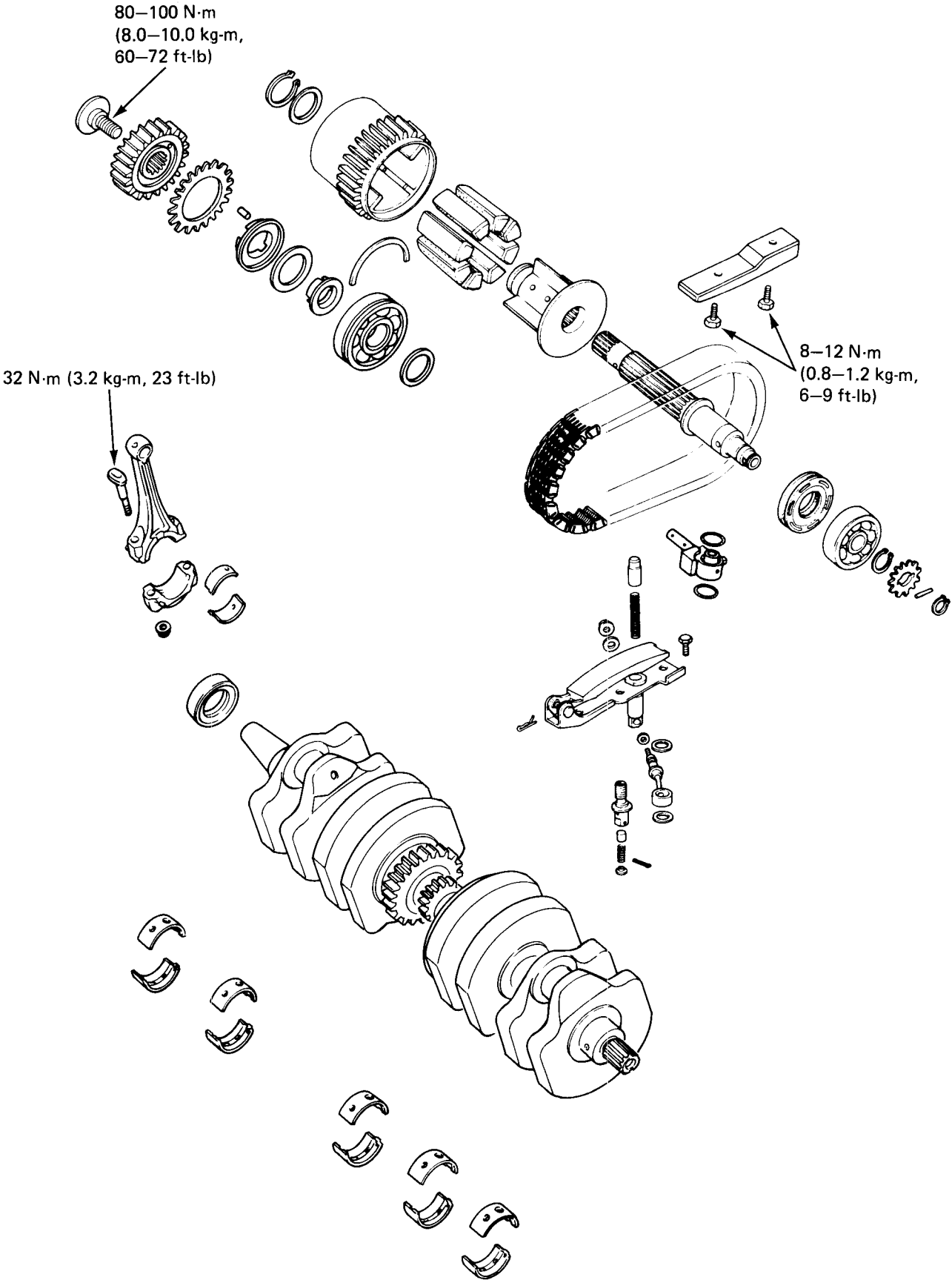




CRANKSHAFT/PRIMARY SHAFT





SERVICE INFORMATION	12-1	BEARING INSPECTION	12-8
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PRIMARY SHAFT REMOVAL	12-3	CONNECTING ROD INSTALLATION	12-13
PRIMARY SHAFT DISASSEMBLY	12-3	PRIMARY SHAFT ASSEMBLY	12-14
PRIMARY CHAIN TENSIONER DIASSEMBLY	12-5	PRIMARY CHAIN TENSIONER ASSEMBLY	12-15
CONNECTING ROD REMOVAL	12-7		

SERVICE INFORMATION

GENERAL

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

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.	11.966–11.984 mm (0.4711–0.4718 in)	11.95 mm (0.470 in)
	Idle gear-to-shaft clearance	—	0.10 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	0.025–0.055 mm (0.0010–0.0022 in)	0.065 mm (0.0026 in)
	Main journal oil clearance	0.030–0.060 mm (0.0012–0.0024 in)	0.07 mm (0.0028 in)
Cam chain	Length at 13 kg tension	315.30–315.74 mm (12.417–12.430 in)	318.2 mm (12.53 in)
Primary chain	Length at 36 kg tension	139.3–139.5 mm (5.48–5.49 in)	140.9 mm (5.55 in)

12

TORQUE VALUES

Crankpin	32 N·m (3.2 kg-m, 23 ft-lb)
Crankshaft	21–25 N·m (2.1–2.5 kg-m, 15–18 ft-lb)
Primary chain tensioner bolt	8–12 N·m (0.8–1.2 kg-m, 6–9 ft-lb)
Primary shaft lock bolt	80–100 N·m (8.0–10.0 kg-m, 60–72 ft-lb)

TOOLS

Common

Driver	07746-0020100
Attachment, 20 mm I.D.	07746-0020400



TROUBLESHOOTING

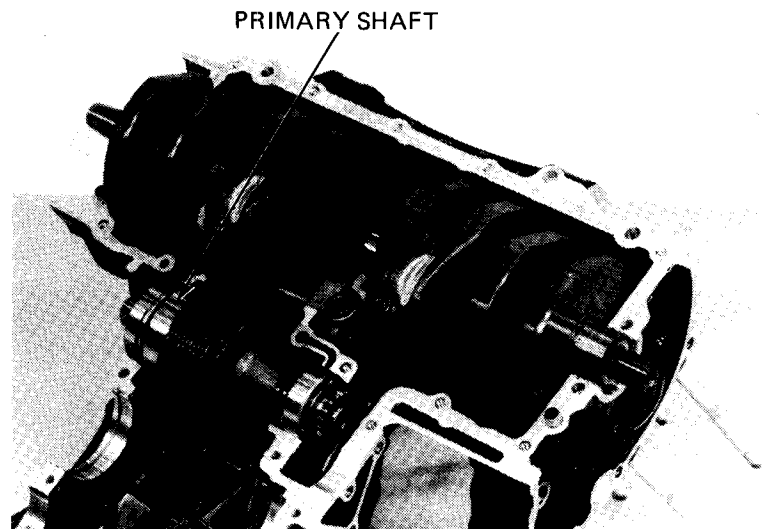
Excessive noise

1. Worn main journal bearing
2. Worn crank pin bearing

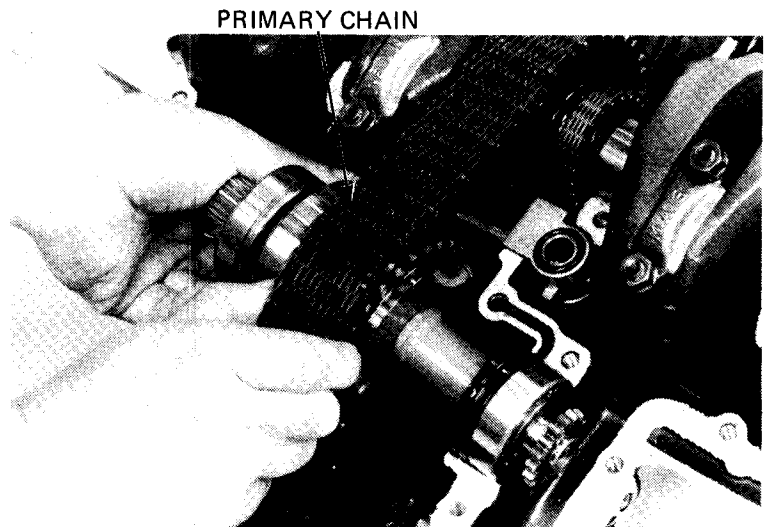


PRIMARY SHAFT REMOVAL

Remove the starting motor (Section 19).
Remove the alternator (Section 8).
Remove the primary shaft drive gear (Section 6).
Disassemble the crankcase (Section 11) and remove the transmission assembly (Section 13).

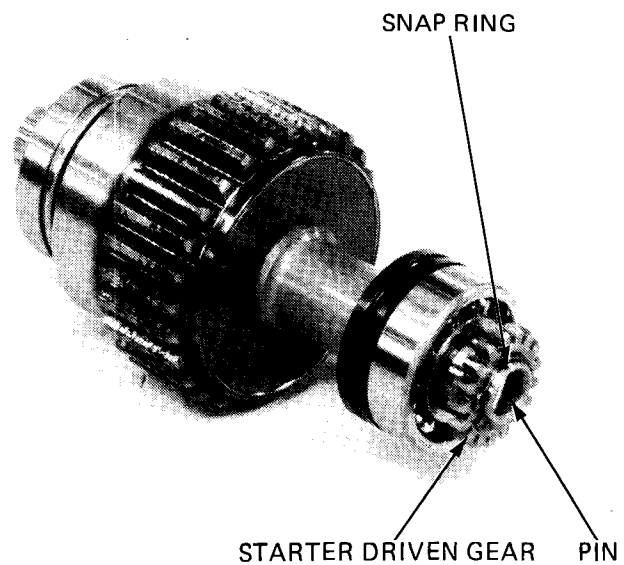


Raise the primary shaft assembly and remove the primary chain.



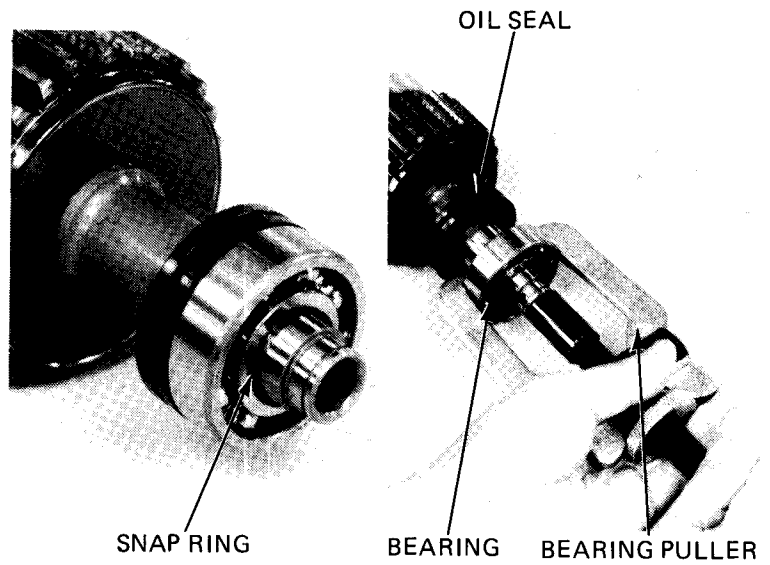
PRIMARY SHAFT DISASSEMBLY

Remove the snap ring, starter driven gear and pin.





Remove the bearing snap ring.
Remove the bearings with a bearing puller.
Remove the oil seal.

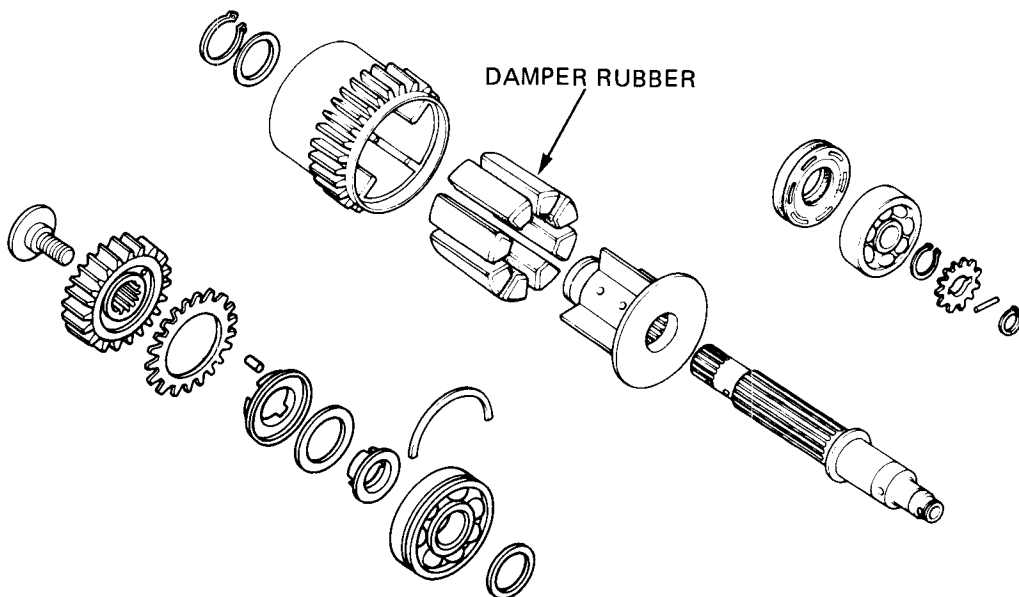
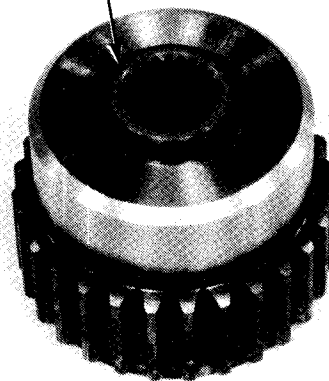


Remove the damper assembly from the primary shaft.
Remove the snap ring and disassemble the damper.

INSPECTION

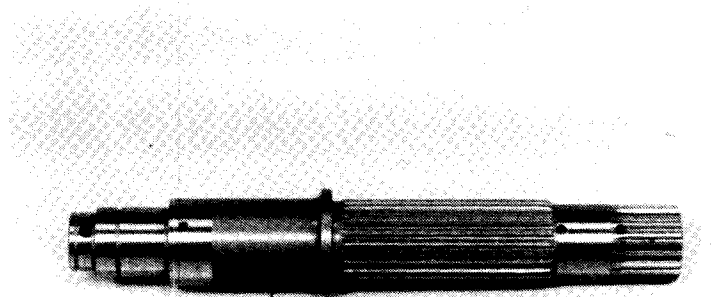
Check the damper rubbers for wear or deterioration.
Replace if they are worn or deteriorated.

SNAP RING





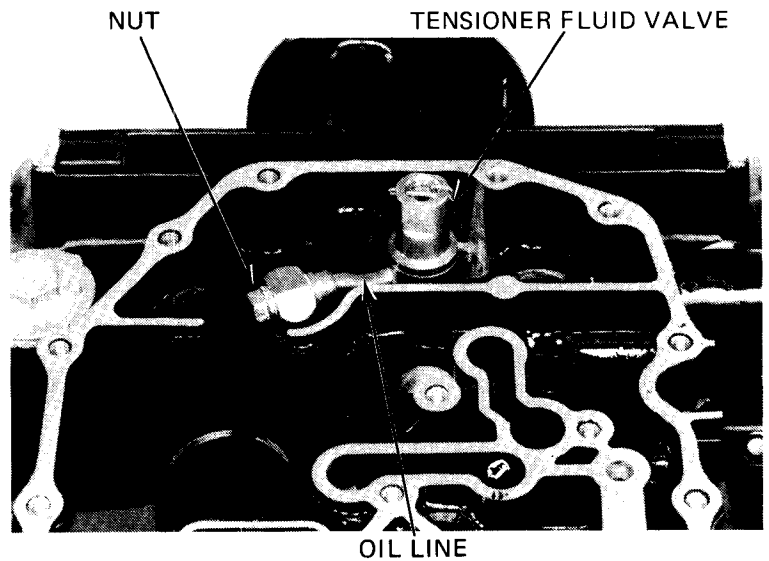
Check the primary shaft for scoring, wear or other damage.



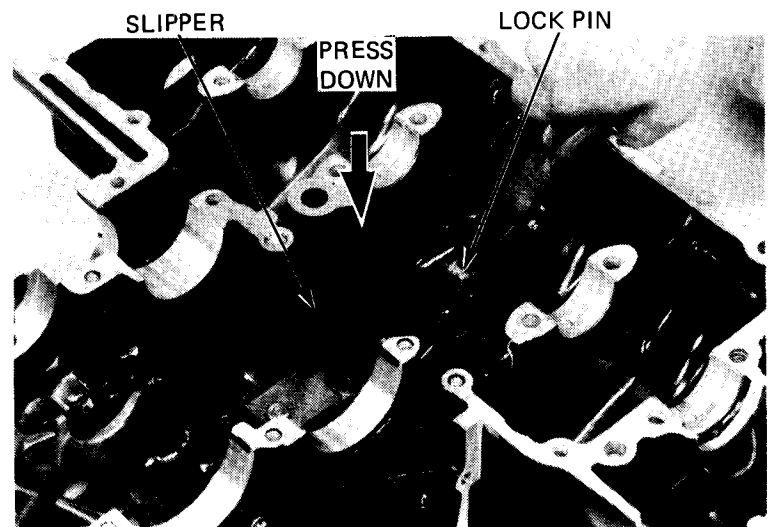
PRIMARY SHAFT

**PRIMARY CHAIN TENSIONER
DISASSEMBLY**

Remove the nut, tensioner fluid valve and oil line.

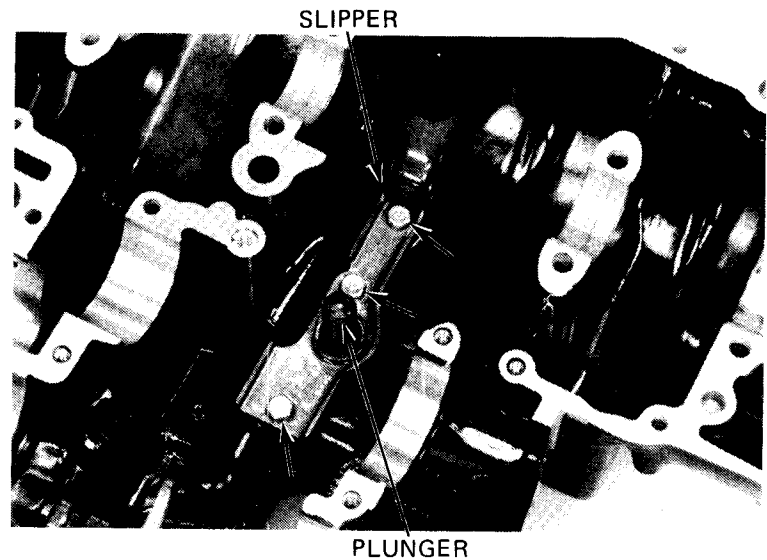


Press the slipper down and remove the lock pin.





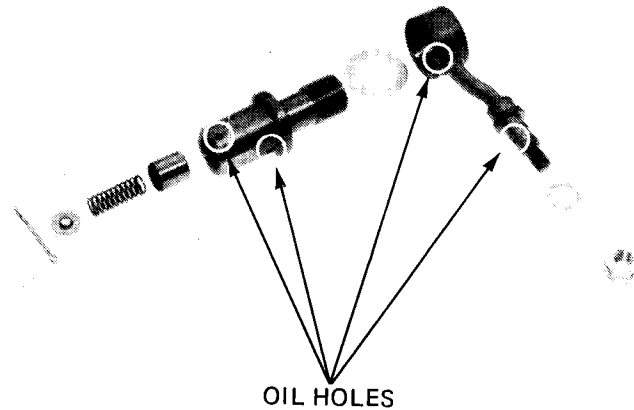
Remove the plunger and spring.
Remove the three slipper mounting bolts and slipper.



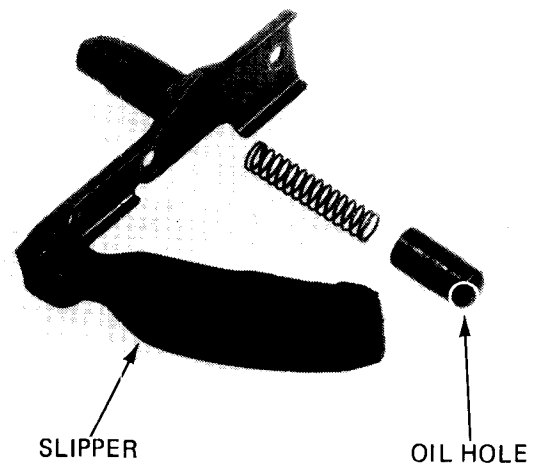
INSPECTION

Check the holes in the oil line and plunger for blockage.

Clean all parts with non-flammable or high flash point solvent.



Inspect the slipper for damage or excessive wear.

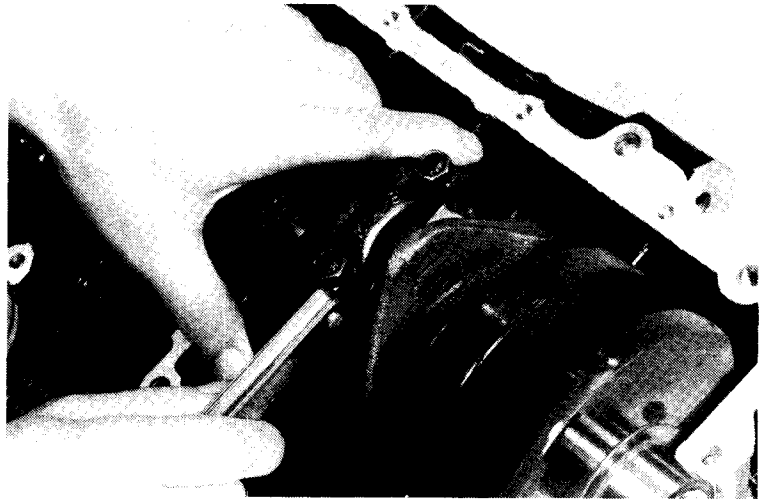




CONNECTING ROD REMOVAL

Check the connecting rod side clearance.

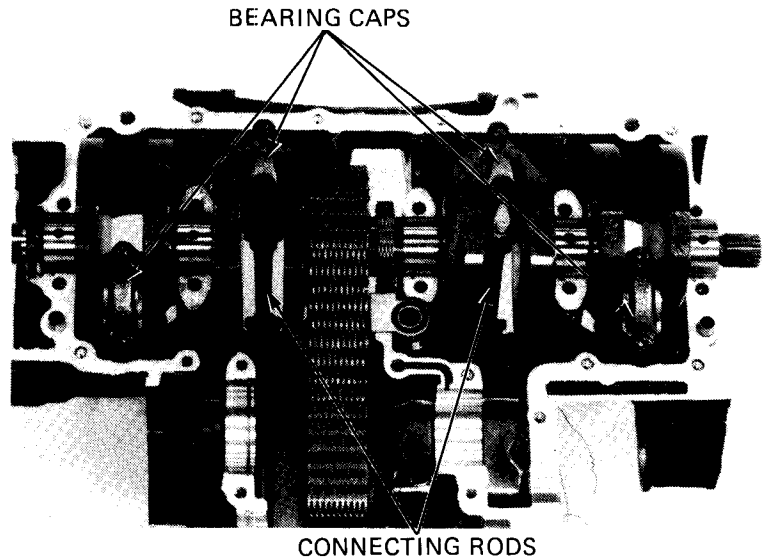
SERVICE LIMIT: 0.3 mm (0.01 in)



Remove the bearing caps and rods.

NOTE:

Mark the rods, bearings and bearing caps to indicate cylinder position for correct re-assembly.



CRANKSHAFT INSPECTION

Remove the cam chain and primary chain.

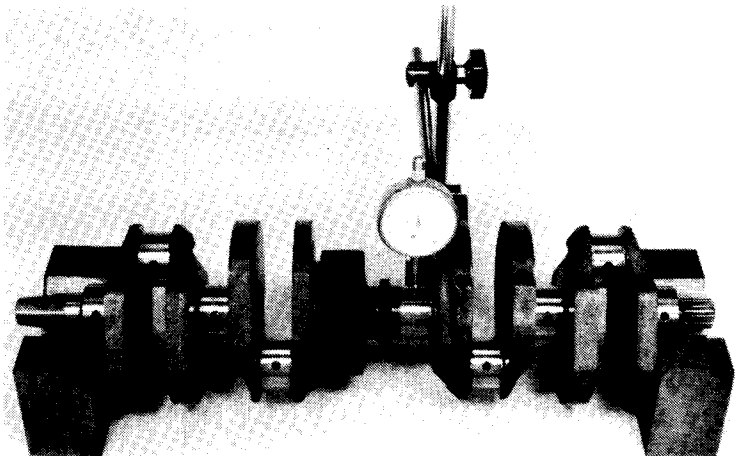
Set the crankshaft on a stand or V blocks.

Set a dial indicator on the center main journal.

Rotate the crankshaft two revolutions and read runout at the center journal.

Actual runout is 1/2 of the Total Indicator Reading.

SERVICE LIMIT: 0.05 mm (0.002 in)



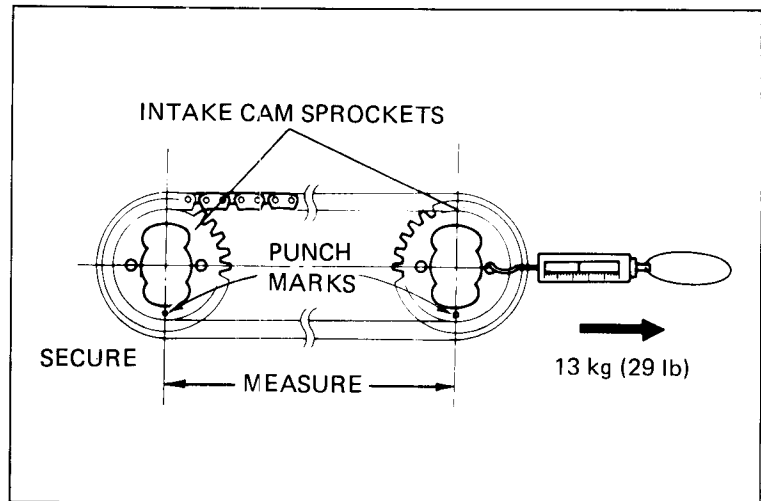


CRANKSHAFT/PRIMARY SHAFT

CAM CHAIN LENGTH MEASUREMENT

Place the cam chain over the intake cam sprockets. Secure one sprocket. Apply 13 kg (29 lb) of tension with a spring scale to the other sprocket. Measure the chain length between the sprocket punch marks as shown.

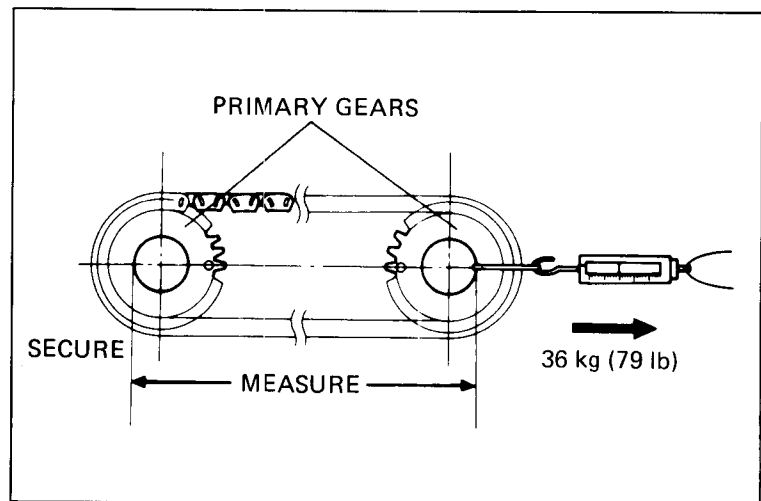
SERVICE LIMIT: 318.2 mm (12.53 in)



PRIMARY CHAIN LENGTH MEASUREMENT

Place the primary chain over the primary driven gears. Secure one gear. Apply 36 kg (79 lb) of tension with a spring scale to the other gear. Measure the chain length as shown.

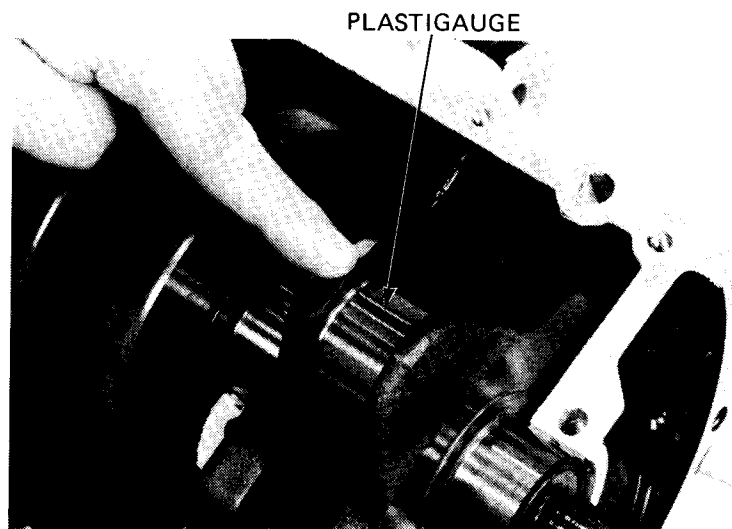
SERVICE LIMIT: 140.9 mm (5.55 in)



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 holes.



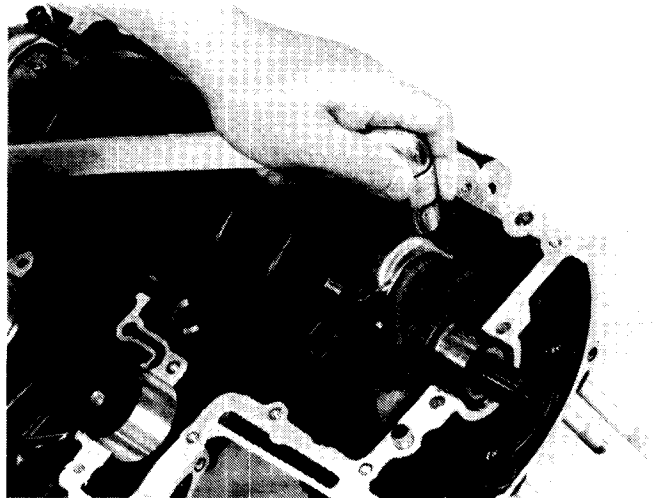


Install the bearing caps and rods on the correct crankpins, and tighten them evenly.

TORQUE: 32N·m (3.2 kg-m, 23 ft-lb)

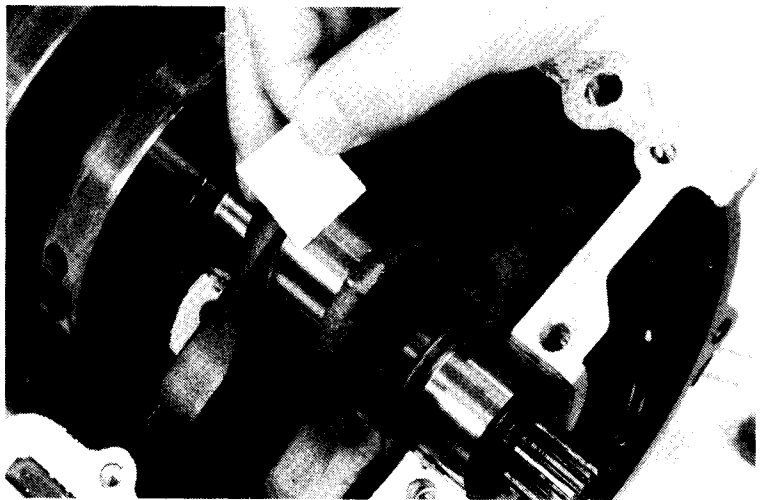
NOTE:

Do not rotate the crankshaft during inspection.



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

**OIL CLEARANCE SERVICE LIMIT:
0.065 mm (0.0026 in)**

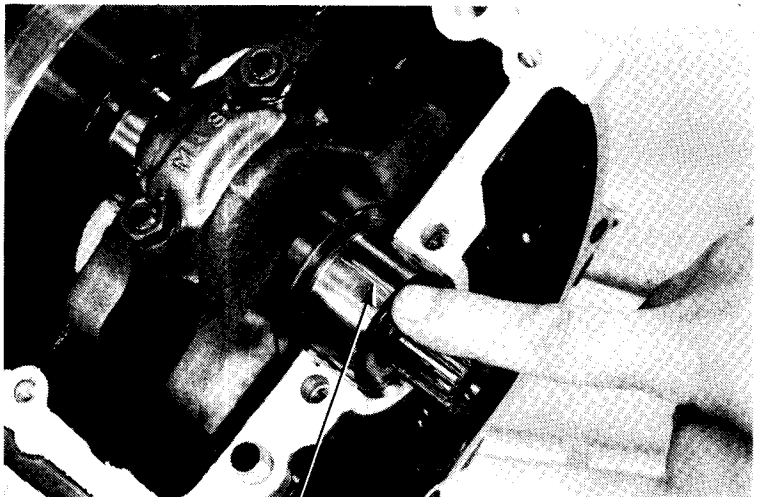


MAIN BEARINGS

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.



PLASTIGAUGE



CRANKSHAFT/PRIMARY SHAFT

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.

TORQUE VALUES:

8 mm bolt (Crankshaft)

21–25 N·m (2.1–2.5 kg-m, 15–18 ft-lb)

8 mm bolt (Crankcase)

21–25 N·m (2.1–2.5 kg-m, 15–18 ft-lb)

6 mm bolt

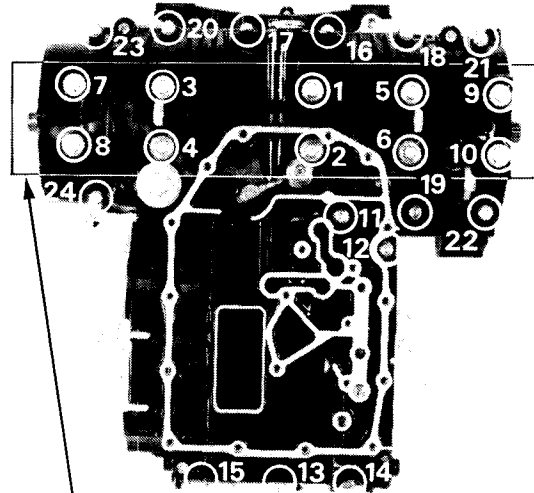
10–14 N·m (1.0–1.4 kg-m, 7–10 ft-lb)

10 mm bolt

45–50 N·m (4.5–5.0 kg-m, 33–36 ft-lb)

NOTE:

Do not rotate the crankshaft during inspection.

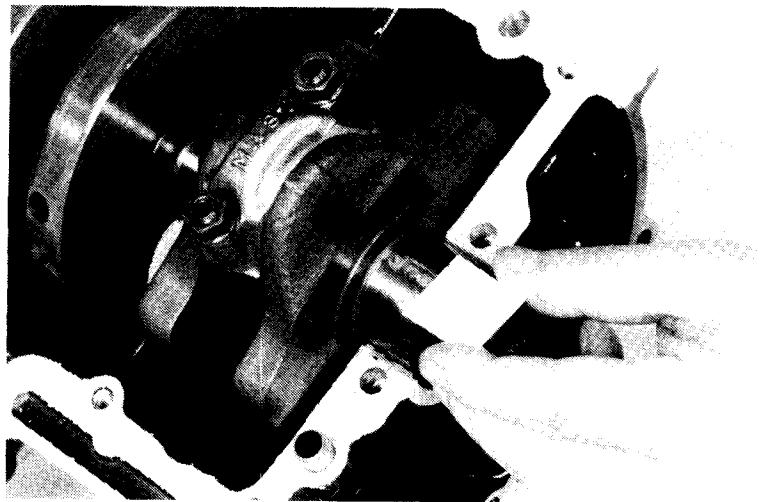


CRANKSHAFT BEARING BOLTS

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

OIL CLEARANCE SERVICE LIMIT:

0.07 mm (0.0028 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.



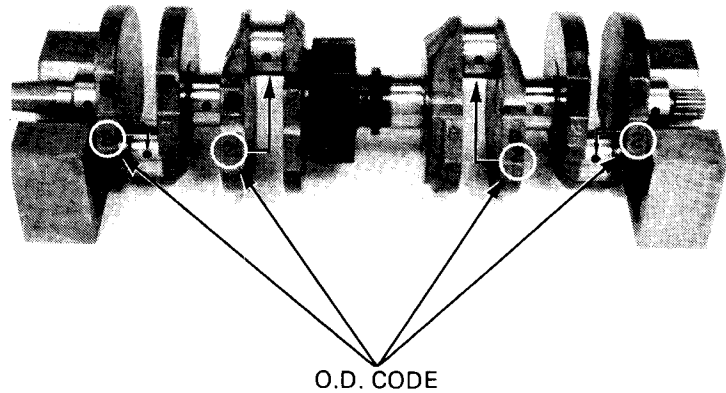
I.D. CODE



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

NOTE:

Number 1, 2 or 3 on each crank weight is the code for each crankpin O.D.

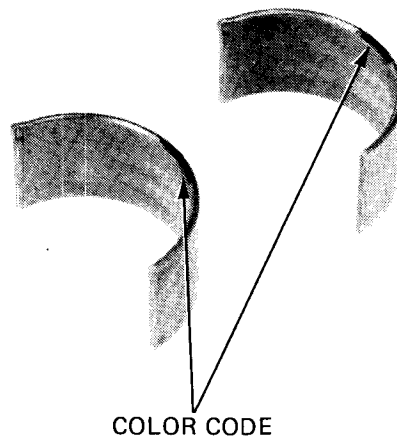


Cross reference the crankpin and rod codes to determine the replacement bearing color.

		CRANKPIN O.D. CODE NO.			
		1	2	3	
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)

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)

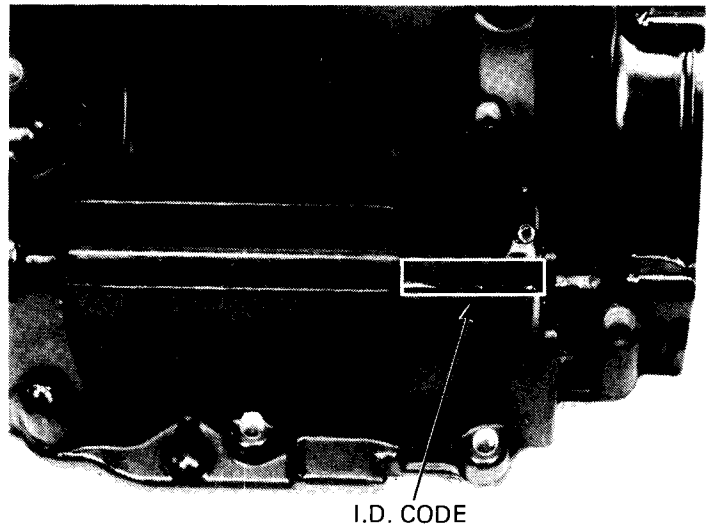


MAIN BEARING

Determine and record crankcase I.D. code numbers.

NOTE:

Letters A, B or C on the upper rear crankcase are the codes for the main journal I.D. from left to right; I.D. code for the third main journal from left to right is B in the example shown.



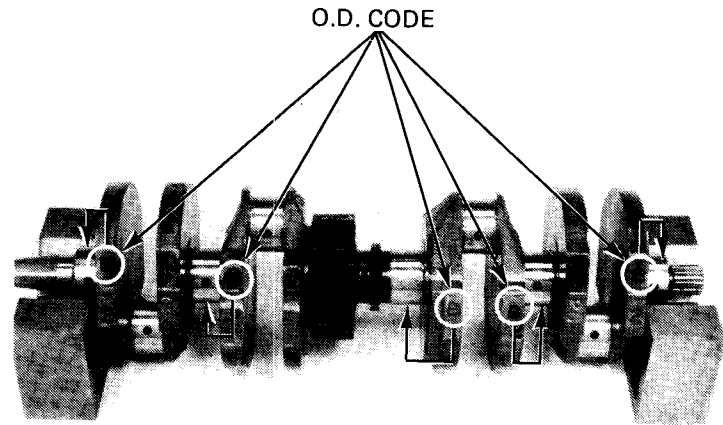


CRANKSHAFT/PRIMARY SHAFT

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

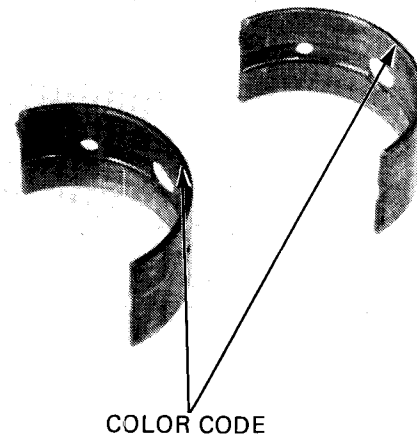
NOTE:

Letters A, B or C on each crank weight is the code for the adjacent main journal O.D.



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

		MAIN JOURNAL O.D. CODE NO.			
		A	B	C	
CASE I.D. CODE NO.	A	39.000–39.008 mm	D (Yellow)	C (Green)	B (Brown)
	B	39.008–39.016 mm	C (Green)	B (Brown)	A (Black)
	C	39.016–39.024 mm	B (Brown)	A (Black)	E (Blue)



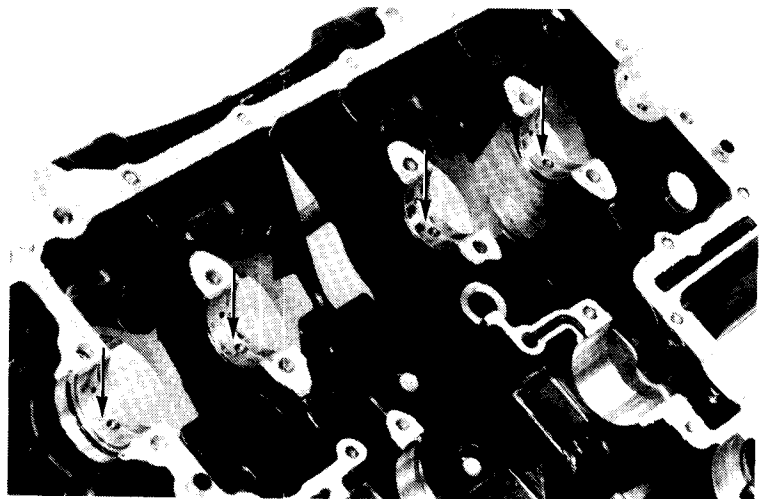
MAIN BEARING INSERT THICKNESS:

- 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)
- E (Blue):** 1.502–1.506 mm (0.0591–0.0593 in)

Install the main bearings into the upper crankcase.

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

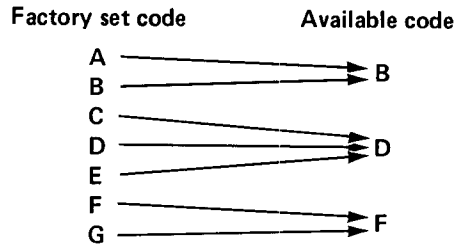
Install the crankshaft with the cam chain and primary chain.





CONNECTING ROD INSTALLATION

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

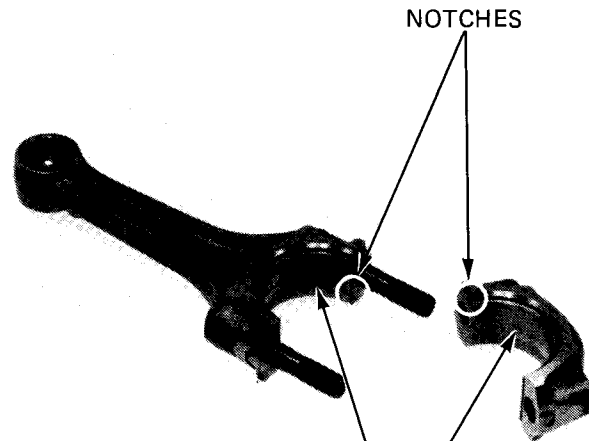


Install the connecting rod and cap bearing inserts aligning the notches with the slots.

Apply molybdenum disulfide grease to the connecting rod bearings.



WEIGHT CODE



NOTCHES

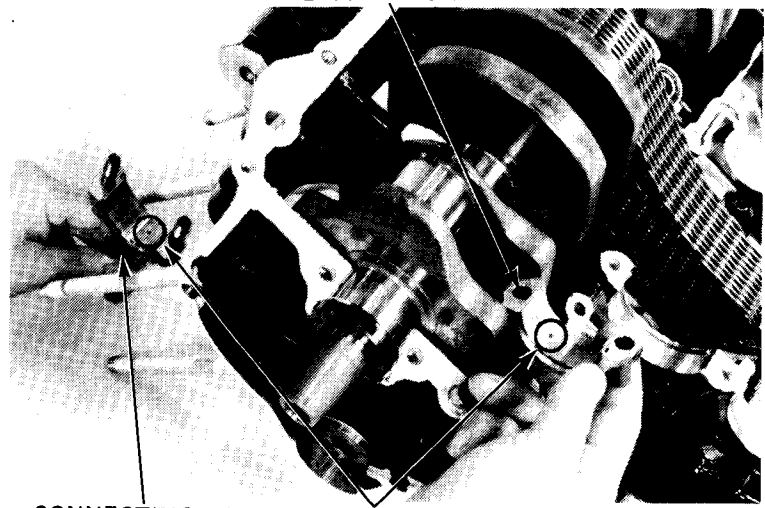
CONNECTING ROD BEARING

BEARING CAP

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 for correct reassembly.



CONNECTING ROD

OIL HOLES

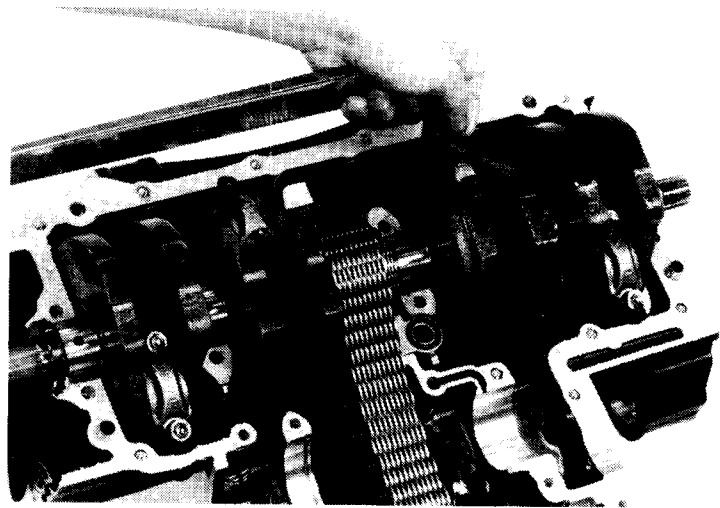


Tighten the connecting rod bearing cap bolts.

TORQUE: 32 N·m (3.2 kg-m, 23 ft-lb)

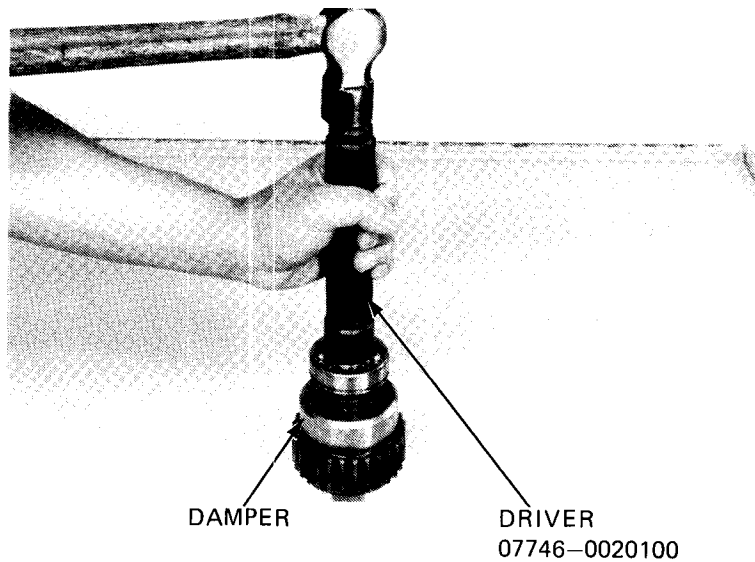
NOTE:

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

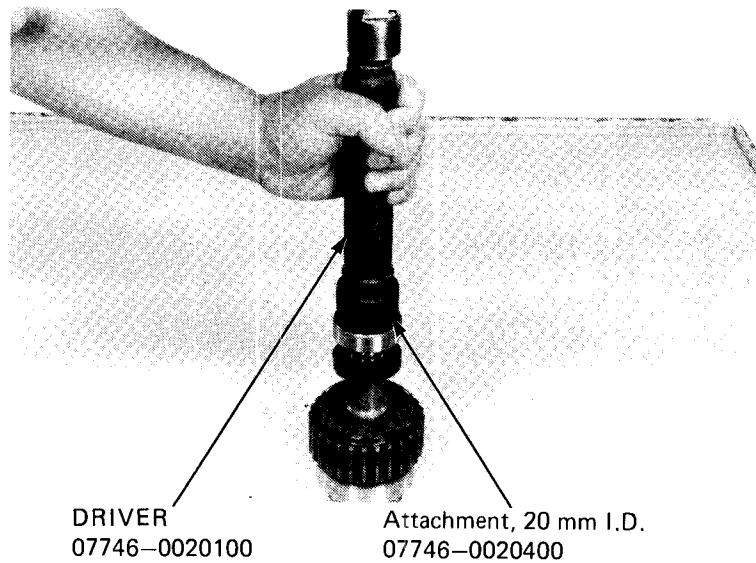


PRIMARY SHAFT ASSEMBLY

Install the damper assembly, plain washer and snap ring over the primary shaft.
Install the plain washer and drive the right bearing over the shaft.

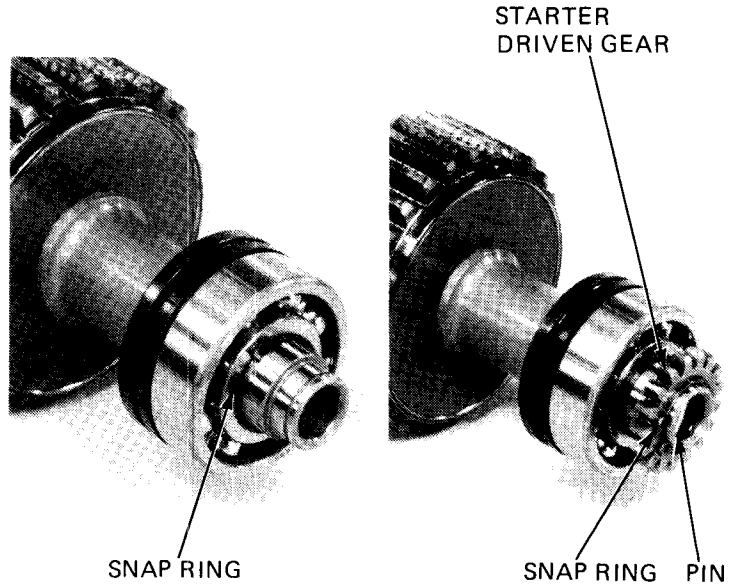


Install the oil seal and drive the left bearing over the primary shaft.



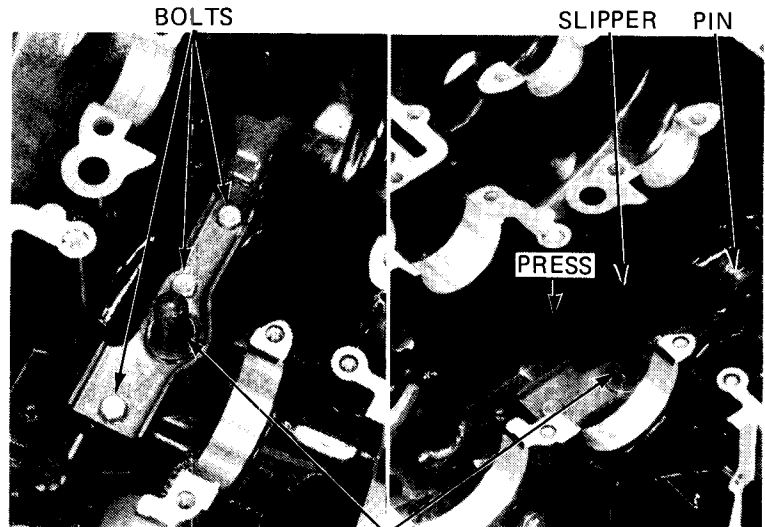


Install the snap ring, starter driven gear and pin.
Install the other snap ring.



PRIMARY CHAIN TENSIONER ASSEMBLY

Install the slipper base tightening the bolts securely.
Insert the spring and plunger.
Press the slipper down and install the pin.



Install the fluid valve and oil line. Tighten the nut.
Insert the plunger, spring and spring seat.
Install the cotter pin as shown.

Assemble the crankcase halves (Section 11).

- Install the removed parts;
- Primary shaft drive gear.
 - Alternator.
 - Starting motor.

