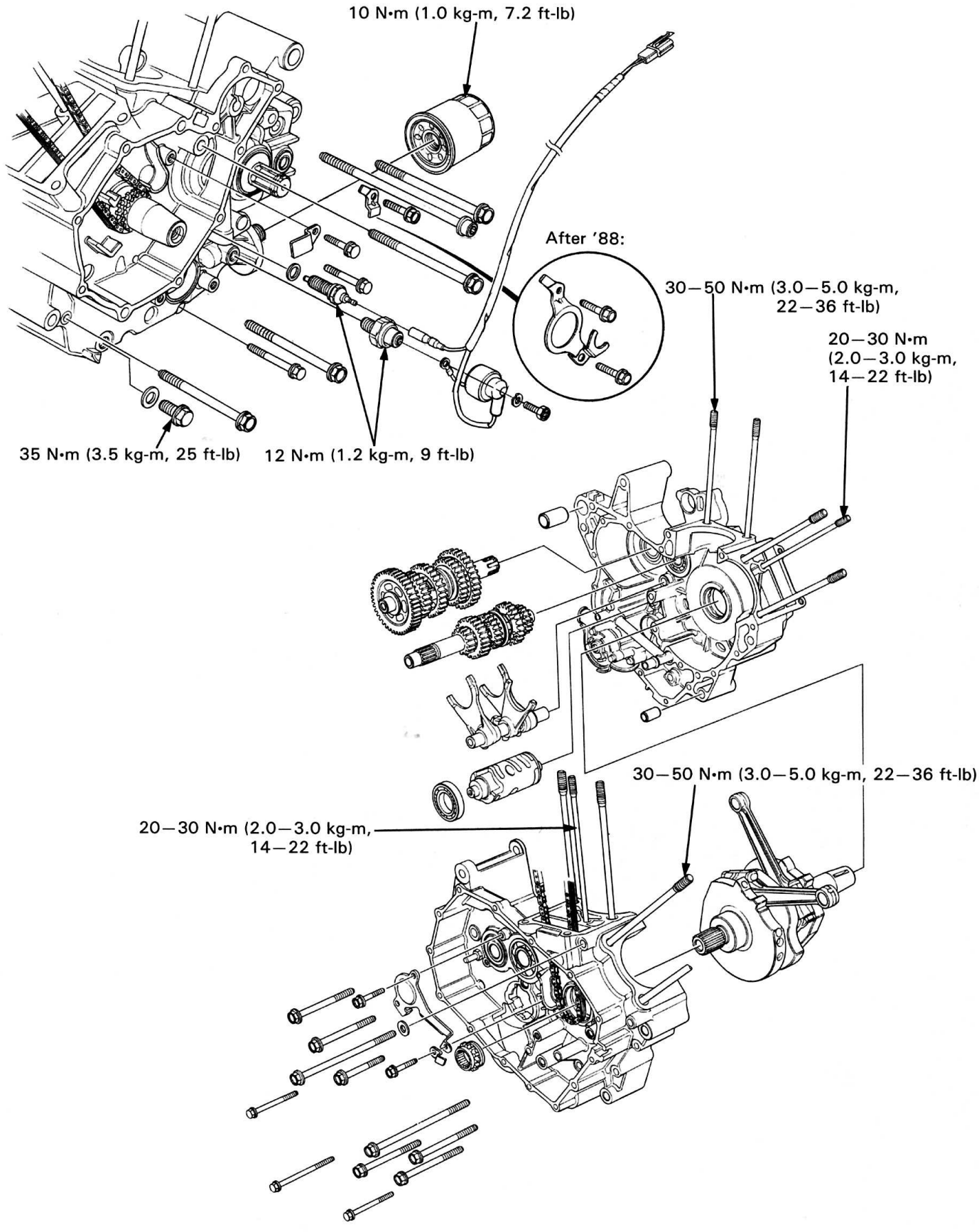
'88 Shown:


10 N•m (1.0 kg-m, 7.2 ft-lb)
After '88:
30—50 N•m (3.0—5.0 kg-m, 22—36 ft-lb)
20—30 N•m (2.0—3.0 kg-m, 14—22 ft-lb)
35 N•m (3.5 kg-m, 25 ft-lb)
12 N•m (1.2 kg-m, 9 ft-lb)
30—50 N•m (3.0—5.0 kg-m, 22—36 ft-lb)
20—30 N•m (2.0—3.0 kg-m, 14—22 ft-lb)

11. CRANKSHAFT/TRANSMISSION

SERVICE INFORMATION

GENERAL

- To service the connecting rods, crankshaft, transmission and oil pump, the engine must be removed from the frame (Section 6).
- All bearing inserts are select fitted and are identified by color code or code letter. Select replacement bearings from the code tables.
  After installing new bearings, recheck them with plastigauge to verify clearance.
- Apply molybdenum disulfide grease to the main journals and crankpins during assembly.
- Before separating the crankcase, the following parts must be removed.
  - Cylinder head (Section 9)
  - Cylinder/piston (Section 10)
  - Clutch/gearshift linkage (Section 7)
  - Flywheel (Section 8)
  - Starter motor (Section 17)
  - Water pump (Section 5)

SPECIFICATIONS

mm (in)

ITEM			STANDARD	SERVICE LIMIT
Crankshaft/ connecting rod	Connecting rod big end side clearance		0.05—0.20 (0.002—0.008)	0.3 (0.012)
	Crankpin oil clearance		0.028—0.052 (0.0011—0.0020)	0.08 (0.003)
	Main journal oil clearance		0.025—0.041 (0.0010—0.0016)	0.05 (0.002)
	Crankshaft runout		——	0.05 (0.002)
Transmission	Gear I.D.	C1	24.000—24.021 (0.9449—0.9457)	24.03 (0.946)
		M4, M5, C2, C3	28.000—28.021 (1.1024—1.1032)	28.03 (1.103)
	Gear bushing O.D.	C1	23.959—23.980 (0.9433—0.9441)	24.95 (0.982)
		M4, M5, C2, C3	27.959—27.980 (1.1007—1.1016)	27.95 (1.100)
	Gear bushing I.D.	C1	20.016—20.037 (0.7880—0.7889)	20.05 (0.789)
		M4, C2, C3	25.000—25.021 (0.9843—0.9851)	25.03 (0.985)
	Bushing-to-shaft clearance	M4, C3	0.020—0.062 (0.0008—0.0024)	0.08 (0.003)
		C2	0.010—0.049 (0.0004—0.0019)	0.07 (0.003)
	Gear-to-bushing clearance	M4, M5, C1, C2, C3	0.020—0.062 (0.0008—0.0024)	0.08 (0.003)
	Mainshaft O.D.	M4 bushing	24.959—24.980 (0.9826—0.9835)	24.95 (0.982)
	Countershaft O.D.	C1 bushing	19.980—19.993 (0.7866—0.7871)	19.97 (0.786)
		C2 bushing	24.972—24.990 (0.9831—0.9839)	24.96 (0.983)
		C3 bushing	24.959—24.980 (0.9826—0.9835)	24.95 (0.982)
Shift fork/ fork-shaft	Claw thickness		5.93—6.00 (0.233—0.236)	5.83 (0.230)
	Right and left shift fork I.D.		13.000—13.018 (0.5118—0.5125)	13.03 (0.513)
	Shaft O.D.		12.966—12.984 (0.5105—0.5112)	12.96 (0.510)
Shift drum O.D. (at the left side journal)			11.966—11.984 (0.4711—0.4718)	11.96 (0.471)

TORQUE VALUES

Connecting rod bearing cap nut	34 N·m (3.4 kg-m, 25 ft-lb)
Crankcase 8 mm stud bolt	20—30 N·m (2.0—3.0 kg-m, 14—22 ft-lb)
10 mm stud bolt	30—50 N·m (3.0—5.0 kg-m, 22—36 ft-lb)

TOOLS

Special

Main bearing driver attachment	07HMF—MM90400
Bearing remover set	07936—3710001
— remover handle	07936—3710100
— bearing remover set	07936—3710600
— remover weight	07741—0010201 or 07936—3710200 U.S.A. only

Common

Driver	07749—0010000
Attachment, 42 x 47 mm	07746—0010300
Pilot, 20 mm	07746—0040500
Attachment, 52 x 55 mm	07746—0010400
Pilot, 22 mm	07746—0041000
Pilot, 25 mm	07746—0040600

TROUBLESHOOTING

Excessive noise
- Crankshaft
  - — Worn main bearing
  - — Worn crankpin bearing
- Connecting rod
  - — Worn rod small end
  - — Worn crankpin bearing

Hard to shift
- Shift fork bent
- Shift fork shaft bent
- Shift spindle claw bent
- Shift drum cam grooves damaged
- Shift fork guide pin damaged

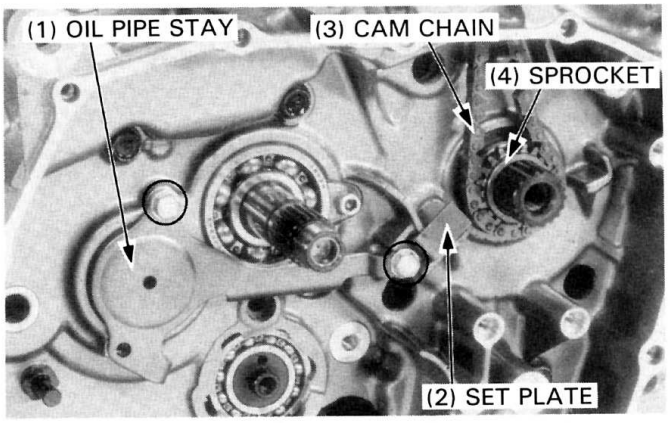
Transmission jumps out of gear
- Gear dogs worn
- Shift shaft bent
- Shift fork bent

CRANKCASE SEPARATION

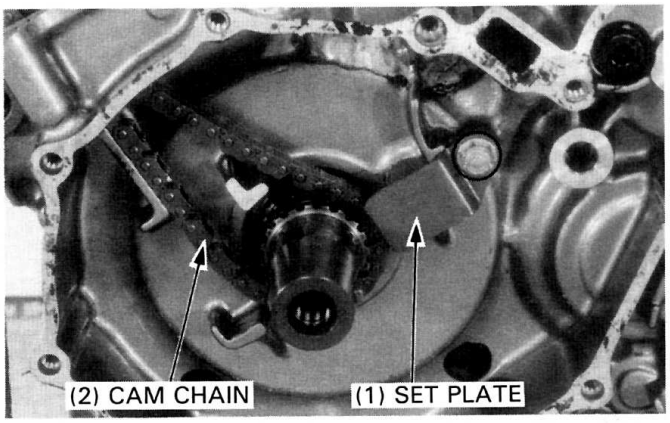
Remove the engine from the frame (Section 6).
Remove the oil filter.
Refer to the service information (page 11-1) for the parts that must be removed before the separating the crankcase.

Remove the oil pipe stay and cam chain tensioner set plate by removing the bolts.

Remove the rear cam chain and cam chain drive sprocket.



Remove the bolt and cam chain tensioner set plate.
Remove the front cam chain from the crankshaft.



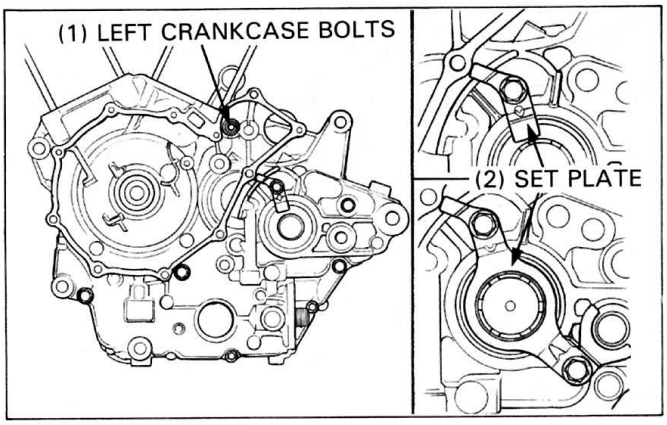
Remove the 8 mm bolts and 6 mm bolts from the left crankcase.

NOTE

- Remove the bolts in a crisscross pattern in 2 or 3 steps.
- Loosen the 6 mm bolts first, then loosen the 8 mm bolts.

'88 Only:
Remove the countershaft set plate bolt and the plate.

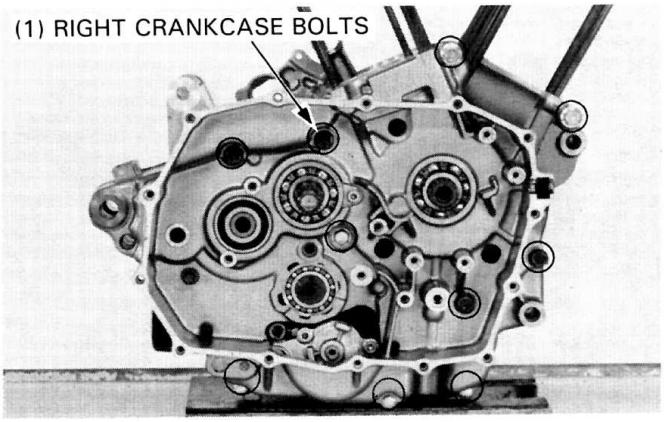
After '88:
Remove the countershaft set plate bolts (2 pcs.) and the plate.



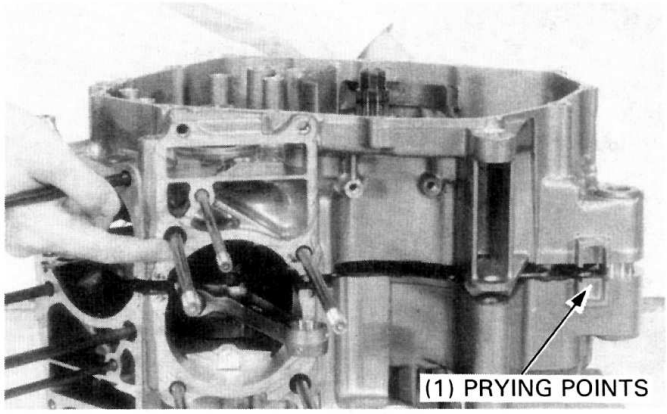
'88, After '88:
Remove the 8 mm bolts and 6 mm bolts from the right crankcase.

NOTE

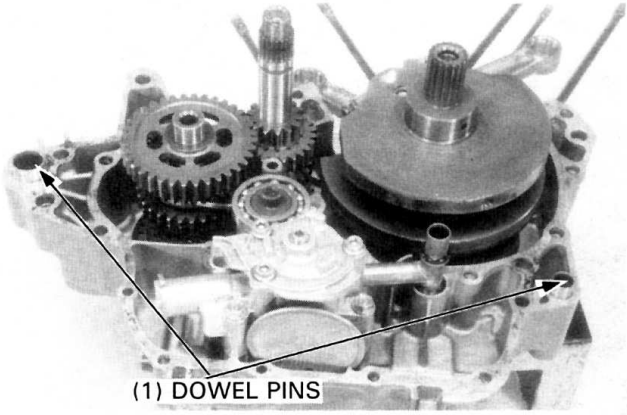
- Remove the bolts in a crisscross pattern in 2 or 3 steps.
- Loosen the 6 mm bolts first, then loosen the 8 mm bolts.



Place the left crankcase side down and separate the right crankcase from the left crankcase while prying where indicated at the points shown and tapping the cases at several locations with a soft hammer.



Remove the dowel pins and clean the crankcase halves of any sealant material.



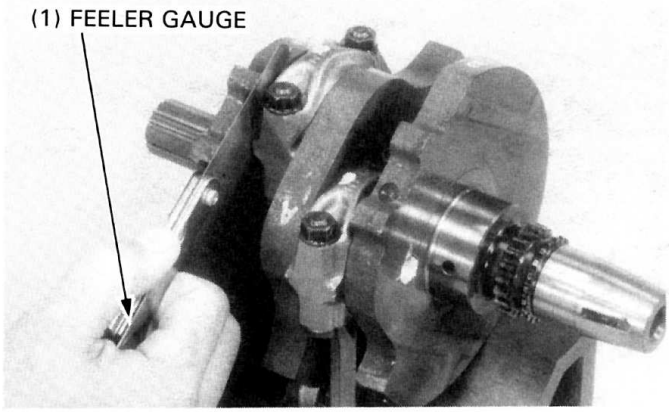
CRANKSHAFT/CONNECTING ROD

CRANKSHAFT SIDE CLEARANCE INSPECTION

Remove the crankshaft from the left crankcase.
Check the connecting rod side clearance with feeler gauge.

SERVICE LIMIT: 0.30 mm (0.012 in)

If either side clearance exceeds the service limit, replace the connecting rod and recheck.
If still beyond the limit, replace the crankshaft.
Inspect the crankshaft for rough spots or damage.



CONNECTING ROD DISASSEMBLY

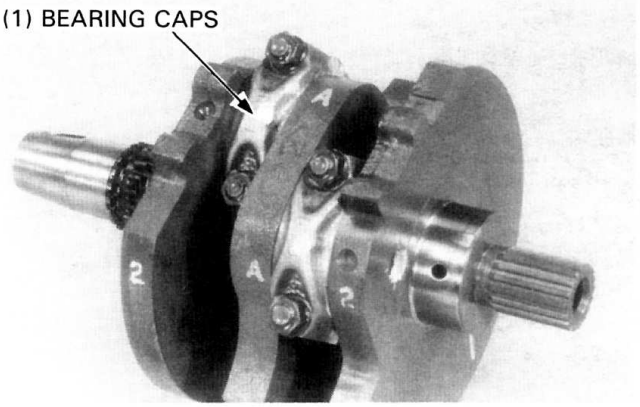
Remove the connecting rod bearing caps noting their locations.

NOTE

- Tap the side of the cap lightly if it is hard to remove.

CAUTION

- *Do not interchange the crankpin bearings. They must be installed in their original positions or the correct bearing oil clearance may not be obtained resulting in engine damage.*



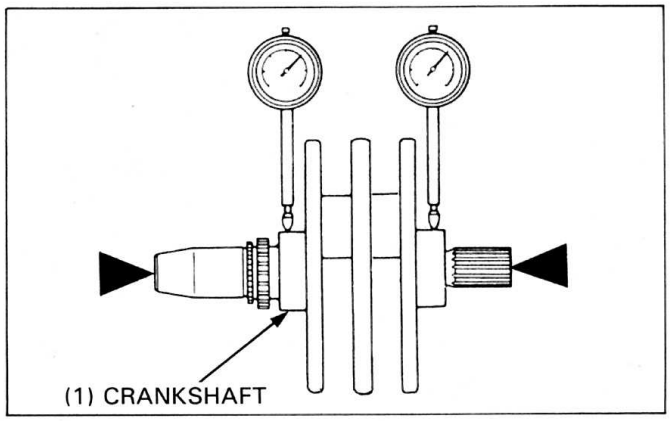
CRANKSHAFT RUNOUT INSPECTION

Place the crankshaft on a stand or V blocks.
Set a dial indicator on the main journals. Rotate the crankshaft two revolutions and read the runout.

SERVICE LIMIT: 0.05 mm (0.002 in)

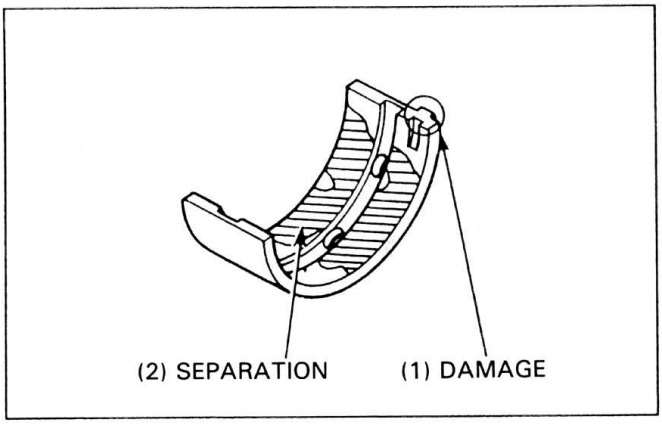
NOTE

- The crankshaft cannot be repaired. Replace it if the journals or crankpins are burnt, cracked, or if the runout is beyond limits.



CONNECTING ROD BEARING INSPECTION

Inspect the bearing inserts for damage or separation.
Clean all oil from the bearing inserts and crankpins.



OIL CLEARANCE INSPECTION

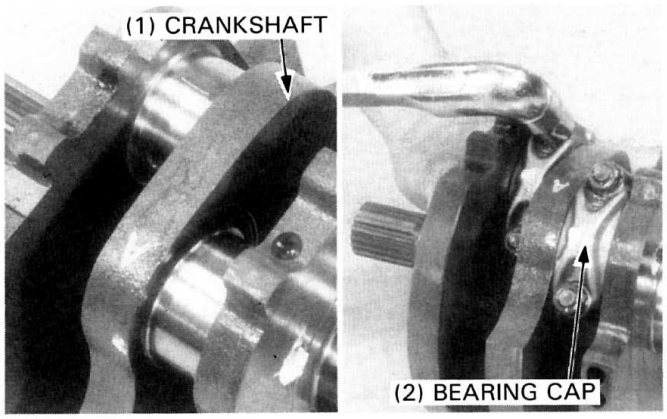
Put a piece of plastigauge on each crankpin avoiding the oil hole.

Install the bearing caps and rods on the correct crankpins, and tighten them evenly.

TORQUE: 34 N·m (3.4 kg-m, 25 ft-lb)

NOTE

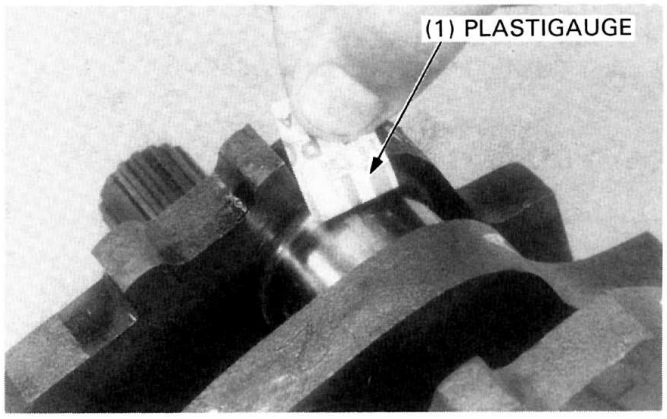
- Do not rotate the crankshaft during inspection.



Remove the caps and measure the compressed plastigauge at its widest point on each crankpin to determine the oil clearance.

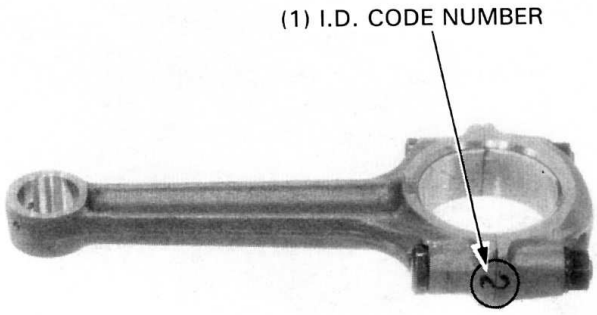
SERVICE LIMIT: 0.08 mm (0.003 in)

If the rod bearing clearance is beyond tolerance, select replacement bearings.

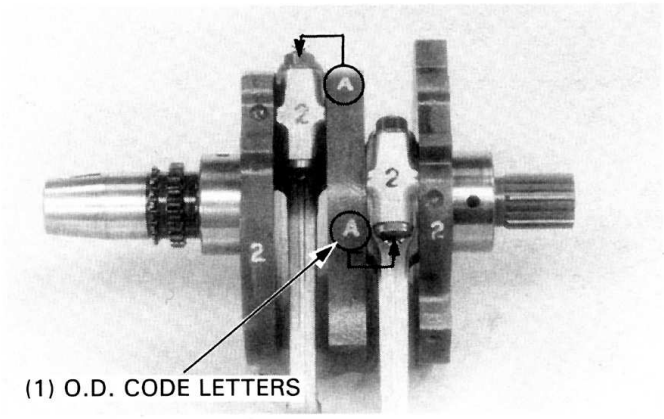


CONNECTING ROD BEARING SELECTION

Determine the connecting rod I.D. code number.
The code will be either a number 1 or 2 located on the rod in the area shown.

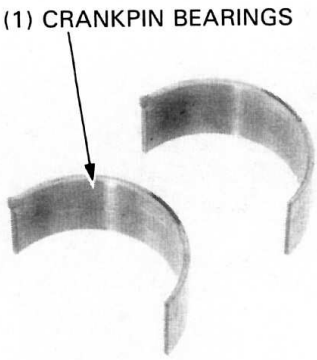


Determine the corresponding crankpin O.D. code (or measure the crankpin O.D.). The code will be either a letter A or B on the crank weight.



Cross reference the crankpin and connecting rod codes to determine the replacement bearing color.

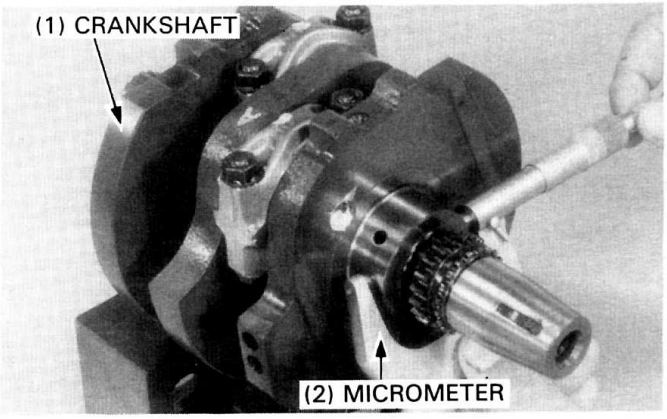
CRANKPIN O.D. CODE / CONNECTING ROD I.D. CODE		A	B
		39.982—39.990 mm (1.5741—1.5744 in)	39.974—39.983 mm (1.5738—1.5741 in)
1	43.000—43.008 mm (1.6929—1.6932 in)	C (BROWN)	B (BLACK)
2	43.008—43.016 mm (1.6932—1.6935 in)	B (BLACK)	A (BLUE)



BEARING INSERT THICKNESS
A (BLUE): 1.495—1.499 mm (0.0589—0.0590 in)
B (BLACK): 1.491—1.495 mm (0.0587—0.0589 in)
C (BROWN):1.487—1.491 mm (0.0585—0.0587 in)

MAIN BEARING INSPECTION

Measure the main journal O.D. and record it.

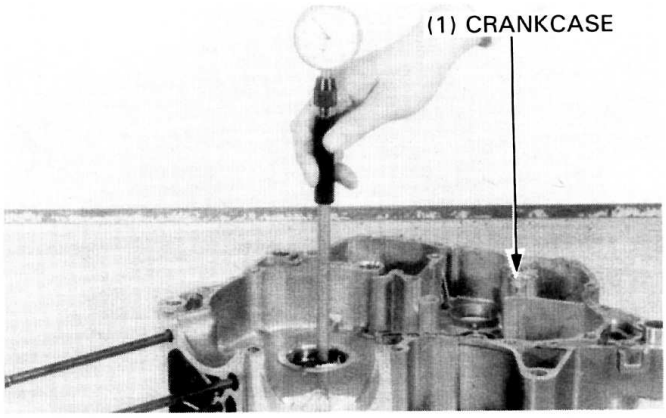


Measure the main journal bearing I.D. and record it.

Calculate the clearance between the main journal and the main bearing.

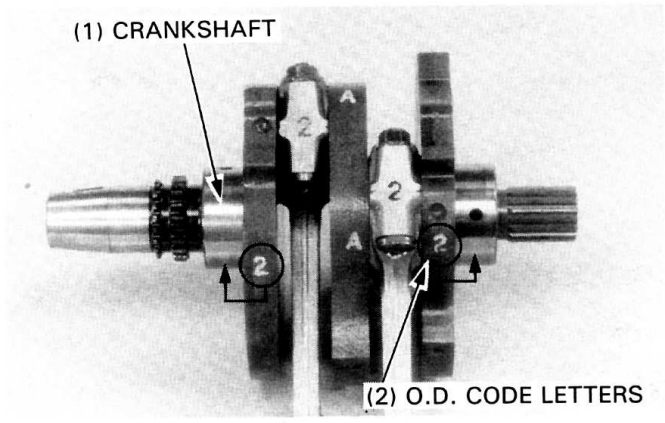
SERVICE LIMIT: 0.06 mm (0.002 in)

If the oil clearance is beyond the service limit, select a replacement bearings as follows:

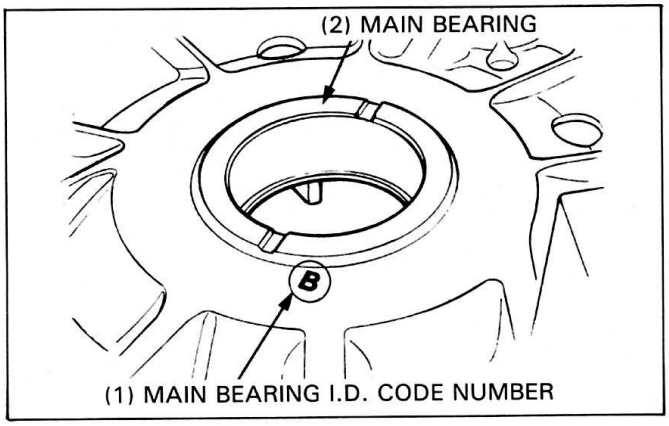


MAIN BEARING SELECTION

Determine the crankshaft main journal O.D. code. The code will be either a number 1 or 2 on the crank weight.



Determine the corresponding main bearing I.D. code. The code will be either a letter A or B on the crankcase.



Choose replacement main bearings in accordance with the table below.

			MAIN JOURNAL O.D. CODE [on crank weight]	
			1	2
			44.992—45.000 mm (1.7713—1.7717 in)	44.984—44.992 mm (1.7710—1.7713 in)
MAIN BEARING I.D. CODE [on crankcase]	A	48.990—49.000 mm (1.9287—1.9291 in)	C (BROWN)	B (BLACK)
	B	49.000—49.010 mm (1.9291—1.9295 in)	B (BLACK)	A (BLUE)

BEARING INSERT THICKNESS
A (BLUE): 2.003—2.013 mm (0.0789—0.0793 in)
B (BLACK): 1.998—2.008 mm (0.0787—0.0791 in)
C (BROWN): 1.993—2.003 mm (0.0785—0.0789 in)

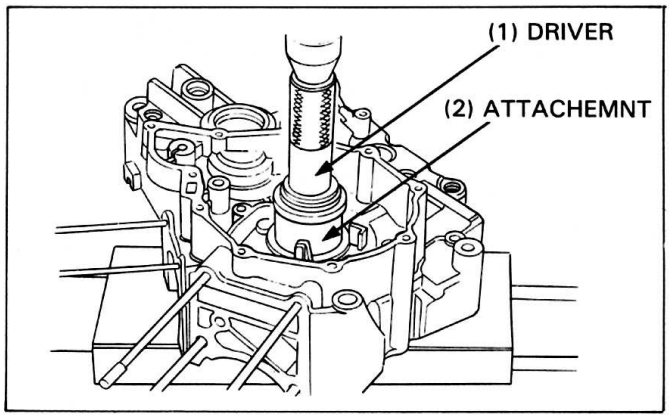
MAIN BEARING REPLACEMENT

Press the main bearing out of the crankcase using a hydraulic press and special tools.

NOTE

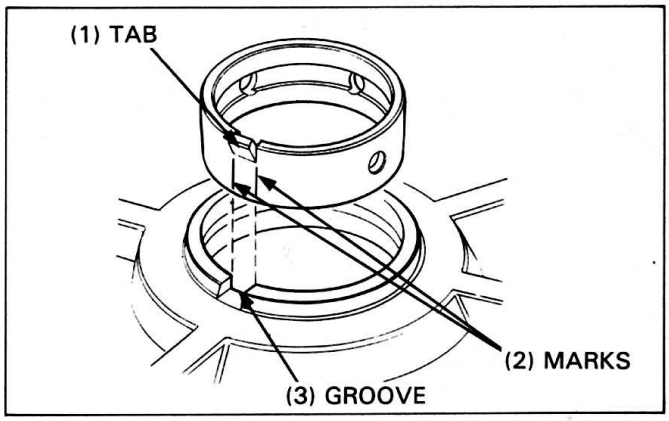
- Always use a press to remove the main bearing.

TOOLS:
Driver **07749–0010000**
Main bearing remover attachment **07HMF–MM90400**



Mark a vertical line below each side of the bearing tab.

Apply molybdenum disulfide grease to the outer surface of the main bearing.

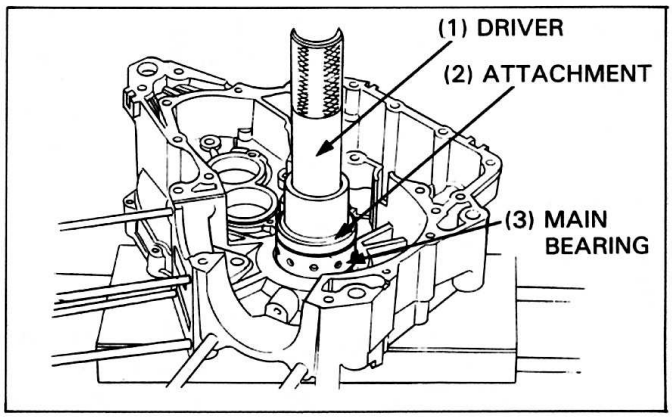


Align the marks on the bearing with the groove in the bearing hole, and press the main bearing into the crankcase.

CAUTION

- *Be careful not to damage the bearings.*

TOOLS:
Driver **07749–0010000**
Main bearing driver attachment **07HMF–MM90400**



CONNECTING ROD SELECTION

A letter stamped on the connecting rod is the code for the rod's weight.

When replacing the connectring rod, select the new rod by cross-matching the front and rear cylinder connecting rod weights using the selection table below.

NOTE

- The "O" mark in the table indicates that the matching is possible in the crossed codes.

SELECTION TABLE

Front rod code / Rear rod code	A	B	C	D
A	O	O		
B	O	O	O	
C		O	O	O
D			O	O