

# ET-250

# Contents

|                                        |    |
|----------------------------------------|----|
| 1. INFORMATION.....                    | 5  |
| 1.1 SAFETY .....                       | 5  |
| 1.2 NOTES .....                        | 5  |
| 1.3 SPECIFICATION ENGINE .....         | 6  |
| 1.4 SERIAL NUMBER .....                | 7  |
| 1.5 TORQUE VALUES .....                | 8  |
| 1.6 Special Tools .....                | 9  |
| 2. MAINTENANCE .....                   | 10 |
| 2.1 MAINTENANCE DATA.....              | 10 |
| 2.2 MAINTENANCE SCHEDULE .....         | 11 |
| 2.3 FUEL TUBE .....                    | 11 |
| 2.4 THROTTLE OPERATION.....            | 12 |
| 2.5 THROTTLE CABLE ADJUSTMENT.....     | 12 |
| 2.6 AIR CLEANER .....                  | 12 |
| 2.7 SPARK PLUG .....                   | 12 |
| 2.8 IDLE SPEED .....                   | 13 |
| 2.9 DRIVE CHAIN .....                  | 13 |
| 2.10 BRAKE SYSTEM .....                | 14 |
| 2.11 WHEELS AND TIRES .....            | 16 |
| 2.13 TOE-IN .....                      | 16 |
| 3. ENGINE REMOVE AND INSTALLATION..... | 18 |
| 3.1 General Information.....           | 18 |
| 3.2 ENGINE REMOVAL .....               | 18 |
| 3.3 ENGINE INSTALLATION.....           | 19 |
| 4-1 Mechanism Diagram .....            | 20 |
| 4-2 Precautions in Operation .....     | 21 |
| 4-3 Troubleshooting.....               | 21 |
| 4-4 Engine Oil.....                    | 22 |
| 4-5 Engine Oil Strainer Clean.....     | 22 |
| 4-6 Oil Pump.....                      | 23 |
| 4-7 Gear Oil .....                     | 23 |
| 5. FUEL SYSTEM.....                    | 24 |
| 5-1 Mechanism Diagram .....            | 24 |
| 5-2 Precautions in Operation .....     | 25 |
| 5-3 Trouble Diagnosis.....             | 26 |
| 5-4 Carburetor Remove / Install .....  | 27 |
| 5-5 Air Cut-Off Valve .....            | 28 |
| 5-6 Throttle Valve .....               | 29 |
| 5-7 Float Chamber .....                | 30 |
| 5-8 Adjustment of Idle Speed .....     | 32 |
| 5-9 Fuel Tank .....                    | 33 |
| 5-10 Air Cleaner .....                 | 34 |
| 6. CYLINDER HEAD/VALVE .....           | 35 |
| 6-1 Mechanism Diagram .....            | 35 |
| 6-2 Precautions in Operation .....     | 36 |



|                                                  |     |
|--------------------------------------------------|-----|
| 6-3 Troubleshooting.....                         | 37  |
| 6-4 Cylinder Head Removal.....                   | 38  |
| 6-5 Cylinder Head Inspection.....                | 41  |
| 6-6 Valve Stem Replacement.....                  | 44  |
| 6-7 Valve Seat Inspection and Service.....       | 45  |
| 6-8 Cylinder Head Reassembly .....               | 48  |
| 6-9 Cylinder Head Installation.....              | 50  |
| 6-10 Valve Clearance Adjustment.....             | 52  |
| 7. CYLINDER/PISTON .....                         | 54  |
| 7-1 Mechanism Diagram .....                      | 54  |
| 7-2 Precautions in Operation .....               | 55  |
| 7-3 Trouble Diagnosis.....                       | 55  |
| 7-4 Cylinder and Piston Removal.....             | 56  |
| 7-5 Piston Ring Installation.....                | 59  |
| 7-6 Piston Installation.....                     | 60  |
| 7-7 Cylinder Installation.....                   | 61  |
| 8. V-BELT DRIVING SYSTEM .....                   | 63  |
| 8-1 Mechanism Diagram .....                      | 63  |
| 8-2 Maintenance Description.....                 | 64  |
| 8-3 Trouble Diagnosis.....                       | 64  |
| 8-4 Left Crankcase Cover.....                    | 65  |
| 8-5 Drive Belt .....                             | 67  |
| 8-6 Drive Face .....                             | 69  |
| 8-7 Clutch Outer/Driven Pulley.....              | 72  |
| 9. FINAL DRIVING MECHANISM .....                 | 77  |
| 9-1 Mechanism Diagram - transmission cover ..... | 77  |
| 9-2 Precautions in operation.....                | 78  |
| 9-3 Trouble Diagnosis.....                       | 78  |
| 9-4 Disassembly of Transmission.....             | 79  |
| 9-5 Inspection of Mission Mechanism .....        | 82  |
| 9-6 Bearing Replacement .....                    | 84  |
| 9-7 Re-assembly of Final Driving Mechanism.....  | 87  |
| 10. ALTERNATOR/STARTING CLUTCH.....              | 89  |
| 10-1 Mechanism Diagram .....                     | 89  |
| 10-2 Precautions in Operation .....              | 90  |
| 10-3 Right Crankcase Cover Removal.....          | 91  |
| 10-4 A.C.G. Set Removal.....                     | 91  |
| 10-5 Right Cover Bearing.....                    | 91  |
| 10-6 Flywheel Removal.....                       | 92  |
| 10-7 Starting Clutch.....                        | 93  |
| 10-8 Flywheel Installation.....                  | 95  |
| 10-9 A.C.G. Set Installation.....                | 96  |
| 10-10 Right Crankcase Cover Installation.....    | 96  |
| 11. CRANKCASE / CRANK.....                       | 98  |
| 11-1 Mechanism Diagram.....                      | 98  |
| 11-2 General information.....                    | 99  |
| 11-3 Trouble diagnosis.....                      | 99  |
| 11-4 Disassembly of crankcase.....               | 100 |

|                                                    |     |
|----------------------------------------------------|-----|
| 11-5 Crankshaft Inspection.....                    | 102 |
| 11-6 Assembly of crankcase .....                   | 103 |
| 12. COOLING SYSTEM .....                           | 106 |
| 12-1 Mechanism Diagram .....                       | 106 |
| 12-2 General Information .....                     | 107 |
| 12-3 Trouble Diagnosis .....                       | 107 |
| 12-4 Trouble Diagnosis for Cooling System .....    | 108 |
| 12-5 System Test.....                              | 110 |
| 12-6 Radiator .....                                | 111 |
| 12-7 Water Pump .....                              | 113 |
| 12-8 Thermostat .....                              | 117 |
| 13. STEERING AND SUSPENSION .....                  | 118 |
| 13.1 PARTS DRAWING.....                            | 118 |
| 13.2 TROUBLESHOOTING.....                          | 119 |
| 13.3 HANDLEBAR.....                                | 119 |
| 13.4 THROTTLE HOUSING.....                         | 122 |
| 13.5 STEERING SYSTEM .....                         | 122 |
| 14. FRONT WHEEL AND BRAKE SYSTEM.....              | 125 |
| 14.1 PARTS DRAWING.....                            | 125 |
| 14.2 TROUBLESHOOTING.....                          | 126 |
| 14.3 FRONT WHEELS .....                            | 126 |
| 14.4 HYDRAULIC BRAKE .....                         | 127 |
| 15. REAR WHEEL AND BRAKE SYSTEM .....              | 131 |
| 15.1 PARTS DRAWING.....                            | 131 |
| 15.2 TROUBLESHOOTING .....                         | 132 |
| 15.2 TROUBLESHOOTING .....                         | 133 |
| 15.3 REMOVE REAR WHEEL AND REAR BRAKE .....        | 133 |
| 15.4 SWINGARM & REAR AXLE HOLDER.....              | 136 |
| 15.5 Suspension Adjustment.....                    | 138 |
| 16. FENDERS AND EXHAUST PIPE .....                 | 139 |
| 16.1 FENDERS DRAWING.....                          | 139 |
| 16.2 REAR FENDERS REMOVAL.....                     | 140 |
| 16.3 FRONT FENDER REMOVAL .....                    | 142 |
| 16.4EXHAUST PIPE REMOVAL .....                     | 143 |
| 17. ELECTRICAL SYSTEM .....                        | 144 |
| 17.1 TROUBLESHOOTING.....                          | 144 |
| 17.2 IGNITION COIL .....                           | 145 |
| 17.3 IGNITION TIMING.....                          | 145 |
| 17.4 BATTERY INFORMATION .....                     | 145 |
| 17.5 ELECTRIC STARTER .....                        | 146 |
| 17.6 LIGHT BULBS REPLACEMENT .....                 | 146 |
| 18.TROUBLESHOOTING .....                           | 152 |
| 18.1 ENGINE CAN NOT WORK.....                      | 152 |
| 18.2 POOR PERFORMANCE AT LOW AND IDLE SPEEDS ..... | 153 |
| 18.3 POOR PERFORMANCE AT HIGH SPEED .....          | 153 |
| 18.4 LOSS POWER.....                               | 154 |
| 18.5 POOR HANDLING.....                            | 155 |

# 1. INFORMATION

|     |               |     |               |
|-----|---------------|-----|---------------|
| 1.1 | SAFTY         | 1.4 | SERIAL NUMBER |
| 1.2 | NOTES         | 1.5 | TORQUE VALUE  |
| 1.3 | SPECIFICATION | 1.6 | SPECIAL TOOLS |

## 1.1 SAFETY

### GASOLINE

Gasoline is extremely flammable and is explosive under certain condition.

Do not smoke or allow sparks or flames in your work area.

### ● CARBON MONOXIDE

Never run the engine in a closed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and lead to death.

### ● BATTERY ELECTROLYTE

The battery electrolyte contains sulfuric acid. Protect your eyes, skin and clothing. If you contact it, flush thoroughly with water and call a doctor if electrolyte gets in your eyes.

### ● HOT PARTS

Engine and exhaust pipe become very hot and remain hot for one hour after the engine is run. Wear insulated gloves before handling these parts.

### ● USED ENGINE/GEAR OIL

Used engine oil and gear oil may cause skin disease if repeatedly contact with the skin for long periods.

Keep out of reach of children.

## 1.2 NOTES

All information, illustrations, directions and specifications included in this publication are base on the latest product information available at the time of approval for printing.

JI-EE Dynamic Technology Industry Co., Ltd. reserves the right to make changes at any time without notice and without incurring any obligation whatever.

**No part of this publication may be reproduced without written permission.**

## 1.3 SPECIFICATION ENGINE

|                   |                                         |
|-------------------|-----------------------------------------|
| <b>Type</b>       | 4 Stroke, Single Cylinder, Water cooled |
| Displacement      | 249c.c.                                 |
| Bore and Stroke   | 71 mm x 63 mm                           |
| Compression       | 10.6:1                                  |
| Maximum Hp        | 19ps / 5600                             |
| Maximum Torque    | (Nm/rpm) 22.3 Nm / 5500                 |
| <b>Carburetor</b> |                                         |
| Ignition          | DC-CDI                                  |
| Starting          | Electric                                |
| Lubrication       | Auto oil injection                      |
| Transmission      | Automatic (C.V.T. V-belt + Reverse)     |

|                    |               |
|--------------------|---------------|
| <b>CHASSIS</b>     |               |
| Overall Length     | <b>1815mm</b> |
| Overall Width      | <b>1062mm</b> |
| Overall Height     | <b>1130mm</b> |
| Wheel base         | <b>1193mm</b> |
| Ground Clearance   | <b>150mm</b>  |
| Dry Weight         | <b>225Kg</b>  |
| Fuel Tank Capacity | <b>12L</b>    |

|                                   |                                         |
|-----------------------------------|-----------------------------------------|
| <b>SUSPENSION</b>                 |                                         |
| Front                             | <b>Double A-Arm &amp; Adjustable</b>    |
| Rear                              | <b>Swing Arm &amp; Adjustable Shock</b> |
| <b>BRAKES</b>                     |                                         |
| Front                             | <b>Front Hydraulic Disc*2</b>           |
| Rear                              | <b>Rear Hydraulic Disc*1</b>            |
| <b>TIRES</b>                      |                                         |
| Front                             | <b>21x7-10</b>                          |
| Rear                              | <b>22x10-10</b>                         |
| <b>PRESSURE 【 psi ( kgf/cm2)】</b> |                                         |
| Front                             | <b>12(0.8)</b>                          |
| Rear                              | <b>12(0.8)</b>                          |

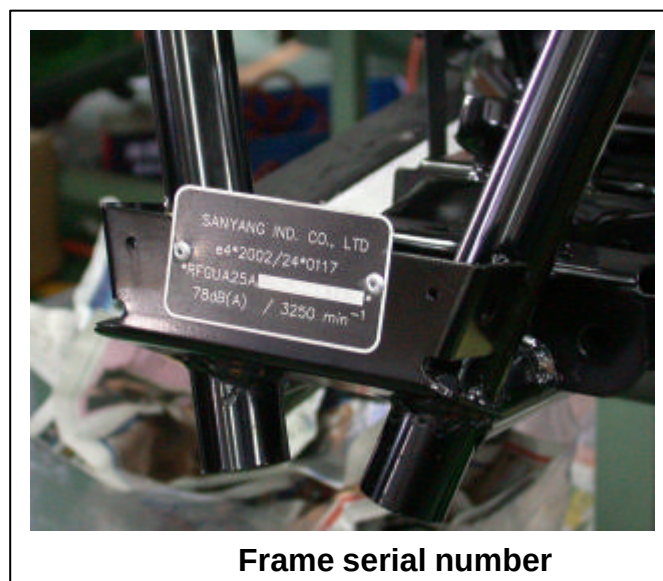
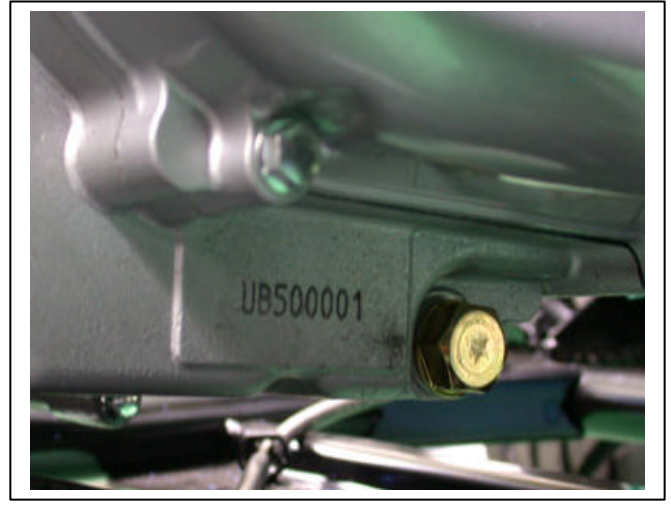
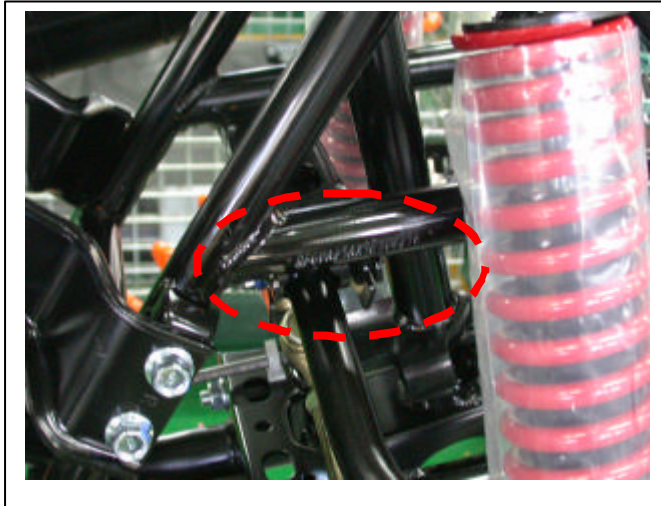
## COLORING

Specifications subject to change without notice.

## 1.4 SERIAL NUMBER

The frame serial number is stamped on the front of the frame.

The engine serial number is stamped on the left side of the crankcase.



Frame serial number

## 1.5 TORQUE VALUES

|                      |                      |
|----------------------|----------------------|
| <b>STANDARD</b>      |                      |
| ● 5 mm bolt and nut  | 5 N.m (3.5 lbf.ft)   |
| ● 6 mm bolt and nut  | 10 N.m (7.2 lbf.ft)  |
| ● 8 mm bolt and nut  | 22 N.m (16 lbf.ft)   |
| ● 10 mm bolt and nut | 35 N.m (25 lbf.ft)   |
| ● 12 mm bolt and nut | 55 N.m (40 lbf.ft)   |
| <b>ENGINE</b>        |                      |
| ● Cylinder head nut  | 28 N.m (20.7 lbf.ft) |
| ● Spark plug         | 12 N.m (8.9 lbf.ft)  |
| ● Cylinder head bolt | 20 N.m (14.8 lbf.ft) |
| ● Alternator bolt    | 8 N.m (5.9 lbf.ft)   |

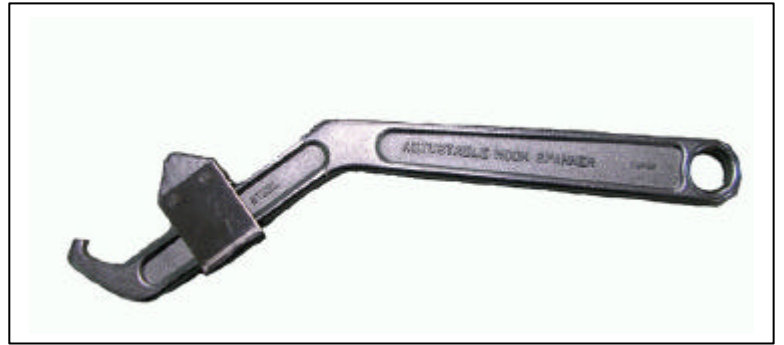
### FRAME

|                                    |                          |
|------------------------------------|--------------------------|
| ● Handlebar upper holder bolt      | 24 N.m (17.7 lbf.ft)     |
| ● Throttle housing cover screw     | 4 N.m (2.9 lbf.ft)       |
| ● Steering shaft nut               | 50 N.m (36.9 lbf.ft)     |
| ● Steering shaft holder bolt       | 33 N.m (24 lbf.ft)       |
| ● Wheel rim bolt                   | 18 N.m (13.3 lbf.ft)     |
| ● Tie rod lock nut                 | 35 N.m (25.8 lbf.ft)     |
| ● King pin nut                     | 40 N.m (29 lbf.ft)       |
| ● Handlebar lower holder nut       | 40 N.m (29.5 lbf.ft)     |
| ● Front wheel bolt                 | 24 N.m (17.7 lbf.ft)     |
| ● Front axle castle nut            | 40-60 N.m (30-45 lbf.ft) |
| ● Front brake arm nut              | 4 N.m (3.0 lbf.ft)       |
| ● Rear brake arm nut               | 7 N.m (5.2 lbf.ft)       |
| ● Rear axle castle nut             | 40-60 N.m (30-45 lbf.ft) |
| ● Rear wheel bolt                  | 24 N.m (17.7 lbf.ft)     |
| ● Exhaust muffler mounting bolt    | 30 N.m (22.1 lbf.ft)     |
| ● Engine hanger bolt               | 30 N.m ( 22 lbf.ft)      |
| ● Rear axle holder bolt            | 90 N.m (65 lbf.ft)       |
| ● Swing arm pivot nut              | 90 N.m (65 lbf.ft)       |
| ● Rear shock absorber mounting nut | 45 N.m (33 lbf.ft)       |

## 1.6 Special Tools

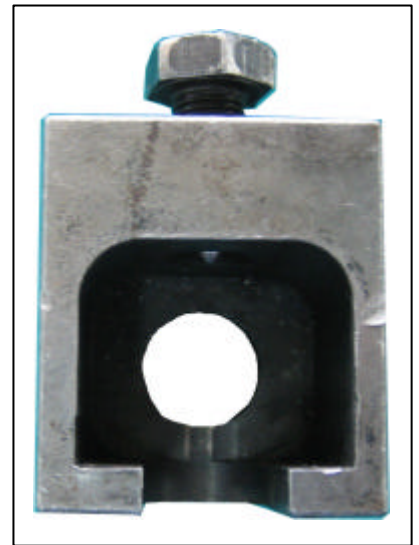
### 1. Adjustable Hook Spencer (E1105-LRA0-FT1)

Purpose: Adjusting of suspension



### 2. Ball Joint Puller(E0205-LRA0-FT1)

Purpose: Taking out the ball joint from front knuckle as repairing.



## 2. MAINTENANCE

|                              |                       |
|------------------------------|-----------------------|
| 2.1 MAINTENANCE DATA         | 2.8 IDLE SPEED        |
| 2.2 MAINTENANCE SCHEDULE     | 2.9 DRIVE CHAIN       |
| 2.3 FUEL TUBLE               | 2.10 BRAKE SYSTEM     |
| 2.4 THROTTLE OPERATION       | 2.11 WHEELS AND TIRES |
| 2.5 THROTTLE CABLE AJUSTMENT | 2.12 STEERING SYSTEM  |
| 2.6 AIR CLEANER              | 2.13 TOE-IN           |
| 2.7 SPARK PLUG               |                       |

### 2.1 MAINTENANCE DATA

#### SPECIFICATION

##### SPARK PLUG

|                          |                    |
|--------------------------|--------------------|
| SPARK PLUG GAP           | 0.8 mm             |
| RECOMMENDED SPARK PLUGS  | NGK CR8E           |
| THROTTLE LEVER FREE PLAY | 5-10 mm            |
| IDLE SPEED               | 1700 $\pm$ 100 rpm |
| BRAKE LEVER FREE PLAY    | 15-25 mm           |
| DRIVE CHAIN SLACK        | 10-25 mm           |
| TOE-IN                   | 5 $\pm$ 10 mm      |

##### TORQUE VALUES

|                      |                                 |
|----------------------|---------------------------------|
| SPARK PLUG           | 12-19 N.m                       |
| TIE-ROD LOCK NUT     | 35-43 N.m                       |
| ENGINE OIL           | 1.4 Liter (1.2Liter for change) |
| GEAR LUBRICATION OIL | 750cc (650cc for change)        |



## 2.2 MAINTENANCE SCHEDULE

The internal maintenance in the following table is based on average riding, normal conditions. Riding in unusually dusty areas, require more frequent servicing.

|                         | 300KM   | Every                                 | Every    | Every  | Every   | Notes |
|-------------------------|---------|---------------------------------------|----------|--------|---------|-------|
|                         | 1 Month | 3 Months                              | 6 Months | 1 Year | 2 Years |       |
| Fuel Lines              | I       |                                       | I        |        | R       |       |
| Throttle Operation      | I       | I                                     |          |        |         |       |
| Air Filter              | I       | C                                     | R        |        |         |       |
| Fuel Filter             |         |                                       |          | R      |         |       |
| Spark Plug              | I       | I                                     | R        |        |         |       |
| Drive Chain             | I, L    | Lubricate for every 1 month           |          |        |         |       |
| Brake Shoes             |         | I                                     |          |        |         |       |
| Brake System            | I       | I                                     |          |        |         |       |
| Brake Fluid             | I       |                                       |          |        | R       |       |
| Nuts, Bolts & Fasteners | I       |                                       |          |        |         |       |
| WHEEL/TIRES             | I       |                                       | I        |        |         |       |
| Wheels                  | I       | I                                     |          |        |         |       |
| Steering System         | I       |                                       | I        |        |         |       |
| Suspension System       | I       |                                       |          | I      |         |       |
| C.V.T Drive belt        |         |                                       | I        |        | R       |       |
| Transmission Oil        | R       | Replace for every 3,000km or 6 Months |          |        |         |       |
| Engine Oil              | R       | Replace for every 3,000km or 6 Months |          |        |         |       |
| Battery                 | I       | I,C                                   |          | I,C    |         |       |
| Oil Filter (Screen)     | C       | C                                     |          |        |         |       |
| Valve Clearance         | I       |                                       | I        |        |         |       |
| Coolant                 | I       | I                                     |          |        | R       |       |
| Cooling Fan             | I       | I                                     |          |        |         |       |
| Carburetor (Idle Speed) | I       | I                                     |          |        |         |       |
| Choke                   | I       |                                       |          |        |         |       |

Note – I: Inspect and Clean, Adjust, Lubricate or Replace, if necessary

C: Clean

L: Lubricate

R: Replace

## 2.3 FUEL TUBE

Inspect the fuel lines for deterioration, damaging or leakage and replace if necessary.



## 2.4 THROTTLE OPERATION

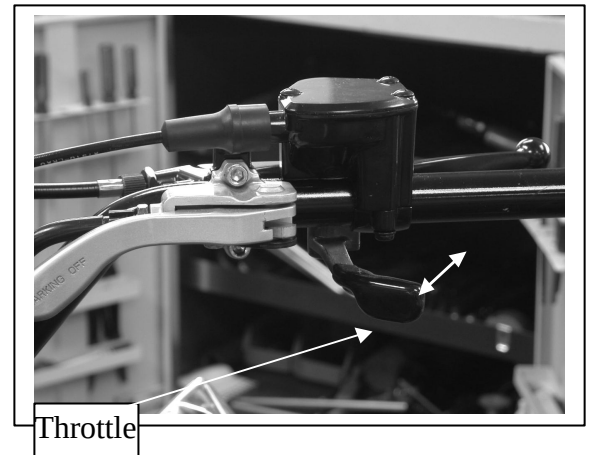
Inspect for smooth throttle lever full opening and automatic full closing in all steering positions.

Inspect if there is no deterioration, damage or kink in the throttle cable, replace it if necessary.

Check the throttle lever, free play is 5-10 mm at the tip of the throttle lever.

Disconnect the throttle cable at the upper end.

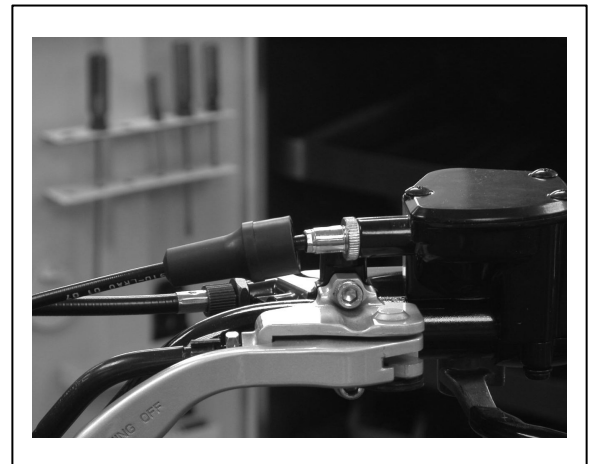
Lubricate the cable with commercially lubricant to prevent premature wear.



## 2.5 THROTTLE CABLE ADJUSTMENT

Slide the rubber cap of the adjuster off the throttle

Housing, loosen the lock nut and adjust the free play of the throttle lever by turning the adjuster on the throttle housing. Inspect the free play of the throttle lever.



## 2.6 AIR CLEANER

Please remove the four hooks, and then disassemble two screws inside the air cleaner case.

Pull out the air filter element from the air cleaner case.

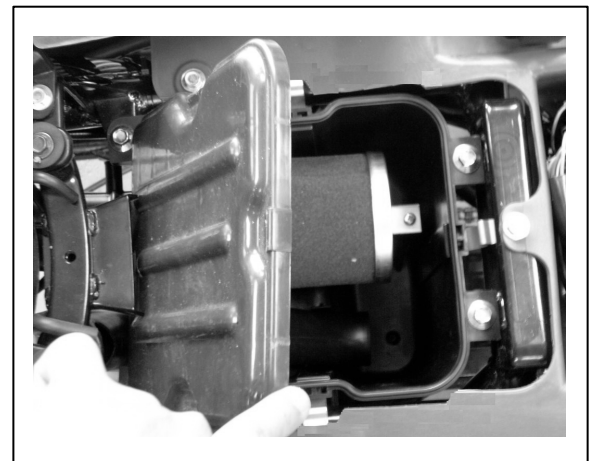
Washing the element in non-flammable solvent, squeeze out the solvent thoroughly.

Let it dry.

Soak the filter element in gear oil and then squeeze out the excess oil.

Install the every component into air cleaner in the reverse order of removal.

**Note: for more detail please check chapter 5-10**



## 2.7 SPARK PLUG

This spark plug is located at the front of the engine.

Disconnect the spark plug cap and unscrew the spark plug.

Check the condition of spark plug electrodes wear.



Change a new spark plug if the electrodes and insulator tip appear unusually fouled or burned.  
Discard the spark plug if there is apparent wear or if the insulator is cracked or chipped.  
The spark plug gap shall keep in **0.6-0.7mm**  
With the sealing washer attached, thread the spark plug in by hand to prevent cross threading.  
Tighten the spark plug with **12-19 N.m**

## 2.8 IDLE SPEED

Connect an engine speed meter.  
Warm up the engine, 10 minutes are enough.  
Turn the idle-speed adjust screw on the carburetor to obtain the idle speed. "Turn in" (clockwise) will get higher speed. "Turn out" (counter clockwise) will get lower speed.  
**IDLE SPEED: 1700±100 rpm**

## 2.9 DRIVE CHAIN

Stopping the ATV and shift the transmission into neutral(N) .  
Measure the drive chain slack midway between the sprockets.

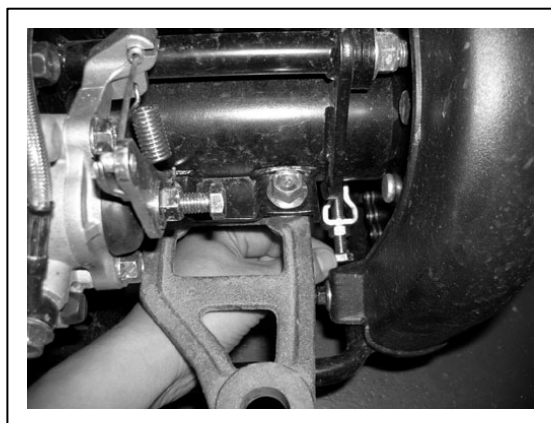
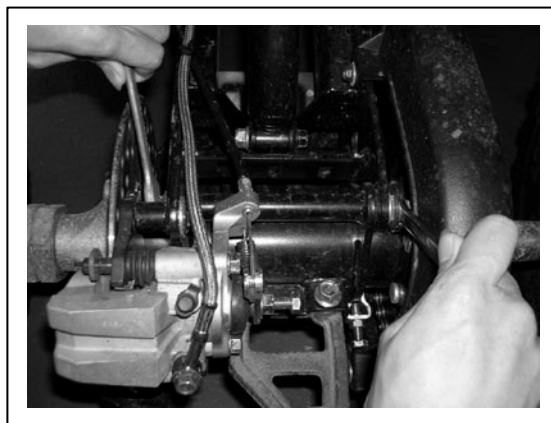
**Chain slack =15~25mm (5/8~1 inch)**

Adjust the chain slack.  
Loosen the lock nuts and turn drive chain adjusting nuts until get the correct slack.  
Tighten the axle holder bolts.

**Torque = 90N.m (65 lbf.ft)**

When the drive chain becomes very dirty, it should be removed, cleaned and lubricated by specify lubricator.  
Please use special chain oil to lubricate the drive chain.  
Clean the drive chain with kerosene and wipe it dry.  
Inspect the drive chain for any possible wearing or damaging.  
Replace the chain, if it is worn excessively or damaged.

Inspect the sprocket teeth, if it is excessive wearing or damaging, please replace it.



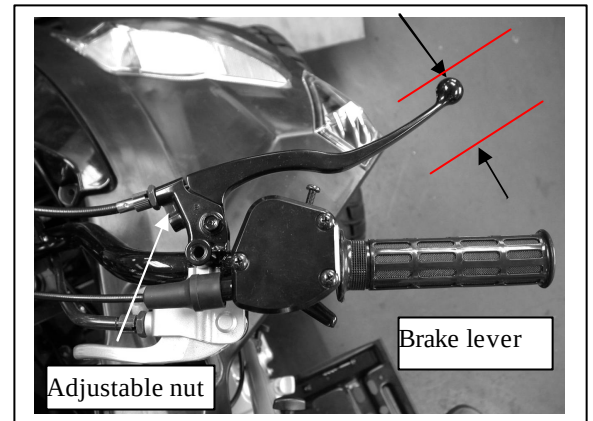
## 2.10 BRAKE SYSTEM

Inspect the front brake lever and cable for excessive play or other damage.

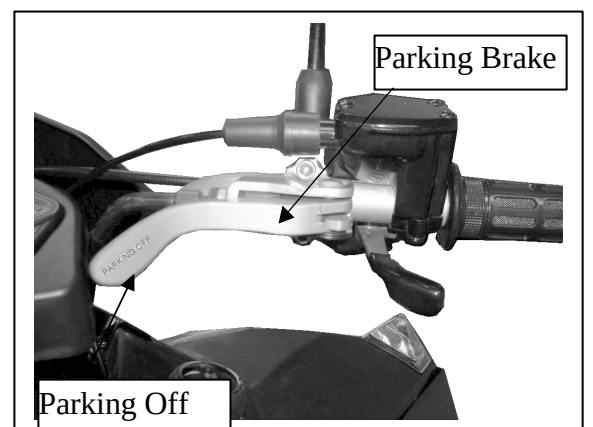
Replace or repair if necessary.

Measure the brake lever free play at the end of the brake lever trip.

**Front Brake lever free play is 15-25 mm.**



Turn the parking brake to the left side is “parking off”, while turn to right side is “parking on”.

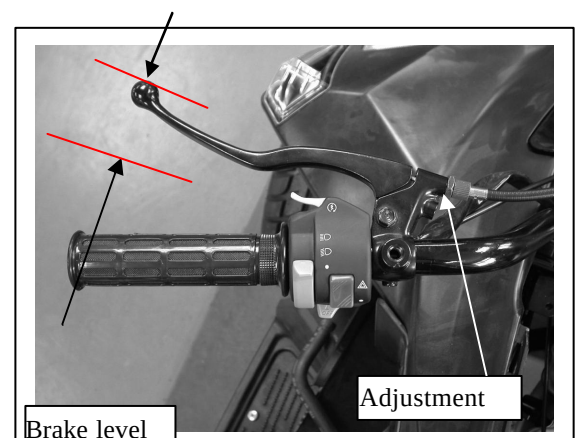
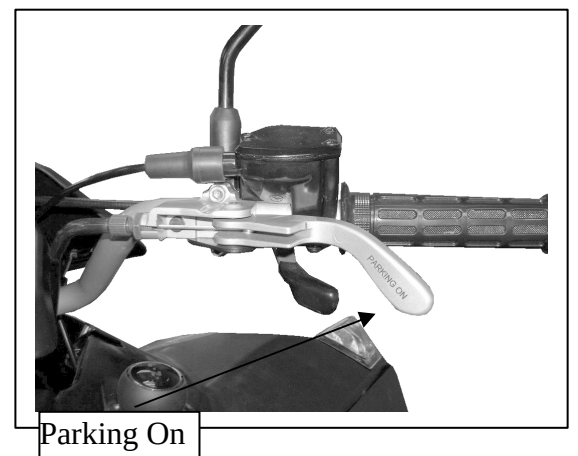


Inspect the rear brake lever and cable for excessive play or other damage.

Replace or repair if necessary.

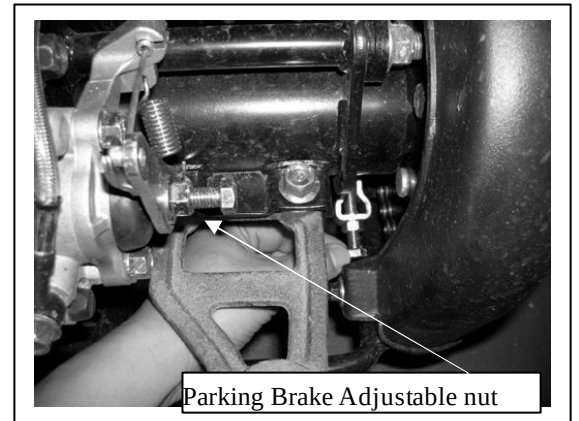
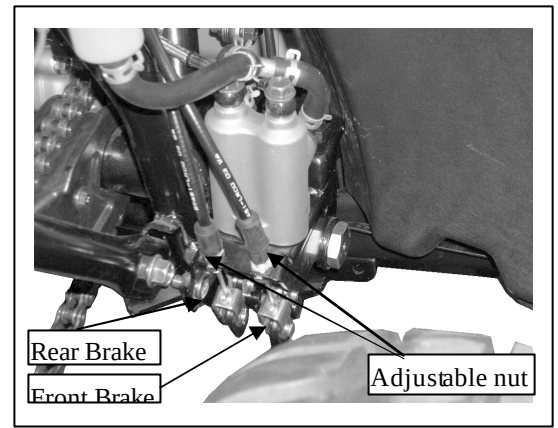
Measure the rear brake lever free play at the end of the lever trip.

**Rear Brake lever free play is 15-25 mm.**



**NOTE:**

- The second method to adjust brake level is under the driver seat and rear brake component.
- In order to avoid a pre-load occurred between brake disk and lining. After all adjusting of brake system are completed, please check the small clearance between brake disk and lining.



## 2.11 WHEELS AND TIRES

Inspect the tire surfaces for cuts, nails or other sharp objects.  
Check the each tire surface at cold tire condition.

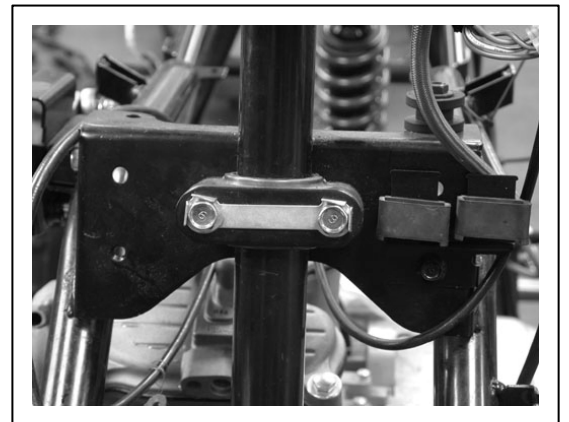
**\*The standard of tire pressure is 12(0.8) psi ( kgf/cm<sup>2</sup>)**



## STEERING SHAFT HOLDER BUSHING

Remove the front fender first.  
Remove the steering shaft holder and check the steering shaft bushing for wears or damage.  
If the bushing is worn or damaged, please change a new one.  
Grease the steering shaft bushing and install the parts in the reverse order of removal.

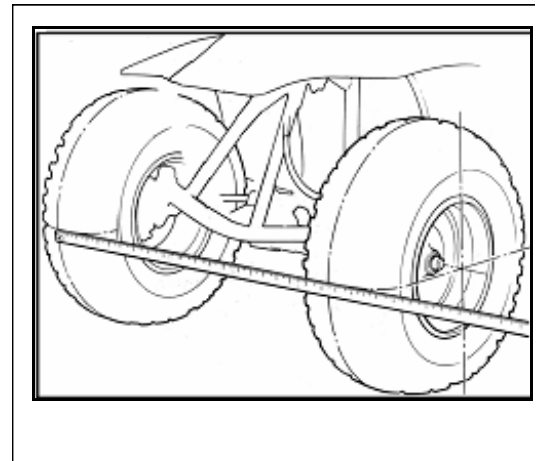
**Torque: steering shaft holder bolt: 33 N.m (24 lbf.ft)**



## 2.13 TOE-IN

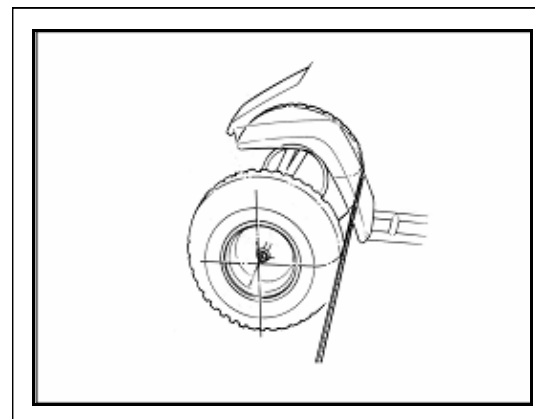
Keep the vehicle on level ground and the front wheels facing straight ahead.

Mark the centers of the tires to indicate the axle center height.  
Measure the distance between the marks.



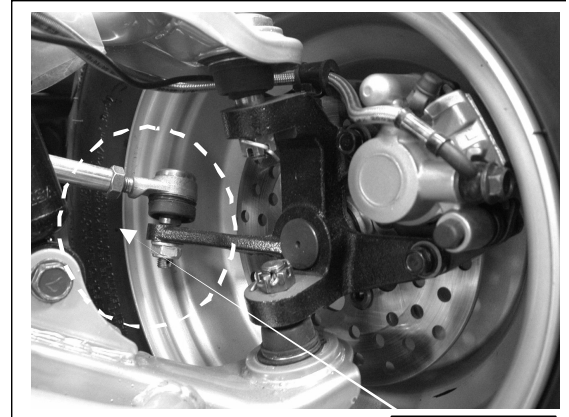
Carefully to move the vehicle back, let the wheels turn 180 degree, so the marks on the tires are aligned with the axle center height.  
Measure the distance between the marks.  
Calculate the difference in the front and rear measurements.

**Toe-in: 5±10mm**



If the toe-in is out of standard, adjust it by changing the length of the tie-rods equally by turning the tie-rod while holding the ball joint.  
Tighten the lock nuts.

**Torque: 35-43 N.m**



Lock Nuts

## 3. ENGINE REMOVE AND INSTALLATION

### 3.1 REPAIR CONDITION

### 3.3 ENGINE INSTALLATION

### 3.2 ENGINE REMOVAL

#### 3.1 General Information

**ENGINE SHALL BE REMOVED IN THE CONDITIONS OF NECESSARY REPAIRMENT OR ADJUSTMENT TO THE TRANSMISSION AND COMBUSTION SYSTEM ONLY**

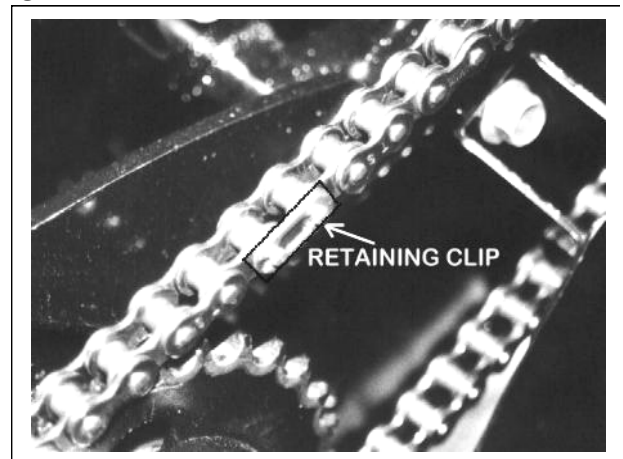
#### 3.2 ENGINE REMOVAL

Before removing engine, you need to remove all of components such as seat, front and back fender, fuel tube, exhaust pipe, carburetor cable and drive chain...etc. You can then see three hanger bolts which have screwed on engine.

Loosen these three hanger bolts. You have succeeded to remove this engine.

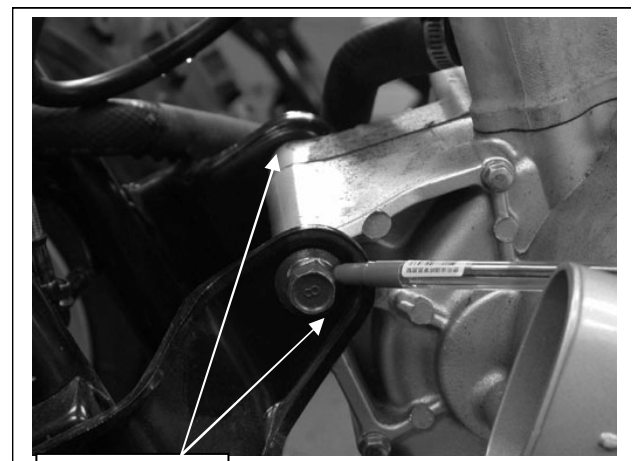
There are some pictures to describe main step of removing engine.

Disconnect the wire connectors. There are three connectors for carburetor auto-choke, starter motor and generator respectively.



Remove the drive chain cover.

Remove the drive chain retaining clip and master link, and remove the drive chain.







### 3.3 ENGINE INSTALLATION

The Engine installation is essentially in the reverse order of removal.

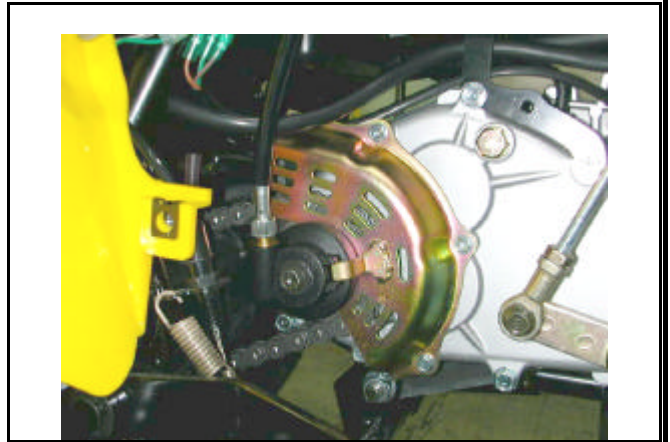
The torque of engine hanger bolt is **30 N.m**

Route the wires and cable in reverse order properly.

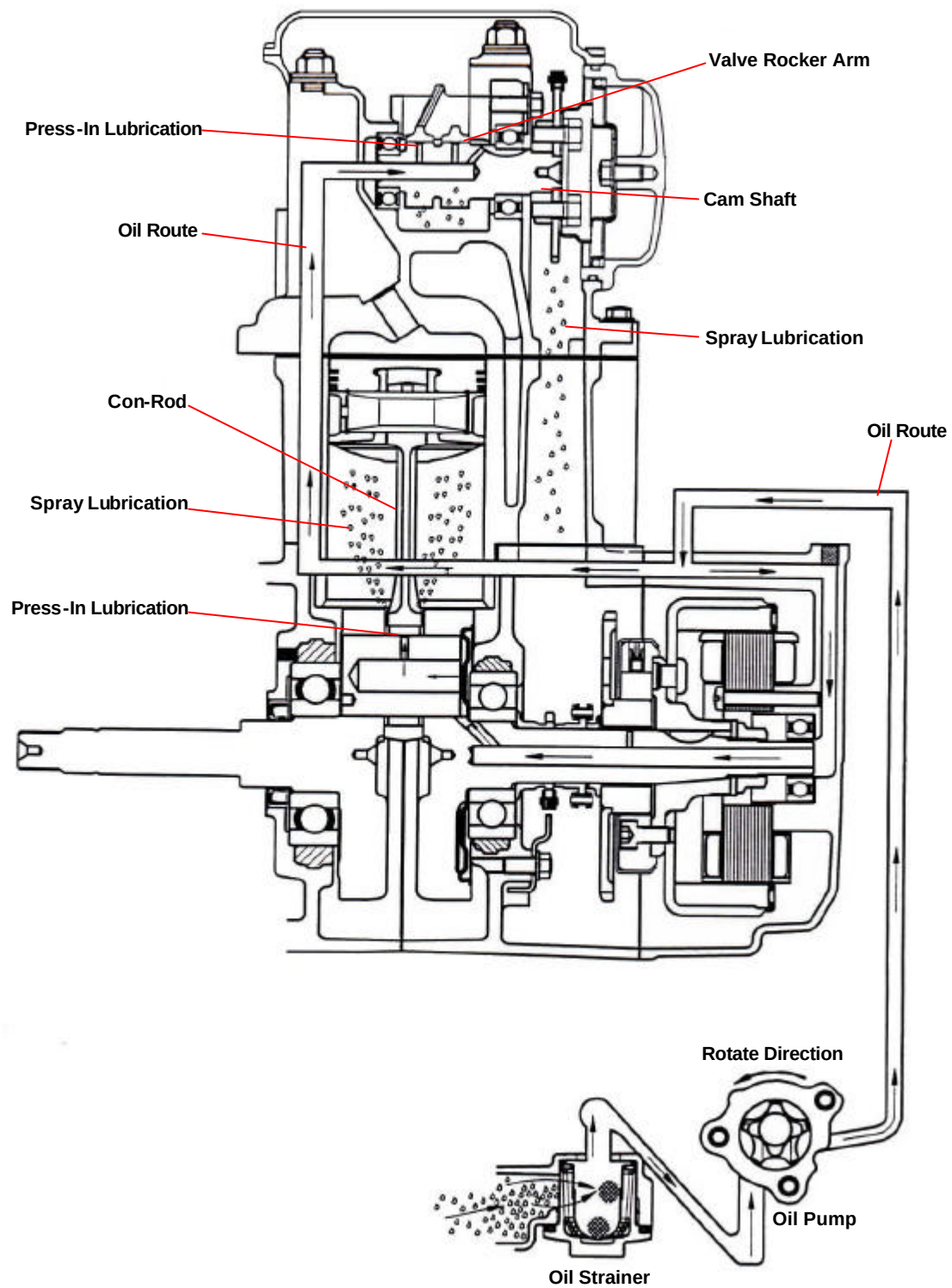
## 4. LUBRICATION SYSTEM

4-1 Mechanism Diagram  
4-2 Precautions in Operation  
4-3 Troubleshooting  
4-4 Engine Oil

4-5 Engine Oil Strainer Clean  
4-6 Oil Pump



## 4-1 Mechanism Diagram



## 4-2 Precautions in Operation

### General Information:

- This chapter contains maintenance operation for the engine oil pump and gear oil replacement.

### Specifications

Engine oil quantity    Disassembly: 1400 c.c.

Change: 1200c.c.

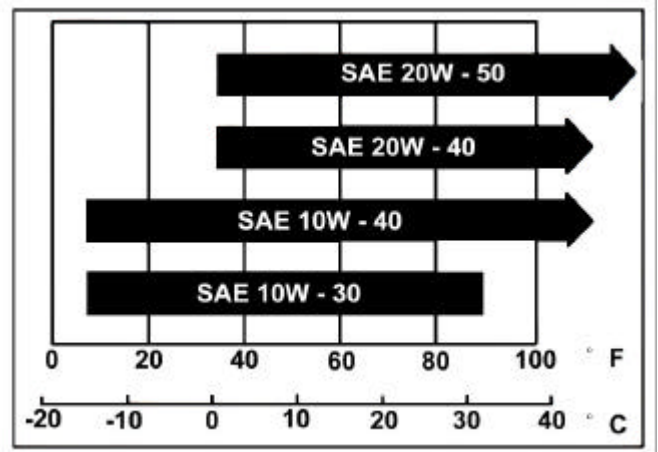
Oil viscosity    SAE 10W-30 (Recommended  
King serial oils)

Gear oil    Disassembly: 750c.c.

Change: 650c.c.

Gear oil viscosity    SAE 140

(Recommended SYM Hypoid gear oils)



? ? :mm

| Items    |                                        | Standard (mm) | Limit (mm) |
|----------|----------------------------------------|---------------|------------|
| Oil pump | Inner rotor clearance                  | 0.15          | 0.20       |
|          | Clearance between outer rotor and body | 0.15~0.20     | 0.25       |
|          | Clearance between rotor side and body  | 0.04~0.09     | 0.12       |

### Torque value

Torque value oil strainer cap    1.5~3.0kgf-m

Engine oil drain bolt    1.9~2.5kgf-m

Gear oil drain bolt    1.0~1.5kgf-m

Gear oil join bolt    1.0~1.5kgf-m

Oil pump connection bolt    0.8~1.2kgf-m

## 4-3 Troubleshooting

### Low engine oil level

- Oil leaking
- Valve guide or seat worn out
- Piston ring worn out

### Dirty oil

- No oil change in periodical
- Cylinder head gasket damage
- Piston ring worn out

### Low oil pressure

- Low engine oil level
- Clogged in oil strainer, circuits or pipes
- Oil pump damage

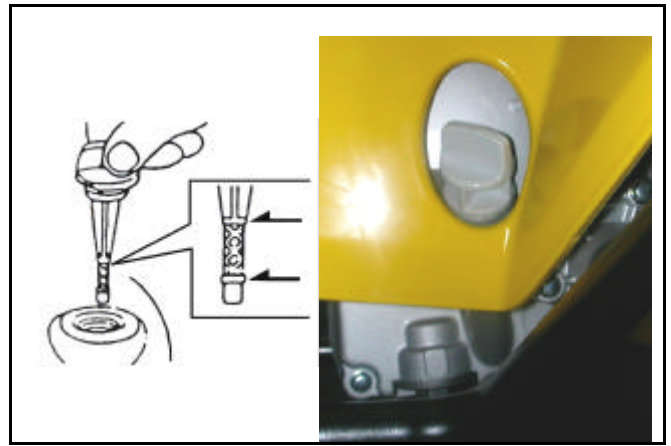
## 4-4 Engine Oil

Turn off engine, and park the ATV in flat surface with main stand.

Check oil level with oil dipstick.

So not screw the dipstick into engine as checking.

If oil level is nearly low level, fill out recommended oil to upper level.



## Oil Change



### Caution

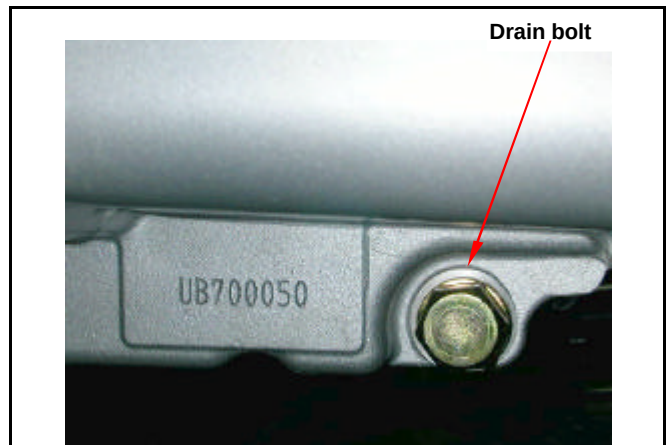
Drain oil as engine warmed up so that makes sure oil can be drained smoothly and completely.

Place an oil pan under the ATV, and remove oil drain bolt.

After drained, make sure washer can be re-used.

Install oil drain bolt.

**Torque value ? 1.9~2.5kgf-m**



## 4-5 Engine Oil Strainer Clean

Drain engine oil out.

Remove oil strainer and spring.

Clean oil strainer.

Check if O-ring can be re-used.

Install oil strainer and spring.

Install oil strainer cap.

**Torque value ? 1.5~3.0kgf-m**

Add oil to crankcase (oil viscosity SAE 10W-30)

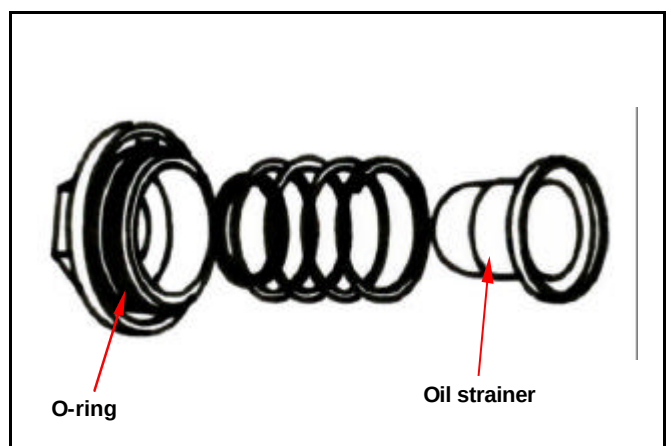
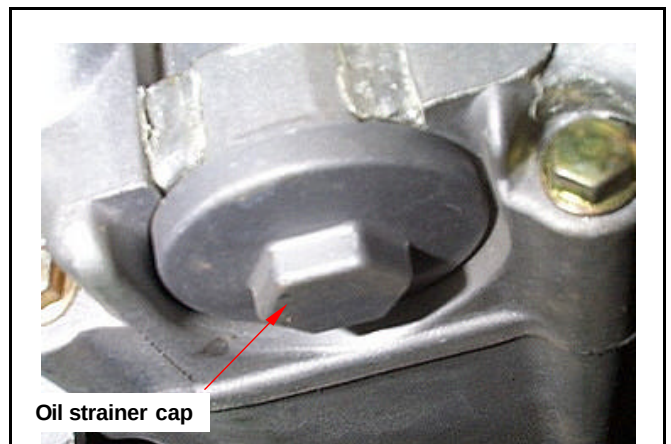
Recommended using King serial oil.

**Engine oil capacity: 1200c.c. when replacing**

Install dipstick, start the engine for running several minutes.

Turn off engine, and check oil level again.

Check if engine oil leaks.

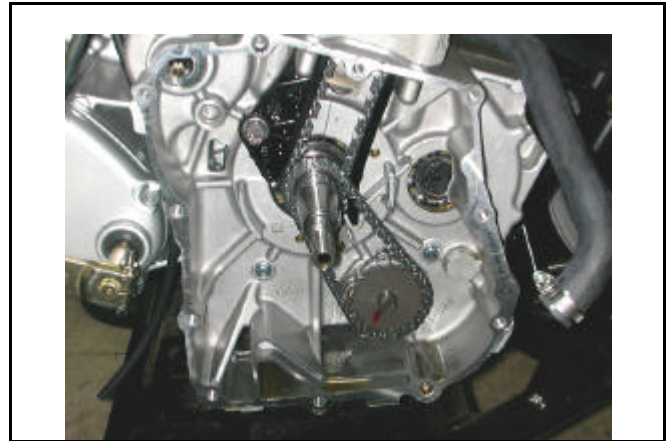




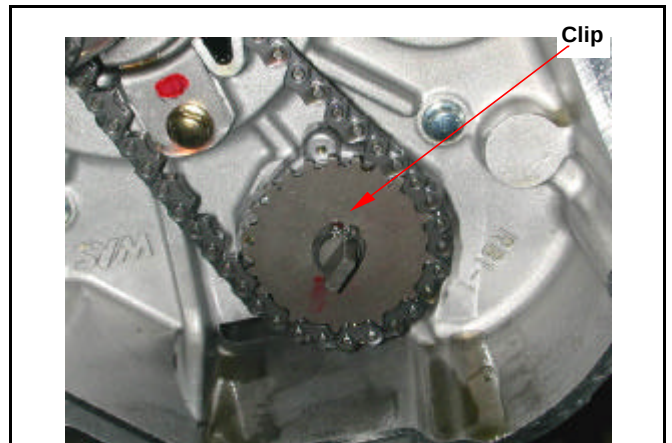
## 4-6 Oil Pump

### Oil Pump Removal

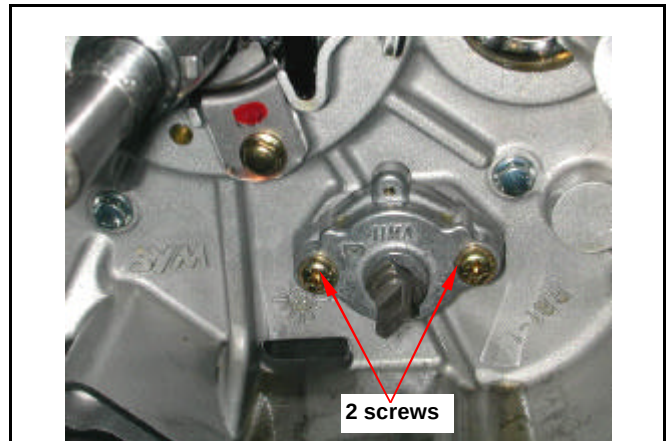
Remove generator and starting gear. (Refer to chapter 10) ?



Remove cir clip and take out oil pump driving chain and sprocket.

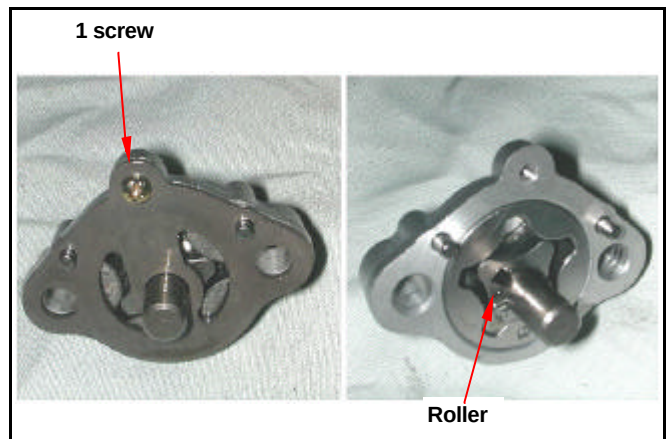


Make sure that pump shaft can be rotated freely.  
Remove 2 screws on the oil pump, and then remove oil pump.



### Oil Pump Disassembly

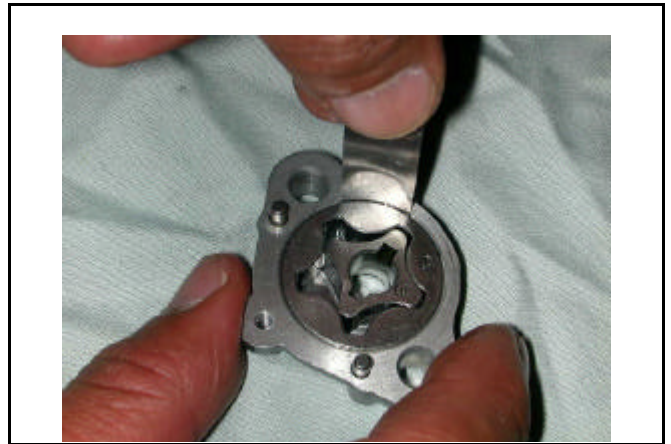
Remove the screws on oil pump cover and remove the cover.  
Remove oil pump shaft roller and shaft.



### Oil Pump Inspection

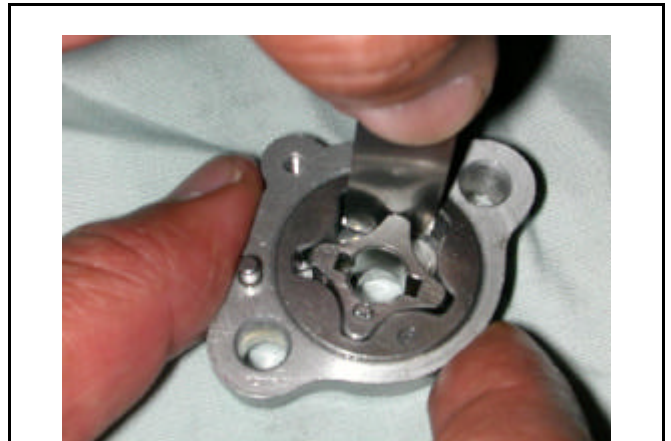
Check the clearance between oil pump body and outer rotor.

**Limit: 0.25 mm**



Check clearance between inner and outer rotors.

**Limit: 0.20 mm**



Check clearance between rotor side face and pump body

**Limit: 0.12 mm**

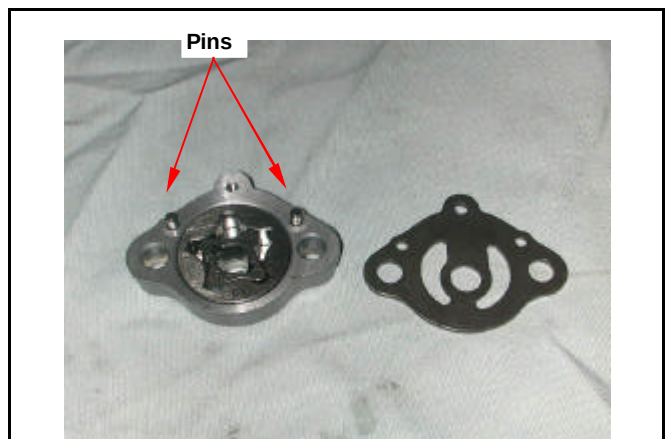


### Oil Pump Re-assembly

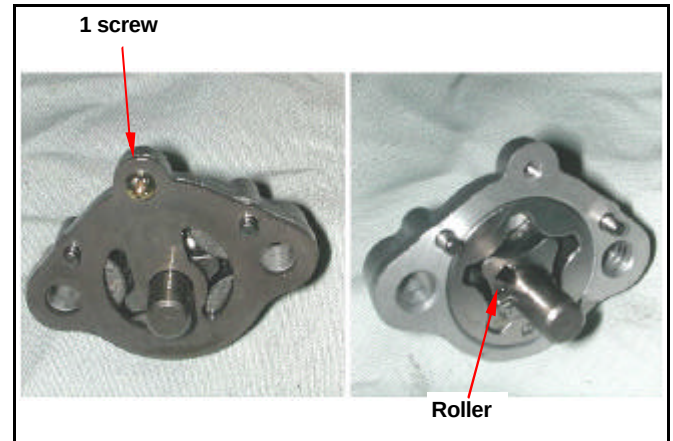
Install inner and outer rotors into the pump body.  
Align the indent on driving shaft with that of inner rotor.

Install the oil pump shaft and roller.

Install the oil pump cover and fixing pins properly.



Tighten the oil pump screw.

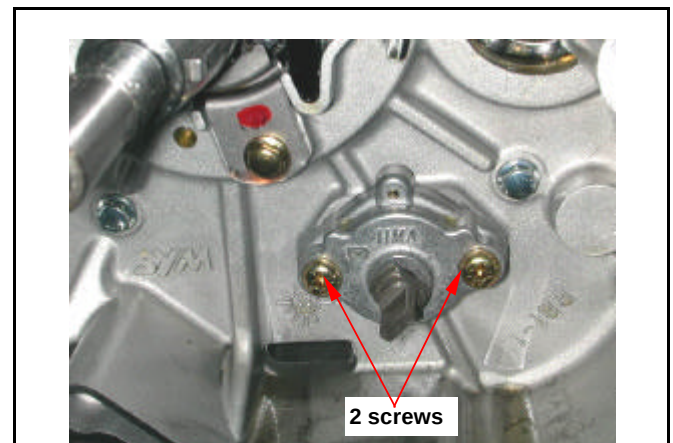


### Oil Pump Installation

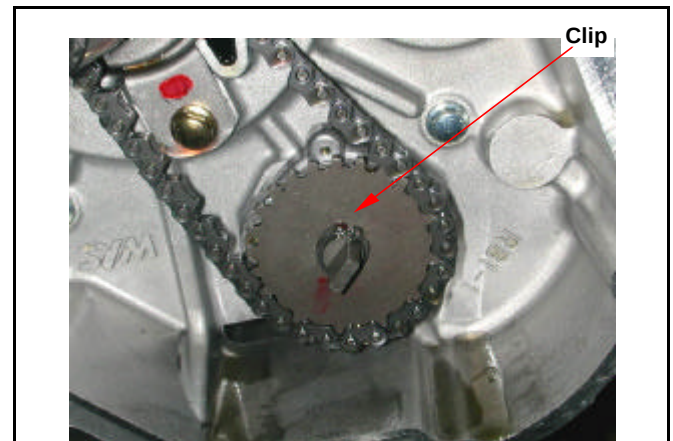
Install the oil pump, and then tighten screws.

**Torque value ? 0.8~1.2kgf-m**

Make sure that oil pump shaft can be rotated freely.



Install oil pump drive chain and sprocket, and then install cir clip onto oil pump shaft.



Install starting gear and generator.  
(Refer to chapter 10)





## 4-7 Gear Oil

### Gear Oil Change

Remove oil join bolt.

Remove drain bolt and drain gear oil out.

Install the drain bolt after drained.

**Torque value: 1.0~1.5kgf-m**

Make sure that the drain bolt washer can be re-used.

Add oil to specified quantity from the join hole.

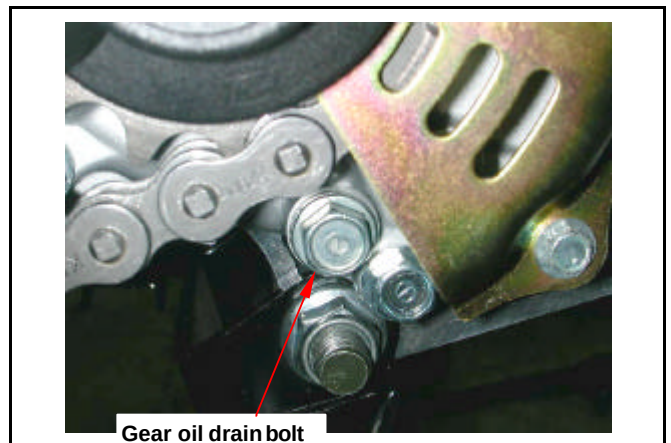
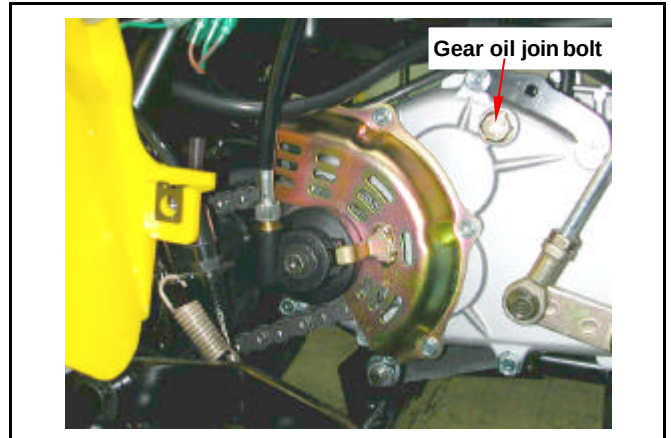
**Gear Oil Quantity: 650c.c. when replacing**

Make sure that the join bolt washer can be re-used, and install the bolt.

Start engine and run engine for 2-3 minutes.

Turn off engine and make sure that oil level is in correct level.

Make sure that no oil leaking.



## 5. FUEL SYSTEM

5-1 Mechanism Diagram

5-2 Precautions in Operation

5-3 Trouble Diagnosis

5-4 Carburetor Remove / Install

5-5 Air Cut-Off Valve

5-6 Throttle Valve

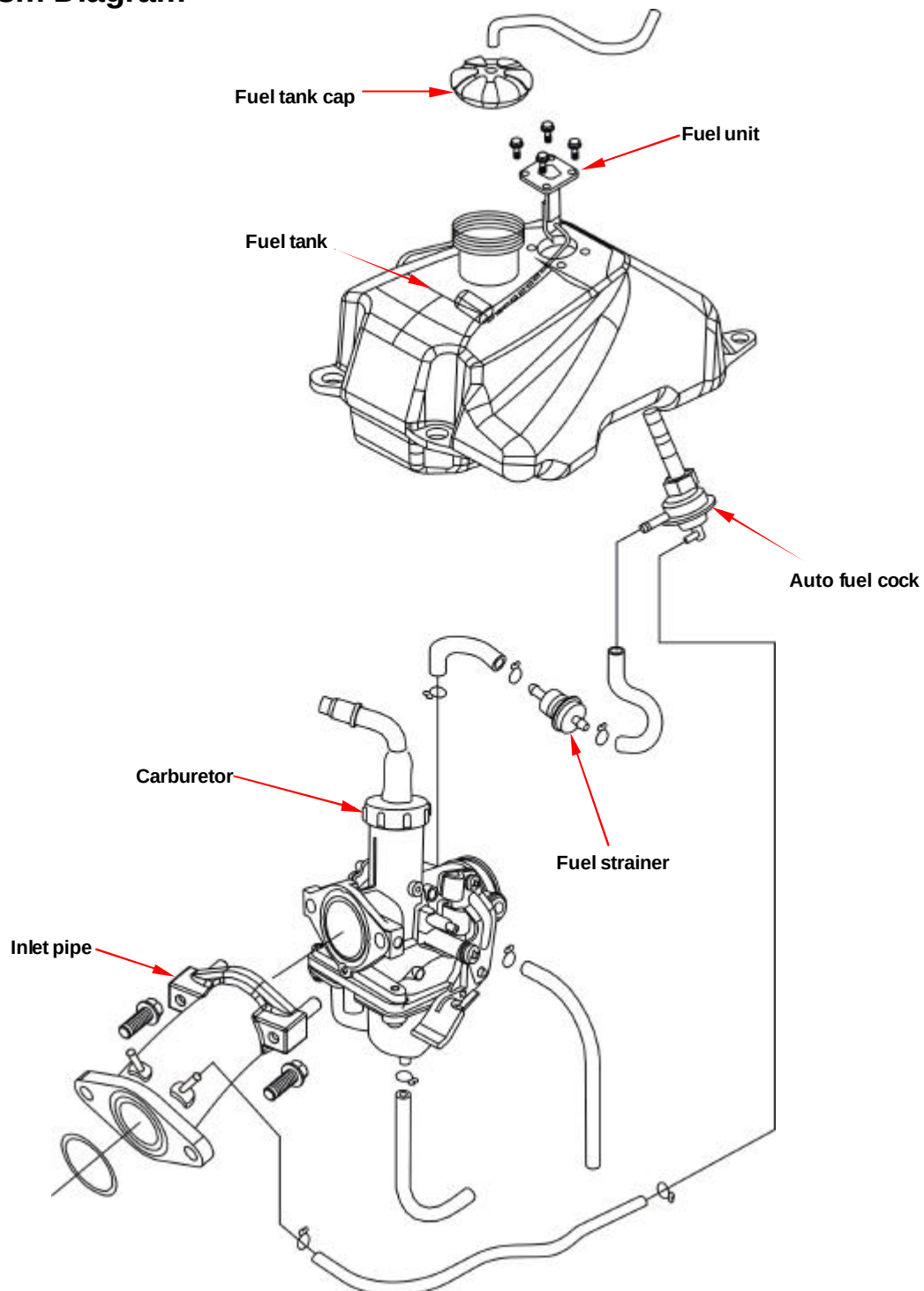
5-7 Float Chamber

5-8 Adjustment of Idle Speed

5-9 Fuel Tank

5-10 Air Cleaner

### 5-1 Mechanism Diagram



## 5-2 Precautions in Operation

### General Information



#### Warning

Gasoline is a low ignition point and explosive materials, so always work in a well-ventilated place and strictly prohibit flame when working with gasoline.



#### Cautions

- Do not bend off throttle cable. Damaged throttle cable will make unstable drive-ability.
- When disassembling fuel system parts, pay attention to O-ring position, replace with new one as re-assembly
- There is a drain screw in the float chamber for draining residual gasoline.
- Do not disassemble air cut valve arbitrarily.

### Tool

#### Special service tools

- Vacuum/air pressure pump
- Fuel level gauge

### Specification of CARBURETOR

| ITEM                     | UA25A         |
|--------------------------|---------------|
| Carburetor diameter      | Ø22mm         |
| I.D. number              | PTG 050       |
| Fuel level               | 14.8mm        |
| Main injector            | # 110         |
| Idle injector            | # 35          |
| Idle speed               | 1700 ± 100rpm |
| Throttle lever clearance | 1~3 mm        |
| Air screw                | 2 turns       |

## **5-3 Trouble Diagnosis**

### **Poor engine start**

- No fuel in fuel tank
- Clogged fuel tube
- Too much fuel in cylinder
- No spark from spark plug(malfunction of ignition system )
- Clogged air cleaner
- Malfunction of carburetor chock
- Malfunction of throttle operation

### **Mixture too lean**

- Clogged fuel injector
- Vacuum piston stick and closed
- Malfunction of float valve
- Fuel level too low in float chamber
- Clogged fuel tank cap vent
- Clogged fuel filter
- Obstructed fuel pipe
- Clogged air vent hose
- Air existing in intake system

### **Stall after started**

- Malfunction of carburetor chock
- Incorrect ignition timing
- Malfunction of carburetor
- Dirty engine oil
- Air existing in intake system
- Incorrect idle speed

### **Mixture too rich**

- Clogged air injector
- Malfunction of float valve
- Fuel level too high in float chamber
- Malfunction of carburetor chock
- Dirty air cleaner

### **Rough idle**

- Malfunction of ignition system
- Incorrect idle speed
- Malfunction of carburetor
- Dirty fuel

### **Intermittently misfire as acceleration**

- Malfunction of ignition system

### **Late ignition timing**

- Malfunction of ignition system
- Malfunction of carburetor

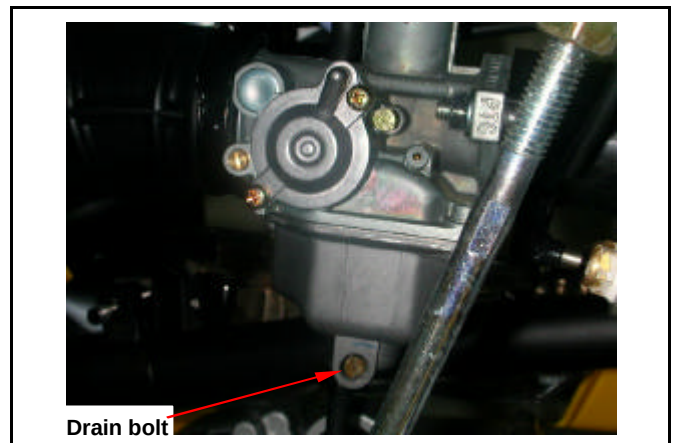
### **Power insufficiency and fuel consuming**

- Fuel system clogged
- Malfunction of ignition system

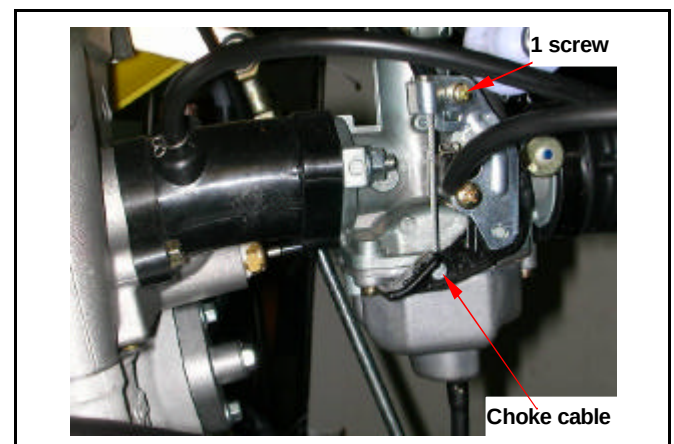
## 5-4 Carburetor Remove / Install

### Removal

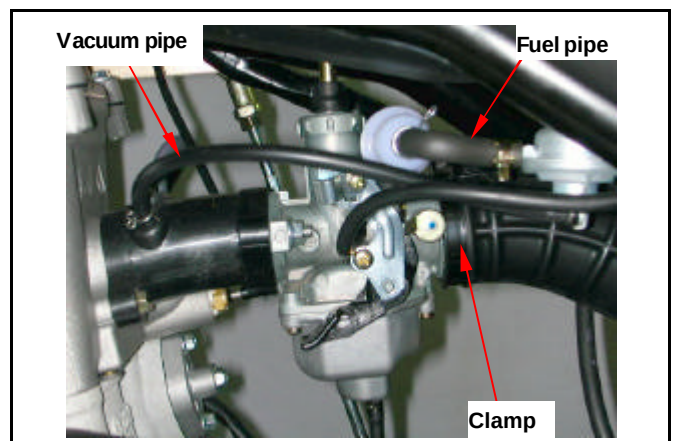
Drain out fuel in the float chamber.



Loosen the choke cable fixed iron sheet screw from plate.  
Remove the choke cable.



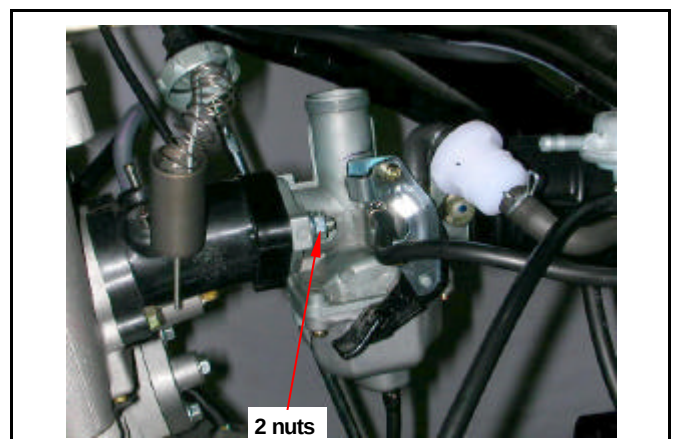
Disconnect the fuel hose.  
Release the clamp strip of air cleaner.



Remove the carburetor upper parts from the carburetor.  
Release the 2 nuts of carburetor insulator, and then remove the carburetor.

### Installation

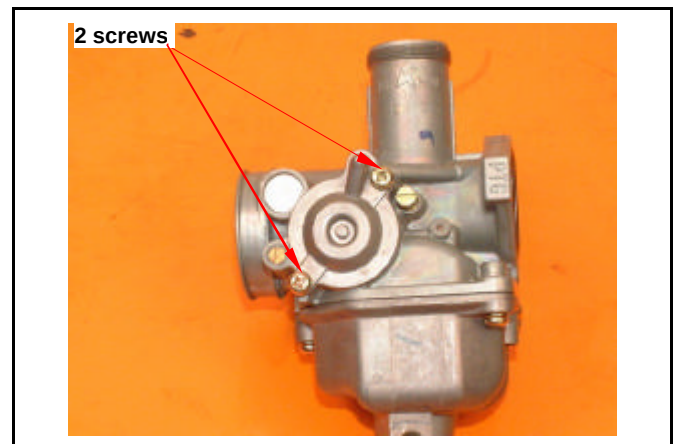
Install in reverse order of removal procedures.



## 5-5 Air Cut-Off Valve Disassembly

Remove 2 screws.

Remove air cut-off valve cover, spring and valve.



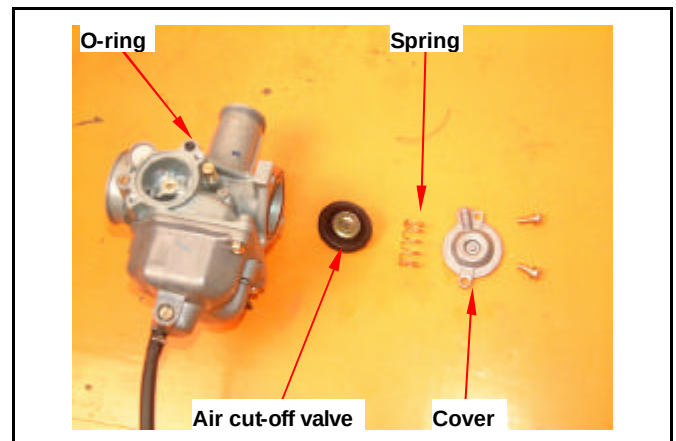
## Inspection

Check the valve is in normal.

If the valve is in normal, it will restrict air-flow.

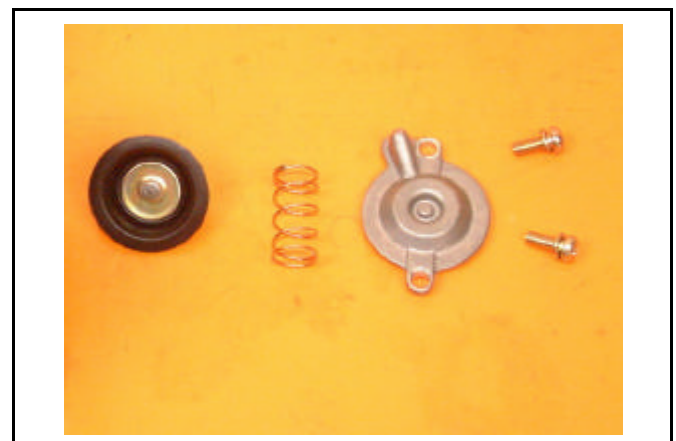
If air-flow is no restricting, replace carburetor assembly.

Check the vacuum pipe o-ring is in normal.



## Assembly

Install in reverse order of removal procedures.



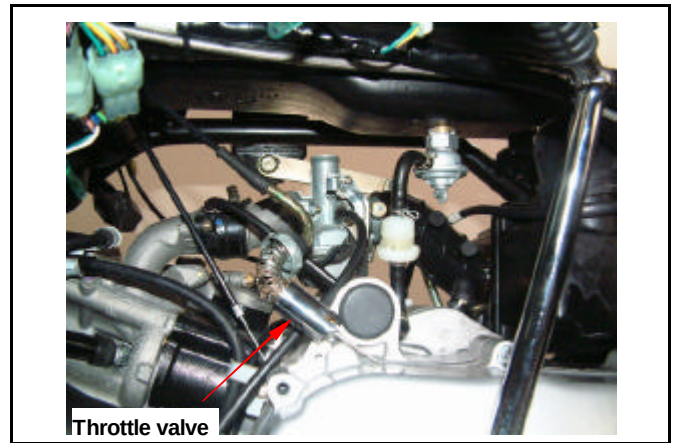


## 5-6 Throttle Valve

### Disassembly

Remove carburetor upper parts, and then remove throttle valve and throttle cable.

Disconnect the throttle cable from the throttle valve and remove the valve spring.  
Remove the fuel needle clamp and fuel needle.



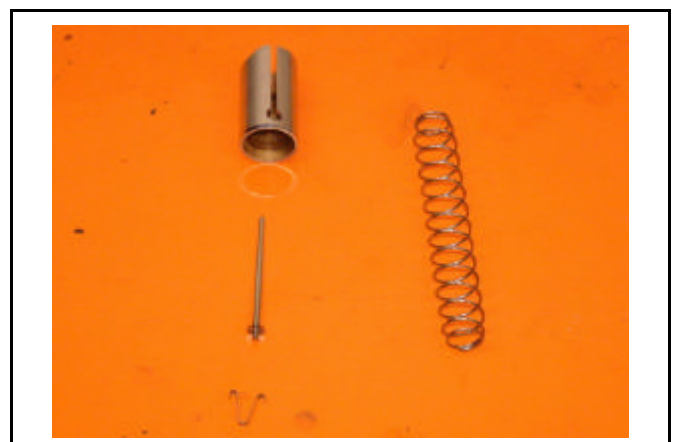
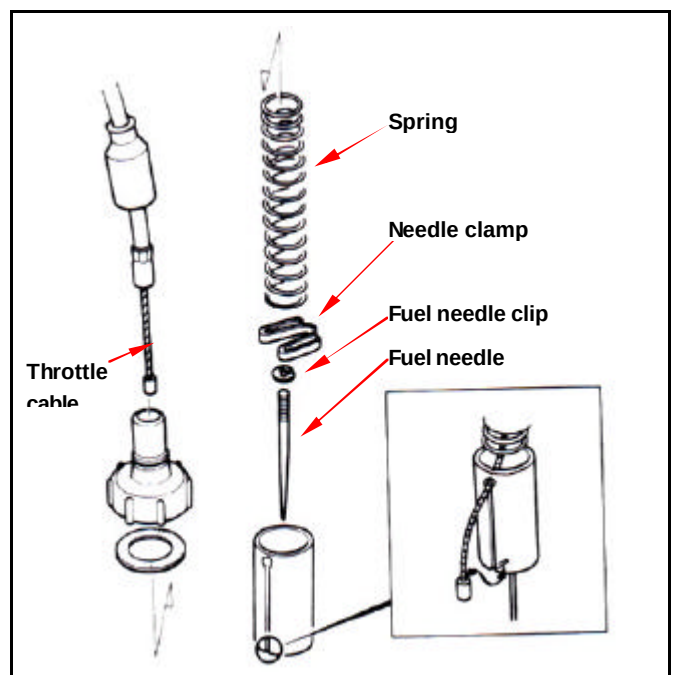
### Assembly

Place the fuel needle onto the throttle valve and clip it with needle clamp.  
Install the sealed cap, carburetor upper part, and throttle valve spring.  
Connect the throttle valve cable to the throttle valve.  
Install the throttle valve into the carburetor body.

### Caution

Align the groove inside the throttle valve with the throttle stopper screw of the carburetor body.

Tighten the carburetor upper part.  
Adjust the free play of throttle valve cable.



## 5-7 Float Chamber

### Disassembly

Remove 3 mounting screws and remove float chamber cover.

Remove the fuel level plate, float pin, float and float valve.

### Inspection

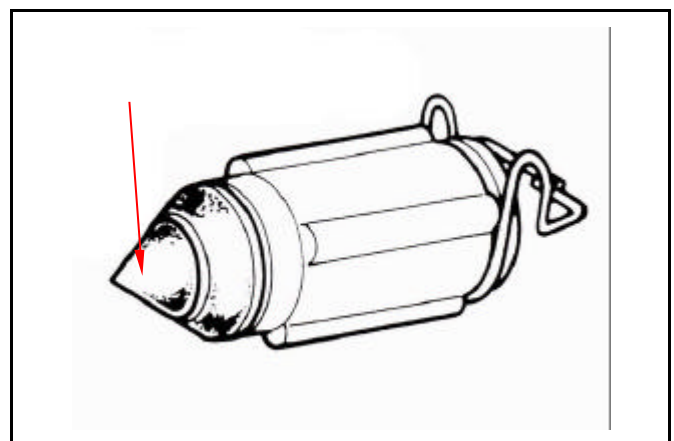
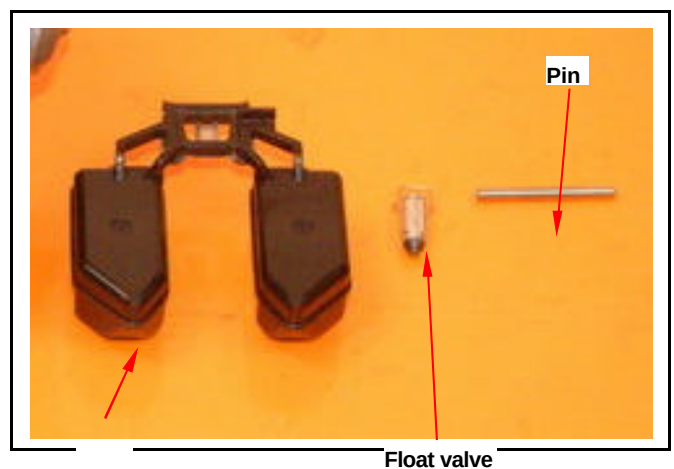
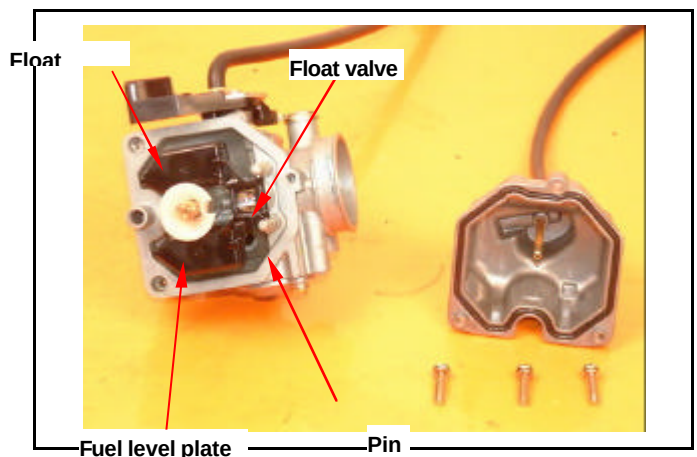
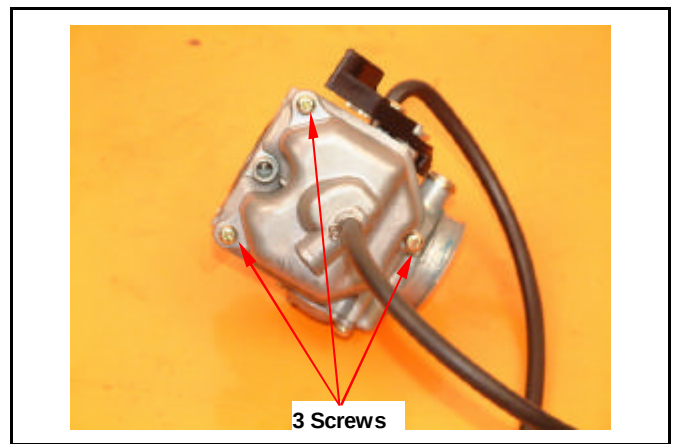
Check float valve and valve seat for damage, blocking.

Check float valve for wearing, and check valve seat face for wear, dirt.



### Caution

In case of worn out or dirt, the float valve and valve seat will not tightly close causing fuel level to increase and as a result, fuel flooding. A worn out or dirty float valve must be replaced with a new one.





Remove main jet, needle jet holder, needle jet, slow jet and air adjustment screw.

### **Caution**

Take care not to damage jets and adjust screw.

- Before removing adjustment screw, turn it all the way down and note the number of turns.
- Does not turn adjust screw forcefully to avoid damaging valve seat face.

Clean jets with cleaning fluid. Then use compressed air to blow the dirt off.  
Blow carburetor body passages with compressed air.

### **Assembly**

Install main jet, needle jet holder, needle jet, slow jet and air adjustment screw.

### **Caution**

Set the air adjustment screw in according to number of turns noted before it was removed.

Install the float valve, float, and float pin.

### **Checking fuel level**

#### **Caution**

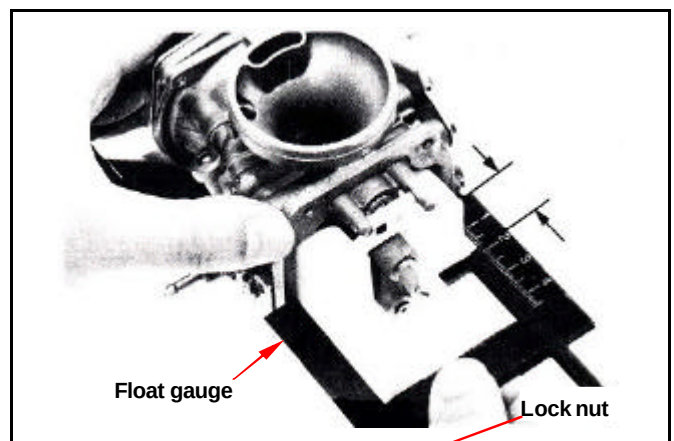
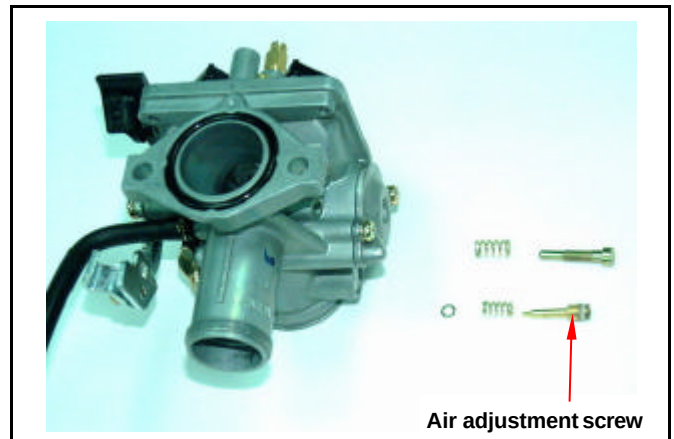
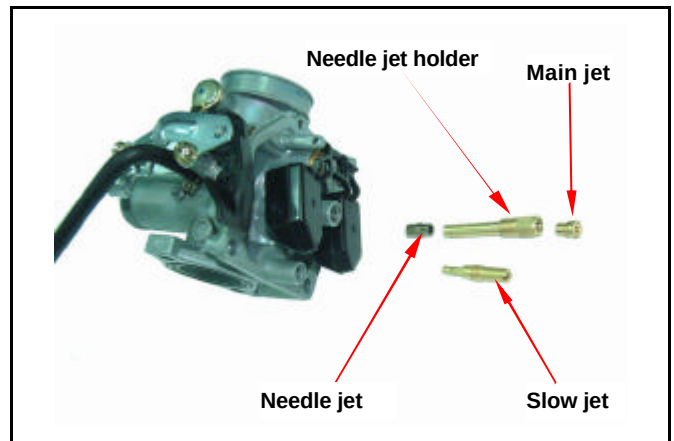
- Check again to ensure float valve, float for proper installation.
- To ensure correct measurement, position the float meter in such a way so that float chamber face is vertical to the main jet.

**Fuel level: 14.8mm**

### **Installation of carburetor**

Install carburetor in the reverse order of removal.  
Following adjustments must be made after installation.

- Throttle cable adjustment.
- Idle adjustment



## 5-8 Adjustment of Idle Speed

### Caution

- Air screw was set at factory, so no adjustment is needed. Note the number of turns it takes to screw it all the way in for ease of installation.
- The parking brake must be used to stop the ATV to perform the adjustments.

Use a tachometer when adjusting engine RPM.  
Screw in air adjustment screw gently, then back up to standard turns.

### Standard turns: 1 1/2 turns

Warm up engine; adjust the throttle stopper screw of throttle valve to standard RPM.

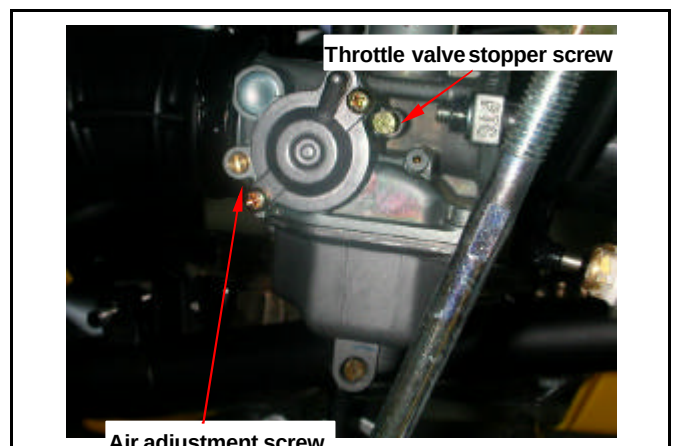
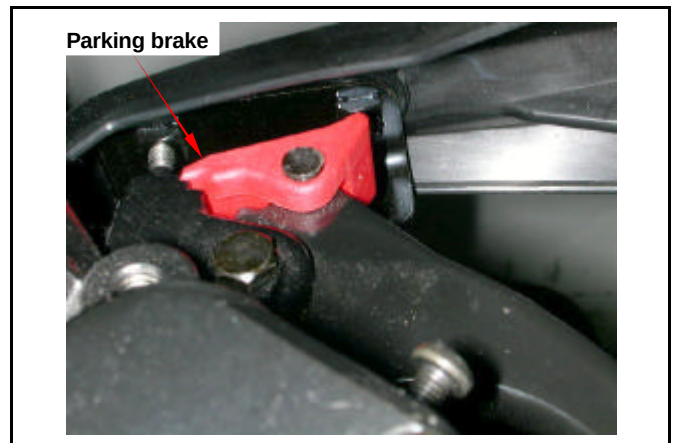
### Idle speed rpm: $1700 \pm 100$ rpm

Connect the hose of exhaust analyzer to exhaust front end. Press test key on the analyzer.

Adjust the pilot screw and read CO reading on the analyzer

### CO standard value: 1.0~1.5 %

Accelerate in gradual increments; make sure rpm and CO value are in standard value after engine running in stable. If rpm and CO value fluctuated, repeat the procedures described above for adjusting to standard value.



## 5-9 Fuel Tank

### Fuel unit removal

Open the seat.

Remove the front cover and fuel tank.

Remove the side covers and lower side covers.

Remove the front fender.

(Covers remove please refer chapter 13)

Disconnect fuel unit coupler.

Remove fuel unit (4 bolts).



### Caution

- Do not bend the float arm of fuel unit
- Do not fill out too much fuel to fuel tank.

Fuel unit inspection (Refer to electrical equipment chapter 17).

### Fuel unit installation

Install the gauge in the reverse order of removal.



### Caution

Do not forget to install the gasket of fuel unit or damage it.

### Fuel tank removal

Open the seat.

Remove the front cover and fuel tank.

Remove the side covers and lower side covers.

Remove the front fender.

(Covers remove please refer chapter 13)

Disconnect fuel unit coupler.

Remove fuel unit (4 bolts).

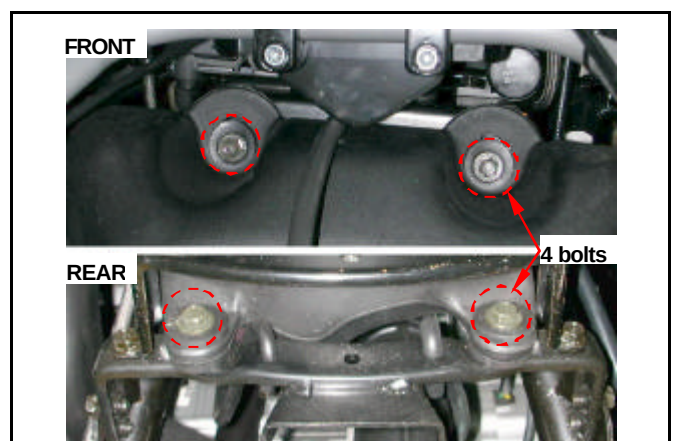
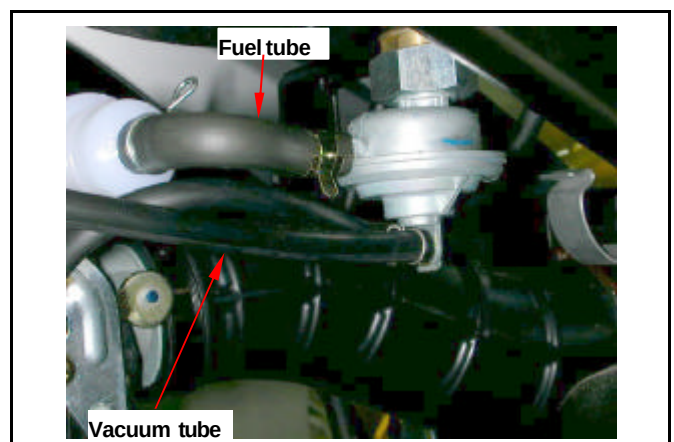
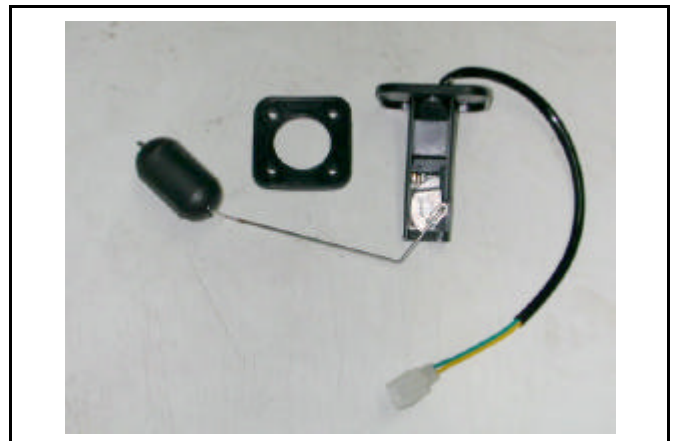
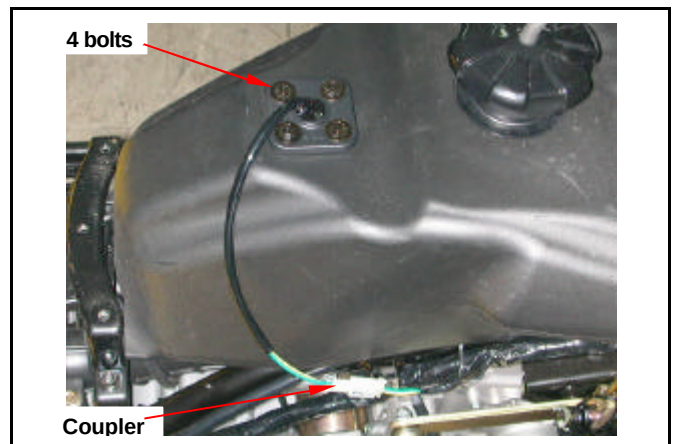
Remove the fuel tube.

Remove the vacuum tube.

Remove fuel tank front and rear side 4 bolts, and then remove fuel tank.

### Installation

Install the tank in the reverse order of removal.





## 5-10 Air Cleaner

### Removal

Loosen the clamp strip of air cleaner and carburetor, and then remove the vapor hose.

Loosen the clamp strip of air cleaner, and then remove the air cleaner vapor hose.  
Remove the air cleaner (4 bolts).

### Installation

Install the tank in the reverse order of removal.

### Cleaning air cleaner element

Remove the air cleaner cover (4 catch hooks).

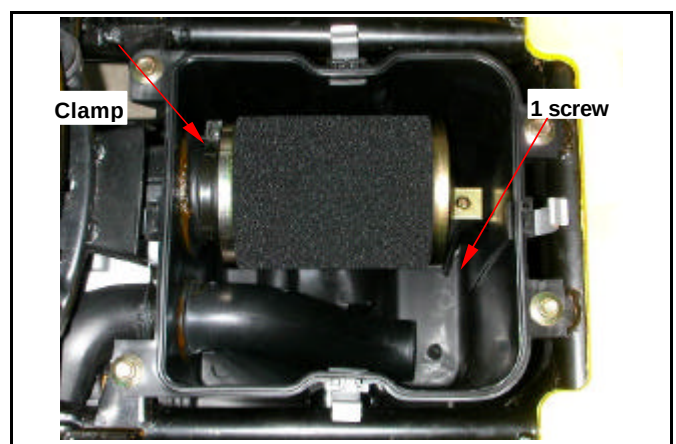
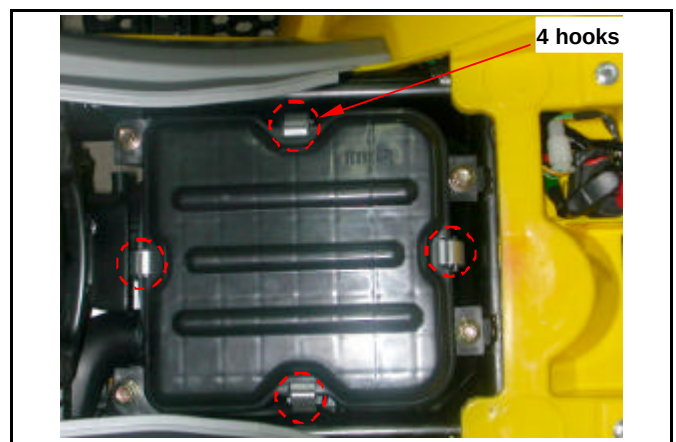
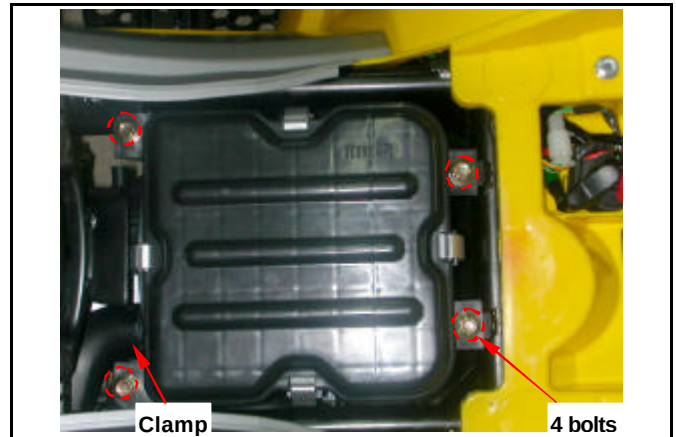
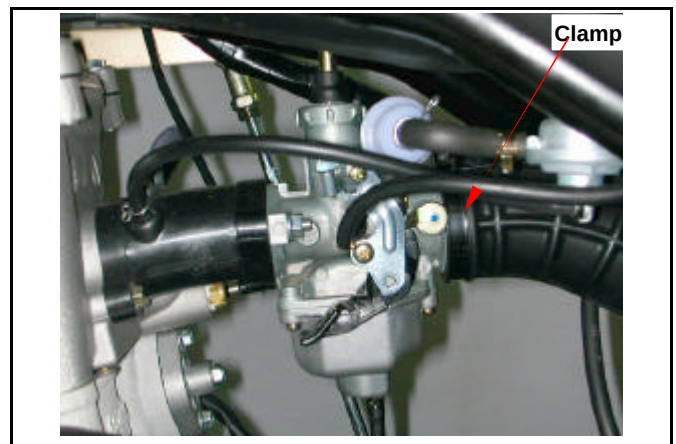
Remove element mounting screw.  
Loosen the clamp strip of air cleaner element, and then remove the air cleaner element.  
Clean the element with non-flammable or high-flash point solvent and then squeeze it for dry.



### Caution

Never use gasoline or acid organized solvent to clean the element.

Soap the element into cleaning engine oil and then squeeze it out. Install the element onto the element seat and then install the air cleaner cover.



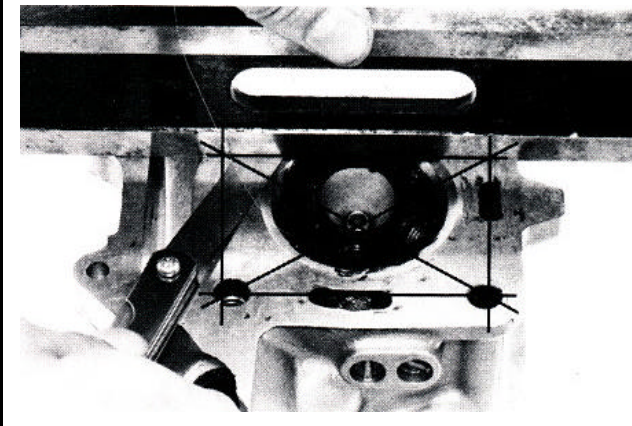
## 6. CYLINDER HEAD/VALVE

**6-1 Mechanism Diagram**

**6-2 Precautions in Operation**

**6-3 Troubleshooting**

**6-4 Cylinder Head Removal**



**6-6 Valve Stem Replacement**

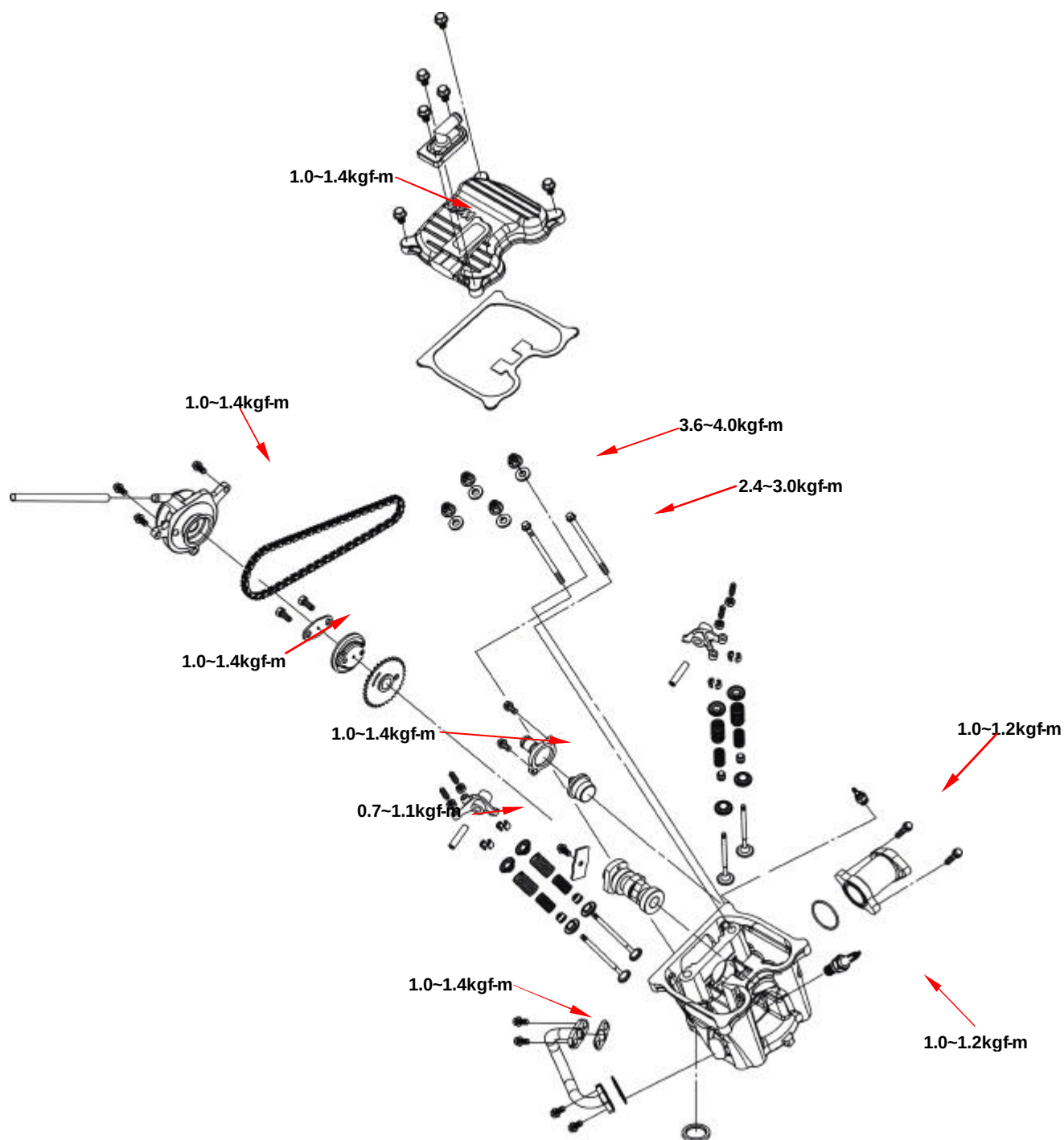
**6-7 Valve Seat Inspection and Service**

**6-8 Cylinder Head Reassembly**

**6-9 Cylinder Head Installation**

**6-10 Valve Clearance Adjustment**

**6-1 Mechanism Diagram**



## 6-2 Precautions in Operation

### General Information

- This chapter is contained maintenance and service for cylinder head, valve, and camshaft as well as rocker arm.
- Cylinder head service can be carried out when engine is in frame.

### Specification of CYLINDER HEAD

| Item                 |                    |        | Standard                | Limit |
|----------------------|--------------------|--------|-------------------------|-------|
| Compression pressure |                    |        | 12±2 kg/cm <sup>2</sup> | ---   |
| Camshaft             | Height of cam lobe | Intake | 5.90                    | 5.85  |

|                             |                                        |         |               |        |
|-----------------------------|----------------------------------------|---------|---------------|--------|
|                             |                                        | Exhaust | 5.70          | 5.65   |
| Rocker arm                  | ID of valve rocker arm                 |         | 11.982~12.000 | 12.080 |
|                             | OD of valve rocker arm shaft           |         | 11.966~11.984 | 11.936 |
| Valve                       | OD of valve stem                       | Intake  | 4.975~4.990   | 4.900  |
|                             |                                        | Exhaust | 4.950~4.975   | 4.900  |
|                             | ID of valve guide                      |         | 5.000~5.012   | 5.030  |
|                             | Clearance between valve stem and guide | Intake  | 0.010~0.037   | 0.080  |
|                             |                                        | Exhaust | 0.025~0.062   | 0.100  |
|                             | Free length of valve spring            | Intake  | 38.700        | 35.200 |
|                             |                                        | Exhaust | 40.400        | 36.900 |
|                             | Valve seat width                       |         | 3.400         | 4.000  |
|                             | Valve clearance                        | Intake  | 0.10±0.02mm   | -      |
|                             |                                        | Exhaust | 0.15±0.02mm   | -      |
| Tilt angle of cylinder head |                                        |         | ---           | 0.050  |

### Torque Value

|                                          |              |
|------------------------------------------|--------------|
| Cylinder head cover bolt                 | 1.0~1.4kgf-m |
| Exhaust pipe stud bolt                   | 2.4~3.0kgf-m |
| Cylinder head bolt                       | 1.0~1.4kgf-m |
| Cylinder head Nut                        | 3.6~4.0kgf-m |
| Sealing bolt of cam chain auto-tensioner | 0.8~1.2kgf-m |
| Bolt of cam chain auto-tensioner         | 1.2~1.6kgf-m |
| Cylinder side cover bolt                 | 1.0~1.4kgf-m |
| Cam sprocket bolt                        | 1.0~1.4kgf-m |
| Tappet adjustment screw nut              | 0.7~1.1kgf-m |
| Spark plug                               | 1.0~1.2kgf-m |

### Tools

#### Special service tools

Valve reamer: 5.0mm  
Valve guide driver: 5.0mm  
Valve spring compressor



## 6-3 Troubleshooting

Engine performance will be affected by troubles on engine top parts. The trouble usually can be determined or by performing cylinder compression test and judging the abnormal noise generated.

### Low compression pressure

#### 1. Valve

- Improper valve adjustment
- Burnt or bent valve
- Improper valve timing
- Valve spring damage
- Valve carbon deposit.

#### 2. Cylinder head

- Cylinder head gasket leaking or damage
- Tilt or crack cylinder

#### 3. Piston

- Piston ring worn out.

### High compression pressure

- Too much carbon deposit on combustion chamber or piston head

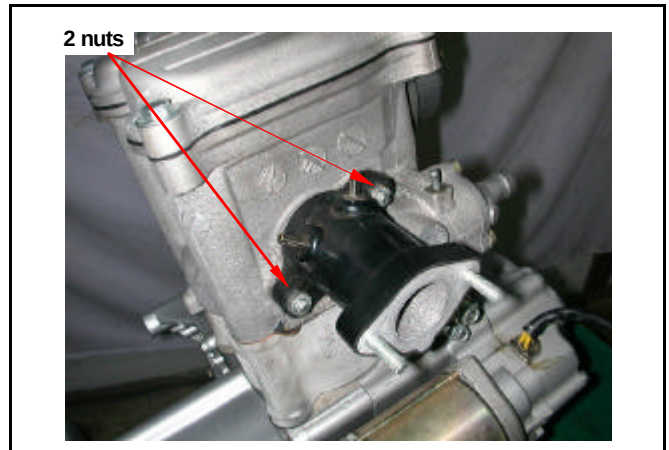
### Noise

- Improper valve clearance adjustment
- Burnt valve or damaged valve spring
- Camshaft wear out or damage
- Chain wear out or looseness
- Auto-tensioner wear out or damage
- Camshaft sprocket
- Rocker arm or rocker arm shaft wear out

## 6-4 Cylinder Head Removal

Remove engine. (Refer to chapter 5)

Remove the inlet pipe (2 nuts).

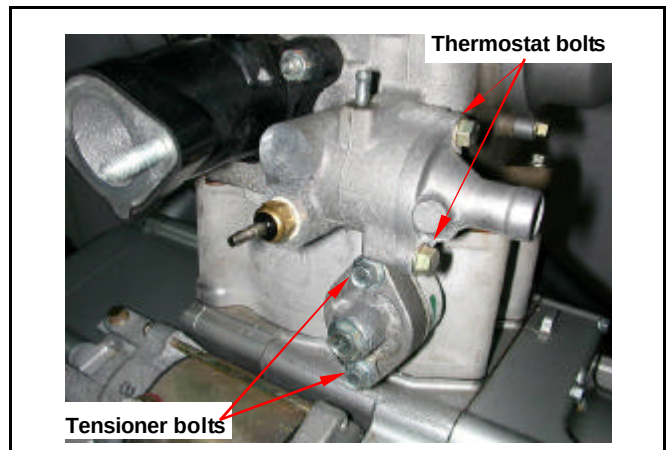


Remove 1 bolt of thermostat and then remove the thermostat.

Remove hole bolt and spring for the cam chain tensioner.

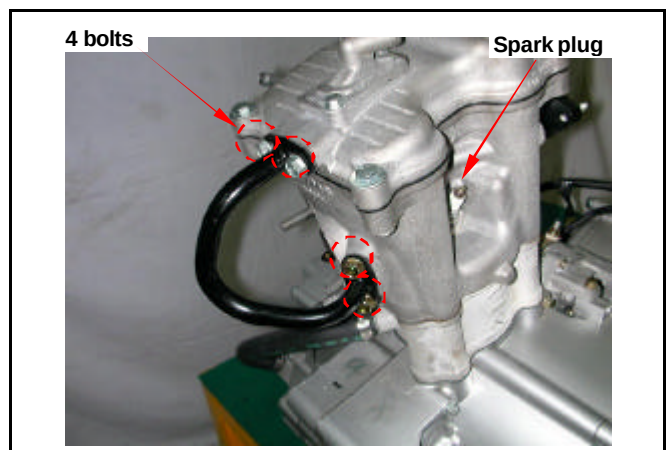
Loosen 2 bolts, and then remove tensioner.

Remove thermostat (2 bolts).

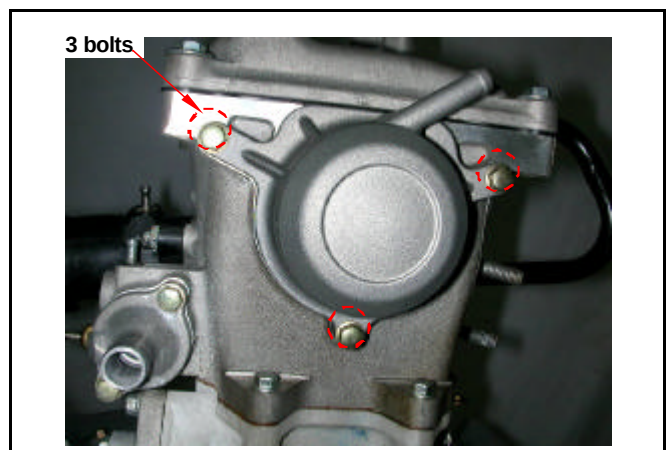


Remove Air Injection system (AI) pipe mounting bolts.

Remove spark plug.

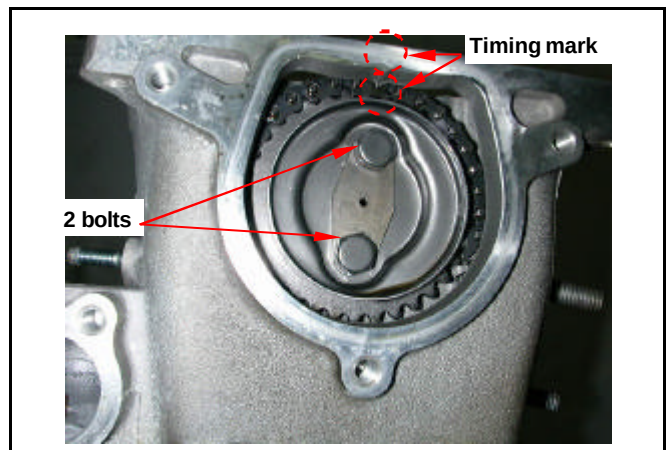


Remove the side cover mounting bolts of cylinder head, and then take out the side cover.

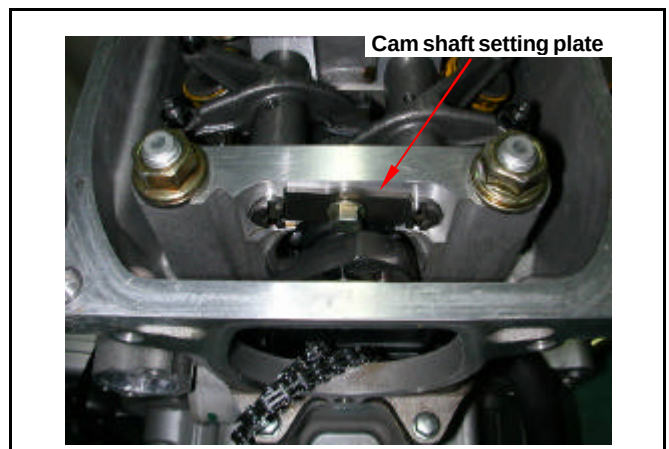


Remove left crankcase cover, and turn the  
Turn the drive face, and align the timing mark on  
the sprocket with that of cylinder head, piston is at  
TDC position.

Remove cam sprocket bolts and then remove the  
sprocket by prying chain out.



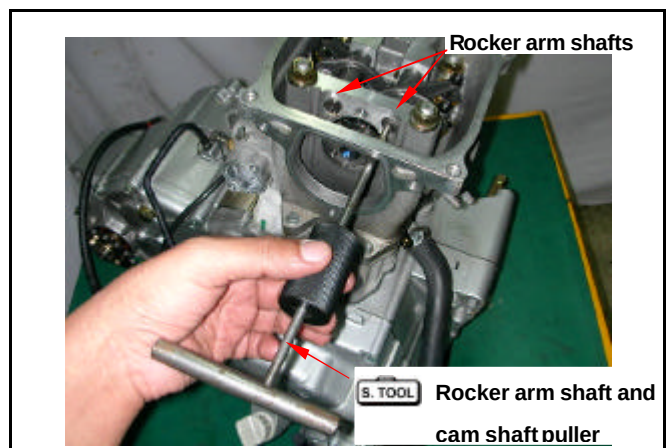
Remove cam shaft setting plate (1 bolt).



Remove rocker arm shafts and rocker arms.

**Special Service Tool:**

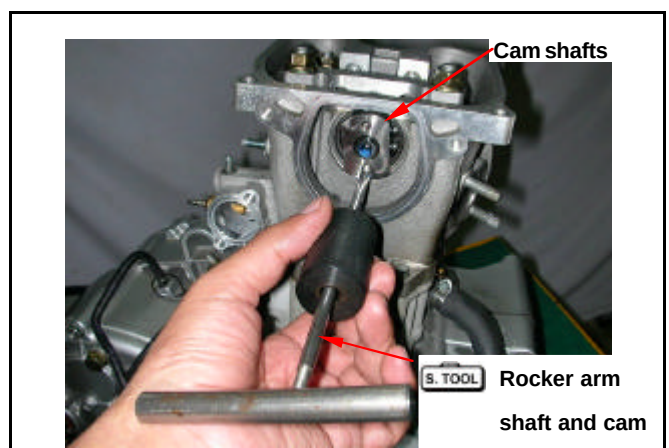
**Rocker arm and cam shaft puller**



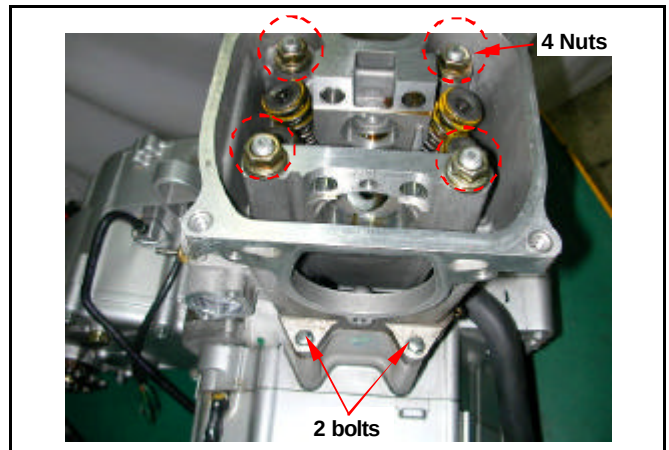
Remove cam shafts.

**Special Service Tool:**

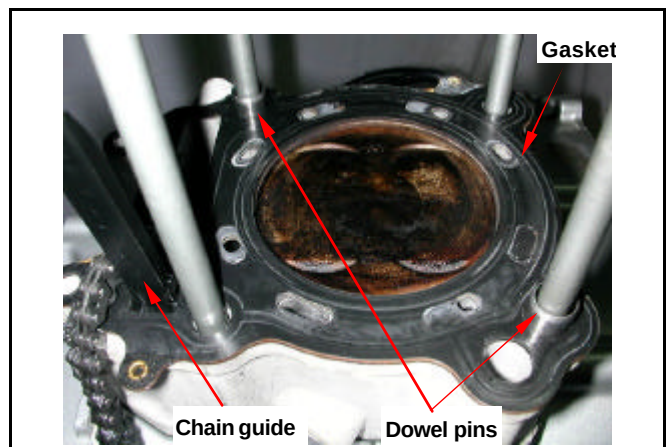
**Rocker arm and cam shaft puller**



Remove the 2 cylinder head mounting bolts from cylinder head right side, and then remove 4 nuts and washers from cylinder head upper side.  
Remove the cylinder head.



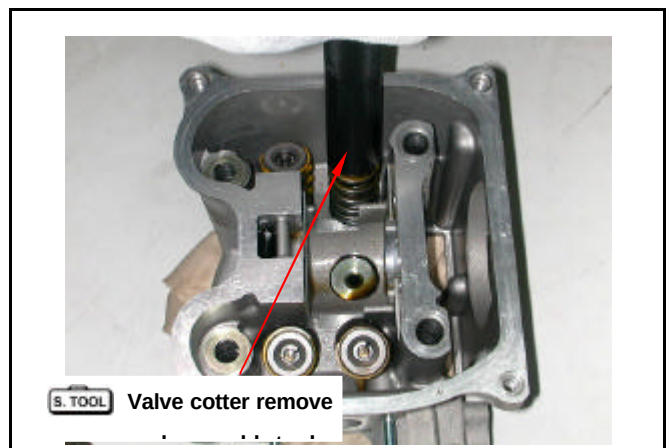
Remove cylinder head gasket and 2 dowel pins.  
Remove chain guide.  
Clean up residues from the matching surfaces of cylinder and cylinder head.



### Caution

- Do not damage the matching surfaces of cylinder and cylinder head.
- Avoid residues of gasket or foreign materials falling into crankcase as cleaning.

Use a valve cotter remove & assembly tool to press the valve spring, and then remove valves.

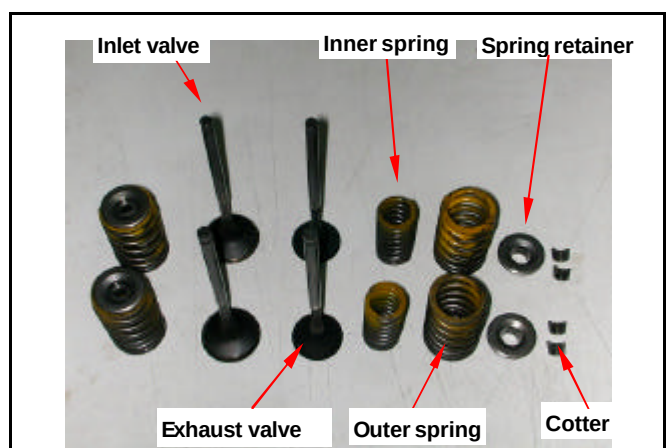


### Caution

- In order to avoid losing spring elasticity, do not press the spring too much. Thus, press length is based on the valve cotter in which can be removed.

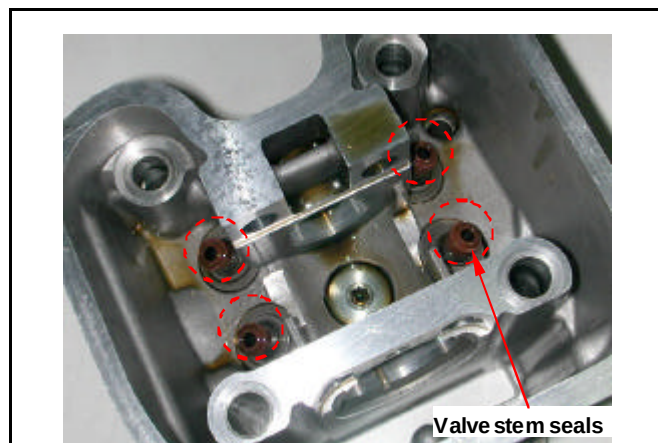
### Special Service Tool:

Valve cotter remove & assembly tool





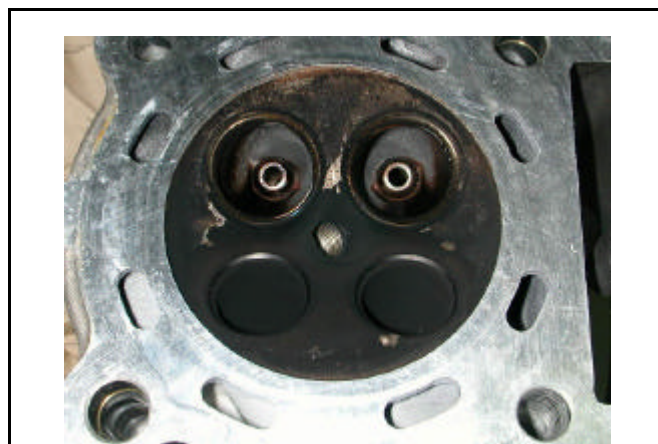
Remove valve stem seals.



Clean carbon deposits in combustion chamber.  
Clean residues and foreign materials on cylinder head matching surface.

 **Caution**

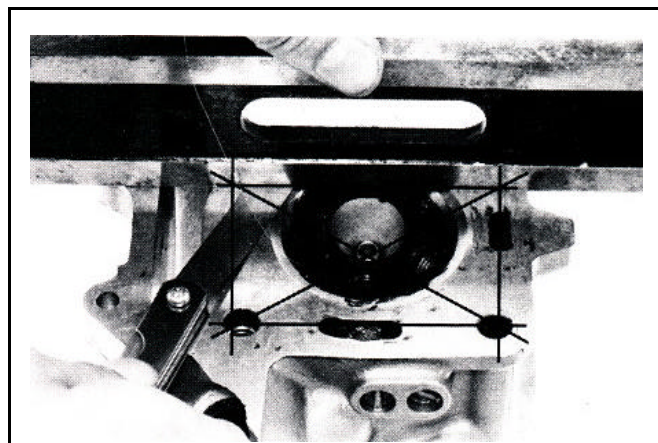
Do not damage the matching surface of cylinder head.



## 6-5 Cylinder Head Inspection

Check if spark plug and valve holes are cracked.  
Measure cylinder head warp with a straightedge and thickness gauge.

**Service limit: 0.5 mm**



### Camshaft

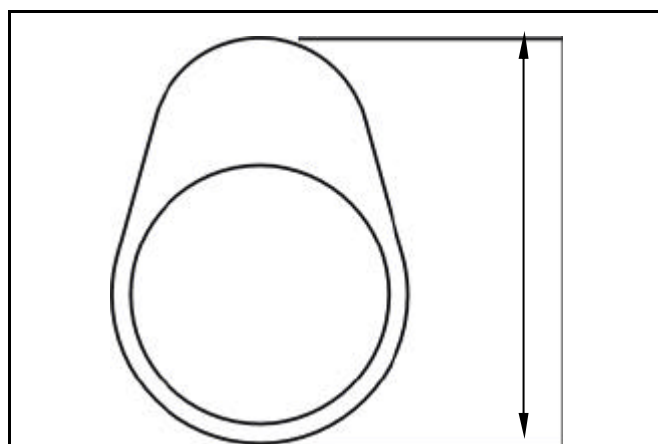
Inspect cam lobe height for damaged.

**Service Limit:**

**IN: Replacement when less than 34.45mm**

**EX: Replacement when less than 34.30mm**

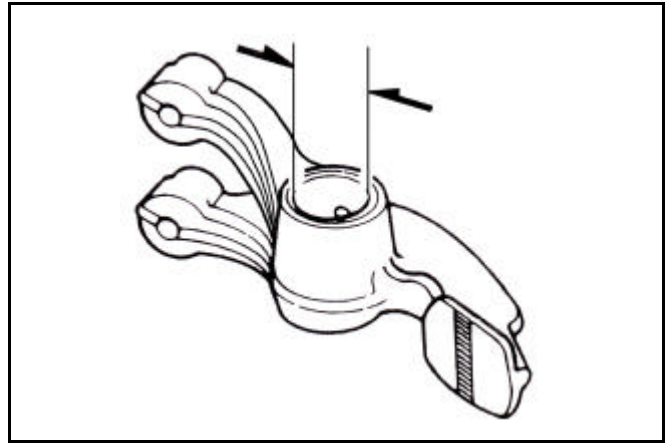
Inspect the camshaft bearing for looseness or wear out. If any damage, replace whole set of camshaft and bearing.



### Rocker Arm

Measure the cam rocker arm I.D., and wear or damage, oil hole clogged?

**Service Limit: Replace when it is less than 12.10 mm.**



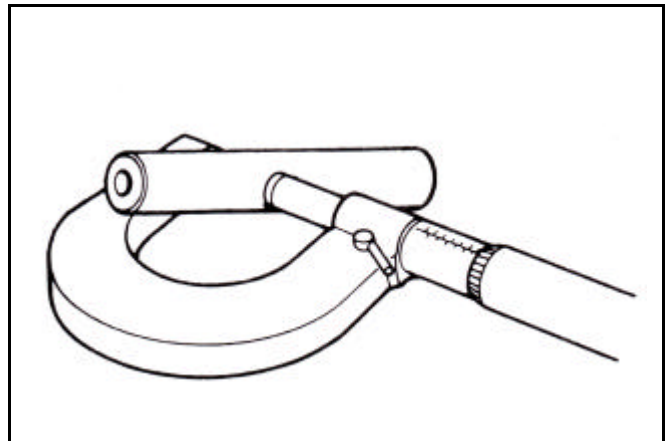
### Rocker Arm Shaft

Measure the active O.D. of the cam rocker arm shaft and cam rocker arm.

**Service Limit: Replace when it is less than 11.91 mm.**

Calculate the clearance between the rocker arm shaft and the rocker arm.

**Service Limit: Replace when it is less than 0.10 mm.**



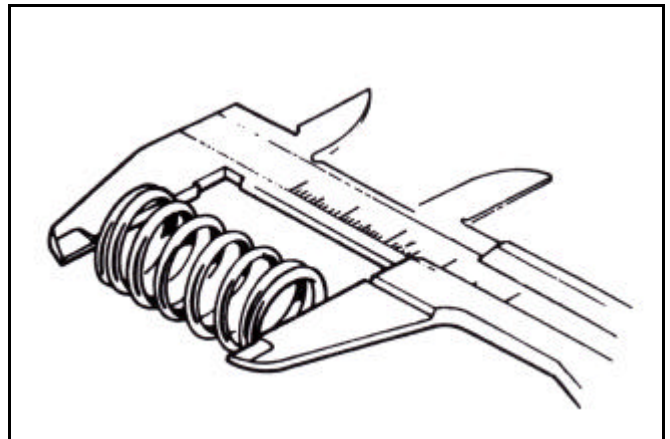
### Valve spring free length

Measure the free length of intake and exhaust valve springs.

**Service limit:**

**Inner spring 35.00 mm**

**Outer spring 39.00 mm**



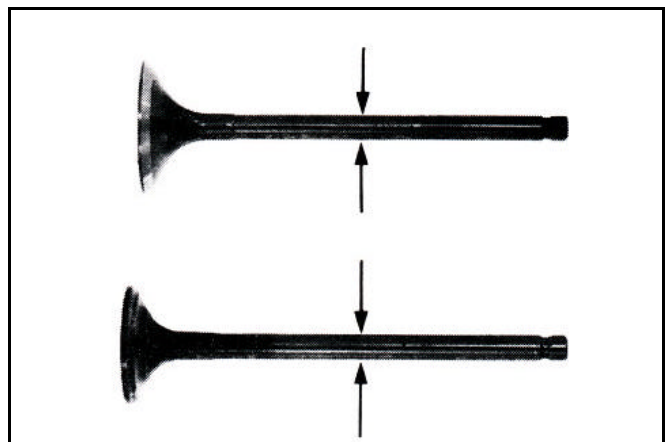
### Valve stem

Check if valve stems are bend, crack or burn.

Check the operation condition of valve stem in valve guide, and measure & record the valve stem outer diameter.

**Service Limit: IN: 4.90 mm**

**EX: 4.90 mm**

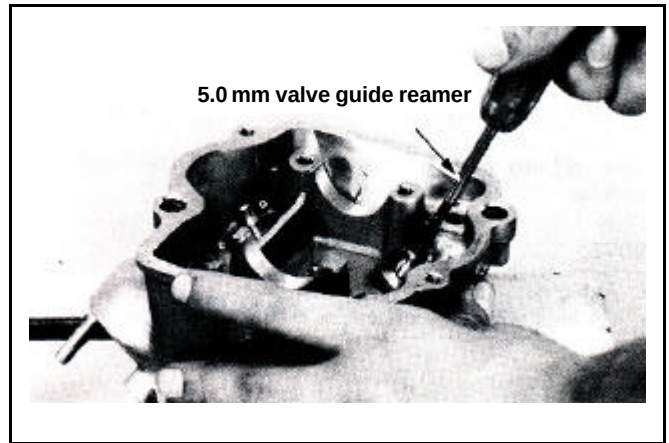


## Valve guide

### Caution

Before measuring the valve guide, clean carbon deposits with reamer.

**Tool: 5.0 mm valve guide reamer**



Measure and record each valve guide inner diameters.

**Service limit: 5.03 mm**

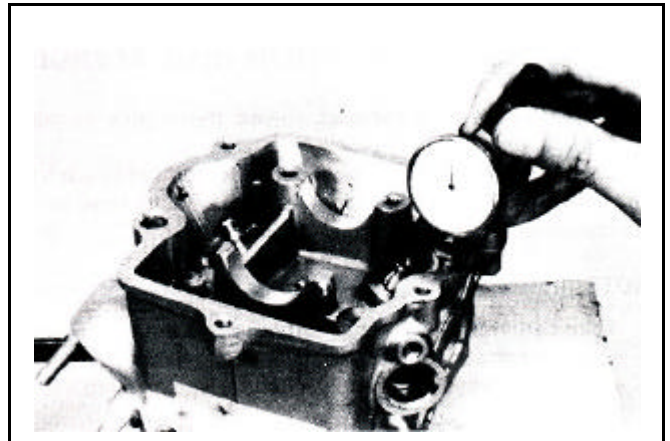
The difference that the inner diameter of valve guide deducts the outer diameter of valve stem is the clearance between the valve stem and valve guide.

**Service Limit: IN→0.08 mm**

**EX→0.10 mm**

### Caution

If clearance between valve stem and valve guide exceeded service limit, check whether the new clearance that only replaces new valve guide is within service limit or not. If so, replace valve guide.



Correct it with reamer after replacement.

If clearance still exceeds service limit after replaced valve guide, replace valve stem too.

### Caution

It has to correct valve seat when replacing valve guide.



## 6-6 Valve Stem Replacement

Heat up cylinder head to 100~150 °C with heated plate or toaster.

### Caution

- Do not let torch heat cylinder head directly. Otherwise, the cylinder head may be deformed as heating it.
- Wear on a pair of glove to protect your hands when operating.

Hold the cylinder head, and then press out old valve guide from combustion chamber side.

**Tool: Valve guide driver: 5.0 mm**

### Caution

- Check if new valve guide is deformation after pressed it in.
- When pressing in the new valve guide, cylinder head still have to be kept in 100~150°C.

Adjust the valve guide driver and let valve guide height is in 13 mm.

Press in new valve guide from rocker arm side.

**Tool: Valve guide driver: 5.0 mm**

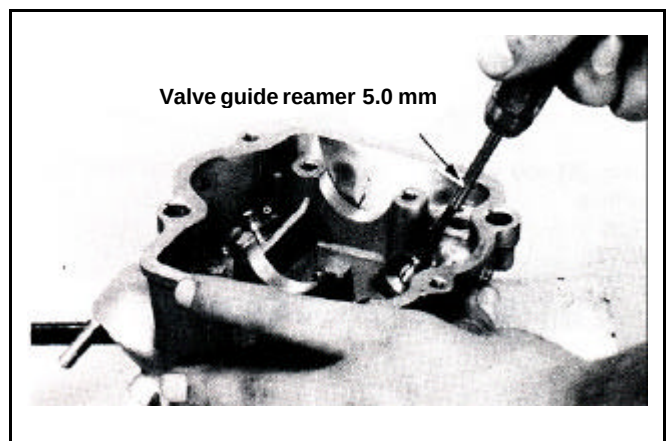
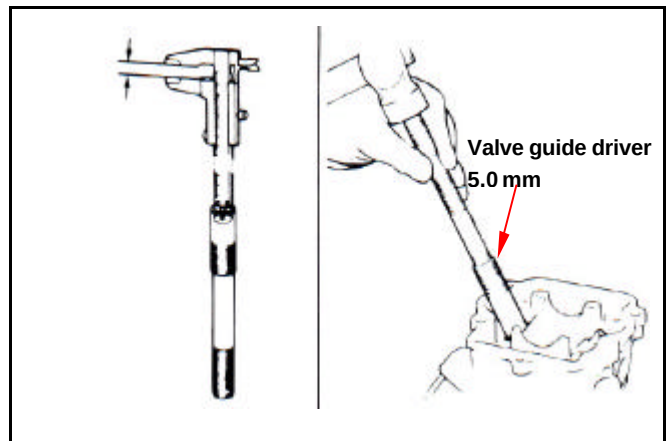
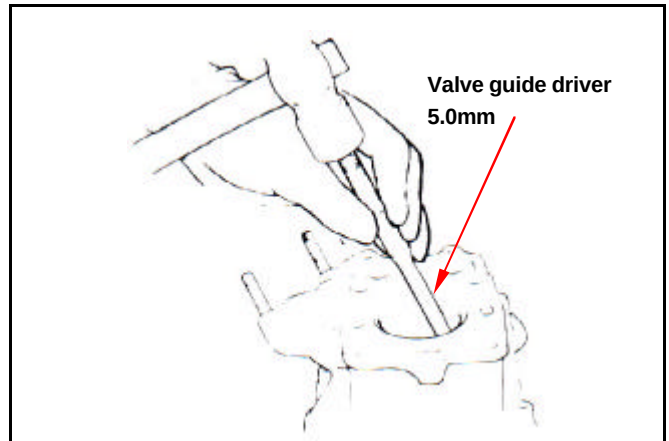
Wait for the cylinder head cooling down to room temperature, and then correct the new valve guide with reamer.

### Caution

- Using cutting oil when correcting valve guide with a reamer.
- Turn the reamer in same direction when it be inserted or rotated.

Correct valve seat, and clean up all metal residues from cylinder head.

**Tool: Valve guide reamer: 5.0 mm**



## 6-7 Valve Seat Inspection and Service

Clean up all carbon deposits onto intake and exhaust valves.

Apply with emery slightly onto valve contact face. Grind valve seat with a rubber hose or other manual grinding tool.

### Caution

- Do not let emery enter into between valve stem and valve guide.
- Clean up the emery after corrected, and apply with engine oil onto contact faces of valve and valve seat.

Remove the valve and check its contact face.

### Caution

Replace the valve with new one if valve seal is roughness, wear out, or incomplete contacted with valve seat.

### Valve seat inspection

If the valve seat is too width, narrow or rough, corrects it.

### Valve seat width

**Service limit: 1.6mm**

Check the contact condition of valve seat.

### Valve seat grinding

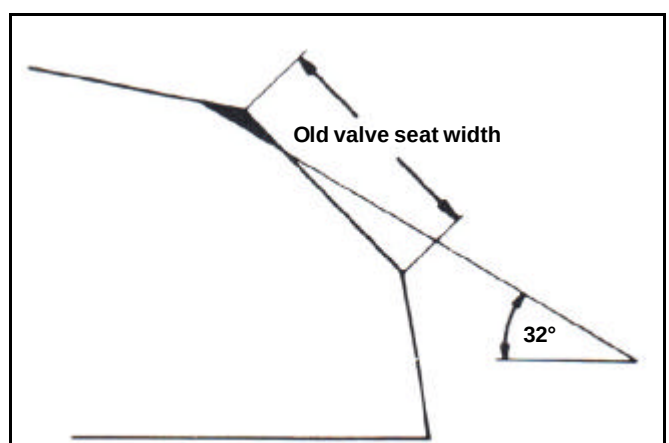
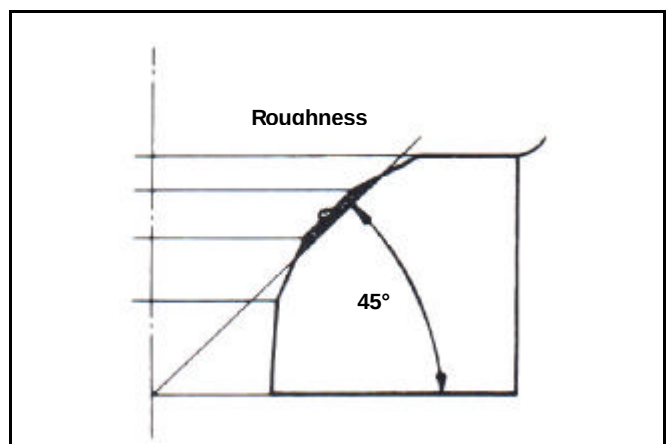
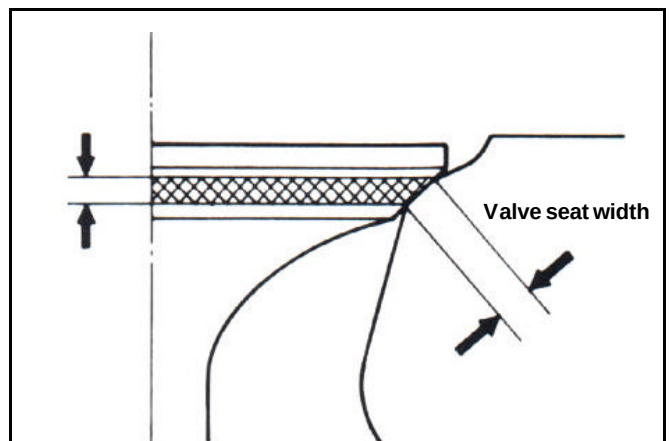
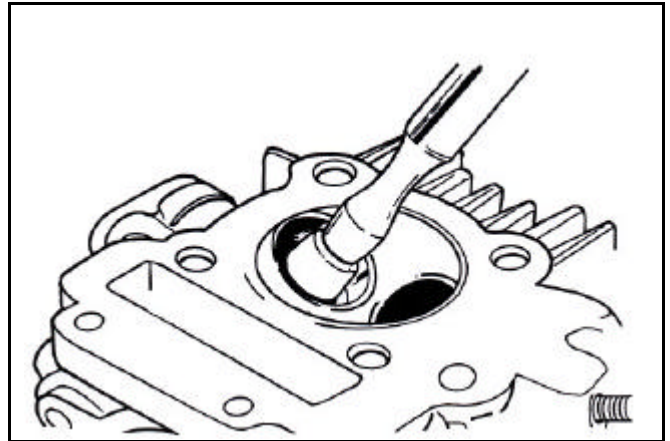
The worn valve seat has to be ground with valve seat chamfer cutter.

Refer to operation manual of the valve seat chamfer cutter.

Use 45° valve seat chamfer cutter to cut any rough or uneven surface from valve seat.

### Caution

After valve guide had been replaced, it has to be ground with 45° valve seat chamfer cutter to correct its seat face.



Use 32° cutter to cut a quarter upper parts out.

Use 60° cutter to cut a quarter lower parts out.  
Remove the cutter and check new valve seat.

Use 45° cutter to grind the valve seat to specified width.

**⚠ Caution**

Make sure that all roughness and uneven faces had been ground.

Grind valve seat again if necessary.

Coat the valve seat surface with red paint.

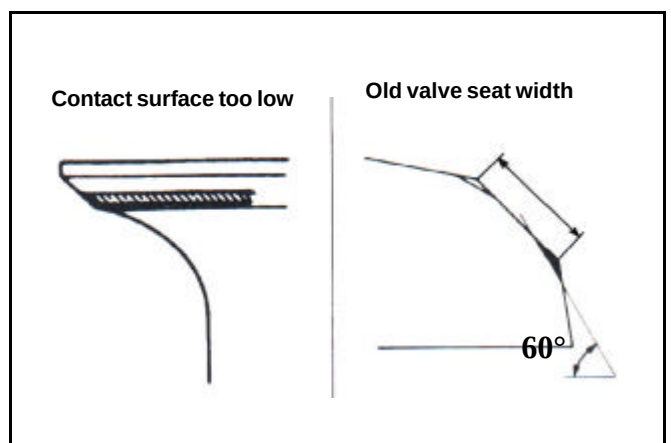
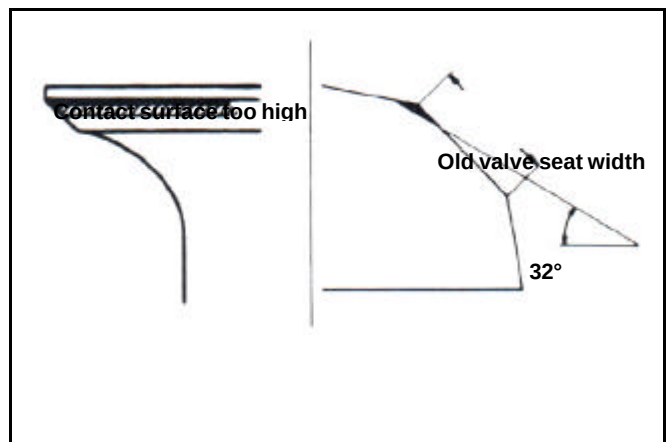
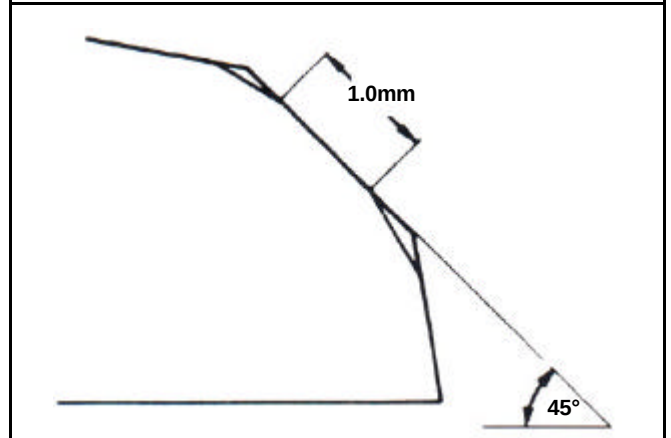
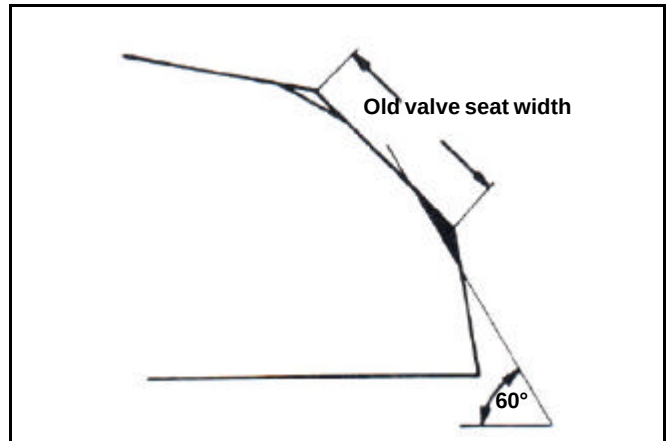
Install the valve through valve guide until the valve contacting with valve seat, slightly press down the valve but do not rotate it so that a seal track will be created on contact surface.

**⚠ Caution**

The contact surfaces of valve and valve seat are very important to the valve sealing capacity.

If the contact surface too high, grind the valve seat with 32° cutter.  
Then, grind the valve seat to specified width.

If the contact surface too low, grind the valve seat with 60° cutter.  
Then, grind the valve seat to specified width.



After the valve seat ground, coat valve seat surface with emery and then slightly press the ground surface.

Clean up all emery coated onto cylinder and valve after ground.

## 6-8 Cylinder Head Reassembly

Lubricate valve stem with engine oil, and then insert the valve into valve guide.

Install new valve stem oil seal.

Install valve springs and retainers.

### Caution

The closed coils of valve spring should face down to combustion chamber.

Use a valve cotter remove & assembly tool to press the valve spring, and then remove valves.

### Caution

In order to avoid damaging the valve stem and the cylinder head, in the combustion chamber place a rag between the valve spring remover/installer as compressing the valve spring directly.

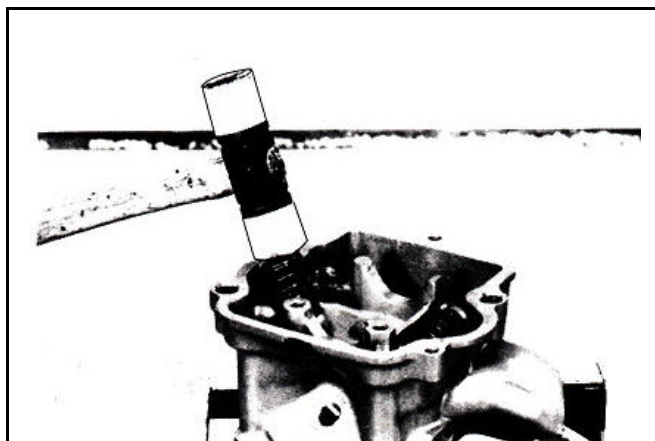
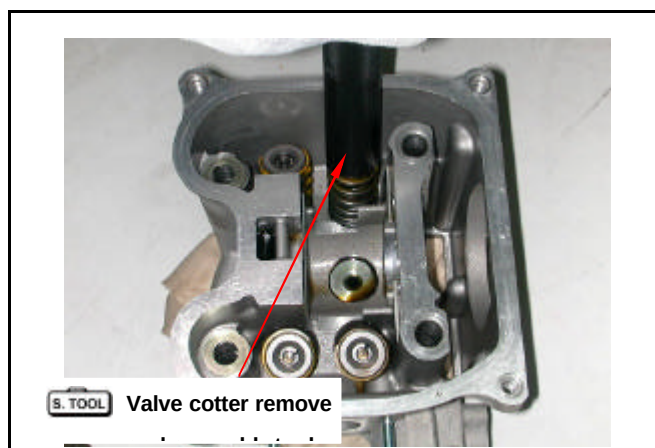
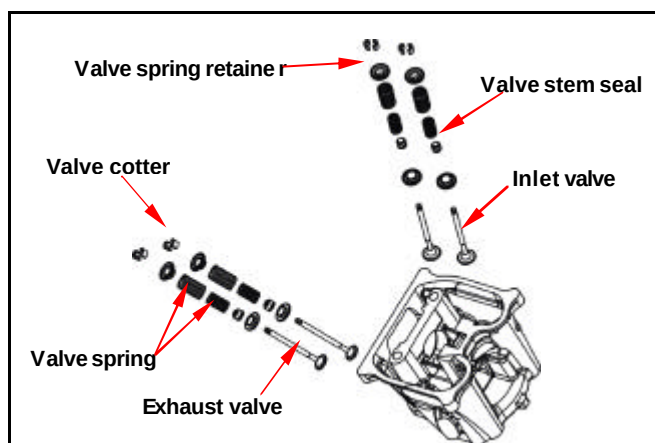
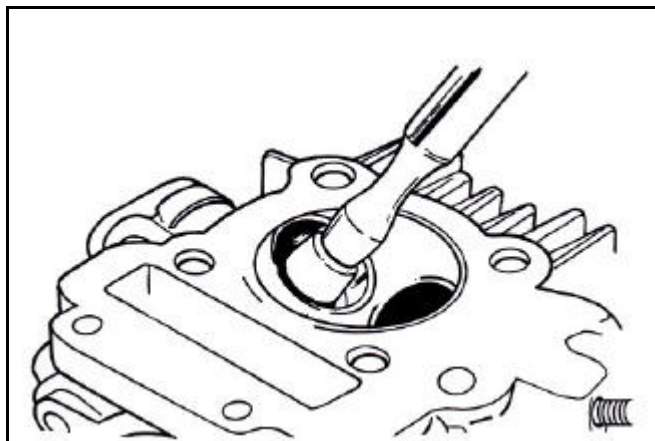
### Special Service Tool:

#### Valve cotter remove & assembly tool

Tap the valve stems gently with a plastic hammer to make sure valve retainer and valve cotter is settled.

### Caution

Place and hold cylinder head on to working table so that can prevent from valve damaged.







## 6-9 Cylinder Head Installation

Clean up all residues and foreign materials onto the matching surfaces of both cylinder and cylinder head.

Install chain guide, dowel pins and a new cylinder head gasket onto the cylinder.



### Caution

Do not damage the matching surfaces of cylinder and cylinder head.

Avoid residues of gasket or foreign materials falling into crankcase as cleaning.

Install 4 washers and tighten 4 nuts on the cylinder head upper side, and then tighten 2 cylinder head mounting bolts of cylinder head right side.

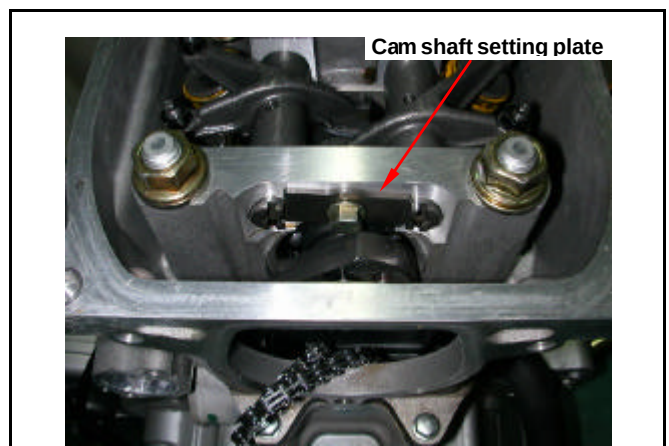
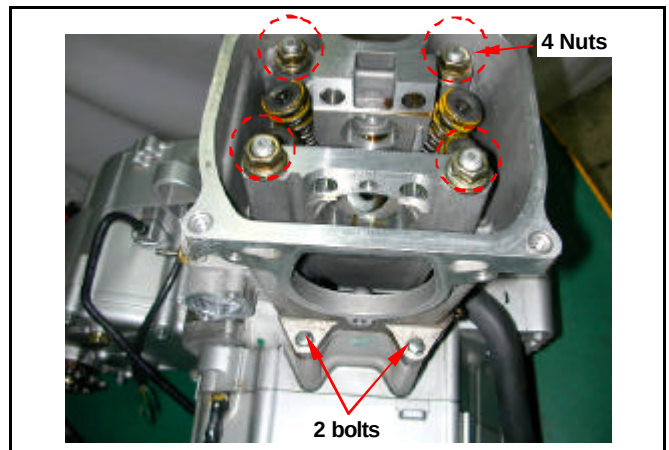
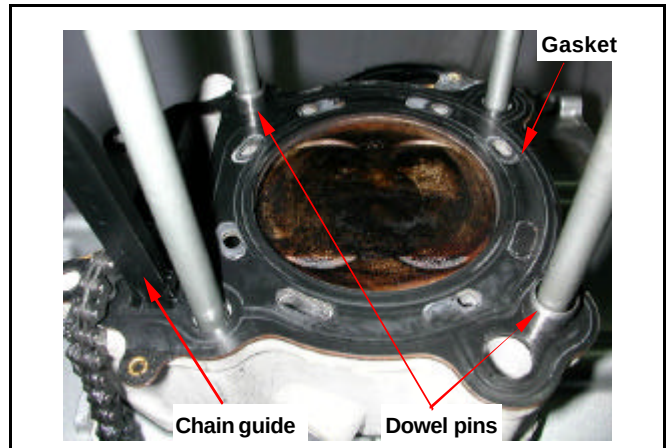
### Torque value:

**Nut** 3.6~4.0kgf-m

**Bolt** 1.0~1.4kgf-m

Install camshaft into cylinder head, and install rocker arm, rocker arm shaft.

Install rocker arm pin mounting plate.

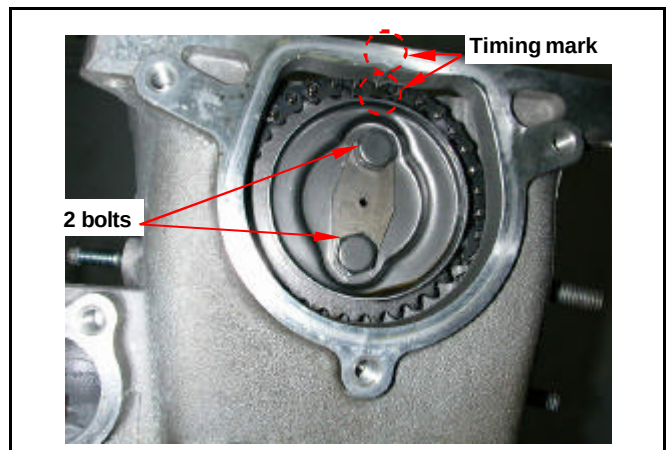


Install cam chain on to sprocket and align the timing mark on the sprocket with that of cylinder head.

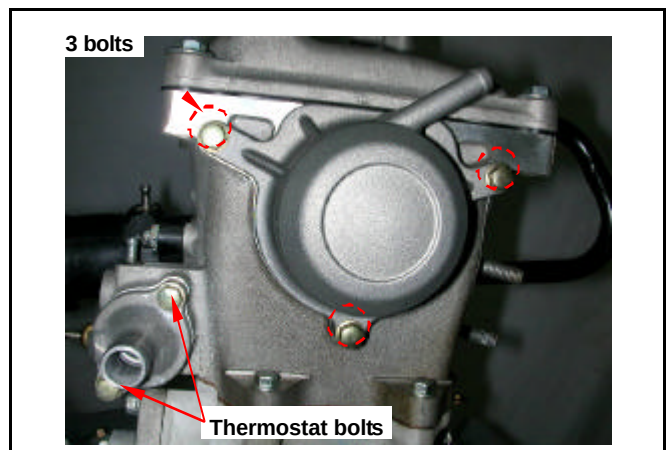
Align sprocket bolt hole with camshaft bolt hole. Tighten the sprocket mounting bolts.

 **Caution**

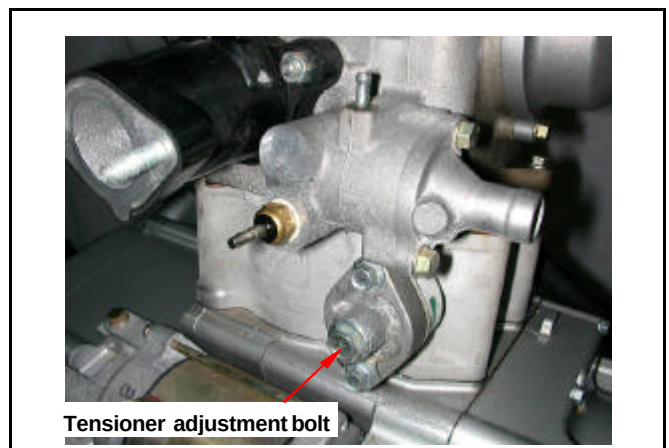
Make sure timing marks are matched.



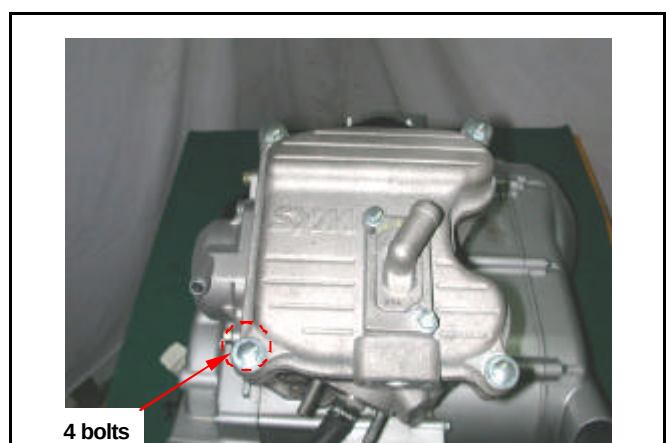
Install cylinder head side cover (3 bolts).  
Install thermostat (2 bolts).



Loosen auto tensioner adjustment bolt and remove bolt and spring.  
Install tensioner and install spring and adjustment bolt.



Install cylinder cover (4 bolts).



Install Air Injection system (AI) pipe. (4 bolts)

Install inlet pipe onto cylinder

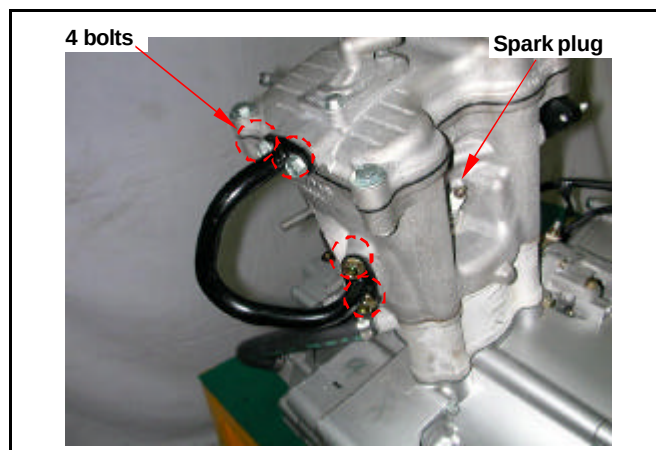
Install and tighten spark plug

**Torque value: 1.0~2.0kgf-m**

 **Caution**

This model is equipped with more precision 4-valve mechanism so its tighten torque can not be exceeded standard value in order to avoid causing cylinder head deformation, engine noise and leaking so that motorcycle's performance be effected.

Install the engine onto frame (refer chapter 5).



## 6-10 Valve Clearance Adjustment

Loosen Air Injection system (AI) pipe upper side bolt (2 bolts).

Remove cylinder head cover.



Remove the cylinder head side cover.

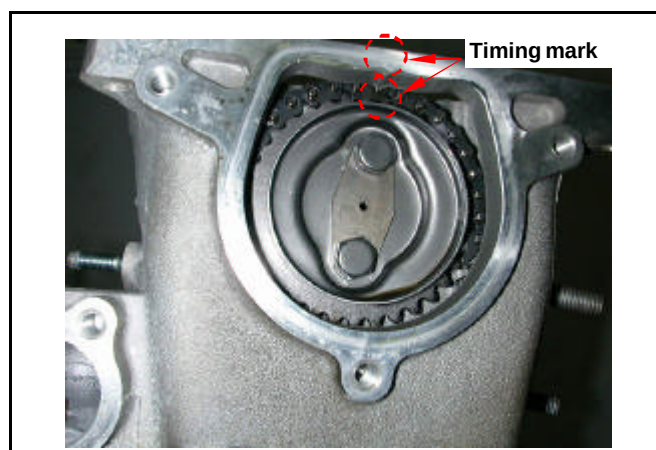
Remove left crankcase cover, and turn the drive face, and align the timing mark on the cam sprocket with that of cylinder head, piston is at TDC position.

Loosen valve clearance adjustment nuts and bolts located on valve rocker arm.

Measure and adjust valve clearance with feeler gauge.

After valve clearance had been adjusted to standard value, hold adjustment bolt and then tighten the Adjustment nut.

**Standard Value:**    **IN  $0.10 \pm 0.02$  mm**  
                              **EX  $0.15 \pm 0.02$  mm**



Install the cylinder head side cover.

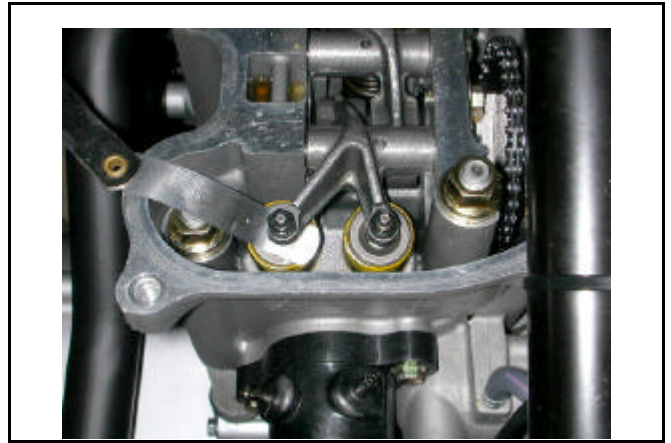
Start the engine and make sure that engine oil flows onto the cylinder head.



Stop the engine after confirmed, and then install the cylinder head cover and AI pipe.

 **Caution**

- If lubricant does not flow to cylinder head, engine components will be worn out seriously. Thus, it must be confirmed.
- When checking lubricant flowing condition, run the engine in idle speed. Do not accelerate engine speed.



## 7. CYLINDER/PISTON

7-1 Mechanism Diagram

7-2 Precautions in Operation

7-3 Trouble Diagnosis

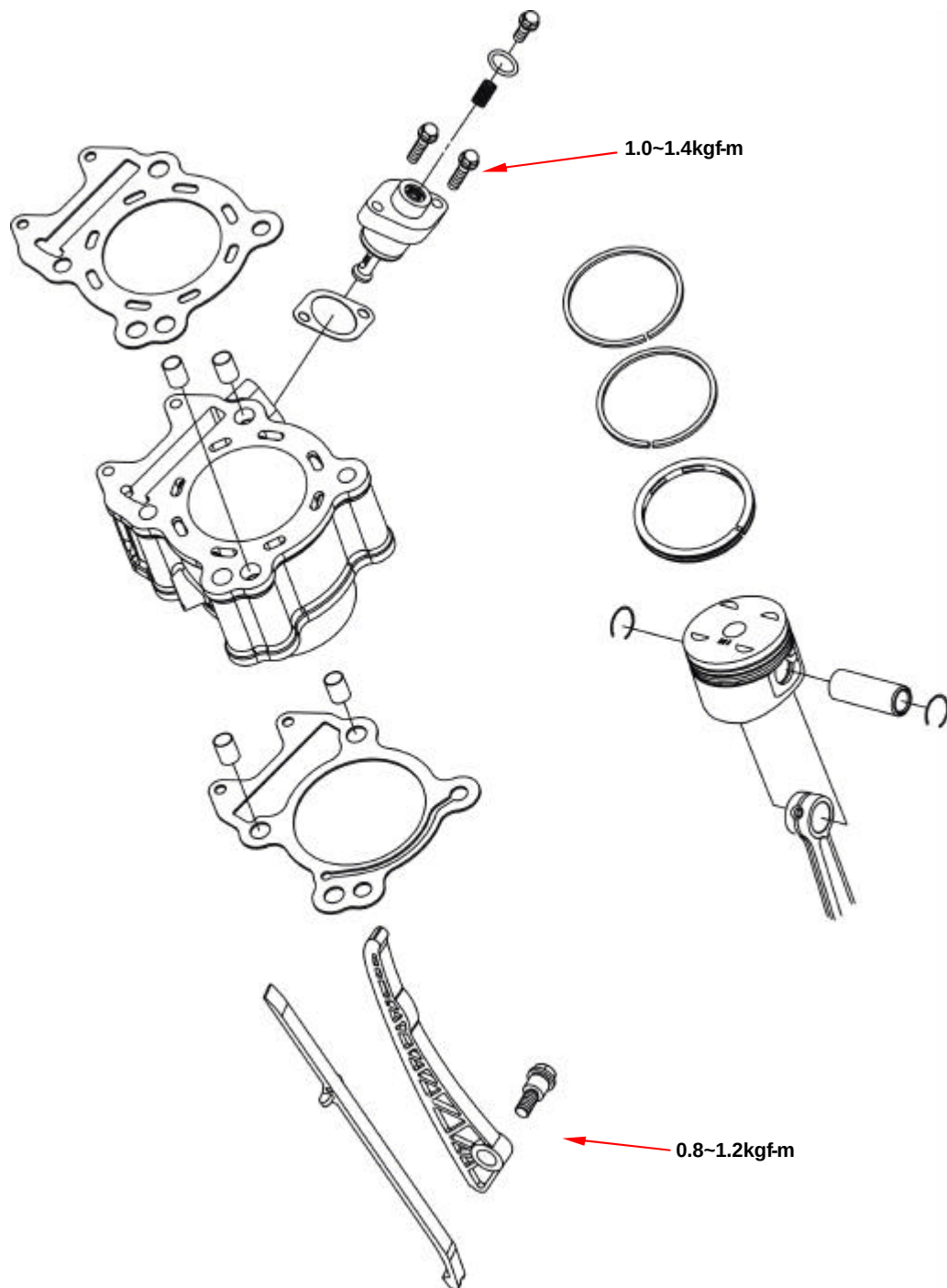


7-5 Piston Ring Installation

7-6 Piston Installation

7-7 Cylinder Installation

## 7-1 Mechanism Diagram





## 7-2 Precautions in Operation

### General Information

- Both cylinder and piston service cannot be carried out when engine mounted on frame.

### Specification of CYLINDER

| Item                                    |                                       |                      | Standard      | Limit  |
|-----------------------------------------|---------------------------------------|----------------------|---------------|--------|
| Cylinder                                | ID                                    |                      | 70.995~71.015 | 71.100 |
|                                         | Bend                                  |                      | -             | 0.050  |
| Piston/<br>Piston ring                  | Clearance between piston rings        | Top ring             | 0.015~0.050   | 0.090  |
|                                         |                                       | 2 <sup>nd</sup> ring | 0.015~0.050   | 0.090  |
|                                         | Ring-end gap                          | Top ring             | 0.150~0.300   | 0.500  |
|                                         |                                       | 2 <sup>nd</sup> ring | 0.300~0.450   | 0.650  |
|                                         |                                       | Oil ring side rail   | 0.200~0.700   | -      |
|                                         | OD of piston (2 <sup>nd</sup> )       |                      | 70.430~70.480 | 70.380 |
|                                         | Clearance between piston and cylinder |                      | 0.010~0.040   | 0.100  |
|                                         | ID of piston pin boss                 |                      | 17.002~17.008 | 16.970 |
| OD of piston pin                        |                                       |                      | 16.994~17.000 | 16.960 |
| Clearance between piston and piston pin |                                       |                      | 0.002~0.014   | 0.020  |
| ID of connecting rod small-end          |                                       |                      | 17.016~17.034 | 17.064 |

## 7-3 Trouble Diagnosis

### Low or Unstable Compression Pressure

- Cylinder or piston ring worn out

### Smoking in Exhaust Pipe

- Piston or piston ring worn out
- Piston ring installation improperly
- Cylinder or piston damage

### Knock or Noise

- Cylinder or piston ring worn out
- Carbon deposits on cylinder head top-side
- Piston pin hole and piston pin wear out

### Engine Overheat

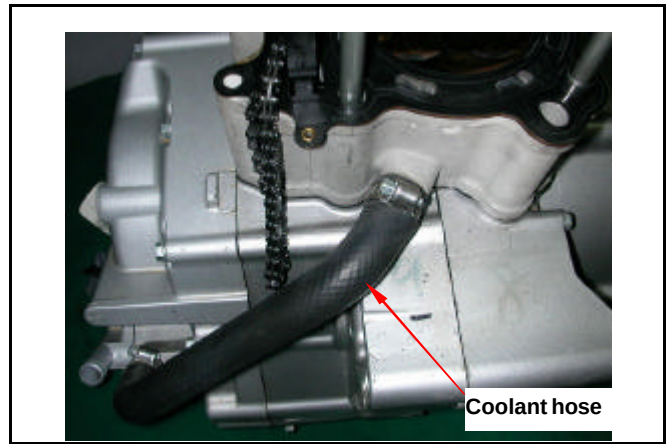
- Carbon deposits on cylinder head top side
- Cooling pipe clogged or not enough in coolant flow

## 7-4 Cylinder and Piston Removal

Remove cylinder head (refer to chapter 6).

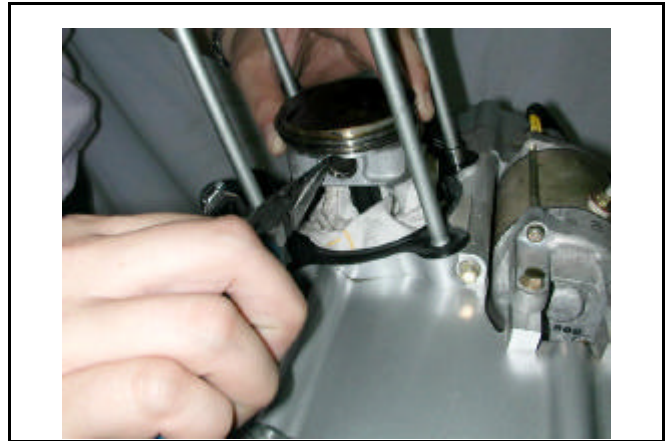
Remove coolant hose from cylinder.

Remove cylinder.



Cover the holes of crankcase and cam chain with a piece of cloth.

Remove piston pin clip, and then remove piston pin and piston.



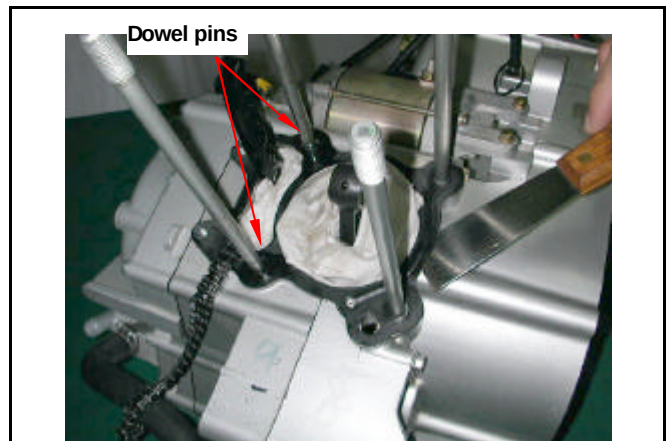
Remove cylinder gasket and dowel pin.

Clean up all residues or foreign materials from the two matching surfaces of cylinder and crankcase.



### Caution

- Soap the residues into solvent so that the residues can be removed more easily.

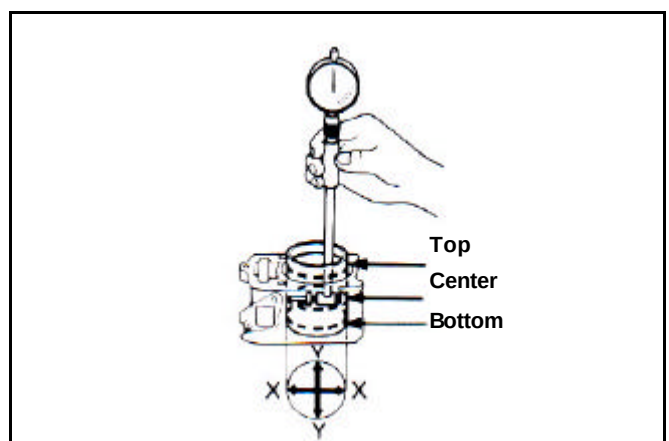


## Inspection

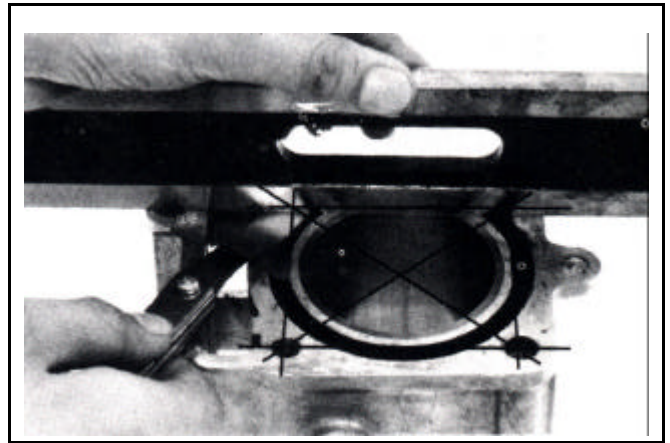
Check if the inner diameter of cylinder is wear out or damaged.

In the 3 positions, top, center and bottom, of cylinder, measure the X and Y values respective in the cylinder.

**Service limit: 71.016 mm**



Check cylinder if warp.  
**Service limit: 0.05 mm**



Measure clearance between piston rings and grooves.  
**Service Limit: Top ring: 0.09 mm**  
**2<sup>nd</sup> ring: 0.09 mm**

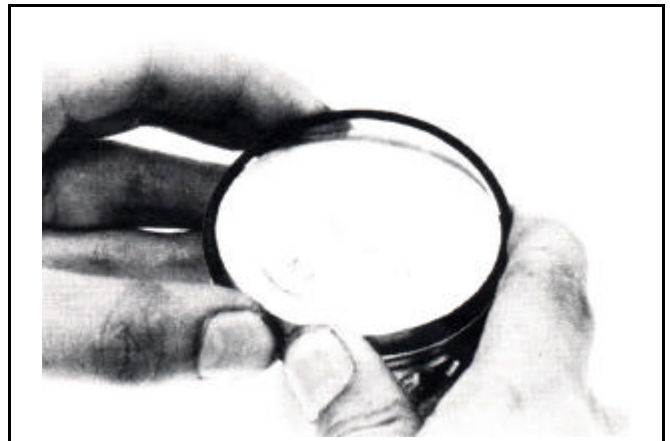


### Remove piston rings

Check if the piston rings are damaged or its grooves are worn.

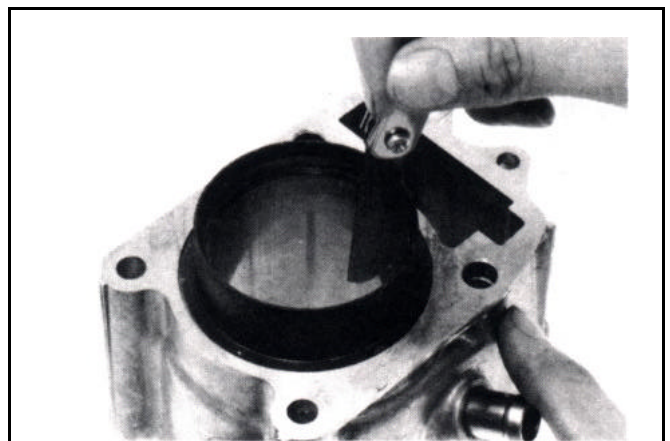
 **Caution**

Pay attention to remove piston rings because they are fragile.



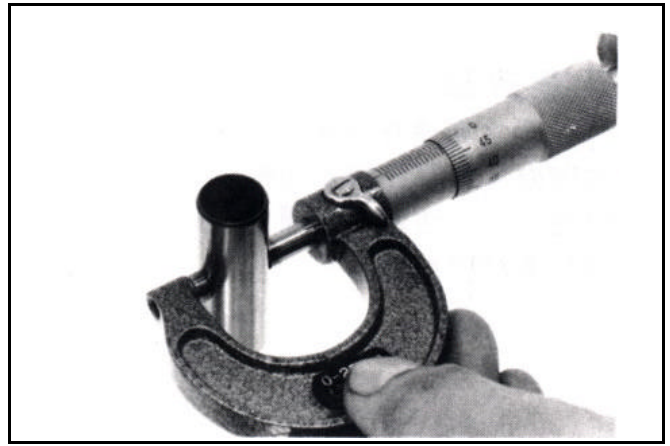
Place piston rings respective into cylinder below 20 mm of cylinder top. In order to keep the piston rings in horizontal level in cylinder, push the rings with piston.

**Service Limit: Top ring: 0.50 mm**  
**2<sup>nd</sup> ring: 0.65 mm**



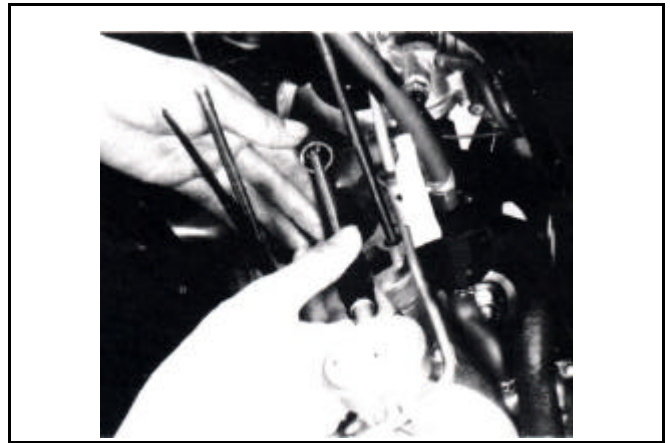
Measure the outer diameter of piston pin.

**Service Limit: 17.00 mm**



Measure the inner diameter of connecting rod small end.

**Service Limit: 17.02 mm**

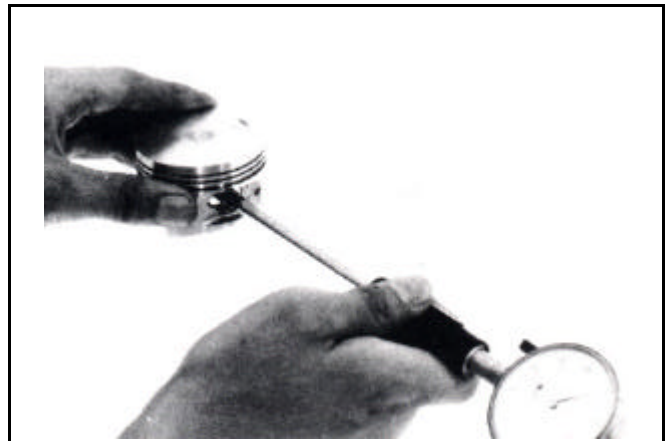


Measure the inner diameter of piston pin hole.

**Service Limit: 17.02 mm**

Calculate clearance between piston pin and its hole.

**Service Limit: 0.02 mm**



Measure piston outer diameter.

**⚠ Caution**

The measurement position is 10 mm distance from piston bottom side, and 90° to piston pin.

**Service limit? 71.00 mm**

Compare measured value with service limit to calculate the clearance between piston and cylinder.



## 7-5 Piston Ring Installation

Clean up piston top, ring groove, and piston surface.

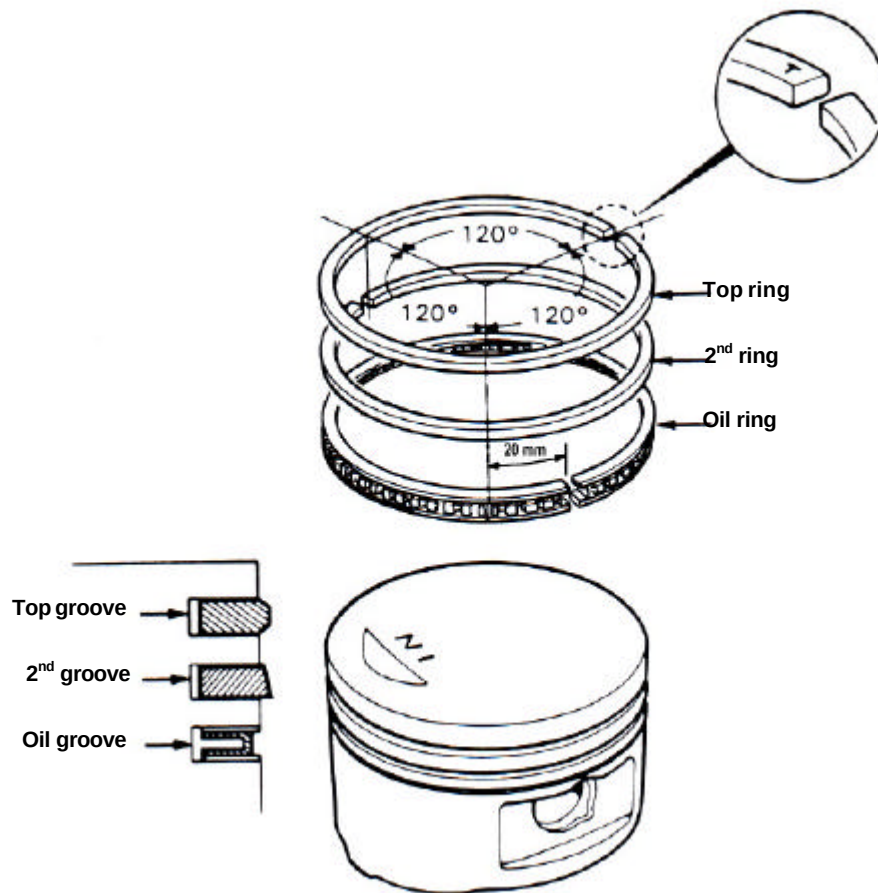
Install the piston ring onto piston carefully.

Place the openings of piston ring as diagram shown.



### Caution

- Do not damage piston and piston rings as installation.
- All marks on the piston rings must be forwarded to up side.
- Make sure that all piston rings can be rotated freely after installed.





Clean up all residues and foreign materials on the matching surface of crankcase. Pay attention to not let these residues and foreign materials fall into crankcase.

**⚠ Caution**

Soap the residues into solvent so that the residues can be removed more easily.



## 7-6 Piston Installation

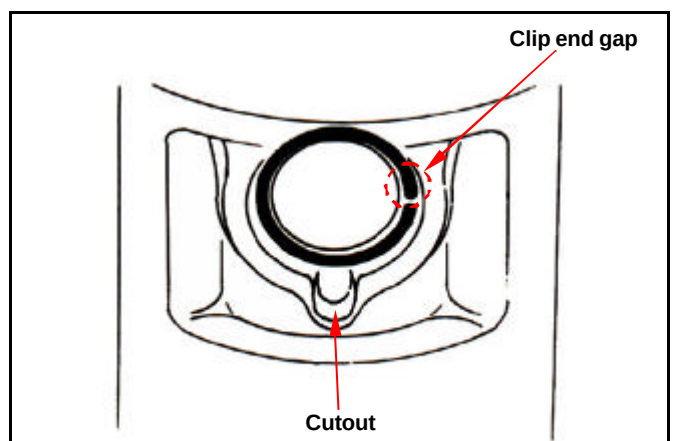
Install piston and piston pin, and place the IN marks on the piston top side forward to inlet valve.



Install new piston pin clip.

**⚠ Caution**

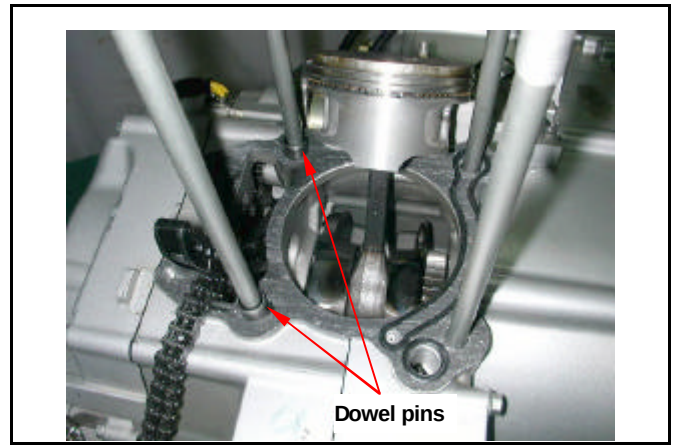
- Do not let the opening of piston pin clip align with the piston cutout.
- Place a piece of cloth between piston and crankcase in order to prevent snap ring from falling into crankcase as operation.





## 7-7 Cylinder Installation

Install dowel pins and new gasket.



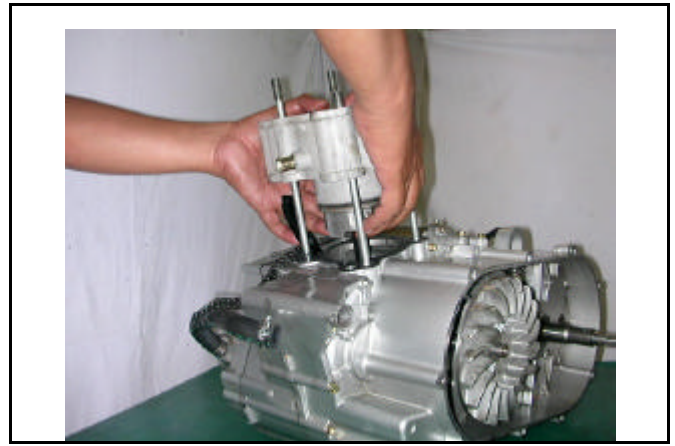
Coat some engine oil to inside of cylinder, piston and piston rings.

Care to be taken when installing piston into cylinder.

Press piston rings in one by one as installation.

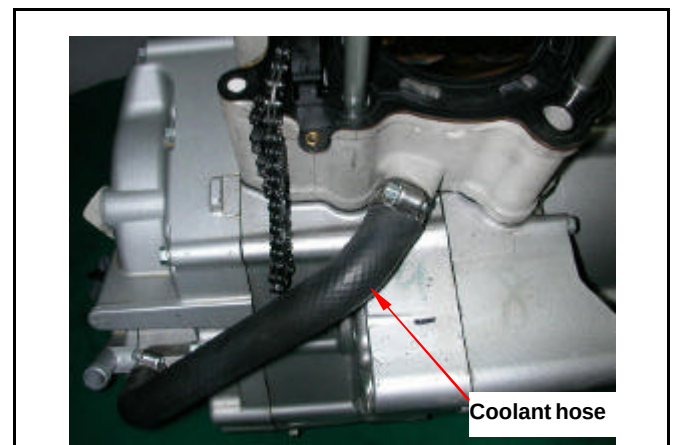
**⚠ Caution**

Do not push piston into cylinder forcefully because piston and piston rings will be damaged.◦



Install coolant hose onto cylinder.

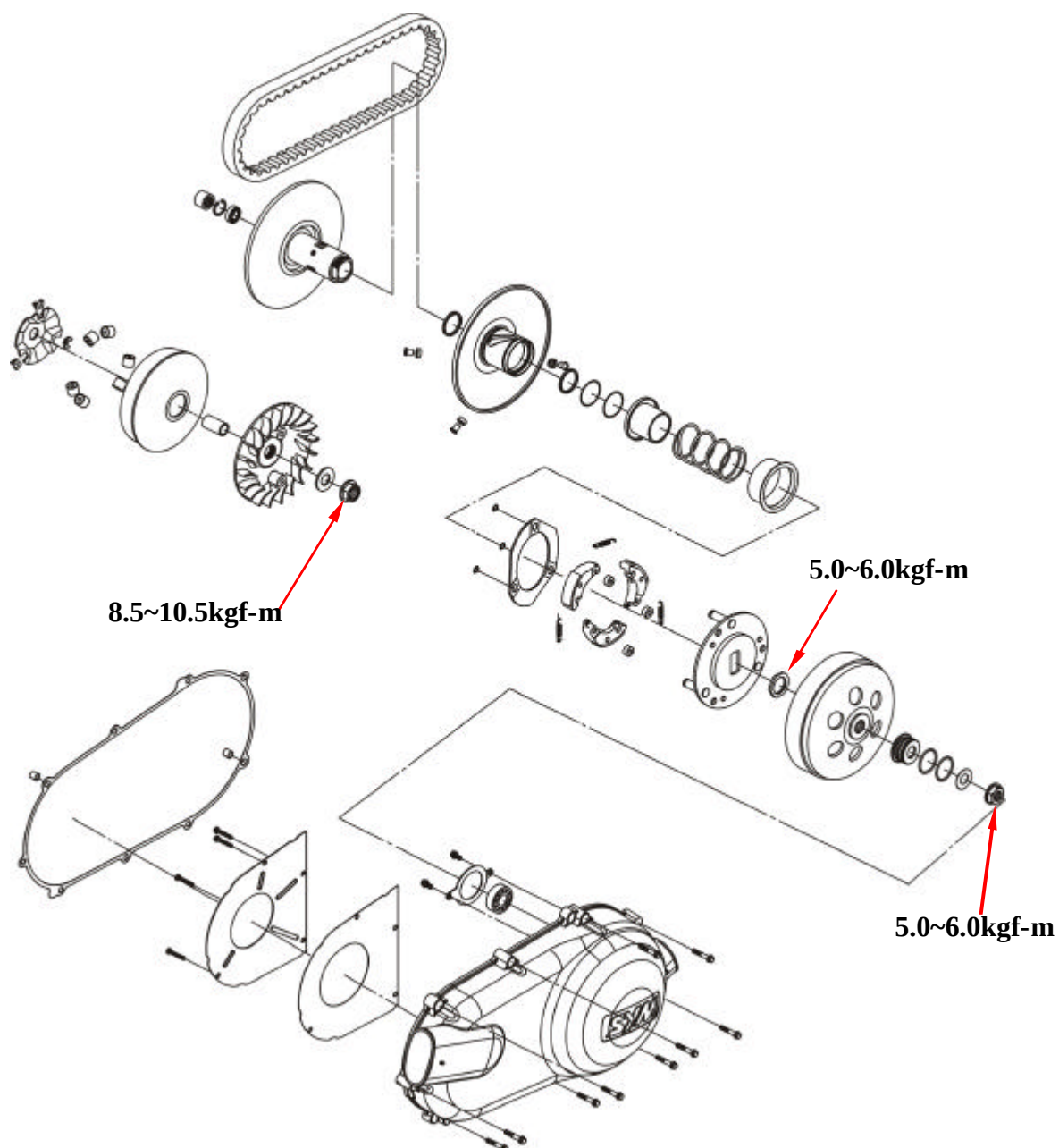
Install cylinder head (refer to Chapter 6).



## 8. V-BELT DRIVING SYSTEM

|                             |                                |
|-----------------------------|--------------------------------|
| 8-1 Mechanism Diagram       | 8-5 Drive Belt                 |
| 8-2 Maintenance Description | 8-6 Drive Face                 |
| 8-3 Trouble Diagnosis       | 8-7 Clutch Outer/Driven Pulley |
| 8-4 Left Crankcase Cover    |                                |

### 8-1 Mechanism Diagram



## 8-2 Maintenance Description

### Precautions in Operation

#### General Information

- Drive face, clutch outer, and driven pulley can be serviced on the motorcycle.
- Drive belt and drive pulley must be free of grease.

#### Specification of V-BELT SYSTEM

| Item                                | Standard value (mm) | Limit (mm) |
|-------------------------------------|---------------------|------------|
| Driving belt width                  | 24.000              | 22.500     |
| OD of movable drive face boss       | 29.946~29.980       | 29.926     |
| ID of movable drive face            | 30.000~30.040       | 30.060     |
| OD of weight roller                 | 19.500~20.000       | 19.000     |
| ID of clutch outer                  | 144.850~145.150     | 145.450    |
| Thickness of clutch weight          | 6.000               | 3.000      |
| Free length of driven pulley spring | 102.400             | 97.400     |
| OD of driven pulley boss            | 40.950~40.990       | 40.930     |
| ID of driven face                   | 41.000~41.050       | 41.070     |
| Weight of weight roller             | 17.700~18.300 g     | 17.200 g   |

#### Torque value

- Drive face nut: 8.5~10.5kgf-m
- Clutch outer nut: 5.0~6.0kgf-m
- Drive plate nut: 5.0~6.0kgf-m

Clutch spring compressor: SYM-2301000

Inner bearing puller: SYM-6204002

Clutch nut wrench 39 x 41 mm: SYM-9020200

Universal holder: SYM-2210100

Bearing driver: SYM-9100100

#### Special Service Tools

## 8-3 Trouble Diagnosis

#### Engine can be started but motorcycle can not be moved

1. Worn drive Belt
2. Worn drive face
3. Worn or damaged clutch weight
4. Broken driven pulley

#### Insufficient horsepower or poor high speed performance

1. Worn drive belt
2. Insufficient spring force of driven pulley
3. Worn roller
4. Driven pulley operation un-smoothly

#### Shudder or misfire when driving

1. Broken clutch weight
2. Worn clutch weight

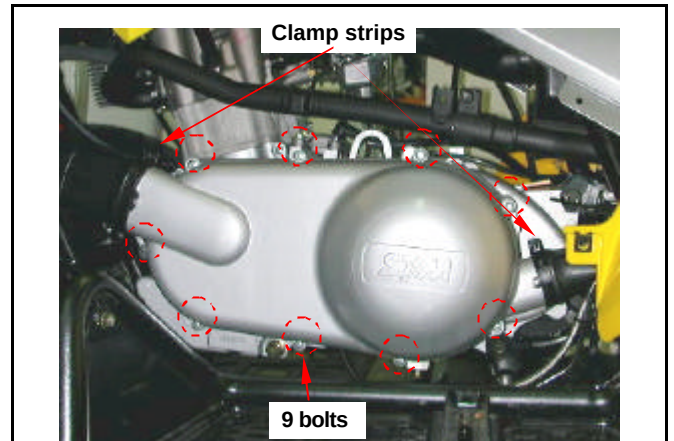
## 8-4 Left Crankcase Cover

### Left crankcase cover removal

Release the 2 clamp strips of left crankcase cover ducts, and then remove the ducts.

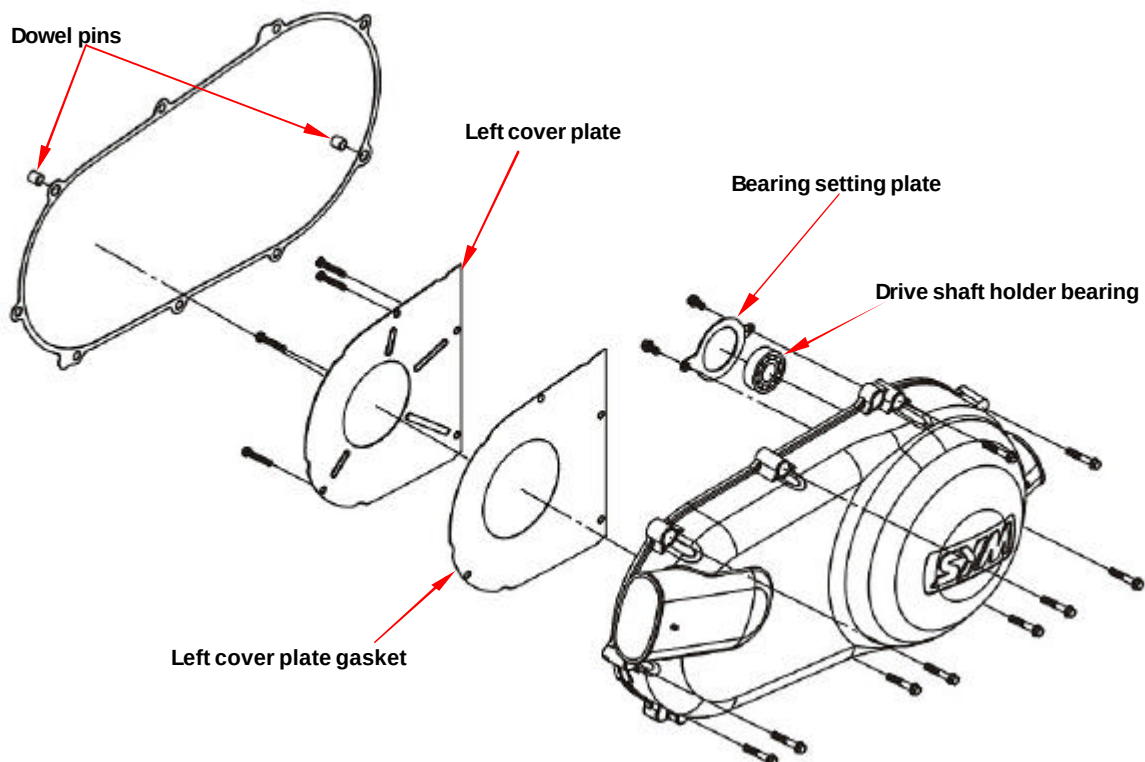
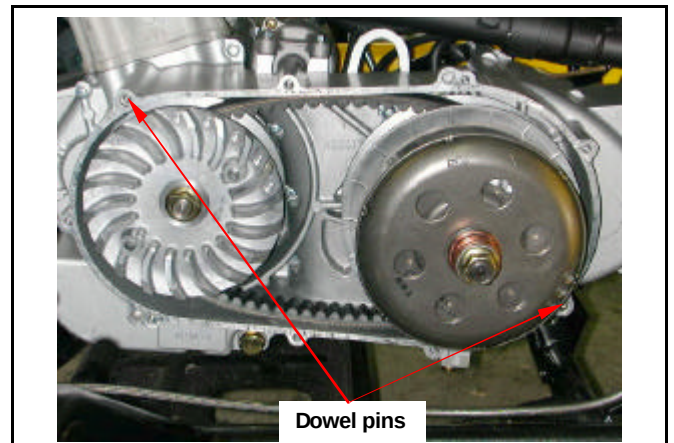
Remove left crankcase cover. (9 bolts)

Remove 2 dowel pin and gasket.



### Left crankcase cover install

Install left crankcase cover in the reverse procedures of removal.

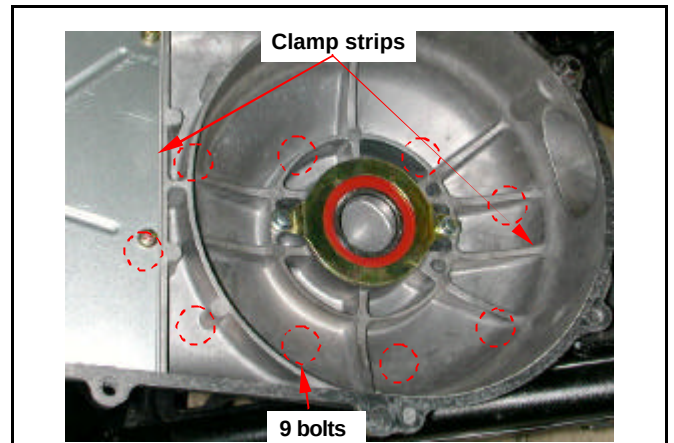


### Left crankcase cover inspection

Release the 2 clamp strips of left crankcase cover ducts, and then remove the ducts.

Remove left crankcase cover. (9 bolts)

Remove 2 dowel pin and gasket.





## 8-5 Drive Belt

### Removal

Remove left crankcase cover.

Hold drive face with universal holder, and remove nut and drive face.

**Special Tool : universal holder**

Hold clutch outer with universal holder, and remove nut, bearing stay collar and clutch outer.

### Caution

- Using special service tools for tightening or loosening the nut.
- Fixed rear wheel or rear brake will damage reduction gear system.

Push the drive belt into belt groove as diagram shown so that the belt can be loosened, and then remove the driven pulley.

Remove driven pulley. Do not remove drive belt. Remove the drive belt from the groove of driven pulley.

### Inspection

Check the drive belt for crack or wear. Replace it if necessary.

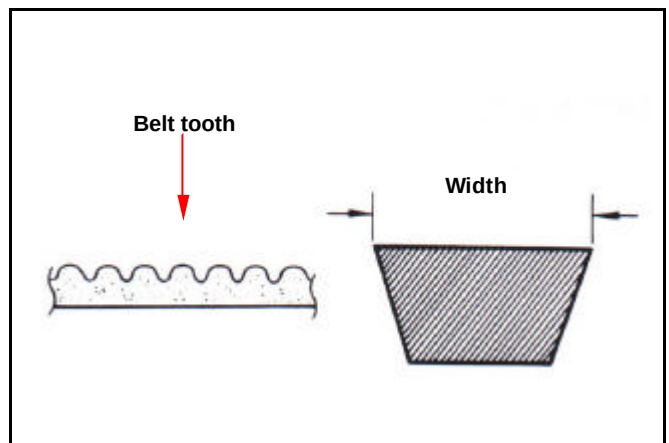
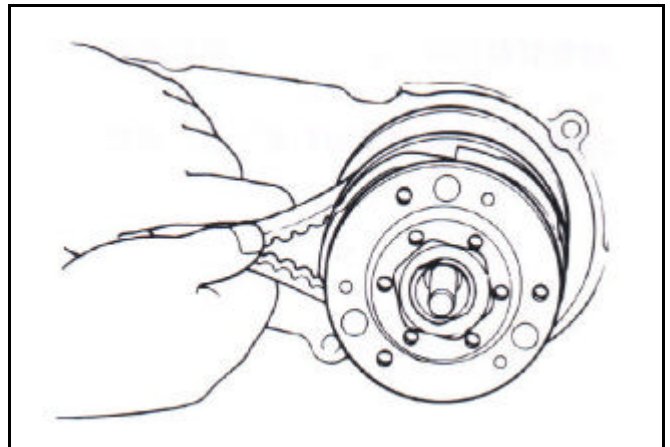
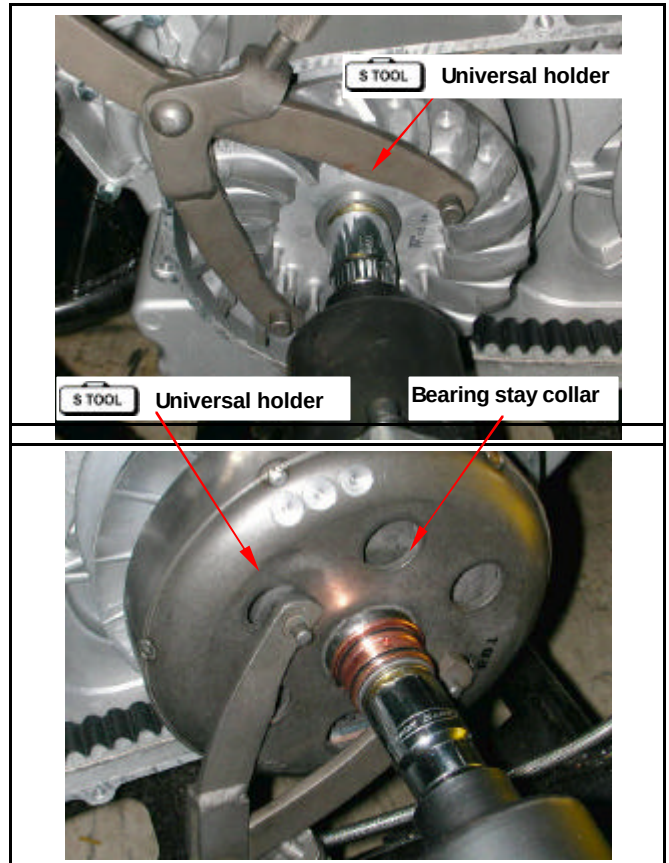
Measure the width of drive belt as diagram shown.

**Service Limit: 22.5 mm**

Replace the belt if exceeds the service limit.

### Caution

- Using the genuine parts for replacement.
- The surfaces of drive belt or pulley must be free of grease.
- Clean up all grease or dirt before installation.



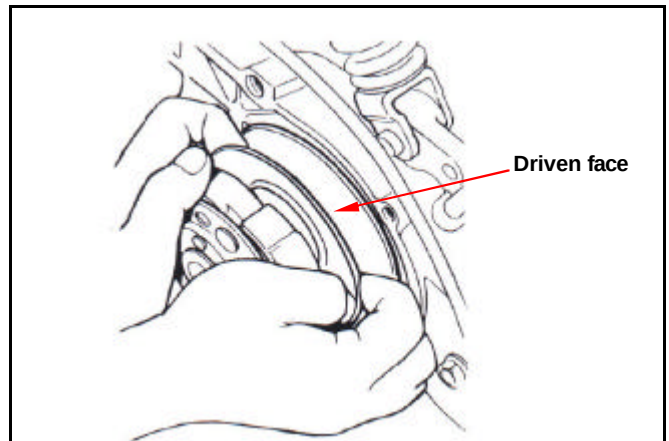
## Installation



### Caution

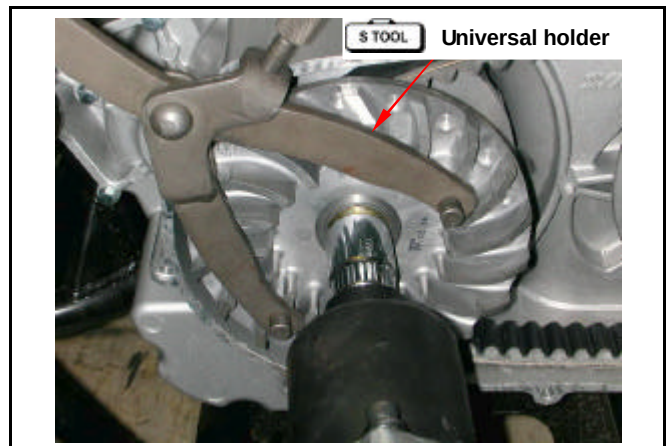
- Pull out driven face to avoid it closing.
- Cannot oppress friction plate comp in order to avoid creates the distortion or the damage.

Install drive belt onto driven pulley.



Install the driven pulley that has installed the belt onto drive shaft.

On the drive belt another end to the movable drive face.



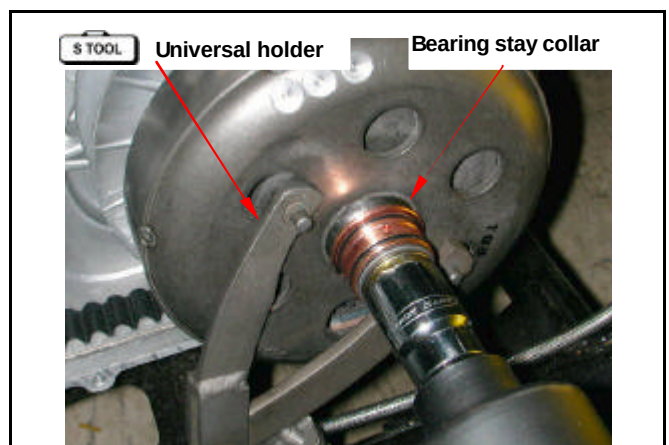
Install the drive face, washer and drive face nut. Hold drive face with universal holder, and then tighten nut to specified torque value.

**Torque value: 8.5~10.5kgf-m**



Install the clutch outer and bearing stay collar. Hold the clutch outer with universal holder, and then tighten nut to specified torque value.

**Torque value: 5.0~6.0kgf-m**



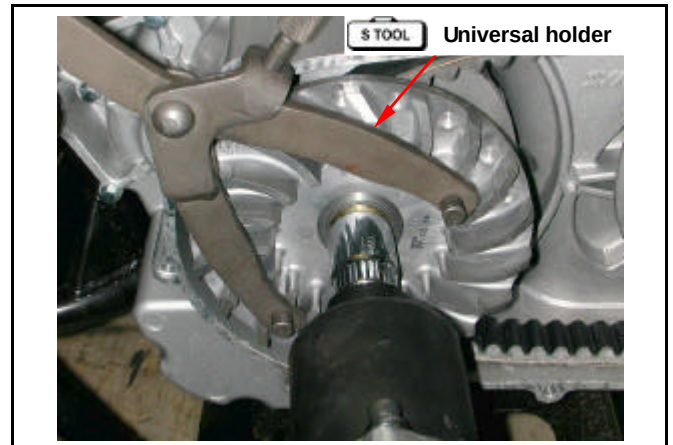
## 8-6 Drive Face

### Removal

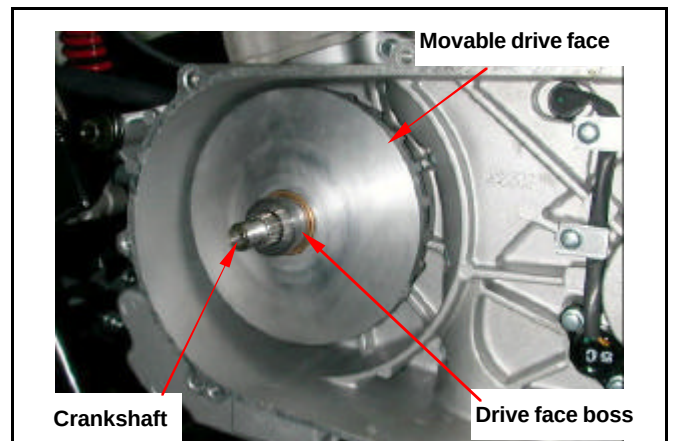
Remove left crankcase cover.

Hold drive face with universal holder, and then remove drive face nut.

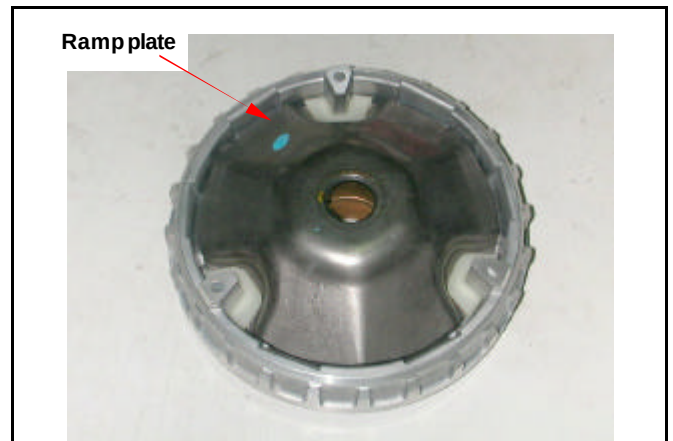
Remove drive face and drive belt.



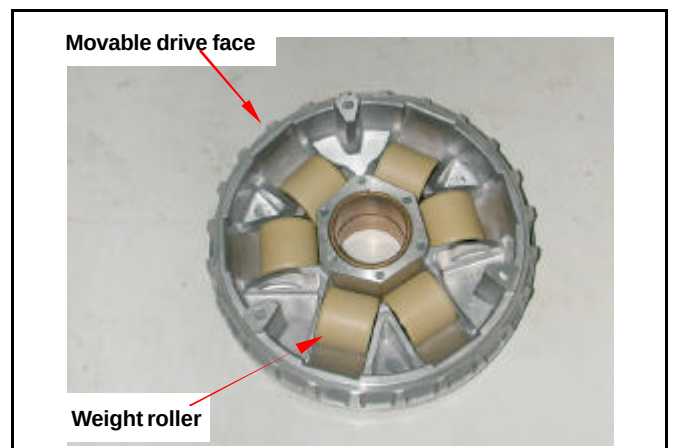
Remove movable drive face comp and drive face boss from crankshaft.



Remove ramp plate.



Remove weight rollers from movable drive face.





## Inspection

The weight rollers are to press movable drive face by means of centrifuge force.

Thus, if weight rollers are worn out or damaged, the centrifuge force will be affected.

Check if rollers are worn or damaged. Replace it if necessary.

Measure each roller's outer diameter. Replace it if exceed the service limit.

**Service limit:**   mm

Weight 18.2g

Check if drive face boss is worn or damaged and replace it if necessary.

Measure the outer diameter of movable drive face boss, and replace it if it exceed service limit.

**Service limit:**   mm

Measure the inner diameter of movable drive face, and replace it if it exceed service limit.

**Service limit:**   mm

## Reassembly/installation

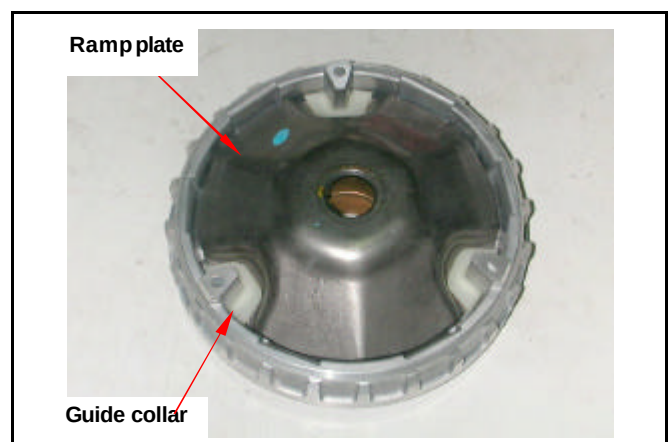
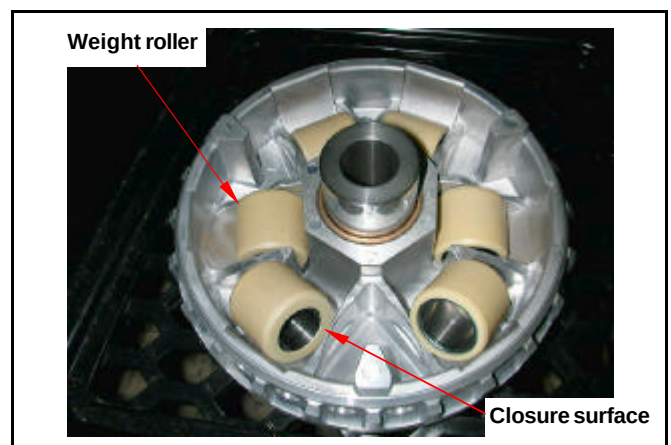
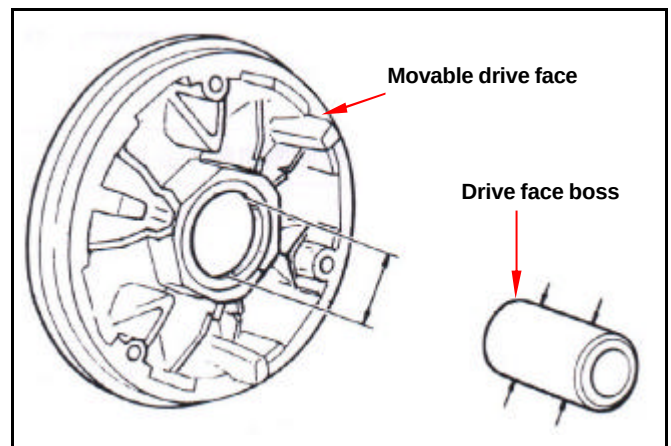
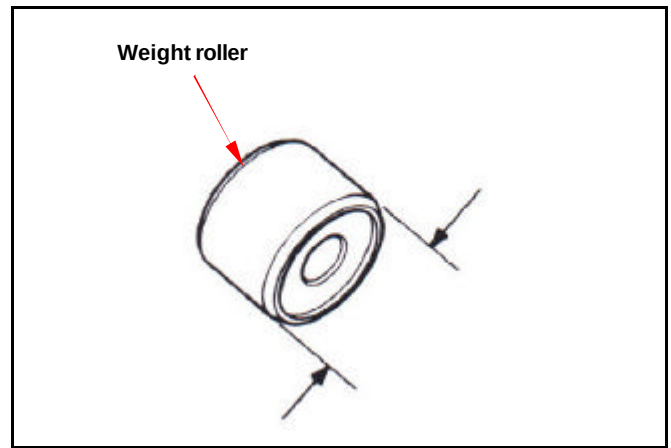
Install weight rollers.



### Caution

The weight roller two end surfaces are not certainly same. In order to lengthen the roller life and prevented exceptionally wears the occurrence, Please end surface of the closure surface counter clockwise assembles onto movable drive face.

Install ramp plate.



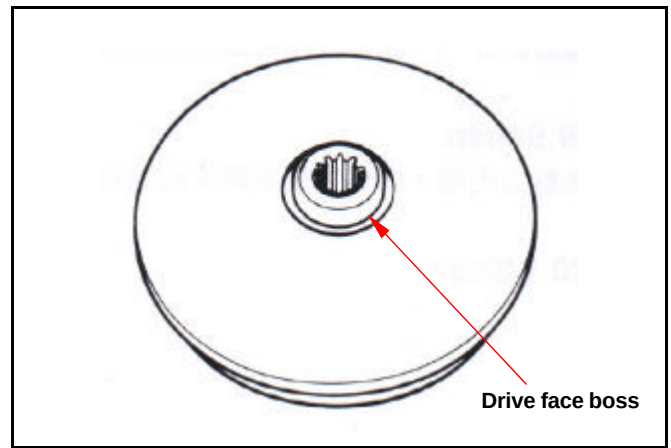
With 4~5g grease spreads wipes drives in the movable drive face axis hole.

Install drive face boss.

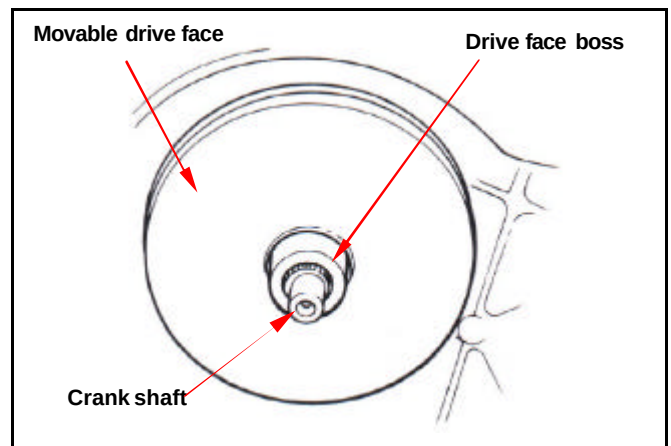


### Caution

The movable drive face surface has to be free of grease. Clean it with cleaning solvent.

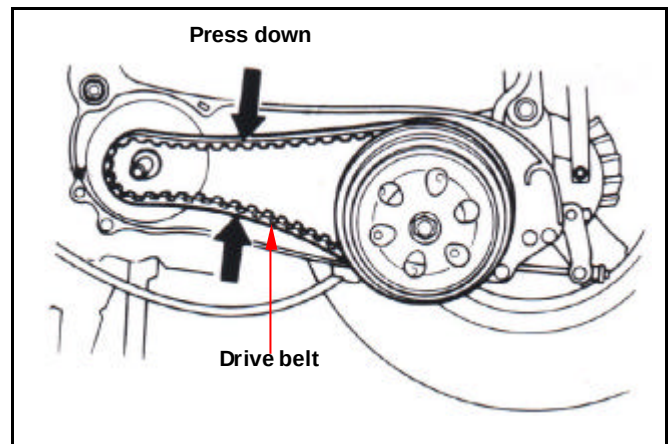


Install movable drive face comp. onto crankshaft.



### Driven pulley installation

Press drive belt into pulley groove, and then pull the belt onto drive shaft.



Install drive face, washer and nut.



### Caution

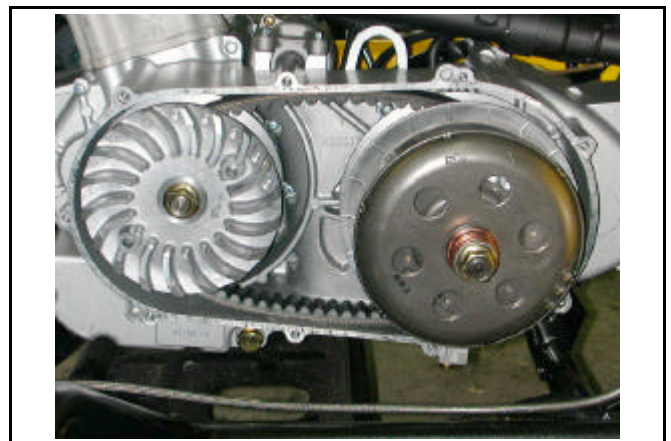
Make sure that two sides of pulley surfaces have to be free of grease. Clean it with cleaning solvent.

Hold drives face with universal holder.

Tighten nut to specified torque.

**Torque value: 8.5~10.5kgf-m**

Install left crankcase cover.



## 8-7 Clutch Outer/Driven Pulley

### Disassembly

Remove drive belt, clutch outer and driven pulley. Install clutch spring compressor onto the pulley assembly, and operate the compressor to let the wrench be installed more easily.

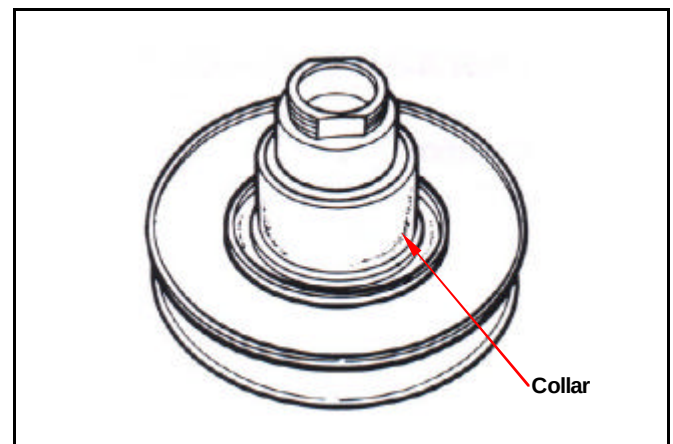
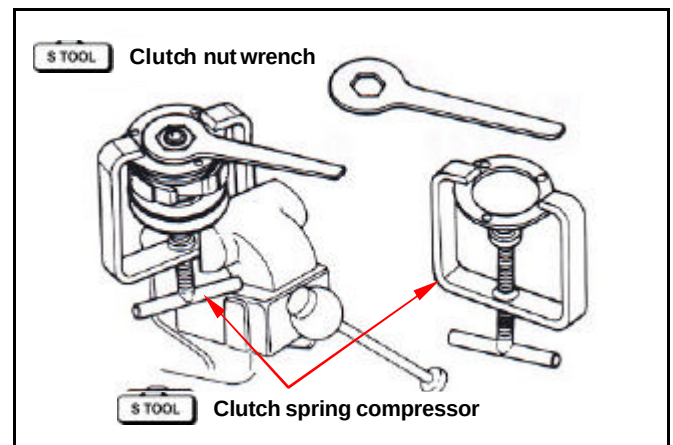
### Caution

Do not press the compressor too much.

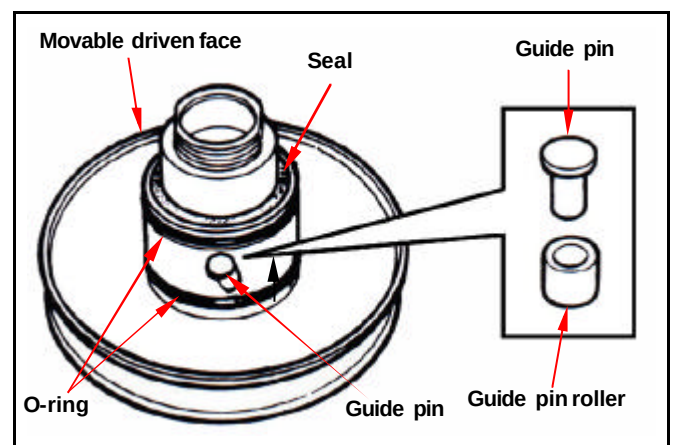
Hold the clutch spring compressor onto bench vise, and then remove mounting nut with special service tool.

Release the clutch spring compressor and remove friction plate, clutch weight and spring from driven pulley.

Remove seal collar from driven pulley.



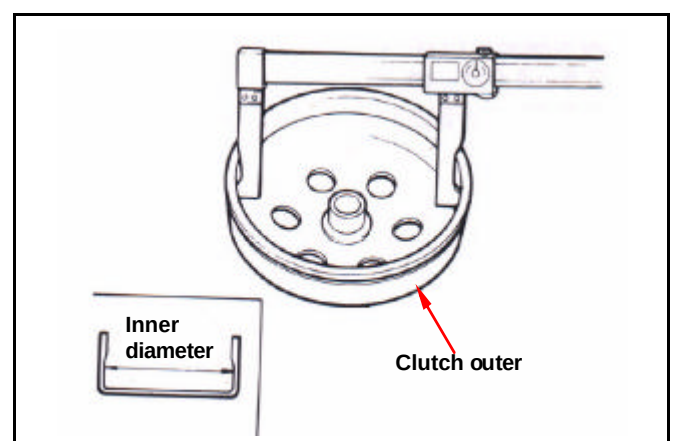
Remove guide pin, guide pin roller, and movable driven face, and then remove O-ring & oil seal seat from movable driven face.



### Inspection Clutch outer

Measure the inner diameter of clutch outer. Replace the clutch outer if exceed service limit.

**Service limit: mm**

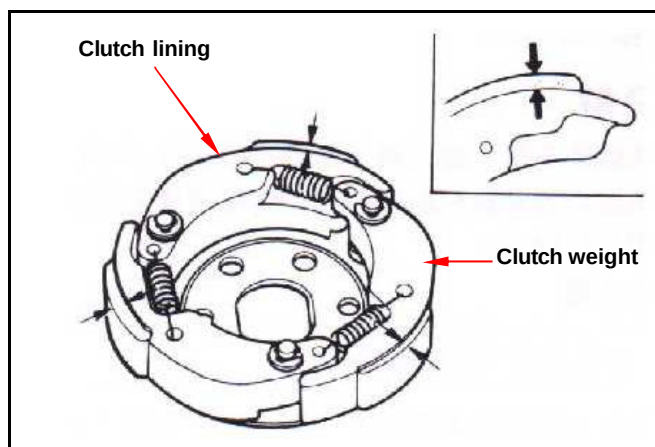




### Clutch lining

Measure each clutch weight thickness. Replace it if exceeds service limit.

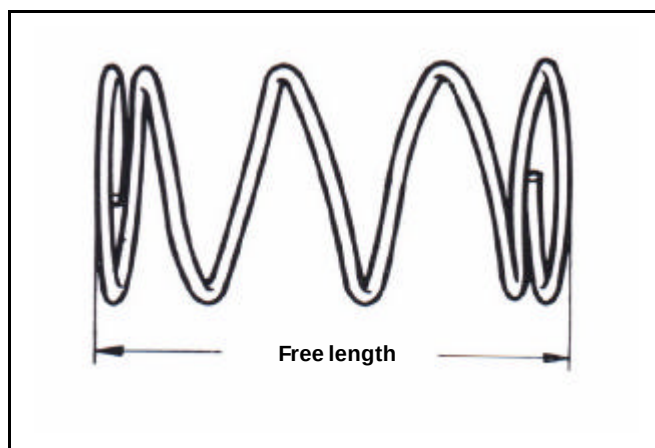
**Service limit: 2.0 mm**



### Driven pulley spring

Measure the length of driven pulley spring. Replace it if exceeds service limit.

**Service limit: 83.2 mm**



### Driven pulley

Check following items:

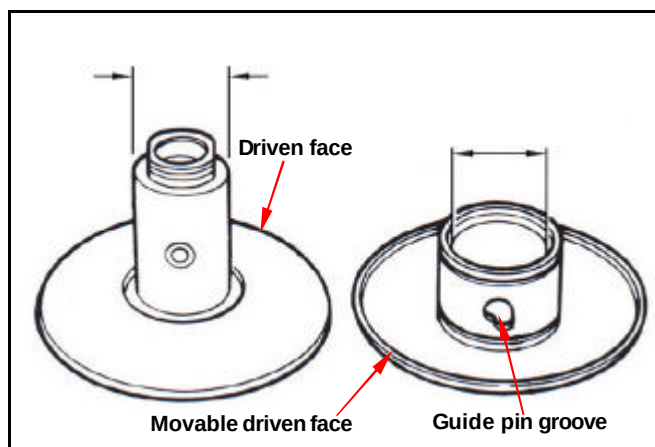
- If both surfaces are damaged or worn.
- If guide pin groove is damaged or worn.

Replace damaged or worn components.

Measure the outer diameter of driven face and the inner diameter of movable driven face. Replace it if exceeds service limit.

**Service limit: Outer diameter 33.94 mm**

**Inner diameter 34.06 mm**



### Driven Pulley Bearing Inspection

Check if the inner bearing oil seal is damage.

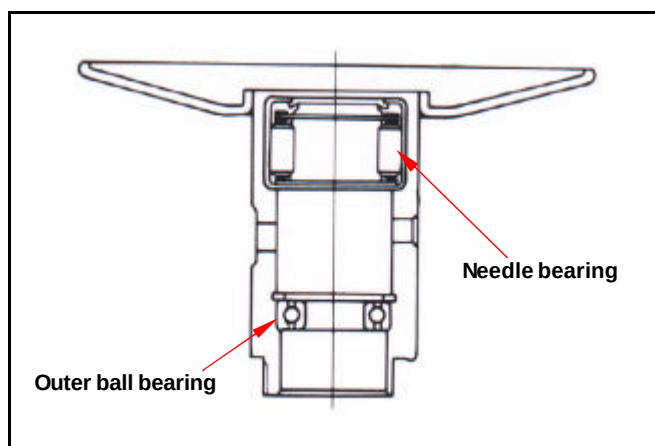
Replace it if necessary.

Check if needle bearing is damage or too big clearance. Replace it if necessary.

Rotate the inside of inner bearing with fingers to check if the bearing rotation is in smooth and silent.

Check if the bearing outer parts are closed and fixed.

Replace it if necessary.



## Clutch weight Replacement

Remove snap ring and washer, and then remove clutch weight and spring from driving plate.



### Caution

Some of models are equipped with one mounting plate instead of 3 snap rings.

Check if spring is damage or insufficient elasticity.

Check if shock absorption rubber is damage or deformation. Replace it if necessary.  
Apply with grease onto setting pins.

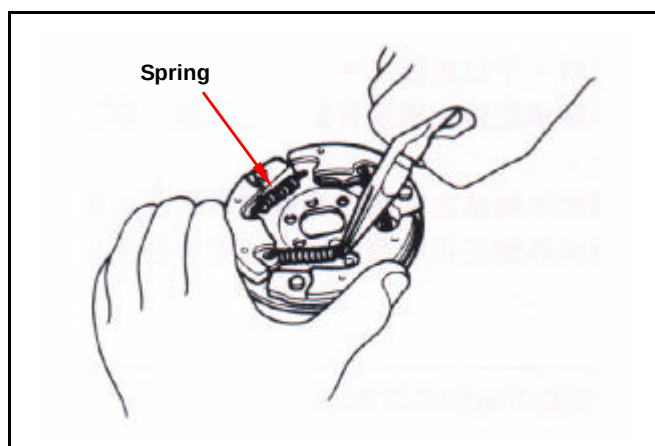
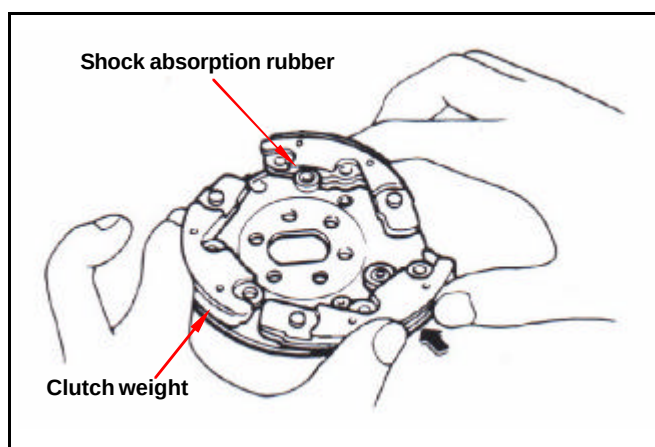
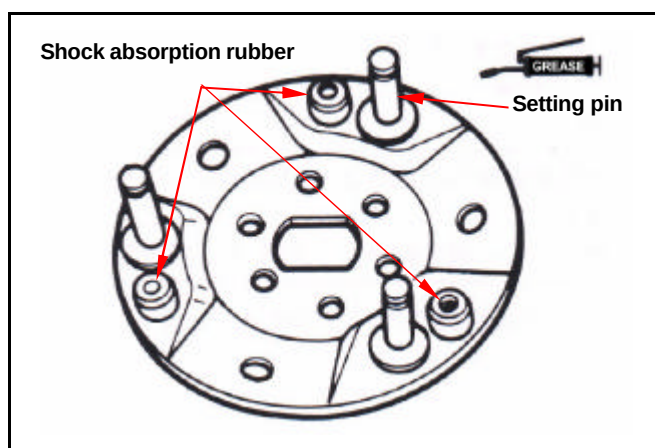
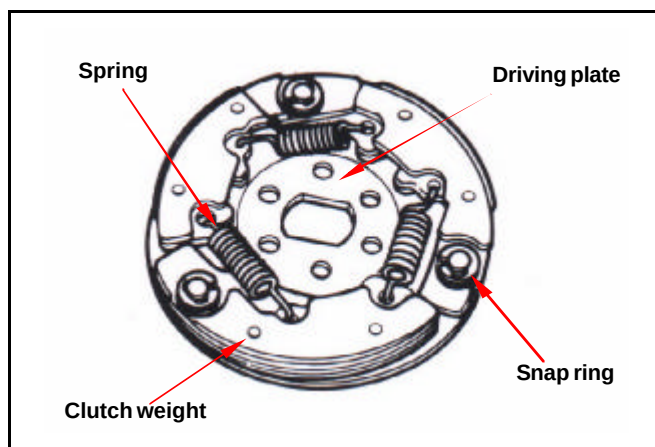
Install new clutch weight onto setting pin and then push to the specified location.  
Apply with grease onto setting pins.  
But, the clutch block should not be greased. If so, replace it.



### Caution

Grease or lubricant will damage the clutch weight and affect the block's connection capacity.

Install the spring into groove with pliers.



Install snap ring and mounting plate onto setting pin.

## Replacement of Driven Pulley Bearing

Remove inner bearing.

### Caution

- If the inner bearing equipped with oil seal on side in the driven pulley, then remove the oil seal firstly.
- If the pulley equipped with ball bearing, it has to remove snap ring and then the bearing.

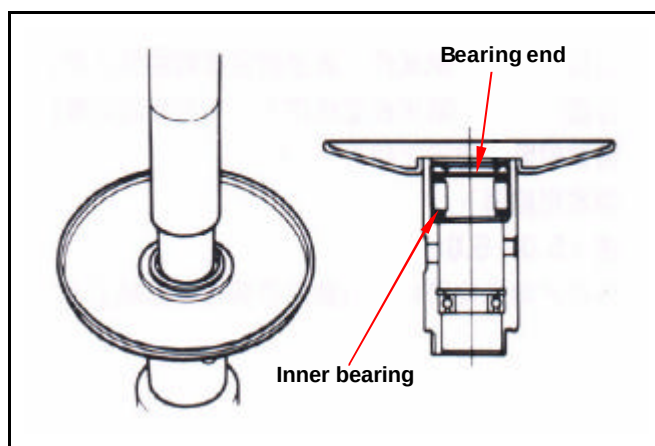
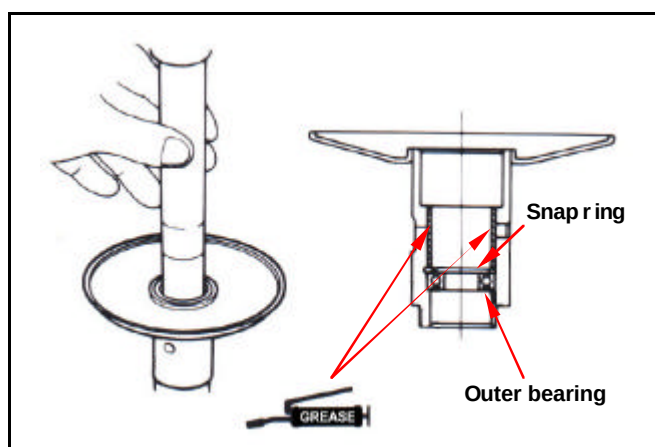
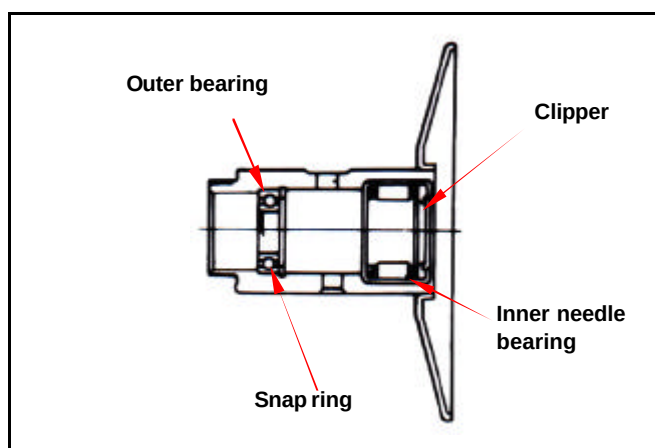
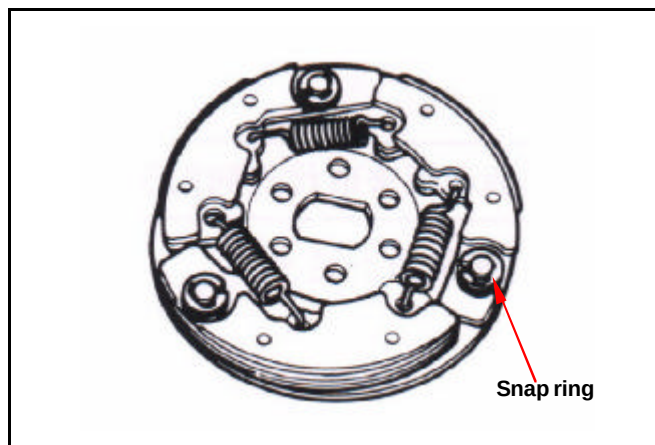
Remove snap ring and then push bearing forward to other side of inner bearing.  
Place new bearing onto proper position and its sealing end should be forwarded to outside. Apply with specified oil.

Install new inner bearing.

### Caution

- Its sealing end should be forwarded to outside as bearing installation.
- Install needle bearing with hydraulic presser. Install ball bearing by means of hydraulic presser.

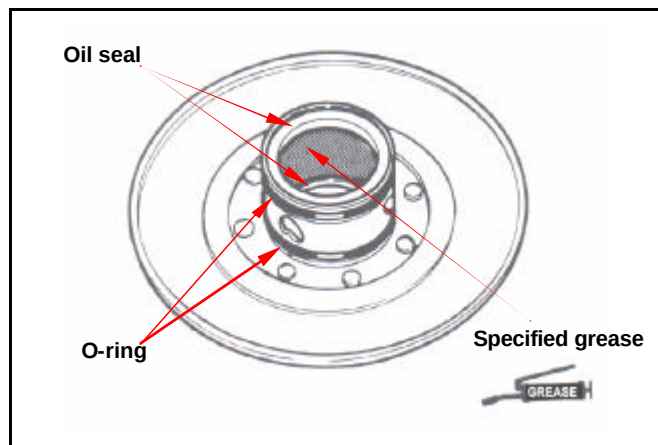
Install snap ring into the groove of drive face.  
Align oil seal lip with bearing, and then install the new oil seal (if necessary).



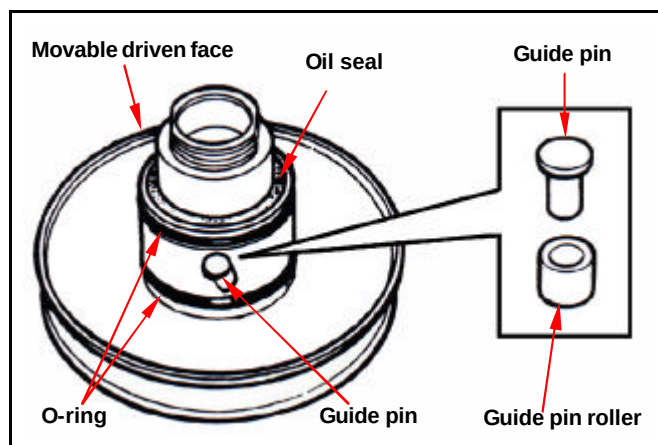
## Installation of Clutch OUTER/Driven Pulley Assembly

Install new oil seal and O-ring onto movable driven face.

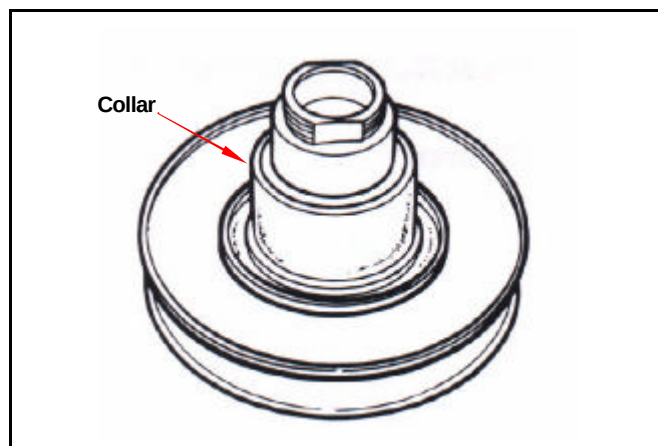
Apply with specified grease to lubricate the inside of movable driven face.



Install the movable driven face onto driven face.  
Install the guide pin and guide pin roller.



Install the collar.



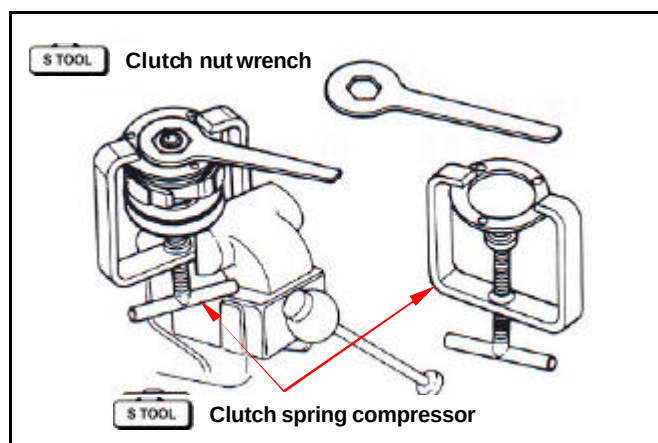
Install friction plate, spring and clutch weight into clutch spring compressor, and press down the assembly by turning manual lever until mounting nut that can be installed.

Hold the compressor by bench vise and tighten the mounting nut to specified torque with clutch nut wrench.

Remove the clutch spring compressor.

**Torque value: 5.0~6.0kgf-m**

Install clutch outer/driven pulley and drive belt onto drive shaft.





## 9. FINAL DRIVING MECHANISM

9-1 Mechanism Diagram - transmission cover

9-2 Precautions in operation

9-3 Trouble Diagnosis

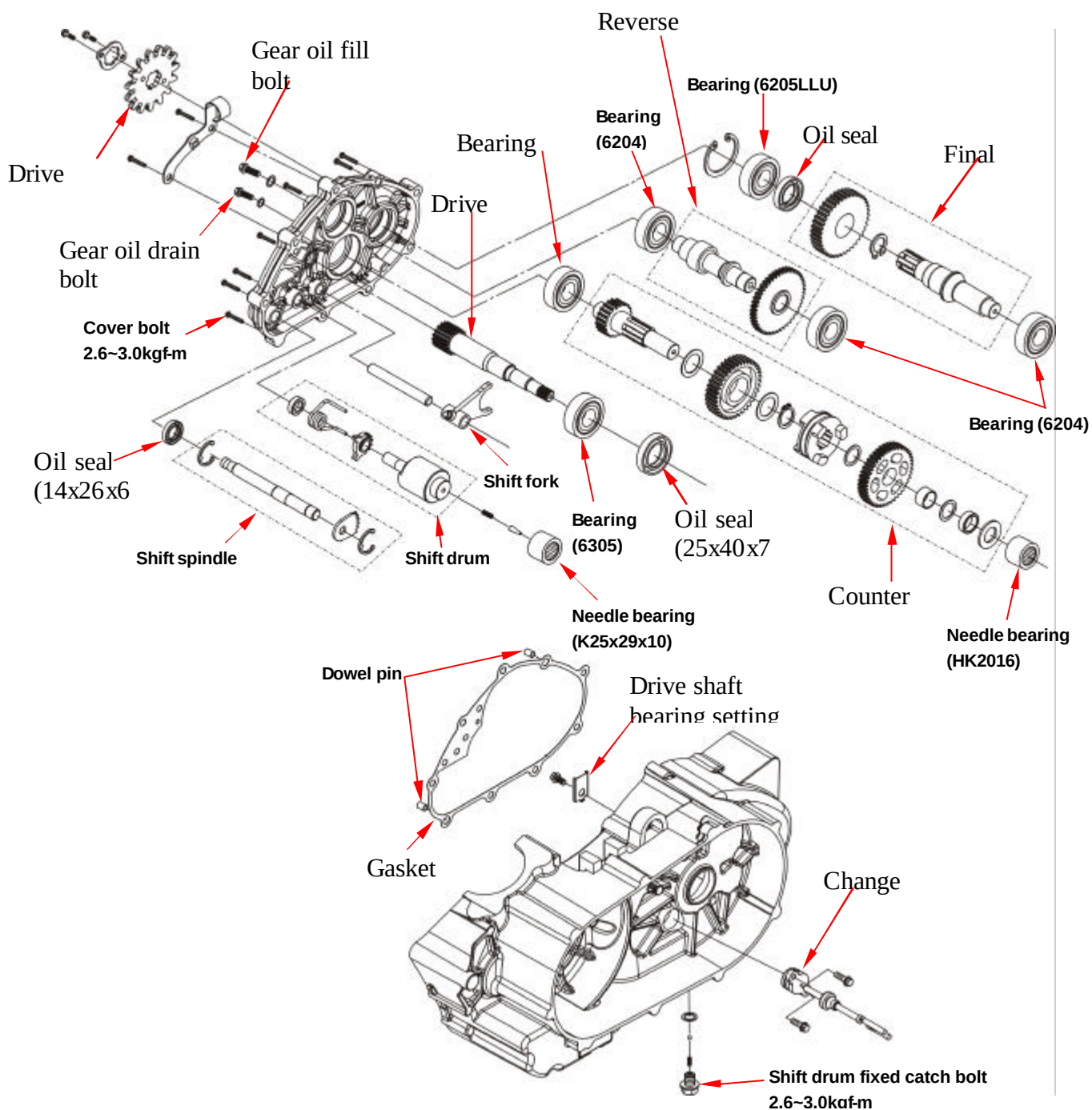
9-4 Disassembly of Transmission

9-5 Inspection of Mission Mechanism

9-6 Bearing Replacement

9-7 Re-assembly of Final Driving Mechanism

### 9-1 Mechanism Diagram - transmission cover





## 9-2 Precautions in operation

### Specification

Application oil: scooter gear oil

Recommended oil: KING MATE serial gear oils

Oil quantity: 750c.c. (650c.c. when replacing)

### Torque value

|                     |              |
|---------------------|--------------|
| Gear box cover      | 2.6~3.0kgf-m |
| Gear oil drain bolt | 0.8~1.2kgf-m |
| Gear oil fill bolt  | 3.5~4.5kgf-m |

### Tools

#### Special tools

Bearing driver (6204): SYM-9110400

Bearing driver (6205LLU): SYM-9100400-HMA

Bearing driver (6305): SYM-9100400-RB1

Needle bearing driver (HK2016): SYM-9100300-RB1

Drive shaft and oil seal driver: SYM-9120200-HMA

Drive shaft puller: SYM-2341100

Inner bearing puller: SYM-6204002

## 9-3 Trouble Diagnosis

### Engine can be started but motorcycle can not be moved.

- Damaged drive gear
- Burnt out drive gear
- Damaged gear shift system

### Noise

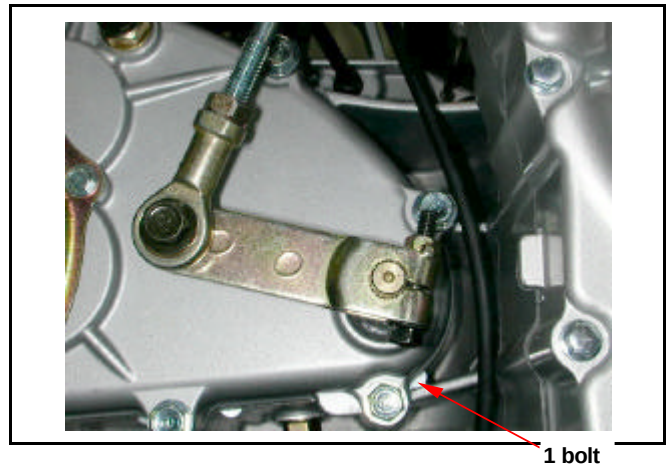
- Worn or burnt gear
- Worn gear

### Gear oil leaks

- Excessive gear oil.
- Worn or damage oil seal

## 9-4 Disassembly of Transmission

Remove gear change lever (1 bolt).

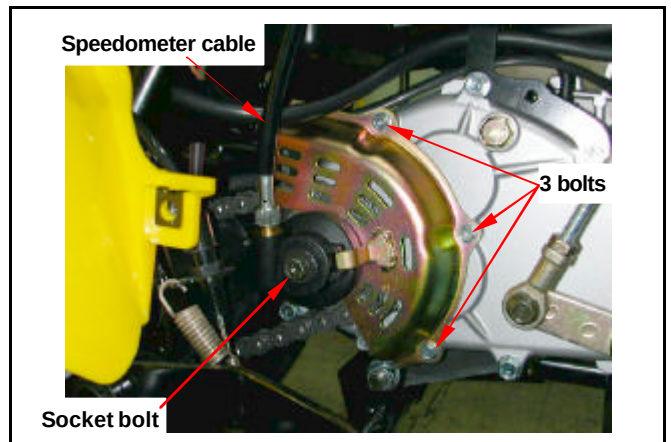


Loosen speedometer cable mounting nut, and then remove the cable.

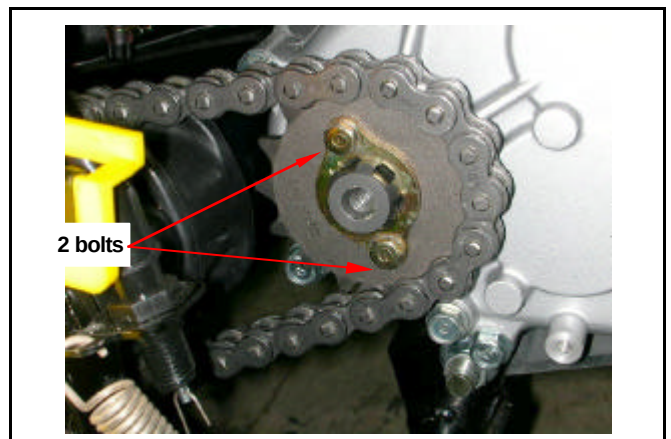
Remove 3 bolts and remove drive chain protector. Turn the socket bolt clockwise, and then remove speedometer gear box.

### Caution

The socket bolt is provided with left turn thread.



Remove 2 bolts, and then remove the drive sprocket fixing plate, drive chain and drive sprocket.



Remove gear fill bolt.

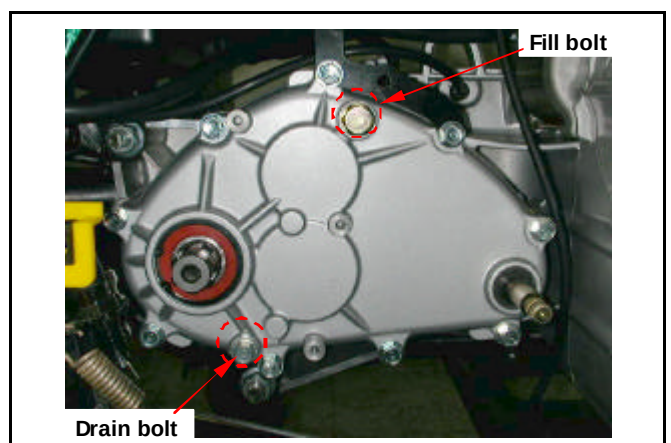
Place an oil pan under the ATV, and remove gear oil drain bolt.

After drained, make sure washer can be re-used. Install oil drain bolt.

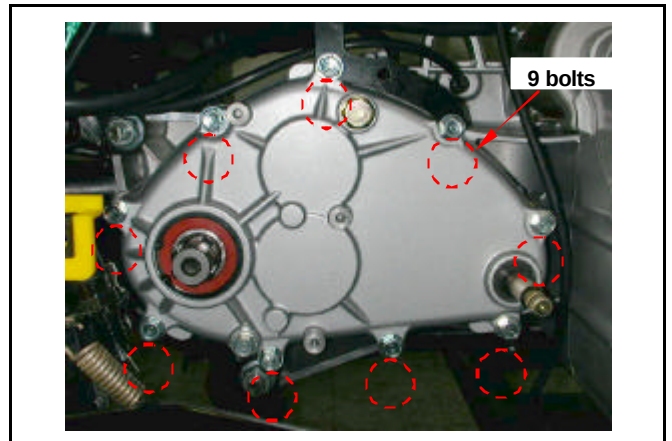
### Torque value:

**Gear oil fill bolt** 3.5~4.5kgf-m

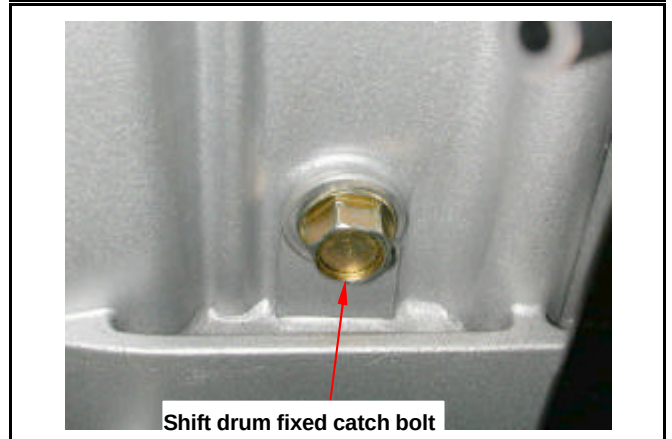
**Gear oil drain bolt** 0.8~1.2kgf-m



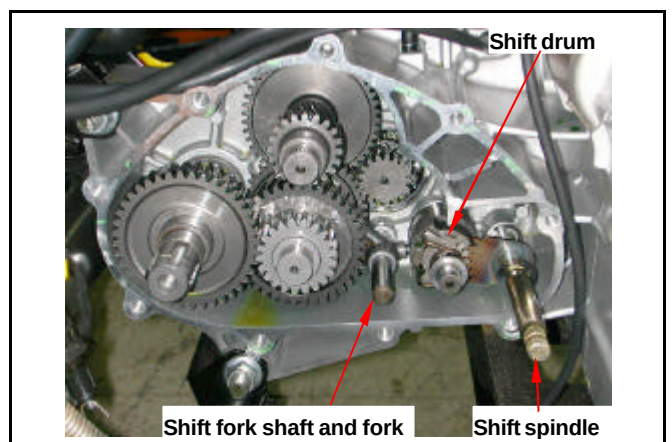
Remove gear box cover bolts (9 bolts) and then remove the cover.



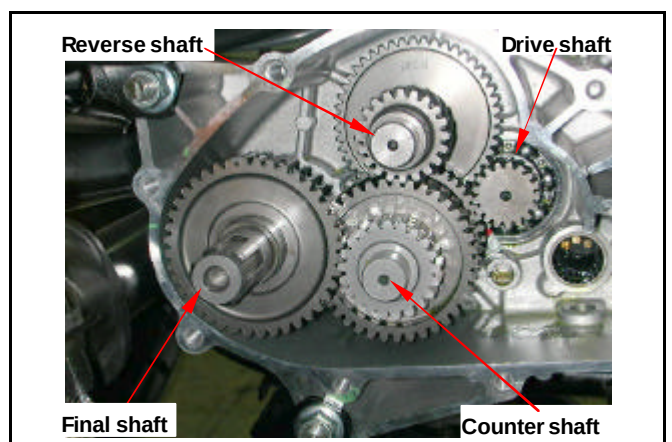
Remove shift drum catch ball, spring and bolt.



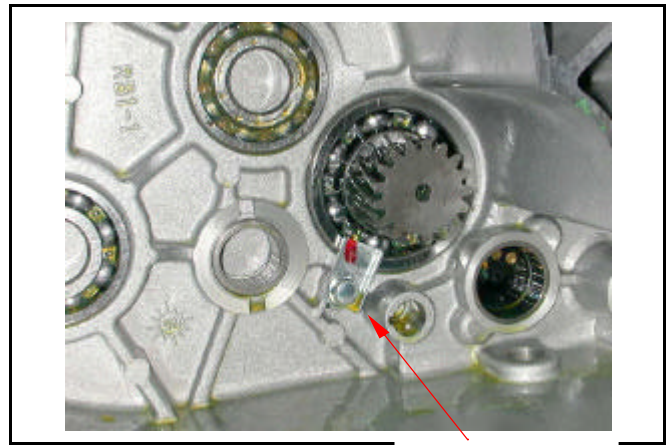
Remove shift spindle, shift fork shaft, shift fork and shift drum.



Remove final shaft, counter shaft and reverse shaft.



Remove drive shaft bearing setting plate (1 bolt).



Bearing setting plate

Remove the drive shaft.

**Special tool:**

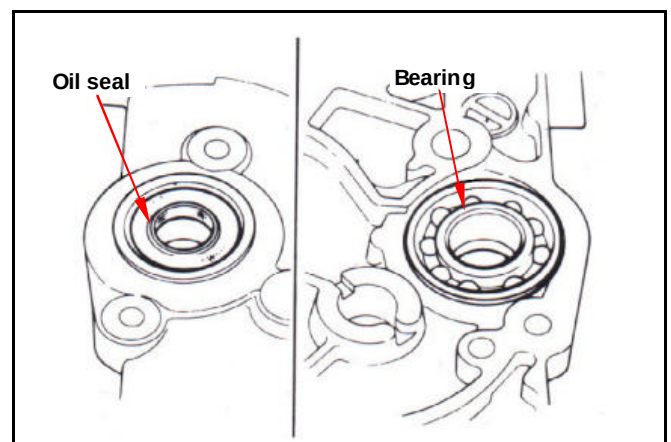
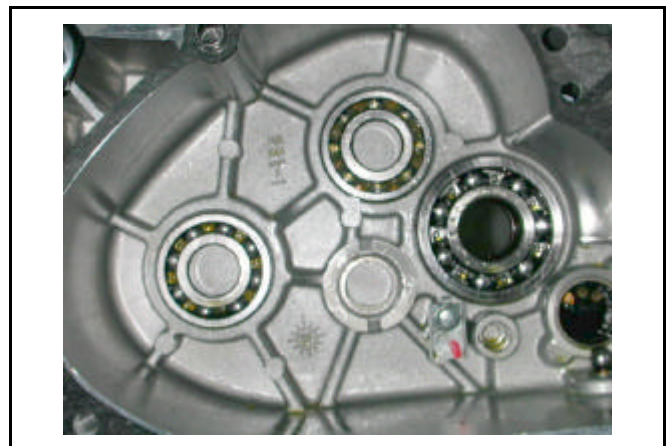
**Shaft protector**

Remove gasket and dowel pin.



### Caution

- If non- essential do not remove the drive shaft from the case upper side.
- If remove the drive shaft from the gear box, then its bearing and oil seal has to be replaced.





## 9-5 Inspection of Mission Mechanism

Check if the shift spindle is wear or damage.



Check if the shift drum is wear or damage.



Check if the shift fork and shaft is wear or damage.

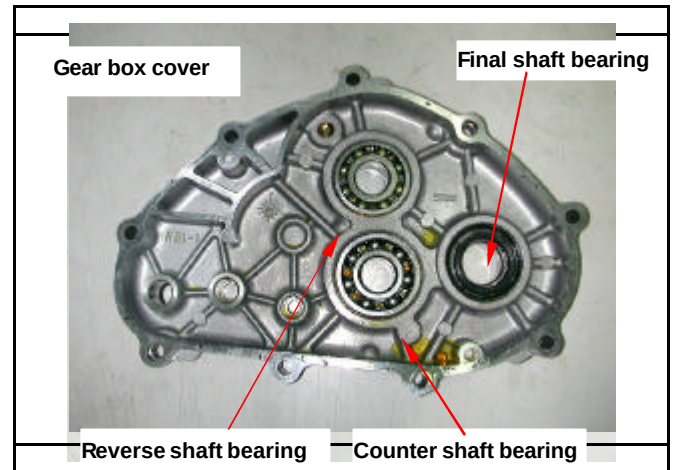


Check if the counter shaft is wear or damage.





Check if the reverse shaft is wear or damage.



Check if the final shaft and gear are burn, wear or damage.

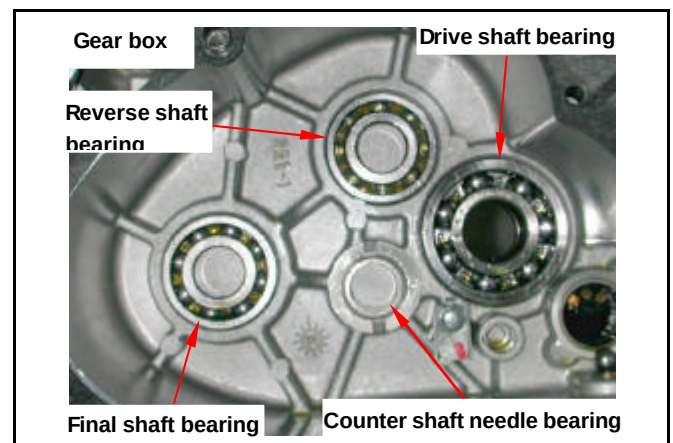


Check bearings on gear box and gear box cover. Rotate each bearing's inner ring with fingers. Check if bearings can be turned in smooth and silent, and also check if bearing outer ring is mounted on gear tightly. If bearing rotation is uneven, noising, or loose bearing mounted, then replace it. Check oil seal for wear or damage, and replace it if necessary.



### Caution

- If remove the drive shaft from the crankcase upper side, then its bearing has to be replaced.



## 9-6 Bearing Replacement



### Caution

- Never install used bearings. Once bearing removed, it has to be replaced with new one.

### Crankcase side

Remove drive shaft bearing setting plate, and then remove drive shaft bearing from left crankcase using following tools.

Remove reverse shaft bearing and counter shaft bearing from left crankcase using following tools.  
Remove drive shaft oil seal.

#### Special tool:

**Inner bearing puller**

Install new final shaft, counter shaft and reverse shaft bearings into left crankcase.

#### Special tool:

**Bearing driver (6204)**

**Needle bearing driver (HK2016)**

Install new drive shaft bearings and bearing driver into left crankcase.

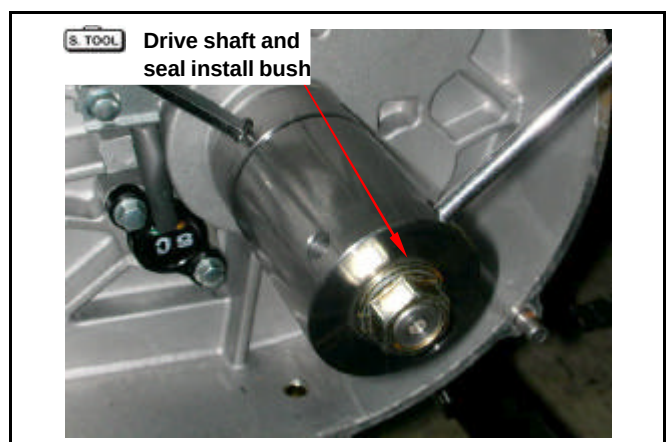
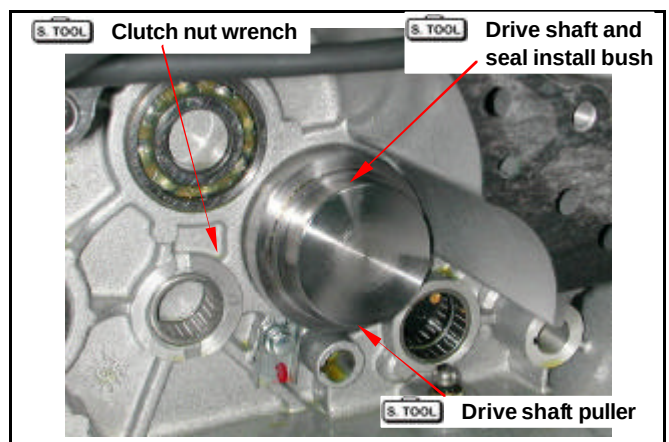
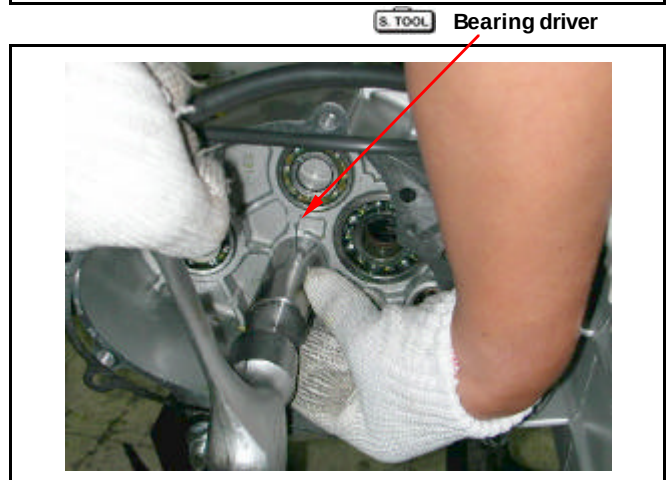
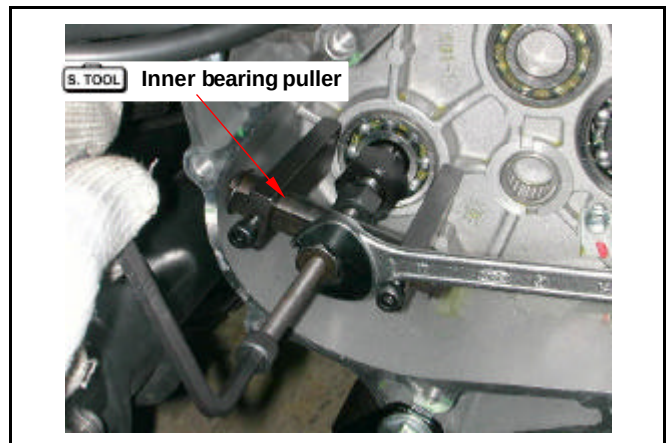
Install the universal bearing puller and bearing driver.

Turn the universal bearing puller to install drive shaft bearing.

#### Special tool:

**Bearing driver (6305)**

**Universal bearing puller**



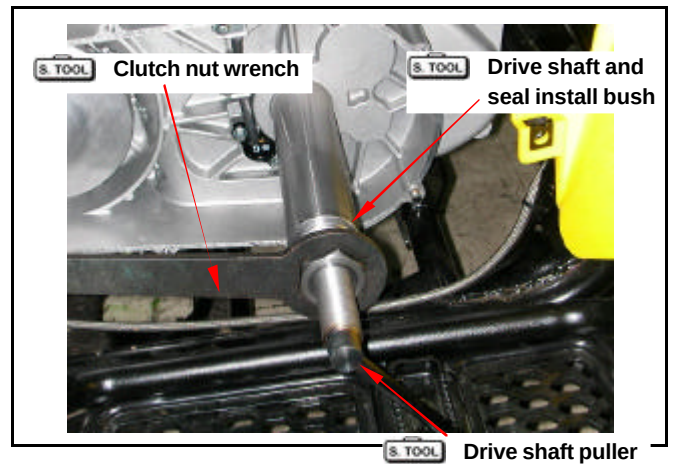
Install drive shaft.

**Special tool:**

**Drive shaft puller**

**Drive shaft and oil seal install bush**

**Clutch nut wrench**

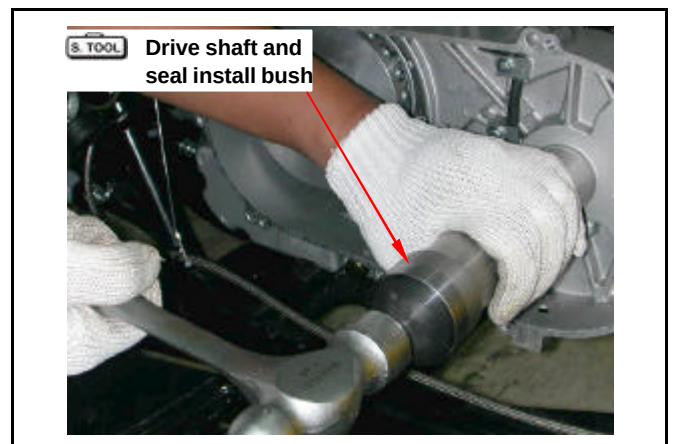


Apply with grease onto new drive shaft oil seal lip, and then install the oil seal.

**Special tool:**

**Drive shaft and oil seal install bush**

Install drive shaft bearing setting plate (1 bolt).

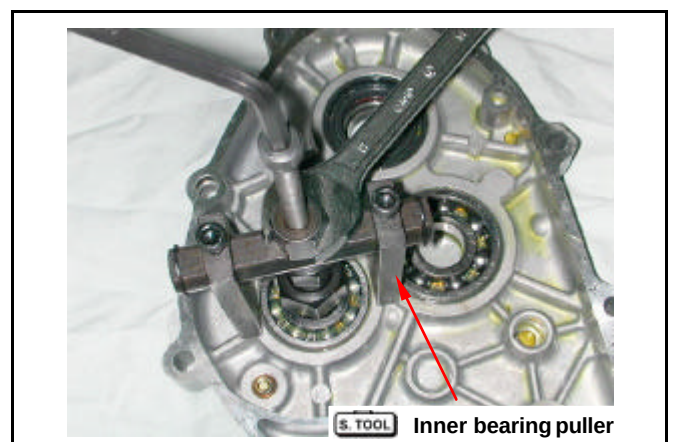


### **Gear box side**

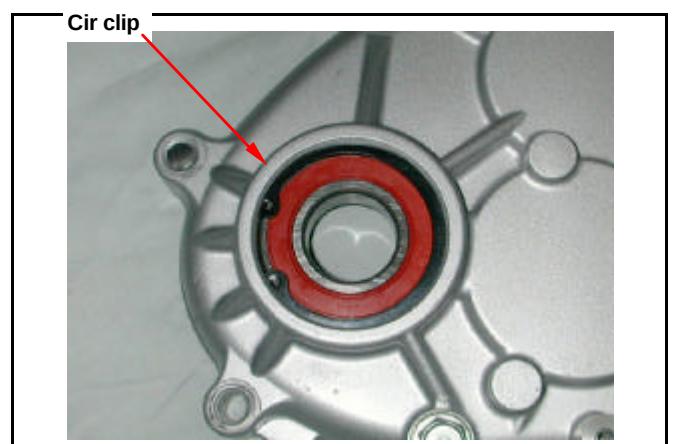
Use inner bearing puller to remove the final shaft needle bearing, gear shift shaft bearing and counter shaft bearing from the cover inner side.

**Special tool:**

**Inner bearing puller**



Remove cir clip of final shaft outside bearing.

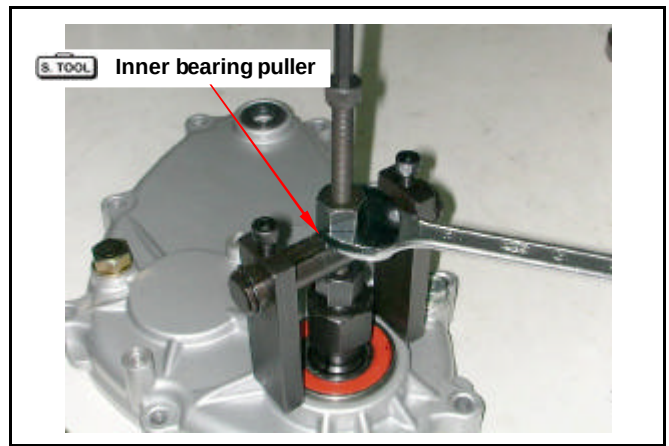




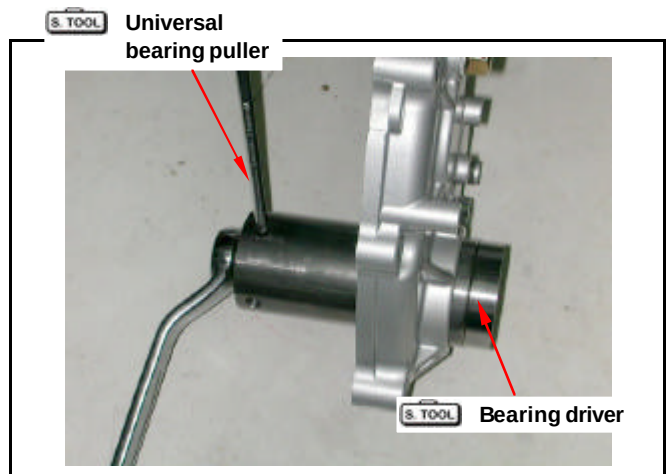
**Special tool:**

**Inner bearing puller**

Remove oil seal from gear box cover and discard the seal



Install new bearing and bearing driver into gear box cover outer side.  
Install the universal bearing puller and bearing driver.

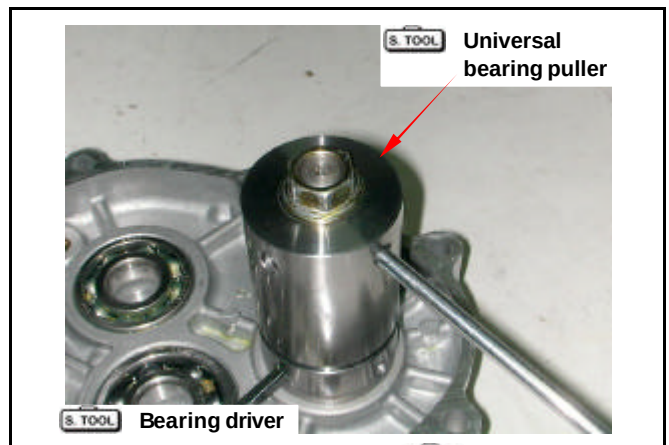


Turn the universal bearing puller to install drive shaft bearing.

**Special tool:**

**Bearing driver (6205)**

**Universal bearing puller**



Install new oil seal and bearing driver into gear box cover inner side.

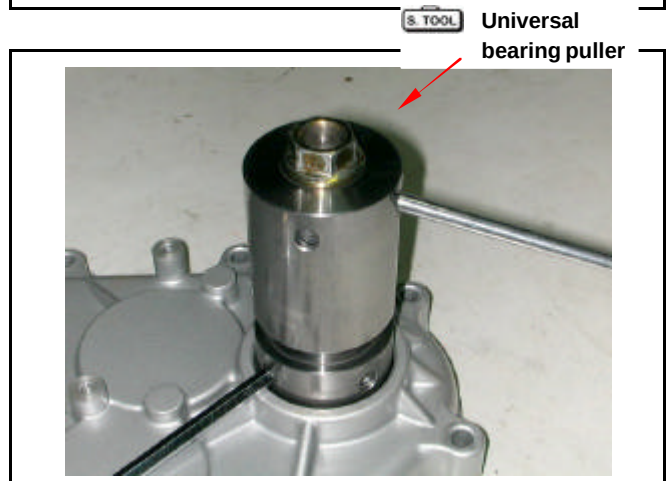
Install the universal bearing puller and bearing driver.

Turn the universal bearing puller to install drive shaft oil seal.

**Special tool:**

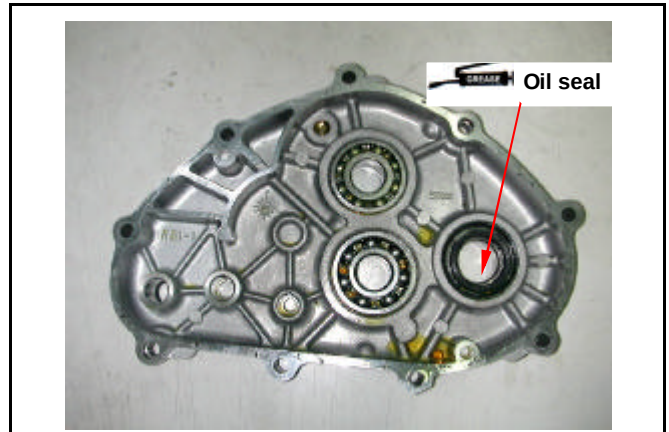
**Bearing driver (6205)**

**Universal bearing puller**

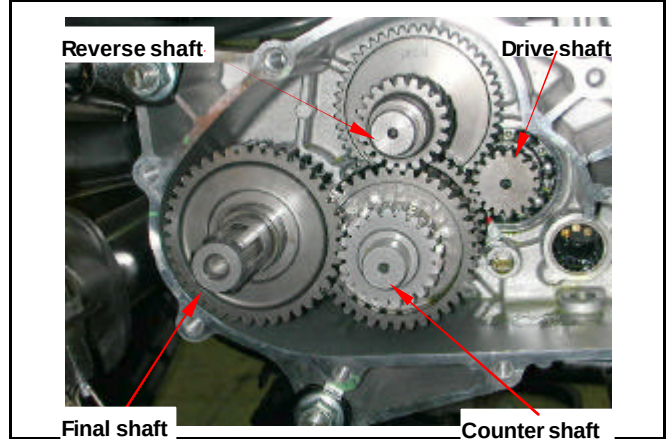


## 9-7 Re-assembly of Final Driving Mechanism

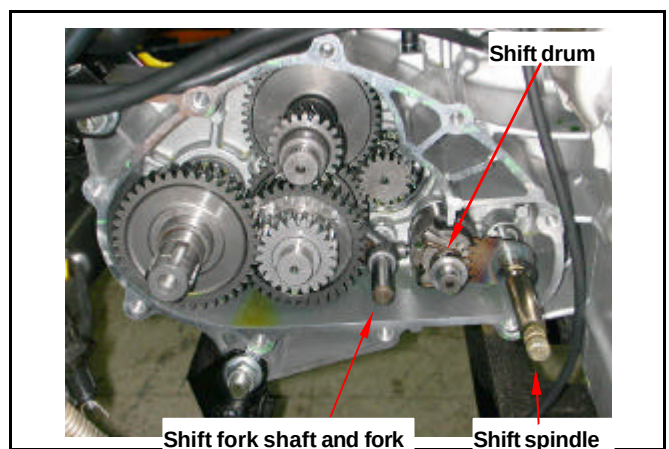
Apply with grease onto the oil seal lip of final driving shaft.



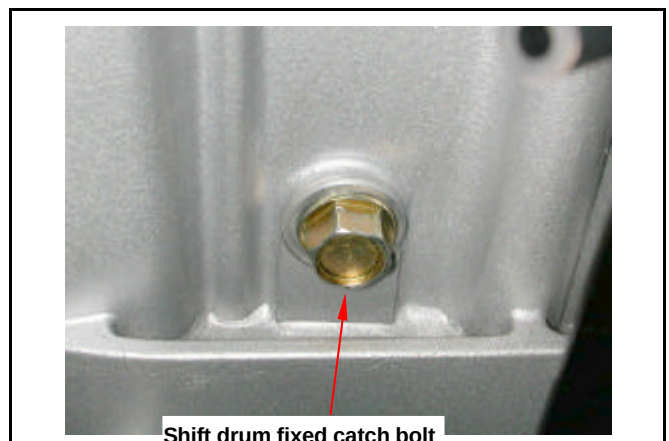
Install counter shaft, reverse shaft and final shaft onto gear box.



Install shift drum, shift fork and fork shaft onto gear box.

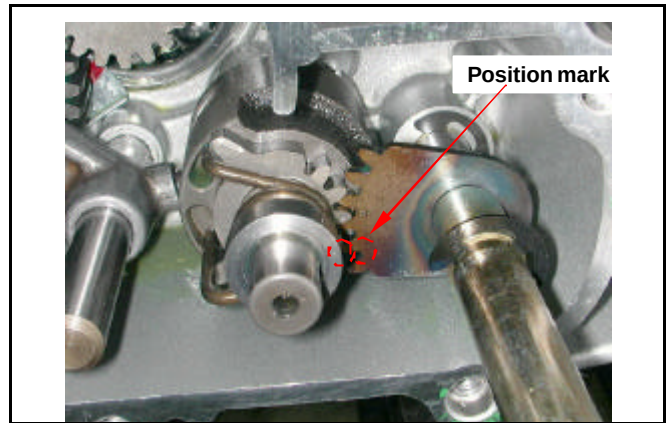


Install shift drum fixed catch ball, spring and bolt onto gear box.

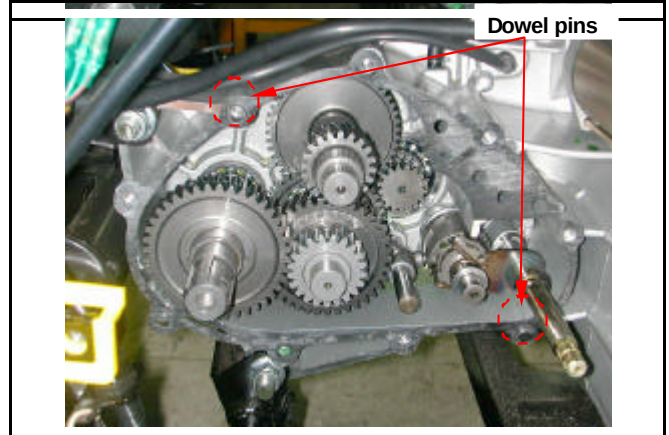




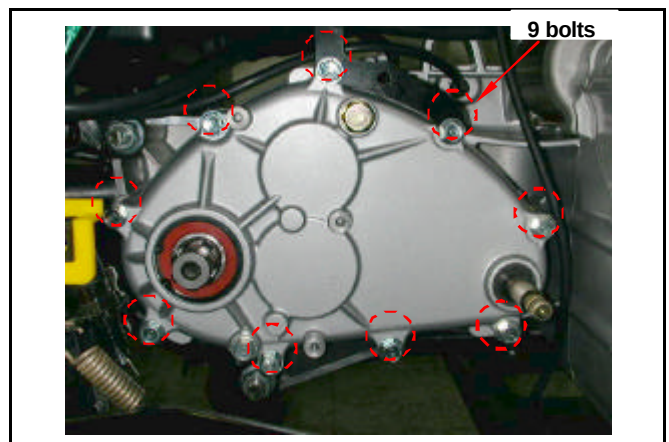
Align the position mark on the shift spindle sprocket with that of shift drum, and then install shift spindle.



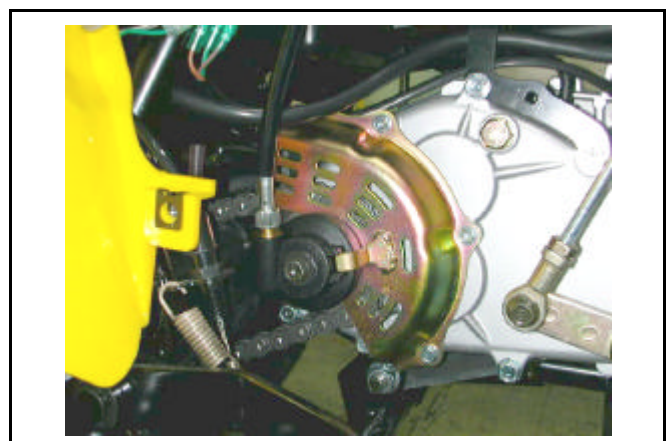
Install dowel pins and new gasket.



Install gear box cover and bolts, and tighten.  
**Torque value: 1.0~1.4kgf-m**



Install the shift spindle bracket, drive chain protector, speedometer gear box and gear change lever.  
Add gear oil.  
**Gear oil quantity: 750c.c.**

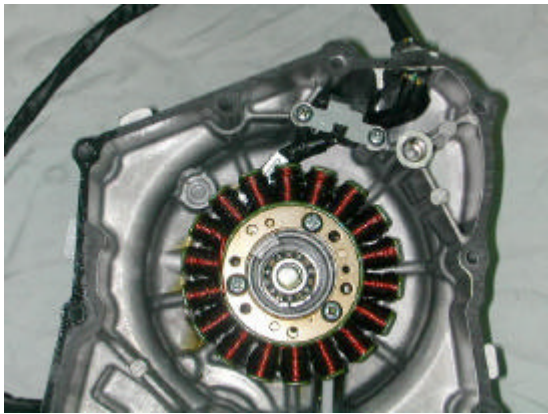


## 10. ALTERNATOR/STARTING CLUTCH

錯誤! 書籤的自我參照不正確。

錯誤! 表格製作不正確。

錯誤! 表格製作不正確。



### 10-4 A.C.G. Set Removal

### 10-5 Right Cover Bearing

### 10-6 Flywheel Removal



### 10-7 Starting Clutch

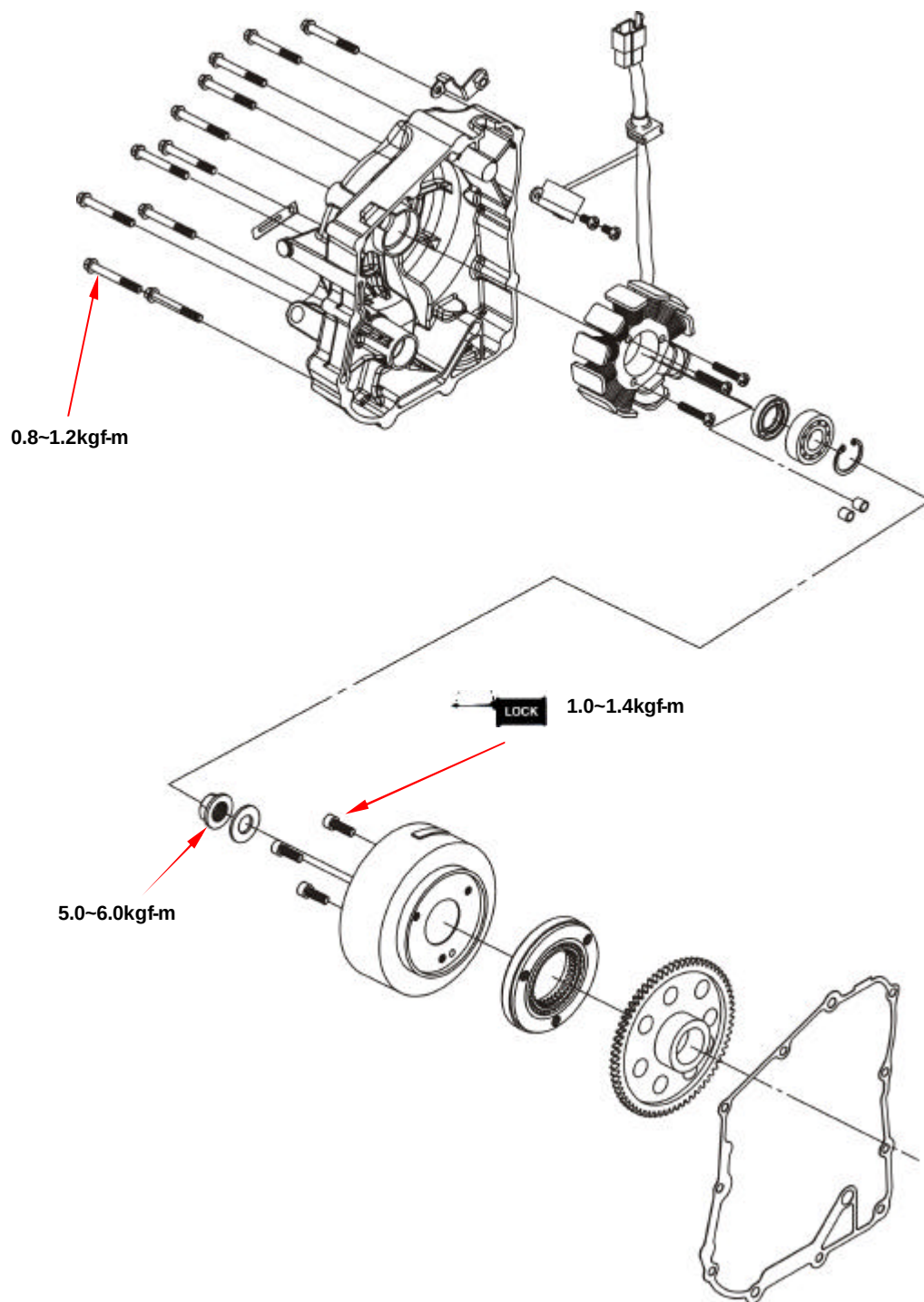


### 10-8 Flywheel Installation

### 10-9 A.C.G. Set Installation



## 10-1 Mechanism Diagram



## 10-2 Precautions in Operation

### General information

- Refer to chapter 17: The troubleshooting and inspection of alternator
- Refer to chapter 17: The service procedures and precaution items of starter motor

### Specification

| Item                       | Standard value (mm) | Limit (mm) |
|----------------------------|---------------------|------------|
| ID of starting clutch gear | 25.026~25.045       | 25.100     |
| OD of starting clutch gear | 42.175~42.200       | 42.100     |

### Torque value

|                              |                            |
|------------------------------|----------------------------|
| Flywheel nut                 | 5.0~6.0kgf-m               |
| Starting clutch hexagon bolt | 1.0~1.4kgf-m with adhesive |
| 8 mm bolts                   | 0.8~1.2kgf-m               |
| 12 mm bolts                  | 1.0~1.4kgf-m               |

### Tools

#### Special tools

A.C.G. flywheel puller: SYM-3110A00

Universal holder: SYM-2210100



### 10-3 Right Crankcase Cover Removal

Remove left footrest.

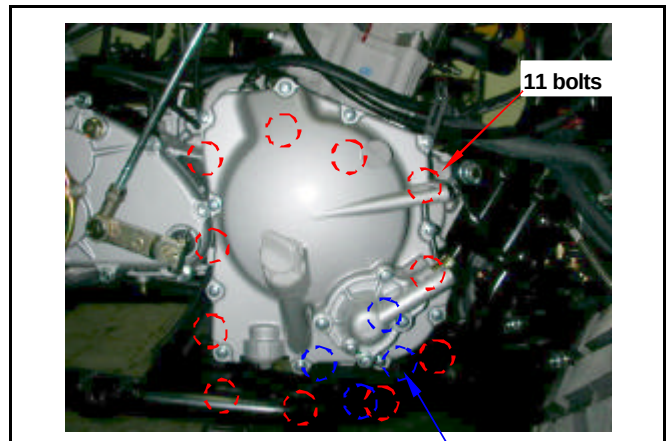
Drain out the engine oil and coolant, and then remove coolant hoses.

Remove water pump cover (4 bolts).

Remove 11 bolts from the right crankcase cover.

Remove the right crankcase cover.

Remove dowel pin and gasket.

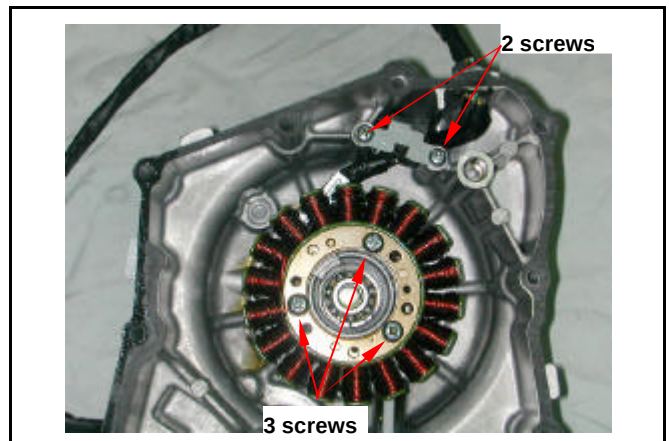


Water pump cover bolts

### 10-4 A.C.G. Set Removal

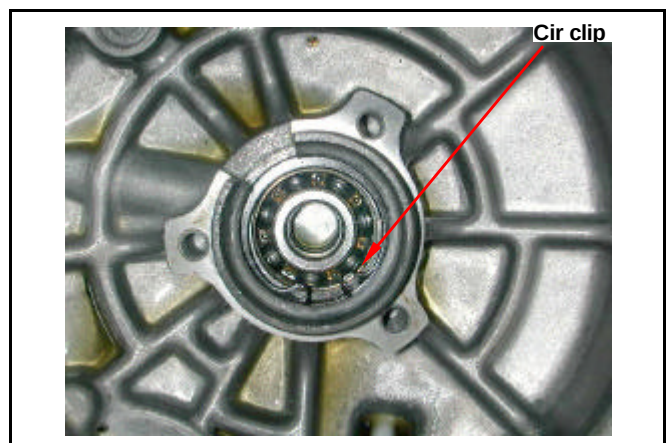
Remove 2 mounted screws from pulse generator and then remove it.

Remove 3 screws from right crankcase cover and then remove generator coil set.



### 10-5 Right Cover Bearing Inspection

Rotate the bearing with finger to check if the bearing rotation is in smooth and silent. Check if the bearing outer parts are closed and fixed. Replace it if necessary.



Remove the cir clip, and then remove bearing.

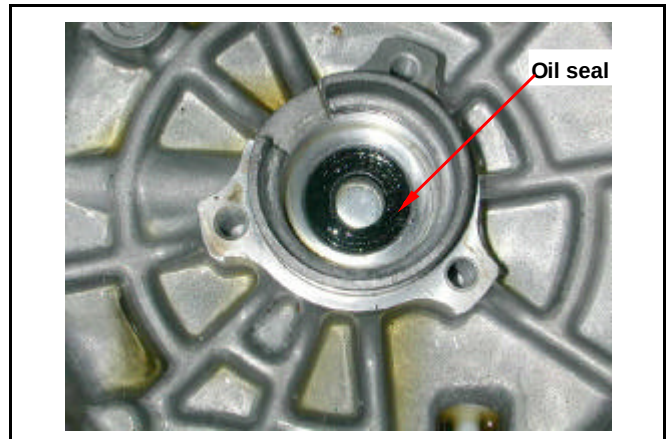
**Special tool:**

**Inner bearing puller**



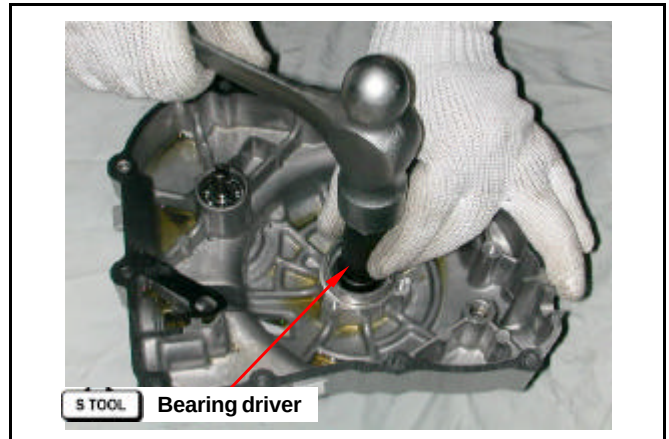


Check the oil seal for wear or damage. Replace it if necessary.



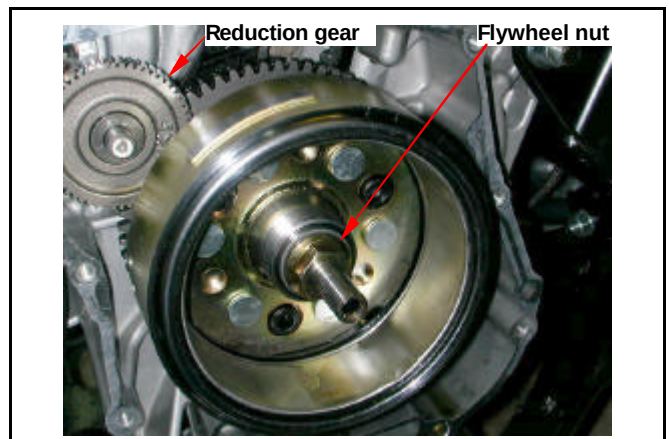
Install a new one bearing (6201LU) by bearing driver.

**Special tool:**  
**Bearing driver**



## 10-6 Flywheel Removal

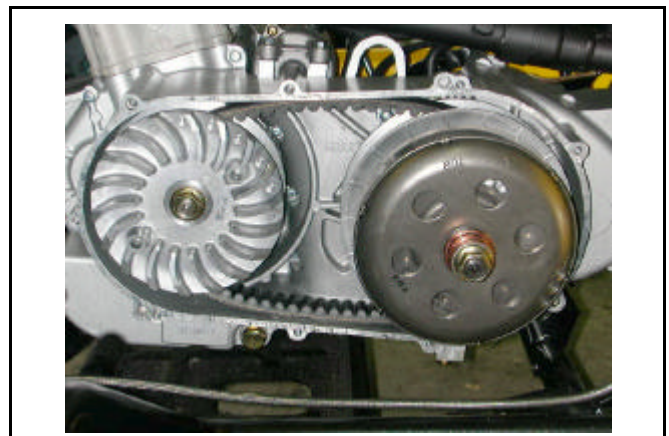
Remove right crankcase cover.



Remove left crankcase cover.  
Hold the flywheel by drive face with universal holder.

Remove flywheel nut.

**Special tool:**  
**Universal Holder**

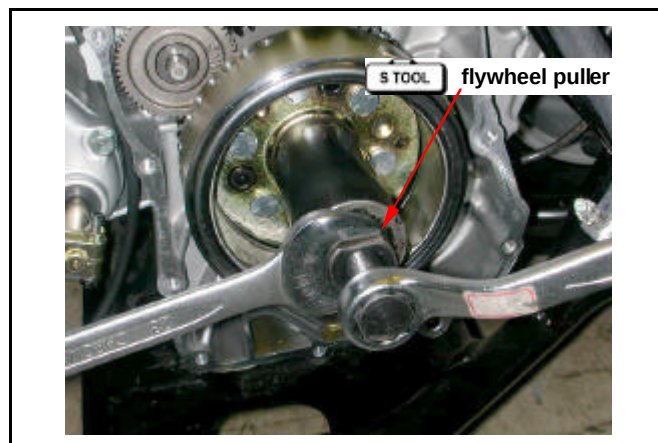


Remove starter reduction gear and shaft.  
Pull out flywheel with A.C.G. flywheel puller.

**Special tool:**

**A.C.G. Flywheel puller**

Remove flywheel and starting driven gear.

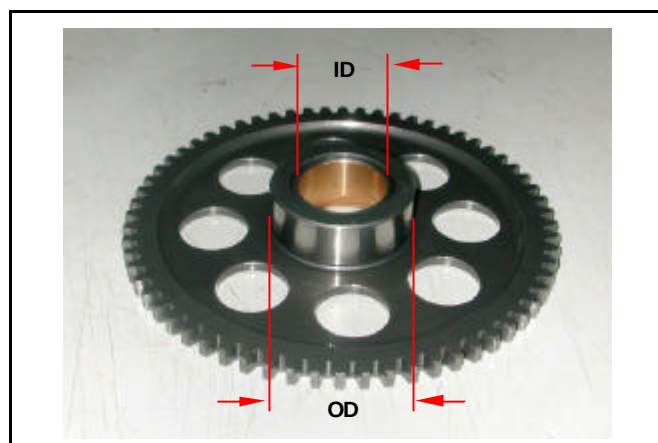


## 10-7 Starting Clutch

### Starting Clutch Inspection

Remove starting clutch driven gear.  
Check the gear for wear or damage.  
Measure the ID and OD of the starting clutch driven gear.

**Service Limit: ID: 25.1 mm**  
**OD: 42.10 mm**



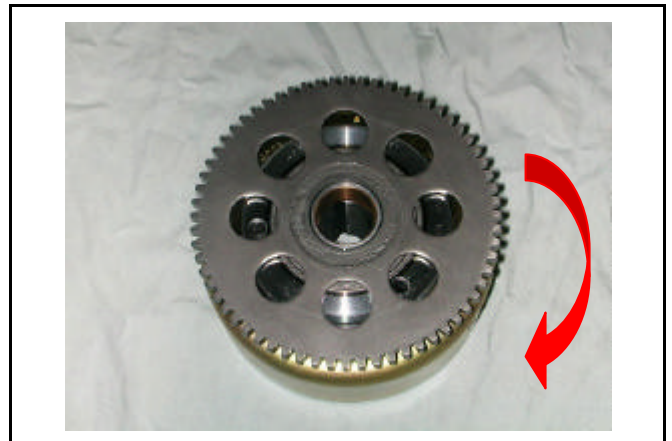
Check the starting reduction gear and shaft for wear or damage.



Check each roller for wear or damage.

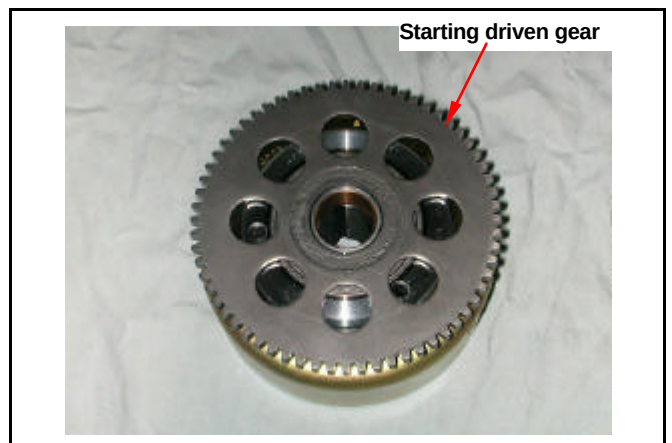


Install starting clutch driven gear onto one way clutch.  
 Hold flywheel and rotate starting clutch gear.  
 The starting clutch gear should be rotated in C.C.W direction freely, but not C.W direction. (View as shown in this figure.)

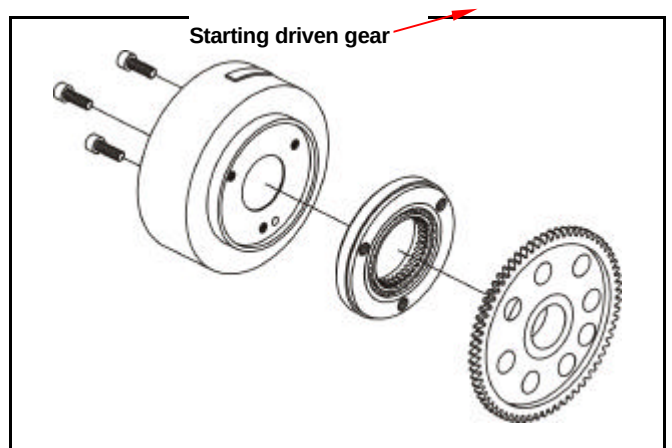
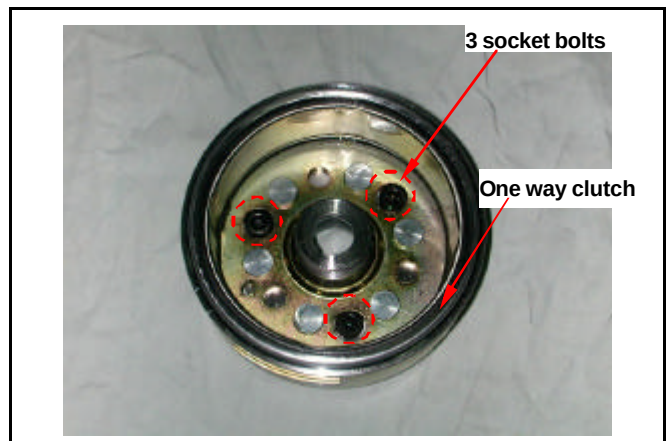


### One way clutch removal

Remove starting driven gear.



Remove 3 socket bolts, and then remove one way clutch.





### One way clutch Installation

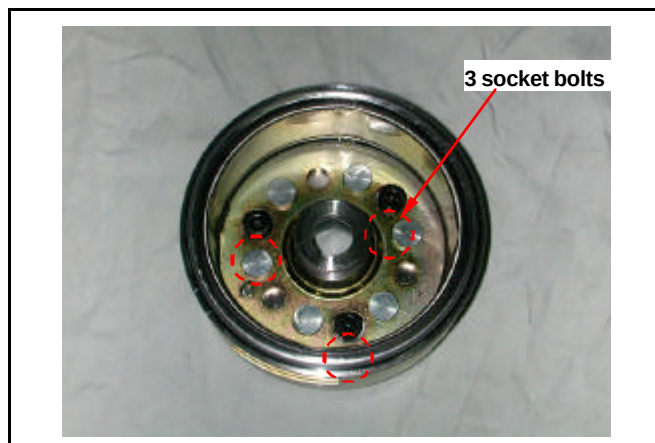
Install the components in the reverse procedures of removal.



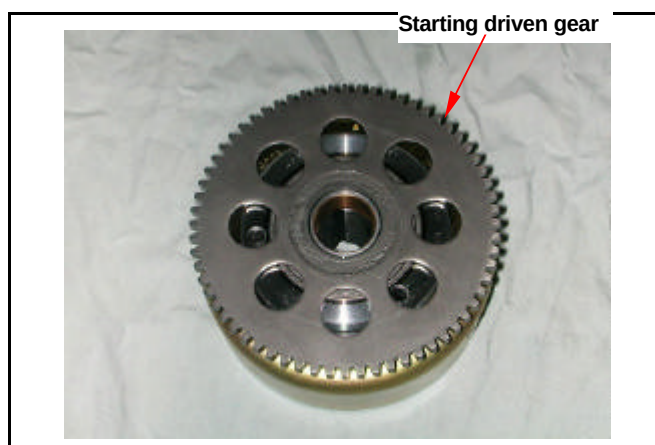
#### Caution

Tape a tightening tape onto the thread of hexagon bolt.

**Torque value: 1.0~1.4kgf-m**

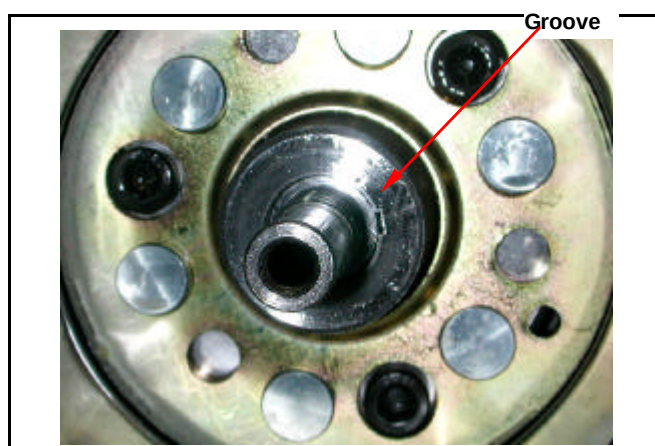


Install starting driven gear.



### 10-8 Flywheel Installation

Align the key on crankshaft with the flywheel groove, and then install the flywheel.



Hold the flywheel by drive face with universal holder, and tighten flywheel nut.

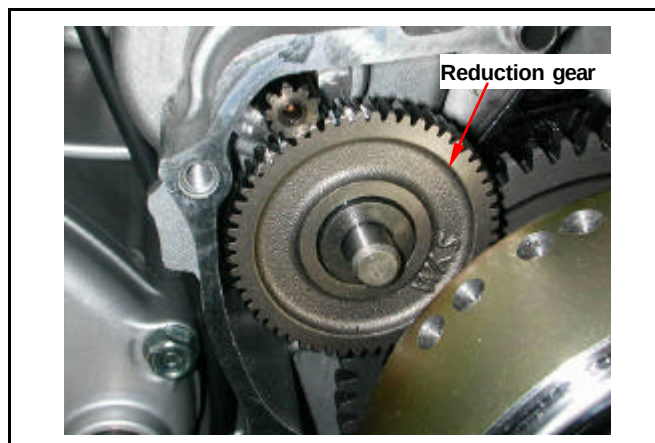
**Torque value: 5.0~6.0kgf-m**

**Special tool:**

**Universal Holder**



Install reduction gear shaft and reduction gear.



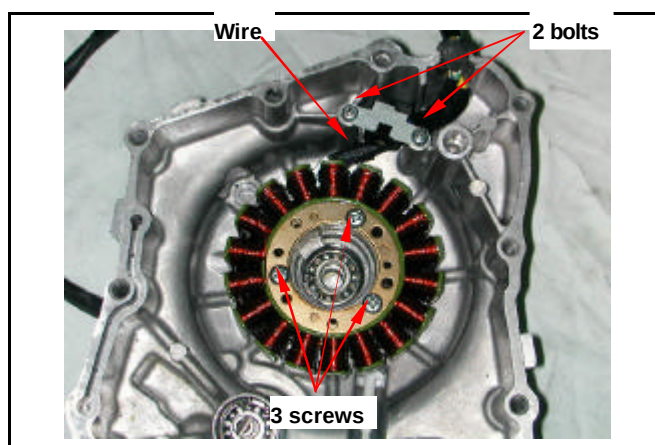
## 10-9 A.C.G. Set Installation

Install the A.C.G. coil set onto right crankcase cover (3 screws).  
Install pulse generator (2 screws).  
Tie the wire harness securely onto the indent of crankcase.



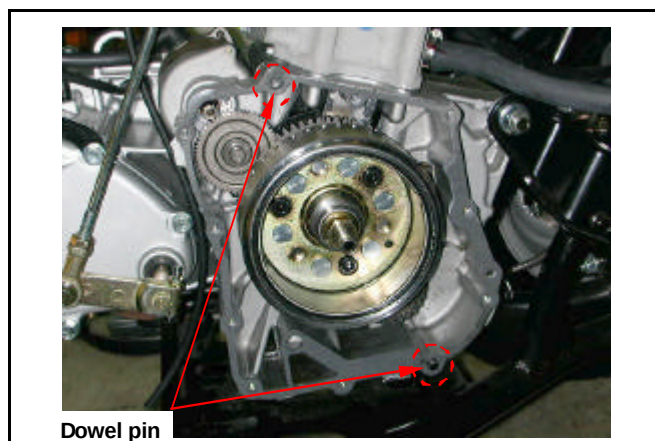
### Caution

Make sure that the wire harness is placed under pulse generator.



## 10-10 Right Crankcase Cover Installation

Install dowel pin and new gasket.

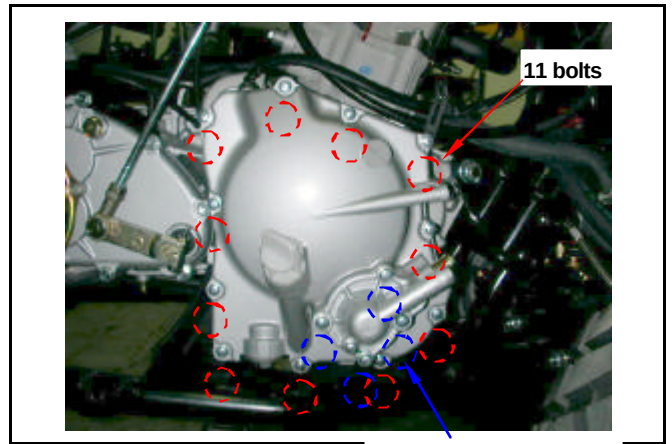


Remove water pump cover.  
Install right crankcase cover onto the crankcase.  
Note: Align the water pump shaft indent with the oil pump shaft.

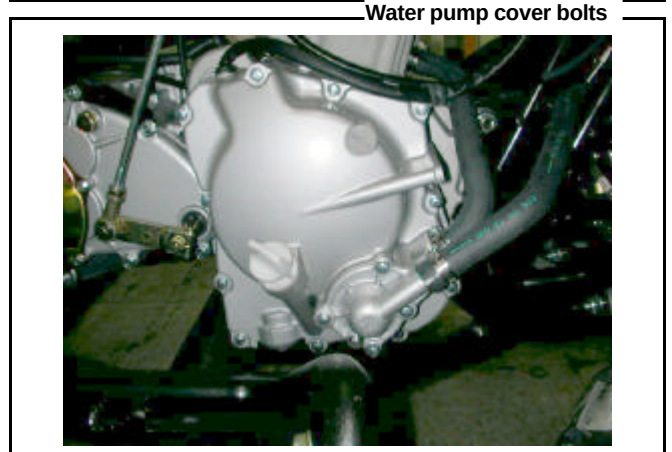




Install right crankcase cover (11 screws).  
Install the dowel pin, new gasket and water pump cover onto crankcase cover.



Connect water hoses to the right crankcase cover and water pump cover.



## 11. CRANKCASE / CRANK

11-1 Mechanism Diagram

11-2 General information

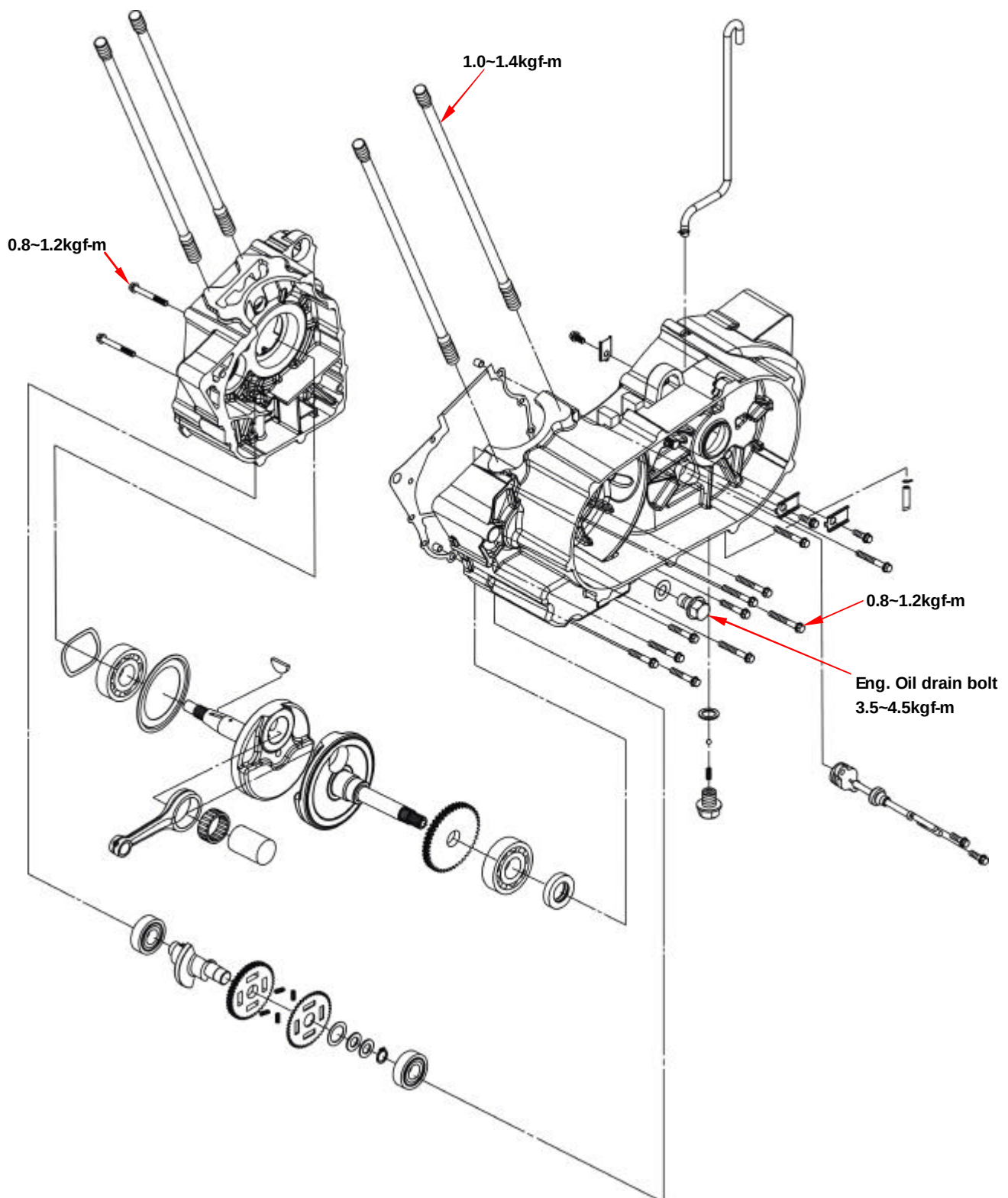
11-3 Trouble diagnosis

11-4 Disassembly of crankcase

11-5 Crankshaft Inspection

11-6 Assembly of crankcase

### 11-1 Mechanism Diagram



## 11-2 General information

### Operational precautions

- This Section concerns disassembly of the crankcase for repair purpose.
- Remove following components before disassembling crankcase.
  - Engine remove Section 5
  - Cylinder head Section 6
  - Cylinder and piston Section 7
  - Drive face and driven pulley Section 8
  - AC generator/Start one way clutch Section 10
- In case it requires replacing the crankshaft bearing, the driving chain of engine oil pump or the timing chain, it is preferably to replace crankshaft as a unit.

### Specification

Unit: mm

| Crankshaft | Item                                                    | Standard    | Limit |
|------------|---------------------------------------------------------|-------------|-------|
|            | Connecting rod side clearance of the big end            | 0.100~0.400 | 0.600 |
|            | Vertical clearance of the big end of the connecting rod | 0~0.008     | 0.050 |
|            | Run-out                                                 | 0.030       | 0.100 |

### Torque value

|                       |              |
|-----------------------|--------------|
| Bolts for crankcase   | 0.8~1.2kgf·m |
| Engine oil drain bolt | 3.5~4.5kgf·m |
| Cylinder stud bolt    | 1.0~1.4kgf·m |

### Tools

#### Special tools

L. crank shaft oil seal driver (27\*42\*7): SYM-1332100-HMA

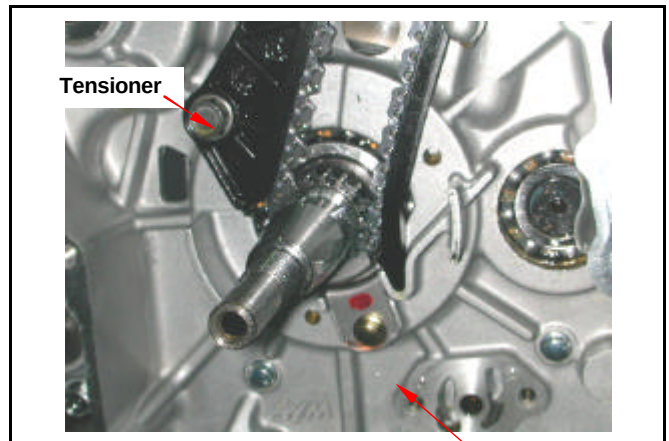
## 11-3 Trouble diagnosis

### Engine noise

- Loose crankshaft bearing
- Loose crankshaft pin bearing
- Worn out piston pin and pin hole

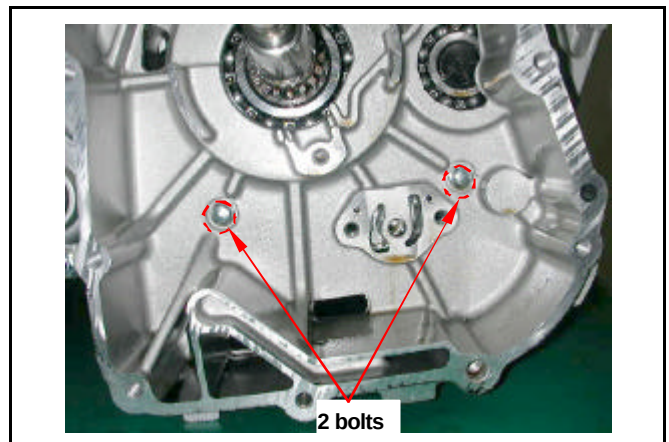
## 11-4 Disassembly of crankcase

Remove the cam chain setting plate, and then remove cam chain.  
Loosen the pivot bolt and remove the tensioner.

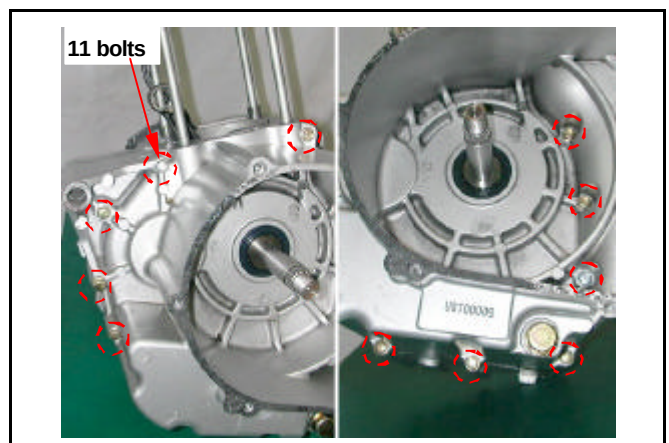


Cam chain setting plate

Loosen 2 bolts on the right crankcase.



Loosen 11 bolts on the left crankcase.



Place right crankcase downward and left crankcase up.

Tap the left crankcase with a plastic hammer to remove it.



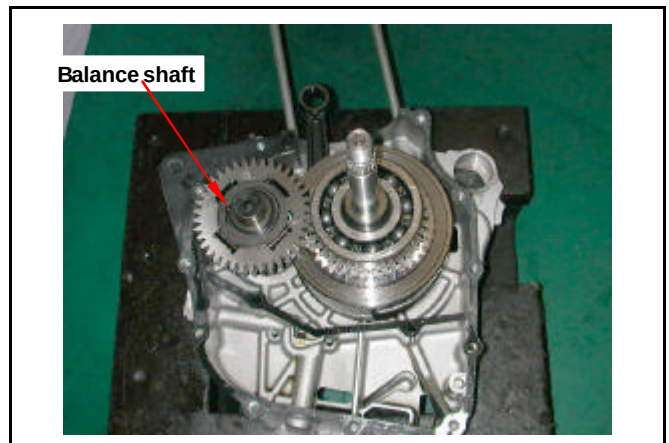
### Caution

Care should be taken not to damage the contact surfaces.

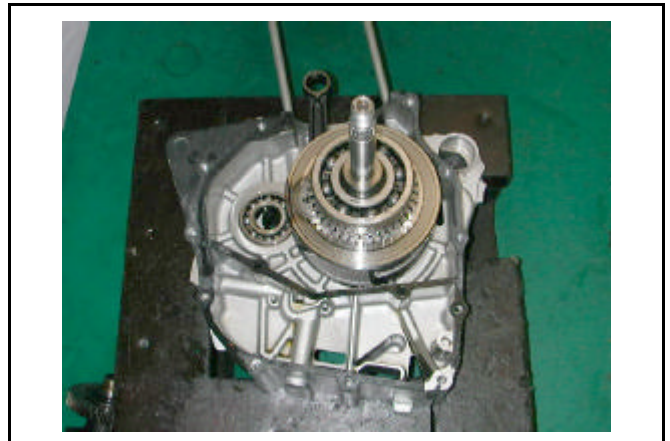




Remove balance shaft from right crankcase.



Remove crankshaft from right crankcase.



Remove gasket and dowel pins.  
Scrape gasket residues off the crankcase contact surface.

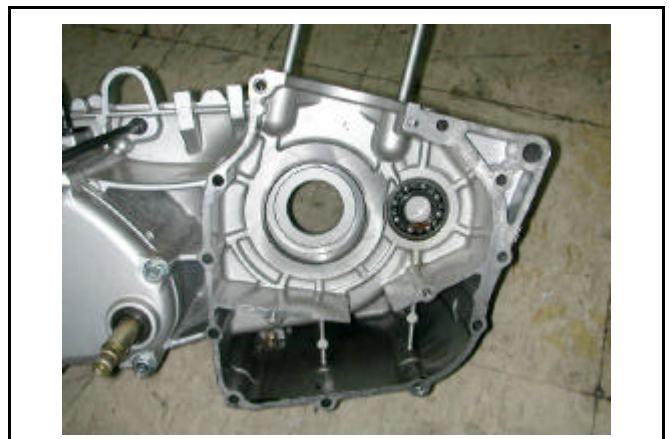


**Caution**

Do not damage contact surface of the gasket.  
It is better to moisten the gasket residue for easy scrapping.



Drive out left crankcase oil seal.





## 11-5 Crankshaft Inspection

Use a thickness gauge to measure left and right clearance of connecting rod big end.

**Service limit: 0.6 mm**

Measure the clearance of the big end at the vertical directions.

**Service limit: 0.05 mm**

Place the crankshaft on a V-block, measure run-out of the crankshaft.

**Service limit: 0.10 mm**

### Check crankshaft bearing

Use hand to crank the bearing to see it moves freely, smoothly and noiseless.

Check the inner ring to see it links firmly on the bearing.

If any roughness, noise and loose linkage are detected, replace the bearing with new one.

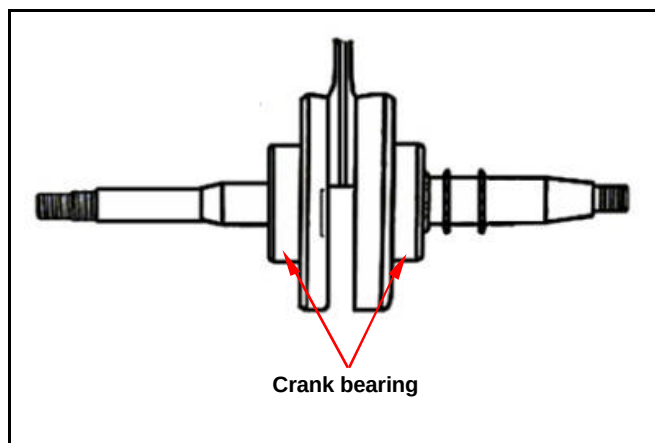
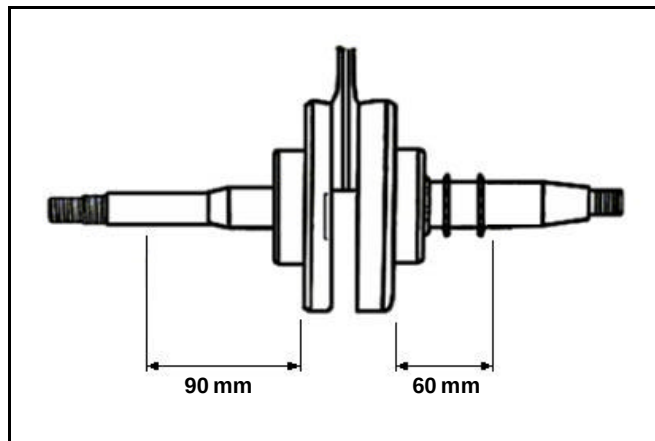
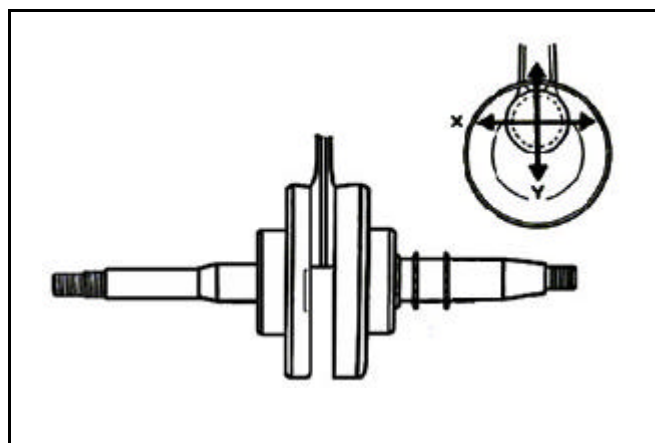
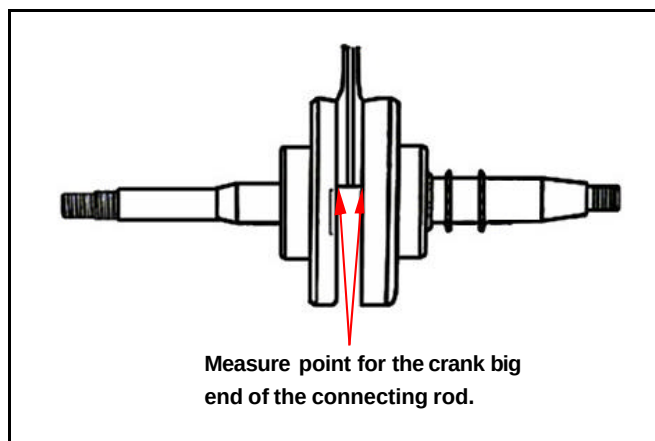


#### Caution

The bearing shall be replaced in pair.

**Special tool: outer bearing puller**

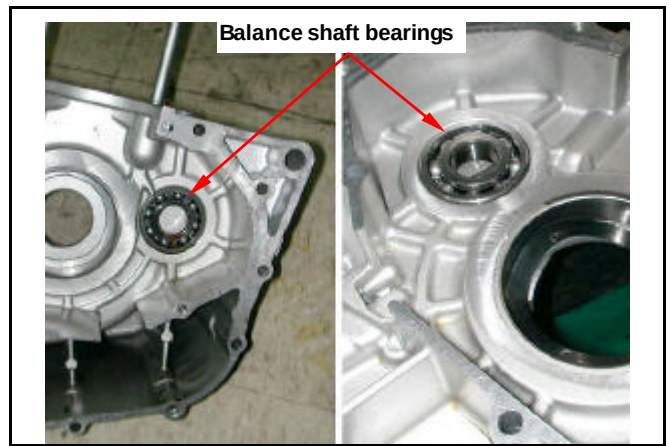
**Check balance shaft bearing**



Check bearings on right and left crankcase.  
Rotate each bearings inner ring with fingers.  
Check if bearings can be turned in smooth and silent,  
and also check if bearing outer ring is mounted on  
gear tightly.

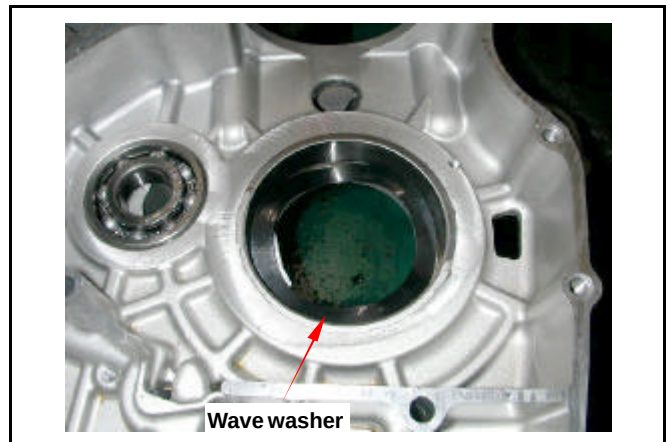
If bearing rotation is uneven, noising, or loose bearing  
mounted, then replace it.

**Special tool: Inner bearing puller**  
**Bearing driver**

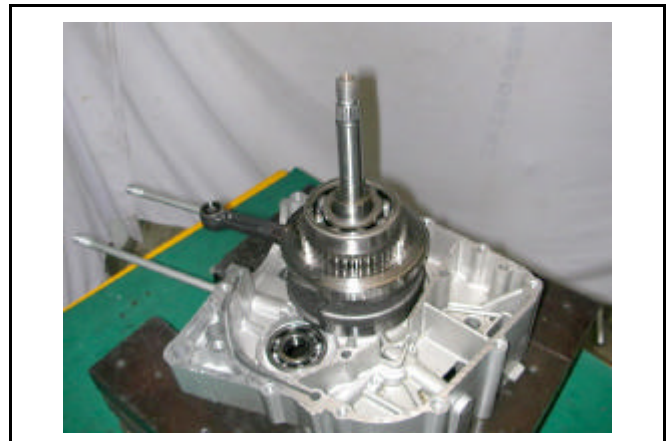


## 11-6 Assembly of crankcase

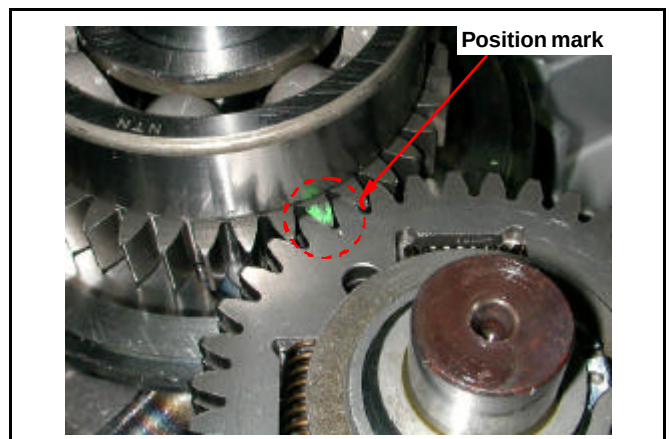
Install wave washer into right crank bearing seat.



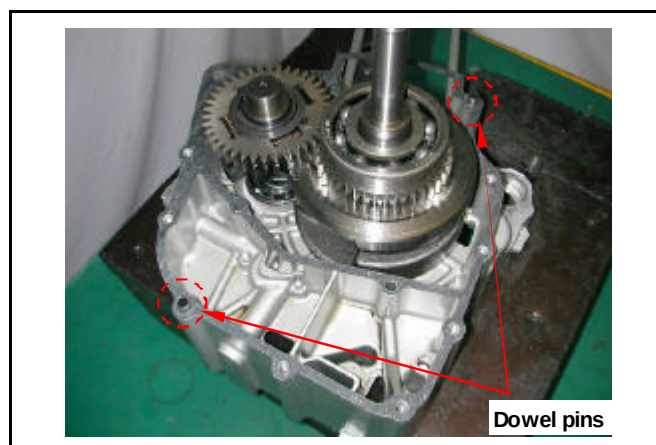
Install crank shaft on the right crankcase.



Align the position mark on the balance shaft drive  
gear with that of balance shaft driven gear, and then  
install balance shaft onto right crankcase.



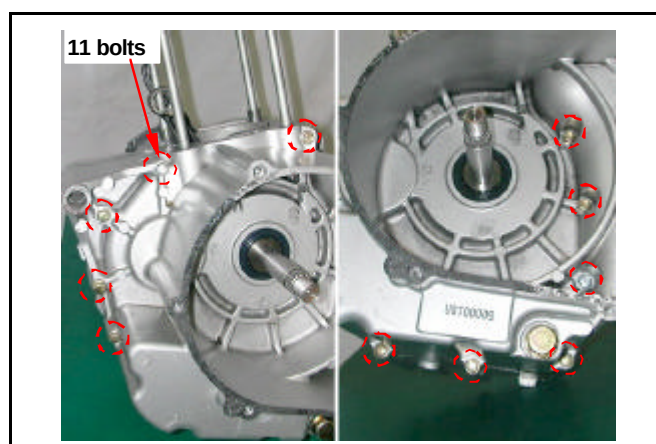
Install 2 dowel pins and new gasket.



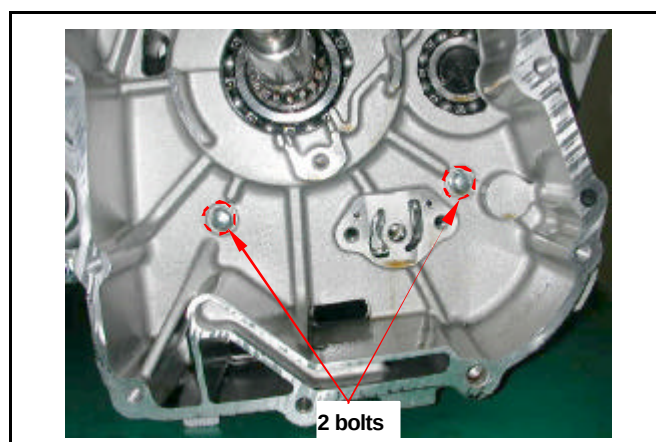
Install the left crankcase onto the right crankcase.



Tighten 11 bolts on the left crankcase.  
**Torque value: 0.8~1.2kgf-m**



Tighten 2 bolts on the right crankcase.  
**Torque value: 0.8~1.2kgf-m**



Clean the crankshaft.

Apply a layer of grease on the lip of oil seal, Puts on the left crank shaft.

Install the oil seal in the left crankcase with care not to damage the lip of the oil seal.



By oil seal driver (27×42×7), oil seal will knock into located.

**Special tool:**

**Oil seal driver (27×42×7)**

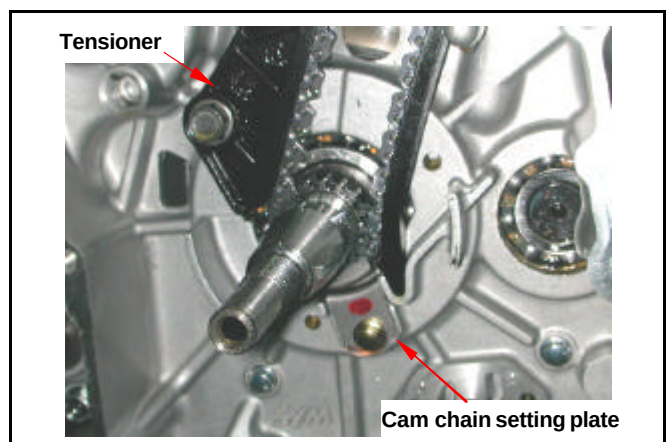


Install the tensioner and tighten the pivot bolt.

**Torque value: 0.8 ~1.2kgf-m**

Install the cam chain.

Install the cam chain setting plate.





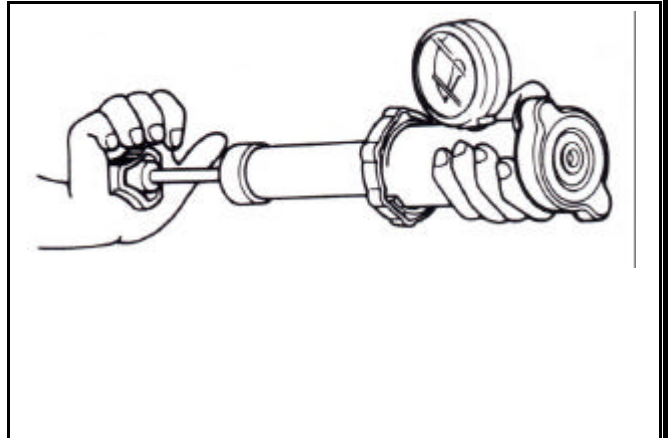
## 12. COOLING SYSTEM

12-1 Mechanism Diagram

12-2 General Information

12-3 Trouble Diagnosis

12-4 Trouble Diagnosis for Cooling System



**12-5 System Test**

12-6 Radiator

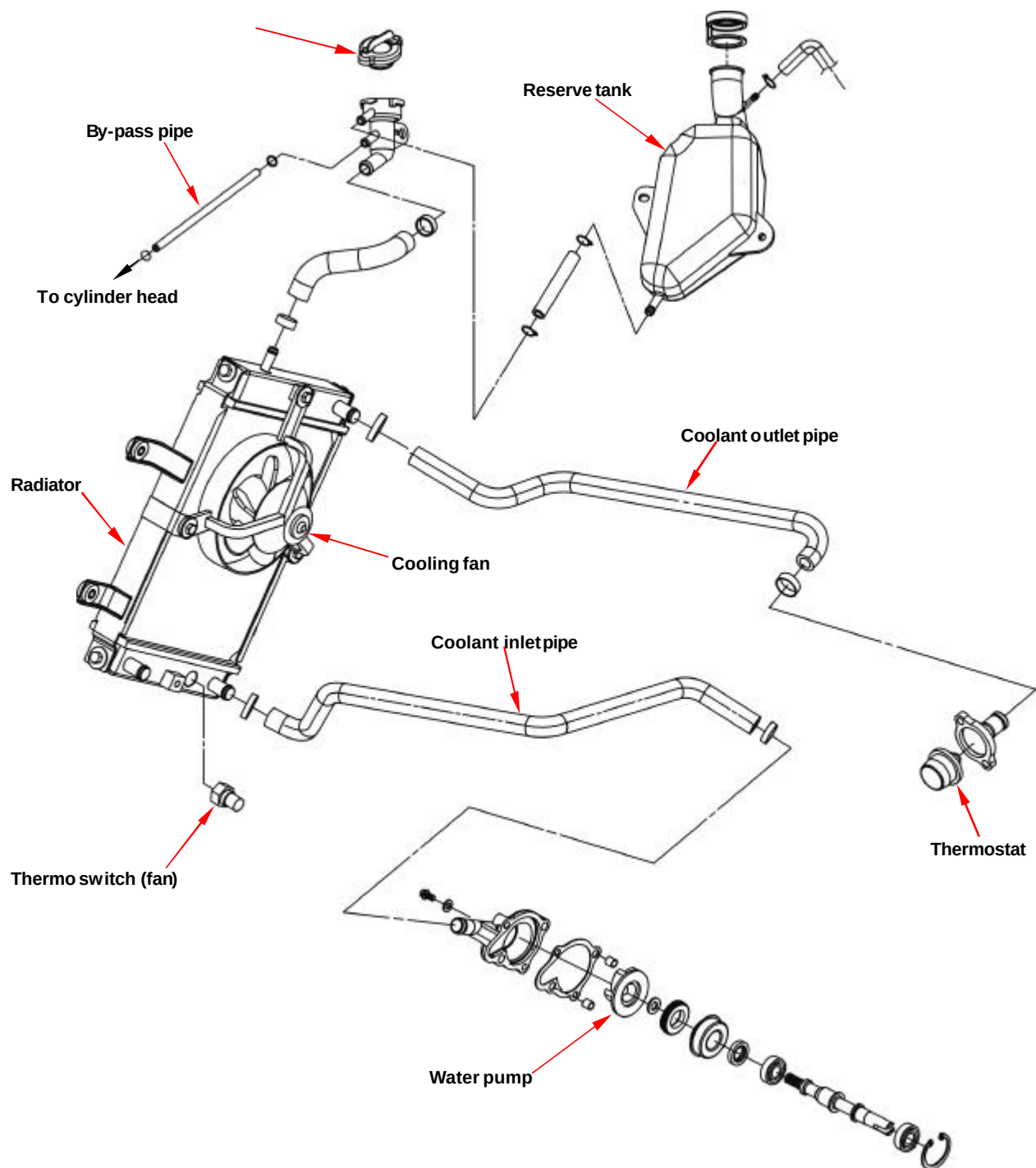
12-7 Water Pump

12-8 Thermostat

### 12-1 Mechanism Diagram

Radiator filler cap





## 12-2 General Information

### General



#### Warning:

While the engine is running, never attempt to open the radiator filler cap, the pressurized hot coolant may shoot out and cause serious scalding injury. No maintenance work is allowed to perform unless the engine is completely cooled down.

- Refill the radiator with distilled water or specified additives.
- Add coolant to the reservoir.
- The cooling system can be serviced on the ATV.
- Never spill the coolant to the painted surface.
- Test the cooling system for any leakage after the repair.
- Please refer to Section 17 for inspection of the temperature sensor switch for the fan motor and the water thermometer.

### Technical Specification

| Item                                                      | Specification                                     |
|-----------------------------------------------------------|---------------------------------------------------|
| Pressure to open filler cap                               | 0.9±0.15 kgf/cm <sup>2</sup>                      |
| Capacity of coolant: Engine + radiator<br>Reservoir upper | 850c.c.<br>420c.c.                                |
| Thermostat                                                | Begins to activate at 82~95°C<br>Stroke: 0.05~3mm |
| Thermos switch (fan)                                      | Begins to activate at 98±3°C                      |
| Boiling point                                             | Not-pressure: 107.7°C<br>Pressurized: 125.6°C     |

### Torque Value

For water pump rotor

1.0~1.4kgf-m

### Tools Requirement

#### Special tools

Water pump bearing driver (6901): SYM-9100100

Water pump oil seal driver (Inner): SYM-9120500-H9A

Water pump mechanical seal driver: SYM-1721700-H9A

Inner bearing puller: SYM-6204020

## 12-3 Trouble Diagnosis

### The engine temperature is too high

- The water thermometer and the temperature sensor do not work properly.
- The thermostat is stuck to close.
- Insufficient coolant.
- The water hose and jacket are clogged.
- Fan motor malfunction.
- The filler cap of the radiator malfunction.

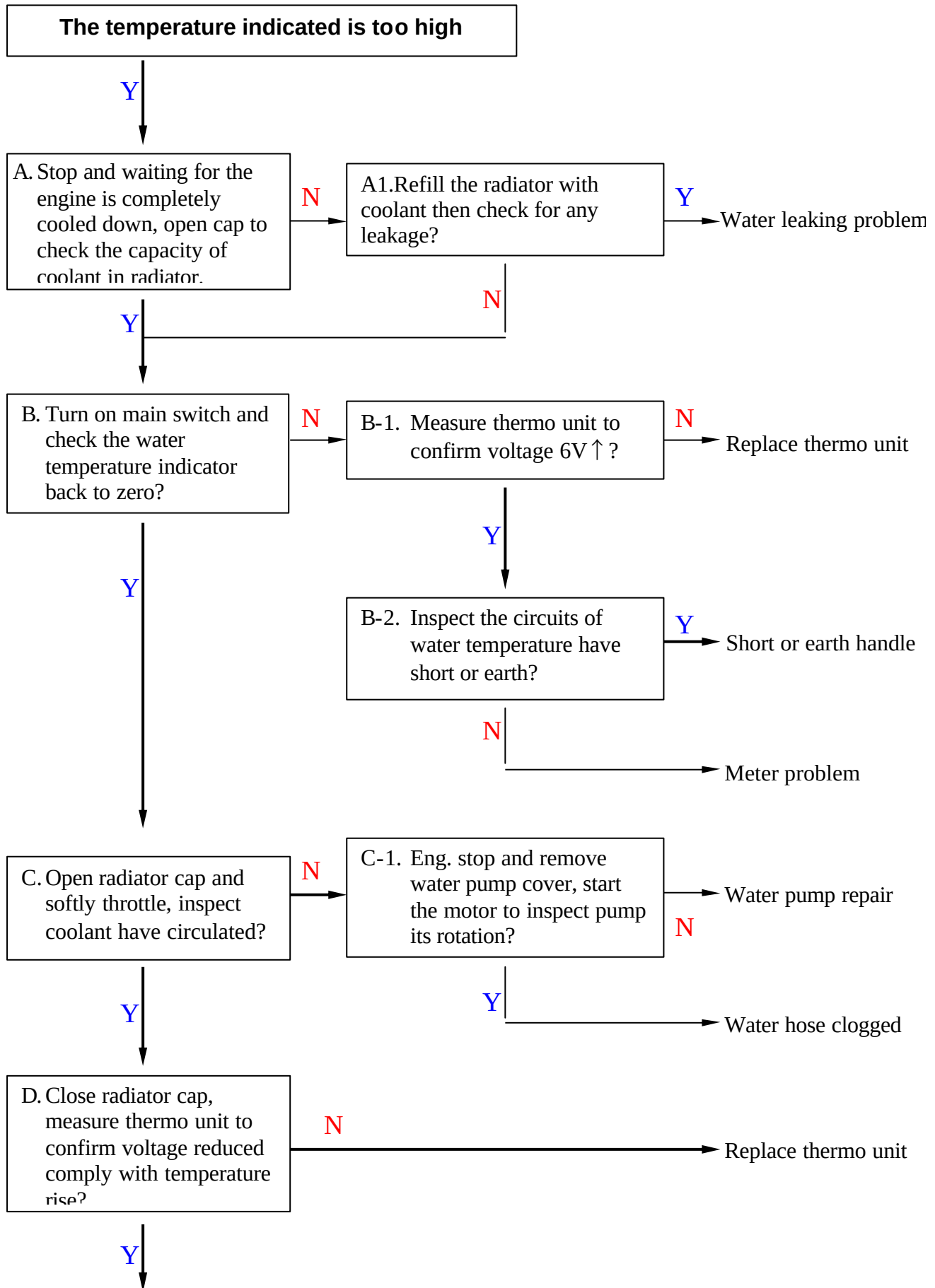
### The engine temperature is too low

- The water thermometer and the temperature sensor malfunction.
- The thermostat is stuck to open.

### Coolant is leaking

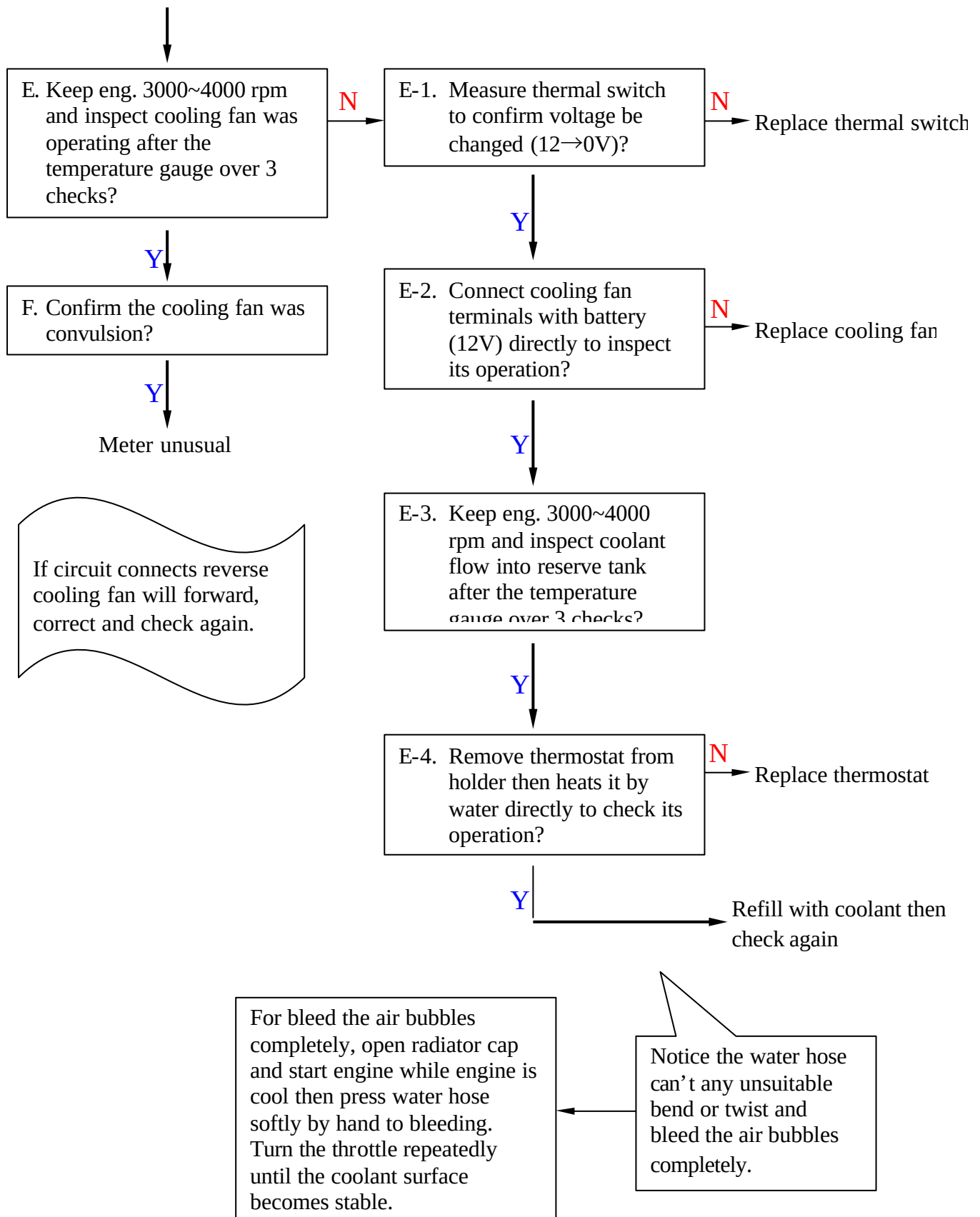
- The water pump mechanical seal does not function properly.
- The O ring is deteriorated.
- The water hose is broken or aged.

## 12-4 Trouble Diagnosis for Cooling System



Next page

Preceding page



## 12-5 System Test

### Test on the filler cap

Hermetically seal the filler cap, apply water and pressure to the filler cap. Replace it with new one if found failing to maintain the specified pressure within a given time limit, or the opening pressure is too high or too low. The specified pressure shall be maintained at least for 6 seconds in the test

**Relief pressure for the filler cap: 0.9-0.15 kgf/cm<sup>2</sup>**

Apply pressure to the radiator, engine and water hose to check for any leakage

#### **Caution**

Pressure which is too high may damage the radiator.  
Never use pressure which exceeds 1.05 kg/cm<sup>2</sup>.

If the system fails to maintain the specified pressure for at least 6 seconds, repair or replace parts.

### Change of coolant

#### **Warning**

Never attempt to carry out service work on the cooling system unless the engine is completely cooled down, otherwise, you may get scalded.

Remove the front center cover, and then remove filler cap. Place a water pan under the water pump; loosen the drain bolt to drain out the coolant. Reinstall the drain bolt.

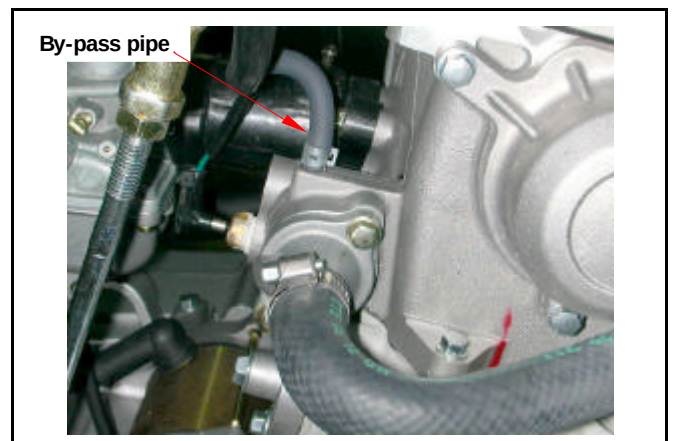
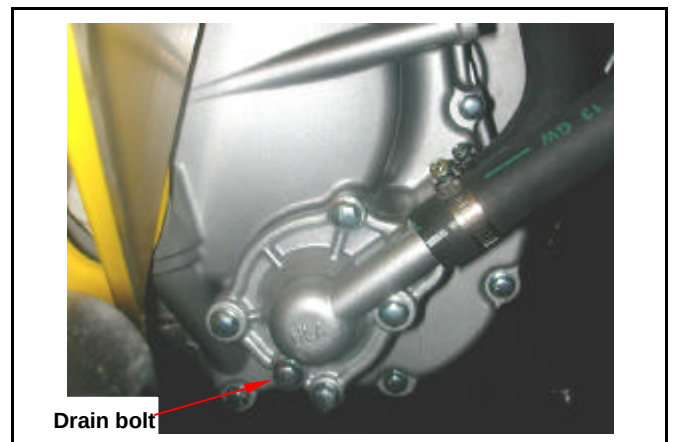
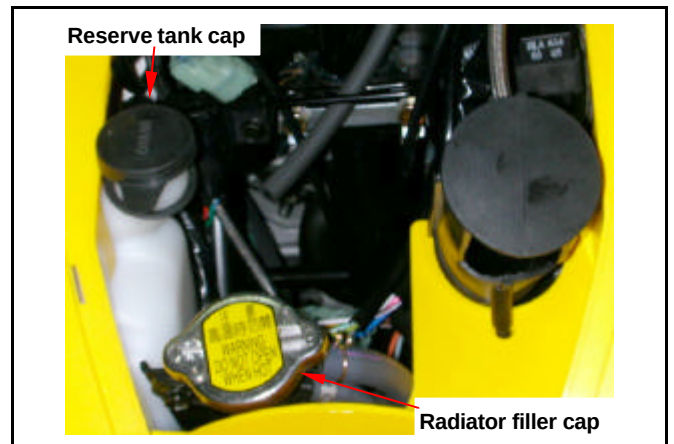
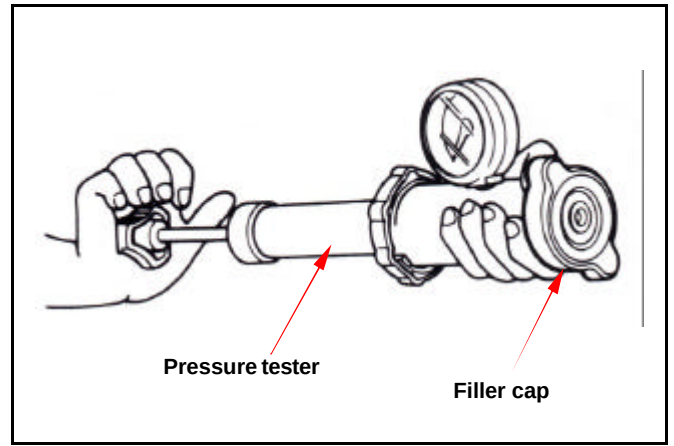
Refilling system with coolant and bleeding the air bubbles.

- Run the engine, and remove by-pass pipe.
- Check by-pass hole whether has the air bubble to emit.
- If emits without the air bubble, only has the coolant to flow out, then backflow pipe joint on, engine flameout.
- Remove radiator filler cap.
- Starts the engine, inspects does not have the air bubble in the radiator coolant, also the coolant liquid level is stable.
- Stop the engine. Add coolant to proper level if necessary.
- Screw and tighten up the radiator filler cap.

#### **Caution**

In order to avoid the water tank rusting, please do not use the unclear trade mark refrigerant.

Coolant recommended: SYM Bramax radiator agent.  
Concentration: 50%



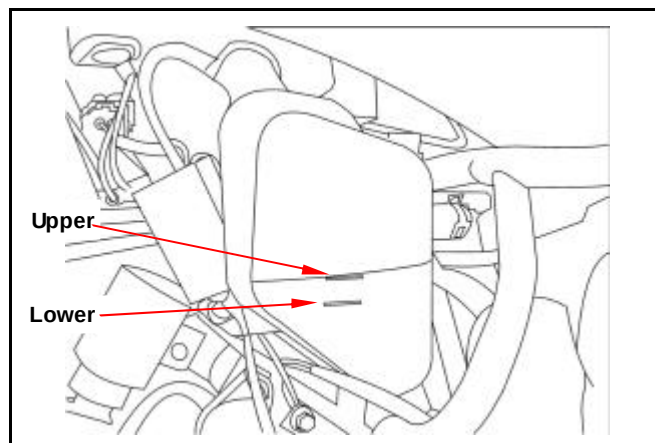


### Check reserve tank

- Remove the front center cover, and then remove reserve tank filler cap.
- Check the liquid level in the front fender right side. Add coolant to proper level if too low.
- Reinstall the reserve tank filler cap.

### Caution

The reserve tank liquid level can be too high, after avoids the water temperature elevating, in the cooling system the refrigerant backflow floods.



## 12-6 Radiator

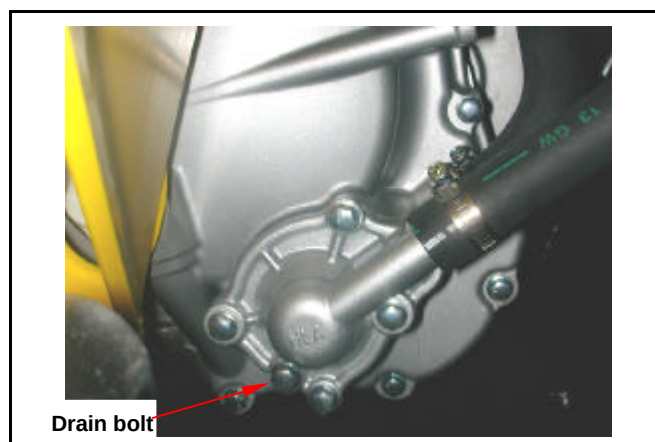
### Check

Remove the front center cover, side covers and front fender. (refer chapter 13), check for any leakage from weld seam. Blow radiator clean using compressed air. If the radiator is blocked by dirt, use low pressure water jet to clean it. Care shall be taken when straightening the sink fan.

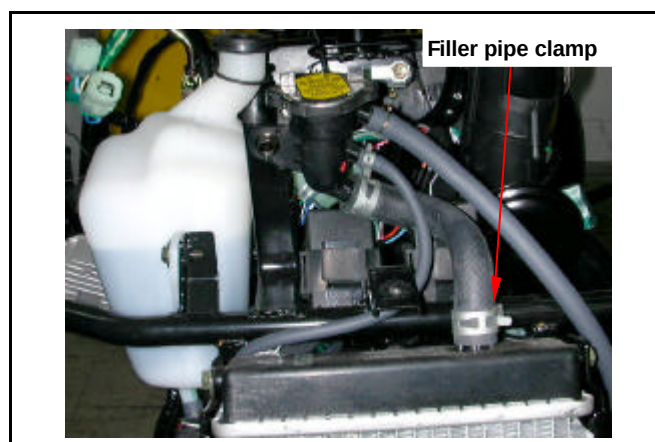


### Removal

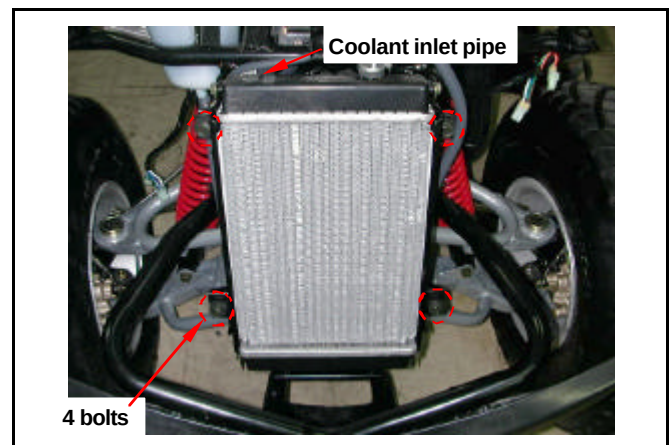
Place a water pan under the water pump; loosen the drain bolt to drain out the coolant.



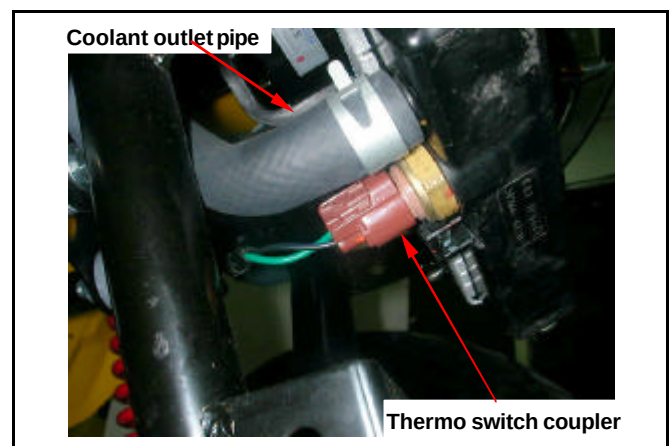
Remove coolant filler pipe.



Loosen the radiator 4 bolts.  
Remove coolant upper side pipes.



Remove coolant outlet pipe.  
Disconnect the couplers for the thermo switch and fan motor, and then remove radiator and cooling fan.



### Disassembly

Loosen the 3 bolts from the fan duct, and then remove the fan duct.

Loosen 3 screws from the fan motor, and take off the fan motor.

Remove nut to remove the fan from fan motor.

### Assembly

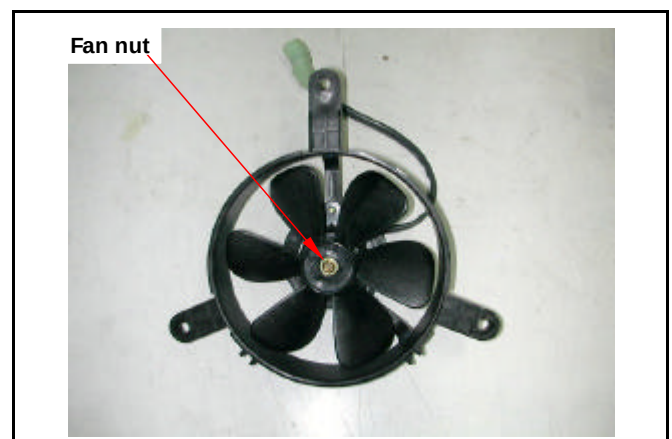
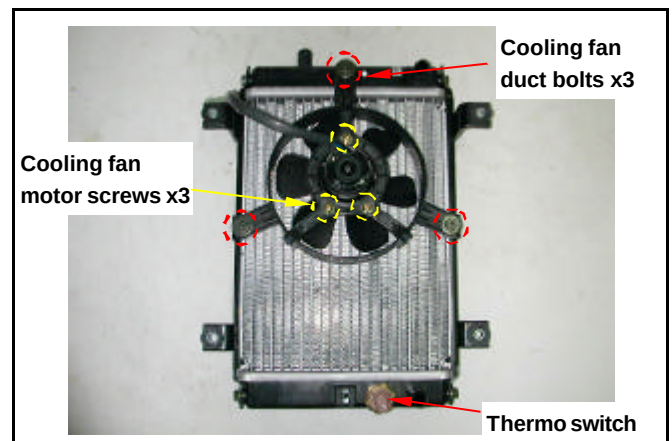
Install fan motor onto fan duct and insert the fan into the motor shaft.

Apply a coat of the adhesive to the shaft thread of the motor, and then install the washer and the lock nut.

Tighten the fan duct onto the radiator with 3 bolts. Please refer to chapter 17 for the inspection of the thermo switch.

### ⚠ Caution

Liquid packing must be applied to the thermo switch before installing to avoid damaging the radiator.



### Installation

Install the removed parts in the reverse order of removal.

Install radiator in the reverse order of removal.

Upon completion, check for any leakage.

## 12-7 Water Pump

### Check water pump seal / cooling system divulges inspection

- Disassembles the refrigerant drain bolt, overflows little buckles the N actually fluid, confirmed overflows the refrigerant whether has the greasy dirt.
- Turns on lathe the engine oil gauge rule, the inspection engine oil whether does have bleaches situation of the emulsified.

If has the above two kind of interior to divulge the phenomenon, possibly for the water pump inner two seal damages, the engine cooling system damages or the cylinder and the cylinder head gasket damages, please first dismantles the right crank case to say A confirms the replacement water pump seal, if does not have the question to take apart for overhaul cooling system of system again the cylinder head, the cylinder.

### Removal of water pump

Loosen the drain bolt to drain out the coolant.

Remove the water hose.

Loosen 4 bolts and remove the pump cover.

Loosen 9 bolts and remove the right cover.

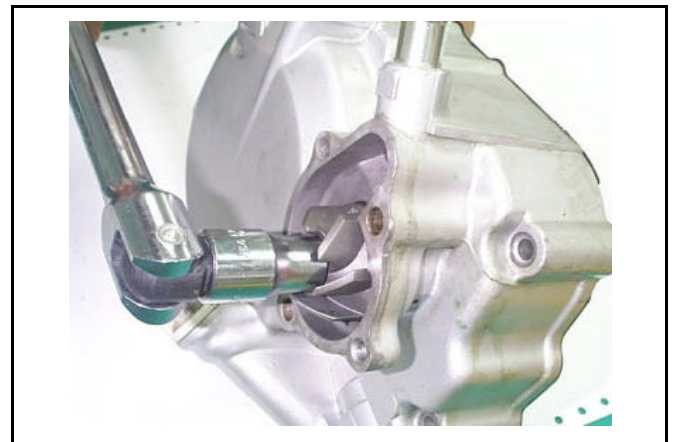
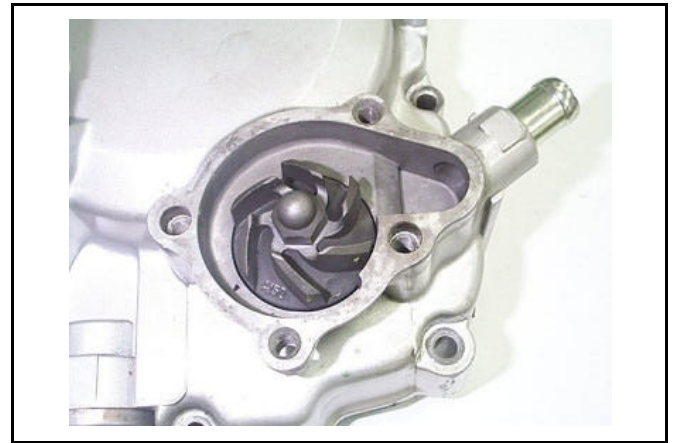
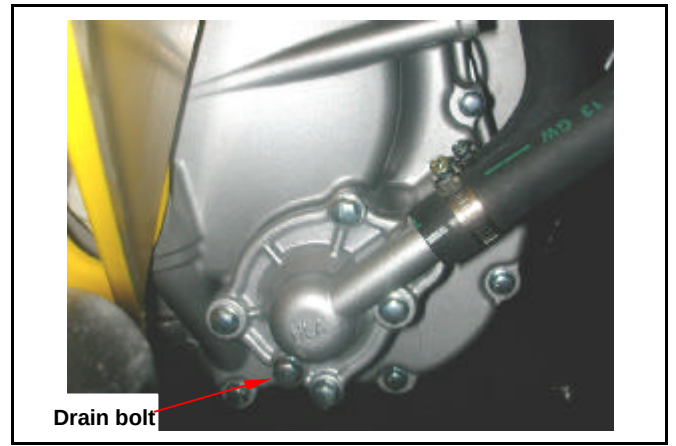
Take off the gasket and dowel pins.

Turn pump rotor clockwise and remove.



#### Caution

The rotor is provided with left turn thread.



Remove the cir clip from the right crankcase cover.

Remove the water pump shaft and the inner bearing.

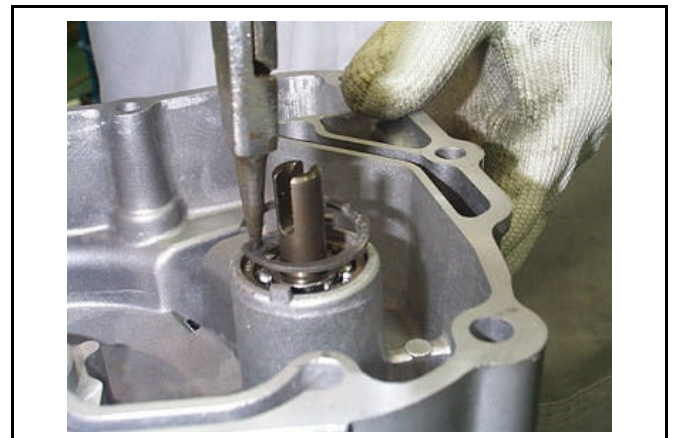
Remove the outside bearing by inner bearing puller.

Rotate the inner ring of bearing, the bearing shall move smoothly and quietly.

If the bearing does not rotate smoothly or produces a noise, replace it with new one.

**Special tool:**

**Inner bearing puller**

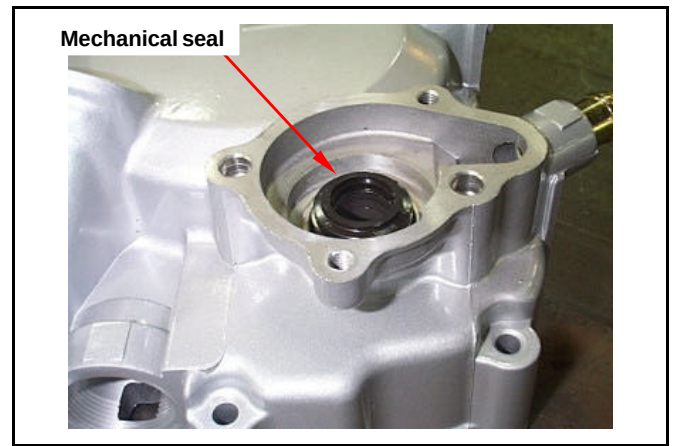




Check any wear and damage of the mechanical seal and inside seal.

**⚠ Caution**

The mechanical seal and inside seal must be replaced as a unit.



### Replacement of Mechanical Seal

Remove the inside bearing by inner bearing puller.  
Drive the mechanical seal and inner seal out of the right crankcase.

**Special tools:**

**Inner bearing puller**

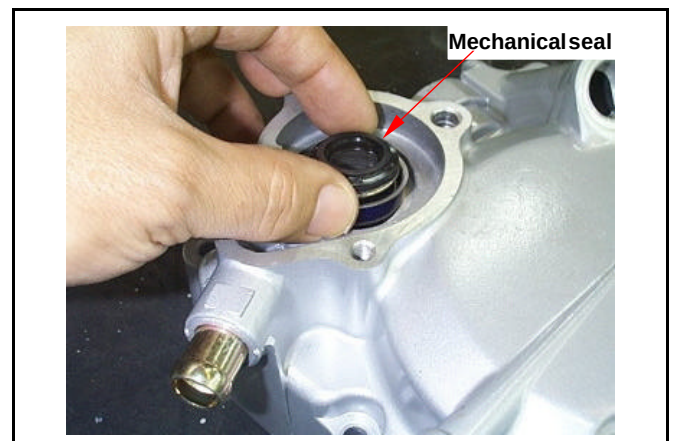
**Water pump bearing driver**

**⚠ Caution**

Replace a new mechanical seal after removing it.



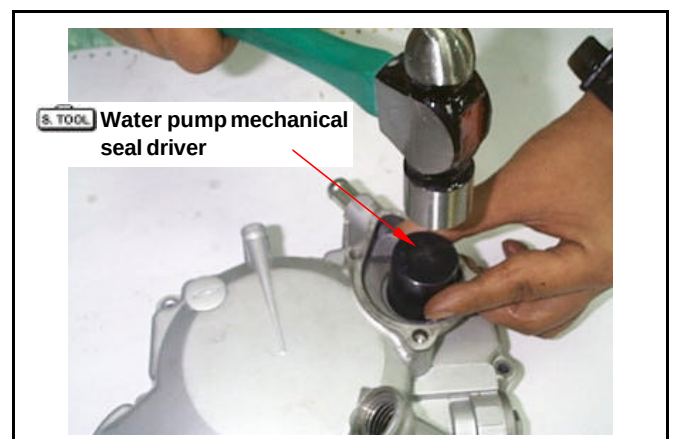
Apply a coat of sealant to the mating surfaces of the right crankcase before installing the new mechanical seal.



Install the mechanical seal onto the right crankcase.

**Special tools:**

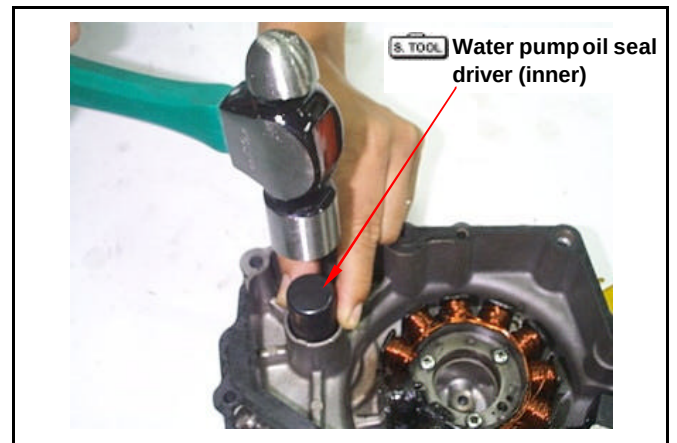
**Water pump mechanical seal driver**



Install the new inner seal onto the right crankcase.

**Special tools:**

**Water pump oil seal driver (inner)**



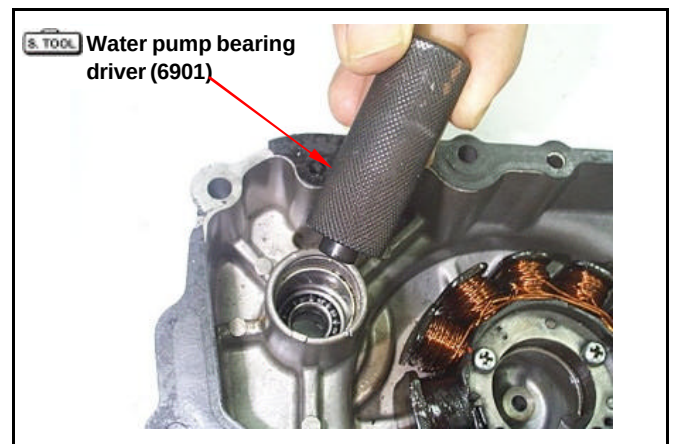
Install a new outside bearing to the right crankcase cover.

**Special tools:**

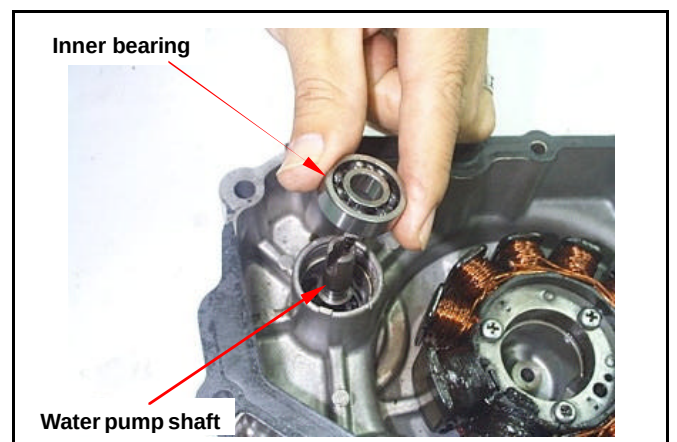
**Water pump bearing driver (6901)**

**⚠ Caution**

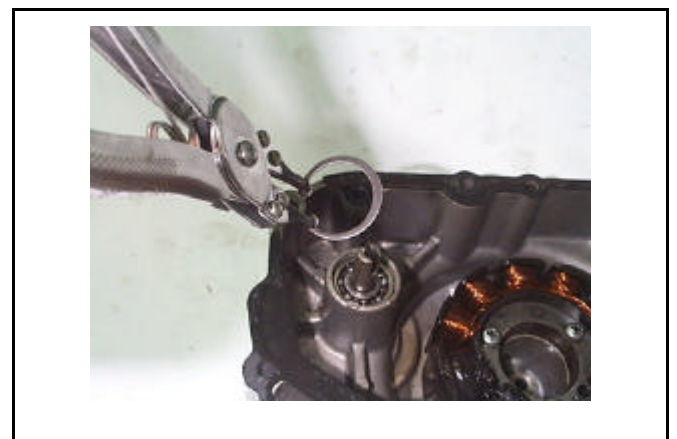
Do not reuse old bearing. It must be replaced with a new one once it has been removed.



Mount the water pump shaft and the inner bearing to the right crankcase cover.



Install the cir clip to hold the inner bearing.

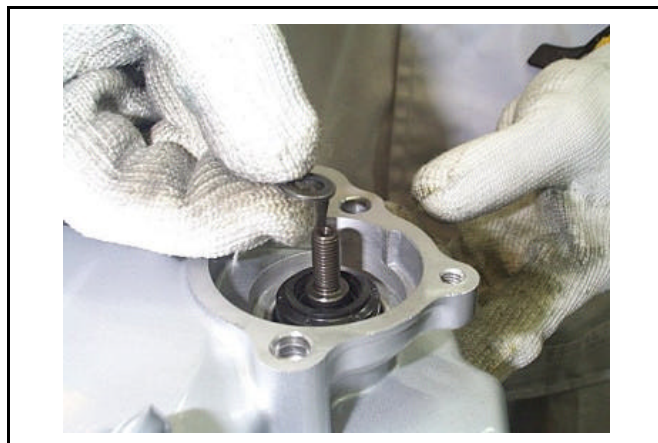




Install the seal washer into the rotor.

**⚠ Caution**

Washer must be replaced together with the mechanical seal.

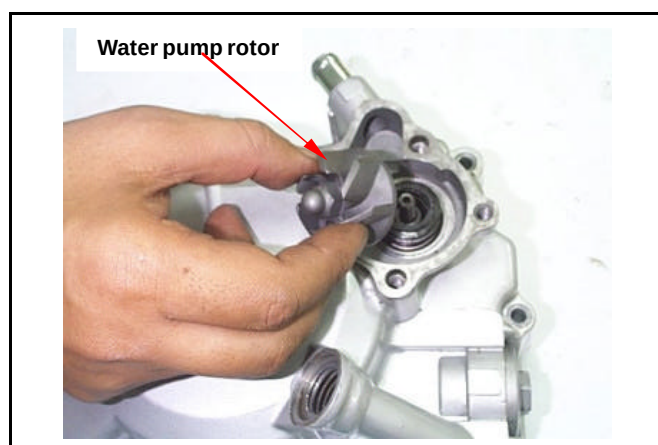


Install the rotor onto the water pump shaft and tighten.

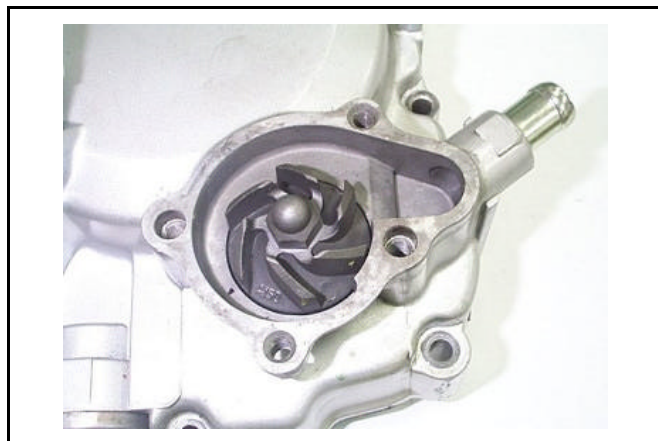
**Torque Value: 1.0~1.4kgf-m**

**⚠ Caution**

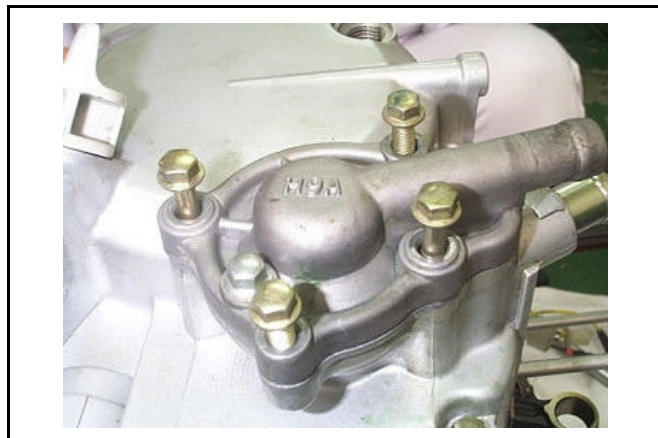
The rotor is left thread.



Install the dowel pin and right cover gasket.  
The rotation water pump rotor, causes the water pump drive shaft scoop channel, aligns the oil pump drive shaft flange, install the right crank case. (9 bolts)



Install the dowel pin and new gasket.  
Install the water pump cover with 4 bolts.



# 12-8 Thermostat

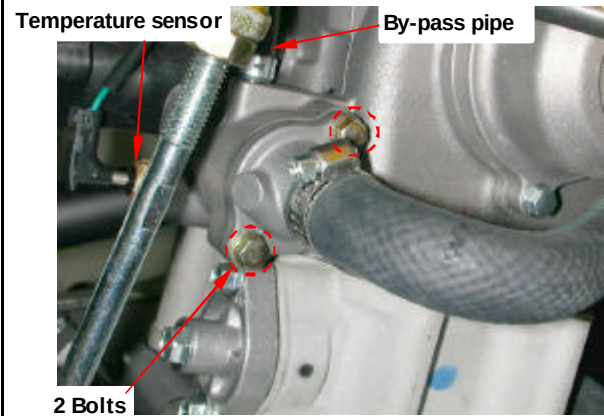
Please refer to chapter 17 for inspection of temperature sensor.

## Removal

Drain out the coolant.  
Remove the thermostat set. (2 bolts)

## Inspection

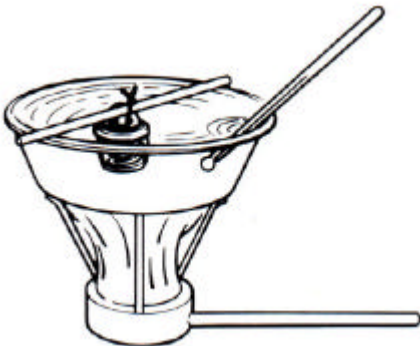
Visually inspect thermostat for any damage.



Place the thermostat into heated water to check its operation.

### ⚠ Caution

Whenever the thermostat and the thermometer are in contact to the wall of heated water container the reading displayed is incorrect. If the valve of the thermostat remains open at room temperature or the valve operation is not corresponding to the temperature change then it must be replaced.



## Technical Data

|                      |            |
|----------------------|------------|
| Valve begins to open | 82~95°C    |
| Valve stroke         | 0.05 ~ 3mm |

## Installation

Install the thermostat.  
Install the thermostat cover. (2 bolts)  
Refill the coolant and bleed out the air bubble (Page 12-5).



## 13. STEERING AND SUSPENSION

### 13.1 PARTS DRAWING

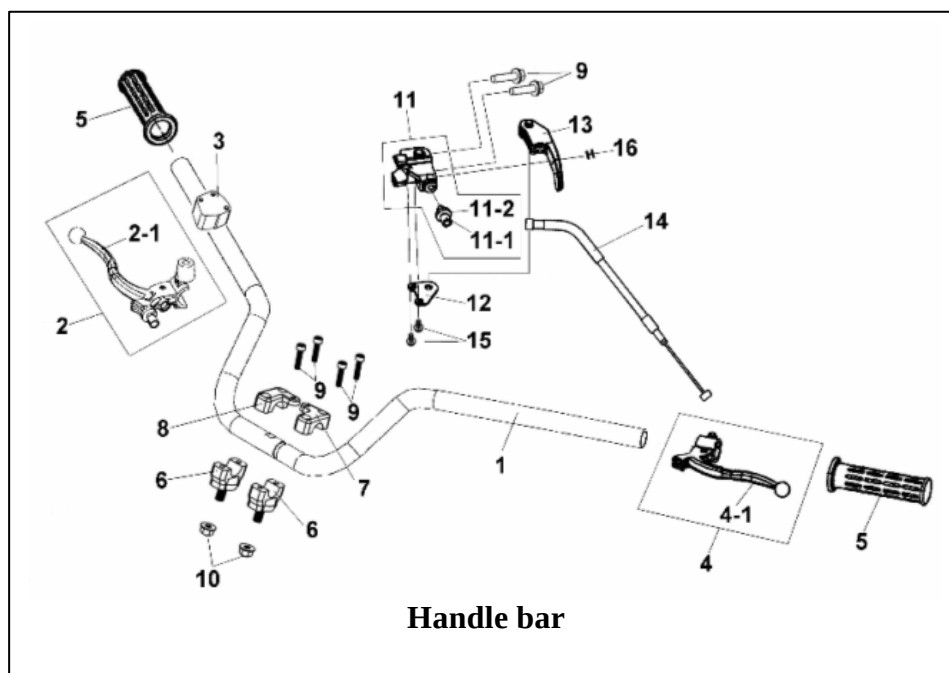
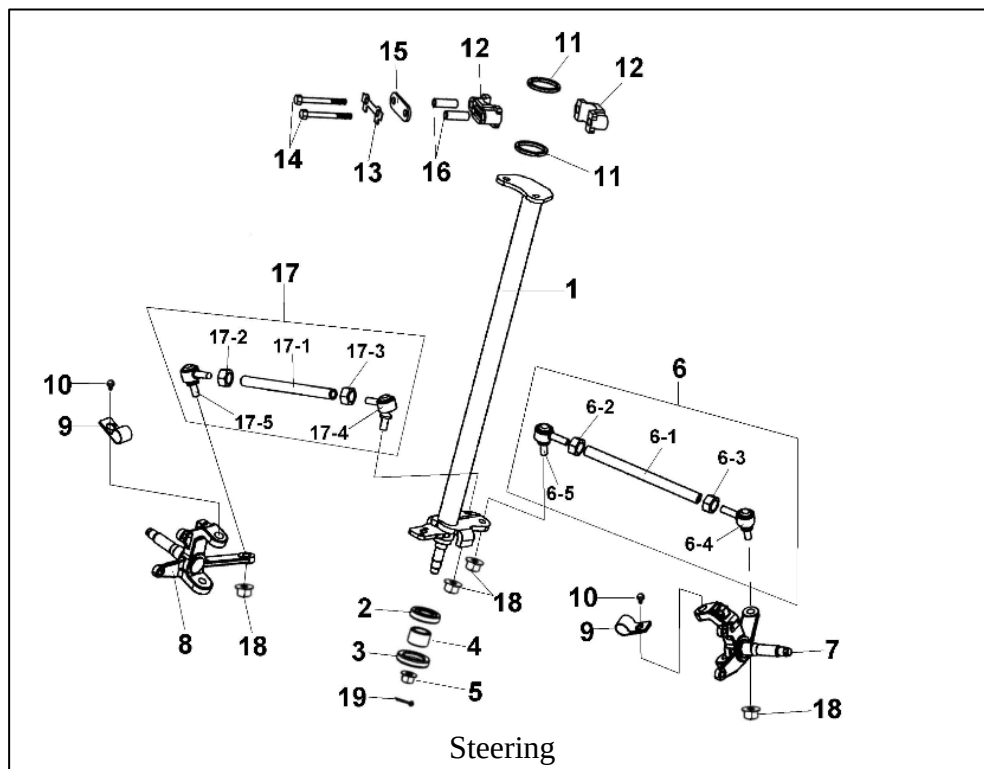
### 13.2 TROUBLESHOOTING

### 13.3 HANDLENAR

### 13.4 THROTTLE HOUSING

### 13.5 STEERING SYSTEM

## 13.1 PARTS DRAWING



## 13.2 TROUBLESHOOTING

### HARD STEERING

- ★ Faulty tire
- ★ Steering shaft holder too tight
- ★ Insufficient tire pressure
- ★ Faulty steering shaft bushing
- ★ Damaged steering shaft bushing

### FRONT WHEEL WOBBLING

- ★ Faulty tire
- ★ Worn front brake drum bearing
- ★ Bent rim
- ★ Axle nut not tightened properly

### STEERS TO ONE SIDE

- ★ Bent tie rods
- ★ Wheel installed incorrectly
- ★ Unequal tire pressure
- ★ Bent frame
- ★ Worn swing arm pivot bushings
- ★ Incorrect wheel alignment

### FRONT SUSPENSION NOISE

- ★ Loose front suspension fasteners
- ★ Binding suspension link

### HARD SUSPENSION

- ★ Faulty front swing arm bushings
- ★ Improperly installed front swing arms
- ★ Bent front shock absorber swing rod

### SOFT SUSPENSION

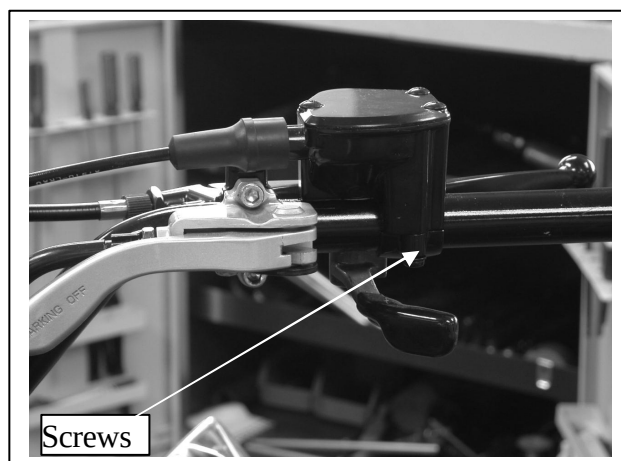
- ★ Weak front shock absorber springs
- ★ Worn or damage front swing arm bushings

## 13.3 HANDLEBAR

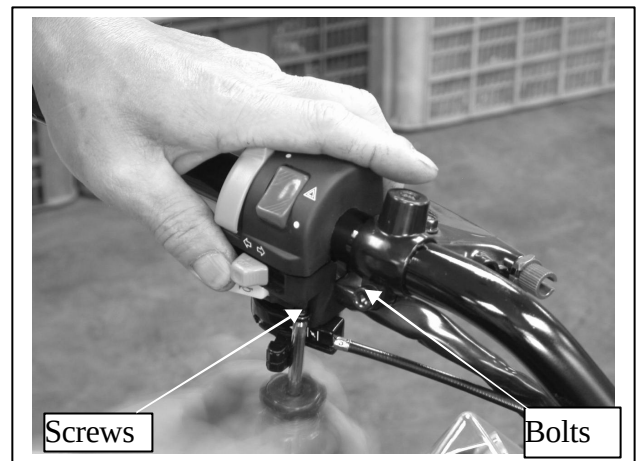
### REMOVAL

Remove the throttle housing by two fixed screws.

Remove the throttle lever housing on the right side handle bar.  
Remove brake lever bracket assembly.



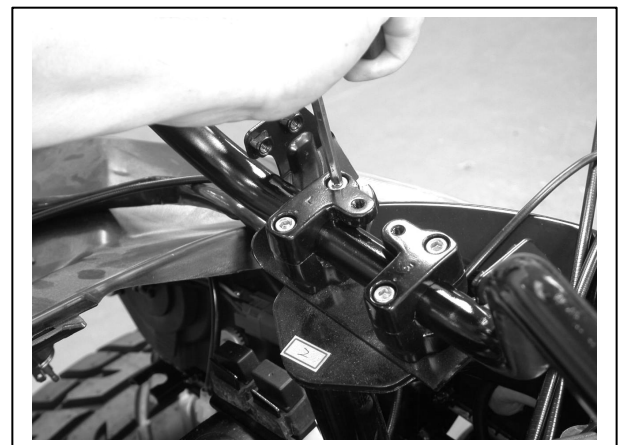
Remove the handle bar switch on the left handle bar.  
Remove rear brake lever bracket assembly.



Remove the handle cover and instrument panel by four screws at right and left side as shown in picture.



Remove the bolts attaching the handlebar upper holder.  
Remove the handlebar.

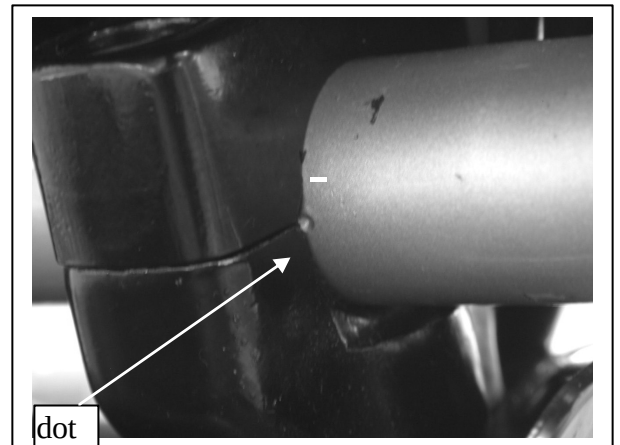




## INSTALLATION

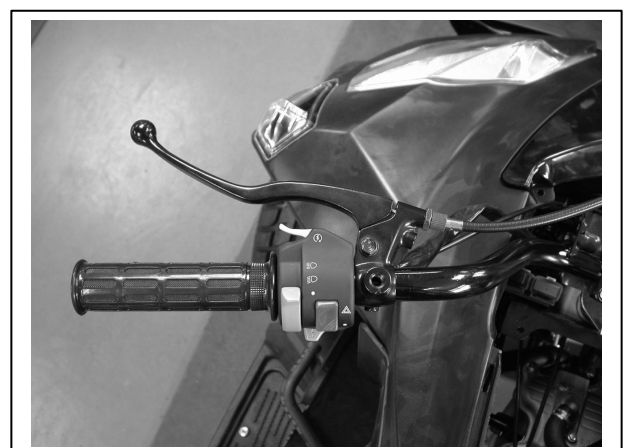
Put the handlebar on the lower holders.  
Make sure the handlebar punch marks match  
with the top end of the handlebar of lower holders.

Install the handlebar upper holders with  
the L or R marks facing forward.  
Tighten the forward bolts first, and then tighten  
the rear bolts.  
Install the handlebar upper holder's cover.



Install the switch housing, aligning the small dot of the  
handlebar.  
Tighten the upper screw firstly, after that tighten  
the lower one.

Install the rear brake lever bracket, aligning  
the small dot of the handlebar.  
Tighten the screw securely.



## 13.4 THROTTLE HOUSING

### DISASSEMBLY

Loosen the screws on the throttle housing cover.  
Remove throttle housing cover and gasket.  
Disconnect throttle cable from the throttle arm  
and remove from the throttle housing.

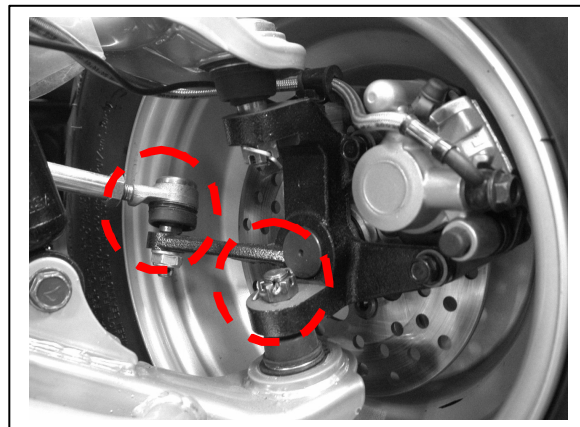
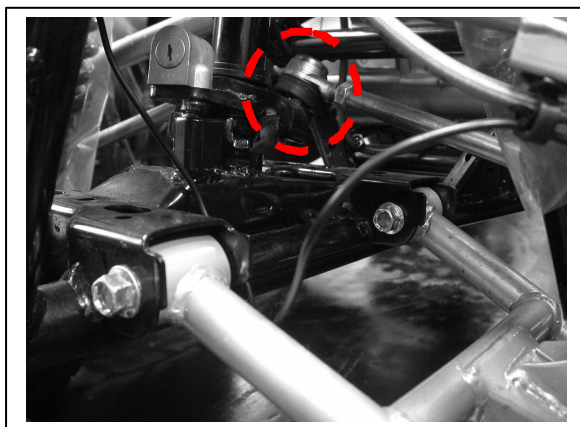
### NOTE:

**Assembly is in the reverse order of disassembly.**



## 13.5 STEERING SYSTEM

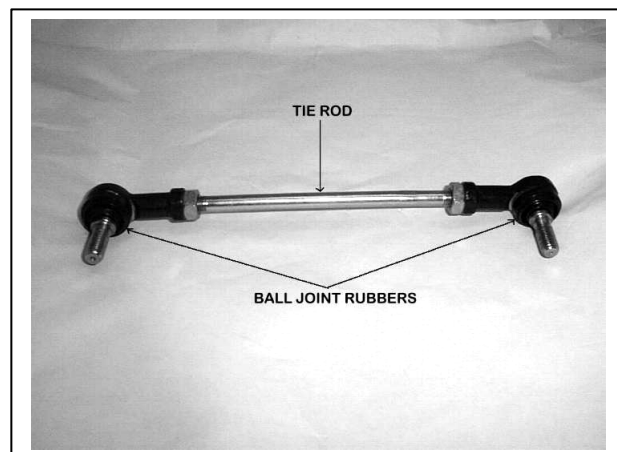
When the steering shaft needs to be repaired, you need to remove three kinds of components: the tie-rods, front wheels and hub assy. Following the steps to check these components, if broken please change the new one



## Step 1 Tie-rod Inspection

- ✓ Inspecting the tie-rod for damage or bending.
- ✓ Inspecting the ball joint rubbers for damage, wearing or deterioration.

Turn the ball joints with fingers. The ball joints should turn smoothly and quietly.



## Steering Shaft Removal

Remove the handle bar cover and handle bar.

(See Chapter 13-3)

Remove the front fender. (See Chapter 16-1)

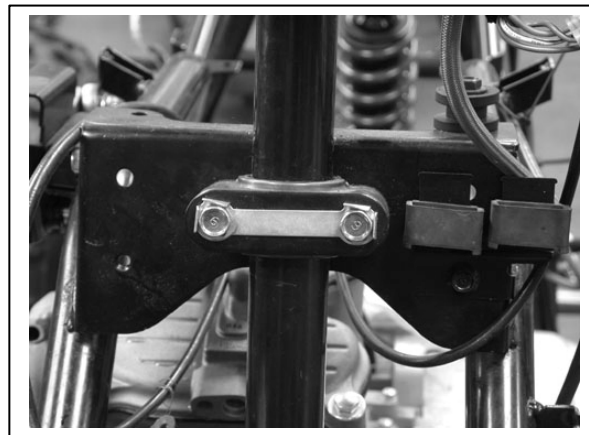
Remove handlebar lower holder.

Loosen the steering shaft holder bolt and remove steering shaft holder.

Take off the cotter pin below steering shaft.

Loosen the steering shaft fixed out below shaft.

Pull steering shaft carefully.



## Step 2 Steering Shaft Holder Inspection

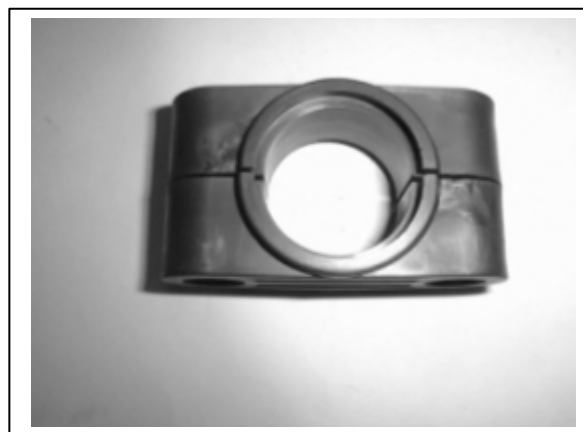
Remove the steering shaft.

Remove the bushing from the shaft.

Inspect the bushing for damage or wear, replace if necessary.

Measure the bushing inner diameter.

**Maximum limit: Ø39.5 mm**



## Step 3 Steering Shaft Inspection

Inspect the steering shaft for damage or cracks.

## Installation of Steering Shaft

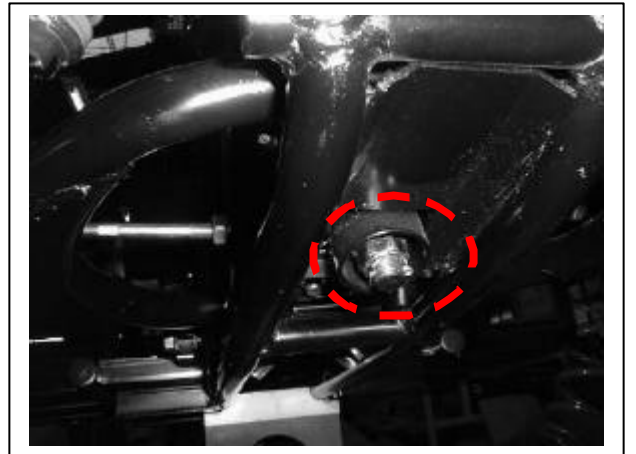
Apply grease to the holder.

Install the holder and oil seal tighten with the nuts.

**Torque: 33 N.m (24 lbf-ft)**

Install the steering shaft nut and tighten it.  
This nut is under this steering shaft.

**Torque: 50 N.m (37 lbf.ft)**



## 14. FRONT WHEEL AND BRAKE SYSTEM

14.1 PARTS DRAWING

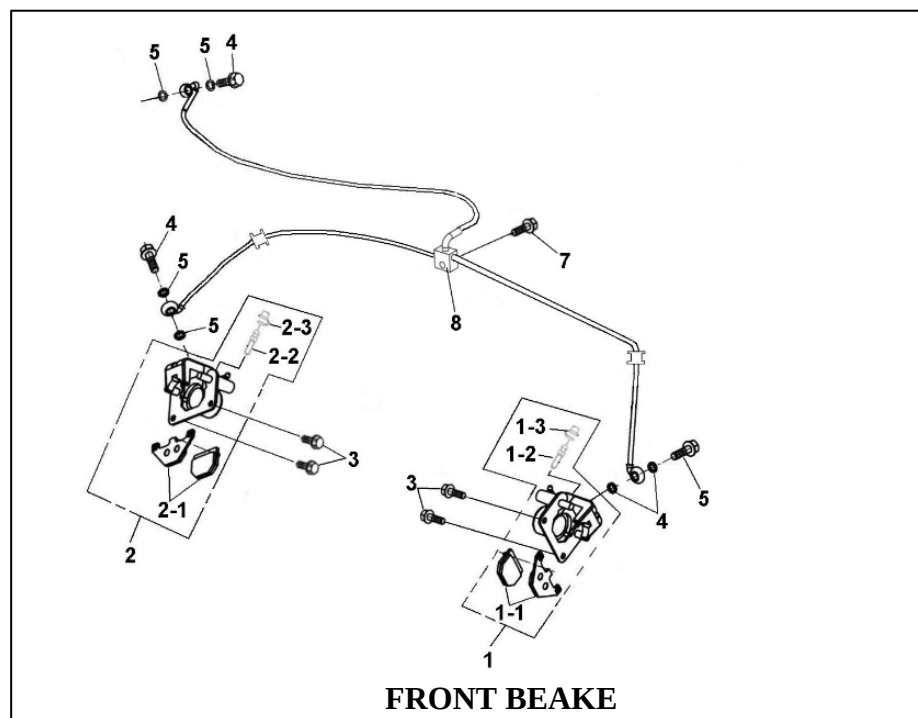
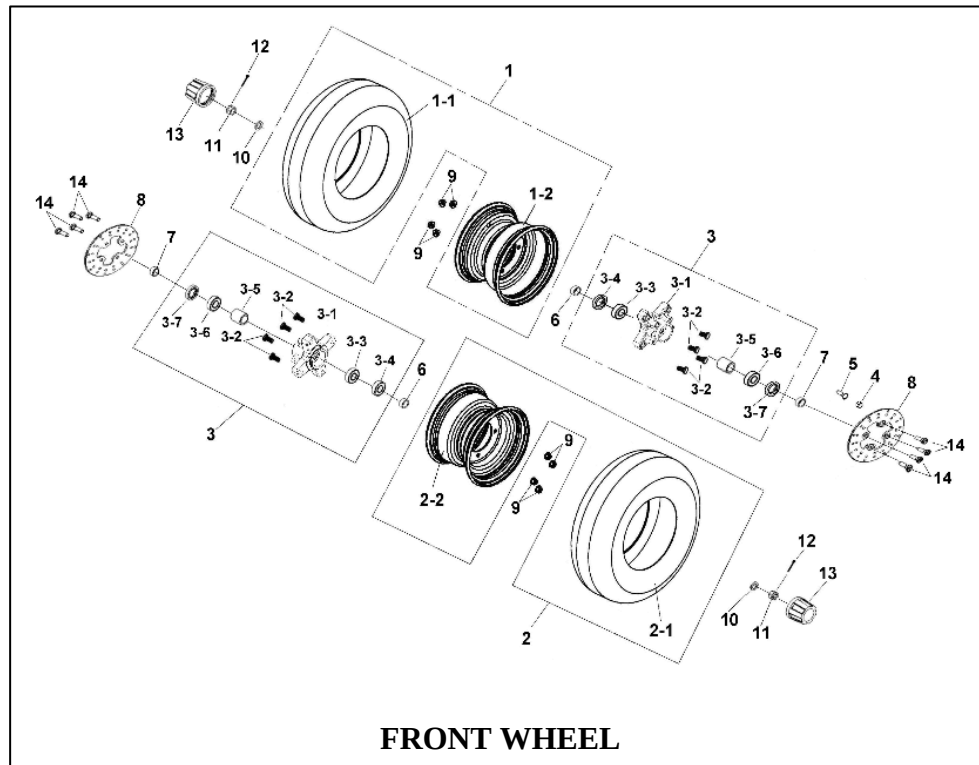
14.2 TROUBLESHOOTING

14.3 FRONT WHEEL

14.4 HYDRAULIC BRAKE

14.5 SUSPENSION SYSTEM

### 14.1 PARTS DRAWING





## 14.2 TROUBLESHOOTING

### HARD STEERING

- ★ Faulty tire
- ★ Insufficient tire pressure

### FRONT WHEEL WOBBLING

- ★ Faulty tire
- ★ Worn front brake drum bearing
- ★ Bent rim
- ★ Axle nut not tightened properly

### BRAKE DRAG

- ★ Incorrect brake adjustment
- ★ Sticking brake cable

### STEERS TO ONE SIDE

- ★ Bent tie rods
- ★ Wheel installed incorrectly
- ★ Unequal tire pressure
- ★ Incorrect wheel alignment

### POOR BRAKE PERFORMANCE

- ★ Brake shoes worn
- ★ Worn brake drum
- ★ Brake linings oily, greasy or dirty
- ★ Improper brake adjustment

## 14.3 FRONT WHEELS

### REMOVAL

(The disassemble of front wheel system in this serials are the same)

Raise the front wheels off the ground by placing a jack or other support under the frame.

Remove the front wheel nuts, washer and wheels.

### INSTALLATION

Install and tighten the four-wheel nuts

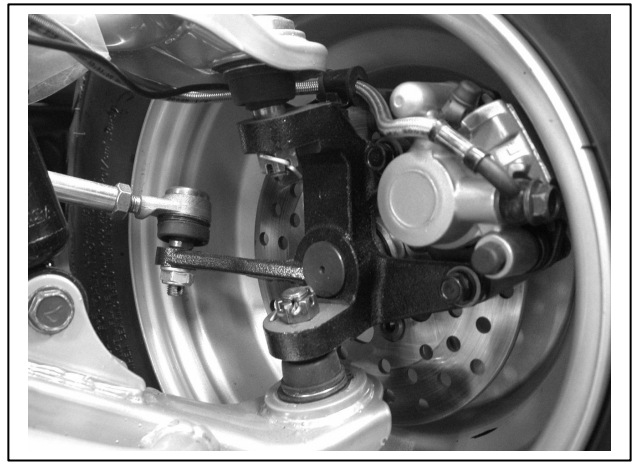
Torque: 24 N.m (17.7 lbf.ft)

Remember put a cotter pin in the castle nut.



## 14.4 HYDRAULIC BRAKE

This type of brakes are applying in front of two wheels of RA1



### REMOVAL

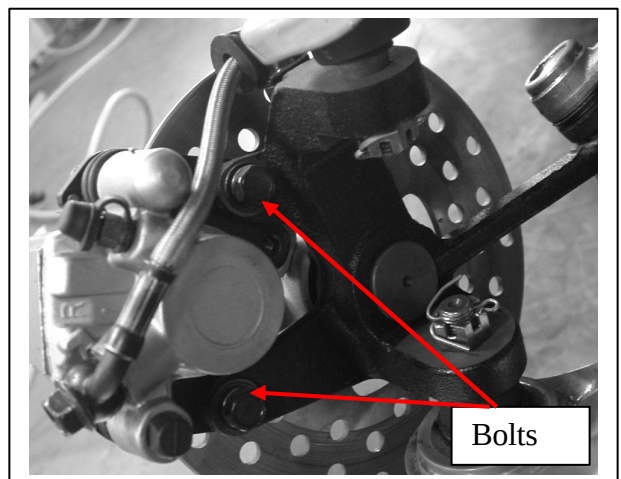
Raise the front wheels off the ground by placing a jack or other support under the frame.

Remove the front wheel nuts, washer and wheels.  
Please follow the next three steps of right pictures.

Loosen four nuts as shown in picture  
Then take the wheel out.



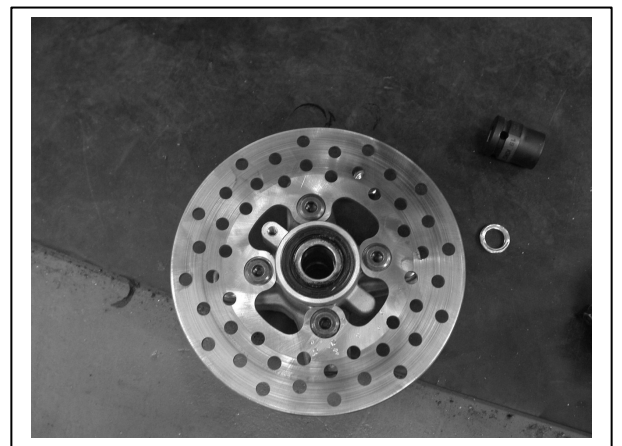
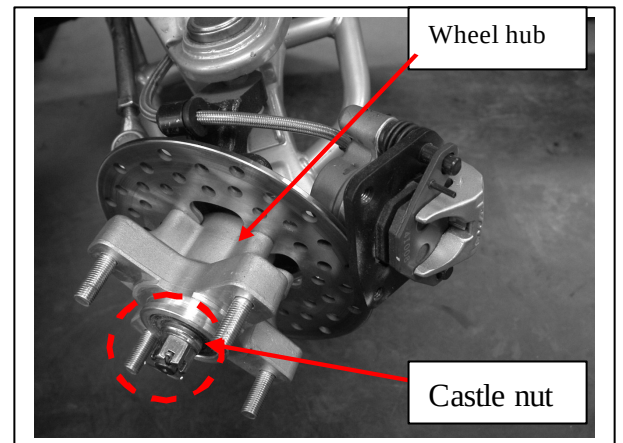
you can find two bolts fixed at front hydraulic disk component.  
Loosen these two bolts and you can take out disk component.



After disassembling the wheel, please inspect the disk plate.  
If the disk plate needs to be changed, you have to loosen castle nut to take wheel hub apart.

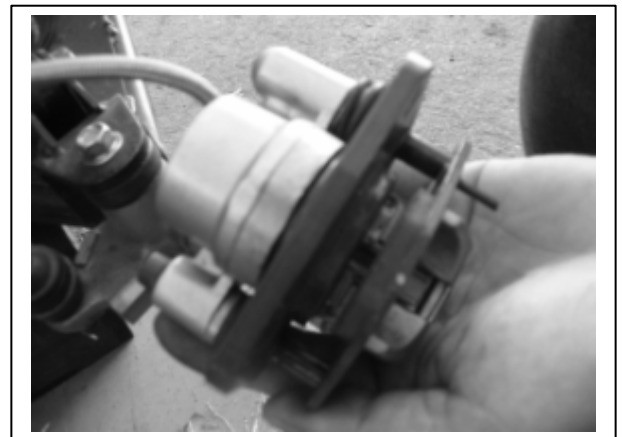
Before loosening castle nut, you have to remove cotter pin

Then using the power tools to take the screw out from brake stopping plate. You can take the brake disc off.



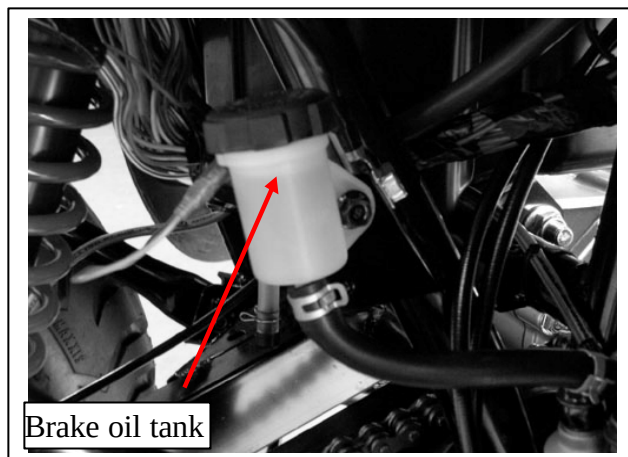
When change brake shoe wear, you must push the master piston to rearward.

After removal the front brake assembly, you must fabricate in reverse sequence.



## ADD BRAKE OIL

The brake oil tank is under the driver seat at right hand side.  
Please check the brake oil level position at outside of tank.  
To open the cap of brake oil tank, please turn “CCW”  
direction.



## 14.5 SUSPENSION ADJUSTMENT

Suspension system in this type of AVT can be adjustable its hardness and softness (fig 1).

1. You can raise the all ATV body up by using a repair platform. The four wheels are in the free position, you can use special tool (adjustable hook spanner, E1105-LRA0-FT1 ) to adjust the suspension.

How to use the “Adjustable Hook Spanner”

When you use the adjustable hook spanner, please depress the slider (fig 2&3.) to a proper position.



Fig 1

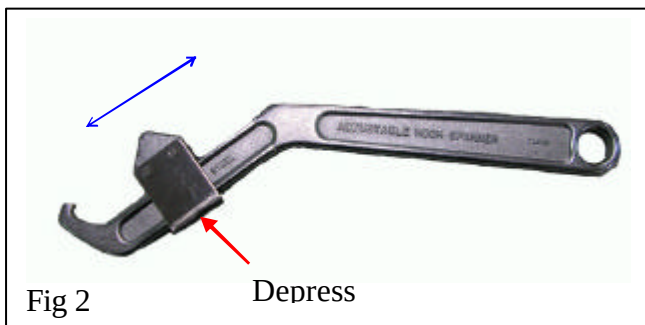


Fig 2

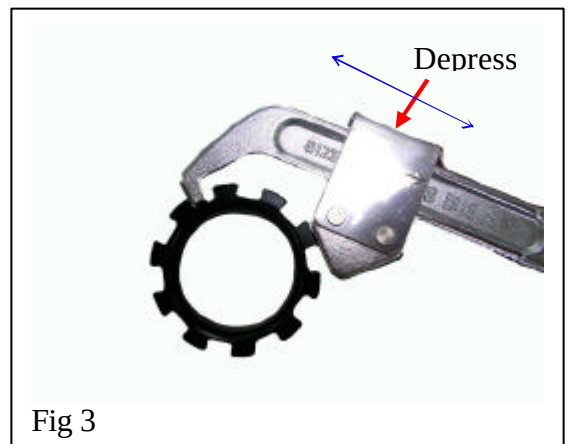


Fig 3



## 15. REAR WHEEL AND BRAKE SYSTEM

15.1 PARTS DRAWING

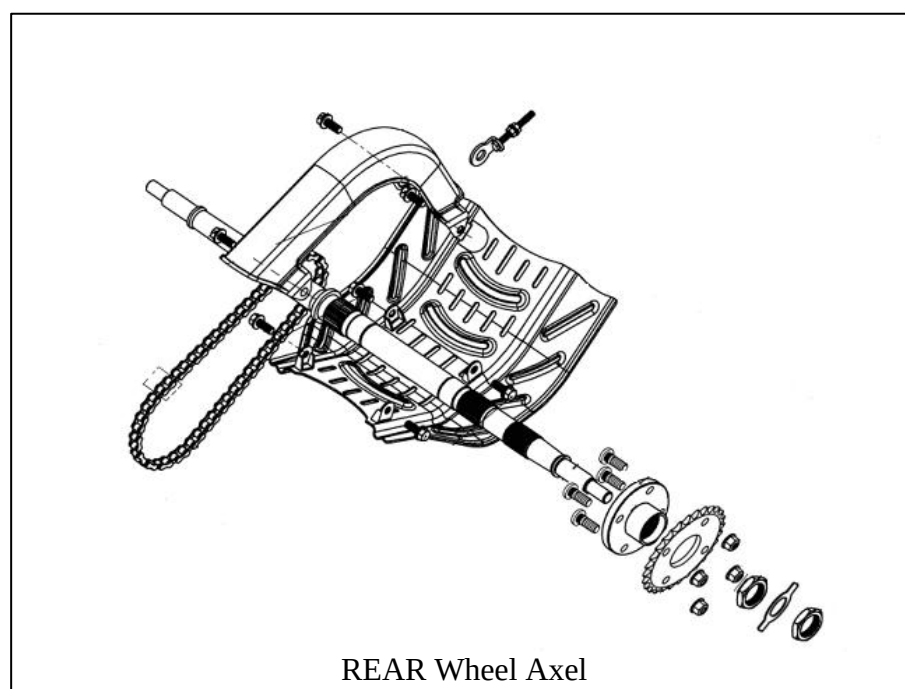
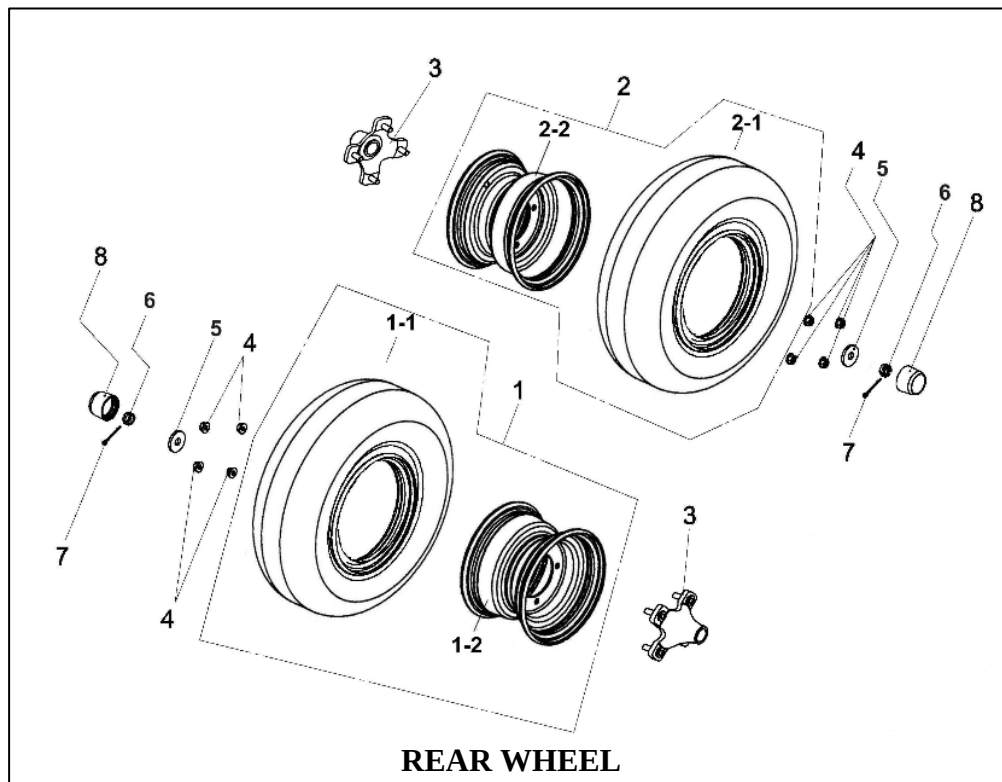
15.2 TROUBLESHOOTING

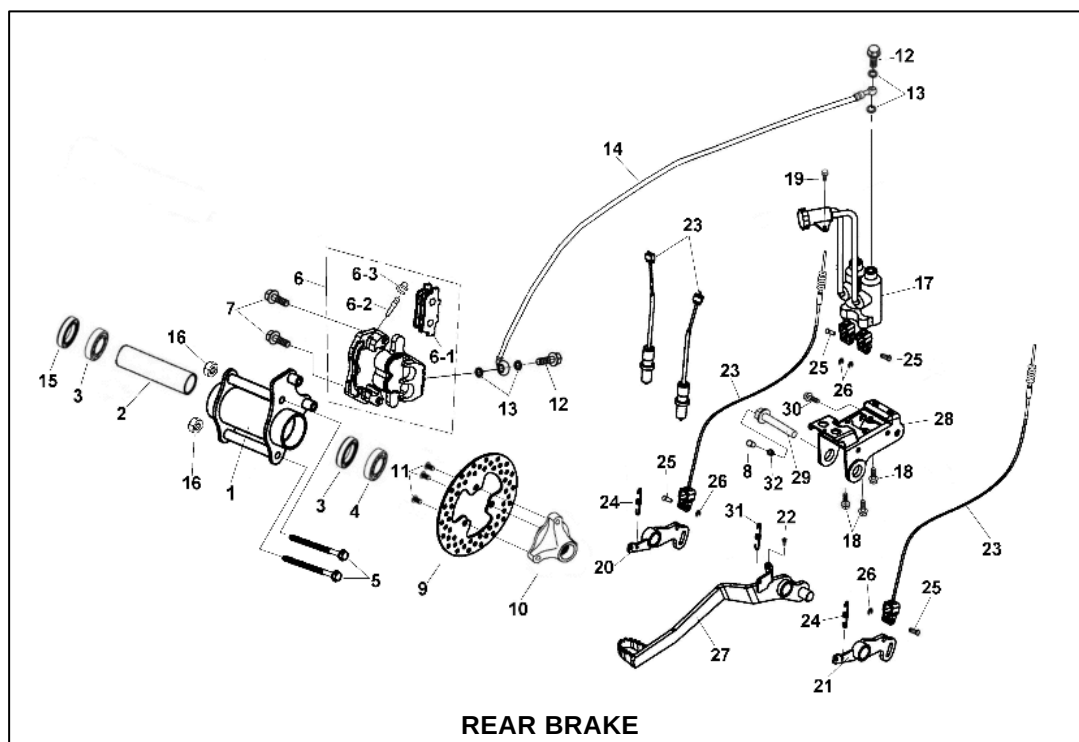
15.3 REMOVE REAR WHEEL AND REAR BRAKE

15.4 SWINGARM & REAR AXLE HOLDER

15.5 SUSPENSION ADJUSTMENT

### 15.1 PARTS DRAWING





## 15.2 TROUBLESHOOTING

|                       |                                           |
|-----------------------|-------------------------------------------|
| Bad Brake Performance | ★ Brake shoes are worn                    |
|                       | ★ Bad brake adjustment                    |
|                       | ★ Brake linings are oily, greasy or dirty |
|                       | ★ Brake drums are worn                    |
| Vibration or Wobble   | ★ Brake arm setting is improperly engage  |
|                       | ★ Axle is not tightened well              |
|                       | ★ Bent rim                                |
|                       | ★ Axle bearings are worn                  |
|                       | ★ Faulty tires                            |
|                       | ★ Rear axle bearing holder is faulty      |
| Brake Drag            | ★ Incorrect brake adjustment              |
|                       | ★ Sticking brake cam                      |
|                       | ★ Sticking brake cable                    |
| Hard Suspension       | ★ Bent damper rod                         |
|                       | ★ Faulty swing arm pivot bushings         |
| Soft Suspension       | ★ Weak shock absorber damper              |
|                       | ★ Weak shock absorber spring              |

## 15.3 REMOVE REAR WHEEL AND REAR BRAKE

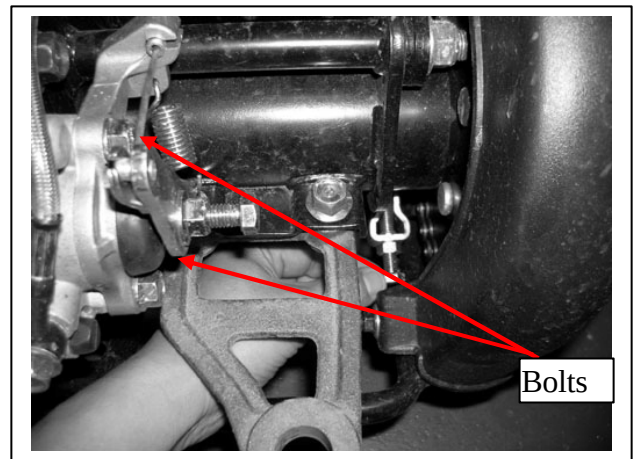
To replace brake disk

The produce of removing the rear left tire is same as removing front tire.

You need to loosen four nuts firstly.



Loosen two bolts to take out rear brake disk as shown in picture.

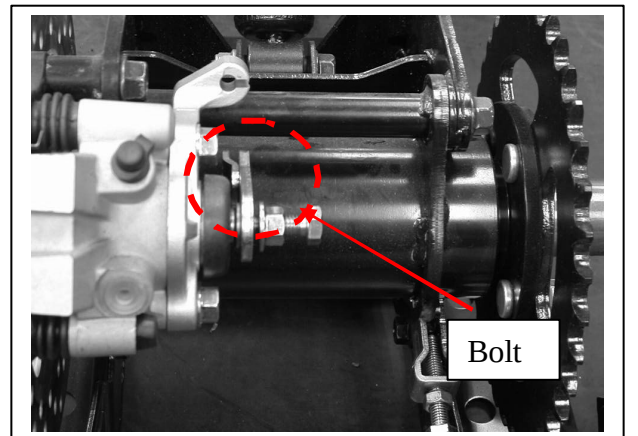


Loosen bolts and remove the brake disc  
Check the thickness of disc and replace a new one if the thickness less than 3mm

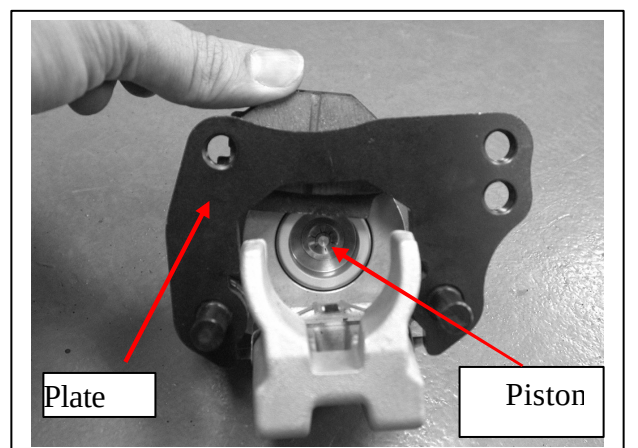


### TO REPLACE THE BRAKE SHOE

To replace the brake shoe, please loosen this bolt as shown in picture.

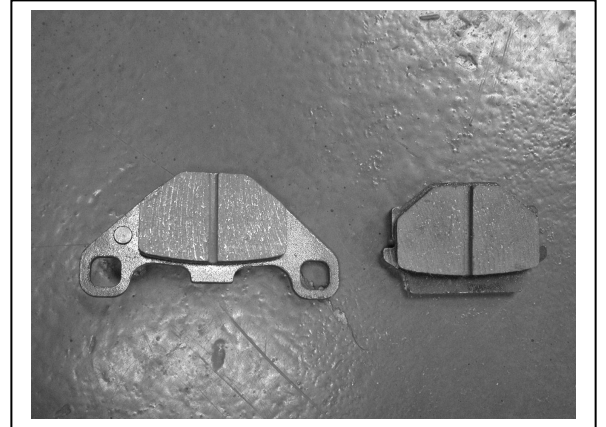


Please push the plate back to take a shoe out as shown in picture



Eventually, you can take all brake shoe out the hub.

There are two kind of brake linings as shown in picture

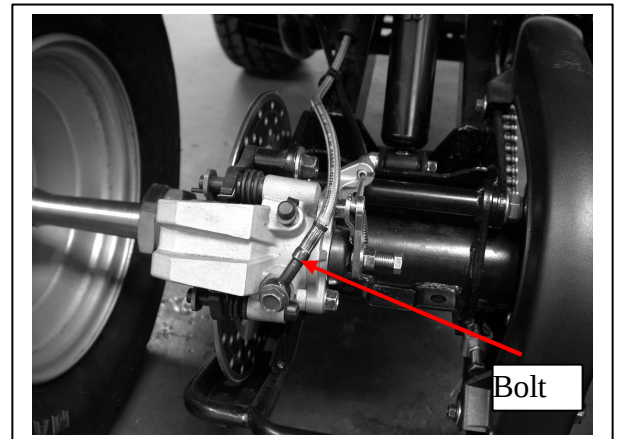


#### TO REPLACE THE BRAKE HYDRAULIC OIL

Loosen the bolts and open the cover

Loosen the bolt and drain the used oil out.

Tighten the bolt after the used oil being drained out completely



Add the brake oil (Dot 3 or Dot 4)

Keep oil level at least half of the cup in order to avoid air in the brake system.



Loosen the bolt to vent the air from brake system.

Tighten the bolt if there isn't any air in the brake system

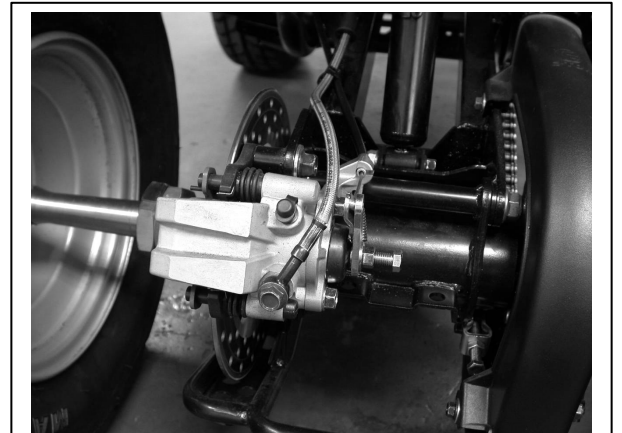
Tighten torque 40~70kgf-cm

Pull left brake lever slightly in order to extract air from brake system

Fill the brake oil in the level shown on the cup

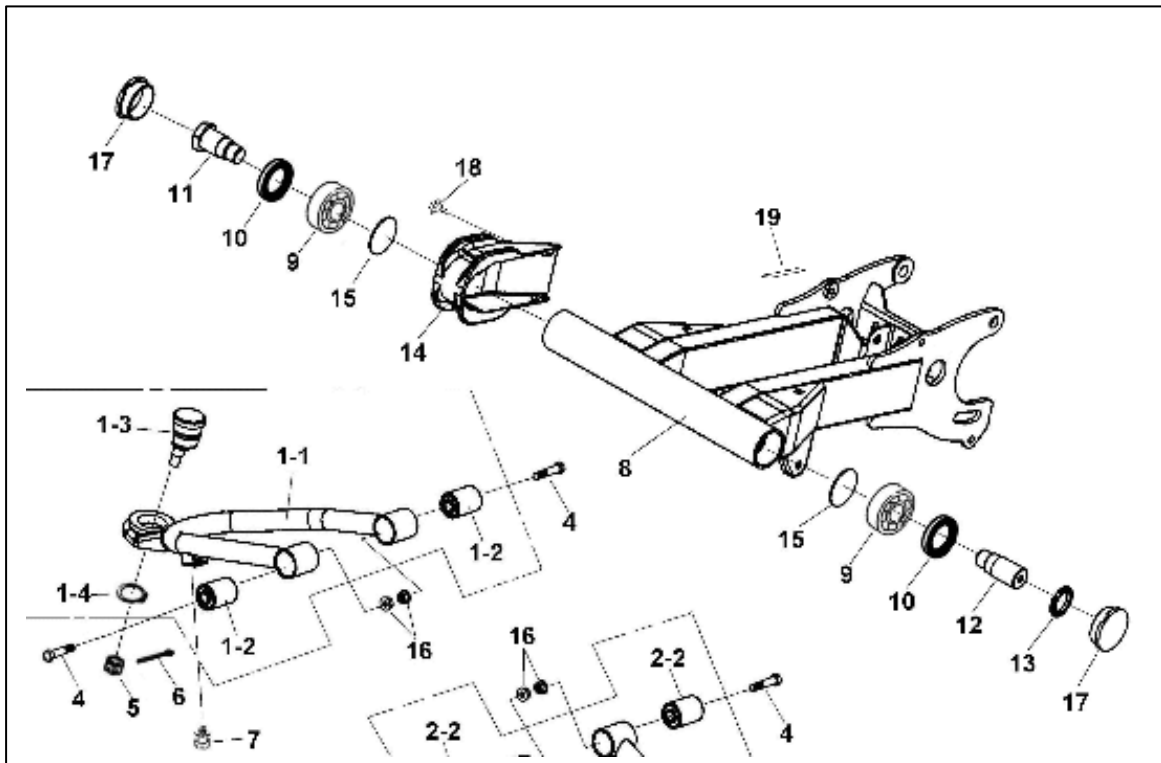
when no air comes out

Assemble the cover



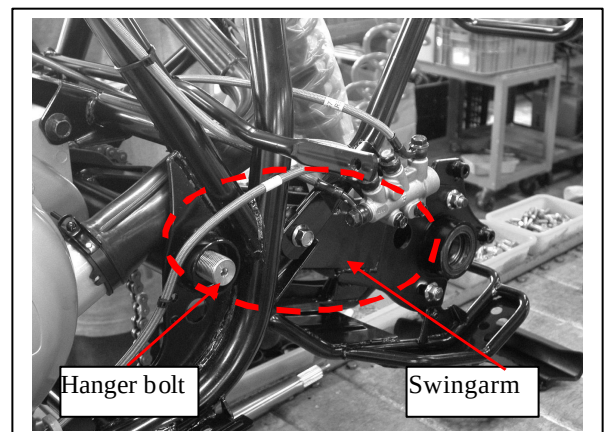


## 15.4 SWINGARM & REAR AXLE HOLDER

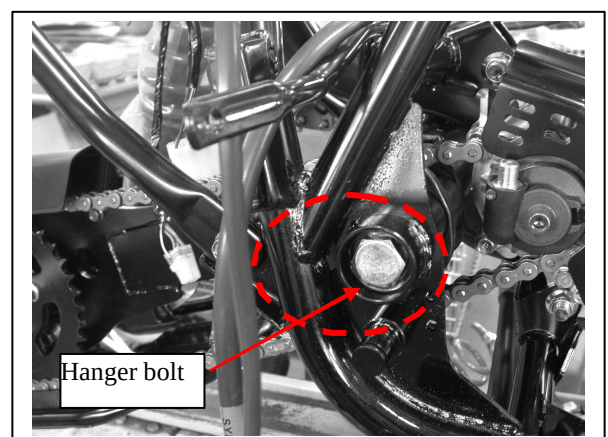


This section is to introduce how to repair the swing-arm,  
The following pictures are going to teach you how to  
Install the swing-arm.

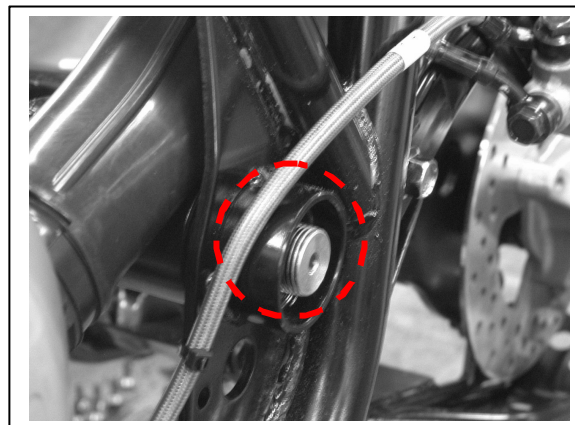
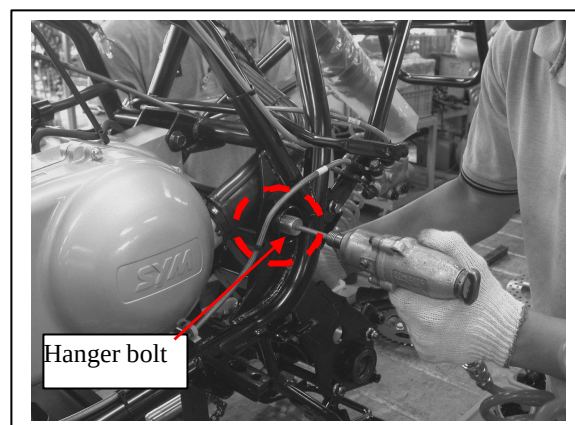
1. Put the swingarm at proper position as shown in picture. Two hanger bolts will be used to hold the swing-arm at right and left side.



2. Tighten a hanger bolt on the right side as shown in picture.



**3. Screw another hanger bolt on the left side as shown in picture. But do not tighten it. Let the cross-section of bolt and cross-section of hole in the same plane.**



**4. Tighten the nut**



## 15.5 Suspension Adjustment

Suspension system in this type of AVT can be adjustable its hardness and softness (fig 1).

1. You can raise the all ATV body up by using a repair platform.  
The four wheels are in the free position, you can use special tool (adjustable hook spanner) to adjust the suspension.

How to use the “Adjustable Hook Spanner”

When you use the adjustable hook spanner, please depress the slider (fig 2&3.) to a proper position. You can then adjust your ATV’s suspension (fig 4).

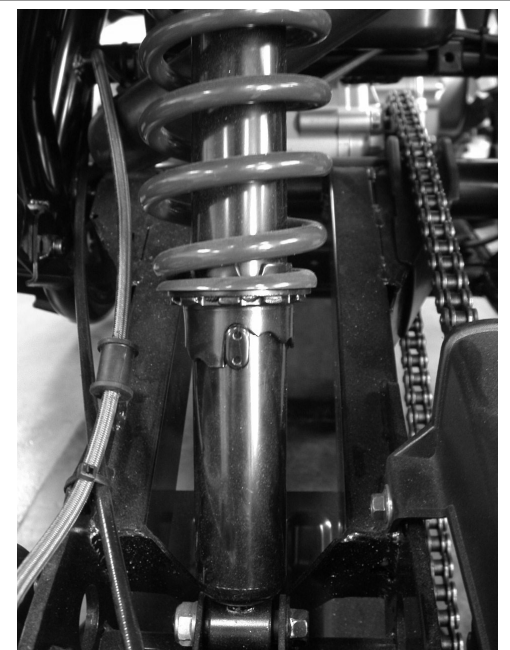


Fig 1

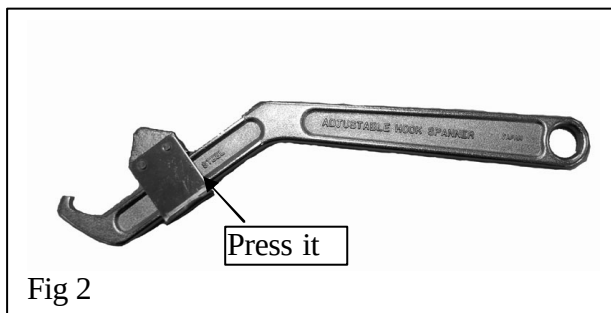


Fig 2

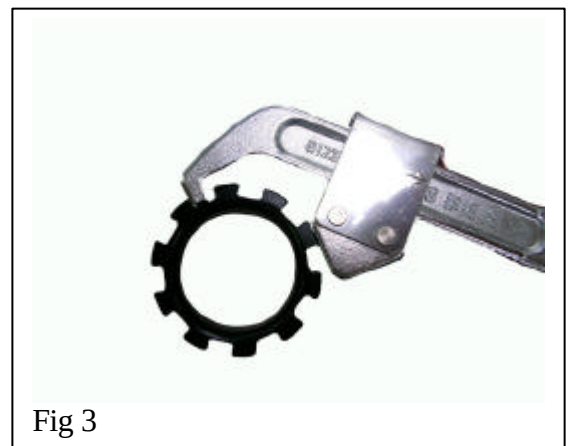


Fig 3

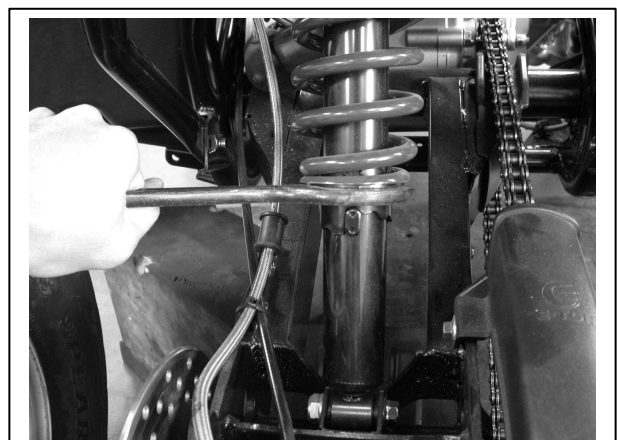
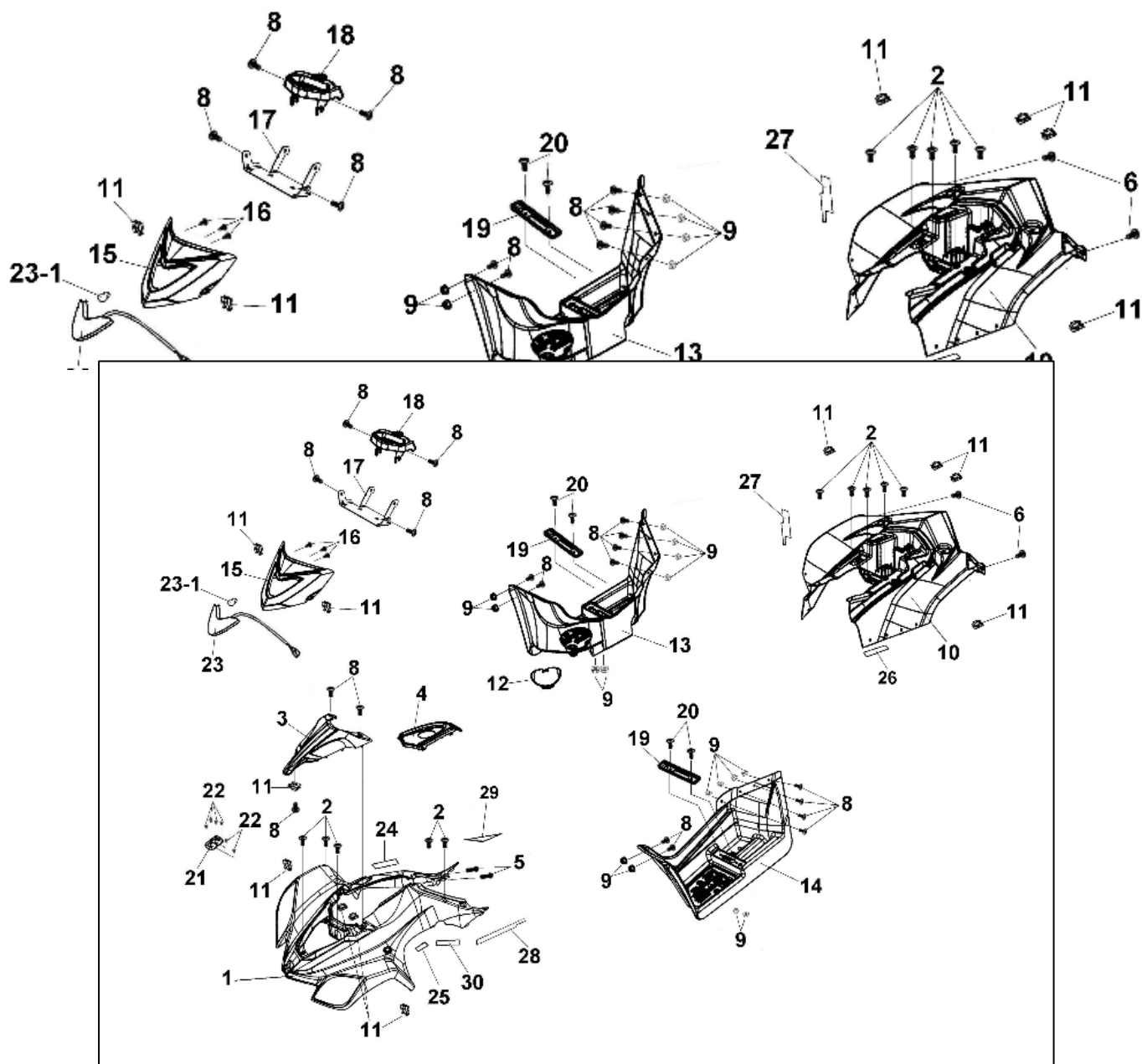
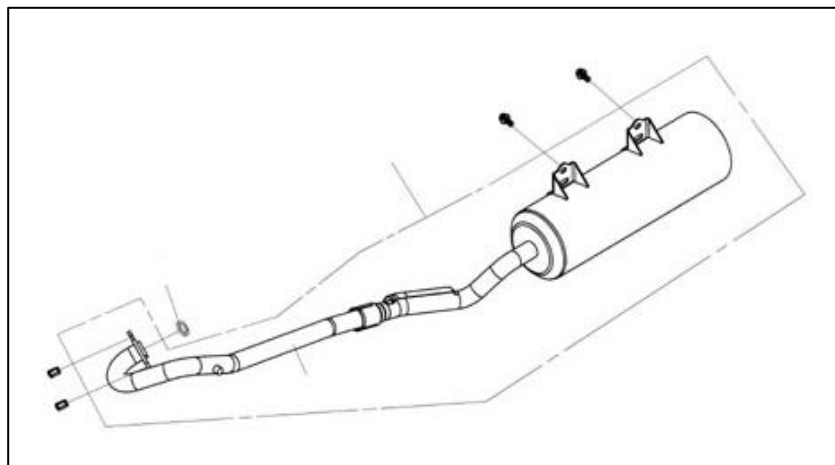


Fig 4



## EXHAUST PIPE (For all serials)





## 16.2 REAR FENDERS REMOVAL

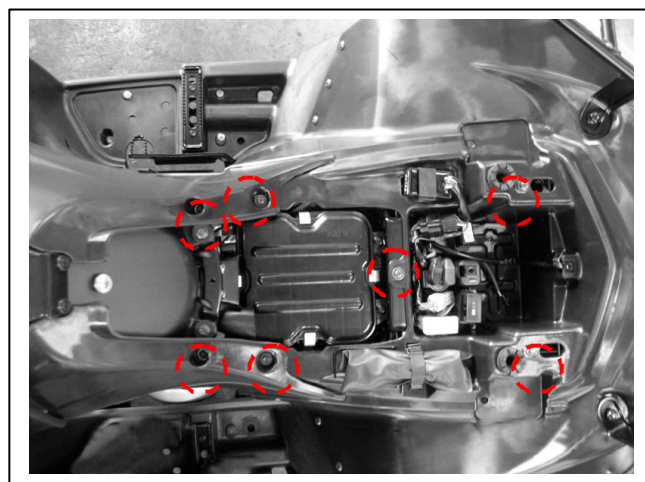
There are two seat release bars located at the right and left hand side of the seat. Please remove the seat first.



Procedures of remove the rear fender:

Remove the rear rack.

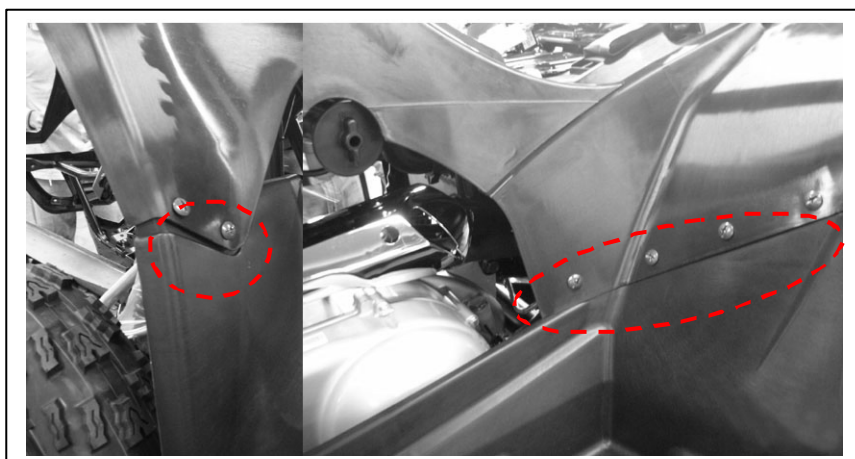
1. Open the seat.
2. Loosen four bolts which connect the front fender and rear fender.
3. Loosen three bolts, which connect the rear tender and frame, these two bolts just below the seat.



Loosen the three screws which connect with footrest plate.

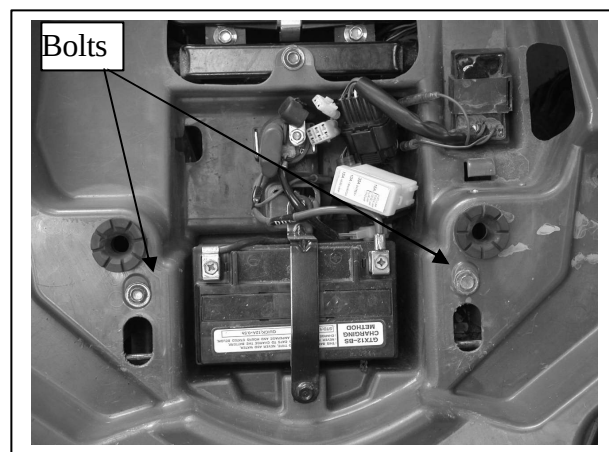
Pull the rear fender backward.

So the rear fender can be removed.

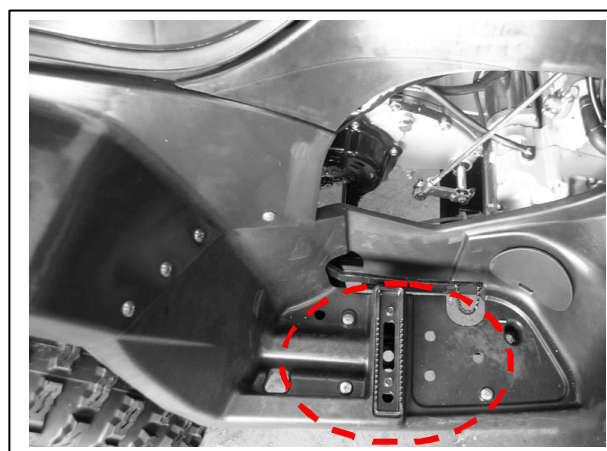




Pull the seat handle up first.  
There are two screws on the top of seat compartment.  
Please remove them.



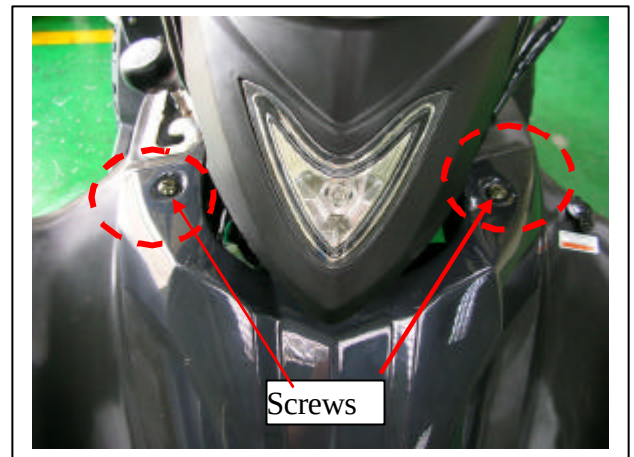
Finally, you must remove the bolts on the footrest.



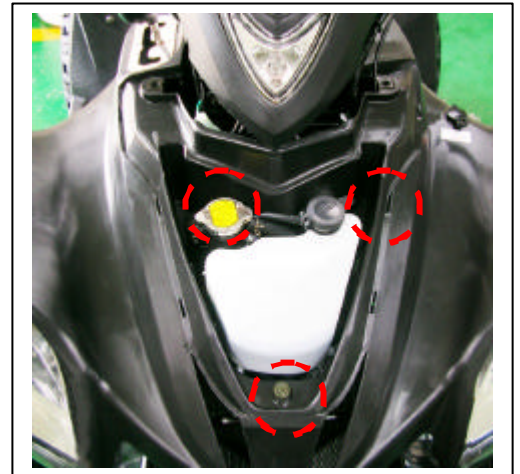
## 16.3 FRONT FENDER REMOVAL

To remove the front fender, there are several tips to indicate users how to remove it.

1. First picture shows there are two screws, loosen it.

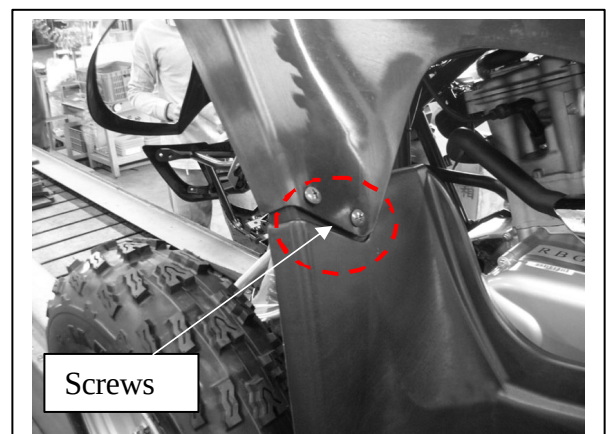
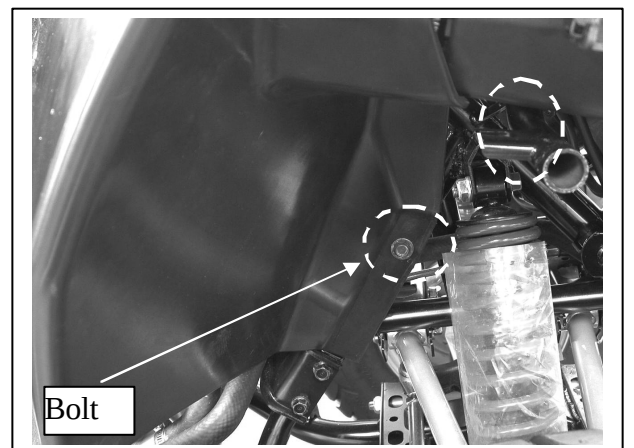


Remove the mounting bolts from the front fender.



Please remove the two screws on the top of the headlight. Then you can see there is a screw on the tip of the vehicle. Please remove it.

There is a screw near the suspension as shown in picture.

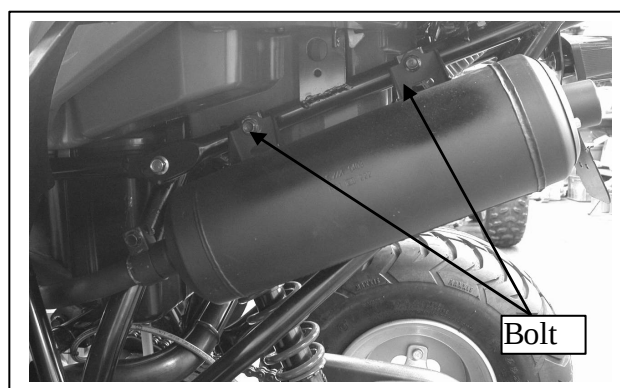
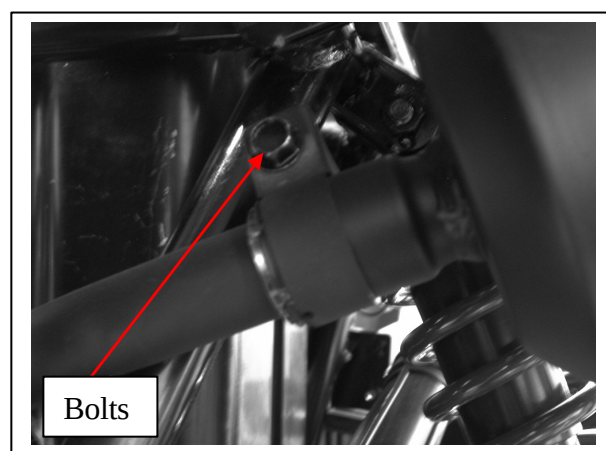
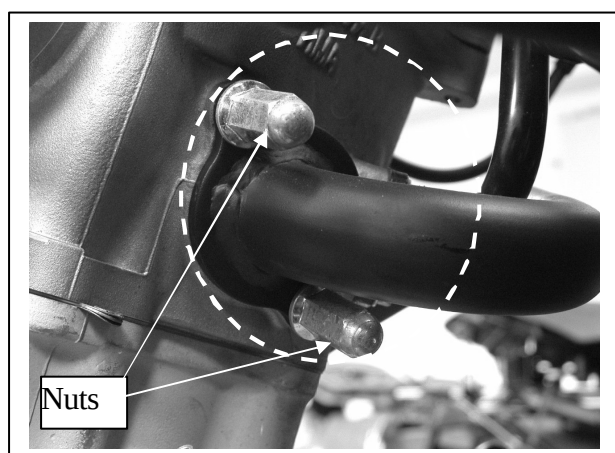


## 16.4 EXHAUST PIPE REMOVAL

You must wait at least 15 minutes after stopping the engine.  
You need to remove the seat, rear fender and footrest plate,  
before you take off the exhaust pipe.  
Loosen the two exhaust pipe bolts that fixed on the engine.

**Warning : DO NOT service the exhaust pipe while they are hot.**

Remove the exhaust pipe bolts mounting on the frame  
below the seat.  
Remove the exhaust pipe carefully.



## EXHAUST PIPE INSTALLATION

Installation is the reverse order of removal.  
Torque: Exhaust muffler bolts 30 N.m (22 lbf.ft)



**CATUATION:**

**After installing, make sure that there are no exhaust leaks.**

## 17. ELECTRICAL SYSTEM

17.1 TROUBLESHOOTING

17.2 IGNITION COIL

17.3 IGNITION TIMING

17.4 BATTERY INFORMATION

17.5 ELECTRIC STARTER

17.6 LIGHT BULBS REPLACEMENT

17.7 INSTRUMENT PANEL

17.8 WIRING DIAGRAM

### 17.1 TROUBLESHOOTING

ENGINE STARTS BUT STOPS

NO SPARK AT PLUG

ENGINE STARTS BUT RUNS POORLY

CHARGING SYSTEM FAILURE

ENGINE INTERMITTENT POWER

STARTER MOTOR CAN NOT WORK

ENGINE CAN NOT WORK

HEAD LIGHT CAN NOT WORK

- ★ IMPROPER IGNITION TIMING
- ★ FAULTY SPARK PLUG
- ★ ENGINE STOP SWITCH AT “ OFF “ POSTION
- ★ GEARSHIFT BAR IS NOT AT NORMAL POSITION
- ★ FAULTY IGNITION COIL
- ★ FAULTY GENERATOR
- ★ FAULTY CDI UNIT
- ★ POOLY CONNECTED:
  - Between CDI and ignition coil
  - Between alternator and CDI unit
  - Between CDI and engine stop switch
  - Between ignition coil and spark plug
  - Between generator and CDI unit
- ★ IGNITION PRIMARY CIRCUIT
  - Faulty generator
  - Faulty CDI unit
  - Faulty alternator exciter coil
  - Loosen contacted terminals
  - Faulty ignition coil
- ★ IGNITION SECONDARY CIRCUIT
  - Faulty plug
  - Loosen contacted spark plug wire
- ★ IMPROPER IGNITION TIMING
  - Faulty generator
  - Faulty CDI unit
- ★ LOOSE, BROKEN OR SHORTED WIRE
- ★ FAULTY ALTERNATOR
- ★ FAULTY IGNITION SWITCH
- ★ LOOSE BATTERY CONNECTION
- ★ LOOSE CHARGING SYSTEM CONNECTION
- ★ BATTERY SHORTAGE
- ★ FAULTY IGNITION SWITCH
- ★ LOOSE OR DISCONNECTED WIRE
- ★ FAULTY IGNITION SYSTEM
- ★ ENGINE PROBLEMS
- ★ FAULTY ENGINE STOP SWITCH
- ★ THE SWITCH DO NOT TURN TO “ON” POSITION
- ★ THE LIGHT BULB WAS BROKEN, REPLACED

## 17.2 IGNITION COIL

Remove the spark plug cap from the spark plug.  
Disconnect the ignition coil primary wire.

Measure the primary coil resistance.

**STANDARD:  $0.1 - 0.3\Omega$  (20°C)**

Measure the secondary coil resistance with the spark plug cap in place.

**STANDARD :  $7.4 - 12\text{ k}\Omega$  (20°C)**



## 17.3 IGNITION TIMING

The ignition advance is  $15 \pm 3^\circ/4000\text{rpm}$

The Capacitive Discharge Ignition (CDI) system is factory pre-set and does not require adjustment.

## 17.4 BATTERY INFORMATION

The battery gives off explosive gases; keep sparks, flames and cigarettes away. Provide adequate ventilation when charging or using the battery in an open area. The battery contains sulfuric acid (Electrolyte). Contact with skin or eyes may cause severe burns. Wear protective clothing and a face shield. Electrolyte is poisonous. If swallowed drink large quantities of water or milk and call a physician.

### BATTERY VOLTAGE INSPECTION

Battery is under the seat. Measure the battery voltage by using a multifunction electric meter.

**VOLTAGE: Fully charged: 13.1 V**  
**Undercharged: Below 12.0 V**

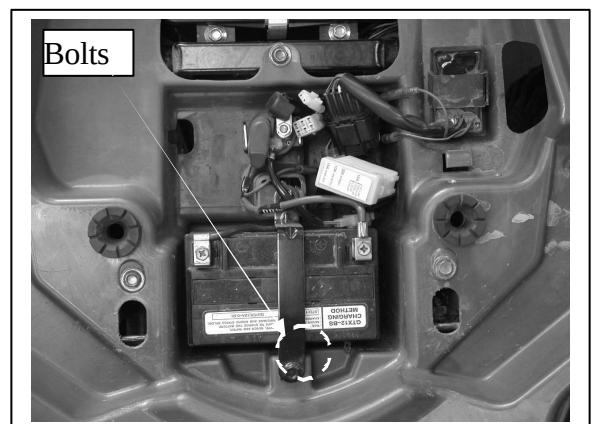


### BATTERY REMOVAL

There are two main steps to teach you how to take out battery. Open the seat, and then you can see the battery. Disconnect the negative cable (Black — ) first and then the positive cable (Red + ).

### BATTERY INSTALLATION

Install the battery in the reverse order of removal. After installing the battery, coat the terminals with clean grease.





## CHARGING

Firstly, connect the charged positive cable to the battery positive terminal. Secondly, connect the charged negative cable to the battery negative terminal.

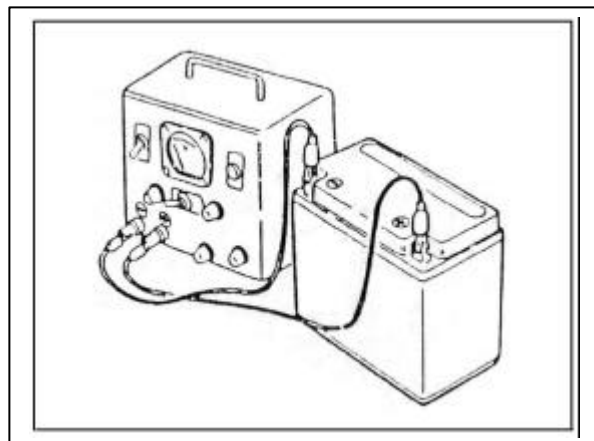
Using **0.9A-charging current about 11 hours.** (Normal charging)

Or using **4A-charging current about 3 hour.** (Quick charging)

Keep flames and sparks away from a battery being charged.

Quick charging should be limited to an emergency;

Normal charging is preferred.



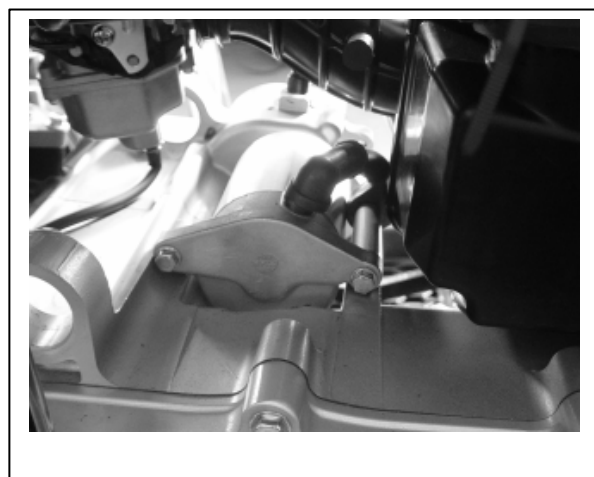
## 17.5 ELECTRIC STARTER

### Information

If a battery has not worked a period of time, the voltage may reduce and may not provide enough power to starter motor.

If a battery is in a good condition, but engine can not be start.

Please go back to service.



### TROUBLESHOOTING

Starter Motor Turns Slowly

Weak battery.

Poorly connected starter motor cable.

Failed starter motor.

Poorly connected battery ground cable.

### Starter Motor Cannot Work

Engine stop switch at “off” position.

Gearshift bar is not at neutral position.

Check for a blown fuse near battery.

Make sure that the battery is fully charged and in good condition.

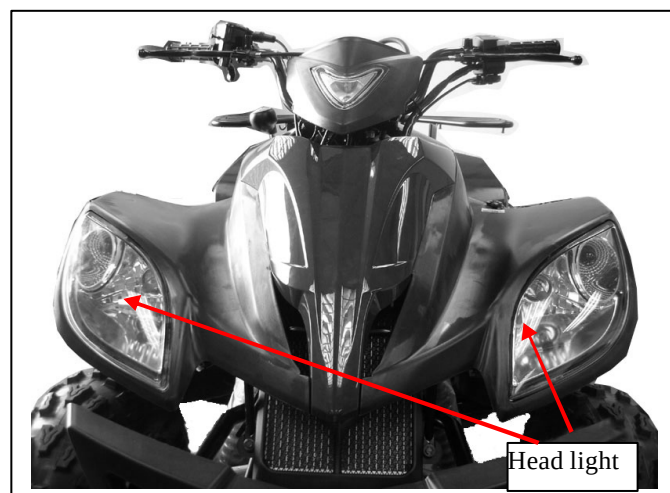
## 17.6 LIGHT BULBS REPLACEMENT

### HEADLIGHT & Front Direction lights

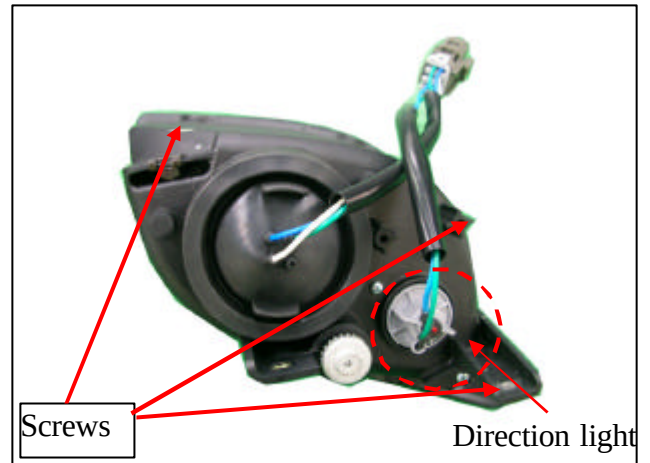
To remove the headlight, please loosen three screws at back of the headlight.

After loosen these three screws, users can find a connector. Please disjoin the connector in order to replace an electrical bulb conveniently and safely. The steps show on pictures.

Installation is in the reverse order of disassembly.

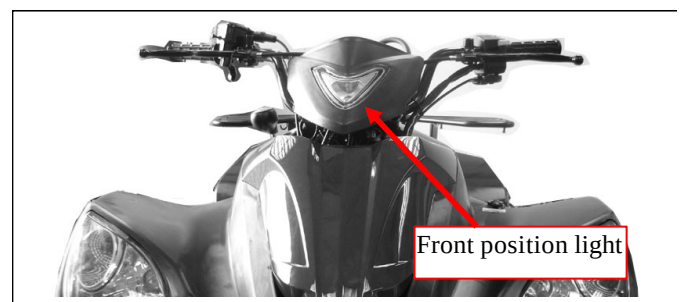


To replace the direction lights must loosen the screws as shown in picture.



### Front position light removes

There are two screws inside the cap.  
Please disassemble first then push the cap upward.  
You could replace the electrical bulb.

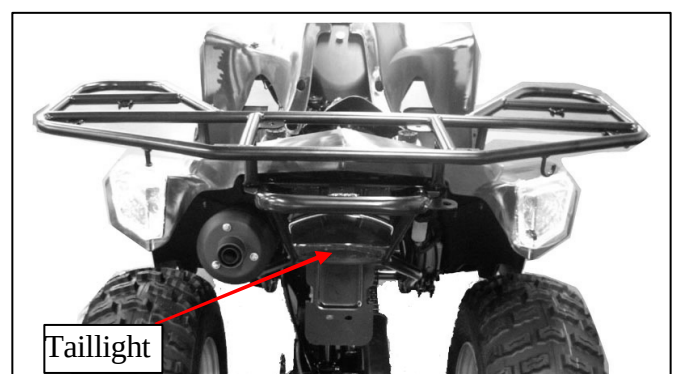


Turn around the cap, you could see the connector.  
Turn the seat to replace the electrical bulb.



### TAILLIGHT

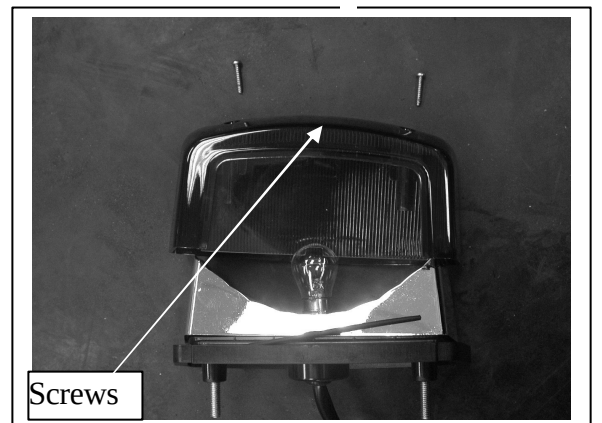
The taillight combines a position and a rear brake light.  
Normally, when users switch the key to “ON” position, the front  
& rear position lights are always keep the light slightly.  
Until a brake handlebar is depressed, the rear position light  
become more light



## Rear Brake lights remove

On the back of the brake light, you could see the cap.  
There are two screws to fix this cap, loosen them can  
open the cap.

Please rotate the electrical bulb, and then it could be removed.



## Rear Direction lights remove

The same disassembling procedure like front direction light.  
Please use the pliers to remove the seat. Then the bubble  
could be see and replaced.



## 17.7 Instrument Panel

The instrument panel includes fuel gauge, speed meter, water Temperature gauge, right and left turn signal, trip do-meter, and indicator camp. A LCD is used on ATV8E's instrument panel to display all driving information for users. Therefore, this is an all-in-one instrument panel.

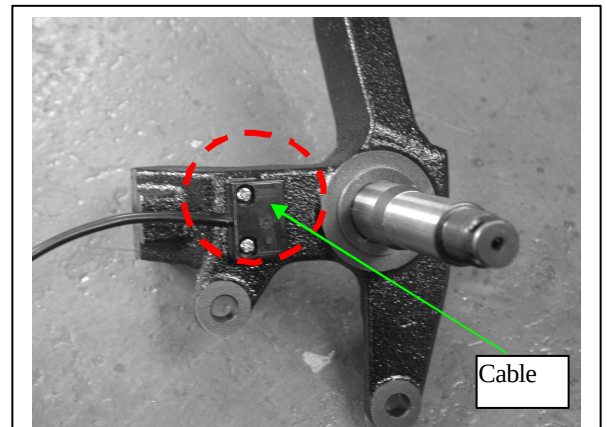
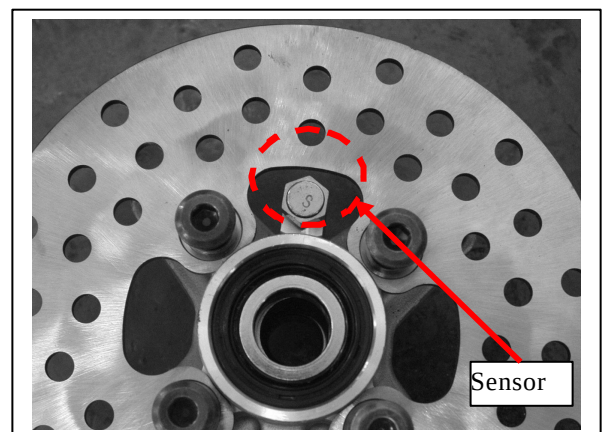


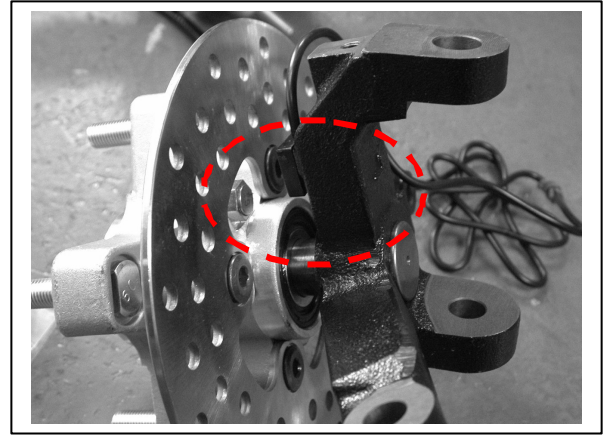
### Instrument Panel REMOVAL

There is a cable and connector on the back of the instrument panel. After removing instrument panel, users can find out an electrical connector which is connected with a driving sensor at the back of the instrument panel.



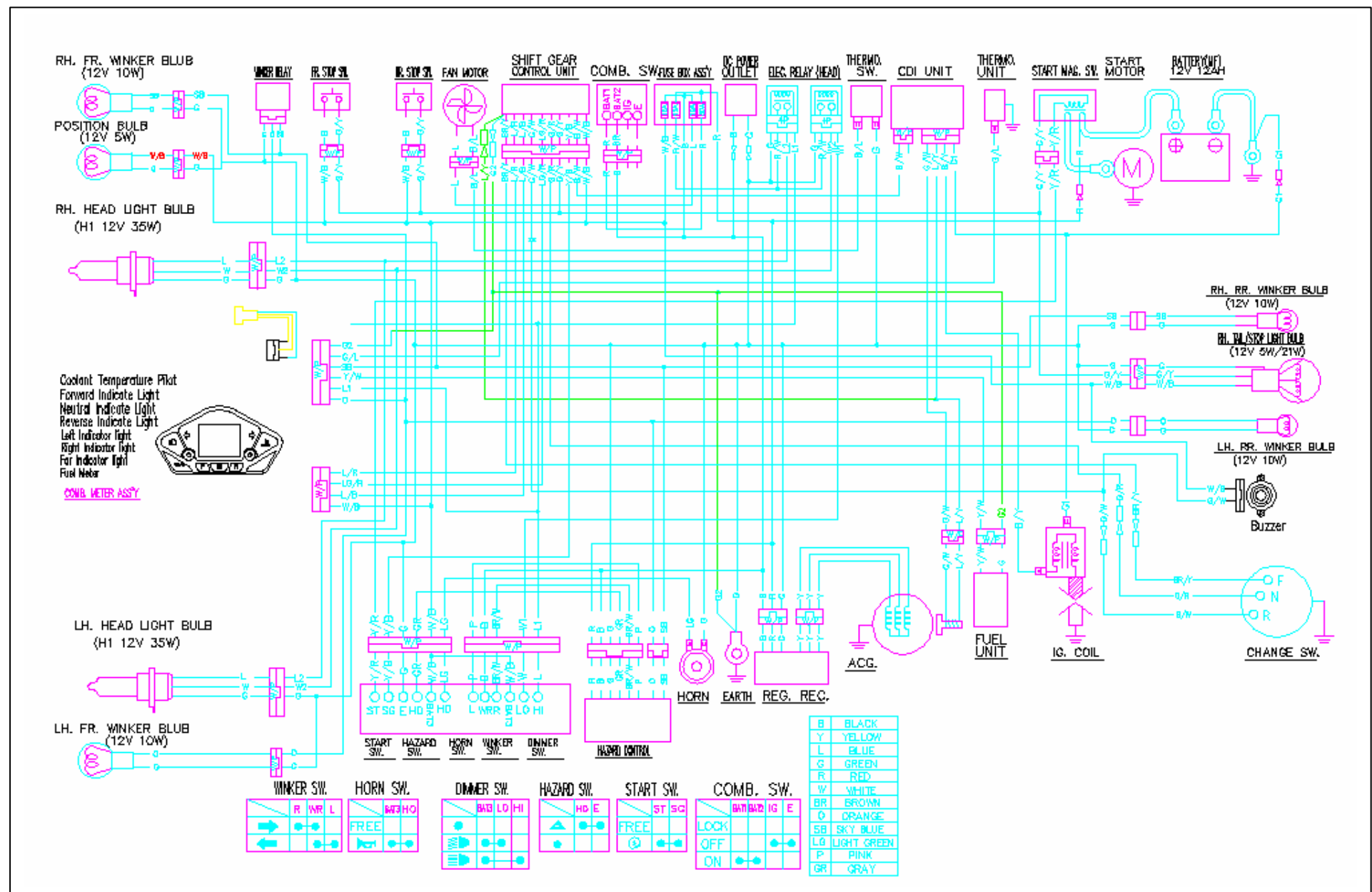
The sensor is installed at the brake disk and a cable is tightened on the left side of knuckle component as shown in pictures







## 17.8 WIRING DIAGRAM



## 18.TROUBLESHOOTING

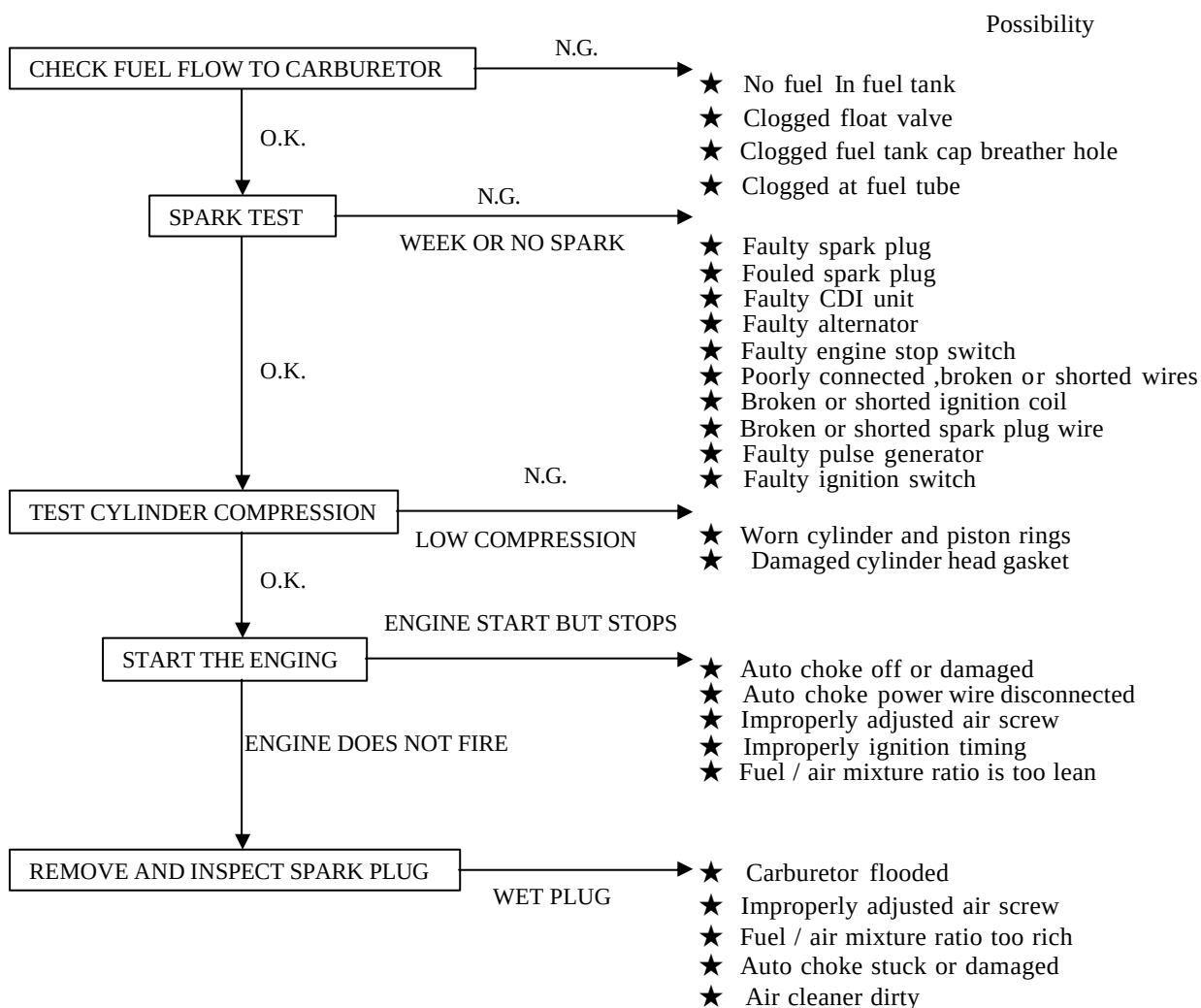
### 18.1 ENGINE CAN NOT WORK

### 18.4 LOSS POWER

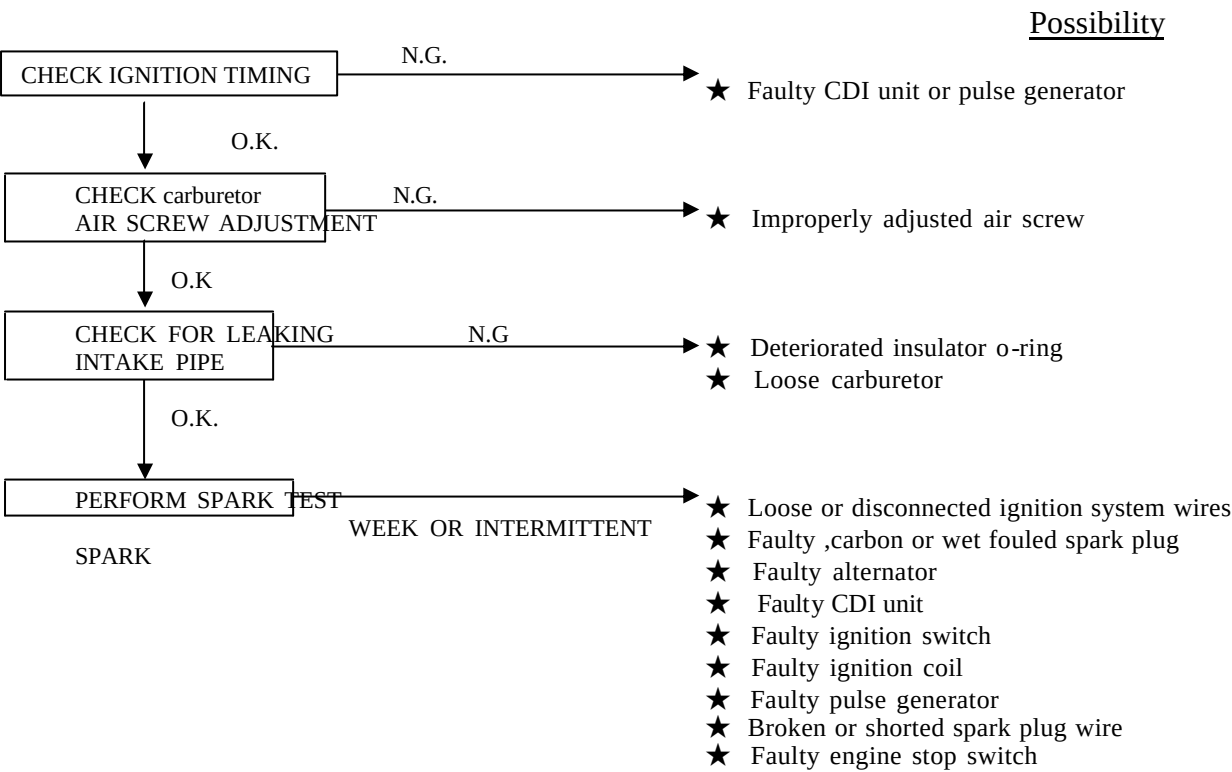
### 18.2 POOR PERFORMANCE AT LOW AND IDLE SPEEDS 18.5 POOR HANDLING

### 18.3 POOR PERFORMANCE AT HIGH SPEED

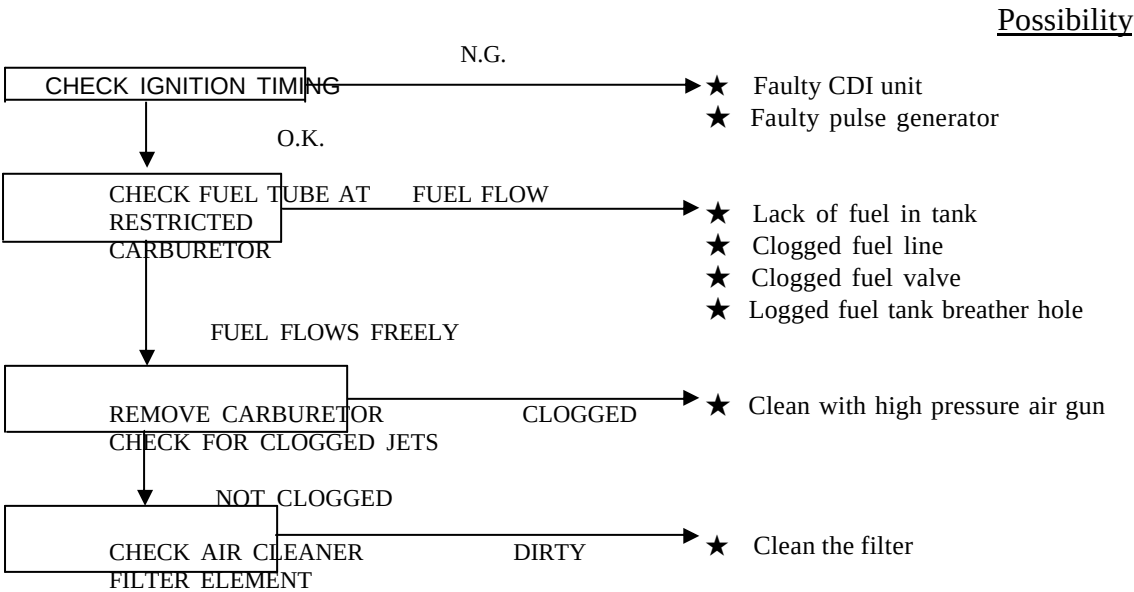
## 18.1 ENGINE CAN NOT WORK



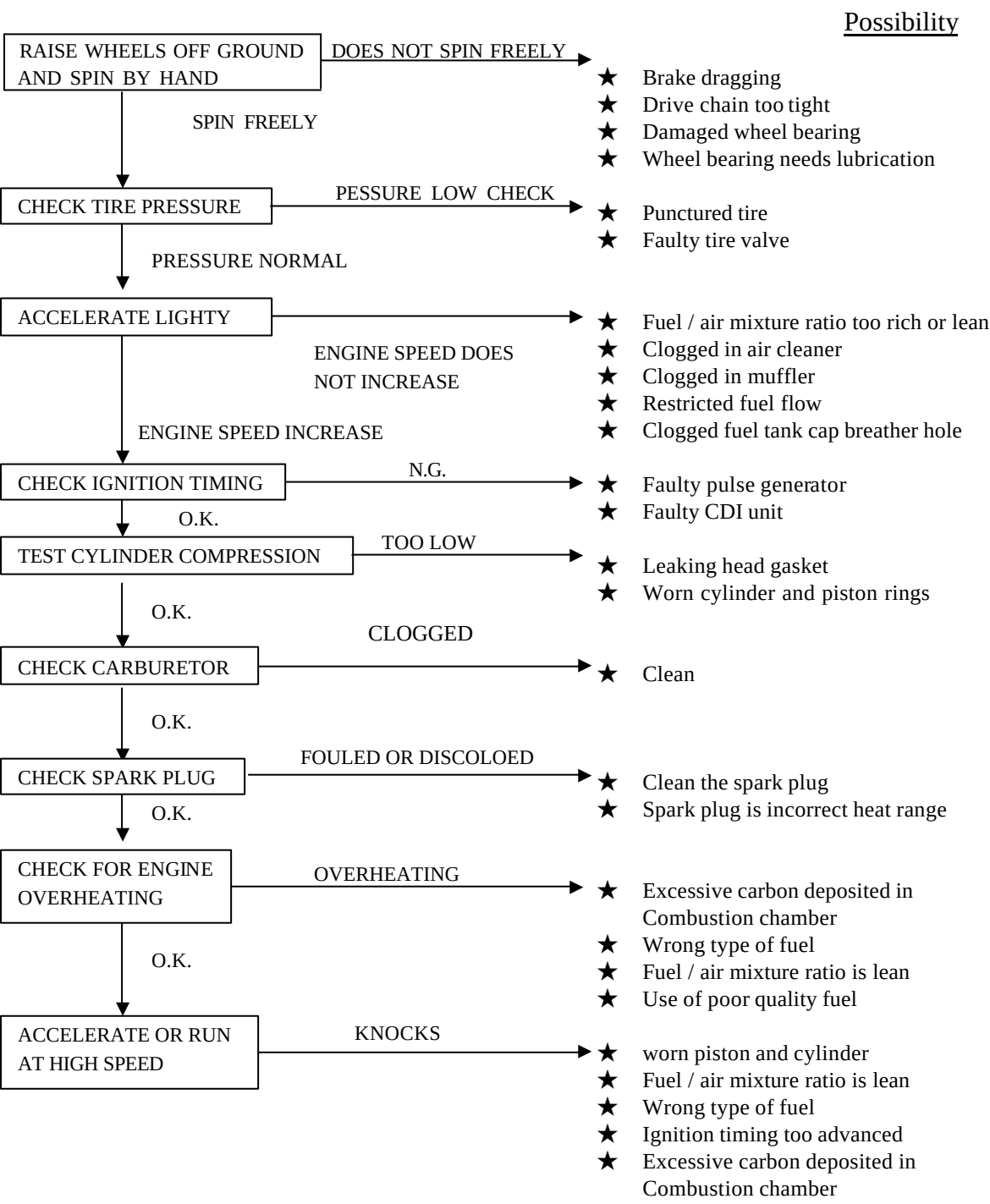
18.2 POOR PERFORMANCE AT LOW AND IDLE SPEEDS



18.3 POOR PERFORMANCE AT HIGH SPEED



# 18.4 LOSS POWER



## 18.5 POOR HANDLING

|                           | <u>Possibility</u>                                                                                                                                                                                                                         |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| STEERING IS HEAVY         | <ul style="list-style-type: none"><li>★ Damaged steering bearing</li><li>★ Damaged steering shaft bushing</li></ul>                                                                                                                        |
| ONE WHEEL IS WOBBLING     | <ul style="list-style-type: none"><li>★ Bent rim</li><li>★ Improperly installed wheel hub</li><li>★ Excessive wheel bearing play</li><li>★ Bent swingarm</li><li>★ Bent frame</li><li>★ Swing arm pivot bushing excessively worn</li></ul> |
| VEHICLE PULLS TO ONE SIDE | <ul style="list-style-type: none"><li>★ Bent tie-rod</li><li>★ Incorrect tie-rod adjustment</li><li>★ Rear tire air pressure incorrect</li><li>★ Improper wheel alignment</li><li>★ Bent frame</li></ul>                                   |