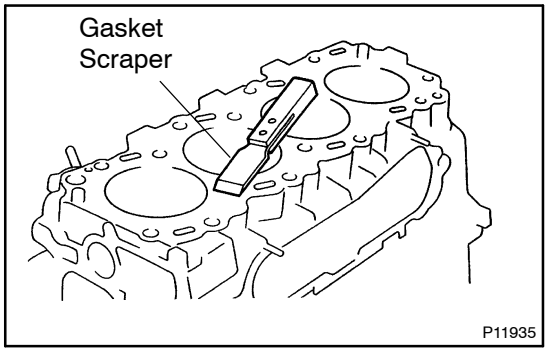
EM15L–01

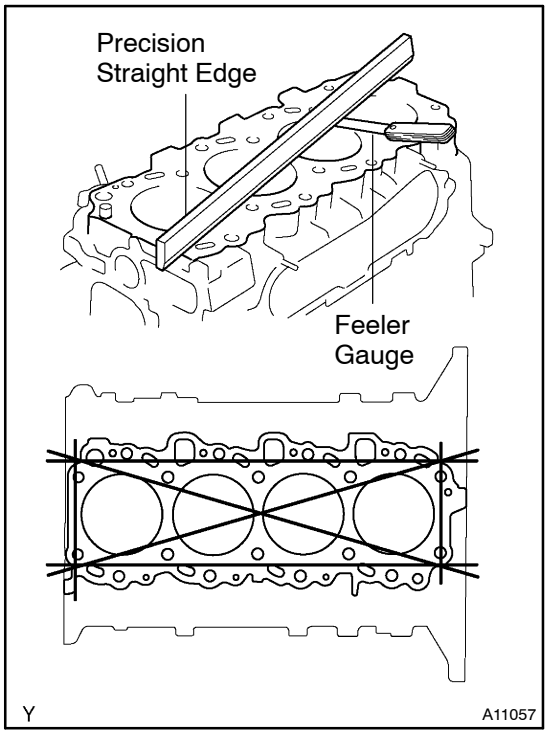
INSPECTION



1. CLEAN CYLINDER BLOCK

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

(b) Clean the cylinder block.
Using a soft brush and solvent, thoroughly clean the cylinder block.

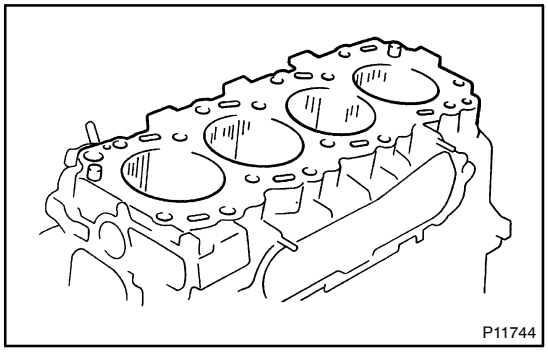


2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

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

Maximum warpage: 0.10 mm (0.0039 in.)

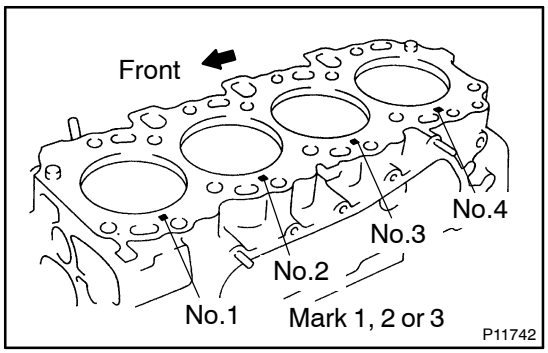
If warpage is greater than maximum, replace the cylinder block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.

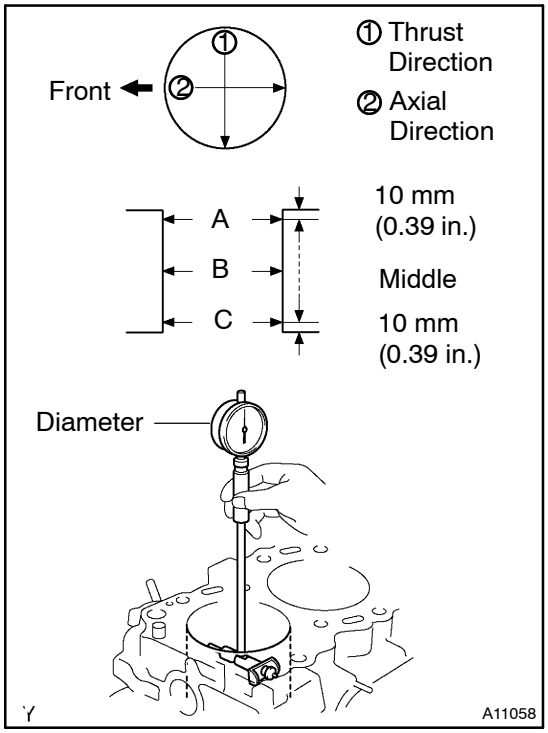
If deep scratches are present, rebore all the 4 cylinders. If necessary, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

HINT:

There are 3 sizes of the standard cylinder bore diameter, marked "1", "2" and "3" accordingly. The mark is stamped on the top of the cylinder block.



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

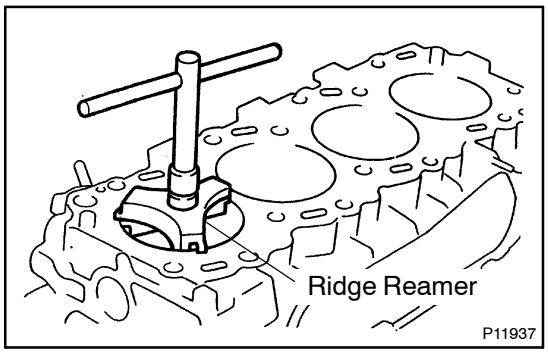
Standard diameter:

STD Mark	96.000 – 96.010 mm (3.7795 – 3.7799 in.)
STD Mark	96.010 – 96.020 mm(3.7799 – 3.7803 in.)
STD Mark	96.020 – 96.030 mm (3.7803 – 3.7807 in.)

Maximum diameter:

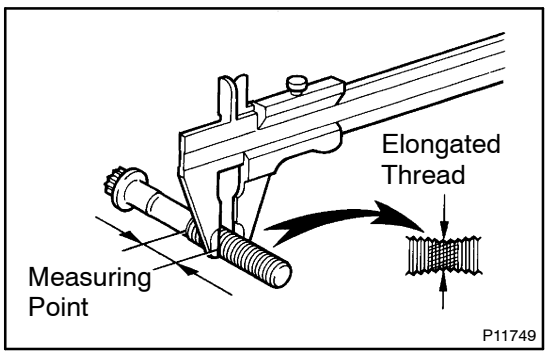
STD	96.23 mm (3.7886 in.)
O/S 0.50	96.73 mm (3.8083 in.)
O/S 0.75	96.96 mm (3.8137 in.)
O/S 1.00	97.23 mm (3.8279 in.)

If the diameter is greater than maximum, rebore all the 4 cylinders. If necessary, replace the cylinder block.



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

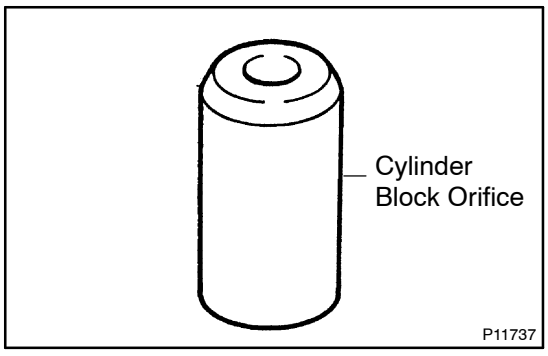
Using vernier calipers, measure the minimum diameter of the compressed thread at the measuring point.

Standard diameter:

13.500 – 14.000 mm (0.5315 – 0.5512 in.)

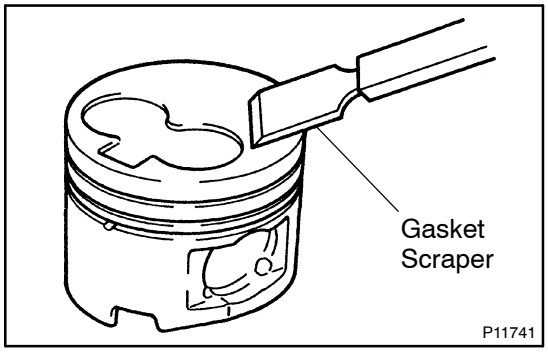
Minimum diameter: 12.60 mm (0.4961 in.)

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



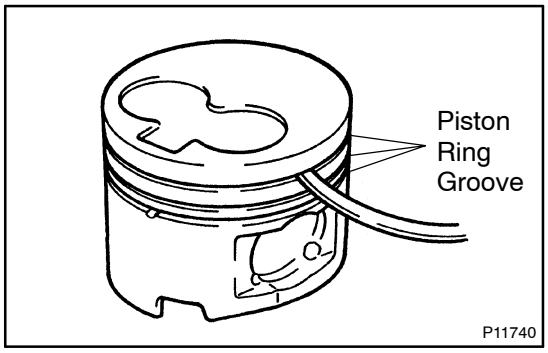
7. INSPECT CYLINDER BLOCK ORIFICE

Visually check that the orifice is not clogged.

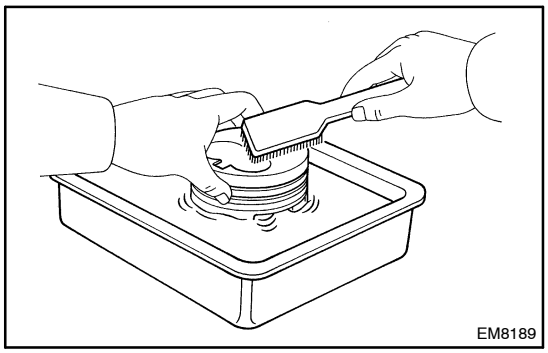


8. CLEAN PISTON

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



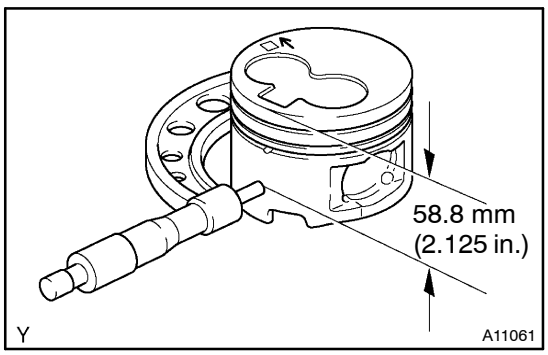
(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



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

NOTICE:

Do not use a wire brush.



9. INSPECT PISTON AND PISTON RING

(a) Inspect the piston oil clearance.

HINT:

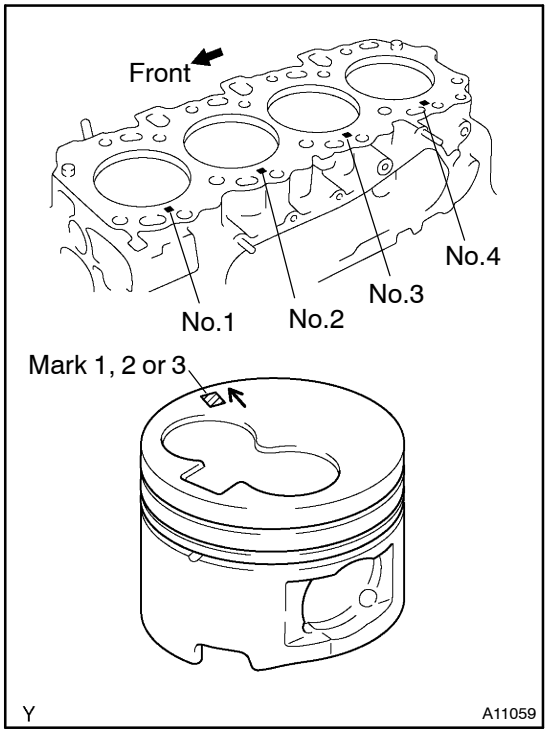
There are 3 sizes of the standard piston diameter, marked ”1”, ”2” and ”3” accordingly. The mark is stamped on the piston top.

(1) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 58.8 mm (2.315 in.) from the piston head.

Piston diameter:

STD Mark 1	95.940 – 95.950 mm (3.7772 – 3.7776 in.)
STD Mark 2	95.950 – 95.960 mm (3.7776 – 3.7779 in.)
STD Mark 3	95.960 – 95.970 mm (3.7779 – 3.7783 in.)
O/S 0.50	96.440 – 96.470 mm (3.7968 – 3.7980 in.)
O/S 0.75	96.690 – 96.720 mm (3.8067 – 3.8079 in.)
O/S 1.00	96.940 – 96.970 mm (3.8165 – 3.8177 in.)

(2) Measure the cylinder bore diameter in the thrust directions. (See page EM–94)



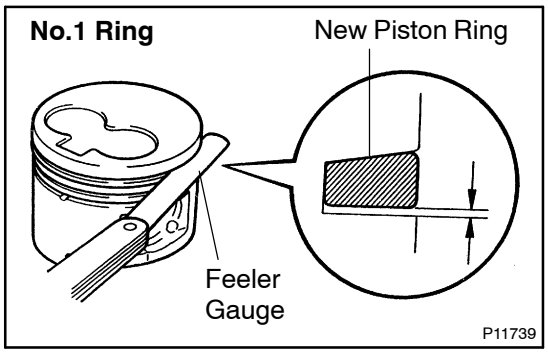
(3) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:
0.050 – 0.070 mm (0.0020 – 0.0028 in.)
Maximum oil clearance: 0.14 mm (0.0055 in.)

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

HINT:

(Use new cylinder block): Use a piston with the same number mark as the cylinder bore diameter marked on the cylinder block.

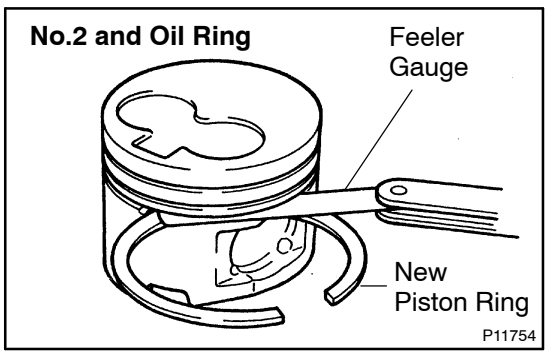


(b) Inspect the piston ring groove clearance.

(1) No.1 ring:

Install a new No.1 piston ring to the piston. Using a feeler gauge, measure the clearance between new piston ring and the wall of the ring groove.

Ring groove clearance (No.1):
0.060 – 0.110 mm (0.0024 – 0.0043 in.)



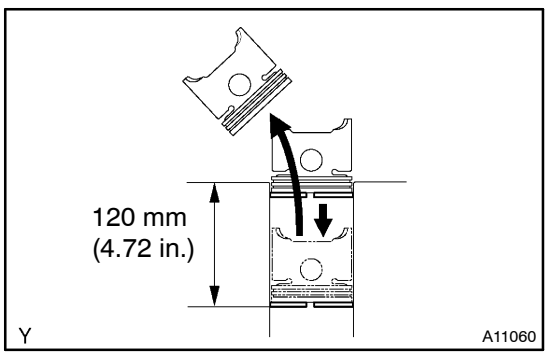
(2) No.2 and oil ring:

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

Ring groove clearance (No.2 and oil ring):

No.2	0.060 – 0.100 mm (0.0024 – 0.0039 in.)
Oil	0.020 – 0.060 mm (0.0009 – 0.0024 in.)

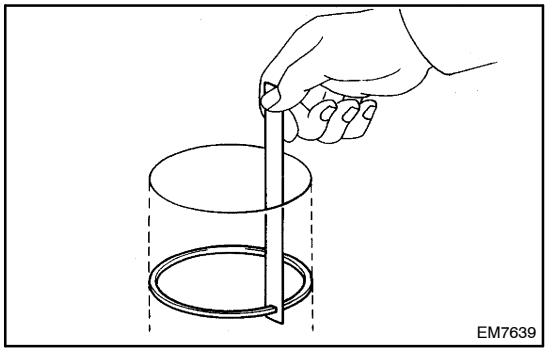
If the clearance is greater than maximum, replace the piston.



(c) Inspect the piston ring end gap.

(1) Insert the piston ring into the cylinder bore.

(2) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 120 mm (4.72 in.) from the top of the cylinder block.



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

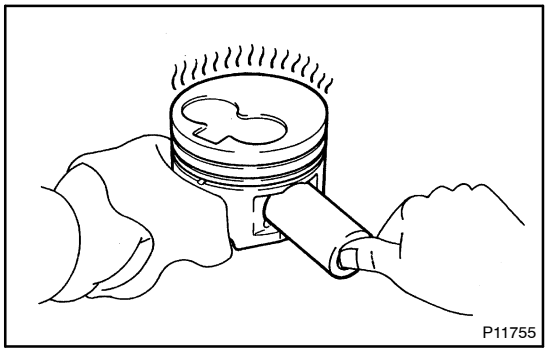
Standard end gap:

No.1	0.350 – 0.570 mm (0.0138 – 0.0224 in.)
No.2	0.400 – 0.600 mm (0.0157 – 0.0236 in.)
Oil	0.200 – 0.500 mm (0.0079 – 0.0197 in.)

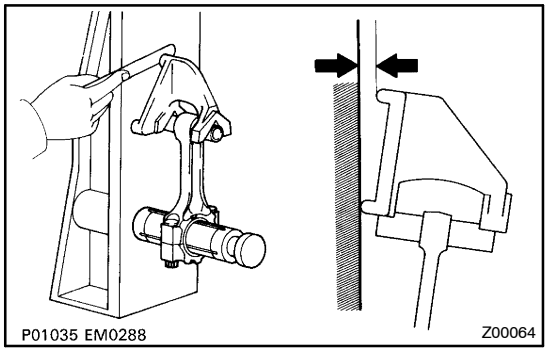
Maximum end gap:

No.1	1.03 mm (0.0406 in.)
No.2	1.10 mm (0.0433 in.)
Oil	0.87 mm (0.0343 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 4 cylinders or replace the cylinder block.



(d) Inspect the pistion pin fit.
At 80˚C (176˚F), you should be able to push the piston pin into the piston pin hole with your thumb.

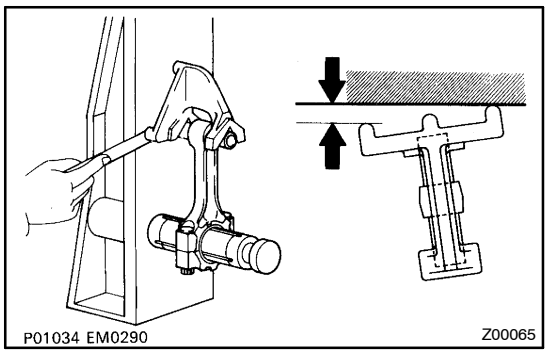


(e) Using a rod aligner and feeler gauge, check the connecting rod alignment.
(1) Check for bend.

Maximum bend:

0.03 mm (0.0012 in.) per 100 mm (3.94 in.)

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

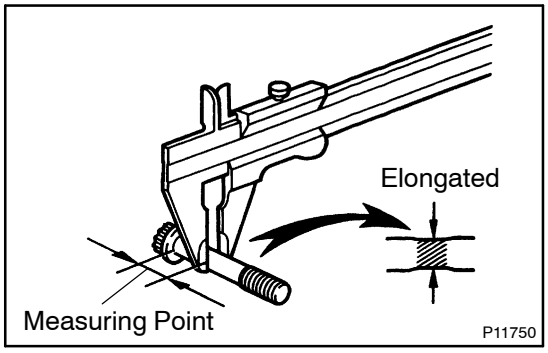


(2) Check for twist.

Maximum twist:

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

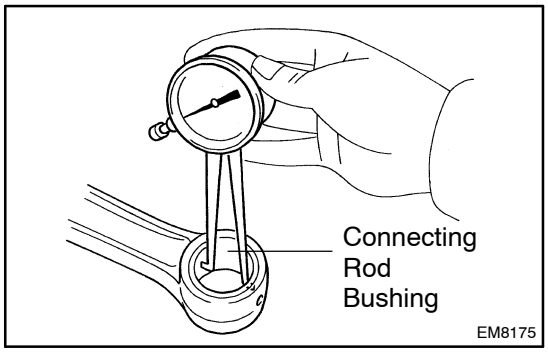
If twist is greater than maximum, replace the connecting rod assembly.



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

Standard diameter:
8.400 – 8.600 mm (0.3307 – 0.3385 in.)
Minimum diameter: 8.20 mm (0.3228 in.)

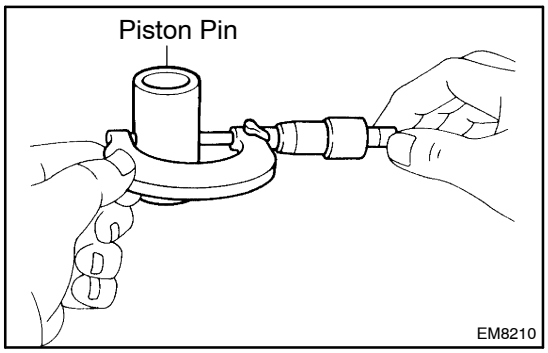
If the diameter is less than minimum, replace the connecting rod bolt.



(g) Inspect the piston pin oil clearance.

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

Bushing inside diameter:
34.012 – 34.024 mm (1.3391 – 1.3395 in.)



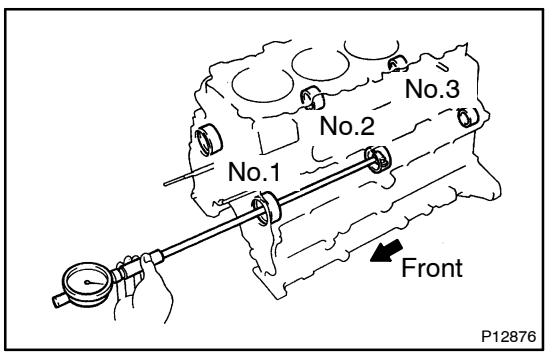
(2) Using a micrometer, measure the piston pin diameter.

Piston pin diameter:
34.000 – 34.012 mm (1.3386 – 1.3391 in.)

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

Standard oil clearance:
0.008 – 0.0016 mm (0.0003 – 0.0006 in.)
Maximum oil clearance: 0.03 mm (0.0012 in.)

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

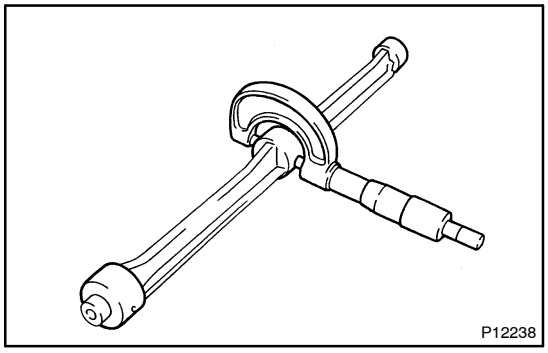


10. INSPECT RH AND LH BALANCE SHAFT

(a) Using cylinder gauge, measure the inside diameter of the balance shaft bearing.

Bearing inside diameter (from front side):

No.1	42.000 – 42.020 mm (1.6535 – 1.6543 in.)
No.2	41.000 – 41.020 mm (1.6142 – 1.6150 in.)
No.3	32.000 – 32.020 mm (1.2598 – 1.2606 in.)


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(b) Using a micrometer, measure the diameter of the balance shaft main journals.

Main journal diameter (from front side):

No.1	41.941 – 41.960 mm (1.6512 – 1.6520 in.)
No.2	40.931 – 40.950 mm (1.6115 – 1.6122 in.)
No.3	31.941 – 31.960 mm (1.2575 – 1.2583 in.)

(c) Subtract the balance shaft main journal diameter measurement from the balance shaft bearing inside diameter measurement.

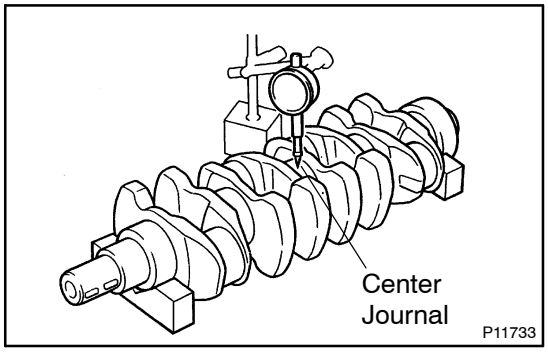
Standard oil clearance:

No.1	0.040 – 0.079 mm (0.0016 – 0.0031 in.)
No.2	0.040 – 0.079 mm (0.0016 – 0.0031 in.)
No.3	0.050 – 0.089 mm (0.0020 – 0.0035 in.)

Maximum oil clearance:

No.1	0.18 mm (0.0071 in.)
No.2	0.19 mm (0.0075 in.)
No.3	0.18 mm (0.0071 in.)

If the clearance is greater than maximum, replace the cylinder block and balance shaft.



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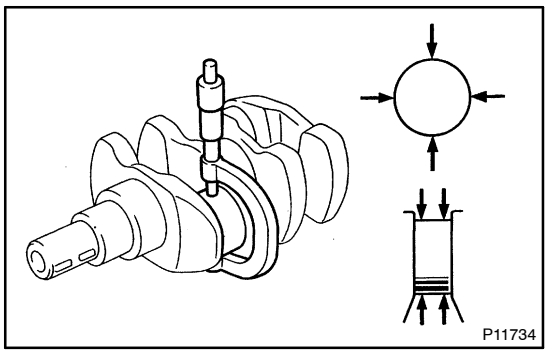
11. INSPECT CRANKSHAFT FOR RUNOUT

(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.


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12. INSPECT MAIN JOURNALS AND CRANK PINS

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

Main journal diameter:

STD	69.982 – 70.000 mm (2.7552 – 2.7559 in.)
U/S 0.25	69.745 – 69.755 mm (2.7459 – 2.7463 in.)
U/S 0.50	69.495 – 69. 505 mm (2.7360 – 2.7364 in.)

Crank pin diameter:

STD	58.982 – 59.000 mm (2.3221 – 2.3228 in.)
U/S 0.25	58.745 – 58.755 mm (2.3128 – 2.3132 in.)
U/S 0.50	58.495 – 58.505 mm (2.3028 – 2.3132 in.)

If the diameter is not as specified, check the oil clearance (See page EM–75). If necessary, grind or replace the crankshaft.

(b) Check each main journal and crank pin for taper and out–of–round as shown.

Maximum taper and out–of–round:
0.020 mm (0.0008 in.)

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