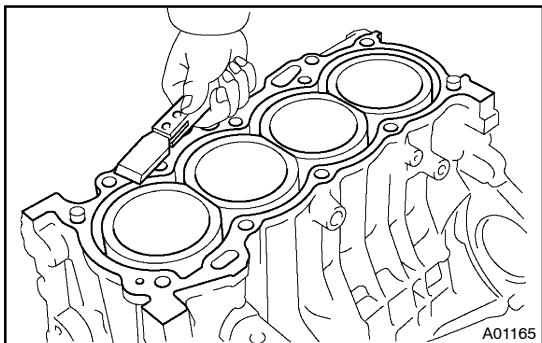




INSPECTION

1. REMOVE GASKET MATERIAL

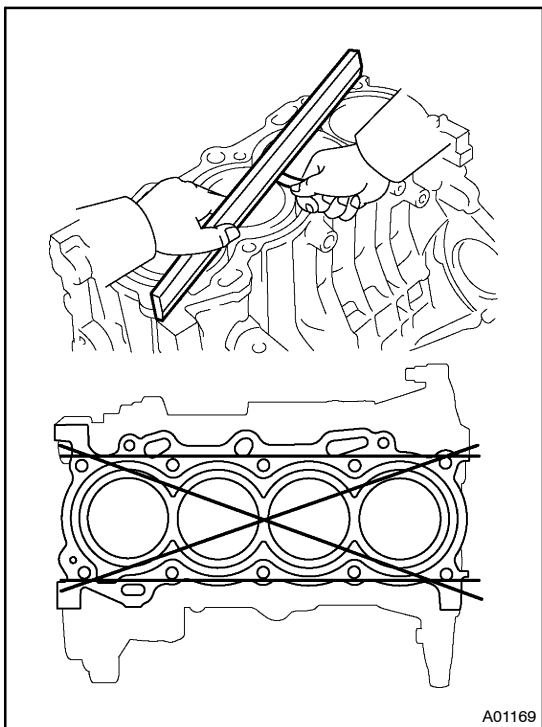
Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, thoroughly clean the cylinder block.

NOTICE:

If the cylinder is washed at high temperatures, the cylinder liner sticks out beyond the cylinder block, so always wash the cylinder block at a temperature of 45°C (133°F) or less.

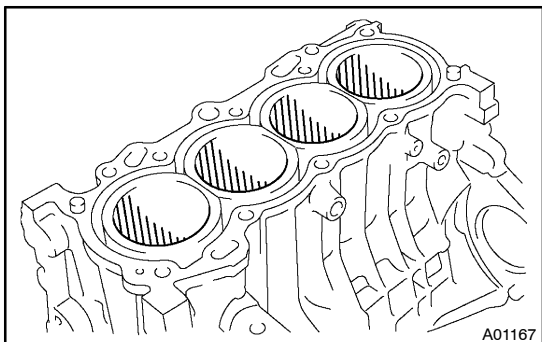


3. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

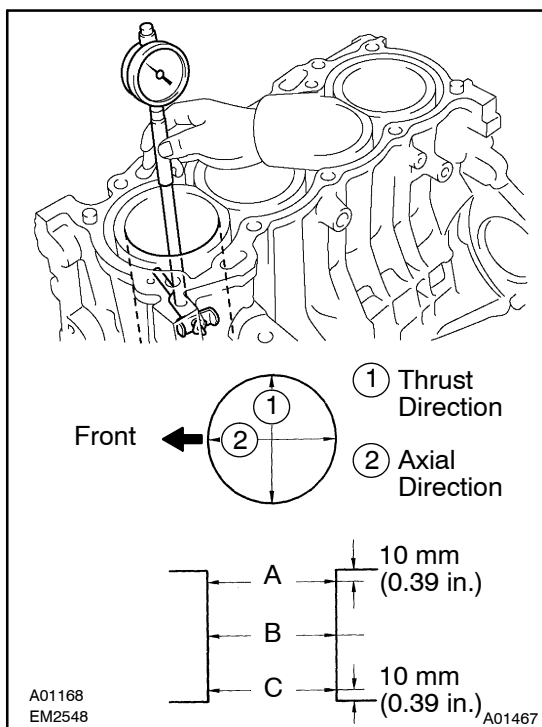
If warpage is greater than maximum, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

Visually check the cylinder for vertical scratches.

If deep scratches are present, replace the cylinder block.



5. INSPECT CYLINDER BORE DIAMETER

Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Standard diameter:

1ZZ-FE 79.000 – 79.013 mm (3.1102 – 3.1107 in.)

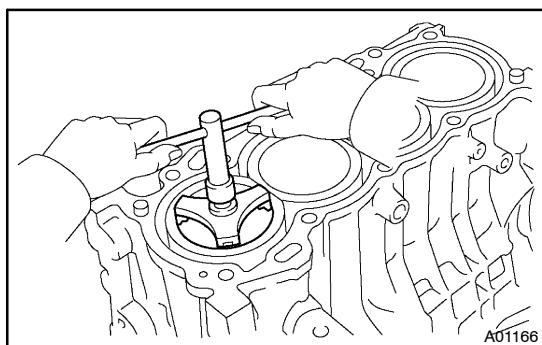
2ZZ-GE 82.000 – 82.013 mm (3.2283 – 3.2289 in.)

Maximum diameter:

1ZZ-FE 79.013 mm (3.1107 in.)

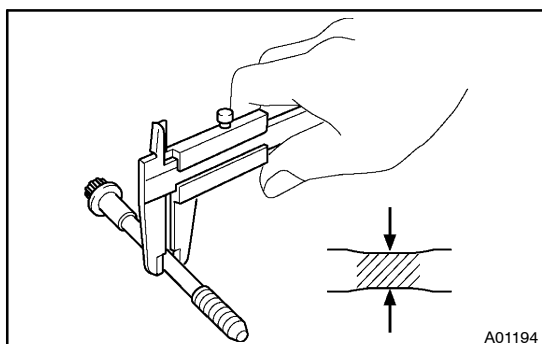
2ZZ-GE 82.013 mm (3.2289 in.)

If the diameter is greater than maximum, replace the cylinder block.



6. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



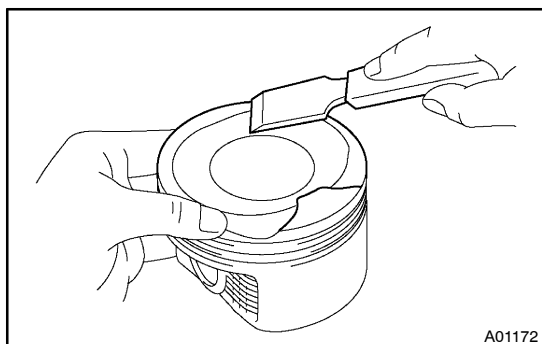
7. INSPECT 12 POINTED HEAD BEARING CAP SUB-ASSEMBLY BOLTS

Using vernier calipers, measure the tension portion diameter of the bolt.

Standard diameter: 7.3 – 7.5 mm (0.287 – 0.295 in.)

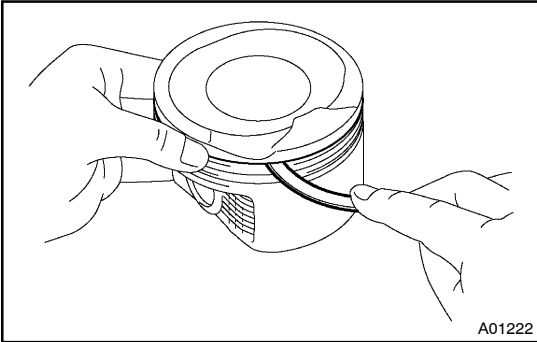
Minimum diameter: 7.3 mm (0.287 in.)

If the diameter is less than minimum, replace the bolt.

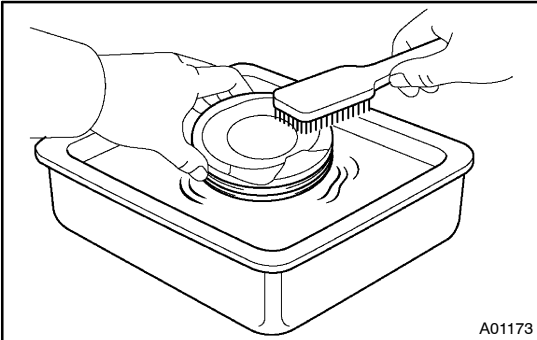


8. CLEAN PISTON

- (a) Using a gasket scraper, remove the carbon from the piston top.



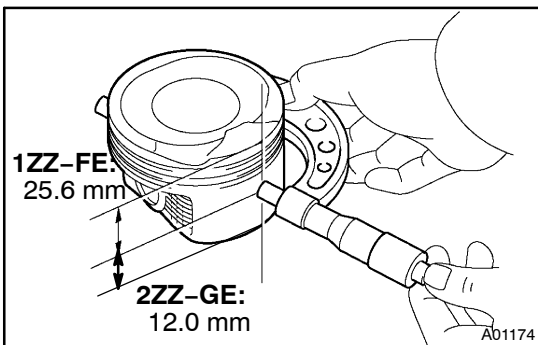
- (b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



- (c) Using solvent and a brush, thoroughly clean the piston.

NOTICE:

Do not use a wire brush.



9. INSPECT PISTON OIL CLEARANCE

- (a) 1ZZ-FE:

Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 25.6 mm (1.008 in.) from the piston head.

- (b) 2ZZ-GE:

Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 12.0 mm (0.048 in.) from the piston bottom.

Piston diameter:

1ZZ-FE:

78.925 – 78.935 mm (3.1073 – 3.1077 in.)

2ZZ-GE:

81.975 – 81.993 mm (3.2274 – 3.2281 in.)

- (c) Measure the cylinder bore diameter in the thrust directions (See procedure in step 5).

- (d) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

1ZZ-FE:

0.065 – 0.088 mm (0.0026 – 0.0035 in.)

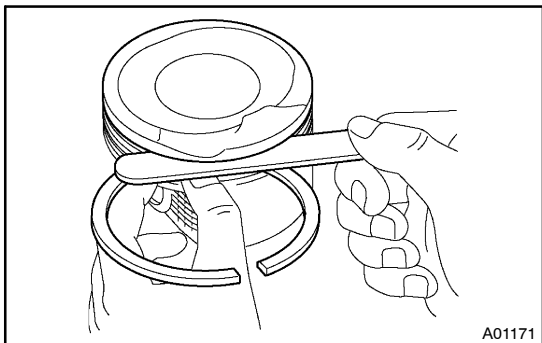
2ZZ-GE:

0.007 – 0.038 mm (0.0003 – 0.0015 in.)

Maximum oil clearance:

0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace all the 4 pistons. If necessary, replace the cylinder block.

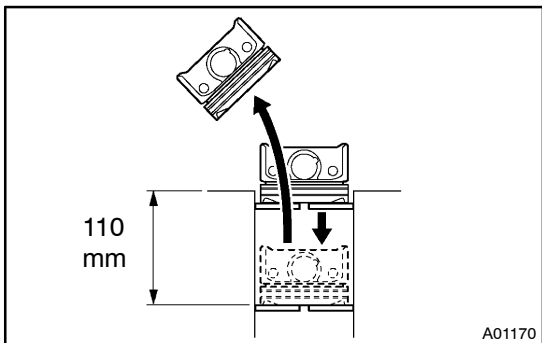
**10. INSPECT PISTON RING END GAP**

Using a feeler gauge, measure the clearance between new piston ring and the wall of the ring groove.

Ring groove clearance:

0.030 – 0.070 mm (0.0012 – 0.0028 in.)

If the clearance is not as specified, replace the piston.

**11. INSPECT PISTON RING END GAP**

- Insert the piston ring into the cylinder bore.
- Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.
- Using a feeler gauge, measure the end gap.

Standard end gap:

No.1 0.25 – 0.35 mm (0.0098 – 0.0138 in.)

No.2 0.35 – 0.50 mm (0.0138 – 0.0197 in.)

Oil (Side rail) 0.15 – 0.40 mm (0.0059 – 0.0157 in.)

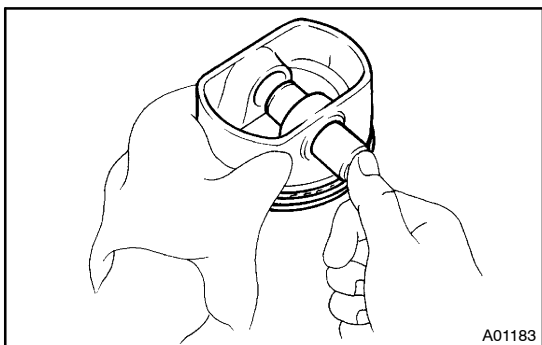
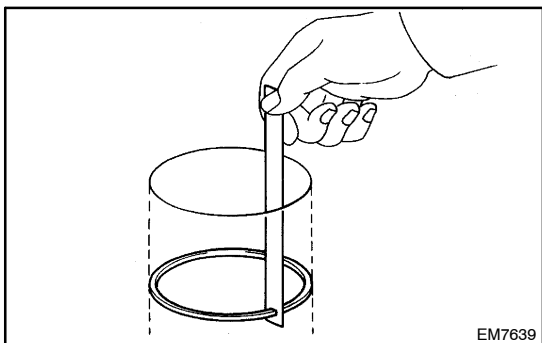
Maximum end gap:

No.1 1.05 mm (0.0413 in.)

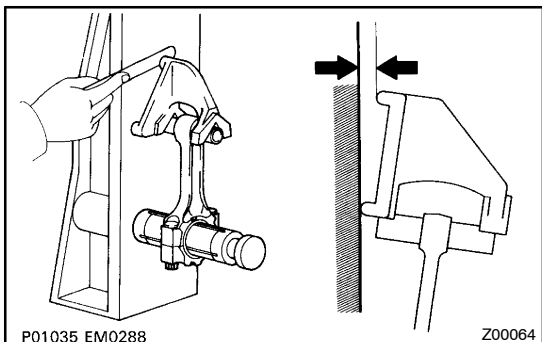
No.2 1.20 mm (0.0472 in.)

Oil (Side rail) 1.05 mm (0.0413 in.)

If the end gap is greater than maximum, replace the piston ring.
If the end gap is greater than maximum, even with a new piston ring, replace the cylinder block.

**12. INSPECT PISTON PIN FIT**

At 80 – 90°C (176 – 194°F), you should be able to push the piston pin into the piston pin hole with your thumb.

**13. INSPECT CONNECTING ROD ALIGNMENT**

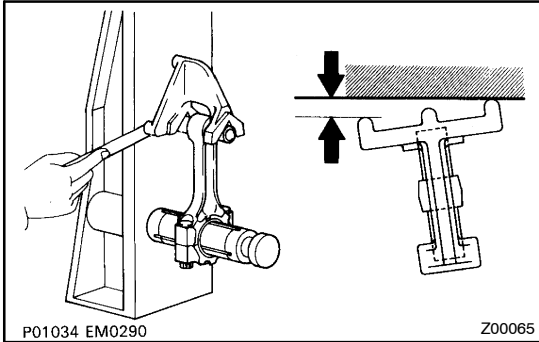
Using a rod aligner and feeler gauge, check the connecting rod alignment.

- Check for out-of-alignment

Maximum out-of-alignment:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If out-of-alignment is greater than maximum, replace the connecting rod assembly.

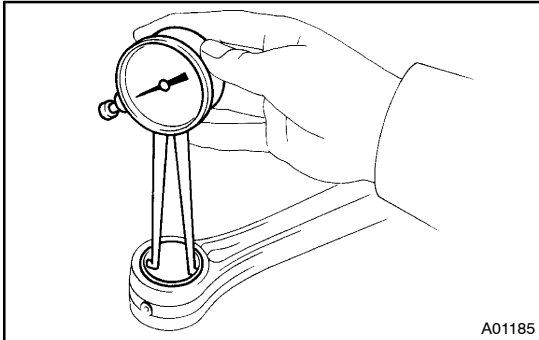


- Check for twist

Maximum twist:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod assembly.



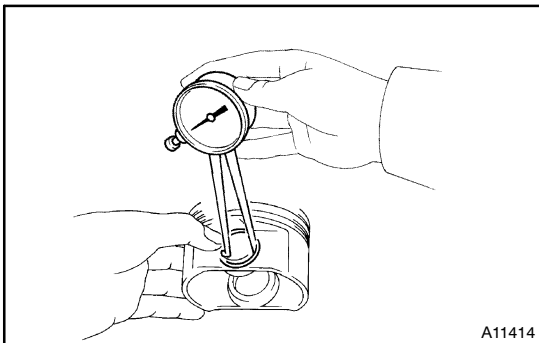
14. INSPECT PISTON PIN OIL CLEARANCE

- (a) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:

1ZZ-FE 20.012 – 20.021 mm (0.7879 – 0.7882 in.)

2ZZ-GE 20.011 – 20.023 mm (0.7878 – 0.7883 in.)

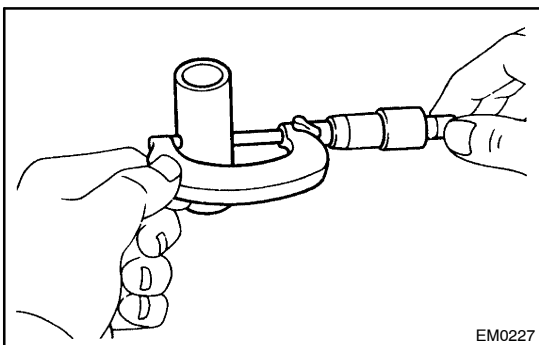


- (b) 2ZZ-GE:

Using caliper gauge, measure the inside diameter of the piston bushing.

Bushing inside diameter:

20.013 – 20.025 mm (0.7879 – 0.7884 in.)



- (c) Using a micrometer, measure the piston pin diameter.

Piston pin diameter:

1ZZ-FE 20.004 – 20.013 mm (0.7876 – 0.7879 in.)

2ZZ-GE 20.004 – 20.016 mm (0.7876 – 0.7880 in.)

- (d) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

Standard oil clearance:

1ZZ-FE 0.005 – 0.011 mm (0.0002 – 0.0004 in.)

2ZZ-GE

Piston x Piston pin

0.005 – 0.013 mm (0.0002 – 0.0005 in.)

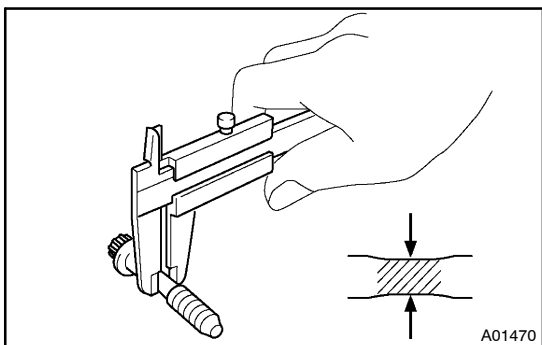
Piston pin x Connecting rod

0.005 – 0.009 mm (0.0002 – 0.0004 in.)

Maximum oil clearance:

0.05 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.

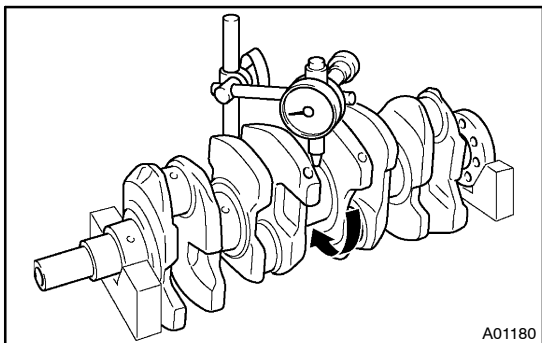
**15. INSPECT CONNECTING ROD BOLTS**

Using a vernier calipers, measure the tension portion diameter of the bolt.

Standard diameter: 6.6 – 6.7 mm (0.260 – 0.264 in.)

Minimum diameter: 6.4 mm (0.252 in.)

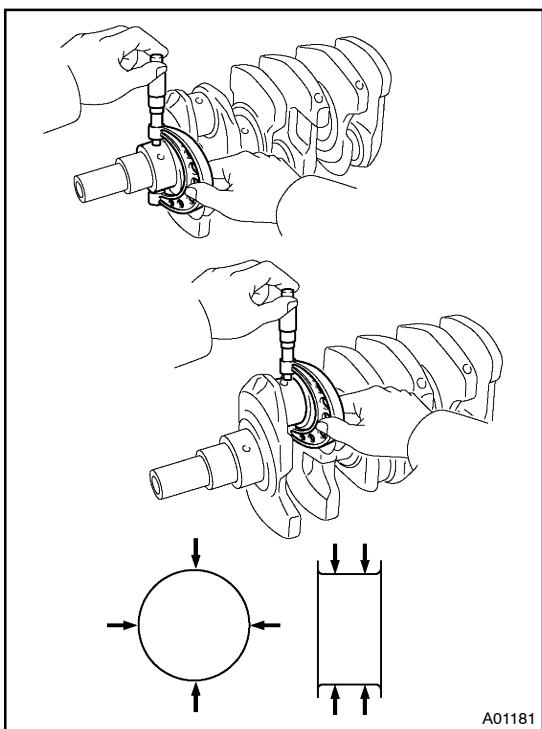
If the diameter is less than minimum, replace the bolt.

**16. INSPECT CRANKSHAFT FOR CIRCLE RUNOUT**

- Place the crankshaft on V-blocks.
- Using a dial indicator, measure the circle runout, as shown in the illustration.

Maximum circle runout: 0.03 mm (0.0012 in.)

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

**17. INSPECT MAIN JOURNALS AND CRANK PINS**

- Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

47.988 – 48.000 mm (1.8893 – 1.8898 in.)

Crank pin diameter:

1ZZ-FE:

43.992 – 44.000 mm (1.7320 – 1.7323 in.)

2ZZ-GE:

44.992 – 45.000 mm (1.7713 – 1.7717 in.)

If the diameter is not as specified, check the oil clearance ([See page EM-75](#)).

If necessary, replace the crankshaft.

- Check each main journal and crank pin for taper and out-of-round as shown.

Maximum taper and out-of-round:

0.02 mm (0.0008 in.)

If the taper and out-of-round is greater than maximum, replace the crankshaft.