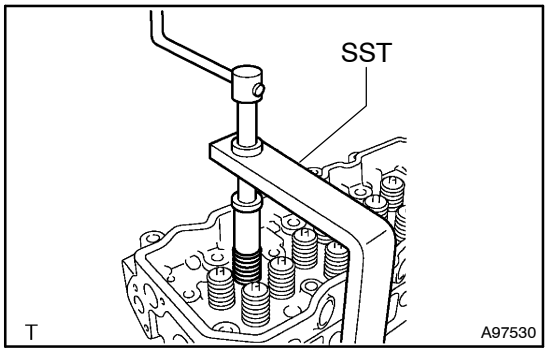
141UQ–01

OVERHAUL



1. REMOVE VALVE SPRING RETAINER LOCK

(a) Using SST, compress the valve spring and remove the retainer lock.
SST 09202–70020 (09202–00030)

2. REMOVE VALVE SPRING RETAINER

NOTICE:

Organize the parts so that each parts location can be remembered for reassembly.

3. REMOVE VALVE SPRING

NOTICE:

Organize the parts so that each parts location can be remembered for reassembly.

4. REMOVE INTAKE VALVE

NOTICE:

Organize the parts so that each parts location can be remembered for reassembly.

5. REMOVE EXHAUST VALVE

NOTICE:

Organize the parts so that each parts location can be remembered for reassembly.

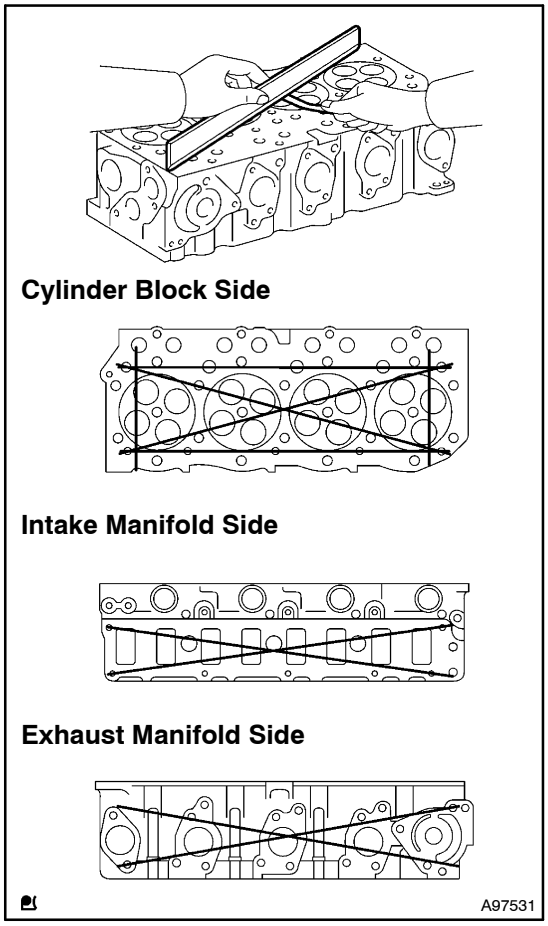
6. REMOVE VALVE STEM OIL SEAL

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

NOTICE:

Organize the parts so that each parts location can be remembered for reassembly.

7. REMOVE STUD BOLT



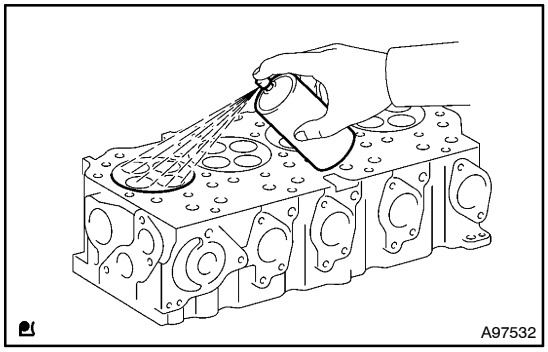
8. INSPECT CYLINDER HEAD SUB–ASSY

(a) Inspect the flatness.

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

Maximum warpage: 2.0 mm (0.079 in.)

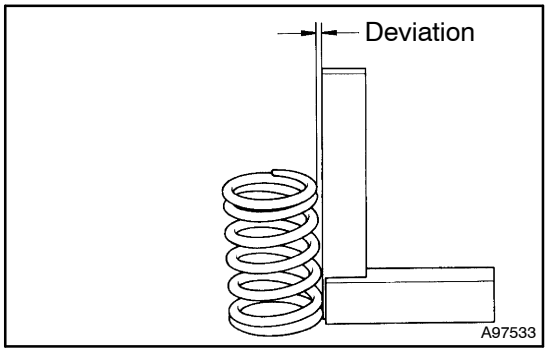
If the warpage is greater than the maximum, replace the cylinder head.



(b) 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.

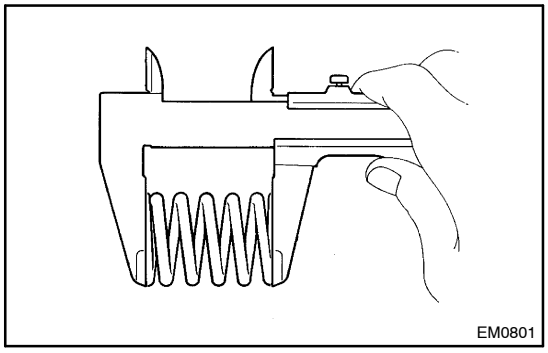


9. INSPECT VALVE SPRING

(a) Using a steel square, measure the deviation of the spring.

Maximum deviation: 2.0 mm (0.079 in.)

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

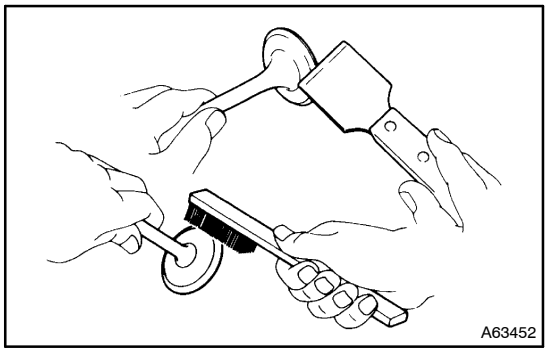


(b) Using a vernier caliper, measure the free length of the spring.

Standard free length: 85.1 mm (3.350 in.)

Minimum free length: 82.1 mm (3.232 in.)

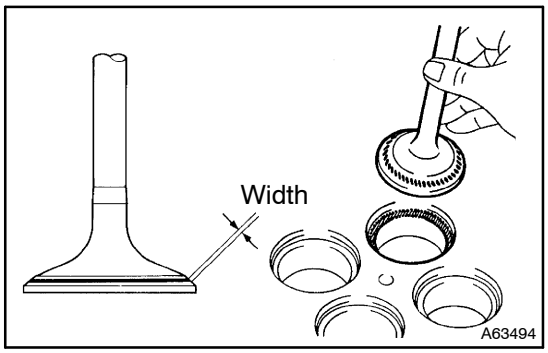
If the free length is less than the minimum, replace the spring.



10. CLEAN VALVE

(a) Using a gasket scraper, chip off any carbons from the valve head.

(b) Using a wire brush, thoroughly clean the valve.



11. INSPECT INTAKE AND EXHAUST VALVE

(a) Visually check the valves for damage, burns, carbons or warpage, and check the valve heads, valve stems and valve stem grooves for cracks.

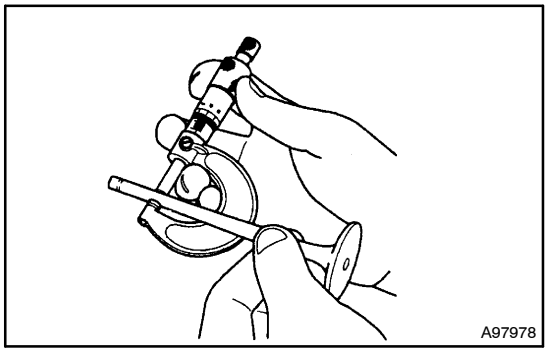
If wear, burns, warpage or cracks are excessive, replace the valves.

(b) Check the valve seating condition.

(1) Lightly apply red lead marking compound to the valve face.

(2) Tapping and rotating the valve against the seat, check the seating condition.

If the red lead mark is not concentric or the compound is scattered all around the valve face or seat, correct the valve face or the valve seat.



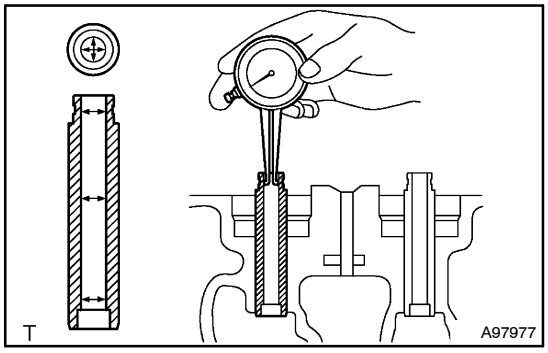
12. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

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

Valve stem diameter:

Intake	6.957 to 6.972 mm (0.2738 to 0.2744 in.)
Exhaust	6.932 to 6.947 mm (0.2729 to 0.2735 in.)

If the stem diameter is less than the minimum, replace the valve.



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

Bush inside diameter:

Intake	7.000 to 7.015 mm (0.2755 to 0.2761 in.)
Exhaust	7.000 to 7.015 mm (0.2755 to 0.2761 in.)

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

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

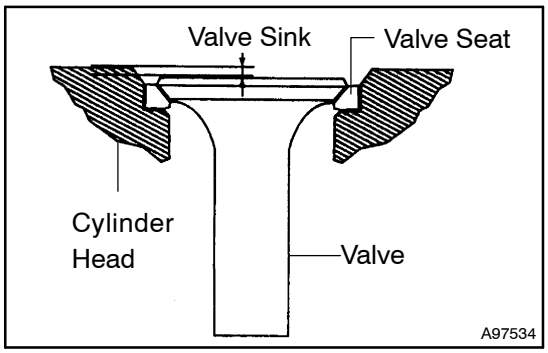
Standard oil clearance:

Intake	0.023 to 0.058 mm (0.0009 to 0.0022 in.)
Exhaust	0.050 to 0.083 mm (0.0020 to 0.0032 in.)

Maximum oil clearance:

Intake	0.12 mm (0.0047 in.)
Exhaust	0.15 mm (0.0059 in.)

If the clearance is greater than the maximum, replace the valve and guide bush (see steps 16 and 17).



13. INSPECT VALVE SINK

(a) Using a vernier caliper, measure the valve sink.

Standard:

Intake	0.8 to 1.0 mm (0.031 to 0.039 in.)
Exhaust	1.8 to 2.0 mm (0.070 to 0.078 in.)

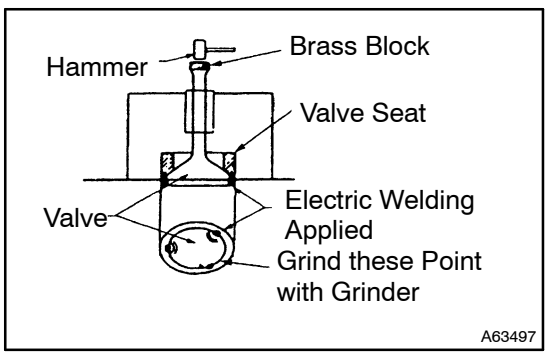
Maximum:

Intake	1.1 mm (0.043 in.)
Exhaust	2.1 mm (0.082 in.)

If the sink is greater than the maximum, replace the valve and valve seat.

NOTICE:

- **If the valve heads are protruding from the cylinder head surface, the valve heads may hit against the pistons while the engine is running.**
- **When replacing the valve and valve seat, always recheck the seating condition.**



14. REMOVE VALVE SEATS

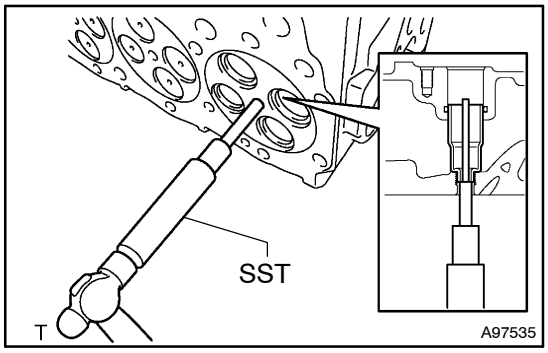
(a) Grind the 3 places on the circumference of an unwanted valve and weld it to the valve seat.

NOTICE:

To protect the lower surface of the cylinder head from welding spatters, be sure to apply grease before welding.

(b) Place a brass block on the top of the valve stem and strike it with a hammer to remove the valve seat.

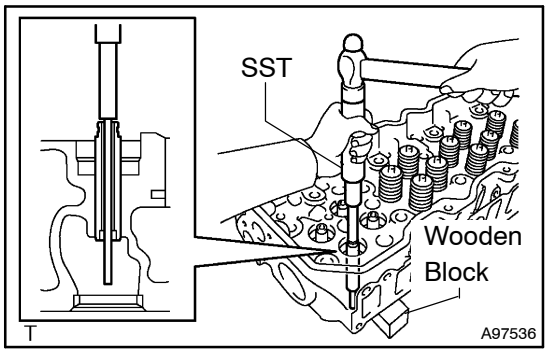
CAUTION:
When striking, a metal tip may fly off on impact. Wear safety glasses to protect your eyes.



15. REMOVE INJECTION NOZZLE SEAT

(a) Using SST, remove the nozzle seat.
SST 09201–10000 (09201–01050), 09950–70010 (09951–07100)

(b) Remove the O–ring from the cylinder head.



16. REMOVE INTAKE AND EXHAUST VALVE GUIDE BUSH

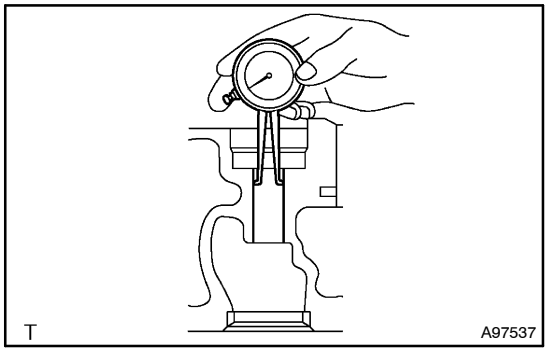
(a) Heat the cylinder head to 80 to 100°C (176 to 212°F) with hot water.

(b) Using SST and a hammer, tap out the valve guide bush.
SST 09201–10000 (09201–01070), 09950–70010 (09951–07100)

17. INSPECT CYLINDER HEAD COOLANT GALLERY FOR LEAKS

(a) Close all coolant holes and apply air pressure of about 245 kPa (2.5 kgf·cm^2, 36 psi) from one of the coolant holes. Immerse the cylinder head into water, then check for air leakage.

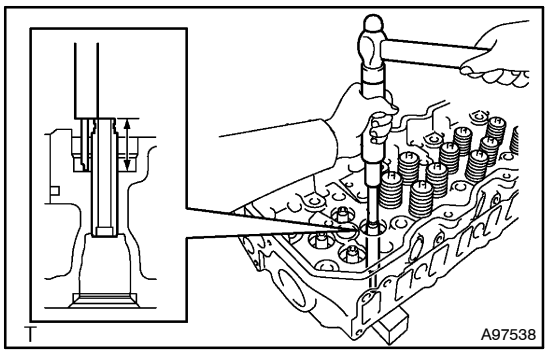
If any leakage is found, replace the cylinder head.



18. INSTALL INTAKE AND EXHAUST VALVE GUIDE BUSH

(a) Using a caliper gauge, measure the inside diameter of the guide bush.
Bush inside diameter:
13.000 to 13.018 mm (0.5118 to 0.5125 in.)

If the bush bore diameter of the cylinder head is greater than 13.018 mm (0.5125 in.), replace the cylinder head.

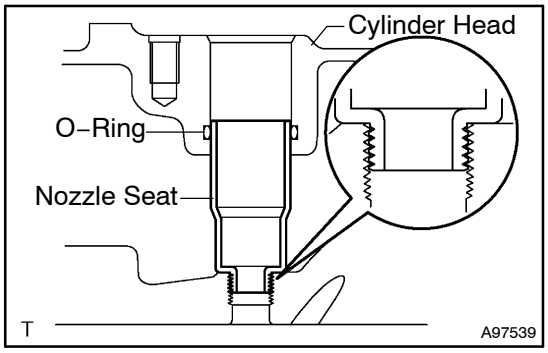


(b) Heat the cylinder head to 80 to 100°C (176 to 212°F) with hot water.

(c) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.
SST 09201–10000 (09201–01070), 09950–70010 (09951–07100)
Protrusion height:
26.4 to 26.8 mm (1.039 to 1.055 in.)

NOTICE:
Do not tap in the guide bush too much.

(d) Using a reamer, ream the guide bush to obtain the standard clearance (see step 12) between the guide bush and valve stem.

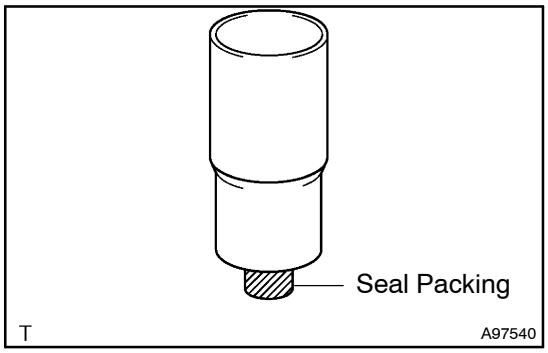


19. INSTALL INJECTION NOZZLE SEAT

(a) Apply a light coat of engine oil to a new O–ring, and install it to the cylinder head.

NOTICE:

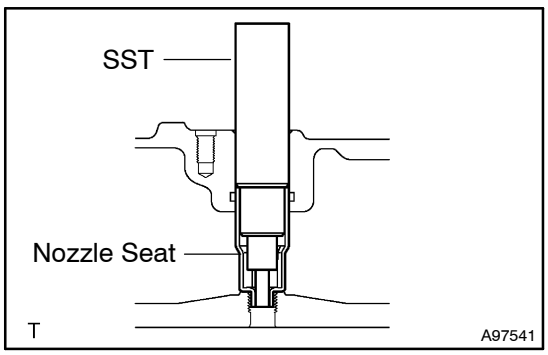
Be sure to install a new O–ring. Reused O–rings may cause water or gas leakage and lead to overheating or cracked heads.



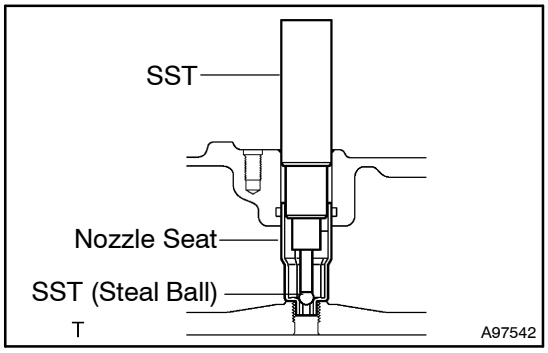
(b) Apply seal packing to a new nozzle seat.
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- **Remove any oil from the installation surface of the cylinder head and nozzle seat.**
- **Be sure to install a new nozzle seat. Reused nozzle seats may cause water or gas leakage and lead to overheating or cracked heads.**



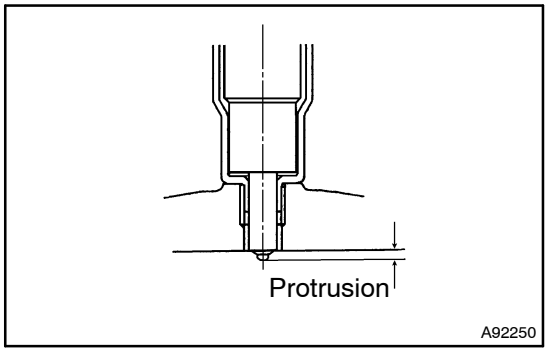
(c) Using SST, install the nozzle seat to the cylinder head.
SST 09260–69015



(d) Using SST, caulk the nozzle seat.
SST 09260–69015

HINT:

Put a container under the cylinder head to prevent the steal ball from being lost.



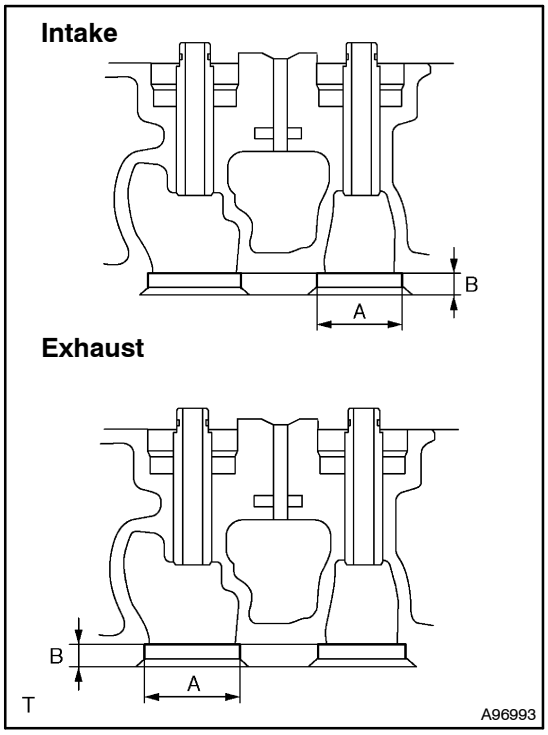
(e) Install the injector to the cylinder head. Using a vernier caliper, measure the protrusion of the injection from the lower surface of the cylinder head.

Protrusion:

Standard: 2.45 to 2.95 mm (0.0964 to 0.1161 in.)

Minimum: 2.95 mm (0.1161 in.)

If the protrusion is greater than the maximum, replace the injection nozzle seat.



20. INSTALL VALVE SEATS

(a) Using a caliper gauge and vernier caliper, measure the dimensions of the valve seat installation hole.

Cylinder head dimension:

Intake	A	36.000 to 36.015 mm (1.4173 to 1.4179 in.)
	B	8.400 to 8.600 mm (0.3307 to 0.3385 in.)
Exhaust	A	32.000 to 32.016 mm (1.2598 to 1.2604 in.)
	B	7.600 to 7.800 mm (0.2992 to 0.3070 in.)

If the result is not as specified, replace the cylinder head.

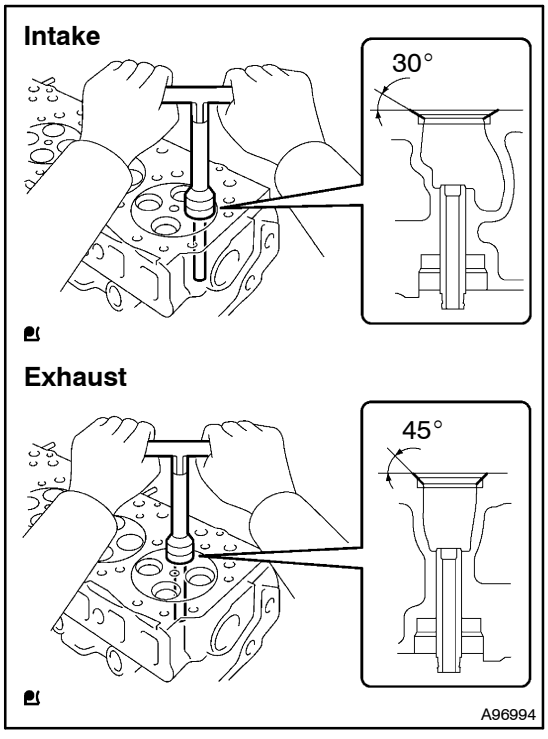
(b) Heat the cylinder head between 80 to 100°C (176 to 212°F) with hot water. Cool the valve seat with dry ice for approximately 30 minutes.

(c) Using SST and a hammer, lightly tap in the valve seat to the cylinder head.

SST 09950–60010 (09951–00300, 09951–00360, 09952–06010), 09950–70010 (09951–07100)

(d) Using SST and a hammer, completely tap in the valve seat.

SST 09950–60010 (09951–00360), 09950–70010 (09951–07100)



21. REPAIR VALVE SEATS

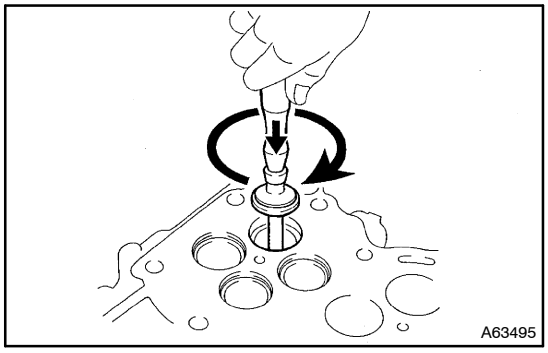
(a) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

Standard:

Intake	0.8 to 1.0 mm (0.031 to 0.039 in.)
Exhaust	1.8 to 2.0 mm (0.070 to 0.078 in.)

CAUTION:

When grinding, a metal tip may fly off on impact. Wear safety glasses to protect your eyes.



(b) Hand–lap the valve and valve seat.
(1) Lightly apply lapping compound to the valve face. Then, tap and rotate the valve against the seat.

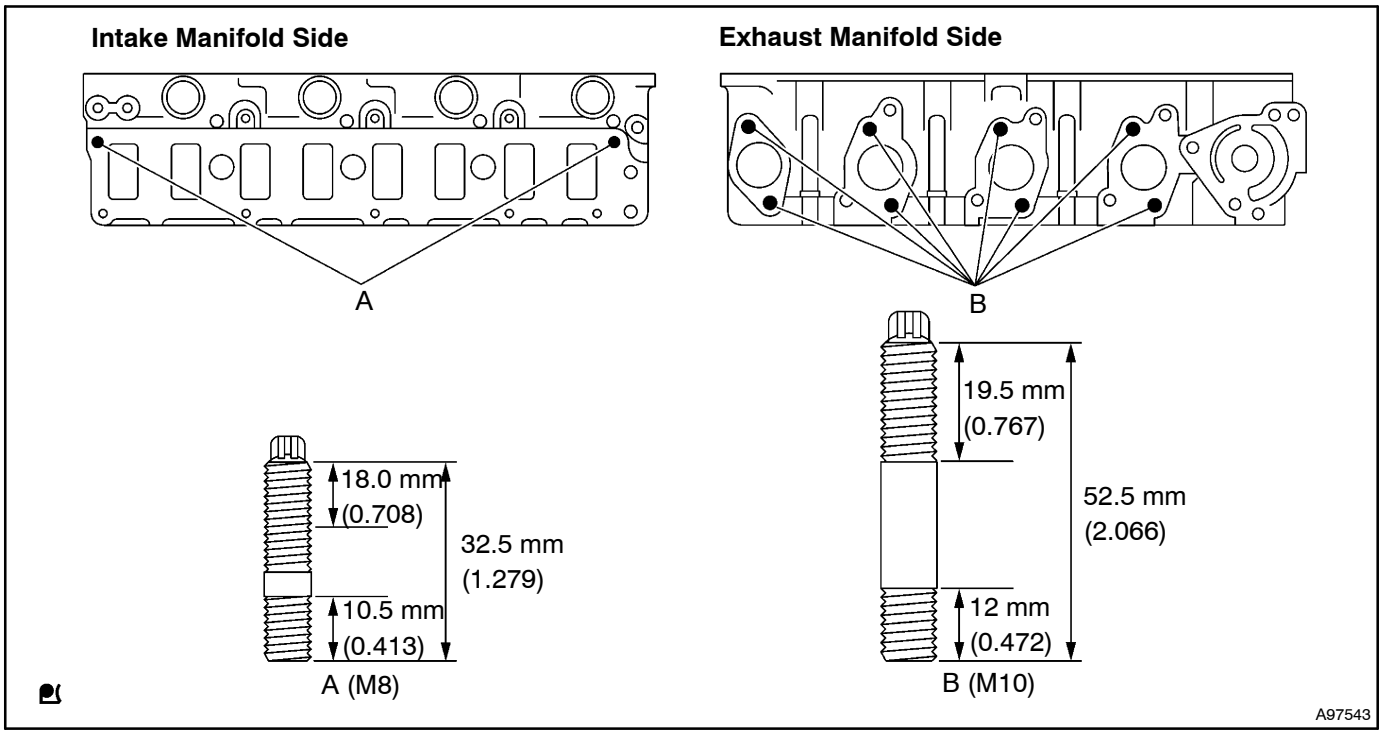
HINT:

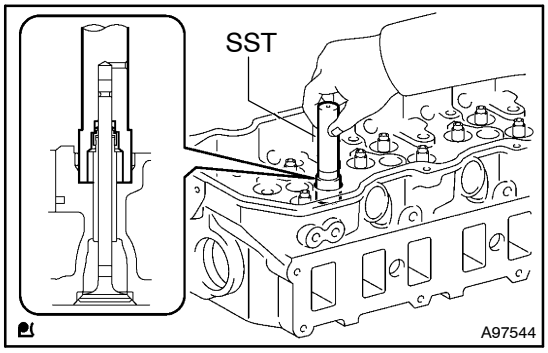
- After hand–lapping, clean off any lapping compound on the valves and valve seats.
- When hand–lapping, always recheck the seating condition (see step 11).

22. INSTALL STUD BOLT

(a) Using a torx socket wrench, install the stud bolts labeled A and B.

Torque:
25 N·m (255 kgf·cm, 18 ft·lbf) for bolt A
51 N·m (520 kgf·cm, 38 ft·lbf) for bolt B



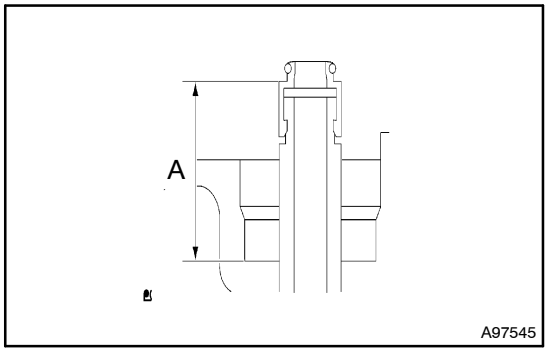


23. INSTALL VALVE STEM OIL SEAL

(a) First, install the lower spring seat and valve to the cylinder head (for guide of SST), then apply engine oil to the lip of the stem seal and drive the guide with SST.
SST S0947–22210

CAUTION:
When striking, a metal tip may fly off impact. Wear safety glasses to protect your eyes.
NOTICE:

- **Do not use the SST if its surface contacting the valve spring lower seat is deformed.**
- **Check that the seal has not been deformed, sloped or cracked after the installation.**



(b) After installing the valve stem oil seal, check the height (A) using a vernier caliper.
Standard height (A):
29.0 to 29.5 mm (1.141 to 1.161 in.)

If the result is greater than specified, adjust the height.
If the result is less than specified, replace the oil seal.

24. INSTALL INTAKE VALVE

(a) Apply engine oil to the valve stem.
(b) Install the valve to the cylinder head.

NOTICE:
Be sure to install the bridge to its original location.

25. INSTALL EXHAUST VALVE

(a) Apply engine oil to the valve stem.
(b) Install the valve to the cylinder head.

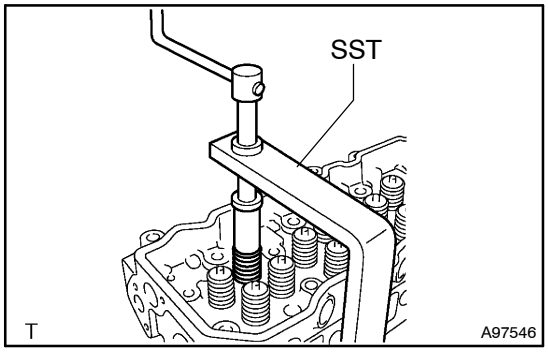
NOTICE:
Be sure to install the bridge to its original location.

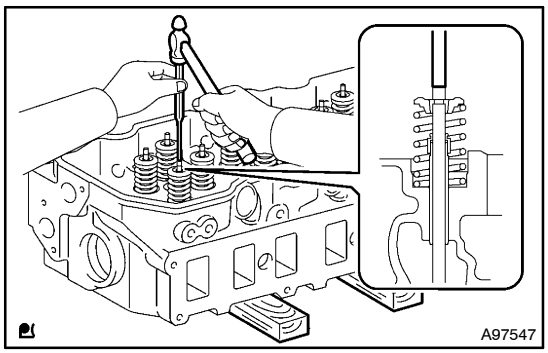
26. INSTALL VALVE SPRING

NOTICE:
Be sure to install the valve spring to its original location.

27. INSTALL VALVE SPRING RETAINER

NOTICE:
Be sure to install the retainer to its original location.





28. INSTALL VALVE SPRING RETAINER LOCK

(a) Using SST, compress the valve spring and install the retainer lock.
SST 09202–70020 (09202–00030)

NOTICE:
- **Be sure to apply engine oil to the contact surface of the parts before the assembly.**
- **Be sure to install the retainer its to original location.**
- **When the valve spring is compressed, be careful that the upper seat will not damage the stem seal.**

(b) Using a 5 mm (0.19 in.) pin punch, tap in the valve tip to settle the spring.

NOTICE:
- **Do not tap the retainer.**
- **Be careful not to damage the valve stem.**