140CX–02

OVERHAUL

HINT:

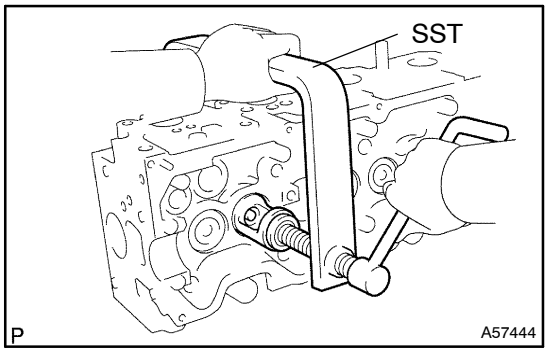
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.

1. REMOVE VALVE LIFTER

(a) Remove the valve lifter and adjusting shim.

HINT:

Arrange the valve lifters and shims in correct order.



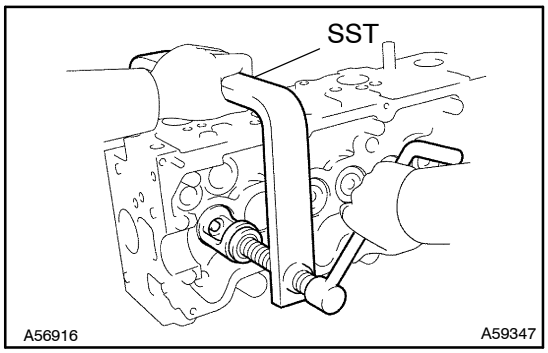
2. REMOVE INTAKE VALVE

(a) Using SST, compress the valve spring and remove the 2 retainer locks.
SST 09202–70020 (09202–00030)

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

HINT:

Arrange the valves, valve springs, spring seats and spring retainers incorrect order.



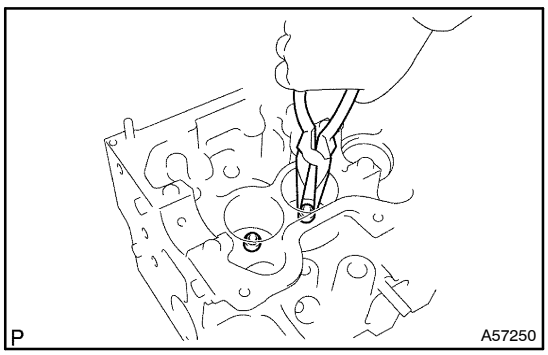
3. REMOVE EXHAUST VALVE

(a) Using SST, compress the valve spring and remove the 2 retainer locks
SST 09202–70020 (09202–00030)

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

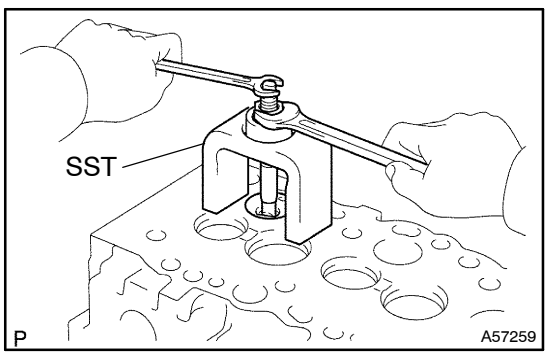
HINT:

Arrange the valves, valve springs, spring seats and spring retainers incorrect order.



4. REMOVE VALVE STEM OIL O SEAL OR RING

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

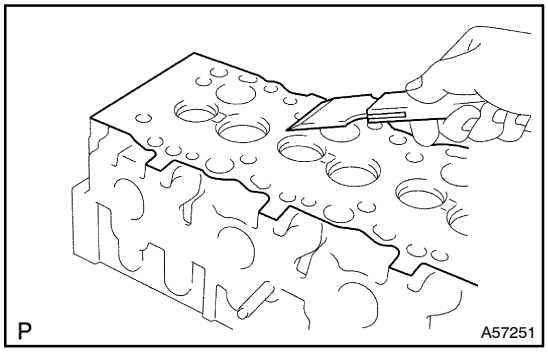


5. REMOVE COMBUSTION CHAMBER SUB–ASSY

(a) Using SST, remove the 4 combustion chambers (and shims).
SST 09208–48010

HINT:

Arrange the combustion chambers (and shims) incorrect order.

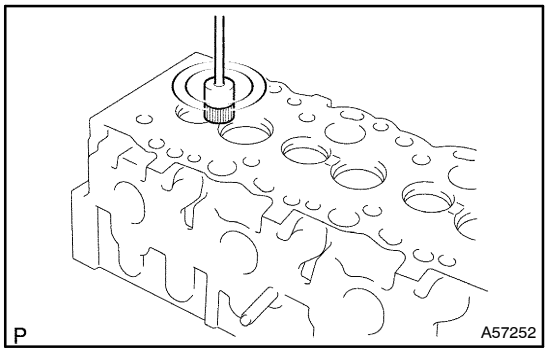


6. CLEAN CYLINDER HEAD SUB–ASSY

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

NOTICE:

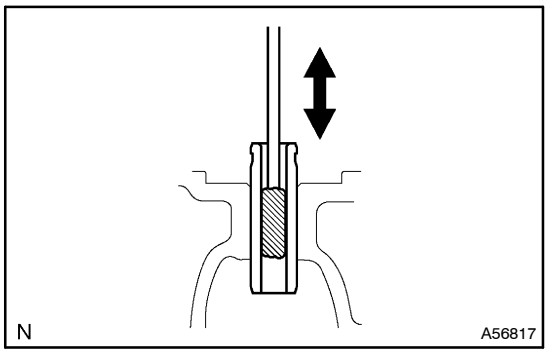
Be careful not to scratch the cylinder block contact surface.



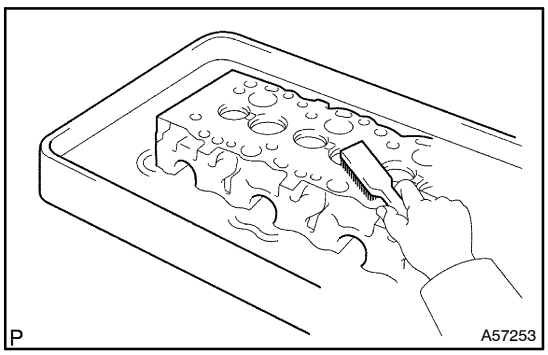
(b) Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE:

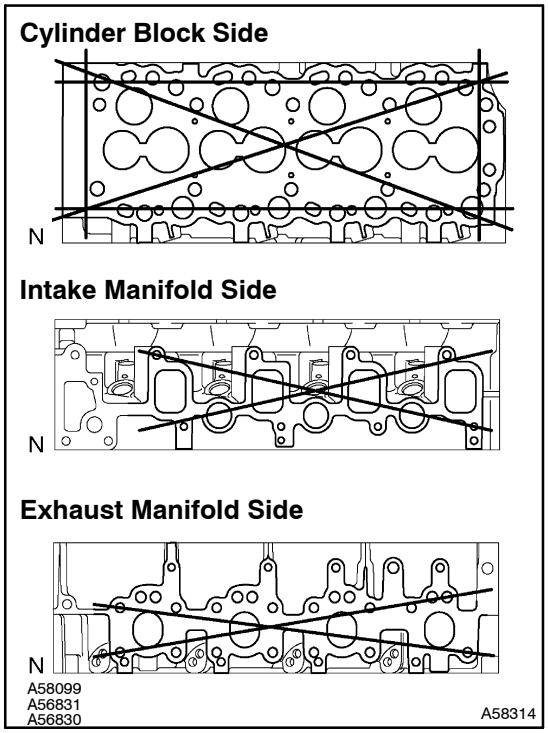
Be careful not to scratch the cylinder block contact surface.



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



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



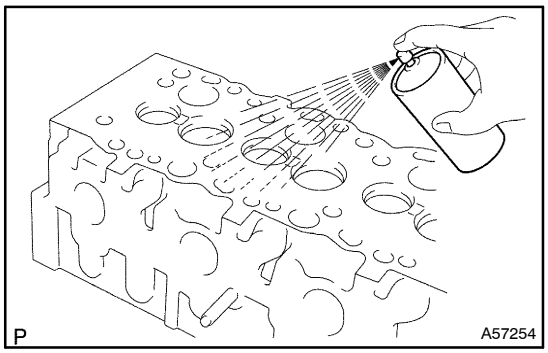
7. INSPECT CYLINDER HEAD SUB–ASSY

(a) Inspect for flatness.

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

Maximum warpage: 0.20 mm (0.0079 in.)

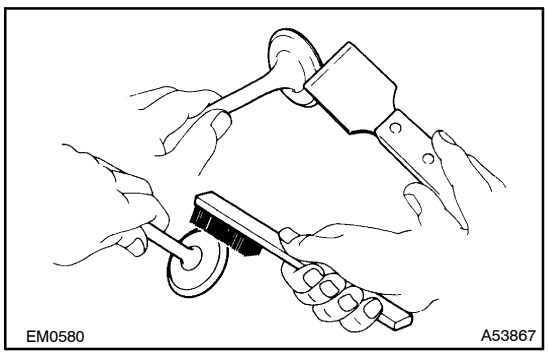
If warpage is greater than maximum, replace the cylinder head.



(b) Inspect for cracks.

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

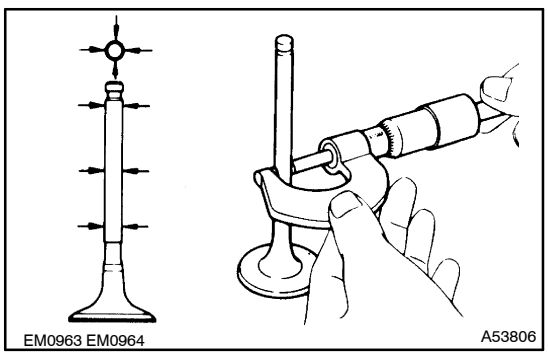
If cracked, replace the cylinder head.



8. CLEAN INTAKE VALVE

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

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

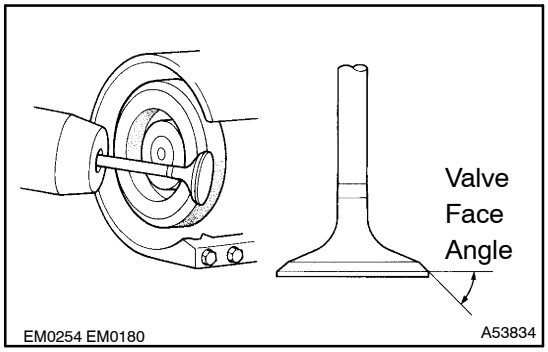


9. INSPECT INTAKE VALVE

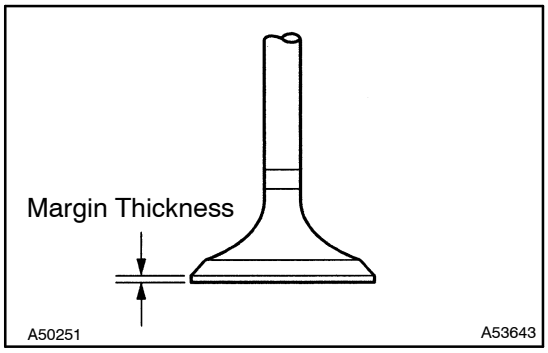
(a) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

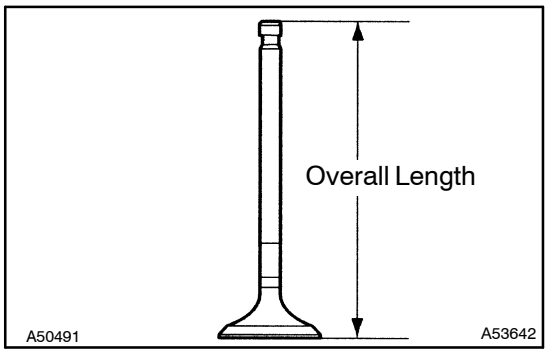
7.975 – 7.990 mm (0.3140 – 0.3146 in.)



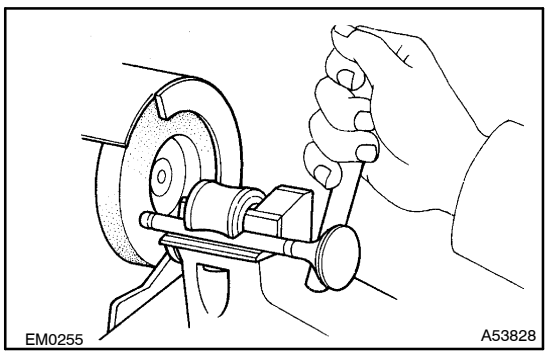
(b) Check the valve face angle.
(1) Grind the valve enough to remove pits and carbon.
(2) Check that the valve is ground to the correct valve face angle.
Valve face angle: 44.5°



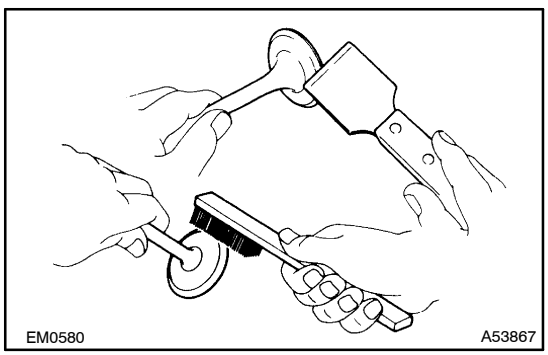
(c) Check the valve head margin thickness.
Standard margin thickness: 1.6 mm (0.063 in.)
Minimum margin thickness: 1.1 mm (0.043 in.)
If the margin thickness is less than minimum, replace the valve.



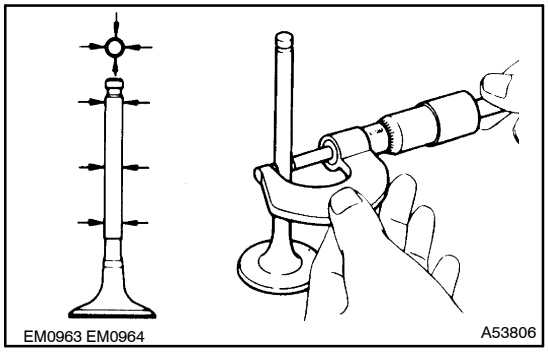
(d) Check the valve overall length.
Standard overall length:
104.10 – 104.50 mm (4.0984 – 4.1142 in.)
Minimum overall length: 103.60 mm (4.0787 in.)
If the overall length is less than minimum, replace the valve.



(e) 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.



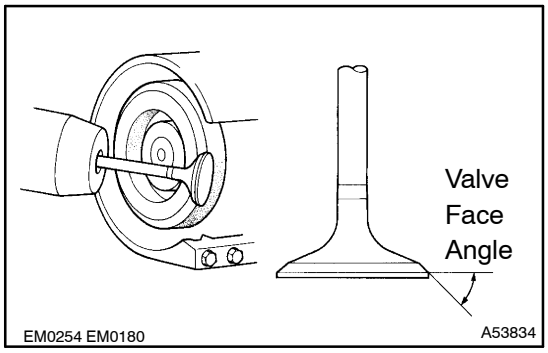
10. CLEAN EXHAUST VALVE
(a) Using a gasket scraper, chip off any carbon from the valve head.
(b) Using a wire brush, thoroughly clean the valve.



11. INSPECT EXHAUST VALVE

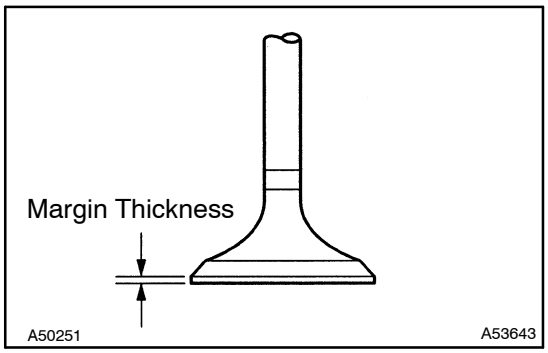
(a) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:
7.960 – 7.975 mm (0.3134 – 0.3140 in.)



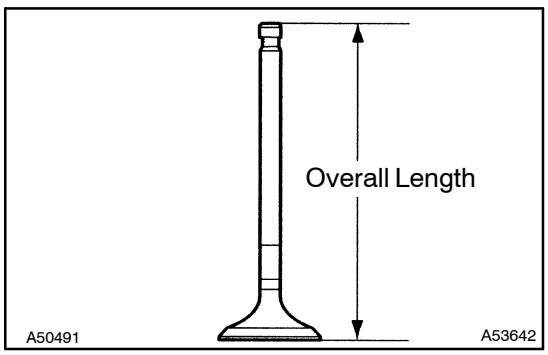
(b) Check the valve face angle.
(1) Grind the valve enough to remove pits and carbon.
(2) Check that the valve is ground to the correct valve face angle.

Valve face angle: 44.5°



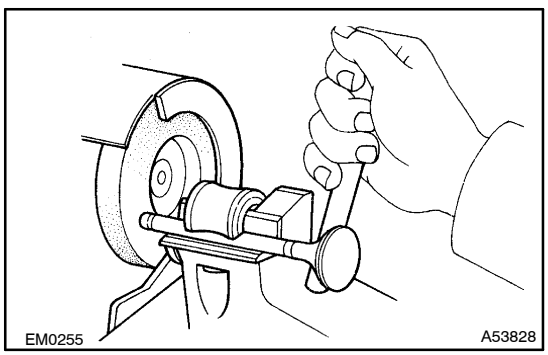
(c) Check the valve head margin thickness.
Standard margin thickness: 1.7 mm (0.067 in.)
Minimum margin thickness: 1.2 mm (0.047 in.)

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



(d) Check the valve overall length.
Standard overall length:
103.95 – 104.35 mm (4.0925 – 4.1083 in.)
Minimum overall length: 103.45 mm (4.0728 in.)

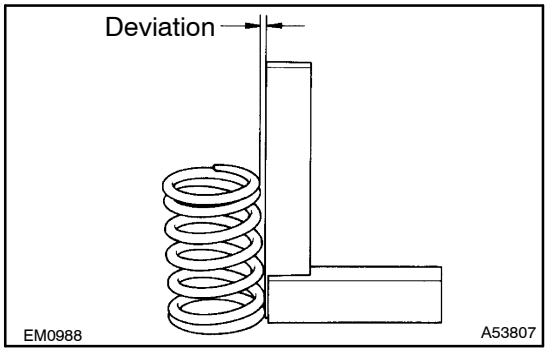
If the overall length is less than minimum, replace the valve.



(e) 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.

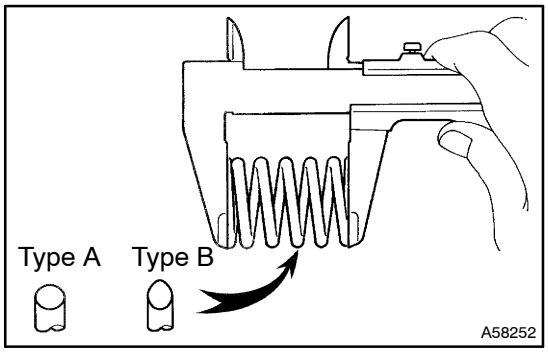
NOTICE:
Do not grind off more than minimum.



12. INSPECT INNER COMPRESSION SPRING

(a) Using a steel square, measure the deviation of the spring.
Maximum deviation: 2.0 mm (0.079 in.)

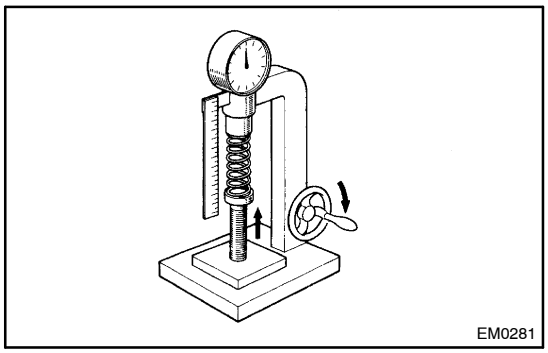
If the deviation is greater than maximum, replace the spring.



(b) Using vernier calipers, measure the free length of the spring.
Free length:

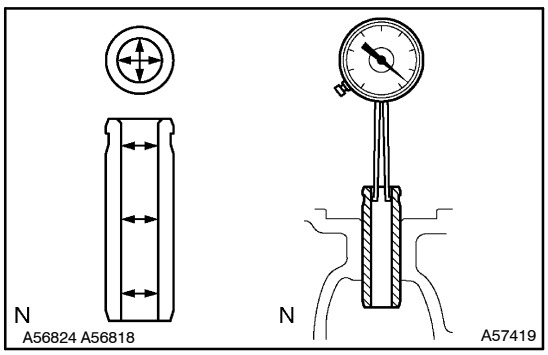
Type A	46.20 mm (1.8189 in.)
Type B	48.54 mm (1.9110 in.)

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



(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.
Installed tension:
301 – 322 N (30.7 – 33.9 kgf, 67.7 – 74.7 lbf)
at 37.0 mm (1.457 in.)

If the installed tension is not as specified, replace the spring.

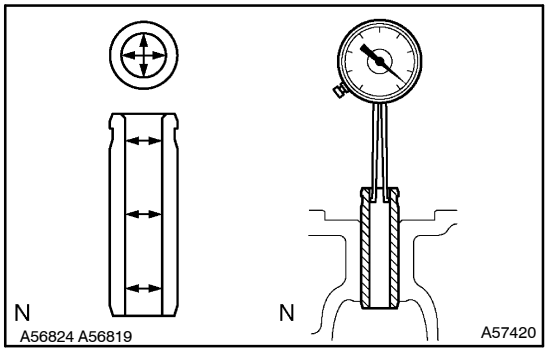


13. INSPECT INTAKE VALVE GUIDE BUSH

(a) Using a caliper gauge, measure the inside diameter of the guide bush.
Bush inside diameter:
8.010 – 8.030 mm (0.3154 – 0.3161 in.)

(b) Subtract the valve stem diameter measurement (See step 9) from the guide bush inside diameter measurement.
Standard oil clearance:
0.020 – 0.055 mm (0.0008 – 0.0022 in.)
Maximum oil clearance: 0.08 mm (0.0031 in.)

If the clearance is greater than maximum, replace the valve and guide bush (See steps 15 and 17).



14. INSPECT EXHAUST VALVE GUIDE BUSH

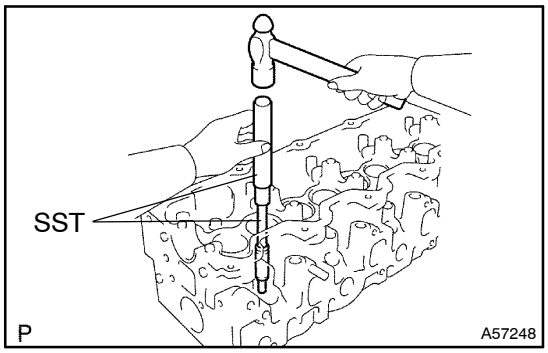
(a) Using a caliper gauge, measure the inside diameter of the guide bush.

Bush inside diameter:
8.010 – 8.030 mm (0.3154 – 0.3161 in.)

(b) Subtract the valve stem diameter measurement (See step 11) from the guide bush inside diameter measurement.

Standard oil clearance:
0.035 – 0.070 mm (0.0014 – 0.0028 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)

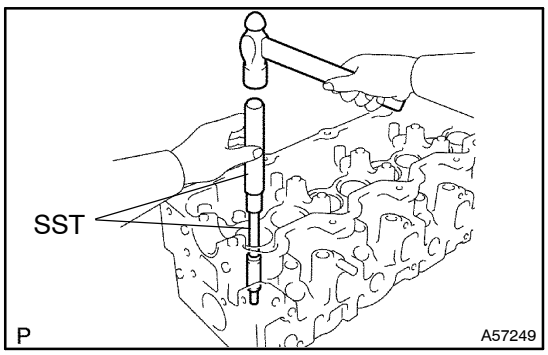
If the clearance is greater than maximum, replace the valve and guide bush (See steps 16 and 18).



15. REMOVE INTAKE VALVE GUIDE BUSH

(a) Using SST and a hammer, tap out the valve guide bushing.

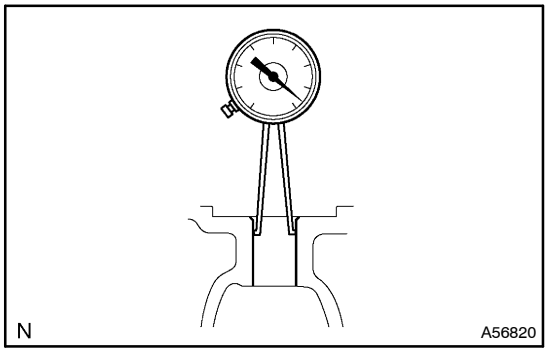
SST 09201–10000 (09201–01080), 09950–70010 (09951–07100)



16. REMOVE EXHAUST VALVE GUIDE BUSH

(a) Using SST and a hammer, tap out the valve guide bushing.

SST 09201–10000 (09201–01080), 09950–70010 (09951–07100)



17. INSTALL INTAKE VALVE GUIDE BUSH

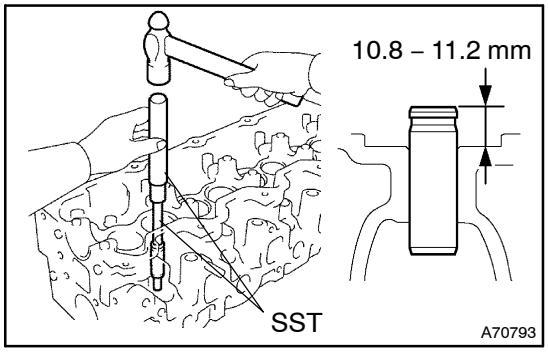
(a) Using a caliper gauge, measure the bush bore diameter of the cylinder head.

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

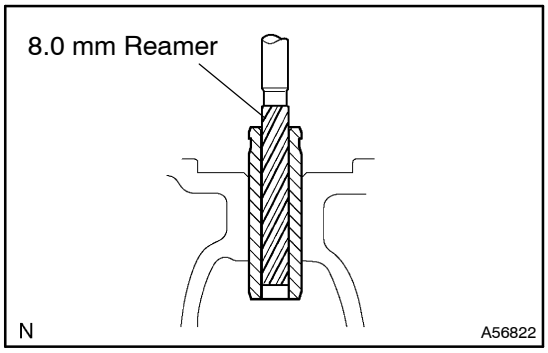
Bush bore diameter	Bush size
13.004 – 13.025 mm (0.5120 – 0.5128 in.)	Use STD
13.054 – 13.075 mm (0.5139 – 0.5148 in.)	Use O/S 0.05

If the bush bore diameter of the cylinder head is greater than 13.025 mm (0.5128 in.), machine the bush bore to this dimension of 13.054 – 13.075 mm (0.5139 – 0.5148 in.).

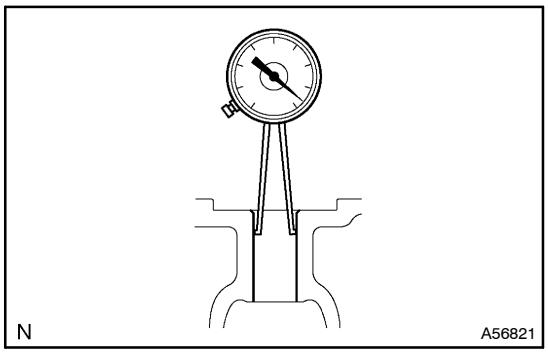
If the bush bore diameter of the cylinder head is greater than 13.075 mm (0.5139 in.), replace the cylinder head.



(c) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.
SST 09201–10000 (09201–01080), 09950–70010 (09951–07100), 23801
Protrusion height: 10.8 – 11.2 mm (0.425 – 0.441 in.)



(d) Using a sharp 8.0 mm reamer, ream the guide bush to obtain the standard specified clearance (See step 13) between the guide bush and valve stem.



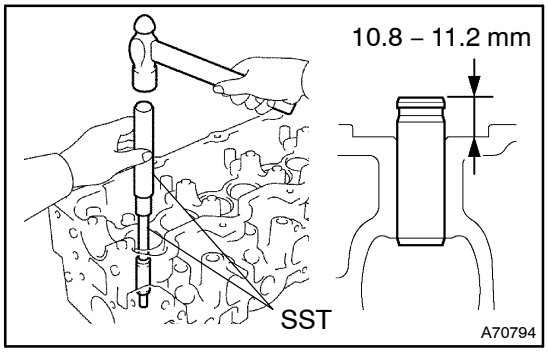
18. INSTALL EXHAUST VALVE GUIDE BUSH

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

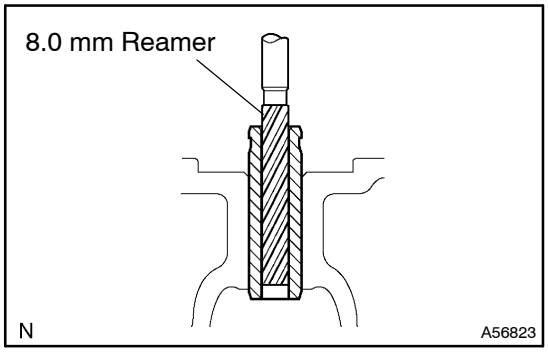
(b) Select a new guide bush (STD or O/S 0.05).

Bush bore diameter	Bush size
13.004 – 13.025 mm (0.5120 – 0.5128 in.)	Use STD
13.054 – 13.075 mm (0.5139 – 0.5148 in.)	Use O/S 0.05

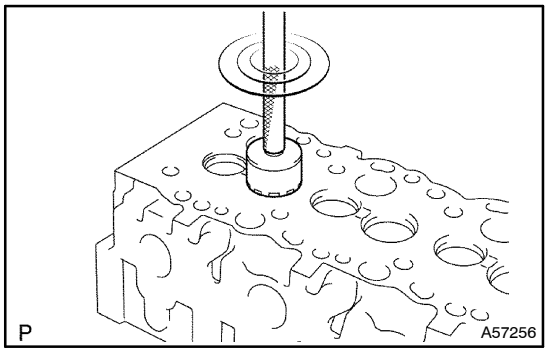
If the bush bore diameter of the cylinder head is greater than 13.025 mm (0.5128 in.), machine the bush bore to this dimension of 13.054 – 13.075 mm (0.5139 – 0.5148 in.).
If the bush bore diameter of the cylinder head is greater than 13.075 mm (0.5139 in.), replace the cylinder head.



(c) Using SST and a hammer, tap in a new guide bush to the specified protrusion height.
SST 09201–10000 (09201–01080), 09950–70010 (09951–07100)
Protrusion height: 10.8 – 11.2 mm (0.425 – 0.441 in.)

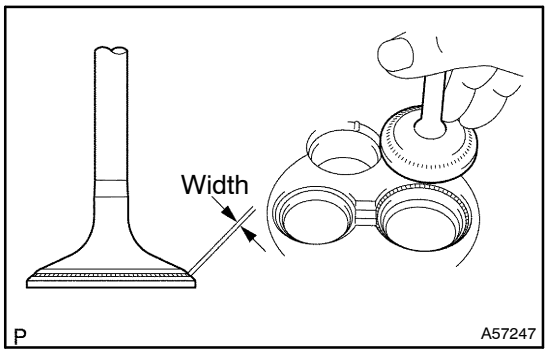


(d) Using a sharp 8.0 mm reamer, ream the guide bush to obtain the standard specified clearance (See step 14) between the guide bush and valve stem.



19. INSPECT INTAKE VALVE SEATS

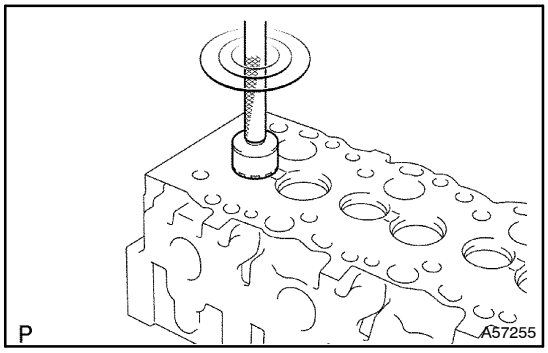
(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.



(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.

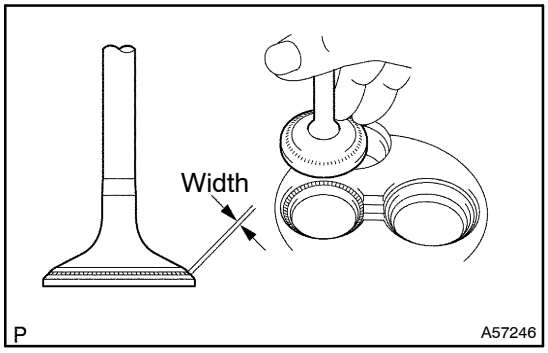
(c) Check the valve face and seat for the following:
  (1) If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
  (2) If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
  (3) Check that the seat contact is in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

Width: 1.5 – 1.9 mm (0.059 – 0.075 in.)



20. INSPECT EXHAUST VALVE SEATS

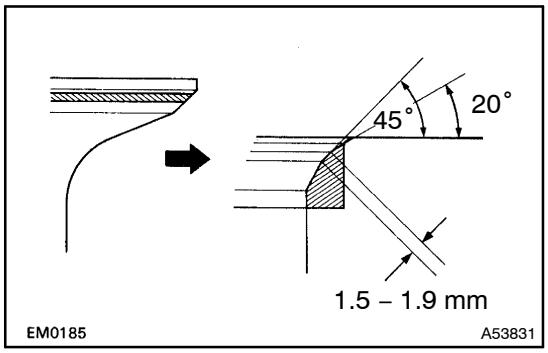
(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.



(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.

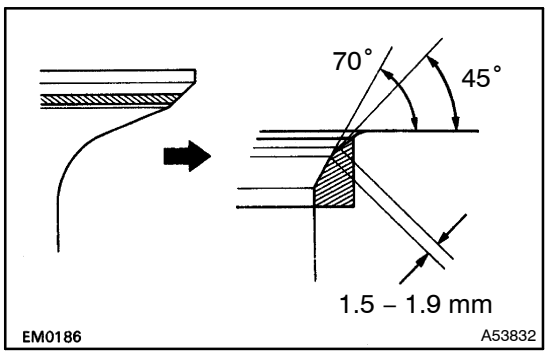
(c) Check the valve face and seat for the following:
  (1) If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
  (2) If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
  (3) Check that the seat contact is in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

Width: 1.8 – 2.2 mm (0.071 – 0.087 in.)

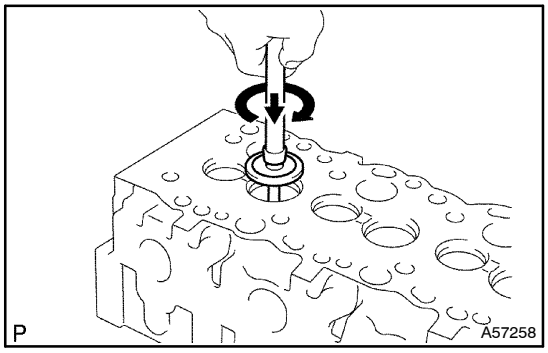


21. REPAIR INTAKE VALVE SEATS

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

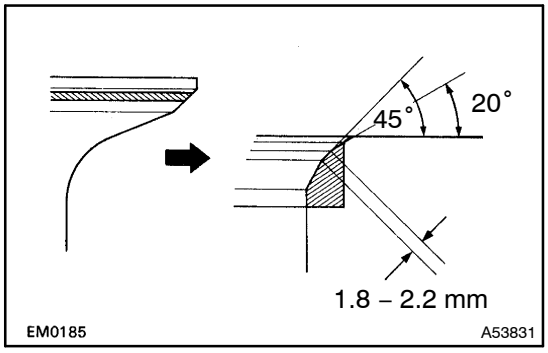


(b) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



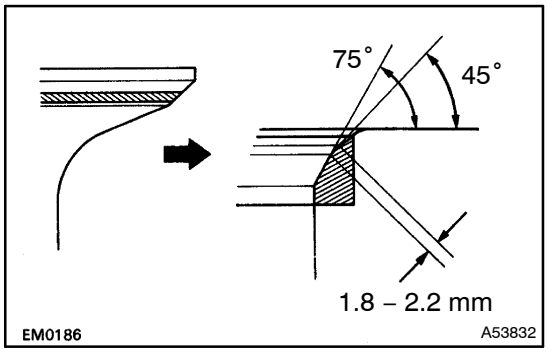
(c) Hand–lap the valve and valve seat with an abrasive compound.

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

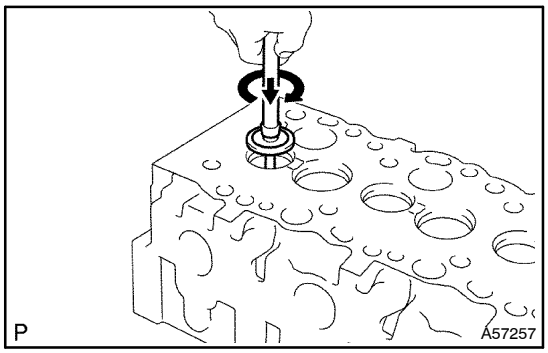


22. REPAIR EXHAUST VALVE SEATS

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

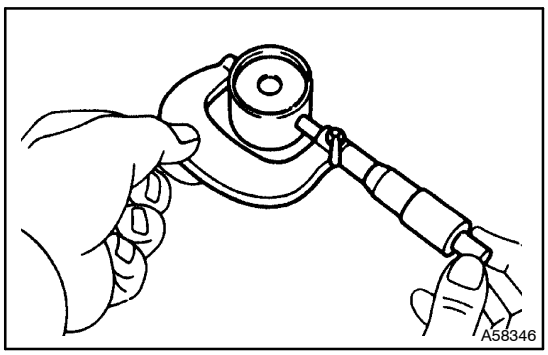


(b) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



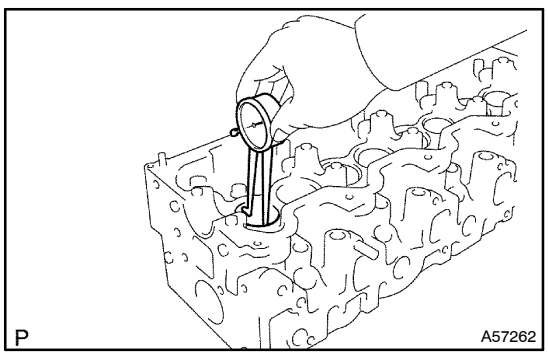
(c) Hand–lap the valve and valve seat with an abrasive compound.

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



23. INSPECT VALVE LIFTER

(a) Using a micrometer, measure the lifter diameter.
Lifter diameter:
40.892 – 40.902 mm (1.6099 – 1.6103 in.)



(b) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
40.960 – 40.980 mm (1.6126 – 1.6134 in.)

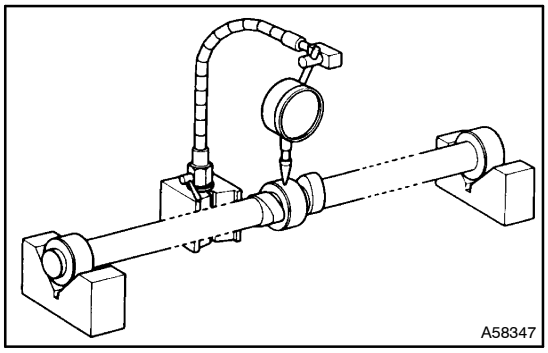
(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance:

0.058 – 0.088 mm (0.0023 – 0.0035 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

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


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24. INSPECT CAMSHAFT

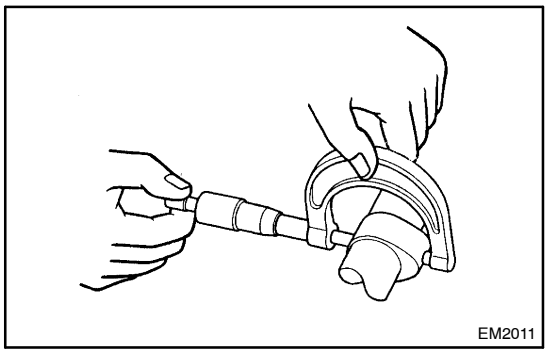
(a) Inspect the circle runout.

(1) Place the camshaft on V–blocks.

(2) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.10 mm (0.0039 in)

If the circle runout is greater than maximum, replace the camshaft.


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(b) Using a micrometer, measure the cam lobe height.

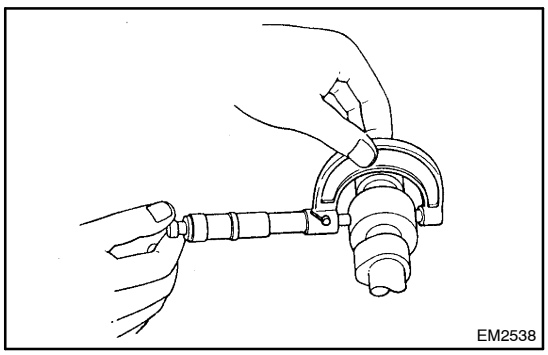
Standard cam lobe height:

Intake	54.890 – 54.910 mm (2.1610 – 2.1618 in.)
Exhaust	54.990 – 55.010 mm (2.1650 – 2.1657 in.)

Minimum cam lobe height:

Intake	54.39 mm (2.1413 in.)
Exhaust	54.49 mm (2.1453 in.)

If the cam lobe height is less than minimum, replace the camshaft.


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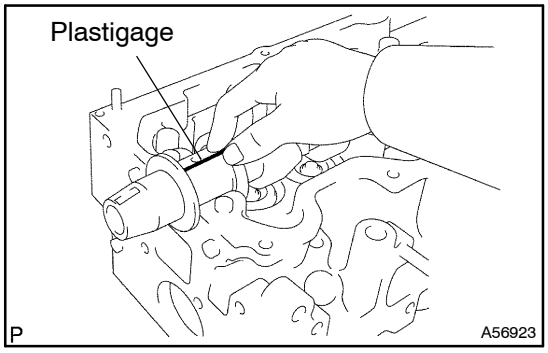
(c) Inspect the journal diameter of the camshaft.

(1) Using a micrometer, measure the journal diameter of the camshaft for the camshaft bearing.

Journal diameter:

STD	No. 1	34.969 – 34.985 mm (1.3767 – 1.3774 in.)
	Others	27.969 – 27.985 mm (1.1011 – 1.1018 in.)
U/S 0.125	No. 1	34.844 – 34.860 mm (1.3718 – 1.3724 in.)
	Others	27.844 – 27.860 mm (1.0962 – 1.0968 in.)
U/S 0.250	No. 1	34.719 – 34.735 mm (1.3669 – 1.3675 in.)
	Others	27.719 – 27.735 mm (1.0913 – 1.0919 in.)

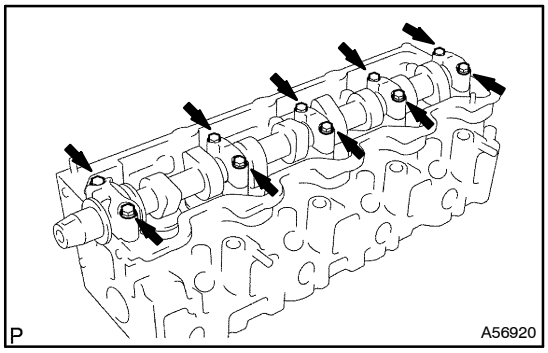
If the journal diameter is not as specified, check the oil clearance.



(d) Check the oil clearance.
(1) Clean the bearing caps and journals.
(2) Check that bearings for flaking and scoring.

If the bearings are damaged, If the bearings are damaged, replace the bearings.

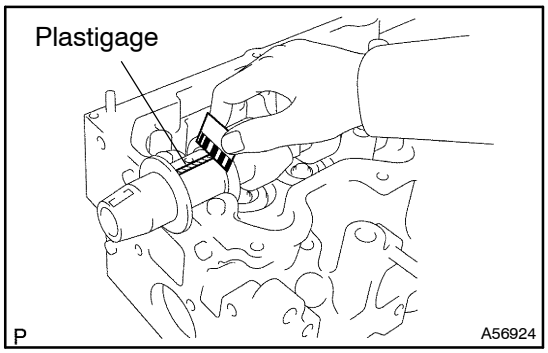
(3) Install the bearings to the bearing caps and cylinder head.
(4) Place the camshaft on the cylinder head.
(5) Lay a strip of Plastigage across each of the journals.



(6) Install the bearing caps (See page 14–3).

NOTICE:
Do not turn the camshaft.

(7) Remove the bearing caps.



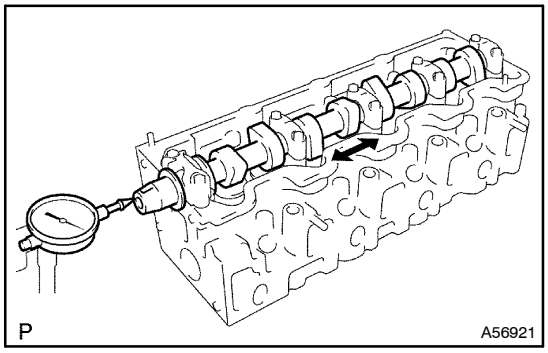
(8) Measure the Plastigage at its widest point.

Standard oil clearance:
0.022 – 0.074 mm (0.0009 – 0.0029 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the camshaft.

(9) Completely remove the Plastigage.
(10) Remove the camshaft.

(e) If necessary, grind and hone camshaft journals.
(1) Grind and hone the journals to U/S diameter (See procedure (c) above). Install new journal U/S bearings.

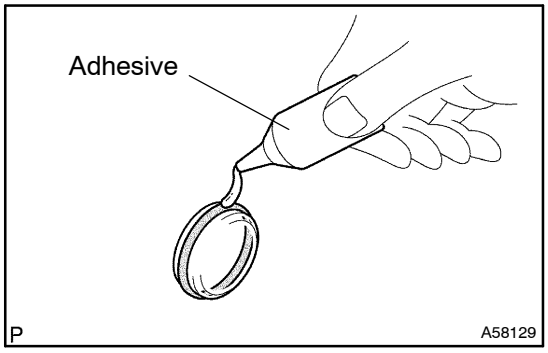


(f) Check the thrust clearance.
(1) Install the camshaft (See page14–3).
(2) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:
0.080 – 0.280 mm (0.0031 – 0.0110 in.)
Maximum thrust clearance: 0.35 mm (0.0138 in.)

If the thrust clearance is greater than maximum, replace the No.1 bearing. If necessary, replace the camshaft.

25. REMOVE SEMICIRCULAR PLUG



26. INSTALL TIGHT PLUG

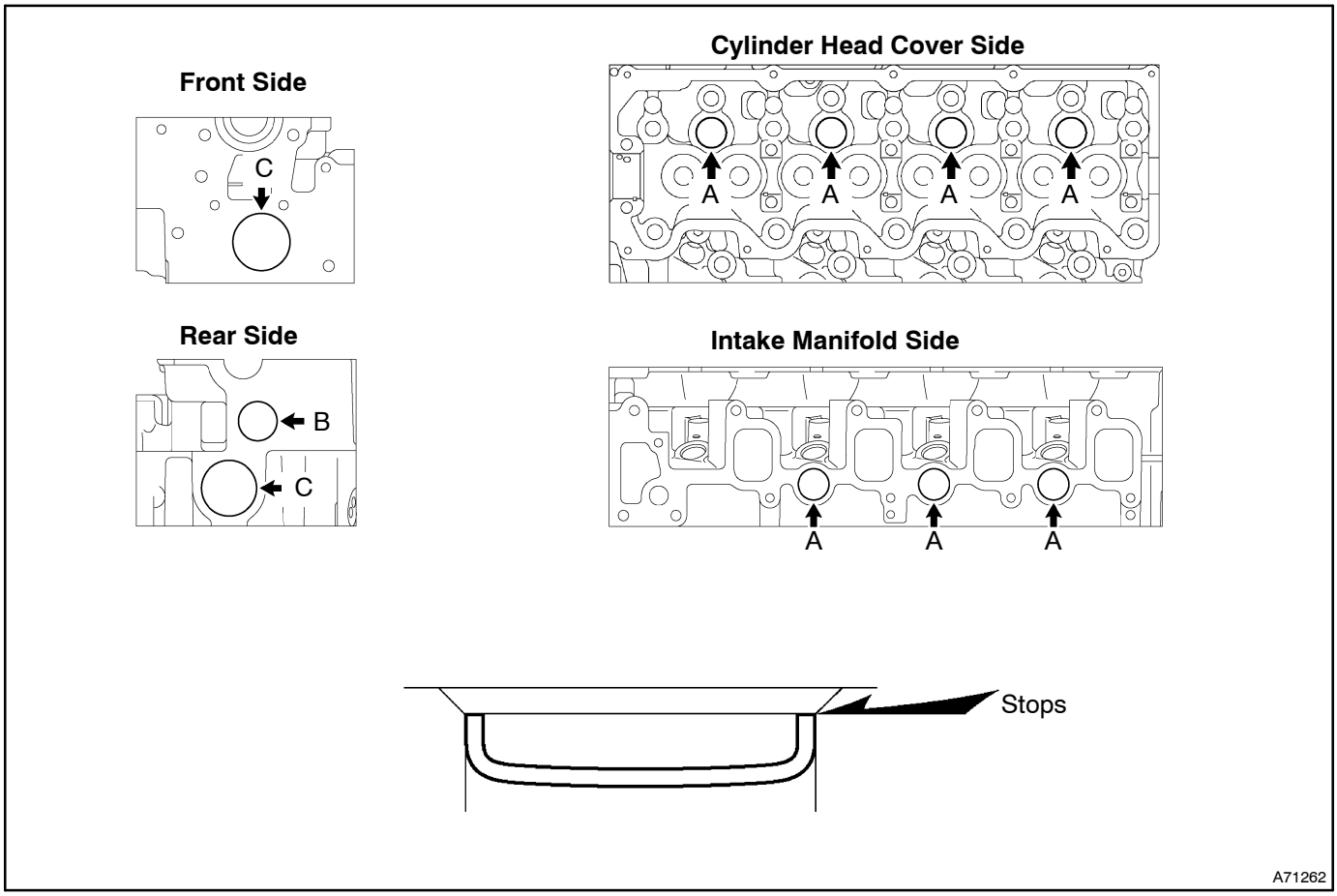
(a) Apply adhesive to the tight plug.

Adhesive:

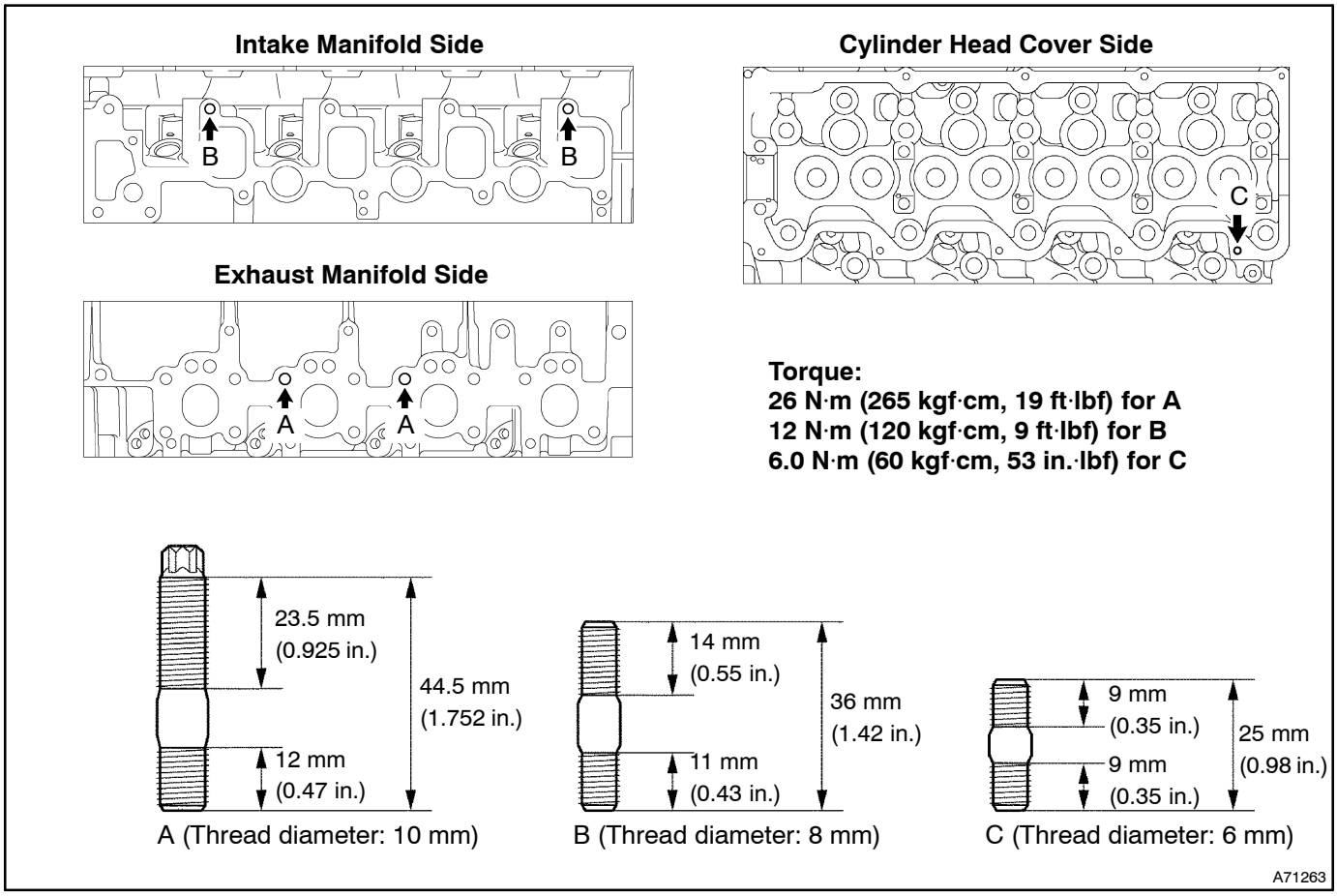
Part No. 08833–00070, THREE BOND 1324 or equivalent

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

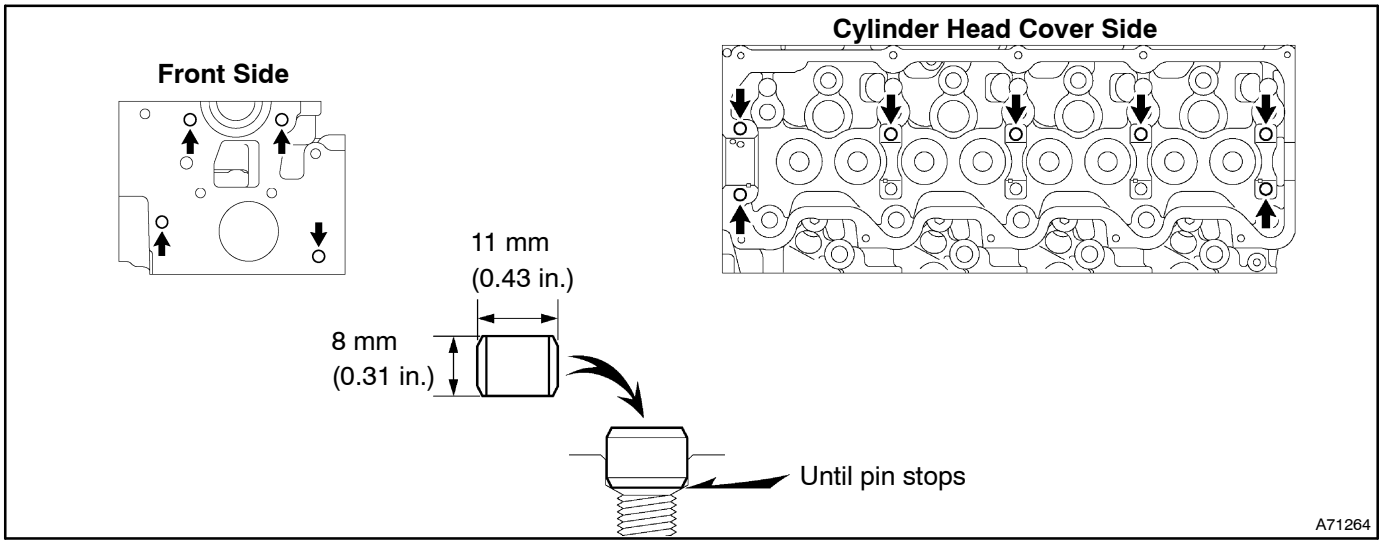
SST Position A:
09950–60010 (09951–00250), 09950–70010 (09951–07100)
Position B:
09950–60010 (09951–00300), 09950–70010 (09951–07100)
Position C:
09950–60010 (09951–00450), 09950–70010 (09951–07100)

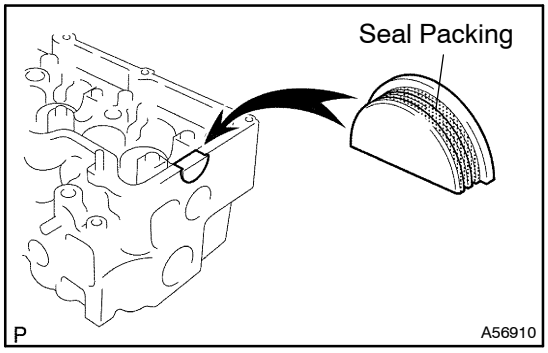


27. INSTALL STUD BOLT



28. INSTALL RING PIN





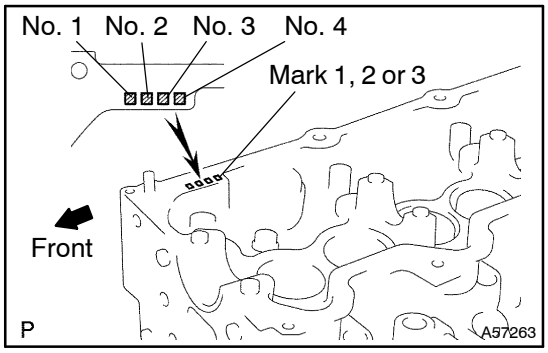
29. INSTALL SEMICIRCULAR PLUG

(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to the semicircular plug as shown in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

(c) Install the semicircular plug to the cylinder head.

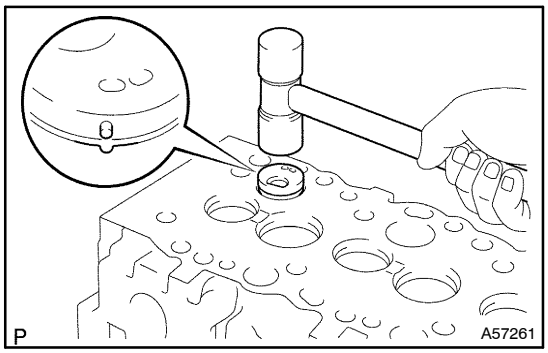


30. INSTALL COMBUSTION CHAMBER SUB–ASSY

(a) Select the number of shim, depending on the table below.

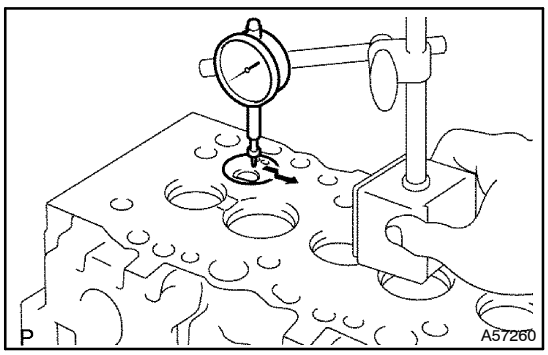
Number mark of cylinder head	Number of shim
1	0
2	0
	1
3	1
	2

Shim thickness: 0.03 mm (0.0012 in.)



(b) Align the combustion chamber knock pin with the cylinder head notch.

(c) Using a plastic–faced hammer, tap in the combustion chamber.

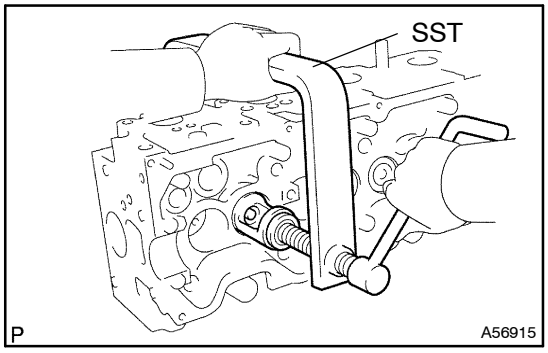


(d) Using a dial indicator, check the combustion chamber protrusion.

Combustion chamber protrusion:
Minus 0.03 – Plus 0.03 mm
(Minus 0.0012 – Plus 0.0012 in.)

If the protrusion is less than specified, adjust with shims.
If the protrusion is greater than specified, replace the chamber and recheck the protrusion.

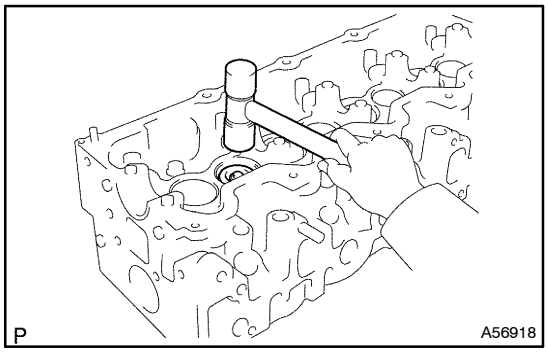
31. INSTALL VALVE STEM OIL O SEAL OR RING



32. INSTALL INTAKE VALVE

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

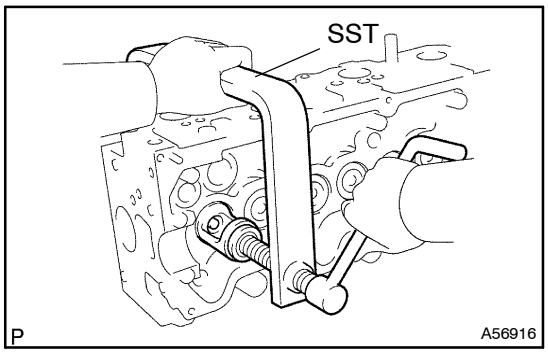
(b) Using SST, compress the valve spring and place the 2 retainer locks around the valve stem.
SST 09202–70020 (09202–00030)



(c) Using a plastic–faced hammer, lightly tap the valve stem tip to assure a proper fit.

NOTICE:

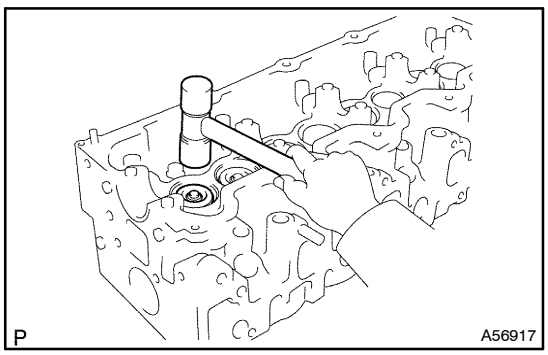
Be careful not do damage the valve stem tip.



33. INSTALL EXHAUST VALVE

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

(b) Using SST, compress the valve spring and place the 2 retainer locks around the valve stem.
SST 09202–70020 (09202–00030)



(c) Using a plastic–faced hammer, lightly tap the valve stem tip to assure a proper fit.

NOTICE:

Be careful not do damage the valve stem tip.

34. INSTALL VALVE LIFTER

(a) Install the valve lifter and shim.

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