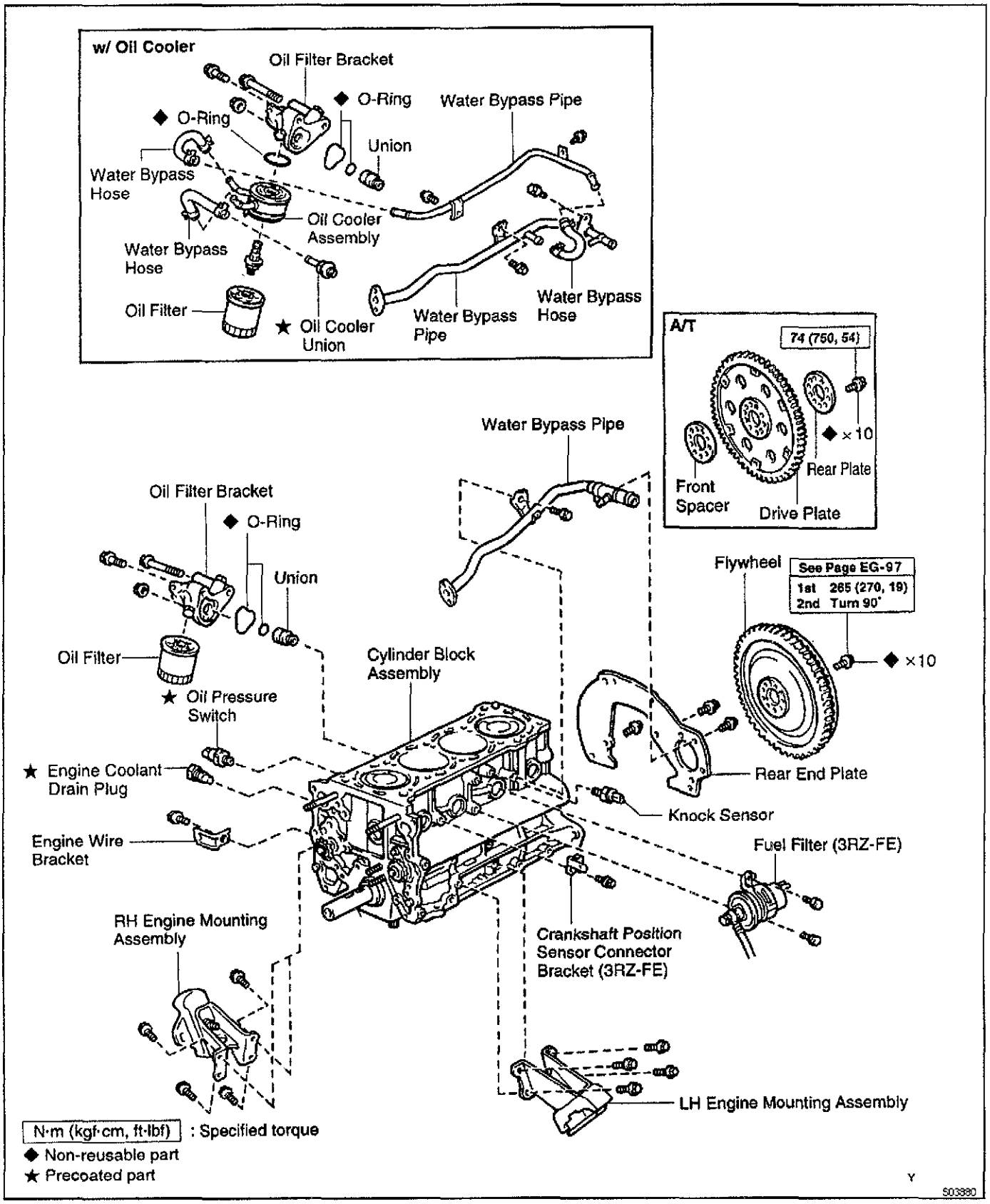
CYLINDER BLOCK

COMPONENTS FOR PREPARATION AND AFTER ASSEMBLY

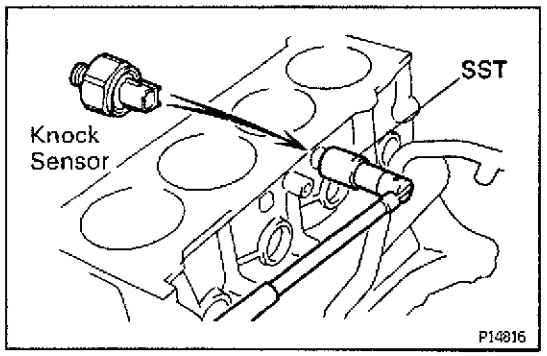
EG1K6-08



EGSMT-03

PREPARATION FOR DISASSEMBLY

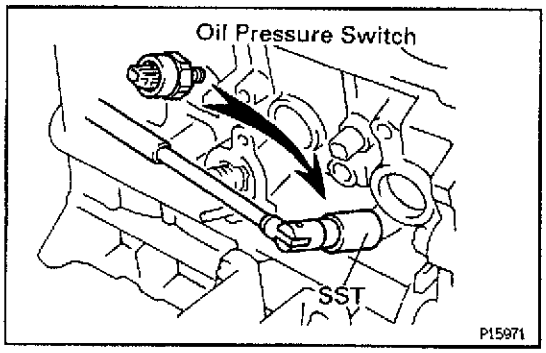
1. **M/T:**
   REMOVE FLYWHEEL
   Remove the 10 bolts and flywheel.
   A/T:
   REMOVE DRIVE PLATE
   Remove the 10 bolts, front spacer, drive plate and rear plate.
2. **REMOVE REAR END PLATE**
   Remove the 3 bolts and rear end plate.
3. **INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**
4. **REMOVE CYLINDER HEAD**
   (See cylinder head removal)
5. **REMOVE TIMING CHAINS, GEARS AND SPROCKET**
   (See timing chain removal)
6. **3RZ—FE:**
   REMOVE FUEL FILTER



7. **3RZ—FE:**
   REMOVE KNOCK SENSOR
   Using SST, remove the knock sensor.
   SST 09816—30010
8. **REMOVE WATER BYPASS PIPE**
   Remove the bolt and water bypass pipe.
9. **REMOVE OIL FILTER**
   (See oil and filter replacement in Lubrication System)
10. **3RZ—F:**
    REMOVE OIL COOLER
    (See oil cooler removal in Lubrication System)
11. **REMOVE OIL FILTER BRACKET**

(a) Remove the 2 bolts, nut, oil filter bracket and O—ring.
(b) Using a 14 mm hexagon wrench, remove the union and O—ring.

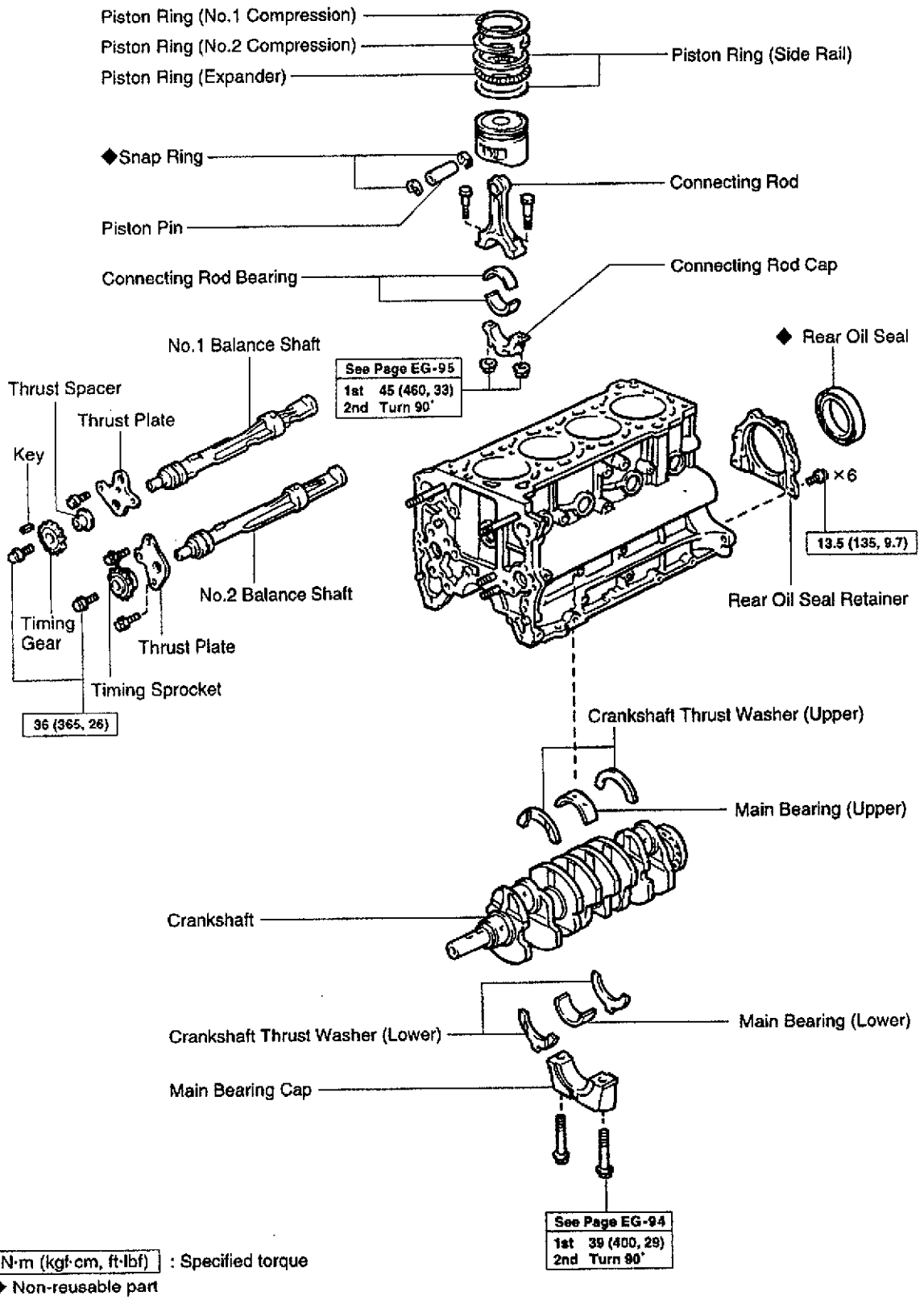
12. **REMOVE ENGINE COOLANT DRAIN PLUG**



13. **REMOVE OIL PRESSURE SWITCH**
    Using SST, remove the oil pressure switch.
    SST 09816—30010
14. **REMOVE RH AND LH ENGINE MOUNTING ASSEMBLIES**
    Remove the 4 bolts and mounting assembly.
15. **3RZ—FE:**
    REMOVE CRANKSHAFT POSITION SENSOR CONNECTOR BRACKET

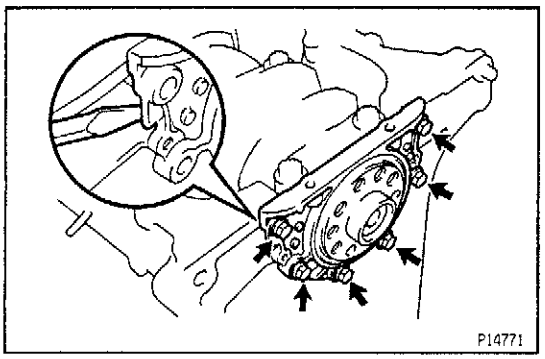
EG6MU-03

COMPONENTS FOR CYLINDER BLOCK DISASSEMBLY AND ASSEMBLY



EGBMV-03

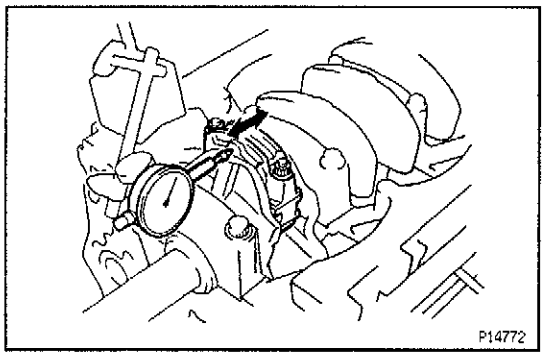
CYLINDER BLOCK DISASSEMBLY



1. REMOVE REAR OIL SEAL RETAINER

(a) Remove the 6 bolts.

(b) Using a screwdriver, remove the oil seal retainer by prying the portions between the oil seal retainer and cylinder block.



2. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

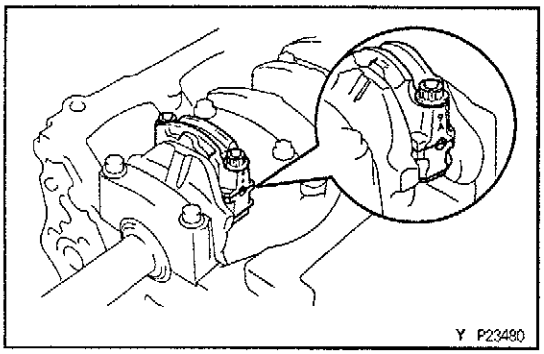
Standard thrust clearance:

0.160 — 0.312 mm (0.0063 — 0.0123 in.)

Maximum thrust clearance:

0.35 mm (0.0138 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.



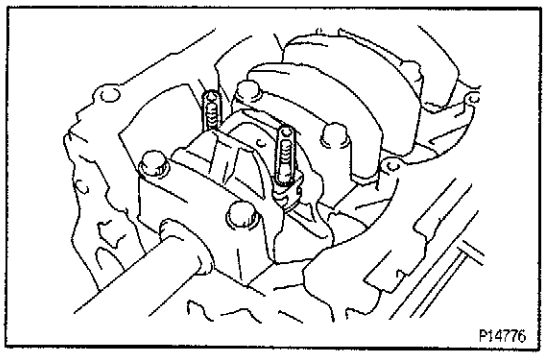
3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Check the matchmarks on the connecting rod and cap are aligned 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.

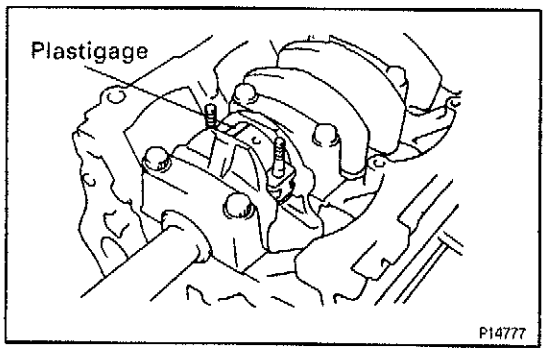


(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.

(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 2 nuts.

(See step 9 in cylinder block assembly)

Torque:

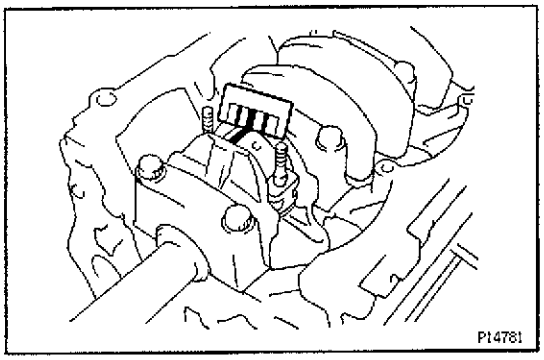
1st 45 N·m (460 kgf·cm, 33 ft·lbf)

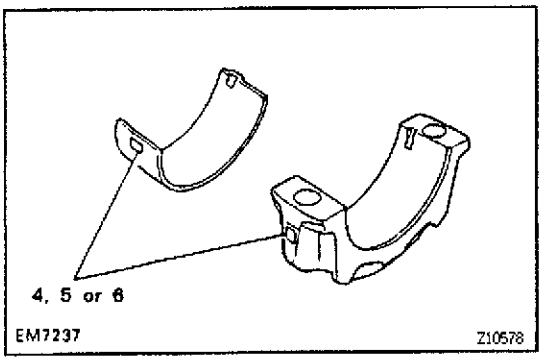
2nd Turn 90°

NOTICE: Do not turn the crankshaft.

(i) Remove the 2 nuts and connecting rod cap.

(See procedure (b) and (c) above)





(j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD

0.030 — 0.055 mm (0.0012 — 0.0022 in.)

U/S 0.25

0.031 — 0.071 mm (0.0012 — 0.0026 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 as marked on the bearing cap. There are 3 sizes of standard bearings, marked "4", "5" and "6" accordingly.

Reference:

Connecting rod big end inside diameter:

STD Mark "4"	56.000 — 56.006 mm (2.2047 — 2.2050 in.)
STD Mark "5"	56.006 — 56.012 mm (2.2050 — 2.2052 in.)
STD Mark "6"	56.012 — 56.018 mm (2.2052 — 2.2054 in.)
U/S 0.25	56.000 — 56.018 mm (2.2047 — 2.2054 in.)

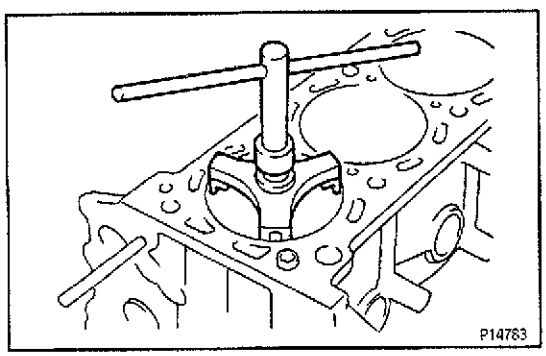
Crankshaft crank pin diameter:

STD	52.987 — 53.000 mm (2.0861 — 2.0866 in.)
U/S 0.25	52.745 — 52.755 mm (2.0766 — 2.0770 in.)

Standard sized bearing center wall thickness:

STD Mark "4"	1.482 — 1.485 mm (0.0583 — 0.0585 in.)
STD Mark "5"	1.485 — 1.488 mm (0.0585 — 0.0586 in.)
STD Mark "6"	1.488 — 1.491 mm (0.0586 — 0.0587 in.)
U/S 0.25	1.601 — 1.607 mm (0.0630 — 0.0633 in.)

(k) Completely remove the Plastigage.



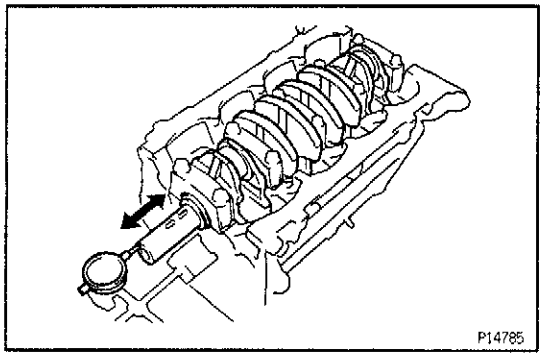
4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

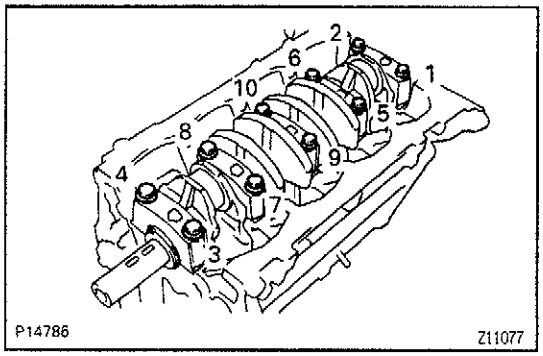
(a) Using a ridge reamer, remove the all carbon from the top of the cylinder.

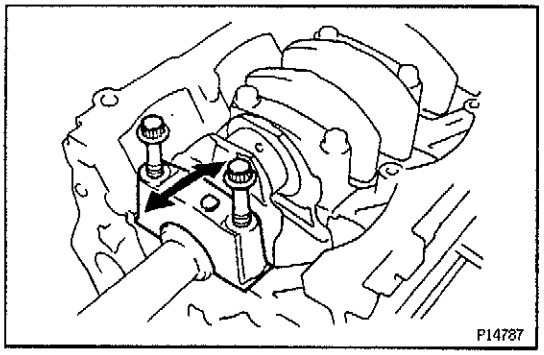
(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

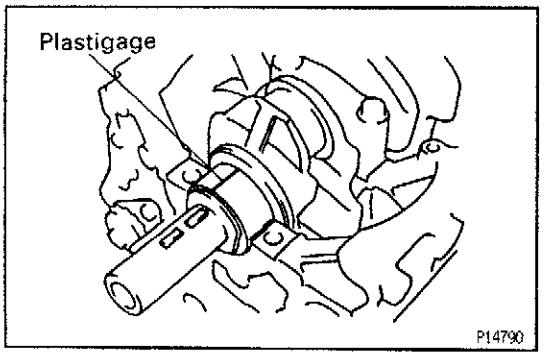
HINT:

- 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.)

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

Thrust washer thickness:

2.440 – 2.490 mm (0.0961 – 0.0980 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 (No.3 main bearing cap only) lower thrust washers.

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 bearings 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 7 in cylinder block assembly)

Torque:

1st 39 N·m (400 kgf·cm, 29 ft·lbf)

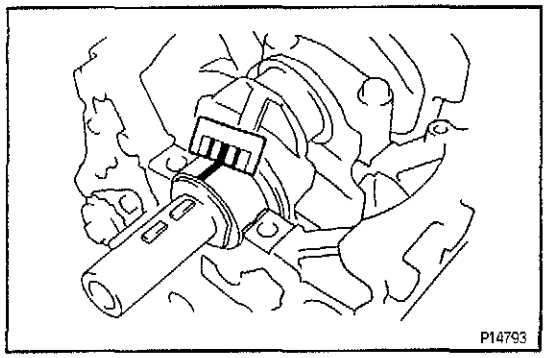
2nd Turn 90°

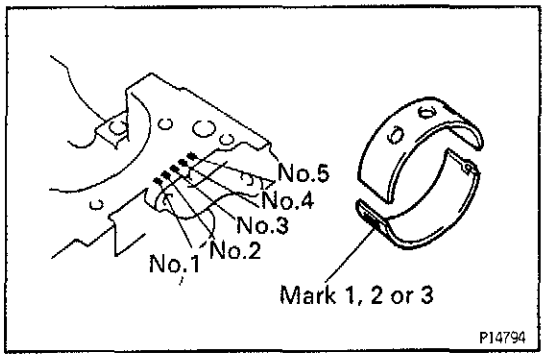
NOTICE: Do not turn the crankshaft.

(i) Remove the main bearing caps.

(See procedure (a) and (b) above)

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(j) Measure the Plastigage at its widest point.

Standard clearance:

STD

No.3

0.030 — 0.055 mm (0.0012 — 0.0022 in.)

Others

0.024 — 0.049 mm (0.0009 — 0.0019 in.)

U/S 0.25

No.3

0.030 — 0.070 mm (0.0012 — 0.0028 in.)

Others

0.025 — 0.065 mm (0.0010 — 0.0026 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.

HINT: If using a standard bearing, replace with one having the same number as marked on the block. There are 3 sizes of standard bearings, marked "1", "2" and "3" accordingly.

Reference:

Cylinder block main journal bore diameter:

STD Mark "1"	64.004 — 64.010 mm (2.5198 — 2.5201 in.)
STD Mark "2"	64.011 — 64.016 mm (2.5201 — 2.5203 in.)
STD Mark "3"	64.017 — 64.022 mm (2.5203 — 2.5205 in.)
U/S 0.25	64.000 — 64.024 mm (2.5197 — 2.5206 in.)

Crankshaft Journal diameter:

STD No.3	59.981 — 59.994 mm (2.2615 — 2.3620 in.)
STD Others	59.987 — 60.000 mm (2.3617 — 2.3622 in.)
U/S 0.25 No.3	59.740 — 59.750 mm (2.3520 — 2.3524 in.)
U/S 0.25 Others	59.745 — 59.755 mm (2.3522 — 2.3526 in.)

Bearing center wall thickness:

STD Mark "1"	1.987 — 1.990 mm (0.0782 — 0.0783 in.)
STD Mark "2"	1.991 — 1.993 mm (0.0784 — 0.0785 in.)
STD Mark "3"	1.994 — 1.996 mm (0.0785 — 0.0786 in.)
U/S 0.25	2.106 — 2.112 mm (0.0829 — 0.0831 in.)

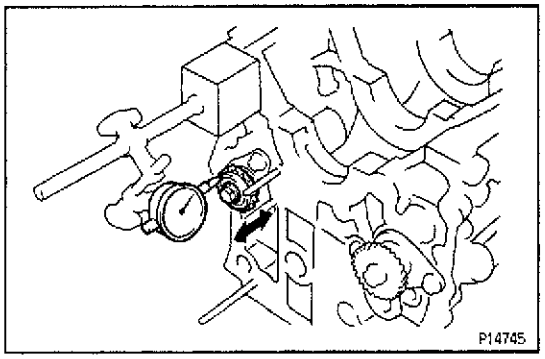
(k) Completely remove the Plastigage.

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.



Balance Shaft

8. CHECK THRUST CLEARANCES OF NO.1 (RH) AND NO.2 (LH) BALANCE SHAFTS

Using a dial indicator, measure the thrust clearance while moving the balance shaft back and forth.

Standard thrust clearance:

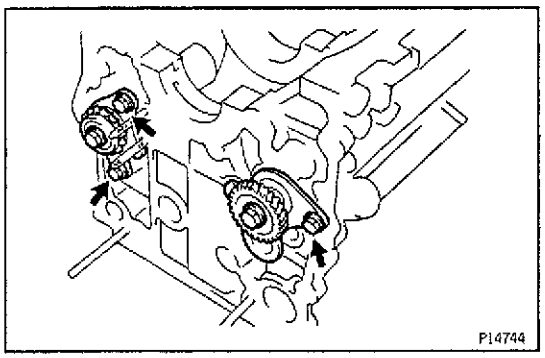
0.07 – 0.13 mm (0.0027 – 0.0051 in.)

Maximum thrust clearance:

0.20 mm (0.0079 in.)

If the thrust clearance is greater than maximum, replace the balance shaft thrust washer.

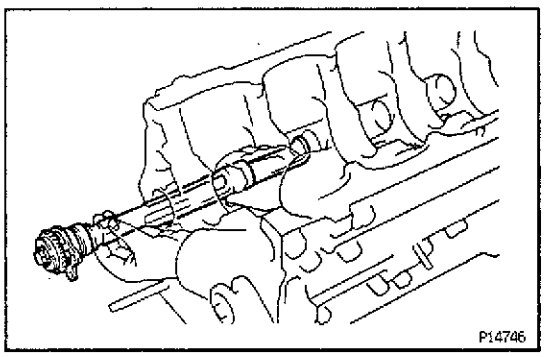
If necessary, replace the balance shaft.



9. REMOVE NO.1 (RH) AND NO.2 (LH) BALANCE SHAFTS

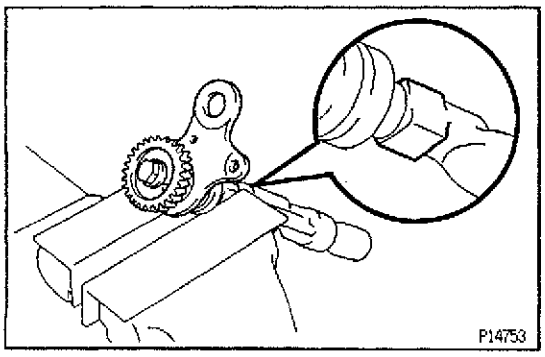
(a) Remove the 1 bolt from the No.1 balance shaft.

(b) Remove the 2 bolts from the No.2 balance shaft.



(c) Remove the balance shafts.

NOTICE: When removing the balance shaft make sure you support the balance shaft with both hands and avoid scratching the balance shaft bearing on the cylinder block side.



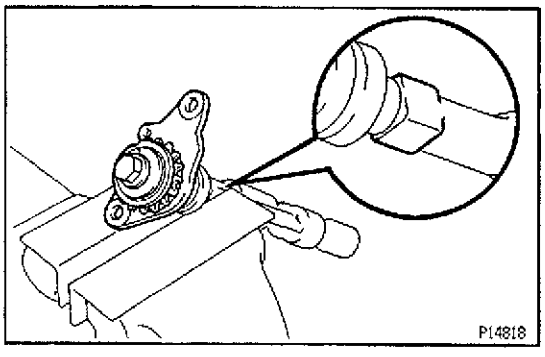
10. DISASSEMBLE NO.1 (RH) BALANCE SHAFT

(a) Mount the hexagon wrench head portion of the balance shaft in a vise.

NOTICE: Be careful not to damage the balance shaft.

(b) Remove these parts:

- Bolt
- No.1 balance shaft thrust plate
- Balance shaft thrust spacer
- Balance shaft timing gear
- Key



11. DISASSEMBLE NO.2 (LH) BALANCE SHAFT

(a) Mount the hexagon wrench head portion of the balance shaft in a vise.

NOTICE: Be careful not to damage the balance shaft.

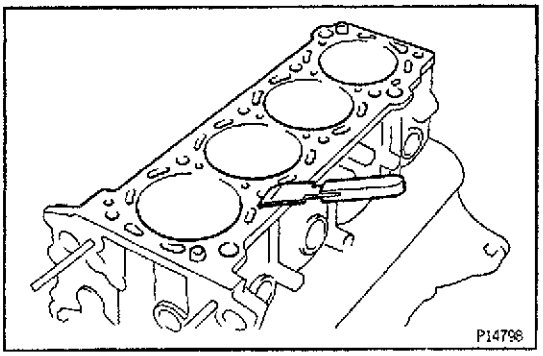
(b) Remove these parts:

- Bolt
- No.2 balance shaft thrust prate
- Balance shaft timing sprocket

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CYLINDER BLOCK INSPECTION



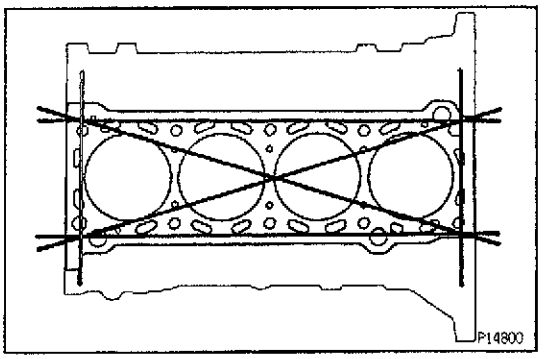
1. CLEAN CYLINDER BLOCK

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.



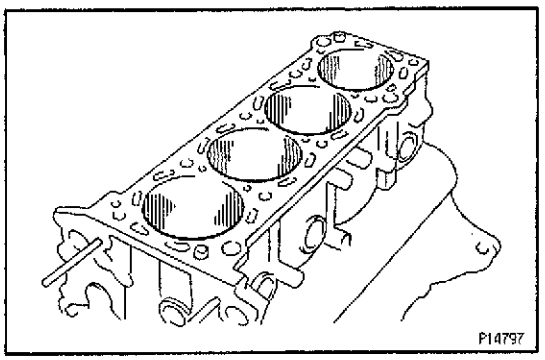
2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

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.)

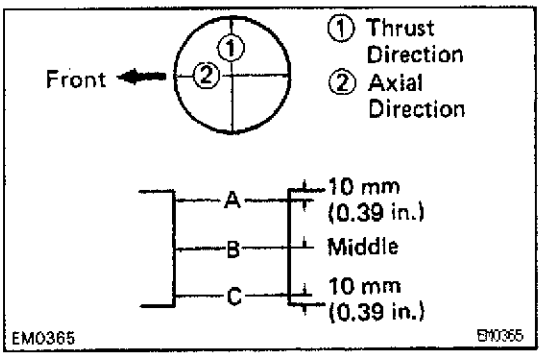
If warpage is greater than maximum, replace the cylinder block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.

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



4. INSPECT CYLINDER BORE DIAMETER

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

Standard diameter:

94.990 — 95.003 mm (3.7400 — 3.7403 in.)

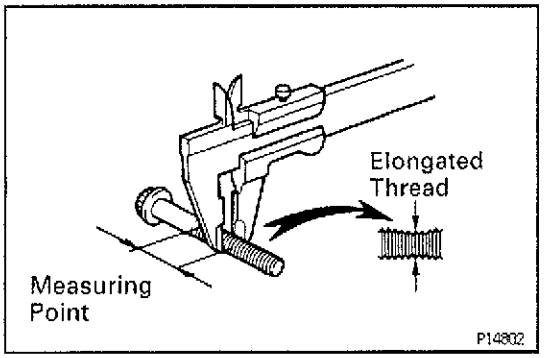
Maximum diameter:

95.06 mm (3.7425 in.)

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

5. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



6. INSPECT MAIN BEARING CAP BOLTS

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

Standard outside diameter:

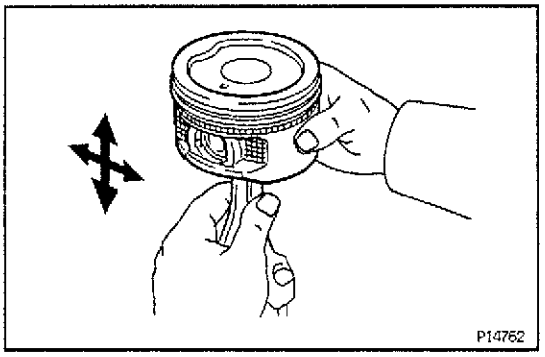
10.76 – 10.97 mm (0.4236 – 0.4319 in.)

Minimum outside diameter:

10.40 mm (0.4094 in.)

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

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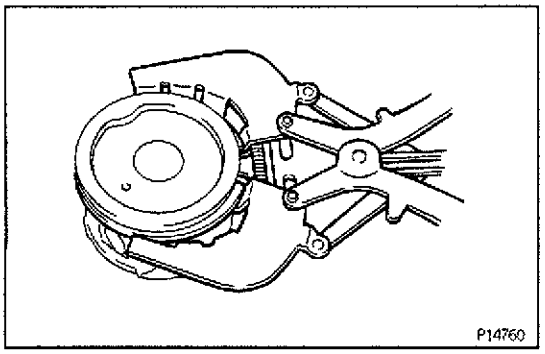
PISTON AND CONNECTING ROD ASSY DISASSEMBLY

EG6MX–04

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.

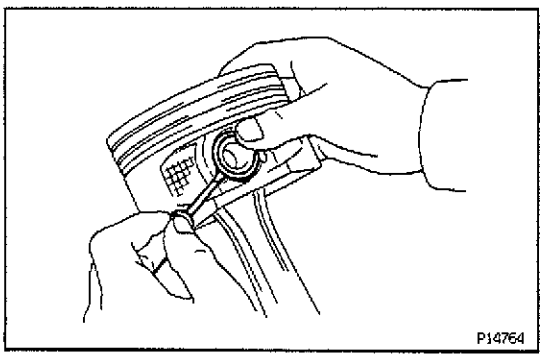


2. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the 2 compression rings.

(b) Remove the 2 side rails and oil ring by hand.

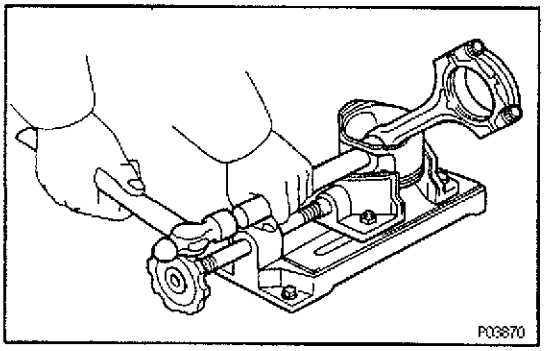
HINT: Arrange the rings in correct order only.



3. DISCONNECT CONNECTING ROD FROM PISTON

(a) Using a small screwdriver, pry out the 2 snap rings.

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

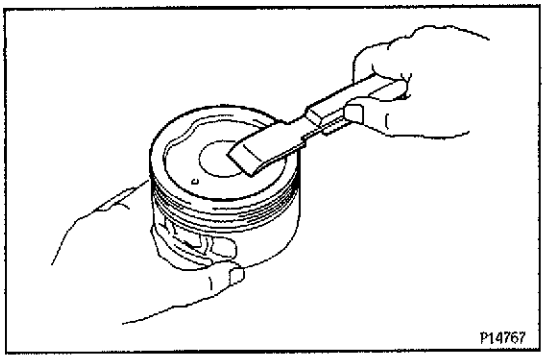


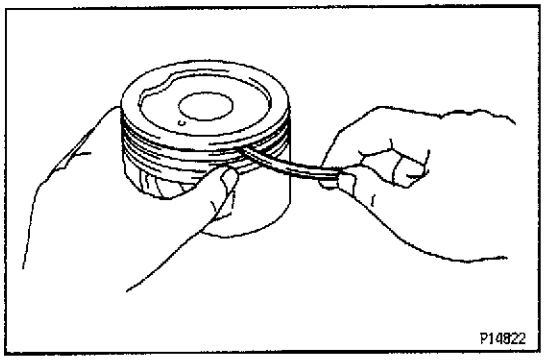
(c) Using plastic–faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

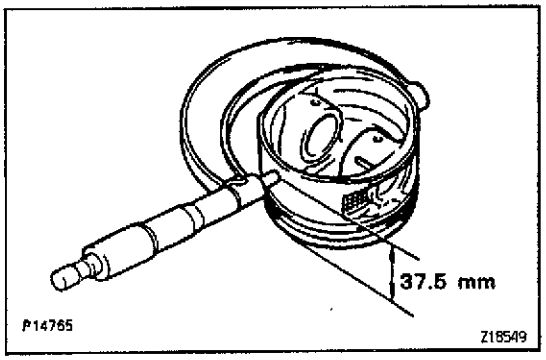
HINT:

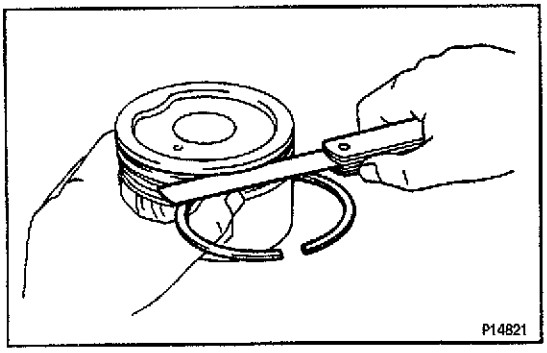
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings correct order.

EG790–03









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

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 37.5 mm (1.47 in.) for the piston head.

Piston diameter:

STD

94.933 – 94.943 mm (3.7375 – 3.7379 in.)

O/S 0.50

95.433 – 95.443 mm (3.7572 – 3.7576 in.)

(b) Measure the cylinder bore diameter in the thrust directions. (See step 4 in cylinder block inspection)

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

Standard oil clearance:

0.047 – 0.070 mm (0.0019 – 0.0028 in.)

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

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

B. Inspect 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:

3RZ–FE:

No.1 0.020 – 0.070 mm (0.0008 – 0.0028 in.)

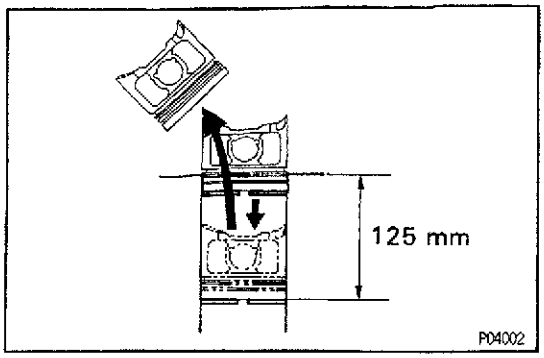
No.2 0.030 – 0.070 mm (0.0012 – 0.0028 in.)

3RZ–F:

No.1 0.030 – 0.080 mm (0.0012 – 0.0031 in.)

No.2 0.040 – 0.080 mm (0.0016 – 0.0031 in.)

If the clearance is not as specified, replace the piston.



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.

Ring end gap:

3RZ–FE:

No.1 0.300 – 0.400 mm (0.0118 – 0.0157 in.)

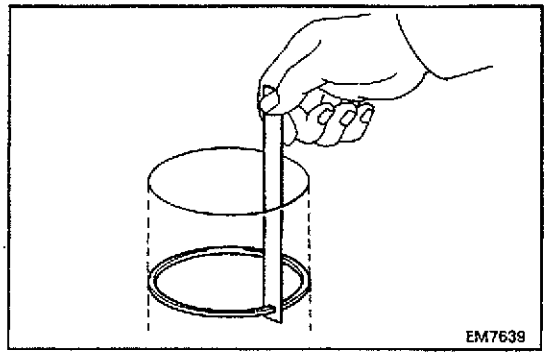
No.2 0.400 – 0.500 mm (0.0157 – 0.0197 in.)

3RZ–F:

No.1 0.300 – 0.430 mm (0.0118 – 0.0169 in.)

No.2 0.450 – 0.600 mm (0.0177 – 0.0236 in.)

If the end gap is not as specified, replace the piston ring. If the end gap is not as specified, even with a new piston ring, rebore all the 4 cylinders or replace the cylinder block.



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

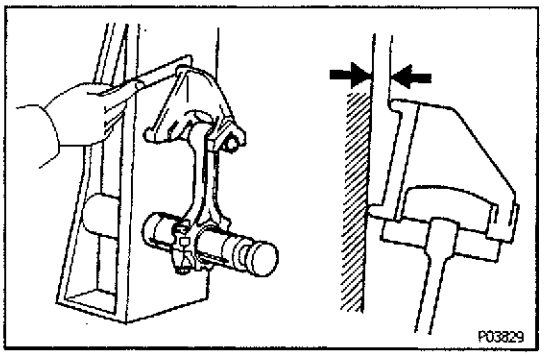
Using a rod aligner and thickness gauge, check the connecting rod alignment.

- Check for out–of–alignment.

Maximum out–of–alignment:

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

If out–of–alignment is greater than maximum, replace the connecting rod assembly.

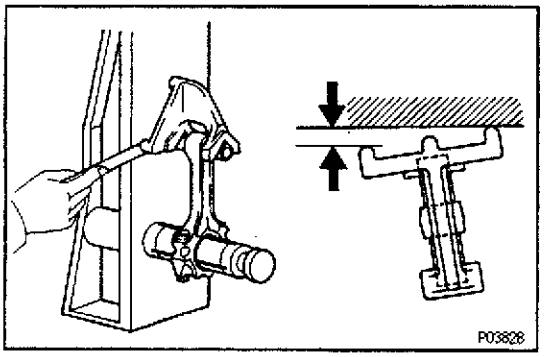


- Check for twist

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.

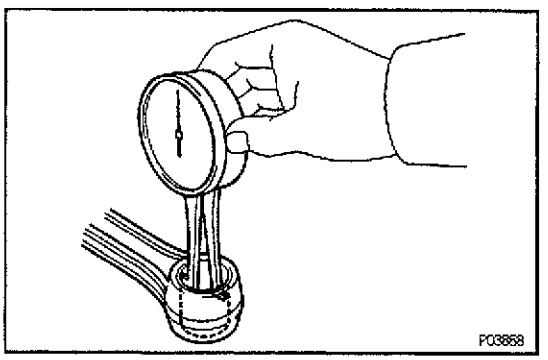


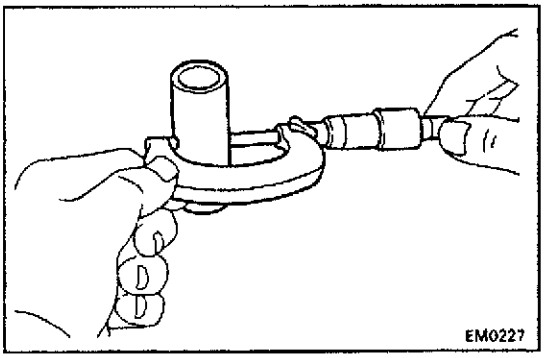
B. Inspect piston pin oil clearance

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

Bushing inside diameter:

24.008 – 24.017 mm (0.9452 – 0.9455 in.)



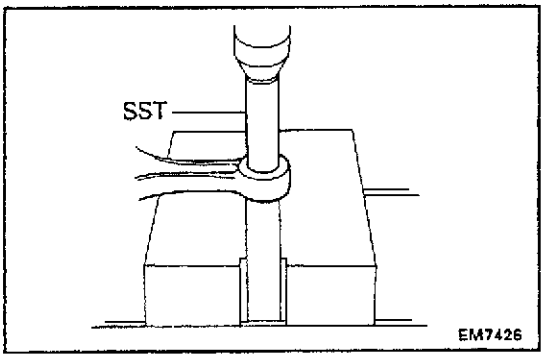


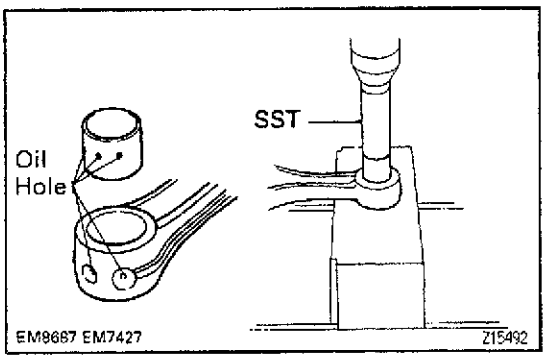
(b) Using a micrometer, measure the piston pin diameter.
Piston pin diameter:
24.000 – 24.009 mm (0.9449 – 0.9452 in.)

(c) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.
Standard oil clearance:
0.005 – 0.011 mm (0.0002 – 0.0004 in.)
Maximum oil clearance:
0.015 mm (0.0006 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

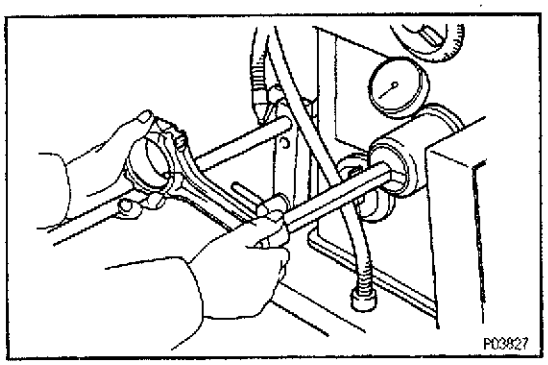
(a) Using SST and a press, press out the bushing.
SST 09207–76010



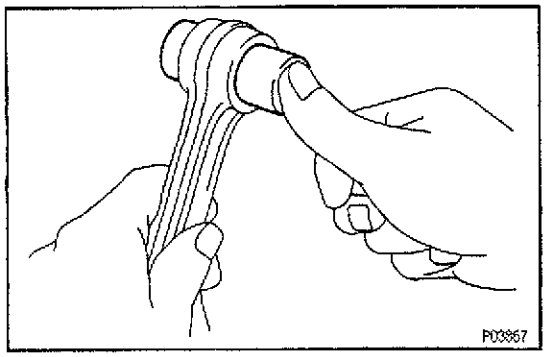


(b) Align the oil holes of a new bushing and the connecting rod.

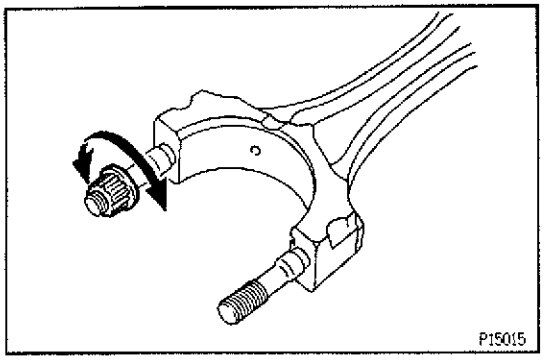
(c) Using SST and a press, press in the bushing.
SST 09207–76010



(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 minimum outside diameter of the connecting rod bolt with vernier calipers.

Standard outside diameter:

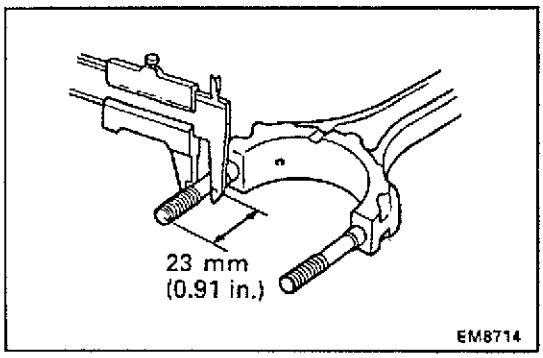
7.80 – 7.90 mm (0.3071 – 0.3110 in.)

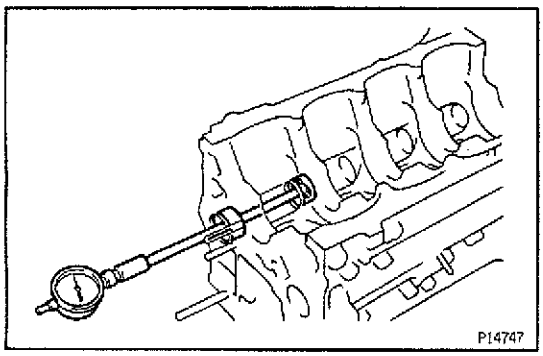
Minimum outside diameter:

7.60 mm (0.2992 in.)

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

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





BALANCE SHAFT INSPECTION

EG35J–07

INSPECT NO.1 (RH) AND NO.2 (LH) BALANCE SHAFTS

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

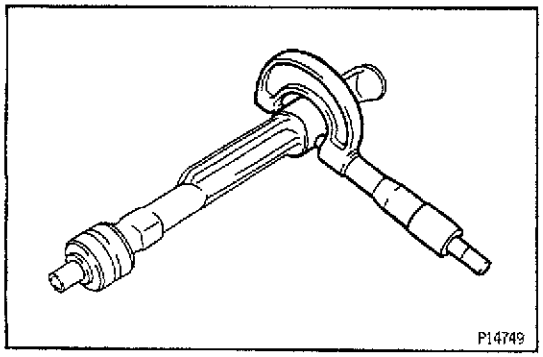
Bearing inside diameter (from front side):

No.1 (RH)

38.025 – 38.045 mm (1.4970 – 1.4978 in.)

No.2 (LH)

37.525 – 37.545 mm (1.4774 – 1.4781 in.)



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

Main journal diameter (from front side):

No.1 (RH)

37.969 – 37.985 mm (1.4948 – 1.4955 in.)

No.2 (LH)

37.449 – 37.465 mm (1.4744 – 1.4750 in.)

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

Standard oil clearance:

No.1 (RH)

0.040 – 0.076 mm (0.0016 – 0.0031 in.)

No.2 (LH)

0.060 – 0.096 mm (0.0024 – 0.0038 in.)

Maximum oil clearance: 0.15 mm (0.0059 in.)

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

CYLINDER BORING

EG64M-03

EG

HINT:

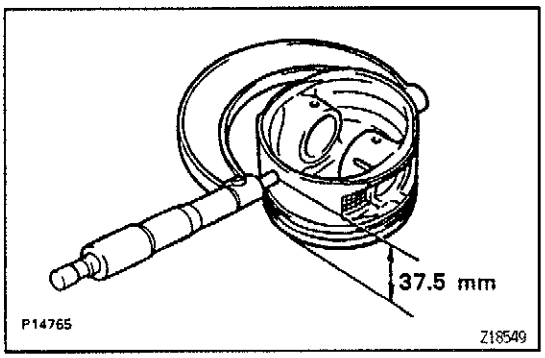
- Bore all the 4 cylinders for the oversized piston outside diameter.
- Replace all the piston rings with ones to match the oversized pistons.

1. SELECT OVERSIZED PISTONS

Oversized piston diameter:

O/S 0.50

95.433 – 95.443 mm (3.7572 – 3.7576 in.)



2. CALCULATE AMOUNT TO BORE CYLINDERS

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 37.5 mm (1.47 in.) for 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

0.047 – 0.070 mm (0.0019 – 0.0028 in.)

H = Allowance for honing

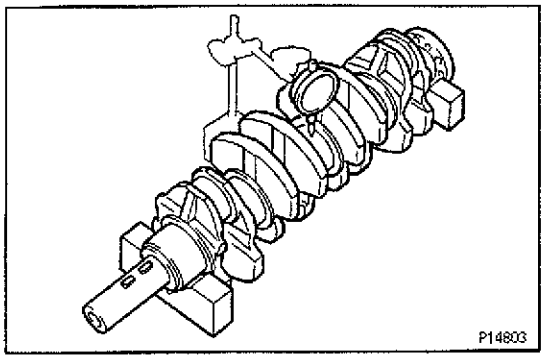
0.020 mm (0.0008 in.) or less

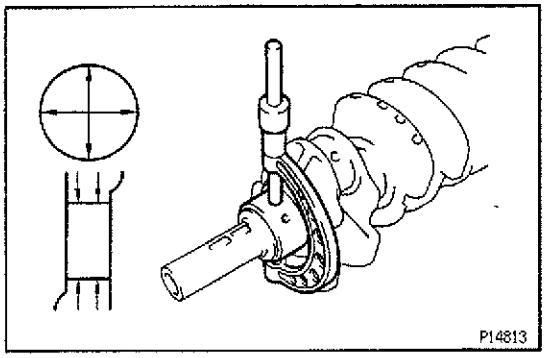
3. BORE AND HONE CYLINDER TO CALCULATED DIMENSIONS

Maximum honing:

0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished roundness.





CRANKSHAFT INSPECTION AND REPAIR EG09Y-20

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:

0.03 mm (0.0012 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

No.3

59.981 – 59.994 mm (2.2615 – 2.3620 in.)

Others

59.987 – 60.000 mm (2.3617 – 2.3622 in.)

U/S 0.25

No.3

59.740 – 59.750 mm (2.3520 – 2.3524 in.)

Others

59.745 – 59.755 mm (2.3522 – 2.3526 in.)

Crank pin diameter:

STD

52.987 – 53.000 mm (2.0861 – 2.0866 in.)

U/S 0.25

52.745 – 52.755 mm (2.0766 – 2.0770 in.)

If the diameter is not as specified, check the oil clearance (See steps 3 and 6 in cylinder block disassembly). 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:

0.005 mm (0.0002 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).

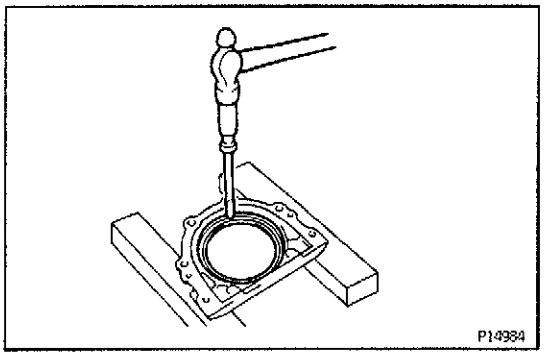
Install new main journal and/or crank pin undersized bearings.

CRANKSHAFT OIL SEALS REPLACEMENT

EG6N0-03

HINT: There are 2 methods (A and B) to replace the oil seal which are as follows:

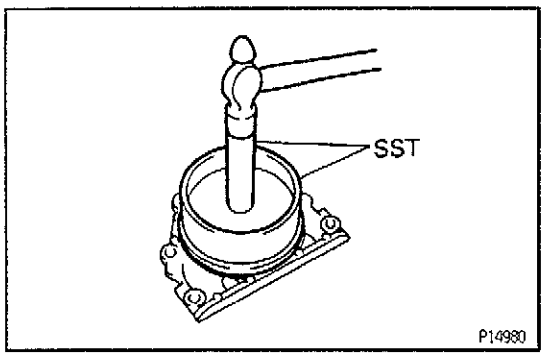
1. **REPLACE CRANKSHAFT FRONT OIL SEAL (See crankshaft front oil seal replacement in Lubrication System)**



2. **REPLACE CRANKSHAFT REAR OIL SEAL**

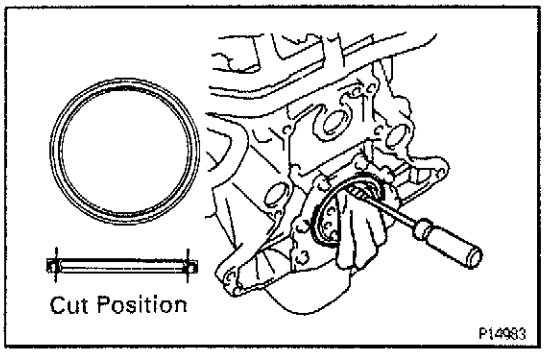
A. If rear oil seal retainer is removed from cylinder block:

(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 oil seal retainer edge.
SST 09223–15030, 09950–70010 (09951–07150)

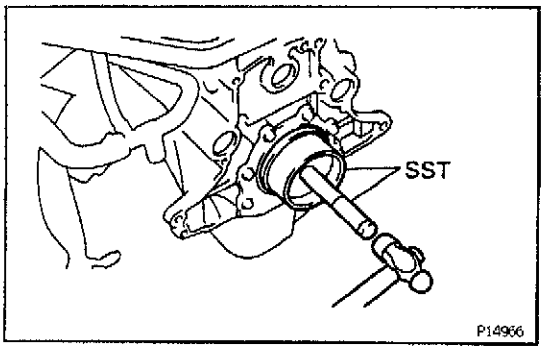
(c) Apply MP grease to the oil seal lip.



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

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

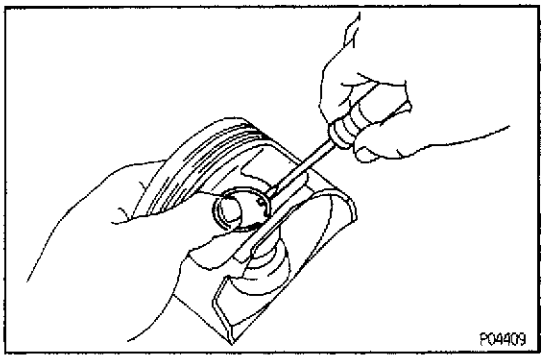
(b) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(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, 09950–70010 (09951–07150)

EG5N1-05



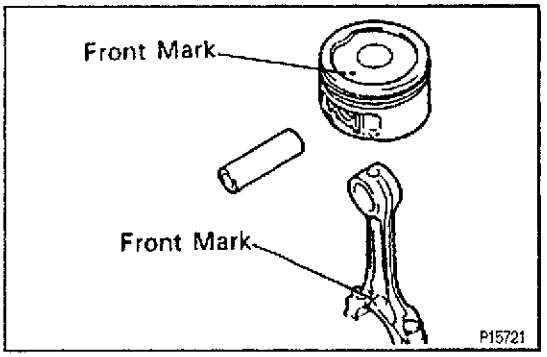
PISTON AND CONNECTING ROD ASSEMBLY

1. ASSEMBLE PISTON AND CONNECTING ROD

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

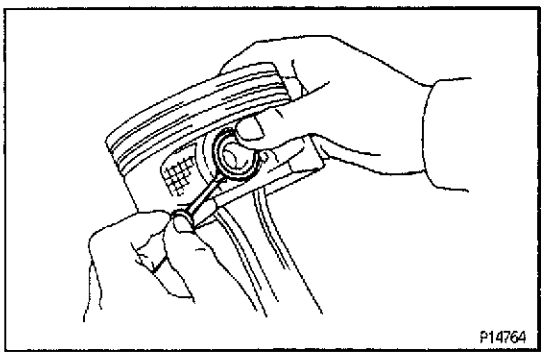
(b) Gradually heat the piston to 80—90°C (176—194°F).

EG

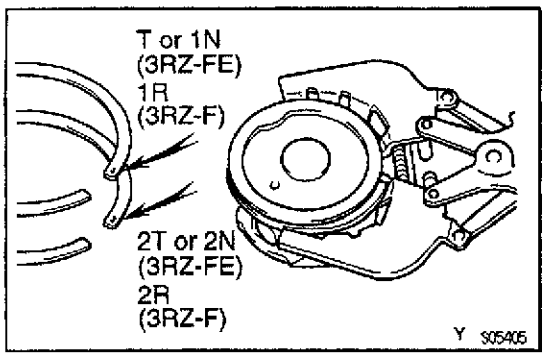


(c) Coat the piston pin with engine oil.

(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 2 side rails by hand.

(b) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.

Code mark:

3RZ—FE

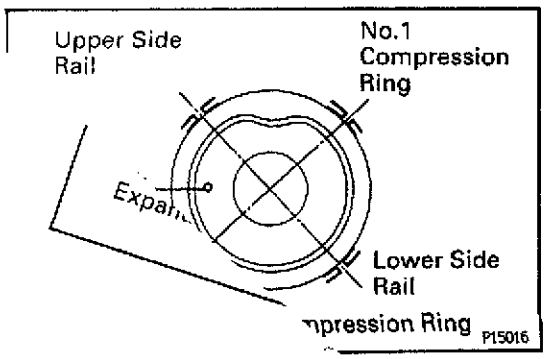
No.1: "T" or "1N"

No.2: "2T" or "2N"

3RZ—F

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

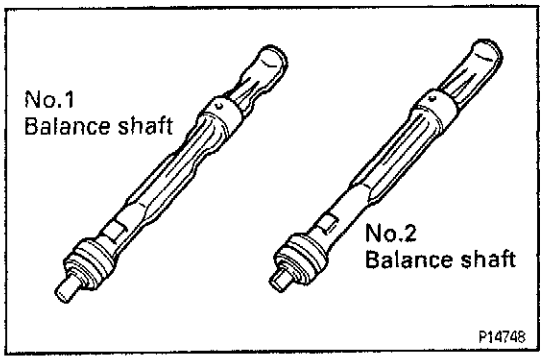
(a) Align the bearing claw with the groove of the connecting rod or connecting rod cap.

(b) Install the bearings in the connecting rod and connecting rod cap.

EG64N–02

CYLINDER BLOCK ASSEMBLY

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



Balance Shaft

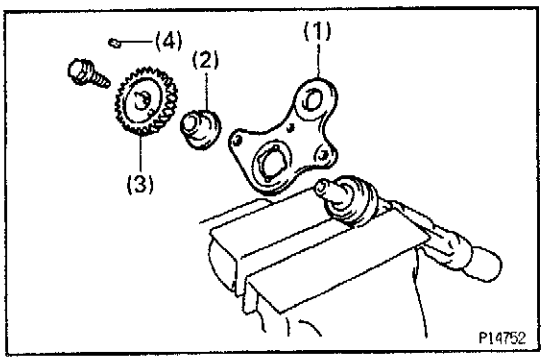
HINT:
- No.1 balance shaft: Has indentations
- No.3 balance shaft: Has no indentations

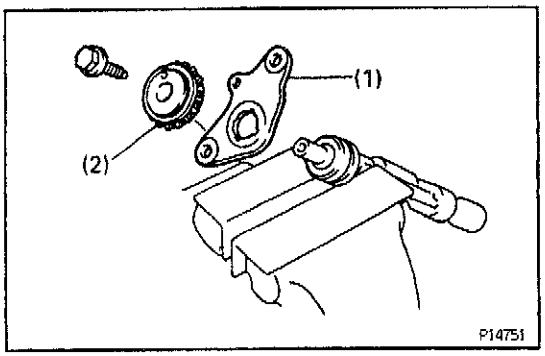
1. ASSEMBLY NO.1 (RH) BALANCE SHAFT

(a) Mount the hexagon wrench head portion of the No.1 balance shaft in a vise.
NOTICE: Be careful not to damage the balance shaft.

(b) Install these parts:
(1) No.1 balance shaft thrust plate
(2) Balance shaft thrust spacer
(3) Balance shaft timing gear
(4) Key

(c) Install and torque the bolt.
Torque: 36 N·m (365 kgf·cm, 26 ft·lbf)



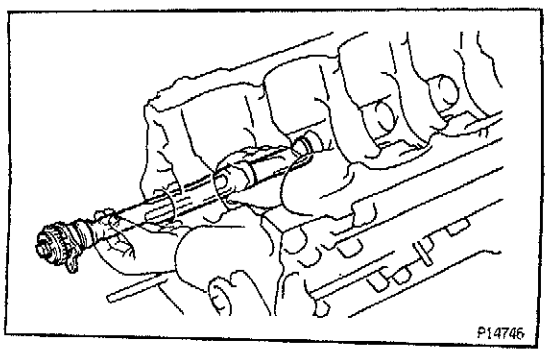


2. ASSEMBLY NO.2 (LH) BALANCE SHAFT

(a) Mount the hexagon wrench head portion of the No.2 balance shaft in a vise.
NOTICE: Be careful not to damage the balance shaft.

(b) Install these parts:
(1) No.2 balance shaft thrust plate
(2) Balance shaft timing sprocket

(c) Install and torque the bolt.
Torque: 36 N·m (365 kgf·cm, 26 ft·lbf)

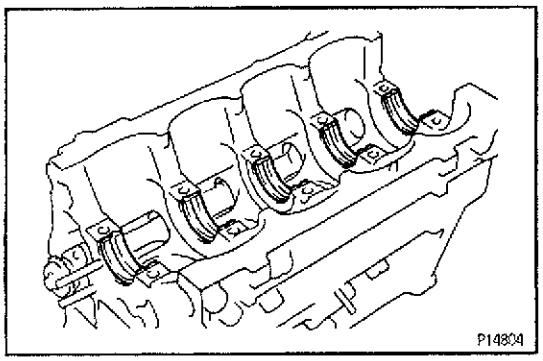


3. INSTALL BALANCE SHAFTS

(a) Install balance shafts.
NOTICE: When installing the balance shaft *make sure* you support the balance shaft with both hands and avoid scratching the balance shaft bearing on the cylin' block side.

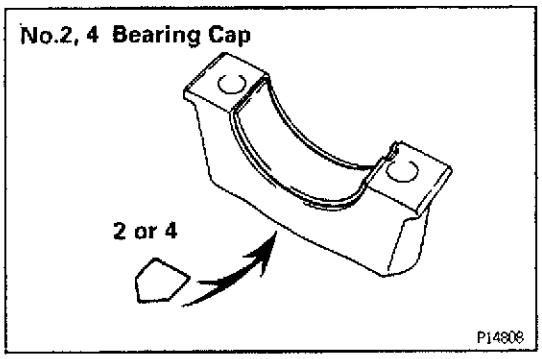
(b) Install the No.1 balance shaft with the bo'

(c) Install the No.2 balance shaft with th'
Torque: 18 N·m (185 kgf·cm, 13 ft·l'

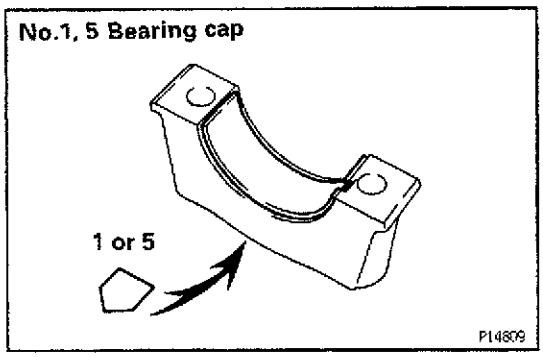


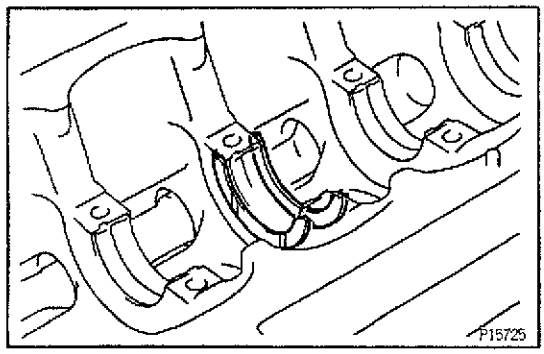
4. INSTALL MAIN BEARINGS

(a) Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.



(b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.
HINT: A number is marked on each main bearing cap to indicate the installation position.

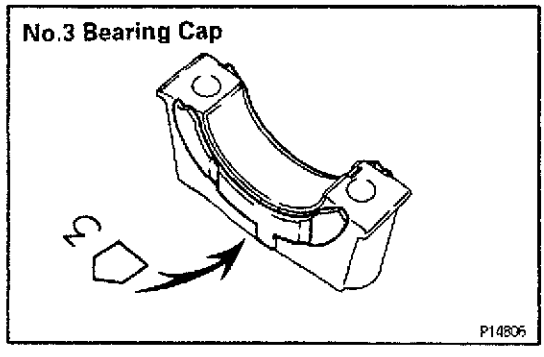




5. INSTALL UPPER THRUST WASHERS

Install the 2 thrust washers under the No.3 journal position of the cylinder block with the oil grooves facing outward.

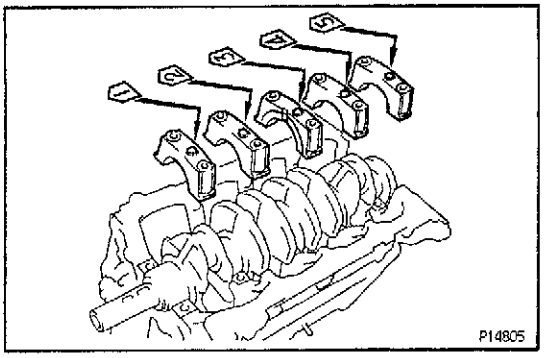
6. PLACE CRANKSHAFT ON CYLINDER BLOCK



7. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

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

(a) Install the 2 thrust washers on the No.3 bearing cap with the grooves facing outward.

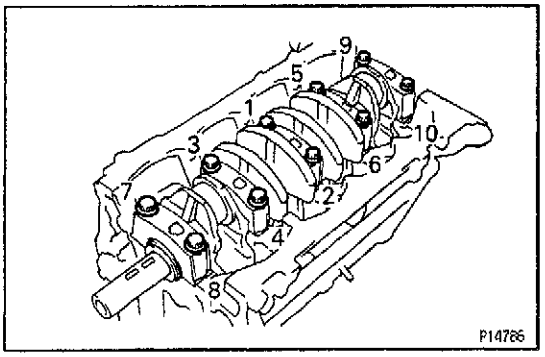


(b) Install the 5 main bearing caps in their proper locations.
HINT: Each bearing cap has a number and front mark.

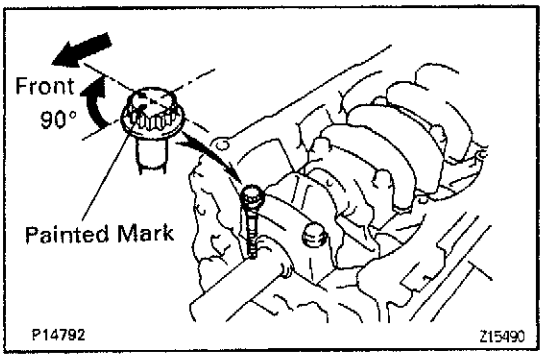
B. Install main bearing cap bolts

HINT:
- The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any of the main bearing cap bolts is broken or deformed, replace it.

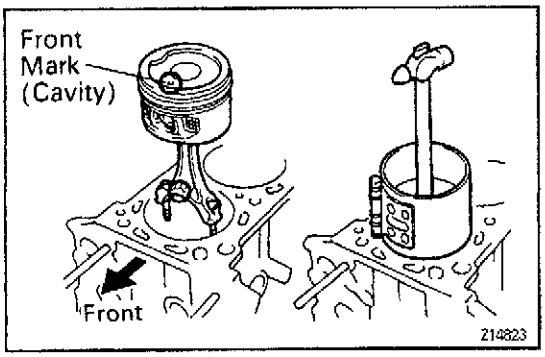
(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.



(b) Install and uniformly tighten the 10 bolts of the main bearing caps, in several passes, in the sequence shown.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
If any one of the main bearing cap bolts does not meet the torque specification, replace the main bearing cap bolt.

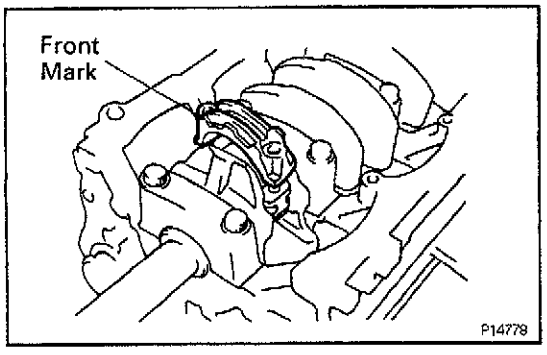


(c) Mark the front of the main bearing cap bolt with paint.
(d) Retighten the main bearing cap bolts by 90° in the numerical order shown above.
(e) Check that the painted mark is now at a 90° angle to the front.
(f) Check that the crankshaft turns smoothly.
(g) Check the crankshaft thrust clearance.
(See step 5 in cylinder block disassembly)



8. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

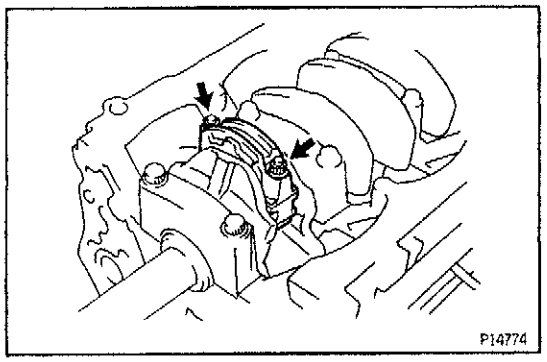
(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.
(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

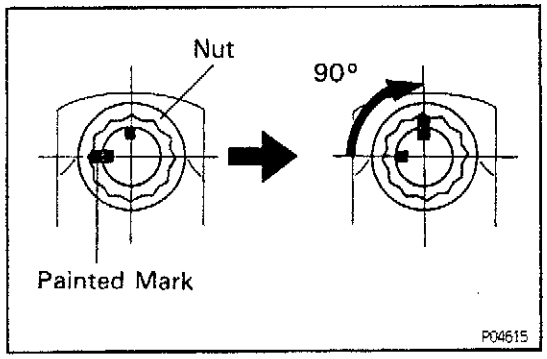


9. INSTALL CONNECTING ROD CAPS

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 2 progressive steps (steps (b) and (d)).
- If any connecting rod bolt is broken or deformed, replace it.

(a) Apply a light coat 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: 45 N·m (460 kgf·cm, 33 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 a 90° angle in relation to the mark on the bolt.

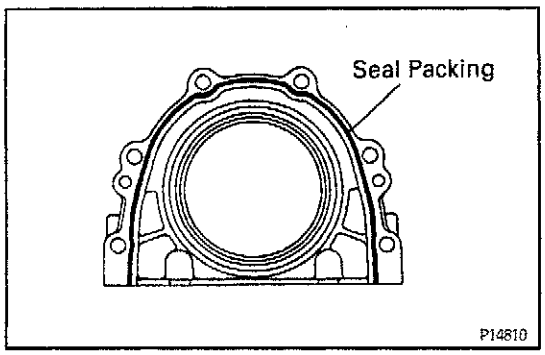
(f) Check that the crankshaft turns smoothly.

(g) Check the connecting rod thrust clearance.
(See step 2 in cylinder block disassembly)

10. 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 6 bolts.

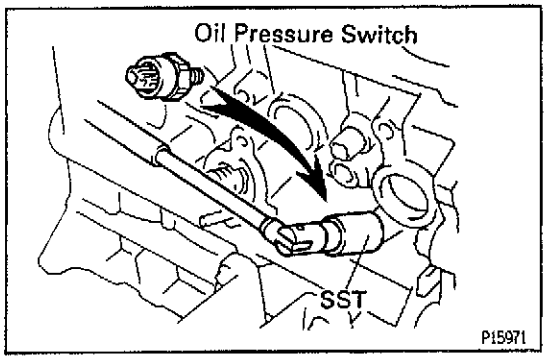
Torque: 13.5 N·m (135 kgf·cm, 9.7 ft·lbf)

EG

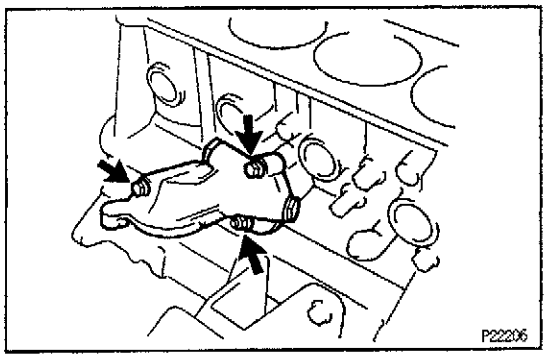
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AFTER ASSEMBLY

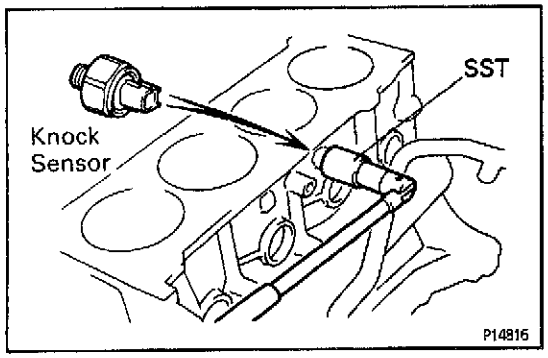
1. **3RZ–FE:**
   INSTALL CRANKSHAFT POSITION SENSOR CONNECTOR BRACKET
2. **INSTALL ENGINE WIRE BRACKET**
3. **INSTALL RH AND LH ENGINE MOUNTING ASSEMBLIES**
   Torque: 52 N·m (520 kgf·cm, 38 ft·lbf)



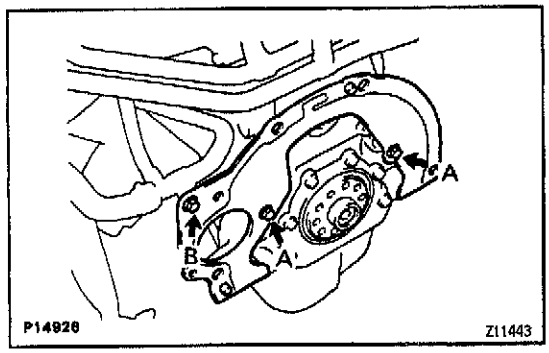
4. **INSTALL OIL PRESSURE SWITCH**
   (a) Apply adhesive to 2 or 3 threads of the oil pressure switch.
   Adhesive:
   Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
   (b) Using SST, install the oil pressure switch.
   SST 09816–30010



5. **INSTALL ENGINE COOLANT DRAIN COCK**
   Torque: 24.5 N·m (250 kgf·cm, 18 ft·lbf)
6. **OIL FILTER BRACKET**
   (a) Install a new O–ring to the union.
   (b) Using a 14 mm hexagon wrench, install the union.
   Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)
   (c) Install a new O–ring and the oil filter bracket with the 2 bolts and nut.
   Torque: 28 N·m (290 kgf·cm, 21 ft·lbf)



7. **3RZ–F:**
   INSTALL OIL COOLER
8. **INSTALL OIL FILTER**
   (See oil and filter replacement in Lubrication System)
9. **INSTALL WATER BYPASS PIPE**
   Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
10. **3RZ–FE:**
    INSTALL KNOCK SENSOR
    Using SST, install the knock sensor.
    SST 09816–30010
    Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)
11. **3RZ–FE:**
    INSTALL FUEL FILTER
    Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
12. **INSTALL TIMING CHAINS, GEARS AND SPROCKETS**
    (See timing chain installation)
13. **INSTALL CYLINDER HEAD**
    (See cylinder head installation)
14. **REMOVE ENGINE STAND**



15. INSTALL REAR END PLATE

Install the rear end plate with the 3 bolts.

Torque:

Bolt A: 18 N·m (185 kgf·cm, 13 ft·lbf)

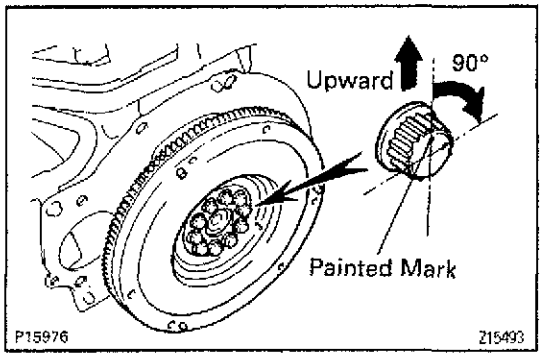
Bolt B: 20 N·m (200 kgf·cm, 14 ft·lbf)

16. M/T:

INSTALL FLYWHEEL

(a) Install and uniformly tighten 10 new bolts to the flywheel, in several passes, in the sequence shown.

Torque: 26.5 N·m (270 kgf·cm, 19 ft·lbf)



(b) Mark the top of the flywheel bolt with paint.

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

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

17. A/T:

INSTALL DRIVE PLATE

(a) Apply adhesive to 2 or 3 threads of the bolt end.

Adhesive:

Part No. 08833—00070, THREE BOND 1324 or equivalent

(b) Install the front spacer, drive plate and rear plate with the 10 bolts.

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

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