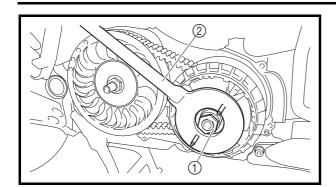
# **V-BELT AUTOMATIC TRANSMISSION**







- 5. Tighten:
  - primary sheave nut ①

**№** 160 Nm (16.0 m · kg, 115 ft · lb)

# **CAUTION:**

 Before tightening the nut to remount the primary sheave, make sure that the serrations of the cam are fitted firmly into the serrations of the crankshaft.

Also, make sure that cam is properly seated.

 Apply grease to the thread and seat of the primary sheave nut.



Recommended lubricant Shell BT grease 3<sup>®</sup>

#### NOTE: .

While holding the primary sheave with the sheave holder ②, tighten the primary sheave nut ①.



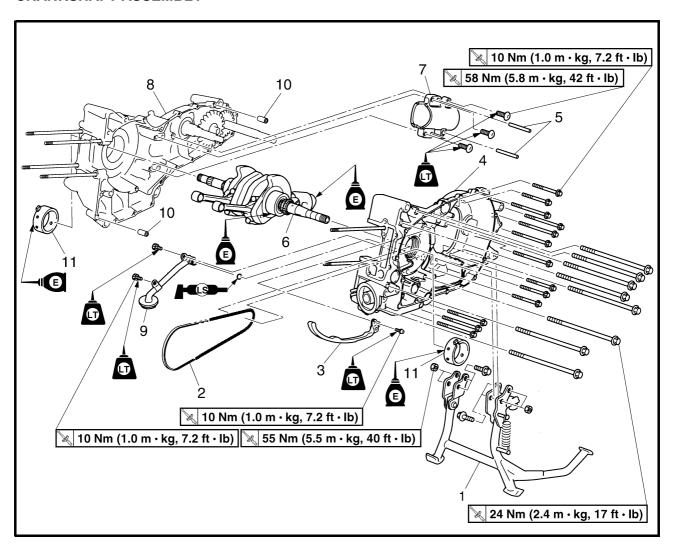
Sheave holder 90890-01481





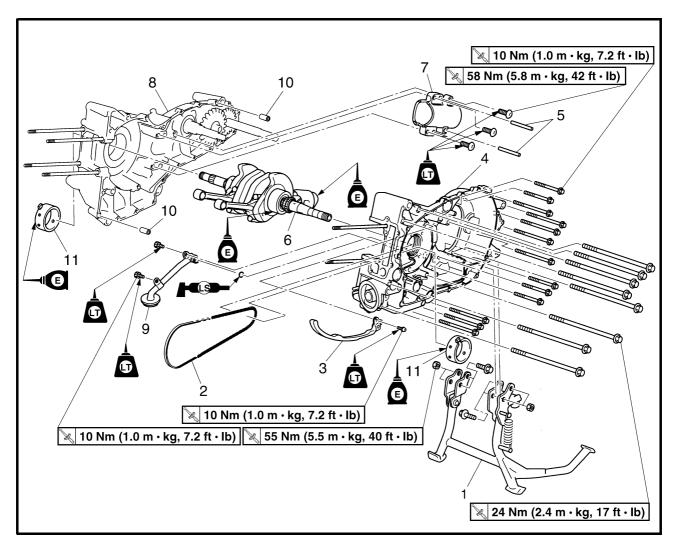
# **CRANKCASE AND CRANKSHAFT**

# **CRANKSHAFT ASSEMBLY**



| Order | Job/Part                          | Q'ty | Remarks  |
|-------|-----------------------------------|------|--|
|       | Removing the crankshaft assembly  |      | Remove the parts in the order listed.                                  |
|       | Engine                            |      | Refer to "ENGINE REMOVAL".   |
|       | Cylinder head                     |      | Refer to "CYLINDER HEAD".  |
|       | Cylinder/piston                   |      | Refer to "CYLINDER AND PISTON".  |
|       | Starter clutch/A.C. magneto rotor |      | Refer to "STARTER CLUTCH AND A.C.                                      |
|       |                                   |      | MAGNETO ROTOR".  |
|       | Clutch                            |      | Refer to "CLUTCH".   |
|       | Oil pump                          |      | Refer to "OIL PUMP".   |
|       | Right crankcase cover             |      | Refer to "V-BELT AUTOMATIC TRANS-                                      |
|       |                                   |      | MISSION".  |
| 1     | Centerstand assembly              | 1    |  |
| 2     | Timing chain                      | 1    |  |
| 3     | Timing chain guide (intake side)  | 1    |  |
| 4     | Left crankcase                    | 1    | Refer to "DISASSEMBLING THE CRANKCASE" and "ASSEMBLING THE CRANKCASE". |

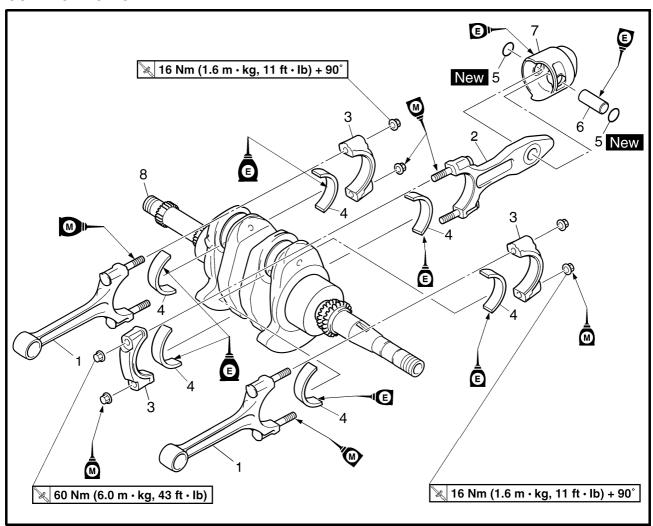




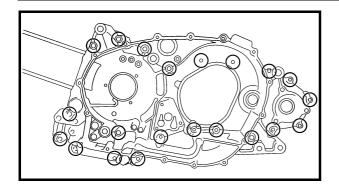
| Order | Job/Part                        | Q'ty | Remarks   |
|-------|---------------------------------|------|---|
| 5     | Dowel pin                       | 2    |   |
| 6     | Crankshaft assembly             | 1    | ☐ Refer to "INSTALLING THE CRANK-   |
| 7     | Balancer cylinder               | 1    | SHAFT".   |
| 8     | Right crankcase                 | 1    |   |
| 9     | Oil strainer                    | 1    |   |
| 10    | Dowel pin                       | 2    |   |
| 11    | Crankshaft main journal bearing | 2    | Refer to "REMOVING THE CRANK-<br>SHAFT MAIN JOURNAL BEARINGS"<br>and "INSTALLING THE CRANKSHAFT<br>MAIN JOURNAL BEARINGS"<br>For installation, reverse the removal pro- |
|       |                                 |      | cedure.   |



### **CONNECTING ROD**



| Order | Job/Part                    | Q'ty | Remarks  |
|-------|-----------------------------|------|--|
|       | Removing the connecting rod |      | Remove the parts in the order listed.                        |
| 1     | Connecting rod              | 2    | Defeate "DEMOVING THE CONNECT                                |
| 2     | Connecting rod (balancer)   | 1    | Refer to "REMOVING THE CONNECT-ING RODS" and "INSTALLING THE |
| 3     | Connecting rod cap          | 3    | CONNECTING RODS".  |
| 4     | Big end bearing             | 6    | JOSNING HODS:  |
| 5     | Circlip                     | 2    |  |
| 6     | Piston pin                  | 1    |  |
| 7     | Balancer piston             | 1    |  |
| 8     | Crankshaft                  | 1    |  |
|       |                             |      | For installation, reverse the removal pro-                   |
|       |                             |      | cedure.  |



EAS0038

#### DISASSEMBLING THE CRANKCASE

- 1. Remove:
  - · crankcase bolts

NOTE:

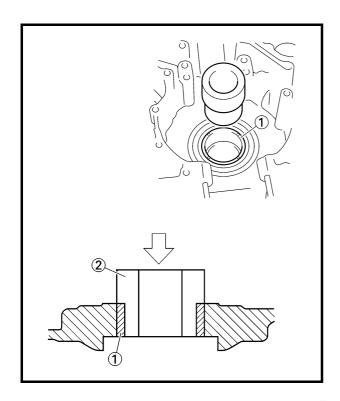
Loosen each bolt 1/4 of a turn at a time, in stages and in a crisscross pattern. After all of the bolts are fully loosened, remove them.

- 2. Remove:
  - left crankcase

**CAUTION:** 

Tap on one side of the crankcase with a soft-face hammer. Tap only on reinforced portions of the crankcase, not on the crankcase mating surfaces. Work slowly and carefully and make sure that the crankcase halves separate evenly.

- 3. Remove:
- dowel pins



EAS00387

# REMOVING THE CRANKSHAFT MAIN JOURNAL BEARINGS

- 1. Remove:
- crankshaft assembly
- crankshaft main journal bearings (1)

NOTE:

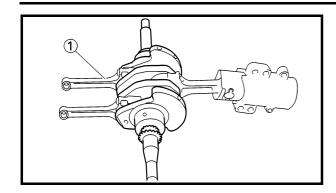
Remove the main journal bearing by the plane bearing installer ②.



Plane bearing installer 90890-04139

NOTE: .

Identify the position of each crankshaft main journal bearing so that it can be reinstalled in its original place.



EAS0039

#### REMOVING THE CONNECTING RODS

The following procedure applies to all of the connecting rods.

- 1. Remove:
  - connecting rod (1)
- big end bearings

NOTE:

Identify the position of each big end bearing so that it can be reinstalled in its original place.

EAS00399

#### **CHECKING THE CRANKCASE**

- 1. Thoroughly wash the crankcase halves in a mild solvent.
- 2. Thoroughly clean all the gasket surfaces and crankcase mating surfaces.
- 3. Check:
  - crankcase

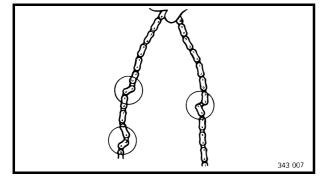
Cracks/damage  $\rightarrow$  Replace.

 $\bullet$  oil delivery passages Obstruction  $\to$  Blow out with compressed air.



#### **CHECKING THE TIMING CHAIN**

- 1. Check:
- timing chain
   Damage/stiffness → Replace the timing chain and camshaft sprockets as a set.



# CHECKING THE CRANKSHAFT AND CONNECTING RODS

- 1. Measure:
- $\bullet$  crankshaft runout  $\mbox{Out of specification} \rightarrow \mbox{Replace the crankshaft}.$



Crankshaft runout Less than 0.03 mm (0.0012 in)





- 2. Check:
- crankshaft journal surfaces
- crankshaft pin surfaces
- bearing surfaces
   Scratches/wear → Replace the crankshaft.
- 3. Measure:
- crankshaft-pin-to-big-end-bearing clearance

Out of specification  $\rightarrow$  Replace the big end bearings.



Crankshaft-pin-to-big-end-bearing clearance
0.026 ~ 0.050 mm
(0.0010 ~ 0.0020 in)

The following procedure applies to all of the connecting rods.

#### **CAUTION:**

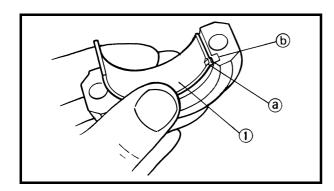
Do not interchange the big end bearings and connecting rods. To obtain the correct crankshaft-pin-to-big-end-bearing clearance and prevent engine damage, the big end bearings must be installed in their original positions.

- a. Clean the big end bearings, crankshaft pins and the inside of the connecting rod halves.
- b. Install the big end upper bearing into the connecting rod and the big end lower bearing into the connecting rod cap.

#### NOTE:

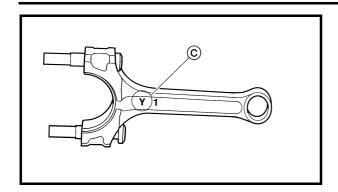
Align the projections (a) on the big end bearings (1) with the notches (b) in the connecting rod and connecting rod cap.

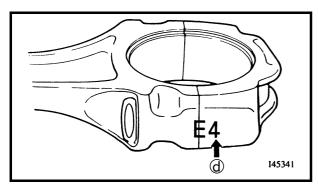
c. Put a piece of Plastigauge® on the crankshaft pin.











d. Assemble the connecting rod halves.

#### NOTE:

- Do not move the connecting rod or crankshaft until the clearance measurement has been completed.
- Apply molybdenum disulfide grease onto the bolts, threads, and nut seats.
- Make sure that the "Y" mark © on the connecting rod faces towards the left side of the crankshaft.
- Make sure that the characters (a) on both the connecting rod and connecting rod cap are aligned.
- e. Tighten the connecting rod nuts.

#### CAUTION:

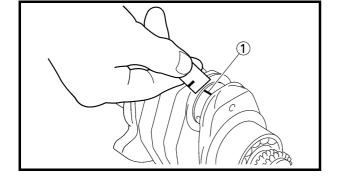
- When tightening the connecting rod nuts, be sure to use an F-type torque wrench.
- After tightening the connecting rod nut to the specified torque, turn the connecting rod nut another+90°.

Refer to "INSTALLING THE CONNECTING RODS".



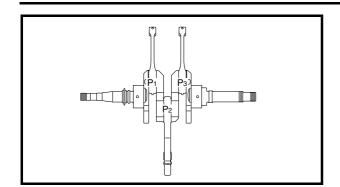
Connecting rod nut 16 Nm (1.6 m  $\cdot$  kg, 11 ft  $\cdot$  lb) + 90°

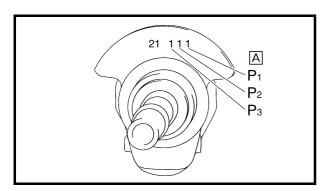
- f. Remove the connecting rod and big end bearings.
  - Refer to "REMOVING THE CONNECTING RODS".
- g. Measure the compressed Plastigauge® width ① on each crankshaft pin.
  - If the clearance is out of specification, select replacement big end bearings.

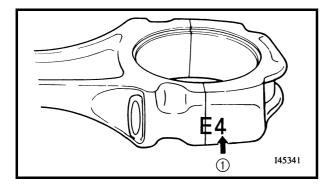












4. Select:

• big end bearings (P<sub>1</sub>, P<sub>2</sub>, P<sub>3</sub>)

NOTE:

- The numbers A stamped into the crankshaft web and the numbers ① on the connecting rods are used to determine the replacement big end bearing sizes.
- "P<sub>1</sub>, P<sub>2</sub>, P<sub>3</sub>" refer to the bearings shown in the crankshaft illustration.

For example, if the connecting rod "P<sub>1</sub>" and the crankshaft web "P<sub>1</sub>" numbers are "4" and "1" respectively, then the bearing size for "P1" is:

Bearing size for "P<sub>1</sub>":

"P<sub>1</sub>" (connecting rod) -

"P<sub>1</sub>" (crankshaft web) =

4-1=3 (brown)

| BEARING COLOR CODE |       |  |
|--------------------|-------|--|
| 1                  | blue  |  |
| 2                  | black |  |
| 3                  | brown |  |
| 4                  | green |  |

5. Measure:

• crankshaft-journal-to-crankshaft-journalbearing clearance.

Out of specification  $\rightarrow$  Replace the crankshaft journal bearings.



Crankshaft-journal-to-crankshaftjournal-bearing clearance 0.040 ~ 0.082 mm (0.0016 ~ 0.0032 in)

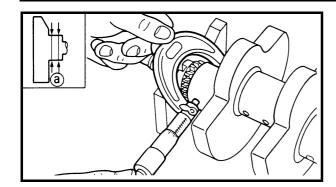
The following procedure applies to all of the journal bearing.

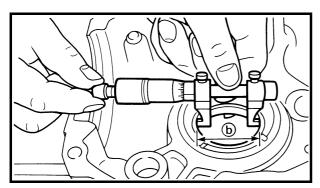
# **CAUTION:**

On the journal, the larger value is used as a basis for calculation of the oil clearance, and on the journal bearing, the smaller value is used.









- a. Clean the surface of main journal and journal bearings.
- b. Check the bearing surface. If the bearing surface is worn or scratched, the bearings should be replace.

#### NOTE: .

If either of the right or left journal bearing is worn or scratched, both bearings should be replaced as a set.

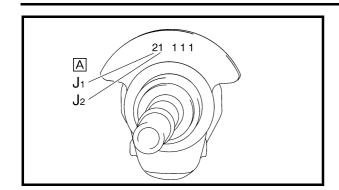
- c. Measure the outside diameter (a) of each main journal at two places. If it is out of specification, replace the crankshaft.
- d. Measure the inside diameter **(b)** of each journal bearing at two places.
- e. If journal bearing inside diameter is "45.03" and crankshaft journal outside diameter is "44.98", then the main journal oil clearance is:

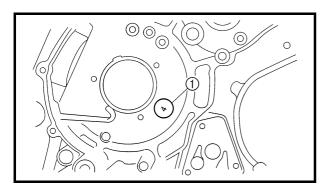
Main journal oil clearance:
Journal bearing inside diameter –
Main journal outside diameter =
45.03 – 44.98 = 0.05 mm

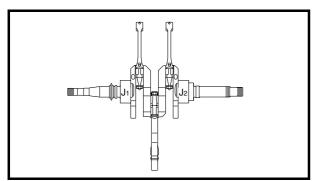
If the oil clearance is out of specification, select a replacement bearings.

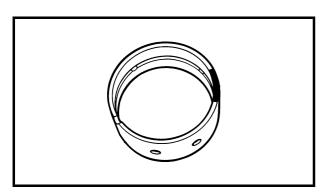












6. Select:

• crankshaft journal bearings (J<sub>1</sub>, J<sub>2</sub>)

NOTE: .

• The numbers A stamped into the crankshaft web and the numbers 1 on the crankcase are used to determine the replacement crankshaft journal bearing size.

• "J<sub>1</sub>, J<sub>2</sub>" refer to the bearings shown in the crankshaft illustration.

For example, if the crankcase "J<sub>1</sub>" and the crankshaft web "J<sub>1</sub>" numbers are "4" and "2" respectively, then the bearing size for "J<sub>1</sub>"

is:

Bearing size for " $J_1$ ":

"J<sub>1</sub>" (crankcase) -

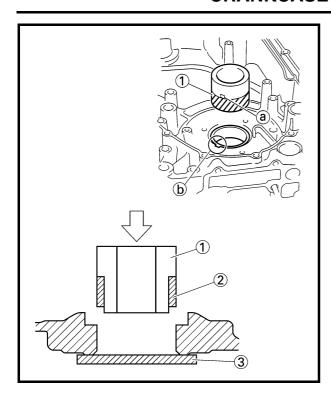
"J<sub>1</sub>" (crankshaft web) =

4 - 2 = 2 (black)

**\*** 

| BEARING COLOR CODE |       |  |
|--------------------|-------|--|
| 1                  | blue  |  |
| 2                  | black |  |
| 3                  | brown |  |
| 4                  | green |  |





# INSTALLING THE CRANKSHAFT MAIN JOURNAL BEARINGS

- 1. Attach:
- · crankshaft main journal bearings

#### NOTE:

Attach the crankshaft main journal bearing to the plane bearing installer ①.

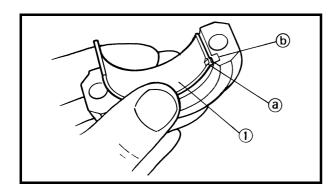


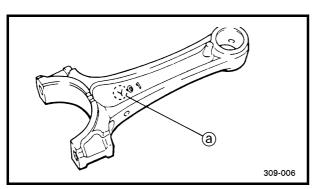
# Plane bearing installer 90890-04139

- 2. Install:
- crankshaft main journal bearings ②

#### NOTE:

- Align the projection (a) on the bearing with the projection (b) on the crankcase.
- Place an iron ③ plate beneath the crankcase and press fit until the end of the plain bearing installer touches the iron plate.





#### **INSTALLING THE CONNECTING RODS**

- 1. Install:
- big end bearings (1)

### NOTE:

- Align the projection (a) of the big end bearings with the notches (b) in the connecting rod cap.
- Install each big end bearing in its original place.
- 2. Install:
- connecting rods

#### NOTE:

- The stamped "Y" mark (a) on the connecting rods should face towards the left side of the crankcase.
- Install each connecting rod in its original place.