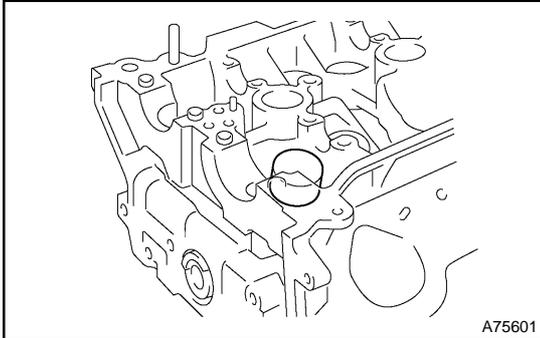


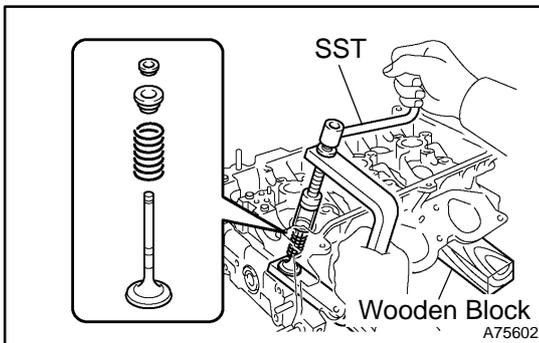
OVERHAUL



1. REMOVE VALVE LIFTER

HINT:

Arrange the valve lifter in the correct order.



2. REMOVE VALVE

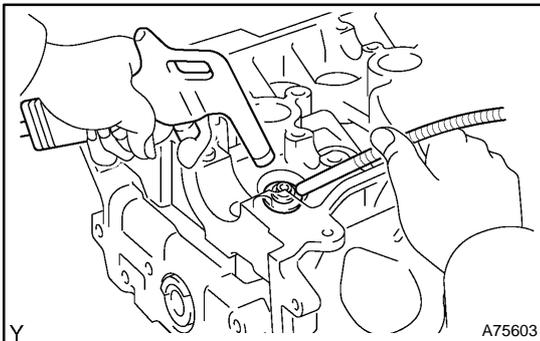
HINT:

Arrange the valves, inner compression springs, valve spring retainers and valve spring retainer rocks in the correct order.

- (a) Place the cylinder head on the wooden block.
- (b) Using SST, compress the inner compression spring and remove the 2 valve spring retainer rocks.

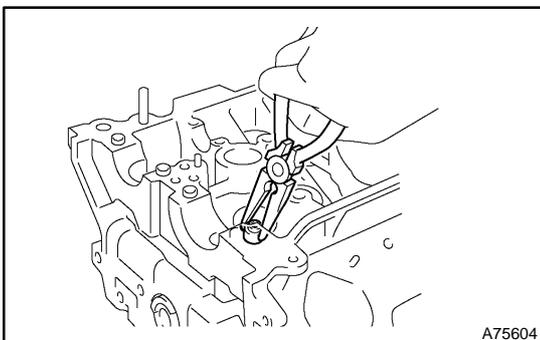
SST 09202-70020 (09202-00010)

- (c) Remove the valve, inner compression spring, valve spring and valve spring retainer.



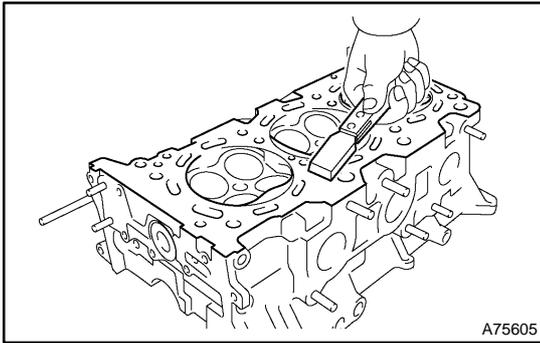
3. REMOVE VALVE SPRING SEAT

- (a) Using compressed air and a magnetic finger, remove the valve spring seat by blowing air.



4. REMOVE VALVE STEM OIL O SEAL OR RING

- (a) Using a needle-nose plier, remove the valve stem oil seal.

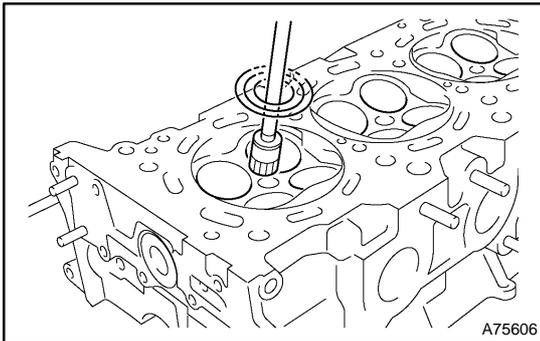


5. CLEAN CYLINDER HEAD SUB-ASSY

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

NOTICE:

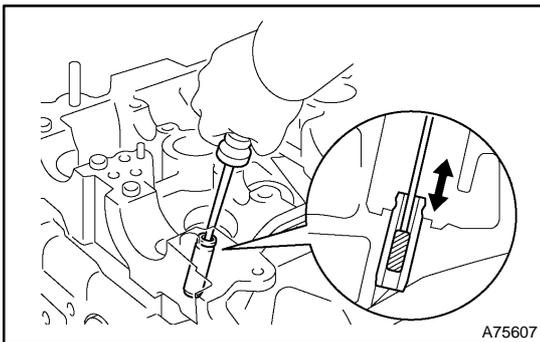
Be careful not to scratch the cylinder block contact surface.



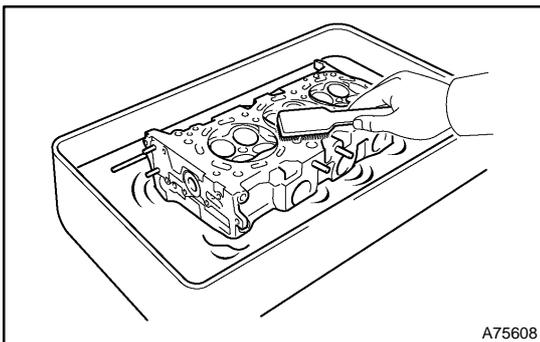
- (b) Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE:

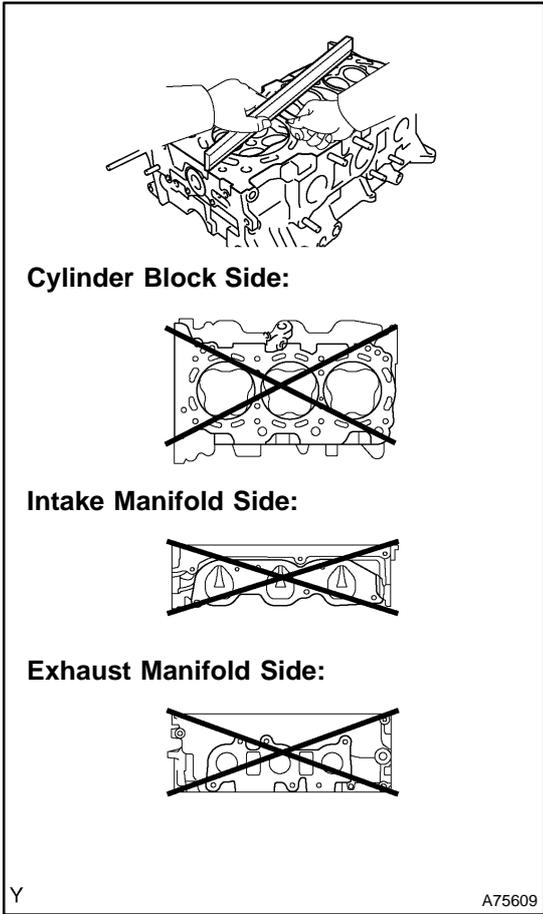
Be careful not to scratch the combustion chambers.



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



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

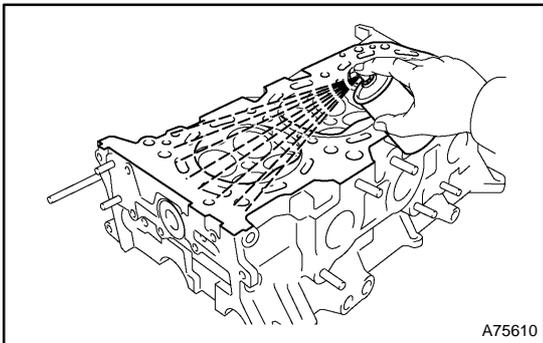


6. INSPECT CYLINDER HEAD SUB-ASSY

- (a) Inspect flatness.
 - (1) Using a precision straight edge and feeler gauge, measure flatness the surfaces contacted the cylinder block and manifolds.

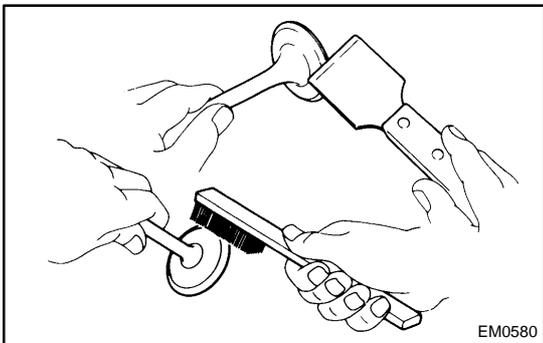
Maximum warpage: 0.10 mm (0.0039 in.)

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



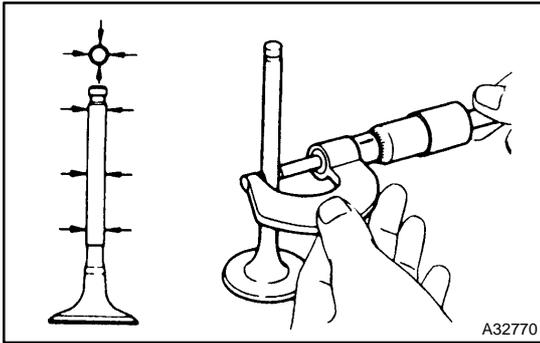
- (b) Inspect cranks.
 - (1) Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.



7. CLEAN VALVE

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



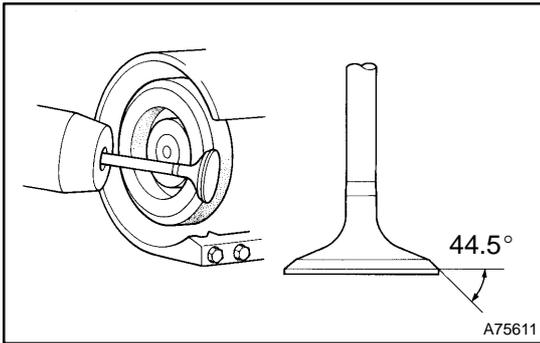
8. INSPECT VALVE

(a) Inspect valve stem diameter.

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

Valve stem diameter:

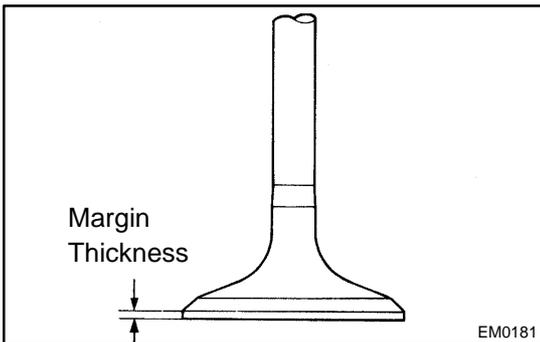
Intake	5.470 - 5.485 mm (0.2154 - 0.2159 in.)
Exhaust	5.465 - 5.480 mm (0.2152 - 0.2158 in.)



(b) Inspect valve face angle.

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

Valve face angle: 44.5°



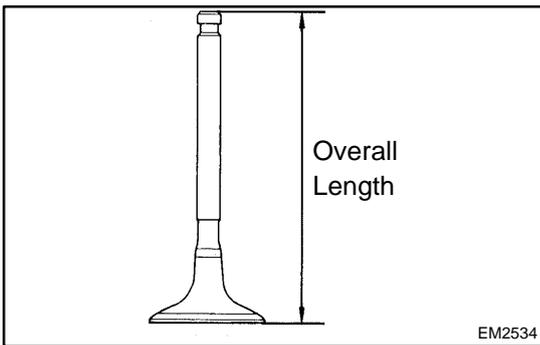
(c) Inspect valve head margin thickness.

- (1) Using vernier calipers, check the valve head margin thickness.

Standard margin thickness: 1.0 mm (0.039 in.)

Minimum margin thickness: 0.5 mm (0.020 in.)

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



(d) Inspect overall length.

- (1) Using vernier calipers, check the overall length.

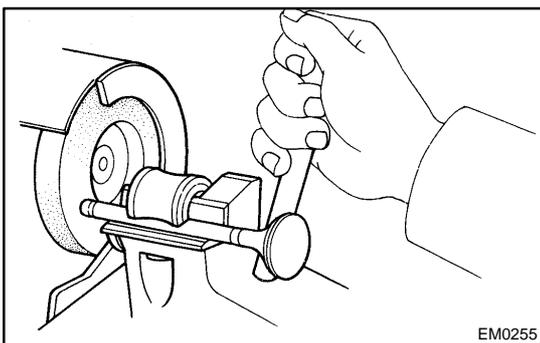
Standard overall length:

Intake	106.95 mm (4.2106 in.)
Exhaust	105.80 mm (4.1654 in.)

Minimum overall length:

Intake	106.40 mm (4.1890 in.)
Exhaust	105.30 mm (4.1457 in.)

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



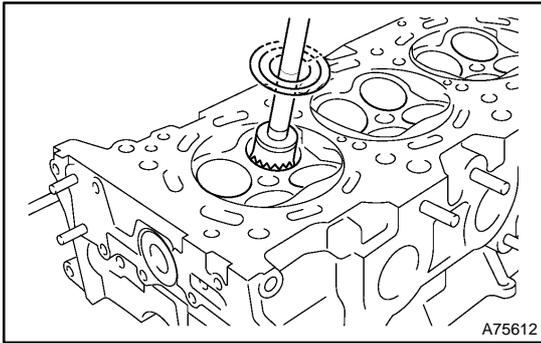
(e) Inspect valve stem tip.

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

NOTICE:

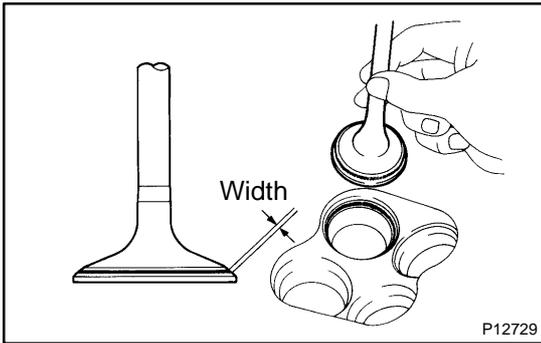
Do not grind off more than minimum length.

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



9. CLEAN VALVE SEAT

- (a) Using a 45° carbide cutter, resurface the valve seats.
- (b) Clean the valve seats.



10. INSPECT VALVE SEAT

- (a) Apply a light coat of prussian blue (or white lead) to the valve face.
- (b) Lightly press the valve against the valve seat.

NOTICE:

Do not rotate the valve.

- (c) Check the valve face and seat according to the following procedure.
 - (1) If the blue appears 360° around the face, the valve is center.

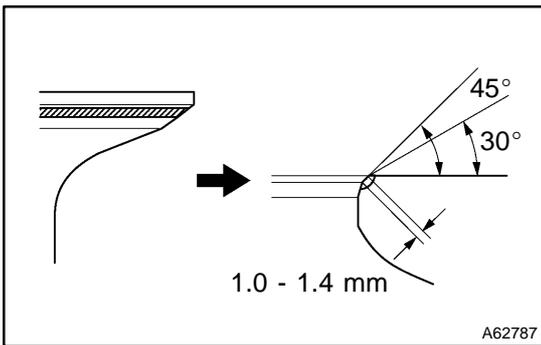
If not, replace the valve.

- (2) If the blue appears 360° around the valve seat, the guide and face are center.

If not, resurface the valve seat.

- (3) Check that the seat contacts the middle of the valve face with these width.

Standard width: 1.0 - 1.4 mm (0.039 - 0.055 in.)

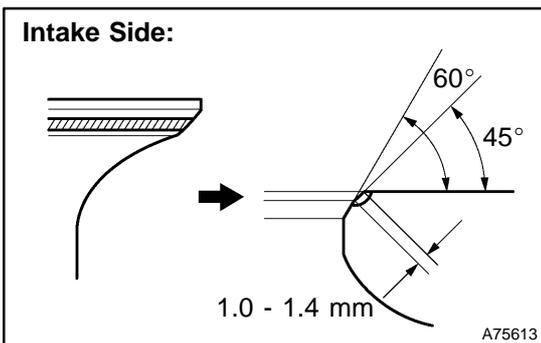


11. REPAIR VALVE SEAT

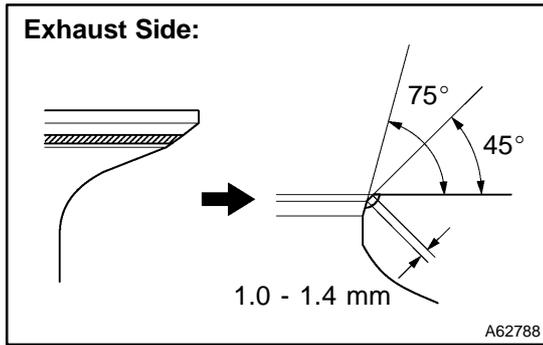
NOTICE:

Take off a cutter gradually to make the intake valve seat smooth.

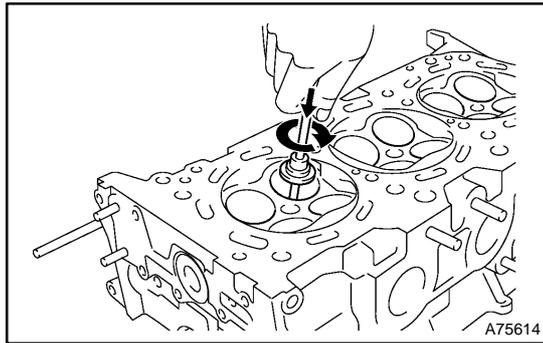
- (a) If the seating is too high to the valve face, use 30° and 45° cutters to correct the seat.



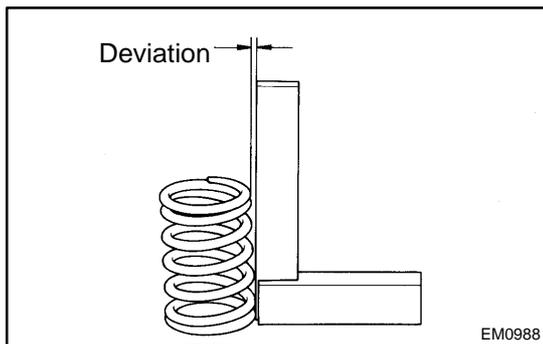
- (b) Intake side: If the seating is too low to the valve face, use 60° and 45° cutters to correct the seat.



- (c) Exhaust side:
If the seating is too low to 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.

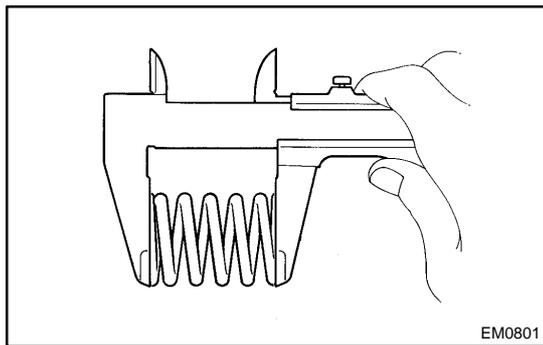


12. INSPECT INNER COMPRESSION SPRING

- (a) Inspect squareness.
 - (1) Using a steel square, measure the squareness of the inner compression spring.

Maximum deviation: 2.0 mm (0.079 in.)

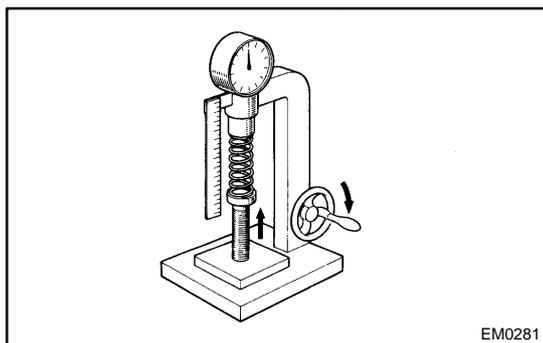
If the deviation is greater than maximum, replace the inner compression spring.



- (b) Inspect free length.
 - (1) Using vernier calipers, measure the free length of the inner compression spring.

Free length: 47.80 mm (1.8819 in.)

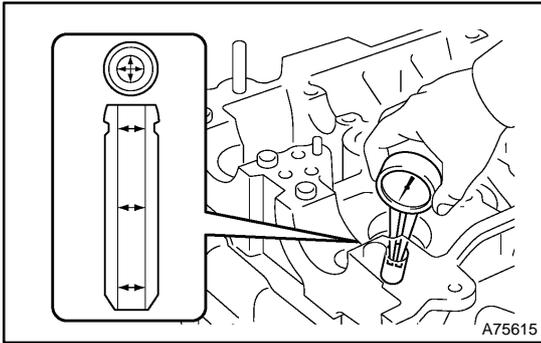
If the free length is not as specified, replace the inner compression spring.



- (c) Inspect tension.
 - (1) Using a spring tester, measure the tension of the inner compression spring at the specified installed length.

**Installed tension:
186.2 - 205.8 N (19.0 - 21.0 kgf, 41.9 - 46.3 lbf) at 33.3 mm (1.311 in.)**

If the installed tension is not specified, replace the inner compression spring.



13. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

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

Inside diameter:

5.51 - 5.53 mm (0.2169 - 0.2177 in.)

- (b) Subtract the valve stem diameter measurement (Step 8) from the valve guide bush inside diameter measurement.

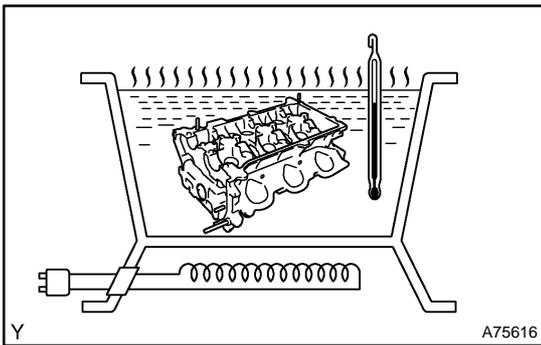
Standard oil clearance:

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:

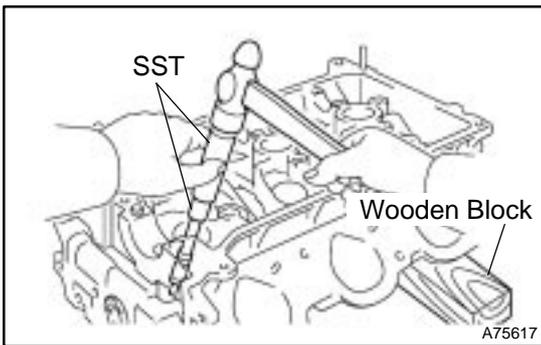
Intake	0.08 mm (0.0031 in.)
Exhaust	0.10 mm (0.0039 in..)

If the oil clearance is greater than maximum, replace the valve and valve guide bush.



14. REMOVE VALVE GUIDE BUSH

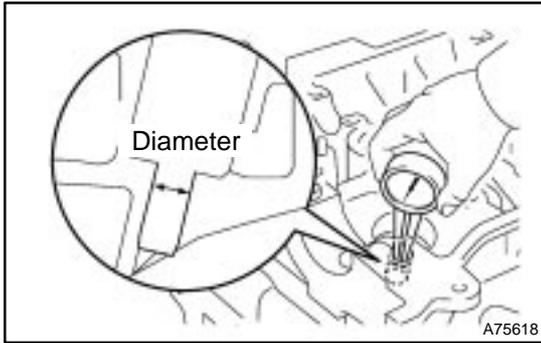
- (a) Gradually heat the cylinder head to 80 - 100°C (176 - 212°F).



- (b) Place the cylinder head on the wooden block.

- (c) Using SST, tap out the valve guide bush.

SST 09201-10000, 09201-01055, 09950-70010 (09951-07100)



15. INSTALL VALVE GUIDE BUSH

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

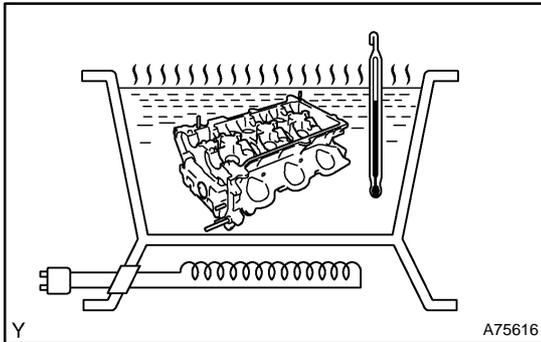
Bush bore diameter:

10.295 - 10.315 mm (0.4053 - 0.4061 in.)

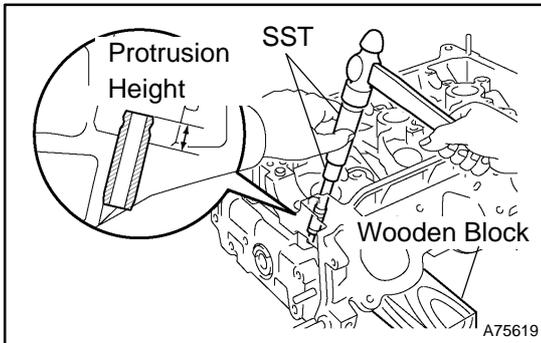
If the bush bore diameter of the cylinder head is greater than 10.315 mm (0.4061 in.), machine the bush bore to the dimension of 10.345 - 10.365 mm (0.4073 - 0.4081 in.).

Valve guide bush diameter

STD	10.333 - 10.344 mm (0.4068 - 0.4072 in.)
O/S 0.05	10.383 - 10.394 mm (0.4088 - 0.4092 in.)



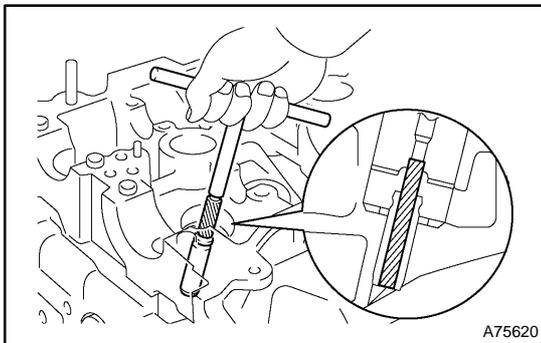
- (b) Gradually heat the cylinder head to 80 - 100°C (176 - 212°F).



- (c) Place the cylinder head on the wooden block.
 (d) Using SST, tap in a new valve guide bush to the specified protrusion height.

SST 09201-10000, 09201-01055, 09950-70010 (09951-07100)

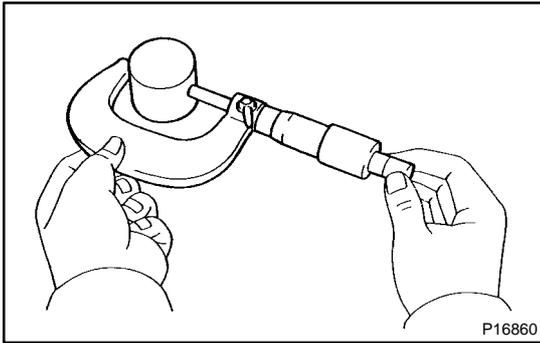
Protrusion height: 9.3 - 9.7 mm (0.366 - 0.382 in.)



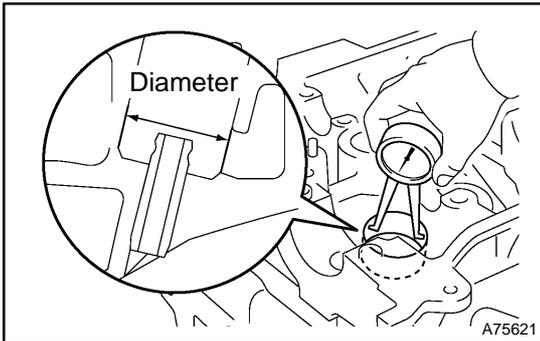
- (e) Using a sharp 5.5 mm reamer, ream the valve guide bush to obtain the standard specified clearance between the valve guide bush and valve stem.

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.)

**16. INSPECT VALVE LIFTER**

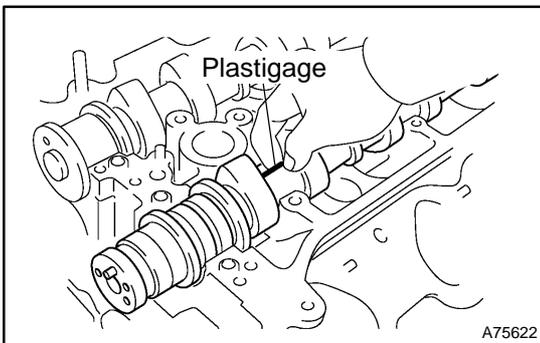
- (a) Using a micrometer measure the valve lifter diameter.
Valve lifter diameter:
30.966 - 30.976 mm (1.2191 - 1.2195 in.)

**17. INSPECT VALVE LIFTER OIL CLEARANCE**

- (a) 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.)
- (b) Subtract the valve lifter diameter measurement (Step 16) from the lifter bore diameter measurement.
Standard oil clearance:
0.033 - 0.059 mm (0.0013 - 0.0023 in.)
Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the valve lifter.

If necessary, replace the cylinder head.

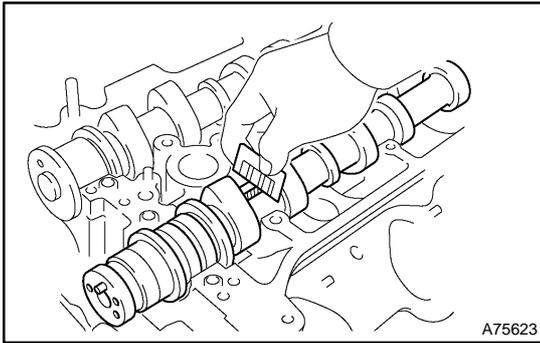
**18. INSPECT CAMSHAFT OIL CLEARANCE**

- (a) Clean the camshaft bearing caps, camshaft bearings and camshaft journals.
- (b) Install the camshaft bearing. (See page [14-39](#))
- (c) Place the camshaft on the cylinder head.
- (d) Lay a strip of Plastigage across each of the camshaft journals.
- (e) Install the camshaft bearing caps. (See page [14-39](#))

NOTICE:

Do not turn the camshafts.

- (f) Remove the camshaft bearing caps. (See page [14-39](#))



- (g) Measure the Plastigage at its widest point.
Standard oil clearance (Cylinder head RH):

No. 1 (Intake)	0.008 - 0.038 mm (0.0003 - 0.0015 in.)
No. 1 (Exhaust)	0.040 - 0.079 mm (0.0016 - 0.0031 in.)
Others	0.025 - 0.062 mm (0.0010 - 0.0024 in.)

Standard oil clearance (Cylinder head LH):

No. 1	0.040 - 0.079 mm (0.0016 - 0.0031 in.)
Others	0.025 - 0.062 mm (0.0010 - 0.0024 in.)

Maximum oil clearance (Cylinder head RH):

No. 1 (Intake)	0.07 mm (0.0028 in.)
Others	0.10 mm (0.0039 in.)

Maximum oil clearance (Cylinder head LH):
0.10 mm (0.0039 in.)

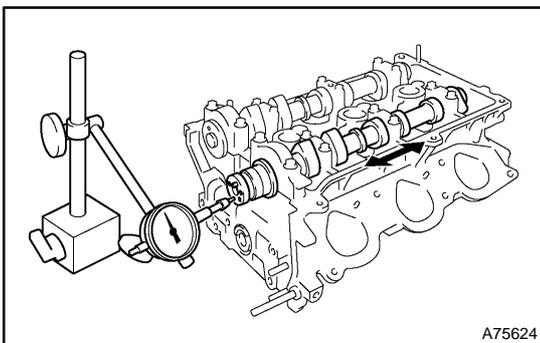
If the oil clearance is greater than maximum, replace the camshaft bearings and/or camshaft.

If necessary, replace the camshaft bearing caps and cylinder head together.

Reference:

Cylinder head journal bore diameter	40.009 - 40.017 mm (1.5752 - 1.5755 in.)
Camshaft bearing center wall thickness (Mark "2")	2.004 - 2.008 mm (0.0789 - 0.0791 in.)
Camshaft journal diameter	35.971 - 35.985 mm (1.4165 - 1.4167 in.)

- (h) Remove the Plastigage completely.
- (i) Remove the camshafts.
- (j) Remove the camshaft bearing.



19. INSPECT CAMSHAFT THRUST CLEARANCE

- (a) Install the camshafts. (See page 14-39)
- (b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:
0.04 - 0.09 mm (0.016 - 0.035 in.)

Maximum thrust clearance: 0.11 mm (0.0043 in.)

If the thrust clearance is greater than maximum, replace the camshafts.

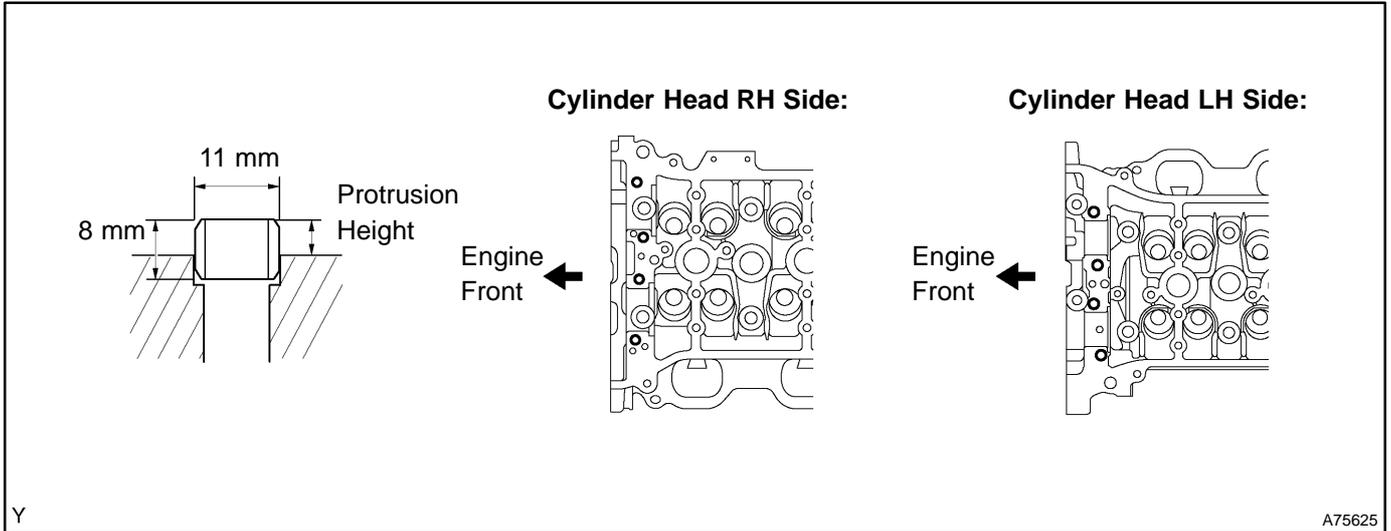
If necessary, replace the camshaft bearing caps and cylinder head as a set.

20. INSTALL RING PIN

- (a) Using a plastic-faced hammer, tap in the new ring pins until it is reached to the specified protrusion height.

Specified protrusion height:

2.7 - 3.3 mm (0.106 - 0.130 in.)



21. INSTALL STRAIGHT PIN

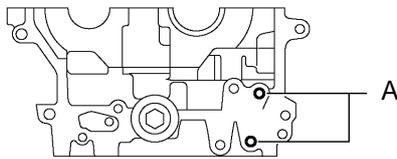
- (a) Using a plastic-faced hammer, tap in the new straight pins until it is reached to the specified protrusion height.

Specified protrusion height:

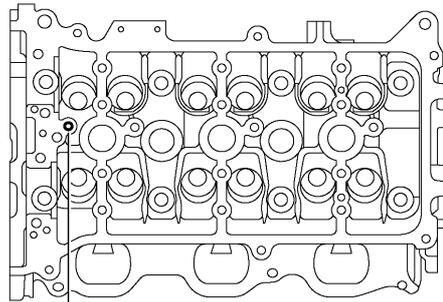
A	17.5 - 19.5 mm (0.689 - 0.768 in.)
B	7.5 - 8.5 mm (0.295 - 0.335 in.)
C	7.0 - 9.0 mm (0.276 - 0.354 in.)

Cylinder Head RH Side:

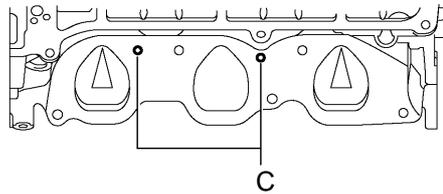
Front Side:



Upper Side:

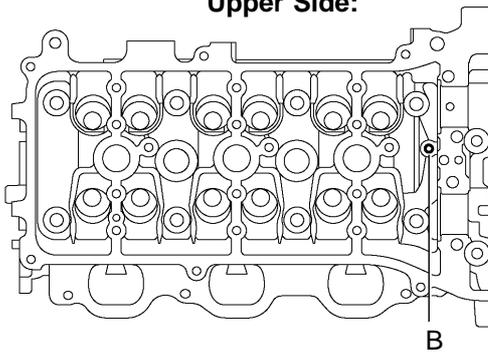


Intake Manifold Side:

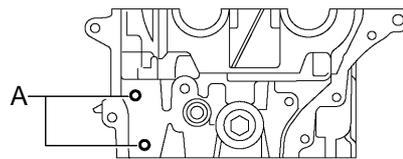


Cylinder Head LH Side:

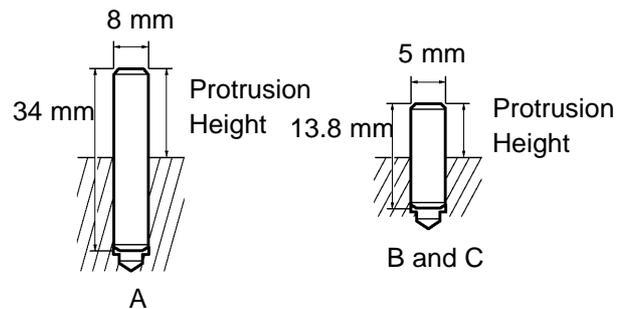
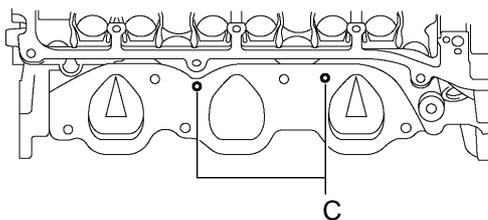
Upper Side:



Front Side:



Intake Manifold Side:



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22. INSTALL STUD BOLT

- (a) Using the torx socket wench E5 and E7, install the stud bolts.

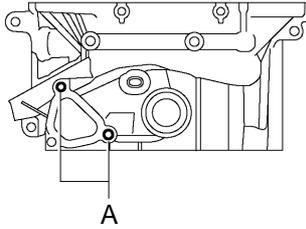
Torque:

4.0 N·m (41 kgf·cm, 35 in·lbf) for stud bolt A

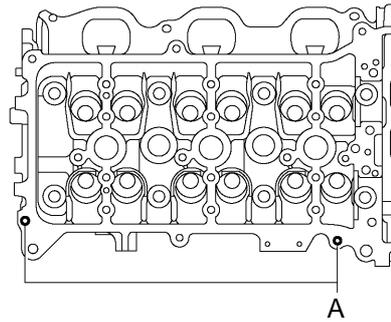
9.0 N·m (92 kgf·cm, 80 ft·lbf) for stud bolt B

Cylinder Head RH Side:

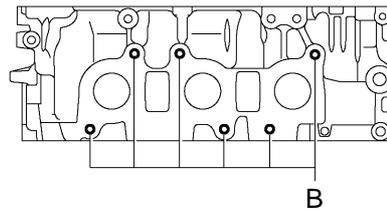
Rear Side:



Upper Side:

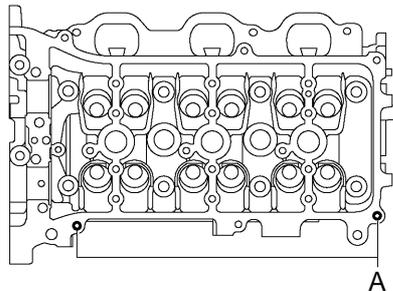


Exhaust Manifold Side:

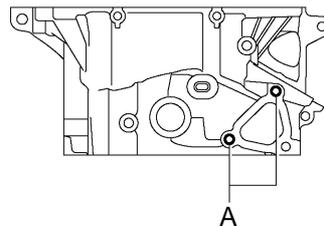


Cylinder Head LH Side:

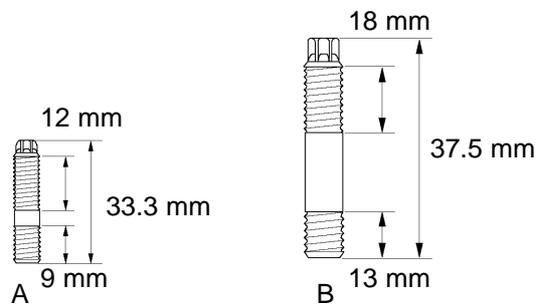
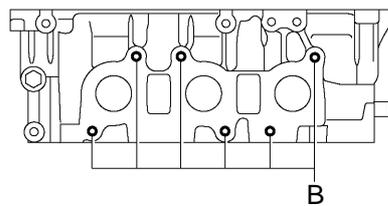
Upper Side:



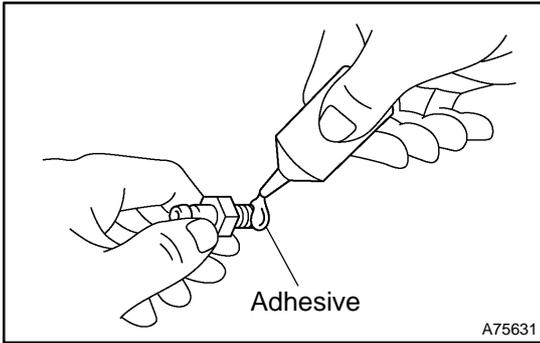
Rear Side:



Exhaust Manifold Side:



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23. INSTALL UNION

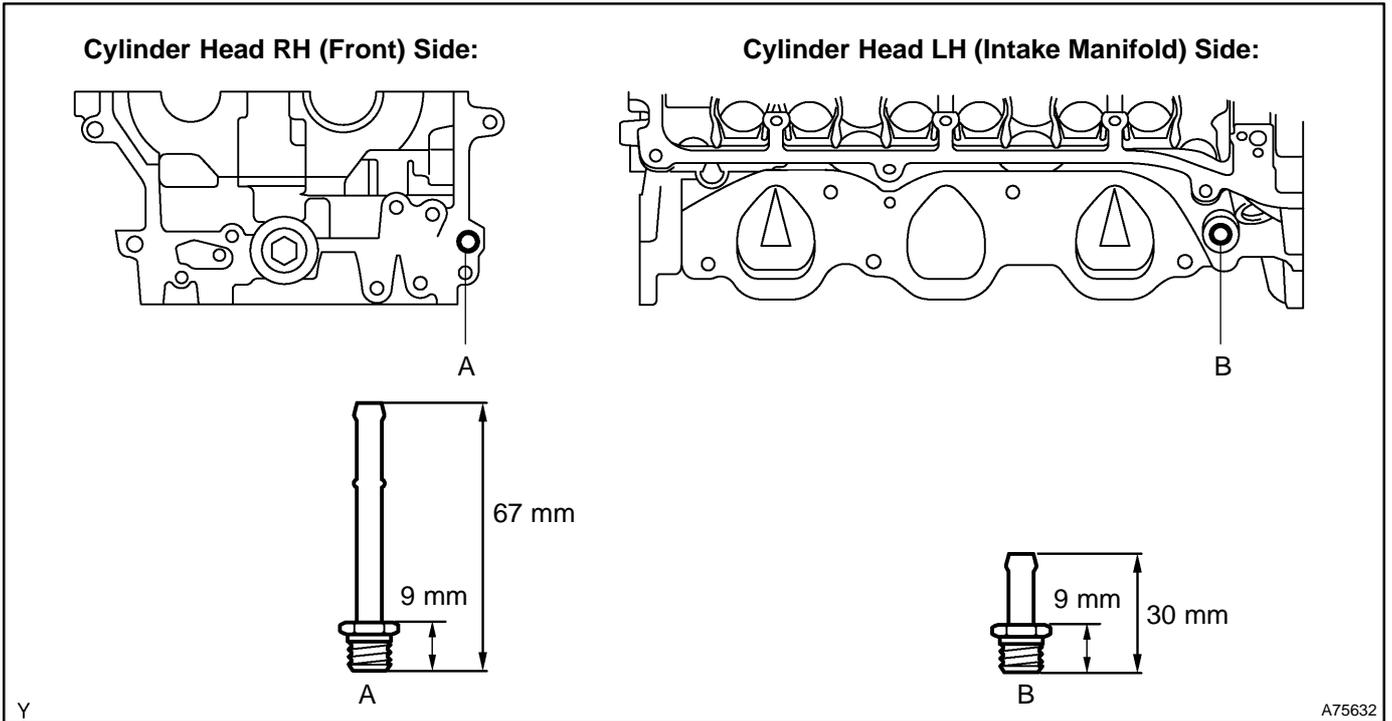
- (a) Apply adhesive to 2 or 3 threads of the bolt end.

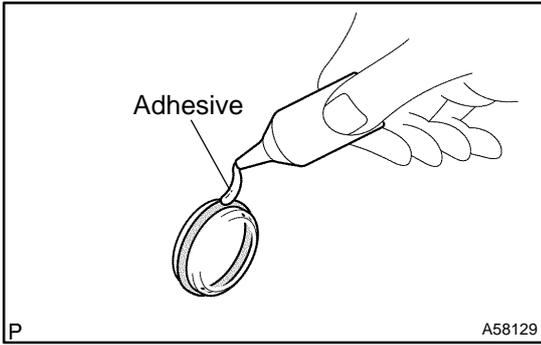
Adhesive:

Part No. 08833 - 00070, THREE BOND 1324 or equivalent

- (b) Using a deep socket wrench 12, install the unions.

Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

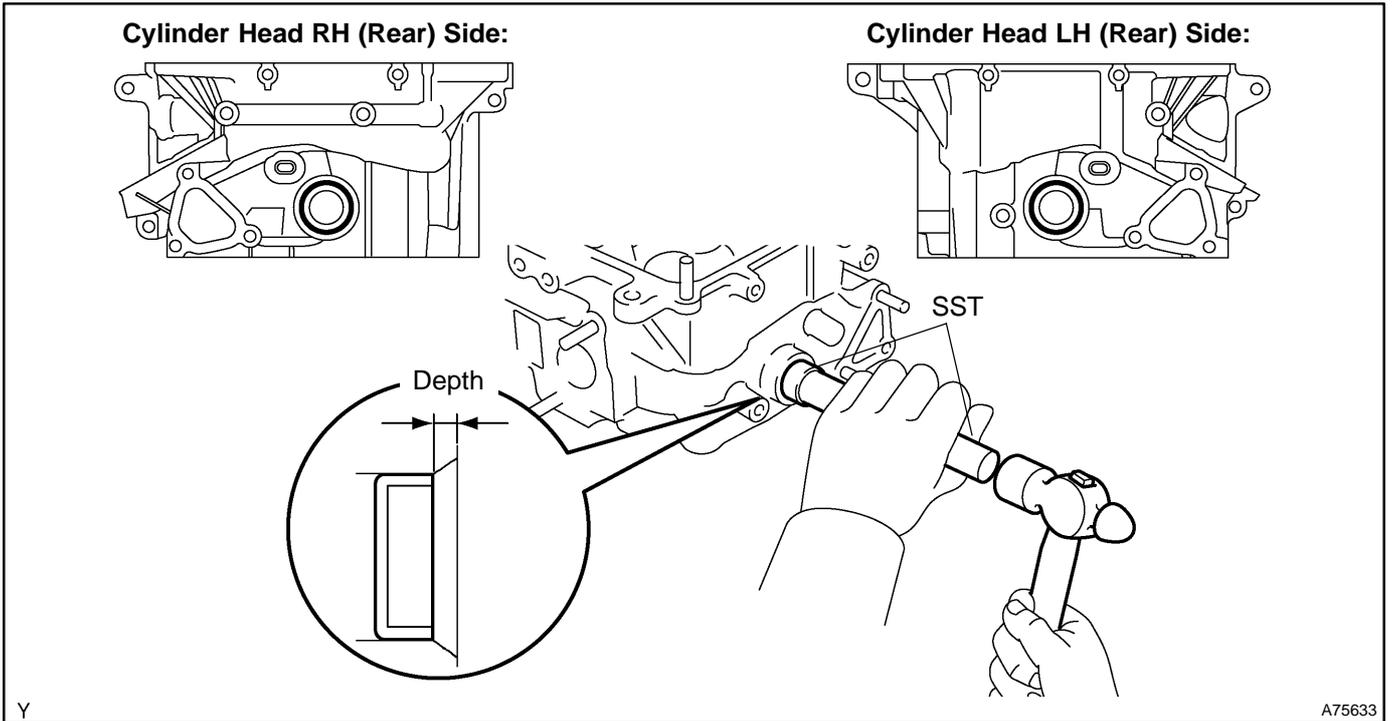




24. INSTALL TIGHT PLUG

- (a) Apply adhesive around tight plug.
 - (b) Using SST, tap in the tight plugs until the specified depth.
- SST 09950-60010 (09951-00250), 09950-70010 (09951-07150)

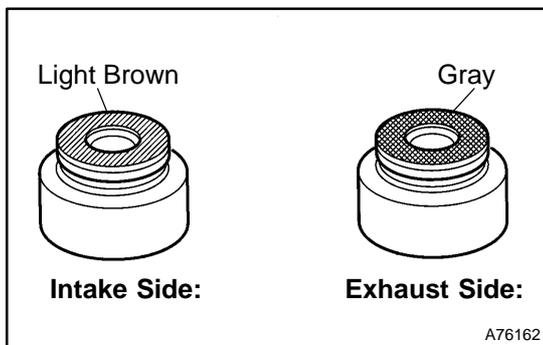
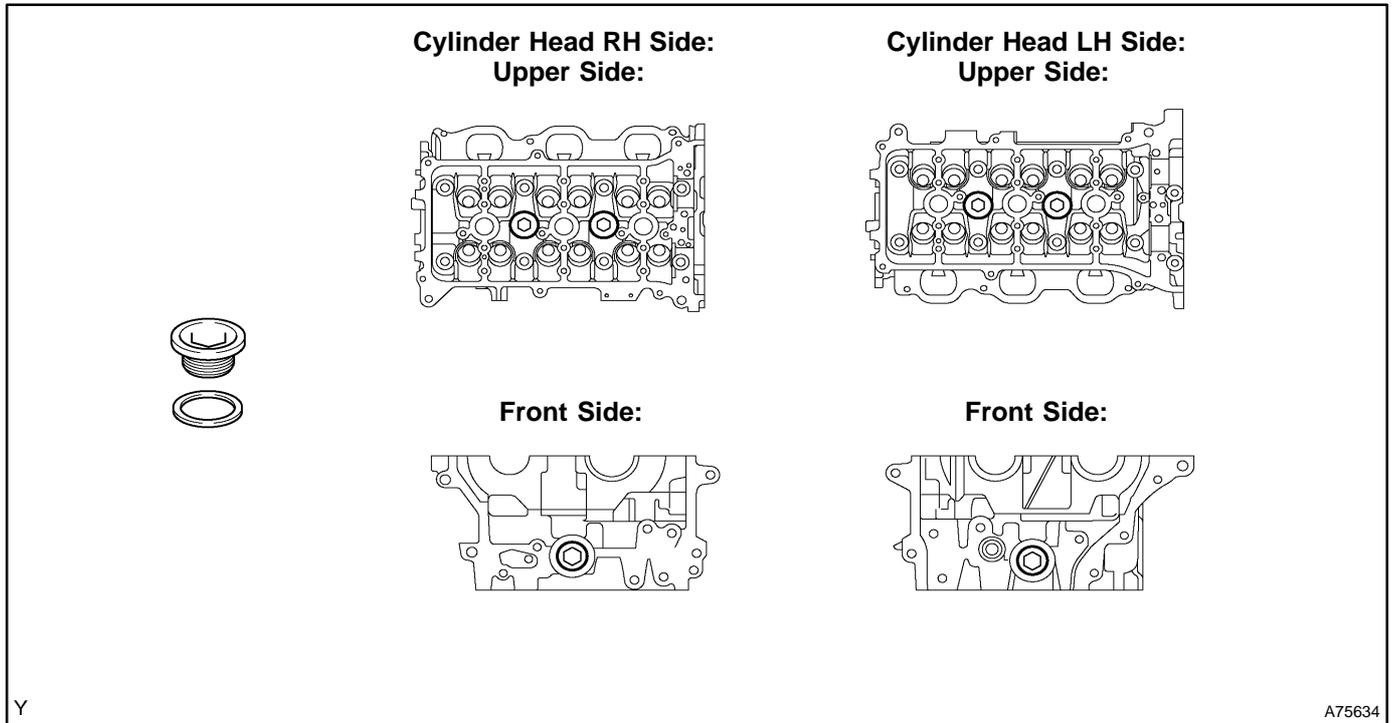
Specified depth: 1.5 mm (0.059 in.)



25. INSTALL W/ HEAD STRAIGHT SCREW PLUG

- (a) Using a straight hexagon wrench 14, install a new gasket and straight screw plug.

Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)

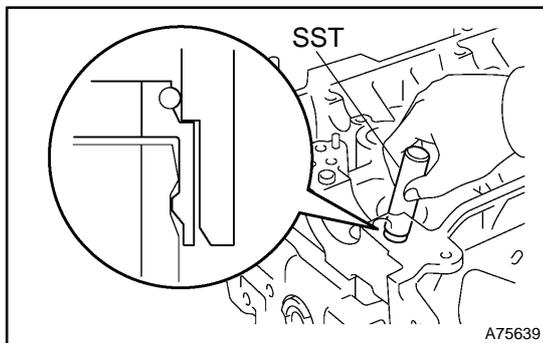


26. INSTALL VALVE STEM OIL O SEAL OR RING

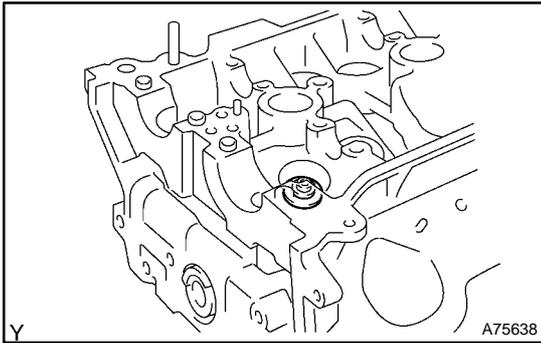
HINT:

The intake valve stem oil seal is light brown and the exhaust valve stem oil seal is gray.

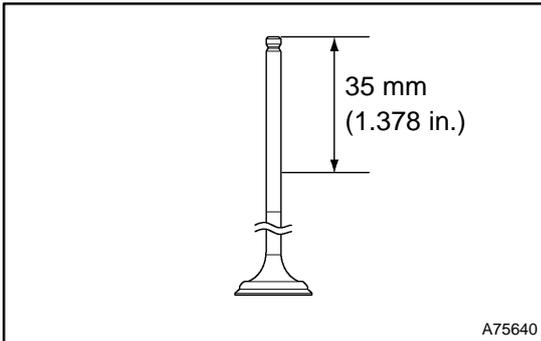
- (a) Apply a light coat of engine oil to the valve guide bush.



- (b) Using SST, push in a new valve stem oil seal.
SST 09201-41020

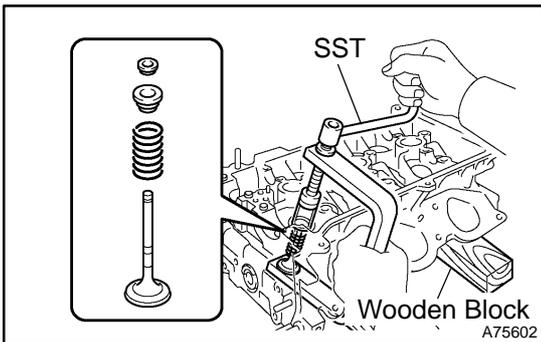


27. INSTALL VALVE SPRING SEAT



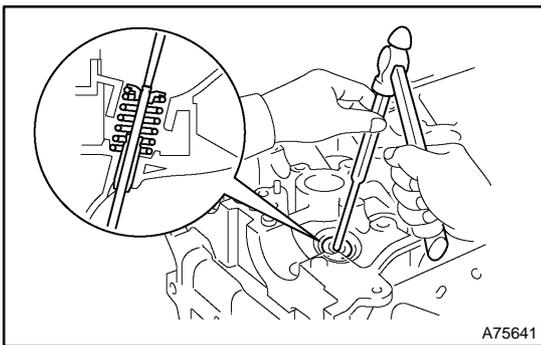
28. INSTALL VALVE

(a) Apply the engine oil to the valve as shown in the illustration.



- (b) Place the cylinder head on the wooden block.
- (c) Install the valve, inner compression spring and valve spring retainer.
- (d) Using SST, compress the inner compression spring and place the 2 valve spring retainer rocks around the valve stem.

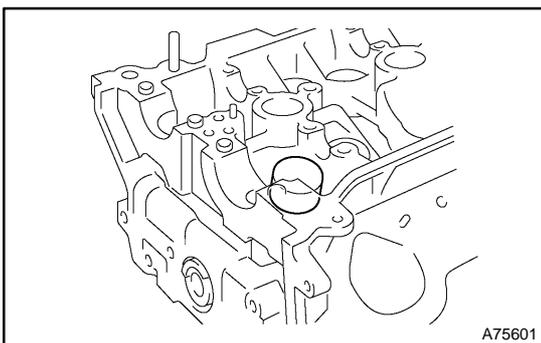
SST 09202-70020 (09202-00010)



(e) Using a pin punch 5, 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) Apply the engine oil to the valve stem end and valve lifter, and install the valve lifter to the valve stem.
- (b) Check that the valve lifter rotates smoothly by hand.