ENGINE

CONTENTS

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 this section for removal and reinstallation instructions.

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Neutral switch	3-18	3-58
Generator	3-18	3-57
Water pump	3-19	3-56
Secondary driven bevel gear	3-19	3-55

ENGINE RIGHT SIDE

PARTS	REMOVAL	INSTALLATION
Clutch	3-14	3-61
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Gearshift	3-16	3-59
Primary drive gear	3-17	3-59
Driveshaft bolt/Secondary driven gearshaft nut	3-17	3-56

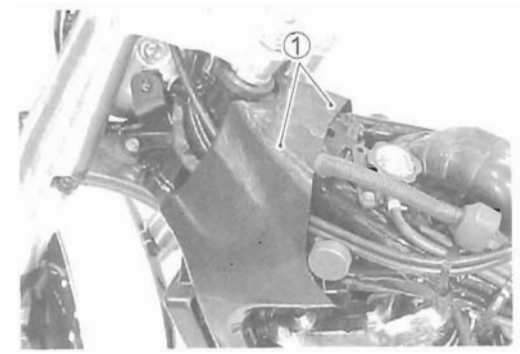
ENGINE REMOVAL AND INSTALLATION

ENGINE REMOVAL

Before taking the engine out of the frame, wash the engine using a steam cleaner. Engine removal is sequentially explained in the following steps. Reinstall the engine by reversing the removal procedure.

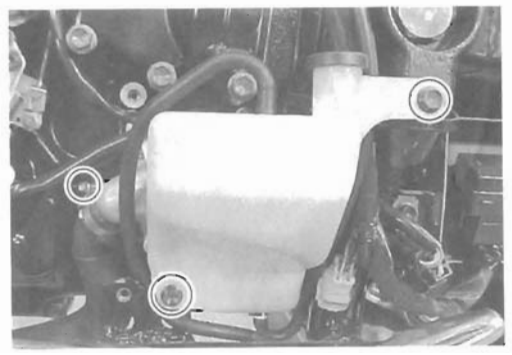
- Drain engine oil. (☞2-8)
- Drain engine coolant. (☞2-13)
- Remove the seats. (☞7-2)
- Remove the fuel tank. (☞ 5-3)
- Disconnect the battery ⊖ lead wire.

- Remove the frame head covers ①.

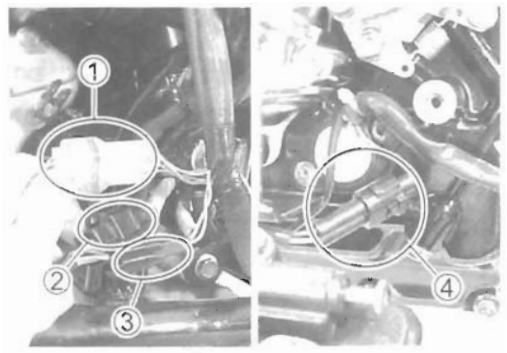


- Remove the radiator. (☞ 6-4)

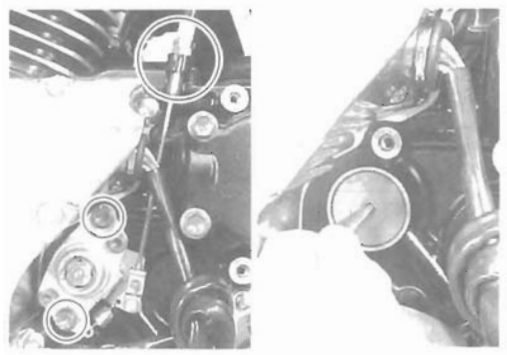
- Remove the left frame cover and the secondary gear case cover.
- Remove the engine coolant reservoir tank.



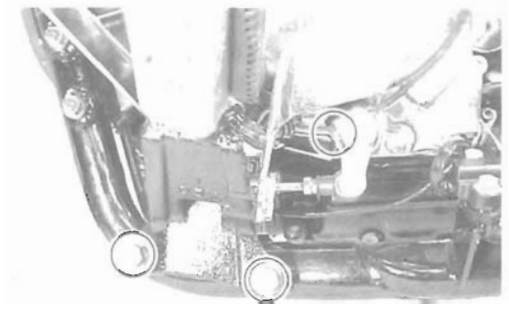
- Disconnect the neutral switch lead wire coupler ①.
- Disconnect the generator lead wire coupler ② and the signal generator lead wire coupler ③.
- Disconnect the side-stand switch lead wire coupler ④.



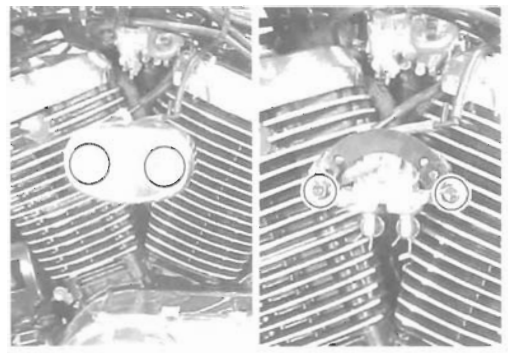
- Remove the clutch release mechanism.
- Remove the push rod.



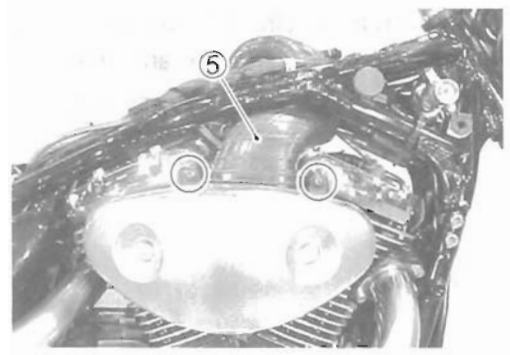
- Remove the left footrest and the gearshift lever.



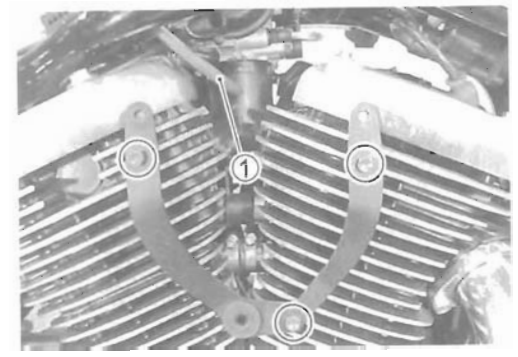
- Remove the PAIR (AIR SUPPLY) cover
- Remove the PAIR system.



- Remove the air cleaner box and the outlet tube ⑤.



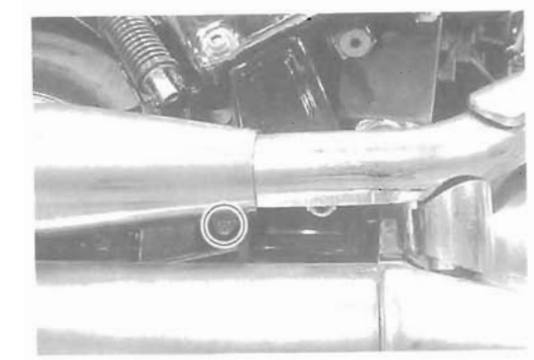
- Remove the air cleaner box bracket.
- Disconnect the negative pressure hose ①.

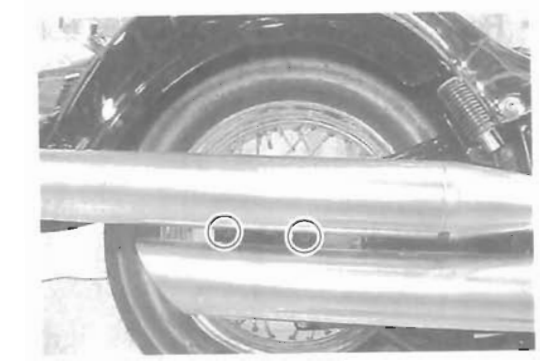


- Remove the carburetor.
  Caburetor removal ☞5-15
- Remove the spark plug caps.

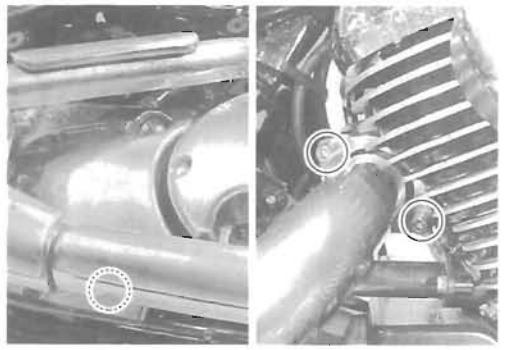
- Remove the right frame cover.

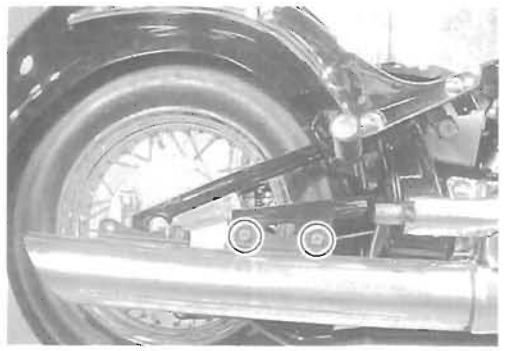
- Remove the No. 1 muffler.





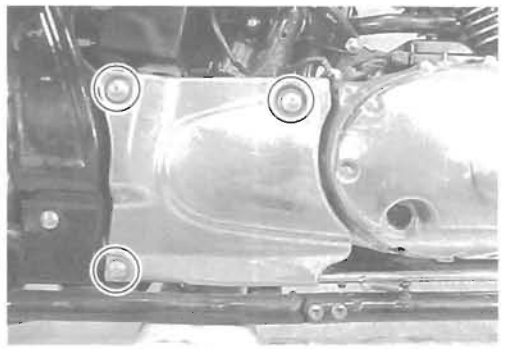
- Remove the No. 1 exhaust pipe and the No. 2 muffler.



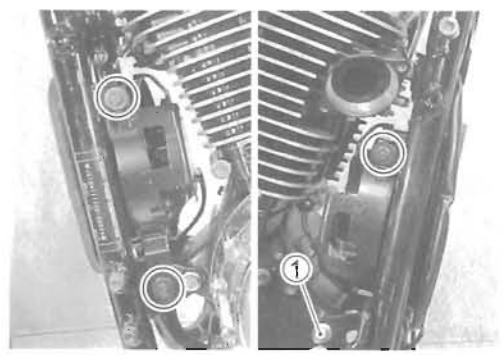


- Remove the No.2 exhaust pipe.

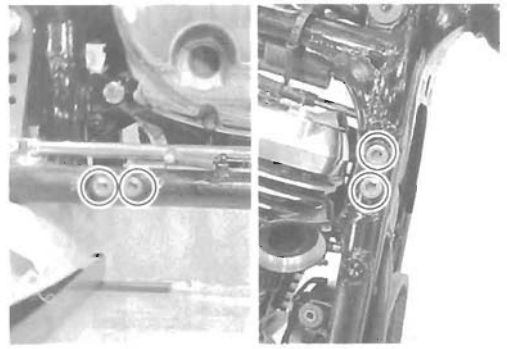
- Remove the rear clutch cover.

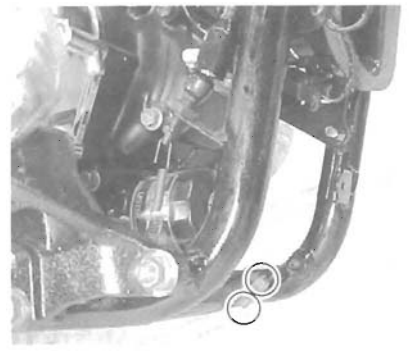


- Remove the cooling fan mounting bolts.
- Remove the engine mounting bolt ①.

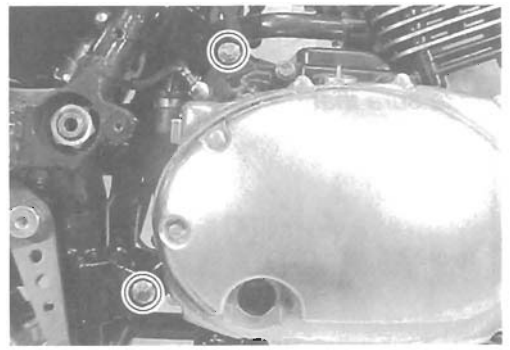


- Remove the frame down tube.





- Support the engine with an engine jack.
- Remove the engine mounting bolts and nuts.
- Gradually lower the engine.

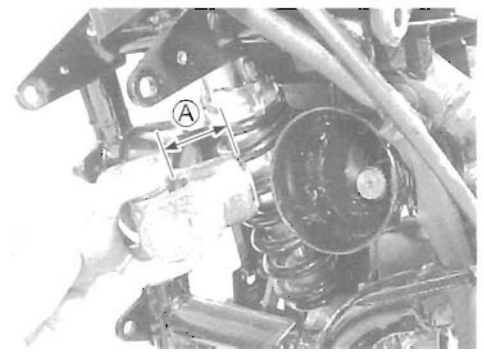


ENGINE INSTALLATION

Install the engine in the reverse order of engine removal
Pay attention to the following points:

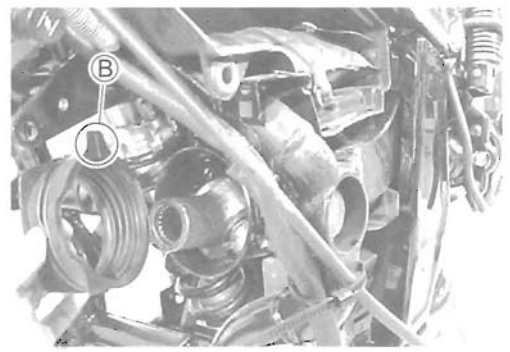
- Install the universal joint.

NOTE:
Be sure to face the short portion Ⓐ backward when installing it.

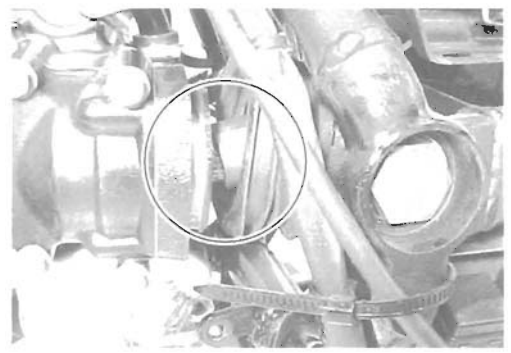


- Install the boot.

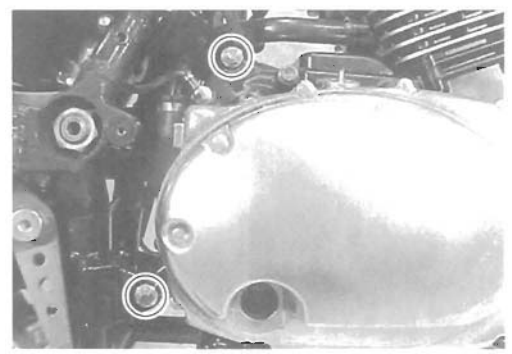
NOTE:
Make sure that the "UP" mark Ⓑ faces up.



- Gradually raise the engine, and then engage the secondary driven gear shaft to the universal joint.

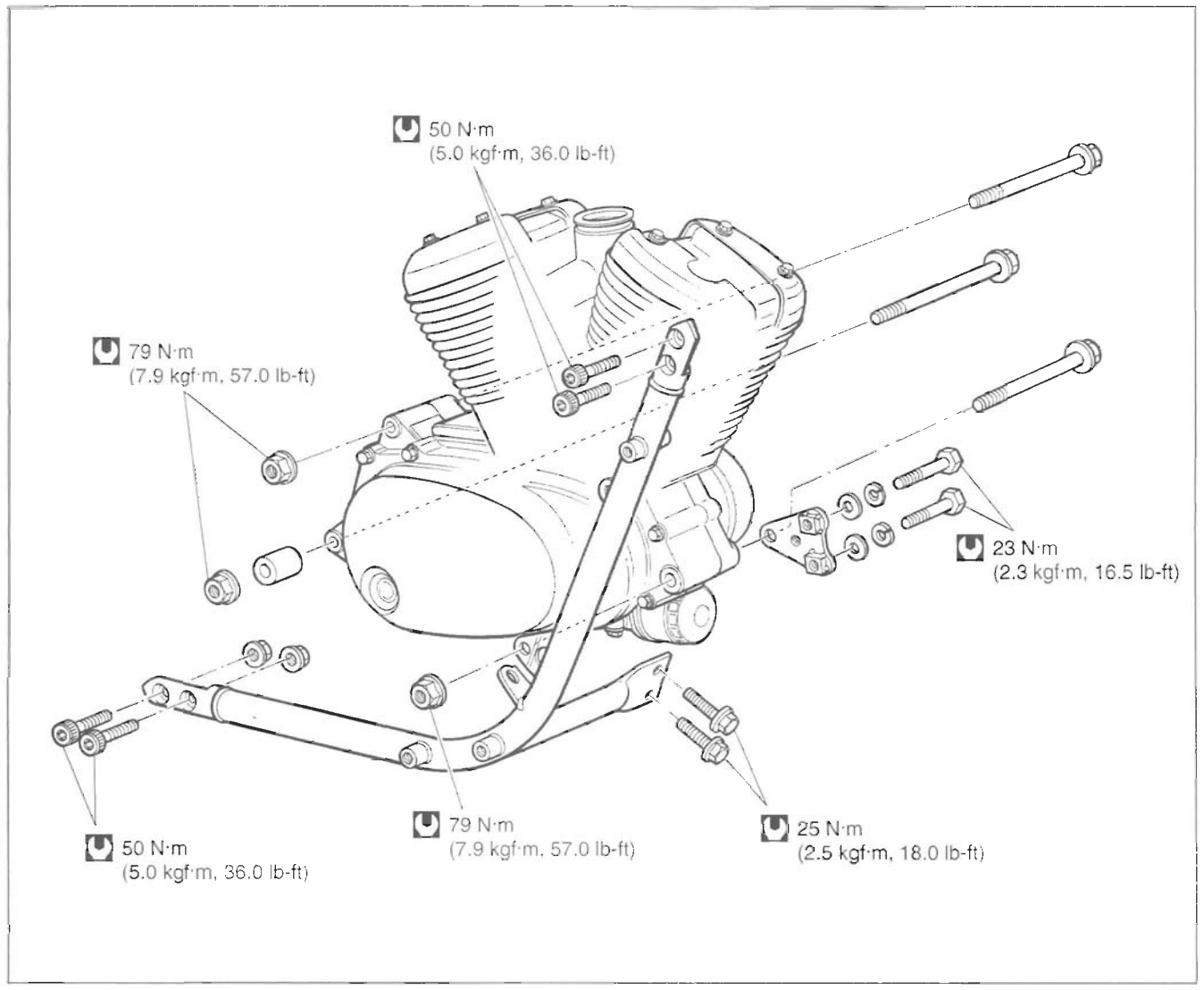


- Install the engine mounting bolts and nuts and tighten them

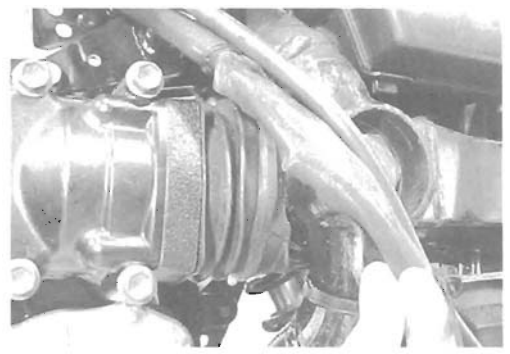


NOTE:

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

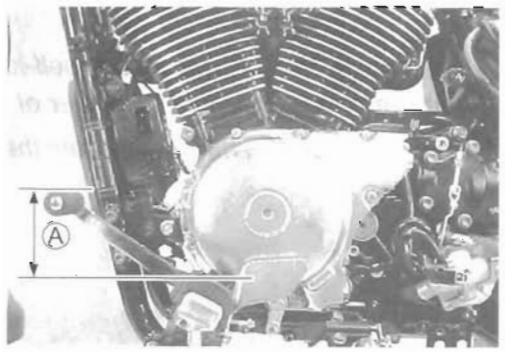


- Properly fit the boot onto the engine and the swingarm.



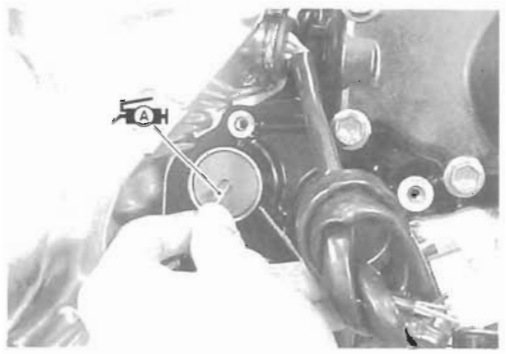
- Install the gearshift lever and the footrest in the correct position.

DATA **Gearshift lever height Ⓐ**
Standard: 90 mm (3.5 in)



- Apply grease to the push rod and install it.

99000-25030: SUZUKI SUPER GREASE "A" (For USA)
99000-25010: SUZUKI SUPER GREASE "A" (For the others)

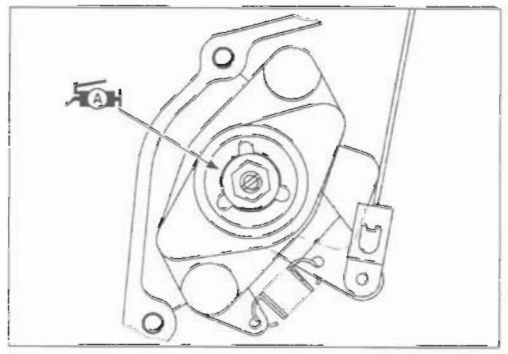


- Apply grease to the clutch release mechanism and install it.

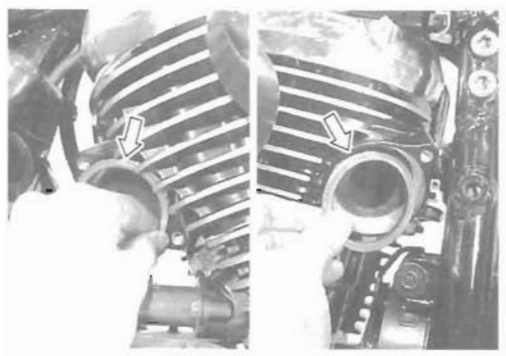
99000-25030: SUZUKI SUPER GREASE "A" (For USA)
99000-25010: SUZUKI SUPER GREASE "A" (For the others)

DATA **Clutch release screw**
Standard: ¼ turn back

CLUTCH CABLE ADJUSTMENT☞2-12



- Install the new gaskets.
- Install the exhaust pipes and mufflers.



- Apply gas sealer to the exhaust pipe connecters.

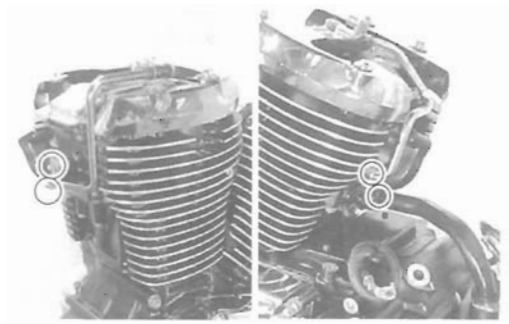
EXHAUST GAS SEALER: PERMATEX 1372

- Adjust the following items.
  - Engine oil ☞2-8
  - Engine coolant ☞2-13
  - Idling adjustment ☞2-10
  - Throttle cable play ☞2-11
  - Rear brake pedal height ☞2-16

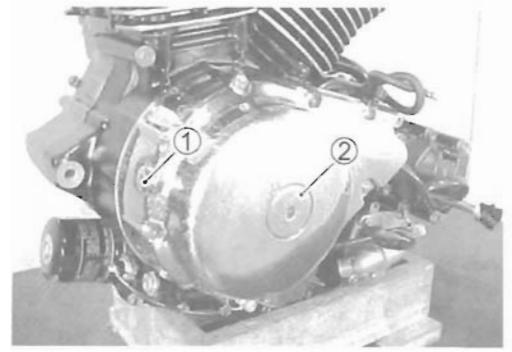
ENGINE DISASSEMBLY

- Remove the PAIR pipes.
- Remove the spark plugs.

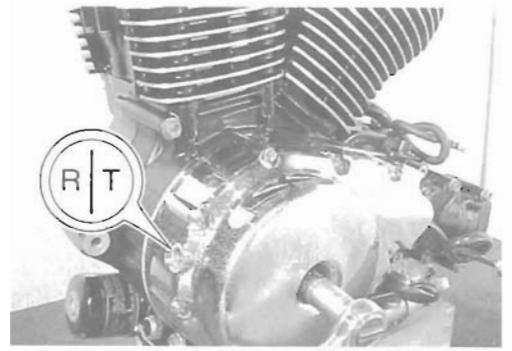
TOOL **09930-10121: Spark plug wrench set**



- Remove the valve timing inspection plug ① and the generator cover cap ②.

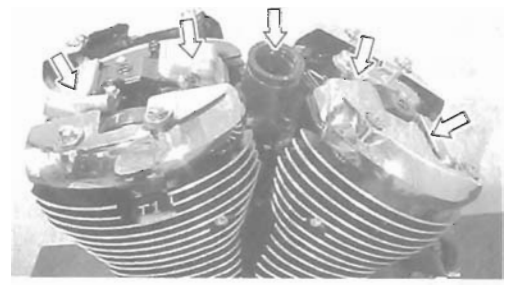


- Position "RIT" mark on the generator with the center of the valve timing inspection hole.



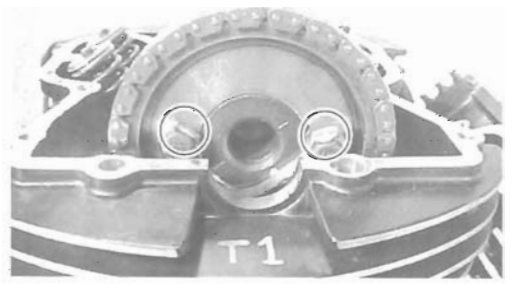
CYLINDER HEAD COVER

- Remove the intake pipe.
- Remove the inspection caps.
- Remove the cylinder head covers.



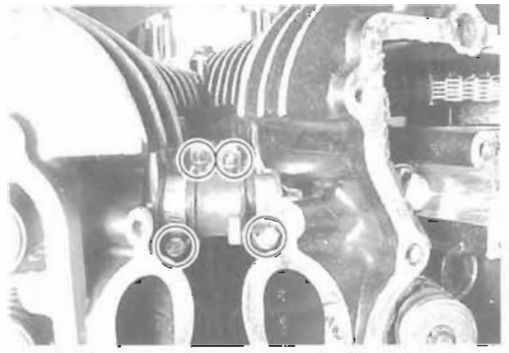
CAMSHAFT

- Flatten the lock washer.
- Remove the cam sprocket and camshaft. (Front and rear cylinders)

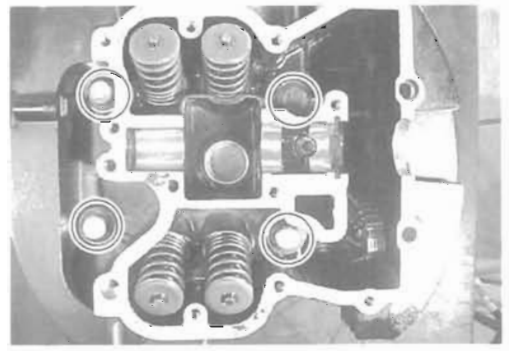


CYLINDER HEAD/CYLINDER

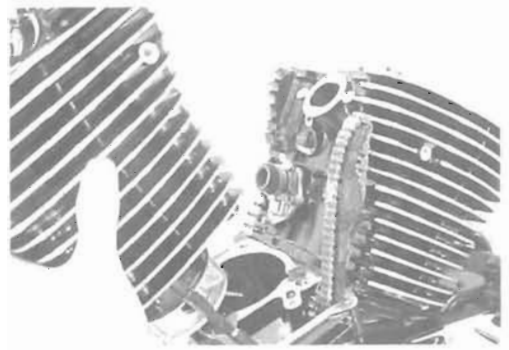
- Loosen the water hose clamp screws.



- Remove the cylinder head bolts. (Front cylinder)

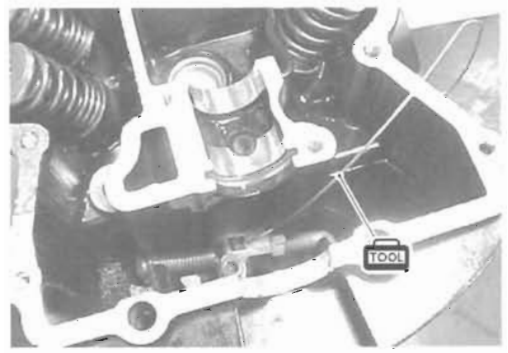


- Remove the cylinder head and cylinder. (Front cylinder)

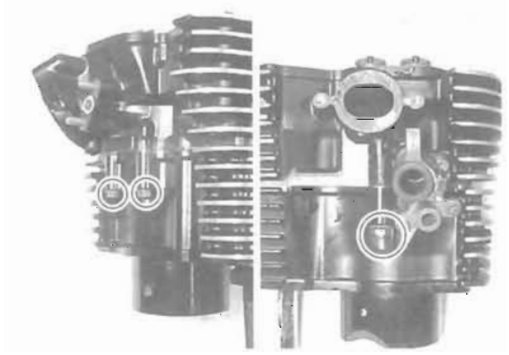


- After unlocking the ratchet, push the cam chain tension adjuster rod fully.
- Insert the special tool between the ratchet and the adjuster body.

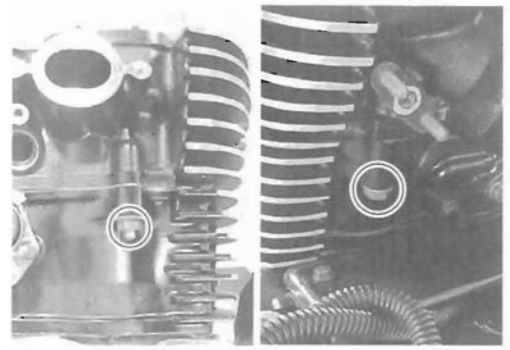
TOOL **09918-53810: Chain tensioner lock tool**



- Separate the cylinder head/cylinder assembly. (Front cylinder)



- Remove the cylinder head bolt and nut. (Rear cylinder)

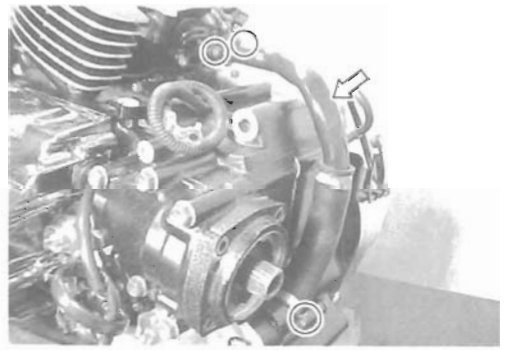


- Push the cam chain tension adjuster rod and insert the special tool.

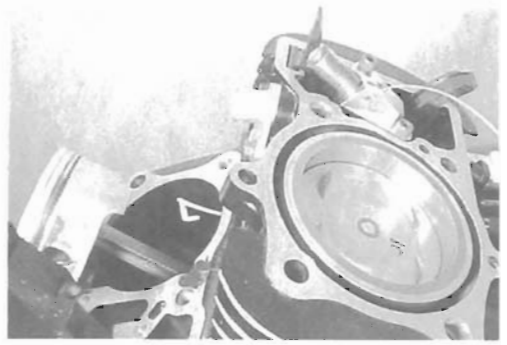
TOOL **09918-53810: Chain tensioner lock tool**

- Remove the cylinder head by removing the cylinder head bolts.

- Remove the water hose and pipe.



- Remove the cylinder. (Rear cylinder)



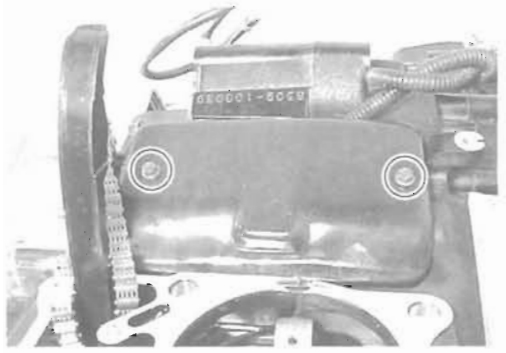
PISTON

- Place a clean rag under the piston to prevent any parts from falling into the crankcase.
- Remove the piston pin circlip ① using long-nose pliers.
- Draw out each piston pin and remove the pistons.

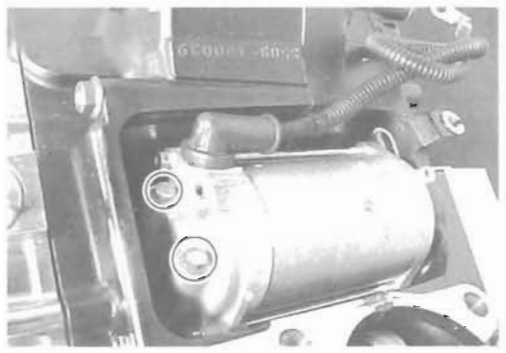
NOTE:
Scribe the cylinder position on the head.

STARTER MOTOR

- Remove the starter motor cover.

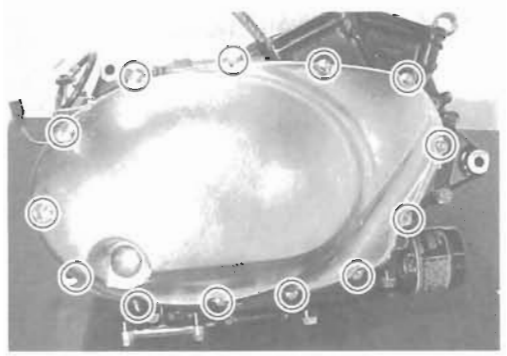


- Remove the starter motor.

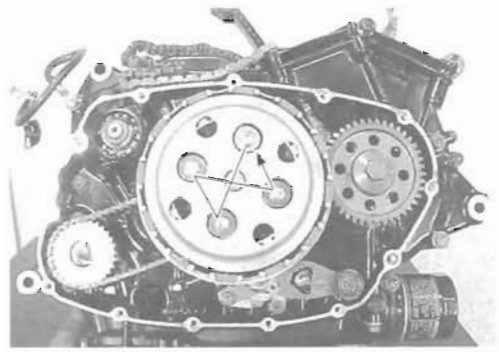


CLUTCH

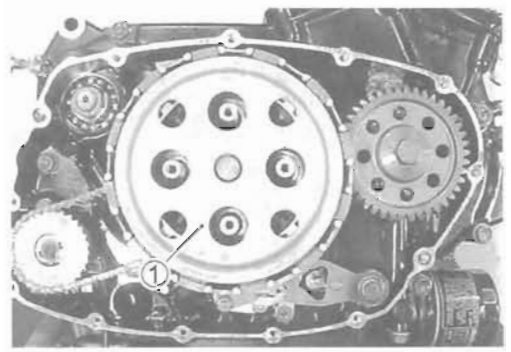
- Remove the clutch cover.



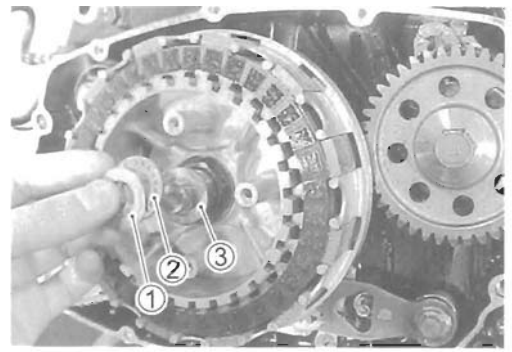
- Remove the clutch spring mounting bolts and springs diagonally.



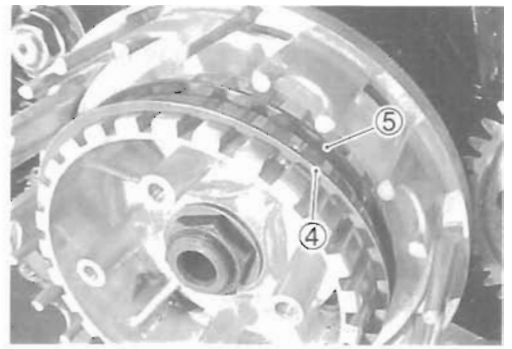
- Remove the pressure plate ①.



- Remove the thrust washer ①, bearing ②, push piece ③ and push rod.
- Remove the clutch drive and driven plates.

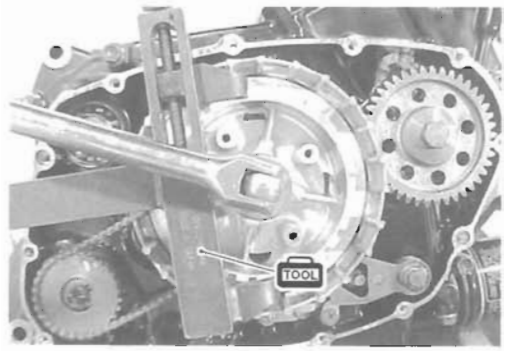


- Remove the spring washer ④ and spring washer seat ⑤.

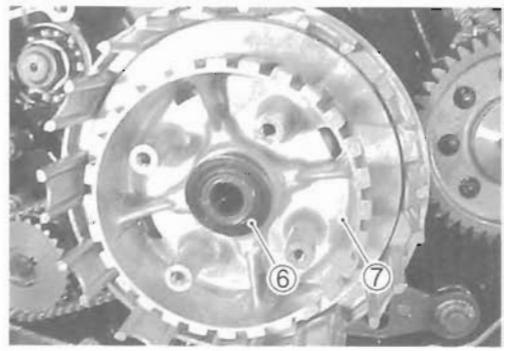


- Remove the clutch sleeve hub nut with the special tool.

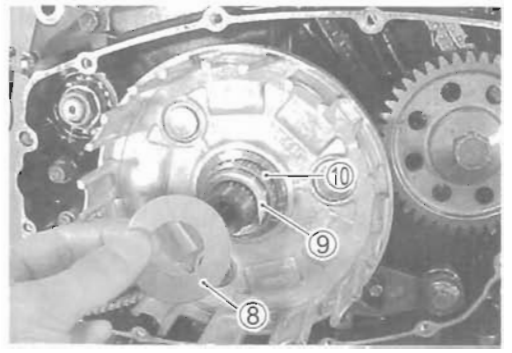
TOOL **09920-53740: Clutch sleeve hub holder**



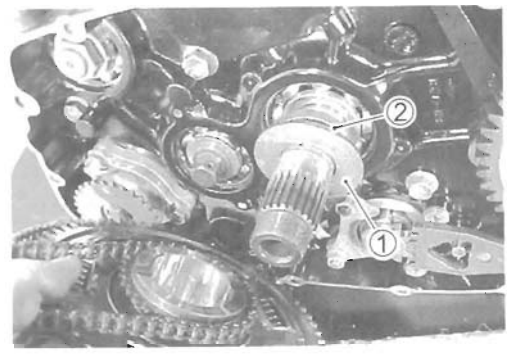
- Remove the washer ⑥ and the clutch sleeve hub ⑦.



- Remove the thrust washer ⑧, spacer ⑨, and needle roller bearing ⑩.



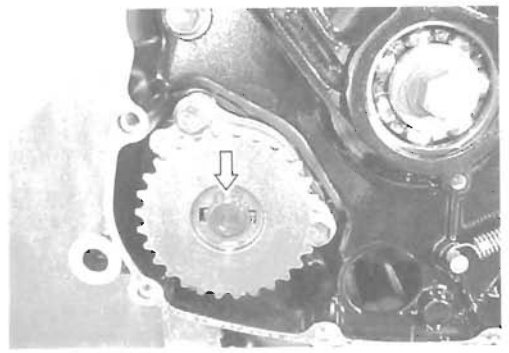
- Remove the primary driven gear assembly and the oil pump drive chain.
- Remove the thrust washer ① and spacer ②.



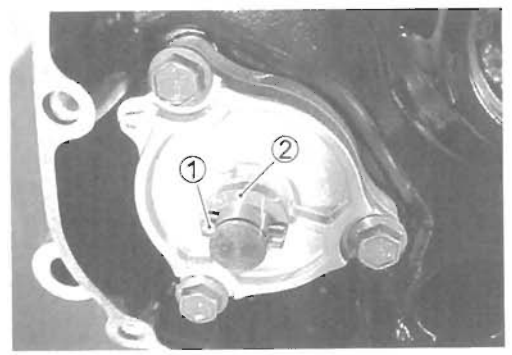
OIL PUMP

- Remove the oil pump by removing the circlip.

TOOL **09900-06107: Snap ring pliers**

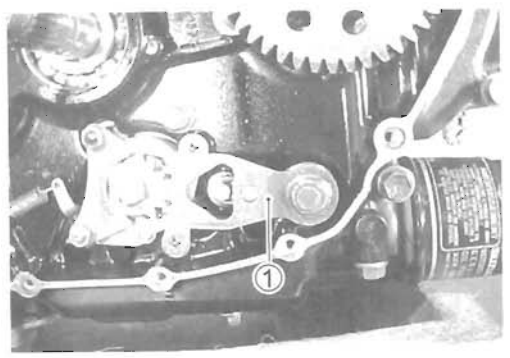


- Remove the pin ① and washer ②.

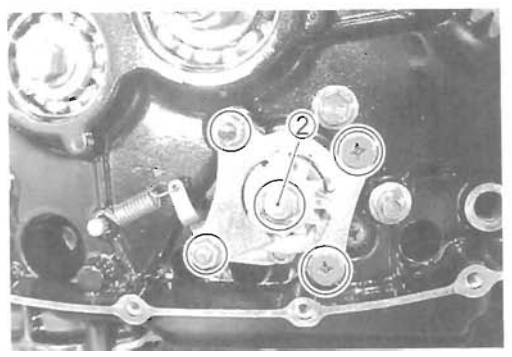


GEARSHIFT

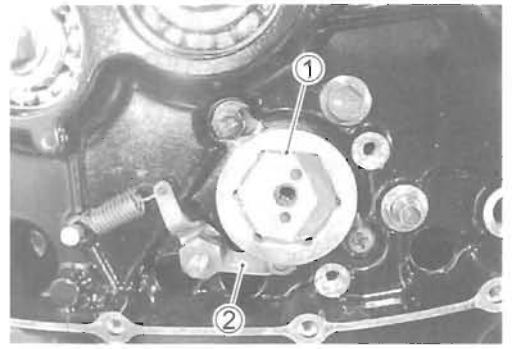
- Draw out the gearshift shaft ①.



- Remove the cam guide and the pawl lifter.
- Remove the cam driven gear assembly by removing the gearshift cam stopper bolt ②.



- Remove the gearshift cam plate ①.
- Remove the gearshift cam stopper ②.



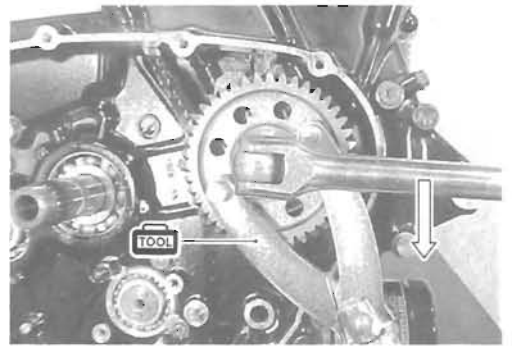
PRIMARY DRIVE GEAR

Remove the primary drive gear by removing the primary drive gear bolt with the special tool.

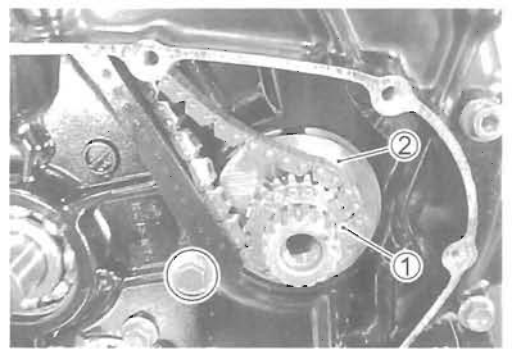
TOOL **09930-40113: Rotor holder**

⚠ CAUTION

This bolt has left-hand thread.
Turning it counter-clockwise may cause damage.



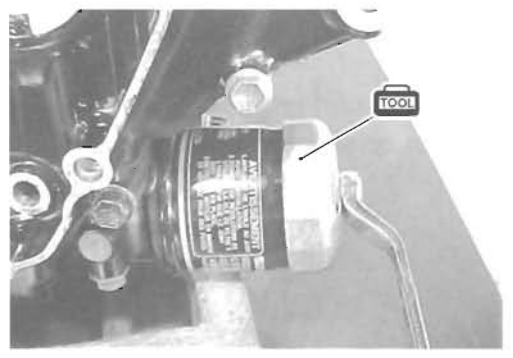
- Remove the cam chain tensioner and the chain.
- Remove the cam chain drive sprocket ① and the thrust washer ②.



OIL FILTER

- Remove the oil filter with the special tool.

TOOL **09915-40610: Oil filter wrench**

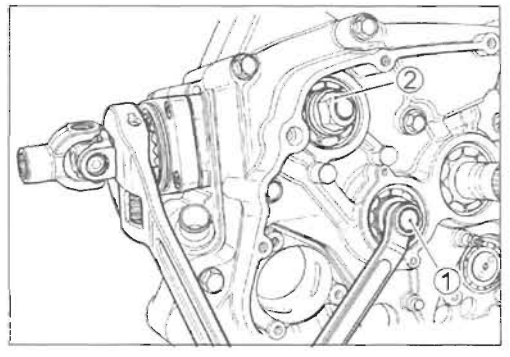


DRIVESHAFT BOLT/SECONDARY DRIVEN GEAR SHAFT NUT

- Install the universal joint on the secondary driven gear shaft.
- While holding the universal joint with an adjustable wrench, remove the driveshaft bolt ① and the secondary drive gear shaft nut ②.

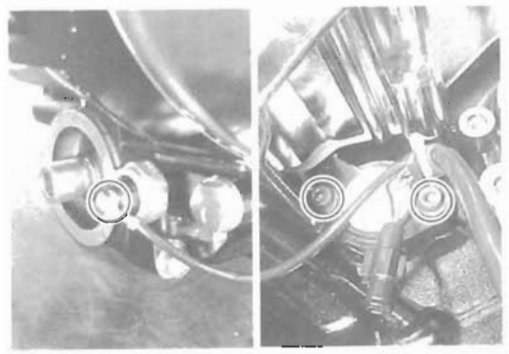
⚠ CAUTION

The driveshaft bolt ① has left-hand thread.
Turning it counter-clockwise may cause damage.



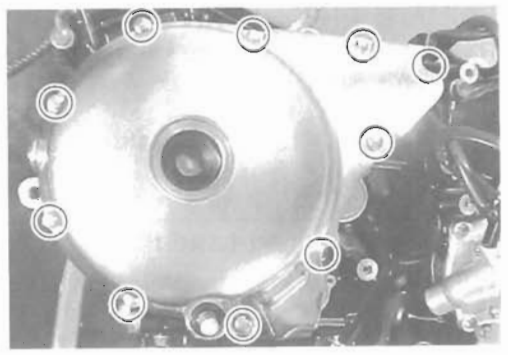
NEUTRAL SWITCH

- Remove the neutral switch assembly.
- Remove the oil pressure switch lead wire.

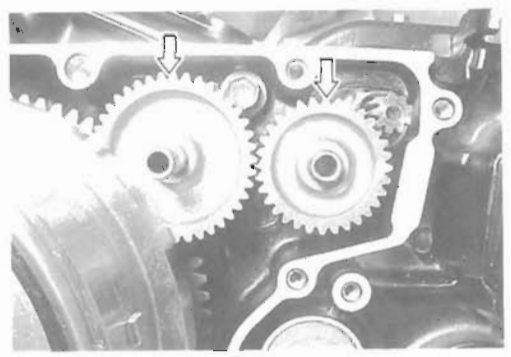


GENERATOR

- Remove the generator cover.

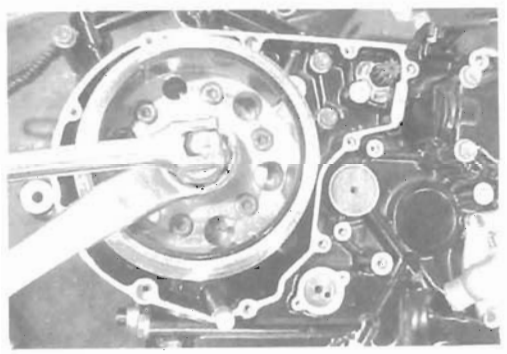


- Remove the starter motor driven gear and the idle gear.



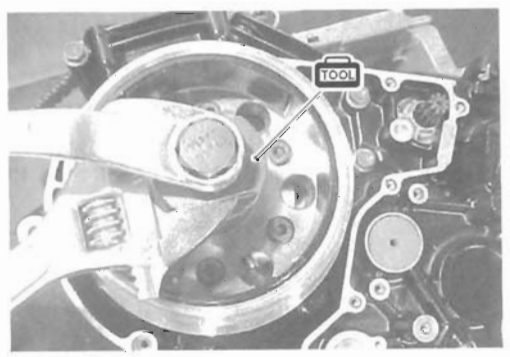
- Loosen the generator rotor bolt.

NOTE:
When loosen the rotor bolt, do not remove it. The rotor bolt is used in conjunction with the rotor remover when removing the rotor.

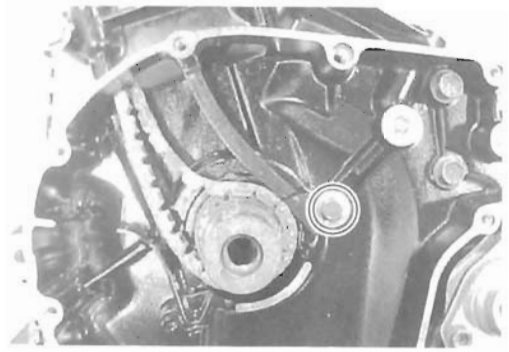


- Remove the generator rotor assembly with the special tool.
- Remove the key.

TOOL: **09930-33730: Rotor remover**

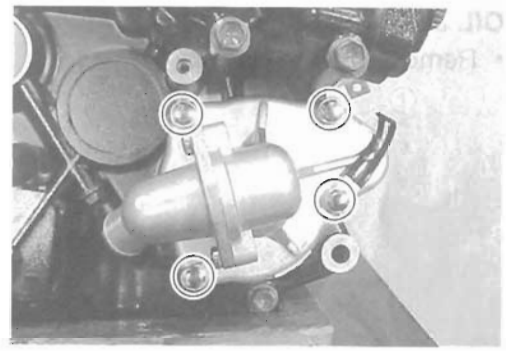


- Remove the cam chain tensioner and the chain.

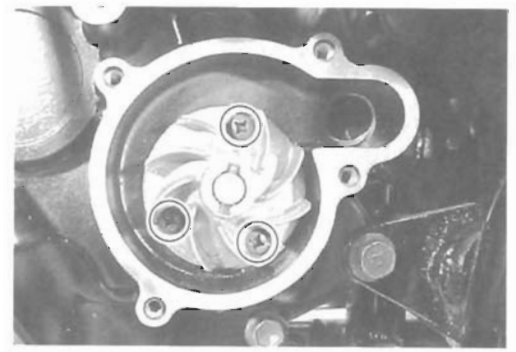


WATER PUMP

- Remove the water pump cover.

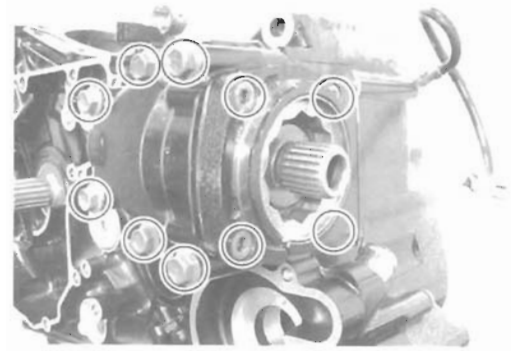


- Remove the water pump assembly.

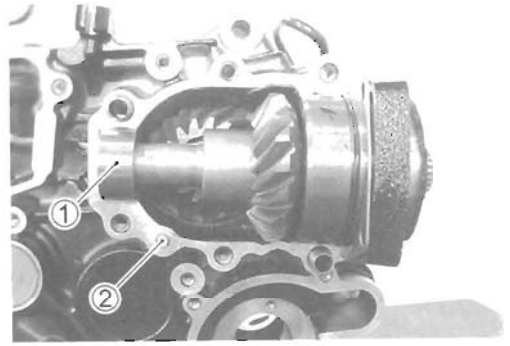


SECONDARY DRIVEN GEAR

- Remove the secondary driven gear housing bolts.
- Remove the secondary driven gear case.

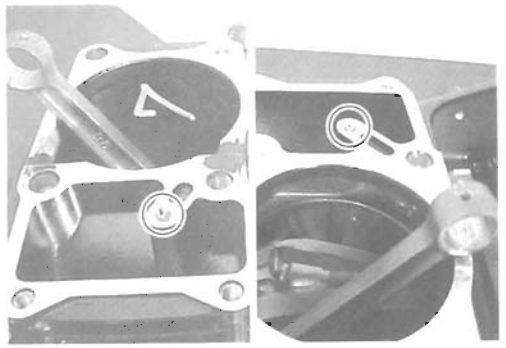


- Remove the secondary driven gear assembly.
- Remove the bearing ①.
- Remove the oil jet ②.



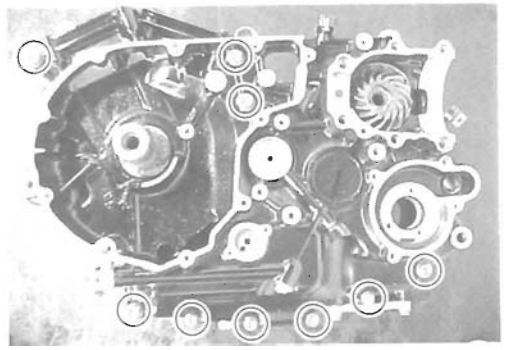
OIL JET

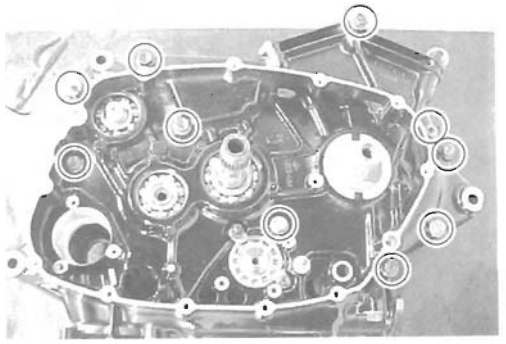
- Remove the oil jets.



CRANKCASE

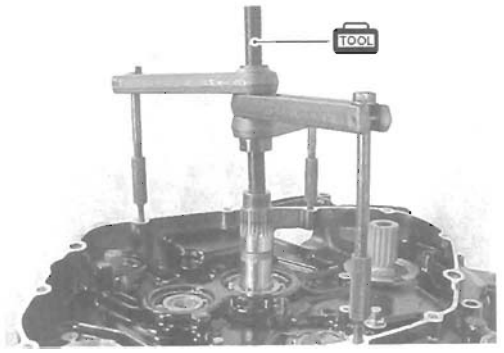
- Remove the crankcase bolts.





- Separate the crankcase into two parts with the special tool.

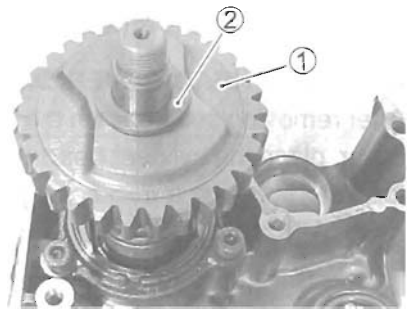
TOOL **09920-13120: Crankcase separator**



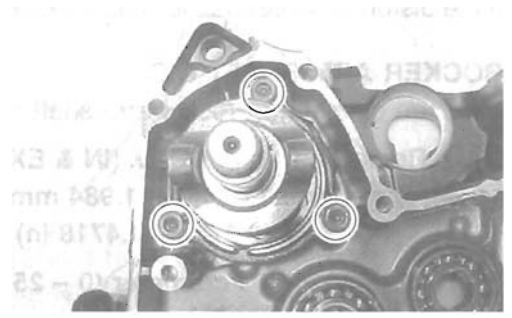
- Remove the crankshaft.
- Remove the gearshift fork shafts and gearshift forks.
- Remove the transmission.

SECONDARY DRIVE BEVEL GEAR

- Remove the over driving gear ① and bush ②.



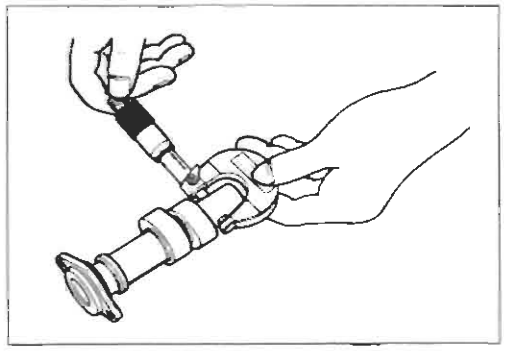
- Remove the secondary drive bevel gear assembly.



If the camshaft journal oil clearance measured exceeds the limit, measure the outside diameter of camshaft.
Replace either the cylinder head set or the camshaft if the clearance is incorrect.

DATA **Camshaft journal O.D.**
(Sprocket side): 24.959 – 24.980 mm (0.9826 – 0.9835 in)
(Other side) : 19.959 – 19.980 mm (0.7858 – 0.7866 in)

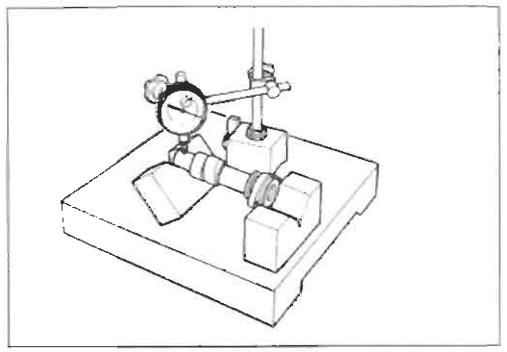
TOOL **09900-20205: Micrometer (0 – 25 mm)**



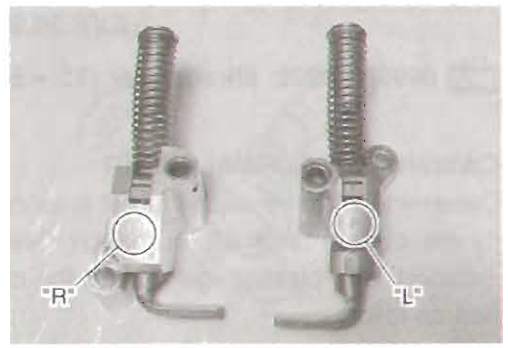
CAMSHAFT RUNOUT
Measure the runout with a dial gauge. Replace the camshaft if the runout exceeds the limit.

DATA **Camshaft runout (IN & EX)**
Service Limit: 0.10 mm (0.004 in)

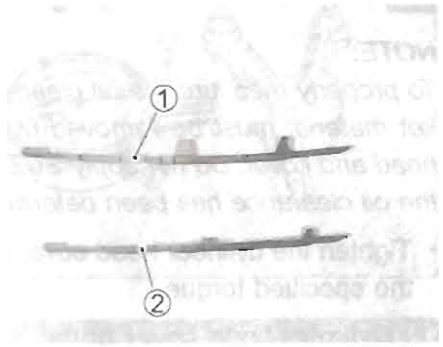
TOOL **09900-20606: Dial gauge (1/100, 10 mm)**
09900-20701: Magnetic stand
09900-21304: V-block (100 mm)



CAM CHAIN TENSIONER AND GUIDE
CAM CHAIN TENSIONER
For driving the camshafts, two cam chain tensioners are used on the respective cam drive chains. Unlock the ratchet mechanism, and move the push rod in place to see if it slides smoothly. If any stickiness is noted or ratchet mechanism is faulty, replace the cam chain tensioner assembly with a new one.
The cam chain tensioner can be distinguished by the embossed-letters, "F" and "R", on the cam chain tensioners.
"F": Front (No. 2) cam chain tensioner
"R": Rear (No. 1) cam chain tensioner

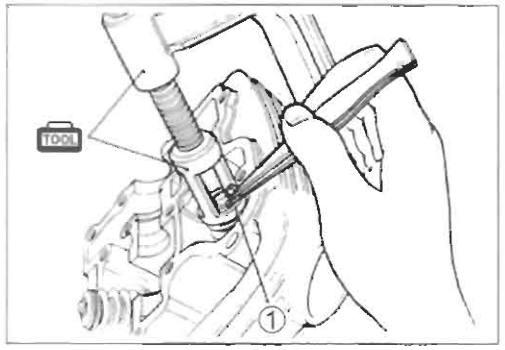


CAM CHAIN GUIDE
Check the contacting surface of the cam chain guide for wear and damage. If it is found to be damaged, replace it with a new one.
Two kinds of cam chain guide are used on the respective cam drive chains.
①: For front cylinder
②: For rear cylinder



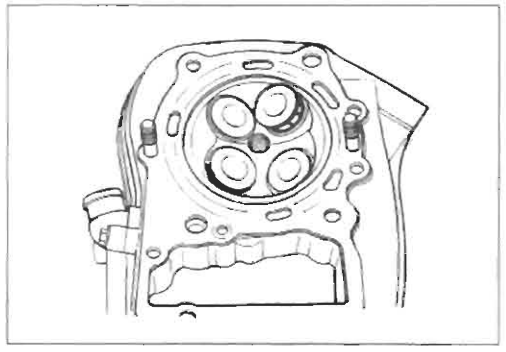
CYLINDER HEAD
VALVE AND VALVE SPRING DISASSEMBLY
- Using special tools, compress the valve springs and remove the two cotter halves ① from valve stem.

TOOL **09916-14510: Valve spring compressor**
09916-14910: Valve spring compressor attachment
09916-84511: Tweezers



- Remove the valve spring retainer, inner spring and outer spring.
- Pull out the valve from the other side.
- Remove the valve stem seal and valve spring seat.

NOTE:
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. (☞ 3-27)

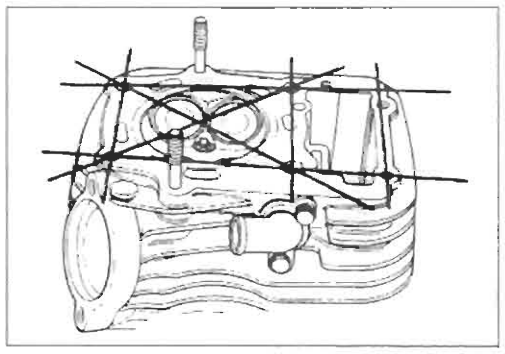


CYLINDER HEAD DISTORTION
- Decarbonize the combustion chambers.

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.

DATA **Cylinder head distortion**
Service Limit: 0.05 mm (0.002 in)

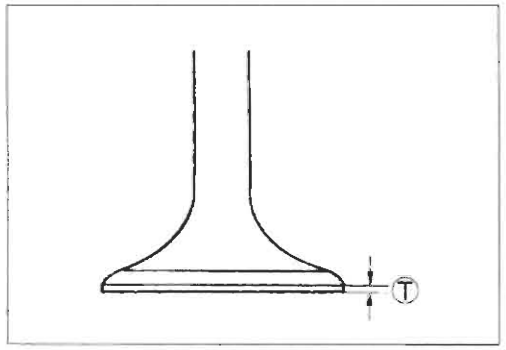
TOOL **09900-20803: Thickness gauge**



VALVE FACE WEAR
Visually inspect each valve for wear of its seating face. Replace any valve with an abnormally worn face.
The thickness Ⓣ 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.

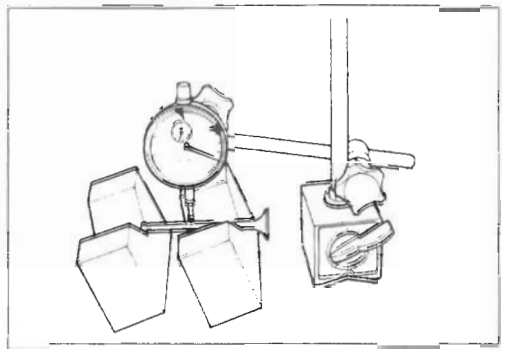
DATA **Valve head thickness**
Service Limit Ⓣ: 0.5 mm (0.02 in)

TOOL **09900-20102: Vernier calipers**



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.

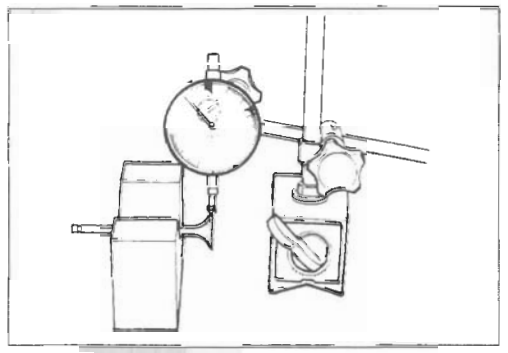


DATA **Valve stem runout**
Service Limit: 0.05 mm (0.002 in)

TOOL **09900-20701: Magnetic stand**
09900-20606: Dial gauge (1/100 mm)
09900-21304: V-block

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 limit, replace the valve.

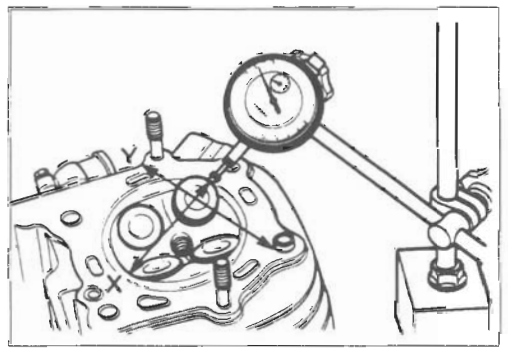


DATA **Valve head radial runout**
Service Limit: 0.03 mm (0.001 in)

TOOL **09900-20701: Magnetic stand**
09900-20606: Dial gauge (1/100 mm)
09900-21304: V-block

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.

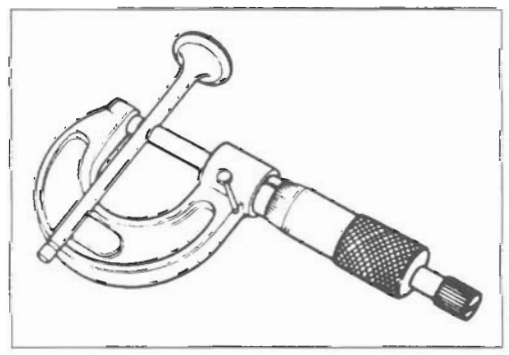


DATA **Valve stem deflection (IN & EX)**
Service Limit: 0.35 mm (0.14 in)

TOOL **09900-20606: Dial gauge (1/100 mm)**
09900-20701: Magnetic stand

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 re-check the clearance.

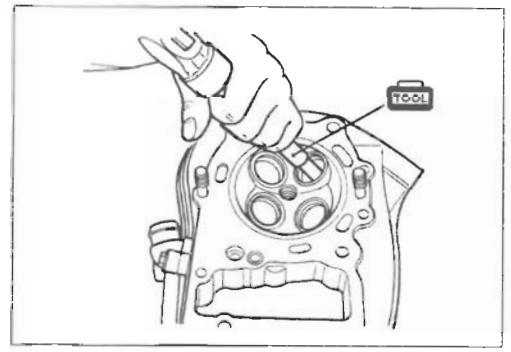


DATA **Valve stem O.D.**
Standard (IN) : 5.475 – 5.490 mm (0.2156 – 0.2161 in)
(EX): 5.455 – 5.470 mm (0.2148 – 0.2154 in)

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

VALVE GUIDE SERVICING

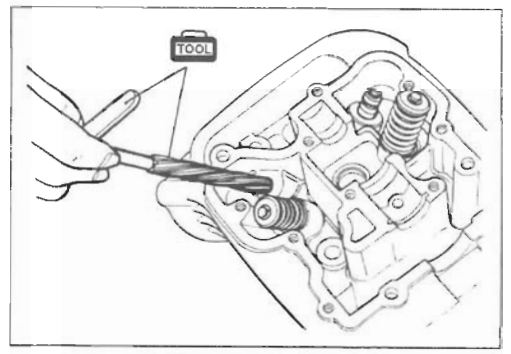
- Using the valve guide remover, drive the valve guide out toward the intake or exhaust rocker arm side.



TOOL **09916-44910: Valve guide remover/installer**

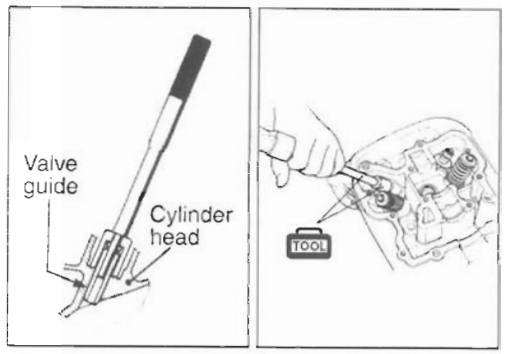
NOTE:
- *Discard the removed valve guide subassemblies.*
- *Only oversized valve guides are available as replacement parts. (Part No. 11115-38A71)*

- Re-finish the valve guide holes in cylinder head with a 10.8 mm reamer and handle.



TOOL **09916-34580: Valve guide hole 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 and attachment.

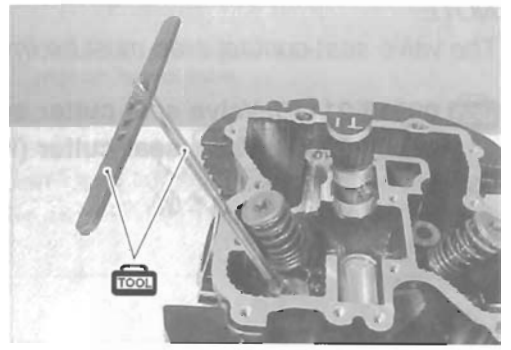


TOOL **09916-44910: Valve guide remover/installer**
09916-44920: Valve guide installer attachment

⚠ CAUTION

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

- After fitting all valve guides, re-finish their guiding bores with a 5.5 mm reamer. Be sure to clean and oil the guide after reaming.

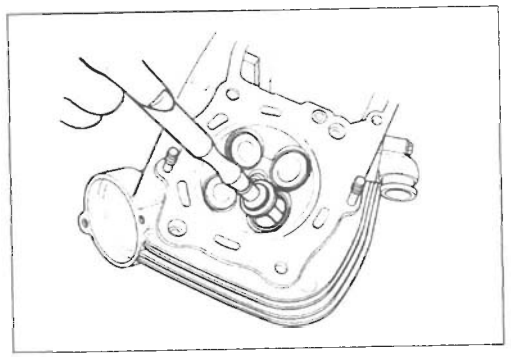


TOOL **09916-34550: Valve guide reamer**
09916-34542: Reamer handle

NOTE:
Insert the reamer from the combustion chamber and always turn the reamer handle clockwise.

VALVE SEAT WIDTH

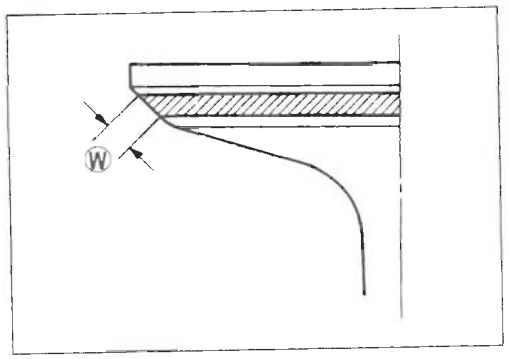
- Coat the valve seat with prussian blue uniformly. Fit the valve and tap the coated seat with the valve face in a rotating manner, in order to obtain a clear impression of the seating contact. In this operation, use the valve lapper to hold the valve head.
- The ring-like dye impression left on the 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:



DATA **Valve seat width Ⓦ**
Standard: 0.9 – 1.1 mm (0.035 – 0.043 in)

TOOL **09916-10911: Valve lapper set**

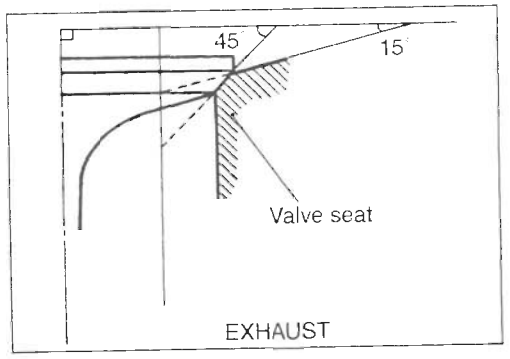
If either requirement is not met, correct the seat by servicing it as follows:



VALVE SEAT SERVICING

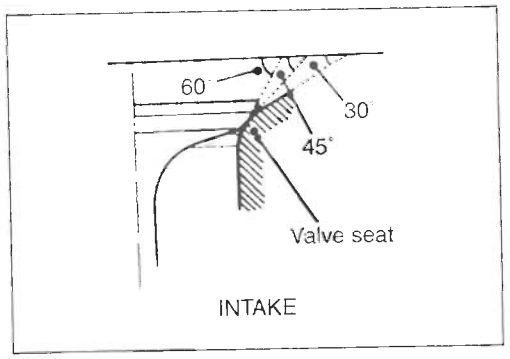
The valve seats for intake and exhaust valves are machined to four different angles. The seat contact surface is cut at 45°.

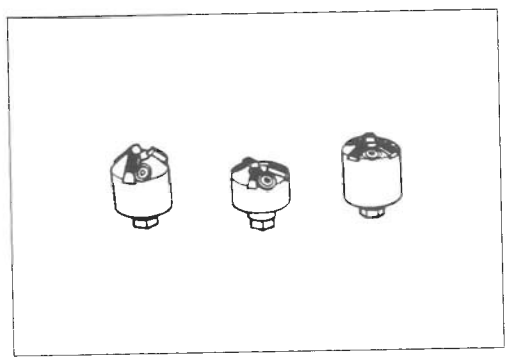
	INTAKE	EXHAUST
15°		N-121
30°	N-128	
45°	N-128	N-122
60°	N-111	



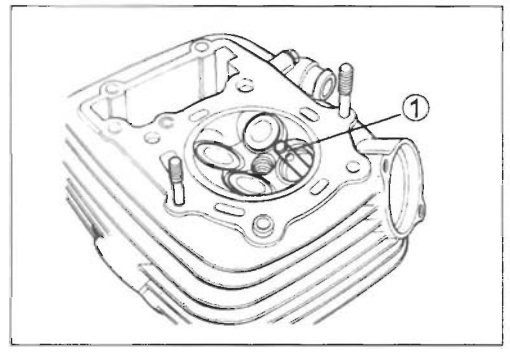
NOTE:
The valve seat contact area must be inspected after each cut.

TOOL **09916-21110: Valve seat cutter set**
09916-22430: Valve seat cutter (N-128)



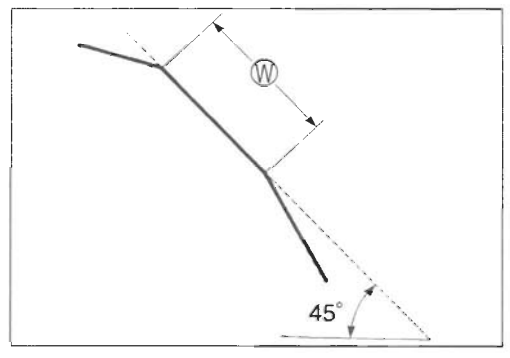


- Insert the solid pilot ① (09916-24450: N-100-5.52) with a slight rotation. Seat the pilot snugly. Install the 45° cutter, attachment and T-handle.



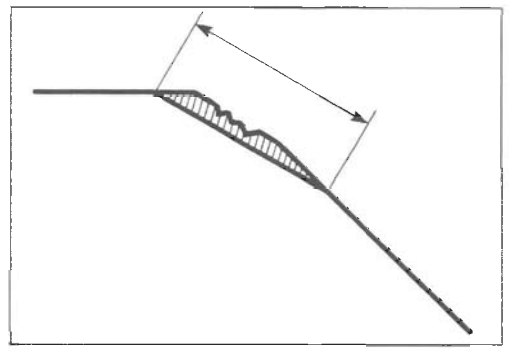
INITIAL SEAT CUT

- Using the 45° cutter, descale and clean up the seat. Rotate the cutter one or two turns.
- Measure the valve seat width Ⓦ after every cut.



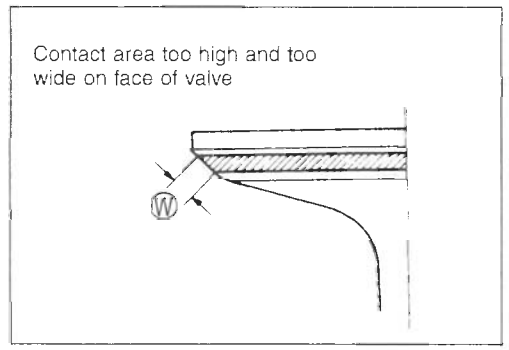
- If the valve seat is pitted or burned, use the 45° cutter to condition the seat some more.

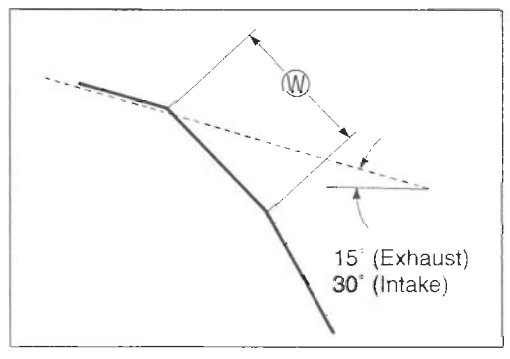
NOTE:
Cut only the minimum amount necessary from the seat to prevent the possibility of the valve stem becoming too close to the camshaft.



TOP NARROWING CUT

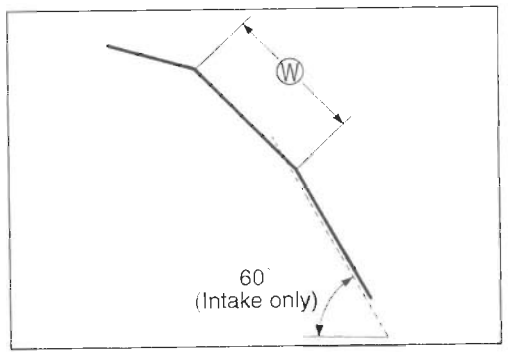
- If the contact area Ⓦ is too high on the valve, or if it is too wide, use the 15° (for the exhaust side) and the 30° (for the intake side) to lower and narrow the contact area.





BOTTOM NARROWING CUT

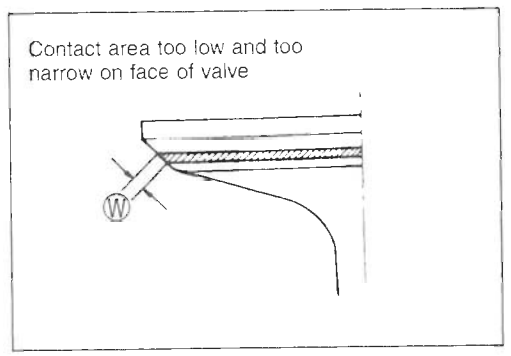
- If the contact area Ⓦ is too wide or too low, use the 60° (intake side only) to narrow and raise the contact area.

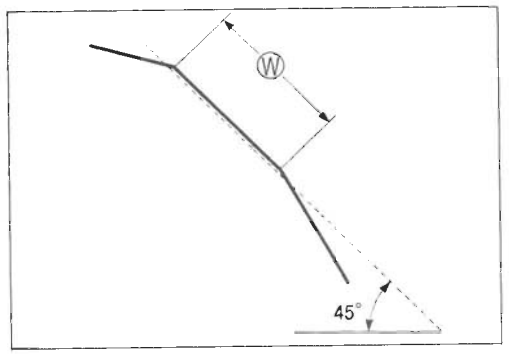


FINAL SEAT CUT

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

NOTE:
After cutting the 15°, 30° and 60° angles, it is possible that the valve seat (45°) is too narrow. If so, re-cut the valve seat to the correct width.



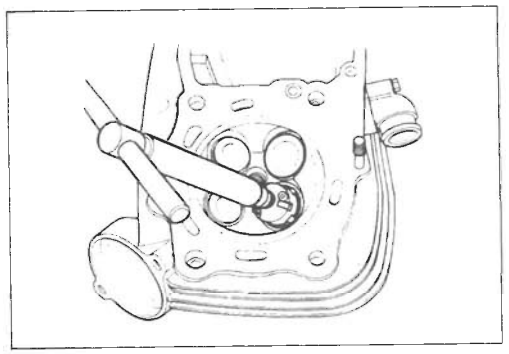


- After the desired seat position and width is achieved, use the 45° cutter very lightly to clean up any burrs caused by the previous cutting operations.

⚠ CAUTION

Do not use lapping compound after the final cut is made. The finished valve seat should have a velvety smooth finish but 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.

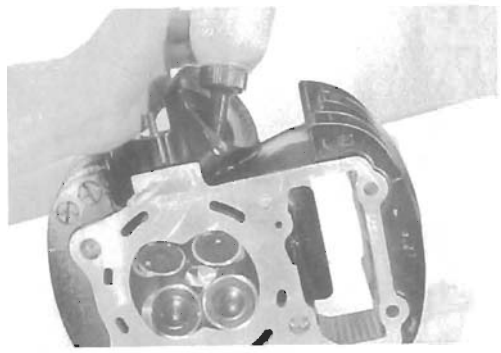
NOTE:
After servicing the valve seats, be sure to check the valve clearance after the cylinder head has been reinstalled. (☞ 2-6)



- 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

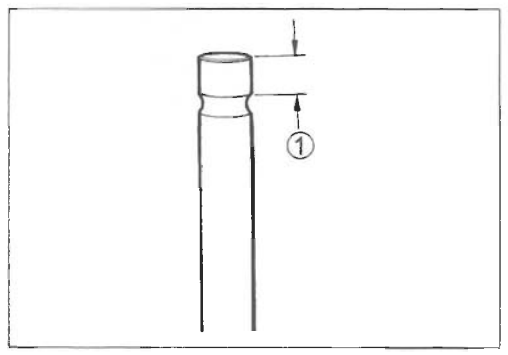
Always use extreme caution when handling gasoline.



VALVE STEM END CONDITION

Inspect the valve stem end face for pitting and wear. If pitting or wear of the stem end face are present, the valve stem end may be resurfaced, providing that the length ① will not be reduced to less than the service limit. If this length becomes less than the service limit, the valve must be replaced.

DATA Valve stem end length
Service Limit: 3.1 mm (0.12 in)



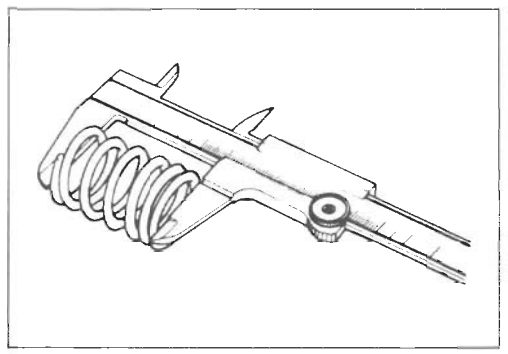
VALVE SPRING

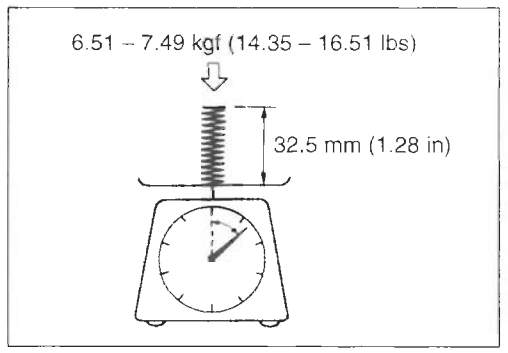
The force of the coil spring keeps the valve seat tight. Weakened spring result in reduced engine power output, and often account for the chattering noise coming from the valve mechanism.
Check the valve springs for proper strength by measuring their free length and also by the force required to compress 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.

TOOL 09900-20102: Vernier calipers

DATA Valve spring free length (IN & EX)
Service Limit INNER : 38.3 mm (1.51 in)
OUTER: 40.1 mm (1.58 in)

DATA Valve spring tension (IN & EX)
Standard INNER : 6.51 – 7.49 kgf/32.5 mm (14.35 – 16.51 lbs/1.28 in)
OUTER : 12.09 – 13.91 kgf/36.0 mm (26.65 – 30.67 lbs/1.42 in)





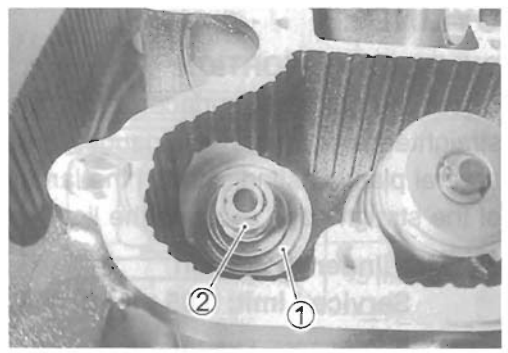
VALVE AND VALVE SPRING REASSEMBLY

- Fit the valve spring lower seats ①.
- Oil each oil seal, and press-fit the oil seal ② into position with the valve guide installer.

TOOL 09916-44910: Valve guide remover/installer

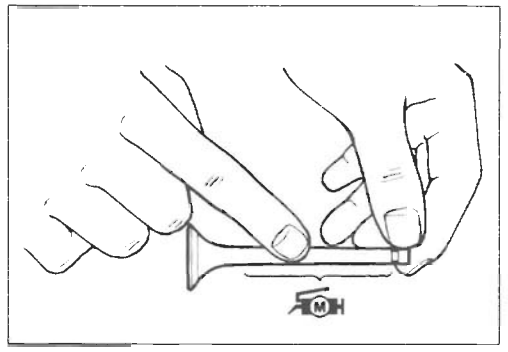
⚠ CAUTION

Do not reuse the oil seal.



- 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.

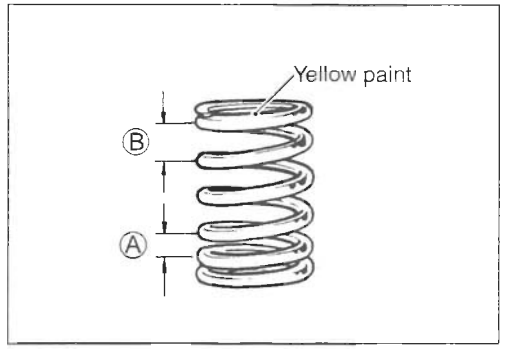
99000-25140: SUZUKI MOLY PASTE



⚠ CAUTION

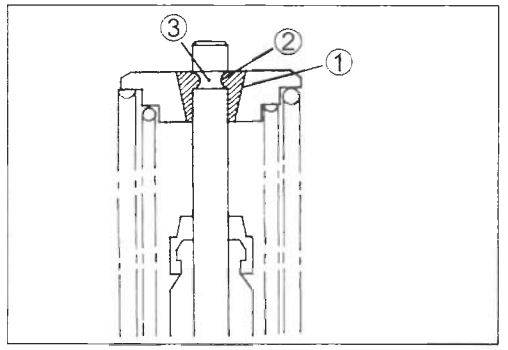
When inserting each valve, take care not to damage the lip of the stem seal.

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



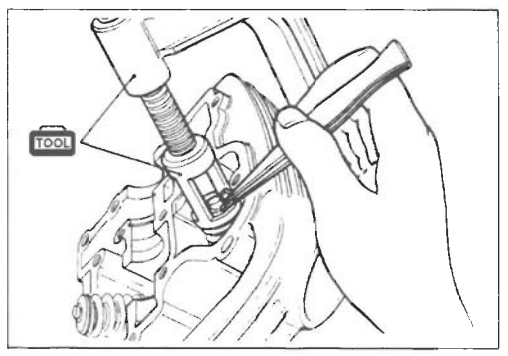
- Put on the valve spring retainer using the valve spring compressor, press down the spring, fit the two cotter halves to the stem end, and release the compressor to allow the cotter ① to wedge in between seat and stem. Be sure that the rounded lip ② of the cotter fits snugly into the groove ③ in the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

09916-14510: Valve spring compressor
09916-14910: Valve spring compressor attachment
09916-84511: Tweezers



⚠ CAUTION

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



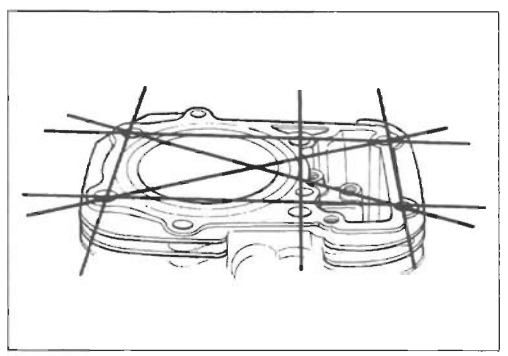
CYLINDER

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.

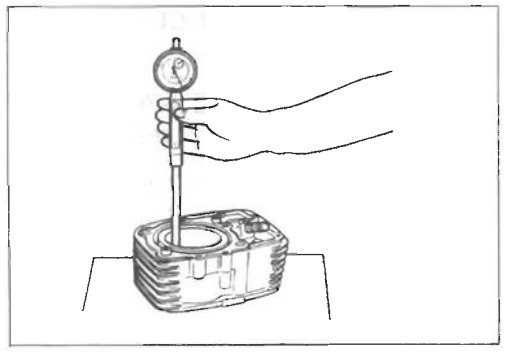
Cylinder distortion
Service Limit: 0.05 mm (0.002 in)

09900-20803: Thickness gauge



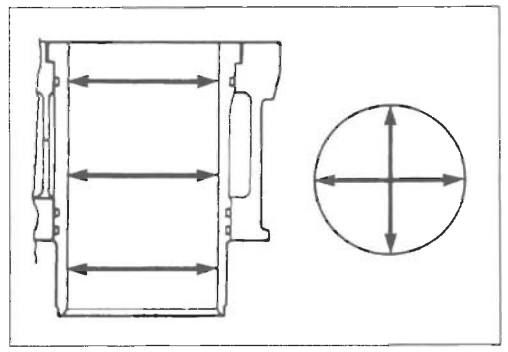
CYLINDER BORE

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 reboring is done on any one cylinder which measurements is beyond the limit, the remaining cylinders must be also rebored accordingly. Otherwise the imbalance might cause excess vibration.



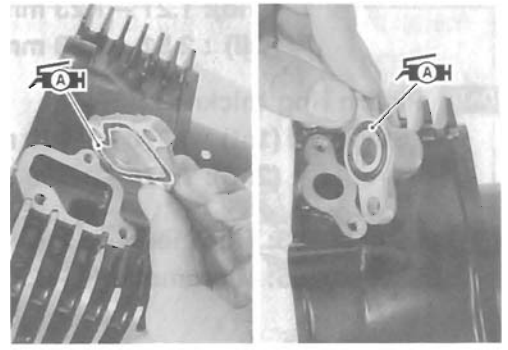
Cylinder bore
Service Limit: 83.085 mm (3.2711 in)

09900-20508: Cylinder gauge set



NOTE:
When installing the water union to the cylinder, apply grease to the new O-rings.

99000-25030: SUZUKI SUPER GREASE "A" (For USA)
99000-25010: SUZUKI SUPER GREASE "A" (For the others)



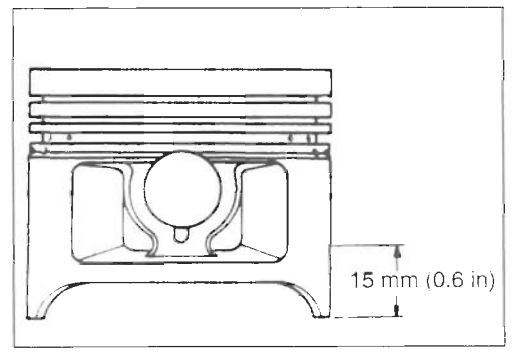
PISTON

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.

Piston diameter
Service Limit: 82.880 mm (3.2630 in)

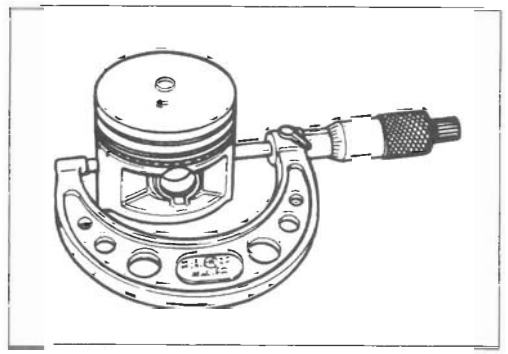
09900-20204: Micrometer (75 – 100 mm)



PISTON TO CYLINDER CLEARANCE

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

DATA **Piston to cylinder clearance**
Service Limit: 0.12 mm (0.0047 in)
Piston oversize: 0.5, 1.0 mm



PISTON RING TO GROOVE CLEARANCE

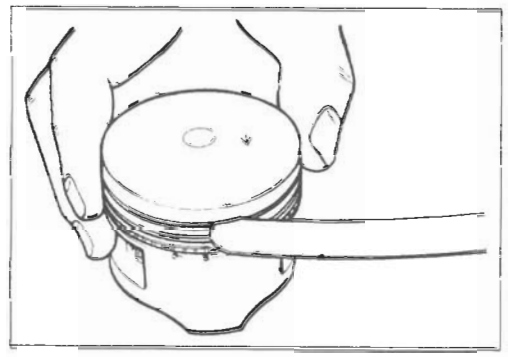
Using a thickness gauge, measure the side clearances of the 1st and 2nd rings. If any of the clearances exceeds the limit, replace both piston and piston rings.

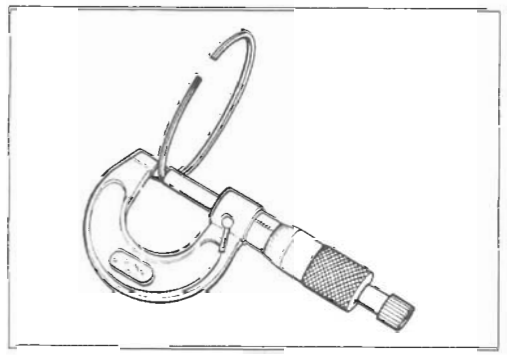
DATA **Piston ring-groove clearance**
Service Limit (1st) : 0.18 mm (0.0071 in)
(2nd): 0.15 mm (0.0059 in)

DATA **Piston ring groove width**
Standard (1st) : 1.01 – 1.03 mm (0.0398 – 0.0406 in)
(2nd): 1.21 – 1.23 mm (0.0476 – 0.0484 in)
(Oil) : 2.51 – 2.53 mm (0.0988 – 0.0996 in)

DATA **Piston ring thickness**
Standard (1st) : 0.970 – 0.990 mm (0.0382 – 0.0390 in)
(2nd): 1.170 – 1.190 mm (0.0461 – 0.0469 in)

TOOL **09900-20803: Thickness gauge**
09900-20205: Micrometer (0 – 25 mm)





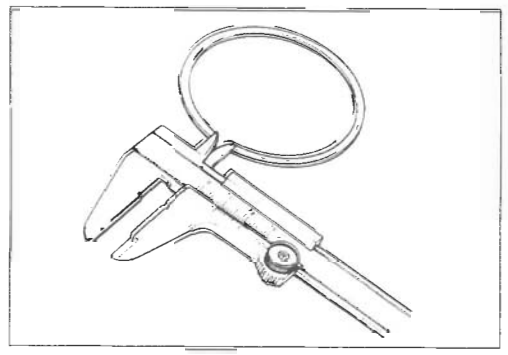
PISTON RING FREE END GAP AND END GAP

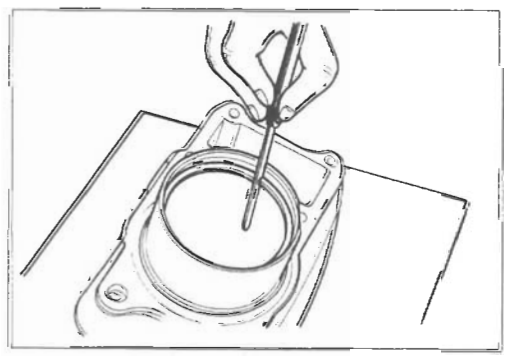
Before installing piston rings, measure the free end gap of each ring using vernier calipers. Next, fit the ring in the cylinder, and measure each ring end gap using a thickness gauge.
If any ring has an excess end gap, replace the ring.

DATA **Piston ring free end gap**
Service Limit (1st) : 7.7 mm (0.30 in)
(2nd): 9.4 mm (0.37 in)

DATA **Piston ring end gap**
Service Limit (1st) : 0.70 mm (0.028 in)
(2nd): 0.70 mm (0.028 in)

TOOL **09900-20102: Vernier calipers**
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
0.5 mm O.S.	50	50
1.0 mm O.S.	100	100

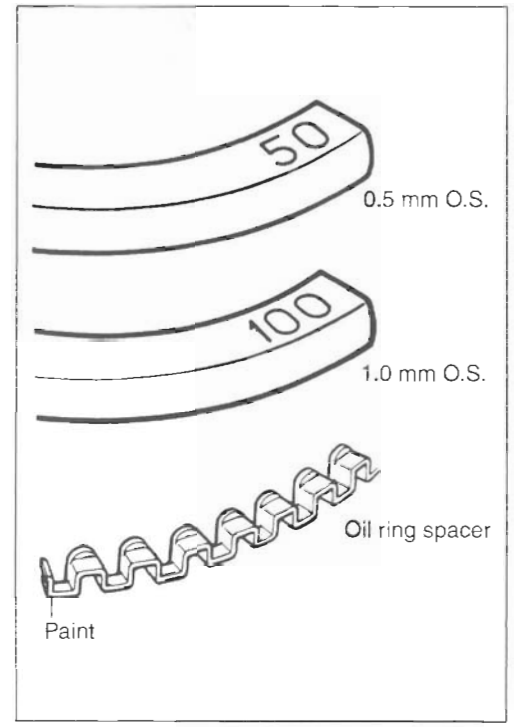
Oversize oil ring

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

SIZE	COLOR
STD	NIL
0.5 mm O.S.	Painted Red
1.0 mm O.S.	Painted Yellow

Oversize side rail

Just measure outside diameter to identify the side rail as there is no mark or numbers on it.

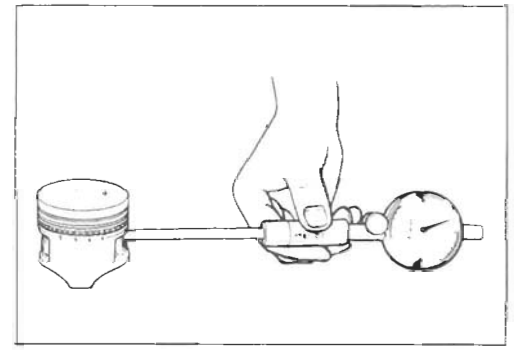


PISTON PIN AND PIN BORE

Using a small bore gauge, measure the piston pin bore inside diameter, and using a micrometer, measure the piston pin outside diameter. If the reading exceeds following limit, replace both piston and piston pin.

DATA **Piston pin bore I.D.**
Service Limit: 20.030 mm (0.7886 in)

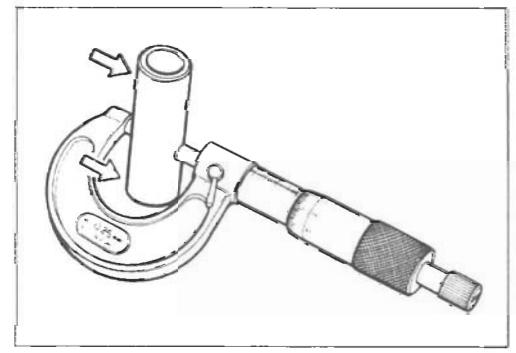
TOOL **09900-20602: Dial gauge (1/1000 mm, 1 mm)**
09900-22403: Small bore gauge (18 – 35 mm)



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

DATA **Piston pin O.D.**
Service Limit: 19.980 mm (0.7866 in)

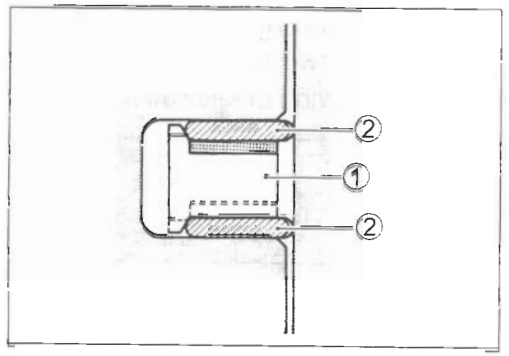
TOOL **09900-20205: Micrometer (0 – 25 mm)**



PISTON RING REASSEMBLY

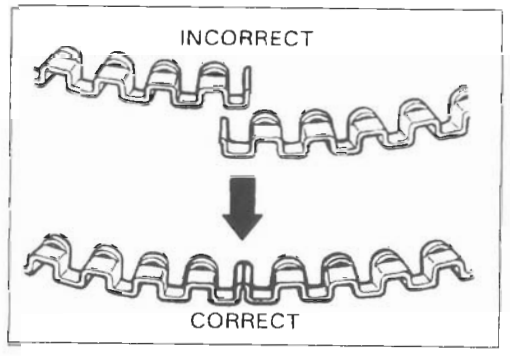
- Install the piston rings in the order of oil ring, 2nd ring and 1st ring.
- The first member to go into the oil ring groove is a spacer ①. After placing the spacer, fit the two side rails ②.

NOTE:
Side designations, top and bottom, are not applied to the spacer and side rails: you can position each either way.



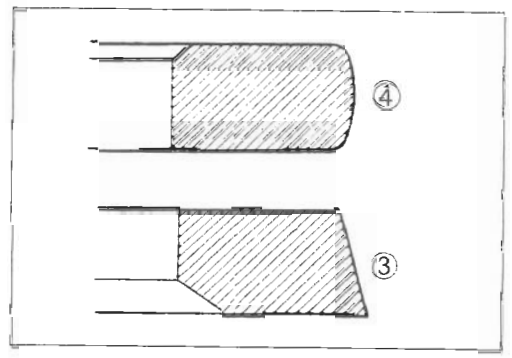
⚠ CAUTION

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

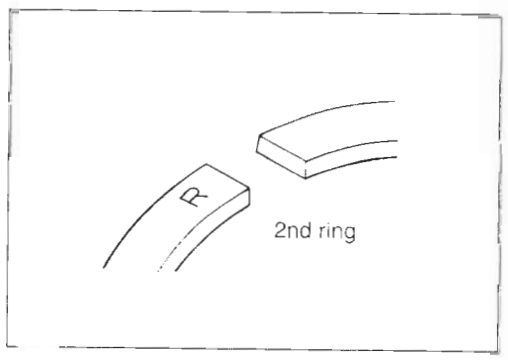


- Install the 2nd ring ③ and the 1st ring ④.

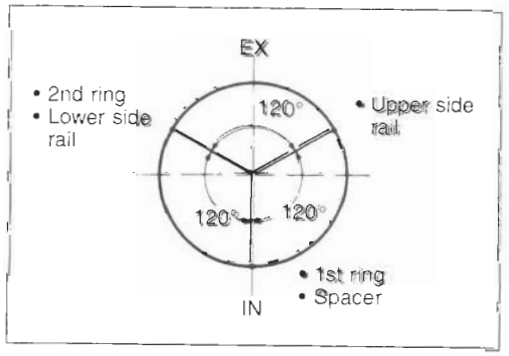
NOTE:
1st ring and 2nd ring differ in shape.



- 2nd ring has letter "R" marked on the side. Be sure to bring the marked side to the top when fitting them to the piston.



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



CONROD/CRANKSHAFT

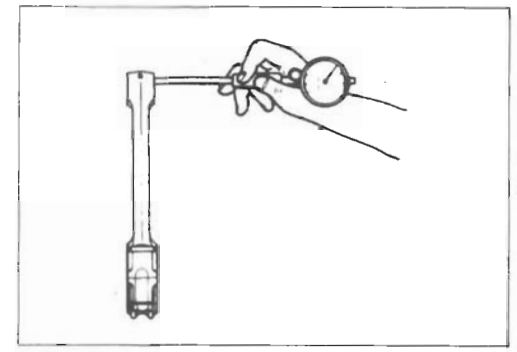
CONROD SMALL END I.D.

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

DATA Conrod small end I.D.
Service Limit: 20.040 mm (0.7890 in)

TOOL 09900-20602: Dial gauge (1/1000 mm, 1 mm)
09900-22403: Small bore gauge (18 – 35 mm)

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



CONROD BIG END SIDE CLEARANCE

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

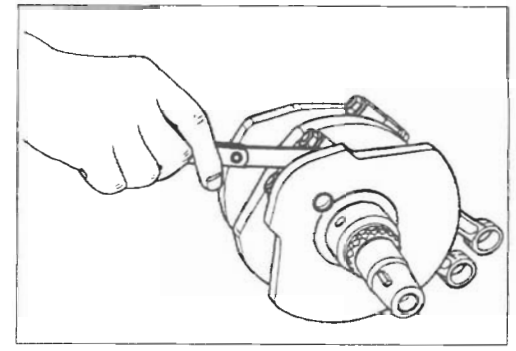
DATA Conrod big end side clearance
Service Limit: 0.30 mm (0.012 in)

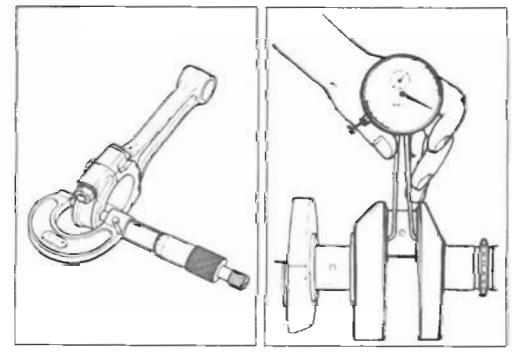
TOOL 09900-20803: Thickness gauge

DATA Conrod big end width
Standard: 21.95 – 22.00 mm (0.864 – 0.866 in)

DATA Crank pin width
Standard: 22.10 – 22.15 mm (0.870 – 0.872 in)

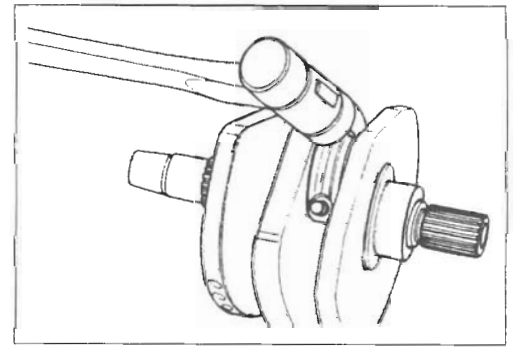
TOOL 09900-20205: Micrometer (0 – 25 mm)
09900-20605: Dial calipers (10 – 34 mm)





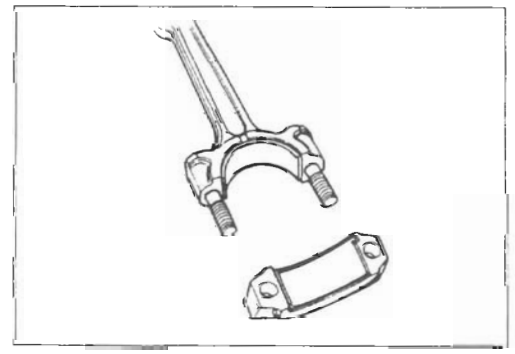
CONROD-CRANK PIN BEARING SELECTION

- Loosen the bearing cap nuts and tap the bolt end lightly with plastic hammer to remove the 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.



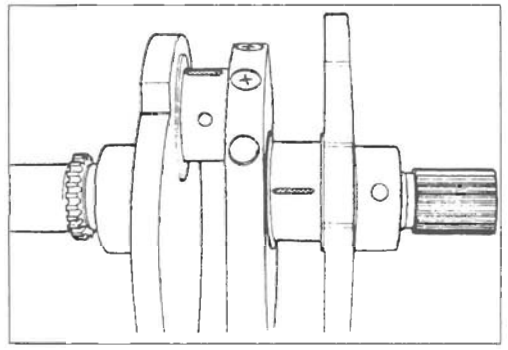
- Place plastigauge axially on the crank pin avoiding the oil hole, at TDC or BDC side as shown.
- Tighten the bearing cap with two-step torque values.

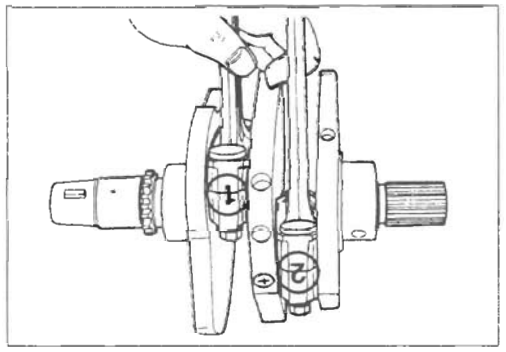
NOTE:
When fitting the bearing cap to crank pin, be sure to discriminate between its two ends, I.D. code side and the other.
I.D. code always faces intake valve side.

Conrod nut
Initial tightening torque : 25 N·m (2.5 kgf·m, 18.0 lb-ft)
Final tightening torque : 51 N·m (5.1 kgf·m, 37.0 lb-ft)

09900-22302: Plastigauge

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





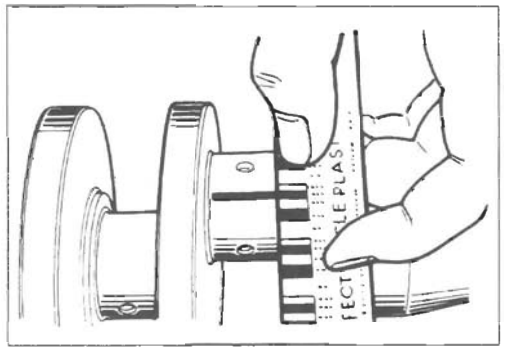
- Remove the caps and measure the width of compressed plastigauge with envelope scale. This measurement should be taken at the widest part.

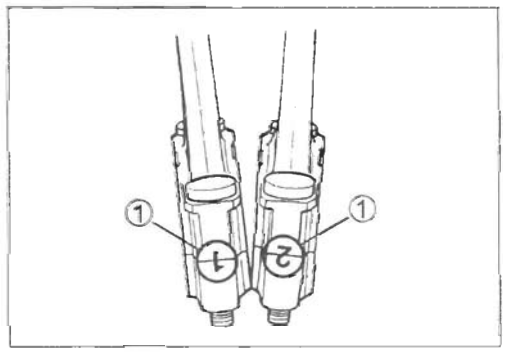
Conrod big end oil clearance
Standard: 0.024 – 0.042 mm (0.0009 – 0.0017 in)
Service Limit: 0.080 mm (0.0031 in)

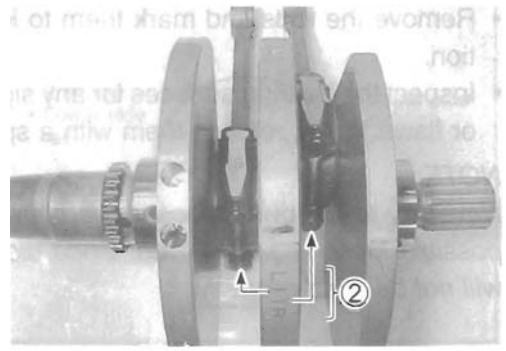
- If oil clearance exceeds the service limit, select the specified bearings from the following table.
- Check the corresponding conrod I.D. code number ①, "1", "2" or "3".
- Check the corresponding crank pin O.D. code number ②, "1", "2" or "3".
- The crank pin O.D. code number ②, "1", "2" or "3" which are stamped on the left crank web.

Bearing selection table

		Crank pin O.D. ②		
	Code	1	2	3
Conrod I.D. code ②	1	Green	Black	Brown
	2	Black	Brown	Yellow
	3	Brown	Yellow	Blue







Conrod I.D. specification

Code ①	I.D. specification
1	44.000 – 44.006 mm (1.7323 – 1.7325 in)
2	44.006 – 44.012 mm (1.7325 – 1.7328 in)
3	44.012 – 44.018 mm (1.7328 – 1.7330 in)

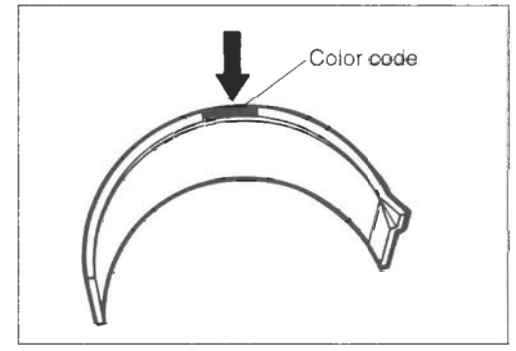
Crank pin O.D. specification

Code ②	O.D. specification
1	40.994 – 41.000 mm (1.6139 – 1.6142 in)
2	40.988 – 40.994 mm (1.6137 – 1.6139 in)
3	40.982 – 40.988 mm (1.6135 – 1.6137 in)

09900-20202: Micrometer (25 – 50 mm)

Bearing thickness specification

Color (Part No.)	Thickness
Green (12164-38E00-0A0)	1.485 – 1.488 mm (0.0585 – 0.0586 in)
Black (12164-38E00-0B0)	1.488 – 1.491 mm (0.0586 – 0.0587 in)
Brown (12164-38E00-0C0)	1.491 – 1.494 mm (0.0587 – 0.0588 in)
Yellow (12164-38E00-0D0)	1.494 – 1.497 mm (0.0588 – 0.0589 in)
Blue (12164-38E00-0E0)	1.497 – 1.500 mm (0.0589 – 0.0591 in)

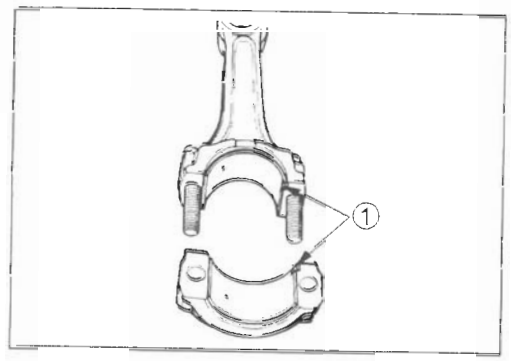


⚠ CAUTION

The bearings should be replaced as a set.

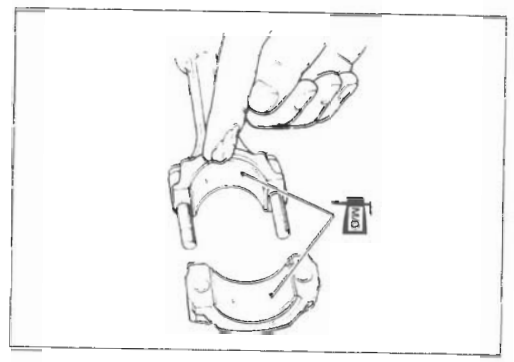
CONROD/CRANK PIN BEARING ASSEMBLY

- When fitting the bearing to the bearing cap and conrod, be sure to fix the stopper part ① first and press in the other end.



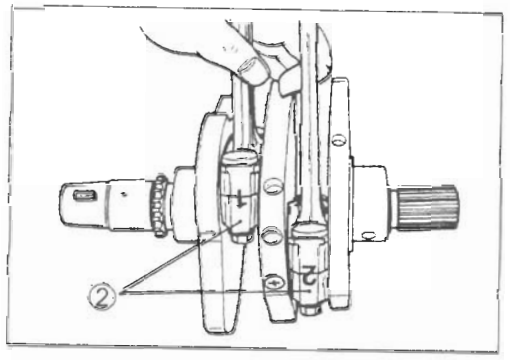
- Apply molybdenum oil solution to the crank pin and bearing surface.

99000-25140: SUZUKI MOLY PASTE



- When mounting the conrod on the crankshaft, make sure that I.D. code ② of the conrod faces rearward.
- Tighten the conrod fitting nuts with specified torque after applying engine oil to the nut thread.

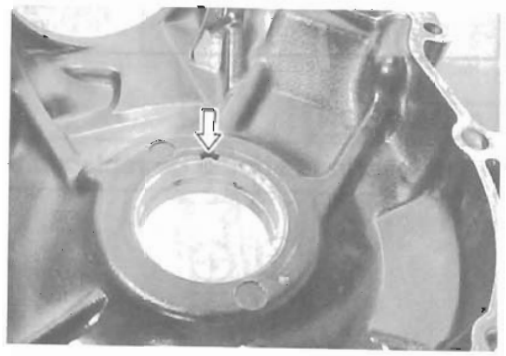
Conrod nut
Initial tightening torque: 25 N·m (2.5 kgf·m, 18.0 lb-ft)
Final tightening torque: 51 N·m (5.1 kgf·m, 37.0 lb-ft)



- Check the conrod movement for smooth turning.

CRANKCASE/CRANKSHAFT BEARING SELECTION

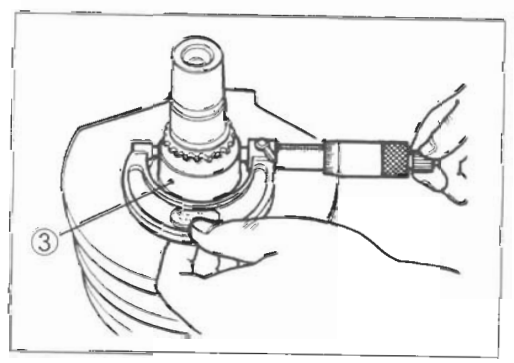
- Inspect the crankshaft and crankshaft journal bearings for any damage.



- Measure the crankshaft journal O.D. ③ by using the special tool.

DATA Crankshaft journal O.D. ③
Standard: 47.965 – 47.980 mm (1.8884 – 1.8890 in)

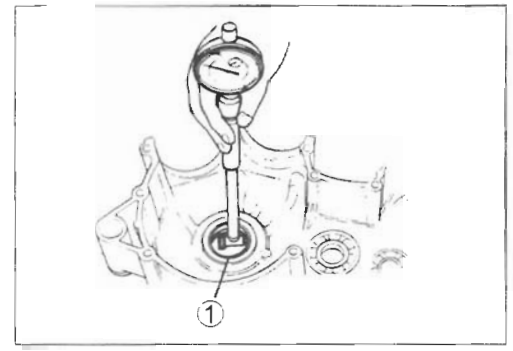
TOOL 09900-20202: Micrometer (25 – 50 mm)



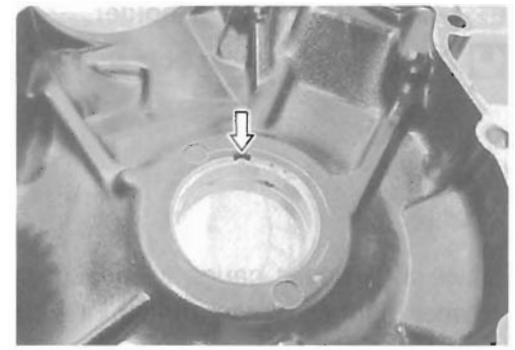
- Measure the crankshaft journal bearing I.D. ① by using the special tool.

DATA Crankshaft journal bearing I.D. ①
Standard: 48.000 – 48.015 mm (1.8898 – 1.8904 in)

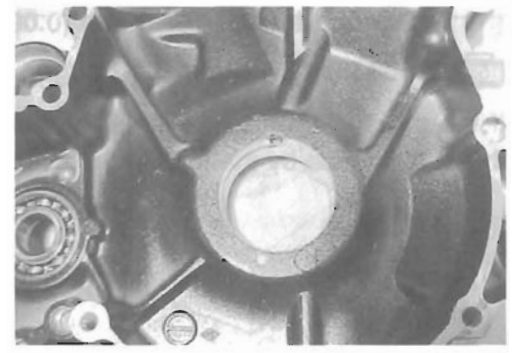
TOOL 09900-20508: Cylinder gauge set



If each crankshaft journal bearing I.D. is not within the standard range, replace them with new ones.



- Remove the crankshaft bearing with taking care not to damage the crankcase journal bearing hole.
- Inspect the journal bearing hole of crankcase for any sign of pitting or flaw.
  If any, repair it with emery paper.
- Install the new journal bearings into the crankcases by hydraulic press.
- Hone the new journal bearings with the specified value by honing machine.



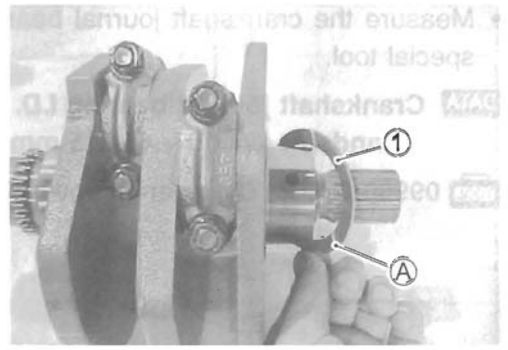
⚠ CAUTION

When honing the new journal bearings, be sure to mate the left and right crankcases.

CRANKSHAFT THRUST CLEARANCE

Install the crankshaft in the right crankcase half after installing the thrust shim on the crankshaft.

NOTE:
The oil grooved face Ⓐ of thrust shim ① is faced to crankshaft web side.

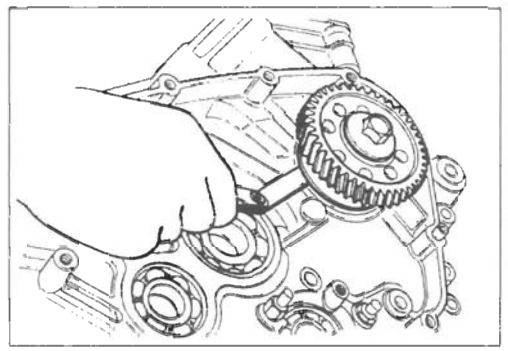


- Place the thrust washer, camshaft drive sprocket and primary drive gear on the right end of the crankshaft and tighten primary drive gear bolt to the specified torque. (☞3-59)

TOOL 09930-40113: Rotor holder

Primary drive gear bolt: 95 N·m (9.5 kgf·m, 68.5 lb-ft)

- Use a thickness gauge to measure the thrust clearance between right cankcase and thrust washer.

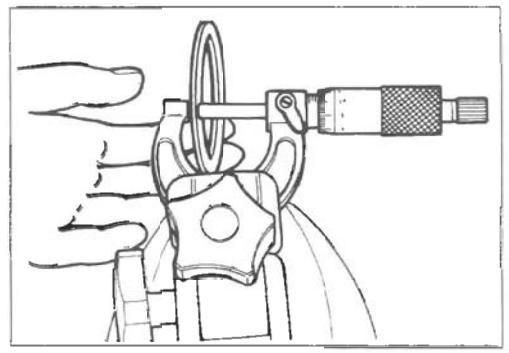


DATA Crankshaft thrust clearance
Standard: 0.05 – 0.10 mm (0.002 – 0.004 in)

TOOL 09900-20803: Thickness gauge

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

- Remove the thrust shim, and measure its thickness with a micrometer.
- Change the thrust shim with the other shim if the thrust clearance is incorrect.
- Perform the thrust clearance measurement described above once again.



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

Checking to make sure it is within standard

Unit: mm (in)

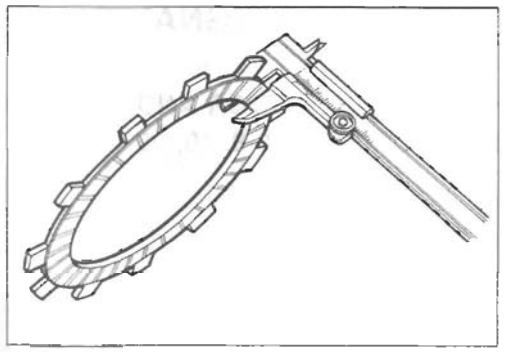
Part number	Thrust shim thickness
09160-48001	1.925 – 1.950 (0.0758 – 0.0768)
09160-48002	1.950 – 1.975 (0.0768 – 0.0778)
09160-48003	1.975 – 2.000 (0.0778 – 0.0787)
09160-48004	2.000 – 2.025 (0.0787 – 0.0797)
09160-48005	2.025 – 2.050 (0.0797 – 0.0807)
09160-48006	2.050 – 2.075 (0.0807 – 0.0817)
09160-48007	2.075 – 2.100 (0.0817 – 0.0827)
09160-48008	2.100 – 2.125 (0.0827 – 0.0837)
09160-48009	2.125 – 2.150 (0.0837 – 0.0846)
09160-48010	2.150 – 2.175 (0.0846 – 0.0856)

CLUTCH

CLUTCH DRIVE AND DRIVEN PLATES

NOTE:
Wipe off the engine oil from the drive and driven plates with a clean rag.

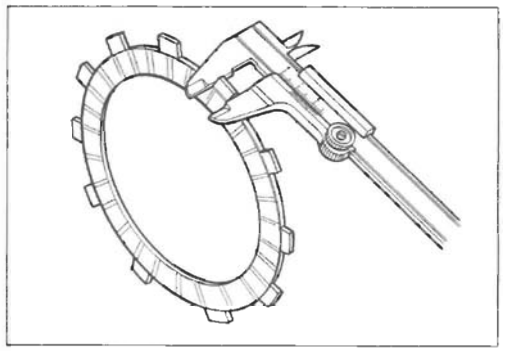
Measure the thickness of drive plates with a vernier calipers. If each drive plate is not within the standard range, replace it with a new one.



DATA Clutch drive plate thickness
Standard (No.1): 2.92 – 3.08 mm (0.115 – 0.121 in)
(No.2): 3.42 – 3.58 mm (0.135 – 0.141 in)

TOOL 09900-20102: Vernier calipers

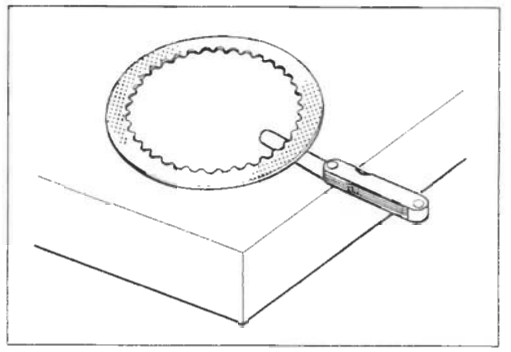
Measure the claw width of drive plates with a vernier calipers. Replace the drive plates found to have worn down to the limit.



DATA Clutch drive plate claw width (No. 1 & No. 2)
Service Limit: 15.1 mm (0.594 in)

TOOL 09900-20102: Vernier calipers

Measure each driven plate for distortion with a thickness gauge and surface plate.
Replace driven plates which exceed the limit.

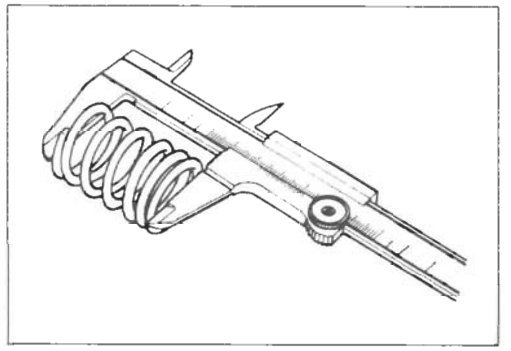


DATA Clutch driven plate distortion
Service Limit: 0.1 mm (0.004 in)

TOOL 09900-20803: Thickness gauge

CLUTCH SPRING FREE LENGTH

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



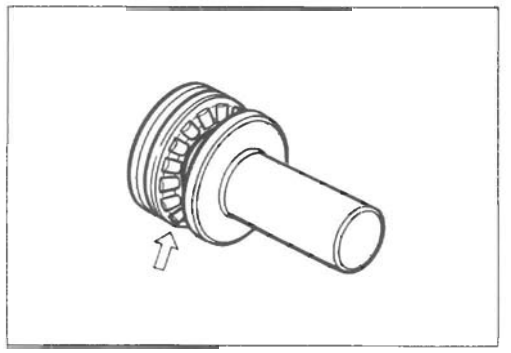
DATA Clutch spring free length
Service Limit: 46.8 mm (1.84 in)

TOOL 09900-20102: Vernier calipers

CLUTCH BEARING

Inspect the clutch release bearing for any abnormality, particularly cracks, upon removal from the clutch, to decide whether it can be reused or should be replaced.
Smooth engagement and disengagement of the clutch depends much on the condition of this bearing.

NOTE:
Thrust washer is located between the pressure plate and thrust bearing.

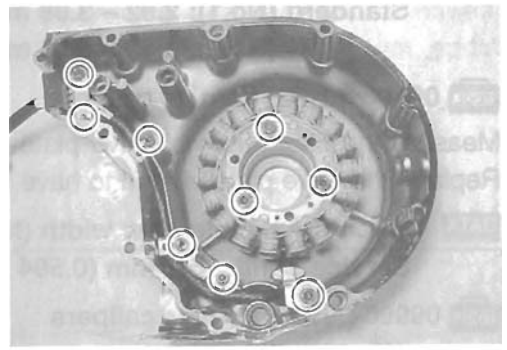


GENERATOR/SIGNAL GENERATOR/ STARTER CLUTCH

GENERATOR STATOR AND SIGNAL GENERATOR STATOR INSPECTION☞8-8, 19, 20

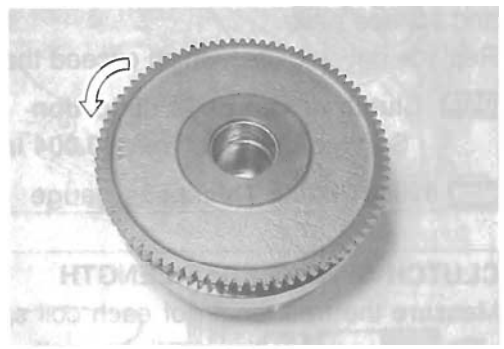
GENERATOR STATOR AND SIGNAL GENERATOR STATOR SERVICING

When replacing the generator stator or signal generator stator, route the wire properly.



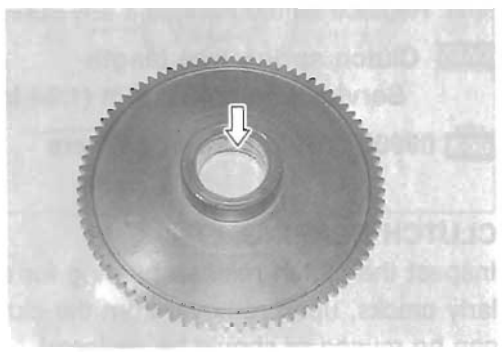
STARTER CLUTCH INSPECTION

Install the starter driven gear onto the starter clutch and turn the starter driven gear by hand to inspect the starter clutch for a smooth movement. The gear turns one direction only. If a large resistance is felt to rotation, inspect the starter clutch for damage or inspect the starter clutch contacting surface of the starter driven gear for wear or damage.
If they are found to be damaged, replace them with new ones.



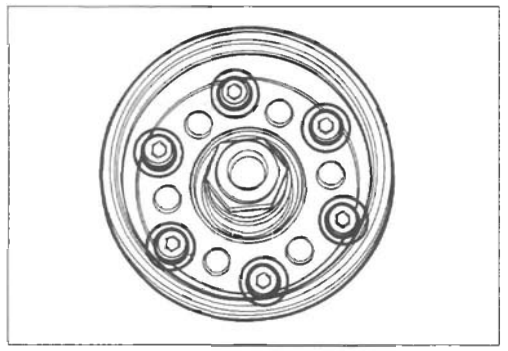
STARTER DRIVEN GEAR BEARING INSPECTION

Inspect the starter driven gear bearing for any damages.

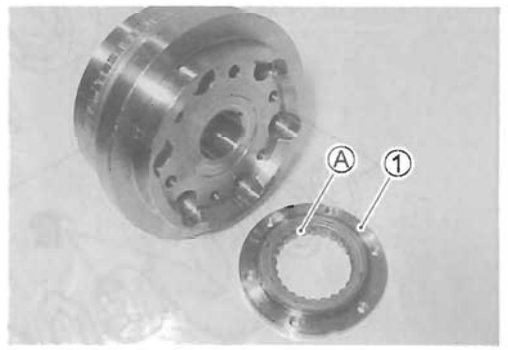


STARTER CLUTCH SERVICING

- Hold the rotor with off-set wrench and remove the starter clutch securing bolts.



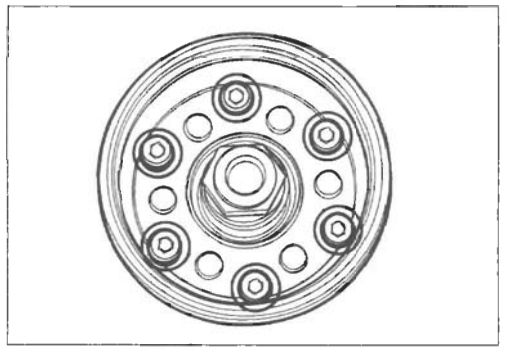
- When fitting the one way clutch to the guide ①, position flange side Ⓐ of one way clutch to the rotor side.



- Apply THREAD LOCK SUPER "1303" to the securing bolts and tighten them to the specified torque while holding the rotor with off-set wrench.

1303 99000-32030: THREAD LOCK SUPER "1303"

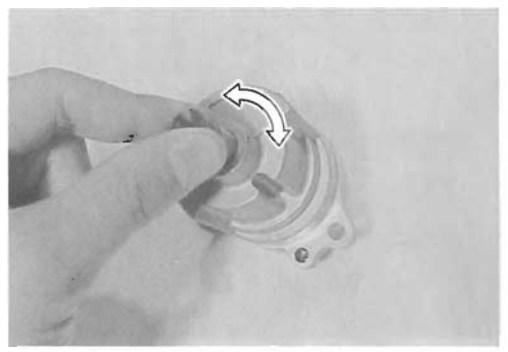
Starter clutch securing bolt: 26 N·m (2.6 kgf·m, 19.0 lb-ft)



OIL PUMP

- Rotate the oil pump by hand and check that it moves smoothly.
- If it does not move smoothly, replace the oil pump assembly.

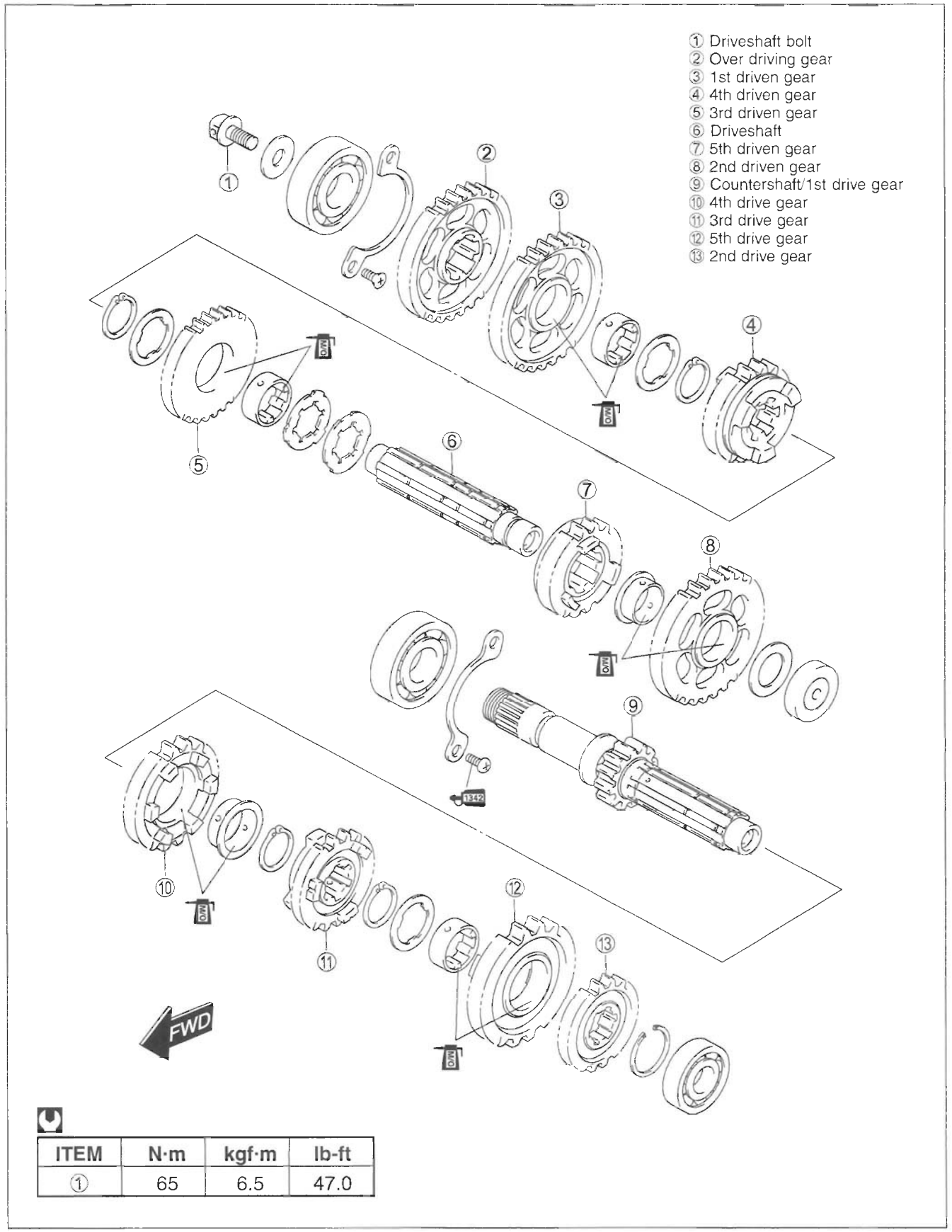
Do not attempt to disassemble the oil pump assembly. The oil pump is available only as an assembly.



TRANSMISSION

DISASSEMBLY

- Disassemble the transmission gears as shown in the illustration.



ITEM	N·m	kgf·m	lb-ft
①	65	6.5	47.0

REASSEMBLY

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

NOTE:
Always use new circlips.

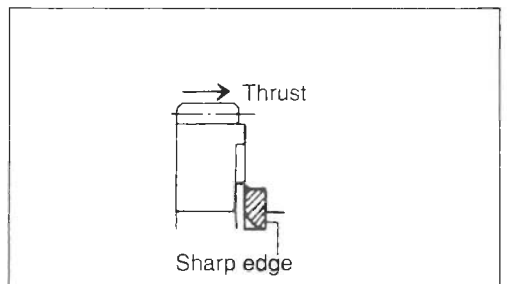
NOTE:
Before installing the gears, coat lightly moly paste or engine oil to the driveshaft and countershaft.

99000-25140: SUZUKI MOLY PASTE

⚠ CAUTION

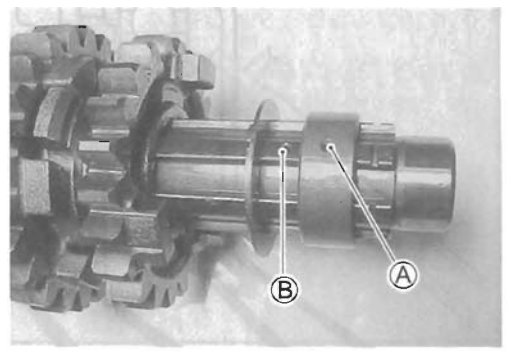
*** Never reuse a circlip. After a circlip has been removed from a shaft, it should be discarded and a new circlip must be installed.**
*** When installing a new circlip, care must be taken not to expand the end gap larger than required to slip the circlip over the shaft.**
*** After installing a circlip,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

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

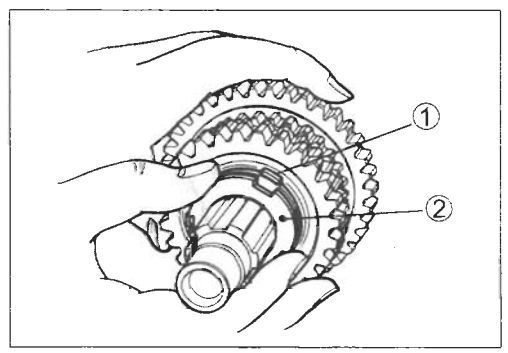


⚠ CAUTION

When installing the top drive gear bushing, align the bushing oil hole Ⓐ with the countershaft hole Ⓑ.

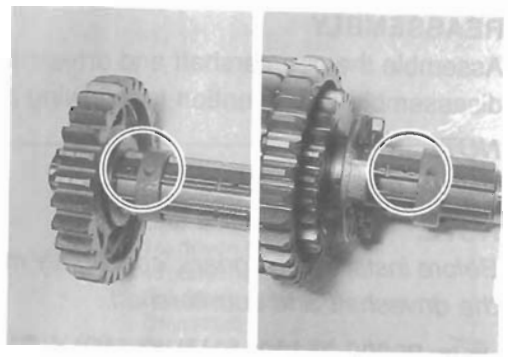


When installing the 3rd driven gear onto the driveshaft, install the lock washer No.2 ① onto the driveshaft, and turn and fit it into the groove.
Then, fit the lock washer No.1 ② in the lock washer No.2 ①.

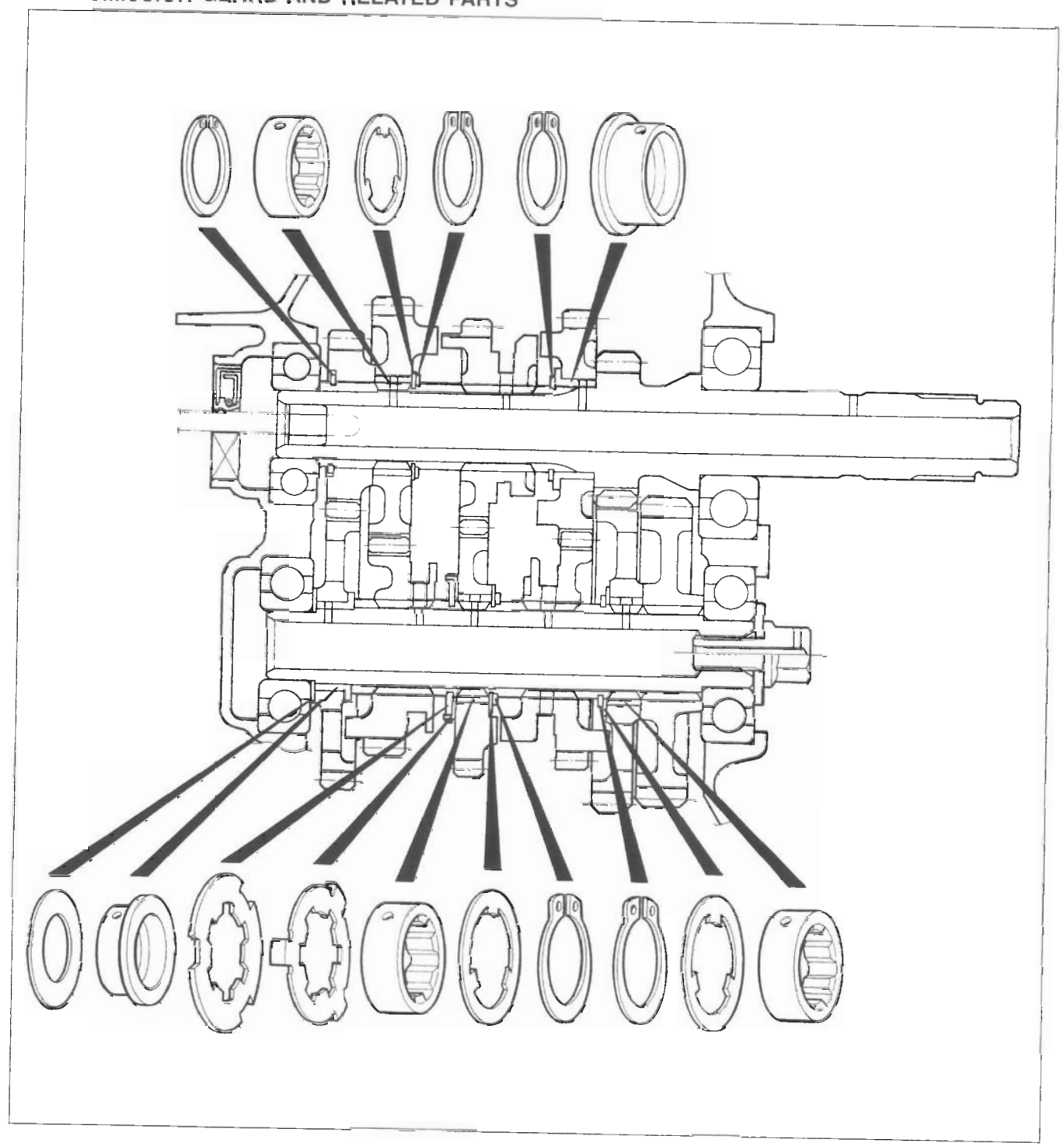


⚠ CAUTION

When installing the 1st and 3rd driven gear bushings, align the bushing oil hole with the driveshaft oil hole.



TRANSMISSION GEARS AND RELATED PARTS



GEARSHIFT FORK

GEARSHIFT FORK TO GROOVE CLEARANCE

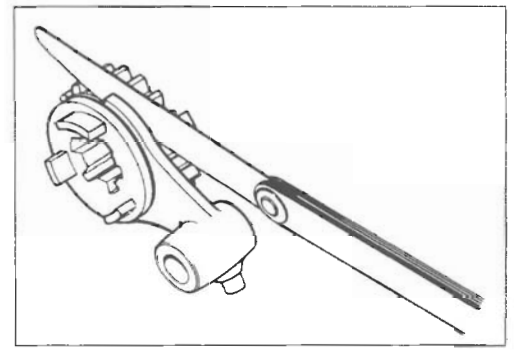
Using a thickness gauge, check the shifting fork clearance in the groove of its gear.

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

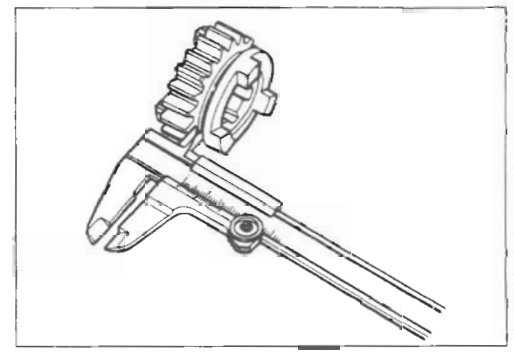
If the clearance checked is noted to exceed the limit specified, replace the fork or its gear, or both.

DATA Gearshift fork to groove clearance
Standard: 0.10 – 0.30 mm (0.004 – 0.012 in)
Service Limit: 0.50 mm (0.020 in)

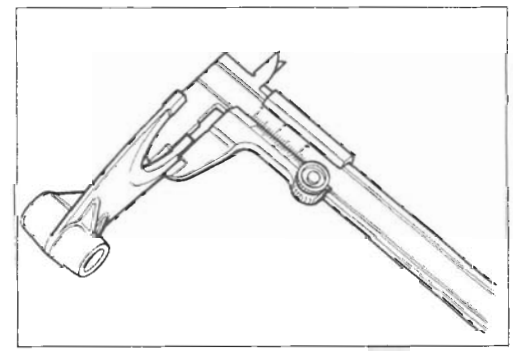
TOOL 09900-20803: Thickness gauge
09900-20102: Vernier calipers



DATA Shift fork groove width
Standard (No. 1): 5.50 – 5.60 mm (0.217 – 0.220 in)
(No. 2): 4.50 – 4.60 mm (0.177 – 0.181 in)



DATA Shift fork thickness
Standard (No. 1): 5.30 – 5.40 mm (0.209 – 0.213 in)
(No. 2): 4.30 – 4.40 mm (0.169 – 0.173 in)



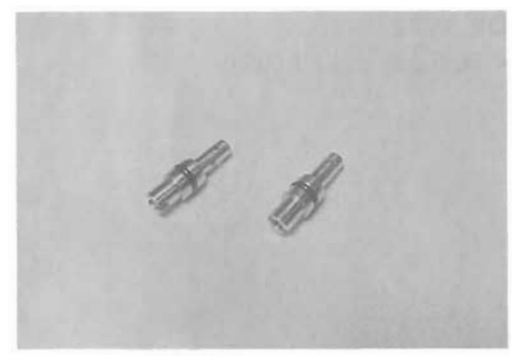
OIL JET

Check the all oil jets for cogging. If it is clogged, clean its oil passage with a compressed air.

⚠ CAUTION

Use new O-rings to prevent the oil pressure down.

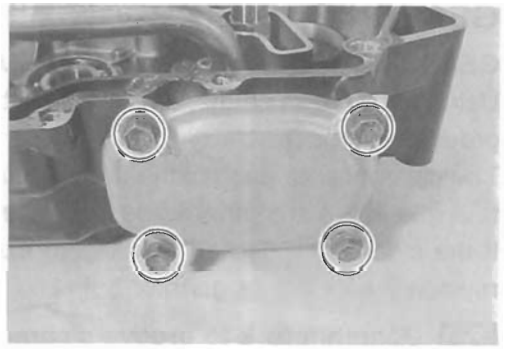
NOTE:
When installing the oil jets apply oil to the O-rings.



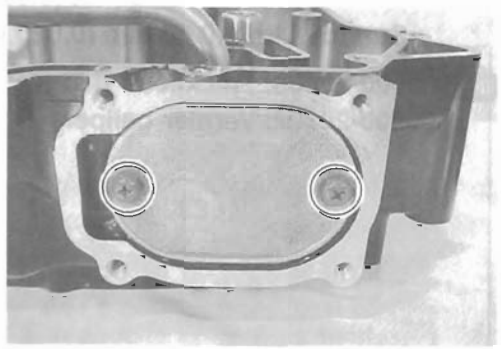
CRANKCASE

OIL SUMP FILTER

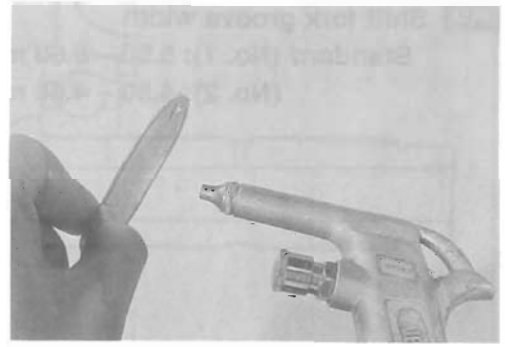
- Remove the oil sump filter cover.



- Remove the oil sump filter.

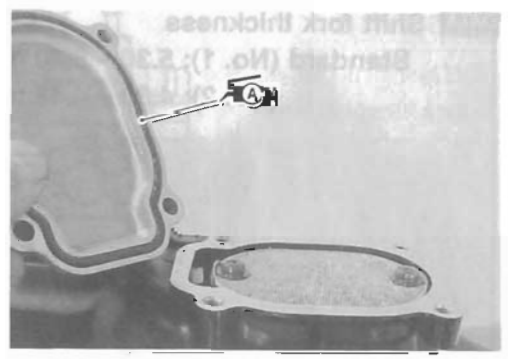


- Clean the oil sump filter using compressed air.



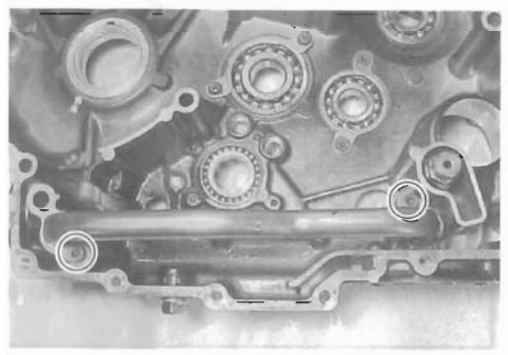
- When installing the O-ring, apply grease to it.

99000-25030: SUZUKI SUPER GREASE "A" (For USA)
99000-25010: SUZUKI SUPER GREASE "A" (For the others)



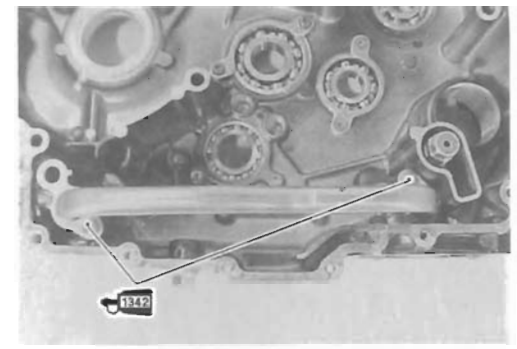
OIL PIPE

- Remove the oil pipe.



- When installing the oil pipe, use the new O-rings.
- Apply a small quantity of the THREAD LOCK "1342" to the oil pipe retainer bolts and tighten them securely.

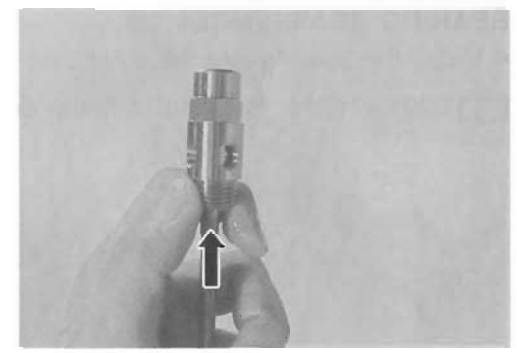
99000-32050: THREAD LOCK "1342"



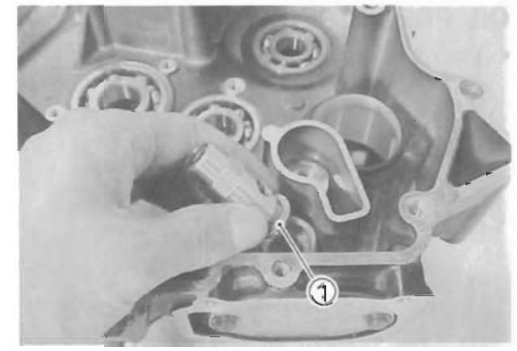
OIL PRESSURE REGULATOR

- Remove the oil pressure regulator.

Check the operation of the oil pressure regulator by pushing on the piston with an appropriately shaped tool. If the piston does not operate, replace the oil pressure regulator with a new one.



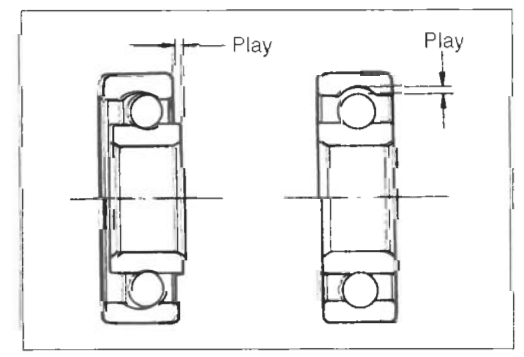
- When installing the oil pressure regulator, install the new washer ①.



BEARING INSPECTION

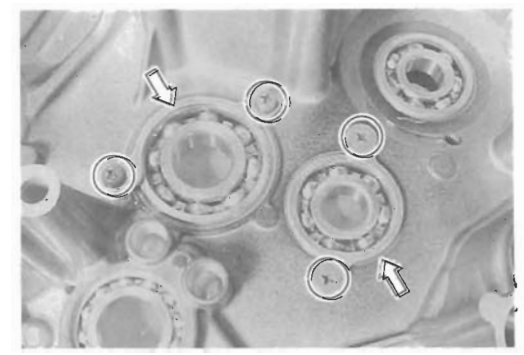
Rotate the bearing inner race by finger to inspect for abnormal play, noise and smooth rotation while the bearings are in the crankcase.

Replace the bearing in the following procedure if there is anything unusual.



BEARING DISASSEMBLY

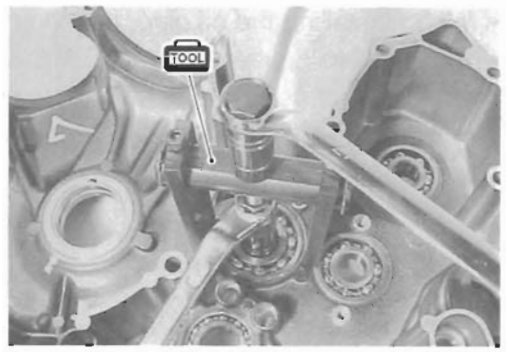
- Remove the bearing retainers.



- Remove the bearing with the special tool.

TOOL **09921-20220: Bearing remover set**

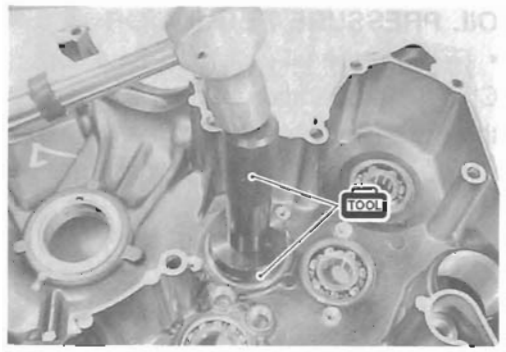
NOTE:
If abnormal noise does not occur, it is not necessary to remove the bearing.



BEARING REASSEMBLY

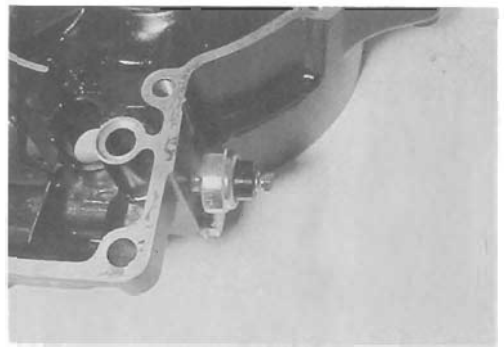
- Install the bearing into the crankcase with the special tool.

TOOL **09913-70210: Bearing installer set**



OIL PRESSURE SWITCH

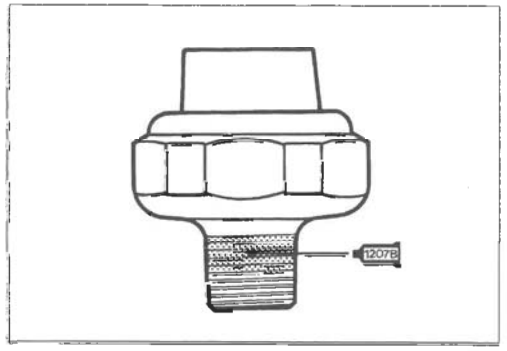
- Remove the oil pressure switch.



- When installing the switch, apply SUZUKI BOND "1207B".

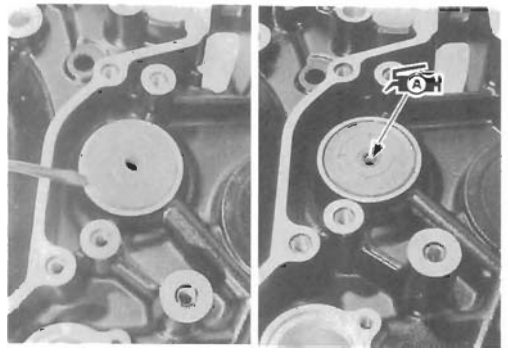
Oil pressure switch: 14 N·m (1.4 kgf·m, 10.0 lb-ft)

1207B **99104-31140: SUZUKI BOND "1207B" (For USA)**
99000-31140: SUZUKI BOND "1207B" (For the others)



OIL SEAL

- Remove the oil seal.



- Install the oil seal with the special tool.
- Apply grease to the oil seal lip.

A **99000-25030: SUZUKI SUPER GREASE "A" (For USA)**
99000-25010: SUZUKI SUPER GREASE "A" (For the others)

TOOL **09913-70210: Bearing installer set**

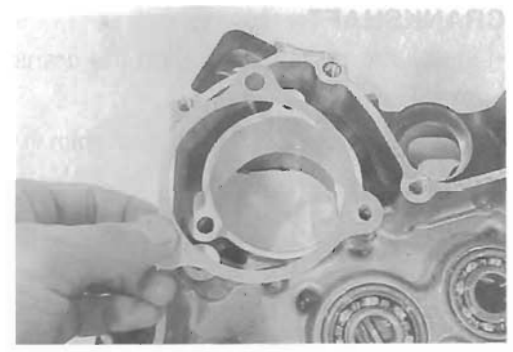
ENGINE REASSEMBLY

Reassemble the engine in the reverse order of disassembly. The following steps require special attention or precautionary measures should be taken.

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

SECONDARY DRIVE BEVEL GEAR

- Install the secondary drive bevel gear shim(s).



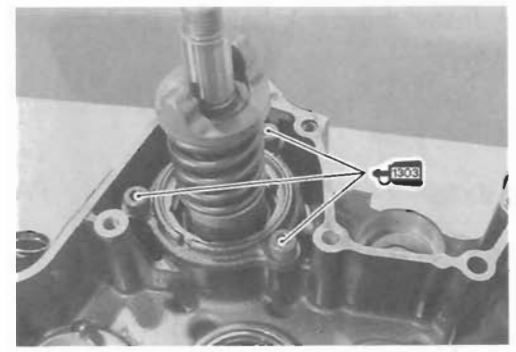
SHIM SELECTION ☞4-6

- Install the secondary drive bevel gear assembly and tighten the retainer bolts to the specified torque.

NOTE:
Apply THREAD LOCK SUPER "1303" to the thread of the bolts.

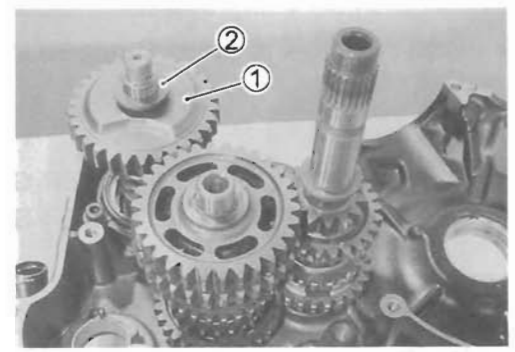
1303 **99000-32030: THREAD LOCK SUPER "1303"**

Secondary drive gear bearing retainer bolt: 23 N·m (2.3 kgf·m, 16.5 lb-ft)

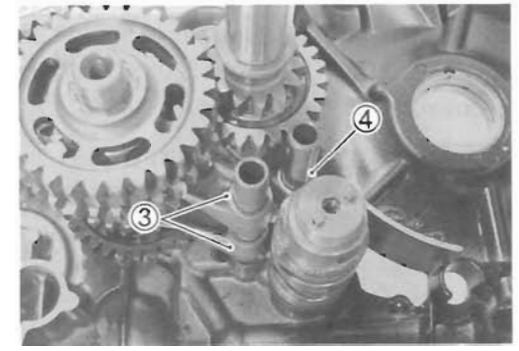


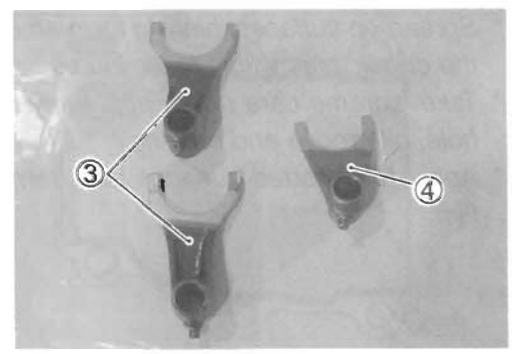
COUNTERSHAFT/DRIVESHAFT

- Install the countershaft assembly and driveshaft assembly.
- Install the over driving gear ① and bush ②.



- Install the gearshift forks ③④, gearshift fork shafts and gearshift cam.
  ③ No. 1 shift forks (For 4th and 5th driven gears)
  ④ No. 2 shift fork (For 3rd drive gear)





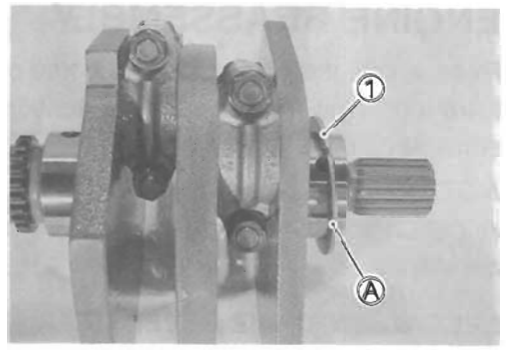
CRANKSHAFT

- Install the thrust shim ① on the crankshaft.

NOTE:

** The grooved face Ⓐ of thrust shim ① faces to crankshaft web side.*

** The thrust shim is selected by the crankshaft thrust clearance. (☞3-42)*



- Install the crankshaft into the left crankcase half.

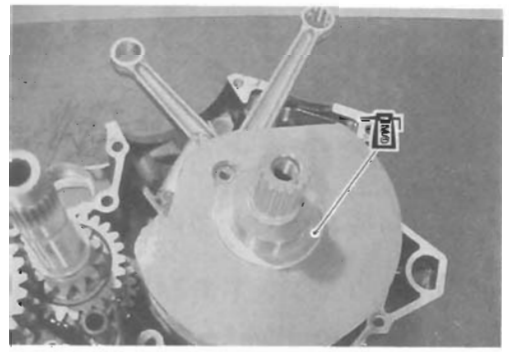
NOTE:

Coat lightly moly paste to the crankshaft journal bearings and the thrust shim.

99000-25140: SUZUKI MOLY PASTE

⚠ CAUTION

Never strike the crankshaft with a plastic hammer when inserting it into the crankcase. It will be easy to install the crankshaft to left crankcase.

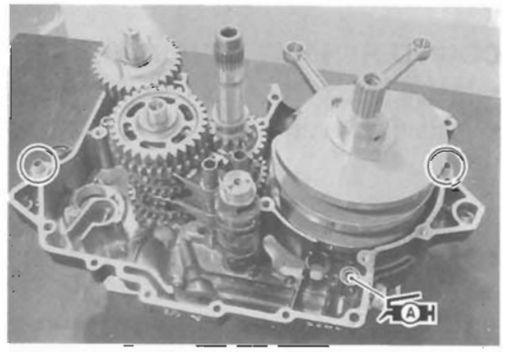


- Install the dowel pins and O-ring on the left crankcase half.

NOTE:

Apply grease to the O-ring.

99000-25030: SUZUKI SUPER GREASE "A" (For USA)
99000-25010: SUZUKI SUPER GREASE "A" (For the others)

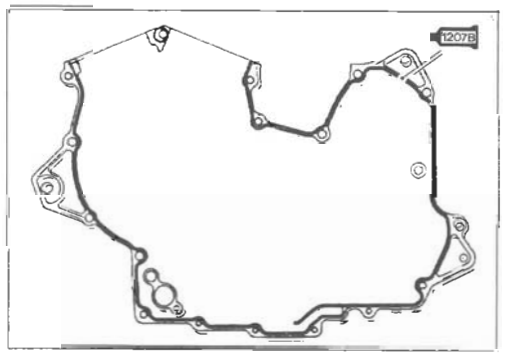


⚠ CAUTION

Use the new O-ring to prevent oil leakage.

- Clean the mating surfaces of the left and right crankcase halves.
- Apply SUZUKI BOND "1207B" to the mating surface of the right crankcase.

99104-31140: SUZUKI BOND "1207B" (For USA)
99000-31140: SUZUKI BOND "1207B" (For the others)



NOTE:

Use of SUZUKI BOND "1207B" is as follows:

** Make surfaces free from moisture, oil, dust and other foreign materials.*

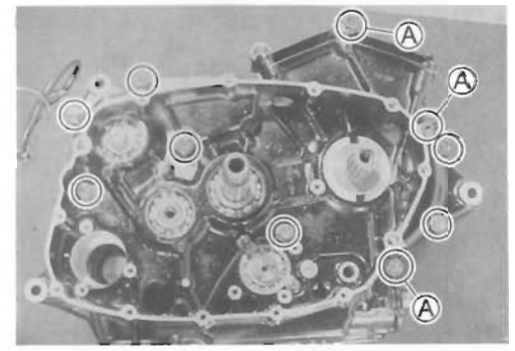
** Spread on surfaces thinly to form an even layer, and assemble the crankcases within few minutes.*

** Take extreme care not to apply any BOND "1207B" to the oil hole, oil groove and bearing.*

** Apply to distorted surfaces as it forms a comparatively thick film.*

- Fit the gasket to the bolt Ⓐ.
- When securing the right and left crankcase halves, tighten each bolt a little at a time to equalize the pressure. Tighten all the securing bolts to the specified torque values.

Crankcase 8mm bolt: (Initial) 15 N·m (1.5 kgf·m, 11.0 lb-ft)
(Final) 22 N·m (2.2 kgf·m, 16.0 lb-ft)
Crankcase 6mm bolt: 11 N·m (1.1 kgf·m, 8.0 lb-ft)



⚠ CAUTION

Do not drop the O-ring into the crankcase when assembling the right and left crankcase halves.

NOTE:

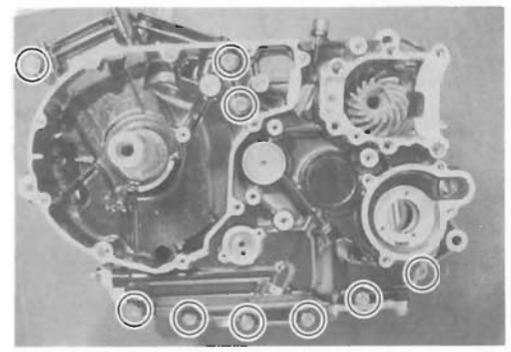
After the crankcase bolts have been tightened, check if the crankshaft, secondary drive bevel gear shaft, countershaft and the driveshaft rotate smoothly.

SECONDARY DRIVEN BEVEL GEAR

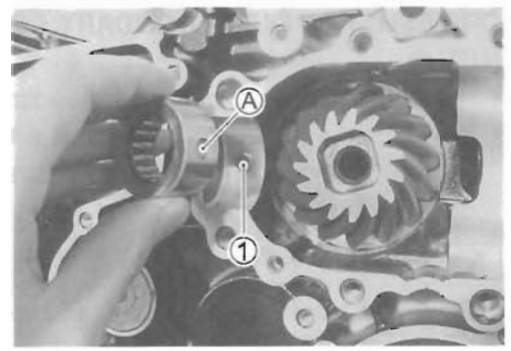
- Install the secondary driven bevel gear bearing and the pin ①.

NOTE:

Align the hole Ⓐ of the secondary driven bevel gear bearing with the pin ①.



- Install the secondary driven bevel gear assembly, shim(s) ② and O-ring ③.
- Install the dowel pins and the oil jet ④.



⚠ CAUTION

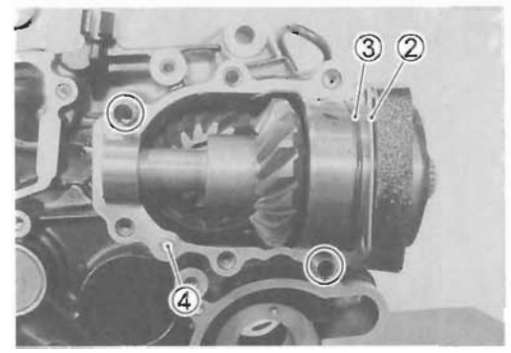
Use the new O-ring to prevent oil leakage.

NOTE:

** Refer to the section 4 for shim selection.*

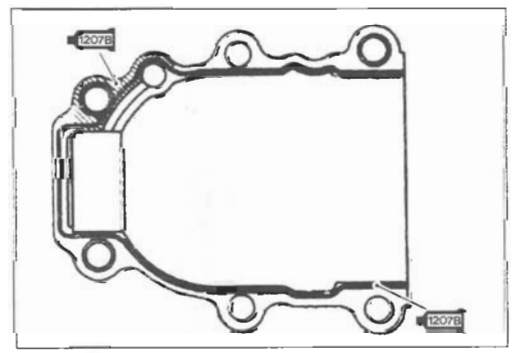
** Apply grease to the O-ring.*

99000-25030: SUZUKI SUPER GREASE "A" (For USA)
99000-25010: SUZUKI SUPER GREASE "A" (For the others)



- Clean the mating surfaces of the crankcase and the secondary gear case.
- Apply SUZUKI BOND "1207B" to the mating surface of the secondary gear case.

99104-31140: SUZUKI BOND "1207B" (For USA)
99000-31140: SUZUKI BOND "1207B" (For the others)



NOTE:

** Make surfaces free from moisture, oil, dust and other foreign materials.*

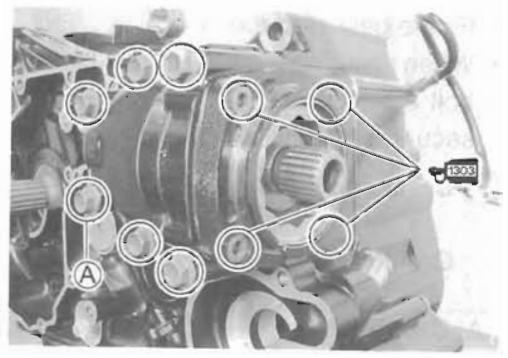
** Spread on surfaces thinly to form an even layer, and assemble the crankcases within few minutes.*

** Take extreme care not to apply any BOND "1207B" to the oil hole, oil groove and bearing.*

** Apply to distorted surfaces as it forms a comparatively thick film.*

- Tighten the secondary gear case bolts to the specified torque.

Secondary gear case bolt (Initial): 15 N·m (1.5 kgf·m, 11.0 lb-ft)
(Final) : 22 N·m (2.2 kgf·m, 16.0 lb-ft)

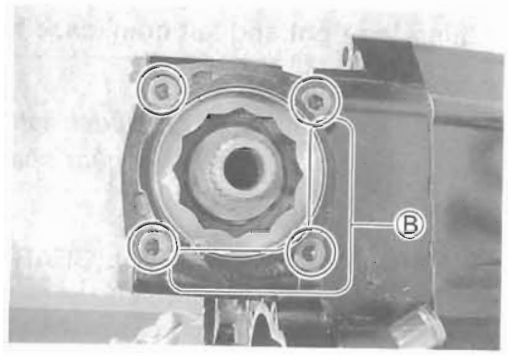


NOTE:
Fit the washer to the bolt Ⓐ.

- Tighten the secondary driven bevel gear bolt to the specified torque.

NOTE:
* *Hollow portion Ⓑ of the secondary driven gear assembly faces inside.*
* *Apply a small quantity of THREAD LOCK SUPER "1303" to the bolt.*

1303 99000-32030: THREAD LOCK SUPER "1303"
Secondary driven bevel gear bolt: 23 N·m (2.3 kgf·m, 16.5 lb-ft)

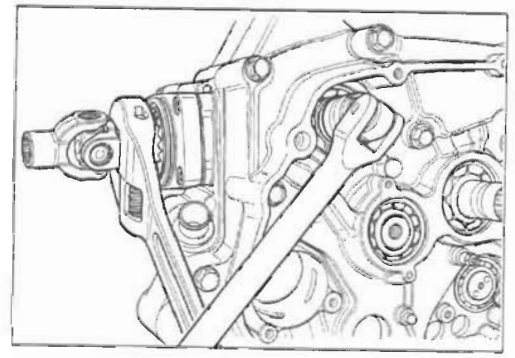


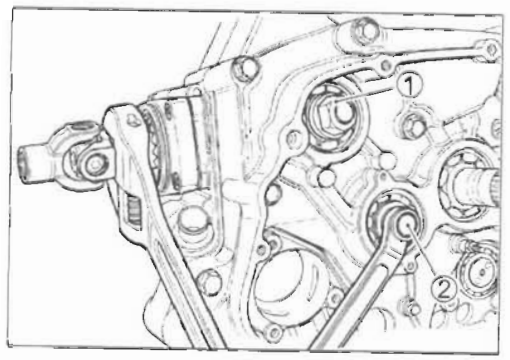
DRIVESHAFT BOLT/SECONDARY DRIVEN GEAR SHAFT NUT

- Install the universal joint on the secondary driven gear shaft.
- While holding the universal joint with a adjustable wrench, tighten the secondary drive gear shaft nut ① and driveshaft bolt ② to the specified torque.

⚠ CAUTION
Driveshaft bolt ② has left-hand thread.

TOOL 09900-18710: Hexagon socket (12 mm)
Secondary drive gear shaft nut: 105 N·m (10.5 kgf·m, 76.0 lb-ft)
Driveshaft bolt: 65 N·m (6.5 kgf·m, 47.0 lb-ft)

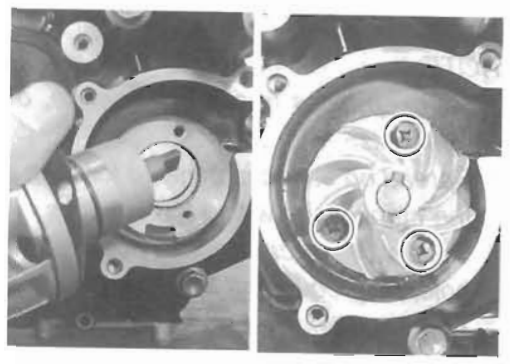




WATER PUMP

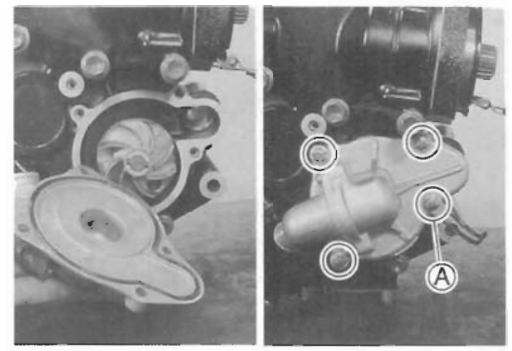
- Install the new O-ring and new gasket.
- Tighten the water pump mounting screws.

⚠ CAUTION
Use the new O-ring to prevent oil leakage.



- Install the new O-ring.
- Install the water pump cover.

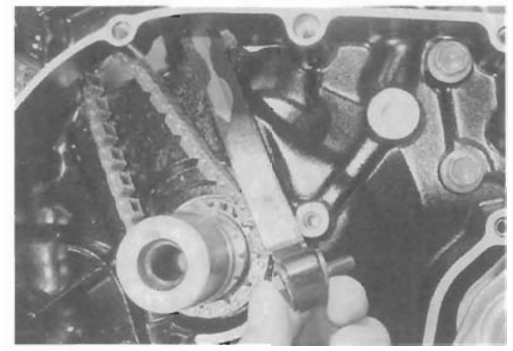
NOTE:
Fit the clamp to the bolt Ⓐ.



CAM CHAIN/CAM CHAIN TENSIONER

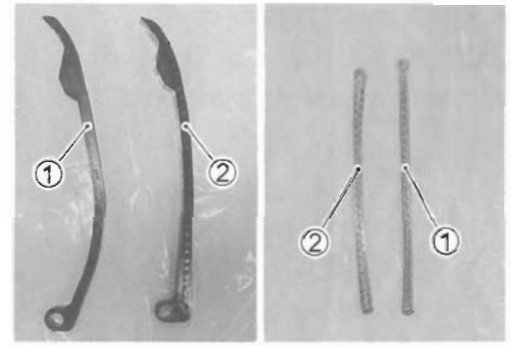
- Install the cam chain tensioner and cam chain.

Cam chain tensioner bolt: 10 N·m (1.0 kgf·m, 7.0 lb-ft)



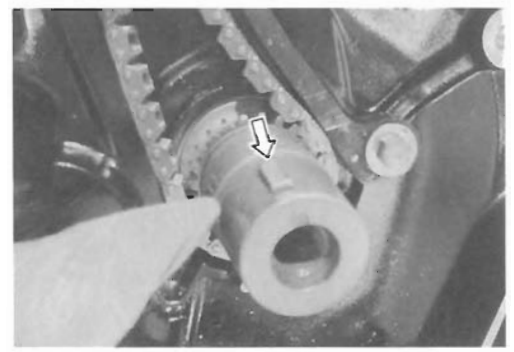
① For front cylinder
② For rear cylinder

NOTE:
The No. 2 cam chain (For front cylinder) is a little longer than the No. 1 cam chain.



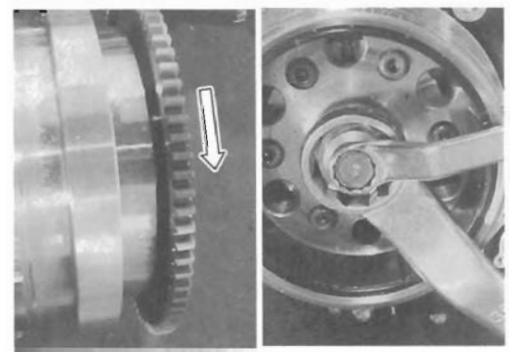
GENERATOR

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

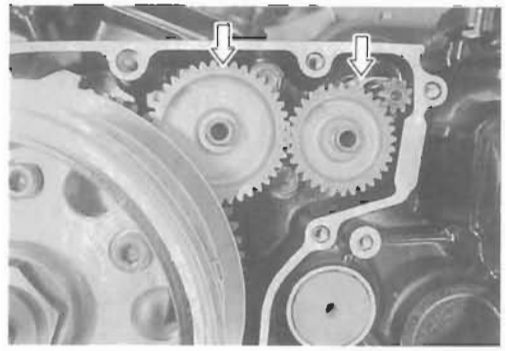


- Install the starter driven gear to the rotor.
- Install the generator rotor assembly and tighten its bolt to the specified torque.

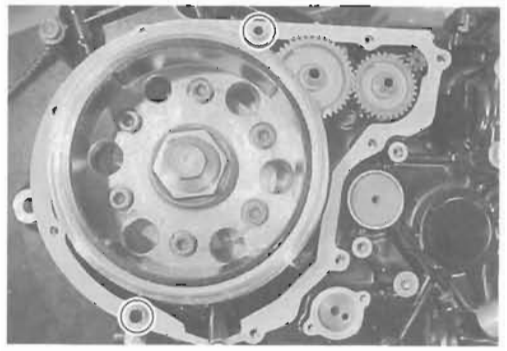
Generator rotor bolt: 160 N·m (16.0 kgf·m, 115.5 lb-ft)



- Install the starter driven gear and the idle gear.

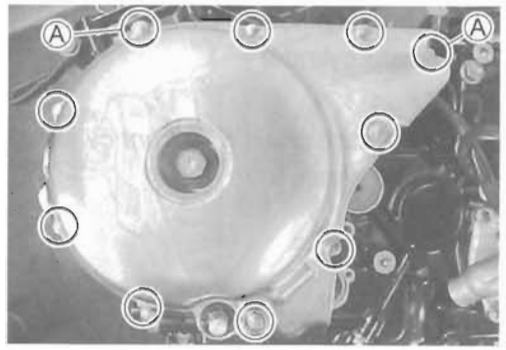


- Install the new gasket and dowel pins.



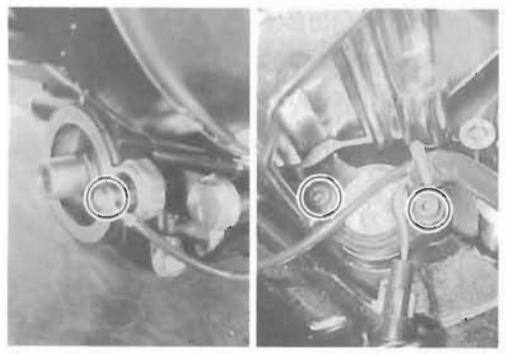
- Install the generator cover.

NOTE:
Fit the new gaskets to the bolts Ⓐ.



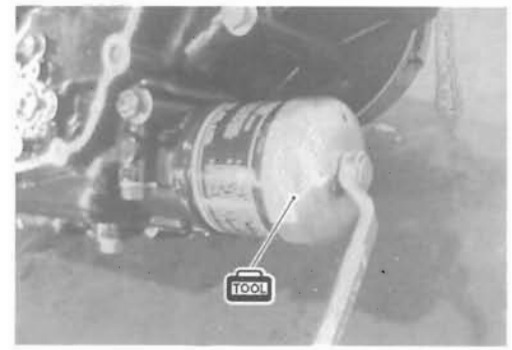
NEUTRAL SWITCH
- Install the springs and switch contacts.

- Install the neutral switch.
- Install the oil pressure switch lead wire.

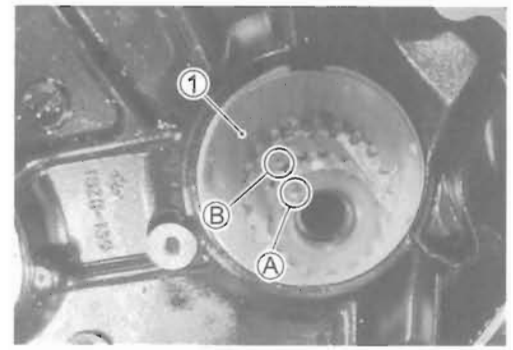


OIL FILTER
- Apply engine oil lightly to the gasket of the oil filter before installation.
- Install the oil filter turning it by hand until feeling that the filter gasket contacts the mounting surface. Then tighten it 2 turns using the oil filter wrench.

TOOL **09915-40610: Oil filter wrench**

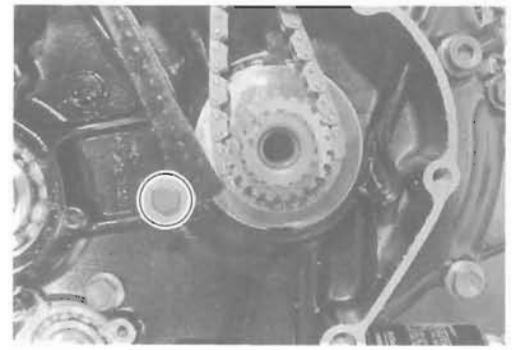


PRIMARY DRIVE GEAR
- Install the thrust washer ① onto the crankshaft.
- Align the punch mark Ⓐ on the crankshaft with the punch mark Ⓑ on the camshaft drive sprocket.



- Install the cam chain and cam chain tensioner.
- Tighten the cam chain tensioner bolt to the specified torque.

Cam chain tensioner bolt: 10 N·m (1.0 kgf·m, 7.0 lb-ft)

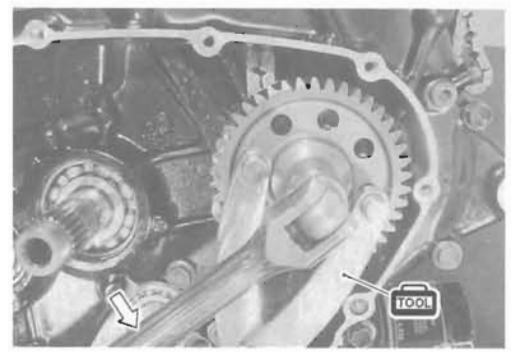


- Install the primary drive gear and tighten the primary drive gear bolt to the specified torque with the special tool.

Primary drive gear bolt: 95 N·m (9.5 kgf·m, 68.5 lb-ft)

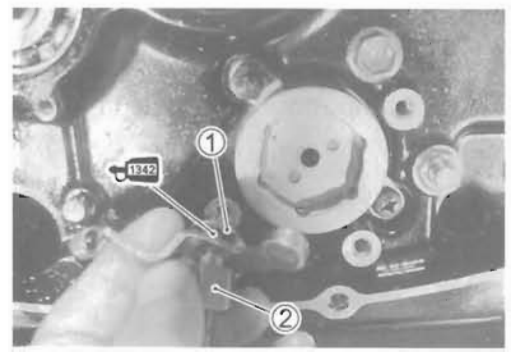
TOOL **09930-40113: Rotor holder**

NOTE:
This bolt has left-hand thread.

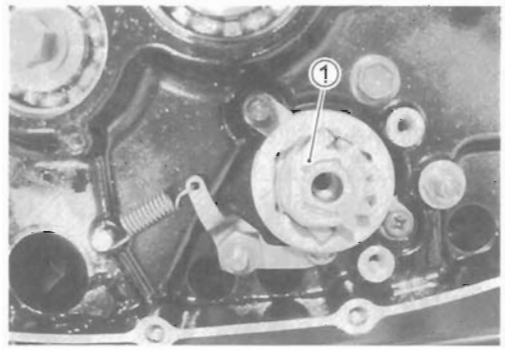


GEARSHIFT
- Install the washer ①.
- Apply a small quantity of THREAD LOCK "1342" to the gearshift cam stopper bolt ② and tighten it.

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

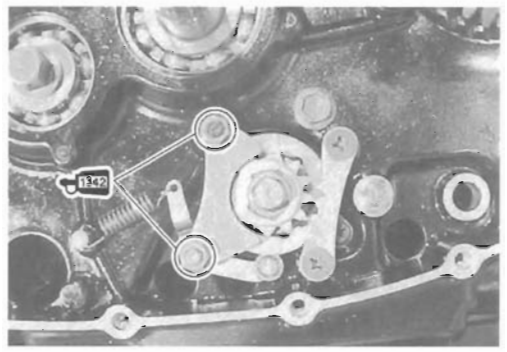


- Install the cam driven gear ① after installing the springs, pins and gearshift pawls.

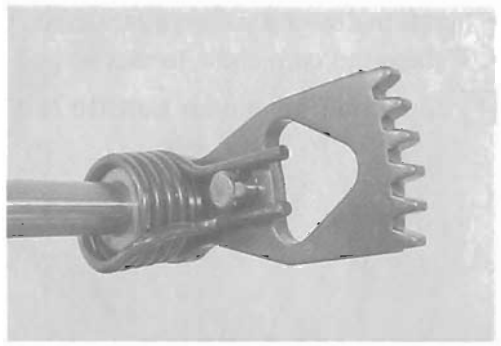


- Install the cam guide and the pawl lifter.
- Apply a small quantity of THREAD LOCK "1342" to the nuts.

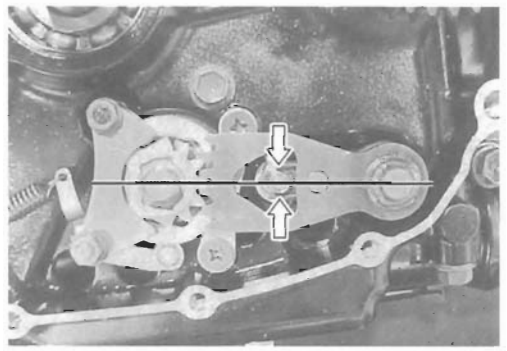
1342 99000-32050: THREAD LOCK "1342"



- Install the gearshift return spring properly.



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



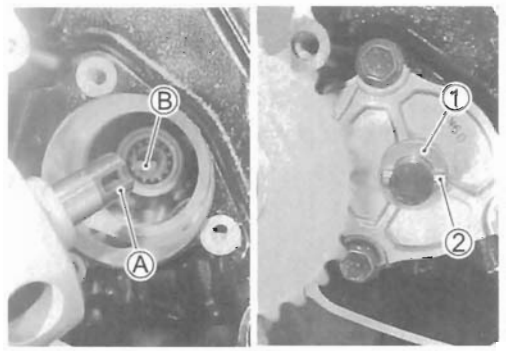
OIL PUMP

- Install the oil pump.

Oil pump mounting bolt: 11 N·m (1.1 kgf·m, 8 lb-ft)

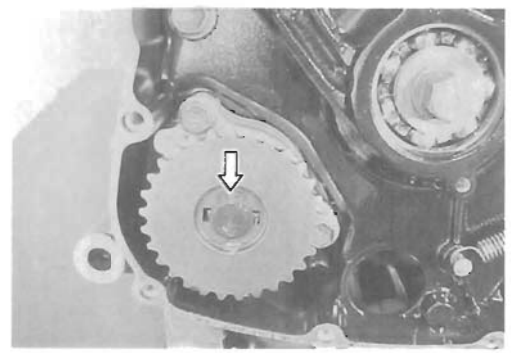
NOTE:
Set the oil pump shaft end Ⓐ to the water pump shaft Ⓑ.

- Install the washer ① and pin ②.



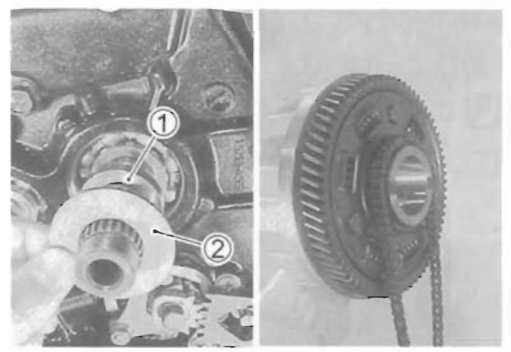
- Install the oil pump driven gear and the circlip.

09900-06107: Snap ring pliers

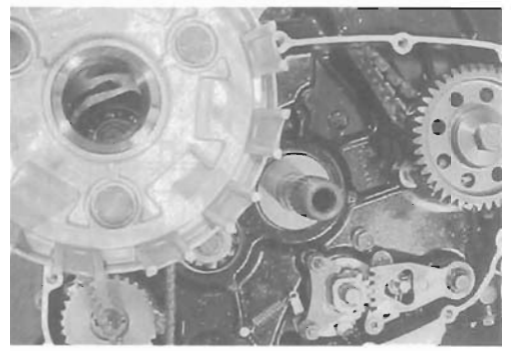


CLUTCH

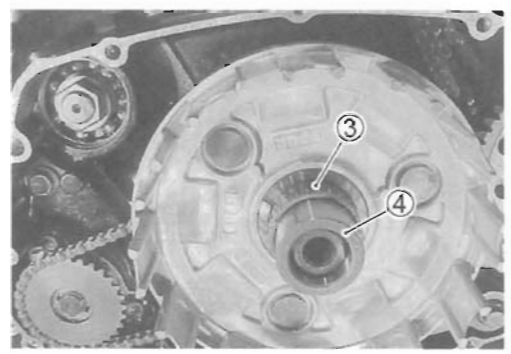
- Install the spacer ① and the thrust washer ②.
- Engage the chain with the oil pump drive gear.



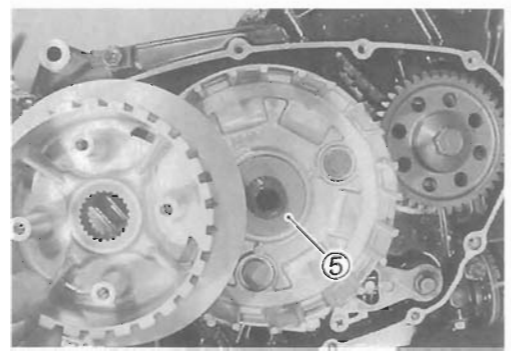
- Install the primary driven gear assembly and engage the chain with the oil pump driven gear.



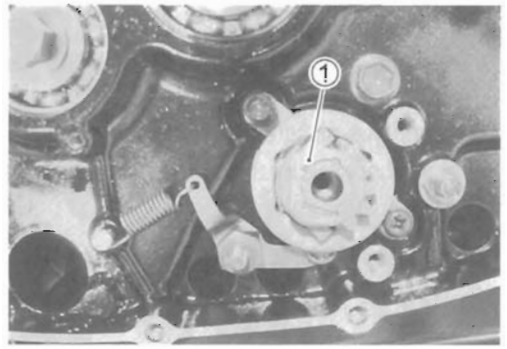
- Apply engine oil to the primary driven gear bearing ③ and install it.
- Install the collar ④.



- Install the thrust washer ⑤ and the clutch sleeve hub.

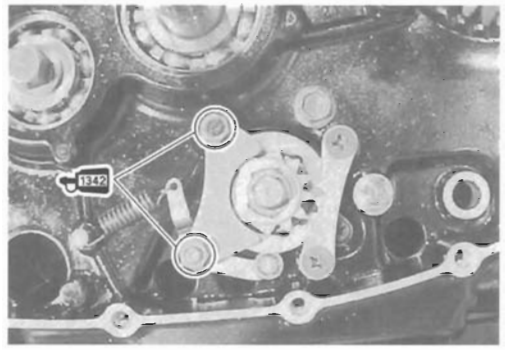


- Install the cam driven gear ① after installing the springs, pins and gearshift pawls.

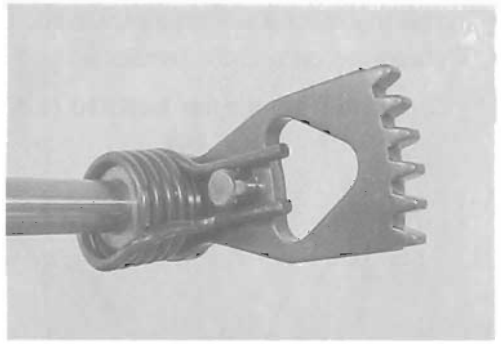


- Install the cam guide and the pawl lifter.
- Apply a small quantity of THREAD LOCK "1342" to the nuts.

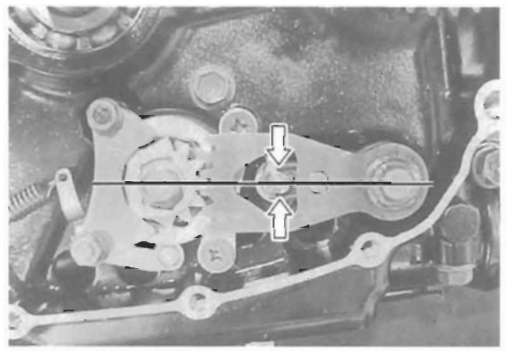
1342 99000-32050: THREAD LOCK "1342"



- Install the gearshift return spring properly.



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



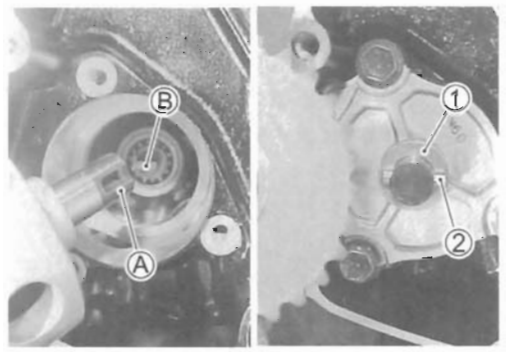
OIL PUMP

- Install the oil pump.

Oil pump mounting bolt: 11 N·m (1.1 kgf·m, 8 lb-ft)

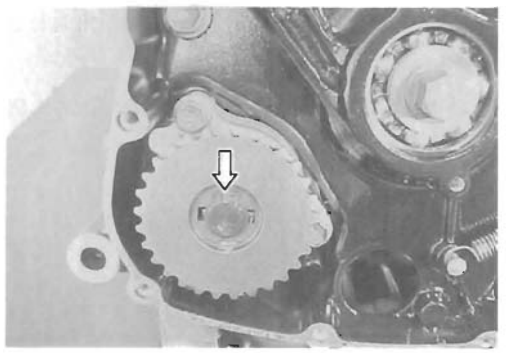
NOTE:
Set the oil pump shaft end Ⓐ to the water pump shaft Ⓑ.

- Install the washer ① and pin ②.



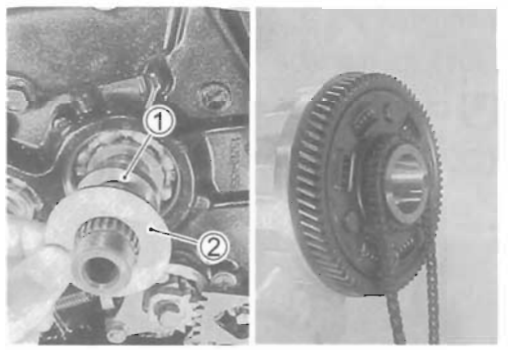
- Install the oil pump driven gear and the circlip.

09900-06107: Snap ring pliers

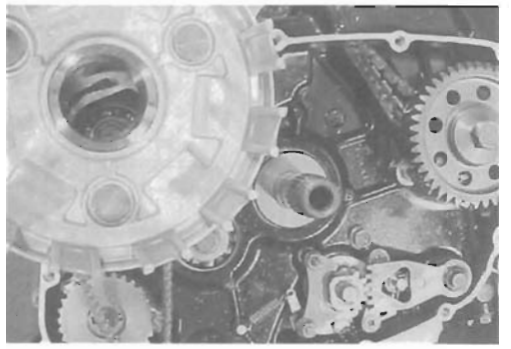


CLUTCH

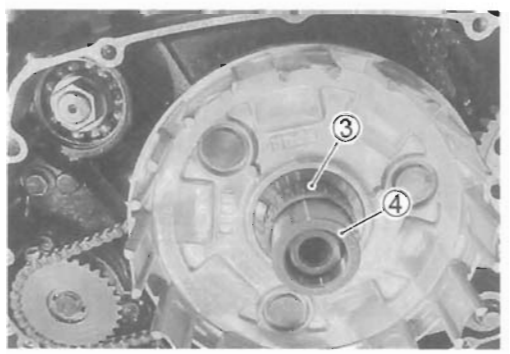
- Install the spacer ① and the thrust washer ②.
- Engage the chain with the oil pump drive gear.



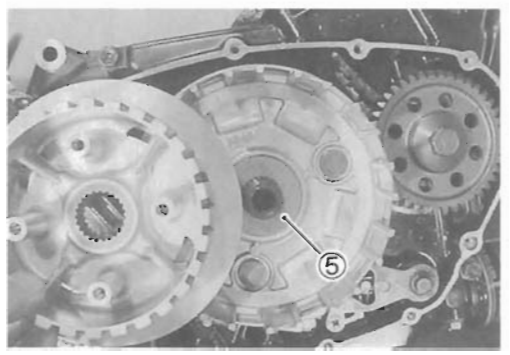
- Install the primary driven gear assembly and engage the chain with the oil pump driven gear.



- Apply engine oil to the primary driven gear bearing ③ and install it.
- Install the collar ④.

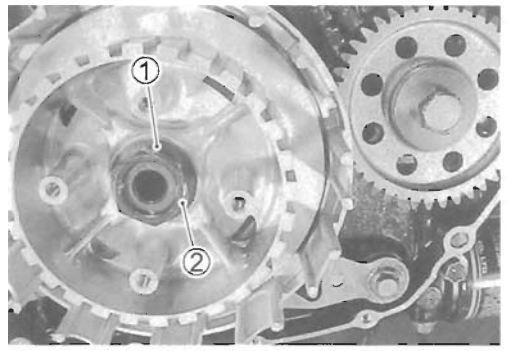


- Install the thrust washer ⑤ and the clutch sleeve hub.



- Install the washer ① and the clutch sleeve hub nut ②.

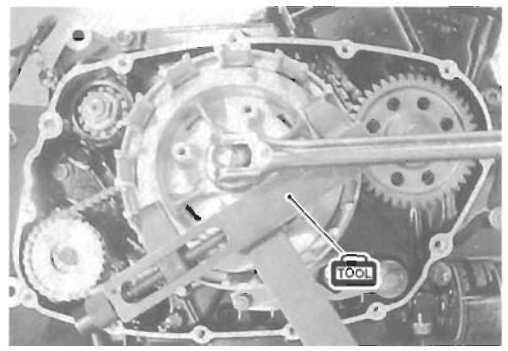
NOTE:
The convex side of the washer faces outside.

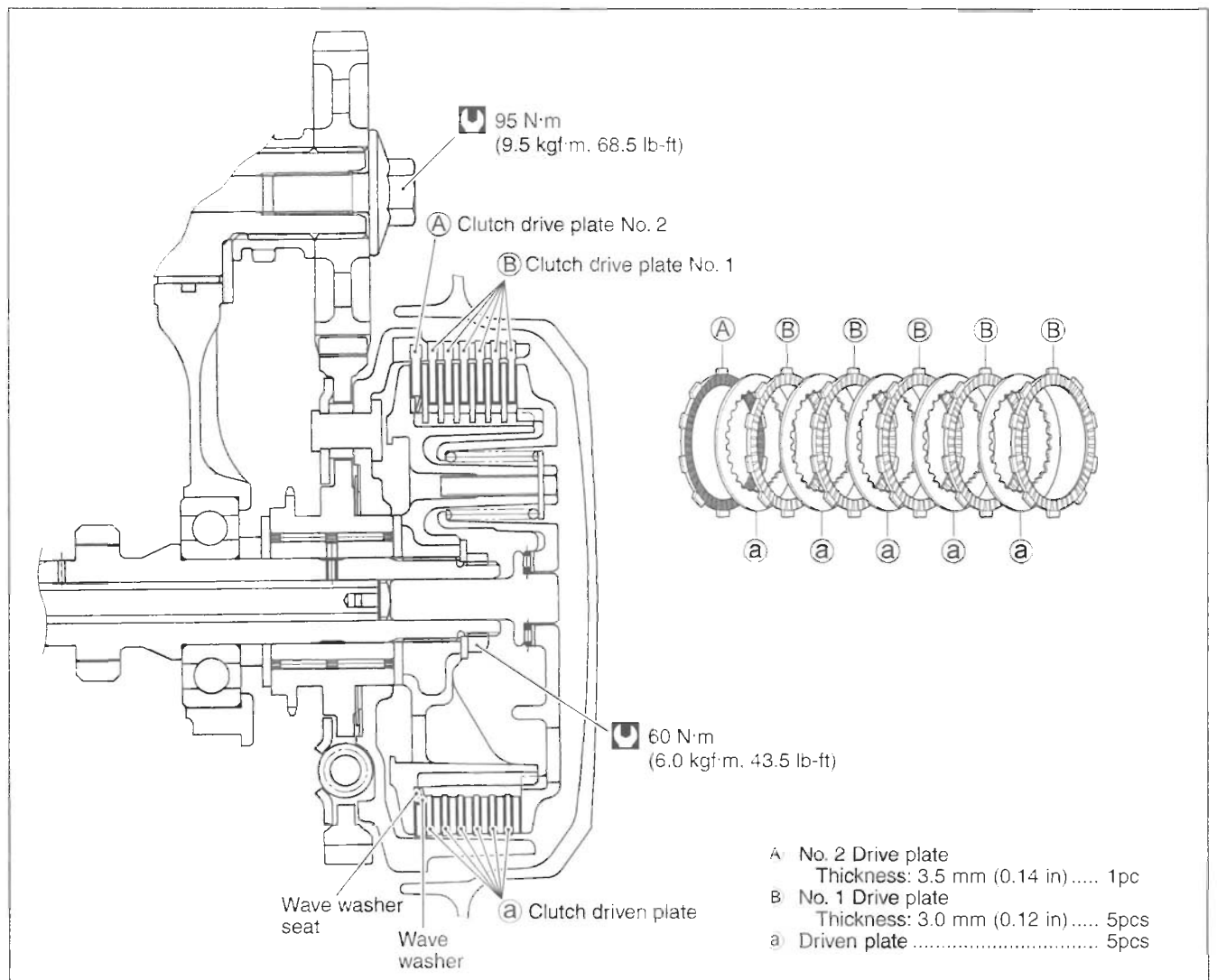


- Tighten the clutch sleeve hub nut to the specified torque with the special tool.

Clutch sleeve hub nut: 60 N·m (6.0 kgf·m, 43.5 lb-ft)

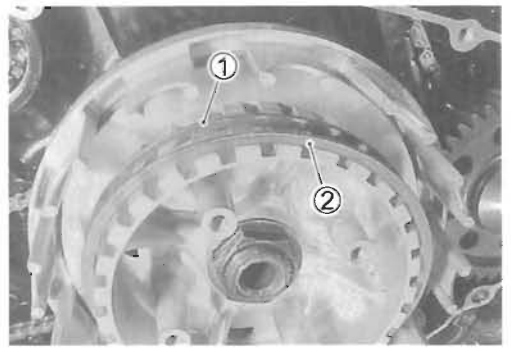
09920-53740: Clutch sleeve hub holder



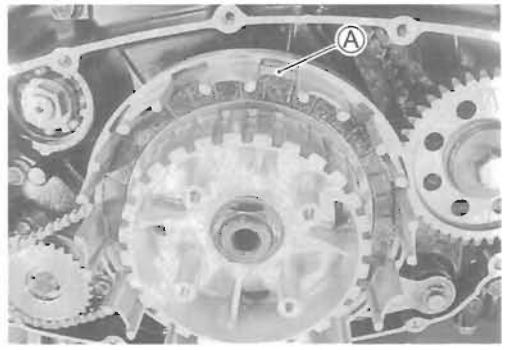


Ⓐ No. 2 Drive plate
Thickness: 3.5 mm (0.14 in) 1pc
Ⓑ No. 1 Drive plate
Thickness: 3.0 mm (0.12 in) 5pcs
ⓐ Driven plate 5pcs

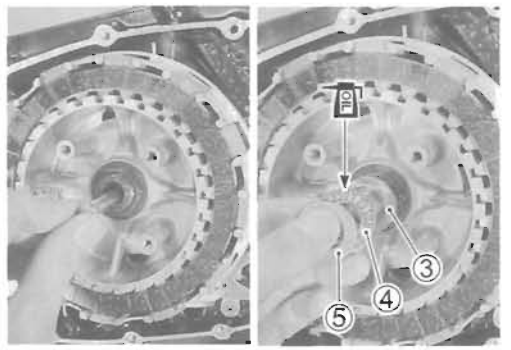
- Install the wave washer seat ① and the wave washer ②.



- Install the clutch drive plate No.2 Ⓐ first.
- Install the drive and driven plate one by one into the clutch sleeve hub.

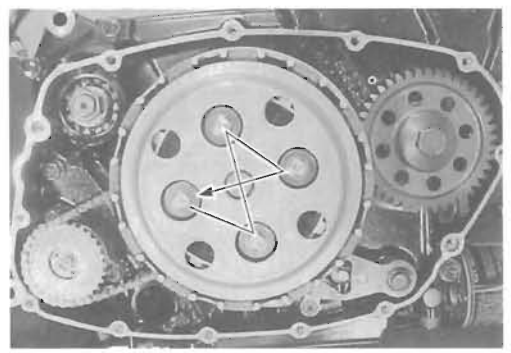


- Install the push rod.
- Install the clutch push piece ③, bearing ④ and thrust washer ⑤.
- Apply engine oil to the bearing.

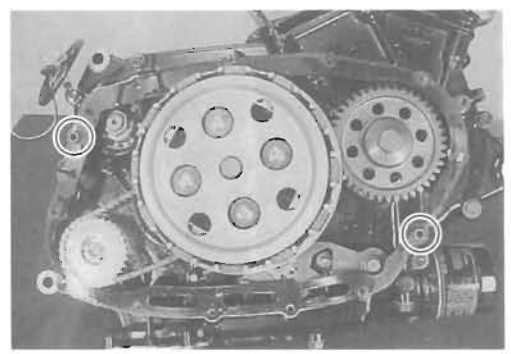


- Install the springs and tighten the clutch spring set bolts diagonally to the specified torque.

Clutch spring set bolt: 10 N·m (1.0 kgf·m, 7.0 lb-ft)

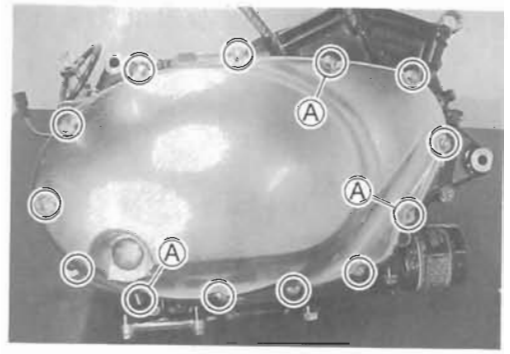


- Install the new clutch cover gasket and dowel pins.



- Install the clutch cover and tighten the bolts.

NOTE:
Fit the new gasket to the bolt Ⓐ.



STARTER MOTOR

- Install the starter motor.

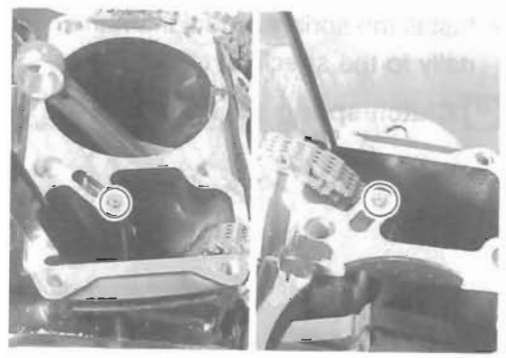
NOTE:
Apply grease to the new O-ring.

99000-25030: SUZUKI SUPER GREASE "A" (For USA)
99000-25010: SUZUKI SUPER GREASE "A"
(For the others)

- Install the starter motor cover.

OIL JET

- Apply engine oil to the new O-ring and install the oil jets.

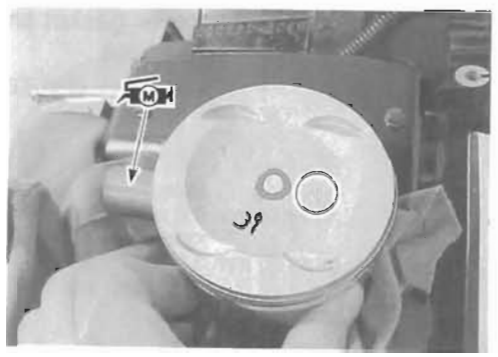


PISTON

- Apply a light coat of SUZUKI MOLY PASTE to the piston pins.

99000-25140: SUZUKI MOLY PASTE

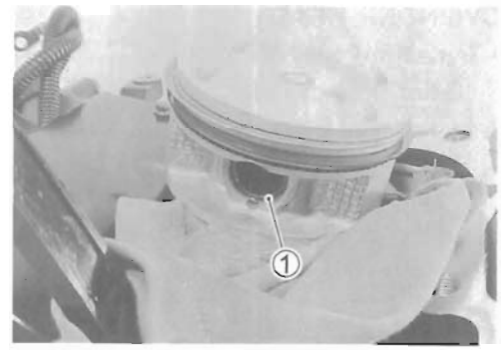
- When installing the piston, the arrow mark on the piston head is located to the exhaust side.



- Place a cloth beneath the piston, and install the circlip ①.

⚠ CAUTION

When turning the crankshaft, pull the cam chains upward, or the chains will be caught between the crankcase and the cam drive sprocket.

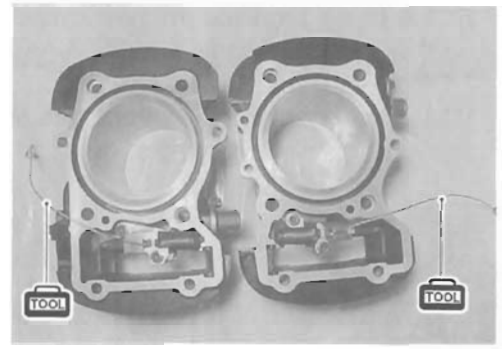


CYLINDER

- Install the cam chain tension adjuster to the cylinder.
- After unlocking the ratchet, push the cam chain tension adjuster rod.
- Insert the special tool between the ratchet and the adjuster body.

09918-53810: Chain tensioner lock tool

Cam chain tension adjuster mounting bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)



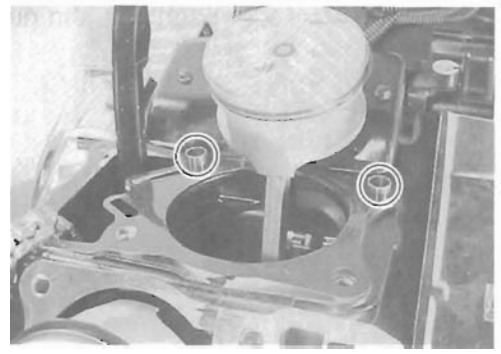
- Coat SUZUKI BOND "1207B" lightly to the mating surfaces among the crankcase mating surfaces.

99104-31140: SUZUKI BOND "1207B" (For USA)
99000-31140: SUZUKI BOND "1207B" (For the others)

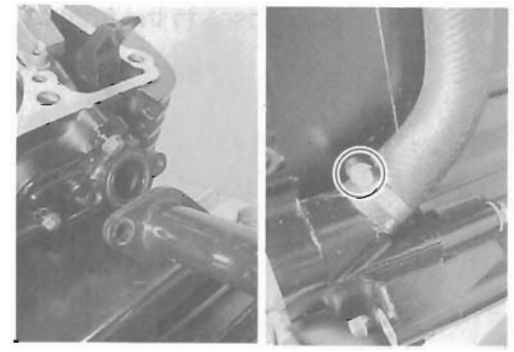
- Fit the dowel pins and the new gasket.

⚠ CAUTION

Use a new gasket to prevent gas leakage.

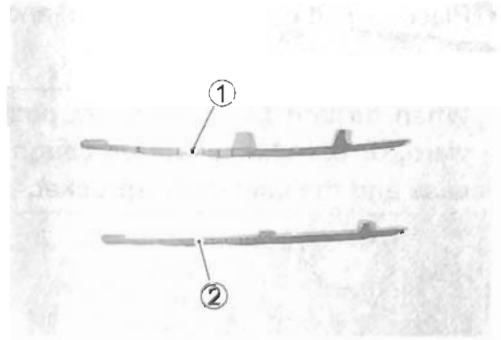


- Install the cylinder. (Rear cylinder)
- Install the water hose and pipe.



CYLINDER HEAD

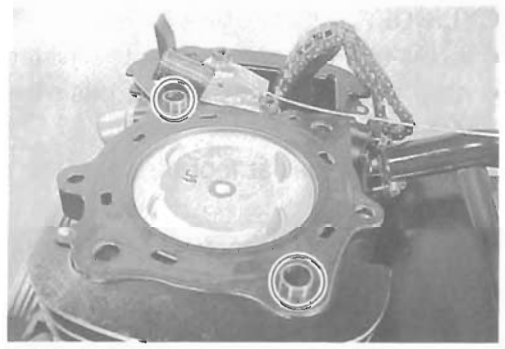
- Install the cam chain guide.
  ① For front cylinder
  ② For rear cylinder



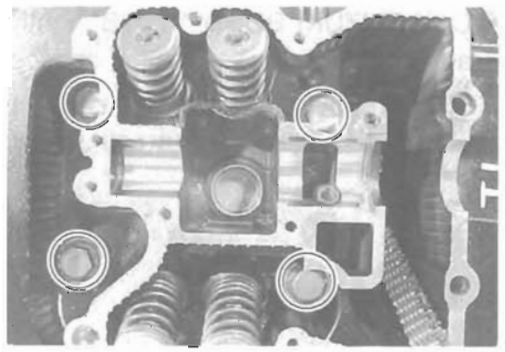
- Fit the dowel pins and the new cylinder head gasket.

⚠ CAUTION

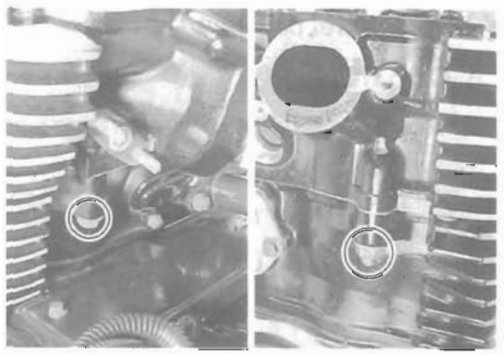
Use a new gasket to prevent gas leakage.



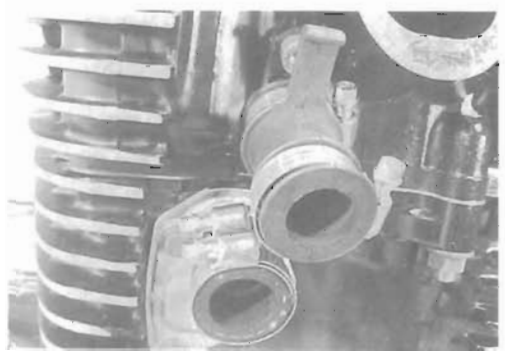
- Install the cylinder head and tighten the cylinder head bolts diagonally to the specified torque. (Rear cylinder)



- Tighten the cylinder head bolt and nut.



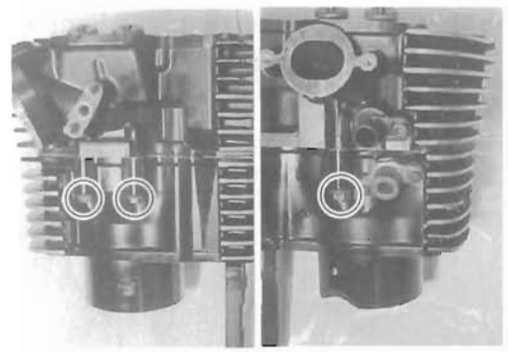
- Install the water hoses to the front cylinder.



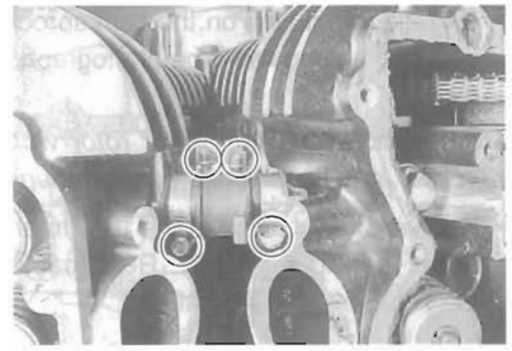
FRONT CYLINDER

- Assemble the front cylinder and the cylinder head.
- Tighten the cylinder head bolts and nut.

Cylinder head bolt and nut (M8): 25 N·m
(2.5 kgf·m, 18.0 lb-ft)



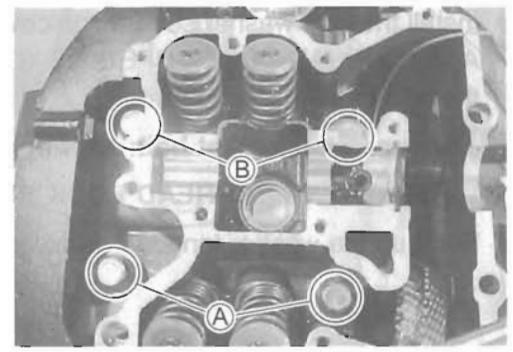
- Install the front cylinder assembly to the crankcase.
- Connect the water hoses.



- Tighten the cylinder head bolts to the specified torque.

Cylinder head bolt (M10): Initial: 25 N·m
(2.5 kgf·m, 18.0 lb-ft)
Final: 38 N·m
(3.8 kgf·m, 27.5 lb-ft)

NOTE:
Bolt Ⓐ: 165 mm (6.5 in)
Bolt Ⓑ: 155 mm (6.1 in)

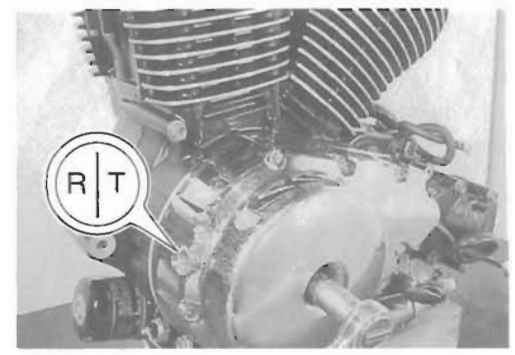


CAMSHAFT

- Position "RIT" mark on the generator rotor with the center of the valve timing inspection hole.

⚠ CAUTION

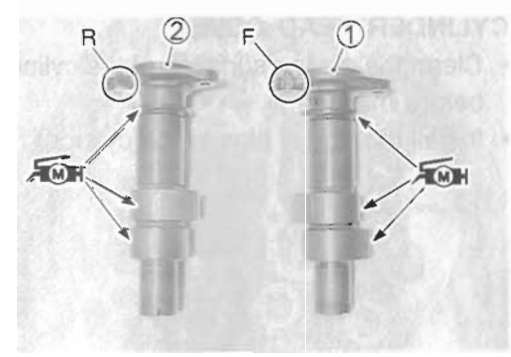
Pull the cam chains upward, or the chain will be caught between crankcase and cam drive sprocket.



- Before installing the camshafts onto each cylinder head, apply SUZUKI MOLY PASTE onto the camshaft journals. Also, apply engine oil onto the camshaft journal holders.

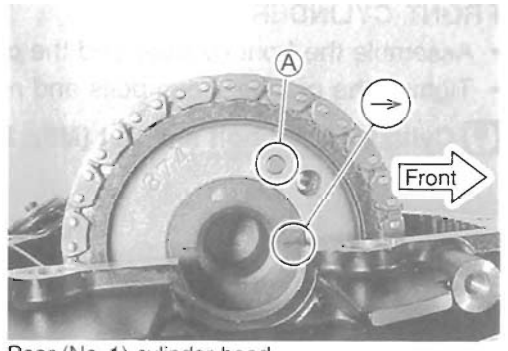
99000-25140: SUZUKI MOLY PASTE

NOTE:
The camshaft is identified by the embossed letters "F" and "R".
① Front cam shaft
② Rear cam shaft



- Align the arrow marks on the front and rear camshafts so it is parallel with the surface of the cylinder heads.

NOTE:
Arrow marks are located to forward.

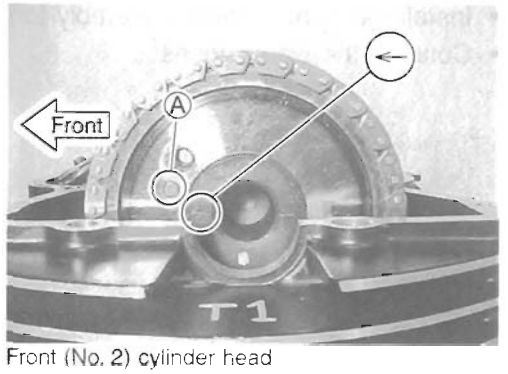


Rear (No. 1) cylinder head

- Engage the chains on the cam sprockets with the locating pin holes Ⓐ as shown in the photograph.

NOTE:
Do not rotate the generator rotor while doing this. When the sprocket is not positioned correctly, turn the sprocket.

- Recheck the position of the "RIT" mark on the generator rotor, arrow mark on the No.1 (Rear) camshaft and arrow mark on the No.2 (front) camshaft.



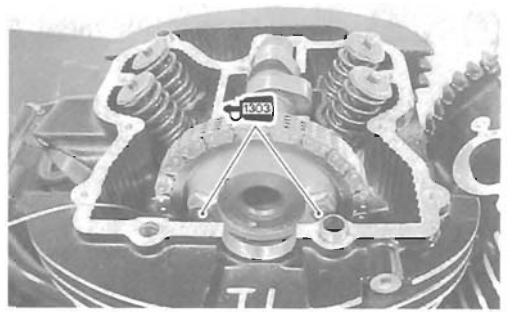
Front (No. 2) cylinder head

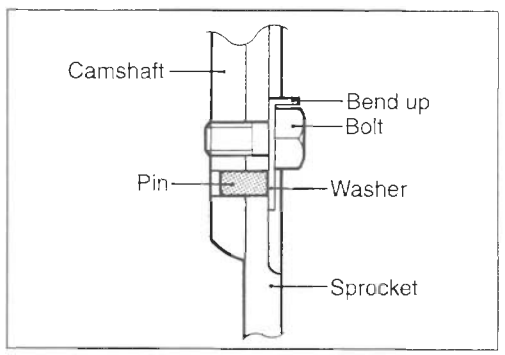
- Install the lock washer so that it is covering the locating pin.
- Apply THREAD LOCK SUPER "1303" to the bolts and tighten them to the specified torque.

Cam chain sprocket bolt: 15 N·m (1.5 kgf·m, 11.0 lb-ft)

1303 99000-32030: THREAD LOCK SUPER "1303"

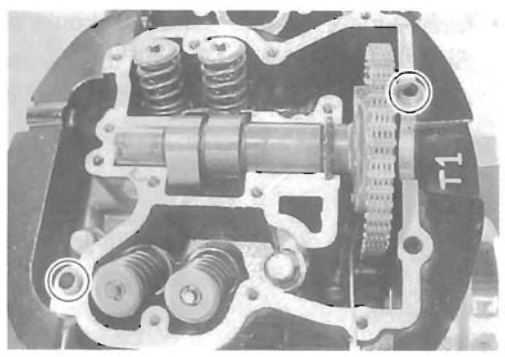
- Bend up the washer tongue positively to lock the bolts.





CYLINDER HEAD COVER

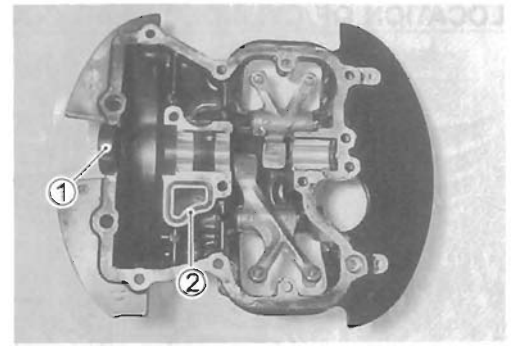
- Clean the mating surfaces of the cylinder head and head cover before matching.
- Install the dowel pins to the cylinder head.

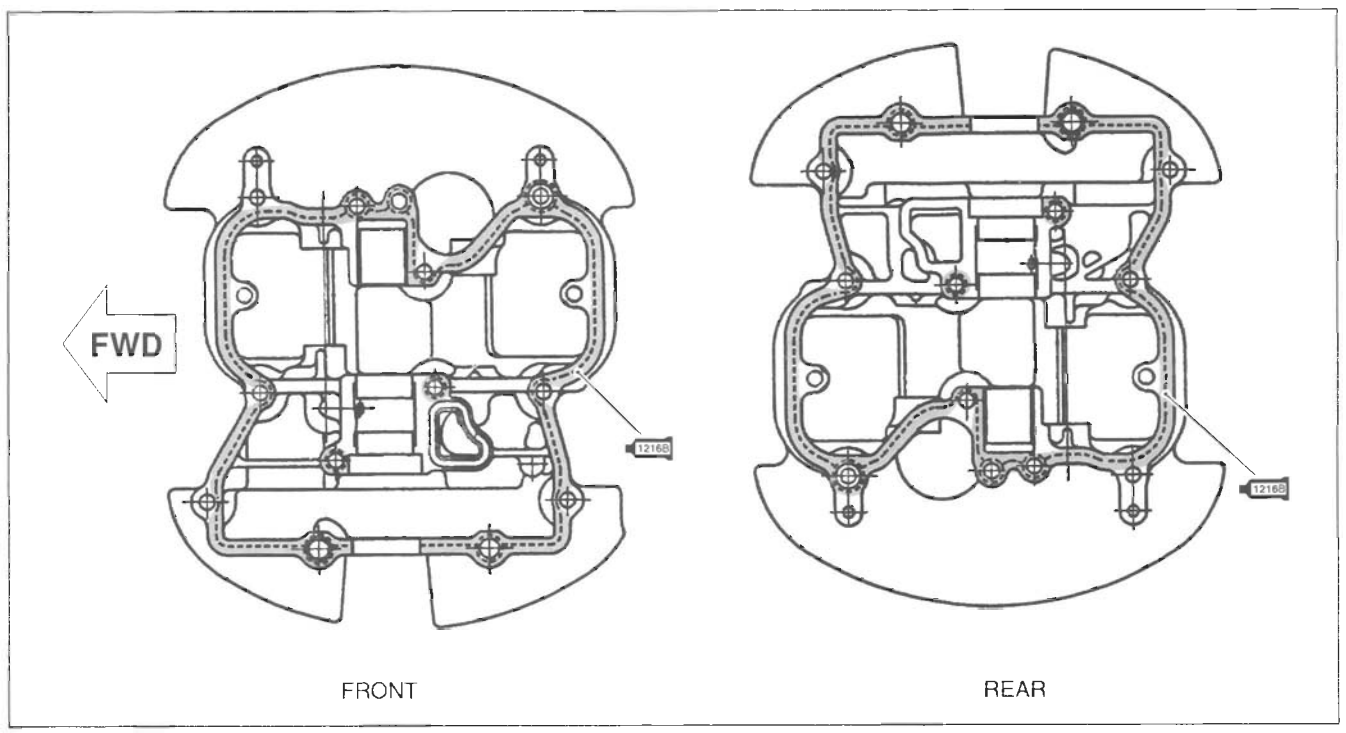


- Apply SUZUKI BOND "1216B" to the mating surface of the cylinder head cover.
- Fit the camshaft end caps ①.
- Apply grease to the O-ring ② and install it. (Front cylinder only)

1216B 99000-31230: SUZUKI BOND "1216B"

Ⓐ 99000-25030: SUZUKI SUPER GREASE "A" (For USA)
99000-25010: SUZUKI SUPER GREASE "A"
(For the others)

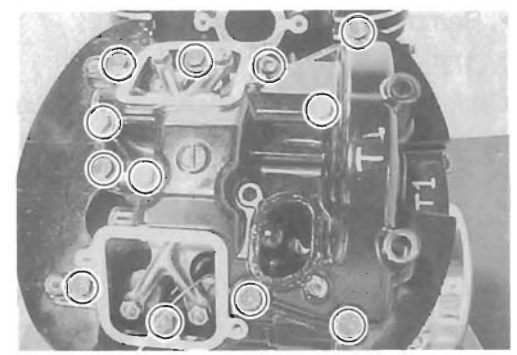


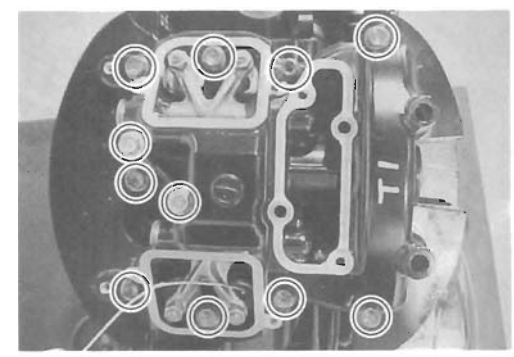


- Lightly tighten the cylinder head cover bolts diagonally, and then if everything is satisfactory, tighten securely with a torque wrench to the specified torque.

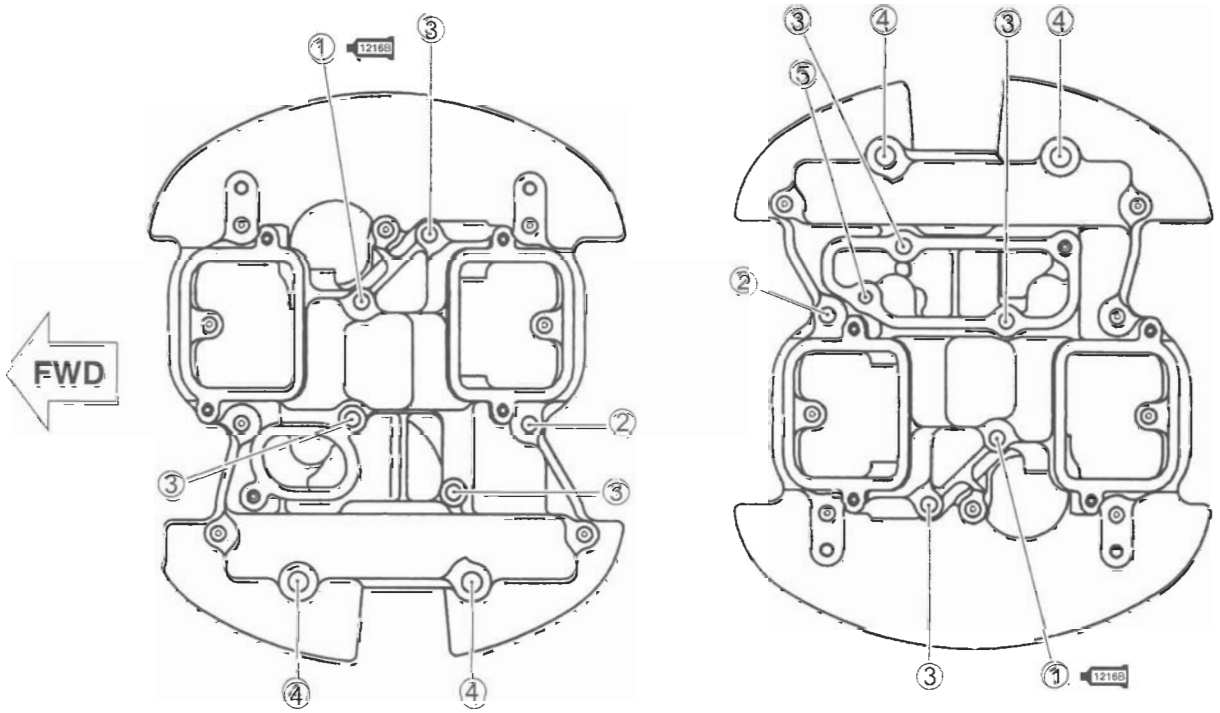
Cylinder head cover bolt (M6): 10 N·m (1.0 kgf·m, 7.0 lb-ft)
(M8): 25 N·m
(2.5 kgf·m, 18.0 lb-ft)

NOTE:
When tightening the cylinder head cover bolts, the piston must be at top dead center on the compression stroke.





LOCATION OF CYLINDER HEAD COVER BOLT

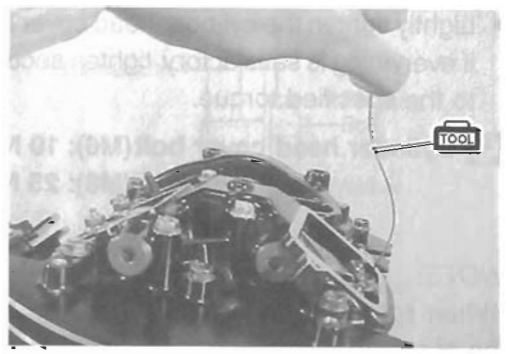


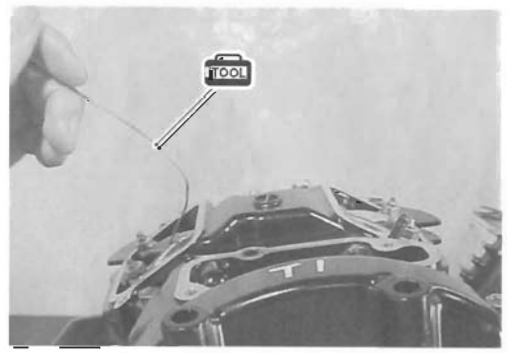
FRONT REAR

NOTE:
* Before installing the bolt ①, apply SUZUKI BOND "1207B" to the thread of the bolt.
* Allen bolt: ②
* Stainless bolt: ①, ③, ④.
* Fit the gasket to the bolt ⑤.

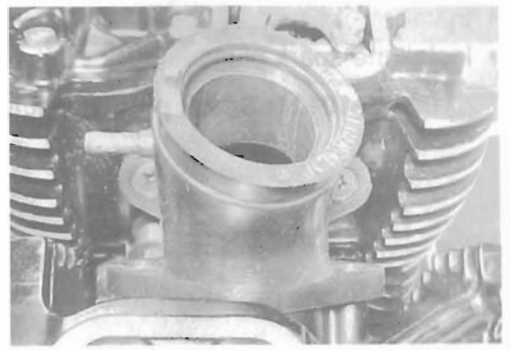
- Remove the tensioner lock tools.

NOTE:
Click sound is heard when the cam chain tension adjuster is released.





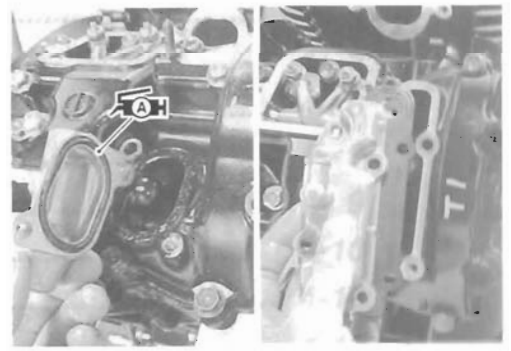
- Install the intake pipe.



- Apply grease to the new O-ring and install the water outlet union.

99000-25030: SUZUKI SUPER GREASE "A" (For USA)
99000-25010: SUZUKI SUPER GREASE "A" (For the others)

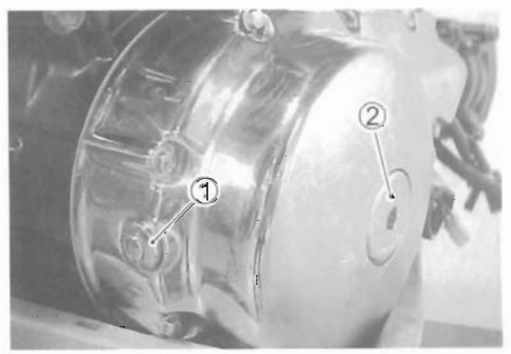
- Install the gasket and the breather cover.



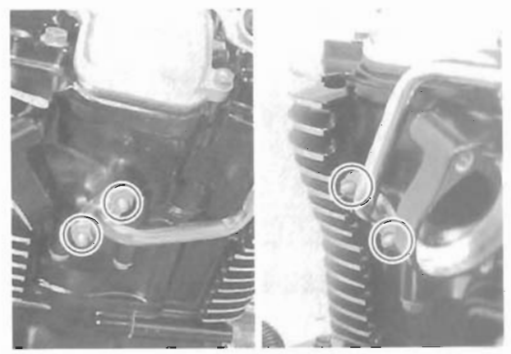
- Apply grease to the new O-rings and install the valve inspection caps.

99000-25030: SUZUKI SUPER GREASE "A" (For USA)
99000-25010: SUZUKI SUPER GREASE "A" (For the others)

- Install the valve timing inspection plug ① and the generator cover cap ②.

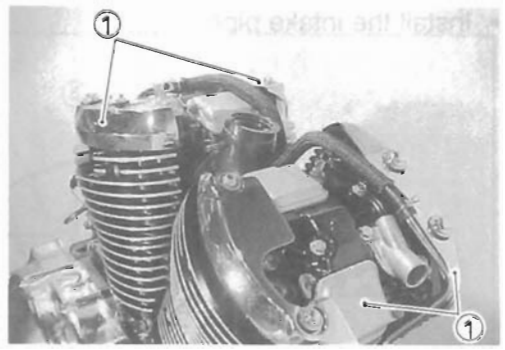


- Install the PAIR pipes.



- Install the head cover caps ①.
- Install the spark plugs.

TOOL **09930-10121: Spark plug wrench set**



SHAFT DRIVE

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