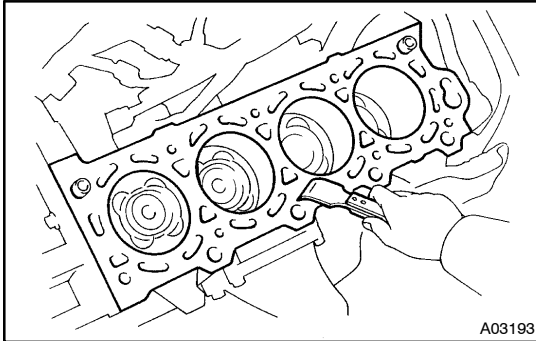


## INSPECTION

### 1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

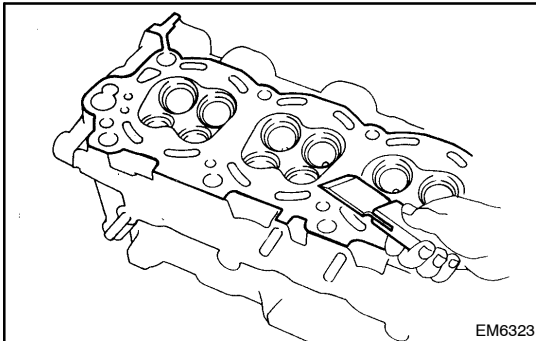
- (a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.



- (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 pressure compressed air.**

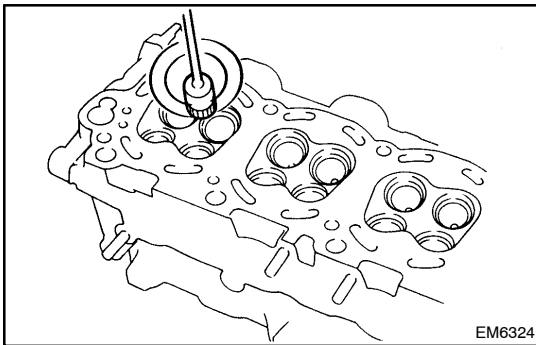


### 2. REMOVE GASKET MATERIAL

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.**

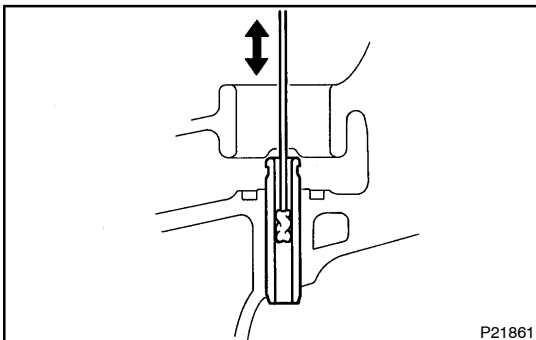


### 3. CLEAN COMBUSTION CHAMBERS

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

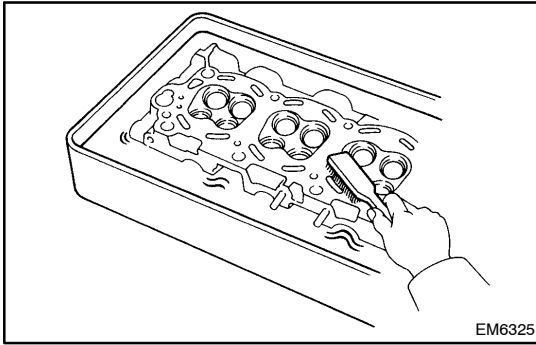
### NOTICE:

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



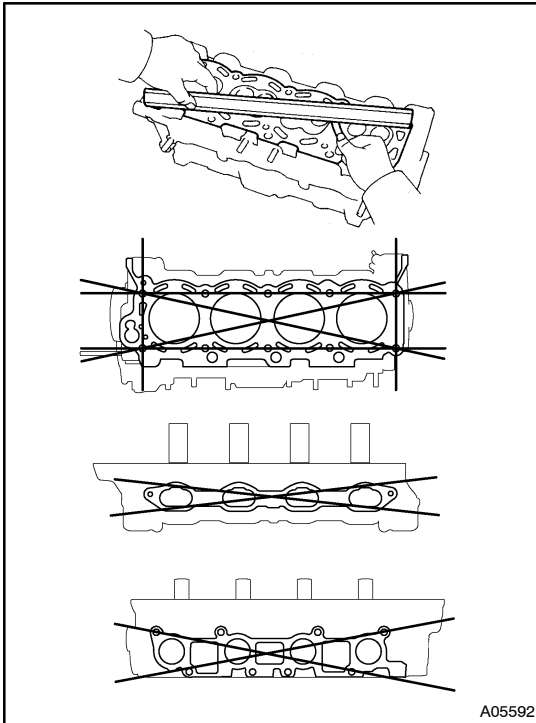
### 4. CLEAN VALVE GUIDE BUSHINGS

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 the cylinder head.



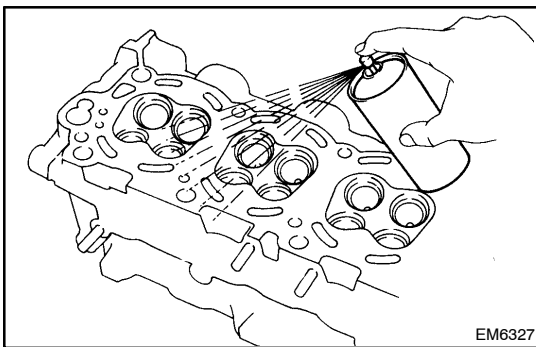
### 6. INSPECT FOR FLATNESS

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

**Maximum warpage:**

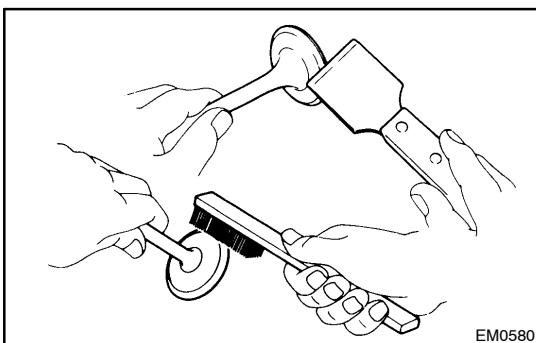
**0.10 mm (0.0039 in.)**

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



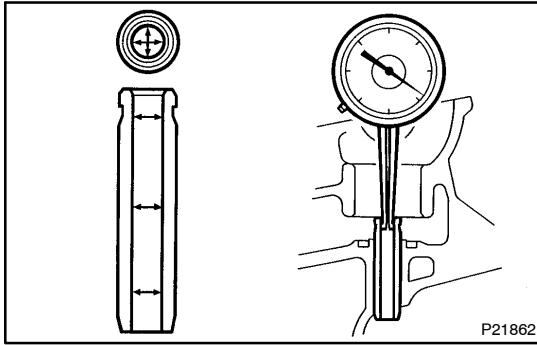
### 7. INSPECT FOR CRACKS

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



### 8. CLEAN VALVES

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

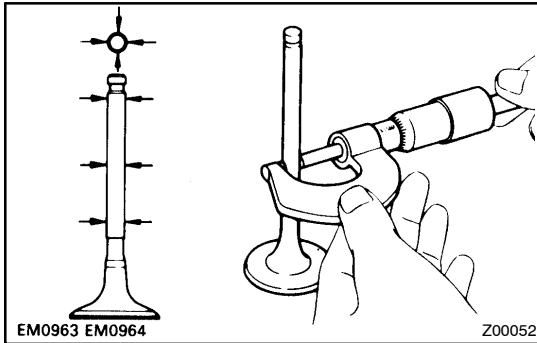


## 9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

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

**Bushing inside diameter:**

**5.510 – 5.530 mm (0.2169 – 0.2177 in.)**



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

**Valve stem diameter:**

**Intake**

**5.470 – 5.485 mm (0.2154 – 0.2159 in.)**

**Exhaust**

**5.465 – 5.480 mm (0.2152 – 0.2157 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:**

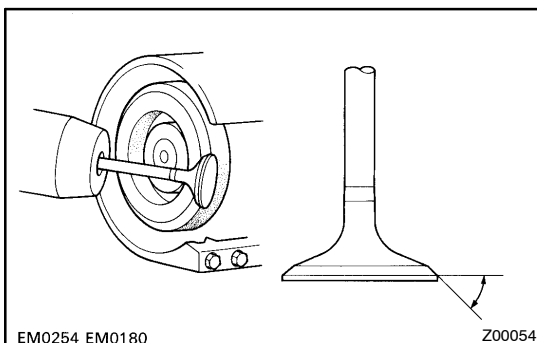
**Intake**

**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-53](#))

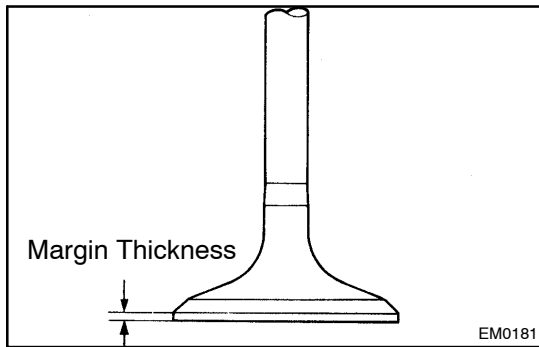


## 10. INSPECT AND GRIND VALVES

- (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:**

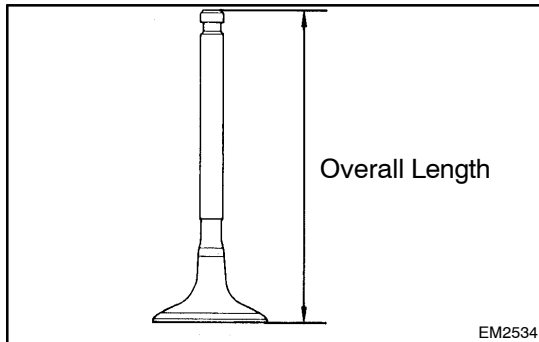
**IN 1.25 mm (0.049 in.)**

**EX 1.4 mm (0.055 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: 95.05 mm (3.7421 in.)**

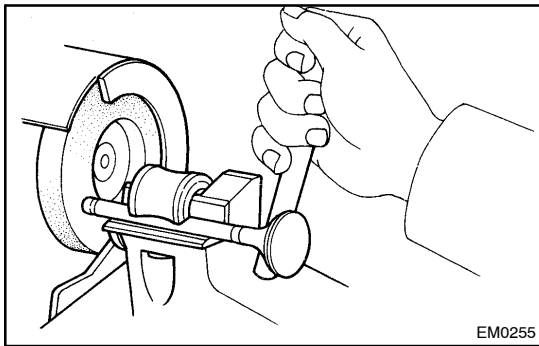
**Exhaust: 95.10 mm (3.7441 in.)**

**Minimum overall length:**

**Intake: 94.55 mm (3.7224 in.)**

**Exhaust: 94.60 mm (3.7244 in.)**

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

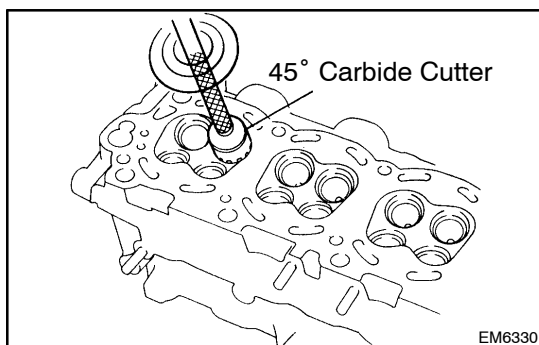


- (e) Check the surface of the valve stem tip for wear.

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

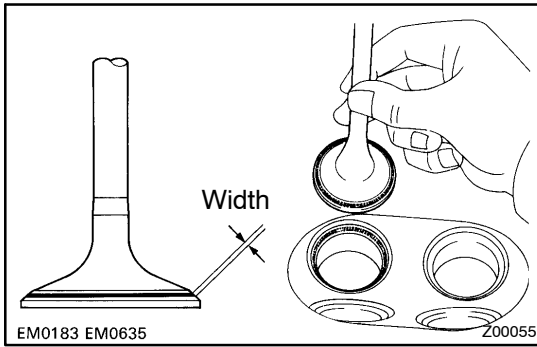
**NOTICE:**

**Do not grind off more than minimum.**



## 11. INSPECT AND CLEAN VALVE SEATS

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



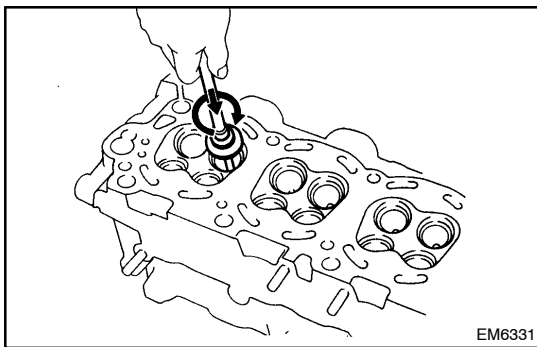
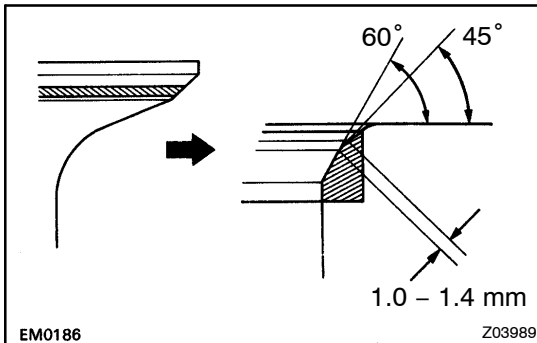
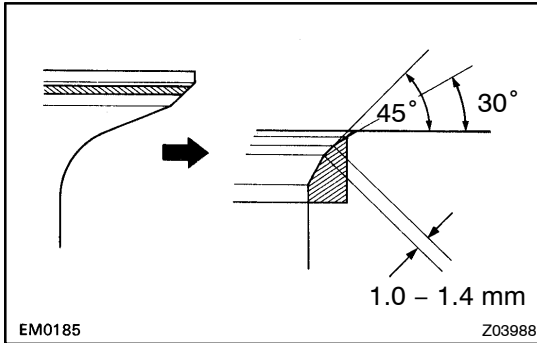
- (b) Check the valve seating position.  
Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.

- (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 the following width:

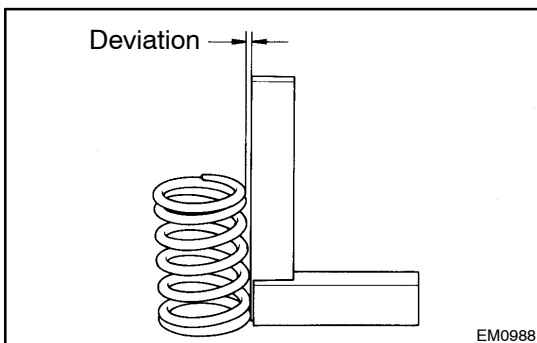
**1.0 – 1.4 mm (0.039 – 0.055 in.)**

If not, correct the valve seats as follows:

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



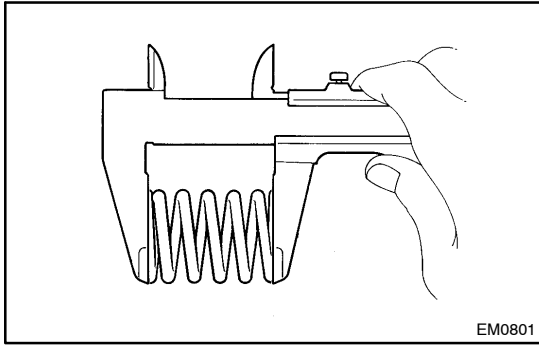
## 12. INSPECT VALVE SPRINGS

- (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.

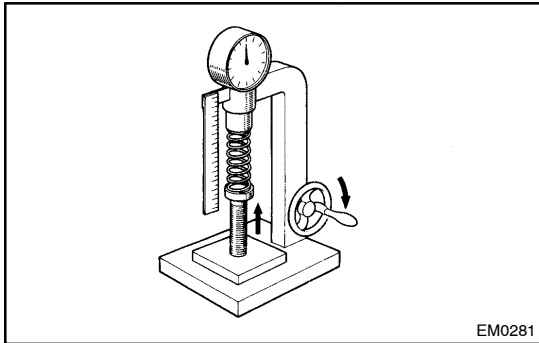


- (b) Using vernier calipers, measure the free length of the valve spring.

**Free length:**

**54.1 mm (2.130 in.)**

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



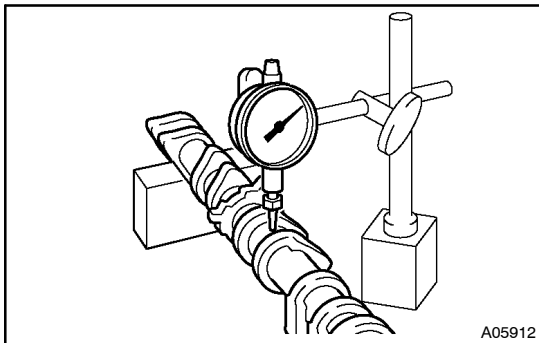
- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

**Installed tension:**

**204 – 226 N (20.8 – 23.0 kgf, 45.9 – 50.7 lbf)**

**at 35.0 mm (1.378 in.)**

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



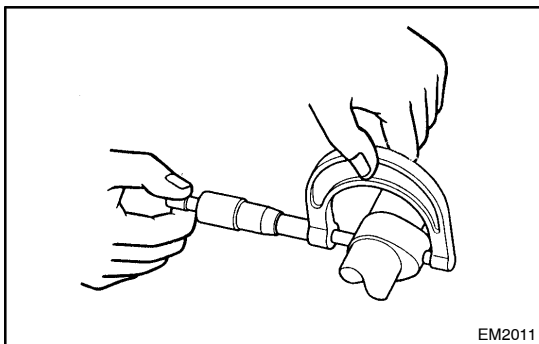
### 13. INSPECT CAMSHAFT FOR RUNOUT

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

**Maximum circle runout:**

**0.08 mm (0.0031 in.)**

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



### 14. INSPECT CAM LOBES

Using a micrometer, measure the cam lobe height.

**Standard cam lobe height:**

**Intake:**

**41.94 – 42.04 mm (1.6512 – 1.6551 in.)**

**Exhaust:**

**41.96 – 42.06 mm (1.6520 – 1.6559 in.)**

**Minimum cam lobe height:**

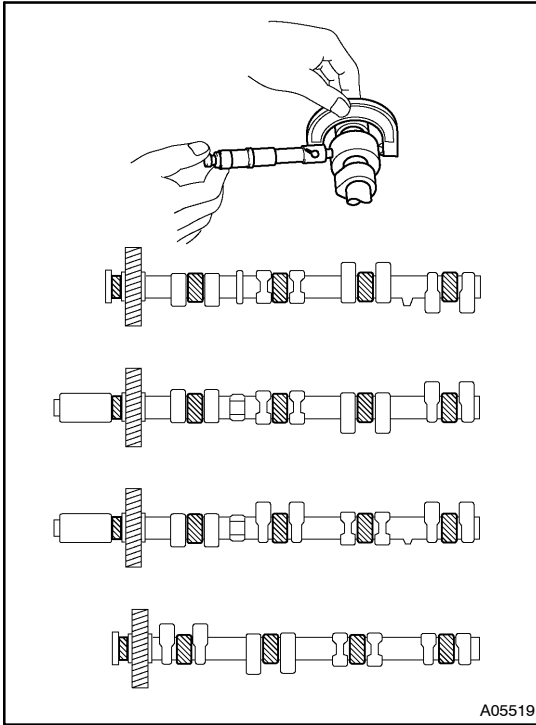
**Intake:**

**41.79 mm (1.6453 in.)**

**Exhaust:**

**41.81 mm (1.6461 in.)**

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



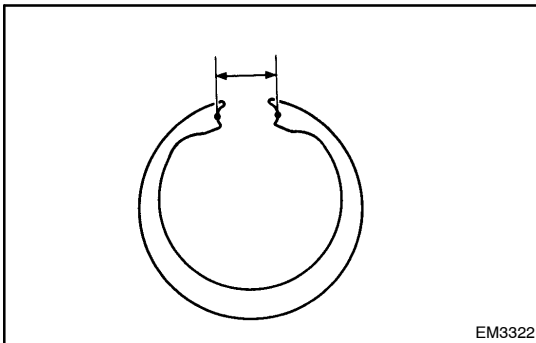
### 15. INSPECT CAMSHAFT JOURNALS

Using a micrometer, measure the journal diameter.

**Journal diameter:**

**26.954 – 26.970 mm (1.0612 – 1.0618 in.)**

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



### 16. INSPECT CAMSHAFT GEAR SPRING

Using vernier calipers, measure the free distance between the spring ends.

**Free distance:**

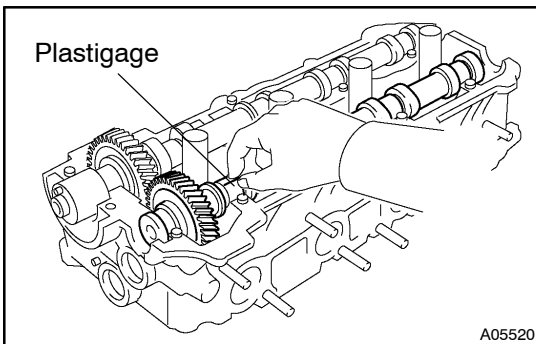
**18.2 – 18.8 mm (0.712 – 0.740 in.)**

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

### 17. INSPECT CAMSHAFT BEARINGS

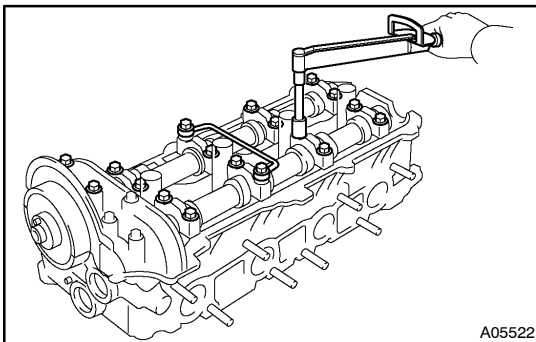
Check that bearings for flaking and scoring.

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



### 18. 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.

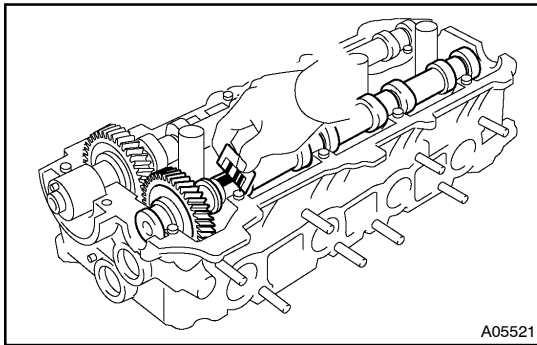
(See page [EM-57](#))

**Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)**

**NOTICE:**

**Do not turn the camshaft.**

- Remove the bearing caps.



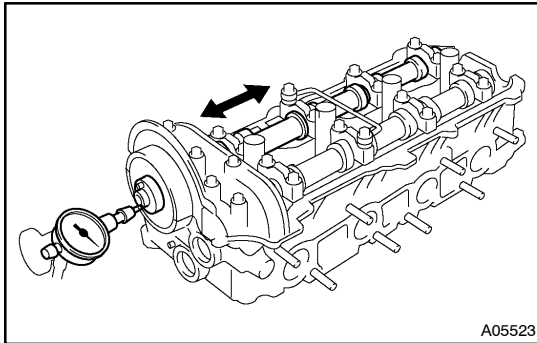
- (f) Measure the Plastigage at its widest point.

**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.  
(h) Remove the camshafts.



## 19. INSPECT CAMSHAFT THRUST CLEARANCE

- (a) Install the camshaft.  
(See page [EM-57](#))  
(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

**Standard thrust clearance:**

**Intake**

**0.040 – 0.090 mm (0.0016 – 0.0035 in.)**

**Exhaust**

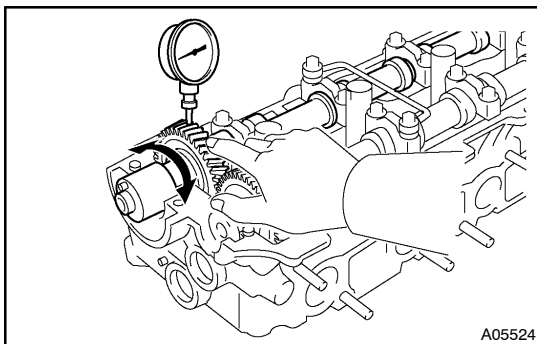
**0.040 – 0.085 mm (0.0016 – 0.0033 in.)**

**Maximum thrust clearance:**

**0.12 mm (0.0047 in.)**

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

- (c) Remove the camshafts.



## 20. INSPECT CAMSHAFT GEAR BACKLASH

- (a) Install the camshafts without installing the exhaust cam sub-gear and front bearing cap.  
(See page [EM-57](#))

- (b) Using a dial indicator, measure the backlash.

**Standard backlash:**

**0.020 – 0.200 mm (0.0008 – 0.0079 in.)**

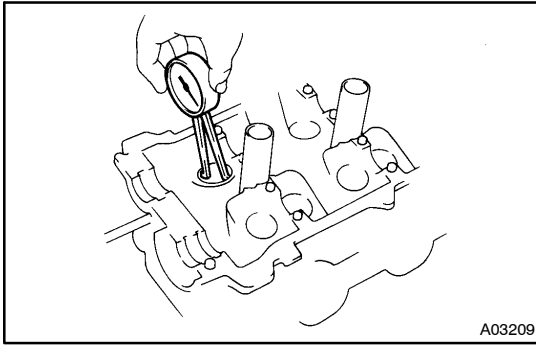
**Maximum backlash:**

**0.30 mm (0.0188 in.)**

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

- (c) Remove the camshafts.



**21. 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 at the valve lifter center line, 12.3 – 12.7 mm (0.484 – 0.500 in.) from the valve lifter head.

**Lifter diameter:**

**30.966 – 30.976 mm (1.2191 – 1.2195 in.)**

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

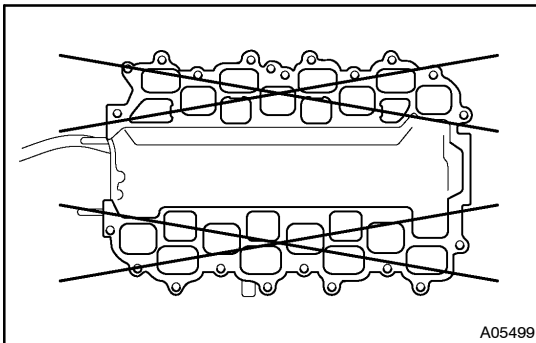
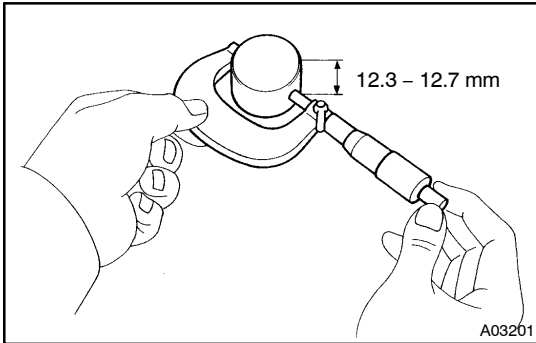
**Standard oil clearance:**

**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.

**22. INSPECT INTAKE MANIFOLD**

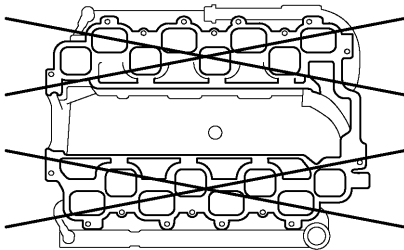
- (a) Upper intake manifold:

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

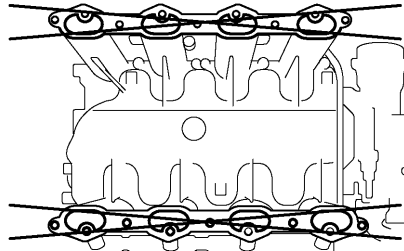
**Maximum warpage: 0.15 mm (0.0059 in.)**

If warpage is greater than maximum, replace the upper intake manifold.

**Upper Intake Manifold Side**



**Cylinder Head Side**



- (b) Lower intake manifold:

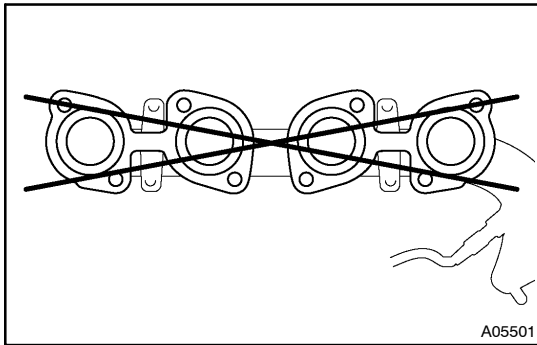
Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head and upper intake manifold for warpage.

**Maximum warpage:**

**0.15 mm (0.0059 in.)**

If warpage is greater than maximum, replace the lower intake manifold.

A05500

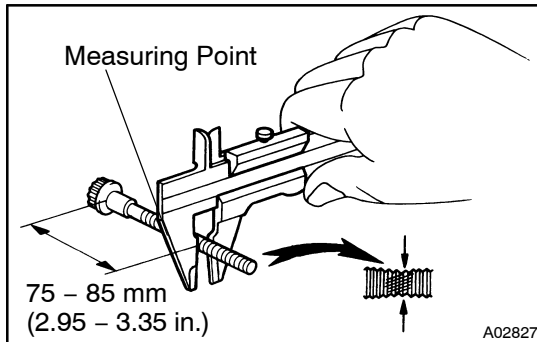
**23. INSPECT EXHAUST MANIFOLD**

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

**Maximum warpage:**

**0.50 mm (0.0197 in.)**

If warpage is greater than maximum, replace the manifold.

**24. INSPECT CYLINDER HEAD BOLTS**

Using vernier calipers, measure the thread outside diameter of the bolt.

**Standard outside diameter:**

**9.810 – 9.960 mm (0.3862 – 0.3921 in.)**

**Minimum outside diameter:**

**9.700 mm (0.3819 in.)**

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