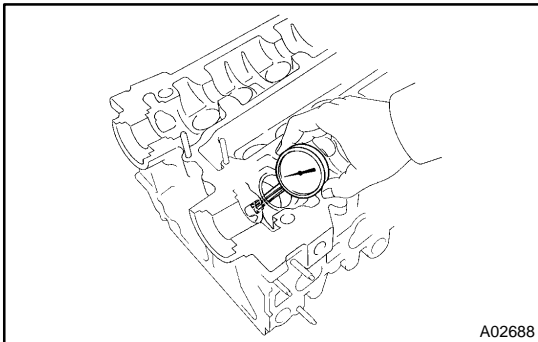


#### 15. INSPECT CAMSHAFT THRUST CLEARANCE

- (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.



#### 16. 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.)**

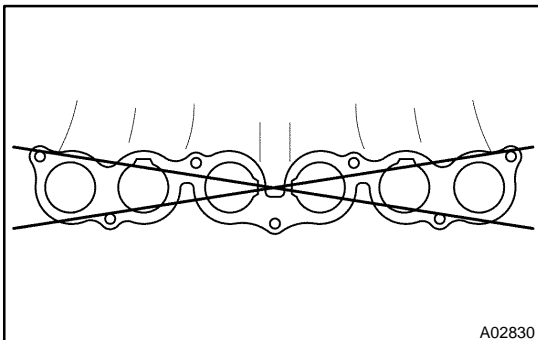
- (b) Using a micrometer, measure the lifter diameter.

**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.

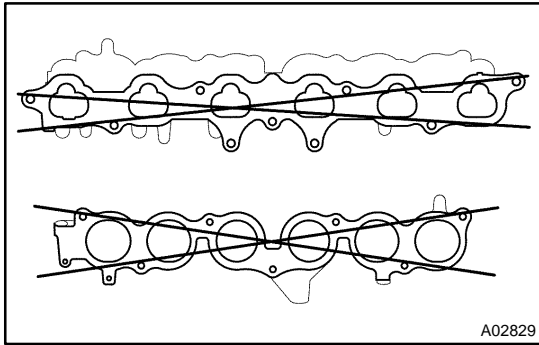


#### 17. INSPECT AIR INTAKE CHAMBER

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.)**

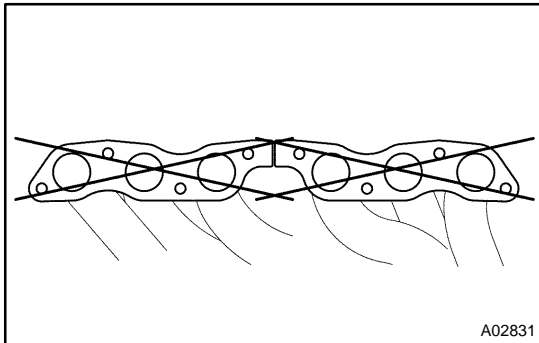
If warpage is greater than maximum, replace the chamber.

**18. 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.)**

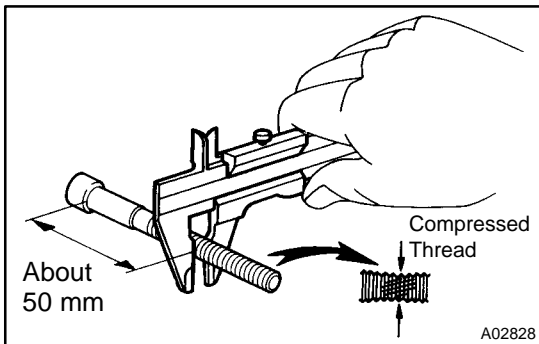
If warpage is greater than maximum, replace the manifold.

**19. 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.

**20. 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.