

DISASSEMBLY

1. REMOVE DRIVE PLATE

Remove the 8 bolts, front spacer, drive plate and rear spacer.

2. INSTALL ENGINE TO ENGINE STAND

3. REMOVE TIMING CHAIN AND SPROCKET

(See page EM-14)

4. REMOVE WATER BY-PASS PIPE NO.3

(a) Disconnect the wire harness clamp from the water by-pass pipe No.3.

(b) Remove the 2 bolts, 2 nuts, water by-pass pipe No.3 and gasket.

5. REMOVE 4 KNOCK SENSORS

6. REMOVE ALTERNATOR BRACKET NO.1

Remove the 4 bolts and bracket.

7. REMOVE OIL FILTER BRACKET WITH OIL FILTER

Remove the 3 nuts, oil filter bracket with filter and 2 O-rings.

8. REMOVE ENGINE MOUNTING BRACKET LH AND RH

Remove the 8 bolts and mounting brackets.

9. REMOVE OIL LEVEL GAUGE GUIDE WITH OIL LEVEL GAUGE

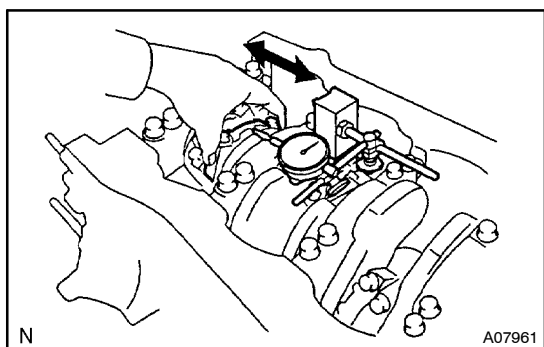
10. REMOVE 2 ENGINE COOLANT DRAIN UNIONS

11. REMOVE REAR OIL SEAL RETAINER

(a) Remove the 8 bolts.

(b) Using a screwdriver, remove the oil seal retainer by prying the portions between the oil seal retainer and main bearing cap.

(c) Remove the O-ring.



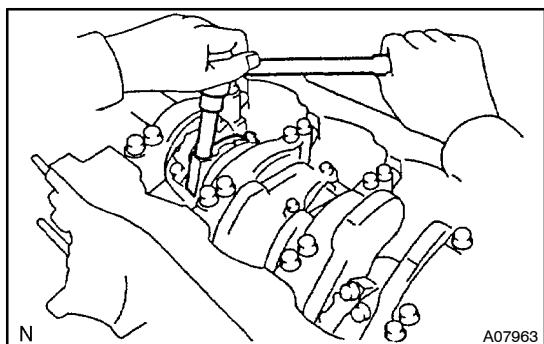
12. INSPECT CONNECTING ROD THRUST CLEARANCE

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

Standard thrust clearance:

0.160 - 0.290 mm (0.00630 - 0.01142 in.)

Maximum thrust clearance: 0.35 mm (0.0138 in.)



13. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

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

(b) Using SST, remove the 2 connecting rod cap bolts.
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(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.

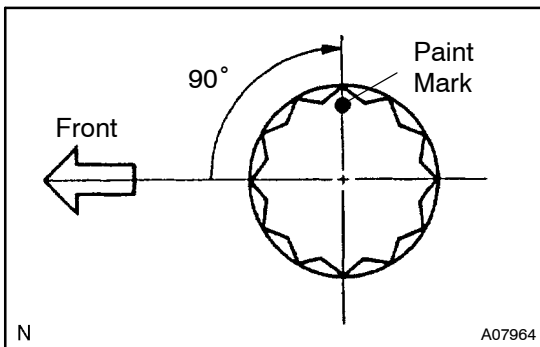
HINT:

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 across the crank pin.
- (g) Apply engine oil to the thread portion of each bolt and the bearing surface.
- (h) Using SST, install the connecting rod cap with the 2 bolts.

Torque: 20 N·m (205 kgf·cm, 15 ft·lbf)

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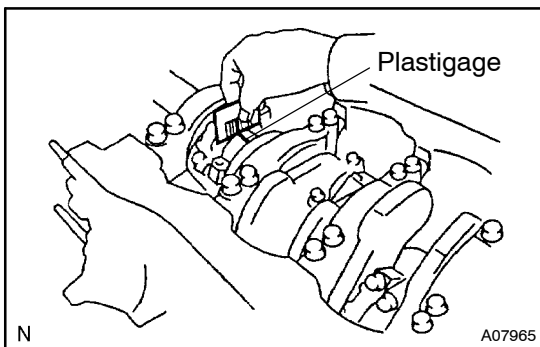


- (i) Put a paint mark on the engine front side of the bolt head.
- (j) Tighten the bolt about 90° on the basis of the paint mark of the bolt.

NOTICE:

Do not turn the crankshaft.

- (k) Using SST, remove the 2 bolts and connecting rod cap.
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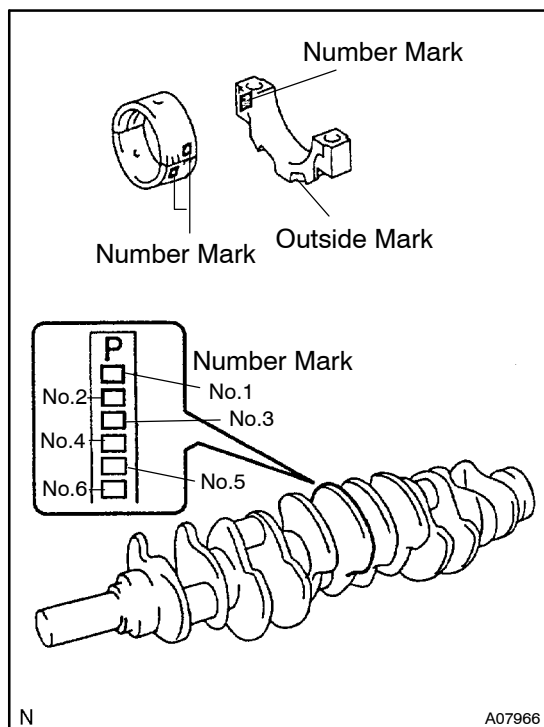
- (l) Measure the Plastigage at its widest point.

Standard oil clearance:

0.024 - 0.042 mm (0.00094 - 0.00165 in.)

Maximum oil clearance: 0.052 mm (0.00205 in.)

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

**HINT:**

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 connecting rod cap and crankshaft, then selecting the bearing with the same number as the total. There are 6 sizes of standard bearings, marked "2", "3", "4", "5", "6" and "7".

	Number mark												
Connecting rod cap	1	1	2	1	2	3	2	3	4	3	4	4	
Crankshaft	1	2	1	3	2	1	3	2	1	3	2	3	
Use bearing	2		3		4			5		6			7

Example:

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

(Reference)**Connecting rod big end inside diameter:**

Mark "1"	51.000 – 51.006 mm (2.00787 – 2.00811 in.)
Mark "2"	51.006 – 51.012 mm (2.00811 – 2.00834 in.)
Mark "3"	51.012 – 51.018 mm (2.00834 – 2.00858 in.)
Mark "4"	51.018 – 51.024 mm (2.00858 – 2.00881 in.)

Crankshaft crank pin diameter:

Mark "1"	47.994 – 48.000 mm (1.88952 – 1.88976 in.)
Mark "2"	47.988 – 47.994 mm (1.88929 – 1.88952 in.)
Mark "3"	47.982 – 47.988 mm (1.88905 – 1.88929 in.)

Standard sized bearing center wall thickness:

Mark "2"	1.485 – 1.488 mm (0.05846 – 0.05858 in.)
Mark "3"	1.488 – 1.491 mm (0.05858 – 0.05870 in.)
Mark "4"	1.491 – 1.494 mm (0.05870 – 0.05882 in.)
Mark "5"	1.494 – 1.497 mm (0.05882 – 0.05894 in.)
Mark "6"	1.497 – 1.500 mm (0.05894 – 0.05906 in.)
Mark "7"	1.500 – 1.503 mm (0.05906 – 0.05917 in.)

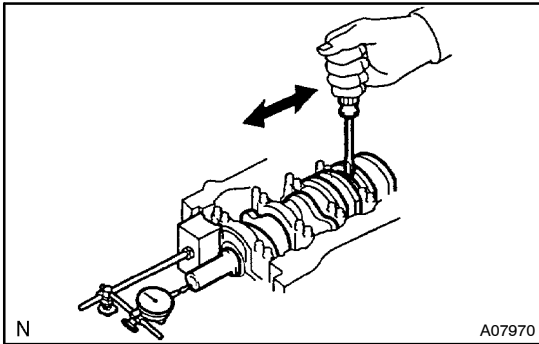
(m) Completely remove the Plastigage.

14. 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 correct order.



15. 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:

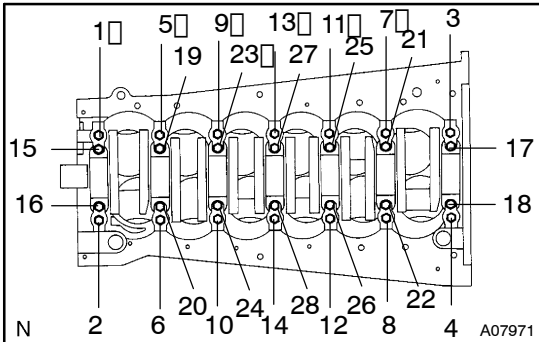
0.020 – 0.220 mm (0.0008 – 0.0087 in.)

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.)



16. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

(a) Uniformly loosen and remove the 28 main bearing cap bolts in several passes, in the sequence shown.

(b) Remove the 4 bolts and seal washers.

(c) Using 2 screwdrivers, pry out the main bearing cap, and remove the 7 main bearing caps, 7 lower bearings and 2 lower thrust washers (No. 4 main bearing cap only).

NOTICE:

Be careful not to damage the cylinder block.

HINT:

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

(d) Lift out the crankshaft.

HINT:

Keep the upper bearings and upper thrust washers together with the cylinder block.

(e) Clean each main journal and bearing.

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

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

(g) Place the crankshaft on the cylinder block.

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

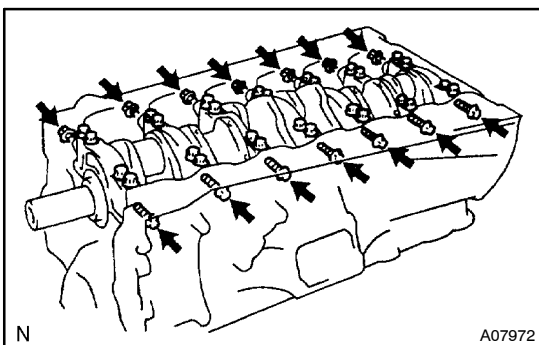
(i) Install the main bearing caps. (See page EM-78)

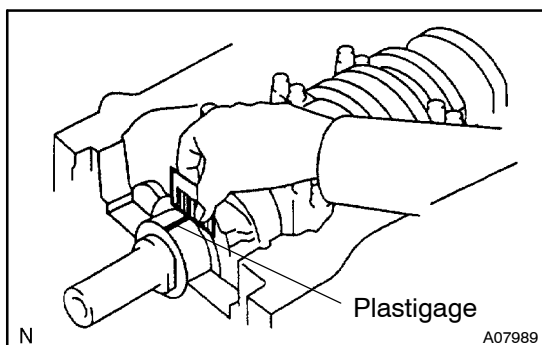
NOTICE:

Do not turn the crankshaft.

(j) Remove the main bearing caps.

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





(k) Measure the Plastigage at its widest point.

Standard clearance:

No.1, No.7 0.020 – 0.036 mm (0.00079 – 0.00142 in.)

Others 0.026 – 0.045 mm (0.00102 – 0.00177 in.)

Maximum clearance:

No.1, No.7 0.046 mm (0.00181 in.)

Others 0.055 mm (0.00217 in.)

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

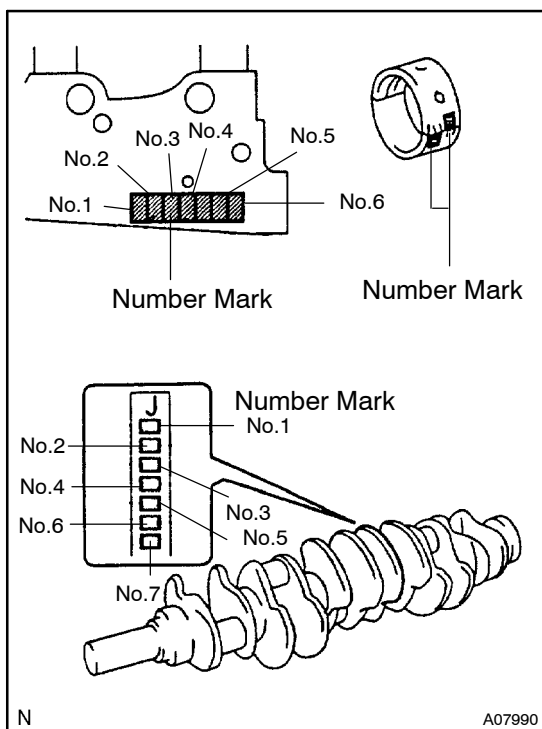
HINT:

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 refer to the table below for the appropriate bearing number. There are 5 sizes of the standard bearings. For No.1 and No.7 position bearings, use bearings marked "A", "1", "2", "3", "4", "5" and "6". For other position bearings, use bearings marked "B", "A", "1", "2", "3", "4" and "5".

No.1, No.7:

(A): Cylinder block

(B): Crankshaft



(A) + (B)	Use upper bearing	Use lower bearing
-12 to -10	A	A
-9 to -7	A	1
-6 to -4	1	1
-3 to -1	1	2
0 to 2	2	2
3 to 5	2	3
6 to 8	3	3
9 to 11	3	4
12 to 14	4	4
15 to 17	4	5
18 to 20	5	5
21 to 23	5	6
24 to 28	6	6

Example:

Cylinder block "6" + Crankshaft "3" = Total number "9" (Use upper bearing "3" and lower bearing "4")

Others:

(A): Cylinder block

(B): Crankshaft

(A) + (B)	Use bearing
-12 to -7	B
-6 to -1	A
0 to 5	1
6 to 11	2
12 to 17	3
18 to 23	4
24 to 28	5

Example:

Cylinder block "8" + Crankshaft "6" = Total number "14" (Use bearing "3")

(Reference)**Cylinder block main journal bore diameter (A):**

Mark "-12"	71.988 – 71.989 mm (2.83417 – 2.83421 in.)
Mark "-11"	71.989 – 71.990 mm (2.83421 – 2.83425 in.)
Mark "-10"	71.990 – 71.991 mm (2.83425 – 2.83429 in.)
Mark "-9"	71.991 – 71.992 mm (2.83429 – 2.83433 in.)
Mark "-8"	71.992 – 71.993 mm (2.83433 – 2.83436 in.)
Mark "-7"	71.993 – 71.994 mm (2.83436 – 2.83440 in.)
Mark "-6"	71.994 – 71.995 mm (2.83440 – 2.83444 in.)
Mark "-5"	71.995 – 71.996 mm (2.83444 – 2.83448 in.)
Mark "-4"	71.996 – 71.997 mm (2.83448 – 2.83452 in.)
Mark "-3"	71.997 – 71.998 mm (2.83452 – 2.83456 in.)
Mark "-2"	71.998 – 71.999 mm (2.83456 – 2.83460 in.)
Mark "-1"	71.999 – 72.000 mm (2.83460 – 2.83464 in.)
Mark "01"	72.000 – 72.001 mm (2.83464 – 2.83468 in.)
Mark "02"	72.001 – 72.002 mm (2.83468 – 2.83472 in.)
Mark "03"	72.002 – 72.003 mm (2.83472 – 2.83476 in.)
Mark "04"	72.003 – 72.004 mm (2.83476 – 2.83480 in.)
Mark "05"	72.004 – 72.005 mm (2.83480 – 2.83484 in.)
Mark "06"	72.005 – 72.006 mm (2.83484 – 2.83488 in.)
Mark "07"	72.006 – 72.007 mm (2.83488 – 2.83492 in.)
Mark "08"	72.007 – 72.008 mm (2.83492 – 2.83495 in.)
Mark "09"	72.008 – 72.009 mm (2.83495 – 2.83499 in.)
Mark "10"	72.009 – 72.010 mm (2.83499 – 2.83503 in.)
Mark "11"	72.010 – 72.011 mm (2.83503 – 2.83507 in.)
Mark "12"	72.011 – 72.012 mm (2.83507 – 2.83511 in.)
Mark "13"	72.012 – 72.013 mm (2.83511 – 2.83515 in.)
Mark "14"	72.013 – 72.014 mm (2.83515 – 2.83519 in.)
Mark "15"	72.014 – 72.015 mm (2.83519 – 2.83523 in.)
Mark "16"	72.015 – 72.016 mm (2.83523 – 2.83527 in.)

Crankshaft main journal diameter (B):

Mark "00"	66.999 – 67.000 mm (2.63775 – 2.63779 in.)
Mark "01"	66.998 – 66.999 mm (2.63771 – 2.63775 in.)
Mark "02"	66.997 – 66.998 mm (2.63767 – 2.63771 in.)
Mark "03"	66.996 – 66.997 mm (2.63763 – 2.63767 in.)
Mark "04"	66.995 – 66.996 mm (2.63759 – 2.63763 in.)
Mark "05"	66.994 – 66.995 mm (2.63755 – 2.63759 in.)
Mark "06"	66.993 – 66.994 mm (2.63751 – 2.63755 in.)
Mark "07"	66.992 – 66.993 mm (2.63748 – 2.63751 in.)
Mark "08"	66.991 – 66.992 mm (2.63744 – 2.63748 in.)
Mark "09"	66.990 – 66.991 mm (2.63740 – 2.63744 in.)
Mark "10"	66.989 – 66.990 mm (2.63736 – 2.63740 in.)
Mark "11"	66.988 – 66.989 mm (2.63732 – 2.63736 in.)
Mark "12"	66.987 – 66.988 mm (2.63728 – 2.63732 in.)

Standard bearing center wall thickness:

Mark "1"	2.486 – 2.489 mm (0.09787 – 0.09799 in.)
Mark "2"	2.489 – 2.492 mm (0.09799 – 0.09811 in.)
Mark "3"	2.492 – 2.495 mm (0.09811 – 0.09823 in.)
Mark "4"	2.498 – 2.501 mm (0.09835 – 0.09846 in.)
Mark "5"	2.501 – 2.504 mm (0.09846 – 0.09858 in.)
Mark "6"	2.501 – 2.504 mm (0.09846 – 0.09858 in.)

(l) Completely remove the Plastigage.

17. REMOVE CRANKSHAFT

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

HINT:

Arrange the main bearing caps, bearings and thrust washers in correct order.

18. 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.

19. REMOVE PISTON RINGS

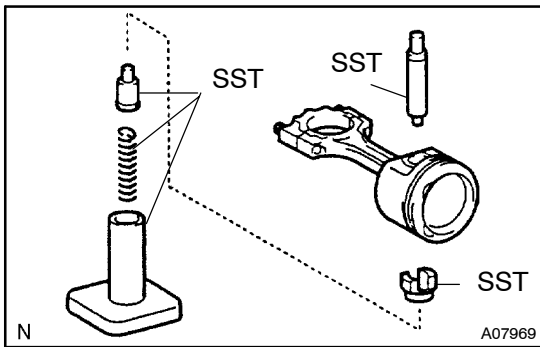
- (a) Using a piston ring expander, remove the 2 compression rings.
- (b) Remove the oil ring by hand.

HINT:

Arrange the piston rings in correct order only.

20. DISCONNECT CONNECTING ROD FROM PISTON

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



(b) Using SST and press, remove the piston pin and connecting rod.

SST 09221-25026 (09221-00021, 09221-00030,
09221-00181, 09221-00210, 09221-00220)