

# ENGINE

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## COMPRESSION PRESSURE CHECK

The compression of a cylinder is a good indicator of its internal condition.

The decision to overhaul the cylinder is often based on the results of a compression test. Periodic maintenance records kept at your dealership should include compression readings for each maintenance service.

### COMPRESSION PRESSURE SPECIFICATION

| Standard  | Limit   | Difference                                     |
|---|---|--|
| 1 000 – 1 450 kPa<br>(10 – 14.5 kg/cm <sup>2</sup> )<br>(142 – 206 psi) | 800 kPa<br>(8 kg/cm <sup>2</sup> )<br>(114 psi) | 200 kPa<br>(2 kg/cm <sup>2</sup> )<br>(28 psi) |

**Low compression pressure can indicate any of the following conditions:**

- \* Excessively worn cylinder wall
- \* Worn-down piston or piston rings
- \* Piston rings stuck in grooves
- \* Poor seating of valves
- \* Ruptured or otherwise defective cylinder head gasket

**Overhaul the engine in the following cases:**

- \* Compression pressure in one of the cylinders is less than 800 kPa (8 kg/cm<sup>2</sup>, 114 psi).
- \* Difference in compression pressure between any two cylinders is more than 200 kPa (2 kg/cm<sup>2</sup>, 28 psi).
- \* All compression pressure are below 1 000 kPa (10 kg/cm<sup>2</sup>, 142 psi) even when they measure more than 800 kPa (8 kg/cm<sup>2</sup>, 114 psi).

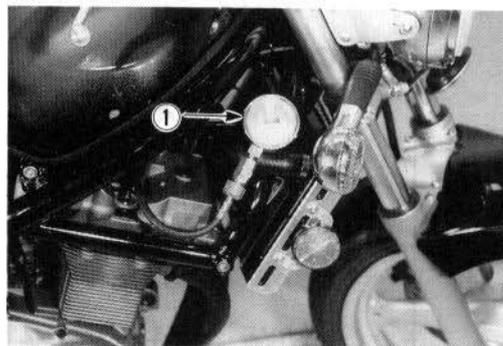
## COMPRESSION TEST PROCEDURE

### NOTE:

- \* *Before testing the engine for compression pressure, make sure that the cylinder head nuts and bolt are tightened to the specified torque values and valves are properly adjusted.*
- \* *Have the engine warmed up by idling before testing.*
- \* *Be sure that the battery used is in fully-charged condition.*

Remove the parts concerned and test the compression pressure in the following manner.

- Remove the spark plugs.
- Fit the compression gauge ① one of the plug holes, taking care to make the connection tight.
- Keep the throttle grip in full-open position.
- While cranking the engine a few seconds with the starter, record the maximum gauge reading as the compression of that cylinder.
- Repeat this procedure with the other cylinders.



**09915-64510: Compression gauge**

**09915-63310: Adaptor**

## OIL PRESSURE CHECK

Check periodically the oil pressure in the engine to judge roughly the condition of the moving parts.

### OIL PRESSURE SPECIFICATION

|   |   |
|---|---|
| <p>Above 250 kPa (2.5 kg/cm<sup>2</sup>, 36 psi)<br/>         Below 600 kPa (6.0 kg/cm<sup>2</sup>, 85 psi)</p> | <p>at 3 000 r/min., Oil temp. at 60° C (140° F)</p> |
|---|---|

If the oil pressure is lower or higher than the specification, the following causes may be considered.

#### LOW OIL PRESSURE

- \* Clogged oil filter
- \* Oil leakage from the oil passage way
- \* Damaged oil seal
- \* Defective oil pump
- \* Combination of above items

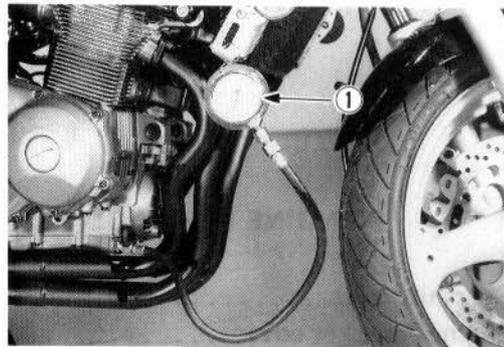
#### HIGH OIL PRESSURE

- \* Used a engine oil which is too heavy a weight
- \* Clogged oil passage way
- \* Combination of above items

## OIL PRESSURE TEST PROCEDURE

Start the engine and check if the oil pressure indicator light is turned on. If it keeps on lighting, check the oil pressure indicator light circuit. If it is in good condition, check the oil pressure in the following manner.

- Install the oil pressure gauge ① in the position shown in the figure.
- Warm up the engine as follows:  
 Summer 10 min. at 2 000 r/min.  
 Winter 20 min. at 2 000 r/min.
- After warming up, increase the engine speed to 3 000 r/min. with the engine tachometer reading, and read the oil pressure gauge.



09915-74510 : Oil pressure gauge  
 09915-77330 : Meter (for high pressure)

## ENGINE COMPONENTS REMOVABLE WITH 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 each section for removal and reinstallation instructions.

### ENGINE CENTER

|  | See page    |
|--|-------------|
| Radiator . . . . .   | 5- 5        |
| Exhaust pipe/muffler . . . . .   | 3- 4        |
| Oil pressure switch . . . . .  | 3-49        |
| Oil filter . . . . .   | 3-16 and 49 |
| Oil pan . . . . .  | 3-17 and 48 |
| Sump filter . . . . .  | 3-17 and 48 |
| Carburetors . . . . .  | 3- 5 and 9  |
| Cam chain tensioner . . . . .  | 3-10 and 60 |
| Cylinder head cover (along with<br>cylinder head breather cover) . . . . . | 3-10        |
| Camshafts . . . . .  | 3-10 and 58 |
| Cylinder head . . . . .  | 3-11 and 57 |
| Cylinder . . . . .   | 3-11 and 56 |
| Pistons . . . . .  | 3-12 and 56 |
| Starter motor . . . . .  | 3-12 and 54 |

### ENGINE LEFT SIDE

|   | See page    |
|---|-------------|
| Gearshift lever . . . . .                               | 3- 6        |
| Engine sprocket cover . . . . .                         | 3- 6        |
| Water pump . . . . .                                    | 3-17        |
| Engine sprocket and drive chain . . . . .               | 3- 6        |
| Neutral indicator switch body . . . . .                 | 3-17        |
| Starter clutch cover . . . . .                          | 3-10        |
| Signal generator (pick-up coil) . . . . .               | 6- 7        |
| Starter idle gear . . . . .                             | 3-12        |
| Starter clutch with signal generator<br>rotor . . . . . | 3-12 and 13 |

### ENGINE RIGHT SIDE

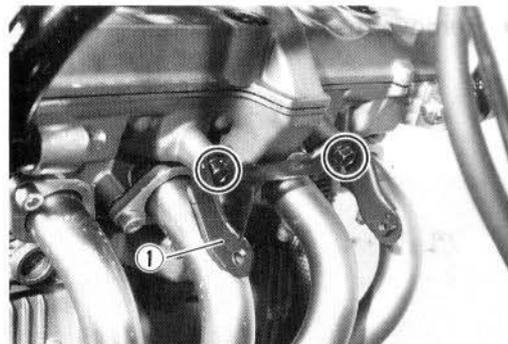
|   | See page |
|---|----------|
| Clutch cover . . . . .                                | 3-12     |
| Generator rotor . . . . .                             | 3-13     |
| Generator . . . . .                                   | 3-13     |
| Clutch pressure, drive and<br>driven plates . . . . . | 3-14     |
| Clutch sleeve hub . . . . .                           | 3-14     |
| Oil pump driven gear and<br>oil pump . . . . .        | 3-15     |
| Primary driven gear . . . . .                         | 3-15     |
| Gearshift shaft . . . . .                             | 3-16     |
| Gearshift cam driven gear . . . . .                   | 3-16     |

## ENGINE REMOVAL AND REINSTALLATION

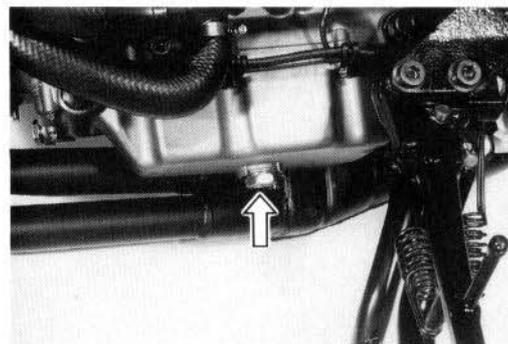
### ENGINE REMOVAL

Before taking the engine out of the frame, wash the engine with a steam cleaner. The procedure of engine removal is sequentially explained in the following steps, and engine installation is effected by reversing the removal procedure.

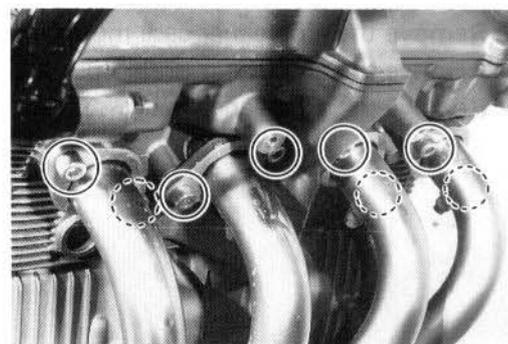
- Remove the front seat.
- Remove the air cleaner side covers, left and right. (See page 1-12.)
- Remove the fuel tank. (See page 4-2.)
- Disconnect the inlet and outlet water hoses to drain out coolant. (See page 5-5.)
- Remove the radiator. (See page 5-5.)
- Remove the radiator bracket ①.



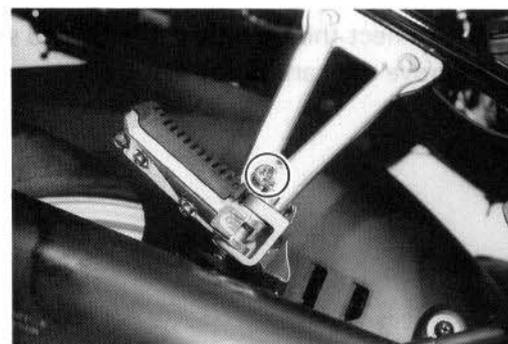
- Place an oil pan under the engine and remove the oil drain plug to drain out engine oil.



- Remove the eight exhaust pipe clamp bolts.

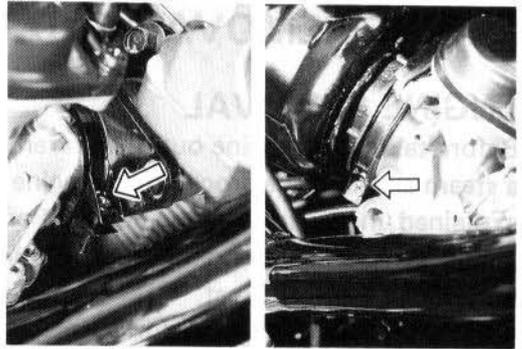


- Remove the muffler mounting bolt, then remove the exhaust pipe/muffler assembly.

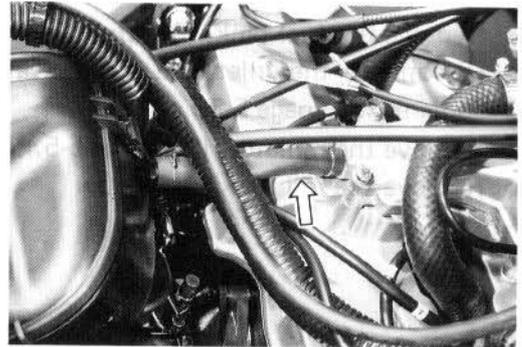


### 3-5 ENGINE

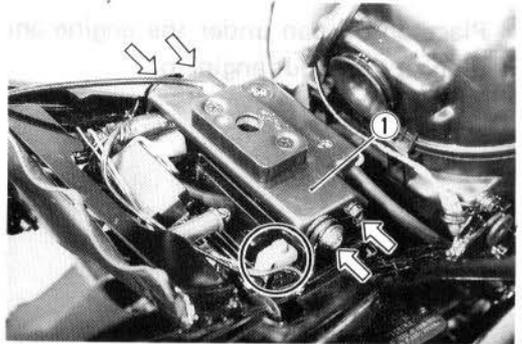
- Loosen each carburetor clamp screw.



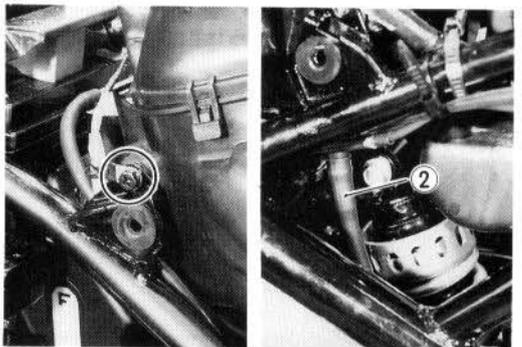
- Remove the breather hose.



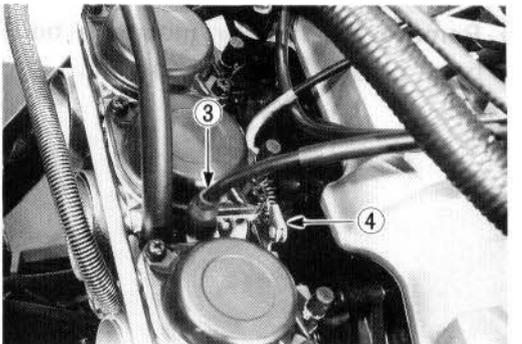
- Remove the front seat lock holder ① by removing the bolts.
- Disconnect the battery  $\ominus$  lead wire from the battery terminal.



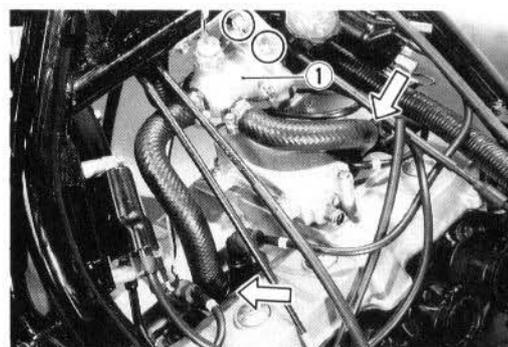
- Remove the air cleaner case mounting bolts, left and right.
- Remove the air cleaner drain hose ②.
- Remove the air cleaner case assembly.



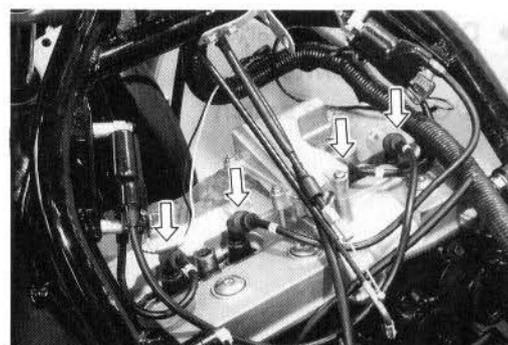
- Disconnect the throttle cable ③ and starter cable ④.
- Remove the carburetor assembly.



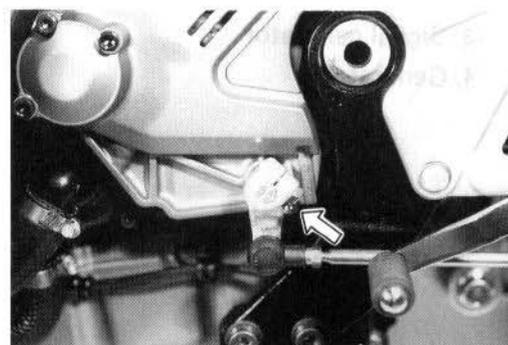
- Loosen the water hose clamp screws and disconnect the left and right water hoses from the cylinder head.
- Disconnect the water thermo-switch lead wires and cooling fan thermo-switch lead wires.
- Remove the thermostat case ① along with the left and right water hoses.



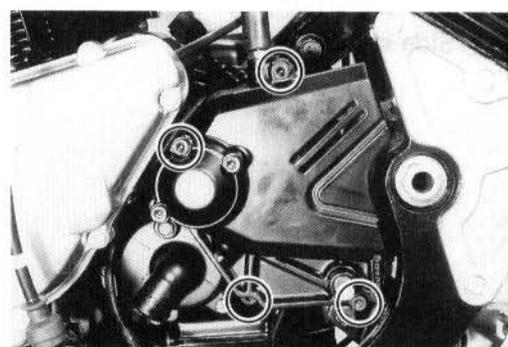
- Disconnect the spark plug caps.



- Remove the gearshift lever.



- Remove the engine sprocket cover.

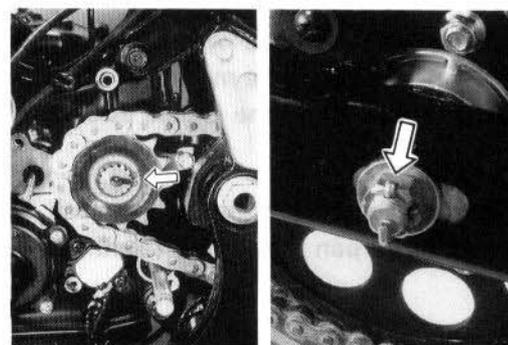


- Remove the engine sprocket by removing the circlip.

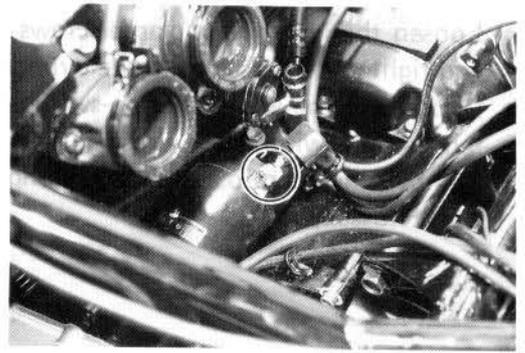
**09900-06107: Snap ring pliers**

**NOTE:**

*If it is difficult to remove the engine sprocket, loosen the axle nut and chain adjusting nuts to provide additional chain slack.*

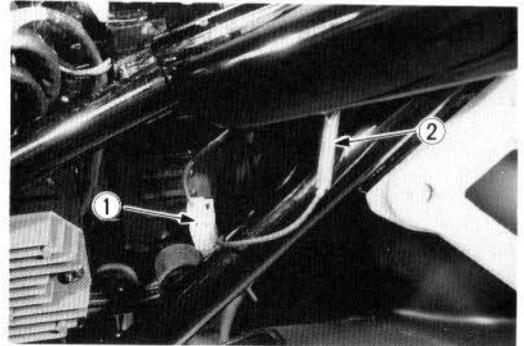


- Disconnect the starter motor lead wire.

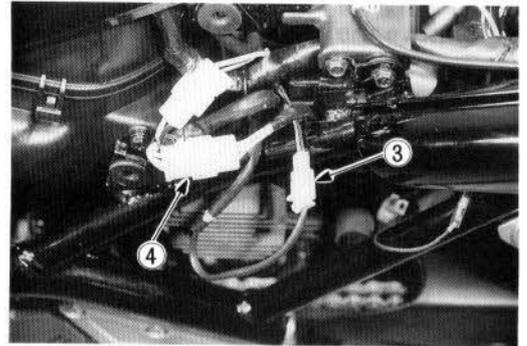


- Disconnect the various lead wires.

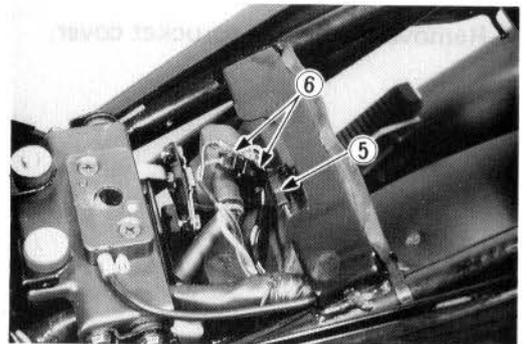
- ① Neutral switch
- ② Oil pressure switch



- ③ Signal generator
- ④ Generator



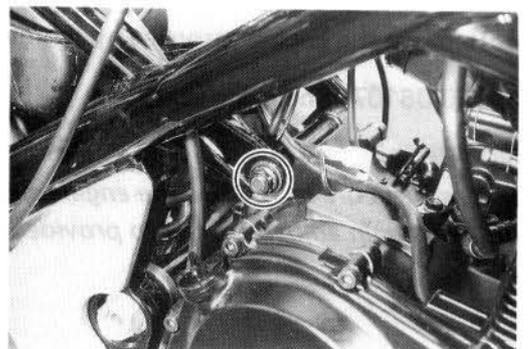
- ⑤ Battery ground
- ⑥ Side-stand switch

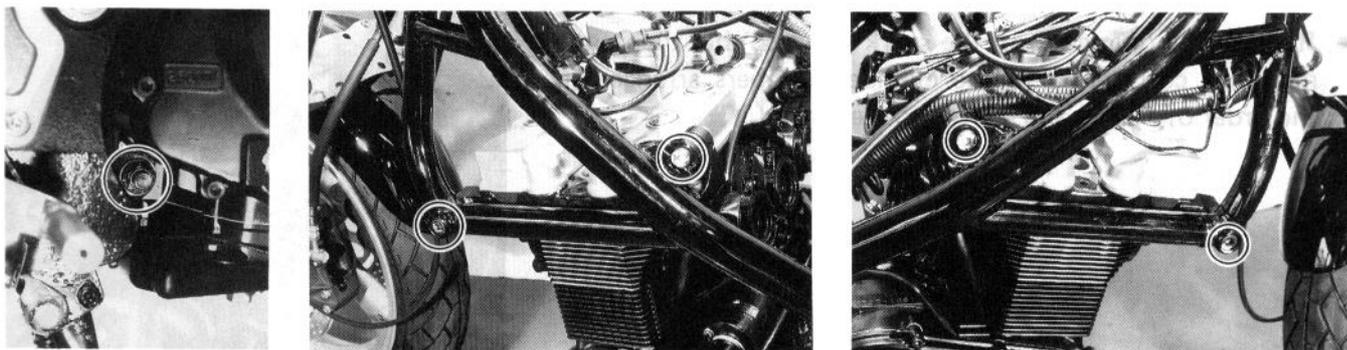


- Support the engine with a proper jack.
- Remove the engine mounting bolts and nuts.
- Gradually lower the engine assembly.

#### CAUTION:

When holding the engine with a jack, place a wooden piece on a jack or oil pan may be damaged.





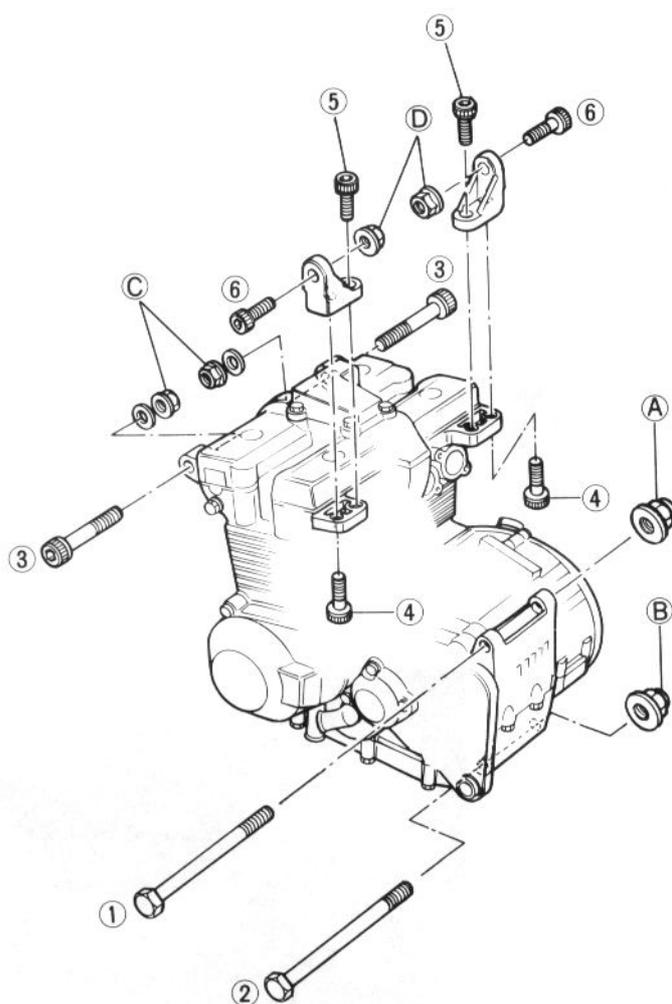
## ENGINE REINSTALLATION

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

- Insert the two long bolts from left side. Install the bolts, washers and nuts properly, as shown in the following illustration.

### NOTE:

*The engine mounting nuts are self-locking. 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.*



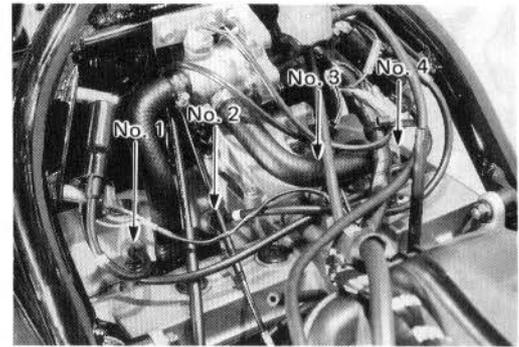
### BOLT LENGTH

|   |                 |
|---|-----------------|
| ① | 135 mm (5.3 in) |
| ② | 145 mm (5.7 in) |
| ③ | 70 mm (2.8 in)  |
| ④ | 30 mm (1.2 in)  |
| ⑤ | 25 mm (1.0 in)  |
| ⑥ | 30 mm (1.2 in)  |

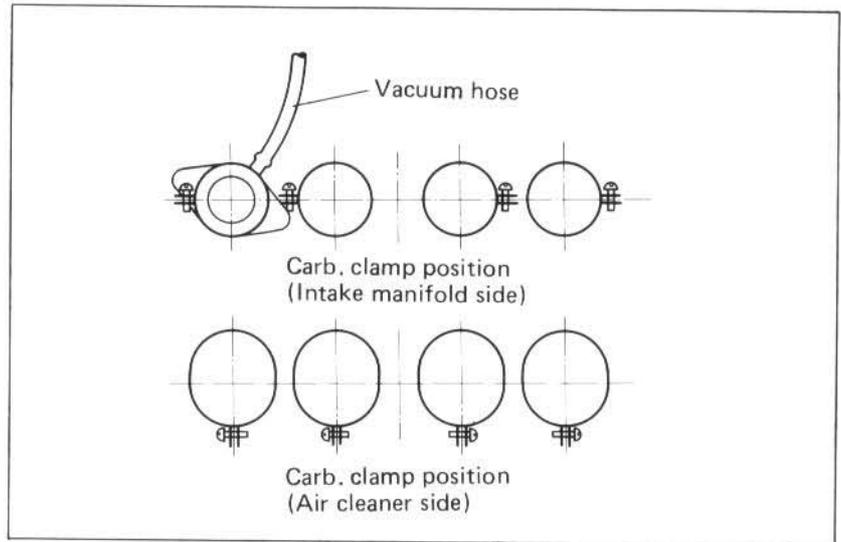
### TIGHTENING TORQUE

| ITEM     | N·m     | kg·m      | lb·ft       |
|----------|---------|-----------|-------------|
| Ⓐ Ⓑ<br>Ⓒ | 60 – 72 | 6.0 – 7.2 | 43.5 – 52.0 |
| ④ ⑤<br>Ⓓ | 22 – 30 | 2.2 – 3.0 | 16.0 – 21.5 |

- Replace the plug caps on the spark plugs so that their code markings correspond to the cylinder numbers arranged in the order of 1, 2, 3 and 4 from the left hand.



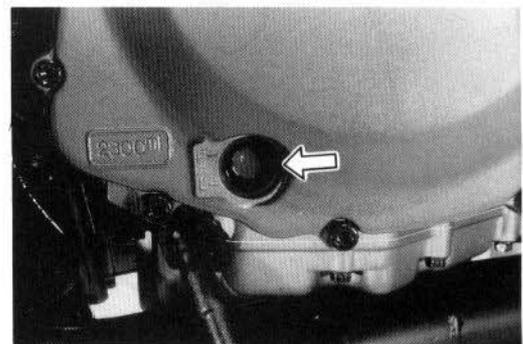
- Locate the carburetor clamps, as shown in the following illustration.



- After remounting the engine, route wiring harness, cables and hoses properly by referring to the sections, for wire routing, cable routing and hose routing. (See pages 8-12 through 20.)
- Adjust the following items to the specification.

|                                   | Page |
|-----------------------------------|------|
| * Filling coolant . . . . .       | 2-10 |
| * Clutch cable play . . . . .     | 2-10 |
| * Throttle cable play . . . . .   | 2-9  |
| * Idling adjustment . . . . .     | 2-9  |
| * Balancing carburetors . . . . . | 4-12 |
| * Drive chain . . . . .           | 2-11 |

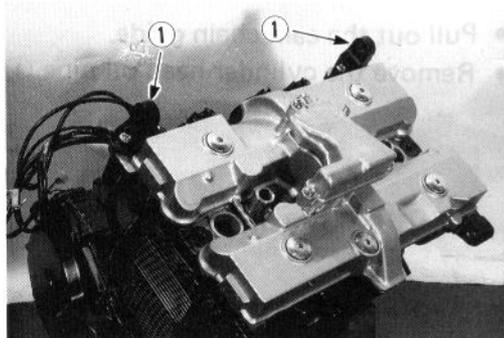
- Pour 3.2 L (3.4/2.8 US/Imp qt) of engine oil SAE 10W/40 graded SE or SF into the engine after overhauling engine.
- Start up the engine and allow it run for several minutes at idle speed. About several minutes after stopping engine, check that the oil level remains between the marks of oil level inspection window.



|               |                             |
|---------------|-----------------------------|
| Change        | 2300 ml (2.4/2.0 US/Imp qt) |
| Filter change | 2800 ml (3.0/2.5 US/Imp qt) |
| Overhaul      | 3200 ml (3.4/2.8 US/Imp qt) |

## ENGINE DISASSEMBLY

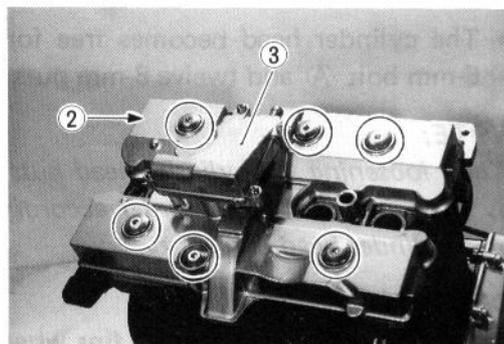
- Remove the engine mounting brackets ①.



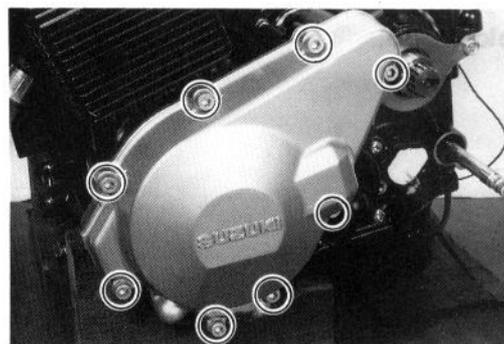
- Remove the cylinder head cover ②.

**NOTE:**

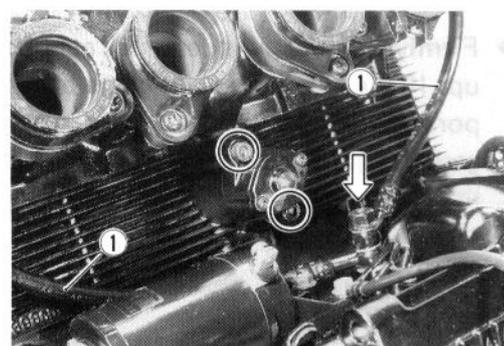
*When removing the cylinder head cover ②, do not remove the breather cover ③.*



- Remove the starter clutch cover.



- Remove the cam chain tensioner.
- Remove the left and right oil hoses ①.

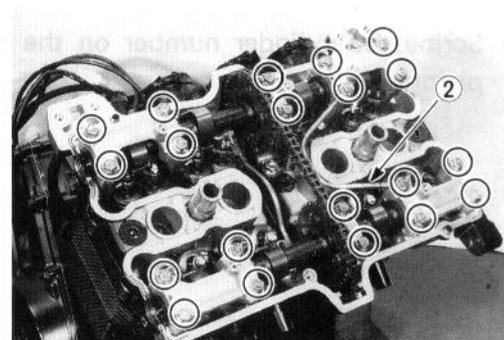


- Remove the camshaft journal holders and cylinder head oil pipe ②.

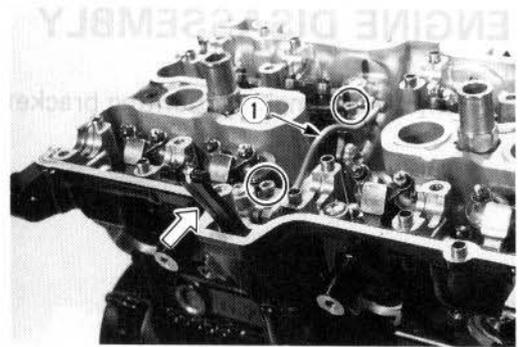
**NOTE:**

*Be sure to loosen camshaft journal holder bolts evenly by shifting the wrench diagonally.*

- Remove the two camshafts, intake and exhaust.



- Pull out the cam chain guide.
- Remove the cylinder head oil pipe ①.



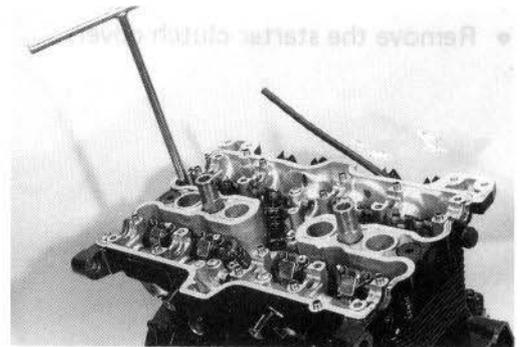
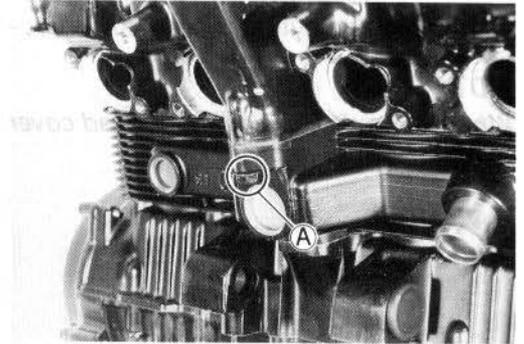
- The cylinder head becomes free for removal when its one 6-mm bolt (A) and twelve 8-mm nuts are removed.

**NOTE:**

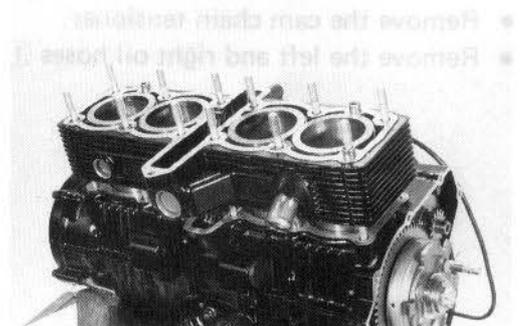
*When loosening the cylinder head nuts, loosen each nut little by little in a descending order according to the numbers cast on a cylinder head.*

**CAUTION:**

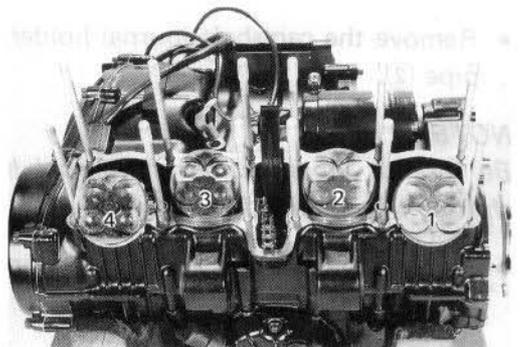
Be careful not to damage the fins when removing or handling the cylinder head. This precaution applies to the cylinder block also.



- Firmly grip the cylinder block at both ends, and lift it straight up. If the block does not come off, lightly tap on the finless portions of the block with a plastic mallet to make the gasketed joint loose.



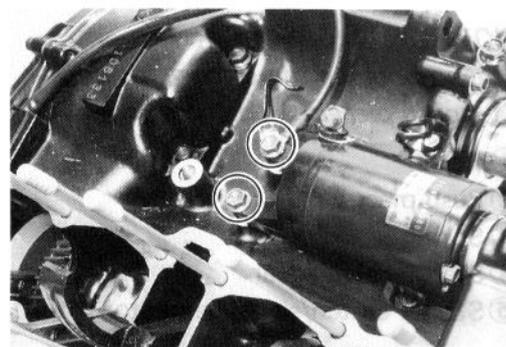
- Scribe the cylinder number on the head of the respective pistons.



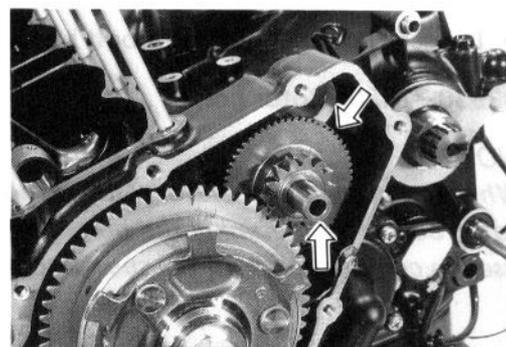
- Place a cloth beneath the piston so as not to drop any parts in the crankcase, and remove the circlip ① with long-nose pliers.
- Draw out the piston pin. Place each piston pin in the same piston as that it was removed from.



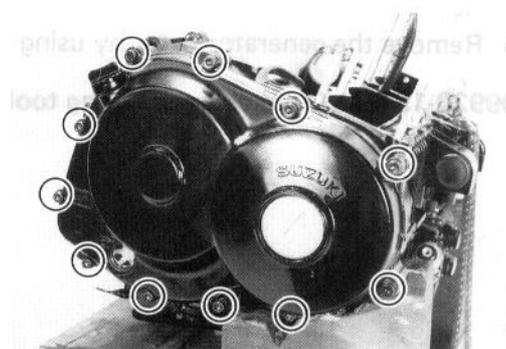
- Remove the starter motor.



- Remove the starter idle gear and its shaft.



- Remove the clutch cover.

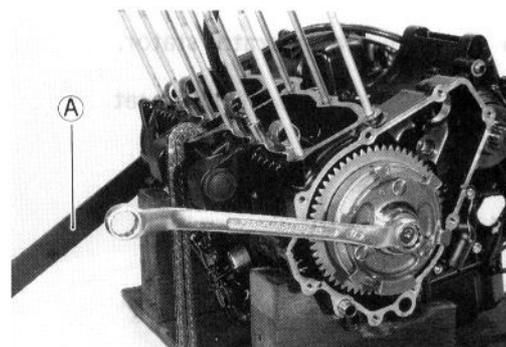


- Loosen the starter clutch mounting bolt by holding the generator rotor with the special tool ①.

**09930-32420: Rotor holder**

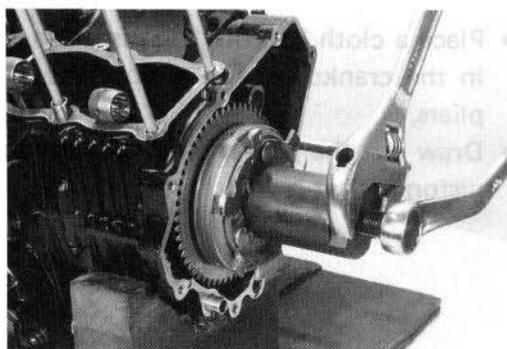
**NOTE:**

*When removing the starter clutch assembly from the crankshaft, do not remove the starter clutch mounting bolt after loosening the bolt. The starter clutch mounting bolt is used in conjunction with the special tool.*



- Remove the starter clutch/signal generator rotor assembly from the crankshaft by using the special tool.

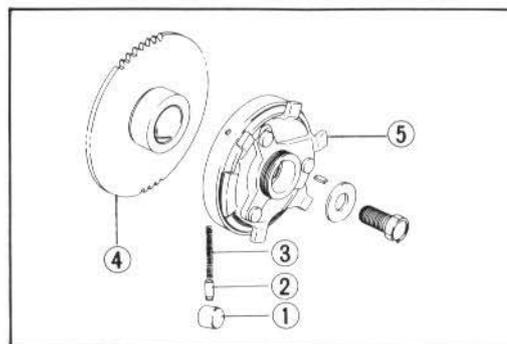
**09930-34960: Rotor remover**



**NOTE:**

*When removing the starter driven gear ④, do not lose rollers ①, push pieces ② and springs ③.*

- ① Roller
- ② Push piece
- ③ Spring
- ④ Starter driven gear
- ⑤ Starter clutch/signal generator rotor

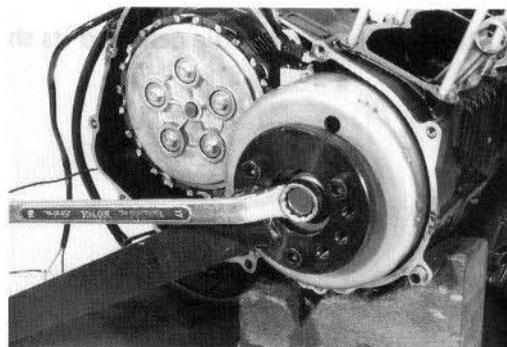


- Loosen the generator rotor bolt by using the special tool.

**09930-32420: Rotor holder**

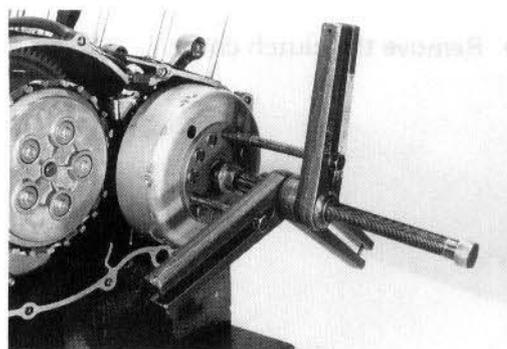
**NOTE:**

*When removing the generator rotor, do not remove the generator rotor bolt after loosening the bolt. The generator rotor bolt is used in conjunction with the special tool.*



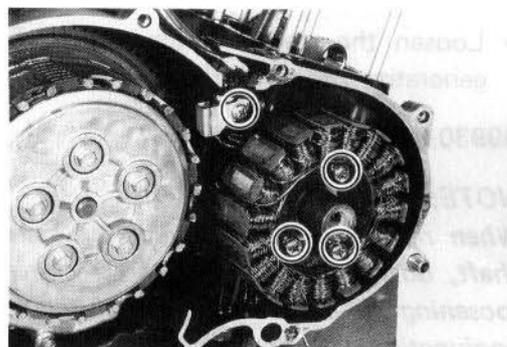
- Remove the generator rotor by using the special tool.

**09920-13120: Crankcase separating tool**

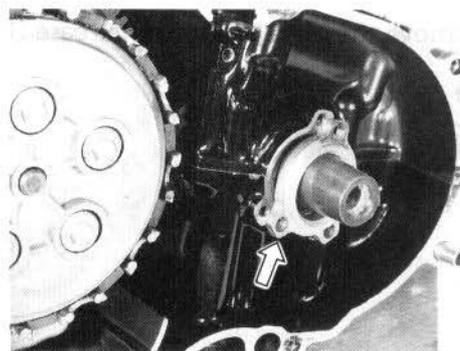


- Remove the generator stator.

**09900-09003: Impact driver set**



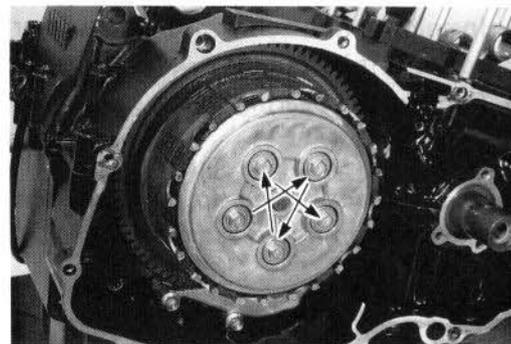
- Remove the generator stator spacer.



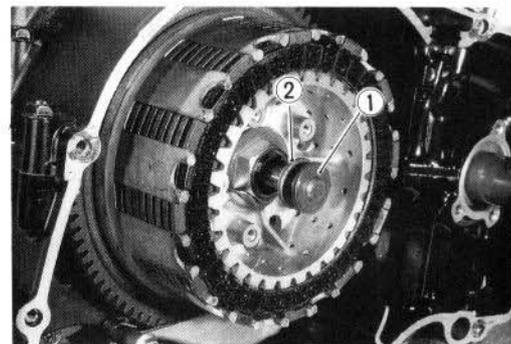
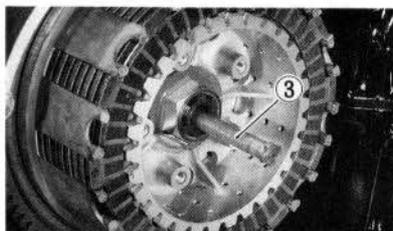
- Holding the conrod with a conrod stopper, remove the clutch spring set bolts diagonally.

**09910-20116: Conrod stopper**

- Remove the clutch pressure plate.



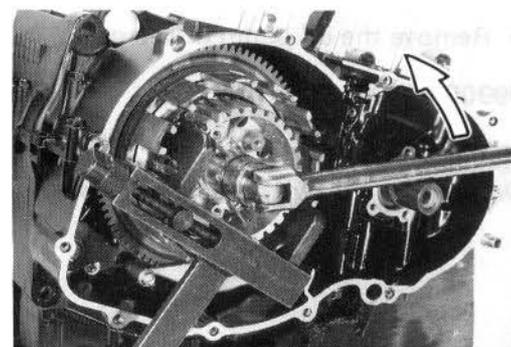
- Remove the thrust bearing ① and clutch push piece ②, and then remove the clutch push rods, ③ and ④.



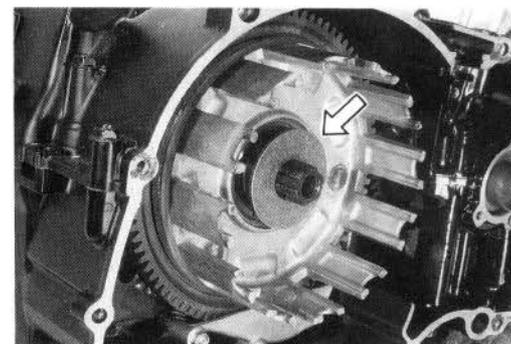
- After removal of clutch drive and driven plates, flatten the lock washer and remove the clutch sleeve hub nut by using the special tool.

**09920-53710: Clutch sleeve hub holder**

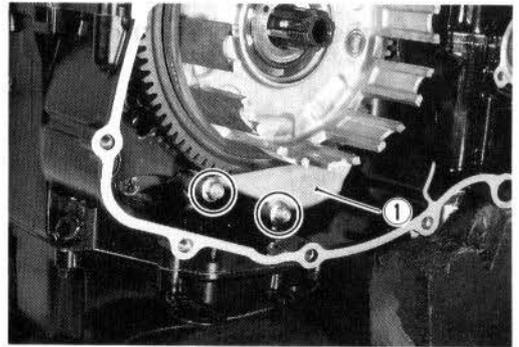
- Remove the clutch sleeve hub.



- Remove the thrust washer.



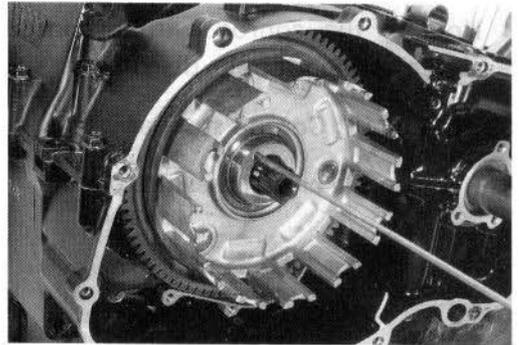
- Remove the oil separator outer case ①.



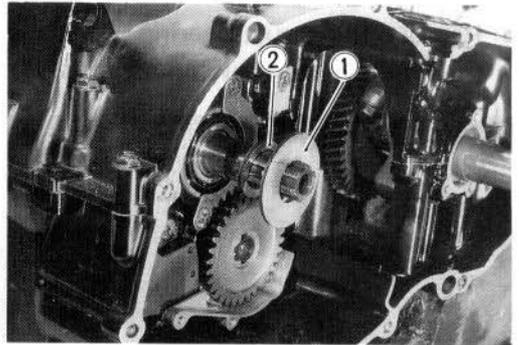
- Install a 4-mm screw into the primary driven gear spacer to ease out it by pulling.
- Remove the bearing.

**NOTE:**

*With the spacer removed, the primary driven gear is free to disengage from the primary drive gear.*



- Remove the thrust washers, ① and ②.

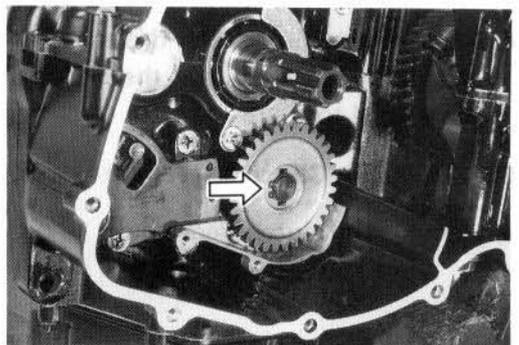


- Remove the oil pump driven gear.

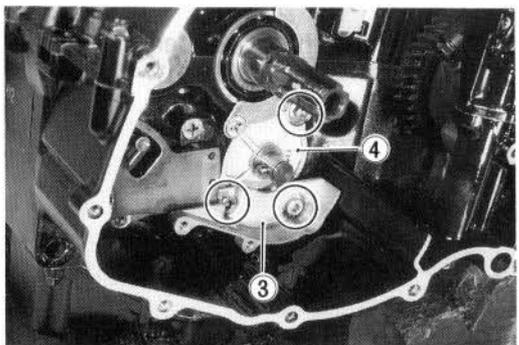
**09900-06107: Snap ring pliers**

**NOTE:**

*Do not lose the circlip, pin and washer.*

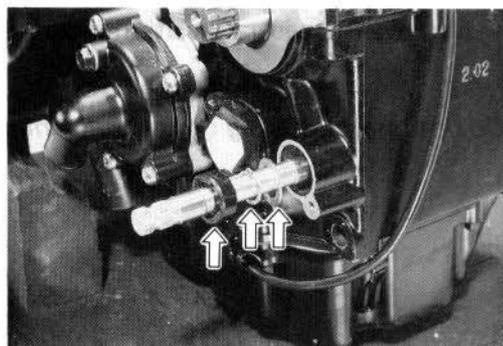


- Remove the oil separator inner case ③ and oil pump ④.

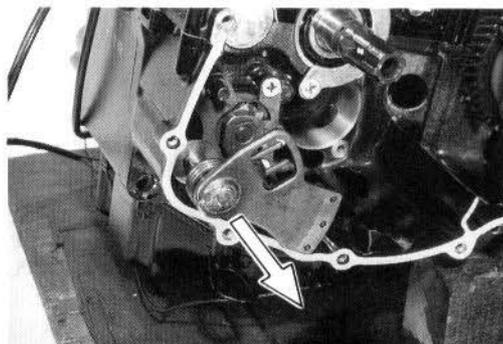


- Remove the gearshift shaft oil seal, circlip and washer.

**09900-06107: Snap ring pliers**



- Draw out the gearshift shaft.

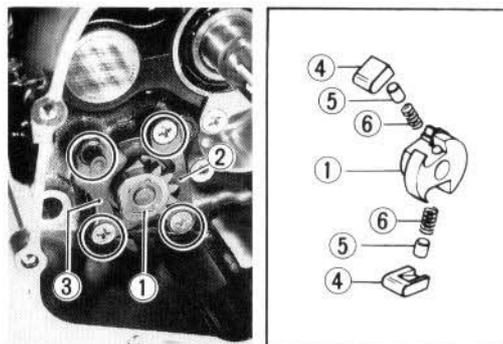


- Remove the cam driven gear ① by removing the cam guide ② and pawl lifter ③.

**09900-09003: Impact driver set**

**NOTE:**

*When removing the cam driven gear, do not lose the gear shifting pawl ④, pin ⑤ and spring ⑥.*

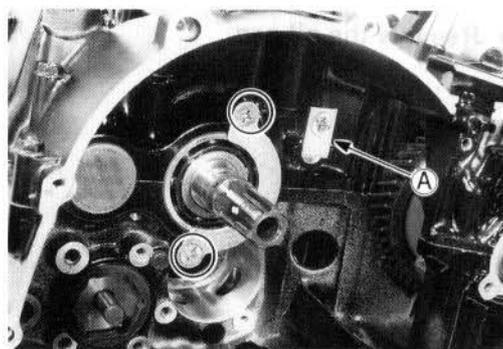


- Remove the countershaft bearing retainer.

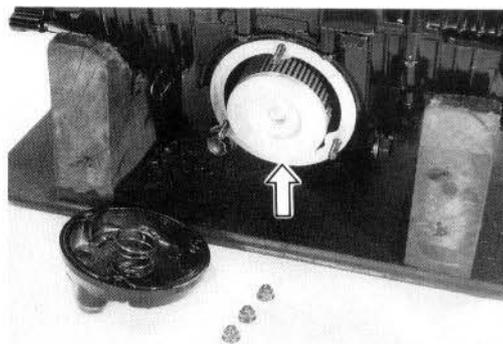
**09900-09003: Impact driver set**

**NOTE:**

*Do not remove the oil gallery plug retainer (A).*



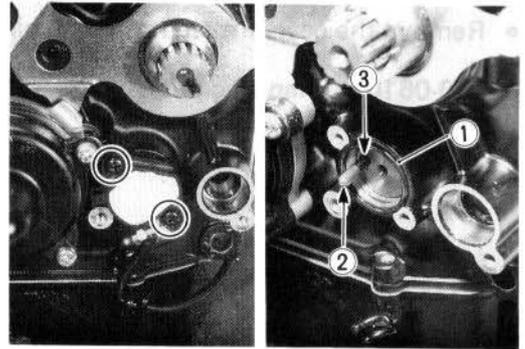
- Remove the oil filter cap and oil filter.



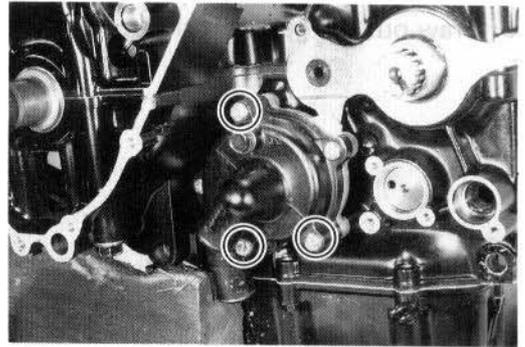
- Remove the neutral position indicator switch.

**NOTE:**

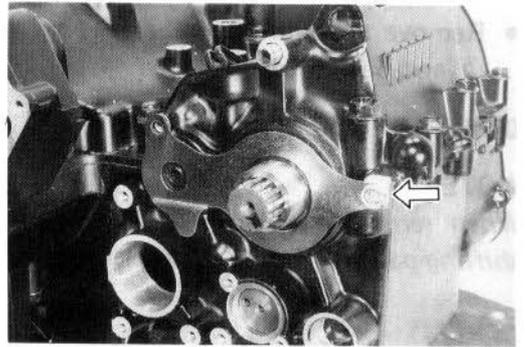
*Do not lose the O-ring ①, switch contact ② and its spring ③.*



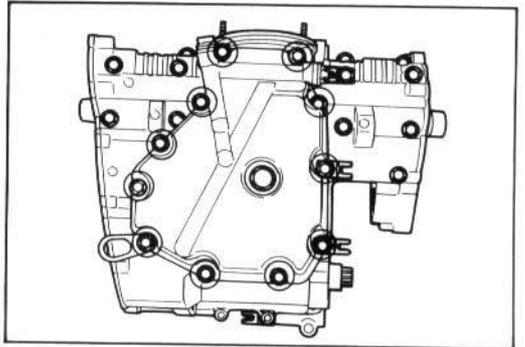
- Remove the water pump.



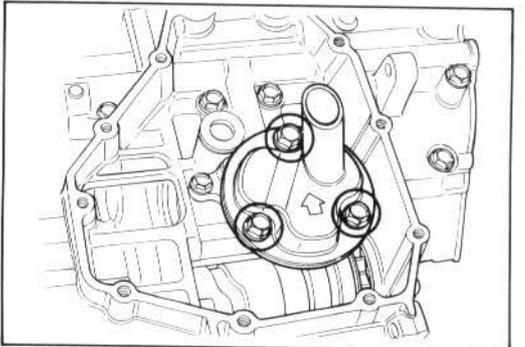
- Remove the oil seal retainer.



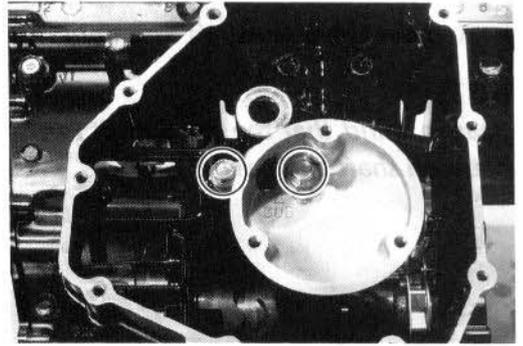
- Remove the oil pan.



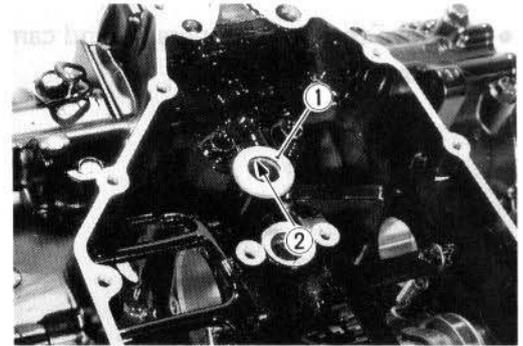
- Remove the oil sump filter.



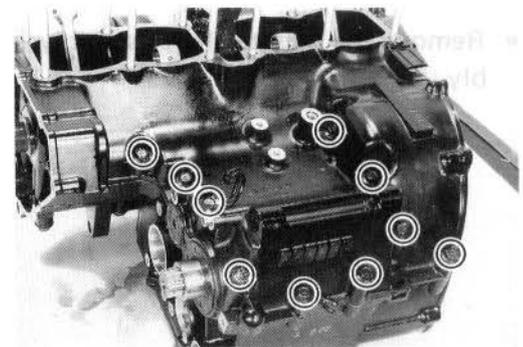
- Remove the oil sump filter guide and its O-ring.



- Remove the shim ① and O-ring ②.



- Remove the upper crankcase securing bolts.



- Remove the lower crankcase securing bolts.
- When removing the crankshaft tightening bolts, loosen them in the descending order of numbers assigned to these bolts.

**NOTE:**

Two allen bolts are used for tightening crankshaft at the portion ①.

**09914-25811: 6-mm "T" type hexagon wrench**

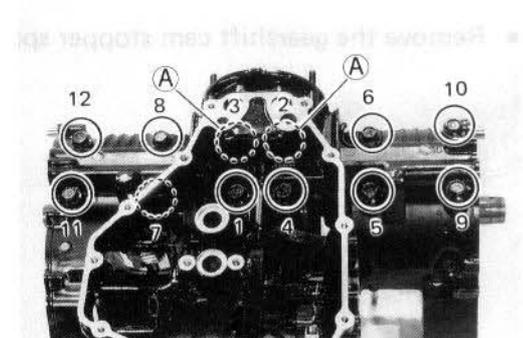
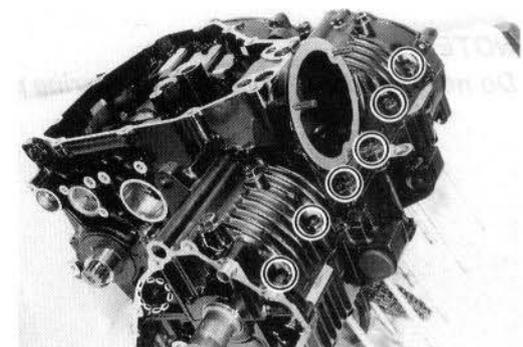
**09900-00410: Hexagon wrench set**

- Make sure that all bolts are removed without fail. Hammer lightly the lower crankcase side with a plastic hammer to separate the upper and lower crankcase halves and then lift the latter.

**09912-34510: Cylinder disassembler**

**CAUTION:**

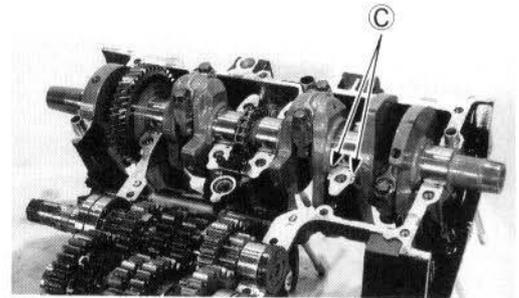
Do not drop the crankshaft journal bearings from the lower crankcase.



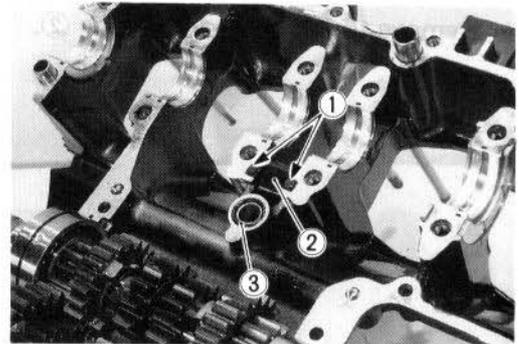
- Remove the crankshaft assembly from the upper crankcase.

**NOTE:**

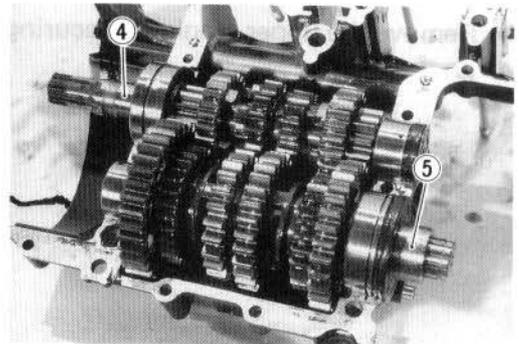
*Bear in mind that the crankshaft thrust bearings ③ are located between shaft and case.*



- Remove the two dampers ① and cam chain guide ②.
- Remove the O-ring ③.

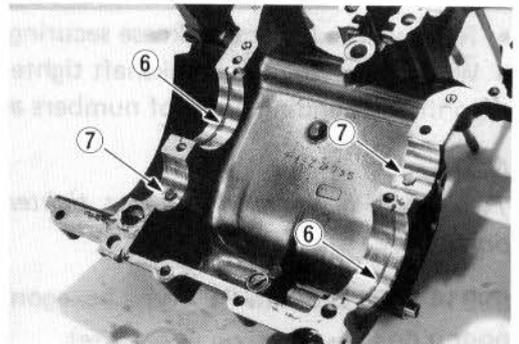


- Remove the countershaft assembly ④ and driveshaft assembly ⑤.

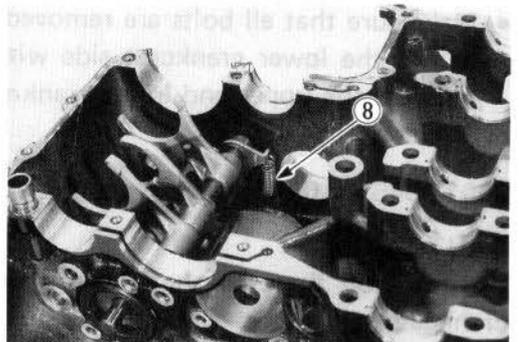


**NOTE:**

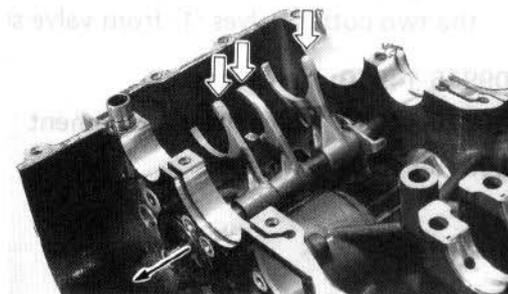
*Do not lose the C-rings ⑥ and bearing pins ⑦.*



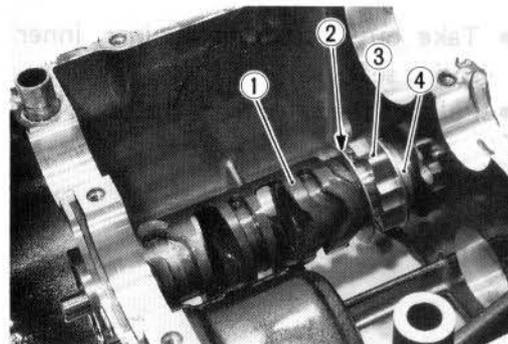
- Remove the gearshift cam stopper spring ⑧.



- Hold the gearshift forks by hand to draw out the gearshift fork shaft.



- Remove the gearshift cam ①, washer ②, gearshift cam stopper plate ③ and spacer ④.



## ENGINE COMPONENTS INSPECTION AND SERVICE

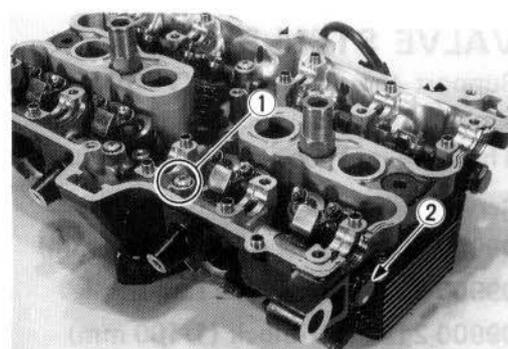
### CYLINDER HEAD

#### CAUTION:

Be sure to identify each removed part as to its location, and lay the parts out in groups designated as "No. 1", "No. 2", "Exhaust", "Inlet", so that each will be restored to the original location during assembly.

#### NOTE:

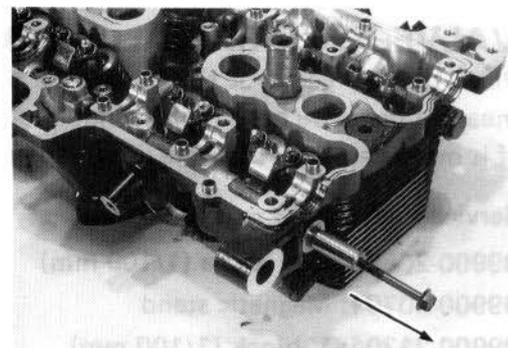
- \* When removing the rocker arm shaft, remove the rocker arm shaft set screw ① and plug ②, screw a 6 mm bolt into the rocker arm shaft end and pull it out.
- \* Removal of valves completes ordinary disassembling work. If valve guides have to be removed (for replacement after inspecting related parts) carry out the steps shown in valve guide servicing.
- \* When installing the rocker arm shaft, apply SUZUKI MOLY PASTE to its surface.
- \* Tighten the set screw ① and plug ② to the specified torque.



#### Tightening torque

Set screw ①: 8 – 10 N·m (0.8 – 1.0 kg-m, 6.0 – 7.0 lb-ft)

Plug ②: 25 – 30 N·m (2.5 – 3.0 kg-m, 18.0 – 21.5 lb-ft)

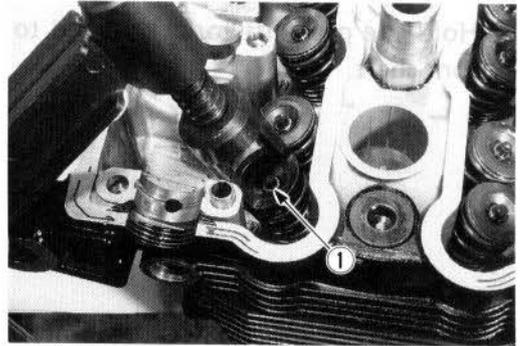


- Using special tools, compress the valve springs and take off the two cotter halves ① from valve stem.

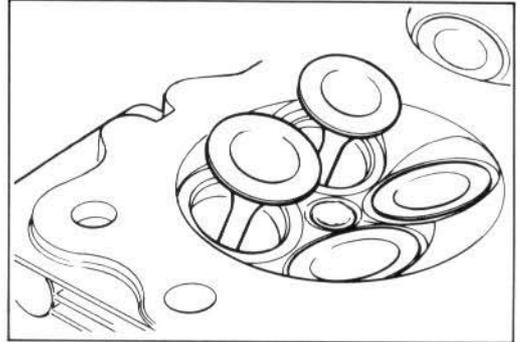
09916-14510: Valve lifter

09916-14910: Valve lifter attachment

09916-84510: Tweezers



- Take out the spring retainer, inner and outer springs and spring seat.
- Pull out the valve from the other side.



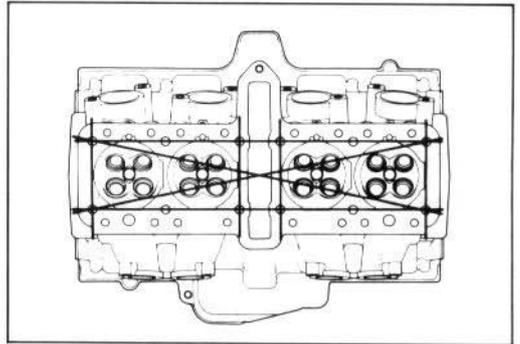
## CYLINDER HEAD DISTORTION

Remove the carbon deposits.

Check the gasketed surface of the cylinder head for distortion with a straightedge and thickness gauge, taking a clearance reading at several places indicated. If the largest reading at any position of the straightedge exceeds the limit, replace the cylinder head.

09900-20803: Thickness gauge

Service Limit: 0.2 mm (0.008 in)



## VALVE STEM RUNOUT

Support the valve with "V" blocks, as shown, and check its runout with a dial gauge.

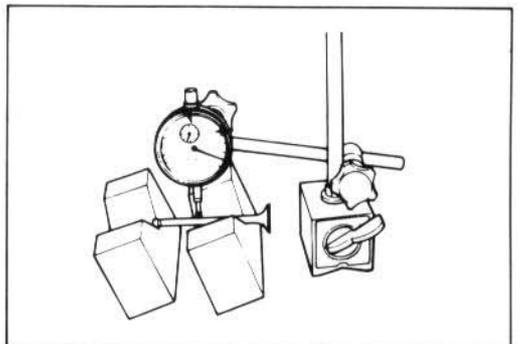
The valve must be replaced if the runout exceeds the limit.

Service Limit: 0.05 mm (0.002 in)

09900-20606: Dial gauge (1/100 mm)

09900-20701: Magnetic stand

09900-21304: V-block (1/100 mm)



## VALVE HEAD RADIAL RUNOUT

Place the dial gauge at right angles to the valve head face, and measure the valve head radial runout.

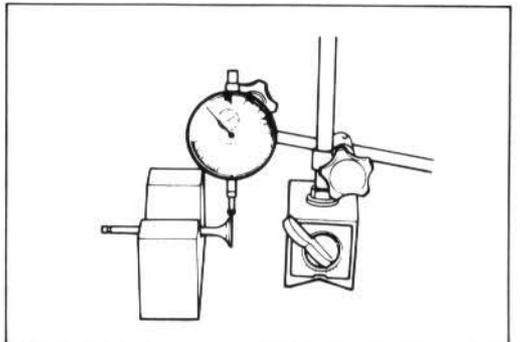
If it measures more than the limit, replace the valve.

Service Limit: 0.03 mm (0.001 in)

09900-20606: Dial gauge (1/100 mm)

09900-20701: Magnetic stand

09900-21304: V-block (1/100 mm)

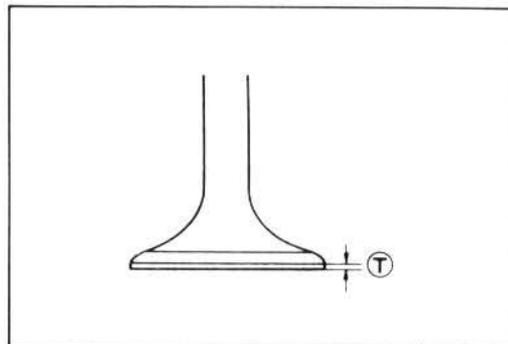


## VALVE FACE WEAR

Visually inspect each valve for wear of its seating face. Replace any valve with an abnormally worn face.

The thickness  $\text{T}$  decreases as the wear of the face advances. Measure the thickness and, if the thickness is found to have been reduced to the limit, replace it.

**Service Limit**  $\text{T}$ : 0.5 mm (0.02 in)



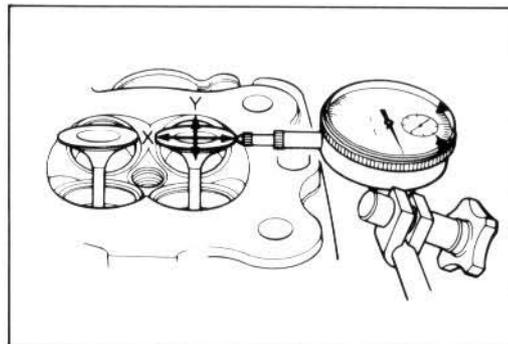
## VALVE STEM DEFLECTION

Lift the valve about 10 mm (0.39 in) from the valve seat. Measure the valve stem deflection in two directions, "X" and "Y", perpendicular to each other, by positioning the dial gauge as shown. If the deflection measured exceeds the limit, (see below) then determine whether the valve or the guide should be replaced with a new one.

**Service Limit**

**Intake valves** : 0.35 mm (0.014 in)

**Exhaust valves**: 0.35 mm (0.014 in)



## VALVE STEM WEAR

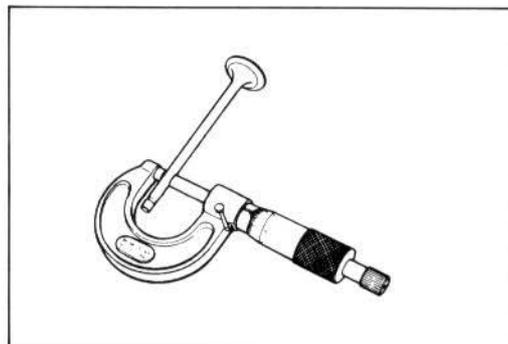
If the valve stem is worn down to the limit, as measured with a micrometer, where the clearance is found to be in excess of the limit indicated, replace the valve; if the stem is within the limit, then replace the guide. After replacing valve or guide, be sure to recheck the clearance.

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

**Standard**

**Intake valves** : 4.460 – 4.475 mm (0.1756 – 0.1762 in)

**Exhaust valves**: 4.445 – 4.460 mm (0.1750 – 0.1756 in)



## VALVE GUIDE SERVICING

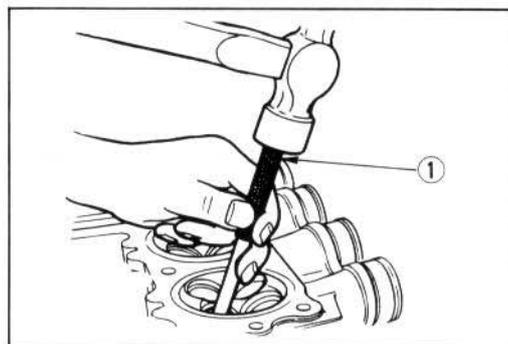
- Using the valve guide remover  $\text{1}$ , drive the valve guide out toward intake or exhaust camshaft side.

**09916-43210: Valve guide remover/installer**

**NOTE:**

\* *Discard the removed valve guide subassemblies.*

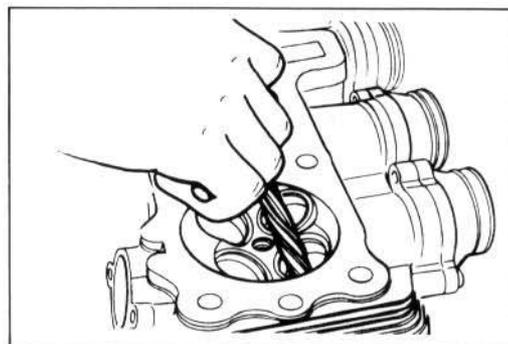
\* *Only oversized valve guides are available as replacement parts. (Part No. 11115-32C70)*



- Re-finish the valve guide holes in cylinder head with the reamer and handle.

**09916-34580: Valve guide reamer**

**09916-34542: Reamer handle**



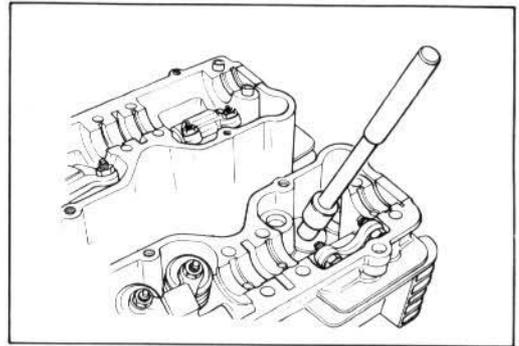
- Oil the stem hole, too, of each valve guide and drive the guide into the guide hole with the valve guide installer.

09916-43210: Valve guide remover/installer

09916-43220: Attachment

**CAUTION:**

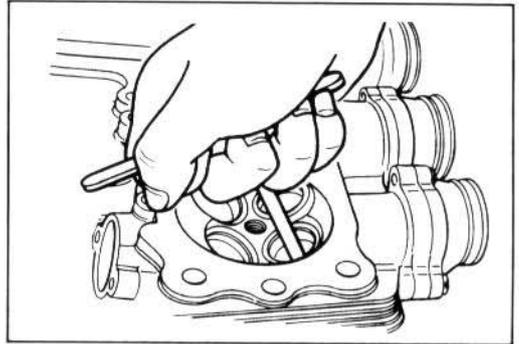
Failure to oil the valve guide hole before driving the new guide into place may result in a damaged guide or head.



- After fitting the valve guides, re-finish their guiding bores with the reamer. Be sure to clean and oil the guides after reaming.

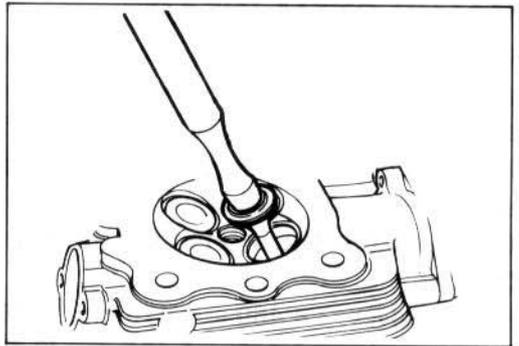
09916-33210: Valve guide reamer

09916-34542: Reamer handle



### VALVE SEAT WIDTH

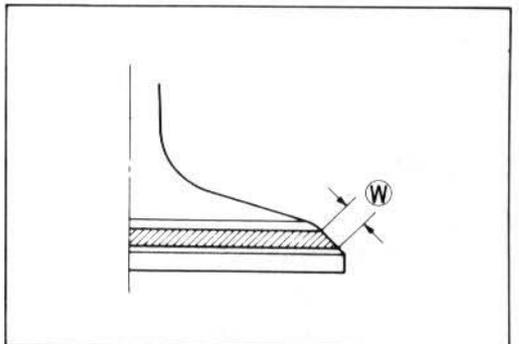
- Coat the valve seat with prussian blue uniformly. Fit the valve and tap the coated seat with the valve face in a rotating manner, in order to obtain a clear impression of the seating contact. In this operation, use the valve lapper to hold the valve head.
- The ring-like dye impression left on the valve face must be continuous-without any break. In addition, the width of the dye ring, which is the visualized seat "width", must be within the following specification:



**Standard**

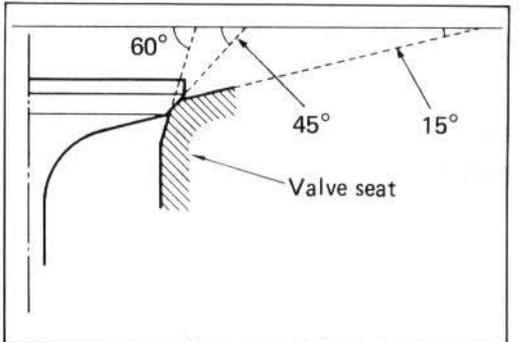
Valve seat width  $\text{W}$  : 0.7 – 0.9 mm (0.03 – 0.04 in)

If either requirement is not met, correct the seat by servicing it as follows:



### VALVE SEAT SERVICING

The valve seats for both intake and exhaust valves are machined to three different angles. The seat contact surface is cut 45°.



|     | Intake side | Exhaust side |
|-----|-------------|--------------|
| 45° | N-122       | N-131        |
| 15° | N-121       | N-130        |
| 60° | N-111       | N-111        |

(For U.S.A. model)

Valve seat cutter: (N-121),(N-122),(N-130),(N-131) and (N-111)

Solid pilot : (N-100-4.5)

(For the other models)

09916-20610: Valve seat cutter (N-121)

09916-20620: Valve seat cutter (N-122)

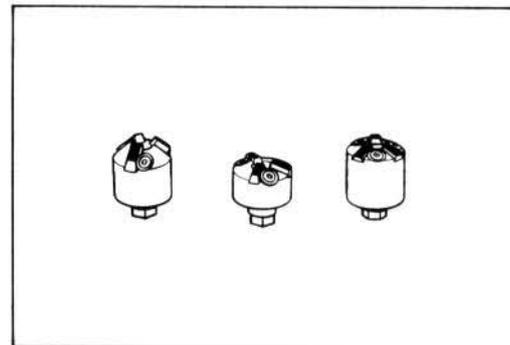
09916-24460: Valve seat cutter (N-130)

09916-24470: Valve seat cutter (N-131)

09916-24410: Valve seat cutter (N-111)

09916-20640: Solid pilot (N-100-4.5)

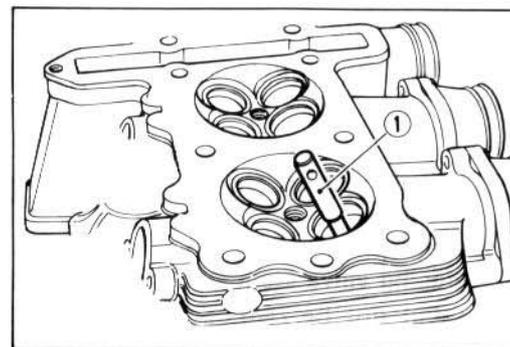
09916-21110: Valve seat cutter set



**NOTE:**

*The valve seat contact area must be inspected after each cut.*

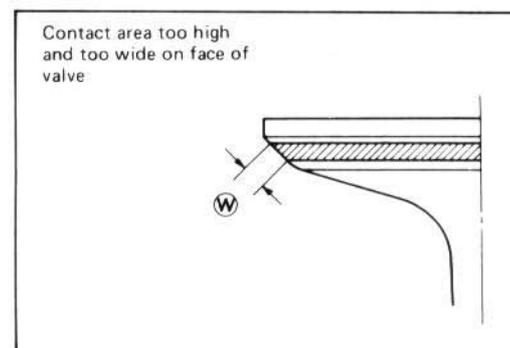
- Insert the solid pilot ① with a slight rotation. Seat the pilot snugly. Install the 45° cutter, attachment and T-handle.
- Using the 45° cutter, descale and clean up the seat with one or two turns.
- Inspect the seat by the previously described seat width measurement procedure. If the seat is pitted or burned, additional seat conditioning with the 45° cutter is required.



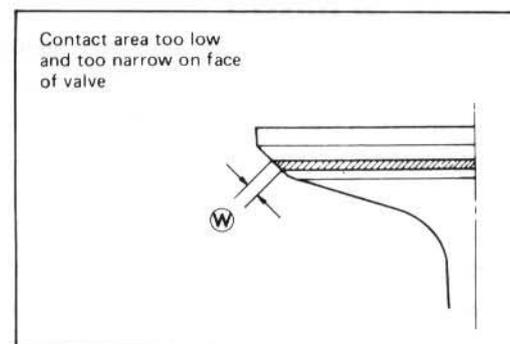
**NOTE:**

*Cut only the minimum amount necessary from the seat to prevent the possibility of the valve stem becoming too close to the rocker arm for correct valve contact angle.*

If the contact area is too high on the valve, or if it is too wide, use the 15°/60° cutter to lower and narrow the contact area.



If the contact area is too low or too narrow, use the 45° cutter to raise and widen the contact area.



- After the desired seat position and width is achieved, use the 45° cutter very lightly to clean up any burrs caused by the previous cutting operations.

**CAUTION:**

**DO NOT** use lapping compound after the final cut is made. The finished valve seat should have a velvety smooth finish and not a highly polished or shiny finish. This will provide a soft surface for the final seating of the valve which will occur during the first few seconds of engine operation.

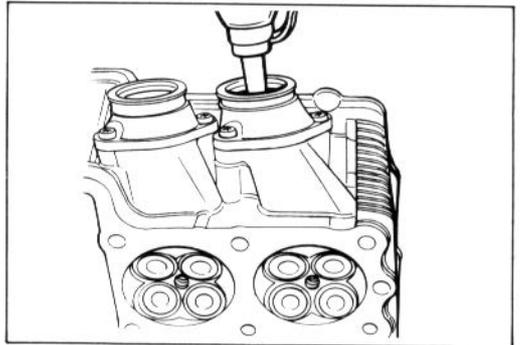
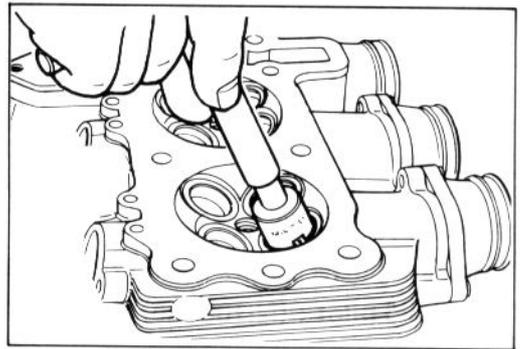
- Clean and assemble the head and valve components. Fill the intake and exhaust ports with gasoline to check for leaks. If any leaks occur, inspect the valve seat and face for burrs or other things that could prevent the valve from sealing.

**WARNING:**

Always use extreme caution when handling gasoline.

**NOTE:**

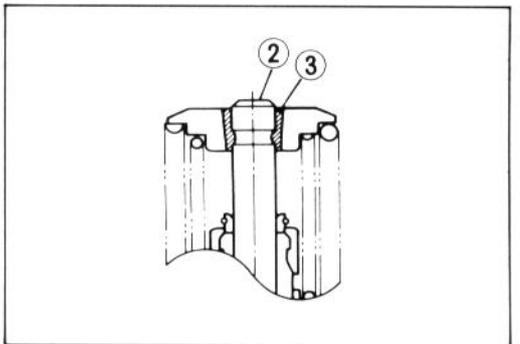
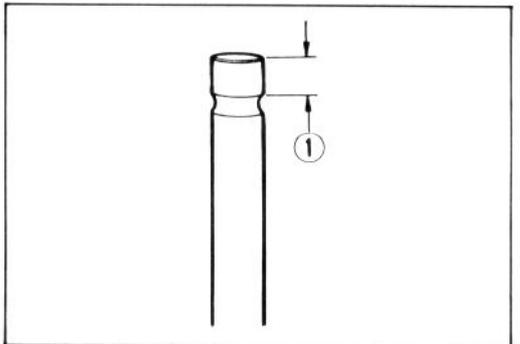
After servicing the valve seats, be sure to adjust the valve clearance after the cylinder head has been reinstalled. (see page 2-5.)



## VALVE STEM END CONDITION

**CAUTION:**

- \* Refacing valve stem end face is permissible where the length ① will not be reduced to less than 2.7 mm. If this length becomes shorter than 2.7 mm, then the valve must be replaced.
- \* After installing the valve whose stem end has been ground off as above, check that the face ② of valve stem end is above the valve cotter ③.



## VALVE SPRINGS

The force of the two coil springs keeps the valve seat tight. Weakened springs result in reduced engine power output, and often account for the chattering noise coming from the valve mechanism.

Check the valve springs for proper strength by measuring their free lengths and also by the force required to compress them. If the spring length is less than the service limit, or if the force required to compress the spring does not fall within the range specified, replace both the inner and outer springs as a set.

**CAUTION:**

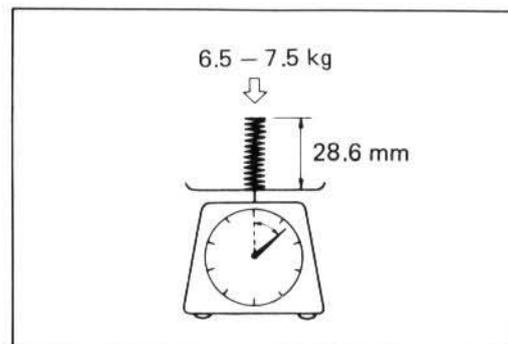
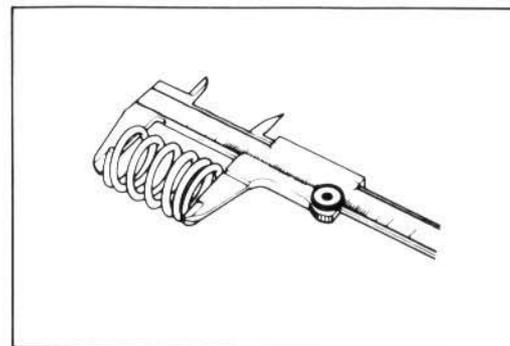
Replace both valve springs, inner and outer, at a time, if any one of these is found to be beyond the limit.

**Valve spring free length**

Service Limit INNER : 32.6 mm (1.28 in)  
 OUTER: 37.3 mm (1.47 in)

**Valve spring tension**

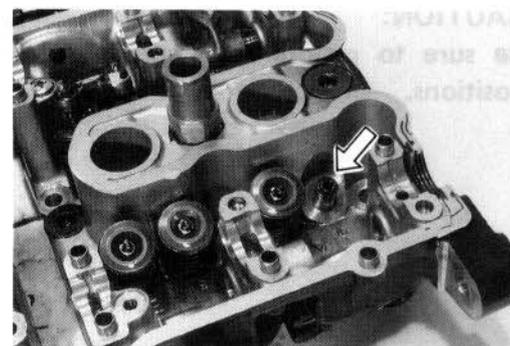
INNER : 6.5 – 7.5 kg/28.6 mm  
 Standard (14.3 – 16.5 lbs/1.13 in)  
 OUTER: 8.8 – 10.2 kg/31.6 mm  
 (19.4 – 22.5 lbs/1.24 in)

**REASSEMBLY**

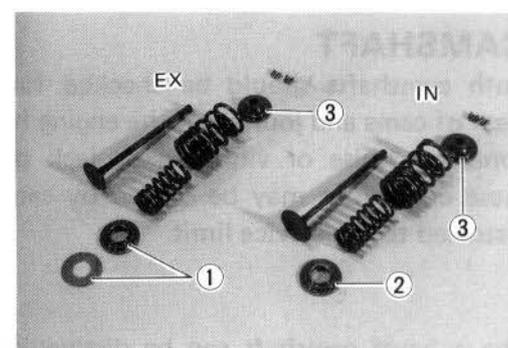
- Oil each oil seal, and press-fit them into position with the finger tip.

**CAUTION:**

Do not reuse the oil seals.



- Install the valve spring lower seats, ① (for exhaust) and ② (for intake). Be careful not to confuse the lower seat with the spring retainer ③.

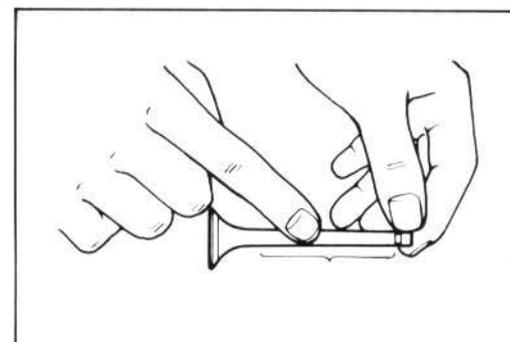


- Insert the valves, with their stems coated with high quality molybdenum disulfide lubricant (SUZUKI MOLY PASTE) all around and along the full stem length without any break.

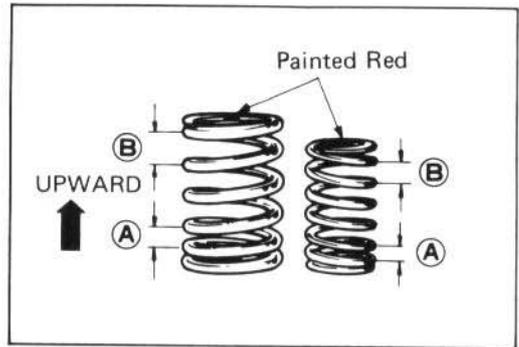
**CAUTION:**

When inserting each valve, take care not to damage the lip of the stem seal.

99000-25140: SUZUKI MOLY PASTE



- Install the valve springs with the small-pitch portion (A) facing cylinder head. (B) Large-pitch portion.



- Put on the valve spring retainer and, using the valve lifter, press down the springs, fit the cotter halves to the stem end, and release the lifter to allow the cotter (1) to wedge in between retainer and stem. Be sure that the rounded lip (2) of the cotter fits snugly into the groove (3) in the stem end.

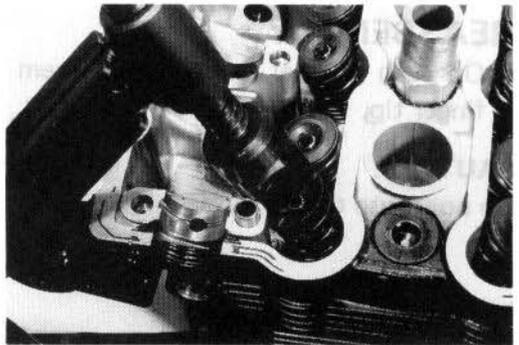
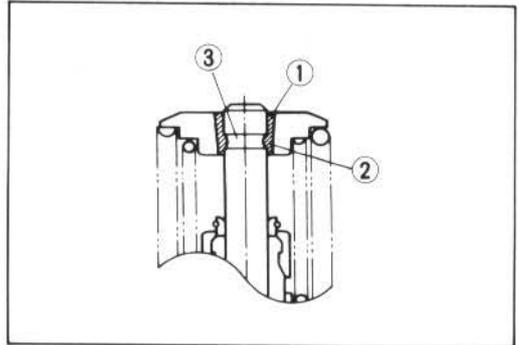
09916-14510: Valve lifter

09916-14910: Valve lifter attachment

09916-84510: Tweezers

**CAUTION:**

Be sure to restore each spring and valve to their original positions.

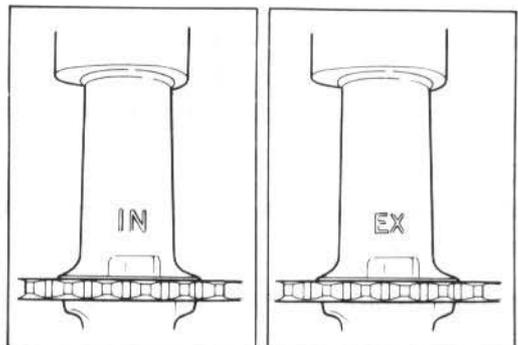
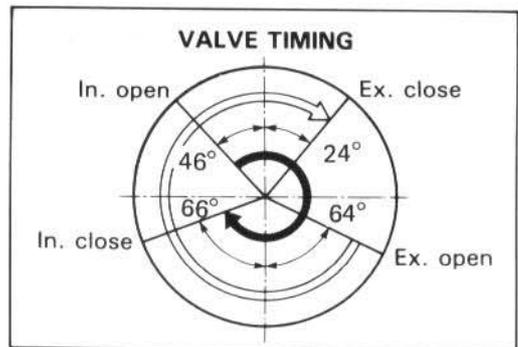
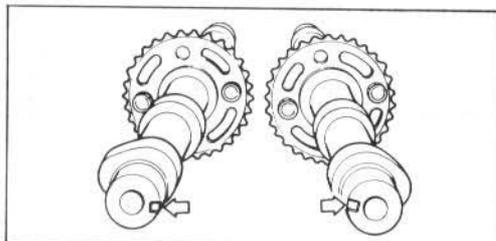


**CAMSHAFT**

Both camshafts should be checked for runout and also for wear of cams and journals if the engine has been noted as giving abnormal noise or vibration or lack power output. Any of these conditions may be caused by camshafts worn down or distorted to the service limit.

The exhaust camshaft can be distinguished from that of the intake by the embossed letters "EX" (for exhaust) as against letters "IN" (for intake).

Similarly, the right end can be distinguished by the notch from the left end.



## CAM WEAR

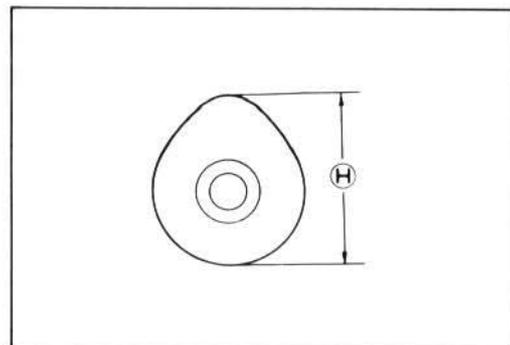
Worn-down cams are often the cause of mistimed valve operation resulting in reduced power output.

The limit of cam wear is specified for both intake and exhaust cams in terms of cam height  $\text{H}$ , which is to be measured with a micrometer. Replace camshafts if found worn down to the limit.

**09900-20202: Micrometer (25 – 50 mm)**

**Cam height  $\text{H}$**

**Service Limit** Intake cams : 32.840 mm (1.2929 in)  
Exhaust cams: 32.540 mm (1.2811 in)



## CAMSHAFT JOURNAL WEAR

Determine whether or not each journal is worn down to the limit by measuring the oil clearance with the camshaft installed in place. Use plastigauge  $\text{①}$  to read the clearance at the widest portion, which is specified as follows:

**Camshaft-Journal oil clearance (IN & EX)**

**Service Limit: 0.150 mm (0.0059 in)**

**09900-22301: Plastigauge**

**NOTE:**

*Install each holder to their original positions. (See page 3-60.)*

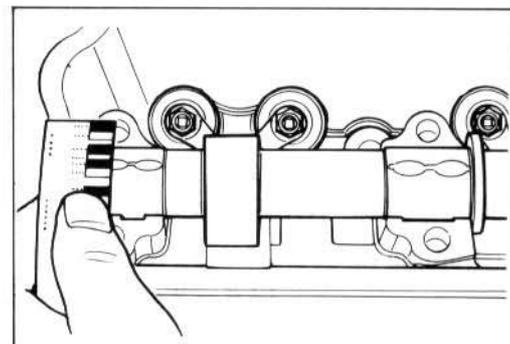
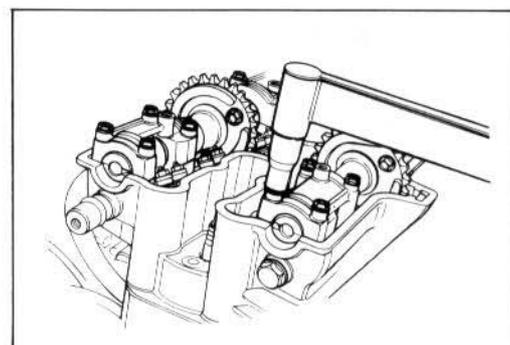
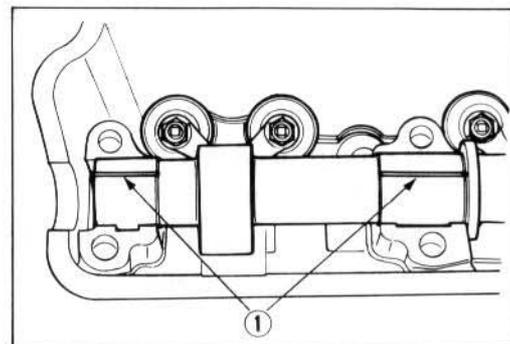
Tighten the camshaft holder bolts evenly and diagonally to the specified torque.

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

**NOTE:**

*Do not rotate the camshafts with plastigauge in place.*

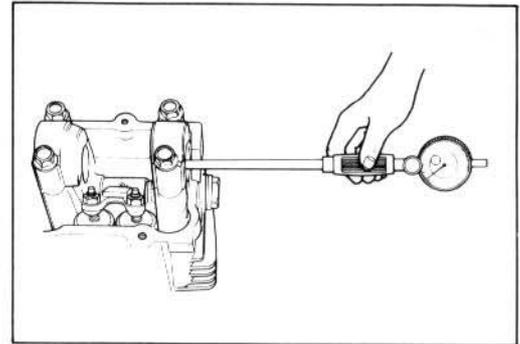
Remove the camshaft holders, and read the width of compressed plastigauge with envelope scale. This measurement should be taken at the widest part.



If the camshaft journal oil clearance measured exceed the limit, measure the inside diameter of camshaft journal holder and outside diameter of the camshaft journal. Replace the camshaft or cylinder head depending upon which one exceeds the specification.

**Standard**

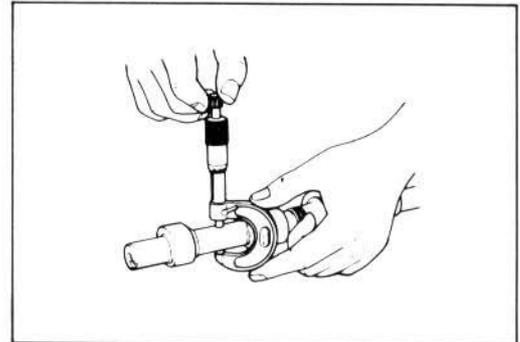
Journal holder I.D. (IN & EX): 22.012 – 22.025 mm  
(0.8666 – 0.8671 in)



09900-20205: Micrometer (0 – 25 mm)

**Standard**

Camshaft journal O.D. (IN & EX): 21.959 – 21.980 mm  
(0.8645 – 0.8654 in)



**CAMSHAFT RUNOUT**

Measure the runout with a dial gauge. Replace the camshaft if the runout exceeds the limit.

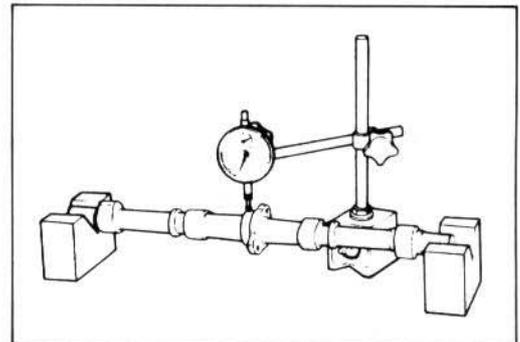
Camshaft runout (IN & EX)

Service Limit: 0.1 mm (0.004 in)

09900-20606: Dial gauge (1/100 mm, 10 mm)

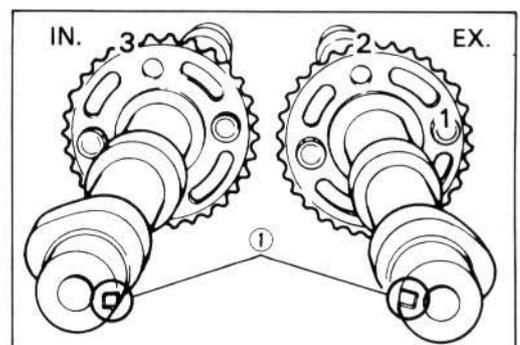
09900-20701: Magnetic stand

09900-21304: V-block (100 mm)



**CAM SPROCKET**

The fixed position of each cam sprocket on each camshaft is determined by arrow mark "3" (on INTAKE sprocket) or arrow marks "1" and "2" (on EXHAUST sprocket) located (as shown) in reference to the notch ① in the right end of each camshaft.

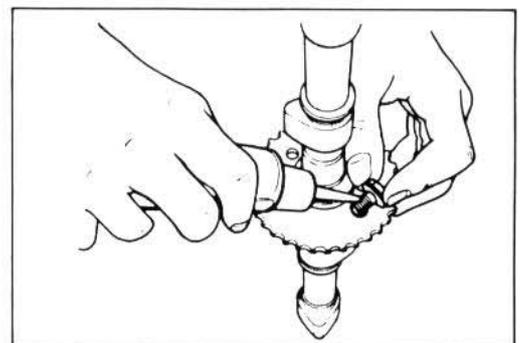


**REASSEMBLY**

- Apply THREAD LOCK SUPER "1303" to the threads of cam sprocket bolts, and tighten them to the following torque value:

99000-32030: THREAD LOCK SUPER "1303"

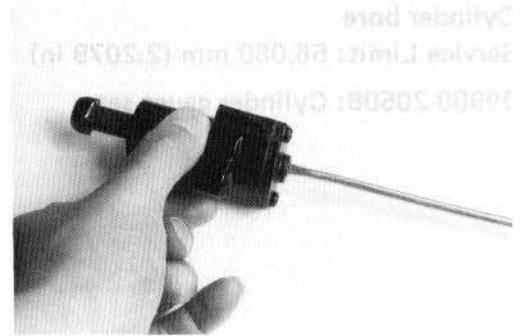
Tightening torque: 24 – 26 N·m  
(2.4 – 2.6 kg-m, 17.5 – 19.0 lb-ft)



## CAM CHAIN TENSIONER

The cam chain is maintained at the proper tension by an automatically adjusted tensioner.

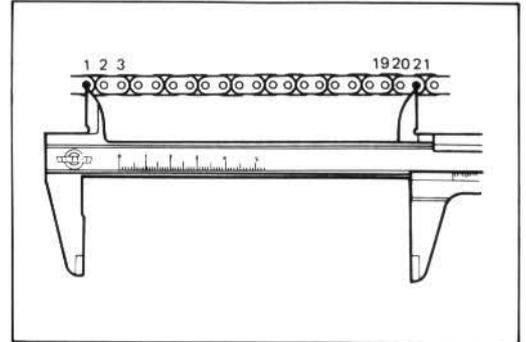
Insert the ⊖ screwdriver into the slotted end of cam chain tensioner and turn the ⊖ screwdriver clockwise to lessen the tension and release the ⊖ screwdriver from the cam chain tensioner, to make sure the push rod movement. If the push rod is stuck or spring mechanism failed, replace the cam chain tensioner assembly with a new one.



## CAM CHAIN 20-PITCH LENGTH

Pull the chain tight to remove any slack, then using vernier calipers, measure the 20-pitch length of cam chain. If it measures more than the limit, replace the cam chain.

**Service Limit: 143.0 mm (5.63 in)**

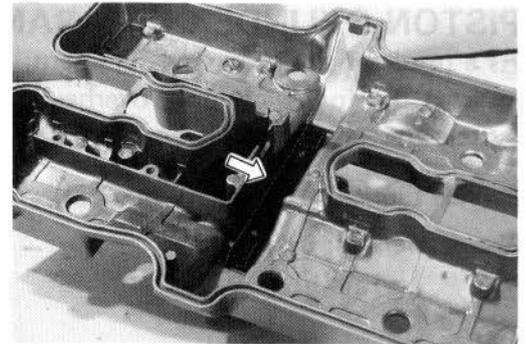


## CAM CHAIN GUIDE

### NOTE:

When replacing the cam chain guide, apply SUZUKI THREAD LOCK SUPER "1303" to threads of screw.

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



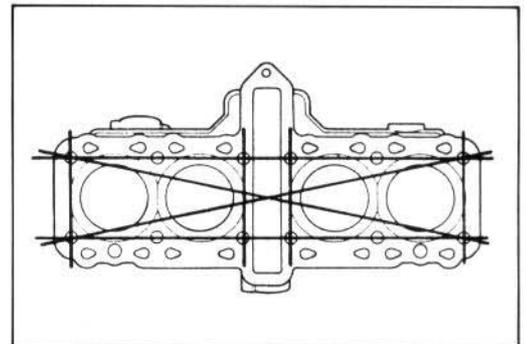
## CYLINDER DISTORTION

Check the gasketed surface of the cylinder for distortion with a straightedge and thickness gauge, taking a clearance reading at several places as indicated. If the largest reading at any position of the straightedge exceeds the limit, replace the cylinder.

**09900-20803: Thickness gauge**

**Cylinder distortion specification**

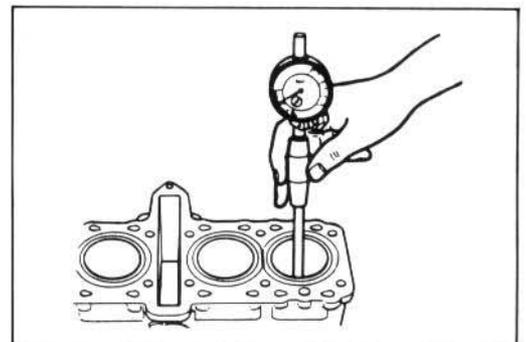
**Service Limit: 0.2 mm (0.008 in)**



## CYLINDER BORE

Measure the cylinder bore diameter at six places. If any one of the measurements exceeds the limit, overhaul the cylinder and replace the piston with an oversize, or replace the cylinder. Once the remaining cylinders must be also rebored accordingly. Otherwise, the imbalance might cause excess vibration.

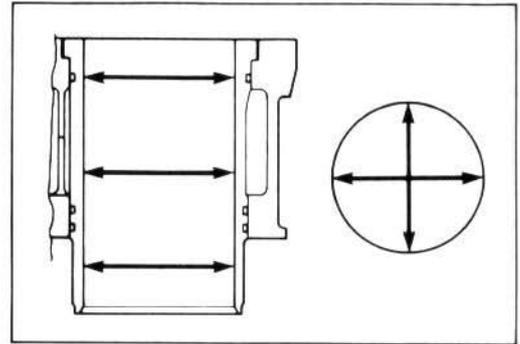
(Continued on next page.)



**Cylinder bore**

Service Limit : 56.080 mm (2.2079 in)

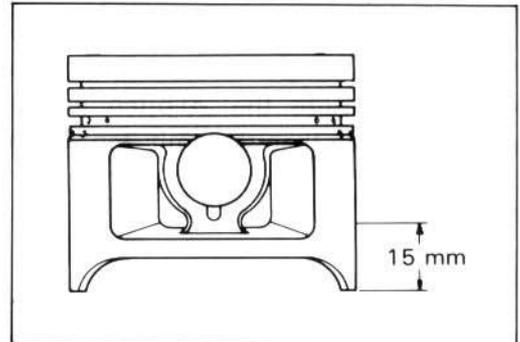
09900-20508: Cylinder gauge set

**PISTON DIAMETER**

Using a micrometer, measure the piston outside diameter at the place shown in Fig. If the measurement is less than the limit, replace the piston.

Service Limit : 55.880 mm (2.2000 in)

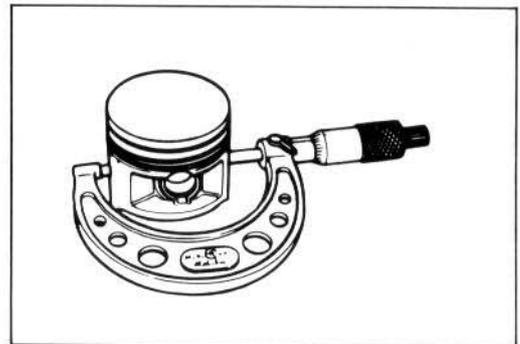
09900-20203: Micrometer (50 – 75 mm)

**PISTON-CYLINDER CLEARANCE**

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

Service Limit : 0.12 mm (0.0047 in)

Piston oversize: 0.5, 1.0 mm

**PISTON RING-GROOVE CLEARANCE**

Using a thickness gauge, measure the side clearances of the 1st and 2nd rings. If any of the clearances exceeds the limit, replace both piston and piston rings.

09900-20803: Thickness gauge

Piston ring-groove clearance

Service Limit 1st : 0.18 mm (0.007 in)

2nd : 0.15 mm (0.006 in)

Piston ring groove width

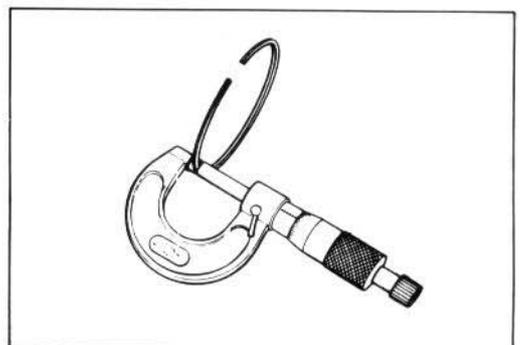
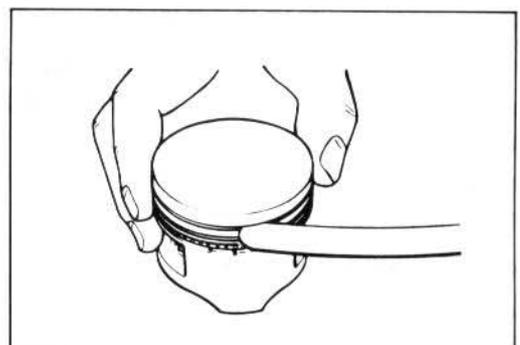
Standard 1st &amp; 2nd: 0.81 – 0.83 mm (0.032 – 0.033 in)

Oil : 1.51 – 1.53 mm (0.059 – 0.060 in)

Piston ring thickness

Standard

1st &amp; 2nd: 0.77 – 0.79 mm (0.030 – 0.031 in)



## PISTON RING FREE END GAP AND PISTON RING END GAP

Before installing piston rings, measure the free end gap of each ring using vernier calipers. Next, fit the ring in the cylinder, and measure each ring end gap using a thickness gauge. If any ring has an excess end gap, replace the ring.

### Piston ring free end gap

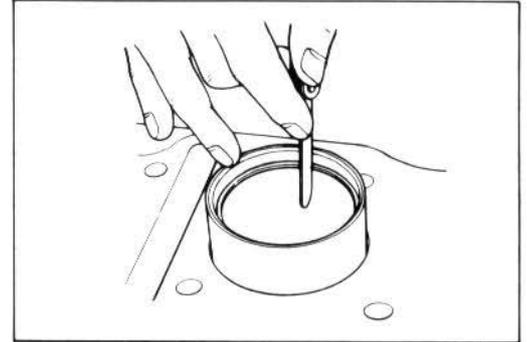
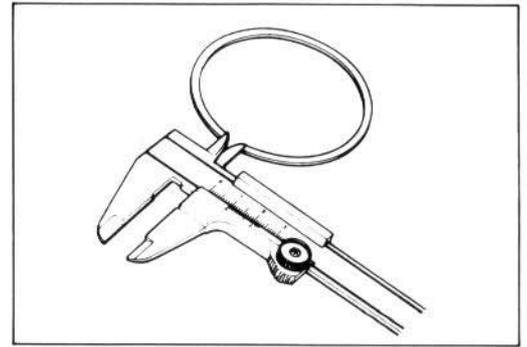
Service Limit 1st : 4.5 mm (0.18 in)  
2nd : 4.6 mm (0.18 in)

09900-20102: Vernier calipers

### Piston ring end gap

Service Limit  
1st & 2nd: 0.5 mm (0.02 in)

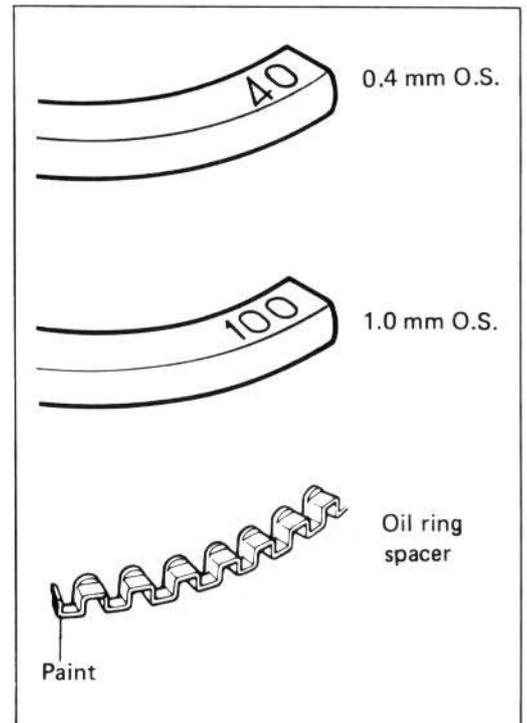
09900-20803: Thickness gauge



### Oversize piston ring

The following two types of oversize piston rings are used. They bear the following identification numbers.

| SIZE        | 1st | 2nd |
|-------------|-----|-----|
| 0.4 mm O.S. | 40  | 40  |
| 1.0 mm O.S. | 100 | 100 |



### Oversize oil ring

The following two types of oversize oil rings are available as optional parts. They bear the following identification marks.

| SIZE        | COLOR          |
|-------------|----------------|
| STD         | NIL            |
| 0.4 mm O.S. | Painted pink   |
| 1.0 mm O.S. | Painted yellow |

### Oversize side rail

Just measure out side diameter to identify the size.

## PISTON PIN AND PIN BORE

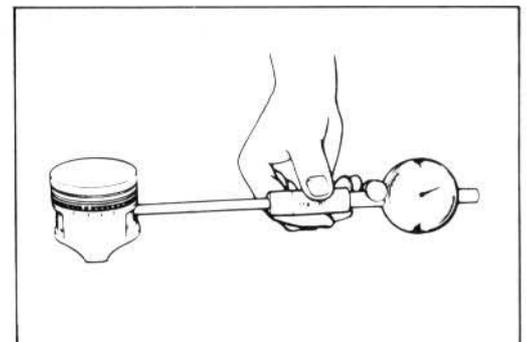
Using a small bore gauge, measure the piston pin bore inside diameter, and using a micrometer, measure the piston pin outside diameter. If the difference between these two measurements is more than the limits, replace both piston and piston pin.

### Piston pin bore I.D.

Service Limit: 16.030 mm (0.6311 in)

09900-20602: Dial gauge (1/1000 mm, 1 mm)

09900-22401: Small bore gauge (10 – 18 mm)

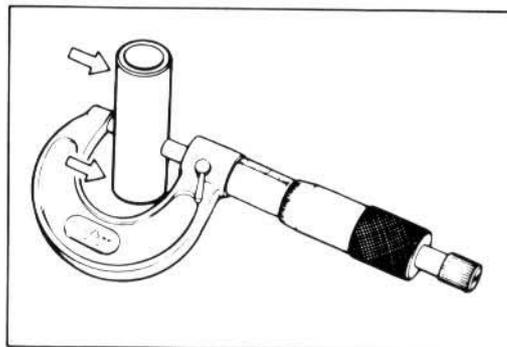


Using a micrometer, measure the piston pin outside diameter at three positions.

**Piston pin O.D.**

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

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



### **CONROD SMALL END I.D.**

Using a small bore gauge, measure the conrod small end inside diameter.

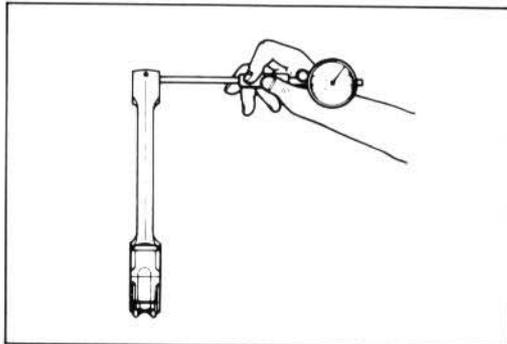
**09900-20602: Dial gauge (1/1000 mm, 1 mm)**

**09900-22401: Small bore gauge (10 – 18 mm)**

**Conrod small end I.D.**

**Service Limit: 16.040 mm (0.6315 in)**

If the conrod small end inside diameter exceeds the above-mentioned limit, replace the conrod.

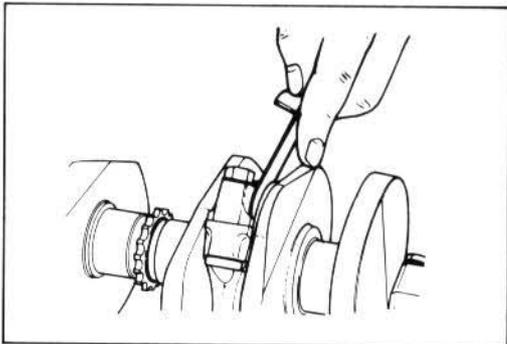


### **CONROD BIG END SIDE CLEARANCE**

Check the conrod side clearance by using a thickness gauge. If the clearance exceeds the limit, replace conrod or crankshaft.

**Service Limit: 0.3 mm (0.01 in)**

**09900-20803: Thickness gauge**



**Standard**

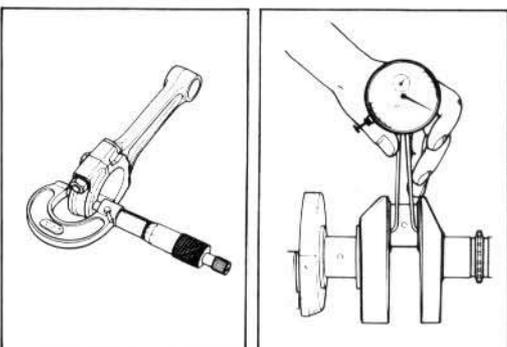
**Big end width : 16.95 – 17.00 mm (0.667 – 0.669 in)**

**Standard**

**Crank pin width: 17.10 – 17.15 mm (0.673 – 0.675 in)**

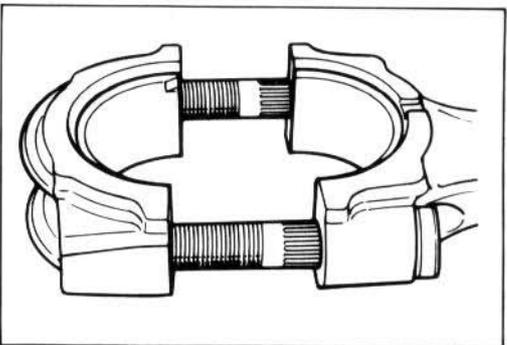
**09900-20205: Micrometer (0 – 25 mm)**

**09900-20605: Dial calipers (10 – 34 mm)**



### **CONROD-CRANK PIN BEARING SELECTION**

- Loosen the bearing cap nuts, and tap the bolt end lightly with plastic hammer to remove bearing cap.
- Remove the rods, and mark them to identify the cylinder position.
- Inspect the bearing surfaces for any sign of fusion, pitting, burn, or flaws. If any, replace them with a specified set of bearings.



**NOTE:**

Never try to remove or loosen the conrod cap bolts due to their possible loosening in the rod. Once displaced, the bearing cap will not be fitted properly.

- Place plastigauge axially on the crank pin avoiding oil hole and at the TDC or BDC side as shown.
- Tighten the bearing cap with two-step to torque values.

**Initial tightening torque: 12 – 14 N·m**

(1.2 – 1.4 kg·m, 8.5 – 10.0 lb·ft)

**Final tightening torque : 28.5 – 31.5 N·m**

(2.85 – 3.15 kg·m, 20.5 – 23.0 lb·ft)

**09900-22301: Plastigauge**

**NOTE:**

When fitting bearing cap to crank pin, be sure to discriminate one end from the other, namely front and rear.

**NOTE:**

Never rotate the crankshaft or conrod when a piece of plastigauge is in the clearance.

- Remove the caps, and measure the width of compressed plastigauge with envelope scale. This measurement should be taken at the widest part.

**Crank pin bearing oil clearance**

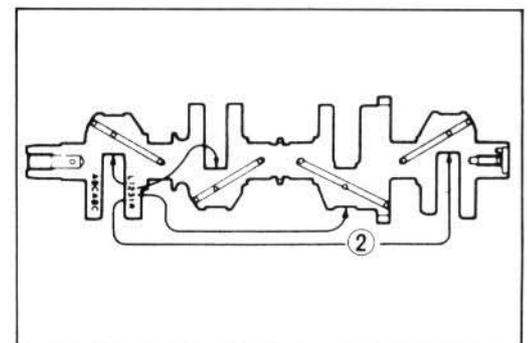
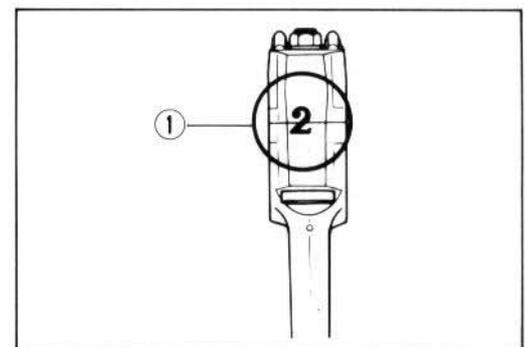
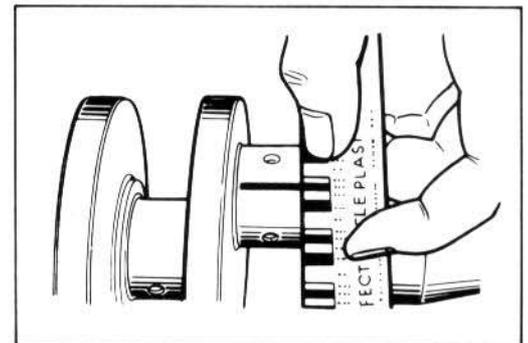
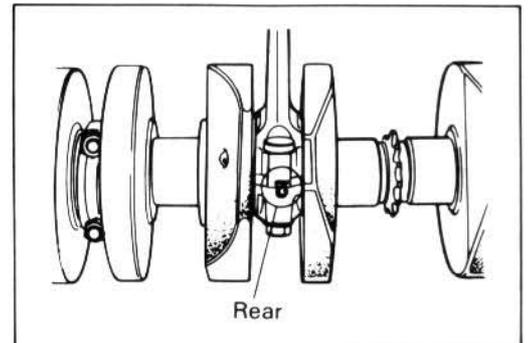
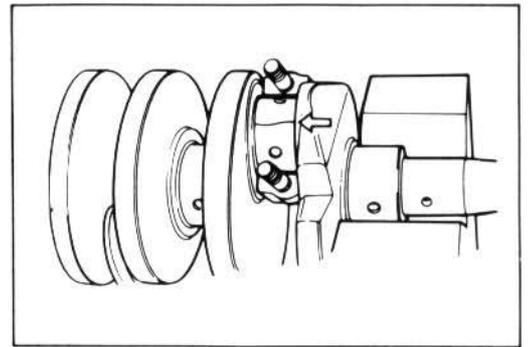
**Standard: 0.024 – 0.048 mm (0.0009 – 0.0019 in)**

**Service Limit: 0.080 mm (0.0031 in)**

- If oil clearance exceeds the service limit, select the specified bearings from the following table.
- Check the corresponding rod I.D. code number ①, "1" or "2".
- Check the corresponding crank pin O.D. code number ②, "1", "2" or "3".

**Bearing selection table**

|               |   | Crank pin O.D. ② |       |        |
|---------------|---|------------------|-------|--------|
|               |   | 1                | 2     | 3      |
| Conrod I.D. ① | 1 | Green            | Black | Brown  |
|               | 2 | Black            | Brown | Yellow |

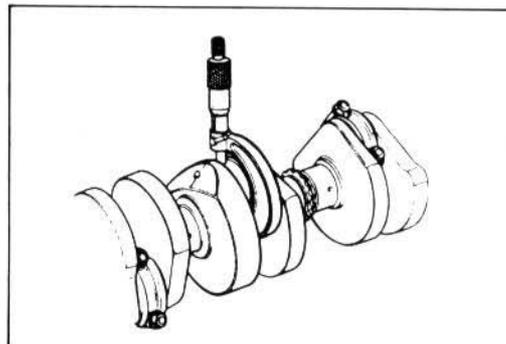


**Conrod I.D. specification**

| Code | I.D. specification                         |
|------|--|
| 1    | 33.000 – 33.008 mm<br>(1.2992 – 1.2995 in) |
| 2    | 33.008 – 33.016 mm<br>(1.2995 – 1.2998 in) |

**Crank pin O.D. specification**

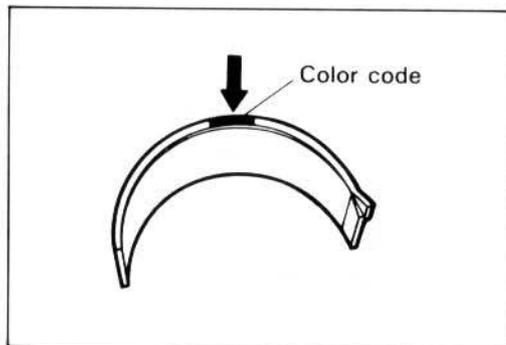
| Code | O.D. specification                         |
|------|--|
| 1    | 29.992 – 30.000 mm<br>(1.1808 – 1.1811 in) |
| 2    | 29.984 – 29.992 mm<br>(1.1805 – 1.1808 in) |
| 3    | 29.976 – 29.984 mm<br>(1.1802 – 1.1805 in) |



09900-20202: Micrometer (25 – 50 mm)

**Bearing thickness**

| Color (Part No.)            | Thickness                                |
|-----------------------------|--|
| Green<br>(12164-04A01-0A0)  | 1.484 – 1.488 mm<br>(0.0584 – 0.0586 in) |
| Black<br>(12164-04A01-0B0)  | 1.488 – 1.492 mm<br>(0.0586 – 0.0587 in) |
| Brown<br>(12164-04A01-0C0)  | 1.492 – 1.496 mm<br>(0.0587 – 0.0589 in) |
| Yellow<br>(12164-04A01-0D0) | 1.496 – 1.500 mm<br>(0.0589 – 0.0591 in) |

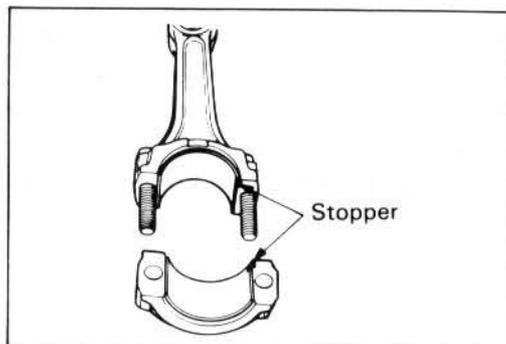


**CAUTION:**

Bearing should be replaced as a set.

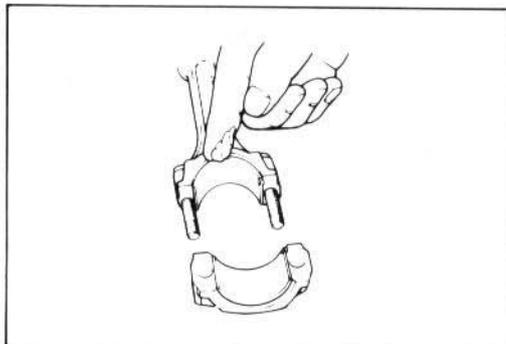
**BEARING ASSEMBLY**

- When fitting the bearings to the bearing cap and conrod, be sure to fix the stopper part first, and press the other end.



- Apply engine oil or SUZUKI MOLY PASTE to the crank pin and bearing surface.

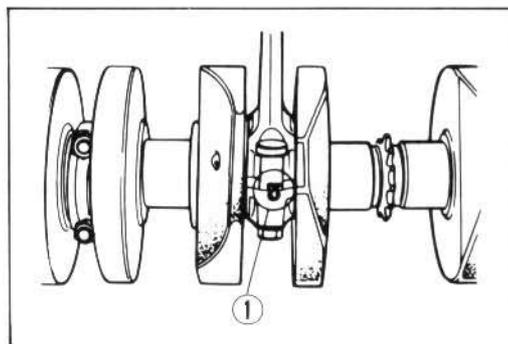
99000-25140: SUZUKI MOLY PASTE



- When mounting the conrod on the crankshaft, make sure that numeral figure ① of the conrod faces rearward.
- Tighten the conrod fitting nuts with specified torque.

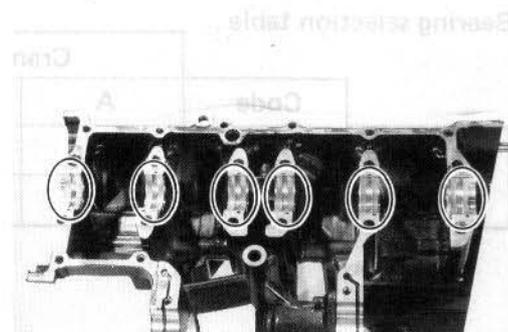
**Tightening torque: 28.5 – 31.5 N·m**  
(2.85 – 3.15 kg·m, 20.5 – 23.0 lb·ft)

- Check the conrod movement for smooth turning.



## CRANKCASE-CRANKSHAFT BEARING SELECTION

- Inspect each bearing of upper and lower crankcases for any damage.

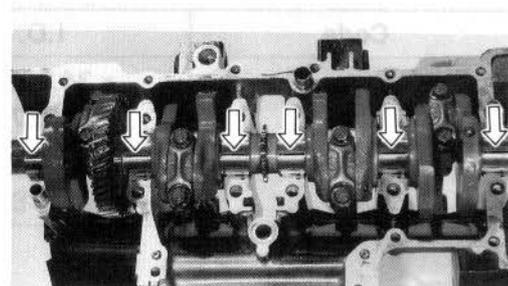


- Place plastigauge on each crankshaft journal in the usual manner.

### 09900-22301: Plastigauge

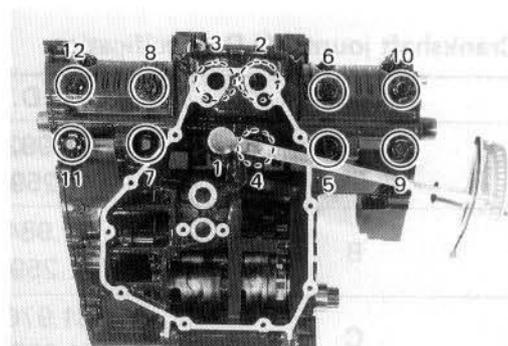
#### NOTE:

*Do not place the plastigauge on the oil hole, and do not rotate the shaft when plastigauge is in place.*



- Mate the lower crankcase with the upper crankcase, and tighten the crankshaft tightening bolts with specified torque value in the indicated order.

| Tightening torque | Initial Tightening                  | Final Tightening                                       |
|-------------------|-------------------------------------|--|
| 8 mm bolt         | 13 N·m<br>(1.3 kg·m)<br>(9.5 lb·ft) | 28 – 32 N·m<br>(2.8 – 3.2 kg·m)<br>(20.0 – 23.0 lb·ft) |



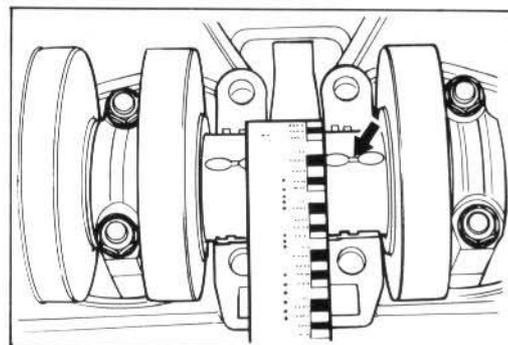
- Remove the lower crankcase, and measure the width of compressed plastigauge in the usual manner.

#### Crank journal bearing oil clearance

**Standard: 0.012 – 0.036 mm (0.0005 – 0.0014 in)**

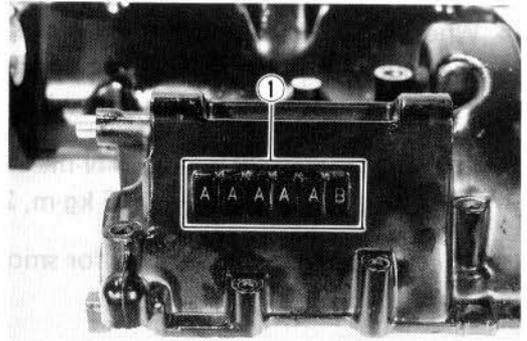
**Service Limit: 0.08 mm (0.0031 in)**

- If the width at the widest part exceeds the limit, replace the set of bearings with new ones by referring to the selection table.



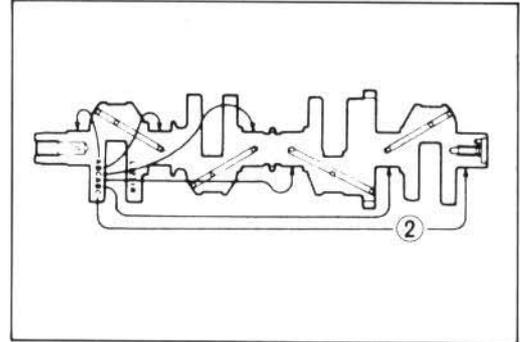
### 3-37 ENGINE

- Check the corresponding crankcase journal I.D. code number ①, "A" or "B" which are stamped on the rear of upper crankcase.
- Check the corresponding crankshaft journal O.D. code number ②, "A", "B" or "C" which are stamped on the crankshaft.



#### Bearing selection table

|                  |   | Crankshaft O.D. ② |       |        |
|------------------|---|-------------------|-------|--------|
|                  |   | A                 | B     | C      |
| Crankcase I.D. ① | A | Green             | Black | Brown  |
|                  | B | Black             | Brown | Yellow |

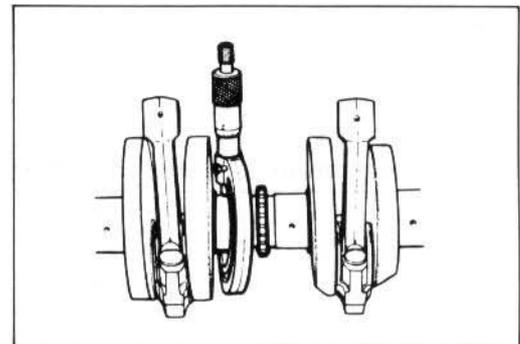


#### Crankcase I.D. specification

| Code | I.D. specification                         |
|------|--|
| A    | 34.992 – 35.000 mm<br>(1.3776 – 1.3780 in) |
| B    | 35.000 – 35.008 mm<br>(1.3780 – 1.3783 in) |

#### Crankshaft journal O.D. specification

| Code | O.D. specification                         |
|------|--|
| A    | 31.992 – 32.000 mm<br>(1.2595 – 1.2598 in) |
| B    | 31.984 – 31.992 mm<br>(1.2592 – 1.2595 in) |
| C    | 31.976 – 31.984 mm<br>(1.2589 – 1.2592 in) |



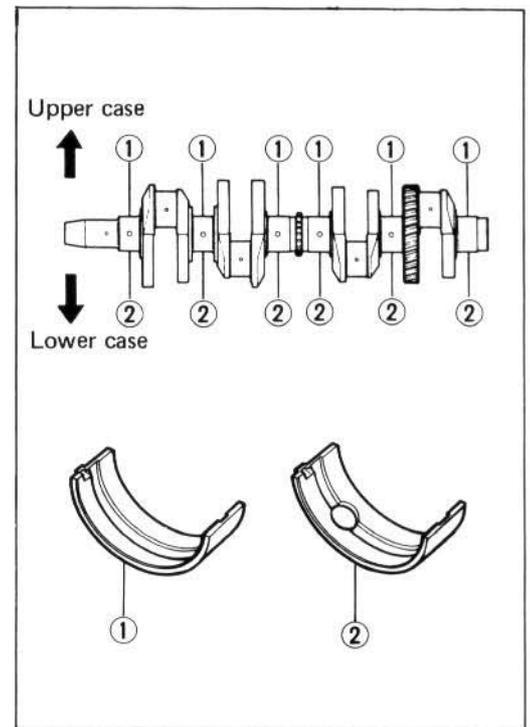
09900-20202: Micrometer (25 – 50 mm)

**Bearing thickness specification**  
(Grooved bearing with oil hole . . . For lower case)

| Color (Part No.)            | Specification                            |
|-----------------------------|--|
| Green<br>(12229-33C00-0A0)  | 1.486 – 1.490 mm<br>(0.0585 – 0.0587 in) |
| Black<br>(12229-33C00-0B0)  | 1.490 – 1.494 mm<br>(0.0587 – 0.0588 in) |
| Brown<br>(12229-33C00-0C0)  | 1.494 – 1.498 mm<br>(0.0588 – 0.0590 in) |
| Yellow<br>(12229-33C00-0D0) | 1.498 – 1.502 mm<br>(0.0590 – 0.0591 in) |

**NOTE:**

- \* Grooved bearings have the same specification as the Grooved bearing with oil hole.
- \* These parts numbers are shown as follows. 12229-30B10-XXX. (Grooved bearing)

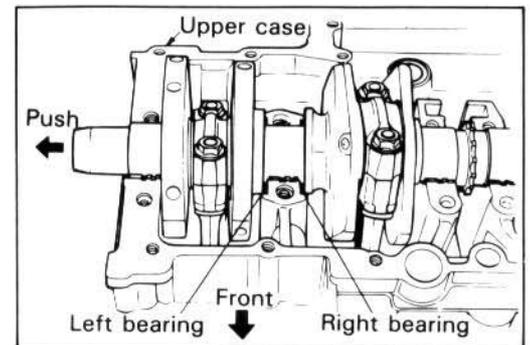


**CRANKSHAFT THRUST CLEARANCE**

- With the crankshaft, right-side thrust bearing and left-side thrust bearing inserted in the upper crankcase, use a thickness gauge to measure the thrust clearance on the left-side.

**NOTE:**

Push the crankshaft to the starter clutch side, so that there is no clearance on the right-side thrust bearing.



**Thrust clearance**

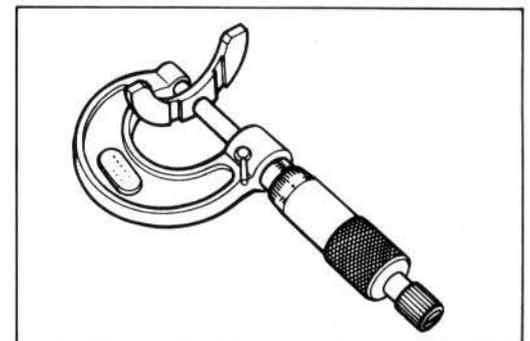
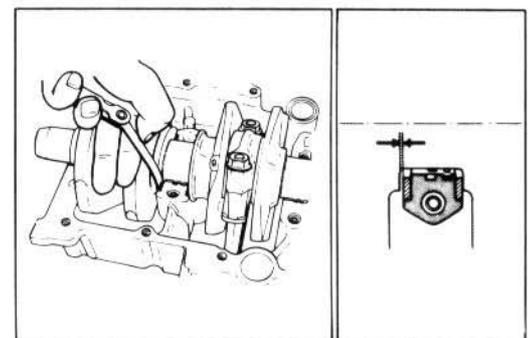
**Standard: 0.045 – 0.100 mm (0.0018 – 0.0039 in)**

If the thrust clearance exceeds the standard range, adjust the thrust clearance by the following procedures:

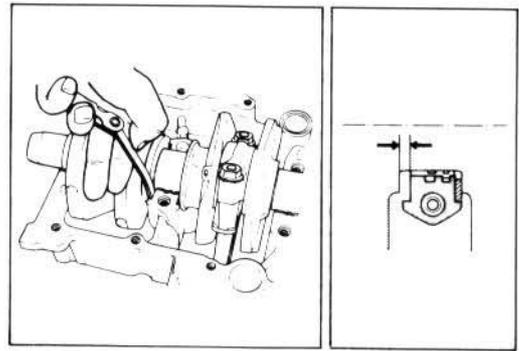
- Remove the right-side thrust bearing and measure its thickness with a micrometer. If the thickness of the right-side thrust bearing is below standard, replace with a new bearing and once again perform the thrust clearance measurement listed above, checking to make sure it is within standard.

**Right-side thrust bearing thickness**

**Standard: 2.425 – 2.450 mm (0.0955 – 0.0965 in)**



- If the right-side thrust bearing is within the standard range, reinsert the right-side thrust bearing and remove the left-side thrust bearing.
- As shown in the illustration, use a thickness gauge to measure the clearance before inserting of the left-side thrust bearing, and select a left-side thrust bearing from the selection table.



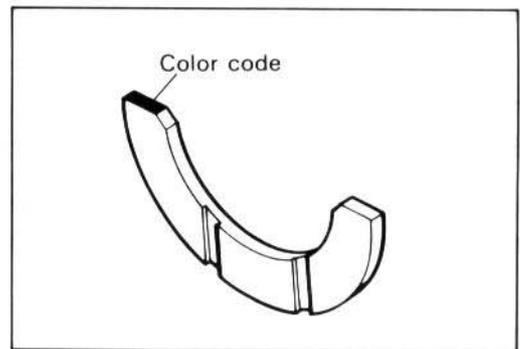
Thrust bearing selection table

| Clearance before inserting left-side thrust bearing | Color (Part No.)        | Thrust bearing thickness                 | Thrust clearance                         |
|---|-------------------------|--|--|
| 2.420 – 2.445 mm<br>(0.0953 – 0.0963 in)            | Red<br>(12228-43411)    | 2.350 – 2.375 mm<br>(0.0925 – 0.0935 in) | 0.045 – 0.095 mm<br>(0.0018 – 0.0037 in) |
| 2.445 – 2.470 mm<br>(0.0963 – 0.0972 in)            | Black<br>(12228-43412)  | 2.375 – 2.400 mm<br>(0.0935 – 0.0945 in) |  |
| 2.470 – 2.495 mm<br>(0.0972 – 0.0982 in)            | Blue<br>(1.2228-43413)  | 2.400 – 2.425 mm<br>(0.0945 – 0.0955 in) |  |
| 2.495 – 2.520 mm<br>(0.0982 – 0.0992 in)            | Green<br>(12228-43414)  | 2.425 – 2.450 mm<br>(0.0955 – 0.0965 in) |  |
| 2.520 – 2.545 mm<br>(0.0992 – 0.1002 in)            | Yellow<br>(12228-43415) | 2.450 – 2.475 mm<br>(0.0965 – 0.0974 in) |  |
| 2.545 – 2.575 mm<br>(0.1002 – 0.1014 in)            | White<br>(12228-43416)  | 2.475 – 2.500 mm<br>(0.0974 – 0.0984 in) | 0.045 – 0.100 mm<br>(0.0018 – 0.0039 in) |

- After selecting a left-side thrust bearing, insert it and again perform the thrust clearance measurement to make sure it falls within the standard range.

**NOTE:**

*Right-side thrust bearing has the same specification as the GREEN (12228-43414) of left-side thrust bearing.*



**CRANKSHAFT RUNOUT**

Support the crankshaft with "V" blocks as shown, with the two end journals resting on the blocks. Set up the dial gauge, as shown, and rotate the crankshaft slowly to read the runout. Replace the crankshaft if the runout is greater than the limit.

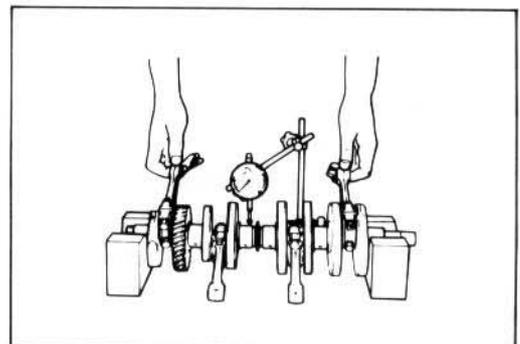
09900-20606: Dial gauge (1/100 mm, 10 mm)

09900-20701: Magnetic stand

09900-21304: V-block (100 mm)

Crankshaft runout

Service Limit: 0.05 mm (0.002 in)



## CLUTCH

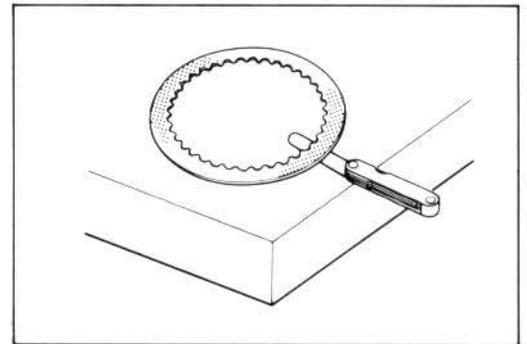
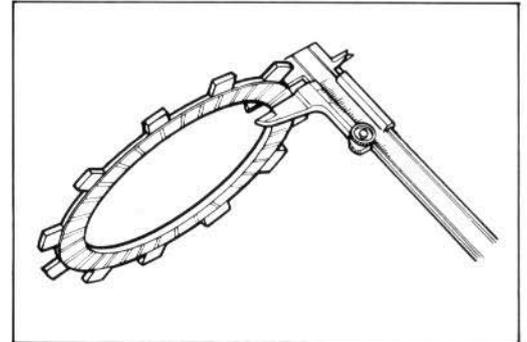
### CLUTCH DRIVE AND DRIVEN PLATES

These plates are expendable: they are meant to be replaced when found worn down or distorted to the respective limit: use a vernier calipers to check thickness and a thickness gauge and surface plate to check distortion.

**09900-20102: Vernier calipers (200 mm)**

**09900-20803: Thickness gauge**

|                         | Standard                             | Service Limit         |
|-------------------------|--------------------------------------|-----------------------|
| Drive plate thickness   | 2.90 – 3.10 mm<br>(0.114 – 0.122 in) | 2.60 mm<br>(0.102 in) |
| Drive plate claw width  | 11.8 – 12.0 mm<br>(0.46 – 0.47 in)   | 11.0 mm<br>(0.43 in)  |
| Driven plate distortion | —                                    | 0.10 mm<br>(0.004 in) |

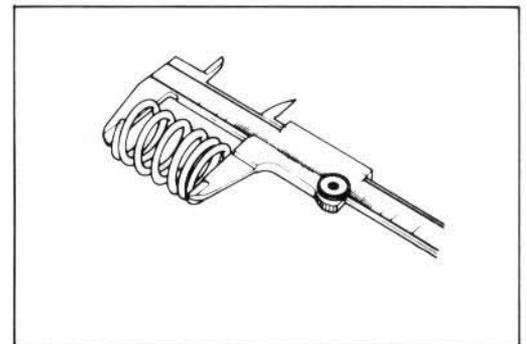


### CLUTCH SPRING FREE LENGTH

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

**09900-20102: Vernier calipers (200 mm)**

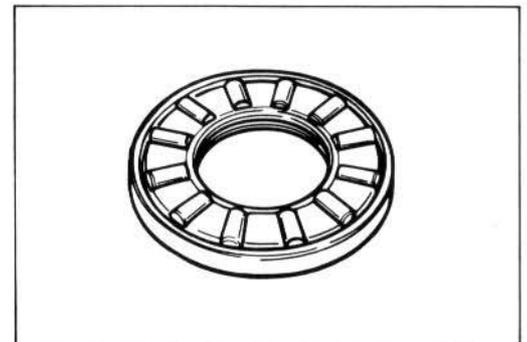
| Clutch spring free length | Service Limit     |
|---------------------------|-------------------|
|                           | 31.0 mm (1.22 in) |



### CLUTCH RELEASE BEARING

Inspect the clutch release bearing for any abnormality to decide whether it can be reused or should be replaced.

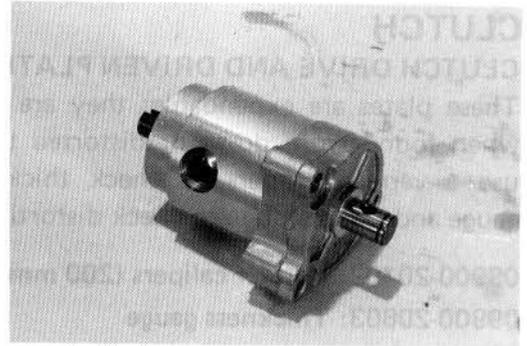
Smooth engagement and disengagement of the clutch depends much on the condition of this bearing.



## OIL PUMP

### CAUTION:

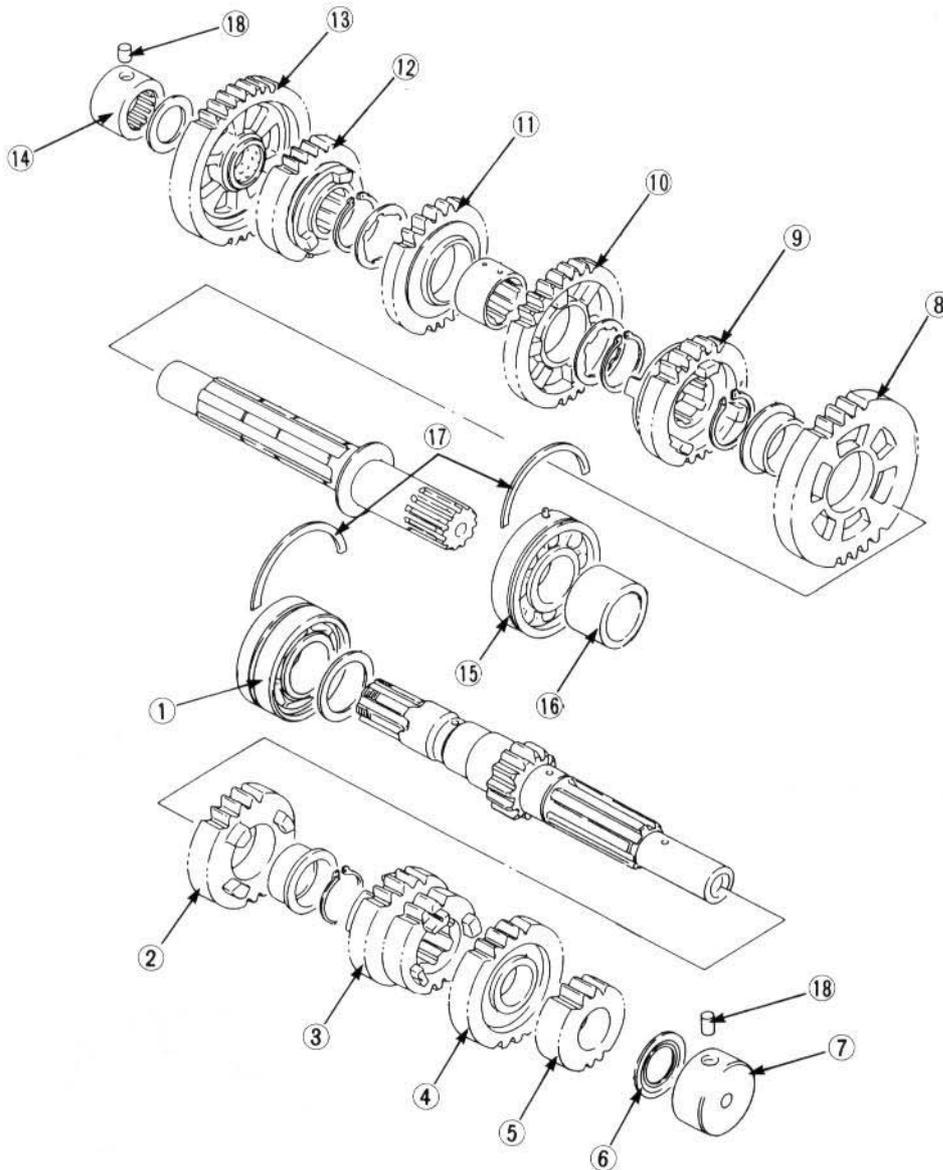
Do not attempt to disassemble the oil pump assembly.  
The oil pump is available only as an assembly.



## TRANSMISSION

### DISASSEMBLY

Disassemble the transmission gears as shown in the illustration.



- ① Bearing
- ② 5th drive gear
- ③ 3rd/4th drive gear
- ④ Top drive gear
- ⑤ 2nd drive gear
- ⑥ Oil seal
- ⑦ Bearing
- ⑧ 2nd driven gear
- ⑨ Top driven gear
- ⑩ 3rd driven gear
- ⑪ 4th driven gear
- ⑫ 5th driven gear
- ⑬ Low driven gear
- ⑭ Bearing
- ⑮ Bearing
- ⑯ Spacer
- ⑰ C-ring
- ⑱ Pin

### NOTE:

When removing the 2nd drive gear, use an appropriate gear puller.

**REASSEMBLY**

Assemble the countershaft and driveshaft in the reverse order of disassembly. Pay attention to following points:

**NOTE:**

- \* Before installing the gears, rotate the bearing by hand to inspect for abnormal noise and smooth rotation. If there is any abnormal, replace the bearing with new one.
- \* Before installing the gears, coat lightly moly paste or engine oil on the driveshaft and countershaft.

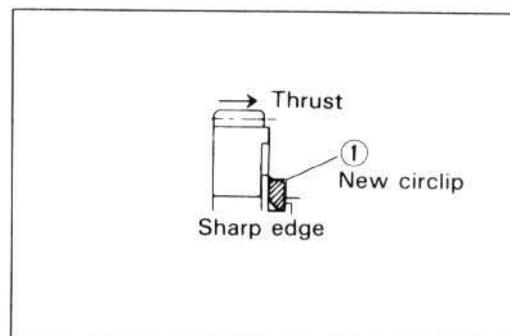
**99000-25140 : SUZUKI MOLY PASTE****CAUTION:**

- \* Never reuse a circlip. After a circlip has been removed from a shaft, it 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.

**NOTE:**

In reassembling the transmission gears, 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. (Refer to page 3-43.)

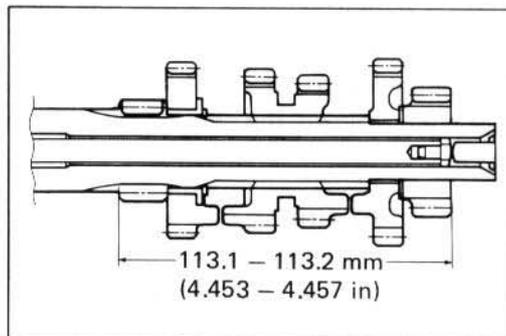
- When installing a new circlip ①, pay attention to the direction of the circlip. Fit it to the side where the thrust is as shown in the illustration.



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

**NOTE:**

- \* Before reassembling the 2nd drive gear, apply its internal surface with **THREAD LOCK SUPER "1303"** and install it so that the length as shown in the illustration.
- \* After installing 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.

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

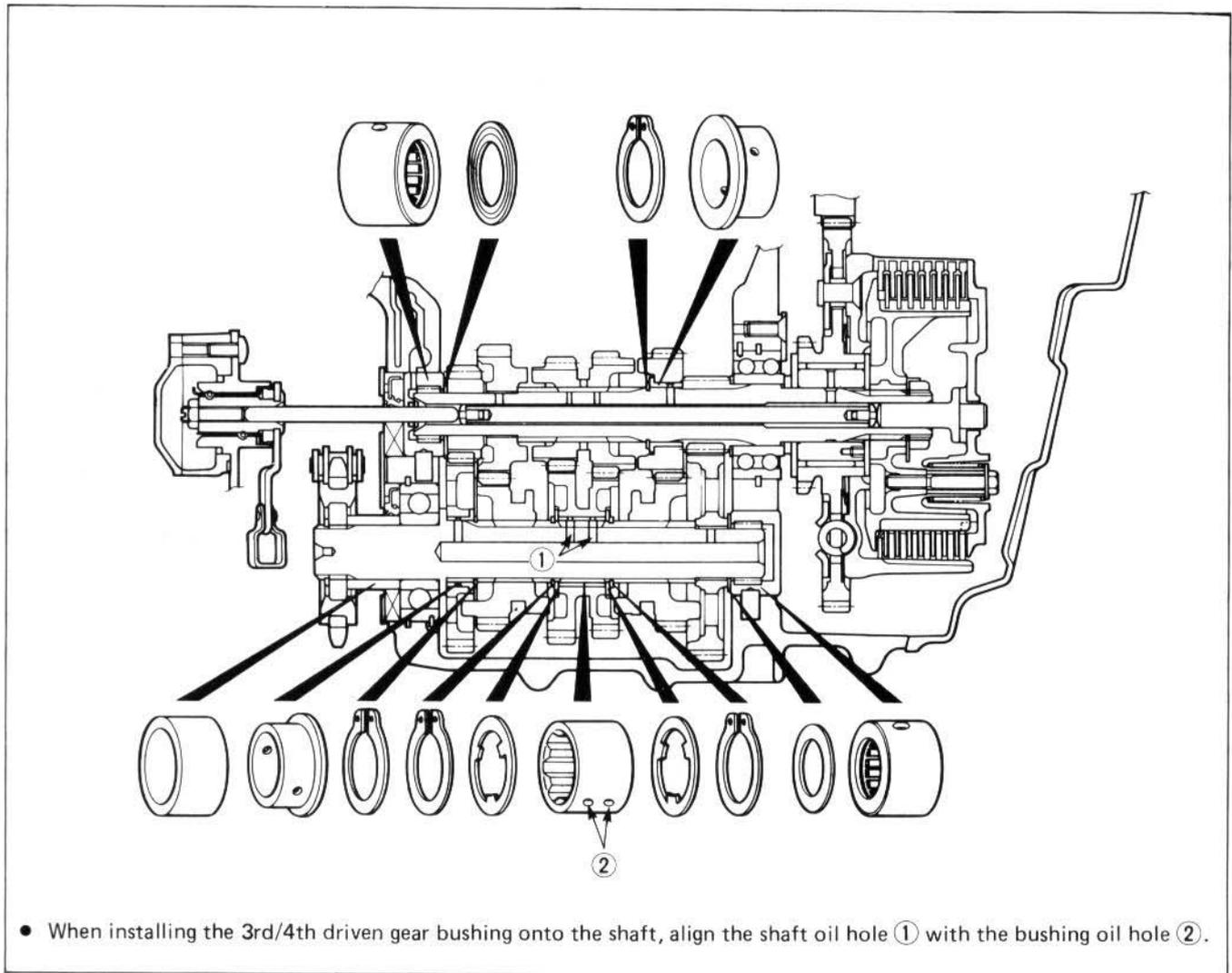
- Apply grease to each oil seal lip and install them onto the driveshaft and countershaft.

(For U.S.A. model)

**99000-25030 : SUZUKI SUPER GREASE "A"**

(For the other models)

**99000-25010 : SUZUKI SUPER GREASE "A"**



## GEARSHIFT FORK-GROOVE CLEARANCE

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

The clearance for each of the three gearshift forks plays an important role in the smoothness and positiveness of shifting action.

### Gearshift fork-Groove clearance

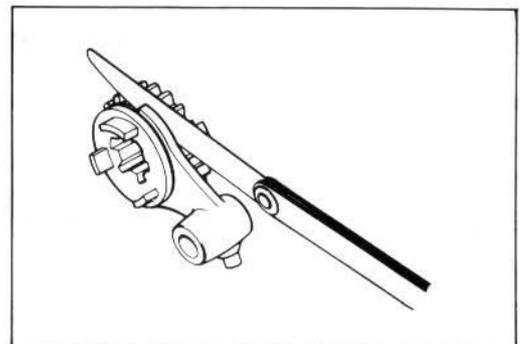
Standard : 0.10 – 0.30 mm (0.004 – 0.012 in)

Service Limit: 0.50 mm (0.020 in)

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

09900-20803: Thickness gauge

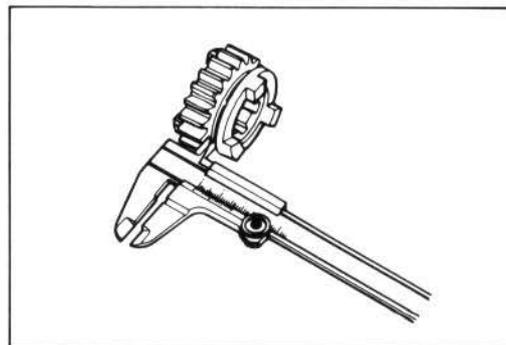
09900-20102: Vernier calipers



Checking clearance

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

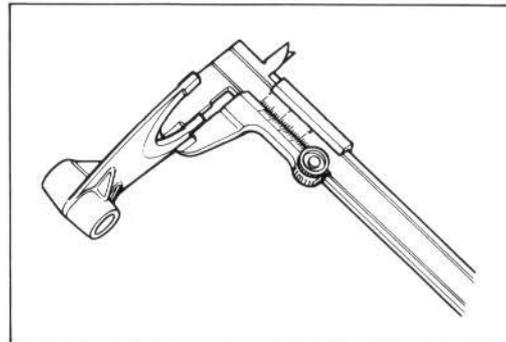
(No. 1, No. 2 &amp; No. 3): 5.50 – 5.60 mm (0.217 – 0.220 in)



Checking groove width

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

(No. 1, No. 2 &amp; No. 3): 5.30 – 5.40 mm (0.209 – 0.213 in)



Checking thickness

**ENGINE REASSEMBLY**

The engine is reassembled by carrying out the steps of disassembly in the reversed order, but there are a number of steps which demand special descriptions or precautionary measures.

**NOTE:**

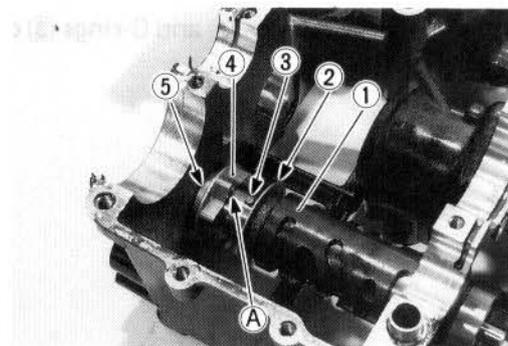
*Apply engine oil to each running and sliding part before reassembling.*

- Install the gearshift cam related parts.

- ① Gearshift cam
- ② Washer
- ③ Pin
- ④ Gearshift cam stopper plate
- ⑤ Spacer

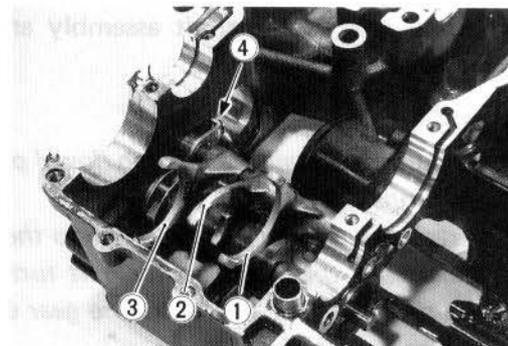
**NOTE:**

*When installing the cam stopper plate ④, align the pin groove A with the pin ③ as shown in the Fig.*



- Install the gearshift forks to the crankcase in the correct positions and directions.

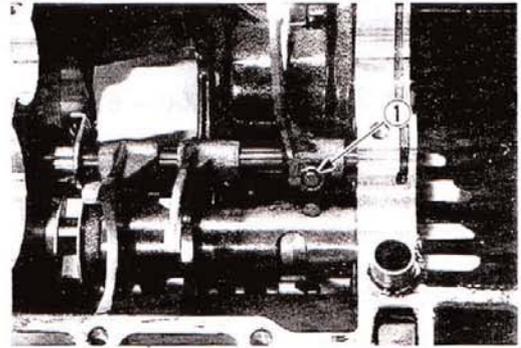
- ① For 5th driven gear (No. 1)
- ② For 3rd/4th drive gear (No. 3)
- ③ For Top driven gear (No. 2)
- ④ Gearshift cam stopper



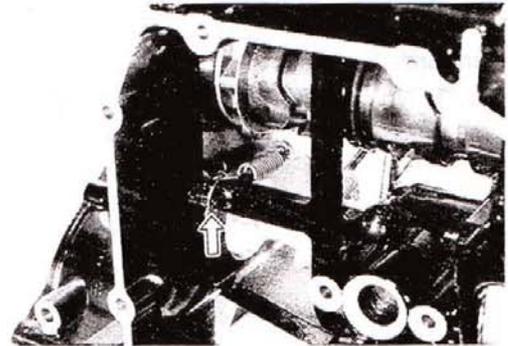
- Install the roller ① to the No. 1 gearshift fork.

**NOTE:**

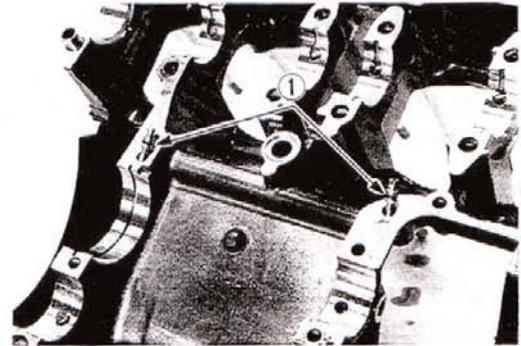
*Position the gearshift cam to the neutral so that gearshift forks and transmission can be installed easily.*



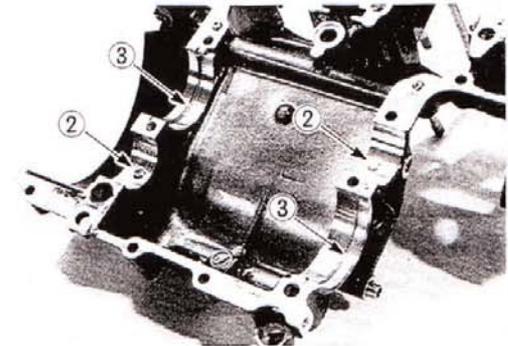
- Hook the gearshift cam stopper spring to the crankcase.



- Check the oil jets ① fitted on the upper crankcase for clogging.



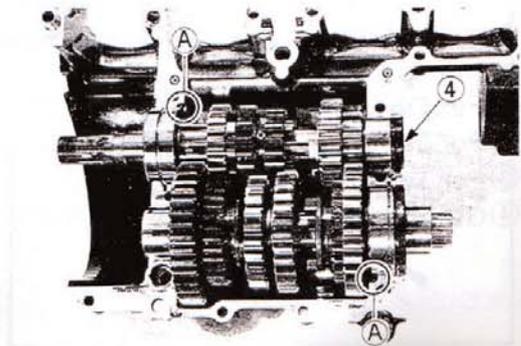
- Fit the bearing pins ② and C-rings ③ on the upper crankcase.



- Install the countershaft assembly and driveshaft assembly on the upper crankcase.

**NOTE:**

- \* *Be sure to install the bearing dowel pins (A) in the respective positions.*
- \* *Install the countershaft end cap to the position ④.*
- \* *Make sure that the countershaft turns freely while holding the driveshaft. If not, shift the gear which is engaged to the neutral position.*



**NOTE:**

Before fitting the crankshaft journal bearings, check the nozzles

① fitted on the upper crankcase for clogging.

① Nozzle (4 pcs) . . . . . For upper case

- When fitting the crankshaft journal bearings to the upper and lower crankcases, be sure to fix the stopper part ② first and press the other end.

(Refer to page 3-38.)

**CAUTION:**

Do not touch the bearing surfaces with your hands. Grasp by the edge of the bearing shell.

- Install the cam chain guide ③ and two dampers ④ properly.
- Fit the O-ring ⑤.

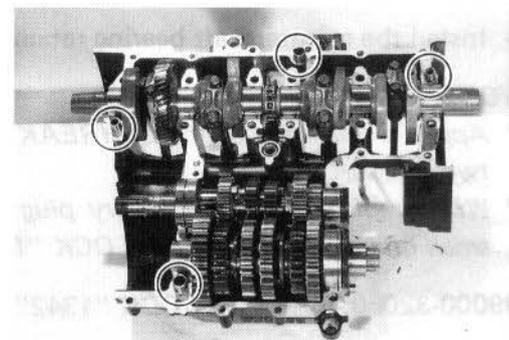
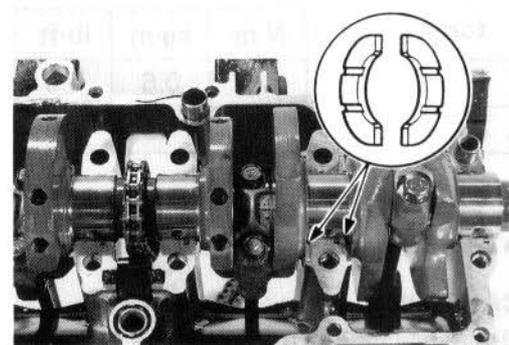
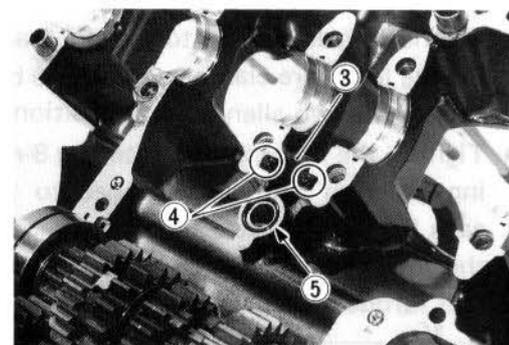
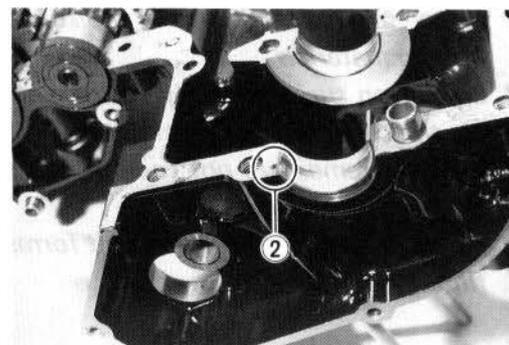
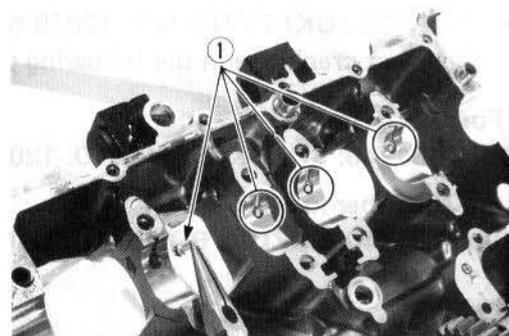
**CAUTION:**

Replace the O-ring with a new one to prevent oil leakage.

- Before installing the crankshaft, apply SUZUKI MOLY PASTE to each journal bearing lightly.

**99000-25140: SUZUKI MOLY PASTE**

- Install the crankshaft with the cam chain to the upper crankcase.
- Insert the right and left-thrust bearings with oil grooved facing the crank web. (Refer to page 3-38.)
- Clean the mating surfaces of the crankcases before matching the upper and lower ones.
- Install the dowel pins to the upper crankcase.



- Apply SUZUKI BOND NO. 1207B to the mating surface of the lower crankcase in the following procedure.

(For U.S.A. model)

99104-31140: SUZUKI BOND NO. 1207B

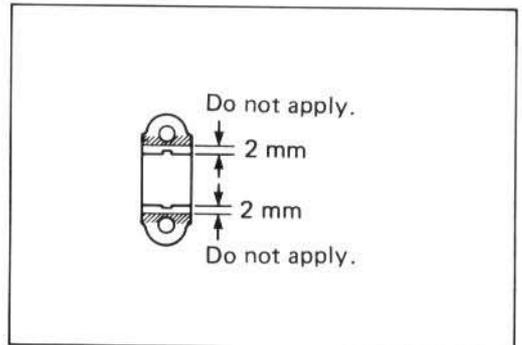
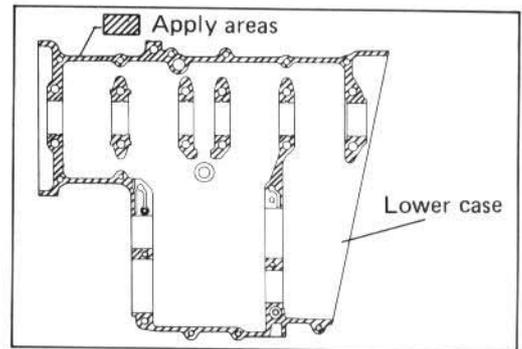
(For the other models)

99000-31140: SUZUKI BOND NO. 1207B

**NOTE:**

Use of SUZUKI BOND NO. 1207B is as follows:

- \* Make surfaces free from moisture, oil, dust and other foreign materials.
- \* Spread on surfaces thinly to form an even layer, and assemble the cases within few minutes.
- \* Take extreme care not to apply and BOND NO. 1207B to the bearing surfaces.
- \* Apply to cornered surface as it forms a comparatively thick film.



- Fit the copper washers to the No. 9 and No. 11 bolts.
- Fit the lead wire clamp to the No. 6 bolt.
- Locate the two allen bolts at position (A).
- Tighten the crankshaft tightening 8-mm bolts in the ascending order of numbers assigned to these bolts, tightening each bolt a little at a time to equalize the pressure. Tighten the lower and upper crankcase securing bolts to the specified torque values.

| Tightening torque | Initial tightening |      |       | Final tightening |      |       |
|-------------------|--------------------|------|-------|------------------|------|-------|
|                   | N·m                | kg·m | lb·ft | N·m              | kg·m | lb·ft |
| 6 mm bolt         | 6                  | 0.6  | 4.5   | 13               | 1.3  | 9.5   |
| 8 mm bolt         | 13                 | 1.3  | 9.5   | 32               | 3.2  | 23.0  |

- Fit the lead wire clamps (B) to the correct position as shown.
- Fit the gaskets (C) to the correct positions as shown.

**CAUTION:**

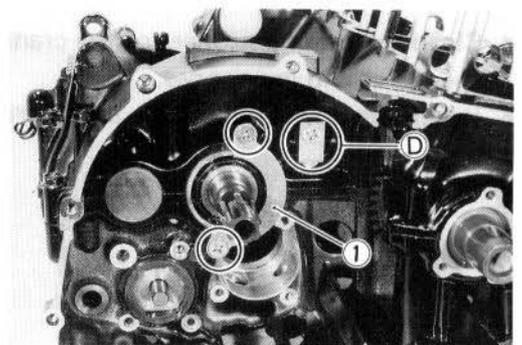
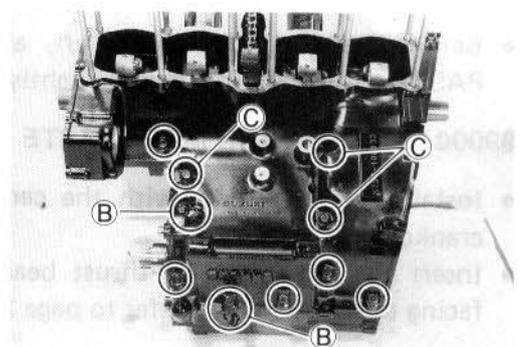
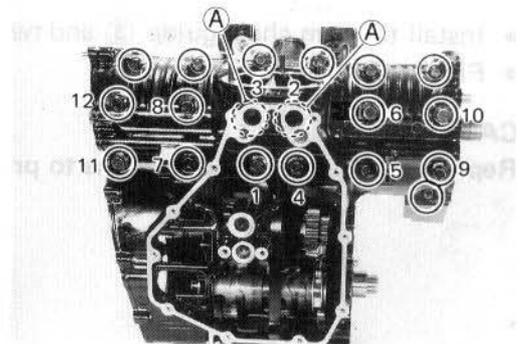
Use a new gasket to prevent oil leakage.

- Install the countershaft bearing retainer with two screws.

**NOTE:**

- \* Apply a small quantity of **THREACK LOCK "1342"** to the two screws.
- \* When replacing the oil gallery plug retainer (D), apply a small quantity of **THREAD LOCK "1342"** to its screw.

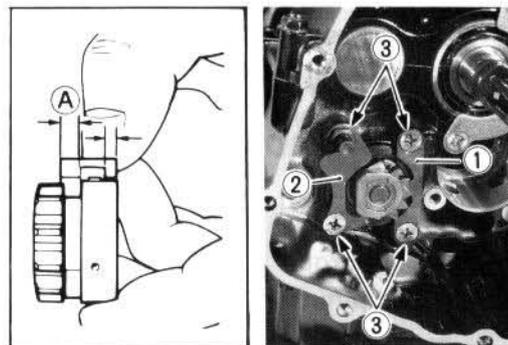
99000-32050: **THREAD LOCK "1342"**



- Install each gear shifting pawl into the cam driven gear. The large shoulder **A** must face to the outside as shown.
- When installing the cam guide **1** and pawl lifter **2**, apply a small quantity of THREAD LOCK "1342" to the screws **3**.

99000-32050: THREAD LOCK "1342"

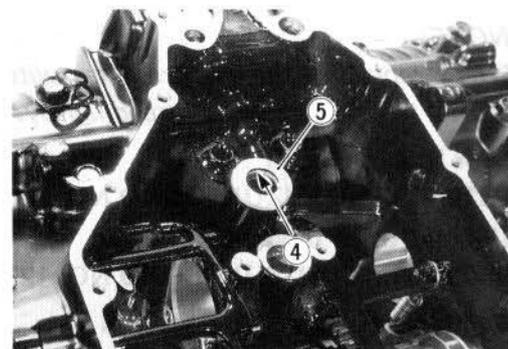
09900-09003: Impact driver set



- Fit a new O-ring **4** and shim **5**.

**CAUTION:**

Use a new O-ring to prevent oil leakage.



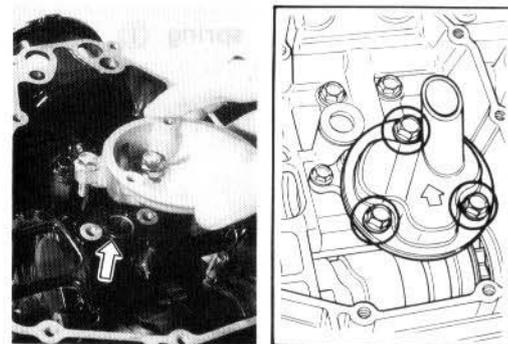
- Fit a new O-ring, then install the oil sump filter guide and oil sump filter.

**NOTE:**

Be sure to face the arrow mark on the oil sump filter guide and oil sump filter to the front side.

**CAUTION:**

Use a new O-ring to prevent oil leakage.



- Seat the washer and install the oil pressure regulator **1** to the oil pan.
- Tighten the oil pressure regulator to the specified torque.

Tightening torque: 25 – 30 N·m

(2.5 – 3.0 kg-m, 18.0 – 21.5 lb-ft)



- Fit a new gasket and install the oil pan with bolts. Tighten the oil pan bolts to the specified torque.

Tightening torque: 6 – 10 N·m

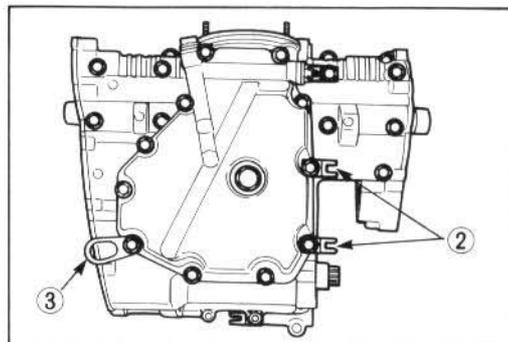
(0.6 – 1.0 kg-m, 4.5 – 7.0 lb-ft)

**NOTE:**

Fit the lead wire clamps **2** and air cleaner water drain hose guide **3** to the correct positions as shown.

**CAUTION:**

Use a new gasket to prevent oil leakage.



- Apply grease lightly to the O-ring ①.
- Install the oil filter and its cap.

**NOTE:**

*Be sure that the O-ring ① and spring ② are installed correctly.*

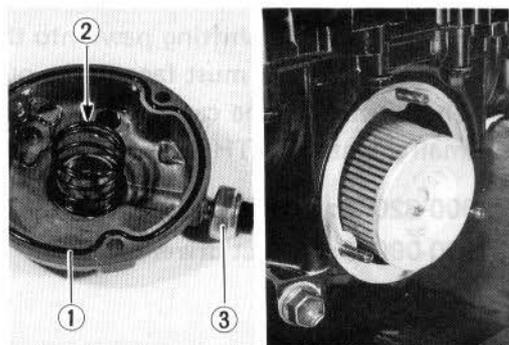
**CAUTION:**

Replace the O-ring ① with a new one.

**Tightening torque**

Oil filter cap nut: 12 – 16 N·m

(1.2 – 1.6 kg·m, 8.5 – 11.5 lb-ft)



**NOTE:**

*When replacing the oil pressure switch ③, apply SUZUKI BOND NO. 1207B to its thread lightly.*

(For U.S.A. model)

99104-31140: SUZUKI BOND NO. 1207B

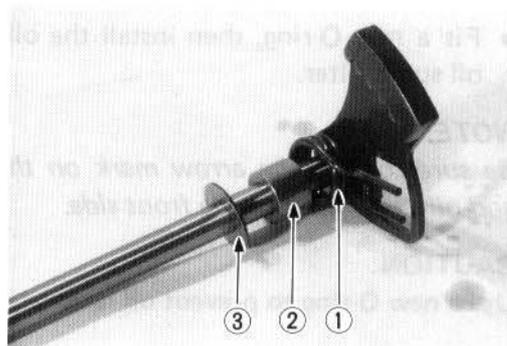
(For the other models)

99000-31140: SUZUKI BOND NO. 1207B

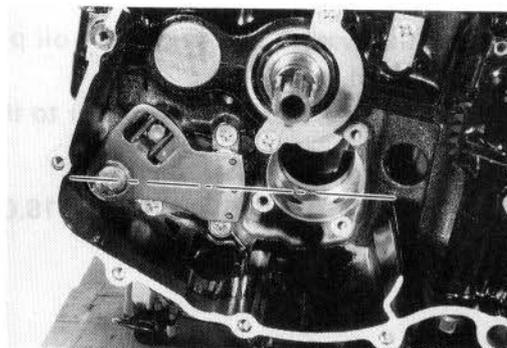
**Tightening torque:** 12 – 15 N·m

(1.2 – 1.5 kg·m, 8.5 – 11.0 lb-ft)

- Install the return spring ①, spacer ② and washer ③ onto the gearshift shaft.



- Install the gearshift shaft with the center of the gear on shaft aligned the center of gearshift cam driven gear.

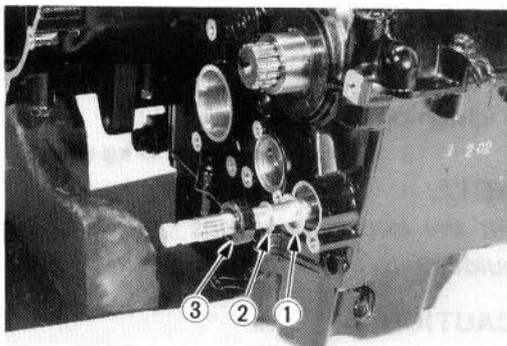


- Install the washer ① and fix the gearshift shaft with the circlip ②.
- Press-fit the oil seal ③ into the crankcase.

09900-06107: Snap ring pliers

**CAUTION:**

Replace the oil seal with a new one.

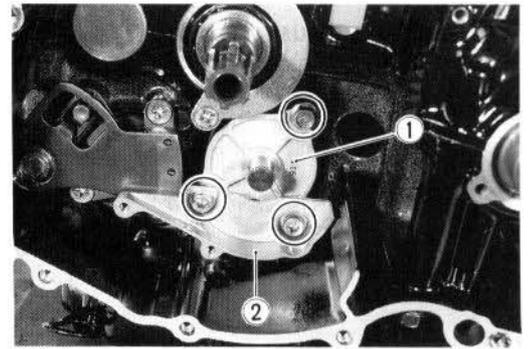


- Install the oil pump ① and oil separator inner case ② with the bolts.

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

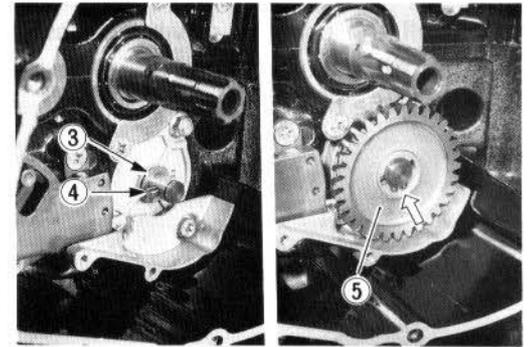
**NOTE:**

*Before mounting the oil pump, apply engine oil to the sliding surfaces of the case, outer rotor, inner rotor and shaft.*

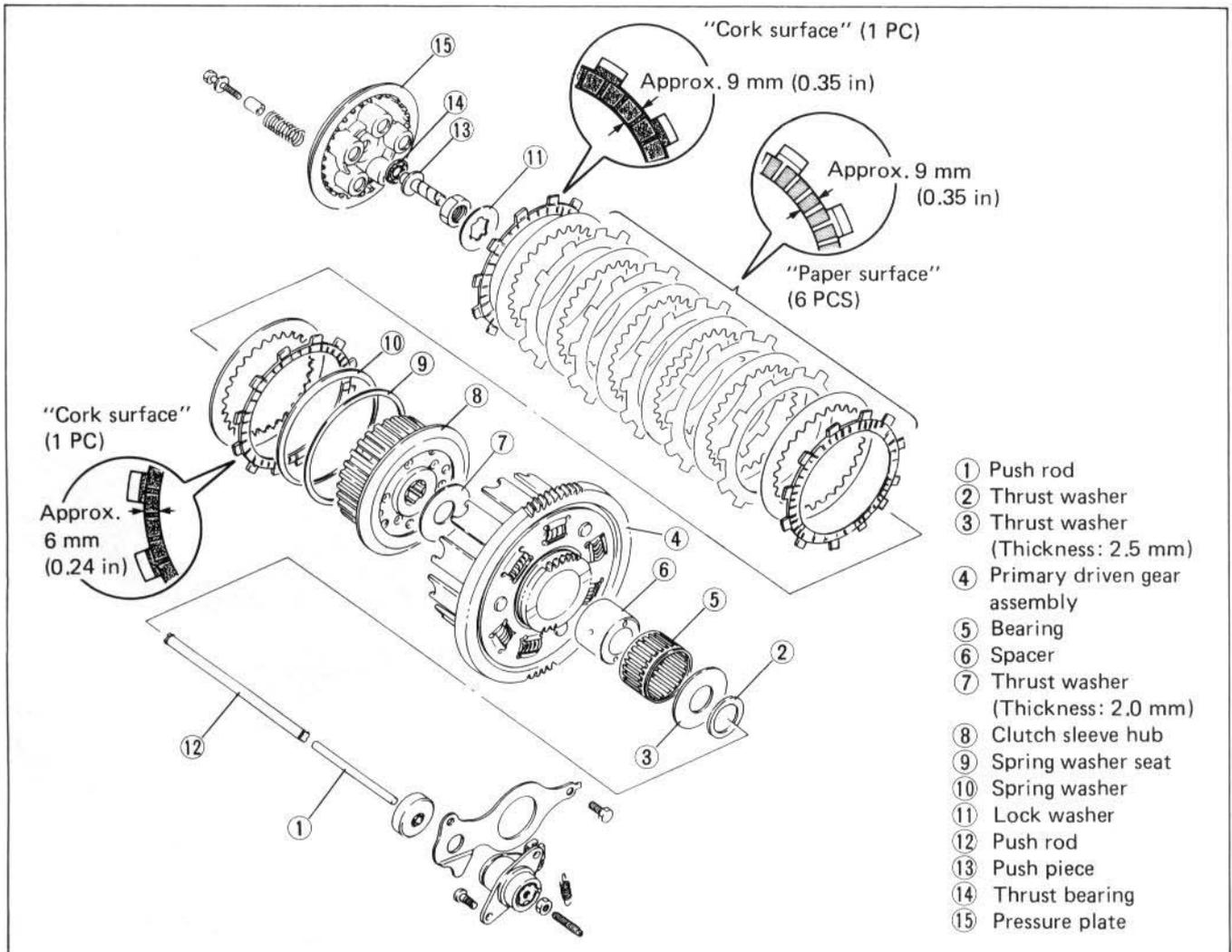


- Install the washer ③ and pin ④.
- Fix the oil pump driven gear ⑤ with the circlip.

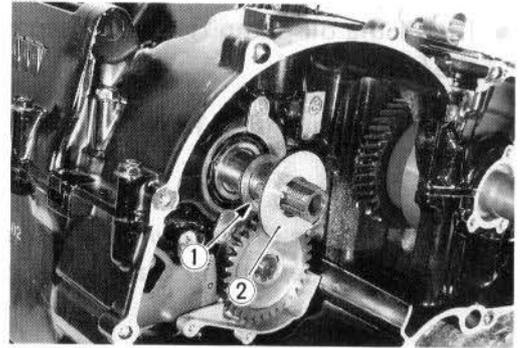
09900-06107: Snap ring pliers



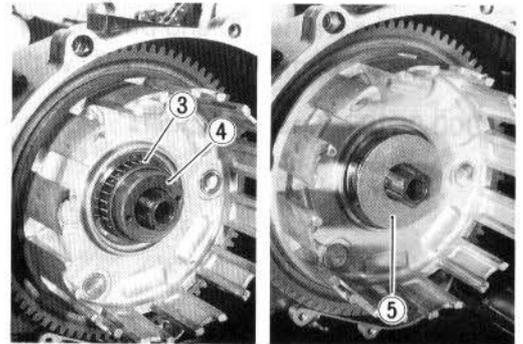
**CLUTCH**



- Install the thrust washers, ① and ②.



- Install the primary driven gear assembly onto the counter-shaft, then apply engine oil to the bearing ③ and spacer ④.
- Install the thrust washer ⑤.

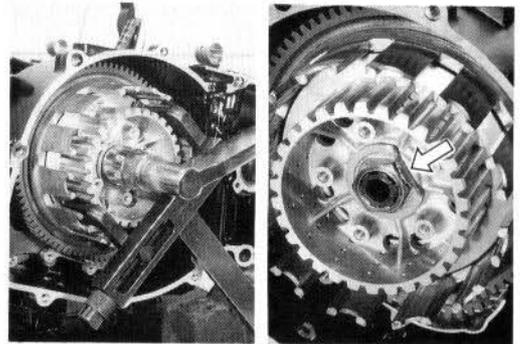


- Tighten the clutch sleeve hub nut to the specified torque.

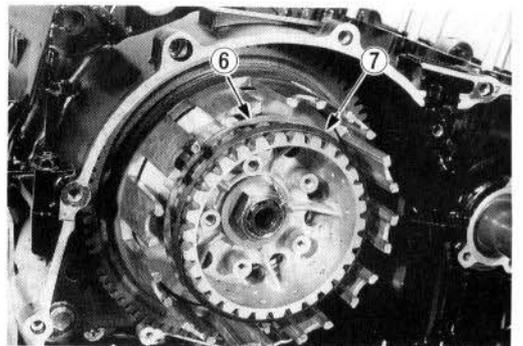
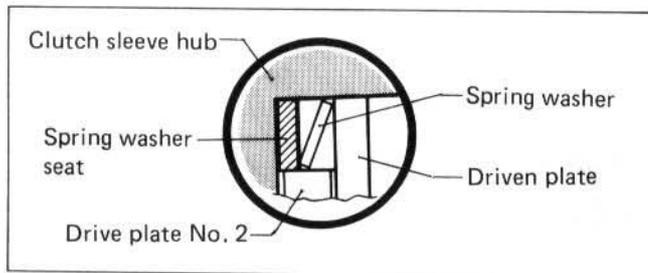
Clutch sleeve : 50 – 70 N·m  
 hub nut (5.0 – 7.0 kg·m, 36.0 – 50.5 lb-ft)

09920-53710 : Clutch sleeve hub holder

- After tightening the clutch sleeve hub nut, be sure to lock the nut by firmly bending the tongue of the washer.



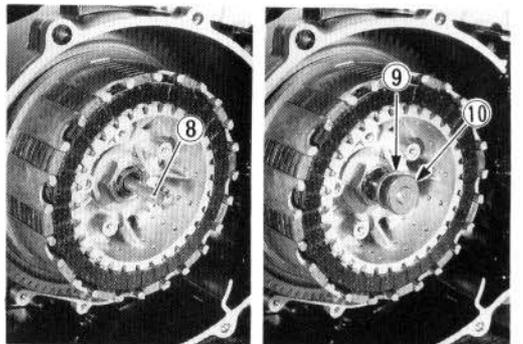
- Install the spring washer seat ⑥ and spring washer ⑦.



- Install the clutch drive and driven plates one by one into the clutch sleeve hub in the prescribed order. (Refer to page 3-50.)
- Install the push rod ⑧, push piece ⑨ and thrust bearing ⑩.

**CAUTION:**

The bearing face of the thrust bearing ⑩ faces push piece side.



- Tighten the clutch spring set bolts in the order.

**NOTE:**

*Tighten the clutch spring set bolts in the manner indicated, tightening them by degrees until they attain a uniform tightness.*

**Clutch spring set bolt: 7 – 11 N·m  
(0.7 – 1.1 kg·m, 5.0 – 8.0 lb-ft)**

- Install the oil separator outer cover ①.
- Fit the generator stator spacer to the crankcase.

**NOTE:**

*The chamfered face ① of the generator stator spacer faces outside.*

- Apply a small quantity of THREAD LOCK SUPER "1322"/"1333B" to the generator stator mounting screws and lead wire clamp screw.

(For U.S.A. model)

**99000-32020: THREAD LOCK SUPER "1333B"**

(For the other models)

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

- Degrease the tapered portion of the generator rotor and also the crankshaft. Use nonflammable cleaning solvent to wipe off the oily or greasy matter to make these surfaces completely dry.

**NOTE:**

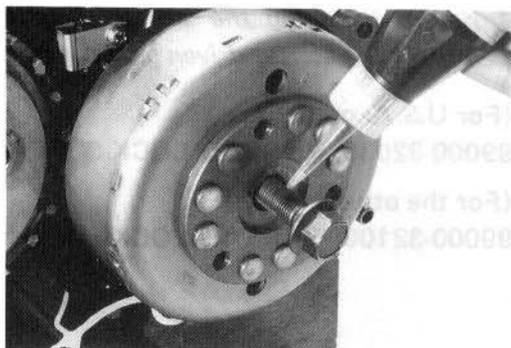
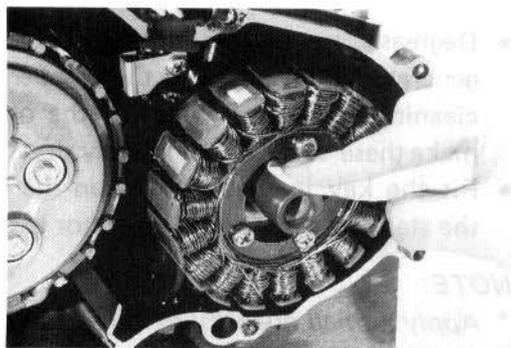
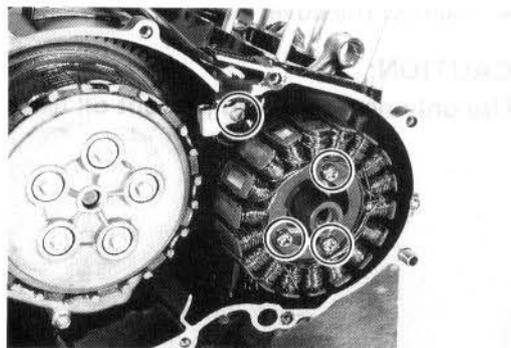
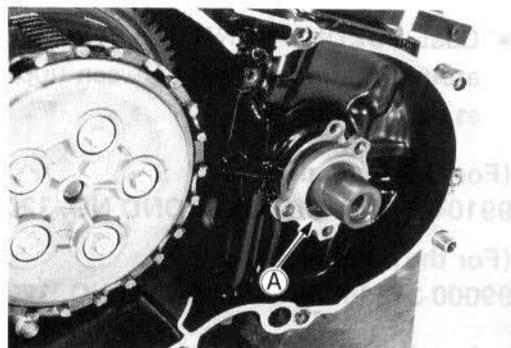
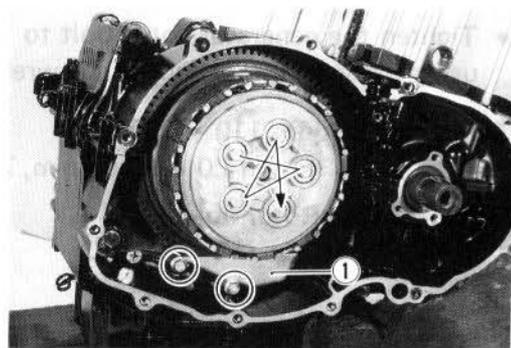
*Apply a small quantity of THREAD LOCK SUPER "1303"/"1305" to the generator rotor bolt.*

(For U.S.A. model)

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

(For the other models)

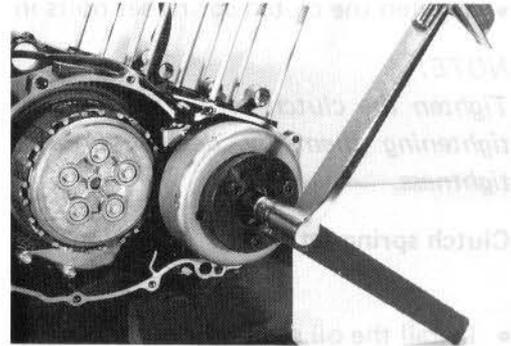
**99000-32100: THREAD LOCK SUPER "1305"**



- Tighten the generator rotor bolt to the specified torque by using the special tool and torque wrench.

**Tightening torque: 110 – 130 N·m**  
(11.0 – 13.0 kg·m, 79.5 – 94.0 lb-ft)

09930-32420: Rotor holder



- Coat SUZUKI BOND NO. 1207B lightly to the portion around mating surface between upper and lower crankcases as shown in the Fig.

(For U.S.A. model)

99104-31140: SUZUKI BOND NO. 1207B

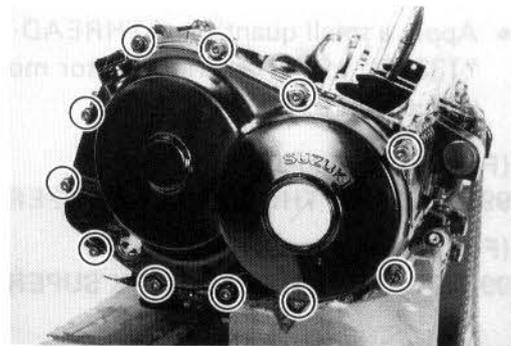
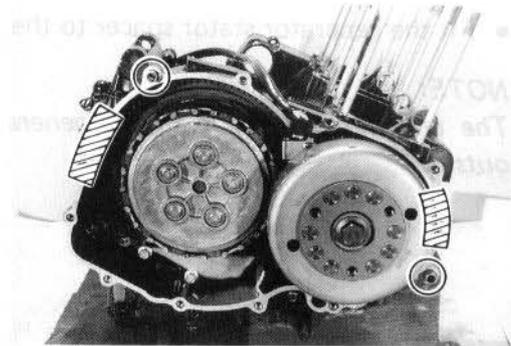
(For the other models)

99000-31140: SUZUKI BOND NO. 1207B

- Install the dowel pins, a new gasket and clutch cover.
- Tighten the cover bolts securely.

#### CAUTION:

Use only new gasket to prevent oil leakage.



- Degrease the tapered portion of the starter clutch/signal generator rotor and also the crankshaft. Use nonflammable cleaning solvent to wipe off the oily or greasy matter to make these surfaces completely dry.
- Fit the key in the key slot on the crankshaft, then install the starter clutch/signal generator rotor.

#### NOTE:

\* Apply a small quantity of *THREAD LOCK SUPER "1303"/"1305"* to the starter clutch bolt.

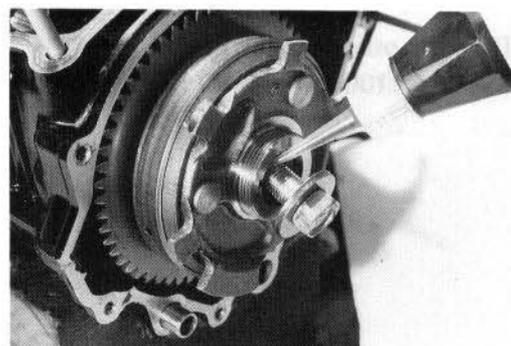
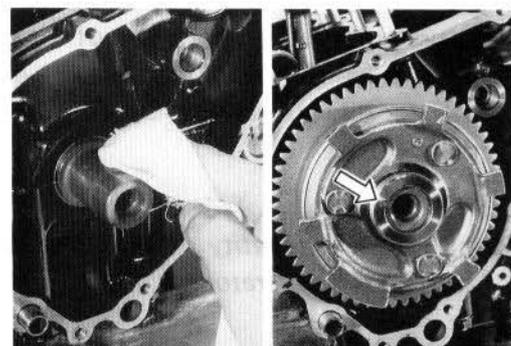
\* Before installing the starter clutch/signal generator rotor, inspect the starter driven gear for smooth movement.

(For U.S.A. model)

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

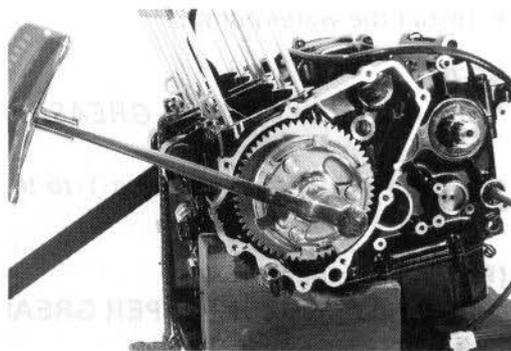
(For the other models)

99000-32100: *THREAD LOCK SUPER "1305"*

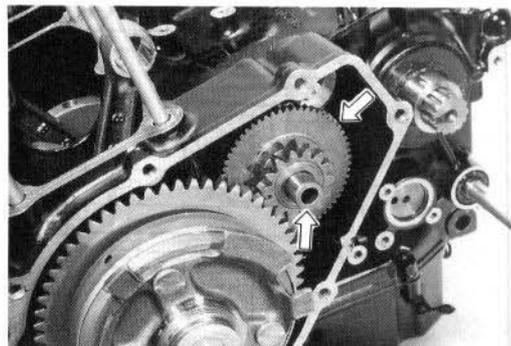


- Hold the generator rotor bolt with a box wrench and tighten the starter clutch bolt to the specified torque.

**Tightening torque: 85 – 95 N·m**  
(8.5 – 9.5 kg-m, 61.5 – 68.5 lb-ft)



- Install the starter idle gear and its shaft.



- Install the starter motor.

**NOTE:**

\* Apply *SUZUKI SUPER GREASE "A"* to the starter motor O-ring.

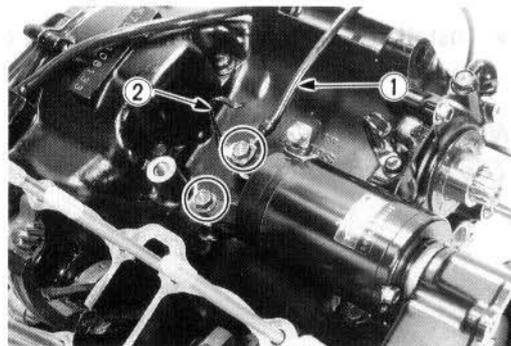
\* Fit the engine ground wire ① and lead wire clamp ② to the starter motor mounting bolt.

(For U.S.A. model)

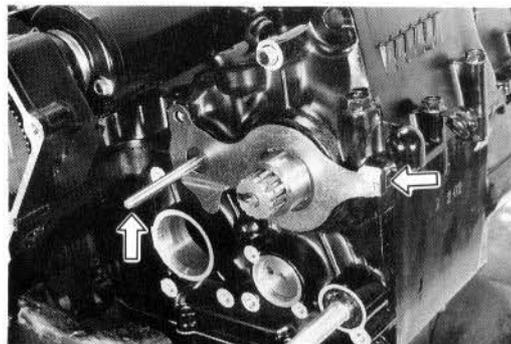
99000-25030: *SUZUKI SUPER GREASE "A"*

(For the other models)

99000-25010: *SUZUKI SUPER GREASE "A"*



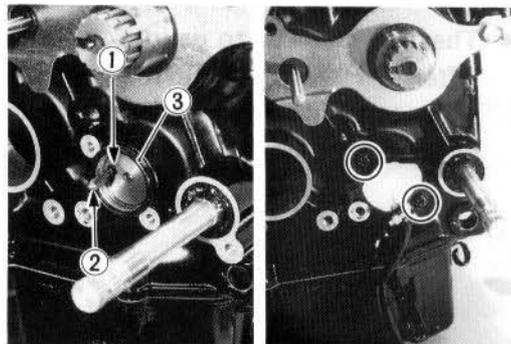
- Install the oil seal retainer and positively bend the lock portion of the retainer.
- Insert the clutch push rod into the countershaft.



- Install the neutral position indicator switch.

**NOTE:**

When installing the neutral position indicator switch, be sure to locate the spring, ① switch contact ② and O-ring ③.



### 3-55 ENGINE

- Install the water pump.

**NOTE:**

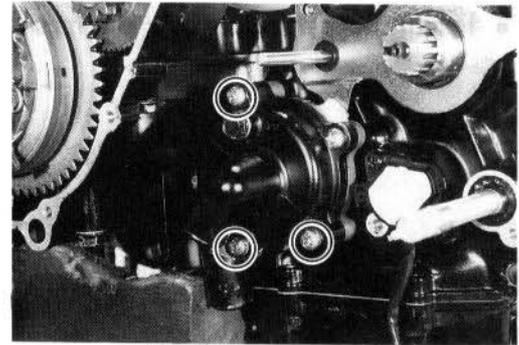
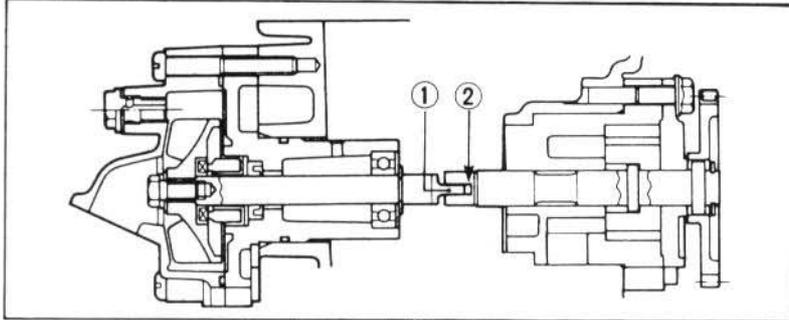
- \* Apply **SUZUKI SUPER GREASE "A"** to the water pump O-ring.
- \* Set the water pump shaft lug ① to the oil pump shaft slit ②.

(For U.S.A. model)

99000-25030: **SUZUKI SUPER GREASE "A"**

(For the other models)

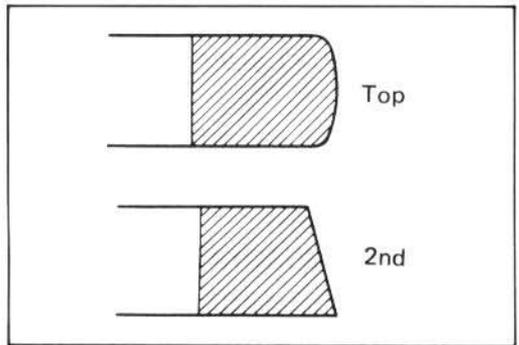
99000-25010: **SUZUKI SUPER GREASE "A"**



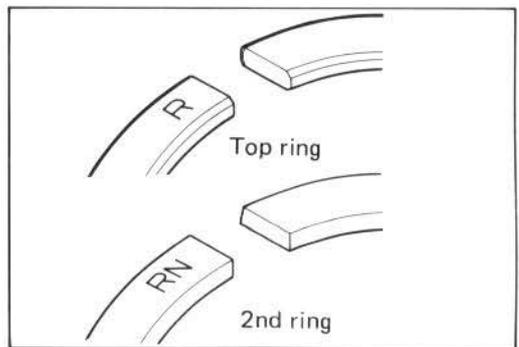
- Install the piston rings in the order of oil ring, 2nd ring and top ring.

**NOTE:**

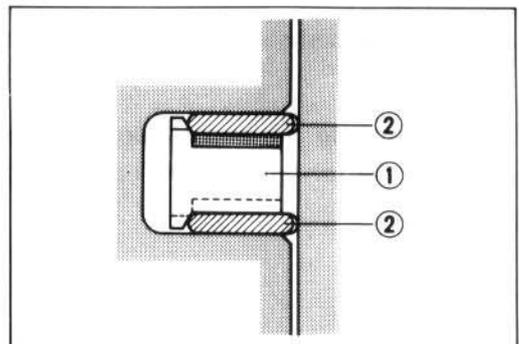
*Top ring and 2nd ring differ in the shape of ring face.*



- Top and 2nd rings have letter "R" and "RN" marked on the side. Be sure to bring the marked side to top when fitting them to the piston.

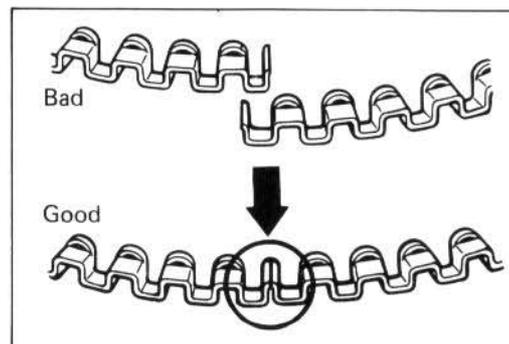


- The first member to go into the oil ring groove is spacer ①. After placing spacer, fit the two side rails ②. Side designations, top and bottom, are not applied to the spacer and side rails: you can position each either way.

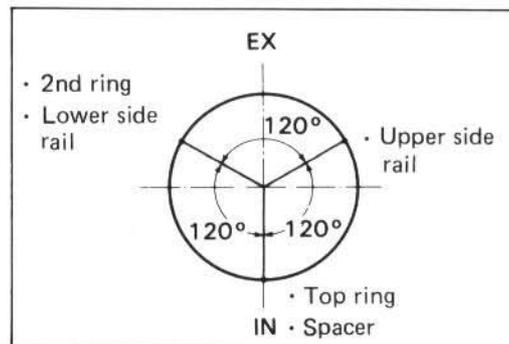


**CAUTION:**

When installing the spacer, be careful not to allow its two ends to overlap in the groove.



- Position the gaps of the three rings as shown. Before inserting each piston into the cylinder, check that the gaps are so located.

**NOTE:**

When replacing the cylinder stud bolts, tighten them to the specified torque.

**Tightening torque: 13 – 16 N·m**  
(1.3 – 1.6 kg·m, 9.5 – 11.5 lb-ft)

- The triangle mark on the piston head faces exhaust port side.
- Be sure to install the pistons in the cylinder from which they were taken out in disassembly, refer to the letter mark, "1" through "4", scribed on the piston.
- Have each piston pin moly paste oiled lightly before installing it.
- Place a cloth beneath the piston, and install the circlips.

**CAUTION:**

Be sure to use new circlips.

- Place the dowel pins and new cylinder gasket on the crankcase.

**NOTE:**

Be sure to identify the top surface by "UP" mark ① on the cylinder gasket as shown in the Fig.

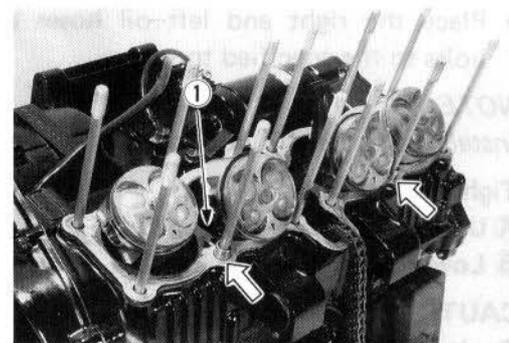
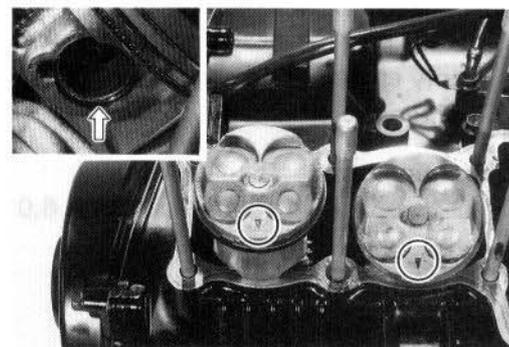
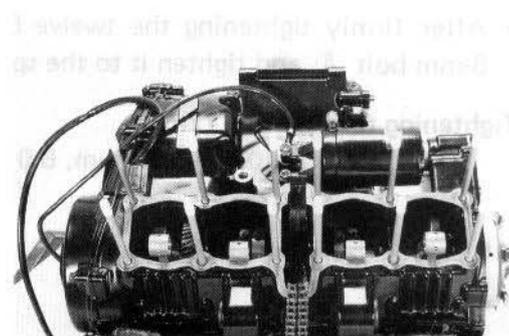
**CAUTION:**

Use a new gasket to prevent oil leakage.

- Install the piston ring holders to each piston.

09916-74521: Holder body

09916-74530: Band



- Place the dowel pins and new cylinder head gasket on the cylinder.

**NOTE:**

Be sure to identify the top surface by "UP" mark ① on the cylinder head gasket as shown in the Fig.

**CAUTION:**

Use a new gasket to prevent gas leakage.

- Tighten the cylinder head nuts to the specified torque with a torque wrench sequentially in the ascending order of numbers.

**Tightening torque: 25 – 29 N·m**  
(2.5 – 2.9 kg·m, 18.0 – 21.0 lb·ft)

- After firmly tightening the twelve 8-mm nuts, install one 6-mm bolt (A) and tighten it to the specified torque.

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

- Fit the new O-rings ① to the oil pipe.
- Apply engine oil to the O-rings ①.
- Tighten the oil pipe bolts to the specified torque.

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

- Place the right and left oil hoses and tighten the union bolts to the specified torque.

**NOTE:**

Install the gaskets to both sides of union.

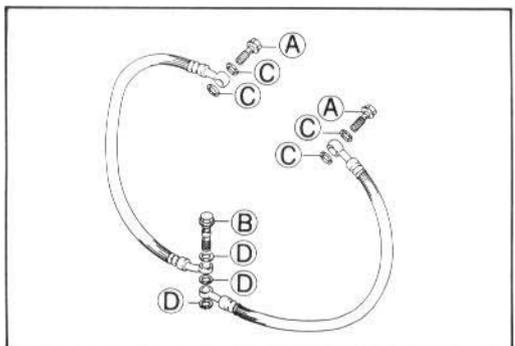
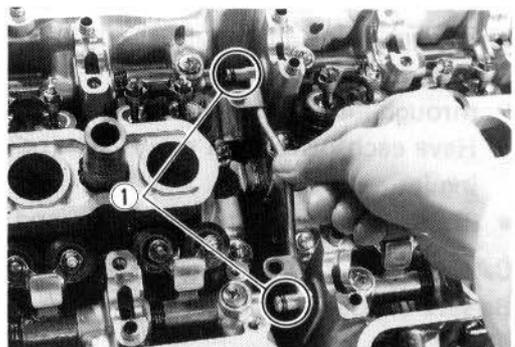
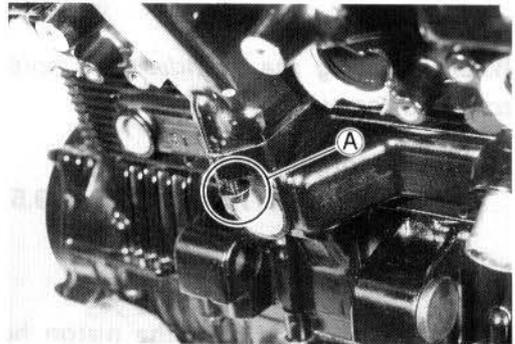
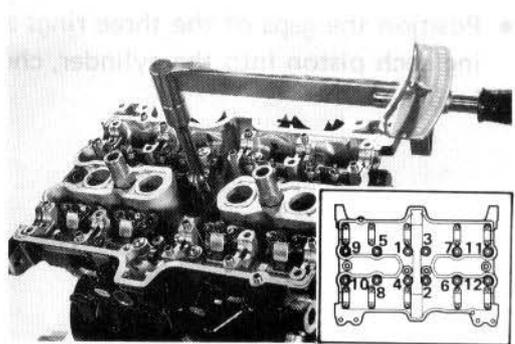
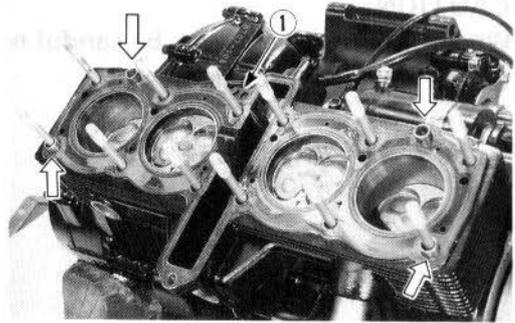
**Tightening torque:**

(A) Upper side : 18 – 22 N·m (1.8 – 2.2 kg·m, 13.0 – 16.0 lb·ft)

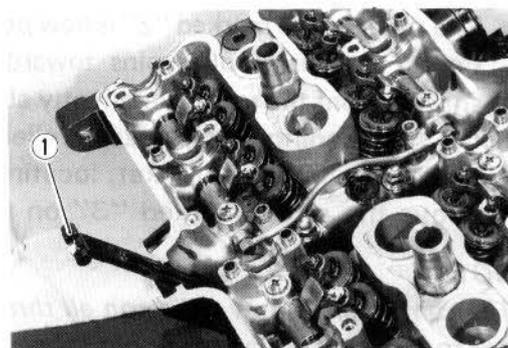
(B) Lower side : 20 – 24 N·m (2.0 – 2.4 kg·m, 14.5 – 17.5 lb·ft)

**CAUTION:**

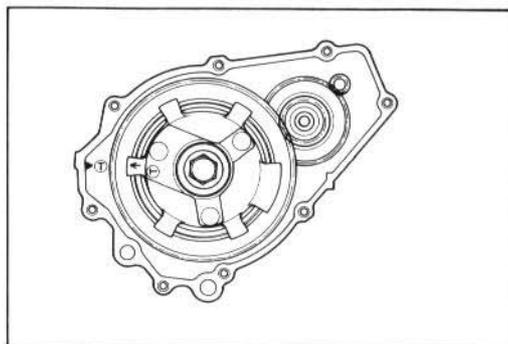
Replace the gaskets (C) and (D) with new ones to prevent oil leakage.



- Place the cam chain guide ① properly.



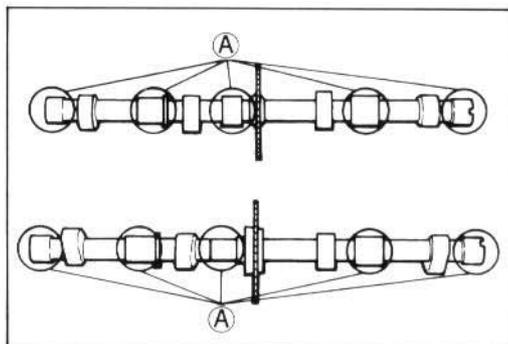
- While holding down the cam chain, rotate the crankshaft in normal direction to bring the arrow "Ⓟ" mark on the signal generator rotor to the arrow "Ⓟ" mark on the crankcase.



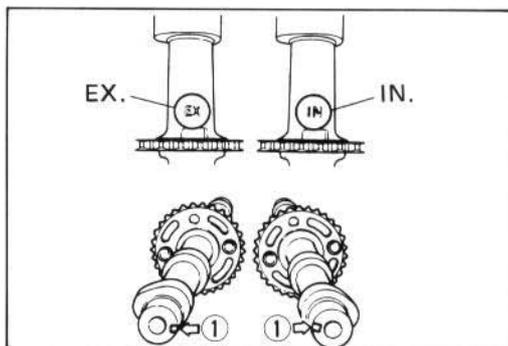
**NOTE:**

Just before placing the camshaft on the cylinder head, apply SUZUKI MOLY PASTE to its journals, fully coating each journal Ⓐ with the paste taking care not to leave any dry spot. Apply engine oil to the camshaft journal holders.

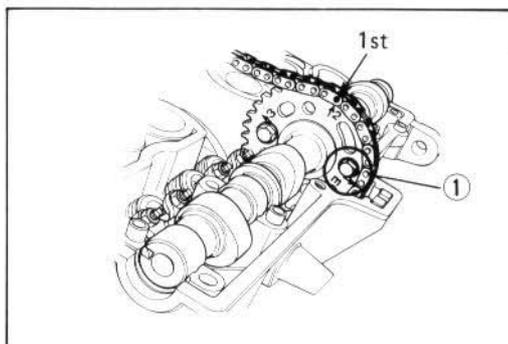
**99000-25140: SUZUMI MOLY PASTE**



- The exhaust camshaft can be distinguished from that of the intake by the embossed letters "EX" (for exhaust) as against letters "IN" (for intake). Similarly, the right end can be distinguished by the notch ① at the right end.



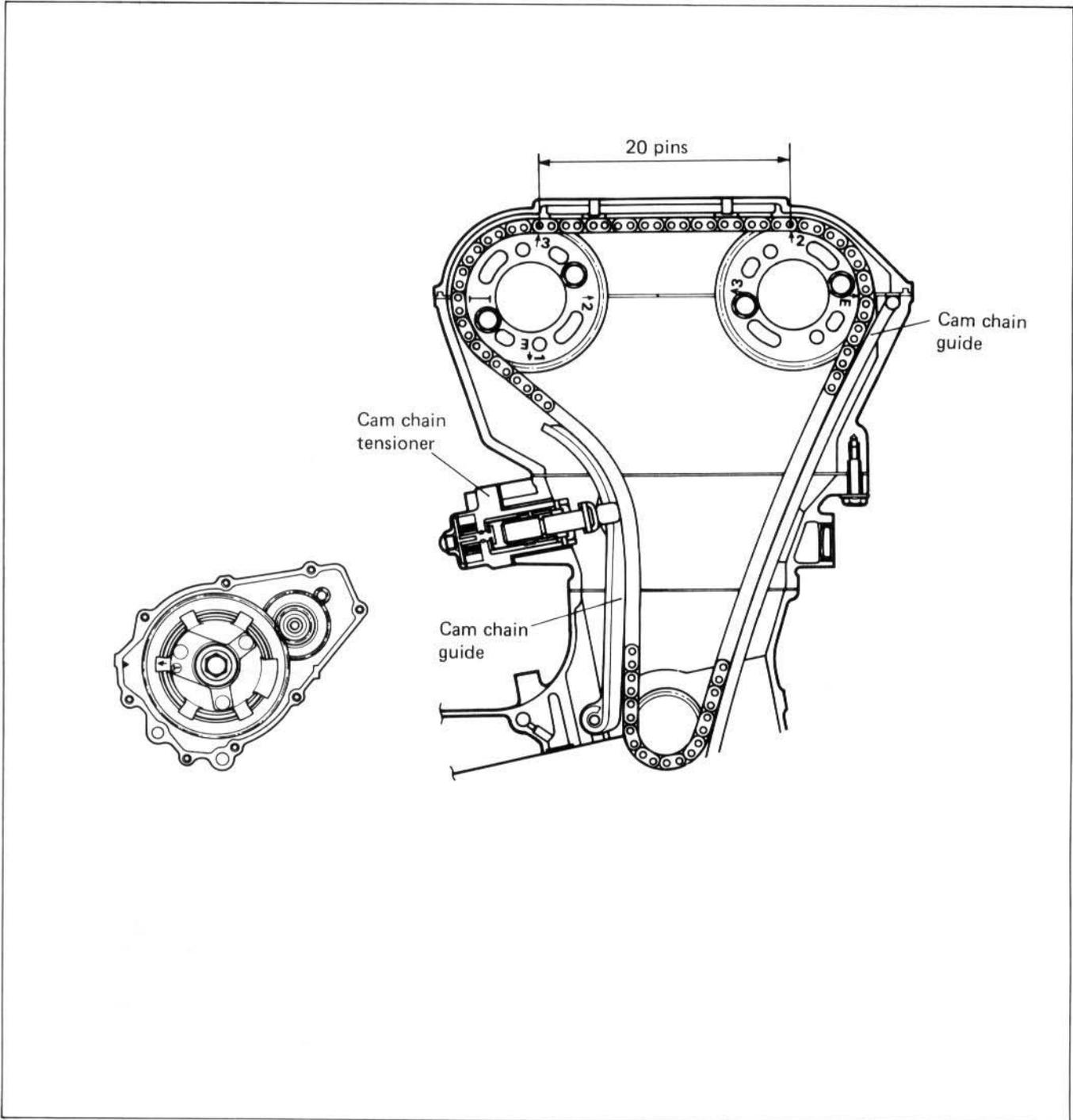
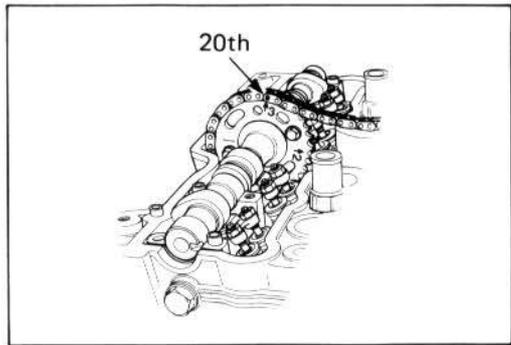
- With "Ⓟ" mark accurately lined up with the timing mark, hold the camshaft steady and lightly pull up the chain to remove the slack between the crank sprocket and exhaust sprocket.
- Exhaust sprocket bears an arrow marked "1" indicated as ①. Turn over the exhaust camshaft so that the arrow points flush with the gasketed surface of the cylinder head. Engage the cam chain with this sprocket.



- The other arrow marked "2" is now pointing straight upward. Count the chain roller pins toward the intake camshaft, starting from the roller pin directly above this arrow marked "2" and ending with the 20th roller pin. Engage the cam chain with intake sprocket, locating the 20th pin at the above the arrow marked "3" on the intake sprocket.

**NOTE:**

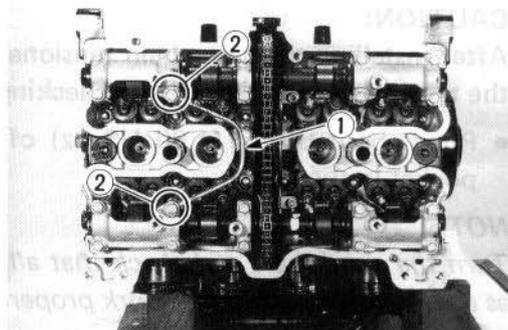
*The cam chain is now riding on all three sprockets. Be careful not to disturb the crankshaft until the camshaft journal holders and cam chain tensioner are secured.*



- Each camshaft journal holder is identified with a cast-on letter. Install the dowel pins to each camshaft journal holder.
- Place the cylinder head oil pipe ① to the camshaft journal holders.

**NOTE:**

Fit the washer to each oil pipe union bolt ②.



- Secure the camshaft journal holders evenly by tightening the camshaft journal holder bolts sequentially. Try to equalize the pressure by moving the wrench diagonally from one bolt to another and from one camshaft journal holder to another, to push shafts down evenly.

**NOTE:**

Damage to head or camshaft journal holder thrust surfaces may result if the camshaft journal holders are not drawn down evenly.

- Tighten the camshaft journal holder bolts to the specified torque.

**Tightening torque: 8 – 12 N·m**

(0.8 – 1.2 kg·m, 6.0 – 8.5 lb-ft)

**CAUTION:**

The camshaft journal holder bolts are made of special material and much superior in strength compared with other type of high strength bolts.

Take special care not to use other types of bolts instead of these special bolts. To identify these bolts, each of them has a figure "9" on its head.

- Turn the slotted end of the cam chain tensioner to lock it with a screwdriver in the clockwise direction.
- Install the cam chain tensioner on the cylinder.

**Tightening torque: 6 – 8 N·m**

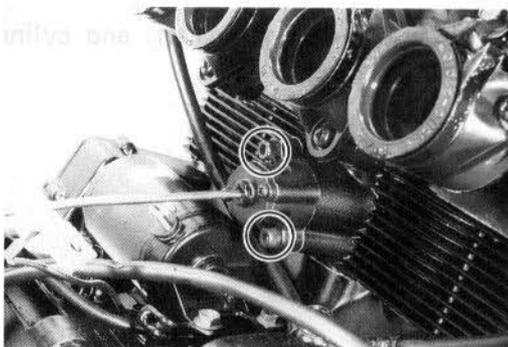
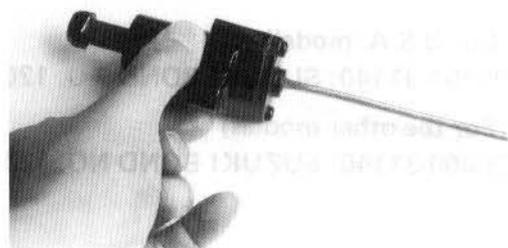
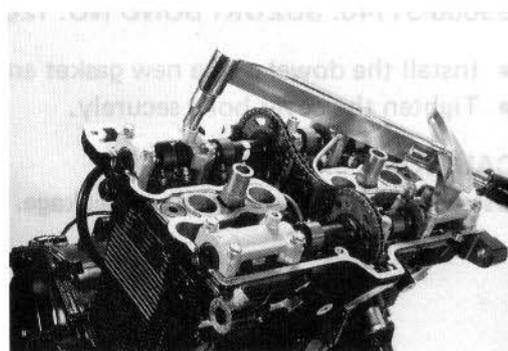
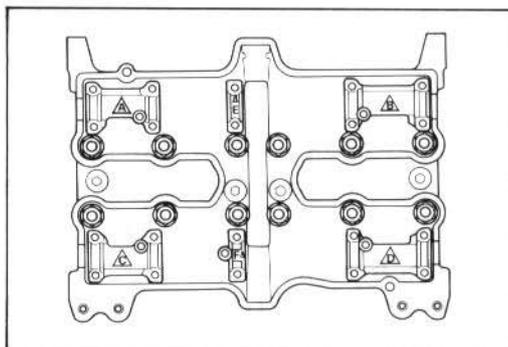
(0.6 – 0.8 kg·m, 4.5 – 6.0 lb-ft)

**09911-73730: "T" type hexagon wrench (5 mm)**

- Turn back and pull out the screwdriver from the cam chain tensioner. As the cylinder turns, the tensioner rod is advanced under spring force and pushes the tensioner against the cam chain.

**NOTE:**

The cam chain tensioner is maintained at the proper tension by an automatically adjusted tensioner. Before installing the cam chain tensioner, inspect the smooth movement.



**CAUTION:**

After installing the cam chain tensioner, check to be sure that the tensioner work properly by checking the slack of cam chain.

- Pour about 50 ml (1.69 US oz) of engine oil in each oil pocket in the head.

**NOTE:**

Turn the crankshaft and check that all the moving parts such as cam follower, camshaft, work properly.

**CAUTION:**

Be sure to check and adjust the valve clearance. (Refer to page 2-5.)

- Coat SUZUKI BOND NO. 1207B lightly to the portion around mating surface between upper and lower crankcases as shown in the Fig.

(For U.S.A. model)

99104-31140: SUZUKI BOND NO. 1207B

(For the other models)

99000-31140: SUZUKI BOND NO. 1207B

- Install the dowel pin, a new gasket and starter clutch cover.
- Tighten the cover bolts securely.

**CAUTION:**

Use a new gasket to prevent oil leakage.

- Apply SUZUKI BOND NO. 1207B to the four cam end caps of the gasket as shown in the Fig.

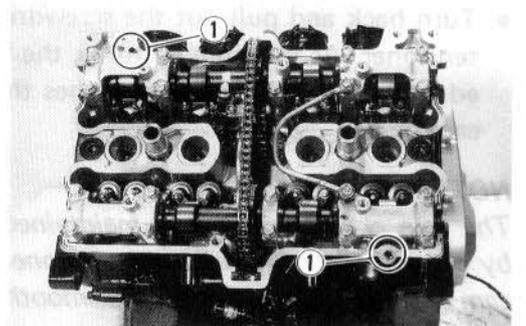
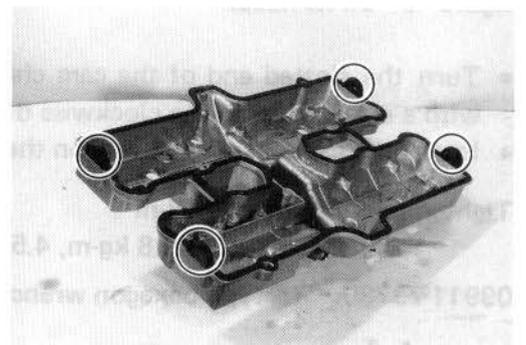
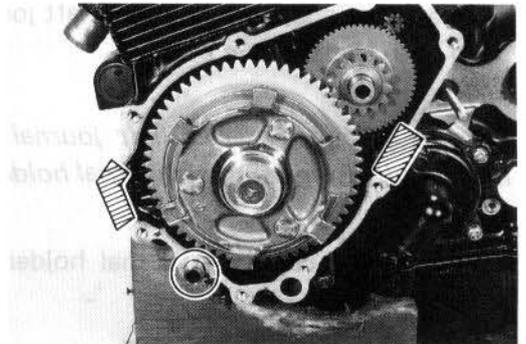
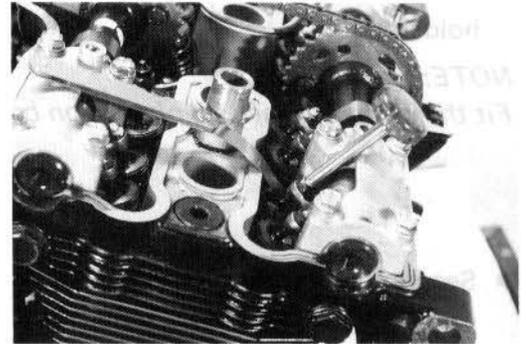
(For U.S.A. model)

99104-31140: SUZUKI BOND NO. 1207B

(For the other models)

99000-31140: SUZUKI BOND NO. 1207B

- Place the dowel pins ① and cylinder head cover on the cylinder head.



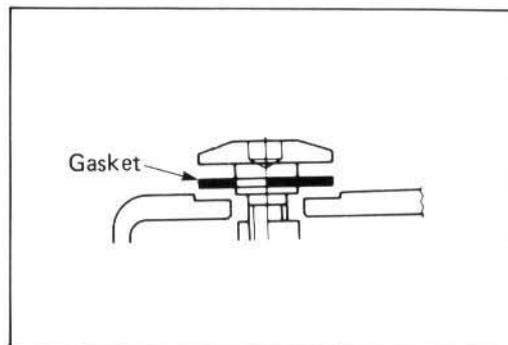
- Seat the six gaskets to each exact position.

**CAUTION:**

Replace the gaskets with new ones to prevent oil leakage.

**NOTE:**

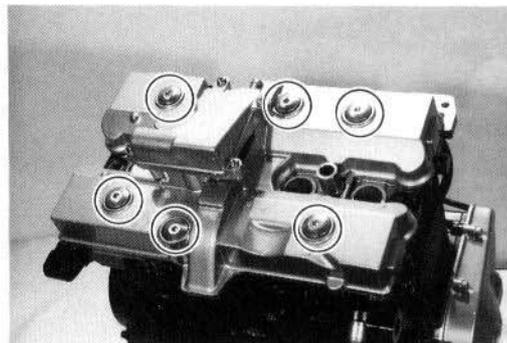
Apply engine oil to the gasket surfaces.



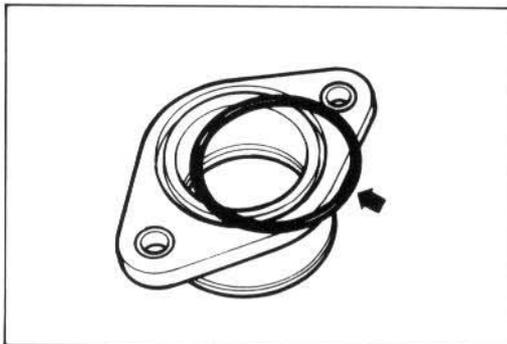
- Tighten the cylinder head cover bolts to the specified torque.

Tightening torque: 8 – 12 N·m

(0.8 – 1.2 kg·m, 6.0 – 8.5 lb·ft)

**CAUTION:**

When replacing the intake pipe, use a new O-ring to prevent sucking air from the joint.

**BREATHER COVER SERVICING**

- Apply engine oil to the O-rings ①.
- Apply SUZUKI BOND NO. 1207B to the mating surfaces of the cylinder head cover and lower breather cover.
- Apply SUZUKI THREAD LOCK SUPER "1303" to the screws ②.

**CAUTION:**

Replace the O-rings ① and gasket ③ with new ones.

