

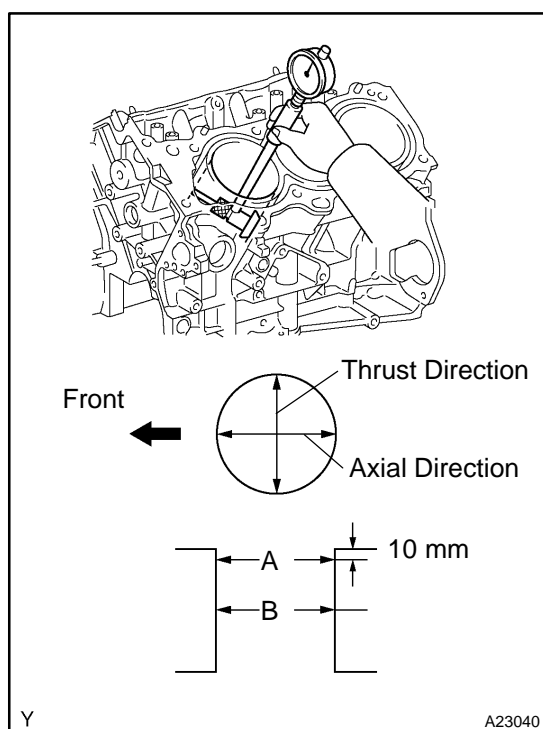
## INSPECTION

### 1. INSPECT CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the flatness of the surface that is in contact with the cylinder head gasket.

**Maximum warpage: 0.05 mm (0.0020 in.)**

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



### 2. INSPECT CYLINDER BORE

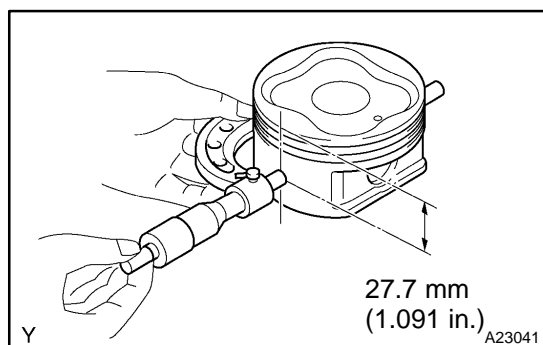
Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in the thrust and axial directions.

**Standard diameter:**

**94.000 to 94.012 mm (3.7008 to 3.7013 in.)**

**Maximum diameter: 94.132mm (3.7060 in.)**

If the average diameter of the 4 positions is greater than the maximum, replace the cylinder block.



### 3. INSPECT PISTON

Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 27.7 mm (1.091 in.) from the piston head.

**Piston diameter:**

**93.910 to 93.940 mm (3.6972 to 3.6984 in.)**

**4. INSPECT PISTON OIL CLEARANCE**

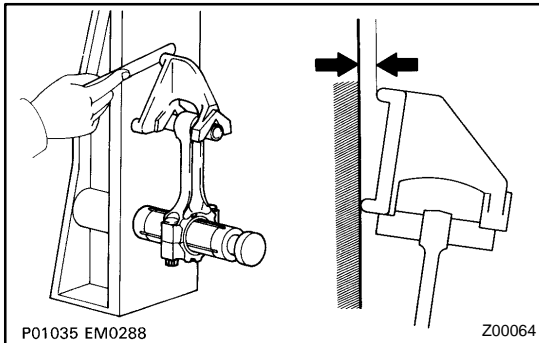
Subtract the piston diameter measurement from the cylinder bore diameter measurement.

**Standard oil clearance:**

**0.060 to 0.102 mm (0.0024 to 0.0040 in.)**

**Maximum oil clearance: 0.13 mm (0.0051 in.)**

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

**5. INSPECT CONNECTING ROD**

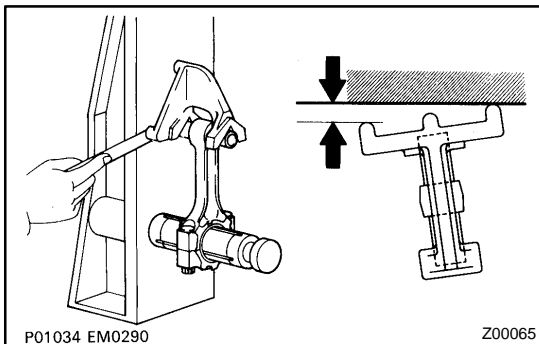
Using a rod aligner and feeler gauge, check the connecting rod alignment.

(1) Check for misalignment.

**Maximum misalignment:**

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

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

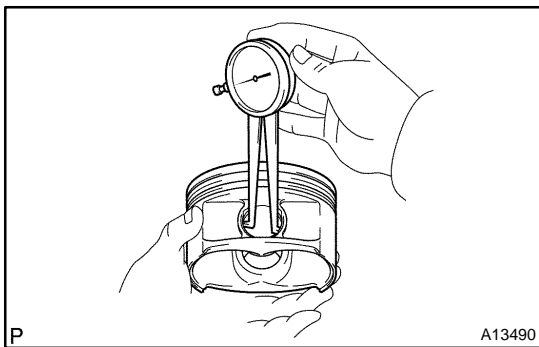


(2) Check twist.

**Maximum twist:**

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

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

**6. INSPECT PISTON PIN OIL CLEARANCE**

(a) Using a caliper gauge, measure the inside diameter of the piston pin hole.

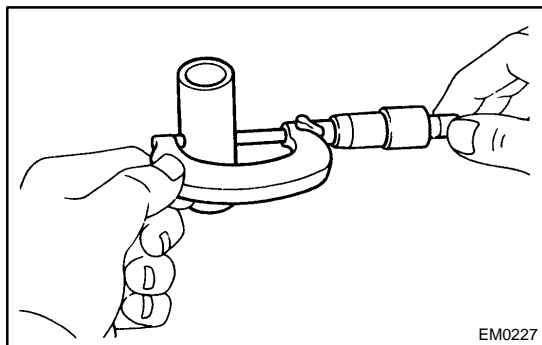
**Piston pin hole inside diameter:**

**22.001 to 22.010 mm (0.8662 to 0.8665 in.)**

**HINT:**

**Piston pin hole inside diameter**

Mark	mm (in.)
A	22.001 to 22.004 (0.8662 to 0.8663)
B	22.005 to 22.007 (0.8663 to 0.8664)
C	22.008 to 22.010 (0.8665 to 0.8665)



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

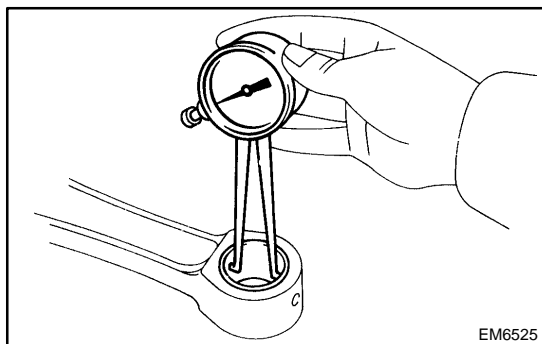
**Piston pin diameter:**

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

HINT:

**Piston pin diameter**

Mark	mm (in.)
A	21.997 to 22.000 (0.8660 to 0.8661)
B	22.001 to 22.003 (0.8661 to 0.8663)
C	22.004 to 22.006 (0.8663 to 0.8664)



- (c) 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.)**

HINT:

**Bushing inside diameter**

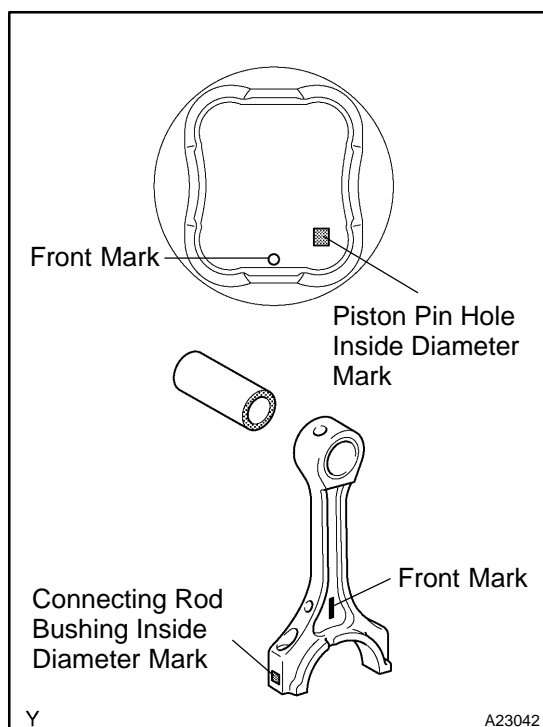
Mark	mm (in.)
A	22.005 to 22.008 (0.8663 to 0.8665)
B	22.009 to 22.011 (0.8665 to 0.8666)
C	22.012 to 22.014 (0.8666 to 0.8667)

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

**Standard oil clearance:**

**0.001 to 0.007 mm (0.00004 to 0.00028 in.)**

**Maximum oil clearance: 0.040 mm (0.0016 in.)**



- (e) If the oil clearance is greater than the maximum, replace the bushing. If necessary, replace the piston and piston pin together.

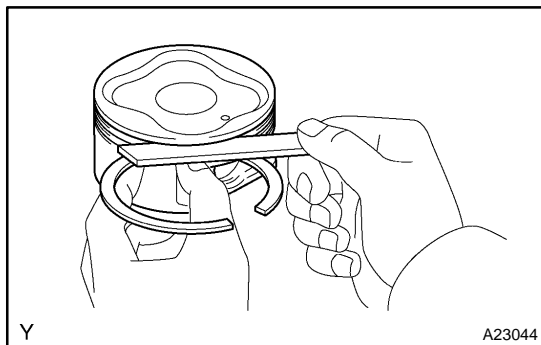
- (f) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

**Standard oil clearance:**

**0.005 to 0.011 mm (0.0002 to 0.0004 in.)**

**Maximum oil clearance: 0.050 mm (0.0020 in.)**

- (g) If the oil clearance is greater than the maximum, replace the bushing. If necessary, replace the connecting rod and piston pin together.



## 7. INSPECT RING GROOVE CLEARANCE

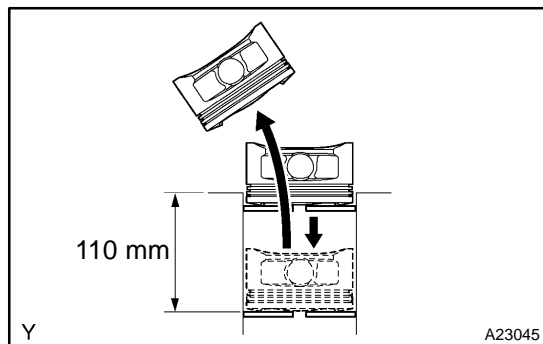
Using a feeler gauge, measure the clearance between the new piston ring and the wall of the ring groove.

**Ring groove clearance:**

**No.1: 0.02 to 0.07 mm (0.0008 to 0.0028 in.)**

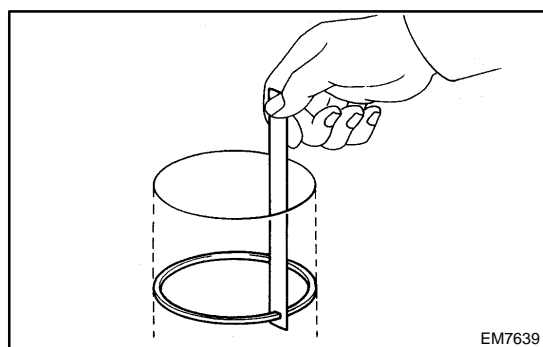
**No.2: 0.02 to 0.06 mm (0.0008 to 0.0024 in.)**

**Oil: 0.07 to 0.15 mm (0.0028 to 0.0060 in.)**



## 8. INSPECT PISTON RING END GAP

(a) 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.



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

**Standard end gap:**

**No. 1: 0.30 to 0.40 mm (0.0118 to 0.0157 in.)**

**No. 2: 0.40 to 0.50 mm (0.0157 to 0.0197 in.)**

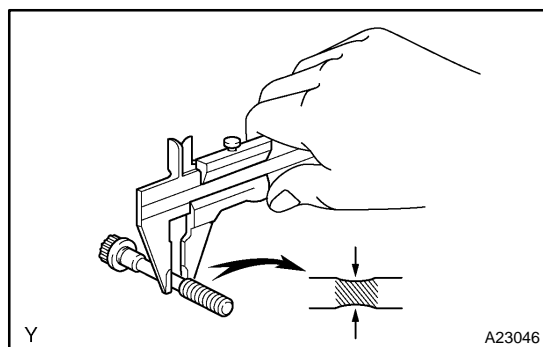
**Oil (Side rail): 0.10 to 0.40 mm (0.0039 to 0.0157 in.)**

**Maximum end gap:**

**No. 1: 1.0 mm (0.039 in.)**

**No. 2: 1.1 mm (0.043 in.)**

**Oil (Side rail): 1.0 mm (0.039 in.)**



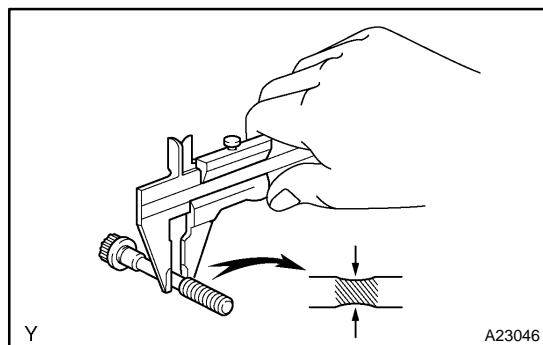
## 9. INSPECT CONNECTING ROD BOLT

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

**Standard diameter: 7.2 to 7.3 mm (0.283 to 0.287 in.)**

**Minimum diameter: 7.0 mm (0.276 in.)**

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



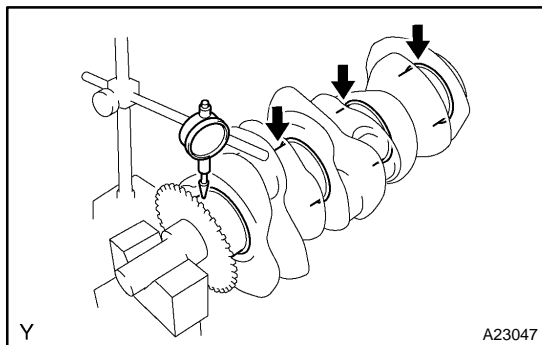
## 10. INSPECT CRANKSHAFT BEARING CAP SET BOLT

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

**Standard diameter:**

**10.0 to 10.2 mm (0.393 to 0.402 in.)**

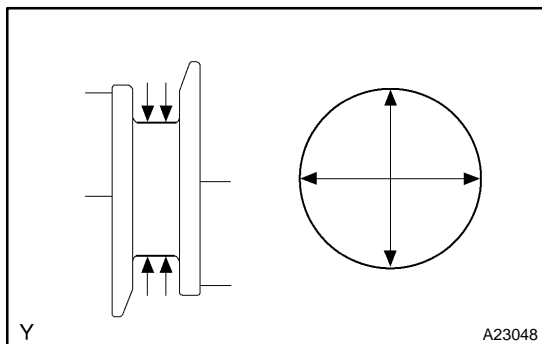
If the diameter is less than the minimum, replace the bolt.



## 11. INSPECT CRANKSHAFT

- (a) Using a dial indicator and V-blocks, measure the runout as shown in the illustration.

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

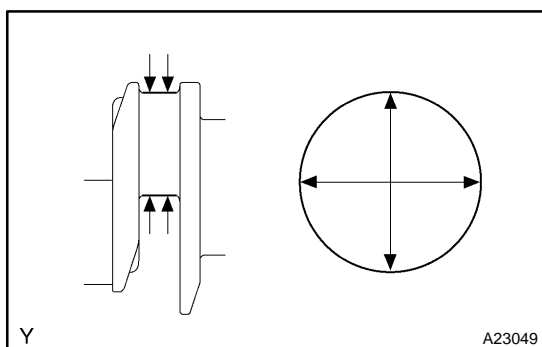


- (b) Using a micrometer, measure the diameter of each main journal.

**Diameter: 71.988 to 72.000 mm (2.8342 to 2.8346 in.)**

- (c) Check each main journal for taper and out-of-round as shown in the illustration.

**Maximum taper and out-of-round: 0.02 mm (0.0008 in.)**

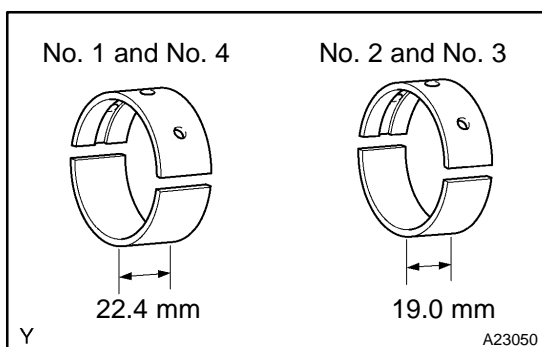


- (d) Using a micrometer, measure the diameter of each crank pin.

**Diameter: 55.992 to 56.000 mm (2.2044 to 2.2047 in.)**

- (e) Check each crank pin for taper and out-of-round as shown in the illustration.

**Maximum taper and out-of-round: 0.02 mm (0.0008 in.)**

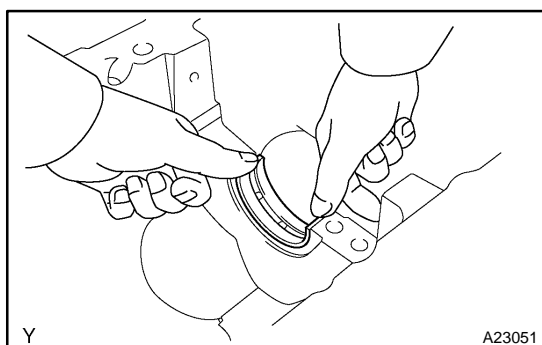


## 12. INSPECT CRANKSHAFT OIL CLEARANCE

### HINT:

Main bearings come in widths of 19.0 mm (0.748 in.) and 22.4 mm (0.882 in.). Install the 22.4 mm (0.882 in.) bearings in the No. 1 and No. 4 cylinder block journal positions with the main bearing cap. Install the 19.0 mm (0.748 in.) bearings in the No. 2 and No. 3 positions.

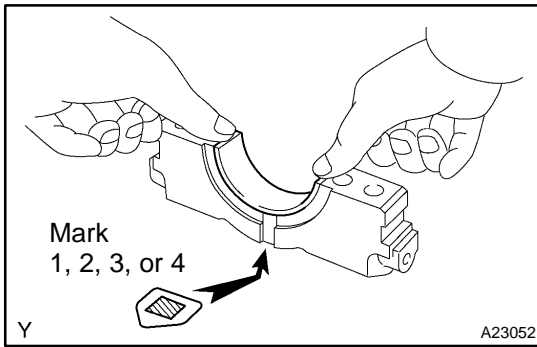
- (a) Clean each main journal and bearing.



- (b) Align the bearing claw with the claw groove of the cylinder block, and push in the 4 upper bearings.

### NOTICE:

**Do not apply engine oil to the bearing and its contact surface.**



- (c) Align the bearing claw with the claw groove of the main bearing cap, and push in the 4 bottom bearings.

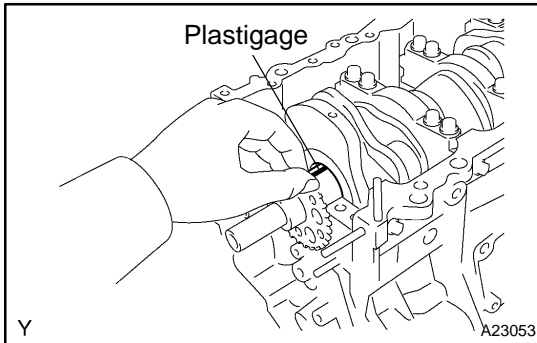
**NOTICE:**

**Do not apply engine oil to the bearing or its contact surface.**

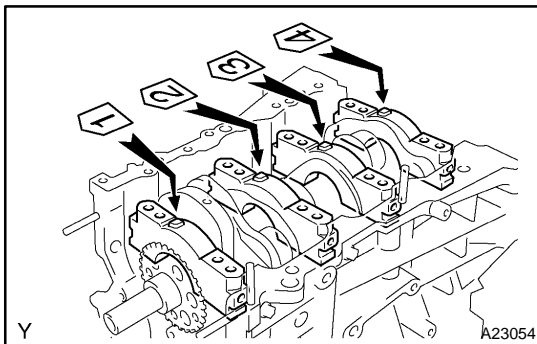
**HINT:**

A number marked on each main bearing cap indicates the installation position.

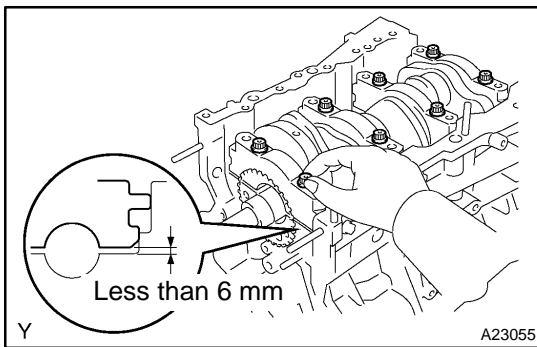
- (d) Place the crankshaft on the cylinder block.



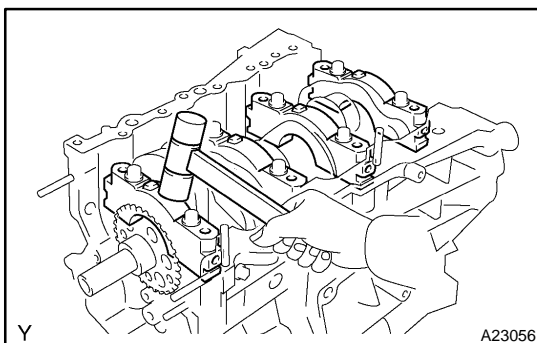
- (e) Lay a strip of Plastigage across each journal.



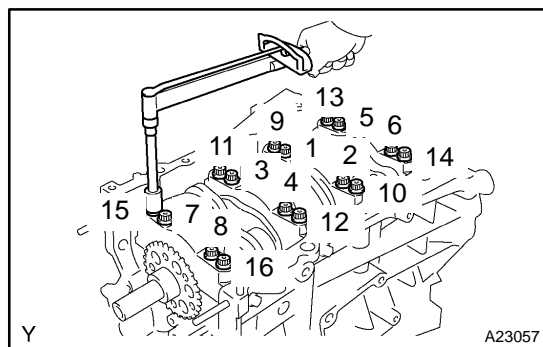
- (f) Examine the front marks and numbers and install the bearing caps on the cylinder block.  
 (g) Apply a light coat of engine oil to the threads of the bearing cap bolts.  
 (h) Temporarily install the 8 main bearing cap bolts to the inside positions.



- (i) Install the main bearing caps. Tighten the 2 bolts for each bearing cap until the clearance between the bearing cap and the cylinder block becomes less than 6 mm (0.23 in.).

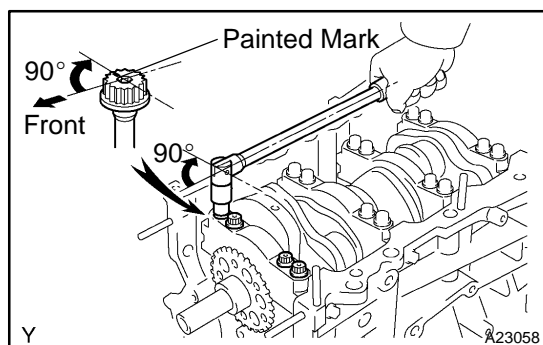


- (j) Using a plastic-faced hammer, lightly tap the bearing cap to ensure a proper fit.  
 (k) Apply a light coat of engine oil to the threads of the main bearing cap bolts.



- (l) Install the 16 main bearing cap bolts. Using several steps, uniformly tighten the bolts in the sequence as shown in the illustration.

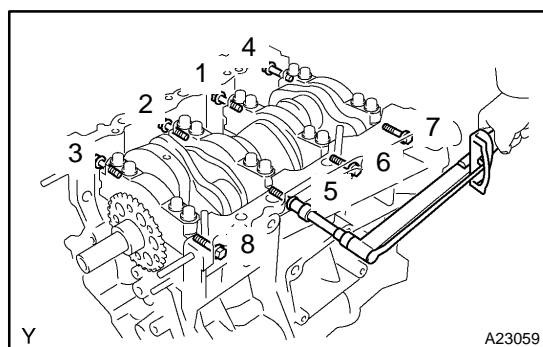
**Torque: 61 N·m (622 kgf·cm, 45 ft·lbf)**



- (m) Mark the front side of the bearing cap bolts with paint.  
 (n) Retighten the bearing cap bolts until 90° in the sequence as shown in the illustration.  
 (o) Check that the painted mark is now at a 90° angle to the front.

**NOTICE:**

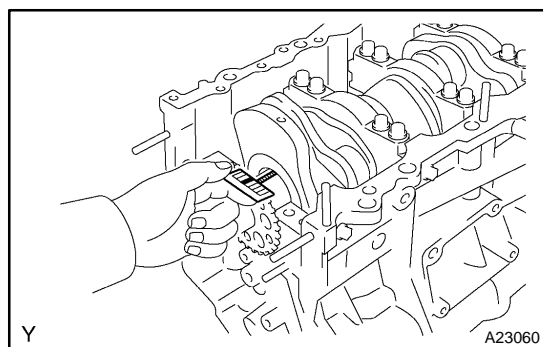
**Do not turn the crankshaft.**



- (p) Install the 8 main bearing cap bolts. Using several steps, uniformly tighten the bolts in the sequence as shown in the illustration.

**Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)**

- (q) Remove the main bearing caps.



- (r) Measure the Plastigage at its widest point.

**Standard oil clearance:**

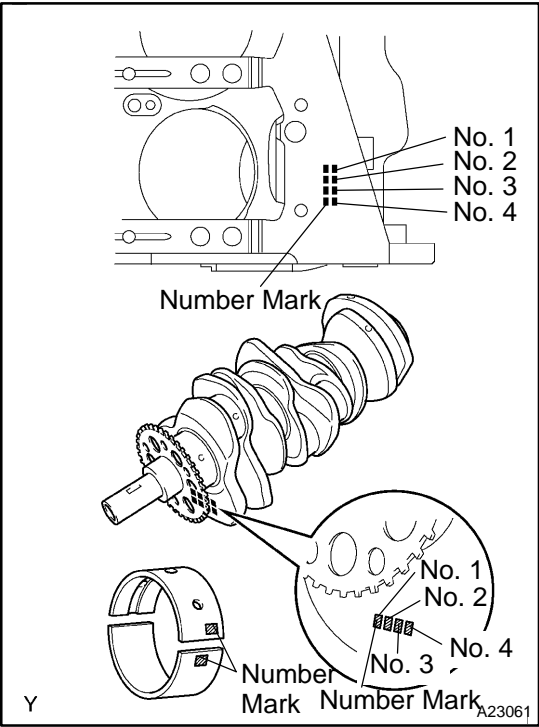
**0.018 to 0.030 mm (0.0007 to 0.0012 in.)**

**Maximum clearance: 0.046 mm (0.0018 in.)**

If the oil clearance is greater than the maximum, replace the bearings. If necessary, replace the crankshaft.

**NOTICE:**

**Completely remove the Plastigage.**



- (s) If replacing a bearing, replace it with one that has the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then refer to the table below for the appropriate bearing number. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly

Journal bearings

Cylinder block (A) + Crankshaft	0 to 5	6 to 11	12 to 17	18 to 23	24 to 28
Use Bearing	"1"	"2"	"3"	"4"	"5"

HINT:

EXAMPLE

Cylinder block "11" (A) + Crankshaft "06" (B)  
= Total number 17 (Use bearing "3")

Item	Mark	mm (in.)
Cylinder block main journal bore diameter (A)	"00"	77.000 (3.0315)
	"01"	77.001 (3.0315)
	"02"	77.002 (3.0316)
	"03"	77.003 (3.0316)
	"04"	77.004 (3.0317)
	"05"	77.005 (3.0317)
	"06"	77.006 (3.0317)
	"07"	77.007 (3.0318)
	"08"	77.008 (3.0318)
	"09"	77.009 (3.0319)
	"10"	77.010 (3.0319)
	"11"	77.011 (3.0319)
	"12"	77.012 (3.0320)
	"13"	77.013 (3.0320)
	"14"	77.014 (3.0320)
	"15"	77.015 (3.0321)
	"16"	77.016 (3.0321)



## ENGINE MECHANICAL (1GR-FE) – CYLINDER BLOCK

Crankshaft main journal diameter (B)	"00"	71.999 to 72.000 (2.8346 to 2.8346)
	"01"	71.998 to 71.999 (2.8346 to 2.8346)
	"02"	71.997 to 71.998 (2.8345 to 2.8346)
	"03"	71.996 to 71.997 (2.8345 to 2.8346)
	"04"	71.995 to 71.996 (2.8344 to 2.8345)
	"05"	71.994 to 71.995 (2.8344 to 2.8344)
	"06"	71.993 to 71.994 (2.8343 to 2.8344)
	"07"	71.992 to 71.993 (2.8343 to 2.8343)
	"08"	71.991 to 71.992 (2.8343 to 2.8343)
	"09"	71.990 to 71.991 (2.8343 to 2.8343)
	"10"	71.989 to 71.990 (2.8342 to 2.8343)
	"11"	71.988 to 71.989 (2.8342 to 2.8342)
Standard bearing center wall thickness	"1"	2.488 to 2.491 (0.0980 to 0.0981)
	"2"	2.491 to 2.494 (0.0981 to 0.0982)
	"3"	2.494 to 2.497 (0.0982 to 0.0983)
	"4"	2.497 to 2.500 (0.0982 to 0.0984)
	"5"	2.500 to 2.503 (0.0984 to 0.0985)