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SERVICE INFORMATION

GENERAL INSTRUCTIONS

- The gearshift spindle and stopper arms can be serviced with the engine in the frame.
- The outline of the shift forks and drum can be inspected by removing the oil pan. If the shift forks, drum or transmission require servicing, remove the engine and separate the crankcases.

TORQUE VALUES

Stopper arm shaft	8–12 N·m (0.8–1.2 kg-m, 6– 9 ft-lb)
Neutral switch	11–15 N·m (1.1–1.5 kg-m, 8–11 ft-lb)
Oil drain bolt	28–32 N·m (2.8–3.2 kg-m, 20–23 ft-lb)

TROUBLESHOOTING

Hard to Shift

1. Improper clutch adjustment; too much free play
2. Shift forks bent
3. Shift shaft bent
4. Shift claw bent
5. Shift drum cam grooves damaged

Transmission Jumps Out of Gear

1. Gear dogs worn
2. Shift shaft bent
3. Shift drum stopper broken
4. Shift forks bent

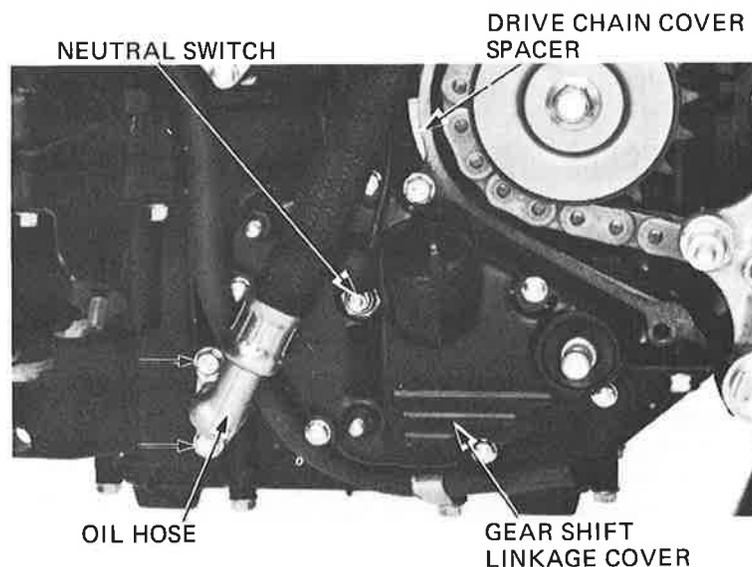
GEARSHIFT PEDAL AND LINKAGE REMOVAL

Drain engine oil.

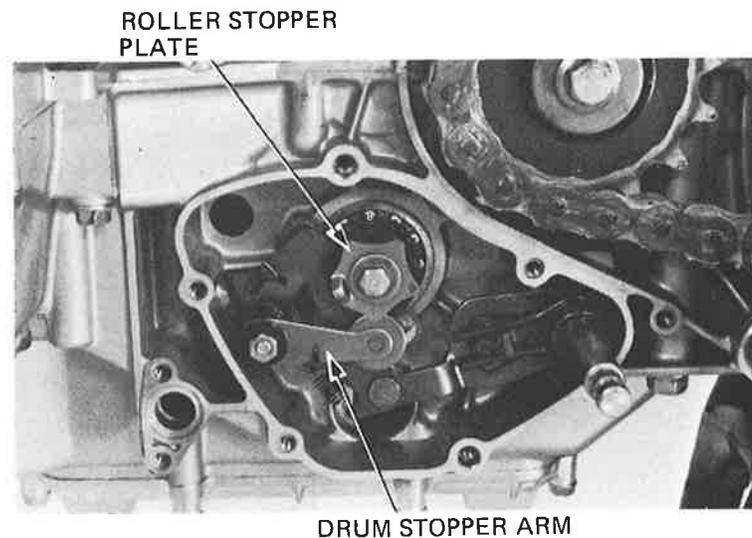
Remove the left exhaust pipes.
 Remove the oil hose cover.
 Remove the gear shift pedal.
 Remove the drive sprocket cover.



Remove the oil hose.
 Disconnect the neutral switch lead.
 Remove the drive sprocket and gear shift linkage covers.
 Remove the gasket and dowel pins.
 Remove the drive chain cover spacer.

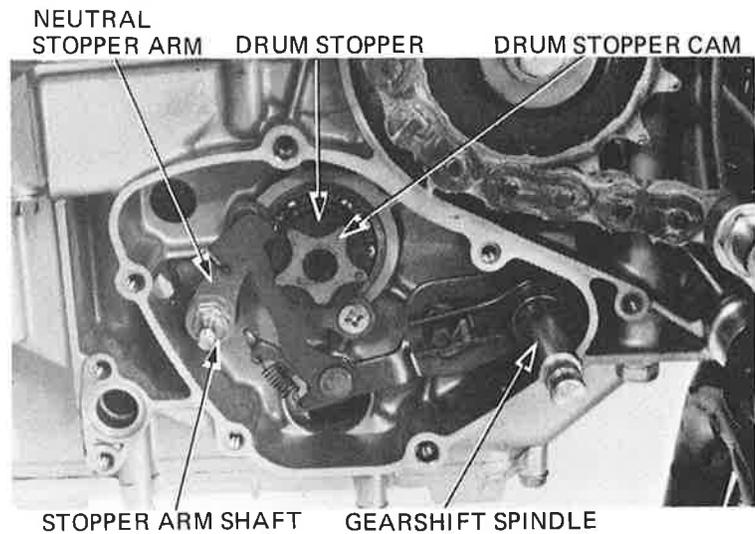


Remove the roller stopper plate bolt and plate.
 Remove the drum stopper arm nut, arm and spring.



Remove the gearshift spindle assembly.
 Remove the drum stopper cam and drum stopper.
 Loosen the stopper arm shaft.
 Remove the neutral stopper arm and spring.

If bearing removal is necessary, remove the bearing stopper plate.



NEUTRAL SWITCH INSPECTION

Check the switch operation.
 Check the neutral switch for continuity between the top and bottom terminals, when pressing the end terminal.
 The switch is normal if there is continuity. Also check for shorts between the top terminal and any ground.
 Replace the switch if there is continuity.

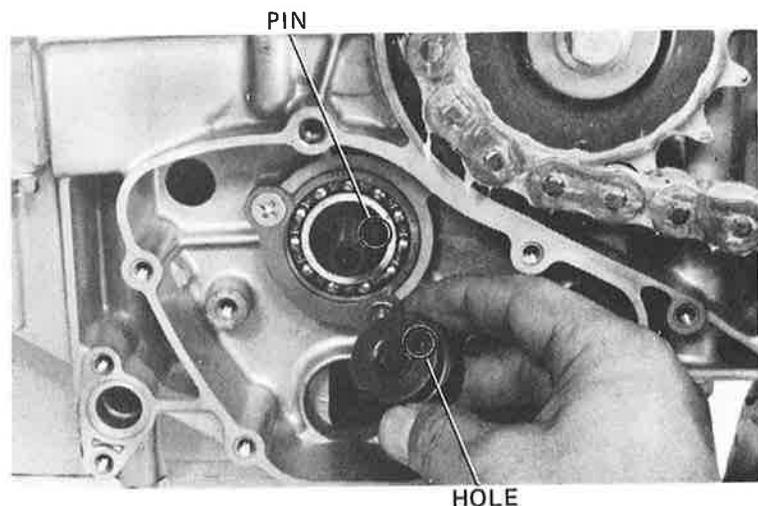


GEARSHIFT LINKAGE INSTALLATION

Align the hole in the drum stopper with the pin on the shift drum.

NOTE

If bearing replacement is necessary, apply locking agent to the threads of the screws.



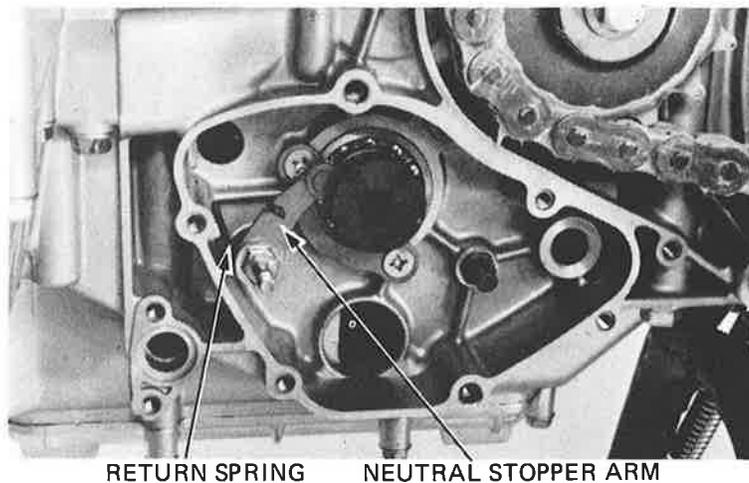


Install the stopper arm shaft, neutral stopper arm and return spring.

TORQUE:

8–12 N·m (0.8–1.2 kg-m, 6–9 ft-lb)

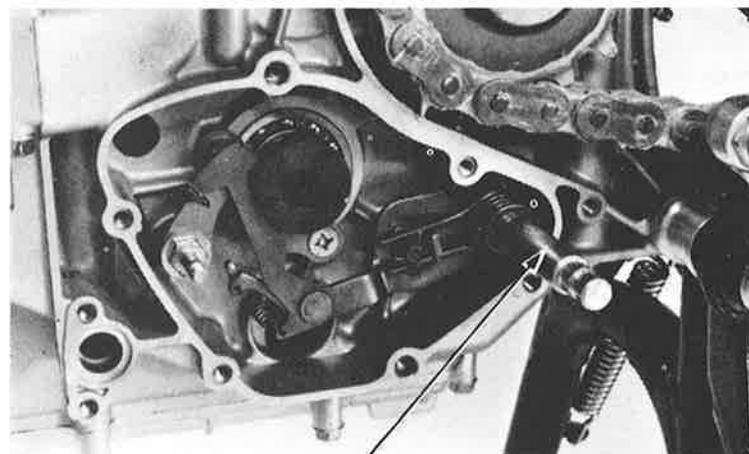
Make sure that the roller on the neutral stopper arm is positioned correctly in the groove of the drum stopper.



RETURN SPRING

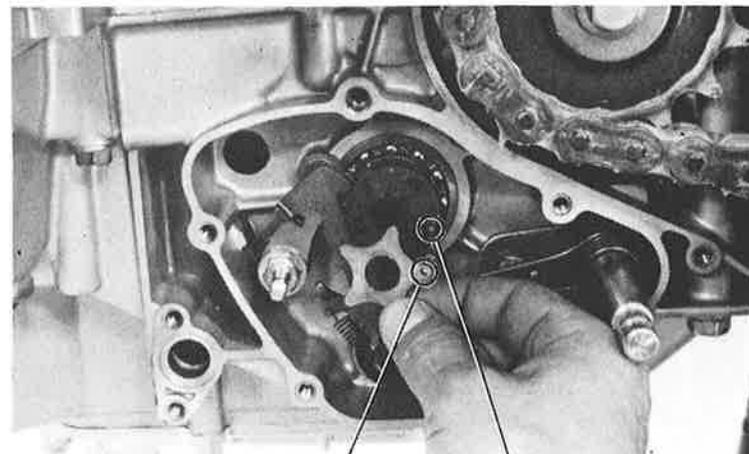
NEUTRAL STOPPER ARM

Assemble the gearshift spindle, return spring and snap ring.
Install as shown.



GEAR SHIFT SPINDLE

Align the hole in the drum stopper cam with the pin on the drum stopper.

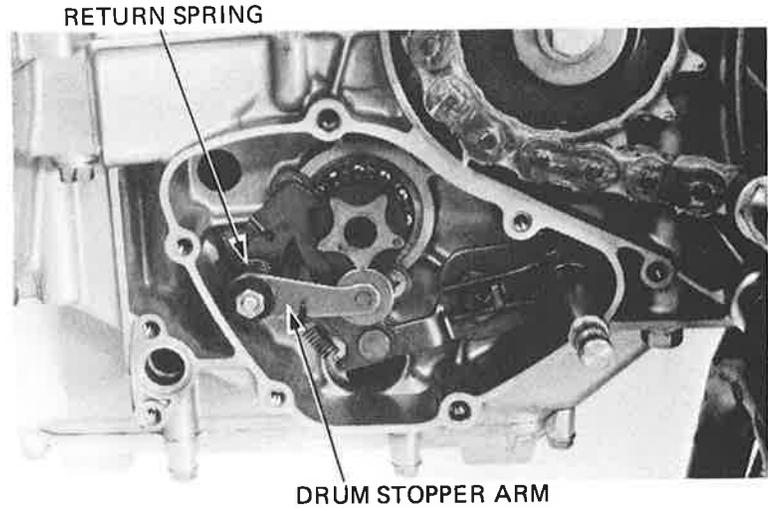


HOLE

PIN



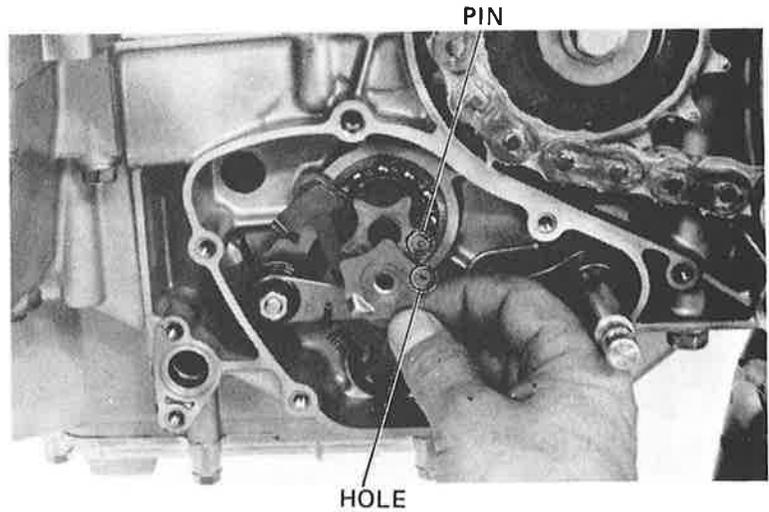
Install the drum stopper arm and return spring.



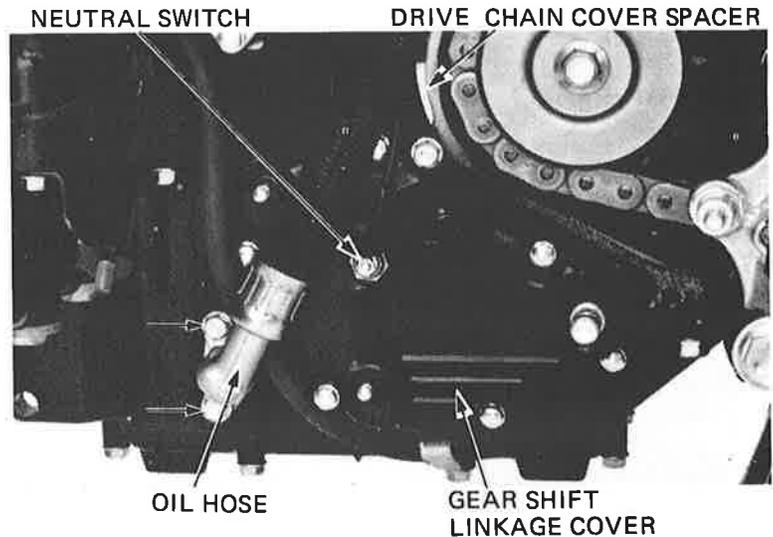
Align the hole in the roller stopper plate with the pin on the drum stopper cam.

Apply a locking agent to the bolt.
Tighten the stopper plate bolt securely.

Check the linkage for smooth operation by rotating the gearshift spindle.



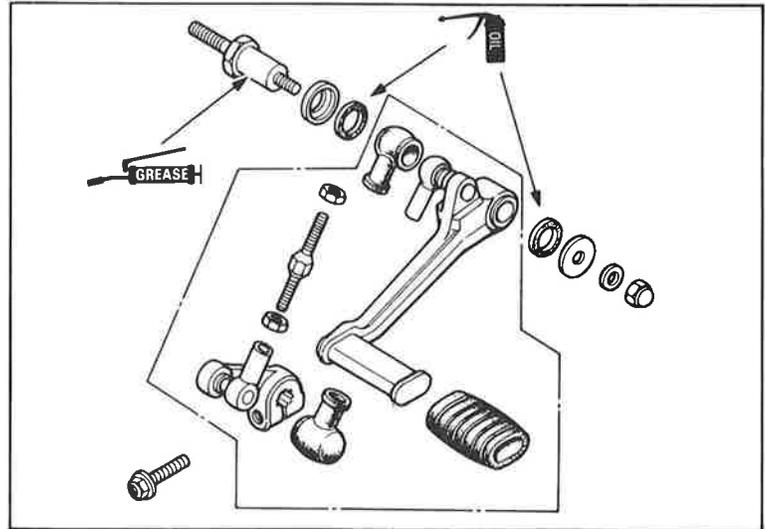
Install the gearshift linkage cover.
Install the drive sprocket cover spacer.
Connect the neutral switch lead.
Apply grease or oil to the O-ring and install it on the oil hose.
Connect the oil hose.
Install the oil hose and drive sprocket covers.





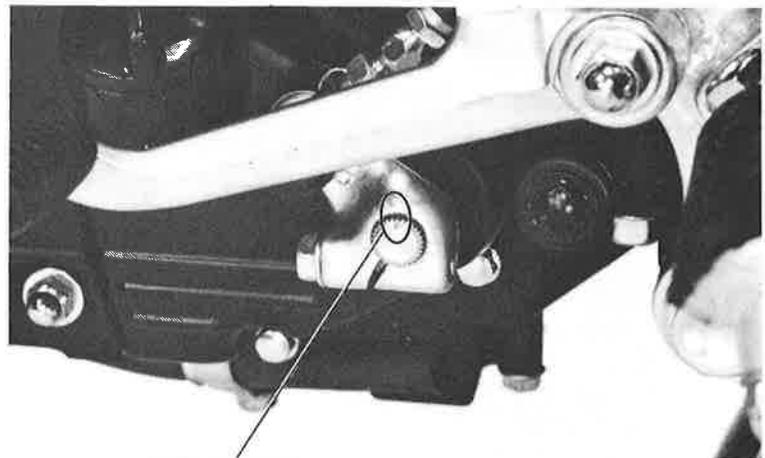
GEARSHIFT PEDAL INSTALLATION

Install the gear shift pedal as shown.



NOTE

- Coat the dust seal with oil.
- Align the punch mark on the joint arm with the punch mark on the gear shift spindle.
- Tighten the bolt and nut securely.



PUNCH MARKS

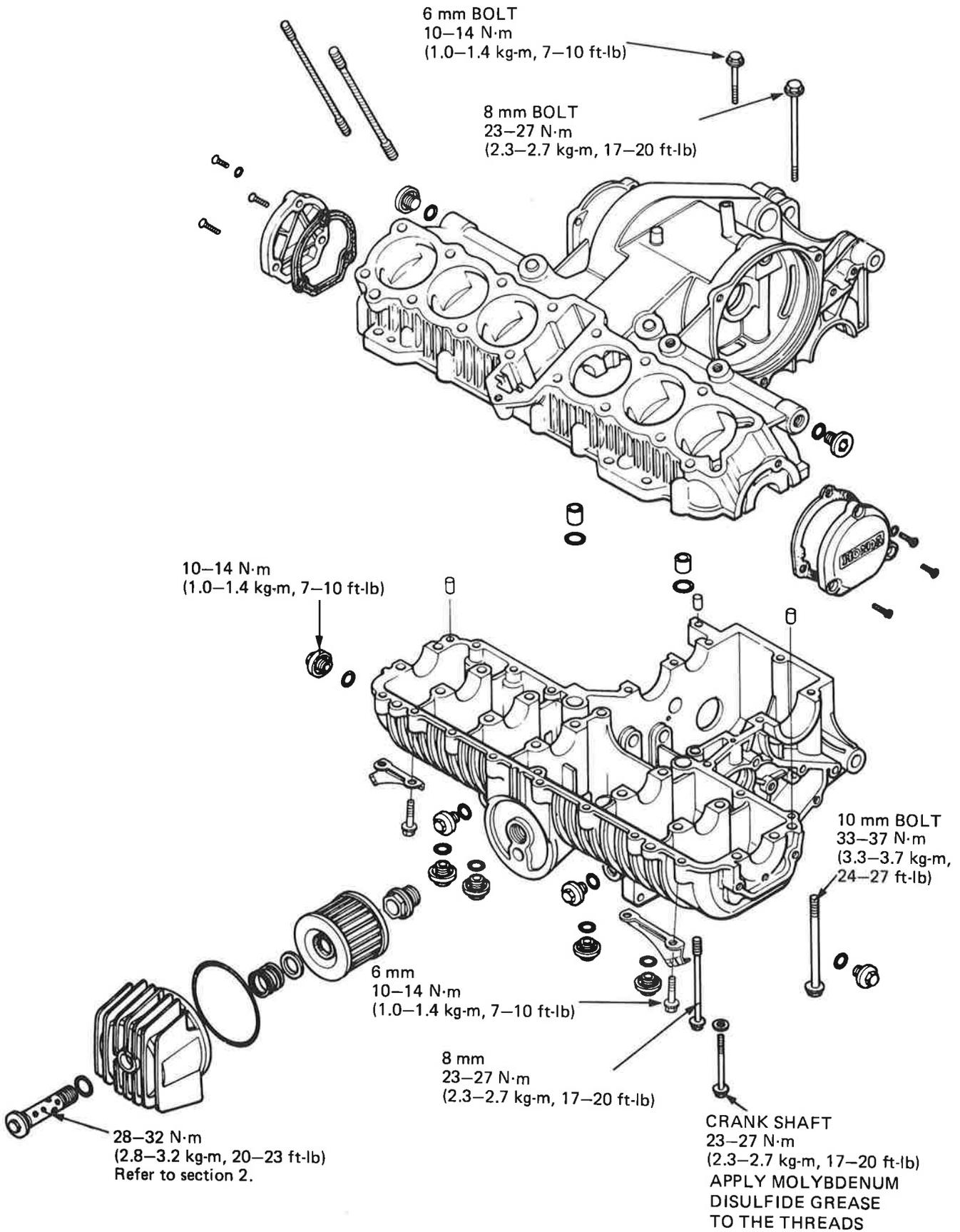
Adjust by turning the adjuster after loosening the lock nuts.
Tighten the lock nuts.



LOCK NUTS



MEMO





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SERVICE INFORMATION

GENERAL INSTRUCTIONS

- To repair the crankshaft, connecting rod, primary shaft and the transmission including the shift forks and drum, it is necessary to separate the crankcase halves.
- The following parts must be removed before disassembling the crankcase.

Item to be serviced	Items to be removed
Crankshaft and connecting rod	Cylinder head, cylinder, pistons and primary shaft assembly
Primary shaft	A.C. generator and lock nut (inside the clutch)
Transmission	Clutch, oil pump drive chain and gear shift linkage

TORQUE VALUES

8 mm bolt (crankshaft)	23–27 N·m (2.3–2.7 kg-m, 17–20 ft-lb) Apply molybdenum disulfide grease to the threads and underside of the bolt head.
8 mm bolt (crankcase)	23–27 N·m (2.3–2.7 kg-m, 17–20 ft-lb)
6 mm bolt	10–14 N·m (1.0–1.4 kg-m, 7–10 ft-lb)
10 mm bolt	33–37 N·m (3.3–3.7 kg-m, 24–27 ft-lb)
Oil pass cap	10–14 N·m (1.0–1.4 kg-m, 7–10 ft-lb)
Oil filter center bolt	28–32 N·m (2.8–3.2 kg-m, 20–23 ft-lb)



CRANKCASE DISASSEMBLY

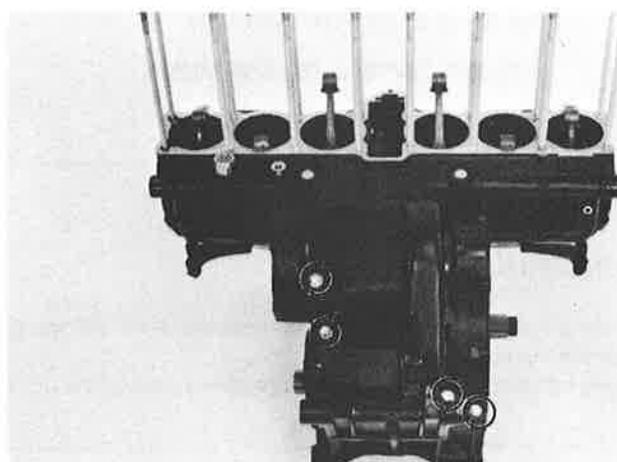
Remove the cylinder head, cylinder, pistons and oil filter (Sections 6 and 7).

Remove the clutch, clutch related parts, A. C. generator, gear shift linkage and starter motor (Sections 8, 9, 16 and 18).

NOTE

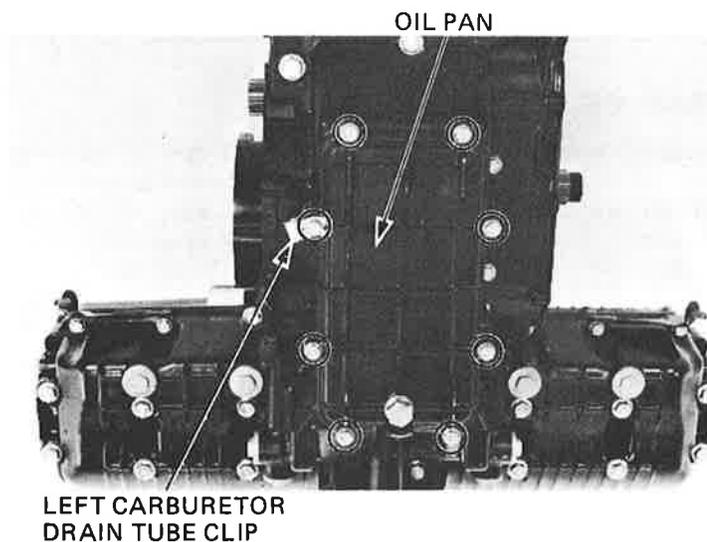
The crankcase can be separated without removing the clutch, clutch related parts, A. C. generator, gearshift mechanism and starting motor.

However, removal of those parts is recommended because the transmission gears may be dropped when separating the crankcase if they are not removed.



Remove the upper crankcase bolts.

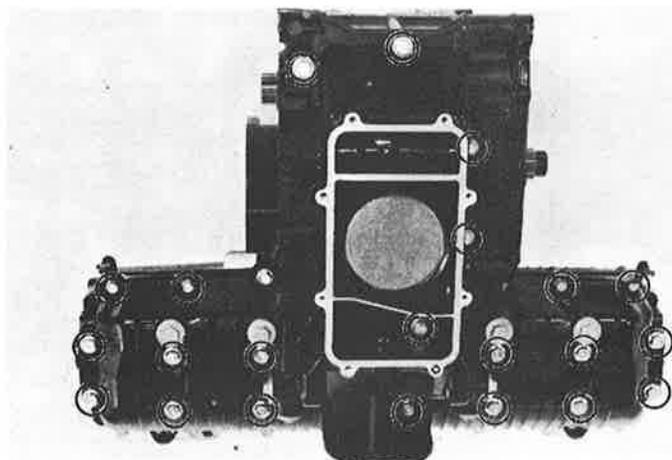
Turn the engine upside down.
Remove the oil pan.



Remove the lower crankcase bolts.

NOTE

Remove the bolts in two or more steps and in a crisscross pattern to prevent warpage.

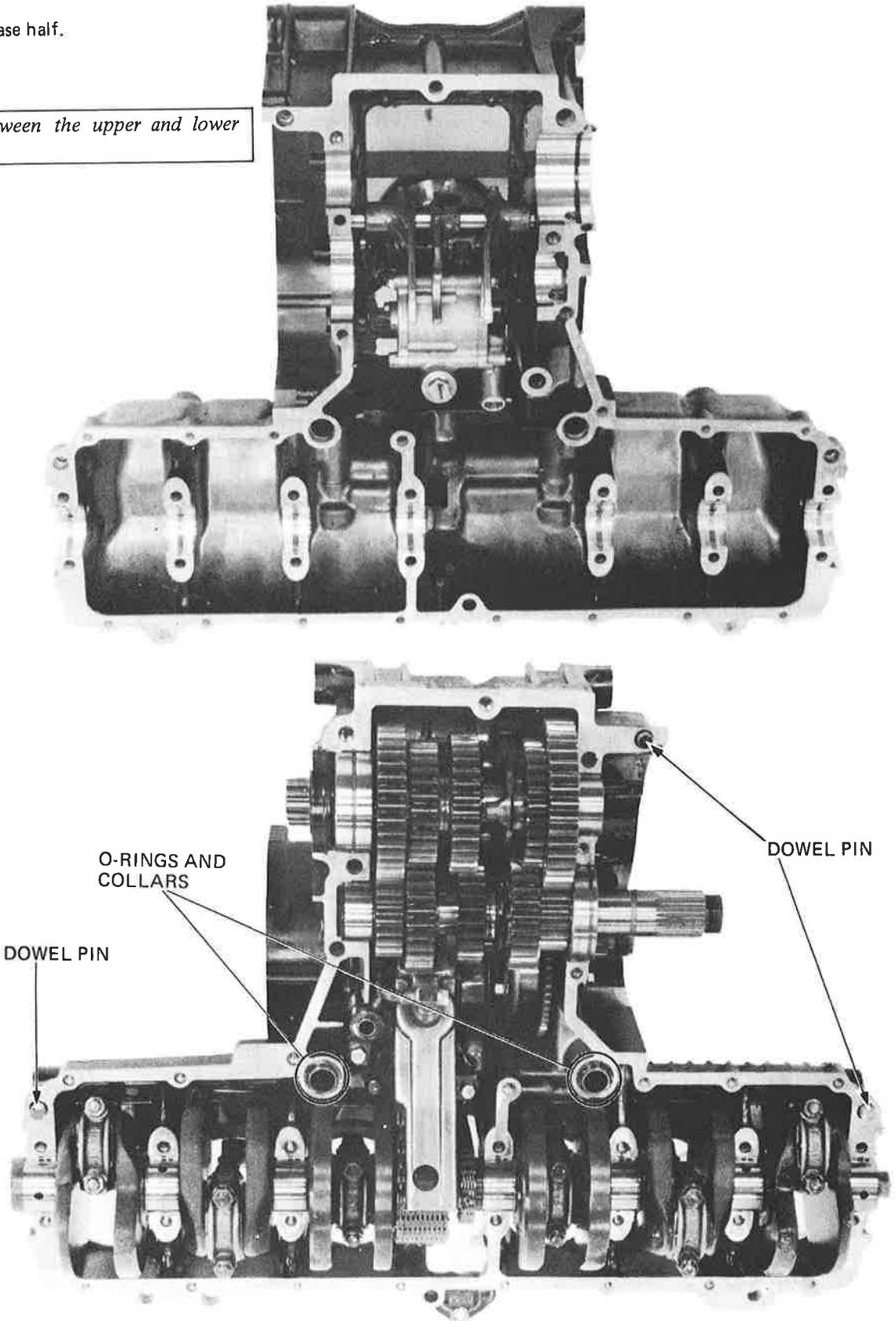




Separate the lower case half.

CAUTION:

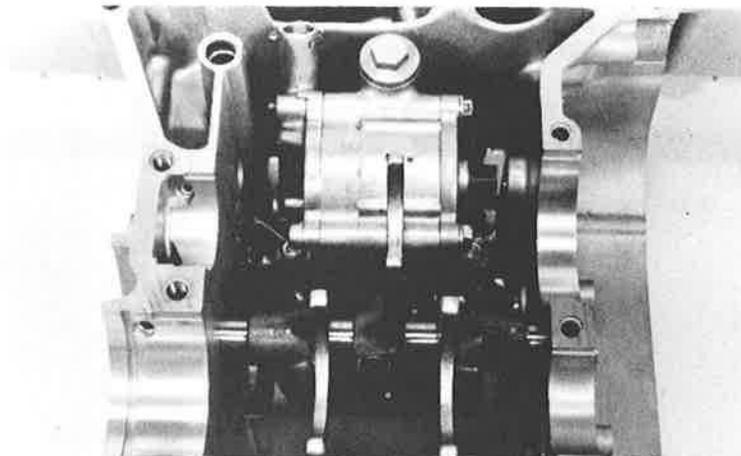
Do not pry between the upper and lower cases.





CRANKCASE ASSEMBLY

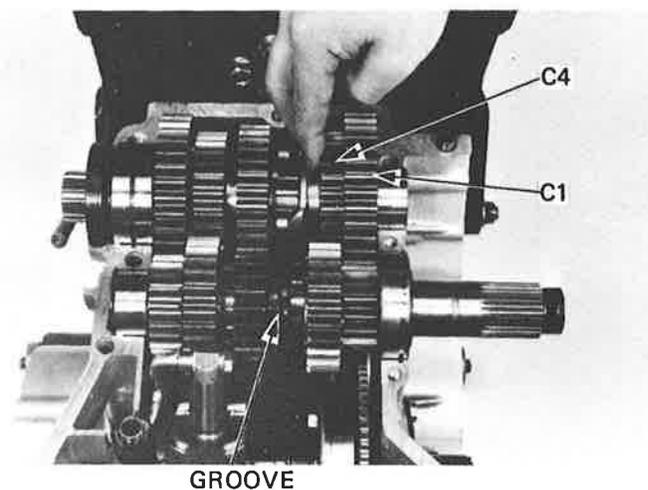
If the gearshift linkage, shift fork and shift drum are installed in the lower crankcase, shift the gearshift linkage into 1st gear for easier assembly.



Slide the C4 gear into the C1 gear.
 Make sure that the other gears are not engaged.

Apply molybdenum disulfide grease to the groove of the M3 gear.

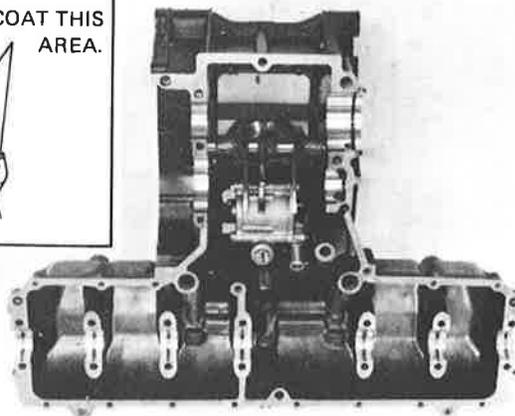
Apply molybdenum disulfide grease to the crankshaft main bearings.



Clean the crankcase mating surfaces.
 Apply liquid sealant to the mating surface of the lower crankcase.

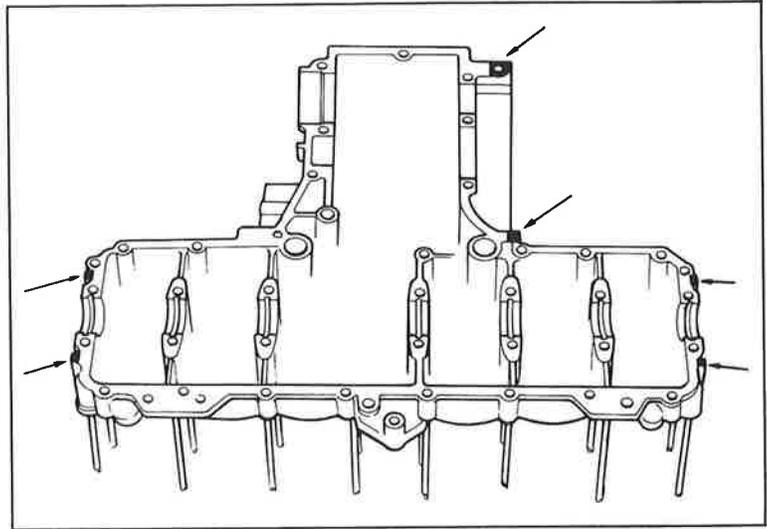
CAUTION

Do not apply sealant to the portion near the main bearing.





For the upper crankcase, apply sealant only where shown.



Assemble the crankcase halves, aligning the shift fork claws with the gears. Tighten the bolts to the specified torques in the sequence shown.

TORQUE SPECIFICATIONS:

8 mm bolt (Crankshaft)

23–27N·m (2.3–2.7 kg-m, 17–20 ft-lb)

8 mm bolt (Crankcase)

23–27N·m (2.3–2.7 kg-m, 17–20 ft-lb)

6 mm bolt

10–14N·m (1.0–1.4 kg-m, 7–10 ft-lb)

10 mm bolt

33–37N·m (3.3–3.7 kg-m, 24–27 ft-lb)

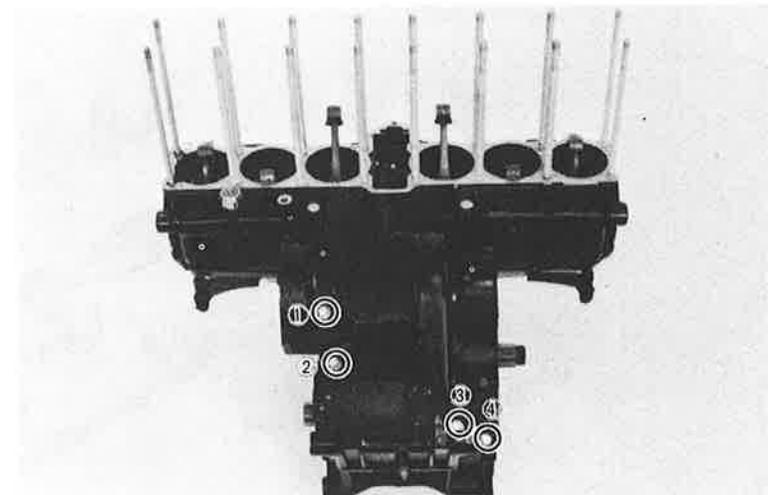
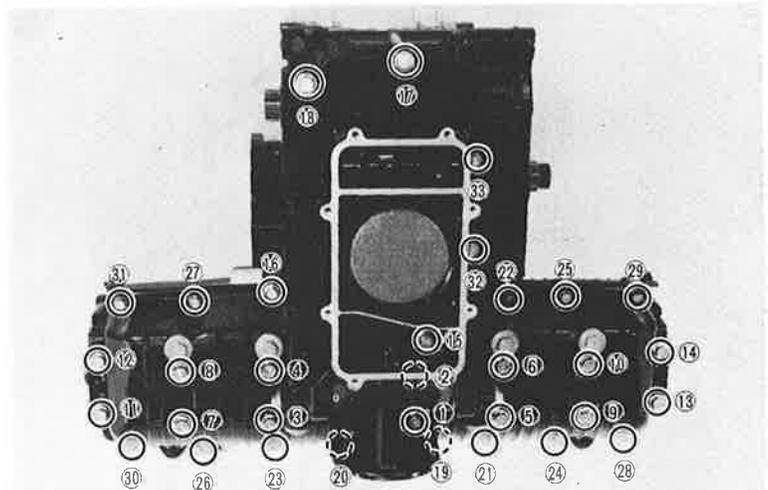
NOTE

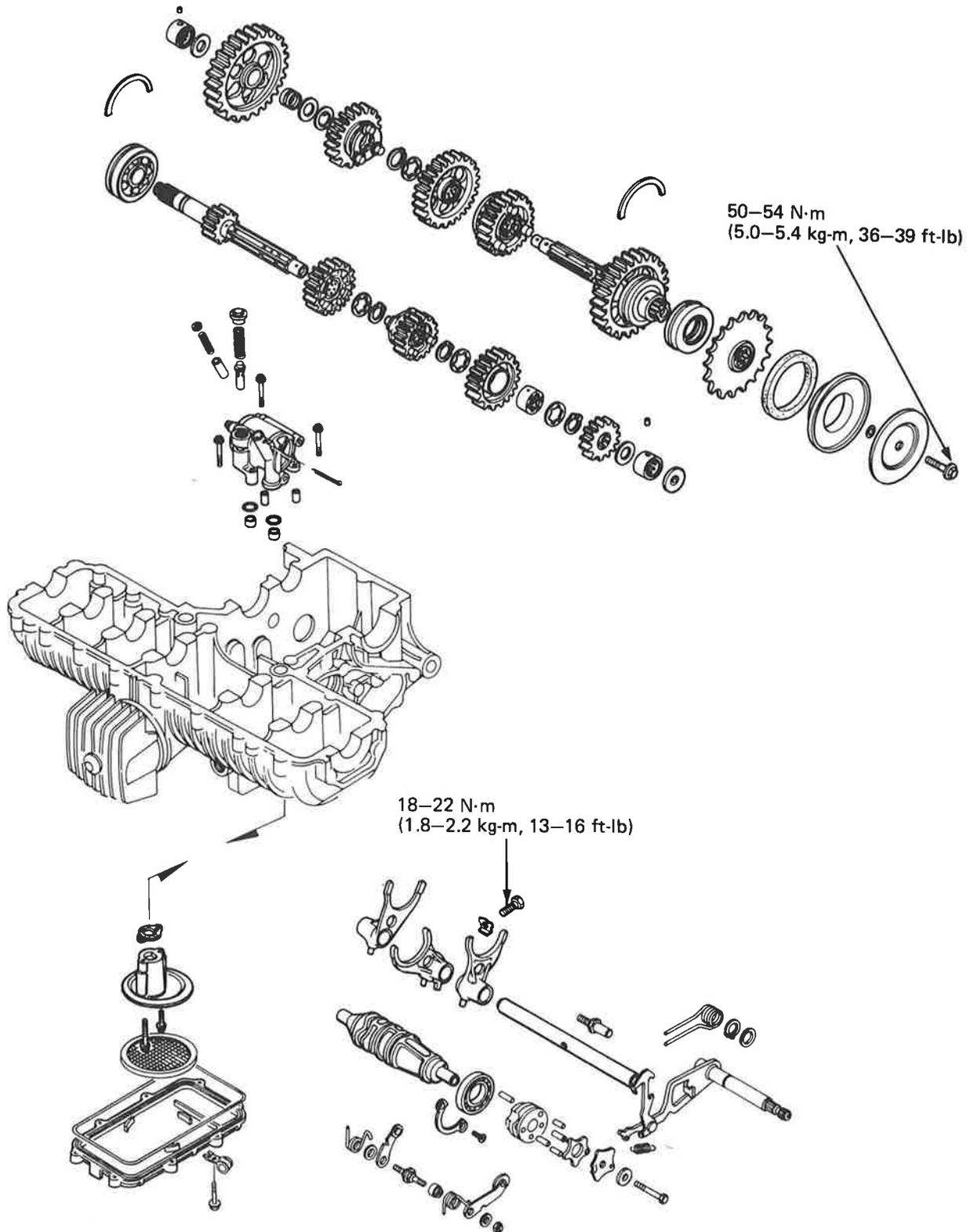
- Make sure that the plain washers are under the crankshaft bearing bolts.
- Apply molybdenum disulfide grease to the threads and heads of the fourteen crankshaft holding bolts.

Tighten the upper crankcase bolts to the specified torque, proceeding front to rear.

NOTE

- If the oil path cap is removed, apply molybdenum disulfide grease to the threads when reinstalling.







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SERVICE INFORMATION

GENERAL INSTRUCTION

The gear shift linkage can be serviced with engine in the frame. For internal transmission repairs, the crankcase must be separated (Refer to Section 10).

TOOLS

Common

Driver	07746-0030100
Attachment 30 mm	07746-0030300

TORQUE VALUES

Drive sprocket	50-54 N·m (5.0-5.4 kg-m, 36-39 ft-lb)
Shift fork shaft	18-22 N·m (1.8-2.2 kg-m, 13-16 ft-lb)

SPECIFICATIONS

			STANDARD	SERVICE LIMIT	
Transmission	Backlash		0.024-0.074 mm (0.0009-0.0029 in)	0.12 mm (0.005 in)	
	Gear I.D.	M4 gear	28.020-28.041 mm (1.1031-1.1040 in)	28.06 mm (1.105 in)	
		M5 gear	31.000-31.025 mm (1.2205-1.2215 in)	31.04 mm (1.222 in)	
		C1 gear	28.000-28.021 mm (1.1024-1.1032 in)	28.04 mm (1.104 in)	
		C3 gear	28.020-28.041 mm (1.1031-1.1040 in)	28.06 mm (1.105 in)	
	Gear bushing	M5 O.D.	30.950-30.975 mm (1.2185-1.2195 in)	30.93 mm (1.218 in)	
		C1 O.D.	27.959-27.980 mm (1.1007-1.116 in)	27.94 mm (1.100 in)	
		C1 I.D.	24.007-24.028 mm (0.9452-0.9460 in)	24.05 mm (0.947 in)	
	Mainshaft O.D.	at M4	27.959-27.980 mm (1.1007-1.1016 in)	27.94 mm (1.100 in)	
	Countershaft O.D.	at C1 bushing	23.9935-24.0065mm (0.9446-0.9451 in)	23.97 mm (0.944 in)	
		at C3	27.959-27.980 mm (1.1007-1.1016 in)	27.94 mm (1.100 in)	
	Gear-to-bushing or shaft clearance	M4-to-shaft		—————	0.10 mm (0.004 in)
		M5-to-M5 bushing		—————	0.10 mm (0.004 in)
		C1-to-C1 bushing		—————	0.10 mm (0.004 in)
		C1 bushing-to-shaft		—————	0.10 mm (0.004 in)
C3-to-shaft		—————	0.10 mm (0.004 in)		



			STANDARD	SERVICE LIMIT
Shift fork	Claw thickness		6.43–6.50 mm (0.253–0.256 in)	6.1 mm (0.24 in)
	I.D.	Center	16.009–16.012 mm (0.6303–0.6304 in)	—————
		Left and right	16.000–16.021 mm (0.6299–0.6307 in)	16.55 mm (0.652 in)
Fork shaft	O.D.		15.966–15.984 mm (0.6286–0.6293 in)	15.95 mm (0.628 in)
Oil pump	Pressure	Left pump	50–100 kPa (0.5–1.0 kg/cm ² , 7.1–14.2 psi)	—————
		Right pump	40–530 kPa (4.0–5.3 kg/cm ² , 75.4 psi)	—————
	Left pump clearances	Tip clearance	0.08–0.12 mm (0.003–0.005 in)	0.15 mm (0.006 in)
		Body clearance	0.15–0.21 mm (0.006–0.008 in)	0.35 mm (0.014 in)
		End clearance	0.02–0.07 mm (0.001–0.003 in)	0.10 mm (0.004 in)
	Right pump clearances	Tip clearance	0.08–0.12 mm (0.003–0.005 in)	0.15 mm (0.006 in)
		Body clearance	0.15–0.21 mm (0.006–0.008 in)	0.35 mm (0.014 in)
		End clearance	0.02–0.07 mm (0.001–0.003 in)	0.10 mm (0.004 in)

TROUBLESHOOTING

Hard to shift

1. Improper clutch adjustment: too much free play
2. Shift fork bent
3. Shift shaft bent
4. Shift claw bent
5. Shift drum cam grooves damaged

Transmission Jumps Out of Gear

1. Gear dogs worn
2. Shift shaft bent
3. Shift drum stopper broken
4. Shift forks bent

Low Oil Pressure

1. Pressure relief valve stuck open
2. Plugged oil pick-up screen
3. Oil pump worn
4. External oil leaks
5. Oil level low

High Oil Pressure

1. Pressure relief valve stuck closed
2. Plugged oil filter, gallery, or mating orifice
3. Incorrect oil being used

No Oil Pressure

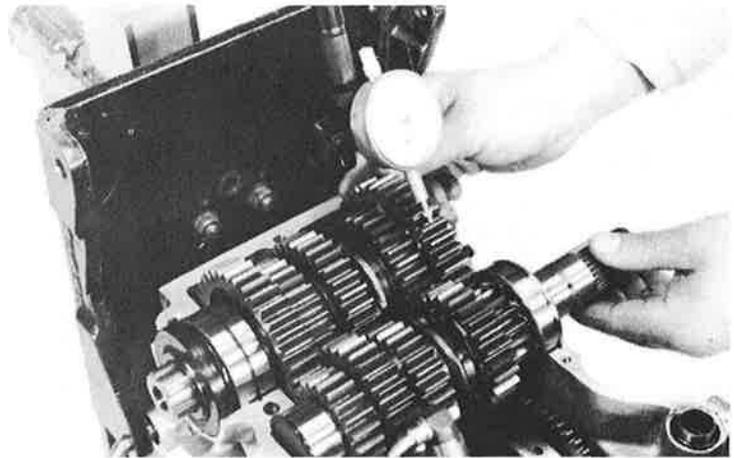
1. Oil level low
2. Oil pump drive chain broken
3. Oil pump faulty
4. Internal oil leakage

For servicing of the gearshift linkage, see Section 9.

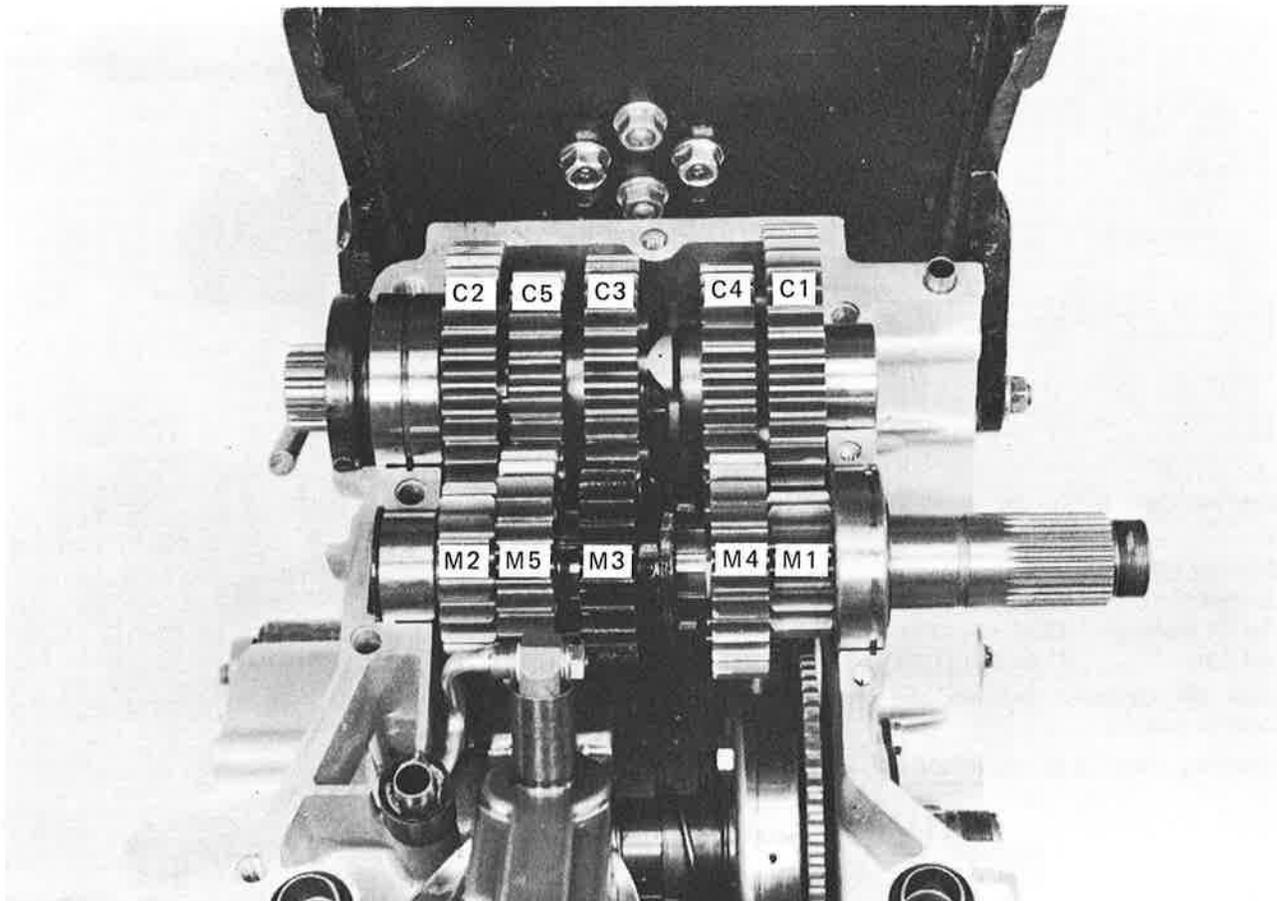
TRANSMISSION DISASSEMBLY

Separate the crankcase (Section 10).
Inspect each gear for backlash.

SERVICE LIMIT: 0.12 mm (0.005 in)



Remove the main and countershafts.
Remove the dowel pins from the crankcase.





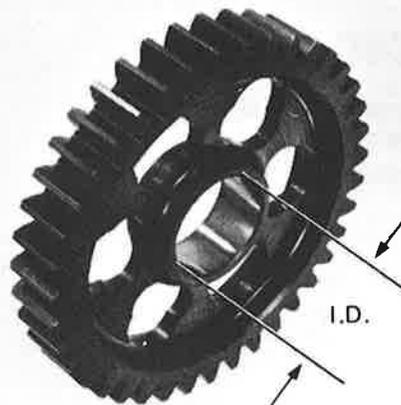
TRANSMISSION INSPECTION

Check gear dogs, dog holes and teeth for excessive or abnormal wear, or evidence of insufficient lubrication.

Measure the I. D. of each gear.

SERVICE LIMITS:

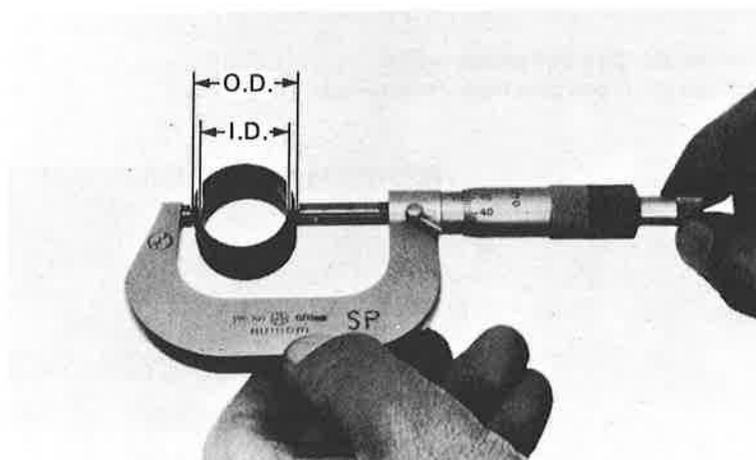
M4 gear:	28.06 mm (1.105 in)
M5 gear:	31.04 mm (1.222 in)
C1 gear:	28.04 mm (1.104 in)
C3 gear:	28.06 mm (1.105 in)



Measure the I.D. and O.D. of the gear bushings.

SERVICE LIMITS:

M5 O.D.:	30.93 mm (1.218 in)
C1 O.D.:	27.94 mm (1.100 in)
C1 I.D.:	24.05 mm (0.947 in)



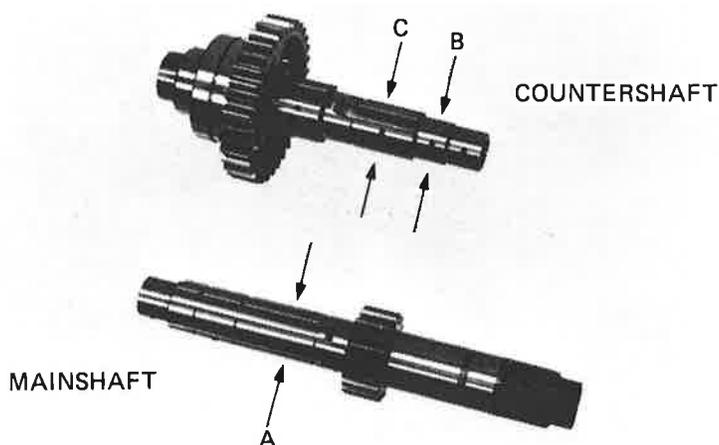
Measure the O.D. of the mainshaft and countershaft.

SERVICE LIMITS:

A (at M4):	27.94 mm (1.100 in)
B (at C1 bushing):	23.97 mm (0.944 in)
C (at C3):	27.94 mm (1.100 in)

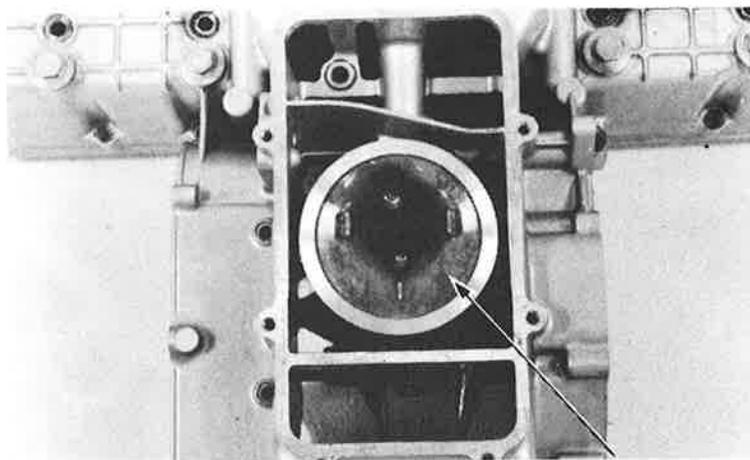
Calculate the clearance between the gear and gear shaft or bushing.

SERVICE LIMIT: 0.10 mm (0.004 in)



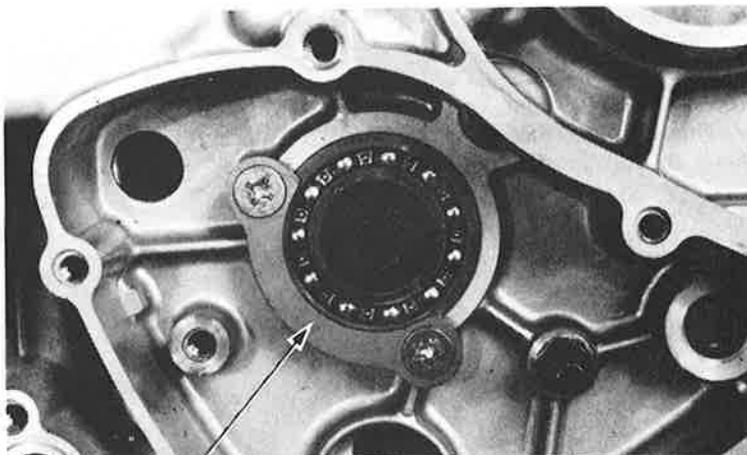
SHIFT FORK, SHIFT DRUM AND OIL PUMP REMOVAL

Remove the oil strainer.



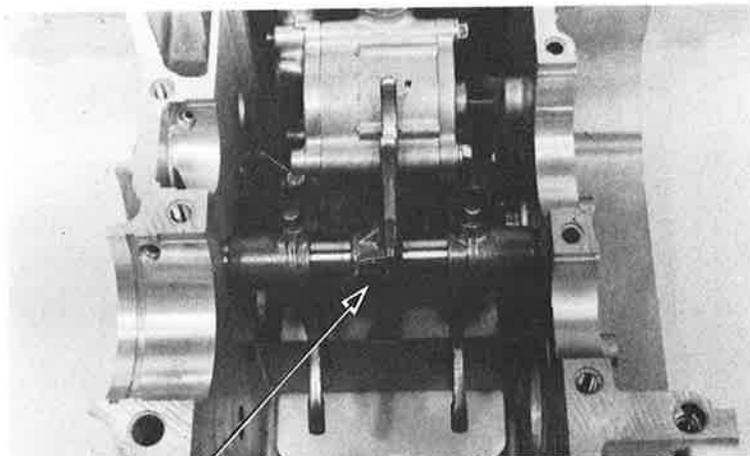
OIL
STRAINER

Remove the bearing stopper plate.
Remove the bearing.



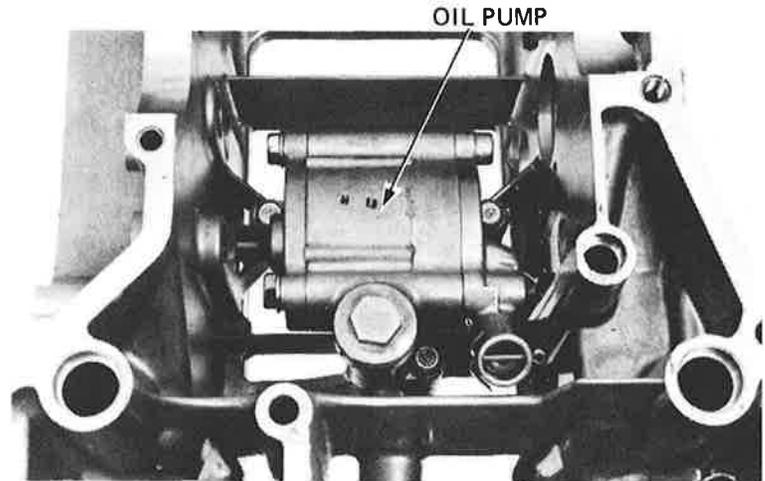
BEARING STOPPER PLATE

Bend the tabs of the lock washer at the center shift
fork.
Loosen the bolt.
Remove the shift forks, shaft and shift drum.



LOCK WASHER

Remove the oil pump.

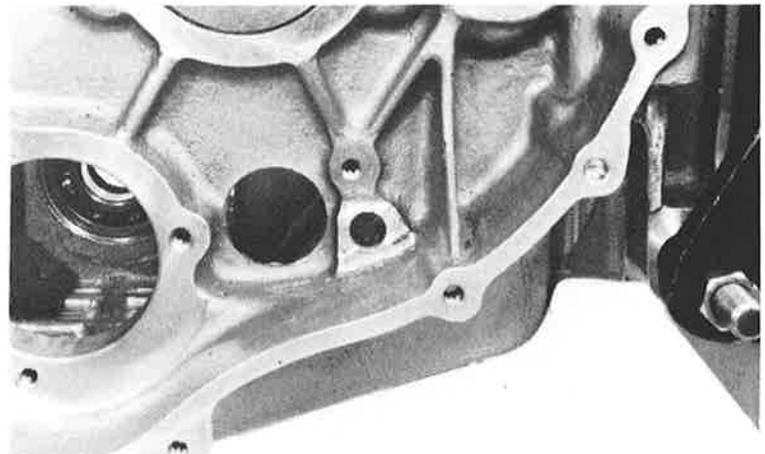


GEAR SHIFT DRUM AND SHIFT FORK INSPECTION

Inspect the shift drum end for scoring, scratches, or evidence of insufficient lubrication.
Check the shift grooves for damage.



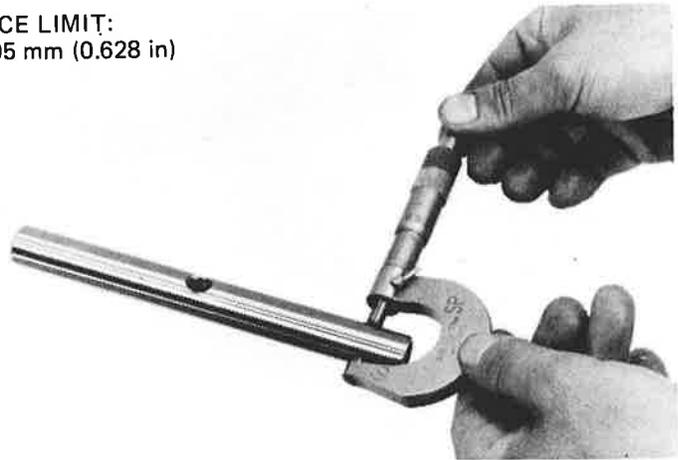
Inspect the shift drum hole and shift fork shaft hole for scoring or scratches.





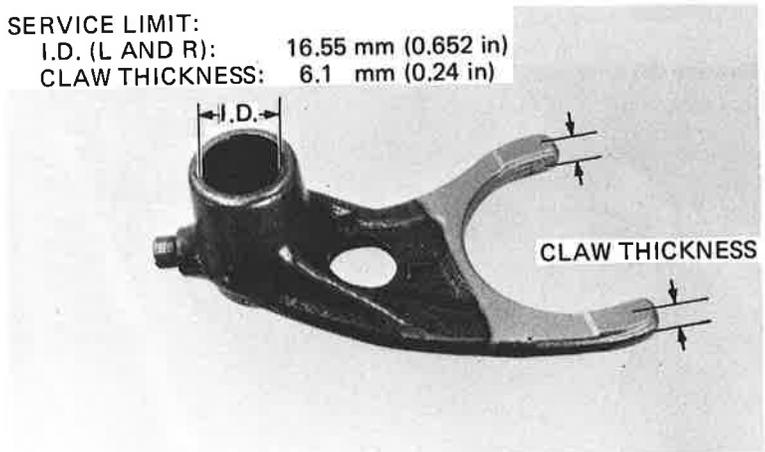
Measure the shift fork shaft O.D.
Check for scratches, scoring, or evidence of insufficient lubrication.

SERVICE LIMIT:
15.95 mm (0.628 in)



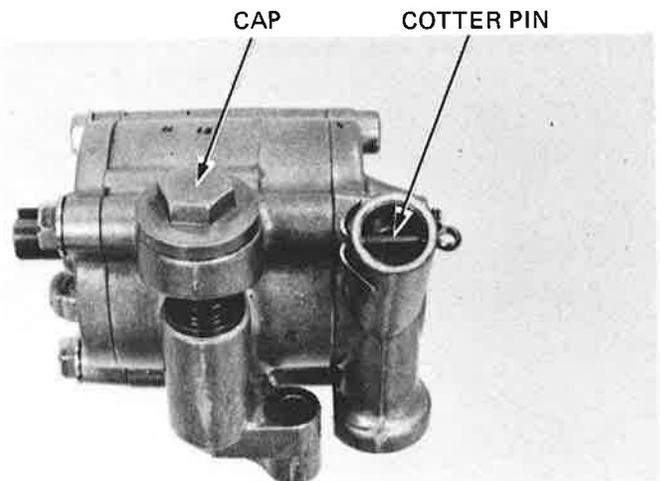
Measure the shift fork I.D. and claw thickness.

SERVICE LIMIT:
I.D. (L AND R): 16.55 mm (0.652 in)
CLAW THICKNESS: 6.1 mm (0.24 in)

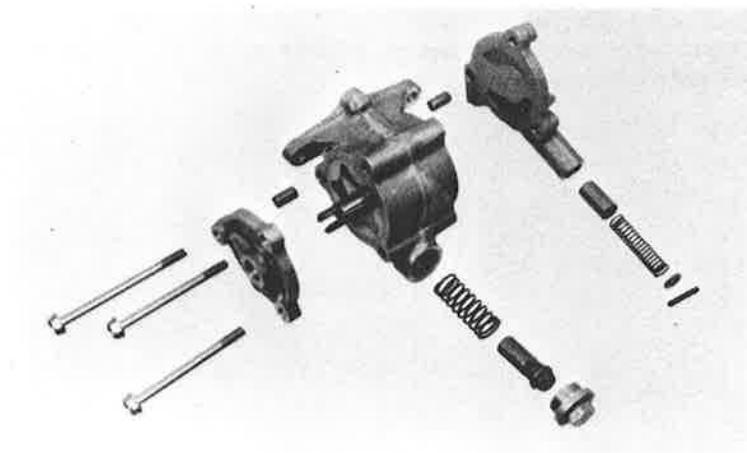


OIL PUMP DISASSEMBLY

Remove the relief valve cap and cotter pin.



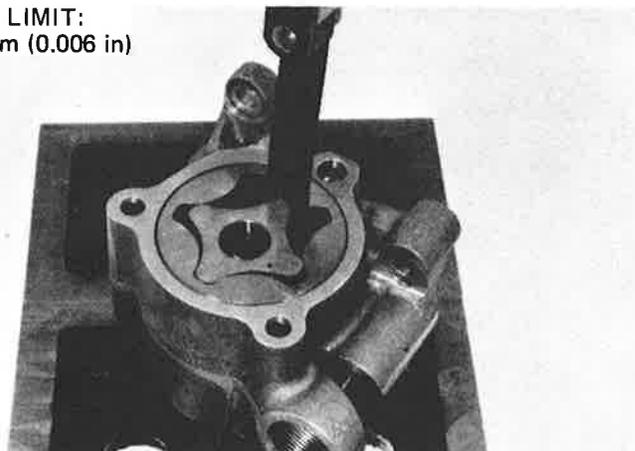
Remove the oil pump side covers.



OIL PUMP INSPECTION

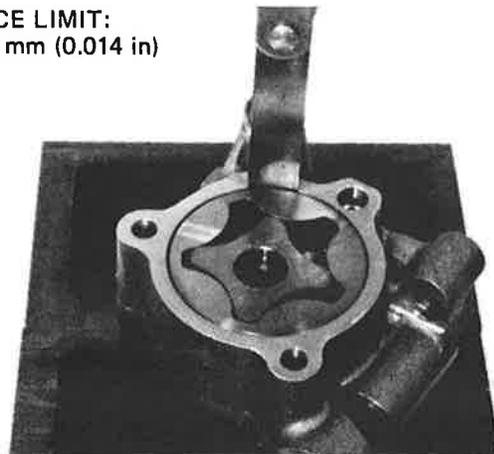
Measure the left pump tip clearance.

SERVICE LIMIT:
0.15 mm (0.006 in)



Measure the left pump body clearance.

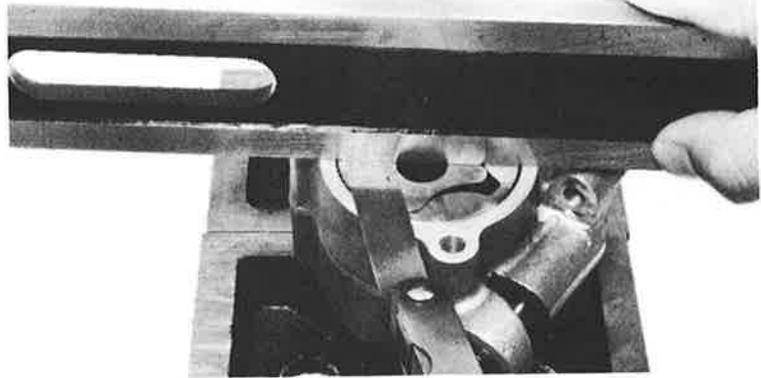
SERVICE LIMIT:
0.35 mm (0.014 in)





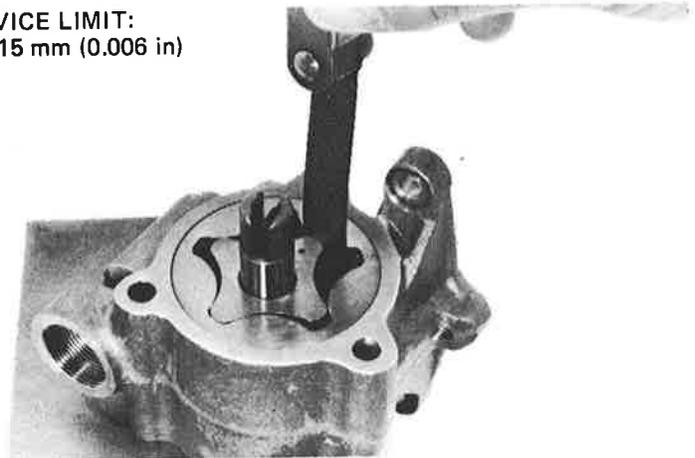
Measure the left pump end clearance.

SERVICE LIMIT:
0.10 mm (0.004 in)



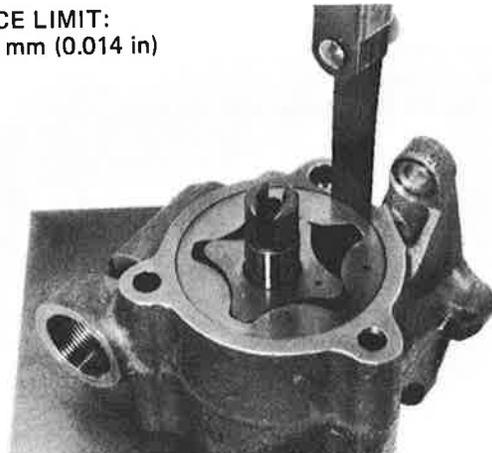
Measure the right pump tip clearance.

SERVICE LIMIT:
0.15 mm (0.006 in)



Measure the right pump body clearance.

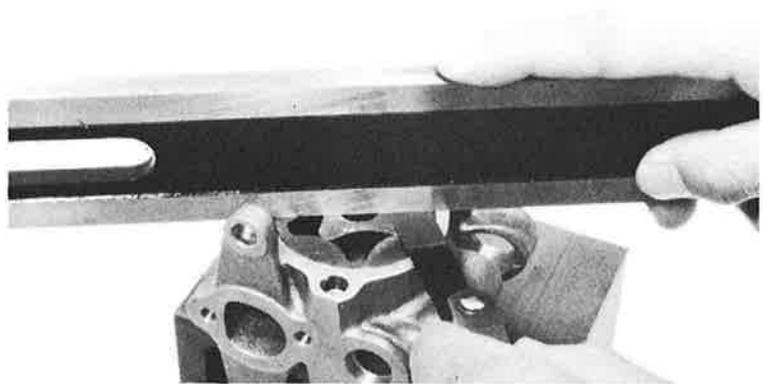
SERVICE LIMIT:
0.35 mm (0.014 in)





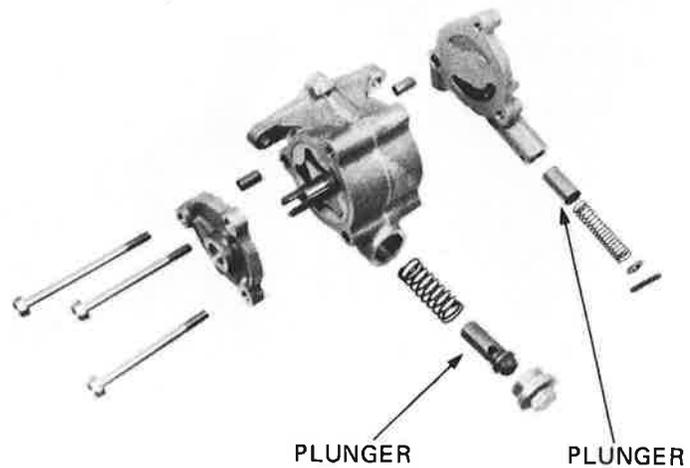
Measure the right pump end clearance.

SERVICE LIMIT:
0.10 mm (0.004 in)



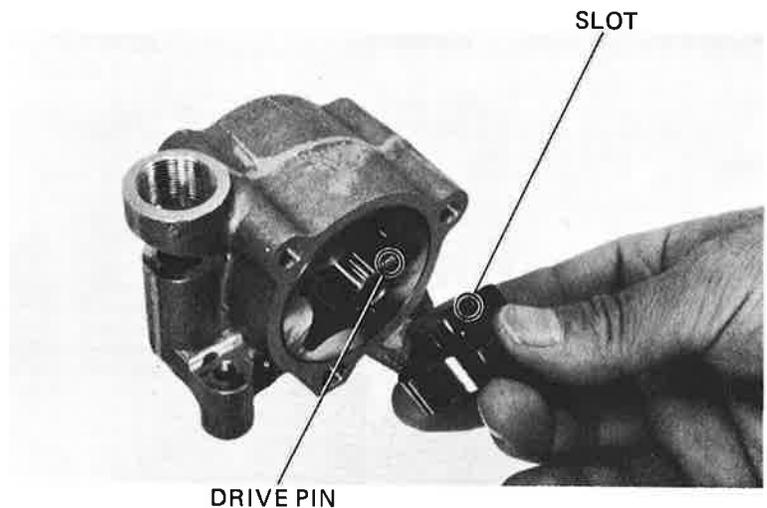
RELIEF VALVE INSPECTION

Check that the plungers operate smoothly and that the springs are not damaged or weak. Replace the relief valve as a unit if the spring must be replaced.



OIL PUMP ASSEMBLY

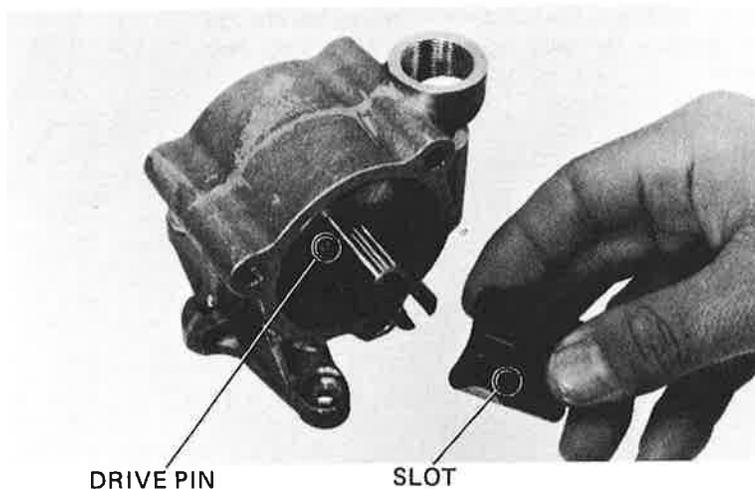
Install the left outer rotor.
Insert the drive pin into the shaft.
Align the slot in the left inner rotor with the drive pin.





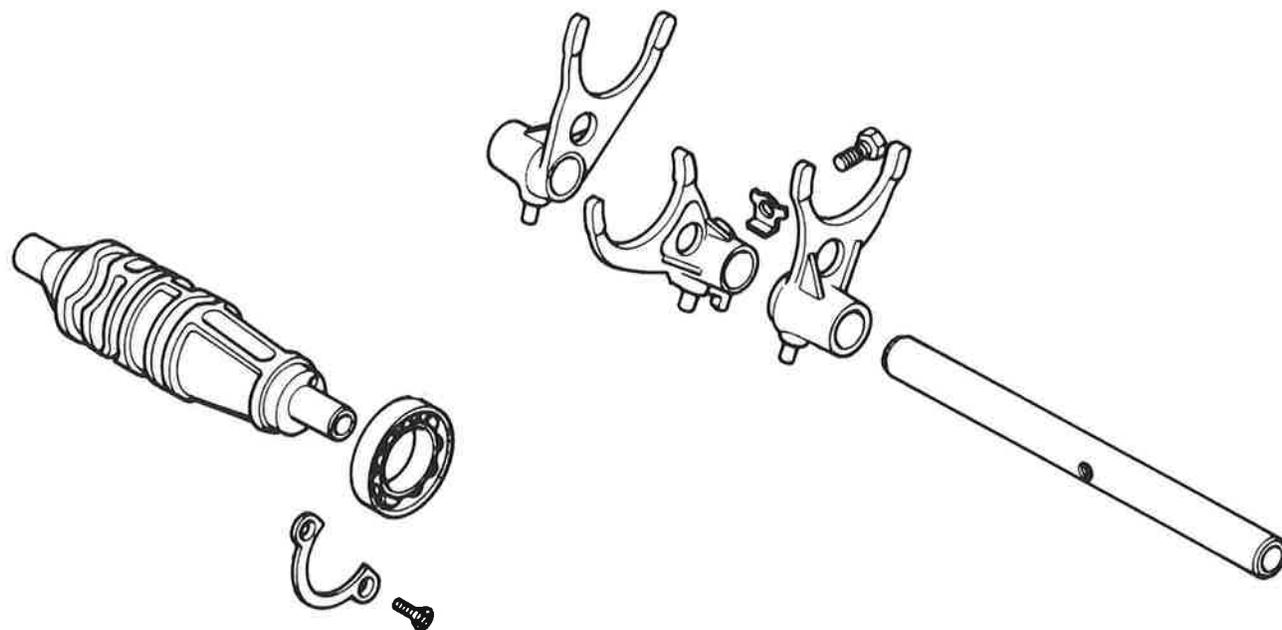
Install the right outer rotor.
Insert the drive pin into the shaft.
Align the slot in the inner rotor with the drive pin.

Install the side covers.
Install the relief valves.



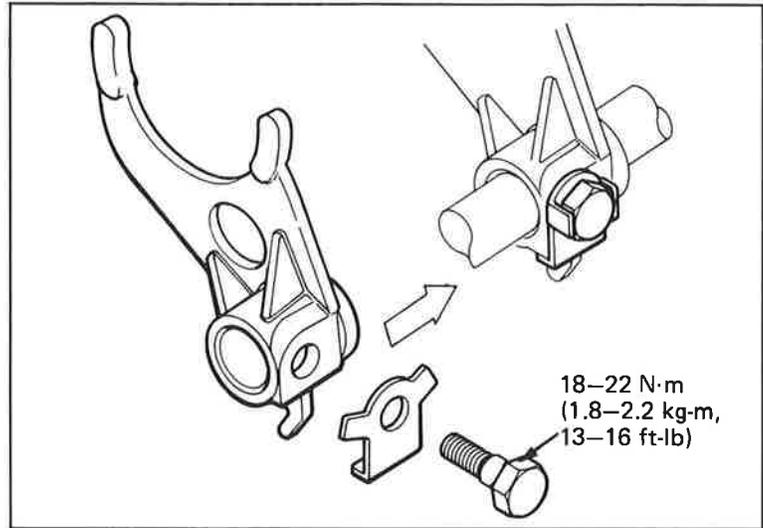
OIL PUMP, SHIFT DRUM AND SHIFT FORK INSTALLATION

To install the oil pump, shift drum and shift fork, reverse the removal procedure.
Key points are shown here.

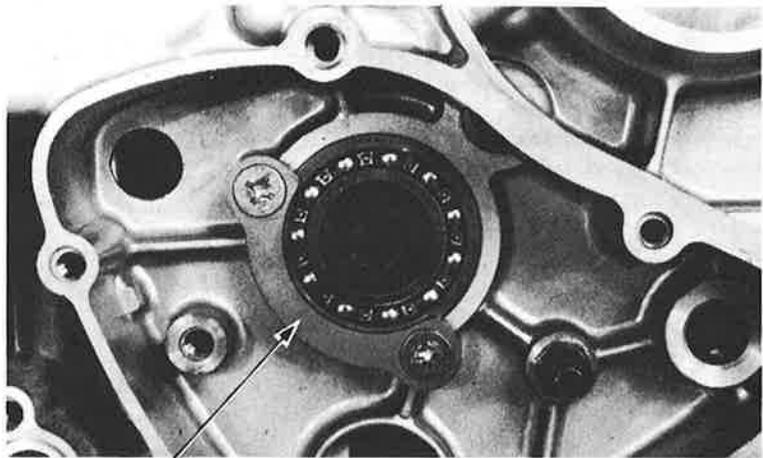




After tightening the center shift fork secure the bolt by bending the lock washer tabs against the bolt head.



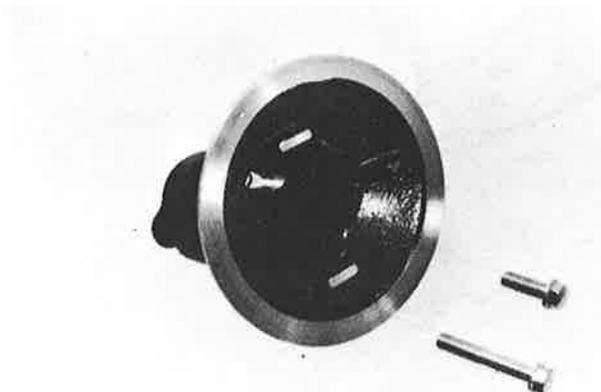
When installing the bearing stopper plate, apply a locking agent to the screw threads.



BEARING STOPPER PLATE

CAUTION

The oil strainer bolts are different lengths. Use the bolts correctly when installing the oil strainer. If the bolts are used incorrectly, the shift drum may lock.



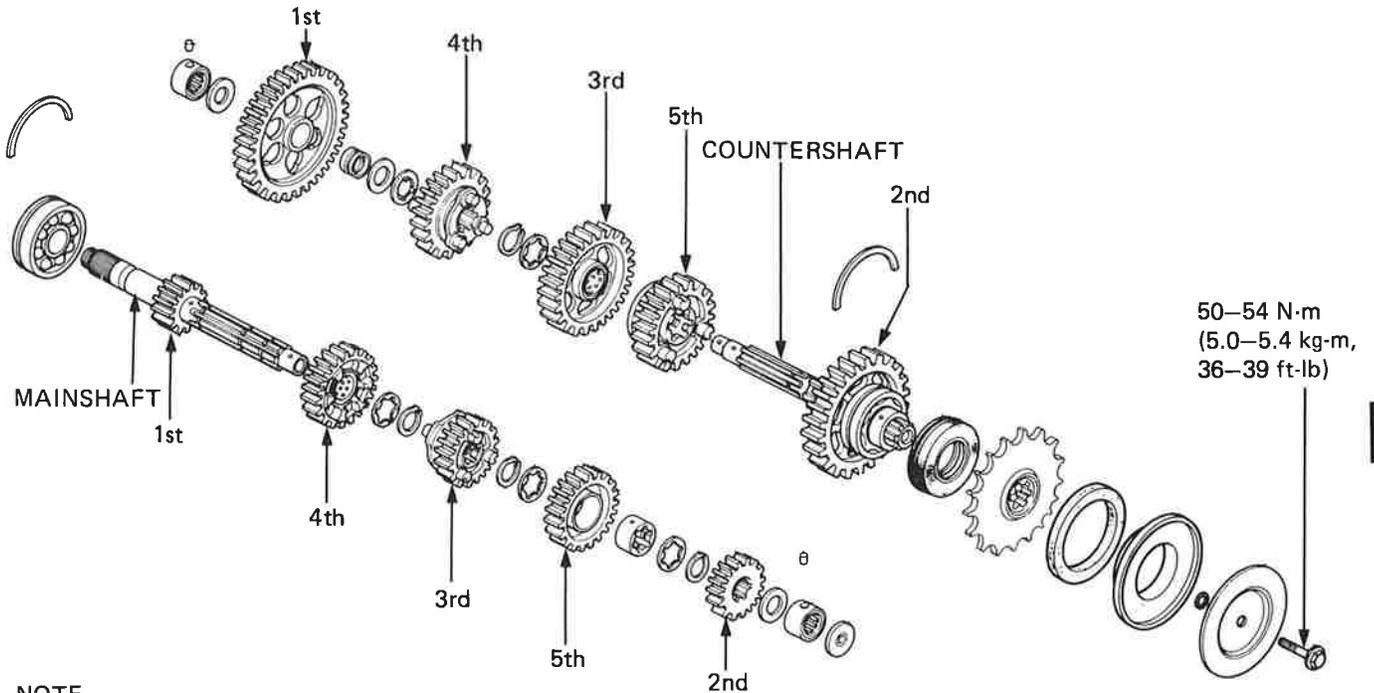


TRANSMISSION ASSEMBLY

Assemble the mainshaft and countershaft.

CAUTION

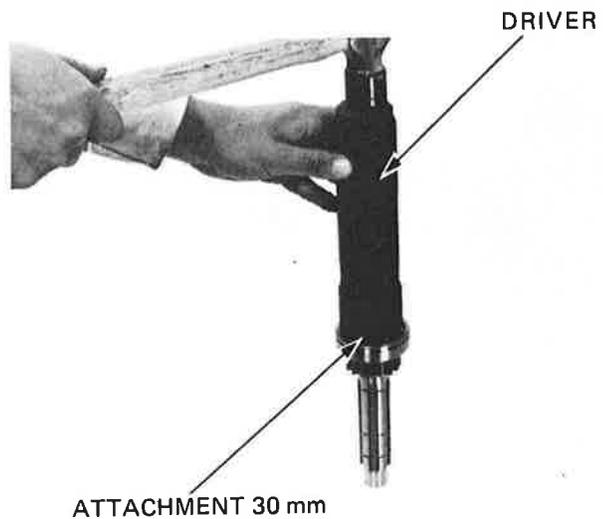
Note the installation direction of the C3 gear. The 8.5 mm recess should face the C5 gear. The 4.0 mm recess should face the C4 gear. If installed incorrectly, proper gear engagement will not occur.



NOTE

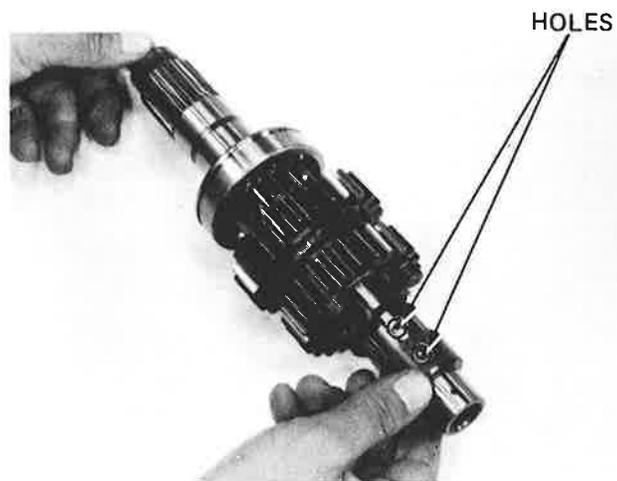
- Check the gears for freedom of movement or rotation on the shaft.
- Check that the snap rings are seated in the grooves.

Install the mainshaft bearing.

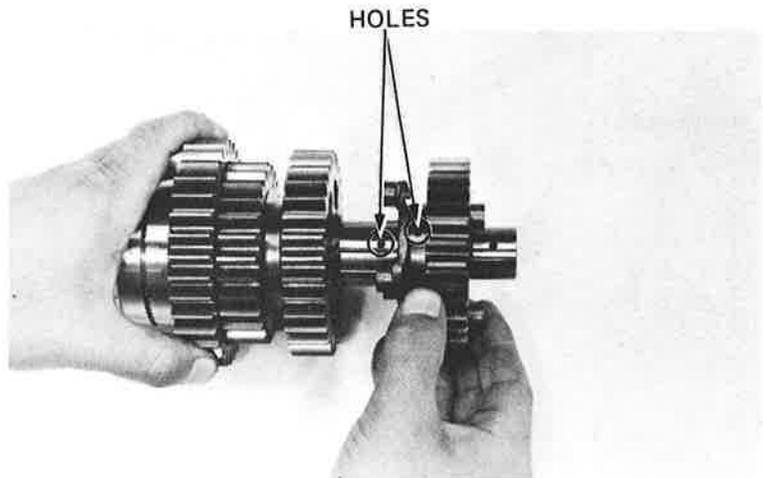




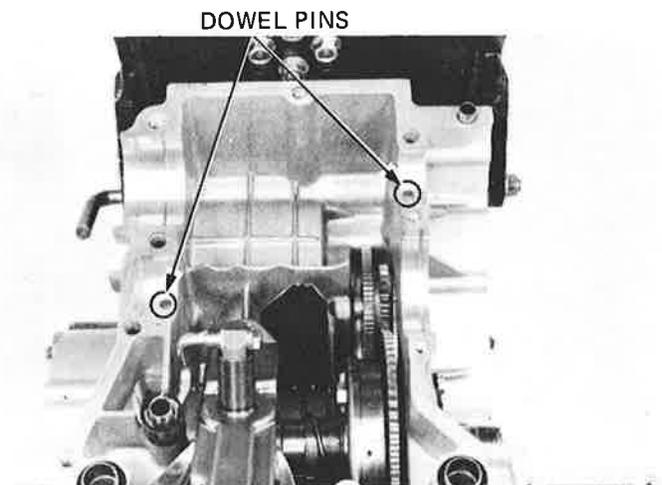
Align the hole in the M5 gear bushing with the hole in the mainshaft.



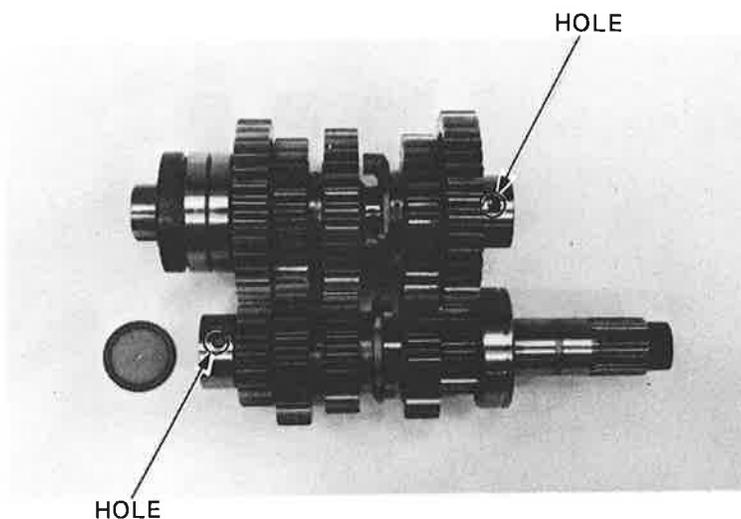
Align the hole in the C5 gear with the hole in the countershaft.



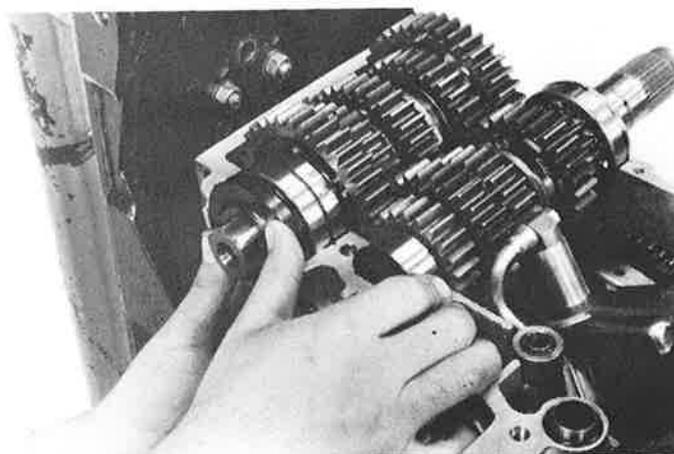
Insert the dowel pins.



Align the holes in the mainshaft bearing and countershaft bearing with the dowel pins.

**NOTE**

- Install the countershaft oil seal carefully so that the oil seal lip is seated completely on the bearing before assembling the lower crankcase.
Apply molybdenum disulfide grease to the shift fork groove of M-3 gear.

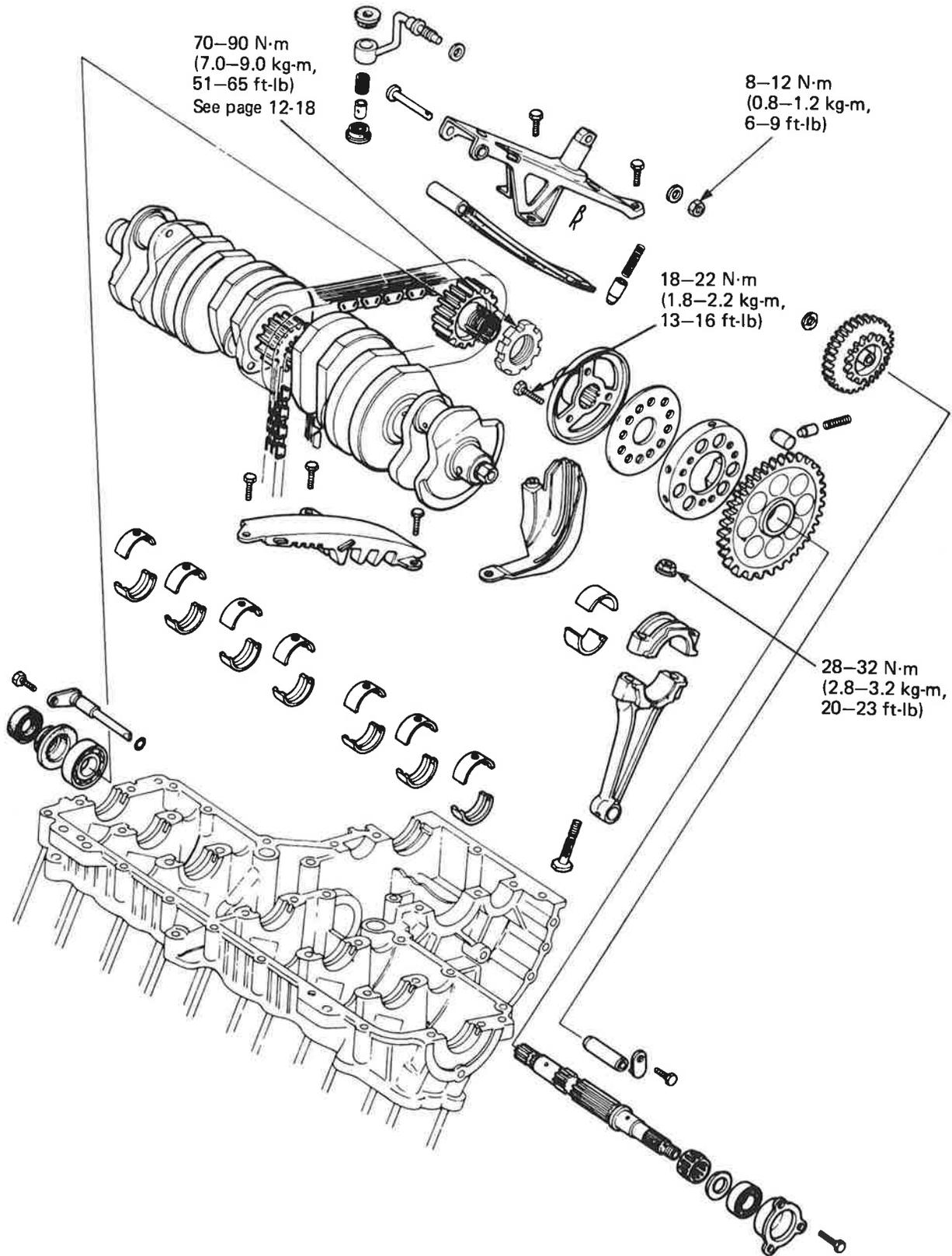


Install the lower crankcase (Refer to Section 10).

NOTE

- Check the oil orifice for clogging, before installing the lower crankcase.







SERVICE INFORMATION	12-1
TROUBLESHOOTING	12-1
PRIMARY SHAFT/STARTER CLUTCH REMOVAL	12-2
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BEARING INSPECTION	12-8
BEARING SELECTION	12-10
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OIL SEAL AND BEARING INSTALLATION	12-14
PRIMARY SHAFT ASSEMBLY	12-15
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PRIMARY SHAFT INSTALLATION	12-16
STARTER IDLE GEAR INSTALLATION	12-18
PRIMARY CHAIN TENSIONER ASSEMBLY	12-19

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- All bearing inserts are select fit and are identified by color code. 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.

TOOLS

Common

Driver	07749-0010000
Pilot 25 mm	07746-0040600
Attachment 37 x 40 mm	07746-0010200
Attachment 52 x 55 mm	07746-0010400
Driver	07746-0030100
Attachment 25 mm	07746-0030200

Special

Primary shaft holder	07924-6340300 or 07923-6890101
Pin spanner 55 mm	07902-4220000

TORQUE VALUES

Crankpin	28-32 N·m (2.8-3.2 kg-m, 20-23 ft-lb)
Starter clutch	18-22 N·m (1.8-2.2 kg-m, 13-16 ft-lb)
Primary chain tensioner nut	8-12 N·m (0.8-1.2 kg-m, 6-9 ft-lb)
Primary driven sprocket	70-90 N·m (7.0-9.0 kg-m, 51-65 ft-lb)
	(See page 12-18)

SPECIFICATIONS

		STANDARD	SERVICE LIMIT
Electric Starter	Drive gear O.D.	47.175-47.200 mm (1.8573-1.8583 in)	47.155 mm (1.8565 in)
	Idle gear I.D.	10.000-10.015 mm (0.3937-0.3943 in)	10.04 mm (0.395 in)
	Idle gear shaft O.D.	9.972-9.987 mm (0.3926-0.3932 in)	9.95 mm (0.392 in)
	Idle gear-to-shaft clearance	—	0.1 mm (0.004 in)
Crankshaft	Connecting rod big end side clearance	0.05-0.20 mm (0.002-0.008 in)	0.3 mm (0.001 in)
	Runout	—	0.05 mm (0.002 in)
	Crankpin oil clearance	0.020-0.060 mm (0.0008-0.0024 in)	0.08 mm (0.003 in)
	Main journal oil clearance	0.020-0.060 mm (0.0008-0.0024 in)	0.08 mm (0.003 in)
Cam chain	Length	260.35-260.57 mm (10.250-10.259 in)	261.8 mm (10.31 in)
Primary chain	Length	194.65-194.92 mm (7.663-7.674 in)	195.8 mm (7.71 in)

TROUBLESHOOTING

Excessive Noise

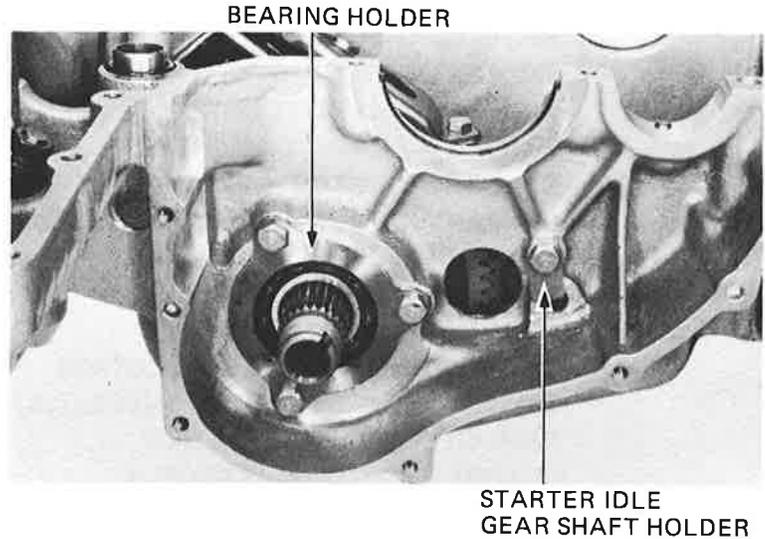
- Worn main journal bearing
- Worn crank pin bearing



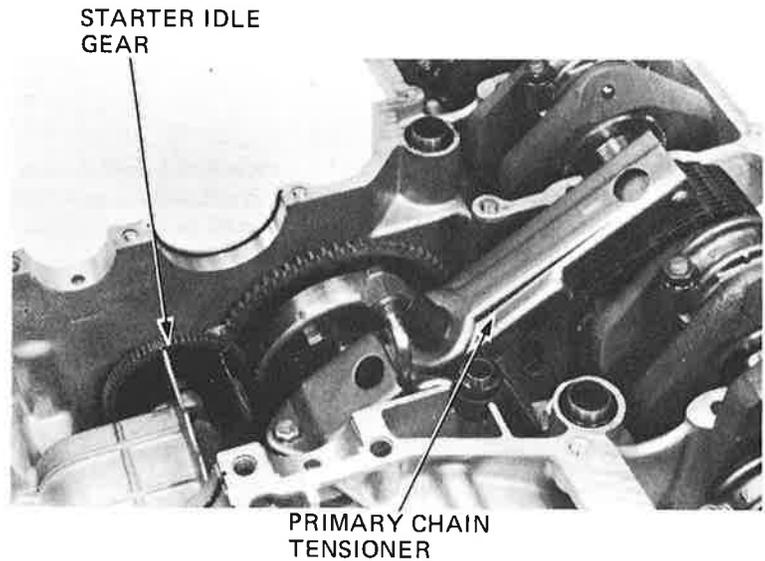
PRIMARY SHAFT/STARTER CLUTCH REMOVAL

Disassemble the crankcase (Section 10).
 Remove the primary shaft drive gear (Section 8).
 Remove the starter motor (Section 18).
 Remove the transmission assembly (Section 11).
 Remove the A. C. generator (Section 16).

Remove the starter idle gear shaft holder.
 Loosen the primary shaft bearing holder bolts.



Remove the starter idle gear shaft.
 Remove the starter idle gear and wave washer.
 Remove the primary chain tensioner.



Remove the oil supply nozzle.



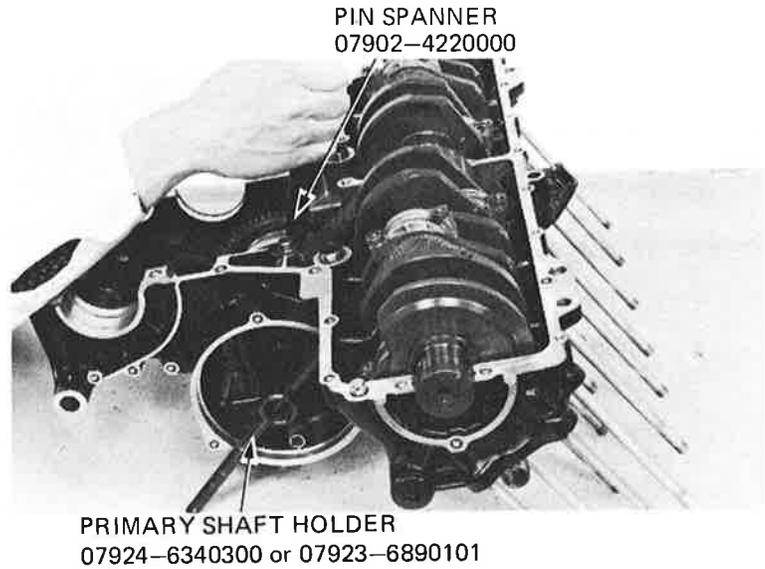


Hold the shaft with the special "PRIMARY SHAFT HOLDER" tool.

Loosen the primary driven sprocket collet ring nut with the special tool "PIN SPANNER".

NOTE

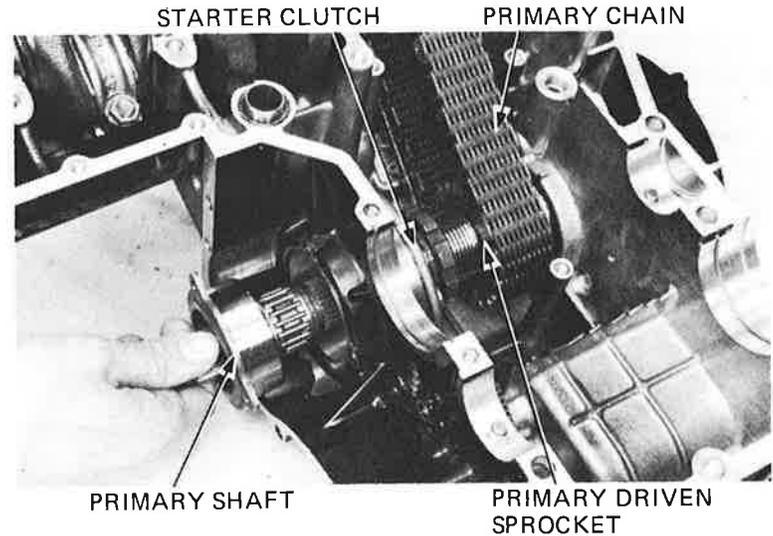
The ring nut has left-hand threads.



Remove the primary shaft.

Lift the primary driven sprocket and starter clutch and remove the primary chain.

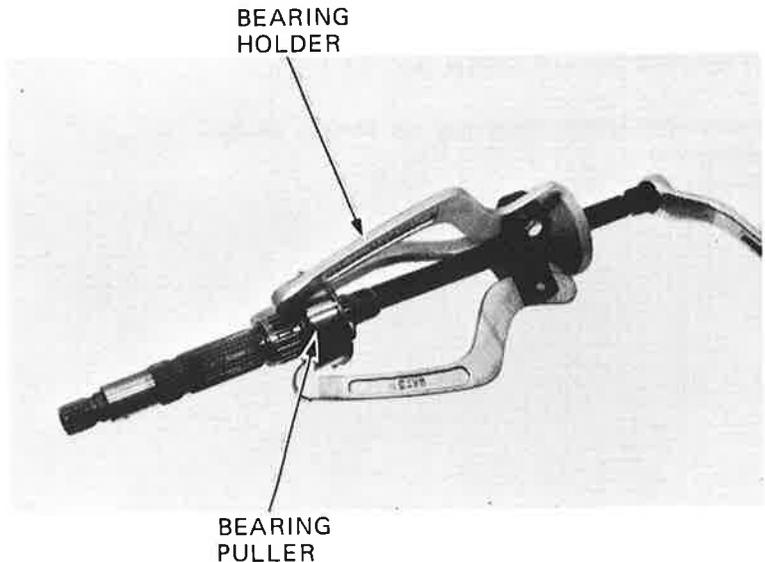
Remove the primary driven sprocket, ring nut and starter clutch.



PRIMARY SHAFT DISASSEMBLY

Remove the bearing holder.

Remove the bearing from the holder.



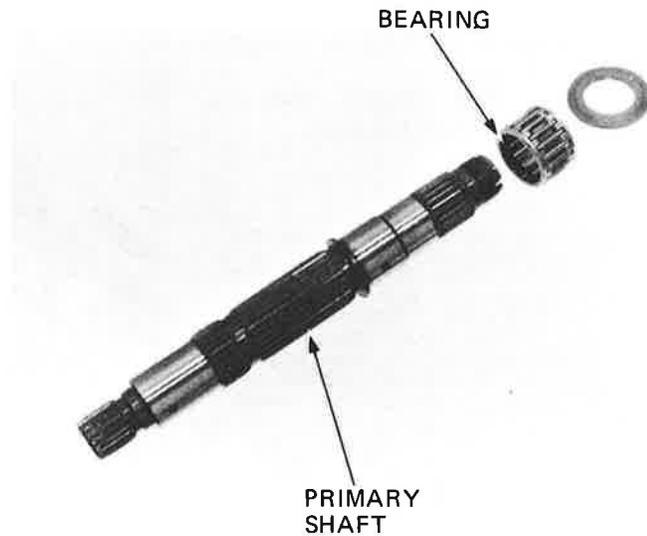


PRIMARY SHAFT INSPECTION

Check for scoring, wear or other damage.

BEARING INSPECTION

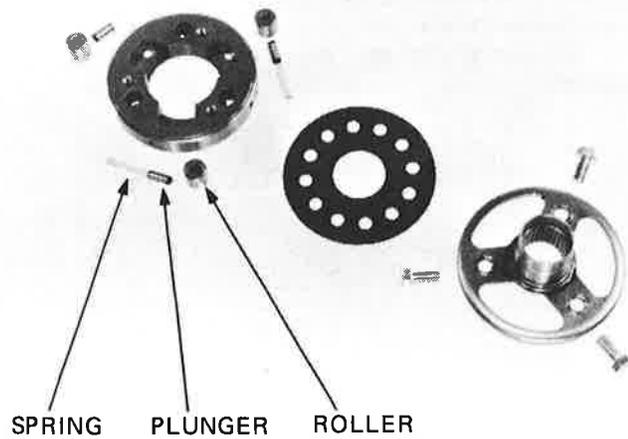
Check for damage.



STARTER CLUTCH DISASSEMBLY

STARTER CLUTCH INSPECTION

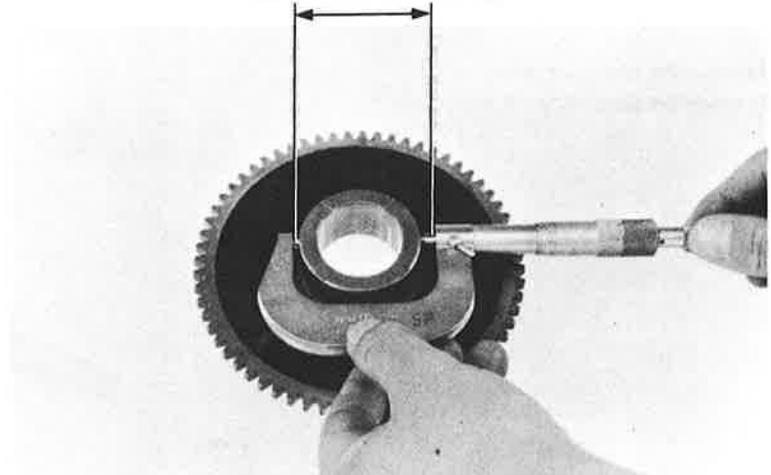
Inspect the rollers for smooth operation.
 Remove the rollers and check for excessive wear.
 Clean all parts with non-flammable or high flash-point solvent.



SERVICE LIMIT
 47.155 mm (1.8565 in)

STARTER DRIVE GEAR INSPECTION

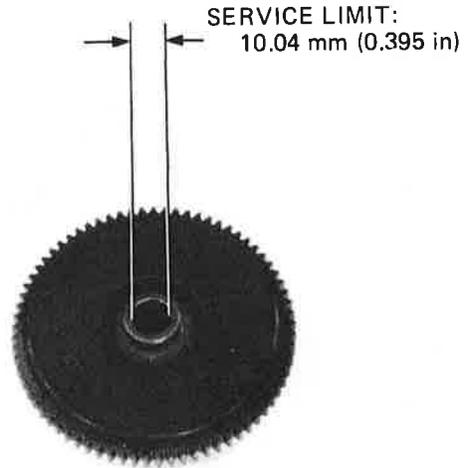
Inspect the starter drive gear for damage or excessive wear.
 Measure the O. D..





STARTER IDLE GEAR INSPECTION

Inspect the idle gear for tooth damage.
Measure the idle gear I.D..



Measure the idle gear shaft O. D..
Measure the idle gear-to-shaft clearance.

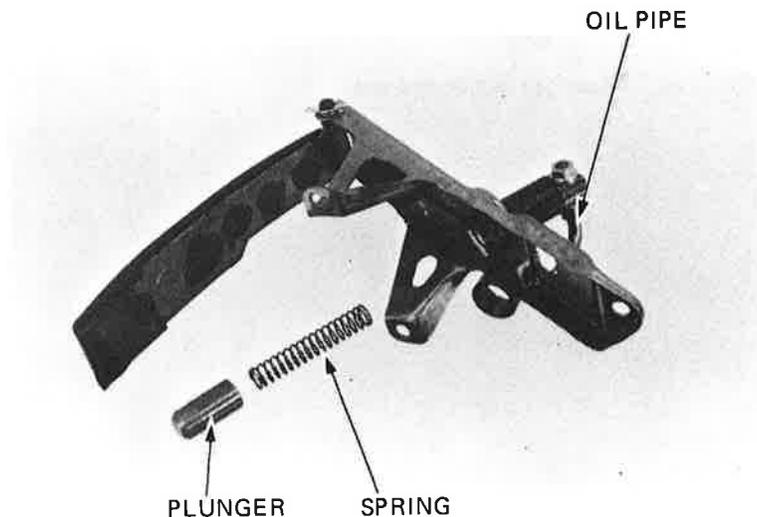
SERVICE LIMIT: 0.10 mm (0.004 in)

SERVICE LIMIT:
9.95 mm (0.392 in)



PRIMARY CHAIN TENSIONER DISASSEMBLY

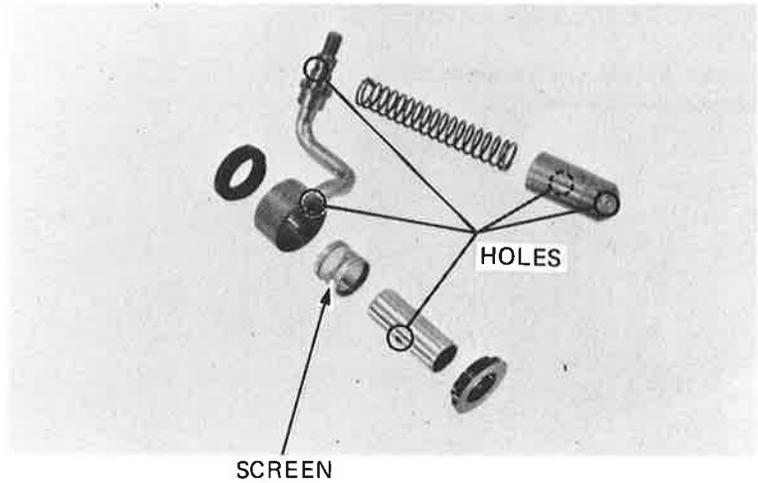
Remove the inner oil pipe and screen.
Remove the spring and plunger.
Remove the lock pin and slipper.
Remove the nut and oil pipe.





INSPECTION

Check the holes in the oil pipes and plunger for blockage.
 Clean all parts with non-flammable or high flashpoint solvent.



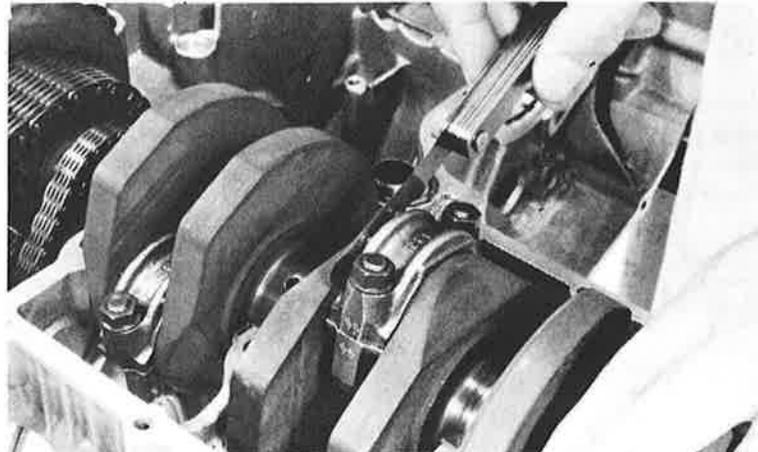
Inspect the slipper for damage or excessive wear.



CONNECTING ROD REMOVAL

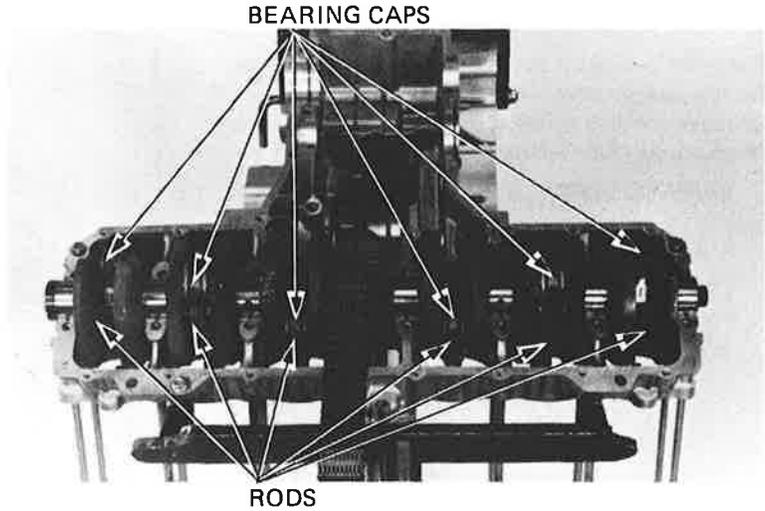
Check the connecting rod side clearance.

SERVICE LIMIT:
 0.3 mm (0.01 in)





Remove the bearing caps and rods.



NOTE

Mark the rods, bearings and bearing caps to indicate cylinder position.



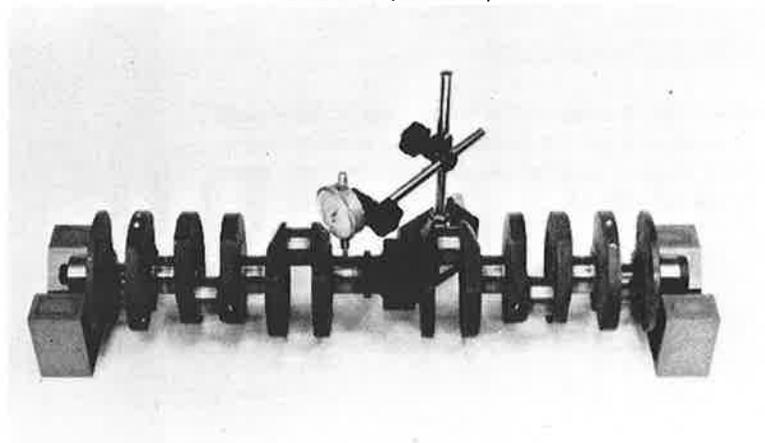
SERVICE LIMIT:
0.05 mm (0.002 in)

CRANKSHAFT INSPECTION

Remove the cam chain and primary chain.

Set the crankshaft on a stand or V blocks.
Set a dial gauge into the center main journal.
Rotate the crankshaft two revolutions and read runout at the center journal.

Actual runout is 1/2 of total indicator reading.

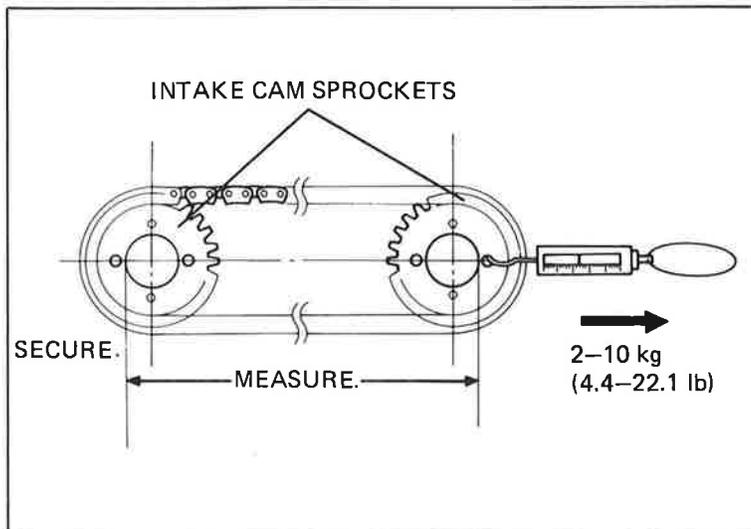




CAM CHAIN LENGTH MEASUREMENT

Place the cam chain over the intake cam sprockets. Secure one sprocket. Apply 2–10 kg (4.4–22.1 lb) of tension with a spring scale to the other sprocket. Measure the chain length as shown.

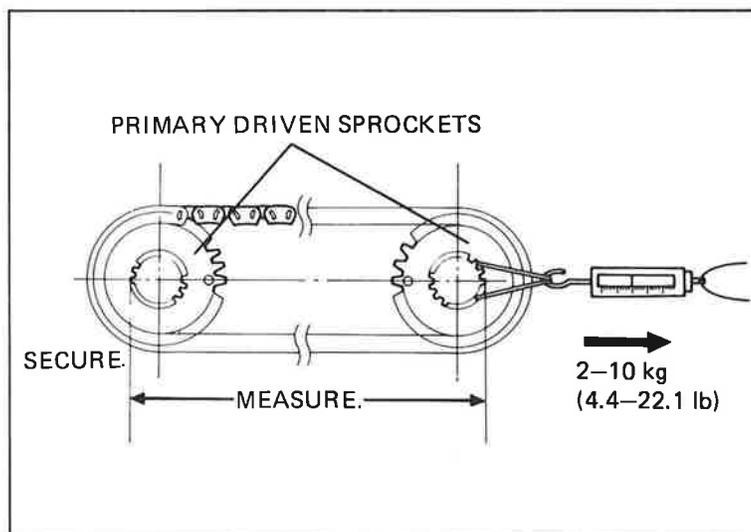
SERVICE LIMIT: 261.8 mm (10.31 in)



PRIMARY CHAIN LENGTH MEASUREMENT

Place the primary chain over the primary driven sprockets. Secure one sprocket. Apply 2–10 kg (4.4–22.1 lb) of tension with a spring scale to the other sprocket. Measure the chain length as shown.

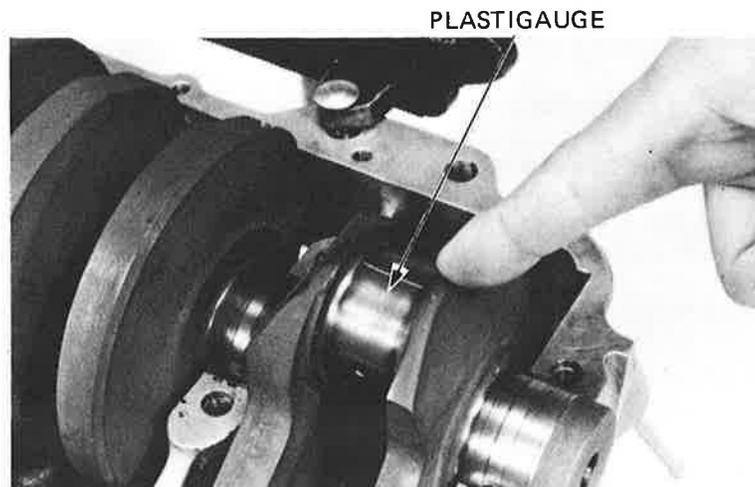
SERVICE LIMIT: 195.8 mm (7.71 in)



BEARING INSPECTION

CONNECTING RODS

Inspect the bearing inserts for damage or separation. Clean all oil from the bearing inserts and crankpins. Put a piece of plastigauge on each crankpin, avoiding the oil hole.



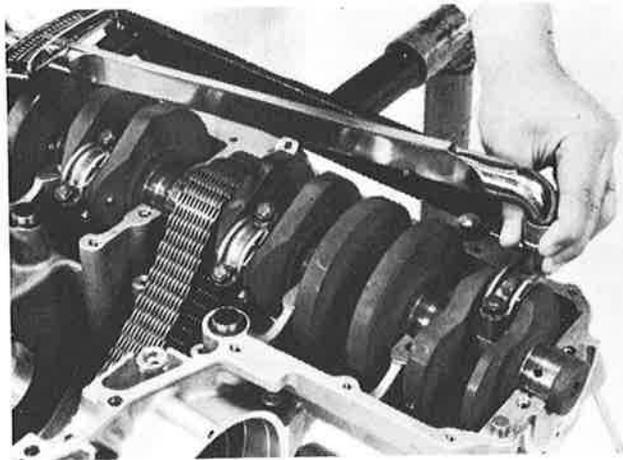


Install the bearing caps and rods on the correct crankpins, and tighten them evenly.

TORQUE: 28–32 N·m
(2.8–3.2 kg·m, 20–23 ft·lb)

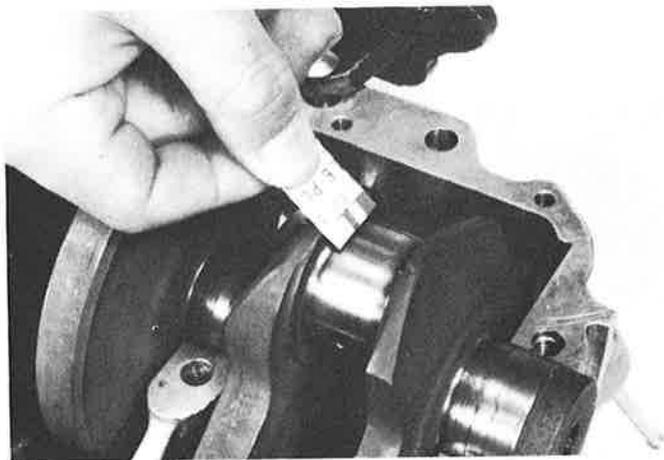
NOTE

Do not rotate the crankshaft during inspection.



Remove the caps and measure the compressed plastigauge on each crankpin.

OIL CLEARANCE SERVICE LIMIT:
0.08 mm (0.003 in)

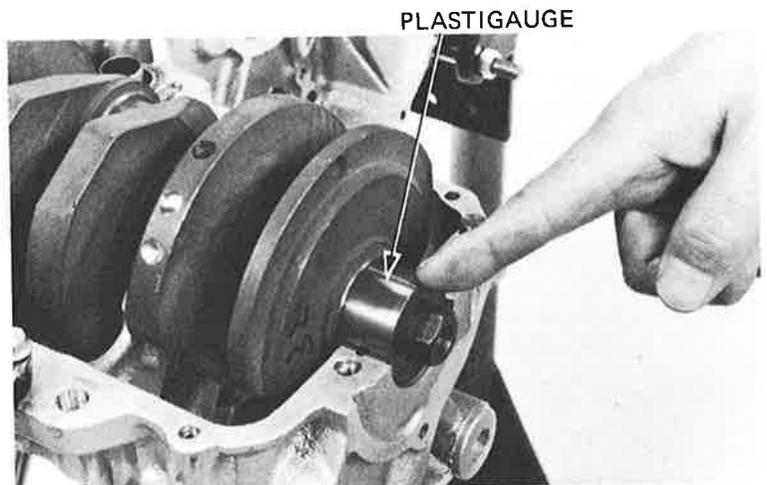


MAIN BEARINGS

Inspect the bearing inserts for damage or separation.

Clean all oil from the bearing inserts and journals.

Put a piece of plastigauge on each journal, avoiding the oil holes.





Install the main bearings on the correct journals on the lower crankcase and tighten them evenly in the sequence shown and in 2-3 steps.

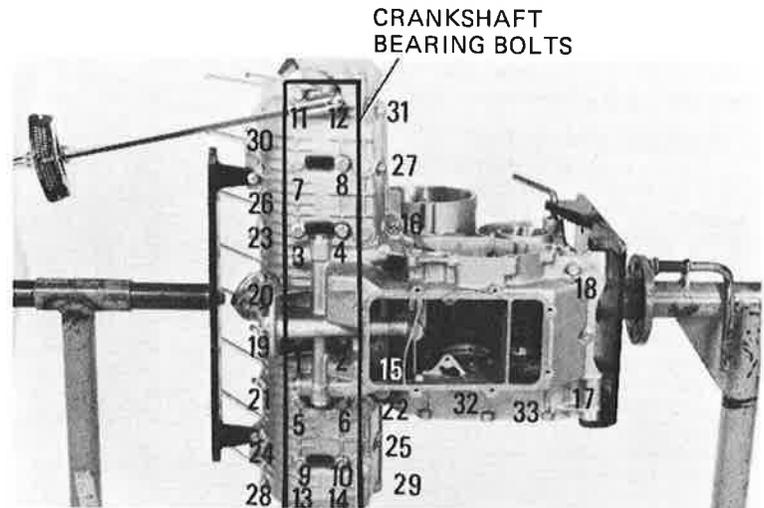
TORQUES:

8 mm bolt:	23–27 N·m (2.3–2.7 kg·m, 17–20 ft·lb)
6 mm bolt:	10–14 N·m (1.0–1.4 kg·m, 7–10 ft·lb)
10 mm bolt:	33–37 N·m (3.3–3.7 kg·m, 24–27 ft·lb)

Tighten the upper crankcase bolts to the specified torque, proceeding front to rear.

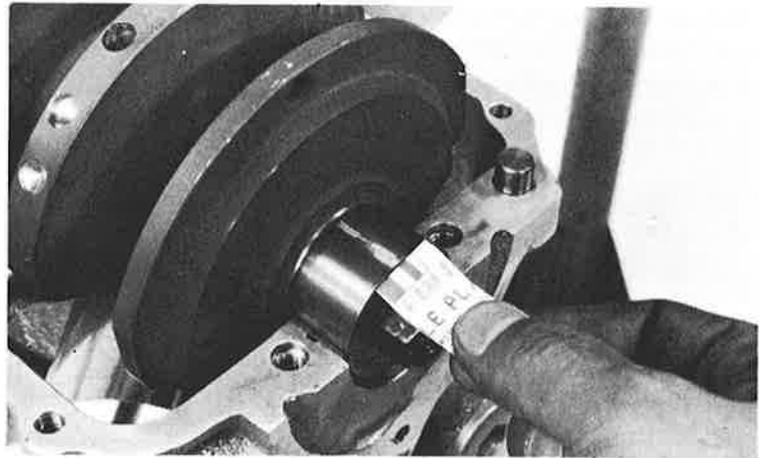
NOTE

Do not rotate the crankshaft during inspection.



Remove the lower crankcase and measure the compressed plastigauge on each journal.

OIL CLEARANCE SERVICE LIMIT:
 0.08 mm (0.003 in)



BEARING SELECTION

If rod bearing clearance is beyond tolerance, select replacement bearings as follows:

CONNECTING ROD BEARING INSERTS

Determine and record the corresponding rod I.D. code number.



I.D. CODE



Determine and record the corresponding crankpin O.D. code number (or measure the crankpin O.D.).

NOTE

The six letters "P L-BBCBBB" on the crank weight indicate the code numbers for the crankpin O.D. from left to right; e.g. O.D. code number for the second crankpin from left is B.

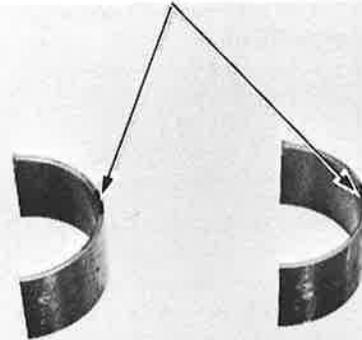


O.D. CODE

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

		CRANKPIN O.D. CODE NO.			
		A	B	C	
		35.992– 36.000 mm	35.984– 35.992 mm	35.976– 35.984 mm	
CONNECTING ROD I.D. CODE NO.	1	39.000– 39.008 mm	E (Yellow)	D (Green)	C (Brown)
	2	39.008– 39.016 mm	D (Green)	C (Brown)	B (Black)
	3	39.016– 39.024 mm	C (Brown)	B (Black)	A (Blue)

COLOR CODE



BEARING INSERT THICKNESS:

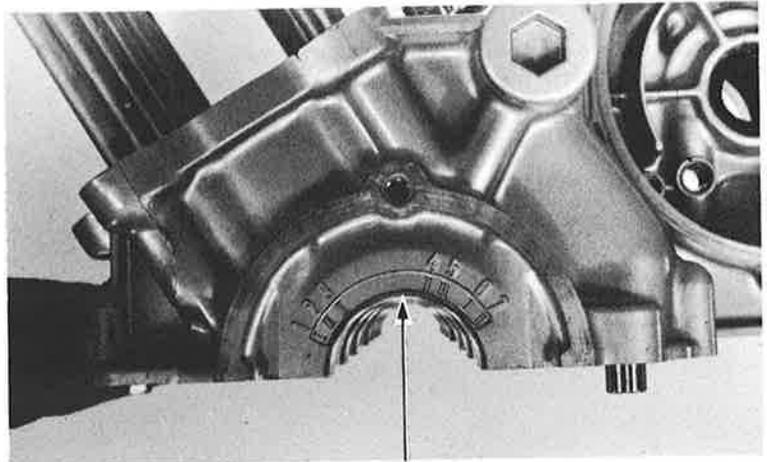
- A (Blue) : 1.502–1.506 mm (0.0591–0.0593 in)
- B (Black) : 1.498–1.502 mm (0.0590–0.0591 in)
- C (Brown): 1.494–1.498 mm (0.0588–0.0590 in)
- D (Green): 1.490–1.494 mm (0.0587–0.0588 in)
- E (Yellow): 1.486–1.490 mm (0.0585–0.0587 in)

MAIN BEARING

Determine and record crankcase I.D. code numbers.

NOTE

The seven numbers "I III II II III I II" on the upper left crankcase indicate the code numbers for the main journal I.D. from left to right; e.g. I.D. code number for the fifth Main journal from left to right is III.

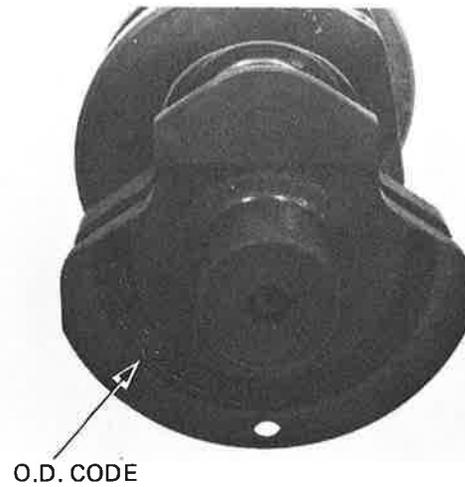


I D. CODE

Determine and record the corresponding main journal O.D. code letters (or measure the main journal O.D.).

NOTE

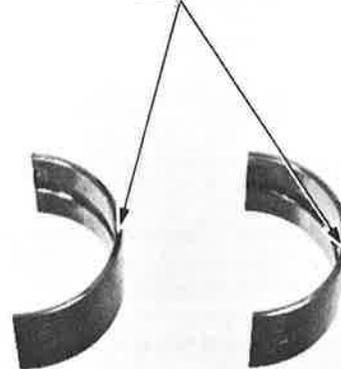
The seven numbers "① L-3322232" on the crank weight indicate the code numbers for the main journal O.D. from left to right; e.g. O.D. code number for the third main journal from left to right is 2.



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

		MAIN JOURNAL O.D. CODE NO.		
		1	2	3
CASE I.D. CODE NO.	I	39.000–39.008 mm D (Yellow)	35.984–35.992 mm C (Green)	35.976–35.984 mm B (Brown)
	II	39.008–39.016 mm C (Green)	39.016–39.024 mm B (Brown)	39.016–39.024 mm A (Black)
	III	39.016–39.024 mm B (Brown)	39.016–39.024 mm A (Black)	39.016–39.024 mm AA (Blue)

COLOR CODE



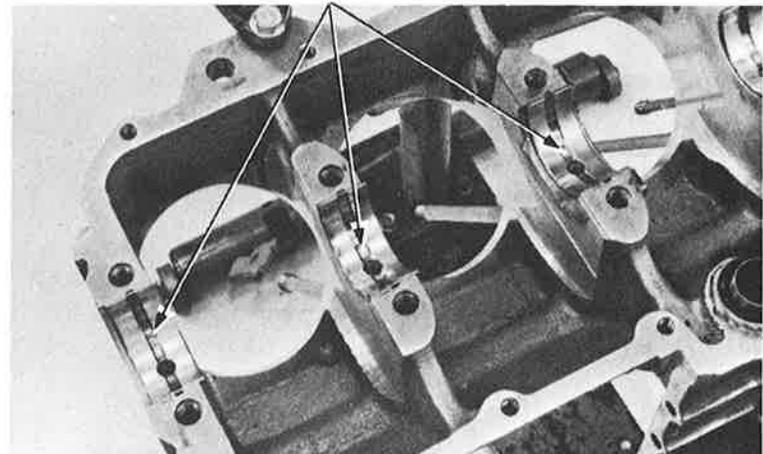
MAIN BEARING INSERT THICKNESS:

- AA (Blue) : 1.502–1.506 mm (0.0591–0.0593 in)
- A (Black) : 1.498–1.502 mm (0.0590–0.0591 in)
- B (Brown) : 1.494–1.498 mm (0.0588–0.0590 in)
- C (Green) : 1.490–1.494 mm (0.0587–0.0588 in)
- D (Yellow) : 1.486–1.490 mm (0.0585–0.0587 in)

CONNECTING ROD INSTALLATION

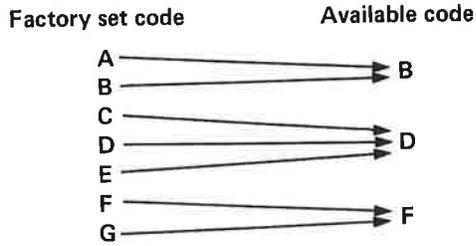
Install the main bearings into the upper crankcase. Apply molybdenum disulfide grease to the upper and lower main bearings. Install the crankshaft with the cam chain and primary chain.

MAIN BEARINGS



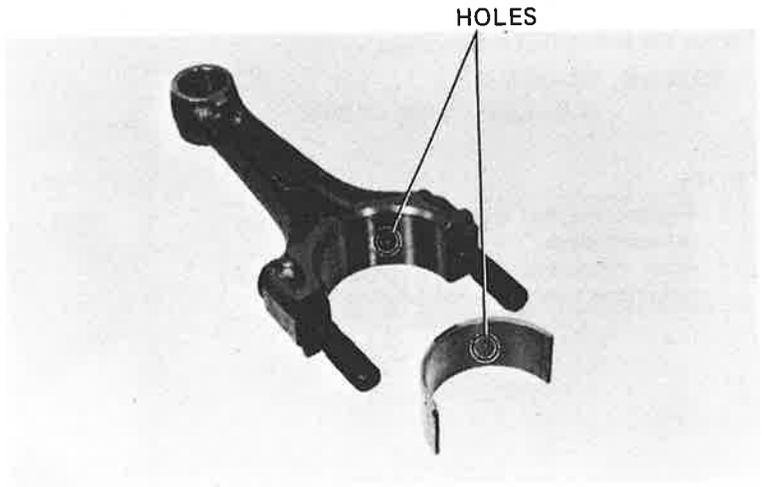


Before installing the connecting rods, make sure that the weight code combination is correct:

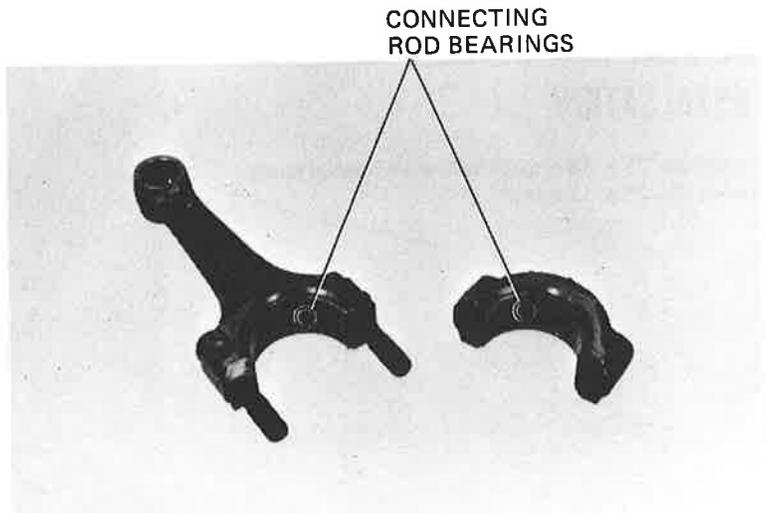


WEIGHT CODE

Align the hole in the bearing insert with the hole in the connecting rod.



Install the connecting rod and cap bearing inserts. Apply molybdenum disulfide grease to the connecting rod bearings.

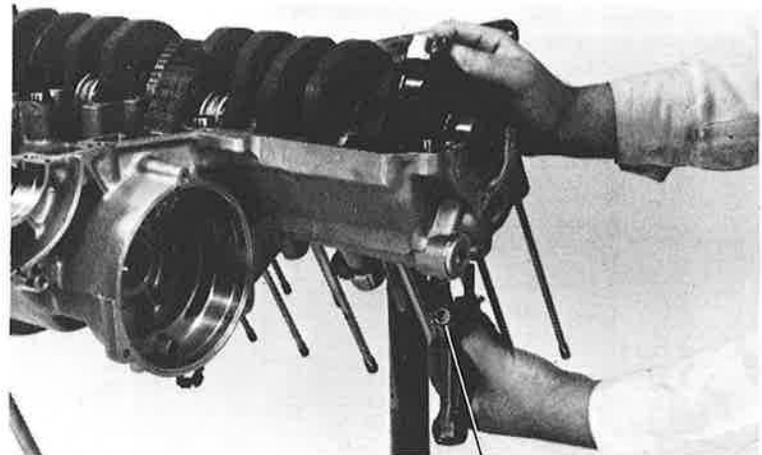




Install the connecting rods and bearing caps.

NOTE

- Be sure connecting rods are installed in their correct position and the oil holes point to the rear.
- Cross reference the rod and cap I. D. codes to insure correct reassembly.



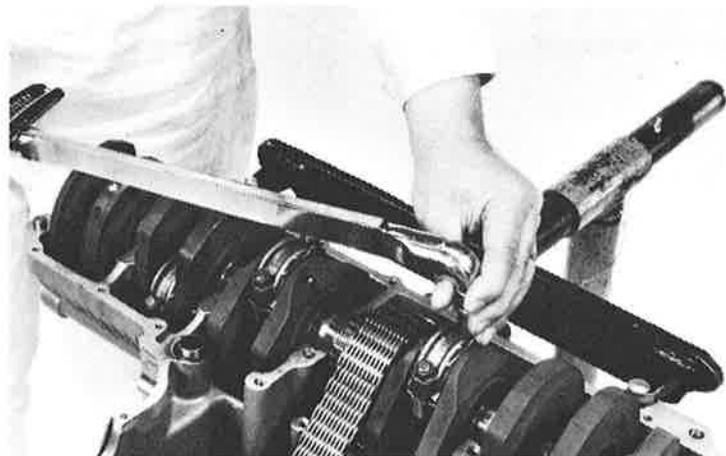
OIL HOLE

Torque the connecting rod bearing cap bolts.

TORQUE: 28–32 N·m
 (2.8–3.2 kg-m, 20–23 ft-lb)

NOTE

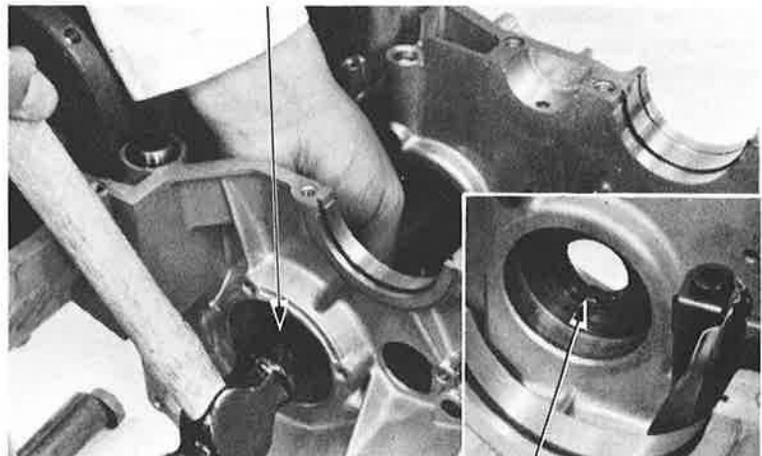
- Tighten the rod bearing cap bolts in two or more steps.
- After tightening the bolts, check that the rod moves freely without binding.



ATTACHMENT 37 x 40 mm
 PILOT 25 mm
 DRIVER

OIL SEAL AND BEARING INSTALLATION

Install the 25 x 38 mm oil seal with special tools.
 Install the 25 x 52 mm oil seal.

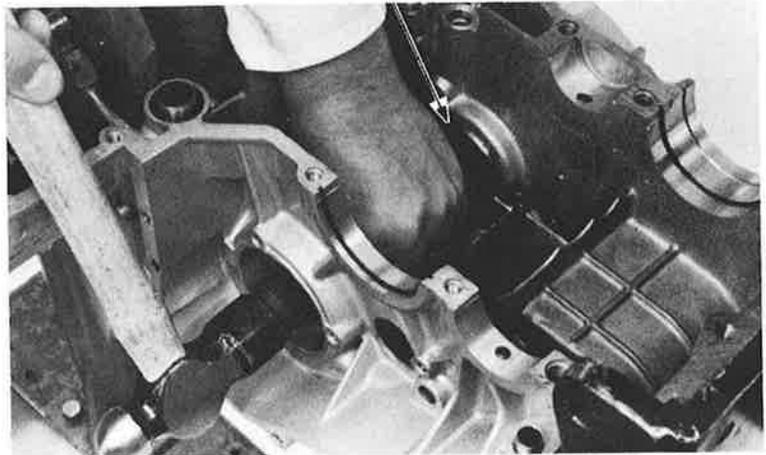


25 x 52 OIL SEAL



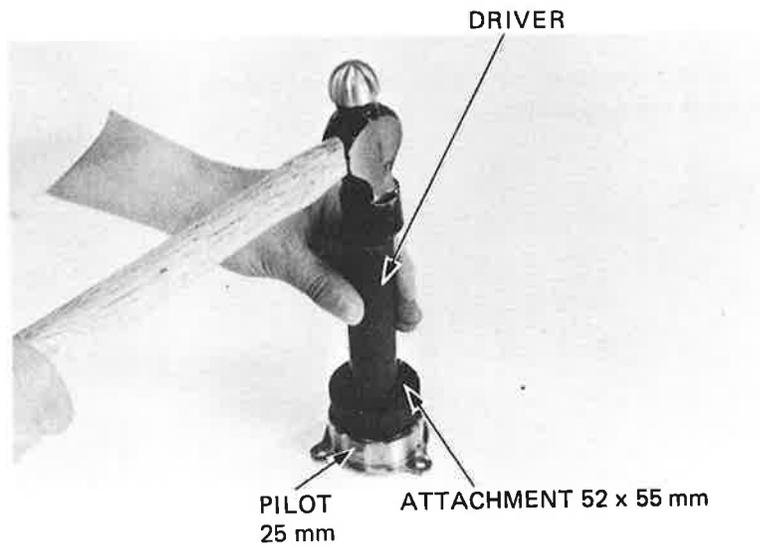
Install the bearing with special tools.

ATTACHMENT 52 x 55 mm
PILOT 25 mm DRIVER



PRIMARY SHAFT ASSEMBLY

Insert the primary shaft bearing into the bearing holder.

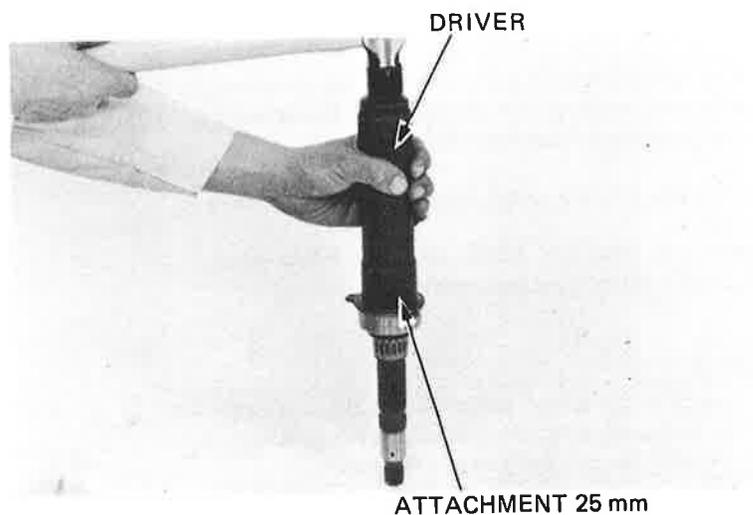


Slide the needle bearing and washer onto the shaft.

NOTE

Install the washer with the chamfered edge facing the spark advancer side.

Install the bearing over the shaft.





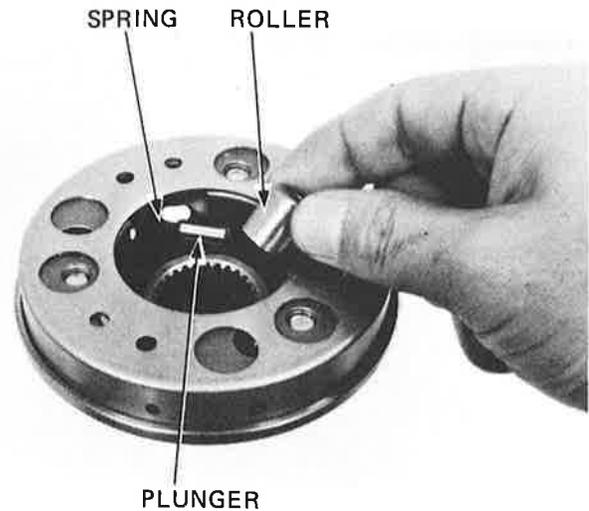
STARTER CLUTCH ASSEMBLY

Install the springs plungers and rollers.

NOTE

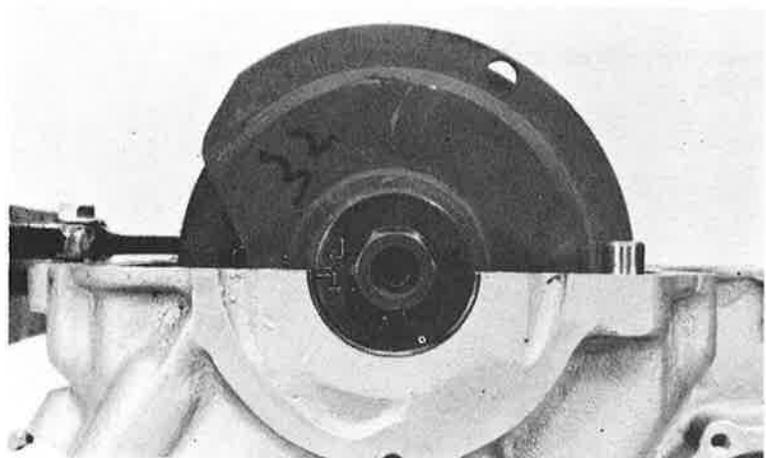
Apply a locking agent to the threads of the locking bolts.

Install the starter clutch outer and side plate.
 Install the springs, plungers and rollers.
 Install the starter drive gear.



PRIMARY SHAFT INSTALLATION

Align the crankshaft "T" mark with the forward crankcase mating surface.



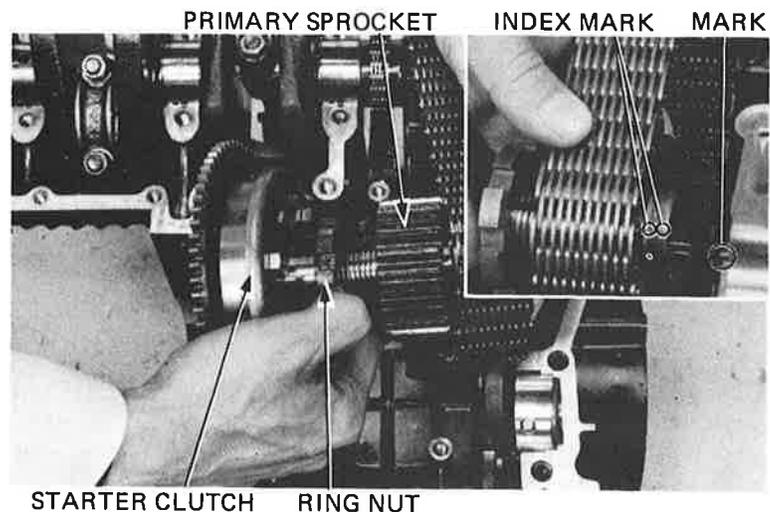
Install the ring nut on the primary driven sprocket.
 Install the starter clutch assembly on the primary driven sprocket by aligning the slots.

Install the primary chain over the primary driven sprocket.

Make sure that the driven sprocket index mark aligns with the bearing boss mark as shown.

NOTE

One primary driven sprocket slot aligns with an index mark on the sprocket's other side. This slot can also be used as a reference.

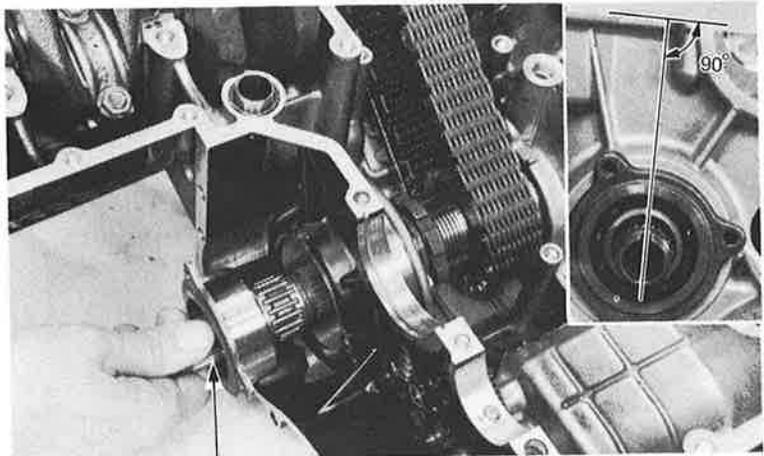




Install the primary shaft assembly. Make sure that the recess in the primary shaft is positioned 90° from the crankcase mating surface, and the bearing holder is in position.

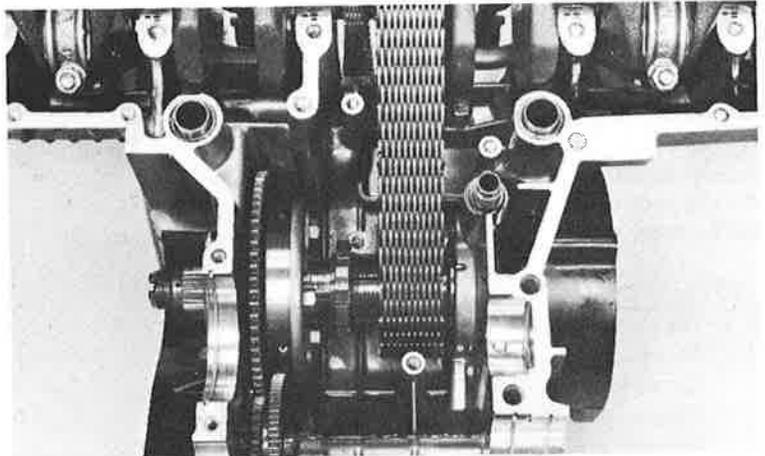
CAUTION

Do not damage the oil seals when installing the primary shaft.

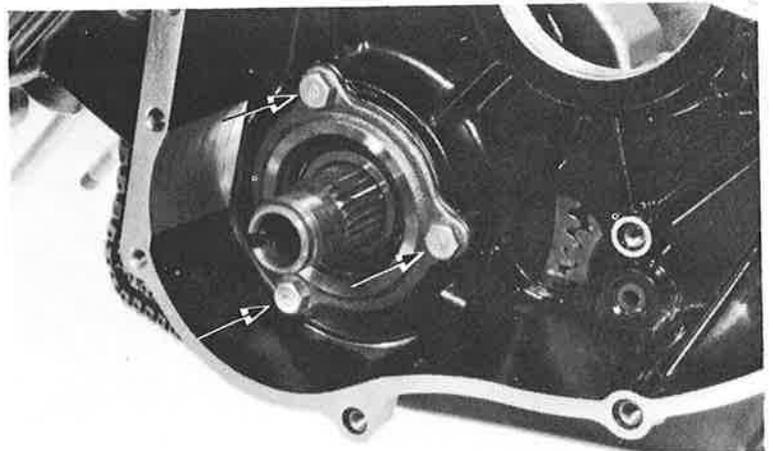


PRIMARY SHAFT

Make certain that the primary shaft recess aligns with the sprocket index mark and corresponding slot. The shaft recess, and sprocket slot/mark should align with the bearing boss mark as shown.

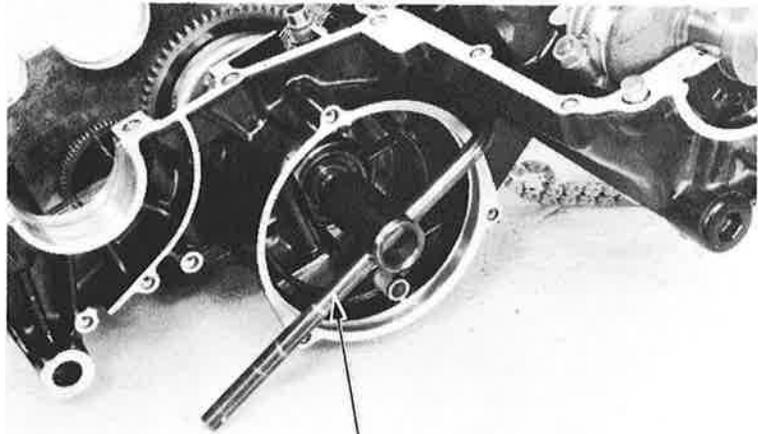


Tighten the primary shaft bearing holder bolts securely.





Hold the primary shaft with the special tool.



PRIMARY SHAFT HOLDER
07924-6340300

Tighten the collet ring nut.

TORQUE:

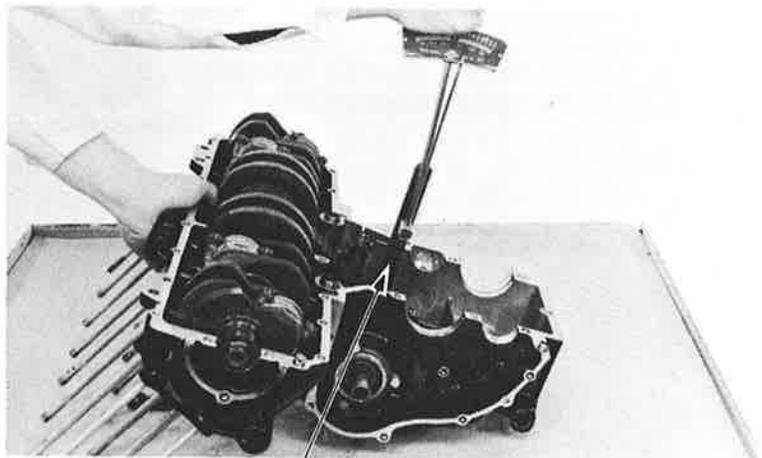
70–90 N·m (7.0–9.0 kg·m, 51–65 ft·lb)

Attach the pin spanner to a torque wrench.

Tighten the collet ring nut to obtain a torque wrench reading of 70–80N·m (7.0–8.0 kg·m, 51–59 ft·lb). This will give you the specified torque valve.

NOTE

- The ring nut has left-hand threads.
- Be certain the sprocket and nut threads do not have any burrs.
- Lightly oil the threads before tightening the nut.



PIN SPANNER 55 mm 07902-4220000

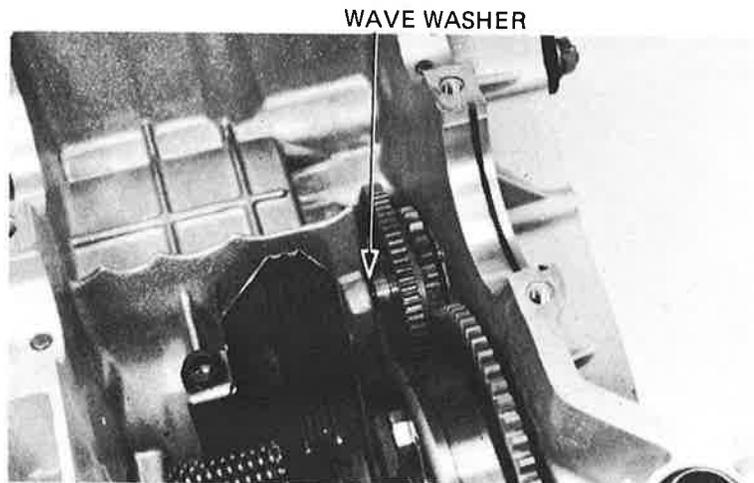
STARTER IDLE GEAR INSTALLATION

Install the starter idle gear as shown.

NOTE

Be sure to install the wave washer.

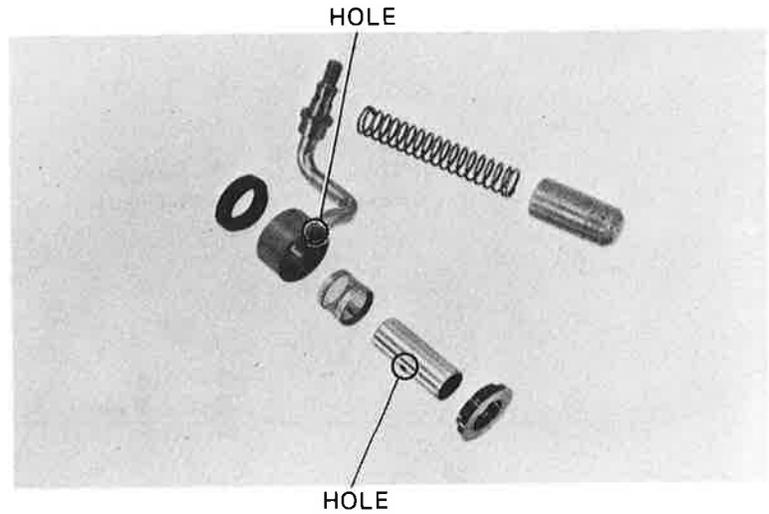
Install the idle gear shaft holder.



WAVE WASHER

PRIMARY CHAIN TENSIONER ASSEMBLY

Before installing the oil pipe, check the holes for blockage.



Assemble the primary chain tensioner as shown.
Tighten the nut loosely.



Insert the oil pipe into the oil opening.
Tighten the nut securely.

Install the oil supply nozzle.
Install the transmission (Section 11).
Assemble the crankcase (Section 10).

