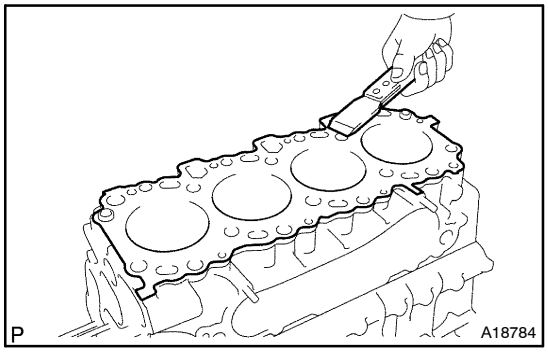
EM1TX–01

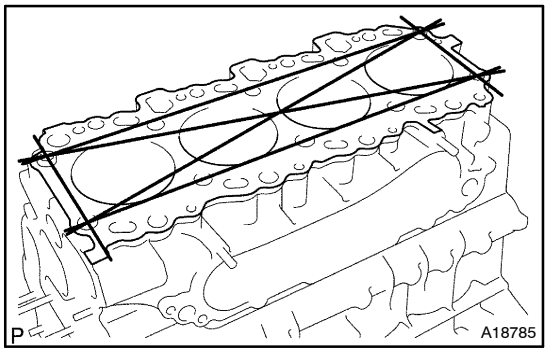
INSPECTION



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.



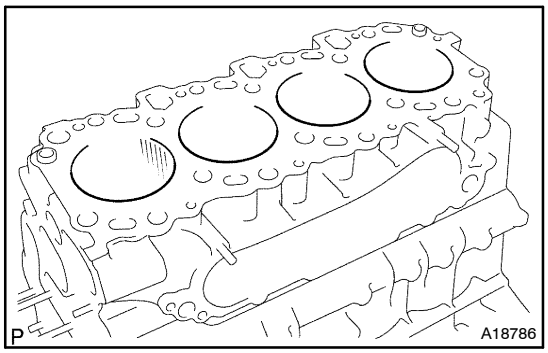
2. INSPEXCT CYLINDER BLOCK

(a) Inspect for flatness.

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

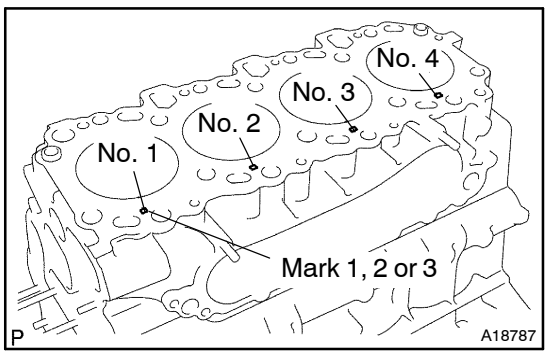
Maximum warpage: 0.10 mm (0.0039 in.)

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



(b) Visually check the cylinder for vertical scratches.

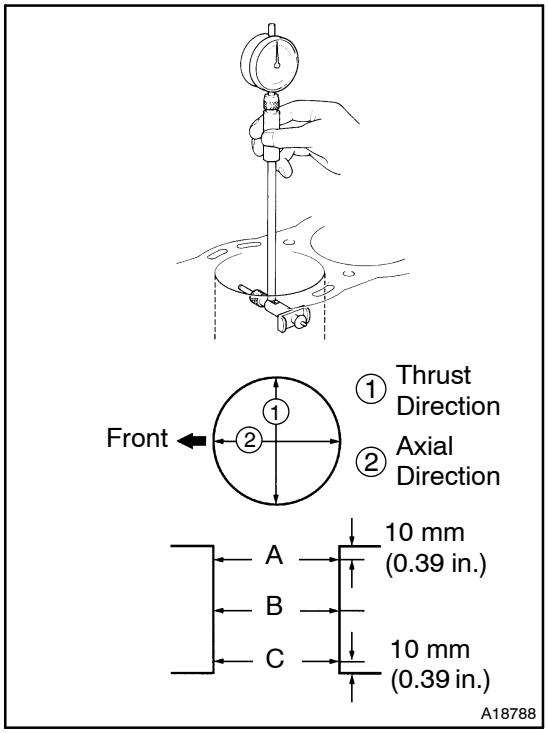
If deep scratches are present, rebore all the 4 cylinders. If necessary, replace the cylinder block.



(c) Inspect the 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 lower left rear of the cylinder block.



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

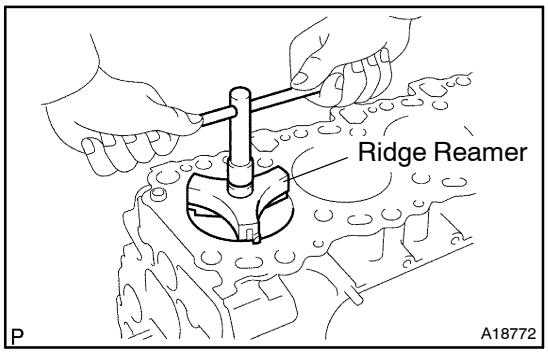
Standard diameter:

Mark 1	92.000 – 92.010 mm (3.6220 – 3.6224 in.)
Mark 2	92.010 – 92.020 mm (3.6224 – 3.6228 in.)
Mark 3	92.020 – 92.030 mm (3.6228 – 3.6232 in.)

Maximum diameter:

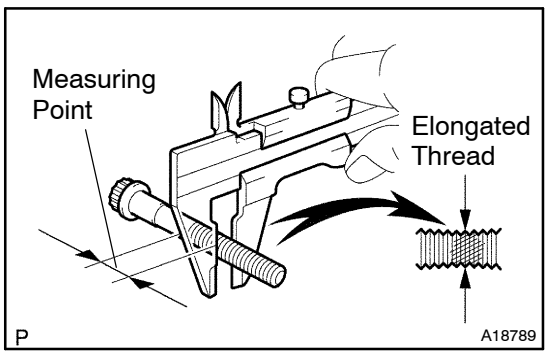
STD	92.23 mm (3.6311 in.)
O/S 0.50	92.73 mm (3.6508 in.)

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



(e) 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.



(f) Inspect the 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.

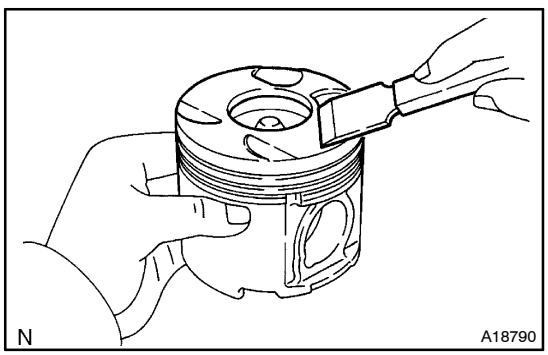
3. INSPECT CYLINDER BLOCK ORIFICE

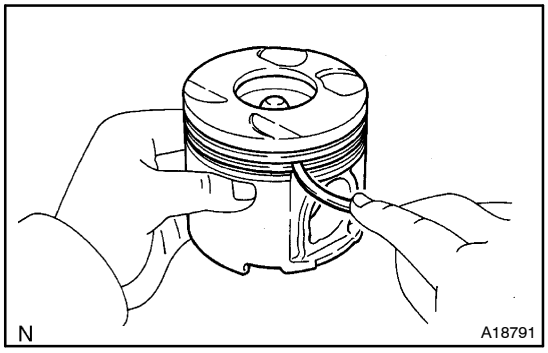
Visually check that the orifice is not clogged.

If necessary, replace the oil orifice.

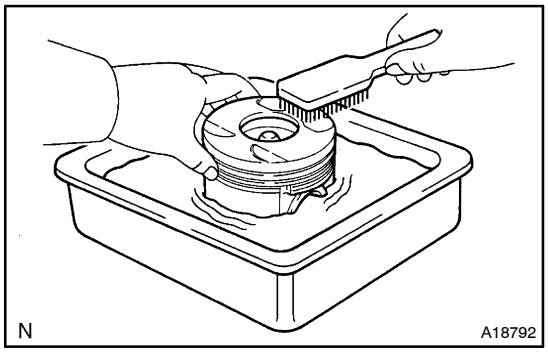
4. CLEAN PISTON

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





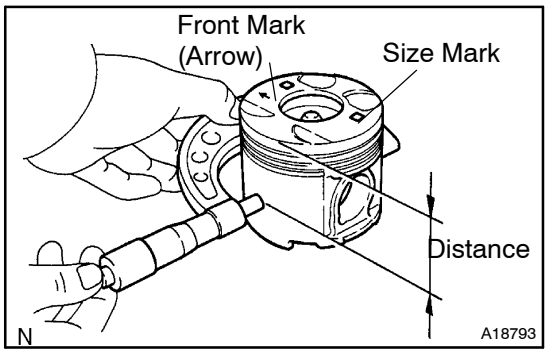
(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



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

NOTICE:

Do not use a wire brush.



5. 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 center line, the indicated distance from the piston head.

Distance: 65.00 – 65.06 mm (2.5591 – 2.5614 in.)

Piston diameter:

STD	Mark 1	91.92 – 91.93 mm (3.6189 – 3.6193 in.)
	Mark 2	91.93 – 91.94 mm (3.6193 – 3.6197 in.)
	Mark 3	91.94 – 91.95 mm (3.6197 – 3.6201 in.)
O/S 0.50		92.42 – 92.45 mm (3.6386 – 3.6398 in.)

(2) Measure the cylinder bore diameter in the thrust directions (See step 2).

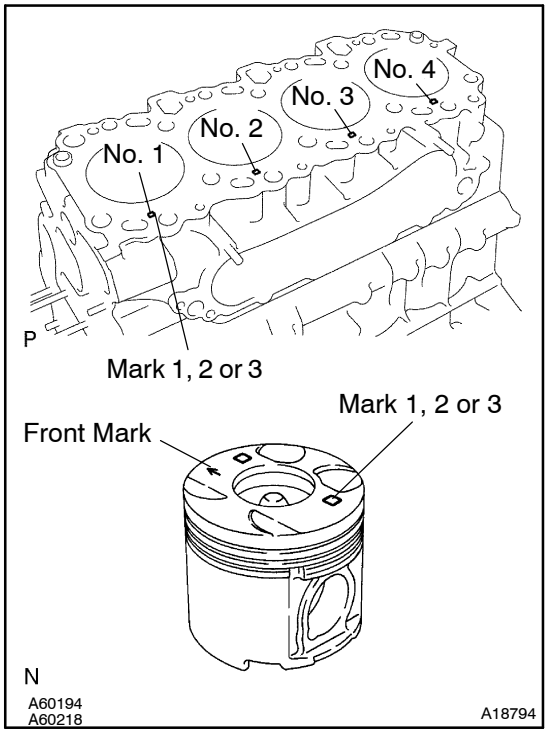
(3) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

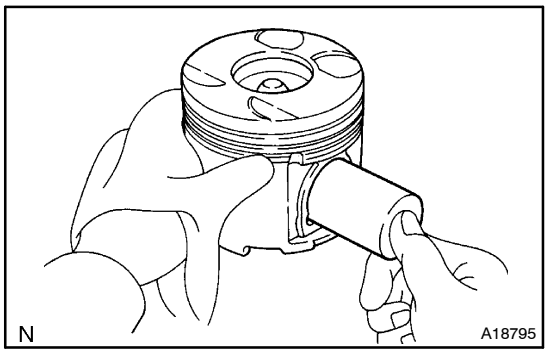
0.070 – 0.090 mm (0.0028 – 0.0035 in.)

Maximum oil clearance: 0.16 mm (0.0063 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.

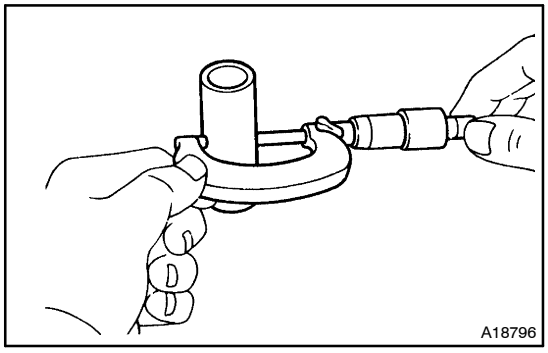


HINT:
Use a piston with the same number mark as the cylinder bore diameter marked on the cylinder block.

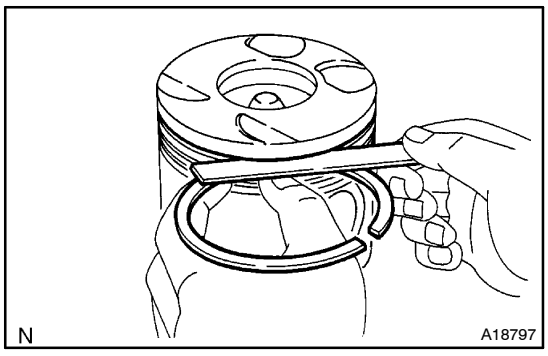


(b) Inspect the piston pin fit.
At 60°C (140°F), you should be able to push the piston pin into the piston pin hole with your thumb.

If the pin can be installed at a lower temperature, replace the piston and pin as set.



(c) Using a micrometer, measure the piston pin diameter.
Piston pin diameter:
33.996 – 34.008 mm (1.3384 – 1.3389 in.)

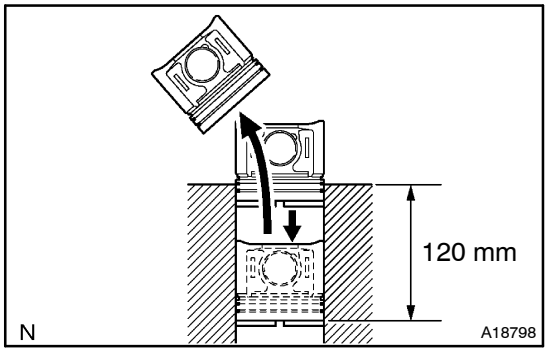


(d) Inspect the piston ring groove clearance.
Using a feeler gauge, measure the clearance between a new piston ring and the wall of the ring groove.
Standard groove clearance:

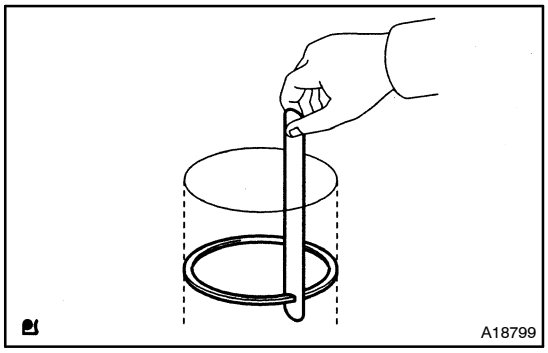
No. 1	0.060 – 0.100 mm (0.0024 – 0.0039 in.)
No. 2	0.050 – 0.090 mm (0.0020 – 0.0035 in.)
Oil	0.030 – 0.075 mm (0.0012 – 0.0030 in.)

Maximum groove clearance: 0.20 mm (0.0079 in.)

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



(e) 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.

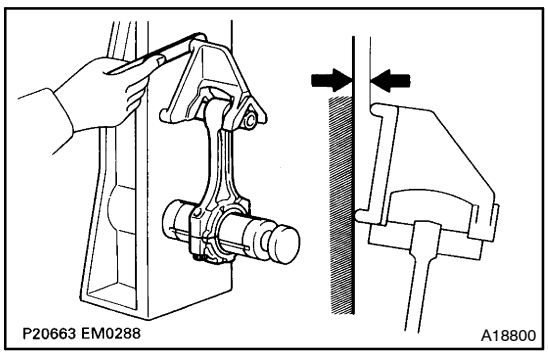
Standard end gap:

No. 1	0.270 – 0.510 mm (0.0106 – 0.0201 in.)
No. 2	0.470 – 0.740 mm (0.0185 – 0.0291 in.)
Oil	0.200 – 0.520 mm (0.0079 – 0.0205 in.)

Maximum end gap:

No. 1	1.21 mm (0.0476 in.)
No. 2	1.44 mm (0.0567 in.)
Oil	1.22 mm (0.0480 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.

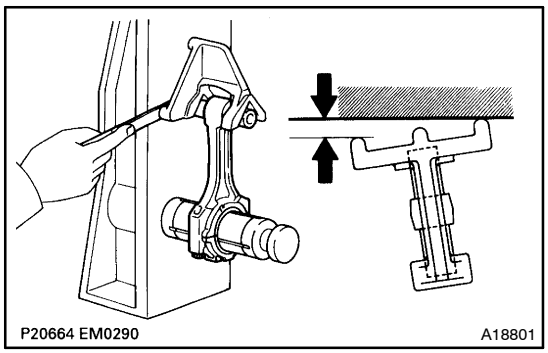


(f) Using a rod aligner and feeler gauge, check the connecting rod alignment.
(1) Check for bend.

Maximum bend:

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

If bend is greater than maximum, replace the connecting rod sub–assy.

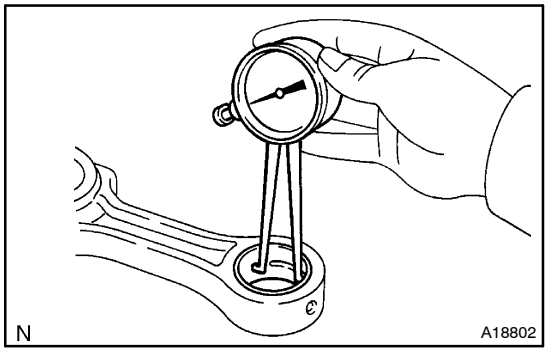


(2) Check for twist

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.



(g) Inspect the piston pin oil clearance.

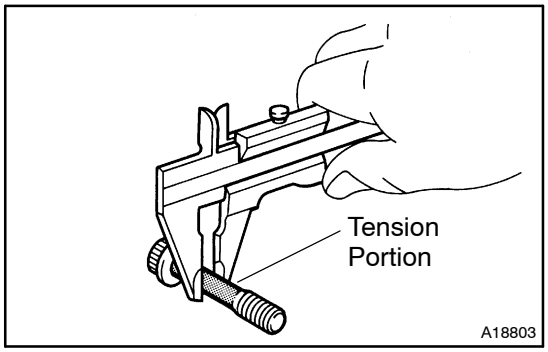
(1) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

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

(2) Subtract the piston pin diameter measurement (See step 5) from the bushing inside diameter measurement.

Standard oil clearance:
0.012 – 0.020 mm (0.0005 – 0.0008 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.

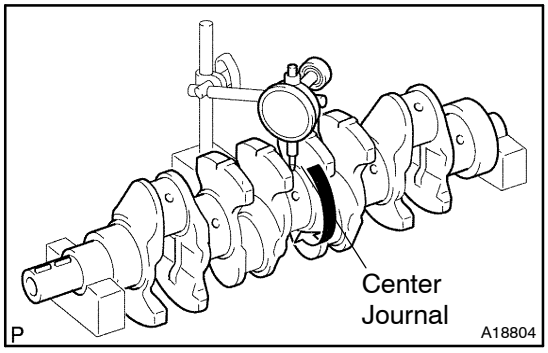


(h) Inspect the connecting rod bolts.

Using vernier calipers, measure the tension portion of the connecting rod bolt.

Standard diameter:
8.500 – 8.600 mm (0.3346 – 0.3385 in.)
Minimum diameter: 8.30 mm (0.3268 in.)

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



6. INSPECT CRANKSHAFT

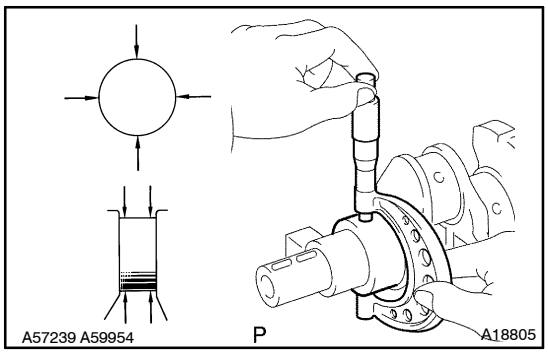
(a) Inspect for circle runout.

(1) Place the crankshaft on V–blocks.

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

Maximum circle runout: 0.06 mm (0.0024 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:

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 (2.3029 – 2.3033 in.)

If the diameter is not as specified, check the oil clearance (See page EM–66). If necessary, grind or 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.

(c) If necessary, grind and hone the main journals and/or crank pins.

Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure (b) above).

Install new main journal and/or crankshaft pin undersized bearing.