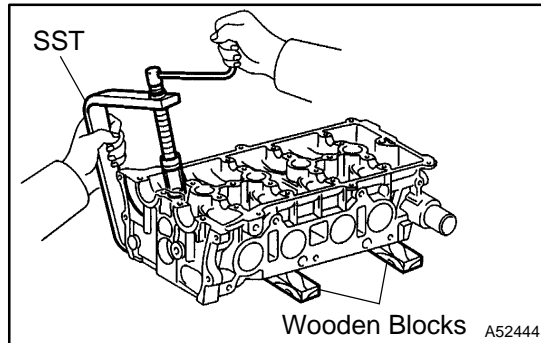


## OVERHAUL

### 1. REMOVE VALVE LIFTER

HINT:

Arrange the valve lifters in the correct order.



### 2. REMOVE INTAKE VALVE

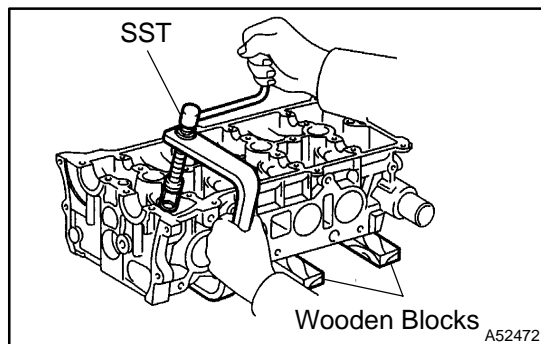
- (a) Using SST and wooden blocks, compress and remove the 8 valve spring retainer locks.

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- (b) Remove the retainer, valve spring and valve.

HINT:

Arrange the removed parts in the correct order.



### 3. REMOVE EXHAUST VALVE

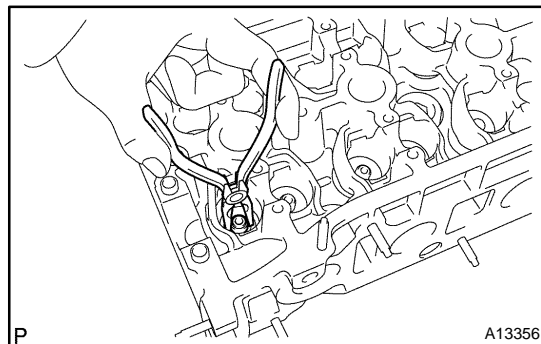
- (a) Using SST and wooden blocks, compress and remove the 8 valve spring retainer locks.

SST 09202-70020 (09202-00010)

- (b) Remove the retainer, valve spring and valve.

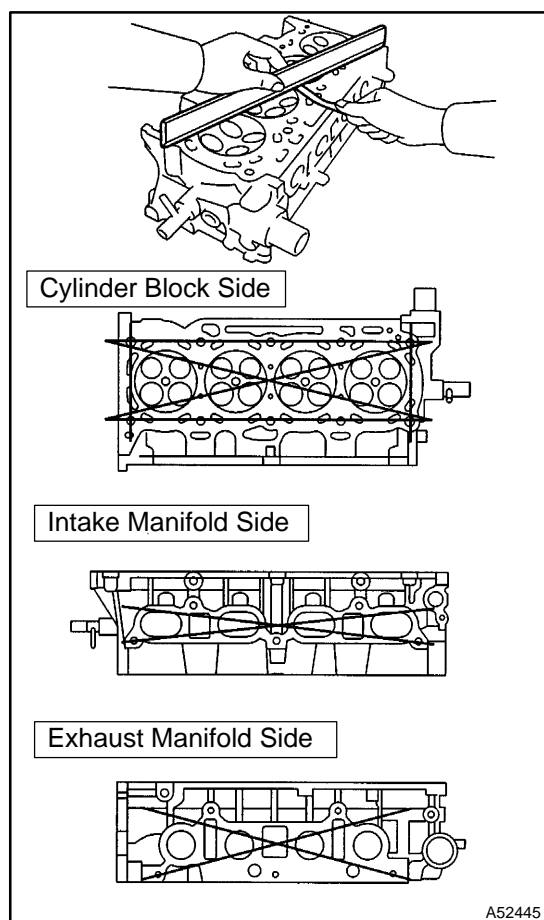
HINT:

Arrange the removed parts in the correct order.



### 5. REMOVE VALVE SPRING SEAT

### 6. REMOVE STUD BOLT



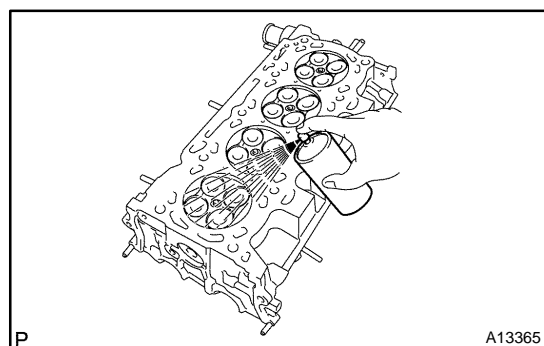
## 7. INSPECT CYLINDER HEAD FOR FLATNESS

- (a) Using a precision straight edge and a feeler gauge, measure the surface contacting the cylinder block and the manifolds for warpage.

### Maximum warpage:

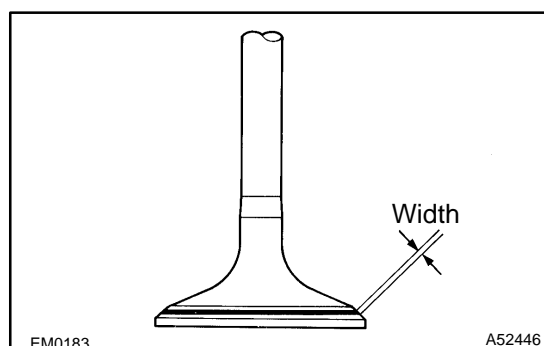
Item	Specified Condition
Cylinder block side	0.05 mm (0.0020 in.)
Intake manifold side	0.08 mm (0.0031 in.)
Exhaust manifold side	0.08 mm (0.0031 in.)

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



## 8. INSPECT CYLINDER HEAD FOR CRACKS

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

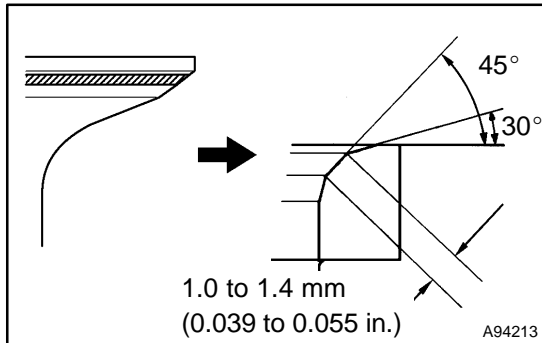


## 9. INSPECT VALVE SEATS

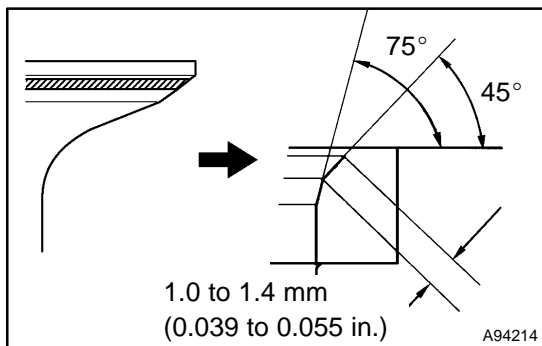
- (a) Apply a light coat of prussian blue (or white lead) to the valve face.
- (b) Lightly press the valve face against the valve seat.
- (c) Check the valve face and valve seat according to the following procedure.
- (1) If blue appears 360° around the valve face, the valve face is concentric. If not, replace the valve.
  - (2) If blue appears 360° around the valve seat, the guide and valve face are concentric. If not, resurface the valve seat.
  - (3) Check that the valve seat contact is in the middle of the valve face with the width between 1.0 to 1.4 mm (0.039 to 0.055 in.).

**10. REPAIR VALVE SEATS****NOTICE:**

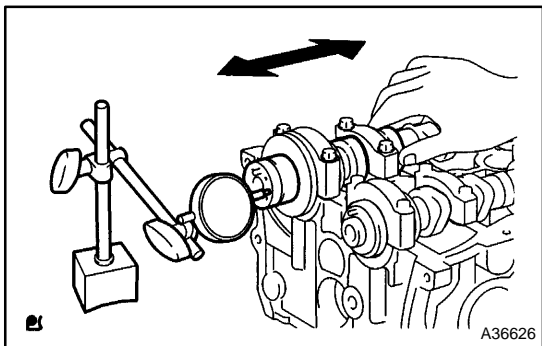
**Keep the lip free from a foreign matter.**



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



- (b) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.  
 (c) Hand-lap the valve and valve seat with an abrasive compound.  
 (d) Check the valve seating position.

**11. INSPECT CAMSHAFT THRUST CLEARANCE**

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

**Standard thrust clearance:**

**Intake 0.040 to 0.095 mm (0.0016 to 0.0037 in.)**

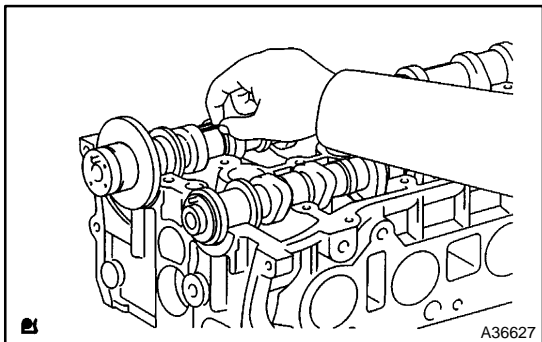
**Exhaust 0.080 to 0.135 mm (0.0032 to 0.0053 in.)**

**Maximum thrust clearance:**

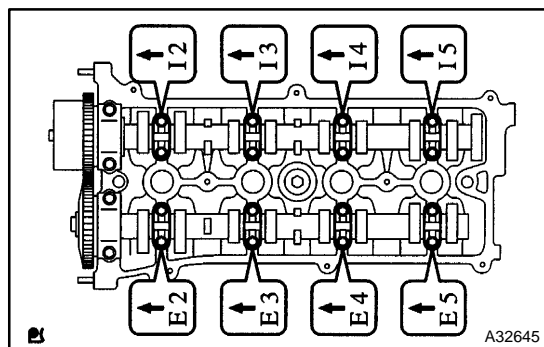
**Intake 0.11mm (0.0043 in.)**

**Exhaust 0.15 mm (0.0059 in.)**

If the thrust clearance is greater than the maximum, replace the cylinder head. If the thrust surface is damaged, replace the camshaft.

**12. INSPECT CAMSHAFT 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 journal.



- (d) Install the bearing caps.

**Torque:**

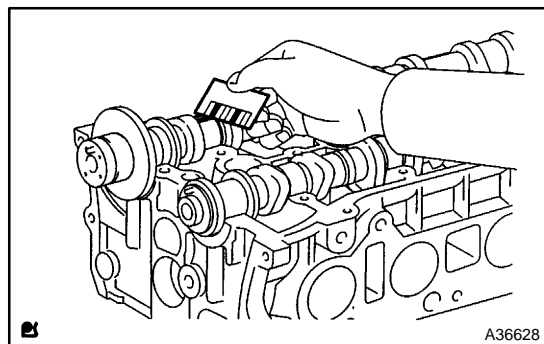
30 N·m (306 kgf·cm, 22 ft·lbf) for No. 1 bearing cap

30 N·m (306 kgf·cm, 22 ft·lbf) for No. 2 bearing cap

9.0 N·m (92 kgf·cm, 80 in·lbf) for No. 3 bearing cap

**NOTICE:**

Do not turn the camshaft.



- (e) Remove the bearing cap, and measure the Plastigage at its widest point.

**Standard oil clearance:**

**Intake No. 1 journal bearing mark 1**

0.007 to 0.038 mm (0.0028 to 0.00150 in.)

**Intake No. 1 journal bearing mark 2**

0.008 to 0.038 mm (0.0031 to 0.00150 in.)

**Intake No. 1 journal bearing mark 3**

0.008 to 0.038 mm (0.0031 to 0.00150 in.)

**Other journals**

0.025 to 0.062 mm (0.00098 to 0.00244 in.)

**Exhaust No. 1 journal**

0.040 to 0.079 mm (0.00157 to 0.00311 in.)

**Other journals**

0.025 to 0.062 mm (0.00098 to 0.00244 in.)

**Maximum oil clearance:**

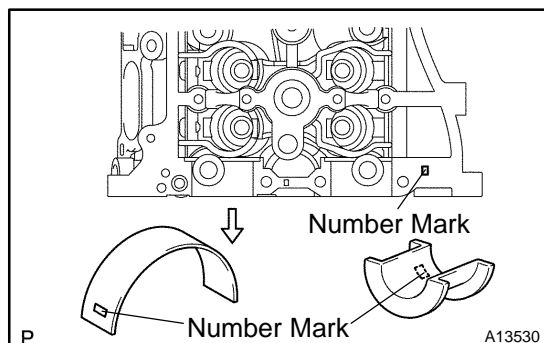
**Intake No. 1 journal 0.07 mm (0.0028 in.)**

**Other journals 0.10 mm (0.0039 in.)**

**NOTICE:**

**Completely remove the Plastigage after the inspection.**

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



If the oil clearance on the No.1 journal is greater than the maximum, choose a new bearing and install it.

**HINT:**

**Cylinder head journal bore diameter**

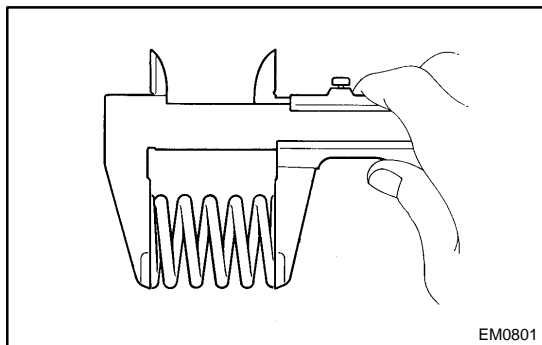
Mark 1	40.000 to 40.008 mm (1.57480 to 1.57511 in.)
Mark 2	40.009 to 40.017 mm (1.57515 to 1.57547 in.)
Mark 3	40.018 to 40.025 mm (1.57551 to 1.57578 in.)

**Standard bearing center wall thickness**

Mark 1	2.000 to 2.004 mm (0.07874 to 0.07890 in.)
Mark 2	2.005 to 2.008 mm (0.07894 to 0.07905 in.)
Mark 3	2.009 to 2.012 mm (0.07909 to 0.07921 in.)

**Camshaft journal diameter:**

35.971 to 35.985 mm (1.41618 to 1.41673 in.)

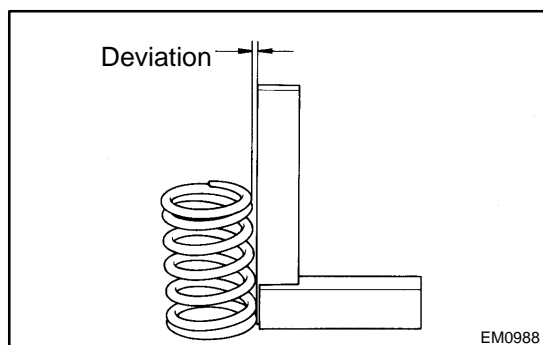


### 13. INSPECT INNER COMPRESSION SPRING

- (a) Using a vernier caliper, measure the free length of the valve spring.

**Free length: 45.7 mm (1.799 in.)**

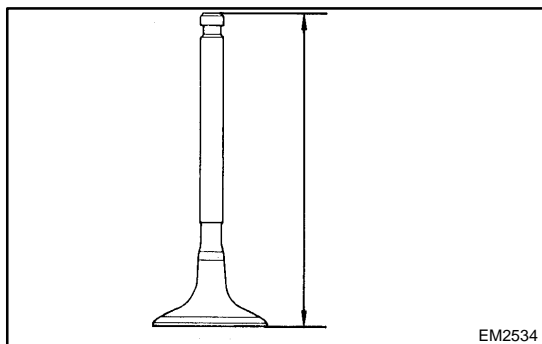
If the free length is not as specified, replace the valve spring.



- (b) Using steel squares, measure the deviation of the valve spring.

**Maximum deviation: 1.6 mm (0.063 in.)**

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



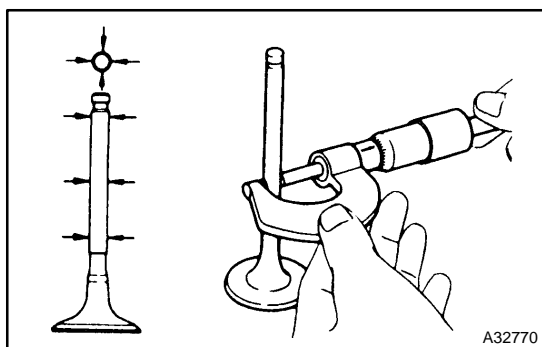
### 14. INSPECT INTAKE VALVE

- (a) Using a vernier caliper, measure the valve overall length.

**Standard overall length: 101.71 mm (4.0043 in.)**

**Minimum overall length: 101.21 mm (3.9846 in.)**

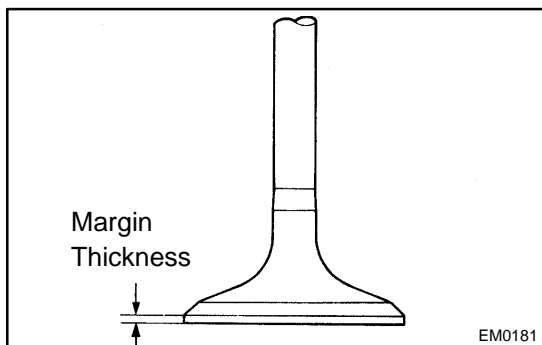
If the overall length is less than the minimum, replace the valve.



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

**Valve stem diameter:**

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



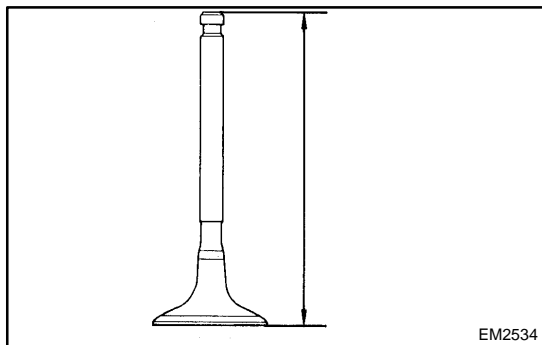
- (c) Using a vernier caliper, measure the valve head margin thickness.

**Standard margin thickness:**

**1.05 to 1.45 mm (0.0413 to 0.0571 in.)**

**Minimum margin thickness: 0.5 mm (0.0197 in.)**

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



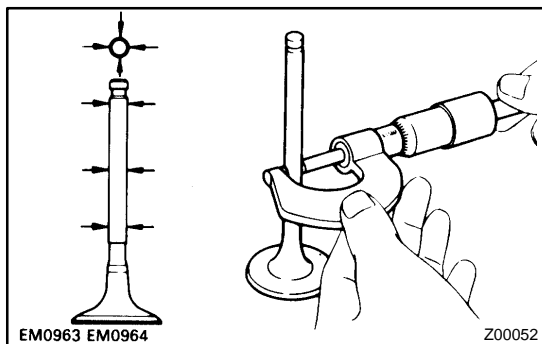
### 15. INSPECT EXHAUST VALVE

- (a) Using a vernier caliper, measure the valve overall length.

**Standard overall length: 101.15 mm (3.9823 in.)**

**Minimum overall length: 100.70 mm (3.9646 in.)**

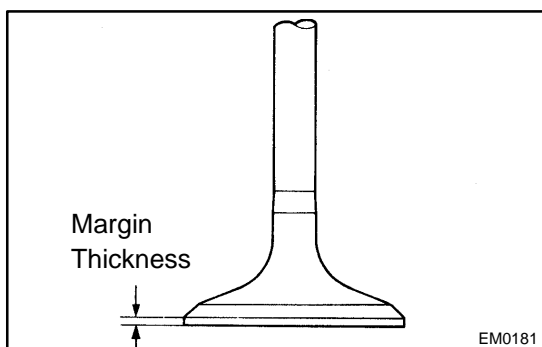
If the overall length is less than the minimum, replace the valve.



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

**Valve stem diameter:**

**5.465 to 5.480 mm (0.2152 to 0.2157 in.)**



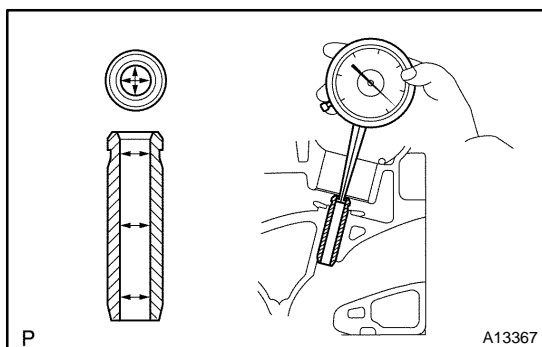
- (c) Using a vernier caliper, measure the valve head margin thickness.

**Standard margin thickness:**

**1.20 to 1.60 mm (0.0470 to 0.0630 in.)**

**Minimum margin thickness: 0.5 mm (0.020 in.)**

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



### 16. INSPECT INTAKE VALVE GUIDE BUSH

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

**Bush inside diameter:**

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

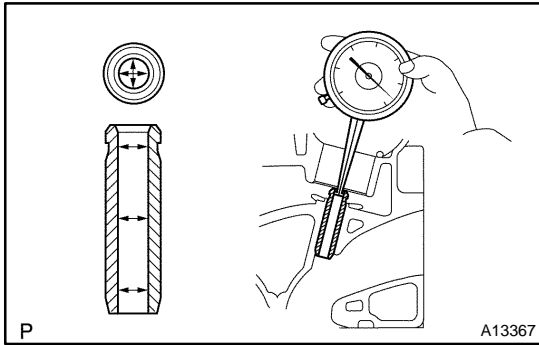
- (b) Subtract the valve stem diameter measurement from the guide bush inside diameter measurement.

**Standard oil clearance:**

**0.025 to 0.060 mm (0.0010 to 0.0024 in.)**

**Maximum oil clearance: 0.08 mm (0.0031 in.)**

If the clearance is greater than the maximum, replace the valve and guide bush (see steps 18 and 20).

**17. INSPECT EXHAUST VALVE GUIDE BUSH**

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

**Bush inside diameter:**

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

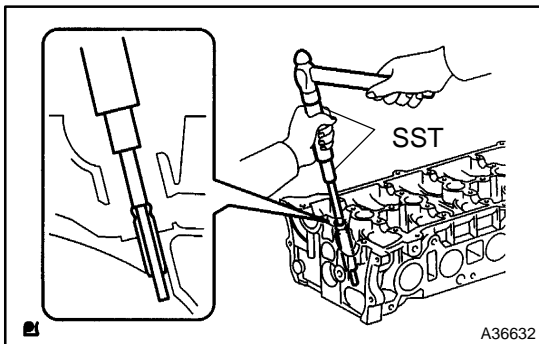
- (b) Subtract the valve stem diameter measurement from the guide bush inside diameter measurement.

**Standard oil clearance:**

**0.030 to 0.065 mm (0.0012 to 0.0026 in.)**

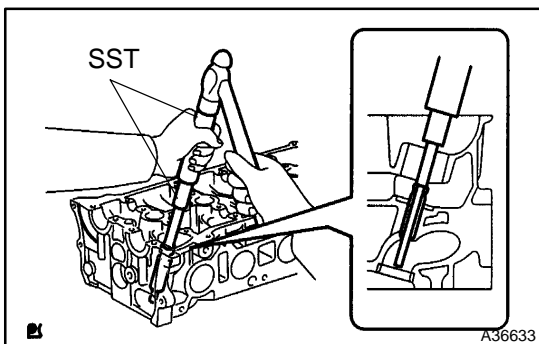
**Maximum oil clearance: 0.10 mm (0.0039 in.)**

If the clearance is greater than the maximum, replace the valve and guide bush (see steps 19 and 21).

**18. REMOVE INTAKE VALVE GUIDE BUSH**

- (a) Using SST and a hammer, tap out the guide bush.

SST 09201-10000 (09201-01050), 09950-70010  
(09951-07100)

**19. REMOVE EXHAUST VALVE GUIDE BUSH**

- (a) Using SST and a hammer, tap out the guide bush.

SST 09201-10000 (09201-01050), 09950-70010  
(09951-07100)

**20. INSTALL INTAKE VALVE GUIDE BUSH**

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

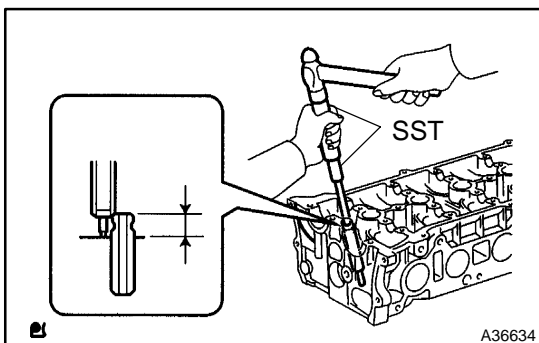
**Diameter: 10.285 to 10.306 mm (0.4049 to 0.4057 in.)**

- (b) Install the STD bush if the diameter is within the specified diameter.

**Standard diameter:**

**10.333 to 10.344 mm (0.4068 to 0.4072 in.)**

If the diameter is not as specified, replace the STD bush.



- (c) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.

**Protrusion height:**

**9.6 to 10.0 mm (0.3780 to 0.3937 in.)**

SST 09201-10000 (09201-01050), 09950-70010  
(09951-07100)

- (d) Using a sharp 5.5 mm reamer, ream the guide bush to obtain the standard specified clearance between the guide bush and valve stem.

**Standard oil clearance:**

**0.025 to 0.060 mm (0.00098 to 0.00236 in.)**

## 21. INSTALL EXHAUST VALVE GUIDE BUSH

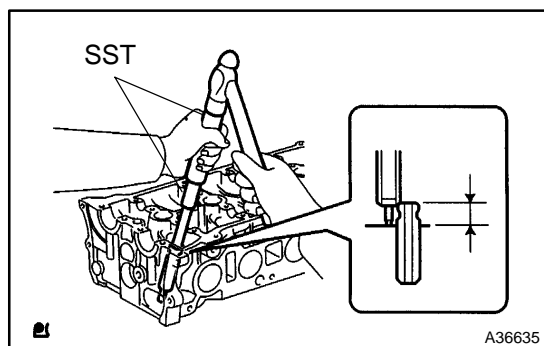
- (a) Using a caliper gauge, measure the bush bore diameter of the cylinder head.

**Diameter: 10.285 to 10.306 mm (0.4049 to 0.4057 in.)**

- (b) Install the STD bush if the diameter is within the specified diameter.

**Standard diameter:**

**10.333 to 10.344 mm (0.4068 to 0.4072 in.)**



- (c) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.

**Protrusion height:**

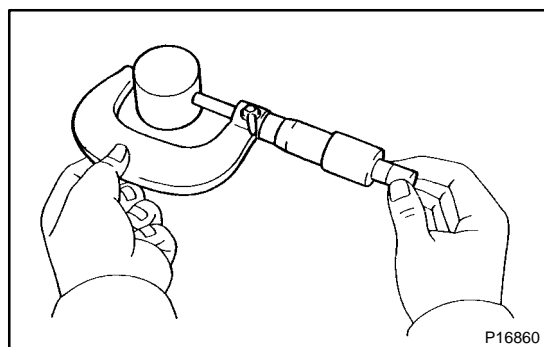
**9.6 to 10.0 mm (0.3780 to 0.3937 in.)**

- (d) Using a sharp 5.5 mm reamer, ream the guide bush to obtain the standard specified clearance between the guide bush and valve stem.

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**Standard oil clearance:**

**0.030 to 0.065 mm (0.00118 to 0.00256 in.)**

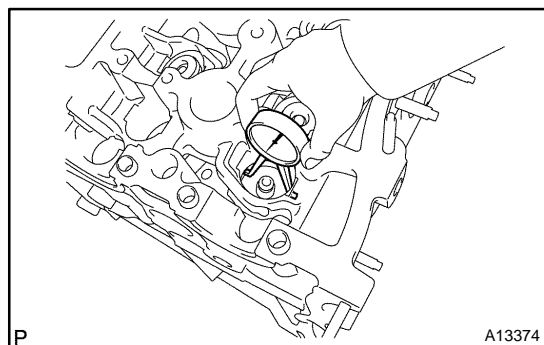


## 22. INSPECT VALVE LIFTER

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

**Lifter diameter:**

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



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

**Lifter bore diameter:**

**31.009 to 31.025 mm (1.2208 to 1.2215 in.)**



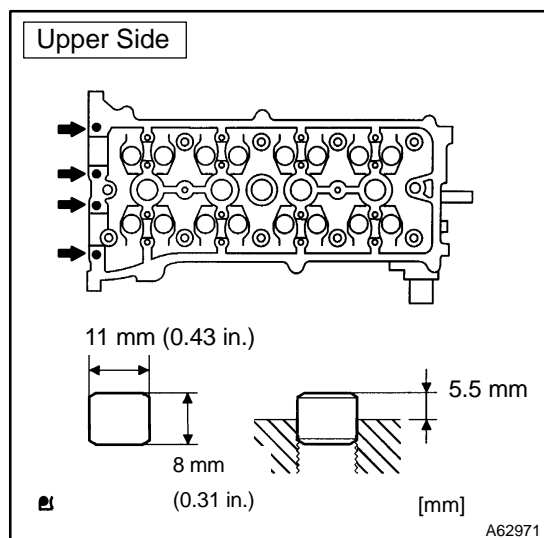
- (c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

**Standard oil clearance:**

**0.033 to 0.059 mm (0.0013 to 0.0023 in.)**

**Maximum oil clearance: 0.07 mm (0.0028 in.)**

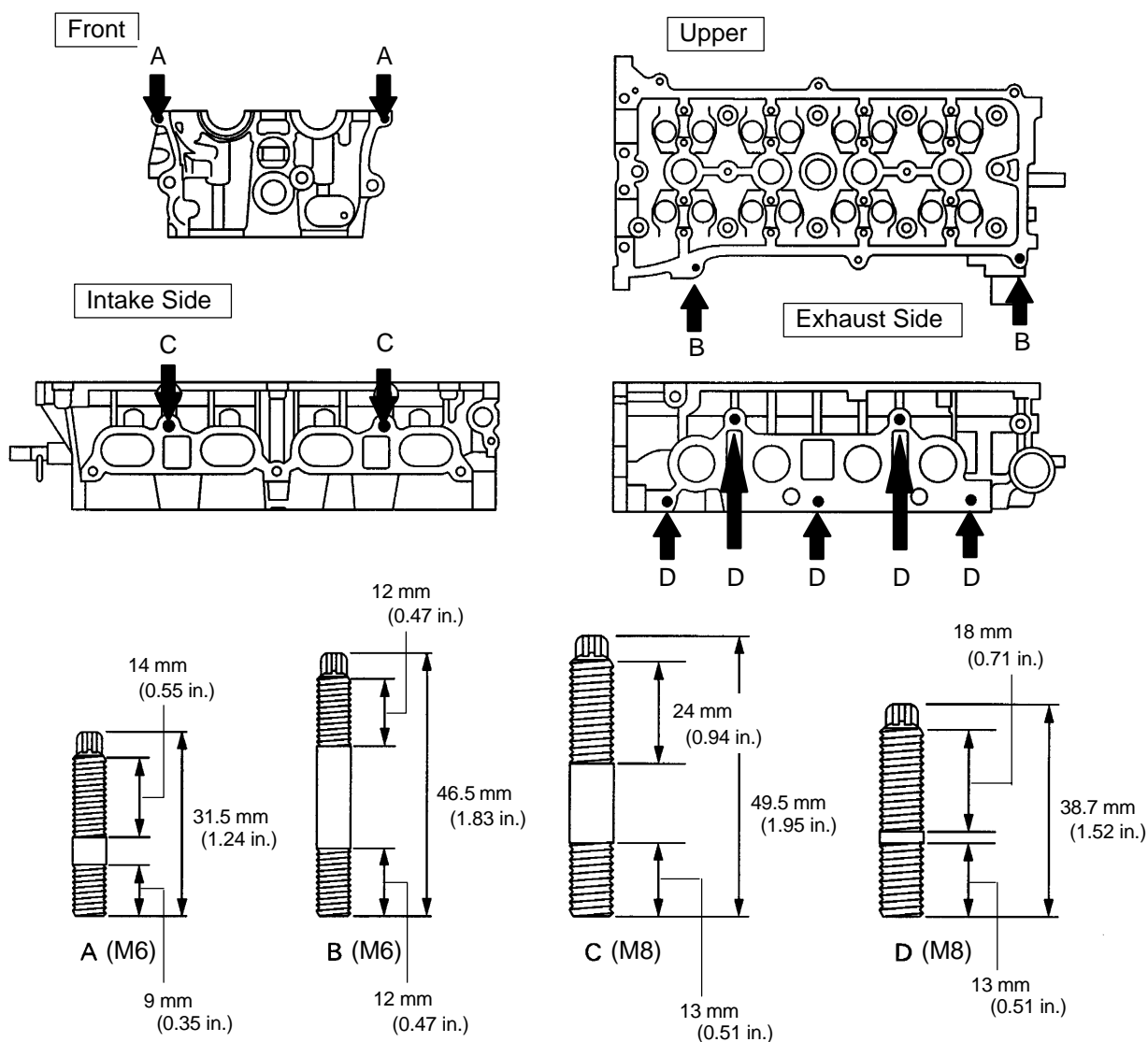
If the oil clearance is greater than the maximum, replace the lifter. If necessary, replace the cylinder head.



## 23. INSTALL RING W/HEAD PIN

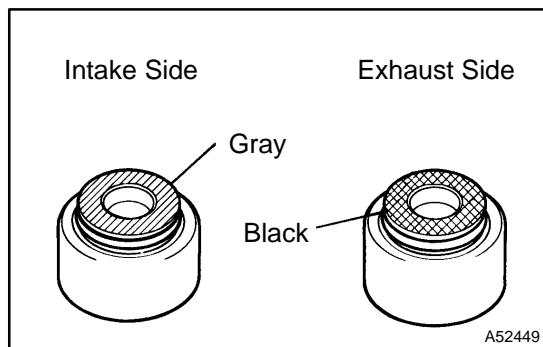
- (a) Using a plastic-faced hammer, tap in a new ring pin to the specified protrusion height.

**Protrusion height: 5.5 mm (0.22 in.)**

**24. INSTALL STUD BOLT****Torque:****5.0 N·m (51 kgf·cm, 44 in·lbf) for bolt A****5.0 N·m (51 kgf·cm, 44 in·lbf) for bolt B****10 N·m (102 kgf·cm, 7 ft·lbf) for bolt C****10 N·m (102 kgf·cm, 7 ft·lbf) for bolt D**

A90852

**25. INSTALL VALVE SPRING SEAT**



## 26. INSTALL VALVE STEM OIL SEAL OR RING

- (a) Apply a light coat of engine oil on a new oil seal.

### NOTICE:

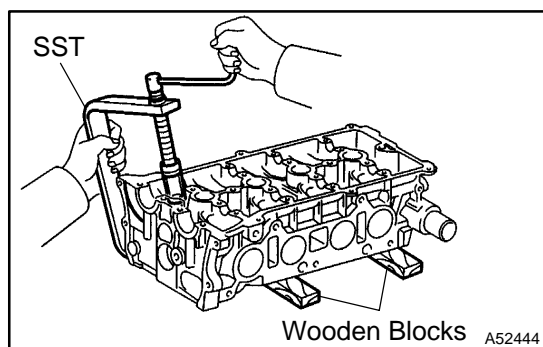
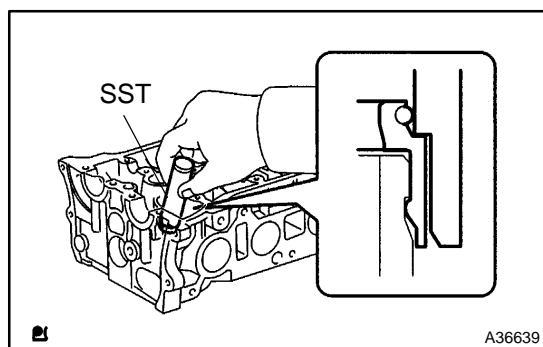
Pay close attention when installing the intake and exhaust oil seals. For example, installing the intake oil seal into the exhaust or installing the exhaust oil seal to the intake can cause installation problems later.

### HINT:

The intake valve oil seal is gray and the exhaust valve oil seal is black.

- (b) Using SST, push in the oil seal.

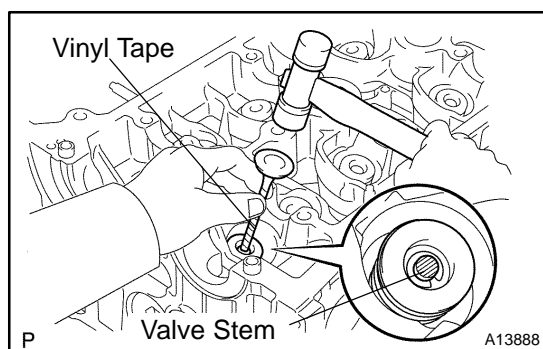
SST 09201-41020



## 27. INSTALL INTAKE VALVE

- (a) Install the valve, spring and retainer to the cylinder head.  
(b) Using SST and wooden blocks, compress the spring and install the 2 retainer locks.

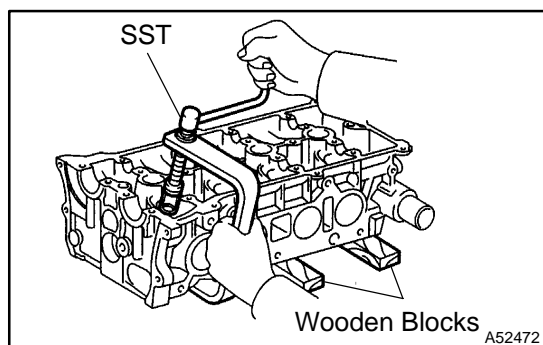
SST 09202-70020 (09202-00010)



- (c) Using a plastic-faced hammer and a discarded valve with its tip wrapped in tape, lightly tap the installed valve to ensure that it is securely fit.

### NOTICE:

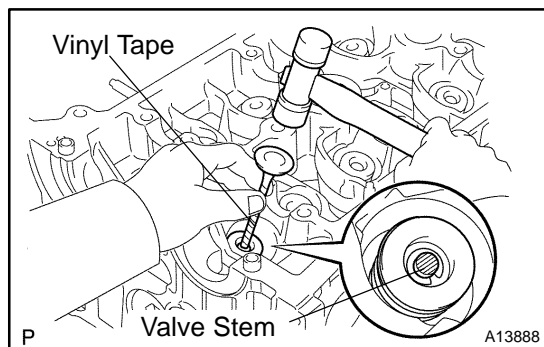
Be careful not to damage the valve stem tip.



## 28. INSTALL EXHAUST VALVE

- (a) Install the valve, spring and retainer to the cylinder head.  
(b) Using SST and wooden blocks, compress the spring and install the 2 retainer locks.

SST 09202-70020 (09202-00010)



- (c) Using a plastic-faced hammer and a discarded valve with its tip wrapped in vinyl tape, lightly tap the installed valve to ensure that it is securely fit.

**NOTICE:**

**Be careful not to damage the valve stem tip.**

**29. INSTALL VALVE LIFTER**

- (a) Assemble the valve lifter and the tip of the valve stem with a light coat of engine oil applied.

**NOTICE:**

**Install the valve lifters in their original places.**