

## INSPECTION

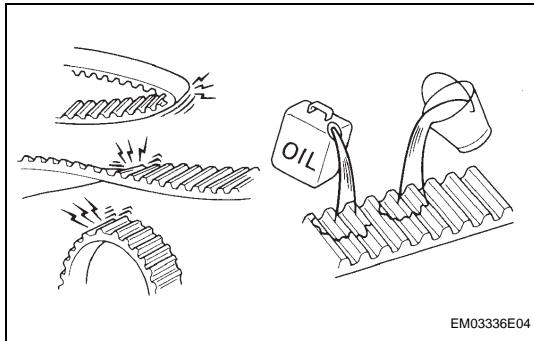
### 1. INSPECT TIMING BELT

#### NOTICE:

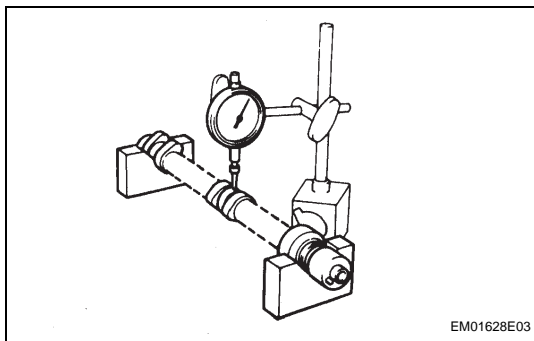
- Do not bend, twist or turn the timing belt inside out.
- Do not allow the timing belt to come into contact with oil, water or steam.
- Do not utilize timing belt tension when installing or removing the mounting bolt of the camshaft timing pulley.

Check the belt for any defects, as shown in the illustrations.

Also, check these points below.



- If there is premature parting :
  - Check for proper installation.
  - Check the timing cover gasket for damage and proper installation.
- If the belt teeth are cracked or damaged, check to see if either camshaft is locked.
- If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock and water pump.
- If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.
- If there is noticeable wear on the belt teeth:
  - Check the timing cover for damage.
  - Check that the gasket has been installed correctly.
  - Check for foreign object on the pulley teeth.
 If there is any doubt about the belt condition, replace the timing belt.



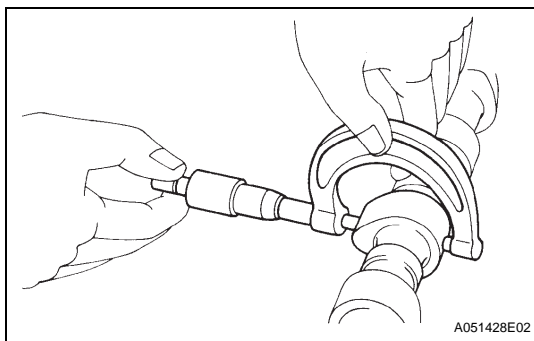
### 2. INSPECT CAMSHAFT

- Inspect camshaft for runout.
  - Place the camshaft on V-blocks.
  - Using a dial indicator, measure the runout at the center journal.

#### Maximum circle runout:

**0.06 mm (0.0024 in.)**

If the runout is greater than maximum, replace the camshaft.



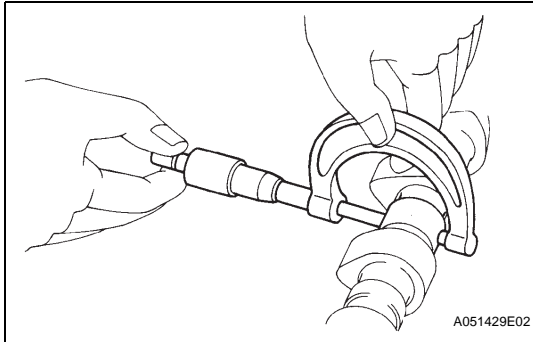
- Inspect cam lobes.
  - Using a micrometer, measure the cam lobe height.
 

**Standard cam lobe height:**  
**Intake 43.132 to 43.232 mm (1.6981 to 1.7020 in.)**  
**Exhaust 43.010 to 43.110 mm (1.6933 to 1.6972 in.)**  
**Minimum cam lobe height:**

**Intake 42.98 mm (1.6921 in.)**

**Exhaust 42.86 mm (1.6874 in.)**

If the cam lobe height is less than minimum, replace the camshaft .

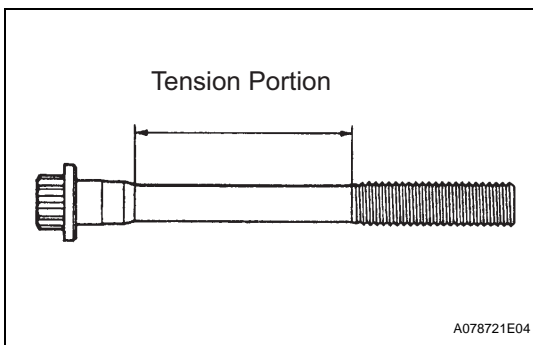


- (c) Inspect camshaft journals.  
 (1) Using a micrometer, measure the journal diameter.

**Journal diameter:**

**26.959 to 26.975 mm (1.0614 to 1.0620 in.)**

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



### 3. INSPECT CYLINDER HEAD SET BOLT

- (a) Using vernier calipers, measure the tension portion diameter of the bolt.

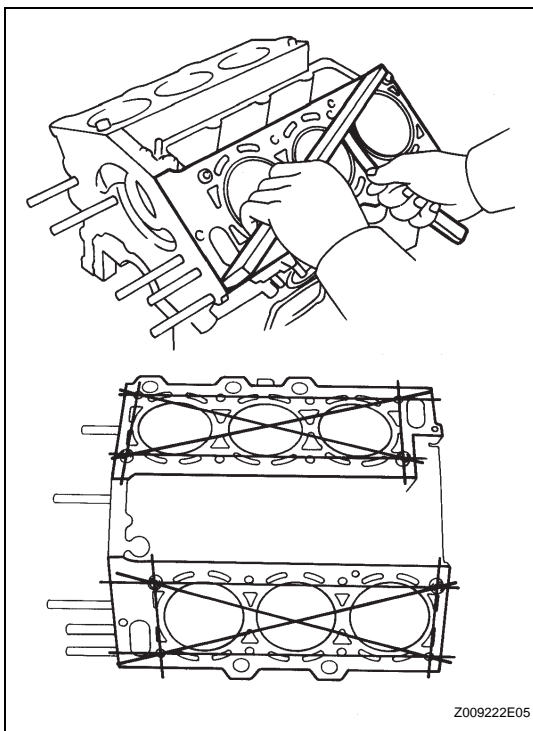
**Standard outside diameter:**

**8.95 to 9.05 mm (0.3524 to 0.3563 in.)**

**Minimum outside diameter:**

**8.75 mm (0.3445 in.)**

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



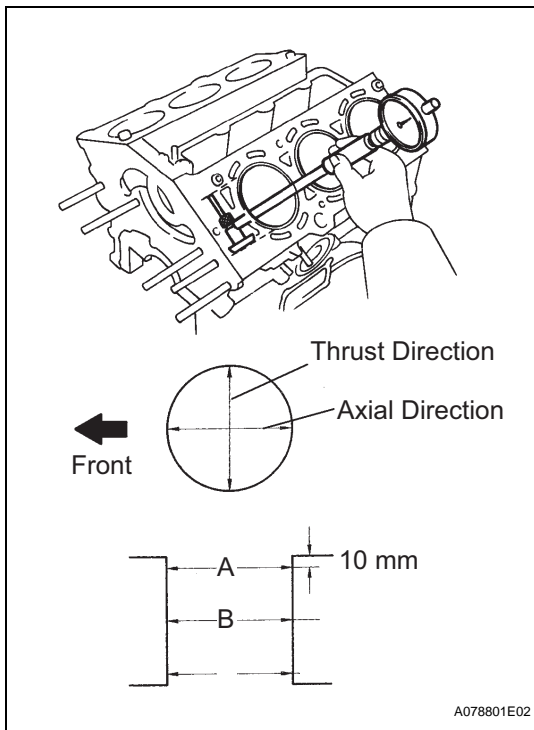
### 4. INSPECT CYLINDER BLOCK FOR FLATNESS

- (a) Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

**Maximum warpage:**

**0.05 mm (0.0020 in.)**

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



## 5. INSPECT CYLINDER BORE

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

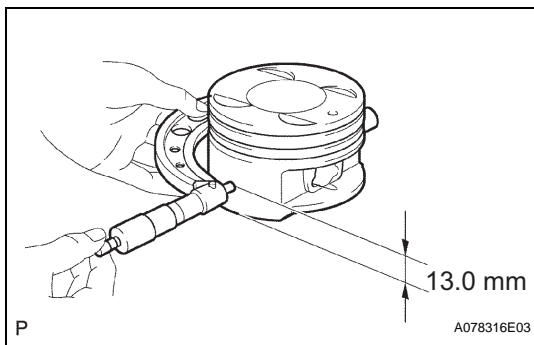
**Standard diameter:**

**92.000 to 92.012 mm (3.6220 to 3.6225 in.)**

**Minimum diameter:**

**92.080 mm (3.6252 in.)**

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



## 6. INSPECT W/PIN PISTON SUB-ASSEMBLY

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

When you measure the diameter, attach the micrometer to a location where 13.0 mm (0.512 in.) above from the piston bottom and meets at the right angles to the piston pin hole.

**Piston diameter:**

**91.953 to 91.967 mm (3.6202 to 3.6207 in.)**

## 7. INSPECT PISTON OIL CLEARANCE

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

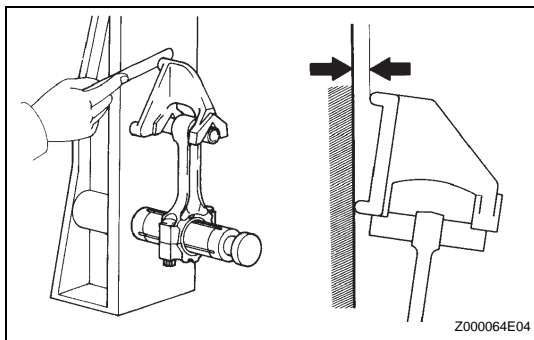
**Standard oil clearance:**

**0.033 to 0.059 mm (0.0013 to 0.0023 in.)**

**Maximum oil clearance:**

**0.13 mm (0.0051 in.)**

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



## 8. INSPECT CONNECTING ROD SUB-ASSEMBLY

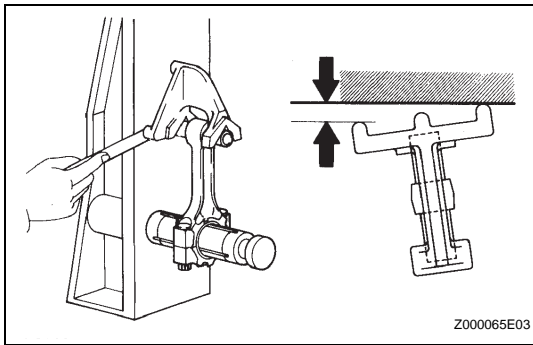
- (a) Using a rod aligner and feeler gauge, check the connecting rod alignment.

- (1) Check for misalignment.

**Maximum misalignment:**

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

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

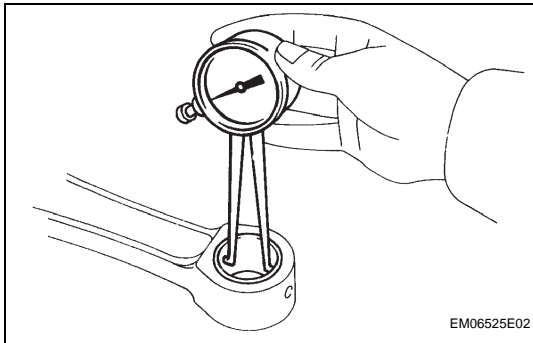


- (2) Check for twist.

**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.

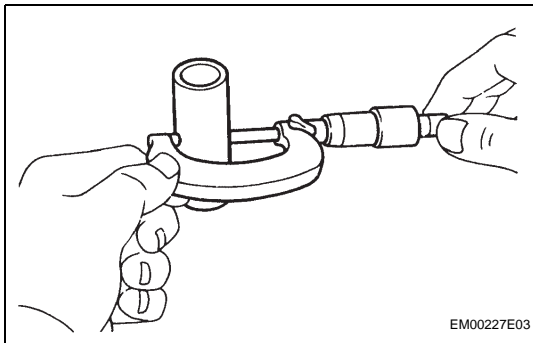


## 9. INSPECT PISTON PIN OIL CLEARANCE

- (a) 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.)**



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

**Piston pin diameter:**

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

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

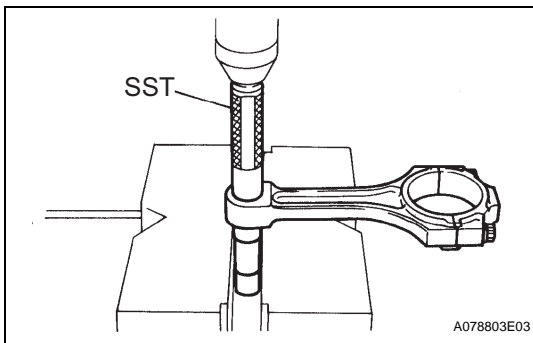
**Standard oil clearance:**

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

**Maximum oil clearance:**

**0.05 mm (0.0020 in.)**

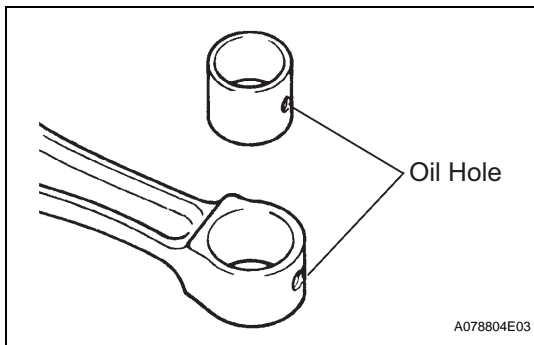
If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and the piston pin together.



## 10. REMOVE CONNECTING ROD SMALL END BUSH

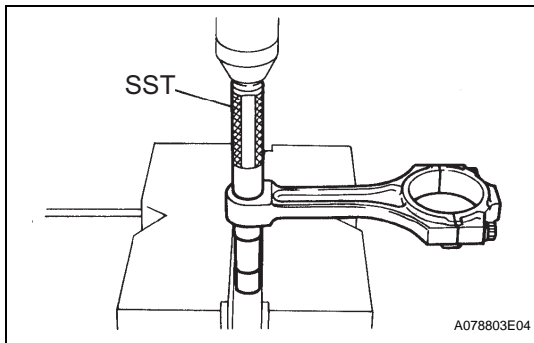
- (a) Using SST and a press, press out the bushing.

**SST 09222-30010**

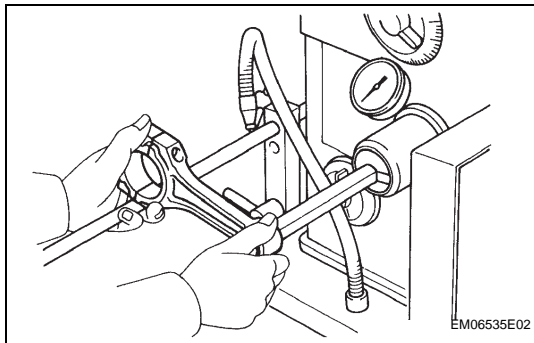


## 11. INSTALL CONNECTING ROD SMALL END BUSH

- (a) Align the oil holes of a new bushing and the connecting rod.



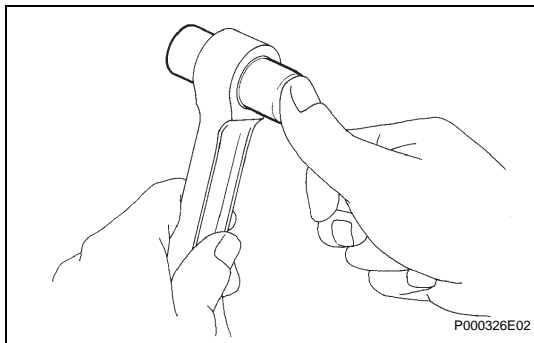
- (b) Using SST and a press, press in the bushing.  
**SST 09222-30010**



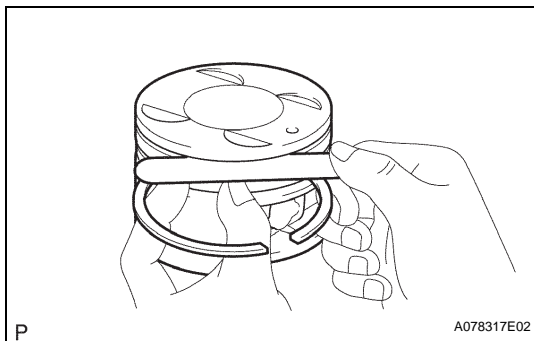
- (c) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance between the bushing and piston pin.

**Standard oil clearance:**

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



- (d) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.



## 12. INSPECT RING GROOVE CLEARANCE

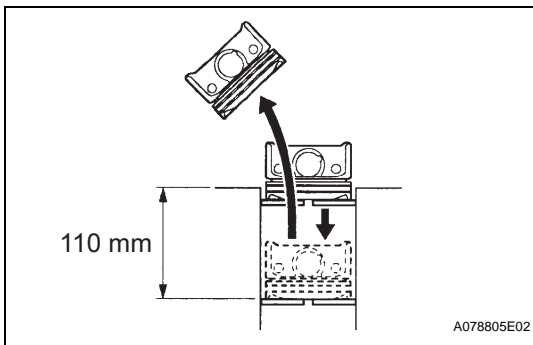
- (a) Using a feeler gauge, measure the clearance between new piston ring and the wall of the ring groove.

**Ring groove clearance:**

**No. 1 0.03 to 0.08 mm (0.0012 to 0.0031 in.)**

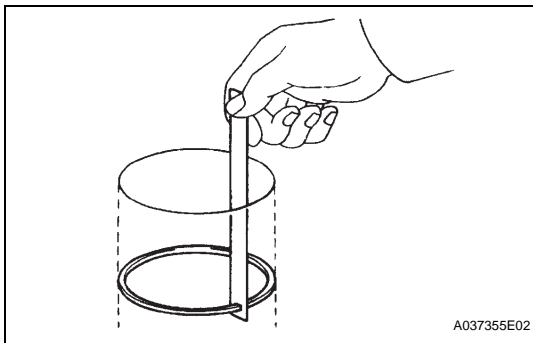
**No. 2 0.02 to 0.06 mm (0.0008 to 0.0024 in.)**

**Oil 0.03 to 0.11 mm (0.0012 to 0.0043 in.)**



### 13. INSPECT PISTON RING END GAP

- (a) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110mm(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 0.50 to 0.60 mm (0.0197 to 0.0236 in.)**

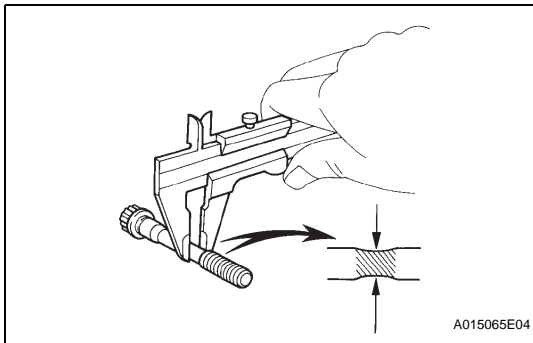
**Oil (Side rail) 0.15 to 0.40 mm (0.0059 to 0.0157 in.)**

**Maximum end gap:**

**No. 1 0.95 mm (0.0374 in.)**

**No. 2 1.05 mm (0.0413 in.)**

**Oil (Side rail) 1.00 mm (0.0394 in.)**



### 14. INSPECT CONNECTING ROD BOLT

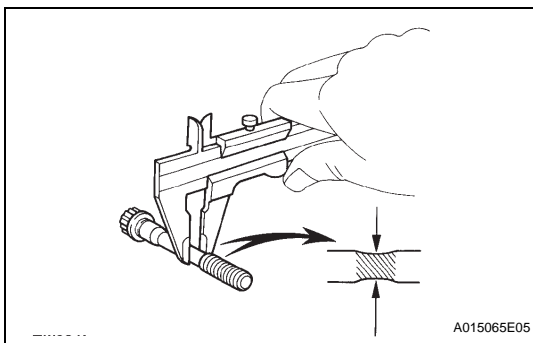
- (a) Using vernier calipers, measure the tension portion diameter of the bolt.

**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 minimum, replace the bolt.



### 15. INSPECT CRANKSHAFT BEARING CAP SET BOLT

- (a) Using vernier calipers, measure the tension portion diameter of the bolt.

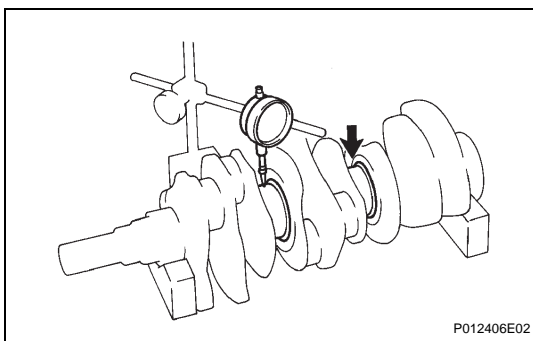
**Standard diameter:**

**7.5 to 7.6 mm (0.295 to 0.299 in.)**

**Minimum diameter:**

**7.2 mm (0.283 in.)**

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

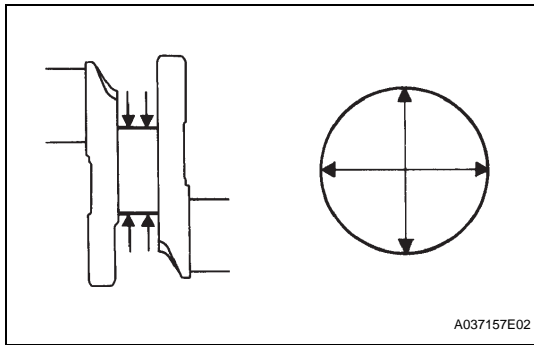


### 16. INSPECT CRANKSHAFT

- (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.

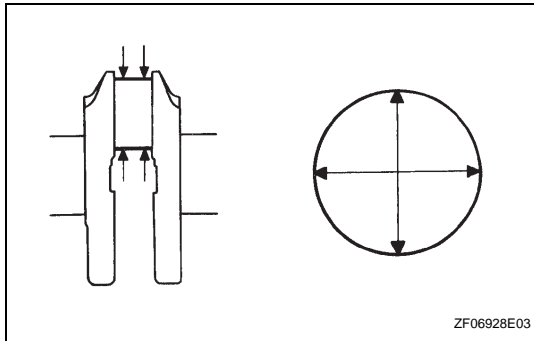
**Diameter:**

**60.988 to 61.000 mm (2.4011 to 2.4016 in.)**

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

**Maximum taper and out-of-round:**

**0.02 mm (0.0008 in.)**



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

**Diameter:**

**52.992 to 53.000 mm (2.0863 to 2.0866 in.)**

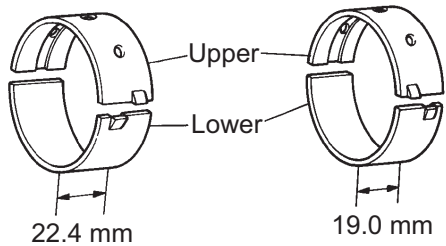
- (e) Check each crank pin for taper and out-of-round as shown.

**Maximum taper and out-of-round:**

**0.02 mm (0.0008 in.)**

No. 1 and No. 4:

No. 2 and No. 3:

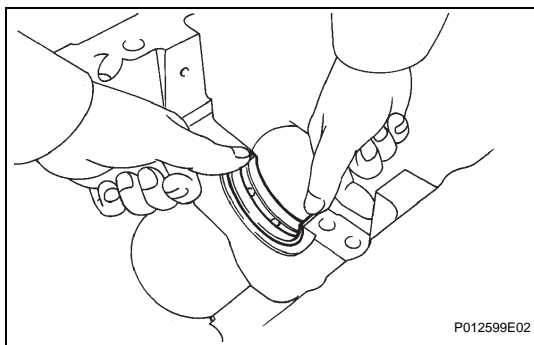


## 17. INSPECT CRANKSHAFT OIL CLEARANCE

- (a) Clean each main journal and bearing.

**HINT:**

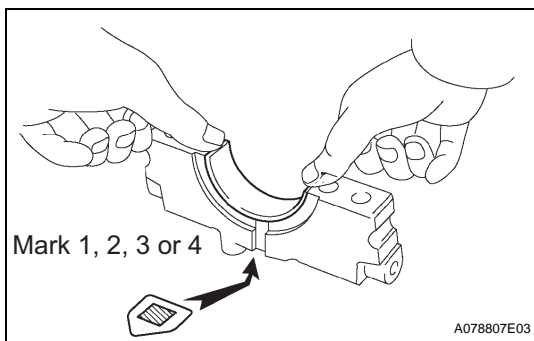
Main bearings come in widths of 22.4 mm (0.882 in.) and 19.0mm (0.748 in.). Install the 22.4mm (0.882 in.) bearings in the No. 1 and No. 4 cylinder block journal positions with the main bearing cap. Install the 19.0 mm (0.748 in.) bearings in the No. 2 and No. 3 positions.



- (b) Align the bearing key with the keyway 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 key with the keyway of the main bearing cap, and push in the 4 lower bearings.

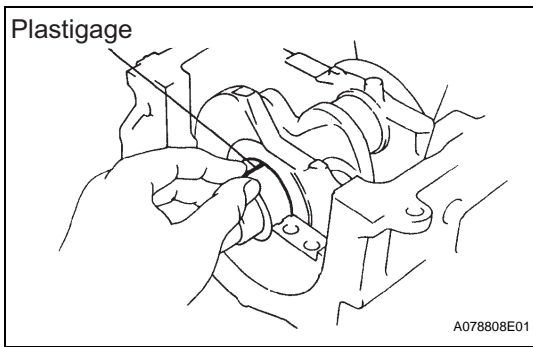
**NOTICE:**

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

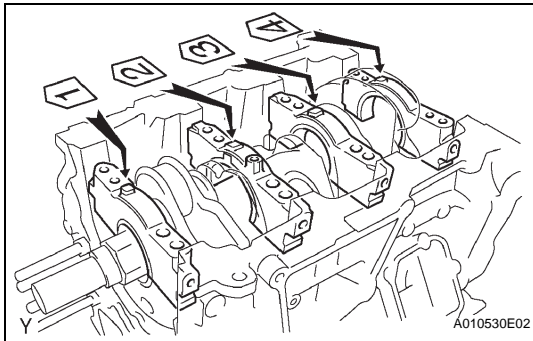
**HINT:**

A number is marked on each main bearing cap to indicate the installation position.

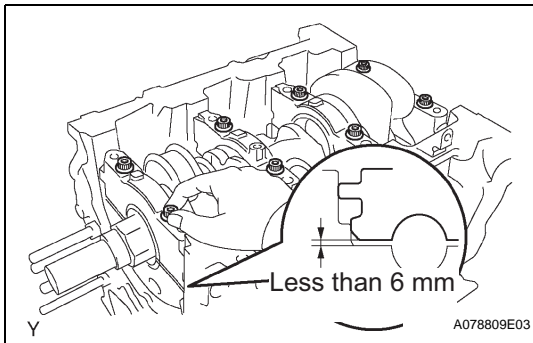
- (d) Place the crankshaft on the cylinder block.



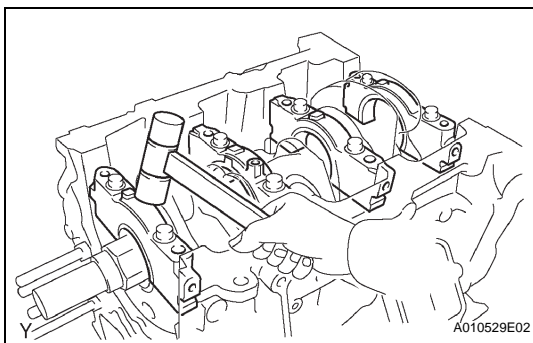
(e) Lay a strip of plastigage across each journal.



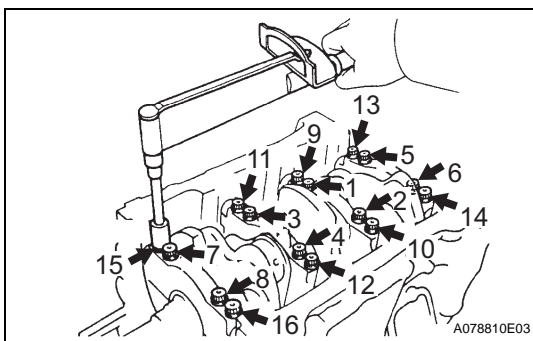
- (f) Examine the front marks and numbers and install the bearing caps on the cylinder block.
- (g) Apply a light coat of engine oil on the threads of the bearing cap bolts.
- (h) Temporarily install the 8 main bearing cap bolts to the inside positions.



(i) Install the main bearing cap by hand, using the inner bolt as a guide. Stop the main bearing cap is about 6mm (0.23 in.) away from contacting with the block.



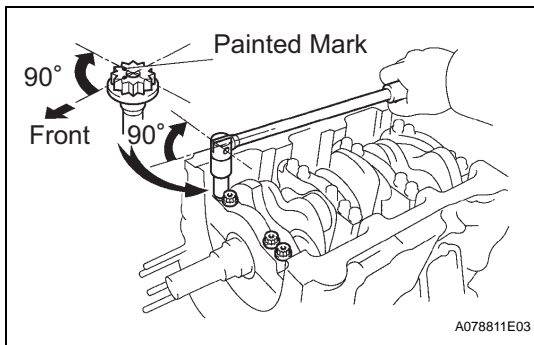
- (j) Using a plastic-faced hammer, lightly tap the bearing cap to ensure a proper fit.
- (k) Apply a light coat of engine oil on the threads of the main bearing cap bolts.



(l) Using several steps, install and tighten the 16 main bearing cap bolts uniformly in the sequence shown in the illustration (procedure "A").

**Torque: 22 N\*m (224 kgf\*cm, 16 ft.\*lbf)**

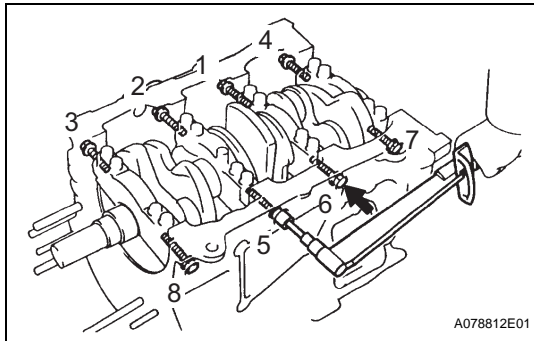




- (m) Mark the front side of the bearing cap bolts with paint.
- (n) Retighten the bearing cap bolts by 90° in the same sequence shown as procedure "A".
- (o) Check that each painted mark is now at a 90° angle to the front.

**NOTICE:**

**Do not turn the crankshaft.**



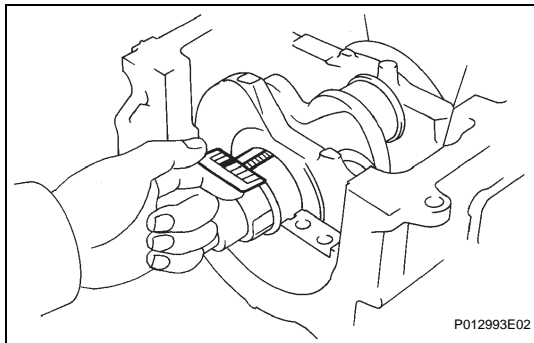
- (p) Using several steps, install and tighten the 8 main bearing cap bolts uniformly in the sequence shown in the illustration.

**Torque: 27 N\*m (275 kgf\*cm, 20 ft.\*lbf)**

**HINT:**

Use the short bolt for the marked position (arrow).

- (q) Remove the main bearing caps.



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

**Standard oil clearance:**

**No. 1 and No. 2 journals 0.014 to 0.034 mm (0.0006 to 0.0013 in.)**

**No. 3 and No. 4 journals 0.026 to 0.046 mm (0.0010 to 0.0018 in.)**

**Maximum clearance:**

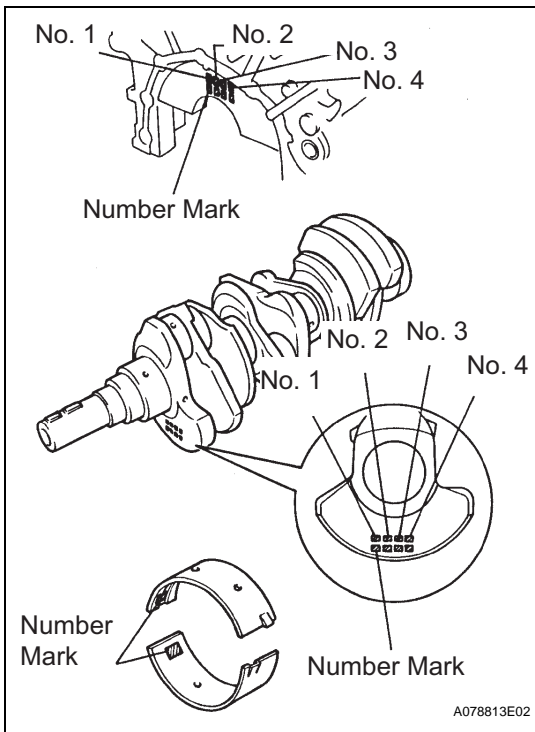
**No. 1 and No. 2 journals 0.05 mm (0.0020 in.)**

**No. 3 and No. 4 journals 0.06 mm (0.0024 in.)**

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

**NOTICE:**

**Completely remove the plastigage.**



(s) If replacing a bearing, replace it with one having 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. The No. 1 and No. 2 journal bearing come in sizes, marked "3", "4", "5", "6" and "7". The No. 3 and No. 4 journal bearings come in 5 standard bearing sizes, marked "1", "2", "3", "4" and "5".

**No. 1 and No. 2 journal bearings**

Cylinder block + Crankshaft =	0 to 5	6 to 11	12 to 17	18 to 23	24 to 28
Replacement Bearing	"3"	"4"	"5"	"6"	"7"

HINT:

EXAMPLE

Cylinder block imprinted number mark is 06

Crankshaft imprinted number mark is 08

$6 + 8 = 14$

Select the bearing marked "5"

**No. 3 and No. 4 journal bearings**

Cylinder block + Crankshaft =	0 to 5	6 to 11	12 to 17	18 to 23	24 to 28
Replacement Bearing	"1"	"2"	"3"	"4"	"5"

HINT:

EXAMPLE

Cylinder block imprinted number mark is 06

Crankshaft imprinted number mark is 08

$6 + 8 = 14$

Select the bearing marked "3"

EM

Item	Mark	mm (in.)
Cylinder block main journal bore diameter (A)	"00"	66.000 (2.5984)
	"01"	66.001 (2.5985)
	"02"	66.002 (2.5985)
	"03"	66.003 (2.5985)
	"04"	66.004 (2.5986)
	"05"	66.005 (2.5986)
	"06"	66.006 (2.5987)
	"07"	66.007 (2.5987)
	"08"	66.008 (2.5987)
	"09"	66.009 (2.5988)
	"10"	66.010 (2.5988)
	"11"	66.011 (2.5989)
	"12"	66.012 (2.5989)
	"13"	66.013 (2.5989)
	"14"	66.014 (2.5990)
	"15"	66.015 (2.5990)
	"16"	66.016 (2.5990)

Item	Mark	mm (in.)
Cylinder main journal bore diameter (B)	"00"	61.000 (2.4016)
	"01"	61.999 (2.4015)
	"02"	61.998 (2.4015)
	"03"	61.997 (2.4015)
	"04"	61.996 (2.4014)
	"05"	61.995 (2.4014)
	"06"	61.994 (2.4013)
	"07"	61.993 (2.4012)
	"08"	61.992 (2.4012)
	"09"	61.991 (2.4012)
	"10"	61.990 (2.4012)
	"11"	61.989 (2.4011)
	"12"	61.988 (2.4011)
Standard bearing center wall thickness	"1"	2.486 to 2.489 (0.0979 to 0.00980)
	"2"	2.489 to 2.492 (0.0980 to 0.00981)
	"3"	2.492 to 2.495 (0.0981 to 0.00982)
	"4"	2.495 to 2.498 (0.0982 to 0.00983)
	"5"	2.498 to 2.501 (0.0983 to 0.00985)
	"6"	2.501 to 2.504 (0.0985 to 0.00986)
	"7"	2.504 to 2.507 (0.0986 to 0.00987)

EM