

# ENGINE

## ENGINE REMOVAL

Before taking the engine out of the frame, thoroughly clean the engine and the frame.

Remove the

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ENGINE COMPONENTS REMOVABLE WITH THE ENGINE IN PLACE

The parts listed below can be removed and reinstalled without removing the engine from the frame. Refer to the page listed in this section for removal instruction.

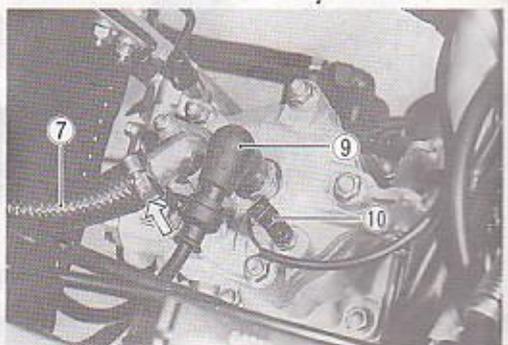
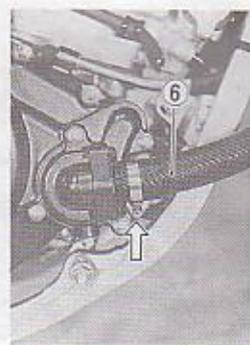
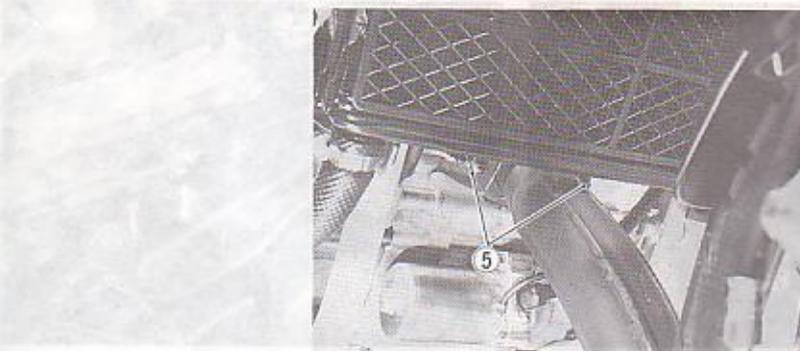
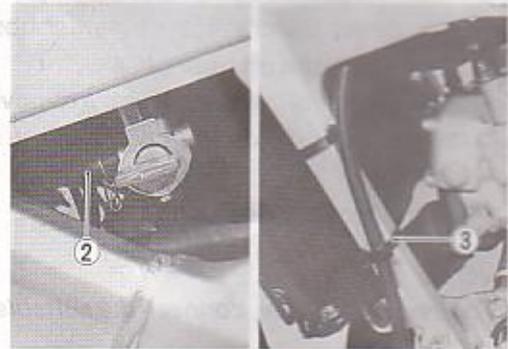
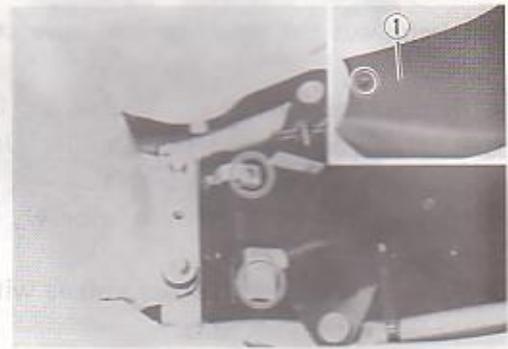
ENGINE LEFT SIDE		ENGINE CENTER		ENGINE RIGHT SIDE	
Engine sprocket	3-4	Carburetor	3-4	Clutch cover	3-10
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## ENGINE REMOVAL AND REMOUNTING

### ENGINE REMOVAL

Before taking the engine out of the frame, thoroughly clean the engine with a suitable cleaner. The procedure of engine removal is sequentially explained in the following steps.

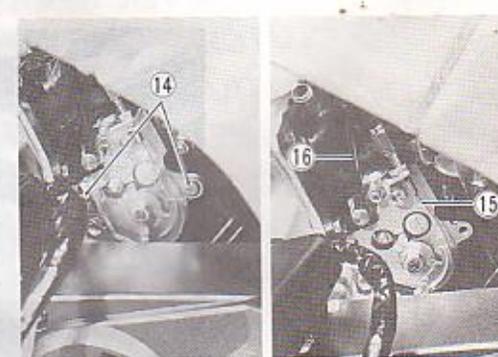
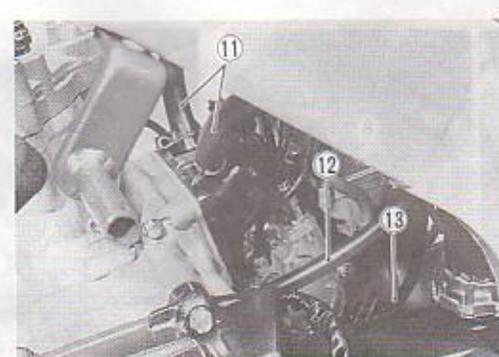
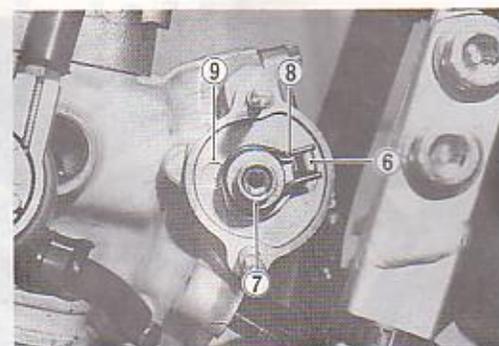
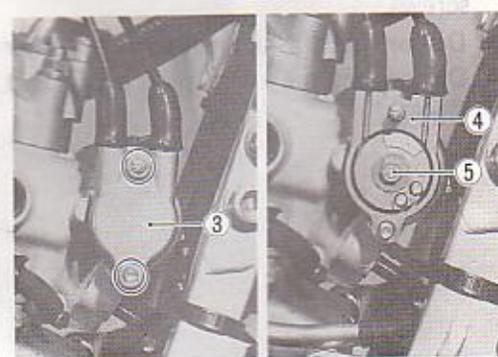
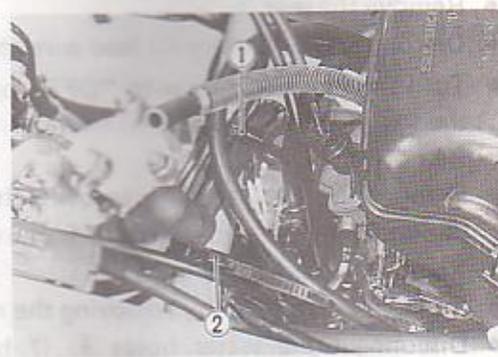
- Remove the lower fairing. (Refer to page 7-1.)
- Drain transmission oil. (Refer to page 2-6.)
- Drain coolant. (Refer to page 2-6.)
- Remove the seat ①.
- Disconnect the battery  $\ominus$  lead wire and then  $\oplus$  lead wire.
- Turn the fuel cock lever to "OFF" position, and disconnect the fuel hose ②.
- Remove the clamp ③.
- Remove the fuel tank by removing the mounting bolts ④ and disconnecting the front boss of frame covers.
- Remove the exhaust pipe nuts ⑤.
- Remove the muffler by removing the mounting bolts.
- Disconnect the water hoses ⑥, ⑦ by loosening the clamp screws.
- Disconnect the exhaust valve breather hose ⑧.
- Disconnect the spark plug cap ⑨ and water temp. gauge lead wire ⑩.



- Disconnect the magneto lead wire couplers and clamps ①, ②.
- Remove the exhaust valve holder cap ③.
- Remove the exhaust valve holder ④ with the exhaust valve cables by removing the bolt ⑤.
- Remove the exhaust valve lever ⑥, spacer ⑦, spring ⑧ and holder ⑨.
- Remove the clutch release arm ⑩ with the clutch cable after loosening the lock nuts.
- Disconnect the interference hose ⑪.
- Disconnect the crankcase breather hose ⑫.
- Disconnect the oil hose ⑬.
- Remove the oil pump cover by removing the screws ⑭.
- Disconnect the oil pump cable by removing the oil pump inner cable ⑮.
- Disconnect the oil hose ⑯.

**NOTE:**

*To prevent oil flow, connect the suitable cap to the oil hose.*



- Remove the gearshift lever arm ①.
- Remove the engine sprocket cover.
- Slacken the chain slack by adjusting the chain adjusters after loosening the rear axle nut.
- Remove the engine sprocket with the chain by removing the mounting bolts ②.

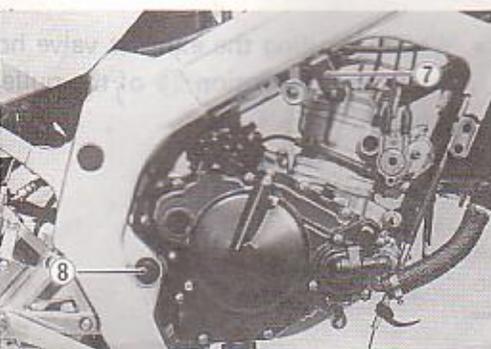
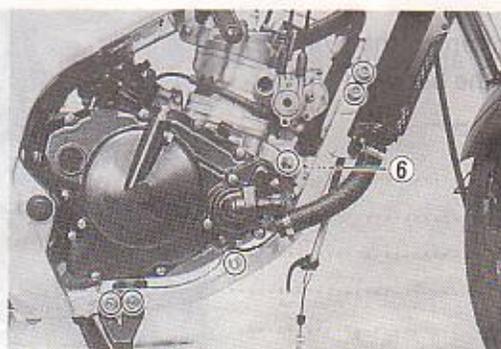
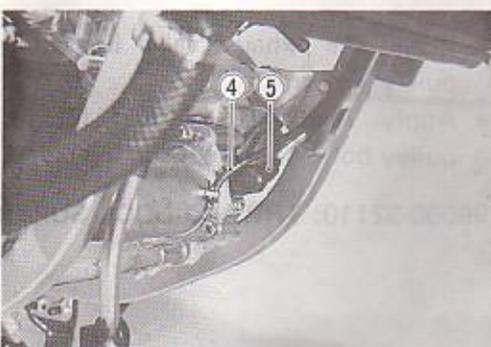
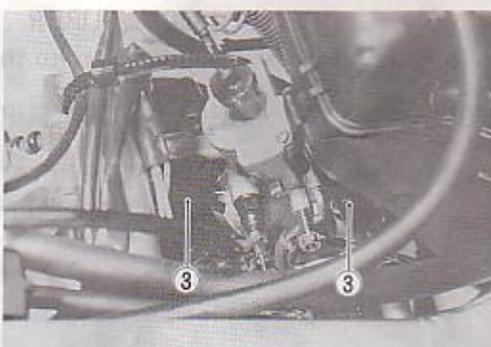
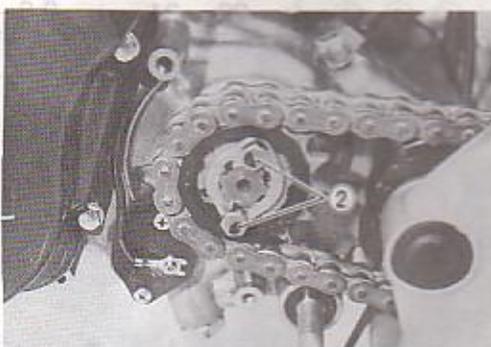
**NOTE:**

When loosening the engine sprocket bolts ②, apply rear brake firmly.

- Remove the carburetor by loosening the clamp screws ③.
- Disconnect the starter motor lead wires ④, ⑤.
- Remove the engine mounting bracket ⑥ by removing the mounting bolts.
- Remove the lower fairing bracket ⑦.
- Remove the engine by removing the engine mounting bracket, mounting bolts and swingarm pivot shaft ⑧.

**NOTE:**

Be careful not to draw out the swingarm pivot shaft completely from the left side swingarm pivoting hole. Insert the suitable shaft into the right side pivoting hole from the right side of the frame. To keep the alignment of the frame holes and swingarm pivoting holes.



### ENGINE REMOUNTING

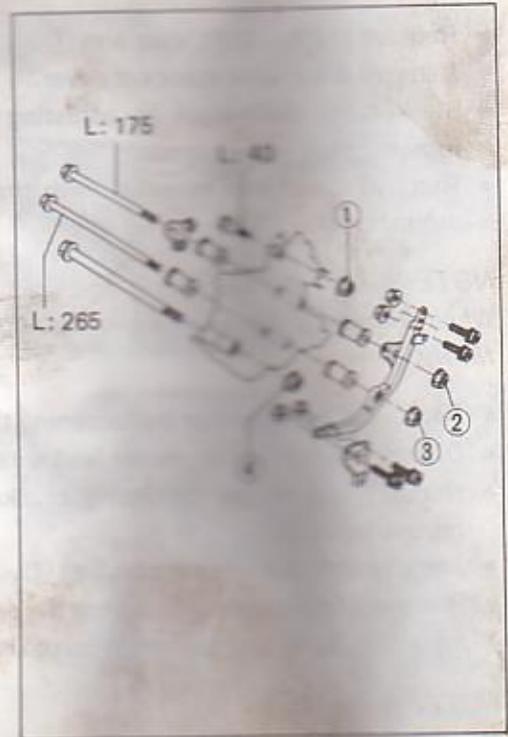
The engine can be mounted in the reverse order of removal.

**NOTE:**

The engine mounting nuts are self-lock type. Once the nut has been removed, it is no longer of any use. Be sure to use new nuts and tighten them to the specified torque.

**Tightening torque**

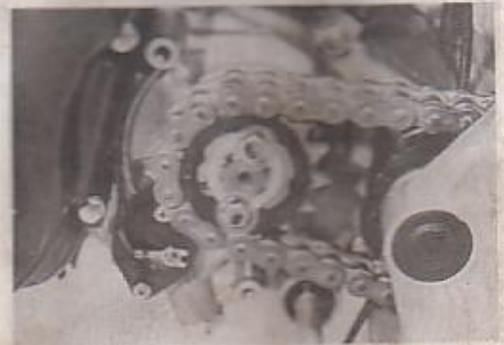
ITEM	N·m	kg-m	lb-ft
①, ②, ③	28 – 34	2.8 – 3.4	20.0 – 24.5
④	86 – 97	8.6 – 9.7	62.0 – 70.0



- Apply THREAD LOCK SUPER "1322" to the engine sprocket bolts and tighten them to the specified torque.

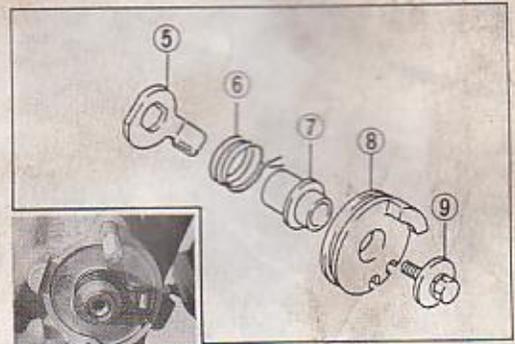
99000-32110 : THREAD LOCK SUPER "1322"

Tightening torque : 10 – 12 N·m  
(1.0 – 1.2 kg-m, 7.5 – 8.5 lb-ft)

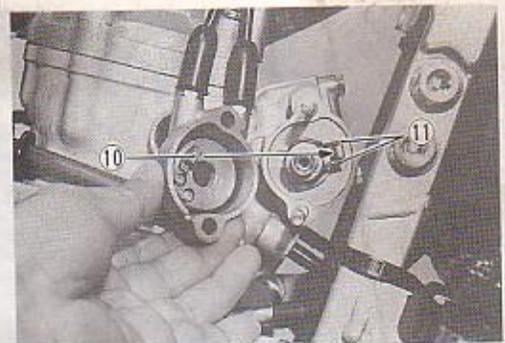


- Install the exhaust valve lever ⑤, spring ⑥, spacer ⑦ and pulley ⑧ correctly.
- Apply THREAD LOCK SUPER "1322" to the exhaust pulley bolt ⑨ before installing it.

99000-32110: THREAD LOCK SUPER "1322"



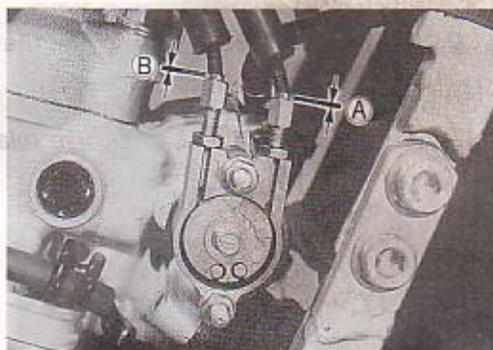
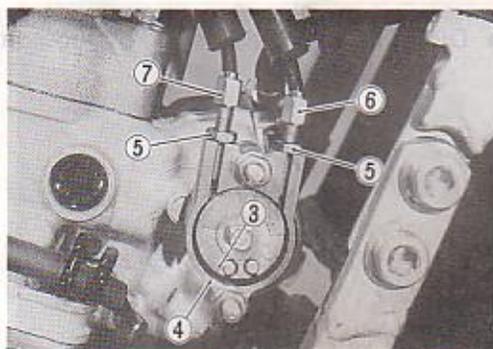
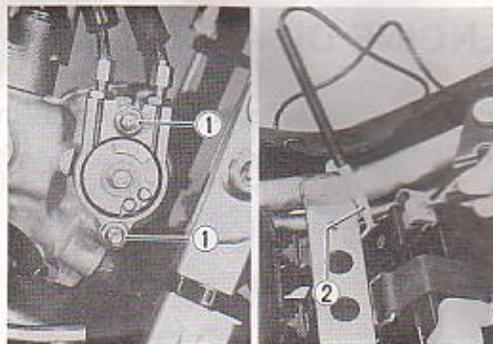
- When installing the exhaust valve holder cap to the cylinder, insert the protrusion ⑩ of the pulley to the between the springs ⑪.



**EXHAUST VALVE CABLE ADJUSTMENT**

Exhaust valve adjustment are as follows.

- Tighten the holder cover nuts ①.
- Connect the suitable lead wire to the Y/W (Yellow with White tracer) lead wire ② and connect it to the battery ⊖ terminal.
- Operate the pulley by turning the ignition switch to the "ON" position.
- Turn the ignition switch to the "OFF" position.
- Check whether the protrusion mark ③ on the pulley is aligned with the aligning mark ④ on the exhaust valve holder.
- If the marks are not aligned, loosen the lock nuts ⑤ and turn the adjusters ⑥, ⑦ to align the marks.
- Adjust the exhaust cable play A to 0.3 – 0.5 mm by turning the adjusters.
- Tighten the lock nuts.
- Disconnect the Y/W lead wire from the battery.



**NOTE:**

Other cable play B is 0 mm.

**CAUTION:**

Make sure that the marks ③, ④ are align, after adjustment is completed.

**TRANSMISSION OIL**

- Before starting the engine, make sure to pour the specified amount of transmission oil in the crankcase. (Refer to page 2-6.)

Transmission : 1 050 ml (0.9 Imp qt) . . . . . (oil change)  
 oil capacity 1 100 ml (1.0 Imp qt) . . . . . (overhaul)

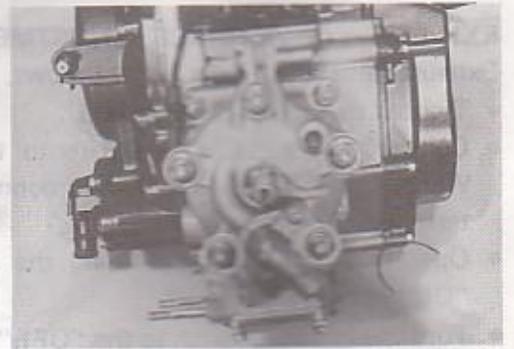
**ADJUSTMENT**

- After remounting the engine, following adjustments are necessary.

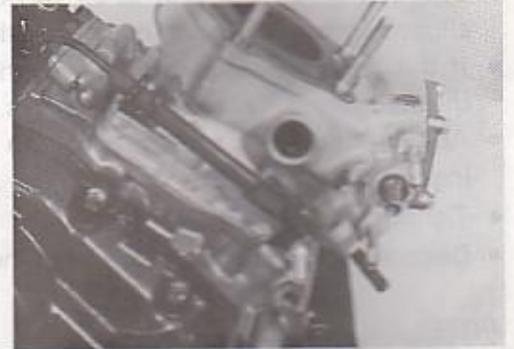
	Page
* Throttle cable play .....	2-7
* Oil pump control cable .....	2-8
* Clutch cable play .....	2-8
* Drive chain slack .....	2-9
* Air bleeding at oil pump.....	5-5
* Engine idle r/min .....	2-7
* Filling cooling solution .....	2-7

## ENGINE DISASSEMBLY

- Loosen the cylinder head nuts in the descending order on the cylinder head.
- Remove the cylinder head.



- Disconnect the oil hose ① by loosening the clamps.



- Remove the cylinder by removing the four nuts.

**NOTE:**

*For disassembling the exhaust valve related parts, refer to page 3-15.*

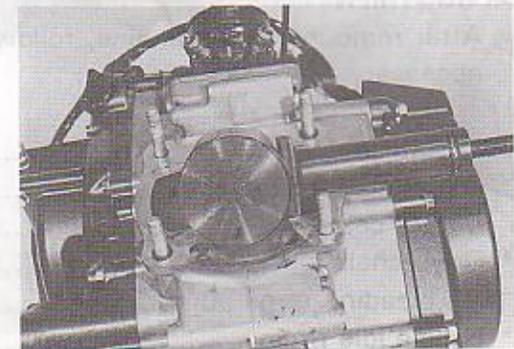


- Place a clean rag over the cylinder base to prevent piston pin circlip from dropping into the crankcase and then, remove the piston pin circlip with long-nose pliers.

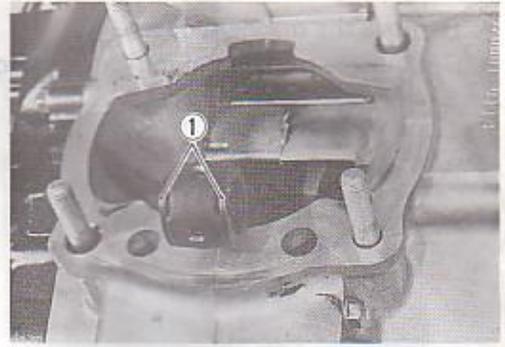


- Remove the piston pin with the special tool.

09910-34510 : Piston pin puller



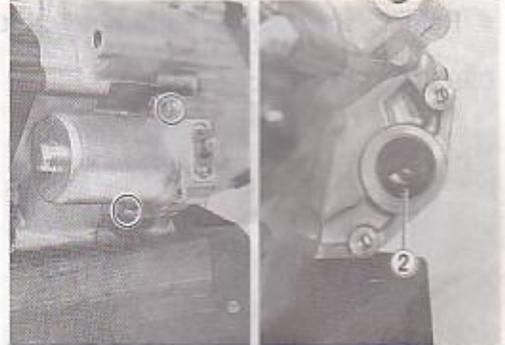
- Remove the washers ① and bearing.



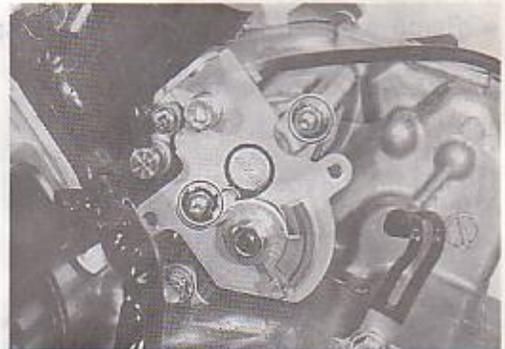
- Remove the starter motor and O-ring ②.

**CAUTION:**

The removed O-ring should be replaced with a new one.



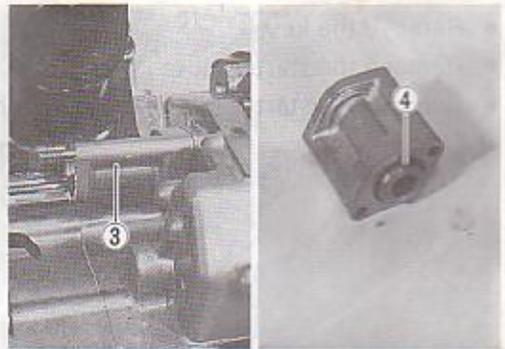
- Remove the oil pump.



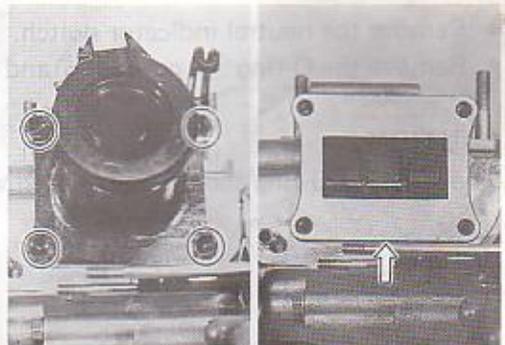
- Remove the oil pump spacer ③ and O-ring ④.

**CAUTION:**

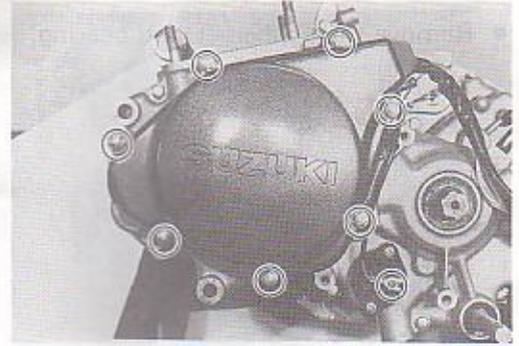
The removed O-ring should be replaced with a new one.



- Remove the intake pipe and reed valve.

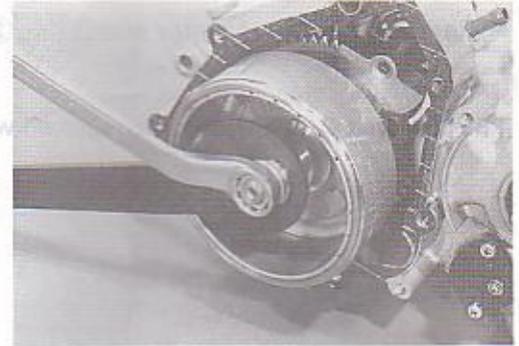


- Remove the magneto cover.
- Disconnect the neutral indicator switch lead wire.



- Remove the magneto rotor nut with the special tool.

09930-44511: Rotor holder

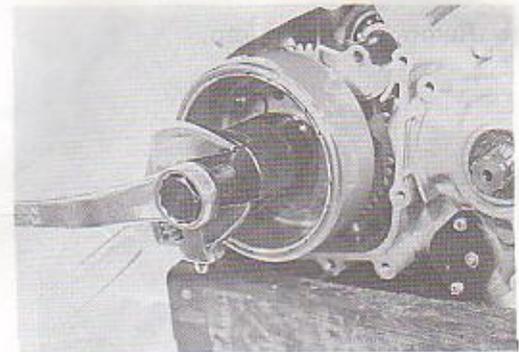


- Remove the magneto rotor with the special tool.

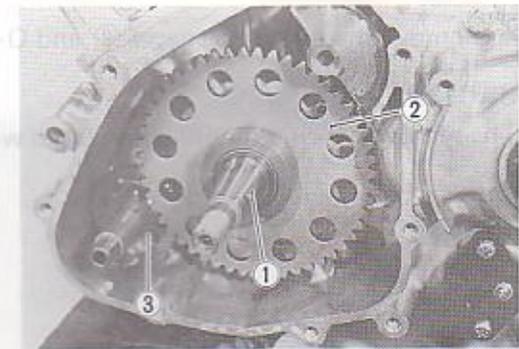
09930-34932: Rotor remover

**CAUTION:**

Do not hit the rotor with a hammer.



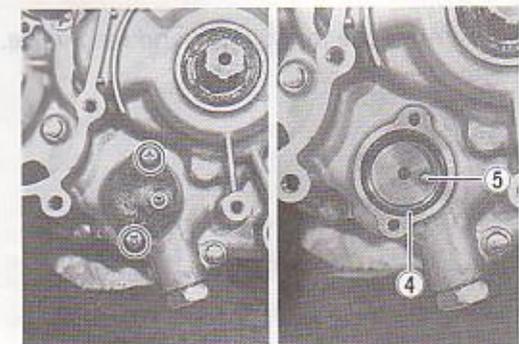
- Remove the key ①.
- Remove the starter clutch gear ②.
- Remove the starter idle gear ③ with shaft.



- Remove the neutral indicator switch.
- Remove the O-ring ④, contact ⑤ and spring.

**CAUTION:**

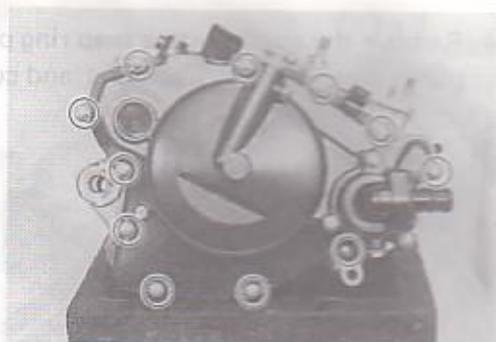
The removed O-ring should be replaced with a new one.



- Remove the clutch cover.

**NOTE:**

For disassembling the water pump related parts, refer to page 4-7.



- Remove the clutch spring bolts diagonally with the special tool.

**09910-20115 : Conrod holder**

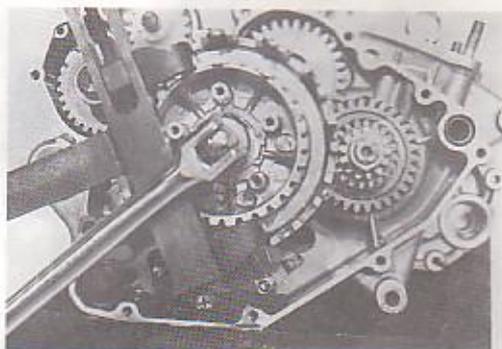
- Remove the clutch pressure plate, push piece and drive/driven plates.



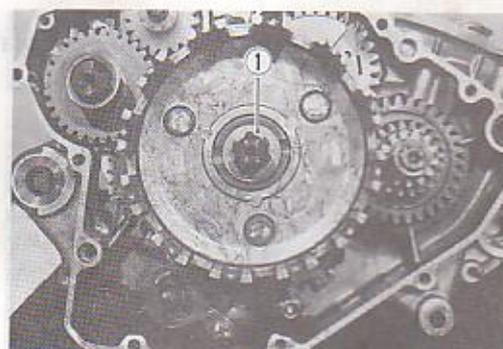
- Flatten the lock washer, and remove the clutch sleeve hub nut with the special tool.

**09920-53740 : Clutch sleeve hub holder****CAUTION:**

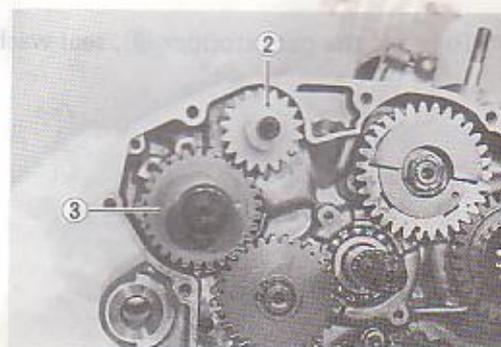
This nut fits inward threads.



- Remove the washer ① and primary driven gear assembly.



- Remove the oil pump driven gear ②.
- Remove the oil pump idle gear ③ with shaft.



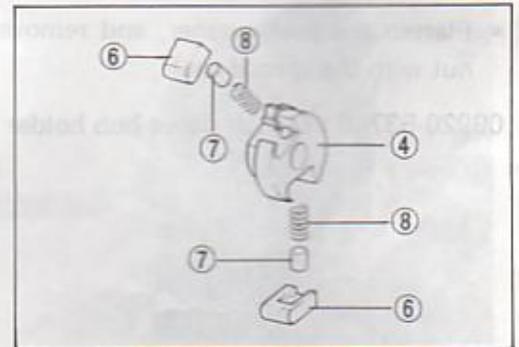
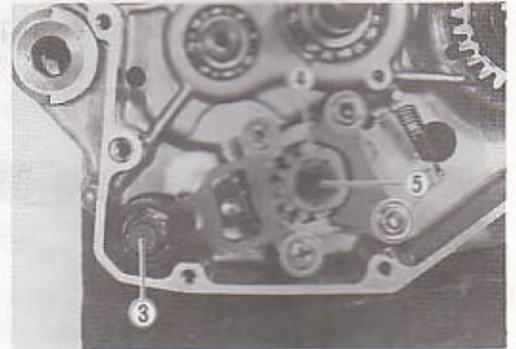
- Remove the circlip with a snap ring pliers, and remove the oil pump drive gear ①, washers ② and concaved washer.



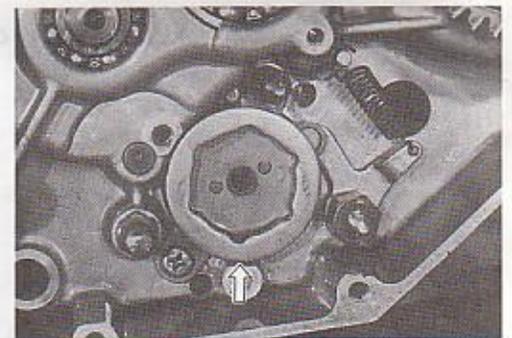
- Remove the gearshift shaft ③.
- Remove the pawl lifter and cam guide.
- Remove the cam driven gear ④ by removing the bolt ⑤.

**NOTE:**

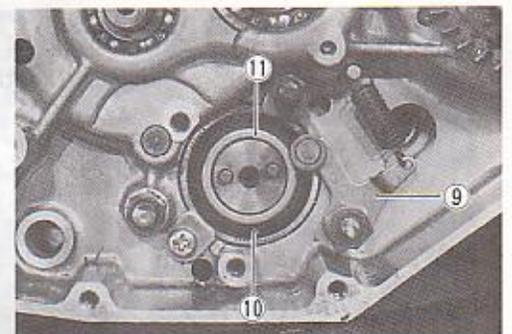
When removing the cam driven gear ④, do not loose the gearshift pawl ⑥, pin ⑦ and spring ⑧.



- Remove the gearshift cam stopper plate.

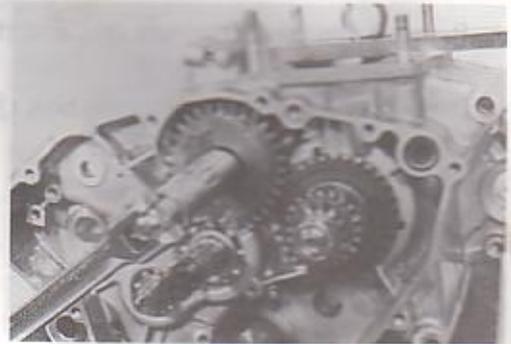


- Remove the cam stopper ⑨, seal washer ⑩ and spacer ⑪.

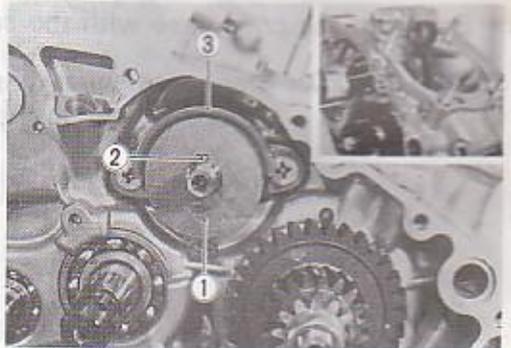


- Remove the crank balancer driven gear by removing the nut with the special tool.

09910-20115: Conrod holder



- Remove the washer ①, key ② and balancer weight ③.
- Remove the balancershaft with a plastic hammer.

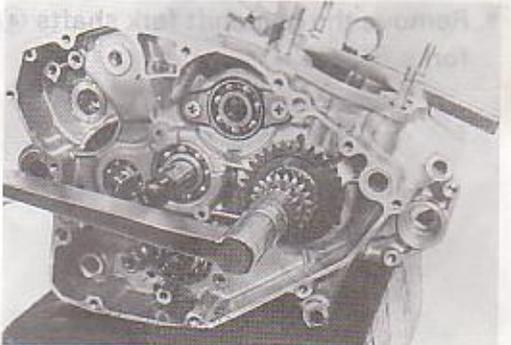


- Remove the water pump drive gear and primary drive gear by removing the nut with the special tool.

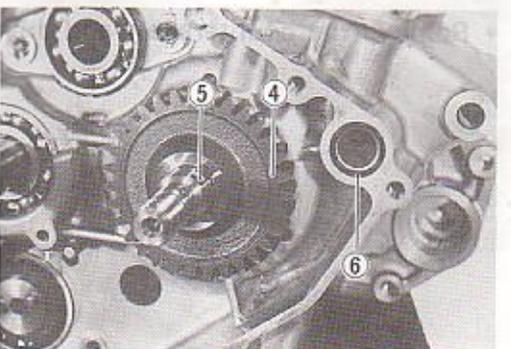
09910-20115 : Conrod holder

**CAUTION:**

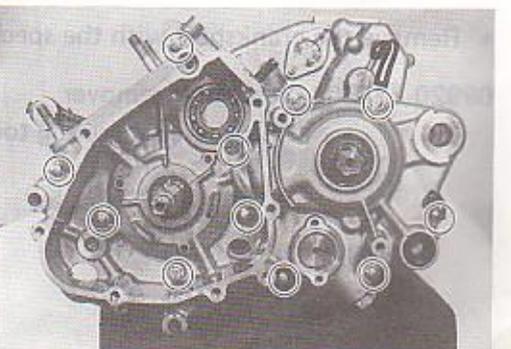
This nut has left-hand threads.



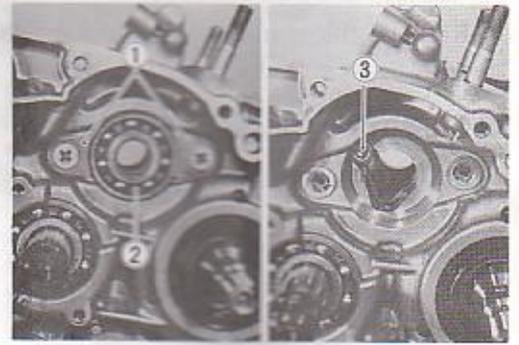
- Remove the balancer drive gear ④ and key ⑤.
- Remove the O-ring ⑥.



- Remove the crankcase securing bolts and screw.



- Remove the two retainers ①, and then remove the bearing ②.
- Remove the crankcase securing bolt ③.

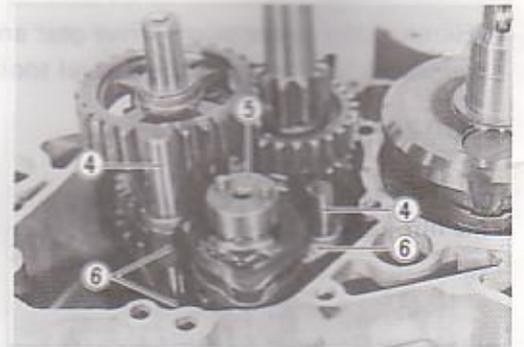


- Separate the crankcase with the special tool.

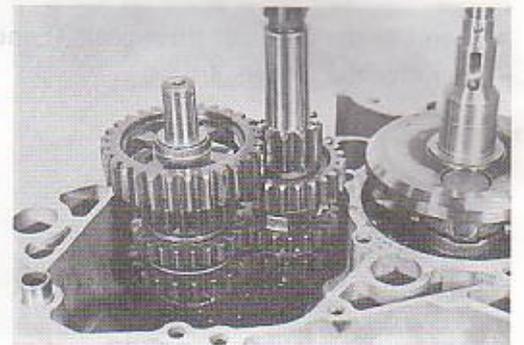
09920-13120 : Crankcase separating tool.



- Remove the gearshift fork shafts ④, gearshift cam ⑤ and forks ⑥.



- Remove the countershaft and driveshaft together.



- Remove the crankshaft with the special tool.

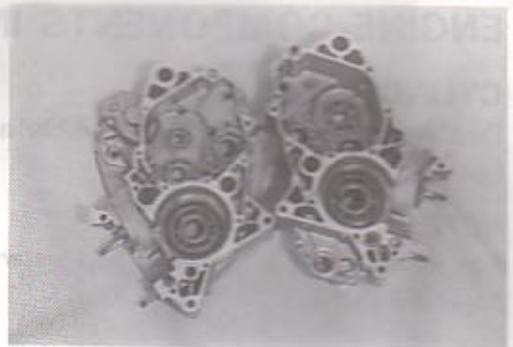
09920-13120: Crankshaft remover  
(Crankcase separating tool)



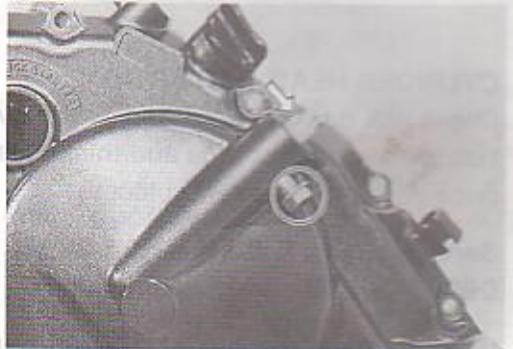
- Remove the respective oil seals and bearings with a suitable drift.

**CAUTION:**

The removed oil seals and bearings should be replaced with new ones.



- Remove the clutch release arm pinion.



## ENGINE COMPONENTS INSPECTION AND SERVICING

### CYLINDER HEAD

Decarbon the combustion chamber and clean the cylinder head.

**NOTE:**

For servicing the thermostat and water thermo-gauge, refer to pages 4-5 and 4-9.



### CYLINDER HEAD DISTORTION

Check the gasketed surface of the cylinder head for distortion with a straightedge and thickness gauge, taking a clearance reading at several places.

**Service Limit : 0.05 mm (0.002 in)**

**09900-20803 : Thickness gauge**

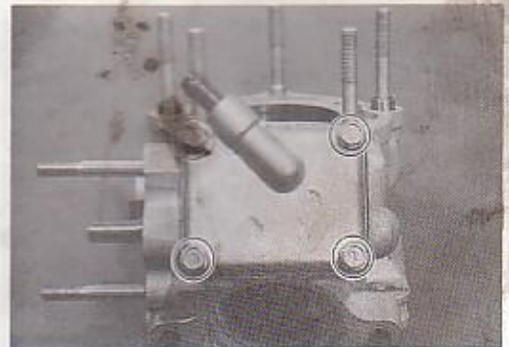
If the largest reading at any portion of the straightedge exceeds the limit, rework the surface by rubbing it against emery paper (of about #400) laid flat on the surface plate in a lapping manner.

The gasketed surface must be smooth and perfectly flat in order to secure a tight joint. A leaky joint can be the cause of reduced power output and increased fuel consumption.



### CYLINDER AND EXHAUST VALVE

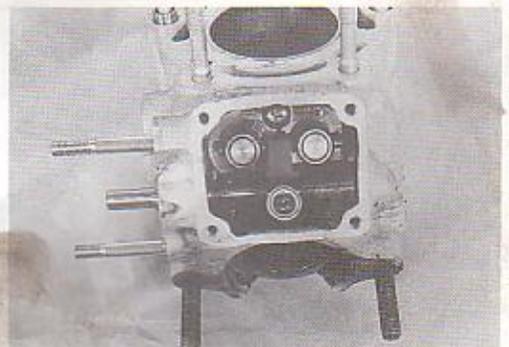
- Remove the exhaust valve cover.



- Remove the exhaust valve shaft, arm and spacer by removing the screw.

09920-13120: Crankshaft remover

(Crankcase separating tool)



- Remove the exhaust valve component by removing the mounting screws.

89000-32110 : THREAD LOCK SUPER, "1322"

Tightening torque : 9 - 12 N·m

(9.8 - 12.7 lb-ft)

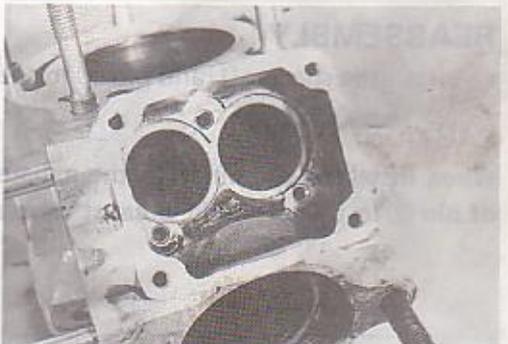
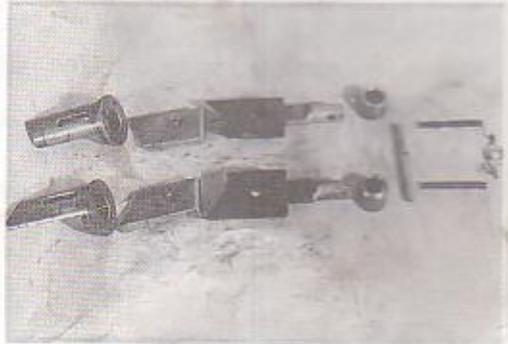


- Inspect the exhaust valve and cylinder sliding surface for nicks, scratches, wear or other damage.

• Do not use a wire brush to clean the piston and piston ring grooves. After cleaning, fit the rings and rotate them in the respective grooves to be sure that they move smoothly.

• Carbon in the groove is liable to cause the piston ring to get stuck in the groove, and this condition will lead to reduced engine power output.

• A piston whose sliding surface is badly grooved or scuffed or deformed should be replaced.



- Remove the oil seal with the special tools.

09921-20200 : Bearing remover

09930-30102 : Sliding shaft

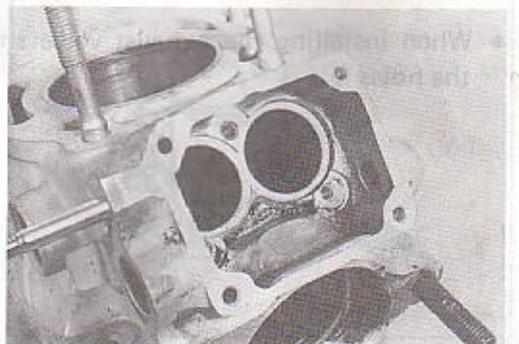
**CAUTION:**

The removed oil seal should be replaced with a new one.



**CYLINDER DECARBON**

Decarbon the exhaust port and the upper part of the cylinder, taking care not to damage the cylinder wall surface.

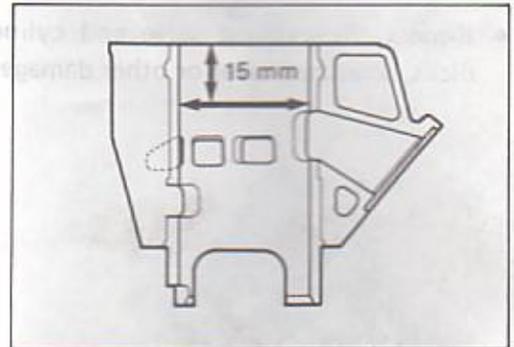
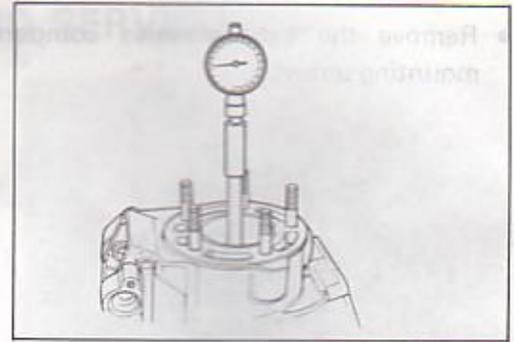


**CYLINDER BORE**

Inspect the cylinder wall for nicks, scratches or other damage.

Standard : 56.000 – 56.023 mm  
(2.2047 – 2.2056 in)

09900-20508 : Cylinder gauge set

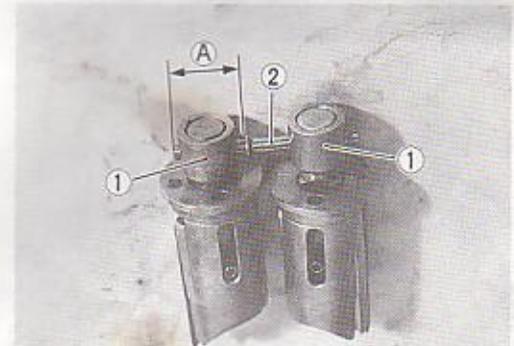


**REASSEMBLY**

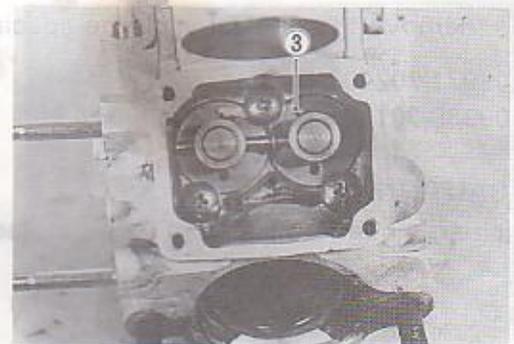
- Install the spacers ① and pin ② to the exhaust valves.

**CAUTION:**

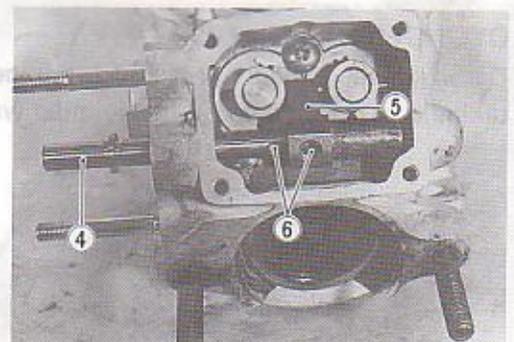
When installing the pin ② to the exhaust valve, the short side A of pin ② to the left hand exhaust valve as shown in photo.



- Install the exhaust valve to the cylinder correctly.
- Install the spring retainer ③ with springs to the exhaust valve and tighten the screw.
- Tighten the other screws securely.



- When installing the exhaust valve shaft ④ and arm ⑤, align the holes ⑥.



- Apply **THREAD LOCK SUPER 1322** to the bolt and tighten it to the specified torque.

**99000-32110 : THREAD LOCK SUPER "1322"**

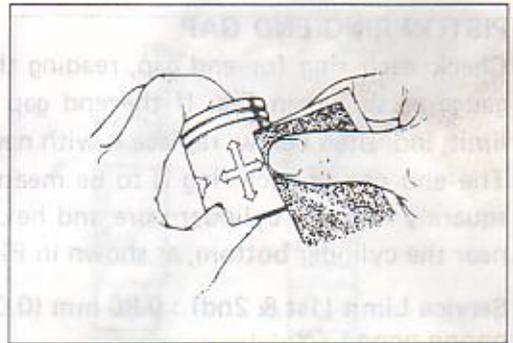
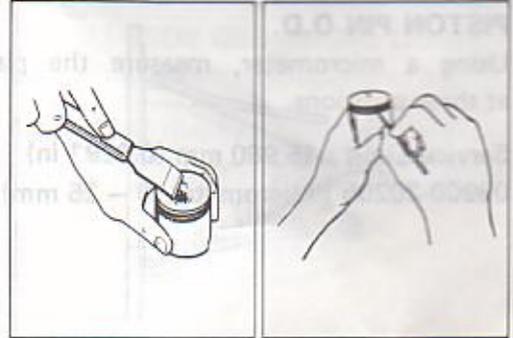
**Tightening torque : 8 – 12 N·m**  
(0.8 – 1.2 kg-m, 6.0 – 8.5 lb-ft)



## PISTON

### PISTON DECARBON

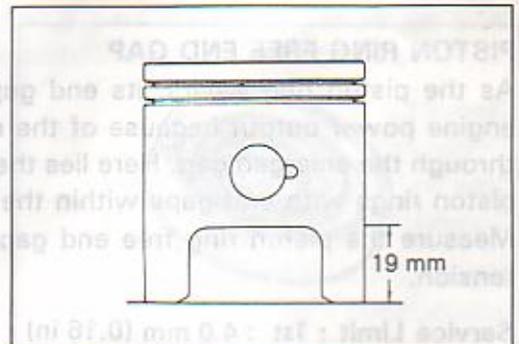
- De-carbon the crown of the piston and piston ring grooves. After cleaning the grooves, fit the rings and rotate them in their respective grooves to be sure that they move smoothly.
- Carbon in groove is liable to cause the piston ring to get stuck in the groove, and this condition will lead to reduced engine power output.
- A piston whose sliding surface is badly grooved or scuffed due to overheating must be replaced.
- Shallow grooves or minor scuff can be removed by grinding with emery paper of about # 400.



### PISTON DIAMETER

Using a micrometer, measure the piston outside diameter at the place 19 mm from the skirt end as shown in Fig. If the measurement is less than the limit, replace the piston.

**Service Limit : 55.880 mm (2.2000 in)**  
**09900-20203 : Micrometer (50 – 75 mm)**



### PISTON-CYLINDER CLEARANCE

As a result of the above measurement, if the piston to cylinder clearance exceeds the limit, overhaul the cylinder and use an oversize piston, or replace both cylinder and piston.

**Service Limit : 0.120 mm (0.0047 in)**



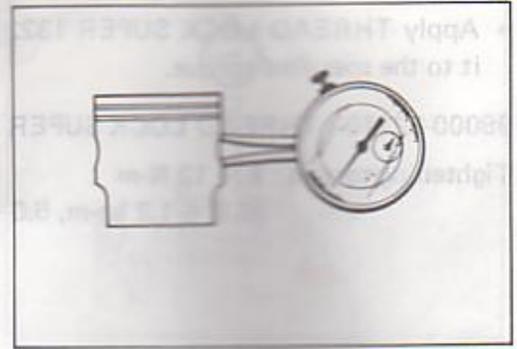
**PISTON PIN BORE I.D.**

Using a caliper gauge, measure the piston pin bore inside diameter.

If reading exceeds the following service limit, replace it with a new one.

**Service Limit : 16.030 mm (0.6311 in)**

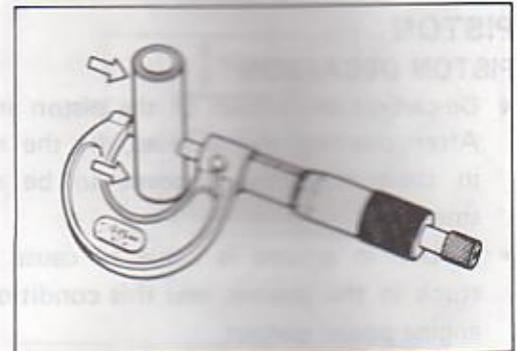
**09900-20605 : Dial calipers**

**PISTON PIN O.D.**

Using a micrometer, measure the piston outside diameter at three positions.

**Service Limit : 15.980 mm (0.6291 in)**

**09900-20205 : Micrometer (0 – 25 mm)**

**PISTON RING END GAP**

Check each ring for end gap, reading the gap with a thickness gauge as shown in Fig. If the end gap is found to exceed the limit, indicated below, replace it with new one.

The end gap of each ring is to be measure with the ring fitted squarely into the cylinder bore and held at the least worn part near the cylinder bottom, as shown in Fig.

**Service Limit (1st & 2nd) : 0.80 mm (0.031 in)**

**09900-20803 : Thickness gauge**

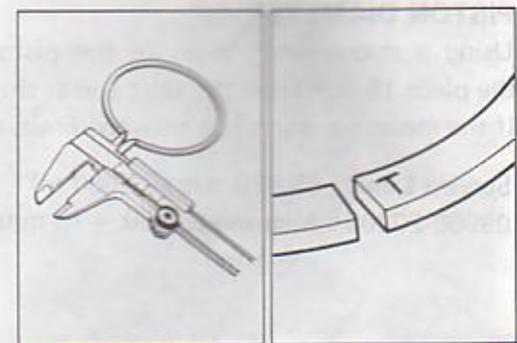
**PISTON RING FREE END GAP**

As the piston ring wears, its end gap increases reducing engine power output because of the resultant blowby gas through the enlarged gap. Here lies the importance of using piston rings with end gaps within the limit.

Measure the piston ring free end gap to check the spring tension.

**Service Limit : 1st : 4.0 mm (0.16 in)**

**2nd : 4.8 mm (0.19 in)**

**PISTON RING TO GROOVE CLEARANCE**

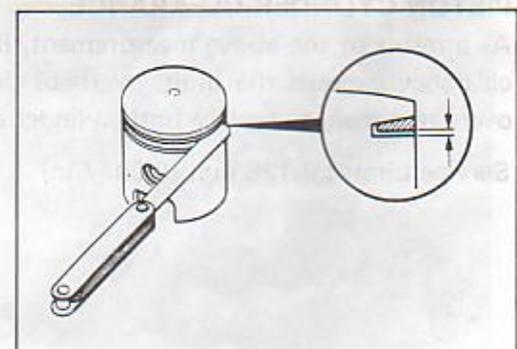
Fix the piston ring in the piston ring groove, measure the ring side clearance with the thickness gauge while matching the sliding surface of piston and ring.

**STD clearance**

**1st : 0.017 – 0.057 mm (0.0007 – 0.0022 in)**

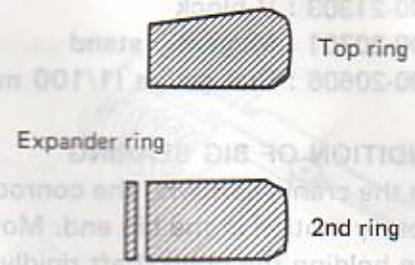
**2nd : 0.025 – 0.060 mm (0.0008 – 0.0024 in)**

**09900-20803 : Thickness gauge**

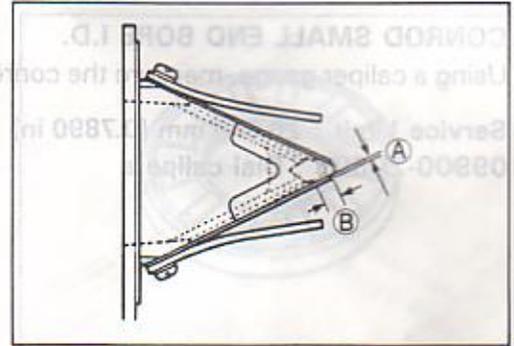


**NOTE:**

1st ring and 2nd ring differ in the shape. Be sure to bring the "T" (1st) and "T" (2nd) marked side to top when fitting them to the piston.

**REED VALVE**

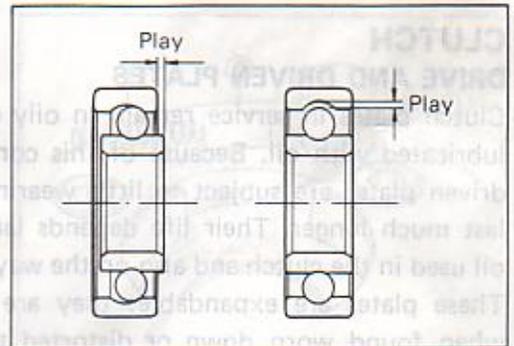
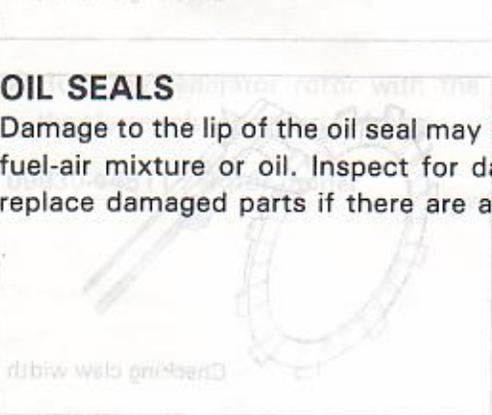
Check the clearance (A) between reed valve and its seat and the dimension (B). If the clearance (A) is noted to exceed 0.2 mm, replace the reed valve assembly. The dimension (B) is at least 1 mm.

**BEARINGS**

Wash the bearing with cleaning solvent and lubricate with motor oil before inspecting.

Turn the inner ring and check to see that the inner ring turns smoothly.

If it does not turn lightly, quietly and smoothly, or if noise is heard, the bearing is defective and must be replaced with a new one.

**OIL SEALS**

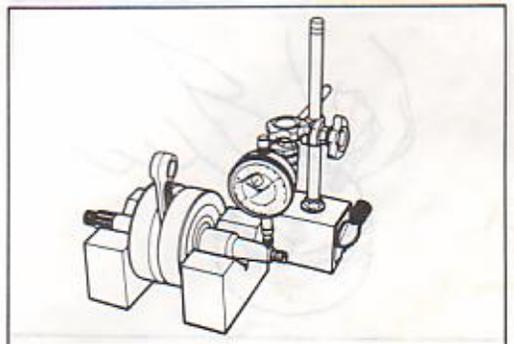
Damage to the lip of the oil seal may result in leakage of the fuel-air mixture or oil. Inspect for damage and be sure to replace damaged parts if there are any.

**CRANKSHAFT****CRANKSHAFT RUNOUT**

Support the crankshaft by "V" blocks, with a dial gauge rigged to read the runout as shown.

**Service Limit : 0.05 mm (0.002 in)**

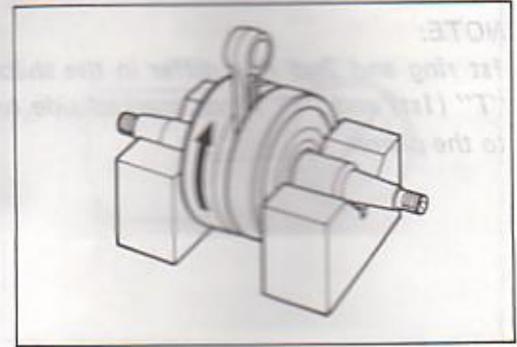
Excessive crankshaft runout is often responsible for abnormal engine vibration. Such vibration shortens engine life.



09900-21303 : V-block  
 09900-20701 : Magnetic stand  
 09900-20606 : Dial gauge (1/100 mm)

**CONDITION OF BIG BEARING**

Turn the crankshaft with the conrod to feel the smoothness of rotary motion in the big end. Move the rod up and down while holding the crankshaft rigidly to be sure that there is no rattle in the big end.

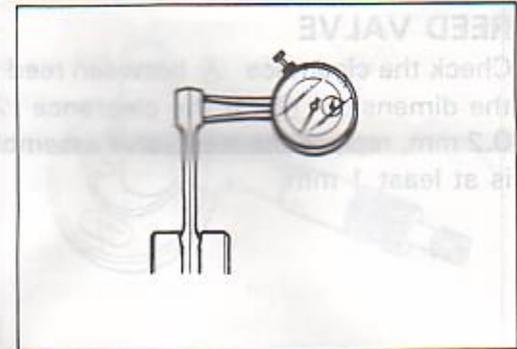


**CONROD SMALL END BORE I.D.**

Using a caliper gauge, measure the conrod small end diameter.

**Service Limit : 20.040 mm (0.7890 in)**

09900-20605 : Dial calipers



**CLUTCH**

**DRIVE AND DRIVEN PLATES**

Clutch plates in service remain in oily condition as they were lubricated with oil. Because of this condition, both drive and driven plates are subject to little wearing action and therefore last much longer. Their life depends largely on the quality of oil used in the clutch and also on the way the clutch is operated. These plates are expandable: they are meant to be replaced when found worn down or distorted to the respective limit: use a caliper to check thickness and claw width and a thickness gauge and surface plate to check distortion.

**Service Limit**

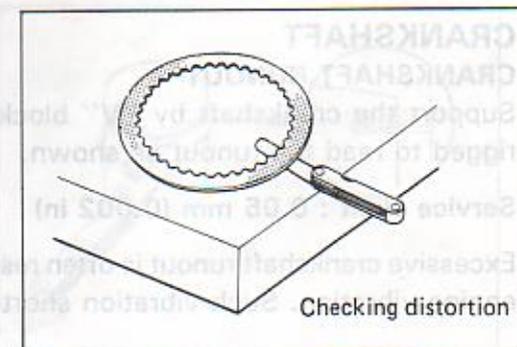
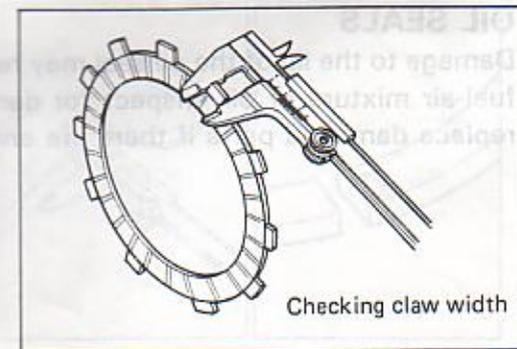
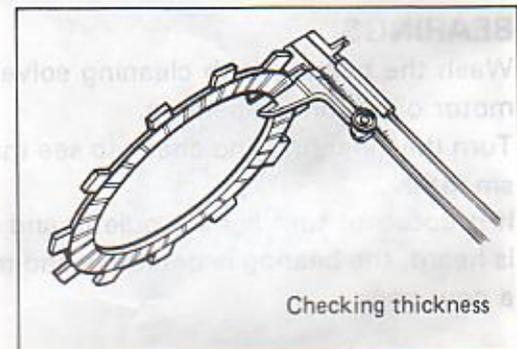
**Thickness : 2.6 mm (0.10 in)**

**Claw width : 11.0 mm (0.43 in)**

**Distortion : 0.10 mm (0.004 in)**

09900-20101 : Vernier calipers

09900-20803 : Thickness gauge



**CLUTCH SPRING FREE LENGTH**

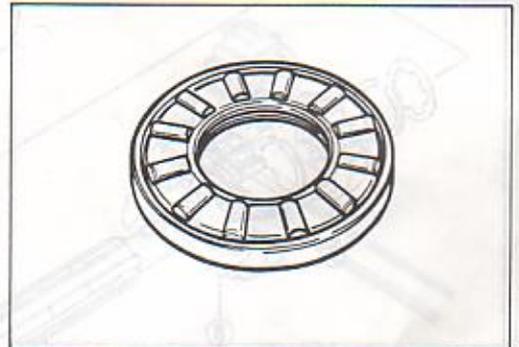
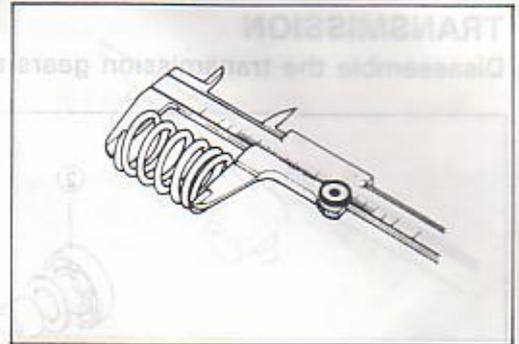
Measure the free length of each coil spring with a vernier calipers, and compare the elastic strength of each with the specified limit. Replace all the springs of any spring is not within the limit.

Service Limit : 29.9 mm (1.18 in)

**CLUTCH RELEASE BEARING**

Inspect clutch bearing for any abnormality, particularly cracks, upon removal from the clutch, to decide whether it can be reused or should be replaced.

Smooth engagement and disengagement of the clutch depends much on the condition of this bearing.

**STARTER CLUTCH****DISASSEMBLY**

- Remove the starter driven gear.
- Remove the roller ①, spring ② and push piece ③.

09900-20101 Vernier calipers

09900-20803 Thickness gauge

- Hold the generator rotor with the rotor holder and remove the starter clutch securing bolts.

09930-44511 : Rotor holder

**NOTE:**

In reassembly, the transmission oil must be given to the locations and adjusted with the wrench. The cross-sectional view given below is for reference for correctly mounting the gears, washers and circlips.

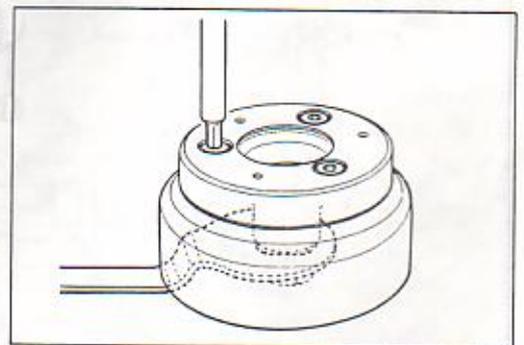
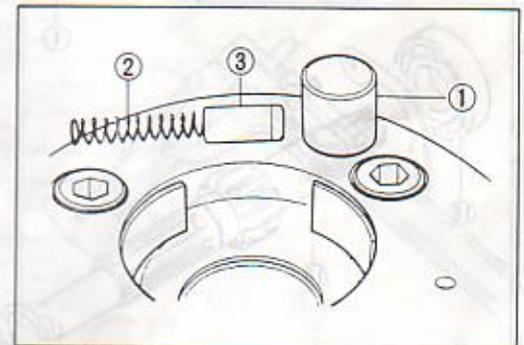
**REASSEMBLY**

- Apply a small quantity of THREAD LOCK SUPER "1303" to the starter clutch securing bolts and tighten them to the specified torque by holding the rotor holder.

99000-32030 : THREAD LOCK SUPER "1303"

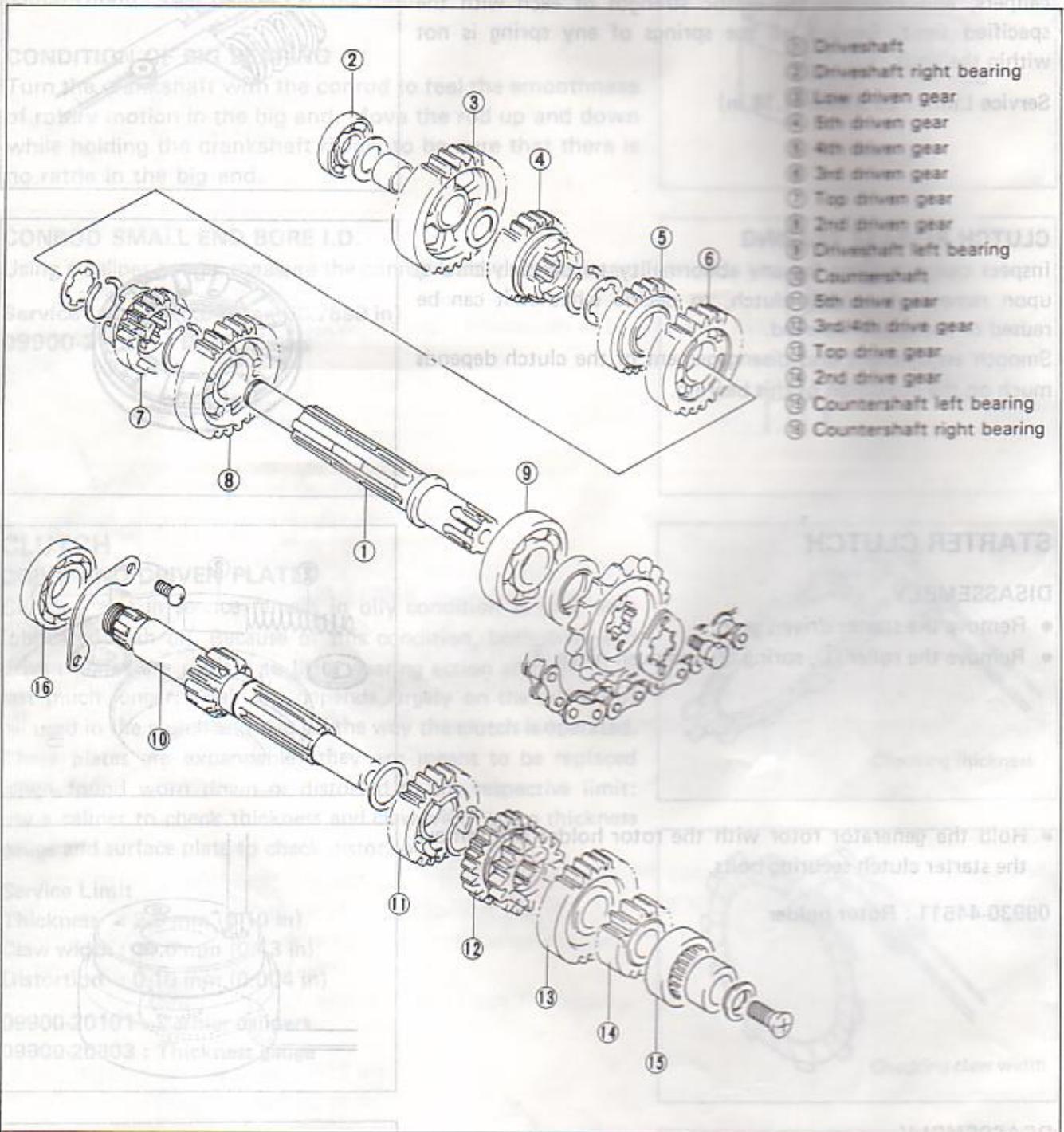
Tightening torque : 15 – 20 N·m

(1.5 – 2.0 kg·m, 11.0 – 14.5 lb·ft)



### TRANSMISSION

Disassemble the transmission gears as shown in the illustration.



- ① Driveshaft
- ② Driveshaft right bearing
- ③ Low driven gear
- ④ 5th driven gear
- ⑤ 4th driven gear
- ⑥ 3rd driven gear
- ⑦ Top driven gear
- ⑧ 2nd driven gear
- ⑨ Driveshaft left bearing
- ⑩ Countershaft
- ⑪ 5th drive gear
- ⑫ 3rd/4th drive gear
- ⑬ Top drive gear
- ⑭ 2nd drive gear
- ⑮ Countershaft left bearing
- ⑯ Countershaft right bearing



Apply a small quantity of THREAD LOCK SUPER "1303" to the starter clutch securing bolts and tighten them to the specified torque by holding the rotor holder.

99000-32030-THREAD-LOCK-SUPER "1303"

Tightening torque : 15 - 20 N·m  
(1.5 - 2.0 kg-m, 11.0 - 14.8 lb-ft)

checked

**GEARSHIFT FORK CLEARANCE**

Using a thickness gauge, check the shift fork clearance in the groove of its gear.

This clearance for each of the three shift forks plays an important role in the smoothness and positiveness of shifting action. Each fork has its prongs fitted into the annular groove provided in its gear. In operation, there is sliding contact between fork and gear and, when a shifting action is initiated, the fork pushes the gear axially. Too much a clearance is, therefore, liable to cause the meshed gears to slip apart.

If the clearance checked is noted to exceed the limit specified, replace the fork or its gear, or both.

**Shift fork to groove clearance**

**Service Limit : 0.45 mm (0.018 in)**

**Shift fork groove width****Standard**

No. 1 & No. 3 : 4.45 – 4.55 mm (0.175 – 0.179 in)

No. 2 : 5.45 – 5.55 mm (0.215 – 0.219 in)

**Shift fork thickness****Standard**

No. 1 & No. 3 : 4.3 – 4.4 mm (0.169 – 0.173 in)

No. 2 : 5.3 – 5.4 mm (0.209 – 0.212 in)

09900-20101 : Vernier calipers

09900-20803 : Thickness gauge

**REASSEMBLY**

Assemble the countershaft and driveshaft, in the reverse order of disassembly.

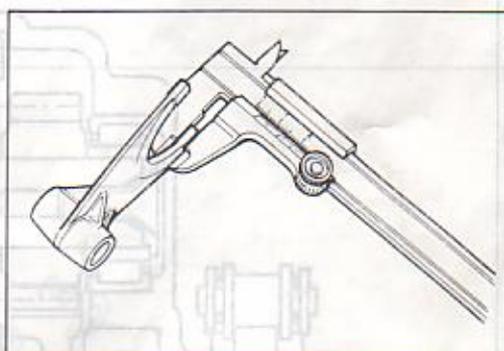
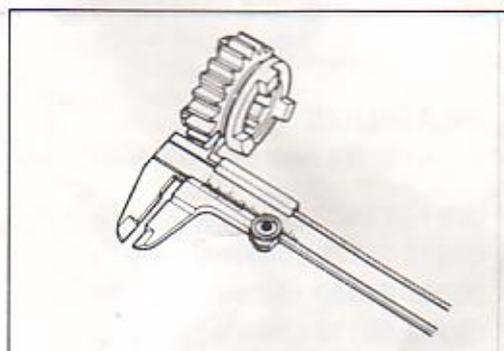
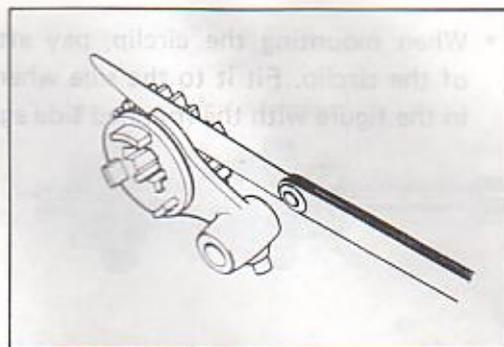
Pay attention to the following points:

**NOTE:**

*In reassembling the transmission, attention must be given to the locations and positions of washers and circlips. The cross sectional view given here will serve as a reference for correctly mounting the gears, washers and circlips.*

**CAUTION:**

- \* **Never reuse a circlip. After a circlip has been removed from a shaft, the removed circlip should be discarded and a new circlip must be installed.**
- \* **When installing a new circlip, care must be taken not to expand the end gap larger than required to slip the circlip over the shaft.**
- \* **After installing a circlip, always insure that it is completely seated in its groove and securely fitted.**





**MOUNTING THE 2ND DRIVE GEAR**

- Press fit the 2nd drive gear onto the countershaft.

Countershaft length  $\text{\AA}$  (Low to 2nd)

105.2 – 105.3 mm (4.1417 – 4.1457 in)

**NOTE:**

Before reassembling, coat the internal face of the 2nd drive gear with **THREAD LOCK SUPER "1322"** and install it.

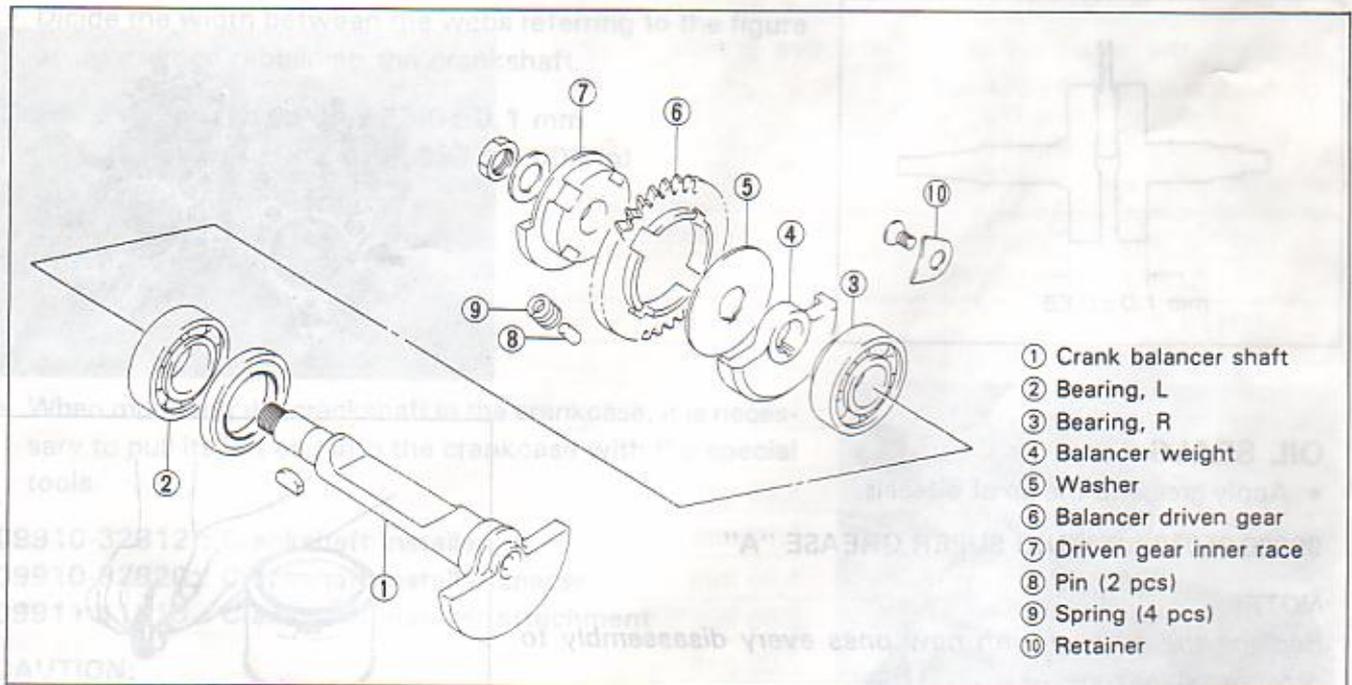
**99000-32110 : THREAD LOCK SUPER "1322"**

**NOTE:**

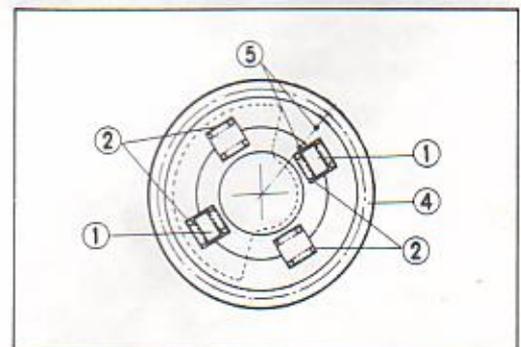
Take care not to smear **TOP** drive gear with **THREAD LOCK SUPER "1322"**

**NOTE:**

- \* After mounting the 2nd drive gear, check that **TOP** drive gear spins smoothly by moving it with your fingers.
- \* This procedure may be performed only twice before shaft replacement is required.

**CRANK BALANCER SHAFT AND DRIVEN GEAR**

- When installing the pins ①, springs ② and inner race ③ to the balancer driven gear ④, set the pins ① to the symmetrical position, and align the punched marks ⑤ as shown in the illustration.



## ENGINE REASSEMBLY

Reassembly is generally performed in the reverse order of disassembly, but there are numbers of reassembling steps that demand or deserve detailed explanation or emphasis. These steps will be taken up for respective parts and components.

### NOTE:

*Apply engine oil to each running and sliding part before reassembling.*

## BEARINGS

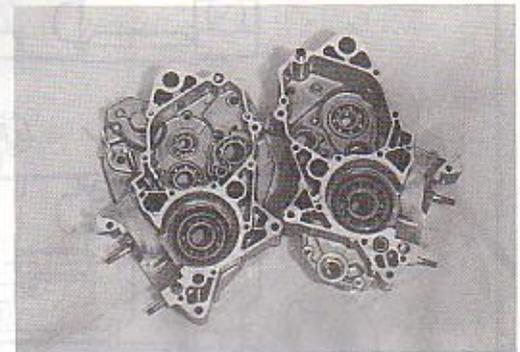
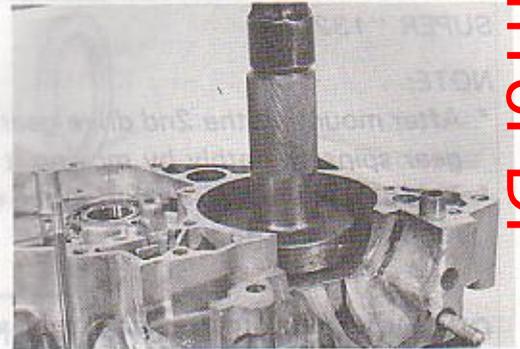
- Install the new bearings with the special tools.

09913-75520 : Bearing installer

09913-75810 : Bearing installer

09913-76010 : Bearing installer

09913-80112 : Bearing installer



## OIL SEALS

- Apply grease to the lip of oil seals.

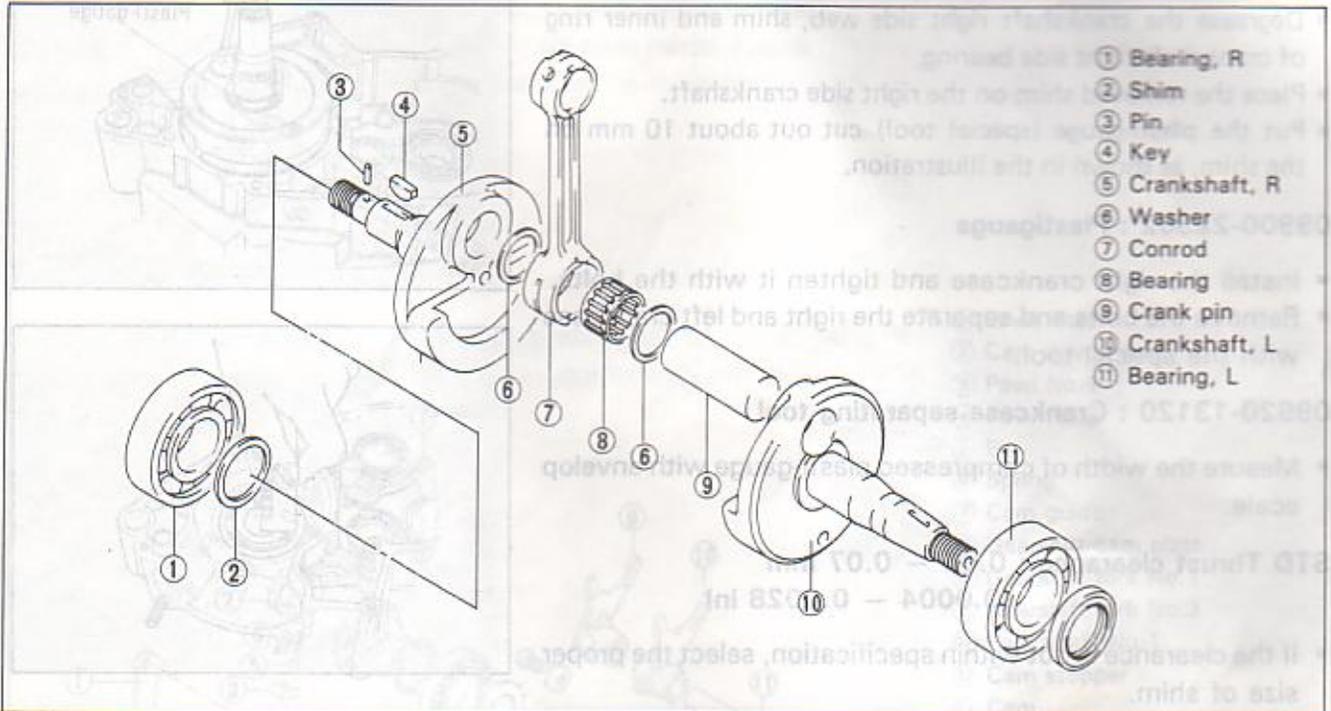
99000-25010 : SUZUKI SUPER GREASE "A"

### NOTE:

*Replace the oil seal with new ones every disassembly to prevent oil leakage.*



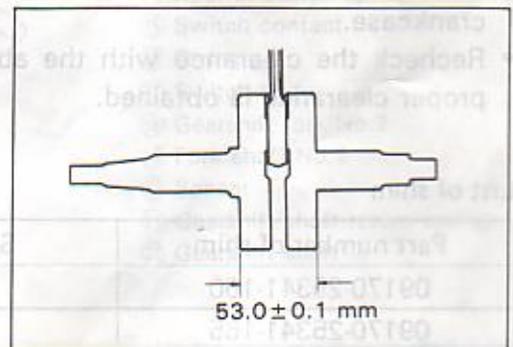
**CRANKSHAFT**



- ① Bearing, R
- ② Shim
- ③ Pin
- ④ Key
- ⑤ Crankshaft, R
- ⑥ Washer
- ⑦ Conrod
- ⑧ Bearing
- ⑨ Crank pin
- ⑩ Crankshaft, L
- ⑪ Bearing, L

- Decide the width between the webs referring to the figure at right when rebuilding the crankshaft.

**Crank web to web width :  $53.0 \pm 0.1$  mm  
( $2.087 \pm 0.004$  in)**



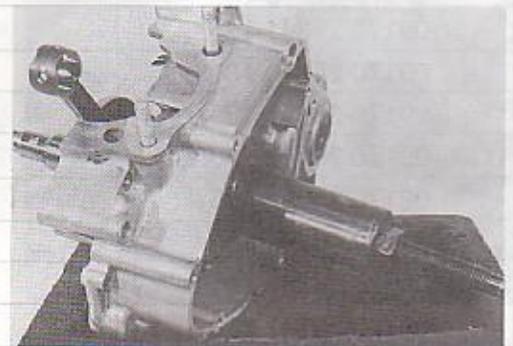
- When mounting the crankshaft in the crankcase, it is necessary to pull its left end into the crankcase with the special tools.

- 09910-32812 : Crankshaft installer
- 09910-32820 : Crankshaft installer spacer
- 09911-11310 : Crankshaft installer attachment

**CAUTION:**

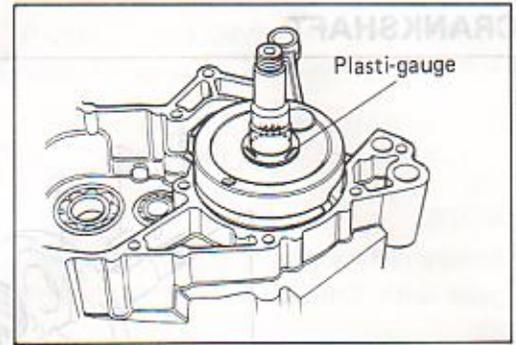
Never fit the crankshaft into the crankcase by tapping it with a plastic hammer.

Always use the special tools, otherwise crankshaft alignment accuracy will be affected.



**CRANKSHAFT SHIM SELECTION**

- Degrease the crankshaft right side web, shim and inner ring of crankshaft right side bearing.
- Place the removed shim on the right side crankshaft.
- Put the plasti-gauge (special tool) cut out about 10 mm on the shim, as shown in the illustration.

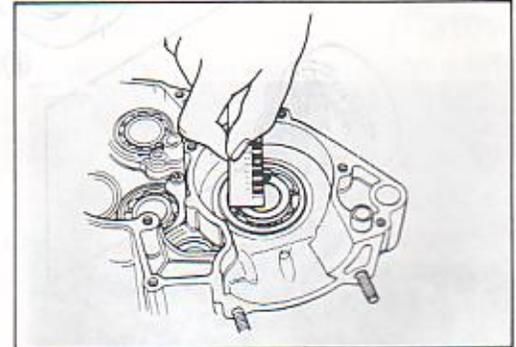


**09900-22302 : Plastigauge**

- Install the right crankcase and tighten it with the bolts.
- Remove the bolts and separate the right and left crankcase with the special tool.

**09920-13120 : Crankcase separating tool**

- Measure the width of compressed plasti-gauge with envelop scale.



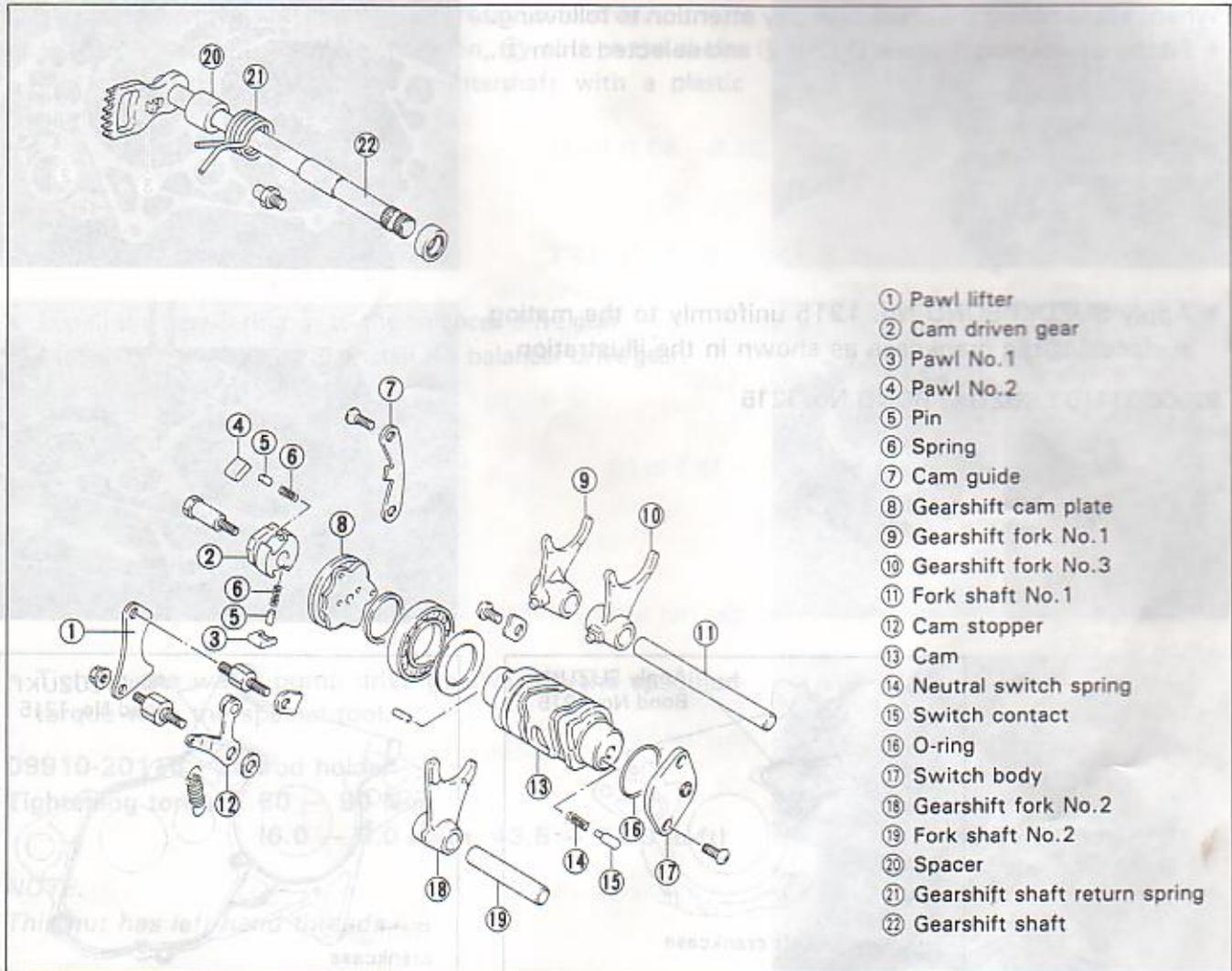
**STD Thrust clearance : 0.01 – 0.07 mm**  
(0.0004 – 0.0028 in)

- If the clearance is not within specification, select the proper size of shim.
- After selecting the proper size of shim, place it on the crankcase.
- Recheck the clearance with the above procedure until proper clearance is obtained.

**List of shim**

Part number of shim	Shim thickness
09170-25341-160	1.60 mm
09170-25341-165	1.65 mm
09170-25341-170	1.70 mm
09170-25341-175	1.75 mm
09170-25341-180	1.80 mm
09170-25341-185	1.85 mm
09170-25341-190	1.90 mm
09170-25341-195	1.95 mm
09170-25341-200	2.00 mm
09170-25341-205	2.05 mm
09170-25341-210	2.10 mm
09170-25341-215	2.15 mm
09170-25341-220	2.20 mm
09170-25341-225	2.25 mm
09170-25341-230	2.30 mm

## GEARSHIFT CAM AND FORK



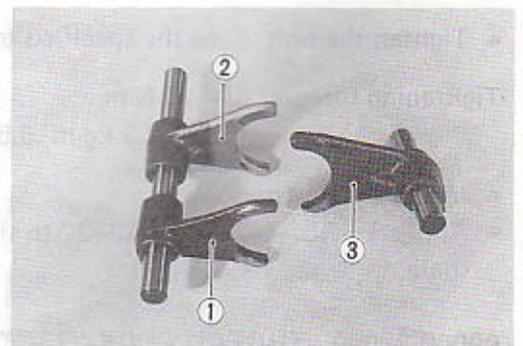
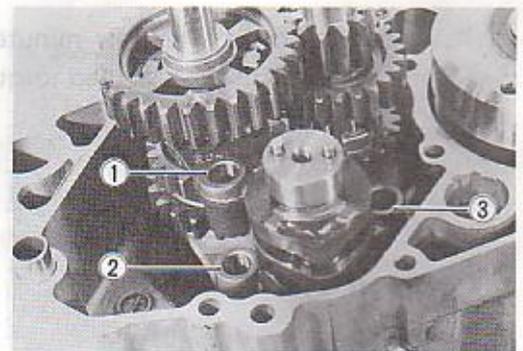
- After fitting the gearshift forks ①, ② and ③ into the gearshift grooves, fit the gearshift cam on the crankcase.

**NOTE:**

Three kinds of gearshift forks ①, ② and ③ are used. They reassemble each other very closely in external appearance and configuration.

Carefully examine the photograph for correct installing positions and directions.

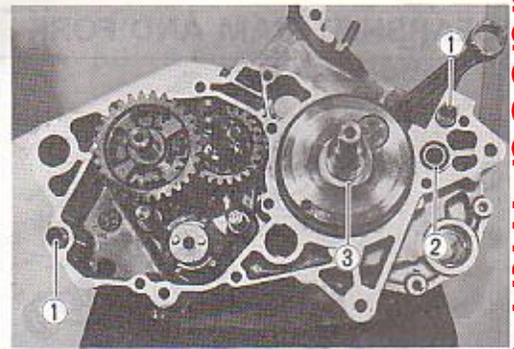
- ① For 5th driven gear (No. 1)
- ② For Top driven gear (No. 3)
- ③ For 3rd/4th drive gear (No. 2)



### CRANKCASE

When reassembling the crankcase pay attention to following.

- Fit the dowel pins ①, new O-ring ② and selected shim ③.



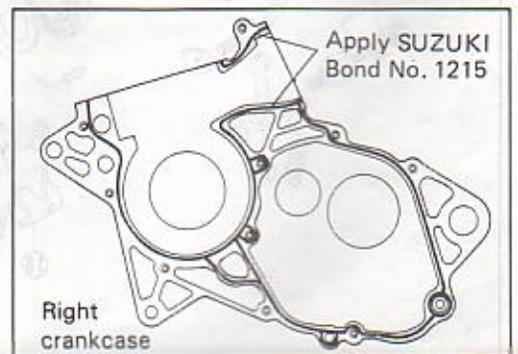
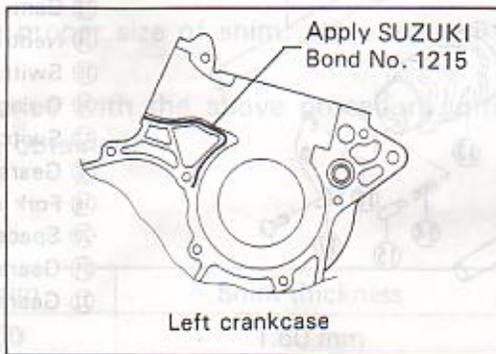
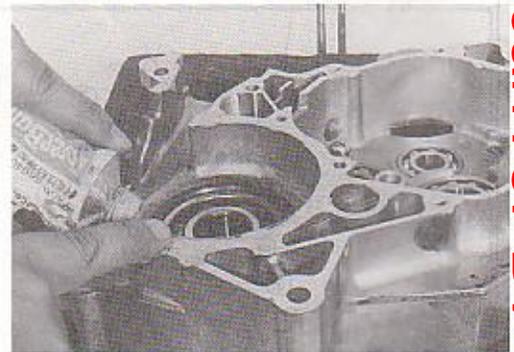
- Place the removed shim on the right side crankshaft.
- Put the plasti-gauge (special tool) cut out about 10 mm on the shim, as shown in the illustration.

99800-22302 : Plastiguage

- Install the right crankcase and tighten it with the bolts.

- Apply SUZUKI BOND No. 1215 uniformly to the mating surfaces of the crankcase as shown in the illustration.

99000-31110 : SUZUKI BOND No. 1215

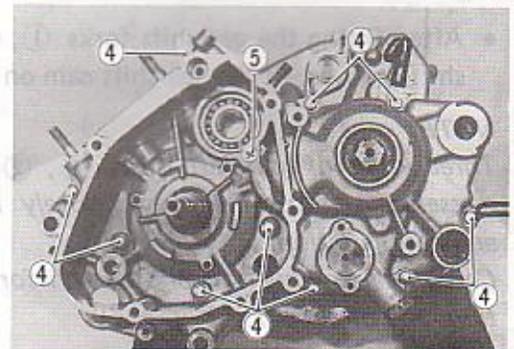


- Assemble the cases after few minutes and tighten the bolts ④ and screw ⑤ to the specified torque.

**Tightening torque**

④ : 9 – 13 N·m (0.9 – 1.3 kg·m, 6.5 – 9.5 lb·ft)

⑤ : 6 – 10 N·m (0.6 – 1.0 kg·m, 4.5 – 7.0 lb·ft)

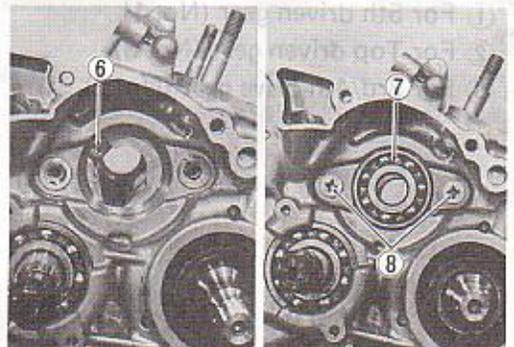


- Tighten the bolt ⑥ to the specified torque.

**Tightening torque : 9 – 13 N·m**  
(0.9 – 1.3 kg·m, 6.5 – 9.5 lb·ft)

- Install the bearing ⑦ .
- Apply THREAD LOCK "1342" to the screws ⑧ and tighten them.

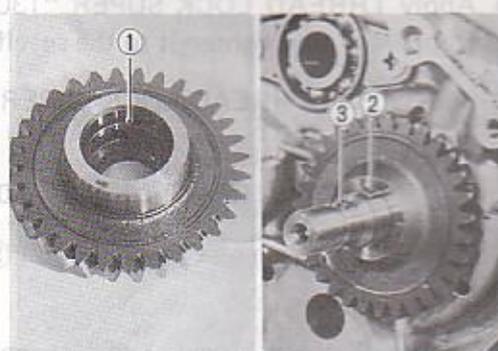
99000-32050 : THREAD LOCK "1342"



- After the crankcase bolts and screws have been tightened, check if driveshaft and countershaft rotate smoothly.
- If a large resistance is felt to rotation, try to free the shafts by tapping the driveshaft or countershaft with a plastic hammer.



- Install the new O-ring ① to the balancer drive gear.
- Fit the key ② and pin ③, install the balancer drive gear.



- Tighten the water pump drive gear nut to the specified torque with the special tool.

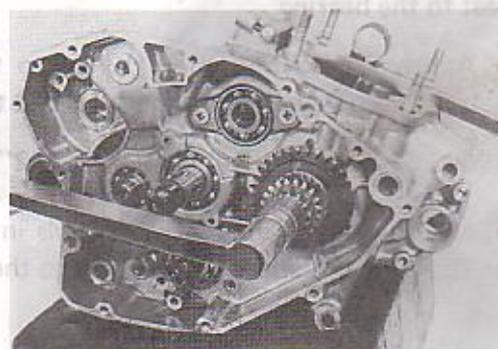
09910-20115 : Conrod holder

Tightening torque : 60 – 80 N·m

(6.0 – 8.0 kg-m, 43.5 – 58.0 lb-ft)

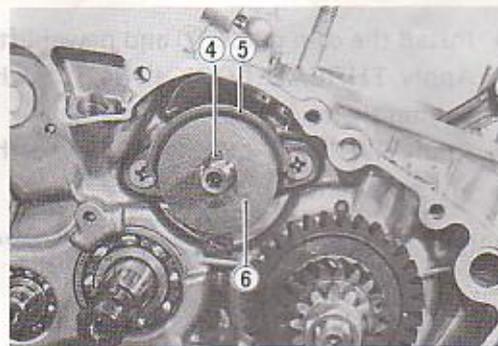
NOTE:

This nut has left-hand threads.

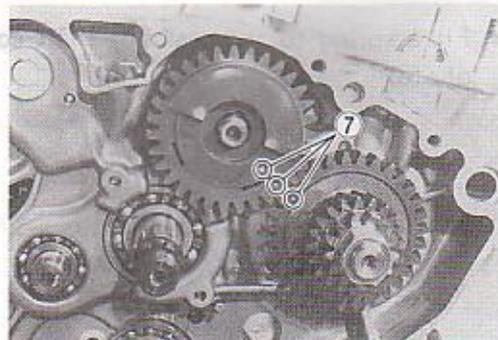


### BALANCER SHAFT AND GEAR

- Fit the key ④ and install the balancer weight ⑤ and washer ⑥.



- When installing the balancer driven gear, align the three punched marks ⑦.



- Tighten the balancer nut to the specified torque with the special tool.

09910-20115 : Conrod holder

Tightening torque : 45 – 55 N·m  
(4.5 – 5.5 kg-m, 32.5 – 40.0 lb-ft)

### CAM DRIVEN GEAR AND GEARSHIFT SHAFT

- Apply THREAD LOCK SUPER "1303" to the gearshift arm stopper ①, and tighten it to the specified torque.

99000-32030 : THREAD LOCK SUPER "1303"

Tightening torque: 15 – 23 N·m  
(1.5 – 2.3 kg-m, 11.0 – 16.5 lb-ft)

- Install the bearing seat ② and spacer ③.

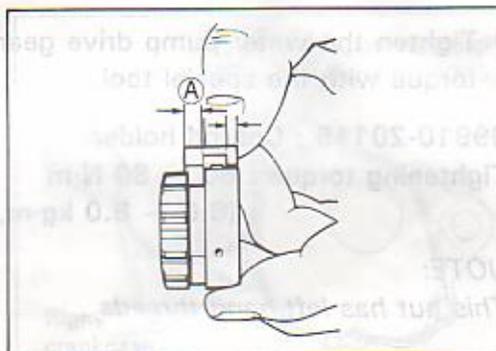
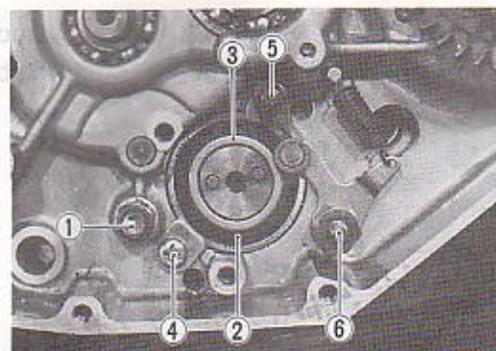
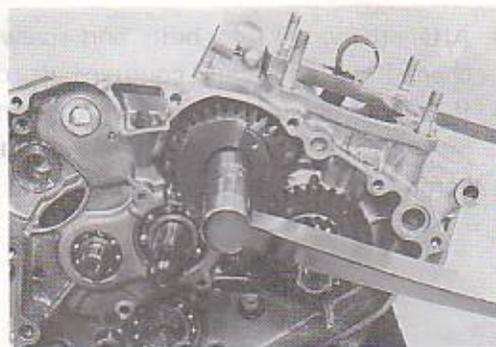
#### CAUTION:

When installing the bearing seat ②, face the flat surface of the seat to the bearing.

- Apply THREAD LOCK "1342" to the retainer screw ④, bolt ⑤ and stopper arm bolt ⑥, and tighten them.

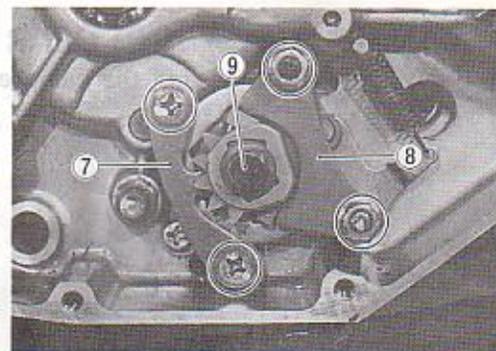
99000-32050 : THREAD LOCK "1342"

- When installing the gearshift pawls into the cam driven gear. The large shoulder A must face to the outside as shown.



- Install the cam guide ⑦ and pawel lifter ⑧.
- Apply THREAD LOCK "1342" to the screws and nuts, and tighten them.
- Apply THREAD LOCK "1342" to the cam driven gear bolt ⑨, and tighten it.

99000-32050 : THREAD LOCK "1342"



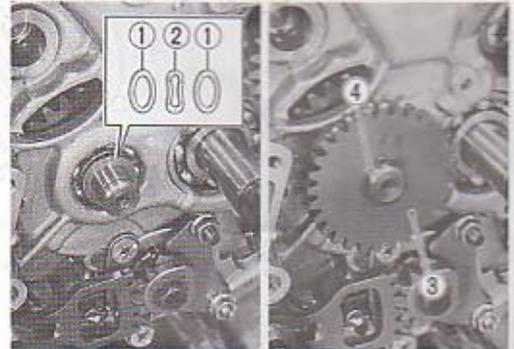
- Fit a spring to the gearshift shaft correctly as shown in the photo.



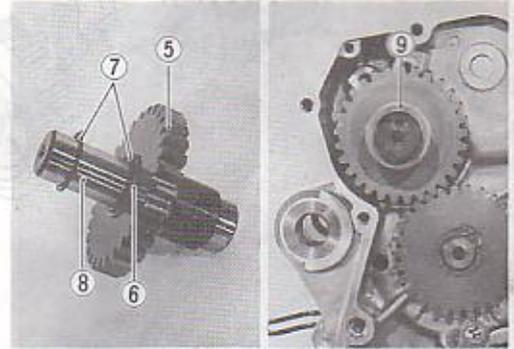
- Install the gearshift shaft. Match the center teeth of the gear on the gearshift shaft with the center teeth on the cam driven gear as shown in photo.



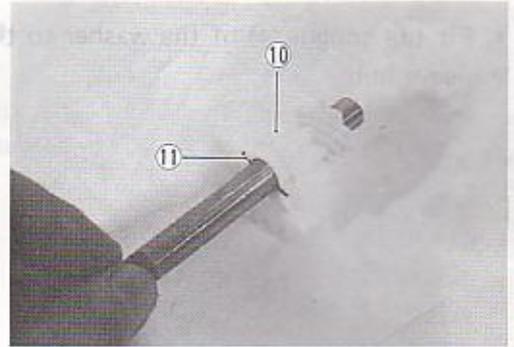
- Install the two washers ① and concaved washer ② as shown in the illustration.
- Install the oil pump drive gear ③ and circlip ④.



- Install the oil pump idle gear ⑤, washer ⑥ and circlips ⑦ to the shaft ⑧.
- Install the oil pump idle gear assembly and washer ⑨.



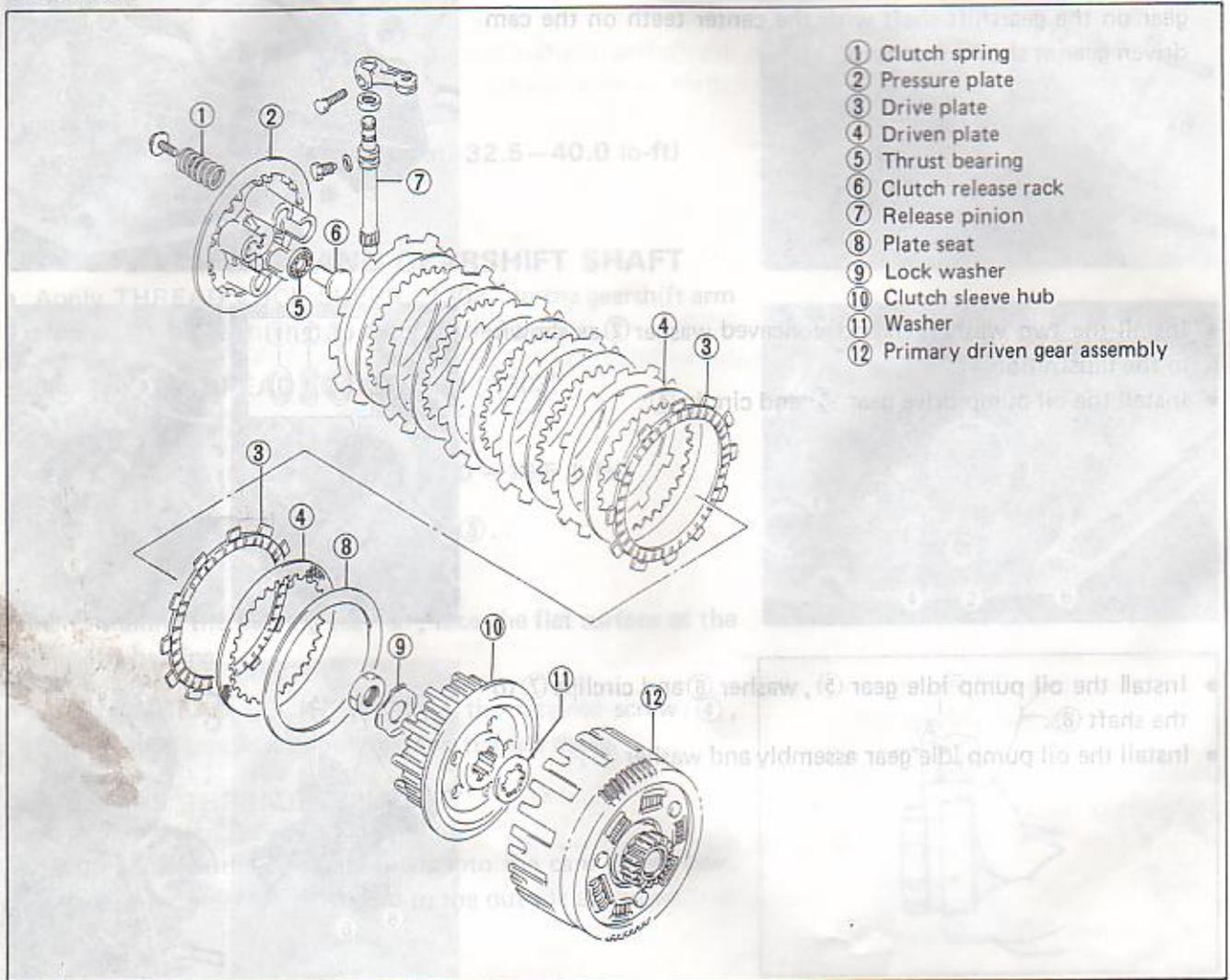
- Install the oil pump driven gear ⑩ and pin ⑪ to the shaft.



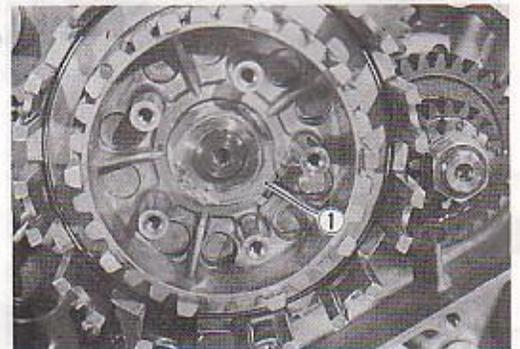
- Install the oil pump driven gear to the crankcase.



## CLUTCH



- Fit the tongue ① of the washer to the groove of the clutch sleeve hub.

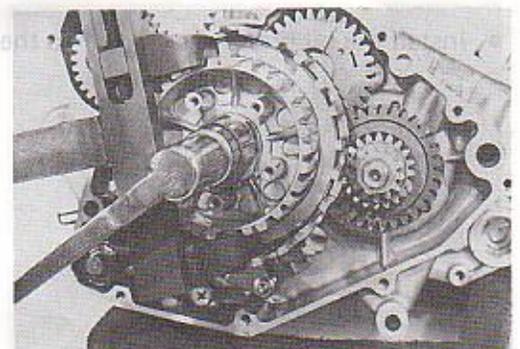


- Tighten the clutch sleeve hub nut to the specified torque with the special tool.

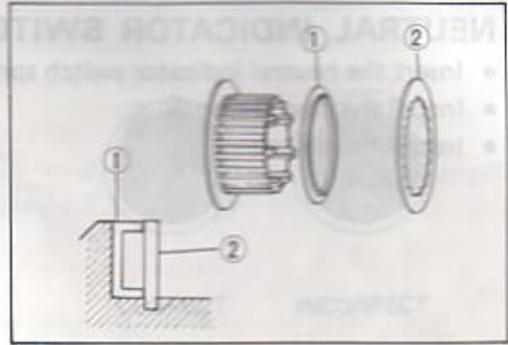
Tightening torque : 40 – 60 N·m

(4.0 – 6.0 kg-m, 29.0 – 43.5 lb-ft)

09920-53740 : Clutch sleeve hub holder



- Install the clutch plate seat ① and driven plate ② as shown in the illustration.
- Install the drive plate and driven plate one by one.

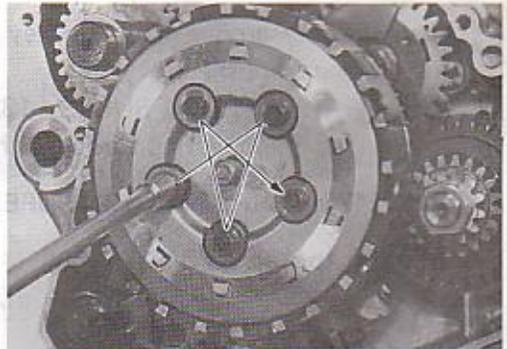


- Insert the clutch release rack and bearing into the pressure plate.



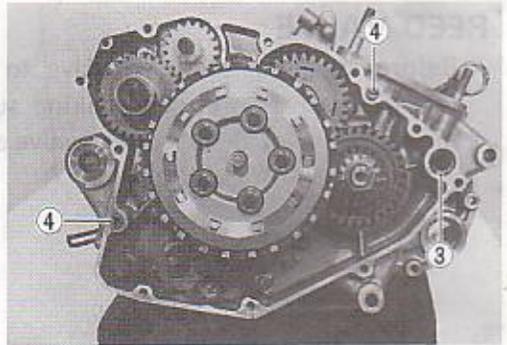
- Tighten the clutch spring bolts diagonally with the special tool.

09910-20115 : Conrod holder

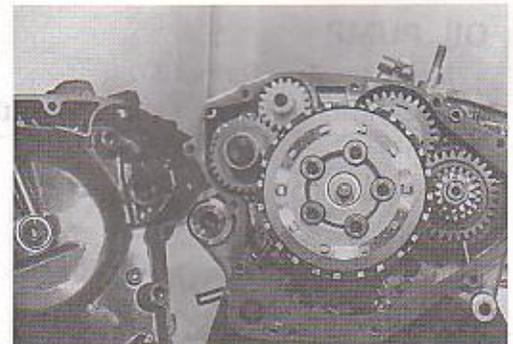


- Fit the new O-ring ③ and dowel pins ④.
- Install the oil pump drive gear with shaft.

**CAUTION:**  
Use a new gasket to prevent oil leakage.

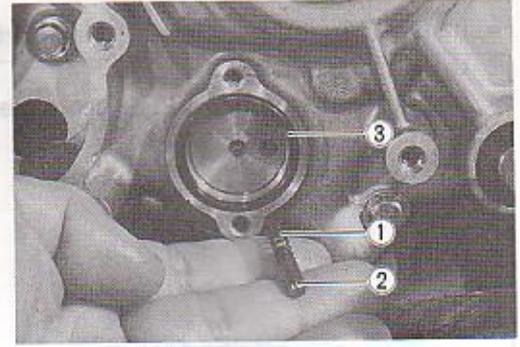


- Engage the teeth of clutch release rack with those of pinion gear at the clutch cover side, and replace the clutch cover. Make sure that the rack and pinion gears engage positively. To install the cover, tap lightly with plastic hammer, and tighten the bolts.

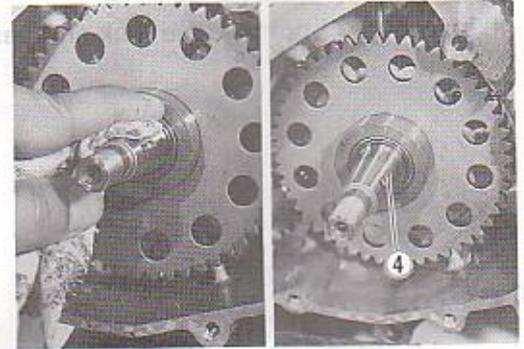


**NEUTRAL INDICATOR SWITCH**

- Insert the neutral indicator switch spring ① and contact ②.
- Install the new O-ring ③.
- Install the switch.

**MAGNETO**

- Degrease the tapered portion of the crankshaft and also the magneto rotor.
- Fit the key ④.

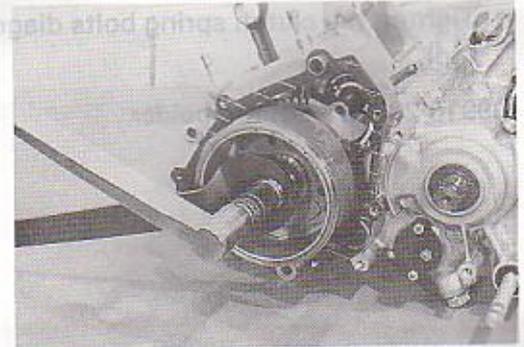


- Align the key groove with the key and install the magneto rotor to the crankshaft.
- Apply **THREAD LOCK SUPER "1324"** to the rotor nut and tighten it to the specified torque with the special tool.

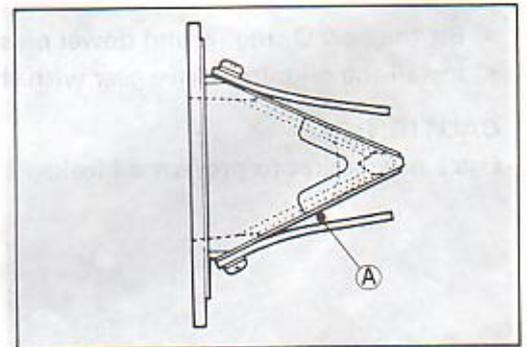
99000-32120 : **THREAD LOCK SUPER "1324"**

**Tightening torque : 75–85 N·m**  
(7.5–8.5 kg-m, 54.0–61.5 lb-ft)

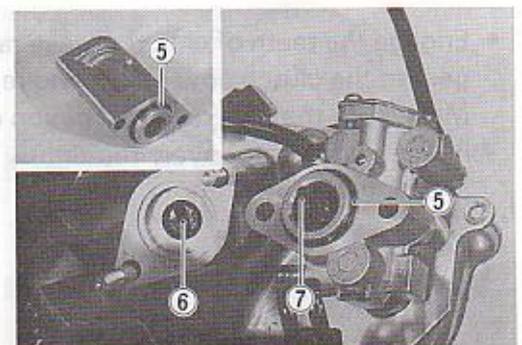
09930-44511 : Rotor holder

**REED VALVE**

- Before installing the reed valve to the crankcase, examine the reed valve carefully, making sure there is not foreign matter (A) stuck between reed valve and reed valve stopper.

**OIL PUMP**

- Install the new O-rings ⑤.
- When installing the oil pump, align the groove ⑥ with protrusion ⑦.



## PISTON RING AND PISTON

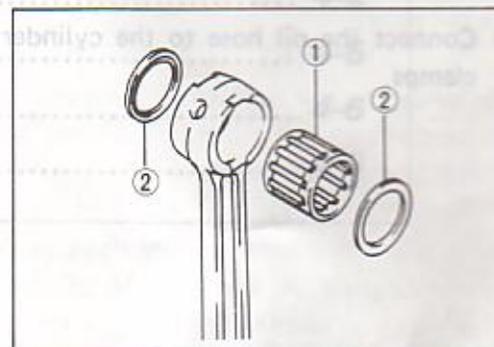
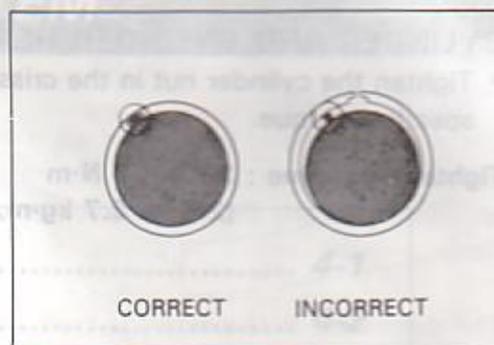
- Mount the piston rings in the order of expander ring, 2nd ring and top ring.

### NOTE:

Top and 2nd rings have letter "T" marked.

Be sure to bring the marked side to top when fitting them to the piston.

- Each ring in place should be so positioned as to hug the locating pin.
- Install the bearing ① and two thrust washers ② to the conrod.



- Before installing the piston to the conrod, be sure to apply SUZUKI CCI Oil or two-stroke oil to the conrod big end and small end bearings.
- The arrow mark on the piston crown points to the cylinder exhaust port side.



- The circlip should be mounted in such a position ③ that the mating ends of the circlip do not coincide with the groove portion of the piston.



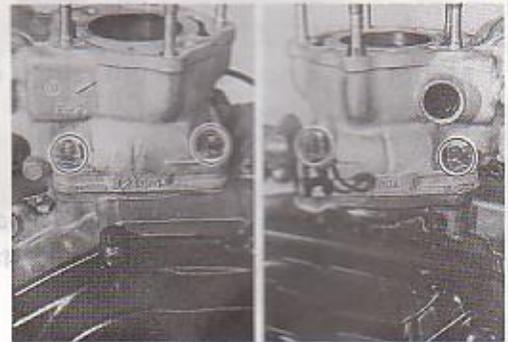
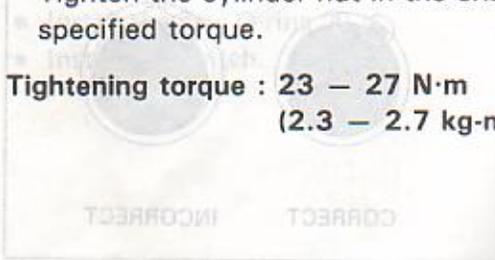
- Before inserting the piston in the cylinder, be sure to apply SUZUKI CCI Oil or two-stroke oil to the outer surface of the piston and piston ring grooves.
- Fit the two dowel pins ④.
- Install the new gasket.



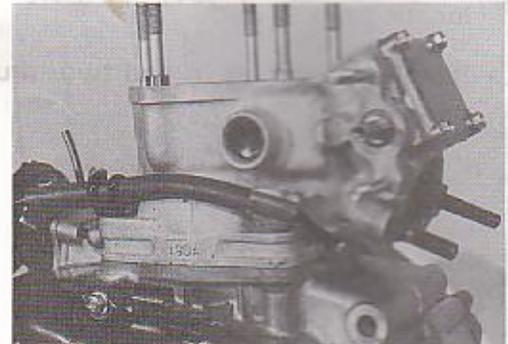
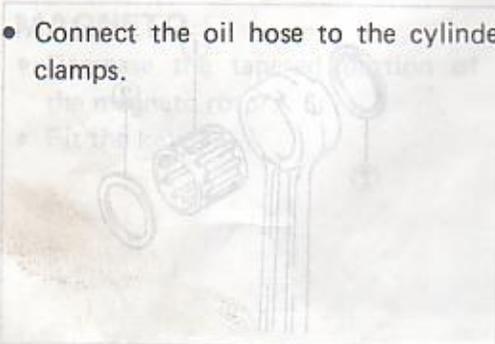
### CYLINDER AND CYLINDER HEAD

- Tighten the cylinder nut in the criss-cross manner to the specified torque.

**Tightening torque : 23 – 27 N·m  
(2.3 – 2.7 kg-m, 16.5 – 19.5 lb-ft)**



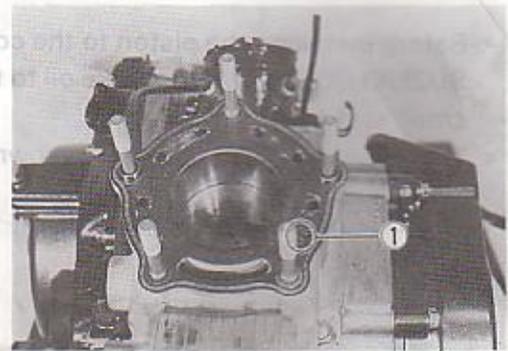
- Connect the oil hose to the cylinder and fix the hose with clamps.



- Install the new cylinder head gasket properly position.

**CAUTION:**

When installing the cylinder head gasket, be sure to bring "SP" marked ① side to the top as shown in the photograph.



- Install the copper washers ②.
- Tighten the cylinder head nuts to the specified torque in ascending numerical order on the cylinder head.

**Tightening torque : 23 – 27 N·m  
(2.3 – 2.7 kg-m, 16.5 – 19.5 lb-ft)**

**NOTE:**

Cap nuts ③ position is as shown in the photograph.

