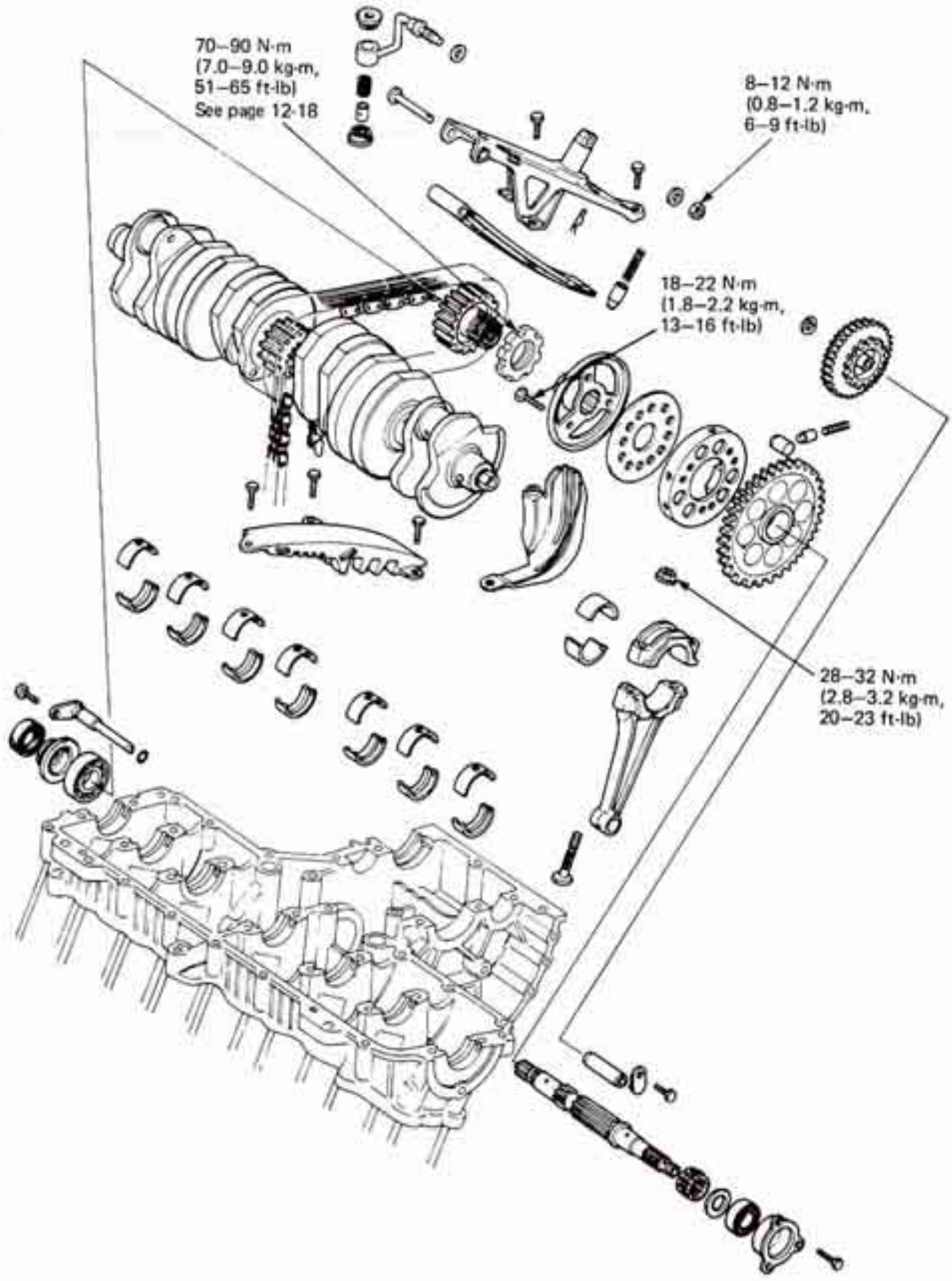


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SERVICE INFORMATION

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

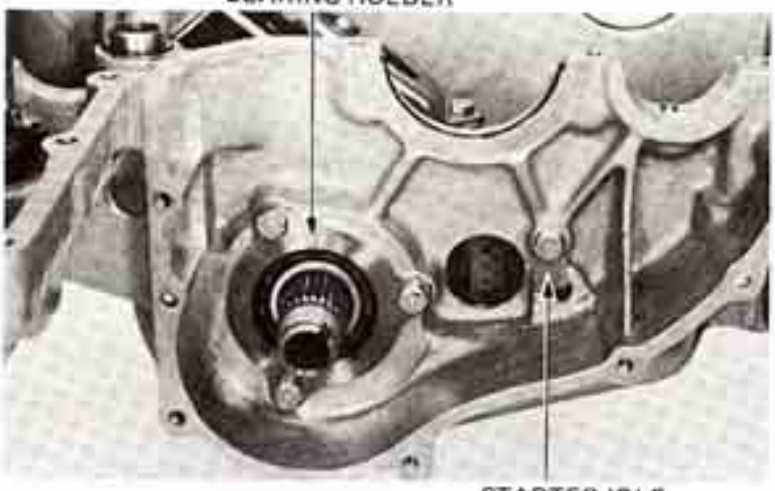
– Worn crank pin bearing

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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.

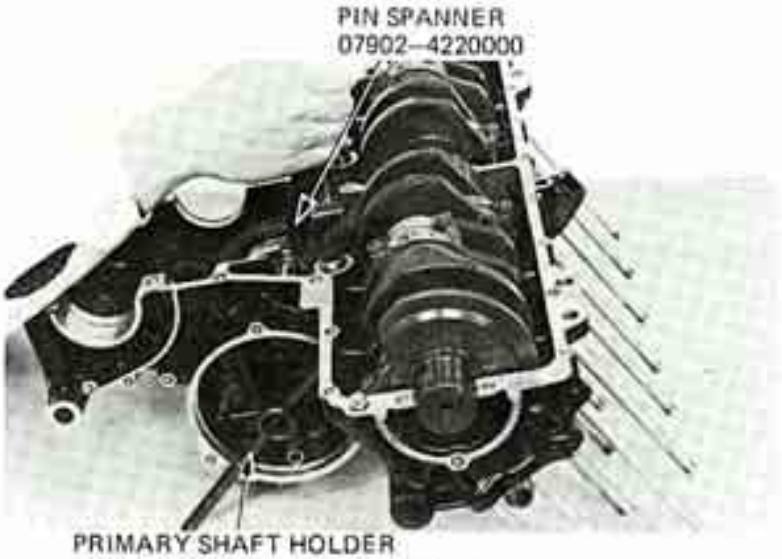


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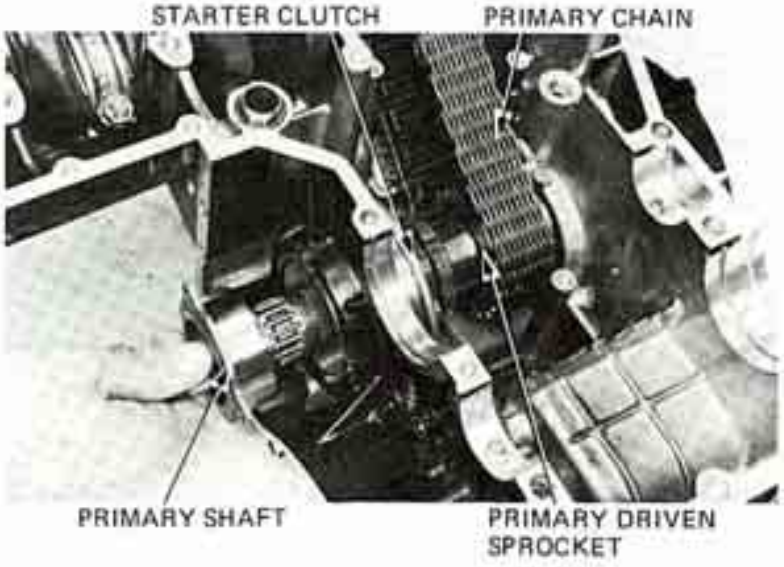
Hold the shaft with the special "PRIMARY SHAFT HOLDER" tool.
Loosen the primary driven sprocket collet ring nut with the special tool "PIN SPANNER".

NOTE

The ring nut has left-hand threads.

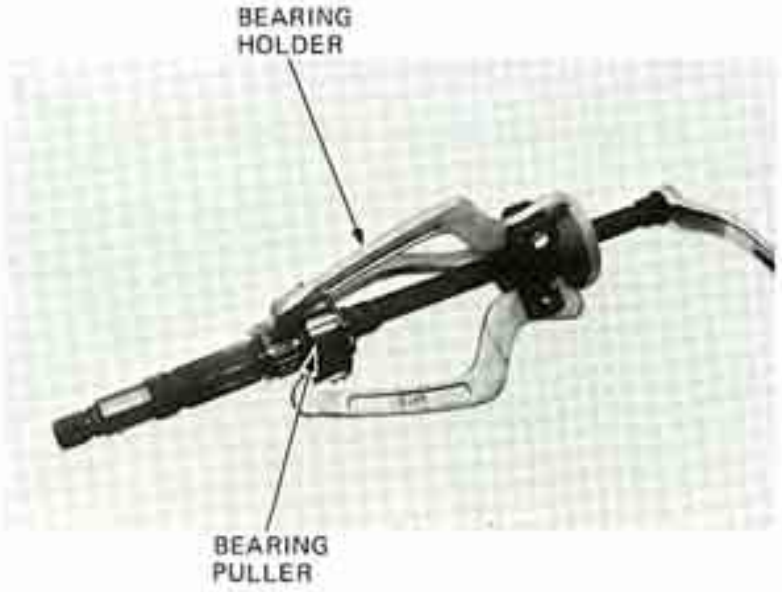


Remove the primary shaft.
Lift the primary driven sprocket and starter clutch and remove the primary chain.
Remove the primary driven sprocket, ring nut and starter clutch.



PRIMARY SHAFT DISASSEMBLY

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



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PRIMARY SHAFT INSPECTION

Check for scoring, wear or other damage.

BEARING INSPECTION

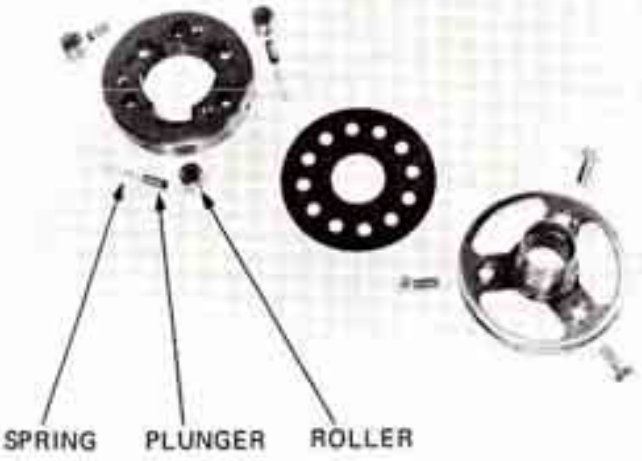
Check for damage.



STARTER CLUTCH DISASSEMBLY

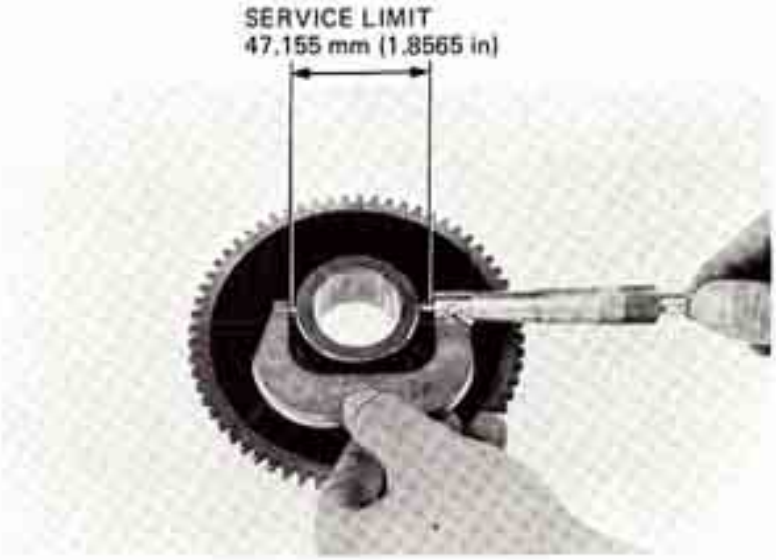
STARTER CLUTCH INSPECTION

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.



STARTER DRIVE GEAR INSPECTION

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



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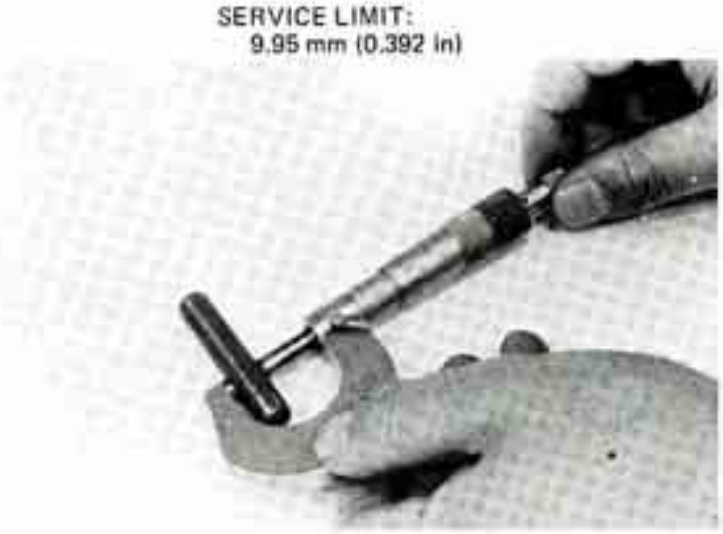
STARTER IDLE GEAR INSPECTION

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



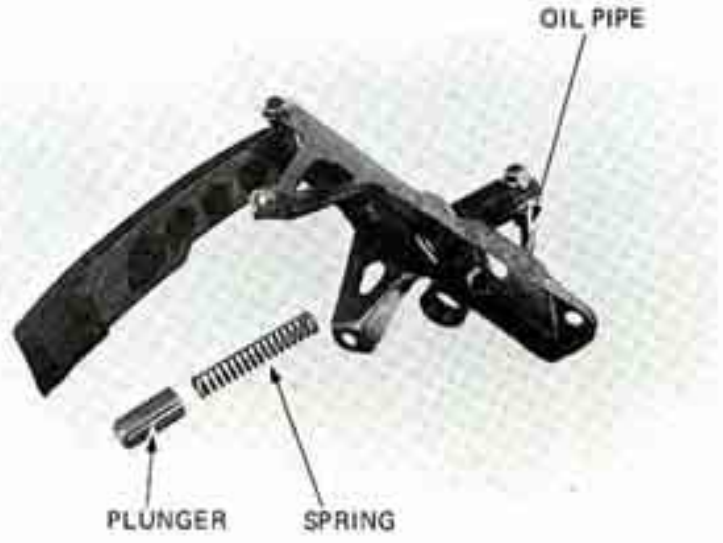
Measure the idle gear shaft O. D..
Measure the idle gear-to-shaft clearance.

SERVICE LIMIT: 0.10 mm (0.004 in)



PRIMARY CHAIN TENSIONER DISASSEMBLY

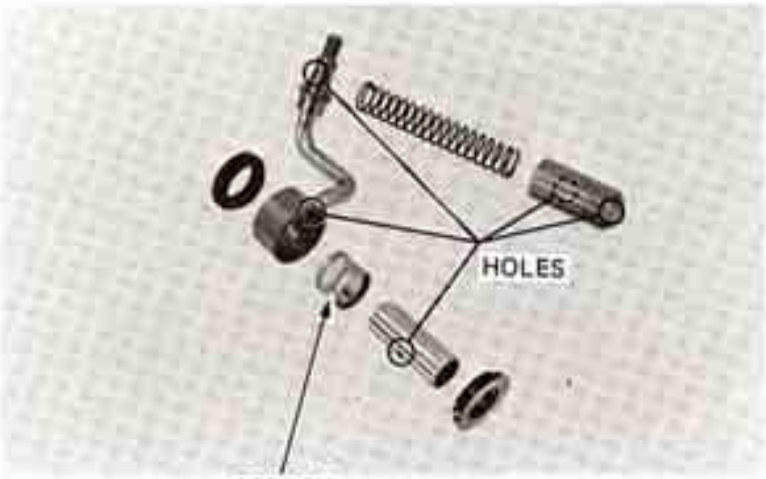
Remove the inner oil pipe and screen.
Remove the spring and plunger.
Remove the lock pin and slipper.
Remove the nut and oil pipe.



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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

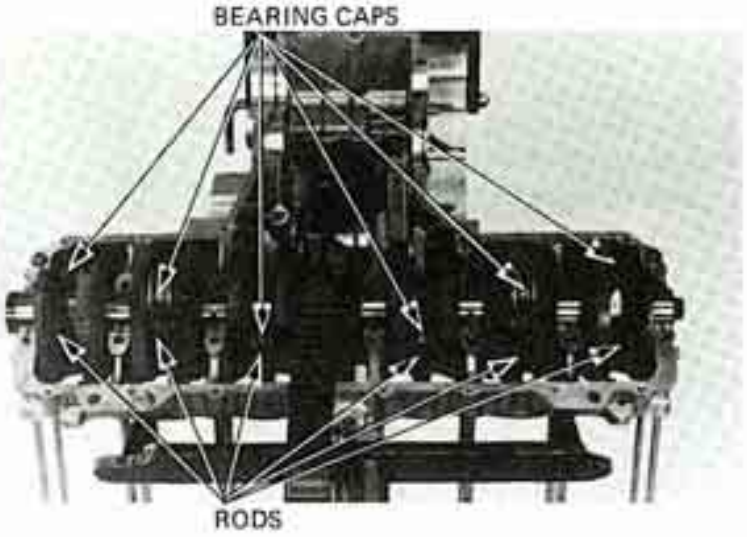
Check the connecting rod side clearance.

SERVICE LIMIT:
0.3 mm (0.01 in)



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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.

SERVICE LIMIT:
0.05 mm (0.002 in)

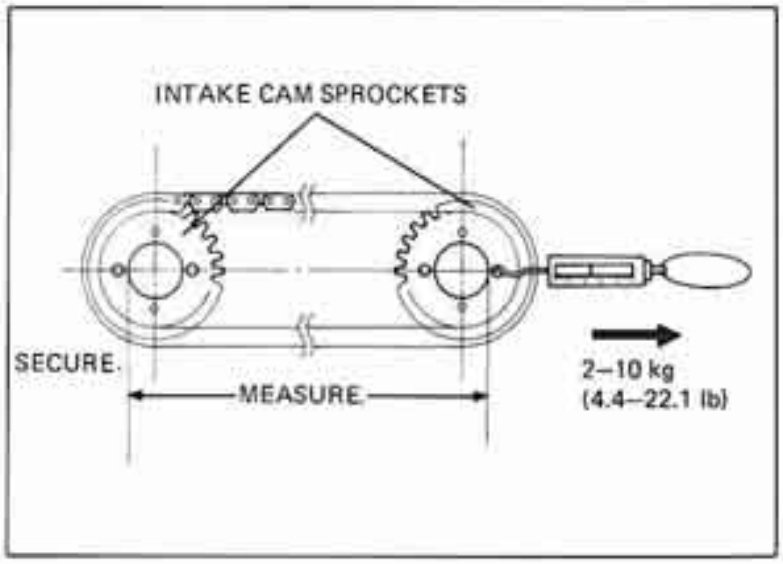


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CAM CHAIN LENGTH MEASUREMENT

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.

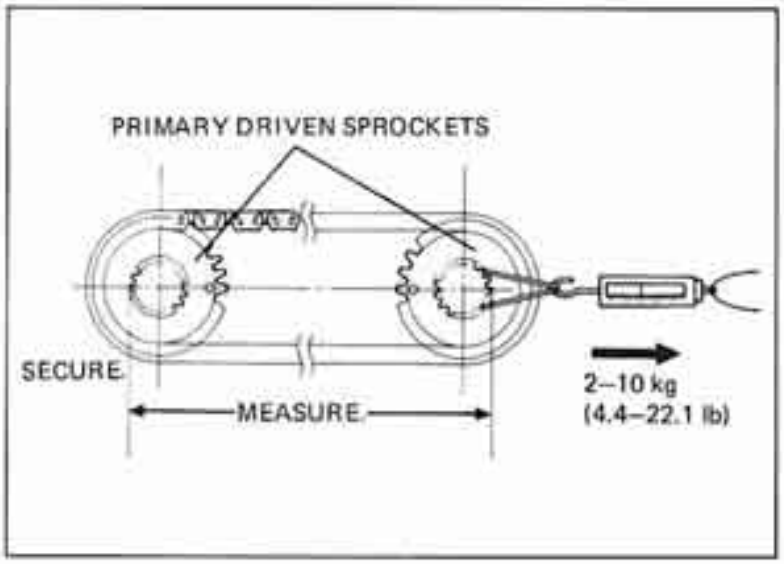
SERVICE LIMIT: 261.8 mm (10.31 in)



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.

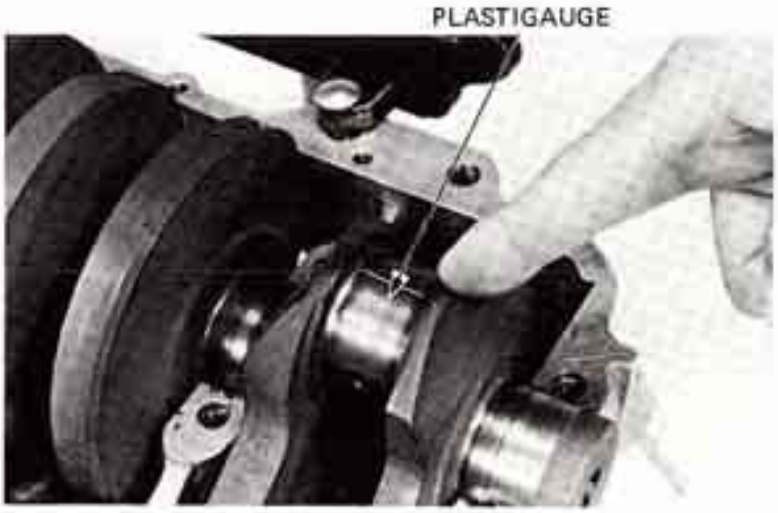
SERVICE LIMIT: 195.8 mm (7.71 in)



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.



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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)

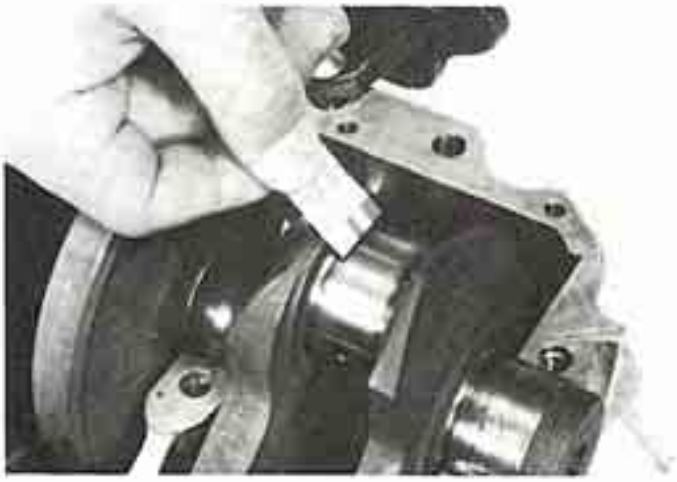
NOTE

Do not rotate the crankshaft during inspection.



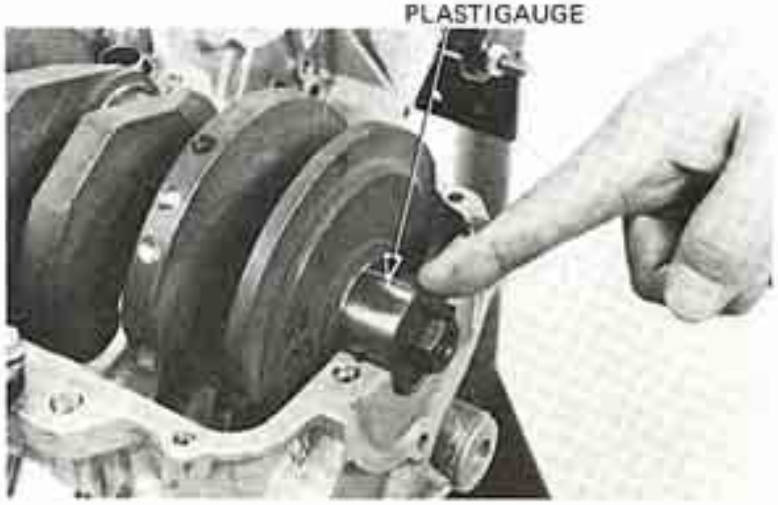
Remove the caps and measure the compressed plastigauge on each crankpin.

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.



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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.

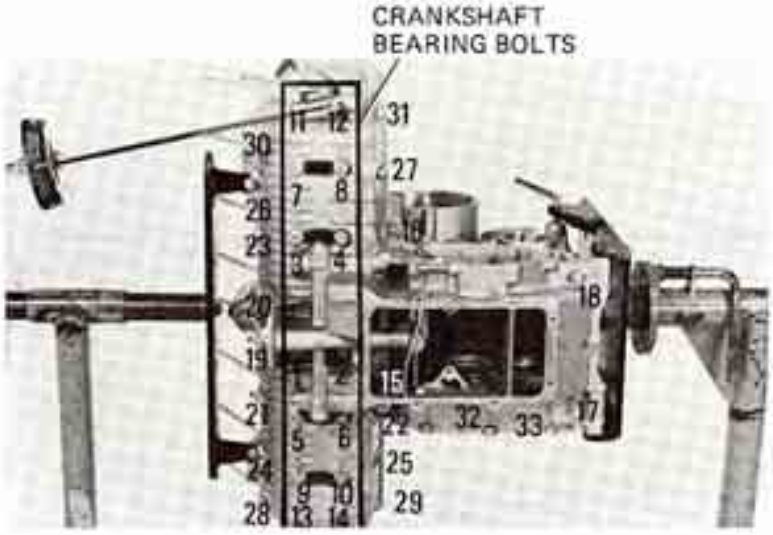
TORQUES:

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.



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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)	A (Blue)



BEARING INSERT THICKNESS:

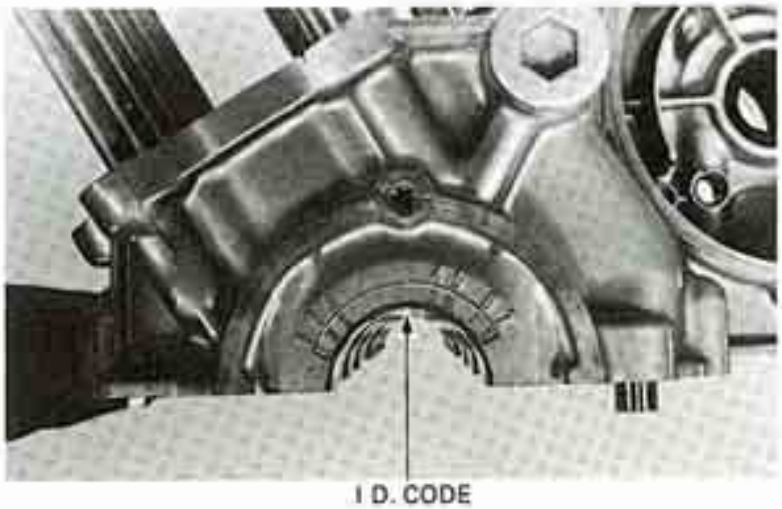
A (Blue) : 1.502–1.506 mm (0.0591–0.0593 in)
B (Black) : 1.498–1.502 mm (0.0590–0.0591 in)
C (Brown): 1.494–1.498 mm (0.0588–0.0590 in)
D (Green) : 1.490–1.494 mm (0.0587–0.0588 in)
E (Yellow): 1.486–1.490 mm (0.0585–0.0587 in)

MAIN BEARING

Determine and record crankcase I.D. code numbers.

NOTE

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.



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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)	AA (Blue)

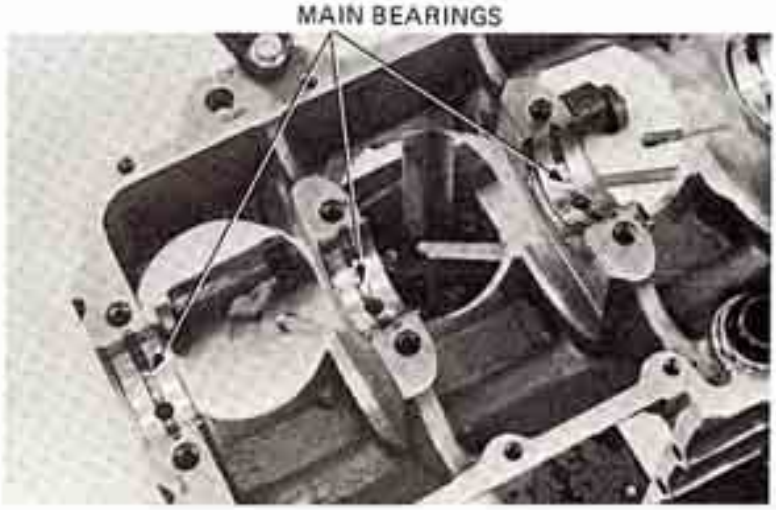


MAIN BEARING INSERT THICKNESS:

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.



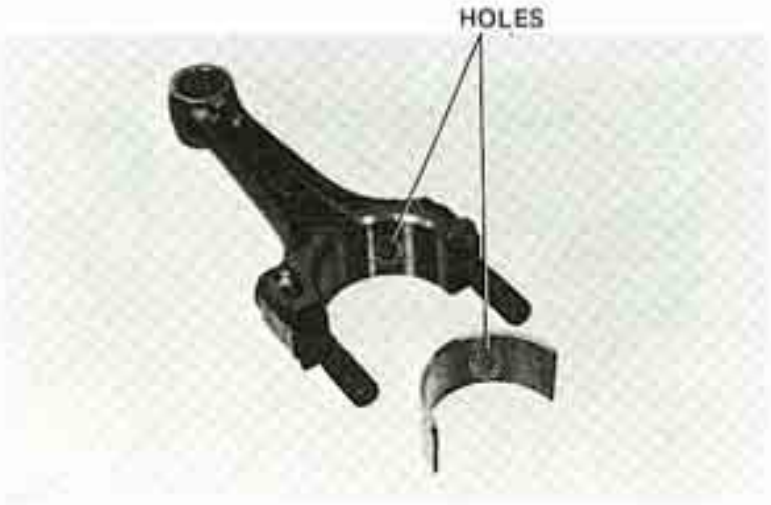
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Before installing the connecting rods, make sure that the weight code combination is correct:

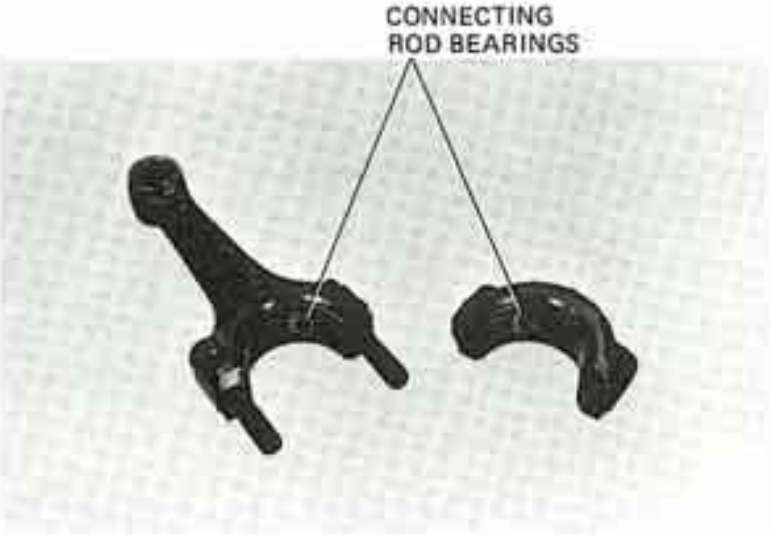
Factory set code	Available code
A	B
B	
C	D
D	
E	
F	F
G	



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.



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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 corect reassenbly.



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.



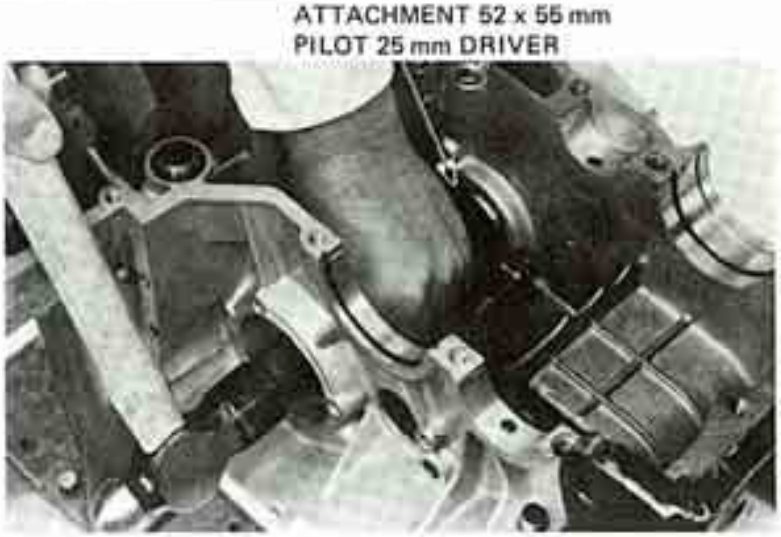
OIL SEAL AND BEARING INSTALLATION

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



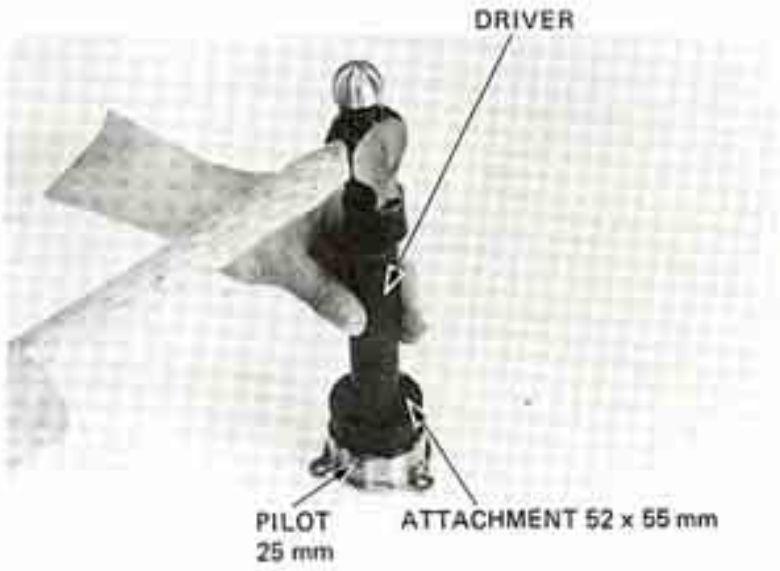
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Install the bearing with special tools.



PRIMARY SHAFT ASSEMBLY

Insert the primary shaft bearing into the bearing holder.

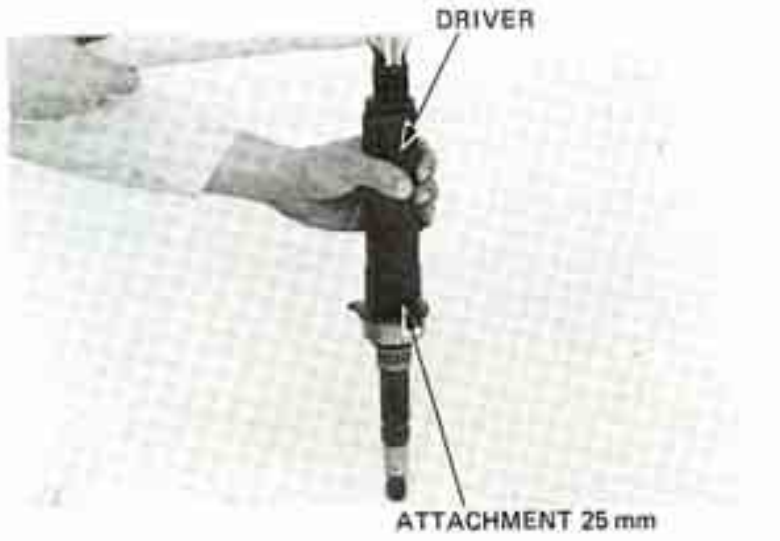


Slide the needle bearing and washer onto the shaft.

NOTE

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

Install the bearing over the shaft.



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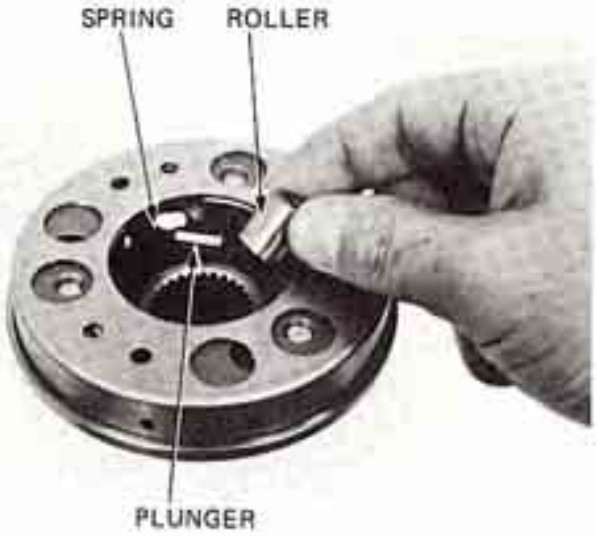
STARTER CLUTCH ASSEMBLY

Install the springs plungers and rollers.

NOTE

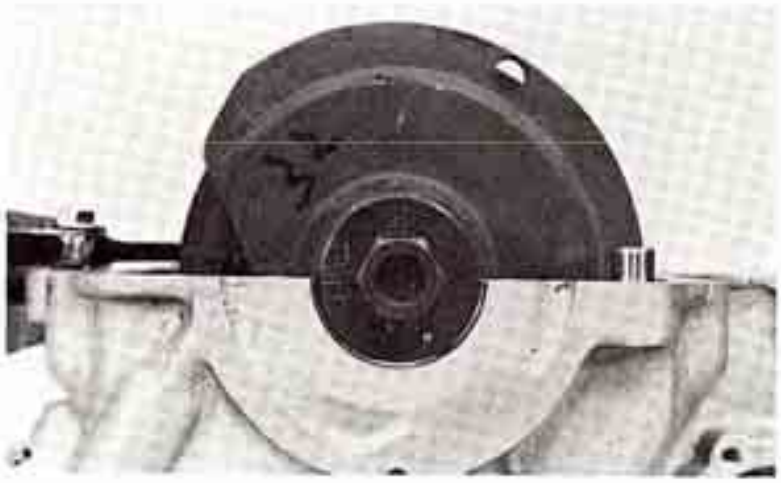
Apply a locking agent to the threads of the locking bolts.

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.

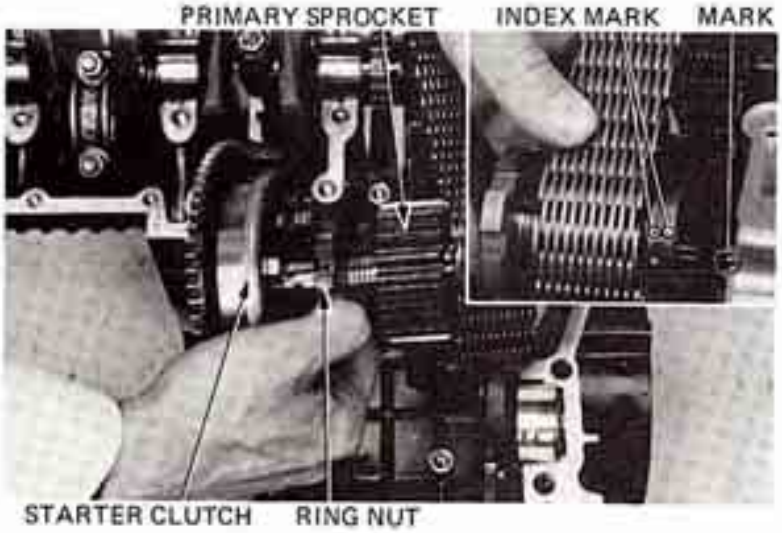


Install the ring nut on the primary driven sprocket.
Install the starter clutch assembly on the primary driven sprocket by aligning the slots.

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.

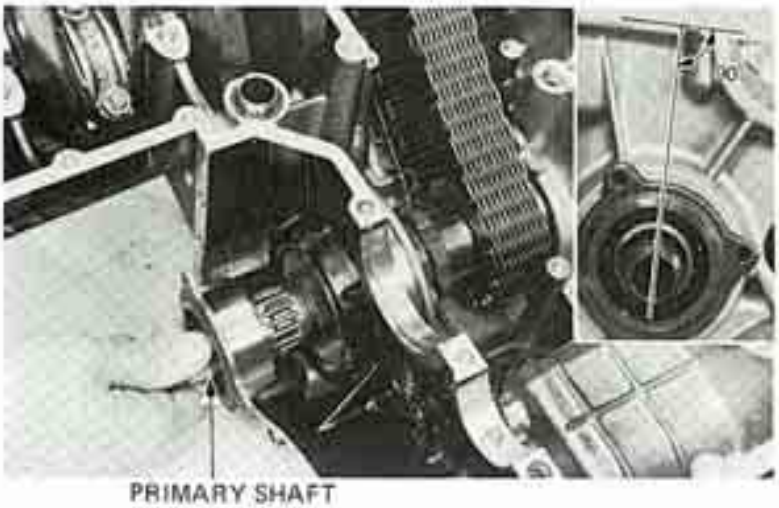


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Install the primary shaft assembly. Make sure that the recess in the primary shaft is positioned 90° from the crankcase mating surface, and the bearing holder is in position.

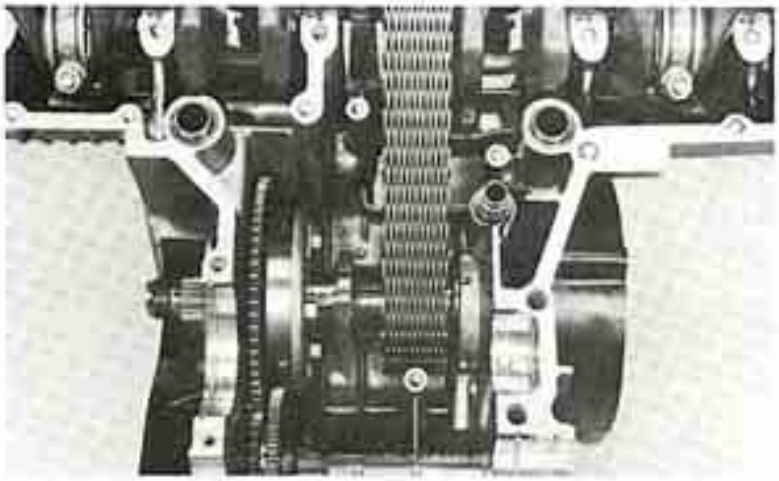
CAUTION

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

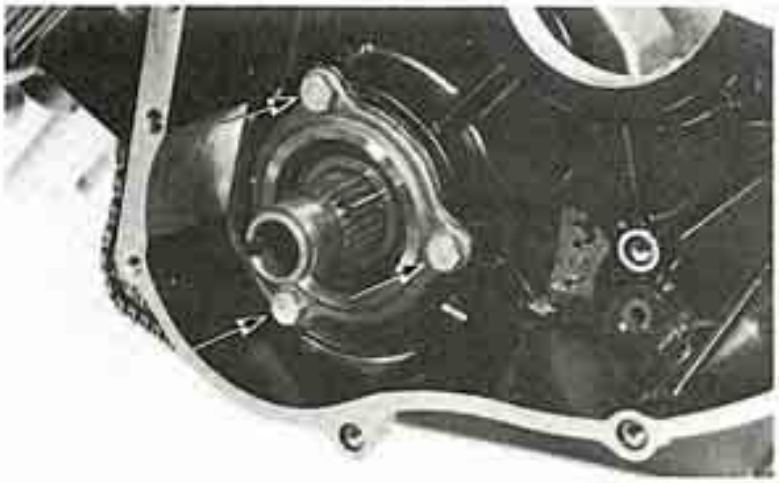


PRIMARY SHAFT

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.

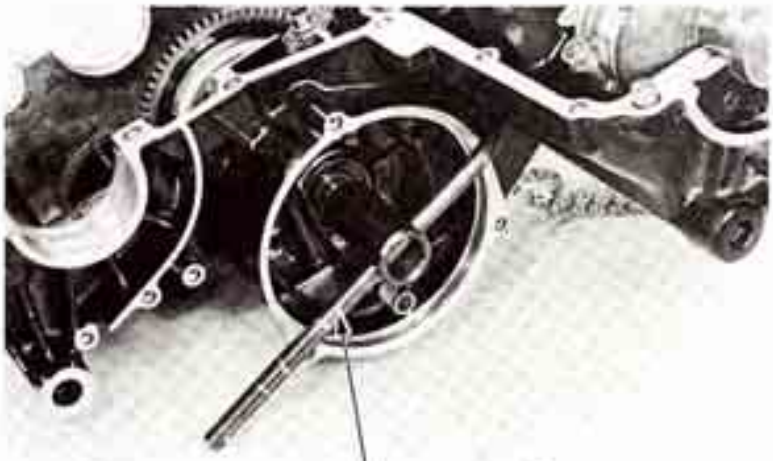


Tighten the primary shaft bearing holder bolts securely.



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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

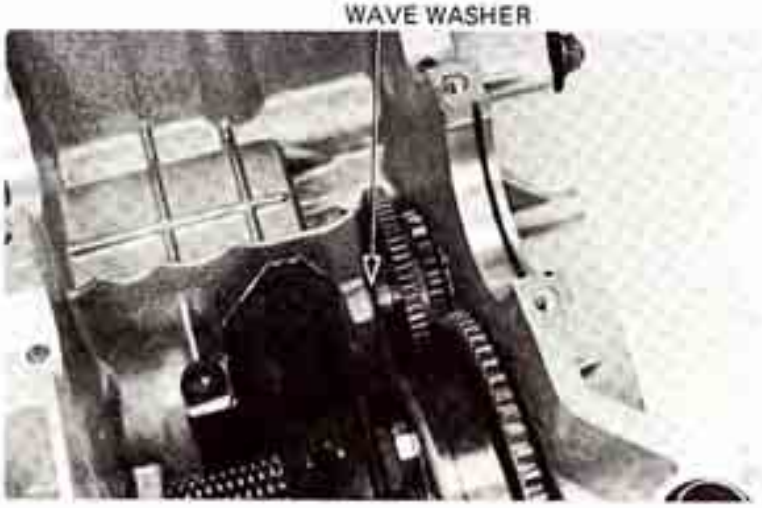
Install the starter idle gear as shown.

NOTE

Be sure to install the wave washer.

Install the idle gear shaft holder.

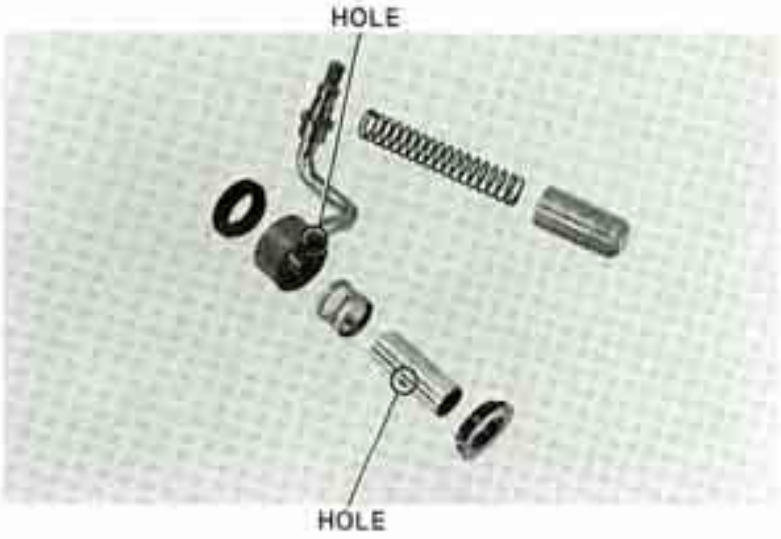
WAVE WASHER



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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).



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