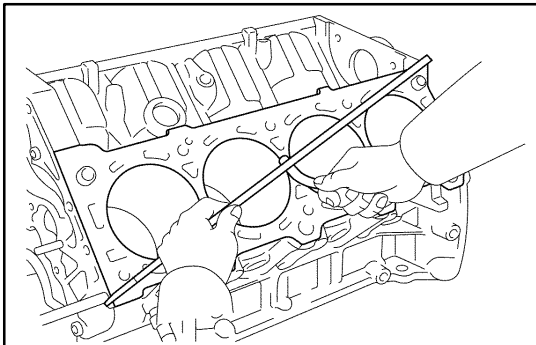


INSPECTION

1. CLEAN CYLINDER BLOCK

- (a) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.
- (b) Using a soft brush and solvent, thoroughly clean the cylinder block.



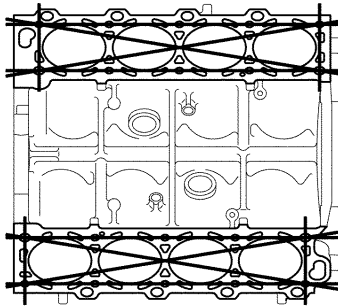
2. INSPECT CYLINDER BLOCK

- (a) Inspect for flatness.
Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head and main bearing cap for warpage.

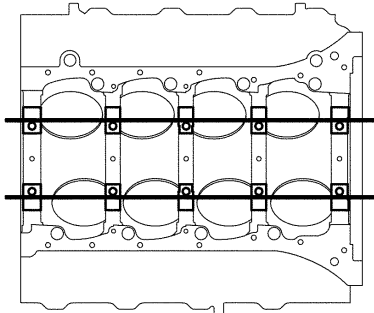
Maximum warpage: 0.07 mm (0.0028 in.)

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

Cylinder Block Side

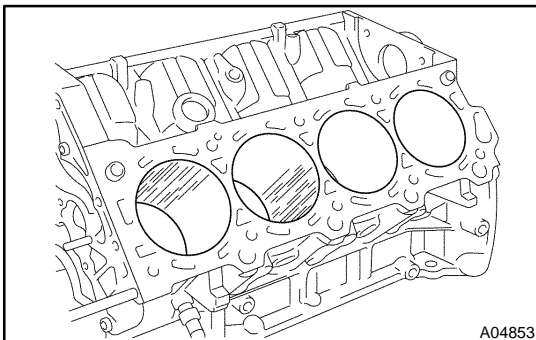


Main Bearing Cap Side

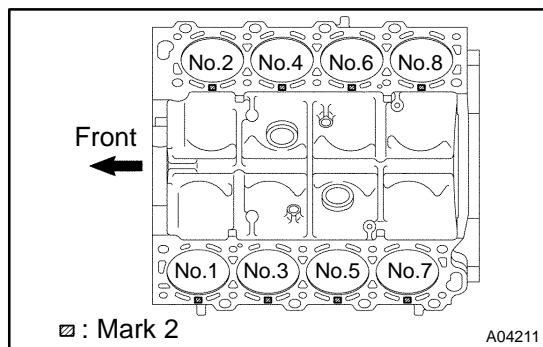


A04850
A04210
A04212

A05178



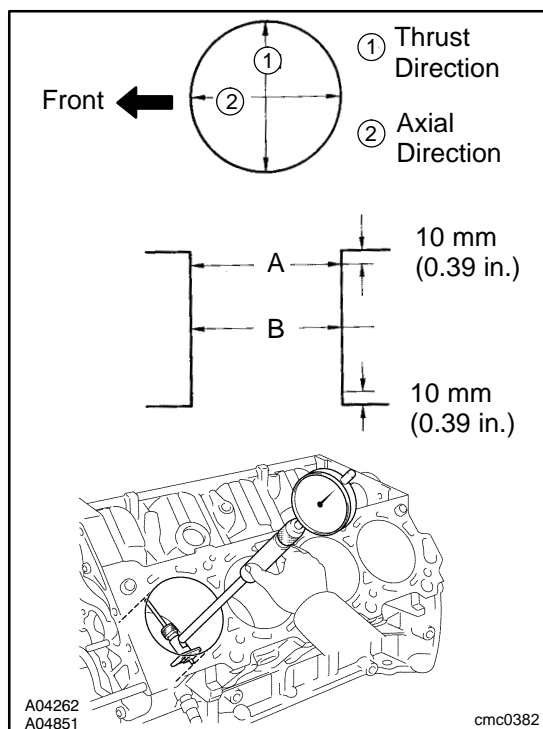
- (b) Visually check the cylinder for vertical scratches.
If deep scratches are present, rebore all the 8 cylinders and replace all the 8 pistons. (See page [EM-115](#)) If necessary, replace the cylinder block.



(c) Inspect the cylinder bore diameter.

HINT:

There is 1 size of the standard cylinder bore diameter, marked "2" accordingly. The mark is stamped on the top of the cylinder block.



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

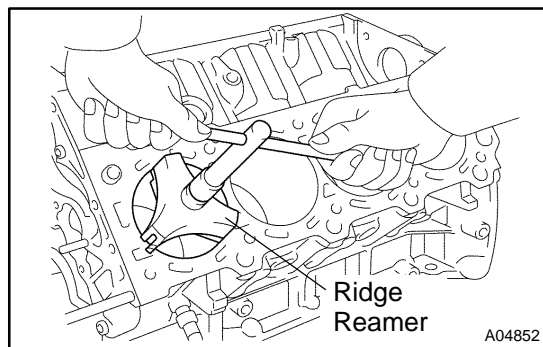
Standard diameter:

94.010 to 94.023 mm (3.7012 to 3.7017 in.)

Maximum diameter:

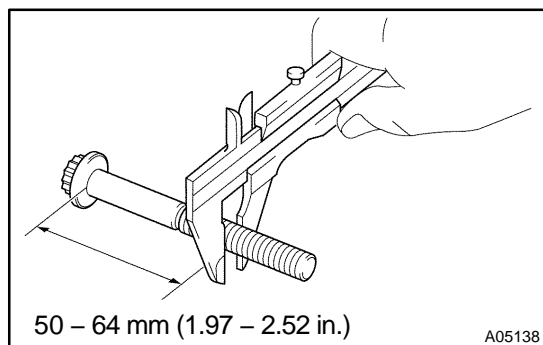
| | |
|----------|------------------------|
| STD | 94.223 mm (3.7096 in.) |
| O/S 0.50 | 94.723 mm (3.7292 in.) |

If the diameter is greater than maximum, rebore all the 8 cylinders and replace all the 8 pistons. (See page [EM-115](#)) If necessary, replace the cylinder block.



(d) Remove the cylinder ridge.

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



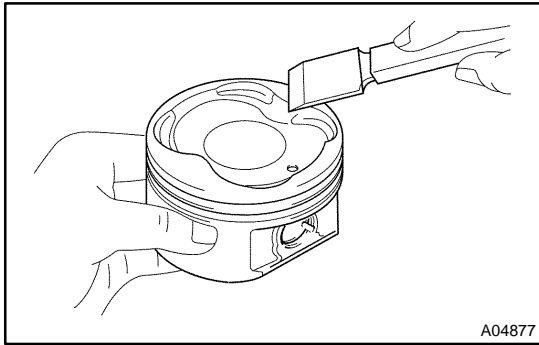
(e) Using vernier calipers, measure the thread outside diameter of the main bearing cap bolt.

Standard diameter:

10.760 to 10.970 mm (0.4236 to 0.4319 in.)

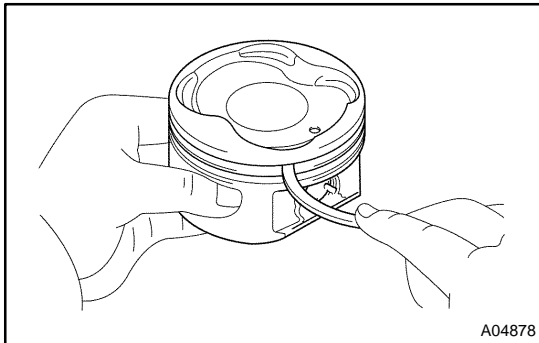
Minimum diameter: 10.40 mm (0.4094 in.)

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

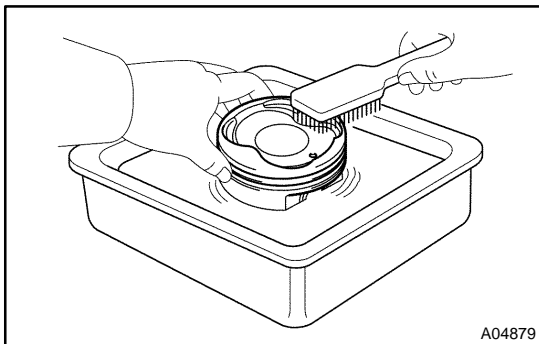


3. CLEAN PISTON

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



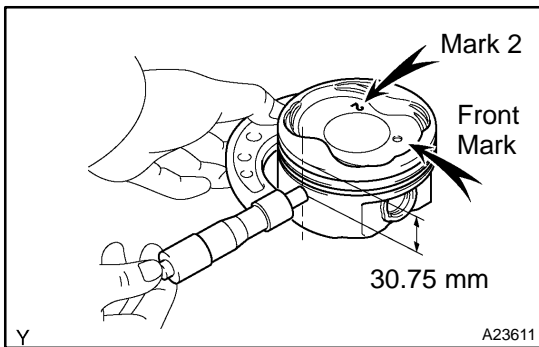
- (b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



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

NOTICE:

Do not use a wire brush.



4. INSPECT PISTON AND CONNECTING ROD

- (a) Inspect the piston oil clearance.

HINT:

There is 1 size of the standard piston diameter, marked "2" accordingly. The mark is stamped on the piston top.

- (1) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 30.75 mm (1.2106 in.) from the piston head.

Piston diameter:

| | | |
|----------|----------|--|
| STD | Mark "2" | 93.912 to 93.940 mm (3.6973 to 3.6984 in.) |
| O/S 0.50 | | 94.392 to 94.440 mm (3.7162 to 3.7181 in.) |

- (2) Measure the cylinder bore diameter in the thrust directions (see step 2 above).

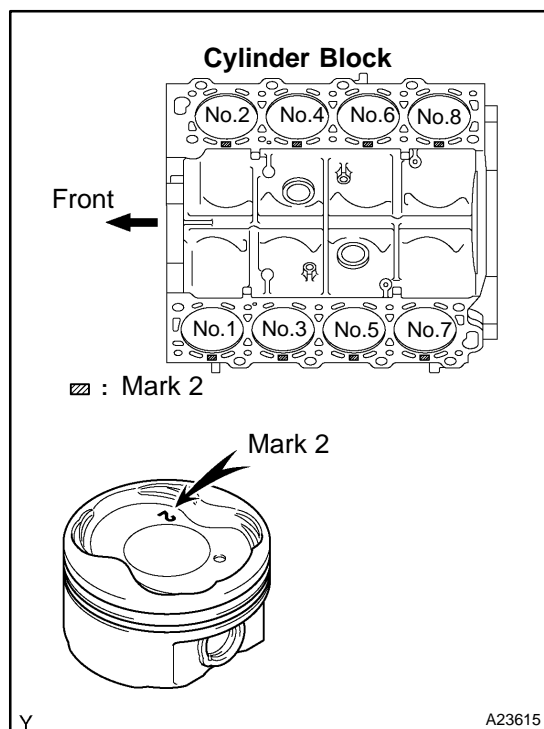
- (3) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

0.030 to 0.071 mm (0.0012 to 0.0028 in.)

Maximum oil clearance: 0.13 mm (0.0051 in.)

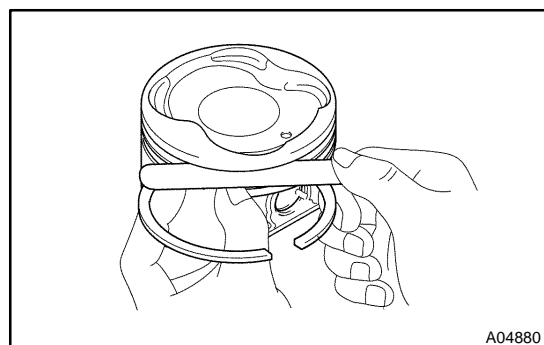
If the oil clearance is greater than maximum, replace all the 8 pistons and rebore all the 8 cylinders. (See page [EM-115](#)) If necessary, replace the cylinder block.



HINT

Use a new cylinder block:

- Use a piston with the same number mark as the cylinder diameter number marked on the cylinder block.

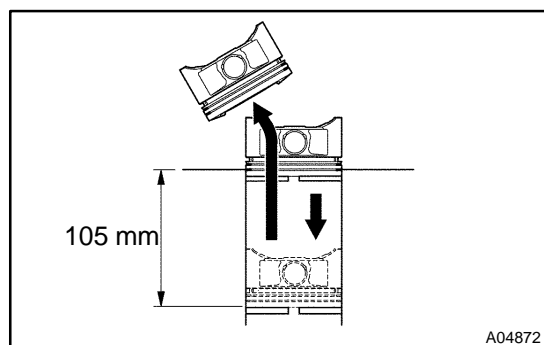


- (b) Inspect the piston ring groove clearance.
Using a feeler gauge, measure the clearance between the new piston ring and the wall of the ring groove.

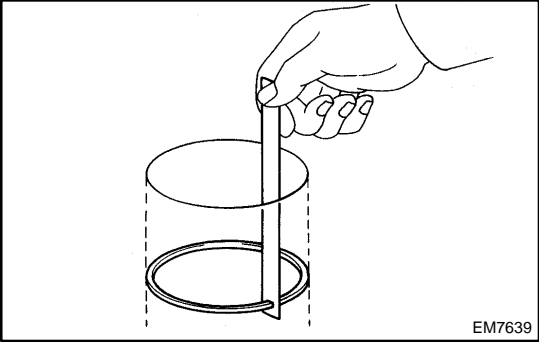
Ring groove clearance:

| | |
|-------|--|
| No. 1 | 0.030 to 0.080 mm (0.0012 to 0.0031 in.) |
| No. 2 | 0.020 to 0.060 mm (0.0008 to 0.0024 in.) |

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



- (c) Inspect the piston ring end gap.
- Insert the piston ring into the cylinder bore.
 - Using a piston, push the piston ring a little to the bottom of the ring travel, 105 mm (4.13 in.) from the top of the cylinder block.



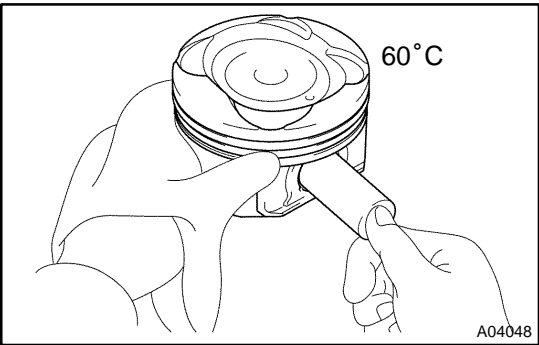
- (3) Using a feeler gauge, measure the end gap.
Standard end gap:

| | |
|-----------------|--|
| No.1 | 0.300 to 0.400 mm (0.0118 to 0.0157 in.) |
| No.2 | 0.450 to 0.600 mm (0.0177 to 0.0236 in.) |
| Oil (Side rail) | 0.100 to 0.350 mm (0.0039 to 0.0138 in.) |

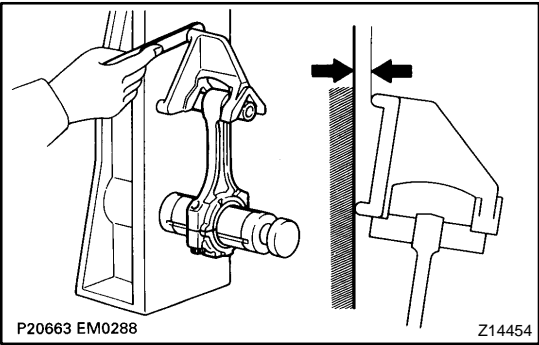
Maximum end gap:

| | |
|-----------------|----------------------|
| No.1 | 1.10 mm (0.0433 in.) |
| No.2 | 1.30 mm (0.0512 in.) |
| Oil (Side rail) | 0.75 mm (0.0295 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, rebore all the 8 cylinders (See page EM-115) or replace the cylinder block.



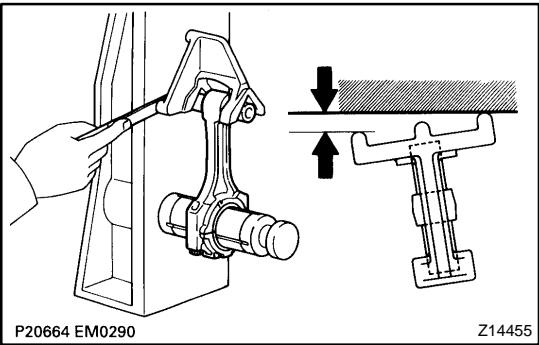
- (d) Inspect the piston pin fit.
At 60°C (140°F), you should be able to push the piston pin into the piston pin hole with your thumb.



- (e) Using a rod aligner and feeler gauge, check the connecting rod alignment.
(1) Check for bend.

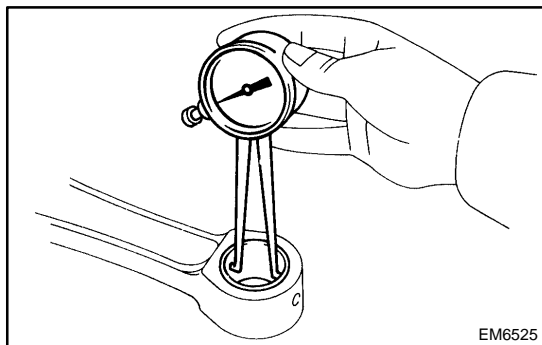
Maximum bend:
0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

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



(2) Check for twist.
Maximum twist:
0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

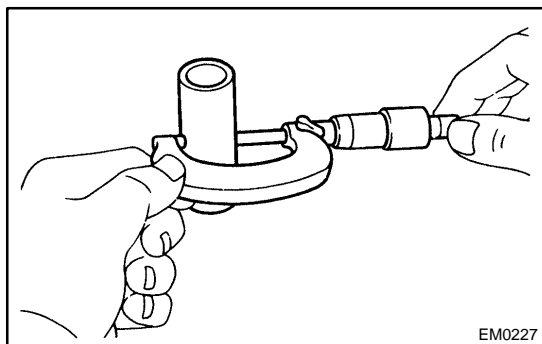
If twist is greater than maximum, replace the connecting rod assembly.



- (f) Inspect the piston pin oil clearance.
- (1) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:

22.005 to 22.014 mm (0.8663 to 0.8667 in.)



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

Piston pin diameter:

21.997 to 22.009 mm (0.8660 to 0.8664 in.)

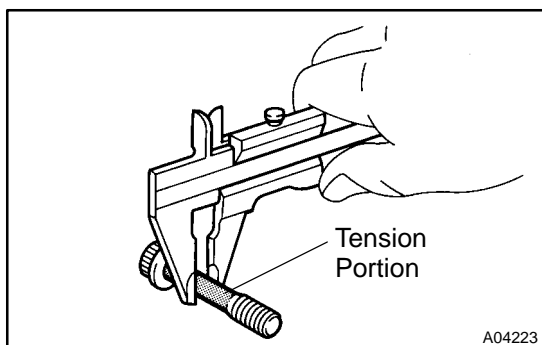
- (3) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

Standard oil clearance:

0.005 to 0.011 mm (0.0002 to 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.



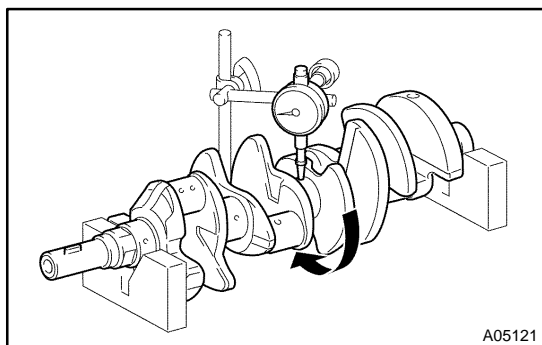
- (g) Using vernier calipers, measure the tension portion of the connecting rod bolt.

Standard diameter:

7.200 to 7.300 mm (0.2835 to 0.2874 in.)

Minimum diameter: 7.00 mm (0.2756 in.)

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

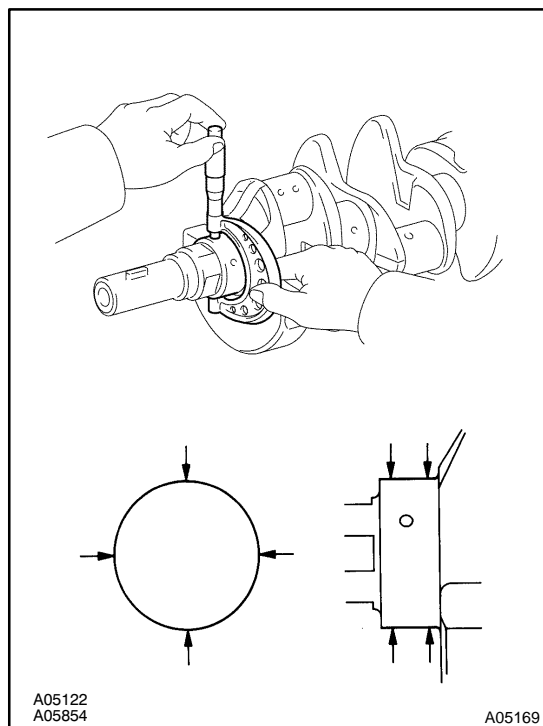


5. INSPECT CRANKSHAFT

- (a) Inspect for circle runout.
 - (1) Place the crankshaft on V-blocks.
 - (2) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.04 mm (0.0016 in.)

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



- (b) Inspect the main journals and crank pins.
- (1) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

66.988 to 67.000 mm (2.6373 to 2.6378 in.)

Crank pin diameter:

51.982 to 52.000 mm (2.0465 to 2.0472 in.)

If the diameter is not as specified, check the oil clearance (See page [EM-100](#)). If necessary, replace the crankshaft.

- (2) 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.