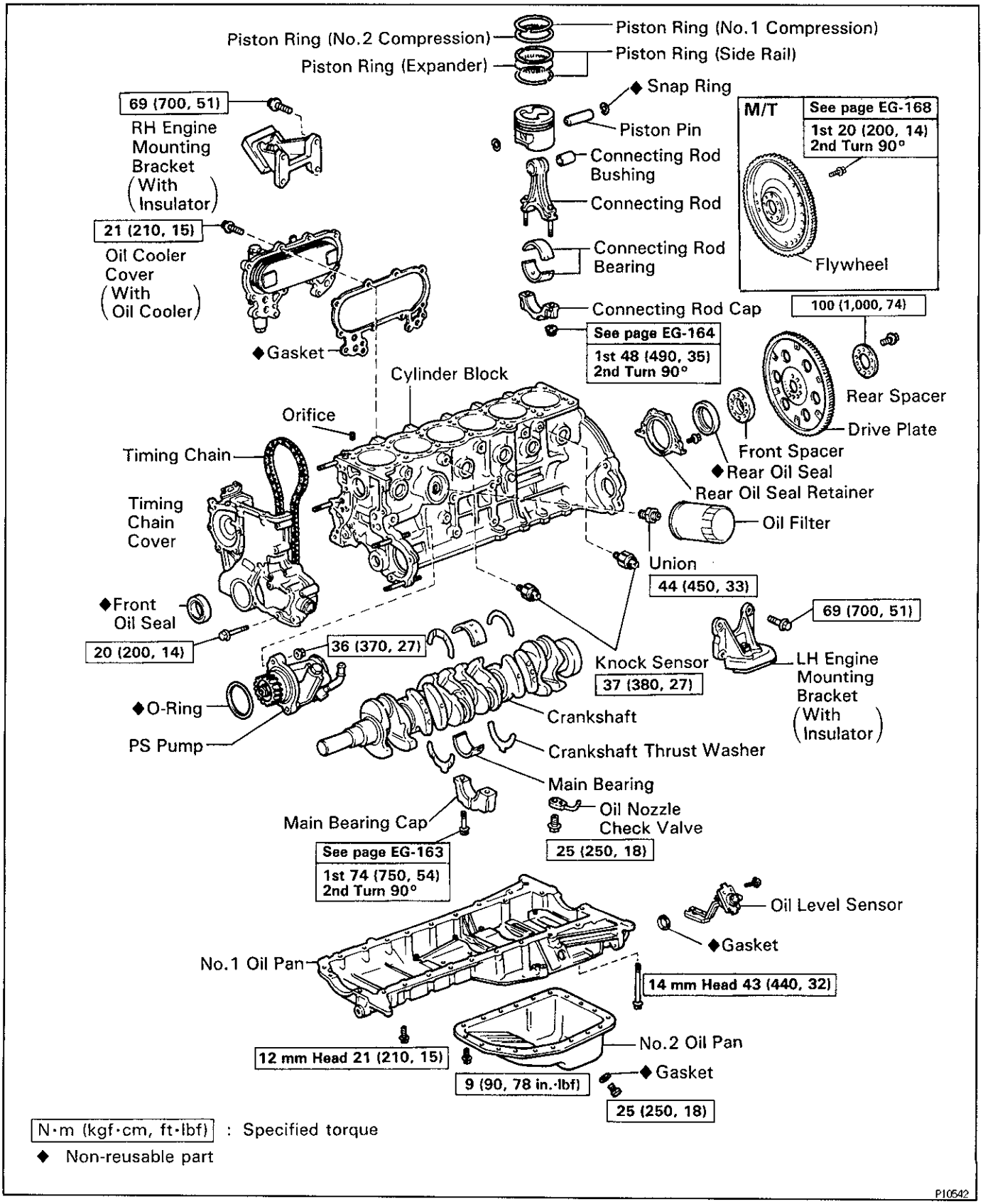
CYLINDER BLOCK

COMPONENTS FOR DISAEEMBLY AND ASSEMBLY

EG1K5-02



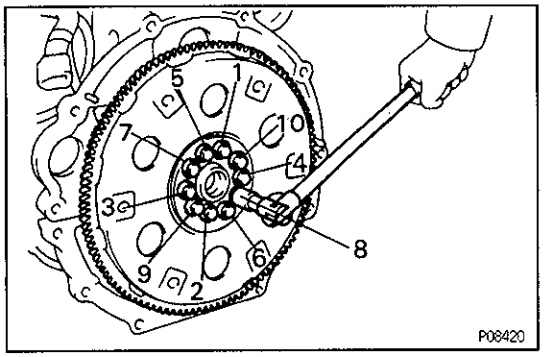
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

PI0542

EGOVL–03

PREPARATION FOR DISASSEMBLY

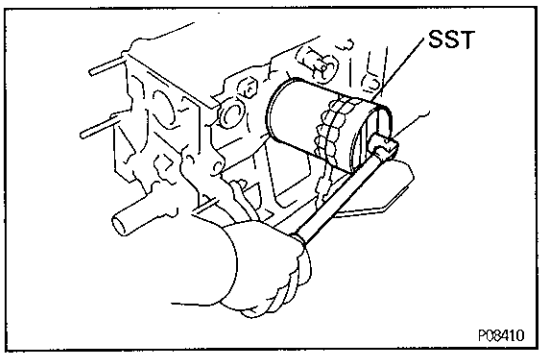


1. REMOVE DRIVE PLATE
Uniformly loosen and remove the drive plate bolts in several passes, in the sequence shown.

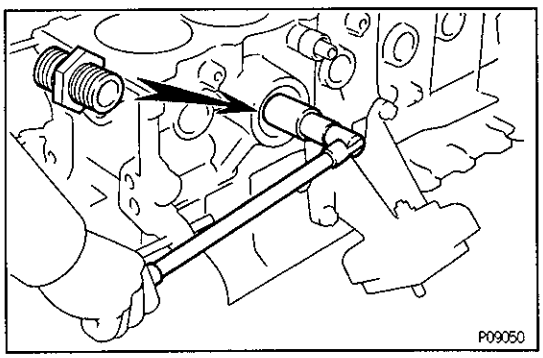
2. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY

3. REMOVE CYLINDER HEAD
(See page EG–38 or 89)

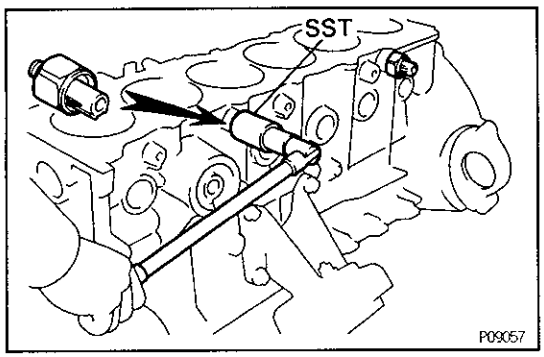
4. REMOVE TIMING CHAIN AND GEARS
(See page EG–120)



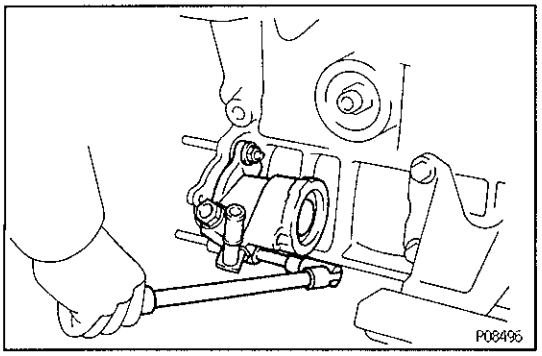
5. REMOVE OIL FILTER
Using SST, remove the oil filter.
SST 09228–44011



6. REMOVE OIL FILTER UNION

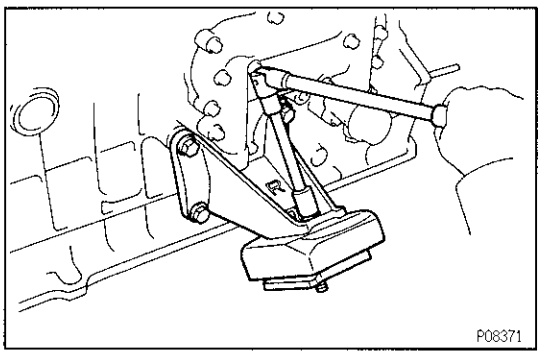


7. (1FZ–FE)
REMOVE KNOCK SENSORS
Using SST, remove the two knock sensors.
SST 09816–30010



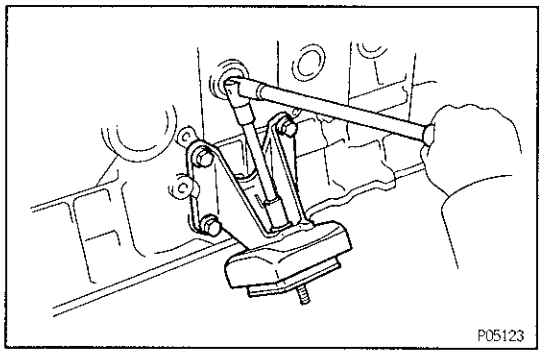
8. REMOVE PS PUMP

(a) Remove the two nuts and pump.
(b) Remove the O–ring from the pump.



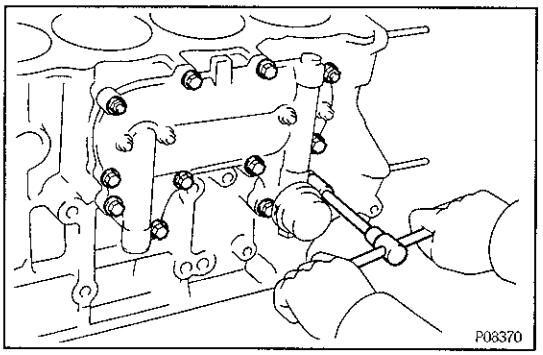
9. REMOVE RH ENGINE MOUNTING BRACKET

(a) Remove the nut and insulator.
(b) Remove the four bolts and bracket.



10. REMOVE LH ENGINE MOUNTING BRACKET

(a) Remove the nut and insulator.
(b) Remove the four bolts and bracket.

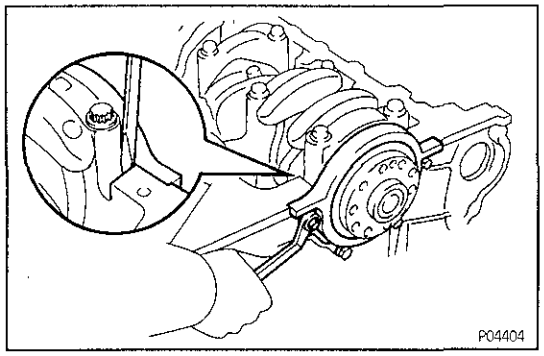


11. REMOVE OIL COOLER COVER AND OIL COOLER

Remove the ten bolts, two nuts, oil cooler cover with the oil cooler and gasket.

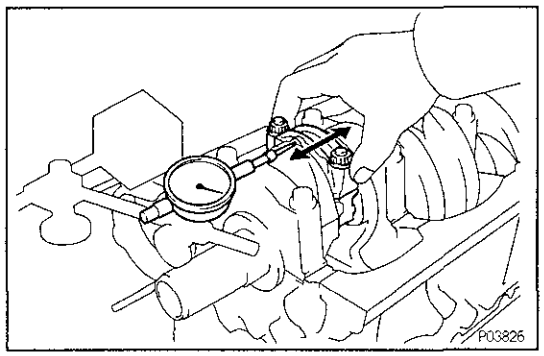
EGOVM–02

CYLINDER BLOCK DISASSEMBLY

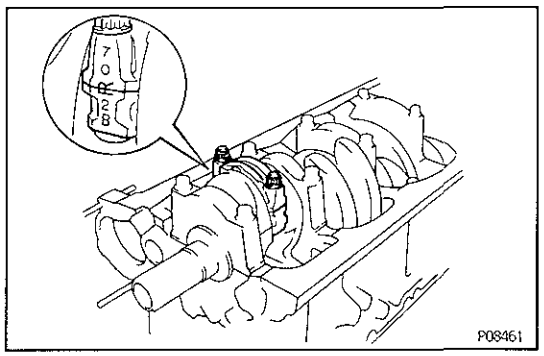


(See Components for Disassembly and Assembly)

1. **REMOVE REAR OIL SEAL RETAINER**
   Remove the four bolts and retainer.

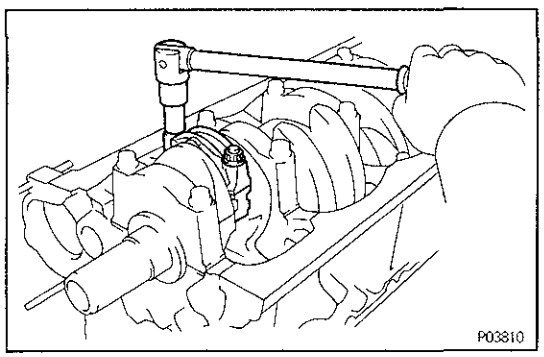


2. **CHECK CONNECTING ROD THRUST CLEARANCE**
   Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.
   Standard thrust clearance:
   0.160 – 0.262 mm (0.0063 – 0.0103 in.)
   Maximum thrust clearance:
   0.362 mm (0.0143 in.)
   If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.

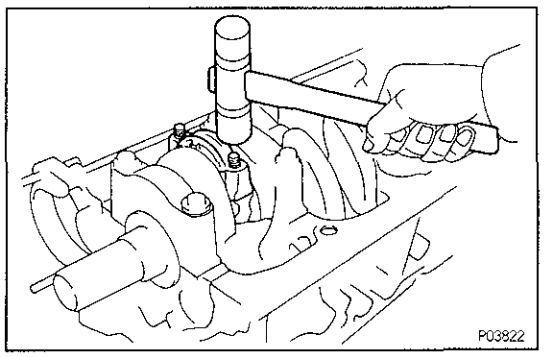


3. **REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE**

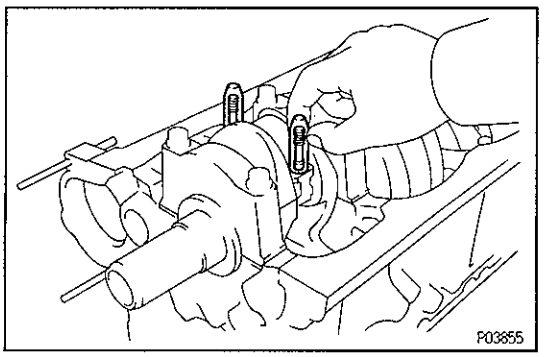
(a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly.



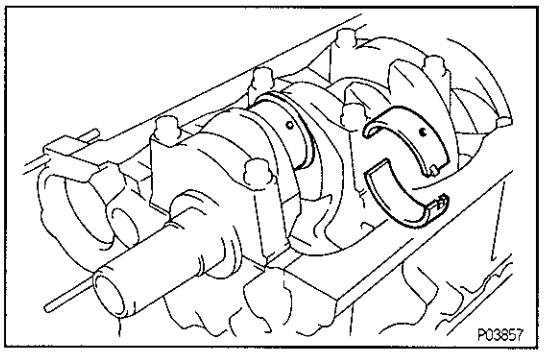
(b) Remove the connecting rod cap nuts.



(c) Using a plastic–faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.
HINT: Keep the lower bearing inserted with the connecting rod cap.



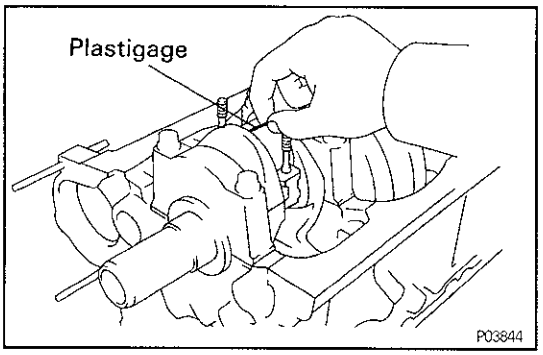
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



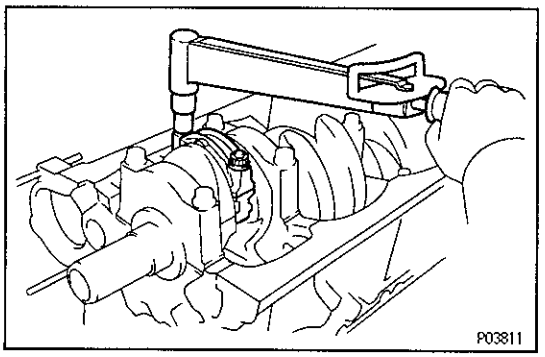
(e) Clean the crank pin and bearing.

(f) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



(g) Lay a strip of Plastigage across the crank pin.



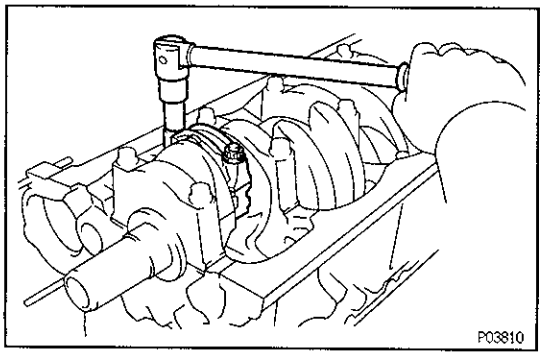
(h) Install the connecting rod cap with the two nuts.
(See step 8 on page EG–164)

1st

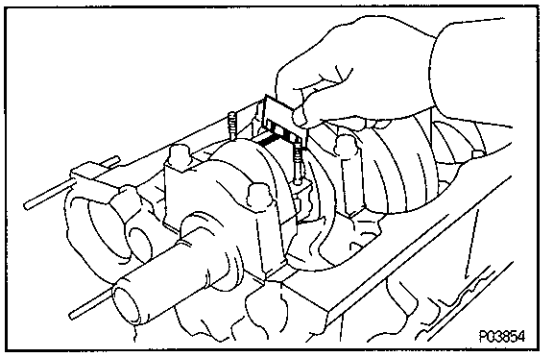
Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)

2nd Turn 90°

NOTICE: Do not turn the crankshaft.



(i) Remove the two nuts and connecting rod cap.
(See procedure (b) and (c) above)



EG

(j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD

0.032 — 0.050 mm (0.0013 — 0.0020 in.)

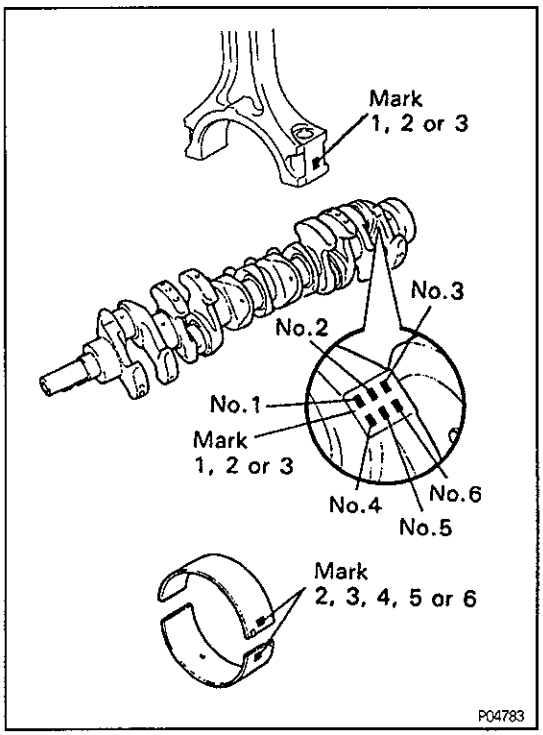
U/S 0.25

0.033 — 0.073 mm (0.0013 — 0.0029 in.)

Maximum oil clearance:

0.10 mm (0.0039 in.)

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



HINT: If using a standard bearing, replace 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 connecting rod and crankshaft, then selecting the bearing with the same number as the total. There are five sizes of standard bearings, marked "2", "3", "4", "5" and "6" accordingly.

	Number marked								
Connecting rod	1			2			3		
Crankshaft	1	2	3	1	2	3	1	2	3
Use bearing	2	3	4	3	4	5	4	5	6

EXAMPLE: Connecting rod "3" + Crankshaft "1" = Total number 4 (Use bearing "4")

V04532

(Reference)

Connecting rod big end inside diameter:

Mark "1"

60.526 — 60.532 mm (2.3829 — 2.3831 in.)

Mark "2"

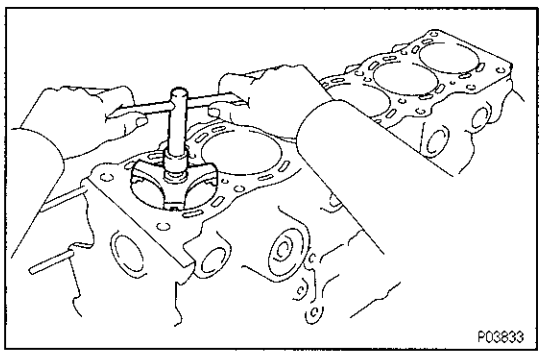
60.532 — 60.538 mm (2.3831 — 2.3834 in.)

Mark "3"

60.538 — 60.544 mm (2.3834 — 2.3836 in.)

Crankshaft crank pin diameter:
Mark "1"
56.994 – 57.000 mm (2.2439 – 2.2441 in.)
Mark "2"
56.988 – 56.994 mm (2.2436 – 2.2439 in.)
Mark "3"
56.982 – 56.988 mm (2.2434 – 2.2436 in.)
Standard sized bearing center wall thickness:
Mark "2"
2.489 – 2.492 mm (0.0980 – 0.0981 in.)
Mark "3"
2.492 – 2.495 mm (0.0981 – 0.0982 in.)
Mark "4"
2.495 – 2.498 mm (0.0982 – 0.0983 in.)
Mark "5"
2.498 – 2.501 mm (0.0983 – 0.0985 in.)
Mark "6"
2.501 – 2.504 mm (0.0985 – 0.0986 in.)

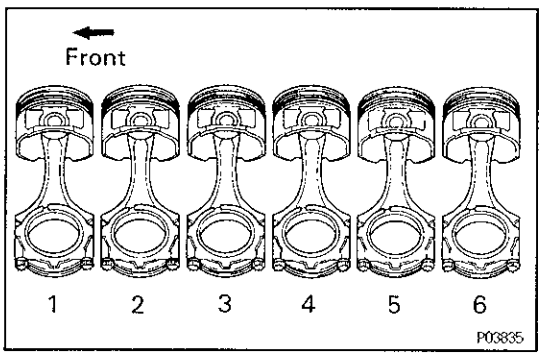
(k) Completely remove the Plastigage.



4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

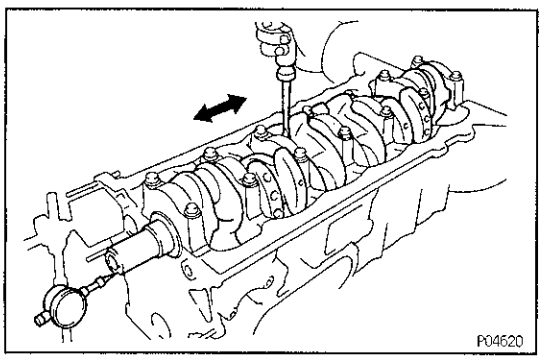
(a) Using a ridge reamer, remove the all carbon from the top of the cylinder.

(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.



HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



5. CHECK CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:
0.020 – 0.220 mm (0.0008 – 0.0087 in.)
Maximum thrust clearance:
0.30 mm (0.0118 in.)

EG

If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness:

STD

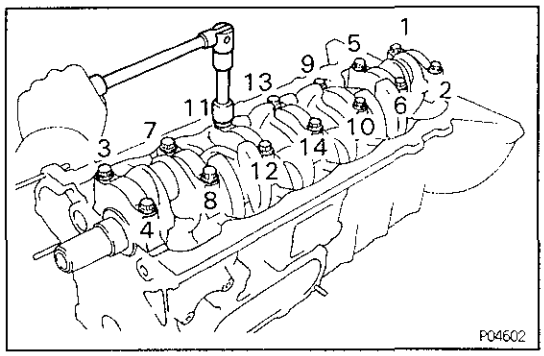
2.440 — 2.490 mm (0.0961 — 0.0980 in.)

O/S 0.125

2.503 — 2.553 mm (0.0985 — 0.1005 in.)

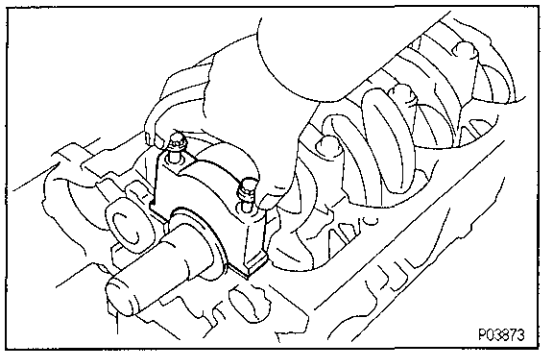
O/S 0.250

2.565 — 2.615 mm (0.1010 — 0.1030 in.)



6. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

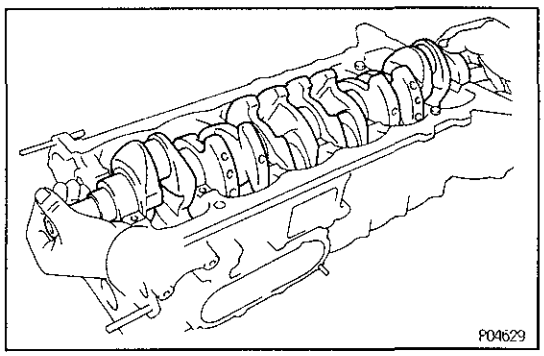
(a) Uniformly loosen and remove the main bearing cap bolts in several passes, in the sequence shown.



(b) Using the removed main bearing cap bolts, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and lower thrust washers (No.4 main bearing cap only).

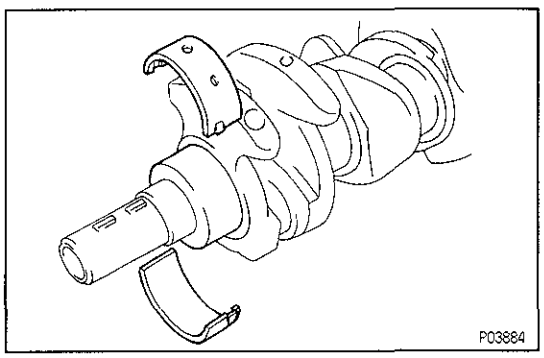
HINT:

- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in correct order.



(c) Lift out the crankshaft.

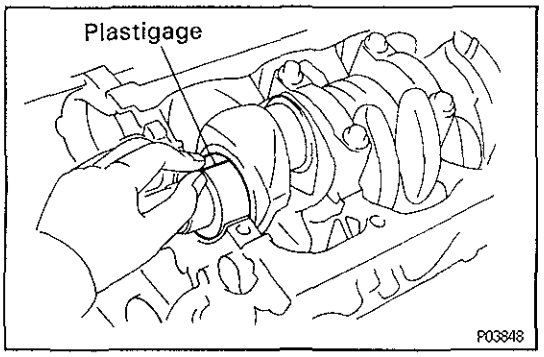
HINT: Keep the upper bearing and upper thrust washers together with the cylinder block.



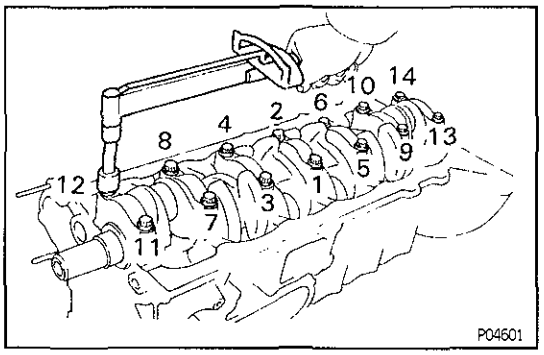
(d) Clean each main journal and bearing.

(e) Check each main journal and bearing for pitting and scratches.

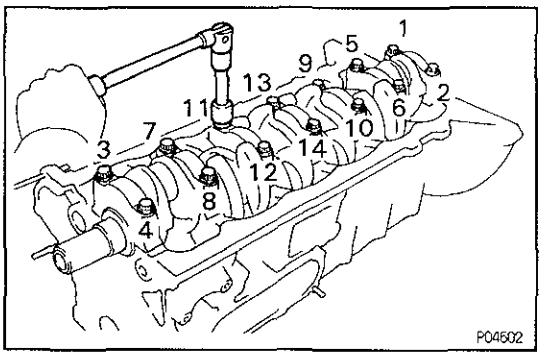
If the journal or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



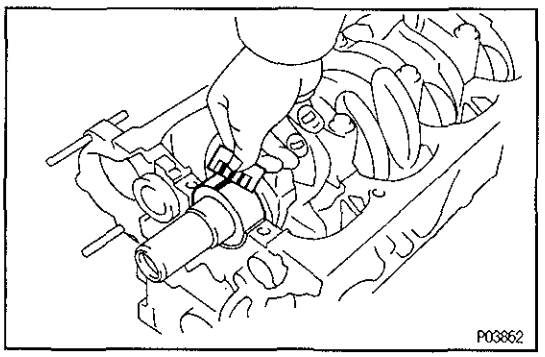
(f) Place the crankshaft on the cylinder block.
(g) Lay a strip of Plastigage across each journal.



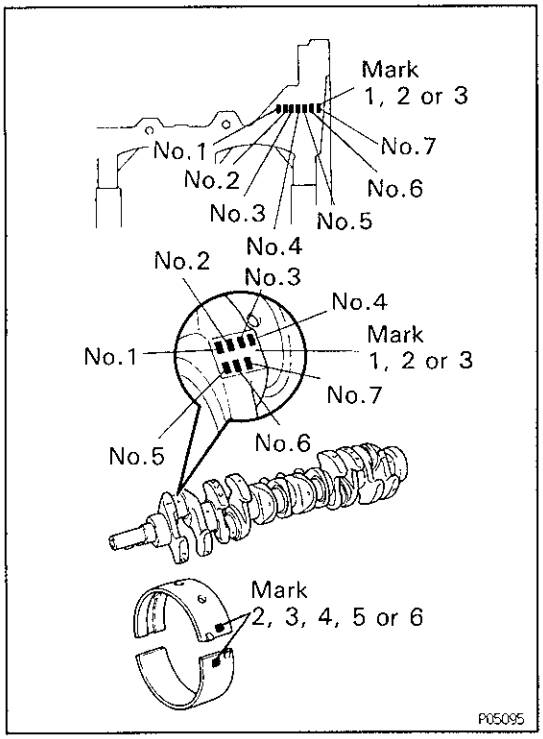
(h) Install the main bearing caps.
(See step 6 on page EG–162)
1st
Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)
2nd Turn 90°
NOTICE: Do not turn the crankshaft.



(i) Remove the main bearing caps.
(See procedure (a) and (b) above)



(j) Measure the Plastigage at its widest point.
Standard clearance:
STD
0.042 – 0.060 mm (0.0017 – 0.0024 in.)
U/S 0.25
0.041 – 0.081 mm (0.0016 – 0.0032 in.)
Maximum clearance:
0.10 mm (0.0039 in.)
If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.



EG

HINT: If using a standard bearing, replace 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 selecting the bearing with the same number as the total. There are five sizes of standard bearings, marked "2", "3", "4", "5" and "6" accordingly.

	Number marked								
Cylinder block	1			2			3		
Crankshaft	1	2	3	1	2	3	1	2	3
Use bearing	2	3	4	3	4	5	4	5	6

EXAMPLE: Cylinder block "2" + Crankshaft "1"
= Total number 3 (Use bearing "3")

V00739

(Reference)

Cylinder block main journal bore diameter:

Mark "1"

74.026 — 74.032 mm (2.9144 — 2.9146 in.)

Mark "2"

74.032 — 74.038 mm (2.9146 — 2.9149 in.)

Mark "3"

74.038 — 74.044 mm (2.9149 — 2.9151 in.)

Crankshaft journal diameter:

Mark "1"

68.994 — 69.000 mm (2.7163 — 2.7165 in.)

Mark "2"

68.988 — 68.994 mm (2.7161 — 2.7163 in.)

Mark "3"

68.982 — 68.988 mm (2.7158 — 2.7161 in.)

Standard sized bearing center wall thickness:

Mark "2"

2.489 — 2.492 mm (0.0980 — 0.0981 in.)

Mark "3"

2.492 — 2.495 mm (0.0981 — 0.0982 in.)

Mark "4"

2.495 — 2.498 mm (0.0982 — 0.0983 in.)

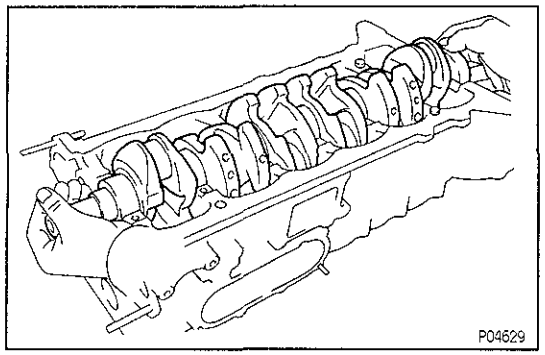
Mark "5"

2.498 — 2.501 mm (0.0983 — 0.0985 in.)

Mark "6"

2.501 — 2.504 mm (0.0985 — 0.0986 in.)

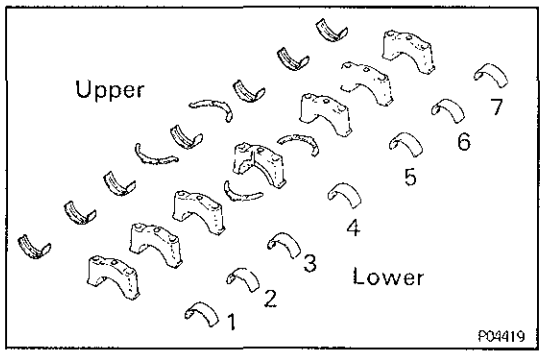
(k) Completely remove the Plastigage.



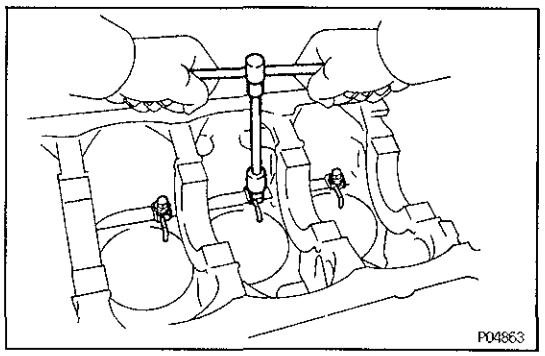
7. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the upper main bearings and upper thrust washers from the cylinder block.

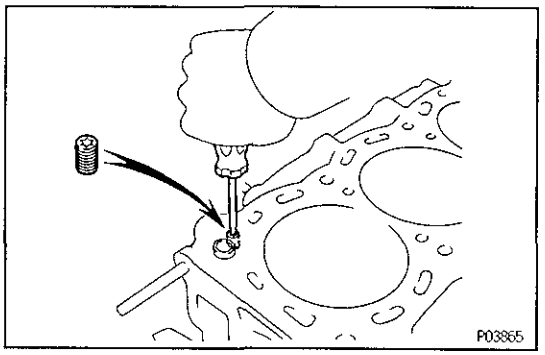


HINT: Arrange the main bearings and thrust washers in correct order.



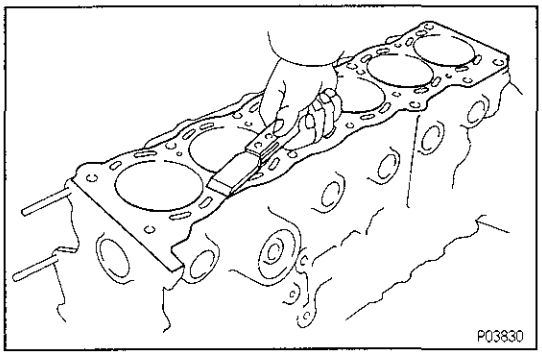
8. REMOVE CHECK VALVES AND OIL NOZZLES

Remove the six check valves and oil nozzles.



9. REMOVE CYLINDER BLOCK ORIFICE

EG



EG0VV-03

CYLINDER BLOCK INSPECTION

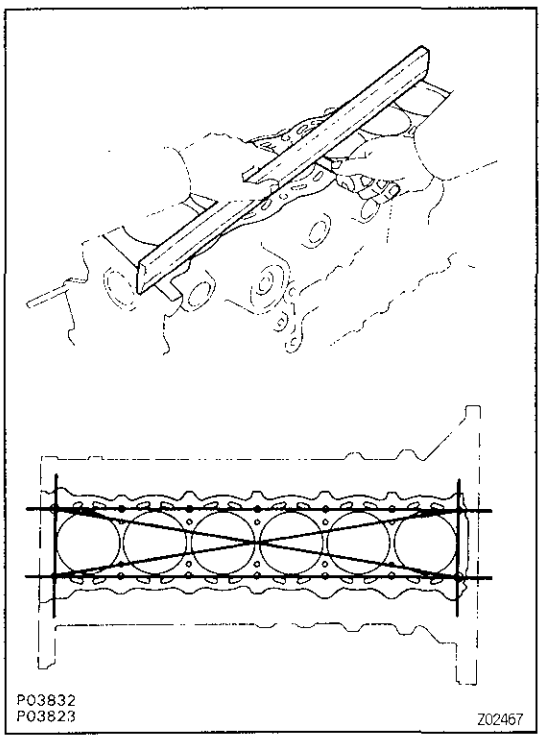
1. CLEAN CYLINDER BLOCK

A. Remove gasket material

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

B. Clean cylinder block

Using a soft brush and solvent, thoroughly clean the cylinder block.



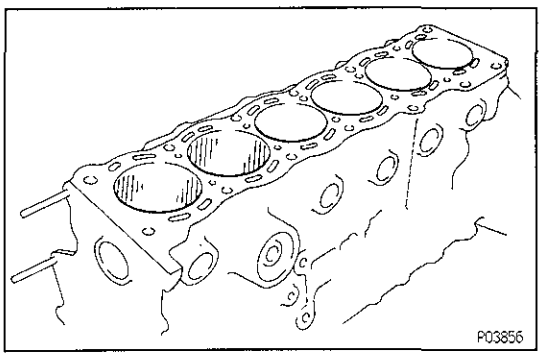
2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

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

Maximum warpage:

0.05 mm (0.0020 in.)

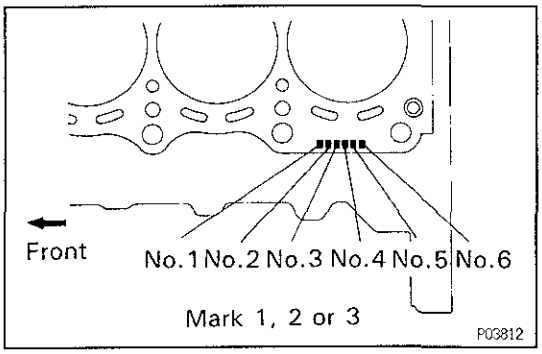
If warpage is greater than maximum, replace the cylinder block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

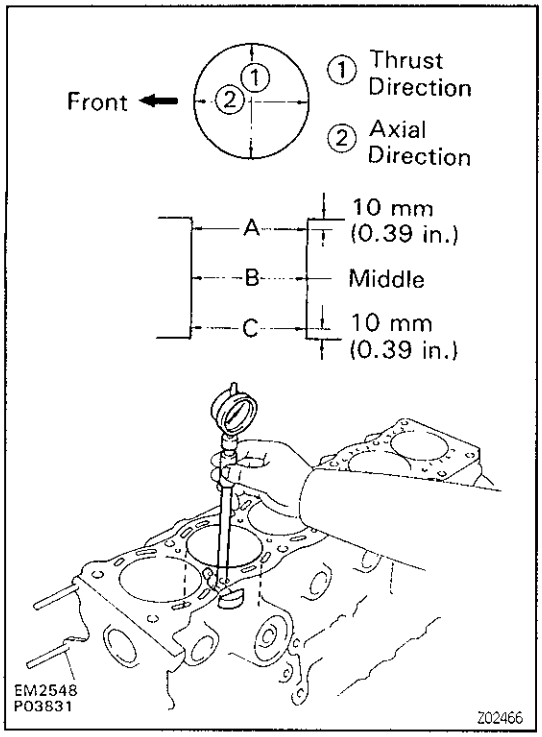
Visually check the cylinder for vertical scratches.

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



4. INSPECT CYLINDER BORE DIAMETER

HINT: There are three 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 "1"

100.000 — 100.010 mm (3.9370 — 3.9374 in.)

Mark "2"

100.010 — 100.020 mm (3.9374 — 3.9378 in.)

Mark "3"

100.020 — 100.030 mm (3.9378 — 3.9382 in.)

Maximum diameter:

STD

100.23 mm (3.9461 in.)

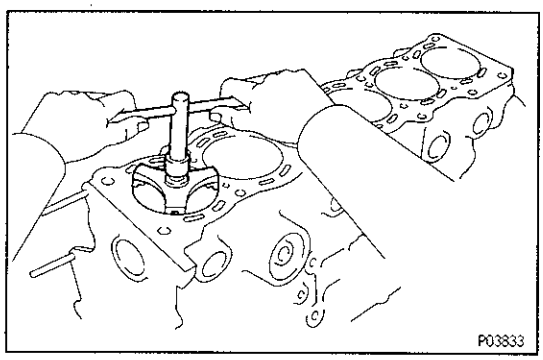
O/S 0.50

100.73 mm (3.9658 in.)

O/S 1.00

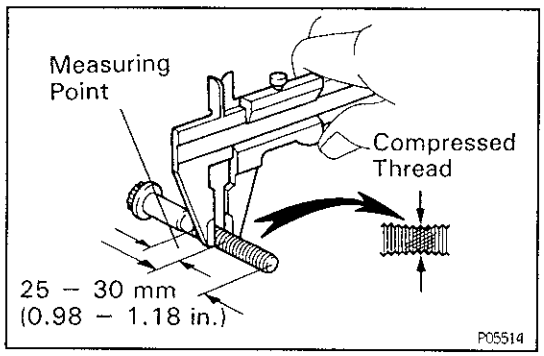
101.23 mm (3.9854 in.)

If the diameter is greater than maximum, rebore all the six 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 thread outside diameter of the bolt.

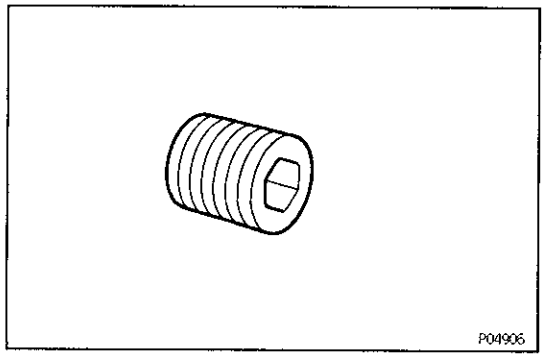
Standard outside diameter:

10.85 — 11.00 mm (0.4271 — 0.4331 in.)

Minimum outside diameter:

10.6 mm (0.417 in.)

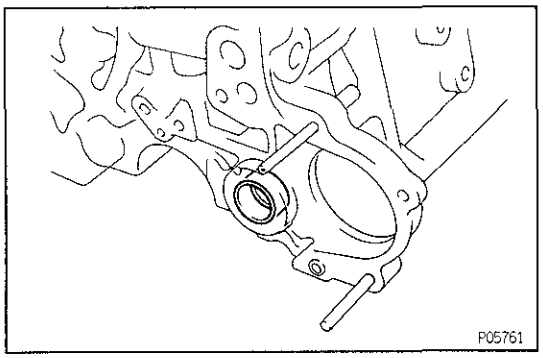
If the diameter is less than minimum, replace the bolt.



7. INSPECT CYLINDER BLOCK OLIFICE

Check the olifice for clogging.

If necessary, replace the olifice.



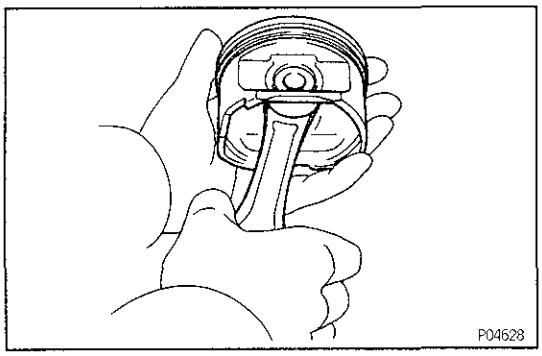
8. **INSPECT BEARING OF OIL PUMP DRIVE SHAFT GEAR**

Check the bearing for pitting and scratches.

If the bearing is damaged, replace the bearing.

PISTON AND CONNECTING ROD ASSY DISASSEMBLY

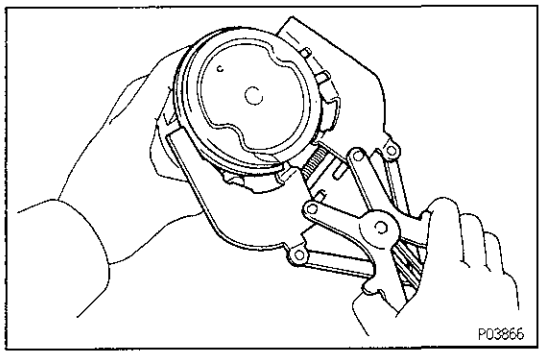
EG08V-05



1. **CHECK FIT BETWEEN PISTON AND PISTON PIN**

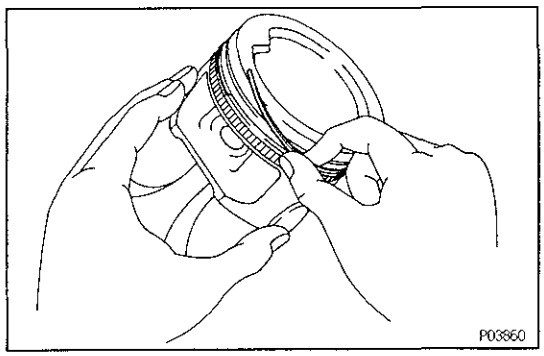
Try to move the piston back and forth on the piston pin.

If any movement is felt, replace the piston and pin as a set.



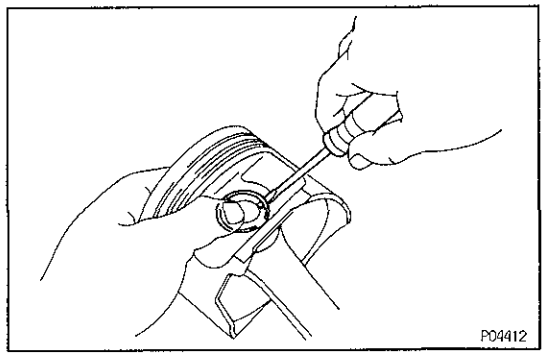
2. **REMOVE PISTON RINGS**

(a) Using a piston ring expander, remove the two compression rings.



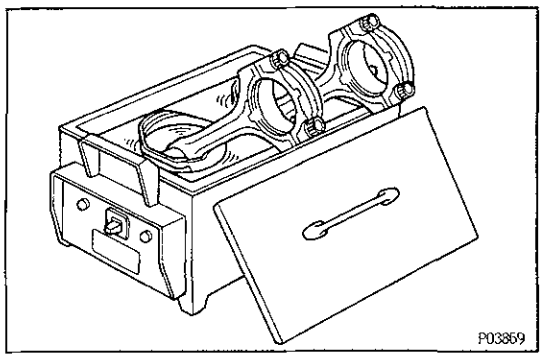
(b) Remove the two side rails and oil ring by hand.

HINT: Arrange the rings in correct order only.

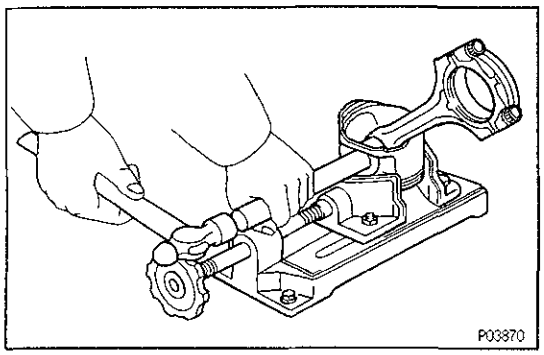


3. **DISCONNECT CONNECTING ROD FROM PISTON**

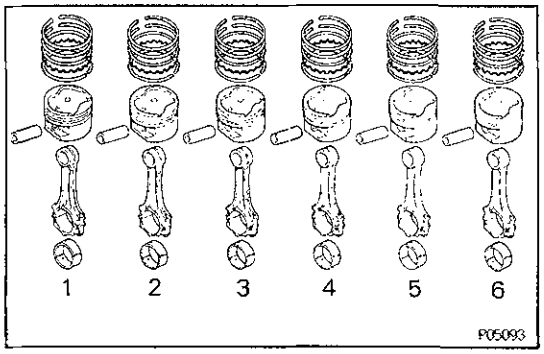
(a) Using a small screwdriver, pry out the two snap rings.



(b) Gradually heat the piston to 80 – 90°C (176 – 194° F).



(c) Using plastic–faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.



HINT:

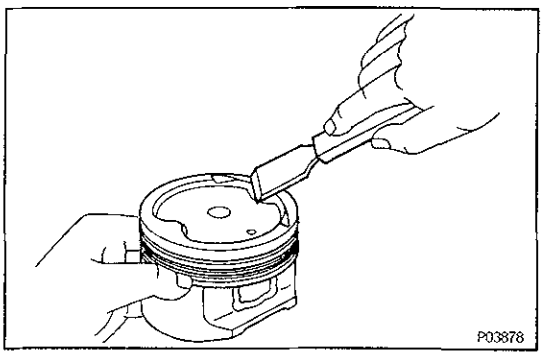
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.

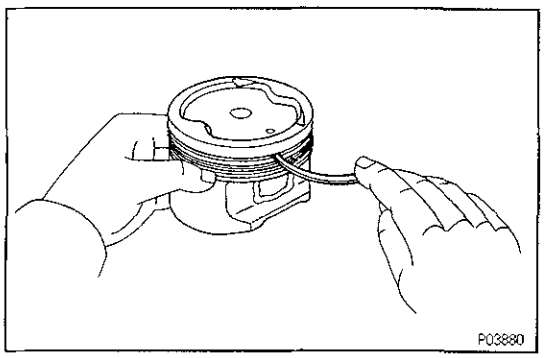
EG0VP-02

PISTON AND CONNECTING ROD INSPECTION

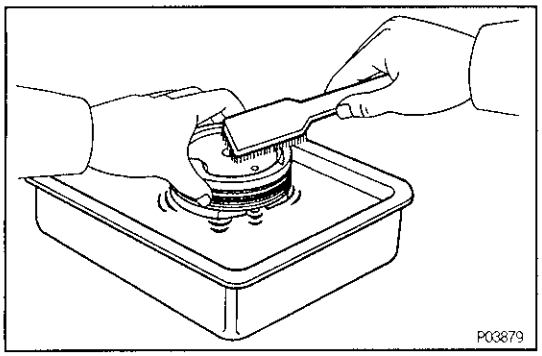
1. CLEAN PISTON

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

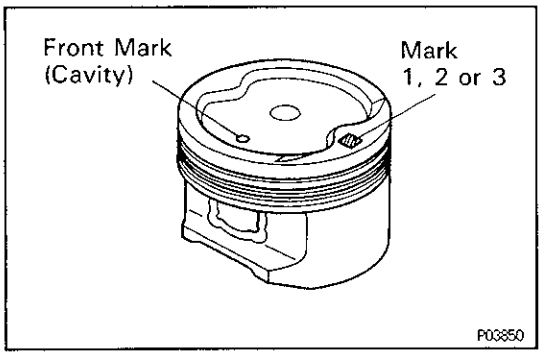




(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



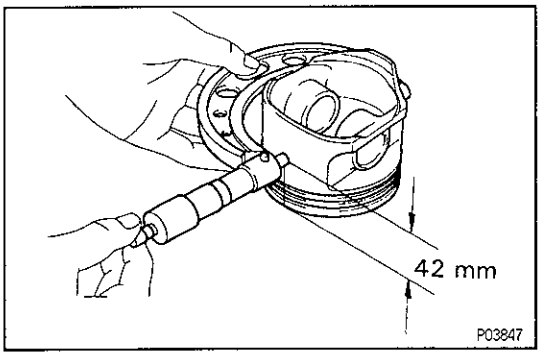
(c) Using solvent and a brush, thoroughly clean the piston.
NOTICE: Do not use a wire brush.



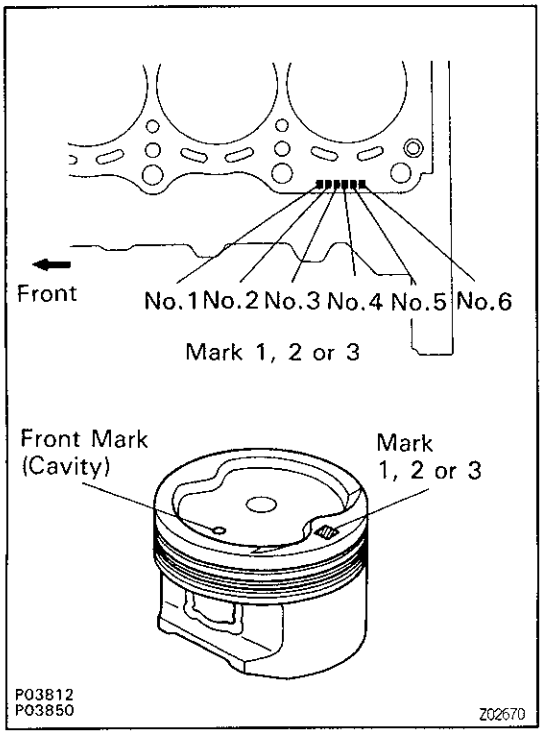
2. INSPECT PISTON AND PISTON RING

A. Inspect piston oil clearance

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

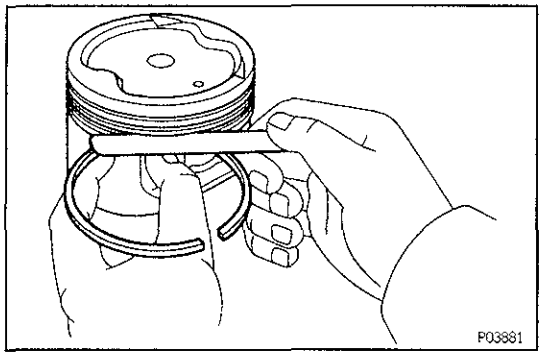


(a) Using a micrometer, measure the piston diameter at ring angles to the piston pin center line, 42 mm (1.65 in.) from the piston head.
Piston diameter:
STD
Mark "1"
99.950 – 99.960 mm (3.9350 – 3.9354 in.)
Mark "2"
99.960 – 99.970 mm (3.9354 – 3.9358 in.)
Mark "3"
99.970 – 99.980 mm (3.9358 – 3.9362 in.)
O/S 0.50
100.450 – 100.480 mm (3.9547 – 3.9559 in.)
O/S 1.00
100.950 – 100.980 mm (3.9744 – 3.9756 in.)



(b) Measure the cylinder bore diameter in the thrust directions.
(See step 4 on page EG–146)

(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.
Standard oil clearance:
0.040 – 0.060 mm (0.0016 – 0.0024 in.)
If the oil clearance is greater than maximum, replace all the six pistons and rebore all the six 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 piston ring groove clearance

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

Ring groove clearance:

No.1

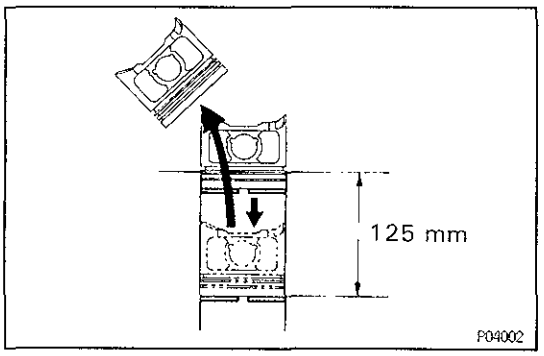
0.040 – 0.080 (0.0016 – 0.0031 in.)

No.2

0.030 – 0.070 (0.0012 – 0.0028 in.)

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

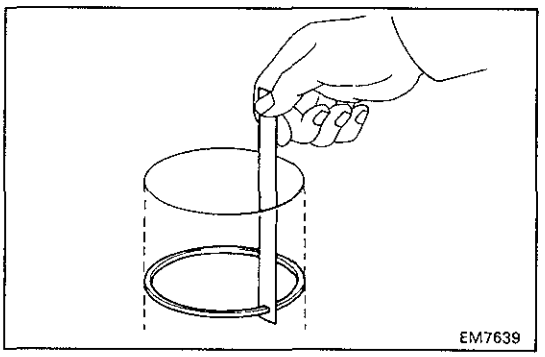
EG



C. 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, 125 mm (4.92 in.) from the top of the cylinder block.



(c) Using a thickness gauge, measure the end gap.

Standard end gap:

No.1

0.300 – 0.520 mm (0.0118 – 0.0205 in.)

No.2

0.450 – 0.670 mm (0.0177 – 0.0264 in.)

Oil (Side rail)

0.150 – 0.520 mm (0.0059 – 0.0205 in.)

Maximum end gap:

No.1

1.12 mm (0.0441 in.)

No.2

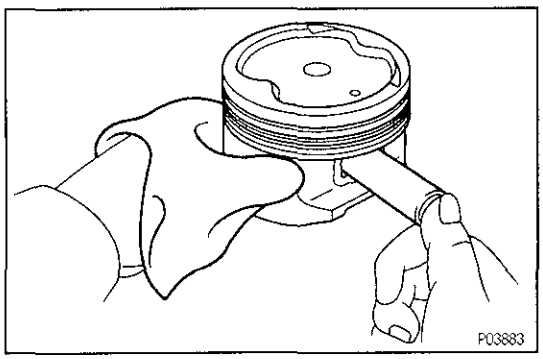
1.17 mm (0.0461 in.)

Oil (Side rail)

1.12 mm (0.0441 in.)

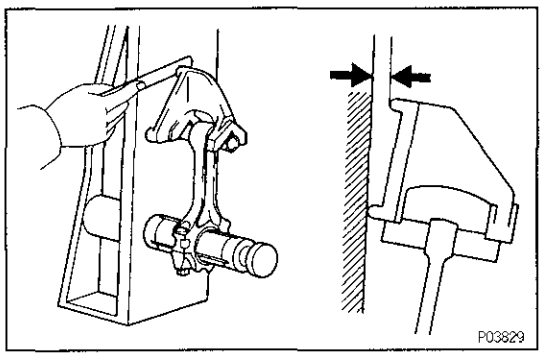
If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, rebore all the six cylinders or replace the cylinder block.

EG



D. Inspect piston pin fit

At 80 – 90°C (176 – 194°F), you should be able to push the piston pin into the piston pin hole with your thumb.



3. INSPECT CONNECTING ROD

A. Inspect connecting rod alignment

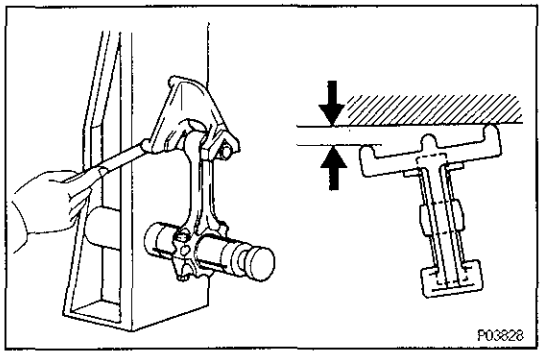
Using a rod aligner and thickness gauge, check the connecting rod alignment.

- Check for bend.

Maximum bend:

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

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

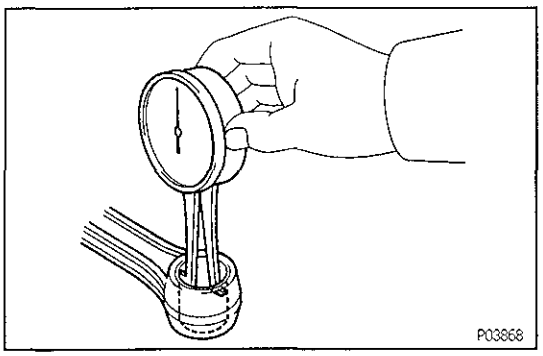


- Check for twist

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.

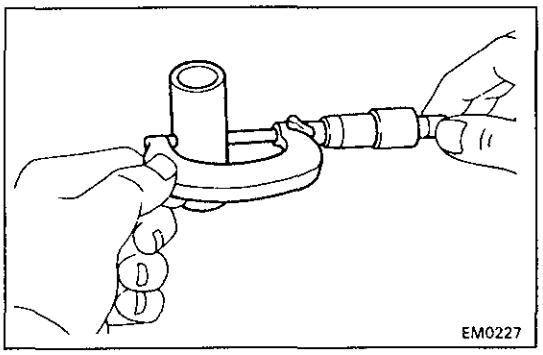


B. Inspect piston pin oil clearance

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

Bushing inside diameter:

26.008 – 26.020 mm (1.0239 – 1.0244 in.)



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

Piston pin diameter:

26.000 – 26.012 mm (1.0236 – 1.0241 in.)

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

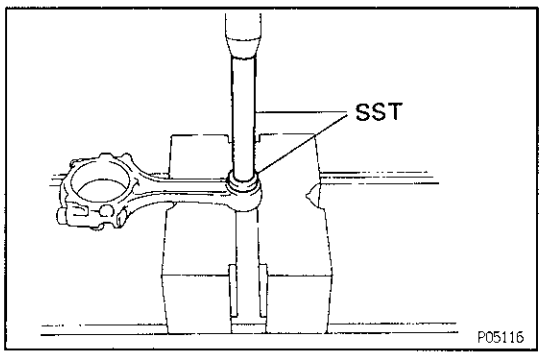
Standard oil clearance:

0.004 – 0.012 mm (0.0002 – 0.0005 in.)

Maximum oil clearance:

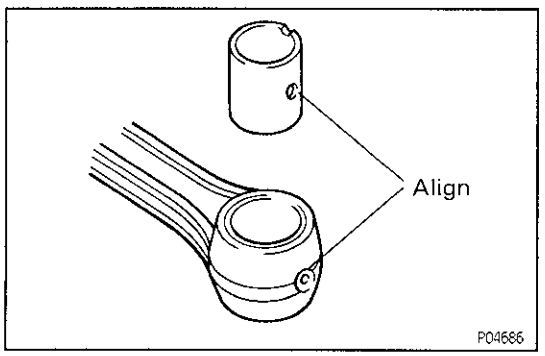
0.05 mm (0.0020 in.)

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

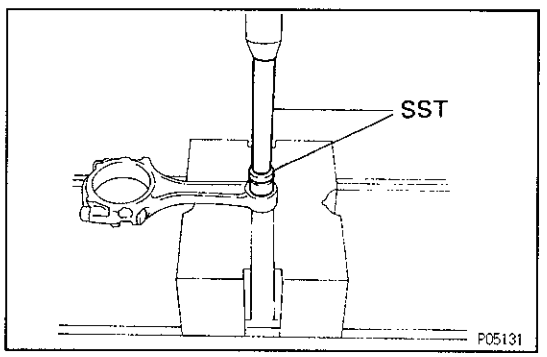


C. If necessary, replace connecting rod bushing

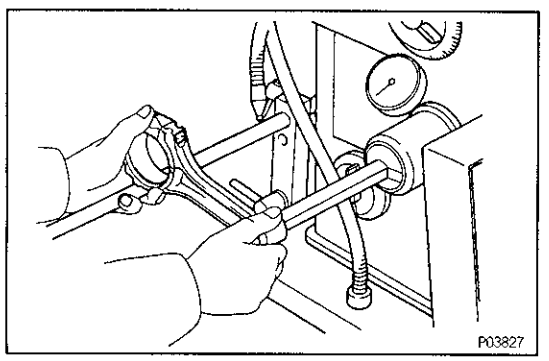
(a) Using SST and a press, press out the bushing.
SST 09608–30012, (09608–04020), 09631–20031



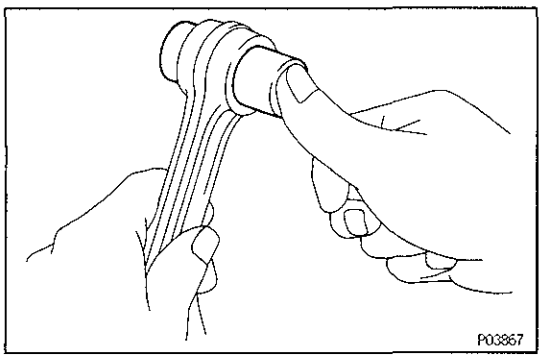
(b) Align the oil holes of a new bushing and the connecting rod.



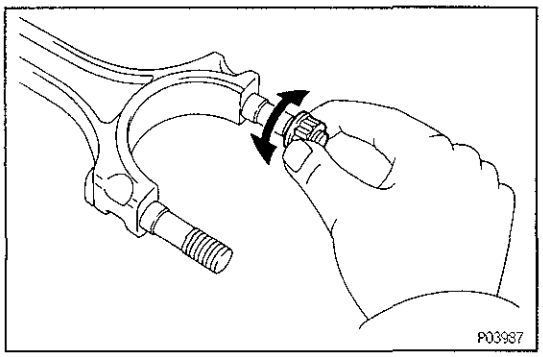
(c) Using SST and a press, press in the bushing.
SST 09608–30012, (09608–04020), 09631–20031



(d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (see step B above) between the bushing and piston pin.

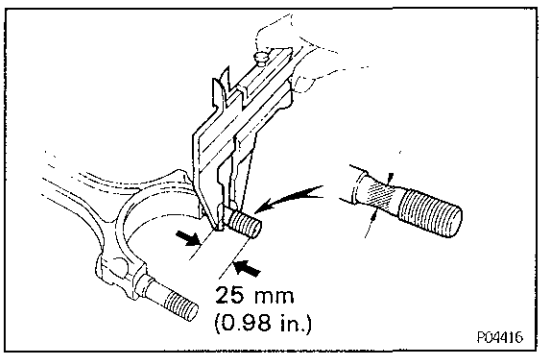


(e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.



D. Inspect connecting rod bolts

(a) Install the cap nut to the connecting rod bolt. Check that the cap nut can be turned easily by hand to the end of the thread.



(b) If the cap nut cannot be turned easily, measure the outside diameter of the connecting rod bolt with vernier calipers.

Standard outside diameter:

8.40 – 8.60 mm (0.3307 – 0.3386 in.)

Minimum outside diameter:

8.00 mm (0.3150 in.)

HINT: If the location of this area cannot be judged by visual inspection, measure the outer diameter at the location shown in the illustration.

If the outside diameter is less than minimum, replace the connecting rod bolt and nut as a set.

EG1K6-01

CYLINDER BORING

HINT:

- Bore all the six cylinders for the oversized piston outside diameter.
- Replace all the piston rings with ones to match the oversized pistons.

EG

1. SELECT OVERSIZED PISTONS

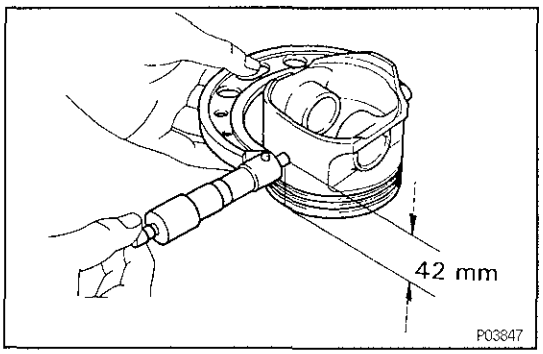
Oversized piston diameter:

O/S 0.50

100.450 – 100.480 mm (3.9547 – 3.9559 in.)

O/S 1.00

100.950 – 100.980 mm (3.9744 – 3.9756 in.)



2. CALCULATE AMOUNT TO BORE CYLINDERS

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 42 mm (1.65 in.) from the piston head.

(b) Calculate the amount of each cylinder is to be rebored as follows:

Size to be rebored = P + C – H

P = Piston diameter

C = Piston clearance

0.040 – 0.060 mm (0.0016 – 0.0024 in.)

H = Allowance for honing

0.20 mm (0.0008 in.) or less

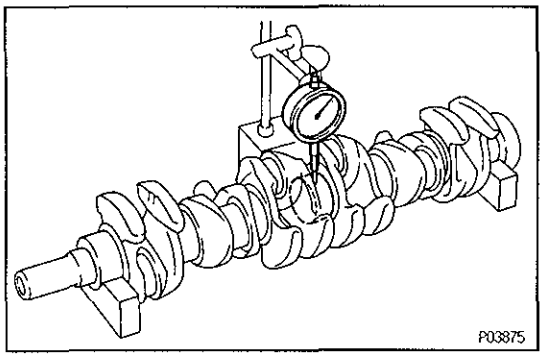
3. BORE AND HONE CYLINDER TO CALCULATED DIMENSIONS

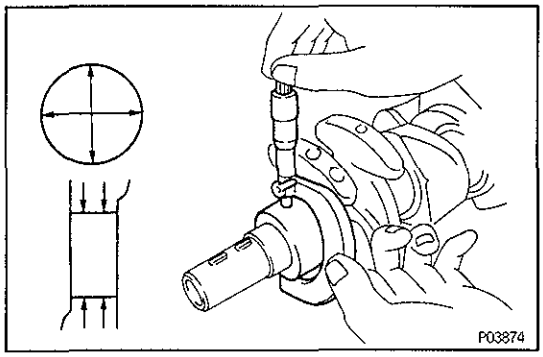
Maximum honing:

0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished roundness.

EG





CRANKSHAFT INSPECTION AND REPAIR

EG0BY–0A

1. 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.

2. INSPECT MAIN JOURNALS AND CRANK PINS

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

Main journal diameter:

STD size

68.982 – 69.000 mm (2.7158 – 2.7165 in.)

U/S 0.25

68.745 – 68.755 mm (2.7065 – 2.7069 in.)

Crank pin diameter:

STD size

56.982 – 57.000 mm (2.2434 – 2.2441 in.)

U/S 0.25

56.745 – 56.755 mm (2.2341 – 2.2344 in.)

If the diameter is not as specified, check the oil clearance (See pages EG–142 to 144). 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:

0.02 mm (0.0008 in.)

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

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

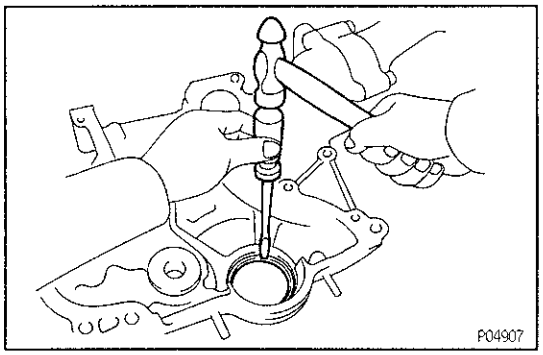
Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure in step 2).

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

CRANKSHAFT OIL SEALS REPLACEMENT

EG0CG-08

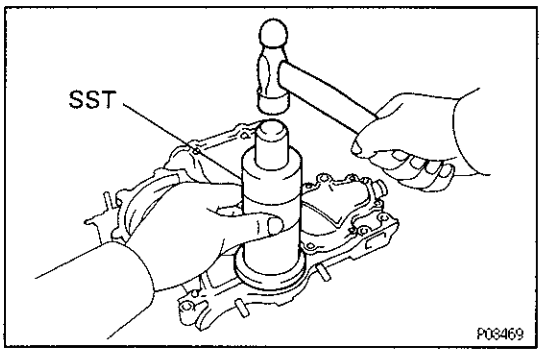
HINT: There are two methods (A and B) to replace the oil seal which are as follows:



1. REPLACE CRANKSHAFT FRONT OIL SEAL

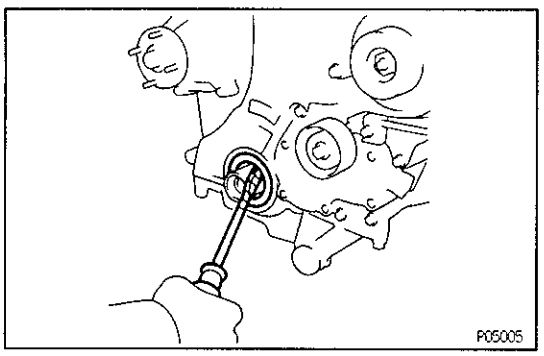
A. If timing chain cover is removed from cylinder block:

(a) Using a screwdriver and a hammer, tap out the oil seal.



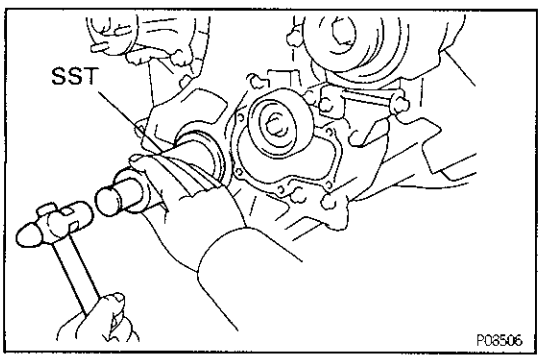
(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.
SST 09316–60010 (09316–00010, 09316–00050)

(c) Apply MP grease to the oil seal lip.



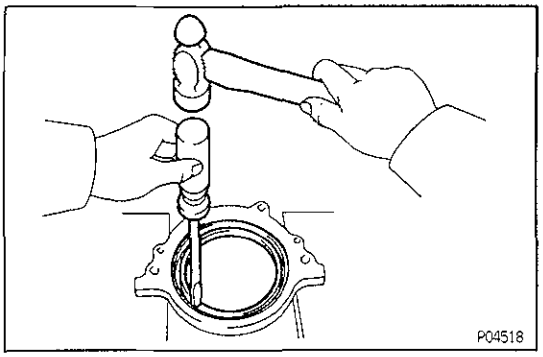
B. If timinh chain cover is installed to the cylinder block:

(a) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(b) Apply MP grease to a new oil seal lip.

(c) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge.
SST 09316–60010 (09316–00010, 09316–00050)

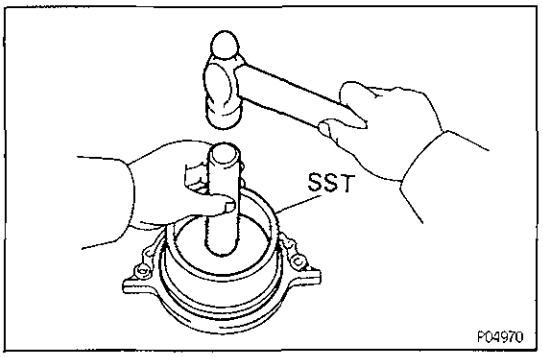


EG

2. REPLACE CRANKSHAFT REAR OIL SEAL

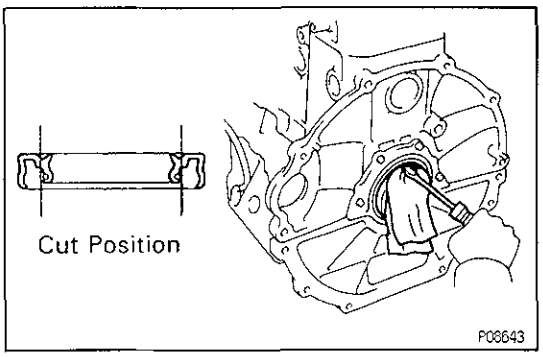
A. If rear oil seal retainer is removed from cylinder block:

(a) Using a screwdriver and a hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal edge.
SST 09223–15030, 09608–30012 (09608–04020)

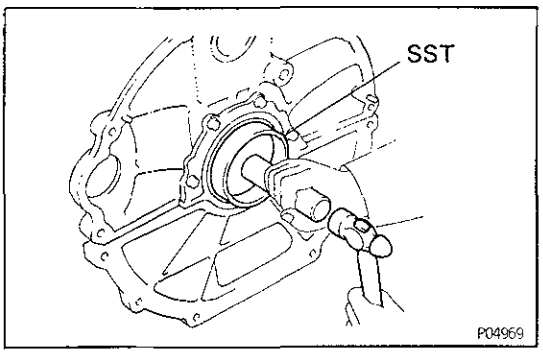
(c) Apply MP grease to the oil seal lip.



B. If rear oil seal retainer is installed to cylinder block:

(a) Using a knife, cut off the oil seal lip.

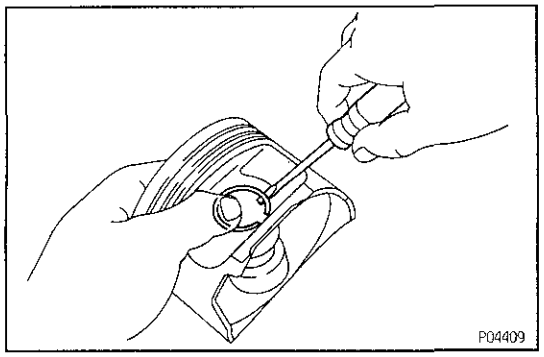
(b) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–15030, 09608–30012 (09608–04020)

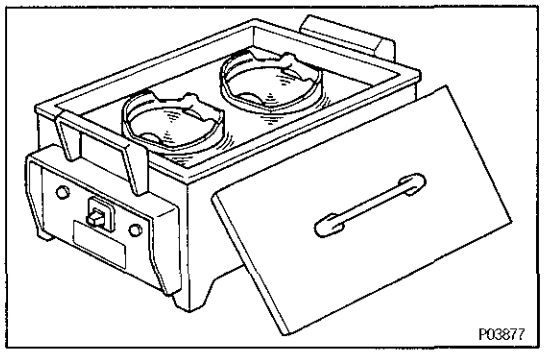
EG0C1-06



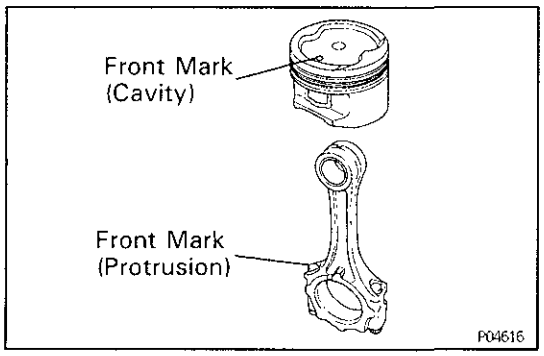
PISTON AND CONNECTING ROD ASSEMBLY

1. ASSEMBLE PISTON AND CONNECTING ROD

(a) Install a new snap ring on one side of the piston pin hole.

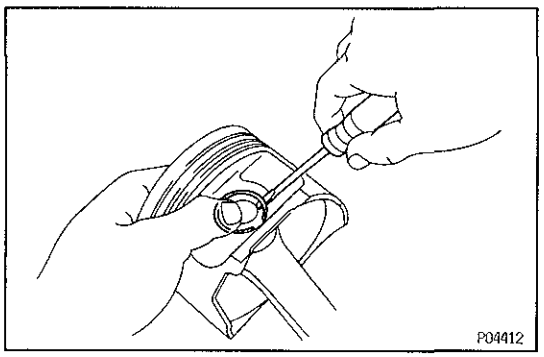


(b) Gradually heat the piston to 80—90°C (176—194°F).

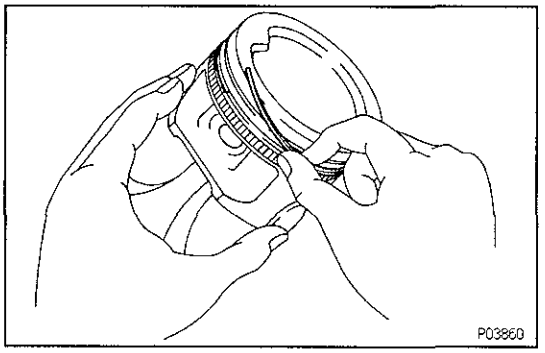


(c) Coat the piston pin with engine oil.

(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.

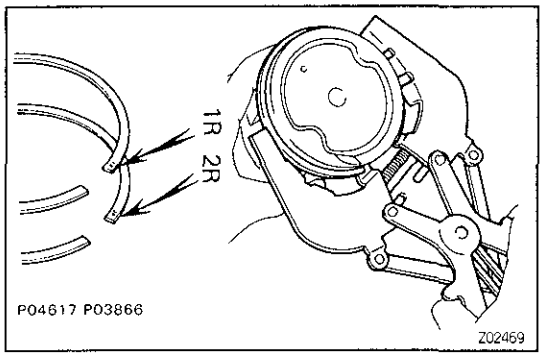


(e) Install a new snap ring on the other side of the piston pin hole.

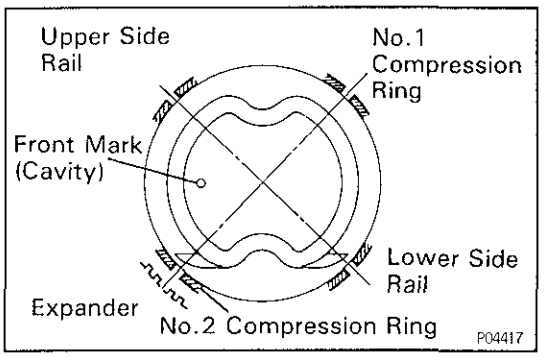


2. INSTALL PISTON RINGS

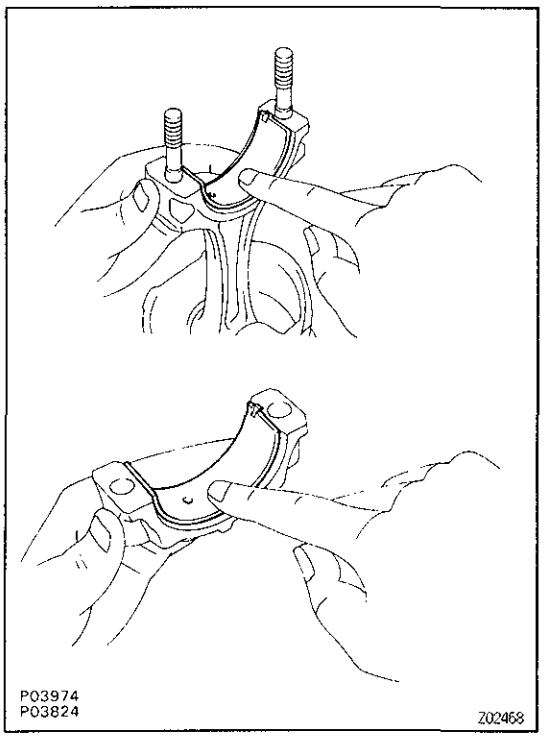
(a) Install the oil ring expander and two side rails by hand.



(b) Using a piston ring expander, install the two compression rings with the code mark facing upward.
Code mark:
No.1
1R
No.2
2R



(c) Position the piston rings so that the ring ends are as shown.
NOTICE: Do not align the ring ends.



3. INSTALL BEARINGS

(a) Align the bearing claw with the groove of the connecting rod or connecting cap.
(b) Install the bearings in the connecting rod and connecting rod cap.

EG0VR-02

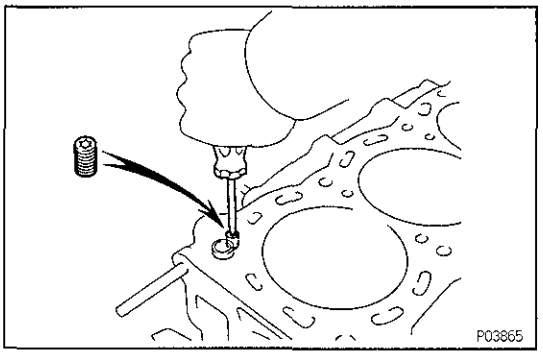
CYLINDER BLOCK ASSEMBLY

(See Components for Disassembly and Assembly)

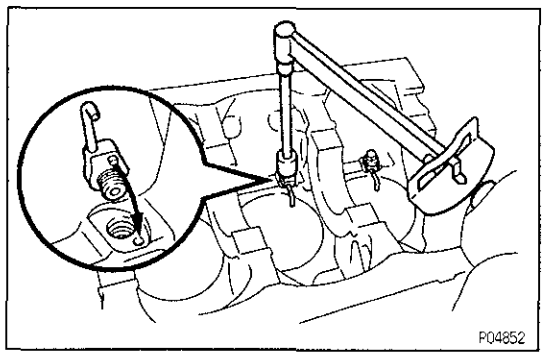
HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O–rings and oil seals with new parts.

EG



1. INSTALL CYLINDER BLOCK ORIFICE

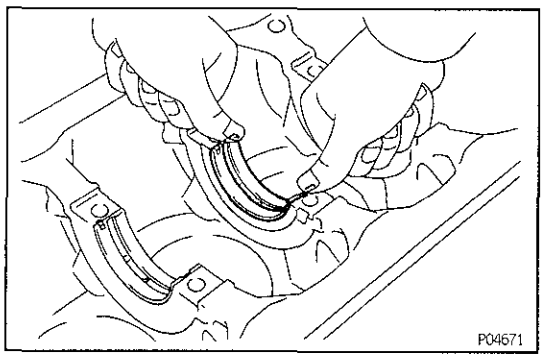


2. INSTALL OIL NOZZLES AND CHECK VALVES

(a) Align the pin of the oil nozzle with the pin hole of the cylinder block.

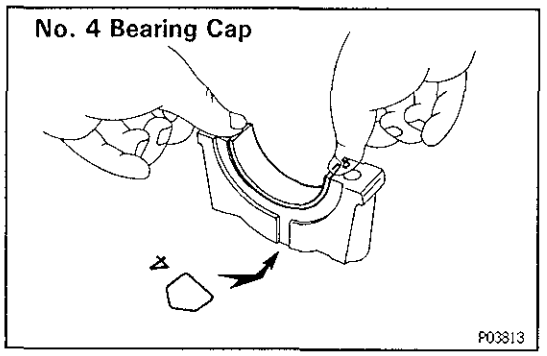
(b) Install the oil nozzle with the check valve. Install the six oil nozzles and check valves.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



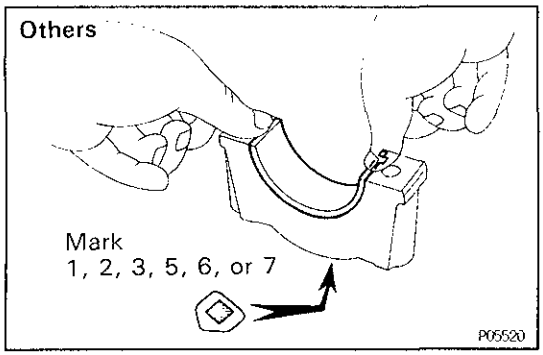
3. INSTALL MAIN BEARINGS

(a) Align the bearing claw with the claw groove of the cylinder block, and push in the seven upper bearings.

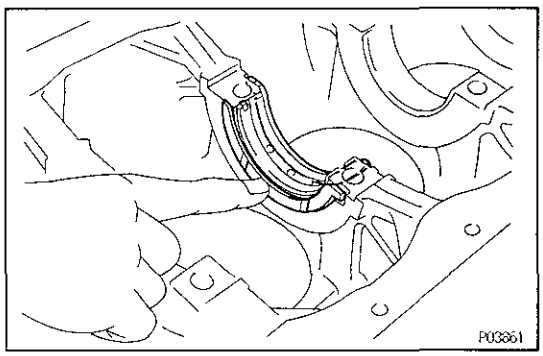


(b) Align the bearing claw with the claw groove of the main bearing cap, and push in the seven lower bearings.

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

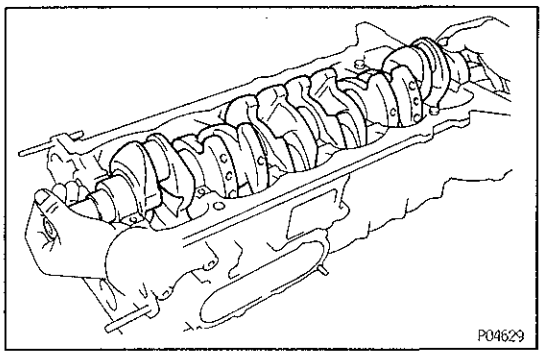


EG

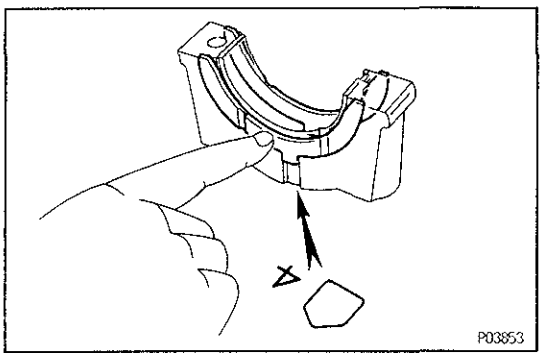


4. INSTALL UPPER THRUST WASHERS

Install the two thrust washers under the No.4 journal position of the cylinder block with the oil grooves facing outward.



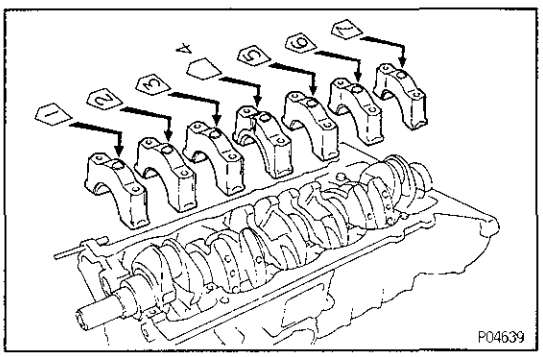
5. PLACE CRANKSHAFT ON CYLINDER BLOCK



6. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

A. Place main bearing cap and lower thrust washers on cylinder block

(a) Install the two thrust washers on the No.4 bearing cap with the grooves facing outward.



(b) Install the seven main bearing caps in their proper locations.

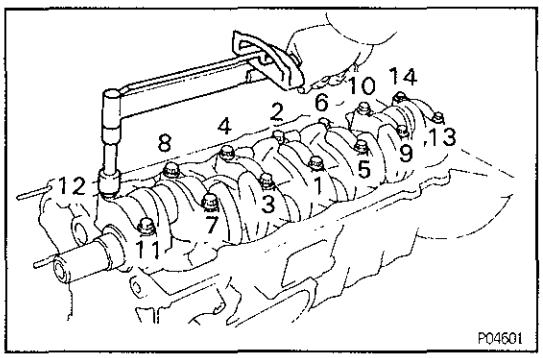
HINT: Each bearing cap has a number and front mark.

B. Install main bearing cap bolts

HINT:

- The main bearing cap bolts are tightened in two progressive steps (steps (b) and (d)).
- If any one of the main bearing cap bolts is broken or deformed, replace it.

EG

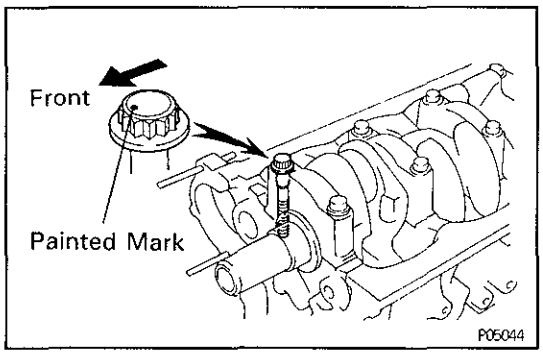


(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.

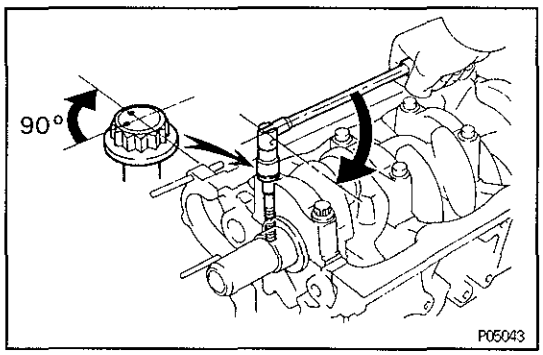
(b) Install and uniformly tighten the 14 bolts of the main bearing caps in several passes, in the sequence shown.

Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)

If any one of the main bearing cap bolts does not meet the torque specification, replace the main bearing cap bolt.



(c) Mark the front of the main bearing cap bolt with paint.

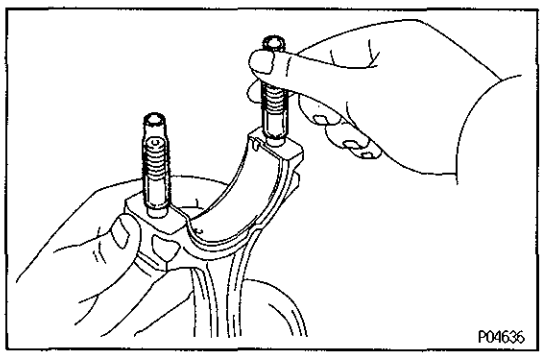


(d) Retighten the main bearing cap bolts 90° in the numerical order shown above.

(e) Check that the painted mark is now at a 90° angle to the front.

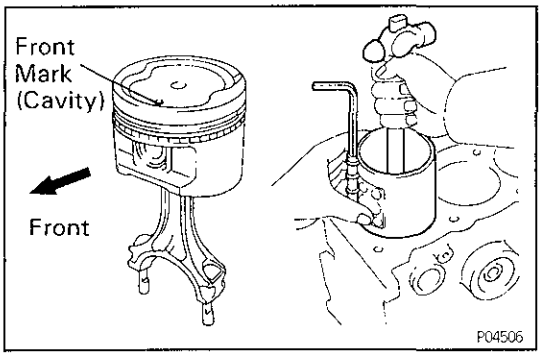
(f) Check that the crankshaft turns smoothly.

(g) Check the crankshaft thrust clearance.
(See step 5 on page EG−141)

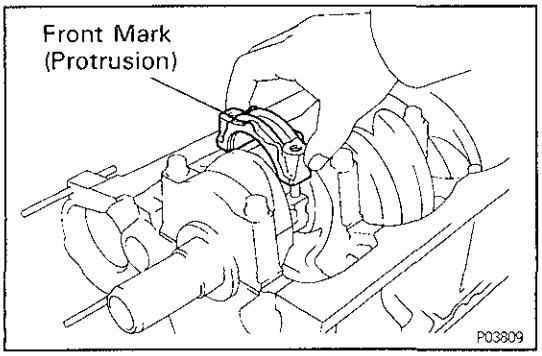


7. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



8. INSTALL CONNECTING ROD CAPS

A. Place connecting rod cap on connecting rod

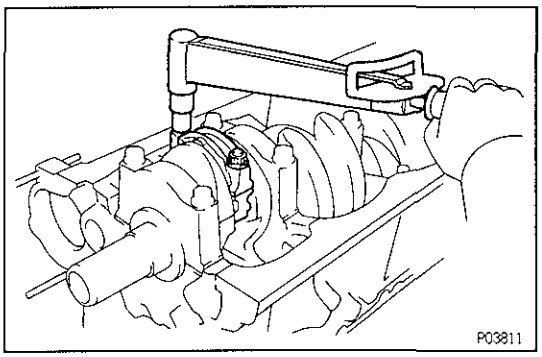
(a) Match the numbered connecting rod cap with the connecting rod.

(b) Install the connecting rod cap with the front mark facing forward.

B. Install connecting rod cap nuts

HINT:

- The connecting rod cap nuts are tightened in two progressive steps (steps (b) and (d)).
- If any connecting rod bolt is broken or deformed, replace it.

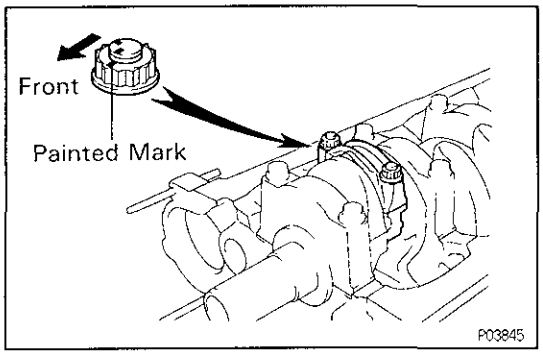


(a) Apply a light of engine oil on the threads and under the nuts of the connecting rod cap.

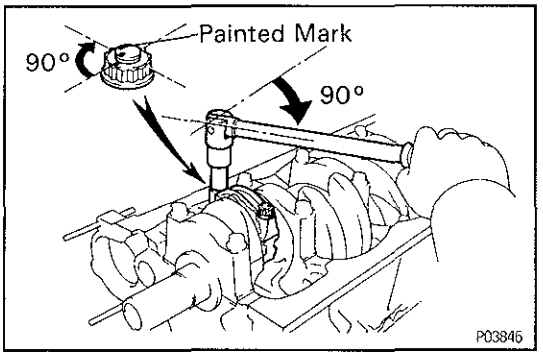
(b) Install and alternately tighten the nuts of the connecting rod cap in several passes.

Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)

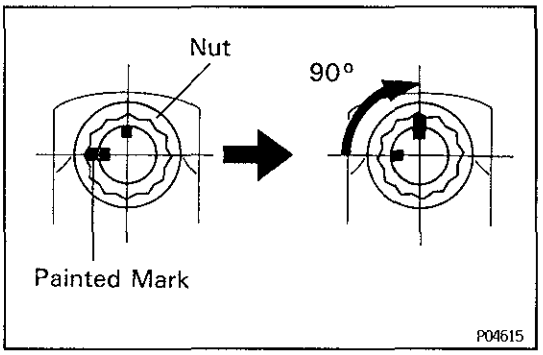
If any one of the connecting rod cap nuts does not meet the torque specification, replace the connecting rod bolt and cap nut as a set.



(c) Mark the front of the connecting rod cap nut and bolt with paint.



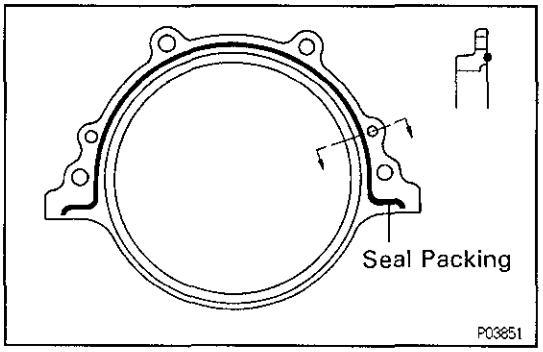
(d) Retighten the connecting rod cap nuts 90° as shown.



(e) Check that the painted mark on the nut is at 90° angle in relation to the mark on the bolt.
(f) Check that the crankshaft turns smoothly.
(g) Check the connecting rod thrust clearance.
(See step 2 on page EG—138)

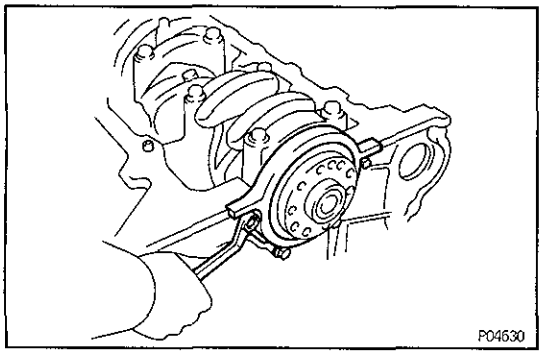
9. INSTALL REAR OIL SEAL RETAINER

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the retainer and cylinder block.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non—residue solvent, clean both sealing surfaces.



(b) Apply seal packing to the retainer as shown in the illustration.
Seal packing:
Part No. 08826—00080 or equivalent
- Install a nozzle that has been cut to a 2 — 3 mm (0.08 — 0.12 in.) opening.

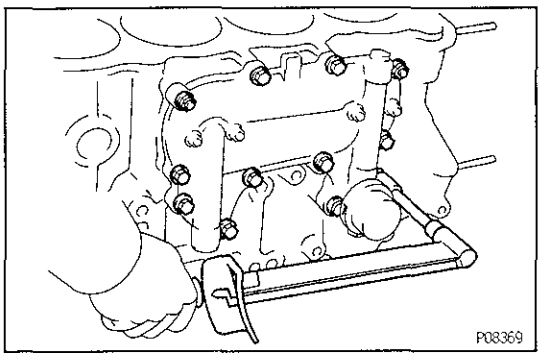
HINT: Avoid applying an excessive amount to the surface.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



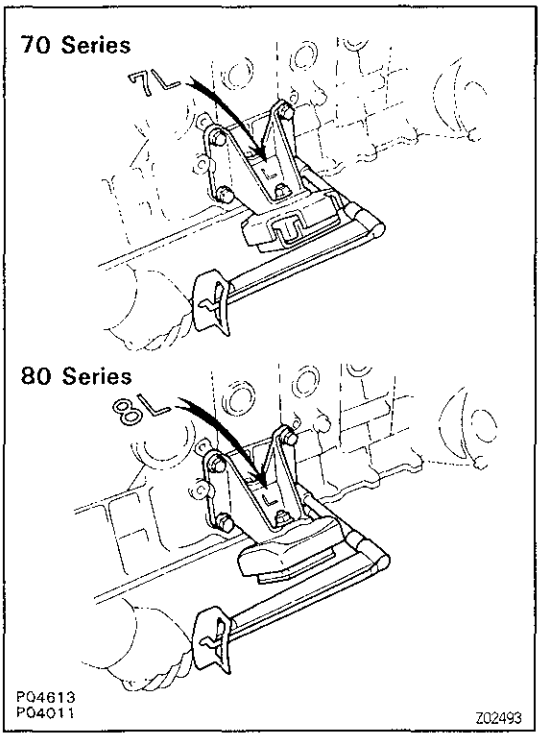
(c) Install the retainer with the four bolts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

EG1K7-02

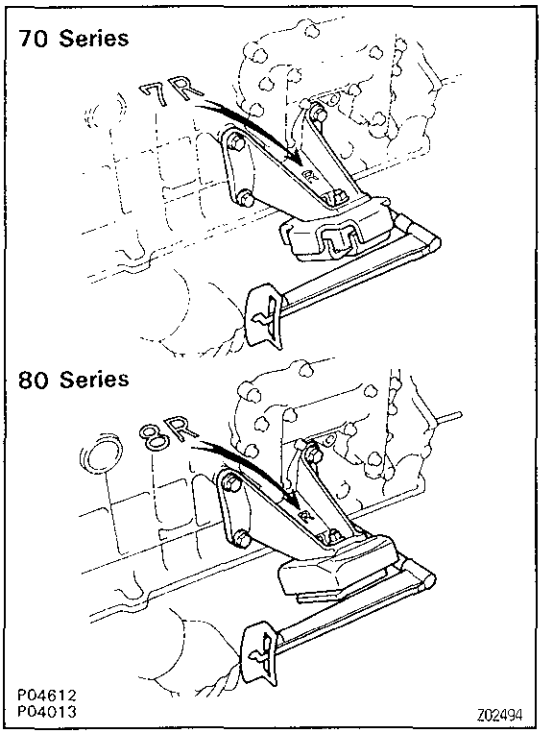
POST ASSEMBLY



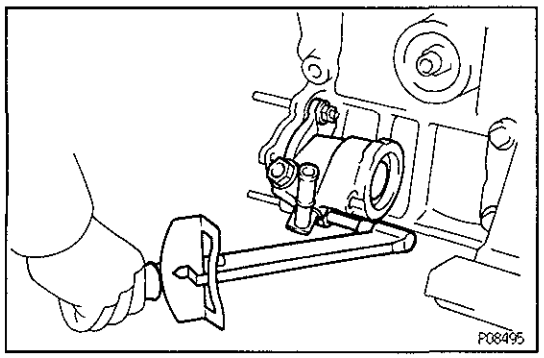
1. **INSTALL OIL COOLER COVER AND OIL COOLER**
Install a new gasket, oil cooler cover and oil cooler with the ten bolts and two nuts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)



2. **INSTALL LH ENGINE MOUNTING BRACKET**
(a) Install the bracket with the four bolts.
Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)
(b) Install the insulator with the nut.
Torque: 72 N·m (730 kgf·cm, 43 ft·lbf)



3. **INSTALL RH ENGINE MOUNTING BRACKET**
(a) Install the bracket with the four bolts.
Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)
(b) Install the insulator with the nut.
Torque: 72 N·m (730 kgf·cm, 43 ft·lbf)

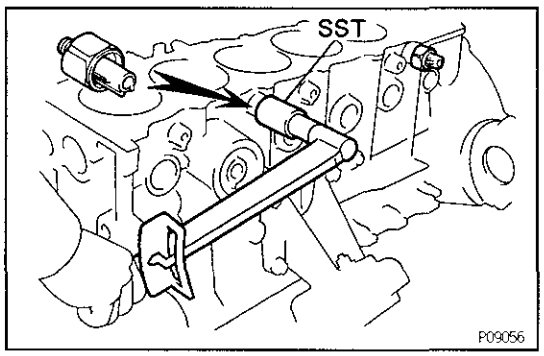


4. INSTALL PS PUMP

(a) Place a new O–ring to the pump.

(b) Install the pump with the two nuts.

Torque: 36 N·m (370 kgf·cm, 27 ft·lbf)

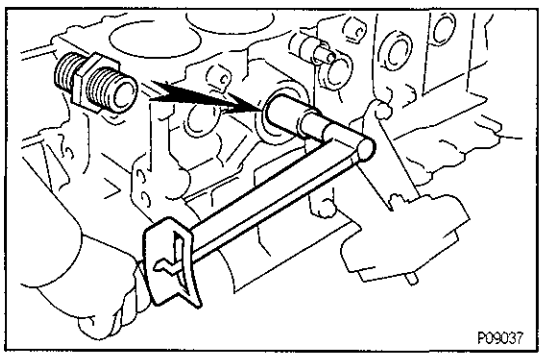


5. INSTALL KNOCK SENSORS

Uing SST, install the two knock sensors.

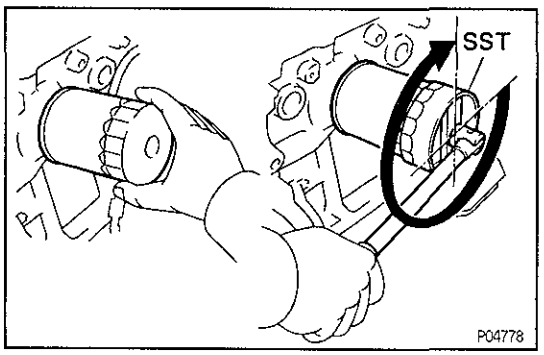
SST 09816–30010

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)



6. INSTALL OIL FILTER UNION

Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)



7. INSTALL OIL FILTER

(a) Lubricate the filter rubber gasket with engine oil.

(b) Tighten filter until the gasket contacts seat of the filter mounting. Then using SST, give it an additional 3/4 turn to seat the filter.

SST 09228–44011

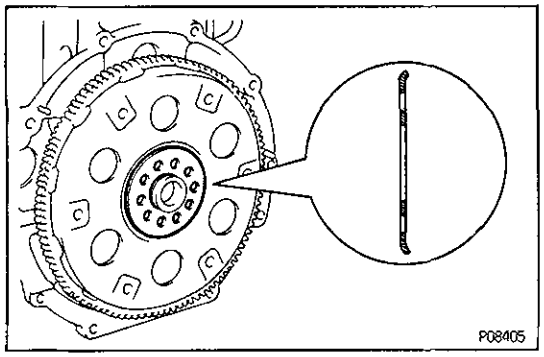
8. INSTALL TIMING CHAIN

(See page EG–128)

9. INSTALL CYLINDER HEAD

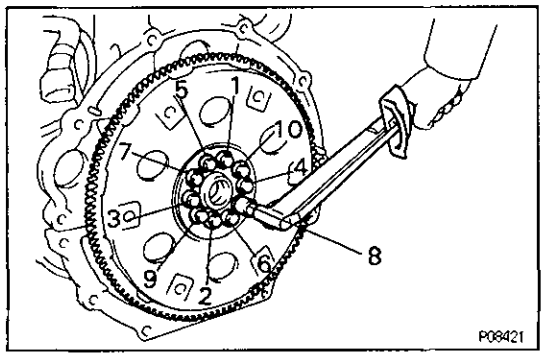
(See page EG–70 or 106)

10. REMOVE ENGINE STAND

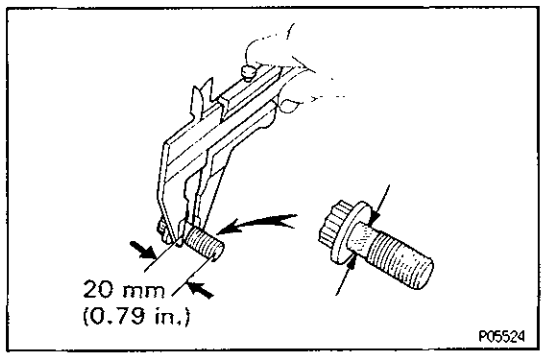


11. INSTALL DRIVE PLATE (A/T)

(a) Install the front spacer, drive plate and rear plate on the crankshaft.



(b) Install and uniformly tighten the ten drive plate bolts in several passes, in the sequence shown.
Torque: 100 N·m (1,000 kgf·cm, 74 ft·lbf)



12. INSTALL FLYWHEEL (M/T)

A. Inspect flywheel bolts

Using vernier calipers, measure the outside diameter of the flywheel bolt.

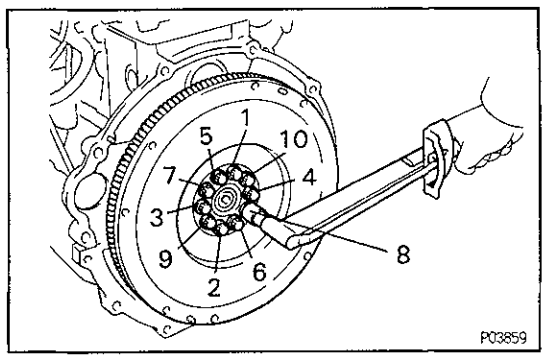
Standard outside diameter:

10.3 – 10.5 mm (0.406 – 0.413 in.)

Minimum outside diameter:

9.5 mm (0.374 in.)

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



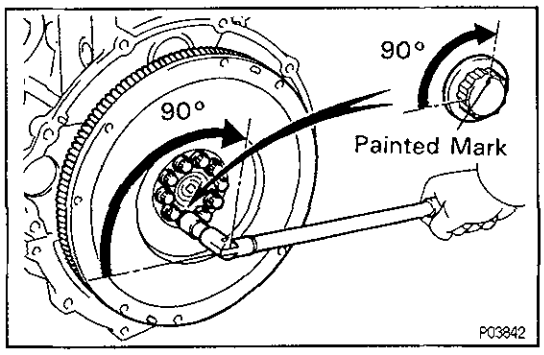
B. Install flywheel bolts

HINT:

- The flywheel bolts are tightened in two progressive steps (steps (b) and (d)).
- If any flywheel bolt is broken of deformed, replace it

(a) Apply a light of engine oil on the threads and under the heads of the flywheel bolts.

(b) Install and uniformly tighten the ten flywheel bolts in several passes, in the sequence shown.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
If any one of the flywheel bolts does not meet the torque specification, replace the flywheel bolt.



(c) Mark the flywheel bolt with paint.

(d) Retighten the flywheel bolts 90° in the numerical order shown above.

(e) Check that the painted mark is now at a 90° angle to (c).