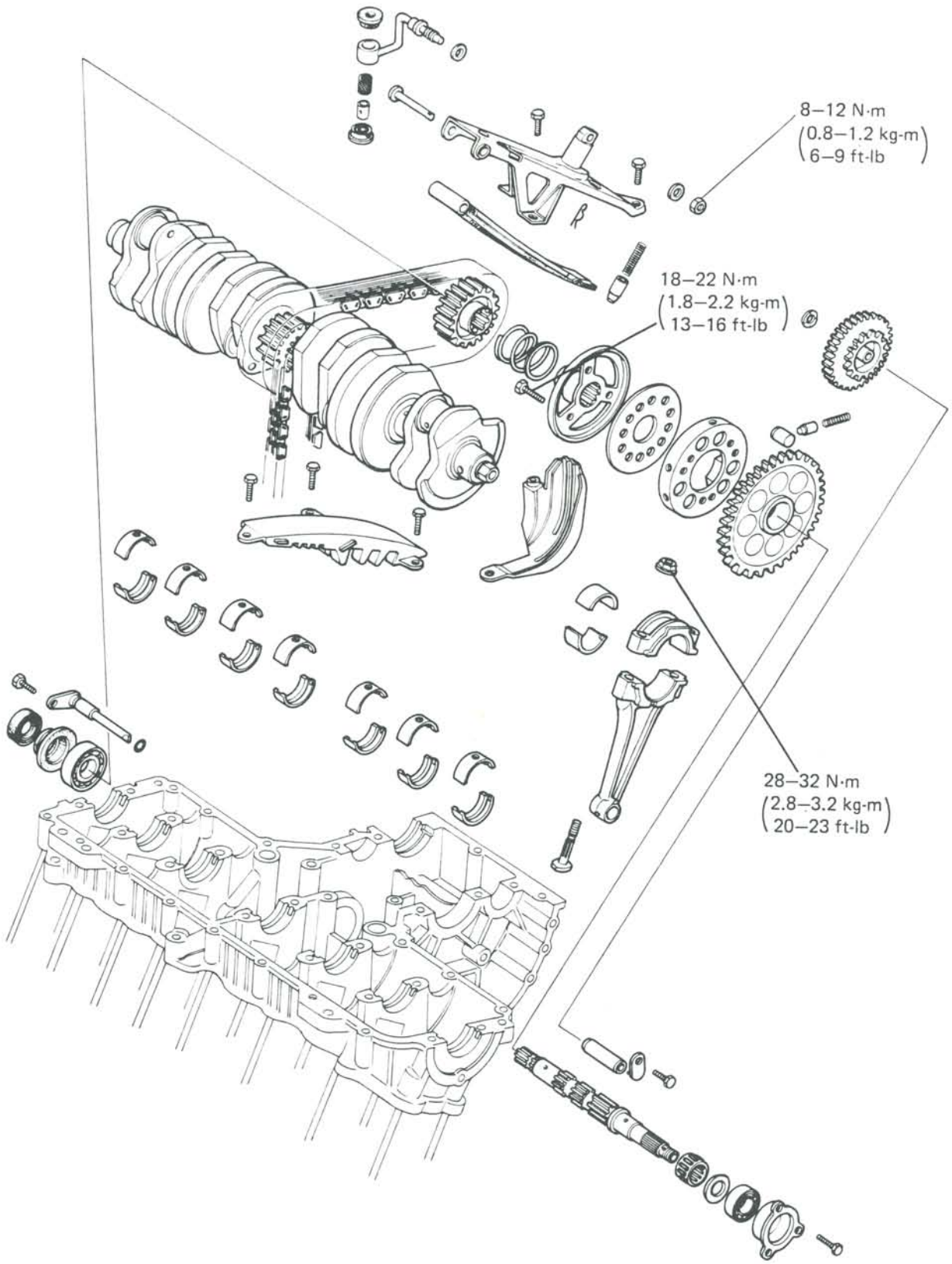
CRANKSHAFT/PRIMARY SHAFT

VILEBREQUIN/ ARBRE PRIMAIRE

KURBELWELLE/ PRIMÄRANTRIEBSWELLE

CIGÜEÑAL/EJE PRIMARIO


8–12 N·m
(0.8–1.2 kg-m
6–9 ft-lb)
18–22 N·m
(1.8–2.2 kg-m
13–16 ft-lb)
28–32 N·m
(2.8–3.2 kg-m
20–23 ft-lb)

SERVICE INFORMATION	12–1
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SERVICE INFORMATION

WORKING PRACTICE

All bearing inserts are select fit and are identified by color code. Select replacement bearings from the code tables. After intalling new bearings, recheck them with plastigauge to verify clearance.
Apply molybdenum disulfied grease to the main journals and crankpins during assembly.

SPECIAL TOOLS

Common Tools

Driver Handle	07749–0010000
25mm Driver pilot	07746–0040600
37 x 40mm Outer Driver	07746–0010200
52 x 55mm Outer Driver	07746–0010400
Driver Handle	07746–0030100
25 mm Inner driver	07746–0030200

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)
Crankshaft	23–27 N·m (2.3–2.7 kg-m, 17–20 ft-lb)
Primary chain tensioner nut	8–12 N·m (0.8–1.2 kg-m, 6–9 ft-lb)

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 (0.01 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)

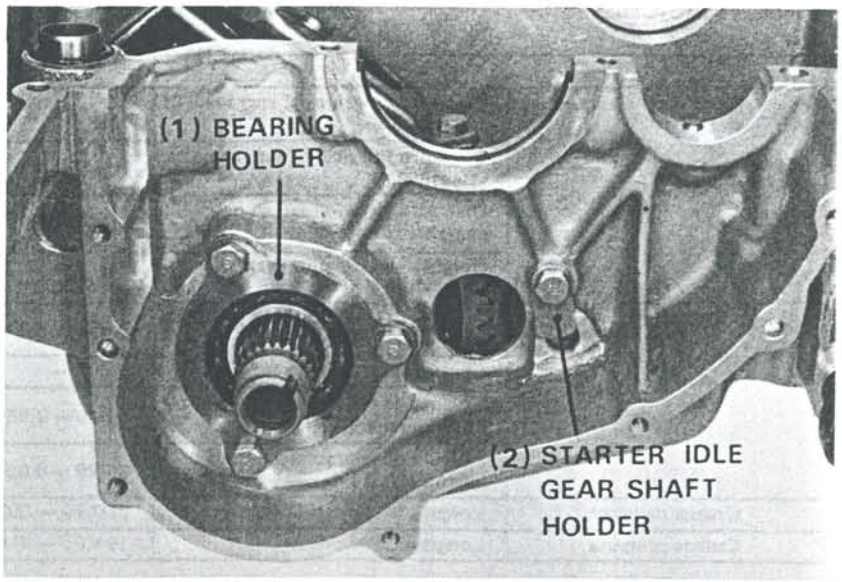
TROUBLESHOOTING

Excessive Noise
–Worn main journal bearing
–Worn crank pin bearing

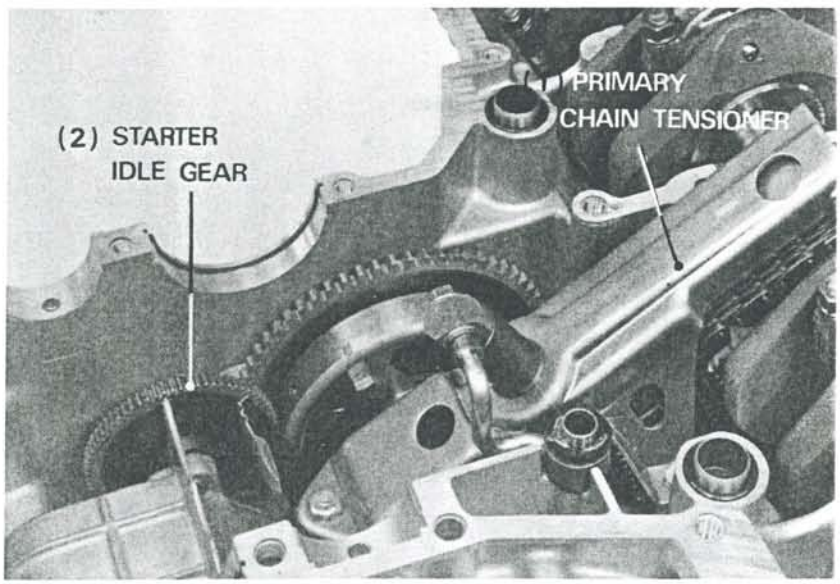
PRIMARY SHAFT/STARTER CLUTCH REMOVAL

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

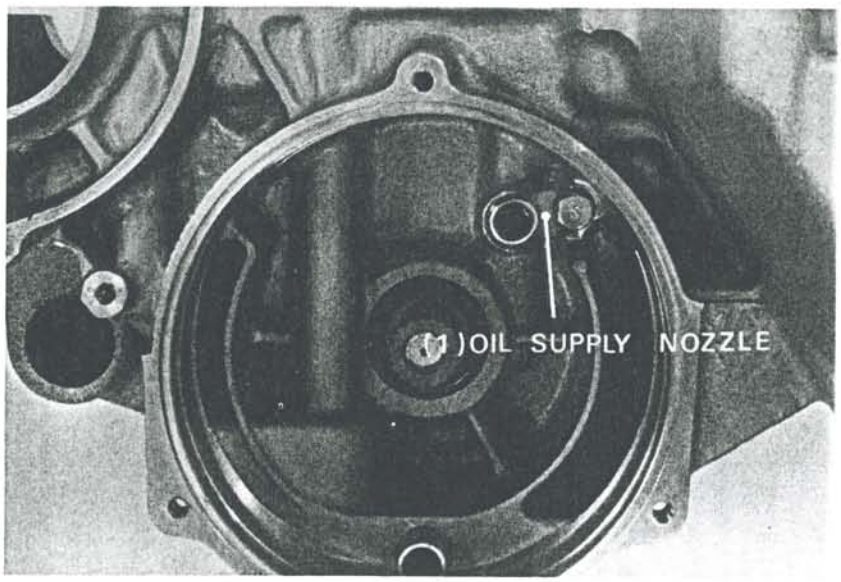
Remove the starter idle gear shaft holder.
Loosen the primary shaft bearing holder bolts.



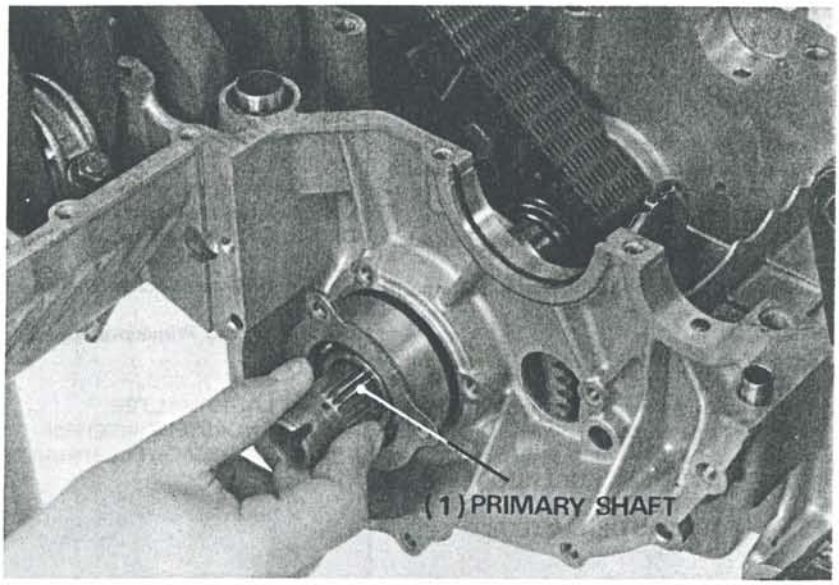
Remove the starter idle gear shaft.
Remove the starter idle gear and wave washer.
Remove the primary chain tensioner.



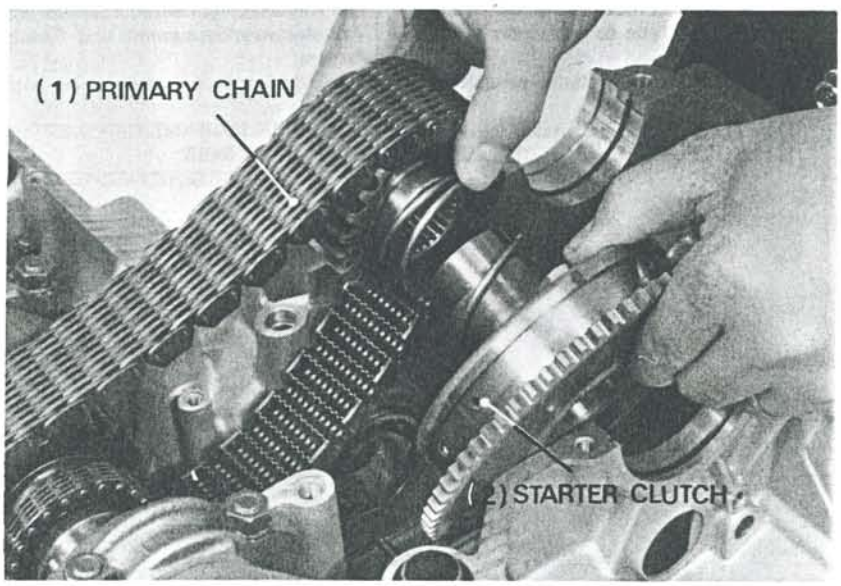
Remove the oil supply nozzle.



Remove the primary shaft.

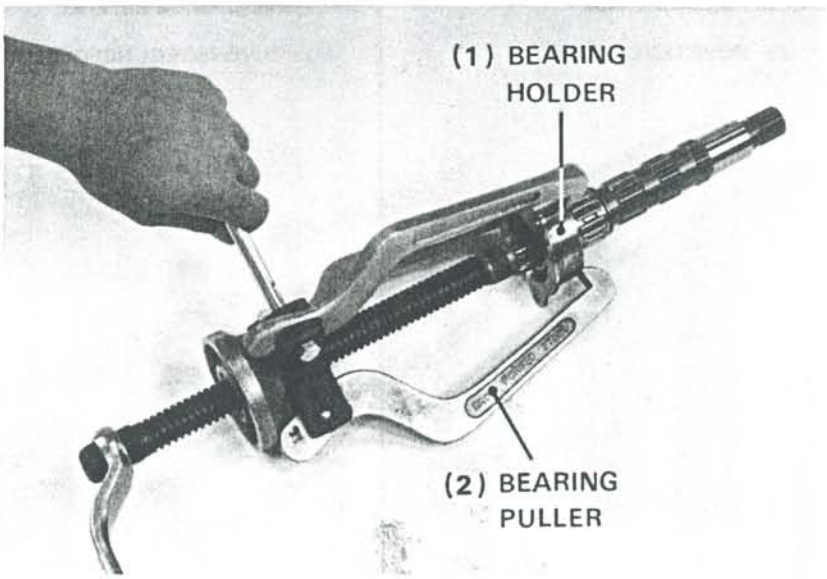


Raise the primary driven sprocket and starter clutch and remove the primary chain.
Remove the primary driven sprocket and the starter clutch.



PRIMARY SHAFT DISASSEMBLY

Remove the bearing holder.
Remove the bearing from the holder.

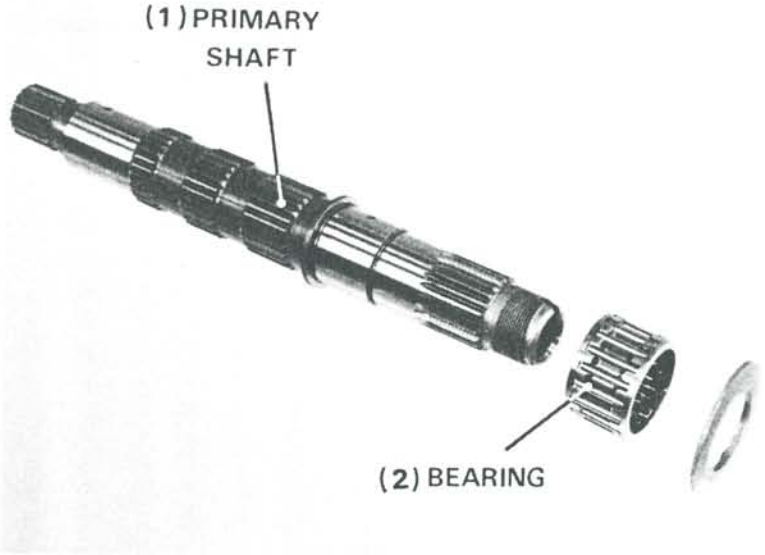


PRIMARY SHAFT INSPECTION

Check for scoring, wear or other damage.

BEARING INSPECTION

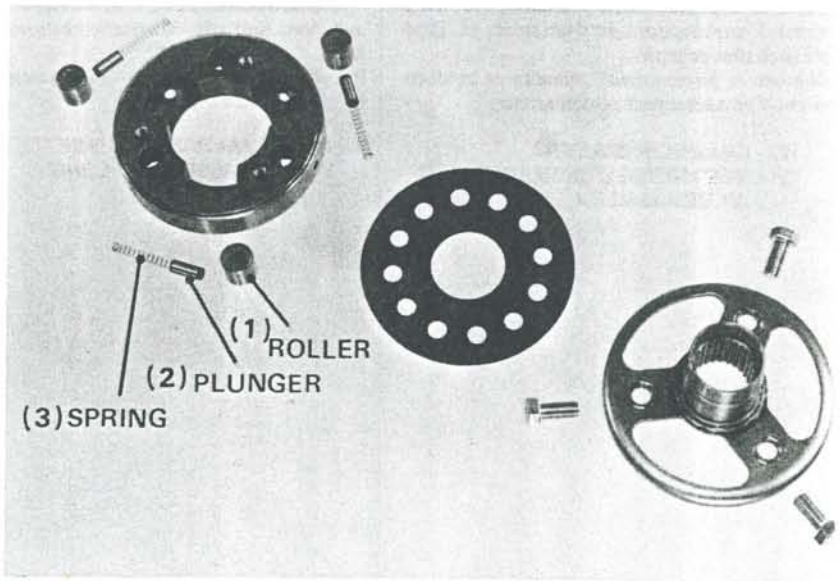
Check for damage.



STARTER CLUTCH DISASSEMBLY

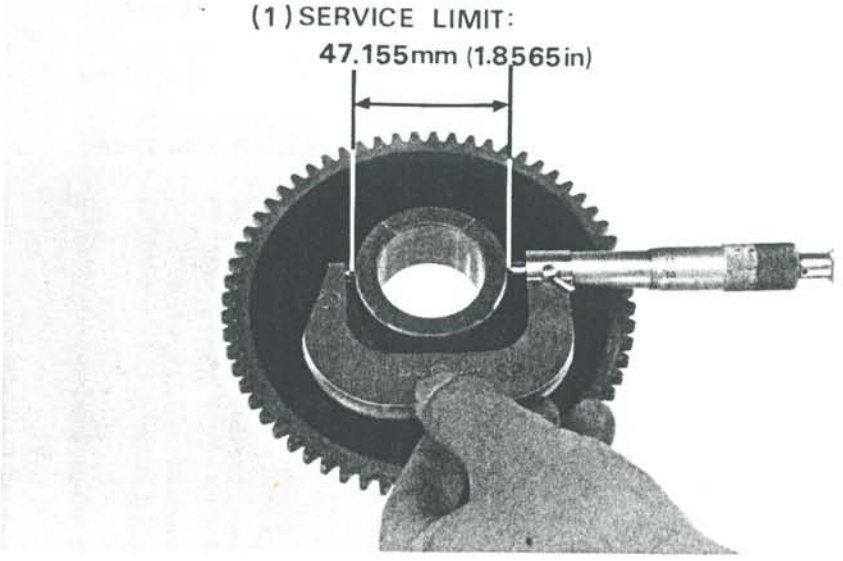
STARTER CLUTCH INSPECTION

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



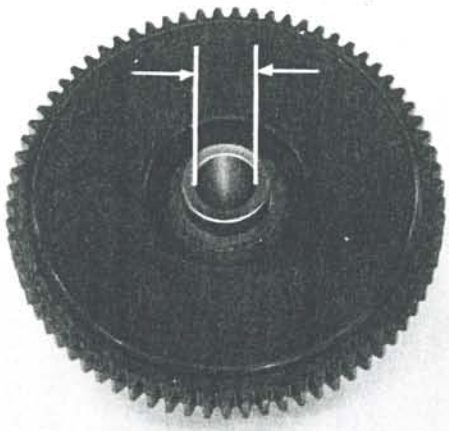
STARTER DRIVE GEAR INSPECTION

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



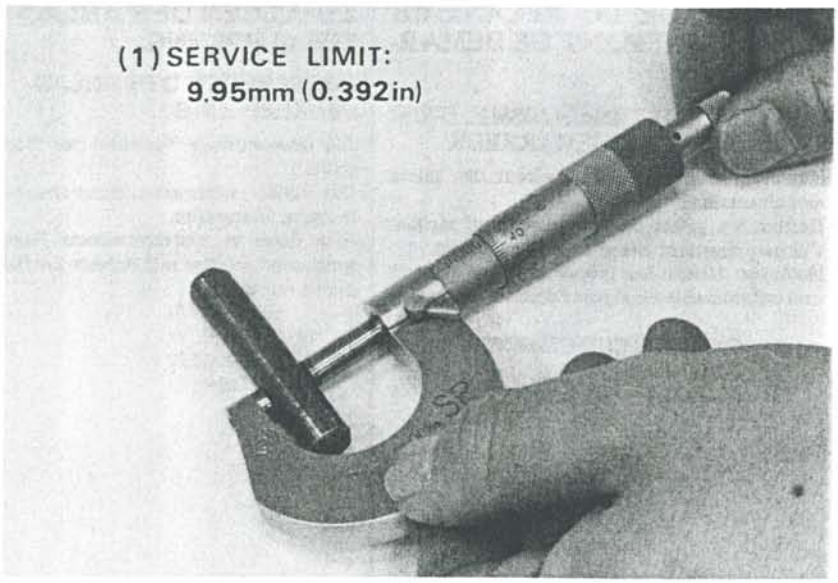
STARTER IDLE GEAR INSPECTION

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



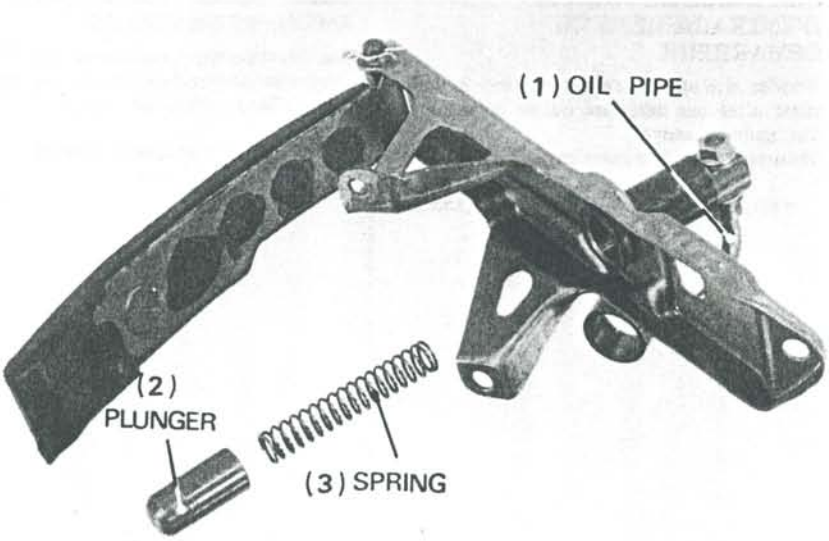
Measure the idle gear shaft O. D..
Measure the idle gear-to-shaft clearance.

SERVICE LIMIT: 0.1 mm (0.004 in)



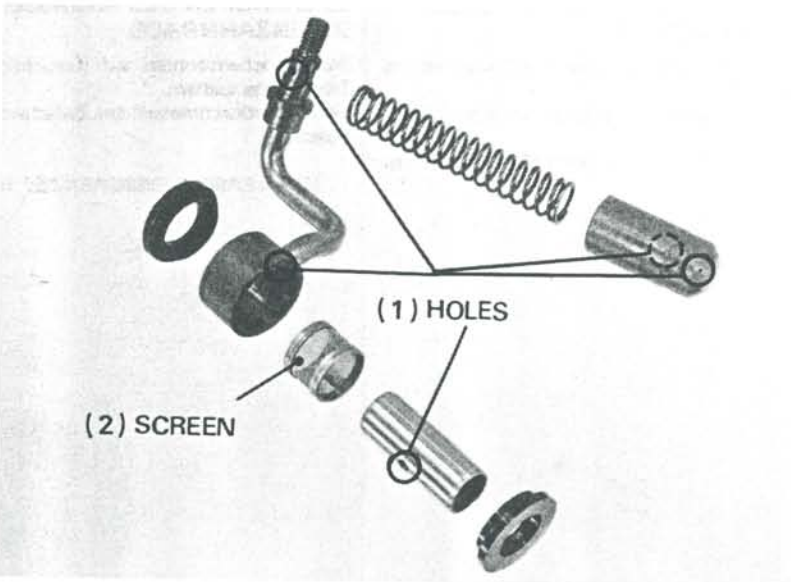
PRIMARY CHAIN TENSIONER DISASSEMBLY

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

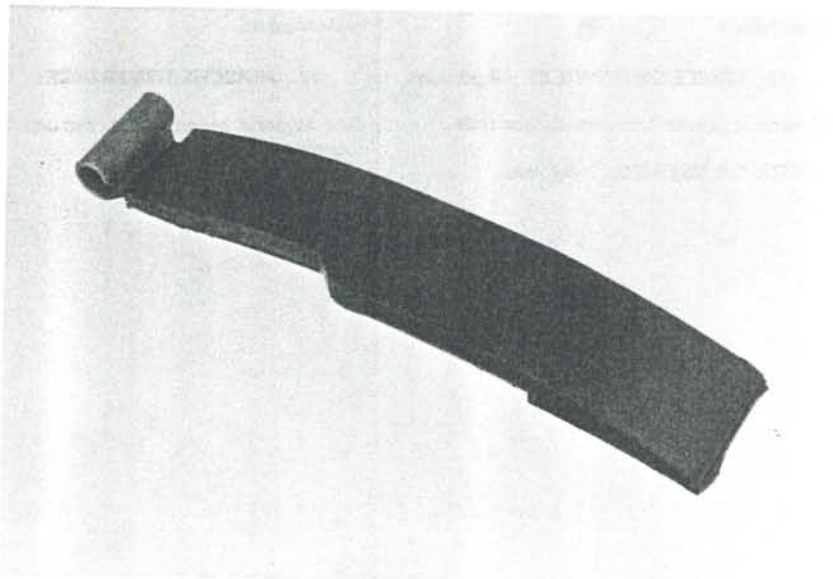


INSPECTION

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

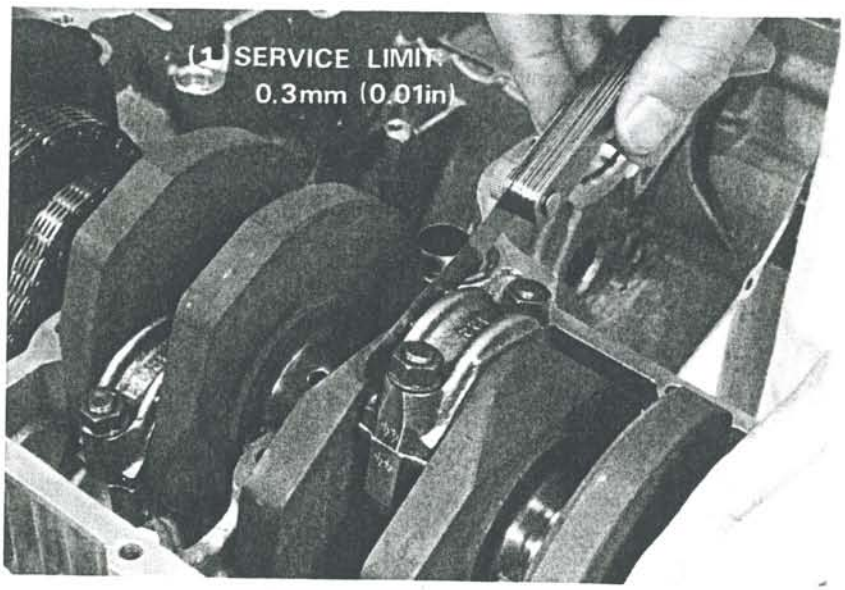


Inspect the slipper for damage or excessive wear.

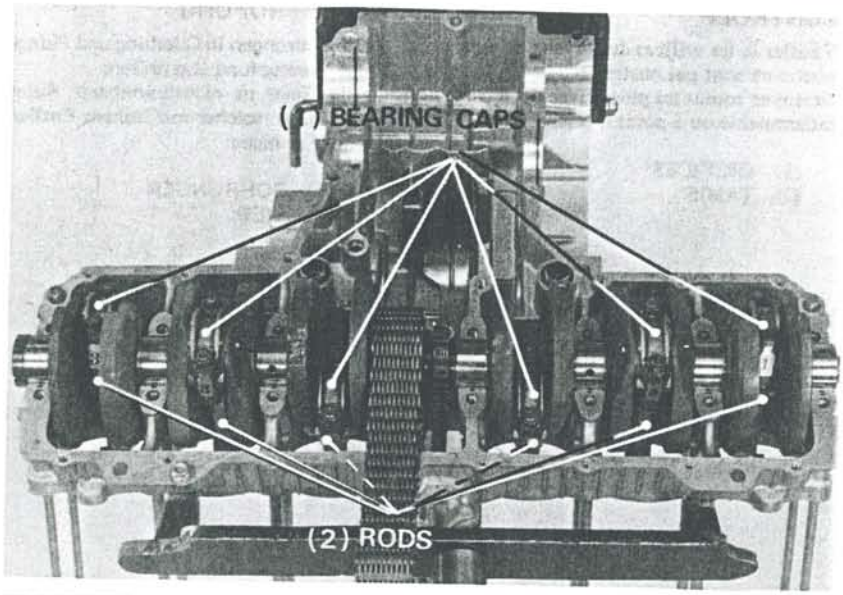


CONNECTING ROD REMOVAL

Check the connecting rod side clearance.

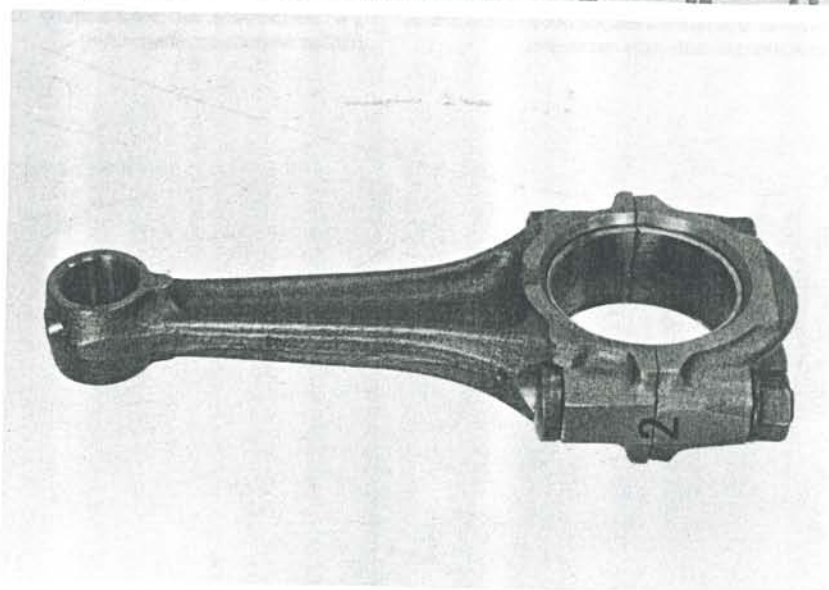


Remove the bearing caps and rods.



NOTE

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



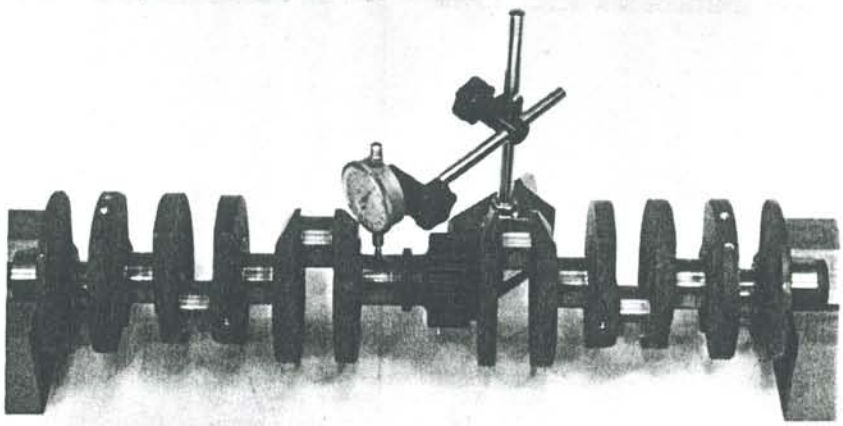
CRANKSHAFT INSPECTION

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.

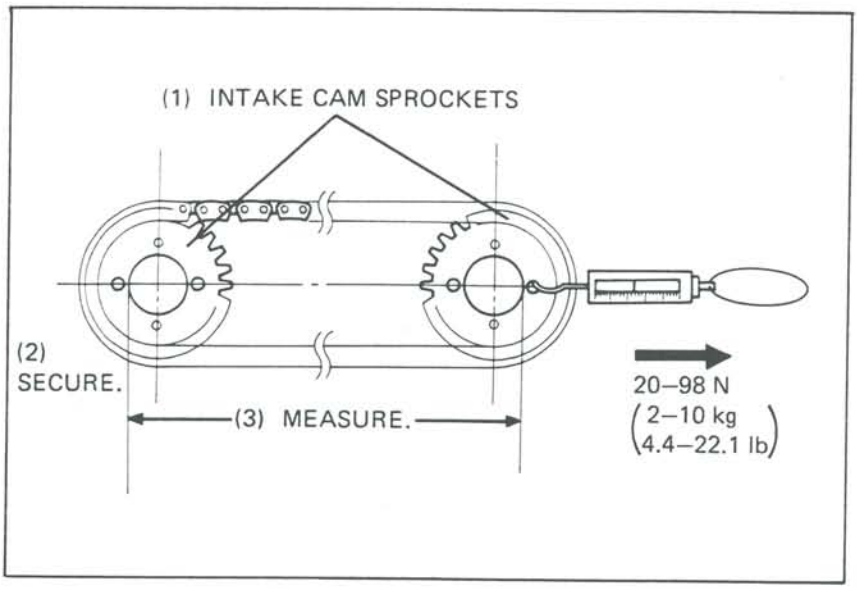
(1) SERVICE LIMIT:
0.05mm (0.002in)



CAM CHAIN LENGTH MEASUREMENT

Place the cam chain over the intake cam sprockets.
Secure one sprocket. Apply 20–98 N (2–10 kg, 4.4–22.1 lb) of tension with a spring scale to the other sprocket.
Measure the chain length as shown.

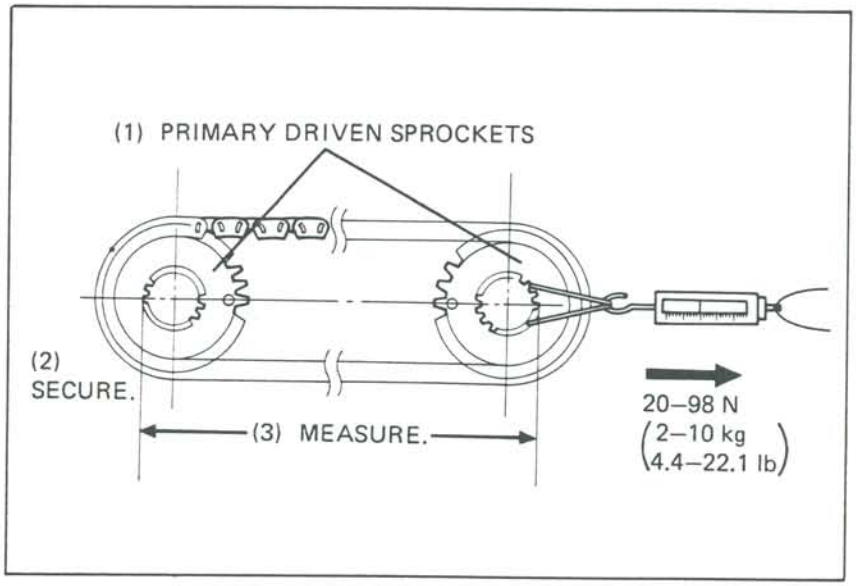
SERVICE LIMIT: 261.8 mm (10.31 in)



PRIMARY CHAIN LENGTH MEASUREMENT

Place the primary chain over the primary driven sprockets. Secure one sprocket.
Apply 20–98 N (2–10 kg, 4.4–22.1 lb) of tension with a spring scale to the other sprocket. Measure the chain length as shown.

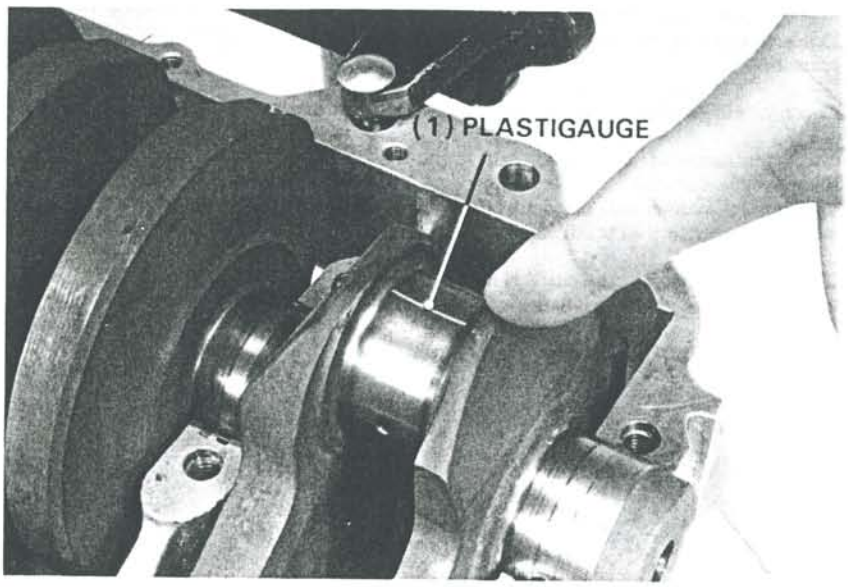
SERVICE LIMIT: 195.8 mm (7.71 in)



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.

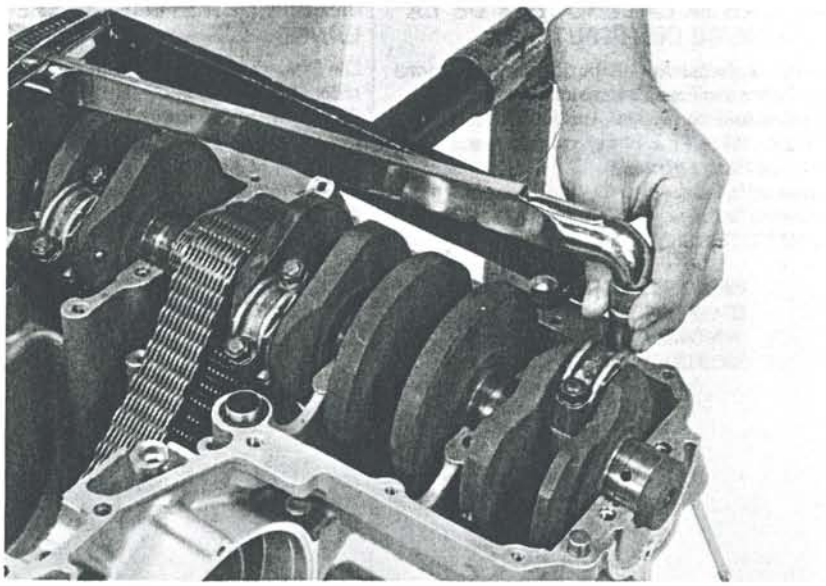


Install the bearing caps and rods on the correct crankpins, and tighten them evenly.

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

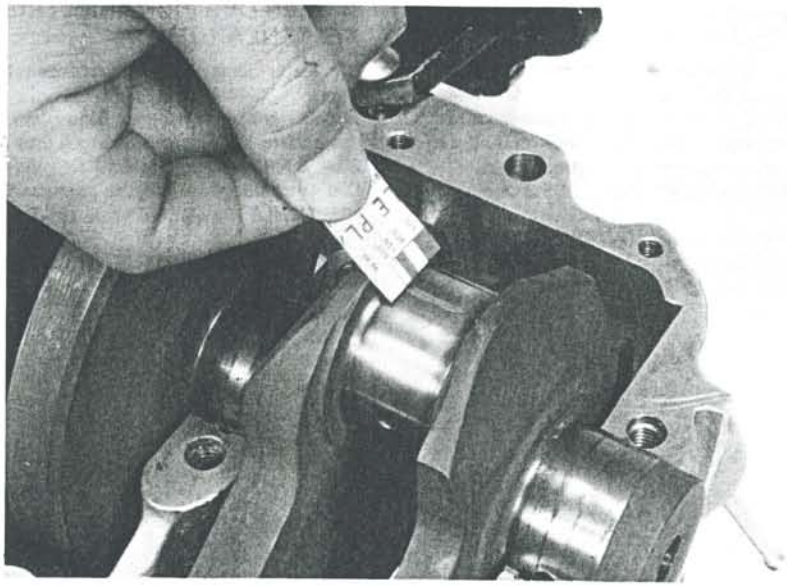
NOTE

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)

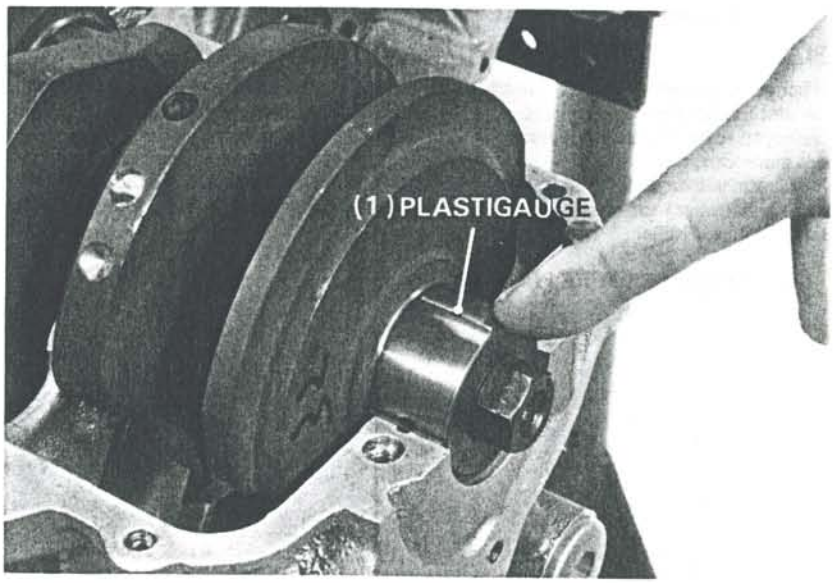


MAIN BEARINGS

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 (Crankshaft)	23–27 N·m (2.3–2.7 kg-m, 17–20 ft-lb)
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)

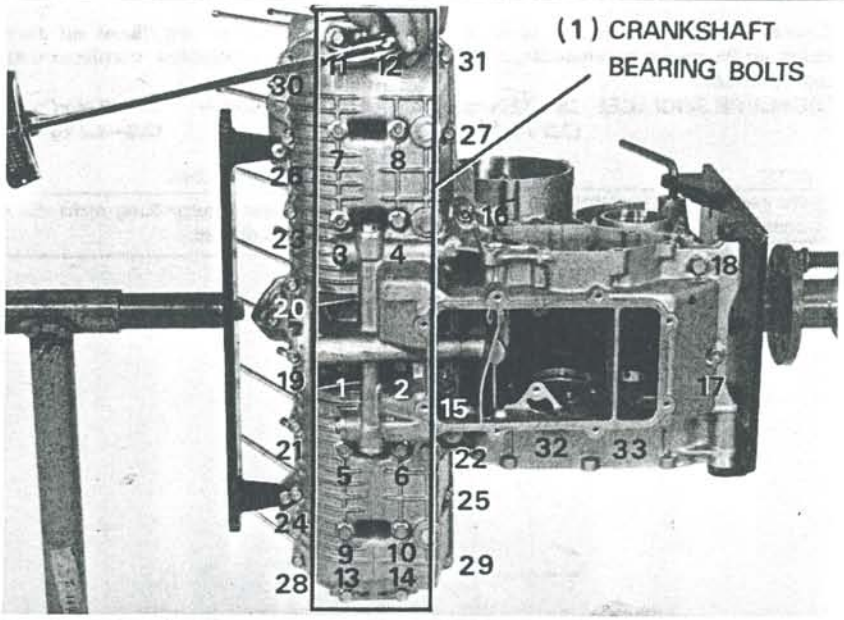
Tighten the upper crankcase bolts to the specified torque, proceeding front to rear.

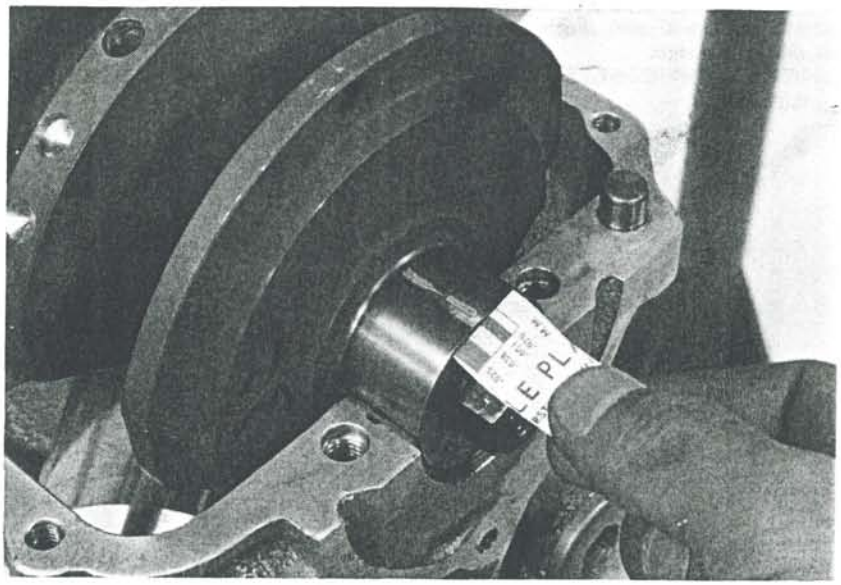
NOTE

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)



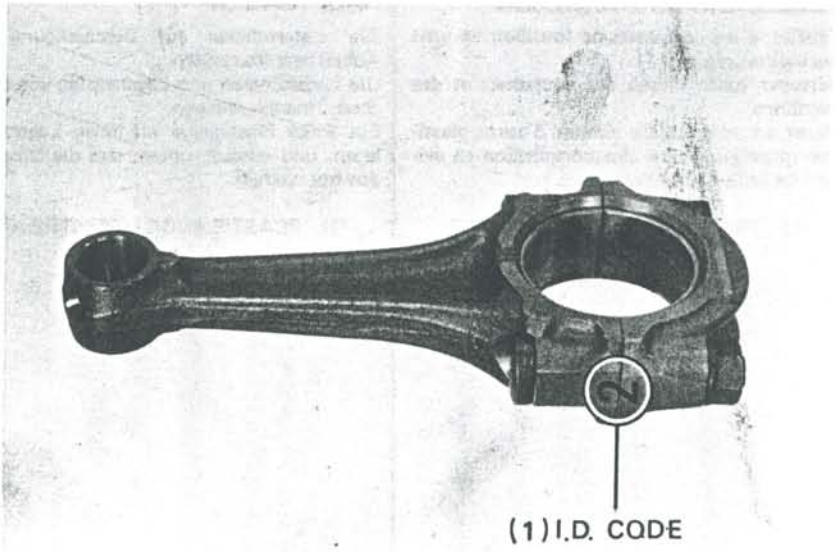


BEARING SELECTION

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

CONNECTING ROD BEARING INSERTS

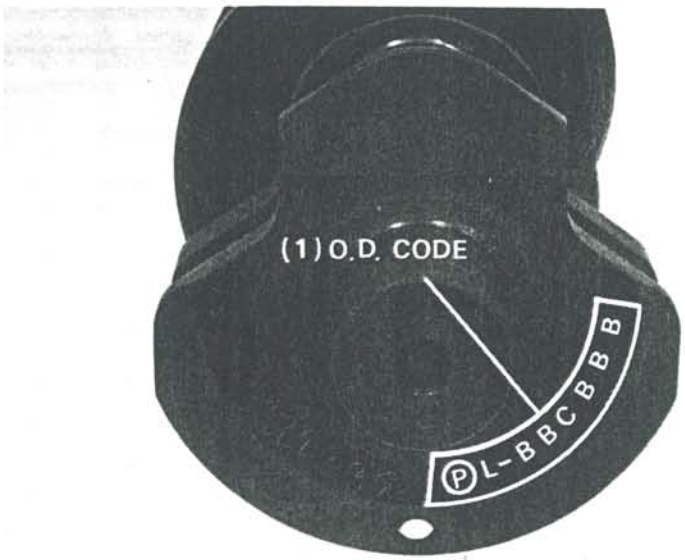
Determine and record the corresponding rod I.D. code number.



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

NOTE

The six letters "Ⓟ 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.

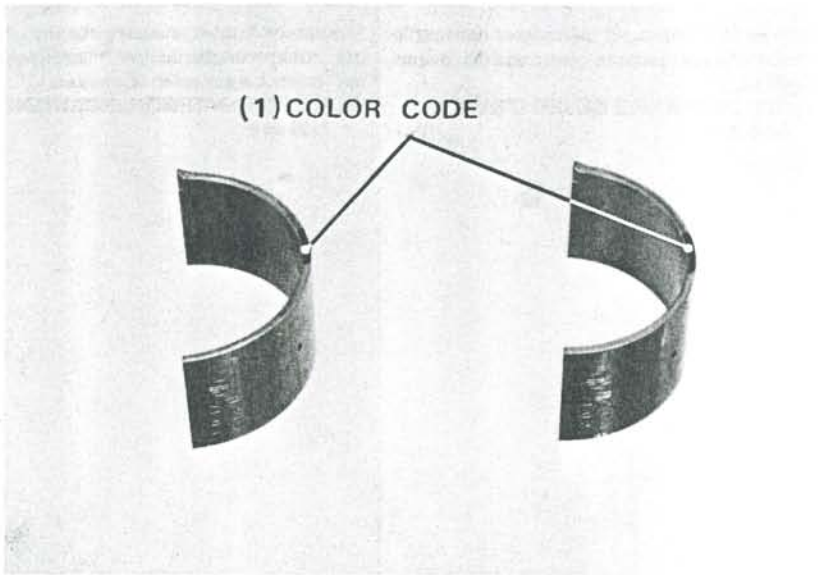


Cross reference the crankpin and rod codes to determine the replacement bearing color.

			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)	—

BEARING INSERT THICKNESS:

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)

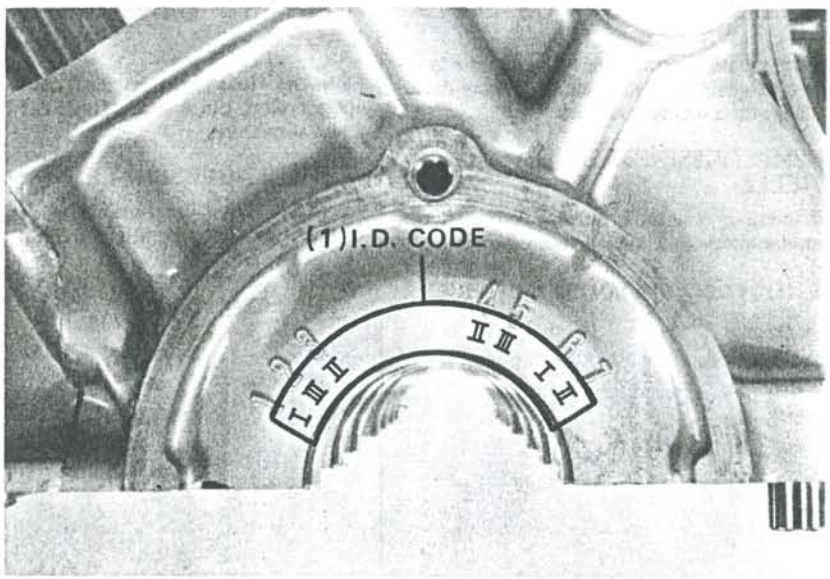


MAIN BEARING

Determine and record crankcase I. D. code numbers.

NOTE

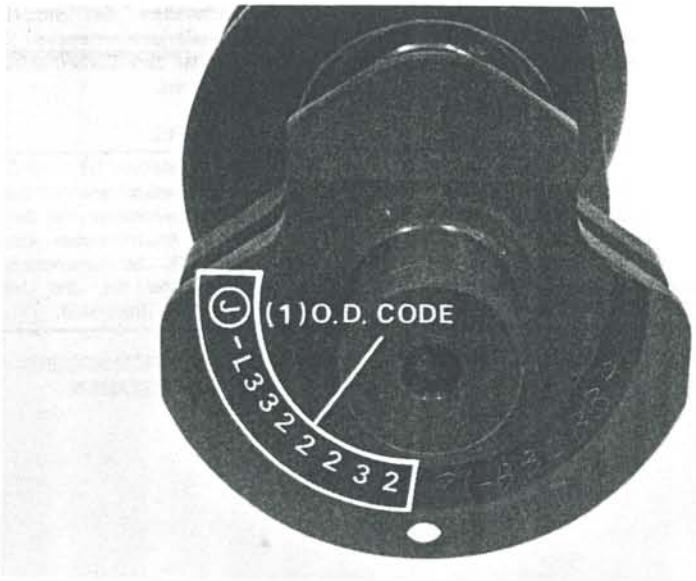
The seven numbers "I III II II III I II" on the upper left crankcase indicate the code numbers for the mian journal I.D. from left to right; e. g. I. D. code number for the fifth main journal from left to right is III.



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

NOTE

The seven numbers "Ⓙ 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.

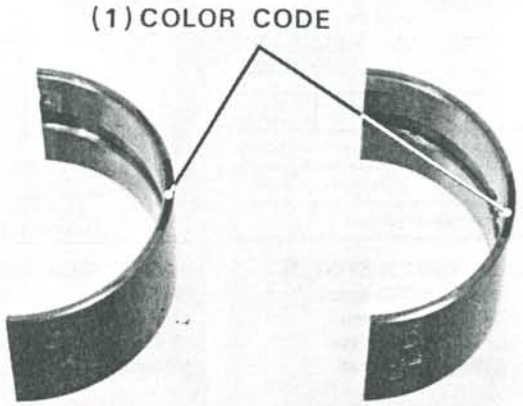


Cross reference the case and journal codes to determine the replacement bearing.

			MAIN JOURNAL O. D. CODE NO.		
			1	2	3
			35.992–36.000 mm	35.984–35.992 mm	35.976–35.984 mm
CASE I. D. CODE NO.	I	39.000–39.008 mm	D (Yellow)	C (Green)	B (Brown)
	II	39.008–39.016 mm	C (Green)	B (Brown)	A (Black)
	III	39.016–39.024 mm	B (Brown)	A (Black)	—

MAIN BEARING INSERT THICKNESS:

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)

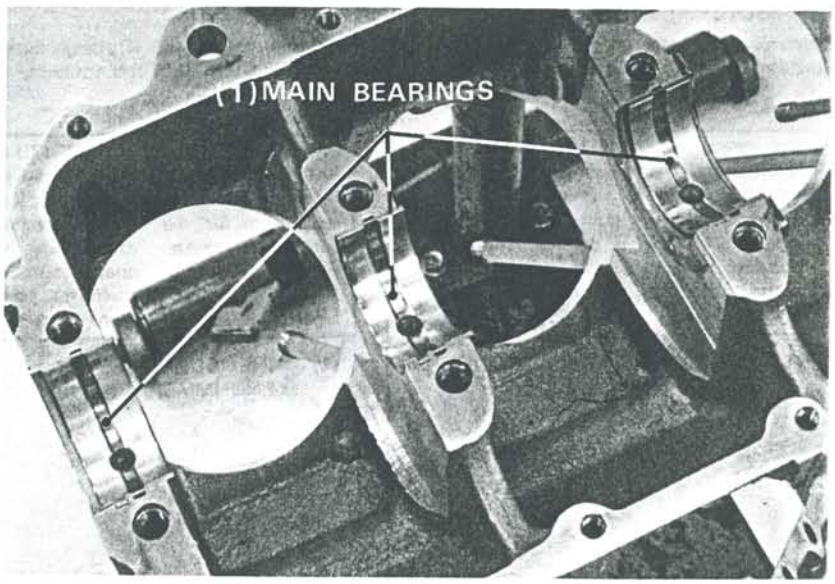


CONNECTING ROD INSTALLATION

Install the main bearings into the upper crankcase.

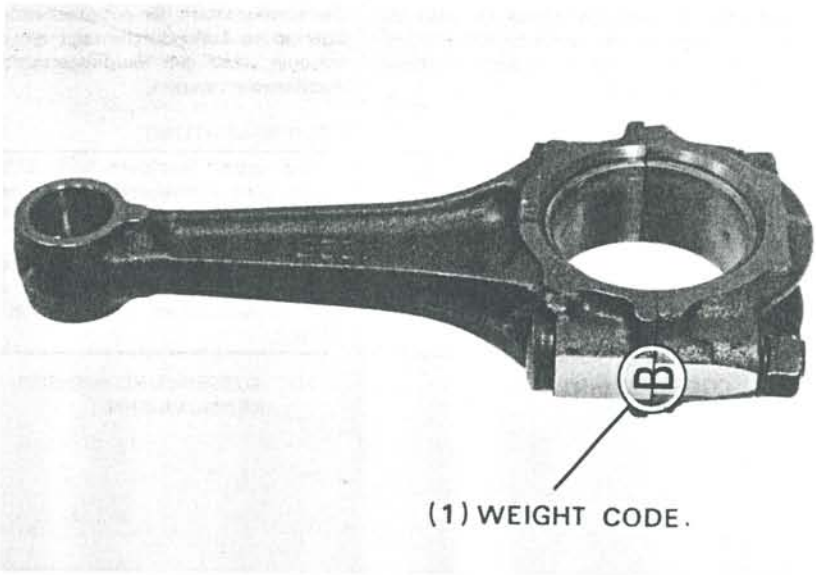
Apply molybdenum disulfide grease to the upper and lower main bearings.

Install the crankshaft with the cam chain and primary chain.

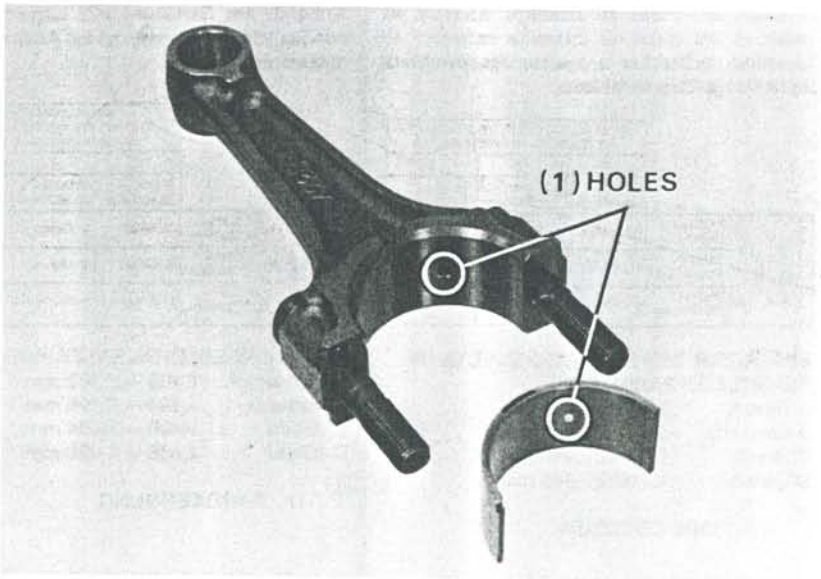


Before installing the connecting rods, make sure that the weight code combination is correct:

Factory set code	Available code
A	B
B	
C	D
D	
E	
F	F
G	

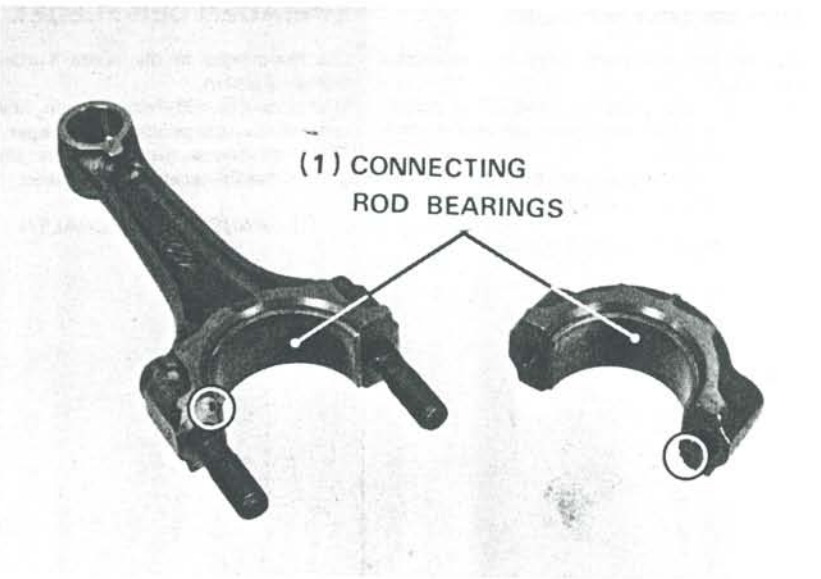


Align the hole in the bearing insert with the hole in the connecting rod.

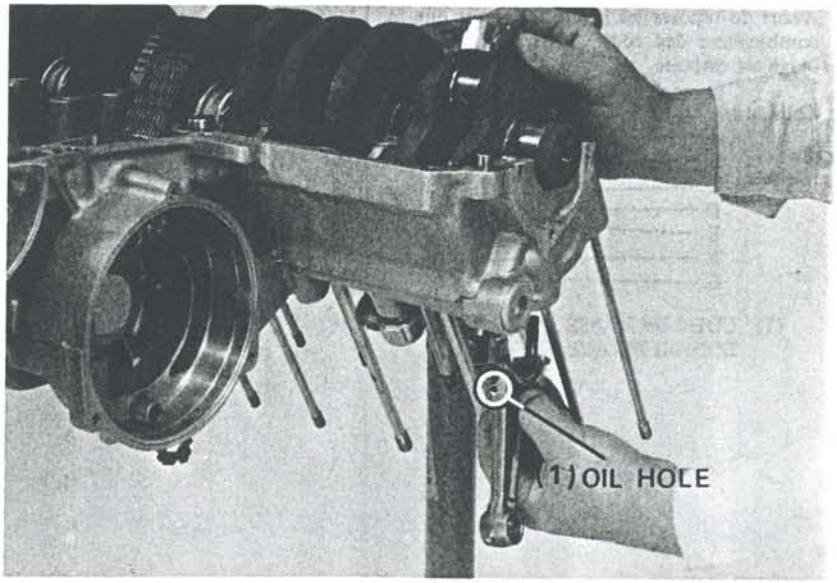


Install the connecting rod and cap bearing inserts.

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 original assembly.

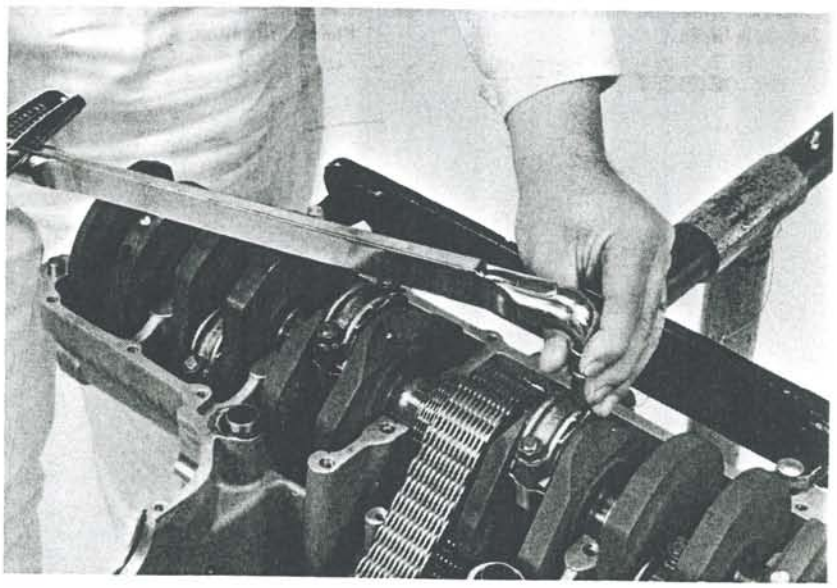
Torque the connecting rod bearing cap bolts.

TORQUE:

28–32 N·m (2.8–3.2 kg-m, 20–23 ft-lb)

NOTE

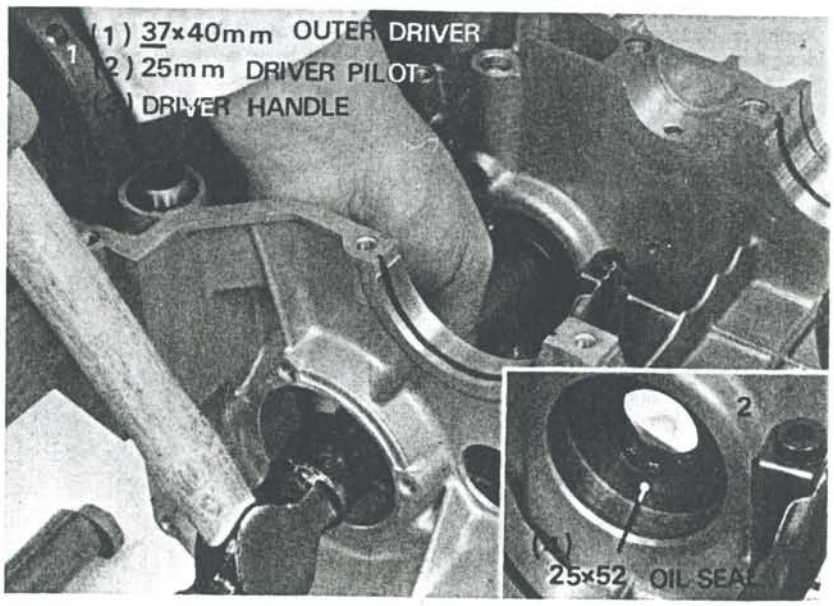
- Tighten the rod bearing cap bolts in two ore more steps.
- After tightening the bolts, check that the rod moves freely without binding.



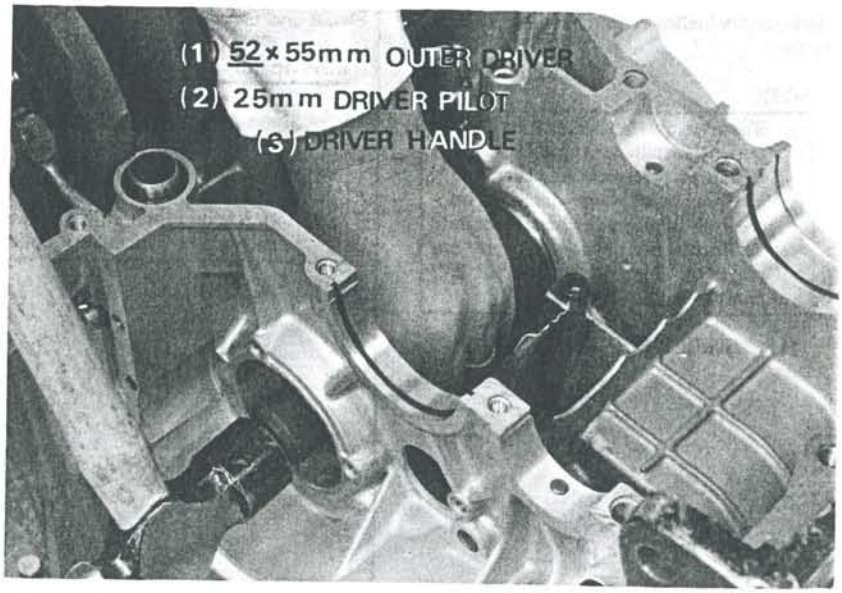
OIL SEAL AND BEARING INSTALLATION

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

Install the 25 x 52 mm oil seal.

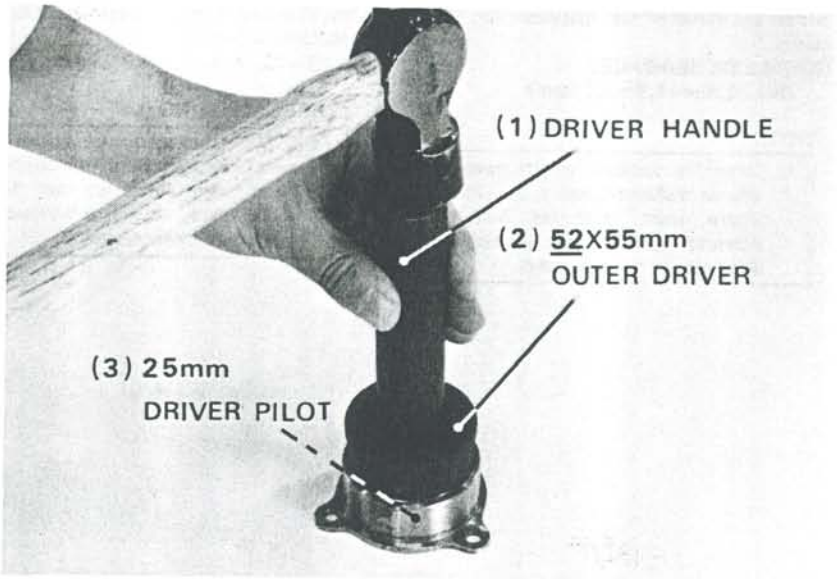


Install the bearing with special tools.



PRIMARY SHAFT ASSEMBLY

Insert the primary shaft bearing into the bearing holder.

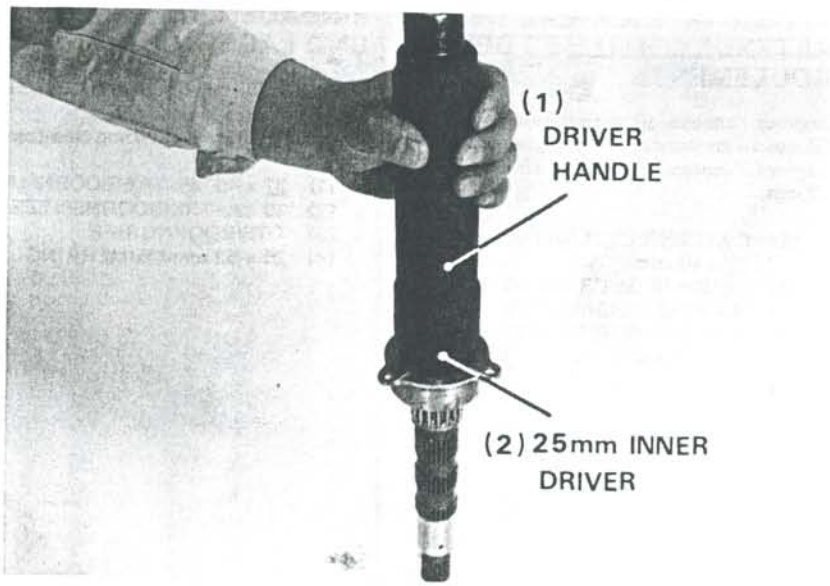


Slide the needle bearing and washer onto the shaft.

NOTE

When installing the washer, face the chamfered edge to the spark advancer side.

Install the bearing over the shaft.

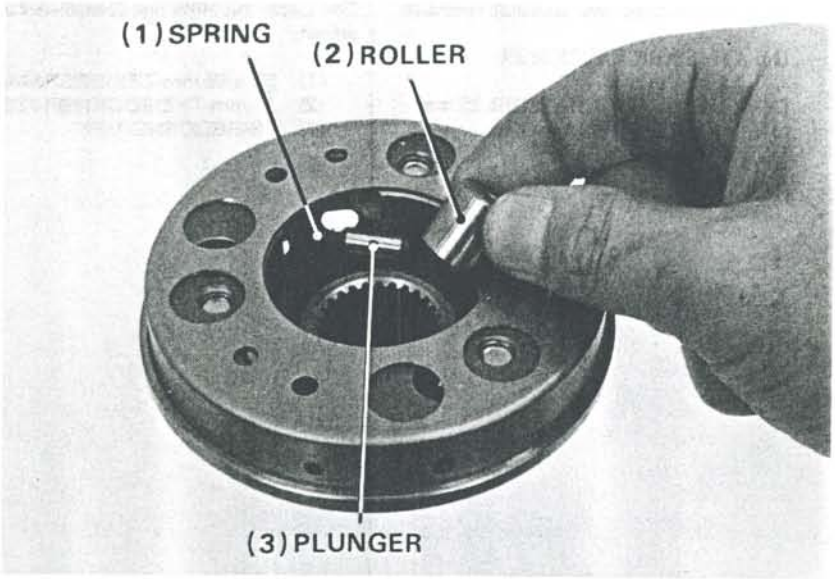


STARTER CLUTCH ASSEMBLY

Install the springs, plungers and rollers.

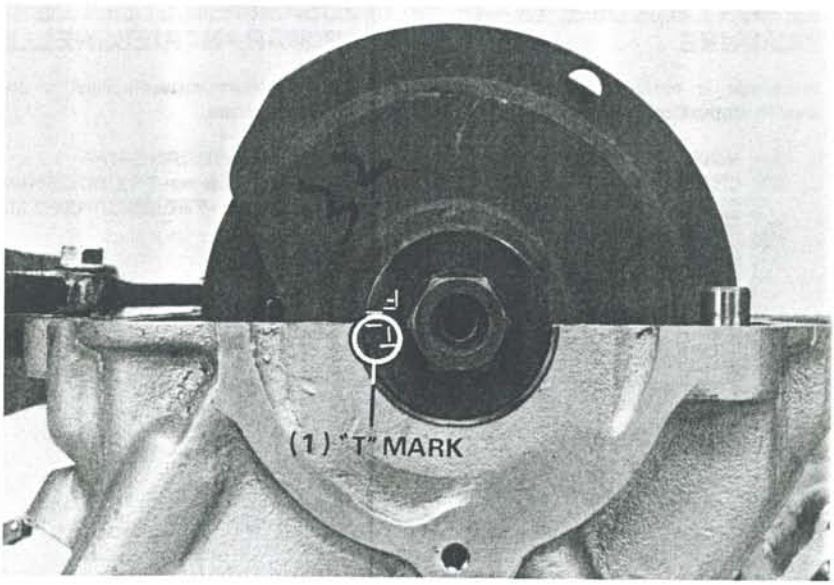
NOTE

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



PRIMARY SHAFT INSTALLATION

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



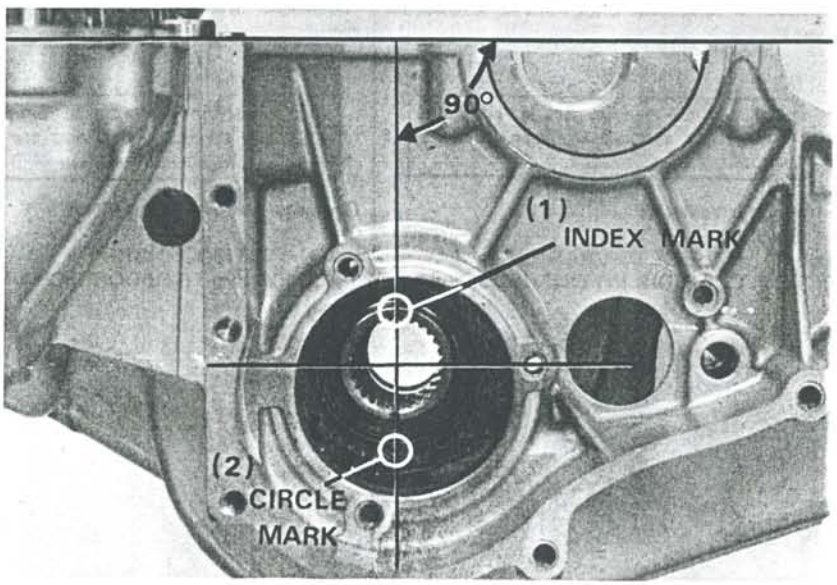
Install the primary chain over the primary driven sprocket.

Make sure that the index mark on the driven sprocket is positioned 90° from the crankcase mating surface, with the circle mark on the driven sprocket facing downward and the driven sprocket in place.

Install the thrust spring and starter clutch.

NOTE

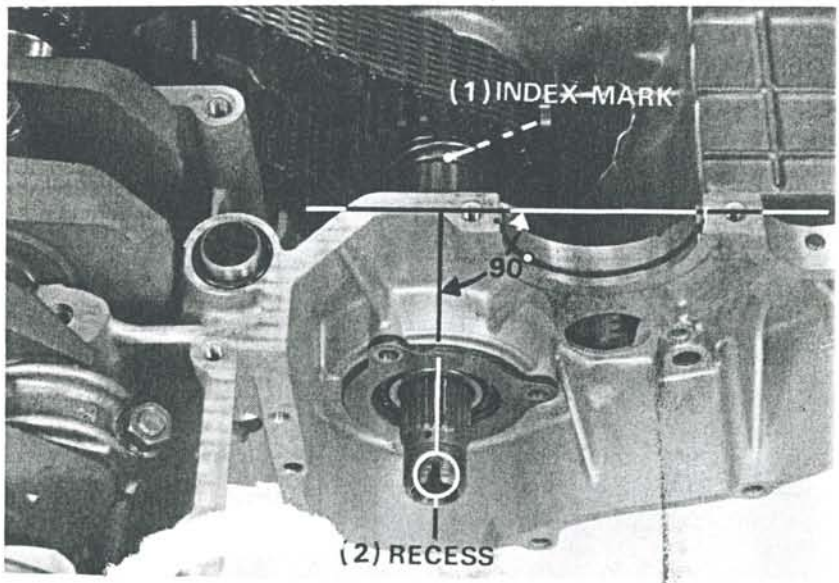
Do not move the driven sprocket from the correct position when installing the starter clutch and thrust spring.



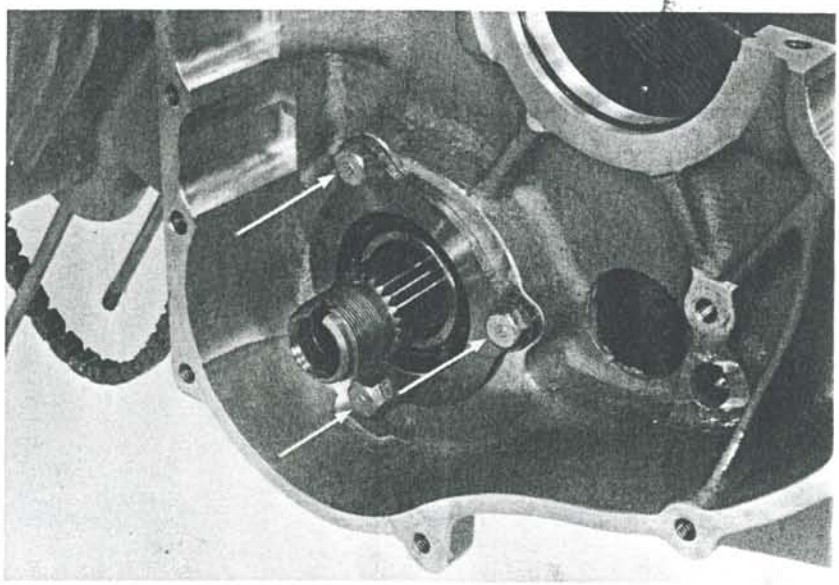
Install the primary shaft assembly. Make sure that the recess in the primary shaft is positioned 90° from the crankcase mating surface (is aligned with the index mark on the primary driven sprocket.), and the bearing holder is in position.

CAUTION

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



'ighten the primary shaft bearing holder bolts securely.



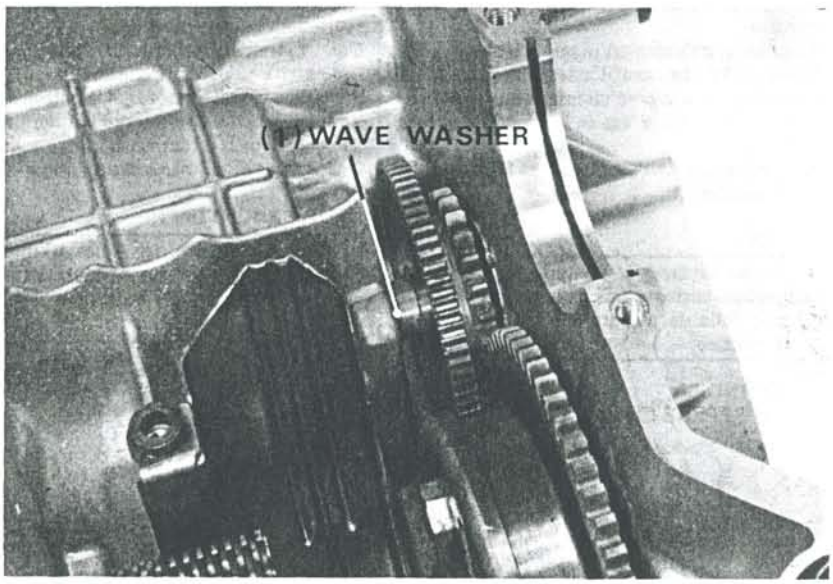
STARTER IDLE GEAR INSTALLATION

nstall the starter idle gear as shown.

NOTE

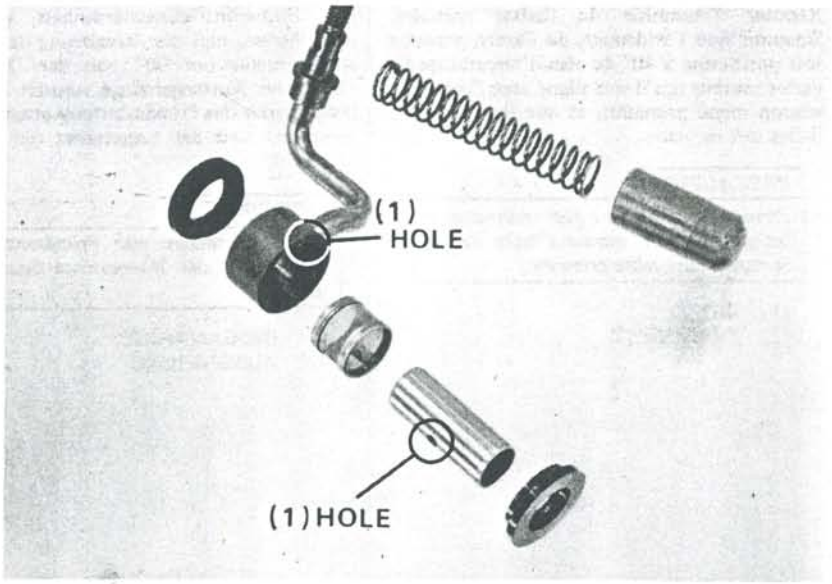
Be sure to install the wave washer.

Install the idle gear shaft holder.

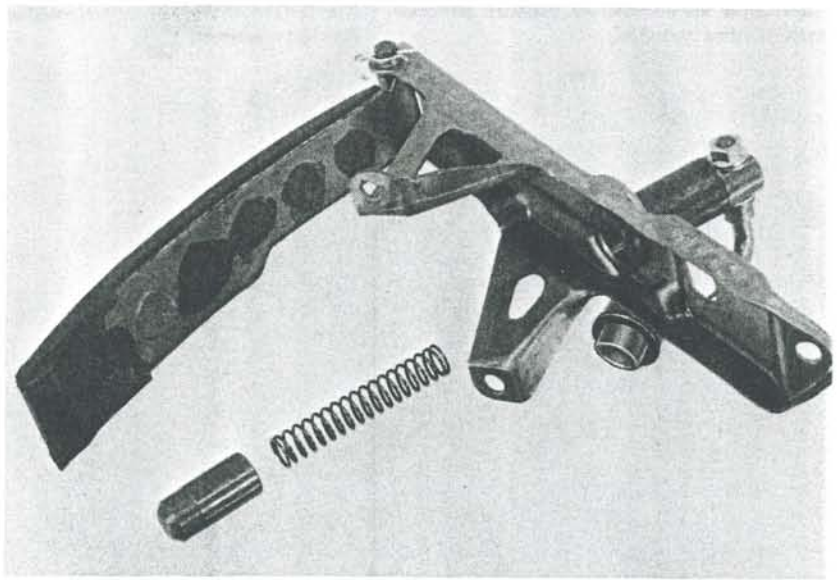


PRIMARY CHAIN TENSIONER ASSEMBLY

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



\ssemble the primary chain tensioner as shown.
Tighten the nut loosely.



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

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

