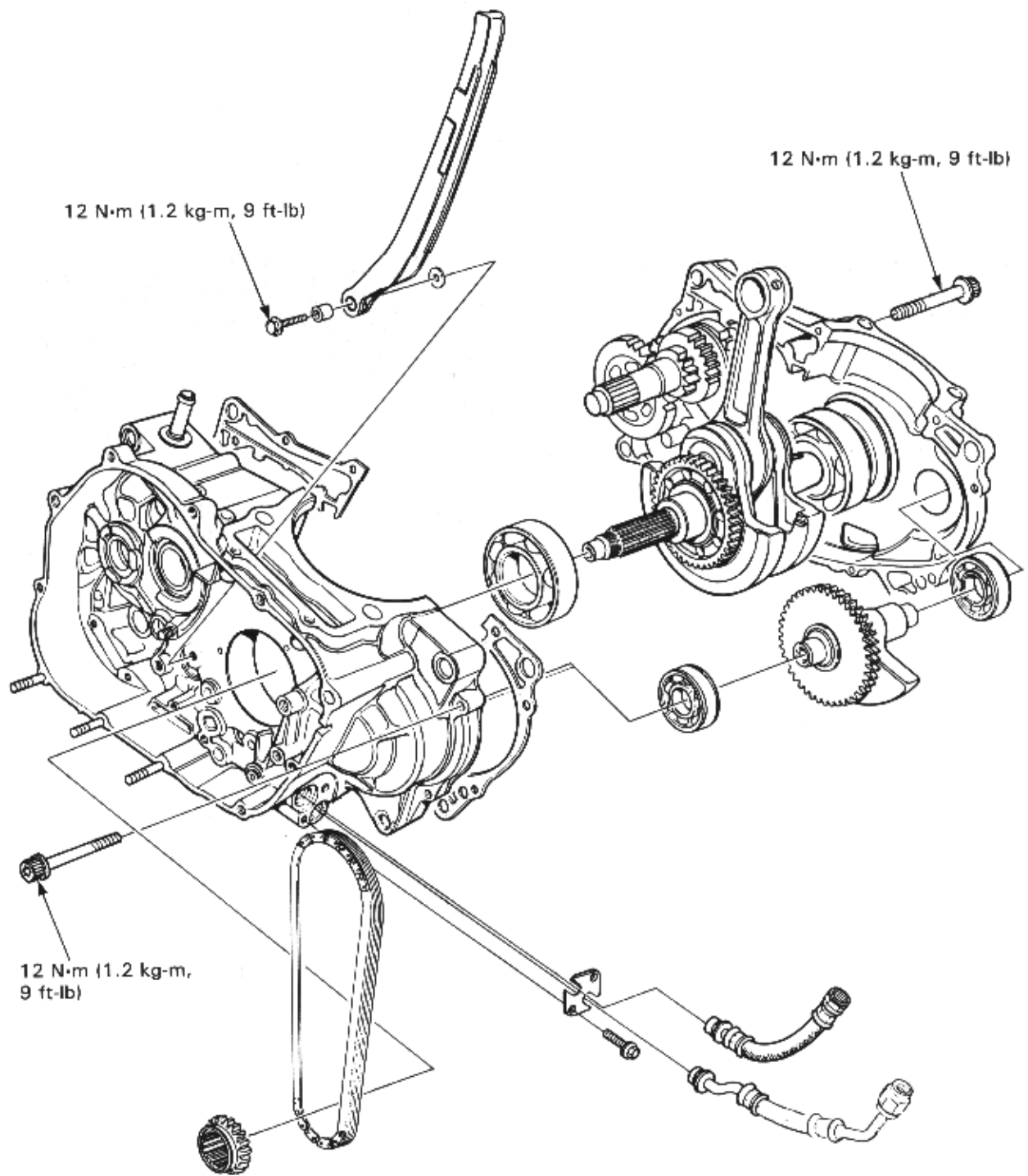


# CRANKSHAFT/BALANCER



# 10. CRANKSHAFT/BALANCER

<b>SERVICE INFORMATION</b>	<b>10-1</b>	<b>CRANKCASE BEARING REPLACEMENT</b>	<b>10-6</b>
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<b>CRANKCASE SEPARATION</b>	<b>10-3</b>	<b>CRANKCASE ASSEMBLY</b>	<b>10-11</b>
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## SERVICE INFORMATION

### GENERAL

- The crankcase must be separated to service the crankshaft, connecting rod, transmission and balancer.
- Remove the following parts before separating the crankcase.

Engine	Section 5
Oil pump	Section 2
Cylinder head	Section 6
Cylinder/piston	Section 7
Clutch	Section 8
Alternator	Section 9

### SPECIFICATIONS

ITEM	STANDARD	SERVICE LIMIT
Connecting rod big end side clearance	0.050–0.650 mm (0.0020–0.0256 in)	0.80 mm (0.031 in)
Connecting rod big end radial clearance	0.006–0.018 mm (0.0002–0.0007 in)	0.05 mm (0.002 in)
Crankshaft runout	—	0.10 mm (0.004 in)

### TORQUE VALUE

Crankcase bolt 12 N·m (1.2 kg-m, 9 ft-lb)

### TOOLS

#### Special

Universal bearing puller	07631–0010000	
Bearing puller catch	07931–MK20100	
Bearing remover	07936–MK50100	or equivalent commercially available in U.S.A.
Remover handle	07936–KC10100	
Remover sliding weight	07741–0010201	
Needle race remover	07GMC–MK50100	
Bearing remover shaft	07746–0060100	
Puller shaft	07931–ME40000	or 07931–ME4000A
Assembly collar	07931–KF00100	
Thread adaptor	07931–KF00200	
Attachment, 78 x 90 mm	07GAD–SD40101	

#### Common

Driver	07749–0010000
Pilot, 35 mm	07746–0040800
Attachment, 52 x 55 mm	07746–0010400
Pilot, 25 mm	07746–0040600
Attachment, 42 x 47 mm	07746–0010300
Pilot, 40 mm	07746–0040900
Attachment, 32 x 35 mm	07746–0010100
Attachment, 62 x 68 mm	07746–0010500
Attachment, 35 mm I.D.	07746–0030400
Attachment, 72 x 75 mm	07746–0010600
Pilot, 20 mm	07746–0040500

## **TROUBLESHOOTING**

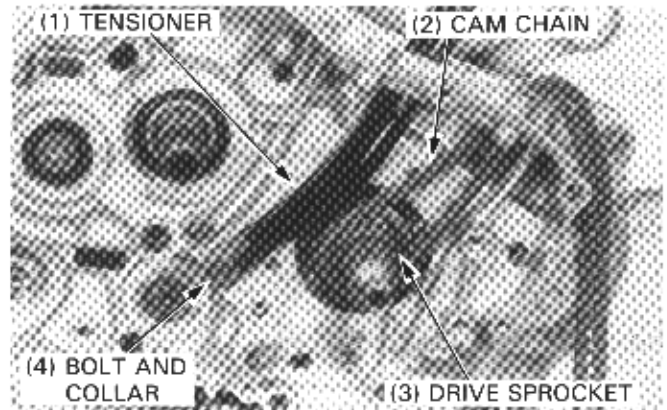
### **Excessive Noise**

- Crankshaft
  - Worn connecting rod bearings
  - Bent connecting rod
  - Worn crankshaft bearings
  
- Balancer
  - Improper installation
  - Worn balancer bearings

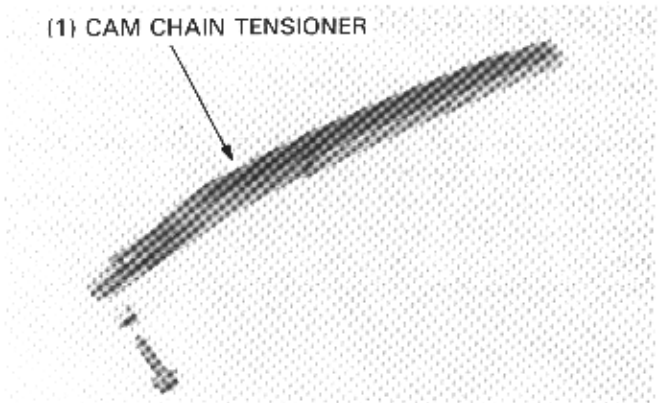
## CRANKCASE SEPARATION

Remove the following:

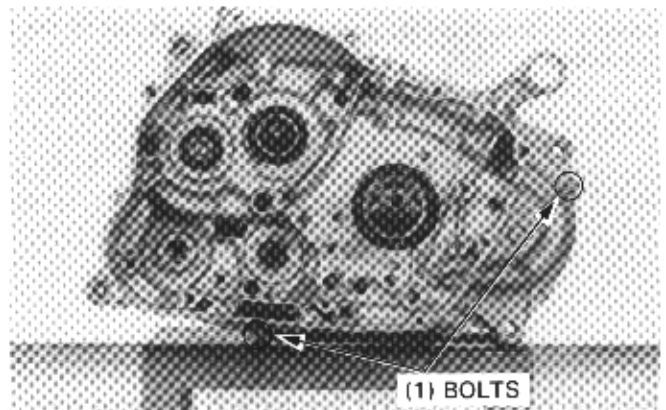
- bolt, collar and cam chain tensioner
- cam chain
- cam chain drive sprocket



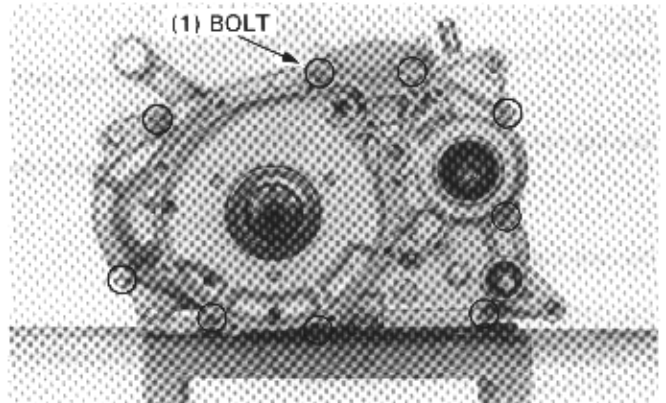
Inspect the cam chain tensioner for excessive wear or damage.



Loosen and remove the right crankcase bolts.



Loosen and remove the left crankcase bolts in a crisscross pattern in two or more steps.



## CRANKSHAFT/BALANCER

Remove the right crankcase from the left crankcase.

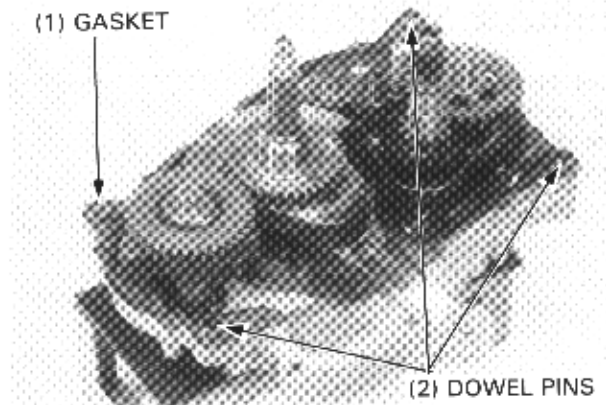
### NOTE

- Separate the right and left crankcases from each other while tapping them at several locations with a soft hammer.

### CAUTION

- Do not pry the crankcases apart with a screwdriver.

Remove the gasket and dowel pins.

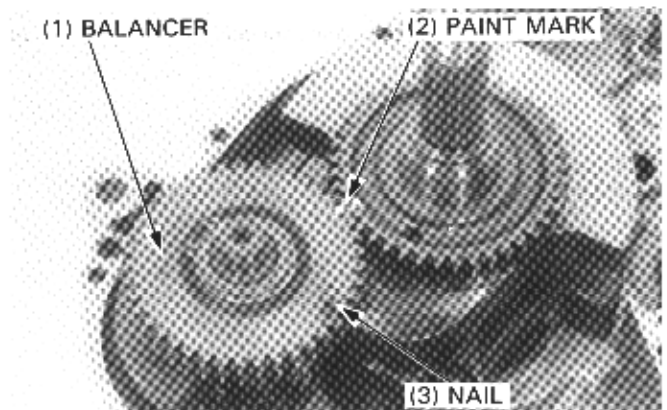


## BALANCER/CRANKSHAFT REMOVAL

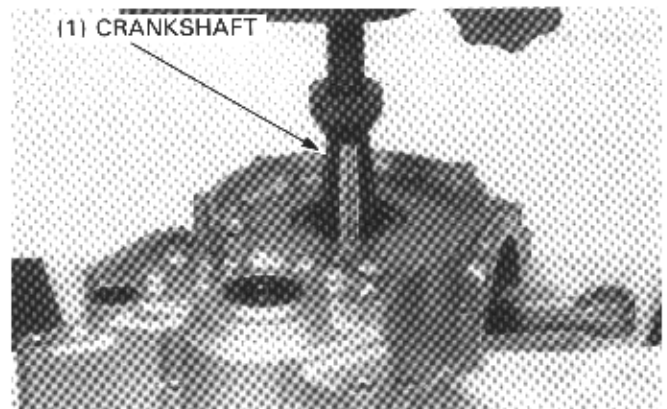
Remove the transmission (page 11-3).

Insert a proper sized nail into the holes in the balancer, while prying the scissors gears with a screwdriver. Turn the balancer weight with the balancer weight out of the crank weight, and paint on the balancer drive gear and driven gear.

Remove the balancer and pull out the nail.



Using a hydraulic press, press the crankshaft out of the left crankcase.



Remove the left crankshaft bearing with a bearing puller if it comes out with the crankshaft.

### TOOL:

Universal bearing puller

07631-0010000  
or equivalent commercially  
available in U.S.A.

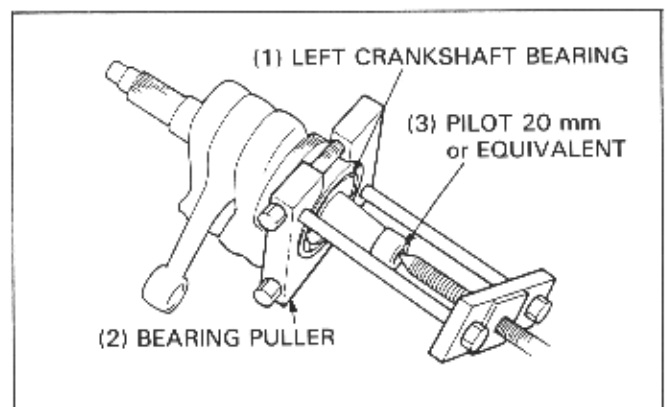
Bearing puller catch

07931-MK20100  
or equivalent commercially  
available in U.S.A.

Discard the bearing.

### CAUTION

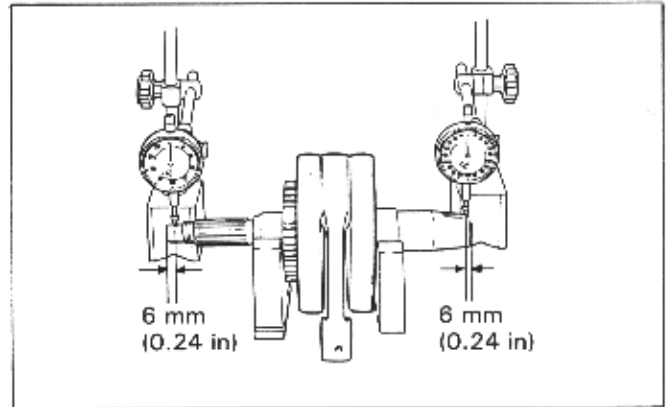
- Always replace the left bearing with a new one if it comes with the crankshaft.



**CRANKSHAFT INSPECTION**

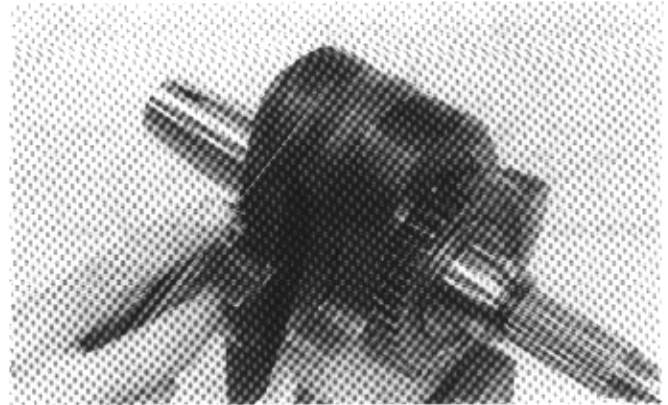
Set the crankshaft on a truing stand or V blocks and measure the runout using a dial indicator.

**SERVICE LIMIT: 0.10 mm (0.004 in)**



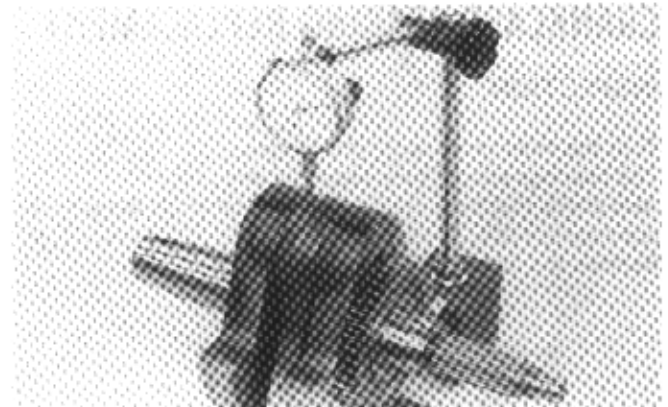
Measure the side clearance of the connecting rod big end with a feeler gauge.

**SERVICE LIMIT: 0.80 mm (0.031 in)**

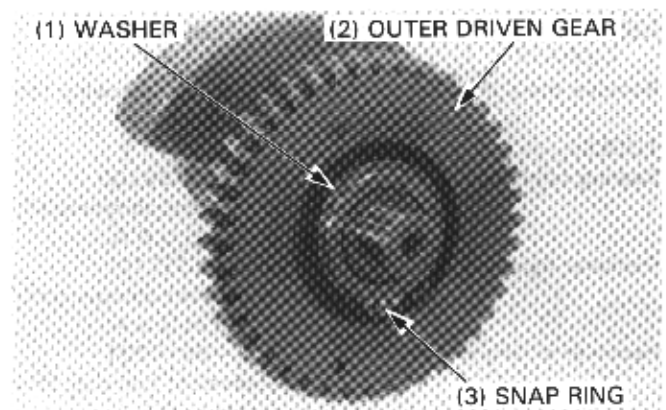


Measure the connecting rod big end radial clearance.

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

**BALANCER DISASSEMBLY/ASSEMBLY**

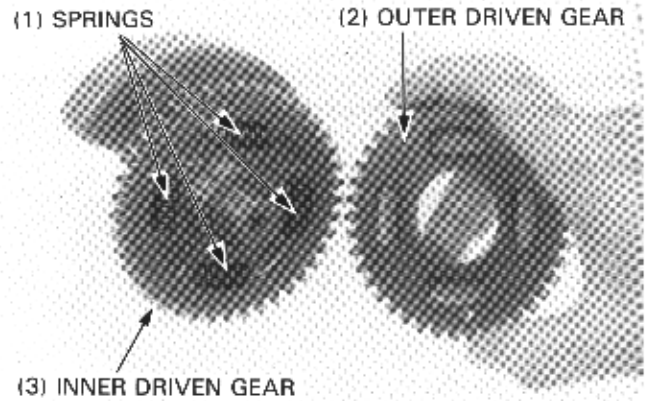
Separate the outer driven gear from the inner driven gear by removing the snap ring and cone spring washer. Remove the four springs from the inner driven gear.



## CRANKSHAFT/BALANCER

Check the gears and springs for wear, damage or fatigue, and replace if necessary.

Install the four springs into the inner driven gear.

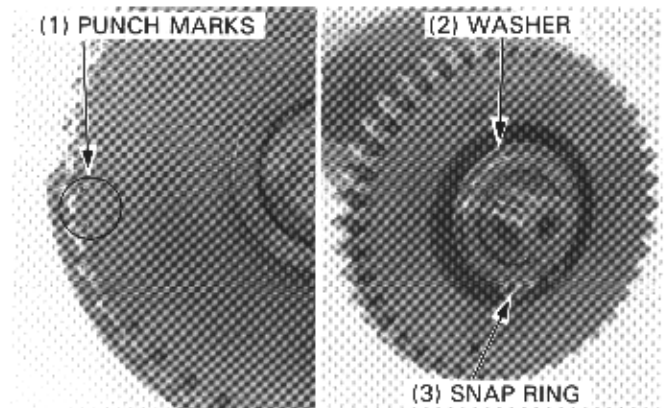


Install the outer driven gear onto the inner driven gear.

### NOTE

- Position the punch mark on the outer gear between the punch marks on the inner gear.

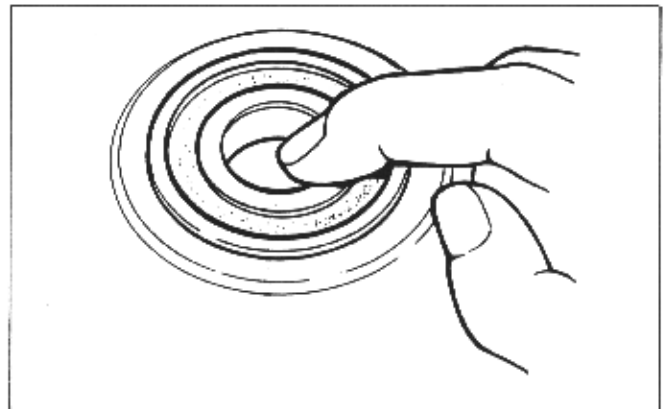
Install the cone spring washer and the snap ring securely.



## CRANKCASE BEARING REPLACEMENT

### INSPECTION

Turn the inner races with your finger.  
The bearings should turn smoothly and quietly.  
Also check that the outer races of the bearings fit tightly in the crankcase.  
Replace the bearings if necessary.

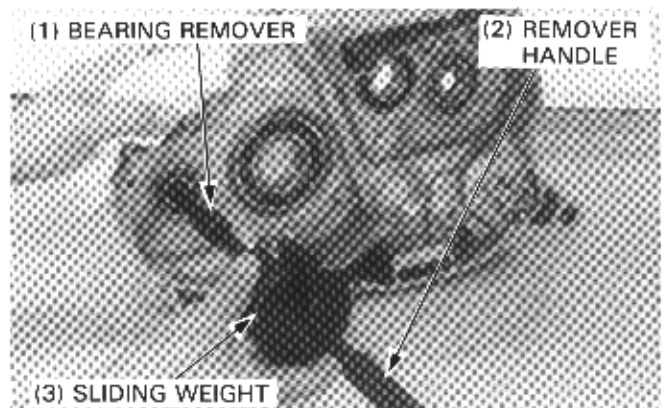


### RIGHT CRANKCASE BEARING REPLACEMENT

Remove the right balancer bearing using the following tools.

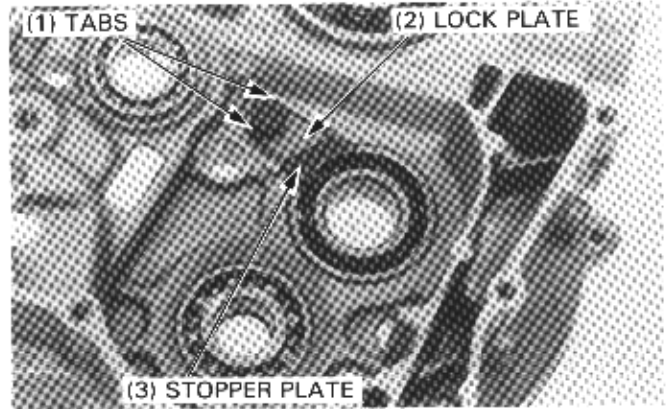
#### TOOLS:

Bearing remover	07936—MK50100 or equivalent commercially available in U.S.A.
Remover handle	07936—KC10100 or equivalent commercially available in U.S.A.
Remover sliding weight	07741—0010201 or equivalent commercially available in U.S.A.





Bend down the tabs of the lock plate, and remove the bolt, lock plate and bearing stopper plate.  
Discard the lock plate.



Remove each bearing out of the right crankcase.  
Remove the oil seal and discard it after removing the right crankshaft bearing.  
Apply clean engine oil to the lip of the new right counter shaft oil seal and install it securely.



Apply oil to each new bearings, and drive each bearing into the right crankcase.

**NOTE**

- Drive in the bearing perpendicularly to the right crankcase.

**TOOLS:**

**Crankshaft bearing**

Driver	07749-0010000
Attachment, 72 x 75 mm	07746-0010600
Pilot, 35 mm	07746-0040800

**Right mainshaft bearing**

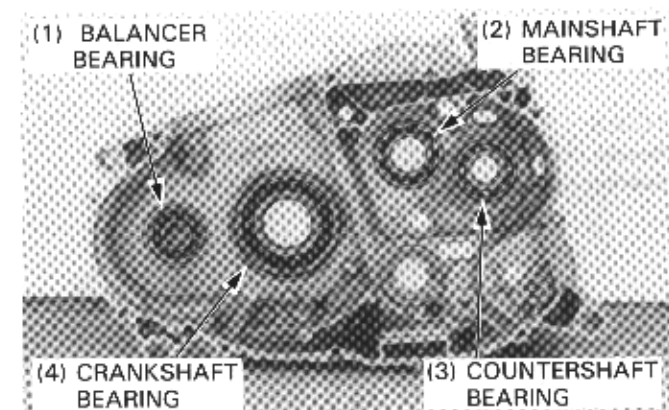
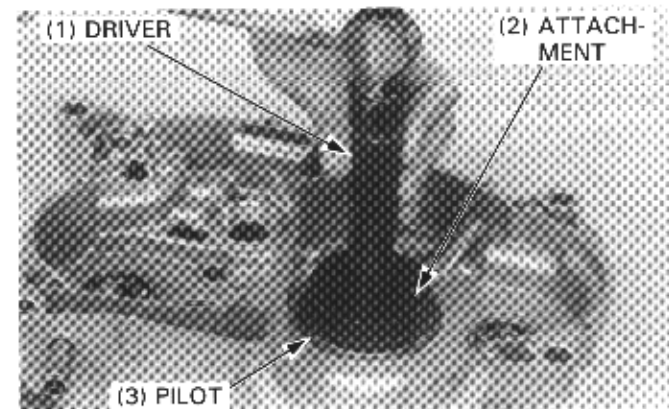
Driver	07749-0010000
Attachment, 52 x 55 mm	07746-0010400
Pilot, 25 mm	07746-0040800

**Right countershaft bearing**

Driver	07749-0010000
Attachment, 42 x 47 mm	07746-0010300
Pilot, 20 mm	07746-0040500

**Right balancer bearing**

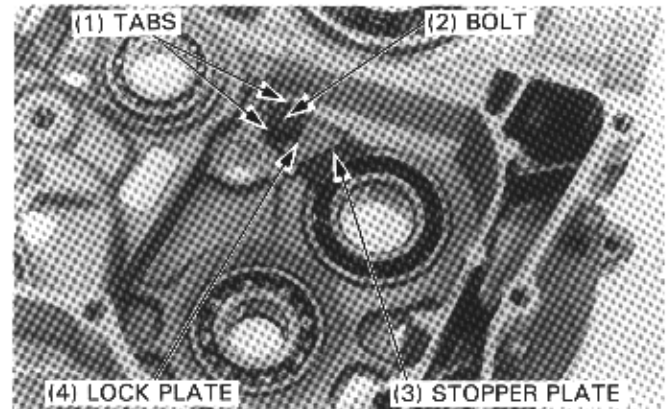
Driver	07749-0010000
Attachment, 42 x 47 mm	07746-0010300





## CRANKSHAFT/BALANCER

Install the bearing stopper plate and new lock plate, and secure them with a bolt.  
Bend up the tabs of the lock plate against the bolt.

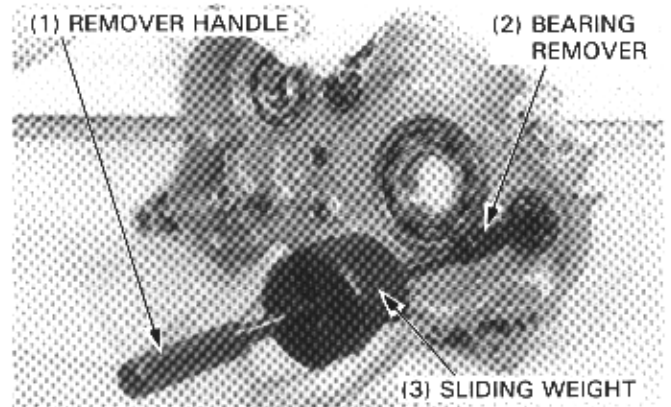


### LEFT CRANKCASE BEARING REPLACEMENT

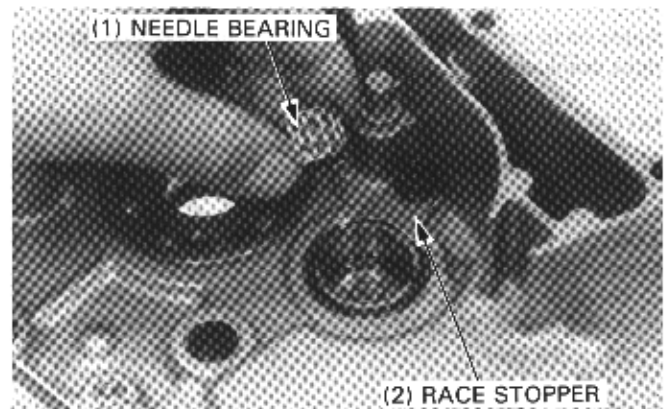
Remove the left balancer bearing using the following tools.

#### TOOLS:

Bearing remover	07936—MK50100 or equivalent commercially available in U.S.A.
Remover handle	07936—KC10100 or equivalent commercially available in U.S.A.
Remover sliding weight	07741—0010201 or equivalent commercially available in U.S.A.



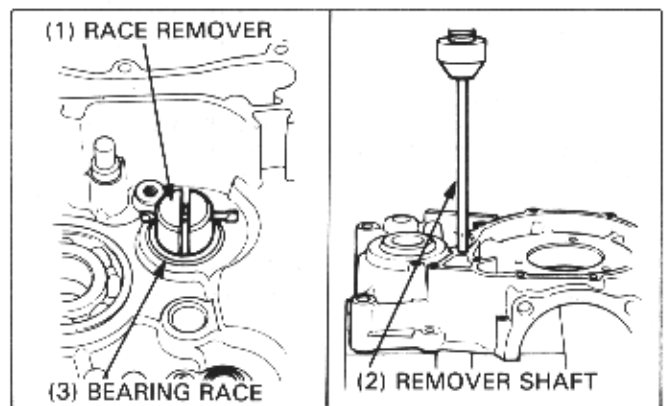
Remove the needle bearing and check it for wear or damage, and replace if necessary.  
Remove the bolt and bearing race stopper.



Remove the needle bearing race from the right crankcase using the following tools.

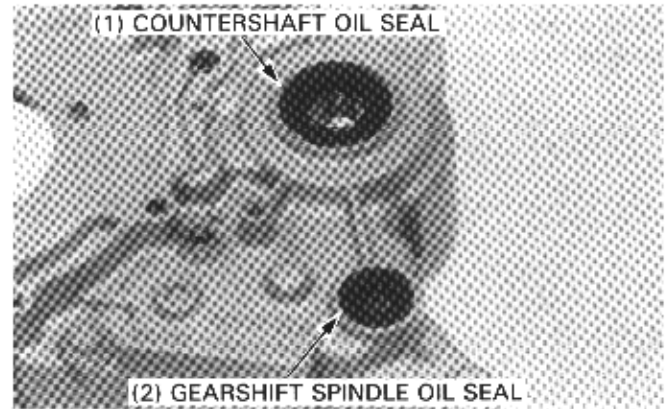
#### TOOLS:

Needle race remover	07GMC—MK50100
Bearing remover shaft	07746—0060100

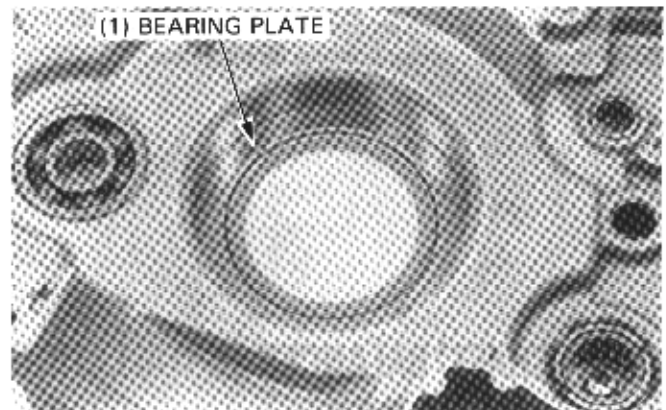


Remove the left countershaft bearing oil seal and discard it. Check the gearshift spindle oil seal for wear, damage or fatigue, and replace it if necessary.

Remove each bearing out of the left crankcase.



Replace the bearing plate if necessary.



Apply oil to each new bearing, and drive each bearing into the left crankcase.

**NOTE**

- Drive in the bearings perpendicularly to the left crankcase.

**TOOLS:**

**Left crankshaft bearing**

Driver	07749-0010000
Attachment, 78 x 90 mm	07GAD-SD40101
Pilot, 40 mm	07746-0040900

**Left mainshaft bearing race**

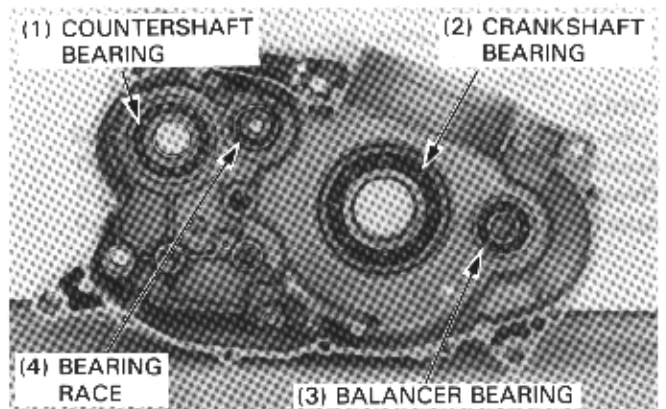
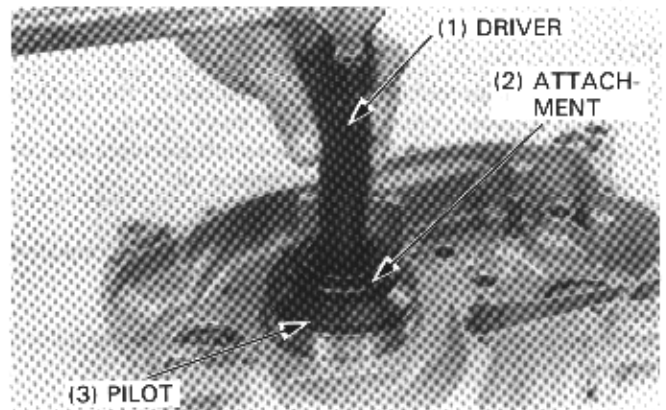
Driver	07749-0010000
Attachment, 32 x 35 mm	07746-0010100

**Left countershaft bearing**

Driver	07749-0010000
Attachment, 62 x 68 mm	07746-0010500
Pilot, 25 mm	07746-040600

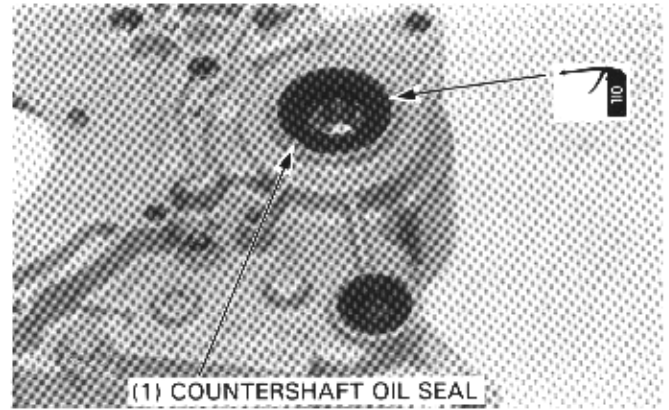
**Left balancer bearing**

Driver	07749-0010000
Attachment, 42 x 47 mm	07746-0010300

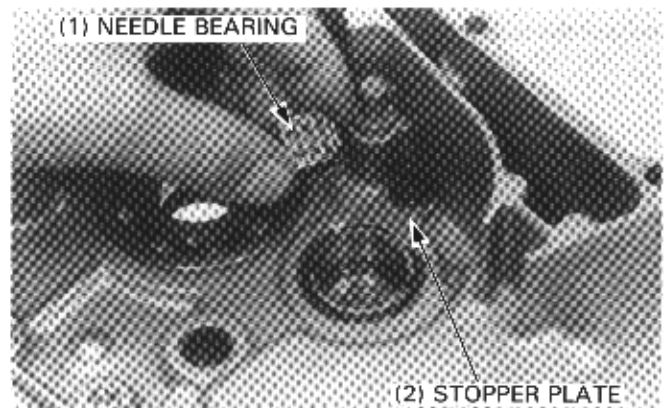


## CRANKSHAFT/BALANCER

Install a new countershaft oil seal in the left crankcase, and apply oil to the oil seal lip.



Secure the bearing race stopper plate with the bolt. Install the needle bearing into the bearing race.



## CRANKSHAFT/BALANCER INSTALLATION

Clean the crankcase mating surfaces before assembling and check for wear or damage.

### NOTE

- If there is minor roughness or irregularities on the crankcase mating surfaces, dress them with an oil stone.
- After cleaning, lubricate the crankshaft bearings and other contacting surfaces with clean engine oil.

Install the special tool into the thread end of the crankshaft. Position the crankshaft into the left crankcase.

Draw the crankshaft into the left crankcase with the following tools:

### NOTE

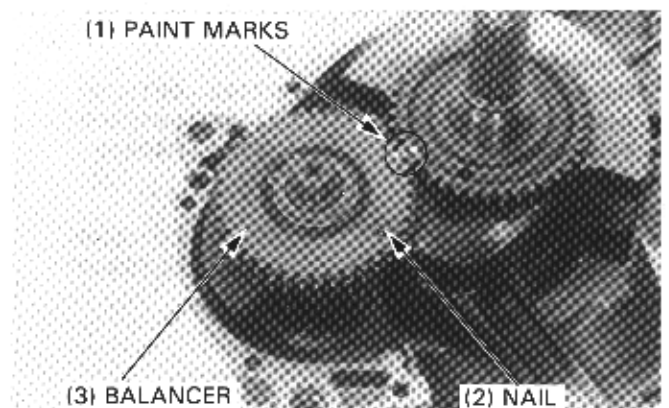
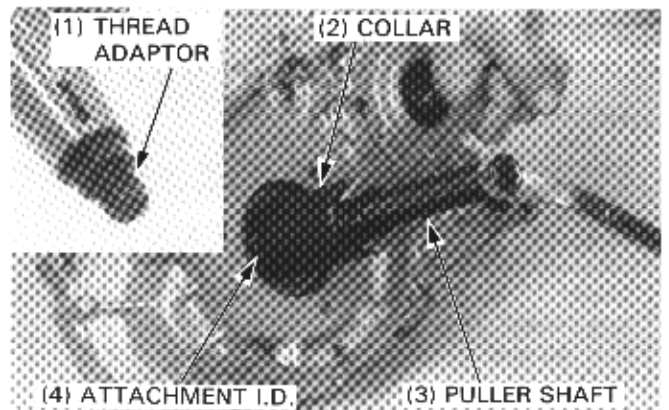
- Draw in the crankshaft, making sure the connecting rod is not compressed against the crankcase edge.

### TOOLS:

Puller shaft	07931 – ME40000
Assembly collar	07931 – KF00100
Thread adaptor	07931 – KF00200
Attachment I.D. 35 mm	07746 – 0030400

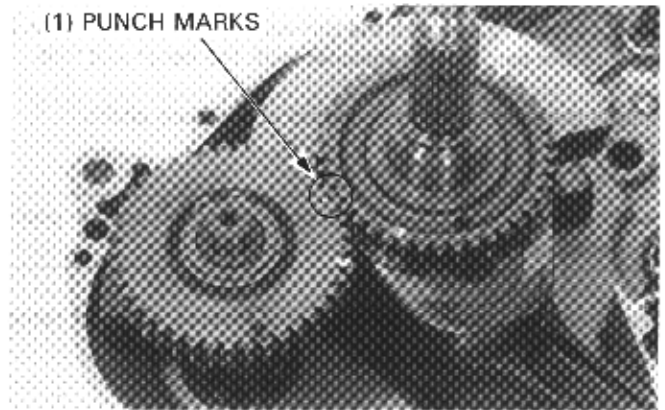
Insert a proper sized nail into the hole in the balancer, while prying the scissors gears with a screw driver.

Install the balancer with the paint marks aligned.



Turn the balancer, and make sure the punch marks on the balancer drive gear and driven gear are aligned. Draw the nail out of the balancer.

Install the transmission (section 11).



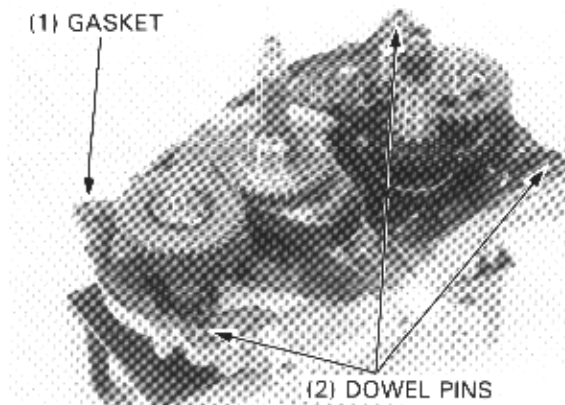
## CRANKCASE ASSEMBLY

Install the three dowel pins and a new gasket.

Assemble the right and left crankcases being careful to align the dowel pins and shafts.

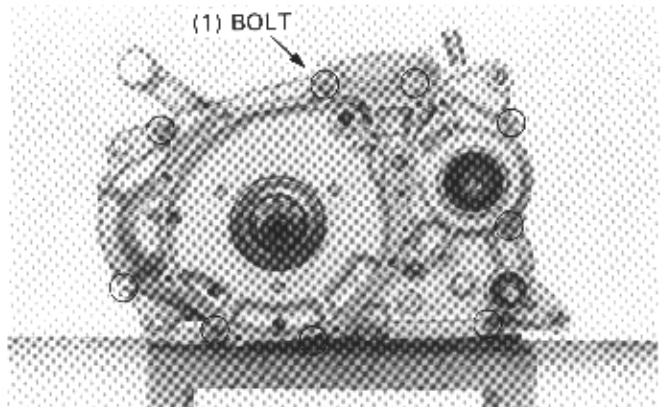
### CAUTION

- *Don't force the crankcase halves together; if there is excessive force required, something is wrong. Remove the right crankcase and check for misaligned parts.*



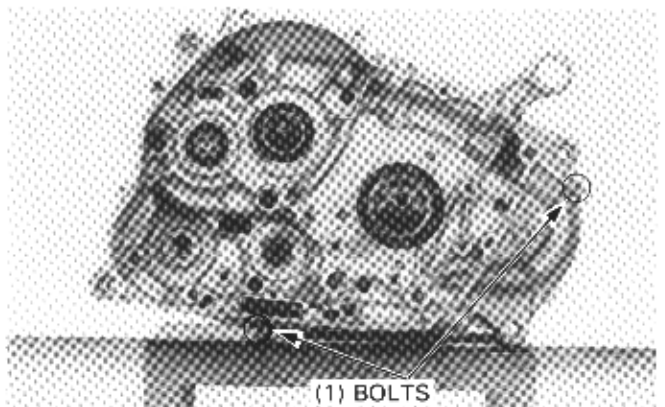
Tighten the left crankcase bolts in a crisscross pattern in two or more steps.

**TORQUE: 12 N·m (1.2 kg-m, 9 ft-lb)**



Tighten the right crankcase bolts.

**TORQUE: 12 N·m (1.2 kg-m, 9 ft-lb)**



## CRANKSHAFT/BALANCER

---

Apply a locking agent to the threads of the tensioner bolt. Secure the cam chain tensioner with the collar and bolt.

Install the cam chain drive sprocket and cam chain.

### NOTE

- The cam chain drive sprocket will only go on one position because of extra-wide aligning spline.

Reinstall the removed parts in the reverse order of removal (page 10-1).

