



**SYM**

FOREWORD

HOW TO USE THIS MANUAL

CONTENTS

SERIAL NUMBER

*GTS 250/250EFi*  
*JOYMAX 250/250EFi*  
**SERVICE MANUAL**



This service manual contains the technical data of each component inspection and repair for the SANYANG LM25W series scooter. The manual is shown with illustrations and focused on “Service Procedures”, “Operation Key Points”, and “Inspection Adjustment”, providing technicians with service guidelines.

If the style or the mechanical structures of the scooter, LM25W series scooter, are different from those of the photos or pictures shown in this manual, the actual vehicle shall prevail. Specifications are subject to changes without notice.

**Service Department  
SANYANG INDUSTRY CO., LTD.**

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## How To Use This Manual



This service manual describes the basic information of different system parts and system inspection & service for SANYANG LM25W series scooter. In addition, please refer to the manual contents in detail for the model you serviced in inspection and adjustment.

The first chapter covers the general information and the trouble diagnosis.

The second chapter covers the periodic maintenance information and the special tool models.

The third to the 12th chapters cover the engine and the driving systems.

The 13th chapter is the cooling system.

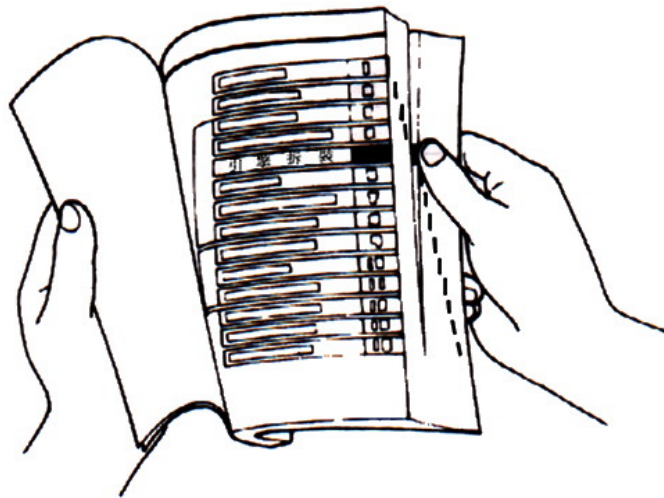
The 14th to the 17th chapter contain the relative parts of the body frame assembly.

The 18th chapter is the electrical system.

The 19th chapter is the emission control system.

The 20th chapter is the wiring diagram.

Please see index of content for quick having the special parts and system information.



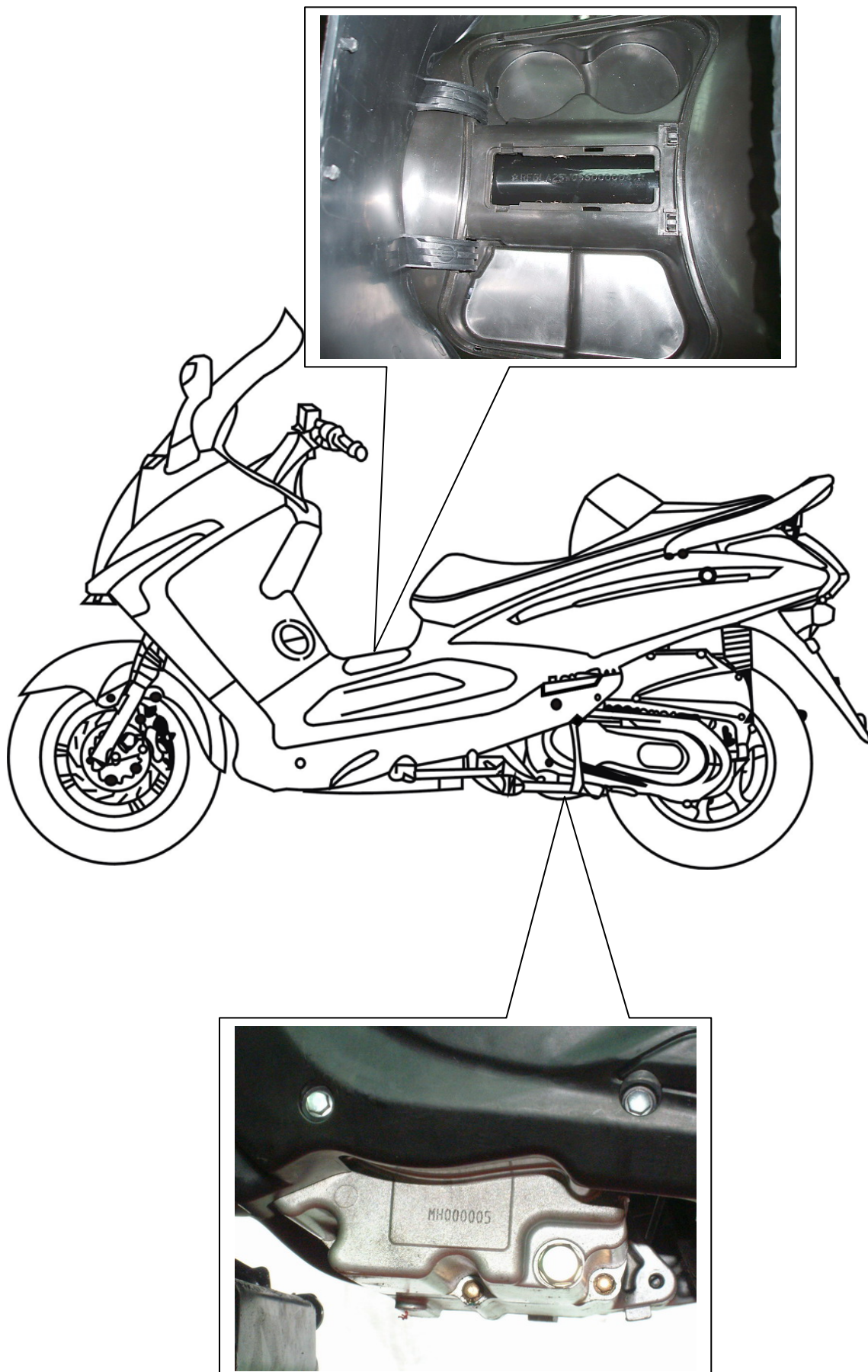
There are 4 buttons, "[Foreword](#)", "[Contents](#)", "[How to use this manual](#)" and "[Mechanism Illustrations](#)" on the CD-R version, and can be access to these items by click the mouse.

If user wants to look for the content of each chapter, selecting the words of each chapter on the contents can reach to each chapter. There are two buttons, "Homepage and contents, onto the top line of first page of the each chapter. Thus, if the user needs to check other chapters, he can click the top buttons to back the homepage or contents. The content of each chapter can be selected too.

Therefore, when needs to checking the content inside of the chapter, click the content words of the chapter so that can back to the initial section of the content. In addition, there is a "[To this chapter contents](#)" button at the second page of each contents so that clicking the button can back to the contents of this chapter.



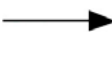
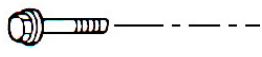
| Page         | Content                                                    | Index     |
|--------------|------------------------------------------------------------|-----------|
| 1-1 ~ 1-16   | <a href="#">General Information</a>                        | <b>1</b>  |
| 2-1 ~ 2-18   | <a href="#">Periodic Maintenance Information</a>           | <b>2</b>  |
| 3-1 ~ 3-8    | <a href="#">Engine Lubrication System</a>                  | <b>3</b>  |
| 4-1 ~ 4-14   | <a href="#">Carburetor Fuel System</a>                     | <b>4</b>  |
| 5-1 ~ 5-14   | <a href="#">Fuel Injection System</a>                      | <b>5</b>  |
| 6-1 ~ 6-10   | <a href="#">Engine Removal</a>                             | <b>6</b>  |
| 7-1 ~ 7-16   | <a href="#">Cylinder Head/ Valve</a>                       | <b>7</b>  |
| 8-1 ~ 8-8    | <a href="#">Cylinder/ Piston</a>                           | <b>8</b>  |
| 9-1 ~ 9-14   | <a href="#">“V” Type Belt Driving System/ Kick-Starter</a> | <b>9</b>  |
| 10-1 ~ 10-8  | <a href="#">Final Drive Mechanism</a>                      | <b>10</b> |
| 11-1 ~ 11-10 | <a href="#">AC Generator</a>                               | <b>11</b> |
| 12-1 ~ 12-8  | <a href="#">Crankshaft/ Crankcase</a>                      | <b>12</b> |
| 13-1 ~ 13-14 | <a href="#">Cooling System</a>                             | <b>13</b> |
| 14-1 ~ 14-14 | <a href="#">Body Cover</a>                                 | <b>14</b> |
| 15-1 ~ 15-12 | <a href="#">Front Brake/ Front Wheel</a>                   | <b>15</b> |
| 16-1 ~ 16-10 | <a href="#">Steering/ Front Suspension</a>                 | <b>16</b> |
| 17-1 ~ 17-6  | <a href="#">Rear Brake/ Rear Wheel/ Rear Suspension</a>    | <b>17</b> |
| 18-1 ~ 18-24 | <a href="#">Electrical Equipment</a>                       | <b>18</b> |
| 19-1 ~ 19-10 | <a href="#">Emission Control System</a>                    | <b>19</b> |
| 20-1 ~ 20-2  | <a href="#">Electrical Diagram</a>                         | <b>20</b> |



|                                    |                                      |
|------------------------------------|--------------------------------------|
| <b>Symbols and Marks</b> .....1-1  | <b>Torque Values</b> ..... 1-10      |
| <b>General Safety</b> .....1-2     | <b>Troubles Diagnosis</b> ..... 1-12 |
| <b>Before Servicing</b><br>.....1- | <b>Lubrication Points</b> ..... 1-16 |
| שגיאה! הסימניה אינה מוגדרת.        |                                      |
| <b>Specifications</b> .....1-9     |                                      |

## Symbols and Marks

Symbols and marks are used in this manual to indicate what and where the special service is needed. If supplemental information is needed for these symbols and marks, explanations will be added in the text instead of using the symbols or marks.

|                                                                                                     |                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  Warning           | Means that serious injury or loss of life may happen if procedures are not correctly followed.                                                                              |
|  Caution           | Means that equipment damages may result if procedures are not followed.                                                                                                     |
|  Engine oil        | Limits to use SAE 10W-30 API SG class oil. Warranty will not cover the damage that caused by not apply with the limited engine oil.<br>(Recommended oil: KING MATE G-3 oil) |
|  Grease          | King Mate G-3 is recommended.                                                                                                                                               |
|  Gear oil        | King Mate gear oil serials are recommended. (Bramax HYPOID GEAR OIL # 140)                                                                                                  |
|  Locking sealant | Apply sealant; medium strength sealant should be used unless otherwise specified.                                                                                           |
|  Oil seal        | Apply with lubricant.                                                                                                                                                       |
|  Renew           | Replace with a new part before installation.                                                                                                                                |
|  Brake fluid     | Use recommended brake fluid DOT3 or WELLRUN brake fluid.                                                                                                                    |
|  Special tools   | Special tools                                                                                                                                                               |
|  Correct         | Meaning correct installation.                                                                                                                                               |
|  Wrong           | Meaning wrong installation.                                                                                                                                                 |
|  Indication      | Indication of components.                                                                                                                                                   |
|  Directions      | Indicates position and operation directions                                                                                                                                 |
|                  | Components assembly directions each other.                                                                                                                                  |
|                  | Indicates where the bolt installation direction, --- means that bolt cross through the component (invisibility).                                                            |



## General Safety

### Carbon Monoxide

Before you start the engine, make sure the place is well ventilated. Never start the engine in an unventilated place. If you have to start the engine in an unventilated place, an exhaust fume extractor is needed.

#### Caution

Exhaust fume contains toxic gas which may cause one to lose consciousness and even result in loss of life.

### Gasoline

Gasoline is a low ignition point and explosive material. Work in a well-ventilated place, no flame or spark should be allowed in the work place or where gasoline is being stored.

#### Caution

Gasoline is highly flammable, and may explode under some conditions, keep it away from the children.

### Used Engine Oil

#### Caution

Prolonged contact with the used engine oil (or transmission oil) may cause skin cancer although it might not be verified yet. We recommend that you wash your hands with soap right after contacting. Keep the used oil beyond reach of the children.

### Hot Components

#### Caution

Components of the engine and exhaust system can be extremely hot after engine running. They remain very hot even after the engine has been stopped for a period of time. Before performing service work on these parts, wear the heat insulation gloves or wait until the temperature drops.

### Battery

#### Caution

- Battery emits explosive gases; flame is strictly prohibited. Keep the place well ventilated when the battery is being charged.
- Battery contains sulfuric acid (electrolyte) which can cause serious burns, be careful not to spill it on your skin or eyes. If you get battery fluid on your skin, flush it off with water immediately. If you get battery fluid in your eyes, flush it off immediately with water and go to hospital to see an ophthalmologist doctor.
- If you swallow the battery fluid by mistake, drink a lot of water or milk, and take some laxative such as Epsom salts or vegetable oil and then go to see a doctor.
- Keep the battery and battery fluid beyond reach of the children.

### Brake Shoes

Do not use compressed air or brush to clean the components of the brake system. Use a vacuum cleaner or the equivalent to avoid dust drifting in the air.

#### Caution

Inhaling brake shoes dust may cause disease or even cancer of the respiratory system.

### Brake Fluid

#### Caution

Brake fluid spilled on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the top of the parts for protection when servicing the brake system. Keep the brake fluid beyond reach of the children.

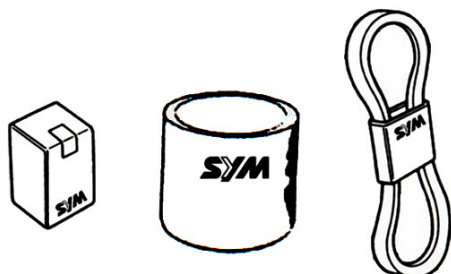


# 1. General Information

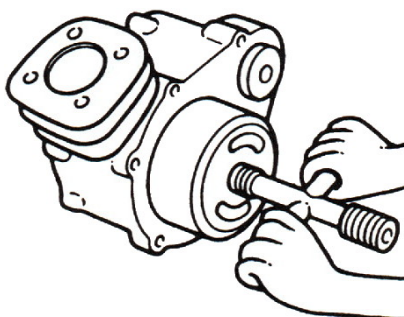


## Before Servicing

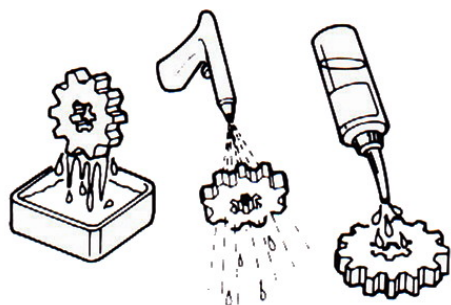
- Always use SANYANG genuine parts and recommended oil. Using improper parts may cause damage to or destruction of the vehicle.



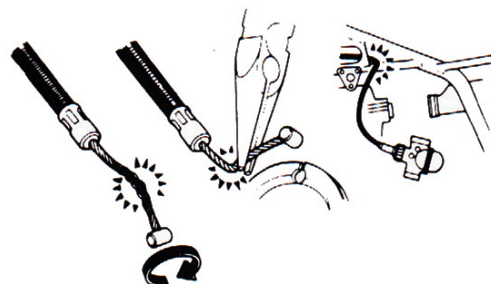
- Special tools are designed for removal and installation of component parts without damaging them. Using wrong tools may result in parts damage.



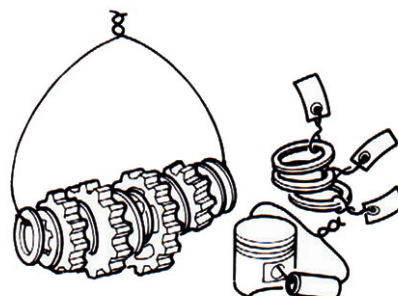
- When servicing this vehicle, use only metric tools. Metric bolts, nuts, and screws are not interchangeable with the Britain system, using wrong tools and fasteners may damage this vehicle.
- Clean the outside of the parts or the cover before removing it from the vehicle. Otherwise, dirt and deposit accumulated on the part's surface may fall into the engine, chassis, or brake system to cause damage.
- Wash and clean parts with high flash point solvent, and then blow dry with compressed air. Pay special attention to O-rings or oil seals because most of the cleaning agents have bad effect on them.



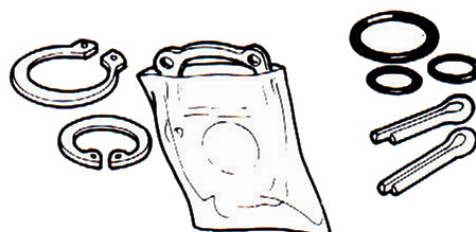
- Never bend or twist control cables to avoid unsmooth control and premature worn out.



- Rubber parts may become deteriorated when old, and be damaged by solvent and oil easily. Check these parts before installation to make sure that they are in good condition, replace if necessary.
- When loosening a component which has different sized fasteners, operate with a diagonal pattern and work from inside out. Loosen the small fasteners first. If the bigger ones are loosen first, small fasteners may receive too much stress.
- Store complex components such as transmission parts in the proper assemble order and tie them together with a wire for ease of installation later.



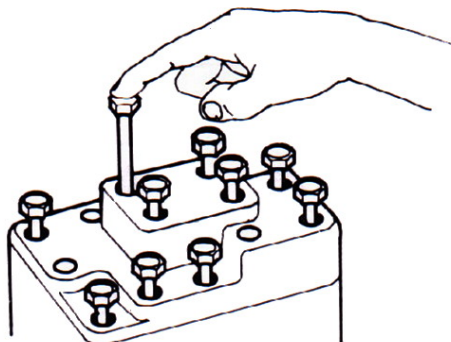
- Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).
- Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap rings, and split pins.



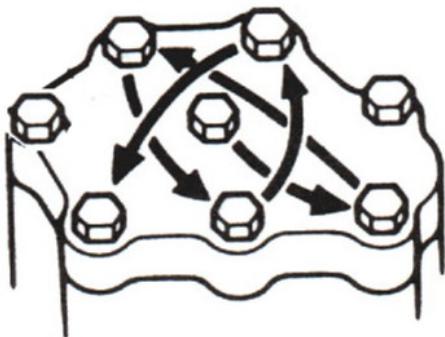


## 1. General Information

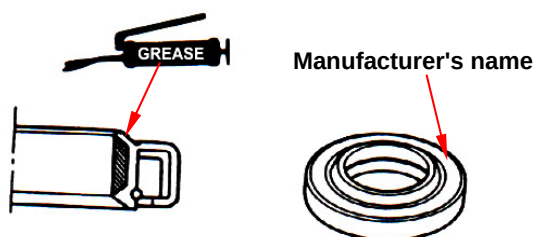
- The length of bolts and screws for assemblies, cover plates or boxes is different from one another, be sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length out side the hole is the same with other bolts, it is a correct bolt. Bolts for the same assembly should have the same length.



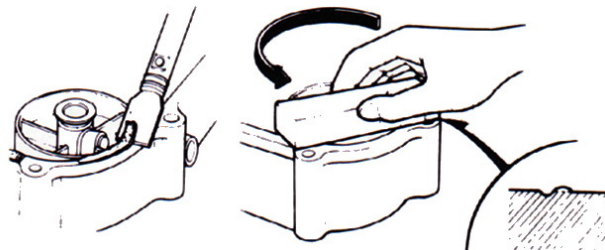
- Tighten assemblies with different dimension fasteners as follows: Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless otherwise indicated. Bolts and fasteners should be kept clean and dry. Do not apply oil to the threads.



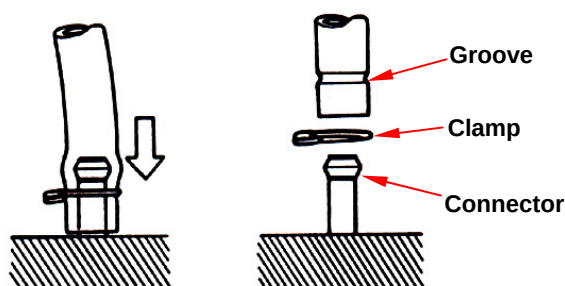
- When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, and check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.



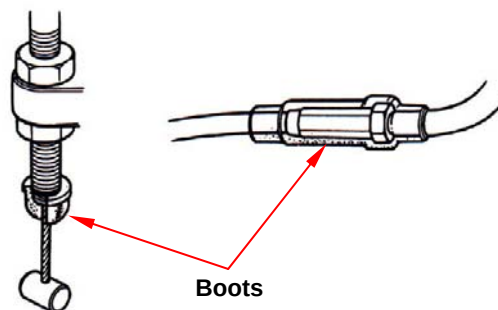
- Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any damage.



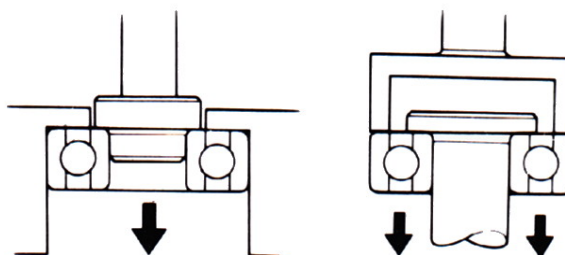
- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.



- Rubber and plastic boots should be properly reinstalled to the original correct positions as designed.



- The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both races.

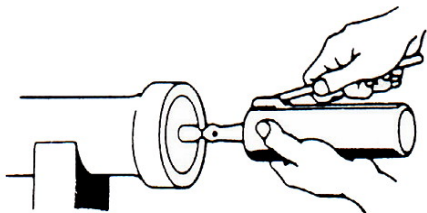


Both of these examples can result in bearing damage.

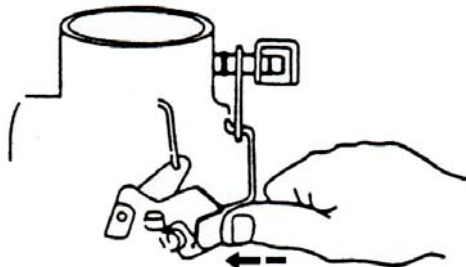
## 1. General Information



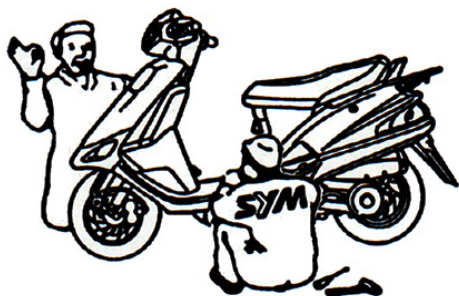
- Lubricate the rotation face with specified lubricant on the lubrication points before assembling.



- Check if positions and operation for installed parts is in correct and properly.



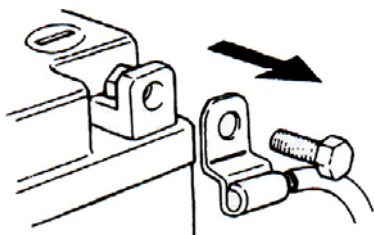
- Make sure service safety each other when conducting by two persons.



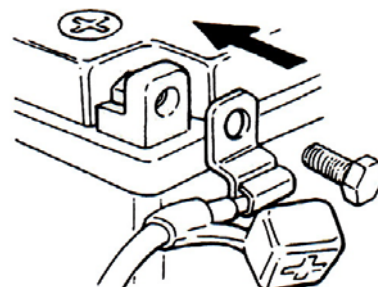
- Note that do not let parts fall down.



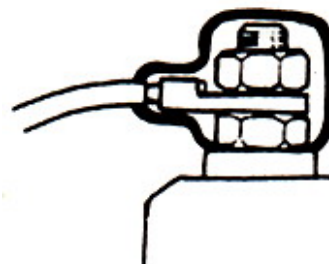
- Before battery removal operation, it has to remove the battery negative (-) cable firstly. Notre tools like open-end wrench do not contact with body to prevent from circuit short and create spark.



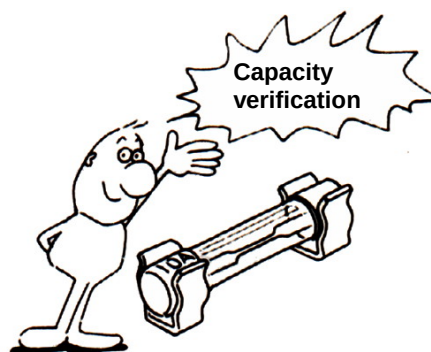
- After service completed, make sure all connection points is secured. Battery positive (+) cable should be connected firstly.
- And the two posts of battery have to be greased after connected the cables.



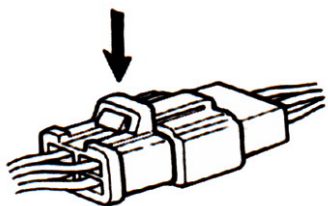
- Make sure that the battery post caps are located in properly after the battery posts had been serviced.



- If fuse burned, it has to find out the cause and solved it. And then replace with specified capacity fuse.



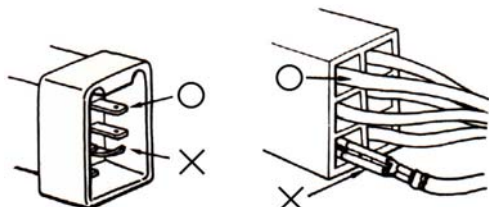
- When separating a connector, it locker has to be unlocked firstly. Then, conduct the service operation.



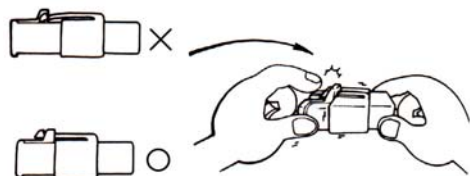
- Do not pull the wires as removing a connector or wires. Hold the connector body.



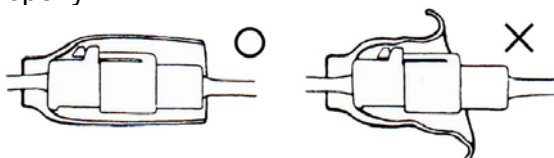
- Make sure if the connector pins are bent, extruded or loosen.



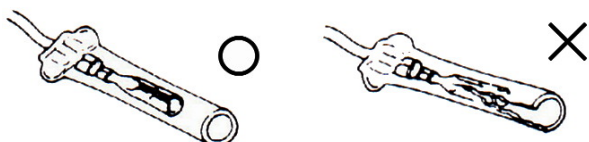
- Insert the connector completely.  
If there are two lockers on two connector sides, make sure the lockers are locked in properly.  
Check if any wire loose.



- Check if the connector is covered by the twin connector boot completely and secured properly.



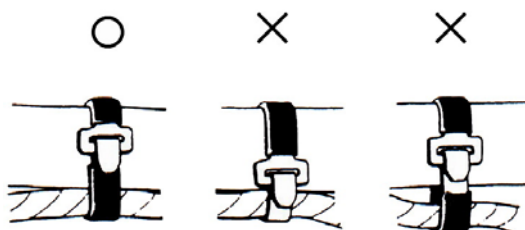
- Before terminal connection, check if the boot is crack or the terminal is loose.



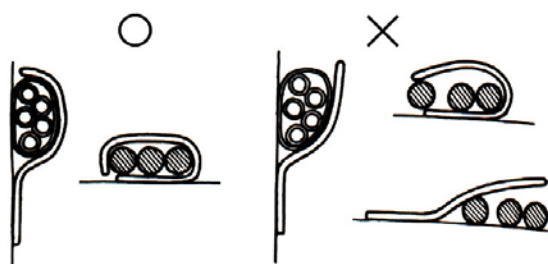
- Insert the terminal completely.  
Check if the terminal is covered by the boot.  
Do not let boot open facing up.



- Secure wires and wire harnesses to the frame with respective wire bands at the designated locations. Tighten the bands so that only the insulated surfaces contact the wires or wire harnesses.



- Wire band and wire harness have to be clamped secured properly.



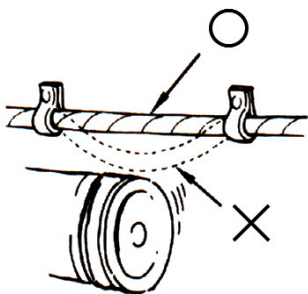
- Do not squeeze wires against the weld or its clamp.



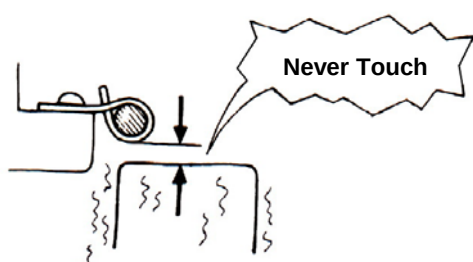


## 1. General Information

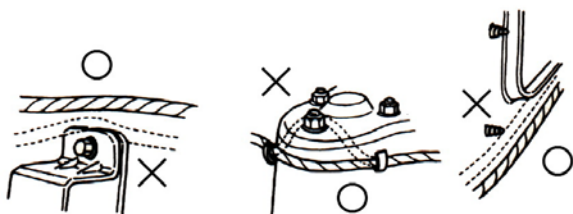
- Do not let the wire harness contact with rotating, moving or vibrating components as routing the harness.



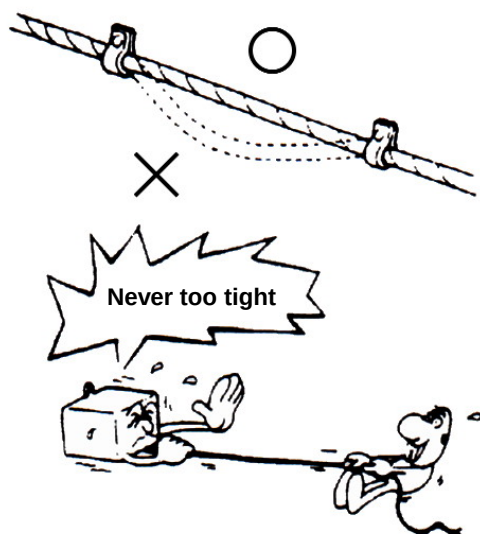
- Keep wire harnesses far away from the hot parts.



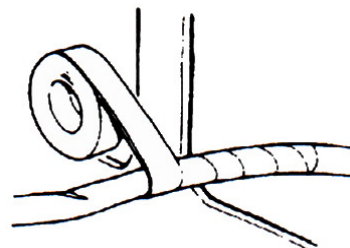
- Route wire harnesses to avoid sharp edges or corners and also avoid the projected ends of bolts and screws.



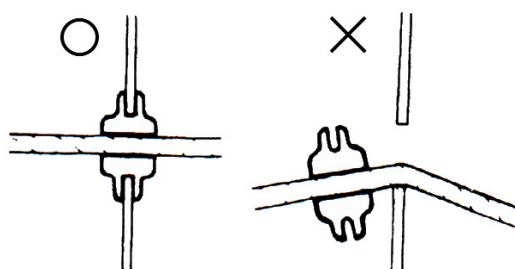
- Route harnesses so that they neither pull too tight nor have excessive slack.



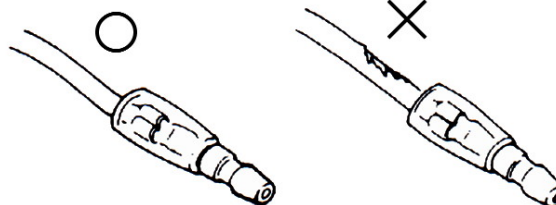
- Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.



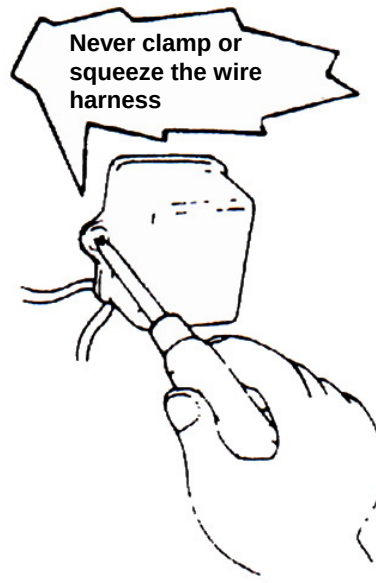
- Secure the rubber boot firmly as applying it on wire harness.



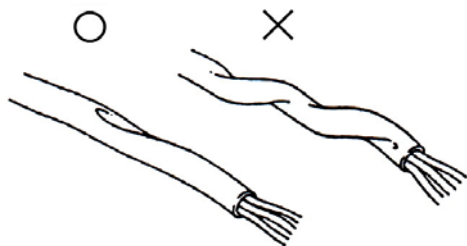
- Never use wires or harnesses which insulation has been broken. Wrap electrical tape around the damaged parts or replace them.



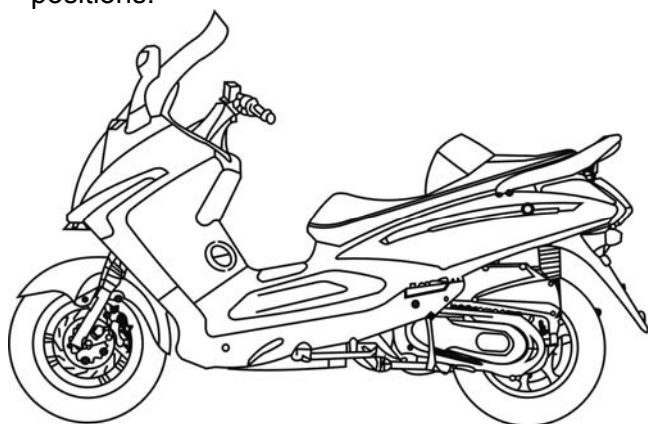
- Never clamp or squeeze the wire harness as installing other components.



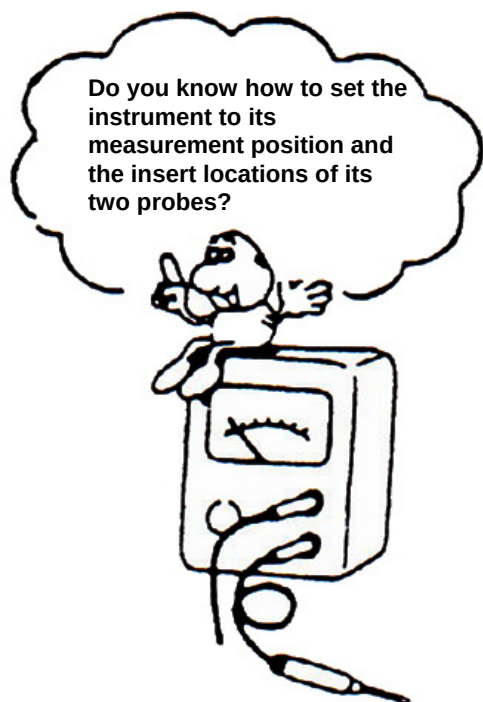
- Do not let the wire harness been twisted as installation.



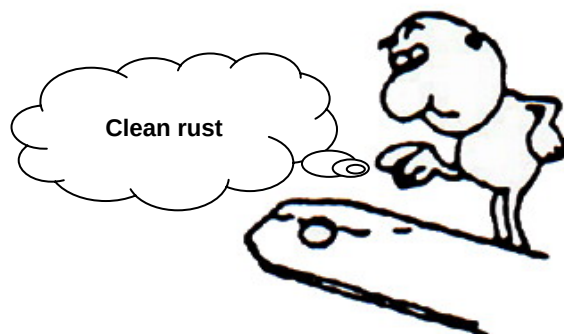
- Wire harnesses routed along the handlebar should not be pulled too tight or have excessive slack, be rubbed against or interfere with adjacent or surrounding parts in all steering positions.



- Before operating a test instrument, operator should read the operation manual of the instrument. And then, conduct test in accordance with the instruction.



- With sand paper to clean rust on connector pins/terminals if found. And then conduct connection operation later.



# 1. General Information



## Specifications

| MAKER     |                              | SANYANG            |                                     | MODEL                               |                     | LM25W                          |
|-----------|------------------------------|--------------------|-------------------------------------|-------------------------------------|---------------------|--------------------------------|
| Dimension | Overall Length               |                    | 2165 mm                             | Suspension System                   | Front               | TELESCOPIC FORK                |
|           | Overall Width                |                    | 870 mm                              |                                     | Rear                | UNIT SWING                     |
|           | Overall Height               |                    | 1380 mm                             | Tire Specifications                 | Front               | 110 / 90-13 56P                |
|           | Wheel Base                   |                    | 1495 mm                             |                                     | Rear                | 130 / 70-13 57P                |
| Weight    | Curb Weight                  | Front              | 69 kg                               | Brake System                        | Front               | DISK (ø 240 mm)                |
|           |                              | Rear               | 104 kg                              |                                     | Rear                | DISK (ø 220 mm)                |
|           |                              | Total              | 173 kg                              | Performance                         | Max. Speed          | Above 115 km/hr                |
|           | Passengers/Weight            |                    | Two / 110 kg                        |                                     | Climb Ability       | Below 24°                      |
|           | Total Weight                 | Front              | 91 kg                               | Reduction                           | Primary Reduction   | Belt                           |
|           |                              | Rear               | 192 kg                              |                                     | Secondary Reduction | Gear                           |
|           |                              | Total              | 283 kg                              |                                     | Clutch              | Centrifugal, dry type          |
|           | Type                         |                    | 4-STROKE ENGINE                     |                                     | Transmission        | CVT                            |
| Engine    | Installation and arrangement |                    | Vertical, below center, incline 80° | Speedometer                         |                     | 0 ~ 160 km/hr                  |
|           | Fuel                         |                    | Above 92 unleaded                   | Horn                                |                     | 80~112 dB/A                    |
|           | Cycle/ Cooling               |                    | 4-stroke/ Liquid-cooled             | Muffler                             |                     | Expansion & Pulse Type         |
|           | Cylinder                     | Bore               | 71 mm                               | Exhaust Pipe Position and Direction |                     | Right side, and Backward       |
|           |                              | Stroke             | 63 mm                               | Lubrication System                  |                     | Forced circulation & splashing |
|           |                              | Number/Arrangement | SINGLE CYLINDER                     | Exhaust Concentration               | Solid Particulate   | -                              |
|           | Displacement                 |                    | 249.4 cc                            |                                     | CO                  | Below 7.0 g/km                 |
|           | Compression Ratio            |                    | 10.5 : 1                            |                                     | HC+Nox              | Below 2.0 g/km                 |
|           | Max. HP                      |                    | 15.4kw / 7500 rpm                   | E.E.C.                              |                     | √                              |
|           | Max. Torque                  |                    | 21.6 Nm / 6500 rpm                  | P.C.V.                              |                     | √                              |
|           | Ignition                     |                    | Full transistor ignition            | Catalytic reaction control system   |                     | √                              |
|           | Starting System              |                    | Electrical starter                  |                                     |                     |                                |



## Torque Values

The torque values listed in below are for more important tightening torque values. Please see standard values for those not listed in the table.

### Standard Torque Values for Reference

| Type           | Tighten Torque | Type              | Tighten Torque |
|----------------|----------------|-------------------|----------------|
| 5 mm bolt、nut  | 0.45~0.6kgf-m  | 5 mm screw        | 0.35~0.5kgf-m  |
| 6 mm bolt、nut  | 0.8~1.2kgf-m   | 6 mm screw、SH nut | 0.7~ 1.1kgf-m  |
| 8 mm bolt、nut  | 1.8~2.5kgf-m   | 6 mm bolt、nut     | 1.0 ~1.4kgf-m  |
| 10 mm bolt、nut | 3.0~4.0kgf-m   | 8 mm bolt、nut     | 2.4 ~3.0kgf-m  |
| 12 mm bolt、nut | 5.0~6.0kgf-m   | 10 mm bolt、nut    | 3.5~4.5kgf-m   |

### Engine Torque Values

| Item                                 | Q'ty | Thread Dia. (mm) | Torque Value(kgf-m) | Remarks             |
|--------------------------------------|------|------------------|---------------------|---------------------|
| Cylinder stud bolt                   | 4    | 10               | 1.0~1.4             | Apply oil to thread |
| Cylinder head nut                    | 4    | 8                | 3.6~4.0             |                     |
| Cylinder head right bolt             | 2    | 8                | 2.0~2.4             |                     |
| Cylinder head side cover bolt        | 2    | 6                | 1.0~1.4             |                     |
| Cylinder head cover bolt             | 4    | 6                | 1.0~1.4             |                     |
| Cylinder head stud bolt (inlet pipe) | 2    | 6                | 1.0~1.4             |                     |
| Cylinder head stud bolt (EX. pipe)   | 2    | 8                | 2.4~3.0             |                     |
| Air inject pipe bolt                 | 4    | 6                | 1.0~1.4             |                     |
| Air inject reed valve bolt           | 2    | 3                | 0.07~0.09           |                     |
| Tappet adjustment screw nut          | 4    | 5                | 0.7~1.1             |                     |
| Spark plug                           | 1    | 10               | 1.0~1.2             |                     |
| Camshaft Chain Tensioner bolt        | 2    | 6                | 1.0~1.4             |                     |
| Carburetor insulator bolt            | 2    | 6                | 0.7~1.1             |                     |
| Oil pump screw                       | 2    | 3                | 0.1~0.3             |                     |
| Water pump impeller                  | 1    | 7                | 1.0~1.4             |                     |
| Engine left cover bolt               | 9    | 6                | 1.1~1.5             |                     |
| Engine oil draining bolt             | 1    | 12               | 3.5~4.5             |                     |
| Engine oil strainer cap              | 1    | 30               | 1.3~1.7             |                     |
| Mission draining bolt                | 1    | 8                | 0.8~1.2             |                     |
| Mission filling bolt                 | 1    | 10               | 1.0~1.4             |                     |
| Clutch driving plate nut             | 1    | 28               | 5.0~6.0             |                     |
| Clutch outer nut                     | 1    | 14               | 5.0~6.0             |                     |
| Drive face nut                       | 1    | 14               | 8.5~10.5            |                     |
| ACG. Flywheel nut                    | 1    | 14               | 5.0~6.0             |                     |
| Crankcase bolt                       | 7    | 6                | 0.8~1.2             |                     |
| Mission case bolt                    | 7    | 8                | 2.6~3.0             |                     |
| Muffler mounting bolt                | 3    | 10               | 3.2 ~3.8            |                     |
| Muffler mounting nut                 | 2    | 8                | 1.0 ~1.2            |                     |

## 1. General Information

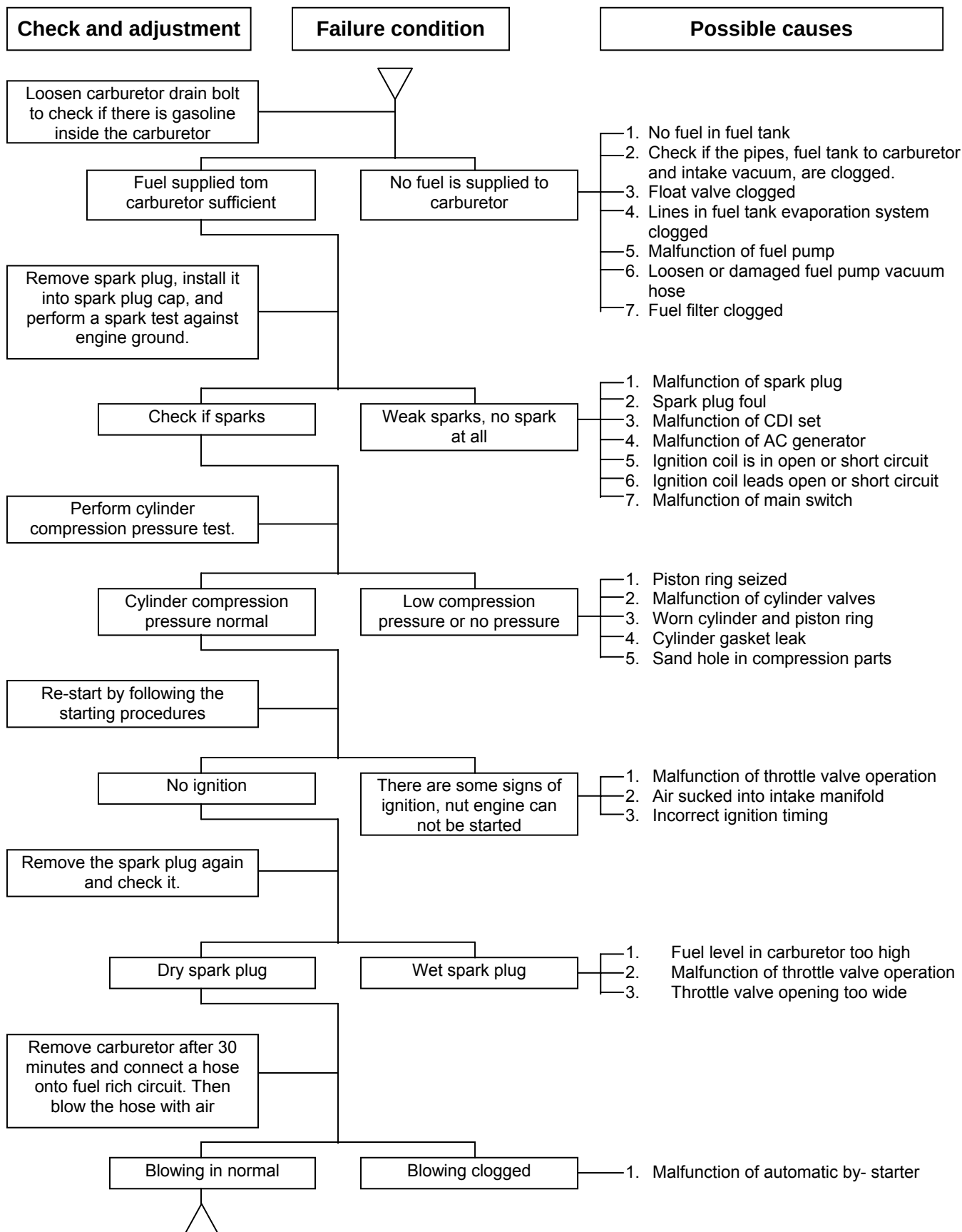


### Frame Torque Values

| Item                                   | Q'ty | Thread Dia. (mm) | Torque Value (Kg-m) | Remarks        |
|----------------------------------------|------|------------------|---------------------|----------------|
| Mounting bolt for steering handle post | 1    | 10               | 4.0~5.0             |                |
| Lock nut for steering stem             | 1    | BC1              | 1.0~2.0             |                |
| Steering top cone race                 | 1    | BC1              | 2.0~3.0             |                |
| Front wheel axle nut                   | 1    | 12               | 5.0~7.0             |                |
| Rear wheel axle nut                    | 1    | 16               | 11.0~13.0           |                |
| Front cushion mounting bolt            | 4    | 10               | 3.5~4.5             |                |
| Rear cushion upper connection bolt     | 1    | 10               | 3.5~4.5             |                |
| Rear cushion under connection bolt     | 1    | 8                | 2.4~3.0             |                |
| Rear fork mounting bolt                | 2    | 10               | 4.0~5.0             |                |
| Brake hose bolt                        | 2    | 10               | 3.0~4.0             |                |
| Brake air-bleeding valve               | 1    | 6                | 0.8~1.0             |                |
| Front brake disc mounting bolt         | 5    | 8                | 4.0~4.5             |                |
| Rear brake disc mounting bolt          | 5    | 8                | 4.0~4.5             |                |
| Brake clipper mounting bolt            | 2    | 8                | 2.9~3.5             |                |
| Engine hanger link bolt                | 2    | 12               | 7.5~9.5             | On frame side  |
| Engine hanger link nut                 | 1    | 12               | 7.5~9.5             | On engine side |
| Main standard nut                      | 1    | 10               | 4.0~5.0             |                |
| Air cleaner bolts                      | 2    | 6                | 1.0~1.4             |                |

## Troubles Diagnosis

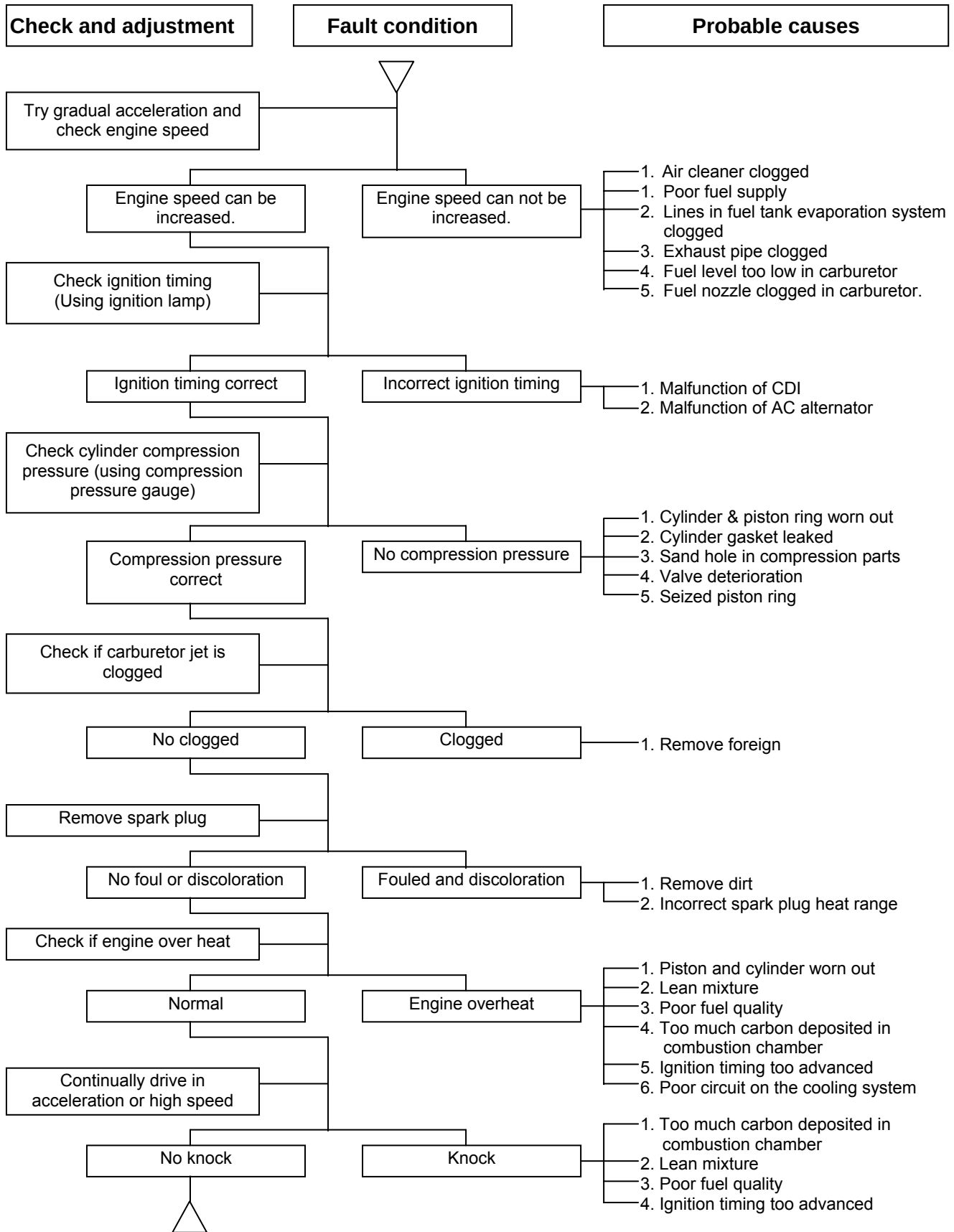
### A. Engine hard to start or can not be started



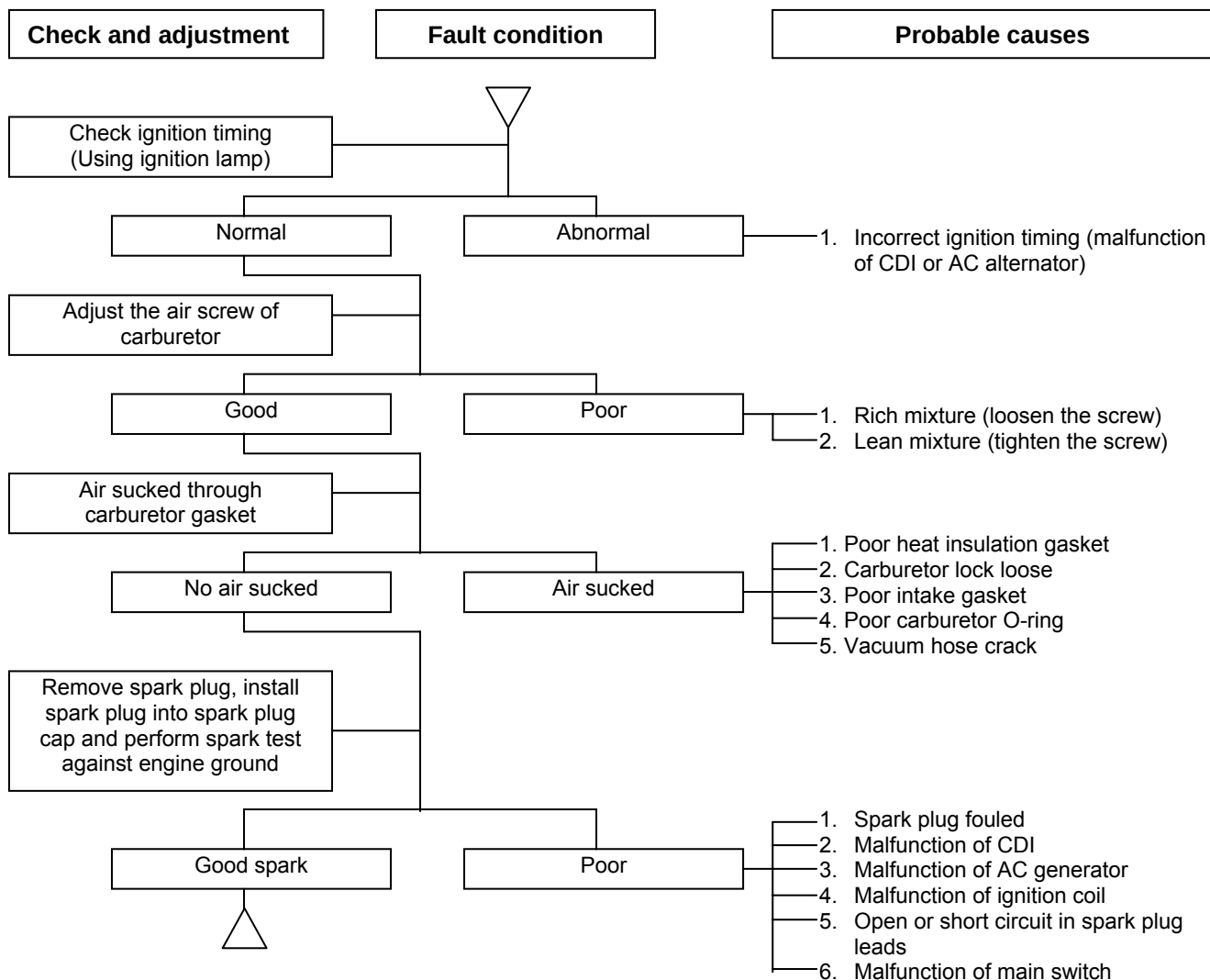
# 1. General Information



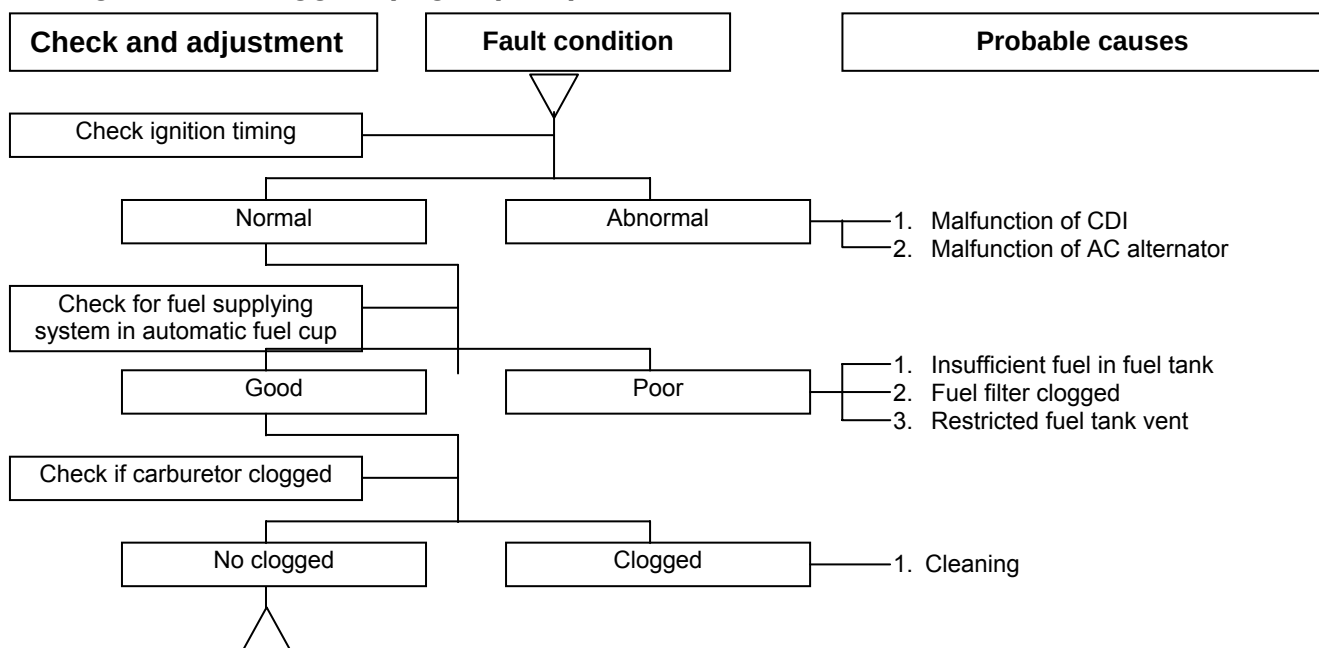
## B. Engine run sluggish (Speed does not pick up, lack of power)



## C. Engine runs sluggish (especially in low speed and idling)



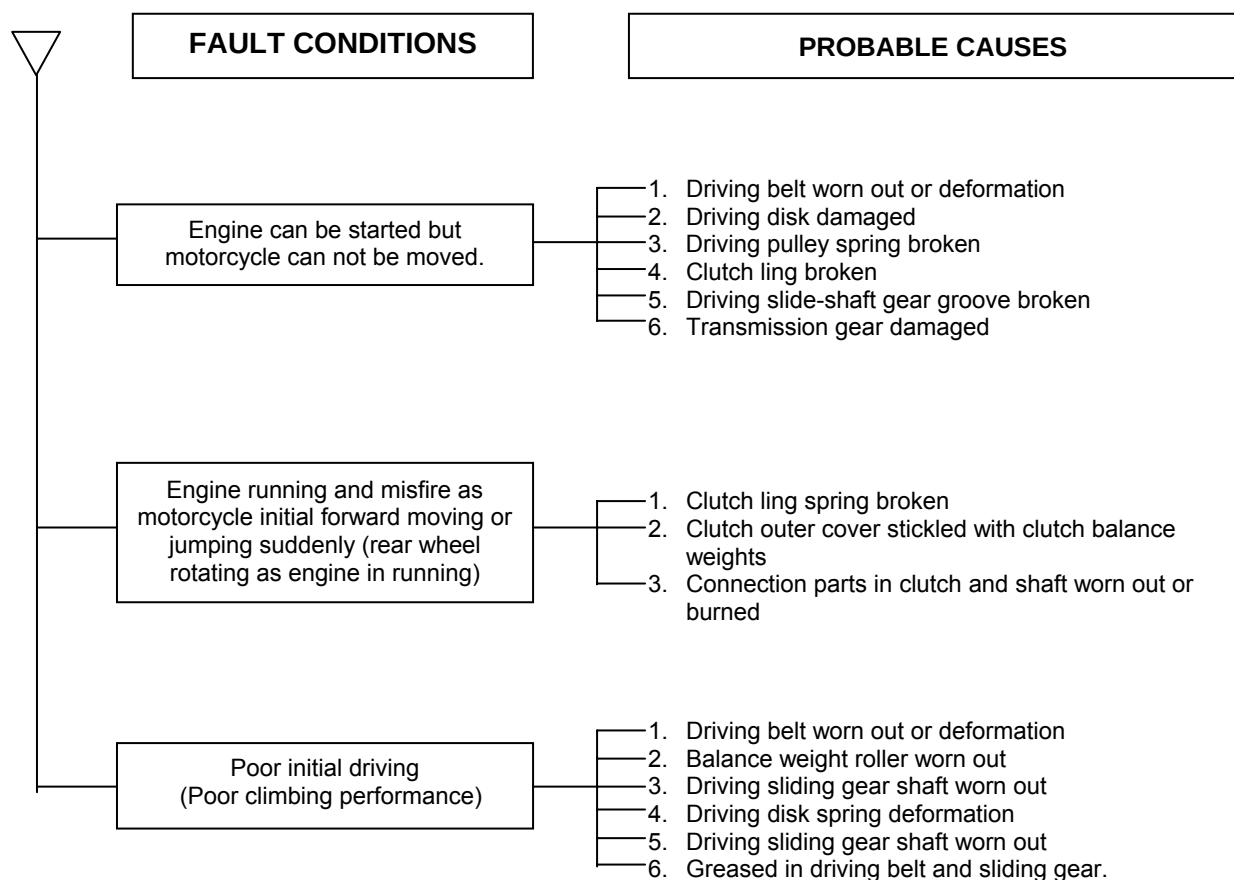
## D. Engine runs sluggish (High speed)



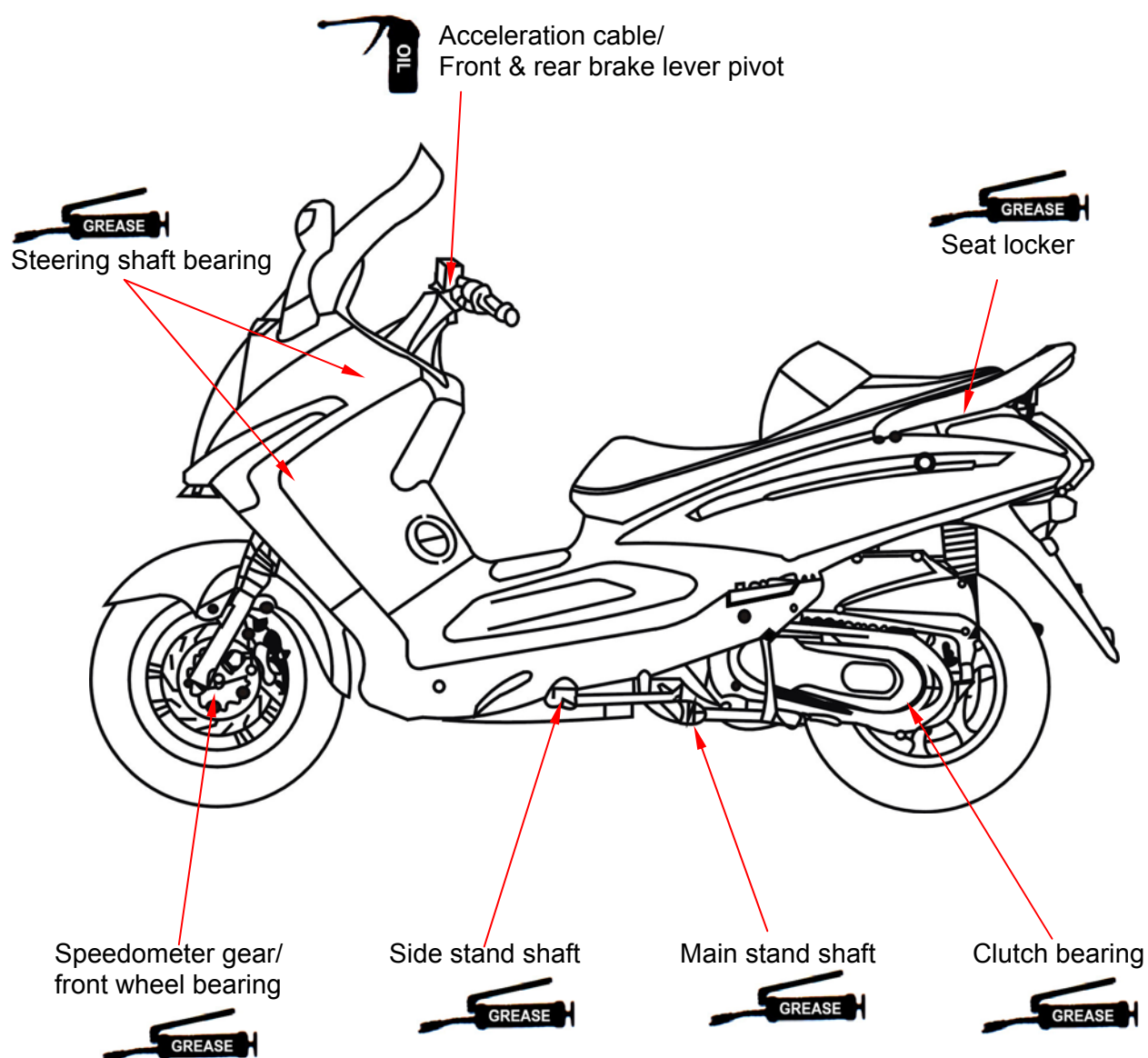


# 1. General Information

## E. Clutch, Driving And Driving Pulley



## Lubrication Points



|                                               |            |                                                          |             |
|-----------------------------------------------|------------|----------------------------------------------------------|-------------|
| <b>Precautions in Operation.....</b>          | <b>2-1</b> | <b>Cylinder Compression Pressure.....</b>                | <b>2-9</b>  |
| <b>Periodical Maintenance Schedule .....</b>  | <b>2-2</b> | <b>Drive Belt.....</b>                                   | <b>2-9</b>  |
| <b>Engine Oil .....</b>                       | <b>2-3</b> | <b>Steering Handle Top Bearing .....</b>                 | <b>2-10</b> |
| <b>Engine Oil Strainer Clean .....</b>        | <b>2-3</b> | <b>Cushion .....</b>                                     | <b>2-10</b> |
| <b>Gear Oil .....</b>                         | <b>2-4</b> | <b>Disk Brake System .....</b>                           | <b>2-11</b> |
| <b>Fuel Lines / Cable.....</b>                | <b>2-4</b> | <b>Brake Light Switch/Starting Inhibitor Switch.....</b> | <b>2-13</b> |
| <b>Air Cleaner.....</b>                       | <b>2-5</b> | <b>Headlight Beam Distance .....</b>                     | <b>2-13</b> |
| <b>P.C.V. system .....</b>                    | <b>2-6</b> | <b>Wheel / Tire .....</b>                                | <b>2-13</b> |
| <b>Valve Clearance.....</b>                   | <b>2-6</b> | <b>Battery .....</b>                                     | <b>2-14</b> |
| <b>Carburetor Idle Speed Adjustment .....</b> | <b>2-7</b> | <b>Nuts, Bolts Tightness.....</b>                        | <b>2-14</b> |
| <b>Ignition System .....</b>                  | <b>2-8</b> | <b>Special Tools List.....</b>                           | <b>2-15</b> |
| <b>Spark Plug .....</b>                       | <b>2-8</b> |                                                          |             |

### Precautions in Operation

| Model                         |                        | LM25W                                                        | LM25W1               |
|-------------------------------|------------------------|--------------------------------------------------------------|----------------------|
| Fuel Tank Capacity            |                        | 12,000 c.c.                                                  |                      |
| Engine Oil                    | capacity               | 1,400 c.c.                                                   |                      |
|                               | change                 | 1,200 c.c.                                                   |                      |
| Transmission Gear oil         | capacity               | 180 c.c.                                                     |                      |
|                               | change                 | 170 c.c.                                                     |                      |
| Capacity of coolant           | Engine + radiator      | 850 c.c.                                                     |                      |
|                               | Reservoir upper        | 420 c.c.                                                     |                      |
| Clearance of throttle valve   |                        | 2~6 mm                                                       |                      |
| Spark plug                    |                        | CR7HSA (gap:0.6~0.7 mm)                                      |                      |
| “F” Mark in idling speed      |                        | BTDC 10° / 1,600 rpm                                         | BTDC 13° / 1,650 rpm |
| Full timing advanced          |                        | BTDC 30°                                                     | BTDC 27°             |
| Idling speed                  |                        | 1,600±100 rpm                                                | 1,650±100 rpm        |
| Cylinder compression pressure |                        | 12 ± 2 Kg/cm <sup>2</sup>                                    |                      |
| Valve clearance               | IN                     | 0.1±0.02 mm                                                  |                      |
|                               | EX                     | 0.15±0.02 mm                                                 |                      |
| Tire dimension                | Front                  | 110/90-13 56P                                                |                      |
| Tire dimension                | Rear                   | 130/70-13 57P                                                |                      |
| Tire pressure (cold)          | single                 | Front: 1.75 Kg/cm <sup>2</sup> Rear: 2.25 Kg/cm <sup>2</sup> |                      |
|                               | Load 90 Kg (full load) | Front: 2.25 Kg/cm <sup>2</sup> Rear: 2.5 Kg/cm <sup>2</sup>  |                      |
| Battery                       |                        | 12V10Ah (MF battery) / YTX12-BS                              |                      |

## 2. Maintenance Information



### Periodical Maintenance Schedule

| No | item                                     | Every 300KM | 1 Month every 1,000KM          | 3 month every 3,000KM | 6 month every 6,000KM | 1 year every 12,000KM |
|----|------------------------------------------|-------------|--------------------------------|-----------------------|-----------------------|-----------------------|
| 1  | ☆ Air cleaner                            | I           |                                | C                     | C                     | R                     |
| 2  | ☆ 2nd air jet cleaner                    | I           |                                | C                     | C                     | R                     |
| 3  | ☆ Fuel filter                            | I           |                                |                       | I                     | R                     |
| 4  | ☆ Oil filter                             | C           |                                |                       | C                     | C                     |
| 5  | ☆ Engine oil change                      | R           | Replacement for every 1,000 km |                       |                       |                       |
| 6  | Tire pressure                            | I           | I                              | I                     | I                     | I                     |
| 7  | Battery inspection                       | I           | I                              | I                     | I                     | I                     |
| 8  | Brake & free ply check                   | I           | I                              | I                     | I                     | I                     |
| 9  | Steering handle check                    | I           |                                |                       | I                     | I                     |
| 10 | Cushion operation check                  | I           |                                |                       | I                     | I                     |
| 11 | Every screw tightening check             | I           | I                              | I                     | I                     | I                     |
| 12 | Gear oil check for leaking               | I           | I                              | I                     | I                     | I                     |
| 13 | ☆ Spark plug check or change             | I           |                                | I                     | R                     | R                     |
| 14 | ☆ Gear oil change                        | R           | Replacement for every 5,000 km |                       |                       |                       |
| 15 | Frame lubrication                        |             |                                |                       | L                     | L                     |
| 16 | Exhaust pipe                             | I           | I                              | I                     | I                     | I                     |
| 17 | ☆ Ignition timing                        | I           | I                              | I                     | I                     | I                     |
| 18 | ☆ emission check in Idling               | A           | I                              | I                     | I                     | I                     |
| 19 | ☆ Throttle operation                     | I           |                                | I                     | I                     | I                     |
| 20 | ☆ Engine bolt tightening                 | I           |                                | I                     | I                     | I                     |
| 21 | ☆ CVT driving device(belt)               |             |                                |                       | I                     | R                     |
| 22 | ☆ CVT driving device(roller)             |             |                                |                       | C                     | C                     |
| 23 | Lights/electrical equipment/multi-meters | I           | I                              | I                     | I                     | I                     |
| 24 | Main/side stands & springs               | I           |                                |                       | I                     | I                     |
| 25 | Fuel lines                               | I           |                                | I                     | I                     | I                     |
| 26 | Shock absorbers                          |             |                                | I                     | I                     | I                     |
| 27 | Cam chain                                | I           |                                | I                     | I                     | I                     |
| 28 | ☆ Valve clearance                        | I           |                                | A                     | A                     | A                     |
| 29 | ☆ Crankcase evaporative control system   | I           |                                | C                     | C                     | C                     |
| 30 | ☆ Crankcase blow-by over-flow pipe       |             | Replacement for every 2,000 km |                       |                       |                       |
| 31 | ☆ 2nd air jet system                     | I           |                                | I                     | C                     | C                     |
| 32 | ☆ Evaporative control system             |             |                                | I                     | I                     | I                     |
| 33 | Lines & connections in cooling system    | I           | I                              | I                     | I                     | I                     |
| 34 | Coolant reservoir                        | I           | I                              | I                     | I                     | I                     |
| 35 | Coolant                                  | I           | Replace                        |                       |                       |                       |
| 36 | ECU燃油噴射控制器輸入電壓訊號                         |             |                                |                       | I                     |                       |
| 37 | EMS燃油噴射感應器接頭                             | I           |                                | I                     |                       |                       |

**Code: I ~ Inspection, cleaning, and adjustment R ~ Replacement C ~ Cleaning (replaced if necessary) L ~ Lubrication**

Have your motorcycle checked, adjusted, and recorded maintenance data periodically by your SYM Authorized Dealer to maintain the motorcycle at the optimum condition

The above maintenance schedule is established by taking the monthly 1,000 kilometers as a reference which ever comes first.

Remarks: 1. **These marks "☆" in the schedule are emission control items. According to EPA regulations, these items must be performed normally periodical maintenance following the use r manual instructions. They are prohibited to be adjusted or repaired by unauthorized people. Otherwise, SYM is no responsible for the charge.**

- Clean or replace the air cleaner element more often when the motorcycle is operated on dusty roads or in the Heavily- polluted environment.
- Maintenance should be performed more often if the motorcycle is frequently operated in high speed and after the motorcycle has accumulated a higher mileage.
- Preventive maintenance
  - Ignition system - Perform maintenance and check when continuous abnormal ignition, misfire, after-burn, overheating occur.
  - Carbon deposit removal - Remove carbon deposits in cylinder head, piston heads, exhaust system when power is obvious lower. Than ever
  - Replace worn out pistons, cylinder head.



## Engine Oil

Turn off engine, and park the motorcycle 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 make sure oil can be drained smoothly and completely.

Place an oil pan under the motorcycle, and remove oil drain bolt.  
After drained, make sure washer can be re-used.  
Install oil drain bolt.

**Torque value: 3.5~4.5kgf-m**

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

Recommended using King serial oil.

**Engine oil capacity:**

**Disassembly 1400c.c.**

**Replacement 1200c.c.**

Install dipstick, start the engine for running several minutes.

Turn off engine, and check oil level again.

Check if engine oil leaks.



## Engine Oil Strainer Clean

Drain engine oil out.

Remove oil strainer and spring.

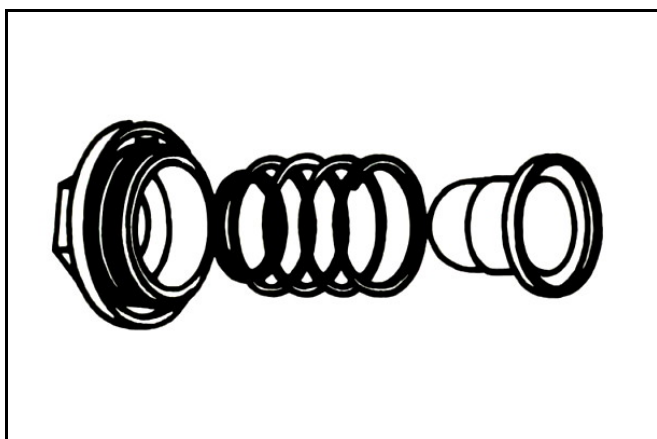
Clean oil strainer.

Check if O-ring can be re-used.

Install oil strainer and spring.

Install oil strainer cap.

**Torque value : 1.3~1.7kgf-m**





## 2. Maintenance Information



### Gear Oil

Oil level inspection

Park the motorcycle on flat surface with main stand.

Turn off the engine.

### Gear Oil Change

Remove oil inspection bolt.

Remove drain plug and drain oil out.

Install the drain plug after drained.

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

Add gear oil to specified quantity from the inspection hole.

Install the inspection bolt.

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

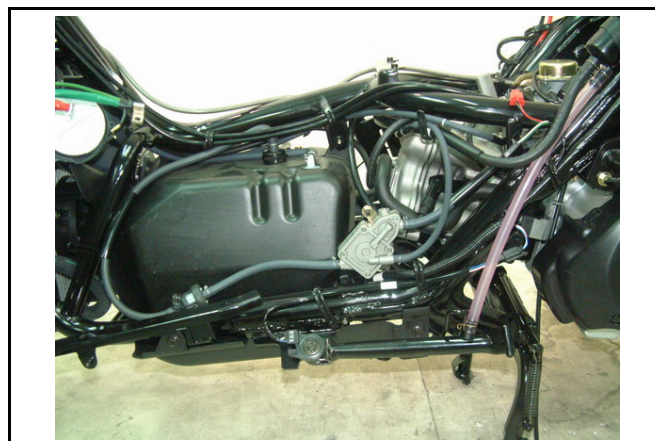
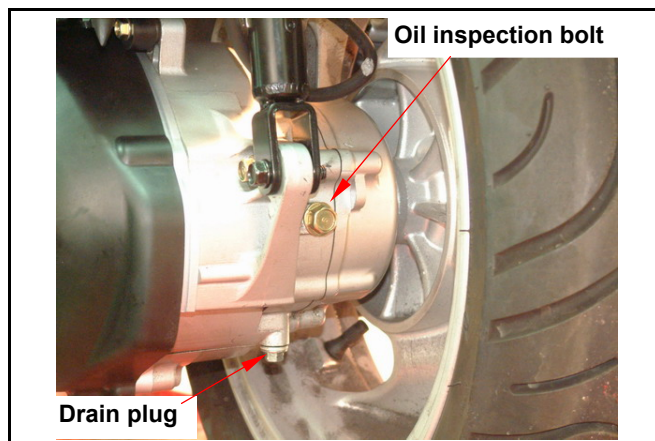
**Gear Oil Quantity: 170 c.c. when replacing**

Make sure that the 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.



### Fuel Lines / Cable

Remove luggage box.

Remove rear carrier.

Remove body covers.

Check all lines, and replace it when they are deterioration, damage or leaking.

### ⚠ Warning

- Gasoline is a low ignition material so any kind of fire is strictly prohibited as dealing it.

### Acceleration Operation

Have a wide open of throttle valve as handle bar in any position and release it to let back original (full closed) position.

Check handle bar if its operation is smooth.

Check acceleration cable and replace it if deteriorated, twisted or damaged.

Lubricate the cable if operation is not smooth

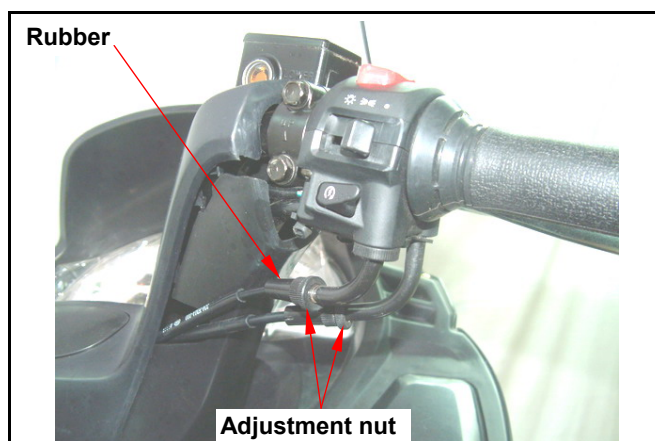
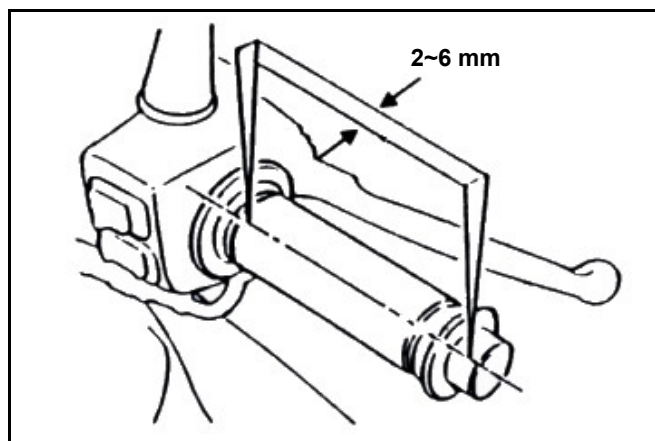
Measure handle bar free play in its flange part.

**Free play: 2~6 mm.**

Adjustment can be done in either end.

Secondary adjustment is conducted from top side.

Remove rubber boot, loosen fixing nut, and then adjust it by turning the adjustment nut.





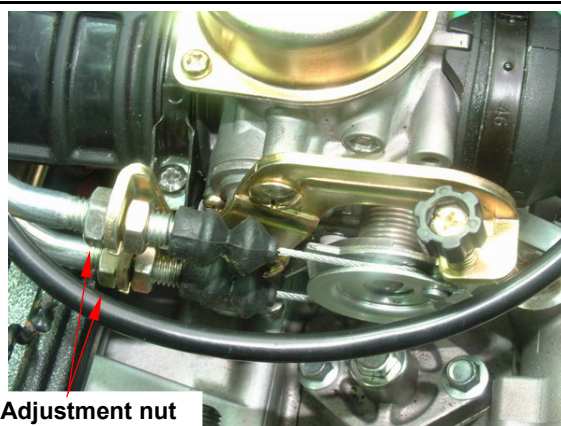


## 2. Maintenance Information

Primary adjustment is conducted from bottom side.

Loosen fixing nut, and adjust by turning the adjustment nut.

Tighten the fixing nut, and check acceleration operation condition.

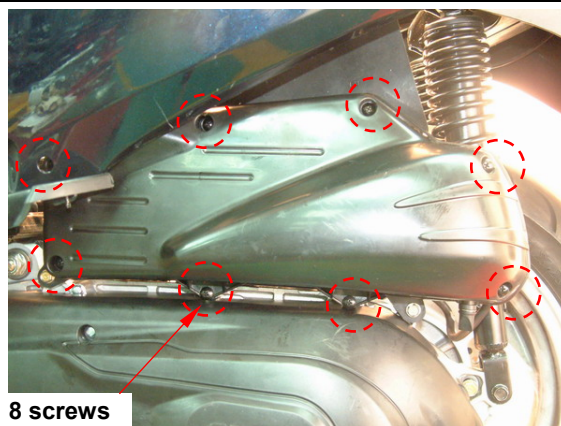


Adjustment nut

### Air Cleaner

#### Air Cleaner Element

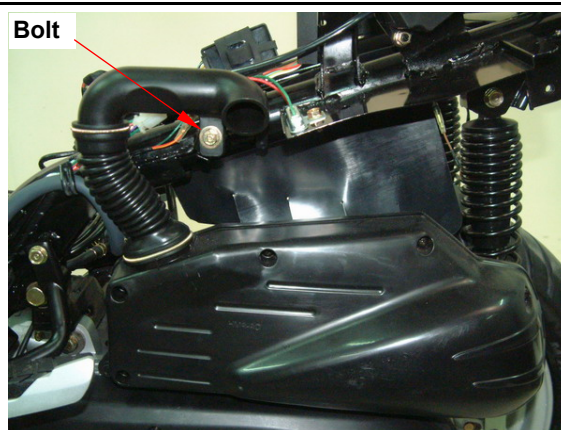
Remove 8 screws from the air cleaner cover and then remove the cover.



8 screws

Remove the body cover.

Loosen bolt from the air cleaner air hose.

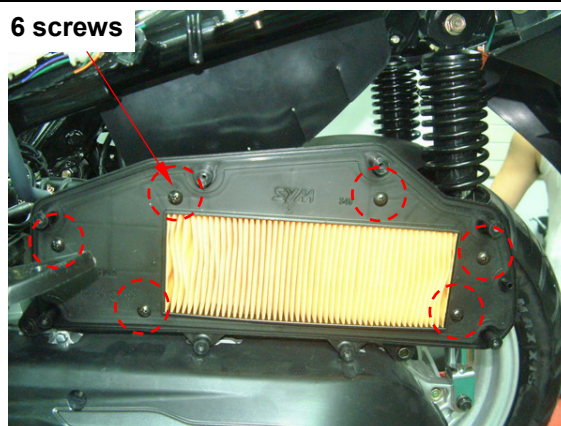


Bolt

Remove 6 screws, and then remove the air cleaner element.

#### ⚠ Caution

- The air cleaner element is made of paper so do not soap it into water or wash it with water.



6 screws

## 2. Maintenance Information



### P.C.V. system

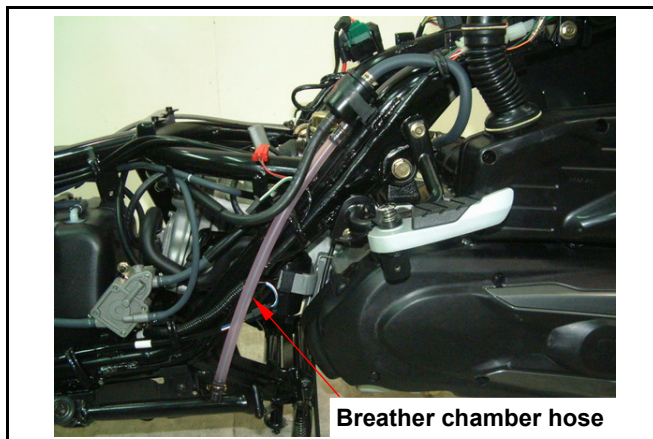
Draws out the plug from lower of the breather chamber hose.

Releases the dry internal deposit.

Every 2,000 kilometers release oil

#### ⚠ Caution

- A In releases the breather chamber hose in the transparent section as worthy of looking at as any deposit
- In the multi- rain or the accelerator in the situation rides, must reduce the maintenance traveling schedule
- In releases the breather chamber hose in the transparent section as worthy of looking at as any deposit



### Valve Clearance

#### ⚠ Caution

- Checks and adjustment must be performed when the engine temperature is below 35°C.

Remove luggage box.

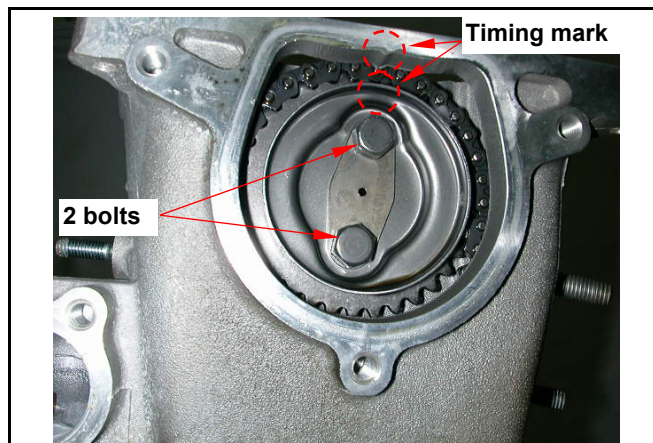
Remove cylinder head cover & side cover.

Remove ignition timing hole cap located in front upper side of engine right cover

Turn camshaft bolt in C.W. direction and let the "T" mark on the camshaft sprocket aligns with cylinder head mark so that piston is placed at TDC position in compression stroke.

#### ⚠ Caution

- Do not turn the bolt in C.C.W. direction to prevent from camshaft bolt looseness.



#### Valve clearance inspection and adjustment:

Check & adjust valve clearance with feeler gauge.

**Valve clearance (IN) :  $0.1 \pm 0.02$  mm.**

**Valve clearance (EX) :  $0.15 \pm 0.02$  mm.**

Loosen fixing nut and turn the adjustment nut for adjustment.

#### ⚠ Caution

- Re-check the valve clearance after tightened the fixing nut.

**Special tool: Tappet adjuster**

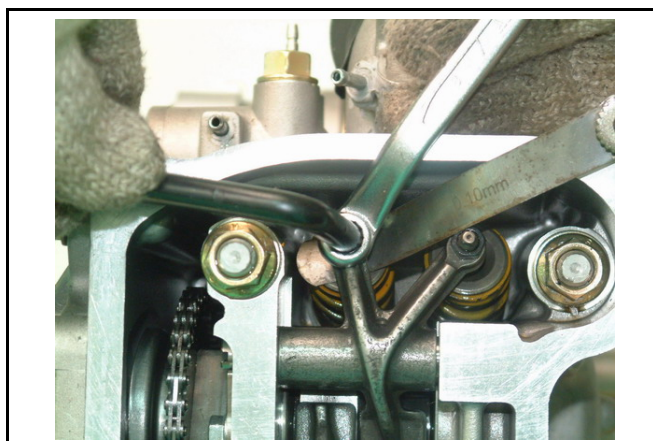
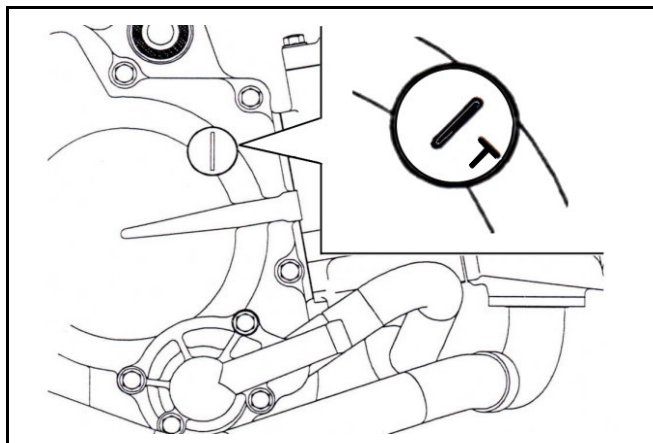
**SYM-9001200-08**

**SYM-9001200-09**

**SYM-9001200-10**

**Special tool: Tappet adjuster wrench**

**SYM-9001200**





## Carburetor Idle Speed Adjustment

### ⚠ Caution

- Inspection & adjustment for idle speed have to be performed after all parts in engine that needed adjustment have been adjusted.
- Idle speed check and adjustment have to be done after engine is being warm up. (It is enough that operates engine from stop to running for 10 minutes.)

Park the motorcycle with main stand and warm up engine.

Connect tachometer (the wire clamp of tachometer is connected to the high tension cable).

Open carburetor cover from the luggage box.

Turn the throttle valve stopper screw to specified idle speed

**Specified idle speed:  $1500 \pm 100$  rpm.**

Emission adjustment in idle speed

Warm up the engine for around 10 minutes and then conduct this adjustment.

Connect the tachometer onto engine.

Adjust the throttle valve stopper screw and let engine runs in  $1500 \pm 100$  rpm.

Insert the exhaust sampling pipe of exhaust analyzer into the front section of exhaust pipe.

Adjust the air adjustment screw so that emission value in idle speed is within standard.

Slightly accelerate the throttle valve and release it immediately. Repeat this for 2~3 times.

Read engine RPM and value on the exhaust analyzer. Repeat step 2 to step 4 procedures until measured value within standard.

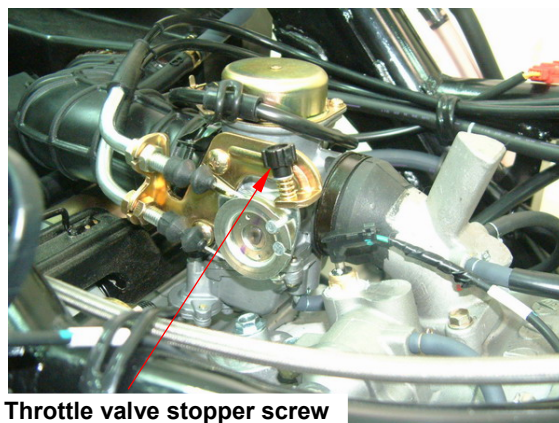
**Emission standard CO: 3.0 %↓**

**HC: 2,000 P.P.M.↓**

### ⚠ 注意

- 燃油噴射系統之引擎，怠速及 CO 都不需調校。
- 若污染排放值有異常升高時，請檢修燃油噴射系統。

Ignition coil cable



Throttle valve stopper screw



Mixture air adjusting screw

## 2. Maintenance Information



### Ignition System

#### ⚠ Caution

- C.D.I ignition system is set by manufacturer so it can not be adjusted.
- Ignition timing check procedure is for checking whether CDI function is in normal or not.

Remove right side cover.

Remove ignition timing hole cap located in front upper side of engine right cover.

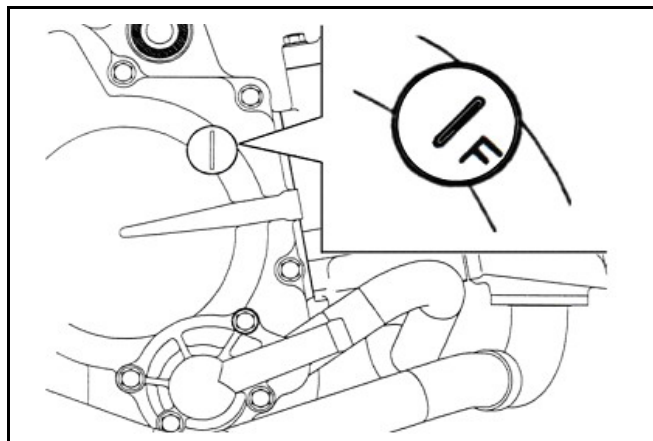
Connect tachometer and ignition lamp.

Start engine.

As engine in idle speed: 2,500 rpm, aim at the "F" mark with the ignition lamp. Then, it means that ignition timing is correct.

Increase engine speed to 6,000 rpm to check ignition advance degree. If indent is located within the ignition advance degrees, it means that the ignition advance degree is in normal.

If ignition timing is incorrect, check CDI set, pulse rotor and pulse generator. Replace it if malfunction of these parts is found.



### Spark Plug

Recommended spark plug: CR8E

Remove luggage box

Remove central cover.

Remove spark plug cap.

Clean dirt around the spark plug hole.

Remove spark plug.

Measure spark plug gap.

**Spark plug gap: 0.6~0.7 mm**

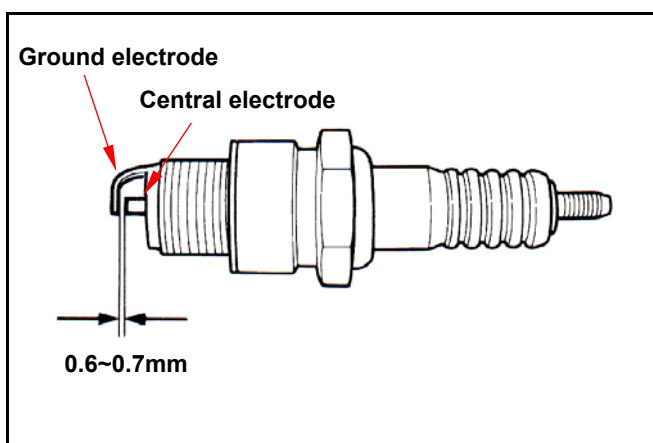
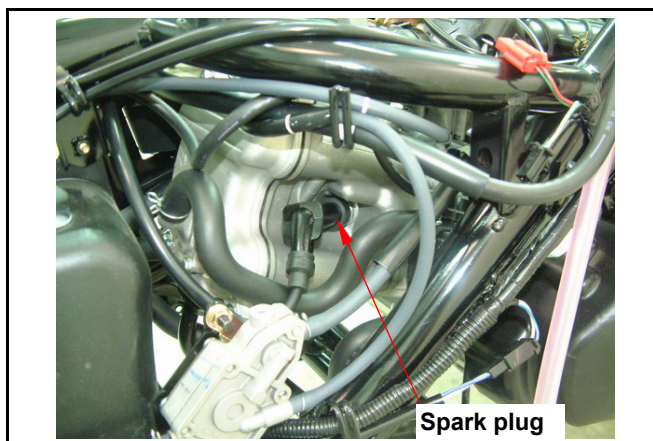
Carefully bend ground electrode of the plug to adjust the gap if necessary.

Hold spark plug washer and install the spark plug by screwing it.

Tighten the plug by turning 1/2 turn more with plug socket after installed.

**Tighten torque: 1.0~1.2kgf-m**

Connect spark plug cap





## 2. Maintenance Information

### Cylinder Compression Pressure

Warm up engine.

Turn off the engine.

Remove luggage box and central cover

Remove spark plug cap and spark plug.

Install compression gauge.

Full open the throttle valve, and rotate the engine by means of starter motor.

#### ⚠ Caution

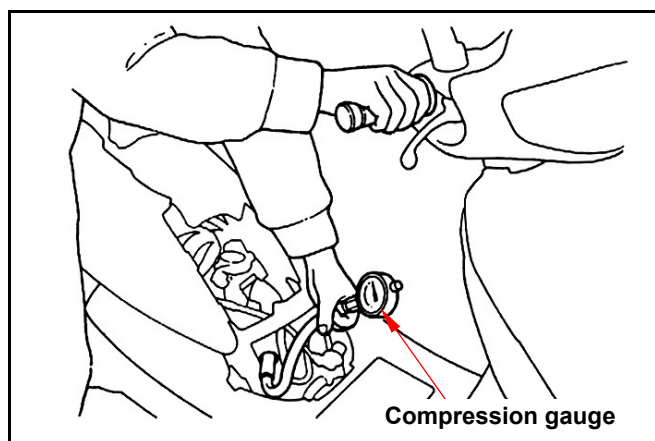
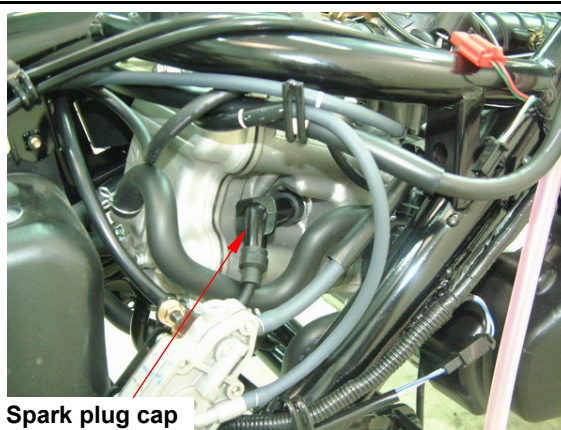
- Rotate the engine until the reading in the gauge no more increasing.
- Usually, the highest pressure reading will be obtained in 4~7 seconds.

**Compression pressure :  $12 \pm 2 \text{ Kg/cm}^2$**

Check following items if the pressure is too low:

- Incorrect valve clearance.
- Valve leaking.
- Cylinder head leaking, piston, piston ring and cylinder worn out.

If the pressure is too high, it means carbon deposits in combustion chamber or piston head.



### Drive Belt

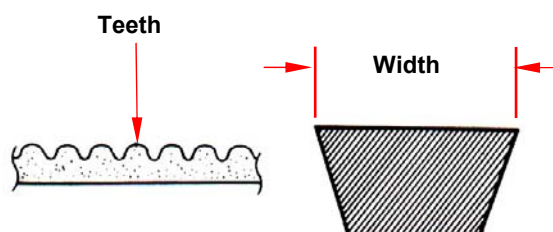
Remove mounting bolt located under air cleaner.

Remove the engine left side cover and the cover.

Check if the belt is crack or worn out.

Replace the belt if necessary or in accord with the periodical maintenance schedule to replace it.

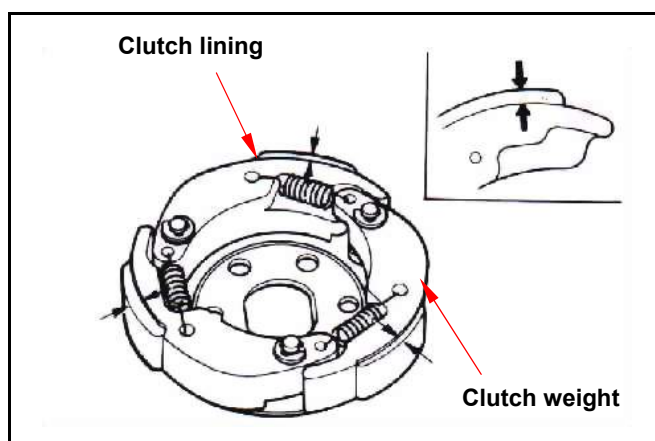
**Width limit: 22.5 mm or above**



### Clutch Disc Wear

Run the motorcycle and increase throttle valve opening gradually to check clutch operation.

If the motorcycle is in forward moving and shaking, check clutch disc condition. Replace it





## 2. Maintenance Information



### Steering Handle Top Bearing

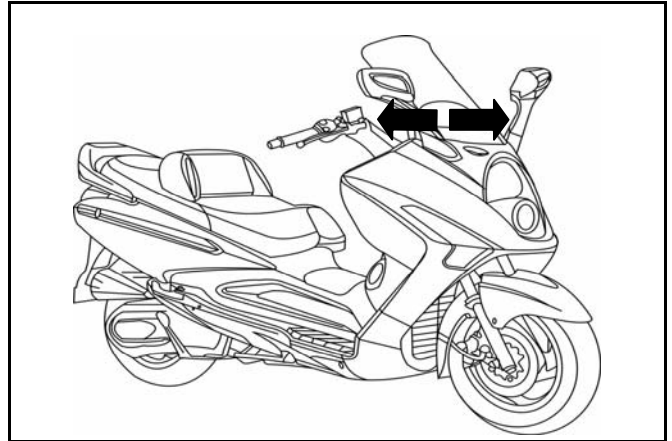
#### ⚠ Caution

- Check all wires and cables if they are interfered with the rotation of steering handle bar.

Lift the front wheel out of ground.

Turn handle from right to left alternative and check if turning is smoothly.

If handle turning is uneven and bending, or the handle can be operated in vertical direction, then adjust the handle top bearing.



### Cushion

#### ⚠ Caution

- Do not ride the motorcycle with poor cushion.
- Looseness, wear or damage cushion will make poor stability and drive-ability.

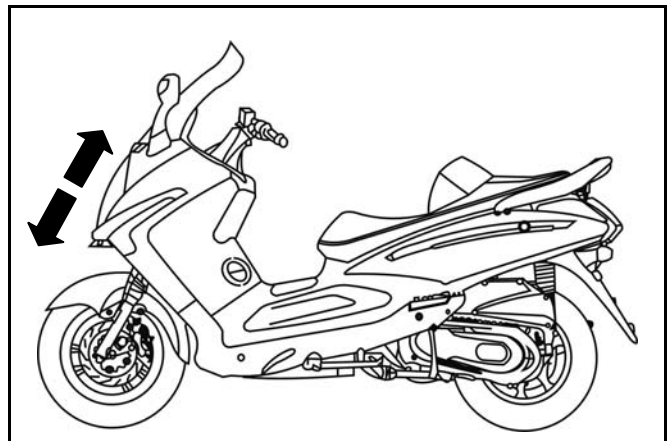
#### Front cushion

Press down the front cushion for several times to check it operation.

Check if it is damage

Replace relative parts if damage found.

Tighten all nuts and bolts.



#### Rear Cushion

Press down the front cushion for several times to check it operation.

Check if it is damage

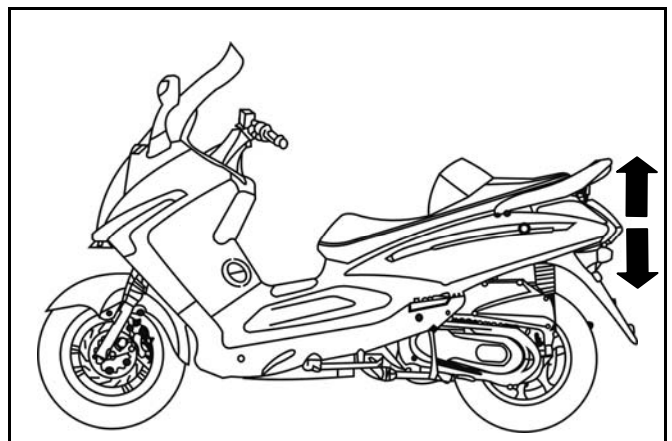
Replace relative parts if damage found.

Park motorcycle with main stand.

Turn the rear wheel forcefully and check if engine bracket bushing worn out

Replace the bushing if looseness found.

Tighten all nuts and bolts.





### Disk Brake System

#### Brake System Hose

Make sure the brake hoses for corrosion or leaking oil.

#### Brake Fluid

Check brake fluid level in the brake fluid reservoir. If the level is lower than the **LOWER** limit, add brake fluid to **UPPER** limit. Also check brake system for leaking if low brake level found

#### ⚠ Caution

- In order to maintain brake fluid in the reservoir in horizontal position, do not remove the cap until handle stop.
- Do not operate the brake lever after the cap had been removed. Otherwise, the brake fluid will spread out if operated the lever.
- Do not mix non-compatible brake fluid together.

#### Filling Out Brake Fluid

Tighten the drain valve, and add brake fluid. Operate the brake lever so that brake fluid contents inside the brake system hoses.

#### Added Brake Fluid

Add brake fluid to **UPPER** limit lever. Recommended brake fluid: DOT3 or DOT4 WELL RUN brake fluid.

#### ⚠ Caution

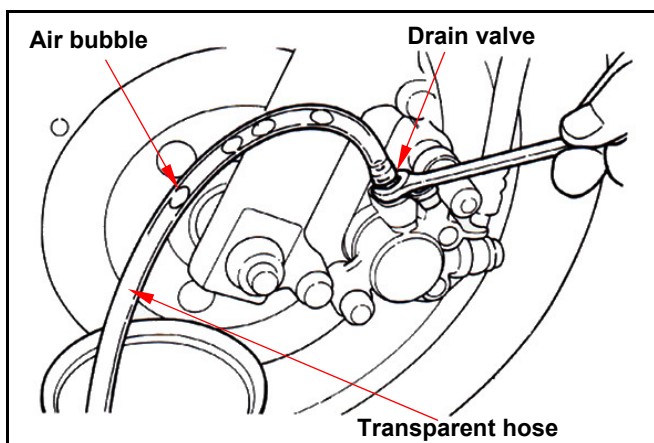
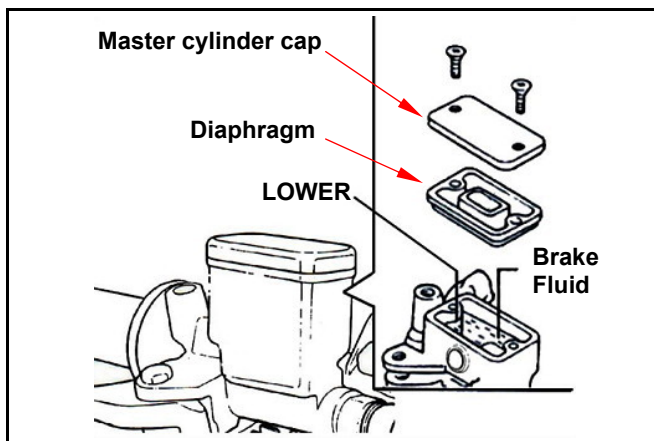
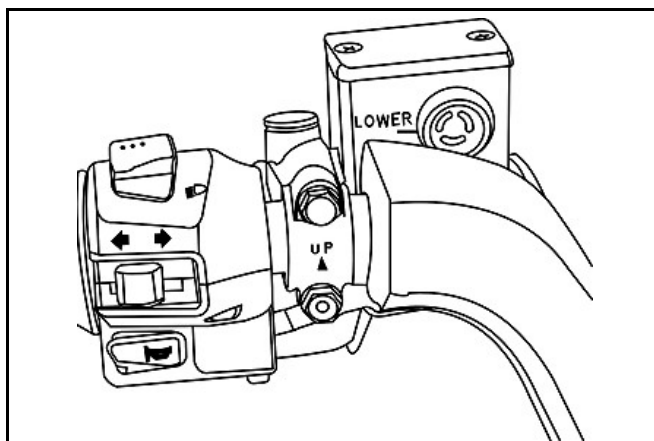
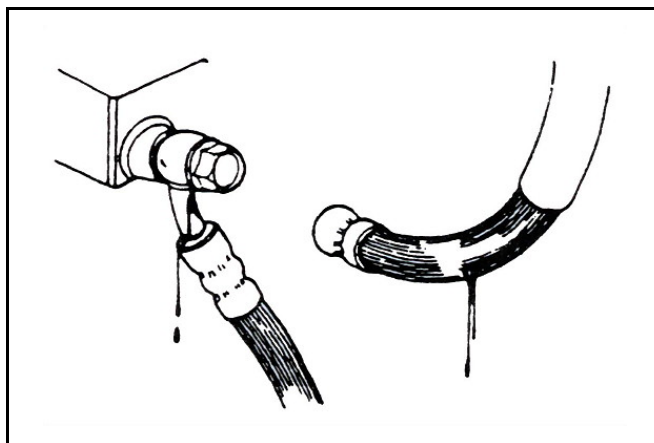
- Never mix or use dirty brake fluid to prevent from damage brake system or reducing brake performance.

#### Air Bleed Operation

Connect a transparent hose to draining valve. Hold the brake lever and open air bleeding valve. Perform this operation alternative until there is no air inside the brake system hoses.

#### ⚠ Caution

- Before closing the air bleed valve, do not release the brake lever.



## 2. Maintenance Information



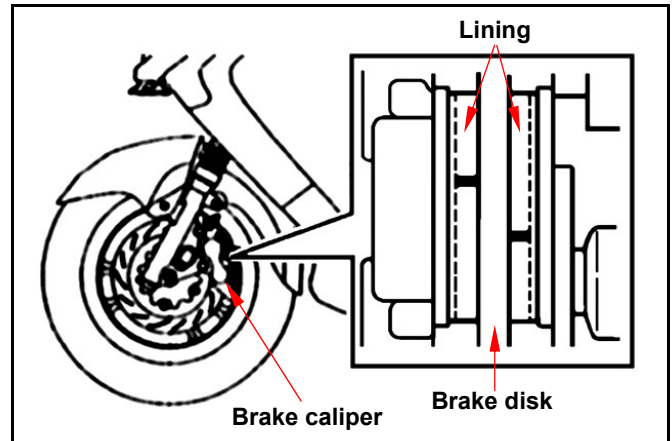
### Brake Lining Wear

The indent mark on brake lining is the wear limitation.

Replace the brake lining if the wear limit mark closed to the edge of brake disc.

#### ⚠ Caution

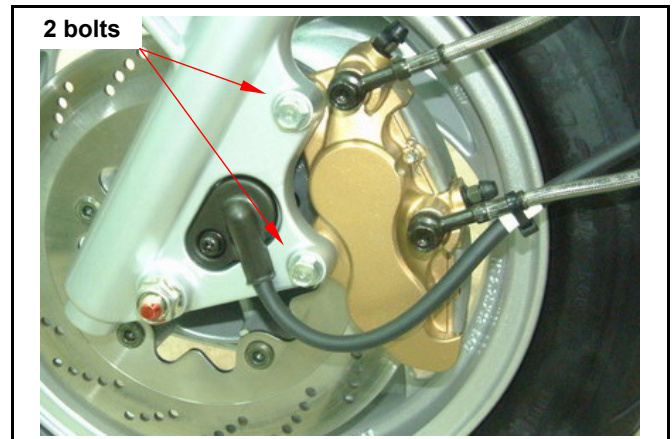
- It is not necessary to remove brake hose when replacing the brake lining.



Remove the brake clipper bolt, and take out the clipper.

#### ⚠ Caution

- Do not operate the brake lever after the clipper removed to avoid clipping the brake lining.

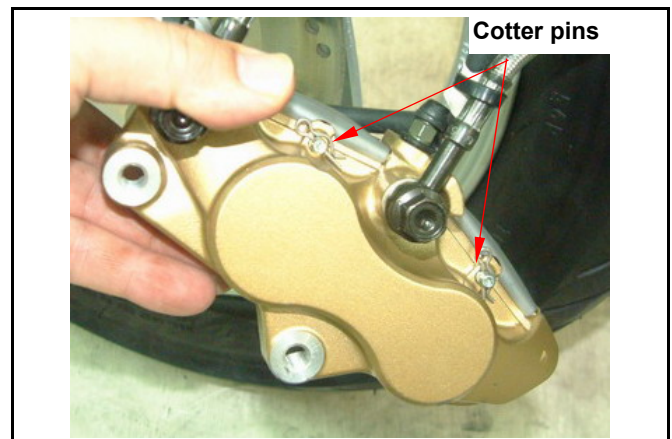


Pry out the brake lining with a flat driver if lining is clipped.

Remove 2 cotter pins

#### ⚠ Caution

- In order to maintain brake power balance, the brake lining must be replaced with one set.



Remove the brake pad shafts and pads.







## Brake Light Switch/Starting Inhibitor Switch

The brake lamp switch is to light up brake lamp as brake applied.

Make sure that electrical starter can be operated only under brake applying.

## Headlight Beam Distance

Turn on main switch

Headlight beam adjustment. Turn the headlight adjustment screw to adjust headlight beam high.

### ⚠ Caution

- To adjust the headlight beam follows related regulations.
- Improper headlight beam adjustment will make in coming driver dazzled or insufficient lighting.

## Wheel / Tire

### ⚠ Caution

- Tire pressure check should be done as cold engine.

### Appointed tire pressure

| Tire size                                          |                      | Front tire | Rear tire |
|----------------------------------------------------|----------------------|------------|-----------|
| Tire pressure as cold engine (Kg/cm <sup>2</sup> ) | Load for under 90 Kg | 1.75       | 2.25      |
|                                                    | Full loaded          | 1.75       | 2.50      |

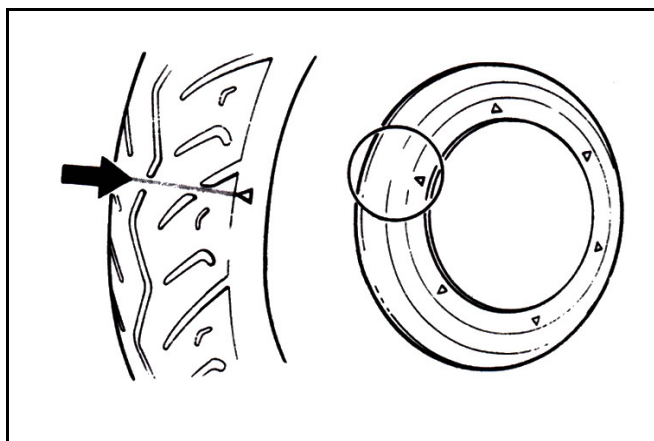
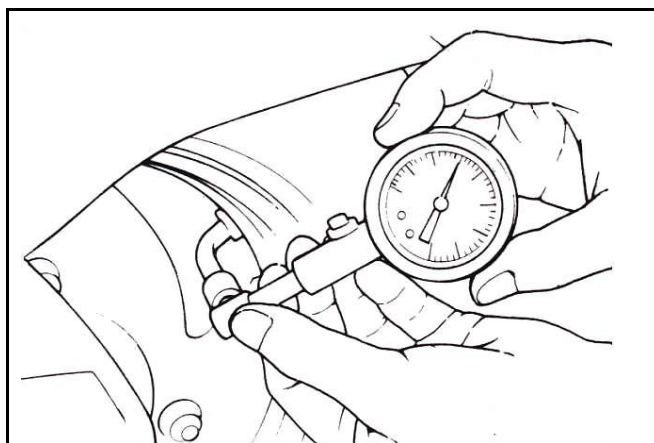
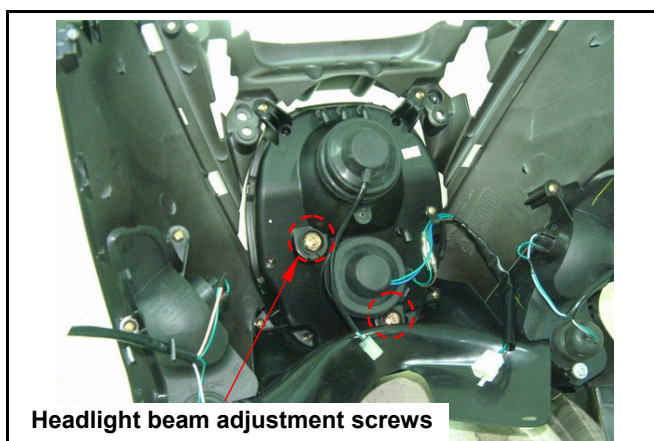
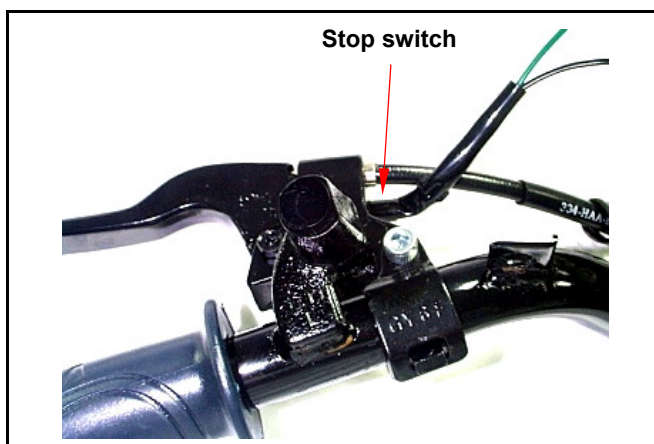
Check if tire surface is ticked with nails, stones or other materials.

Check if front and rear tires' pressure is in normal. Measure tire thread depth from tire central surface.

Replace the tire if the depth is not come with following specification

**Front tire : 1.5 mm**

**Rear tire : 2.0 mm**





## 2. Maintenance Information



### Battery

Open the inner box lid.

Loosen screw & remove the battery cover

#### Battery cable remove :

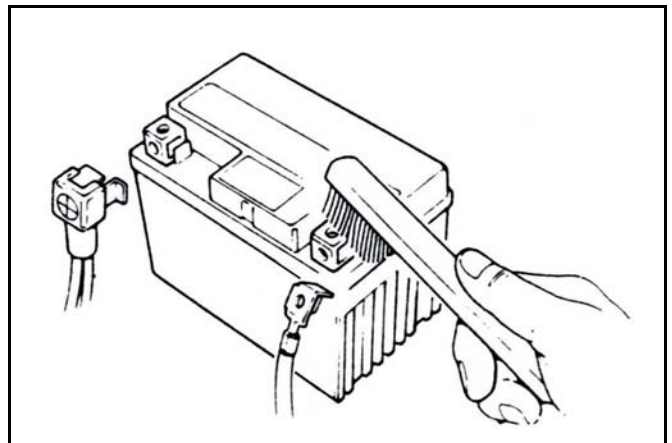
1. Disconnect the cable negative terminal (-),
2. then the cable positive terminal (+)
3. Remove the battery from the motorcycle.。

If there is some rust on battery posts, clean it with steel brush

Install the battery in the reverse procedures of removal

#### Caution

- If there is rust on the posts very serious, spray some hot water on the posts. Then, clean it with steel brush so that can remove rust for more easily.
- Apply some grease on the posts after rust removed to prevent from rust again.



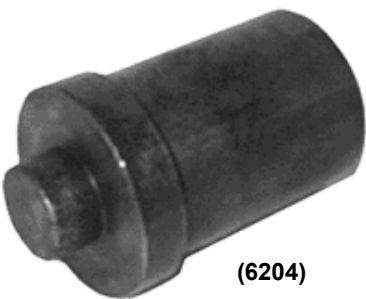
### Nuts, Bolts Tightness

Perform periodical maintenance in accord with the Periodical Maintenance Schedule.

Check if all bolts and nuts on the frame are tightened securely.

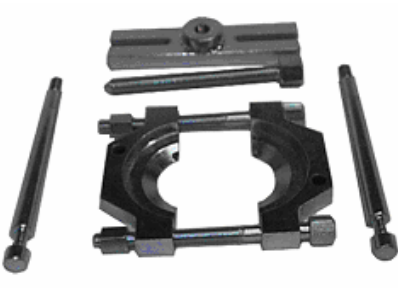
Check all fixing pins, snap rings, hose (pipe) clamps, and wire holders for security.

## Special Tools List

|                                                                                     |                                           |                                                                                     |                                             |                                                                                       |                                     |
|-------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------|
|    |                                           |    |                                             |    |                                     |
| NAME                                                                                | Left crank bearing puller                 | NAME                                                                                | R/L. crank case disassemble tool            | NAME                                                                                  | Valve cotter remove & assembly tool |
| NO                                                                                  | SYM-9100100                               | NO                                                                                  | SYM-1120000-HMA H9A                         | NO                                                                                    | SYM-1471110/20                      |
|    |                                           |    |                                             |    |                                     |
| NAME                                                                                | L. Crank shaft puller                     | NAME                                                                                | Tappet adjusting wrench                     | NAME                                                                                  | Tappet adjusting                    |
| NO                                                                                  | SYM-1130000-HMA H9A                       | NO                                                                                  | SYM-9001200                                 | NO                                                                                    | SYM-9001200-08 09 10                |
|  |                                           |  |                                             |  |                                     |
| NAME                                                                                | R. crank case bearing 6201 assembles tool | NAME                                                                                | Left crankshaft & oil seal assembly socket. | NAME                                                                                  | Rocker arm shaft disassemble        |
| NO                                                                                  | SYM-9614000-HMA 6201                      | NO                                                                                  | SYM-2341110- HMA RB1                        | NO                                                                                    | SYM-1445100                         |
|  |                                           |  |                                             |  |                                     |
| NAME                                                                                | Bearing driver 6204                       | NAME                                                                                | Assembly directs puller                     | NAME                                                                                  | Drive shaft puller                  |
| NO                                                                                  | SYM-9110400                               | NO                                                                                  | SYM-2341110                                 | NO                                                                                    | SYM-2341110- HMA RB1                |

## 2. Maintenance Information



|                                                                                     |                                 |                                                                                     |                            |                                                                                       |                                            |
|-------------------------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------|----------------------------|---------------------------------------------------------------------------------------|--------------------------------------------|
|    |                                 |    |                            |    |                                            |
| NAME                                                                                | Inner bearing puller            | NAME                                                                                | Outer bearing puller       | NAME                                                                                  | Handle stand nut wrench                    |
| NO                                                                                  | SYM-6204022                     | NO                                                                                  | SYM-6204001                | NO                                                                                    | SYM-5321100                                |
|    |                                 |    |                            |    |                                            |
| NAME                                                                                | Clutch nut wrench               | NAME                                                                                | Universal holder           | NAME                                                                                  | AC.G. Flywheel puller                      |
| NO                                                                                  | SYM-9020200                     | NO                                                                                  | SYM-2210100                | NO                                                                                    | SYM-3110000-HMA                            |
|  |                                 |  |                            |  |                                            |
| NAME                                                                                | Steering head top thread wrench | NAME                                                                                | Bearing driver HK1516      | NAME                                                                                  | Bearing puller 6205                        |
| NO                                                                                  | SYM-5320010                     | NO                                                                                  | SYM-9100200-HMA RB1 HK1516 | NO                                                                                    | SYM-9100400 HMA RAI 6205                   |
|  |                                 |  |                            |  |                                            |
| NAME                                                                                | Air operated bearing puller     | NAME                                                                                | Oil seal driver 34*52*5    | NAME                                                                                  | Right crankcase cover bearing 6201 puller. |
| NO                                                                                  | SYM-9100410-400 A6205           | NO                                                                                  | SYM-9125500-HMA            | NO                                                                                    | SYM-9614000-HMA RB1 6201                   |

|                                                                                     |                                   |                                                                                              |                                         |                                                                                                |                                    |
|-------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------|------------------------------------------------------------------------------------------------|------------------------------------|
|    |                                   |             |                                         |             |                                    |
| NAME                                                                                | Bearing driver 6205               | NAME                                                                                         | Drive shaft & oil seal (25*40*8) socket | NAME                                                                                           | Bearing puller 6303                |
| NO                                                                                  | SYM-9615000-6205                  | NO                                                                                           | SYM-9120200-HMA                         | NO                                                                                             | SYM-6303000-HMA H9A 6303           |
|    |                                   | <br>(Ø30mm) |                                         | <br>(Ø22mm) |                                    |
| NAME                                                                                | Bearing driver 6201               | NAME                                                                                         | Crankcase bush puller                   | NAME                                                                                           | Crankcase bush puller              |
| NO                                                                                  | SYM-9614000-6201                  | NO                                                                                           | SYM-1120310                             | NO                                                                                             | SYM-1120320                        |
|  |                                   |           |                                         |           |                                    |
| NAME                                                                                | Water pump mechanical seal driver | NAME                                                                                         | Water pump bearing driver 6901          | NAME                                                                                           | Water pump oil seal driver (inner) |
| NO                                                                                  | SYM-1721700-H9A                   | NO                                                                                           | SYM-9100100                             | NO                                                                                             | SYM-9120500-H9A                    |



## 2. Maintenance Information

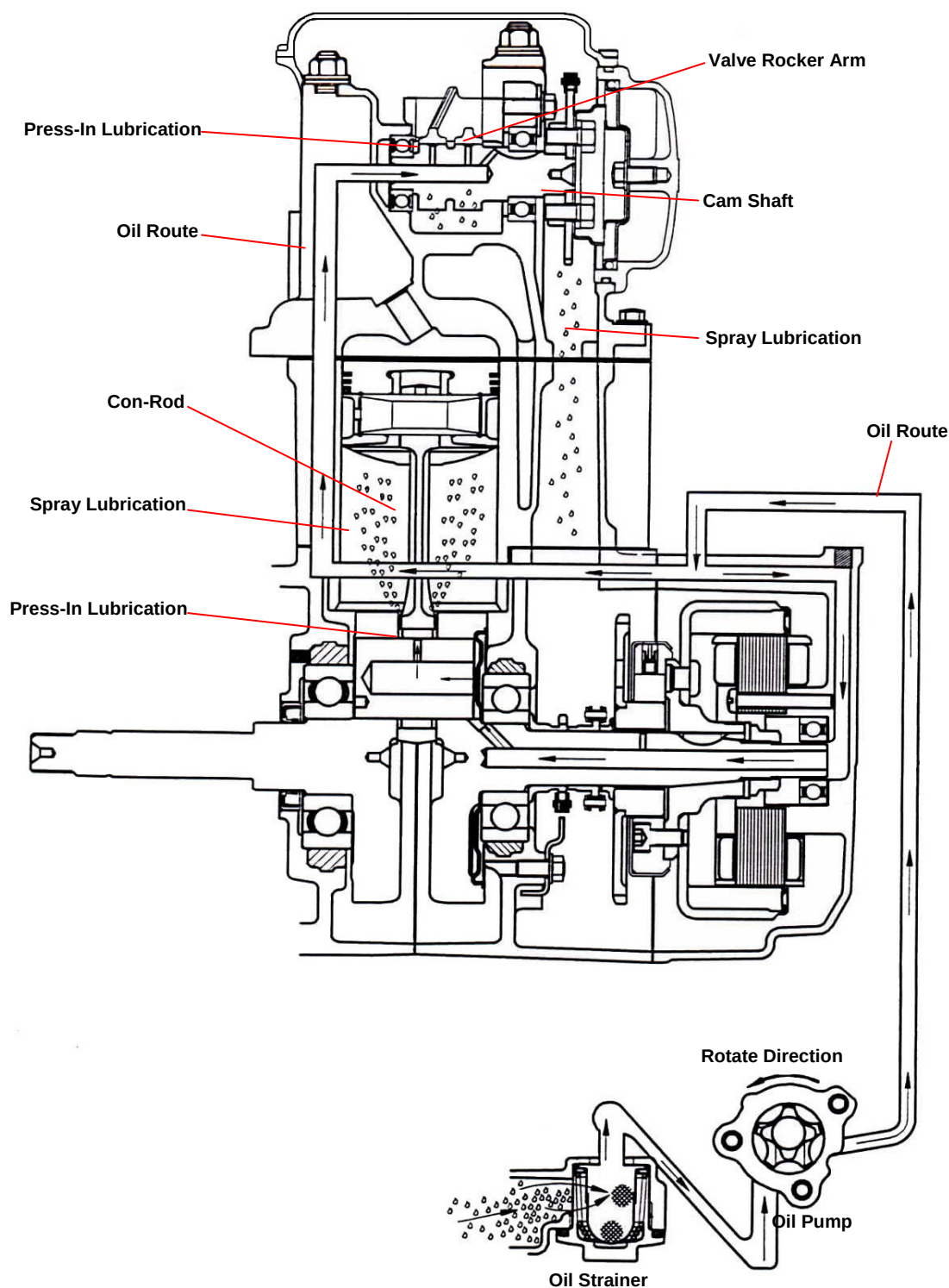
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**Note:**

|                                |     |                                 |     |
|--------------------------------|-----|---------------------------------|-----|
| Mechanism Diagram .....        | 3-1 | Engine Oil Strainer Clean ..... | 3-3 |
| Precautions in Operation ..... | 3-2 | Oil Pump .....                  | 3-4 |
| Troubleshooting .....          | 3-2 | Gear Oil .....                  | 3-7 |
| Engine Oil .....               | 3-3 |                                 |     |

## Mechanism Diagram



### 3. Lubrication System

#### 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.

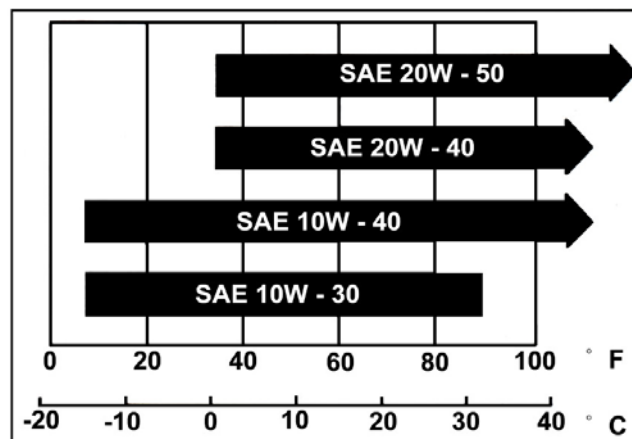
Change: 1200c.c.

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

Gear oil      Disassembly: 180c.c.

Change: 170c.c.

Gear oil viscosity      SAE 140  
(Recommended SYM Hypoid gear oils)



##### Unit:

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 | 1.3~1.7kgf-m |
| Engine oil drain bolt         | 3.5~4.5kgf-m |
| Gear oil drain bolt           | 1.1~1.5kgf-m |
| Gear oil join bolt            | 1.0~1.4kgf-m |
| Oil pump connection screw     | 0.1~0.3kgf-m |

#### 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

### Engine Oil

Turn off engine, and park the scooter 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 scooter, and remove oil drain bolt.  
After drained, make sure washer can be re-used.  
Install oil drain bolt.

**Torque value : 3.5~4.5kgf-m**

### 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.

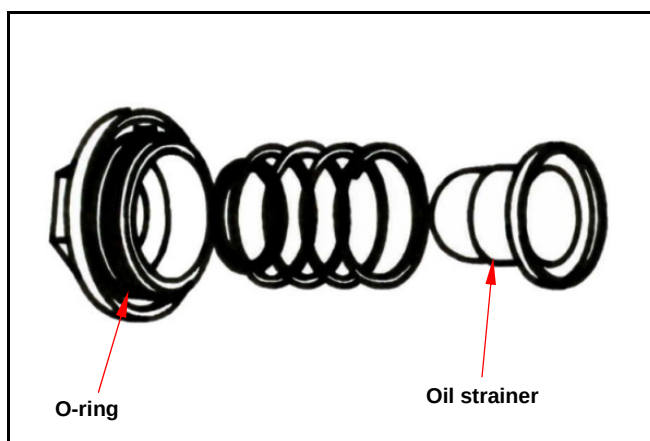
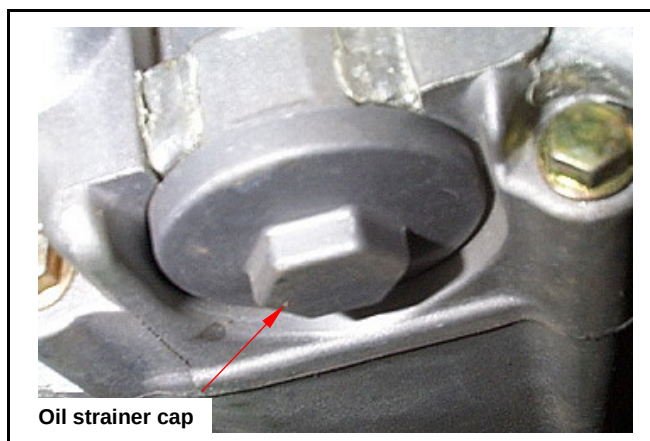
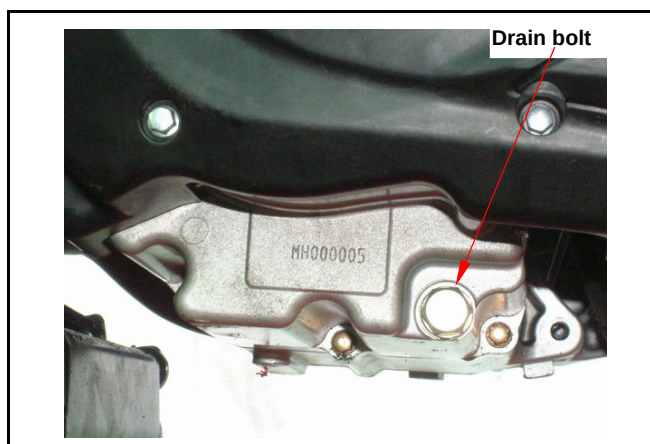
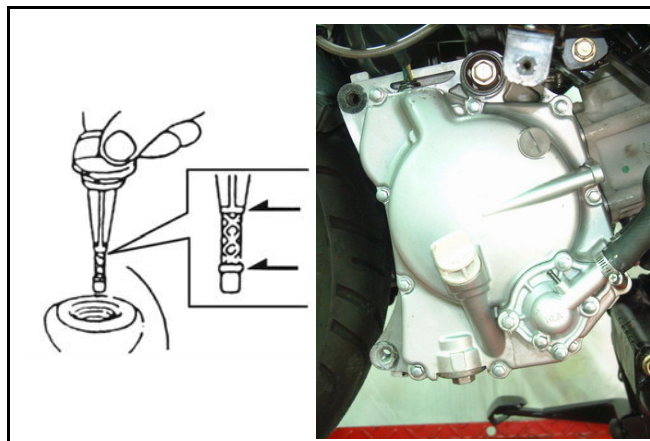
**Torque value : 1.3~1.7kgf-m**

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.



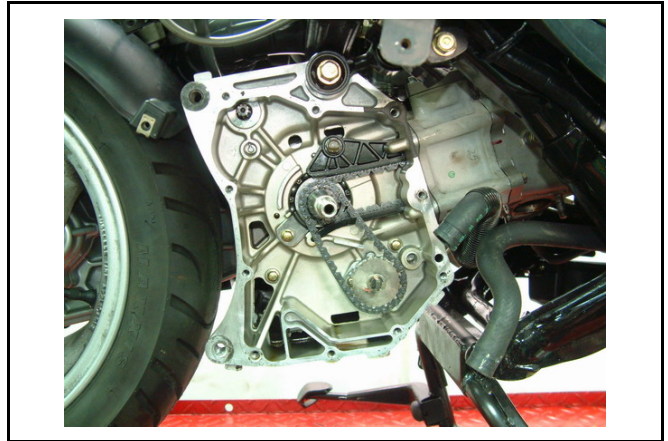


### 3. Lubrication System

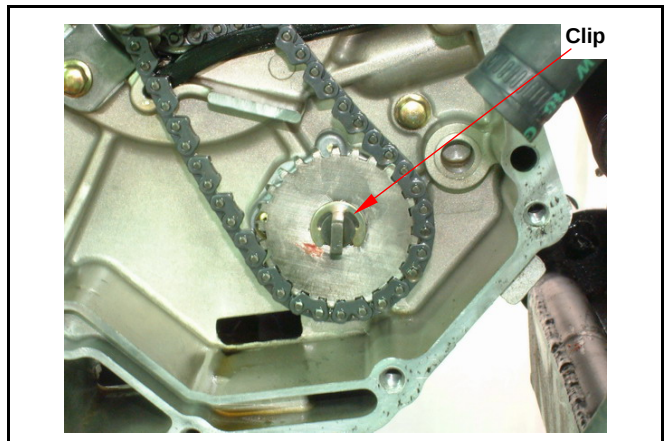
#### Oil Pump

##### Oil Pump Removal

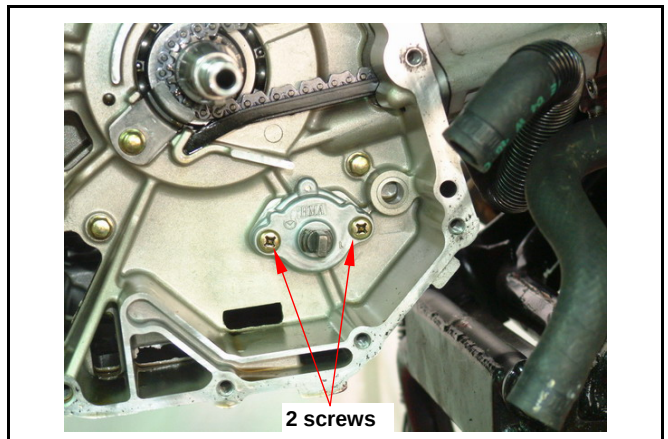
Remove generator and starting gear. (Refer to chapter 10) .



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



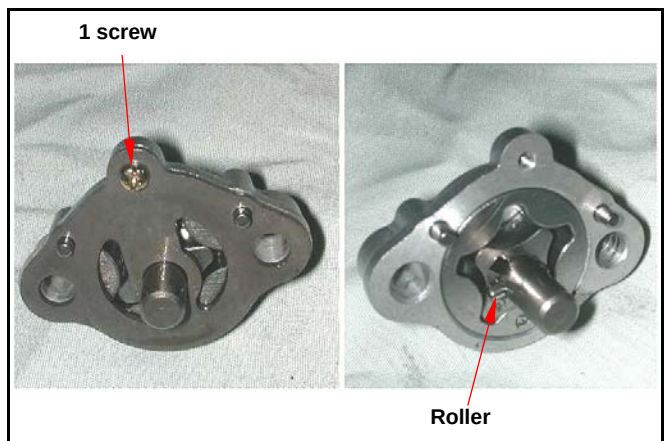
Make sure that pump shaft can be rotated freely. Remove 2 screws on the oil pump, and then remove oil pump.



##### Oil Pump Disassembly

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

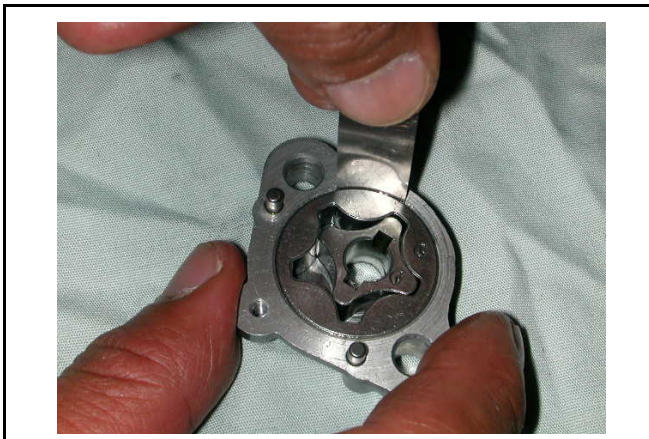
Remove oil pump shaft roller and shaft.



#### Oil Pump Inspection

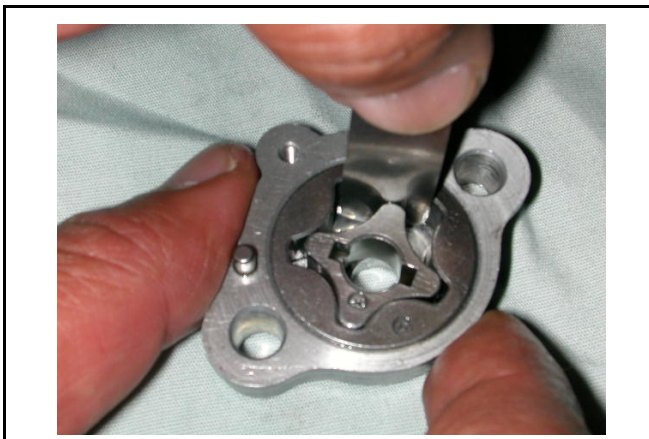
Check the clearance between oil pump body and outer rotor.

**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**

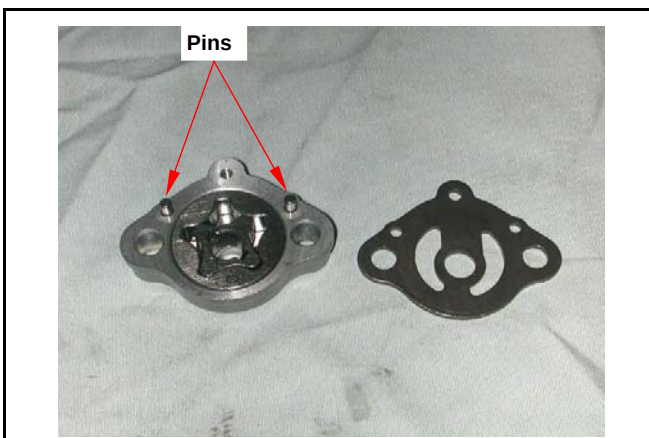


#### Oil Pump Re-assembly

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.

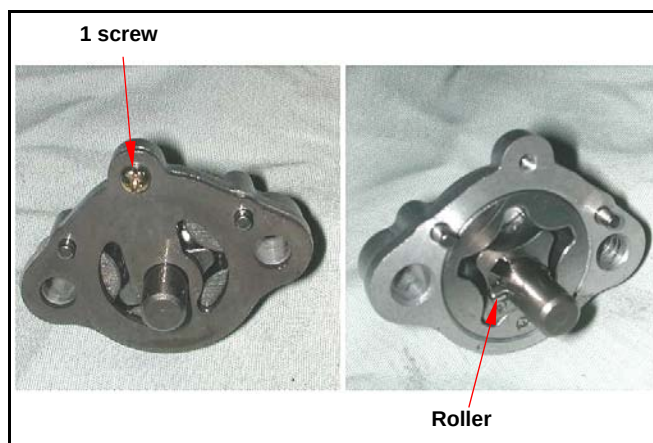
Install the oil pump cover and fixing pins properly.





### 3. Lubrication System

Tighten the oil pump screw.

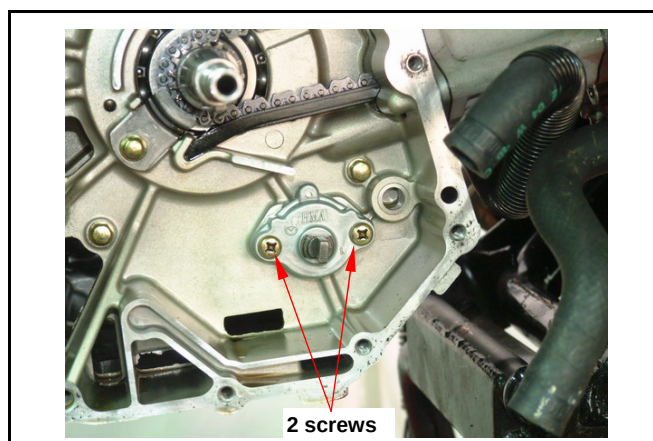


#### Oil Pump Installation

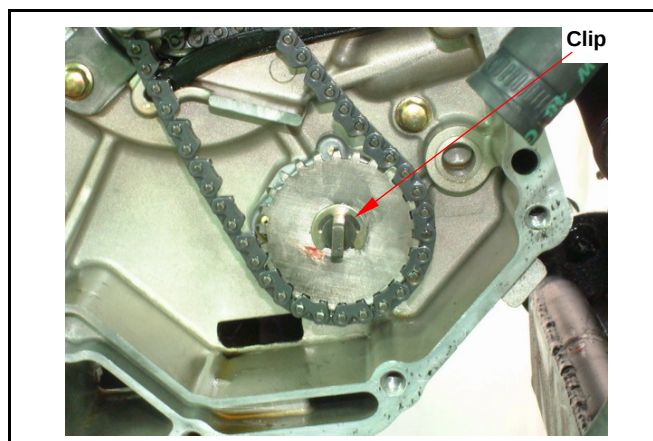
Install the oil pump, and then tighten screws.

**Torque value : 0.1~0.3kgf-m**

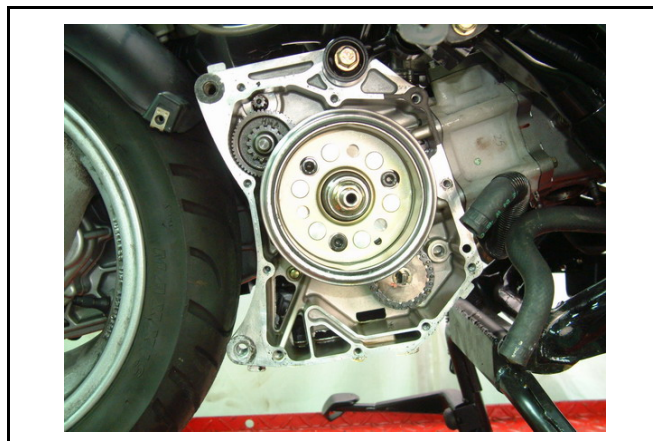
Make sure that oil pump shaft can be rotated freely.



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)



## 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: 1.1~1.5kgf-m**

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

Add oil to specified quantity from the join hole.

**Gear Oil Quantity: 170c.c. when replacing**

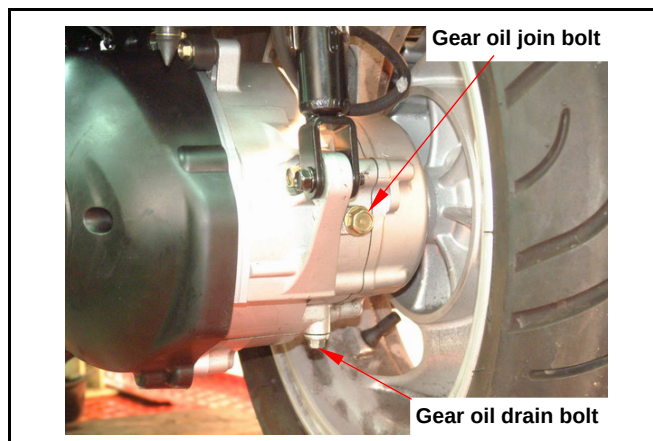
Make sure that the join bolt washer can be re-used, and install the bolt.

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

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.





## 3. Lubrication System

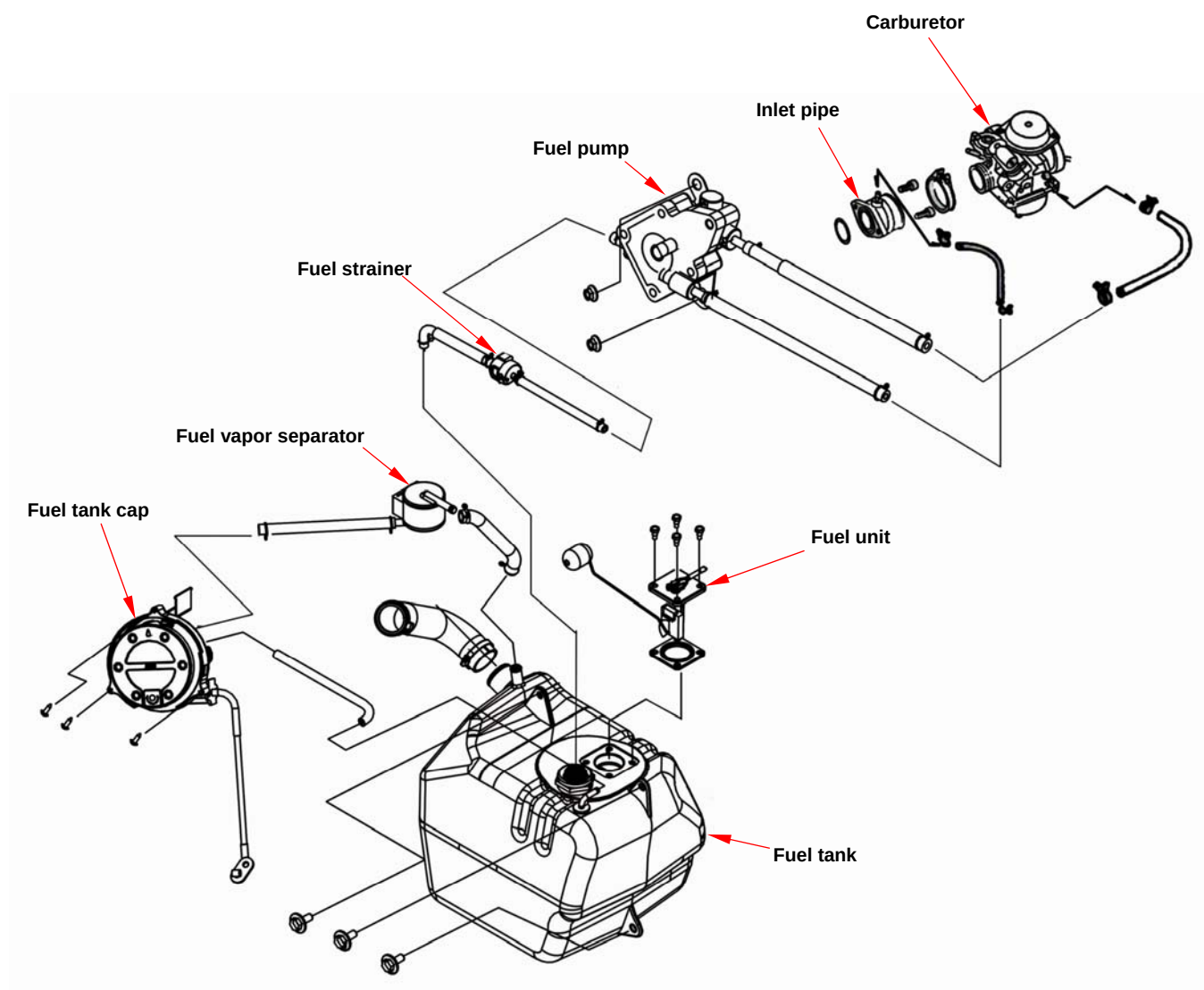
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Notes:

|                                   |     |                               |      |
|-----------------------------------|-----|-------------------------------|------|
| Mechanism Diagram .....           | 4-1 | Automatic by-starter .....    | 4-7  |
| Precautions in Operation.....     | 4-2 | Float Chamber.....            | 4-8  |
| Trouble Diagnosis.....            | 4-3 | Adjustment of Idle Speed..... | 4-10 |
| Carburetor Remove / Install ..... | 4-4 | Fuel Tank.....                | 4-11 |
| Vacuum Chamber.....               | 4-4 | Fuel Pump .....               | 4-13 |
| Air Cut-off Valve .....           | 4-6 | Air Cleaner.....              | 4-14 |

### Mechanism Diagram



## 4. Fuel System

### 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.

### Specification

| ITEM                      | LM25W        |
|---------------------------|--------------|
| Carburetor diameter       | Ø28.8 mm     |
| I.D. number               | CVK122B      |
| Fuel level                | 18.5 mm      |
| Main injector             | # 122        |
| Idle injector             | # 38         |
| Idle speed                | 1500±100 rpm |
| Throttle handle clearance | 2~6 mm       |
| Pilot screw               | 2±1/2 turns  |

### Tool

#### Special service tools

Vacuum/air pressure pump

Fuel level gauge

### 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 choke
- Malfunction of throttle operation

#### Stall after started

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

#### 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

#### 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

#### Mixture too rich

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



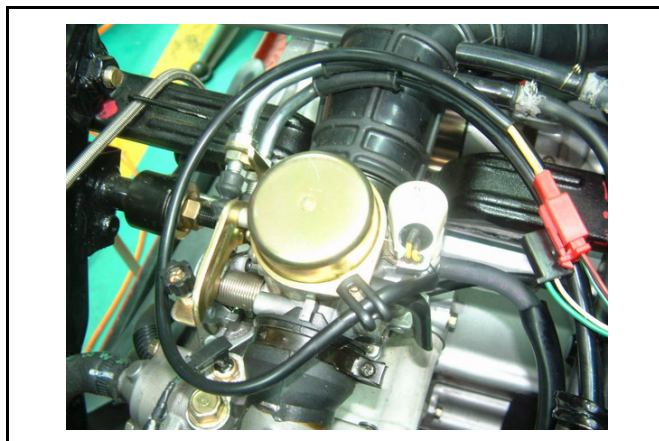
## 4. Fuel System



### Carburetor Remove / Install

#### Removal

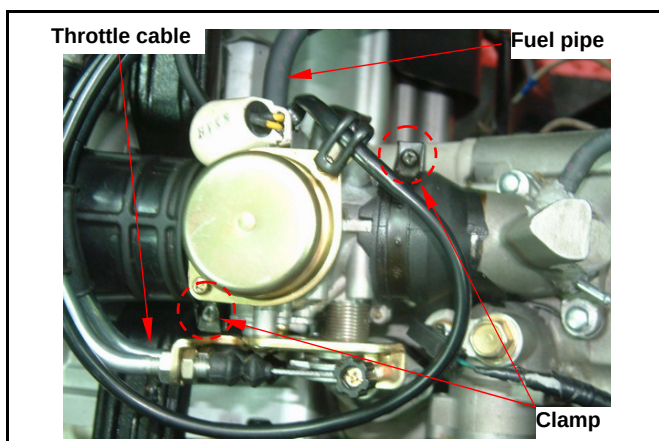
Remove luggage box.  
Drain out fuel in the float chamber.



Disconnect the fuel hose, vacuum hose.  
Disconnect the auto by-start and heater couplers.  
Loosen the adjustment nut and fixing nut of throttle valve cable, and release the cable from carburetor.  
Release the clamp strip of carburetor, and then remove the carburetor.

#### Installation

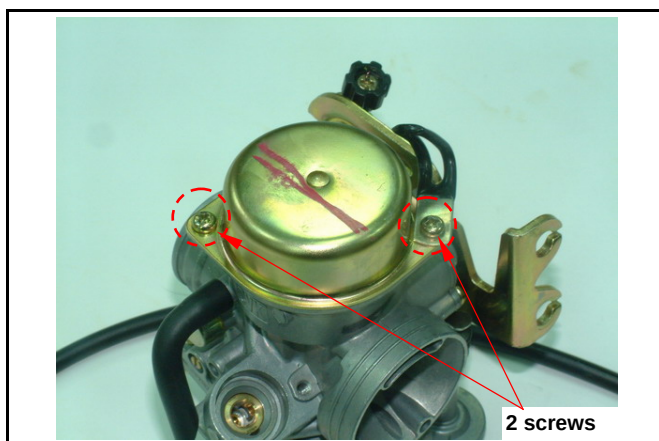
Install in reverse order of removal procedures.



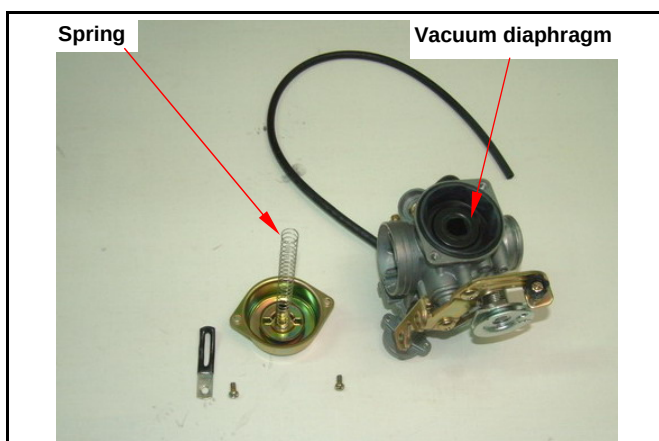
### Vacuum Chamber

#### Removal

Loosen drain screw, and drain out residual fuel in float chamber.  
Remove screws (2 screws) of vacuum chamber cover and the cover.



Remove compress spring and vacuum piston.



Remove fuel needle seat, spring, and injector needle.

## Inspection

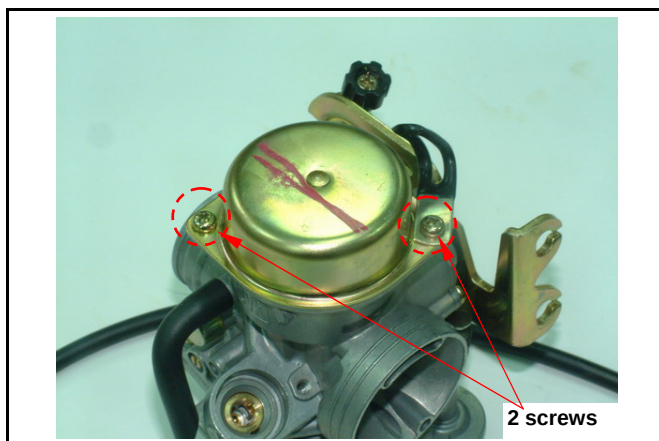
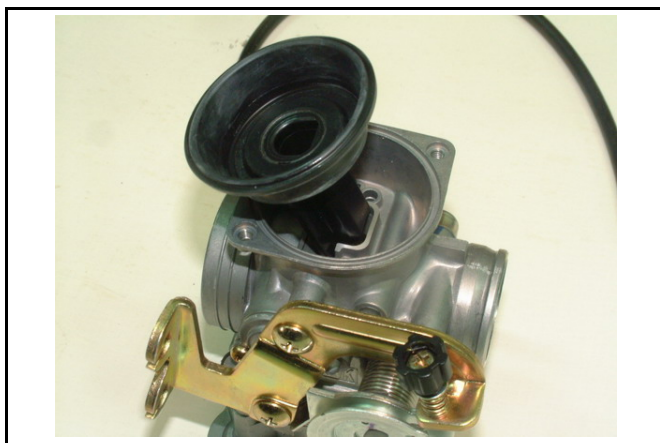
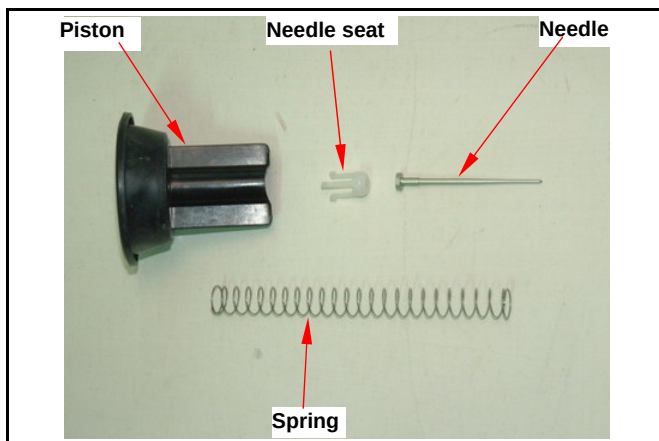
Check if the vacuum piston and needle for wear out, crack or other damage.  
Check if the diaphragm for damage or crack.

## Caution

- Do not damage vacuum diaphragm.

## Installation

Install in reverse order of removal procedures.

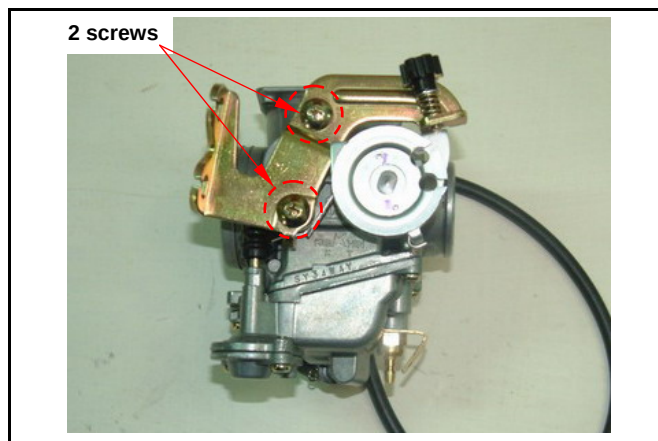


## 4. Fuel System

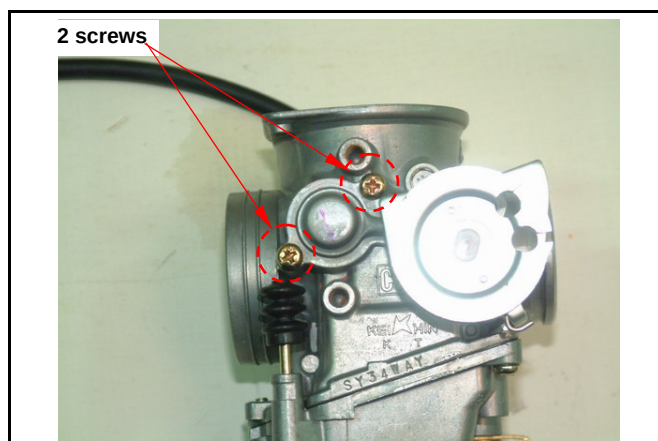
### Air Cut-off Valve

#### Removal

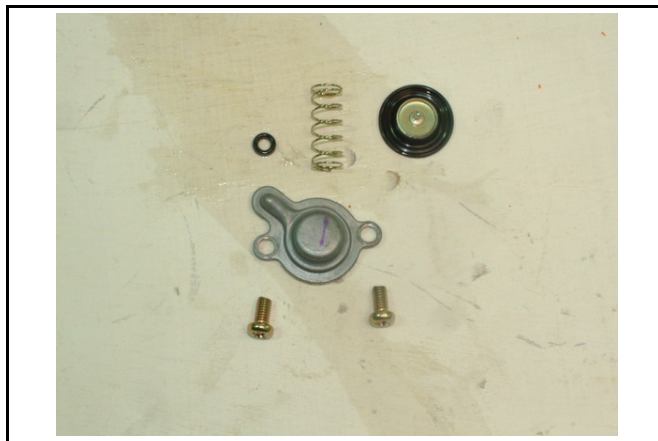
Removal the throttle cable seat (2 screws)



Remove the screws (2 screws) of the air cut-off valve and its cover.



Remove the spring and vacuum diaphragm.  
Check if the diaphragm for deterioration or crack.



#### Installation

Install the valve as reverse order of removal.

#### ⚠ Caution

- Do not damage the vacuum diaphragm or in opposite installation direction.



## Automatic by-starter

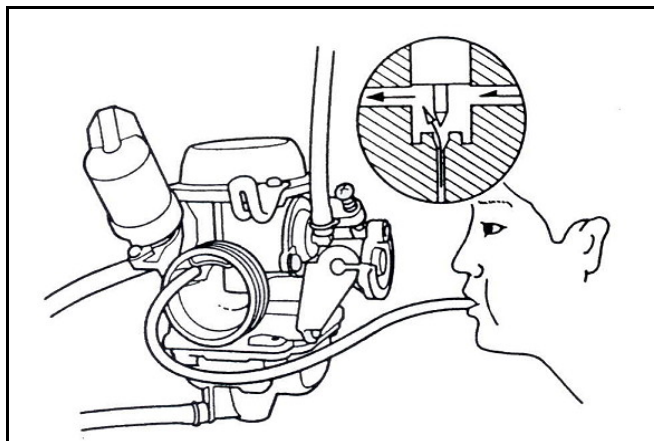
### Inspection

Turn off engine and waiting for over 10 minutes for cooling.

Check resistance across the two terminals of the automatic by-starter.

**Resistance value: Max. 10Ω (Measured after engine stopped for more than 10 minutes)**

Replace the automatic by-starter with a new one if resistance value exceeds standard.



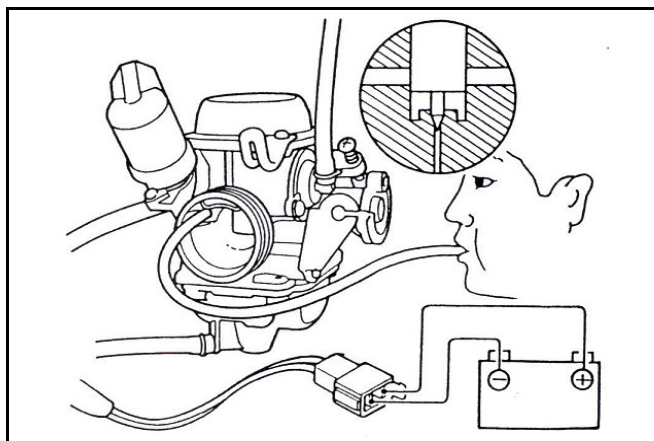
Remove the carburetor, allow it to cool off for 30 minutes.

Connect a pressure tester form air pump.

Connect fuel rich circuit.

Pump compressed air to the circuit.

Replace the automatic by-starter if the circuit clogged.

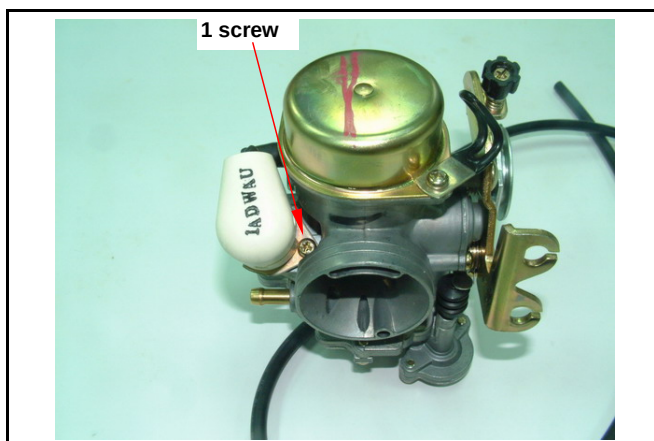


Connect battery posts (12V) to starter's connectors. After 5 minutes, test the rich circuit with compressed air.

If air flow through the circuit, then replace the by-starter.

### Removal

Remove fixing plate screw, and then remove the plate and automatic by-starter from carburetor.



### Valve inspection

Check if automatic by-starter and valve needle for damage or wear out.

### Installation

Install automatic by-starter to the carburetor body.

Install fixing plate to the upper groove of automatic by-starter, and install its flat surface to carburetor.

Install screw and tighten it.

### Caution

- Align the round point of the starter with the screw hole of air intake side.





## 4. Fuel System

### 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.

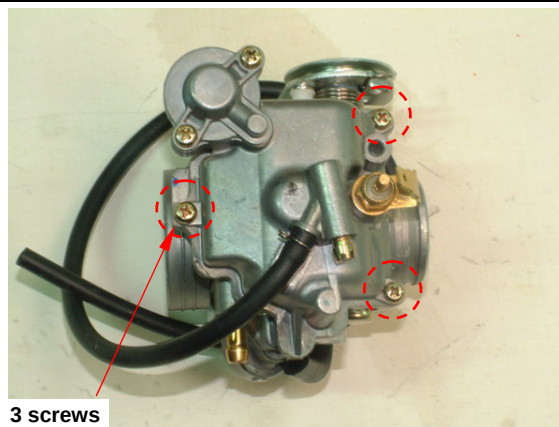
Remove main jet, needle jet holder, needle jet, slow jet and air adjustment screw.

#### Caution

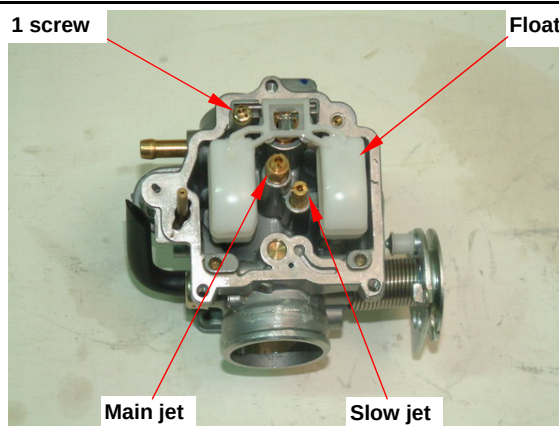
Take care not to damage jets and adjust screw.

- 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.



3 screws

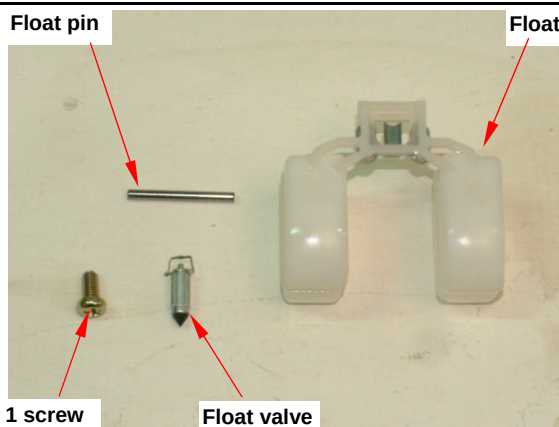


1 screw

Float

Main jet

Slow jet

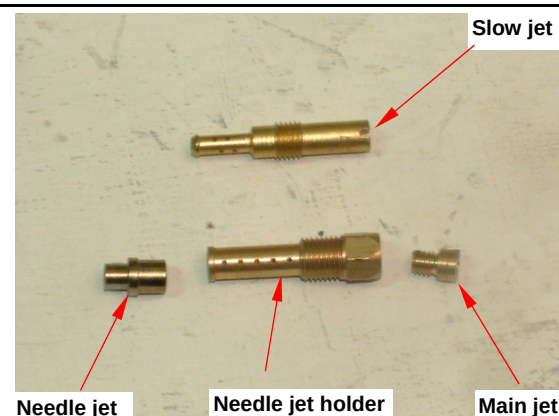


Float pin

Float

1 screw

Float valve



Slow jet

Needle jet

Needle jet holder

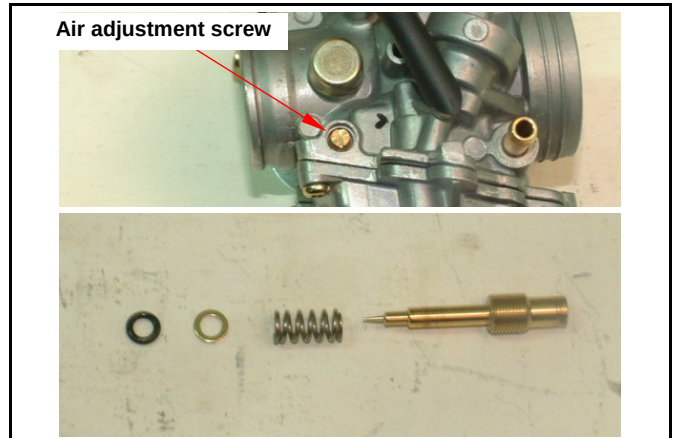
Main jet

## Assembly

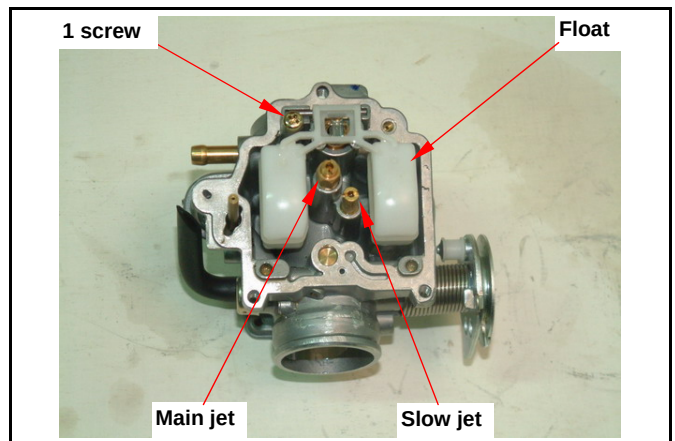
Install main jet, needle jet holder, needle jet, slow jet and air adjustment screw.

### 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.

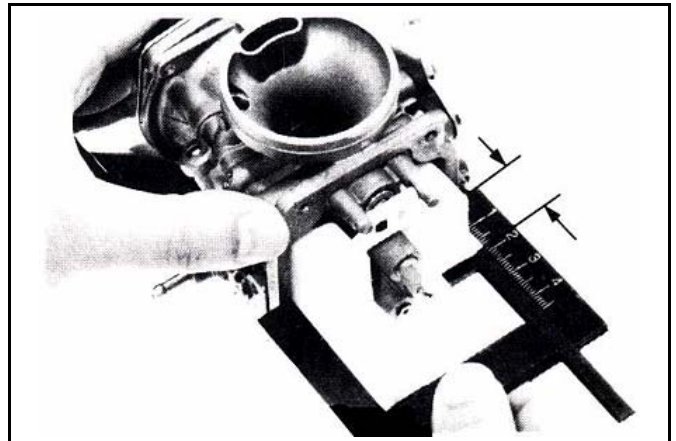


## Checking fuel level

### 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.

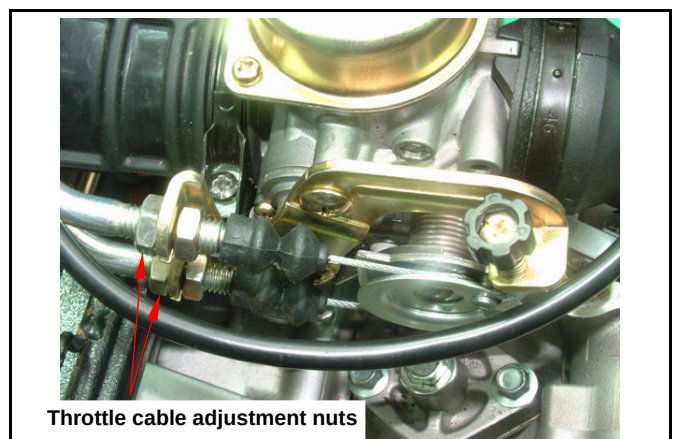
**Fuel level: 18.5mm**



## Installation of carburetor

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

- Throttle cable adjustment.
- Idle adjustment



## 4. Fuel System

### 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 scooter 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: $2\pm 1/2$ turns**

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

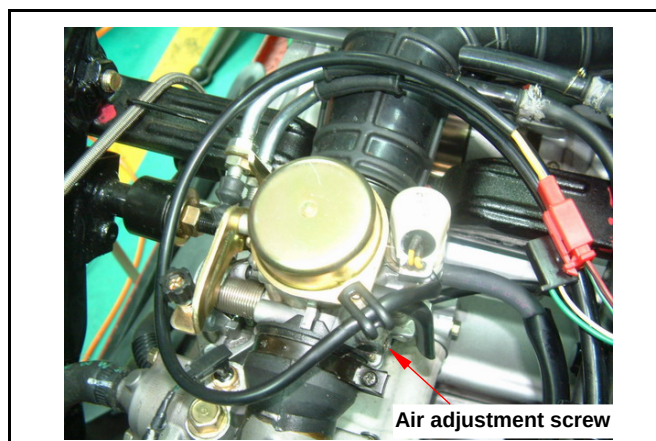
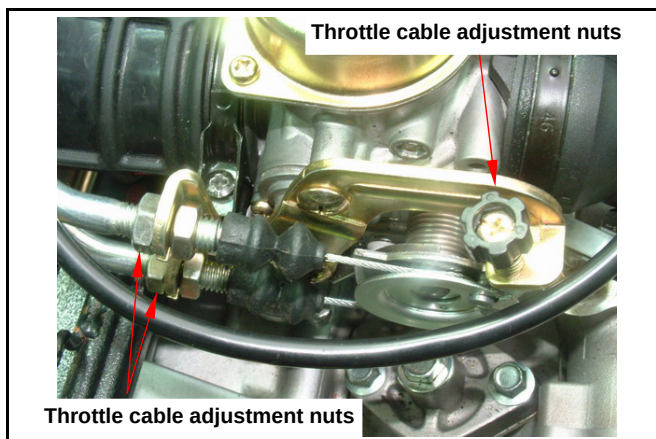
#### **Idle speed rpm: $1500\pm 100$ rpm**

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: 1.3~2.0 %**

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.





## Fuel Tank

### Fuel unit removal

Remove the left and right side covers.  
Open seat and remove the luggage box.  
Remove rear carrier.  
Remove the left and right body covers.  
Remove the foot pedal (please refer to chapter 13 for these components above.)

Remove fuel unit coupler, and then remove fuel unit (4 screws).

#### 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 fuel unit in the reverse order of removal.

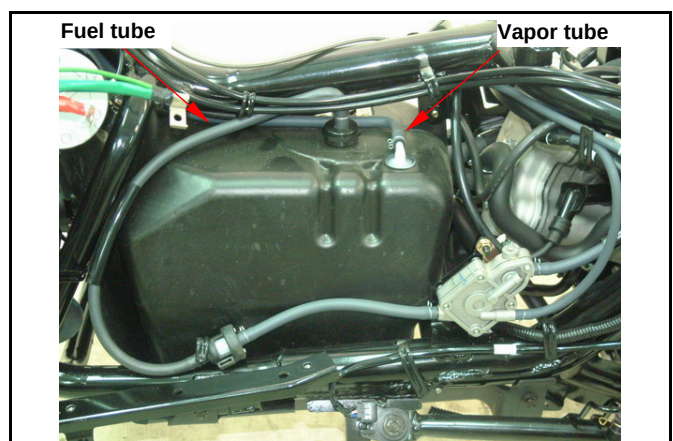
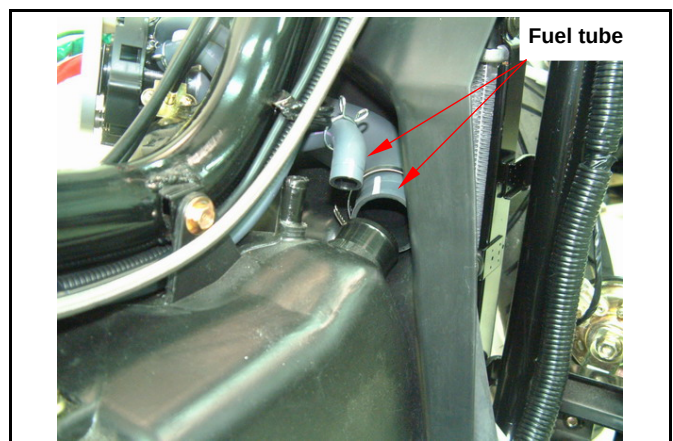
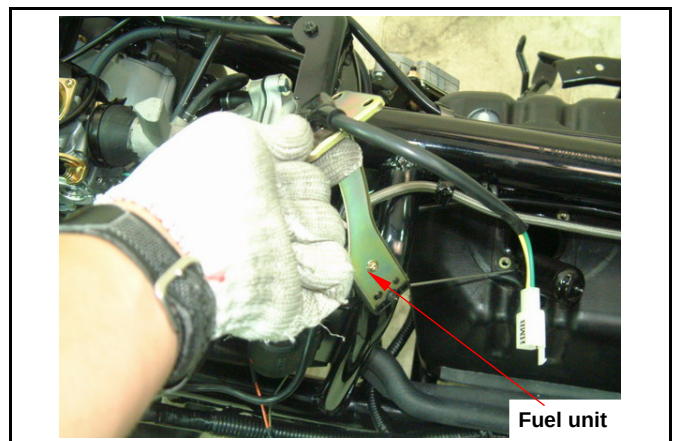
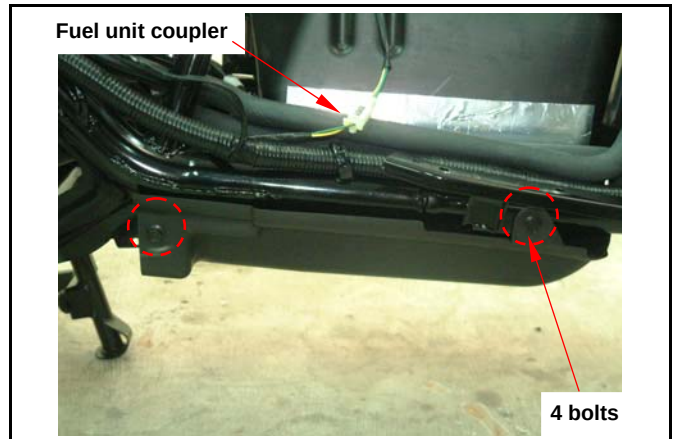
#### Caution

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

### Fuel tank removal

Remove the left and right side covers.  
Open seat and remove the luggage box.  
Remove rear carrier.  
Remove the left and right body covers.  
Remove the foot pedal (please refer to chapter 13 for these components above.)  
Remove under cover (4 bolts).  
Disconnect fuel unit coupler.  
Remove the fuel inlet tubes.

Remove the vapor tube, fuel outlet tube.  
Remove fuel tank front and rear side 4 bolts, and then remove fuel tank.

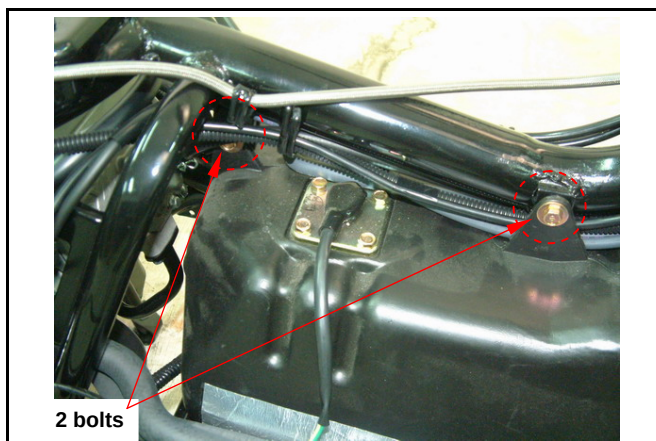




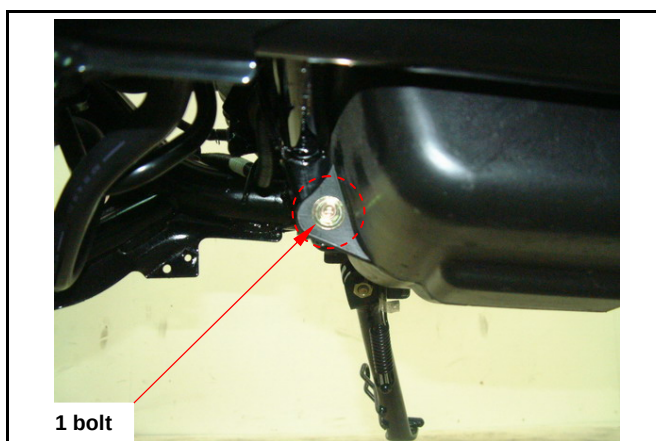
## 4. Fuel System



Remove fuel tank upper bolts (2 bolts).



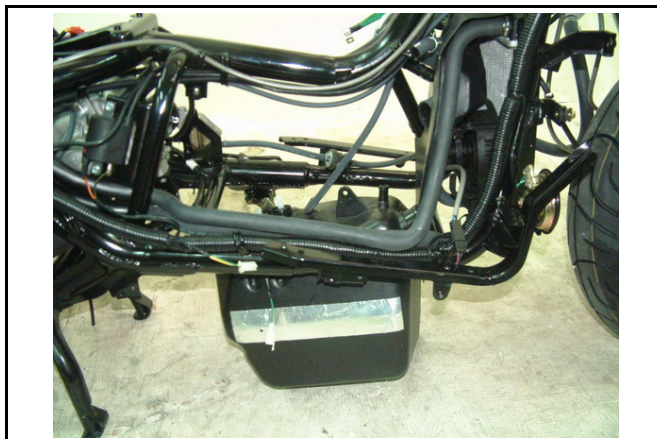
Remove fuel tank under bolt (1 bolt).



Remove fuel tank.

### Installation

Install the fuel tank in the reverse order of removal.



## Fuel Pump

### Inspection

Remove the left side cover and floor panel side cover.

Warm up the engine and adjust idle speed.

Remove fuel hose from carburetor and then wait for 5 minutes.

Measure the output of fuel pump. Its output time is 10 seconds.

**Output quantity: Min. 20 c.c.**

If the output quantity is lower than 20 c.c., check fuel hose, vacuum hose and fuel filter.

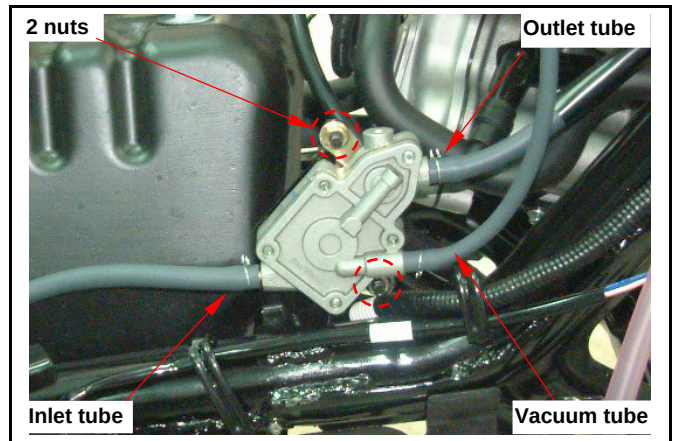
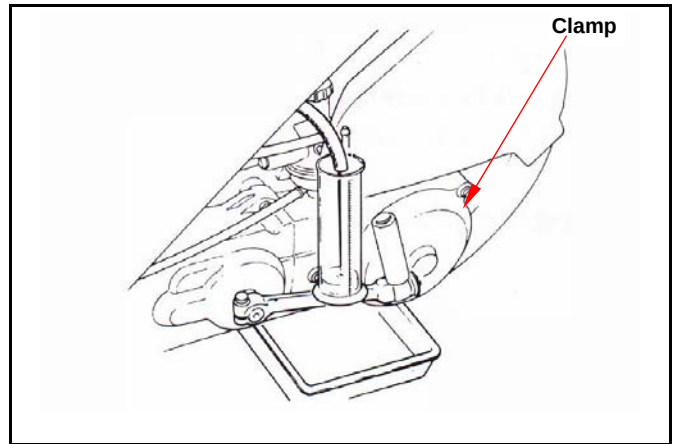
### Removal / Installation

Remove floor plate.

Remove fuel inlet, outlet and vacuum tube.

Remove 2 nuts and fuel pump.

Install the fuel pump in the reverse order of removal procedures.

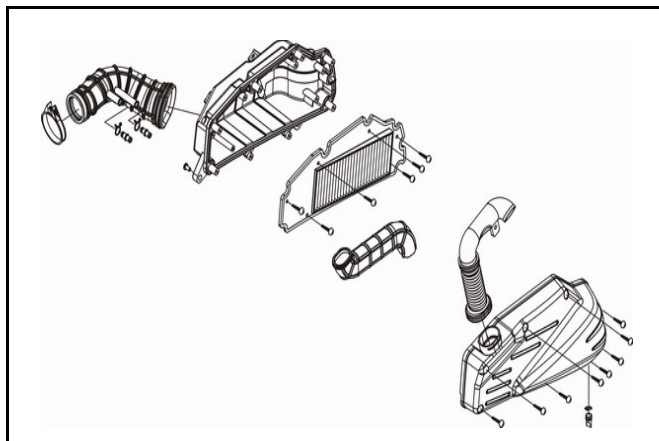


## 4. Fuel System

### Air Cleaner

#### Removal

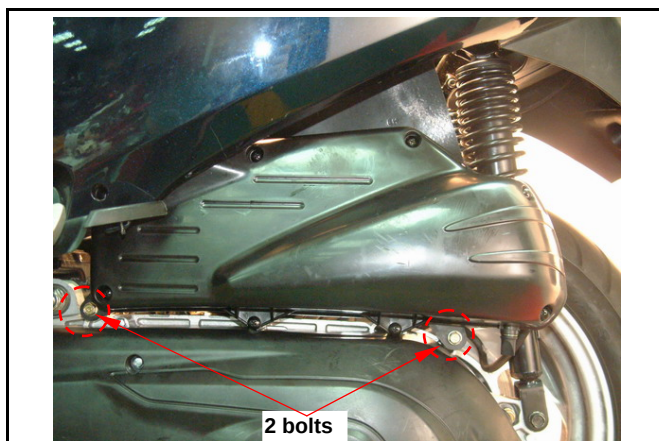
Loosen the clamp strip of air cleaner and carburetor, and then remove the vapor hose.



Remove the air cleaner (3 bolts).

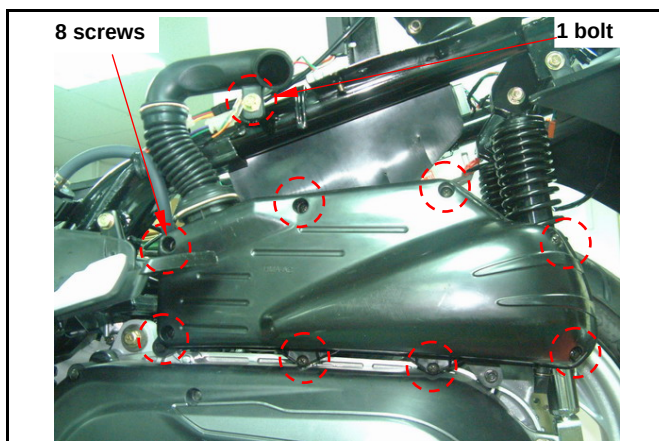
#### Installation

Install the air cleaner in the reverse order of removal.



#### Cleaning air cleaner element

Remove the air cleaner cover (8 screws).

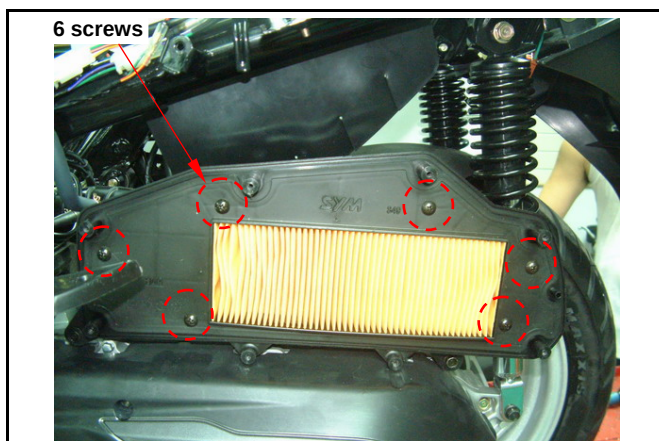


Remove element mounting screws (6 screws).  
Remove the air cleaner element.  
With compressed air to cleaning dirty around the element. Replace it if it is too dirty to clean.

#### Caution

The air cleaner element is made of paper so do not soap it into water or wash it with water.

Install the element onto the element seat and then install the air cleaner cover.

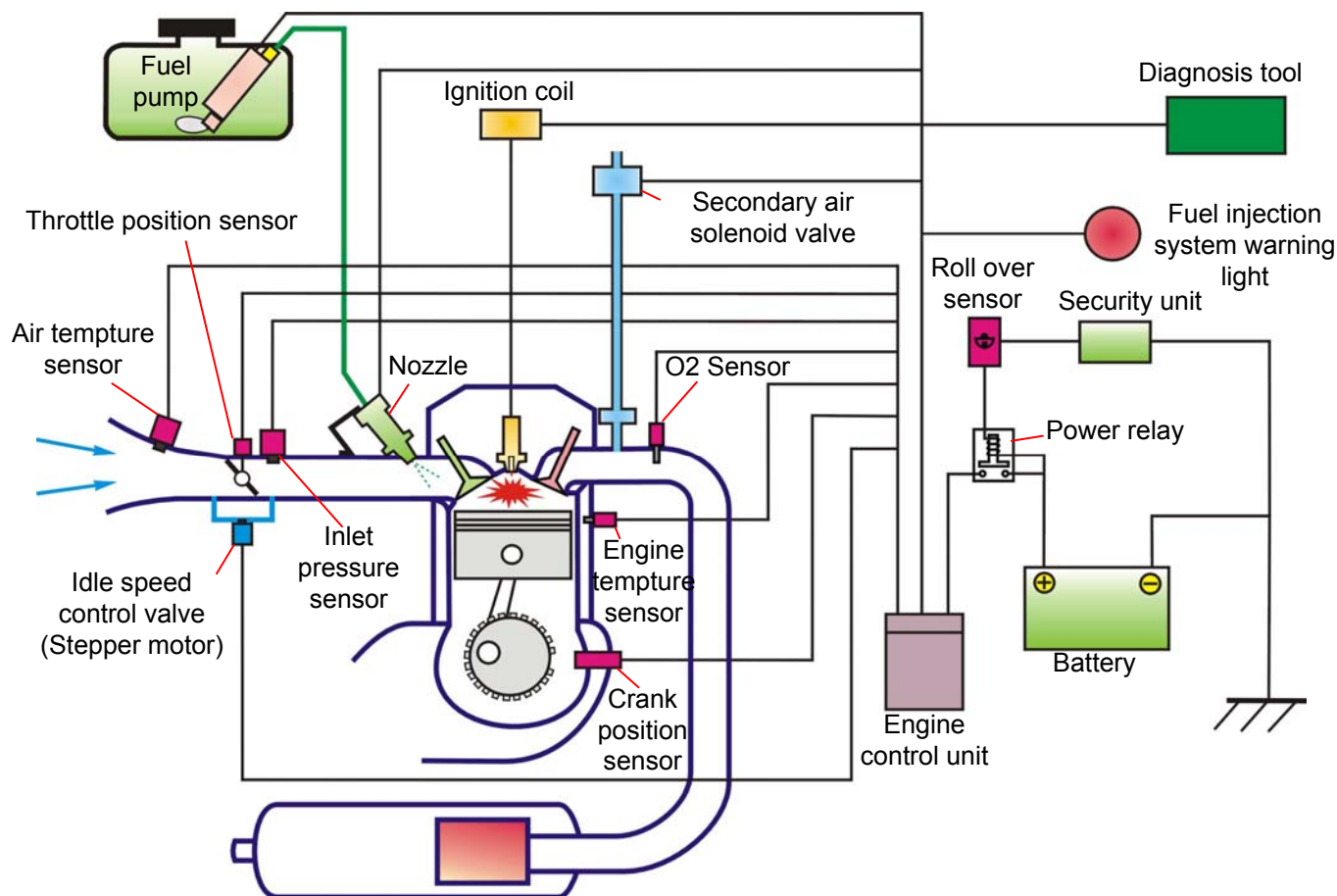




## 5. Fuel Injection System

|                                                             |                                                                                               |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| <a href="#">Fuel Injection System Components ..... 5-1</a>  | <a href="#">Integrated Fault Diagnosis Program· 5-38</a>                                      |
| <a href="#">EFi System Vehicle Configuration ..... 5-2</a>  | <a href="#">Air Cleaner ..... 5-41</a>                                                        |
| <a href="#">Operation of The Fuel Injection System 5-3</a>  | <a href="#">Fault Diagnosis Note..... 5-42</a>                                                |
| <a href="#">The Fuel Injection System Introduction· 5-4</a> | <a href="#">Check Light Fault Codes Discriminant Method ..... 5-43</a>                        |
| <a href="#">Fuel System Outlined ..... 5-5</a>              | <a href="#">Fault Code And The Sensors Of The Table ..... 5-44</a>                            |
| <a href="#">Ignition System Outlined..... 5-6</a>           | <a href="#">Fault Code and Check Light Flashing Lighting Identification Tables ..... 5-45</a> |
| <a href="#">Sensors and Drives Outlined..... 5-7</a>        | <a href="#">Injection System for Use diagnosis - V70 ..... 5-46</a>                           |
| <a href="#">Precautions in Operation ..... 5-14</a>         | <a href="#">Diagnosis Use Note ..... 5-47</a>                                                 |
| <a href="#">EFI System Components Description .... 5-15</a> | <a href="#">Troubleshooting Table..... 5-59</a>                                               |
| <a href="#">Fuel Injection System Circuit..... 5-32</a>     | <a href="#">Comprehensive Maintenance List .... 5-60</a>                                      |
| <a href="#">ECU Pin Configurations ..... 5-33</a>           |                                                                                               |
| <a href="#">Fault Diagnosis ..... 5-34</a>                  |                                                                                               |

### Fuel Injection System Components

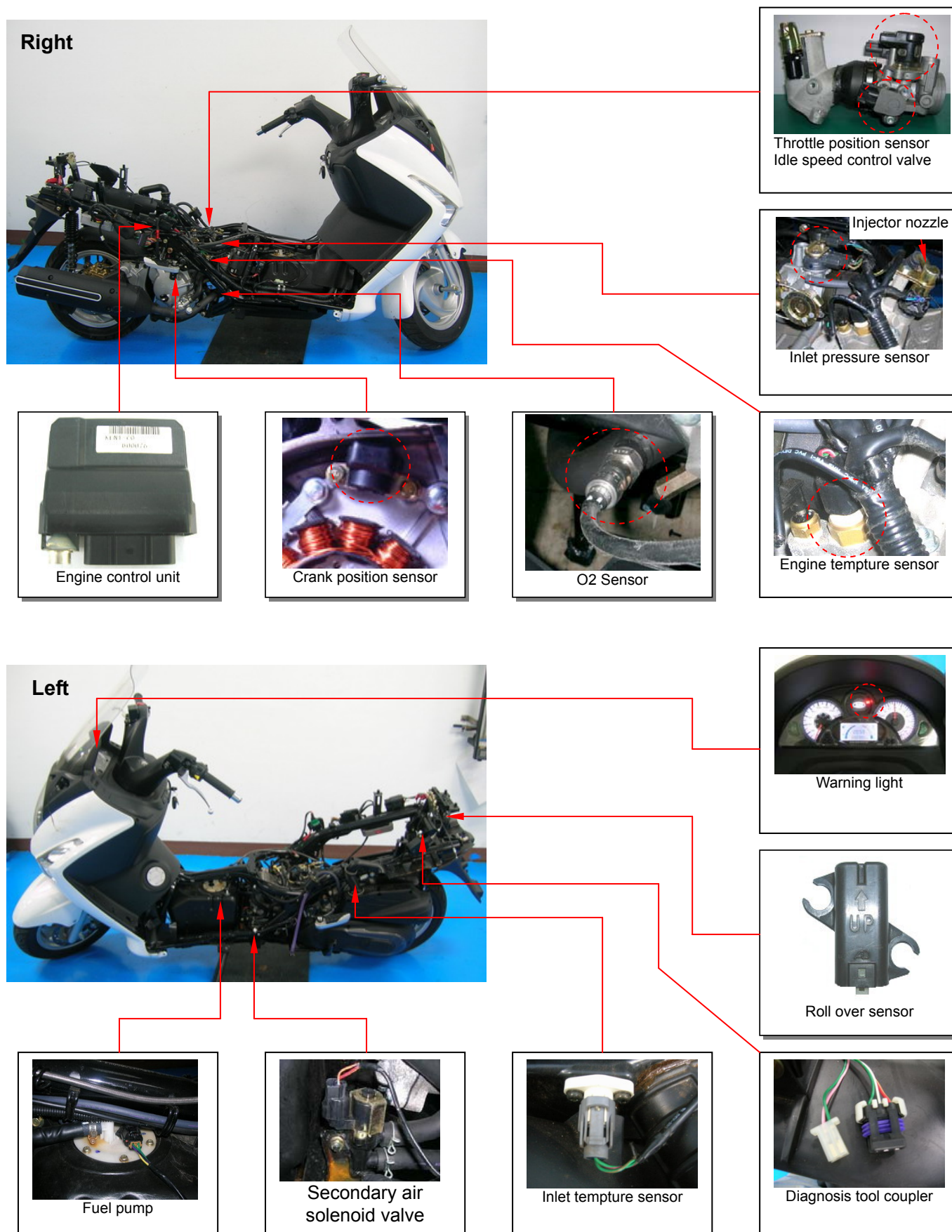




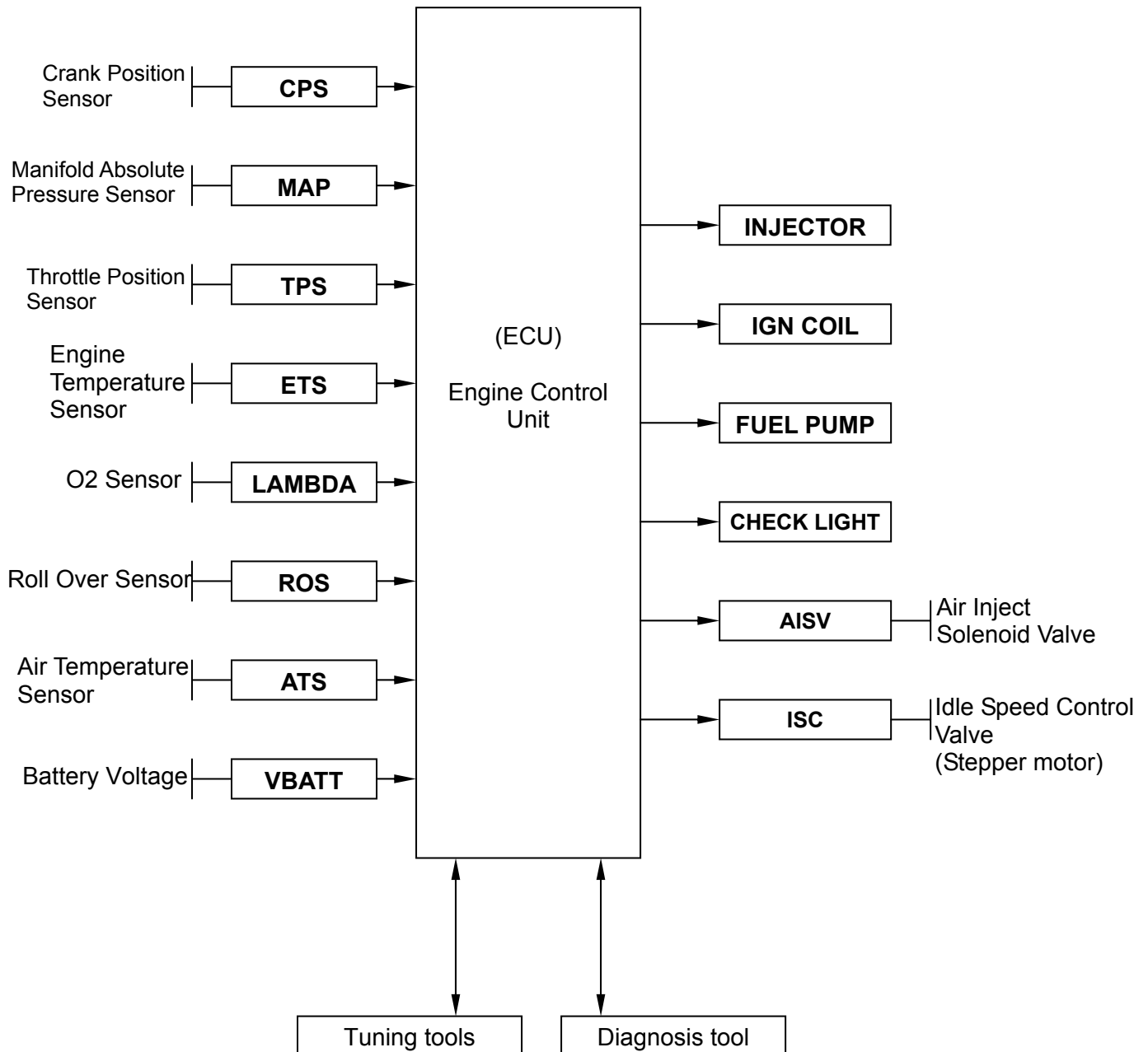
## 5. Fuel Injection System



### EFi System Vehicle Configuration



### Operation of The Fuel Injection System



## 5. Fuel Injection System

### The Fuel Injection System Introduction

Based on 4-stroke SOHC engine, displacement 250 c.c. Electronically controlled fuel injection, fuel vapor absorbed by carbon canisters. The engine burns off the blow-by fuel-gas in the crankcase through the fuel-air separating device. The O<sub>2</sub> sensor enhances the efficiency of the catalyzer, by dynamically controlling the Fuel/Air ratio.

### Electronic Fuel Injection Device

Consisting of fuel supply devices: Fuel tank, fuel pump, fuel filter, and pressure regulating valve. And fuel controller devices: fuel injector, and ECU.

The fuel is pumped from electrical fuel pump in the fuel tank, to the injector on the inlet pipe. The pressure-regulating valve keeps the pressure around  $294 \pm 6$  kpr. The signals from ECU enable the injector to spray fuel into the combusting chamber once each two crankshaft-revolutions. The excessive fuel flows back to the fuel tank through the pressure-regulating valve. Fuel pump is placed within the tank to reduce the working noise, and the complicity of fuel pipes. Electrically controlled ignition and injection system effectively reduce fuel consumption rate and pollution.

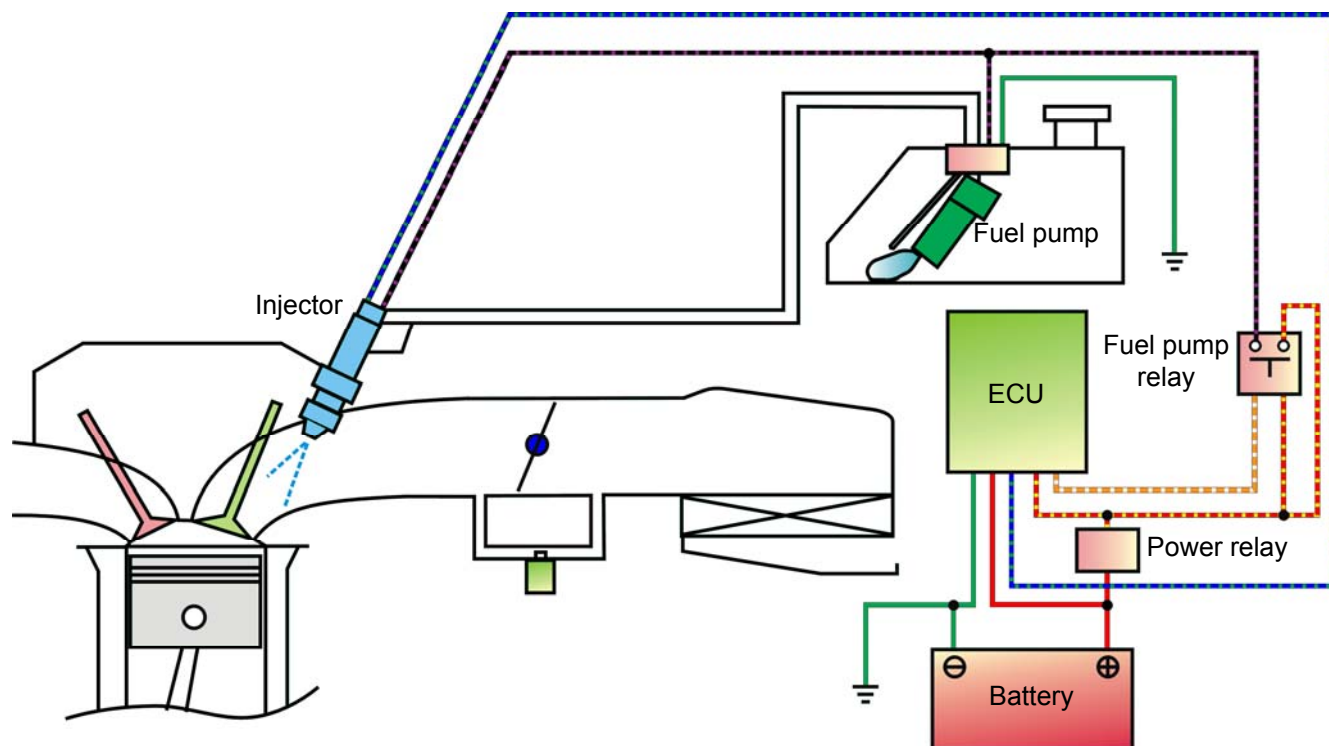
In traditional gasoline engine, carburetor supplies the fuel. The process is done by engine vacuum, and the negative pressure in the carburetor mixes fuel with air. Under this condition, three major processes are done simultaneously in the carburetor: 1. Air quantity measurement. 2. The determination of fuel quantity. 3. Mix of fuel and air.

Electric Fuel Injection System separates the three major processes into three different devices: 1. T-MAP gauges the air quantity and temperature and sends the signal to ECU as a reference. 2. ECU decides the amount of fuel to be injected, according to the default A/F rate. 3. ECU enables the injector to spray appropriate fuel amount. The independence of these three functions will raise the accuracy of the whole process.

Our EFI engine uses computer-programmed fuel injection, the main features are:

1. The quantity of fuel injected is decided according to the condition of the engine. The engine RPM, and throttle position determines the fuel quantity and injection time-length. This throttle-controlled fuel injection is better responding and more accurate.
2. The quantity of fuel injection, and the determination of injection time length, are all controlled by 16-bit microcomputer.
3. The pressure regulating valve maintains a  $294 \pm 6$  kpr pressure difference between inlet pipe and fuel pipe, raising the accuracy of fuel injection.
4. By measuring the air pressure of inlet pipe, this system gives the vehicle better accommodation to the environment.
5. Idle air by-pass system supplies fuel and air to stabilize the idle running, and cold starting.
6. O<sub>2</sub> sensor feeds back the signal to minimize the exhaust pollution.

## Fuel System Outlined



### System Description

1. The fuel tank of fuel pumps in the Key-on, the sensors signal to be sent to the ECU, ECU control fuel pump relay, fuel pump to start operation, if not start the engine fuel pump will be 2 to 3 seconds after the closure in order to save power. Pressure regulating valve to the fuel manifold pressure maintained at  $294 \pm 6\text{kpa}$  (about  $3 \text{ kg / cm}^2$ ), injector according to operating conditions and environment appropriate compensation coefficient fuel emissions, Key-off or engine stopped operating, the fuel pump to stop moving.
2. Gasoline filter impurities in the fuel filter should be regularly replaced.
3. When the engine could not start, do not start motor for continuous movement which led to lack of battery power (less than  $10 \text{ V}$ ), the electric fuel pump will not be able to move, the correct way is a new battery lap.

### Injector

Double hole type injector to provide two intake valve fuel injection quantity, increase fogging effect, reduce HC emissions, short-fixed cap, can be easily fixed injector and receiving fuel from the fuel pump, fixator limit injector rotation sliding, injector fuel injection quantity from the ECU signal control Pressure Regulating Valve (Regulator), the use of the diaphragm spring and fuel manifold vacuum pressure and maintain pressure in  $294 \pm 6\text{kpa}$  (about  $3 \text{ kg / cm}^2$ ), the injector can be different engine load conditions, Fuel Injector width (time) to control the fuel injection quantity.

### Fuel pump

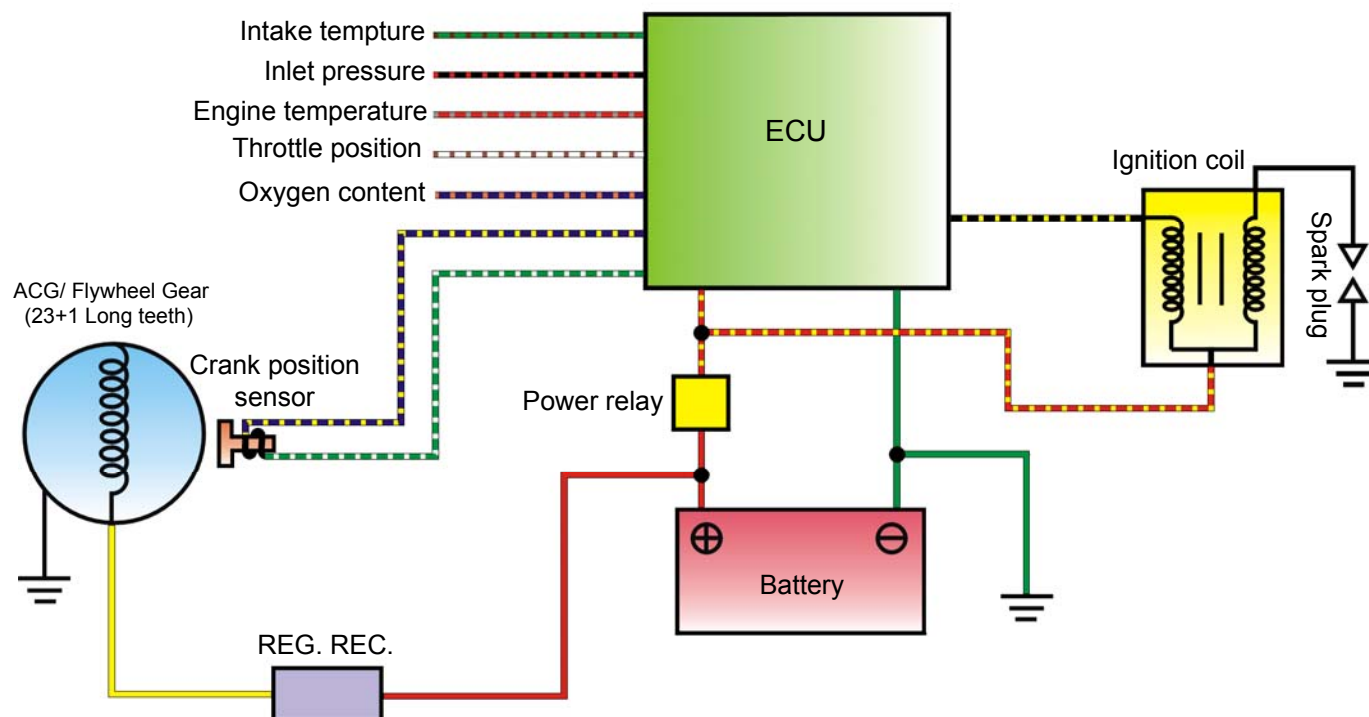
Electrical fuel pump is mounted inside the fuel tank. Rely on battery power supply from the ECU control opening and closing, idling at the fuel pressure:  $294 \pm 6\text{kpa}$  (about  $3 \text{ kg / cm}^2$ ).



## 5. Fuel Injection System



### Ignition System Outlined



### Principle

The engine used in a computer program is when the ignition control from the Crank position sensor, Throttle position sensor, O<sub>2</sub> Sensor, Inlet pressure sensor, Intake temperature sensor, Engine temperature sensor issued by the signal. With engine speed, 8-bit microcomputer by the appropriate decision when the ignition is, from a current transistor control of intermittent, 25000-30000 V is a secondary hypertension, flashover triggered spark plug. This way not only can be the engine to achieve the maximum output power, but also help improve fuel consumption rates.

### Specifications

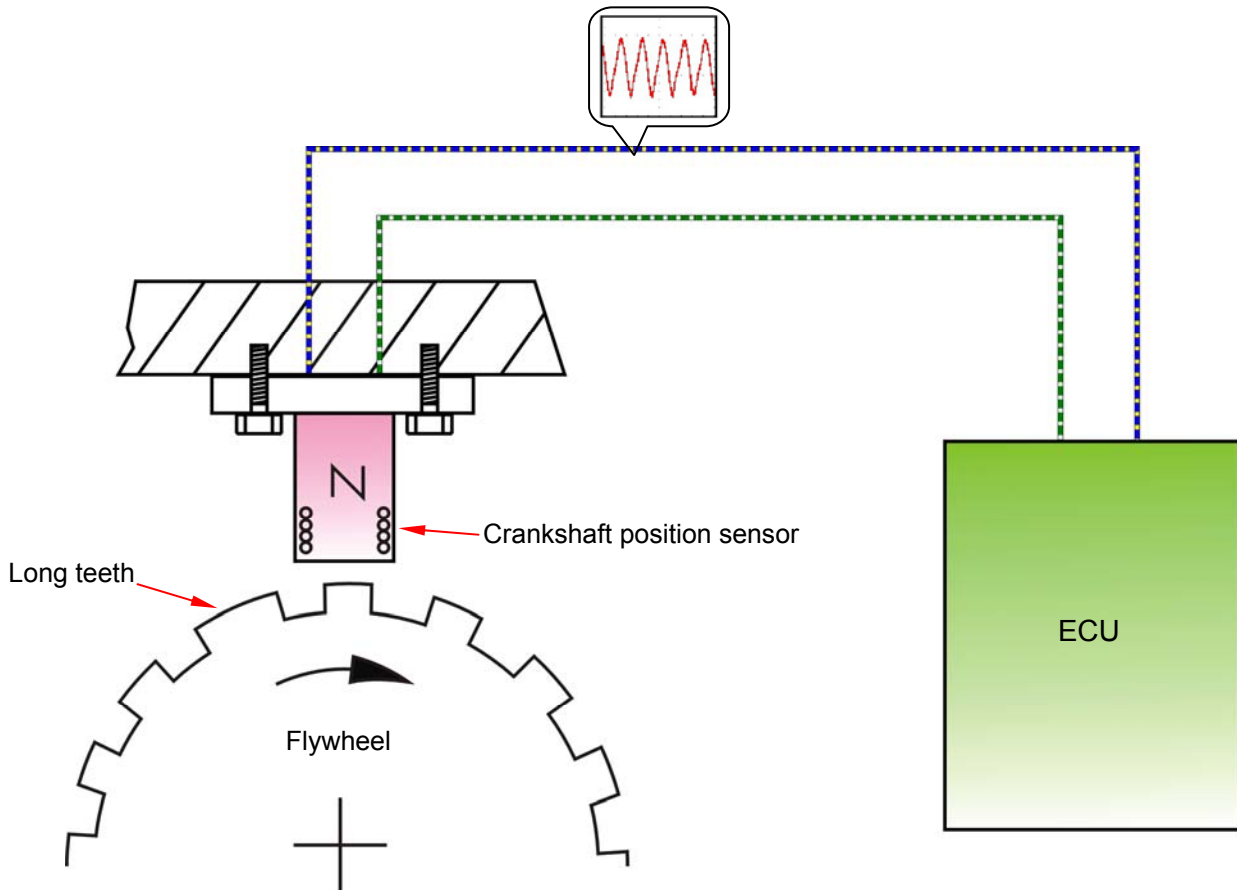
1. Ignition timing: 13 ° BTDC / 1650RPM
2. Spark plug: NGK CR8E Clearance: 0.6 to 0.7 mm
3. ACG crankshaft position sensor coil impedance: 80 ~ 160 Ω (Green / White - Blue / Yellow)
4. Ignition coil primary circuit: 3.6 Ω ± 10% (20 ° C) (Red / Yellow - Black / Yellow)
5. Battery Type / Capacity: YTX12A-BS or GTX12A-BS / 12V 12Ah

## Sensors and Drives Outlined

### Crankshaft Position Sensor (CPS)

#### Function

Induction sequence teeth on the flywheel voltage signals will be transmitted to ECU, ECU normal work.



#### Note

By receiving signals from the various sensors ECU to speed output control perspective Idle Air Control Valve opened, the adjustment to the inlet manifold idle air bypass pipe to amend idle speed, engine operation chemokine normal.

When starting, TDC are not yet known location, so by crankshaft position sensor to detect the long tooth of flywheel, calculated to identify the TDC position, a fixed point of ignition timing to the ignition, when the engine speed reach Software set speed, and then the ignition timing will change to the software.

## 5. Fuel Injection System



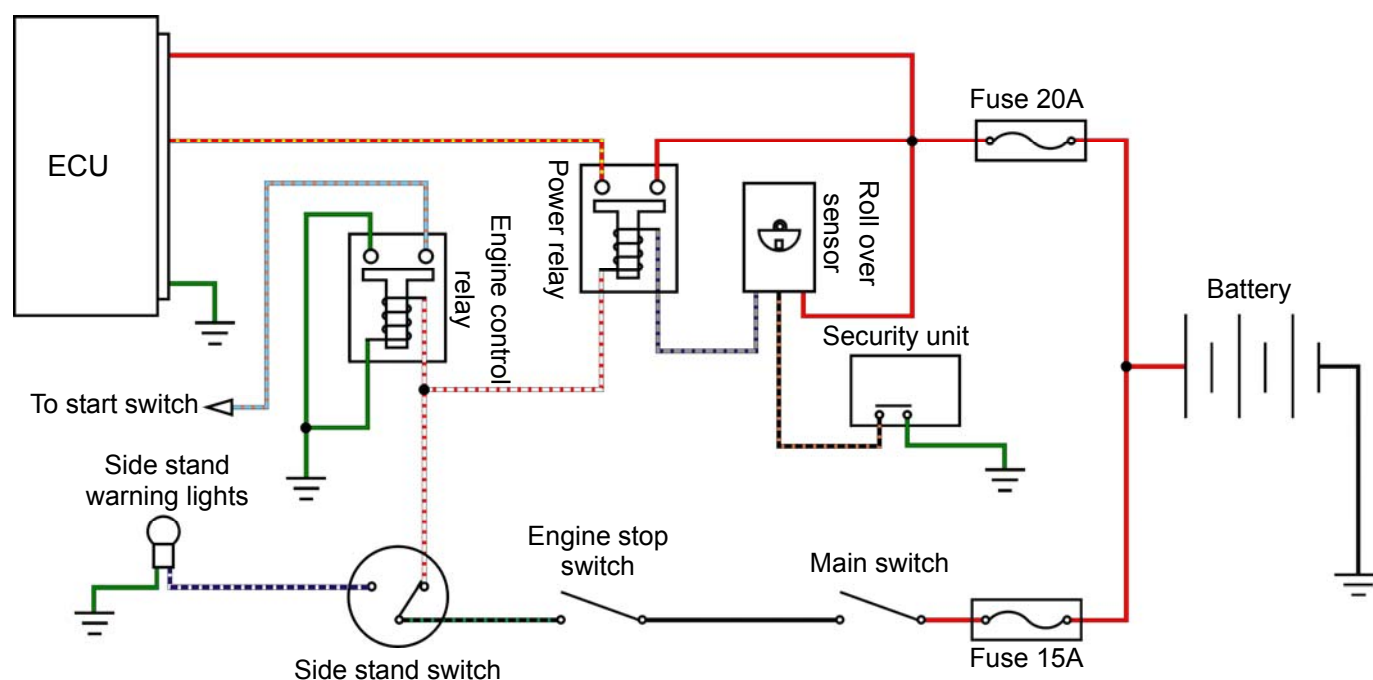
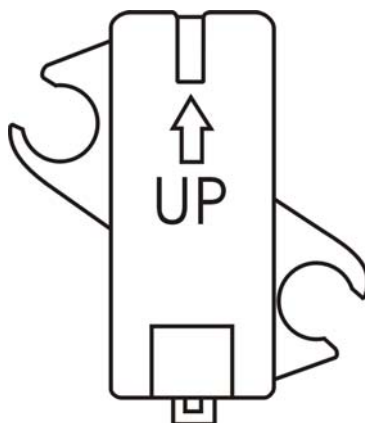
### Roll Over Sensor

#### Function

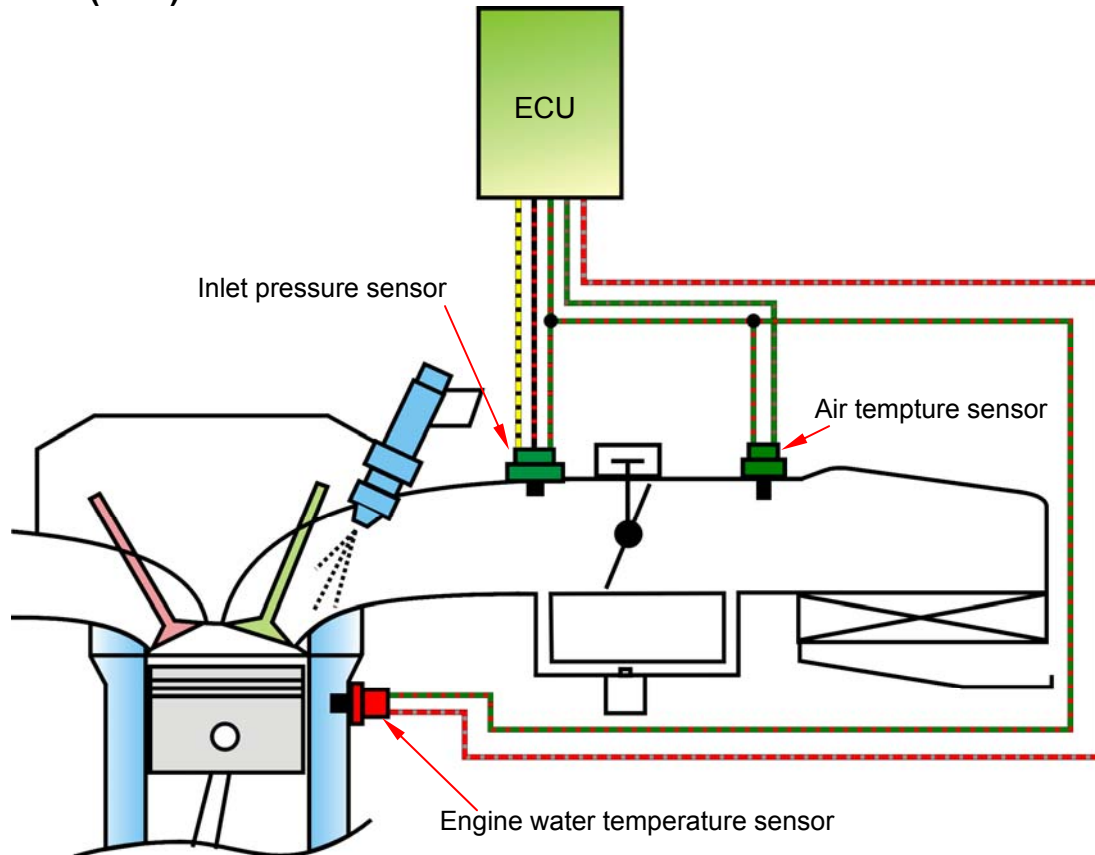
As a safety device, when the motorcycle is overturned, it will be cut off power supply of ECU and engine flameout.

#### Note

For the heavy hammer-dumping sensor, when vehicles dumping more than 65 degree angle, the executive power of ECU system. At this point once again to restart the engine, the need to re-Key-on the main switch.

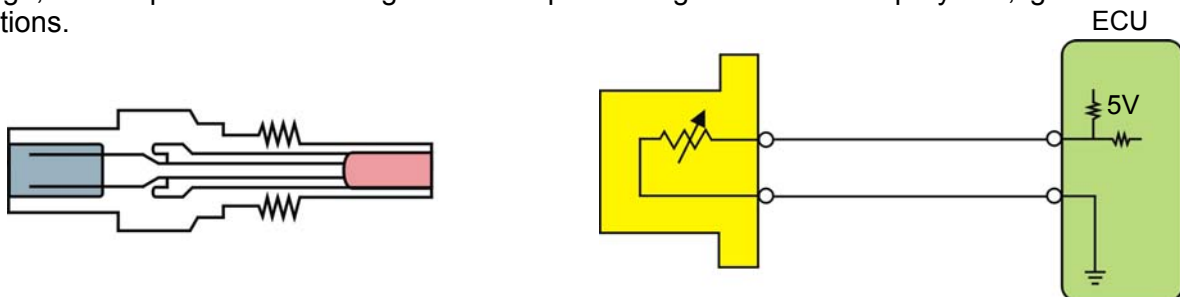


### Manifold Absolute Pressure (MPS) / Engine Water Temperature (WTS) / Air Temperature (TAS) Sensors



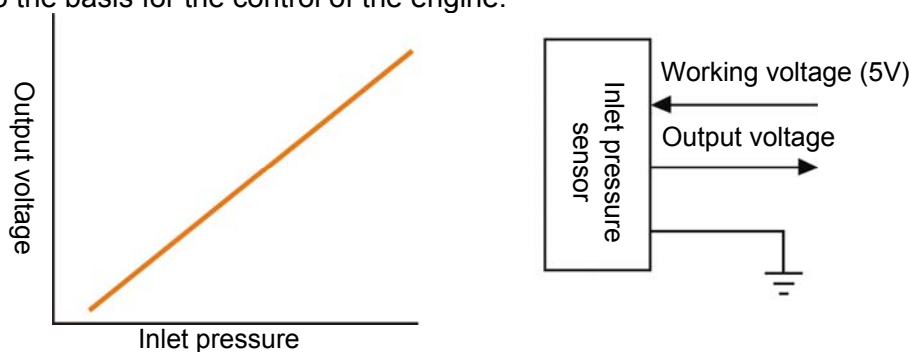
#### Engine water temperature / Air temperature sensor:

Use negative temperature coefficient of the variable resistor (thermistor) to the outside temperature sensor, when the high temperature resistance values at the smaller, low temperature resistance. Instead of change, the temperature of the engine ECU to provide signals to control spray fuel, ignition applications.



#### Inlet pressure sensor:

Manifold absolute pressure sensor (MAP) is the use of silicon-based thin film resistor pressure flu deterred by the Winston bridge circuit to the sensor atmospheric pressure and intake manifold pressure ECU feedback as to the basis for the control of the engine.

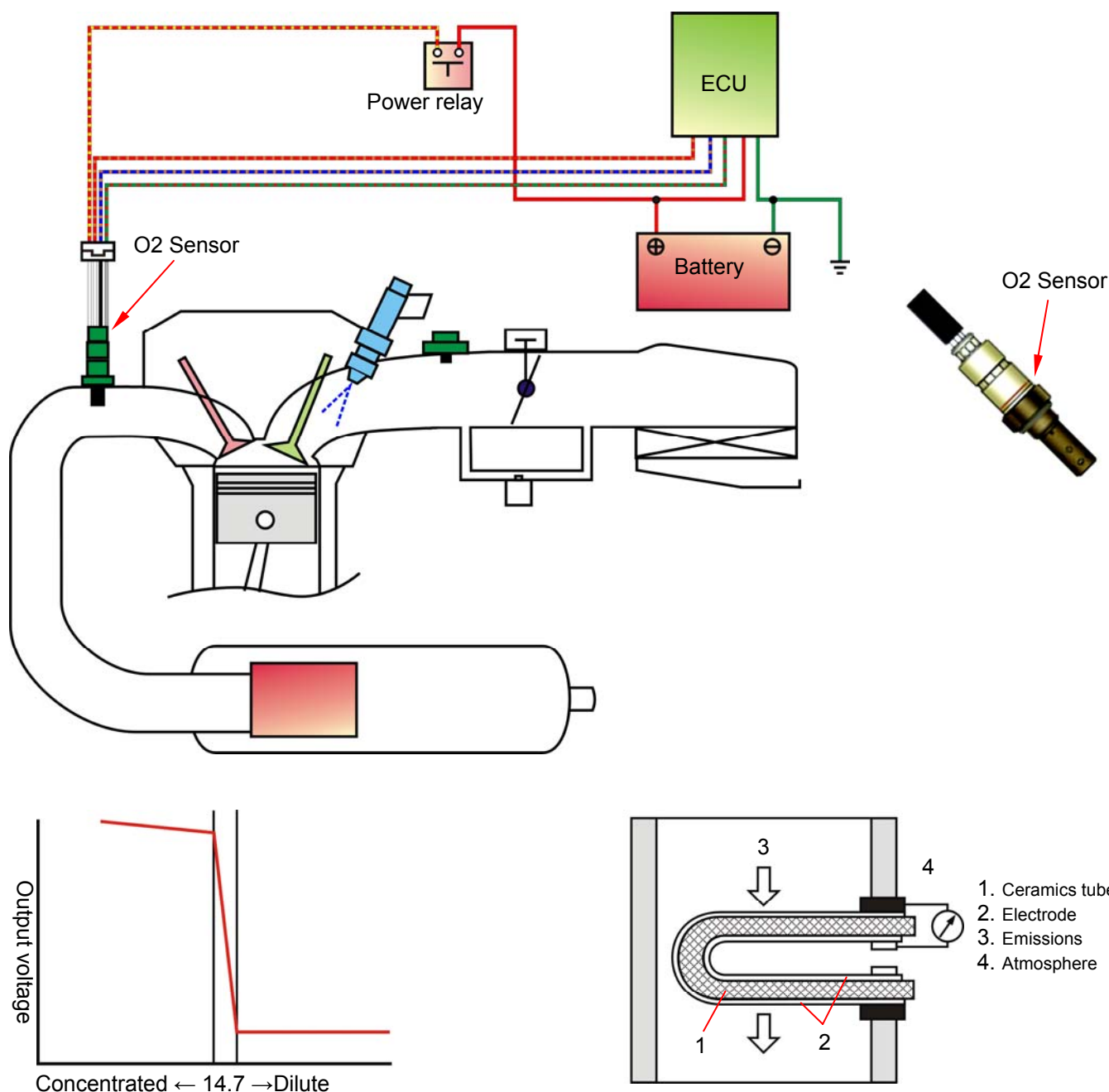




## 5. Fuel Injection System



### O2 Sensor

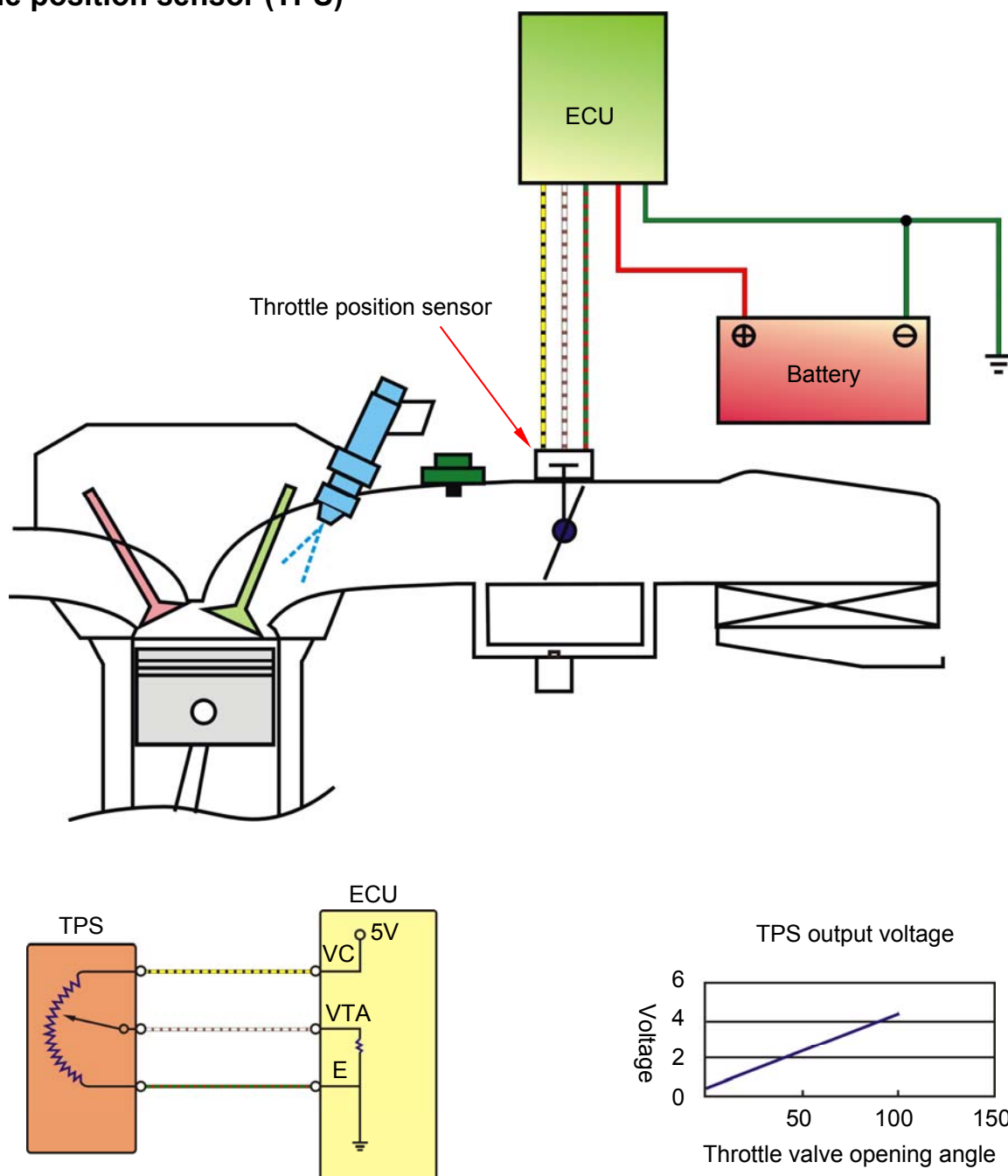


### Function

Measurement cylinder emissions of oxygen (O<sub>2</sub>) concentration <oxygen content>, and will return the computer signal to change the injector fuel injection time, the mixing ratio adjusted diluted concentration. If the oxygen level is too low that the mixture footprint, HC and CO emissions in the concentration will be higher if the oxygen content is too high that the mixture too lean, lean more mixed than the combustion temperature will increase emissions of NO<sub>x</sub> and the higher the concentration.

1. O<sub>2</sub> Sensor output feedback signal to the ECU fuel ratio control in the vicinity of a 14.7 fuel closed-loop control.
2. When the air-fuel ratio control in the near equivalent, CO / HC / Nox had the highest conversion efficiency.
3. Heating resistor (two white line): 6.7 ~ 10.5 Ω
4. O<sub>2</sub> Sensor amendment in the voltage value of between 100 ~ 900 mV beatings.

## Throttle position sensor (TPS)

**Basic Principle**

TPS is a rotary variable resistor, when the resistance values at the moment it will change, voltage values also change, the resulting voltage value to reflect the throttle position.

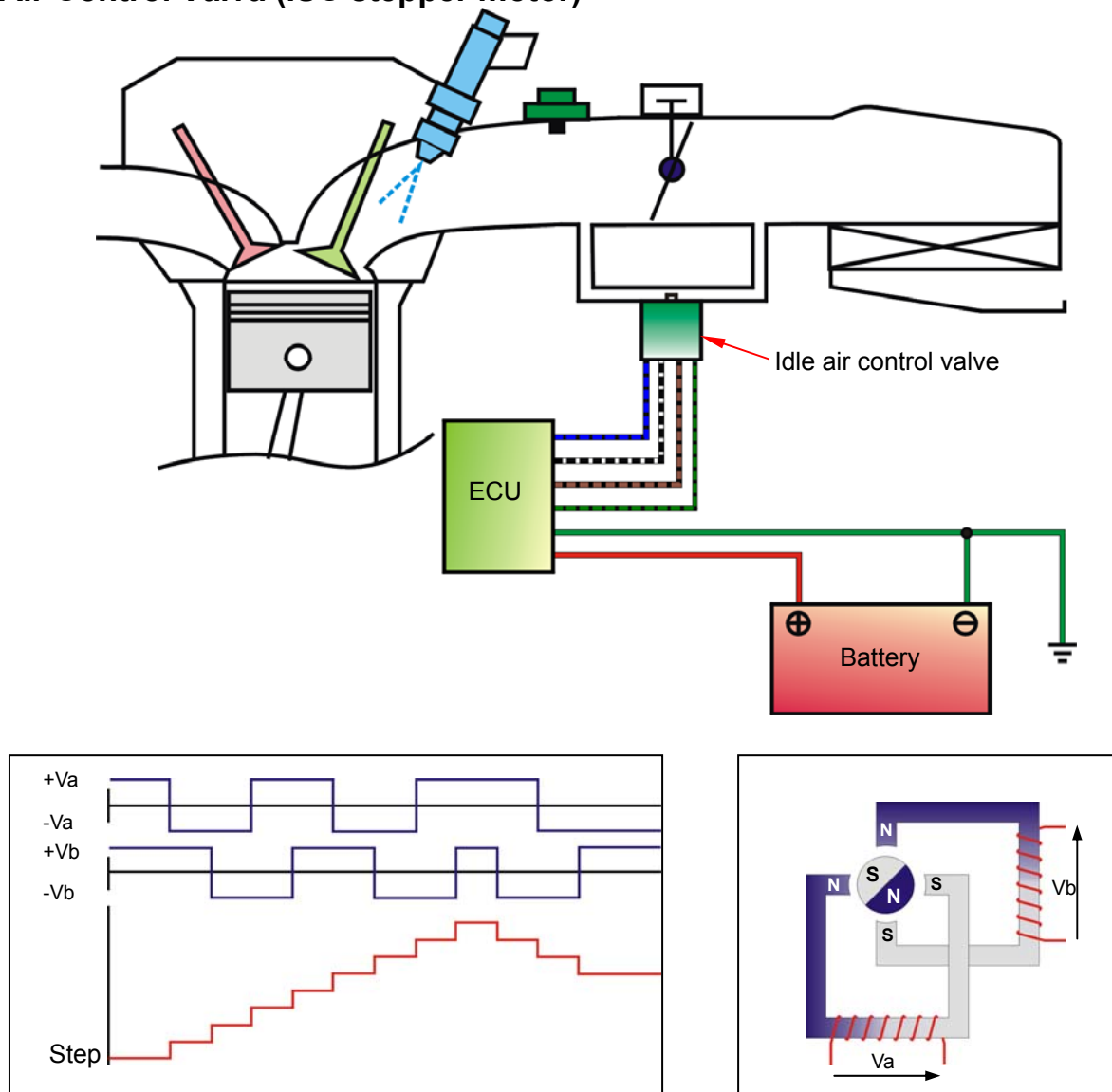
**Function**

Measurements throttle valve position feedback to control the engine ECU as the basis.

## 5. Fuel Injection System



### Idle Air Control Valva (ISC stepper motor)



### Function

Stepper motor control to move forward or backward, to maintain the engine running for air (Figure 1), the stepper motor rotor-on currents, generated by cutting the stator magnetic line rotary torque generated, resulting in motor rotor rotation (Figure 2).

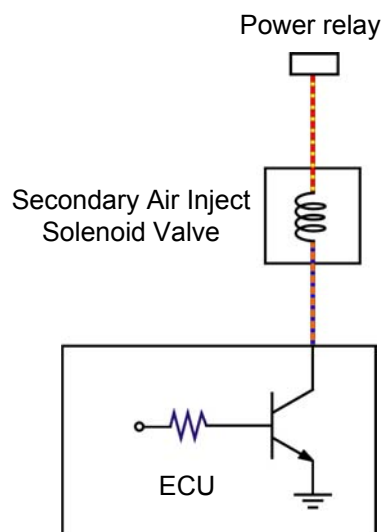
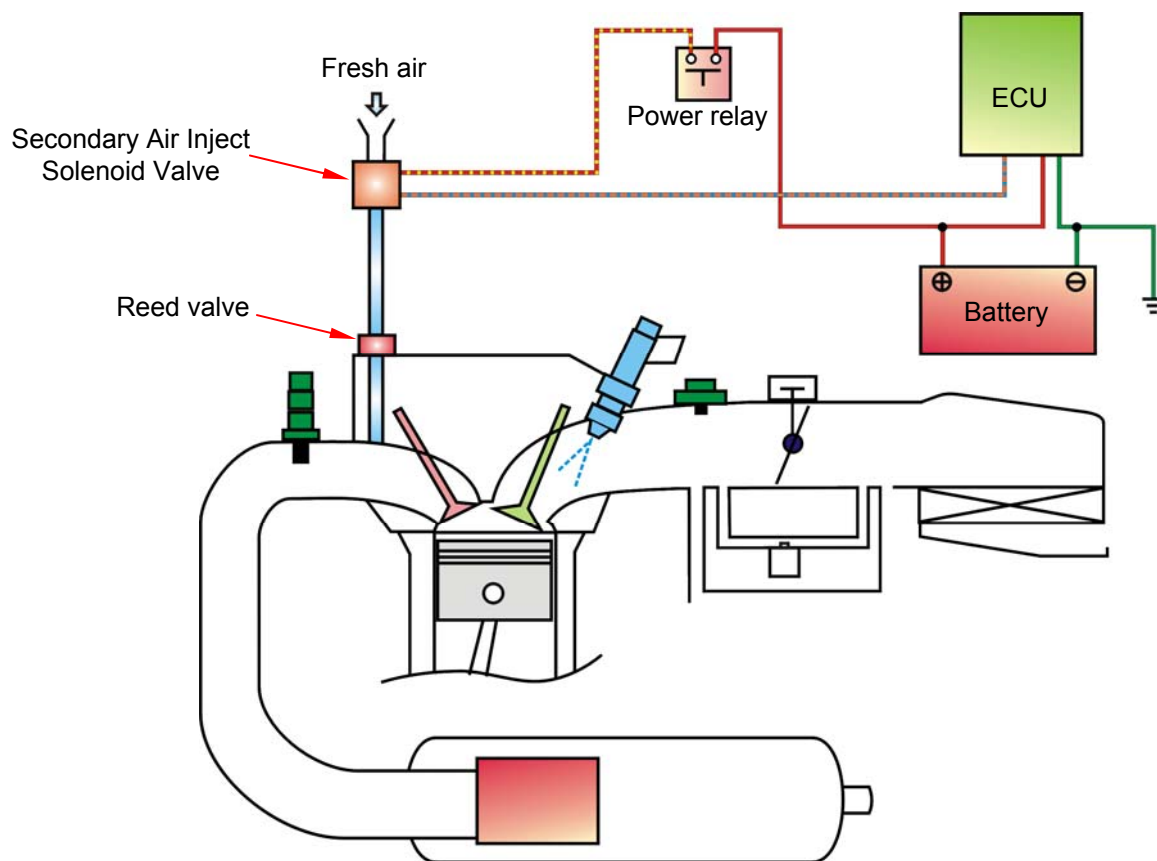
## Secondary Air Inject Solenoid Valve (AISV)

### Function

In the low engine load, into appropriate to air in the exhaust pipe to reduce the emission of pollutants.

### Basic Principle

When the engine speed and throttle opening greater than the setting, the ECU can control AISV open or closed.





## 5. Fuel Injection System

### 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.
- Dismantling fuel pipeline, the first of the fuel system in leak in addition to the fuel pressure, or tubing surrounds the folder of fuel to prevent fuel splash.

#### Cautions

- Do not bend or twist throttle cable. Damaged cable will make unstable drive ability.
- When disassembling fuel system parts, pay attention to O-ring position, replace with new one as re-assembly.

### Specification

| Item                      | Specifications                          |
|---------------------------|-----------------------------------------|
| Idle RPM                  | 1650±100 rpm                            |
| Throttle handle free play | 2~6 mm                                  |
| Fuel pressure             | 294±6kpr (about 3.0kg/cm <sup>2</sup> ) |

### Torque value

|                           |                 |
|---------------------------|-----------------|
| Engine Temperature sensor | 0.74~0.88 kgf-m |
| O2 Sensor                 | 3.6~4.6 kgf-m   |

### Special Tools

Vacuum/air pressure pump  
 Injection system diagnostic (Data Scan)  
 Fuel pipeline folder

## EFI System Components Description

### ECU (Electronic Control Unit)



#### Functional Description:

- Powered by DC 8~16V, and has 36-pin socket on the unit. (socket-pin wiring Please refer to page 5-31 ECU pin wiring)
- The hardware component consists of an 8-bite computer that is its control center. It contains the functional circuit interface of engine condition sensing and the driving actuator for the by-pas valve, fuel injector, and fuel pump, as well as transistor ignition coil.
- Its major software is a monitor strategy operation program that includes with controlling strategy, MAP and self-diagnosis programs.

#### Testing Procedures:

1. Connect diagnosis tool to the diagnostic connector on the motorcycle.
2. Key-on but not to start engine, confirmation ECU and the diagnosis tool can be connected.
3. Diagnosis tool will automatically display Version "certification" of the screen.
4. ECU confirmed the application model, version is correct (refer to pages 5-46 diagnosed with instructions).
5. Confirm the diagnosis of the fault codes in existence.
6. For the removal of fault diagnosis code.
7. Start engine for the diagnosis of the numerical parameters.

```
==Version==
DIAG. ID:0002000000020
S/H VER :001
DIAG. VER: 03
MODEL: SYM GTS250
NAME: HML00203

<UP> up <DOWN> down
<Enter> Exit <LEFT> left <RIGHT> right
```

```
==Version==
H/W VER :
S/H VER : 001
CALI ID :
ECU NI : 001

DIAG. ID:0002000000020
S/H VER :001
DIAG. VER: 03
MODEL: SYM GTS250
NAME: HML00203

<UP> up <DOWN> down
<Enter> Exit <LEFT> left <RIGHT> right
```

#### Detection judge:

- Fault code can be read and cleaning, and re-started, the fault code will not occur again.

#### Treatment of abnormal phenomena:

1. Can not connect→ First determine whether the correct cartridge, ECU check whether abnormal Moreover, the replacement of new parts to confirm
2. Unable to start→ ECU relevant parts or abnormal replacement parts to confirm.
3. Fault codes appear→ ECU relevant parts or anomalies, troubleshooting reasons to confirm.

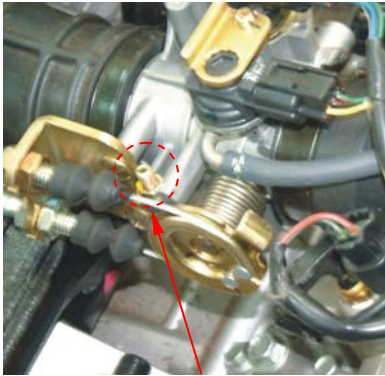
## 5. Fuel Injection System

### Throttle Body



#### Functional Description:

- Throttle body is fuel inject system inlet flow regulating body (similar to the role carburetor).
- Throttle valve shaft of the driven synchronous throttle position sensor, ECU immediately to detect the throttle opening.
- Throttle positioning screw, and the factory has been adjusted at Chatham positioning, in principle, Shall not adjust.
- Above configuration Idle bypass control valve role when engine cold, compensation air to easily start vehicles, hot engine after the engine by reducing demand for air pipe.

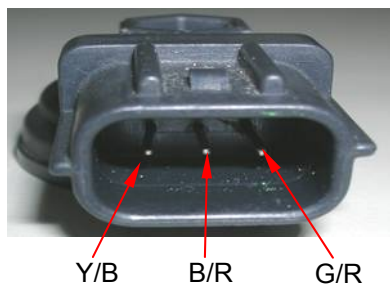


Throttle positioning screw

#### Treatment of abnormal phenomena:

- If all fuel injection associated components identified no adverse, and other traditional engine components are also normal, the engine is still not smooth, please confirm whether the throttle body coke serious.
- If coke serious, please clean throttle body, and then adjust the injection system.

## Intake Pressure Sensor



Working voltage measurement

Output voltage measurement  
plains

## Functional Description:

- Powered by 5V DC from ECU. It has 3-pin socket on the sensor. One terminal is for power, and 1 terminal are for signal output. And, the rest one is for ground.
- The major component of the intake pressure sensor is a variable transistor IC. Its reference voltage is DC 5V, and output voltage range is DC 0~5V.
- It is a sensor by sensing pressure, and can measure the absolute pressure in intake process. It also conducts fuel injection quantity correction based on environmental position level.

| Pin    | Wire color     | Function         |
|--------|----------------|------------------|
| Left   | Yellow / Black | 5V voltage input |
| center | Black / Red    | Signal output    |
| Right  | Green / Red    | Ground           |

## Testing Procedures:

1. Inlet pressure sensor connector to properly (using the probe tool).
2. Open the main switch, but not to start engine.
3. Use "volteg meter" DC stalls (DCV) to check inlet pressure sensor voltage.
4. Confirmed working voltage:
  - Volteg meter negative access to the inlet pressure sensor third pin (Green / Red).
  - Voltage meter positive access to the inlet pressure sensor first pin (Yellow / Black).
5. Confirmed plains output voltage values:
  - Volteg meter negative access to the inlet pressure sensor third pin (Green / Red).
  - Voltage meter positive access to the inlet pressure sensor second pin (Black / Red)



## Cautions

- Attentions to the tools required close to the probe wire waterproof apron penetrate skin and internal terminal before measurements to the correct value.

## Detection judge:

- Working voltage value:  $5.0 \pm 0.1V$
- Plains output voltage values:  $2.87 \pm 0.03V$  (Conditions: In the plains 101.3 kpa Measurement)



## Cautions

- The higher the altitude, the measurement value to the lower voltage.
- Sea-level atmospheric pressure = 1Atm = 101.3kpa = 760mmHg = 1013mbar

## Treatment of abnormal phenomena:

- Inlet pressure sensor damaged, or poor contact couplers.
- Check whether the abnormal wire harness lines.
- Inlet pressure sensor anomaly, the proposed replacement of the sensor to measure the output voltage.
- ECU anomaly, the proposed replacement of the ECU to measure the working voltage.





## Intake Temperature Sensor



### Functional Description:

- Use ECU DC 5V power supply provided, has the two-pin coupler, a voltage output pin; another one for a grounding pin.
- Its main component is a negative temperature coefficient (resistance temperature rise smaller) thermistor.
- Installed in the air cleaner on the intake temperature sensor within the resistance, with the induction to the temperature change, and converted into voltage signals sent to the ECU then calculated the temperature and, in accordance with the ECU temperature and state amendments injection time and ignition angle.

### Testing Procedures:

#### Resistance Value Measurement:

- Dismantled inlet temperature sensor connector.
- Use of the "Ohmmeter" Ohm stalls, inspection sensor resistance.

### Detection judge:

Resistance value and the temperature between relationships as follows

| Temperature (°C) | Resistance value (KΩ) |
|------------------|-----------------------|
| -20              | 18.8 ± 2.4            |
| 40               | 1.136 ± 0.1           |
| 100              | 0.1553 ± 0.007        |

### Treatment of abnormal phenomena:

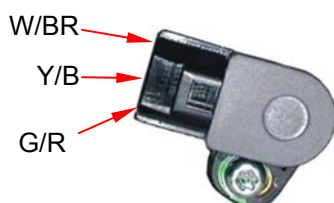
- Temperature sensor damage or connector poor contact.
- Check whether the abnormal wire harness lines.
- Temperature sensor anomaly, the proposed replacement of the temperature sensor.



Resistance value measurement

## 5. Fuel Injection System

### Throttle Position Sensor



#### Functional Description:

- Use ECU provided DC 5V power supply, has the three-pin coupler, one for the power supply pin; one for a voltage output pin; one for a grounding pin.
- Its main component is a sophisticated type of variable resistor.
- Installed on the throttle body beside the throttle through (the accelerator) rotates, the output of linear voltage signal provided ECU perception and judgement then throttle position (opening), and in this signal with have the most appropriate fuel injection and ignition timing control.

| Pins   | Wire color     | Function         |
|--------|----------------|------------------|
| Upper  | White / Brown  | Signal output    |
| Center | Yellow / Black | 5V voltage input |
| Under  | Green / Red    | Ground           |



Working voltage measurement



Throttle output signal measurement - full closed



Throttle output signal measurement - full

#### Testing Procedures:

1. Sensor connector to properly (using the probe tool), or can be removed connector to voltage measurements (direct measurement).
2. Opened the main switch, but not to start engine.
3. Use "volteg meter" DC stalls (DCV) to check sensor voltage.
4. Confirmed working voltage:
  - Volteg meter negative access to the inlet pressure sensor third pin (Green / Red).
  - Voltage meter positive access to the inlet pressure sensor first pin (Yellow / Black).
5. Throttle output signal recognition (using the probe tool)
  - Volteg meter negative access to the sensor third pin (Green / Red).
  - Voltage meter positive access to the sensor first pin (white / Brown).
  - Measurements were full throttle at full throttle closed the values of the output voltage.



#### Cautions

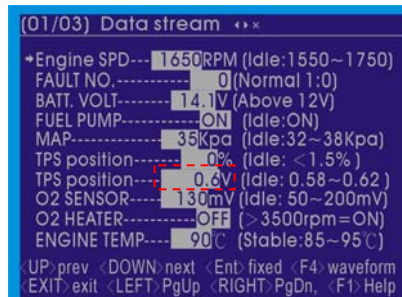
- Attentions to the tools required close to the probe wire waterproof apron penetrate skin and internal terminal before measurements to the correct value.

#### Detection judge:

- Working voltage value:  $5.0 \pm 0.1V$
- Full throttle voltage value:  $0.6 \pm 0.02V$
- Full throttle closed voltage value:  $3.77 \pm 0.1V$



## 5. Fuel Injection System



Throttle output signal  
measurement

Also, can be used for diagnosis tool confirm to the throttle output signal.

1. Connected to the "diagnosis tool", and open the main switch, but not to start engine.
2. "Diagnosis tool" screen switches to a "data analysis (01 / 03)" screen.
3. Rotations throttle and check voltages.

### Treatment of abnormal phenomena:

- Throttle sensor damage or connector poor contact.
- Check whether the abnormal wire harness lines.
- Throttle sensor anomaly, the proposed replacement of the throttle sensor to measure the voltage.



### Warning

- Throttle sensor prohibited removed from the throttle body to do any testing.



## 5. Fuel Injection System

### Engine Temperature Sensor



#### Functional Description:

- Powered by 5V DC from ECU. It has the two-pin socket on the sensor. One terminal is for power output, and 1 terminal are for ground.
- Its main component is a negative temperature coefficient (resistance temperature rise smaller) thermistor.
- Installed in the cylinder head, the engine temperature sensor resistance, with the induction to the temperature change, and converted into voltage signals sent to the ECU was calculated engine temperature, ECU accordance with the engine warm up to amendment the injection time and ignition angle.



Resistivity measurements

#### Testing Procedures:

- Dismantled engine temperature sensor.
- Use of the "meter" Ohm stalls, inspection sensor resistance.

#### Detection judge:

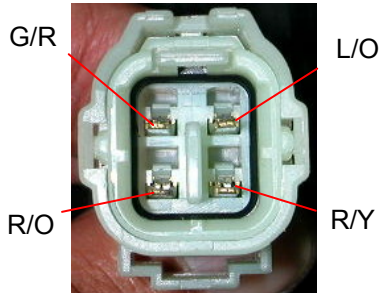
Resistance value and the temperature between relationships as follows:

| Temperature (°C) | Resistance value (KΩ) |
|------------------|-----------------------|
| -20              | 18.8 ± 2.4            |
| 40               | 1.136 ± 0.1           |
| 100              | 0.1553 ± 0.007        |

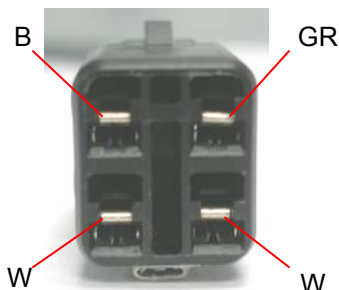
#### Treatment of abnormal phenomena:

- Temperature sensor damage or couplers to poor contact.
- Check whether the abnormal wire harness lines.
- Temperature sensor anomaly, the proposed replacement of the temperature sensor.

## O2 Sensor



Confirmed working voltage



Resistance Confirmation

### Functional Description:

- Use 8 ~ 16V DC power supply, has the 4-pin coupler, a power supply pins for heater; for a heater control pin; signal for a grounding pin; O2 for a signal pin.
- O2 Sensor output feedback signal to the ECU fuel ratio control in the vicinity of 14.5 ~ 14.7, a closed-loop fuel control.
- When the air-fuel ratio control in the near equivalent, CO / HC / Nox to have the highest conversion efficiency.

### Testing Procedures:

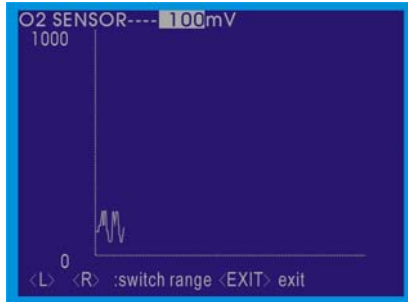
#### 1. Voltage confirmed:

- Removed O2 Sensor and the wire harness between the coupler.
- Open the main switch, but not to start engine.
- Use "volteg meter" DC stalls (DCV) to check inlet pressure sensor voltage.
- Confirmed working voltage:  
Volteg meter negative access to the wire harness sensor coupler 2nd pin (Red / Orange).  
Voltage meter positive access to the wire harness sensor coupler first pin (Red / Yellow).

#### 2. Resistance Confirmation:

- Removed O2 Sensor and the wire harness between the coupler.
- Use of the "meter" Ohm stalls, Measurement O2 Sensor heater resistance.
- Measurement resistance value  
Ohm meter negative access to the O2 sensor coupler 2nd pin (White).  
Ohm meter negative access to the O2 sensor coupler first pin (White).

## 5. Fuel Injection System



Numerical voltage changes that the situation.

### 3. Used the diagnosis tool to confirm of O2 sensor work situations:

- Connected the "diagnosis tool" to diagnosis coupler and open the main switch to start the engine.
- Engine to be completely warm-up (idling state operation "5 minutes" above).
- Screen will switch to the diagnosis tool of "DATA STREAM 01/01" screen, select "O2 Sensor" project, and switches to a wave of images, turn the throttle engine speed to about 4500 rpm, Observation O2 Sensor actuator circumstances.
- Observation O2 Sensor voltage values that the situation changes.

### Detection judge:

- Working voltage value: **above 10V**
- Resistance value: **6.7~10.5Ω**
- O2 Sensor amendment in the voltage value of between 100 ~ 900 mV beating; representatives pollution closed-loop control system to normal, if contrary to maintain a fixed value for abnormalities.



### Treatment of abnormal phenomena:

- O2 sensor damage, heater damaged or couplers to poor contact.
- Check whether the abnormal wire harness lines.
- O2 Sensor anomaly, the proposed replacement of the O2 Sensor , and measurements again.

## Roll over sensor

**Functional Description:**

- Control power of the power relay coil, has the three-pin socket.
- When vehicles tilt angle greater than 65 degrees, roll over sensor will be the implementation of ECU system power off. At this point once again to restart the engine, the need to re-open a main switch.
- This as a safety device, when the dumping of vehicles, be cut off power supply of ECU, and engine stop.

**Testing Procedures:**

- Because of the roll over sensor for the electronic control agencies, not against removed after a single measurement.
- Normal state, after power is turned on the main switch, measurement of ECU power relays red / yellow line to the Green Line (ground), the power supply voltage measurement can determine whether it is normal for the roll over sensor.

**Detection judge:**

Voltage: **Supply voltage = Battery voltage**

**Treatment of abnormal phenomena:**

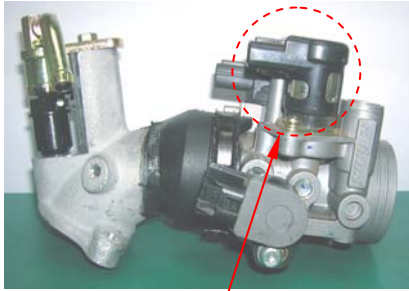
Vehicle state vertical, power relays or ECU without electricity supply.

- Roll over sensor internal short circuit or open circuit, or coupler bad contact.
- Check whether the abnormal wire harness lines.
- Roll over sensor anomaly, the proposed replacement of the roll over sensor.



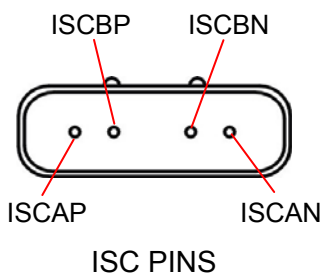
## 5. Fuel Injection System

### Idle Speed Control Valve (stepper motor) :



#### Functional Description:

- Use ECU provided power, has the four-pin socket.
- 4-pin coupler for the two motor coils of the power supply and grounding wire, grounding ECU power through the control and management of the stepper motor actuators.
- If it's mainly low-power DC motors, drives idle speed control valve (ISC) of the movement to adjust the idle air flow channel size, control of idle speed of the engine in the cold or hot.



#### Testing Procedures 1:

##### Resistance Confirmation:

- Idle Air Control Valve will be demolished down coupler (directly in the body, can also measure).
- Use of the "meter" Ohm stalls ( $\Omega$ ), measurement of the two step motor coil resistance values.  
A phase: ISCAP and ISCAN  
B phase: ISCBP and ISCBN

Inspection of the actuation (testing can only be on engine, not a single test):

- Closure of the main switch.
- Use hand to touch Idle Air Control Valve body.
- Open the main switch.
- Feeling the Idle Air Control Valve Actuation.

#### Cautions

- Dynamic checking for Idle Air Control valve, can only be tested on the engine, not a single test.

#### Detection judge:

##### 1. Resistance value:

A phase:  $80 \pm 10\Omega$  (Environmental conditions:  $15 \sim 25^\circ\text{C}$ )

B phase:  $80 \pm 10\Omega$  (Environmental conditions:  $15 \sim 25^\circ\text{C}$ )

##### 2. Actuator inspection:

In the above steps Idle Air Control Valve (ISC) Idling motor actuator control of inspection, ISC will be slightly vibration or "... da... da..." continuous voice.

#### Treatment of abnormal phenomena:

- Idle air control valve damage, or poor coupler contact.
- Check whether the abnormal wire harness lines.
- Idle Air Control Valve anomaly, the proposed replacement of the Idle Air Control Valve, further inspection of its actuator.

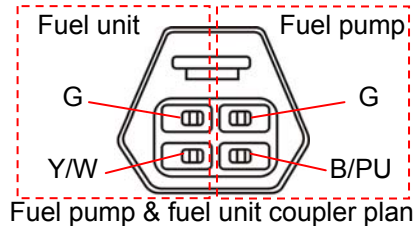


A phase measurement of the resistance value

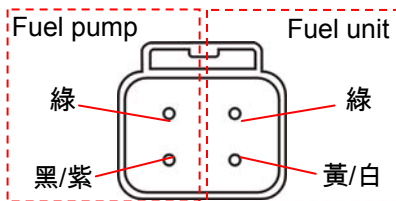


B phase measurement of the resistance value

## Fuel Pump



Confirmed working voltage



Harness-face coupler plan



Resistance Confirmation

### Functional Description:

- Powered by DC 8~16V, and has four-pin socket on the pump.
- The two terminals are connected to power source and ground respective. The ECU is to control and manage the operation of fuel pump through electrical power.
- Its major component is a driving fan pump that equipped with a low electrical consuming DC motor. Powered by 12V voltage and keep fuel pressure inside the fuel pump in  $294 \pm 6 \text{ kPa}$  (about  $3 \text{ kg / cm}^2$ ).
- The fuel pump is located inside of the fuel tank, and installed a filter in front of its inlet so that can prevent from foreign materials sucking into the fuel pump to damage it and the fuel injector.

### Testing Procedures 1:

Fuel pump working voltage confirmed:

- Fuel pump coupler to properly (using the probe tool), or can be removed coupler working voltage measurements (direct measurement).
- Open the main switch, but not to start engine.
- Use "volteg meter" DC stalls (DCV) to check fuel pump voltage.
- Confirmed working voltage:  
Volteg meter negative access to the wire harness fuel pump coupler 2nd pin (Green).  
Voltage meter positive access to the wire harness fuel pump coupler first pin (Black / Purple).



### Cautions

- Conducting fuel pump voltage measurement, if the main switch to open three seconds after the engine did not started, the ECU will automatically cut off the fuel pump power supply.

### Detection judge 1:

1. Working voltage value: **Above 10V**
2. Resistance value:  **$1.5 \pm 0.5 \Omega$**
3. Fuel pressure:  **$294 \pm 6 \text{ kPa}$  (about  $3 \text{ kg/cm}^2$ )**

### Testing Procedures 2:

#### Resistance Confirmation:

- Removed coupler on the fuel pump.
- Use of the "meter" Ohm stalls, Measurement fuel unit resistance (Yellow / White & Green).

### Detection judge 2:

- Fuel unit resistance value:  **$4 \sim 107.5 \Omega$**

## 5. Fuel Injection System



Fuel system pressure measurement

### Testing Procedures 3:

#### Fuel pressure measurement:

- Use fuel pressure gauge, connected in series between the injector and the fuel tank.



#### Cautions

- In the implementation of the fuel pressure measurement, will go to the demolition of the fuel hose, such as: injector or fuel pump hose, hydraulic measurements after, be sure to confirm whether there is a leakage of fuel situation in order to avoid danger.



Fuel pressure measurement demolition - injector

### Detection judge 3:

1. Fuel pressure:  $294 \pm 6 \text{ kPa}$  (about  $3 \text{ kg/cm}^2$ )

#### Treatment of abnormal phenomena:

1. Fuel pump damage internal coil break, or coupler bad contact.
2. Fuel filter blockage.
3. Fuel pump anomaly, the proposed replacement of the fuel pump.
4. Fuel unit anomaly, the proposed replacement of the fuel unit.



Fuel pressure measurement demolition - fuel pump

## Fuel Injector



### Functional Description:

- Powered by DC 8~16V, and has two-pin socket on the injector.
- Its major component is the solenoid valve of high resistance driven by electronic current.
- The two terminals are connected to power source and ground respective. It is controlled by ECU to decide the injection timing, and the injector pulse width.

### Testing Procedures:

#### 1. Resistance Confirmation:

Use of the "meter" Ohm stalls ( $\Omega$ ), measurement of the injector resistance value.

#### 2. Injector injection state examination:

- Removed the injector fixed bolt and removed the injector from intake manifold, but not removal of harness coupler.
- Injector and injector cap tightly by hands, fuel spills should not be the case.
- Key-on and start the engine, injector injection state examination.



Injector resistance confirmation

### Detection judge:

#### 1. Between the two pin resistance values: $11.7 \pm 0.6 \Omega$

#### 2. injection state:

- Fuel atomizing good, with a clear scattering angle  $\rightarrow$  judged as normal.
- Injection-state such as water, no obvious scattering angle  $\rightarrow$  found abnormal.

### Treatment of abnormal phenomena:

1. Injector abnormal, the proposed replacement of the new one injector.
2. Injection-state abnormal, for the following reasons:

- Injector obstructive  $\rightarrow$  the proposed replacement of the new one injector.
- Fuel pressure shortage  $\rightarrow$  confirmed hydraulic pressure, the proposed replacement fuel pump to confirm.

### Warning

- Gasoline is lower ignited explosive materials, in the ventilation premises operations, and prohibited fire.
- In the inspection injector fuel injection state, the outflow of gasoline, and the application of appropriate collection containers, so as to avoid danger.



Injection-state atomizing good

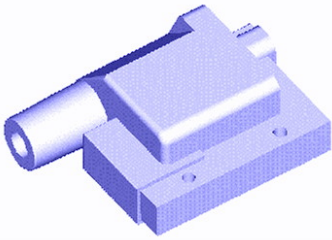


Injection-state unusual



## 5. Fuel Injection System

### Transistor ignition coil



First circuit coil resistance measurement

#### Functional Description:

- Use 8 ~ 16V DC power supply, has the two-pin socket.
- Two-pin socket for the power supply and grounding. Its main components for the high conversion ratio transformer.
- Through computer programs when the ignition is controlled, from ignition timing (TDC) / crank position sensor, the throttle valve position sensor, engine temperature sensor, the inlet pressure sensor and O2 Sensor, issued by the signal, with the engine Speed through the ECU to determine the appropriate ignition is, by the current of a crystal intermittent control, a 25000-30000 volts of secondary hypertension, flashover triggered spark plug, this approach will not only enable the engine to achieve maximum output function, also help to improve the efficiency of fuel consumption and pollution improvements.

#### Testing Procedures:

##### Resistance Confirmation:

- Removed coil first circuit plugs on the ignition coil (Red / Yellow & Black / Yellow).
- Use of the "meter" Ohm stalls ( $\Omega$ ), measurement of the ignition coil resistance value.

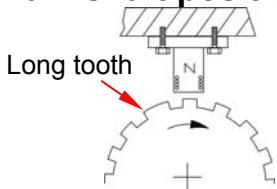
#### Detection judge:

- Ignition coil first circuit:  $3 \pm 0.3 \Omega (20^\circ\text{C})$

#### Treatment of abnormal phenomena:

1. Ignition coil internal coil disconnection damaged, or plugs bad contact.
2. Ignition coil ignition is not abnormal, proposes to replace the ignition coil.

### Crankshaft position sensor



Measurement resistance value

#### Functional Description:

- Do not need for an external power supply, has two-pin of signal plug.
- Constitutes a major change in its reluctance induction coil.
- The spacing of flywheel and sensor should be 0.7 to 1.1 mm.
- Magnetic induction sensor is the use of flywheel on the Gear (23 +1 long tooth) rotary cutting induction coil changes in the magnetic field sensor with the inductive voltage signal for ECU judgement, calculated at the engine speed and crankshaft position, and with a most appropriate time of fuel injection and ignition control.

#### Testing Procedures:

##### Resistance Confirmation:

- Removed crankshaft position sensor coupler (Blue / Yellow & Green / White).
- Use of the "meter" Ohm stalls ( $\Omega$ ), measurement of the crankshaft position sensor resistance value.

#### Detection judge:

- Resistance value:  $80 \sim 160 \Omega (20^\circ\text{C})$

#### Treatment of abnormal phenomena:

1. Sensor internal coil interrupted damaged, or coupler bad contact.
2. Check whether the abnormal wire harness lines.
3. Sensor coil anomaly, the proposed replacement of the new one.

### Secondary air injection solenoid valve



#### Functional Description:

- Control power, has two-pin socket, one for the power supply pin, one for grounding pin.
- Secondary air injection solenoid valve at the Idle (3500 rpm below) actuator.
- At Idling, ECU control solenoid valve by the grounding circuit to be moving or closing.



#### Testing Procedures:

##### Resistance Confirmation:

- Use of the "meter" Ohm stalls ( $\Omega$ ), measurement of the secondary air injection solenoid valve resistance value.

#### Detection judge:

Resistance value =  $26\Omega \pm 2.6\Omega$ (於  $20^\circ\text{C}$ )

#### Treatment of abnormal phenomena:

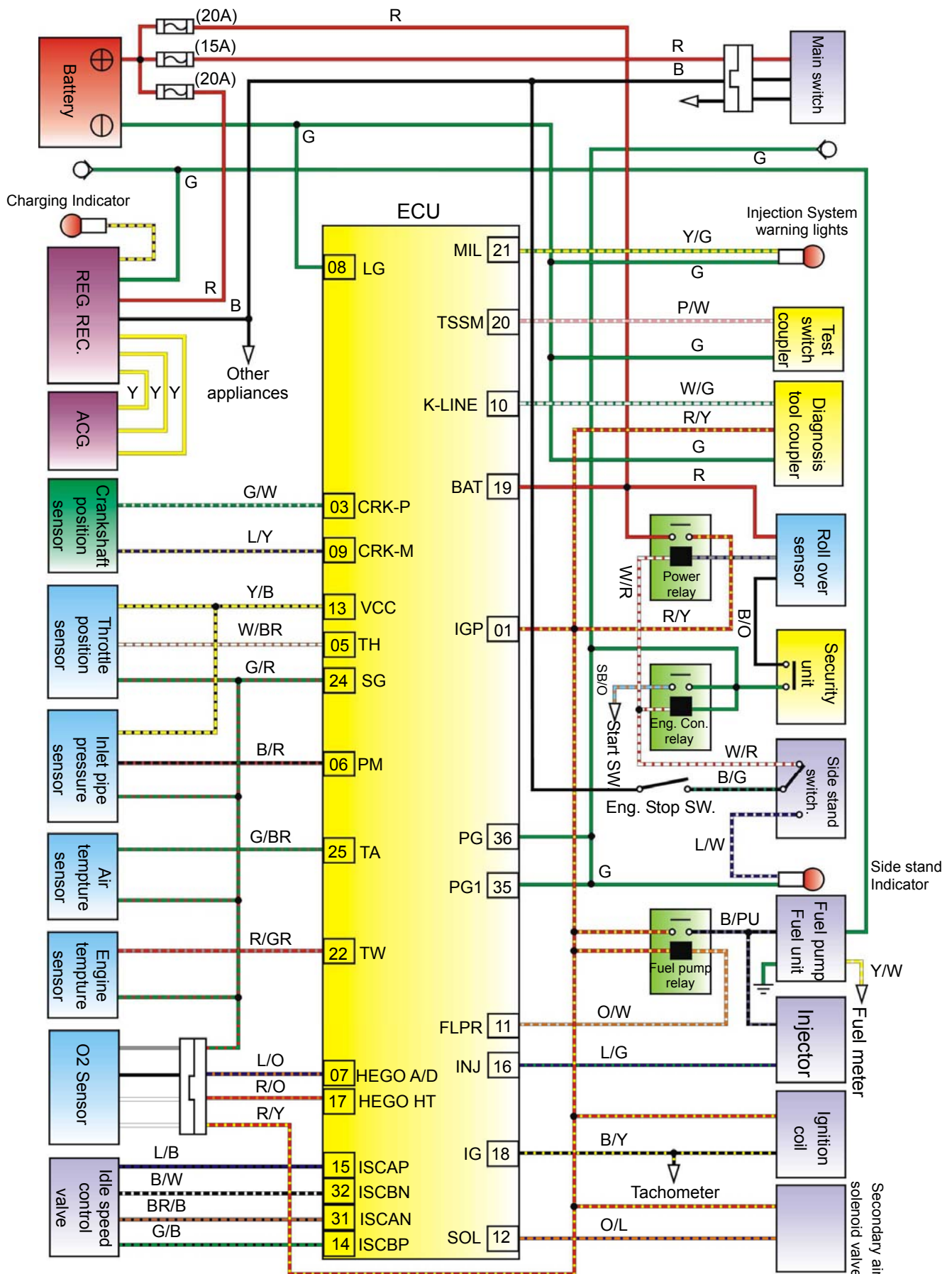
- Secondary air injection solenoid valve internal short circuit or open circuit, or coupler bad contact.
- Check whether the abnormal wire harness lines.
- Secondary air injection solenoid valve anomaly, the proposed replacement of the new one.



## 5. Fuel Injection System



### Fuel Injection System Circuit

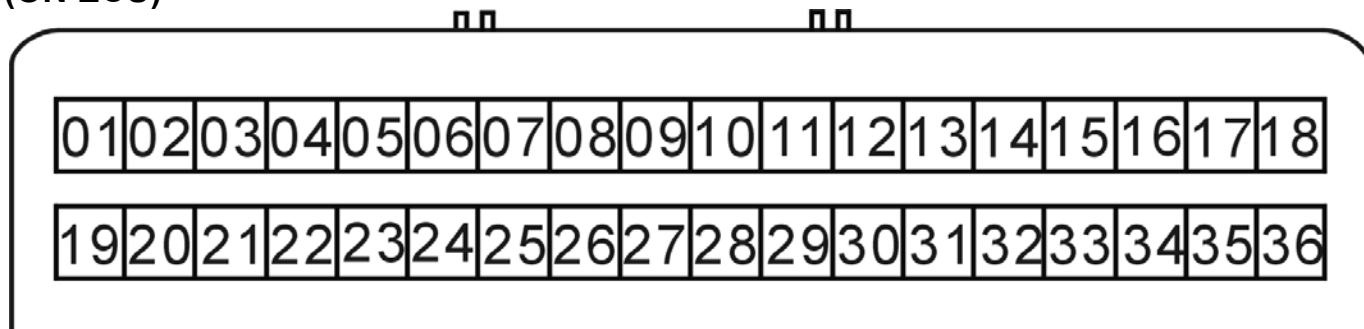




## 5. Fuel Injection System

### ECU Pin Configurations

(ON ECU)



### ECU Pin Note

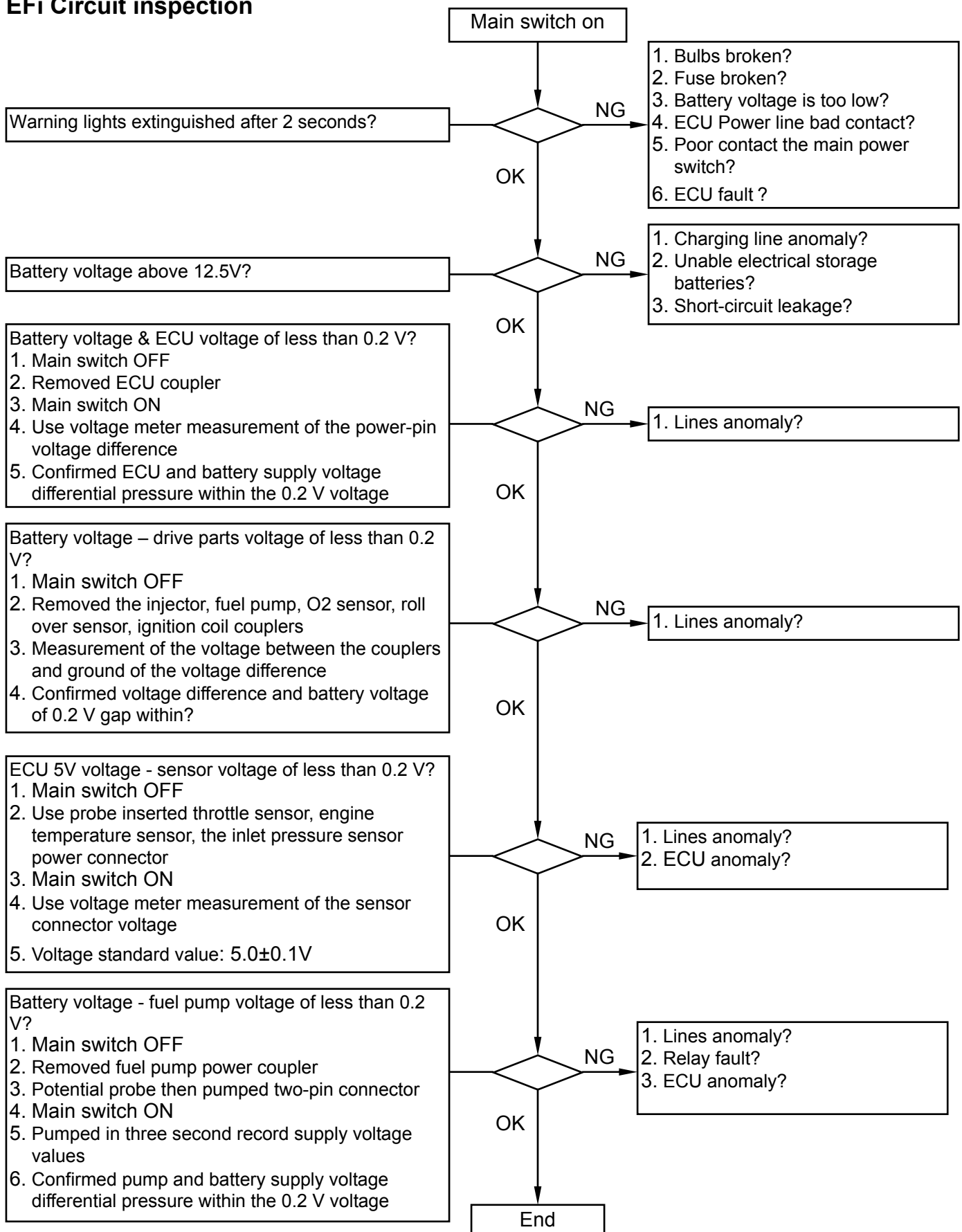
| Pin NO. | Wire color | Pin code | Note                                        | Pin NO. | Wire color | Pin code | Note                              |
|---------|------------|----------|---------------------------------------------|---------|------------|----------|-----------------------------------|
| 01      | R/Y        | IGP      | Drive components Power +                    | 19      | R          | BAT      | ECU power +                       |
| 02      |            |          | No use                                      | 20      | Pink       | TSSM     | Test switch signal (A/D)          |
| 03      | G/W        | CRK-P    | Crankshaft pos. Sensor-                     | 21      | Y/G        | MIL      | Warning Lights O/P                |
| 04      |            |          | No use                                      | 22      | R/GR       | TW       | Eng. Temp. Sensor (A/D)           |
| 05      | W/BR       | TH       | Throttle angle [A/D]                        | 23      |            |          | No use                            |
| 06      | B/R        | PM       | Manifold Press. SNSR I/P [A/D]              | 24      | G/R        | SG       | Sensor ground                     |
| 07      | L/O        | HEGO A/D | O2 Sensor [A/D]                             | 25      | G/BR       | TA       | Inlet airtemperature sensor (A/D) |
| 08      | G          | LG       | ECU ground                                  | 26      |            |          | No use                            |
| 09      | L/Y        | CRK-M    | Crankshaft pos. Sensor+                     | 27      |            |          | No use                            |
| 10      | W/G        | K-LINE   | Sequence transmission signal output / input | 28      |            |          | No use                            |
| 11      | O/W        | FLPR     | Fue pump relay O/P                          | 29      |            |          | No use                            |
| 12      | O/L        | SOL      | 2 <sup>nd</sup> air solenoid valve O/P      | 30      |            |          | No use                            |
| 13      | Y/B        | VCC      | Sensor power + (DC 5V)                      | 31      | BR/B       | ISCAN    | Step motor A phase power -        |
| 14      | G/B        | ISCBP    | Step motor A phase power +                  | 32      | B/W        | ISCBN    | Step motor B phase power -        |
| 15      | L/B        | ISCAP    | Step motor B phase power +                  | 33      |            |          | No use                            |
| 16      | L/G        | INJ      | Fuel injector O/P                           | 34      |            |          | No use                            |
| 17      | R/O        | HEGO HT  | O2 Sensor heater ground                     | 35      | G          | PG1      | Drive components ground           |
| 18      | B/Y        | IG       | Ignition coil O/P                           | 36      | G          | PG       | Drive components ground           |



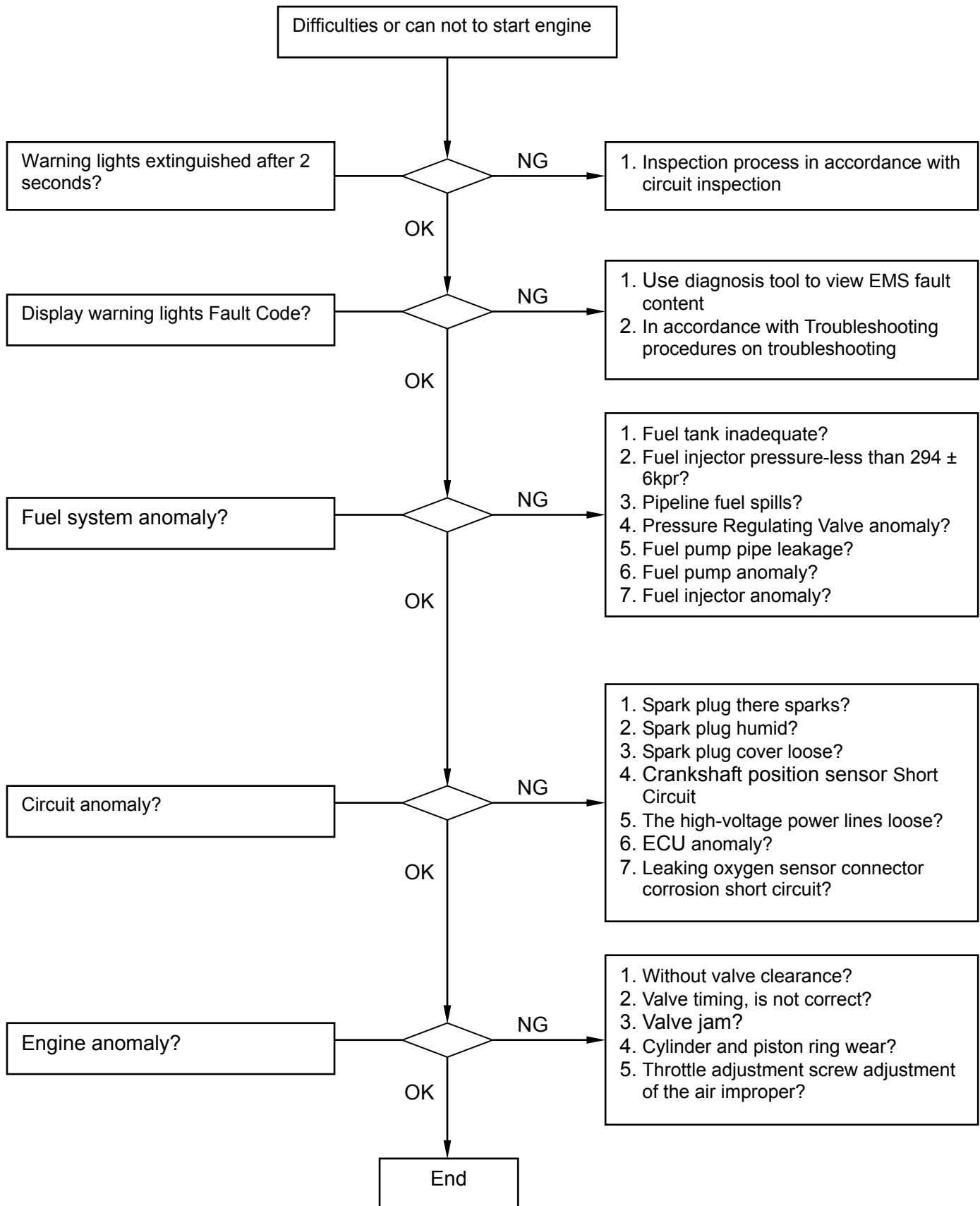
## 5. Fuel Injection System

### Fault Diagnosis

#### EFI Circuit inspection



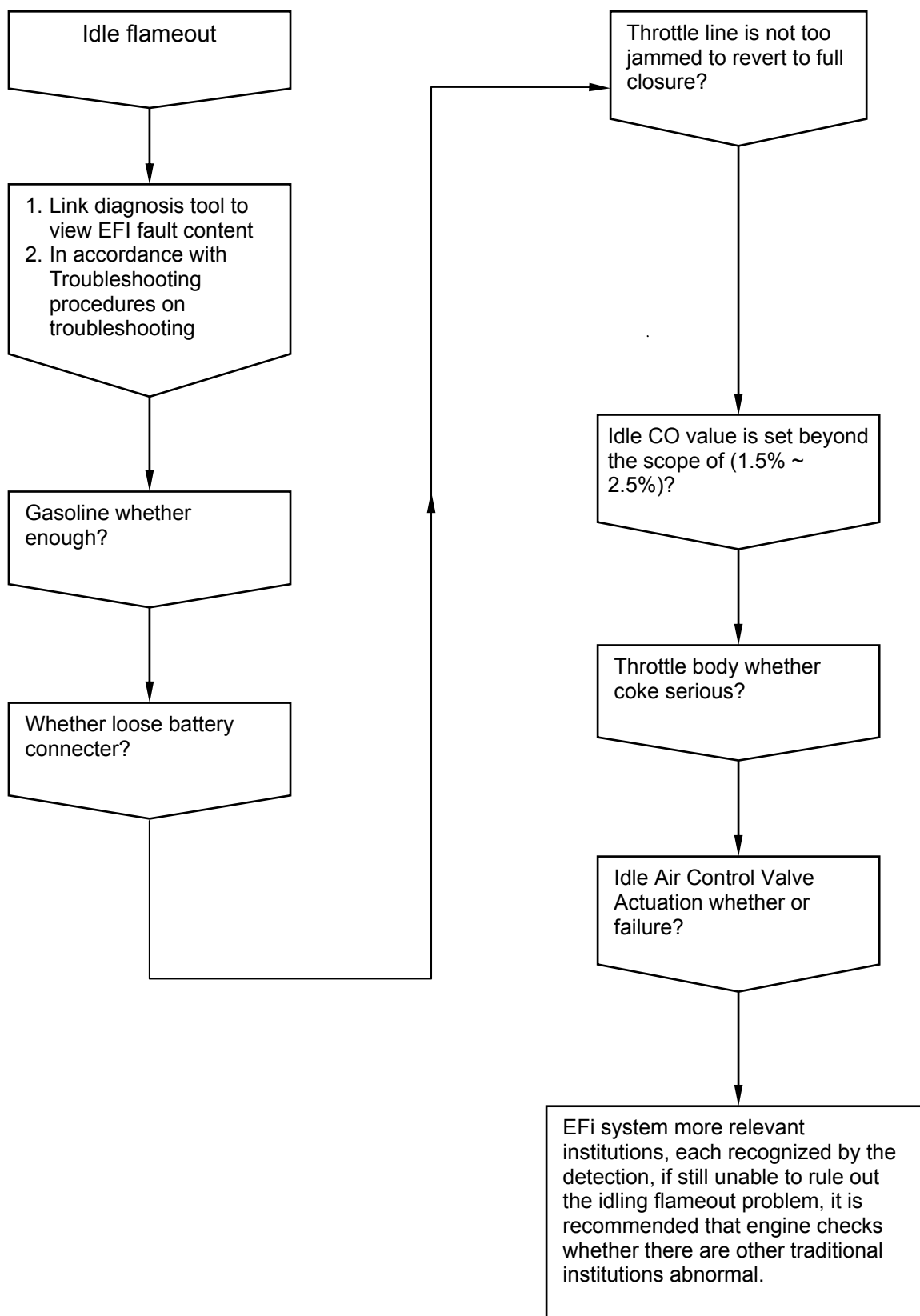
## Can not Start the engine or difficult to start inspection



## 5. Fuel Injection System



### Idle flameout diagnosis

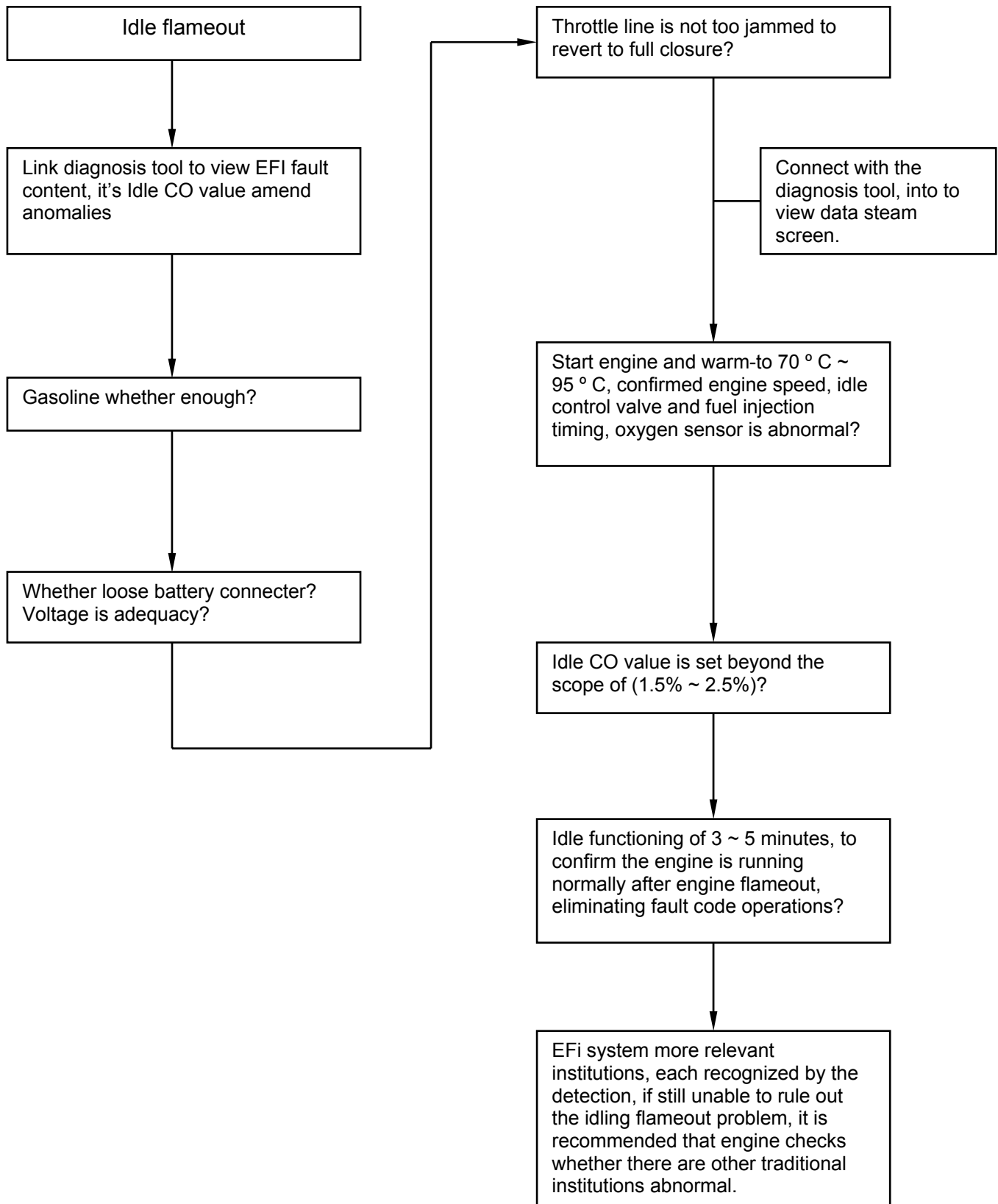




## 5. Fuel Injection System

### CO value revised anomaly

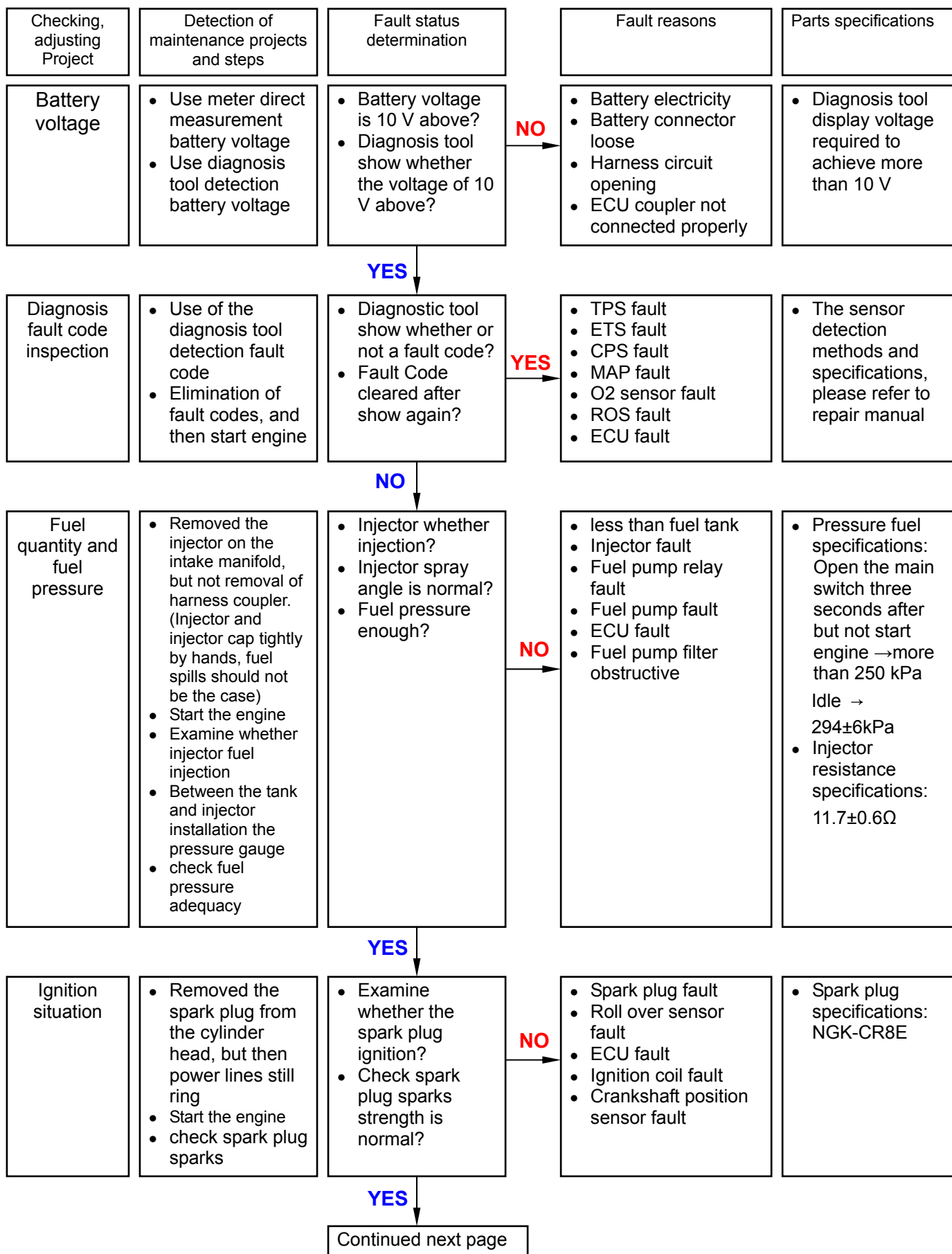
O2 Sensor equipped with the system, in principle, not adjusted CO value, such as CO value deviated from the normal range, check O2 Sensor and other agencies anomaly.

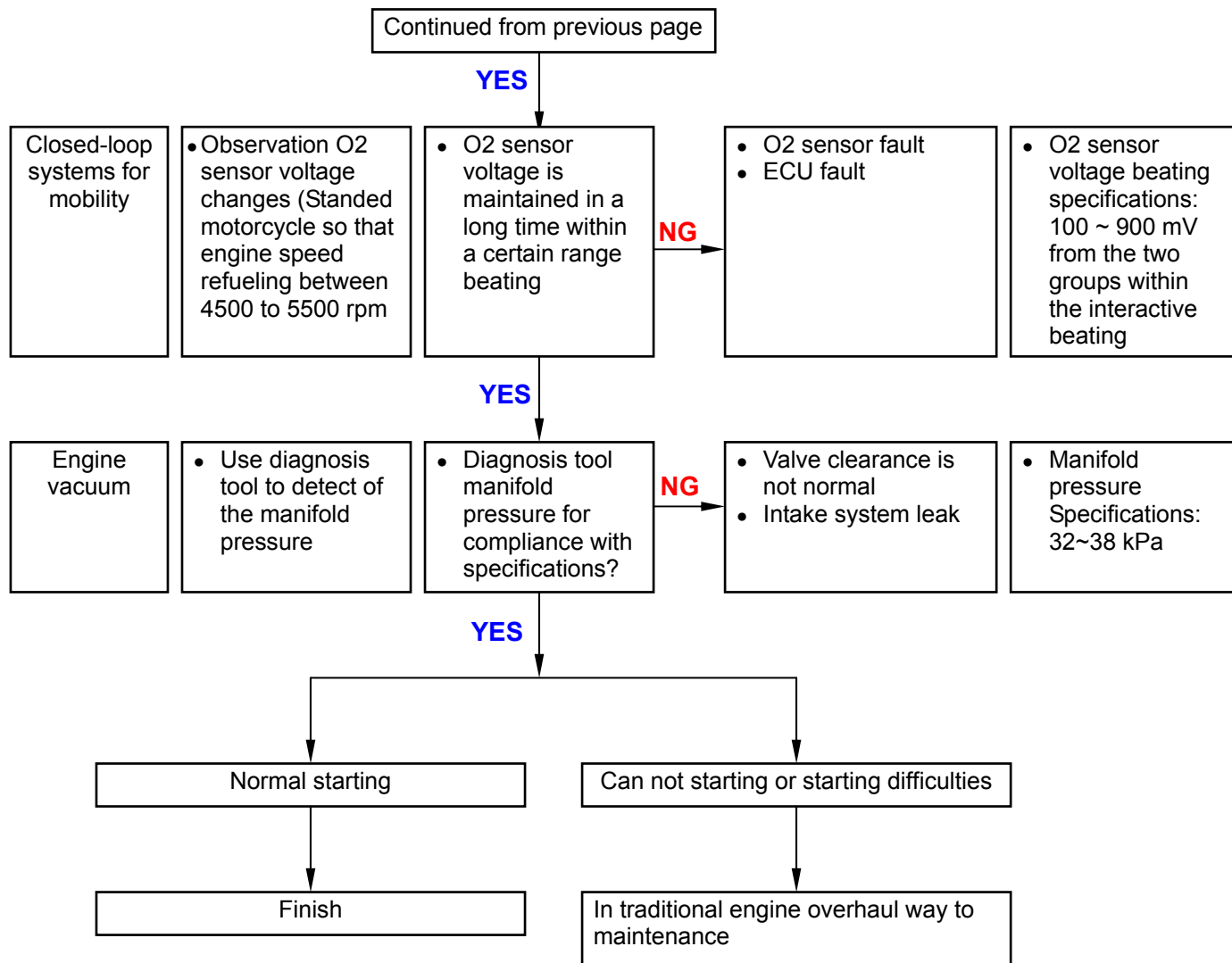




## 5. Fuel Injection System

### Integrated Fault Diagnosis Program





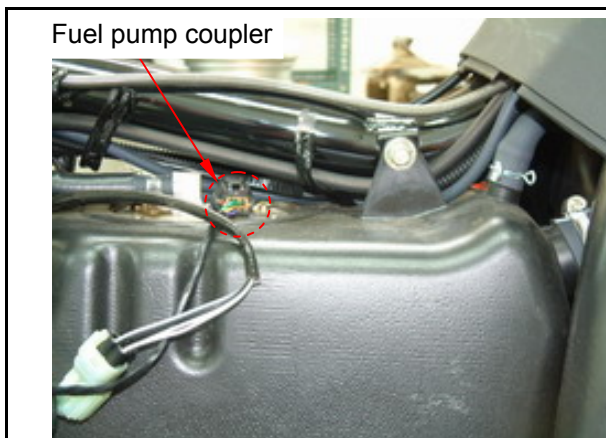
## 5. Fuel Injection System

### Remove fuel pump/fuel unit

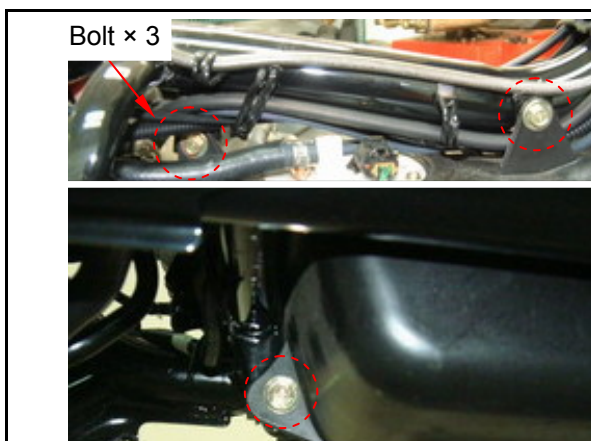
Remove side cover.  
Remove rear carrier  
Remove rear bodycover.  
Remove floor panel.  
Remove under cover.  
(refer to chapter 14)



Remove fuel pump lines coupler.  
Release the fuel tube folder, removed the fuel tube.



Remove the fuel tank fixed bolts (Bolt × 3), remove the fuel tank.

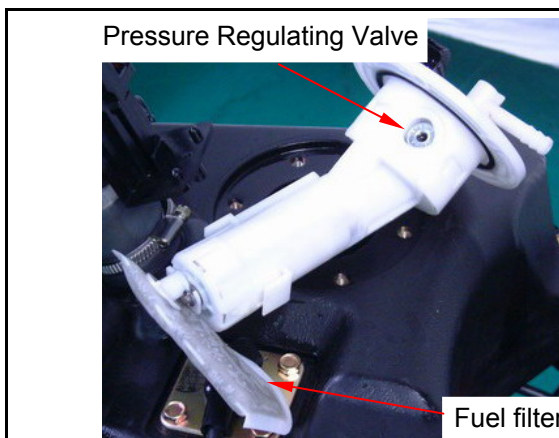


### Remove / Install fuel pump and fuel unit

Remove fuel pump fixed bolts (Bolt × 6), remove fuel pump.  
Install In the anti-demolition order.

### Cautions

- Then remove fuel pump, fuel in fuel tank internal to confirm not excessive.
- Then install fuel pump and fuel unit, attention direction.
- Confirm whether the fuel filter dirt, obstructive.
- Fuel pump installation, to confirm whether it is normal to the fuel out (the pressure about 3 kg/cm<sup>2</sup>).





## 5. Fuel Injection System

### Air Cleaner

#### Remove

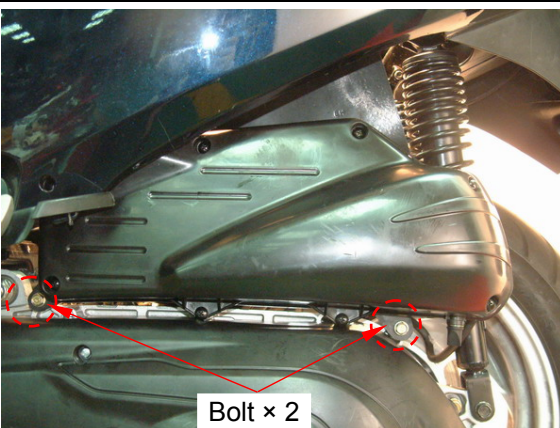
Remove left side body cover and luggage box.  
Remove rear carrier and body cover.  
Remove fuel gas recover tube.  
Remove waste gas purification system pipes.  
Remove intake temperature sensor coupler.



Remove intake tube fixed bolt (bolt×1).  
Remove air cleaner fixed bolts (bolt×2).  
Remove air cleaner.

#### Install

Install In the anti-demolition order.

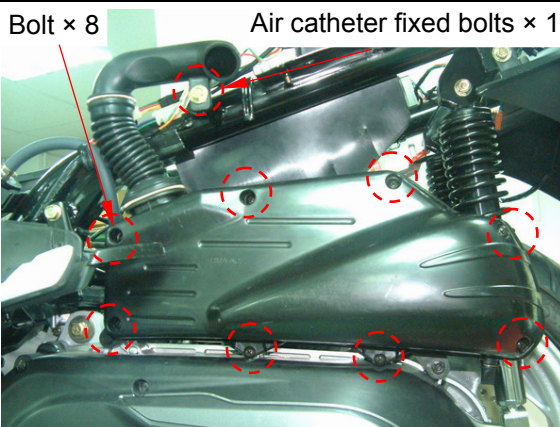


### Clean air cleaner filter

Remove air cleaner cover (bolt×8).  
Remove air cleaner filter (bolt×6).  
Use compressed air to remove the adhesion of dirt,  
if not too much dirt cleared, please new replacement.

#### ⚠ Cautions

- Air cleaner filter for paper products, must not soak or cleaning by water.

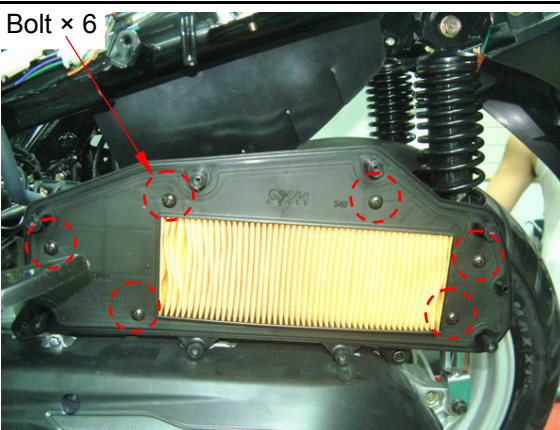


### Install air cleaner filter

Install In the anti-demolition order.

#### ⚠ Cautions

- Air cleaner filter and air filter cover should be covered formation is the installation, not to skew a seam, resulting dust, foreign body aspiration in the engine.





## 5. Fuel Injection System

### Fault Diagnosis Note

When the motorcycle injection system in the wrong signal, causing abnormal functioning of the engine or can not start engine, warning light at the meter will be lighting, to inform drivers to carry out maintenance.

Overhaul, the diagnosis tool can be used for troubleshooting (refer to diagnosis tool use guide), or manually by the meter warning light inspection revealed that the fault codes (refer to checking signal fault codes discriminant method), the two methods for maintenance.

If the fault has been ruled out or repair after the inspection light will be extinguished, but ECU fault code will be recorded, so the need to get rid of fault codes. If a fault exists, this system has two kinds of methods to eliminate fault codes respectively in the diagnosis tool removal and manual removal.

### Diagnosis tool for overhaul

Diagnosis tool will connect to the motorcycle for coupler diagnosis, according to the use of diagnostic tool testing methods, when belong fuel injection system fault or parts fault, according to the diagnosis tool of the fault code display messages do describe parts of the inspection testing maintenance and replacement parts. When after the maintenance, the need to get rid of fault codes (Please refer to detailed steps diagnosis tool of instructions), or fault code will always be stored in the ECU.

### Maintenance Manual

Use of cross-wiring (wire or paper clips, etc.) to cross-Joints Test Switch for grounding, in the meter of this check light are flashing, it means that the injection system or parts of abnormal situations, but not in the diagnosis tool can be - for the detection, inspection can enjoy for a long time flashing lights flashing and the short period of time to inform the cause of the malfunction (refer to check light fault information fault code table).

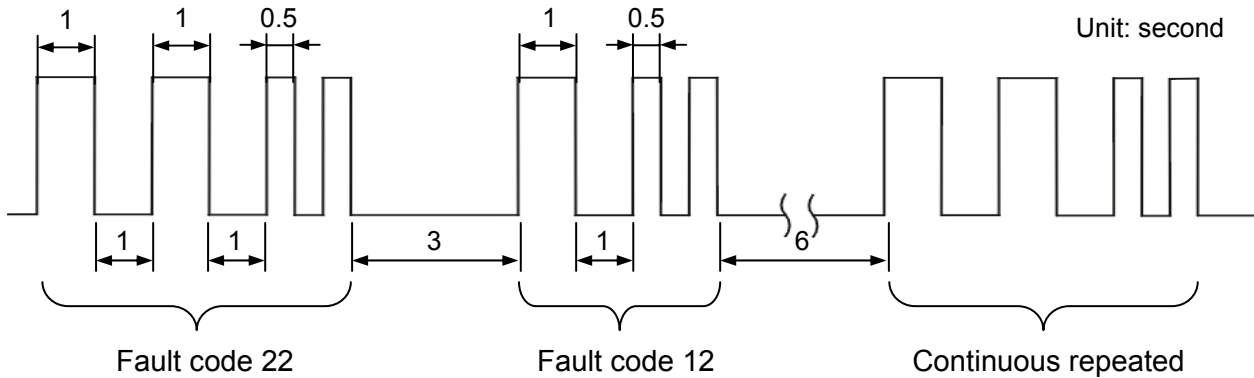


Diagnosis tool coupler and test switch coupler plant

## Check Light Fault Codes Discriminant Method

### Check light flashing mode

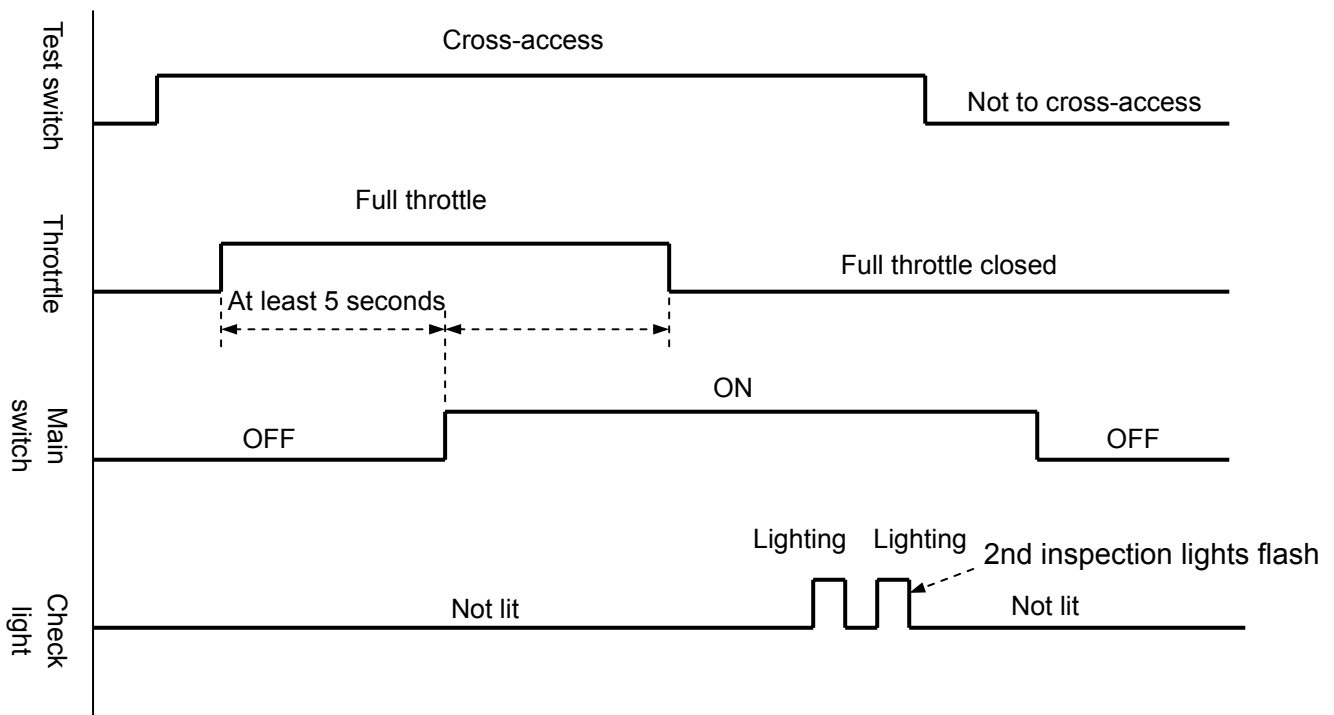
If problem without diagnosis tool to be detected, it can be cross-access the test switch coupler, the motorcycle from the CHK lights flashing signal interpretation, and then the basis for the diagnosis of dynamic information tables on the priorities of light, and prompts you to the motorcycle to the emergence of some warning, or FLASH CODE is to determine what kind of fault, and exclusion.



### Fault Code manual removal procedure:

When there is without diagnosis tool, can be manually cleared Fault Code, the implementation of the following steps:

1. Main switch OFF
2. Cross-access the test switch for interconnection access, and without opening up (cross-access movement must indeed).
3. Full throttle and do not open up.
4. Main switch ON
5. Described above, the No. 3 with the No. 4 movements continued liberalization of 5 seconds later, about 5 seconds after inspections at carnivals "flash twice" to complete the removal of fault code.
6. Then remove the cross-wiring.



## 5. Fuel Injection System

### Fault Code And The Sensors Of The Table

| No. | Fault codes | Fault Description                                        | Parts Inspection                           |
|-----|-------------|----------------------------------------------------------|--------------------------------------------|
| 1   | 0120        | Throttle position sensor fault                           | Throttle position sensor and wire          |
| 2   | 0105        | Manifold absolute pressure sensor fault                  | MAP sensor and wire                        |
| 3   | 0115        | Engine temperature sensor fault (water)                  | Engine temperature sensor and wire         |
| 4   | 0195        | Engine oil temperature sensor fault (oil)                | Engine temperature sensor and wire         |
| 5   | 0110        | Intake temperature sensor fault                          | Intake temperature sensor and wire         |
| 6   | 1630        | Roll over sensor fault                                   | Roll over sensor and wire                  |
| 7   | 0130        | O <sub>2</sub> sensor fault                              | O <sub>2</sub> Sensor and wire             |
| 8   | 0201        | I N J #1 fault                                           | injector and wire                          |
| 9   | 0351        | IG #1 fault                                              | Ignition coil and wire                     |
| 10  | 0230        | Fuel pump fault                                          | Fuel pump and wire                         |
| 11  | 0135        | O <sub>2</sub> sensor heater fault                       | O <sub>2</sub> Sensor and wire             |
| 12  | 1505        | ISC Idle_speed control motor fault                       | Ster motor and wire                        |
| 13  | 1410        | Exhaust 2 <sup>nd</sup> air control solenoid valve fault | 2 <sup>nd</sup> air control valve and wire |
| 14  | 0335        | Crank position sensor fault                              | Crank position sensor and wire             |
| 15  | 1205        | PM wire fault                                            | Manifold absolute pressure sensor wire     |
| 16  | 0603        | EEPROM fault                                             | EEPROM                                     |

## Fault Code and Check Light Flashing Lighting Identification Tables

| No. | Fault codes | Fault Description                                                                                                                   | Check light | Check light flashing state | Parts Inspection                           |
|-----|-------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------|--------------------------------------------|
| 1   | 0120        | Throttle position sensor fault                                                                                                      | Lighting    | long 0 , short 6           | Throttle position sensor and wire          |
|     |             | Fault detection procedures Please refer to the "EFI System components description" throttle position sensor (TPS) chapter           |             |                            |                                            |
| 2   | 0105        | Manifold Absolute Pressure sensor fault                                                                                             | lighting    | long 0 , short 9           | MAP sensor and wire                        |
|     |             | Fault detection procedures Please refer to the "EFI System components description" manifold Absolute Pressure sensor (MAP) chapter  |             |                            |                                            |
| 3   | 0115        | Engine temperature sensor fault (water)                                                                                             | lighting    | long 1 , short 2           | Engine temperature sensor and wire         |
|     |             | Fault detection procedures Please refer to the "EFI System components description" engine temperature sensor (WPS) chapter.         |             |                            |                                            |
| 4   | 0195        | Engine oil temperature sensor fault (oil)                                                                                           | lighting    | long 1 , short 1           | Engine temperature sensor and wire         |
|     |             | The current reservation                                                                                                             |             |                            |                                            |
| 5   | 0110        | Intake temperature sensor fault                                                                                                     | lighting    | long 1 , short 3           | Intake temperature sensor and wire         |
|     |             | Fault detection procedures Please refer to the "EFI System components description" intake temperature sensor (TAS) chapter.         |             |                            |                                            |
| 6   | 1630        | Roll over sensor fault                                                                                                              | lighting    | long 1 , short 5           | Roll over sensor and wire                  |
|     |             | Fault detection procedures Please refer to the "EFI System components description" Roll over sensor chapter.                        |             |                            |                                            |
| 7   | 0130        | O <sub>2</sub> sensor fault                                                                                                         | lighting    | long 1 , short 7           | O <sub>2</sub> Sensor and wire             |
|     |             | Fault detection procedures Please refer to the "EFI System components description" O <sub>2</sub> sensor chapter.                   |             |                            |                                            |
| 8   | 0201        | I N J #1 fault                                                                                                                      | lighting    | long 3 , short 3           | Injector and wire                          |
|     |             | Fault detection procedures Please refer to the "EFI System components description" fuel injector chapter.                           |             |                            |                                            |
| 9   | 0351        | IG #1 fault                                                                                                                         | lighting    | long 3 , short 7           | Ignition coil and wire                     |
|     |             | Fault detection procedures to adhere to the traditional way                                                                         |             |                            |                                            |
| 10  | 0230        | Fuel pump fault                                                                                                                     | lighting    | long 4 , short 1           | Fuel pump and wire                         |
|     |             | Fault detection procedures Please refer to the "EFI System components description" fuel pump chapter.                               |             |                            |                                            |
| 11  | 0135        | O <sub>2</sub> sensor heater fault                                                                                                  | lighting    | long 4 , short 5           | O <sub>2</sub> Sensor and wire             |
|     |             | Fault detection procedures Please refer to the "EFI System components description" O <sub>2</sub> Sensor chapter.                   |             |                            |                                            |
| 12  | 1505        | ISC motor fault                                                                                                                     | lighting    | long 4 , short 9           | Step motor and wire                        |
|     |             | Fault detection procedures Please refer to the "EFI System components description" idle speed control valve (ISC) chapter.          |             |                            |                                            |
| 13  | 1410        | Exhaust 2 <sup>nd</sup> air solenoid valve fault                                                                                    | lighting    | long 5 , short 4           | 2 <sup>nd</sup> air control valve and wire |
|     |             | Fault detection procedures Please refer to the "EFI System components description" 2 <sup>nd</sup> air solenoid valve chapter.      |             |                            |                                            |
| 14  | 0335        | Crankshaft position sensor fault                                                                                                    | lighting    | long 6 , short 6           | Crankshaft position sensor and wire        |
|     |             | Fault detection procedures Please refer to the "EFI System components description" Crankshaft position sensor chapter.              |             |                            |                                            |
| 15  | 1205        | PM wire fault                                                                                                                       | lighting    | long 6 , short 8           | Manifold absolute pressure sensor and wire |
|     |             | Fault detection procedures Please refer to the "EFI System components description" Manifold absolute pressure sensor (MAP) chapter. |             |                            |                                            |
| 16  | 0603        | EEPROM fault                                                                                                                        | Not lit     | long – , short –           | EEPROM                                     |
|     |             | This fault Please direct replacement ECU                                                                                            |             |                            |                                            |



## 5. Fuel Injection System



### Injection System for Use diagnosis - V70



#### Note:

- When problems arise, can be used for diagnosis tool of the fault is detected, and exclusion.
- In addition to testing, troubleshooting, another of the operation can be carried out data analysis-type monitor.

#### Method of Use:

1. Maintain engine flameout state, do not open main switch.
2. Opened the luggage box lighting light cover (screw x2), connected to the diagnostic connector for diagnosis tool.
3. Then open the main switch and the diagnosis tool power switch after diagnosis display screen appeared the words connection.
4. Press the "ENTER" button into the main screen (there are 6 major functions: ECU ID, DATA STREAM, FREEZED DATA, TROUBLE CODE, ERASE TB CODE and CO ADAPTION)
5. Use ▲, ▼ select button under the function, press the "ENTER" button access into various functions. Example: select "DATA STREAM," by the "ENTER" button, the screen showed that the existing fault codes; indicates no fault "system is OK."
6. Press "EXIT" button to leave of the various functions.
7. Must to close the main switch or power switch of the diagnosis tool after, and then can removal of diagnosis tool coupler.

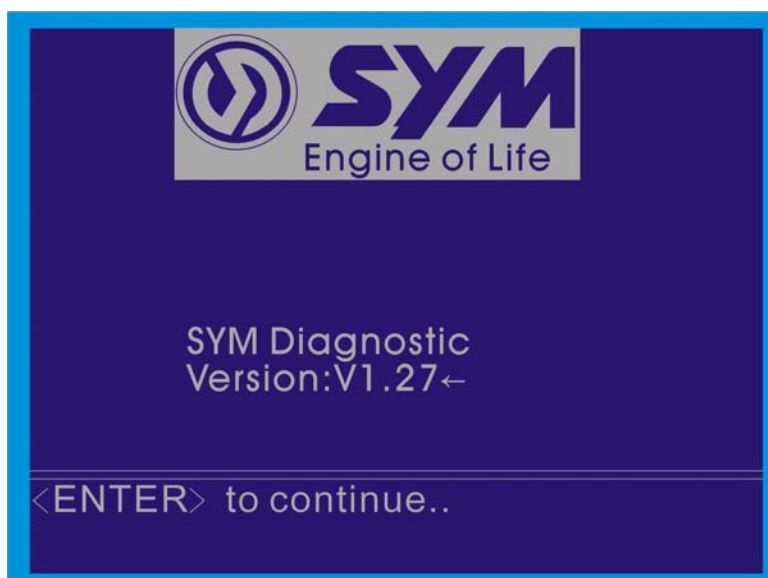
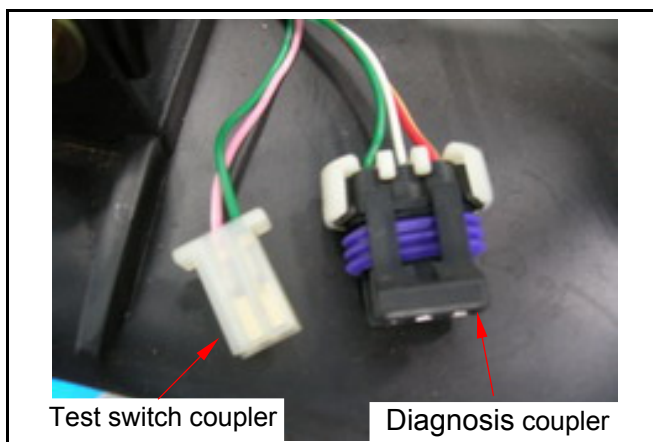


## 5. Fuel Injection System

### Diagnosis Use Note

#### Diagnosis of connectivity

1. For the diagnosis tool coupler access to the motorcycle injection system diagnostic signal coupler.
2. main switch ON.
3. Open the diagnosis left power switch, which turn on the LCD screen, the screen brightness adjustment knob to the appropriate brightness.
4. SYM and cartridge content display on screen (such as icon), by the beginning of the implementation of any button.
5. Display diagnostic software release; press the "ENTER" button to the implementation.



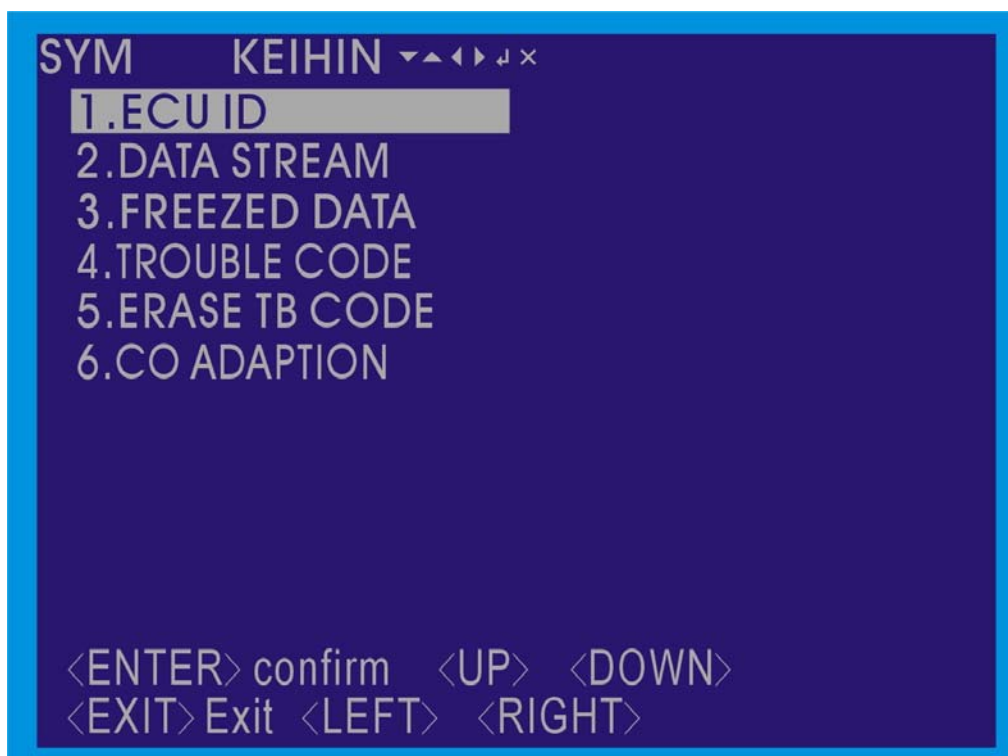
## 5. Fuel Injection System



### Options main functional areas:

1. ECU ID
2. DATA STREAM
3. FREEZED DATA
4. TROUBLE CODE
5. ERASE TB CODE
6. CO ADAPTION

Use "▲" "▼" button, select mobile anti-white subtitles implementation of the project, and then press the "ENTER" key to the implementation.



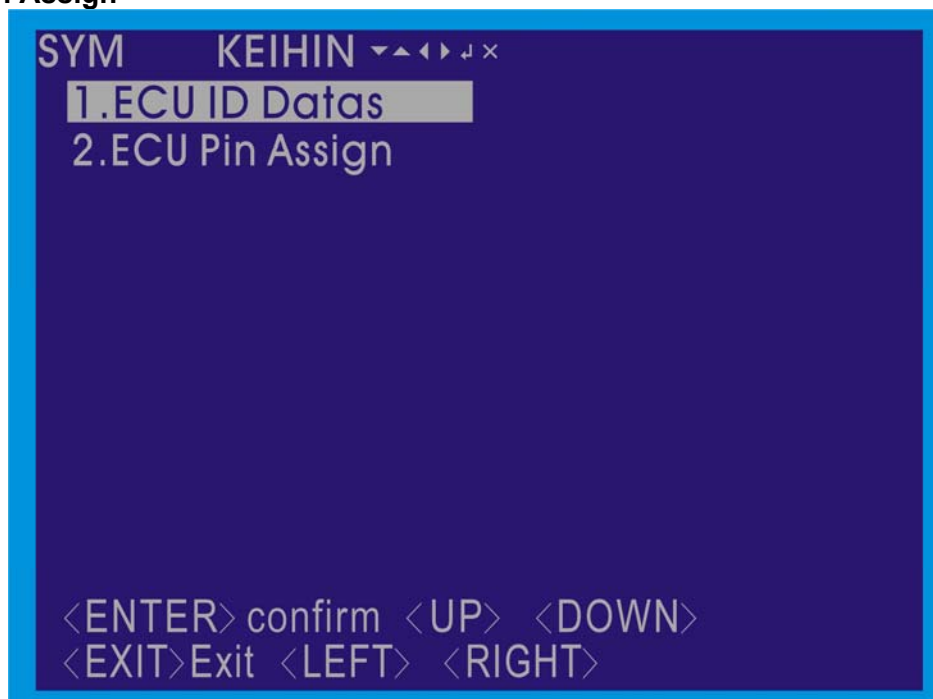
### 1. ECU ID

In the directory functions used "▲" "▼" button, select ECU ID project, press the "ENTER" button to the implementation of information systems function.

ECU ID containing two functions:

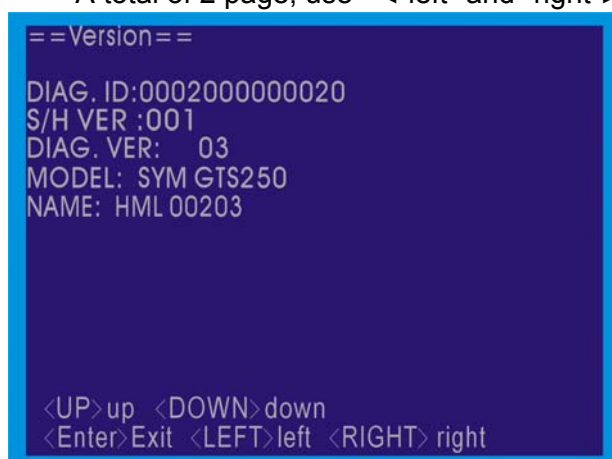
#### 1-1. ECU ID Datas

#### 1-2. ECU Pin Assign

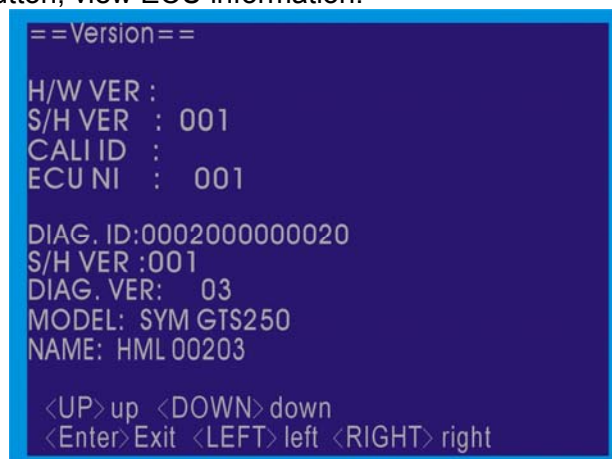


#### 1-1. ECU ID Datas

Use "▲" "▼" button, select ECU ID projects, press the "ENTER" button to the implementation. A total of 2 page, use "◀ left" and "right ▶" button, view ECU information.



DIAG. ID: 0002000000020 (Diagnosis tool ID)  
S/H VER: 001 (Software Version)  
DIAG. VER: 03 (Diagnosis Version)  
MODEL: SYM GTS250  
NAME: HML 00203

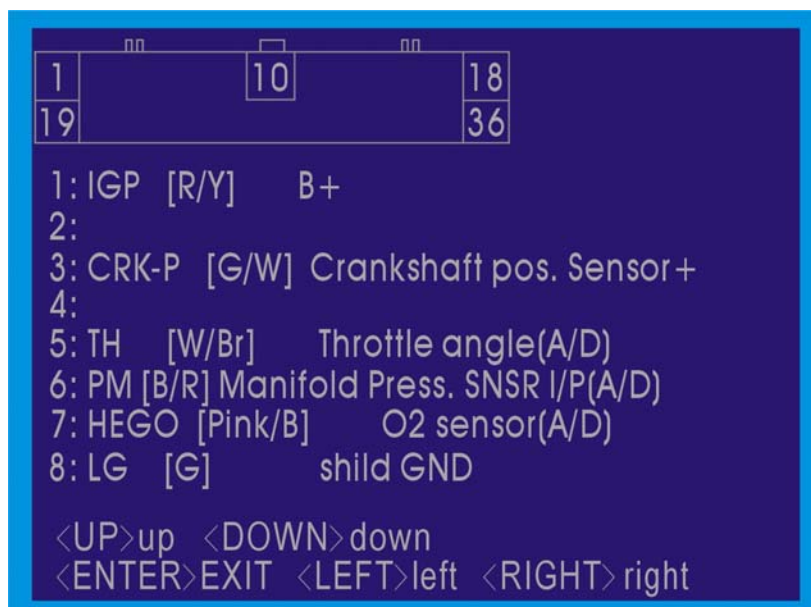


H/W VER: (Hardware version)  
S/H VER: 001 (Software Version)  
CALI ID: (Correction ID Code)  
ECU NO: 001

### 1-2. ECU Pin Assign

Use "▲" "▼" button, select the ECU pin project, press the "ENTER" button to the implementation of the ECU pin functions.

ECU pin assign total of 5 pages that can be used "◀ left" and "right ▶" button, view the page note.



#### Page 1:

- 1: IGP [R/Y] B+
- 2:
- 3: CRK-P [G/W] Crankshaft pos. Sensor-
- 4:
- 5: TH [W/Br] Throttle angle [A/D]
- 6: PM [B/R] Manifold Press. SNSR I/P [A/D]
- 7: HEGO [Pink/B] O2 sensor [A/D]
- 8: LG [G] shild GND

#### Page 2:

- 9: CRK-M [L/Y] Crankshaft pos. Sensor+
- 10: K-LINE [W/G] K-Line
- 11: FLPR [O/W] Fuel pump relay O/P
- 12: SOL [O/L] 2<sup>nd</sup> air (RV250)
- 13: VCC [Y/B] Sensor V+ (DC 5V)
- 14: ISCBP [G/B] Step MTR B+ (RV250)
- 15: ISCAP [L/B] Step MTR A+ (RV250)
- 16: INJ [L/G] Injection O/P

#### Page 3:

- 17: HEGOHT [R/O] O2 Sensor heater
- 18: IG [B/Y] Ignition O/P
- 19: BAT [R] Battery B+ (RV250)
- 20: TRIG [Pink] Test sw
- 21: MIL [Y/G] MIL O/P
- 22: TE [R/Gr] Eng. Temp. Sensor (A/D)
- 23:
- 24: SG [G/R] Sensor (A/D) GND

#### Page 4:

- 25: TA [G/Br] IAT Sensor (RV250)
- 26:
- 27:
- 28:
- 29:
- 30:
- 31: ISCAN [Br/B] Step MTR A- (RV250)
- 32: ISCBN [B/W] Step MTR B- (RV250)

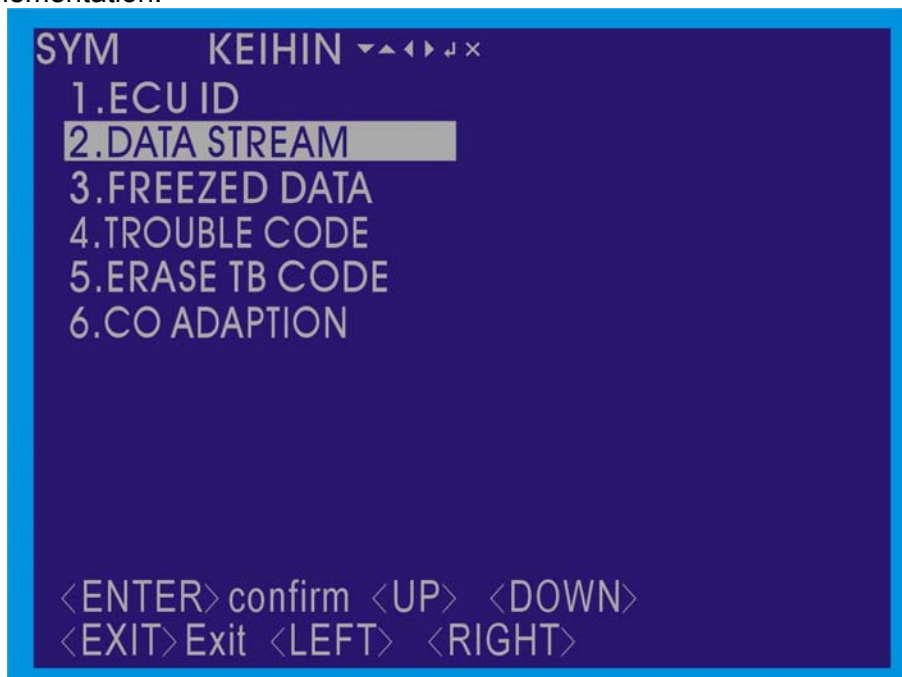
#### Page 5:

- 33:
- 34:
- 35: PG1 [G] System GND
- 36: PG [G] System GND

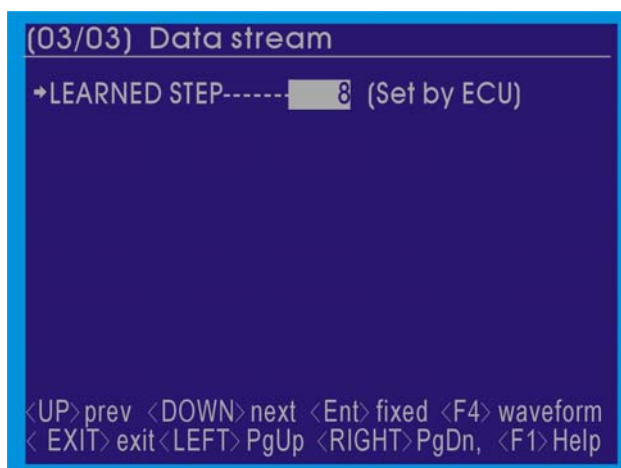
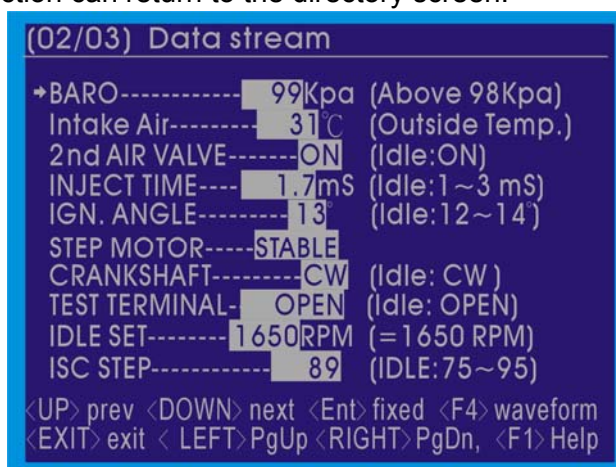
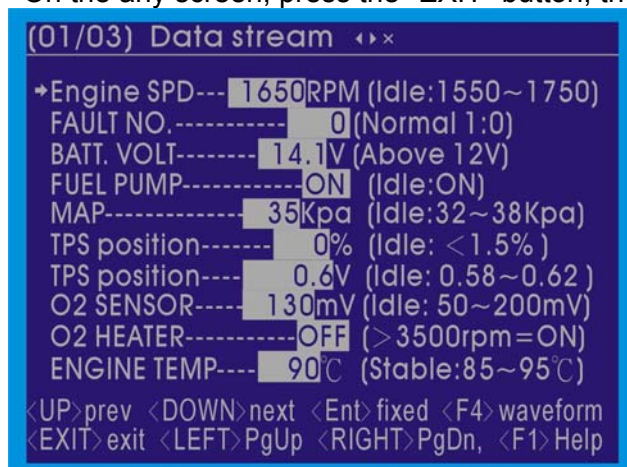


## 2. DATA STREAM

In the directory functions used "▲" "▼" button, select "DATA STREAM" project, press the "ENTER" key to the implementation.



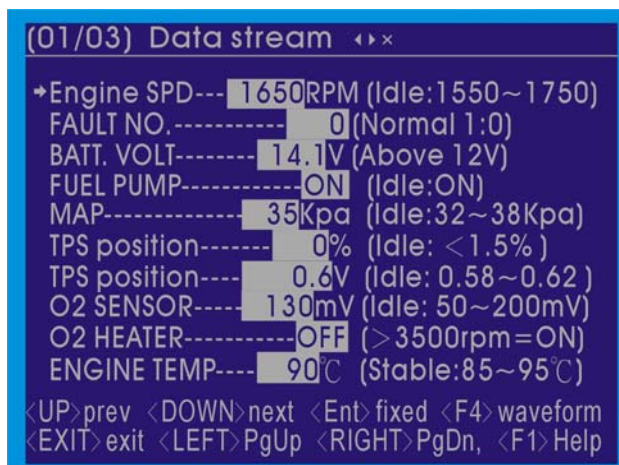
A total of 3 pages, are able to use "◀ left" and "right ▶" button, view injection system information. On the any screen, press the "EXIT" button, the function can return to the directory screen.



## 5. Fuel Injection System



### Data stream (1/3)



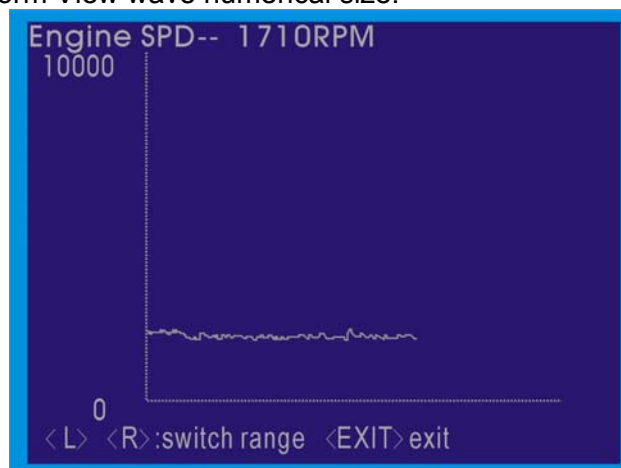
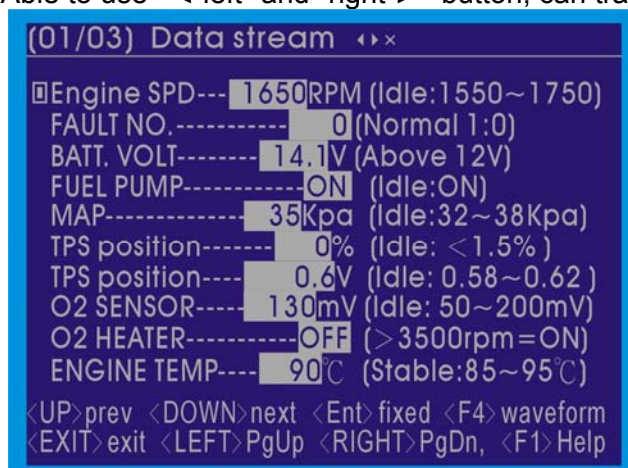
The screen showed the ECU captured by the engine of the state immediately.

The following data for the benchmark idling state:

- Engine SPD--- 1650RPM (Idle:1550~1750) →Engine idle speed
- FAULT NO.----- 0 (Normal:0) →Fault code number
- BATT. VOLT----- 14.1V (Above 12V) →Battery voltage
- FUEL PUMP----- ON (Idle:ON) →Fuel pump actuator state
- MAP----- 35kPa (Idle:32~38kPa) →Manifold pressure
- TPS position----- 0% (Idle:< 1.5%) →Throttle opening
- TPS position--- 0.6V (Idle:0.58~0.62) →Throttle sensor voltage
- O<sub>2</sub> SENSOR----- 130mV (Idle:50~200mV) →O<sub>2</sub> sensor voltage
- O<sub>2</sub> HEATER----- OFF (Idle:> 3500rpm=ON) →O<sub>2</sub> heater actuator state
- ENGINE TEMP--- 90°C (Stable:85~95°C) →Engine temperature (cooling water temperature)

In the "DATA STREAM" of the screen use "▲" "▼" button to move the left side of the project "→" symbol selected items, press the "ENTER" button lock of the project, and press the "F4" button showed that the wave of projects.

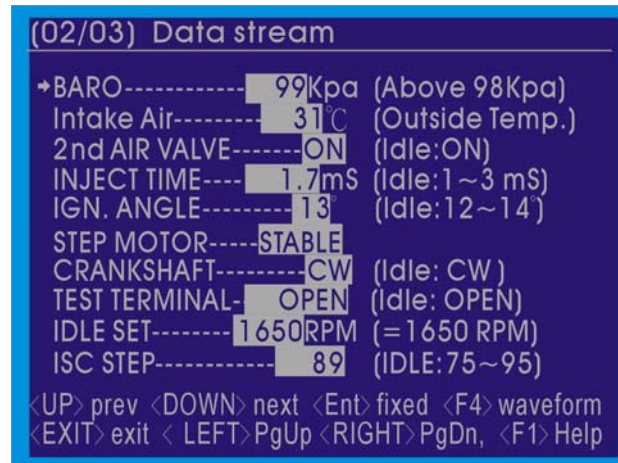
Able to use "◀ left" and "right ▶" button, can transform View wave numerical size.



Numerical analysis of images (1 / 3), the waveform can be displayed as shown in the following items:

- Engine SPD
- BATT. VOLT
- MAP
- TPS position %
- TPS position Voltage
- O<sub>2</sub> SENSOR Voltage
- ENGINE TEMP

### Data stream (2/3)



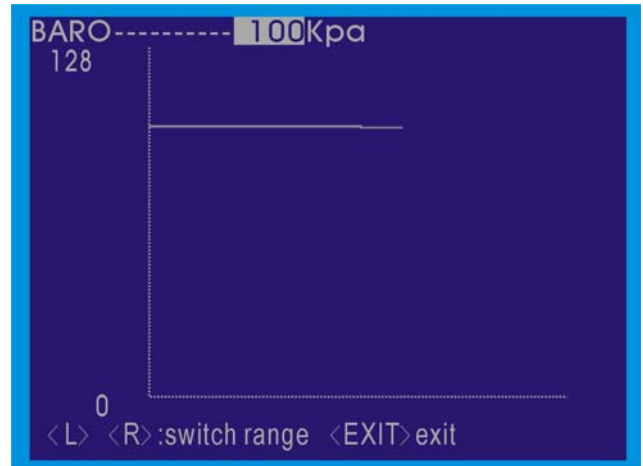
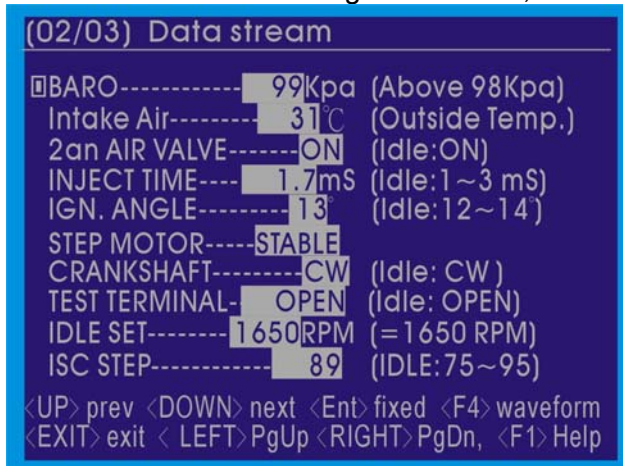
The screen showed the ECU captured by the engine of the state immediately.

The following data for the benchmark idling state:

- BARO----- kPa (Above 98kPa) → Atmospheric pressure
- Intake Air----- °C (Outside Temp.) → Intake air temperature
- 2nd AIR VALVE----- V (Idle: ON) → Secondary air solenoid valve actuator state
- INJECT TIME----- mS (Idle: 1~3mS) → Injection time
- IGN. ANGLE----- (Idle: 12~14) → Ignition timing
- STEP MOTOR ----- → Idle air control valve step motor actuator state
- CRANKSHAFT ----- (Idle: CW) → Crankshaft functioning direction
- TEST TERMINAL-- (Idle: OPEN) → Test terminal state
- IDLE SET----- RPM (=1650 RPM) → Idle speed goal set value
- ISC STEP----- (Idle: 75~95) → Idle Air Control Valve stepper motor learning step

In the "DATA STREAM" of the screen use "▲" "▼" button to move the left side of the project "→" symbol selected items, press the "ENTER" button lock of the project, and press the "F4" button showed that the wave of projects.

Able to use "◀ left" and "right ▶" button, can transform View wave numerical size.

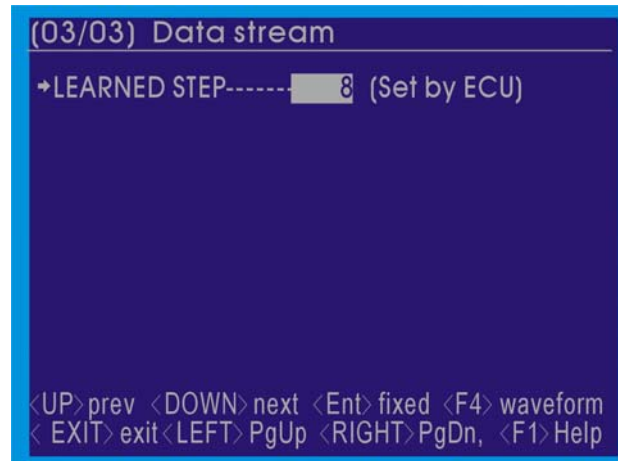


Numerical analysis of images (2 / 3), the waveform can be displayed as shown in the following items:

- BARO
- Intaje Air
- INJECT TIME
- IGN. ANGLE
- IDLE SET
- ISC STEP



### Data stream (3/3)



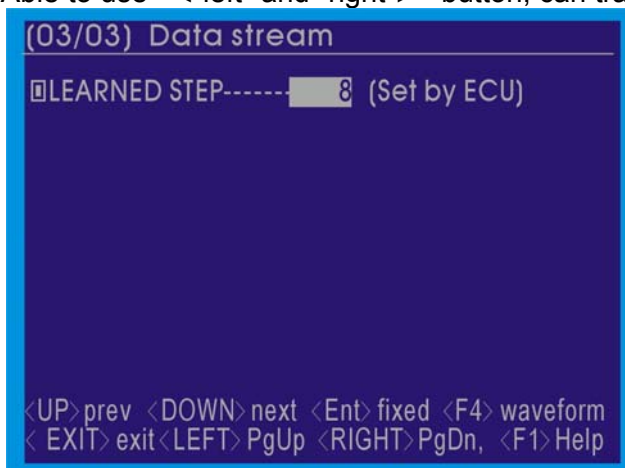
The screen showed the ECU captured by the engine of the state immediately.

The following data for the benchmark idling state:

- LEARNED STEP-----8 (Set by ECU) →Idle Air Control Valve stepper motor learning step

In the "DATA STREAM" of the screen use "▲" "▼" button to move the left side of the project "→" symbol selected items, press the "ENTER" button lock of the project, and press the "F4" button showed that the wave of projects.

Able to use "◀ left" and "right ▶" button, can transform View wave numerical size.



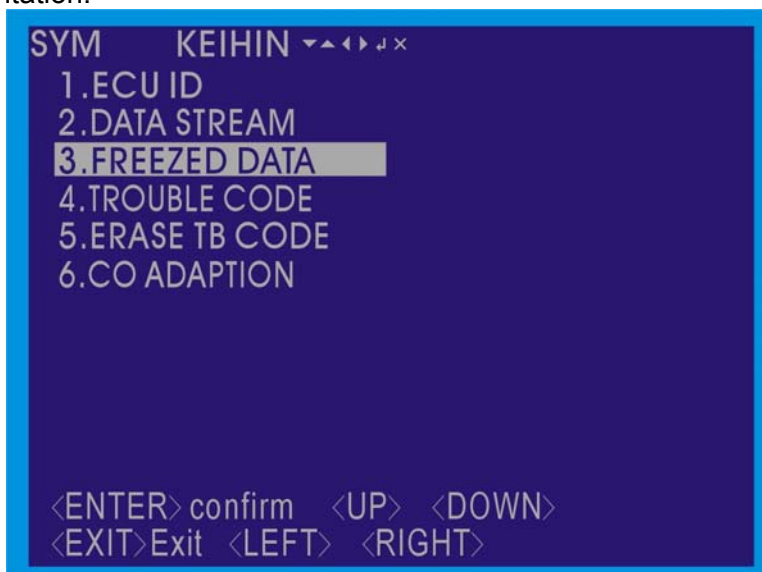
Numerical analysis of images (3 / 3), the waveform can be displayed as shown in the following items:

- LEARNED STEP NO.

### 3. FREEZED DATA

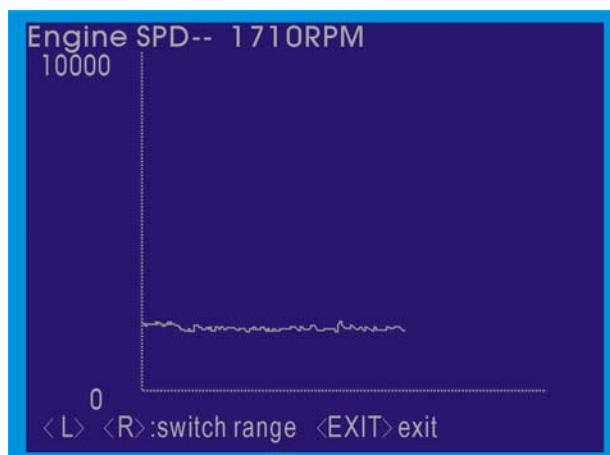
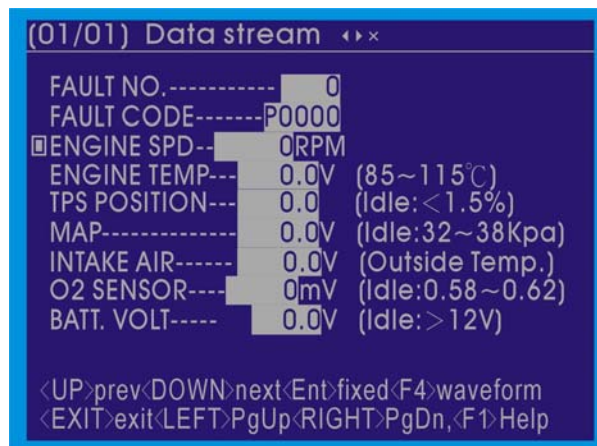
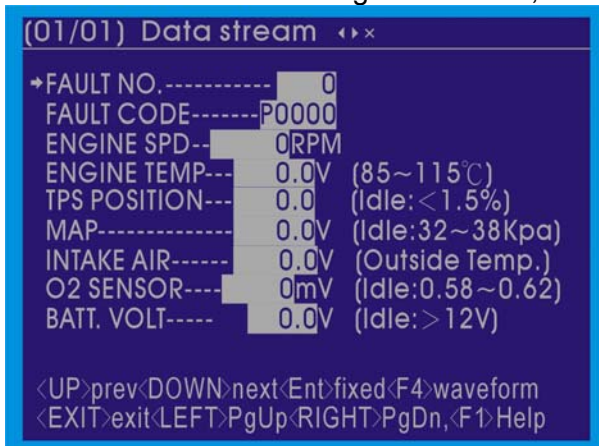
**Objective:** When a sensor fault, the EMS system will record all the parameters of fault signals, in order to facilitate fault diagnosis.

In the directory functions used "▲" "▼" button, select "FREEZED DATA" project, press the "ENTER" key to the implementation.



Only one page, at any screen, press the "EXIT" button, the function can return to the directory screen. In the "FREEZED DATA" of the screen use "▲" "▼" button to move the left side of the project "→" symbol selected items, press the "ENTER" button lock of the project, and press the "F4" button showed that the wave of projects.

Able to use "◀ left" and "right ▶" button, can transform View wave numerical size.





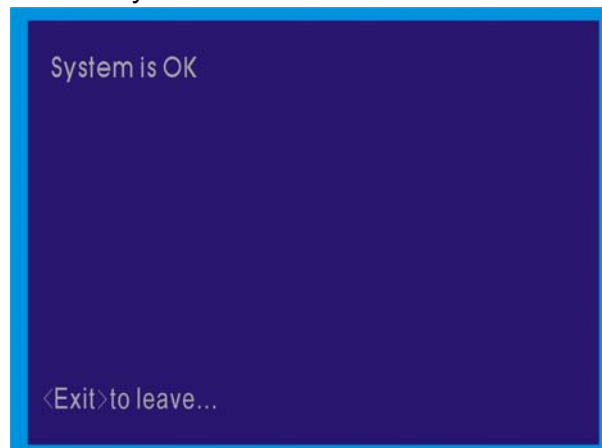
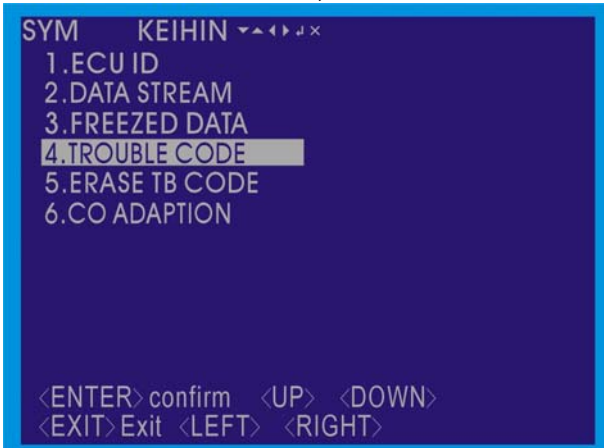
### 4. TROUBLE CODE

In the functional directory select "TROUBLE CODE" project, press the "ENTER" button implementation, the message began to read fault.

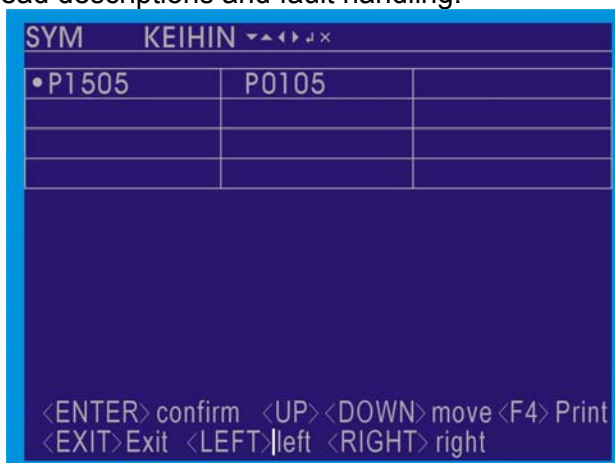
**Fault Code:** electronic injection system that had happened fault of the message (whether or not completion of repair).

Without any fault is that showing "System is OK".

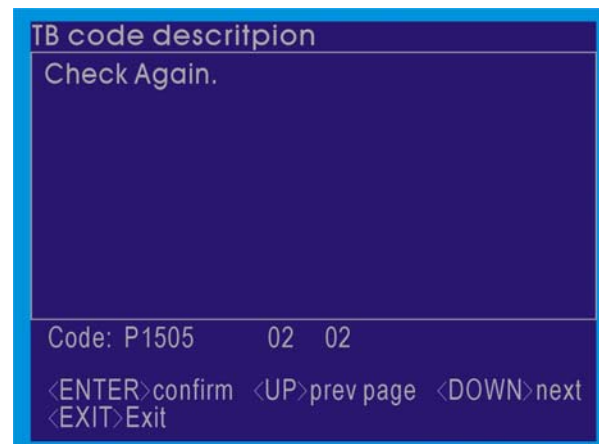
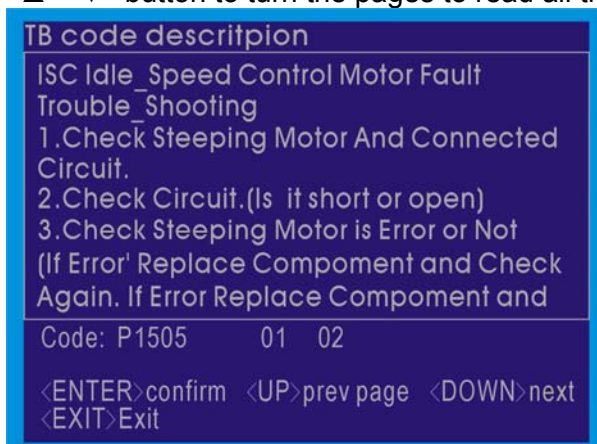
Press the "EXIT" button, the function can return to the directory screen.



If the system has faulty code, that is showing the fault code, that can be used "◀ left" and "right ▶" or "▲" "▼" button selected the fault code (selected before the code "•" tags) that, press the "ENTER" button, the code can be read descriptions and fault handling.



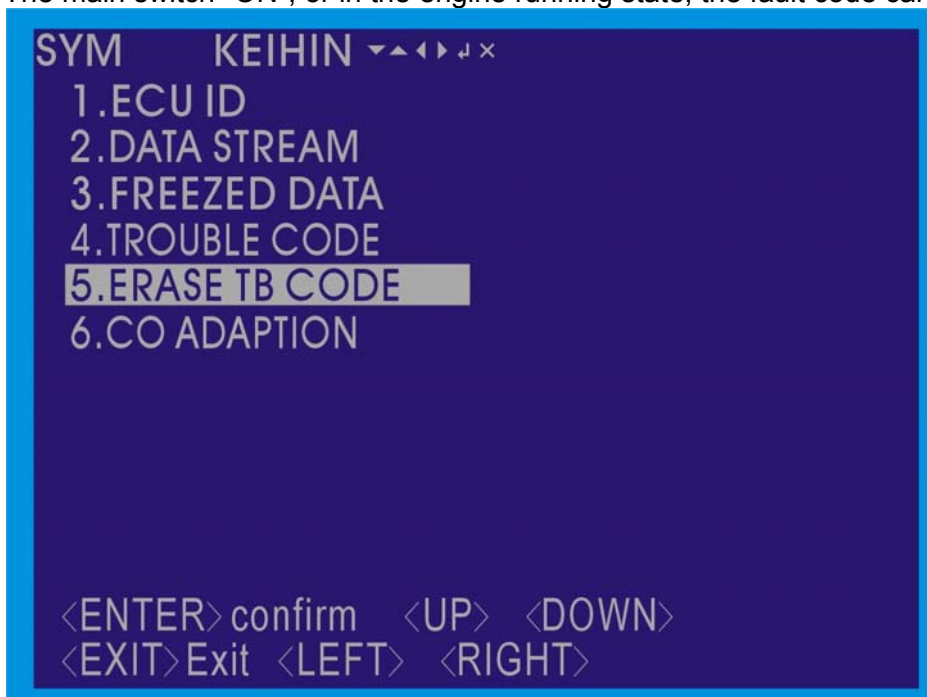
Fault code in the note and treatment of the pages, if the first one page did End, they can press the "▲" "▼" button to turn the pages to read all that.



### 5. ERASE TB CODE

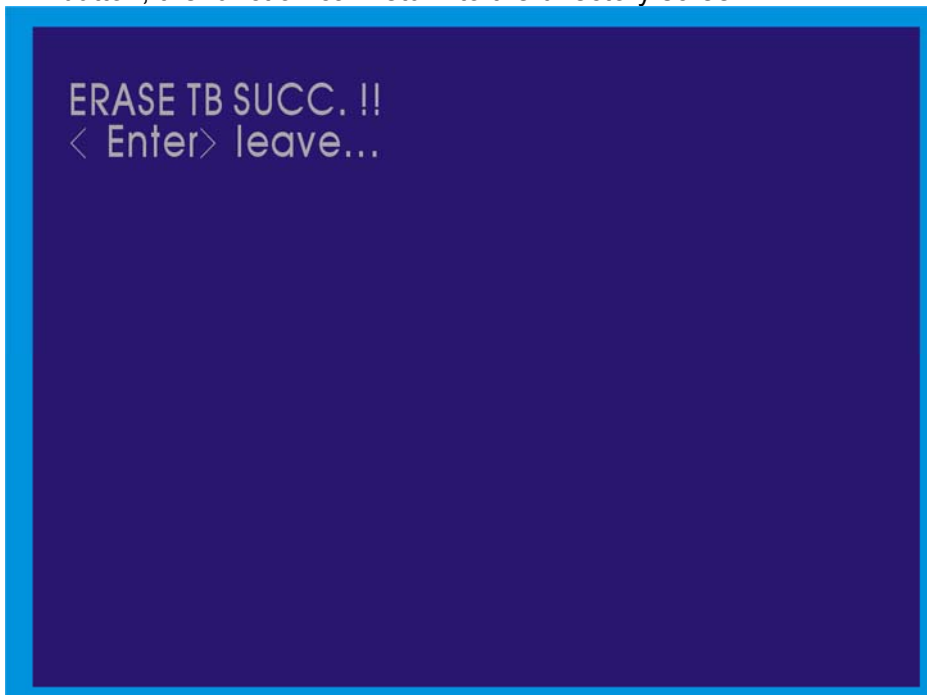
In the directory functions used "▲" "▼" button, select "ERASE TB CODE" project, press the "ENTER" key to the implementation.

**Conditions:** The main switch "ON", or in the engine running state, the fault code can be removed.



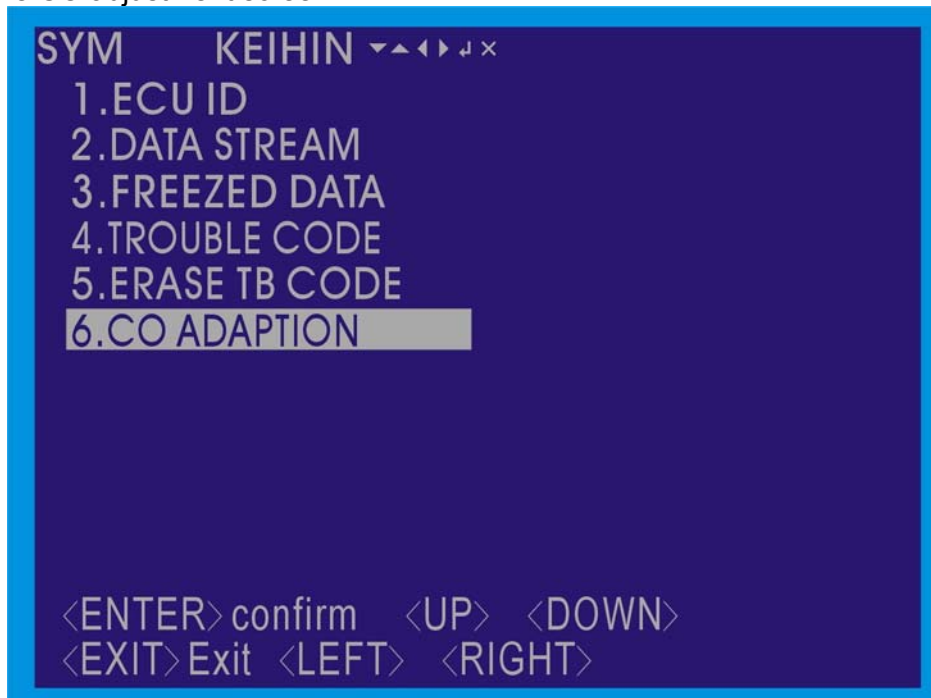
Fault code removed, namely showing the "ERASE TB SUCC.!!".

Press the "EXIT" button, the function can return to the directory screen.



### 6. CO ADAPTION

In the directory functions used "▲" "▼" button, select "CO ADAPTION" project, press the "ENTER" button into the CO adjustment screen.

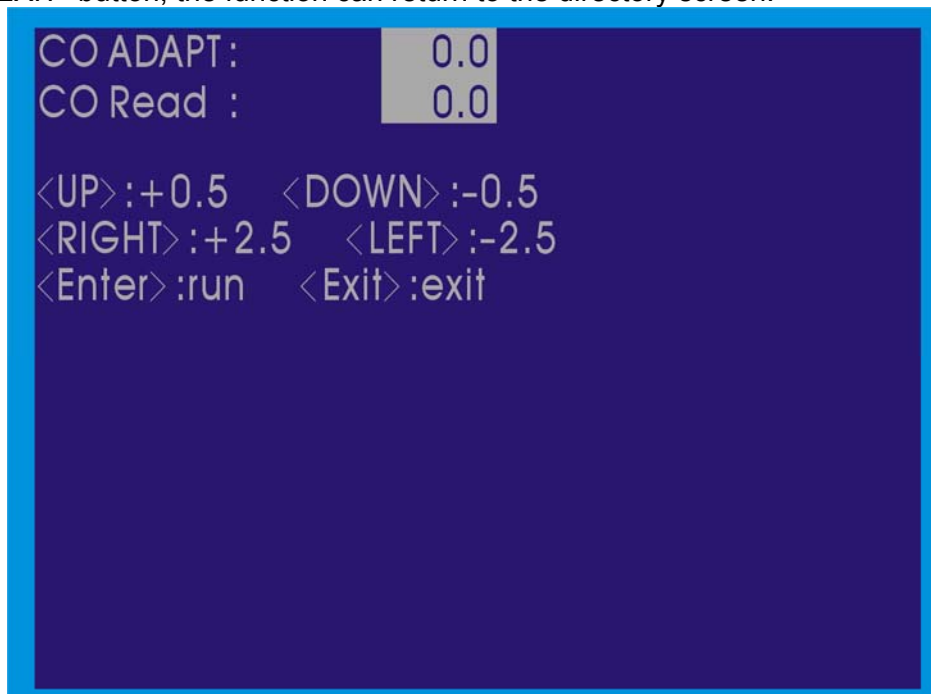


Use "◀ left" and "right ▶" or "▲" "▼" button, CO value can be adjusted.

CO ADAPT: CO adjusted value.

CO Read: CO read-back value.

Press the "EXIT" button, the function can return to the directory screen.



## Troubleshooting Table

| Test items<br>Abnormal phenomena |                       | Comprehensive testing program |                                |                |                       |                                |                                        |                      | Parts |                          |                     |
|----------------------------------|-----------------------|-------------------------------|--------------------------------|----------------|-----------------------|--------------------------------|----------------------------------------|----------------------|-------|--------------------------|---------------------|
|                                  |                       | Power voltage                 | Fuel press.                    | Ignition state | Engine vacuum         | Injection state                | closed-loop control system             | Fault Code Detection | ECU   | Throttle position sensor | Engine temp. sensor |
| Start state                      | Can't start           | ○                             | ○                              | ○              | ○                     | ○                              |                                        | ○                    | ○     |                          |                     |
|                                  | Difficult to start    | ○                             | ○                              |                | ○                     |                                |                                        | ○                    |       | ○                        | ○                   |
| Idle state                       | Without idle          |                               |                                | ○              | ○                     | ○                              |                                        | ○                    |       | ○                        | ○                   |
|                                  | Idle not smooth       |                               |                                |                |                       | ○                              | ○                                      | ○                    | ○     | ○                        |                     |
|                                  | RPM NG                |                               |                                |                |                       |                                |                                        | ○                    | ○     |                          |                     |
|                                  | CO NG                 |                               | ○                              |                |                       | ○                              | ○                                      | ○                    | ○     |                          |                     |
| Acceleration                     | Not smooth            |                               | ○                              | ○              | ○                     | ○                              |                                        | ○                    | ○     | ○                        | ○                   |
|                                  | Inability and slow    |                               | ○                              | ○              | ○                     | ○                              |                                        | ○                    | ○     | ○                        | ○                   |
| Flameout                         | Idle flameout         |                               |                                |                | ○                     |                                |                                        | ○                    |       |                          |                     |
|                                  | Acceleration flameout |                               |                                |                |                       |                                |                                        | ○                    | ○     |                          |                     |
| Related spare parts              |                       | Roll over sensor              | Fuel pump                      | Ignition coil  | Inlet pipe            | Injector                       | O2 sensor                              |                      |       |                          |                     |
|                                  |                       | Power relay                   | Fuel pressure adjustment valve | Spark plug     | Cylinder head         | Fuel pump                      | Secondary air injection solenoid valve |                      |       |                          |                     |
|                                  |                       | Security unit                 | Fuel pump relay                |                | Inlet pressure sensor | Fuel pressure adjustment valve |                                        |                      |       |                          |                     |
|                                  |                       | Main switch                   | Fuel filter                    |                |                       |                                |                                        |                      |       |                          |                     |
|                                  |                       | Battery                       |                                |                |                       |                                |                                        |                      |       |                          |                     |

**Notes:** 1. Integrated test motorcycle, according to the "Comprehensive Maintenance list" implementation.  
2. Spare parts, according to the "EFI System components description" implementation.



## 5. Fuel Injection System

### Comprehensive Maintenance List

| No. | Maintenance Project                 | Testing Procedures                                                                                                                                                                                                                                                                                                                                                                                            | Test items                                                                                                                                                                                                | Determine benchmarks                                                                                                                                                                                                                                                                | Fault reasons                                                                                                                                                                                                                                                                                                                                    |
|-----|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | <b>Power and voltage</b>            | <ul style="list-style-type: none"> <li>• Use meter direct measurement battery voltage</li> <li>• Use diagnosis tool detection of battery voltage</li> </ul>                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>• Battery voltage</li> </ul>                                                                                                                                       | <ul style="list-style-type: none"> <li>• Battery voltage = 10V Above</li> </ul>                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• Battery electricity</li> <li>• Battery connector loose</li> <li>• Harness circuit opening</li> <li>• ECU coupler not connected properly</li> </ul>                                                                                                                                                      |
| 2   | <b>Fuel pressure</b>                | <ul style="list-style-type: none"> <li>• Use fuel pressure gauge, connected in series between the injector and the Pressure Regulating Valve</li> <li>• Main switch ON, but not start engine</li> <li>• Check fuel pressure</li> <li>• Start engine (idle)</li> <li>• Check change of the fuel pressure</li> <li>• throttle several rotation</li> <li>• check to the change of fuel pressure again</li> </ul> | <ul style="list-style-type: none"> <li>• Open the main switch, but not to start the engine of pressure</li> <li>• Pressure in idle</li> <li>• Rotating throttle, situation of pressure changes</li> </ul> | <ul style="list-style-type: none"> <li>• Open main switch, but not start: pressure = 250kPa (Stable value)</li> <li>• Idle state: pressure = 294±6kPa (Beating situation from top to bottom)</li> <li>• rotation throttle moment: pressure = 294±6kPa (Slightly beating)</li> </ul> | <ul style="list-style-type: none"> <li>• Fuel not enough</li> <li>• Security switch not disarm</li> <li>• Fuel pump relay fault</li> <li>• Fuel pump fault</li> <li>• Injector fault</li> <li>• ECU fault</li> </ul>                                                                                                                             |
| 3   | <b>Ignition state</b>               | <ul style="list-style-type: none"> <li>• The spark plug removed from the cylinder head, but the power lines still ring</li> <li>• Start engines or use for the diagnosis tool of output View spark plug ignition conditions</li> </ul>                                                                                                                                                                        | <ul style="list-style-type: none"> <li>• Spark plug specifications</li> <li>• Whether the spark plug ignition</li> <li>• Spark plug sparks whether it is normal strength</li> </ul>                       | <ul style="list-style-type: none"> <li>• Specifications: NGK-CR8H</li> <li>• Ignition conditions: With traditional engines found ways</li> </ul>                                                                                                                                    | <ul style="list-style-type: none"> <li>• Spark plug fault</li> <li>• Roll over sensor fault</li> <li>• ECU No. 5 pin fault</li> <li>• Ignition coil fault</li> <li>• Crankshaft position sensor fault</li> </ul>                                                                                                                                 |
| 4   | <b>Engine vacuum</b>                | <ul style="list-style-type: none"> <li>• Diagnosis tool to detect the use of</li> </ul>                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>• Manifold pressure of diagnosis tool</li> </ul>                                                                                                                   | <ul style="list-style-type: none"> <li>• Manifold pressure = 32~38kPa</li> </ul>                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• Valve clearance abnormal</li> <li>• Intake system leak</li> </ul>                                                                                                                                                                                                                                       |
| 5   | <b>Injection state</b>              | <ul style="list-style-type: none"> <li>• The injector removed from the throttle body, but not dismantle pipeline</li> <li>• Main switch ON, but not start engine</li> <li>• Investigation the injector it's leaking fuel?</li> <li>• Once again start engines or use for the diagnosis tool of output function</li> <li>• Check injector fuel injection and the injection situation</li> </ul>                | <ul style="list-style-type: none"> <li>• Open the main switch, but did not start engine the injection situation</li> <li>• Injector state when start</li> </ul>                                           | <ul style="list-style-type: none"> <li>• Not started, injector not leaking fuel</li> <li>• In started, the injection state must show fan shape</li> </ul>                                                                                                                           | <ul style="list-style-type: none"> <li>• Security unit is configured not disarm</li> <li>• Fuel pump relay fault</li> <li>• Fuel pump fault</li> <li>• Injector fault</li> <li>• ECU fault</li> </ul>                                                                                                                                            |
| 6   | <b>Closed - loop control system</b> | <ul style="list-style-type: none"> <li>• Use of diagnostic tool observation O2 Sensor voltage changes</li> </ul>                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• Stable condition, sensor voltage variation (Idle continued 5 minutes later to measurement)</li> </ul>                                                            | <ul style="list-style-type: none"> <li>• Idle stable condition: O2 Sensor voltage = 50 ~ 200mV (Show from top to bottom beating phenomenon)</li> </ul>                                                                                                                              | <ul style="list-style-type: none"> <li>• O2 Sensor fault</li> <li>• ECU fault</li> </ul>                                                                                                                                                                                                                                                         |
| 7   | <b>Fault Code Detection</b>         | <ul style="list-style-type: none"> <li>• Use of the diagnosis tool existing fault-detection code or historical Fault Code</li> <li>• Elimination of the implementation of fault codes, check can be eliminated</li> <li>• Once again start engine</li> <li>• Check fault is it happen again</li> </ul>                                                                                                        | <ul style="list-style-type: none"> <li>• Diagnosis tool of the fault code is it can be eliminated</li> <li>• Start again, the fault is it will happen again</li> </ul>                                    | <ul style="list-style-type: none"> <li>• Without any residual Fault Code</li> <li>• If residual Fault Code, according to the "Fault Code Maintenance Form" implementation of troubleshooting</li> </ul>                                                                             | <ul style="list-style-type: none"> <li>• throttle position sensor fault</li> <li>• Engine temperature sensor fault</li> <li>• Intake temperature sensor fault</li> <li>• Manifold pressure sensor fault</li> <li>• O2 Sensor fault</li> <li>• Crankshaft position sensor fault</li> <li>• ECU fault</li> <li>• Roll over sensor fault</li> </ul> |

**Notes:** 1. Fuel pressure gauge connected between the fuel tank and injector, open the main switch to repeatedly shut down, fuel system makes pressure stability.  
 2. Injector and injector cap tightly by hands, fuel spills should not be the case.



Note:

## 6. Removal & Installation of Engine

|                                               |                     |
|-----------------------------------------------|---------------------|
| <a href="#">Operational Precautions .....</a> | <a href="#">6-1</a> |
| <a href="#">Engine Removal .....</a>          | <a href="#">6-2</a> |
| <a href="#">Engine Hanger .....</a>           | <a href="#">6-8</a> |

|                                              |                      |
|----------------------------------------------|----------------------|
| <a href="#">Rear Fork .....</a>              | <a href="#">6-9</a>  |
| <a href="#">Removal of Engine Bush .....</a> | <a href="#">6-11</a> |
| <a href="#">Installation of Engine .....</a> | <a href="#">6-12</a> |

### Operational Precautions

#### General Information

- Engine must be supported by a bracket or adjustable tool in height.
- The following parts can be serviced with the engine installed on the frame.
  1. Carburetor.
  2. Driving disk, driving belt, clutch, and transporting disk.
  3. Final reduction gear mechanism.
  4. AC. Generator.

**6**

#### Specification

| Item                |                   | LM25W / LM25W1 |
|---------------------|-------------------|----------------|
| Engine Oil Capacity | Replacement       | 1,200 c.c.     |
|                     | Disassemble       | 1,400 c.c.     |
| Gear Oil Capacity   | Replacement       | 170 c.c.       |
|                     | Disassemble       | 180 c.c.       |
| Capacity of coolant | Engine + radiator | 850 c.c.       |
|                     | Reservoir upper   | 420 c.c.       |

#### Torque Values

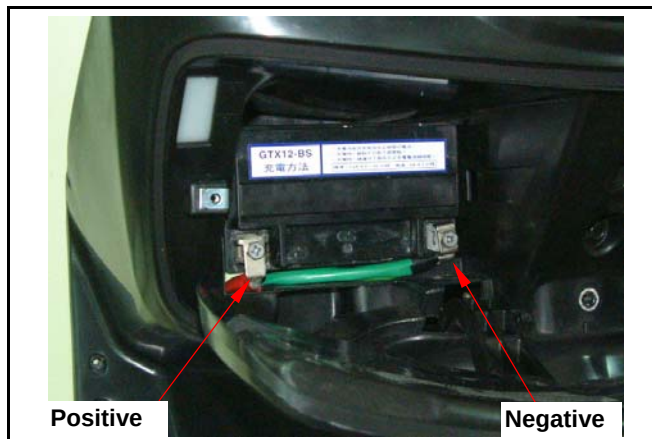
|                                       |                |
|---------------------------------------|----------------|
| Engine hanger bolt (frame side)       | 7.5~9.5kgf-m   |
| Engine hanger nut (engine side)       | 7.5~9.5kgf-m   |
| Bolt of rear cushion upper connection | 3.5~4.5kgf-m   |
| Bolt of rear cushion lower connection | 2.4~3.0kgf-m   |
| Rear wheel axle nut                   | 11.0~13.0kgf-m |

## 6. Removal & Installation of Engine

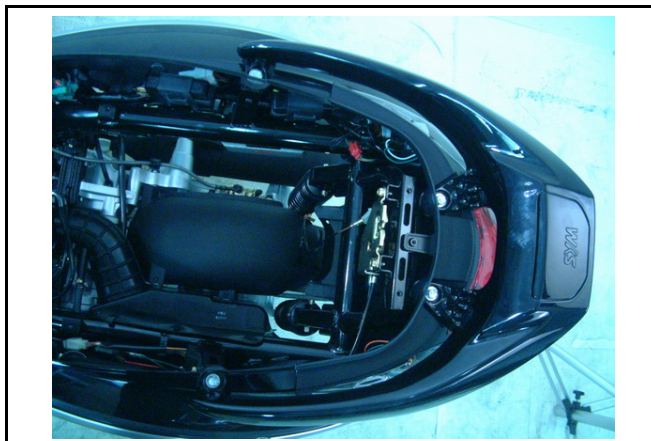


### Engine Removal

Open inner box cover.  
Remove battery cover (1 screw).  
Remove the battery negative (-) cable.  
Remove the battery positive (+) cable.



Open the seat.  
Remove the luggage box (6 bolts, 2 screws).  
(Refer to chapter 14)

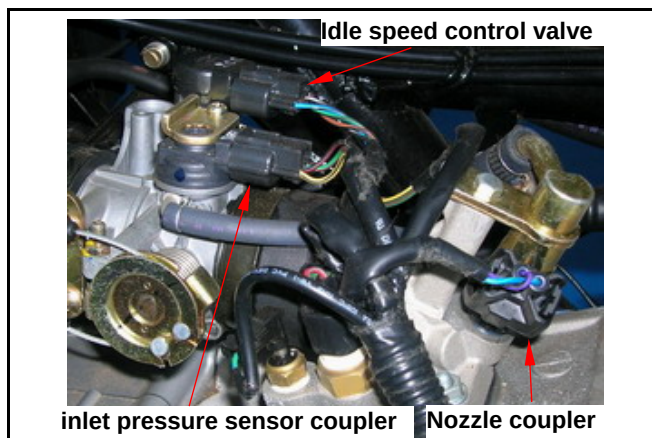


Remove right and left side covers (4 screws on each side.).  
Remove rear carrier (4 bolts).  
Remove body cover (4 screws & 1 coupler).  
(Refer to chapter 14)



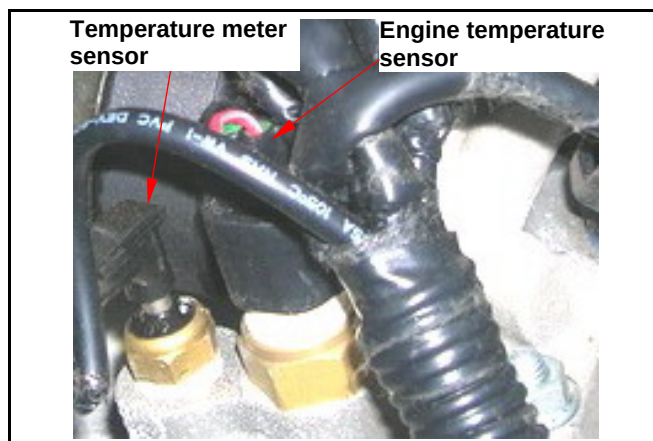
### Remove fuel injection system of electrical couplers and fuel hoses

Remove idle speed control valve, inlet pressure sensor, nozzle of couplers.

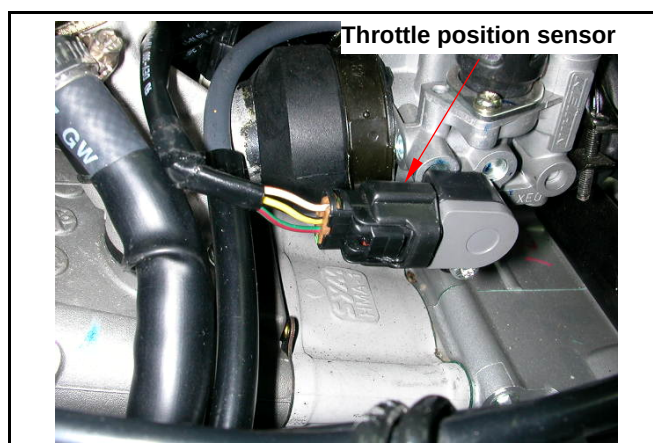


## 6. Removal & Installation of Engine

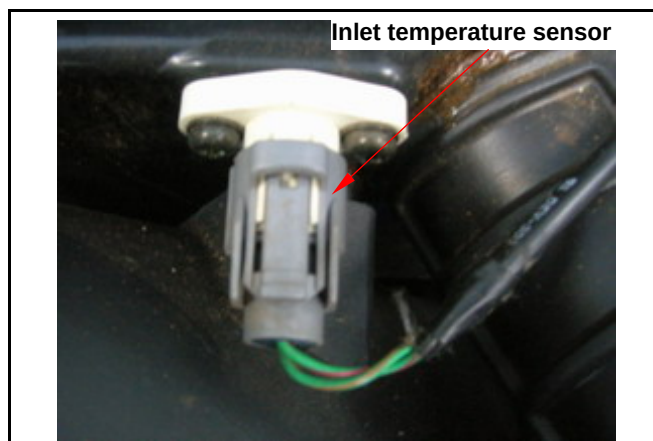
Remove the temperature meter sensor and engine temperature sensor wire couplers.



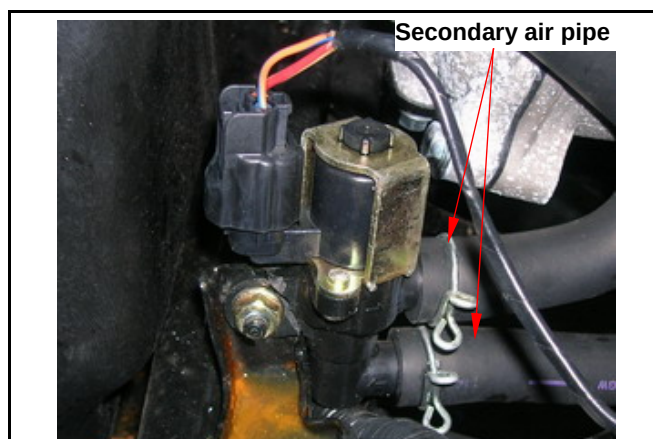
Remove throttle position sensor coupler.



Remove inlet temperature sensor coupler.



Remove secondary air electromagnetic valve pipe.

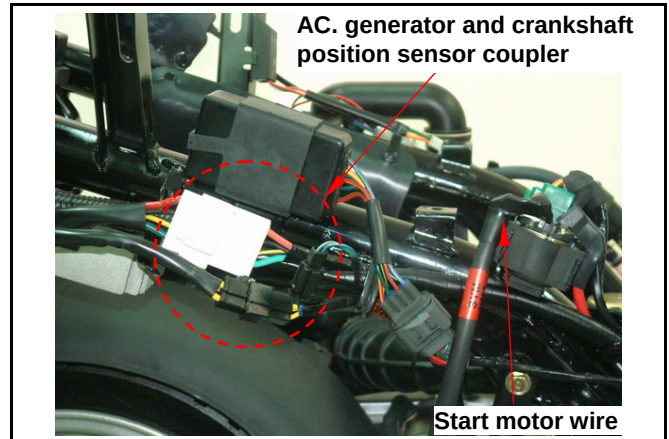




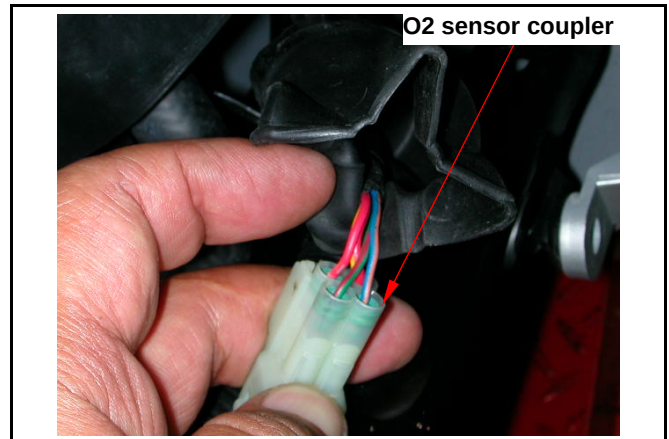
## 6. Removal & Installation of Engine



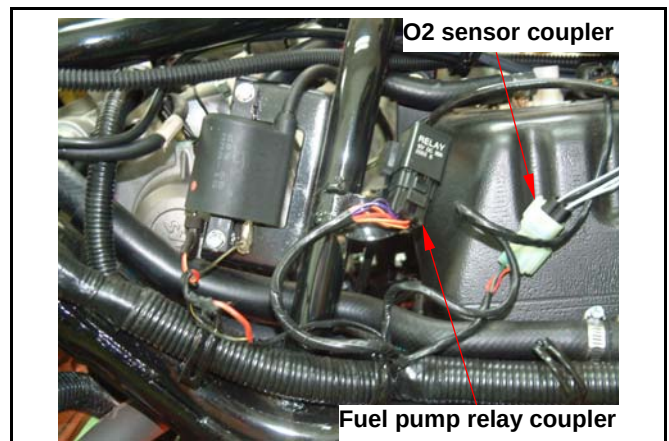
Remove AC. generator and crankshaft position sensor coupler.  
Remove start motor wire from the start relay.



Remove O2 sensor wire coupler.



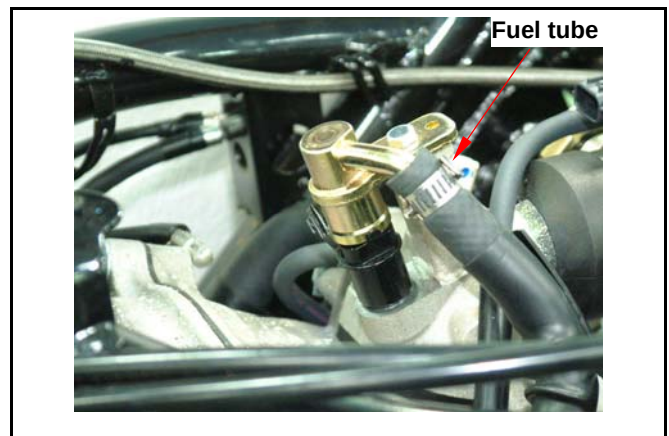
Remove fuel pump relay wire coupler.



Start engine for the pipeline to be exhausted within the residual pressure, the engine flameout, relaxing fuel tube folder, open for fuel tube.

### Caution

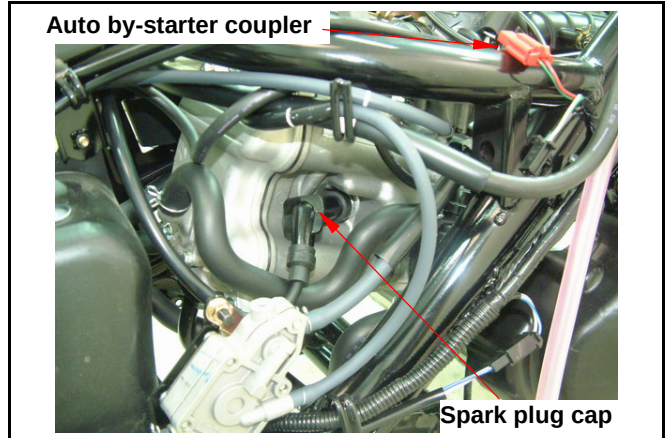
- Demolition for the pipeline, will be required for residual pressure in the pipeline to divest, or use the folder surrounds the tubing to prevent petrol splash.



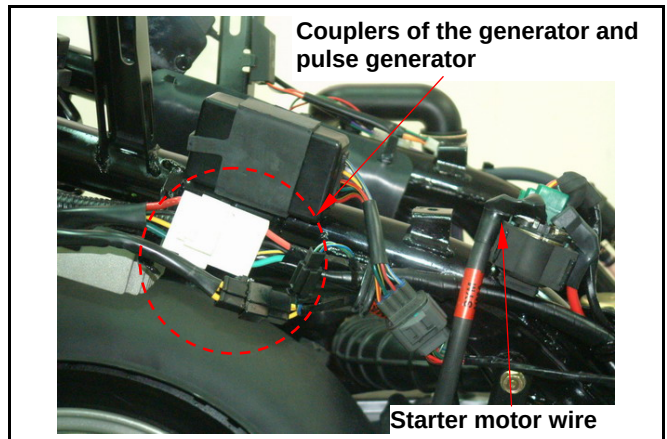
## 6. Removal & Installation of Engine

### Carburetor type and other common Mechanical

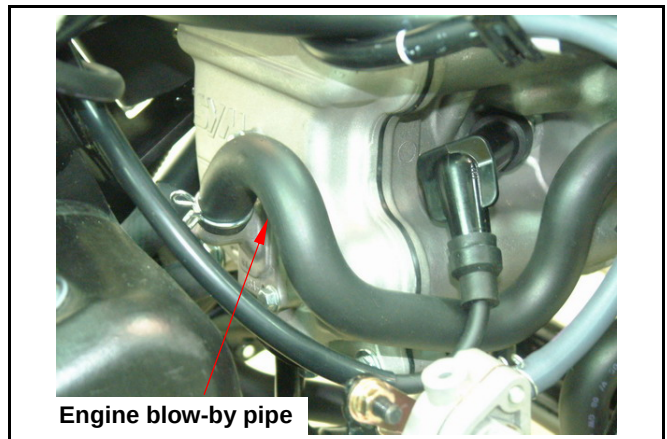
Remove the power coupler of auto by-starter.  
Remove the spark plug cap.



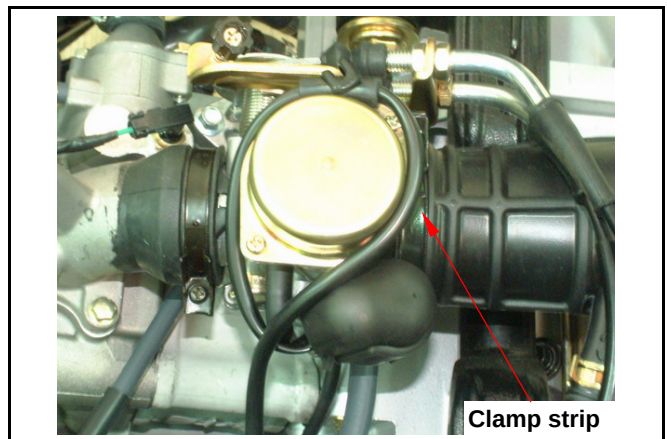
Remove the generator power wire and pulse generator connector.  
Remove the starter motor wire.



Remove engine blow-by pipe.



Remove the fuel line, vacuum hose, and throttle valve cable from the carburetor.  
Loosen the clamp strip of air cleaner and carburetor, and then remove the air cleaner hose.

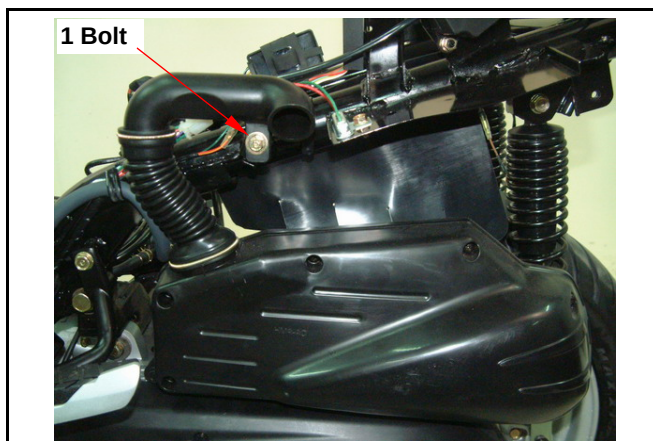




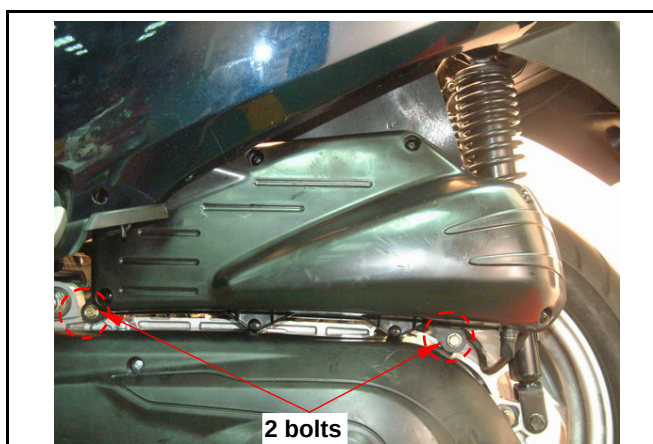
## 6. Removal & Installation of Engine



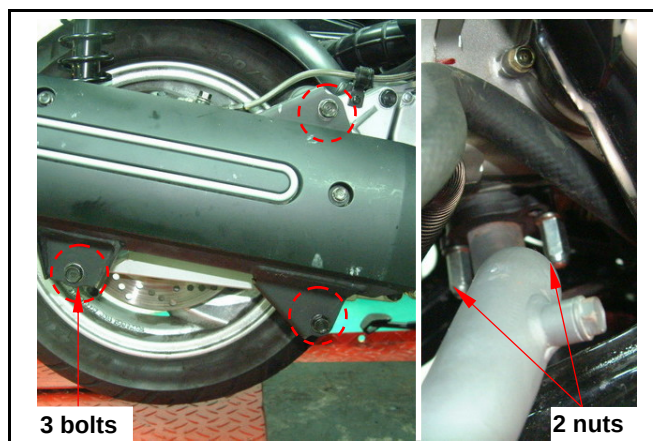
Remove the air cleaner inlet pipe connection bolt (1 bolt).



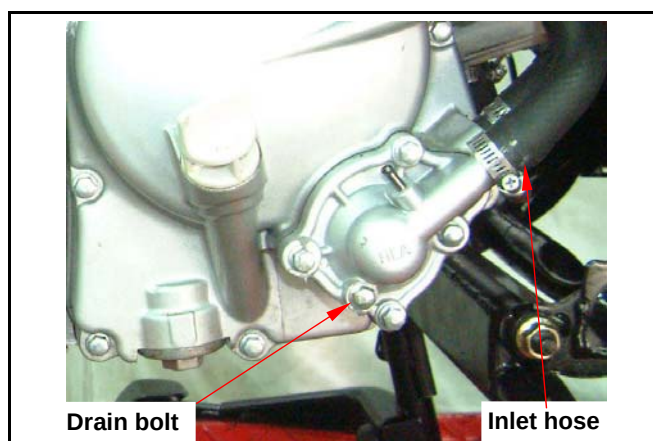
Remove the air cleaner connection bolts (2 bolts).  
Remove the air cleaner.



Remove the exhaust muffler (3 bolts, 2 nuts).

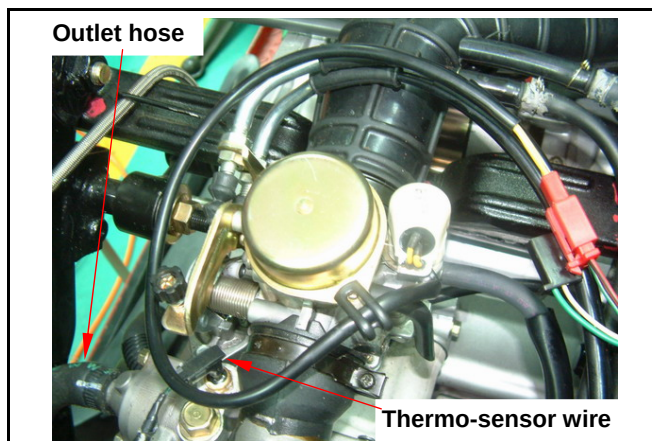


Drain out coolant, and remove coolant inlet hose.

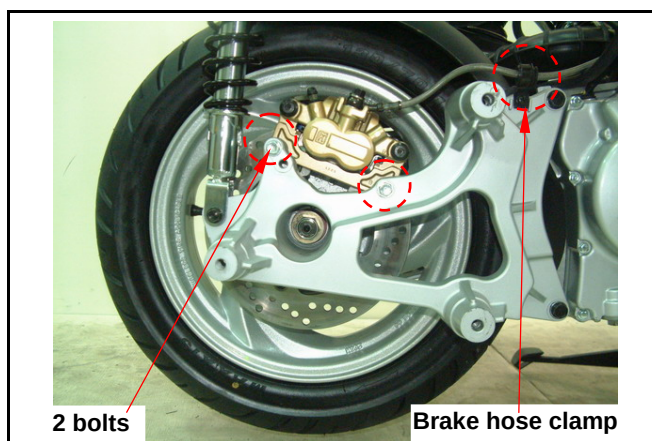


## 6. Removal & Installation of Engine

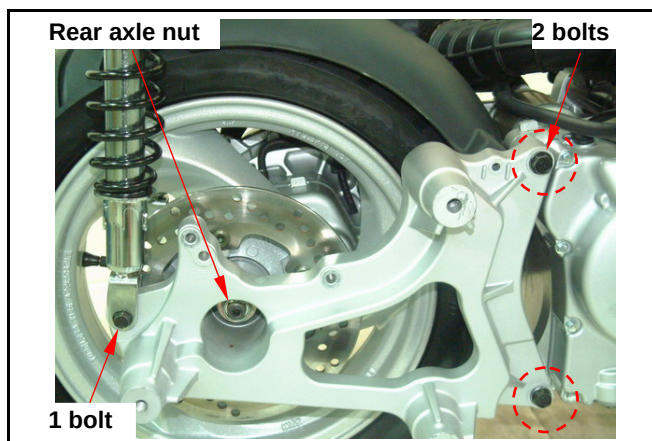
Remove the coolant outlet hose and thermo-sensor wire.



Remove rear brake hose clamp and rear brake caliper.



Remove the right rear cushion lower bolt (1 bolt).  
Remove the rear fork bolts (2 bolts).  
Remove the rear wheel axle nut (1 nut).



Remove the rear fork and rear axle collars.

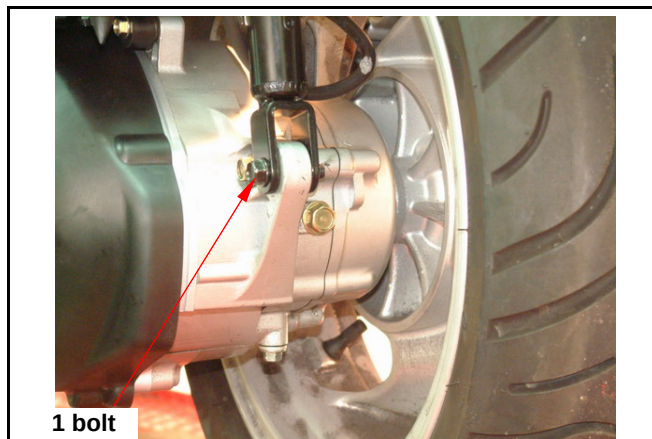




## 6. Removal & Installation of Engine

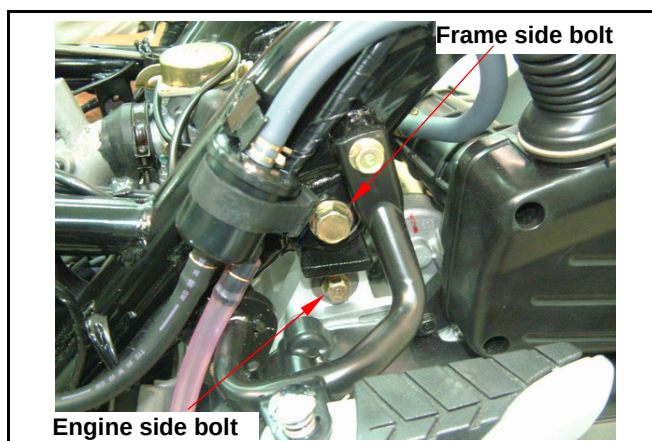


Remove left rear cushion lower bolt (1 bolt).



With a bracket to support the engine to prevent from it damage by falling down as removing the engine.

Remove frame side engine hanger bolts (each side 1 bolt), and then remove engine.



### Engine Hanger

#### Removal

Remove the engine side bolts of engine hanger. (1 bolt on each side)

Remove the engine hanger.

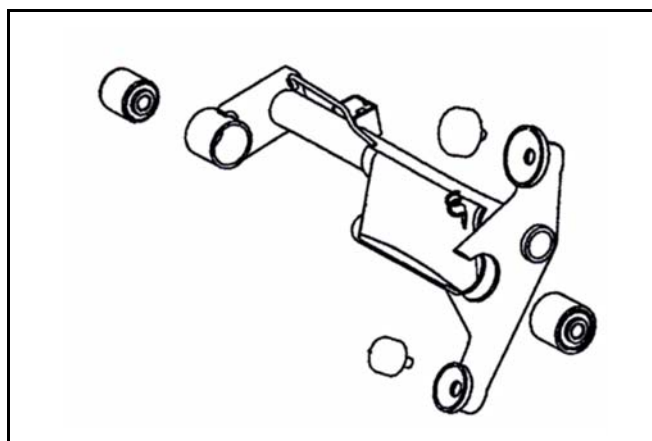
Check if the engine hanger bush and cushion rubber for damage. If so, replace with new ones.

#### Installation

Tighten the bolts and nuts of engine hanger.

**Engine hanger nut:**

**Torque Value: 7.5~9.5kgf-m**

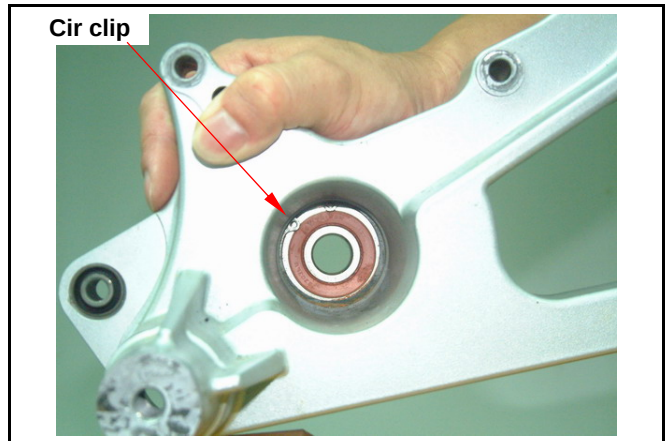




### Rear Fork

#### Bearing Inspection

Check bearings on rear fork.  
 Rotate bearing inner ring with fingers.  
 Check if bearing can be turned in smooth and silent, and also check if bearing outer ring is mounted on rear fork tightly.  
 If bearing rotation is uneven, noising, or loose bearing mounted, then replace it.



#### Bearing removal

Remove bearing mounting cir clip.  
 Drive the bearing out of the rear fork.

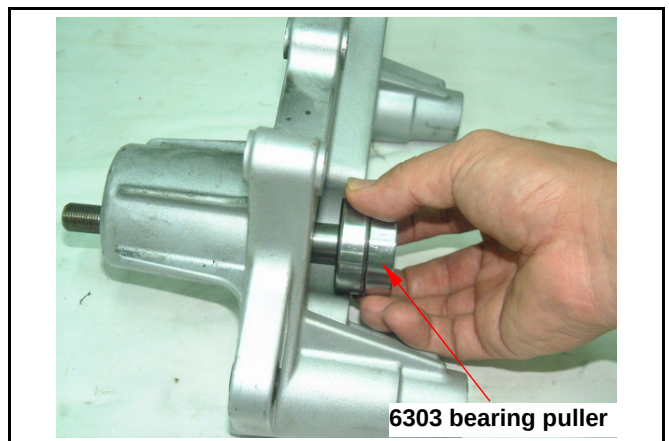


#### Bearing installation

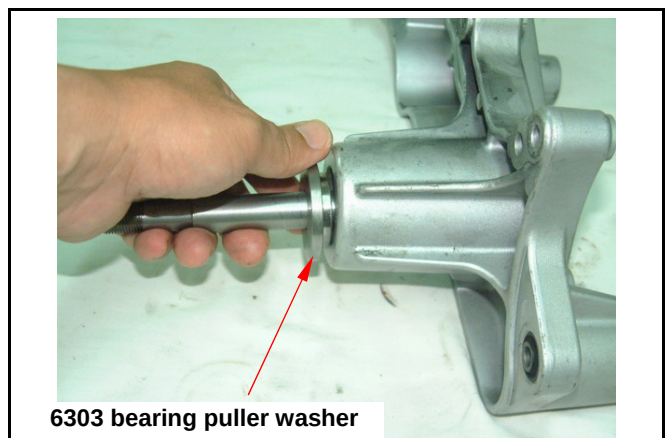
Install new rear axle bearing and bearing puller into rear fork.

#### Special Service Tools:

Rear fork bearing puller SYM-6303000-6303



Install the washer of the 6303 bearing puller.



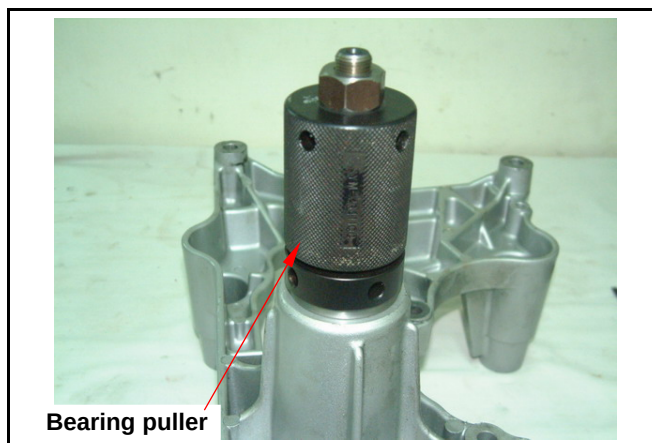
## 6. Removal & Installation of Engine



Install assembly directs puller bearing puller.

**Special Service Tools:**

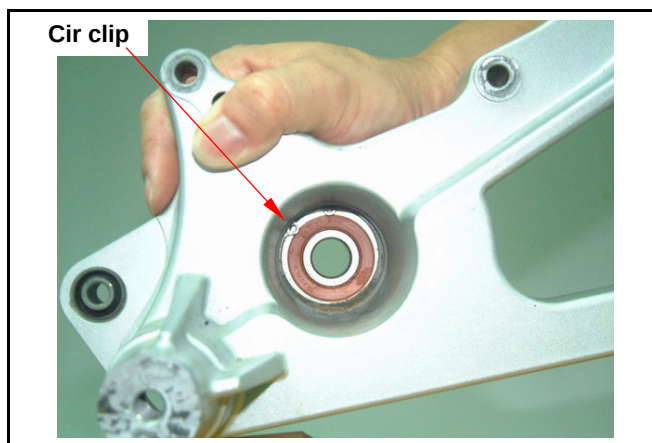
Assembly directs puller      SYM-2341110



Use screw driver holder bearing puller lower part, and turn the bearing puller upper part to install the rear fork bearing.



Install bearing mounting cir clip.





## 6. Removal & Installation of Engine

### Removal of Engine Bush

If engine hanger frame and the cushion rubber of rear cushion bush damaged. Then, with the bush remover / presser,  $\varnothing 28\text{mm}$  &  $\varnothing 20\text{mm}$ , to press the bush out, and replace it with new one.

Engine hanger bush:  $\varnothing 28\text{mm}$

Rear cushion bush:  $\varnothing 20\text{mm}$



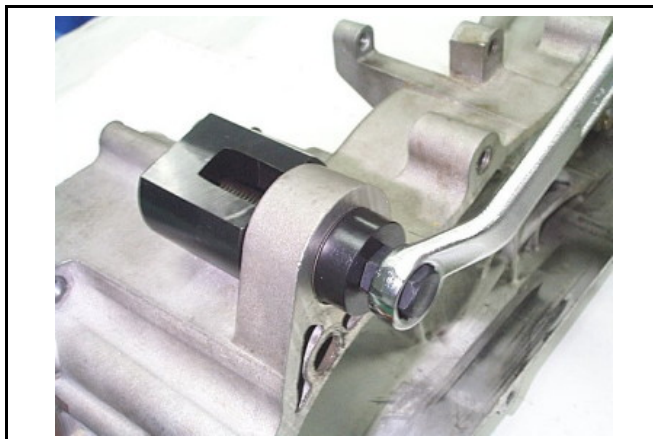
### Pressing out

Place the detent section of the bush remover toward the bush, and drive both the pressing ring and bolt in to press the bush out.

#### Special Service Tools:

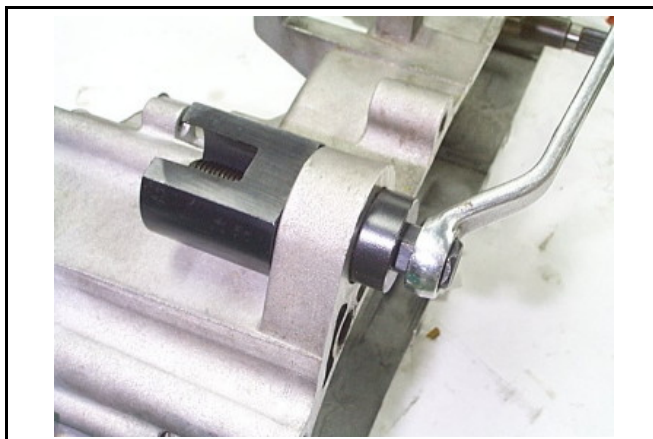
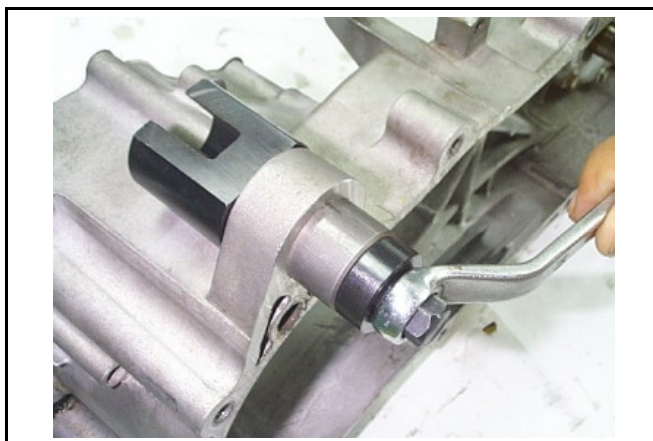
Crankcase bush remover/presser SYM-1120310

Crankcase bush remover/presser SYM-1120320



### Pressing In

Place the flat section of the remover toward the bush, and then drive the bush, pressing ring, and bolt in to install the bush.





## 6. Removal & Installation of Engine



### Installation of Engine

Install the engine according to the reversing order of removal.

#### Caution

- Note both feet and hands safety for squeezing as engine installation.
- Do not bent or squeeze each wires or hose.
- Route all cables and wires in accordance with the routine layout.

**Engine hanger nut:**

**Torque Value: 7.5~9.5kgf-m**

**Rear cushion bolt:**

**Torque Value: upper: 3.5~4.5kgf-m  
under: 2.4~3.0kgf-m**

**Rear wheel axle nut:**

**Torque Value: 11.0~13.0kgf-m**



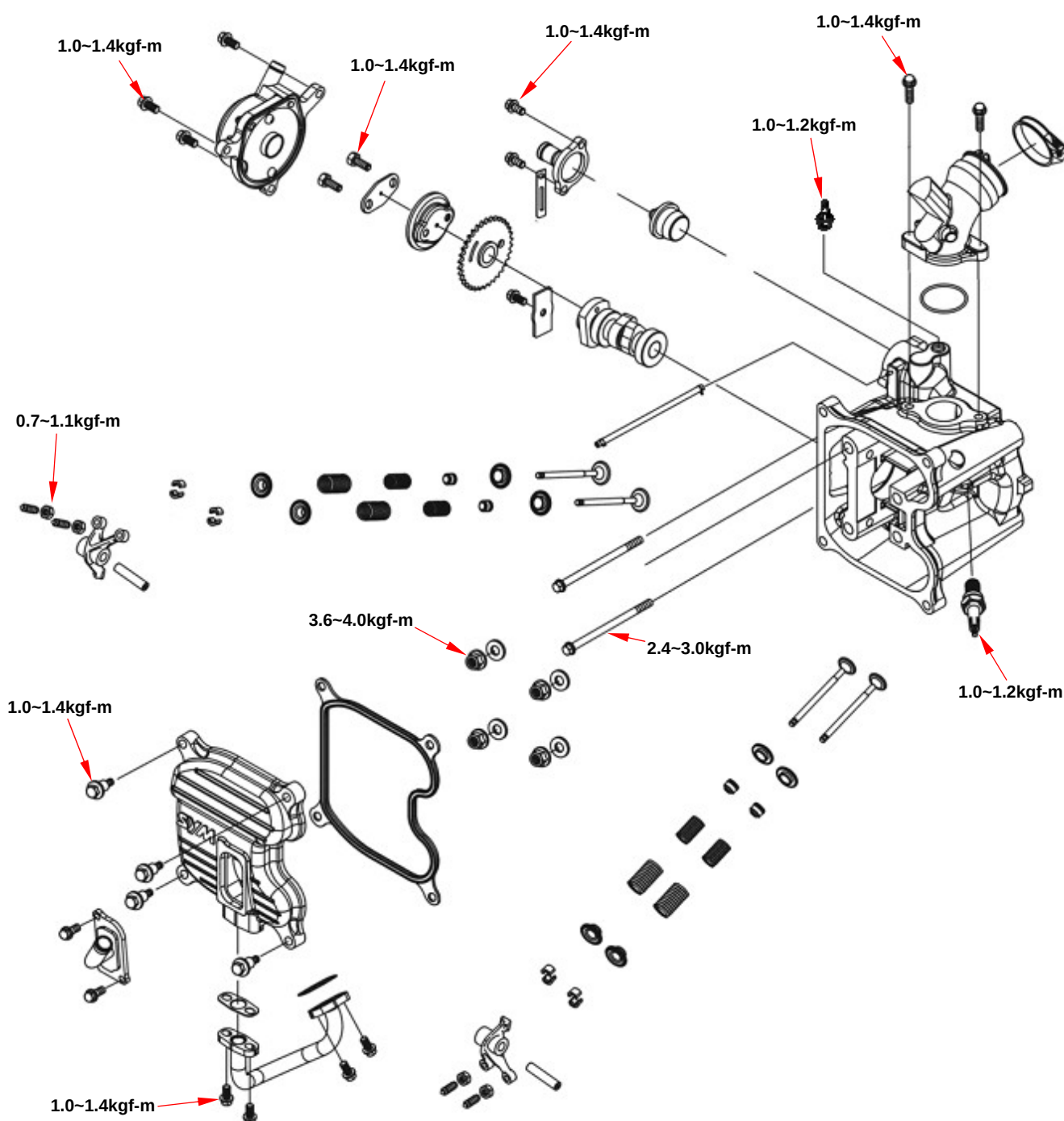


## 7. Cylinder Head / Valve

|                                       |            |
|---------------------------------------|------------|
| <b>Mechanism Diagram .....</b>        | <b>7-1</b> |
| <b>Precautions in Operation .....</b> | <b>7-2</b> |
| <b>Troubleshooting.....</b>           | <b>7-3</b> |
| <b>Cylinder Head Removal.....</b>     | <b>7-4</b> |
| <b>Cylinder Head Disassembly.....</b> | <b>7-6</b> |
| <b>Cylinder Head Inspection.....</b>  | <b>7-8</b> |

**Valve Stem Replacement..... 7-10**  
**Valve Seat Inspection and Service... 7-11**  
**Cylinder Head Reassembly..... 7-13**  
**Cylinder Head Installation ..... 7-14**  
**Valve Clearance Adjustment..... 7-16**

## Mechanism Diagram



## 7. Cylinder Head / Valve

### 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

| Item                        |                                        |         | Standard      | Limit  |
|-----------------------------|----------------------------------------|---------|---------------|--------|
| Compression pressure        |                                        |         | 12±2 kg/cm2   | ---    |
| Camshaft                    | Height of cam lobe                     | Intake  | 34.880        | 34.860 |
|                             |                                        | Exhaust | 34.740        | 34.725 |
| 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            | Inner   | 38.700        | 35.200 |
|                             |                                        | outer   | 40.400        | 36.900 |
|                             | Valve seat width                       |         | 1.600         | ---    |
|                             | 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

### 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

## 7. Cylinder Head / Valve

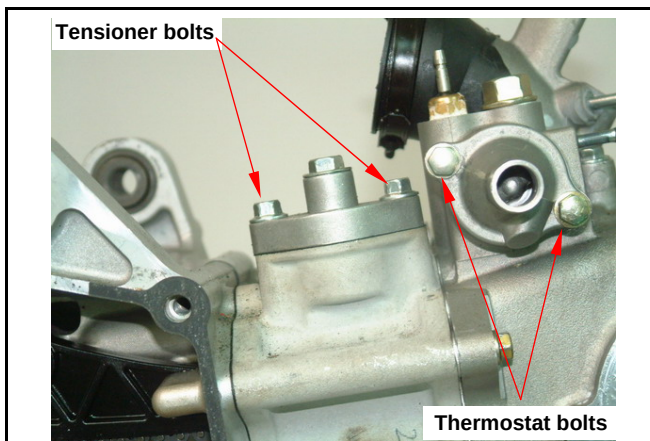


### Cylinder Head Removal

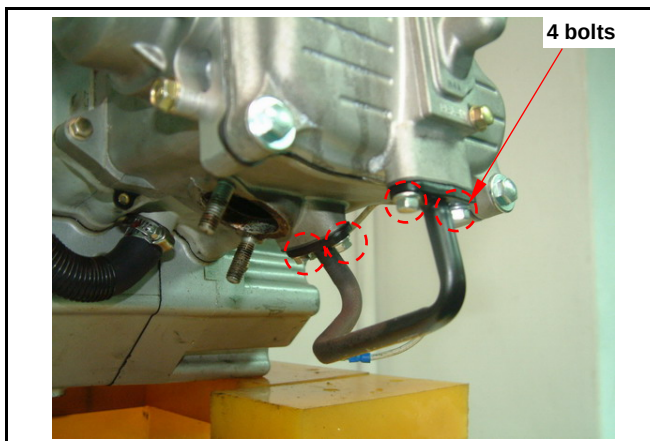
Remove engine. (Refer to chapter 5)



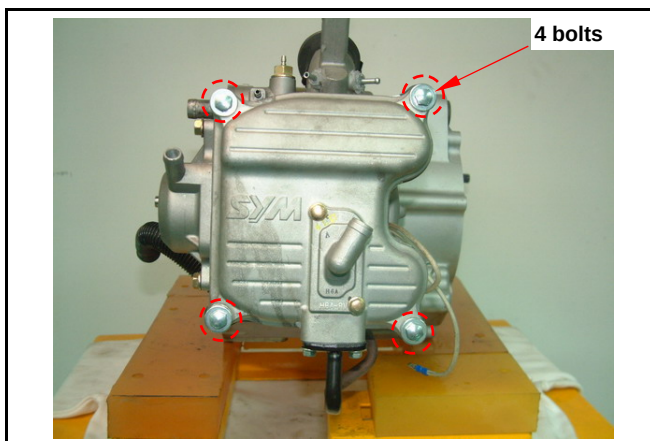
Remove 2 bolts of thermostat and then remove the thermostat.  
Remove hole bolt and spring for the cam chain tensioner.  
Loosen 2 bolts, and then remove tensioner.  
Remove thermostat (2 bolts).



Remove Air Injection system (AI) pipe mounting bolts.  
Remove spark plug.

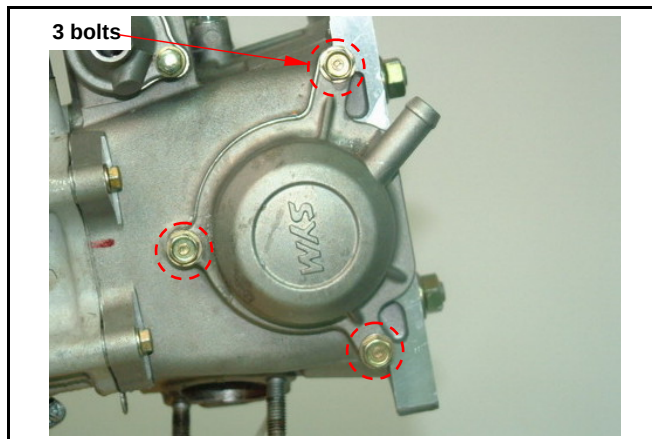


Remove cylinder head cover (4 bolts).



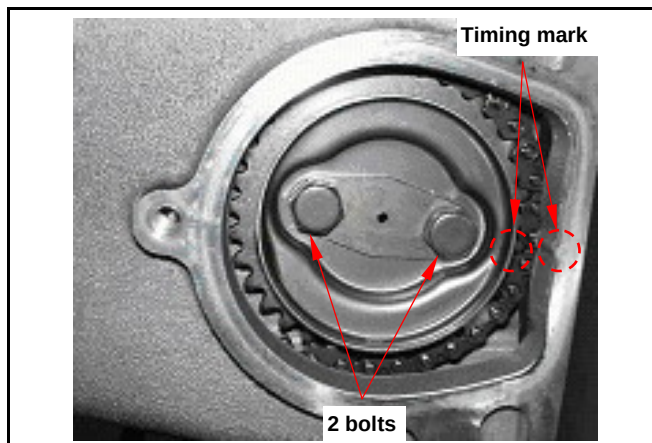


Remove the side cover mounting bolts of cylinder head, and then take out the side cover.

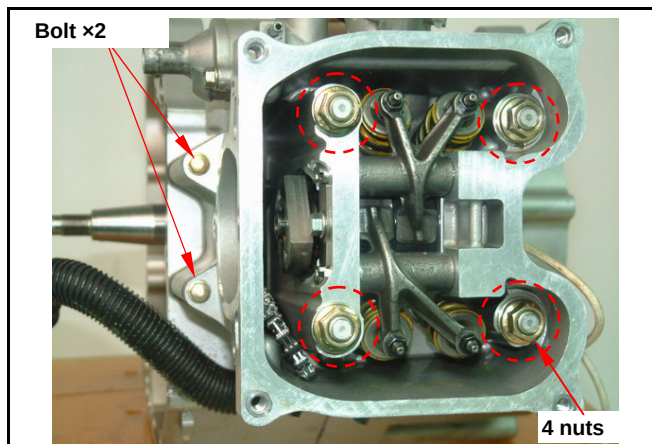


Remove left crankcase cover, and turn the Turn the drive face, and align the timing mark on the sprocket with that of cylinder head, piston is at TDC position.

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



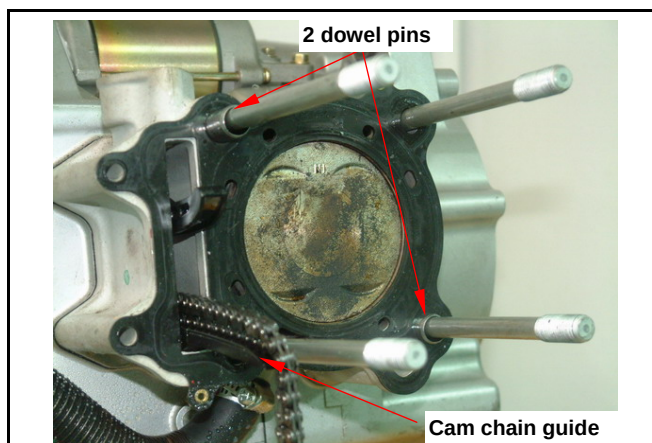
Remove the 2 cylinder head mounting bolts from cylinder head right side, and then remove 4 nuts and washers from cylinder head upper side. Remove the cylinder head.



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

### Caution

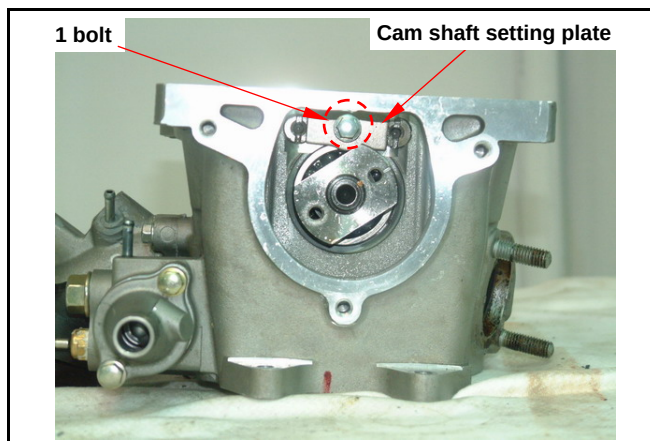
- Do not damage the matching surfaces of cylinder and cylinder head.
- Avoid residues of gasket or foreign materials falling into crankcase as cleaning.



## 7. Cylinder Head / Valve

### Cylinder Head Disassembly

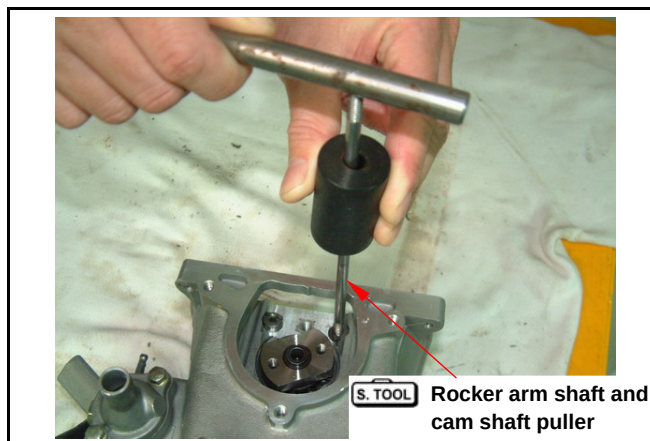
Remove cam shaft setting plate (1 bolt).



Remove rocker arm shafts and rocker arms.

**Special Service Tool:**

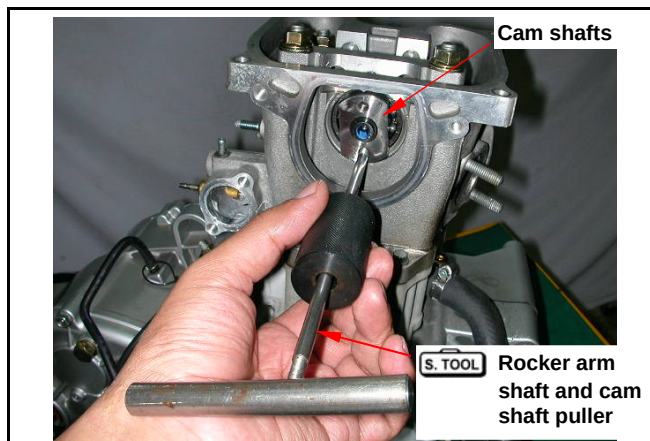
**Rocker arm and cam shaft puller SYM-1445100**



Remove cam shafts.

**Special Service Tool:**

**Rocker arm and cam shaft puller SYM-1445100**



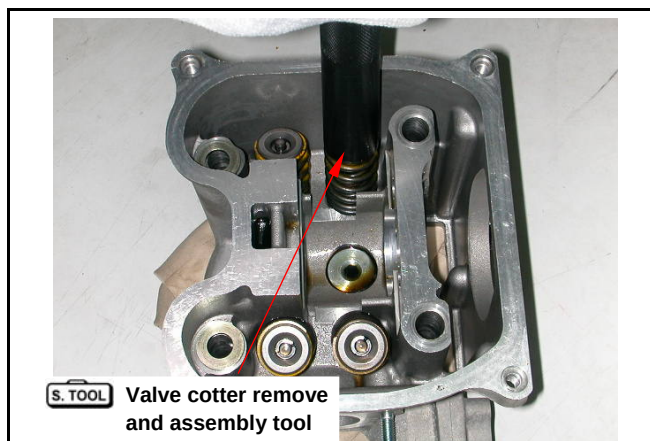
Use a valve cotter remove & assembly tool to press the valve spring, and then remove valves.

#### 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.

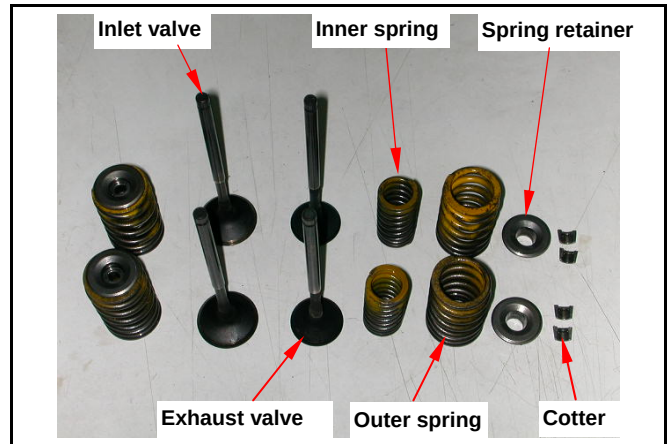
**Special Service Tool:**

**Valve cotter remove & assembly tool  
SYM-1471110-SY125**

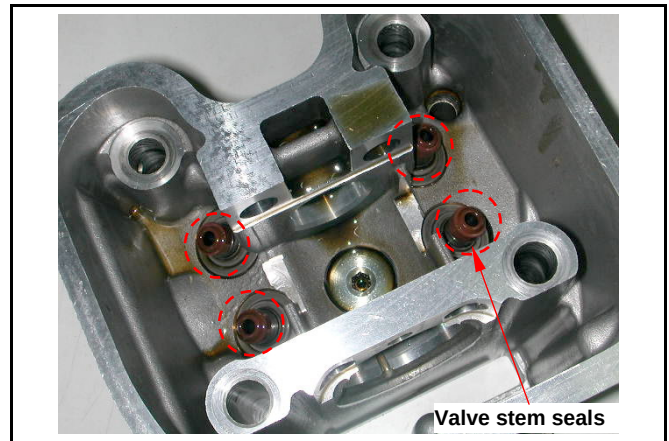




Remove valve cotters, spring retainers, springs and valves.



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.

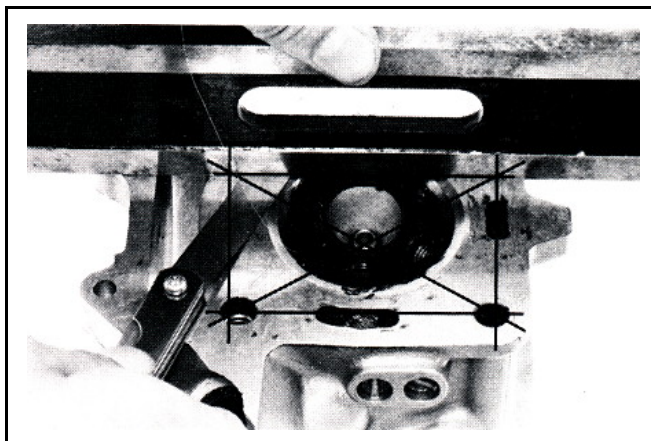


## 7. Cylinder Head / Valve

### Cylinder Head Inspection

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

**Service limit: 0.05 mm**



### Camshaft

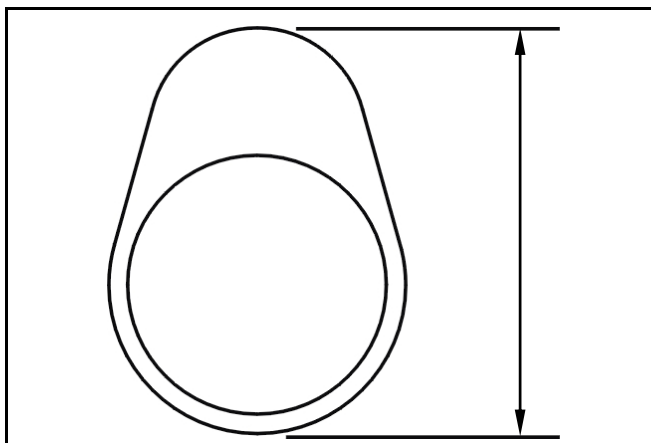
Inspect cam lobe height for damaged.

**Service Limit:**

**IN: Replacement when less than 34.860mm**

**EX: Replacement when less than 34.725mm**

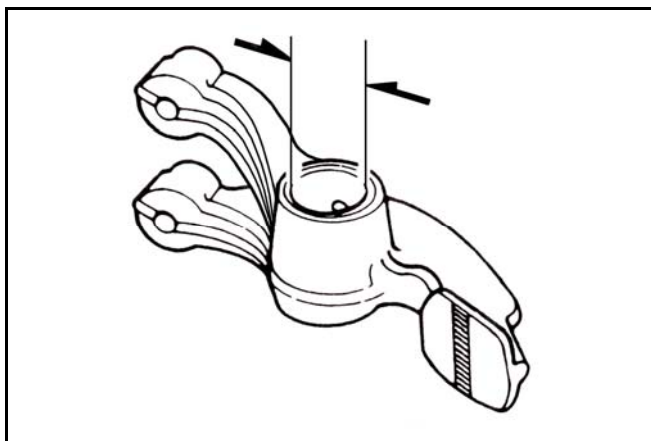
Inspect the camshaft bearing for looseness or wear out. If any damage, replace whole set of camshaft and bearing.



### Rocker Arm

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

**Service Limit: Replace when it is less than 12.080 mm.**



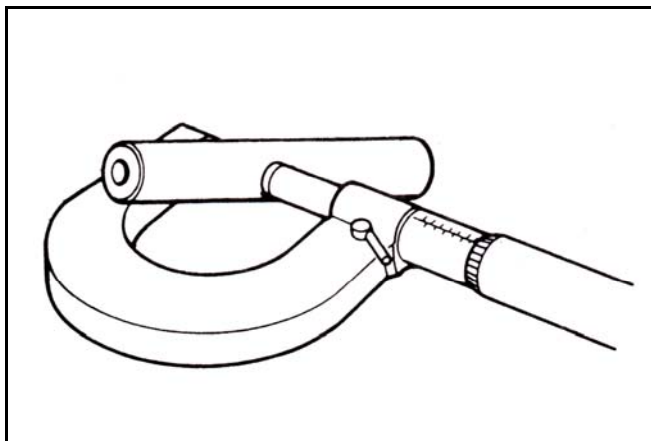
### Rocker Arm Shaft

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

**Service Limit: Replace when it is less than 11.936 mm.**

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

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





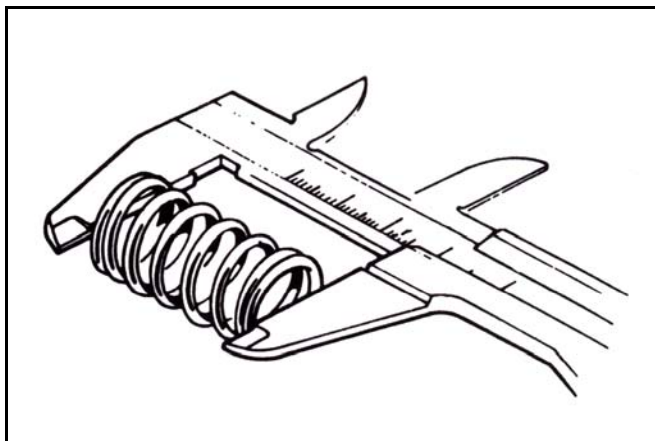
**Valve spring free length**

Measure the free length of intake and exhaust valve springs.

**Service limit:**

**Inner spring** 35.20 mm

**Outer spring** 36.90 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.

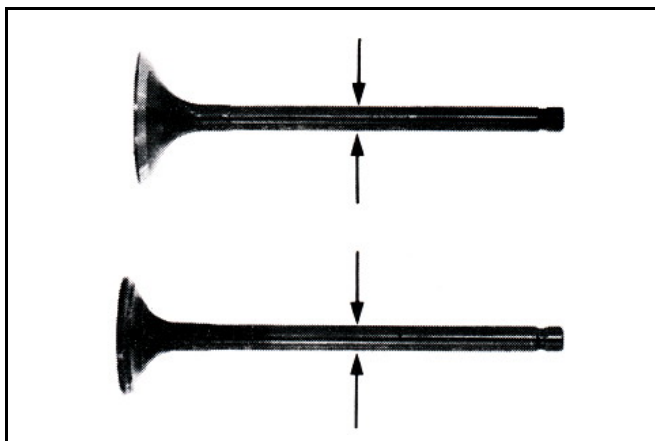
**Service Limit: IN: 4.90 mm**

**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**

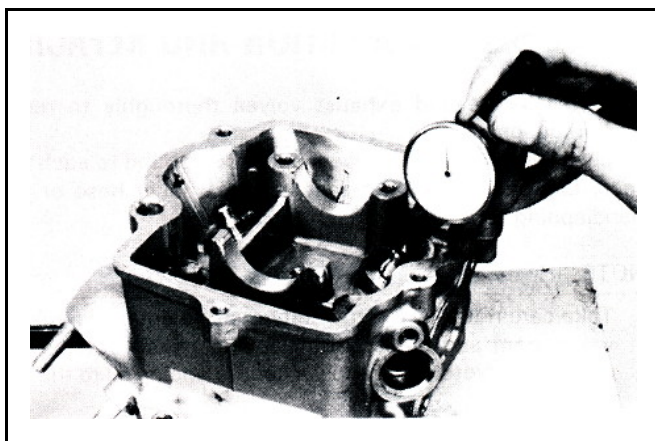
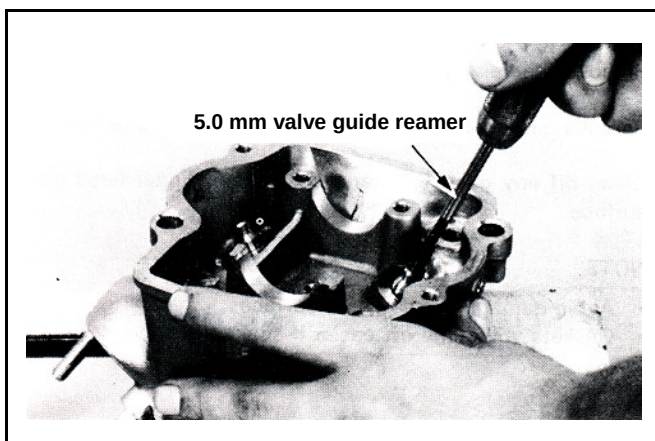
**⚠ Caution**

- 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.



## 7. Cylinder Head / Valve

### 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**

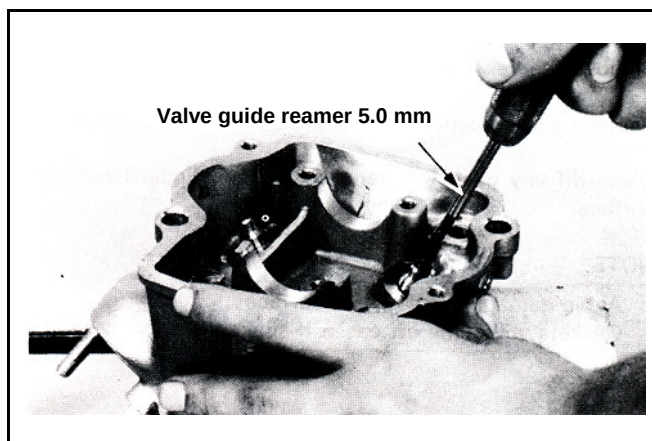
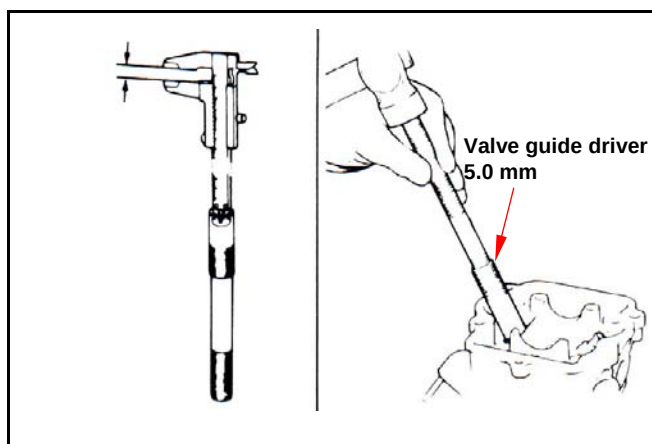
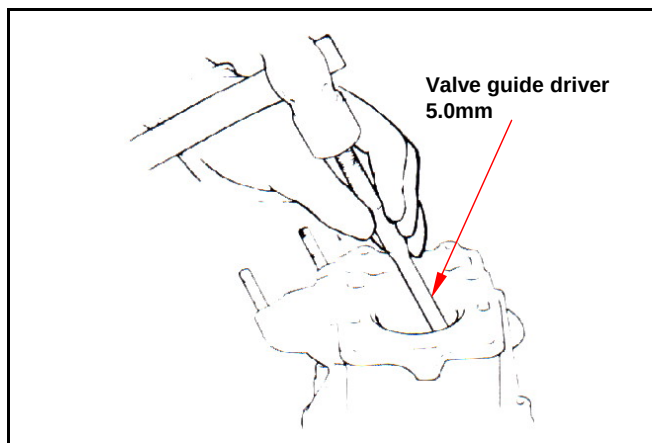
Wait for the cylinder head cooling down to room temperature, and then correct the new valve guide with reamer.

#### 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**



## 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.

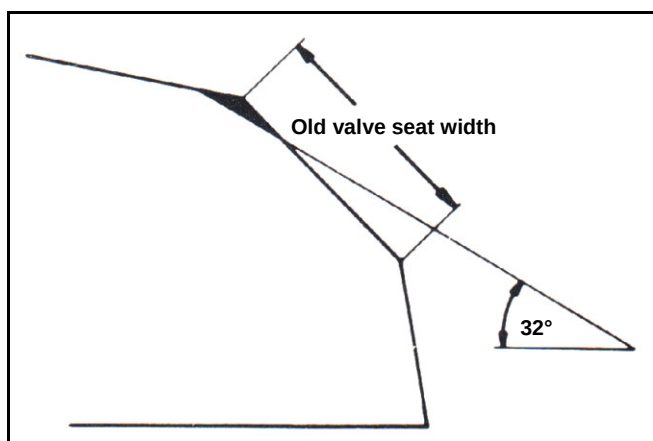
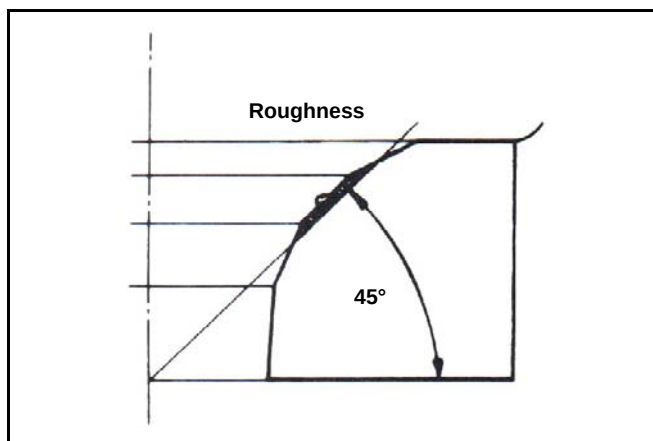
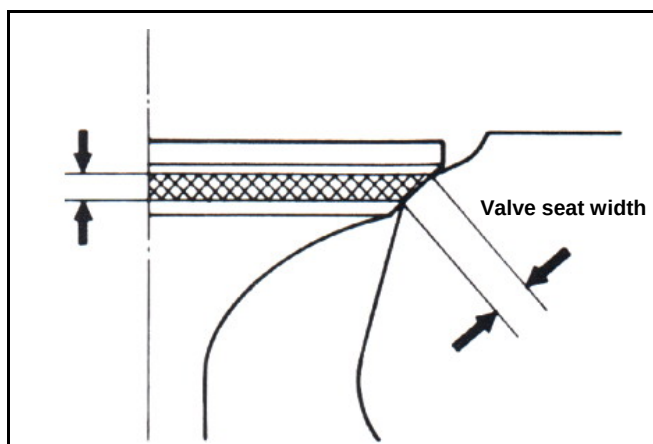
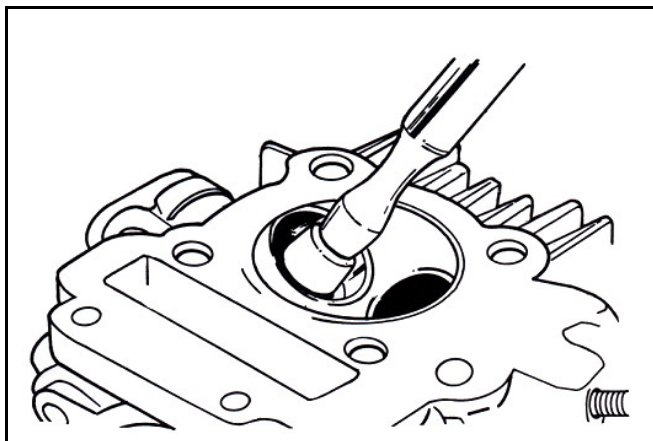
Refer to operation manual of the valve seat chamfer cutter.

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 seal chamfer cutter to correct its seat face.

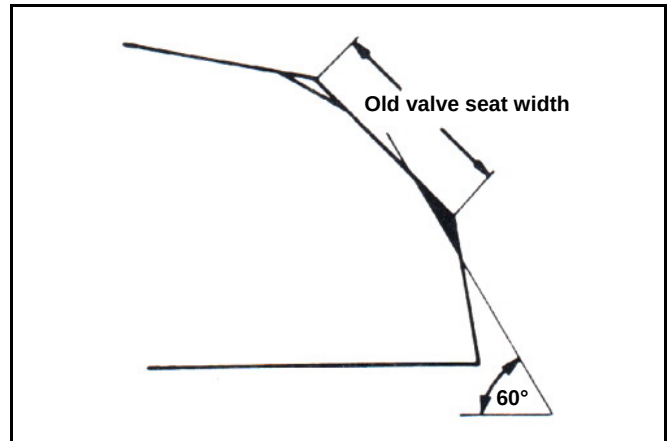
Use 32° cutter to cut a quarter upper parts out.



## 7. Cylinder Head / Valve



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

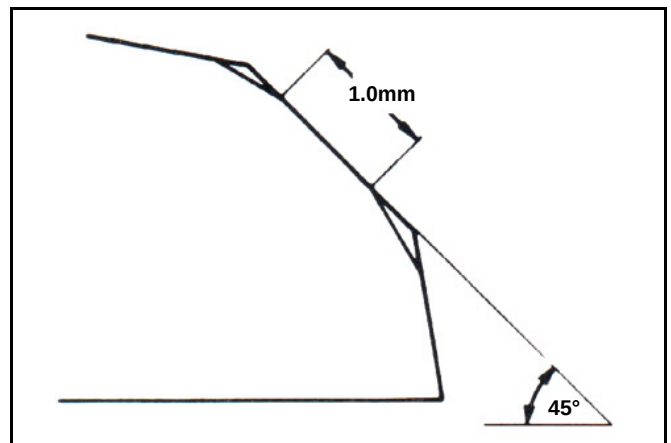


Use 45° cutter to grind the valve seat to specified width.

### Caution

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

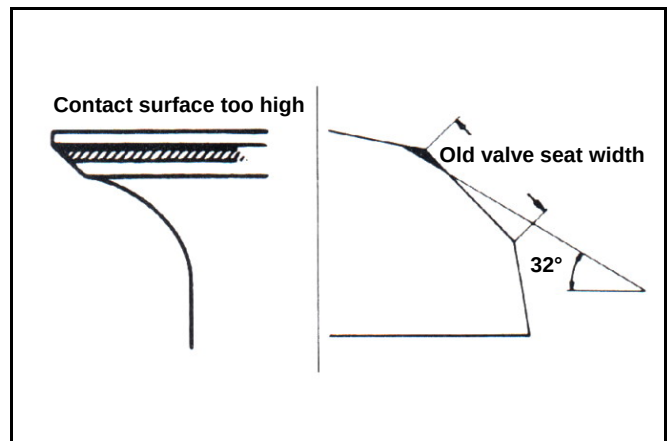
Grind valve seat again if necessary.



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.

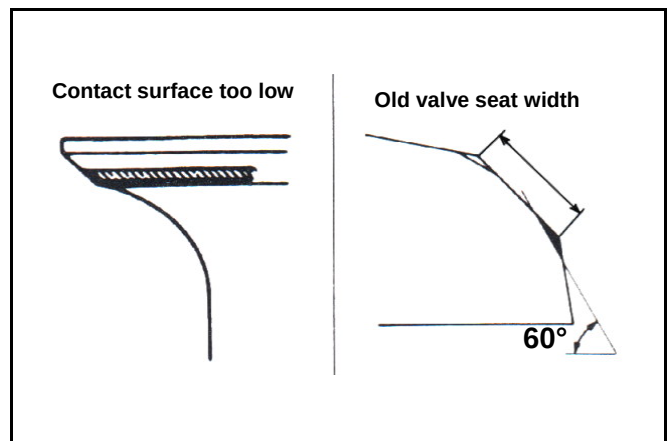
### Caution

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



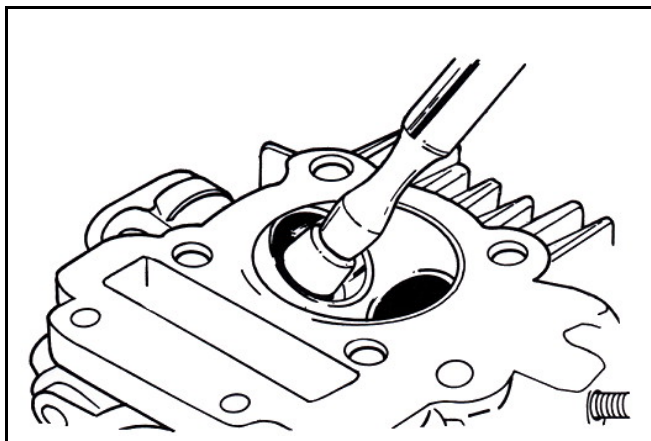
If the contact surface too high, grind the valve seat with 32° cutter.  
Then, grind the valve seat to specified width.

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.

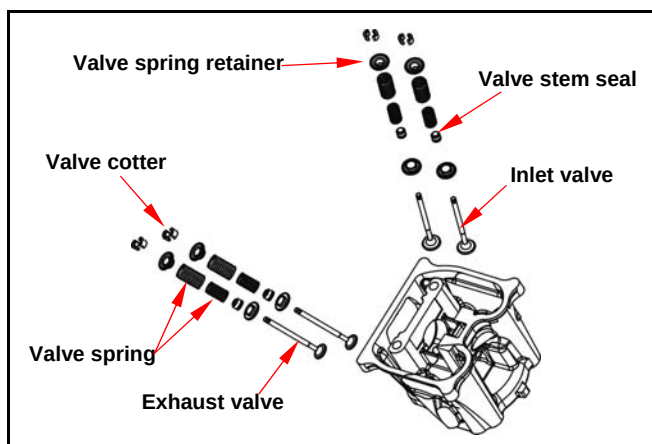


### Cylinder Head Reassembly

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.



Put the valve cotters onto valve spring retainer.  
Use a valve cotter remove & assembly tool to press the valve springs, and then install 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.

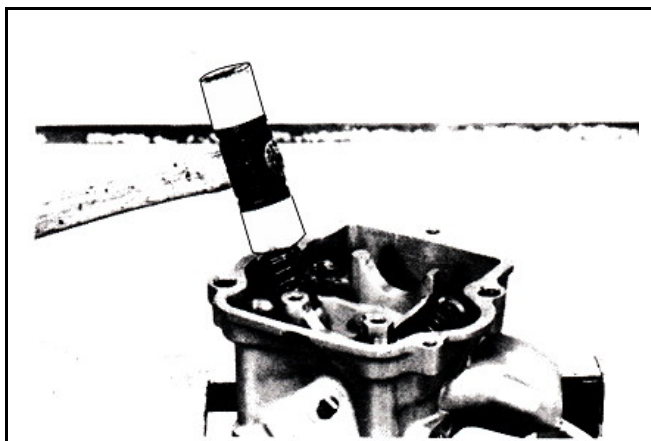
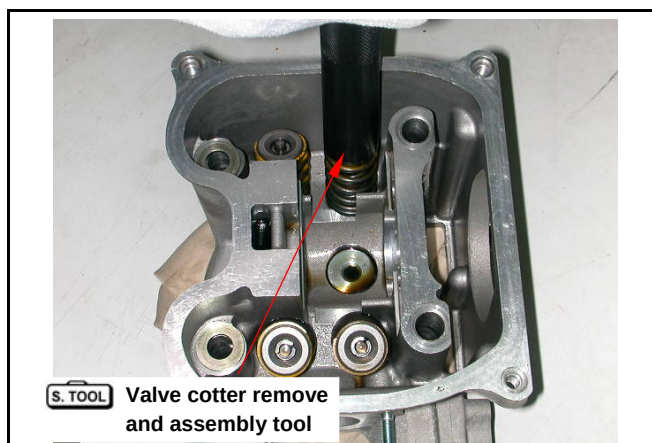
#### Special Service Tool:

**Valve cotter remove & assembly tool**  
**SYM-1471110-SY125**

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

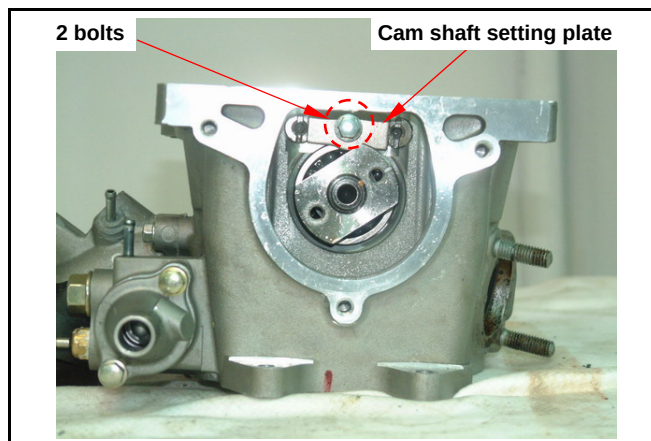
#### Caution

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



## 7. Cylinder Head / Valve

Install camshaft into cylinder head.  
Install valve rocker arm, rocker arm shaft and cam shaft setting plate.

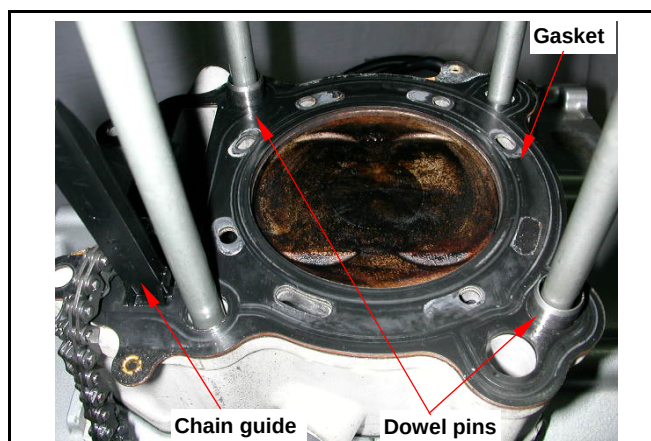


### Cylinder Head Installation

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.

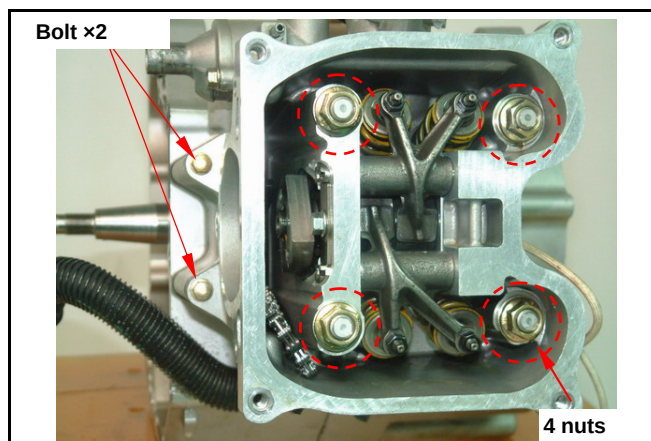


Install 4 washers and tighten 4 nuts on the cylinder head upper side, and then tighten 2 cylinder head mounting bolts of cylinder head right side.

#### Torque value:

**Nut** 3.6~4.0kgf-m

**Bolt** 1.0~1.4kgf-m

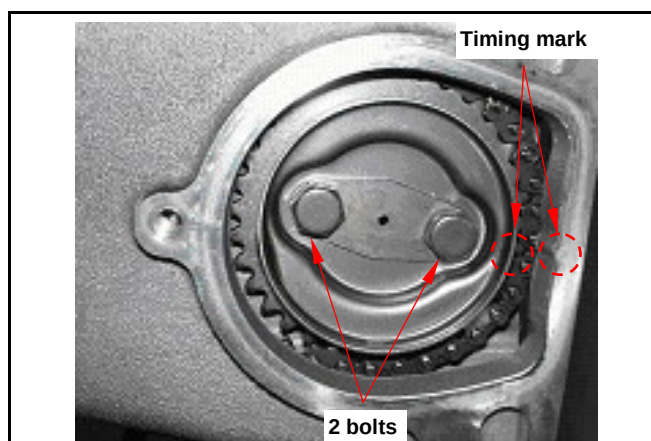


Install cam chain on to sprocket and align the timing mark on the sprocket with that of cylinder head.

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

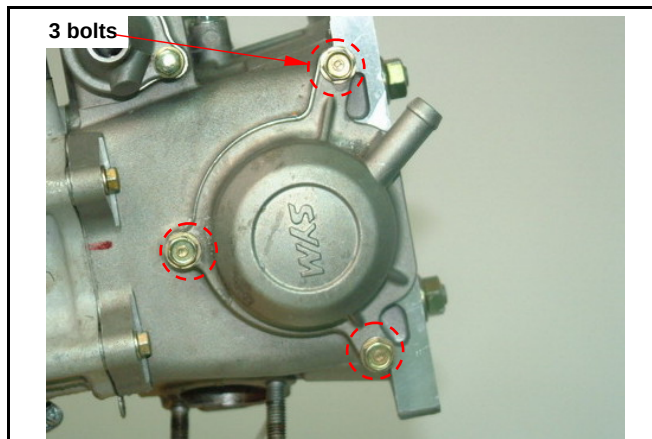
#### Caution

- Make sure timing marks are matched.

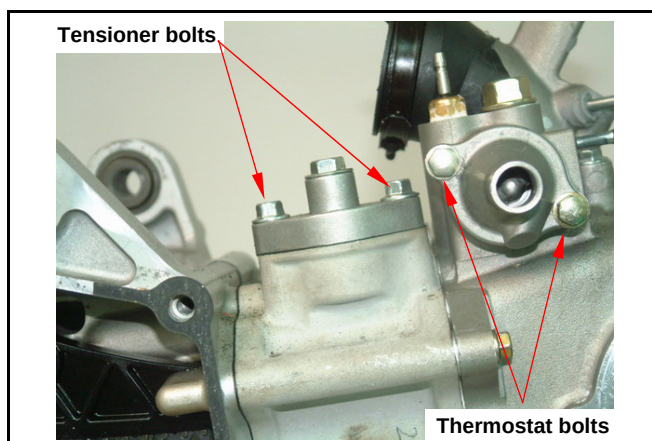




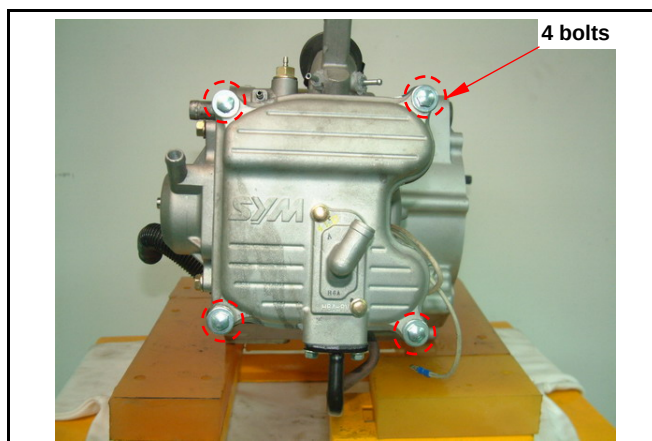
Install cylinder head side cover (3 bolts).



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).



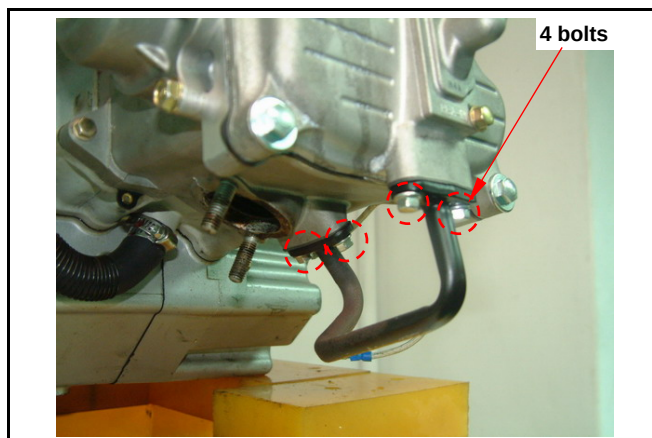
Install Air Injection system (AI) pipe. (4 bolts)  
Install inlet pipe onto cylinder head.  
Install and tighten spark plug.

**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.

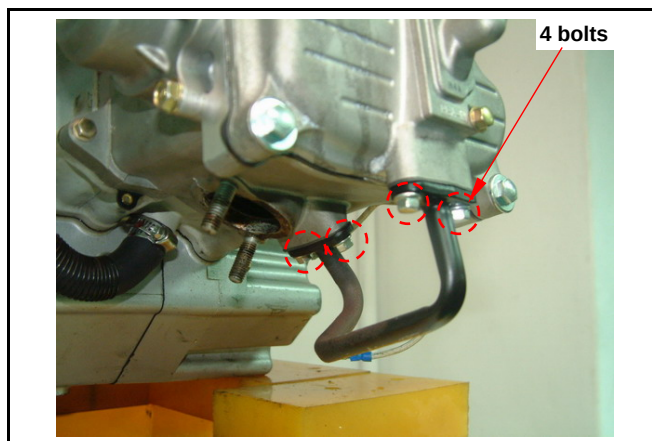
Install the engine onto frame (refer chapter 5).



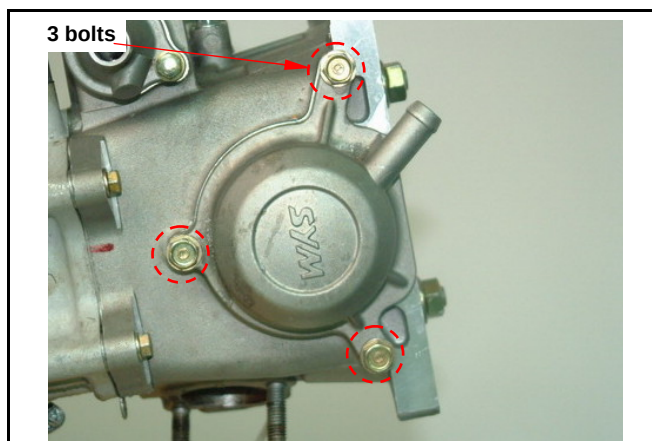
## 6. Cylinder Head / Valve

### 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

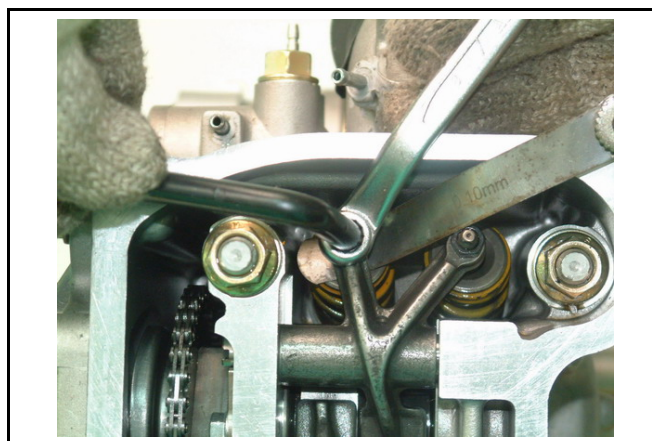
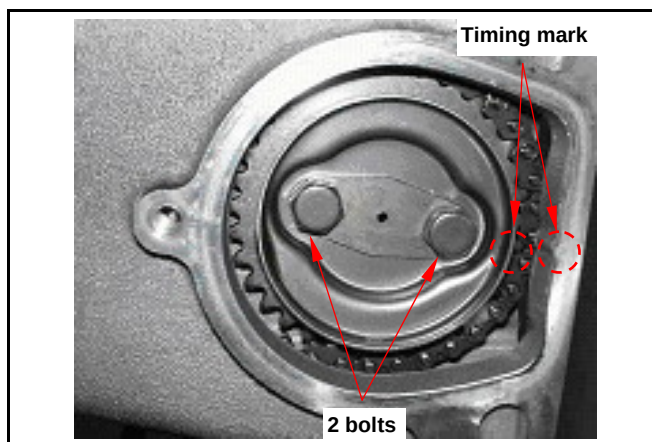
Install the cylinder head side cover.

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

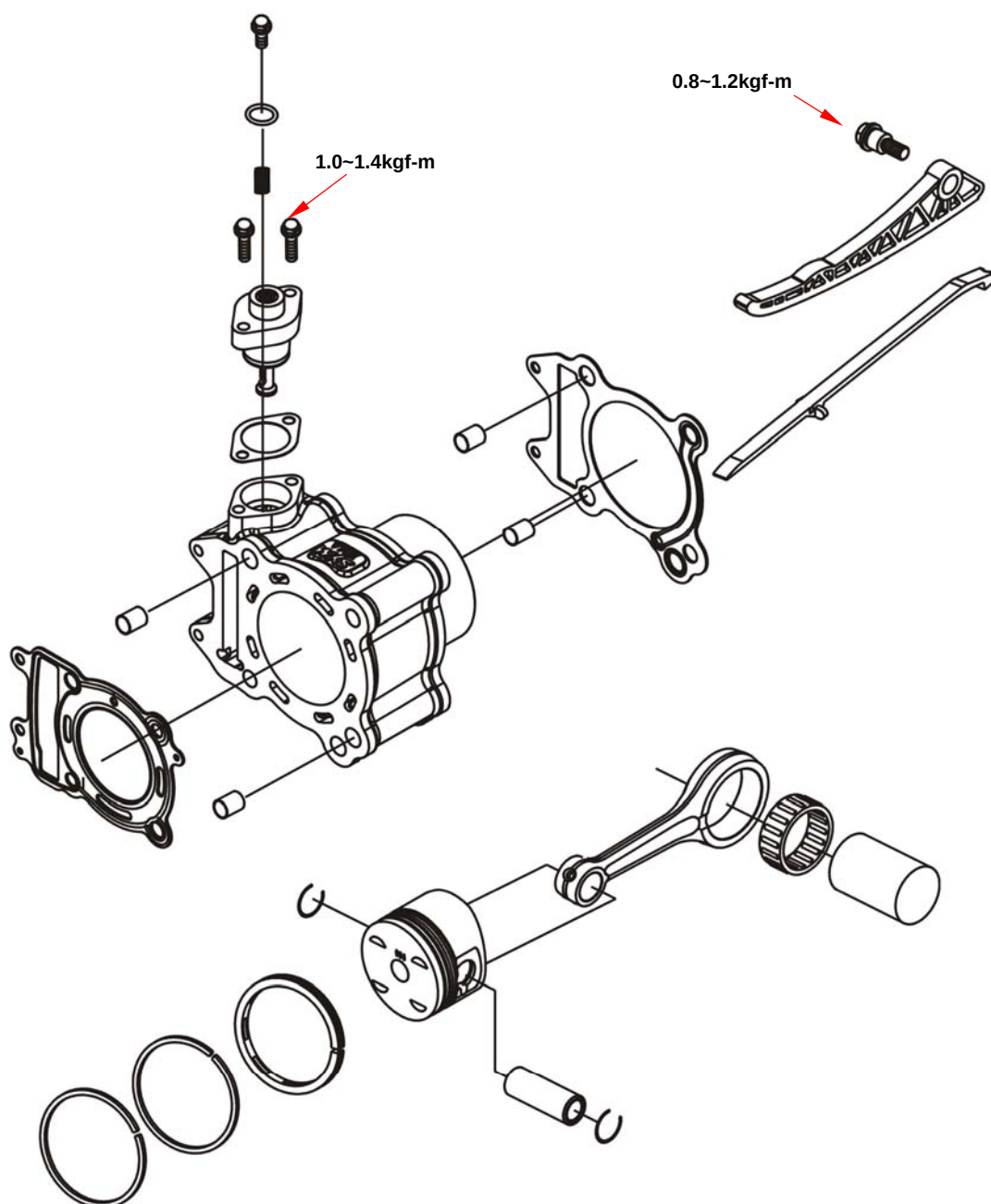
- If lubricant does not flow to cylinder head, engine components will be worn out seriously. Thus, it must be confirmed.
- When checking lubricant flowing condition, run the engine in idle speed. Do not accelerate engine speed.





|                                       |                                    |
|---------------------------------------|------------------------------------|
| Mechanism Diagram ..... 8-1           | Piston Ring Installation ..... 8-6 |
| Precautions in Operation ..... 8-2    | Piston Installation ..... 8-7      |
| Trouble Diagnosis..... 8-2            | Cylinder Installation ..... 8-7    |
| Cylinder and Piston Removal ..... 8-3 |                                    |

### Mechanism Diagram



## 8. Cylinder / Piston



### Precautions in Operation

#### General Information

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

#### Specification

Unit : mm

| 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 | 17.020 |
| 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 |

### 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

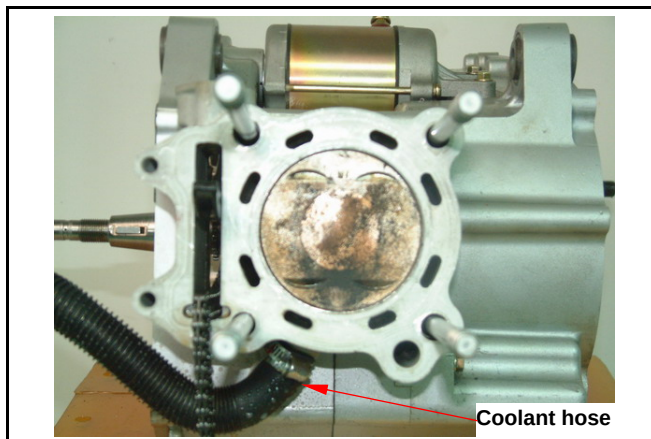
- Carbon deposits on cylinder head top side
- Cooling pipe clogged or not enough in coolant flow

## 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.

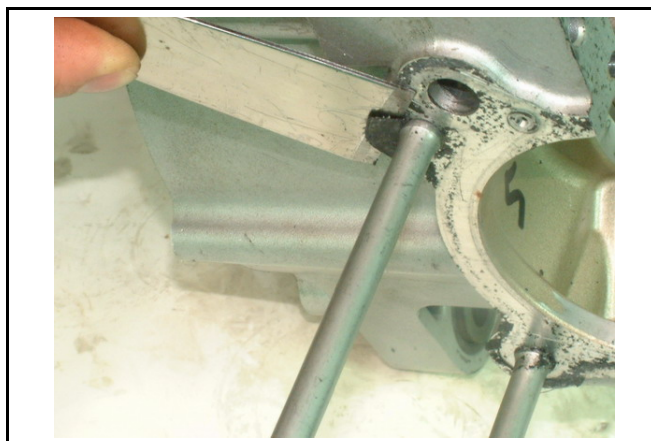


Remove cylinder gasket and dowel pin.

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.

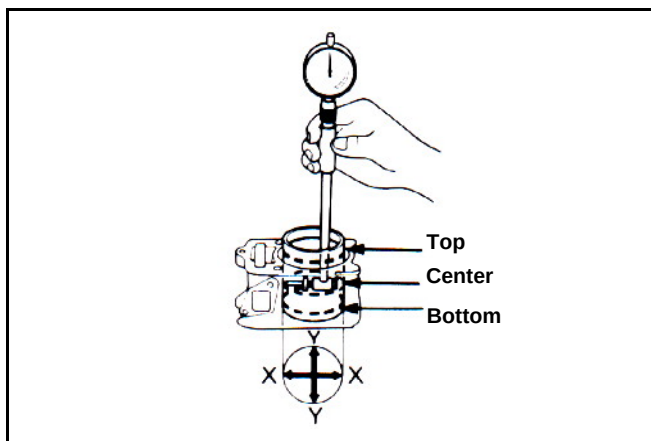


## Inspection

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: 71.100 mm**

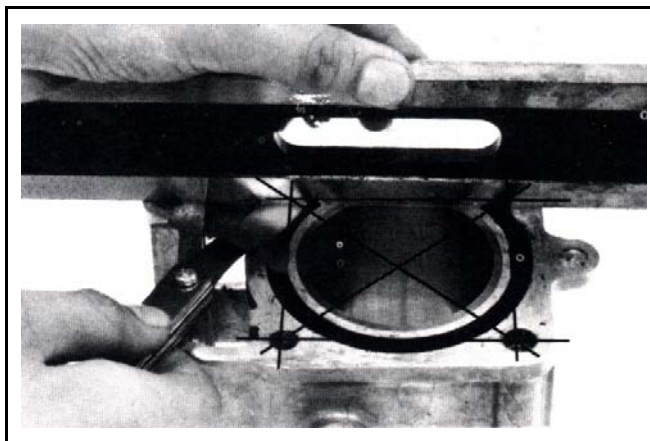


## 8. Cylinder / Piston



Check cylinder if warp.

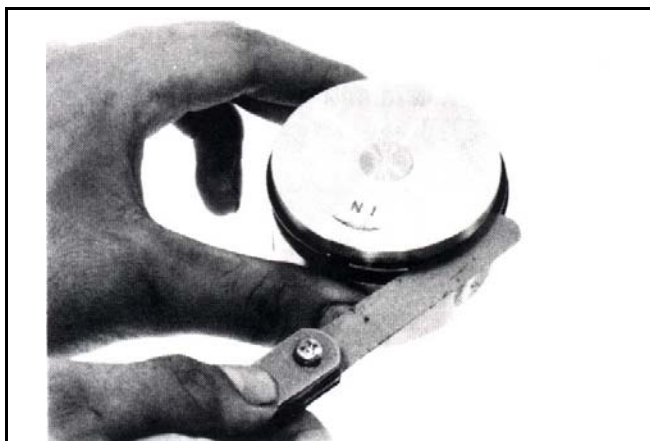
**Service limit: 0.05 mm**



Measure clearance between piston rings and grooves.

**Service Limit: Top ring: 0.09 mm**

**2<sup>nd</sup> ring: 0.09 mm**

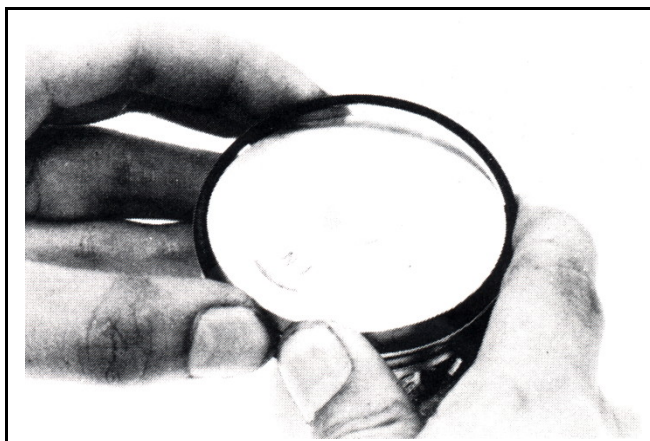


### Remove piston rings

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

#### **Caution**

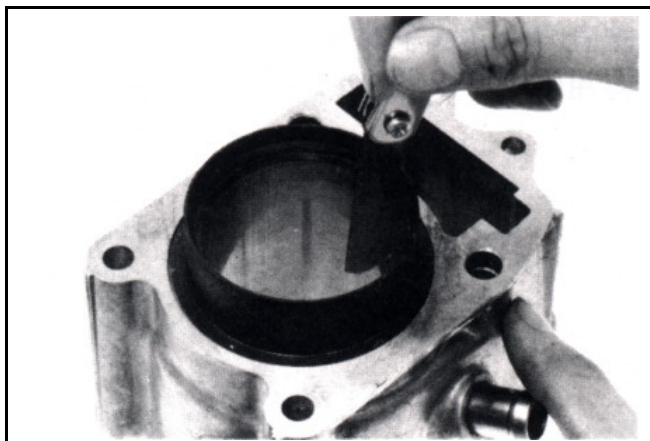
- Pay attention to remove piston rings because they are fragile.



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**





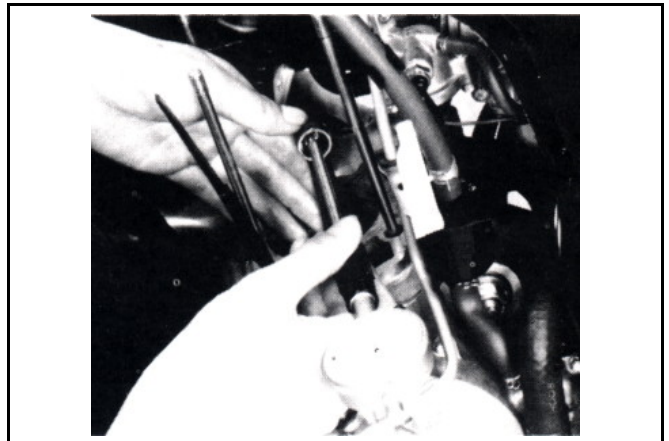
Measure the outer diameter of piston pin.

**Service Limit: 16.96 mm**



Measure the inner diameter of connecting rod small end.

**Service Limit: 17.064 mm**

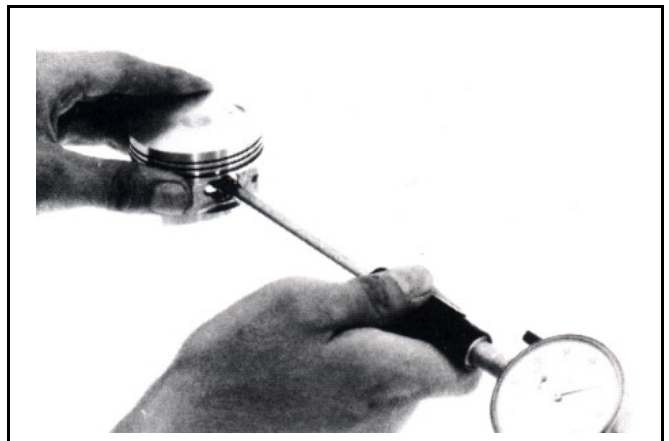


Measure the inner diameter of piston pin hole.

**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 : 70.380 mm**

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



## 8. Cylinder / Piston

### Piston Ring Installation

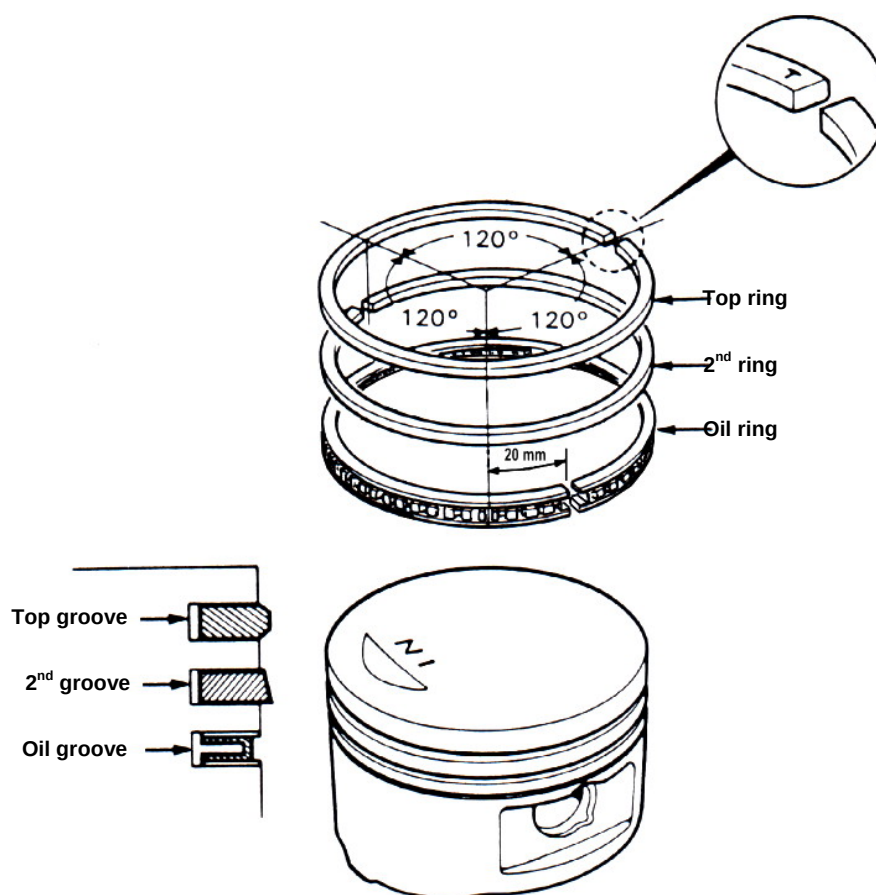
Clean up piston top, ring groove, and piston surface.

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.



## 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.

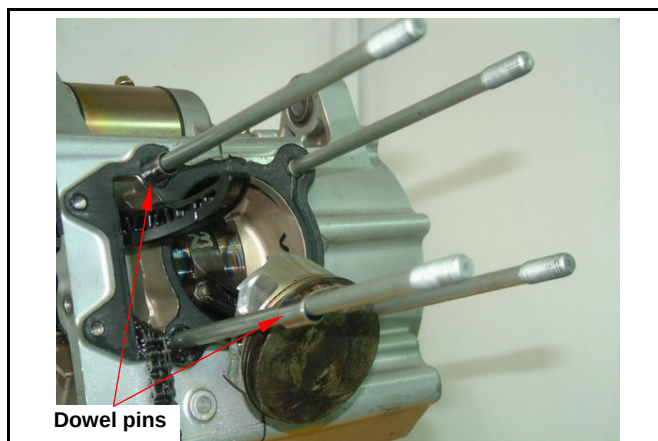
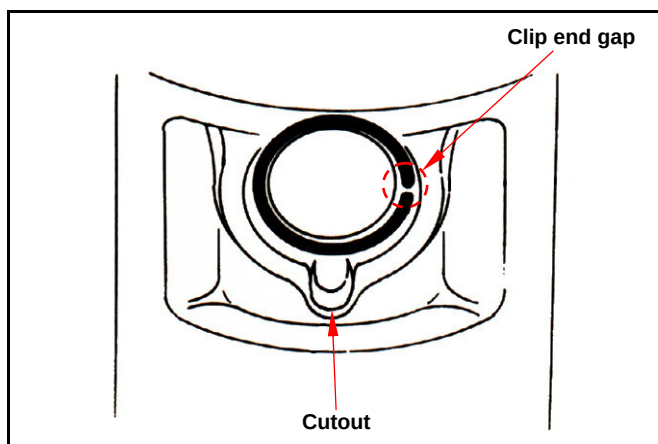
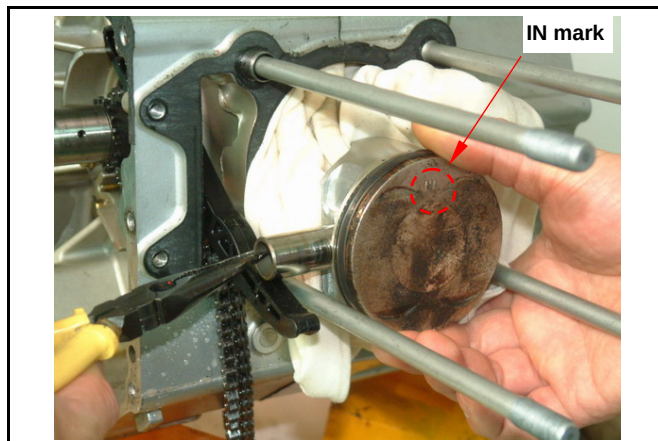
## Cylinder Installation

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.

Install dowel pins and new cylinder gasket.



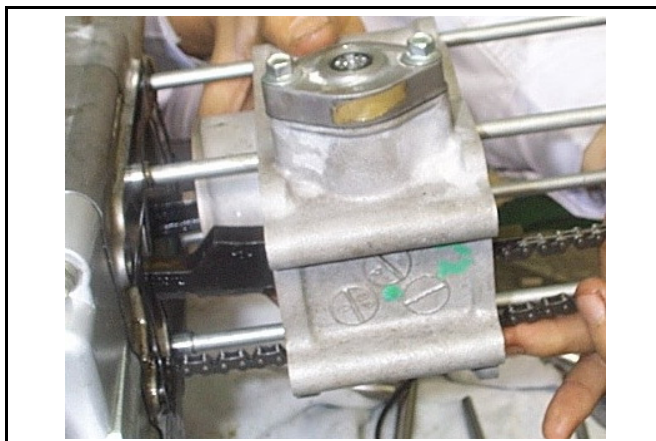
## 8. Cylinder / Piston

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.

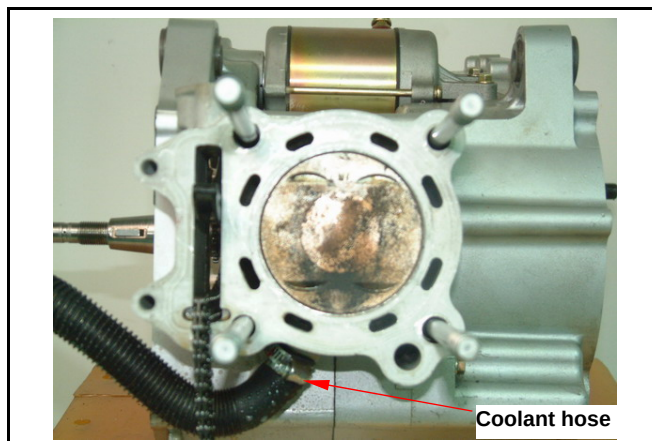
### Caution

- 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).

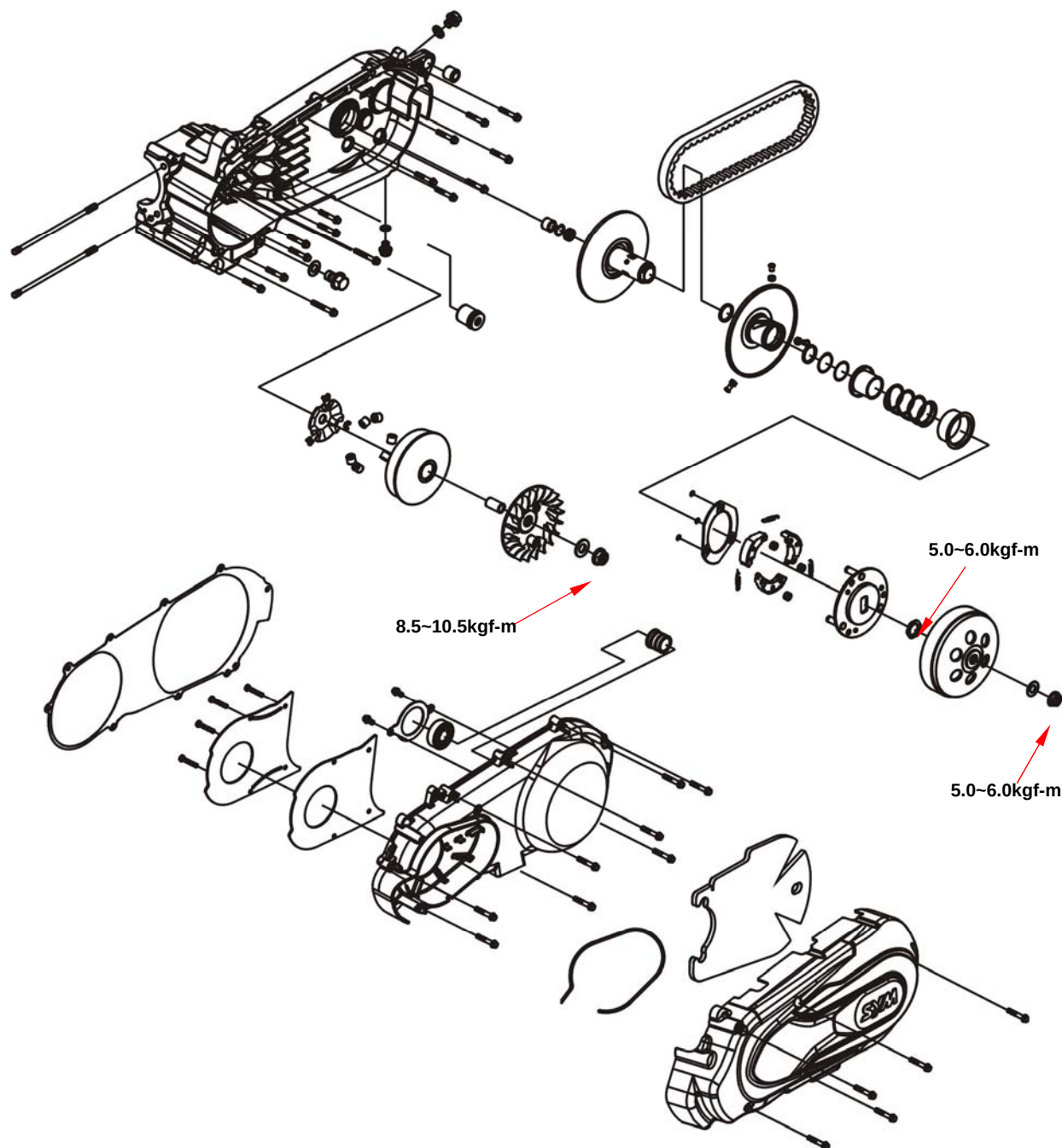




|                               |     |
|-------------------------------|-----|
| Mechanism Diagram .....       | 9-1 |
| Maintenance Description ..... | 9-2 |
| Trouble Diagnosis .....       | 9-2 |
| Left Crankcase Cover .....    | 9-3 |

|                                    |      |
|------------------------------------|------|
| Drive Belt .....                   | 9-5  |
| Drive Face .....                   | 9-7  |
| Clutch Outer / Driven Pulley ..... | 9-10 |

### Mechanism Diagram



## 9. V-Belt Driving System

### 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

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

#### Special Service Tools

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

### 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

### Left Crankcase Cover

#### Left crankcase cover removal

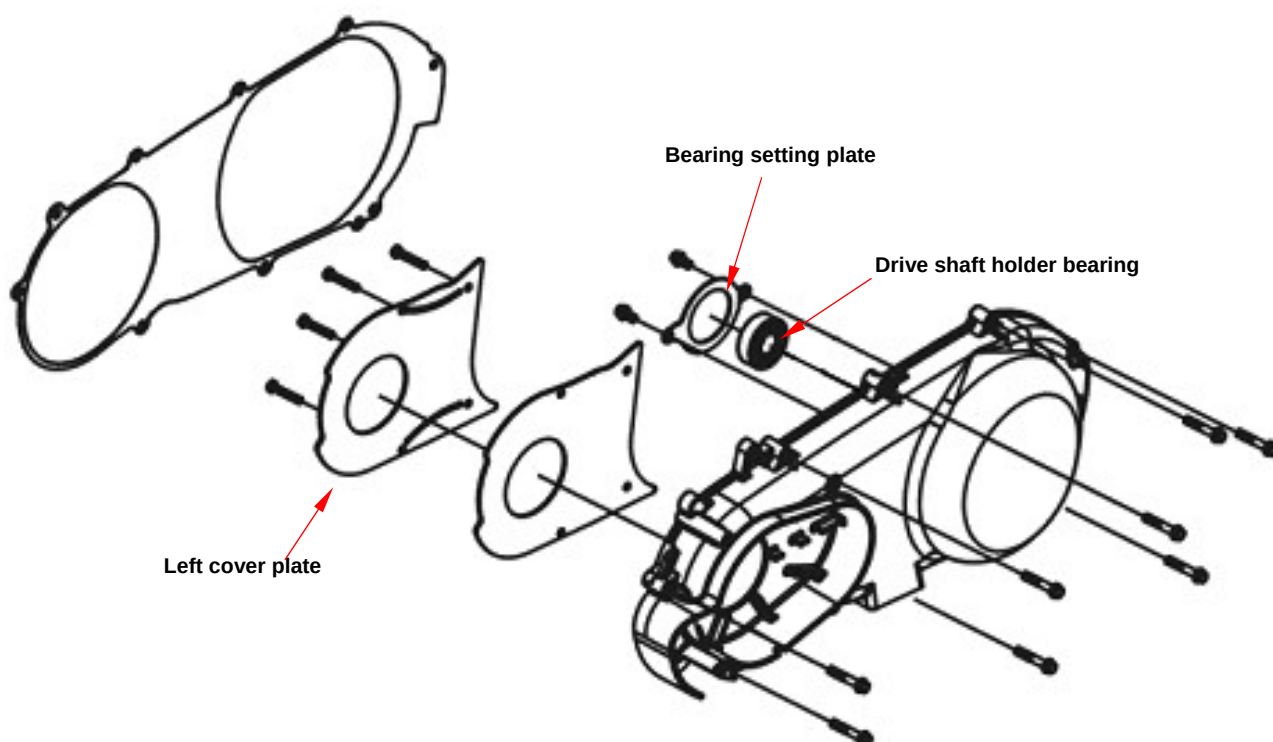
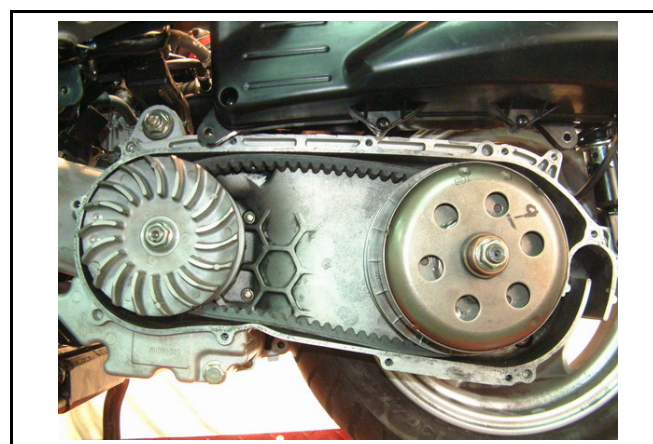
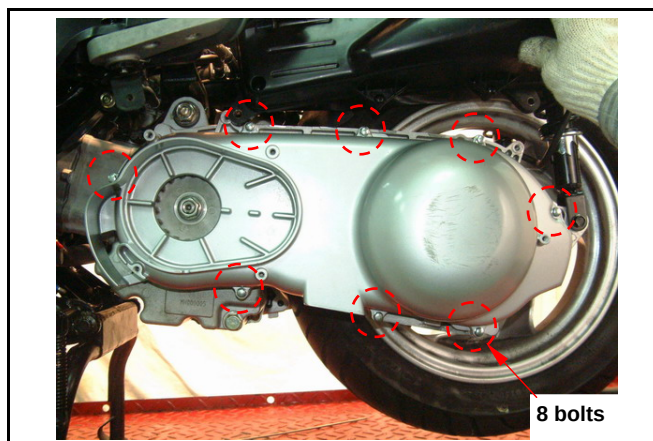
Loosen 4 bolts from left side crank out cover & remove it.

Remove left crankcase cover. (8 bolts)

Remove 2 dowel pin and gasket.

#### Left crankcase cover install

Install left crankcase cover in the reverse procedures of removal.





## 9. V-Belt Driving System

### Left crankcase cover inspection

Remove 2 bolts to remove left crankcase cover bearing setting plate.

Check bearing on left crankcase cover.  
Rotate 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 cover tightly.  
If bearing rotation is uneven, noising, or loose bearing mounted, then replace it.

### Bearing replacement

Remove bearing with special service tools

**Special tools:**

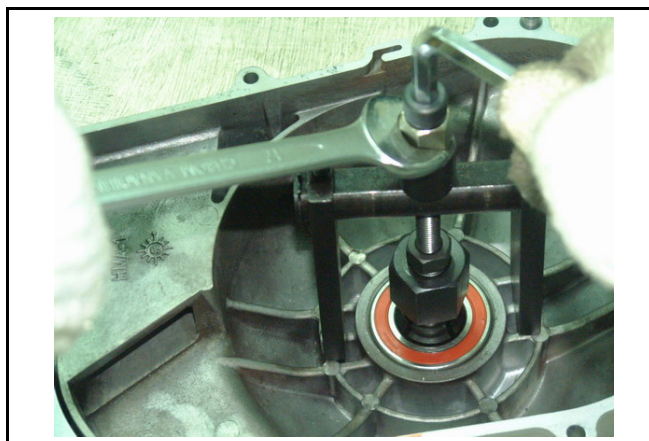
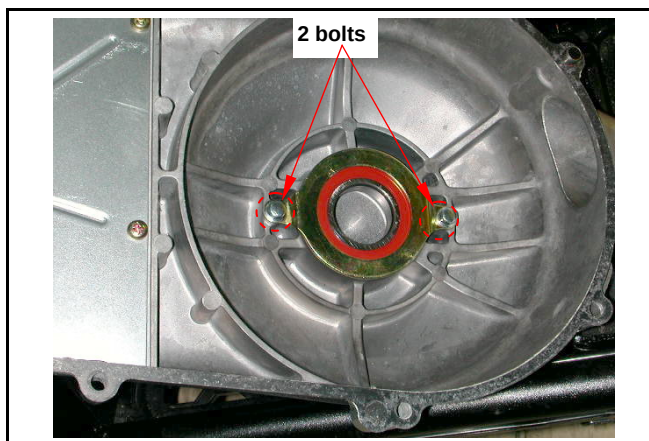
Inner bearing puller    **SYM-6204022**

Install bearing with special service tools.

**Special tools:**

Right crank case bearing 6201 assemblies tool

**SYM-9614000-HMA 6201**



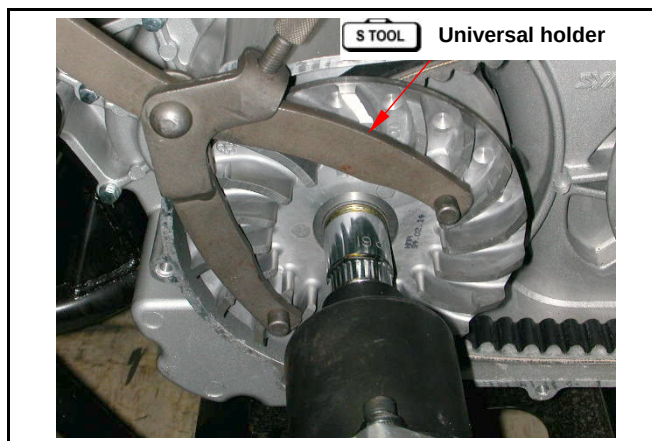


## Drive Belt

### Removal

Remove left crankcase cover.  
Hold drive face with universal holder, and remove nut and drive face.

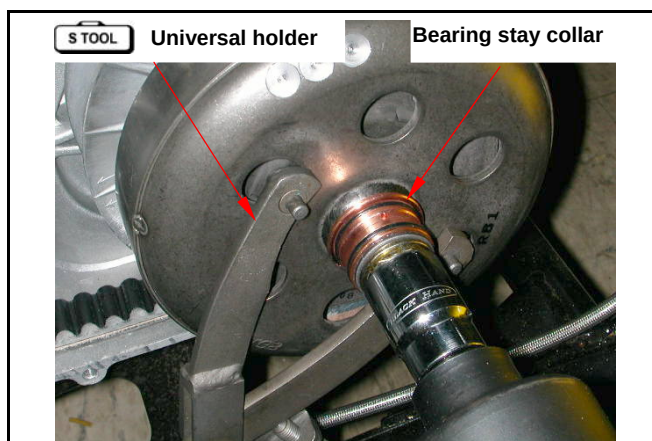
**Special Tool : universal holder**



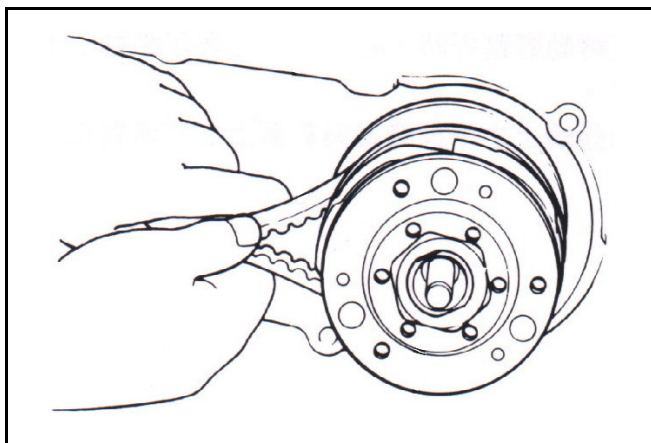
Hold clutch outer with universal holder, and remove nut, bearing stay collar and clutch outer.

### ⚠ 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.

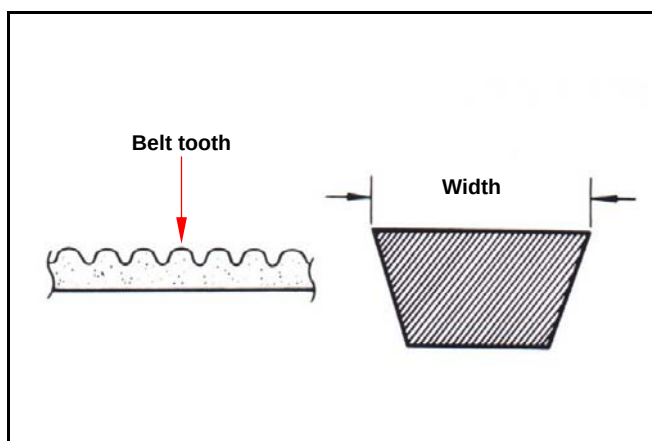
Measure the width of drive belt as diagram shown.

**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.



## 9. V-Belt Driving System



### 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.

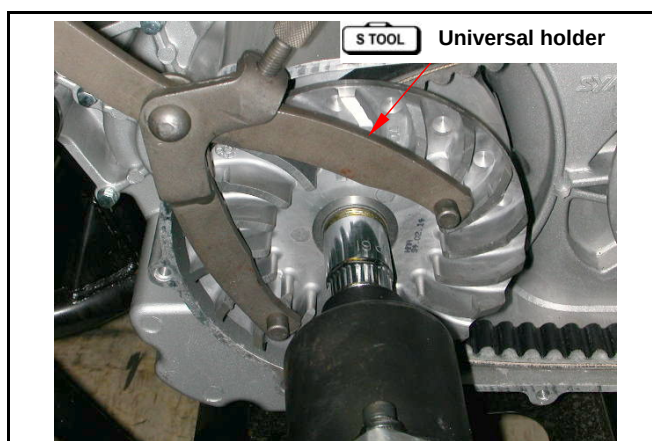
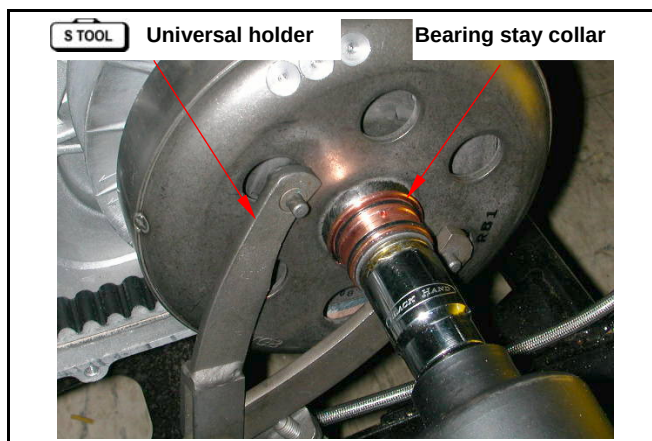
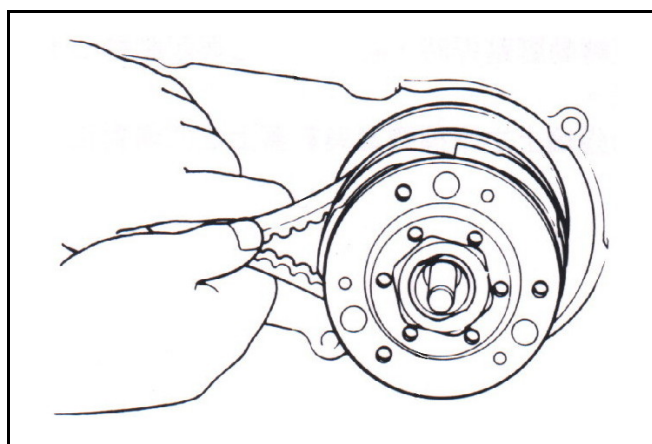
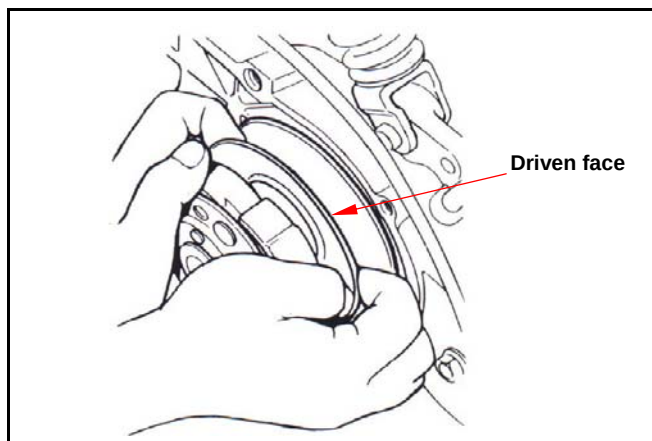
On the drive belt another end to the movable drive face.

Install the 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**

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

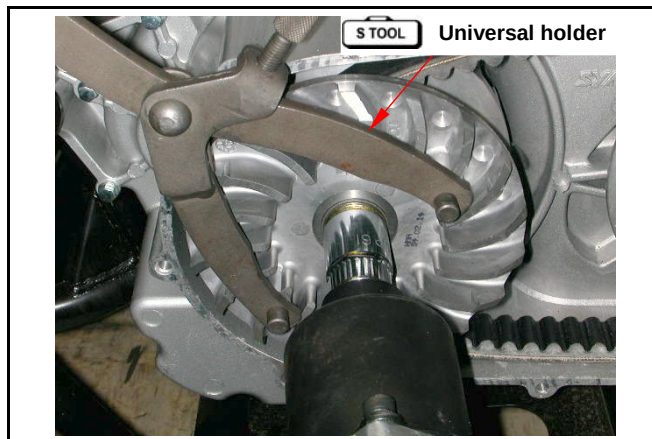
**Torque value: 8.5~10.5kgf-m**



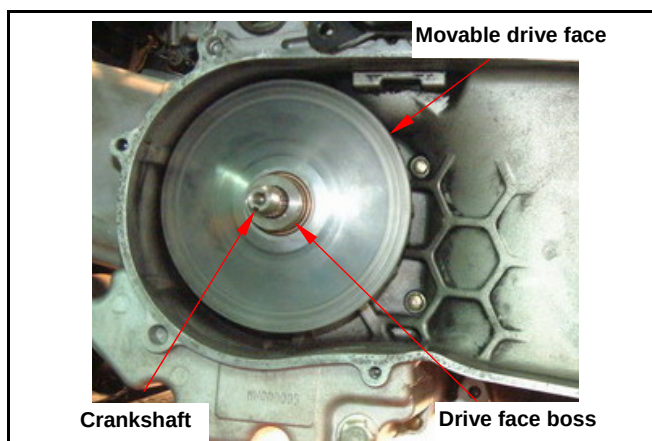
## Drive Face

### Removal

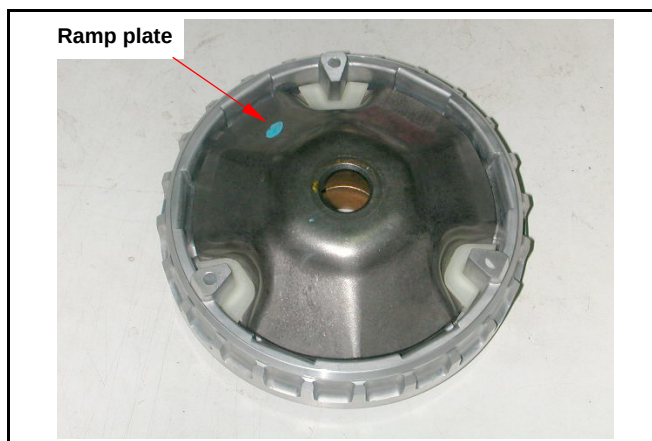
Remove left crankcase cover.  
Hold drive face with universal holder, and then remove drive face nut.  
Remove drive face and drive belt.



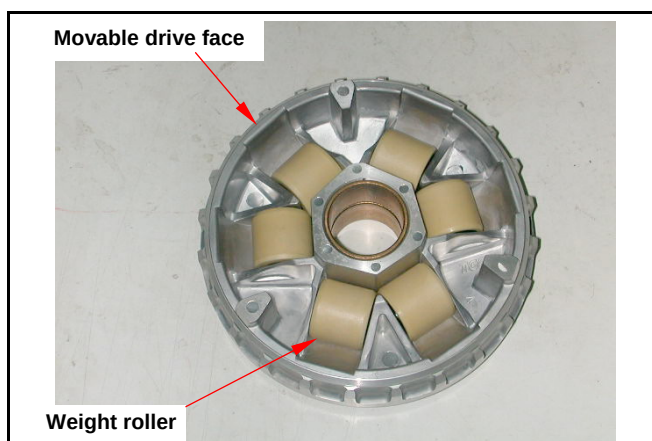
Remove movable drive face comp and drive face boss from crankshaft.



Remove ramp plate.



Remove weight rollers from movable drive face.





## 9. V-Belt Driving System



### 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 it exceed the service limit.

**Service limit: 19.0 mm**

**Weight: 17.2g**

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: 29.962 mm**

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

**Service limit: 30.060 mm**

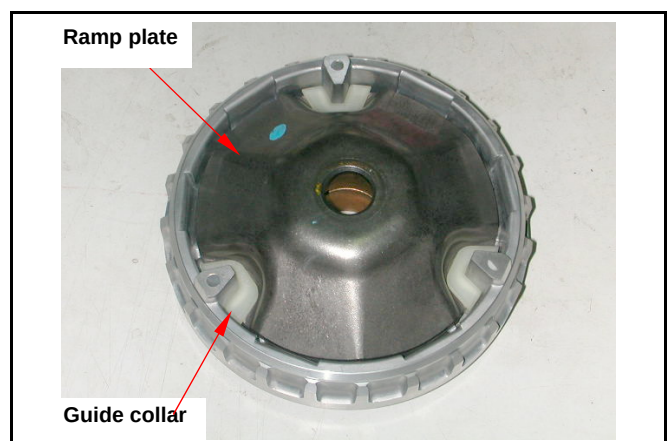
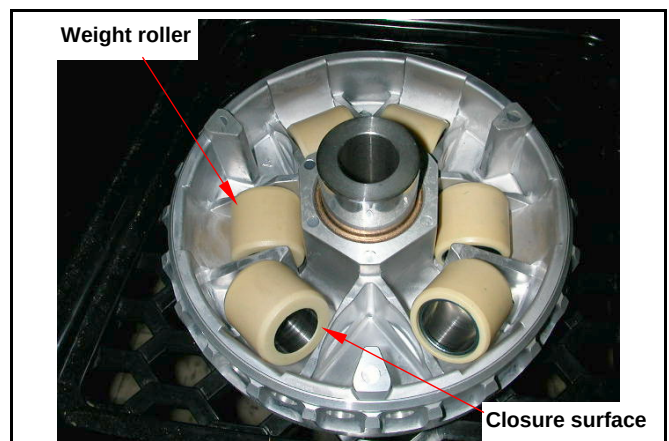
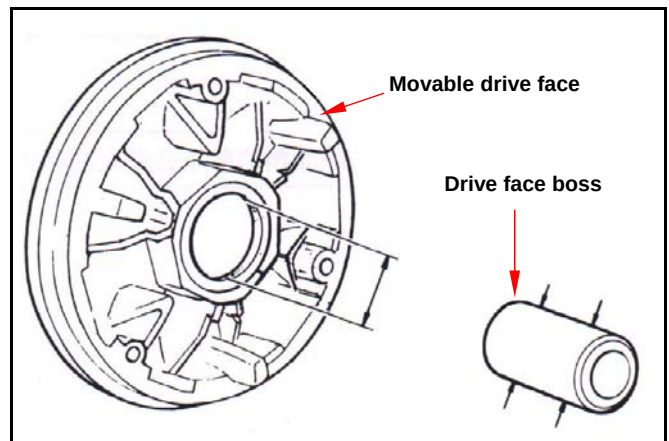
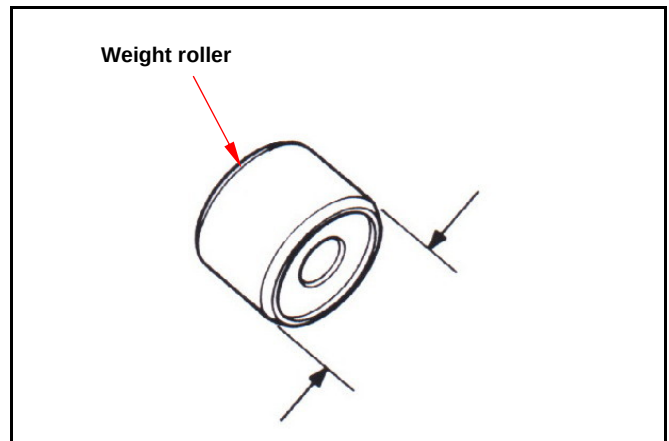
Reassembly/installation

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.

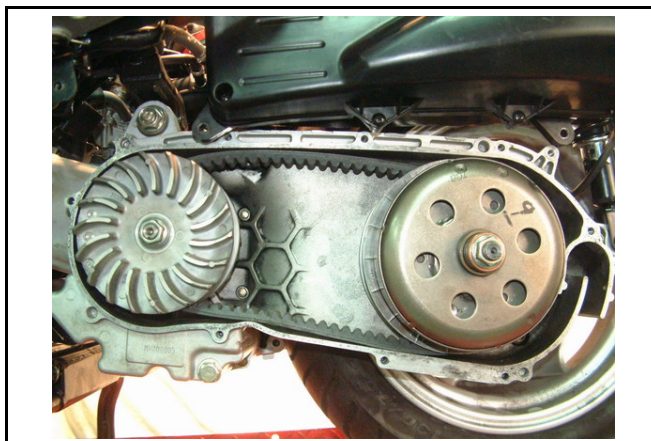
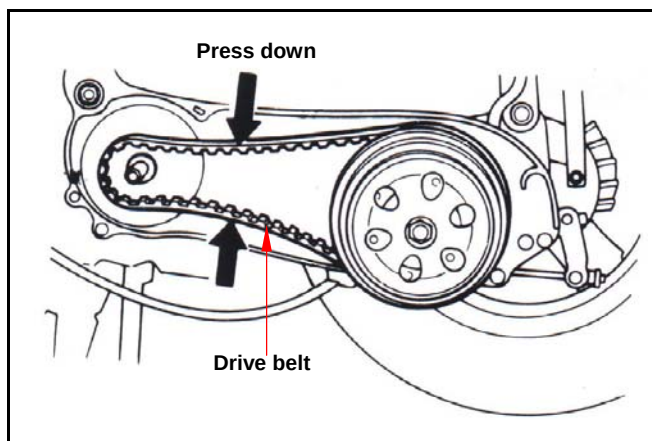
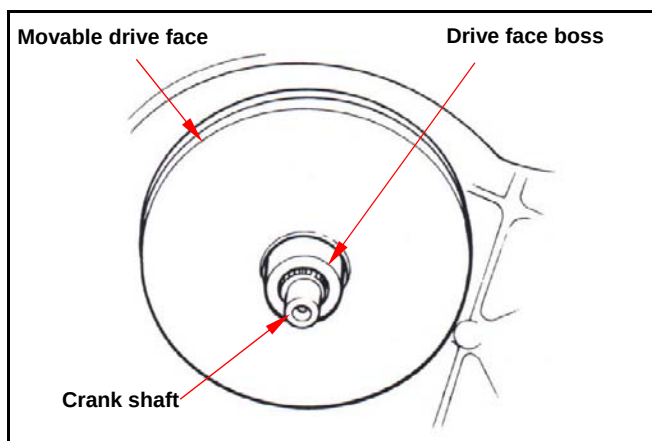
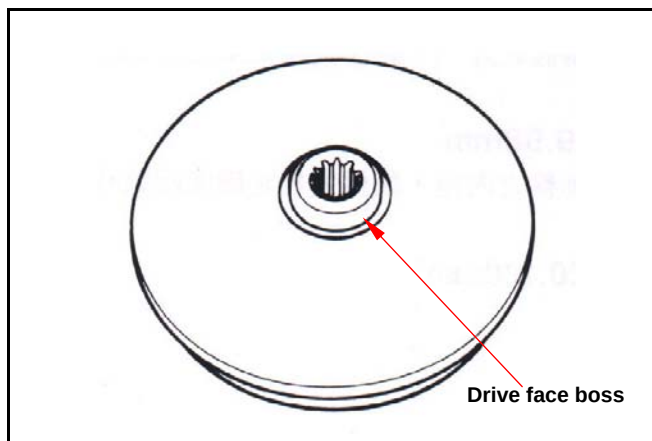
## ⚠ Caution

- 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.



## 9. V-Belt Driving System

### 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.

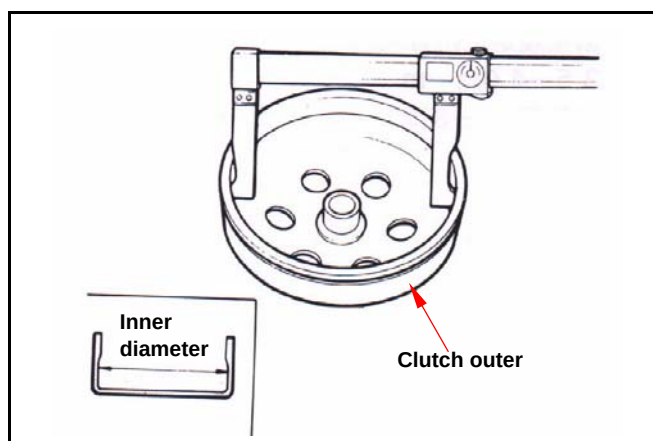
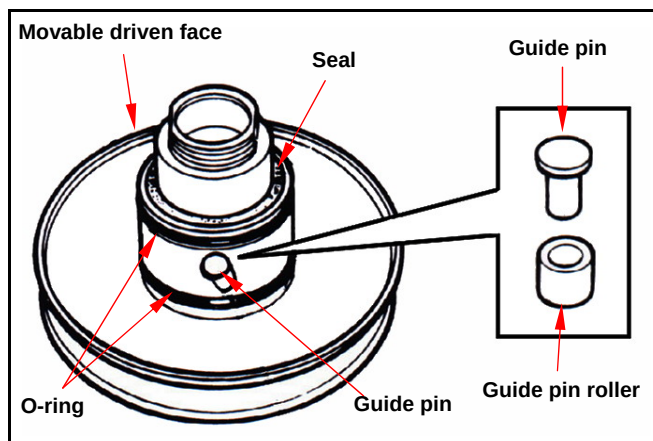
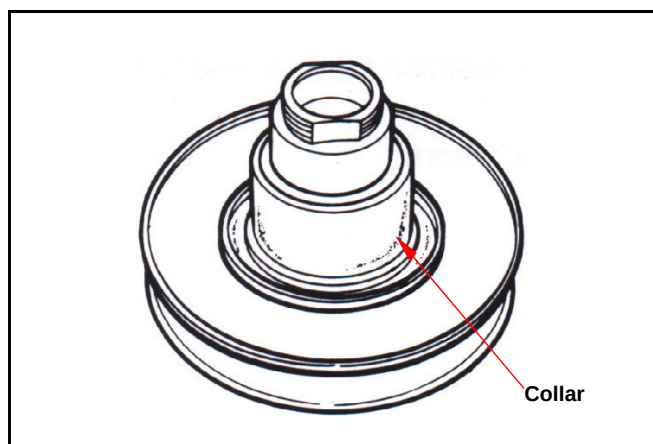
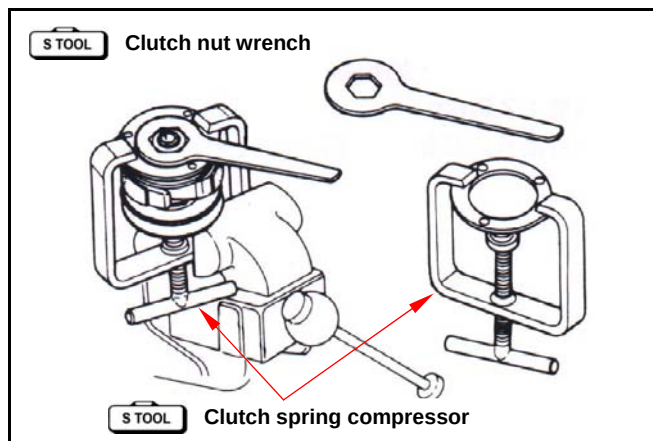
Remove guide pin, guide pin roller, and movable driven face, and then remove O-ring & oil seal seat from movable driven face.

#### Inspection

##### Clutch outer

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

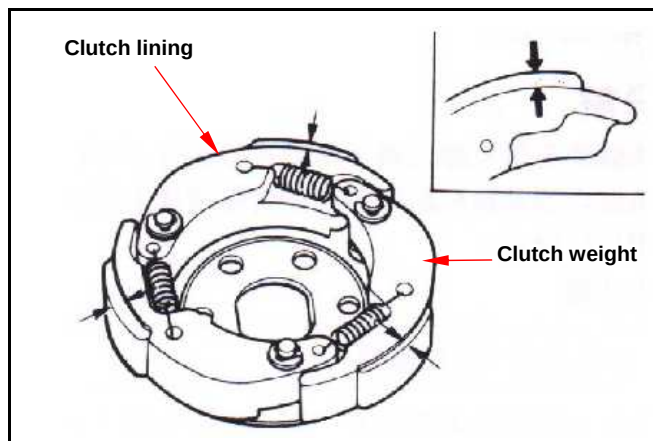
**Service limit: 145.450 mm**



### Clutch lining

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

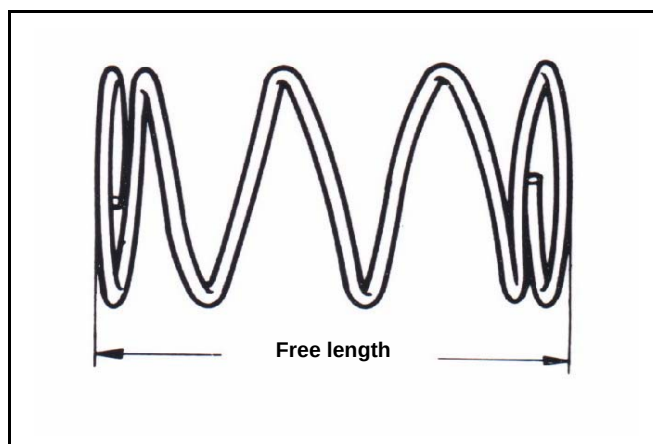
**Service limit: 3.0 mm**



### Driven pulley spring

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

**Service limit: 97.400 mm**



### Driven pulley

Check following items:

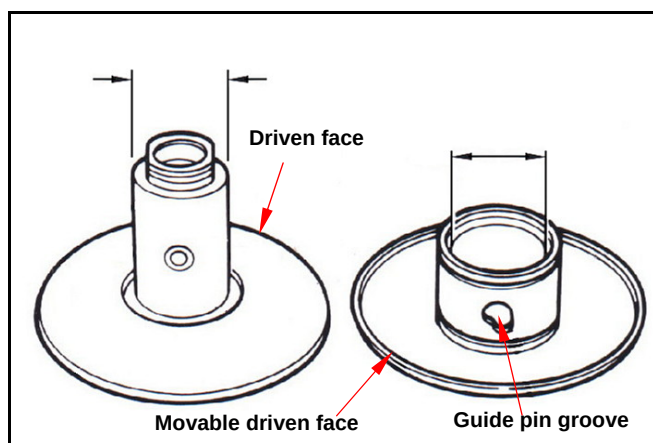
- If both surfaces are damaged or worn.
- If guide pin groove is damaged or worn.

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 40.93 mm**

**Inner diameter 41.07 mm**



### Driven Pulley Bearing Inspection

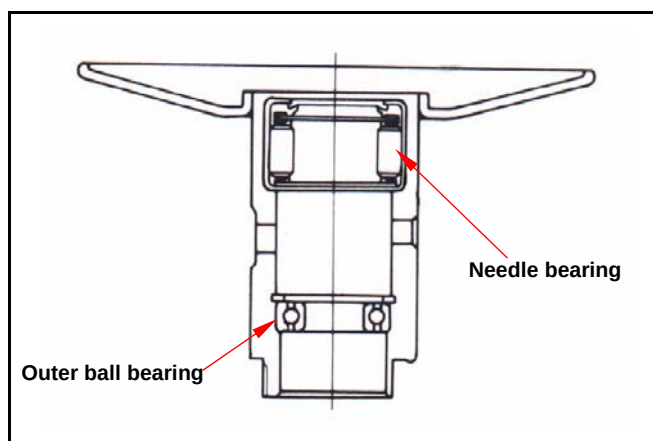
Check if the inner bearing oil seal is damage.

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.



## 9. V-Belt Driving System



### 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.

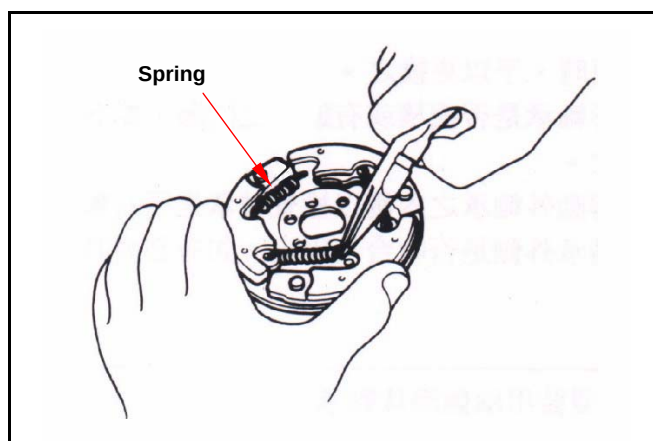
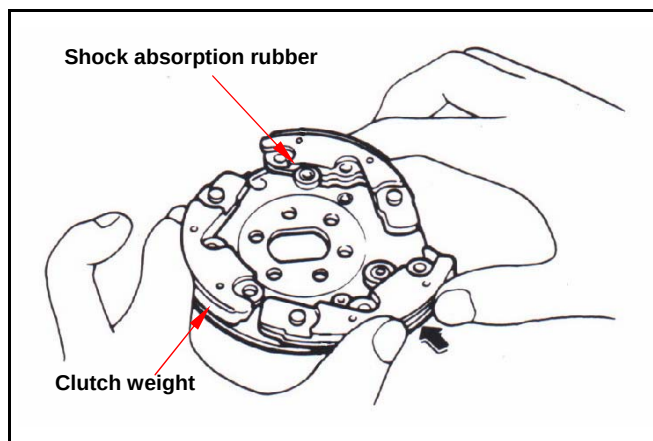
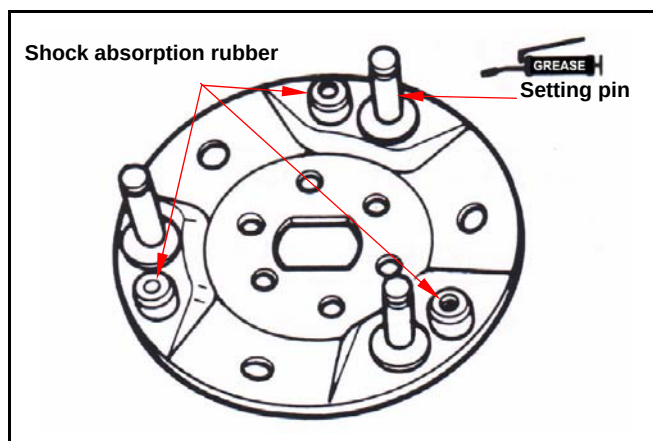
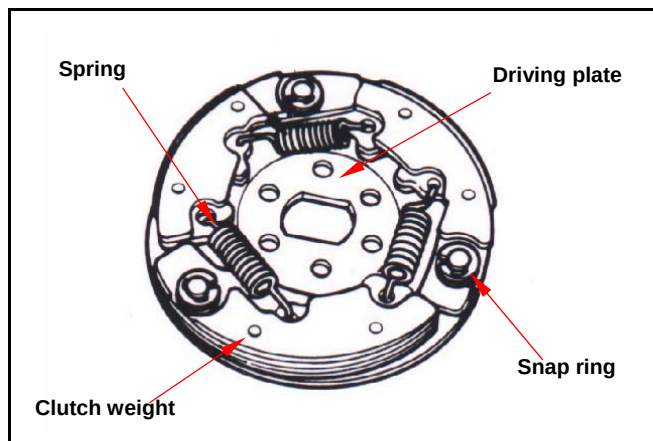
Check if shock absorption rubber is damage or deformation. Replace it if necessary.  
Apply with grease onto setting pins.

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.

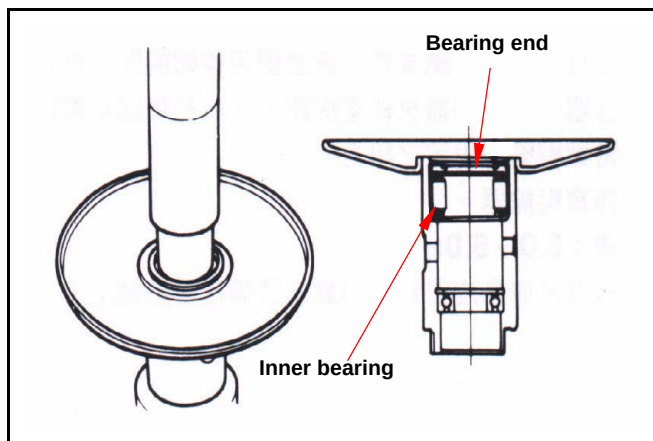
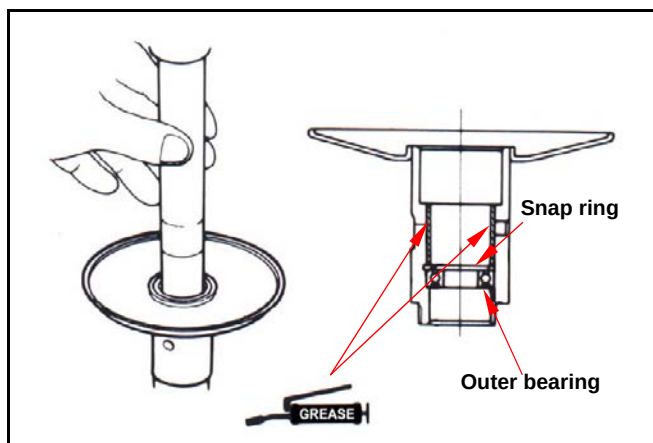
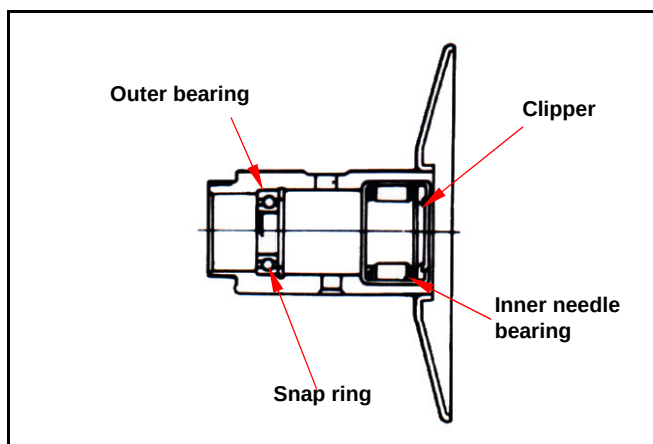
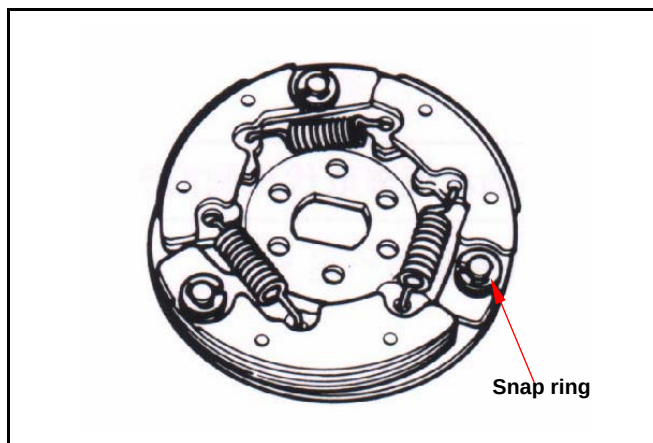
Place new bearing onto proper position and its sealing end should be forwarded to outside. Apply with specified oil.

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).

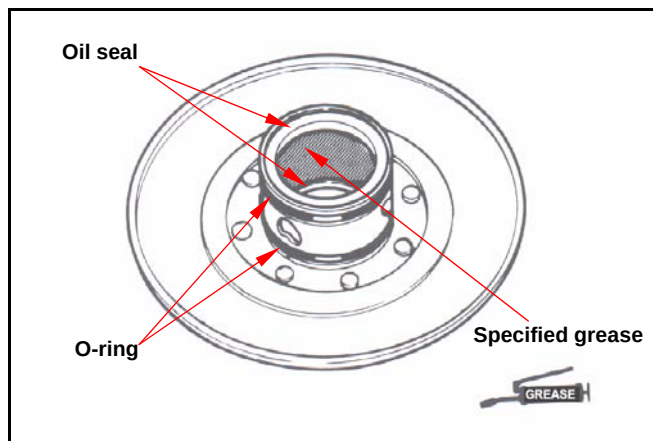


## 9. V-Belt Driving System

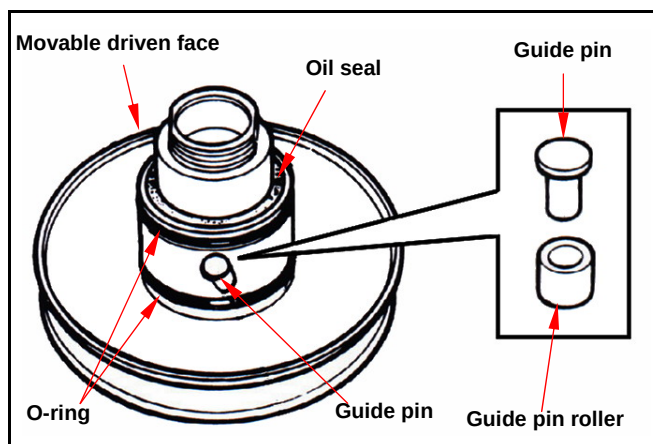
### Installation of Clutch Outer/Driven Pulley Assembly

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

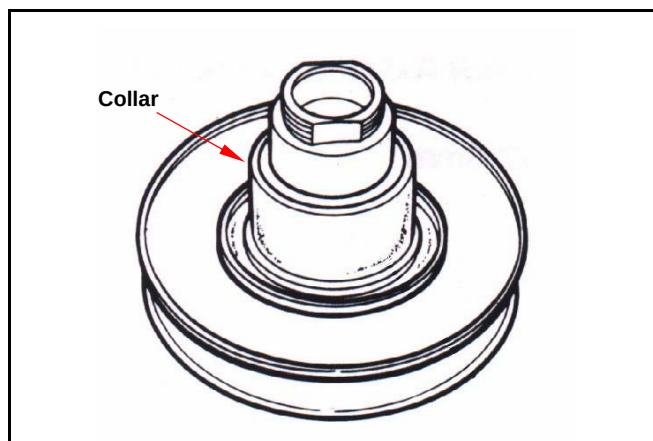
Apply with specified grease to lubricate the inside of movable driven face.



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



Install the collar.



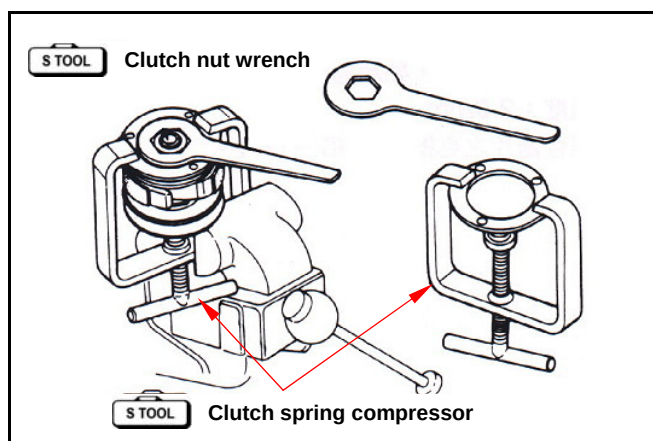
Install friction plate, spring and clutch weight into clutch spring compressor, and press down the assembly by turning manual lever until mounting nut that can be installed.

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**

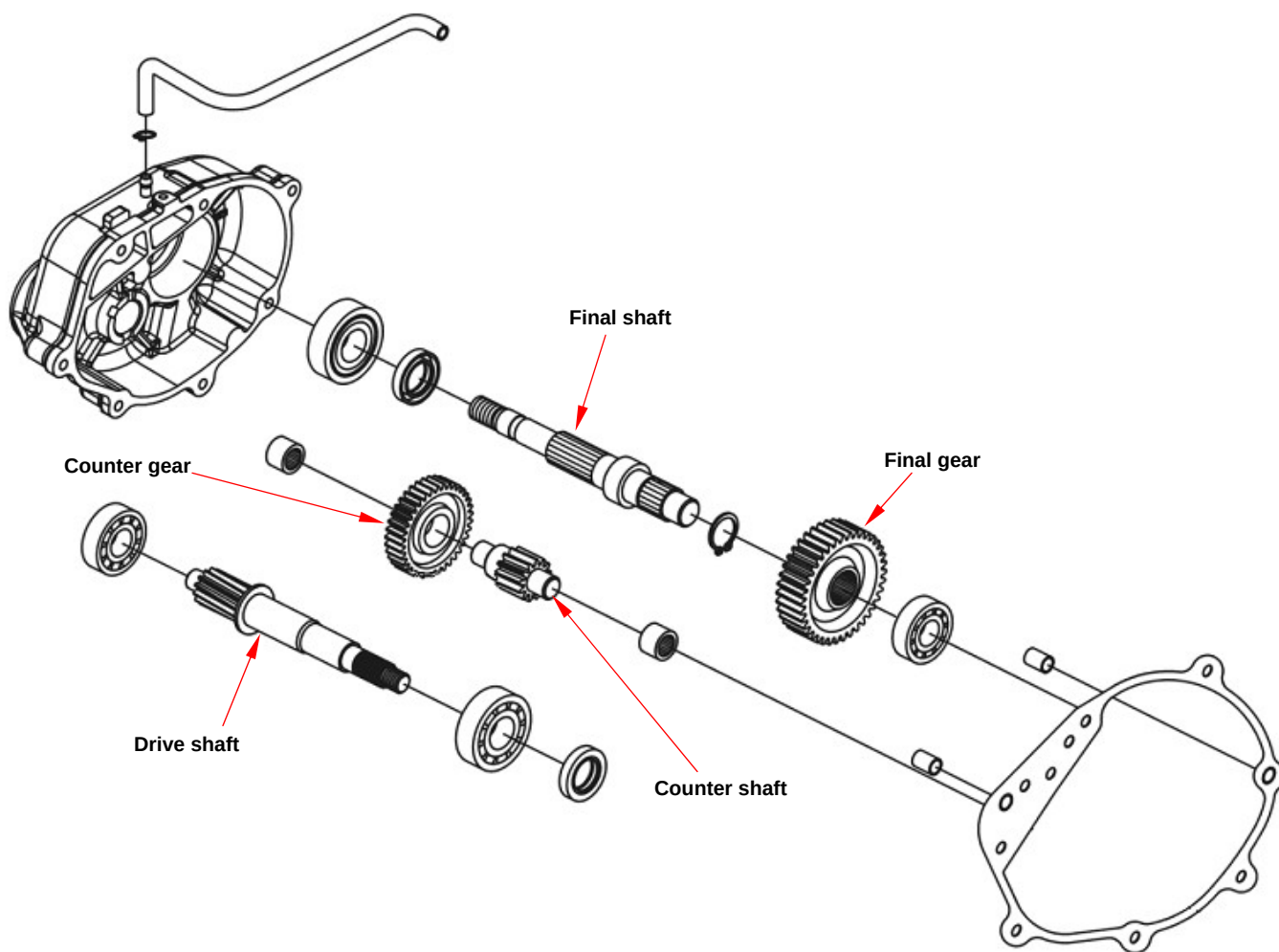
Install clutch outer/driven pulley and drive belt onto drive shaft.



## 10. Final Driving Mechanism

|                                        |      |                                             |      |
|----------------------------------------|------|---------------------------------------------|------|
| Mechanism Diagram .....                | 10-1 | Inspection of Final Driving Mechanism ..... | 10-4 |
| Precautions in Operation .....         | 10-2 | Bearing Replacement .....                   | 10-5 |
| Trouble Diagnosis .....                | 10-2 | Re-Assembly of Final Driving Mechanism ..   | 10-8 |
| Disassembly of Final Driving Mechanism | 10-3 |                                             |      |

### Mechanism Diagram



## 10. Final Driving Mechanism

### Precautions in Operation

#### Specification

Application oil: scooter gear oil

Recommended oil: KING MATE serial gear oils

Oil quantity: 180 c.c. (170 c.c. when replacing)

#### Torque value

Gear box cover      2.6~3.0kgf-m

#### Special tools

|                                         |                            |
|-----------------------------------------|----------------------------|
| Bearing (6205) driver                   | SYM-9615000-6205           |
| Bearing (6205) puller                   | SYM-9100400 HMA RA1 6205   |
| Bearing (6203) driver                   | SYM-9620000                |
| Drive shaft & oil seal (25*40*8) socket | SYM-9120200-HMA            |
| Bearing (HK1516) driver                 | SYM-9100200-HMA HK1516     |
| Bearing (6204) driver                   | SYM-9110400-6204           |
| Oil seal drive 34*52*5                  | SYM-9125500-HMA            |
| Inner bearing puller                    | SYM-6204021 or SYM-6204022 |
| Outer bearing puller                    | SYM-6204001                |
| Drive shaft install puller              | SYM-2341110- HMA RB1       |
| Bearing install puller                  | SYM-2341100                |
| Clutch nut wrench                       | SYM-9020200                |

### Trouble Diagnosis

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

- Damaged driving gear
- Burnt out driving gear
- Damaged driving belt.

#### Noise

- Worn or burnt gear
- Worn gear

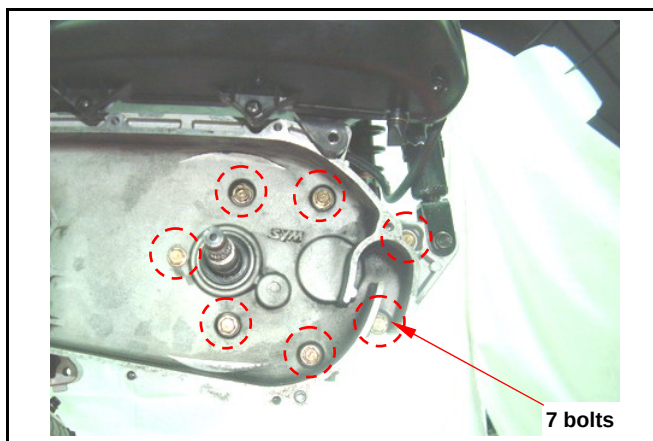
#### Gear oil leaks

- Excessive gear oil.
- Worn or damage oil seal



## Disassembly of Final Driving Mechanism

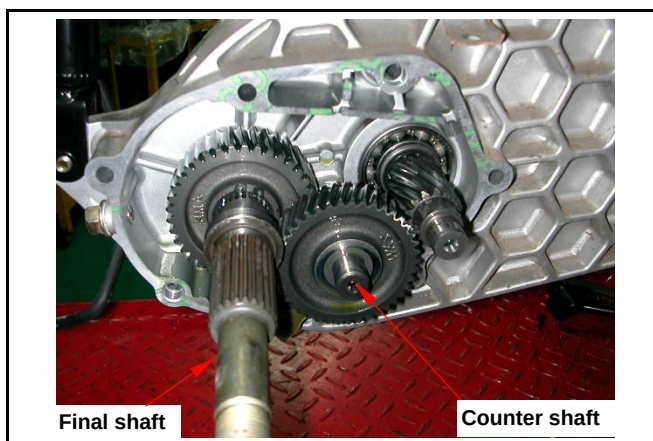
Remove the rear wheel.  
Remove the clutch.  
Drain out gear oil from gear box.  
Loosen 7 bolts and remove gear box cover bolts.



Remove the gear box cover.  
Remove the gasket & dowel pin.



Remove final gear.  
Remove counter shaft, gear and 2 washers.  
Remove final shaft.

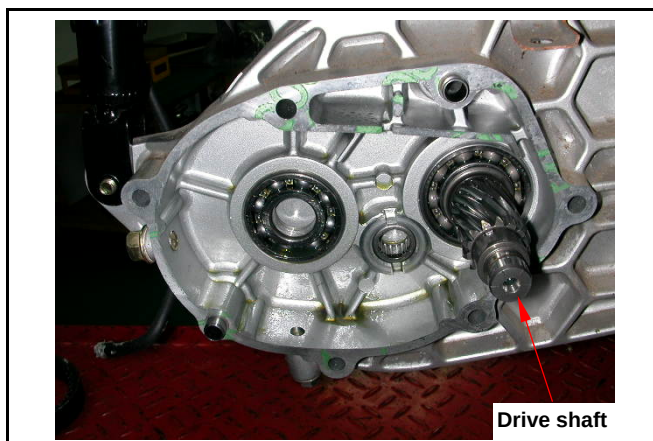


Remove the drive shaft.

**Special tool:**  
**Shaft protector**

 **Caution**

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



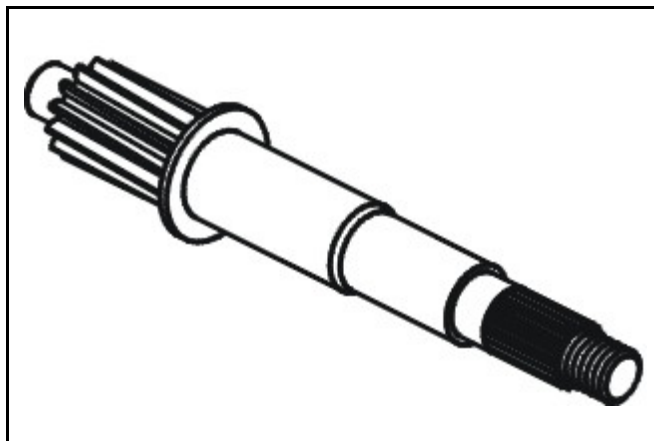
## 10. Final Driving Mechanism

### Inspection of Final Driving Mechanism

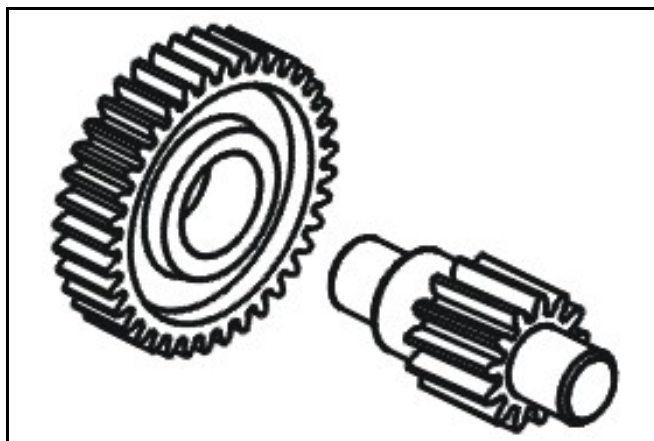
Check if the drive shaft are burn, wear or damage and replace it if necessary.

#### Caution

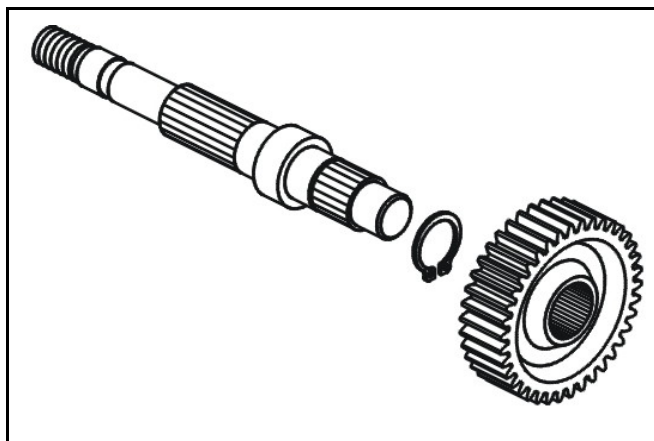
- If remove the drive shaft from the gear box upper side, then its bearing has to be replaced.



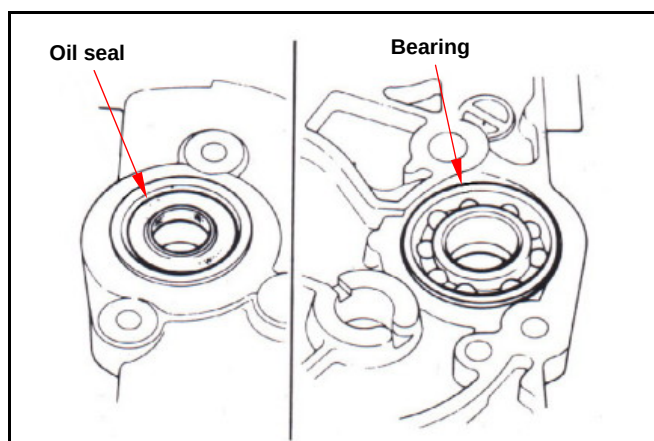
Check if the countershaft is wear or damage and replace it if necessary.



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



Check bearings on 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.  
Check gear box bearing as the same way above, and replace it if necessary.





## Bearing Replacement

### Left crankcase side

If the drive shaft is pulled out with its bearing, then remove the bearing with bearing puller and shaft protector.

#### Special tool:

**Multi-functional bearing puller or Outer bearing puller**      **SYM-6204001**

**Shaft protector**      **SYM-6204010**

Remove final shaft bearing and counter shaft bearing from left crankcase using following tools.

#### Special tool:

**Inner bearing puller** **SYM-6204020 or SYM-6204021**

### Caution

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

Install new final shaft bearing and counter shaft bearing into left crankcase.

#### Special tool:

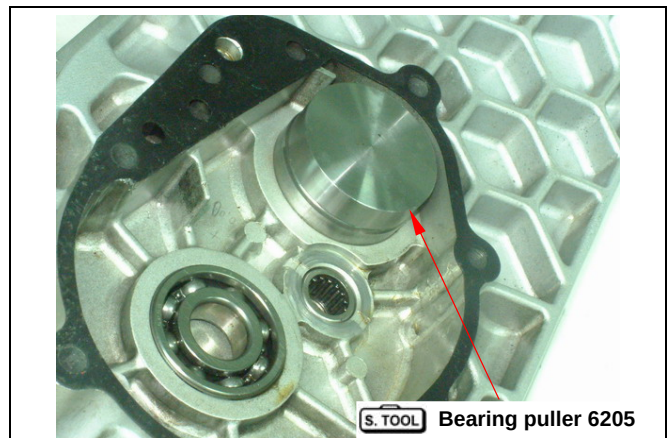
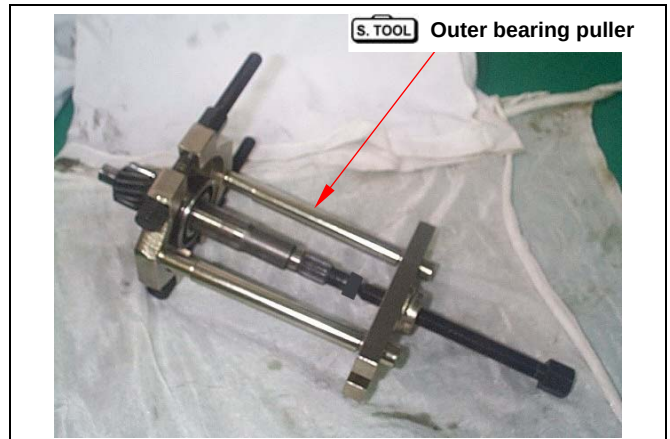
**Bearing driver 6205**      **SYM-9615000-6205**

**Bearing driver HK1516**      **SYM-9100200-HK1516**

Install new drive shaft bearing and bearing puller onto left crankcase.

#### Special tool:

**Bearing puller 6205**      **SYM-9100400-6205**



## 10. Final Driving Mechanism

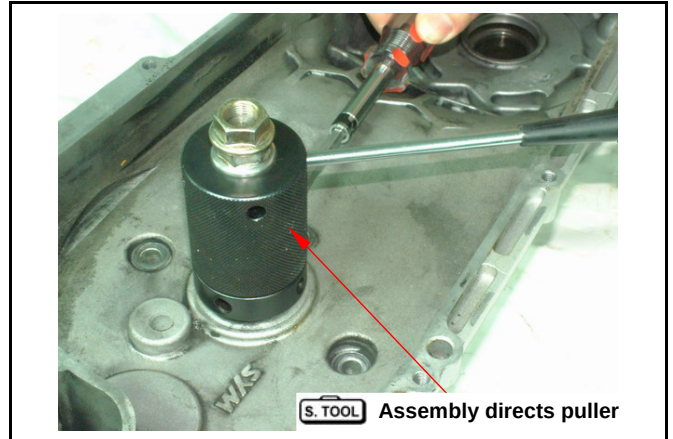


Install assembly directs puller bearing puller.

**Special Service Tools:**

**Assembly directs puller**      **SYM-2341110**

Use screw driver hold bearing puller lower part, and turn the bearing puller upper part to install the drive shaft bearing.

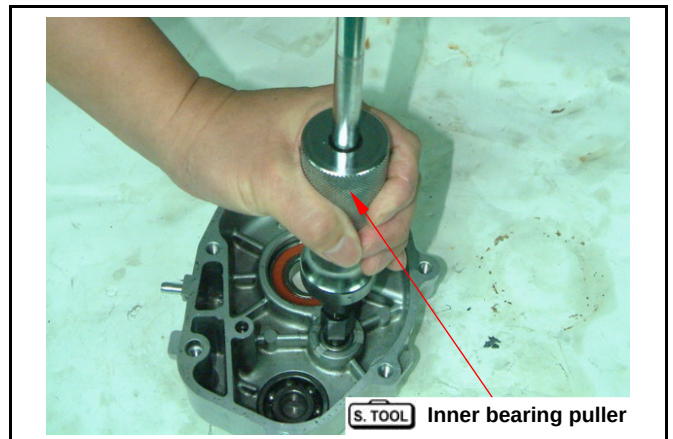


### Gear box cover side

Remove drive shaft bearing and counter shaft bearing from gear box cover using following tools.

**Special tool:**

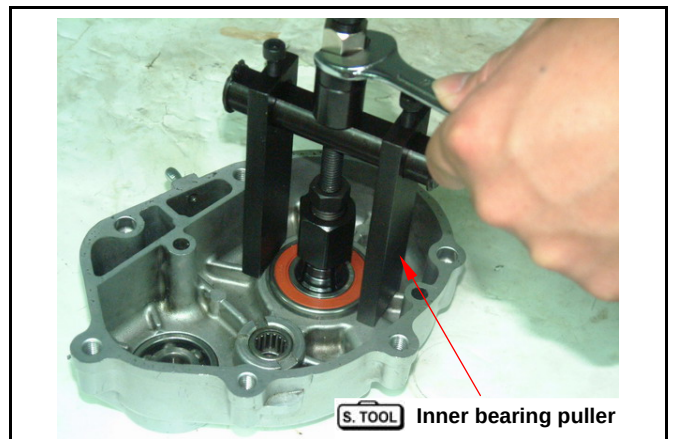
**Inner bearing puller** **SYM-6204020** or **SYM-6204021**



Remove oil seal, and then remove final shaft bearing from gear box cover using following tools.

**Special tool:**

**Inner bearing puller**      **SYM-6204022**



Install a new drive shaft bearing and counter shaft bearing into gear box cover.





Install new final shaft bearing and bearing puller onto left crankcase.

**Special tool:**

**Bearing puller 6205**      **SYM-9100400-6205**

Install assembly directs puller bearing puller.

**Special Service Tools:**

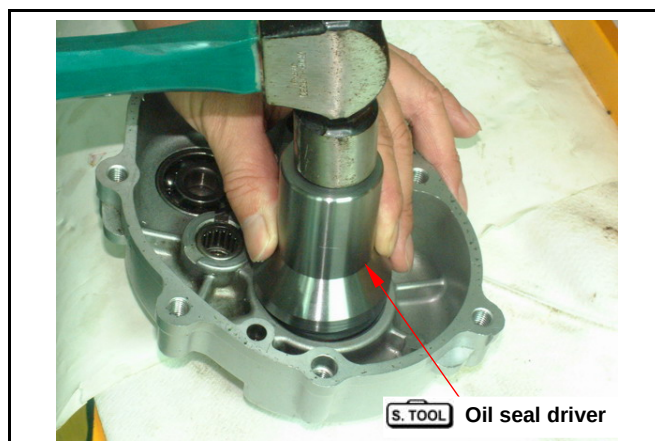
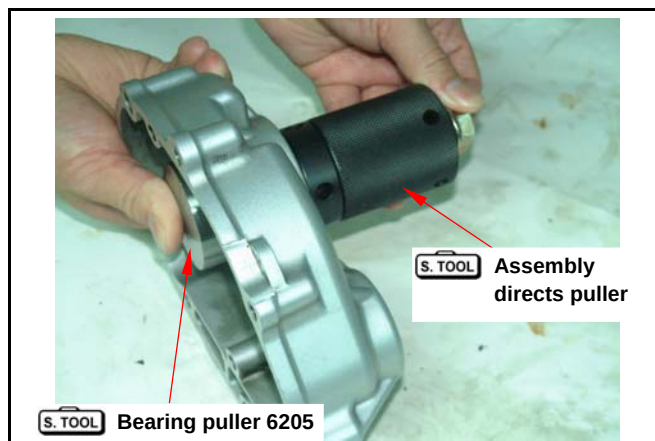
**Assembly directs puller**      **SYM-2341110**

Use screw driver holder bearing puller lower part, and turn the bearing puller upper part to install the final shaft bearing.

Apply with grease onto final shaft oil seal.  
Install the oil seal into gear box cover.

**Special tool:**

**Oil seal driver 34\*52\*5** **SYM-9125500-HMA**



## 10. Final Driving Mechanism



### Re-Assembly of Final Driving Mechanism

Install drive shaft.

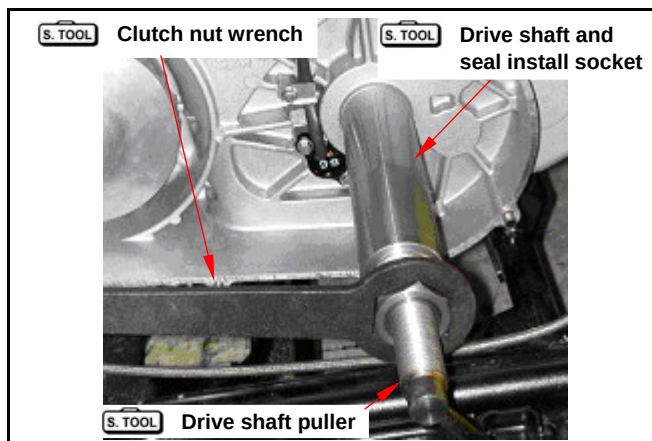
**Special tool:**

Drive shaft puller SYM-2341110- HMA RB1

Drive shaft socket & oil seal driver (25\*40\*8)

SYM-9120200-HMA

Clutch nut wrench SYM-9020200



Apply with grease onto drive shaft oil seal.

Install the oil seal to left crankcase.

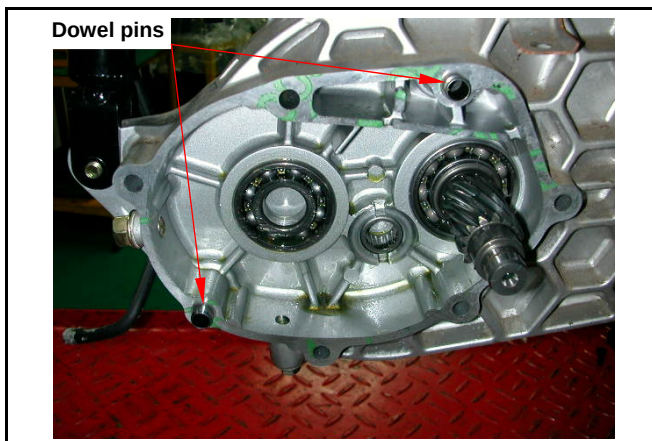
**Special tool:**

Drive shaft socket & oil seal driver (25\*40\*8)

SYM-9120200-HMA



Install 2 dowel pins & new gasket.



Install counter shaft and final shaft into the gear box cover.

Install the gear box and tighten the bolts (7 bolts).

**Torque value: 2.6~3.0kgf-m**

Install driven pulley / clutch outer / belt.

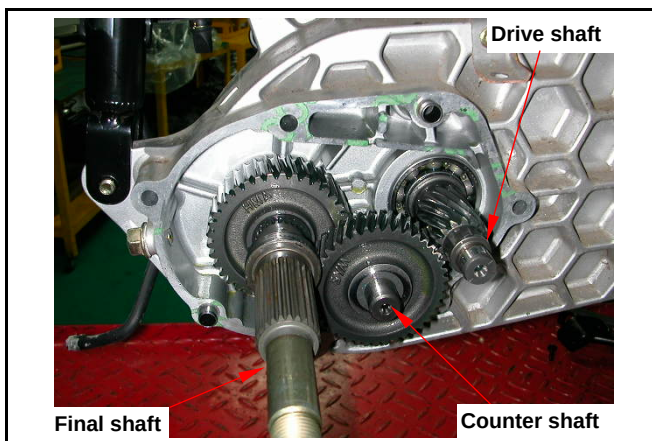
Install movable drive face, drive face and left

crankcase cover.

Install rear wheel.

Add gear oil.

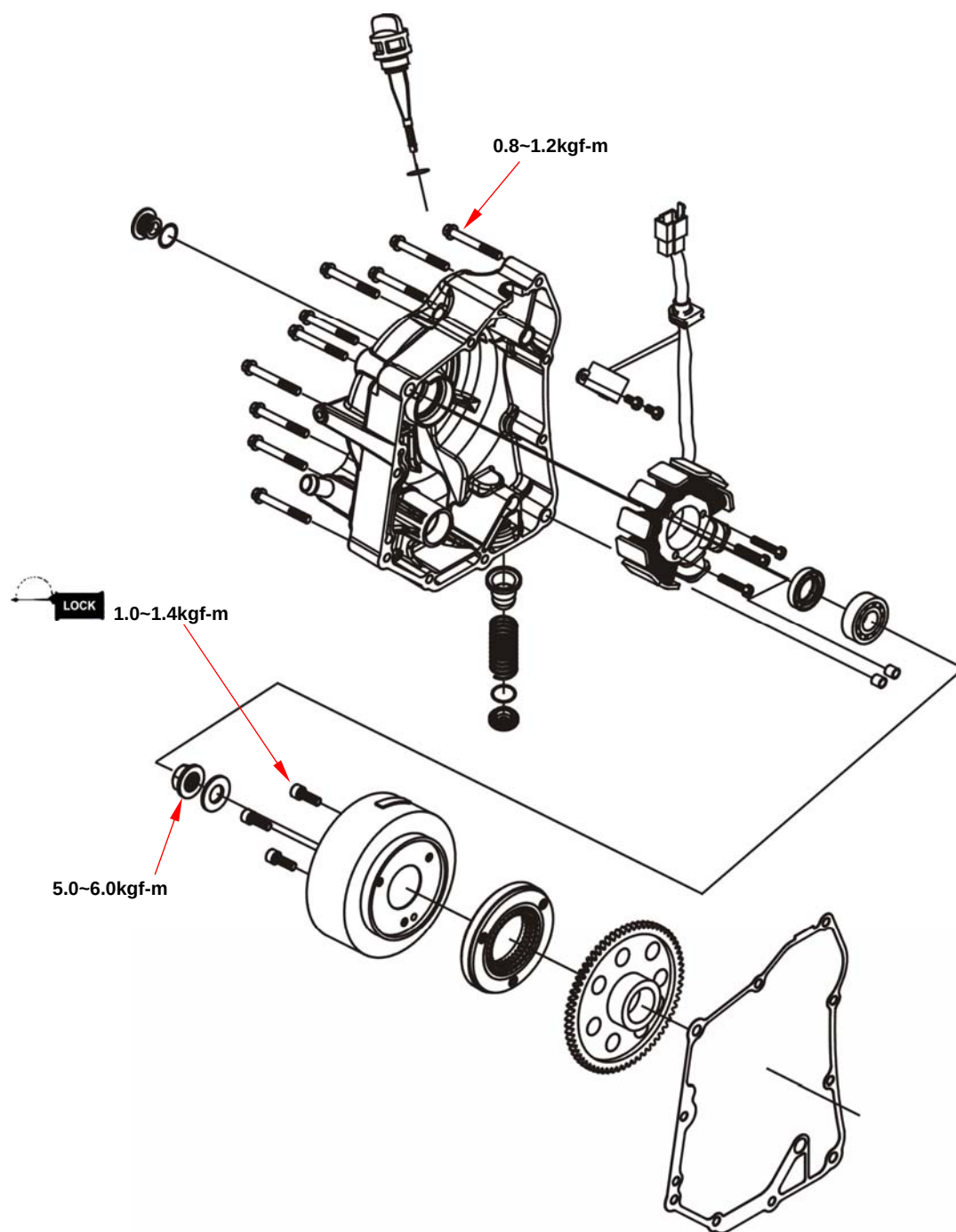
**Gear oil quantity: 180c.c.**



## 11. Alternator / Starting Clutch

|                                     |      |                                       |      |
|-------------------------------------|------|---------------------------------------|------|
| Mechanism Diagram .....             | 11-1 | Flywheel Removal .....                | 11-5 |
| Precautions in Operation .....      | 11-2 | Starting Clutch .....                 | 11-6 |
| Right Crankcase Cover Removal ..... | 11-3 | AC.G. Flywheel Installation .....     | 11-8 |
| AC.G. Set Removal .....             | 11-4 | AC.G. Set Installation .....          | 11-9 |
| Right Cover Bearing .....           | 11-4 | Right Crankcase Cover Installation .. | 11-9 |

### Mechanism Diagram



## 11. Alternator / Starting Clutch

### 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       | 25.050     |
| OD of starting clutch gear | 42.192~42.208       | 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                  | 1.8~2.2kgf-m               |

#### Special tools

|                                           |                          |
|-------------------------------------------|--------------------------|
| AC.G. flywheel puller                     | SYM-3110000-HMA          |
| Left crank case cover 6201 bearing puller | SYM-9614000-HMA RB1 6201 |
| Inner bearing puller                      | SYM-6204022              |
| Universal holder                          | SYM-2210100              |



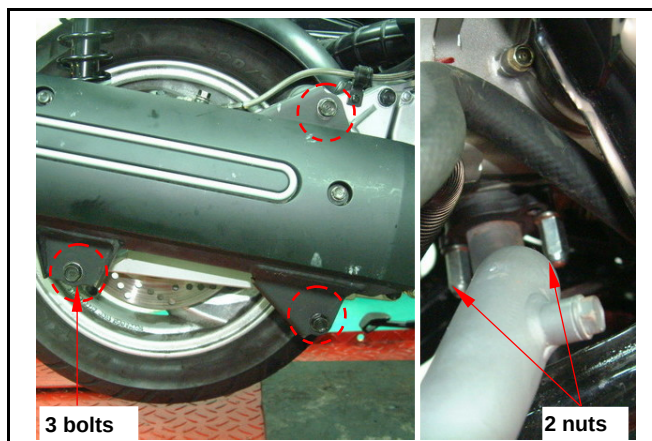
## Right Crankcase Cover Removal

Remove left side cover.

Remove seat and luggage box.

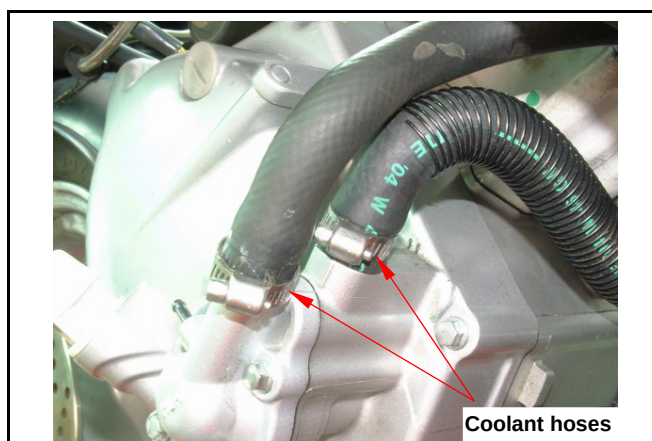
(Refer chapter 13)

Remove the exhaust muffler (3 bolts, 2 nuts).

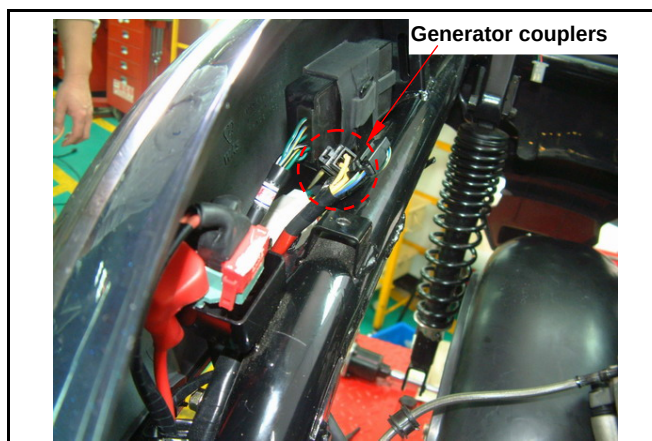


Drain out the engine oil and coolant (refer chapter 5).

Remove coolant hoses.



Disconnect the couplers of the power source output line.

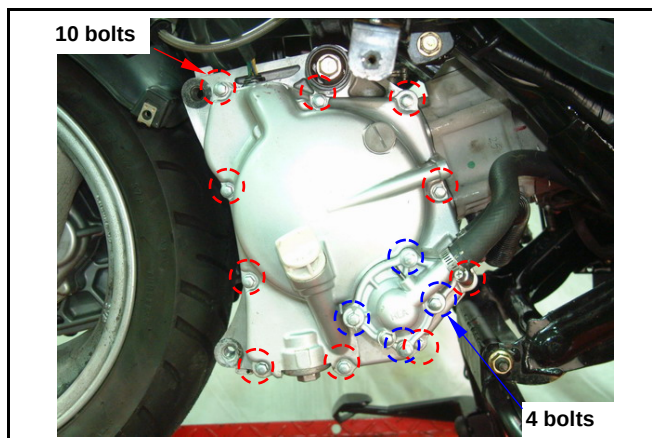


Remove water pump cover (4 bolts).

Remove 10 bolts from the right crankcase cover.

Remove the right crankcase cover.

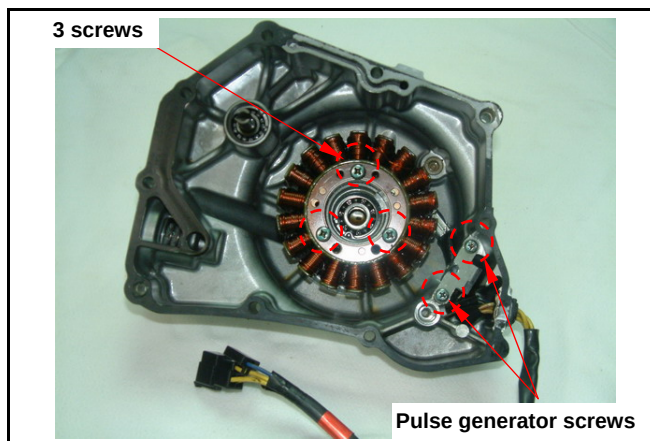
Remove dowel pin and gasket.



## 11. Alternator / Starting Clutch

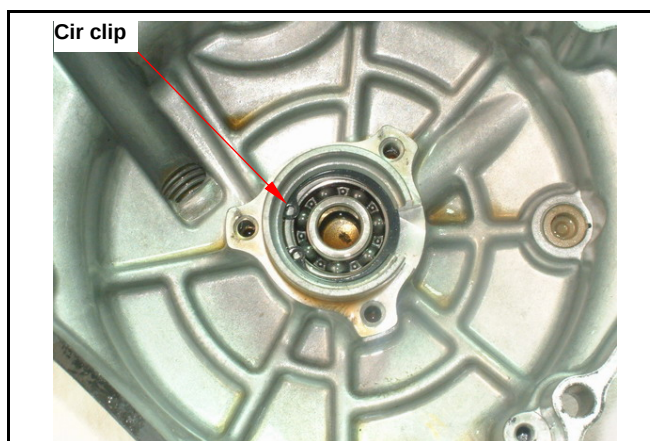
### AC.G. Set Removal

Remove 2 mounting screws from pulse generator.  
Remove 3 screws from right crankcase cover and then remove generator coil set.



### Right Cover Bearing

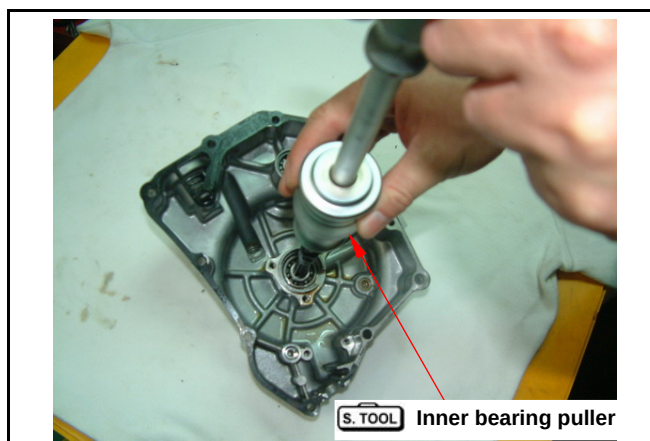
Rotate the bearing with finger to check if the bearing rotation is in smooth and silent.  
Check if the bearing outer parts are closed and fixed. Replace it if necessary.



Remove the bearing 6201 with inner bearing puller.

**Special tool:**

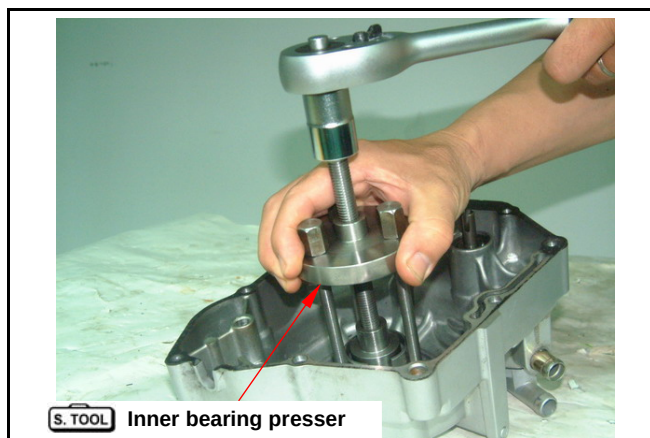
Inner bearing puller SYM-6204022



Install the bearing 6201 bearing with special tool.

**Special tool:**

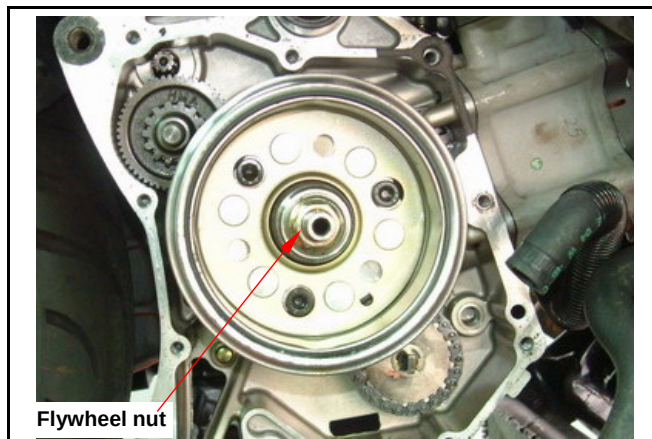
Right crankcase cover bearing 6201 presser  
SYM-9614000-HMA RB1 6201





### Flywheel Removal

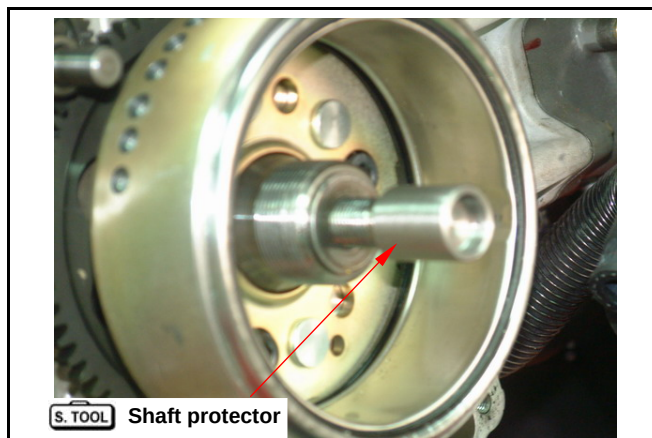
Remove right crankcase cover and generator coil.  
Remove flywheel nut.



Installs shaft protector onto the crank shaft.

**Special tool:**

**Shaft protector**

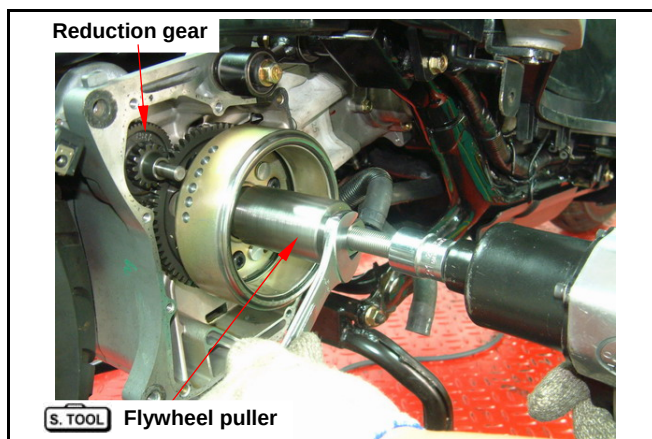


Remove starter reduction gear and shaft.

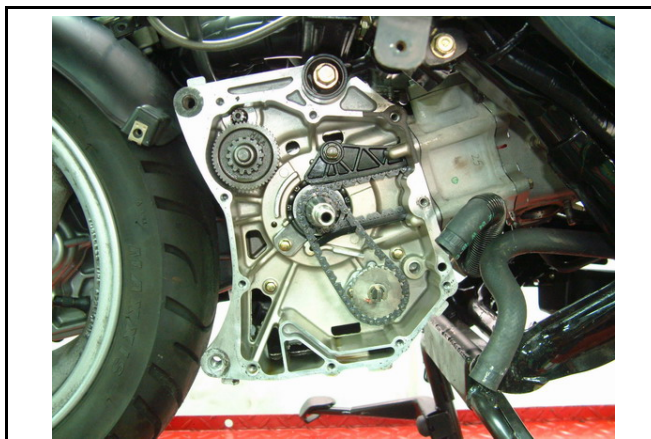
Pull out flywheel with AC.G. flywheel puller.

**Special tool:**

**AC.G. Flywheel puller SYM-3110000-HMA**



Remove flywheel and starting driven gear.



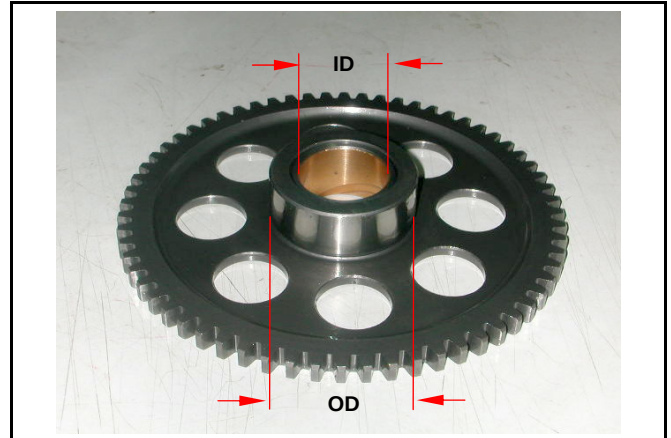
## 11. Alternator / Starting Clutch

### Starting Clutch

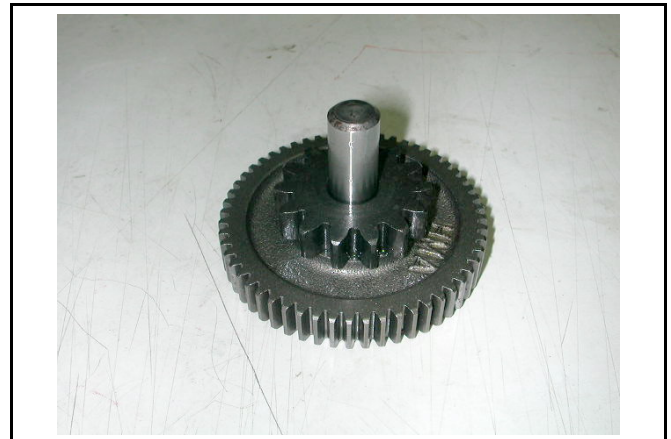
#### Starting Clutch Inspection

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: 25.050 mm**  
**OD: 42.100 mm**



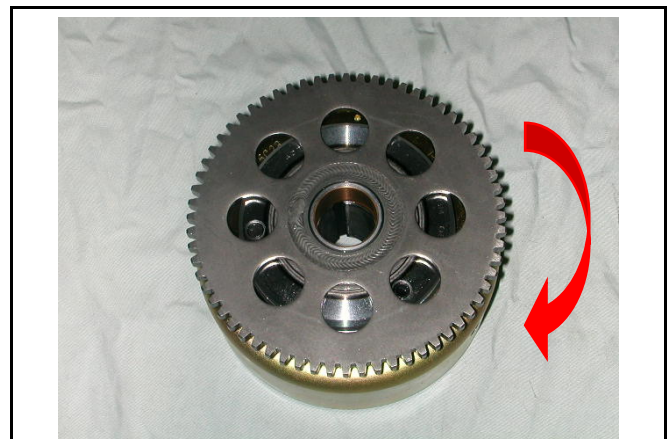
Check the starting reduction gear and shaft for wear or damage.



Check each roller for wear or damage.

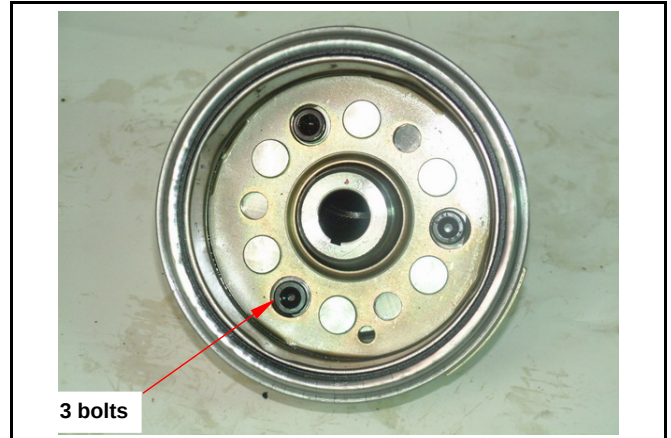


Install starting clutch driven gear onto one way clutch.  
Hold flywheel and rotate starting clutch gear.  
The starting clutch gear should be rotated in C.C.W direction freely, but not C.W direction.  
(View as shown in this figure.)





Remove the starting gear  
Loosen 3 starting clutch socket bolts from one way clutch and remove one way clutch.



Push out the roller set and check each roller for wear or damage.



### One way clutch Installation

Install the components in the reverse procedures of removal.

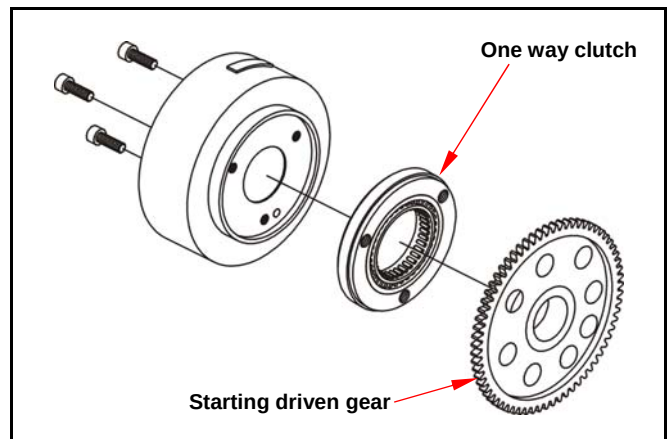
**Torque value: 1.0~1.4kgf-m**

#### Caution

- Cannot lock the thread of socket bolt.

#### Caution

- The one way clutch must to with the generator flywheel and the starter gear, after one and loads the crank in, only then may lock the socket bolt, otherwise will create concentric the deviation, will cause the part to suffer injury.

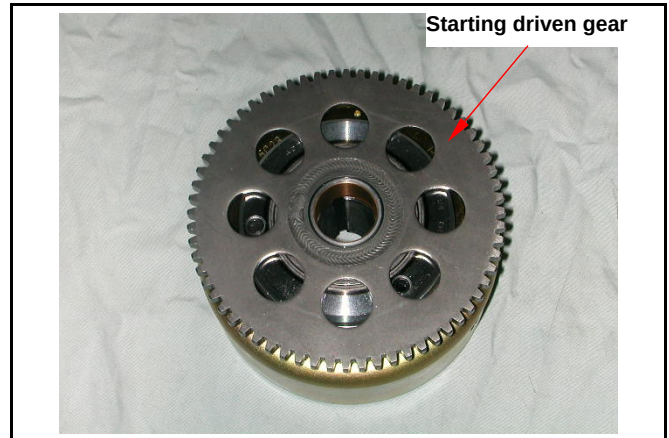


## 11. Alternator / Starting Clutch

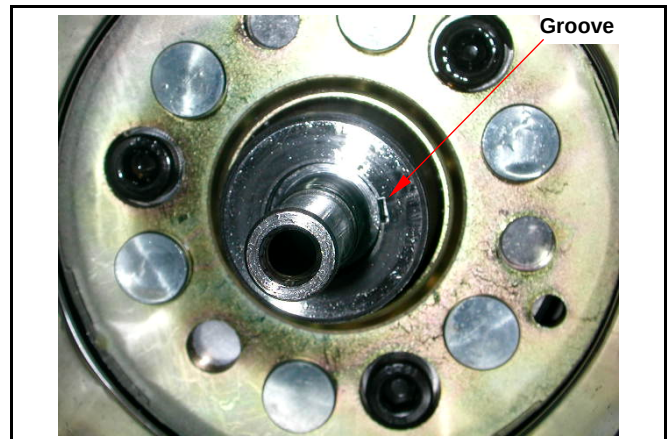


### AC.G. Flywheel Installation

Install starting driven gear onto one way clutch.



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

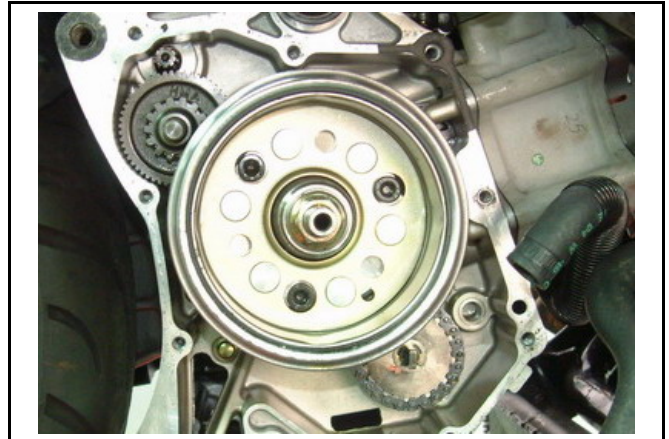


Hold the flywheel by drive face with universal holder, and tighten flywheel nut.

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

**Special tool:**

**Universal Holder SYM-2210100**



### AC.G. Set Installation

Install the AC.G. coil set onto right crankcase cover (3 screws).

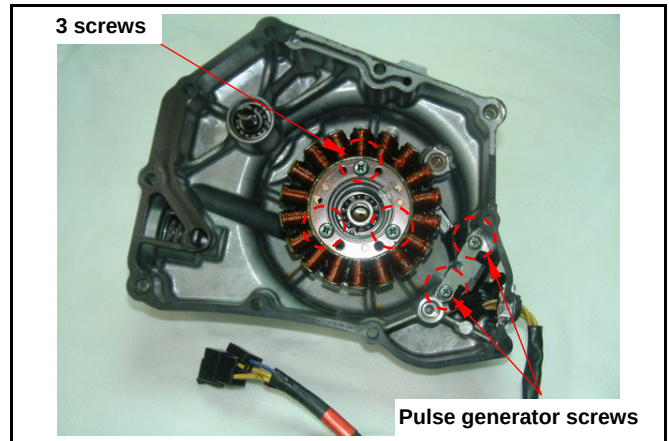
Install pulse generator (2 screws).

Tie the wire harness securely onto the indent of crankcase.



#### Caution

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



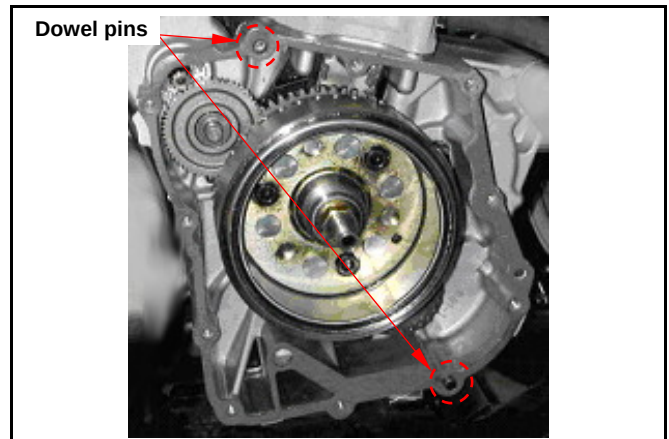
### Right Crankcase Cover Installation

Install dowel pins and new gasket.

Remove water pump cover.

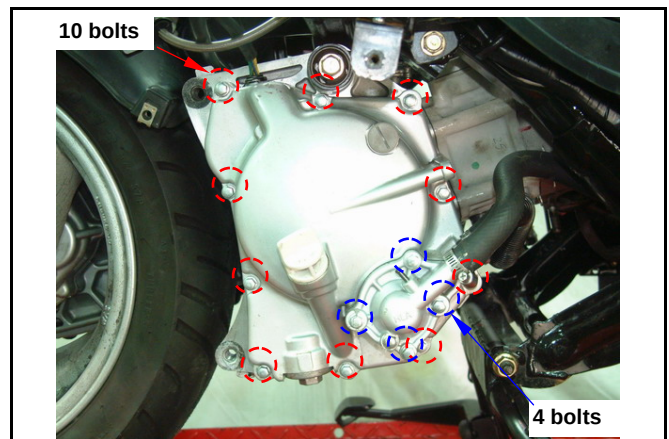
Install right crankcase cover onto the crankcase.

Note: Align the water pump shaft indent with the oil pump shaft.



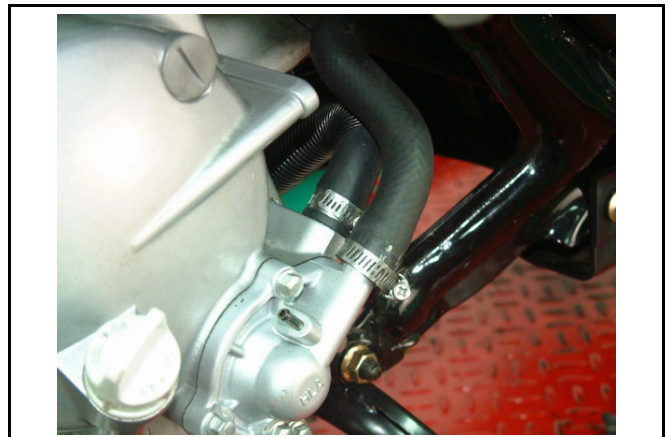
Install right crankcase cover (10 screws).

Install the dowel pin, new gasket and water pump cover onto crankcase cover.



Connect coolant hoses onto the right crankcase cover.

Add engine oil and coolant.



## 11. Alternator / Starting Clutch

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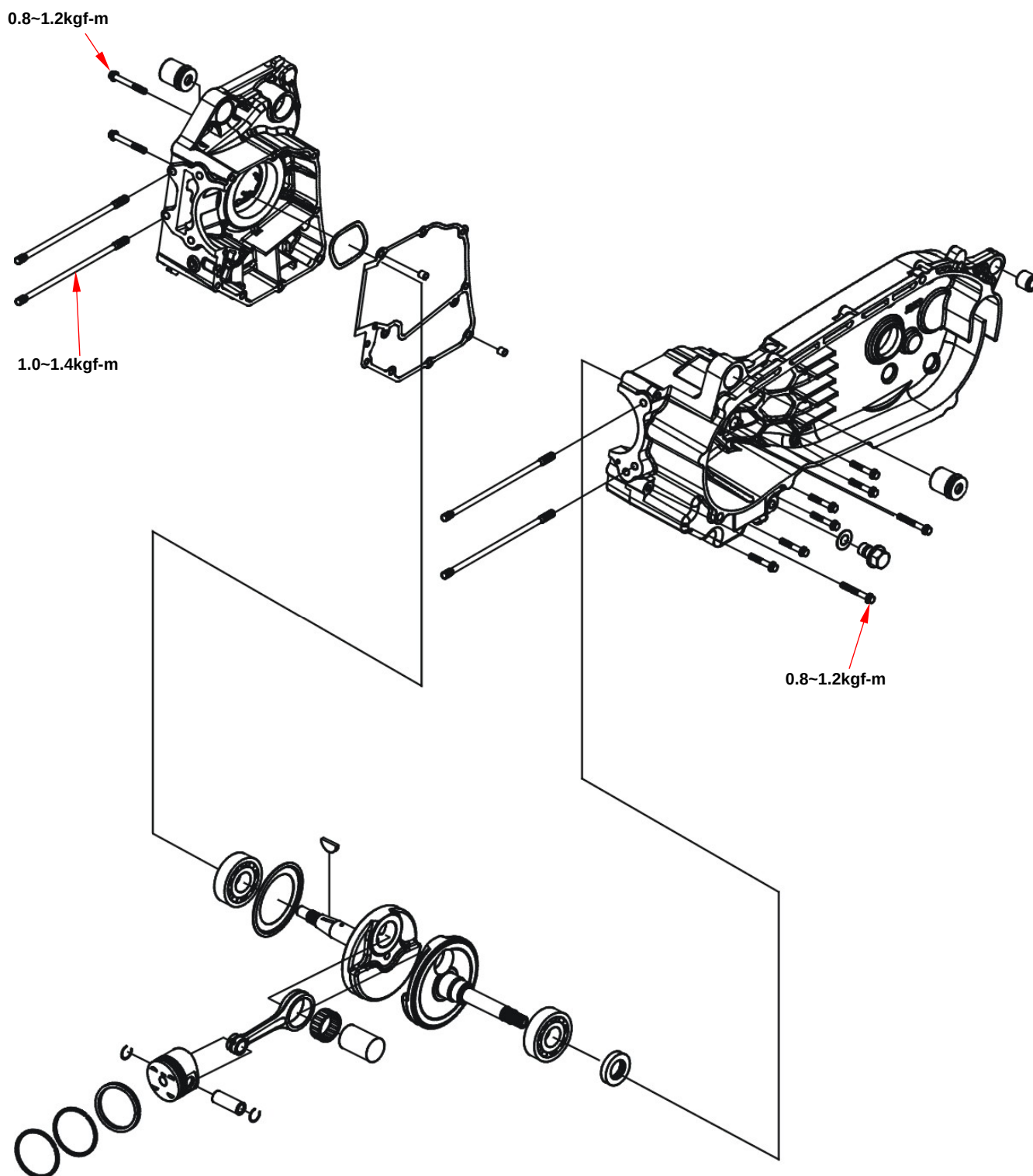


Notes:



|                                           |                      |                                               |                      |
|-------------------------------------------|----------------------|-----------------------------------------------|----------------------|
| <a href="#">Mechanism Diagram .....</a>   | <a href="#">12-1</a> | <a href="#">Disassembly of Crankcase.....</a> | <a href="#">12-3</a> |
| <a href="#">General Information .....</a> | <a href="#">12-2</a> | <a href="#">Crankshaft Inspection .....</a>   | <a href="#">12-4</a> |
| <a href="#">Trouble Diagnosis .....</a>   | <a href="#">12-2</a> | <a href="#">Assembly of Crankcase.....</a>    | <a href="#">12-6</a> |

### Mechanism Diagram



## 12. Crankcase / Crank

### General Information

#### Operational precautions

- This Section concerns disassembly of the crankcase for repair purpose.
- Remove following components before disassembling crankcase.
  - Engine remove Chapter 5
  - Cylinder head Chapter 6
  - Cylinder and piston Chapter 7
  - Drive face and driven pulley Chapter 8
  - AC generator/Start one way clutch Chapter 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

| 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                                                 | -           | 0.100 |

#### Torque value

|                             |              |
|-----------------------------|--------------|
| Bolts for crankcase         | 0.8~1.2kgf-m |
| Cylinder stud bolts         | 1.0~1.4kgf-m |
| Bolt for cam chain adjuster | 1.2~1.6kgf-m |

#### Special tools

|                                              |                      |
|----------------------------------------------|----------------------|
| R/L. crank disassemble tool                  | SYM-1120000-HMA H9A  |
| L. crank shaft bearing puller                | SYM-9100100          |
| Crank shaft install socket & oil seal driver | SYM-2341110- HMA RB1 |
| Crank shaft puller                           | SYM-1130000-HMA H9A  |
| Outer bearing puller                         | SYM-6204001          |
| Inner bearing puller                         | SYM-6204022          |
| Clutch nut wrench                            | SYM-9020200          |

### Trouble Diagnosis

#### Engine noise

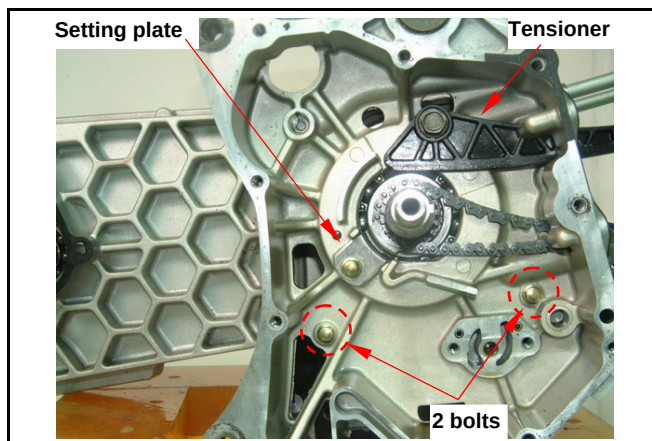
- Loose crankshaft bearing
- Loose crankshaft pin bearing
- Worn out piston pin and pin hole

### Disassembly of Crankcase

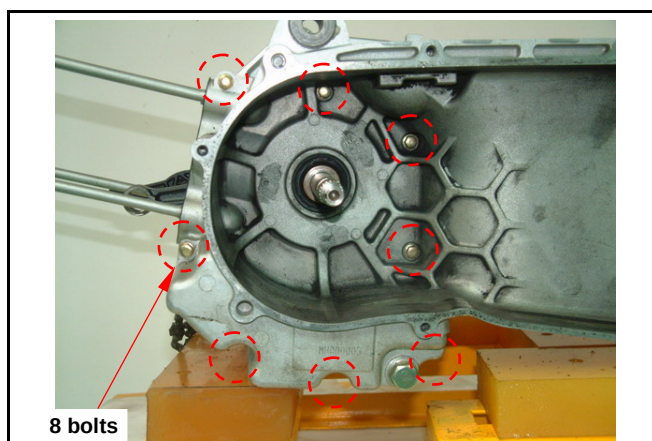
Remove the cam chain setting plate, and then remove cam chain.

Loosen the pivot bolt and remove the tensioner.

Loosen 2 bolts on the right crankcase.



Loosen 8 bolts on the left crankcase.

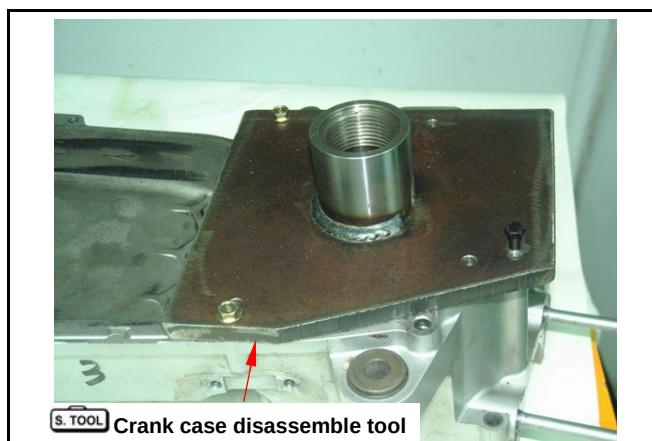


Place right crankcase downward and left crankcase upward.

Install crank disassemble tool onto left crankcase.

#### Caution

- Care should be taken not to damage the contact surfaces.



Install left crank shaft puller into crank case disassemble.

Hold left crank shaft puller nut by clutch nut wrench, and turn the shaft puller to press out crank shaft from left crankcase.

#### Special tool:

**Crank case disassemble**

SYM-1120000-HMA H9A

**L. Crank shaft puller**

SYM-1130000-HMA H9A

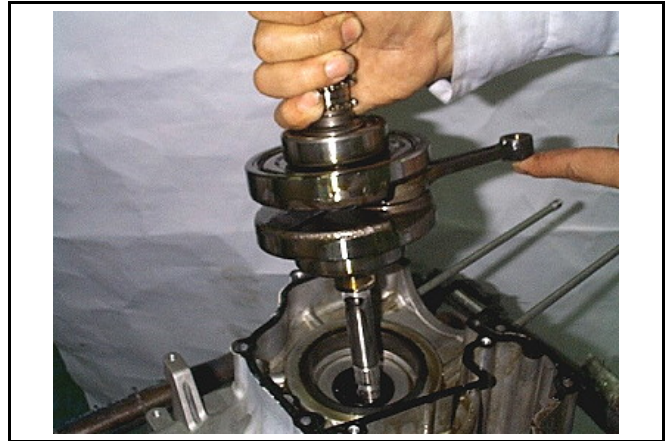
**Clutch nut wrench** SYM-9020200





## 12. Crankcase / Crank

Remove crankshaft and wave washer from right crankcase.

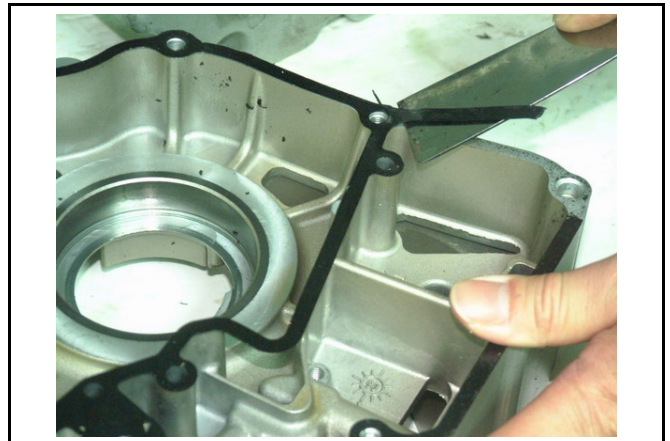


Remove gasket and dowel pins.  
Scrape gasket residues off the crankcase contact surface.

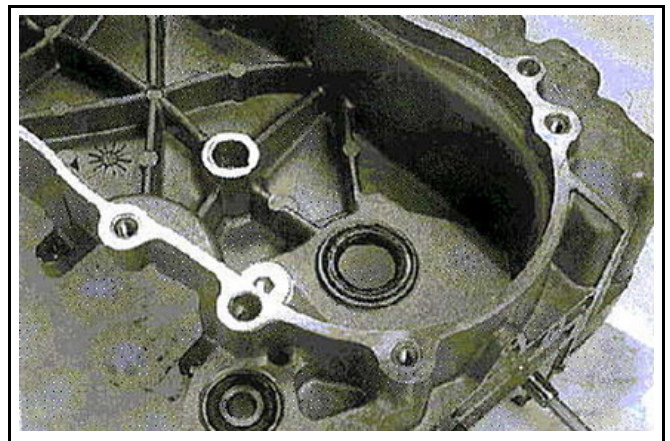


### Caution

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



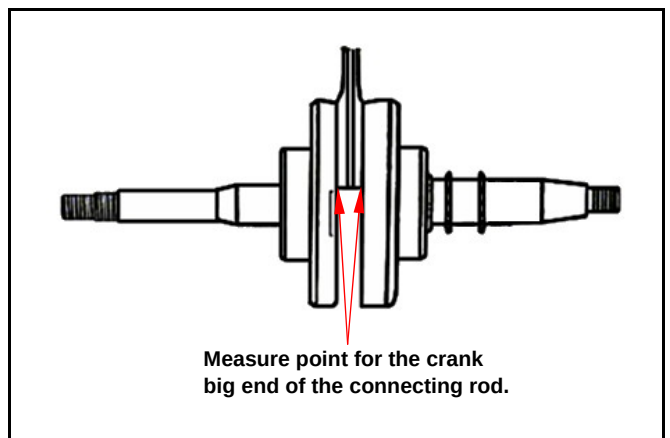
Drive out left crankcase oil seal.



### Crankshaft Inspection

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

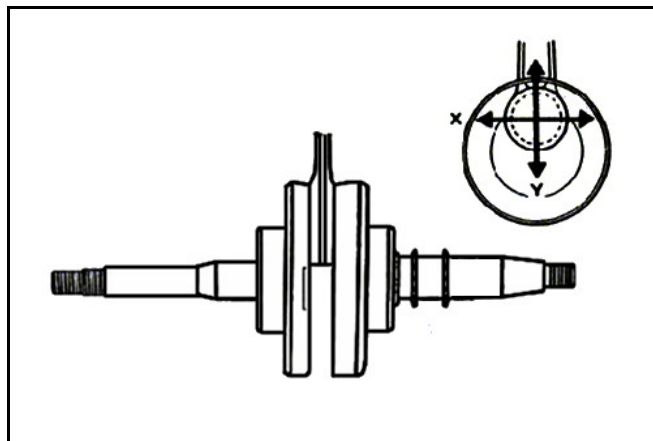
**Service limit: 0.6 mm**





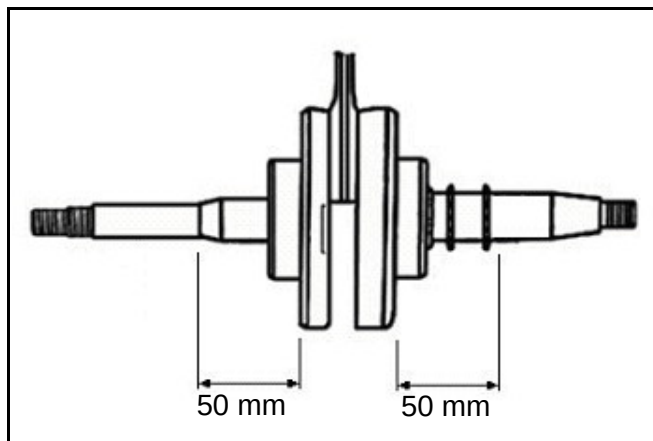
Measure the clearance of the big end at the vertical directions.

**Service limit: 0.05 mm**



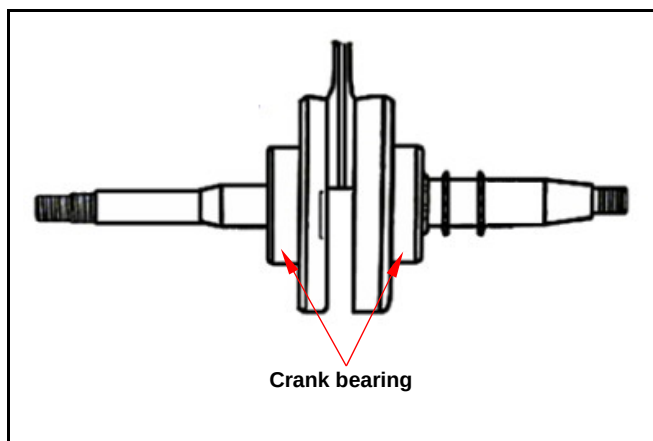
Place the crankshaft on a V-block, measure run-out of the crankshaft.

**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.



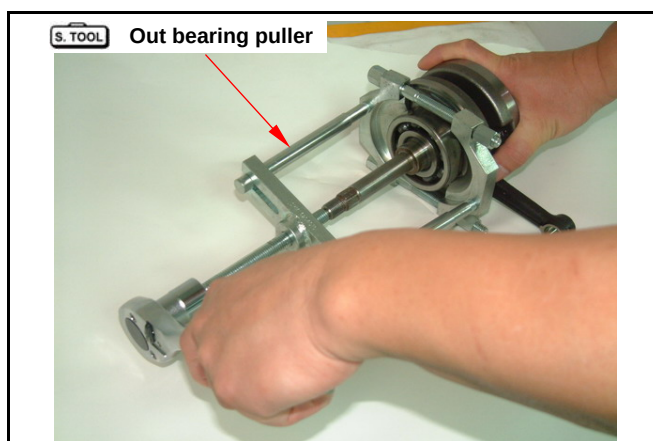
If any roughness, noise and loose linkage are detected, replace the bearing with new one.

### Caution

- The bearing shall be replaced in pair.

### Special tool:

**Outer bearing puller    SYM-6204001**



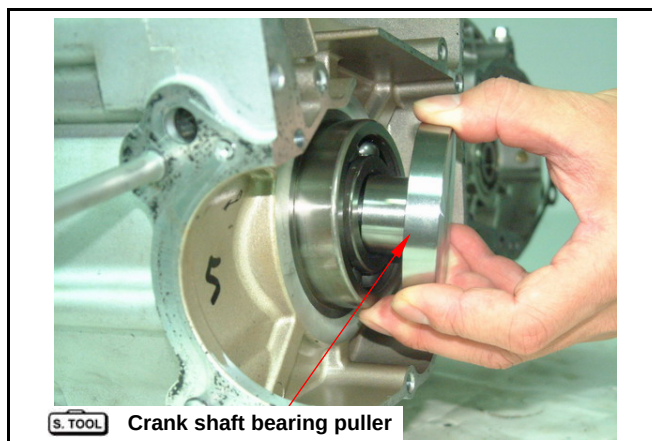
## 12. Crankcase / Crank

### Assembly of Crankcase

Install new bearing and bearing puller onto left crankcase bearing hole.

**Special tool:**

L. crank shaft bearing puller SYM-9100100



Install crank disassemble tool onto left crankcase. Install left crank shaft puller into crank case disassemble.

Hold left crank shaft puller, and turn the shaft puller nut by clutch nut wrench to pull in crank shaft bearing into left crankcase.

**Special tool:**

Crank case disassemble SYM-1120000-HMA H9A

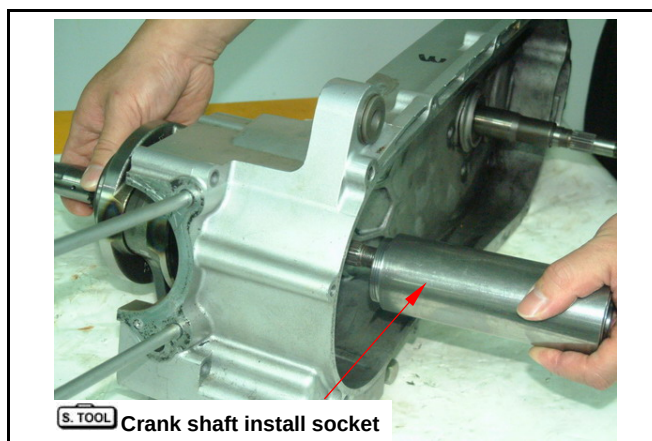
L. Crank shaft puller SYM-2341110-HMA  
Clutch nut wrench SYM-9020200



Install crank shaft onto the left crankcase and install crank shaft install socket.

**Special tool:**

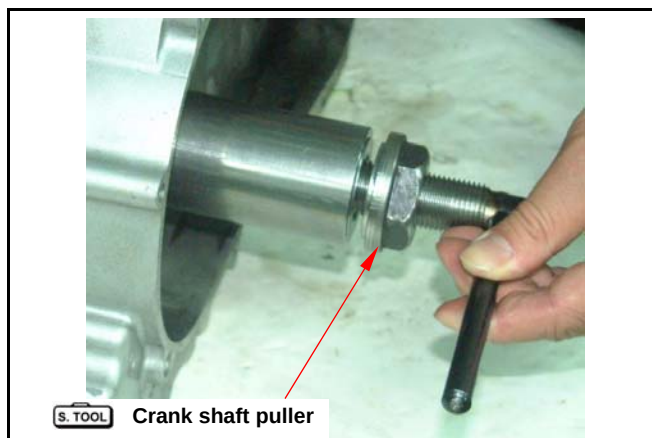
Crank shaft install socket & oil seal driver SYM-2341110- HMA RB1



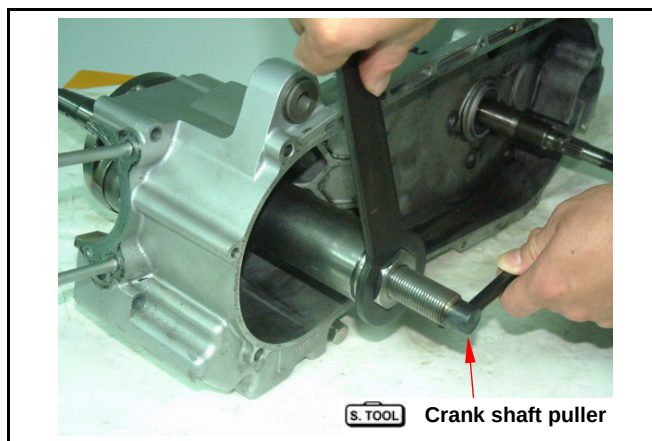
Turn in the crank shaft puller spiral tooth to the left crank shaft.

**Special tool:**

L. Crank shaft puller SYM-1130000-HMA H9A



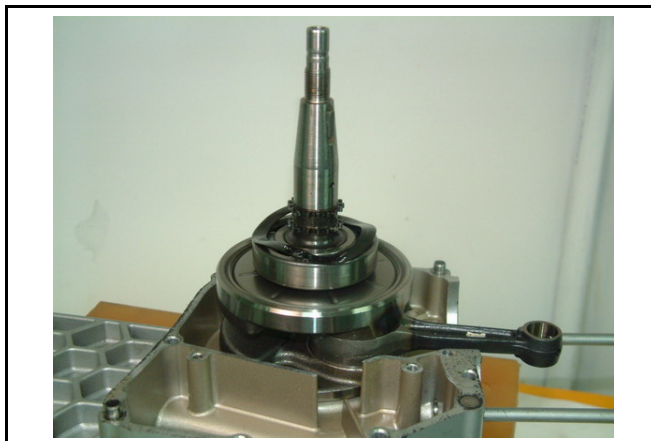
Hold left crank shaft puller, and turn the shaft puller nut by clutch nut wrench to pull in crank shaft into left crankcase.



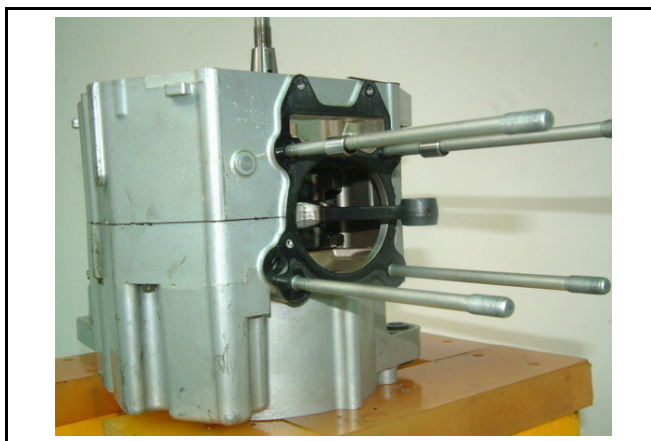
Put wave washer onto right crank bearing.

### Caution

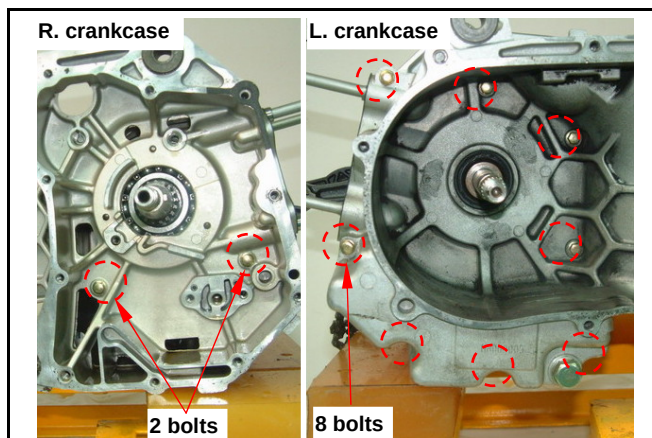
- Right flank the wave washer piece certainly must install. Cannot install the wrong position or leak the attire. Otherwise can cause the motorcycle to have the fierce vibration



Install 2 dowel pins and new gasket.  
Install the right crankcase onto the left crankcase



Tighten 8 bolts on the left crankcase.  
Tighten 2 bolts on the left crankcase.  
**Torque value: 0.8~1.2kgf-m**





## 12. Crankcase / Crank

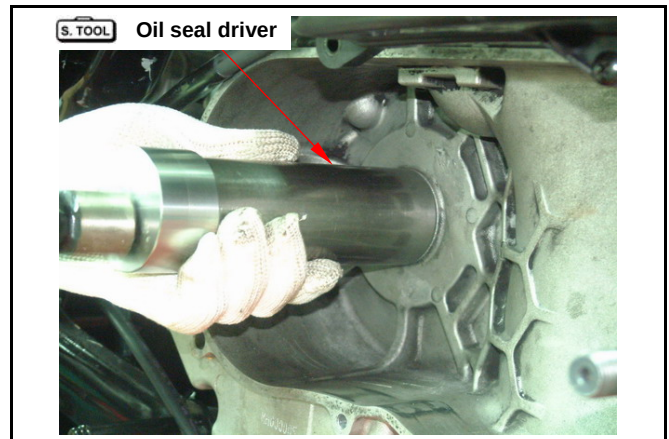
Apply a layer of grease on the lip of oil seal  
Clean the crankshaft with clean solvent.



Install the oil seal in the left crankcase with special tool.

**Special tool:**

**Crank shaft install socket & oil seal driver**  
**SYM-2341110- HMA RB1**

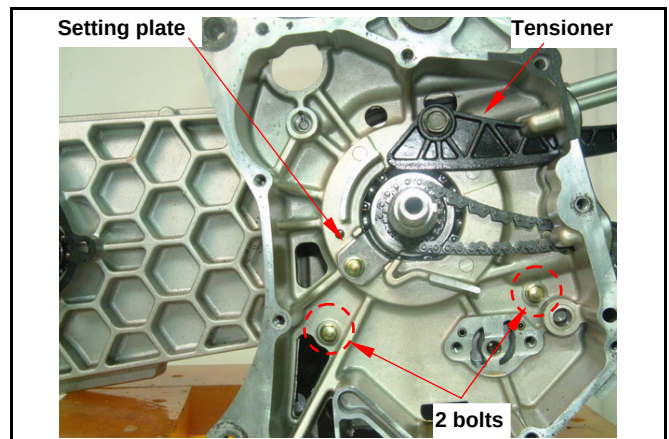


Install the cam chain tensioner & and tighten the bolts.

**Torque value: 1.2~1.6kgf-m**

Install the cam chain.

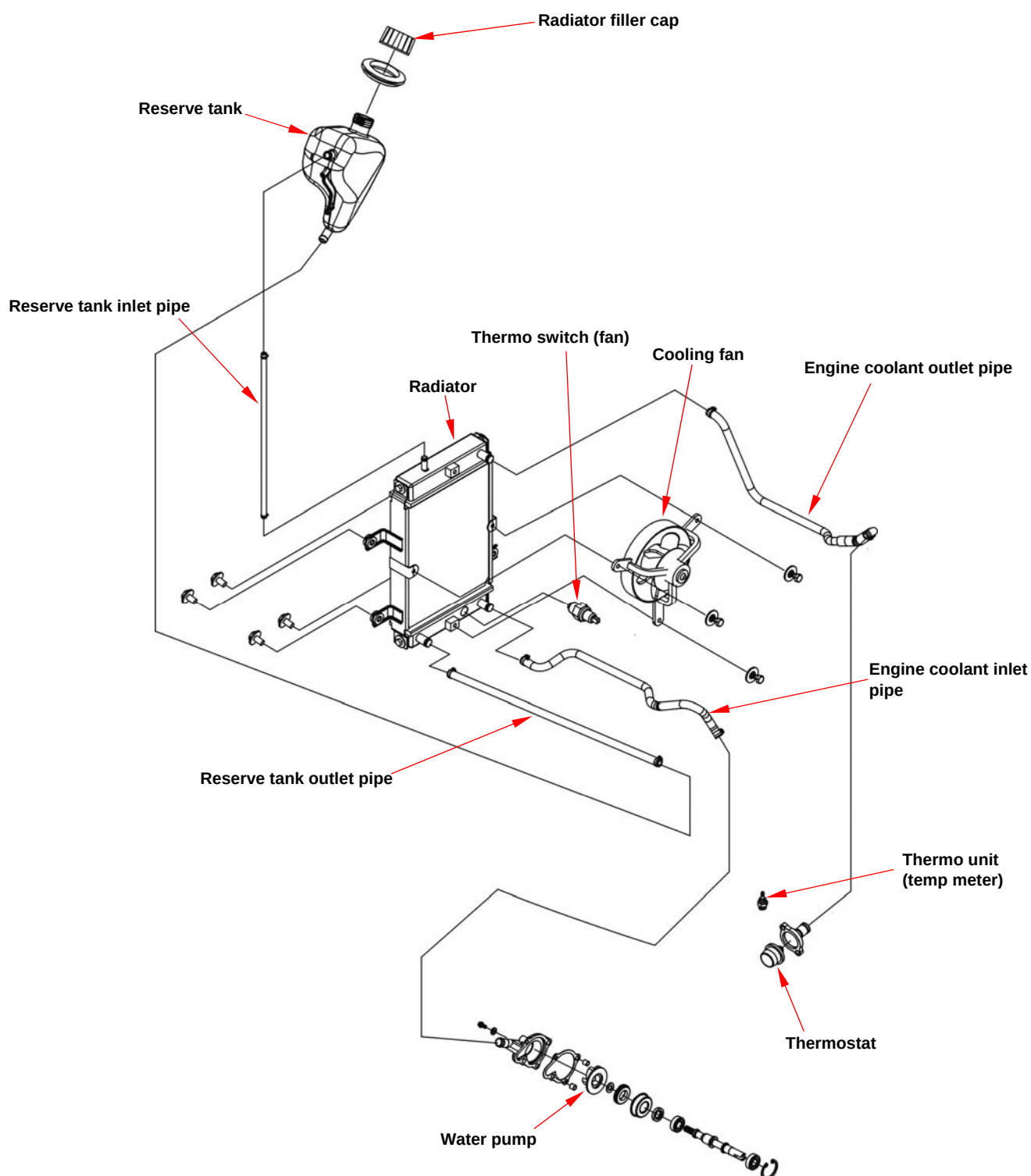
Install the cam chain setting plate.





|                                                            |                      |                                        |                       |
|------------------------------------------------------------|----------------------|----------------------------------------|-----------------------|
| <a href="#">Mechanism Diagram .....</a>                    | <a href="#">12-1</a> | <a href="#">Change of coolant.....</a> | <a href="#">12-5</a>  |
| <a href="#">General Information .....</a>                  | <a href="#">12-2</a> | <a href="#">Radiator .....</a>         | <a href="#">12-6</a>  |
| <a href="#">Trouble Diagnosis .....</a>                    | <a href="#">12-2</a> | <a href="#">Water Pump.....</a>        | <a href="#">12-8</a>  |
| <a href="#">Trouble Diagnosis for Cooling System .....</a> | <a href="#">12-3</a> | <a href="#">Thermostat .....</a>       | <a href="#">12-12</a> |

## Mechanism Diagram



## 12. Cooling System

### 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 motorcycle.
- 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 Kg/cm <sup>2</sup>                                 |
| Capacity of coolant: Engine + radiator<br>Reservoir upper | 1400c.c.<br>420c.c.                                         |
| Thermostat                                                | Begins to activate at : 82~92°C<br>Stroke : 0.05~3.0mm/80°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

### Trouble Diagnosis

#### The engine temperature is too high

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

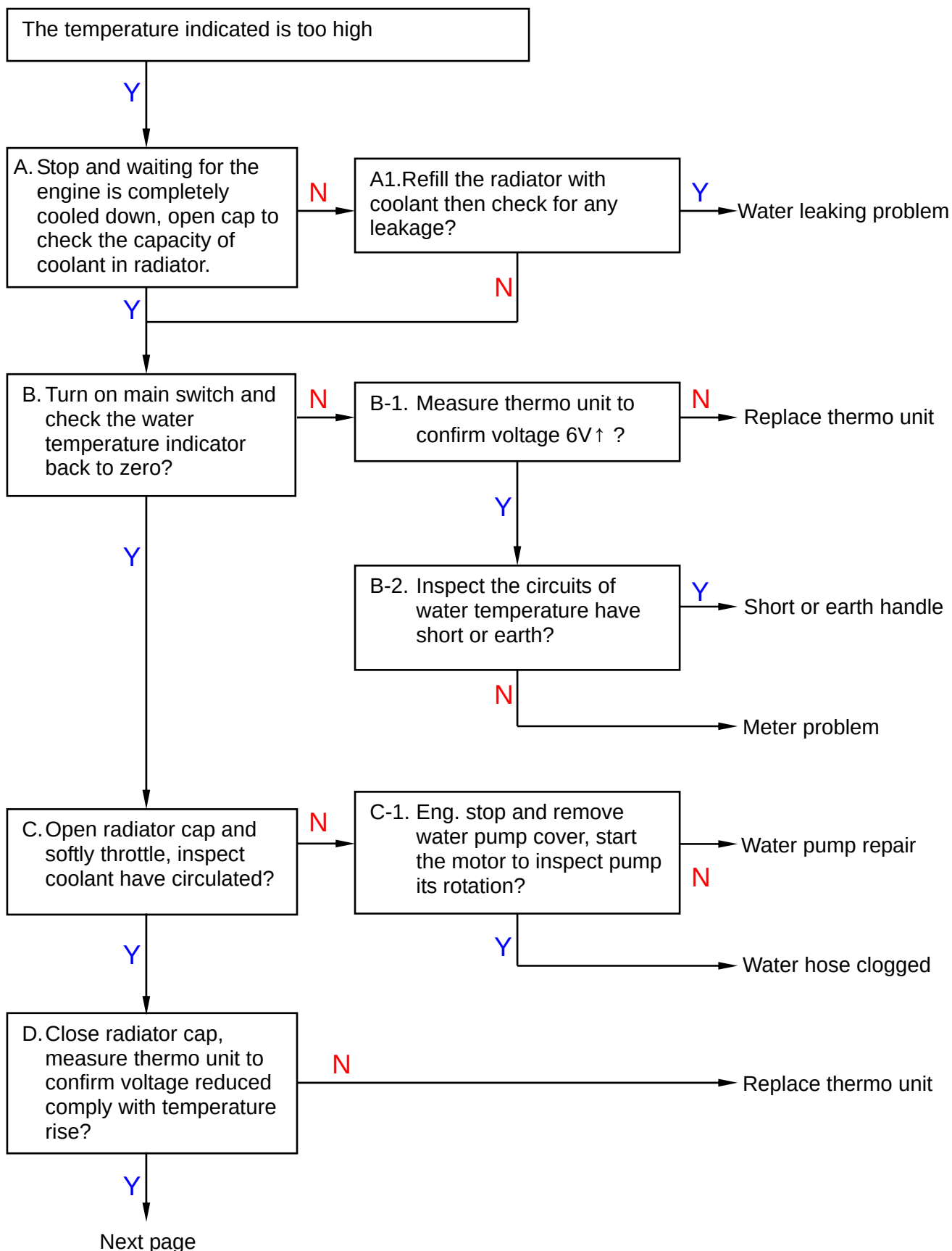
#### The engine temperature is too low

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

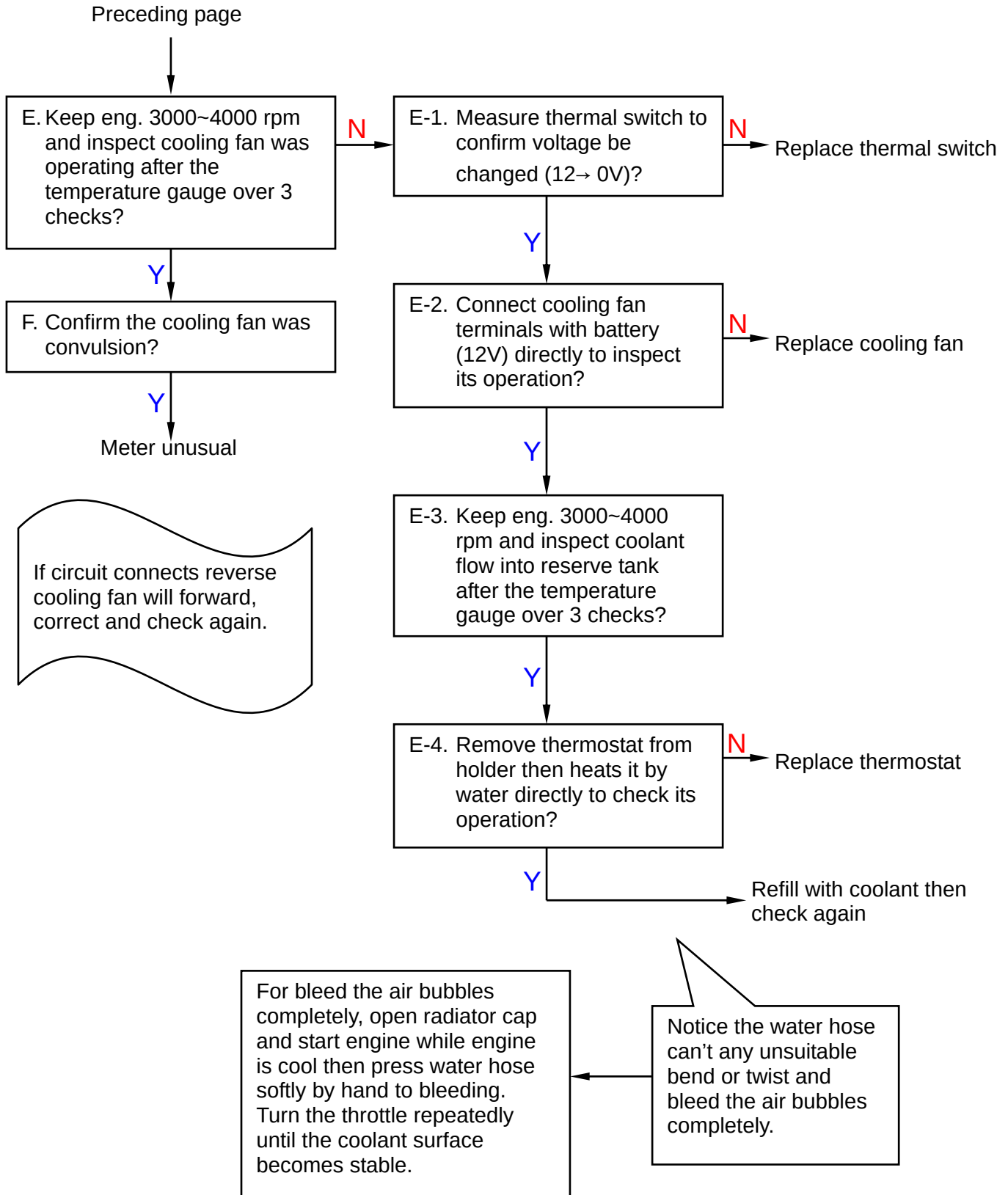
#### Coolant is leaking

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

### Trouble Diagnosis for Cooling System



## 12. Cooling System



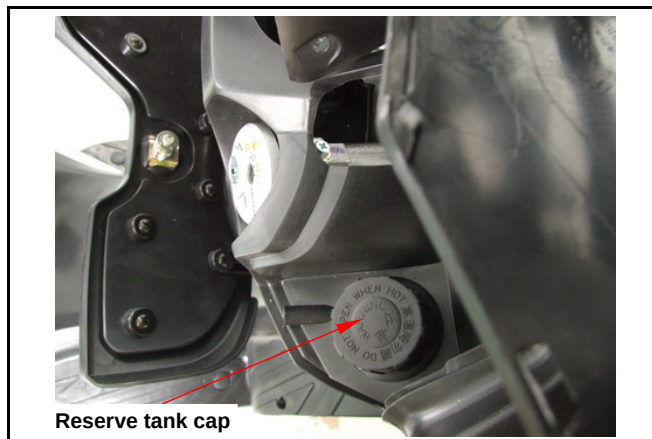


## Change of coolant

### Warning

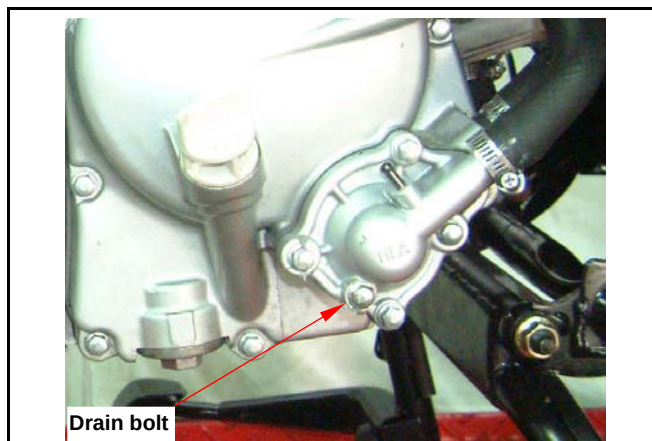
- Never attempt to carry out service work on the cooling system unless the engine is completely cooled down, otherwise, you may get scalded.

Remove the reserve tank cap cover, and then remove tank cap.



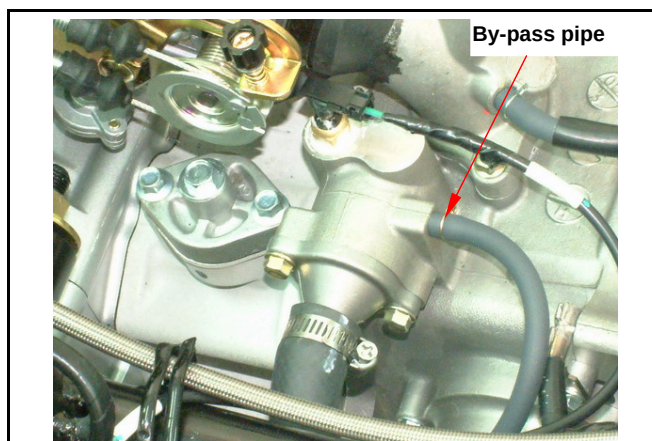
Place a water pan under the water pump; loosen the drain bolt to drain out the coolant.

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%

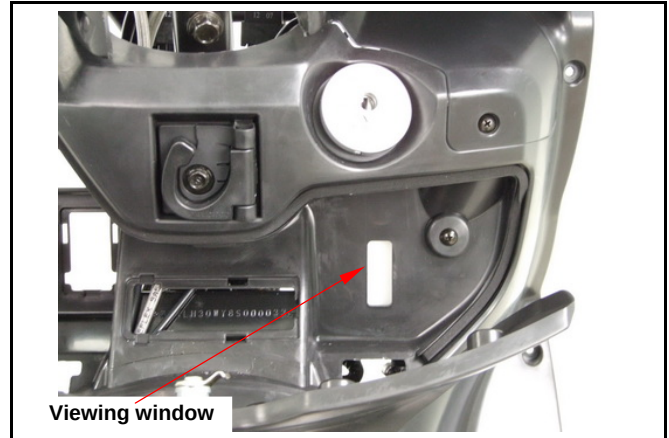
## 12. Cooling System

### Check reserve tank

- Open the inner box lid.
- Check the liquid level in the reservoir.
- Add coolant to proper level if too low.

### Caution

- The reserve tank liquid level too low is not high, after avoids the water temperature elevating, in the cooling system the refrigerant backflow floods.



### Radiator

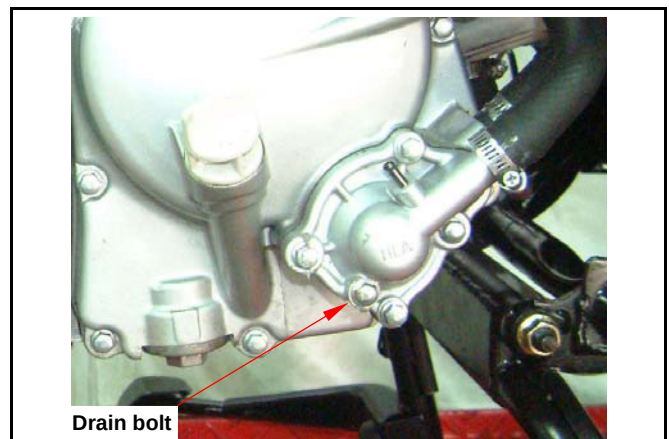
#### Check

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.



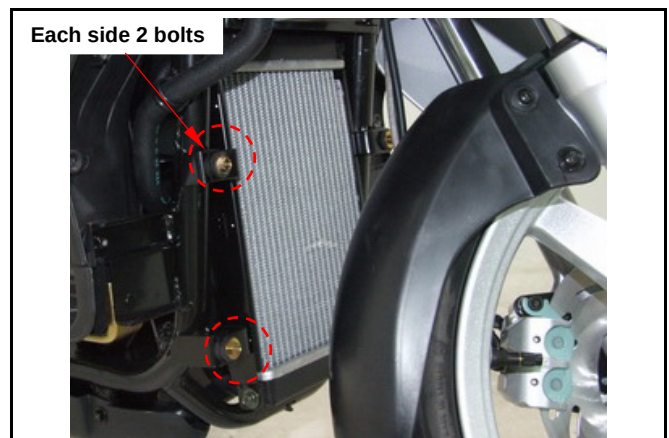
#### Remove

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



Remove the front cover and under spoiler (refer chapter 12).

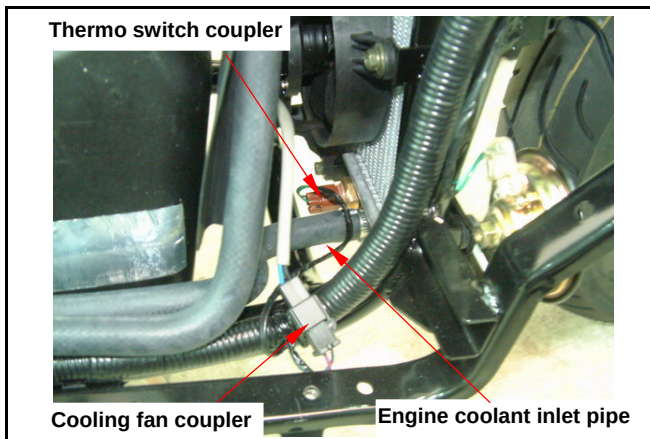
Loosen the radiator mounting bolts (4 bolts).





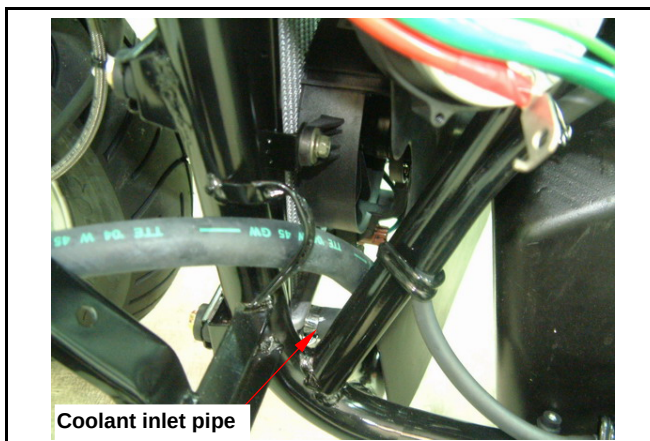
Disconnect the couplers for the thermo switch and fan motor.

Remove engine coolant inlet pipe, reserve tank inlet pipe and radiator inlet pipe.



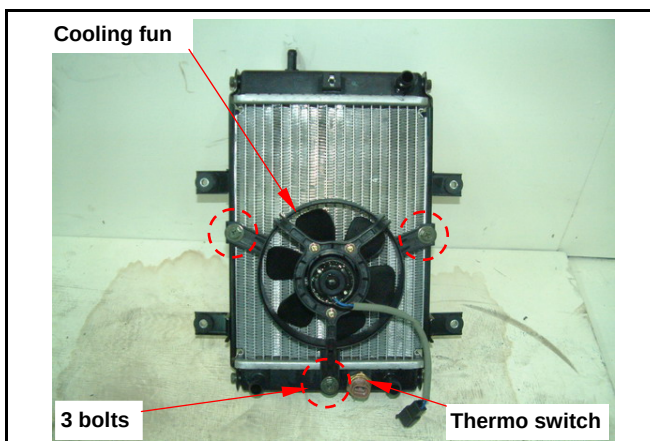
Remove reserve tank coolant inlet pipe.

Remove the radiator and the cooling fan.



Loosen the cooling fan mounting bolts (3 bolts).

Remove thermo switch.



### 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.



### Caution

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



## 12. Cooling System

### 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 10 bolts and remove the engine right cover.

Take off the gasket and dowel pins.

Turn pump rotor clockwise and remove.

#### Caution

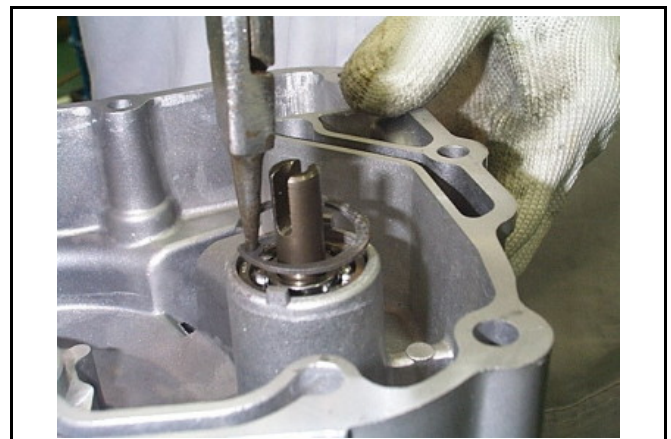
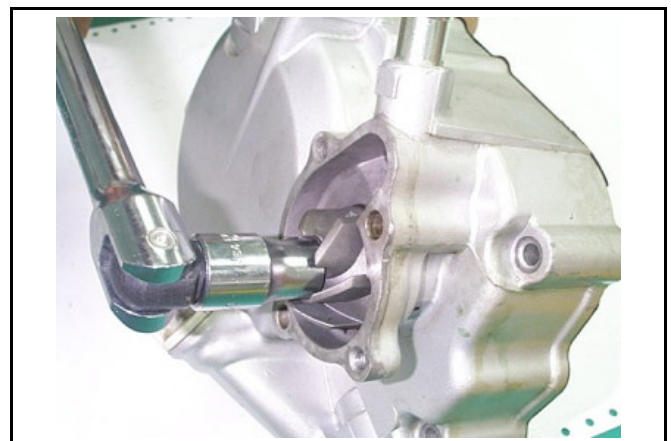
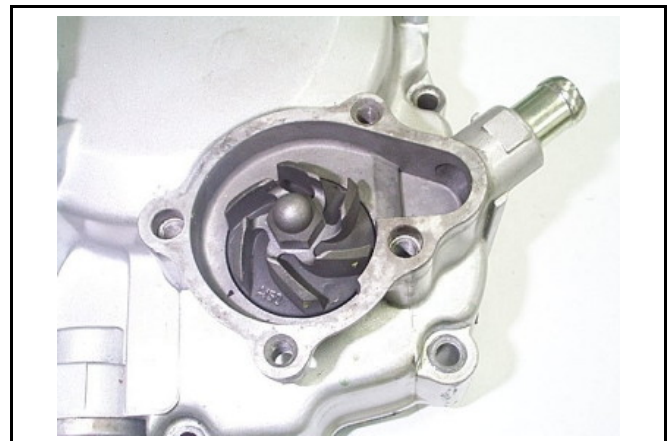
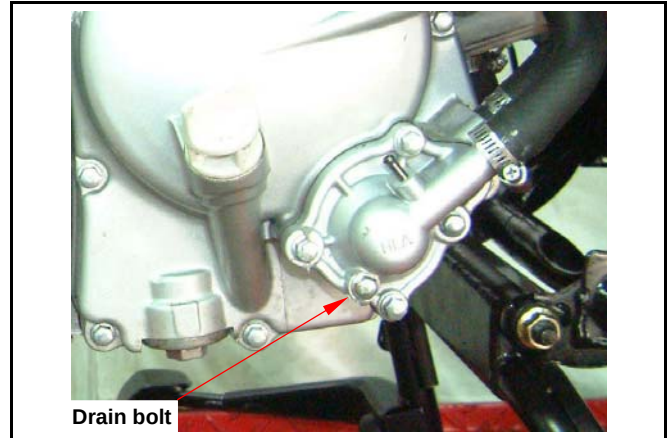
- The rotor is provided with left turn thread.

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.





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 drive**

### Caution

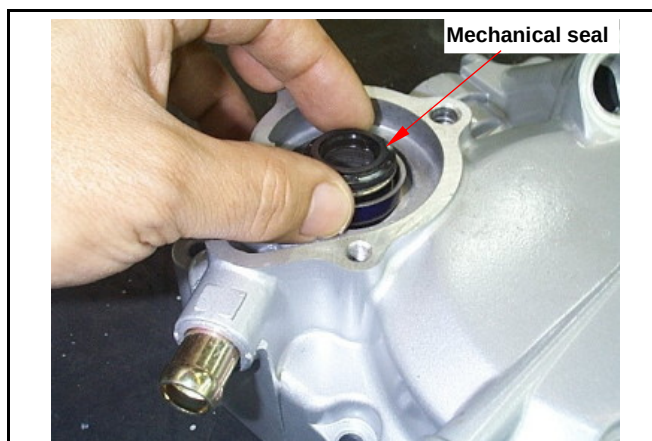
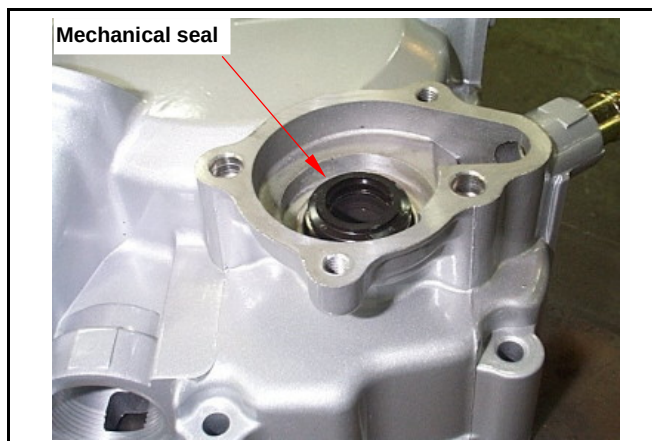
- Replace a new mechanical seal after removing it.

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**



## 12. Cooling System

Install the new inner seal onto the right crankcase.

**Special tools:**

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



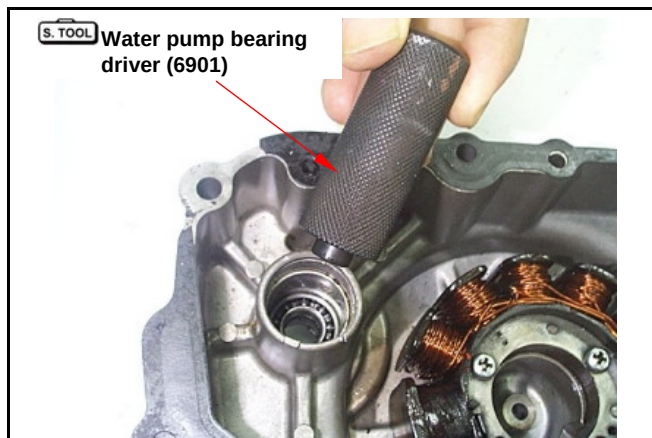
Install a new outside bearing to the right crankcase cover.

**Special tools:**

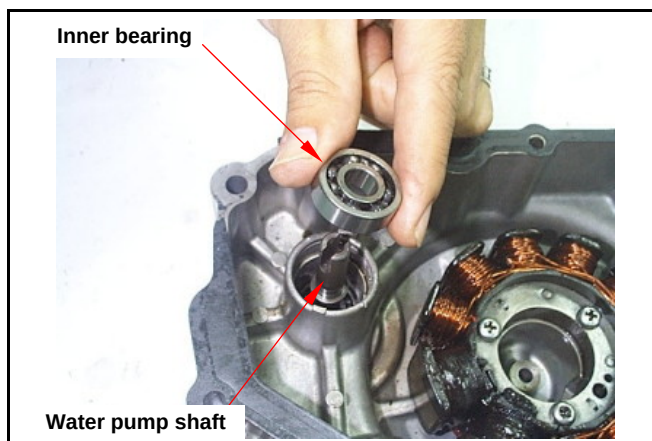
**Water pump bearing driver (6901)**

**⚠ Caution**

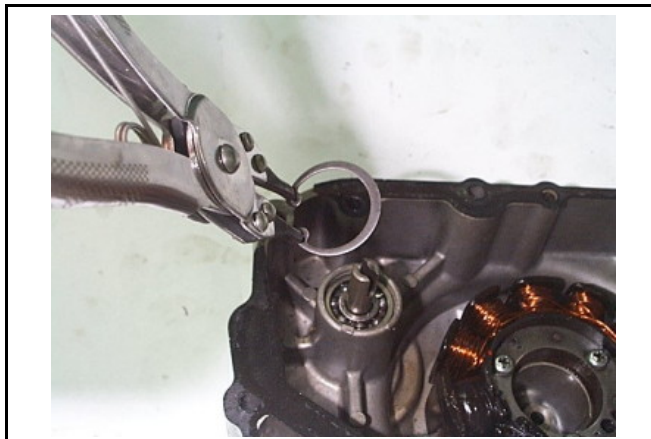
- Do not reuse old bearing. It must be replaced with a new one once it has been removed.



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



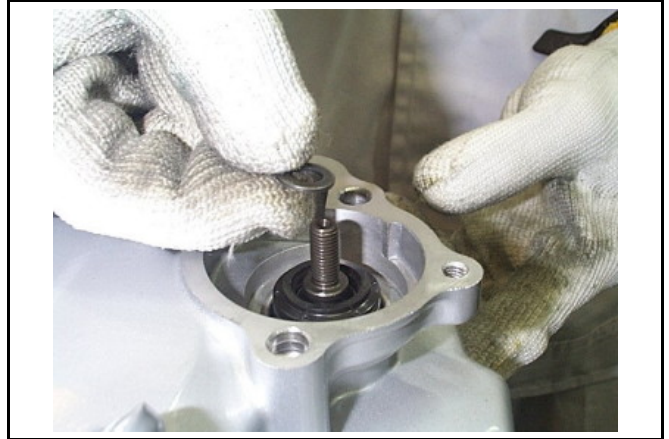
Install the cir clip to hold the inner bearing.



Install the seal washer into the rotor.

**⚠ Caution**

- Washer must be replaced together with the mechanical seal.

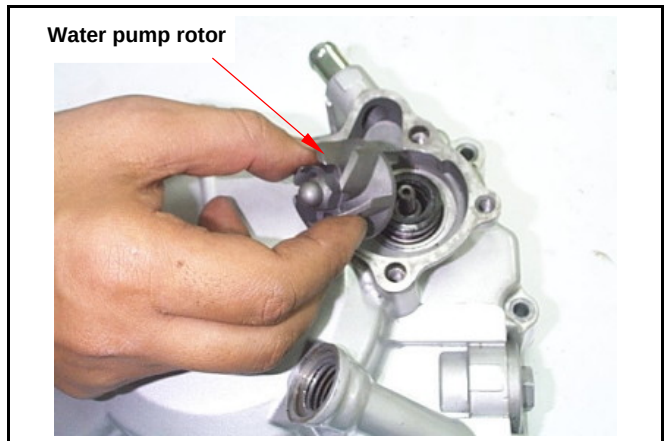


Install the rotor onto the water pump shaft and tighten.

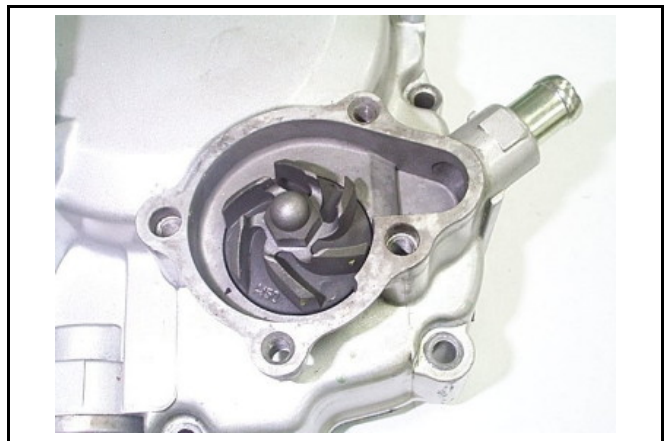
**Torque Value: 1.0~1.4kgf-m**

**⚠ Caution**

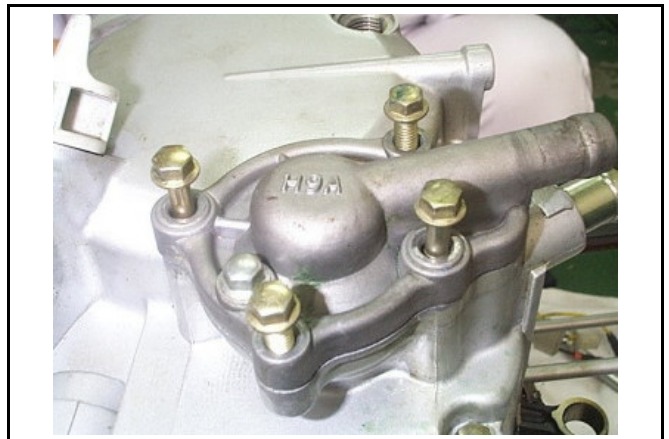
- The rotor is left thread.



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. (10 bolts)



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





## 12. Cooling System

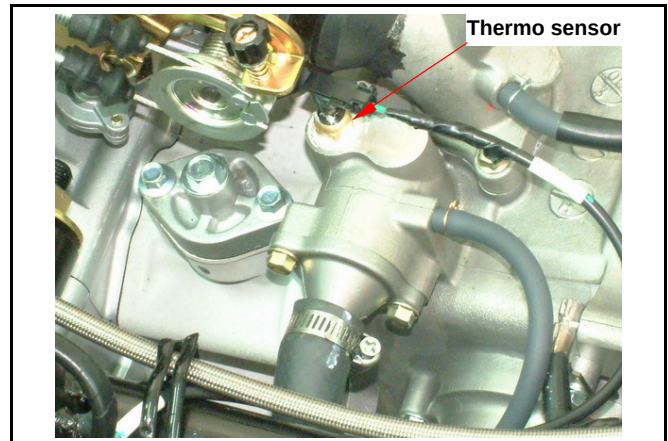


### Thermostat

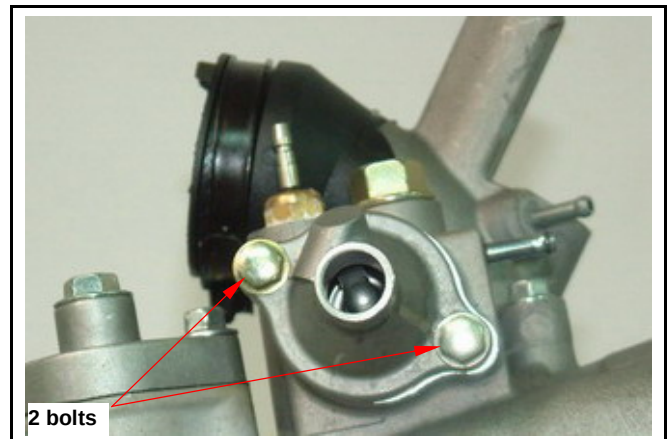
Please refer to chapter 17 for inspection of thermo unit.

### Removal

Remove the luggage box and body cover.  
Drain out the coolant.



Remove the thermostat cover. (2 bolts)



Remove the thermostat.



### 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

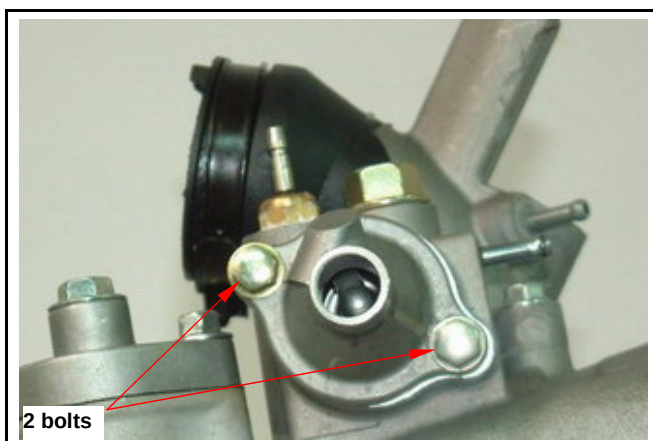
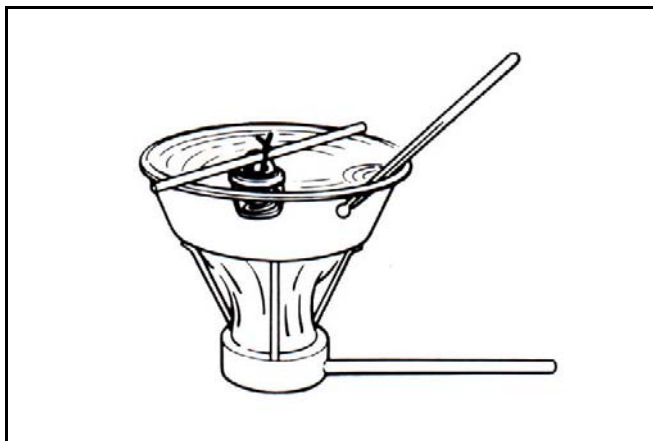
|                      |            |
|----------------------|------------|
| Valve begins to open | 82~95      |
| Valve stroke         | 0.05 ~ 3mm |

### Installation

Install the thermostat.

Install the thermostat cover. (2 bolts)

Refill the coolant and bleed out the air bubble (Page 12-5).



## 12. Cooling System

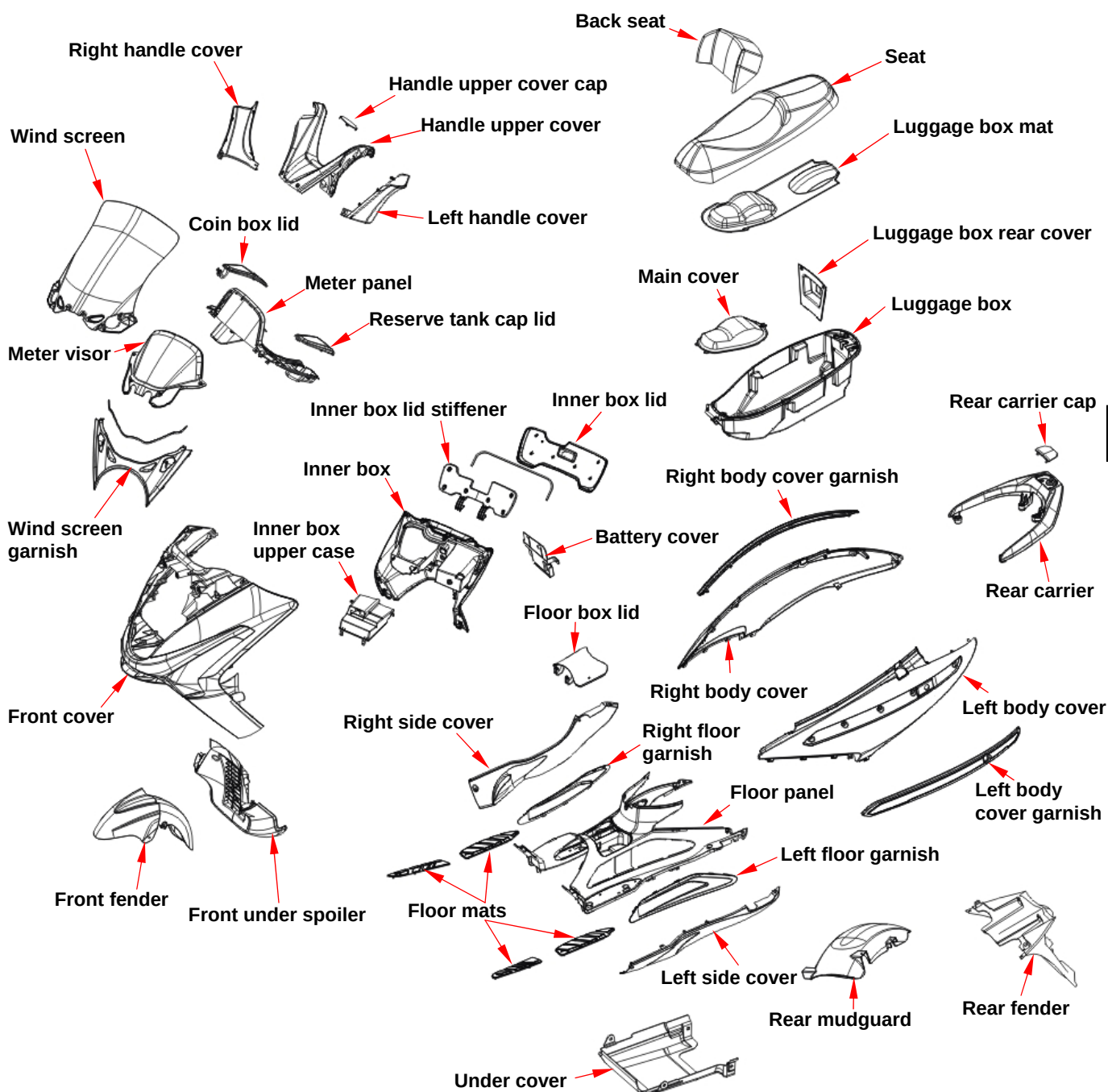
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Notes:

|                                         |                      |                                           |                       |
|-----------------------------------------|----------------------|-------------------------------------------|-----------------------|
| <a href="#">Mechanism Diagram</a> ..... | <a href="#">14-1</a> | <a href="#">Front under Spoiler</a> ..... | <a href="#">14-10</a> |
| <a href="#">Maintenance</a> .....       | <a href="#">14-2</a> | <a href="#">Rear Carrier</a> .....        | <a href="#">14-10</a> |
| <a href="#">Handle Cover</a> .....      | <a href="#">14-3</a> | <a href="#">Luggage Box</a> .....         | <a href="#">14-11</a> |
| <a href="#">Front Cover</a> .....       | <a href="#">14-4</a> | <a href="#">Rear Body Cover</a> .....     | <a href="#">14-12</a> |
| <a href="#">Meter Panel</a> .....       | <a href="#">14-6</a> | <a href="#">Floor Panel</a> .....         | <a href="#">14-13</a> |
| <a href="#">Inner Box</a> .....         | <a href="#">14-7</a> | <a href="#">Front Fender</a> .....        | <a href="#">14-13</a> |
| <a href="#">Side Cover</a> .....        | <a href="#">14-9</a> | <a href="#">Rear Fender</a> .....         | <a href="#">14-14</a> |

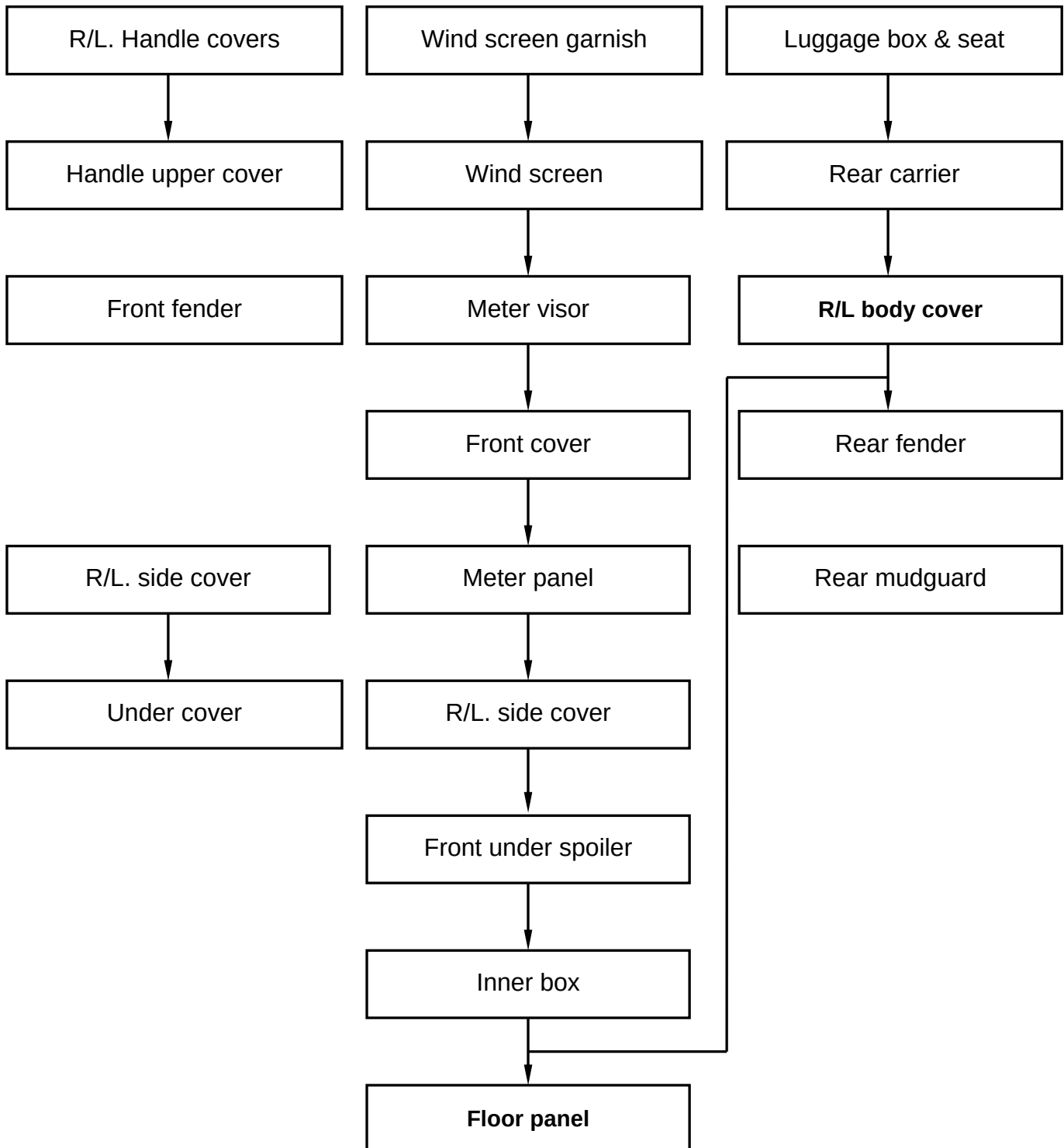
## Mechanism Diagram



## 14. Body Cover

### Maintenance

Body covers disassemble sequence:



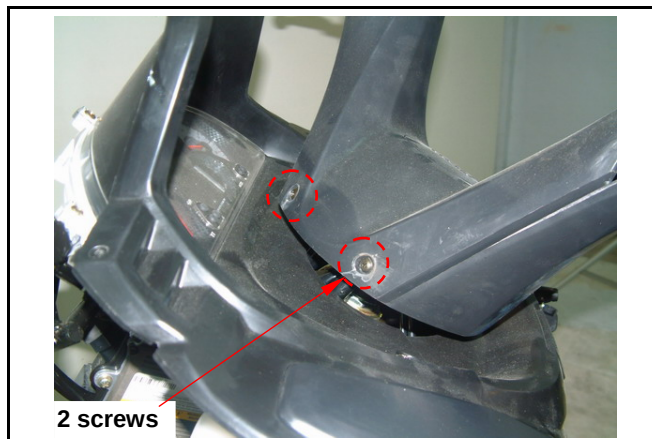
- Be careful not to damage various covers in assembly or disassembly operation.
- Never injure hooks molded on the body covers.
- Align the buckles on the guards with slot on the covers.
- Make sure that each hook is properly installed during the assembly.
- Never compact forcefully or hammer the guard and the covers during assembly.



## Handle Cover

### Remove

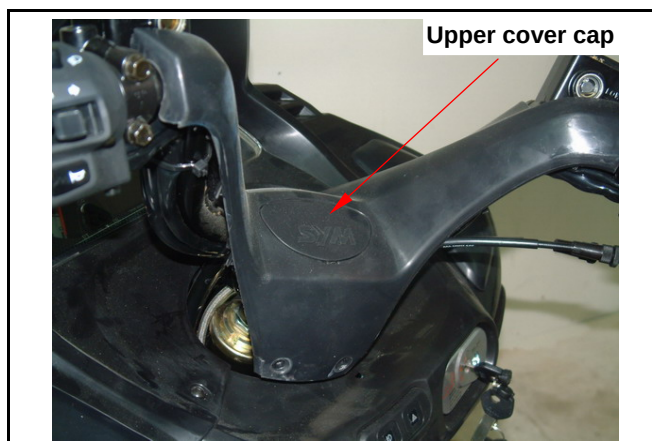
Loosen the 2 screws from handle upper cover front end.



Loosen the 2 screws from handle upper cover rear end.  
Remove right and left handle side cover.



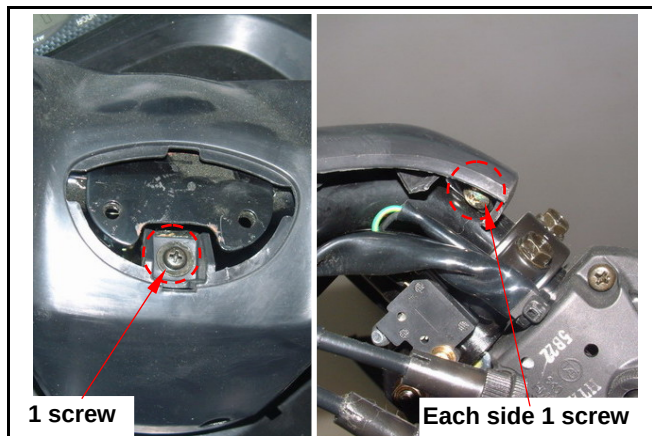
Remove the handle upper cover cap.



Loosen the 3 screws from the handle upper cover, and then remove handle upper cover.

### Installation

Install in reverse order of removal procedures.

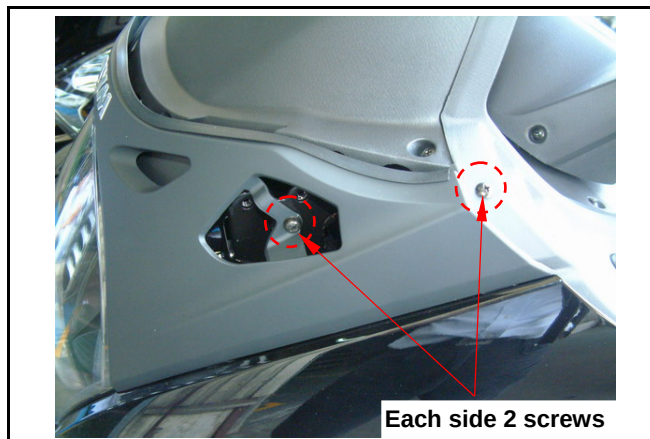


## 14. Body Cover

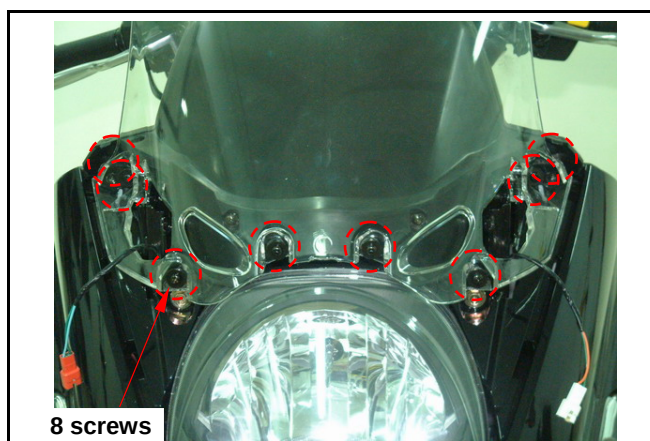
### Front Cover

#### Remove

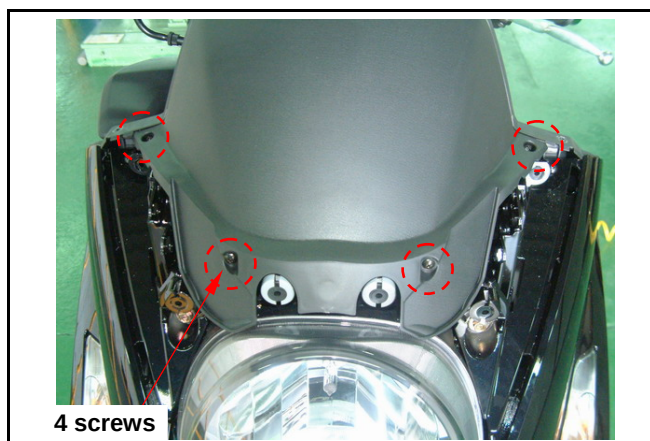
Loosen 4 screws from the wind screen garnish and remove the wind screen garnish.



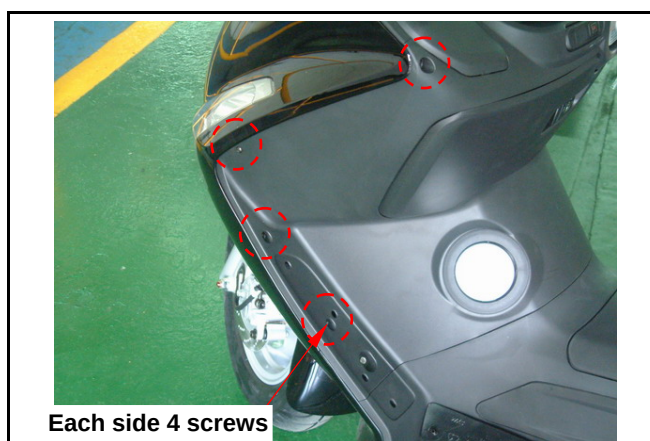
Loosen 8 screws from the wind screen and remove the wind screen.



Loosen 4 screws from the meter visor and remove the meter visor.

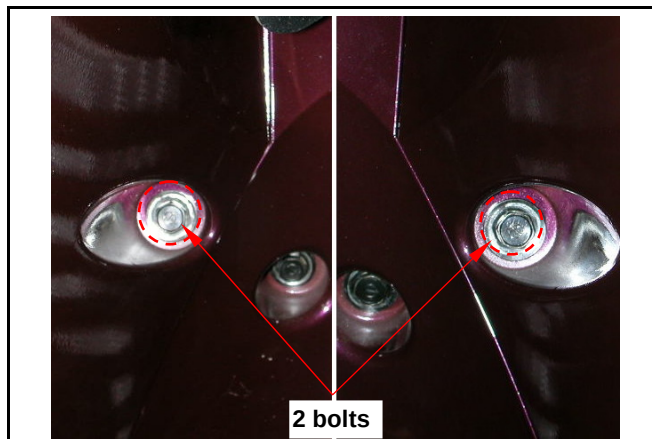


Loosen 8 screws from the inner box.

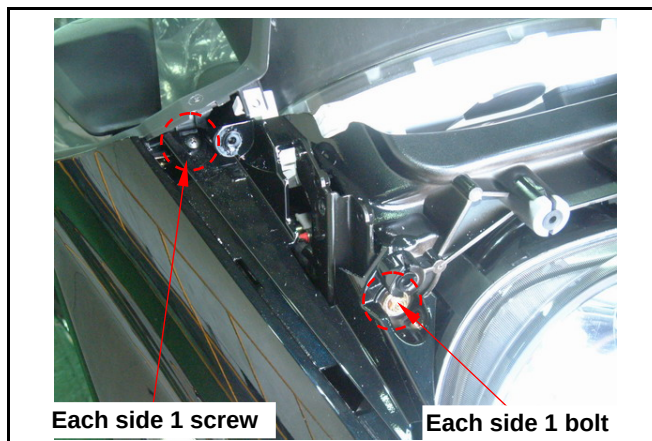




Loosen 2 bolts from the front cover under side.



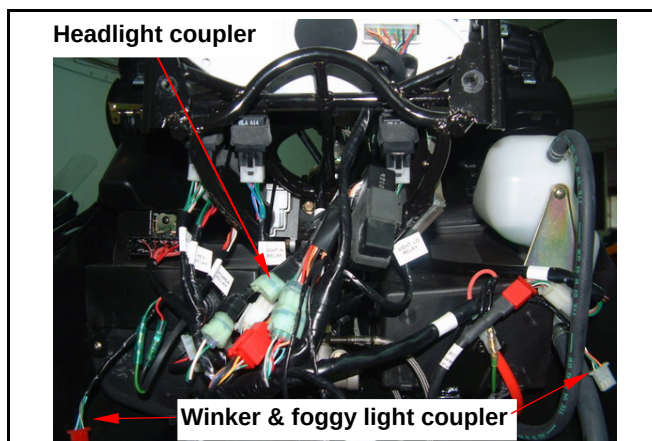
Loosen 2 screws and 2 bolts from the front cover upper side.



Disconnect the headlight, foggy light and winker light couplers.  
Remove the front cover.

## Installation

Install in reverse order of removal procedures.



## 14. Body Cover

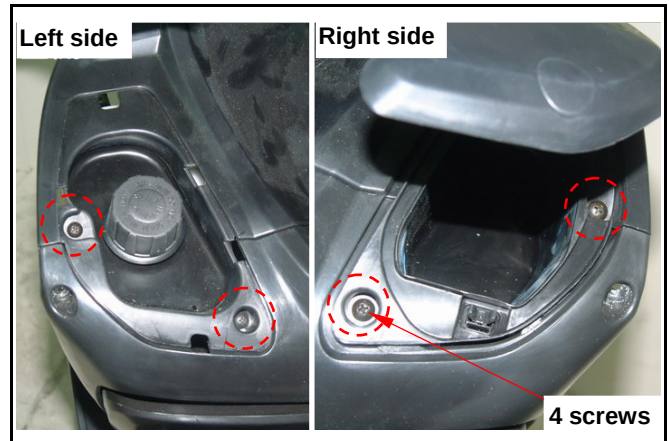
### Meter Panel

#### Remove

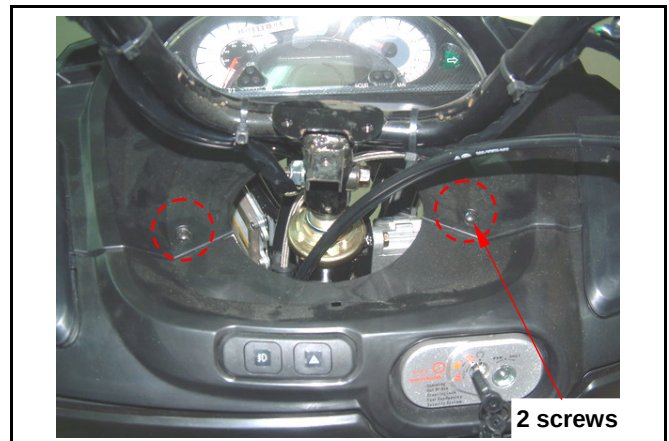
Remove wind screen garnish, wind screen, meter visor and front cover.

Remove reserve tank cap.

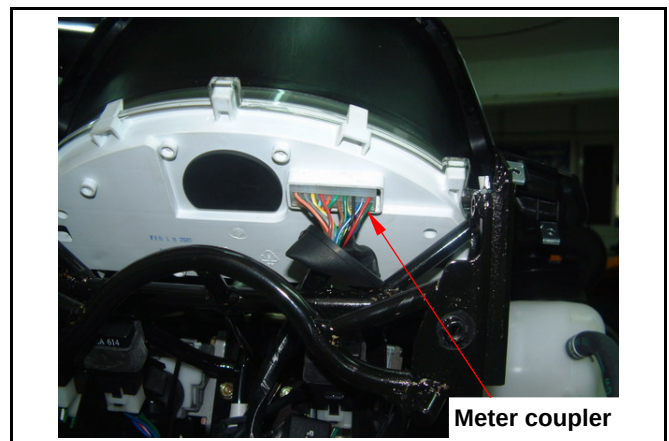
Loosen 4 screws from right & left side of the meter panel.



Loosen 2 screws from in side of meter panel.



Loosen the meter cord coupler.



Remove the meter panel.

#### Installation

Install in reverse order of removal procedures.



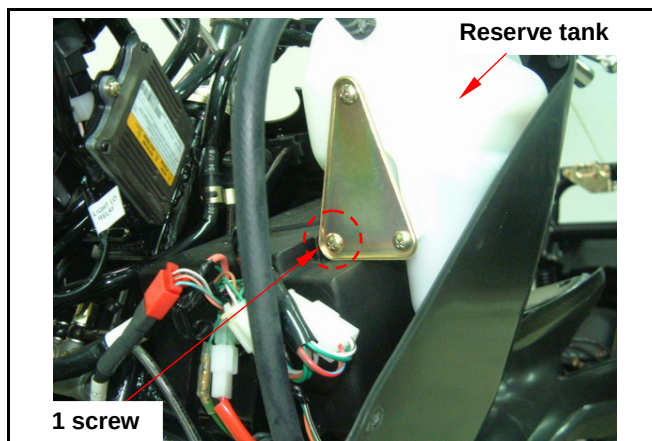


## Inner Box

### Remove

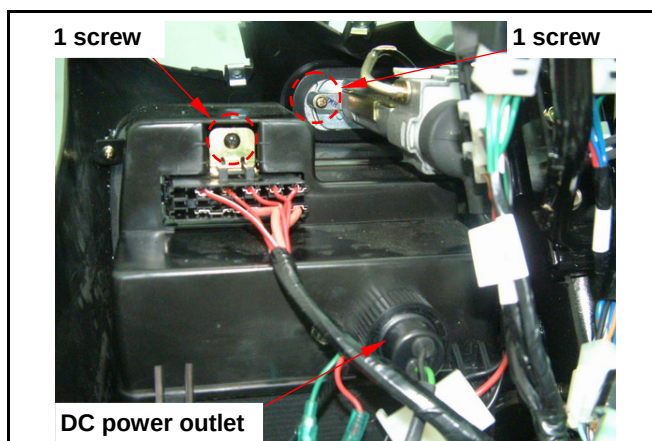
Remove wind screen garnish, wind screen, meter visor, front cover, meter panel, R/L side cover and front under spoiler.

Loosen 1 screw from reserve tank stay.



Loosen 1 screw from fuse box and remove it.  
Loosen 1 screw from main switch cap and remove the cap.

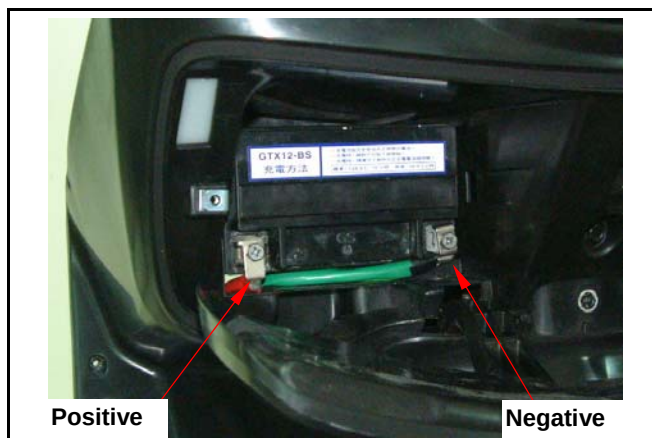
Loosen DC power outlet mounting nut, and remove DC power outlet.



Loosen 1 screw from battery cover and remove it.



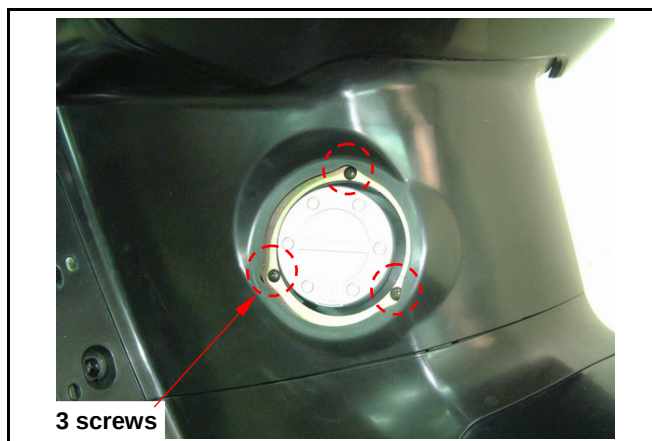
Remove the battery negative (-) cable.  
Remove the battery positive (+) cable.  
Remove the battery.



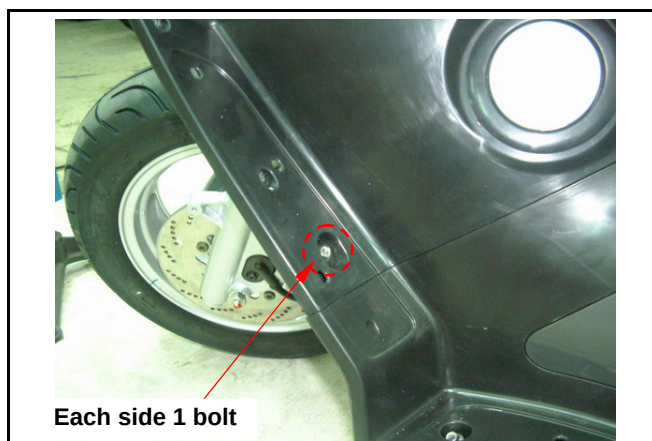
## 14. Body Cover



Remove the filler pipe cover.  
Loosen 3 screws of the filler pipe.



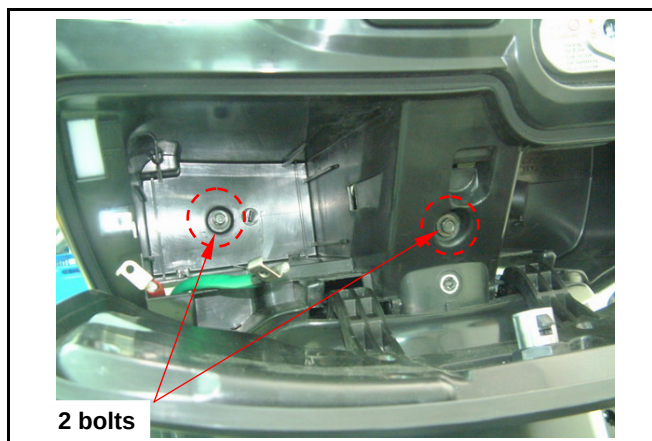
Loosen 2 bolts from inner box under side.



Loosen 2 bolts from inside of the inner box.  
Disconnect the hazard light and foggy light switch couplers.  
Remove inner box.

### Installation

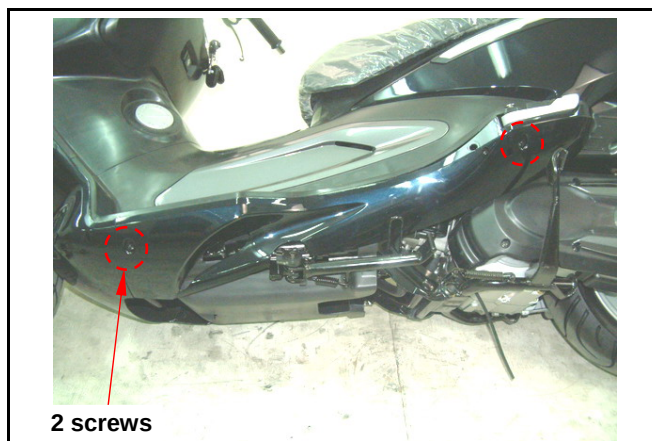
Install in reverse order of removal procedures.



### Side Cover

#### Remove

Loosen 2 screws from the side cover side end.



Loosen 2 screws from the side cover upper end.



Remove the side cover.

#### Installation

Install in reverse order of removal procedures.



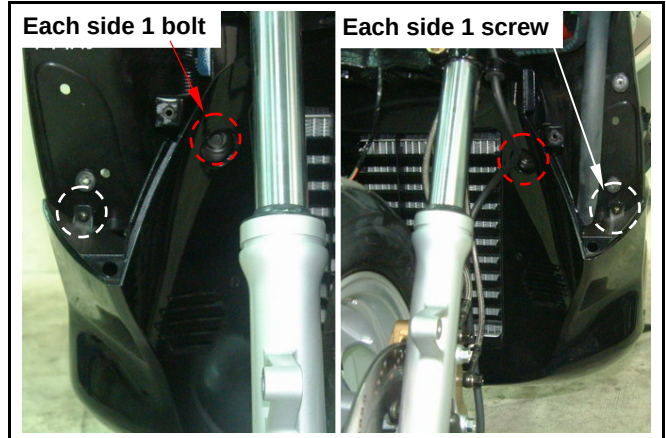


## 14. Body Cover

### Front under Spoiler

#### Remove

Remove wind screen garnish, wind screen, meter visor, front cover and R/L side cover.  
Loosen 2 screw and 2 bolts from the front under spoiler upper end.



Remove the front spoiler.

#### Installation

Install in reverse order of removal procedures.



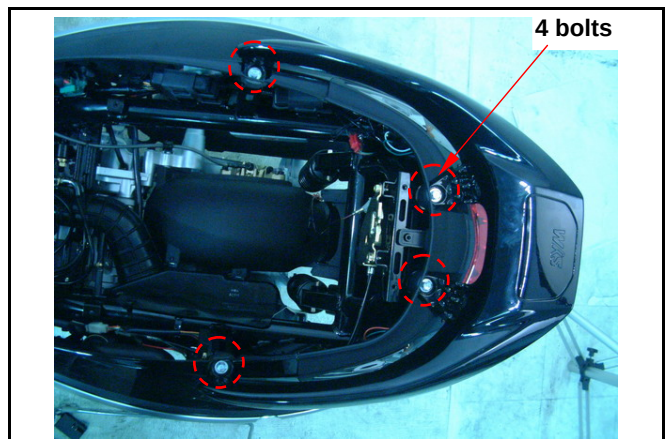
### Rear Carrier

#### Remove

Loosen 4 bolts from the rear carrier and remove it.

#### Installation

Install in reverse order of removal procedures.





## Luggage Box

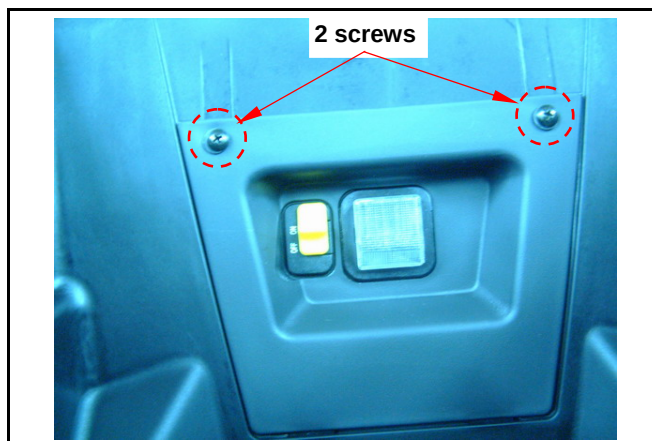
### Remove

Open the seat.

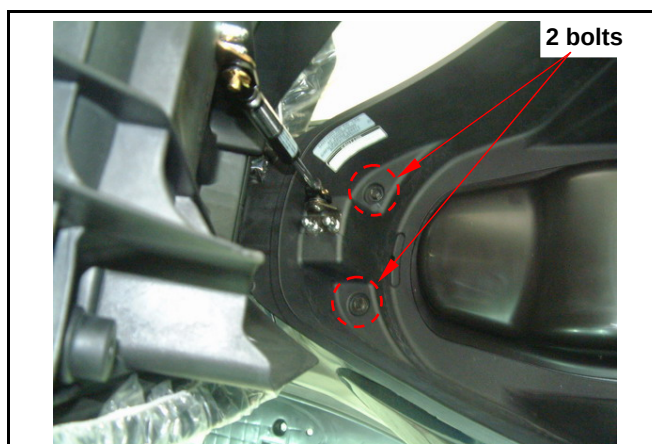
Loosen 2 screws from the luggage box rear cover.

Disconnect the luggage box light and switch coupler.

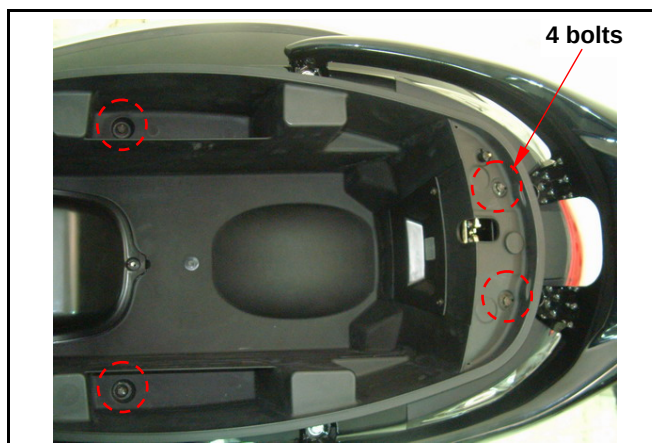
Remove the luggage box rear cover.



Loosen 2 bolts from luggage box front side



Loosen 4 bolts from luggage box rear side.



Remove the luggage box.

### Installation

Install in reverse order of removal procedures.



## 14. Body Cover

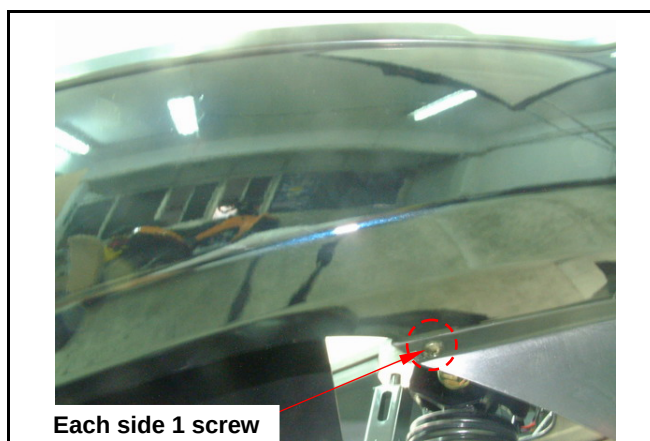
### Rear Body Cover

#### Remove

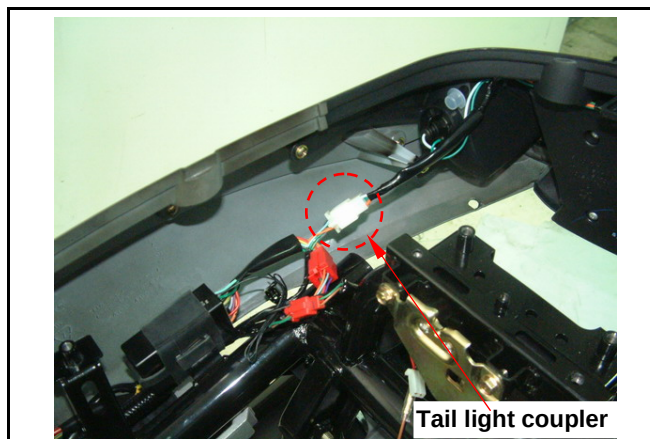
Loosen right and left side screws from rear end of floor panel.



Loosen right and left side screws from rear side of the body cover.



Disconnect the tail light coupler.



Remove the body cover.

#### Installation

Install in reverse order of removal procedures.

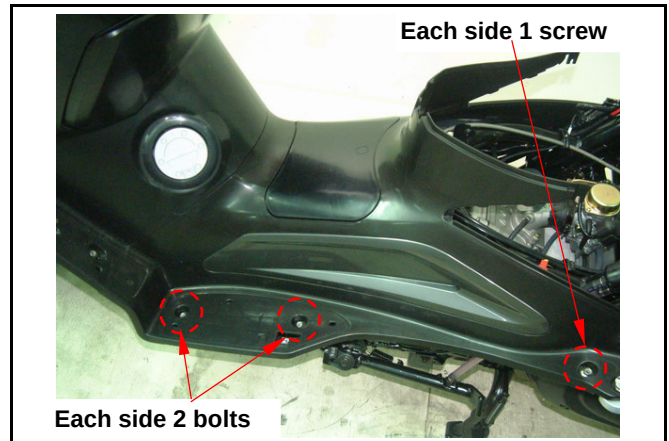




## Floor Panel

### Remove

Remove wind screen garnish, wind screen, meter visor, front cover, R/L side cover, front under spoiler, inner box, luggage box and body cover. Loosen 4 bolts and 2 screws from floor panel.



Remove floor panel.

### Installation

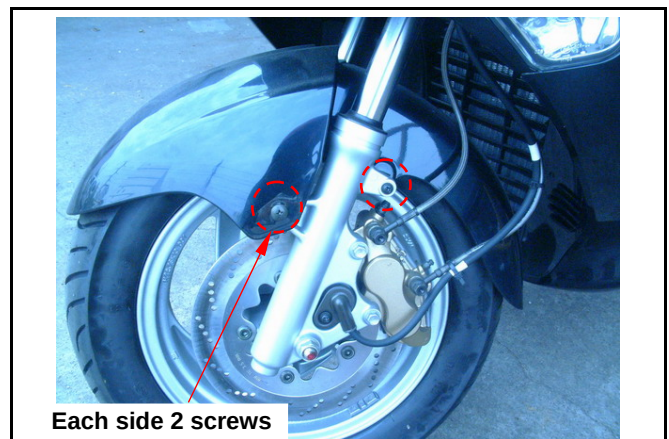
Install in reverse order of removal procedures.



## Front Fender

### Remove

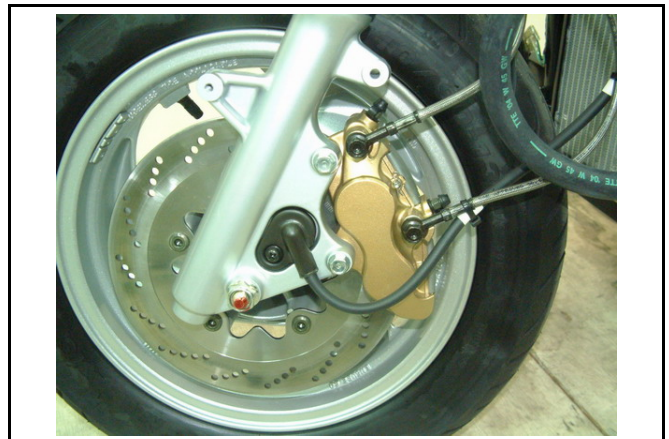
Loosen 4 screws from front cushion.



Remove the front fender.

### Installation

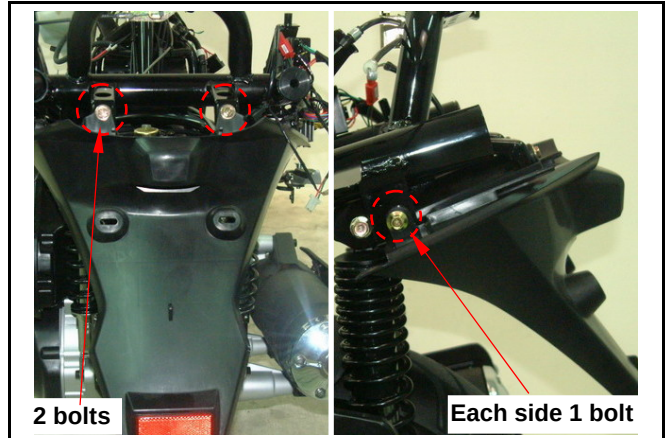
Install in reverse order of removal procedures.



## 14. Body Cover

### Rear Fender

Loosen 4 bolts from rear fender.



Remove the rear fender.

### Installation

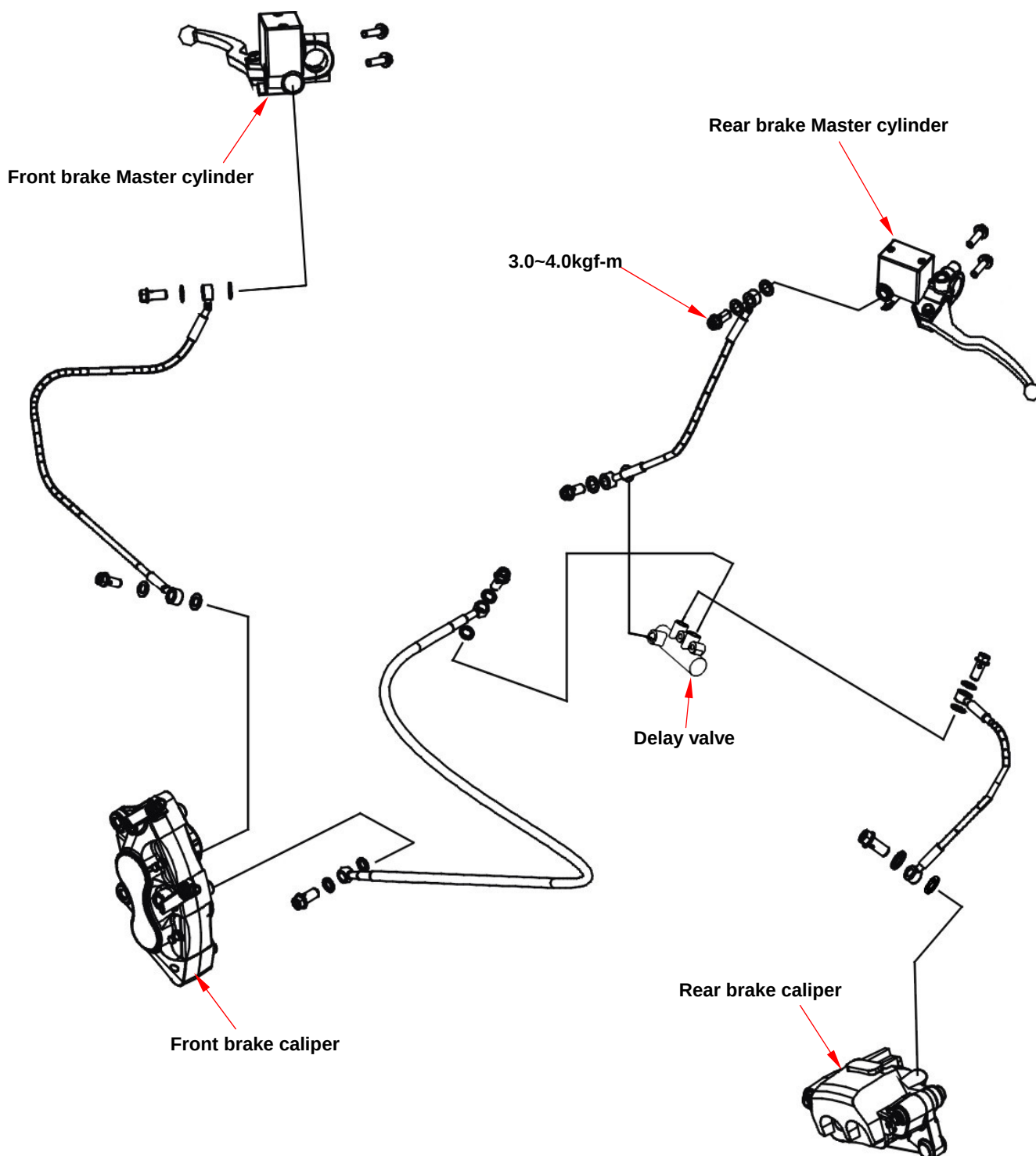
Install in reverse order of removal procedures.





|                                    |      |                                        |      |
|------------------------------------|------|----------------------------------------|------|
| Mechanism Diagram .....            | 15-1 | Brake fluid replacement / Air-bleed .. | 15-6 |
| Maintenance Description .....      | 15-2 | Front Brake Caliper .....              | 15-7 |
| Trouble Diagnosis .....            | 15-3 | Rear Brake Caliper .....               | 15-8 |
| Disk Brake System Inspection ..... | 15-4 | Brake Disk .....                       | 15-9 |
| Adding Brake Fluid .....           | 15-5 | Master Cylinder .....                  | 15-9 |

## Mechanism Diagram



## 15. Brake System



### Maintenance Description

#### Operational precautions

#### Caution

- Inhaling asbestos may cause disorders of respiration system or cancer, therefore, never use air hose or dry brush to clean brake parts. Use vacuum cleaner or other authorized tool instead.
- The brake caliper can be removed without removing the hydraulic system.
- After the hydraulic system is removed, or the brake system is felt to be too soft, bleed the hydraulic system.
- While refilling brake fluid, care should be taken not to let the foreign material entering into the brake system.
- Do not spill brake fluid on the painted surfaces, plastic or rubber parts to avoid damage.
- Check the operation of the brake system before riding.

#### Specifications

unit: mm

| Item                                              | Standard      | Limit  |
|---------------------------------------------------|---------------|--------|
| The thickness of front brake disk                 | 4.000         | 2.500  |
| The thickness of rear brake disk                  | 5.000         | 3.500  |
| Front and rear brake disk eccentricity            | < 0.100       | 0.300  |
| Front brake master cylinder inner diameter        | 11.000~11.043 | 11.055 |
| Front brake master cylinder piston outer diameter | 10.957~10.984 | 10.945 |
| Rear brake master cylinder inner diameter         | 14.000~14.043 | 14.055 |
| Rear brake master cylinder piston outer diameter  | 13.957~13.984 | 13.945 |
| Diameter of front disk                            | 240.000       | —      |
| Diameter of rear disk                             | 220.000       | —      |
| Thickness of front brake lining                   | 5.000         | 2.000  |
| Thickness of rear brake lining                    | 6.000         | 2.000  |

#### Torque values:

|                              |              |
|------------------------------|--------------|
| Brake hose bolts             | 3.0~4.0kgf-m |
| Bolt for front brake caliper | 2.9~3.5kgf-m |
| Brake lever nut              | 0.8~1.0kgf-m |
| Air-bleed valve              | 0.8~1.0kgf-m |

### Trouble Diagnosis

#### Soft brake lever

1. Air inside the hydraulic system
2. Hydraulic system leaking
3. Worn master piston
4. Worn brake pad
5. Poor brake caliper
6. Worn brake lining/disk
7. Low brake fluid
8. Blocked brake hose
9. Warp/bent brake disk
10. Bent brake lever

#### Hard operation of brake lever

1. Blocked brake system
2. Poor brake caliper
3. Blocked brake pipe
4. Seized/worn master cylinder piston
5. Bent brake lever

#### Uneven brake

1. Dirty brake lining/disk
2. Poor wheel alignment
3. Clogged brake hose
4. Deformed or warped brake disk
5. Restricted brake hose and fittings

#### Tight brake

1. Dirty brake lining/disk
2. Poor wheel alignment
3. Deformed or warped brake disk

#### Brake noise

1. Dirty lining
2. Deformed brake disk
3. Poor brake caliper installation
4. Imbalance brake disk or wheel

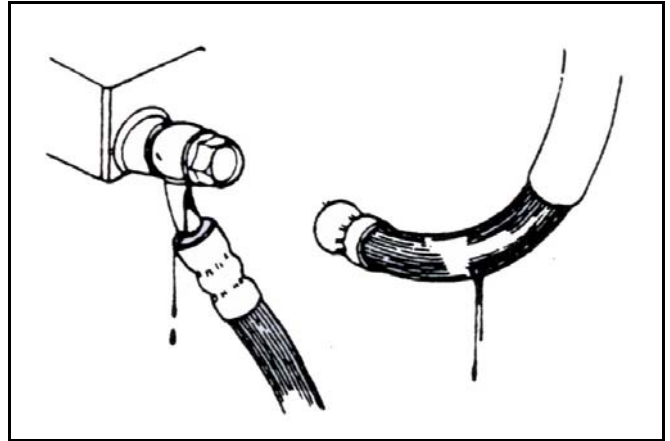
## 15. Brake System



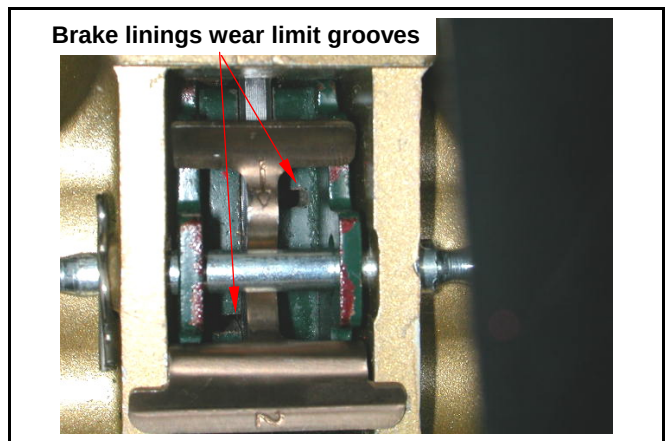
### Disk Brake System Inspection

#### Inspection

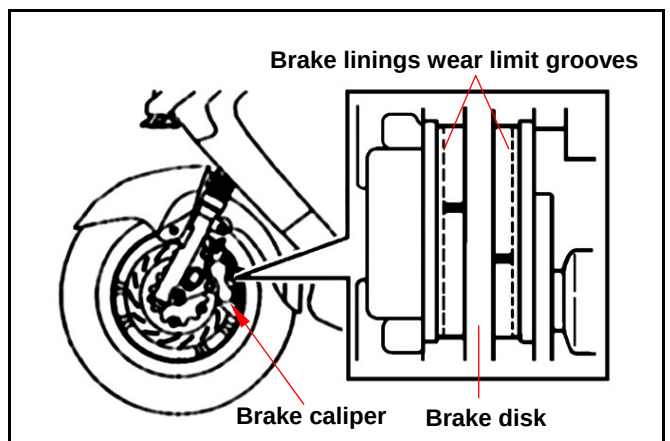
By visual examination whether divulges or the damage, with spanner inspection brake tube seam whether becomes less crowded, and the inspection handle bar turn right or turn left, or pressure the cushion, whether besides the pipeline protection department, whether there is interferes, contacts other parts of.



Remove the front brake pad cap.  
Check the brake from behind the brake caliper.



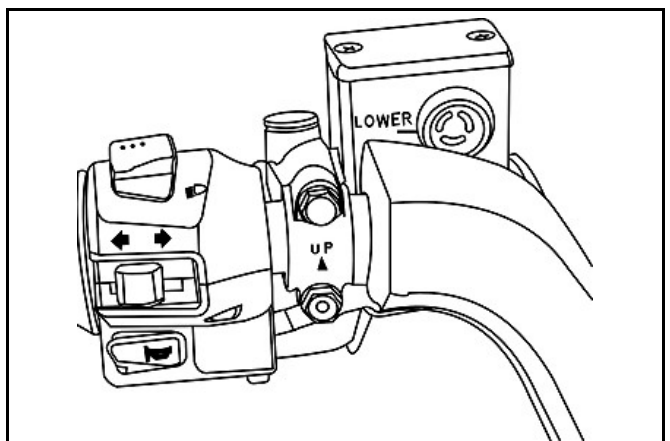
The brake pad must be replaced with new lining when the brake pad wear limit reaches the brake disk.



Park the motorcycle on a level ground, and check if fluid level is under the "LOWER" mark.  
Recommended Brake Fluid: WELL RUN BRAKE OIL (DOT 3).

#### Caution

- The vehicles inclined or just stop, the survey oil level could not be accurate, had to settle the 3~5 minute.
- In order to prevent has the chemical change, please do not use counterfeiting or other unclear trade marks brake fluid.
- Uses by all means must with the trade mark brake fluid, guarantees the ghost vehicle efficiency.





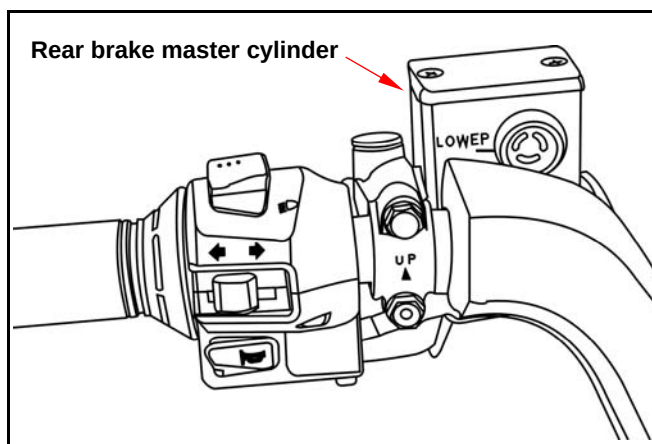
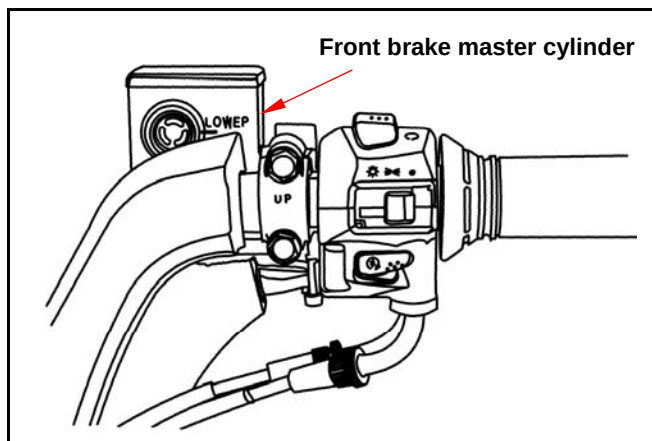
## Adding Brake Fluid

Before the brake fluid reservoir is removed, turn the handle so that the brake fluid reservoir becomes horizontal, and then remove the brake fluid reservoir.

When maintenance brake system, will be supposed to paint the surface or the rubber parts catches up by the rags.

### Caution

- Supplement brake fluid please do not surpass the upper limit, spilled brake fluid on painted surfaces, plastic or rubber components may result in their damages.

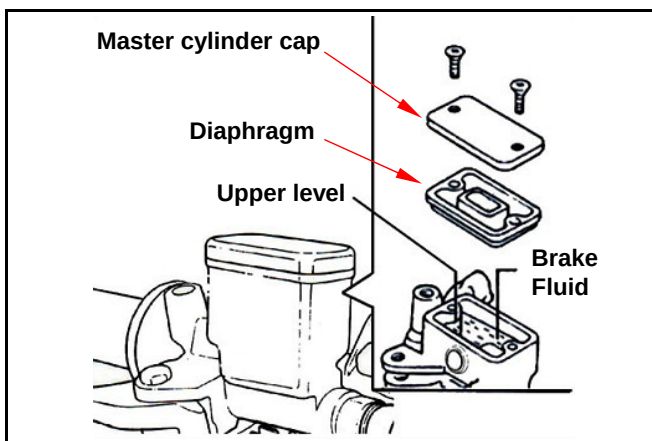


Remove the master cylinder cap and diaphragm. Increases the high quality brake fluid, uses by all means must with the trade mark brake fluid joins in the master cylinder.

Clean the dirty brake disk.

### Caution

- The dirty brake lining or disk will reduce the brake performance.
- To mixed non-compatible brake fluid will reduce brake performance.
- Foreign materials will block the system causing brake performance to be reduced or totally lost.



## 15. Brake System

### Brake fluid replacement / Air-bleed

Connect drain hose to air-bleed valve.

Open the drain valve on the calipers and delay valve the brake lever until the old brake fluid is entirely drained out.

Close the drain valve and add specified brake fluid into the brake master cylinder.

#### Recommended brake fluid: WELLRUN DOT 3 brake fluid

Connect one end of transparent hose to the drain valve, and put the other end into a container.

Open the drain valve around 1/4 turns, and at the same time hold the brake lever until there is no air bubble in the drain hose and also feeling resistance on the brake lever.

Close the drain valve when finishing the brake system refilling fluid procedure, and operate the brake lever to check whether air bubble is in brake system or not.

If brake is still soft, please bleed the system as described below:

1. Tightly hold the brake lever and open the drain valve around 1/4 turns, and then close the valve.

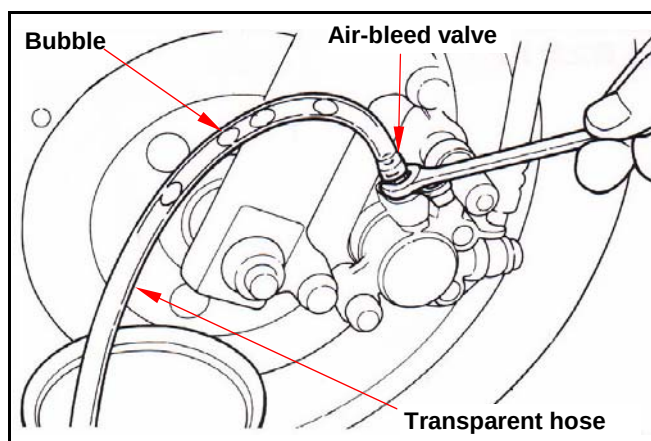
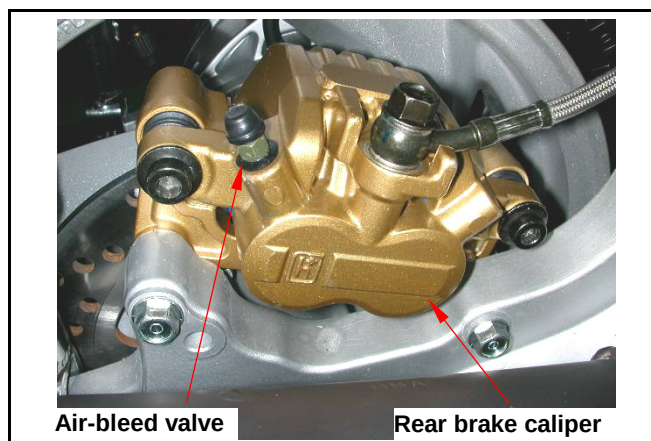
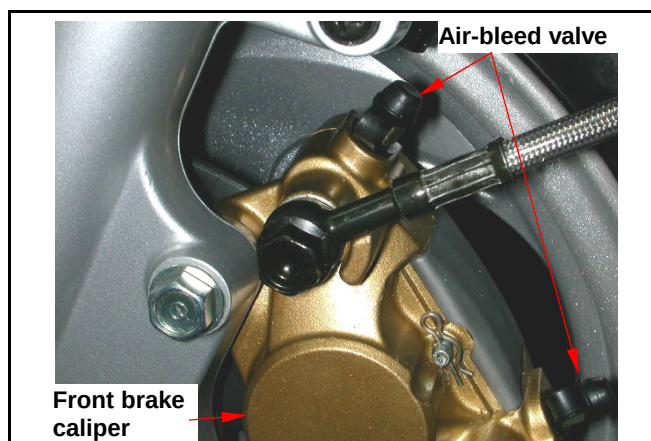
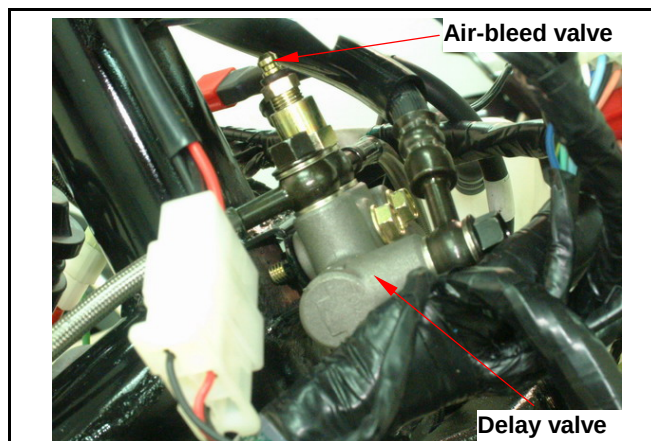
#### Caution

- Do not release the brake lever before the drain valve is closed.
- Always check the brake fluid level when carrying out the air bleeding procedure to avoid air enter into the system.

2. Slowly release the brake lever, and wait for a few seconds until it reaches its top position.
3. Repeat the steps 1 and 2 until there is no air bubble at the end of the hose.
4. Tightly close the drain valve.
5. Make sure the brake fluid is in the UPPER level of the master cylinder, and refill the fluid if necessary.
6. Cover the cap

#### Caution

- Divulges the air to have to pump by the minute first divulges, then to caliper.
- May use fluid the replacement machine, the replacement fluid, the time is quicker, the air bubble also Compared with cannot remain





## Front Brake Caliper

### Removal

Place a container under the brake caliper, and loosen the brake hose bolts and finally remove the brake hoses.

### ⚠ Caution

- Do not spill brake fluid on painted surfaces.

Remove two caliper mounting bolts and the caliper.

### Installation

Install the brake caliper and tighten the mounting bolts.

**Torque: 2.9~3.5kgf-m**

### ⚠ Caution

- Use M8 x 35 mm flange bolt only.
- Long bolt will impair the operation of brake disk.

Use two seal washers and hose bolts to lock the hoses and brake caliper in place.

**Torque: 3.0~4.0kgf-m**

Refill up the brake fluid to the reservoir and make necessary air bleeding.

### Brake pad replacement

Remove brake caliper.

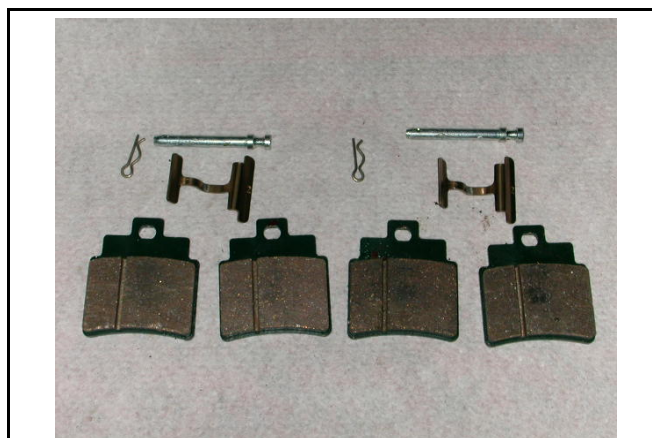
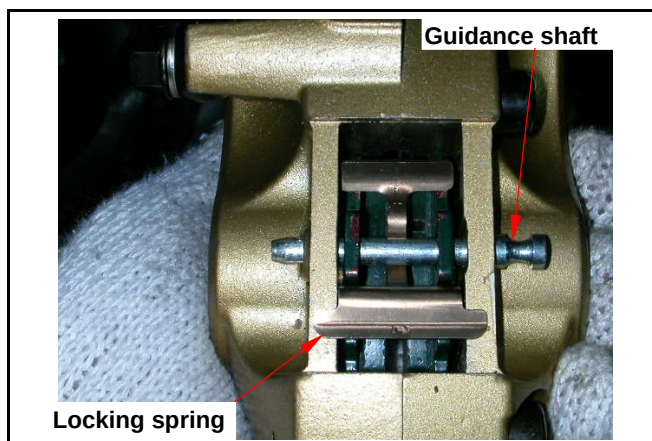
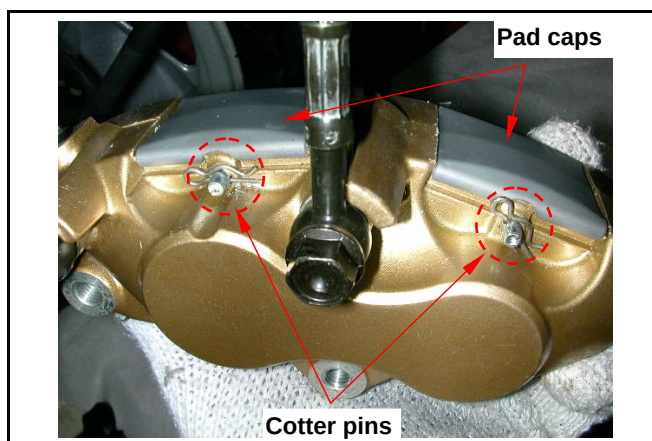
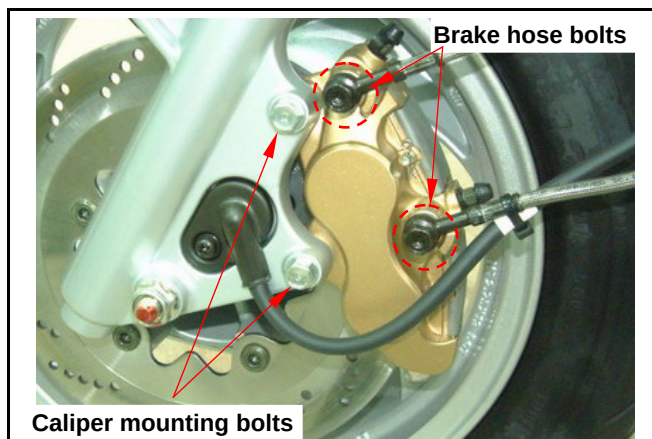
Remove brake pad caps.

Remove the brake pad guidance shafts cotter pins.

Remove the brake pad guidance shafts and locking spring, and then remove brake pads.

Install the new brake pads onto brake caliper.  
Install the brake pad guidance shafts and locking springs.

Install the brake pad guidance shafts cotter pins.  
Install the brake caliper and tighten the mounting bolts.



## 15. Brake System

### Rear Brake Caliper

#### Removal

Place a container under the brake caliper, and loosen the brake hose bolt and finally remove the brake hose.

#### ⚠ Caution

- Do not spill brake fluid on painted surfaces.

Remove two caliper mounting bolts and the caliper.

#### Installation

Install the brake caliper and tighten the mounting bolts.

**Torque: 2.9~3.5kgf-m**

#### ⚠ Caution

- Use M8 x 35 mm flange bolt only.
- Long bolt will impair the operation of brake disk.

Use two seal washers and hose bolts to lock the hoses and brake caliper in place.

**Torque: 3.0~4.0kgf-m**

Refill up the brake fluid to the reservoir and make necessary air bleeding.

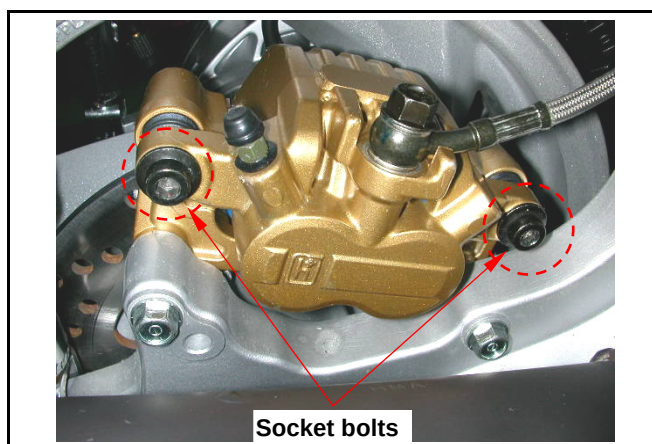
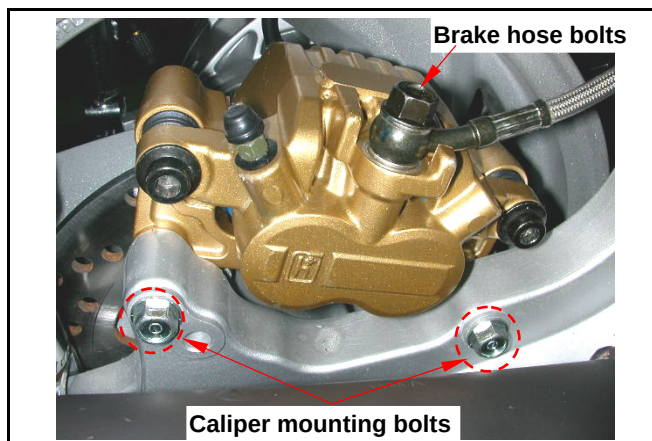
#### Brake pad replacement

Remove the brake caliper upper parts (2 socket bolts).

Take out the brake pads.

Install the new brake pads onto brake caliper bracket.

Install the brake caliper upper parts and tighten the socket bolts.





## Brake Disk

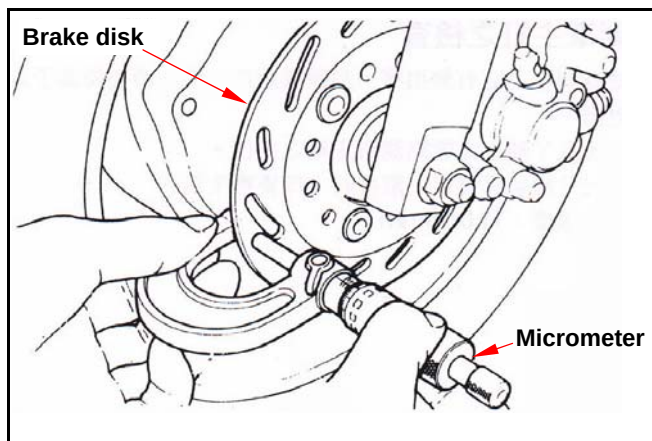
### Inspection

Visually check the brake disk for wear or break. Measure the thickness of the disk at several places. Replace the disk if it has exceeded the service limit.

#### Allowable limit:

Front brake disk 2.5 mm

Rear brake disk 3.5 mm

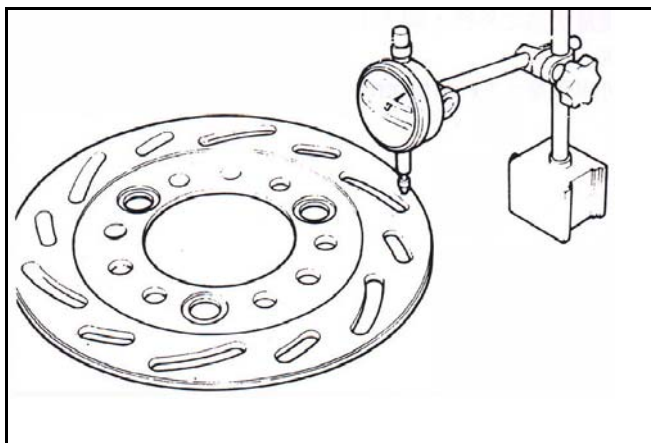


Remove the brake disk from wheel. Check the disk for deformation and bend.

Allowable limit: 0.30 mm

### ⚠ Caution

- The dirty brake lining or disk will reduce the brake performance.
- Brake lining includes the asbestos ingredient, cannot use the air-gun to be clean, the operator should dress the mouthpiece and the glove, use vacuum cleaner clean it.



## Master Cylinder

### Master Cylinder Removal

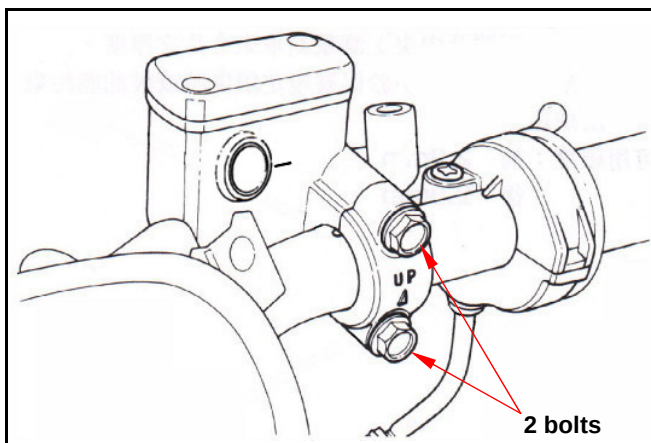
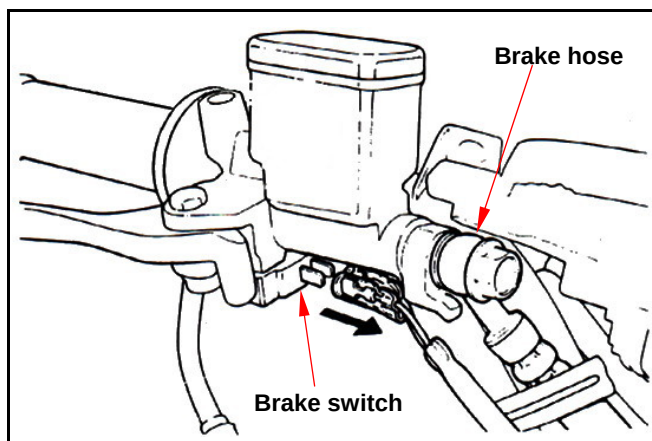
### ⚠ Caution

- Do not let foreign materials enter into the cylinder.

### ⚠ Caution

- The whole set of master cylinder, piston, spring, diaphragm and cir clip should be replaced as a set.

Remove the handlebar covers.  
Remove the leads of brake light switch.  
Drain out the brake fluid.  
Remove the brake lever from the brake master cylinder.  
Remove the brake hose.  
Remove the master cylinder bolts and the master cylinder.



## 15. Brake System

Remove the rubber pad.  
Remove the cir clip.  
Remove the piston and the spring.  
Clean the master cylinder with recommended brake fluid.

### Master Cylinder Inspection

Check the master cylinder for damage or scratch.  
Replace it if necessary.  
Measure the cylinder inner diameter at several points along both X and Y directions.  
Replace the cylinder if the measured values exceed allowable limit.

**Allowable limit:**

**Front brake: 11.055 mm**

**Rear brake: 14.055 mm**

Measure the outer diameter of the piston.  
Replace the piston if its measured value exceeds allowable limit.

**Allowable limit:**

**Front brake: 10.945 mm**

**Rear brake: 13.945 mm**

### Master Cylinder Assembly

#### ⚠ Caution

- It is necessary to replace the whole set comprising piston, spring, piston cup, and cir clip.
- Make sure there is no dust on all components before assembling.

Apply clean brake fluid to the piston cup, and then install the cup onto the piston.

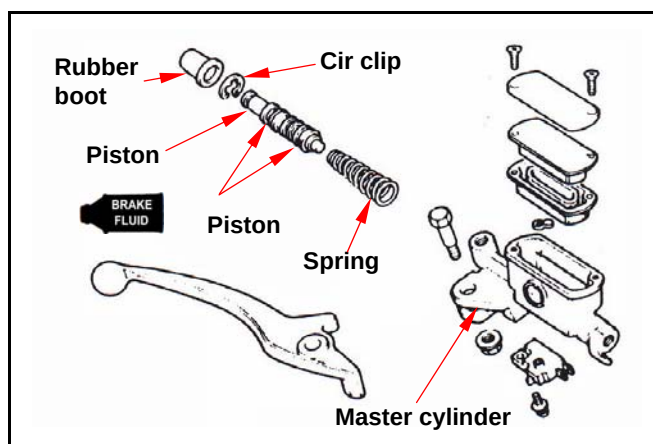
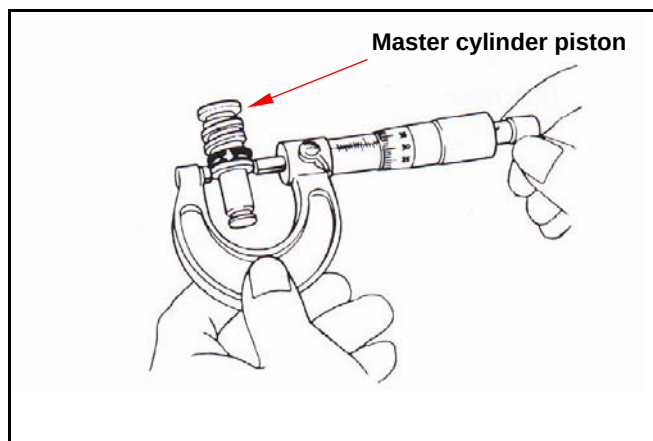
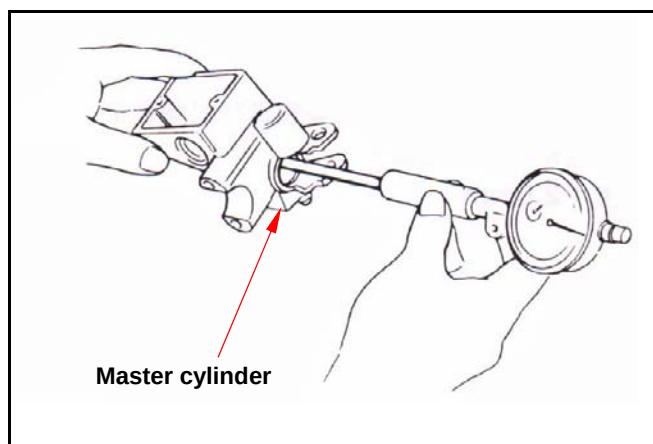
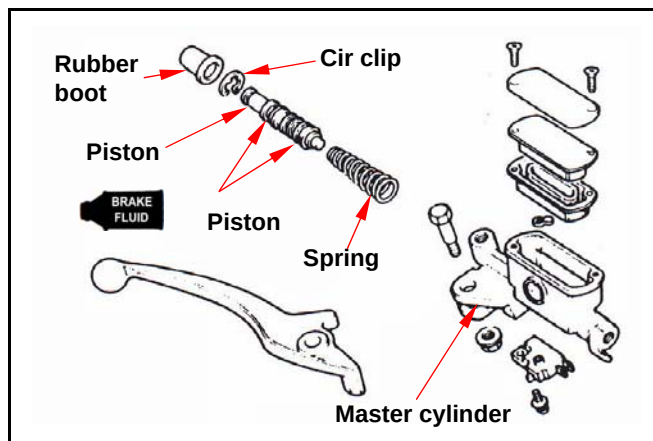
Install the larger end of the spring onto the master cylinder.

The master cup's cavity should be face inside of master cylinder when installing the master cup.  
Install the cir clip.

#### ⚠ Caution

- Never install cup lip in the opposite direction.
- Make sure the cir clip is seated securely in the groove.

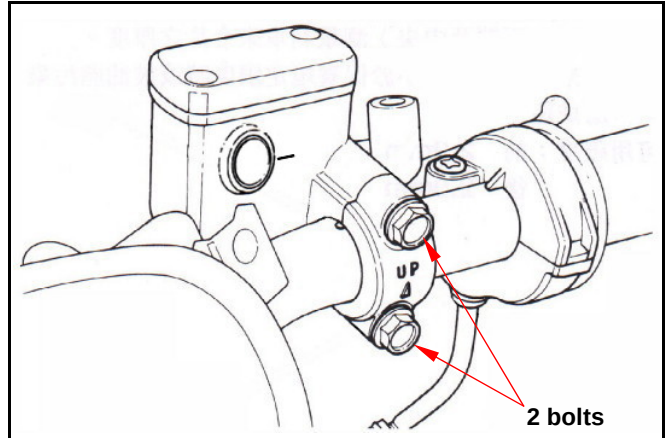
Install the rubber pad into groove properly.



### Master Cylinder Install

Install the rubber pad into the groove correctly.  
Place the master cylinder onto handlebar, and  
install the bolts.

Install the brake lever, and connect leads to brake  
light switch.



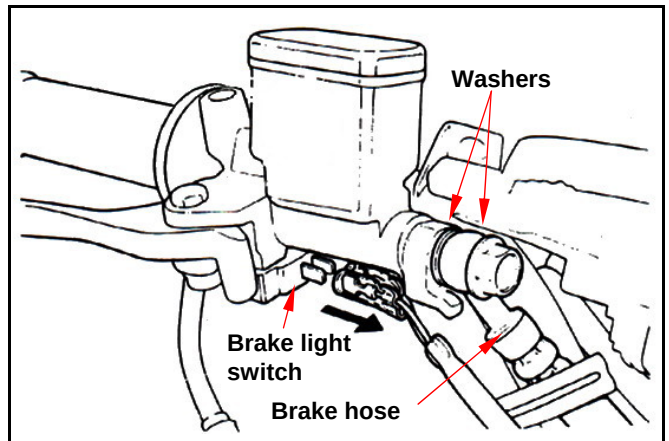
Connect brake hoses with 2 new washers.  
Tighten the brake hose bolt to the specified torque  
value.  
Make sure the hose is installed correctly.  
Install all wires, hoses, and components carefully  
so avoid to twisting them together.

#### Caution

- Improper routing may damage leads, hoses or pipes.

#### Caution

- Kink of brake leads, hose or pipe may reduce brake performance.



Add specified brake fluid and bleed the system.

## 15. Brake System

---



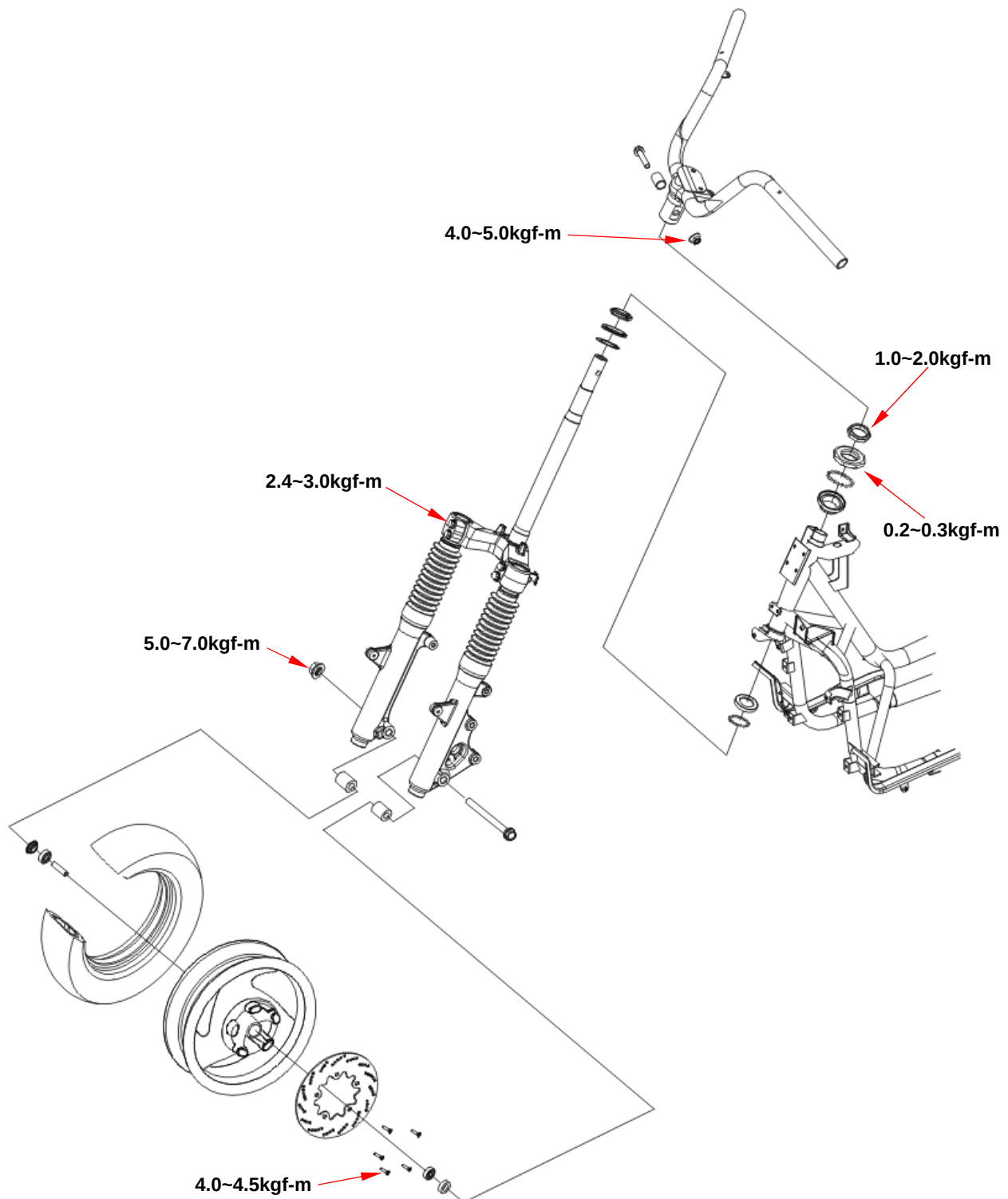
Note:



## 16. Steering / Front Wheel / Front Cushion

|                                      |             |                            |             |
|--------------------------------------|-------------|----------------------------|-------------|
| <b>Mechanism Diagram</b> .....       | <b>16-1</b> | <b>Front Wheel</b> .....   | <b>16-5</b> |
| <b>Operational Precautions</b> ..... | <b>16-2</b> | <b>Front Cushion</b> ..... | <b>16-8</b> |
| <b>Trouble Diagnosis</b> .....       | <b>16-2</b> | <b>Steering Stem</b> ..... | <b>16-9</b> |
| <b>Steering Handle</b> .....         | <b>16-3</b> |                            |             |

## Mechanism Diagram



## 16. Steering / Front Wheel / Front Cushion

### Operational Precautions

#### General

Please refer to the Maintenance Manual of tubeless tire in respect to the removal, repair and installation of the tire.

#### Torque Values

|                                          |                |
|------------------------------------------|----------------|
| Nut for the front wheel axle             | 5.0 ~ 7.0kgf-m |
| Nut for the steering handle              | 4.0 ~ 5.0kgf-m |
| Lock nut for the steering handle stem    | 1.0 ~ 2.0kgf-m |
| Top crown for the steering handle stem   | 0.2 ~ 0.3kgf-m |
| Locating screw for the speedometer cable | 0.15 ~0.3kgf-m |
| Front cushion upper lock bolt            | 2.4 ~ 3.0kgf-m |
| Front brake disk                         | 4.0~4.5kgf-m   |

#### Special Tools

|                                   |                         |
|-----------------------------------|-------------------------|
| Steering handle top thread wrench | SYM-5320000、SYM-5321100 |
| Inner bearing puller              | SYM-6204020             |
| Steering nut wrench               | SYM-6204010             |
| Driver 32*35mm                    |                         |
| Driver 42*47mm                    |                         |

### Trouble Diagnosis

#### Hard to steer

- The steering handle stem nut is too tight.
- The ball and the top crown of the steering handle stem are damaged.
- Insufficient tire pressure.

#### The steering handlebar is tilted

- Uneven arrangement of the front cushion.
- The front fork is bent.
- The front wheel axle is bent

#### The front wheel rim run-out

- The rim is bent.
- The wheel axle nut is not tightened enough.
- Side-worn or poor tire.
- The bearing clearance of the wheel axle is too large.

#### Soft front cushion

- The front cushion spring is worn out.
- The oil seal of the front cushion is leaking.

#### Noise in front cushion

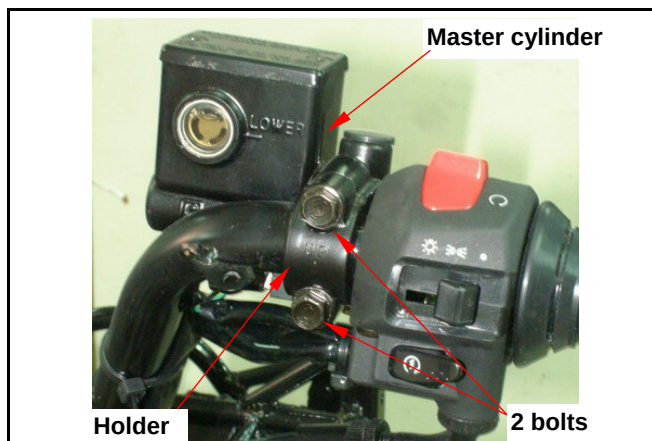
- Front cushion is warped.
- The joint of the front cushion gets loose.

## Steering Handle

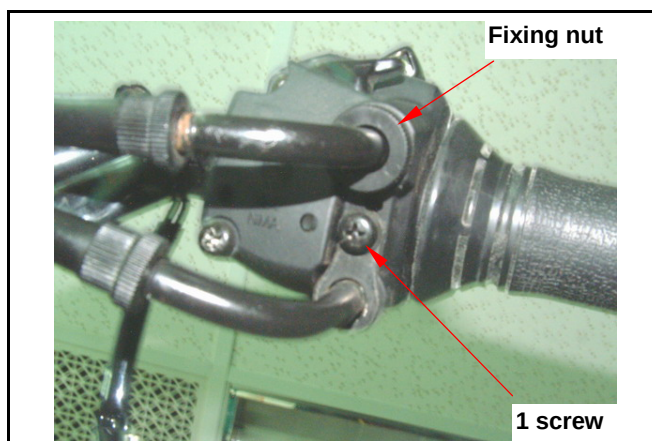
### Remove

Remove the right and left handle side cover, handle upper cover and front cover. (Refer to chapter 13)

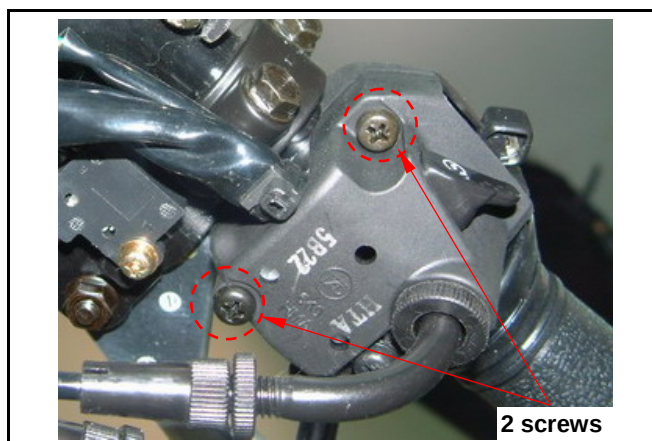
Loosen the lock bolts for the master cylinder of the front brake.



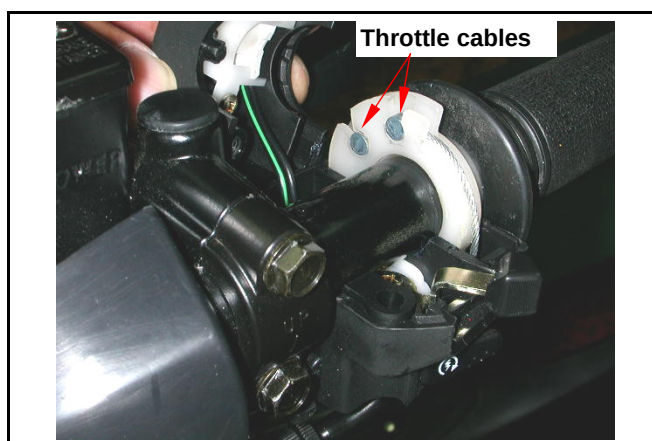
Loosen the deceleration throttle cable fixing nut. Loosen 1 screw from the acceleration throttle fixing plate.



Loosen 2 screws from the throttle holder.



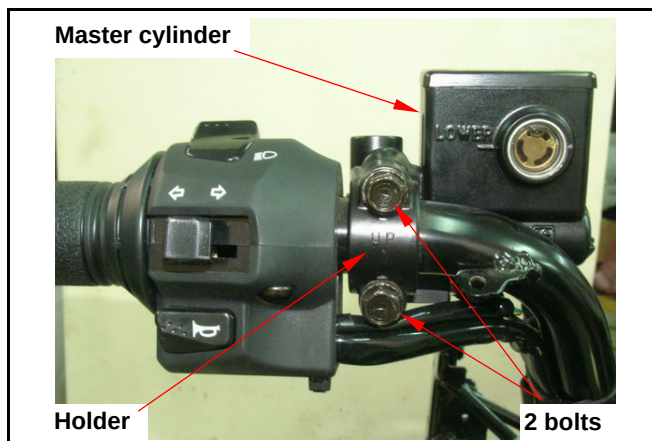
Remove throttle holder, handle switch, cables and grip.



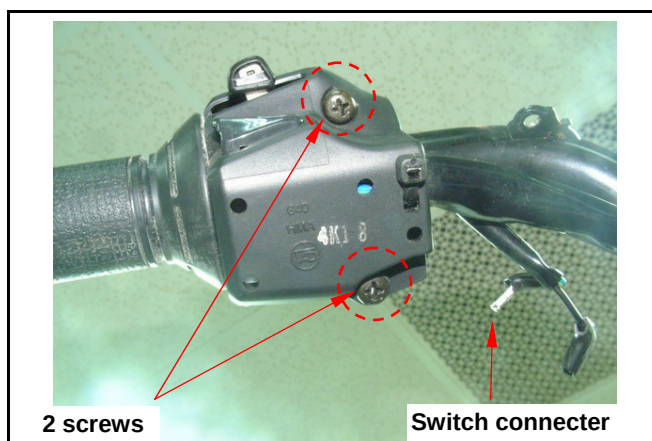
## 16. Steering / Front Wheel / Front Cushion



Loosen 2 bolts from the master cylinder of the rear brake.  
Remove holder and master cylinder.



Loosen left handle switch connector.  
Loosen 2 screws from left side handle switch holder.  
Remove the right handle switch.

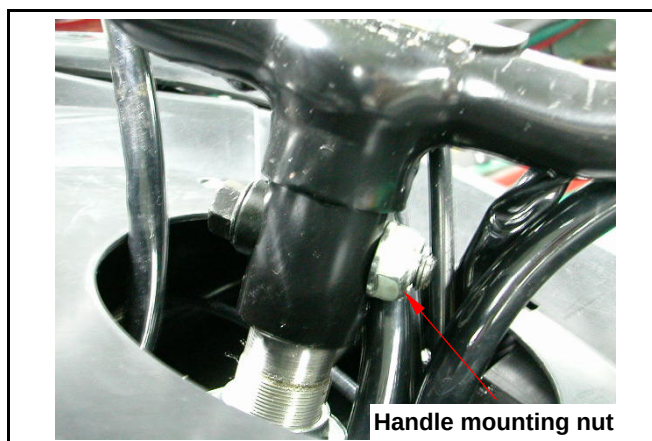


Loosen handle mounting nut.  
Remove handle mounting bolt, and then remove the handle.

### Installation

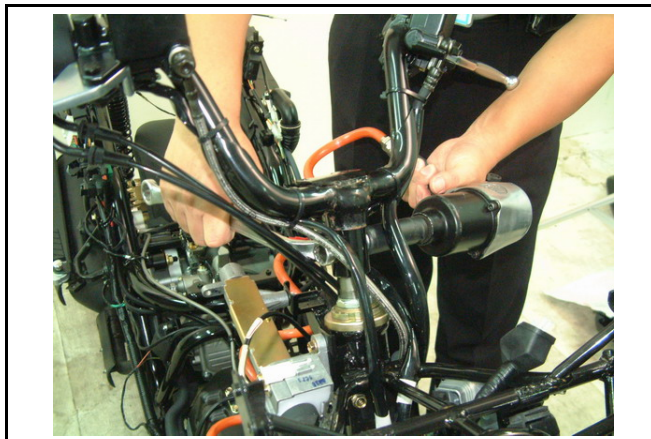
Install handle and align with bolt hole.  
Install bolt and nut and then tighten it.

**Torque value: 4.0~5.0kgf-m**



Apply with grease onto throttle cable and the sliding surface of handle.  
Align the lock pin with the hole on the handle.  
After the installment completes, carries on the following inspection and the adjustment:

- Throttle grip operation.
- All electric appliances, the meter function







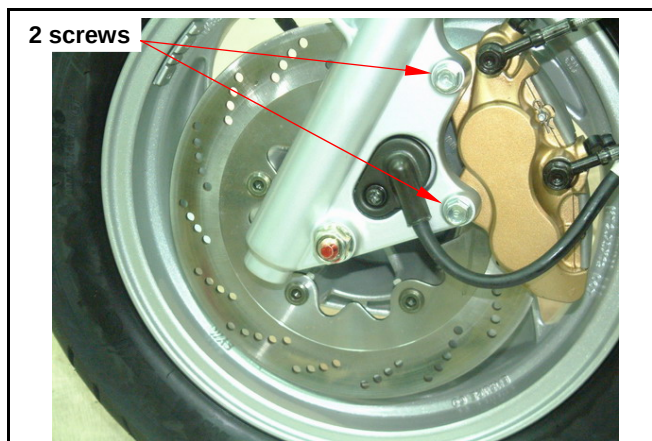
## 16. Steering / Front Wheel / Front Cushion

### Front Wheel

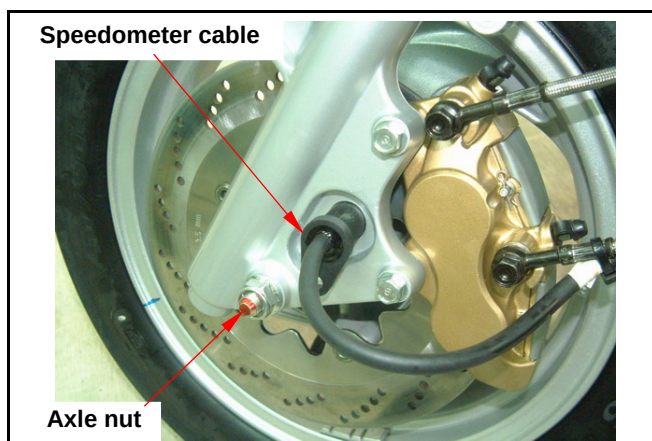
Loosen 2 bolts from the front brake caliper and remove it

#### **⚠ Caution**

- Care shall be taken not to push the brake lever to avoid the brake pad being squeezed out. In case that the brake pad is accidentally squeezed out, use a screwdriver to force it back to the place.



Loosen screw & remove speedometer cable.  
Turn loose the axle nut.



Pull out the front wheel axle.  
Remove the front wheel and both side collar.



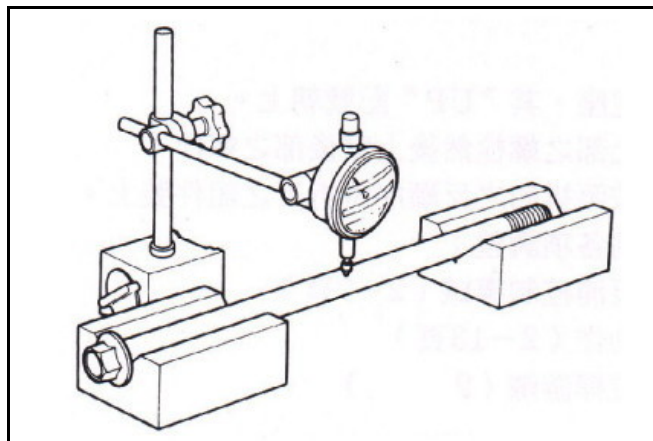
## 16. Steering / Front Wheel / Front Cushion

### Inspection

#### Wheel axle

Place the wheel axle on a V block, measure its run out.

**Service limit: 0.2 mm**

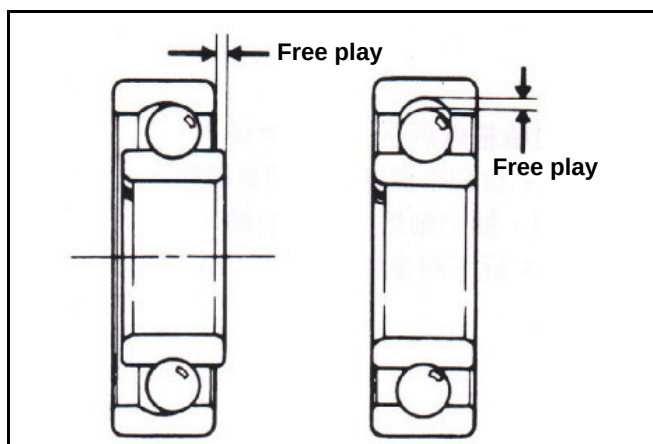


#### Bearing

Use finger to move the inner ring of each bearing, it shall move smoothly and quietly. Check the outer ring is securely attached on the wheel hub. If the motion of the inner ring of the bearing is not smooth, or noisy and loose when being moved, remove and discard it.

#### ⚠ Caution

- The bearing shall be replaced in pair.



#### Wheel

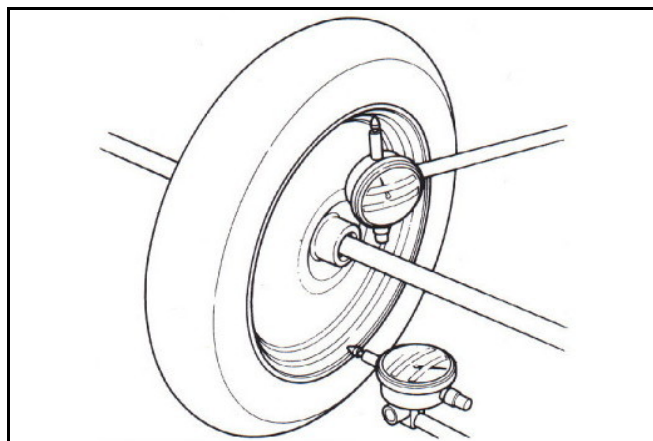
Place the wheel on to a rotation seat to check its rim wobbling.

Turn the wheel with hand and measure its rim wobbling value with a dial gauge.

**Service limit:**

**Radial: 2.0 mm (0.08 in)**

**Axial: 2.0 mm (0.08 in)**



### Disassembly

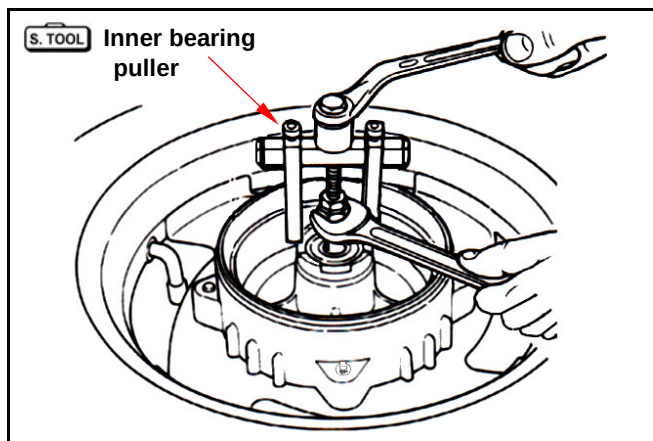
Remove brake disk (5 bolts).

Remove dust seal, bearing and dist collar from left side.

Remove dust seal and bearing from right side.

**Special tools:**

**Inner bearing puller SYM-6204020**



## 16. Steering / Front Wheel / Front Cushion

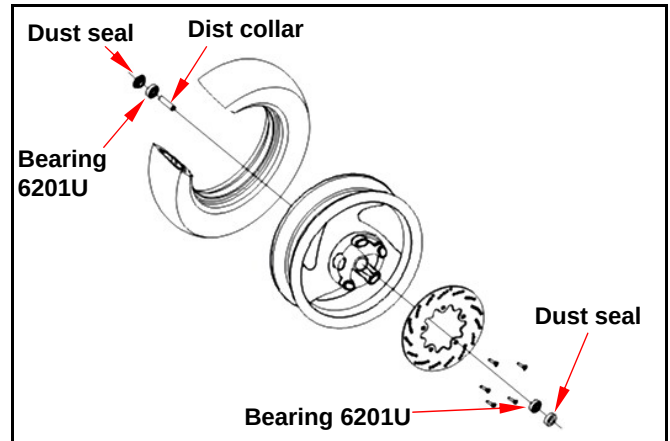
### Assembly

Fill out the block of bearing by grease.  
Drive the left bearing, dust seal and install the dist. collar.

Install the right side bearing.

### ⚠ Caution

- Carefully install the bearing in correct and evenly.
- Bearing outer face should be faced up as bearing installation.



Install the brake disk and then tighten the bolts.

**Torque value: 4.0~4.5kgf-m**



## 16. Steering / Front Wheel / Front Cushion



### Front Cushion

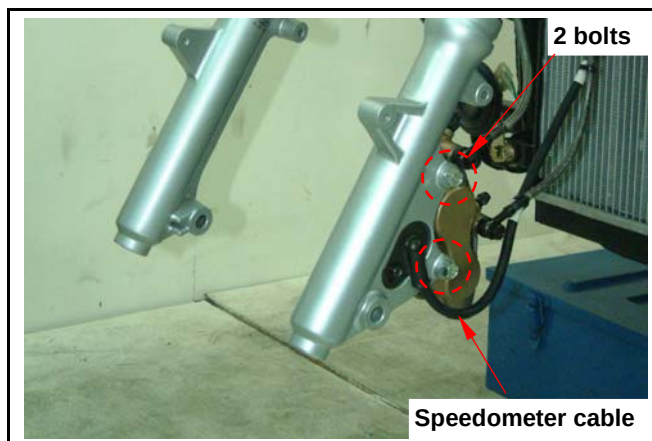
#### Remove

Remove front cover, front under spoiler and front fender.

Remove front wheel.

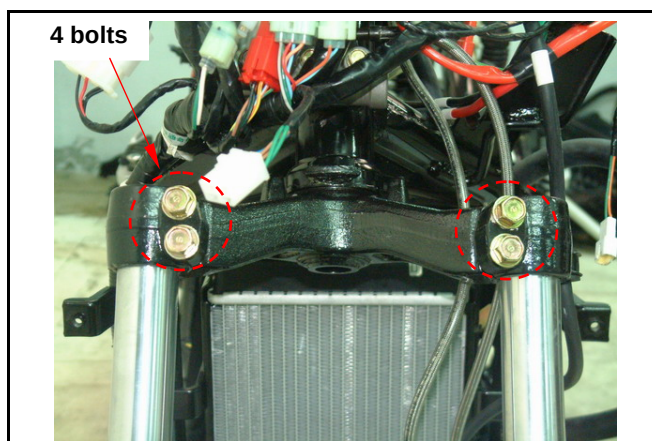
Remove front brake caliper.

Remove speedometer cable.



Loosen 4 bolts from steering stem.

Remove the front cushions.

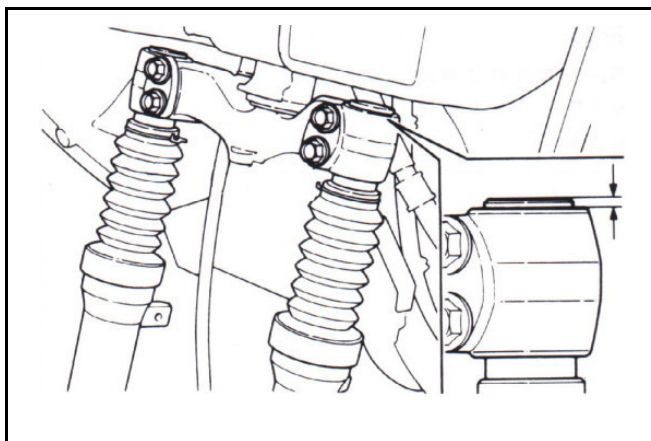


#### Installation

Align the cover flange with upper level of the cushion clamp, and then tighten bolts.

**Torque value: 2.4~3.0kgf-m**

Install the removed components in reverse order of removal procedures.





## 16. Steering / Front Wheel / Front Cushion

### Steering Stem

#### Remove

Remove handle, front wheel and front cushion.  
Remove the steering stem mounting nut.

Remove top cone race and steering stem.

#### ⚠ Caution

- Place the steel ball onto a parts container to prevent from missing.

#### Special tools:

Steering stem top thread wrench SYM-5320010

Handle stand nut wrench SYM-5321100

Slightly tap the top and bottom ball bearing seats with a plastic hammer to remove the seats.  
Remove bottom cone race body with a punch.

#### ⚠ Caution

- Do not damage the steering stem.

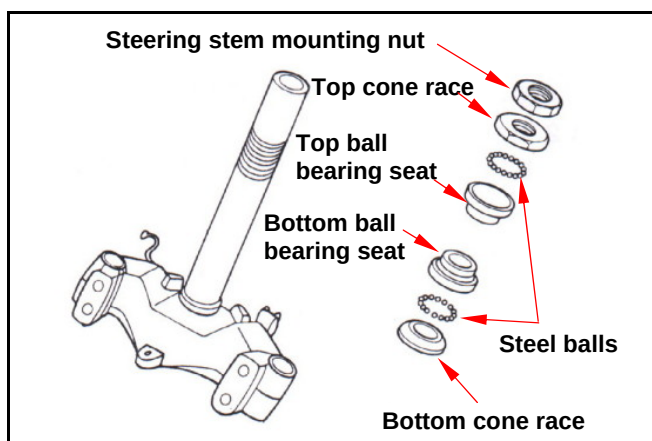
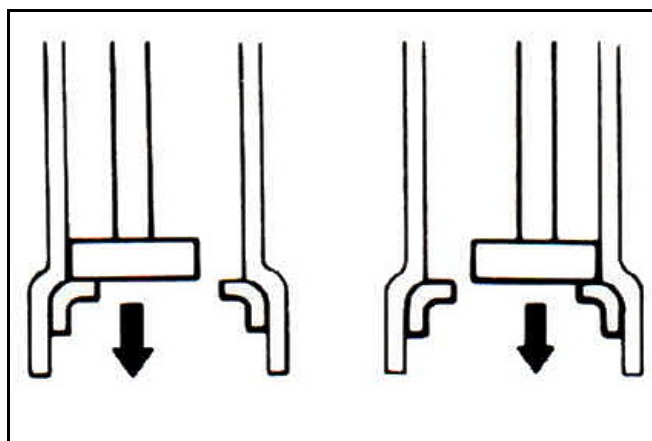
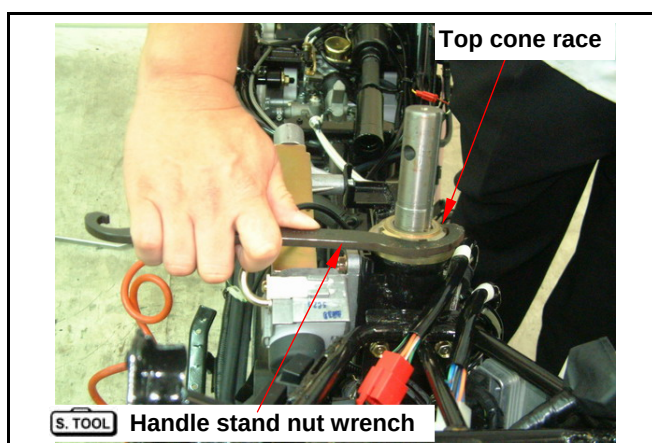
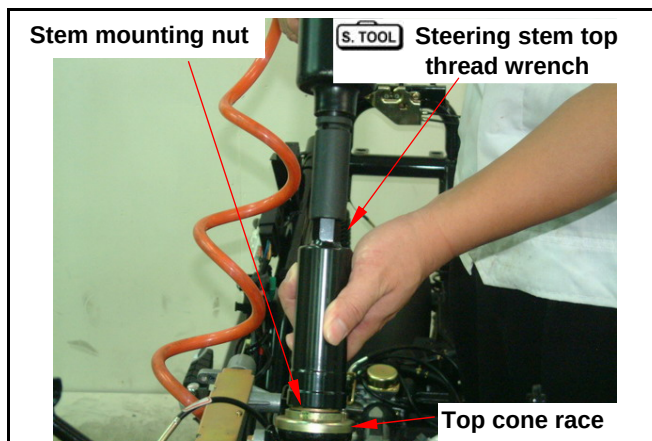
#### Installation

Install a new bottom cone race onto the steering stem.  
Push the cone race until to mounted position.

#### ⚠ Caution

- Do not tilt the ball bearing seats as installation.

Apply with grease onto the ball bearing seats, and install steel balls onto the seats. (Top: 26 balls, bottom: 29 balls)



## 16. Steering / Front Wheel / Front Cushion

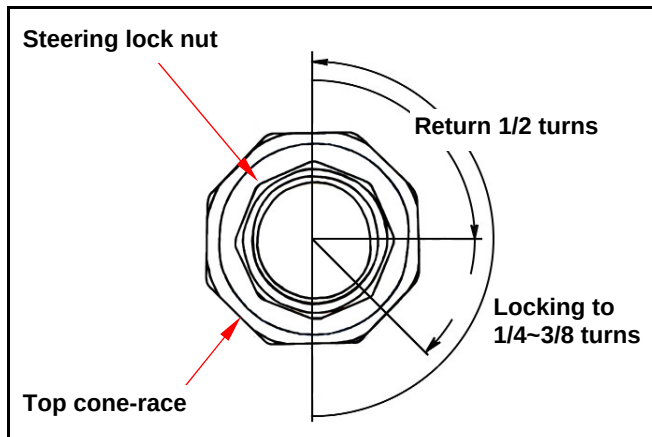


Lubricate the top cone race seat with grease. Screw the cone race in to top ball bearing seat till touching, and then screw out the cane race 1/4~3/8 turns.

**Torque value: 0.25kgf-m**

### Caution

- Check the steering stem that should be rotated freely and no clearance in vertical direction.



Install the steering stem mounting nut and tighten the nut by means of holding the top cone race body.

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

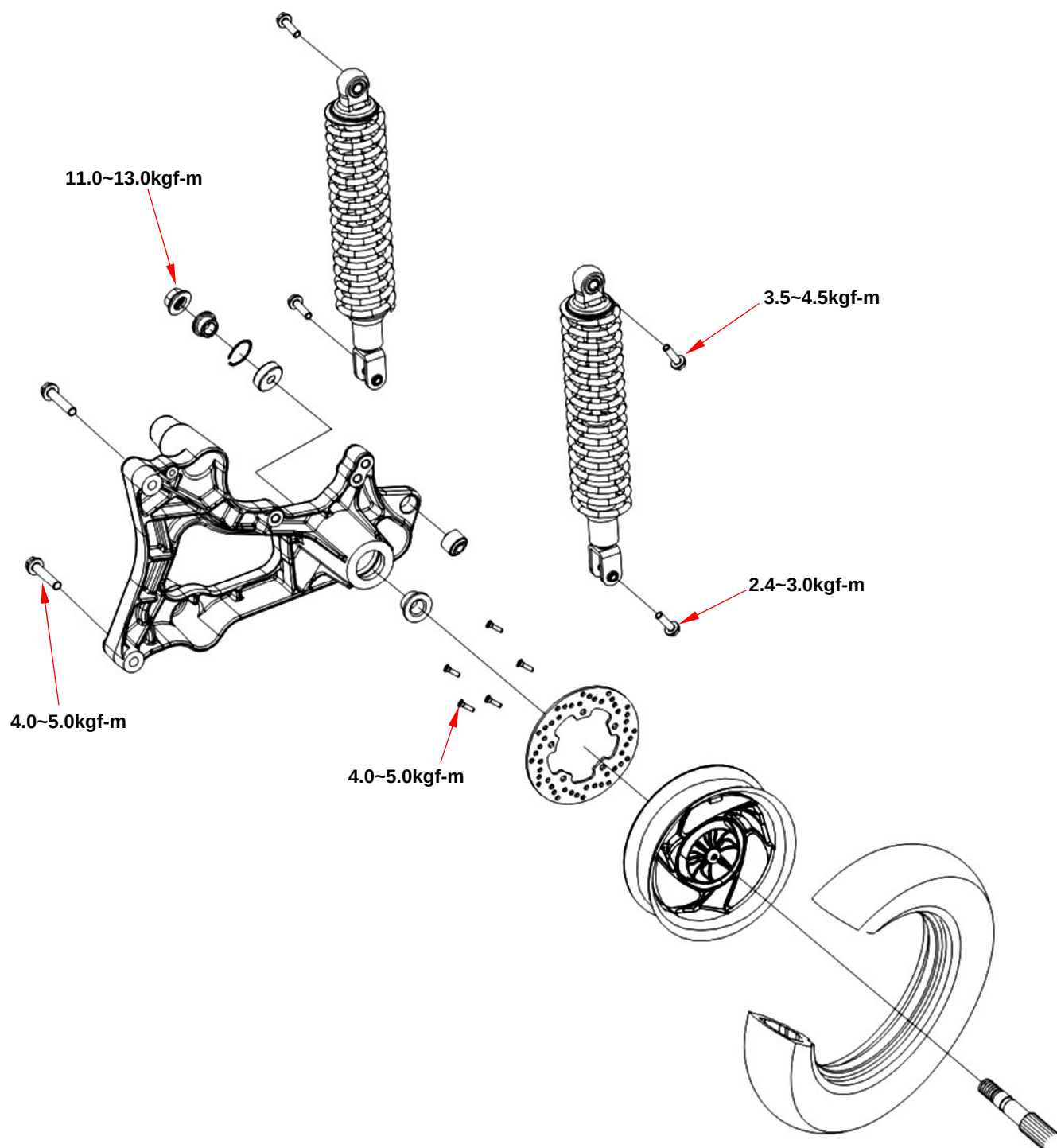
Install in reverse order of removal procedures.



## 17. Rear Wheel / Rear Fork / Rear Cushion

|                              |      |                   |      |
|------------------------------|------|-------------------|------|
| Mechanism Diagram.....       | 17-1 | Rear Wheel .....  | 17-3 |
| Operational Precaution ..... | 17-2 | Rear Fork .....   | 17-5 |
| Trouble Diagnosis .....      | 17-2 | Rear Cushion..... | 17-6 |
| Muffler.....                 | 17-3 |                   |      |

### Mechanism Diagram



## 17. Rear Wheel / Rear Fork / Rear Cushion



### Operational Precaution

#### General

Please refer to the Maintenance Manual for tubeless tire in respect to the removal, repair and installation of the tires.

#### Service data

Unit: mm

| Item                |        | Standard | Allowable Limit |
|---------------------|--------|----------|-----------------|
| Run-out of rear rim | Radial | -        | 2.0             |
|                     | Axial  | -        | 2.0             |

#### Torque Value

|                               |                |
|-------------------------------|----------------|
| Rear wheel axle nut           | 11.0~13.0kgf-m |
| Rear cushion upper bolt       | 3.5~4.5kgf-m   |
| Rear cushion under bolt       | 2.4~3.0kgf-m   |
| Rear fork mounting bolt       | 4.0~5.0kgf-m   |
| Exhaust muffler mounting nut  | 1.0~1.2kgf-m   |
| Exhaust muffler mounting bolt | 3.2~3.8kgf-m   |
| Brake clipper mounting bolts  | 2.9~3.5kgf-m   |
| Brake disc mounting bolt      | 4.0~5.0kgf-m   |

### Trouble Diagnosis

#### Run-out of rear wheel

- Deformed or bent wheel hub.
- Improper tires.
- Loose wheel shaft.

#### Soft Cushion

- The spring is too weak.

#### Noisy Brake

- Worn brake lining.
- Offset brake disc.
- Improper assembly of brake caliper.
- Brake disc or wheel imbalance.

#### Poor Performance of Brake

- Improperly adjusted brake.
- Contaminated brake disc.
- Worn brake lining.
- Air inside brake fluid pipe.
- Grease on brake disc.
- The brake fluid piping is clogged.
- The brake fluid pipe is deformed or bent.
- The brake fluid pipe is deformed or bent.
- Insufficient amount of brake fluid in the reservoir

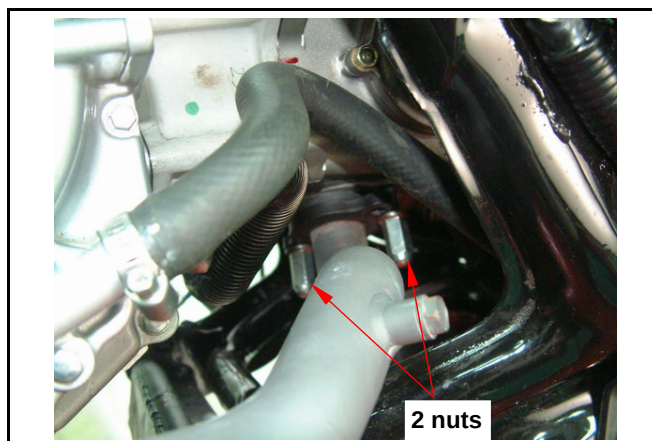


## 17. Rear Wheel / Rear Fork / Rear Cushion

### Muffler

#### Removal

Loosen the 2 nuts from exhaust muffler front side.



Loosen the 3 mounting bolts by exhaust muffler right side.

Remove exhaust muffler.

#### Installation

Install in reverse order of removal procedures.

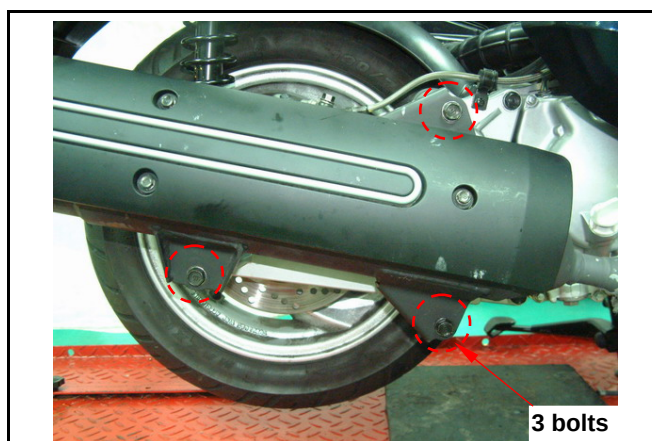
#### ⚠ Caution

- Replace the front side muffler pipe gasket if worn or deformed.

#### Torque Value:

Muffler mounting bolt 3.2 ~ 3.8kgf-m

Muffler mounting nut 1.0 ~ 1.2kgf-m



### Rear Wheel

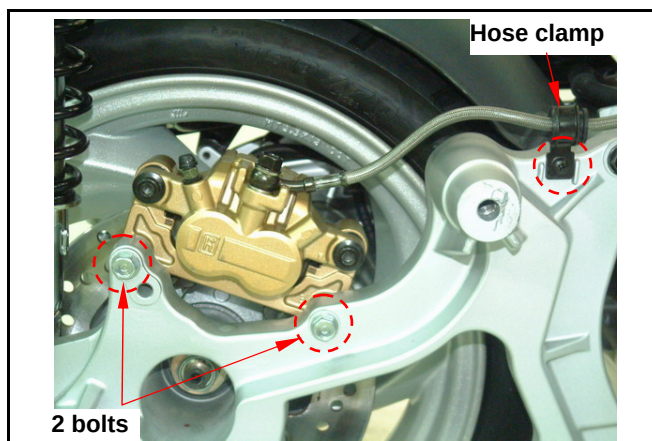
#### Removal

Remove the exhaust muffler.

Remove the rear brake caliper (2 bolts) and brake hose clamp (1 bolt).

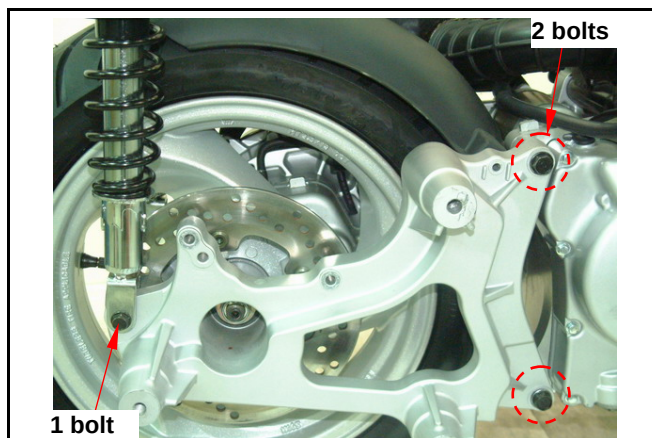
#### ⚠ Caution

- Care shall be taken not to push the brake lever to avoid the brake pad being squeezed out. In case that the brake pad is accidentally squeezed out, use a screwdriver to force it back to the place.



Remove the lower bolt of the right side rear cushion.

Remove 2 bolts of the rear fork.



## 17. Rear Wheel / Rear Fork / Rear Cushion



Remove rear wheel axle nut.



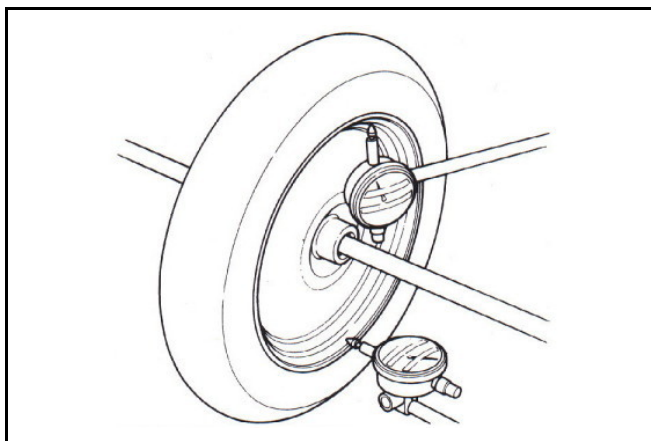
Remove rear fork and both side collars.  
Remove the rear wheel.



### Inspection rear wheel rim

Place the wheel rim on a rotational support.  
Rotate it by hand and measure the run-out with a dial indicator.

**Run-out limit: 2.0 mm**



### Installation

Install in reverse order of removal procedures.

#### Torque Value:

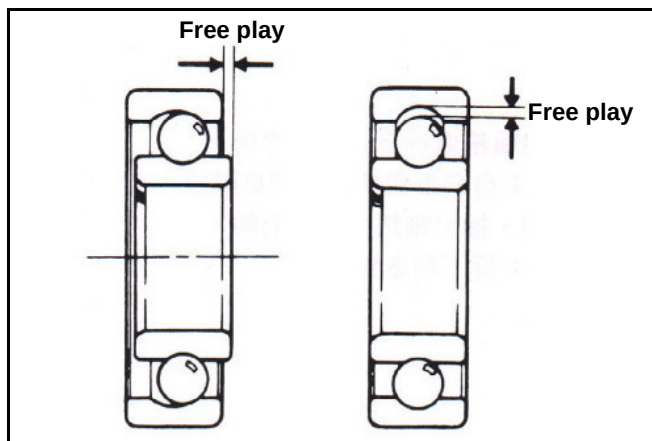
|                              |                |
|------------------------------|----------------|
| Rear wheel axle nut          | 11.0~13.0kgf-m |
| Rear cushion under bolt      | 2.4~3.0kgf-m   |
| Rear fork mounting bolt      | 4.0~5.0kgf-m   |
| Brake clipper mounting bolts | 2.9~3.5kgf-m   |



### Rear Fork

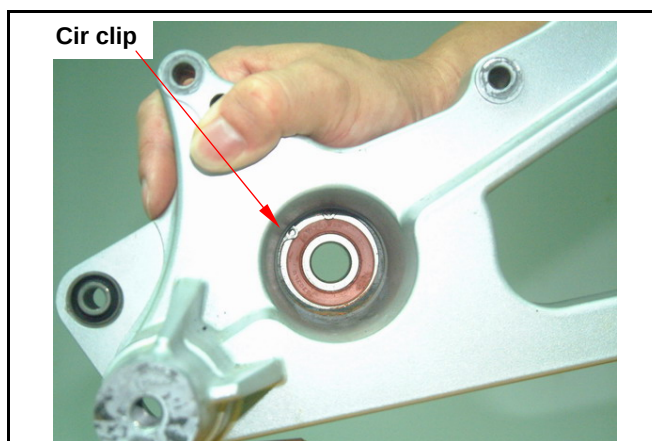
#### Inspection rear fork bearing

Rotate the inner ring of the bearing with a finger. The bearing should move smoothly and quietly. Check the fit of the bearing and rim. Replace the bearing if its motion is not smooth or noisy.



#### Replacement of rear fork bearing

Remove the bearing lock cir clip.



Uses the bearing driver; drive out the bearing.

**Special tool: Bearing driver**



Install new rear fork bearing and bearing puller (6303) onto rear fork.

Install assembly directs puller bearing puller.

**Special Service Tools:**

**Rear fork bearing 6303 bearing puller**

**SYM-6303000-HMA H9A 6303**

**Assembly directs puller SYM-2341110**

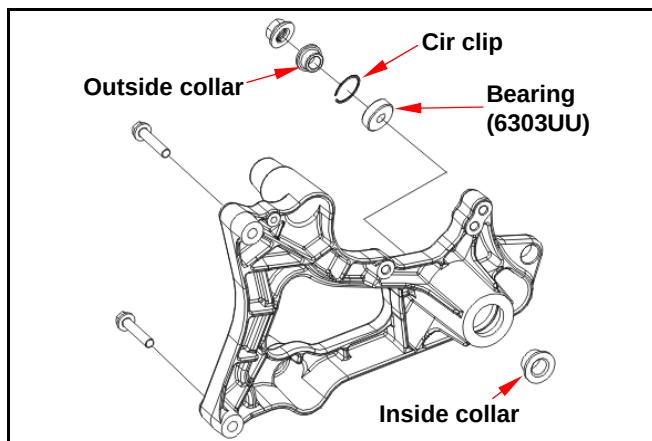
Use screw driver hold bearing puller lower part, and turn the bearing puller upper part to install the rear fork bearing.



## 17. Rear Wheel / Rear Fork / Rear Cushion



Install the bearing lock cir clip.



### Rear Cushion

#### Removal

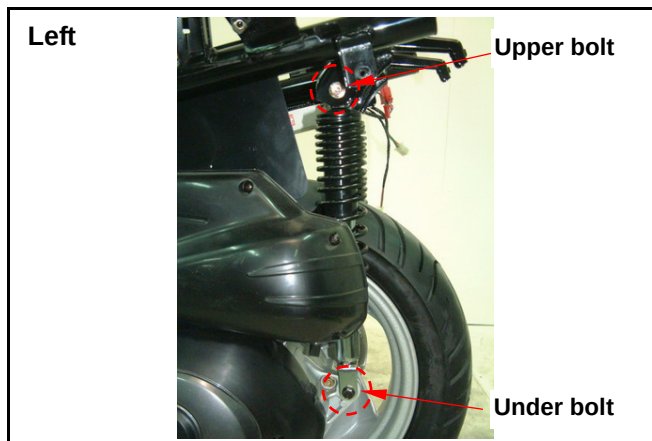
Remove the luggage box, rear carrier and body covers.

Loosen the mounting bolts of the air cleaner (2 bolts).

Remove the exhaust muffler (3 bolts, 2 nuts).

Remove the under bolts by left and right rear cushions.

Remove the upper bolts by left and right rear cushions, and then remove the cushion.



#### Installation

Install in reverse order of removal procedures.

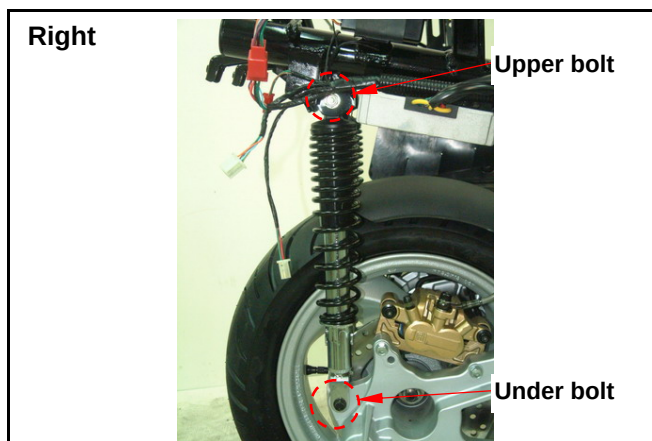
#### ⚠ Caution

- The rear cushion must be replaced as a unit. Never disassemble the rear cushion as that would damage the structure.

#### Torque Value

Rear cushion upper bolt: 3.5~4.5kgf-m

Rear cushion under bolt: 2.4~3.0kgf-m

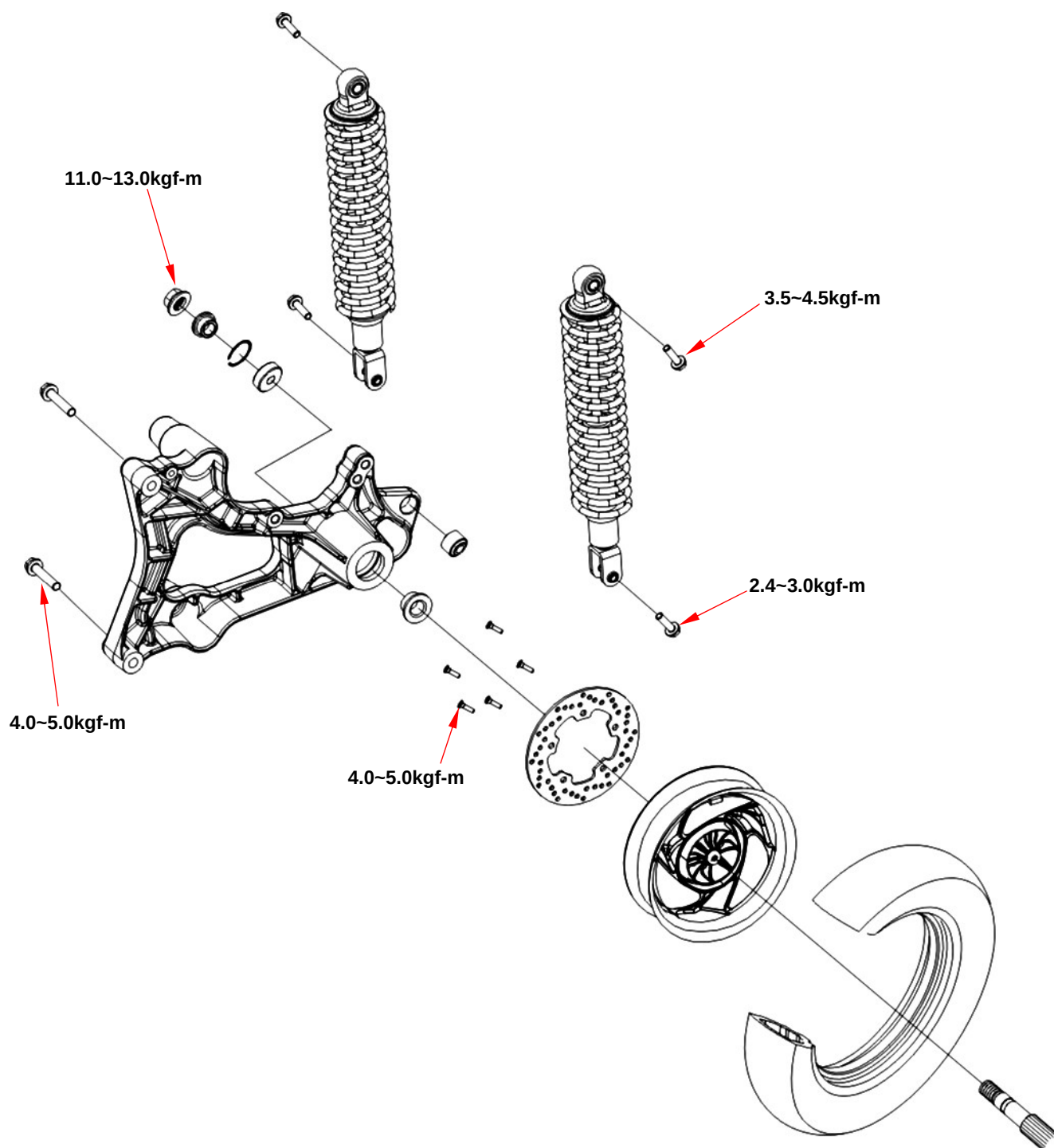




## 17. Rear Wheel / Rear Fork / Rear Cushion

|                              |      |                   |      |
|------------------------------|------|-------------------|------|
| Mechanism Diagram.....       | 17-1 | Rear Wheel .....  | 17-3 |
| Operational Precaution ..... | 17-2 | Rear Fork .....   | 17-5 |
| Trouble Diagnosis .....      | 17-2 | Rear Cushion..... | 17-6 |
| Muffler.....                 | 17-3 |                   |      |

### Mechanism Diagram



## 17. Rear Wheel / Rear Fork / Rear Cushion



### Operational Precaution

#### General

Please refer to the Maintenance Manual for tubeless tire in respect to the removal, repair and installation of the tires.

#### Service data

Unit: mm

| Item                |        | Standard | Allowable Limit |
|---------------------|--------|----------|-----------------|
| Run-out of rear rim | Radial | -        | 2.0             |
|                     | Axial  | -        | 2.0             |

#### Torque Value

|                               |                |
|-------------------------------|----------------|
| Rear wheel axle nut           | 11.0~13.0kgf-m |
| Rear cushion upper bolt       | 3.5~4.5kgf-m   |
| Rear cushion under bolt       | 2.4~3.0kgf-m   |
| Rear fork mounting bolt       | 4.0~5.0kgf-m   |
| Exhaust muffler mounting nut  | 1.0~1.2kgf-m   |
| Exhaust muffler mounting bolt | 3.2~3.8kgf-m   |
| Brake clipper mounting bolts  | 2.9~3.5kgf-m   |
| Brake disc mounting bolt      | 4.0~5.0kgf-m   |

### Trouble Diagnosis

#### Run-out of rear wheel

- Deformed or bent wheel hub.
- Improper tires.
- Loose wheel shaft.

#### Soft Cushion

- The spring is too weak.

#### Noisy Brake

- Worn brake lining.
- Offset brake disc.
- Improper assembly of brake caliper.
- Brake disc or wheel imbalance.

#### Poor Performance of Brake

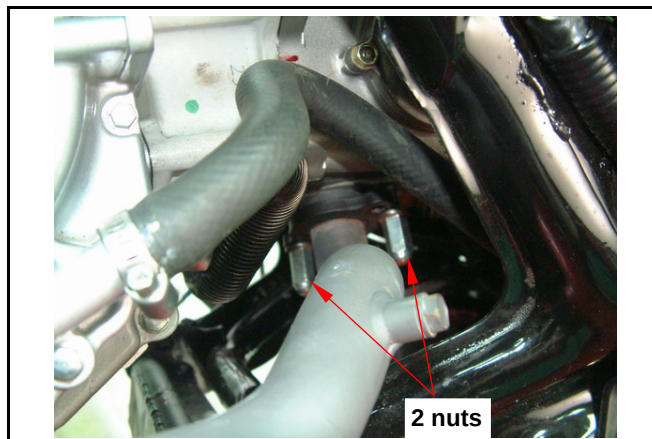
- Improperly adjusted brake.
- Contaminated brake disc.
- Worn brake lining.
- Air inside brake fluid pipe.
- Grease on brake disc.
- The brake fluid piping is clogged.
- The brake fluid pipe is deformed or bent.
- The brake fluid pipe is deformed or bent.
- Insufficient amount of brake fluid in the reservoir

## 17. Rear Wheel / Rear Fork / Rear Cushion

### Muffler

#### Removal

Loosen the 2 nuts from exhaust muffler front side.



Loosen the 3 mounting bolts by exhaust muffler right side.

Remove exhaust muffler.

#### Installation

Install in reverse order of removal procedures.

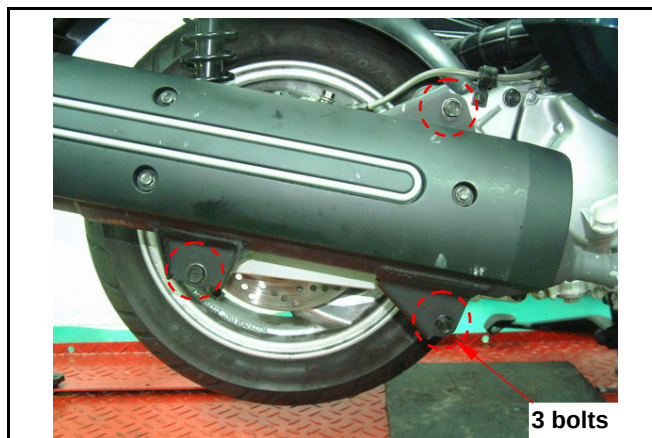
#### ⚠ Caution

- Replace the front side muffler pipe gasket if worn or deformed.

#### Torque Value:

Muffler mounting bolt 3.2 ~ 3.8kgf-m

Muffler mounting nut 1.0 ~ 1.2kgf-m



### Rear Wheel

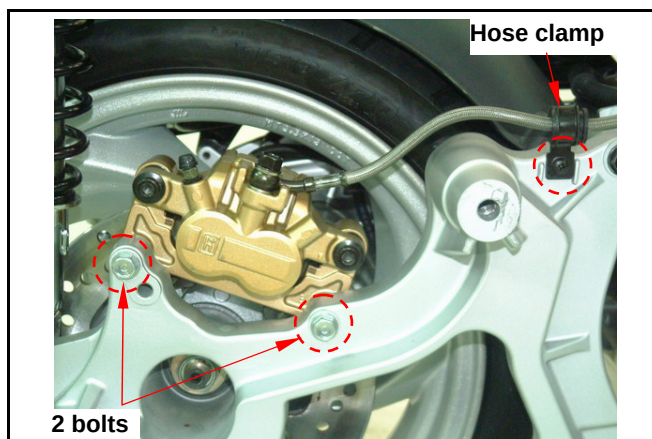
#### Removal

Remove the exhaust muffler.

Remove the rear brake caliper (2 bolts) and brake hose clamp (1 bolt).

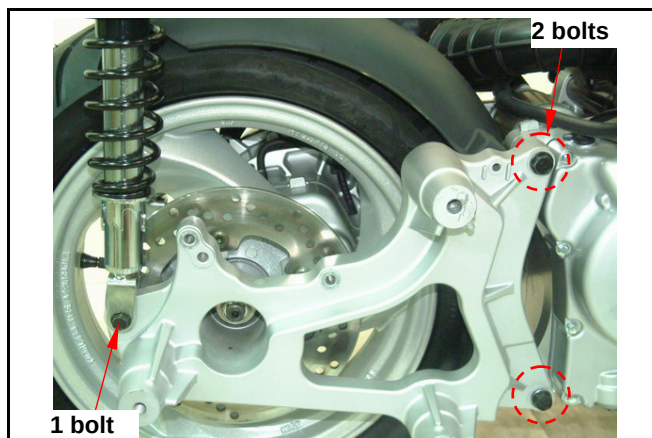
#### ⚠ Caution

- Care shall be taken not to push the brake lever to avoid the brake pad being squeezed out. In case that the brake pad is accidentally squeezed out, use a screwdriver to force it back to the place.



Remove the lower bolt of the right side rear cushion.

Remove 2 bolts of the rear fork.



## 17. Rear Wheel / Rear Fork / Rear Cushion



Remove rear wheel axle nut.



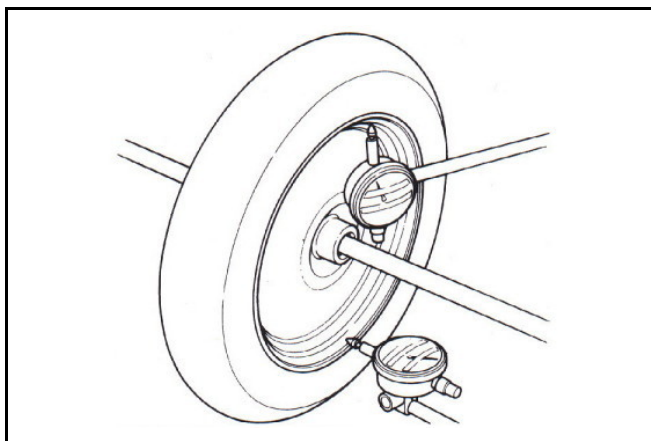
Remove rear fork and both side collars.  
Remove the rear wheel.



### Inspection rear wheel rim

Place the wheel rim on a rotational support.  
Rotate it by hand and measure the run-out with a dial indicator.

**Run-out limit: 2.0 mm**



### Installation

Install in reverse order of removal procedures.

#### Torque Value:

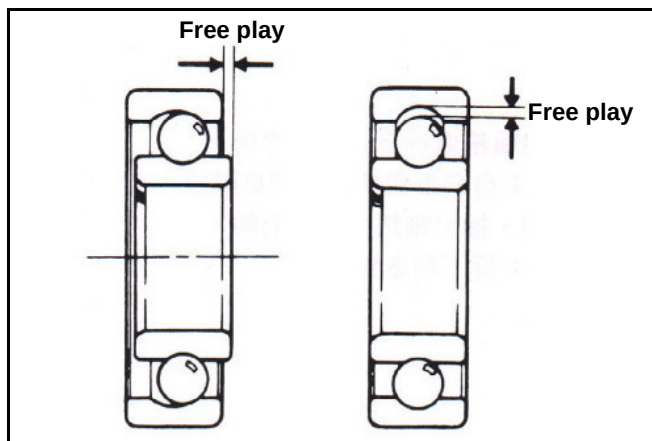
|                              |                |
|------------------------------|----------------|
| Rear wheel axle nut          | 11.0~13.0kgf-m |
| Rear cushion under bolt      | 2.4~3.0kgf-m   |
| Rear fork mounting bolt      | 4.0~5.0kgf-m   |
| Brake clipper mounting bolts | 2.9~3.5kgf-m   |



### Rear Fork

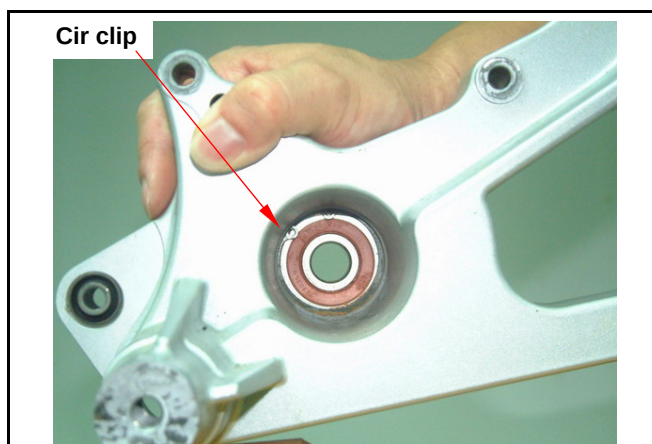
#### Inspection rear fork bearing

Rotate the inner ring of the bearing with a finger. The bearing should move smoothly and quietly. Check the fit of the bearing and rim. Replace the bearing if its motion is not smooth or noisy.



#### Replacement of rear fork bearing

Remove the bearing lock cir clip.



Uses the bearing driver; drive out the bearing.

**Special tool: Bearing driver**



Install new rear fork bearing and bearing puller (6303) onto rear fork.

Install assembly directs puller bearing puller.

**Special Service Tools:**

**Rear fork bearing 6303 bearing puller**

**SYM-6303000-HMA H9A 6303**

**Assembly directs puller SYM-2341110**

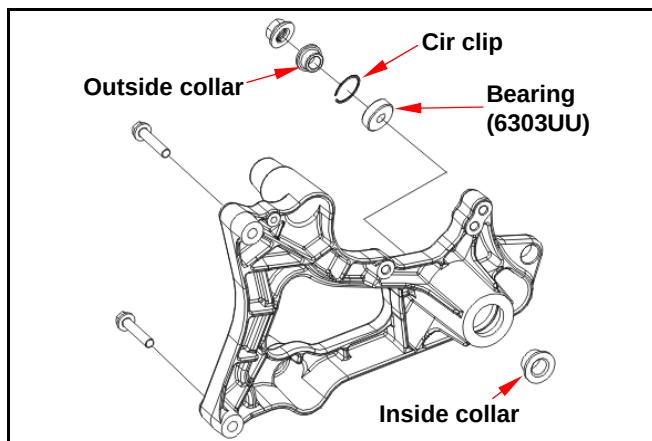
Use screw driver hold bearing puller lower part, and turn the bearing puller upper part to install the rear fork bearing.



## 17. Rear Wheel / Rear Fork / Rear Cushion



Install the bearing lock cir clip.



### Rear Cushion

#### Removal

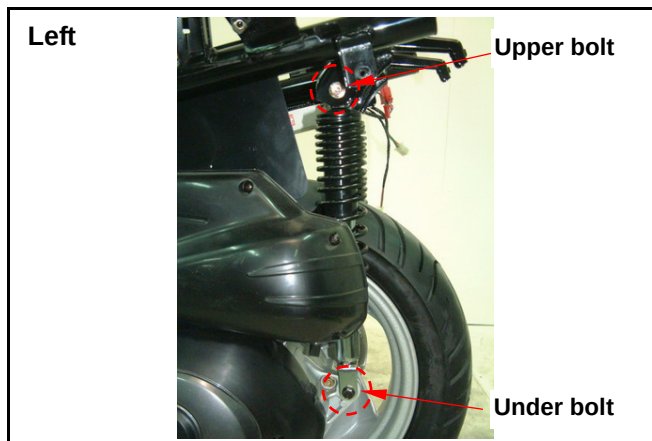
Remove the luggage box, rear carrier and body covers.

Loosen the mounting bolts of the air cleaner (2 bolts).

Remove the exhaust muffler (3 bolts, 2 nuts).

Remove the under bolts by left and right rear cushions.

Remove the upper bolts by left and right rear cushions, and then remove the cushion.



#### Installation

Install in reverse order of removal procedures.

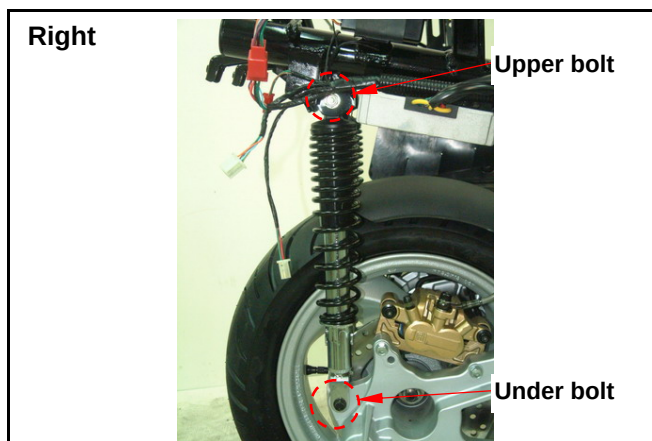
#### ⚠ Caution

- The rear cushion must be replaced as a unit. Never disassemble the rear cushion as that would damage the structure.

#### Torque Value

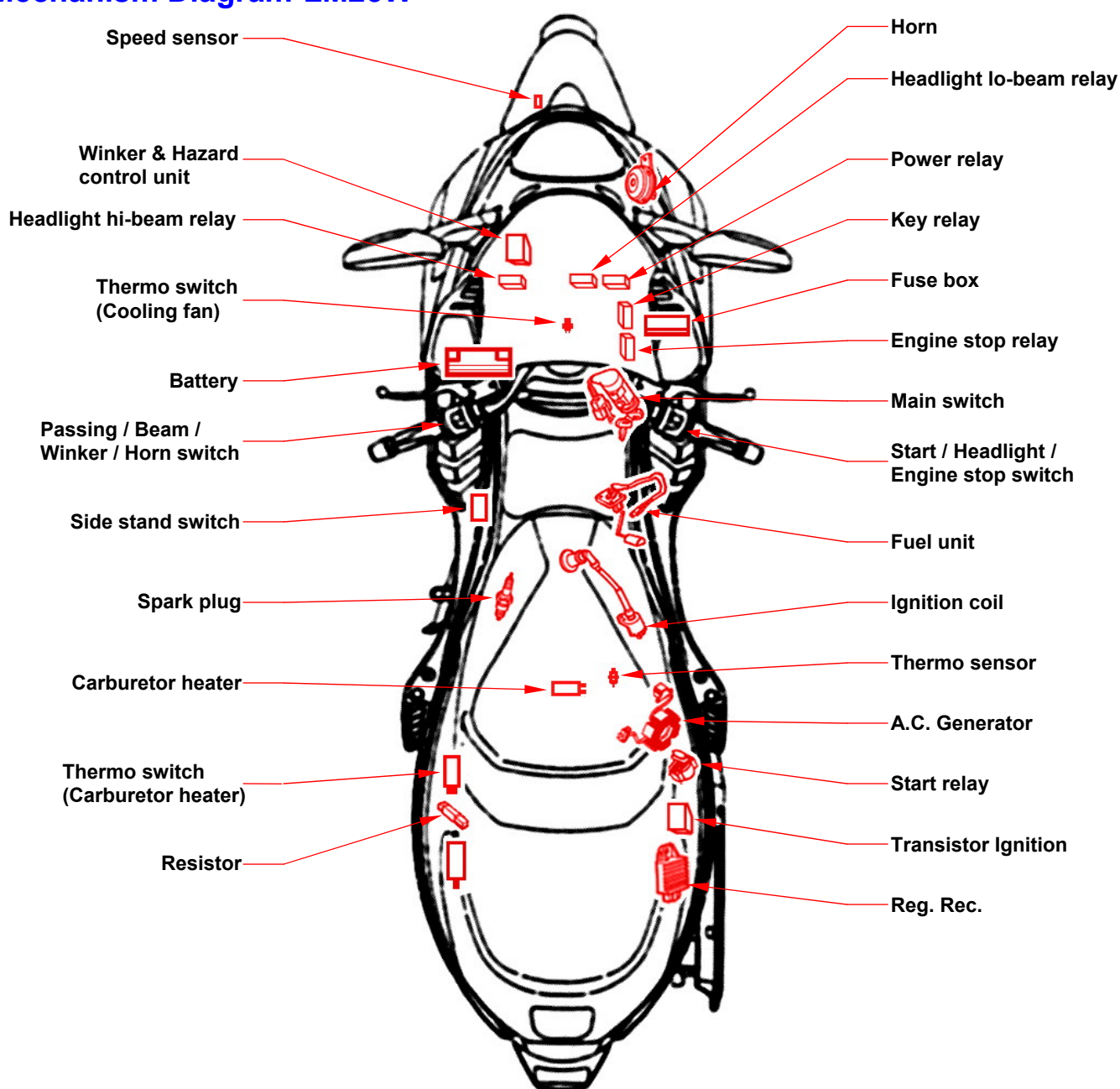
Rear cushion upper bolt: 3.5~4.5kgf-m

Rear cushion under bolt: 2.4~3.0kgf-m



|                                |       |                                 |       |
|--------------------------------|-------|---------------------------------|-------|
| Mechanism Diagram-LM25W.....   | 18-1  | Starting System .....           | 18-15 |
| Mechanism Diagram-LM25W1 ..... | 18-2  | Meters .....                    | 18-17 |
| Maintenance Data .....         | 18-3  | Light / Bulb .....              | 18-19 |
| Technical Specification .....  | 18-3  | Switch / Horn .....             | 18-23 |
| Trouble Diagnosis .....        | 18-4  | Fuel Unit .....                 | 18-25 |
| Battery .....                  | 18-5  | Cooling Fan Thermo Switch ..... | 18-26 |
| Fuse .....                     | 18-6  | Thermo Sensor .....             | 18-27 |
| Charging System .....          | 18-8  | Water Temperature Meter .....   | 18-27 |
| Ignition System .....          | 18-11 |                                 |       |

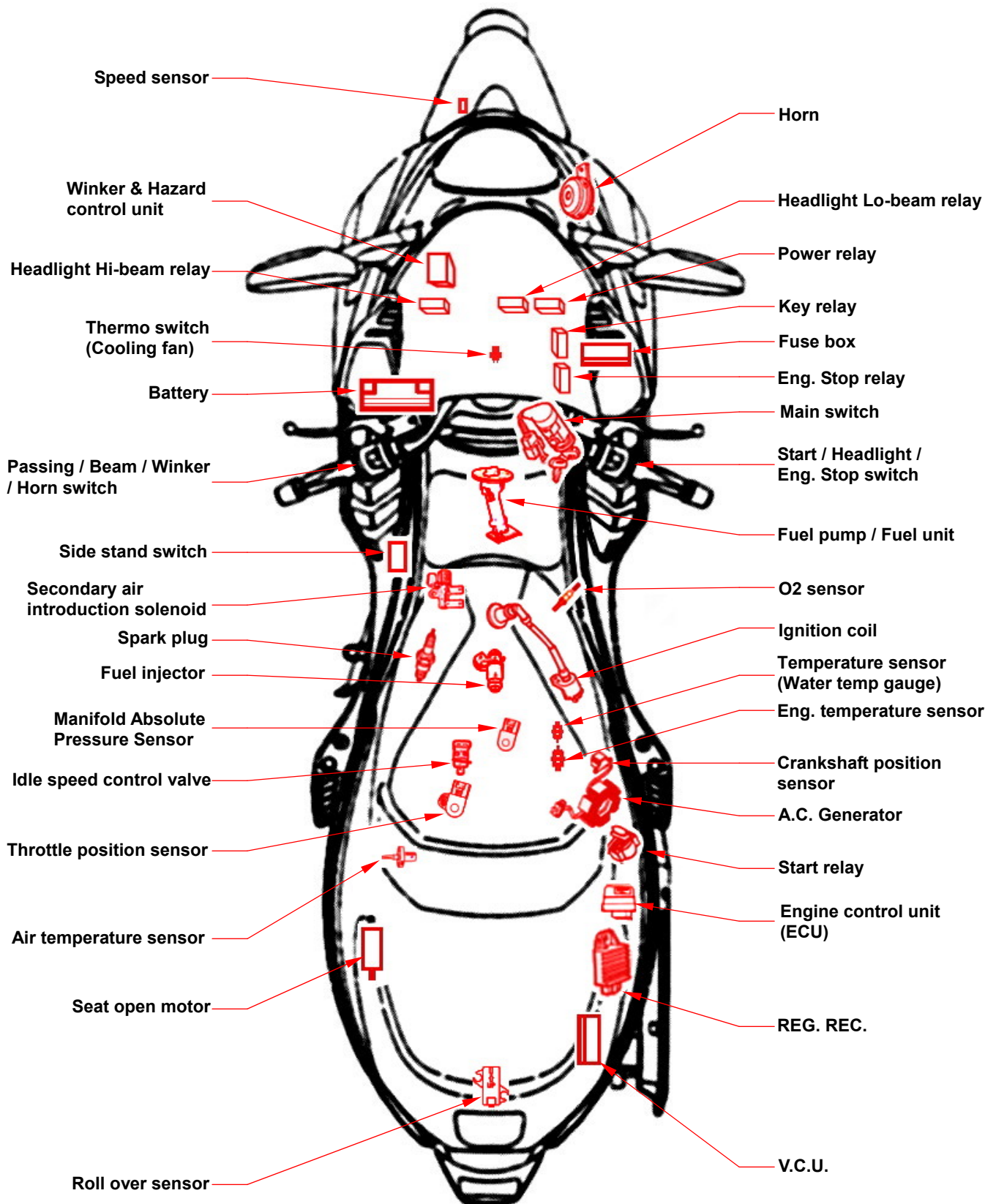
### Mechanism Diagram-LM25W



## 18. Electrical System



### Mechanism Diagram-LM25W1





## Maintenance Data

### Operational precaution

- When remove the battery, the disconnection sequence of cable terminals shall be strictly observed. (First disconnect the negative cable terminal, next, the positive cable terminal.)
- The model of the spark plug and the tightening torque.
- The ignition timing.
- Adjustment of headlight.
- Removal and installation of AC generator.
- The maintenance free battery requires no inspection of electrolyte level and refilling of distilled water.
- To recharge the battery, remove the battery from rack without removing ventilation caps.
- Unless in emergency, never rapid charge the battery.
- The voltage must be checked with the voltmeter while charging the battery.
- As CDI. or ECU. assembly does not require an ignition timing check. In case ignition timing is incorrect, check CDI. or ECU. and AC generator. Verify with an ignition timing light after replacement if necessary.

## Technical Specification

### Charging system

| Description                 |               | Specification                                     |
|-----------------------------|---------------|---------------------------------------------------|
| Battery                     | Capacity      | 12V10Ah                                           |
|                             | Charging rate | 1.2A / 5~10hr (standard) 5A / 1hr (fast charging) |
| Leak current                |               | Below 1mA                                         |
| Charging current            |               | 1.2A / 1500 rpm                                   |
| Control voltage in charging |               | 14.5+0.5 V / 2,000 rpm                            |

### Ignition system

| Description                                  |                   | LM25W                    | LM25W1                            |
|----------------------------------------------|-------------------|--------------------------|-----------------------------------|
| Spark plug                                   | Model             | NGK CR7HSA (Recommended) |                                   |
|                                              | Gap               | 0.6~0.7 mm               |                                   |
| Ignition coil and resistance                 | Primary winding   | 0.17±10% Ω               | 3.6±10% Ω                         |
|                                              | Secondary winding | Without cap:9 ± 20% KΩ   | --                                |
|                                              |                   | With cap:14.1 ± 20% KΩ   | --                                |
| Pulse generator resistance (20°C)            |                   | 480~550 Ω                | --                                |
| Crankshaft position sensor resistance (20°C) |                   | --                       | 80~160 Ω                          |
| Ignition timing                              | "F" mark          | 10° TDC / 2500 rpm       | 13° TDC / 1650 rpm                |
|                                              | Advanced degree   | 26° TDC / 3500 rpm       | 27° TDC<br>(Full Advanced degree) |
|                                              |                   | 30° TDC / 6000 rpm       |                                   |
|                                              |                   | 16° TDC / 8300 rpm       |                                   |

## 18. Electrical System

### Trouble Diagnosis

#### No voltage

- Battery discharged
- The cable disconnected
- The fuse is blown
- Improper operation of the main switch
- Low voltage
- The battery is not fully charged
- Poor contact
- Poor charging system
- Poor voltage regulator

#### No spark produced by spark plug

- The spark plug is out of work
- The cable is poorly connected, open or short-circuited
- Between AC.G. and C.D.I. or ECU.
- Poor connection between C.D.I. or ECU. and ignition coil
- Poor connection between C.D.I. or ECU. and the main switch
- Poor main switch
- Poor C.D.I. or ECU.
- A.C.G. is out of work

#### Starter motor does not work

- The fuse is blown
- The battery is not fully charge
- Poor main switch
- Poor starter switch
- The front and rear brake switches do not operate correctly
- Starter relay is out of work
- The ignition coil is poorly connected, open or short-circuited
- The starter motor is out of work

#### Intermittent power supply

- The connector of the charging system becomes loose
- Poor connection of the battery cable
- Poor connection or short-circuit of the discharging system
- Poor connection or short-circuit of the power generation system

#### Charging system does not operate properly

- Burnt fuse
- Poor contact, open or short circuit
- Poor regulator
- Poor ACG

#### Engine does not crank smoothly

- Primary winding circuit
  - Poor ignition coil
  - Poor connection of cable and connectors
  - Poor main switch
- Secondary winding circuit
  - Poor ignition coil
  - Poor spark plug
  - Poor ignition coil cable
  - Current leakage in the spark plug
- Incorrect ignition timing
  - Poor AC.G.
  - Improper installation of the pulse sensor
  - Poor C.D.I. or ECU.

#### Weak starter motor

- Poor charging system
- The battery is not fully charged
- Poor connection in the windings
- The motor gear is jammed by foreign material

#### Starter motor is working, but engine does not crank

- Poor starter motor pinion
- The starter motor run in reverse direction
- Poor battery

## Battery

### Removal

Loosen 1 screw and remove the battery cover.  
Disconnect the negative cable terminal first, then the positive cable terminal.

Remove the battery.

### Voltage Check

Use the digital voltmeter to check the voltage of the battery.

#### Voltage:

**Fully charged:** 12.8V ↑ at 20□

**Undercharged:** Below 12.0 V at 20□

#### Warning

- Keep flames away while recharging.
- Charging is completely controlled by the ON/OFF switch on the charger, not by battery cables.

### Charging

Connect the positive terminal (+) of the charger to the battery positive terminal (+).  
Connect the negative terminal (-) of the charger to the battery negative terminal (-).

|                  | Standard | Maximum |
|------------------|----------|---------|
| Charging current | 1.2A     | 5A      |
| Charging time    | 10 hr    | 1 hr    |

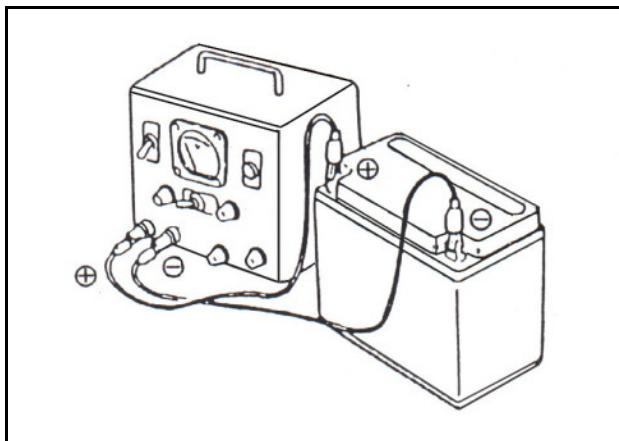
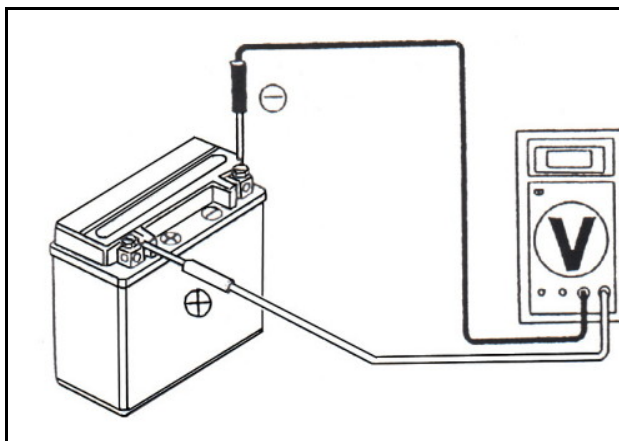
#### Warning

- Keep flames away while recharging.
- Charging is completely controlled by the ON/OFF switch on the charger, not by battery cables.

#### Caution

- Never rapid charge the battery unless in emergency.
- Verify the battery is recharged with current and duration prescribed above.
- Large current and fast time to charge will render damage to the battery.

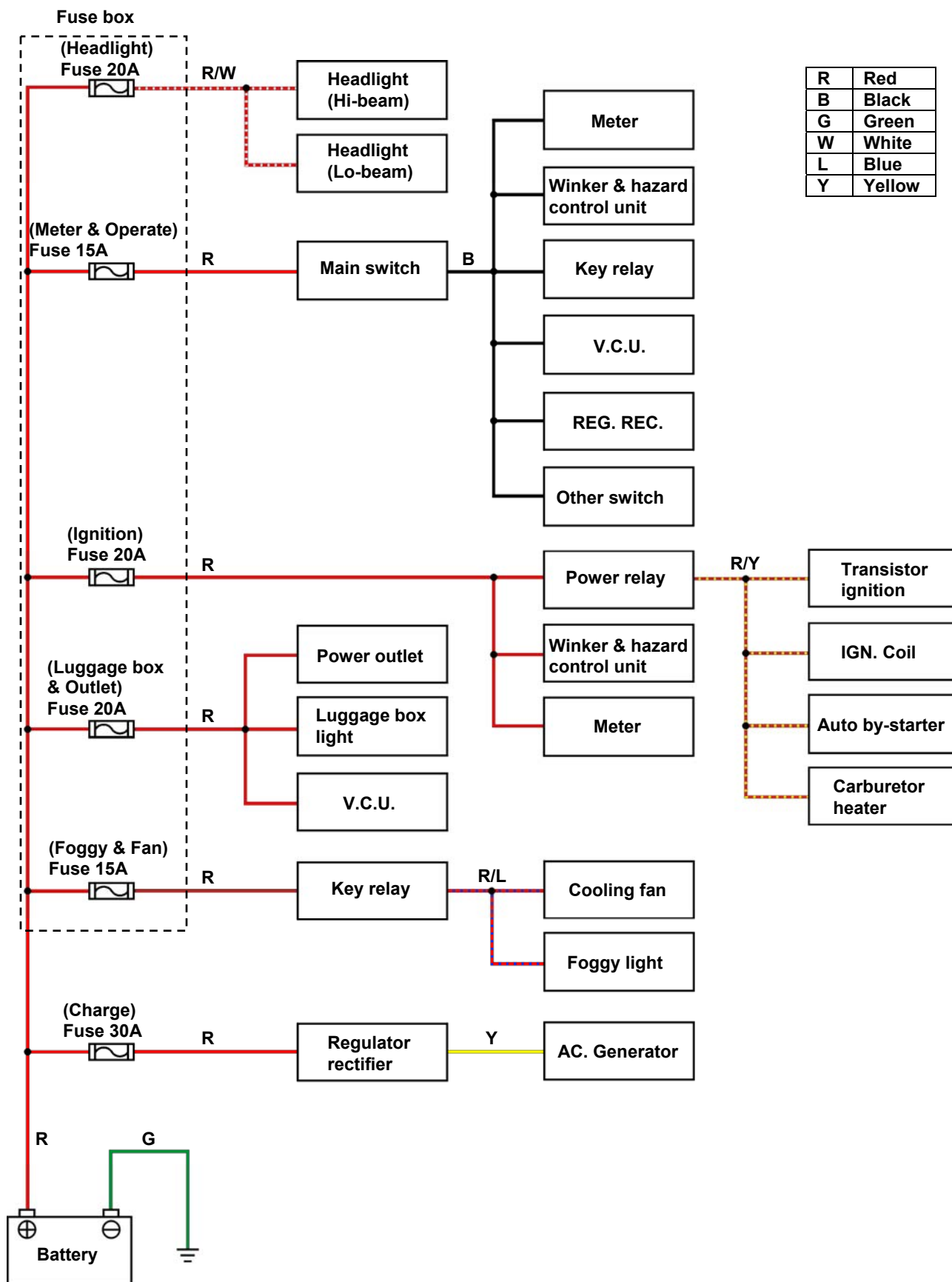
When installing the battery, coat the cable terminal with grease.



## 18. Electrical System

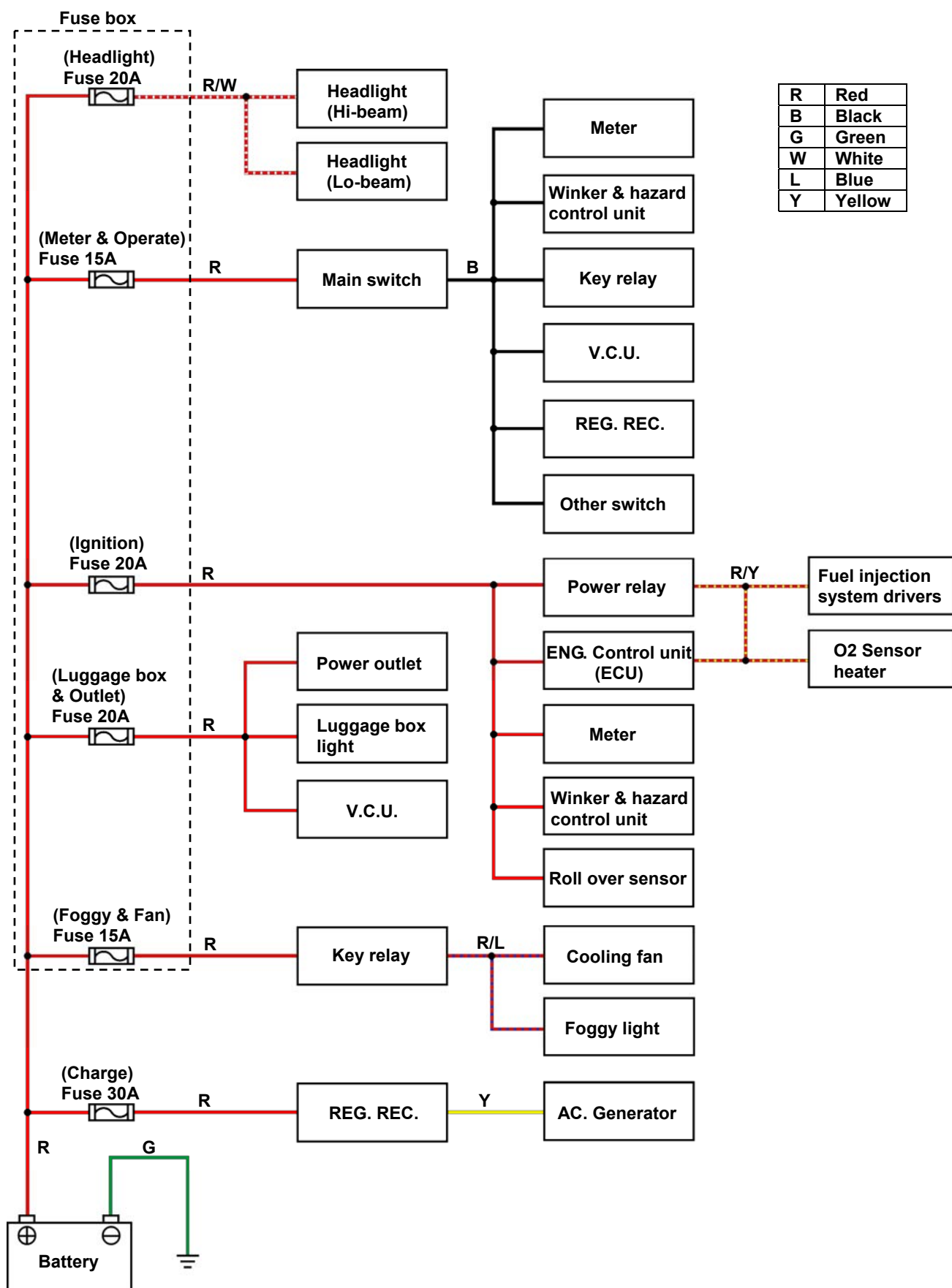
### Fuse

#### Fuse circuit diagram-LM25W





Fuse circuit diagram-LM25W1

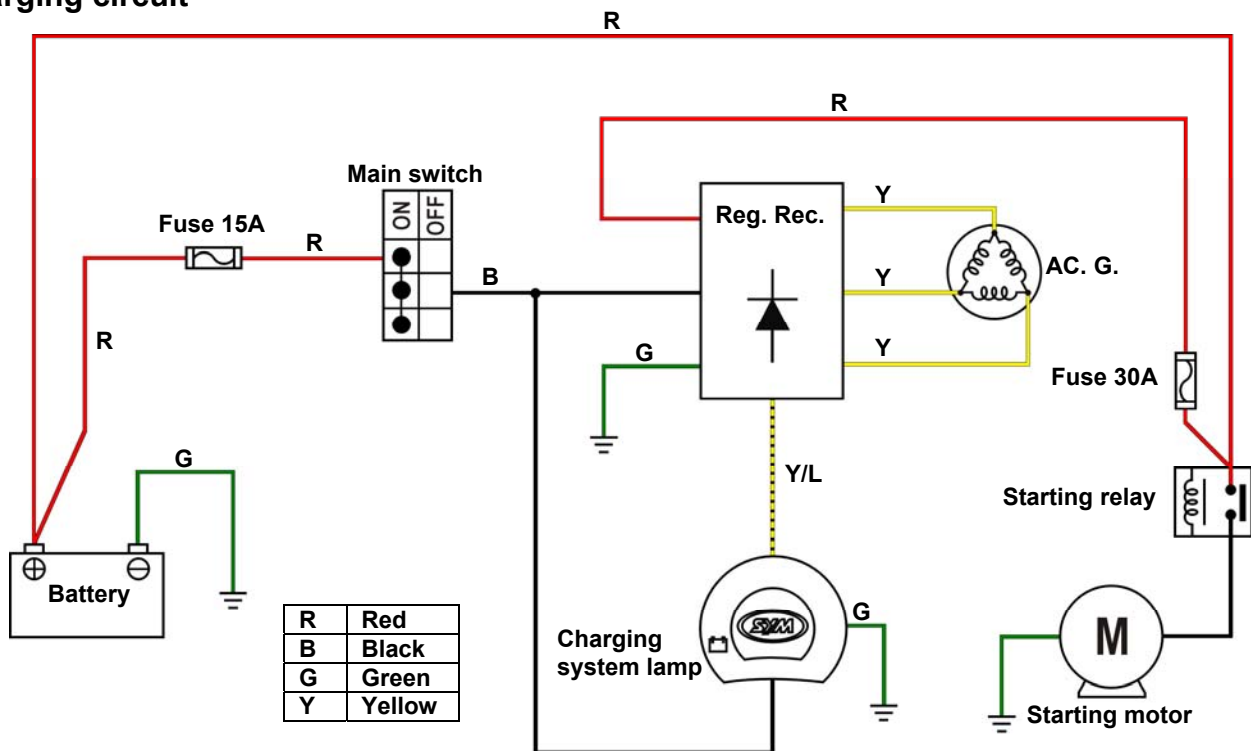


## 18. Electrical System



### Charging System

#### Charging circuit



#### Regulator rectifier Inspection

(KΩ)

| - \ + | Y1   | Y2   | Y3   | R | B    | Y/L  | G    |
|-------|------|------|------|---|------|------|------|
| Y1    |      | ∞    | ∞    | ∞ | ∞    | ∞    | ∞    |
| Y2    | ∞    |      | ∞    | ∞ | ∞    | ∞    | ∞    |
| Y3    | ∞    | ∞    |      | ∞ | ∞    | ∞    | ∞    |
| R     | ∞    | ∞    | ∞    |   | ∞    | ∞    | ∞    |
| B     | 5~30 | 5~30 | 5~30 | ∞ |      | 5~30 | 1~10 |
| Y/L   | ∞    | ∞    | ∞    | ∞ | ∞    |      | ∞    |
| G     | 2~20 | 2~20 | 2~20 | ∞ | 1~10 | 5~30 |      |

#### Inspection on regulator rectifier wire

Remove the luggage box, rear carrier and body covers.

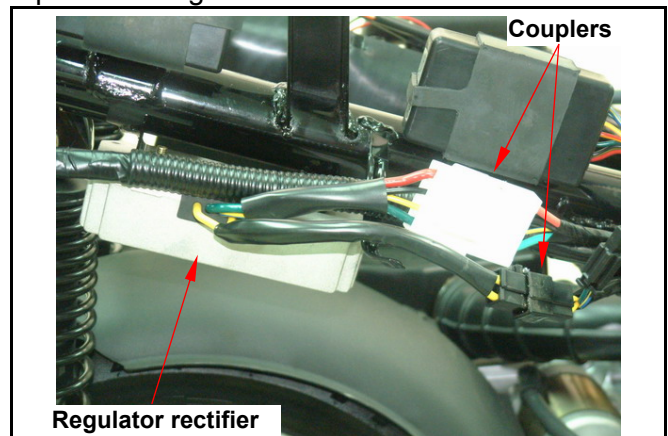
Disconnect two 3 pin couplers of the regulator rectifier.

Inspection the rectifier coupler to the wire harness passes the condition.

| Item                   | Check Points | Standard Value       |
|------------------------|--------------|----------------------|
| Main switch connection | R- B         | Battery voltage (ON) |
| Battery connection     | R- G         | Battery voltage      |
| Charging coil          | Y- Y         | 0.2~0.4 Ω            |

If the readings measured are not normal, check parts in the circuit.

If the parts are normal, then trouble is in the wiring.  
If there is nothing wrong with parts and wiring, replace the regulator rectifier.



### Inspection on AC. Generator coil

Remove the luggage box, rear carrier and body covers.

Disconnect 3 pin couplers of the generator coil.

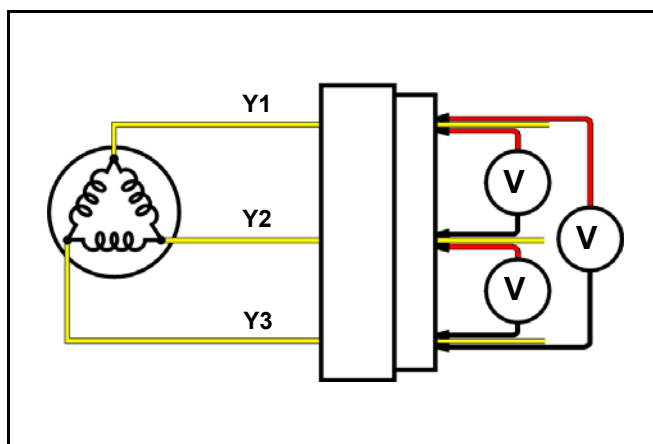
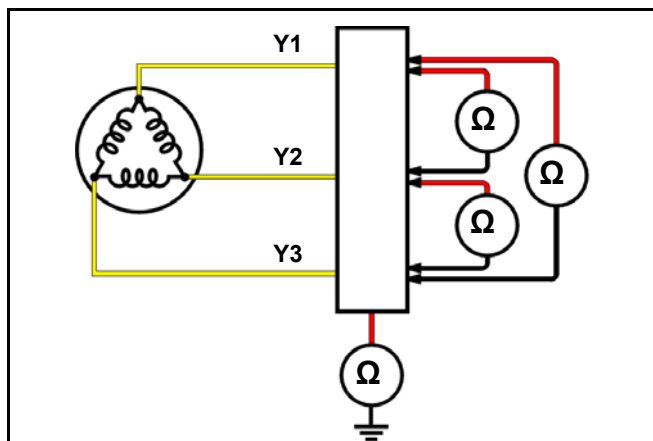
Connect an ohmmeter to the each terminal end.

Check the continuity of the each terminal end, and engine ground with short circuit?

If there is no continuity or short circuit, replace the AC. Generator.

|    | V     | $\Omega$ |
|----|-------|----------|
| Y1 | 70~80 | 0.2~0.4  |
| Y2 | 70~80 | 0.2~0.4  |
| Y3 | 70~80 | 0.2~0.4  |

And you can check voltage by engine is running.



### Current Leakage Inspection

Turn the main switch to OFF position, and remove the negative cable terminal (-) from the battery.

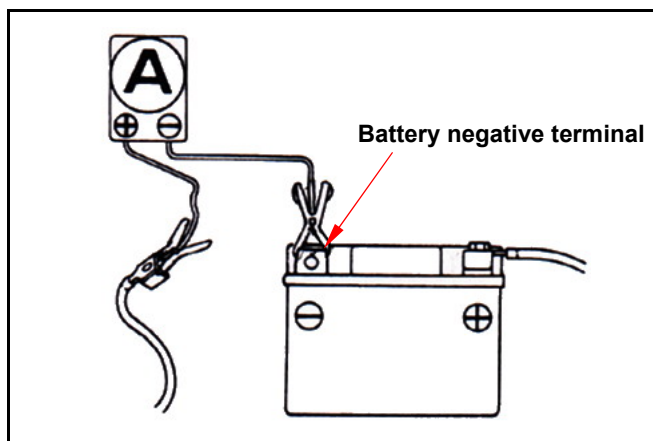
Connect an ammeter between the negative cable terminal and the battery negative terminal.

Disconnect each cable one by one and take measurement of the current of each cable to locate the short circuit.

**Allowable current leakage: Less than 1mA**

#### ⚠ Caution

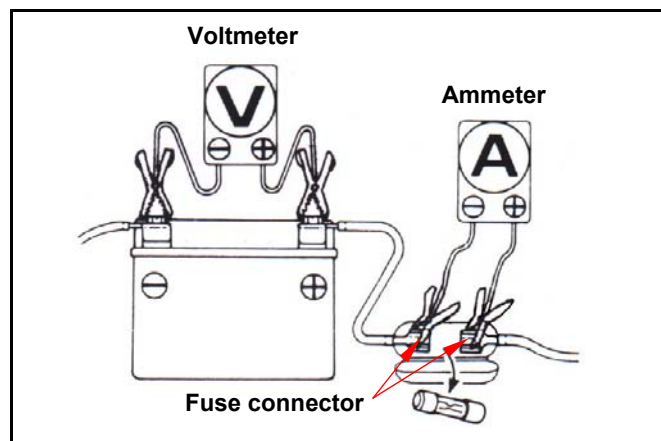
- In the current leakage test, set the current range at the largest scale, then gradually decrease to the lower scale as the test process goes to avoid possible damage to the ammeter and the fuse.
- Do not turn the main switch to ON position during test.



If the leaked current exceeds the specified value, it may indicate a short circuit.

## 18. Electrical System

### Inspection on Charging Voltage



#### ⚠ Caution

- Before conducting the inspection, be sure that the battery is fully charged. If undercharged, the current changes dramatically.
- Use a fully charged battery having a voltage larger than 13.0 V
- While starting the engine, the starter motor draws large amount of current from the battery.

After the engine is warmed up, replace original battery with a fully charged battery.

Connect a digital voltmeter to the battery terminals.

Connect an ammeter between both ends of the main fuse.

#### ⚠ Caution

- When the probe is reversibly connected, use a voltmeter having an indication that the current flows from the positive or the negative direction and the measurement should be at zero, ammeter at one direction only.

#### ⚠ Caution

- Do not use short-circuit cable.
- It is possible to measure the current by connecting an ammeter between the battery positive terminal and the cable position terminal, however, while the starter motor is activated, the surge current the motor draws from the battery may damage the ammeter. Use the kick starter to start the engine.
- The main switch shall be turned to OFF position during the process of inspection. Never tamper with the ammeter and the cable while there is current flowing through. It may damage the ammeter.

Connect a tachometer.

Turn on the headlight to high beam and start the engine.

Accelerate the engine to the specified revolution per minute and measure the charging voltage.

**Specified Charging Current:**

**1.2 A / 6000 rpm**

**Control Charging Voltage:**

**14.5 V/1650 rpm**

#### ⚠ Caution

- To replace the old battery, use a new battery with the same current and voltage.

The following problems are related to the charging system, follow the instructions provided in the checking list to correct it if any one of the problems takes place.

1. The charging voltage can not exceed the voltage between two battery terminals and the charging current is in the discharging direction.
2. The charging voltage and current are too much higher than the standard values.

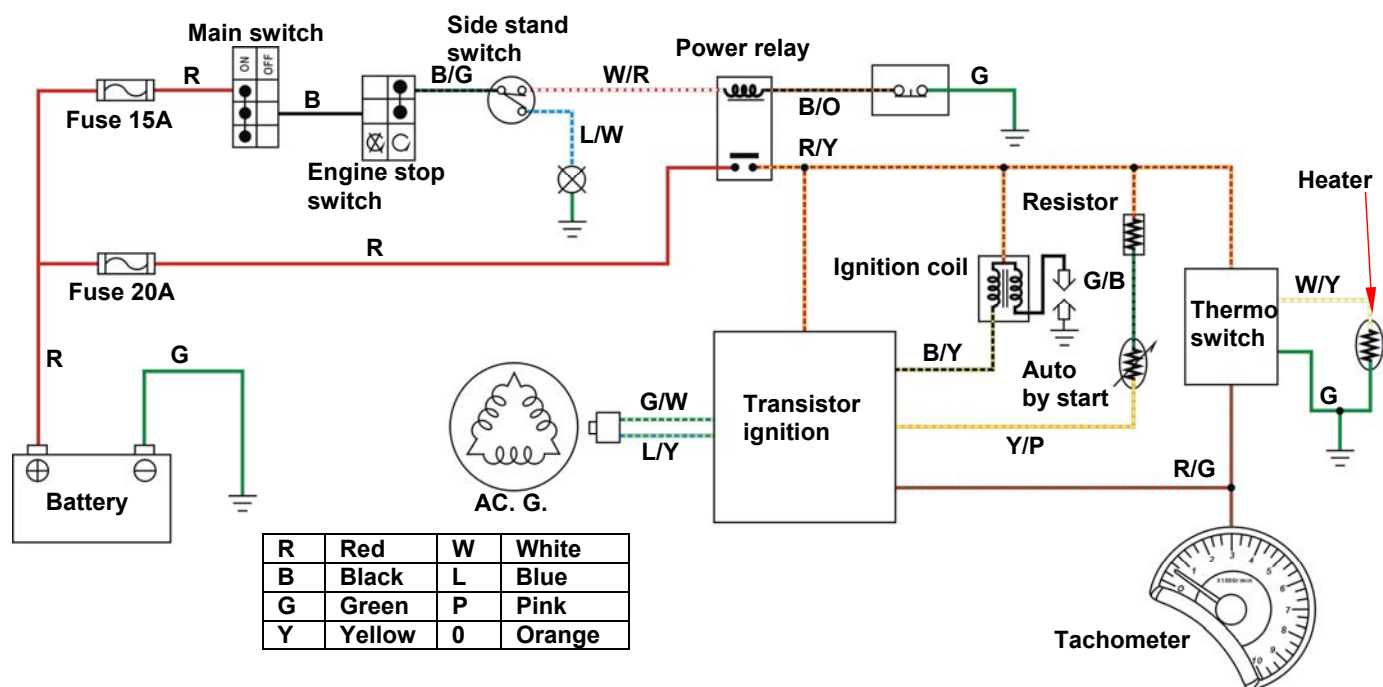
The following problems are not related to the charging system; correct it if any by following steps indicate in the checking list.

- (1) The standard charging voltage and current can only reach when the revolution of the engine exceeds the specified rpm.
  - Bulbs used exceed their rate and consume too much power.
  - The replacement battery is aged and does not have enough capacity.
- (2) The charging voltage is normal, but the current is not.
  - The replacement battery is aged and does not have enough capacity.
  - Battery used do not have enough electricity or is over charged.
  - The fuse of the ammeter is blown.
  - The ammeter is improperly connected.
- (3) The charging current is normal, but the voltage is not.
  - The fuse of the voltmeter is blown.

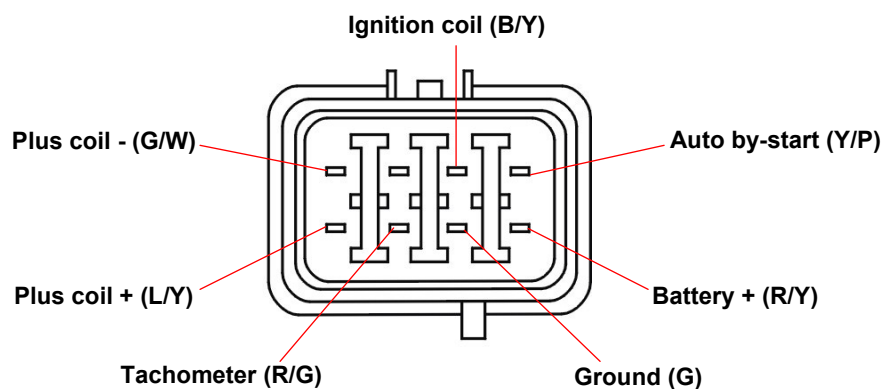


## Ignition System

### Ignition circuit diagram-LM25W



### Transistor ignition coupler



### Inspection on transistor ignition

(KΩ)

| +   | G/W    | B/Y    | Y/P | R/Y    | G      | R/G    | L/Y    |
|-----|--------|--------|-----|--------|--------|--------|--------|
| G/W |        | 20~150 | ∞   | 50~200 | 10~100 | 50~200 | 50~200 |
| B/Y | ∞      |        | ∞   | ∞      | ∞      | ∞      | ∞      |
| Y/P | ∞      | ∞      |     | ∞      | ∞      | ∞      | ∞      |
| R/Y | 50~200 | 10~100 | ∞   |        | 5~30   | 0.1~5  | 50~200 |
| G   | 10~100 | 5~30   | ∞   | 10~100 |        | 10~100 | 10~100 |
| R/G | 50~200 | 10~100 | ∞   | 0.1~5  | 5~30   |        | 50~200 |
| L/Y | 50~200 | 10~100 | ∞   | 50~200 | 10~100 | 50~200 |        |

## 18. Electrical System



### Inspection on ignition coil

Remove the right floor garnish.

Disengage the connector of the ignition coil and the spark plug cap.

Measure the resistance between the terminals of the primary winding.

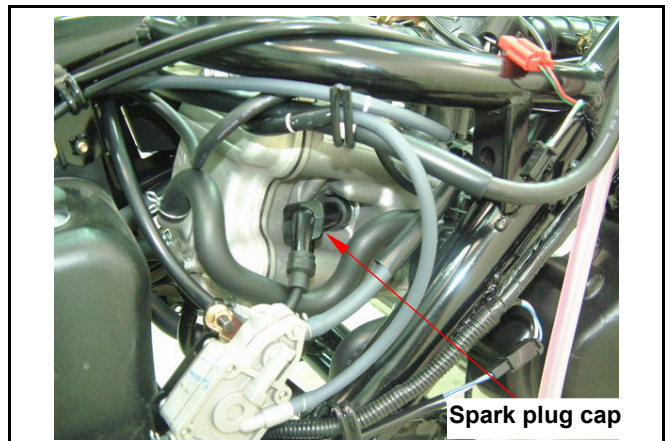
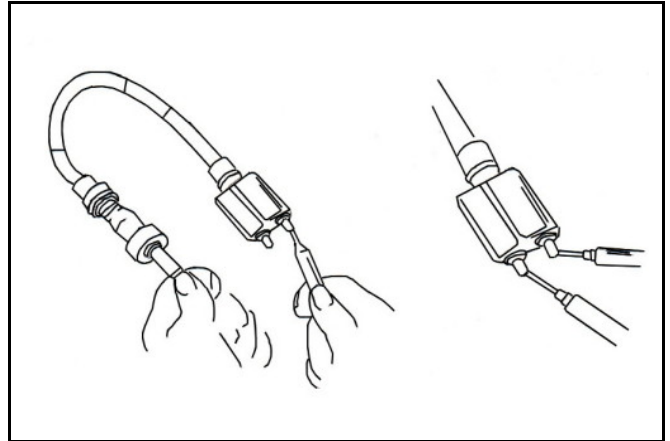
**Standard resistance:  $0.17 \pm 10\% \Omega$**

Remove the cap from the spark plug and measure the resistance between the spark plug and the primary winding.

**Standard resistance:**

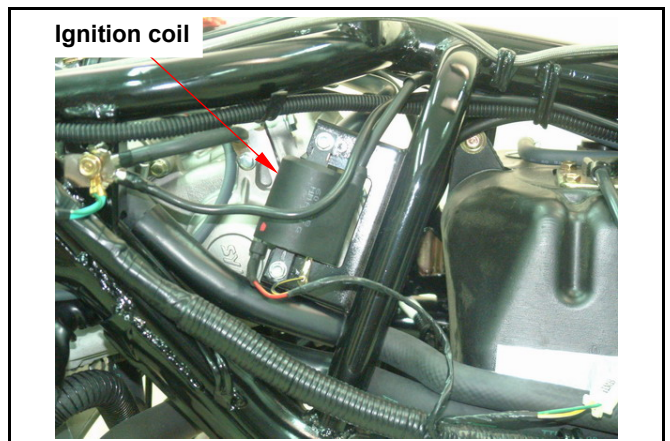
**Without cap  $9 \pm 20\% K\Omega$**

**With cap  $14.1 \pm 20\% K\Omega$**



### Replacement on ignition coil

Loosen 2 bolts and replace the ignition coil if necessary.

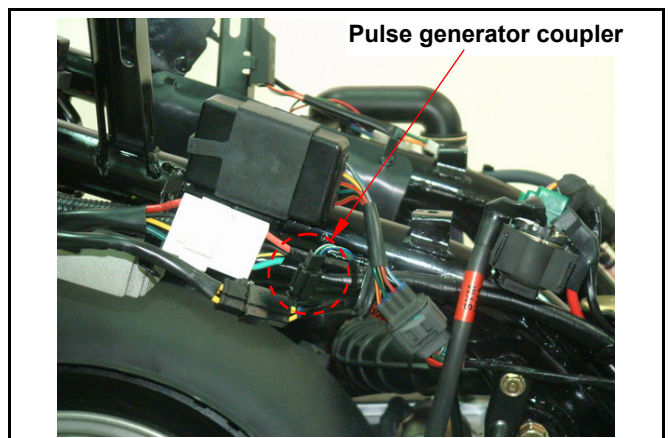


### Inspection of pulse generator

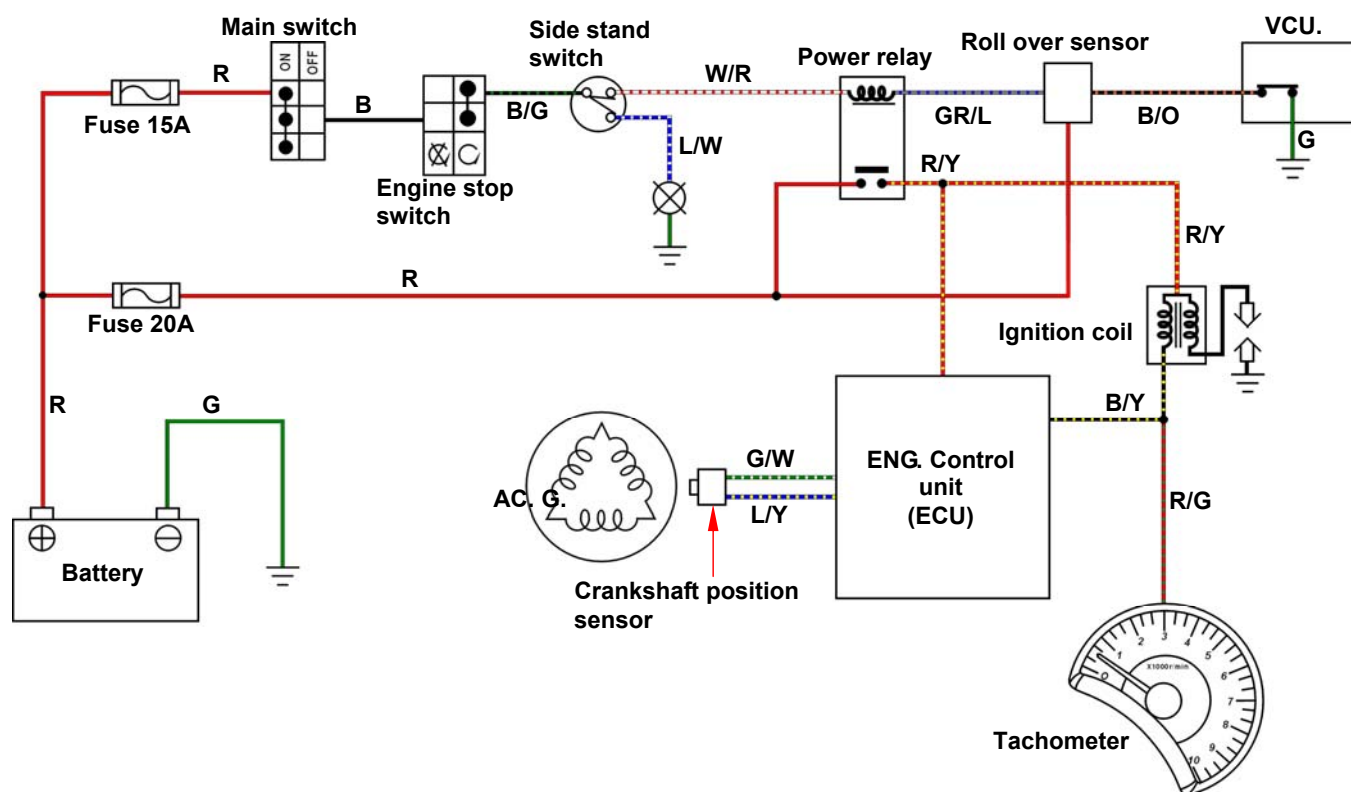
Disconnect the coupler of the pulse generator and measure the resistance between the terminals of green/white and blue/yellow.

**Standard resistance:  $480 \sim 550 \Omega$**

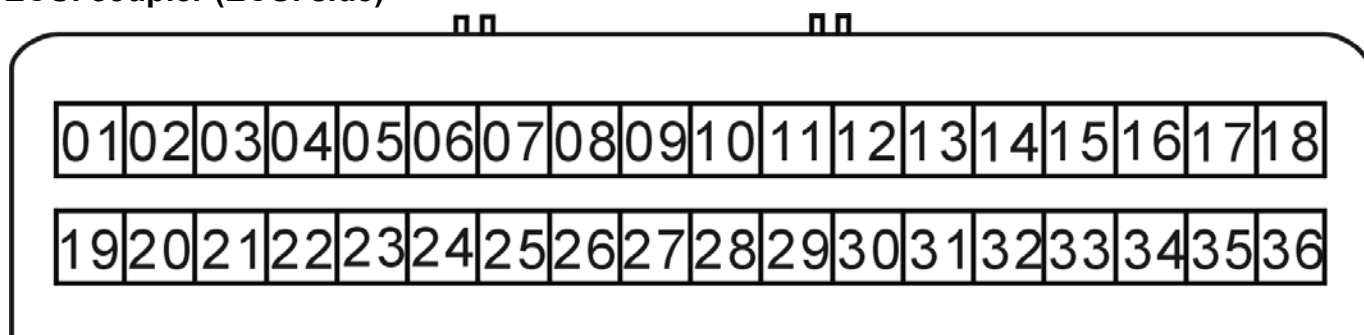
Please refer to the section 11 for disassembly of coil.



### Ignition circuit diagram-LM25W1



### ECU. coupler (ECU. side)



01 pin(R/Y) : Drive components Power.

03 pin(G/W) : Crankshaft position sensor negative.

09 pin(L/Y) : Crankshaft position sensor positive.

18 pin(G/W) : Ignition coil driver.

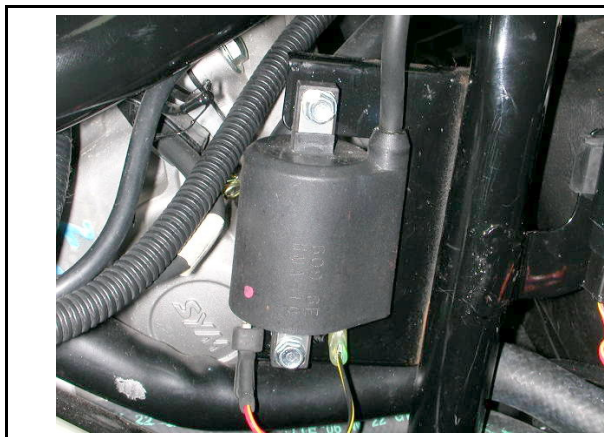


## 18. Electrical System

### Inspection on ignition coil

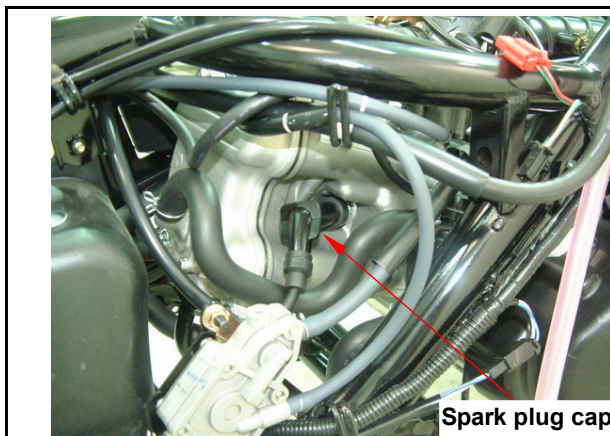
Remove the right floor garnish.  
Disengage the connector of the ignition coil.  
Measure the resistance between the terminals of the primary winding.

**Standard resistance:  $3 \pm 0.3 \Omega$  (20°C)**

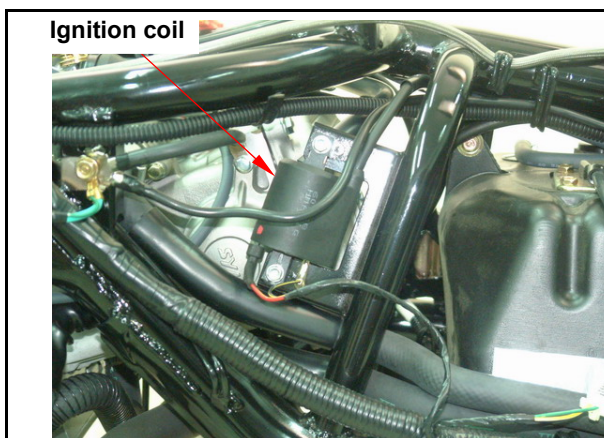


### Replacement on ignition coil

Remove the cap from the spark plug.



Loosen 2 bolts and replace the ignition coil if necessary.



### Inspection of crank position sensor

Remove luggage box (bolt×6).  
Disconnect the coupler of the crank position sensor and measure the resistance between the terminals of green/white and blue/yellow.

**Standard resistance: 80~160Ω**

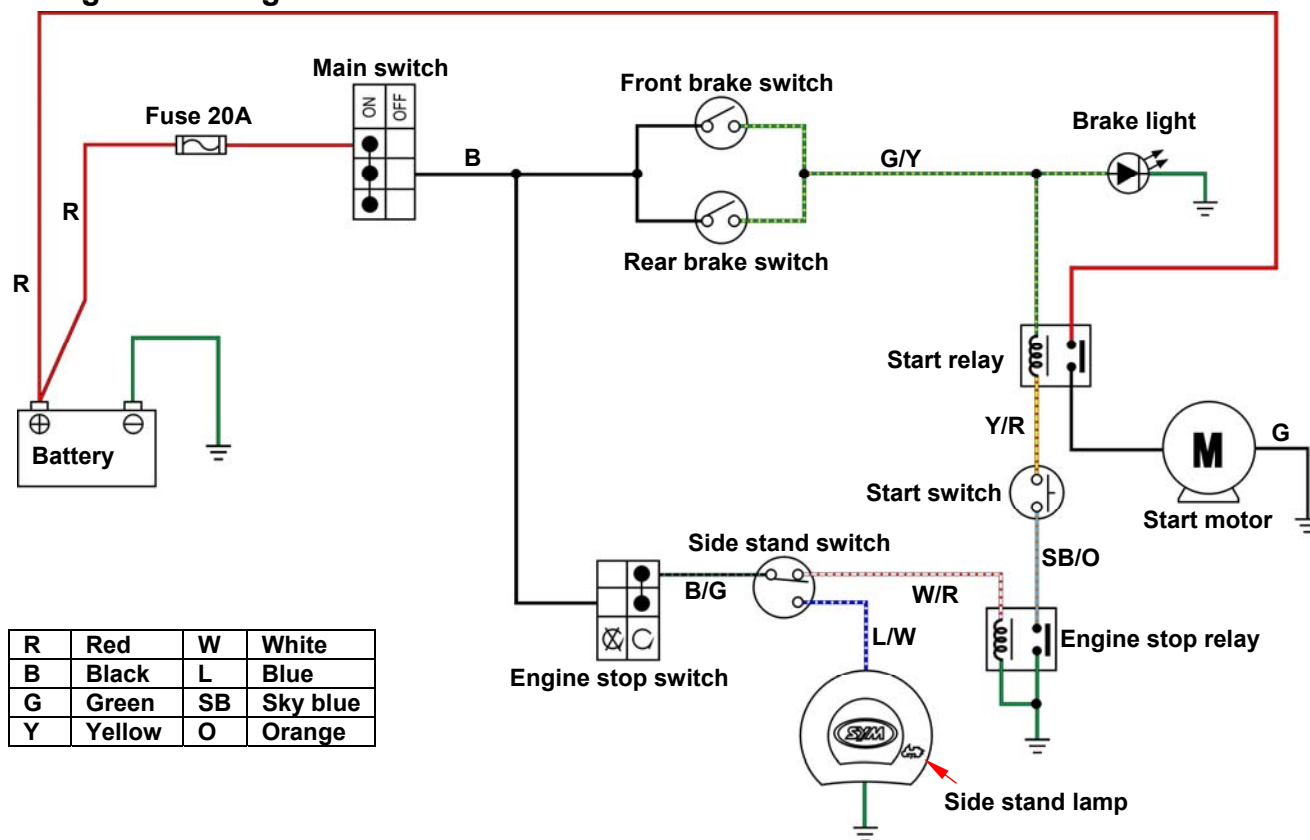
Please refer to the section 11 for disassembly of coil.





## Starting System

### Starting circuit diagram



### Inspection on starter relay

Open the main switch.

Press the brake.

Push down the starter switch.

If a sound of “Looh Looh” is heard, it indicates the relay function normally.

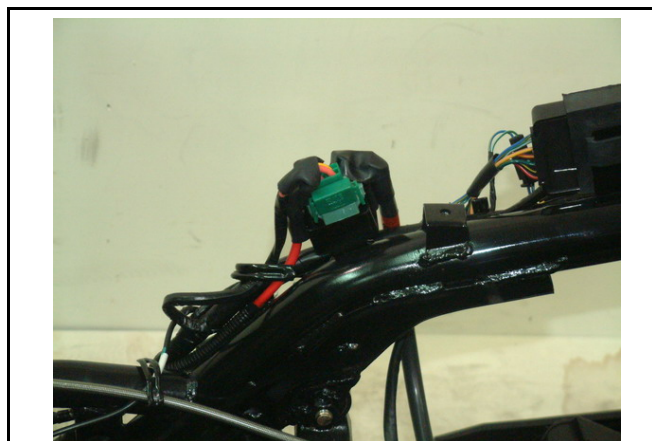
Open the inner box lid, and remove battery cover.

Disconnect the negative cable terminal of the battery.



Remove the luggage box.

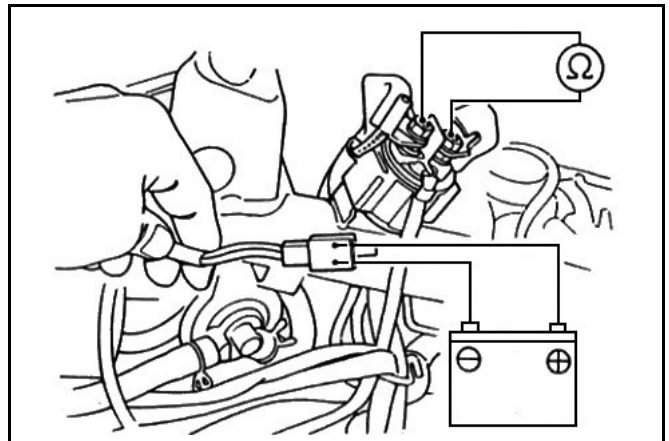
Disconnect the cable positive terminal from the start relay.



## 18. Electrical System



Disconnect the positive cable of the starter motor.  
 Disconnect the coupler of the relay.  
 Connect an ohmmeter to the large terminal end.  
 Connect the yellow/red cable to the battery positive terminal and the green/yellow cable to the battery negative terminal.  
 Check the continuity of the large terminal end.  
 If there is no continuity, replace the relay.

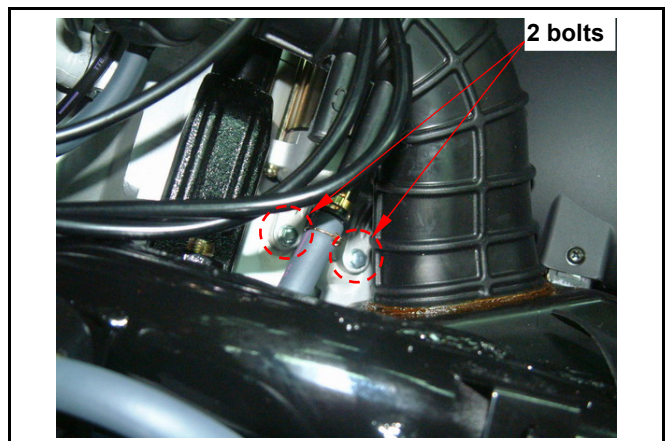


### Removal of Starter motor

Turns off the main switch  
 Remove the luggage box.  
 Disconnect the coupler of the start relay.  
 Disconnect the cable negative terminal of the battery.  
 Disconnect the starter motor power cable.  
 Loosen 2 bolts & remove starter motor.

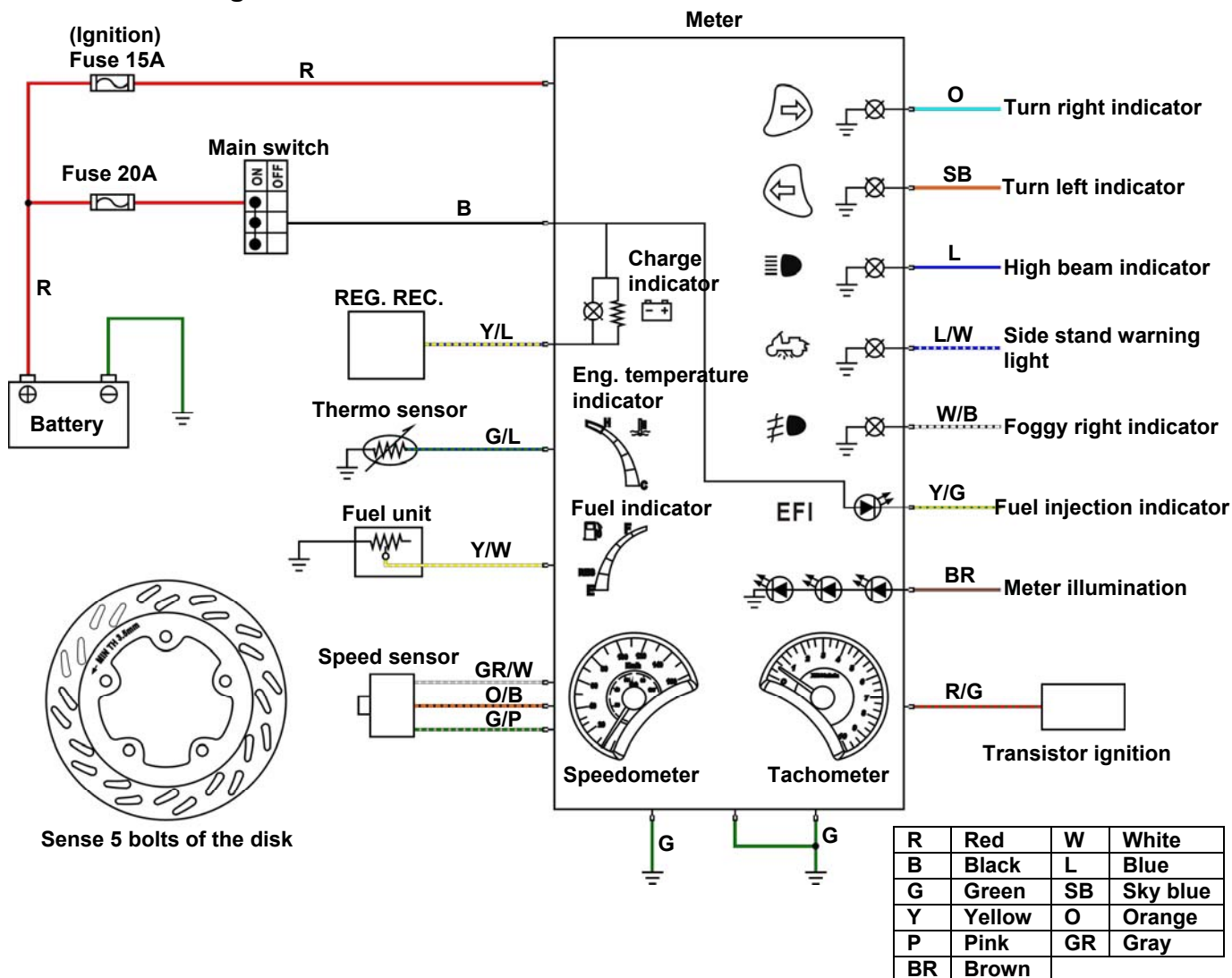
### Installation of starter motor

Install in reverse order of removal procedures.

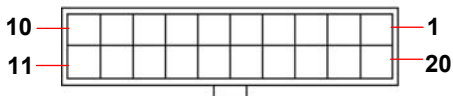


## Meters

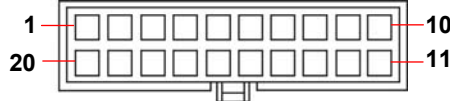
### Meter circuit diagram



Meter coupler



Wire harness coupler



### Wire harness coupler

| Red   | Yellow / Green | Black   | Green         | Green / Pink | Green    | Red / Green | Yellow / White | Gray / White | Orange / black |
|-------|----------------|---------|---------------|--------------|----------|-------------|----------------|--------------|----------------|
| BATT+ | EFI            | IGN+    | BATT-         | SP-          | BATT-    | RPM         | Fuel+          | SP+          | SP             |
| Green | Blue / White   | Blue    | Yellow / Blue | Brown        | Sky Blue | Orange      | White / Black  | Green / Blue |                |
| GND.  | Side stand     | Hi-beam | Charge        | ILLUMI.      | Turn-R   | Turn-L      | Foggy          | TEMP.        |                |

## 18. Electrical System

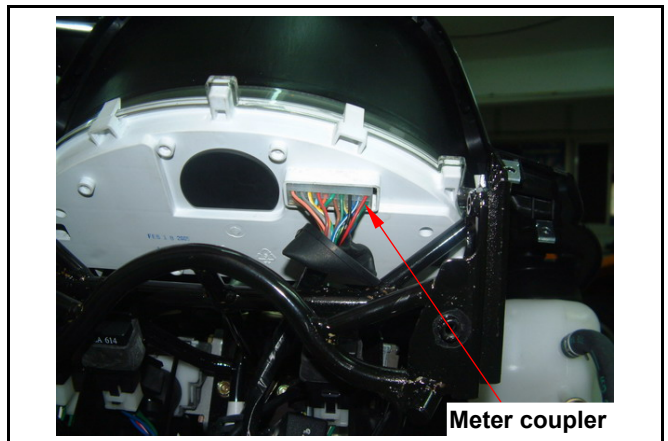


### Removal of meter

Remove wind screen garnish, wind screen, meter visor, front cover, meter visor.  
(Refer chapter 14)



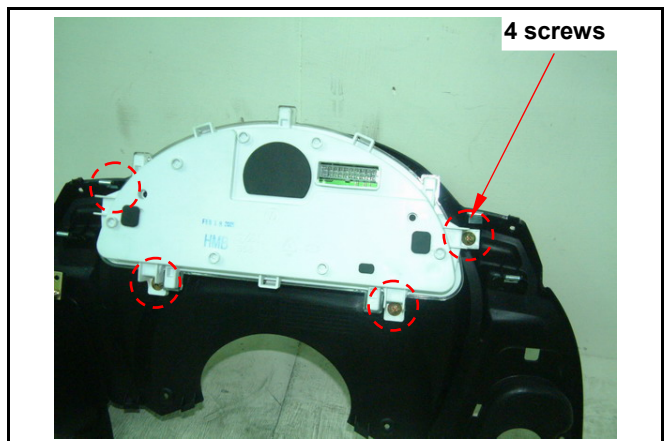
Disconnect the coupler of the speedometer, and take off the meter panel and meter.



Loosen 4 screws from meter panel.  
Remove the speedometer.

### Installation of meter

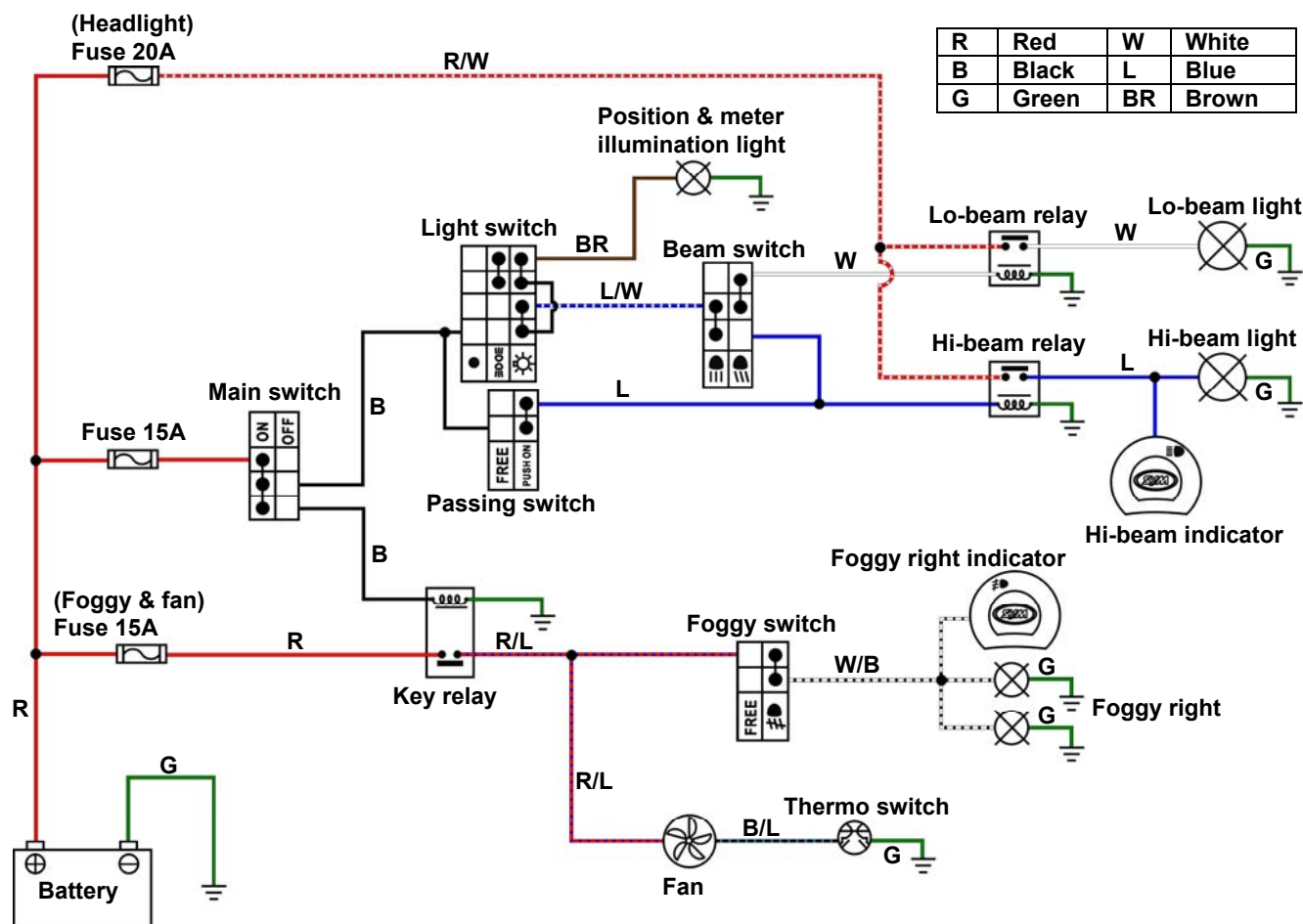
Install in reverse order of removal procedures



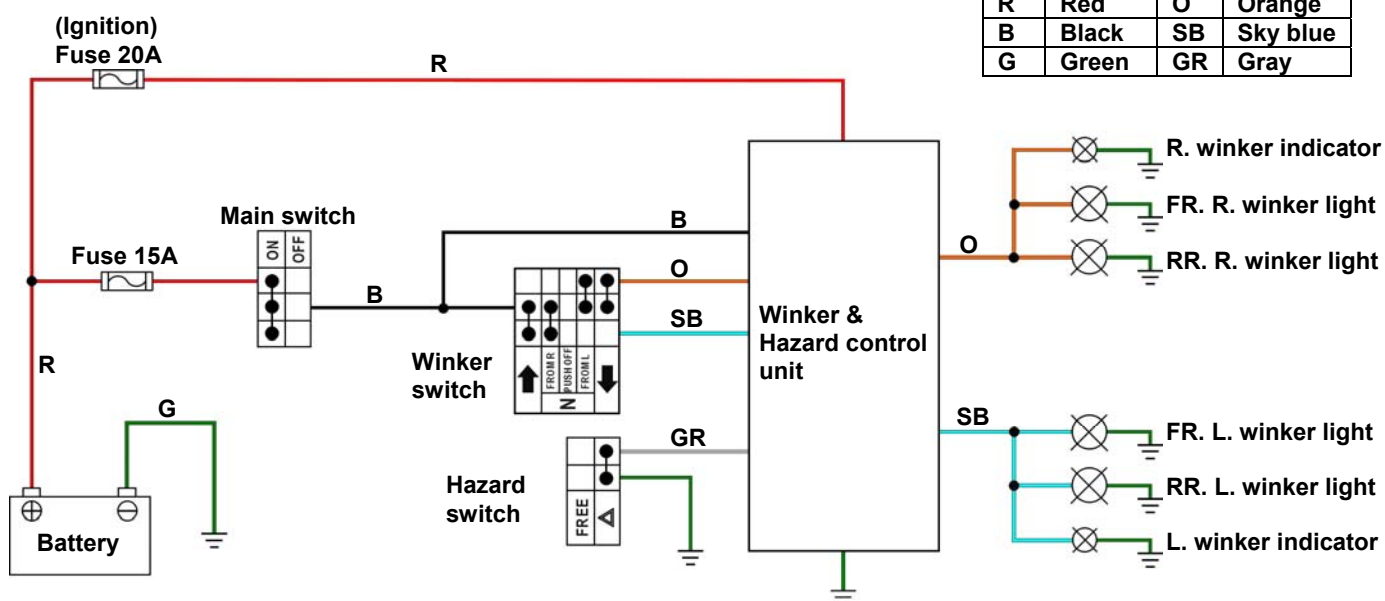


## Light / Bulb

### Headlight and foggy light circuit diagram



### Winker light circuit diagram



## 18. Electrical System

### Replacement headlight bulbs

Remove wind screen garnish, wind screen, meter visor, front cover.

(Refer chapter 13)

Disconnect the rubber sleeve and the terminal coupler from the headlight.

Loosen 1 screw from the headlight bulb setting stay.

Remove setting stay and take out the headlight bulb.

Replace with new bulb if necessary.

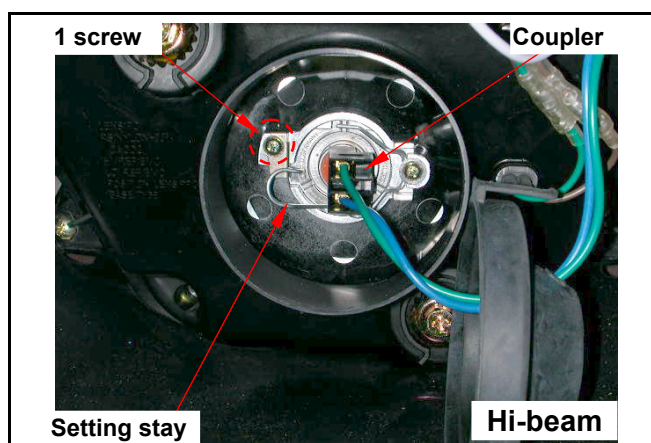
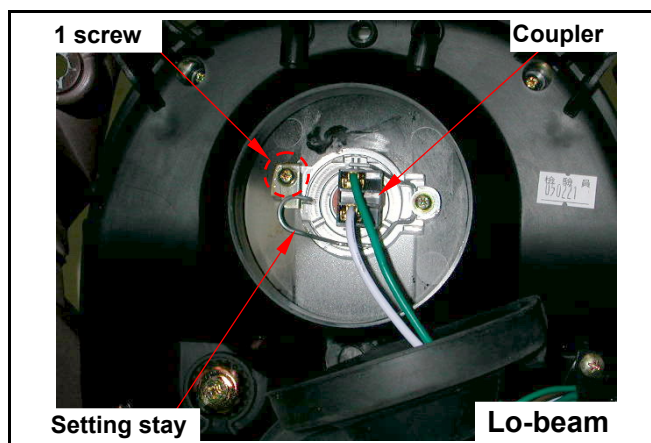
#### Specification:

**Lo-beam bulb** 12V 55W (H7)

**Hi-beam bulb** 12V 55W (H7)

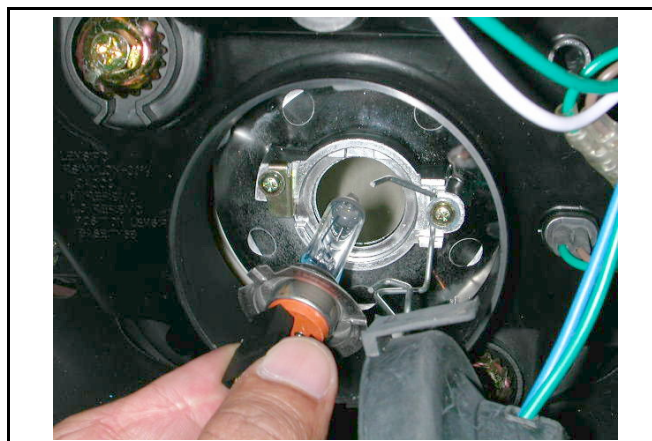
#### Caution

- Never touch the bulb with finger, which will create a heat point.
- Clean the fingerprint left on the bulb with alcohol.



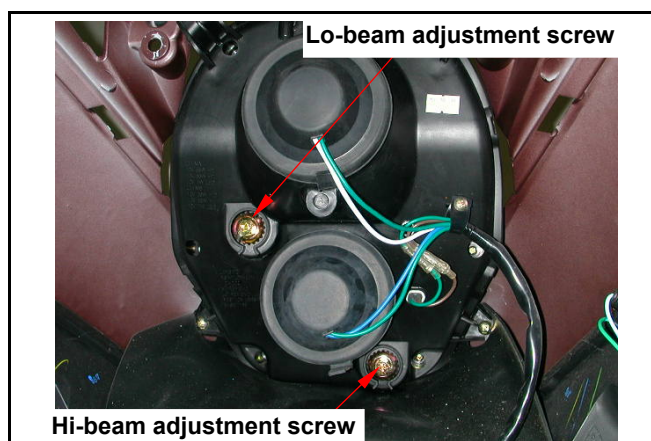
### Installation

Install the bulb of the headlight in reverse order of removal.



Upon completion of replacement, turn on the main switch to ensure the headlight works well.

Adjust the beam and distance of the headlight if necessary.



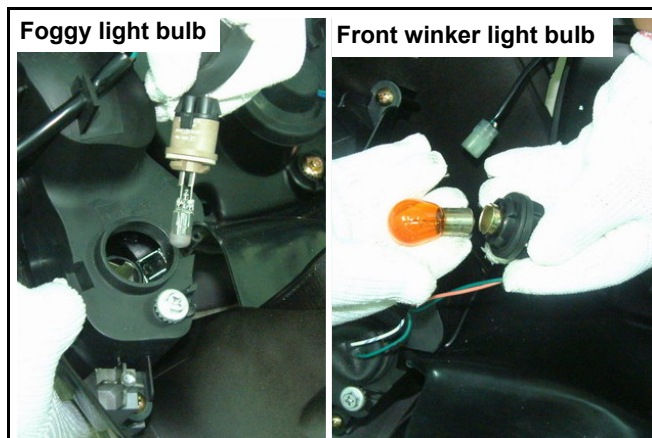
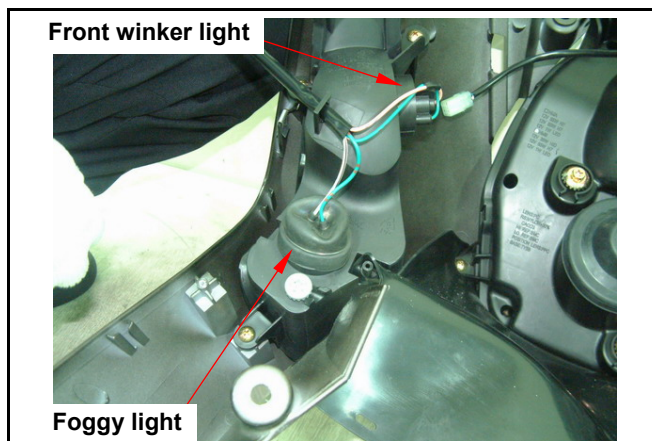
### Replacement the front winker light and foggy light bulb

Remove wind screen garnish, wind screen, meter visor, front cover.  
(Refer chapter 13)

Disconnect the rubber sleeve and turn the foggy light bulb seat in C.C.W. direction to remove the bulb seat and bulb.  
Turn the winker light bulb seat in C.C.W. direction to remove the bulb seat and bulb.  
Replace with new bulb if necessary.

#### Specification:

**Foggy light bulb**      12V 27W  
**Winker light bulb**    12V 21W



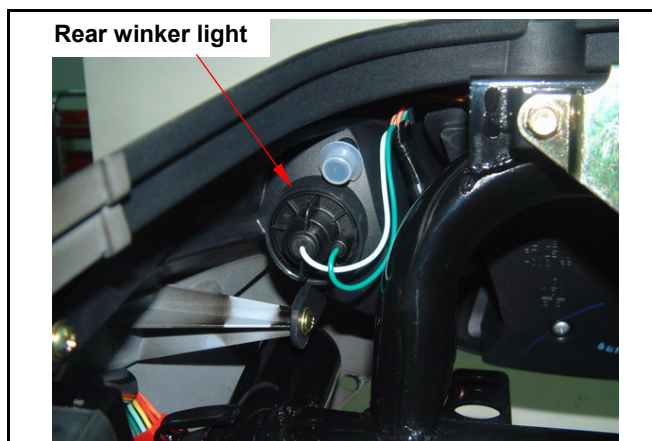
### Replacement the rear winker light bulb

Remove the luggage box.  
Turn the winker light bulb seat in C.C.W. direction to remove the bulb seat and bulb.

Presses the bulb, counterclockwise rotation and remove it.  
Replace with new bulb if necessary.

#### Specification:

**Winker light bulb**      12V 21W



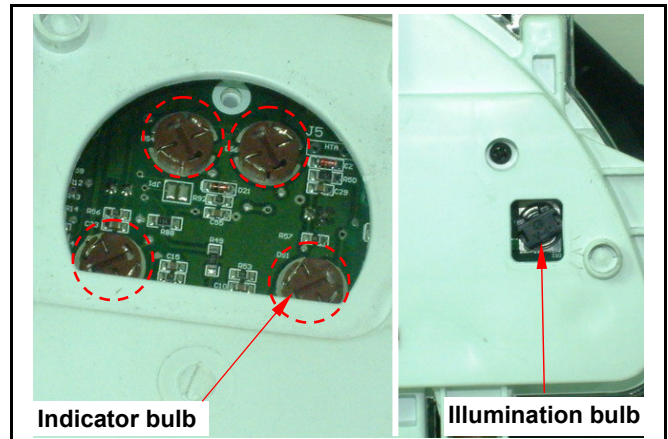


## 18. Electrical System



### Replacement the meter bulbs

Remove the meter board waterproofing rubber.

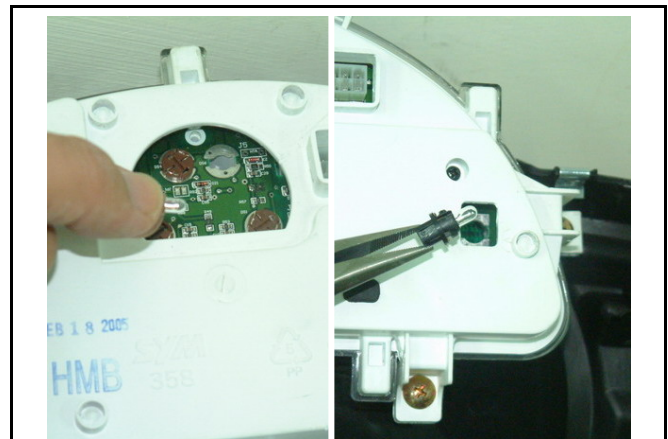


Uses the “-” screw driver turn the indicator bulb seat in C.C.W. direction, and take out the indicator bulb.

Uses the round nose pliers turn the illumination bulb seat in C.C.W. direction, and take out the illumination bulb.

#### Specification:

|                   |          |
|-------------------|----------|
| Indicator bulb    | 12V 1.7W |
| Illumination bulb | 12V 1.7W |





## Switch / Horn

### Main switch

#### Inspection

Remove the front cover.

Disconnect the main switch coupler.

Check the continuity between two points as indicated below

| Position \ Pin | BAT | BAT1  | BAT2  |
|----------------|-----|-------|-------|
| LOCK           |     |       |       |
| OFF            |     |       |       |
| ON             | ●   | ●     | ●     |
| Wire Color     | Red | Black | Blake |

#### Replacement of main switch

Remove main switch cap.

Disconnect the coupler of the main switch and loosen the mounting bolts (3 bolts).

Remove the main switch.

Install the new main switch and tighten the mounting bolts.

Install the main switch coupler and cap.

### Right handle switch

Remove the handle cover and front cover.

Disconnect the coupler of right handle switch.

Check the continuity between two points as indicated in the table below

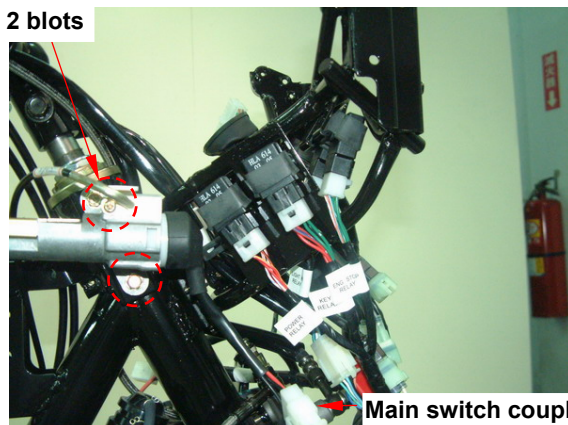
#### Headlight switch

| Position \ Pin                                                                      | TL    | CI    | HL    | CI          |
|-------------------------------------------------------------------------------------|-------|-------|-------|-------------|
| ●                                                                                   |       |       |       |             |
|  | ●     | ●     |       |             |
|  | ●     | ●     | ●     | ●           |
| Wire Color                                                                          | Brown | Black | Black | Blue /White |

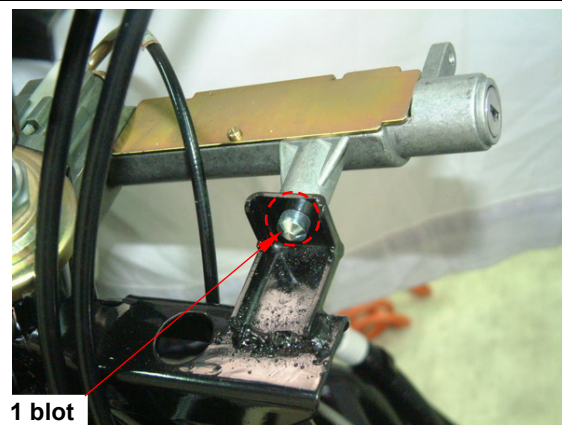
#### Start and engine stop switch

| Position \ Pin                                                                      | ST    | E            | ST           | E                |
|-------------------------------------------------------------------------------------|-------|--------------|--------------|------------------|
|  |       |              |              |                  |
|  | ●     | ●            |              |                  |
| FREE                                                                                |       |              |              |                  |
|  |       |              | ●            | ●                |
| Wire Color                                                                          | Black | Black /Green | Yellow / Red | Sky blue/ Orange |

2 bolts



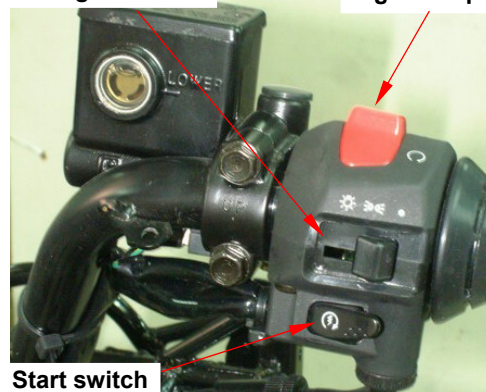
Main switch coupler



1 blot

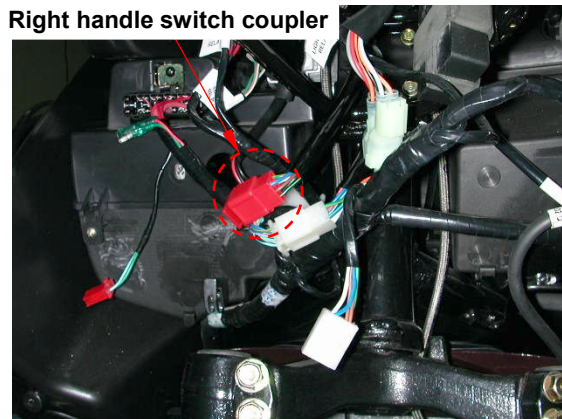
Headlight switch

Engine stop switch



Start switch

Right handle switch coupler



## 18. Electrical System



### Left handle switch

Remove the handle cover and front cover.  
Disconnect the coupler of left handle switch.  
Check the continuity between two points as indicated in the table below

#### High and low beam switch

| Pin        | LO    | HL           | HI   |
|------------|-------|--------------|------|
| Position   |       |              |      |
|            |       | ●            | ●    |
|            | ●     | ●            |      |
| Wire color | White | Blue / White | Blue |

#### Winker switch

| Pin        | R        | WR   | L      |
|------------|----------|------|--------|
| Position   |          |      |        |
|            | ●        | ●    |        |
| FROM R     | ●        | ●    |        |
| PUSH OFF   |          |      |        |
| FROM L     |          | ●    | ●      |
|            |          | ●    | ●      |
| Wire color | Sky blue | Gray | Orange |

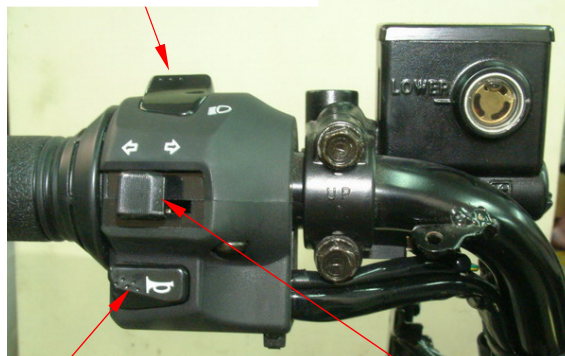
### Brake Switch

While grasp the brake lever firmly, the terminals of white/green and green/yellow of the brake should have continuity.  
Replace the switch if damaged.

### Horn

Remove the front cover and front under spoiler.  
Apply 12 V power source to two terminals of the horn, the horn should sound.  
Replace the horn if necessary.

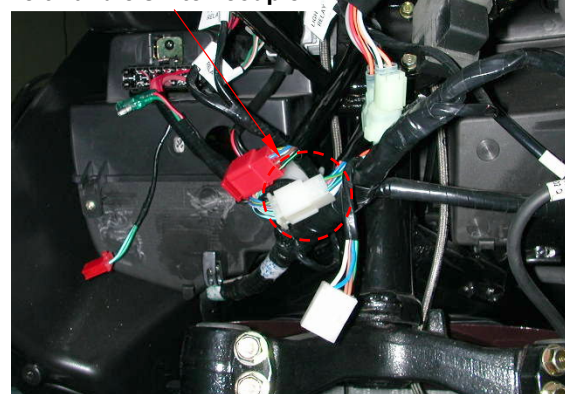
High and low beam switch



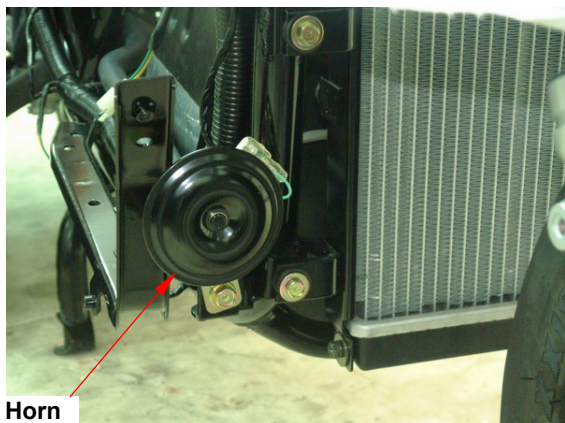
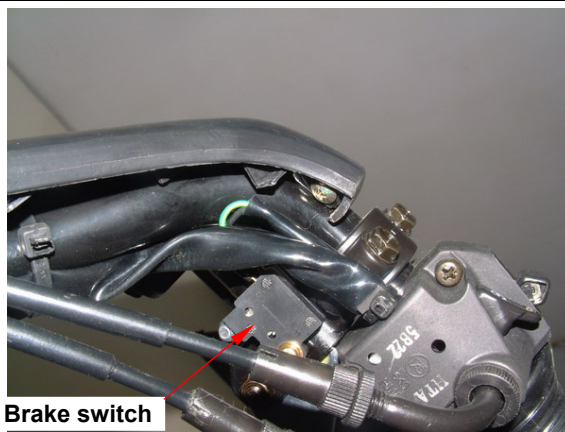
Horn switch

Winker switch

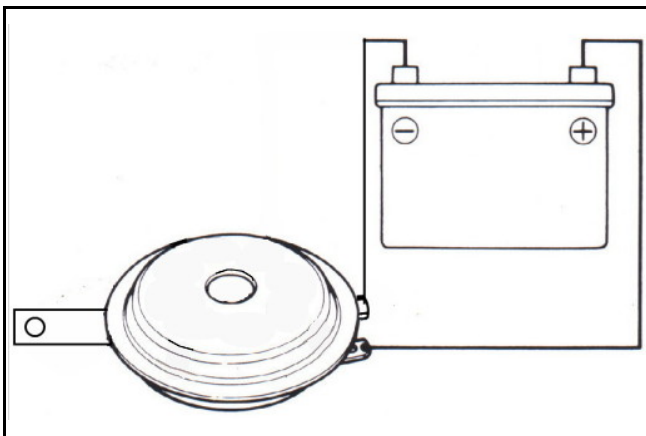
Left handle switch coupler



Brake switch



Horn





### Fuel Unit

Open the seat.  
 Remove the luggage box.  
 Remove the rear carrier.  
 Remove right & left side cover.  
 Remove the body cover  
 Remove the floor panel.  
 Disconnect the coupler of the fuel unit.  
 Loosen 4 bolts from fuel unit and remove it.

#### Caution

- Great care shall be taken not to damage or bend the float arm of the gauge.

When the float arm shifts to the F position or the E position, the resistance measured shall be as follows:

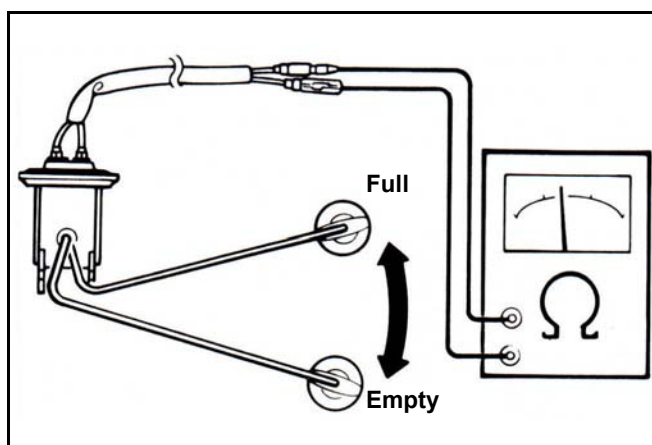
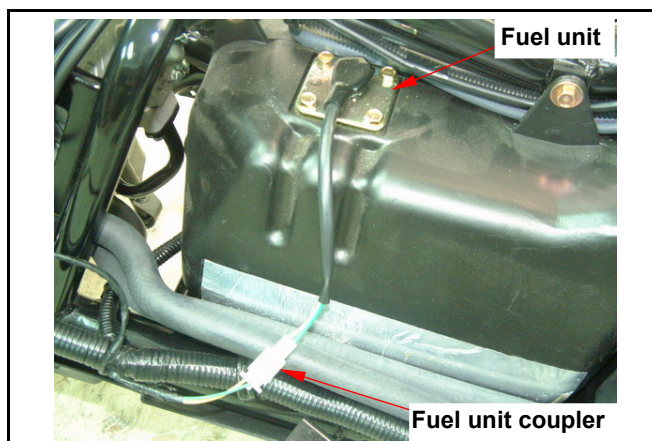
| Position  | Resistance          |
|-----------|---------------------|
| E (Empty) | 97.5~107.5 $\Omega$ |
| F (Full)  | 4~10 $\Omega$       |

Connect the wiring to the fuel unit and the ohmmeter as shown.  
 Connect the fuel unit coupler to the wire harness.  
 Turn on the main switch.  
 Move the float arm to verify the proper position the fuel gauge needle indicates.

| Arm Position | Needle Position |
|--------------|-----------------|
| Up (Full)    | F (Full)        |
| Down (Empty) | E (Empty)       |

#### Caution

- While conducting the test, turn on the direction indication lamp to make sure that the battery is in serviceable condition.



## 18. Electrical System

### Cooling Fan Thermo Switch

The thermo switch mounted on the radiator controls the operation of the cooling fan motor. In case that the fan motor fails to work, disconnect the green and black/blue leads and connect jump wires to the terminals, then, turn on the main switch, the fan motor should operate.

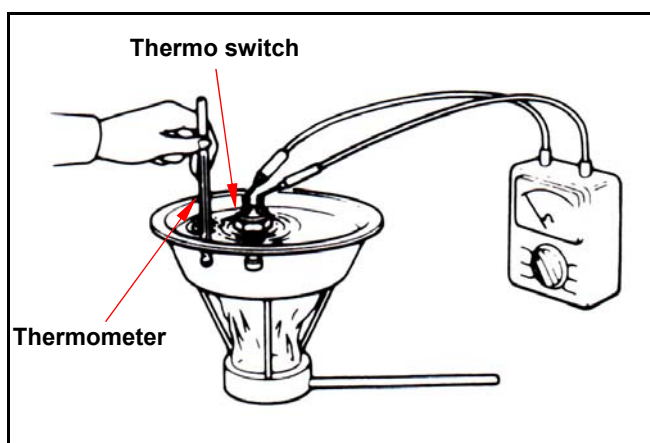
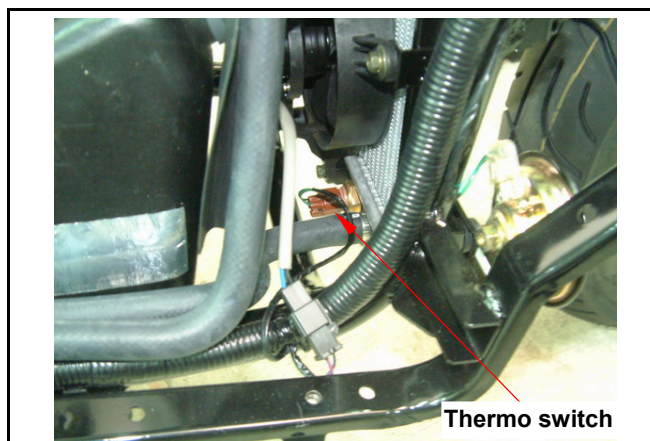
If the fan motor still fails to run, measure battery voltage between the green and black / blue leads. If there is no voltage, check for blown fuse, loose connection or short-circuit.

If the fan motor runs, check the thermo switch in the manner as described below:

Hang the thermo switch on the bowl filled with coolant to check the switch's opening and closing temperatures, confirm the switch is open circuited at room temperature, increase the coolant temperature gradually. The switch should have a continuity at 95-101°C.

#### Caution

- Keep the coolant at a constant temperature at least for three minutes. Sudden increase the coolant temperature will cause the thermometer and the tester to indicate wrong readings.
- Never let the thermometer and the thermo switch contact the wall of the bowl, which may result in wrong readings.
- The thermo switch shall be placed in the coolant until the teeth are completely submerged.





### Thermo Sensor

Remove the thermo unit.

Hang the thermo unit in an oil heater, heat the oil and measure the resistance at each temperature.

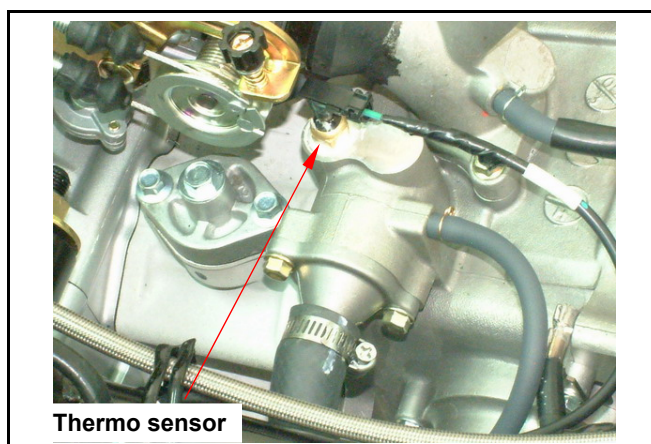
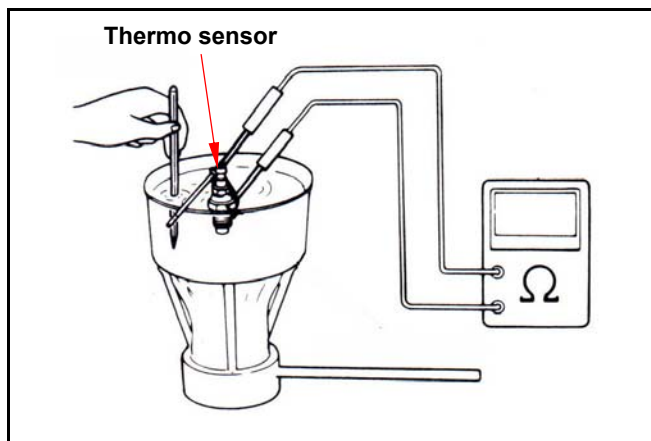
| Temperature  | 50°C    | 80°C      | 100°C | 120°C     |
|--------------|---------|-----------|-------|-----------|
| Standard (Ω) | 134~149 | 47.5~57.0 | 26~29 | 14.8~17.2 |

#### ⚠ Caution

- Wear gloves and goggles when performing this test.

#### ⚠ Caution

- Engine oil should be used as a heating medium as the test temperature must be higher than 100°C.
- Contacting the container wall by the thermometer and the thermo unit may result in wrong readings.



### Water Temperature Meter

Disconnect the thermo sensor coupler and connect it to engine ground.

Turn on the main switch.

The needle of the water temperature meter should move to other end, H position.

#### ⚠ Caution

- Do not ground the water temperature more than 5 seconds, or the meter will be damaged.

## 18. Electrical System

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Note:

|                                                                         |                                                                                                                  |
|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Names of Mechanisms in the Emission Control System</b> ..... 19-1    | <b>Secondary Air Introduction System</b> ... 19-5                                                                |
| <b>Function of Mechanisms in the Emission Control System</b> ..... 19-1 | <b>Positive Crankcase Ventilation System (P.C.V.)</b> ..... 19-8                                                 |
| <b>Fuel Evaporative Emission Control System (E.E.C.)</b> ..... 19-2     | <b>Inspection Items</b> ..... 19-9                                                                               |
| <b>Catalytic Converting System (CATA)</b> ... 19-4                      | <b>Countermeasure for Emission Pollutants Not Within Standard as In Idle Speed (4-Stroke Engine)</b> ..... 19-10 |

## Names of Mechanisms in the Emission Control System

Four-Stroke Engine Model

1. Catalyst converter (CATA.)
2. Evaporative Emission Control System (E.E.C.)
3. Air Injection System (A.I.)
4. Positive Crankcase Ventilation System (P.C.V.)

## Function of Mechanisms in the Emission Control System

### General

The emission control strategy of this model was formulated basing on a four-stroke SOHC carburetor single cylinder engine. It adopts secondary air introducing device to purify the exhaust, in addition, it also adopts a charcoal canister to absorb the fuel vapor generated through evaporation in the fuel system.

### ※ Engine refinements -

Four Valves designed combustion chamber, together with optimum compression ratio, ignition timing, intake and exhaust timing, have all contributed to maximize the intake/exhaust efficiency and combustion efficiency.

### ※ Secondary air introducing system -

It is used to introduce secondary air into exhaust manifold so that incomplete burned exhausts, CO & HC, may be burned again and to be harmless gases.

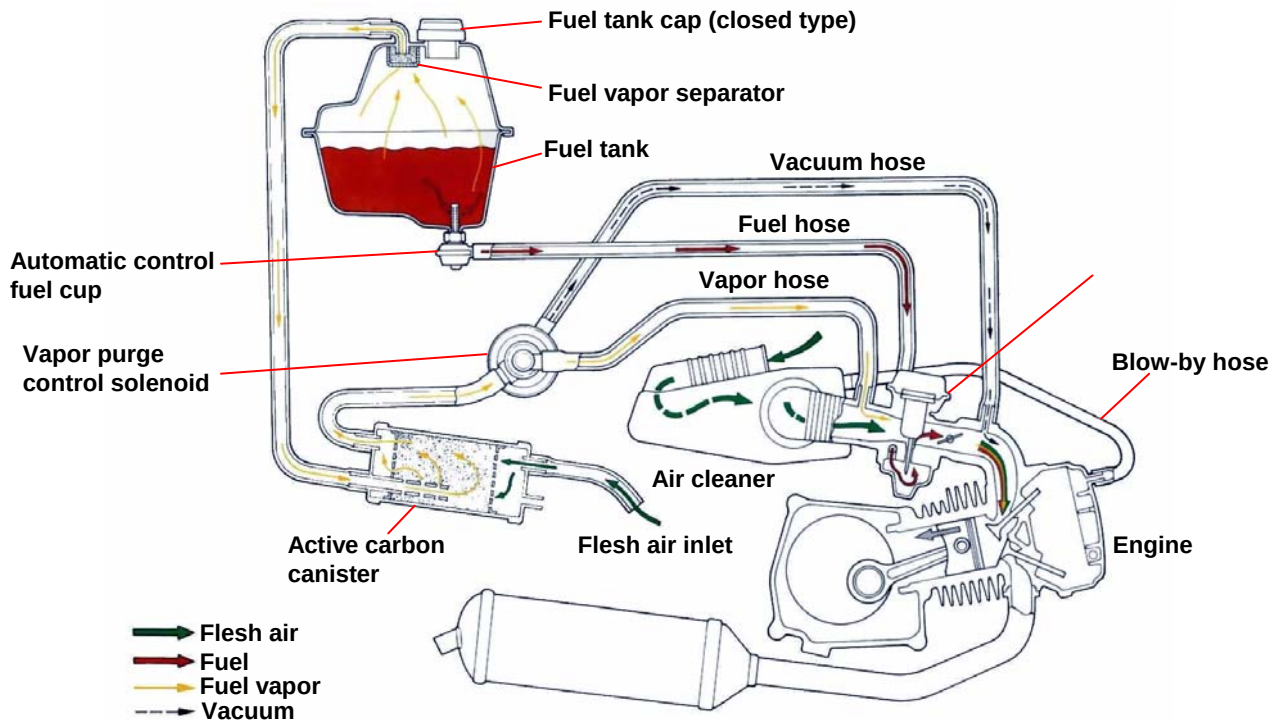
| System             | Device                               | Components                                   | Purpose & function                                                                                                |
|--------------------|--------------------------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Combustion chamber | Combustion chamber                   | 4-valve combustion chamber                   | The semi-circular combustion chamber is designed to balancing the air stream to achieve the combustion stability. |
| Exhaust system     | Post-treatment device                | Catalytic converter                          | Installed a three-way catalytic converter in the middle of exhaust pipe to oxidize the CO, HC in the exhaust gas. |
| E.E.C. system      | Evaporative emission control system  | Charcoal canister<br>Purge control valve     | A canister is used to absorb vapor from fuel tank and to introduce it into carburetor at an opportune timing.     |
| A.I. system        | Secondary air-injection system       | Air inject cut-valve<br>Secondary air filter | To introduce fresh air into exhaust manifold controlled by an air cut-valve to burn the exhaust again.            |
| P.C.V. system      | Crankcase blow-by introducing device | Vapor separator                              | To introduce blow-by into combustion chamber via a vapor separator for burning then discharging.                  |

## 19. Emission Control System

### Fuel Evaporative Emission Control System (E.E.C.)

#### 1. Construction:

- Reduce HC to pollute air.
- To absorber fuel vapor and saving fuel consumption



#### 2. Principle of operation

- Vapor generated in fuel tank and fuel system through evaporation is contained in the confined system to prevent it from escaping into the atmosphere, at the same time, the vapor will be introduced into a charcoal canister where the hydrocarbon in the vapor will be absorbed by active carbon.
- When engine is running, the negative pressure of intake opens the purge line, breaks HC off from active carbon and then sucks it into engine together with air from bottom of the canister.
- The canister can be used repeatedly without reducing its performance because of the system's purge function.

#### 3. Trouble Diagnosis:

Fuel can not flow to carburetor

- No fuel in the fuel tank
- loosen vacuum hose of the fuel pump
- plugged hose in the system

#### 4. Cautions:

- Do not exceed the reed valve of the fuel filler when filling out fuel.
- Do not have rush acceleration or running in high speed when applying the spare fuel.



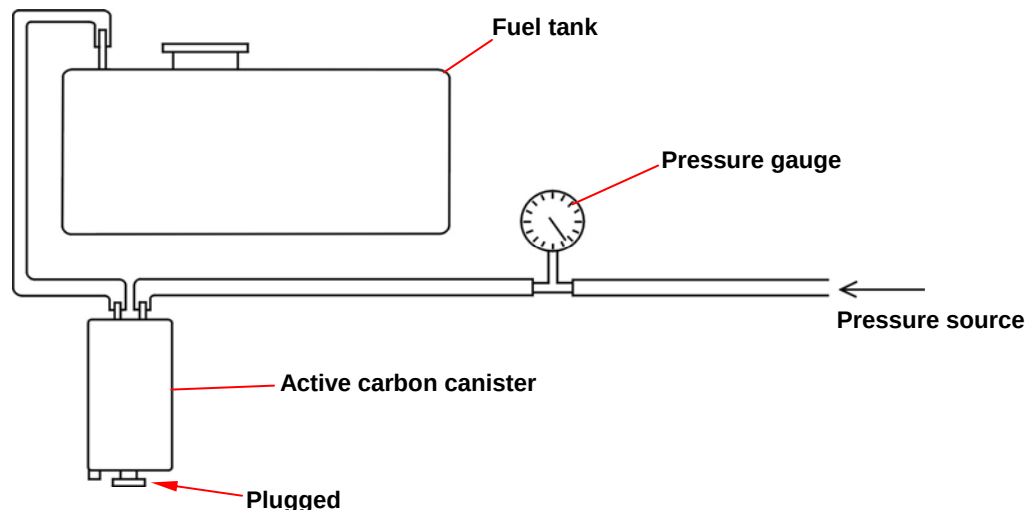
### Evaporative Emission Control System (EEC)

#### 1. Visual check:

- 1) Check the outside of canister for damage.
- 2) Check all hoses for breakage.

#### 2. Leak test:

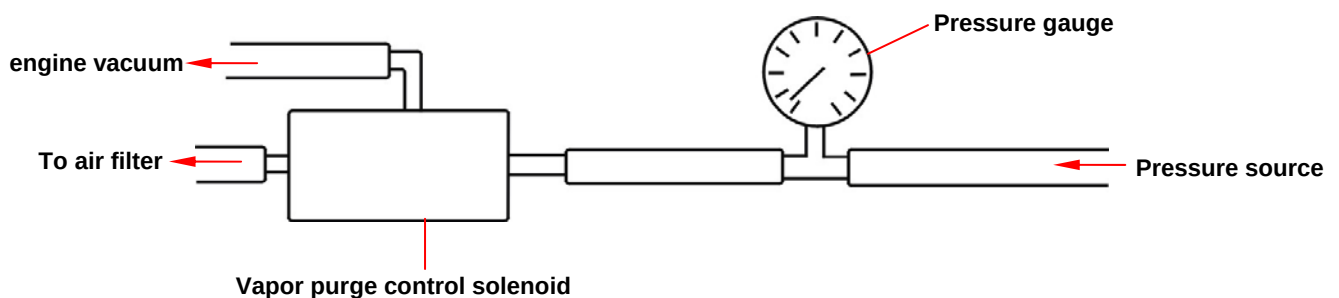
- 1) Disconnect the Vapor purge control solenoid hose, and connect a T-type hose connector to a pressure gauge and a pressure source as shown below:



- 2) Plug canister vent.
- 3) Apply 100mmAq into pressure source inlet then plug it. The pressure at the gauge should not drop to below 10mmAq within 10 seconds.

#### 3. PCV Function Test

- 1) Disconnect the hose of connection to the active carbon canister, and then connect a T-type hose connector to pressure source as shown below:



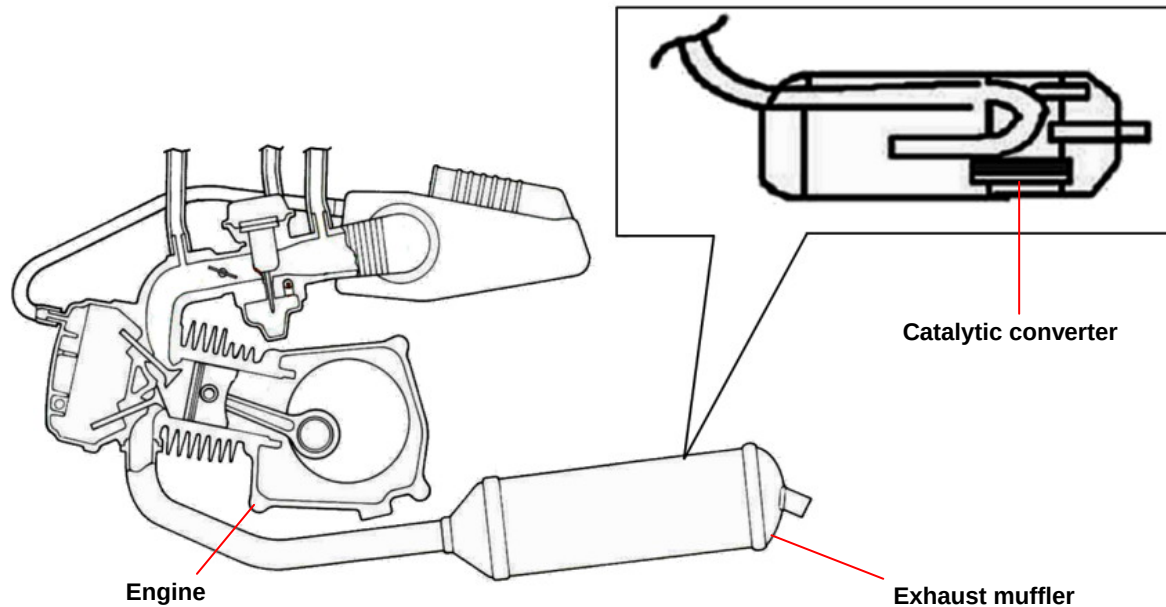
- 2) Apply 100mmAq into pressure source inlet as engine stopped then plug it. The pressure at the gauge should not drop to below 10mmAq within 10 seconds.

## 19. Emission Control System



### Catalytic Converting System (CATA)

#### 1. Construction:

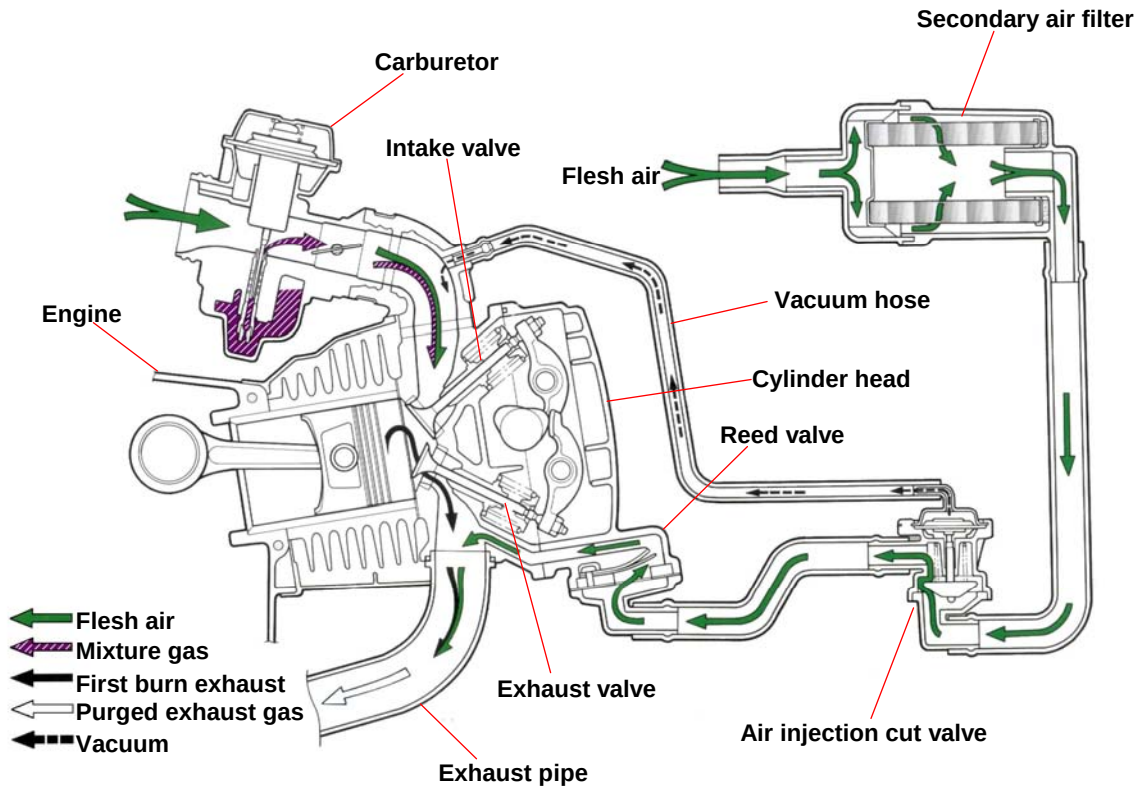


#### 2. Description:

- 1) The function of the catalytic converter is to transfer unburned CO, HC, and NOx harmless CO<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub> gases.
- 2) Pt, Pd, Rh...etc. precious metals are used into the catalytic converter so use only unleaded gasoline to prevent from cause the catalytic converter to fail.

### Secondary Air Introduction System

#### 4. Construction



This system contained AICV (air Injection Cut Valve), R/V (Reed Valve) and other intake components.

#### 2. Principle of operation:

- Secondary air is introduced into exhaust manifold so that CO and HC in the exhaust will be burned again under a state of rich oxygen and appropriate temperature and be turned into harmless  $\text{CO}_2$ ,  $\text{H}_2\text{O}$ .
- The opening and closing of the exhaust valve can generate a positive or a negative pressure pulse inside a motorcycle's exhaust system. Exhaust gas is controlled by a reed valve. When pressure inside the exhaust manifold is negative, reed valve will be sucked open by the negative pressure and outside air will enter to mix with CO, HC, thus generating a secondary burn reaction and turning them into harmless gases. When pressure inside the exhaust manifold is positive, reed valve will close to prevent exhaust back up and enter into the secondary air cleaner.
- Air cut-off valve (AICV) will cut off the secondary air supply during engine fuel returning cycle to reduce after-burning noises.

## 19. Emission Control System

### 3. Service Points/Trouble Diagnosis:

#### Diesel

- Malfunction of air inject cut valve (AICV).
- System hose leakage.
- abnormal ignition timing.
- lean mixture gas.
- abnormal fuel supply.

#### Rich Exhaust Gas:

- plugged air-jet by dirty carburetor.
- poor adjustment of air adjustment screw.
- poor reed valve.
- System hose leakage or plugged.

#### Noise:

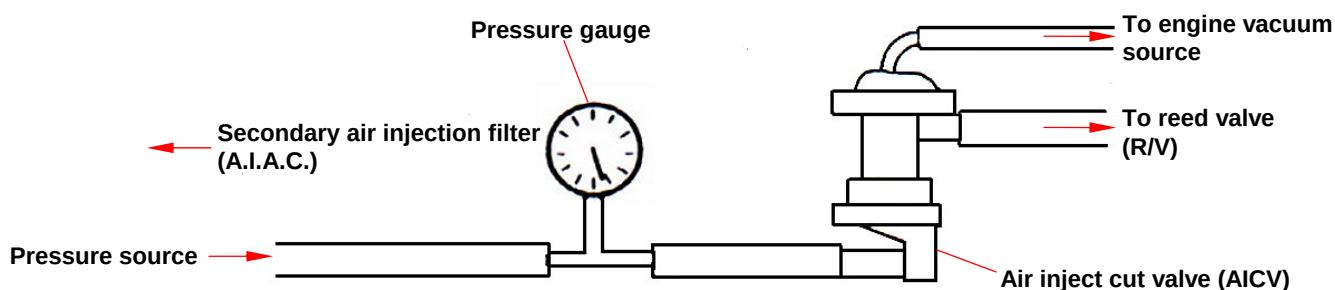
- System hose leakage.
- Loosen secondary air injection filter.
- Loosen secondary air injection filter hose.

### 4. AI System Service methods:

#### a. Visual check:

- Check reed valve, air cut-off valve, secondary air cleaner for outside damages.
- Check metal pipes and hoses for breakage and cracks.

#### b. Leak test:

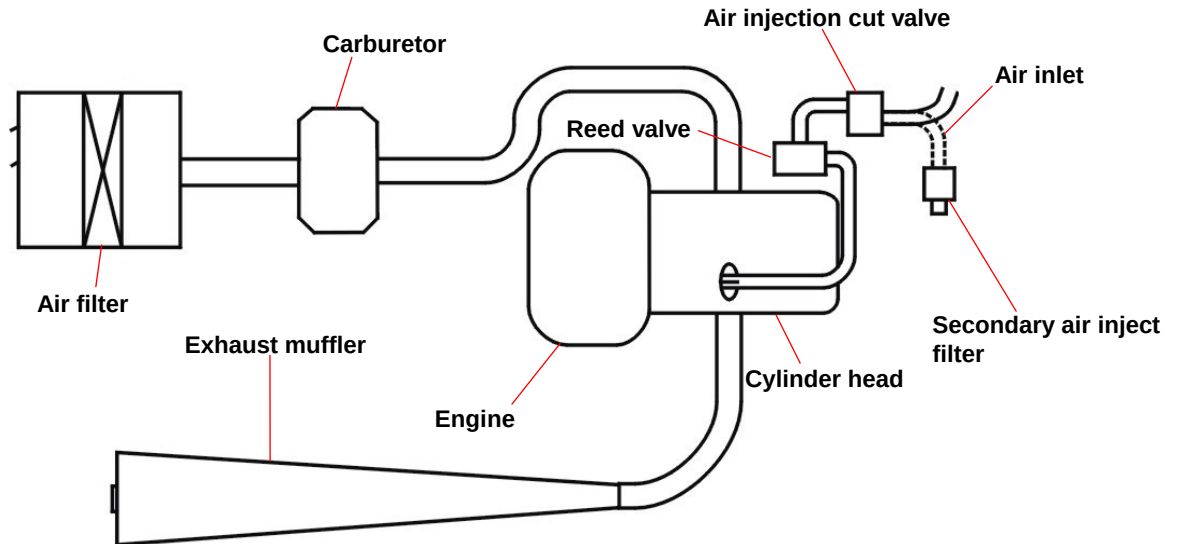


- Plug the hose leading to reed valve.
- Remove the hose of connection to air injection cut valve. Connect a T-type hose connector, pressure gauge and pressure source as shown above.
- With engine stopped, apply 1.0kg/cm<sup>2</sup> pressure to inlet and then plug it. There should be no leakage.

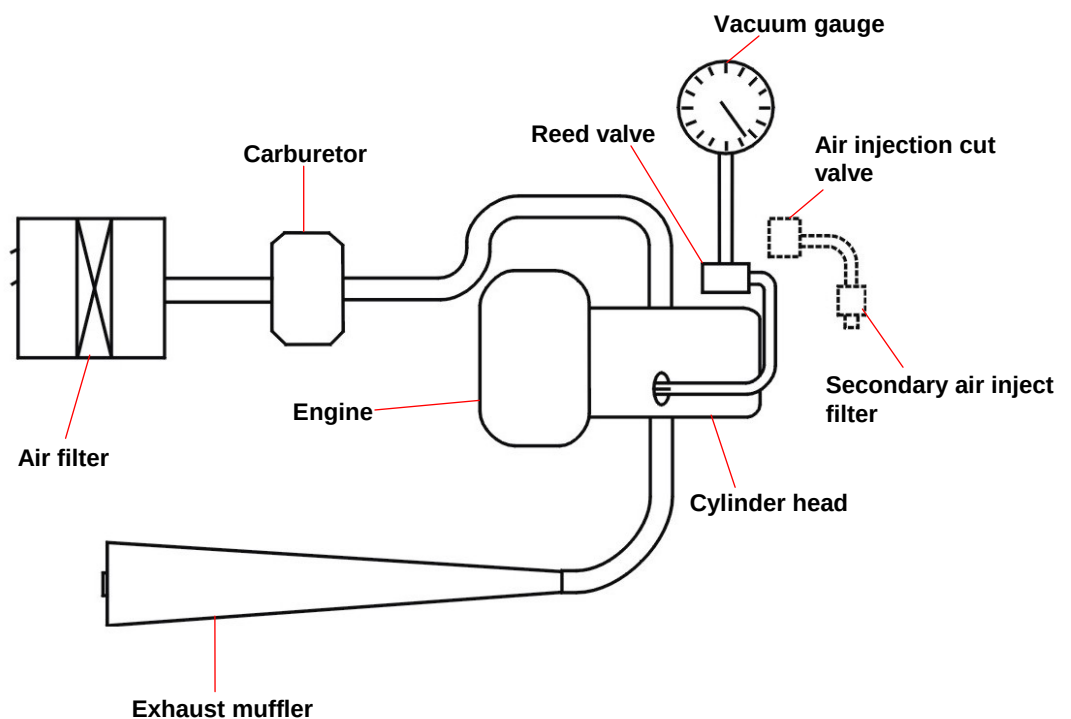


### 1. Warm-up test:

- Start engine.
- Remove the air injection filter.
- Check the air inlet if there is air-sucking sounds during idling (should hear Bo-Bo-Bo sound).



- If no sound is heard, remove air cut-off valve, and connect a vacuum meter to air pipe to check for leakage.

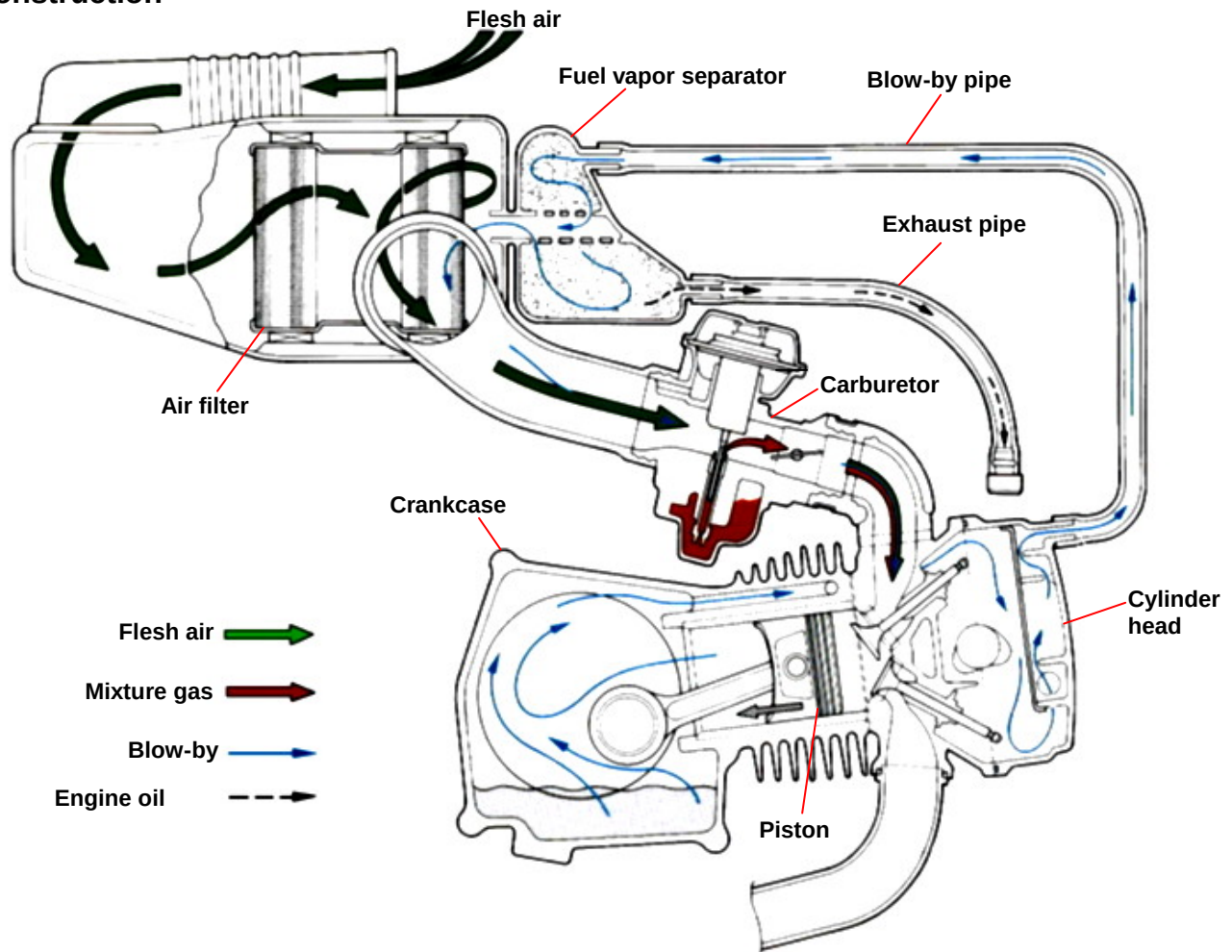


- If there is no vacuum, replace reed valve and test again.
- If there is no vacuum, check the air pipe for leakage, plugged or loose.

## 19. Emission Control System

### Positive Crankcase Ventilation System (P.C.V.)

#### 1. Construction



#### 2. Principle of operation:

- Install a separated chamber on cylinder head, and suck the blow-by gas to the fuel vapor separator by engine vacuum.
- Drill a hole in the air cleaner and install a vapor separator, so that blow-by from crankcase will flow through a cylinder check valve and then separated by the separator.
- The separated vapor will be sucked into combustion chamber by engine negative pressure to be burned again instead of discharging into atmosphere. Drain liquidized fuel in the drain pipe periodically.

#### 3. Service Methods

##### Visual check:

- Remove drain plug to drain the fuel when fuel level on the drain pipe reaches 80 % full.
- Check connecting hose for damage and looseness.

### Inspection Items

#### Secondary air injection system

1. Visual inspect the reed valve, air injection cut valve, and secondary air filter as well as hoses for damage.
2. Leaking check.
3. Warm-up running check.

#### Fuel Evaporation Control System

1. Visual inspect the carbon canister and hoses for damage.
2. Leaking check.
3. Function test of the purge control solenoid.

#### Catalytic converter

1. Check if exhaust gas content is within standard.
2. Remove the exhaust pipe and shake it gently for noise.

#### Fuel Supply System

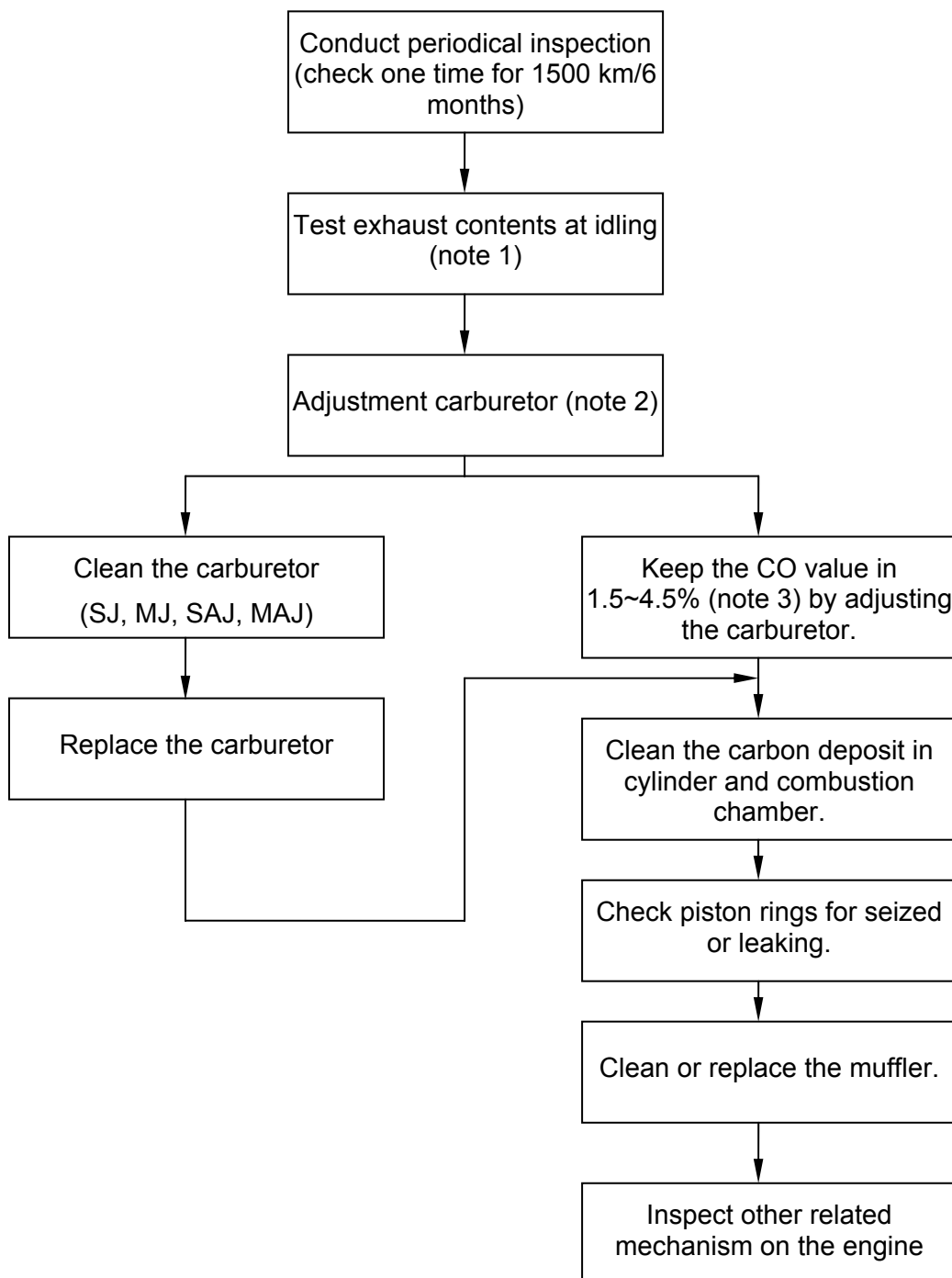
1. Clean the air filter.
2. Check the air filter.
3. Clean the carburetor fuel jet, air jet and all circuit with air gun or specified solvent.
4. Check the float level of carburetor.
5. Adjust CO/HC values at idling. (engine rpm must be within specification)

#### Ignition system

1. Spark plug check and replacement.
2. Ignition coil check and replacement.

## 19. Emission Control System

### Countermeasure for Emission Pollutants Not Within Standard as In Idle Speed (4-Stroke Engine)



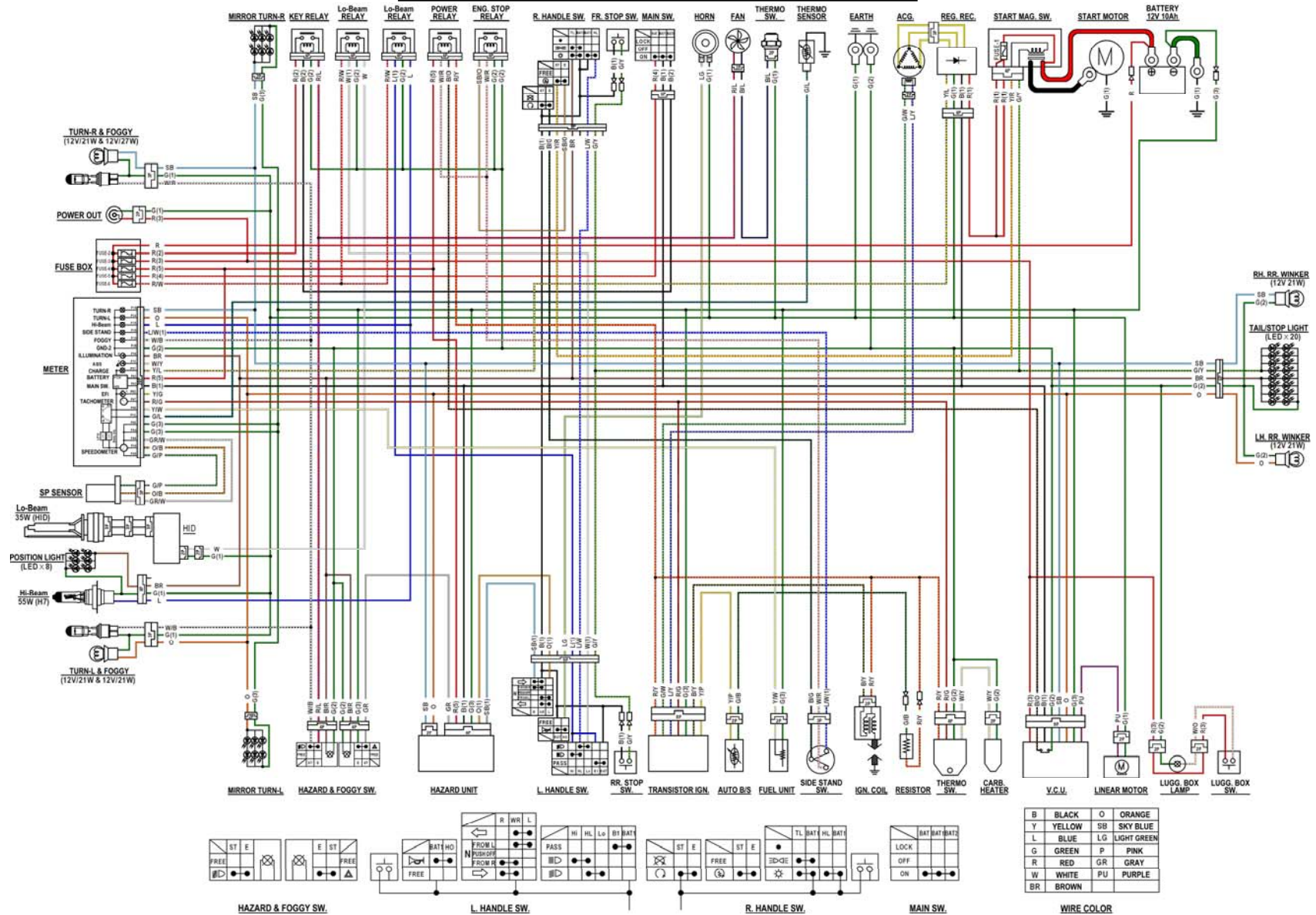
Note 1: Test it according to the idling test procedure.

Note 2: Adjustment the idle adjustment screw. Set the engine rpm in specified speed, and test CO, HC at idling. And then adjust the air adjustment screw at the same time to let CO value to be 1.5~4.5%.

Note 3: If the values still can not be reached to specification after adjusted the carburetor, then clean or replace it with new one according to the procedures.



## LM25W Electrical Diagram



## 20. Electrical Diagram

### LM25W EFi Electrical Diagram

