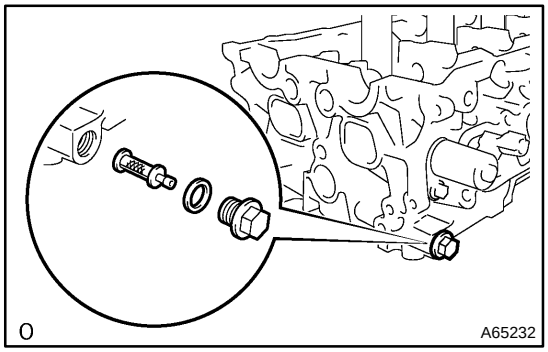
CYLINDER HEAD ASSY (2ZZ–GE)

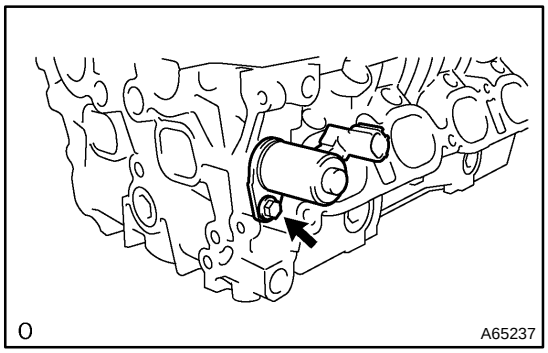
140RJ–01

OVERHAUL



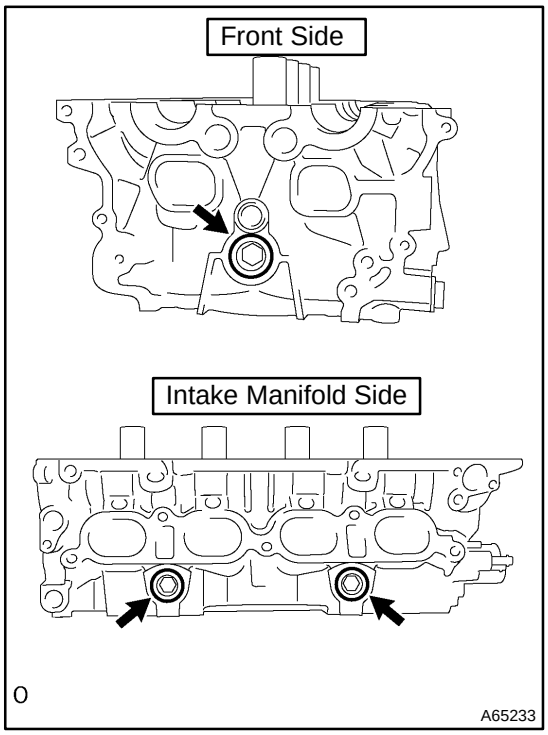
1. REMOVE OIL CONTROL VALVE FILTER

(a) Remove the plug and oil control valve filter.



2. REMOVE CAMSHAFT TIMING OIL CONTROL VALVE ASSY

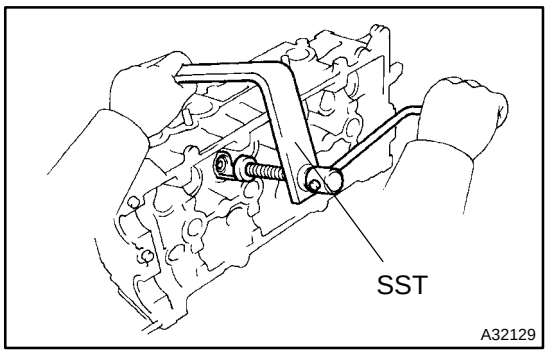
(a) Remove a bolt and oil control valve.



3. REMOVE W/HEAD TAPER SCREW PLUG NO.1

(a) Using hexagon socket wrench (14), remove 3 taper screw plug No.1 as shown in the illustration.

4. REMOVE VALVE ADJUSTING SHIM



5. REMOVE INNER COMPRESSION SPRING

HINT:

Arrange the inner compression spring, spring retainer and retainer lock in the correct order.

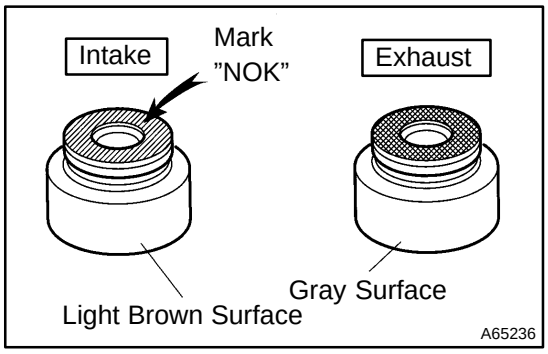
(a) Using SST compress the inner compression spring and remove 2 keepers.
SST 09202–70020

(b) Remove the spring retainer.

(c) Remove the inner compression spring.

6. REMOVE VALVE STEM OIL O SEAL OR RING

(a) Using a needle–nose pliers,remove the valve stem oil o seal or ring.



7. REMOVE VALVE SPRING SEAT

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

HINT:

Arrange the spring seat in the correct order.

8. REMOVE INTAKE VALVE

HINT:.

Arrange the intake valve in the correct order.

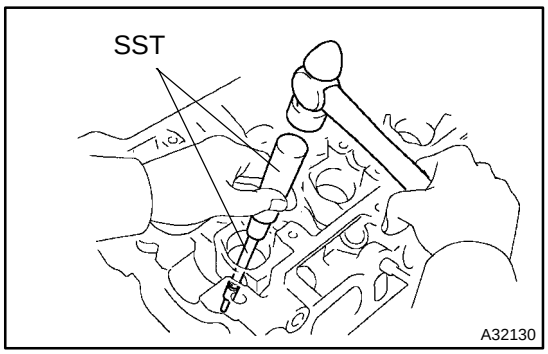
9. REMOVE EXHAUST VALVE

HINT:

Arrange the exhaust valve in the correct order.

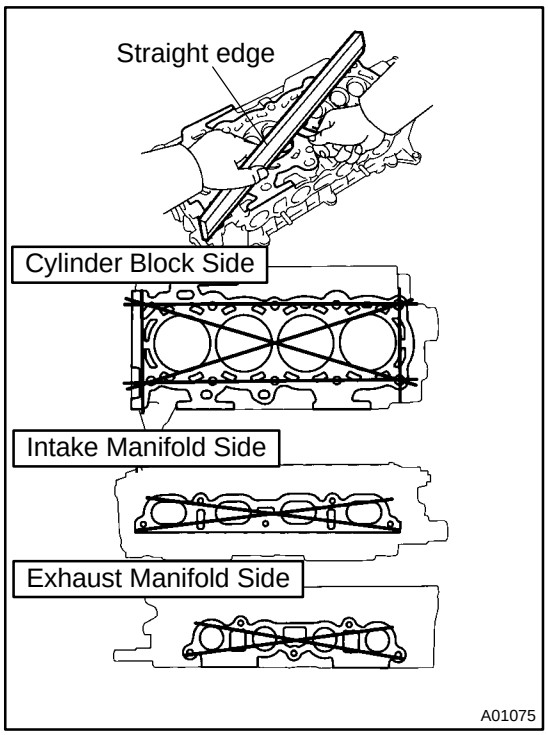
10. REMOVE VALVE GUIDE BUSH

(a) Heat the cylinder head to 110 – 130°C (230 – 266°F).



(b) Using SST and a hammer tap out the valve guide bushing.
SST 09201–10000, 09201–01055, 09950–70010 (09951–07100)

11. REMOVE STUD BOLT

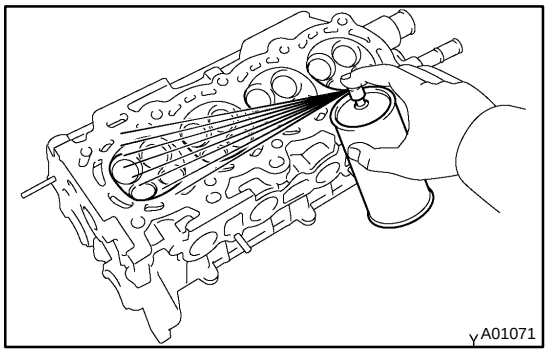


12. INSPECT CYLINDER HEAD FOR FLATNESS

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

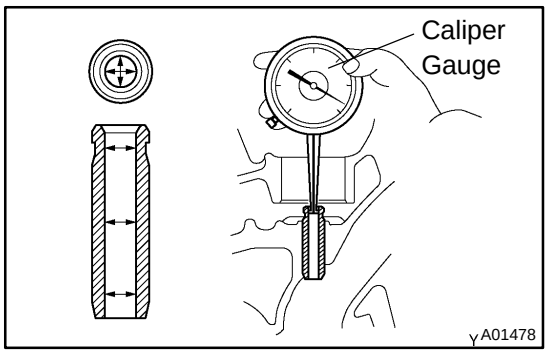
Maximum warpage:

Cylinder block side	0.2 mm (0.0080 in.)
Intake manifold side	0.2 mm (0.0080 in.)
Exhaust manifold side	0.3 mm (0.0120 in.)



13. INSPECT CYLINDER HEAD FOR CRACKS

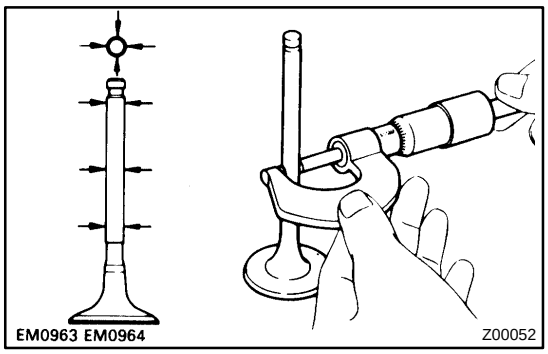
(a) Using a dye penetrate, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.



14. INSPECT VALVE GUIDE BUSHING OIL CLEARANCE

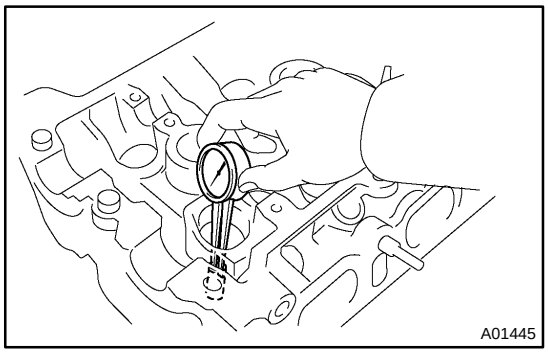
(a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Busing inside diameter:
5.500 – 5.518 mm (0.2165 – 0.2172 in.)



(b) Using a micrometer, measure the diameter of the valve stem.
Valve stem diameter:
Intake 5.460 – 5.475 mm (0.2145 – 0.2156 in.)
Exhaust 5.455 – 5.470 mm (0.2144 – 0.2154 in.)

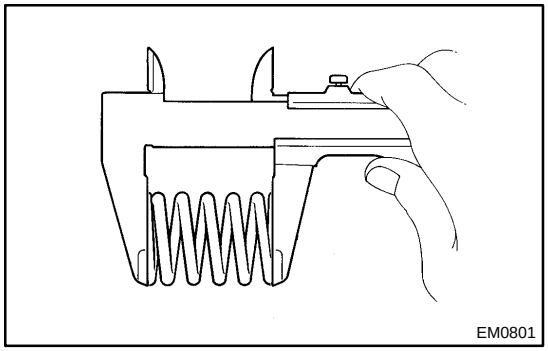
(c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.
Standard oil clearance:
Intake 0.025 – 0.058 mm (0.0010 – 0.0023 in.)
Exhaust 0.030 – 0.063 mm (0.0012 – 0.0025 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)



15. INSPECT VALVE GUIDE BUSH

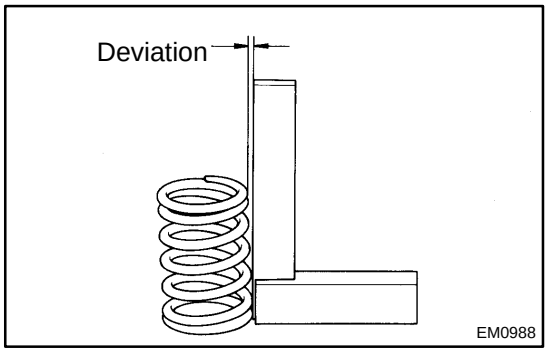
(a) If the busing bore diameter of the cylinder head is greater than 10.506 mm (0.4136 in.), machine the bushing bore to the dimension of 10.538 – 10.556 mm (0.4149 – 0.4156 in.) to install a over size busing.
Bushing bore diameter:
10.538 – 10.556 mm (0.4149 – 0.4156 in.)

bushing size	Bushing bore diameter mm (in.)
Use STD	10.448 – 10.506 (0.4129 – 0.4136)
Use O/S 0.05	10.538 – 10.556 (0.4149 – 0.4156)

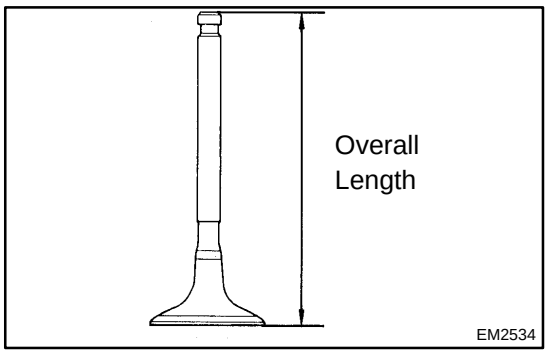


16. INSPECT INNER COMPRESSION SPRING

(a) Using a vernier caliper measure the free length of the valve spring.
Free length:
Intake 46.4 mm (1.827 in.)
Exhaust 46.5 mm (1.831 in.)

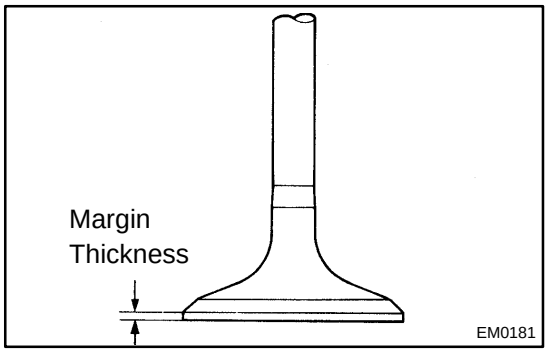


(b) Using a steel square, measure the deviation of the valve spring.
Maximum deviation: 1.6 mm (0.063 in.)
Maximum angle (reference): 2°

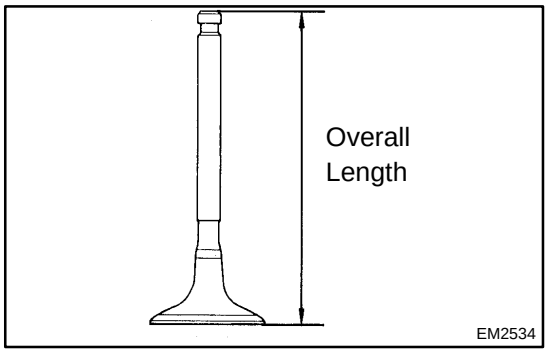


17. INSPECT INTAKE VALVE

(a) Check the valve overall length.
Standard overall length: 111.3 mm (4.382 in.)
Minimum overall length: 110.9 mm (4.366 in.)

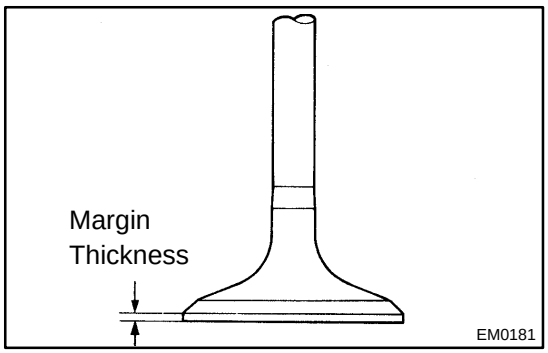


(b) Check the valve head margin thickness.
Standard margin thickness: 1.0 mm (0.039 in.)
Minimum margin thickness: 0.7 mm (0.028 in.)



18. INSPECT EXHAUST VALVE

(a) Check the valve overall length.
Standard overall length: 111.7 mm (4.392 in.)
MInimum overall length: 111.3 mm (4.382 in.)

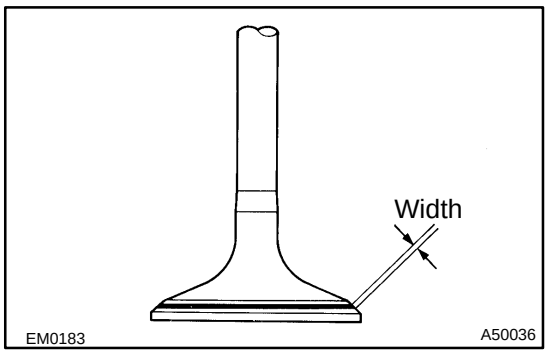


(b) Check the valve head margin thickness.
Standard margin thickness: 1.0 mm (0.039 in.)
MInimum margin thickness: 0.7 mm (0.028 in.)

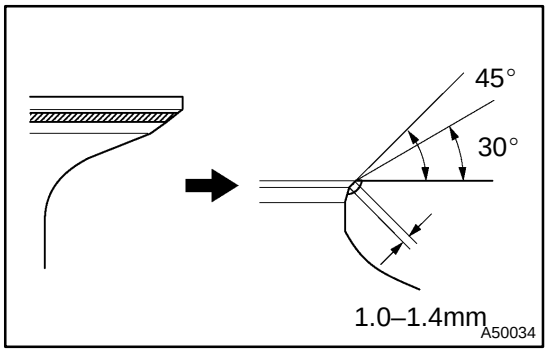
19. INSPECT VALVE SEATS

(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.).

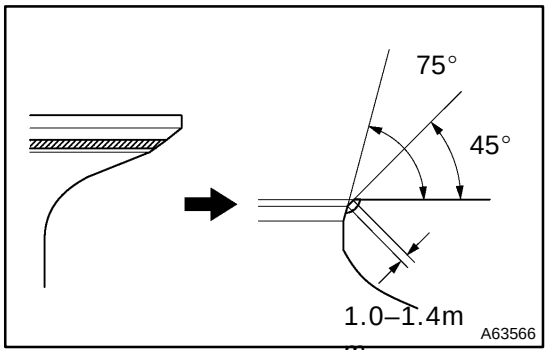


20. REPAIR VALVE SEATS

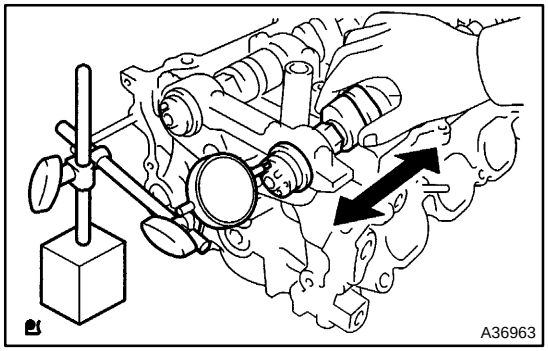
NOTICE:

Take off a cutter gradually to make smooth valve 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.

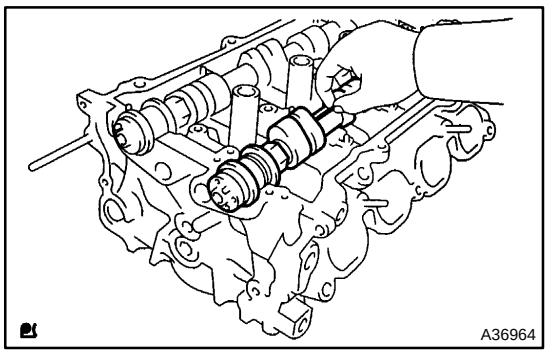


21. INSPECT CAMSHAFT THRUST CLEARANCE

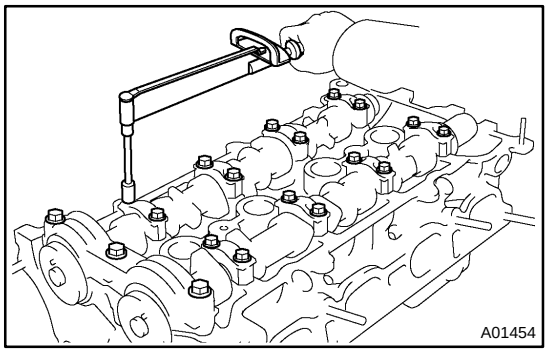
(a) Install the camshafts.
(b) Using a dial indicator measure the thrust clearance while moving the camshaft back and forth.
  Standard thrust clearance:
  0.10 – 0.24 mm (0.0039 – 0.0095 in.)
  Maximum thrust clearance: 0.15 mm (0.0059 in.)
(c) If the thrust clearance is greater than maximum, replace the cylinder head. If damages are found on the camshaft thrust surfaces, the camshaft also has to be replaced.

22. INSPECT CAMSHAFT OIL CLEARANCE

(a) Clean the bearing caps and camshaft journals.
(b) Place the camshafts on the cylinder head.



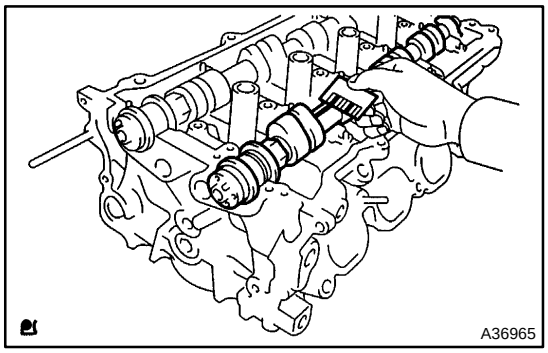
(c) Lay a strip of plastigage across each of the camshaft journal.



(d) Install the bearing caps (See page 14–262).
Torque: 18.5 N·m (189 kgf·cm, 14 ft·lbf)

NOTICE:
Do not turn the camshaft.

(e) Remove the bearing caps.



(f) Measure the plastigage at its widest point.
Standard oil clearance:
0.025 – 0.062 mm (0.0001 – 0.0024 in.)
Maximum oil clearance: 0.062 mm (0.0024 in.)

NOTICE:
Completely remove the plastigage after the measuring.

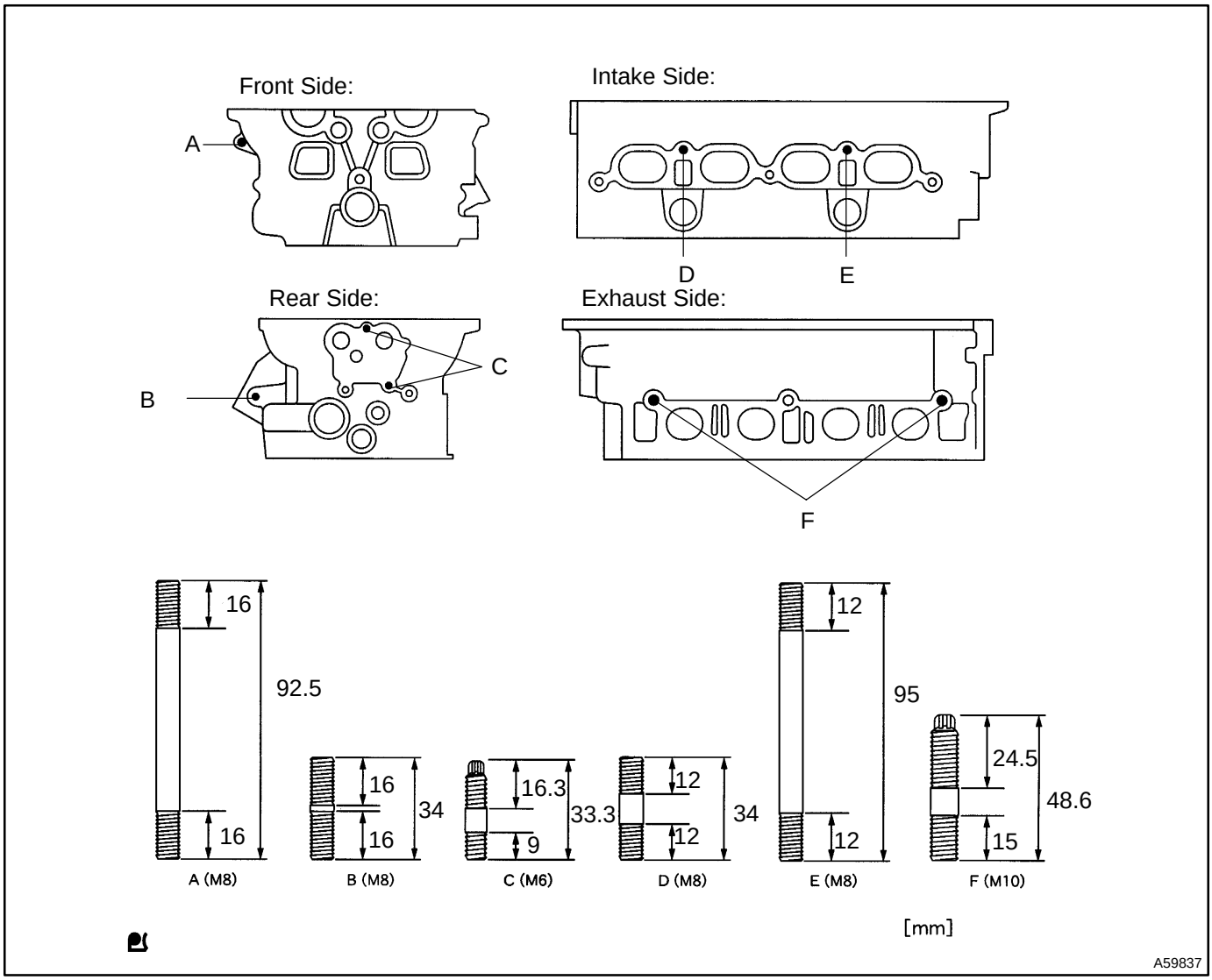
(g) If the oil clearance is greater than maximum, replace the cylinder head.

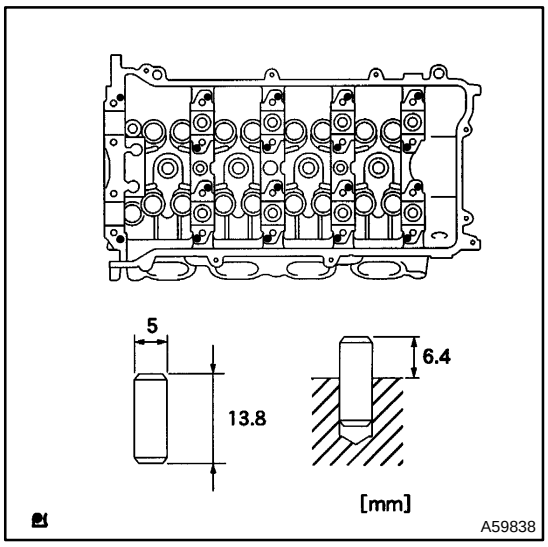
23. INSTALL STUD BOLT

(a) Install the stud bolts as shown in the illustration.

Torque:

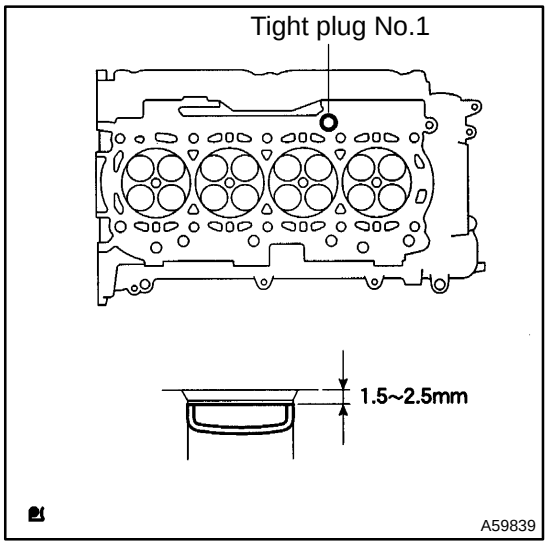
A 9.5 N·m (97 kgf·cm, 84 in.·lbf)
B 9.5 N·m (97 kgf·cm, 84 in.·lbf)
C 5.0 N·m (51 kgf·cm, 44 in.·lbf)
D 9.5 N·m (97 kgf·cm, 84 in.·lbf)
E 9.5 N·m (97 kgf·cm, 84 in.·lbf)
F 19 N·m (194 kgf·cm, 14 ft·lbf)





24. INSTALL RING PIN

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



25. INSTALL TIGHT PLUG NO.1

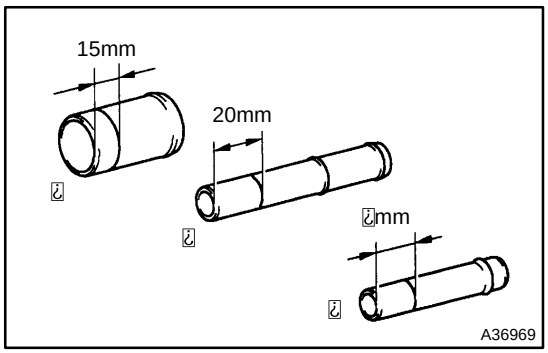
(a) Apply adhesive around tight plugs.

Adhesive:

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

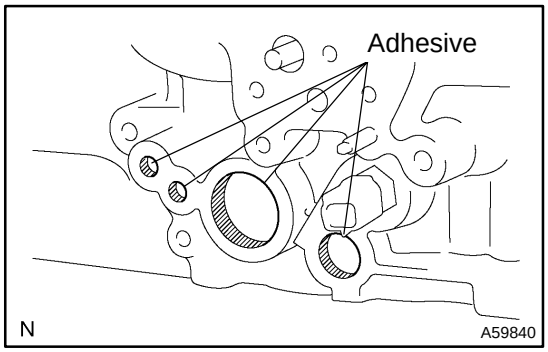
SST 09950–60010 (09951–00350), 09950–70010 (09951–07100)

Standard depth: 1.5 – 2.5 mm (0.0591 – 0.9843 in.)



26. INSTALL UNION

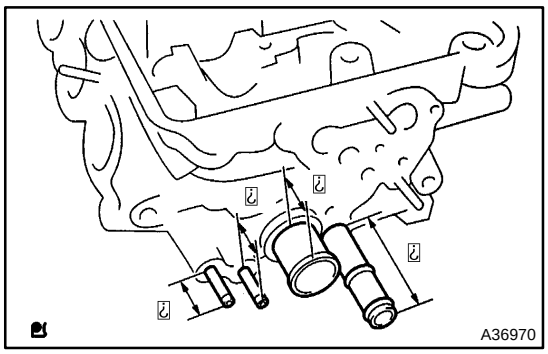
(a) Mark the standard position away from the edge, onto the water hose union as shown in the illustration.



(b) Apply adhesive to the water hose union hole of the cylinder head.

Adhesive:

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

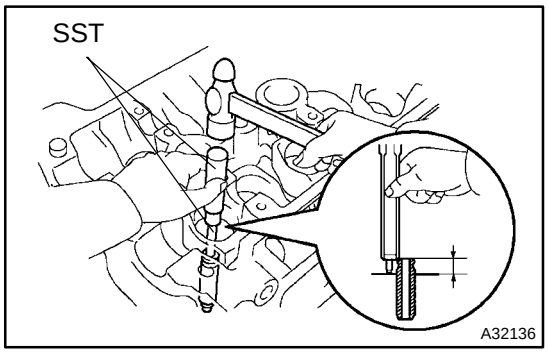


(c) Using a press press in a new water hose union until the standard marks come to the level of the cylinder head surface.

Standard protrusion:
A 29 mm (1.14 in.)
B 69.8 mm (2.748 in.)
C 24 mm (0.95 in.)

NOTICE:

- **Install the water hose union within 3 minutes after applying adhesive.**
- **Do not put into coolant within an hour after installing.**



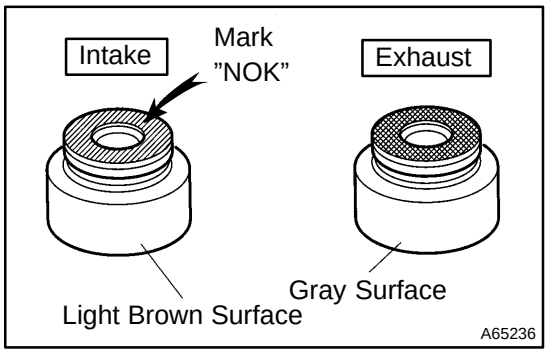
27. INSTALL VALVE GUIDE BUSH

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

(b) Using SST and a hammer, tap in a new guide bushing to the specified protrusion height.

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

Protrusion height: 15.3 – 15.7 mm (0.602 – 0.618 in.)



28. INSTALL VALVE STEM OIL O SEAL OR RING

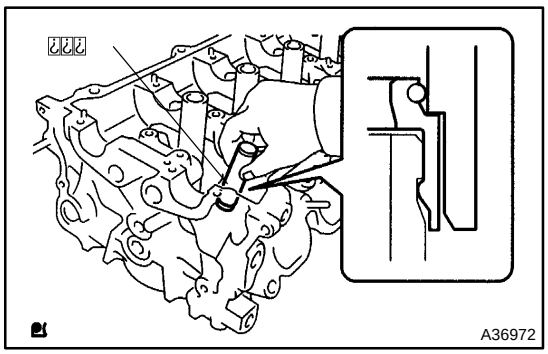
(a) Apply a light coat of engine oil the valve stem seals.

NOTICE:

Be very careful to assemble the oil seal for intake and exhaust. Assembling the wrong one may cause a failure.

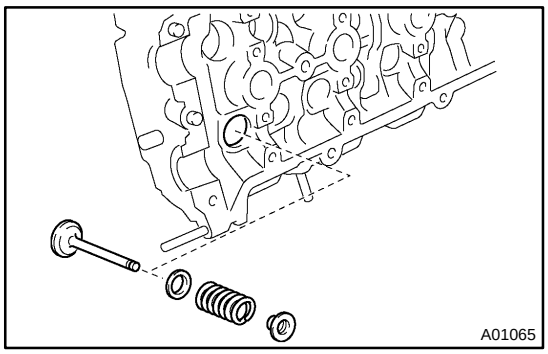
HINT:

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



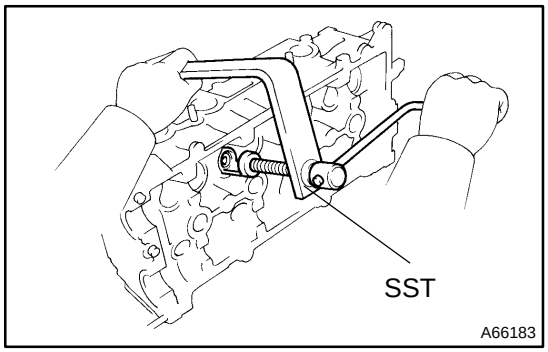
(b) Using SST, push in a new oil seal.

SST 09201–41020

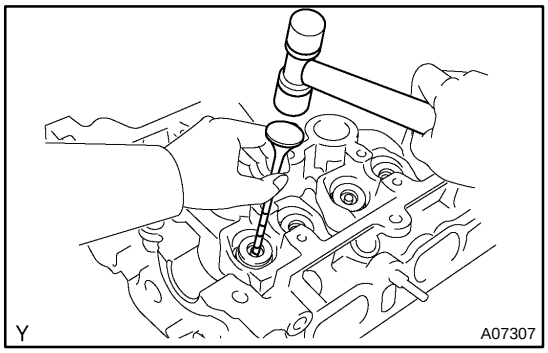


29. INSTALL INNER COMPRESSION SPRING

(a) Install the valve, spring seat, valve spring, and spring retainer.



(b) Using SST, compress the valve spring and place the retainer locks around the valve stem.
SST 09202–70020

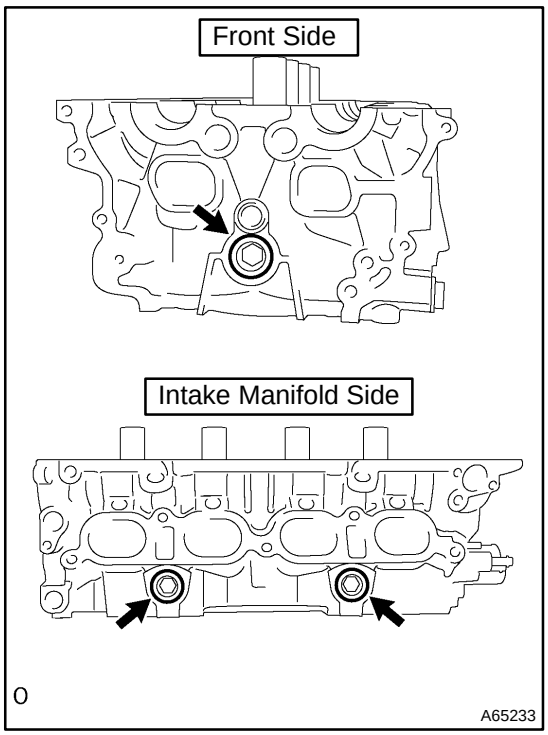


(c) Using a plastic–faced hammer and the valve stem (not in use) tip wound with vinyl tape, lightly tap the valve stem tip to ensure a proper fit.

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

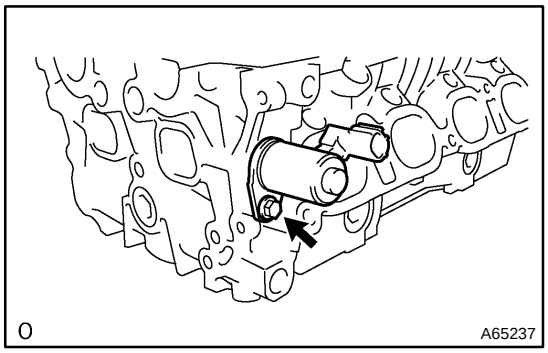
30. INSTALL VALVE ADJUSTING SHIM

(a) Apply a light coat of engine oil on the adjusting shim, install the top of the valve stem.



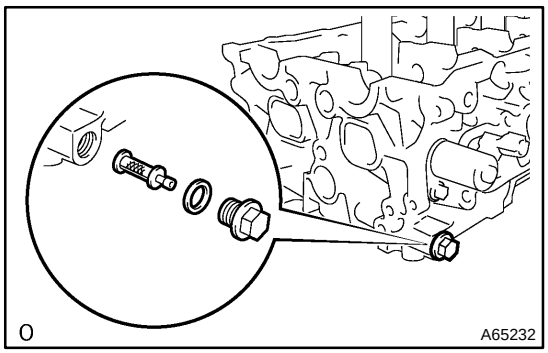
31. INSTALL W/HEAD TAPER SCREW PLUG NO.1

(a) Using hexagon socket wrench (14), install the taper screw plug with a new gasket.
Torque: 78 N·m (796 kgf·cm, 58 ft·lbf)



32. INSTALL CAMSHAFT TIMING OIL CONTROL VALVE ASSY

(a) Install the oil control valve with a bolt.
Torque: 9.0 N·m (92 kgf·cm, 80 ft·lbf)



33. INSTALL OIL CONTROL VALVE FILTER

(a) Confirm that the filter is clear.
(b) Place a new gasket on the bolt and install the filter.(Front side)
Torque: 29 N·m (296 kgf·cm, 22 ft·lbf)