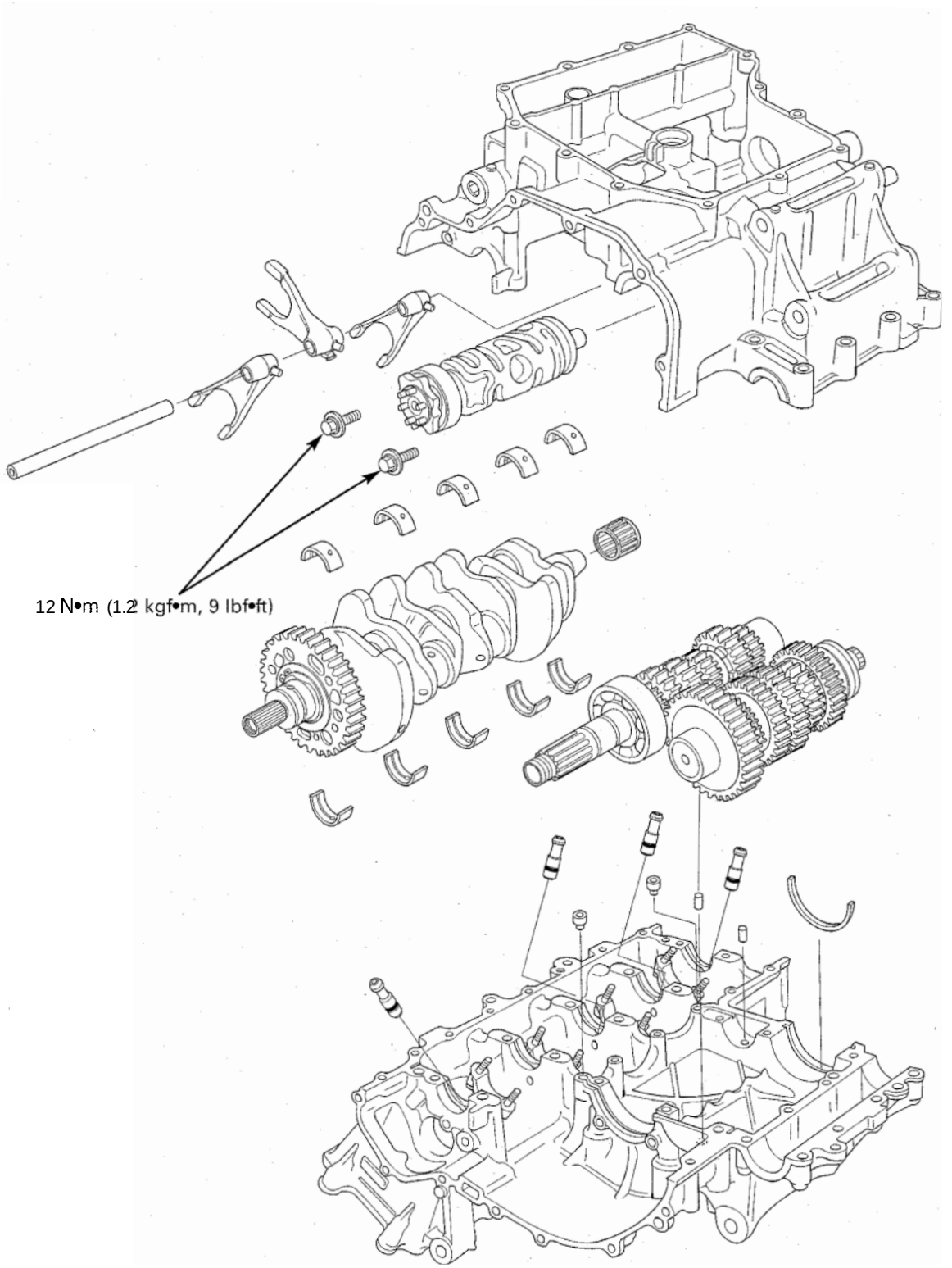

12 N•m (1.2 kgf•m, 9 lbf•ft)

12. CRANKSHAFT/TRANSMISSION

SERVICE INFORMATION

GENERAL

- The crankcase must be separated to service the crankshaft and transmission. Refer to section 11 for crankcase separation/assembly.
- Be careful not to damage the crankshaft main journal and journal bearing while removing or installing the crankshaft.
- Mark and store the disassembled parts to ensure that they are installed in their original locations.
- Mark and store the bearing inserts to ensure that the parts are in their correct locations during reassembly. If the inserts are improperly installed, they will block the oil holes, causing insufficient lubrication and eventual engine seizure.
- The main journal bearing inserts are a select fit and are identified by color codes. Select replacement bearings from the code tables. After installing new bearings, recheck them with a plastigauge to verify clearance. Apply molybdenum disulfide oil to the main journal during assembly.

SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Crankshaft	Side clearance		0.05 – 0.20 (0.002 – 0.008)	0.30 (0.012)
	Runout		—	0.30 (0.012)
	Main journal oil clearance		0.017 – 0.035 (0.0007 – 0.0014)	0.045 (0.0018)
Transmission	Gear I.D.	M5, M6	31.000 – 31.025 (1.2205 – 1.2215)	31.04 (1.222)
		C1	26.000 – 26.021 (1.0236 – 1.0244)	26.04 (1.025)
		c2, C3, C4	33.000 – 33.025 (1.2992 – 1.3002)	33.04 (1.301)
	Bushing O.D.	M5, M6	30.950 – 30.975 (1.2185 – 1.2195)	30.93 (1.218)
		C3, 4	32.950 – 32.975 (1.2972 – 1.2982)	32.93 (1.296)
	Bushing I.D.	M5	27.985 – 28.006 (1.1018 – 1.1026)	28.02 (1.103)
		C2	29.985 – 30.006 (1.1805 – 1.1813)	30.02 (1.182)
	Gear-to-bushing clearance	M5, M6	0.025 – 0.075 (0.0010 – 0.0030)	0.11 (0.004)
		c3, c4	0.025 – 0.075 (0.0010 – 0.0030)	0.11 (0.004)
	Mainshaft O.D.	M5	27.967 – 27.980 (1.1011 – 1.1016)	27.957 (1.1007)
		Clutch outer guide	24.980 – 24.993 (0.9835 – 0.9840)	24.96 (0.983)
	Countershaft O.D.	C2	29.967 – 29.980 (1.1798 – 1.1803)	29.96 (1.180)
	Bushing-to-shaft clearance	M5	0.005 – 0.039 (0.0002 – 0.0015)	0.08 (0.003)
		C2	0.005 – 0.039 (0.0002 – 0.0015)	0.08 (0.003)

TORQUE VALUES

Connecting rod bearing cap nut	35 N•m (3.6 kgf•m, 26 lbf•ft)	Apply oil to the threads and seating surface
Crankcase 9 mm bolt (main journal bolt)	See page 12-7	

TOOLS

Inner driver, 40 mm I.D.	07746–0030100
Attachment, 25 mm	07746–0030200
Driver shaft	07964–MB00200

TROUBLESHOOTING

Excessive noise
- Worn connecting rod big end bearing
- Bent connecting rod
- Worn crankshaft main journal bearing
- Worn transmission bearing

Hard to shift
- Improper clutch operation
- Incorrect transmission oil weight
- Incorrect clutch adjustment
- Bent shift fork
- Bent fork shaft
- Bent fork claw
- Damaged shift drum cam groove
- Bent shift spindle

Transmission jumps out of gear
- Worn gear dogs and slots
- Bent fork shaft
- Broken shift drum stopper
- Worn or bent shift forks
- Broken shift linkage return spring

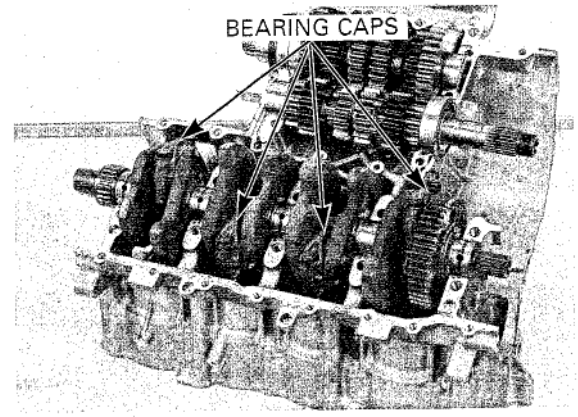
Engine vibration
- Excessive crankshaft runout

CRANKSHAFT

REMOVAL

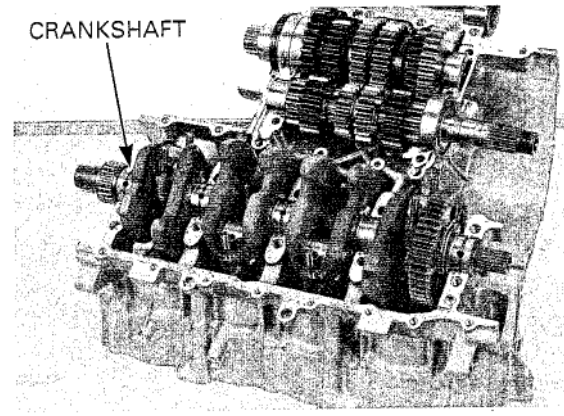
Separate the crankcase halves (page 11-3).

Remove the connecting rod bearing cap nuts and bearing caps.

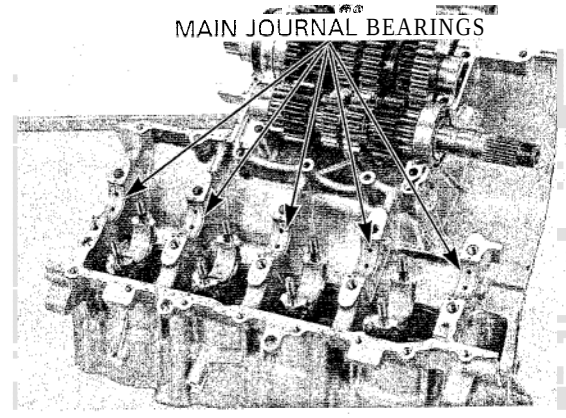


Before removal position all the pistons at TDC (Top Dead Center) to prevent damaging the crankpin with the connecting rod bolt threads

Remove the crankshaft.



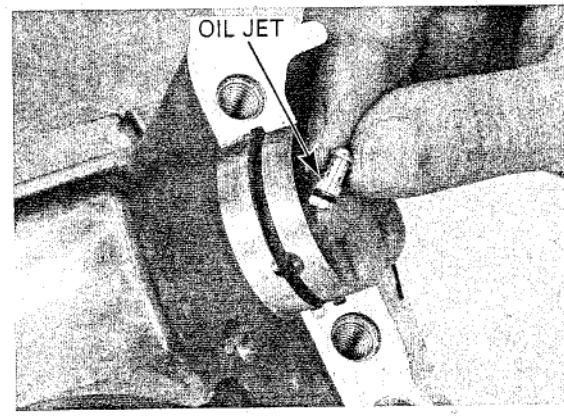
Remove the main journal bearings from both the crankcases.



Remove the crankshaft oil jets from the upper crankcase.

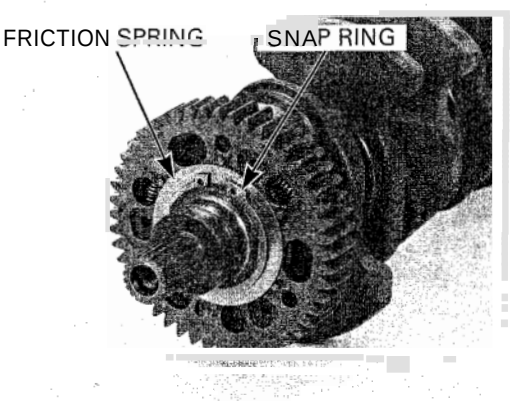
Always replace the O-ring when the oil jets are removed.

Inspect the oil jets for clogs, and replace if necessary.

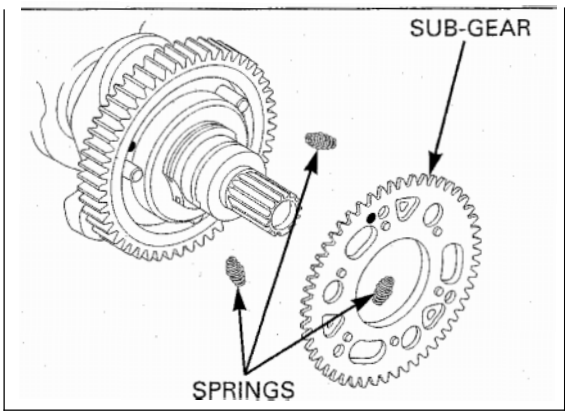


PRIMARY DRIVE SUB-GEAR REMOVAL

Remove the special snap ring and friction spring.



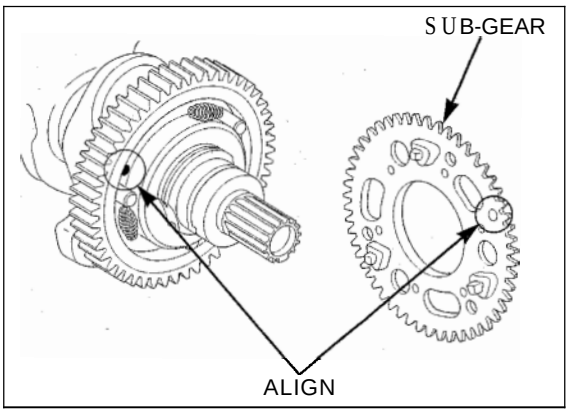
Remove the primary drive sub-gear and springs.



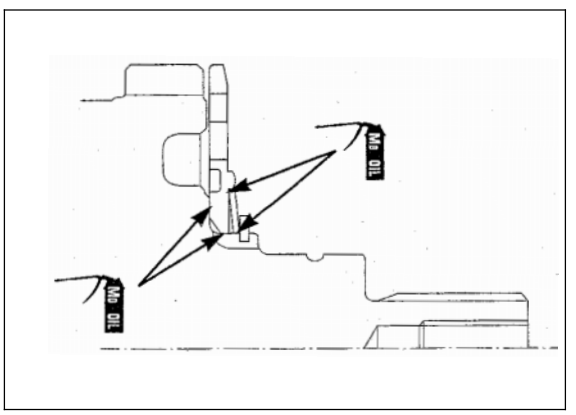
PRIMARY DRIVE SUB-GEAR INSTALLATION

Install the springs into the primary drive gear as shown.

Install the primary drive sub-gear onto the primary drive gear, aligning the holes between the gear.



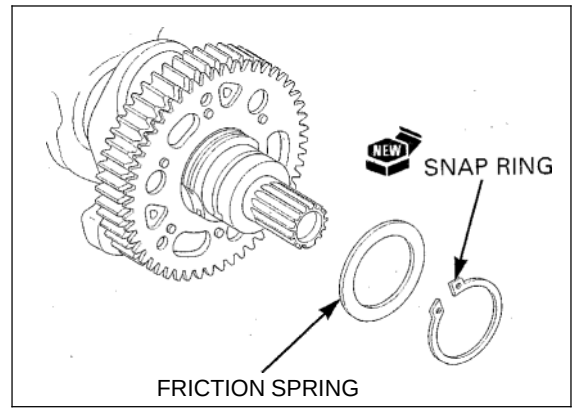
Apply molybdenum disulfide oil to the area shown in the illustration.



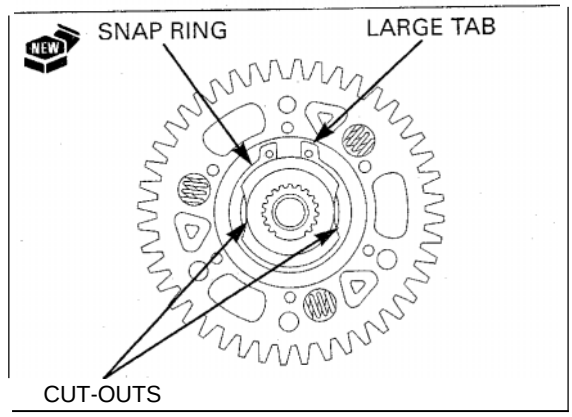
Install the friction spring and new special snap ring.

NOTICE

You must use a new special snap ring. Using a snap ring other than specified or reusing the original snap ring can cause severe engine damage.



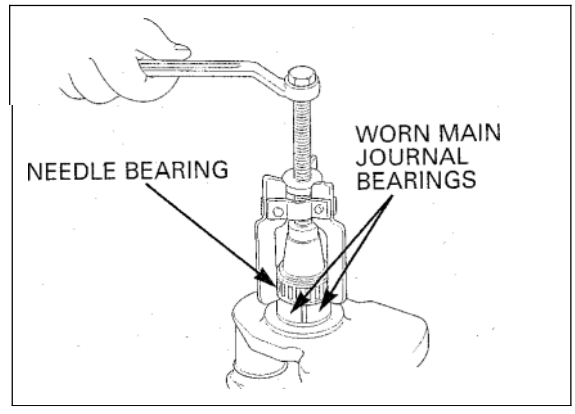
- install a new special snap ring with its large tab facing to the right and the chamfered side facing in.
- Make sure the new special snap ring end gap is aligned with the right angle of the crankshaft cut-outs as shown.



STARTER CLUTCH NEEDLE BEARING REPLACEMENT

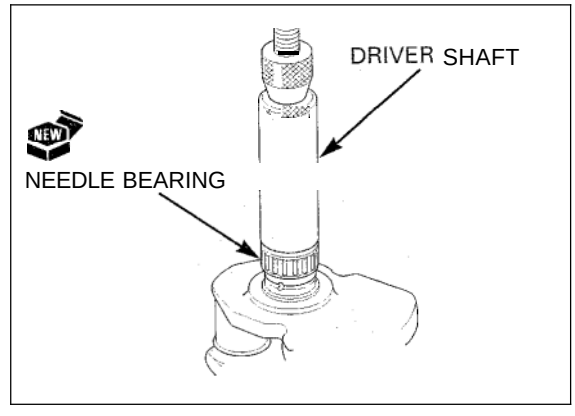
To protect the crankshaft main journal from the bearing puller claws, cover the main journal properly, worn main journal bearings are usable as protectors

Remove the needle bearing with a commercially available universal bearing puller.

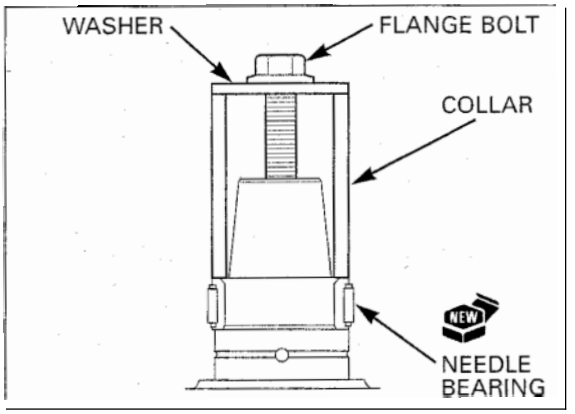


Press a new needle bearing onto the crankshaft using a hydraulic press and special tool.

TOOL:
Driver shaft **07964-NIB00200**



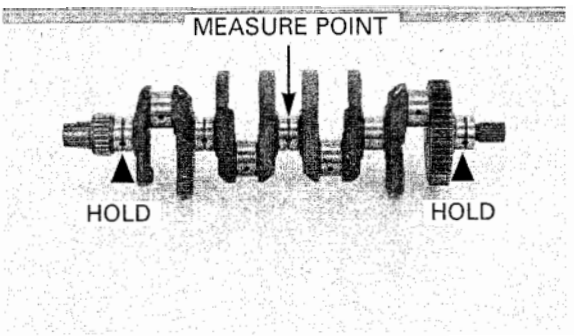
If the special tool is not available, prepare a suitable collar, washer and 10 mm flange bolt (example; flywheel bolt) for the bearing installation.
Assemble the above items, and screw the bolt gradually, until the new needle bearing is properly installed.



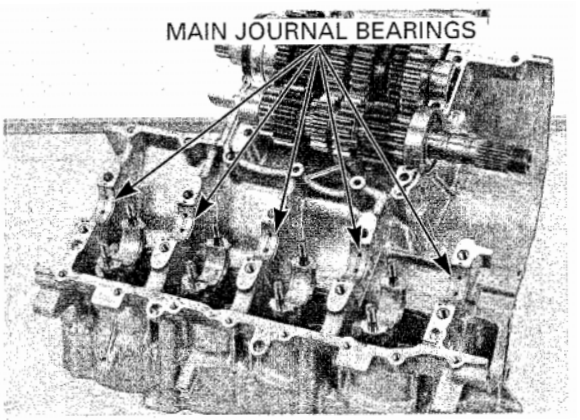
INSPECTION

CRANKSHAFT RUNOUT
Support the crankshaft on both ends.
Set a dial indicator on the center main journal of the crankshaft.
Rotate the crankshaft two revolutions and read runout at the center journal.

SERVICE LIMIT: 0.30 **mm (0.012 in)**

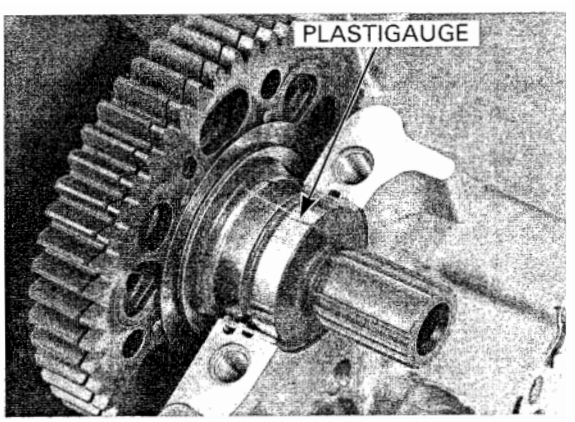


MAIN JOURNAL BEARING
Inspect the main journal bearing inserts for damage or separation.



Wipe the oil from the bearing inserts and journals.
Reinstall the upper crankcase's main journal bearing inserts, then carefully lower the crankshaft in place.
Put a piece of plastigauge on each journal.

- Do not put the plastigauge over the oil hole in the main bearing journal of the crankshaft.
- Do not rotate the crankshaft during inspection.



Assemble the crankcase halves.

PLASTIC REGION TIGHTENING METHOD:
Install the removed main journal 9 mm bolts.

Tighten the main journal 9 mm bolts as follow:

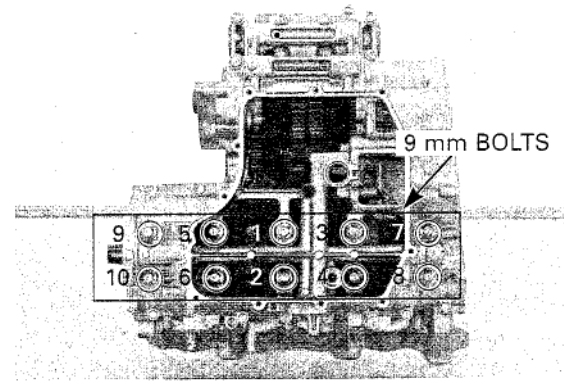
Tighten the 9 mm bolts in numerical order in the illustration to the following torque.

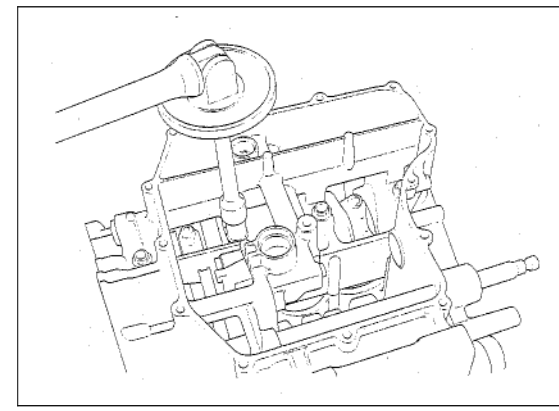
TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)

Retighten the 9 mm bolts in the same order above to the following torque.

TORQUE: 20 **N·m (2.0 kgf·m, 14 lbf·ft)**

Further tighten the 9 mm bolts 150 degrees.

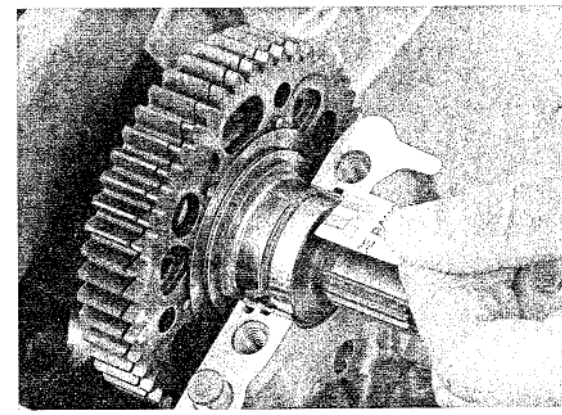




Remove the 9 mm bolts and lower crankcase.
Measure the compressed plastigauge on each journal.

SERVICE LIMIT: **0.045 mm (0.0018 in)**

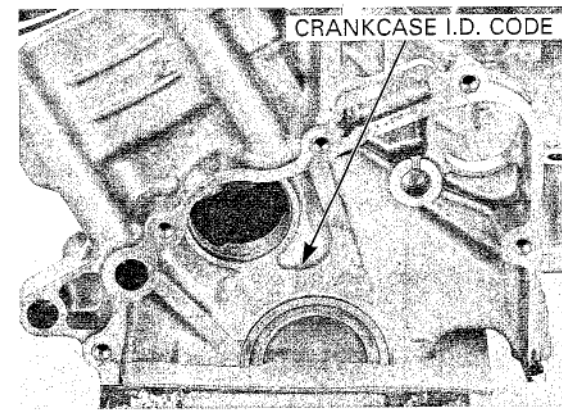
If main bearing clearance is beyond tolerance, select a replacement bearing.



MAIN JOURNAL BEARING SELECTION

The letters (A, B or C) on the upper crankcase are the codes for the main journal I D s from left to right

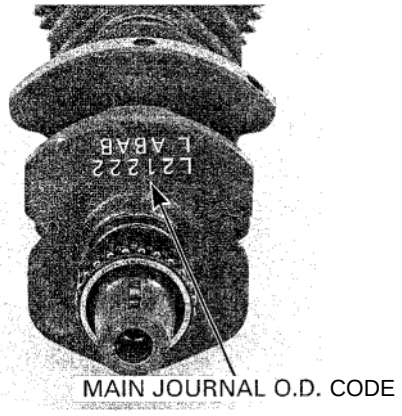
Record the crankcase I.D. letters from the pad on the left side of the upper crankcase as shown.



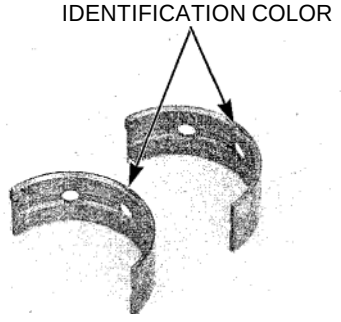
The numbers (0, 1, 2 or 3) on the crank weiaht are the codes for the main journal O D s from left to right

Record the corresponding main journal O.D. code numbers from the crank weight.

Cross reference the case and journal codes to determine the replacement bearing color codes.



BEARING THICKNESS:
B (Brown): Thick
C (Green):
D (Yellow):
E (Pink):
F (Red):
G (White): Thin



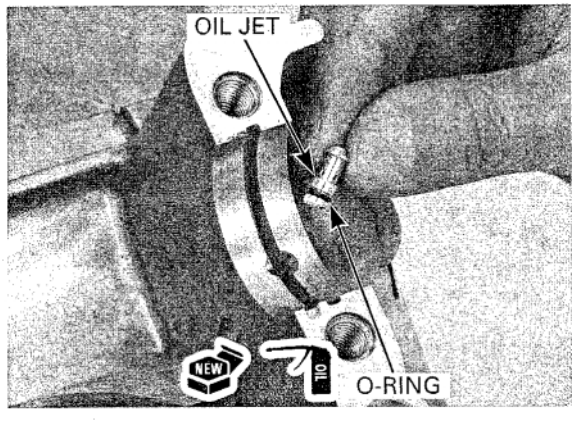
NOTICE

After selecting new bearings, recheck the clearance with a plastigauge. Incorrect clearance can cause severe engine damage.

			B	C
MAIN JOURNAL O.D. CODE	0	(White)	(Red)	
	1	F (Red)	E (Pink)	D (Yellow)
	2	E (Pink)	D (Yellow)	C (Green)
	3	D (Yellow)	C (Green)	B (Brown)

INSTALLATION

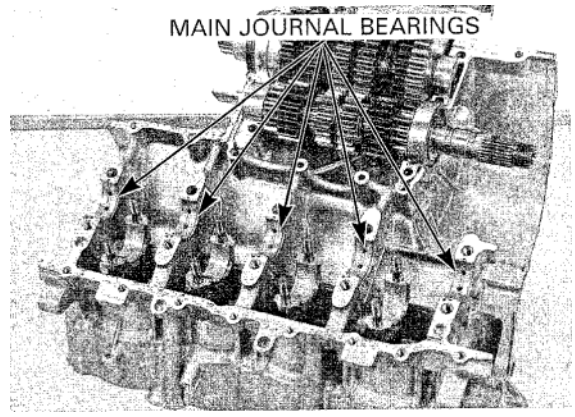
Apply engine oil to the new O-ring and install it to the oil jet.
Install the crankcase oil jets into the lower crankcase main journal.



The bearing tabs should be aligned with the grooves in the case.

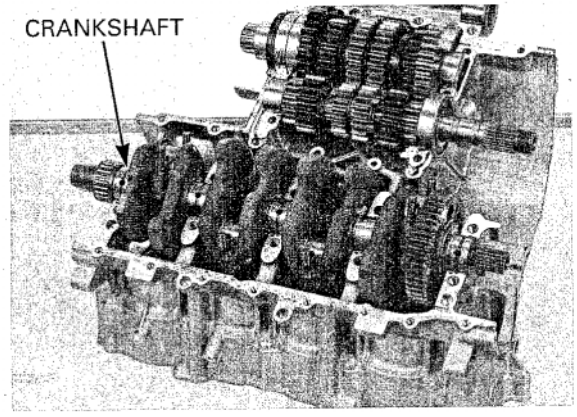
Install the main journal bearings into the upper and lower crankcase.

Apply 'molybdenum disulfide oil to the upper and lower main journal bearings.



Before installation, position all the pistons at TDC (Top Dead Center) to prevent damaging the crankpin with the connecting rod threads

Install the crankshaft.



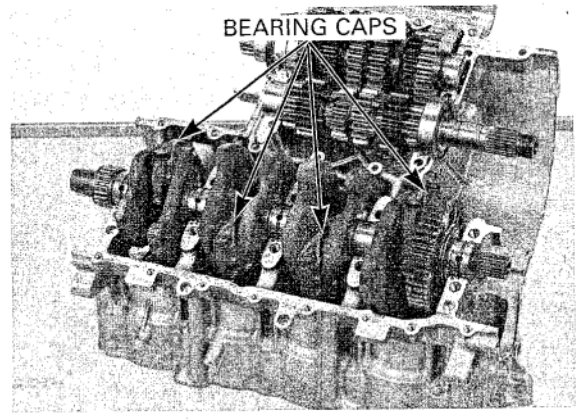
Install the connecting rod bearing caps.

Apply oil to the connecting rod bearing cap nut threads and seating surfaces.

Install and tighten the nuts gradually and alternately.

TORQUE: 35 N•m (3.6kgf•m, 26 lbf•ft)

Assemble the upper and lower crankcase (page 11-12).

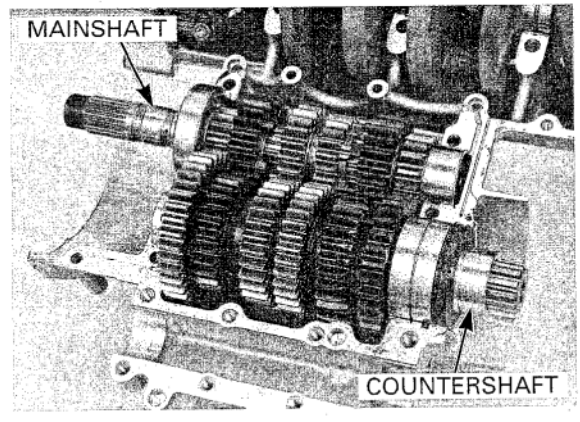


TRANSMISSION

REMOVAL/DISASSEMBLY

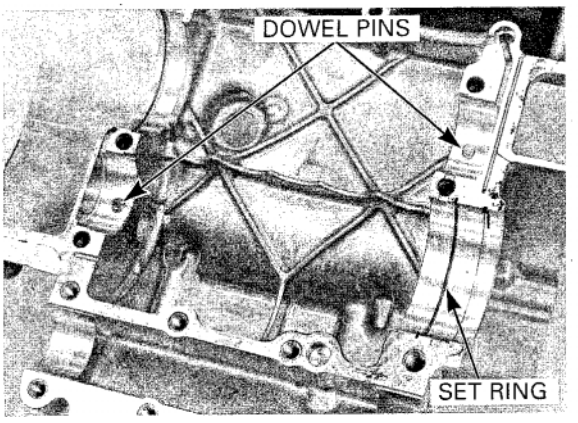
Separate the crankcase halves (page 11-3).

Remove the mainshaft and countershaft as an assembly.



Remove the dowel pins and countershaft bearing set ring.

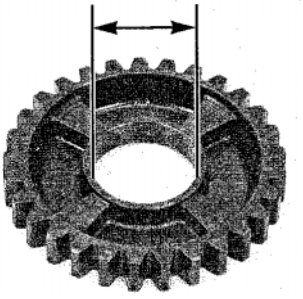
Disassemble the mainshaft and countershaft.



Check the gear dogs, dog holes and teeth for abnormal wear or lack of lubrication.
Measure the I.D. of each gear.

SERVICE LIMITS:

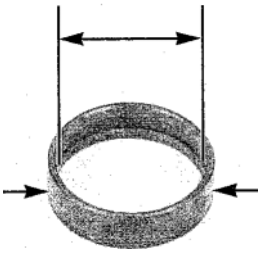
M5, M6:	**31.04 mm**	**1.222 in)**
C1:	**26.04 mm**	**1.025 in)**
C2, C3, C4:	**33.04 mm**	**1.301 in)**



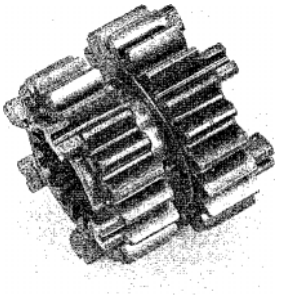
Measure the I.D. and O.D. of each gear bushing.

SERVICE LIMITS:

O.D.:	**M5, M6:**	**30.93 mm (1.218 in)**
	C3, C4:	**32.93 mm (1.296 in)**
I.D.:	**M5:**	**28.02 mm (1.103 in)**
	C2:	**30.02 mm (1.182 in)**



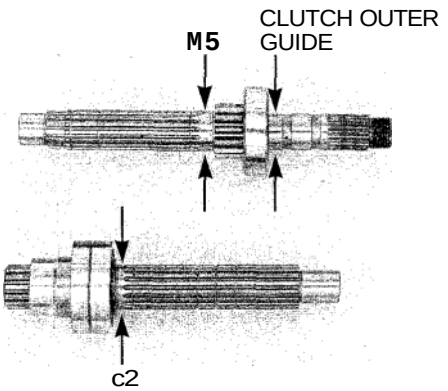
Check the shift fork groove of the shifter gear for excessive wear or damage.



Measure the O.D. of the mainshaft and countershaft.

SERVICE LIMITS:

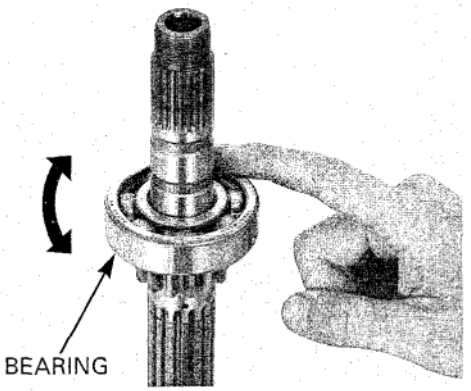
M5:	**27.957 mm (1.1007 in)**
Clutch outer guide:	**24.96 mm (0.983 in)**
c2:	**29.96 mm (1.180 in)**



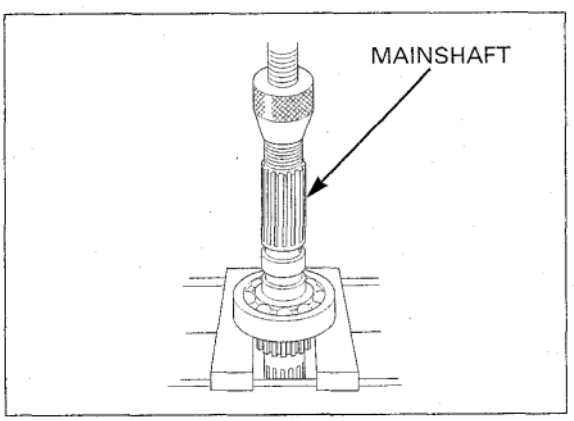
Do not try to remove the countershaft bearing from the shaft If the bearing is worn or damaged, replace the countershaft as an assembly.

BEARING REPLACEMENT

Turn the outer race of each bearing with your finger. The bearings should turn smoothly and quietly.
Also check that the bearing inner race fits tightly on the shaft.
Remove and discard the mainshaft bearing, if the race does not turn smoothly, quietly, or fits loosely on the mainshaft.
Replace the countershaft, collar, and bearing as an assembly, if the race does not turn smoothly, quietly, or fits loosely on the countershaft.



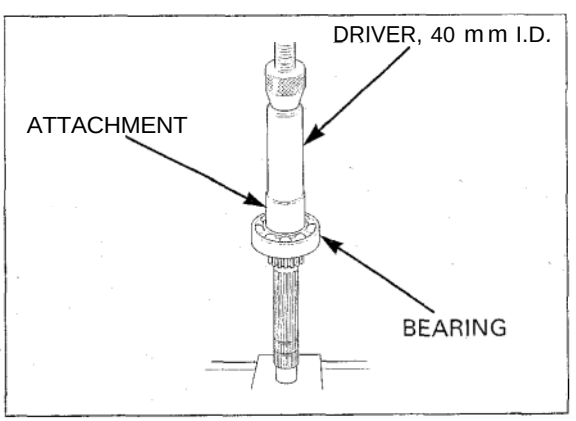
Press out the mainshaft from the bearing using a hydraulic press.



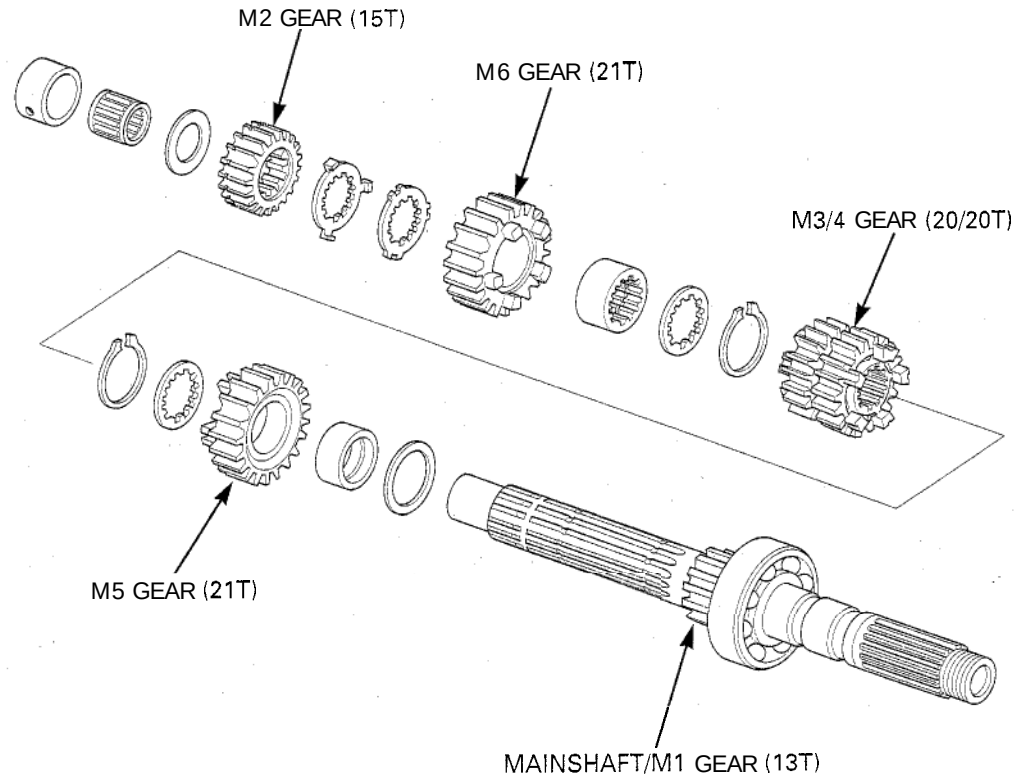
Install a new mainshaft bearing onto the mainshaft by pressing the mainshaft bearing inner race using the special tool.

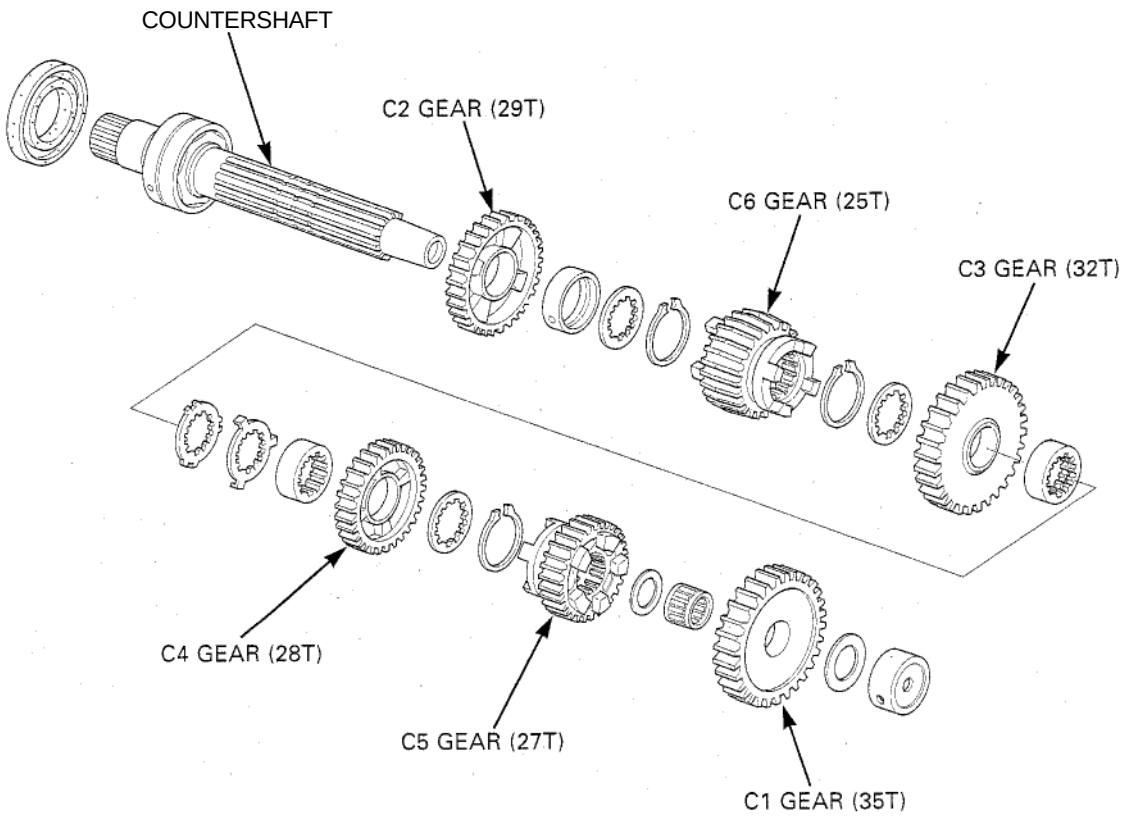
TOOLS:

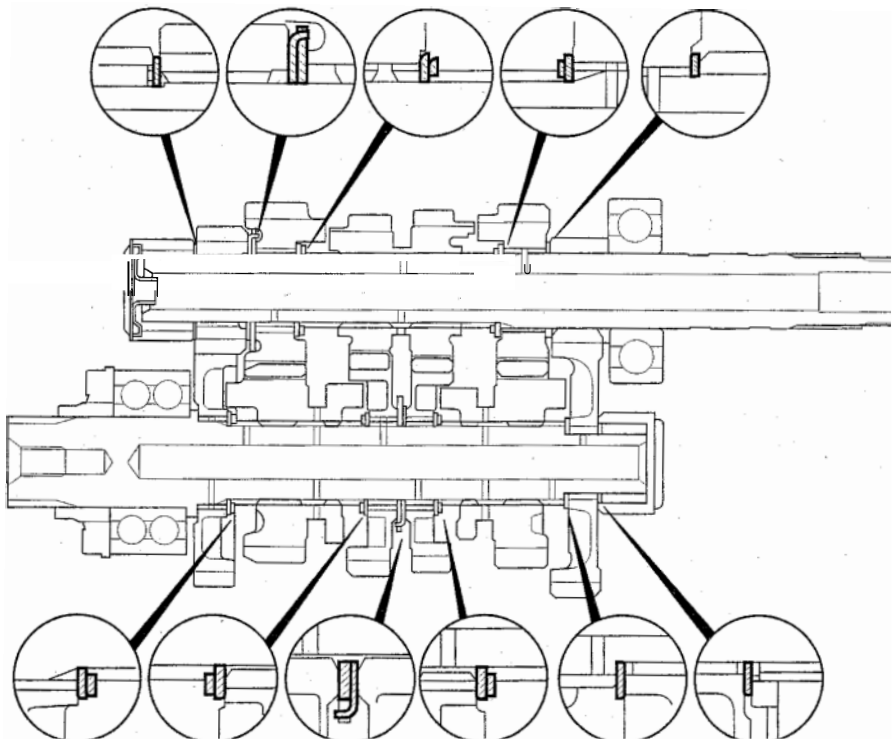
Inner driver, 40 mm I.D.	**07746–0030100**
Attachment, 25 mm	**07746–0030200**



ASSEMBLY

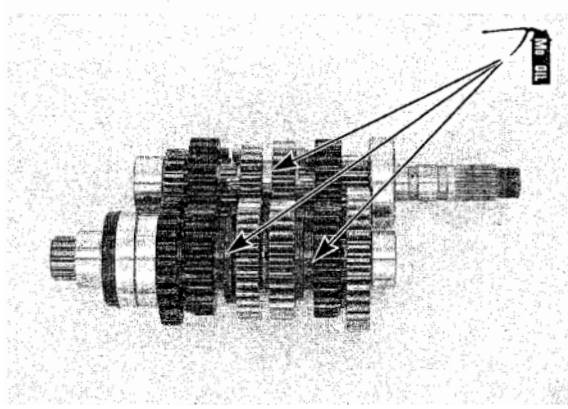

M2 GEAR (15T)
M6 GEAR (21T)
M3/4 GEAR (20/20T)
M5 GEAR (21T)
MAINSHAFT/M1 GEAR (13T)


COUNTERSHAFT
C2 GEAR (29T)
C6 GEAR (25T)
C3 GEAR (32T)
C4 GEAR (28T)
C5 GEAR (27T)
C1 GEAR (35T)



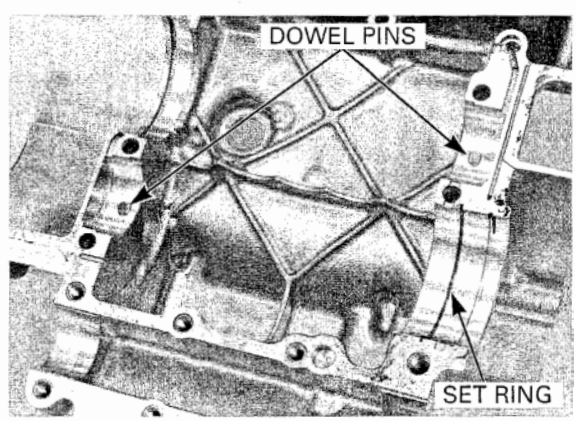
Assemble the transmission gear and shafts.
Coat each gear with clean engine oil and check for smooth movement.

Apply molybdenum disulfide oil to the shift fork grooves in the M3/4, C5 and C6 gear.

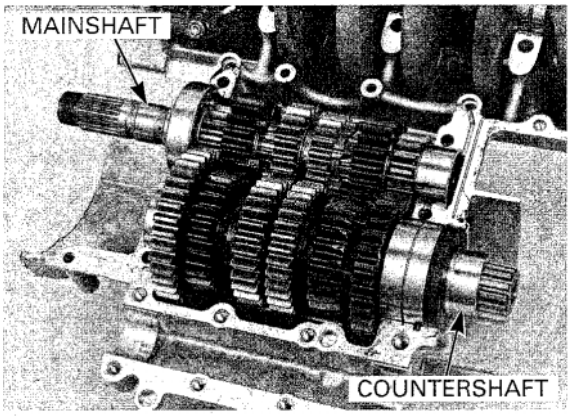


INSTALLATION

Install the dowel pins in the upper crankcase holes.
Install the countershaft bearing set ring into the upper crankcase groove.



Install the mainshaft and countershaft by aligning the countershaft bearing groove with the set ring on the crankcase, and aligning the bearing cap holes with the dowel pins.



Also align the countershaft bearing stopper pin with the groove in the crankcase.

Assemble the crankcase (page 11-12).