

13. CRANKCASE/CRANKSHAFT

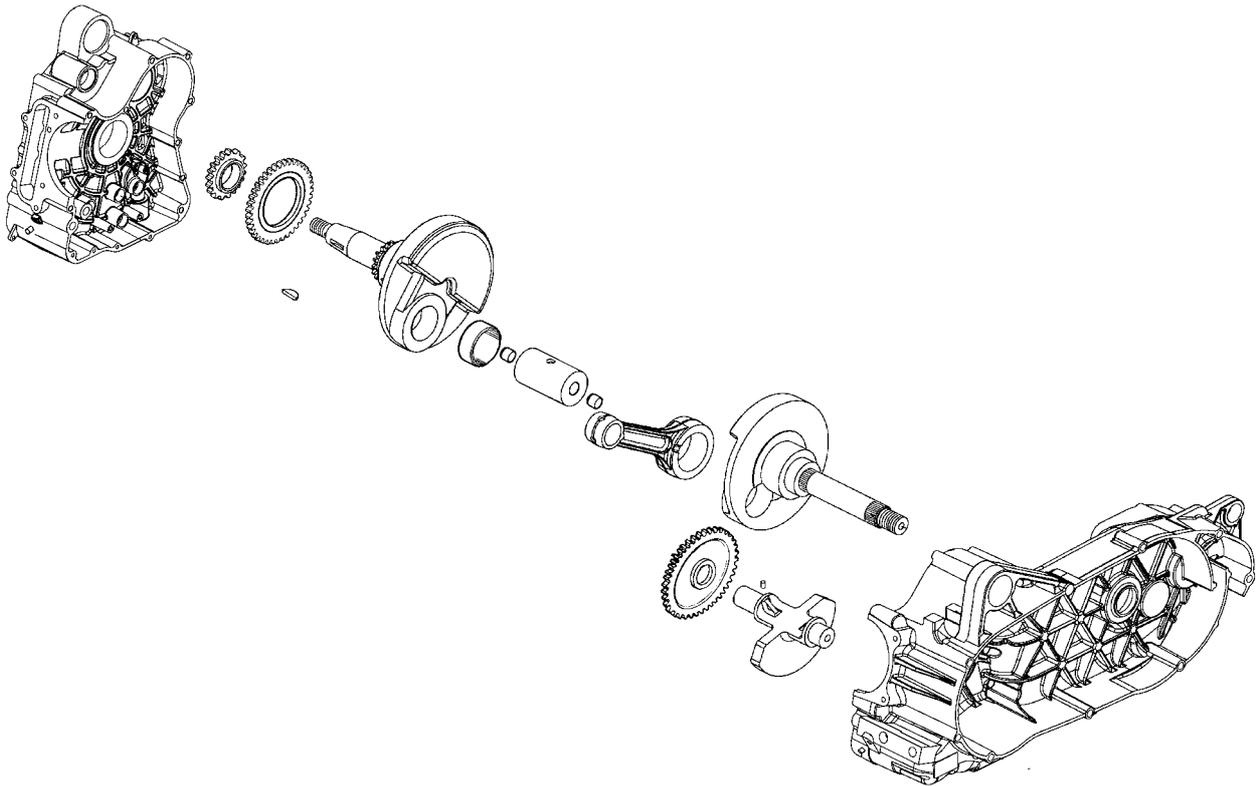
13

CRANKCASE/CRANKSHAFT

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SCHEMATIC DRAWING



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SERVICE INFORMATION

GENERAL INSTRUCTIONS

- This section covers crankcase separation to service the crankshaft and balancer. The engine must be removed for this operation.
- When separating the crankcase, never use a driver to pry the crankcase mating surfaces apart forcibly to prevent damaging the mating surfaces.
- When installing the crankcase, do not use an iron hammer to tap it.
- The following parts must be removed before separating the crankcase.
 - Cylinder head (section 8)
 - Cylinder/piston (section 9)
 - Drive and driven pulley (section 10)
 - A.C. generator/starter clutch (section 12)
 - Starter motor (section 19)
 - Oil pump (section 4)

SPECIFICATIONS

Unit: mm (in)

	Item	Standard	Service Limit
Crankshaft	Main bearing oil clearance	0.025 (0.001)~0.041 (0.0016)	0.07 (0.003)
	Connecting rod big end side clearance	0.05 (0.002)~0.5 (0.02)	0.8 (0.031)
	Runout	—	0.06 (0.002)

TORQUE VALUES

Crankcase bolt	12 N•m (1.2 kgf•m, 9 lbf•ft)
Cam chain guide bolt	20 N•m (2 kgf•m, 15 lbf•ft)
Oil pipe bolt	43 N•m (4.3 kgf•m, 31 lbf•ft)

SPECIAL TOOLS

Bearing puller	E037
Oil seal & bearing driver	E014

TROUBLESHOOTING

Excessive engine noise

- Worn connecting to small end
- Worn or damaged crankshaft bearings

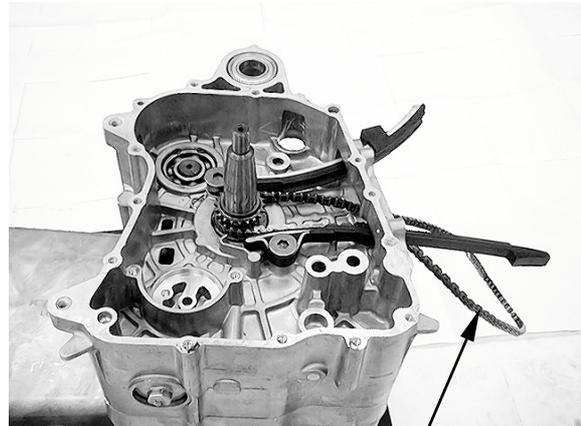
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CAM CHAIN/CAM CHAIN GUIDE REMOVAL

Remove the starter driven gear (page 12-4).

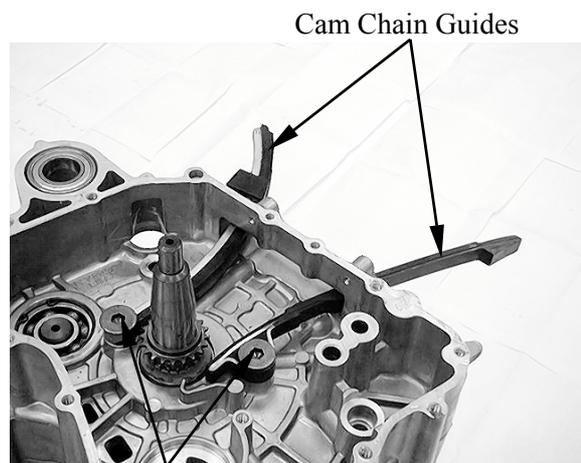
Remove the cylinder (page 9-3).

Remove the cam chain from the right crankcase.



Cam Chain

Remove the bolts and cam chain guides.



Bolts

INSPECTION

Cam chain guide

Inspect the cam chain slipper surface of the cam chain guide for wear or damage.

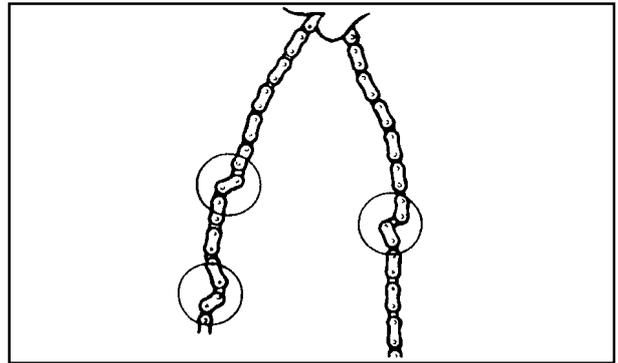


Slipper Surface

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Cam chain

Inspect the cam chain for cracks or stiff.

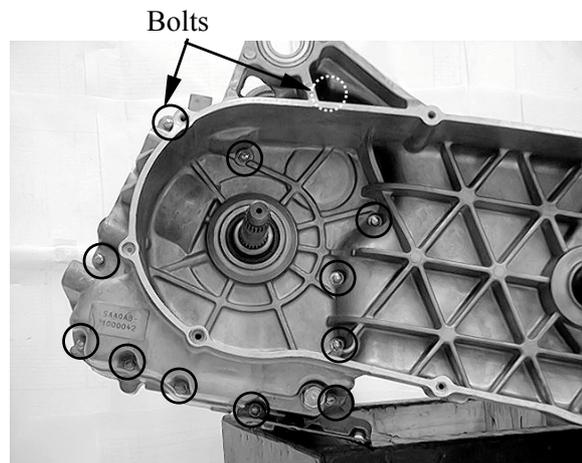


CRANKCASE SEPARATION

Remove the parts required for crankcase separation (page 13-2).

Remove the twelve bolts from left crankcase.

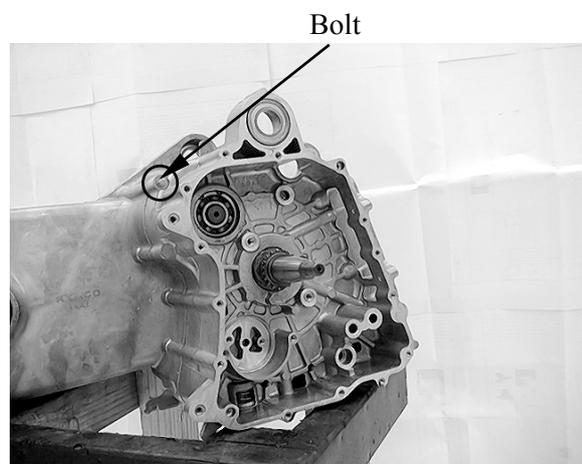
- * Loosen the bolts in a crisscross pattern in several steps.



Remove the bolt from right crankcase.

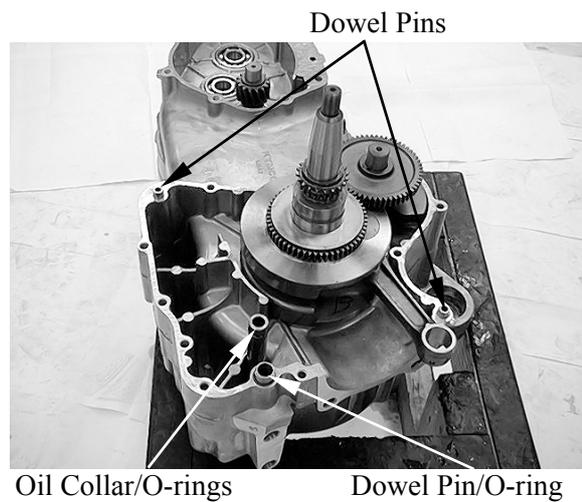
Place the crankcase assembly with the left side down and separate the right crankcase from the left crankcase.

- * Separate the right crankcase from the left crankcase while tapping them at several locations with a soft hammer.



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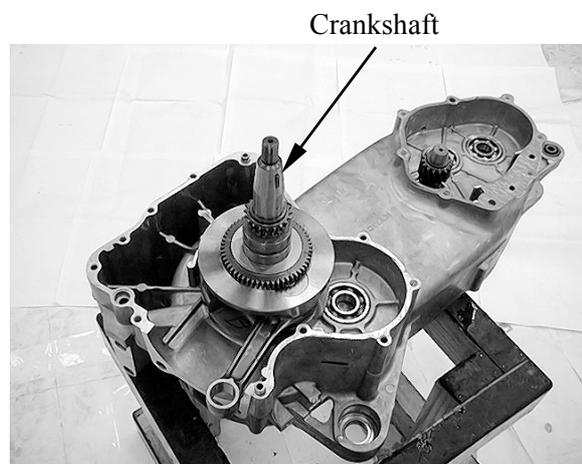
Remove the dowel pins and O-ring.
Remove the oil collar and O-rings from the left crankcase.
Clean of the sealant from the left and right crankcase mating surfaces.



Remove the washer from the crankshaft.
Remove the balancer shaft from the left crankcase.



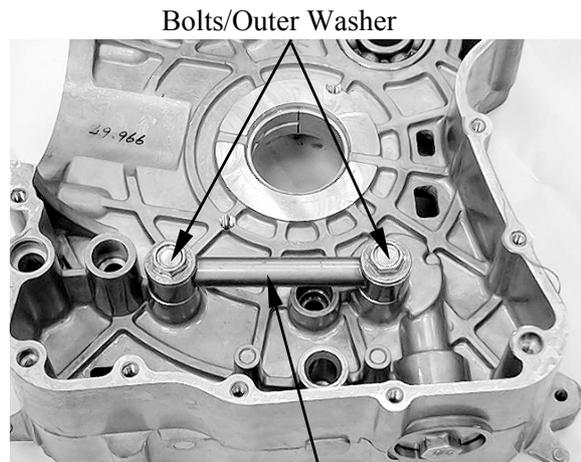
Remove the crankshaft from the left crankcase.



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RIGHT CRANKCASE DISASSEMBLY

Remove the two bolts, outer washer, oil pipe and inner washers.

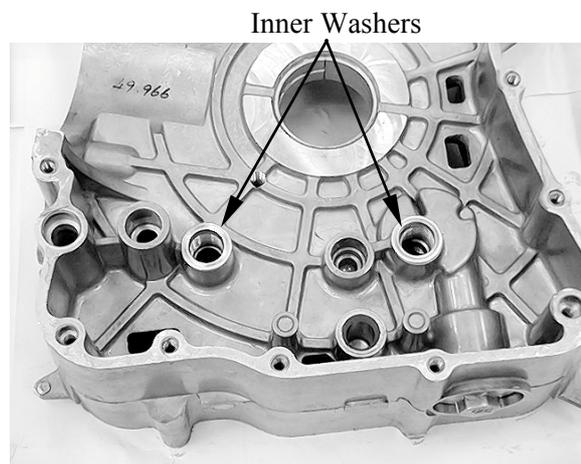


Bolts/Outer Washer

Oil Pipe/Inner Washers

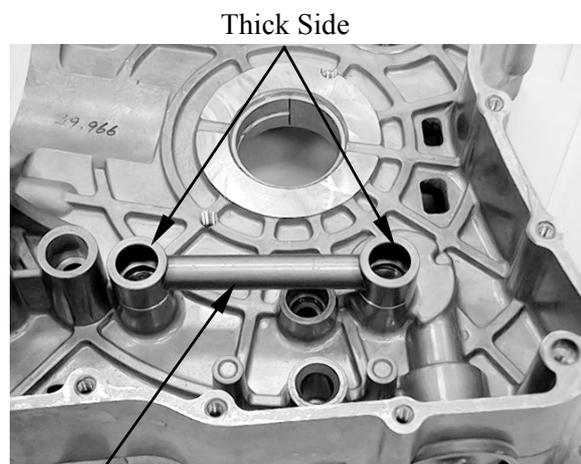
RIGHT CRANKCASE ASSEMBLY

Install the inner washers onto the right crankcase.



Inner Washers

Install the oil pipe with the thick side face upward.



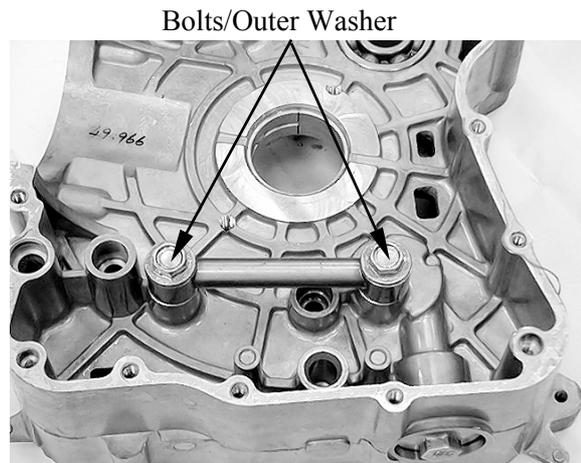
Thick Side

Oil Pipe

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Install the outer washers and two bolts.
Tighten the two bolts to the specified torque.

Torque: 43 N•m (4.3 kgf•m, 31 lbf•ft)



CRANKSHAFT/CRANKCASE SELECTION

Crankcase and crankshaft are select fitted.

Record the main journal O.D. code (— or +)

Record the main journal bearing I.D. color code (green, brown or yellow).

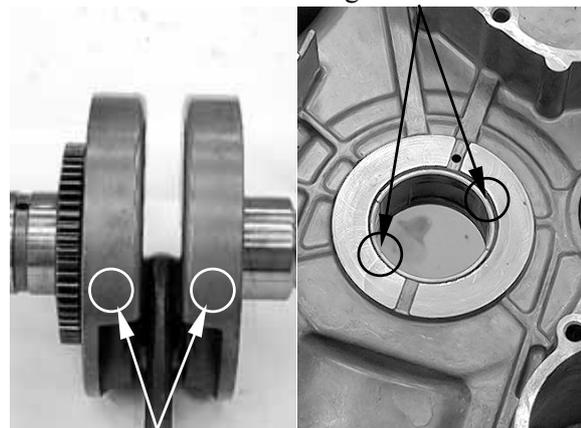
Record the right or left crankcase main journal I.D. code (A or B).

If the crankcase and/or crankshaft are replaced, select them with the following fitting table.

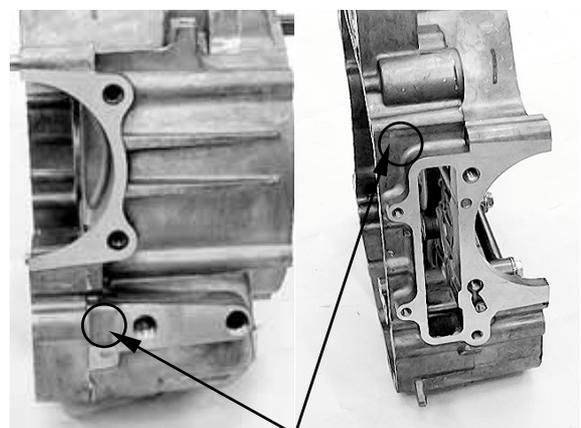
The “✓” mark in the table indicates that mating is possible in the crossed code.

Main journal O.D. code Main journal bearing I.D. color code /Crankcase main journal I.D. code	+	-
	Green/A	✓
Green/B		✓
Brown/A		✓
Yellow/B	✓	

Main Journal Bearing I.D. Color Code



Main Journal O.D. Code



Crankcase Main Journal I.D. Code

13. CRANKCASE/CRANKSHAFT

MAIN BEARING INSPECTION

Inspect the bearing inserts for unusual wear, damage or peeling and replace the crankcase if necessary.

Main bearing oil clearance

Clean off any oil from the main bearing inserts and crankshaft journals.

Measure and record the crankshaft main journal O.D..

Measure and record the main bearing I.D..

Calculate the oil clearance by subtracting the journal O.D. from bearing I.D..

Standard:

0.025 – 0.041 mm (0.001 – 0.0016 in)

Service limit: 0.07 mm (0.003 in)

Replace the crankcase if the service limit is exceeded.

Select the replacement crankcase (page 13-7).

CRANKSHAFT INSPECTION

Measure the connecting rod big end side clearance.

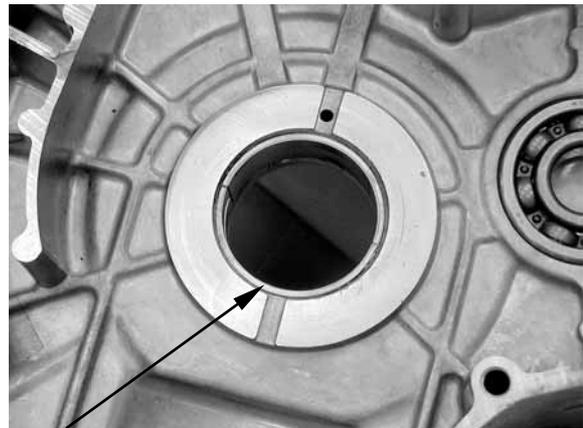
Service limit: 0.8 mm (0.031 in)

Measure the crankshaft runout.

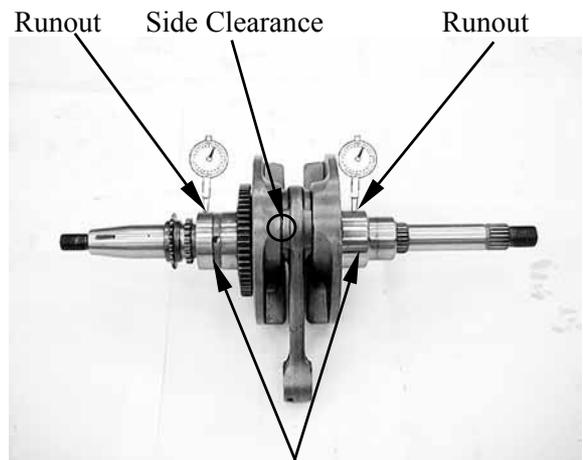
Service limit: 0.06 mm (0.002 in)

BALANCER SHAFT INSPECTION

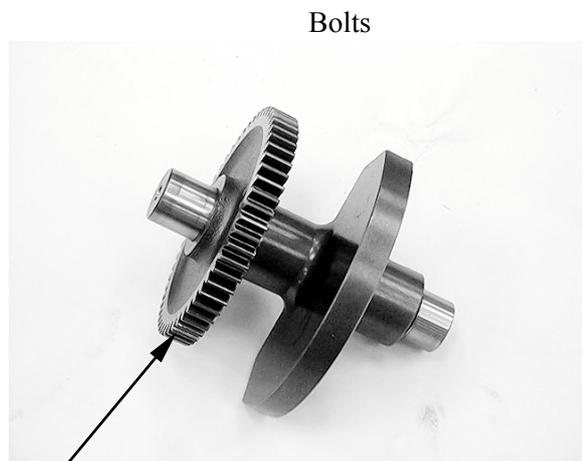
Inspect the balance shaft gear teeth.
Burr/chips/roughness/wear → Replace.



Bearing



Journals



Bolts
Balancer Shaft

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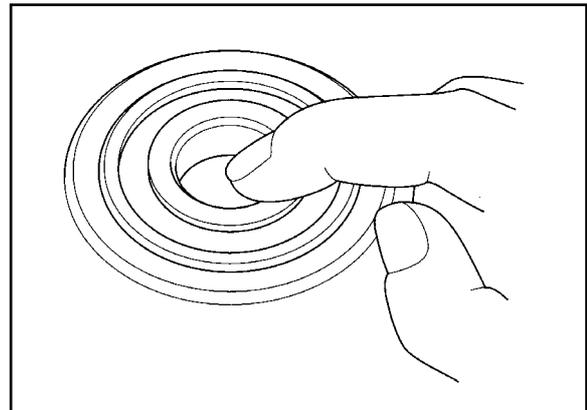
BALANCER SHAFT BEARING REPLACEMENT

Remove the crankshaft and balancer shaft (page 13-4).

Turn the inner race of each bearing with your finger.

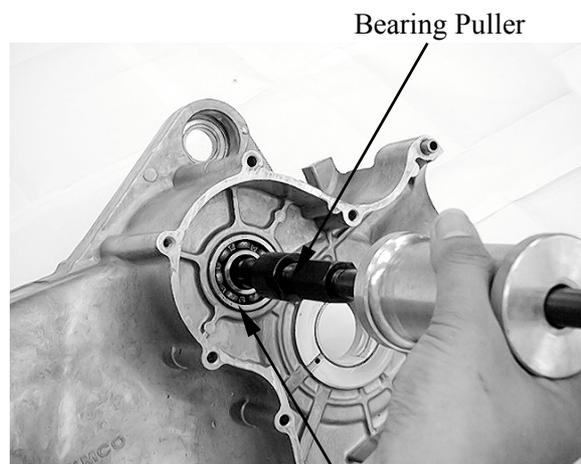
The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the crankcase.

Replace the bearings if the races does not turn smoothly and quietly, or if they fit loosely in the crankcase.



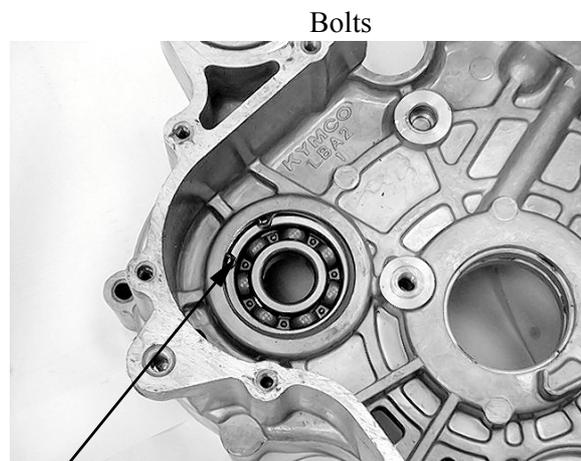
Remove the balancer shaft bearing from the left crankcase using the special tool.

Special tool: Bearing puller E037



Bearing

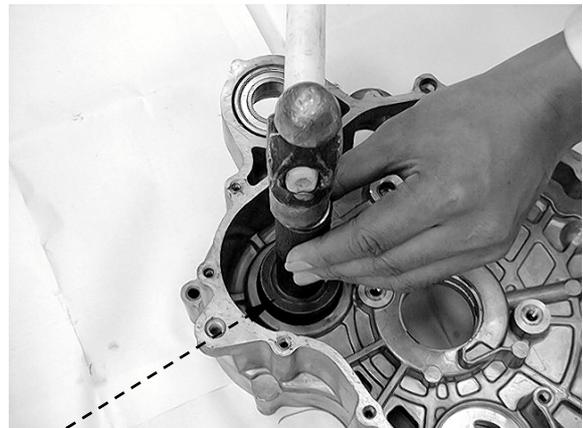
Remove the bearing snap ring from right crankcase.



Snap Ring

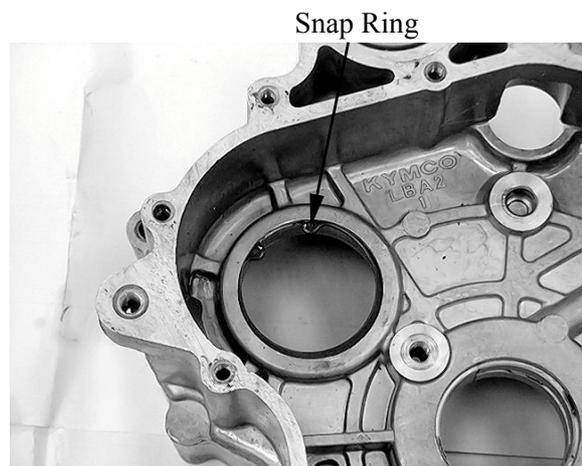
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Remove the balancer shaft bearing from the right crankcase.



Bearing

Install the snap ring into the right crankcase.



Snap Ring

Install the new bearings to the right and left crankcase using special tool.

Special tool:

Oil seal & bearing driver E014

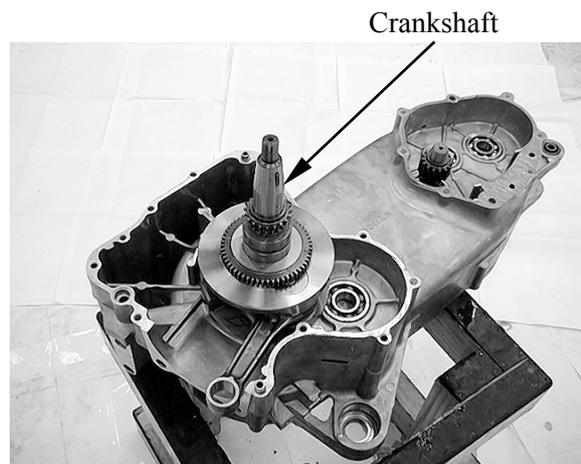


Bearing

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CRANKCASE ASSEMBLY

Install the crankshaft to the left crankcase.



Install the balancer shaft to align the punch mark with the "O" mark on the crankshaft.



Left Front Cover

Install the washer onto the crankshaft.

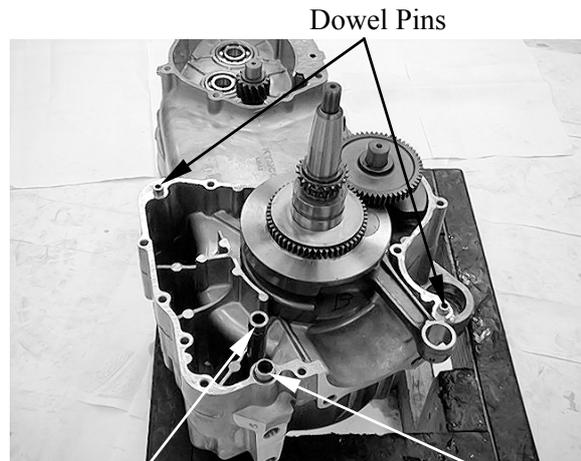


13. CRANKCASE/CRANKSHAFT

Install the oil collar and O-rings

Clean the right and left crankcase mating surface thoroughly, being careful not to damage them.

Install the dowel pins and O-ring.



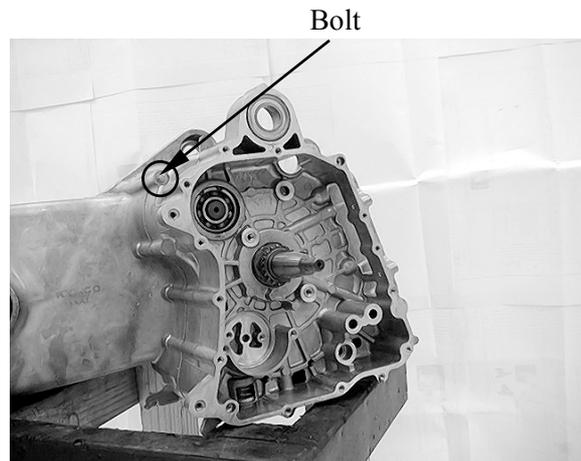
Oil Collar/O-rings

Dowel Pin/O-ring

Apply a light but thorough coating of sealant (Threebond 1215 or equivalent) to all crankcase mating surfaces except the oil passage area.

Install the right crankcase over the left crankcase.

Install and turn in the right crankcase bolt but do not tighten it.



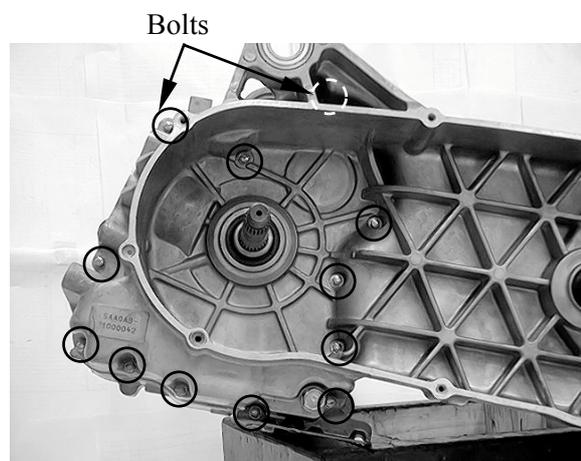
Install and tighten the left crankcase bolts in a crisscross pattern in 2 – 3 steps to the specified torque.

Torque: 12 N•m (1.2 kgf•m, 9 lbf•ft)

Tighten the right crankcase bolt to the specified torque.

Torque: 12 N•m (1.2 kgf•m, 9 lbf•ft)

Make sure that the crankshaft turns smoothly.



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Install the cam chain guides to the right crankcase and tighten the bolts to the specified torque.

Torque: 20 N•m (2 kgf•m, 15 lbf•ft)

Install the cam chain to right crankcase.

