140ZM-01

OVERHAUL

HINT:

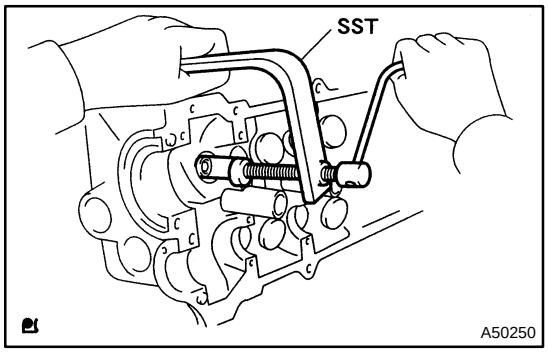
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.

1. REMOVE VALVE LIFTER

(a) Remove the valve lifter and adjusting shim.

HINT:

Arrange the valve lifters and shims in correct order.



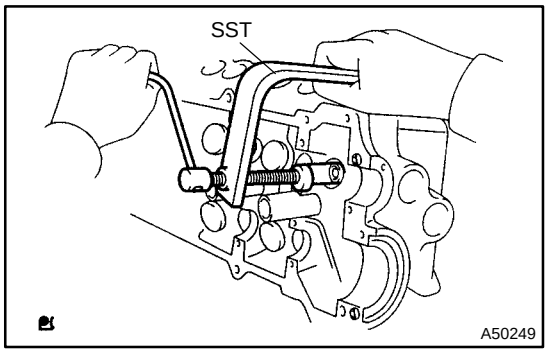
2. REMOVE INTAKE VALVE

(a) Using SST, compress the compression spring and remove the 2 keepers.
SST 09202-70020 (09202-01010)

(b) Remove the spring retainer, compression spring, valve and spring seat.

HINT:

Arrange the valves, compression springs, spring seats and spring retainers in correct order.



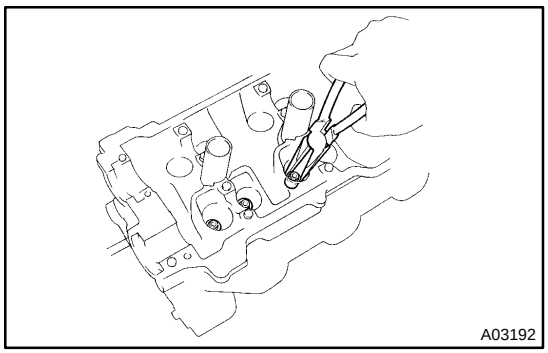
3. REMOVE EXHAUST VALVE

(a) Using SST, compress the compression spring and remove the 2 keepers.
SST 09202-70020 (09202-00010)

(b) Remove the spring retainer, compression spring, valve and spring seat.

HINT:

Arrange the valves, compression springs, spring seats and spring retainers in correct order.



4. REMOVE VALVE STEM OIL O SEAL OR RING

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

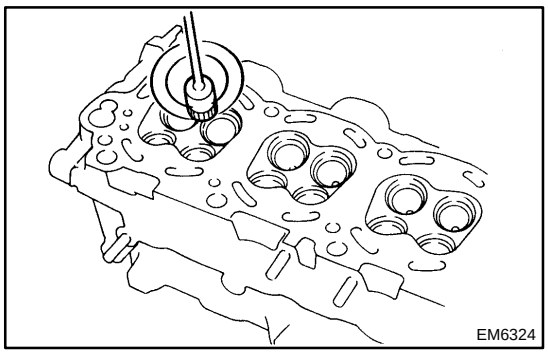
5. INSPECT CYLINDER HEAD SUB-ASSY

(a) Clean the cylinder head.

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

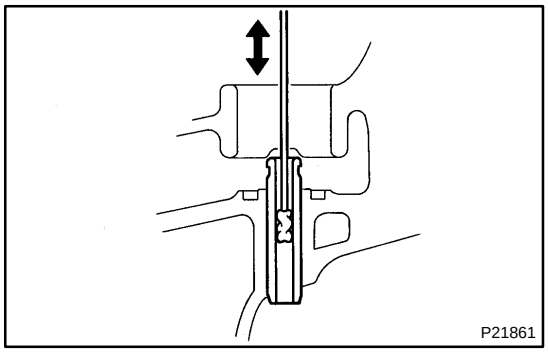
NOTICE:

Be careful not to scratch the cylinder block contact surface.

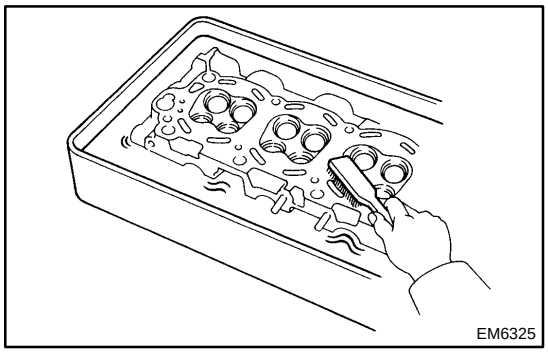


(2) Using a wire brush, remove all the carbon from the combustion chambers.

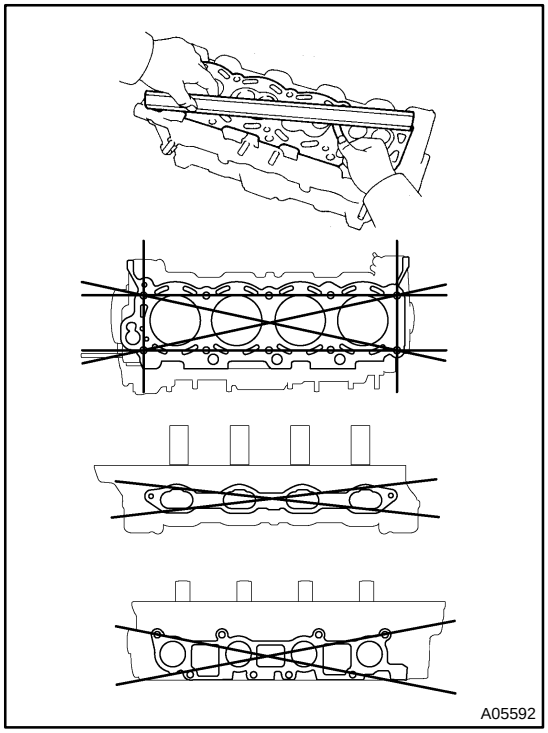
NOTICE:
Be careful not to scratch the cylinder block contact surface.



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



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

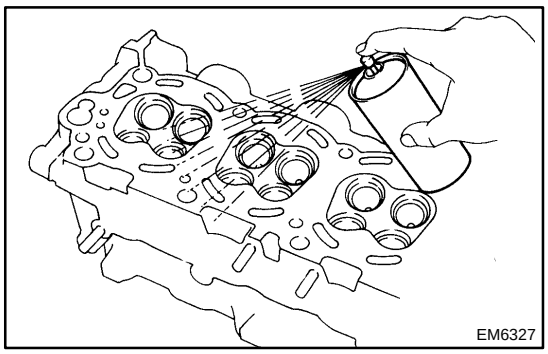


(b) Inspect for flatness.

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

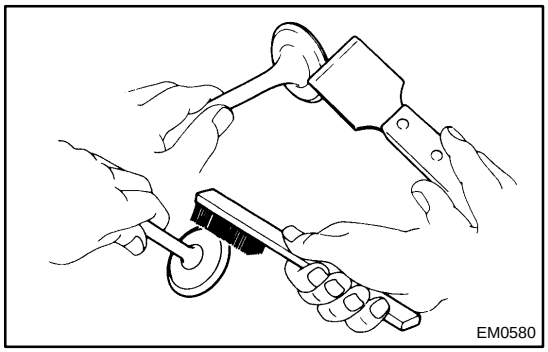
Maximum warpage: 0.10 mm (0.0039 in.)

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



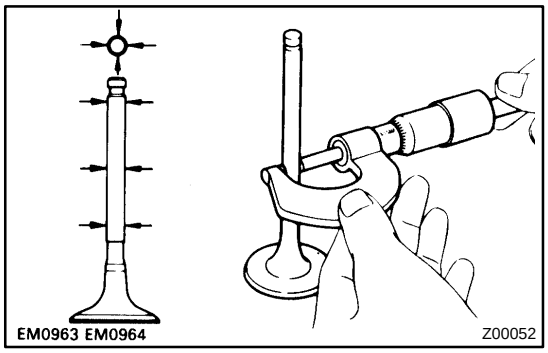
(c) Inspect for cracks.
(1) Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.



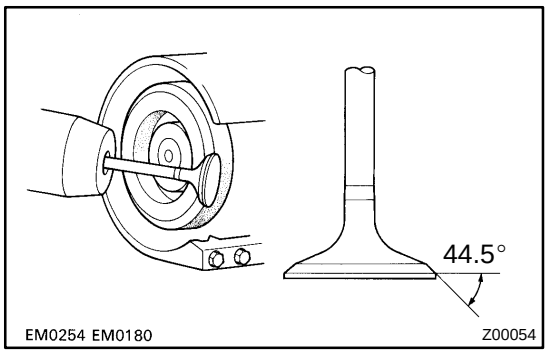
6. INSPECT VALVE

(a) Clean the valves.
(1) Using a gasket scraper, chip off any carbon from the valve head.
(2) Using a wire brush, thoroughly clean the valve.



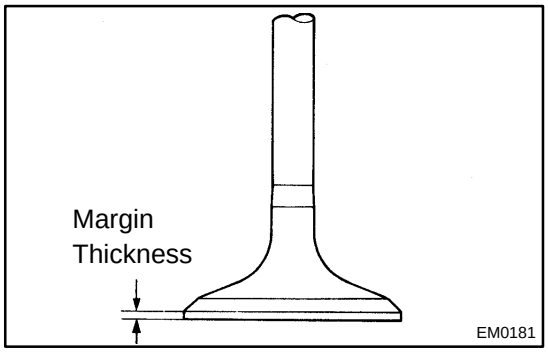
(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:
Intake 5.470 - 5.485 mm (0.2154 - 0.2159 in.)
Exhaust 5.465 - 5.480 mm (0.2152 - 0.2157 in.)



(c) Check the 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.

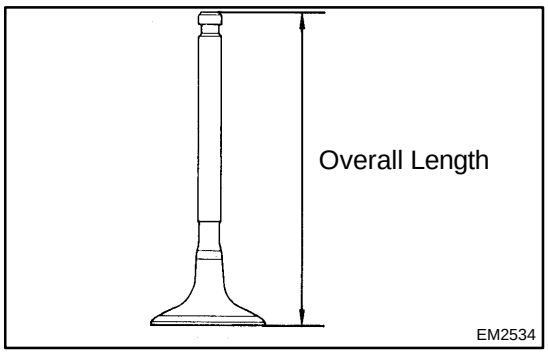
Valve face angle: 44.5°



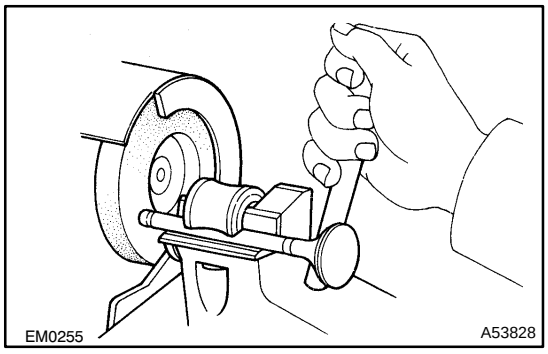
(d) Check the valve head margin thickness.

Standard margin thickness:
Intake 1.25 mm (0.049 in.)
Exhaust 1.4 mm (0.055 in.)
Minimum margin thickness: 0.5 mm (0.020 in.)

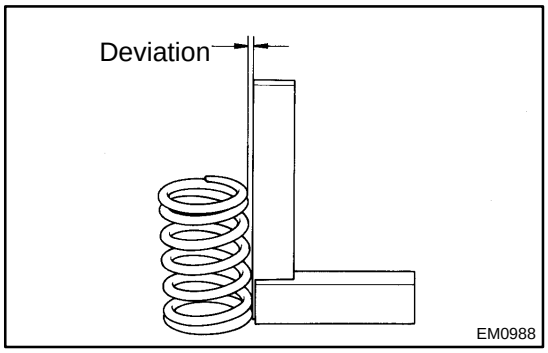
If the margin thickness is less than minimum, replace the valve.



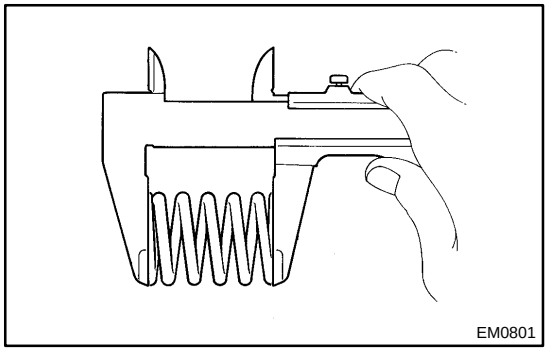
(e) Check the valve overall length.
Standard overall length:
Intake 95.05 mm (3.7421 in.)
Exhaust 95.10 mm (3.7441 in.)
Minimum overall length:
Intake 94.55 mm (3.7224 in.)
Exhaust 94.60 mm (3.7244 in.)
If the overall length is less than minimum, replace the valve.



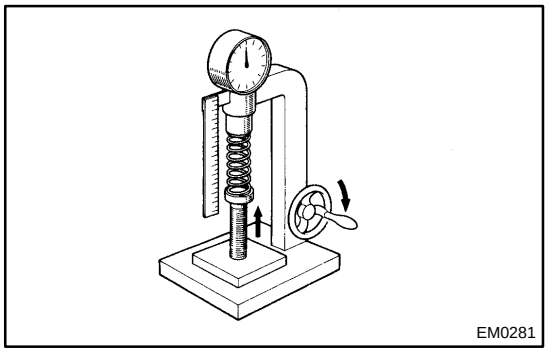
(f) Check the surface of the valve stem tip for wear.
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.
NOTICE:
Do not grind off more than minimum.



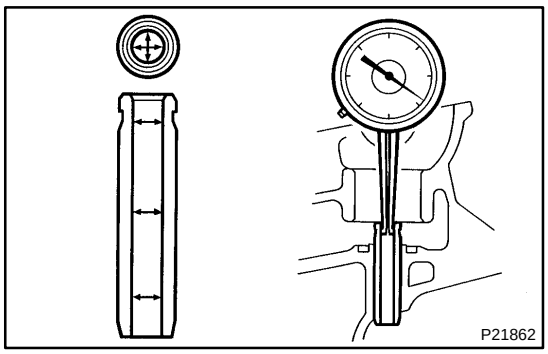
7. INSPECT INNER COMPRESSION SPRING
(a) Using a steel square, measure the deviation of the valve spring.
Maximum deviation: 2.0 mm (0.079 in.)
If the deviation is greater than maximum, replace the valve spring.



(b) Using vernier calipers, measure the free length of the valve spring.
Free length: 54.1 mm (2.130 in.)
If the free length is not as specified, replace the valve spring.



(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.
Installed tension:
210 - 226 N (21.4 - 23.0 kgf, 47.2 - 50.7 lbf)
at 35.0 mm (1.378 in.)
If the installed tension is not as specified, replace the valve spring.



8. INSPECT VALVE GUIDE BUSH

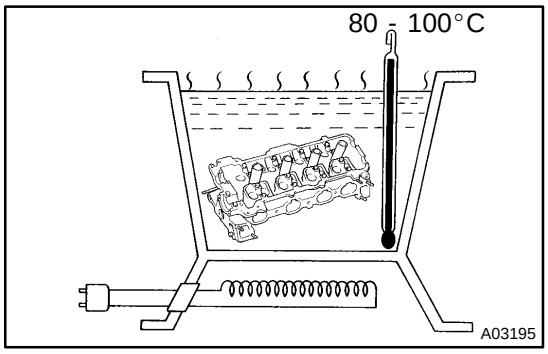
(a) Using a caliper gauge, measure the inside diameter of the guide bush.

Bush inside diameter:
5.510 - 5.530 mm (0.2169 - 0.2177 in.)

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

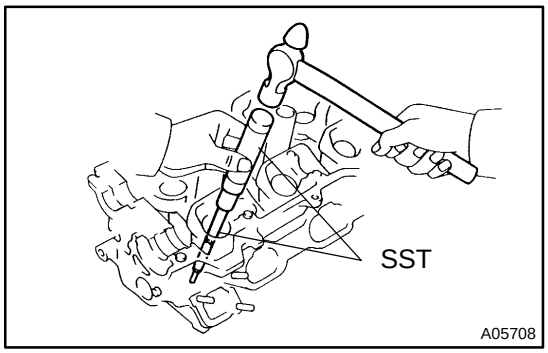
Standard oil clearance:
Intake 0.025 - 0.060 mm (0.0010 - 0.0024 in.)
Exhaust 0.030 - 0.065 mm (0.0012 - 0.0026 in.)
Maximum oil clearance:
Intake 0.08 mm (0.0031 in.)
Exhaust 0.10 mm (0.0039 in.)

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

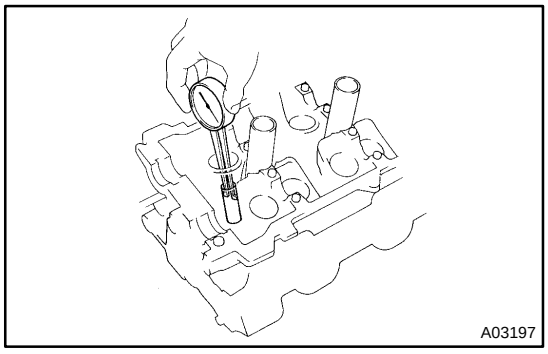


9. REMOVE VALVE GUIDE BUSH

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

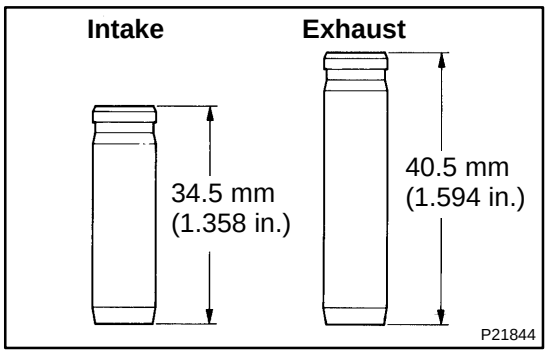


(b) Using SST and a hammer, tap out the guide bush.
SST 09201- 10000 (09201- 01060), 09950- 70010 (09951-07100)



10. INSTALL VALVE GUIDE BUSH

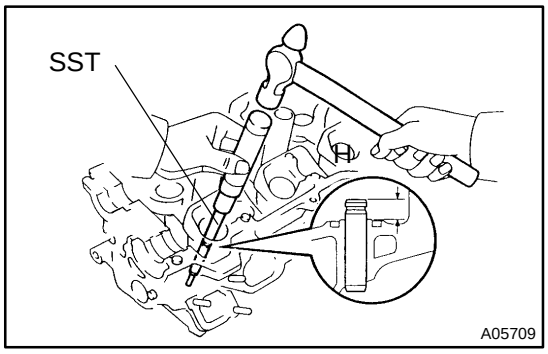
(a) Using a caliper gauge, measure the bush bore diameter of the cylinder head.



(b) Select a new guide bush (STD or O/S 0.05).

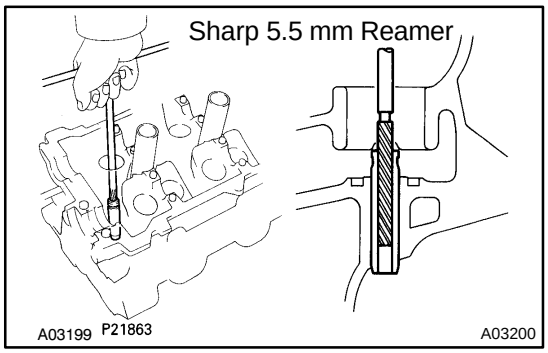
Bush bore diameter	Bush size
10.285 - 10.306 mm (0.4049 - 0.4057 in.)	Use STD
10.335 - 10.356 mm (0.4069 - 0.4077 in.)	Use O/S 0.05

If the bush bore diameter of the cylinder head is greater than 10.306 mm (0.4057 in.), machine the bush bore to this dimension of 10.335 - 10.356 mm (0.4069 - 0.4077 in.).
If the bush bore diameter of the cylinder head is greater than 10.356 mm (0.4077 in.), replace the cylinder head.
HINT:
Different the bushes are used for the intake and exhaust.

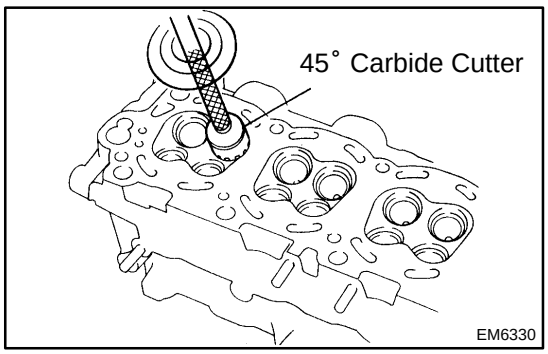


(c) Gradually heat the cylinder head to 80 - 100°C (176 - 212°F).

(d) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.
SST 09201-10000 (09201-01060),
09950-70010 (09951-07100)
Protrusion height :
Intake 9.2 - 9.8 mm (0.362 - 0.386 in.)
Exhaust 8.2 - 8.8 mm (0.323 - 0.346 in.)

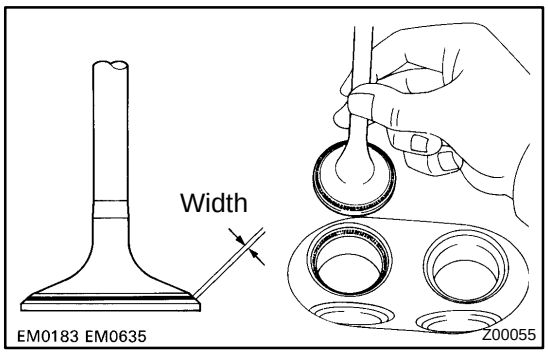


(e) Using a sharp 5.5 mm reamer, ream the guide bush to obtain the standard specified clearance between the guide bush and valve stem.



11. INSPECT VALVE SEAT

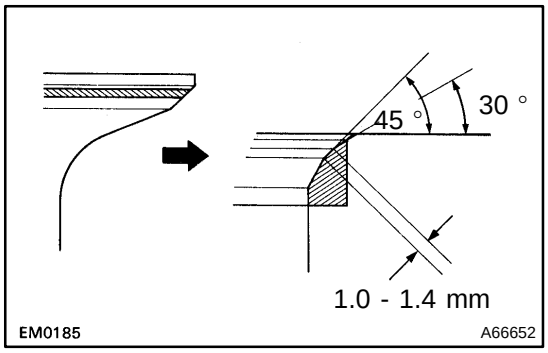
(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.



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

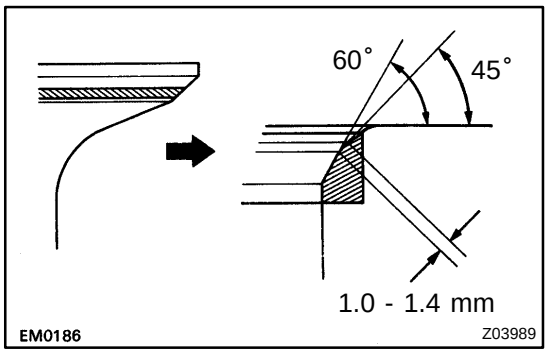
(c) Check the valve face and seat for the following:
  (1) If blue appears 360˚ around the face, the valve is concentric. If not, replace the valve.
  (2) If blue appears 360˚ around the valve seat, the guide and face are concentric. If not, resurface the seat.
  (3) Check that the seat contact is in the middle of the valve face with these width:

Width: 1.0 - 1.4 mm (0.039 - 0.055 in.)

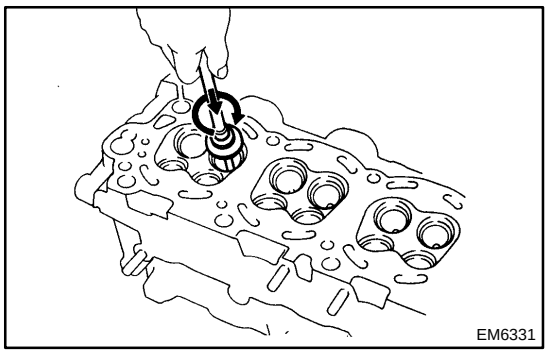


12. REPAIR VALVE SEAT

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

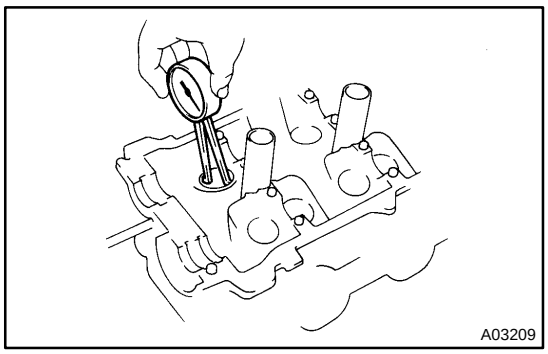


(b) If the seating is too low on the valve face use 60˚ and 45˚ cutters to correct the seat.



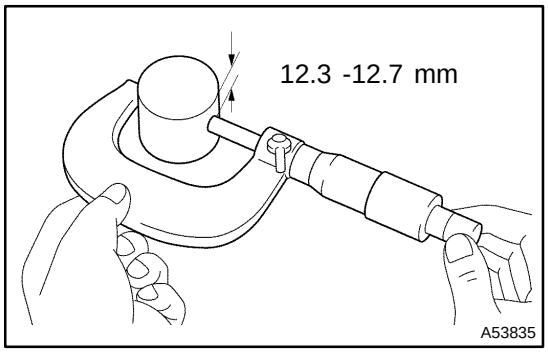
(c) Hand-lap the valve and valve seat with an abrasive compound.

(d) After hand-lapping, clean the valve and valve seat.



13. INSPECT VALVE LIFTER

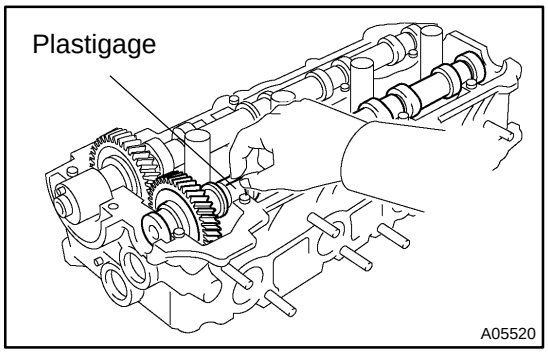
(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.000 - 31.016 mm (1.2205 - 1.2211 in.)



(b) Using a micrometer, measure the lifter diameter at the 12.3 - 12.7 mm (0.484 – 0.500 in.) from the top surface.
Lifter diameter:
30.968 - 30.976 mm (1.2192 - 1.2195 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Standard oil clearance:
0.024 - 0.050 mm (0.0009 - 0.0020 in.)
Maximum oil clearance: 0.07 mm (0.0028 in.)

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

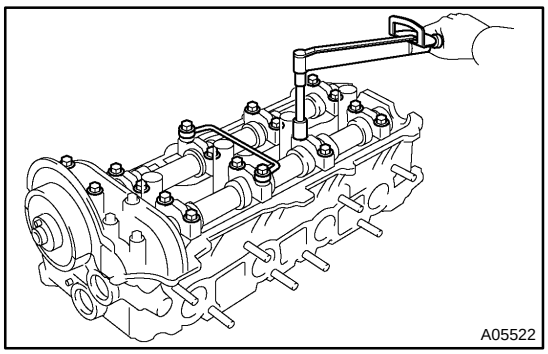


14. INSPECT CAMSHAFT OIL CLEARANCE

(a) Clean the bearing caps and camshaft journals.
(b) Check that bearings for flaking and scoring.

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

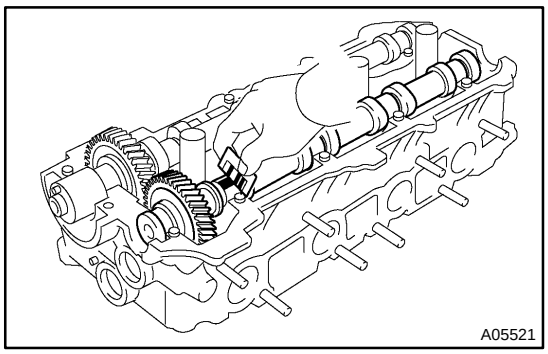
(c) Place the camshafts on the cylinder head.
(d) Lay a strip of plastigage across each of the camshaft journals.



(e) Install the bearing caps. (See page 14-31)
Torque: 16 N·m (163 kgf·cm, 12 ft·lbf)

NOTICE:
Do not turn the camshaft.

(f) Remove the bearing caps.

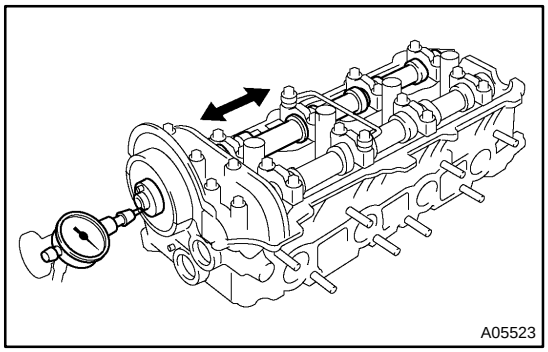


(g) Measure the plastigage at its widest point.
Standard oil clearance:
0.030 - 0.071 mm (0.0012 - 0.0028 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)

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

(h) Completely remove the plastigage.

(i) Remove the camshafts.



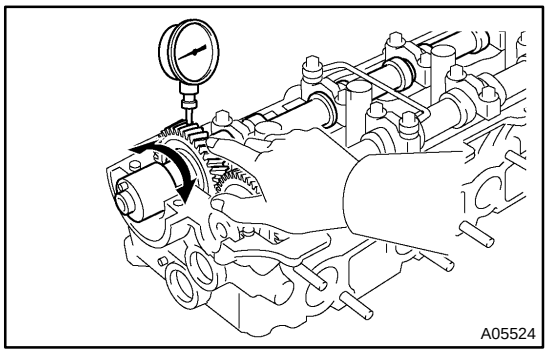
15. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the camshafts. (See page 14-31)

(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.
Standard thrust clearance:
Intake 0.040 - 0.090 mm (0.0016 - 0.0035 in.)
Exhaust 0.030 - 0.075 mm (0.0012 - 0.0030 in.)
Maximum thrust clearance:
Intake 0.12 mm (0.0047 in.)
Exhaust 0.1 mm (0.0039 in.)

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

(c) Remove the camshafts.



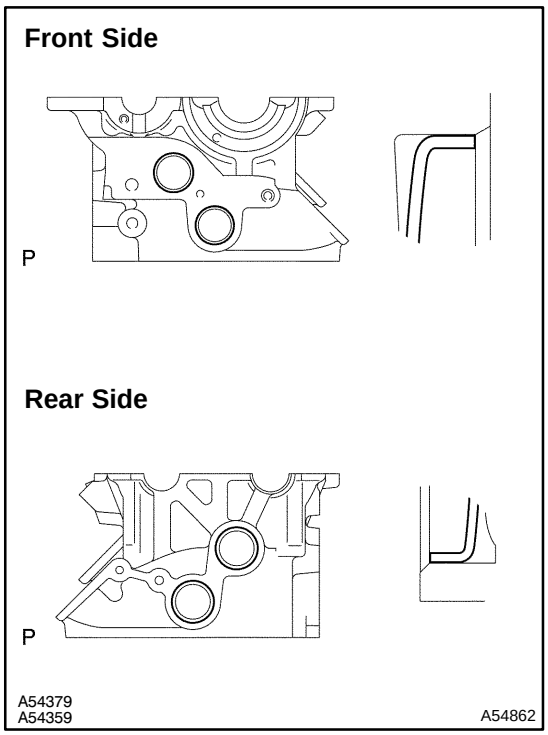
16. INSPECT CAMSHAFT GEAR BACKLASH

(a) Install the camshafts without installing the exhaust cam-sub-gear and front bearing cap. (See page 14-31)

(b) Using a dial indicator, measure the backlash.
Standard backlash:
0.020 - 0.200 mm (0.0008 - 0.0079 in.)
Maximum backlash: 0.30 mm (0.0118 in.)

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

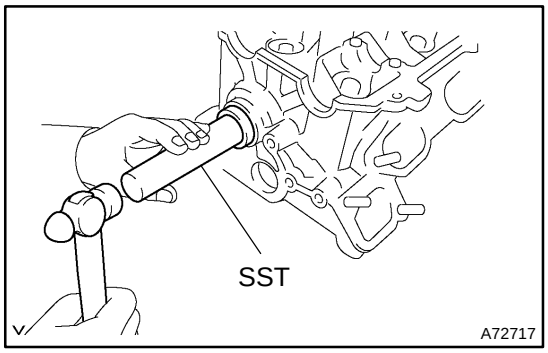
(c) Remove the camshafts.



17. INSTALL TIGHT PLUG NO.1

(a) Apply adhesive to the tight plug.

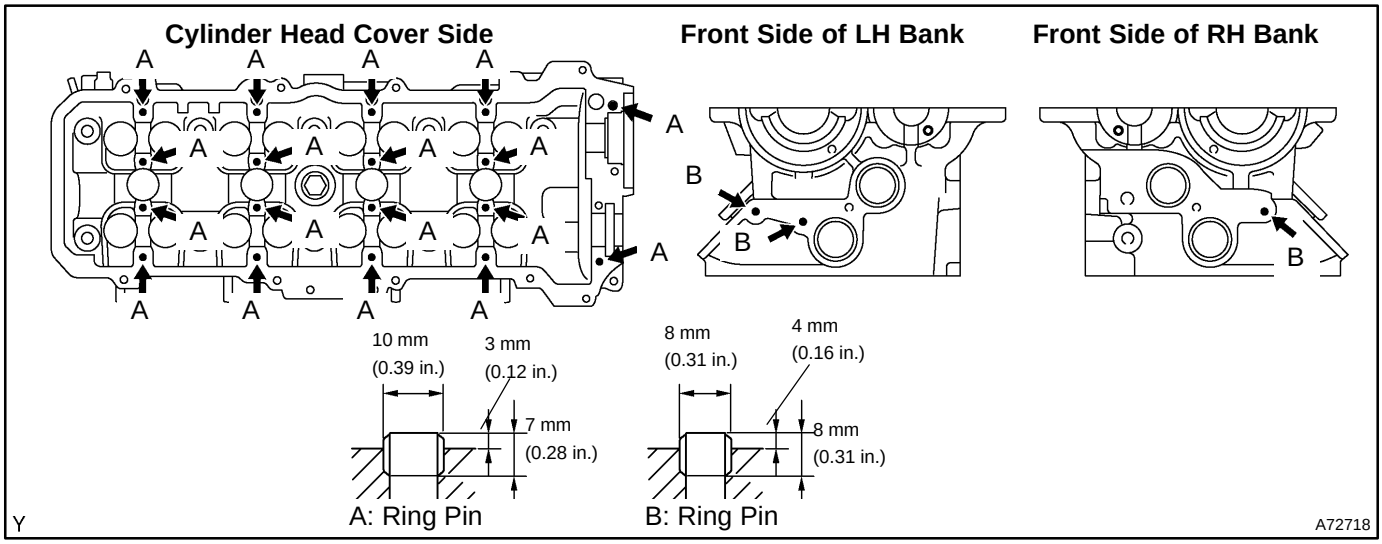
Adhesive:
Part No. 08833-00070, THREE BOND 1324 or equivalent



(b) Using SST and a hammer, tap in a new tight plug as shown in the illustration.

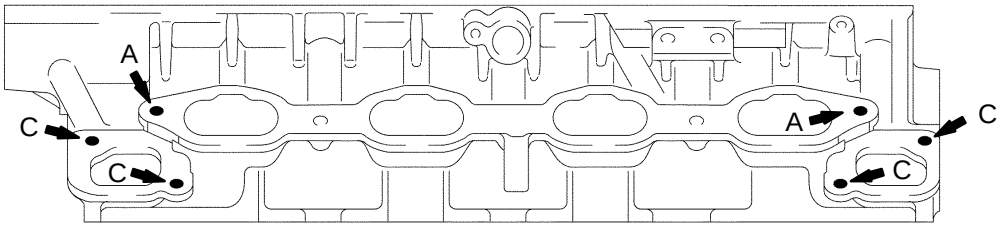
SST 09950-60010 (09951-00300), 09950-70010 (09951-07100)

18. INSTALL CAMSHAFT BEARING CAP SETTING RING PIN

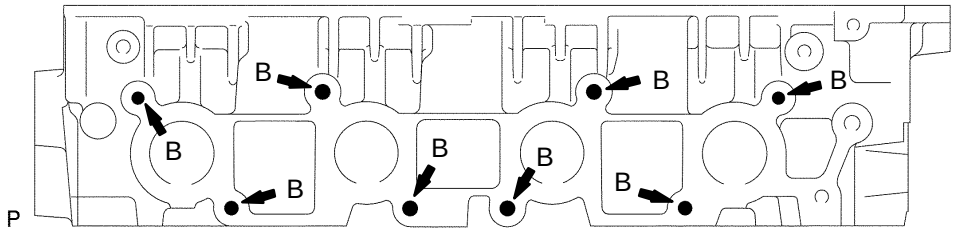


19. INSTALL STUD BOLT

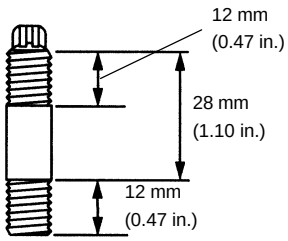
Intake Manifold Side



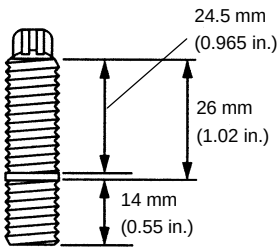
Exhaust Manifold Side



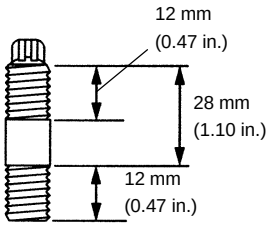
A: Stud Bolt
(Thread diameter: 8 mm)



B: Stud Bolt
(Thread diameter: 10 mm)



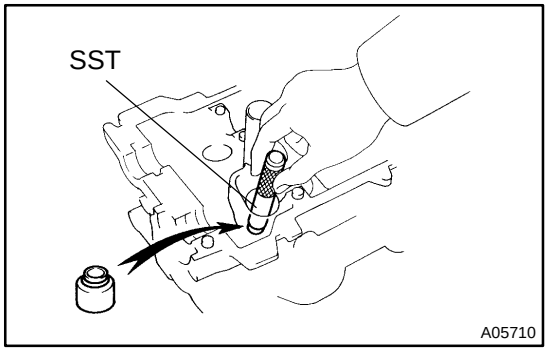
C: Stud Bolt
(Thread diameter: 8 mm)



Torque:
9.0 N·m (90 kgf·cm, 80 in.·lbf) for A, C
15 N·m (150 kgf·cm, 11 ft·lbf) for B

A54354
A50262

A53860



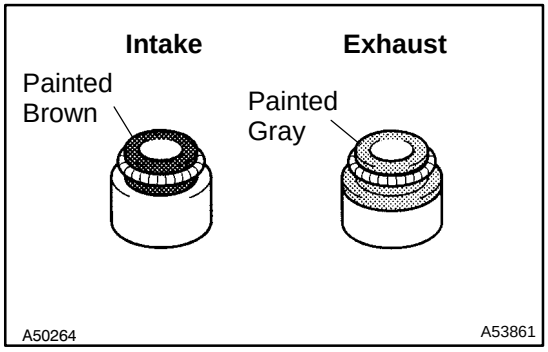
20. INSTALL VALVE STEM OIL O SEAL OR RING

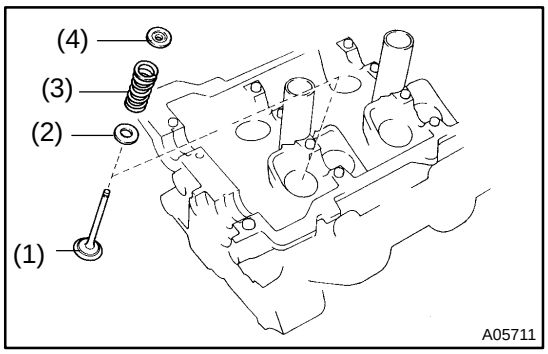
(a) Using SST, push in a new oil seal.

HINT:

The oil seal for intake is brown and the oil seal for exhaust is gray.

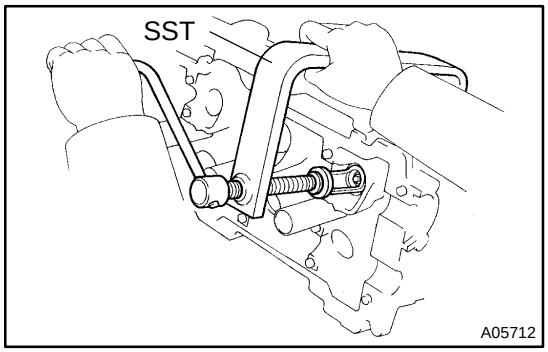
SST 09201-41020



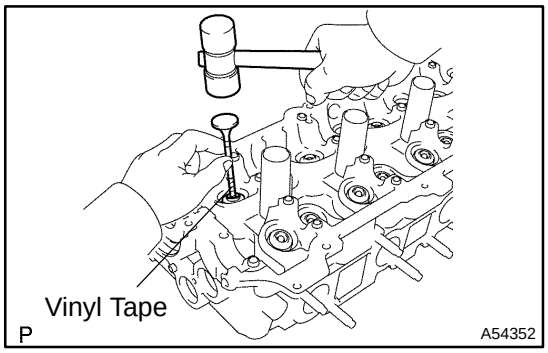


21. INSTALL VALVE

(a) Install these parts:
(1) Valve
(2) Spring seat
(3) Valve spring
(4) Spring retainer



(b) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
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 assure proper fit.

NOTICE:
Be careful not do damage the valve stem tip.

22. INSTALL VALVE LIFTER

(a) Install the valve lifter and shim.
(b) Check that the valve lifter rotates smoothly by hand.