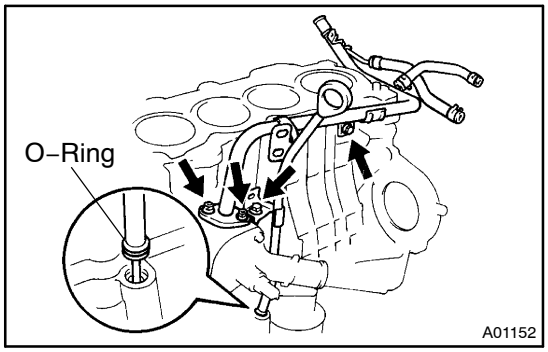
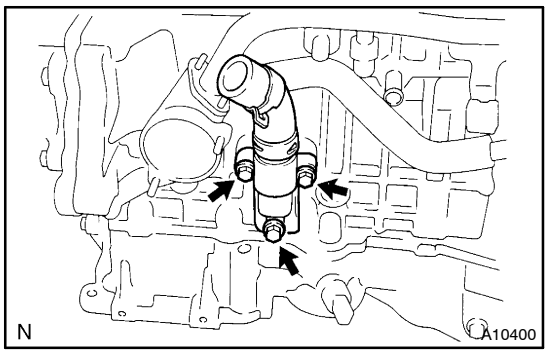
EM163–02

DISASSEMBLY

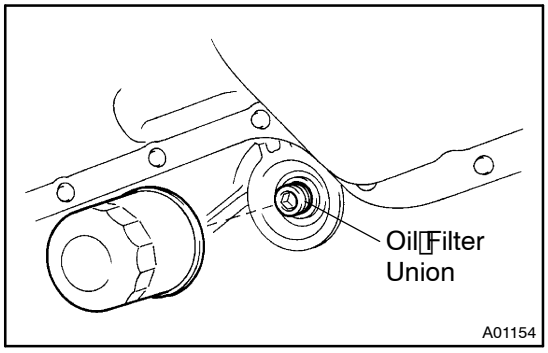
1. **M/T:**
   REMOVE FLYWHEEL
2. **A/T:**
   REMOVE DRIVE PLATE
3. **INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**
4. **REMOVE TIMING CHAIN AND SPROCKETS**
   (See page EM–19)
5. **REMOVE ENGINE WIRE**
6. **REMOVE CYLINDER HEAD**
   (See page EM–43)



7. **1ZZ–FE:**
   REMOVE OIL DIPSTICK AND GUIDE
   (a) Remove the bolt and oil dipstick and guide.
   (b) Remove the O–ring from the dipstick.
8. **REMOVE WATER BYPASS PIPE**
   Remove the 2 nuts, bolts and water bypass pipe.
9. **REMOVE THERMOSTAT**
   (See page CO–9)
10. **REMOVE KNOCK SENSOR**
11. **REMOVE ENGINE COOLANT DRAIN UNION**
12. **REMOVE OIL PUMP**
    (See page LU–9)



13. **2ZZ–GE:**
    REMOVE VENTILATION CASE
    (a) Remove the 3 nuts, ventilation case and gasket.
    (b) Remove the clip and No. 3 ventilation hose.

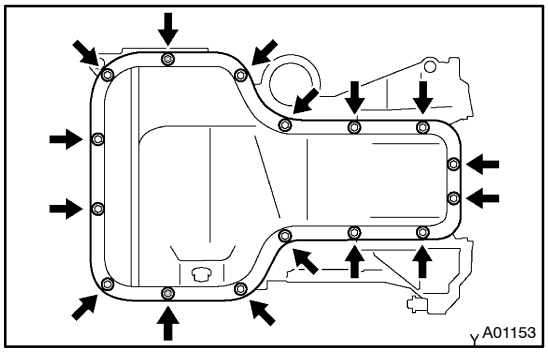


14. REMOVE OIL FILTER
(See page LU–3)

15. Australia spec:
REMOVE OIL COOLER
(See page LU–15)

16. REMOVE OIL FILTER UNION

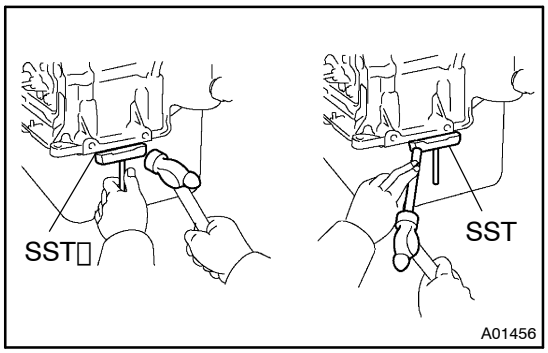
Using a 12 mm hexagon wrench, remove the oil filter union.



17. REMOVE OIL PAN

(a) 1ZZ–FE:
Remove the 14 bolts and 2 nuts.

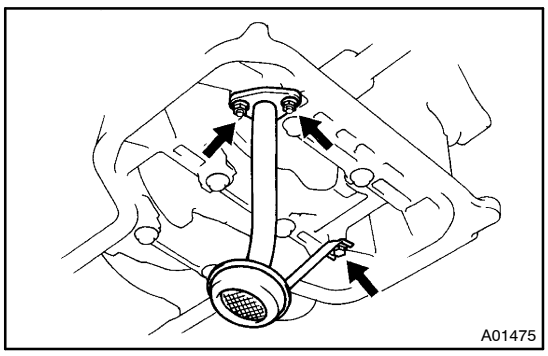
(b) 2ZZ–GE:
Remove the 12 bolts and 4 nuts.



(c) Insert the blade of SST between the bearing cap sub–assembly and oil pan, and cut off applied sealer and remove the oil pan.
SST 09032–00100

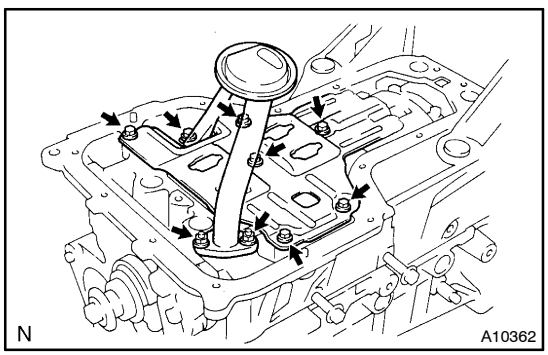
NOTICE:

- **Be careful not to the damage the oil pan contact surface of the bearing cap sub–assembly.**
- **Be careful not to damage the oil pan flange.**



18. 1ZZ–FE:
REMOVE OIL STRAINER

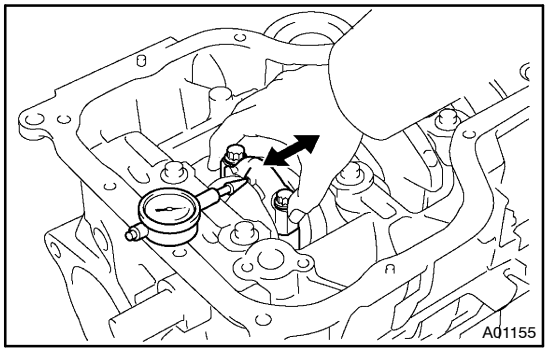
Remove the 2 nuts, bolt, oil strainer and gasket.



19. 2ZZ–GE:
REMOVE OIL STRAINER AND OIL PAN BAFFLE

(a) Remove the 2 nuts, bolt, oil strainer and gasket.

(b) Remove the 4 bolts, 2 nuts and oil pan baffle.



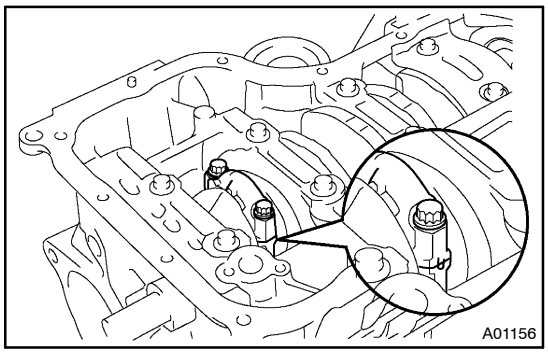
20. CHECK CONNECTING ROD THRUST CLEARANCE

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

Standard thrust clearance:
0.160 – 0.342 mm (0.0063 – 0.0135 in.)
Maximum thrust clearance:
0.342 mm (0.0135 in.)

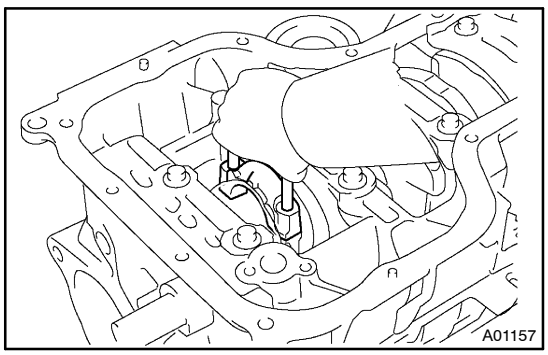
If the thrust clearance is greater than maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.

Connecting rod thickness:
19.788 – 19.840 mm (0.7791 – 0.7811 in.)



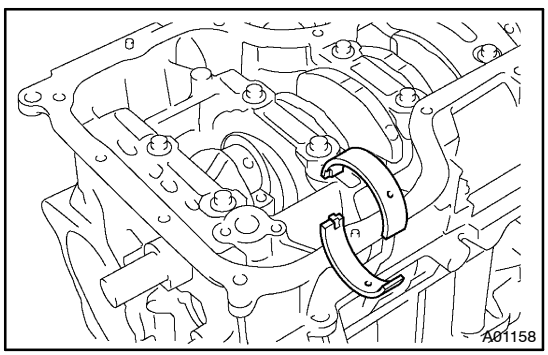
21. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Check the matchmarks on the connecting rod and cap are aligned to ensure correct reassembly.
(b) Remove the 2 connecting rod cap bolts.



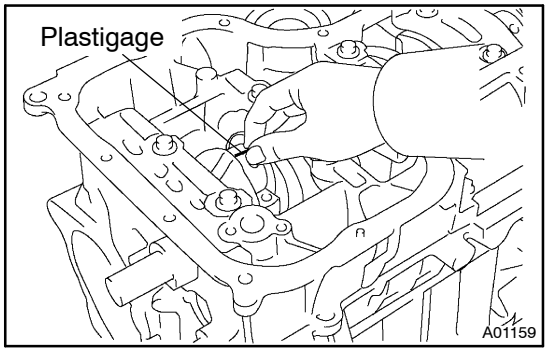
(c) Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

HINT:
Keep the lower bearing inserted with the connecting rod cap.

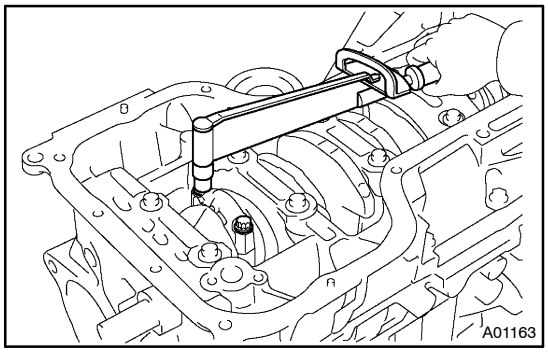


(d) Clean the crank pin and bearing.
(e) Check the crank pin and bearing for pitting and scratches.

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



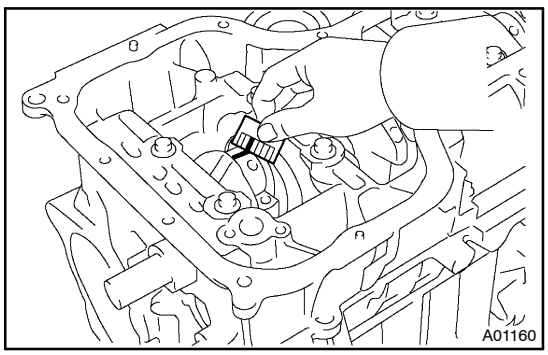
(f) Lay a strip of Plastigage the crank pin.



(g) Install the connecting rod cap with the 2 bolts.
(See page EM–92)
Torque:
1st:
1ZZ–FE: 20 N·m (204 kgf·cm, 15 ft·lbf)
2ZZ–GE: 30 N·m (306 kgf·cm, 22 ft·lbf)
2nd: Turn extra 90°

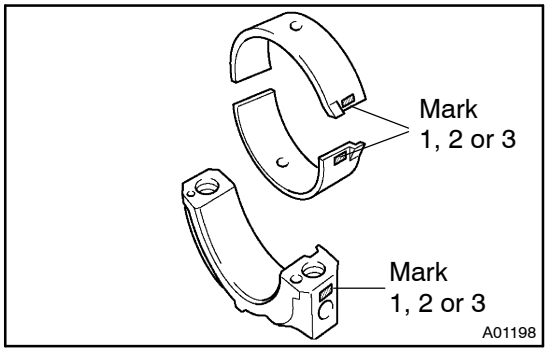
NOTICE:
Do not turn the crankshaft.

(h) Remove the 2 bolts, connecting rod cap and lower bearing. (See procedure (b) and (c) above)



(i) Measure the Plastigage at its widest point.
Standard oil clearance:
1ZZ–FE:
0.028 – 0.060 mm (0.0011 – 0.0024 in.)
2ZZ–GE:
0.028 – 0.052 mm (0.0011 – 0.0020 in.)
Maximum oil clearance;
0.08 mm (0.0031 in.)

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



HINT:
If replacing a bearing, replace it with one having the same number as marked on the connecting rod. There are 3 sizes of standard bearings, marked ”1”, ”2” and ”3” accordingly.

Reference

Standard bearing center wall thickness

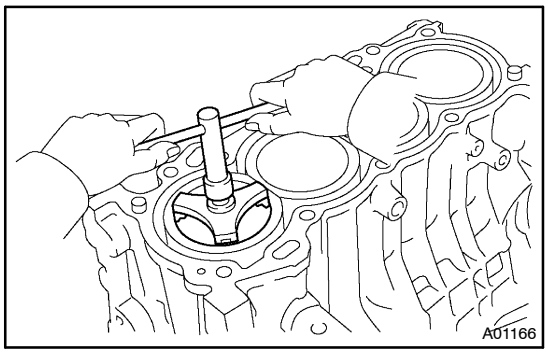
1ZZ–FE:

Mark	mm (in.)
”1”	1.486 – 1.490 (0.0585 – 0.0587)
”2”	1.490 – 1.494 (0.0587 – 0.0588)
”3”	1.494 – 1.498 (0.0588 – 0.0590)

2ZZ–GE:

Mark	mm (in.)
”1”	1.482 – 1.486 (0.0583 – 0.0585)
”2”	1.486 – 1.490 (0.0585 – 0.0587)
”3”	1.490 – 1.494 (0.0587 – 0.0588)

(j) Completely remove the Plastigage.



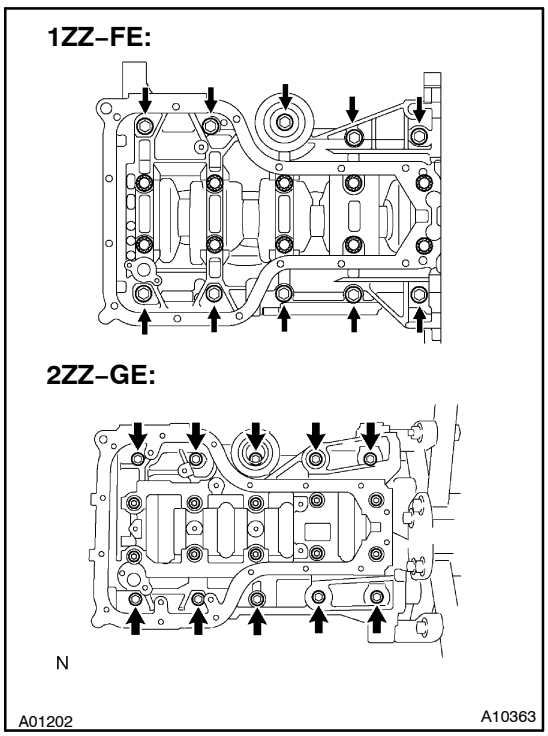
22. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(a) Using a ridge reamer, remove all the 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 the correct order.

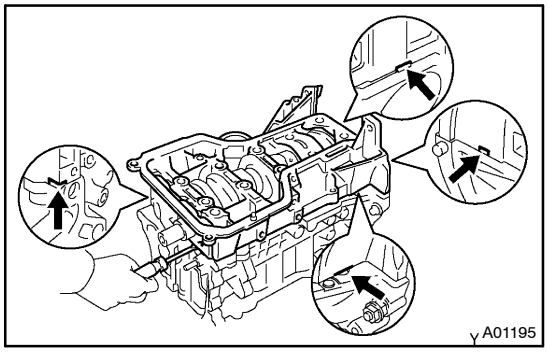


23. REMOVE BEARING CAP SUB–ASSEMBLY AND CRANKSHAFT REAR OIL SEAL, AND CHECK OIL CLEARANCE

(a) 2ZZ–GE:
Remove the 4 screw plugs from the bearing cap sub–assembly.

(b) Remove the 10 hexagon head bearing cap sub–assembly bolts.

(c) Uniformly loosen and remove the 10 bearing cap sub–assembly bolts, in several passes, in the sequence shown.



(d) Using a screwdriver, remove the bearing cap sub–assembly by prying the portions between the cylinder block and bearing cap sub–assembly. Remove the 5 lower main bearings.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder block and bearing cap sub–assembly.

HINT:

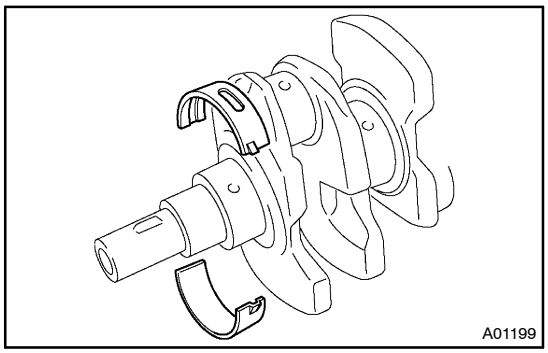
Keep the lower bearing and bearing cap sub–assembly together.

(e) Remove the crankshaft rear oil seal.

(f) Lift out the crankshaft.

HINT:

Keep the upper bearings together with the cylinder block.

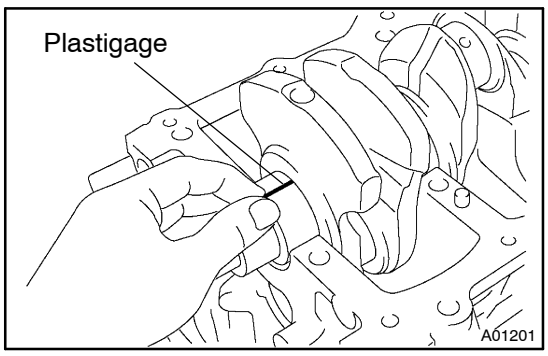


(g) Clean each main journal and bearing.

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

If the journal or bearing is damaged, replace the bearings.

If necessary, replace the crankshaft.



(i) Place the crankshaft on the cylinder block.

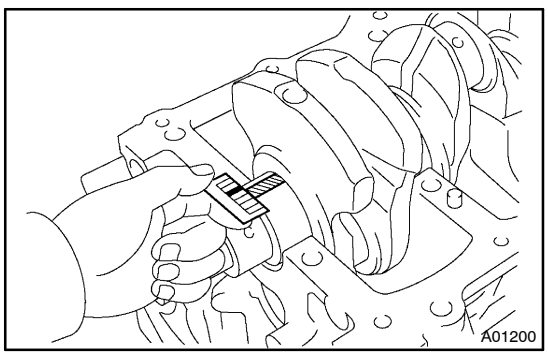
(j) Lay a strip of Plastigage across each journal.

(k) Install the bearing cap sub–assembly.
(See page EM–92)

NOTICE:

Do not turn the crankshaft.

(l) Remove the bearing cap sub–assembly.
(See procedures (a) to (e) above)



(m) Measure the Plastigage at its widest point.

Standard oil clearance:

1ZZ–FE:

0.015 – 0.032 mm (0.0006 – 0.0013 in.)

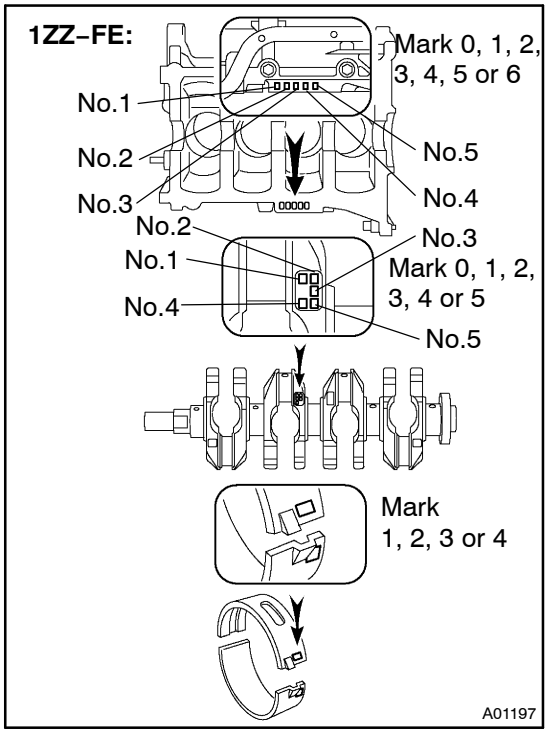
2ZZ–GE:

0.016 – 0.032 mm (0.0006 – 0.0013 in.)

Maximum oil clearance:

0.050 mm (0.0020 in.)

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

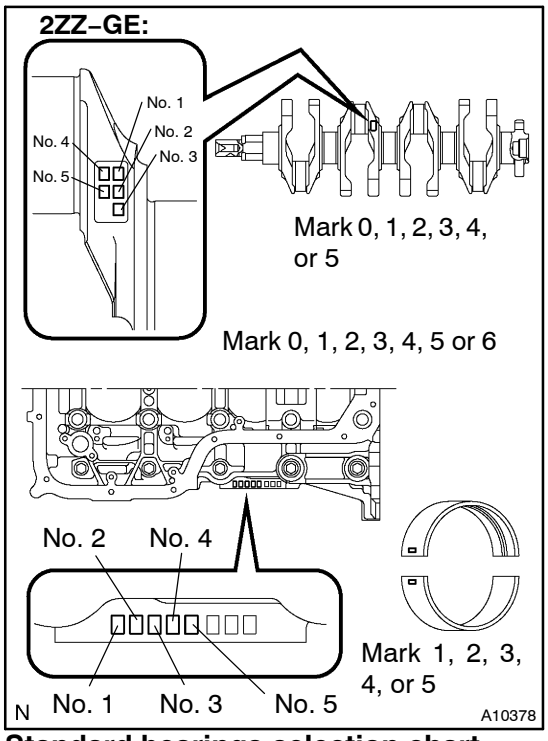


(n) 1ZZ–FE:

If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then selecting the bearing with the same number as the total. There are 4 sizes of standard bearings, marked "1", "2", "3" and "4" accordingly.

	Total number			" ": Number mark
Cylinder block (A) + Crankshaft (B)	0 – 2	3 – 5	6 – 8	9 –11
Use bearing	"1"	"2"	"3"	"4"

EXAMPLE: Cylinder block "4" (A)
+ Crankshaft "3" (B)
= Total number 7 (Use bearing "3")



(o) 2ZZ–GE:

If using standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, refer to the following table to select bearing.

Standard bearings selection chart

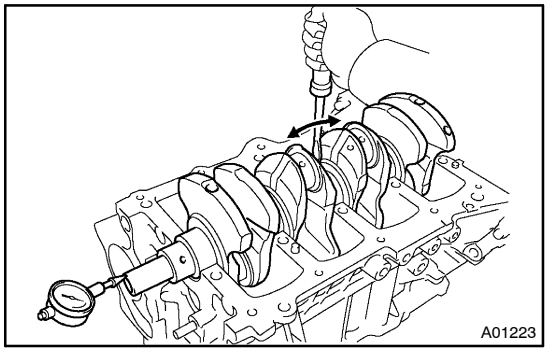
Cylinder block Number mark	Crank shaft number mark					
	0	1	2	3	4	5
0	1	1	1	2	2	2
1	1	1	2	2	2	3
2	1	2	2	2	3	3
3	2	2	2	3	3	3
4	2	3	3	3	4	4
5	3	3	3	4	4	4
6	3	3	4	4	4	5

EXAMPLE: Cylinder block "4", Crank shaft "3", Use bearing "3"

Reference

Item	Mark	mm (in.)
Cylinder block main journal bore diameter (A)	”0”	52.000 – 52.003 (2.0472 – 2.0473)
	”1”	52.003 – 52.005 (2.0473 – 2.0474)
	”2”	52.005 – 52.007 (2.0474 – 2.0475)
	”3”	52.007 – 52.010 (2.0475 – 2.0476)
	”4”	52.010 – 52.012 (2.0476 – 2.0477)
	”5”	52.012 – 52.014 (2.0477 – 2.0478)
	”6”	52.014 – 52.016 (2.0478 – 2.0479)
Crankshaft main journal diameter (B)	”0”	47.998 – 48.000 (1.8897 – 1.8898)
	”1”	47.996 – 47.998 (1.8896 – 1.8897)
	”2”	47.994 – 47.996 (1.8895 – 1.8896)
	”3”	47.992 – 47.994 (1.8894 – 1.8895)
	”4”	47.990 – 47.992 (1.8893 – 1.8894)
	”5”	47.988 – 47.990 (1.8892 – 1.8893)
1ZZ–FE: Standard bearing center wall thickness	”1”	1.993 – 1.996 (0.0785 – 0.0786)
	”2”	1.996 – 1.999 (0.0786 – 0.0787)
	”3”	1.999 – 2.002 (0.0787 – 0.0788)
	”4”	2.002 – 2.005 (0.0788 – 0.0789)
2ZZ–GE Standard bearing center wall thickness	”1”	1.989 – 1.992 (0.0783 – 0.0784)
	”2”	1.992 – 1.995 (0.0784 – 0.0785)
	”3”	1.995 – 1.998 (0.0785 – 0.0787)
	”4”	1.998 – 2.001 (0.0787 – 0.0788)
	”5”	2.001 – 2.004 (0.0788 – 0.0789)

(p) Completely remove the Plastigage.



24. 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:
0.04 – 0.24 mm (0.0016 – 0.0094 in.)
Maximum thrust clearance:
0.30 mm (0.0118 in.)

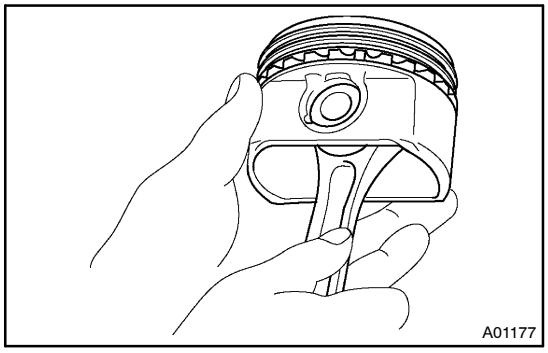
If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness:
2.430 – 2.480 mm (0.0957 – 0.0976 in.)

25. REMOVE CRANKSHAFT

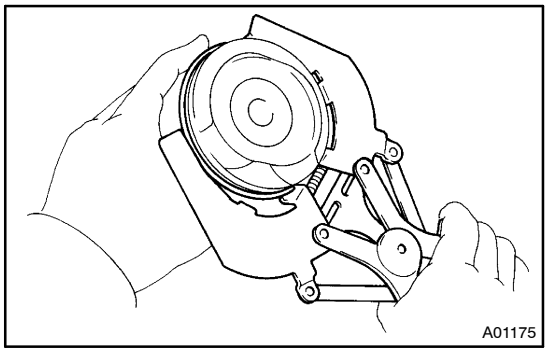
(a) Lift out the crankshaft.
(b) Remove the 5 upper main bearings and 2 thrust washers from the cylinder block.

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



26. CHECK FIT BETWEEN PISTON AND PISTON PIN

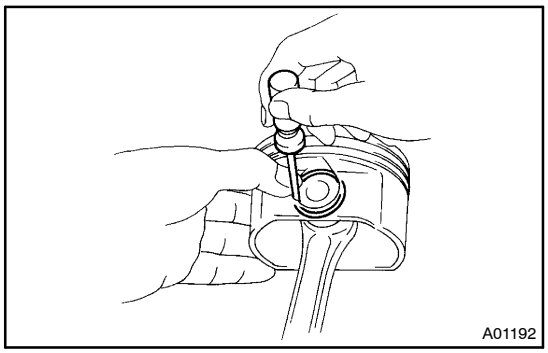
Try to move the piston back and forth on the piston pin.
If any movement is felt, replace the piston and pin as a set.



27. REMOVE PISTON RINGS

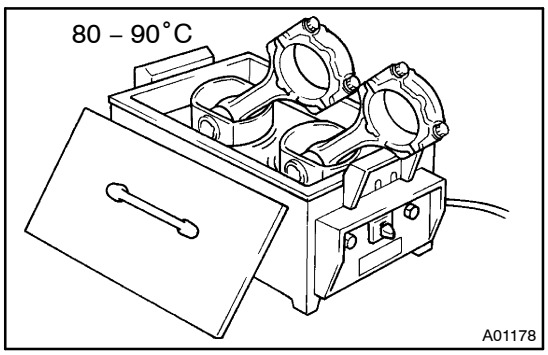
(a) Using a piston ring expander, remove the 2 compression rings.
(b) Remove the 2 side rails and oil ring by hand.

HINT:
Arrange the piston rings in the correct order only.

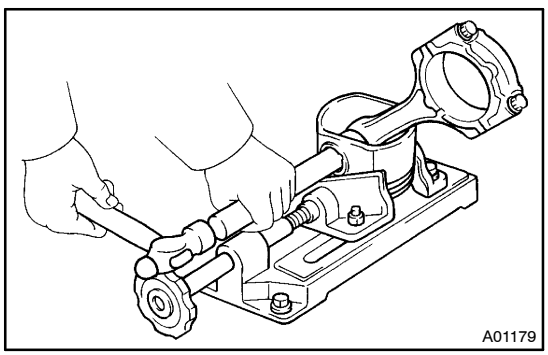


28. DISCONNECT CONNECTING ROD FROM PISTON

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



(b) 1ZZ–FE:
Gradually heat the piston to 80 – 90°C (176 – 194°F).



(c) 1ZZ–FE:
Using a 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 the correct order.

(d) 2ZZ–GE:
Remove the pin and connecting rod from the piston.