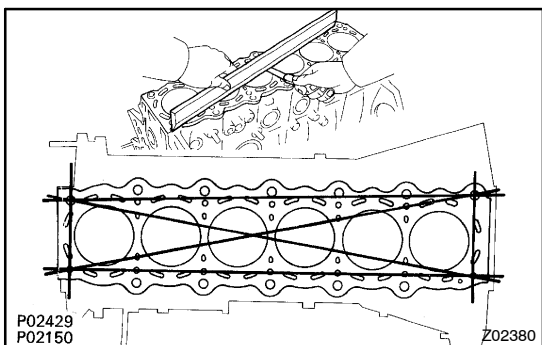


A02685

## INSPECTION

### 1. CLEAN CYLINDER BLOCK

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

P02429  
P02150

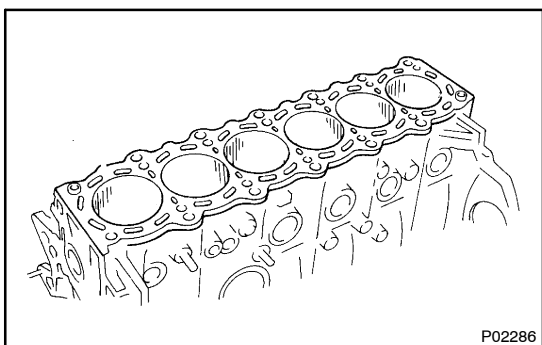
Z02380

### 2. INSPECT CYLINDER BLOCK SURFACE FOR FLATNESS

Using precision straight edge and feeler gauge, measure the top surfaces of the cylinder block for warpage.

**Maximum warpage: 0.07 mm (0.0028 in.)**

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

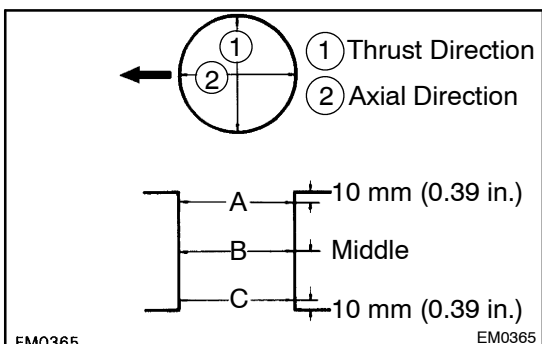


P02286

### 3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.

If deep scratches are present, replace the cylinder block.



EM0365

EM0365

### 4. 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.

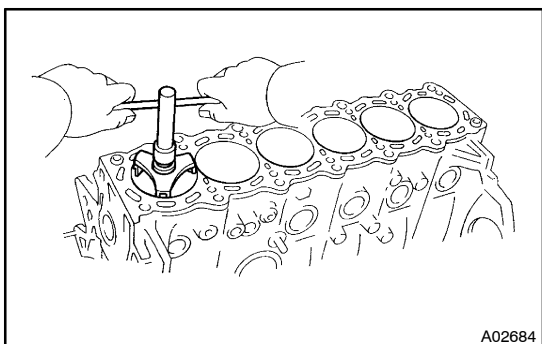
**Standard diameter:**

**86.000 – 86.013 mm (3.3858 – 3.3863 in.)**

**Maximum diameter:**

**86.02 mm (3.3866 in.)**

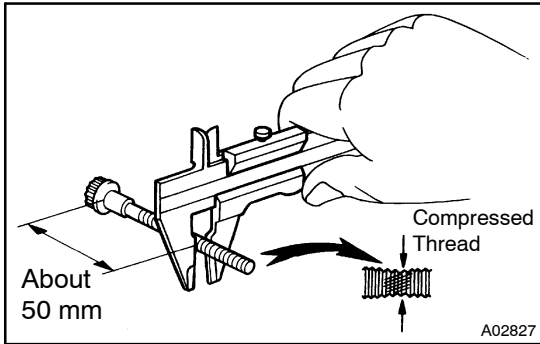
If the diameter is greater than maximum, replace the cylinder block.



A02684

### 5. 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.



## 6. INSPECT MAIN BEARING CAP BOLTS

Using vernier calipers, measure the minimum diameter of the compressed thread at the measuring point.

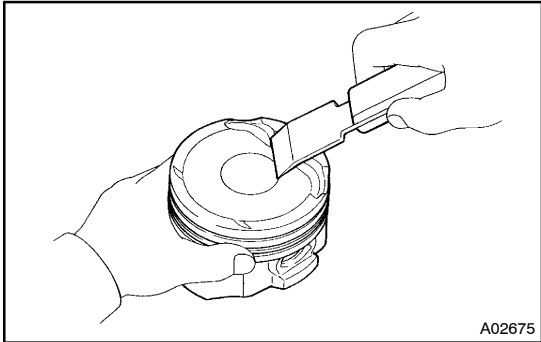
**Standard diameter:**

**9.96 – 9.97 mm (0.3921 – 0.3925 in.)**

**Minimum diameter:**

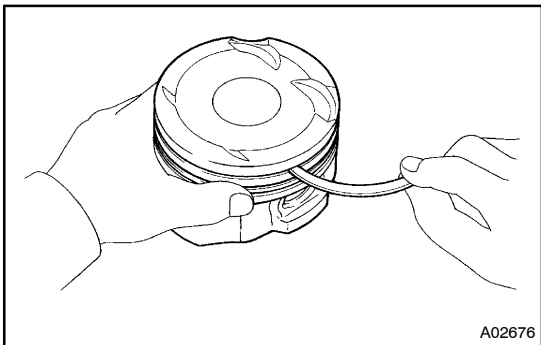
**9.7 mm (0.382 in.)**

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



## 7. CLEAN PISTON

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

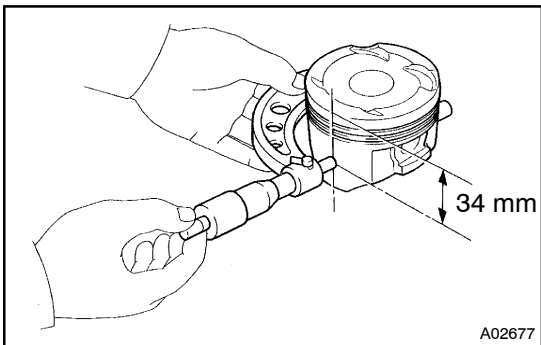


- (b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.

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

**NOTICE:**

**Do not use a wire brush.**



## 8. INSPECT PISTON OIL CLEARANCE

- (a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 34 mm (1.34 in.) from the piston head.

**Piston diameter:**

**85.945 – 85.965 mm (3.3837 – 3.3844 in.)**

- (b) Measure the cylinder bore diameter in the thrust directions. (See step 4)

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

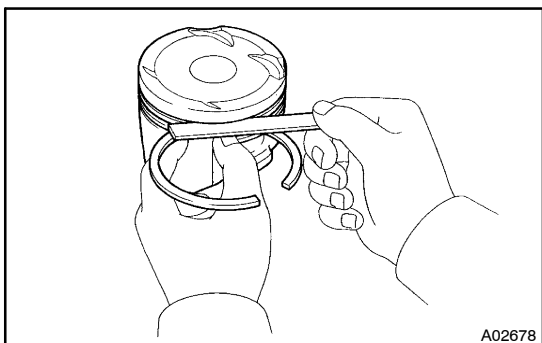
**Standard oil clearance:**

**0.035 – 0.068 mm (0.0014 – 0.0027 in.)**

**Maximum oil clearance:**

**0.10 mm (0.0039 in.)**

If the oil clearance is greater than maximum, replace all the 6 pistons. If necessary, replace the cylinder block.



A02678

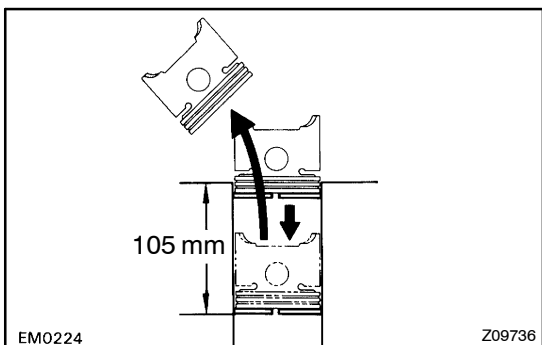
**9. INSPECT PISTON RING GROOVE CLEARANCE**

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

**Ring groove clearance:**

No. 1	0.011 – 0.070 mm (0.0004 – 0.0028 in.)
No. 2	0.030 – 0.070 mm (0.0012 – 0.0028 in.)

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

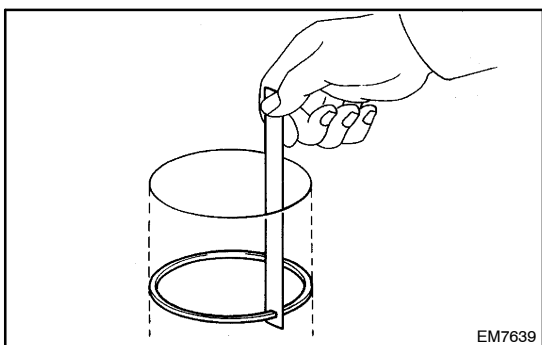


EM0224

Z09736

**10. INSPECT PISTON RING END GAP**

- (a) Insert the piston ring into the cylinder bore.
- (b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 105 mm (4.13 in.) from the top of the cylinder block.



EM7639

- (c) Using a feeler gauge, measure the ring end gap.

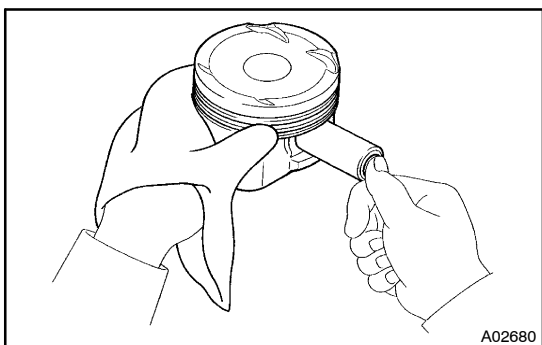
**Standard ring end gap:**

No. 1	0.300 – 0.470 mm (0.0118 – 0.0185 in.)
No. 2	0.350 – 0.520 mm (0.0138 – 0.0205 in.)
Oil (Side rail)	0.130 – 0.450 mm (0.0051 – 0.0177 in.)

**Maximum ring end gap:**

No. 1	1.07 mm (0.0421 in.)
No. 2	1.12 mm (0.0441 in.)
Oil (Side rail)	1.05 mm (0.0413 in.)

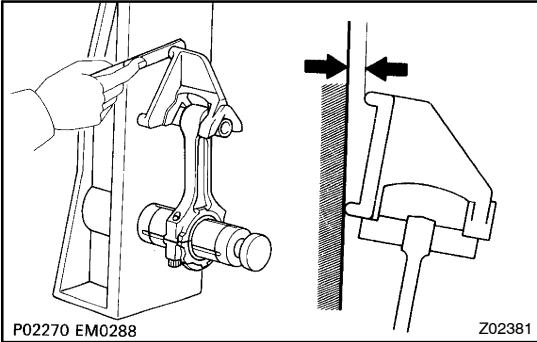
If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, replace the cylinder block.



A02680

**11. INSPECT PISTON PIN FIT**

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



## 12. INSPECT CONNECTING ROD ALIGNMENT

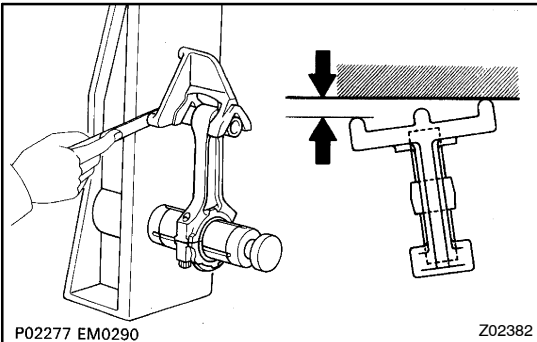
Using a feeler gauge and rod aligner, check the connecting rod alignment.

- 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.

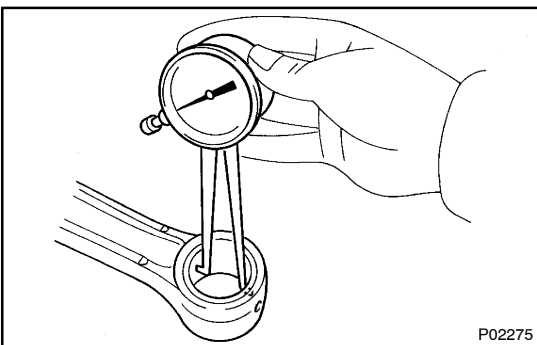


- Check for twist

**Maximum twist:**

**0.15 mm (0.0059 in.) per 100 mm (3.94 in.)**

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

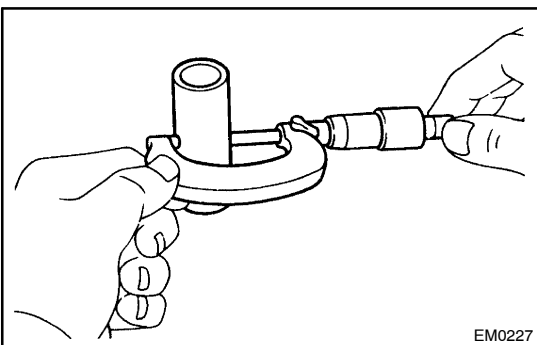


## 13. INSPECT PISTON PIN OIL CLEARANCE

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

**Bushing inside diameter:**

**22.005 – 22.014 mm (0.8663 – 0.8667 in.)**



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

**Piston pin diameter:**

**21.997 – 22.006 mm (0.8660 – 0.8664 in.)**

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

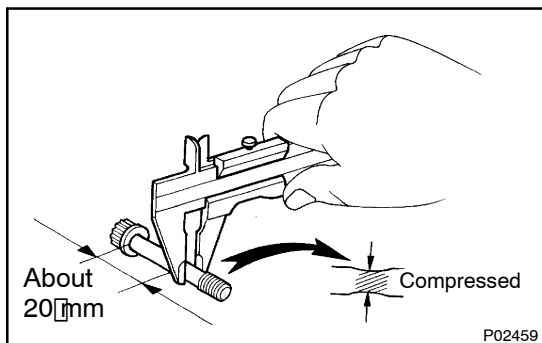
**Standard oil clearance:**

**0.005 – 0.011 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.

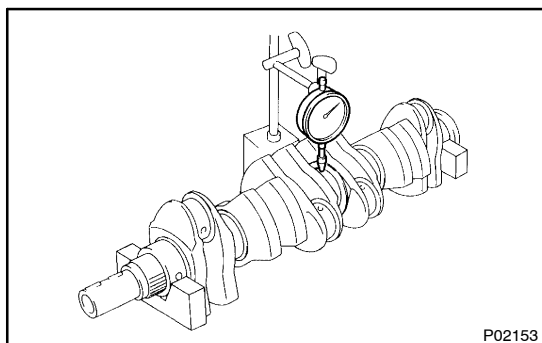
**14. INSPECT CONNECTING ROD BOLTS**

Using vernier calipers, measure the minimum diameter of the compressed bolt at the measuring point.

**Standard diameter: 8.1 – 8.3 mm (0.319 – 0.327 in.)**

**Minimum diameter: 8.0 mm (0.315 in.)**

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

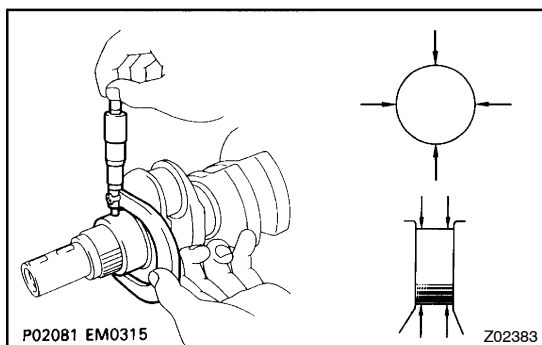
**15. INSPECT CRANKSHAFT FOR RUNOUT**

(a) Place the crankshaft on V-blocks.

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

**Maximum circle runout: 0.06 mm (0.0024 in.)**

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

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

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

**Main journal diameter:**

STD	61.984 – 62.000 mm (2.4403 – 2.4409 in.)
U/S 0.25	61.745 – 61.755 mm (2.4309 – 2.4313 in.)

**Crank pin diameter:**

STD	51.982 – 52.000 mm (2.0465 – 2.0472 in.)
U/S 0.25	51.745 – 51.755 mm (2.0372 – 2.0376 in.)

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

(See page EM-78)

(b) 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 or out-of-round is greater than maximum, grind or replace the crankshaft.

**17. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS**

- Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure step 16).
- Install new main journal and/or crank pin undersized bearings.