

CYLINDER HEAD ASSY (1AZ-FE/2AZ-FE)

1401B-01

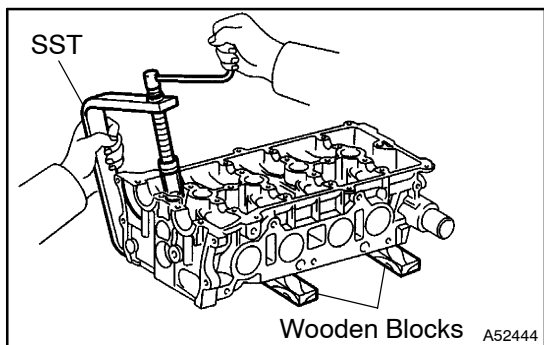
OVERHAUL

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.

SST 09202-70020 (09202-00010)

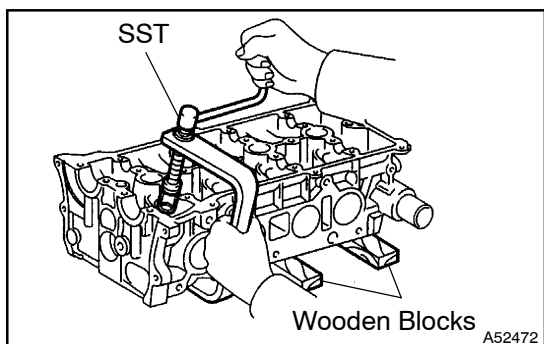
- (b) Remove the parts below from the cylinder head.

1	Retainer
2	Valve spring
3	Intake valve

HINT:

Arrange the removed parts in the correct order.

3. REMOVE EXHAUST VALVE

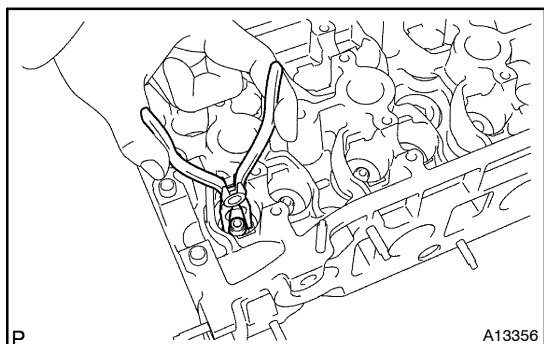


- (a) Using SST and wooden blocks, compress and remove the 8 valve spring retainer locks.

SST 09202-70020 (09202-00010)

- (b) Remove the parts below from the cylinder head.

1	Retainer
2	Valve spring
3	Exhaust valve

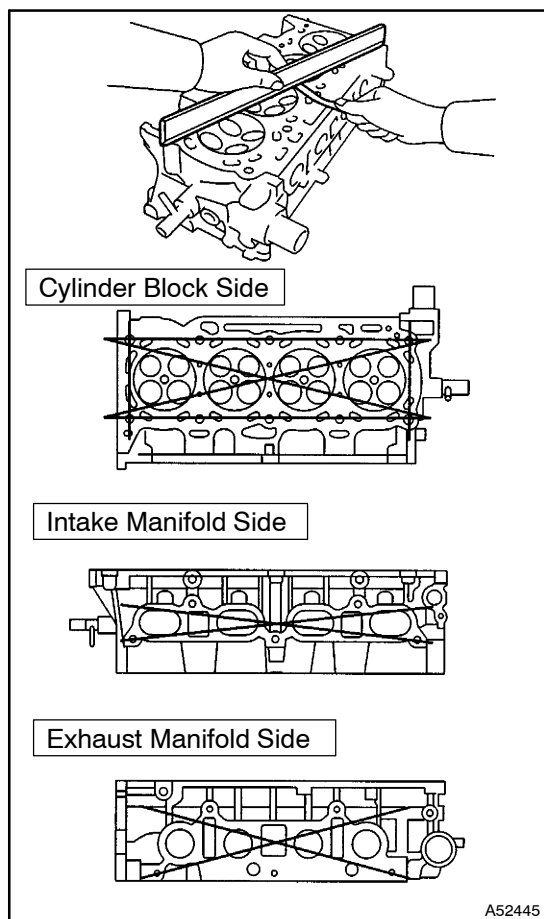


4. REMOVE VALVE STEM OIL O SEAL OR RING

- (a) Using needle-nose pliers, remove the oil seals.

5. REMOVE VALVE SPRING SEAT

6. REMOVE STUD BOLT



7. INSPECT CYLINDER HEAD FOR FLATNESS

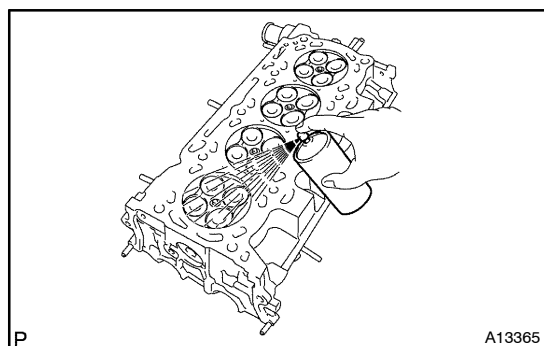
- (a) Using a precision straight edge and a feeler gauge, measure the surface contacting the cylinder block and the manifolds for warpage.

Maximum warpage:

Cylinder block side 0.05 mm (0.0020 in.)

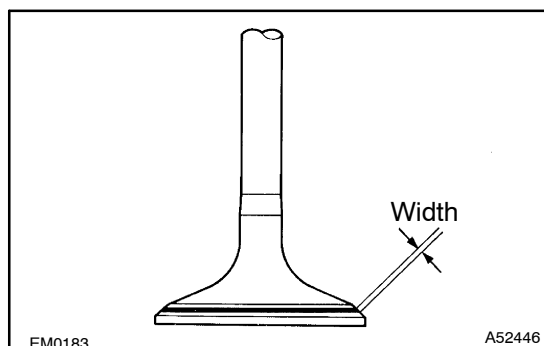
Intake manifold side 0.08 mm (0.0031 in.)

Exhaust manifold side 0.08 mm (0.0031 in.)



8. INSPECT CYLINDER HEAD FOR CRACKS

- (a) Using a dye penetrate, check the intake ports, exhaust ports and cylinder surface for cracks.

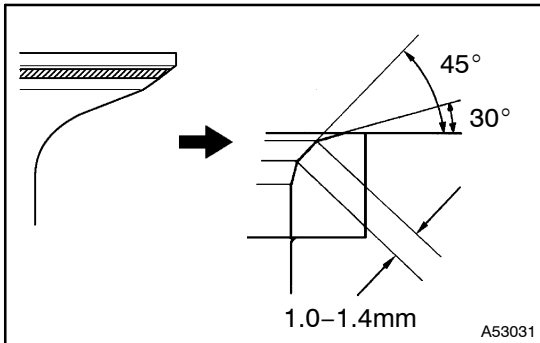


9. INSPECT VALVE SEATS

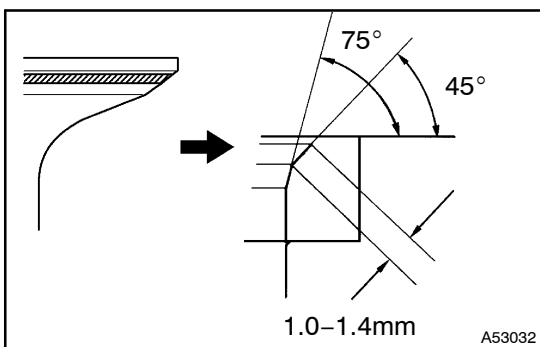
- (a) Apply a light coat of prussian blue (or white lead) to the valve face.
- (b) Lightly press the valve against the seat.
- (c) Check the valve face and seat according to the following procedure.
- (1) If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
 - (2)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

10. REPAIR VALVE SEATS**NOTICE:**

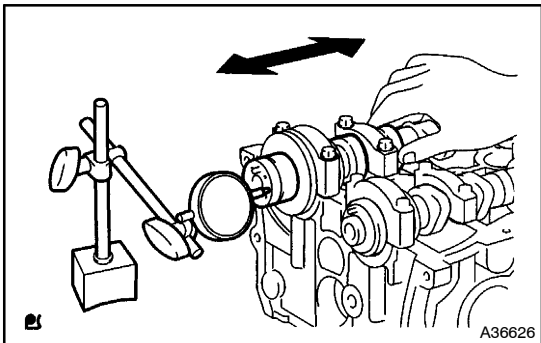
Take off a cutter gradually to make smooth seats.



- (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 – 0.095 mm (0.0016 – 0.0037 in.)

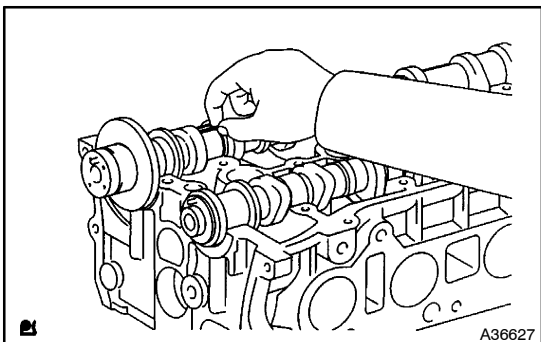
Exhaust 0.080 – 0.135 mm (0.0032 – 0.0053 in.)

Maximum thrust clearance:

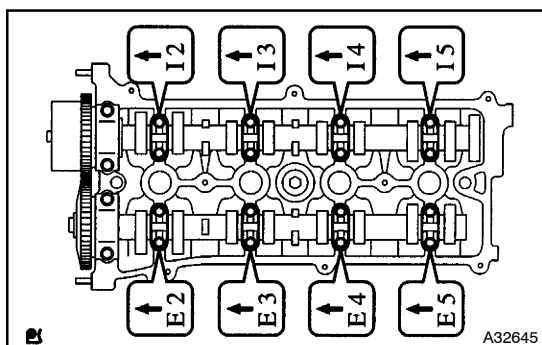
Intake 0.11 mm (0.0043 in.)

Exhaust 0.15 mm (0.0059 in.)

- (c) If the thrust clearance is greater than 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:

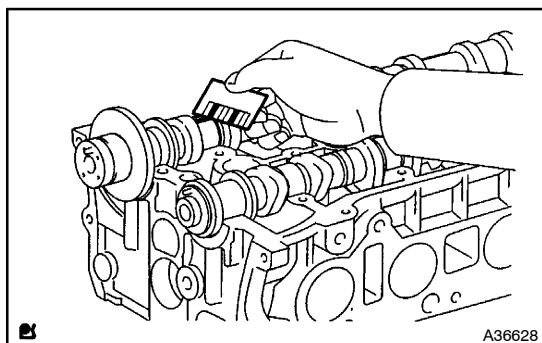
No. 1 30 N·m (301 kgf·cm, 22 ft·lbf)

No. 2 30 N·m (301 kgf·cm, 22 ft·lbf)

No. 3 9 N·m (92 kgf·cm, 80 in·lbf)

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 – 0.038 mm (0.0028 – 0.00150 in.)

Intake No. 1 journal bearing mark 2

0.008 – 0.038 mm (0.0031 – 0.00150 in.)

Intake No. 1 journal bearing mark 3

0.008 – 0.038 mm (0.0031 – 0.00150 in.)

Other journals

0.025 – 0.062 mm (0.00098 – 0.00244 in.)

Exhaust No. 1 journal

0.040 – 0.079 mm (0.00157 – 0.00311 in.)

Other journals

0.025 – 0.062 mm (0.00098 – 0.00244 in.)

Maximum oil clearance:

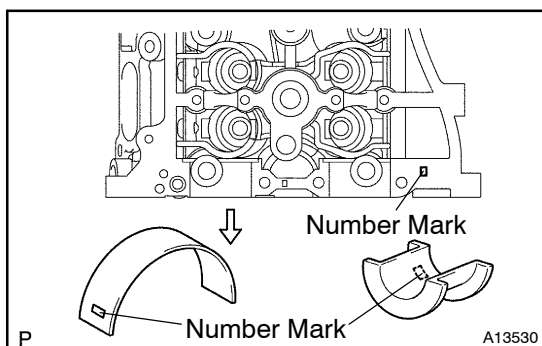
Intake No. 1 journal 0.07 mm (0.0028 in.)

Other journals 0.10 mm (0.0039 in.)

NOTICE:

Completely remove the plastigage after the inspection.

- (f) If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the cylinder head.



- (g) If the oil clearance on No.1 journal is greater than maximum, choose and replace the bearing.

HINT:

Cylinder head journal bore diameter

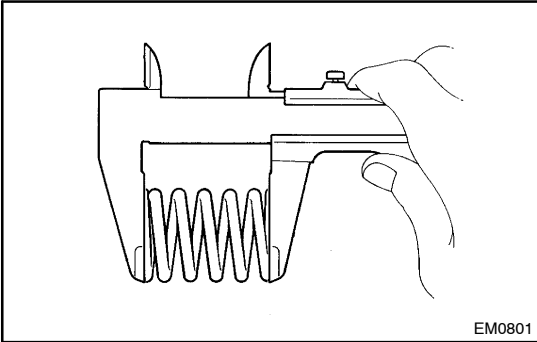
Mark "1"	40.000 – 40.008 mm (1.57480 – 1.57511 in.)
Mark "2"	40.009 – 40.017 mm (1.57515 – 1.57547 in.)
Mark "3"	40.018 – 40.025 mm (1.57551 – 1.57578 in.)

Standard bearing center wall thickness

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

Camshaft journal diameter

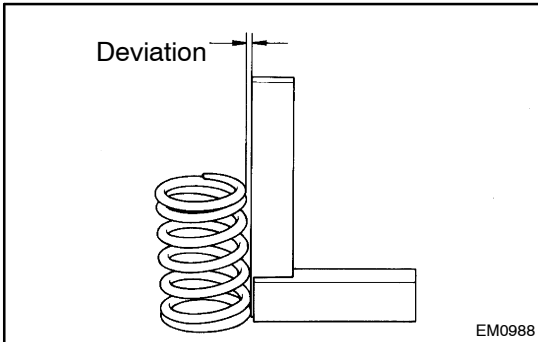
	35.971 – 35.985 mm (1.41648 – 1.41673 in.)
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13. INSPECT INNER COMPRESSION SPRING

- (a) Check the free length.
 (1) Using vernier calipers, measure the free length of the valve spring.

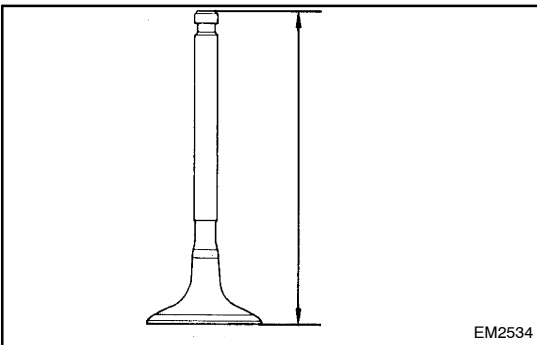
Free length: 45.7 mm (1.799 in.)



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

Maximum deviation: 1.6 mm (0.063 in.)

Maximum angle (reference): 2°

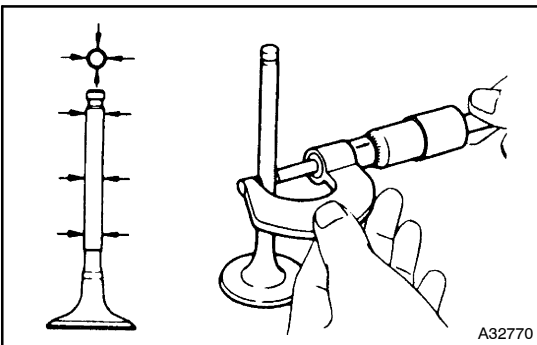


14. INSPECT INTAKE VALVE

- (a) Check the valve overall length.
 (1) Using vernier calipers, measure the valve overall length.

Standard overall length: 101.71 mm (4.0043in.)

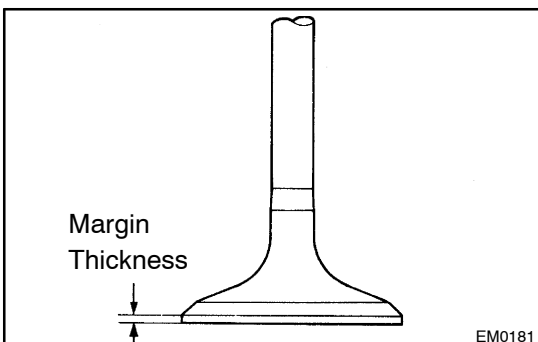
Minimum overall length: 101.21 mm (3.9846in.)



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

Valve stem diameter:

5.470 – 5.485 mm (0.2154 – 0.2159 in.)

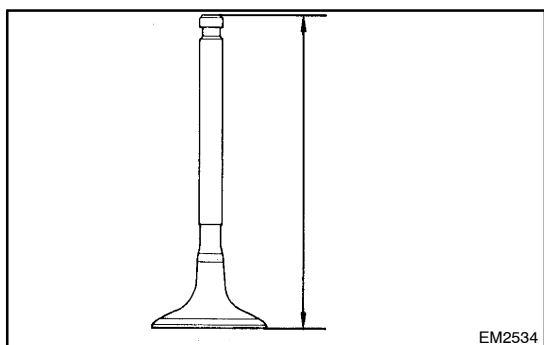


- (c) Check the valve head margin thickness.
 (1) Using vernier calipers, measure the valve head margin thickness.

Standard margin thickness:

1.05 – 1.45 mm (0.041 – 0.057 in.)

Minimum margin thickness: 0.5 mm (0.020 in.)

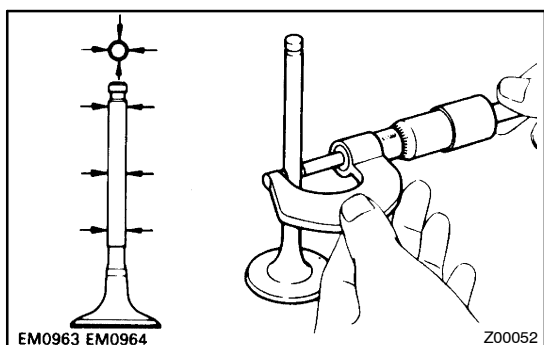


15. INSPECT EXHAUST VALVE

- (a) Check the valve overall length.
 (1) Using vernier calipers, measure the valve overall length.

Standard overall length: 101.15 mm (3.9823 in.)

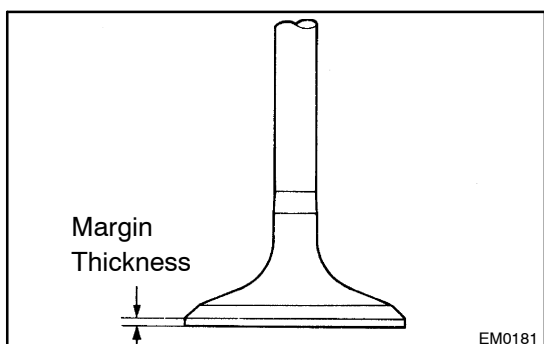
Minimum overall length: 100.70 mm (3.9646 in.)



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

Valve stem diameter:

5.465 – 5.480 mm (0.2152 – 0.2157 in.)

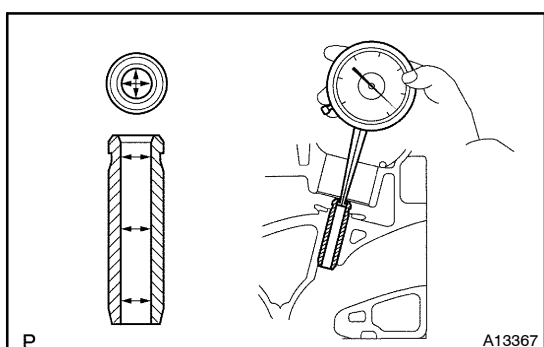


- (c) Check the valve head margin thickness.
 (1) Using vernier calipers, measure the valve head margin thickness.

Standard margin thickness:

1.2 – 1.6 mm (0.047 – 0.063 in.)

Minimum margin thickness: 0.5 mm (0.020 in.)



16. INSPECT INTAKE VALVE GUIDE BUSH

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

Bushing inside diameter:

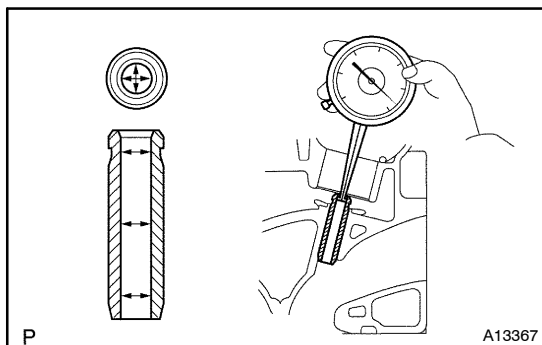
5.510 – 5.530 mm (0.2169 – 0.2177 in.)

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

Standard oil clearance:

0.025 – 0.060 mm (0.00098 – 0.00236 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

**17. INSPECT EXHAUST VALVE GUIDE BUSH**

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

Bushing inside diameter:

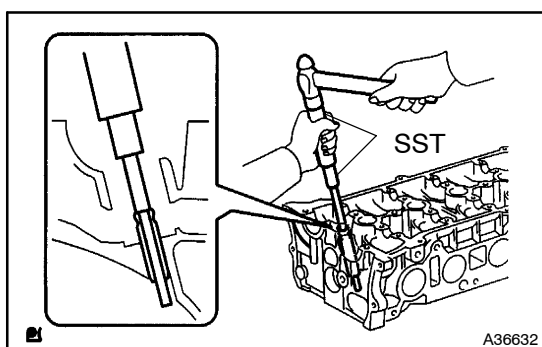
5.510 – 5.530 mm (0.2169 – 0.2177 in.)

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

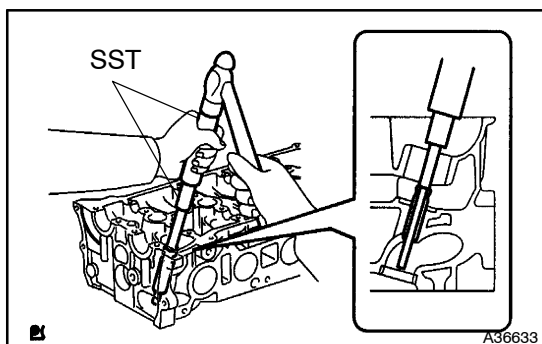
Standard oil clearance:

0.030 – 0.065 mm (0.0012 – 0.0026 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

**18. REMOVE INTAKE VALVE GUIDE BUSH**

- (a) Using SST and a hammer, tap out the guide bushing.
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 bushing.
SST 09201-10000 (09201-01050), 09950-70010 (09951-07100)

20. INSTALL INTAKE VALVE GUIDE BUSH

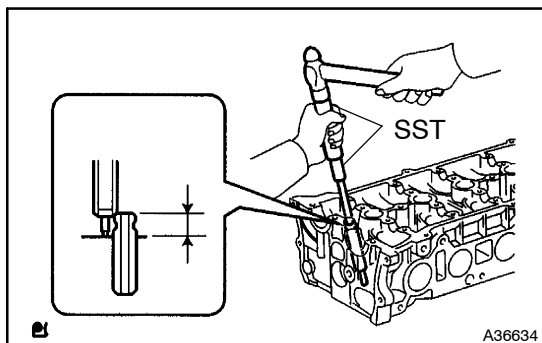
- (a) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Diameter: 10.285 – 10.306 mm (0.4049 – 0.4057 in.)

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

HINT:

STD	10.333 – 10.344 mm (0.4068 – 0.4072 in.)
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- (c) Using SST and a hammer, tap in a new guide bushing to the specified protrusion height.

Protrusion height: 9.6 – 10.0 mm (0.3779 – 0.3937 in.)

SST 09201-10000 (09201-01050), 09950-70010
(09951-07100), 23801

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

Standard oil clearance:

0.025 – 0.060 mm (0.00098 – 0.00236 in.)

21. INSTALL EXHAUST VALVE GUIDE BUSH

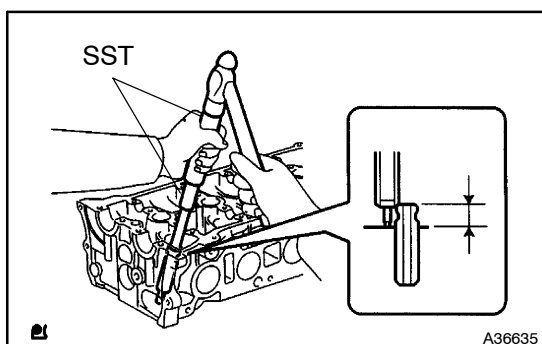
- (a) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Diameter: 10.285 – 10.306 mm (0.4049 – 0.4057 in.)

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

HINT:

STD	10.333 – 10.344 mm (0.4068 – 0.4072 in.)
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- (c) Using SST and a hammer, tap in a new guide bushing to the specified protrusion height.

Protrusion height: 9.6 – 10.0 mm (0.3779 – 0.3937 in.)

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

SST 09201-10000 (09201-01050), 09950-70010
(09951-07100), 23801

Standard oil clearance:

0.030 – 0.065 mm (0.00118 – 0.00256 in.)

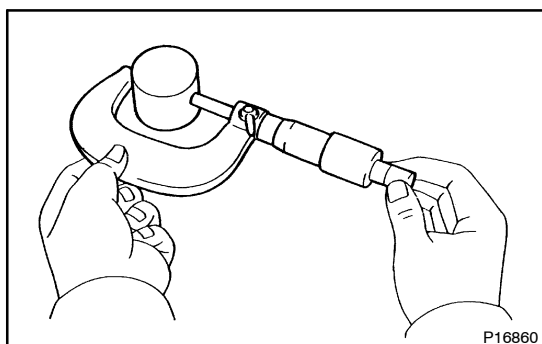
22. INSPECT VALVE LIFTER

- (a) Check the lifter diameter.

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

Lifter diameter:

30.966 – 30.976 mm (1.2191 – 1.2195 in.)



- (b) Check the valve lifter oil clearance.

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

Lifter bore diameter:

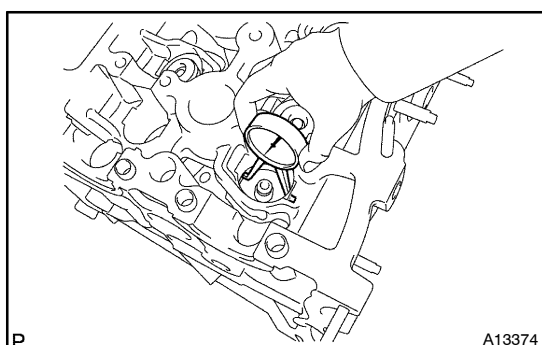
31.009 – 31.025 mm (1.2208 – 1.2215 in.)

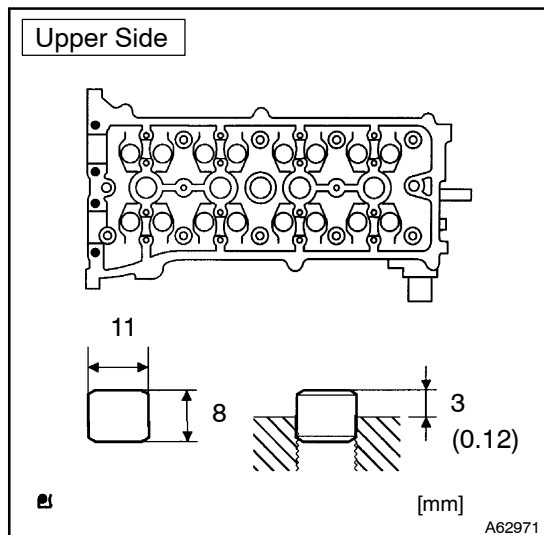
- (c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance:

0.033 – 0.059 mm (0.0013 – 0.0023 in.)

Maximum oil clearance: 0.07 mm (0.0028 in.)

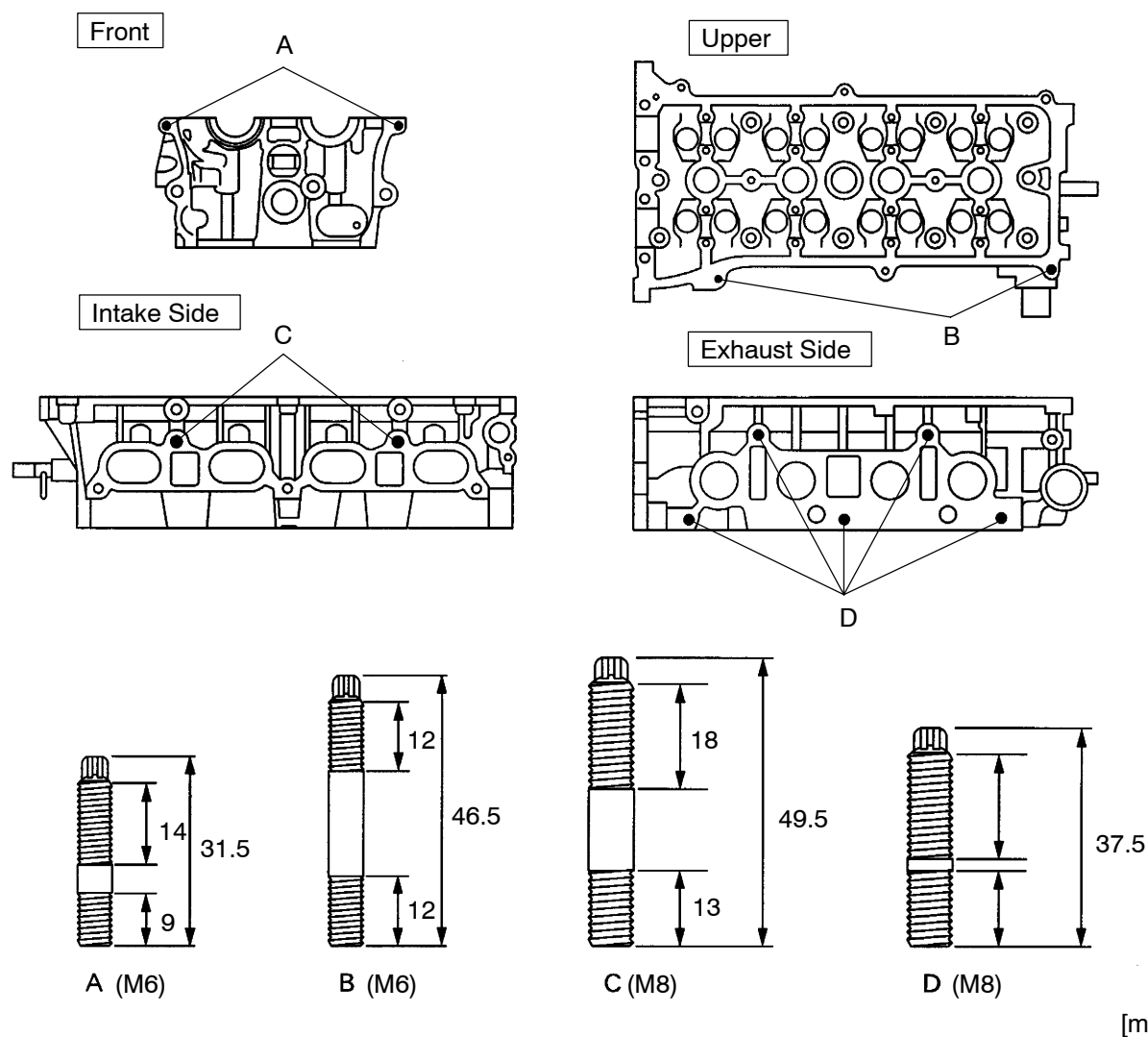




23. INSTALL RING W/HEAD PIN

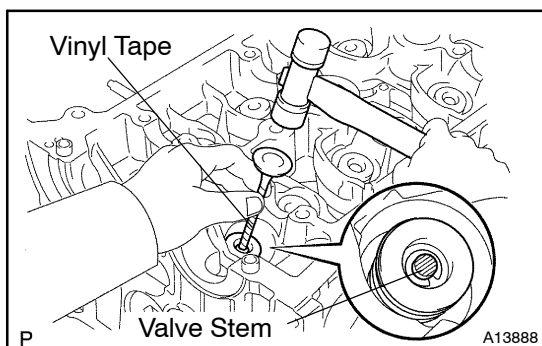
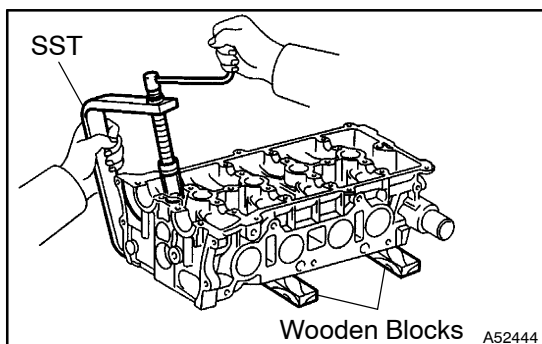
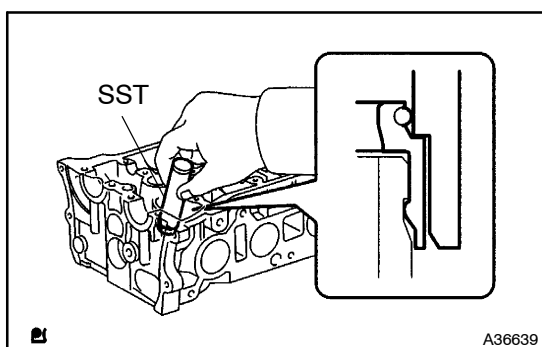
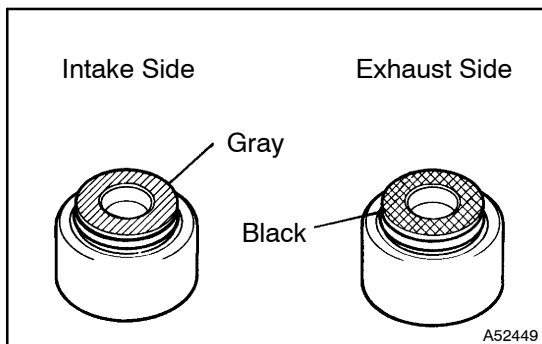
- (a) Using a plastic-faced hammer, tap in a new ring pin to the specified protrusion height.

Protrusion height: 3 mm (0.12 in.)

24. INSTALL STUD BOLT**Torque:****Bolt A 5 N·m (51 kgf·cm, 44 in.·lbf)****Bolt B 5 N·m (51 kgf·cm, 44 in.·lbf)****Bolt C 10 N·m (97 kgf·cm, 84 in.·lbf)****Bolt D 10 N·m (97 kgf·cm, 84 in.·lbf)**

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25. INSTALL VALVE SPRING SEAT



26. INSTALL VALVE STEM OIL O SEAL OR RING

- (a) Apply a light coat of engine oil on new valve stem seals.

NOTICE:

Pay much attention assembling the oil seal for intake and exhaust. Assembling the wrong one may cause a failure.

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 parts below to the cylinder head.

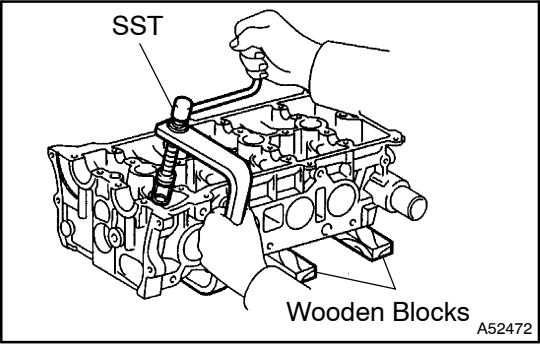
1	Intake valve
2	Spring
3	Retainer

- (b) Using SST and wooden blocks, compress and install 2 valve spring retainer locks.
SST 09202-70020 (09202-00010)

- (c) Using a plastic-faced hammer and the valve stem (not in use) tip wound with vinyl tape, lightly tap the valve stem tip to ensure a proper fit.

NOTICE:

Be careful not to damage the valve stem tip.



28. INSTALL EXHAUST VALVE

- (a) Install the parts below to the cylinder head.

1	Exhaust valve
2	Spring
3	Retainer

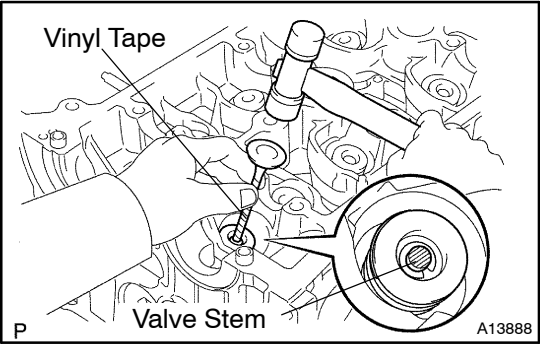
- (b) Using SST and wooden blocks, compress and install 2 valve spring retainer locks.

SST 09202-70020 (09202-00010)

- (c) Using a plastic-faced hammer and the valve stem (not in use) tip wound with vinyl tape, lightly tap the valve stem tip to ensure a proper 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 originally placed.