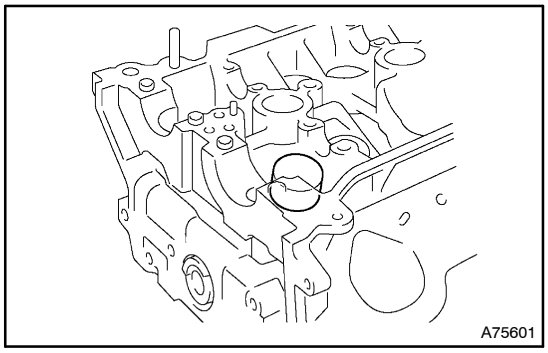
1415I–01

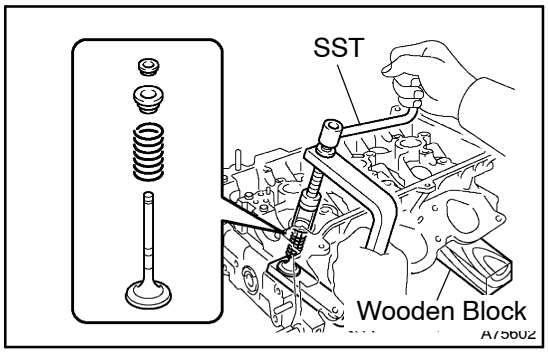
OVERHAUL



1. REMOVE VALVE LIFTER

HINT:

Arrange the valve lifter in the correct order.



2. REMOVE VALVE

HINT:

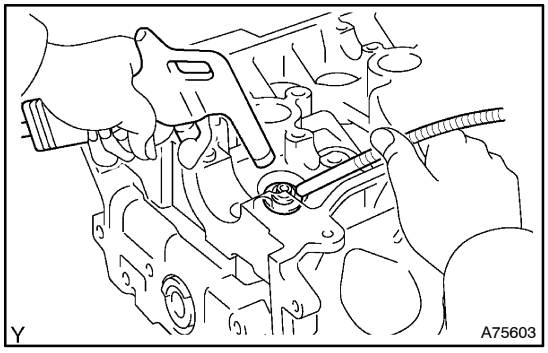
Arrange the valves, inner compression springs, valve spring retainers and valve spring retainer rocks in the correct order.

(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.

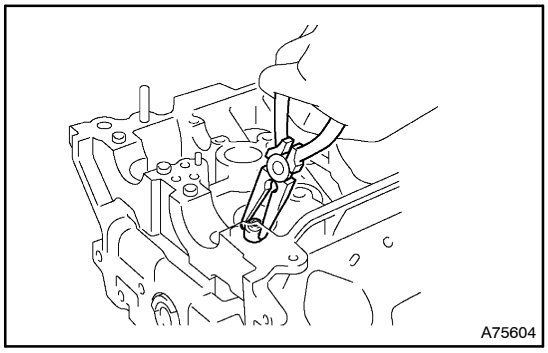
SST 09202–70020 (09202–00010)

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



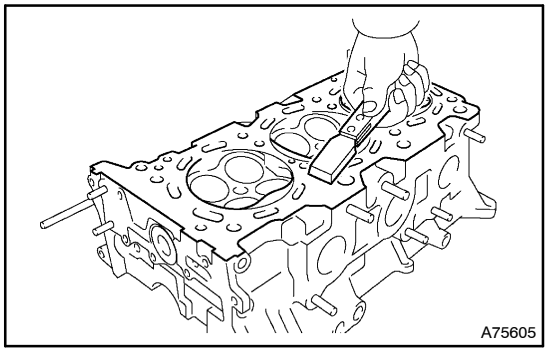
3. REMOVE VALVE SPRING SEAT

(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 pliers, remove the valve stem oil seal.

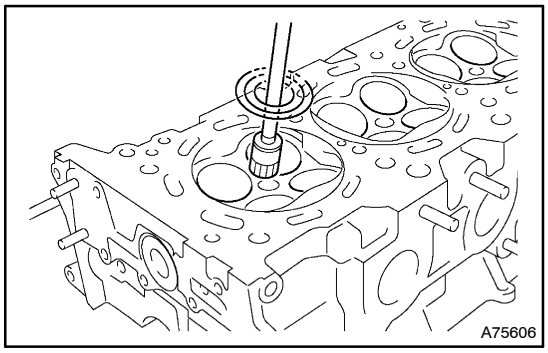


5. CLEAN CYLINDER HEAD SUB–ASSY

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

NOTICE:

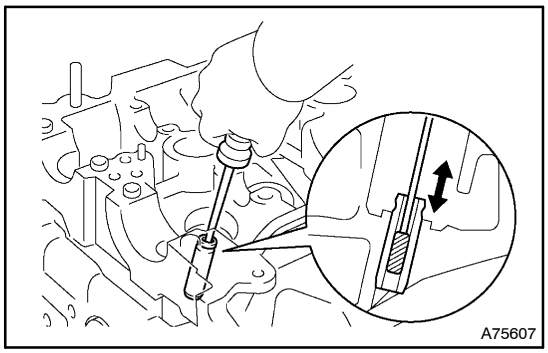
Be careful not to scratch the cylinder block contact surface.



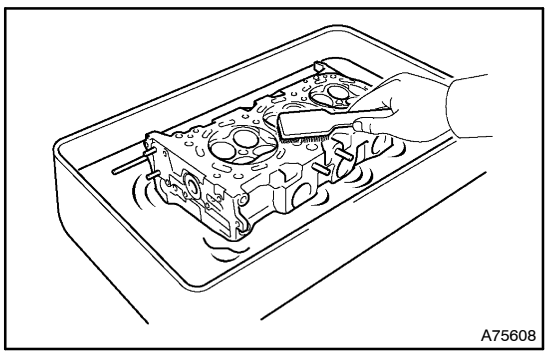
(b) Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE:

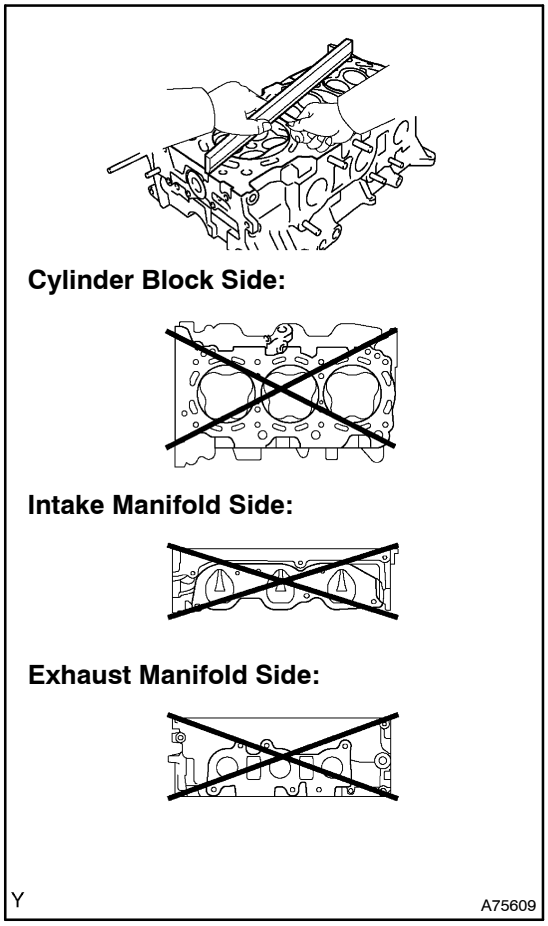
Be careful not to scratch the combustion chambers.



(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.



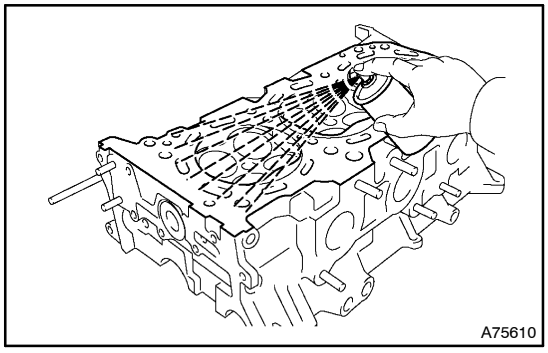
6. INSPECT CYLINDER HEAD SUB–ASSY

(a) Inspect for flatness.

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

Maximum warpage: 0.10 mm (0.0039 in.)

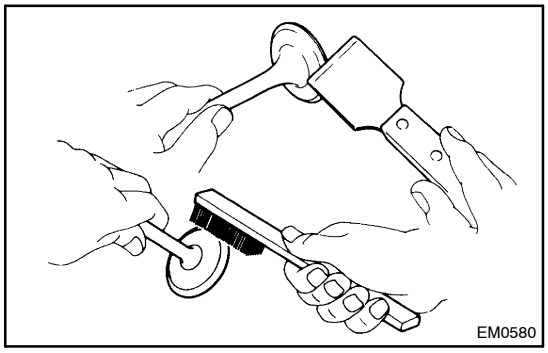
If warpage is greater than maximum, replace the cylinder head.



(b) Inspect for cranks.

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

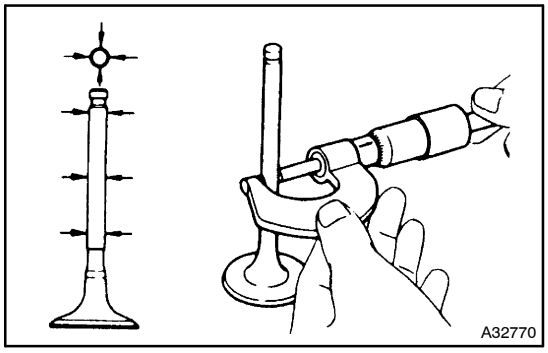
If cracked, replace the cylinder head.



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.



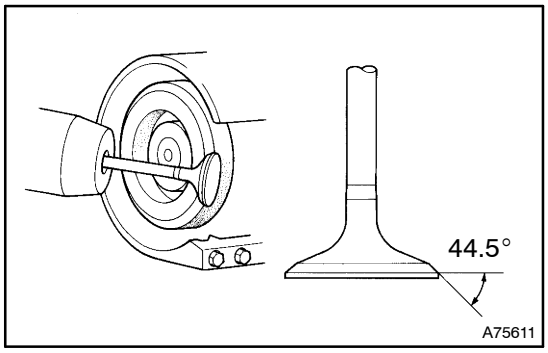
8. INSPECT VALVE

(a) Inspect for 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.)

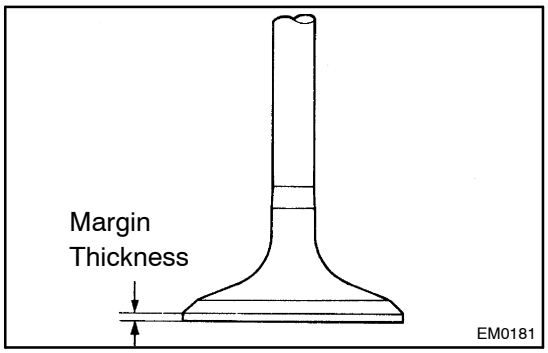


(b) Inspect for valve face angle.

(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°



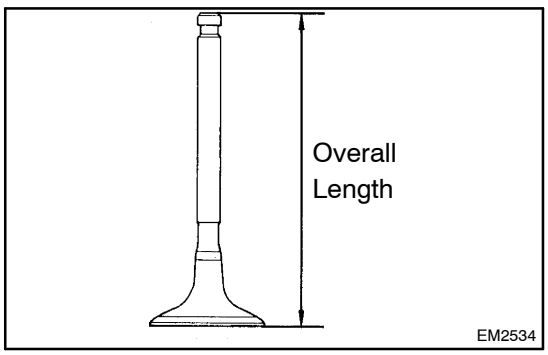
(c) Inspect for valve head margin thickness.

(1) Using a 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 for overall length.

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

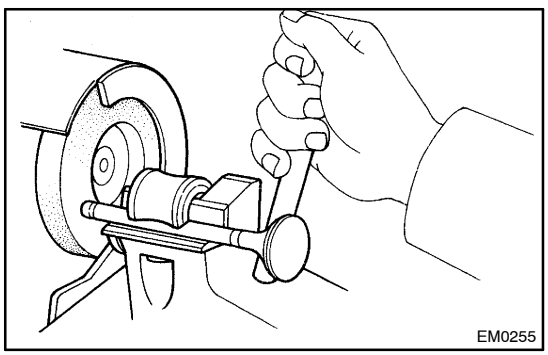
Standard overall length:

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.



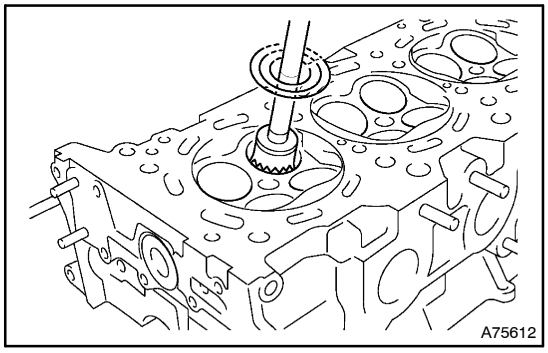
(e) Inspect for valve stem tip.

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

NOTICE:

Do not grind off more than minimum length.

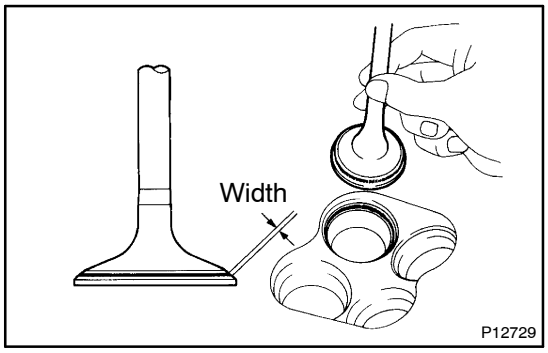
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.



9. CLEAN VALVE SEAT

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

(b) Remove only enough metal to 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 blue appears 360° around the face, the valve is concentric.

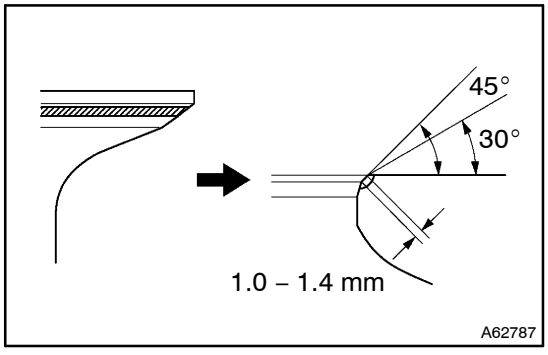
If not, replace the valve.

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

If not, resurface the valve seat.

(3) Check that the seat contact is in the middle of the valve face with these width.

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

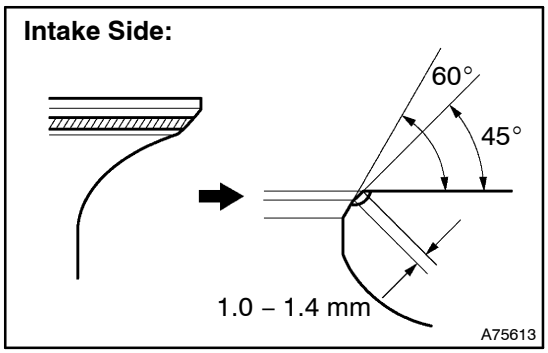


11. REPAIR VALVE SEAT

NOTICE:

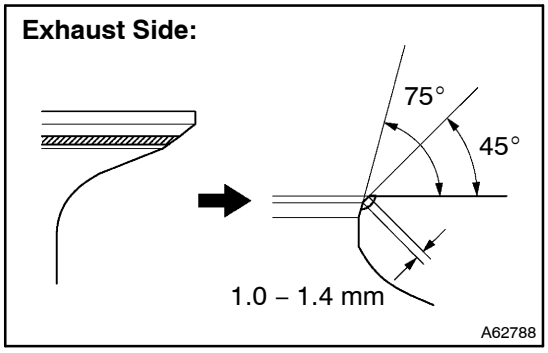
Take off a cutter gradually to makes smooth intake valve seat.

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

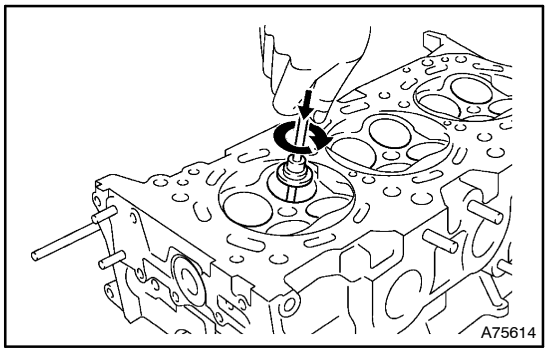


(b) Intake side:

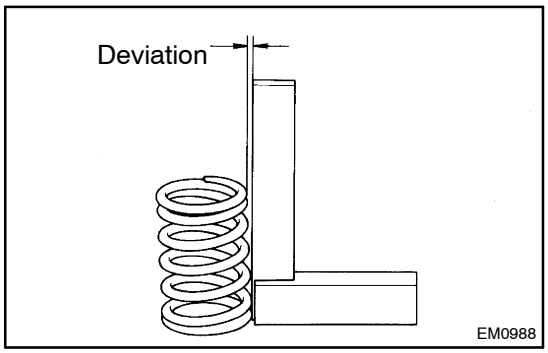
If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



(c) Exhaust side:
If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.



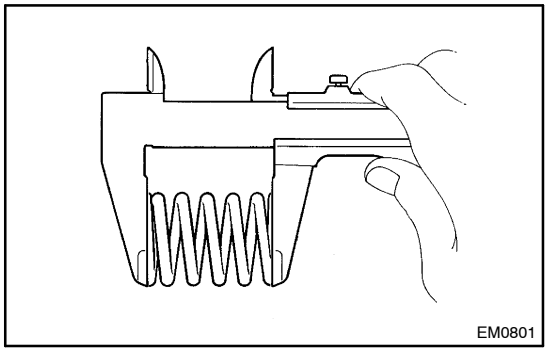
(d) Hand–lap the valve and valve seat with an abrasive compound.
(e) After hand–lapping, clean the valve and valve seat.



12. INSPECT INNER COMPRESSION SPRING

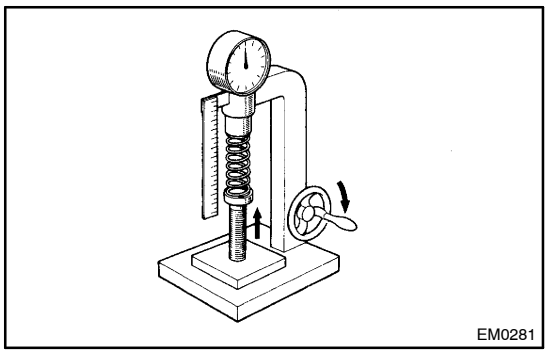
(a) Inspect for squareness.
(1) Using a steel square, measure the squareness of the inner compression spring.
Maximum deviation: 2.0 mm (0.079 in.)

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



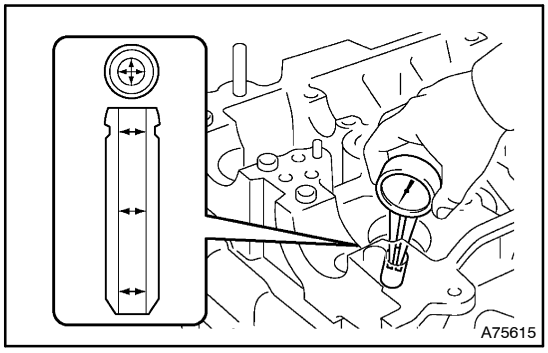
(b) Inspect for free length.
(1) Using a vernier calipers, measure the free length of the inner compression spring.
Free length: 47.80 mm (1.8819 in.)

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



(c) Inspect for 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.

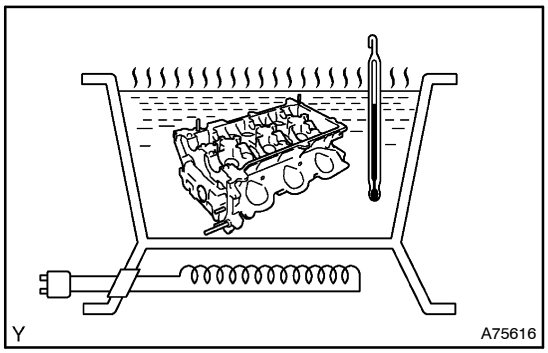
Standard oil clearance:

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:

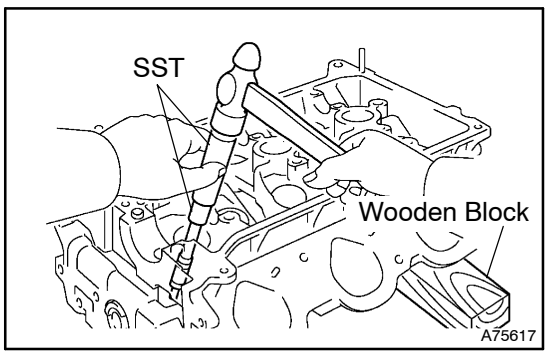
Intake	0.08 mm (0.0031 in.)
Exhaust	0.10 mm (0.0039 in..)

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



14. REMOVE VALVE GUIDE BUSH

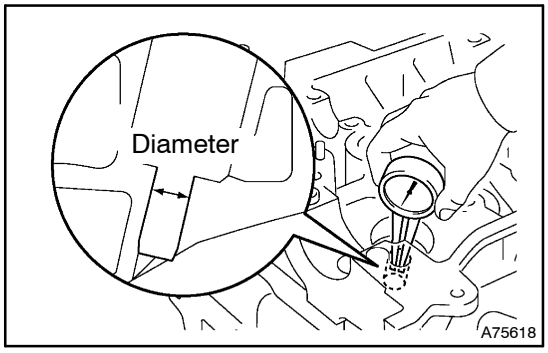
(a) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).



(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.

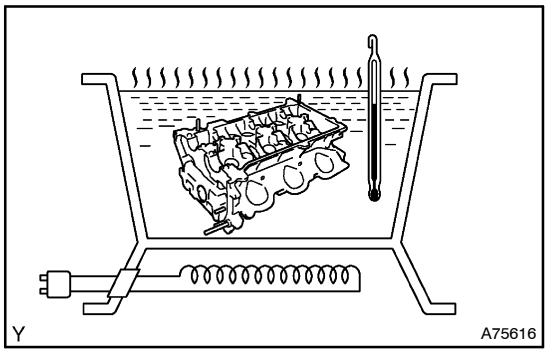
Bush bore diameter:

10.295 – 10.315 mm (0.4053 – 0.4061 in.)

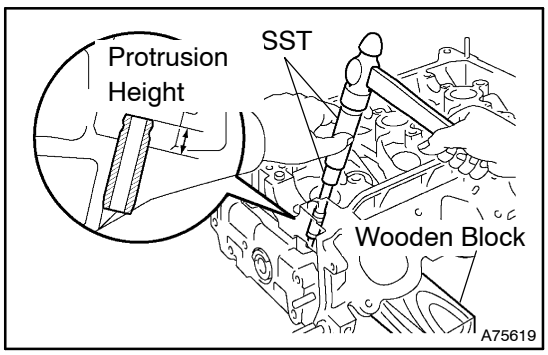
If the bush bore diameter of the cylinder head is greater than 10.315 mm (0.4061 in.), machine the bush bore to the dimension of 10.345 – 10.365 mm (0.4073 – 0.4081 in.).

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).

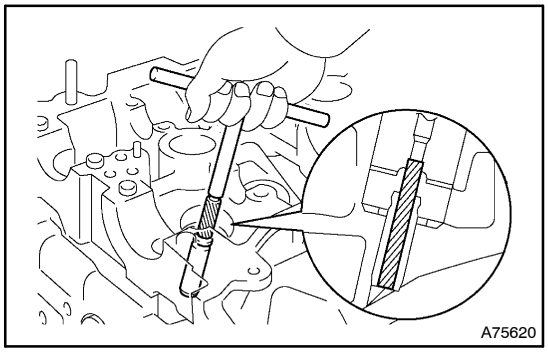


(c) Place the cylinder head on the wooden block.

(d) Using SST, tap in a new valve guide bush to the specified protrusion height.

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

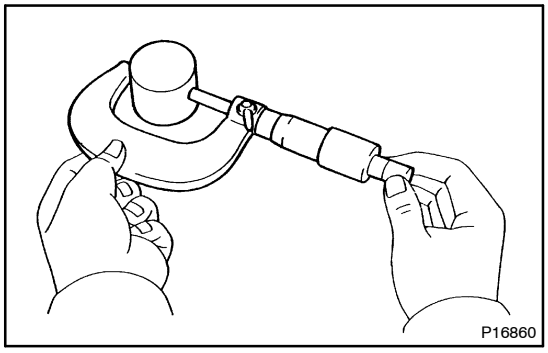
Protrusion height: 9.3 – 9.7 mm (0.366 – 0.382 in.)



(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.)

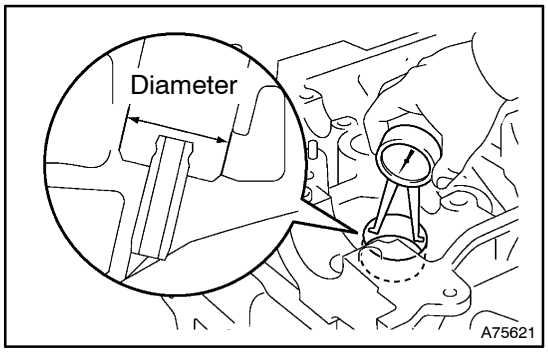


16. INSPECT VALVE LIFTER

(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.

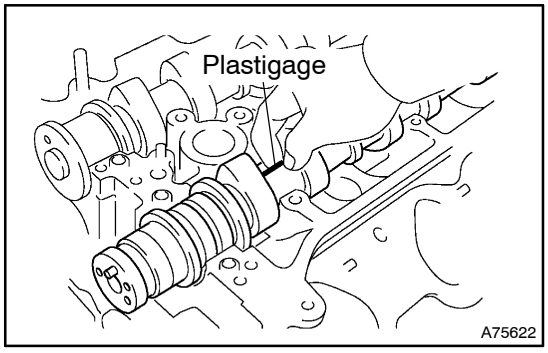
Standard oil clearance:

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 14–4)

(c) Place the camshaft on the cylinder head.

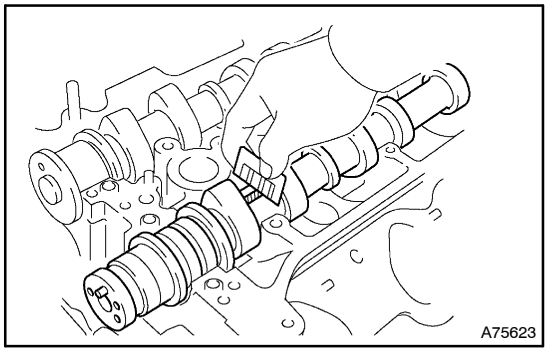
(d) Lay a strip of Plastigage across each of the camshaft journals.

(e) Install the camshaft bearing caps. (See page 14–4)

NOTICE:

Do not turn the camshafts.

(f) Remove the camshaft bearing caps. (See page 14–4)



(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 as a set.

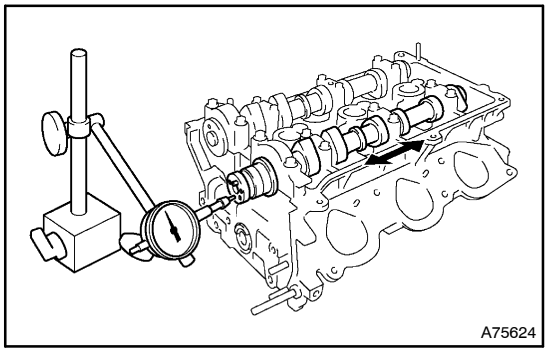
Reference:

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 14–4)

(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.)

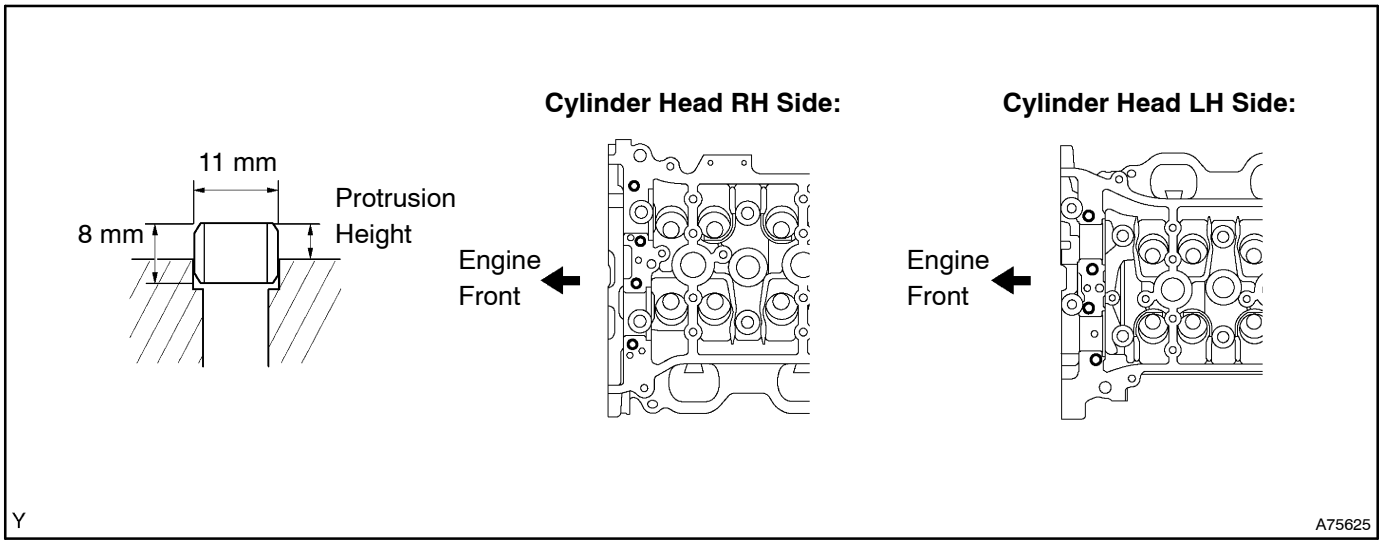
If the thrust clearance is greater than maximum, replace the camshafts.

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 to the specified protrusion height.

Specified protrusion height:
2.7 – 3.3 mm (0.106 – 0.130 in.)



21. INSTALL STRAIGHT PIN

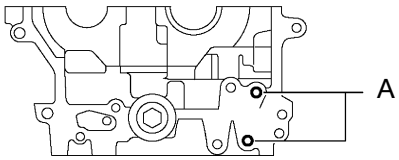
(a) Using a plastic–faced hammer, tap in the new straight pins to the specified protrusion height.

Specified protrusion height:

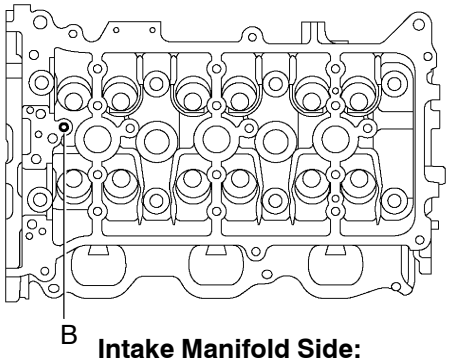
A	17.5 – 19.5 mm (0.689 – 0.768 in.)
B	7.5 – 8.5 mm (0.295 – 0.335 in.)
C	7.0 – 9.0 mm (0.276 – 0.354 in.)

Cylinder Head RH Side:

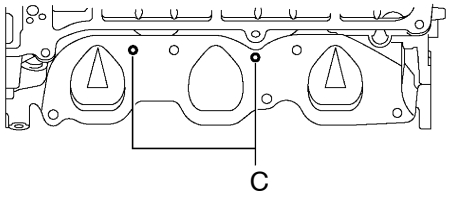
Front Side:



Upper Side:

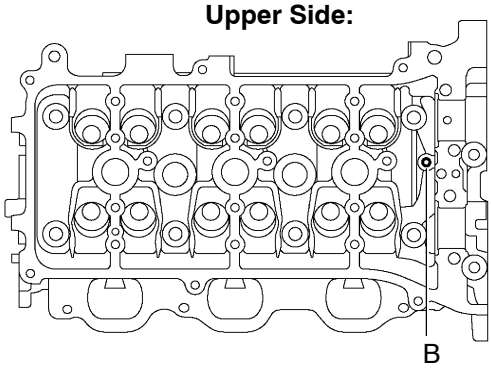


Intake Manifold Side:

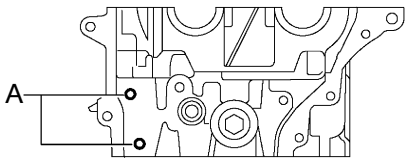


Cylinder Head LH Side:

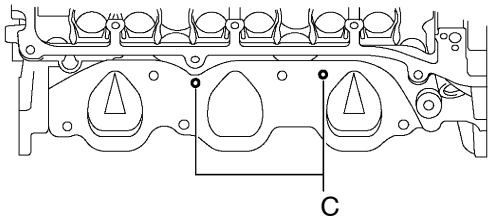
Upper Side:

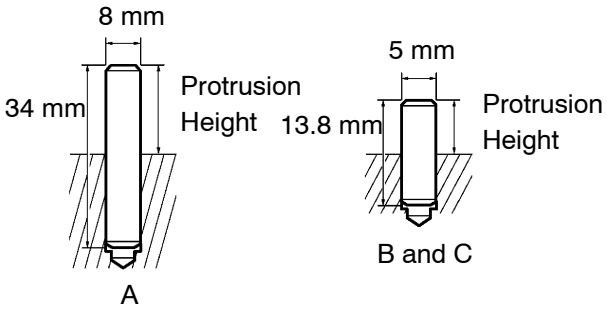


Front Side:



Intake Manifold Side:





Y

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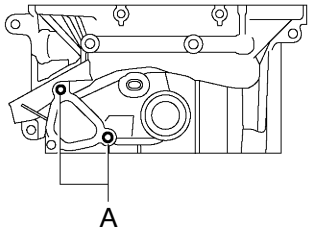
22. INSTALL STUD BOLT

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

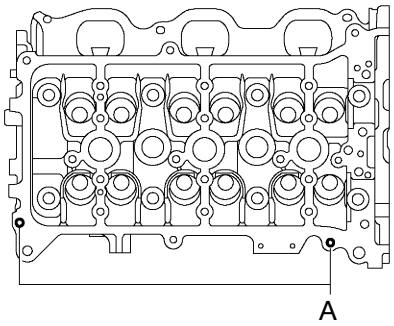
Torque:
4.0 N·m (41 kgf·cm, 35 in.·lbf) for stud bolt A
9.0 N·m (92 kgf·cm, 80 in.·lbf) for stud bolt B

Cylinder Head RH Side:

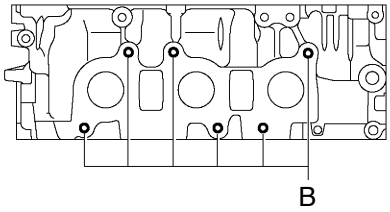
Rear Side:



Upper Side:

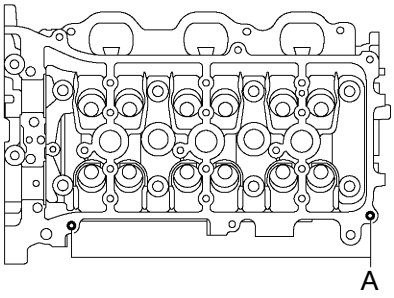


Exhaust Manifold Side:

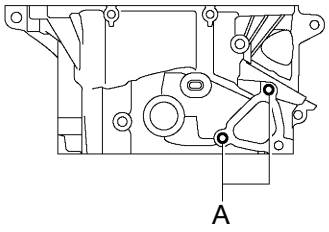


Cylinder Head LH Side:

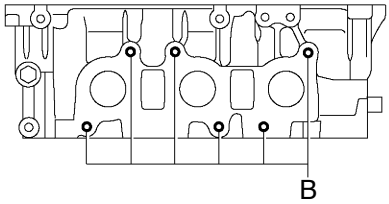
Upper Side:

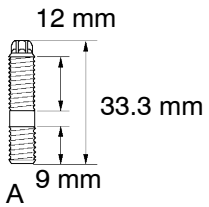


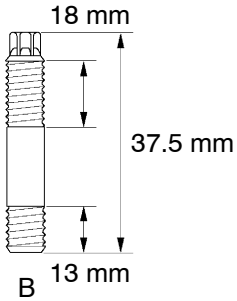
Rear Side:



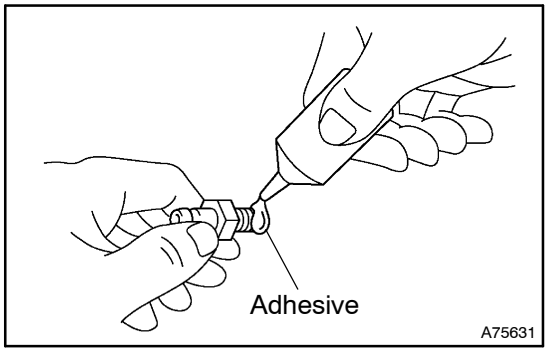
Exhaust Manifold Side:







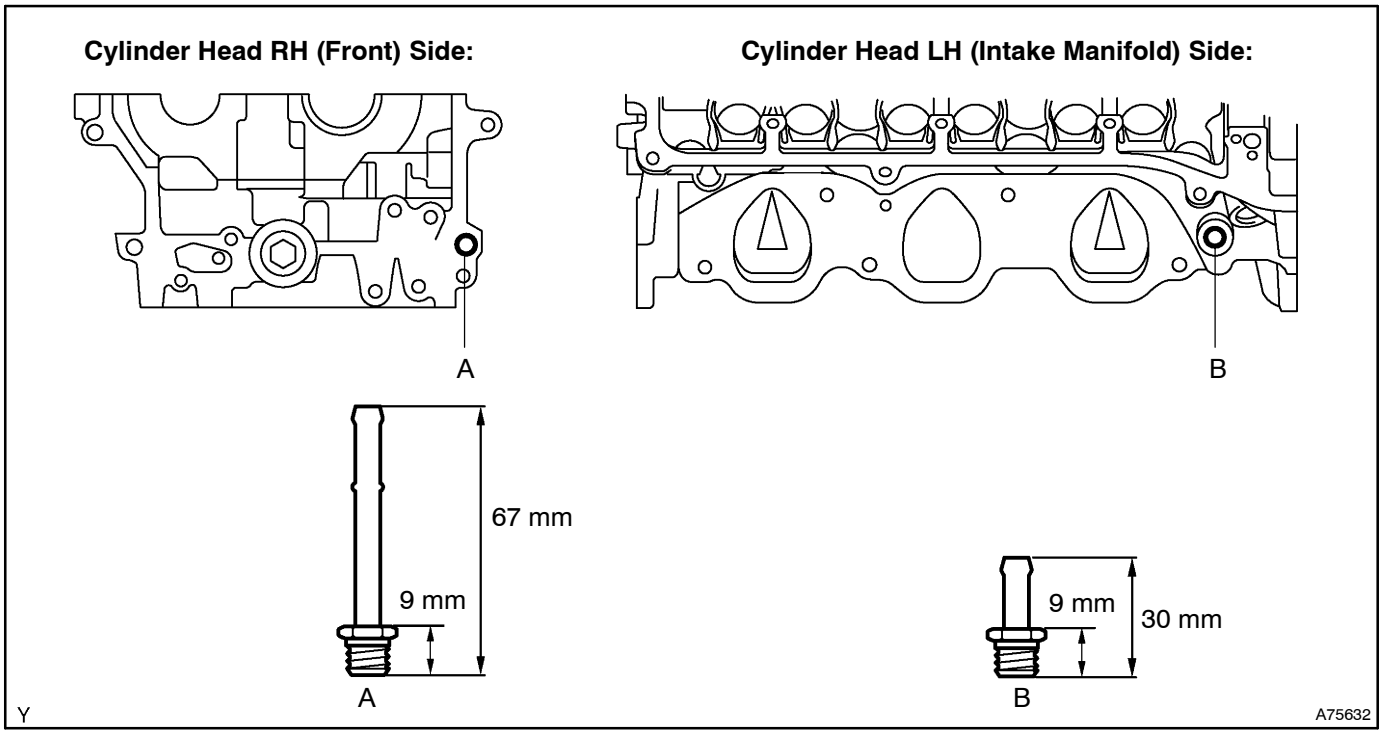
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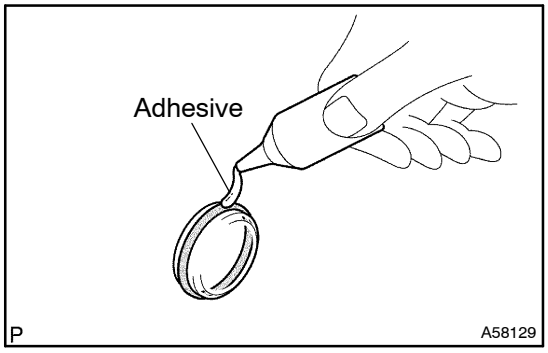


23. INSTALL UNION

(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.

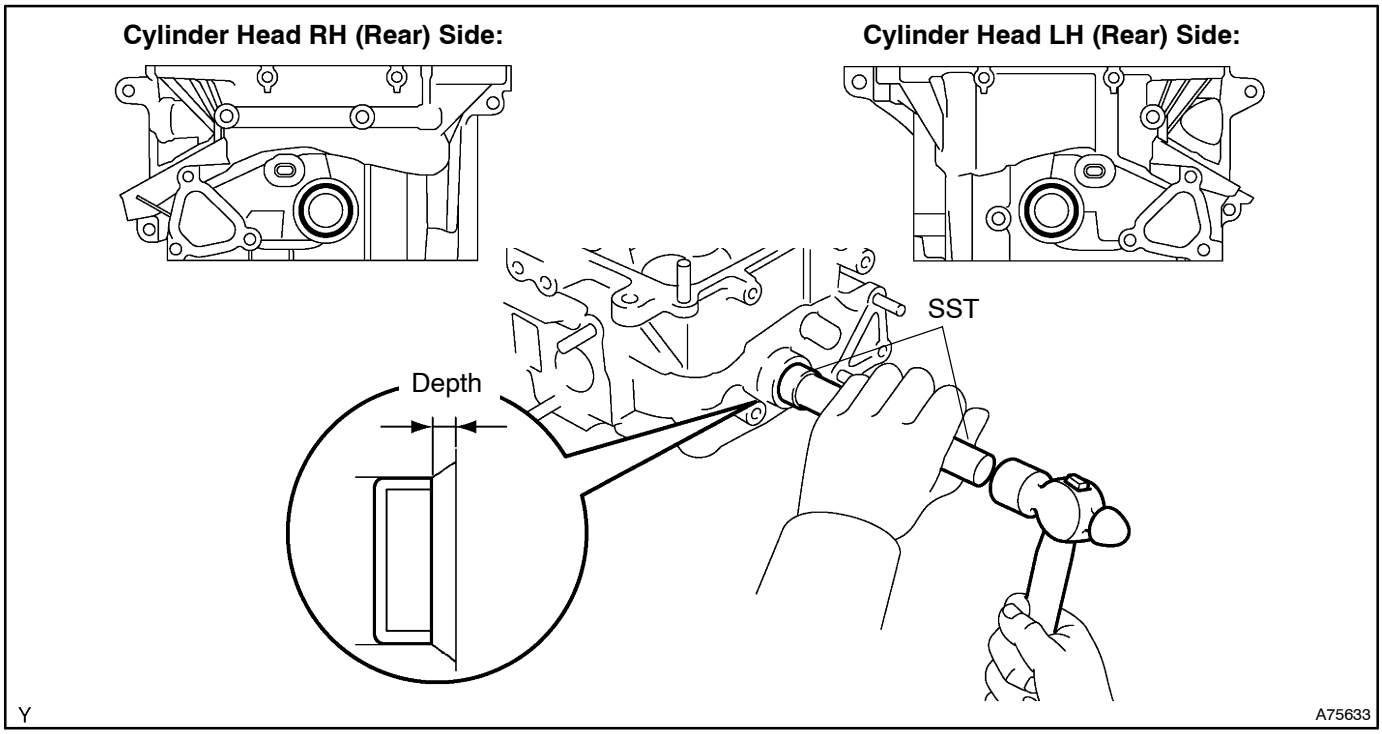
Adhesive:

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

(b) Using SST, tap in the tight plugs to the specified depth.

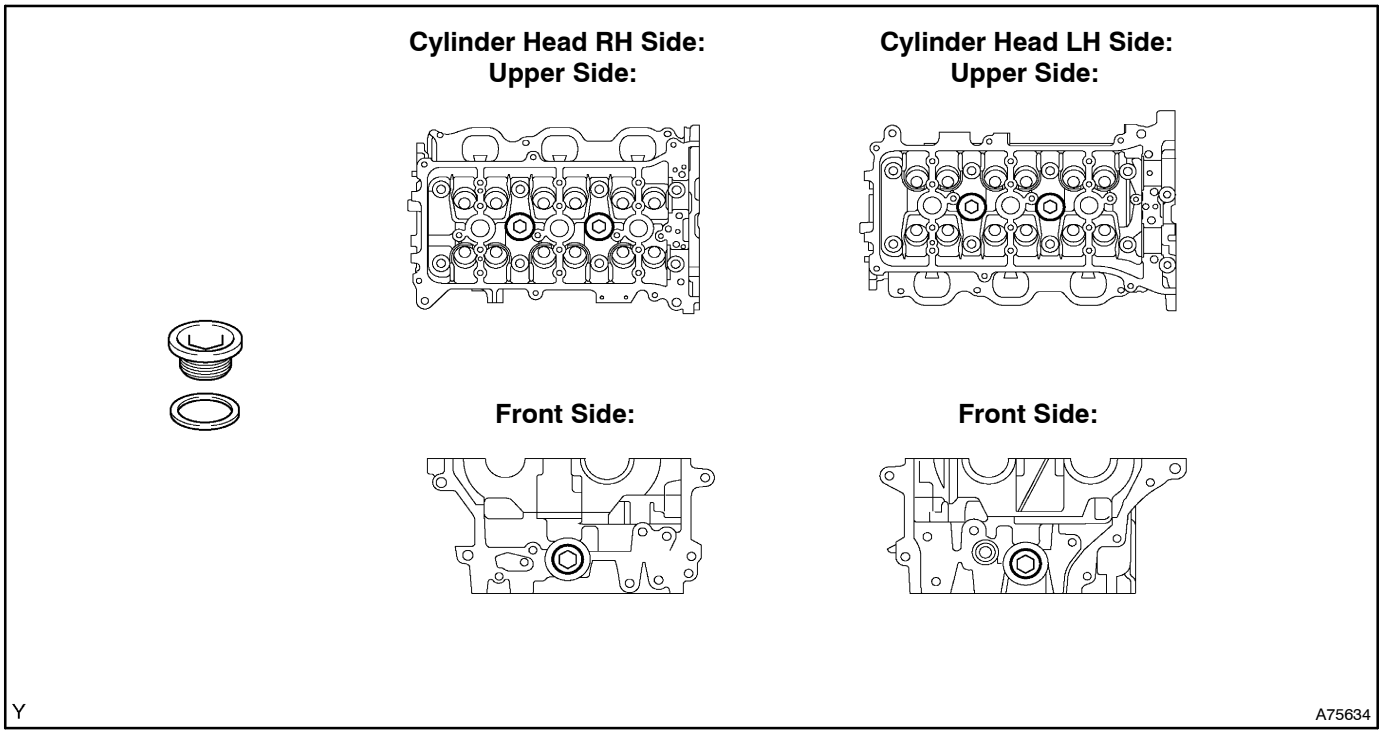
SST 09950–60010 (09951–00250), 09950–70010 (09951–07150)

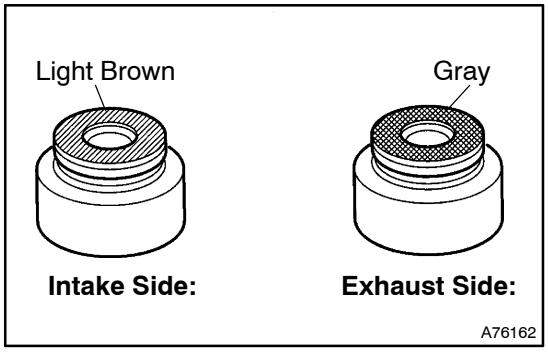
Specified depth: 1.5 mm (0.059 in.)



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)

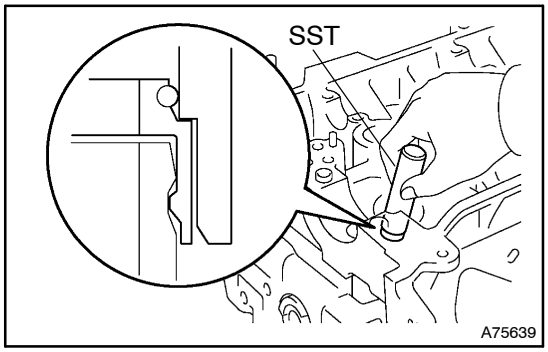




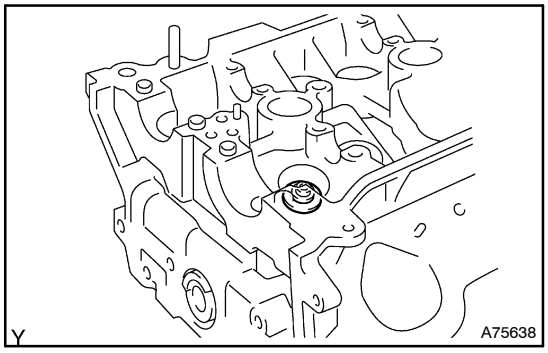
26. INSTALL VALVE STEM OIL O SEAL OR RING

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

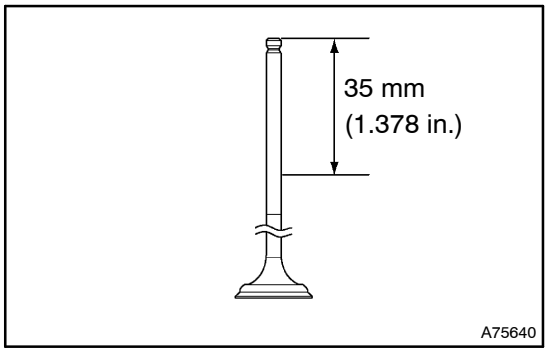
(a) Apply a light coat of engine oil to the valve guide bush.



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

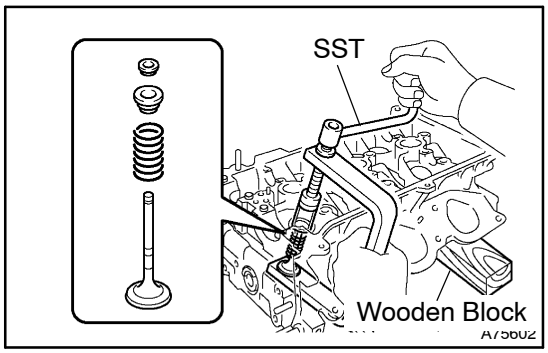


27. INSTALL VALVE SPRING SEAT

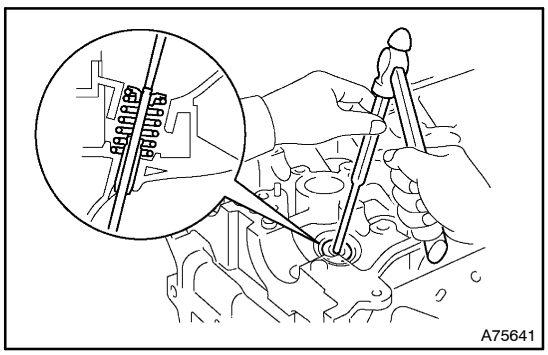


28. INSTALL VALVE

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

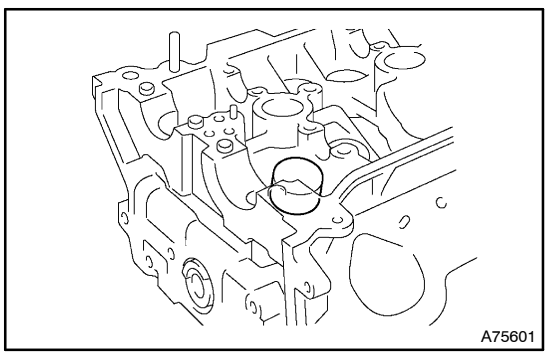


(b) Place the cylinder head on the wooden block.
(c) Install the valve, inner compression spring and valve spring retainer.
(d) Using SST, compress the inner compression spring and place the 2 valve spring retainer rocks around the valve stem.
SST 09202–70020 (09202–00010)



(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 its.
(b) Check that the valve lifter rotates smoothly by hand.