

# SERVICE MANUAL



This service manual contains the technical data of each component inspection and repair for the SYM series motorcycle. The manual is shown with illustrations and focused on 「Service Procedures」, 「Operation Key Points」, and 「Inspection Adjustment」 so that provides technician with service guidelines.

If the style and construction of the motorcycle are different from that of the photos, pictures shown in this manual, the actual vehicle shall prevail. Specifications are subject to change without notice.

This manual that contains all data, illustration, indication and specifications is based on current production information. SYM reserves the right to make changes at any time without notice and without incurring any obligation whatever. No part of this manual can be duplicated by any means without written permission of SYM.

**SERVICE DEPARTMENT**  
**SANYANG MOTOR CO., LTD.**

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# HOW TO USE THIS MANUAL

## SYM

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

The first chapter covers general information and trouble diagnosis.

The second chapter covers service maintenance information.

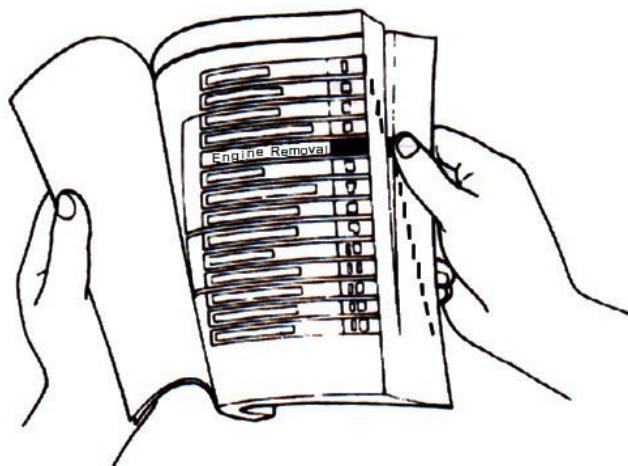
The third to the eleventh chapters cover engine and driving systems.

The twelfth to fifteenth chapters are contained the parts set of assembly body.

The sixteenth chapter is electrical equipment.

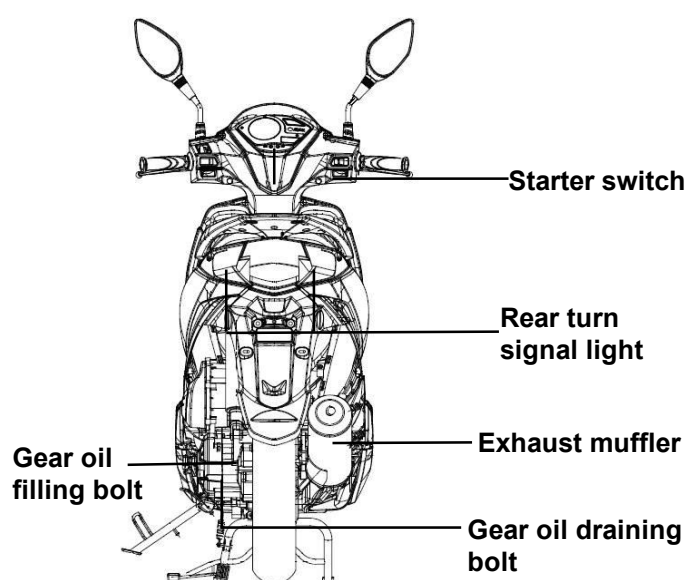
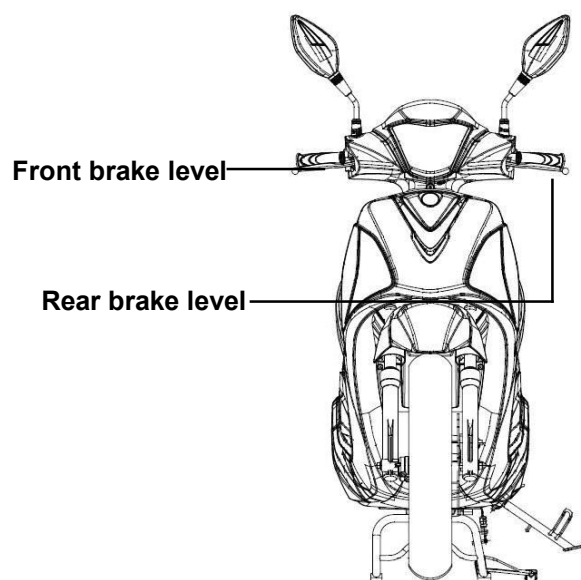
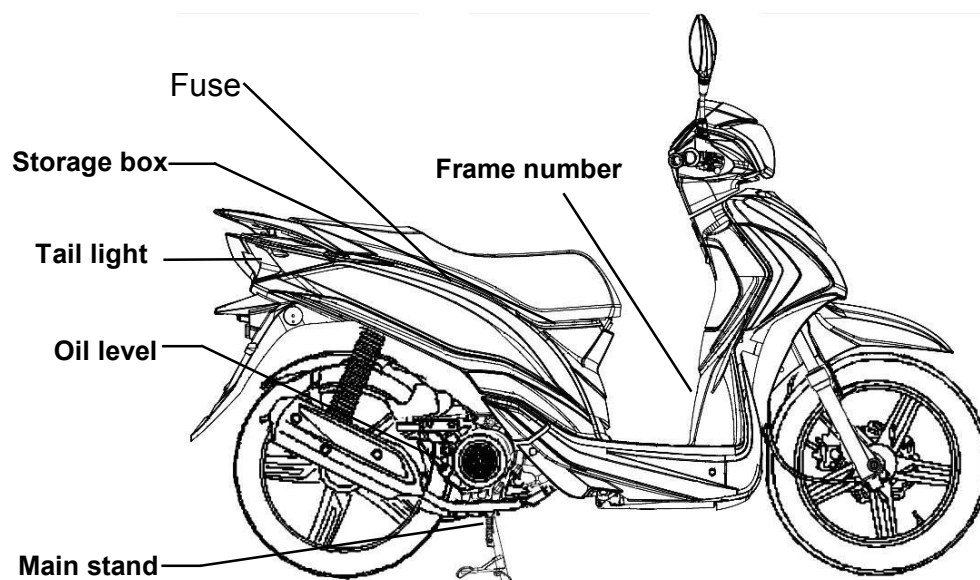
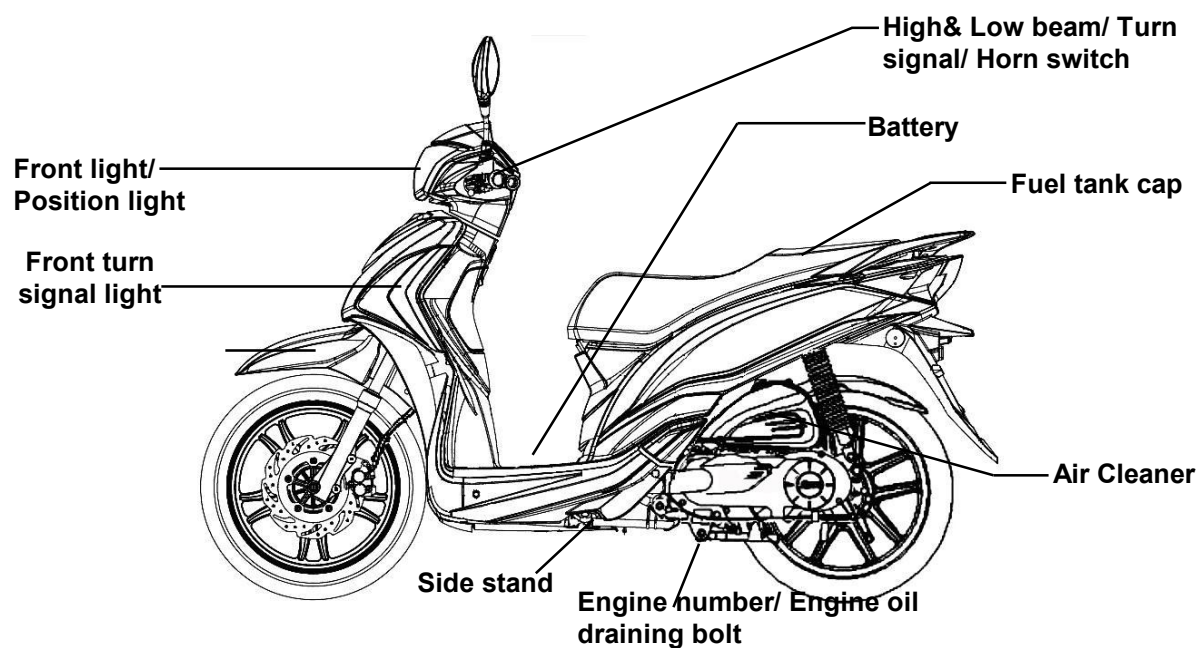
The seventeenth chapter is for wiring diagram.

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



## CONTENTS







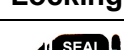


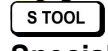





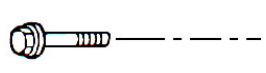
GENERAL INFORMATION/TROUBLE DIAGNOSIS .....	1
MAINTENANCE INFORMATION.....	2
LUBRICATION SYSTEM .....	3
FUEL SYSTEM.....	4
ENGINE REMOVAL.....	5
CYLINDER HEAD/VALVE .....	6
CYLINDER/PISTON .....	7
"V" TYPE BELT DRIVING SYSTEM/KICK STARTER ARM.....	8
FINAL DRIVING MECHANISM.....	9
A.C. GENERATOR/STARTING CLUTCH .....	10
CRANKCASE/CRANKSHAFT.....	11
BODY COVER.....	12
BRAKE SYSTEM .....	13
STEERING/FRONT WHEEL/FRONT SHOCK ABSORBER .....	14
REAR WHEEL/SUSPENSION.....	15
ELECTRICAL EQUIPMENT .....	16
WIRING DIAGRAM .....	17
SPECIAL TOOL .....	18



SYMBOLS AND MARKS .....	1-1	TORQUE VALUES (ENGINE) .....	1-10
GENERAL SAFETY .....	1-2	TORQUE VALUES (FRAME) .....	1-11
SERVICE PRECAUTIONS .....	1-3	TROUBLES DIAGNOSIS .....	1-12
SPECIFICATIONS .....	1-9	LUBRICATION POINTS .....	1-16

## SYMBOLS AND MARKS

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

 <b>Warning</b>	Means that serious injury or even death may result if procedures are not followed.
 <b>Caution</b>	Means that equipment damages may result if procedures are not followed.
 <b>Engine oil</b>	Limits to use SAE 10W-30 API SH/CD class oil. Warranty will not cover the damage that caused by not apply with the limited engine oil.
 <b>Gear oil</b>	Limits to use SAE 85W-140 class oil. Warranty will not cover the damage that caused by not apply with the limited gear oil.
 <b>Grease</b>	King Mate G-3 is recommended.
 <b>Locking sealant</b>	Apply sealant, medium strength sealant should be used unless otherwise specified.
 <b>Oil seal</b>	Apply with lubricant.
 <b>Renew</b>	Replace with a new part before installation.
 <b>Brake fluid</b>	Use recommended brake fluid DOT3 or WELLRUN brake fluid.
 <b>Special tools</b>	Special service tools.
 <b>Correct</b>	Meaning correct installation.
 <b>Wrong</b>	Meaning wrong installation.
 <b>Indication</b>	Indication of components.
 <b>Directions</b>	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**

If you must run your engine, ensure the place is well ventilated. Never run your engine in a closed area. Run your engine in an open area, if you have to run your engine in a closed area, be sure to use an extractor.

**Caution**

Exhaust contains toxic gas which may cause one to lose consciousness and even result in death.

**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 children.

**Used engine oil****Caution**

Prolonged contact with used engine oil (or transmission oil) may cause skin cancer although it might not be verdict.

**Hot components****Caution**

Components of the engine and exhaust system can become extremely hot after engine running. They remain very hot even after the engine has been stopped for some time. When performing service work on these parts, wear insulated gloves and wait until cooling off.

**Battery****Caution**

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

**Brake shoe**

Do not use an compressed air or a dry brush to clean components of the brake system, use a vacuum cleaner or the equivalent to avoid asbestos dust flying.

**Caution**

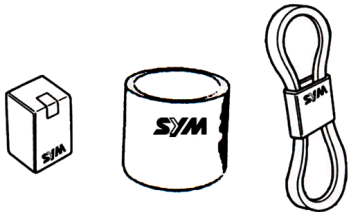
Inhaling asbestos dust may cause disorders and cancer of the breathing system.

**Brake fluid****Caution**

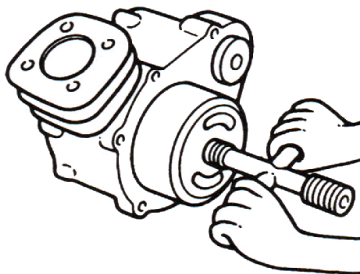
Spilling brake fluid on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the above-mentioned parts for protection when servicing the brake system. Keep brake fluid beyond reach of

## SERVICE PRECAUTIONS

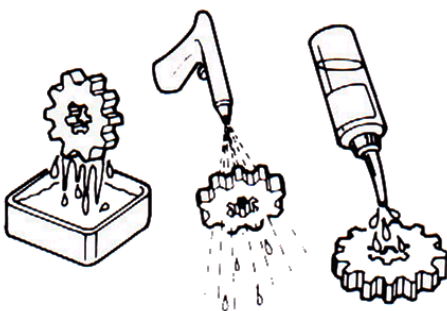
- Always use with SANYANG genuine parts and recommended oils. Using non-designed parts for SANYANG motorcycle may damage the motorcycle.



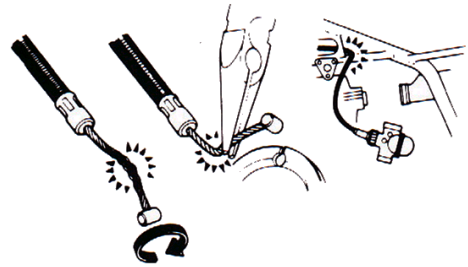
- Special tools are designed for remove and install of components without damaging the parts being worked on. Using wrong tools may result in parts damaged.



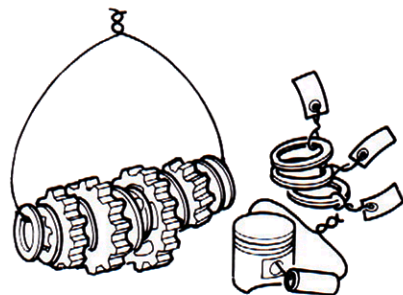
- When servicing this motorcycle, use only metric tools. Metric bolts, nuts, and screws are not interchangeable with the English system, using wrong tools and fasteners may damage this vehicle.
- Clean the outside of the parts or the cover before removing it from the motorcycle. Otherwise, dirt and deposit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



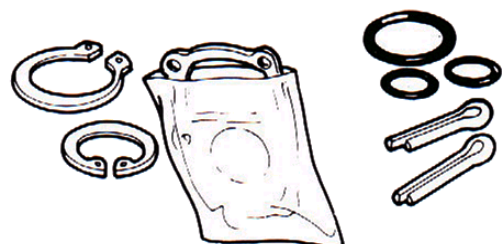
- Never bend or twist a control cable to prevent stiff control and premature worn out.



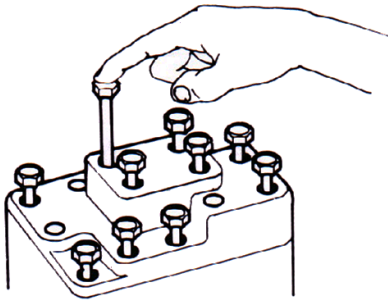
- Rubber parts may become deteriorated when old, and prone to be damaged by solvent and oil. Check these parts before installation to make sure that they are in good condition, replace if necessary.
- When loosening a component which has different sized fasteners, operate with a diagonal pattern and 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.



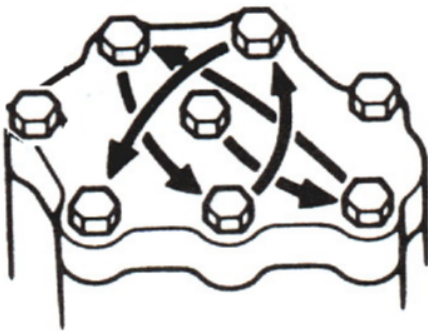
- Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).
- Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap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



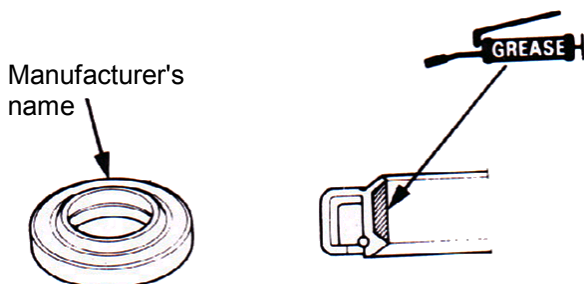
- The length of bolts and screws for assemblies, cover plates or boxes is different from one another, be sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length out side the hole is the same with other bolts, it is a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



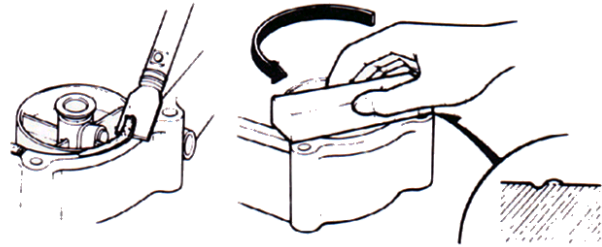
- Tighten assemblies with different dimension fasteners as follows:
- Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless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



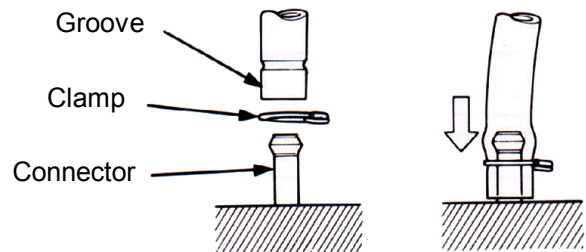
- When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.



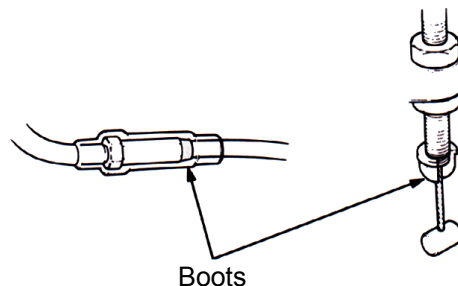
- Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any



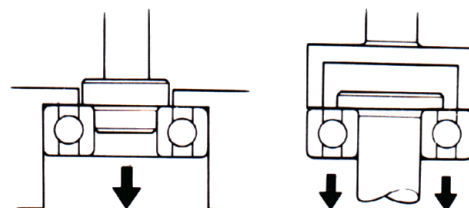
- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.



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

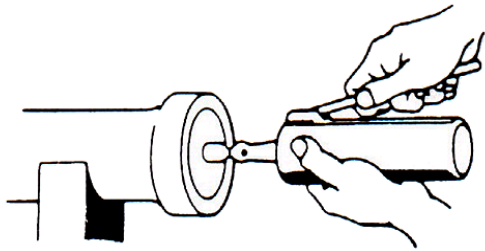


- The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both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

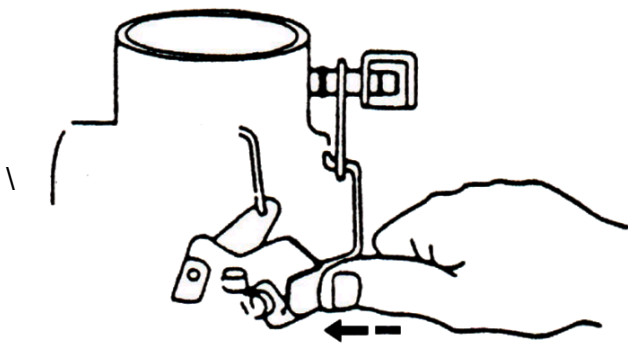


Both of these examples can result in bearing damage.

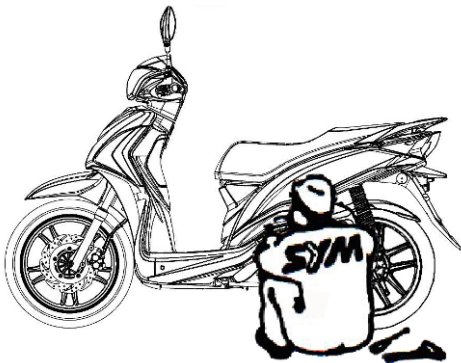
- Lubricate the rotation face with specified lubricant on the lubrication points before assembling.



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



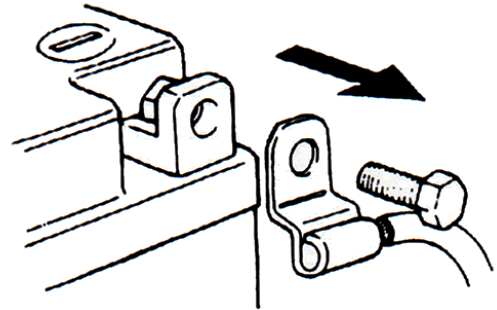
- Make sure service safety each other when



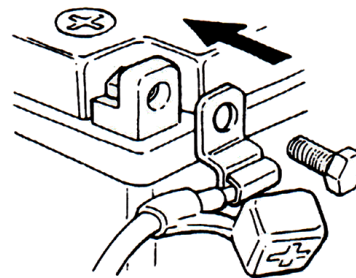
- Note that do not let parts fall down



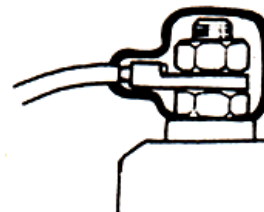
- Before battery removal operation, it has to remove the battery negative (-) cable firstly. Note tools like open-end wrench do not contact with body to prevent from circuit short and create spark.



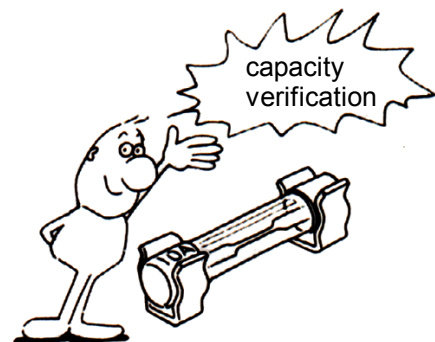
- After service completed, make sure all connection points is secured. Battery positive (+) cable should be connected firstly. And the two posts of battery have to be greased after connected the cables.



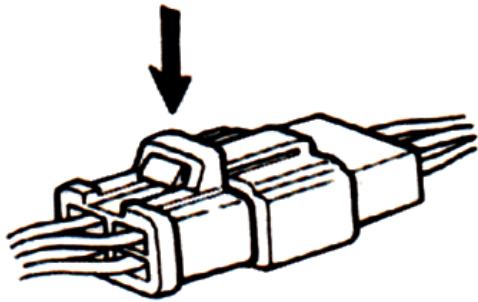
- Make sure that the battery post caps are located in properly after the battery posts had been serviced.



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



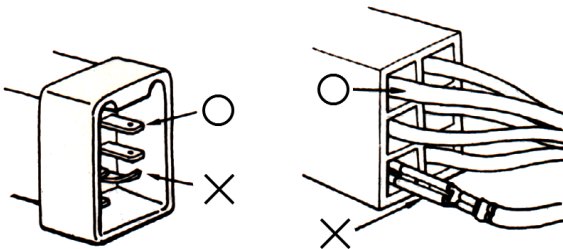
- When separating a connector, it locker has to be unlocked firstly. Then, conduct the service operation.



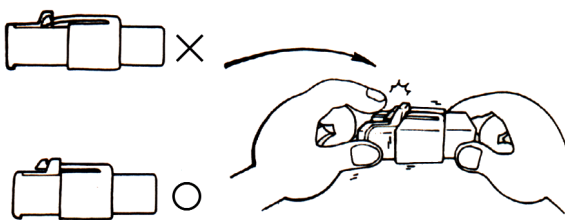
- Do not pull the wires as removing a connector or wires. Hold the connector body.



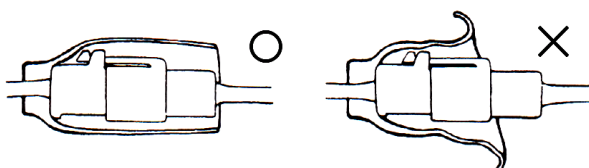
- Make sure if the connector pins are bent, extruded or loosen.



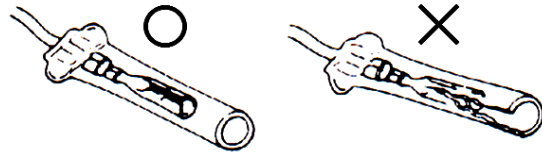
- Insert the connector completely. If there are two lockers on two connector sides, make sure the lockers are locked in properly. Check if any wire loose.



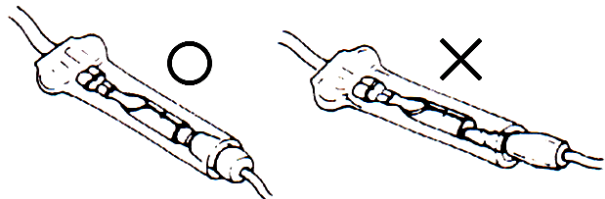
- Check if the connector is covered by the twin connector boot completely and secured properly.



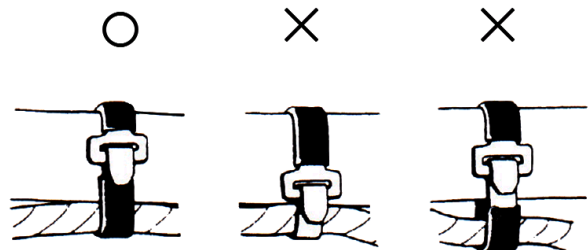
- Before terminal connection, check if the boot is crack or the terminal is loose.



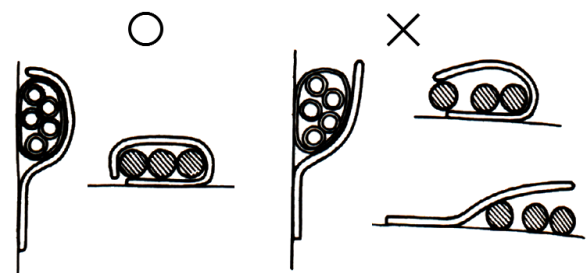
- Insert the terminal completely. Check if the terminal is covered by the boot. Do not let boot open facing up.



- 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.



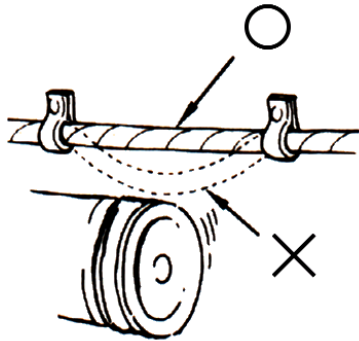
- Wire band and wire harness have to be clamped secured properly.



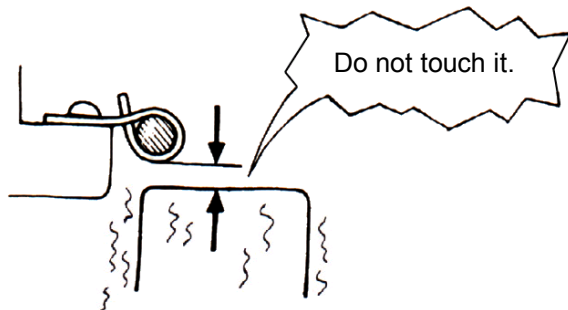
- Do not squeeze wires against the weld or its clamp.



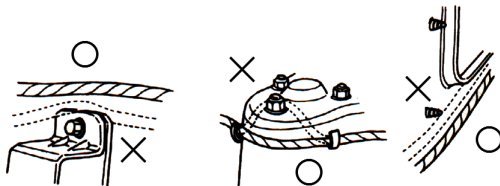
- Do not let the wire harness contact with rotating, moving or vibrating components as routing the harness.



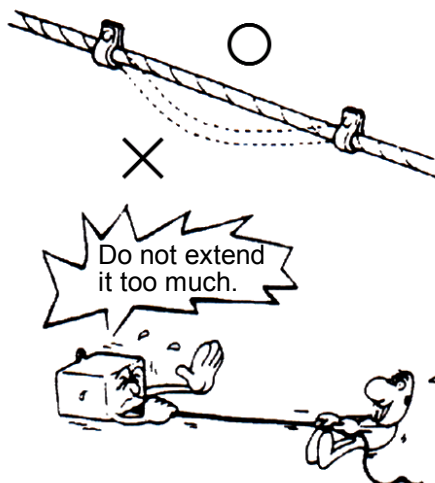
- Keep wire harnesses far away from the hot parts.



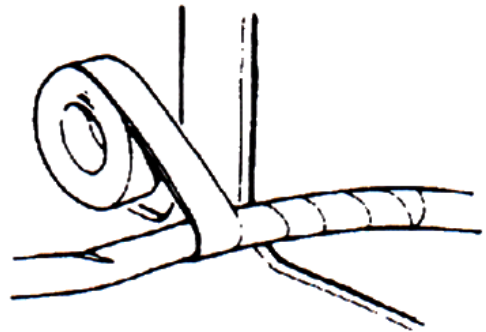
- Route wire harness to avoid sharp edges or corners and also avoid the projected ends of bolts and screws.



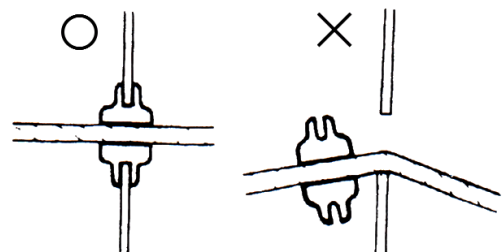
- Route harnesses so that they neither pull too tight nor have excessive slack.



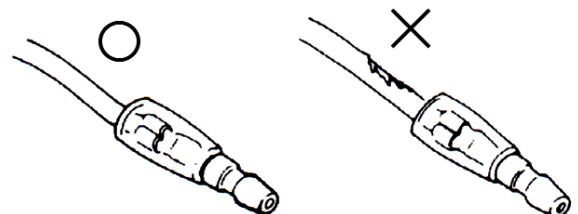
- Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.



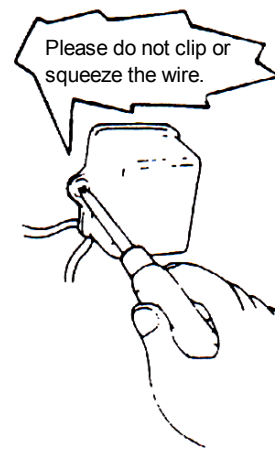
- Secure the rubber boot firmly as applying it on wire harness.



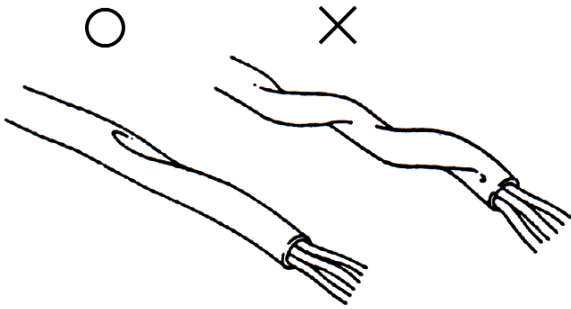
- Never use wires or harnesses which insulation has been broken. Wrap electrical tape around the damaged parts or replace them.



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



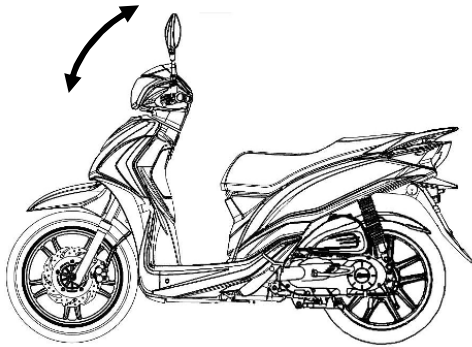
- Do not let the wire harness been twisted as installation.



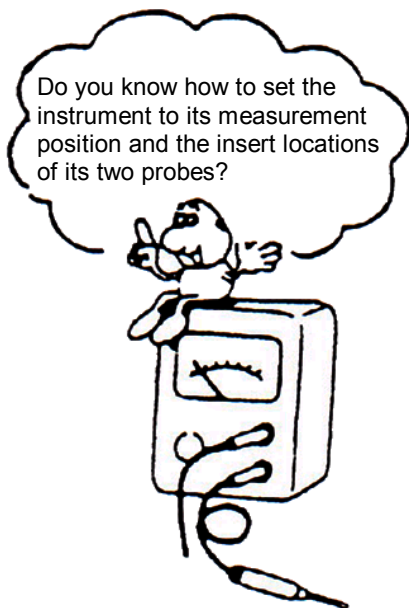
- With sand paper to clean rust on connector pins/terminals if found. And then conduct connection operation later.



- 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.



## SPECIFICATIONS

MAKER			SANYANG	MODEL		XB20W1-EU
DIMENSION	Overall Length		1995±20mm	Suspension System	Front	TELESCOPIC FORK
	Overall Width		725±10mm		Rear	DOUBLE SWING ARM
	Overall Height		1195±20mm	Tire Specifications	Front	110/70-16
	Wheel Base		1350±10mm		Rear	110/70-16
WEIGHT	Curb Weight	Front	48 kg	Brake System	Front	DISK (ø 260 mm)
		Rear	79 kg		Rear	DISK (ø 240 mm)
		Total	127kg			
	Passengers/Weight		Two men/184 kg	Performance	Max. Speed	100km/hr Above
	Total Weight	Front	80kg		Climb Ability	18° Below
		Rear	197 kg	Deceleration equipment	Primary Reduction	C.V.T.
		Total	277kg		Secondary Reduction	GEAR
	Type		4-STROKE ENGINE		Deceleration equipment	Clutch
Installation and arrangement		Vertical, below center, incline 80°	Transmission	V-belt		
ENGINE	Fuel Used		Unleaded (93/95)	Speedometer		0 ~ 140 km/hr
	Cycle/Cooling		4-stroke/forced air cooled	Horn		93~115 dB/A
	Cylinder	Bore	61 mm	Muffler		Expansion & Pulse Type
		Stroke	57.8 mm	Exhaust Pipe Position and Direction		Right side, and Backward
		Number/Arrangement	Single Cylinder	Lubrication System		Separated-lubrication
	Displacement		168.9 cc	Exhaust Emission (IDLE)	CO%	<2.0 g/km
	Compression Ratio		10.2±0.2 : 1		HC%	<0.3 g/km
	Idle speed		1800±100 rpm	Fuel tank capacity		7.5L
	Max. HP		8.8KW / 7500 rpm	Air Filtration		Paper filter
	Max. Torque		12.5N.m / 5500 rpm	Noise Emission		< 77dB
	ECU Throttle bore		26 mm	Fuse		15A×2 &25A×1&10A×1
	Starting System		Electrical starter			

## TORQUE VALUES (ENGINE)

ITEM	Q'TY	THREAD DIA (mm)	TORQUE VALUE(Kg-m)	REMARKS
A.C. generator flange bolts	2	6	0.8~1.2	
L side cover plate pan screws	7	5	0.5~0.7	
Engine oil filter screen cover	1	30	1.0~2.0	
Crankcase bolts	2	6	0.8~1.2	
Oil pump flat screws	2	6	0.8~1.2	
Cylinder/cylinder head two-ends bolts	4	8	0.7~1.1	Tighten to crankcase
Cylinder head left side bolts	2	6	0.7~1.1	
Camshaft sprocket bolts	2	6	1.0~1.5	
Valve adjustment fixing nuts	2	5	0.7~1.1	Apply oil to thread
Camshaft chain Tensioner bolts	2	6	0.8~1.2	
A/I fixing flange bolts	4	6	0.8~1.2	
Oil pump separator bolts	2	6	0.8~1.2	
One-way clutch lock nut	1	22	9.0~10.0	Apply oil to thread
Right crankcase cover bolts	10	6	0.7~1.1	
Pulse generator bolts	2	5	0.4~0.6	
A.C. generator flange bolts	2	5	0.8~1.2	
Flywheel nut	1	12	5.0~6.0	
Cooling fan flange bolts	4	6	0.8~1.2	
Shroud A/B	2	6	0.7~1.1	
Engine oil draining plug bolt	1	12	3.5~4.5	
Start motor bolts	2	6	0.7~1.1	
Transmission bolts	7	8	2.6~3.0	
Gear oil draining plug	1	8	1.0~1.5	
Gear oil filling bolt	1	8	1.0~1.5	
Driven pulley nut	1	12	5.5~6.0	
Driving face nut	1	12	5.0~6.0	
Left crankcase cover bolts	8	6	0.8~1.2	
Cylinder head holder nuts	4	8	1.8~2.2	
Cylinder head cover bolts	4	6	0.8~1.2	
Spark plug	1	10	1.0~1.2	
Carburetor heat protector connecting nuts	2	6	0.7~1.1	
Exhaust pipe bolts	3	8	3.0~3.6	
Exhaust pipe connecting nuts	2	6	1.0~1.4	

**TORQUE VALUES (FRAME)**

ITEM	Q'TY	THREAD DIA (mm)	TORQUE VALUE(Kg-m)	REMARKS
Mounting nut for steering rod	1	25.4	1.0~2.0	
Cone seat for steering rod	1	25.4	0.2~0.3	
Front wheel shaft nut	1	12	5.0~7.0	
Rear wheel shaft nut	1	16	11.0~13.0	
Speedometer cable locking screw	1	5	0.15~0.3	
Front shock absorber mounting bolts	4	8	2.4~3.0	
Rear shock absorber upper connection bolt	1	10	3.5~4.5	
Rear shock absorber lower connection bolt	1	8	2.4~3.0	
Brake lever bolts	2	6	0.8~1.2	
Front brake hose bolts	4	10	3.3~3.7	
Front brake air-bleeding valve	1	6	0.8~1.0	
Front brake disc mounting bolts	5	8	2.8~3.2	
Front brake clipper mounting bolts	2	10	3.1~3.5	
RR.brake disc mounting bolts	5	8	2.8~3.2	
RR.caliper flange bolts	2	10	3.1~3.5	
RR.brake hose bolts	4	10	3.3~3.7	
CBS control valve mounting bolts	2	6	1.0~1.4	
Engine suspension bracket bolts	2	10	4.5~5.5	On frame side
Engine connection bolt	1	10	4.5~5.5	On engine side
Main standard nut	1	10	3.5~4.5	
Foot-starting lever bolt	1	6	1.6~1.8	
Air cleaner bolts	2	6	1.0~1.4	

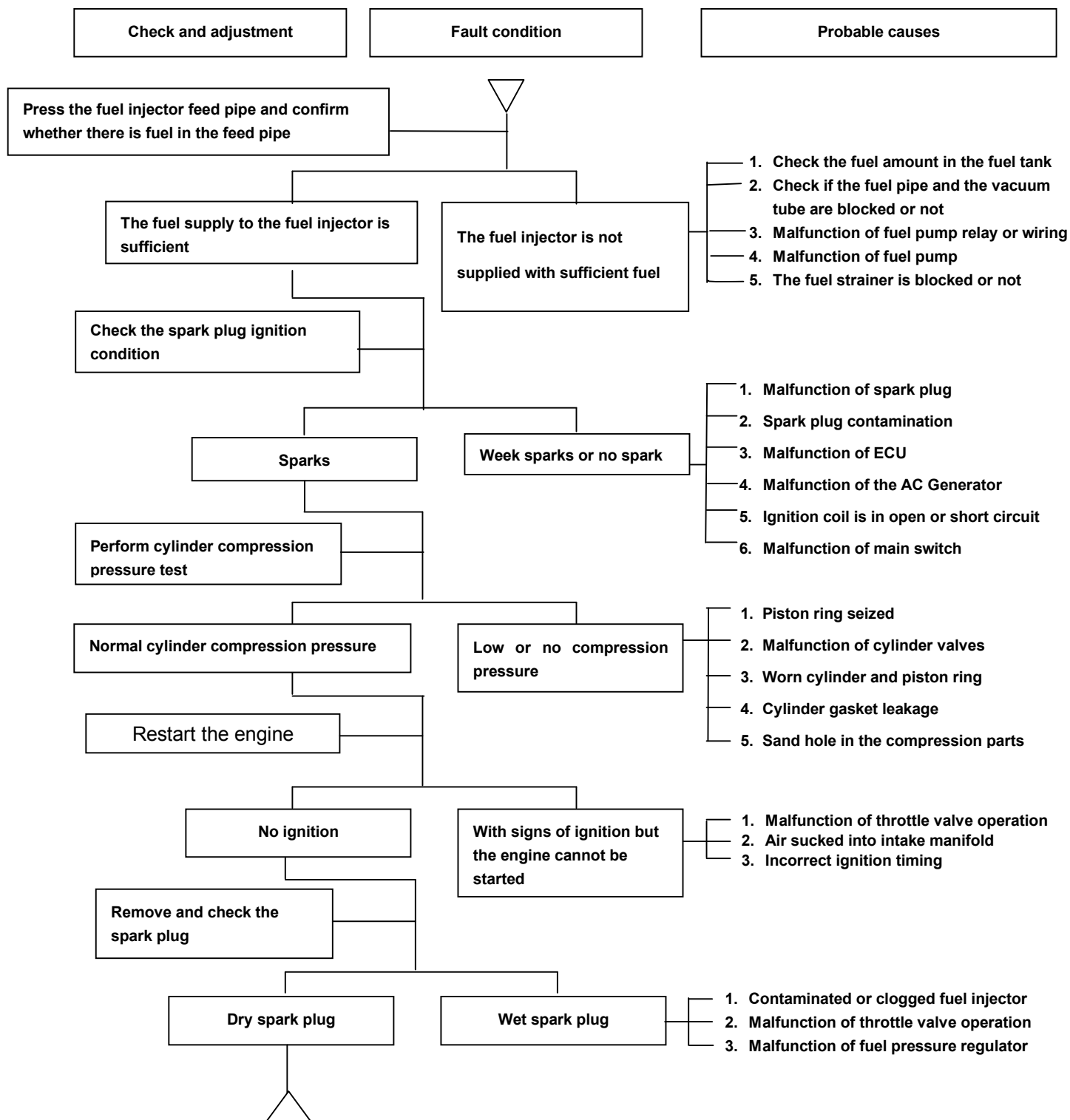
The torque values listed in above table are for more important tighten torque values. Please see standard values for not listed in the table.

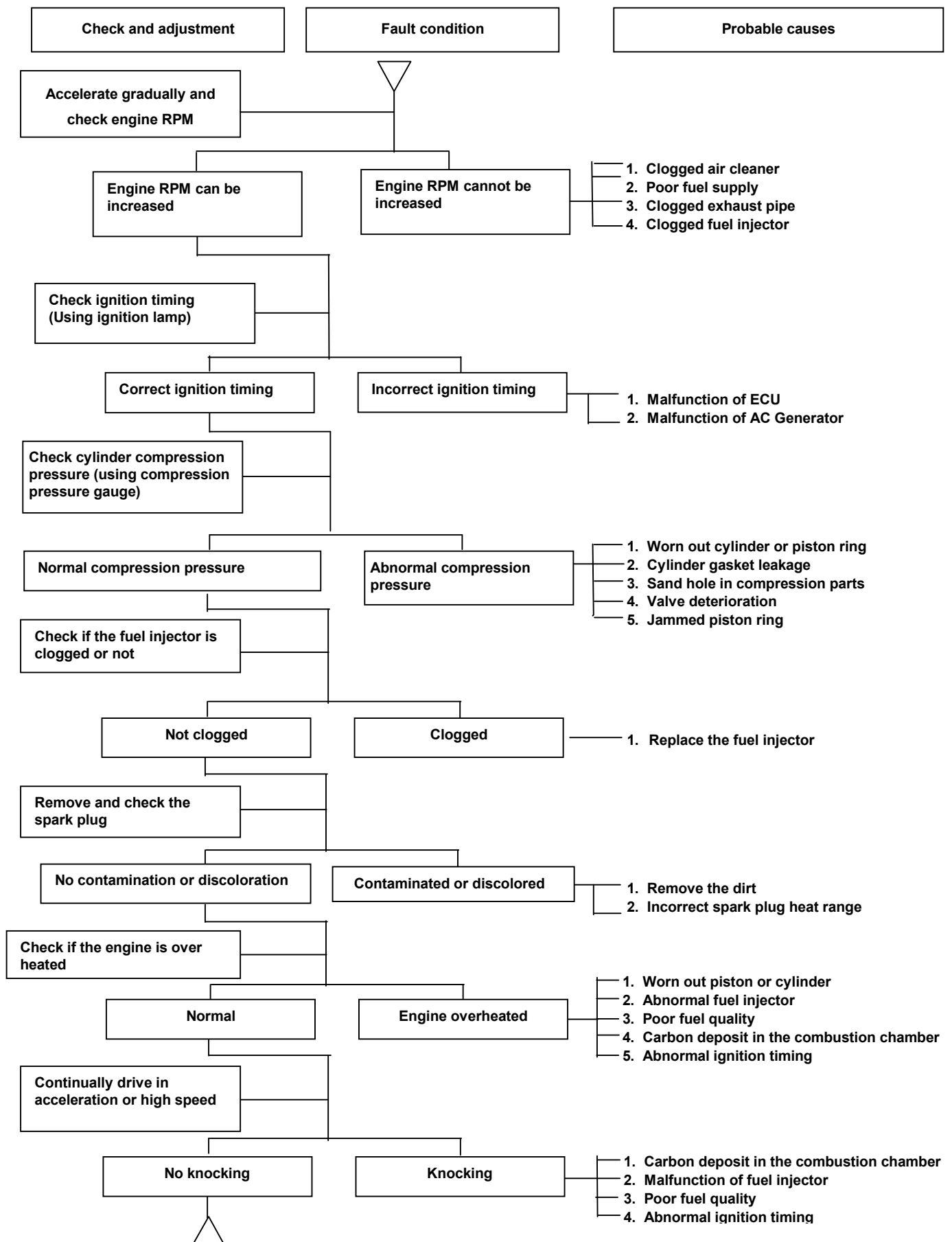
**Standard Torque Values for Reference**

TYPE	TIGHTEN TORQUE	TYPE	TIGHTEN TORQUE
5mm bolt 、nut	0.45~0.60kgf-m	3mm screw	0.05~0.08kgf-m
6mm bolt 、nut	0.80~1.20kgf-m	4mm screw	0.10~0.15kgf-m
8mm bolt 、nut	1.80~2.50kgf-m	5mm screw	0.35~0.50kgf-m
10mm bolt 、nut	3.00~4.00kgf-m	6mm screw 、SH nut	0.70~1.10kgf-m
12mm bolt 、nut	5.00~6.00kgf-m	6mm bolt 、nut	1.00~1.40kgf-m
		8mm bolt 、nut	2.40~3.00kgf-m
		10mm bolt 、nut	3.50~4.50kgf-m

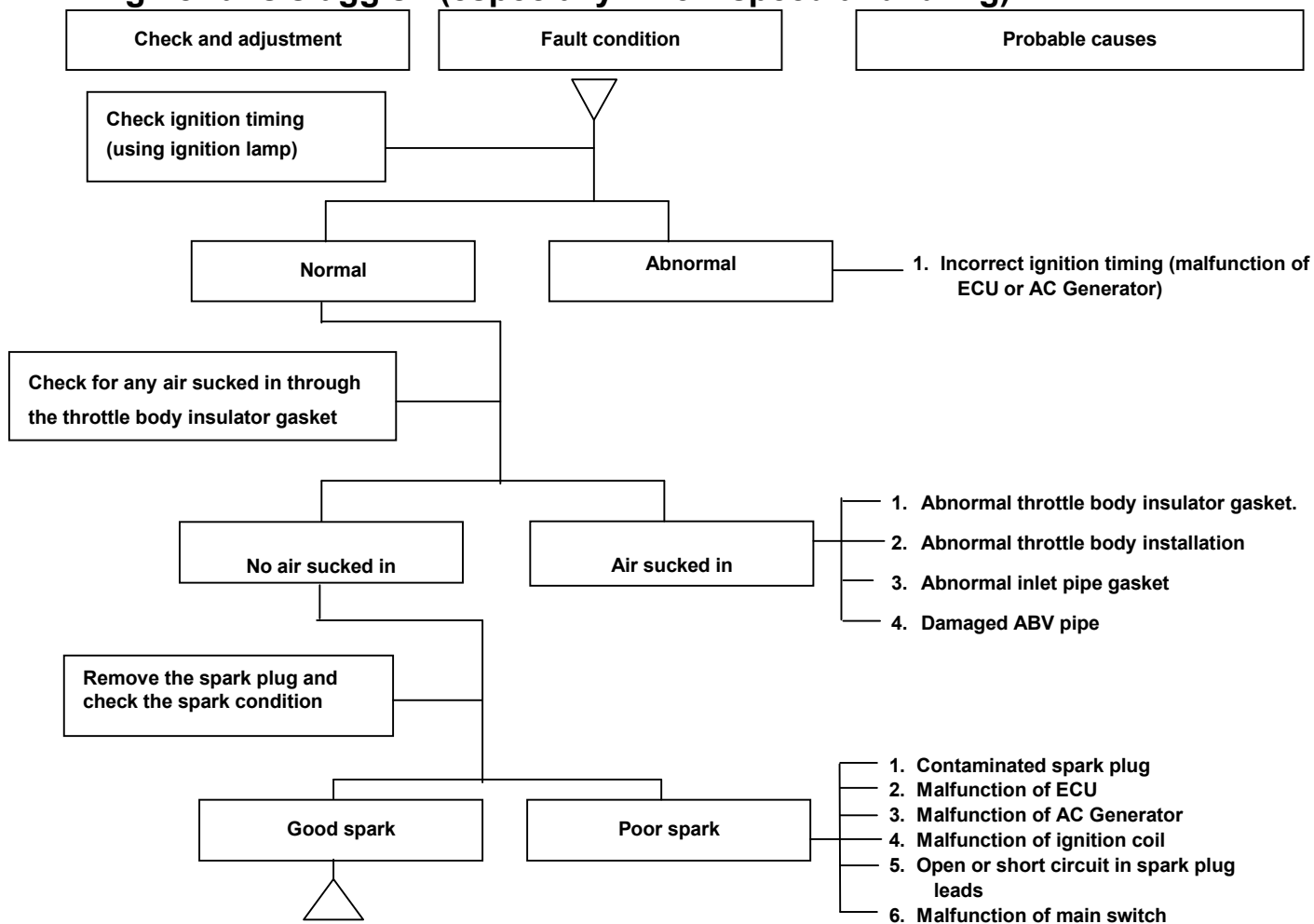
## Troubleshooting-EFi model

### A. Engine cannot be started or difficult to be started

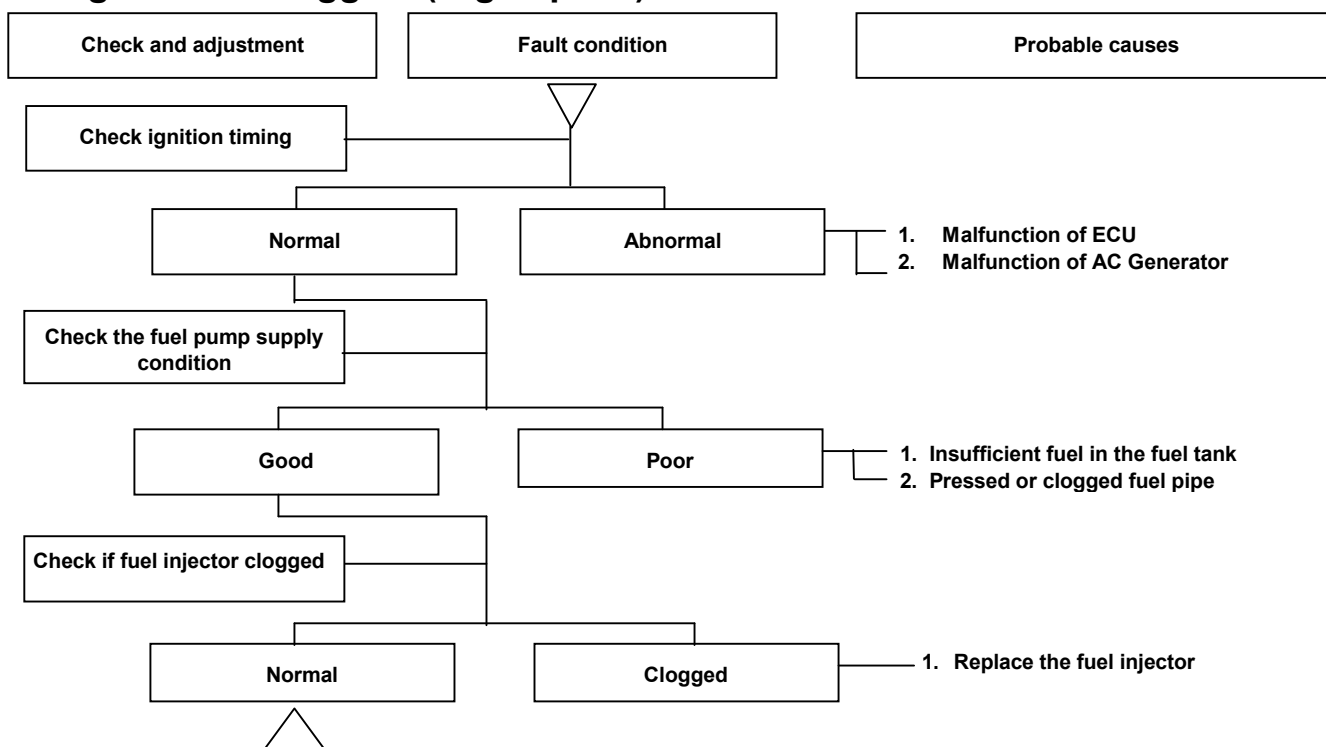


**B. Engine runs sluggish (Speed does not pick up, lack of power)**

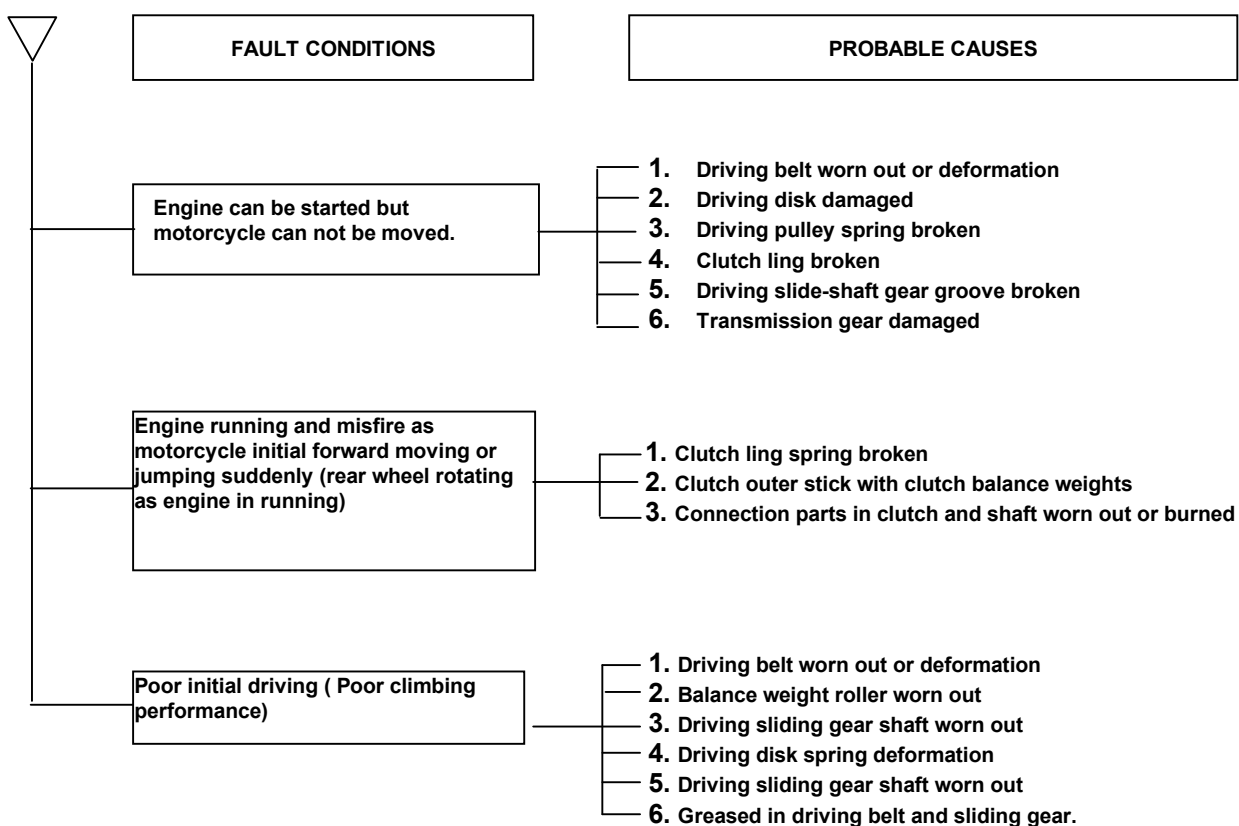
## C. Engine runs sluggish (especially in low speed and idling)



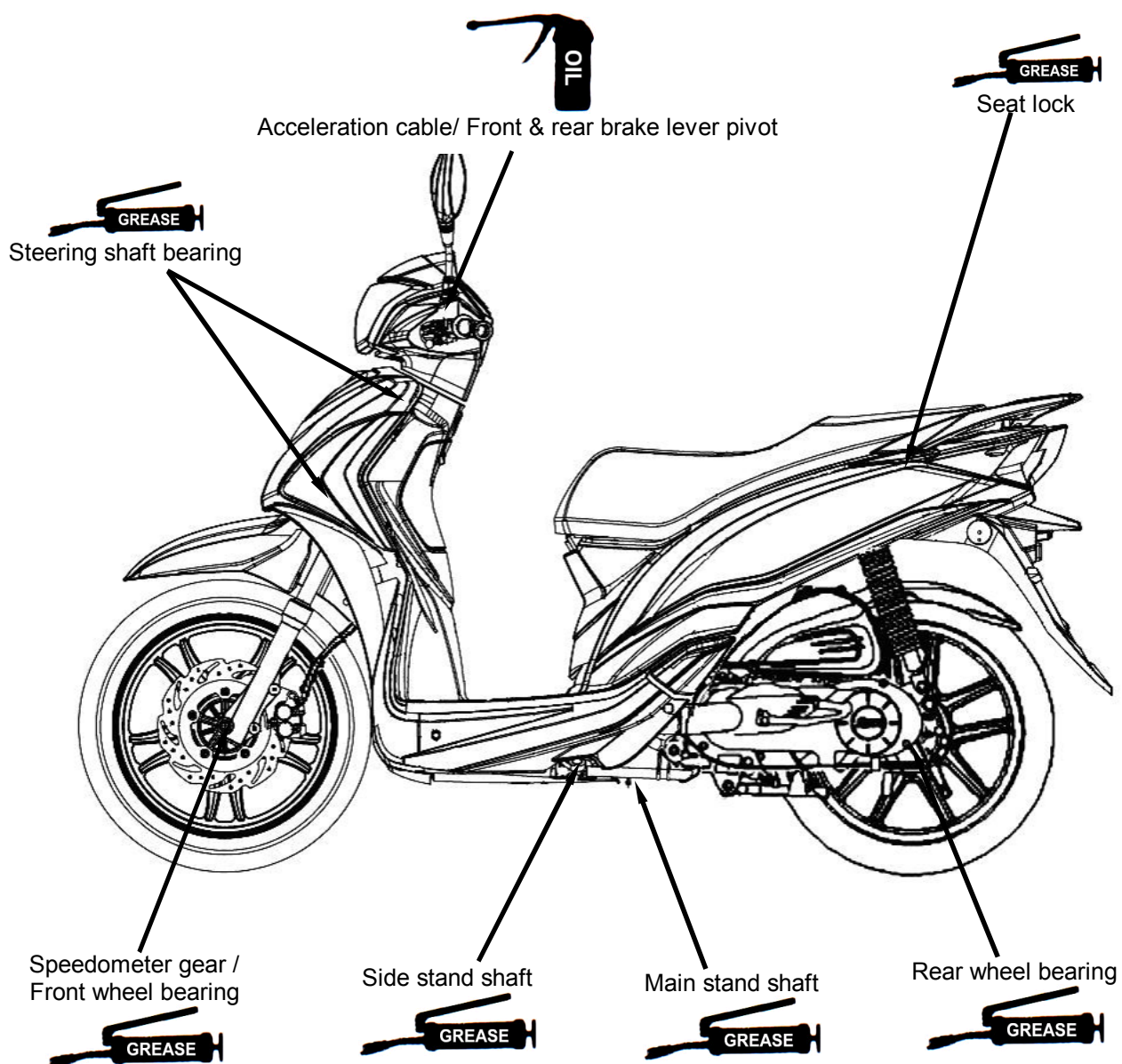
## D. Engine runs sluggish (High speed)



## E. CLUTCH, DRIVING AND DRIVING PULLEY



## LUBRICATION POINTS



PRECAUTIONS IN OPERATION .....2-1	IGNITION SYSTEM/SPARK PLUG ..2-8
PERIODICAL MAINTENANCE	CYLINDER COMPRESSION
SCHEDULE .....2-2	PRESSURE.....2-9
LUBRICATION SYSTEM.....2-3	DRIVING SYSTEM.....2-9
FUEL SYSTEM.....2-4	STEERING SYSTEM.....2-10
AIR CLEANER.....2-5	SUSPENSION SYSTEM .....2-10
THROTTLE VALVE OPERATION .....2-5	FRONT DISK BRAKE SYSTEM .....2-11
CRANKCASE BLOW-BY SYSTEM ....2-6	DRUM BRAKE SYSTEM .....2-13
VALVE CLEARANCE INSPECTION &	WHEEL/TIRE .....2-14
ADJUSTMENT.....2-6	BATTERY .....2-15
CARBURETOR IDLING SPEED	HEADLIGHT ADJUSTMENT .....2-15
ADJUSTMENT .....2-7	NUTS、BOLTS TIGHTEN.....2-15

## PRECAUTIONS IN OPERATION

### Specification

Fuel Tank Capacity	7.50L	
Engine Oil	capacity	950 c.c.
	change	700 c.c.
Transmission Gear oil	capacity	180 c.c.
	change	170 c.c.
Clearance of throttle valve	2~6 mm	
Spark plug	CR7HSA	
“F” Mark in idling speed	Before TDC 13° / 1700 rpm	
Full timing advanced	Before TDC 27° / 8000 rpm	
Idling speed	1800±100 rpm	
Cylinder compression pressure	10.2±0.2 kg/cm <sup>2</sup>	
Valve clearance: IN/EX	0.12±0.02 mm	
Tire dimension	front / rear	110/70-16 / 110/70-16
Tire pressure (cold)	single	Front: 2.00 kg/cm <sup>2</sup> rear: 2.00 kg/cm <sup>2</sup>
	Two persons	Front: 2.00 kg/cm <sup>2</sup> rear: 2.25 kg/cm <sup>2</sup>
battery	12V6Ah (closed type, maintenance-free battery)	
Play of drum brake lever	10~20 mm	

## PERIODICAL MAINTENANCE SCHEDULE

Maintenance Code	Item	Initial 300KM	1 Month Every1000KM	3 month Every3000KM	6 month Every6000KM	1 year Every12000KM
1	☆Air cleaner	I		C	C	R
2	☆Fuel filter	I			I	R
3	☆Oil filter	C			C	C
4	☆Engine oil change	R	Replacement for every 1000km			
5	Tire pressure	I	I			
6	Battery inspection	I	I			
7	Brake & free play check	I	I			
8	Steering handle check	I	I			
9	Cushion operation check	I	I			
10	Every screw tightening check	I	I			
11	Gear oil check for leaking	I	I			
12	☆Spark plug check or change	I		I	R	
13	☆Gear oil change	R	Replacement for every 5000km			
14	Frame lubrication				L	
15	Exhaust pipe	I	I			
16	☆Ignition timing	I	I			
17	☆Emission check in Idling	A	I			
18	☆Throttle operation	I		I		
19	☆Engine bolt tightening	I		I		
20	☆CVT driving device (belt )				I	R
21	☆CVT driving device (roller)				C	
22	Lights/electrical equipment/multi-meters	I	I			
23	Main/side stands & springs	I			I	
24	Fuel pipes	I		I		
25	Cam chain	I		I		
26	☆Valve clearance	I		A		
27	☆Crankcase blow-by over-flow pipe	I	Replacement for every 2000km			

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 1000 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 user manual instructions. They are prohibited to be adjusted or repaired by unauthorized people. Otherwise, SYM is not responsible for the charge.
2. Clean or replace the air cleaner element more often when the motorcycle is operated on dusty roads or in the heavily-polluted environment.
3. Maintenance should be performed more often if the motorcycle is frequently operated in high speed and after the motorcycle has accumulated a higher mileage.
4. Preventive maintenance
  - a. Ignition system - Perform maintenance and check when continuous abnormal ignition, misfire, after-burn, overheating occur.
  - b. Carbon deposit removal - Remove carbon deposits in cylinder head, piston heads, exhaust system when power is obviously lower than ever.
  - c. Replace worn out pistons, cylinder head.

### LUBRICATION SYSTEM

#### Engine Oil Capacity

##### Caution

- The vehicle must be parked on a level ground when checking oil capacity.
- Run the engine for 2-3 minutes then stop, wait about 2-3 more minutes allowing engine oil to settle before checking the oil level.

Remove dipstick to check the oil level. If oil level is below the lower limit mark, add oil to the specified upper limit mark.

#### Oil change

Shut off the engine and remove dipstick. Remove the oil drain plug on the bottom-left of crankcase to drain oil.

After draining out oil, clean oil plug and its gasket and reinstall. Replace the gasket if it is damaged.

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

##### Caution

Warm up the engine. This will make the oil flow out easily.

Add oil to the specified capacity.

Oil Viscosity: SAE 10W-30, recommended using King-Mate serial oil.

**Engine oil capacity:**

**Disassembly: 950cc**

**Change: 700cc**

When checking for oil leak, run the engine at idle speed for a few minutes, then check oil capacity with dipstick.

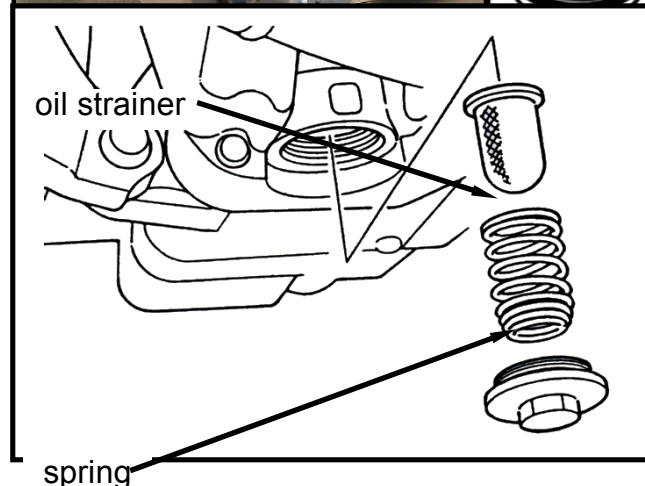
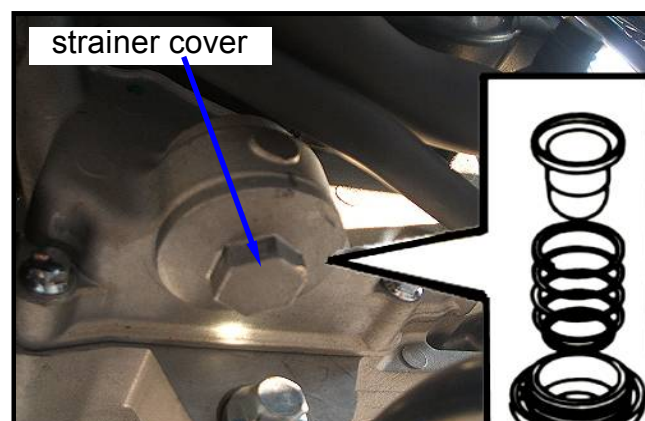
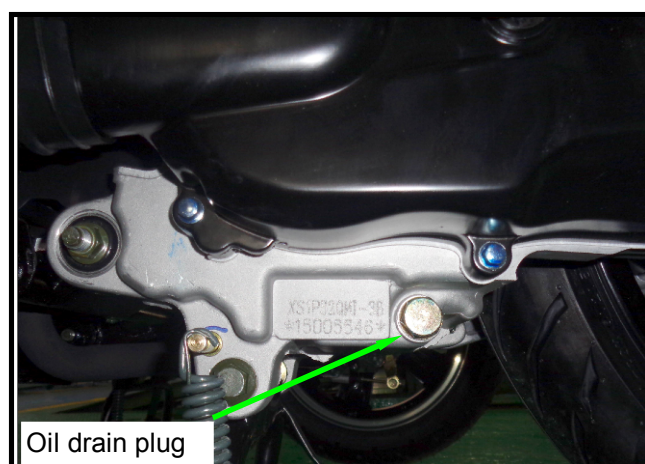
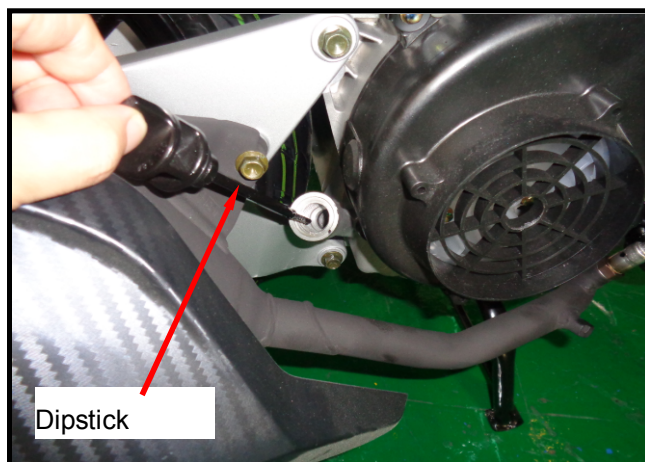
#### Cleaning the oil strainer

Drain oil from engine, remove the strainer cover, spring and strainer.

If there is an accumulation on the screen, wash it off with suitable solvent (recommended using compressed air). Check O-ring for damage, replace if necessary.

Reinstall strainer, spring, O-ring and strainer cover.

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



### Gear Oil

#### Inspection

Check gear oil if leaking.  
Park the motorcycle with main stand on flat level place.  
Turn off engine and remove the gear oil draining plug.  
Place a measurement cup under the draining hole.  
Remove the oil drain plug and drain gear oil into a measurement cup.  
Check gear oil if enough.

#### Replacement

At first, remove the gear oil refilling bolt, and then remove the draining plug.  
Install the draining plug after drained oil out.

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

#### ⚠ Caution

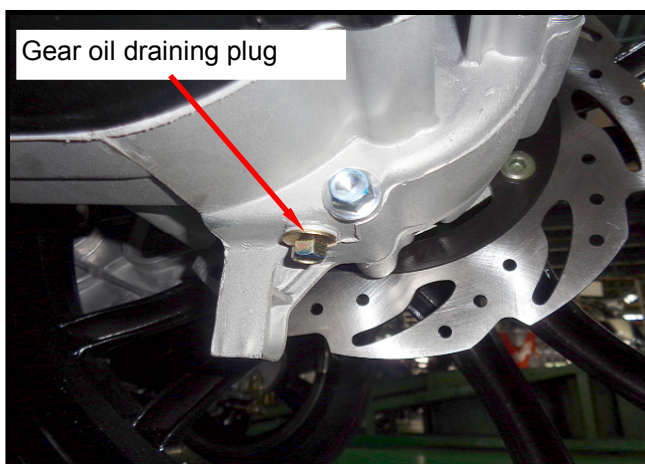
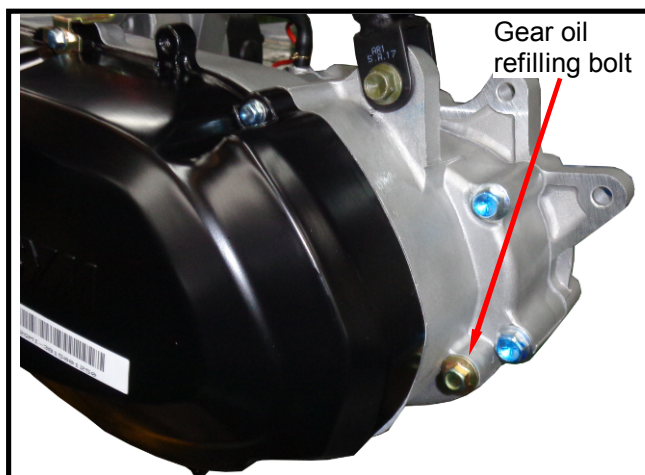
Inspect if washer is in good condition.  
Replace it with new one if it was deformed or damaged.

Fill out gear oil to specified quantity from the engine oil filling hole.  
Install the oil filling bolt.

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

**Transmission oil capacity: 180 c.c.(170 c.c. for change)**

Recommended: genuine SYM HYPOID gear oil (SAE 85W-140).



### Fuel System

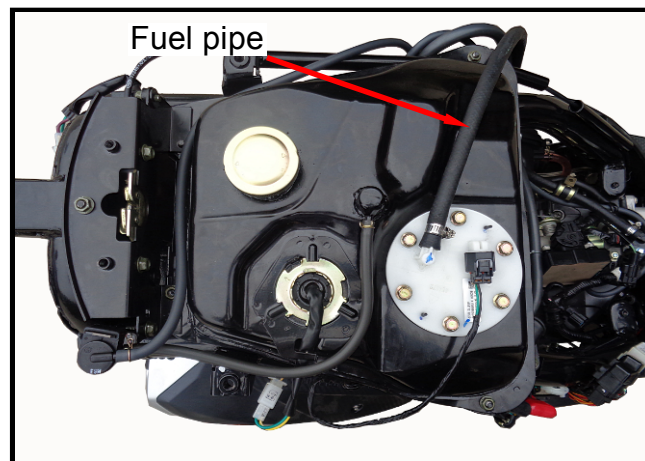
#### Fuel Pipe

Remove luggage box, side cover, center cover, body frame cover, and pedal, as well as front inner box.

Check all pipes, 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.



# SYM

## INFORMATION

## 2. MAINTENANCE

### AIR CLEANER

#### Element

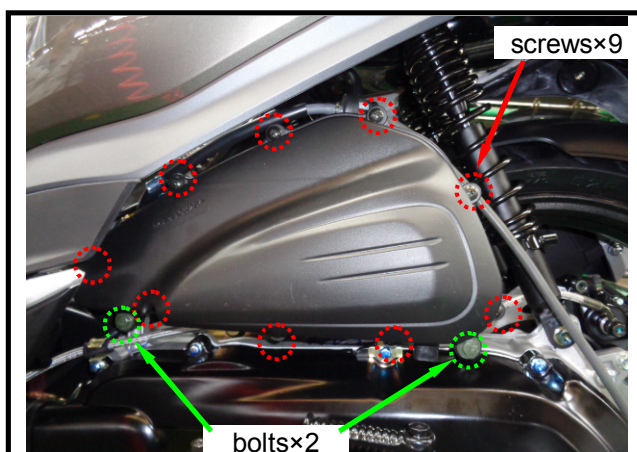
Remove left side cover.

Remove 9 screws from the air cleaner cover.

Remove element of air cleaner (2 bolts).

Check the element if dirt or damaged.

Replace it with new one if dirt or damaged.



#### Caution

- Air cleaner element contains a paper made filter so do not try to clean it.
- Make sure that the air cleaner cover had been installed properly after installation.



### THROTTLE VALVE OPERATION

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

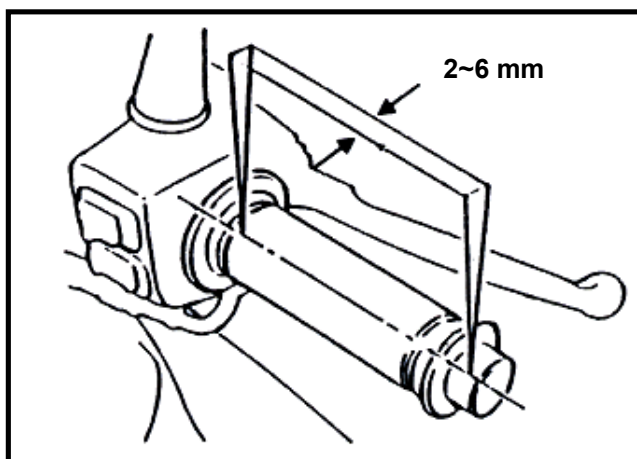
Check handle bar if its operation is smooth.

Check throttle valve 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.

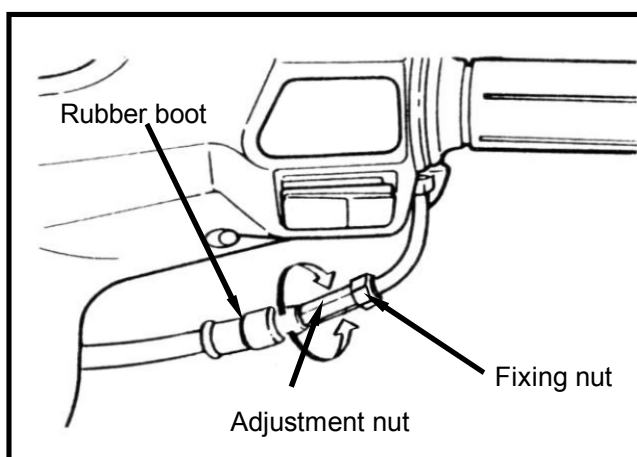
**Free play : 2~6 mm**



Adjustment can be done in either ends.

Secondary adjustment is conducted from top side.

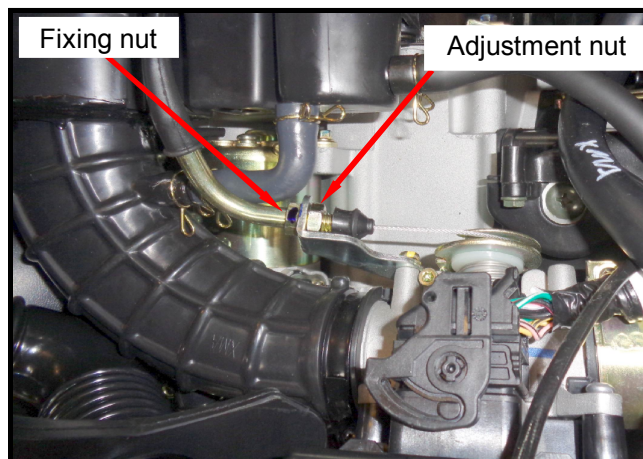
Remove rubber boot, loosen fixing nut, and then adjust it by turning the adjustment nut.



Primary adjustment is conducted from button side.

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

Tighten the fixing nut, and check acceleration operation condition.

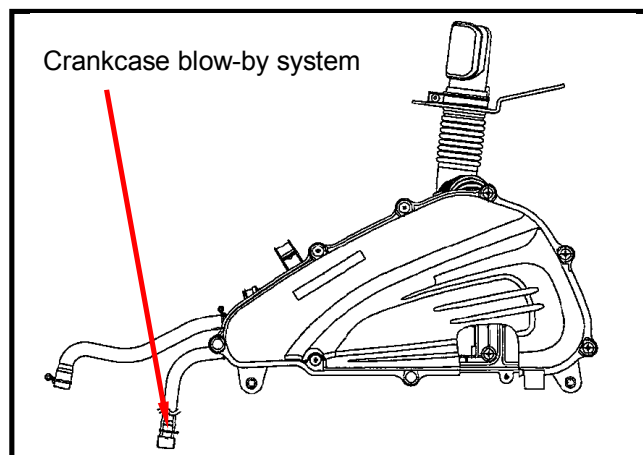


### CRANKCASE VENTILATION

Pull out the plug from draining hose to clean deposits

#### **Caution**

When always riding in rainy area or full throttle position, maintenance period must be shortened. The deposits can be seen in the transparent section of draining hose.



### VALVE CLEARANCE INSPECTION AND ADJUSTMENT

#### **Caution**

Checks and adjustment must be performed when engine is cold (below 35°C).

Remove luggage box and front center cover.  
Remove the left body cover & left side cover.  
Remove cylinder head cap.  
Remove the ignition timing check hole on the cooling fan cover.

With "T" type wrench, turn crankshaft in clockwise motion so that mark ("T") on the generator flywheel aligns with the mark on the crankshaft, and camshaft is at TDC position also as same as level of cylinder head top-end. A single hole on camshaft sprocket is forward to up. (Piston is at TDC position in the compression stroke.)

#### **Caution**

The crankshaft can not be rotated in counter-clockwise to prevent from damage so that valve clearance can not be measured.

Check & adjust valve clearance with feeler gauge.

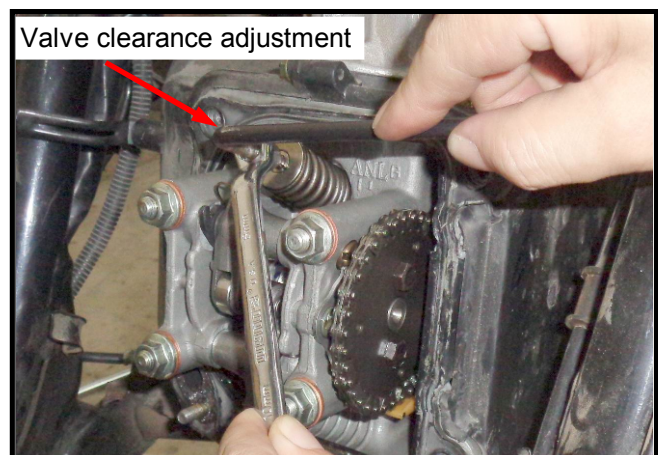
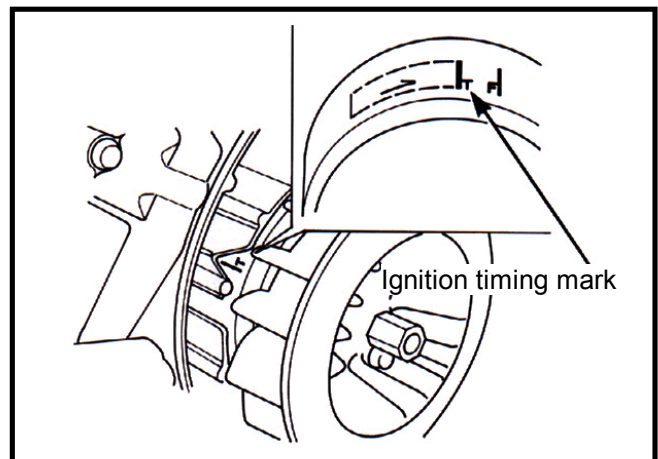
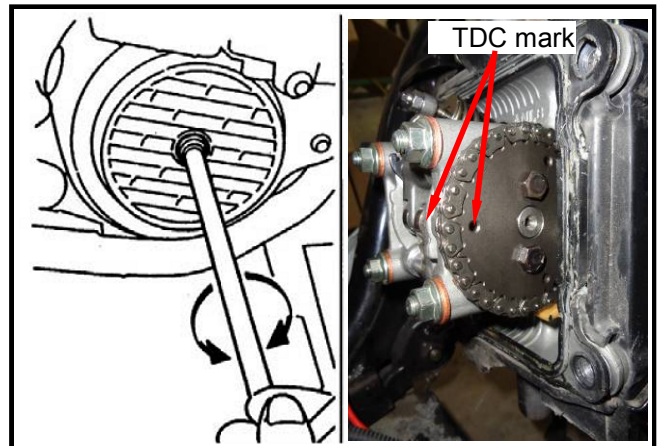
**Valve clearance (IN/EX):**

**0.12±0.02 mm/0.12±0.02 mm**

Loosen fixing nut and turn the adjustment nut for adjustment.

#### **Caution**

It has to make sure that valve-rocker arm is be adjusted to standard level when adjusting it, and re-check the valve clearance after tightened the fixing nut.





## SYM INFORMATION

## 2. MAINTENANCE

### IGNITION SYSTEM

#### Ignition timing

##### Caution

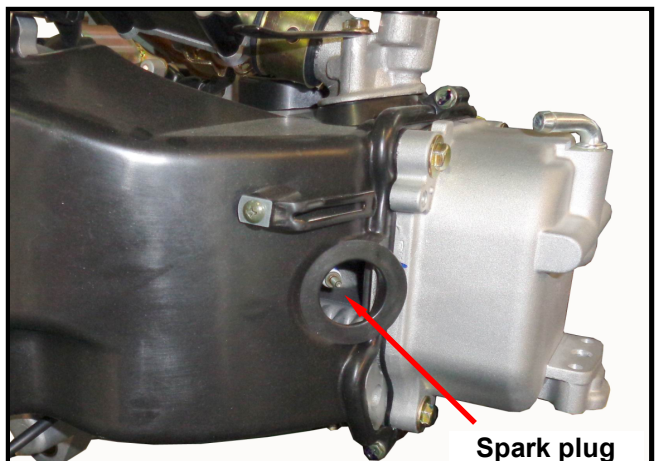
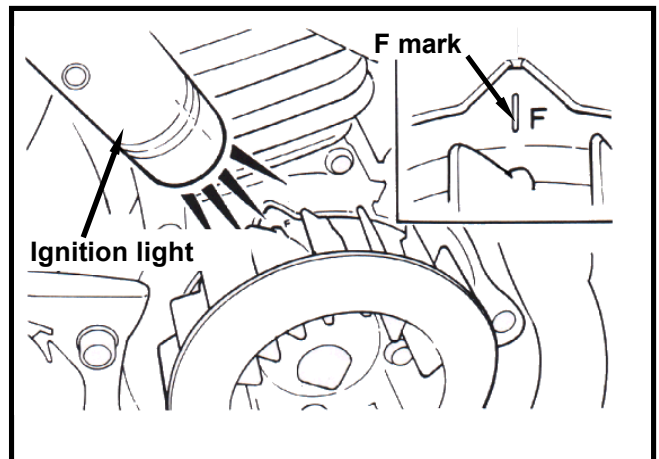
C.D.I ignition system is set by manufacturer so it can not be adjusted.  
Ignition timing check procedure is for checking whether C.D.I. function is in normal or not.

Remove right side cover.

Remove ignition timing hole cap located on the cooling fan cap, or remove the cooling fan cap.

Check ignition timing with ignition light.

Start engine and set engine idle speed in 1700 rpm, and if the mark aligns with the "F", then it means that ignition timing is correct. Increase engine speed to 5000 rpm to check ignition timing advance. If the detent aligns with advance mark "H", then it means ignition timing advance is in functional. If not, check CDI set, pulse flywheel, and pulse generator. Replace these components if malfunction of these parts are found.



### SPARK PLUG

#### Appointed spark plug: A7RC

Remove luggage box.

Remove body side cover.

Remove front center cover.

Remove spark plug cap.

Clean dirt around the spark plug hole.

Remove spark plug.

Measure spark plug gap.

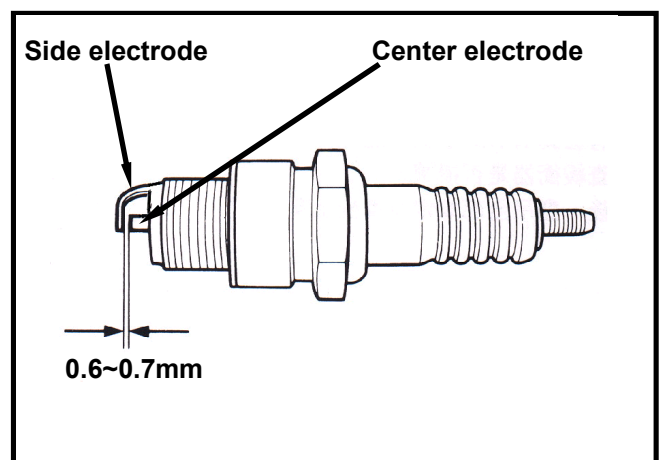
#### Spark plug gap: 0.6~0.7 mm

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

Screw the spark plug into the plug hole with hands, then tighten the plug with a wrench to prevent from damaging the spark plug's thread.

#### Torque value: 1.0~1.2 kgf-m

Connect spark plug cap.



### CYLINDER COMPRESSSION PRESSURE

Warm up engine and then turnoff the engine.  
Open the seat. Remove the luggage box.  
Remove spark plug cap and spark plug.  
Install compression gauge.  
Full open the throttle valve, and rotate the engine by means of stepping the kick-starting lever.

#### **Caution**

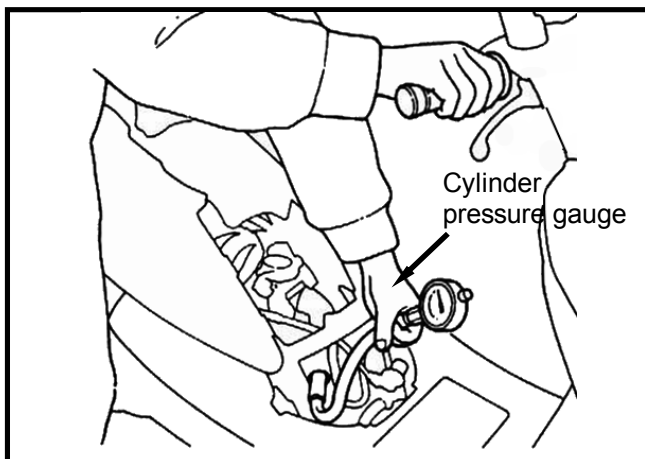
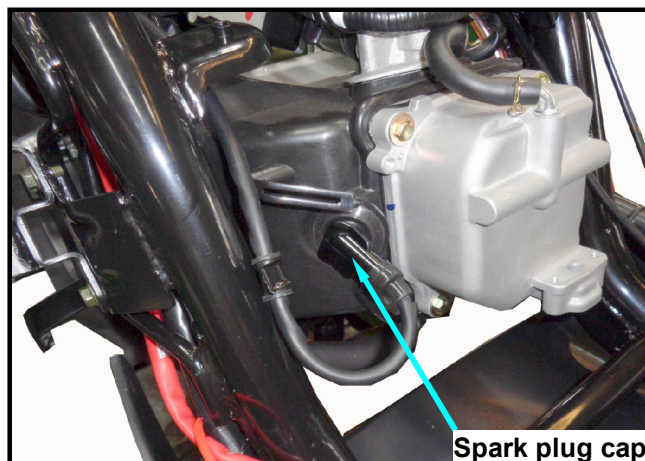
Rotate the engine until the reading in the gauge no more increasing.  
Usually, the highest pressure reading will be obtained in 4~7 seconds by electric start engine.

#### **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.

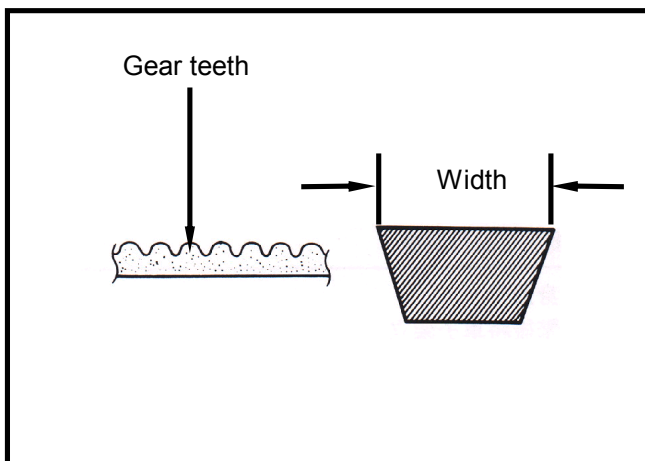


### DRIVING SYSTEM

#### DRIVING BELT

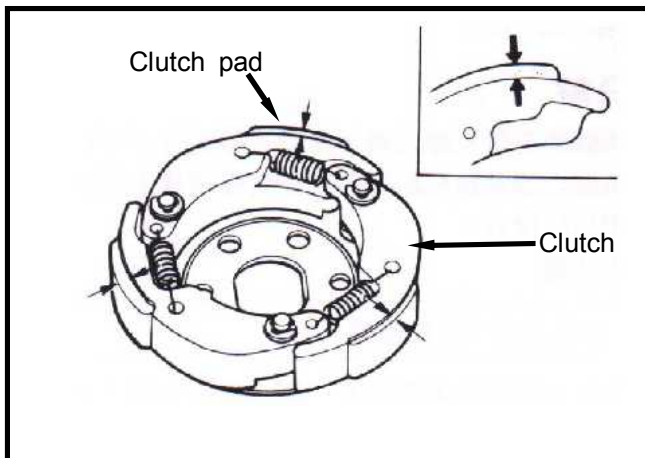
Remove left side cover.  
Remove mounting bolt located under air cleaner.  
Remove 9 bolts of the engine left crankcase.  
Remove the left crankcase cover.  
Check if the belt is crack or worn out.  
Replace the belt if necessary or in accord with the periodical maintenance schedule to replace it.

**Width limit: above 17.5 mm**



#### Clutch pad

Start the motorcycle and gradually increase throttle valve openness to check clutch pad operation.  
If the motorcycle moves with shaking, then check its clutch pad for wearing. Replace it if necessary.



### STEERING SYSTEM

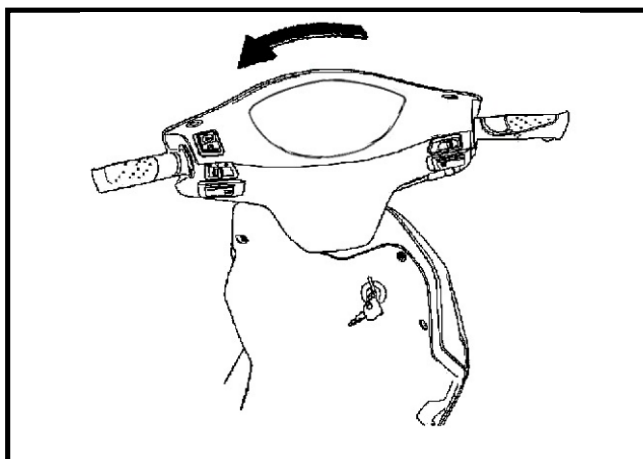
#### Caution

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 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.



### SUSPENSION SYSTEM

#### Warning

- Do not ride the motorcycle with poor shock absorber.
- Looseness, wear or damage shock absorber will make poor stability and drivability.

#### Front shock absorber

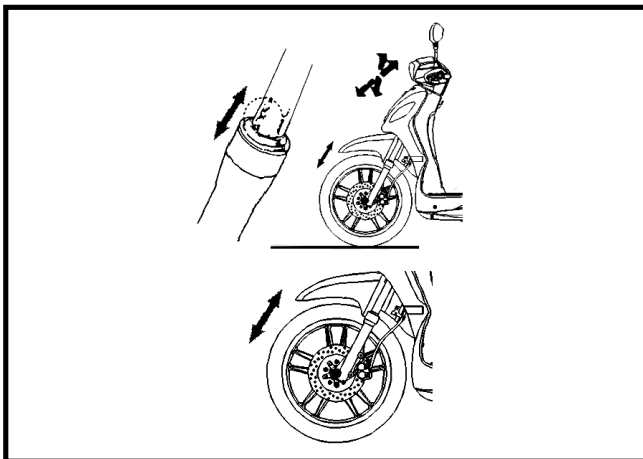
Hold front brake lever and press down the front shock absorber for several times to check its operation.

Hold front brake lever and push forward the front shock absorber for several times to check its locking status.

Check if it is scratched or leaking.

Replace damaged and non-repairable components.

Tighten all nuts and bolts.



#### Rear Shock absorber

Press down the rear shock absorber for several times to check its operation.

Check if it is scratched or leaking.

Replace damaged and non-repairable components.

Park the motorcycle with main stand.

Start engine and let the rear wheel rotate after increased engine rpm. Check engine for any parts loose or shaking. Also check the engine suspension bushing for wear out.

Replace the bushing if worn out.

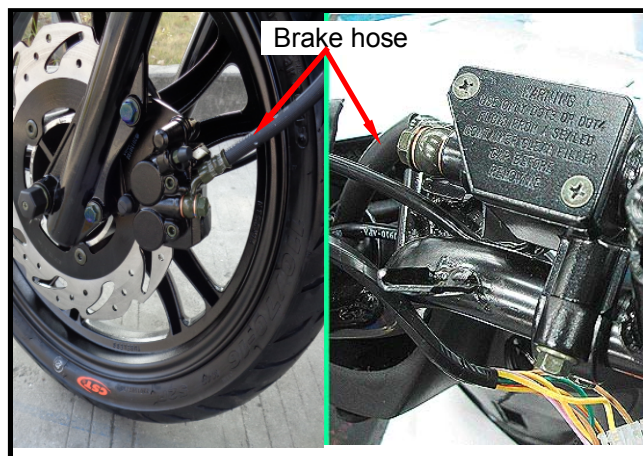
Tighten all nuts and bolts.



### FRONT DISC BRAKE SYSTEM

#### BRAKE SYSTEM HOSE

Make sure the brake hoses for corrosion or leaking oil, and also check brake system for leaking.

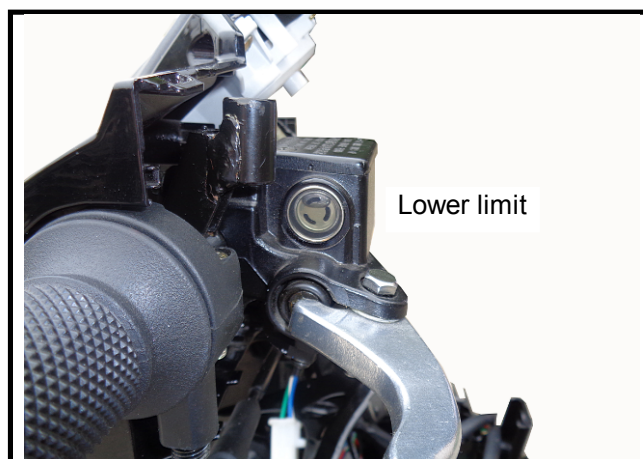


#### BRAKE FLUID

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.

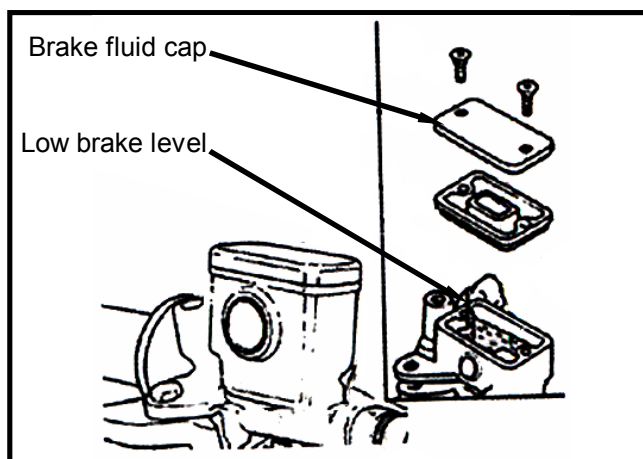
#### ⚠ Caution

- In order to maintain brake fluid in the reservoir in horizontal position, do not remove the cap until handle bar 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. Place the diaphragm in. Operate the brake lever so that brake fluid contents inside the brake system hoses.

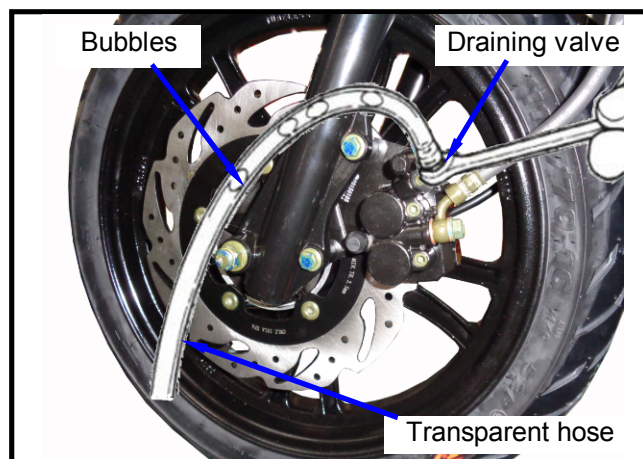


#### AIR BLEED OPERATION

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.



## SYM INFORMATION

### 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.

### 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.

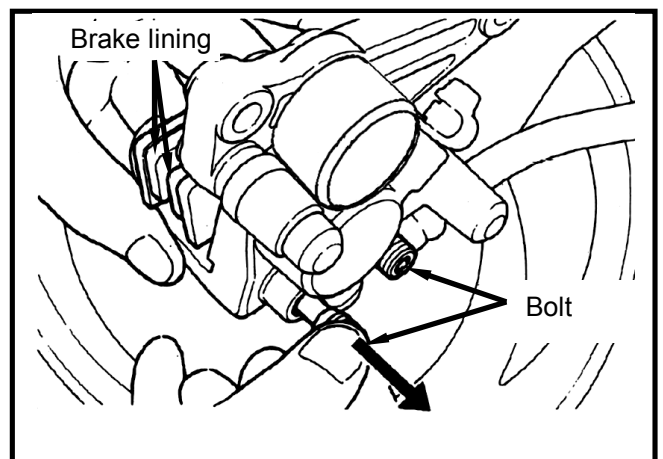
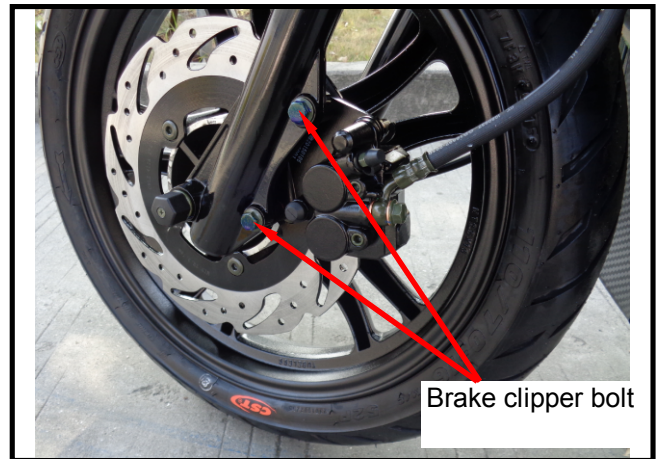
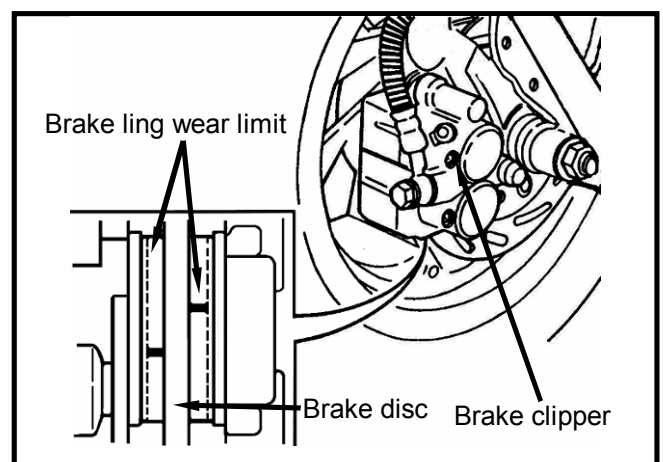
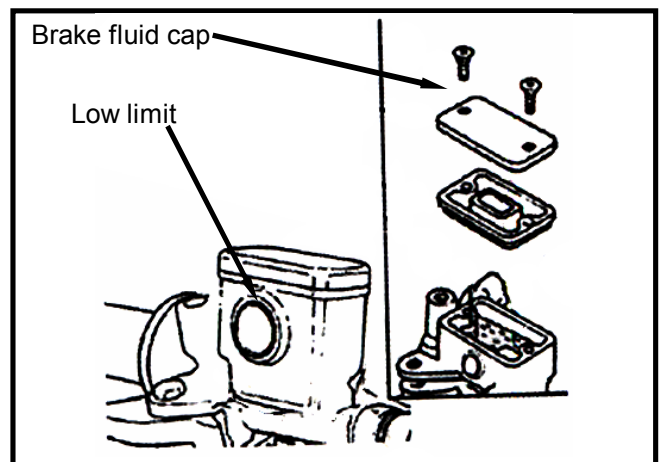
Pry out the brake lining with a flat driver if lining be clipped.

Remove brake lining bolt.  
Take out the lining.

#### **Caution**

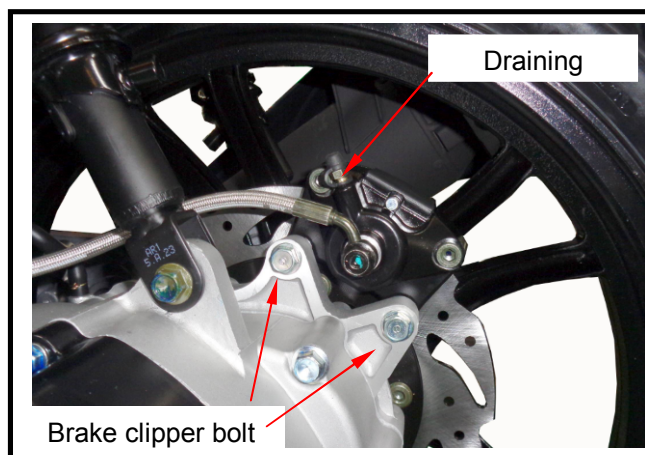
In order to maintain brake power balance, the brake lining must be replaced with one set.

## 2. MAINTENANCE



### REAR BRAKE DISC SYSTEM

Rear Brake Free Play: (Disc brake)



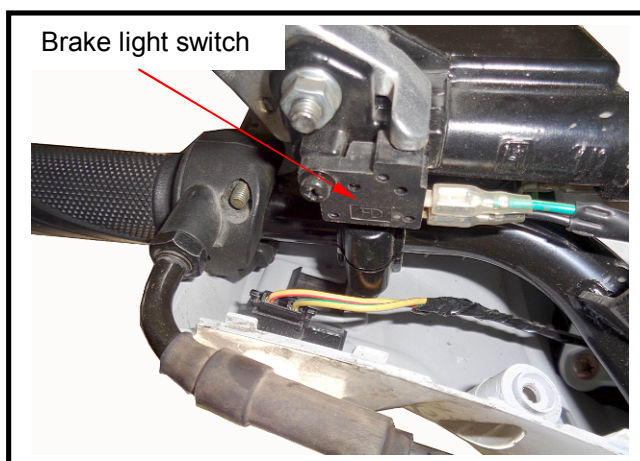
# SYM INFORMATION

## 2. MAINTENANCE

### BRAKE LIGHT SWITCH

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

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

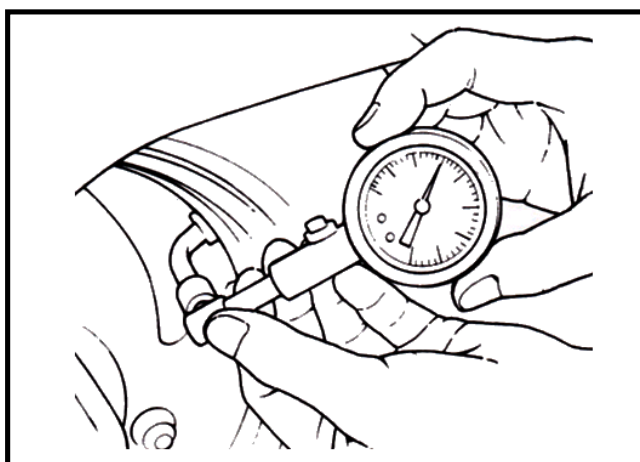


### WHEEL/TIRE

Check if both front and rear tire pressure are within specification.

#### **Caution**

Tire pressure check should be done as cold tire.



#### Appointed tire pressure

Tire size		Front tire	Rear tire
Tire pressure as cold tire (Kg/cm <sup>2</sup> )	Load for single	2.00	2.00
	Load for two persons	2.00	2.25

#### Appointed Tire

##### Front/Rear wheel: 110/70-16

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

Check if tire surface or wall for crack or damaged, and replace it if necessary.

The tire tread depth can be checked by visual inspection or depth gauge.

- Replace the tire if tire tread dent or unusual wearing out.
- The tire should be replaced if the wear limit mark (△) is in visible.

Measure tire thread depth from tire center surface.

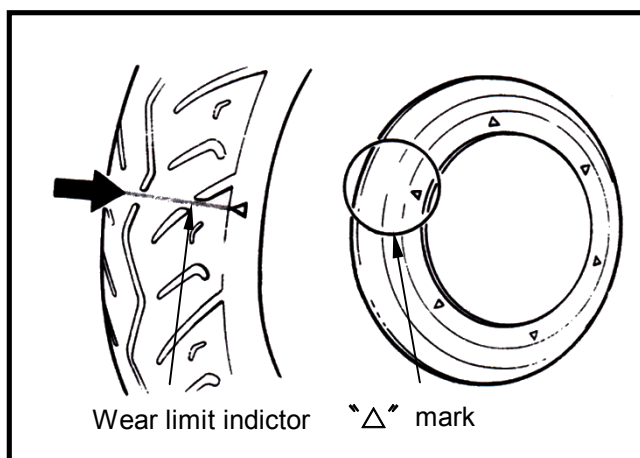
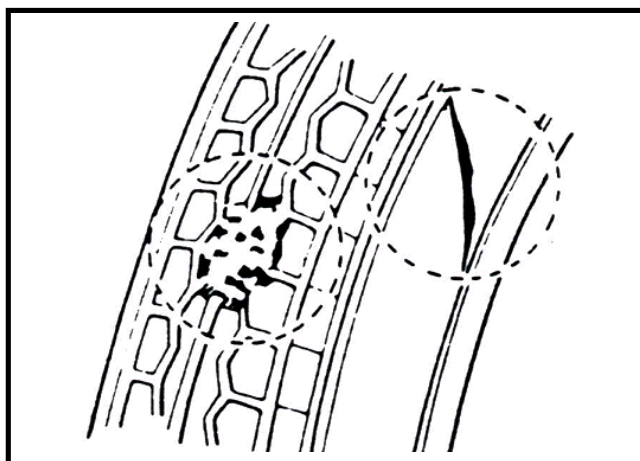
Replace the tire if the depth is not come with following specification:

Front tire: 1.5 mm

Rear tire: 2.0 mm

#### **Caution**

The wear limit marks (△) are located around the tire wall even for inspection.



Wear limit indicator

"△" mark

### BATTERY

#### Battery Removal

Remove the 2 screws on the floor panel.  
Remove battery cap. (2 nuts)

Battery cables removal:

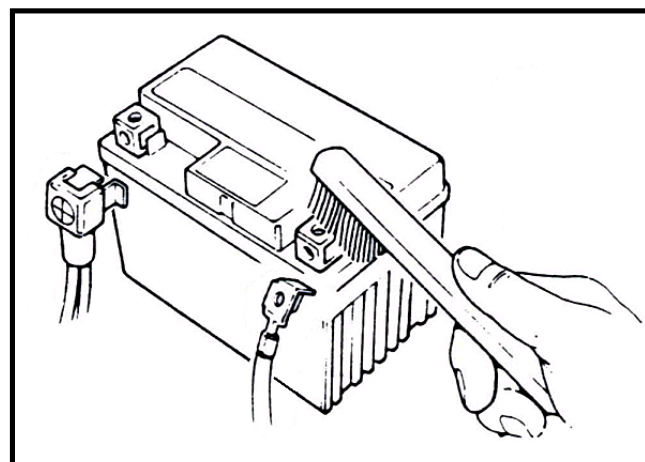
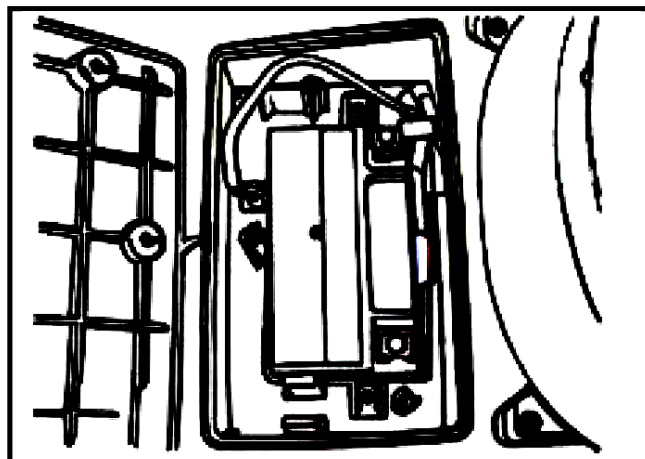
1. At first, remove the negative “-” cable.
2. Then, remove the positive “+” cable.
3. Remove the battery.

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.



### HEADLIGHT ADJUSTMENT

Park the motorcycle with the main stand.

Remove the front cover.

Turn on the main switch.

Turn the headlight adjustment screw. And adjust the headlight beam height.

Then, tighten the adjustment screw after the beam height in proper position.

#### **Caution**

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



### NUTS, BOLTS TIGHTENESS

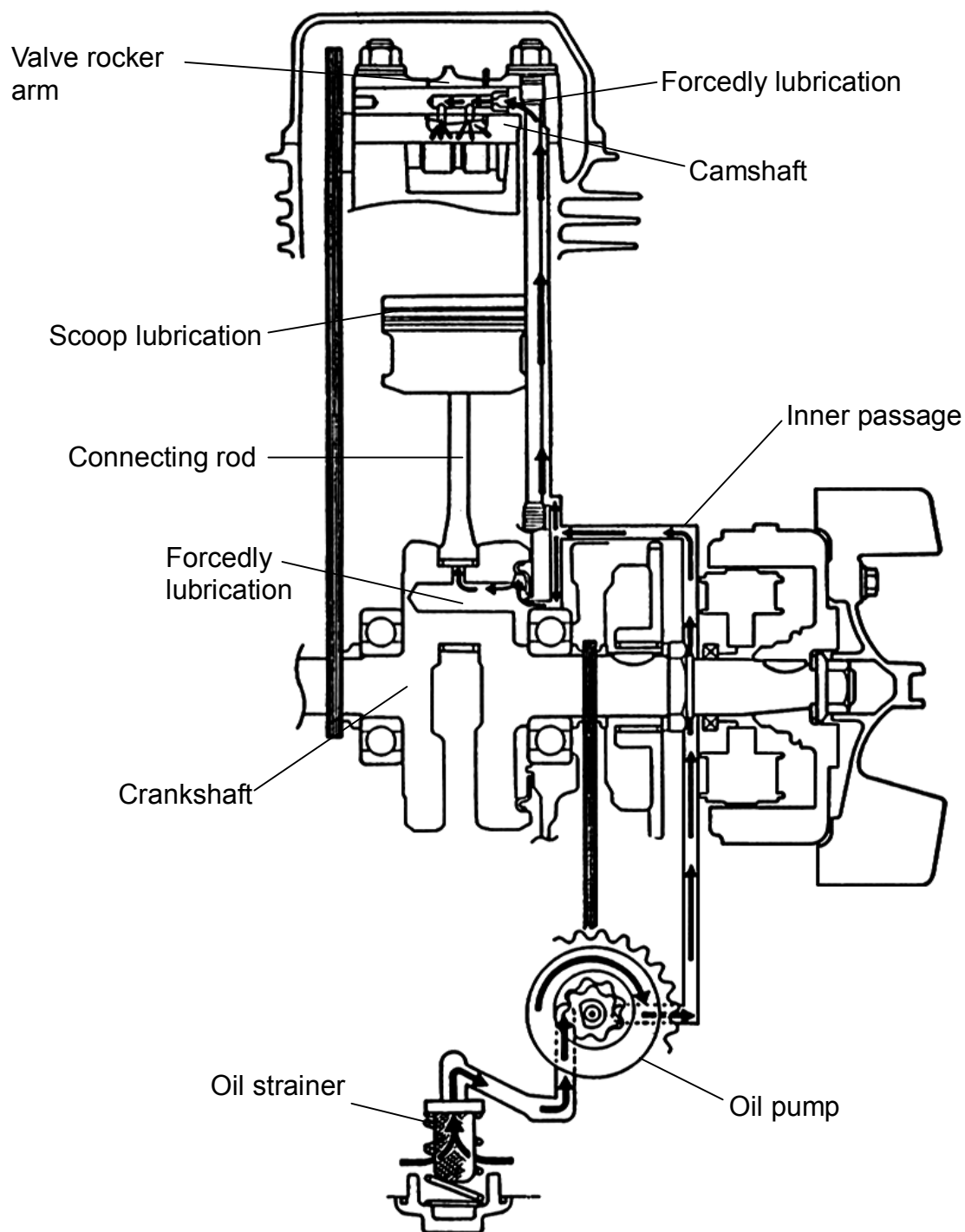
Perform periodical maintenance in accord with the Periodical Maintenance Schedule.

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.

MECHANISM DIAGRAM .....3-1	CLEANING ENGINE OIL STRAINER...3-3
OPERATIONAL PRECAUTIONS .....3-2	OIL PUMP .....3-4
TROUBLE DIAGNOSIS.....3-2	GEAR OIL .....3-6
ENGINE OIL .....3-3	

## MECHANISM DIAGRAM



## OPERATIONAL PRECAUTIONS

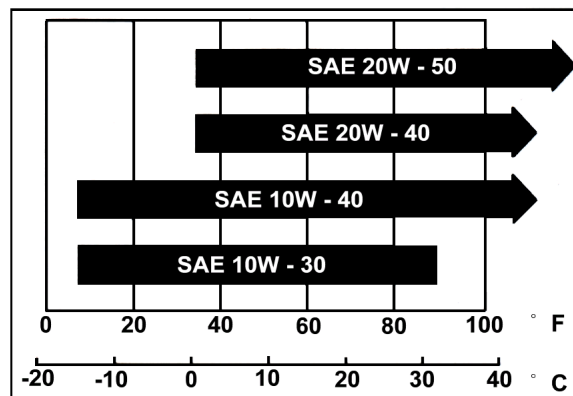
### General Information

- This chapter contains maintenance operations for the engine oil pump, engine oil and gear oil.

### Specifications

Engine oil quantity	Disassembly 950 c.c. Replacement 700 c.c.
Oil viscosity	SAE 10W-30 or equivalent
Gear Oil Capacity	Disassembly 180 c.c. Replacement 170 c.c.
Oil viscosity of gear oil	SAE 85W-140

### Oil viscosity



unit : mm			
Items		Standard	Limit
Oil pump	Inner rotor clearance	-	0.12
	Clearance between outer rotor and body	-	0.12
	Clearance between rotor side and body	0.05~0.10	0.20

### Torque value

Engine oil drain plug	3.5~4.5kgf-m
Engine oil screen cover	1.0~2.0kgf-m
Gear oil drain bolt	1.0~1.5kgf-m
Gear oil filling bolt	1.0~1.5kgf-m
Oil pump drive sprocket nut	0.8~1.2kgf-m

## TROUBLE DIAGNOSIS

### Low engine oil level

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

### Low Oil Pressure

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

### Dirty oil

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

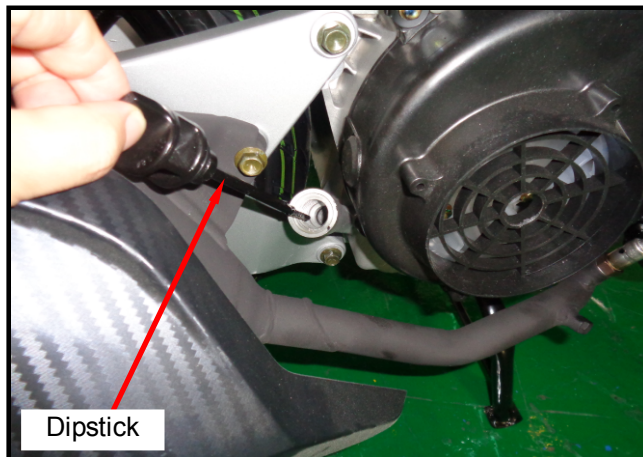
## ENGINE OIL

Turn off engine, and park the motorcycle in flat ground with main stand.

Check oil level with oil dipstick after 3-5 minutes.

Do not rotate the dipstick into engine as checking.

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



Dipstick

## Oil Replacement

### ⚠ Caution

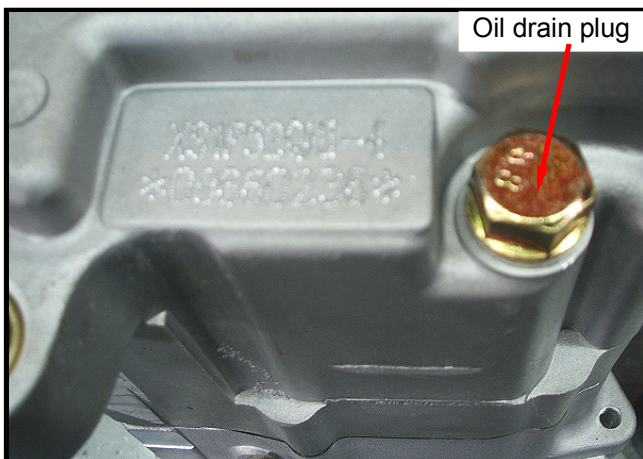
Drain oil as engine warmed up so that make sure oil can be drained smoothly and completely.

Place an oil pan under the motorcycle, and remove oil strainer cap.

Make sure if the aluminum washer of the draining bolt is damaged. If so, replace it with new one.

Install the oil drain plug and tighten it.

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



Oil drain plug

## CLEANING ENGINE OIL STRAINER

Remove the oil strainer cap.

Remove oil strainer and spring.

Clean oil strainer (recommended using compressed air to clean dirty foreign).

Check if the strainer and O-ring of the oil strainer are broken. Replace with new one if found.

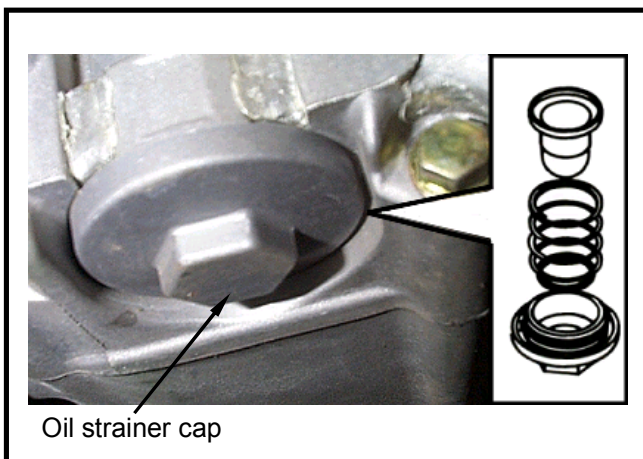
Install the oil strainer and spring.

Install the oil strainer cap and tighten it.

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

Fill out oil to the oil filler (Oil viscosity SAE 10W-30).

**Engine oil quantity: Replacement 700 c.c.**



Oil strainer cap

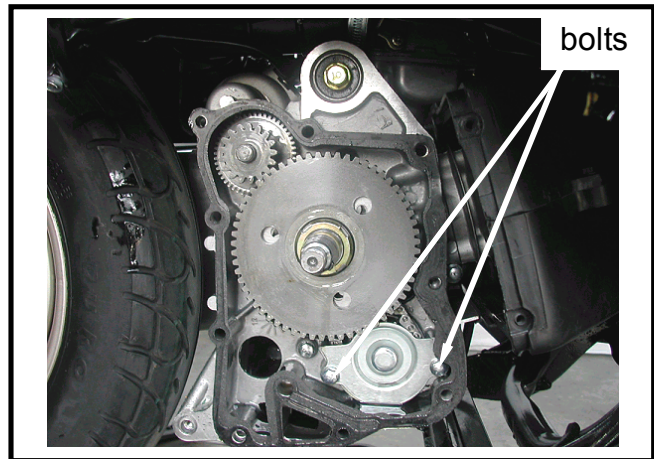
#### OIL PUMP

##### Oil Pump Removal

Remove the alternator (refer to chapter10).  
Remove the engine right crankcase cover.  
Remove the one-way clutch and starting drive gear (1 nut).

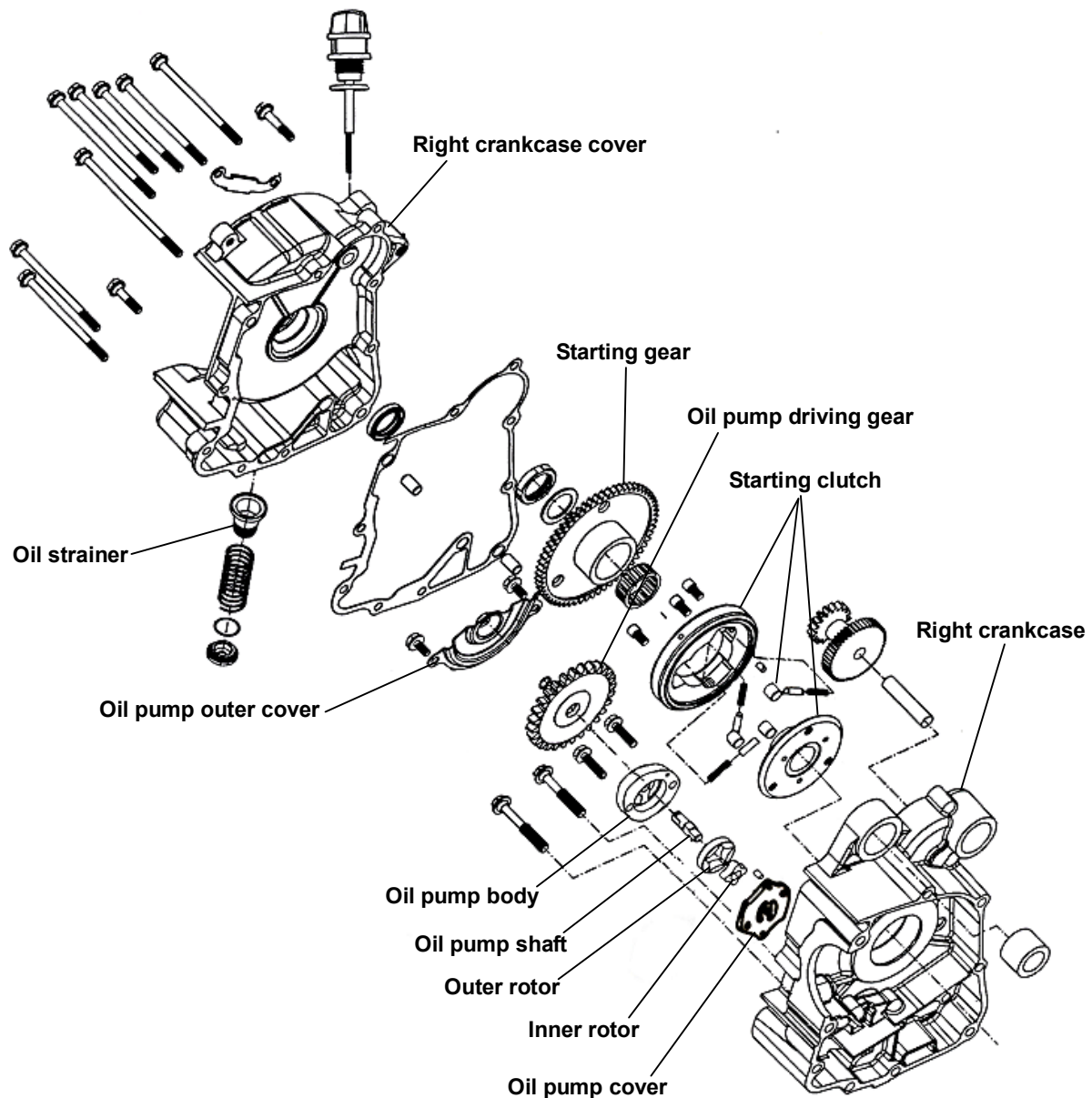
Make sure that the pump axle can be rotated freely.

Remove the oil pump cover (2 bolts),  
Remove the oil pump fixing flat screw .  
Remove oil pump body bolts (2 bolts).



##### Oil Pump Disassembly

Remove the screw on oil pump cover.  
Disassemble the oil pump as illustration shown.



**Oil Pump Inspection**

Check the clearance between oil pump body and outer rotor.

**Limit: below 0.12 mm**



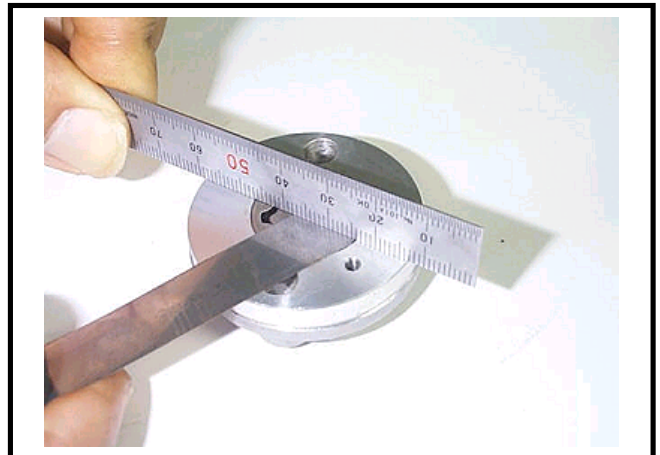
Check clearance between inner and outer rotors.

**Limit: below 0.12 mm**



Check clearance between rotor side face and pump body.

**Limit: below 2.0 mm**

**Oil Pump Re-assembly**

Install inner and outer rotors into the pump body.

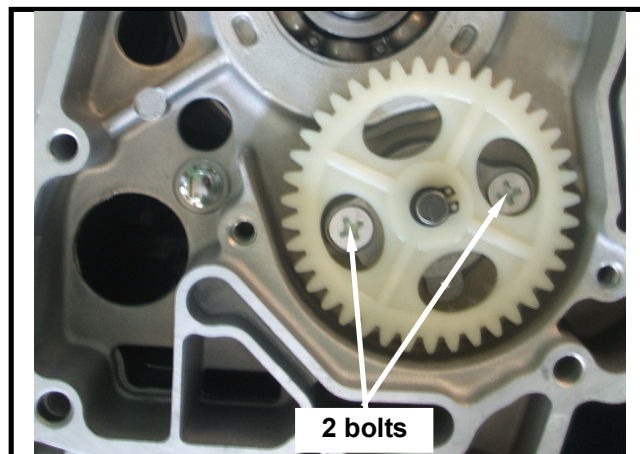
Align the indent on driving shaft with that of inner rotor. Install the driving shaft.

Install the oil pump cover and fixing pin properly and then tighten screw. (1 screw)

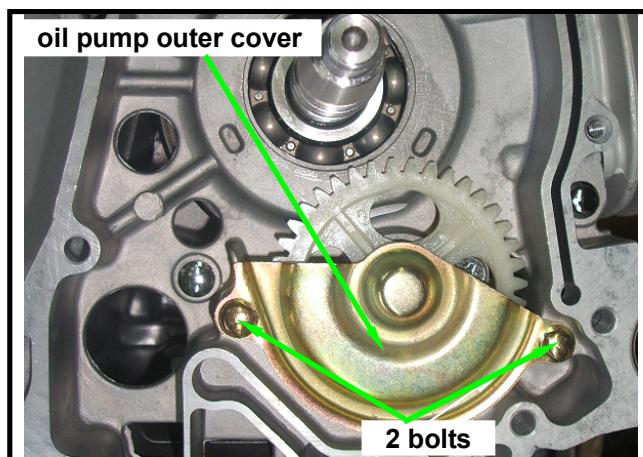


#### Oil Pump Installation

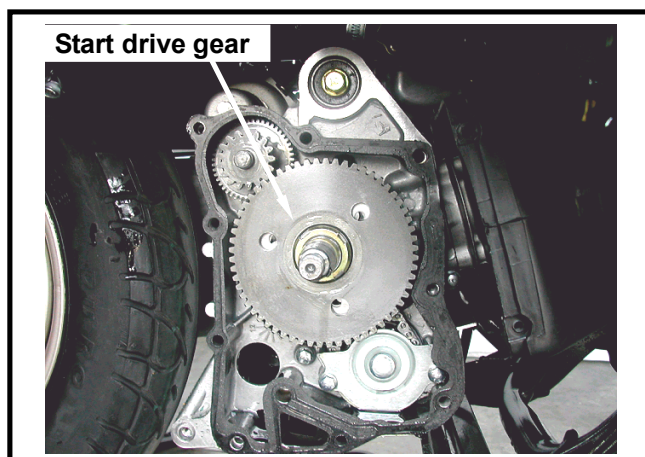
Install the oil pump (2 bolts).



Install oil pump outer cover (2 bolts).



Install the starting gear and the alternator.  
(Refer to chapter 10)

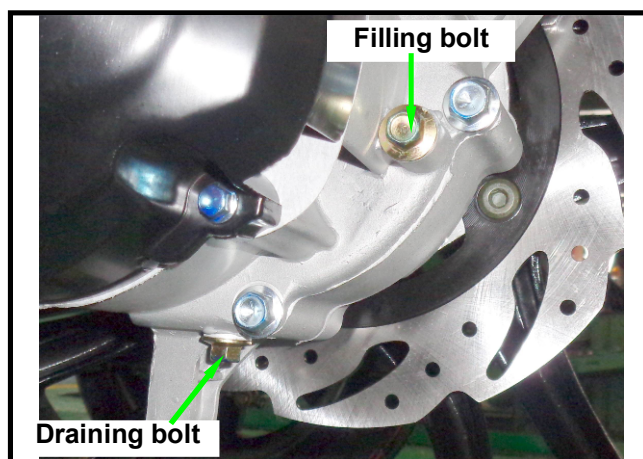


#### GEAR OIL

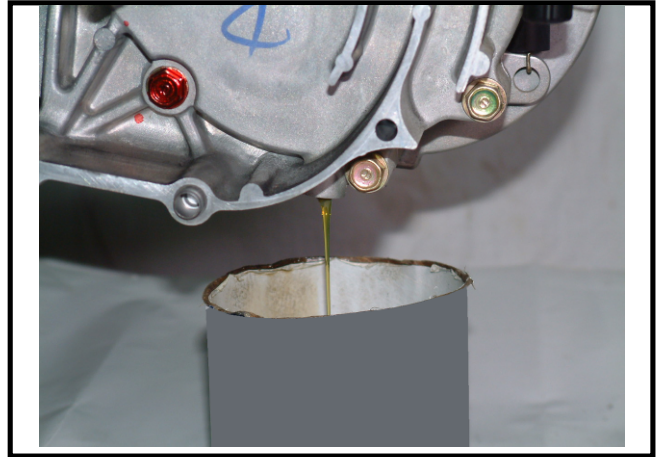
##### Oil Level Inspection

Park the motorcycle on flat ground with main stand.

Turn off engine and remove both engine oil filling bolt and oil draining bolt.



Remove gear oil filling hole bolt and place a measurement cup under the draining plug. Remove the oil draining plug and the pour gear oil into the measurement cup. Measure the gear oil quantity if within standard value. Add specified gear oil if the oil level too low. Standard quantity: 180cc. Replacement: 170 cc.



#### **Gear Oil Replacement**

Remove the gear oil filling hole bolt and its draining plug and then drain oil completely. Install the draining plug and tighten it. (Make sure if the plug washer is damaged. If so, replace it with new one.)

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

Add new gear oil (170 c.c.) from the gear oil filling hole and then install the gear oil filling hole bolt after added oil. And then, tighten the bolt.

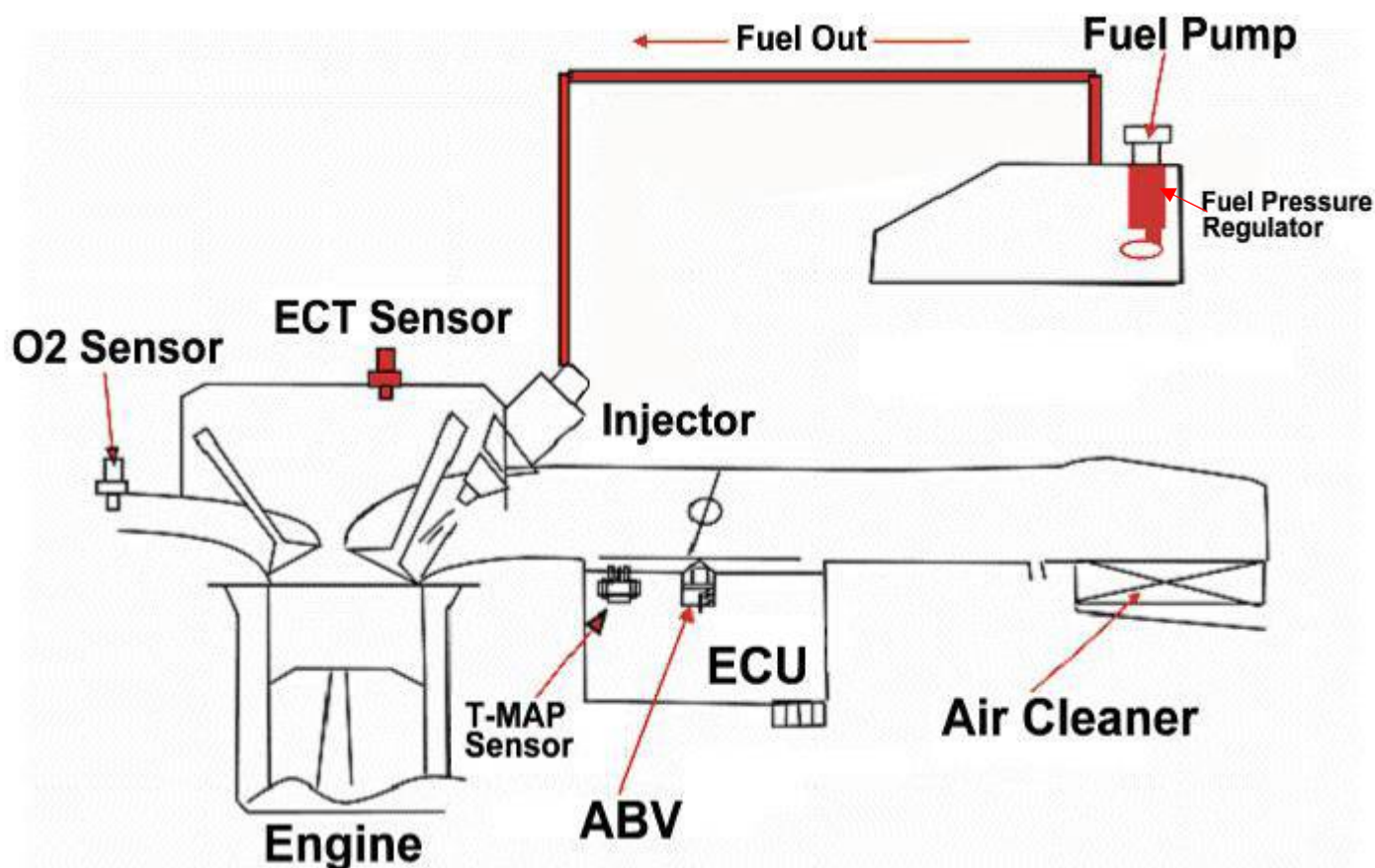
**Torque Value: 1.0~1.5 kgf-m**

※**Recommended to apply with SYM  
HYPOID GEAR OIL (SAE 85W-140)**

Start engine and run it for 2~3 minutes. Turn off engine and check if oil leaking.

EFi System Diagram .....	4-1	Crankshaft Position Sensor .....	4-17
EFi System Introduction .....	4-2	Engine Temperature Sensor / T-Map Sensor .....	4-18
EFi System Components .....	4-3	Air By-pass Valve .....	4-19
EFi System Location .....	4-4	Fuel Injector .....	4-19
EFi System Component Description .....	4-5	Fuel Pump .....	4-19
EFi System Circuit .....	4-8	Fuel Unit .....	4-20
Precautions in Operation .....	4-9	Fuel Tank .....	4-23
Troubleshooting .....	4-10	Air Cleaner .....	4-24
Throttle Body & By-pass Valve Clean Procedure .....	4-14	EFi Troubleshooting & Solution .....	4-25
Fuel Lines .....	4-15	EFi Components Malfunction Check & Replacement Procedure .....	4-53
Ignition System .....	4-16		

### EFi System Diagram



### EFi System Introduction

Based on 4-stroke SOHC engine, displacement 200 c.c. electronically controlled fuel injection. The O2 sensor enhances the efficiency of the catalytic converter, by dynamically controlling the Fuel/Air ratio.

### Electronic Fuel Injection Device

Fuel supply devices: fuel tank, fuel pump, fuel filter, and fuel pressure regulator.

Fuel control 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 fuel pressure regulator keeps the pressure around 2.5 Bar. The signals from ECU enable the injector to spray fuel into the combustion chamber once each two crankshaft-revolutions. The excessive fuel flows back to the fuel tank through the fuel pressure regulator. Fuel pump is placed inside the fuel 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 the 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, the determination of fuel quantity, the mix of fuel and air.

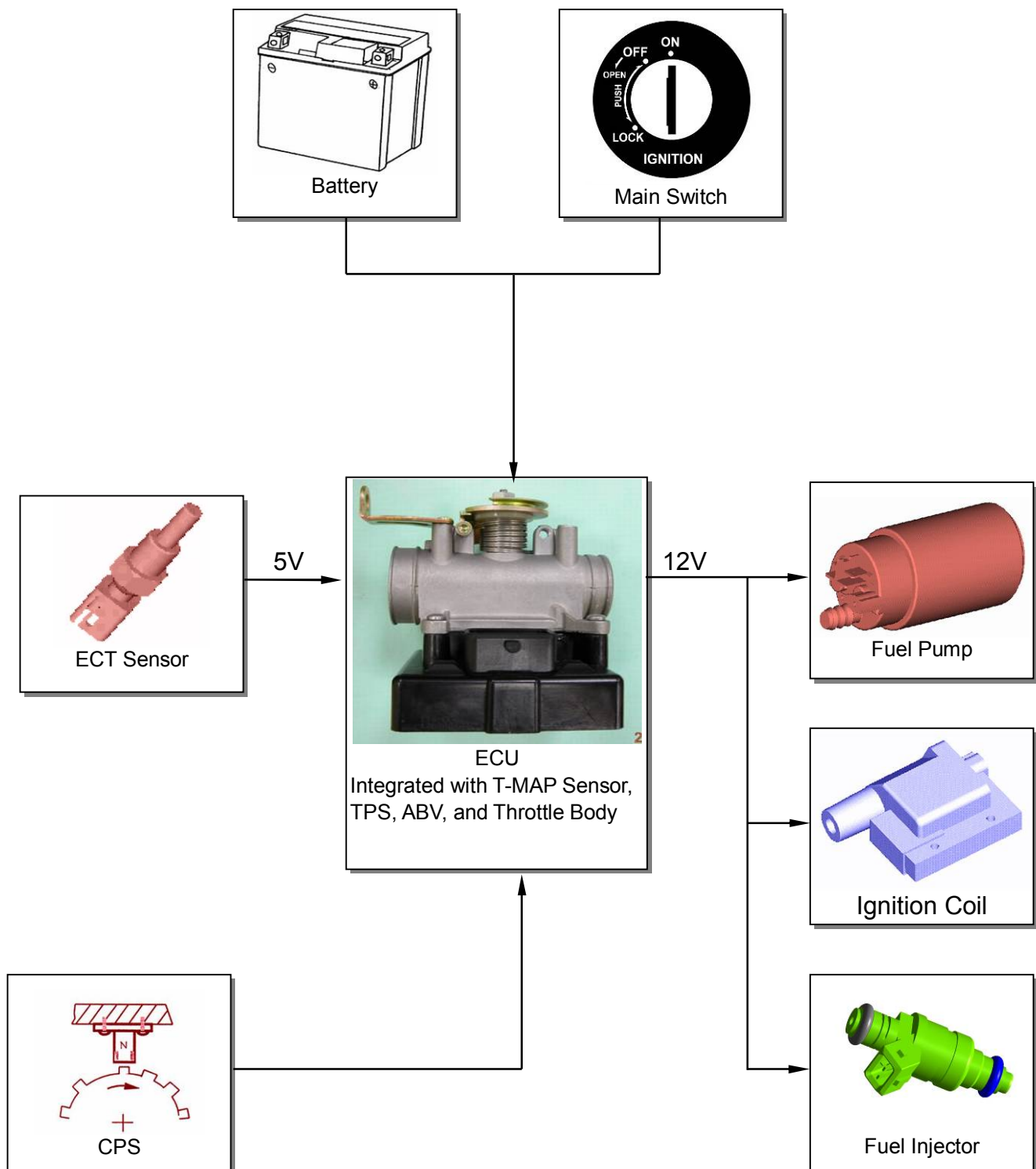
Electronic fuel injection system separates the three major processes into three different devices:

1. T-MAP sensor measures the air quantity and temperature and sends the signal to ECU as a reference.
2. ECU determines 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.

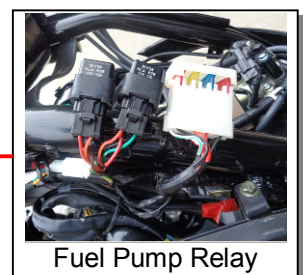
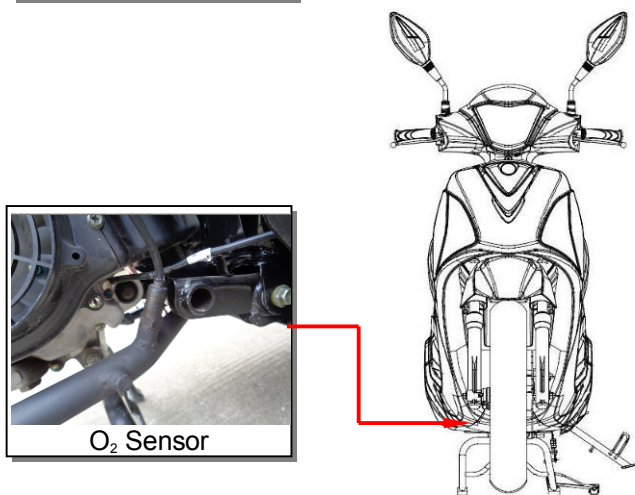
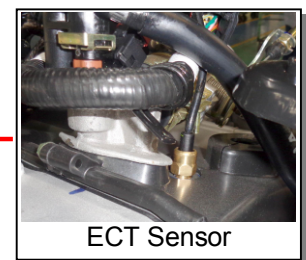
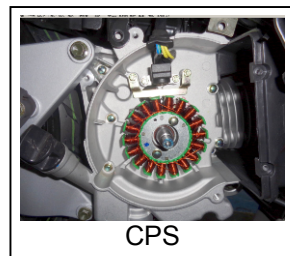
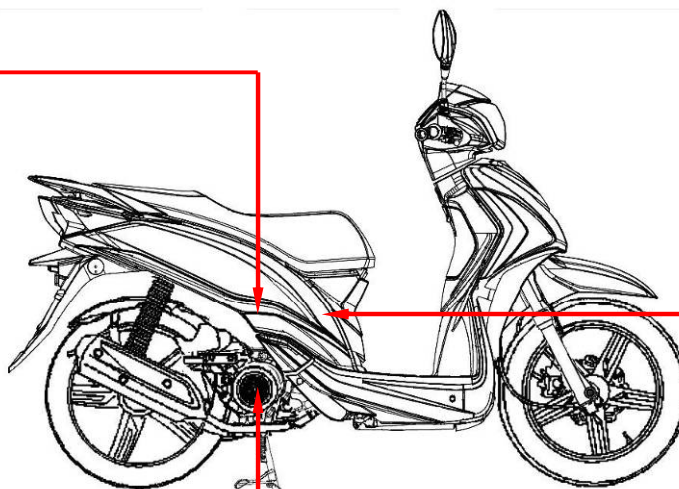
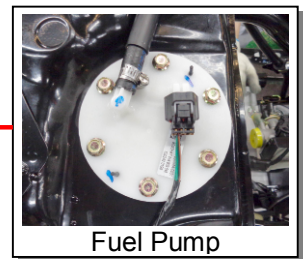
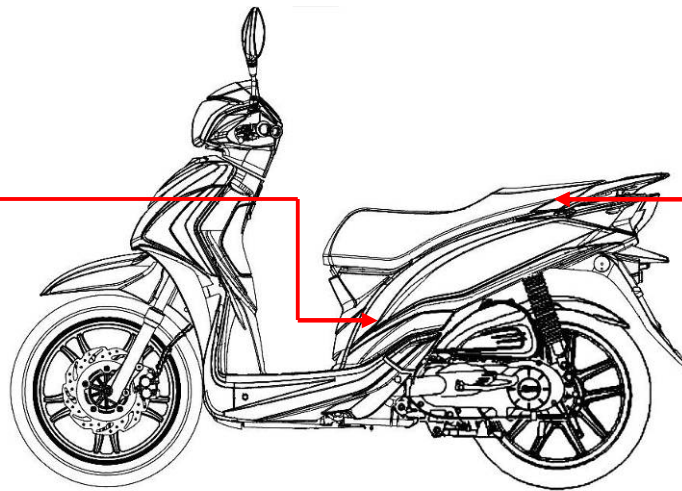
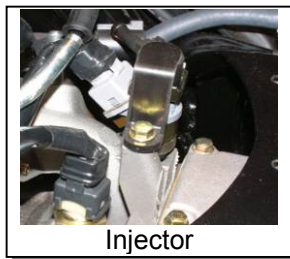
EFi engine uses computer-programmed fuel injection, the main features are:

1. The quantity of fuel injected is determined according to the condition of the engine. The engine RPM, and throttle position determines the fuel quantity and injection time-length.
2. The quantity of fuel injection, and the determination of injection time length, are all controlled by 16-bit microcomputer.
3. The fuel pressure regulator maintains a 2.5 Bar 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. Air by-pass system supplies fuel and air to stabilize the idle running, and cold starting.

## EFi System Components



### EFi System Location



## EFi System Component Description

### Integrated ECU Module



#### Engine Control Unit (ECU)

- Powered by DC 8~16V, and has 32 terminals connector on the unit.
- The hardware component consists of an 16-bit computer that is its control center. It contains the functional circuit interface of engine condition sensing and the driving actuator for the air by-pass 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, microarray profile and self-diagnosis programs.

#### Air Bypass Valve (ABV)

- Its major component is the solenoid valve of high resistance driven by electric current.
- By means of signals from all sensors, ECU outputs a signal to control the opening angle of the valve so that can adjust air flowing to the inlet manifold through the air by-pass valve, and then correct the idle speed to have engine in normal operation.

#### T-MAP Sensor

- The major component of the T-MAP sensor is a variable transistor IC. Its reference voltage is DC 5V, and output voltage range is DC 0~5V.
- It is a sensor of combination by both sensing pressure and temperature, and can measure the absolute pressure and temperature in intake process. It also conducts the fuel injection quantity correction based on environmental temperature and position level.

#### Throttle Position Sensor (TPS)

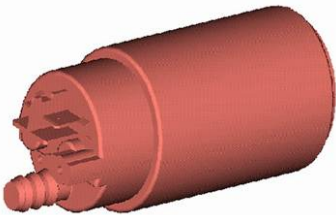
- Its major component is a highly variable resistor. The input voltage range: 5V DC.
- Located on the side of throttle body. By means of the throttle valve rotation to cause voltage change in linear, it provides ECU with current throttle valve openness information. And also, the ECU determines the most properly fuel injection and ignition timing.

### Fuel Injector



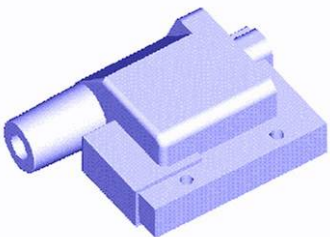
- Powered by DC 8~16V, and has 2 terminals connector on the injector.
- Its major component is the solenoid valve of high resistance driven by electronic current.
- The two terminals are connected to power source and ground respective. It is controlled by ECU to determine the injection timing, and the injector pulse width. Working with 2-valve engine, the unique 2-hole designed injector can provide each intake valve with suitable fuel quantity to reduce HC emission.

### Fuel Pump



- Powered by DC 8~16V, and has 2 terminals connector 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 2.5 bars, which can offer 14 liters of fuel per hour.
- 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.

### Ignition Coil



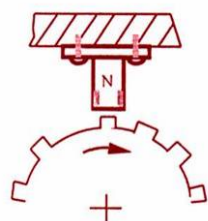
- Powered by DC 8~16V, and has 2 terminals connector on the coil.
- The two terminals are connected to power source and ground respective. Its major component is the high transferring rate transformer.
- Its ignition timing is controlled by computer program. From the signals of crankshaft position sensor, throttle position sensor, and engine temperature sensor as well as intake air temperature sensor, and correspondence with engine speed, then the ECU determines the ignition timing properly by means of controlling primary current in ON & OFF operation to create the secondary voltage of 25000~30000V. And then, the voltage triggers the spark plug ignition. Such kind of ignition system not only can enhance engine performance to maximum, but also increases fuel consumption efficiency and improves emission quality.

## ECT Sensor



- Powered by 5V DC from ECU, and has 2 terminals connector on the sensor. One terminal is for voltage output and the other one for ground.
- Its major component is the thermo-resistance of negative temperature coefficient (temperature rises up while resistance falls down).
- Located on the cylinder head. Correspondence with engine coolant temperature change, it transferred to voltage signal and sent to ECU to calculate current temperature. Then, the ECU will correct fuel injection time and ignition timing according to engine warm up condition.

## CPS



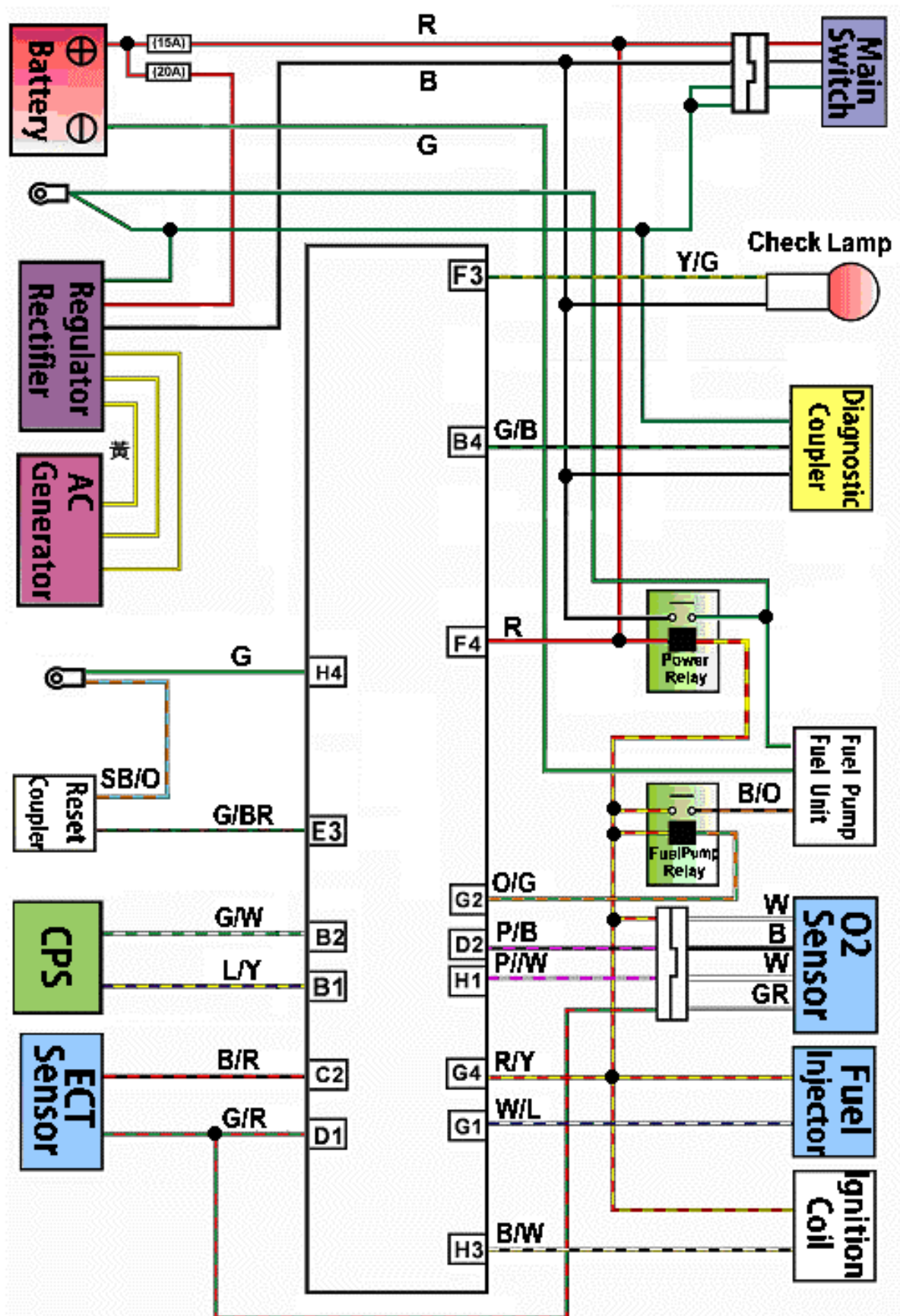
- It does not need power supply, and has 2-signal terminals connector on the sensor.
- Its major component is the magnetic pickup coil, and its output voltage range is  $\pm 0.8 \sim 100V$ .
- The air gap between the sensor and flywheel must have  $.07 \sim 1.1mm$ .
- By cutting the magnetic field, the magnetic sensor sends an inductive voltage that is created with the rotation gear (24-1 tooth) on the flywheel, and the pulse will be sent to the ECU. Then, the ECU calculates current engine speed and crank position based on the voltage so that controls fuel injection quantity and ignition timing properly.

## O2 Sensor



- Powered by DC 8~16V, and has 4 terminals connector on the sensor. The first terminal is for power input; the second is for heating coil. The third is for ground, and the last is for signal output.
- The O2 sensor feeds signal to ECU, and the ECU can control the air/fuel rate around 14.6. It's a close-loop control system.
- The catalytic converter reaches the best converting rate when this 14.6 A/F ratio is maintained.
- The heating coil resistance  $< 200k\Omega$  (30—45k $\Omega$ )

## EFI System Circuit



**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.
- Release the fuel pressure before removing the fuel pipe to prevent splashing the fuel.

** Caution**

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

Fuel pressure release procedure:

Disconnect the fuel pump relay, switch on and press the start switch for a few seconds to crank the engine.

**Specification**

Item	
Idle speed	1700±100 rpm
Throttle grip free play	2~6 mm
Fuel pressure	2.5 bar

**Torque value**

Engine temperature sensor : 0.74~0.88 kgf-m

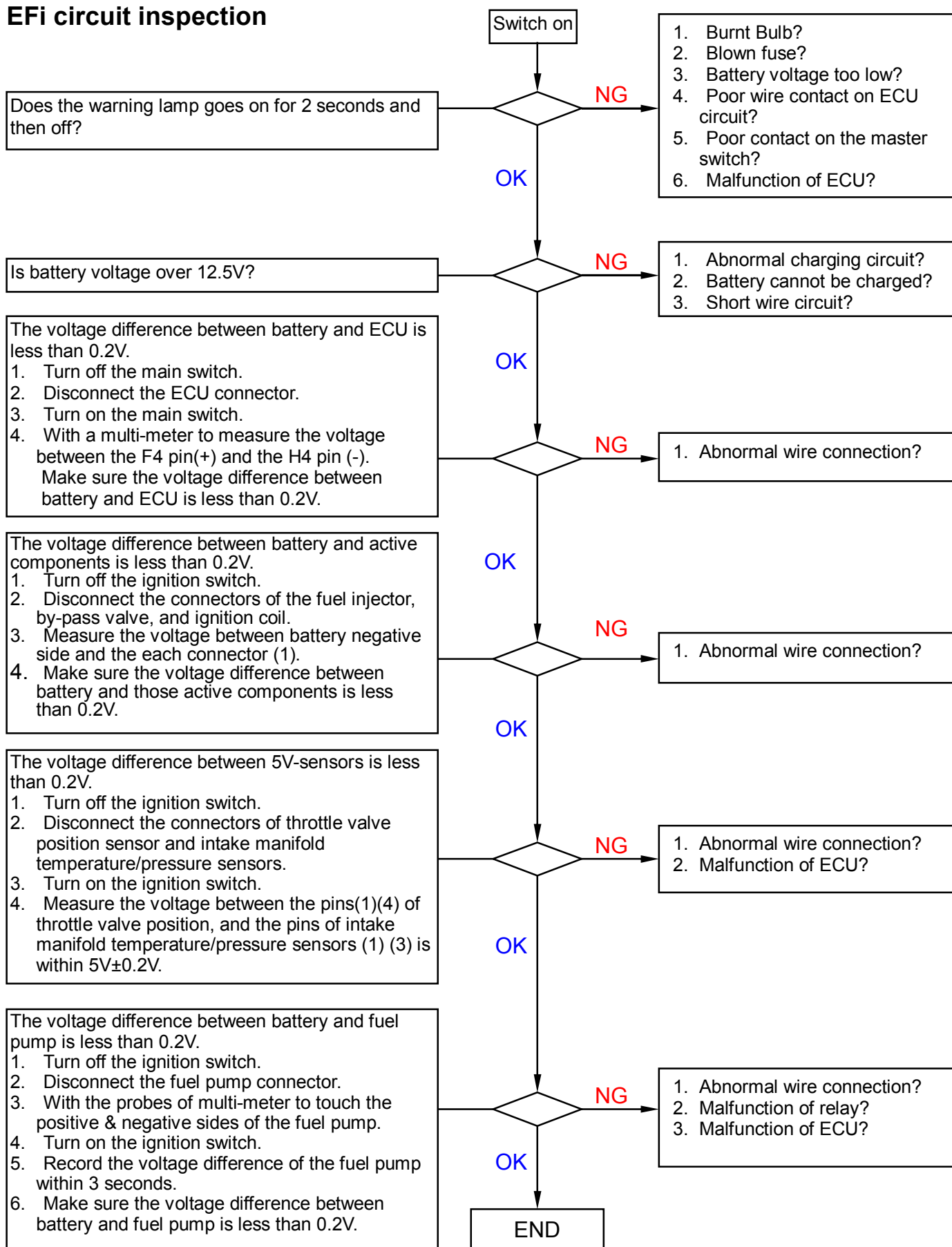
O2 sensor : 3.6~4.6 kgf-m

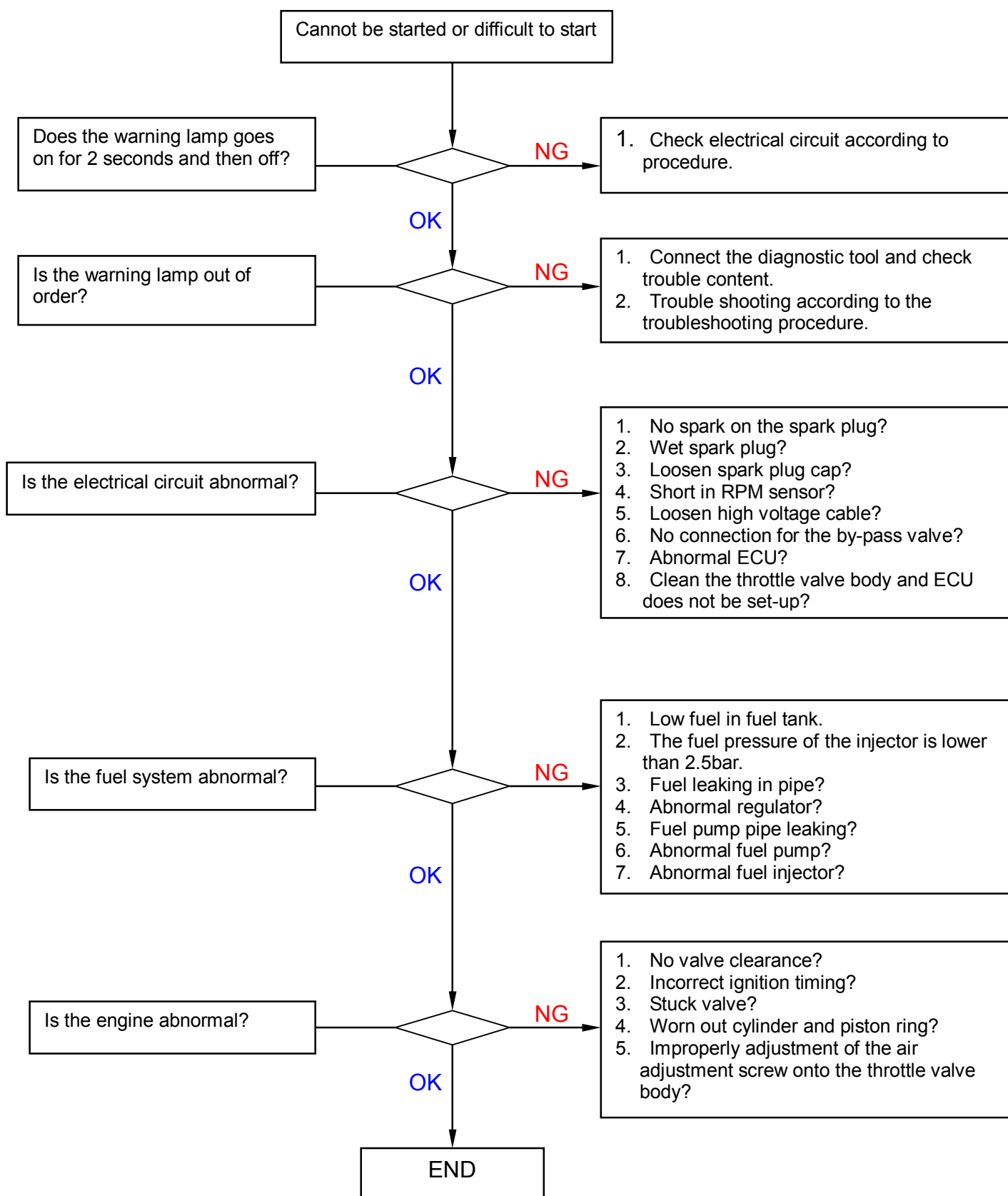
**Special tools**

Injection system diagnostic tool

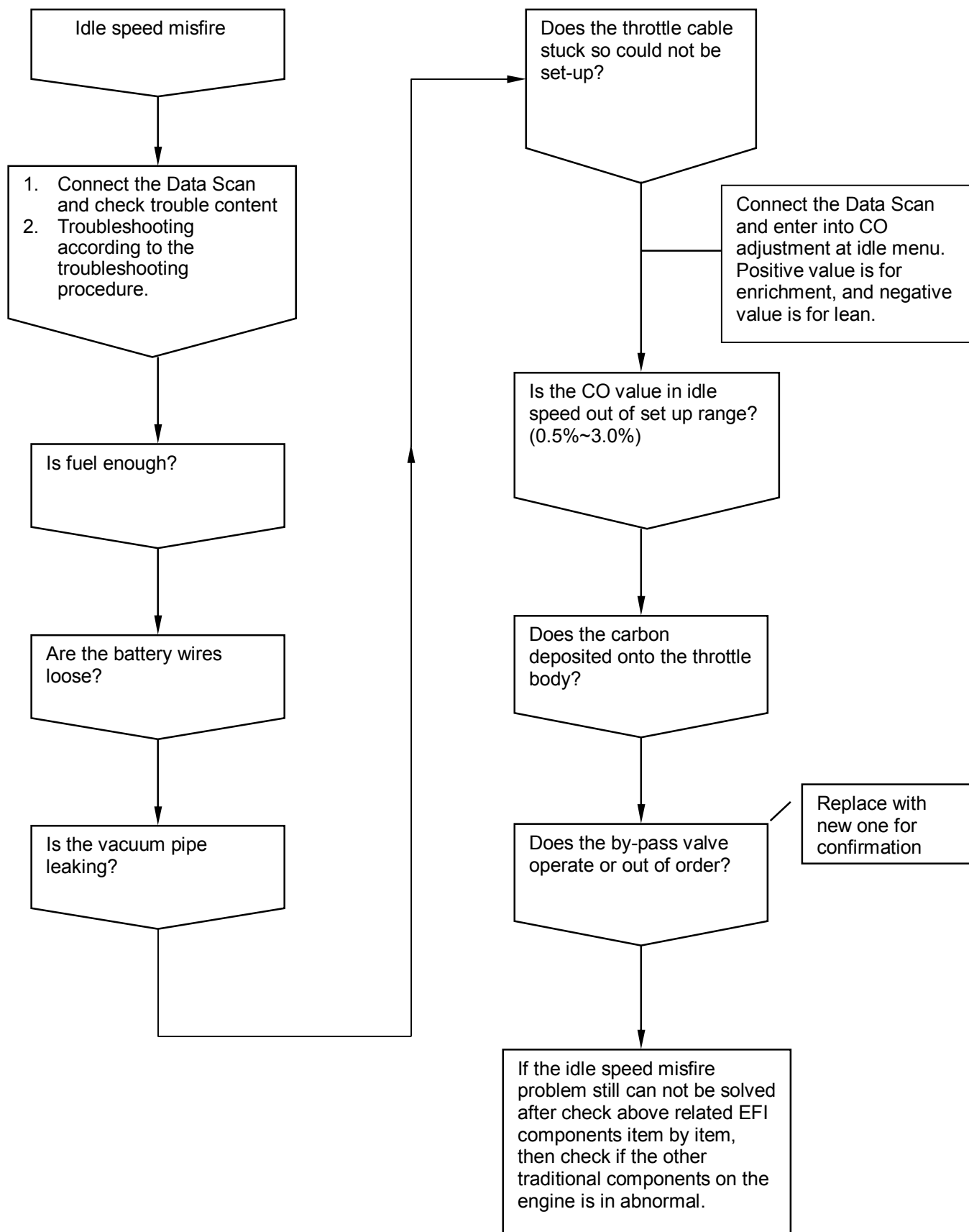
Fuel pressure gauge SYM-HT07010

## Troubleshooting EFI circuit inspection



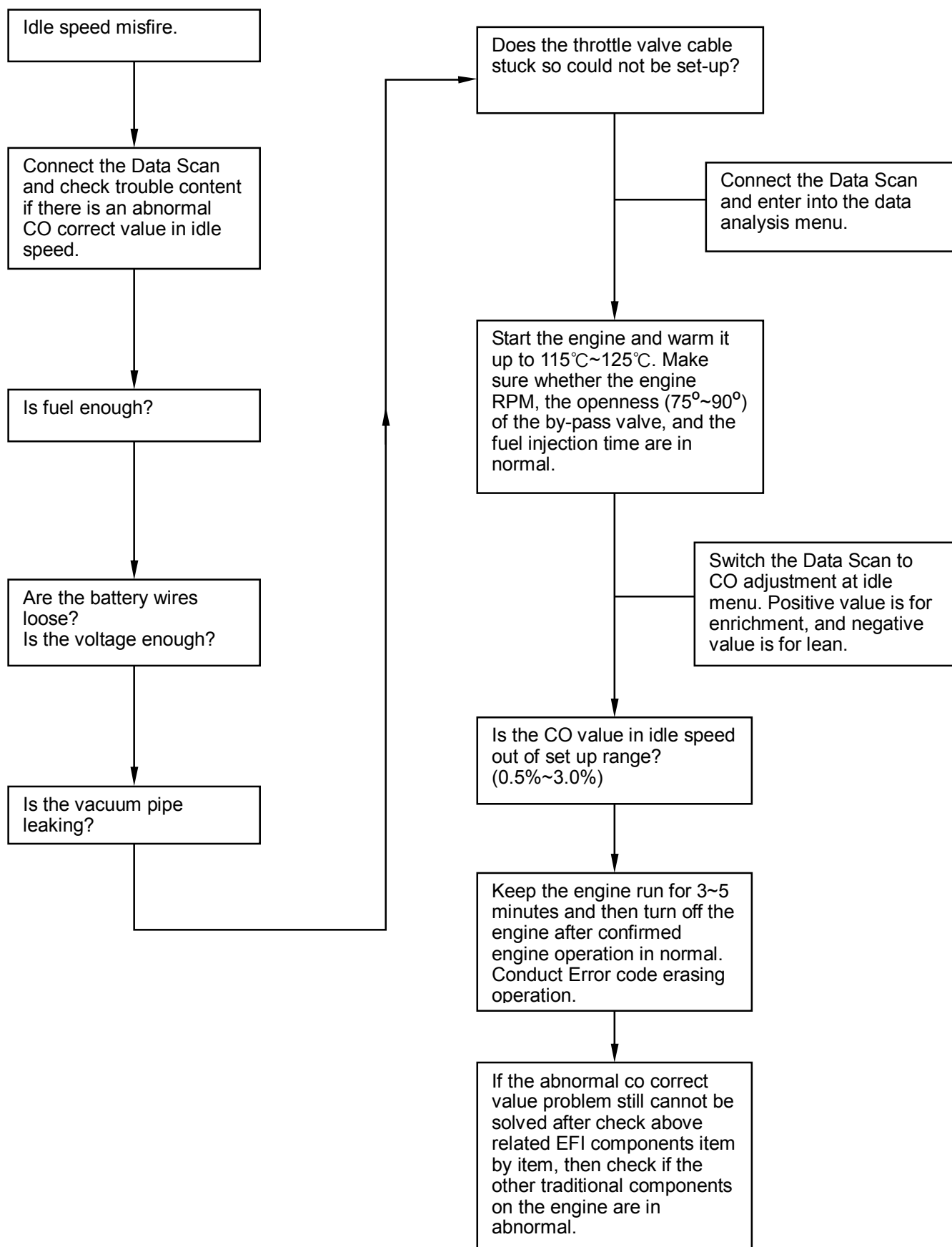
**Engine cannot be started or difficult to start.**

## Diagnosis of Idle Speed Misfire

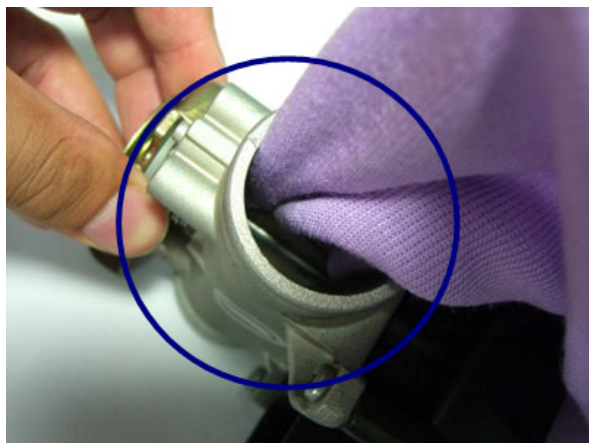


**Abnormal CO value**

If the system has O2 sensor, the CO value doesn't have to be adjusted. If the CO value still goes abnormal, please check O2 sensor first, to see if any malfunction occurred.



### Throttle Body & By-pass Valve Clean Procedure



- It's suggested that clean the air by-pass valve before cleaning the throttle body.
- Recommended cleaning frequency: every 6000 km.

#### Clean procedure:

##### 1. Air by-pass valve :

1. Switch off; disconnect the air tube between the air by-pass valve and connecting pipe.
2. Turn on the engine and keep the idle speed.
3. Spray a little carburetor cleaner into the air by-pass valve for 3~5 minutes. Do not shut down the engine during cleaning.
4. Connect the air tube.

##### 2. Throttle body:

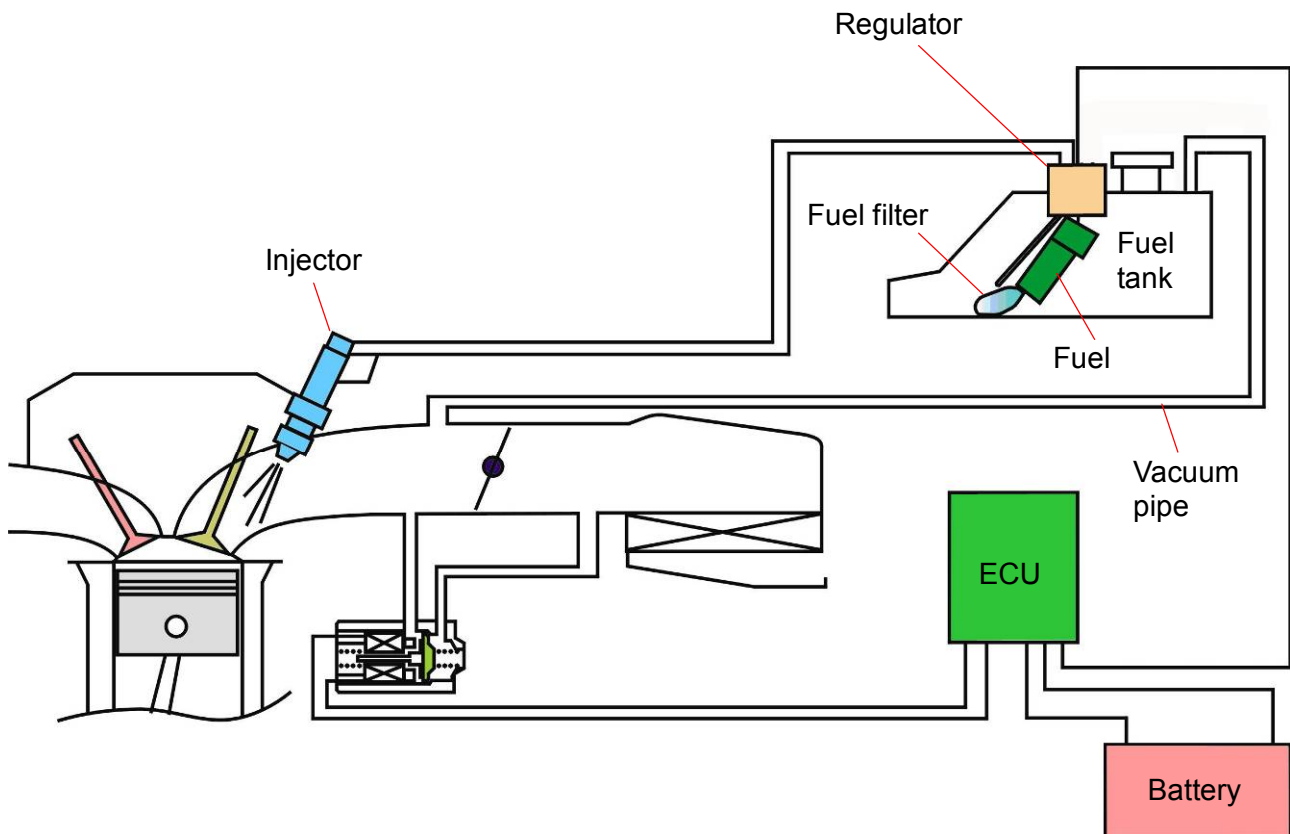
1. Switch off; remove the throttle body.
2. Spray a little carburetor cleaner into the throttle body.
3. Wipe off the dirty oil with clean cloth or tissue.
4. Dry the throttle body with compressed air and install the throttle body. Connect the diagnostic tool and switch on.

#### Idle speed learning:

After performing air by-pass valve or throttle body cleaning, idle speed learning should be carried out to let ECU know the engine condition well.

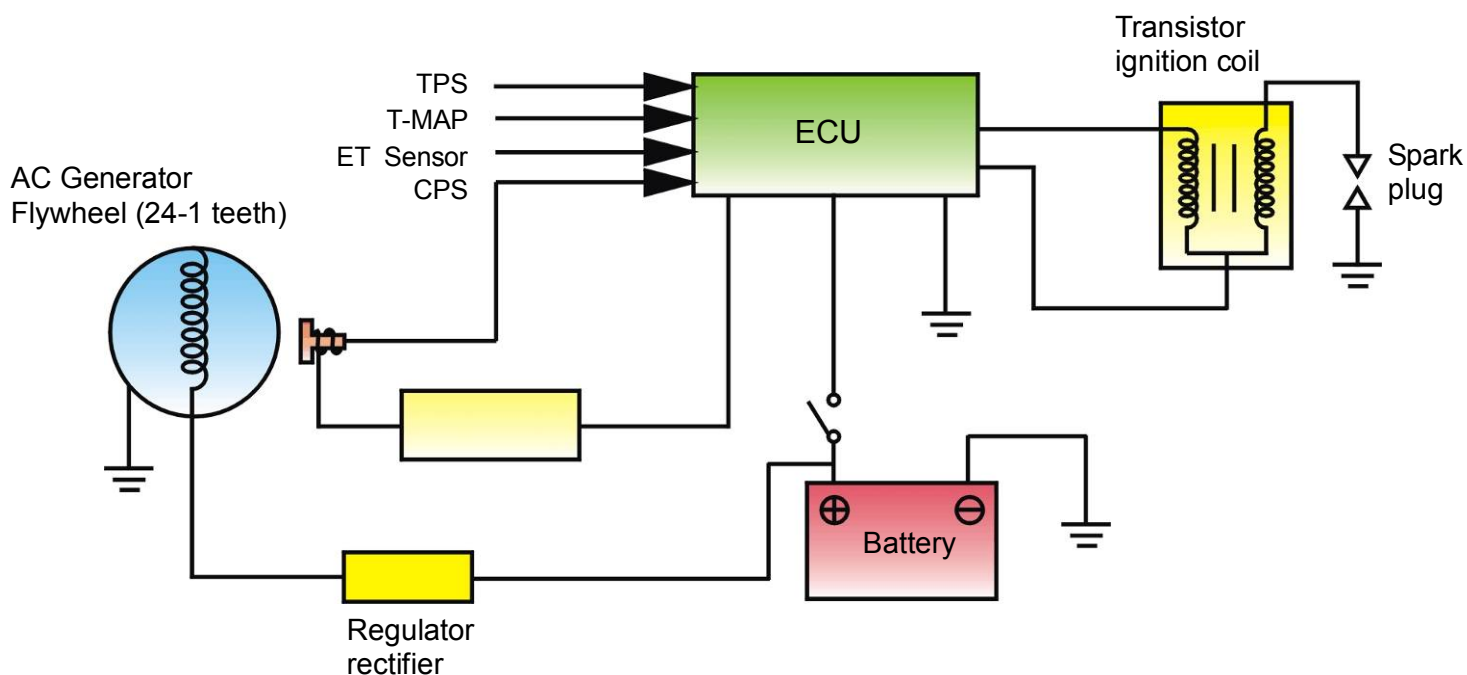
When performing the idle speed learning, run the engine at idle speed over 10 minutes after the engine temperature reaches the working temperature (around 70°C~95°C), and then ECU will get the parameters from sensors.

## Fuel Lines

**System description:**

1. After key-on, all sensors' signals sent to the ECU first. The electrical fuel pump will be activated by ECU signal. If the engine did not start for 2~3 seconds, then the fuel pump will be turned off to save electricity. The pressure regulator maintains the fuel pressure around 2.5 Bar, and the fuel injector spray proper fuel quantity according to the conditions and environmental coefficient. When key-off or engine stopped, the fuel pumps stop operating.
2. The fuel filter is to filter alien materials so it has to be replaced regularly.
3. Do not let the starting motor keep running when the engine cannot start. It will cause battery voltage to decrease. If the voltage drops under 8V, the pump will not operate. The countermeasure will be starting the engine by connecting a new battery or with kick-starter.

### Ignition System



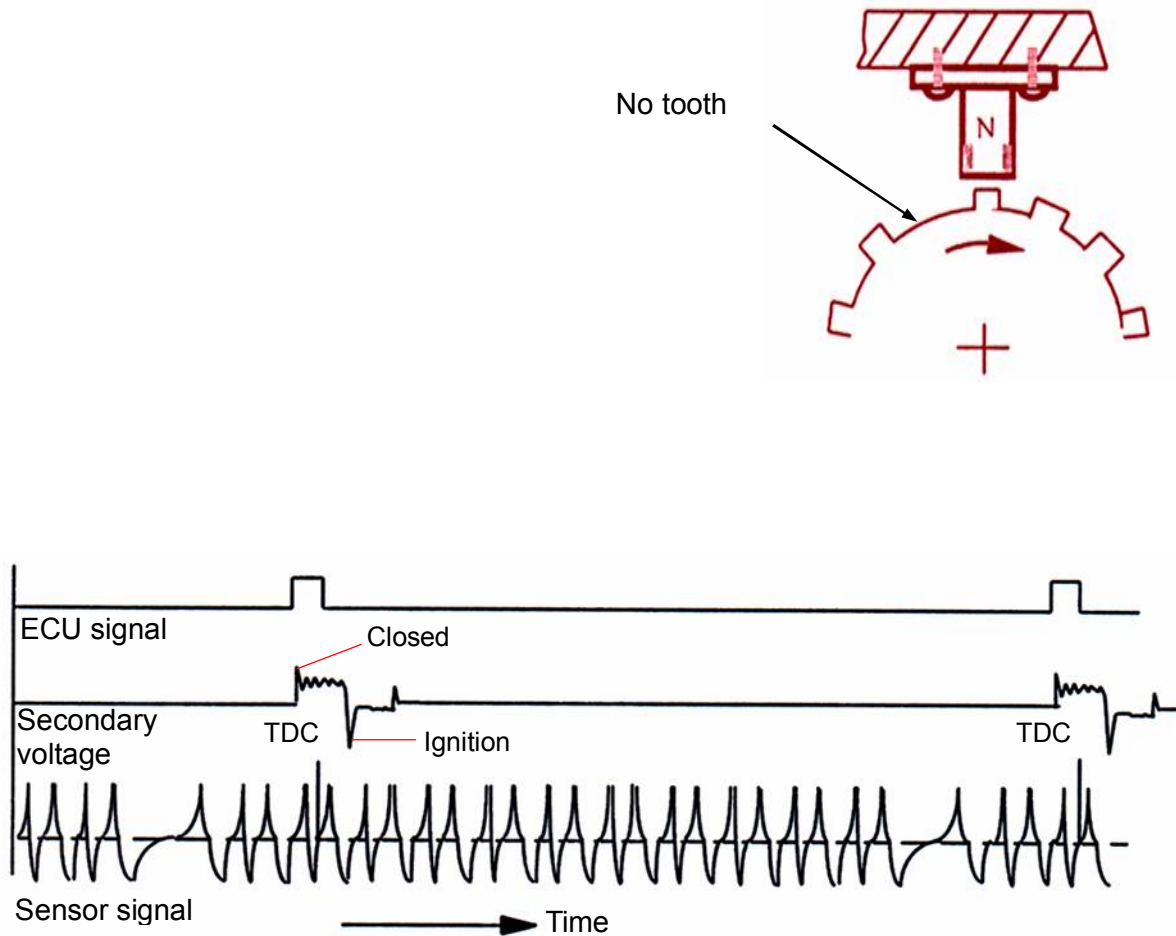
### Principle of operation

The engine is equipped with a computerized ignition control system that collects signals from CPS, TPS, ET Sensor, and T-MAP Sensor. Then, correspondence with engine RPM, this 8-bit microcomputer in the system controls ignition timing properly. The secondary coil creates 25000~30000V high voltage to ignite the spark plug by means of the transistor operation of the primary current entry from the ECU. This can maximize engine performance and also decrease fuel consumption.

### Specification

1. Ignition timing: BTDC 10° / 1700RPM
2. Spark plug: NGK CR8E  
Gap: 0.8mm
3. CPS pulse generator coil: 80~160  $\Omega$  / 20°C (G/W-LY)
4. Ignition coil  
Primary circuit : 0.63±0.03  $\Omega$  (23°C)
5. Battery:  
Type: YTX9-BS / GTX9-BS  
Capacity: 12V 8Ah

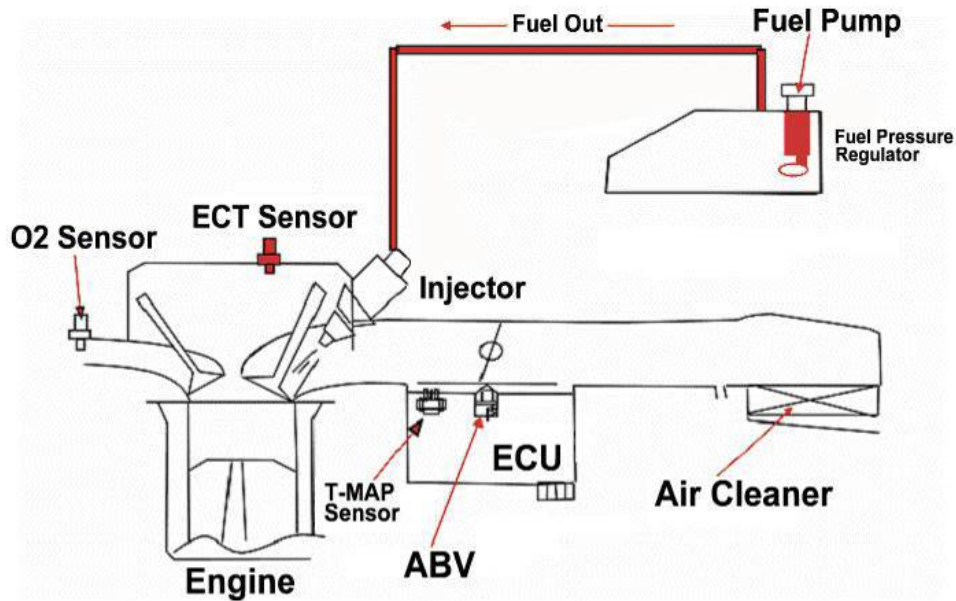
### Crankshaft Position Sensor

**Description:**

The magnetic field type sensor generates a voltage signal to calculate engine speed with ACG gear ring (24-1 tooth).

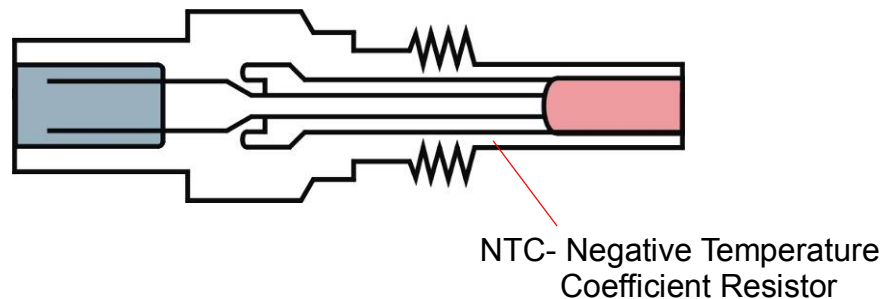
There is one tooth every 15 degree on the gear ring. But, one of the teeth is blank for the TDC calculating base.

### Engine Temperature Sensor / T-Map Sensor



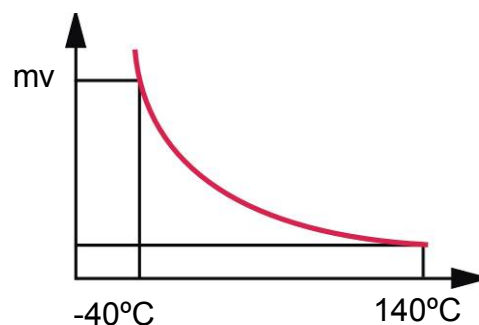
Engine temperature sensor:

According to the semiconductor's characteristic, the sensor detects the temperature of engine oil and metal parts and then sends a voltage signal to the ECU. On this base, the ECU can correct fuel injection and ignition timing.

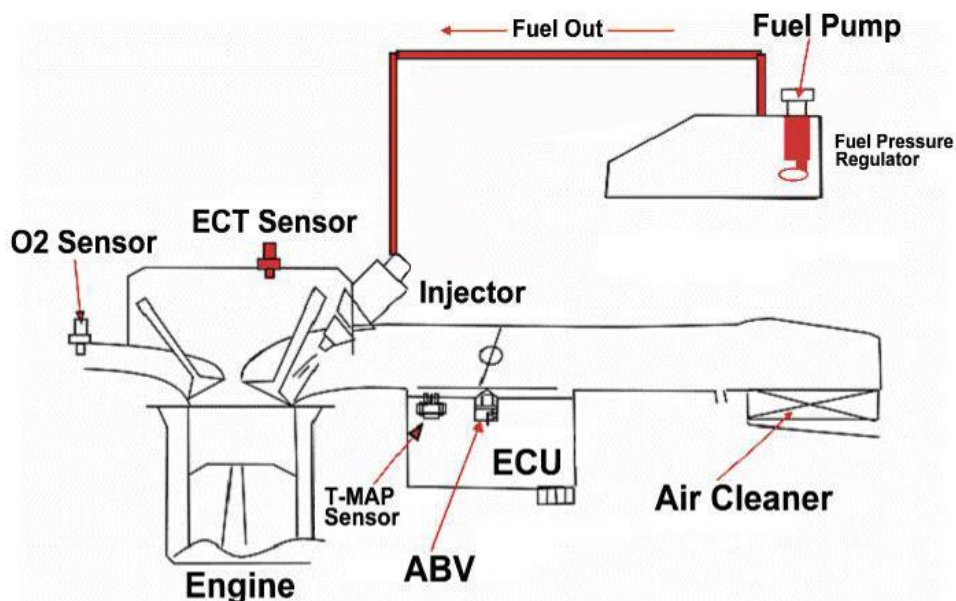


T-MAP Sensor :

Sensor combined both pressure and NTC can detect the absolute pressure and temperature in the intake manifold, and then provides the ECU with signal for adjustment fuel injection quantity based on environmental temperature and air pressure difference from elevation level change.



### Air By-pass Valve



#### Description:

ECU receives all sensors' signals to control the throttle valve openness with PWM, and adjust airflow through the by-pass valve of the intake manifold. It can adjust idle speed for a stably running engine.

1. When engine cold starting---the by-pass valve open for a while to increase airflow and to stabilize engine idle speed within initial starting
2. Warm-up---when engine oil is in low temperature condition, the by-pass valve adjusts airflow according to engine temperature (engine oil temperature), and raises idle speed.
3. Speed decreasing--- ECU controls the by-pass valve in correspondence with throttle operation, to provide inlet pipe with proper airflow quantity. Such operation will smooth the engine rpm reduction process, preventing the engine from stalling, excessive negative pressure, and also reduce HC emission.

### Fuel Injector

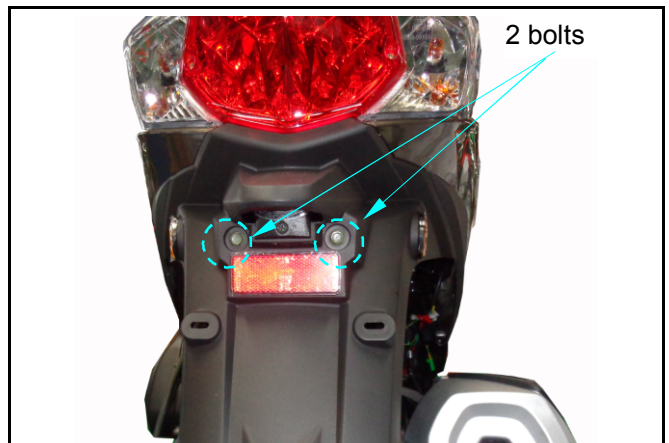
The injector provides intake valve a fuel jet. This can reduce the pollution of HC. The shortened version of fuel pump plate makes its size more compact, and sturdier against shocks. ECU signal controls the regulator to maintain 2.5 bars between the fuel pressure and the air pressure of inlet pipe. Through controlling the time length of injection under steady fuel pressure, the system can optimize the fuel injection quantity according to different engine workloads.

### Fuel Pump

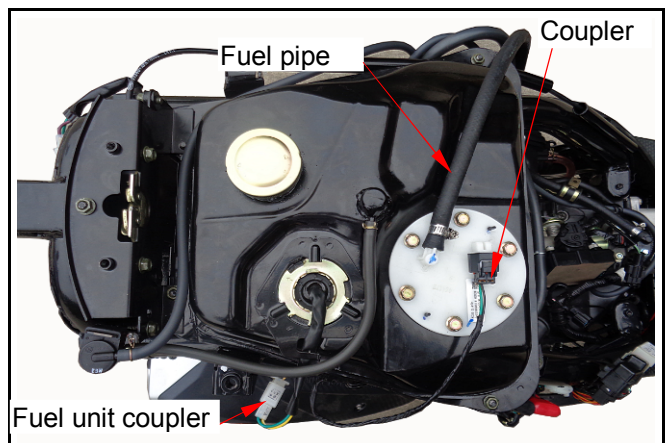
Electrical fuel pump is mounted inside the fuel tank. The power source is DC current provided and controlled by ECU; the pump can provide 14L/hour under the pressure of 2.5 bars.

### Fuel Pump / Fuel Unit Removal

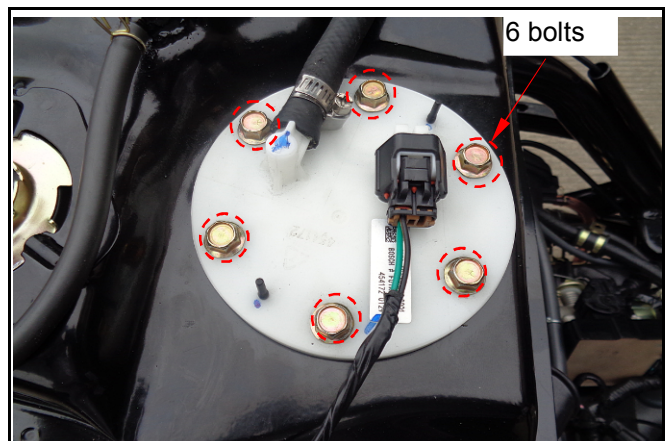
Remove the rear carrier  
Remove the luggage box.  
Remove the right/ left body covers and right/  
left side covers.  
Remove the battery cover.  
Remove 2 mounting bolts of the rear fender.



Disconnect the fuel pump couplers.  
Disconnect the fuel unit couplers  
Remove the fuel pipes.



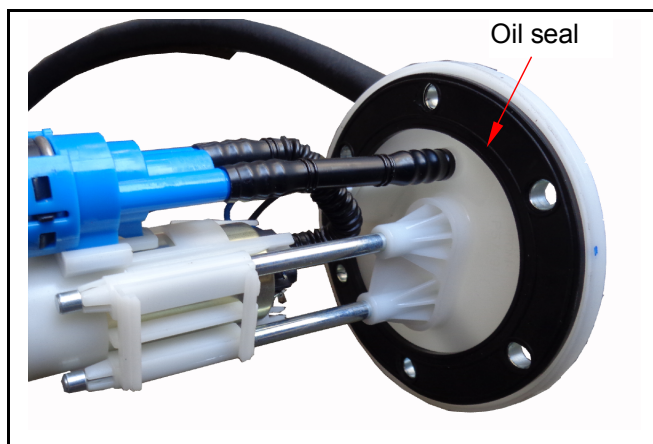
Remove the fuel pump lock bolts.



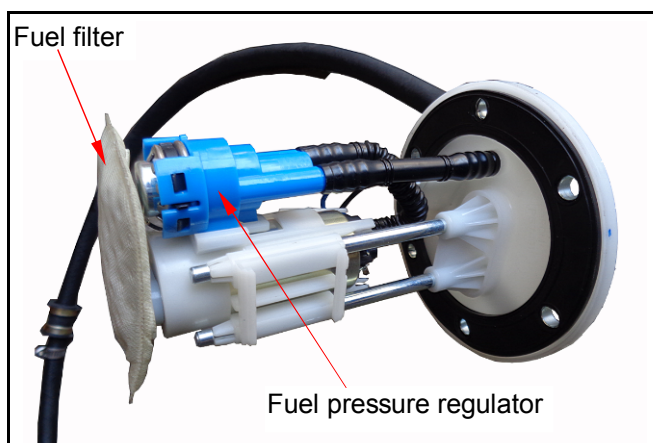
Remove the fuel pump and fuel unit.

**⚠ Caution**

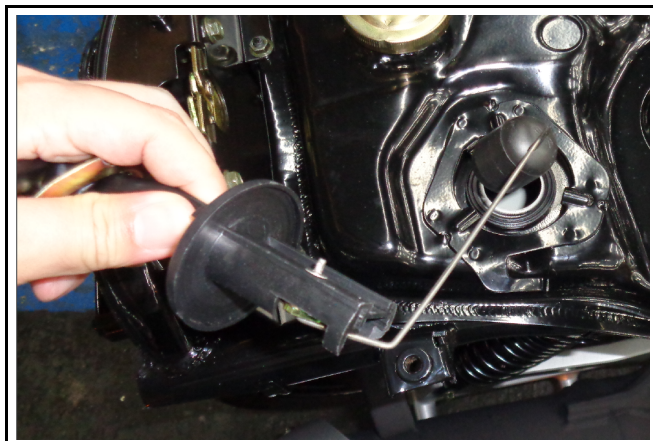
- Check if the oil seal is deformed or damaged. Replace it with new one if necessary.



Check if the fuel filter is contaminated or clogged. Replace it with new one if necessary.



Remove the fuel unit.  
Check the oil seal of fuel unit for any damage or deformation.

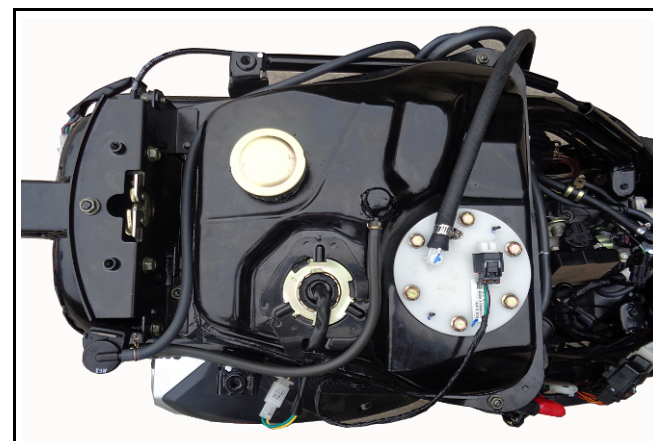


## Installation

Install in the reverse order of removal.

**⚠ Caution**

- Do not bend the fuel unit float arm
- Do not fill out too much fuel in the tank.
- Align the assembly mark when installing the fuel pump and fuel unit.
- Replace the oil seal if any damage or deformation is found.



### Inspection :

Disconnect the fuel pipe from the fuel injector. Connect the fuel pressure gauge to check the fuel pressure.

### Caution

- Make sure the fuel pressure is normal (2.5 bar).
- Always release the fuel pressure before removing the fuel pipe to prevent the fuel from splashing.

### Special tool :

#### Fuel pressure gauge SYM-HT07010

Replace the fuel pump with new one if malfunction is confirmed.

### Fuel Tank

#### Removal

Disconnect the fuel pump and the fuel unit coupler.

Remove fuel pipe.

Remove the fuel cut valve pipe.

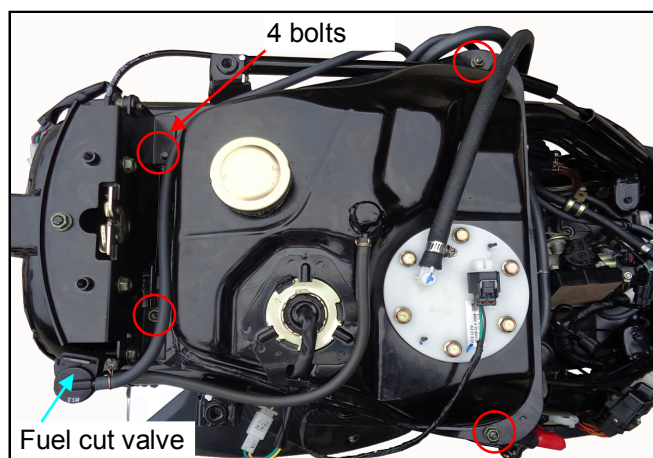
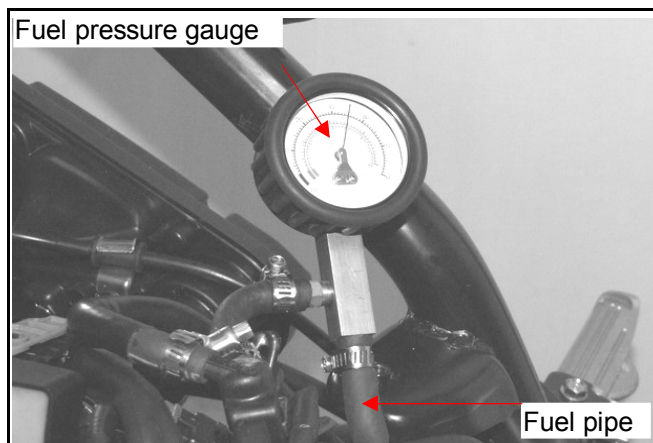
Remove the fuel tank (4 lock bolts).

#### Installation

Install in the reverse order of removal.

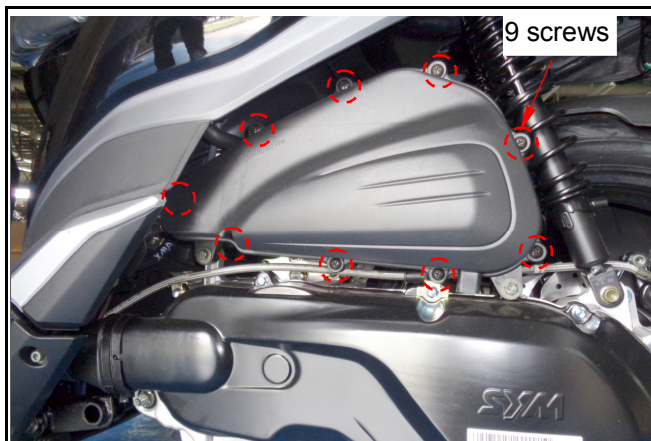
### Caution

- Make sure the fuel in the tank is not too much before removing the fuel tank.
- Replace the fuel tank if there is any damage or leakage.

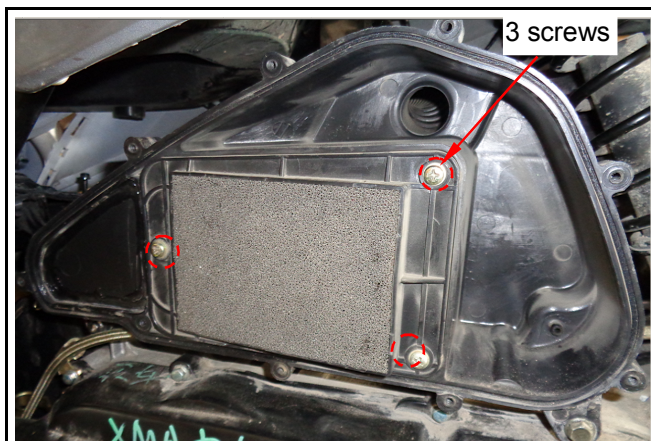


### Air Cleaner

Remove the air cleaner cover (9 screws).



Remove the air cleaner element (3 screws).

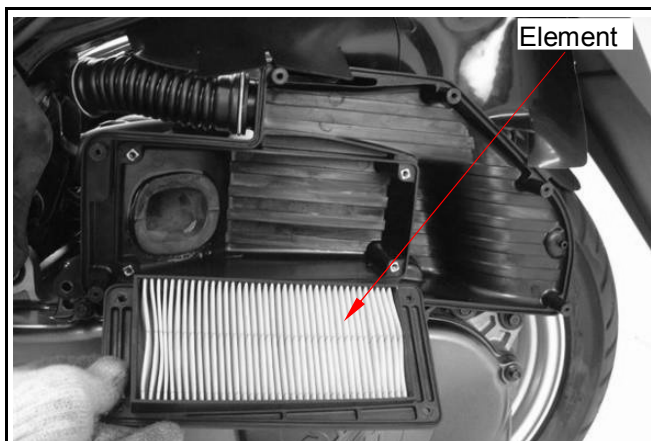


### ⚠ Caution

- The air cleaner is paper-base; please blow it clean with compressed air. Don't use water or other solvent
- Replace it with new one if the dirt cannot be removed.

### Installation

Install in the reverse order of removal.



### EFi Troubleshooting and Solution

#### Readings of Trouble Code through Check Lamp

When the engine might have problem and there is no diagnostic tool to determine, the problem can be judged by reading the flash times of Check Lamp on the speedometer. And then, you can know the service priority level, or the FLASH CODE. Then you can try to fix the problem.

Here are the descriptions for the two ways:

#### To show “Service Priority”

Once the error in the EFi system is detected during driving (or anytime when the engine is running). The Check Lamp on the speedometer will start to light in two ways.

Service Priority 1 : Check Lamp keeps blinking: to warn the driver that the vehicle should be checked **immediately**.

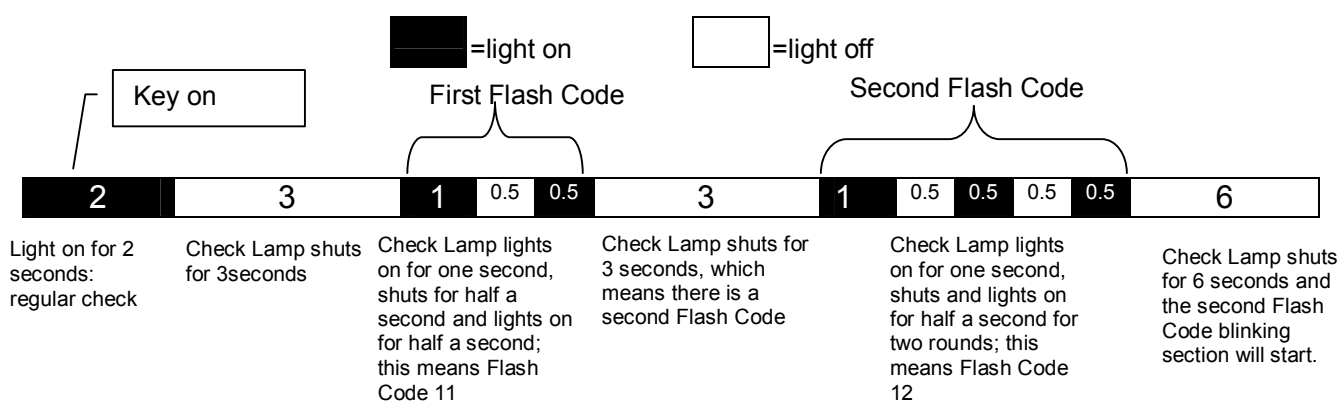
Service Priority 2 : Check Lamp keeps lighting up: to warn the driver that the vehicle should be checked as soon as possible, yet the vehicle has **no immediate problem**.

Service Priority	Light up types
1	<div> <div>ON</div> <div>OFF</div> </div>
2	<div> <div>ON</div> <div>OFF</div> </div>

#### To show “FLASH CODE”

Turn the key on without starting the engine; Check Lamp will start to show Flash Code for four times and then stop. If you turn the key off before Check Lamp shows Flash Code for four times, it will show another four times after you turn the key on again.

Check Lamp lights on for 1 second to show tens digit, and lights on for half a second to show units digit.



If the engine is started during Check Lamp is showing the Flash Code, Check Lamp will start to show the service priority by blinking or lighting up.

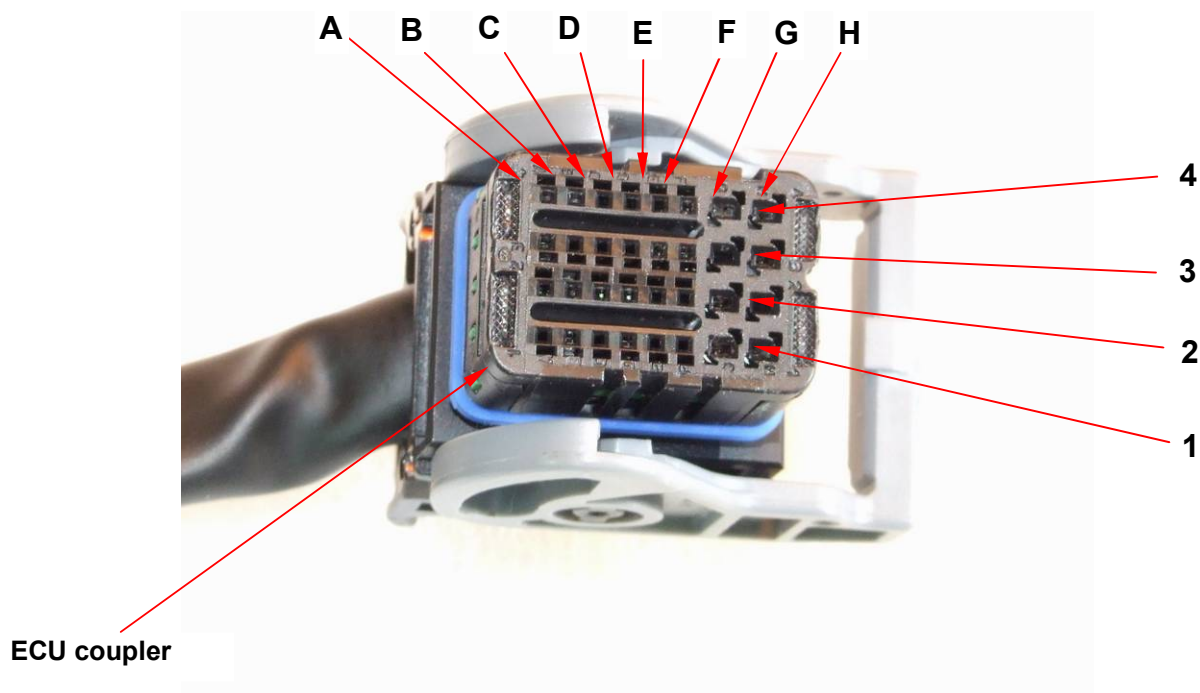
## Error Code Message and Solution Operation

DTC code	Flash code	Service priority	Message	Solution operation
P0217	1	1	Engine temperature overheat	Stop the vehicle immediately, and solve it with priority. Check the lubricant system for malfunction. Check if the ignition or fuel supply system is in normal. Check if the engine is burnt. Make sure if the engine temperature sensor is in normal. Make sure if the connector is in normal.
P0335	2	2	Abnormal crankshaft position sensor	Check if the connection of the crank position sensor is open-circuit. Check if the gap between the sensor and gear tooth is within specification. Check if the crank rotation is run-out. Check if the sensor is in normal according to the new component replacement procedure.
P0120	3	2	Abnormal throttle position sensor learning value	Connect the diagnostic and reset the throttle valve position. Make sure if the idle speed position is within standard range. Make sure if the wire circuit of the throttle valve position sensor is loosen or short. Check if the openness of idle speed by-pass valve is within specification. (40~100%) Adjust the idle speed CO value to specified range. (0.5%~2.0%) If this problem symptom still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P0121	4	2	Abnormal throttle position sensor output voltage	Make sure if the wire circuit of the throttle valve position sensor is loosen or short. If this problem symptom still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P0124	5	2	Abnormal throttle position sensor turning speed	Make sure if the wire circuit of the throttle valve position sensor is loosen or short. If this problem still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P0560	6	1	Abnormal battery voltage	Make sure if the battery voltage is too low or high (below 10V or exceed 16V) Make sure if the ACG generator charging system circuit is short or abnormal. Check if the G4 terminal on the ECU to battery positive post is short. Make sure if the battery is in normal. Replace it with new if the battery is out of order.
P0110	7	2	Abnormal intake air temperature sensor	Make sure if the sensor's wire is in open-circuit. Make sure if the sensor is normal according to the new component replacement procedure.

DTC code	Flash code	Service priority	Message	Solution operation
P0505	9	2	Abnormal air bypass valve learning value	Check if the air bypass valve openness is in normal. Check if the intake manifold is leaking.
P0200	10	2	Abnormal fuel injector	Make sure if the fuel injector resistance is within specification. (12 $\Omega$ , 20°C) Check if the connector or wire is in open-circuit. (The G1 terminal of ECU) Make sure if the fuel injector power supplied is normal. (12~15V)
P0350	11	2	Abnormal ignition circuit	Make sure if the ignition coil resistor is within specification. (0.63 $\Omega$ , 23°C) Make sure if the connector or wire is in open-circuit. (The 12th terminal of ECU) Make sure if the ignition coil's power supplied is in normal. (12~15V)
P0230	12	2	Abnormal fuel pump relay	Make sure if the connector or wire is in open-circuit. Replace with new relay to make sure if this abnormal is disappeared.
P0219	13	2	Engine over-RPM	Engine speed exceed safety limit. Decrease the speed and then the DTC code disappeared. Check if the CVT belt is broken.
P0700	15	2	Too high RPM when starting engine	If the engine RPM exceeds 3000rpm as starting, in order to prevent run-away accident, the ECU will decrease engine speed or stop the engine. Rider should avoid to starting engine with WOT suddenly. Check if acceleration cable is stuck. Re-set the idle speed adjustment position.
P0115	16	2	Abnormal engine temperature sensor	Make sure if the sensor's resistor is within specification. (60°C, 703.8 $\pm$ 40.9 $\Omega$ ) Make sure if the sensor's wire is in open-circuit. (9th terminal of ECU)
P0650	18	2	Abnormal check lamp	Check if the check lamp is burnt. Check if the check lamp circuit is open. (C2 terminal of ECU)
P0136	19	2	Abnormal O2 sensor wiring	Check O2 sensor coupler. Check O2 sensor wiring (D2, D1 terminal of ECU).
P0141	20	2	Abnormal O2 sensor heater wiring	Check O2 sensor coupler. Check O2 sensor wiring (H1 terminal of ECU). Check O2 sensor white cable voltage (12V).
P0105	21	2	Abnormal MAP sensor	Clean the sensor. Replace the ECU.

DTC code	Flash code	Service priority	Message	Solution operation
P0170	23	2	Fuel supply too thick or too thin	Check the fuel tank. Check and clean the air cleaner. Check the fuel injector, O2 sensor and fuel pump.
P1001	25	2	Abnormal reset coupler	Check the coupler wiring.

ECU coupler terminal layout :



### 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.

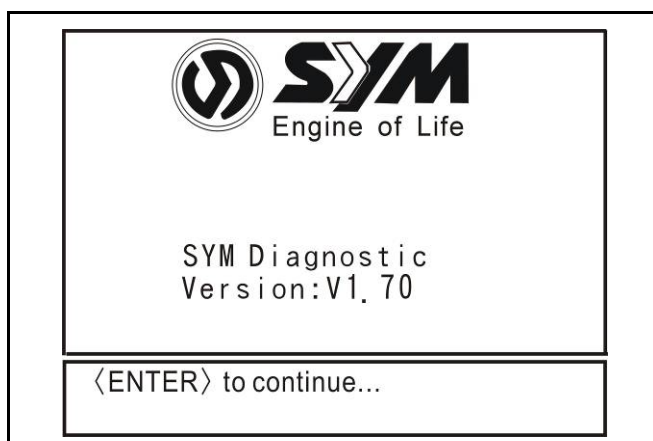
**Diagnostic tool illustration**

Connect the diagnostic tool wire connector and turn on the main switch.

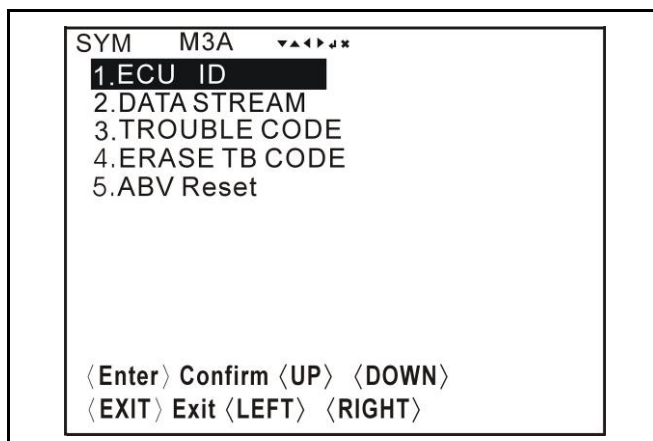
Press <Enter> button to proceed.



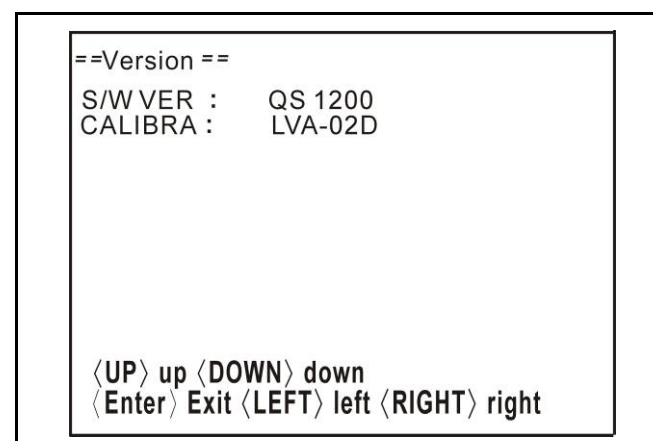
Press <Enter> button to enter function-options page.



Press <Enter> button to enter ECU ID version page.

**System Information**

Press <Enter> button to get back to the function-options page.



**DATA STREAM**

Press <Enter> button to enter Data Stream page.

```

SYM  M3A  ▼▲◀▶⏏
1.ECU ID
2.DATA STREAM
3.TROUBLE CODE
4.ERASE TB CODE
5.ABV Reset

<Enter> Confirm <UP> <DOWN>
<EXIT> Exit <LEFT> <RIGHT>

```

Press <UP> or <DOWN> button to choose Fault No. item.

```

(01-03) Data Stream
*Fault No.----- 0 (Normal : 0)
Intake Air----- 31°C
Engine temp----- 92°C (80~110°C)
BARO----- 100.0KPa (>98KPa)
ECU STATUS-- IDLE
BATT. VOLT----- 14.0V (Idle : >12V)
Engine SPD-- 1852RPM(Idle:1800~2000)
TPS position-- 0.0%
IDLE LEARN--- 0.40V
IDLE SET----- 1850RPM(Idle:1800~2000)
<UP> prev <DOWN> next <Enter> fixed <F4> waveform
<EXIT> exit <LEFT> PgUp <RIGHT> PgDn <F1> Help

```

Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.

```

FAULT NO.-----
==No description !! ==

```

ANY KEY TO CONTINUE.

Press <UP> or <DOWN> button to choose Intake Air item.

```

(01-03) Data Stream
Fault No.----- 0 (Normal : 0)
♦Intake Air----- 31°C
Engine temp----- 92°C (80~110°C)
BARO----- 100.0KPa (>98KPa)
ECU STATUS-- IDLE
BATT. VOLT----- 14.0V (Idle : >12V)
Engine SPD- 1852RPM (Idle:1800~2000)
TPS position-- 0.0%
IDLE LEARN---- 0.40V
IDLE SET----- 1850RPM (Idle:1800~2000)
<UP> prev <DOWN> next <Enter> fixed <F4> waveform
<EXIT> exit <LEFT> PgUp <RIGHT> PgDn <F1> Help
  
```

Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.

Intake Air-----  
Measure the intake air temperature to convey to ECU, then the ECU calculate out proper compensation and controlling amount of injected fuel.

ANY KEY TO CONTINUE.

Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.

```

Intake Air----- 31°C
235
-30
(L)(R) :switch range <EXIT> exit
  
```

Press <UP> or <DOWN> button to choose Engine Temp item.

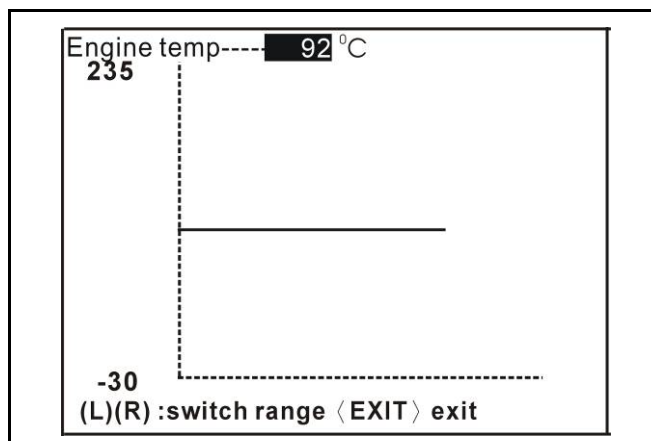
(01-03) Data Stream		
Fault No.-----	0	(Normal : 0)
Intake Air-----	31°C	
→Engine temp-----	92°C	(80~110°C)
BARO-----	100.0KPa	(>98KPa)
ECU STATUS--	IDLE	
BATT. VOLT-----	14.0V	(Idle : >12V)
Engine SPD--	1852RPM	(Idle:1800~2000)
TPS position--	0.0%	
IDLE LEARN---	0.40V	
IDLE SET-----	1850RPM	(Idle:1800~2000)
<UP> prev <DOWN> next <Enter> fixed <F4> waveform <EXIT> exit <LEFT> PgUp <RIGHT> PgDn <F1> Help		

Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.

Engine temp-----  
This data can be used for observing the engine been warm-ready or not. Some ECU control items need implected in engine warm-ready status.

ANY KEY TO CONTINUE.

Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.



Press <UP> or <DOWN> button to choose BARO item.

```

(01-03) Data Stream
Fault No.----- 0 (Normal : 0)
Intake Air----- 31°C
Engine temp----- 92°C (80~110°C)
▶BARO----- 100.0KPa (>98KPa)
ECU STATUS-- IDLE
BATT. VOLT----- 14.0V (Idle : >12V)
Engine SPD-- 1852RPM (Idle:1800~2000)
TPS position-- 0.0%
IDLE LEARN--- 0.40V
IDLE SET----- 1850RPM (Idle:1800~2000)
<UP> prev <DOWN> next <Enter> fixed <F4> waveform
<EXIT> exit <LEFT> PgUp <RIGHT> PgDn <F1> Help
  
```

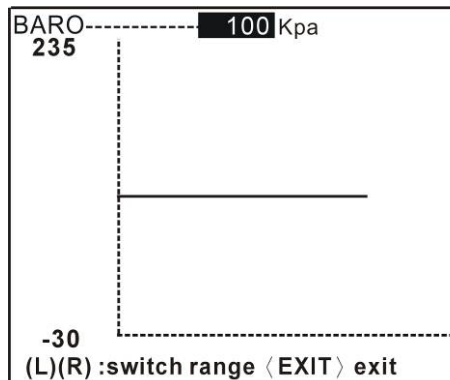
Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.

```

BARO-----
Under different height above sea leve
l, atmospheric pressure with lead to
the fact air thin, so will need a con
pensation coefficient to the injected
fuel.
  
```

ANY KEY TO CONTINUE.

Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.



Press <UP> or <DOWN> button to choose BATT. VOLT item.

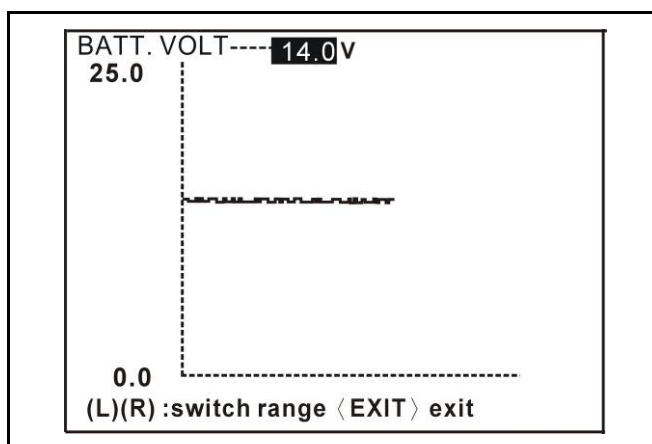
(01-03) Data Stream		
Fault No.-----	0	(Normal : 0)
Intake Air-----	31°C	
Engine temp-----	92°C	(80~110°C)
BARO-----	100.0KPa	(>98KPa)
ECU STATUS-----	IDLE	
▶BATT. VOLT-----	14.0V	(Idle : >12V)
Engine SPD-----	1852RPM	(Idle:1800~2000)
TPS position-----	0.0%	
IDLE LEARN-----	0.40V	
IDLE SET-----	1850RPM	(Idle:1800~2000)
<UP> prev <DOWN> next <Enter> fixed <F4> waveform <EXIT> exit <LEFT> PgUp <RIGHT> PgDn <F1> Help		

Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.

BATT. VOLT-----  
ECU measure the battery voltage pin. This pin connected to injector, ignition coil and fuel pump circuit.

ANY KEY TO CONTINUE.

Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.



Press <UP> or <DOWN> button to choose Engine SPD item.

(01-03) Data Stream

Fault No.-----0 (Normal : 0)

Intake Air-----31°C

Engine temp-----92°C (80~110°C)

BARO-----100.0KPa (>98KPa)

ECU STATUS--IDLE

BATT. VOLT-----14.0V (Idle : >12V)

Engine SPD-1852RPM(Idle:1800~2000)

TPS position--0.0%

IDLE LEARN---0.40V

IDLE SET-----1850RPM(Idle:1800~2000)

<UP> prev <DOWN> next <Enter> fixed <F4> waveform

<EXIT> exit <LEFT> PgUp <RIGHT> PgDn <F1> Help

Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.

Engine SPD-----

Utilize the crankshaft position sensor with the gear teeth to calculate out the engine RPM count.

ANY KEY TO CONTINUE.

Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.

Engine SPD--1790RPM

2470

0

(L)(R) :switch range <EXIT> exit

Press <UP> or <DOWN> button to choose TPS position item.

**(01-03) Data Stream**

Fault No.----- **0** (Normal : 0)

Intake Air----- **31**°C

Engine temp----- **92**°C (80~110°C)

BARO----- **100.0**KPa (>98KPa)

ECU STATUS-- **IDLE**

BATT. VOLT----- **14.0**V (Idle : >12V)

Engine SPD- **1852**RPM(Idle:1800~2000)

▶TPS position-- **0.0**%

IDLE LEARN--- **0.40** V

IDLE SET----- **1850**RPM(Idle:1800~2000)

<UP> prev <DOWN> next <Enter> fixed <F4> waveform

<EXIT> exit <LEFT> PgUp <RIGHT> PgDn <F1> Help

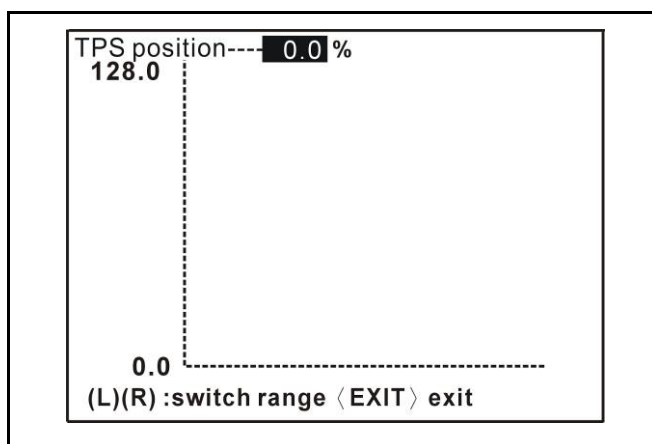
Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.

TPS position-----

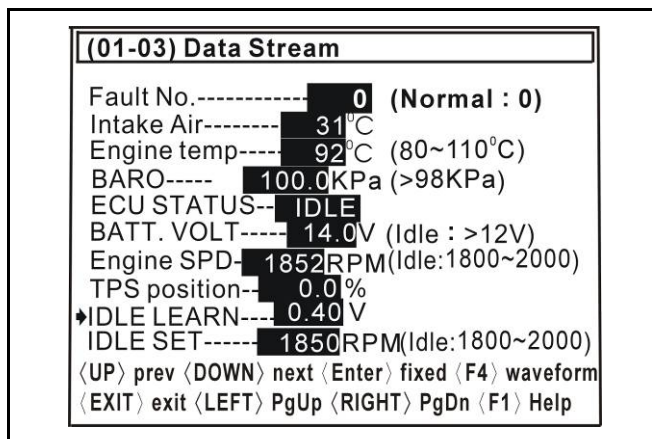
This data is 0% in idle speed, 100% in full speed.

ANY KEY TO CONTINUE.

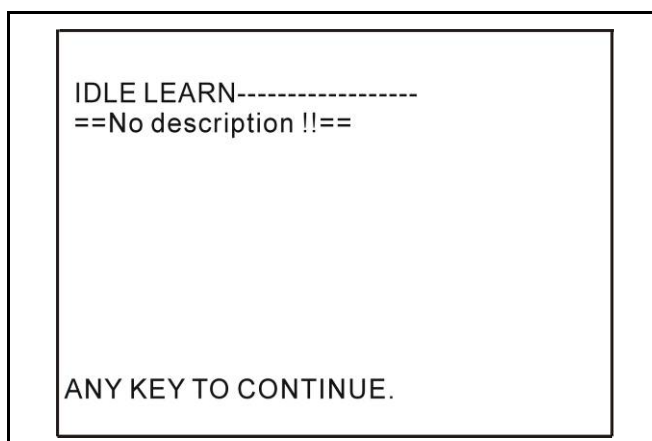
Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.



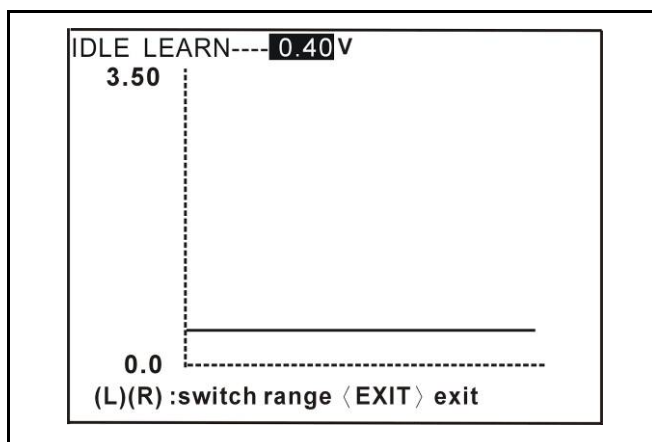
Press <UP> or <DOWN> button to choose IDLE LEARN item.



Press <F1> button to enter description page.  
 Press any key to get back to Data Stream page.



Press <F4> button to enter waveform page.  
 Press <EXIT> button to get back to Data Stream page.



Press <UP> or <DOWN> button to choose IDLE SET item.

**(01-03) Data Stream**

Fault No.----- **0** (Normal : 0)

Intake Air----- **31**°C

Engine temp----- **92**°C (80~110°C)

BARO----- **100.0**KPa (>98KPa)

ECU STATUS-- **IDLE**

BATT. VOLT----- **14.0**V (Idle : >12V)

Engine SPD- **1852**RPM(Idle:1800~2000)

TPS position-- **0.0**%

IDLE LEARN--- **0.40**V

➔IDLE SET----- **1850**RPM(Idle:1800~2000)

<UP> prev <DOWN> next <Enter> fixed <F4> waveform  
 <EXIT> exit <LEFT> PgUp <RIGHT> PgDn <F1> Help

Press <F1> button to enter description page.  
 Press any key to get back to Data Stream page.

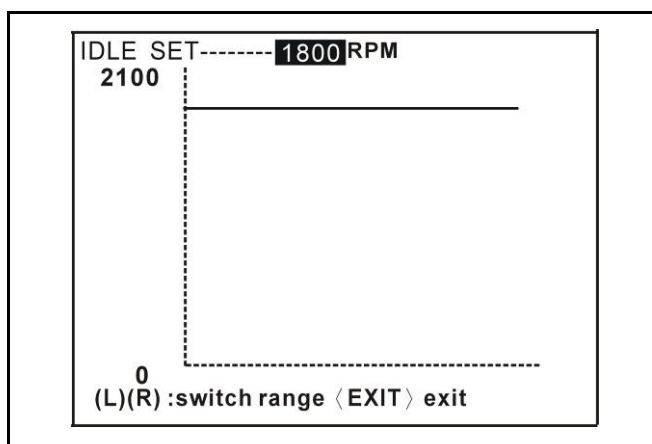
IDLE SET-----

Utilize the engine temperature and intake air temperature to calculate out the idle speed RPM.

ANY KEY TO CONTINUE.

Press <F4> button to enter waveform page.  
 Press <EXIT> button to get back to Data Stream page.



Press <RIGHT> button to get to next page to choose MAP item.

(02-03) Data Stream

MAP

INJECT TIME

IGN. ANGLE

IGN. CHARGE

RUN TIME

FUEL PUMP

TILTED SNSR

BYPASS ADAPT

BYPASS LEARN

BYPASS OPEN

52Kpa (40~60 Kpa)

3.3ms (1.5~2.5 ms)

5.6° (8~18°)

3.36ms (2.5~4.0ms)

5Hr

ON

0.58V

-0.46° (-50~120°)

104.6°

19.2 (0~240°)

<UP> prev <DOWN> next <Enter> fixed <F4> waveform

<EXIT> exit <LEFT> PgUp <RIGHT> PgDn <F1> Help

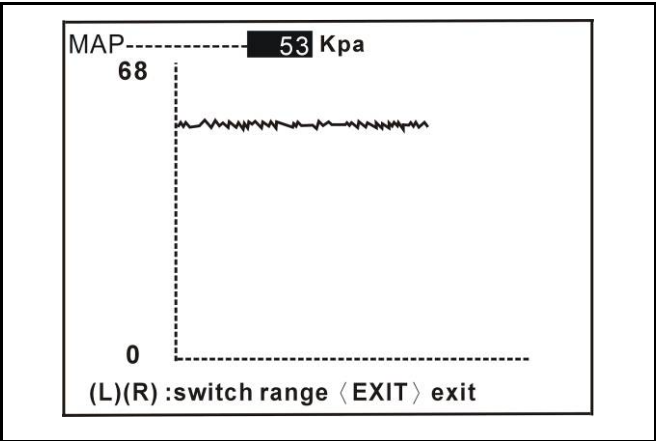
Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.

MAP

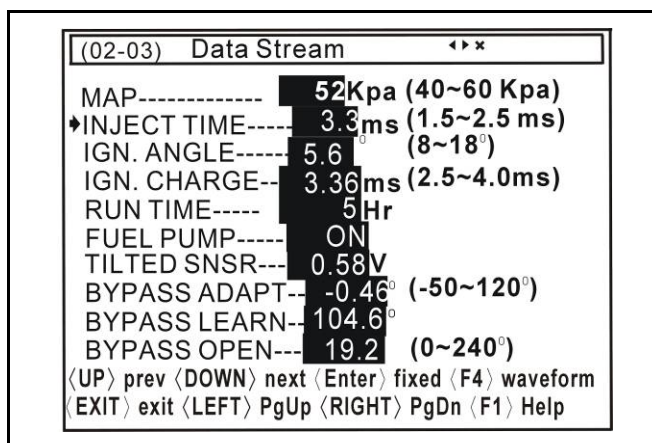
This data used for measure manifold vacuum to calculate fuel amount and ignition angle.

ANY KEY TO CONTINUE.

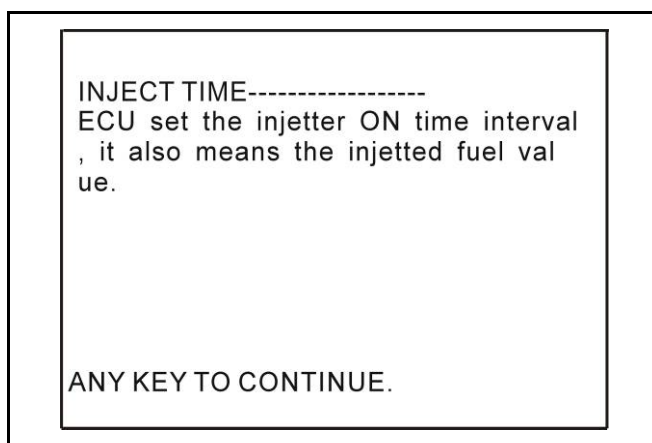
Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.



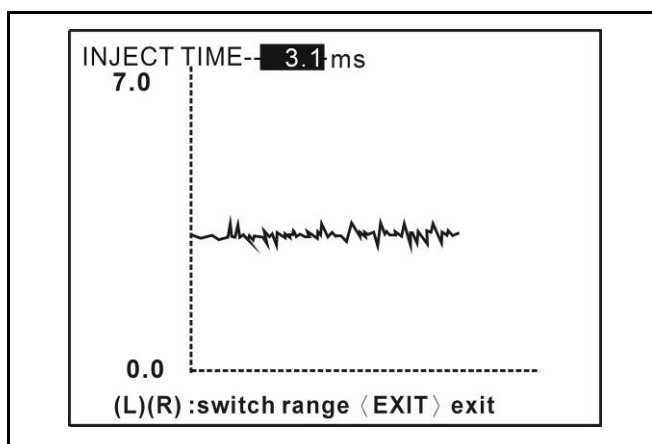
Press <UP> or <DOWN> button to choose INJECT TIME item.



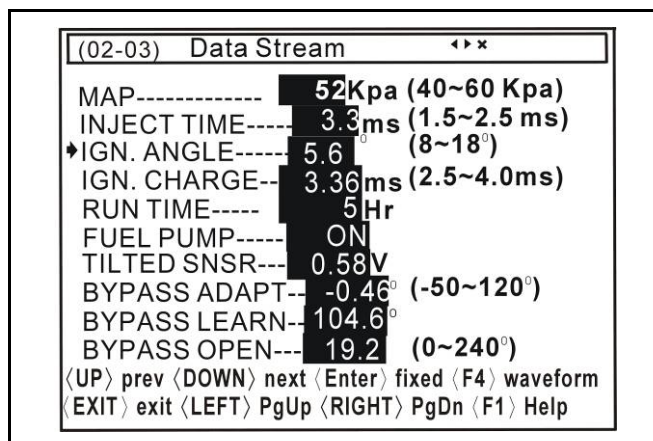
Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.



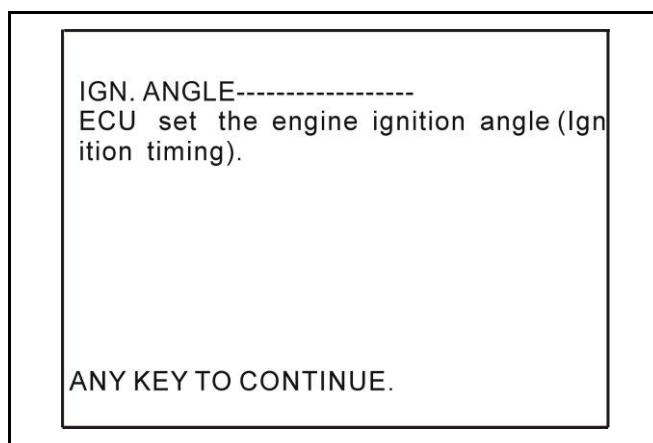
Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.



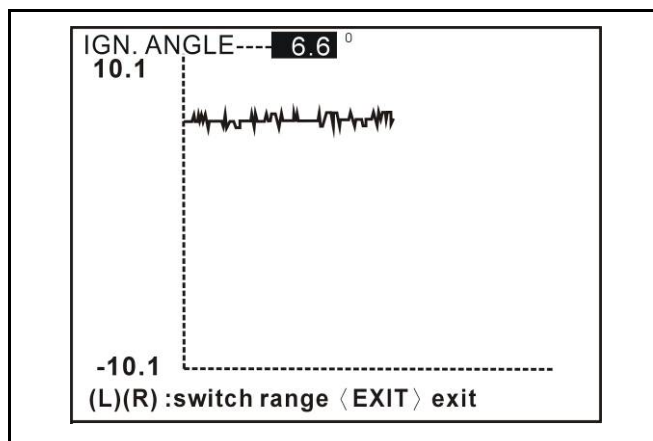
Press <UP> or <DOWN> button to choose IGN. ANGLE item.



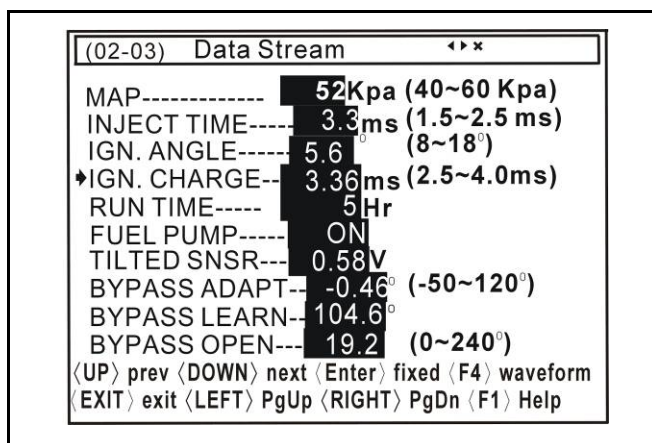
Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.



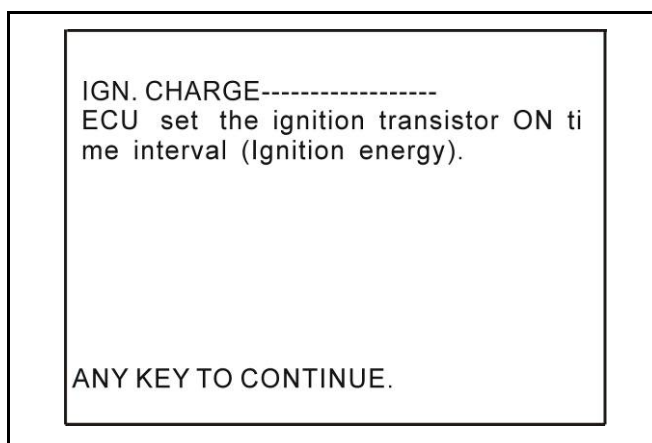
Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.



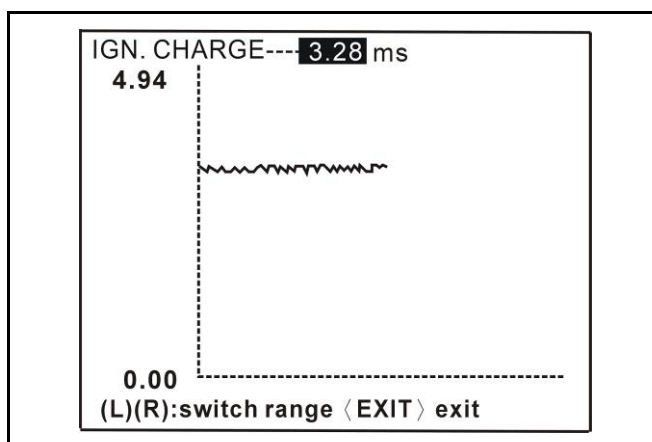
Press <UP> or <DOWN> button to choose IGN. CHARGE item.



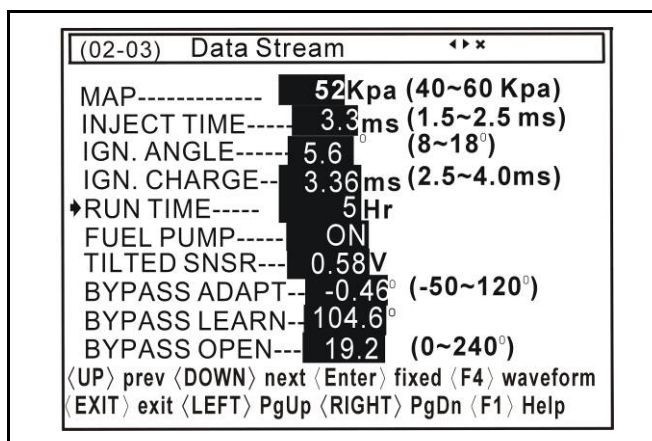
Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.



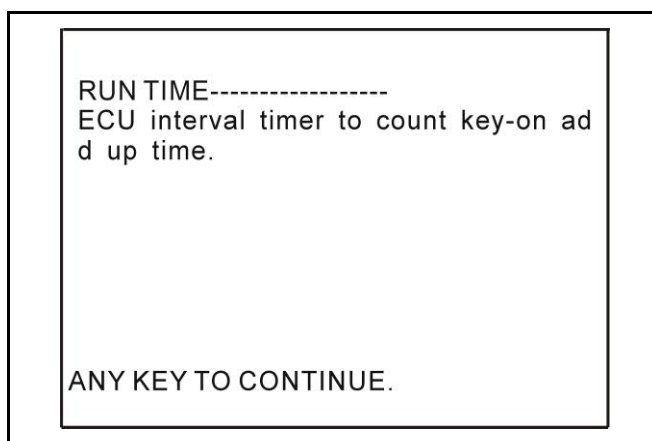
Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.



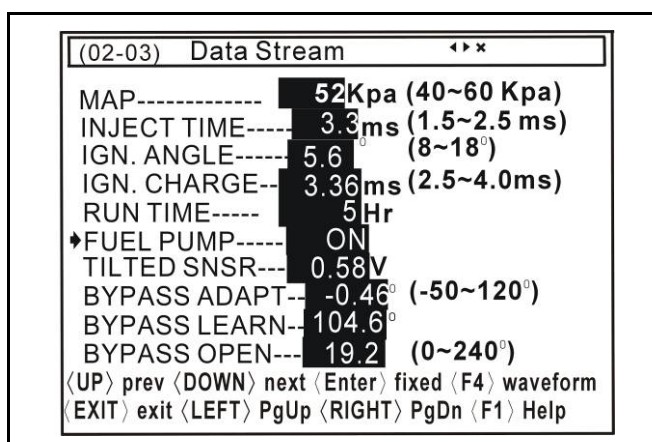
Press <UP> or <DOWN> button to choose RUN TIME item.



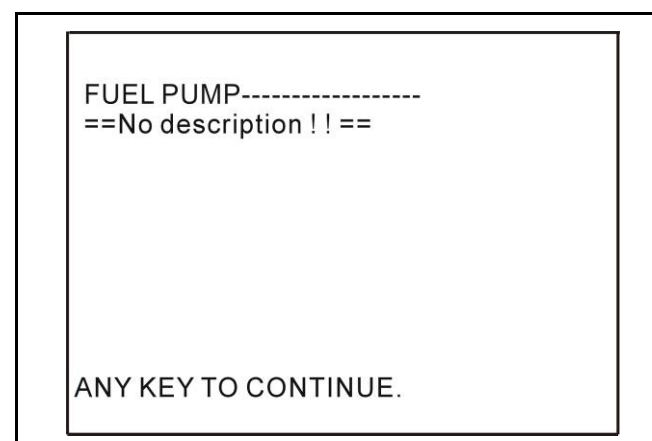
Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.



Press <UP> or <DOWN> button to choose FUEL PUMP item.



Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.



## 5. Fuel Injection System

SYM

Press <UP> or <DOWN> button to choose  
BYPASS ADAPT item.

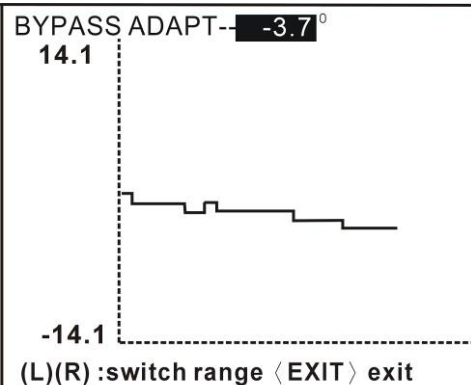
```
(02-03) Data Stream  < *
MAP----- 52Kpa (40~60 Kpa)
INJECT TIME---- 3.3ms (1.5~2.5 ms)
IGN. ANGLE---- 5.6° (8~18°)
IGN. CHARGE-- 3.36ms (2.5~4.0ms)
RUN TIME----- 5Hr
FUEL PUMP----- ON
TILTED SNSR--- 0.58V
♦BYPASS ADAPT-- -0.46° (-50~120°)
BYPASS LEARN-- 104.6°
BYPASS OPEN--- 19.2 (0~240°)
<UP> prev <DOWN> next <Enter> fixed <F4> waveform
<EXIT> exit <LEFT> PgUp <RIGHT> PgDn <F1> Help
```

Press <F1> button to enter description page.  
Press any key to get back to Data Stream  
page.

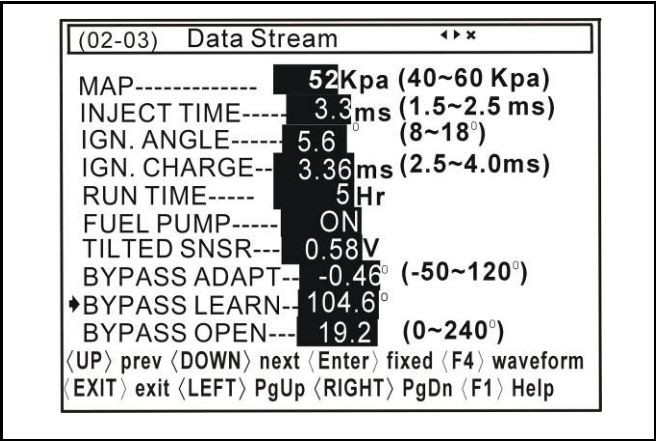
```
BYPASS ADAPT-----
==No description !!==
```

ANY KEY TO CONTINUE.

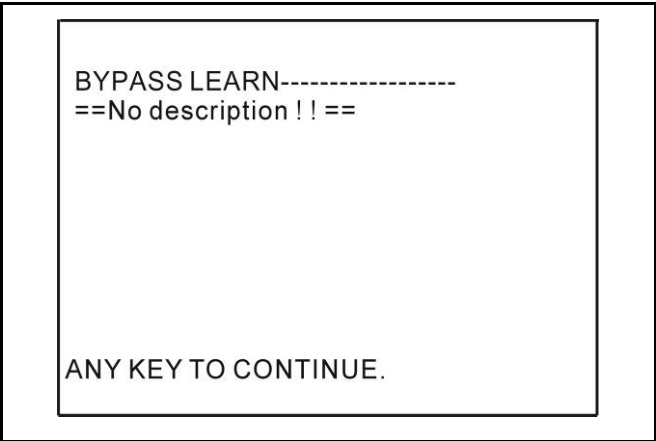
Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data  
Stream page.



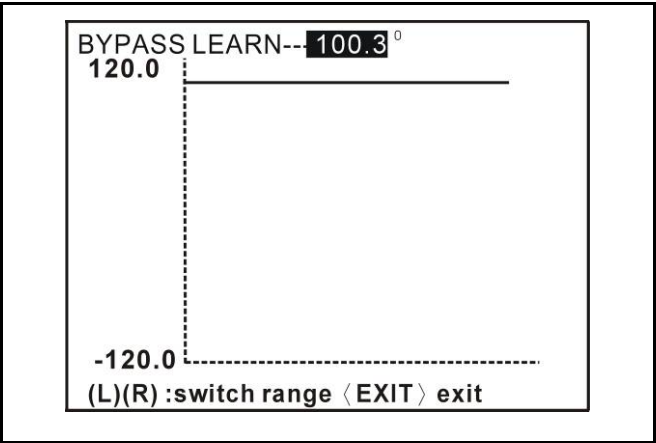
Press <UP> or <DOWN> button to choose  
BYPASS LEARN item.



Press <F1> button to enter description page.  
Press any key to get back to Data Stream  
page.



Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data  
Stream page.



Press <UP> or <DOWN> button to choose  
BYPASS OPEN item.

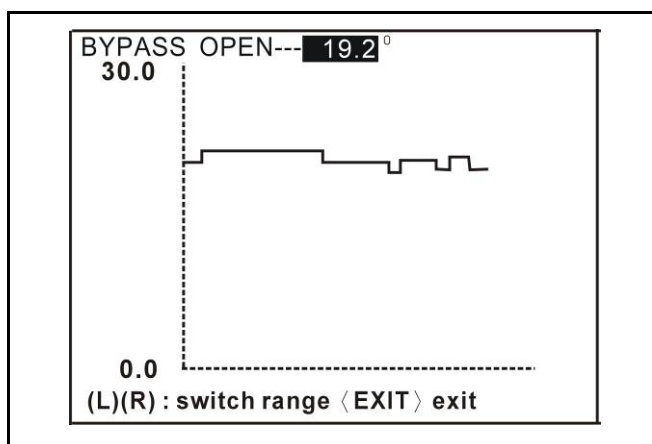
(02-03) Data Stream	
MAP-----	52Kpa (40~60 Kpa)
INJECT TIME----	3.3ms (1.5~2.5 ms)
IGN. ANGLE-----	5.6° (8~18°)
IGN. CHARGE----	3.36ms (2.5~4.0ms)
RUN TIME-----	5Hr
FUEL PUMP-----	ON
TILTED SNSR----	0.58V
BYPASS ADAPT----	-0.46° (-50~120°)
BYPASS LEARN----	104.6°
◆BYPASS OPEN----	19.2 (0~240°)
<UP> prev <DOWN> next <Enter> fixed <F4> waveform <EXIT> exit <LEFT> PgUp <RIGHT> PgDn <F1> Help	

Press <F1> button to enter description page.  
Press any key to get back to Data Stream  
page.

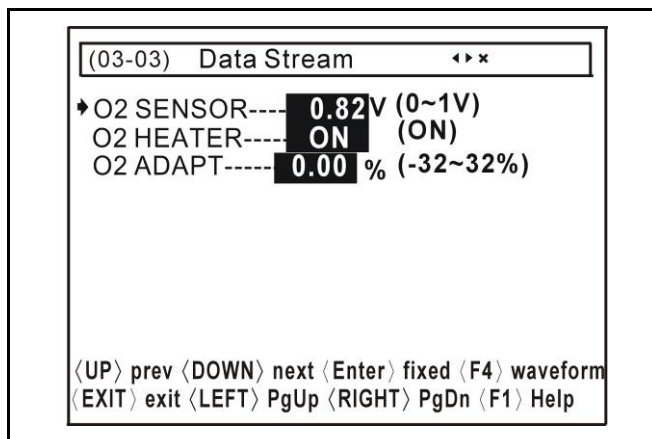
BYPASS OPEN-----  
==No description !! ==

ANY KEY TO CONTINUE.

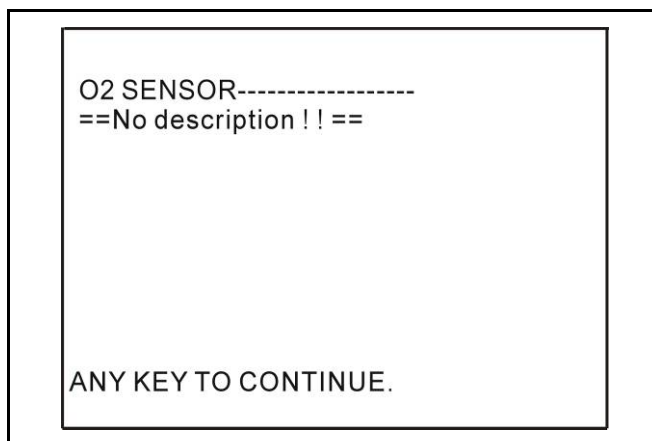
Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data  
Stream page.



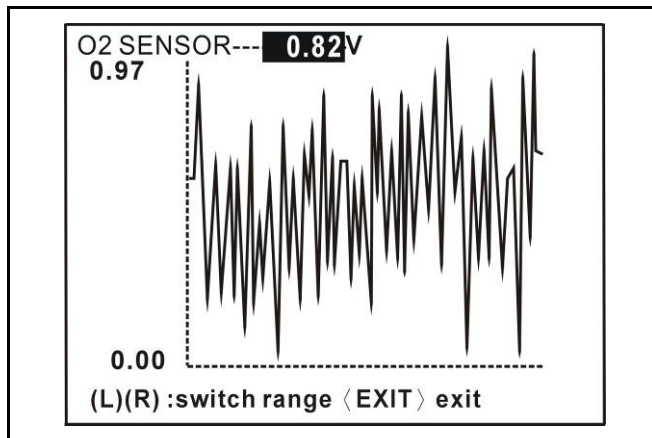
Press <RIGHT> button to get to next page to choose O2 SENSOR item.



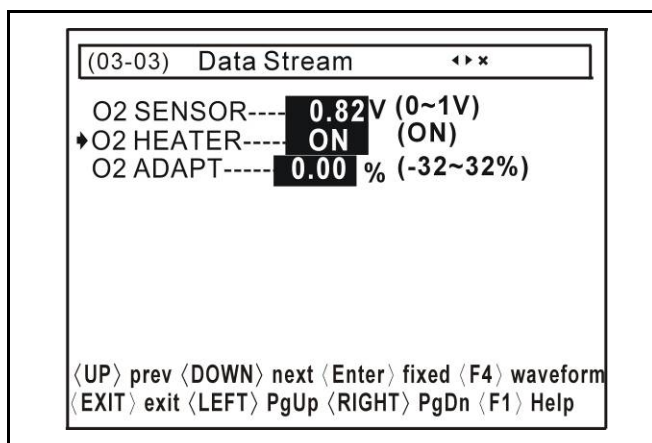
Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.



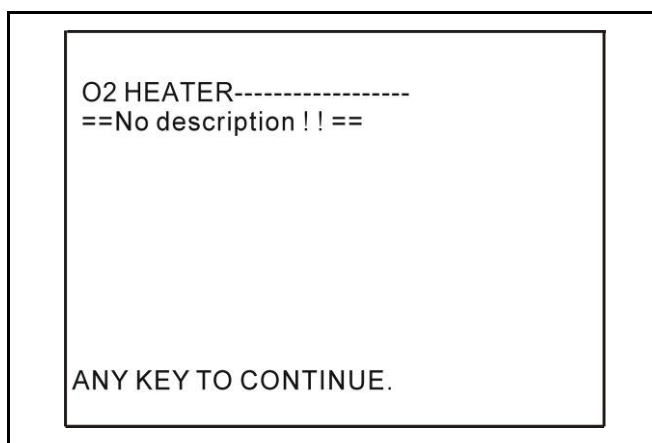
Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.



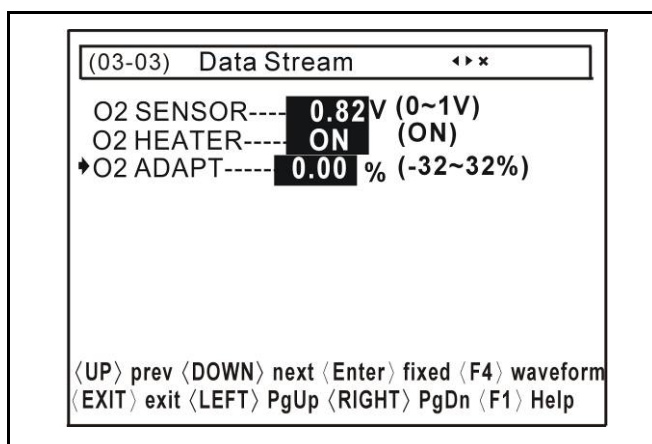
Press <UP> or <DOWN> button to choose O2 HEATER item.



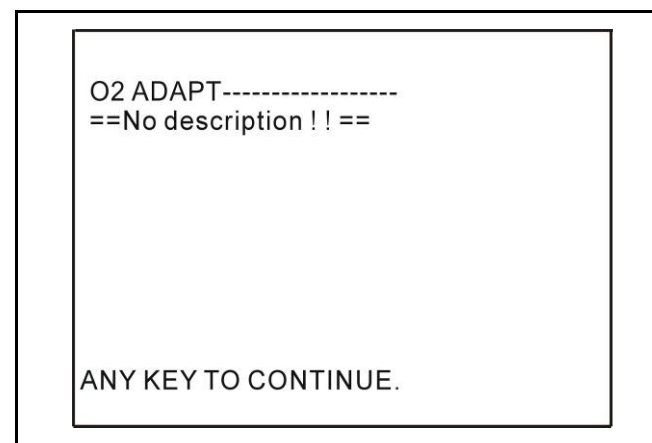
Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.



Press <UP> or <DOWN> button to choose O2 ADAPT item.



Press <F1> button to enter description page.  
Press any key to get back to Data Stream page.



**Read Trouble Code**

Press <UP> or <DOWN> button to choose Trouble Code item.

Press <Enter> button read trouble code.

If there is no malfunction in the EFi system, "System is OK" will be shown.

If there is malfunction happen to the EFi system, Trouble Code will be shown.

Press <Enter> button to enter Trouble Code and troubleshooting description page.

```

SYM  M3A  ▼▲▶◀⏏
1.ECU ID
2.DATA STREAM
3.TROUBLE CODE
4.ERASE TB CODE
5.ABV Reset

<Enter> Confirm <UP> <DOWN>
<EXIT> Exit <LEFT> <RIGHT>
  
```

System is OK

<Exit> to leave---

```

SYM  M3A  ▼▲▶◀⏏

```

● P0115		

<Enter>confirm<UP>prev page<DOWN>next  
<EXIT>Exit

**TB code description**

Cylinder Temperature Sensor or Circuit Fault

Trouble\_Shooting :

1. Make Sure Resistor value is Normal ? (25°C=8.24~14.4k Ohm)
2. Make Sure sensor connector wire damaged or open circuit ?

Code: P0115      01 01

<Enter>confirm<UP>prev page<DOWN>next  
<EXIT>Exit

### Erase Trouble Code

Press <UP> or <DOWN> button to choose  
Erase TB Code item.  
Press <Enter> button erase Trouble Code.

```

SYM  M3A  ▼▲◀▶⏏✕
1.ECU ID
2.DATA STREAM
3.TROUBLE CODE
4.ERASE TB CODE
5.ABV Reset

<Enter> Confirm <UP> <DOWN>
<EXIT> Exit <LEFT> <RIGHT>
    
```

Key on but do not start the engine.  
Press any key to erase Trouble Code.

```

POWER ON , ENG. STOP
TB CODE can erase
ANY KEY TO CONTINUE
    
```

Trouble Code is erased successfully.  
Press <Enter> button to leave.

```

ERASE TB SUCC. !!
<Enter> leave...
    
```

Get back to function-options page.

```

SYM  M3A  ▼▲◀▶⏏✕
1.ECU ID
2.DATA STREAM
3.TROUBLE CODE
4.ERASE TB CODE
5.ABV Reset

<Enter> Confirm <UP> <DOWN>
<EXIT> Exit <LEFT> <RIGHT>
    
```

**Reset ABV**

Press <UP> or <DOWN> button to choose ABV reset item.

Press <Enter> button to reset ABV.

```
SYM  M3A  ▼▲▶♦✱
1.ECU ID
2.DATA STREAM
3.TROUBLE CODE
4.ERASE TB CODE
5.ABV Reset
```

```
<Enter> Confirm <UP> <DOWN>
<EXIT> Exit <LEFT> <RIGHT>
```

ABV reset is completed.

Press any key to continue.

```
FUNC. COMPLETED!!
ANY KEY TO CONTINUE.
```

Get back to function-options page.

```
SYM  M3A  ▼▲▶♦✱
1.ECU ID
2.DATA STREAM
3.TROUBLE CODE
4.ERASE TB CODE
5.ABV Reset
```

```
<Enter> Confirm <UP> <DOWN>
<EXIT> Exit <LEFT> <RIGHT>
```

### EFi Component Malfunction Check& Replacement Procedure

Item	Parts No. Parts Name	Service schedule	Inspection Method	Adjustment & replacement procedure
1	390-002 Ignition coil	At least 20000km life-expectancy Check it every 3000km	Use diagnostic tool to check if the ignition coil has malfunction. Erase the DTC codes and replace with new coil and confirm again. If the DTC codes disappear, then the ignition coil is abnormal. Replace it with new one. If the DTC codes still exist, replace the ECU for confirm. If the DTC codes disappear, then the ECU is abnormal. Replace it with new one Before the ignition coil is verified for malfunction, check the coil resistance and connector wire for short-circuit.	If the ignition coil has to be changed, erase the DTC codes with the diagnostic tool. Turn off ignition switch, and replace the coil with new one. Turn on ignition switch and make sure the DTC codes disappear.
2	379-010 Air by-pass valve	At least 20000km life-expectancy Check it every 3000km	Check if the by-pass valve DTC code appears on the diagnostic. Erase the DTC codes and replace with new one & confirm again. If the DTC codes disappear, then the by-pass valve is abnormal. Replace it with new one. If the DTC codes still exist, check if the wire connector and by-pass valve resistance are normal. If the DTC codes still exist, replace the ECU for confirmation. If the DTC codes disappear, then the ECU is abnormal. Replace it with new one.	If the by-pass valve has to be changed, erase the DTC codes with the diagnostic tool first. Turn off the ignition switch, and then replace the valve with new one. Turn on ignition switch and make sure the DTC codes disappear. Check idle speed CO value and adjust if necessary.
3	358-016 fuel pump and fuel regulating valve	At least 20000km life-expectancy Check it every 6000km	Connect a pressure gauge between the regulator and fuel injector. Make sure fuel pressure is within 2.5bar. The pressure should reach 2.5 bars within 3 seconds after turning on ignition switch. If the fuel pressure is out of the range, check if the fuel pipe is leaking. And check if the fuel pump voltage is over 12V? Replace the fuel-regulating valve and confirm again.	The oil seal has to be replaced along with replacement of the fuel-regulating valve. Oil seal has to be installed into the outer cover before assembling.
4	366-005 Engine temperature sensor	At least 20000km life-expectancy Check it every 3000km.	Is there any DTC code on the Data Scan diagnostic? Engine temperature has to reach to environmental temperature after engine stopped for a while. Erase the DTC codes and replace with new one and confirm again. If the DTC codes disappear, then the sensor is abnormal. Replace it with new one. If the DTC codes still exist, check if wire connector and sensor's resistance are in normal range	If the sensor has to be changed, erase the DTC codes with the diagnostic tool. Turn off ignition switch, and remove connector. Remove the sensor with tools. Engine temp. Sensor tighten torque is 0.74~0.88kg-m. Connect the coupler, and the diagnostic tool. Then, turn on ignition switch. Check if the DTC codes disappear. The value of stopped engine temperature should approximate the environmental temperature.

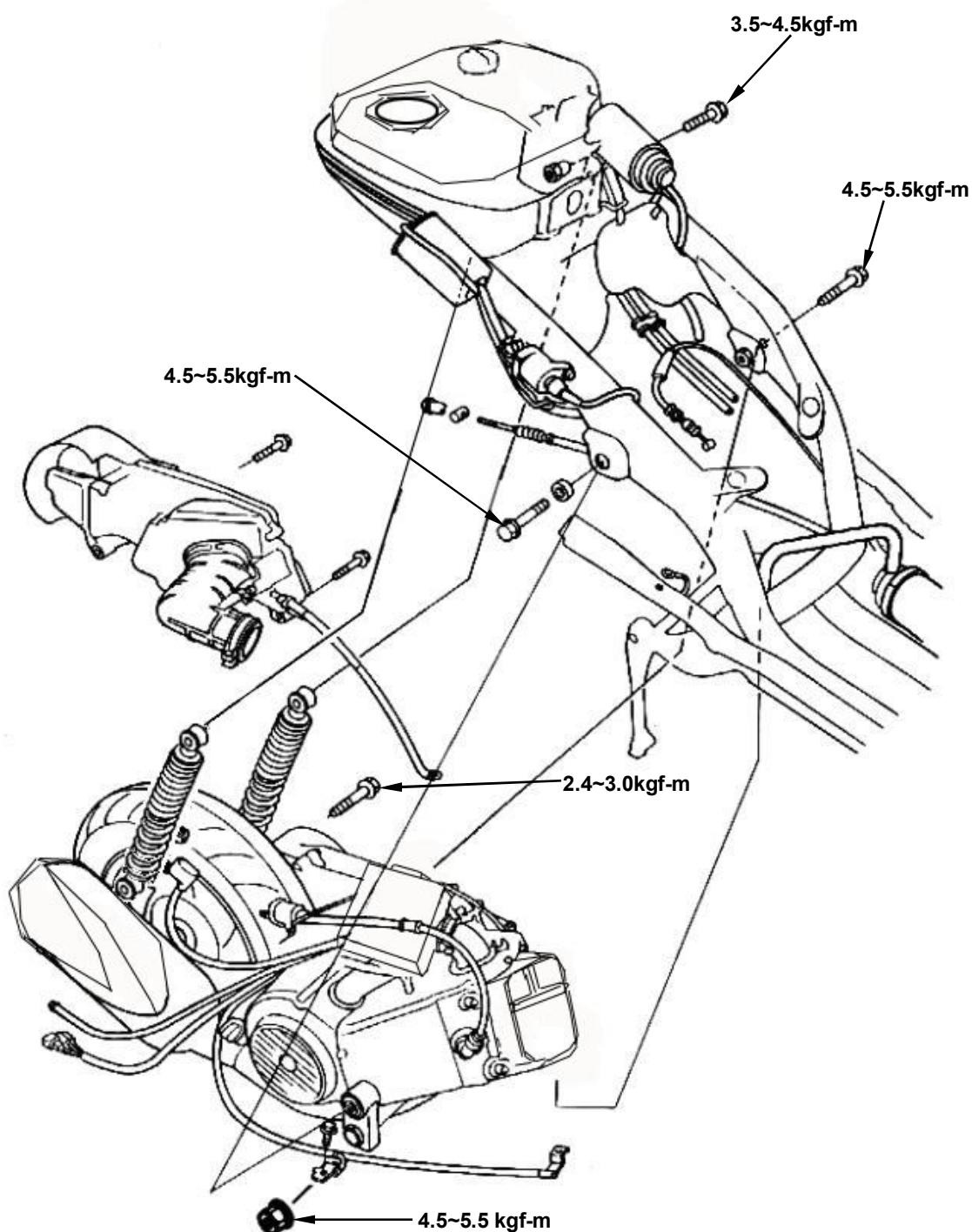
Item	Parts No. Parts Name	Service schedule	Inspection Method	Adjustment & replacement procedure
5	366-008 Intake temperature/pressure sensor	At least 20000km life-expectancy Check every 3000km	Connect the diagnostic tool for inspection. The engine intake temperature and pressure should approximate environmental temperature and atmosphere pressure. (Execute this task after engine is stopped for a while) If the DTC codes of intake temperature or pressure shown on the diagnostic tool, replace the pressure sensor with new one. Check if the DTC codes are disappearing. If not, check the connector wires for short-circuit. Replace the connector if necessary. If the DTC codes still exist, replace the ECU. But if the DTC codes disappear, install the original pressure sensor and check it again. If the original sensor doesn't trigger the DTC error code, replace the ECU with new one.	Replacement procedure for T-MAP (intake temperature/pressure sensor) Turn off the ignition switch. Disconnect the connector of intake temperature/pressure sensor. Replace the sensor with new one. Connect the connector with diagnostic tool. Turn on the ignition switch, and check if the intake temperature/ pressure readings close to environmental temperature and atmosphere pressure. Erase the DTC codes, and make sure the problem is solved.
6	308-008 Throttle body	At least 20000km life-expectancy Check every 3000km	Please refer to idle speed adjustment section for the idle speed CO adjustment. Connect the diagnostic tool and check if the throttle position DTC code appears. If the code appears, replace the throttle body to make sure the code can be erased. If the code disappears, replace the throttle body. If the code still exists, replace the ECU with new one.	The throttle body replacement procedure: Install a new throttle body Make sure there is no leaking. Connect the diagnostic tool and read the carbon-accumulated time. Reset the time with the diagnostic tool. Reset the throttle position data with the diagnostic tool. Throttle valve WOT set up. Turn off ignition switch, and WOT the throttle valve and hold. Turn on the ignition switch and hold WOT position for 2 seconds. Then release the throttle valve. Please refer to the idle speed adjustment section for the idle speed CO if necessary.
7	337-004 Fuel injector	At least 20000km life-expectancy Check every 3000km	Check if the fuel injector DTC code appears. If the code appears, replace a new fuel injector for confirmation. If the code can be erased, then, replace the fuel injector. If the code still is there after changing a new injector, check if connector wire is short. If the code still exists, replace the ECU with new one. If the code can be erased after changing the ECU, this ECU has to be replaced.	Confirmation or replacement procedure for the fuel injector: Erase the DTC code with the Data Scan. Turn off ignition switch and disconnect the fuel injector coupler. Connect to a new fuel injector. Connect the diagnostic tool, and turn on the ignition switch. Make sure the DTC code had been cleared. Please refer to idle speed adjustment section for idle speed CO value confirmation. (Firstly, make sure if the fuel injector DTC code had been clear, and then install a new fuel injector.)

Item	Parts No. Parts Name	Service schedule	Inspection Method	Adjustment & replacement procedure
8	325-002 ECU	At least 20000km life-expectancy Check every 3000km	Connect the diagnostic tool. Record the ECU service time.	ECU replacement procedure: Connect the Diagnostic tool onto the original ECU. Record the ECU service time. Turn off the ignition switch. Replace the ECU with new one. Re-set the ECU service time. Clean the carbon deposition around the throttle body. Please refer to idle speed adjustment section for idle speed CO value confirmation.
9	Idle speed CO Adjustment	Check for new motorcycle and every 3000km.	Warm up the motorcycle by running it in 50km/hr for 5 minutes. Connect the diagnostic tool. Record the idle speed CO value, and engine rpm In O2 sensor closed-loop system, the CO value should be kept in normal range. If the CO value goes wild, please check the O2 sensor, engine, injector, and the fuel system for malfunction.	Warm up the motorcycle by running it in 50km/hr for 5 minutes. Connect the Diagnostic tool. Record the idle speed CO value, rpm. Use the Data Scan to adjust the idle speed CO value to be 0.5%~2.0%. Record the idle speed CO value, rpm and CO variant value. (The engine temperature has to be in 115°C~140°C, and intake temperature to be in 25°C~40°C as adjusting.) Perform ECU learning

**NOTE:**

MECHANISM DIAGRAM .....	5-1	ENGINE SUSPENSION FRAME.....	5-7
OPERATIONAL PRECAUTIONS .....	5-2	INSTALLATION OF ENGINE .....	5-8
ENGINE REMOVAL .....	5-3		
REMOVAL OF ENGINE SUSPENSION			
BUSHING .....	5-6		

## MECHANISM DIAGRAM



**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

**Specification**

Item		Specification
Engine Oil Capacity	Replacement	950 c.c.
	Disassemble	700 c.c.
Gear Oil Capacity	Replacement	180 c.c.
	Disassemble	170 c.c.

**Torque Values**

Engine suspension bolt (frame side)	4.5~5.5kgf-m
Engine suspension nut (engine side)	4.5~5.5kgf-m
Bolt of rear shock absorber upper connection	3.5~4.5kgf-m
Bolt of rear shock absorber lower connection	2.4~3.0kgf-m

**ENGINE REMOVAL**

Open the seat.

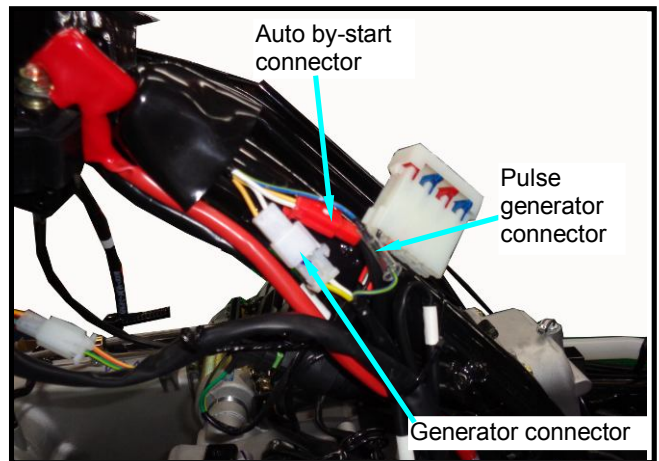
Remove the rear carrier (3 bolts ).

Remove the luggage box assembly (4 bolts ).

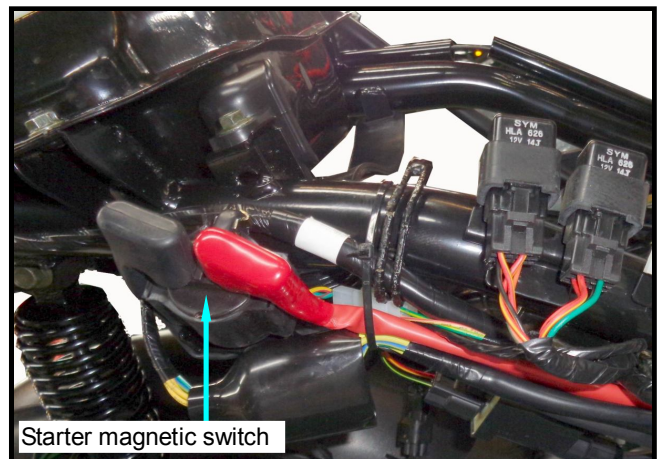
Remove the body cover (4 screws, 3 bolts).

Remove the power connector of auto by-start.

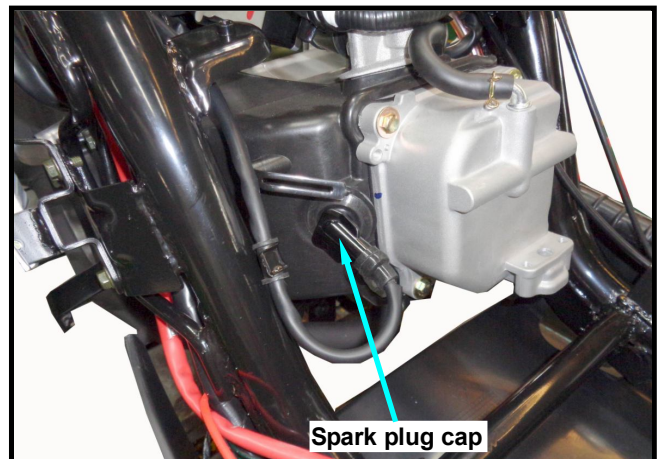
Remove the generator connector and pulse generator connector.



Remove the starter motor wire on the Starter magnetic switch.



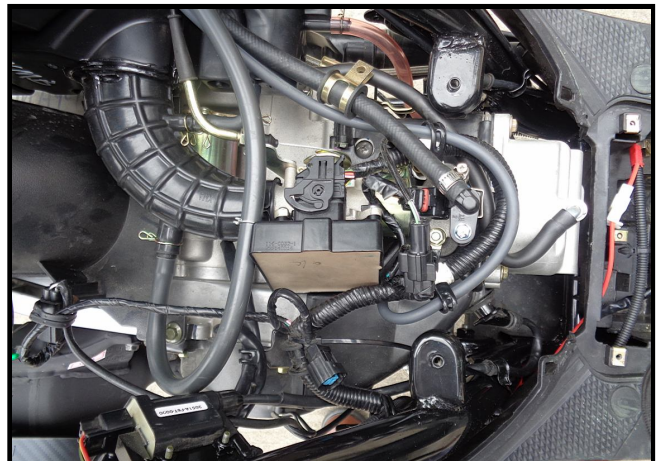
Remove the spark plug cap.



Remove the vacuum hose, and throttle valve cable from the ECU SET.

Loose the strap screw of the air cleaner guide, and remove the air cleaner guide

Remove the throttle cable



## 5. REMOVAL OF ENGINE

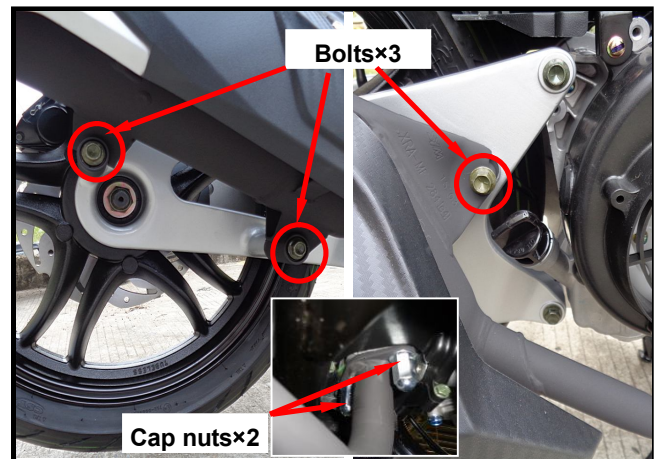
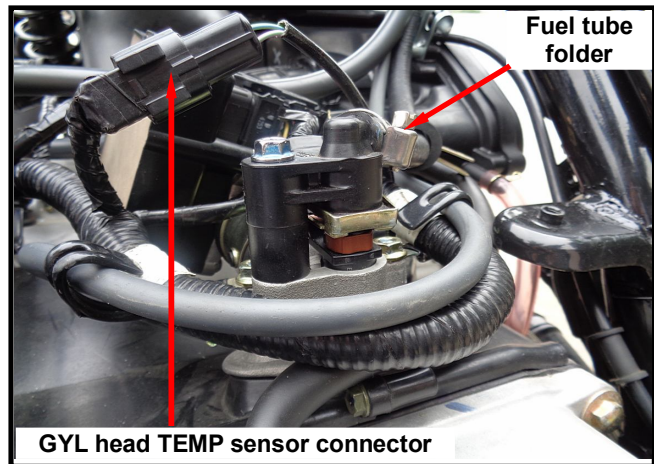
SYM

Remove the fuel tube. Remove cylinder head TEMP sensor connector.  
Start engine for the pipeline to be exhausted  
Within the residual pressure, the engine flameout, relaxing fuel tube folder, open for fuel tube.

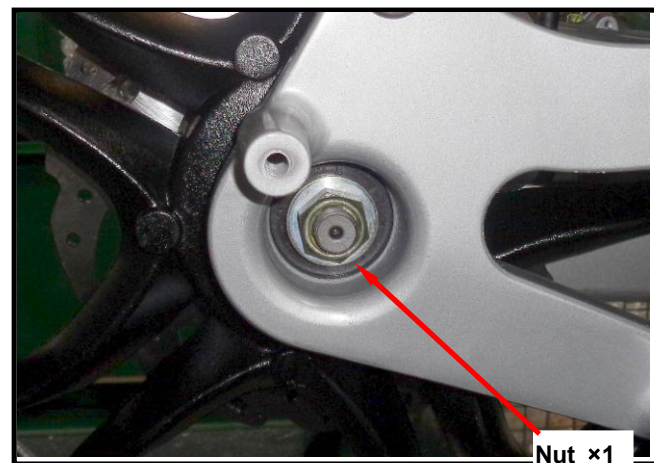
### **Caution**

- 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.

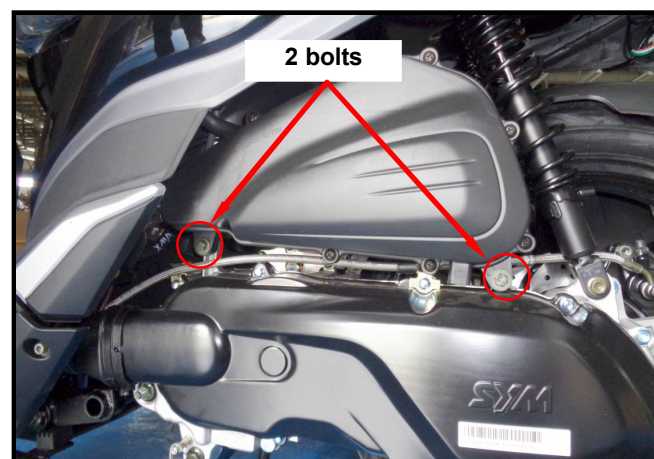
Remove the exhaust muffler (Bolts × 3, Cap Nuts × 2).



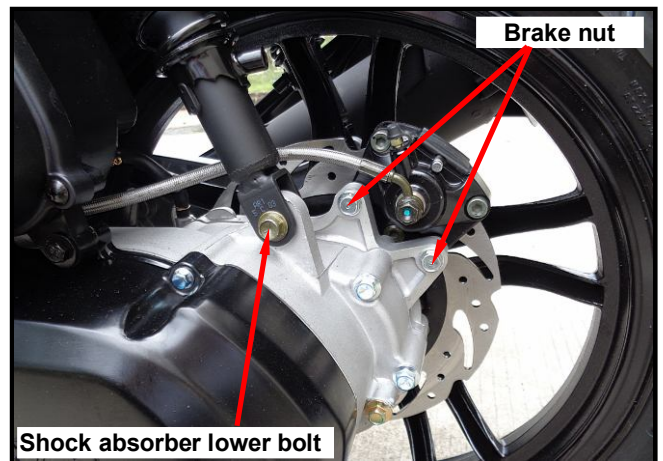
Remove the rear wheel (Nut × 1).



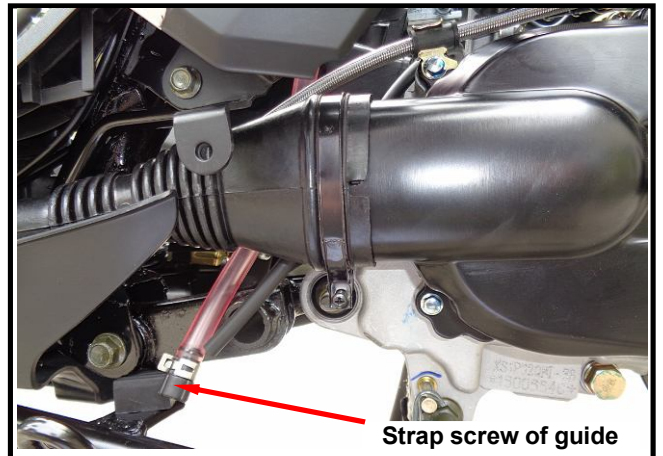
Remove the air cleaner connection bolts (2 bolts).



Remove the rear brake nut.  
Remove the rear brake caliper  
Remove the rear shock absorber lower bolt.



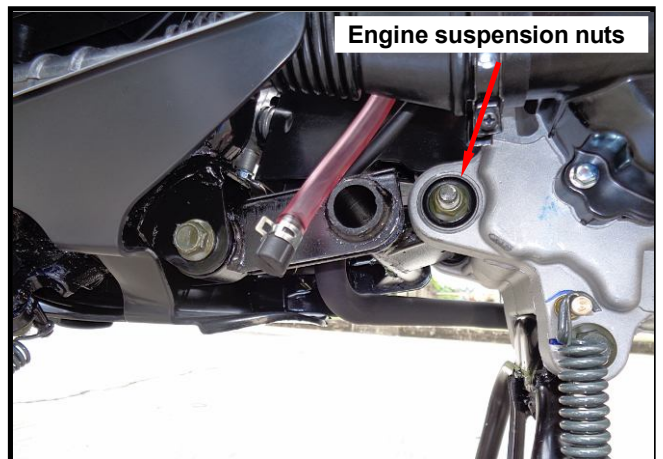
Loose the strap screw of engine left guide,  
and then remove the engine left guide.



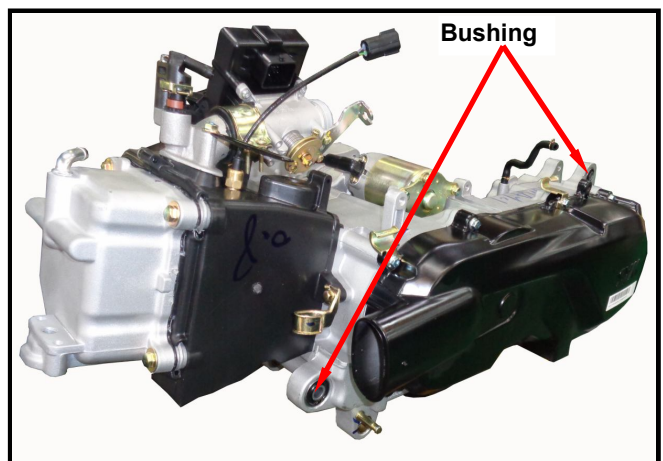
Remove the engine suspension nuts and bolts (engine side), and then remove the engine.

**⚠ Caution**

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



Check if the engine suspension, rear shock absorber bushing, and cushion rubber for damage. Replace them with new ones if so.



### REMOVAL OF ENGINE SUSPENSION BUSHING

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

Engine suspension bushing:  $\Phi 28\text{mm}$

Rear shock absorber bushing:  $\Phi 20\text{mm}$



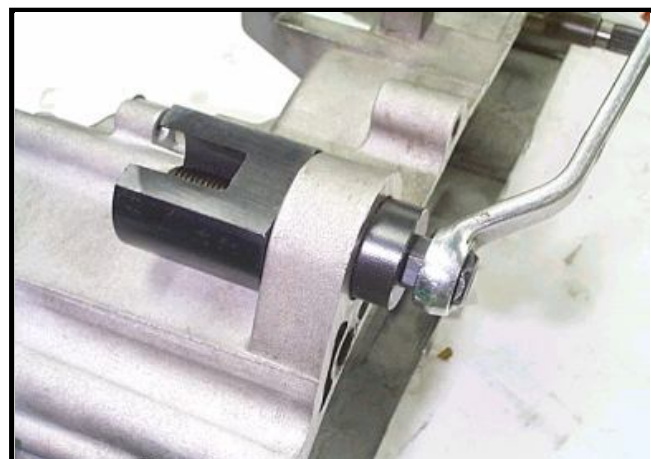
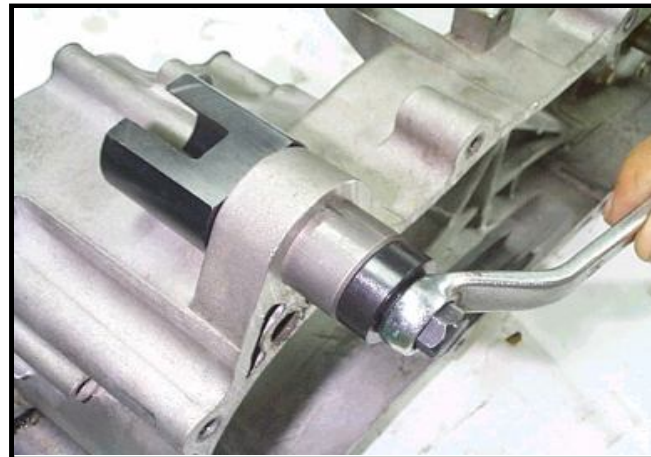
#### Pressing out

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



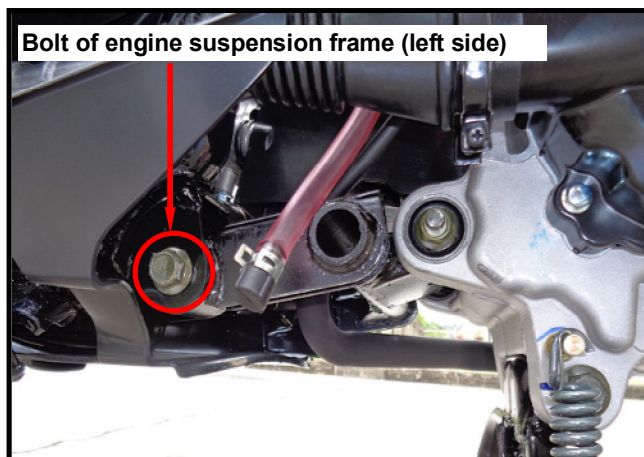
#### Pressing In

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



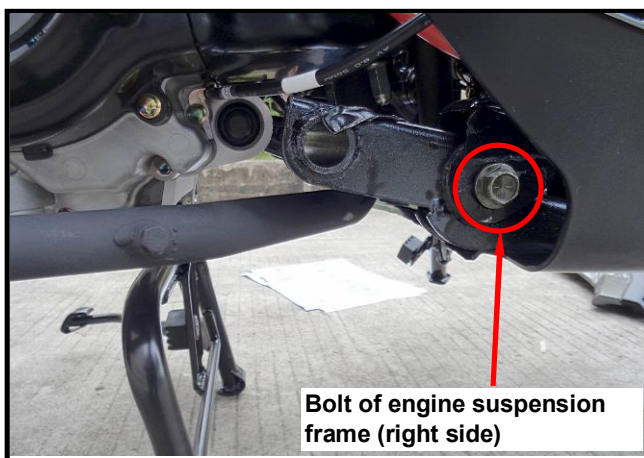
**ENGINE SUSPENSION FRAME****Removal**

Remove the left side bolt of engine suspension frame.



Bolt of engine suspension frame (left side)

Remove the right side bolt of engine suspension frame.



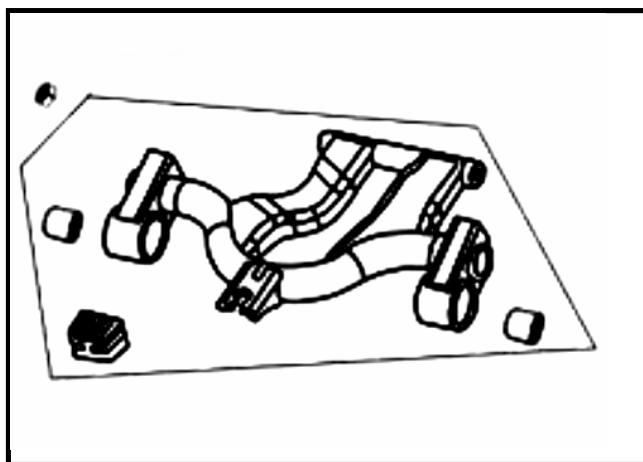
Bolt of engine suspension frame (right side)

Check if the engine suspension frame bushing and cushion rubber for damage. If so, replace with new ones.

**Installation**

Tighten the bolts and nuts of engine suspension frame.

**Engine suspension frame nut:**  
**Torque Value: 4.5~5.5 kgf-m**



### INSTALLATION OF ENGINE

Check if the bushings of engine suspension frame and shock absorber for damaged. If so, replace with new ones.

Install the engine according to the reversing order of removal.

#### **Caution**

- Notice 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 suspension nut:**

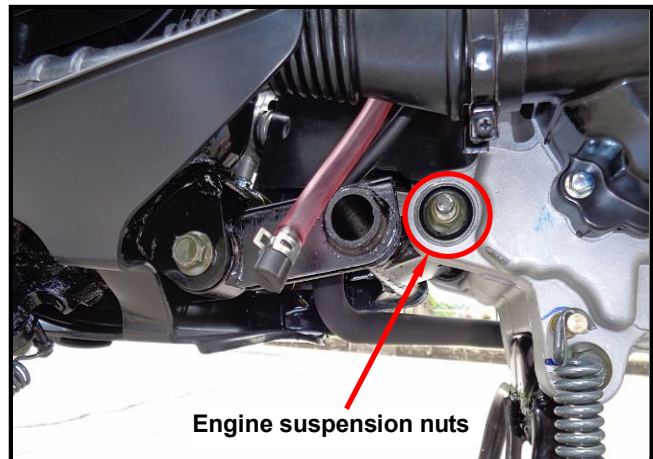
**Torque Value: 4.5~5.5kgf-m**

**Rear shock absorber bolt:**

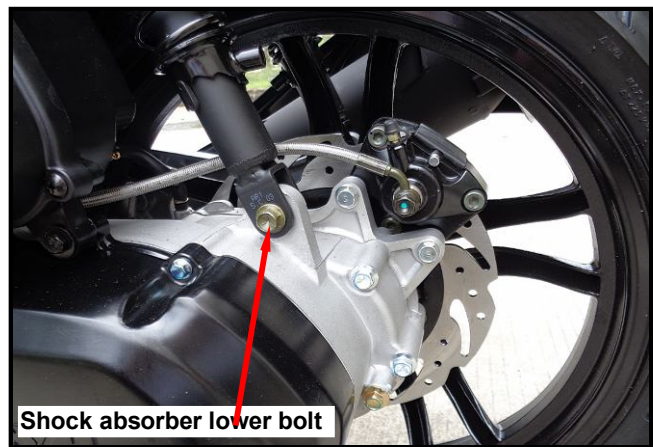
**Torque Value: Top: 3.5~4.5kgf-m  
lower: 2.4~3.0kgf-m**

**Rear wheel axle nut:**

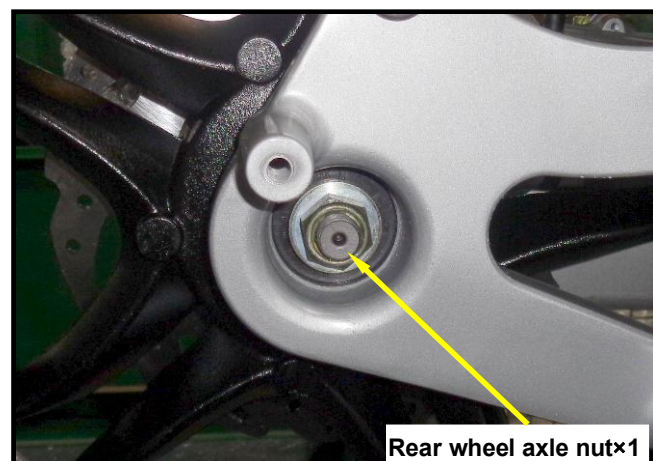
**Torque Value: 11.0~13.0kgf-m**



Engine suspension nuts



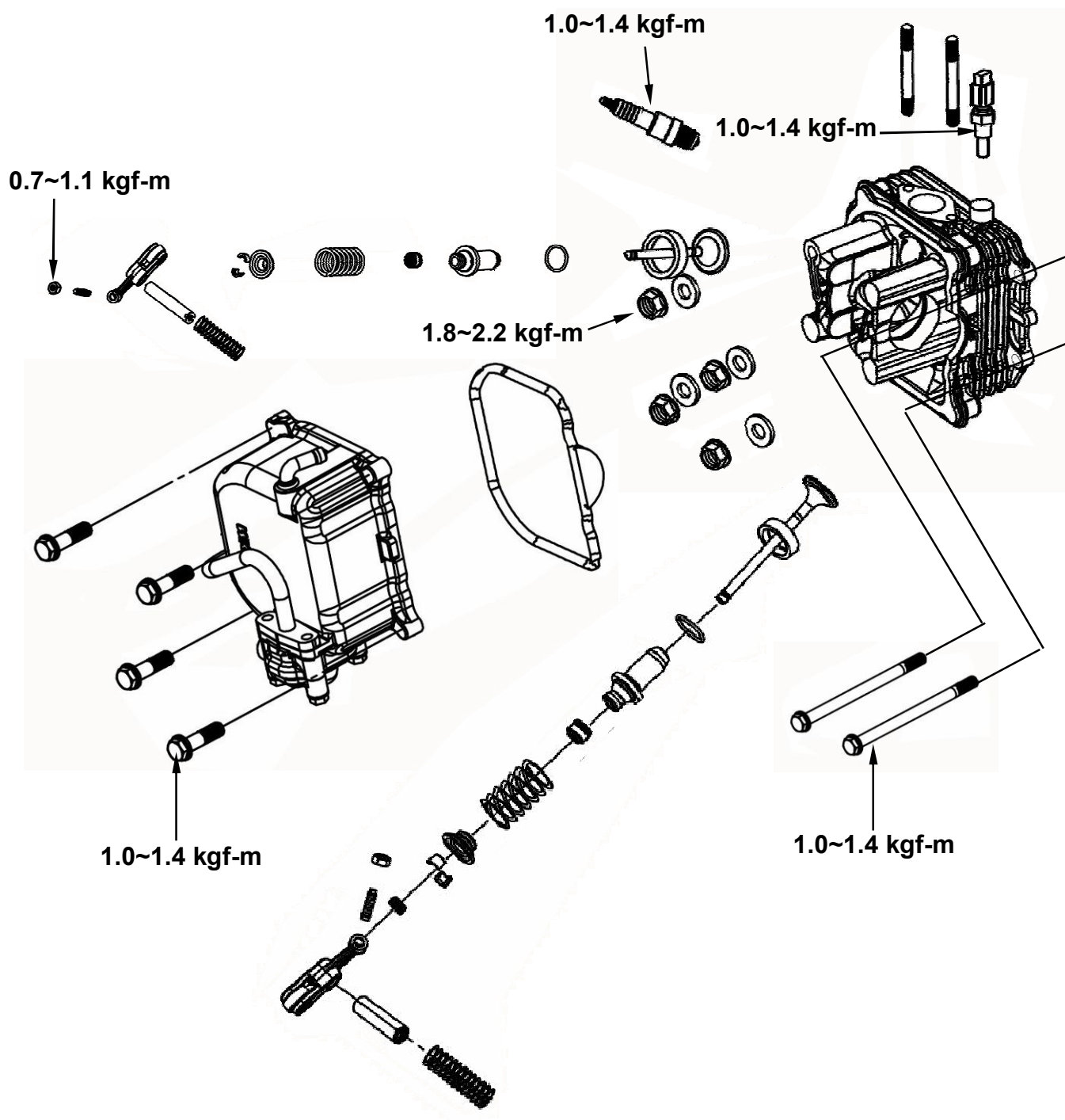
Shock absorber lower bolt



Rear wheel axle nut×1

MECHANISM DIAGRAM.....6-1	CYLINDER HEAD INSPECTION.....6-7
PRECAUTIONS IN OPERATION .....6-2	VALVE SEAT INSPECTION AND
TROUBLE SHOOTING.....6-3	SERVICE.....6-9
CAMSHAFT REMOVAL .....6-4	CYLINDER HEAD REASSEMBLY .....6-11
CYLINDER HEAD REMOVAL .....6-6	CYLINDER HEAD INSTALLATION .....6-12
CYLINDER HEAD DISASSEMBLY ....6-6	VALVE CLEARANCE ADJUSTMENT ..6-13

### MECHANISM DIAGRAM



**PRECAUTIONS IN OPERATION****General Information**

- This chapter is contained maintenance and service for cylinder head, valve, and camshaft as well as valve rocker arm.
- Cylinder head service cannot be carried out when engine is in frame.

**Specification**

unit: mm

Item			Standard	Limit
Compression pressure			10.2 ± 0.2 kg/cm <sup>2</sup>	-
Camshaft	Height of cam lobe	Intake	20.231	20.570
		Exhaust	19.907	19.410
Rocker arm	ID of valve rocker arm		10.00~10.015	10.10
	OD of valve rocker arm shaft		9.972~9.987	9.910
Valve	OD of valve stem	Intake	4.970~4.980	4.900
		Exhaust	4.955~4.970	4.900
	ID of Guide		5.00~5.012	5.030
	Clearance between valve stem and guide	Intake	0.020~0.042	0.080
		Exhaust	0.030~0.057	0.100
	Free length of valve spring	Outer	35.250	-
		Inner	32.410	-
	Valve seat width		1.000	1.600

**Torque Value**

Cylinder head cover bolt	0.8~1.2kgf-m
Cylinder head bolt (LH)	0.7~1.1kgf-m
Sealing screw of timing chain auto-adjuster	0.8~1.2kgf-m
Bolt of timing chain auto-adjuster	1.0~1.4kgf-m
Cam sprocket bolts	0.7~1.1kgf-m (apply with oil on bolt thread & seat)
Spark plug	1.0~1.4kgf-m
Cylinder head temperature sensor	1.0~1.4kgf-m

**TOOLS****Special service tools**

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

**TROUBLE SHOOTING**

Engine performance will be effected by troubles on engine top end. The troubles usually can be determinate or by performing cylinder compression test and judging the abnormal noise generated.

**Rough Idle**

Low compression pressure.

**Low compression pressure****1. Valve**

- Improper valve adjustment.
- Burnt or bended valve.
- Improper valve timing.
- Valve spring damaged.
- Valve carbon.
- Poor sealing on valve seat.
- Improper spark plug installation.

**2. Cylinder head**

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

**3. Piston**

- Piston ring worn out.

**High compression pressure**

- Too much carbon deposit on combustion chamber or piston head.

**Noise**

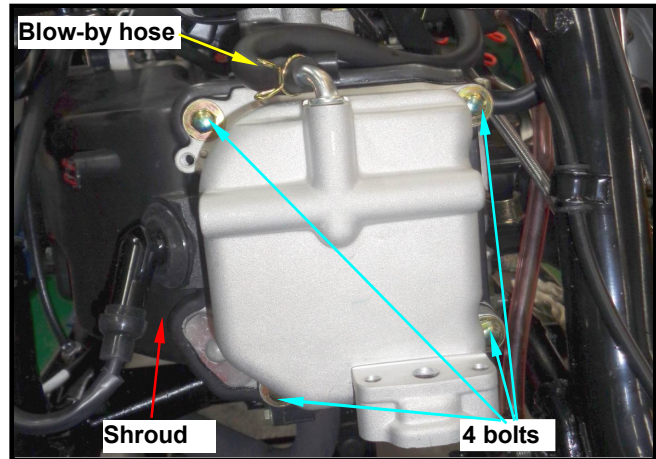
- Improper valve clearance adjustment
- Burnt valve or damaged valve spring
- Camshaft wear out or damage
- Cam chain wear out or looseness
- Auto-adjuster wear out or damage of cam chain
- Camshaft sprocket wear out
- Rocker arm or rocker arm shaft wear out

**White smoke**

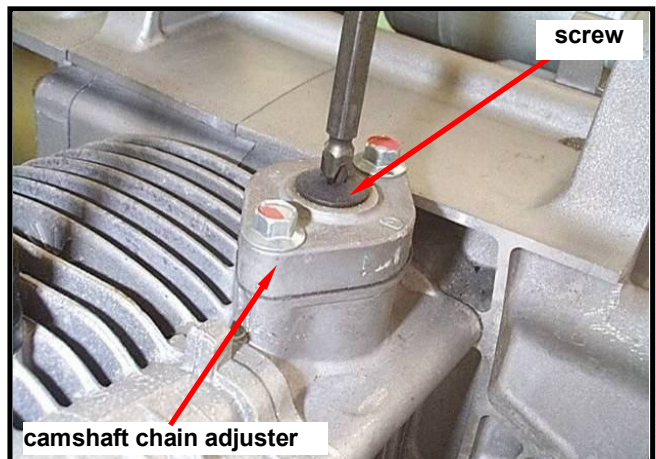
- Valve guide or valve stem wear out
- Valve stem seal wear out

### CAMSHAFT REMOVAL

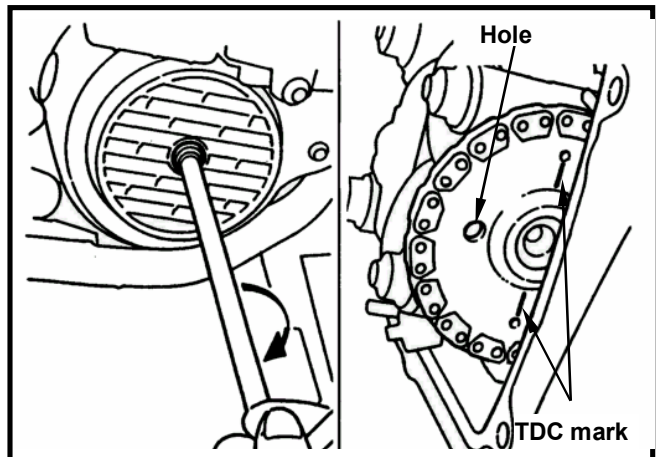
Remove the shroud of the engine.  
Remove the crankcase blow-by system hose from the cylinder head.  
Remove the cylinder head cover 4 bolts and then remove the cylinder head cover.



Loosen the screw of camshaft chain adjuster and remove O-ring.  
With a flat screwdriver to tighten the screw of camshaft chain adjuster in a clockwise motion for release adjuster.



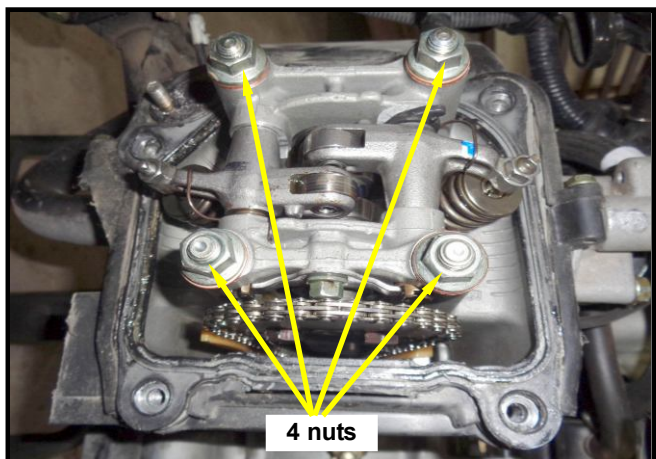
Turn the flywheel in counter-clockwise motion with T type wrench until the "T" mark on flywheel aligned with the mark on the crankcase so that the hole on the camshaft sprocket is forward up and piston is at TDC position.



Remove camshaft holder nut and washer.

#### **Caution**

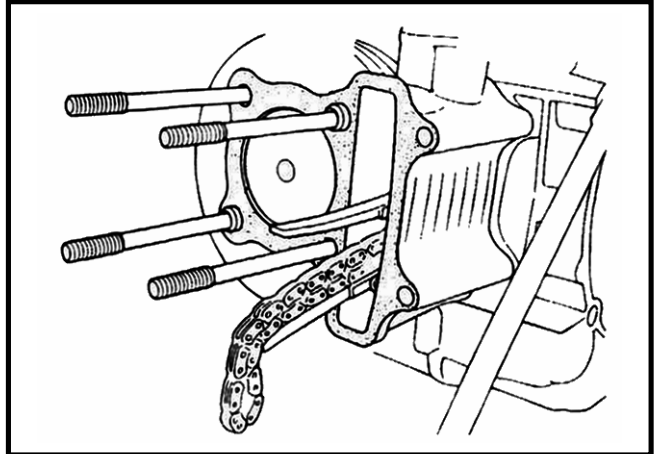
Loosen the nuts diagonally by 2-3 sequences.



Remove the camshaft holder and rocker arm set.

Remove the camshaft chain from the camshaft sprocket.

Remove the cylinder head.



### Camshaft Inspection

Inspect cam lobe height for damaged.

#### Service Limit

**IN: Replacement when less than 20.570mm**

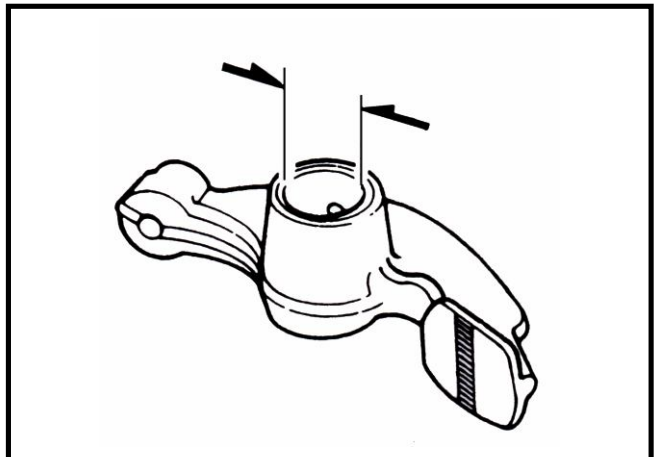
**EX: Replacement when less than 19.410 mm**

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



Measure the valve rocker arm I.D.

**Service Limit: Replace when it is above 10.100 mm**

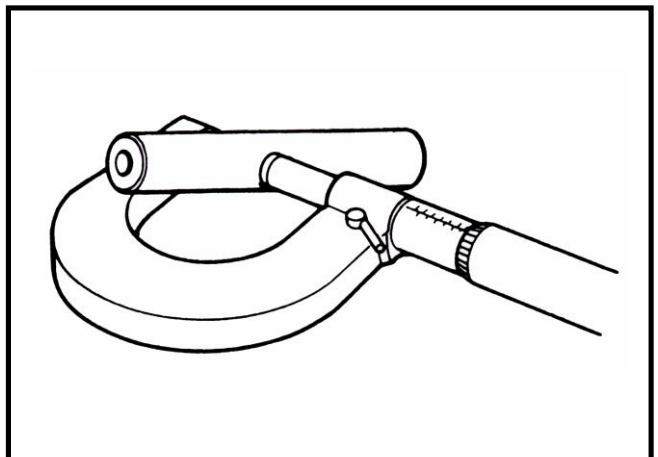


Measure the active O.D. of the valve rocker arm shaft .

**Service Limit: Replace when it is above 9.910 mm**

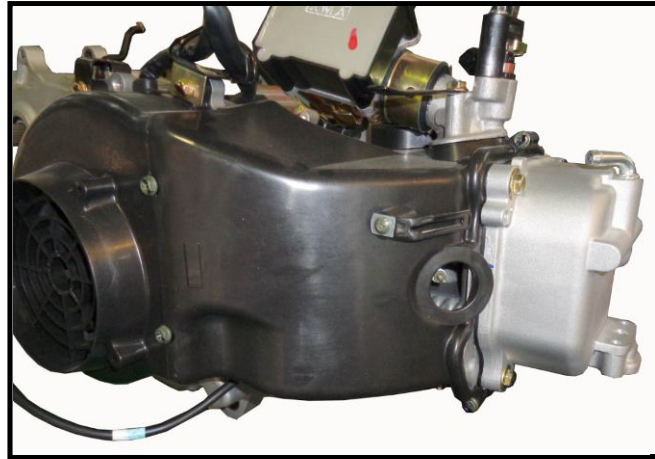
Calculate the clearance between the rocker arm shaft and the rocker arm.

**Service Limit: Replace when it is above 0.10 mm**



### CYLINDER HEAD REMOVAL

Remove the engine (refer to Chapter 5).  
Remove the cooling fan cover.  
Remove the engine shroud .



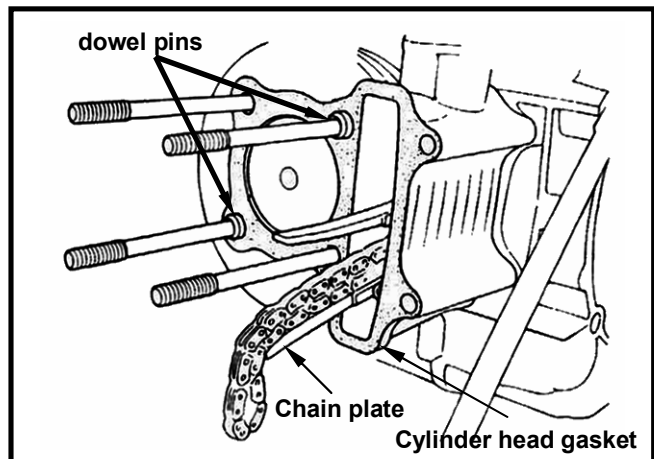
Remove the camshaft sprocket.



Remove the 2 cylinder head mounting bolts from cylinder head left side cover.  
Remove cylinder head gasket and 2 dowel pins.  
Remove chain plate.  
Clean up residues from the matching surfaces of cylinder and cylinder head.

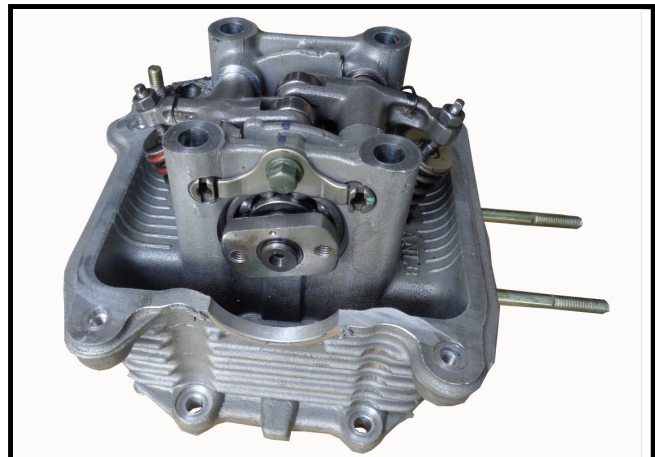
#### **Caution**

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



### CYLINDER HEAD DISASSEMBLY

Use a valve compressor to press the valve spring.

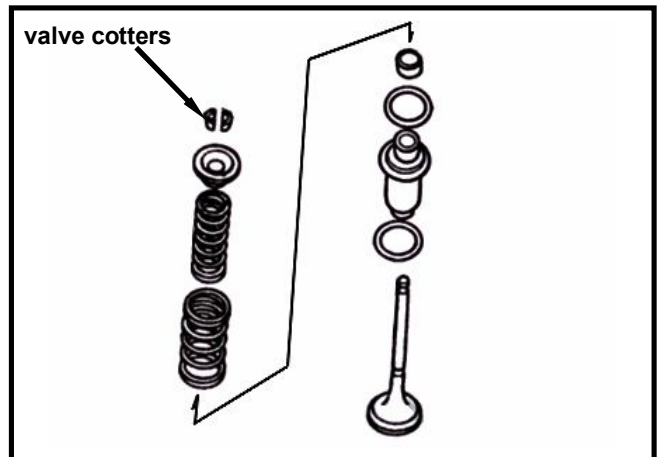


After removed valve cotters, release the compressor and then take out spring retainer, valve spring and valves.

**⚠ Caution**

In order to avoid to loosing spring tension, do not compress the spring too much. Its length is based on the installation of latch.

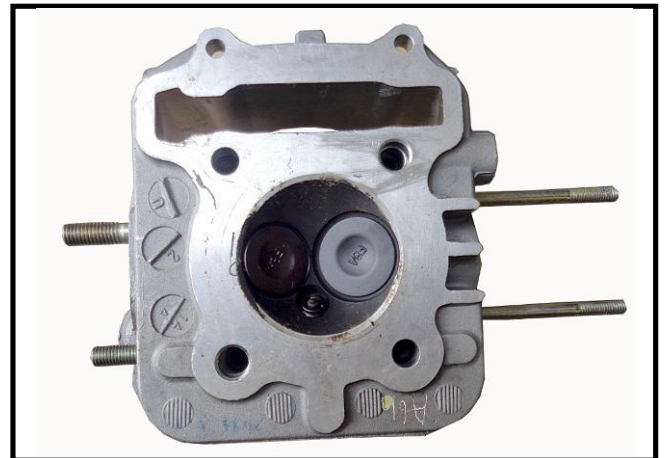
Special Service Tool: Valve spring compressor.



Remove valve stem guide seal.  
Clean carbon deposits in combustion chamber.  
Clean residues and foreign materials on cylinder head matching surface.

**⚠ Caution**

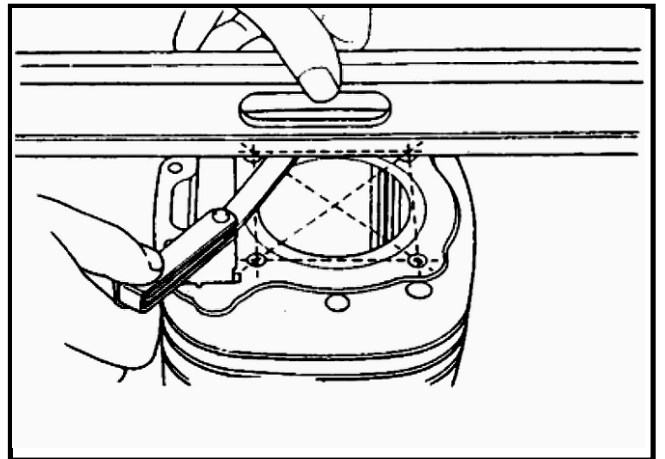
Do not damage the matching surface of cylinder head.



### CYLINDER HEAD INSPECTION

Check if spark plug and valve holes are crack.  
Measure cylinder head flat with a straightedge and flat feeler gauge.

**Service limit: 0.05mm**



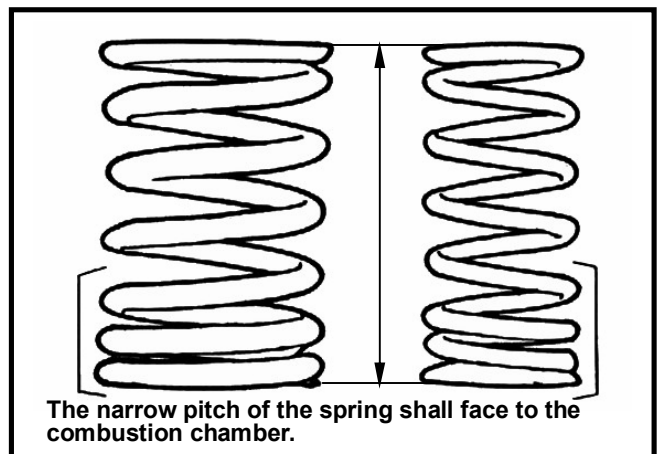
### Valve spring free length

Measure the free length of intake and exhaust valve springs.

**Standard**

**Outer : 35.250 mm**

**Inner : 32.410 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→ 4.900mm**

**EX→ 4.900mm**

### Valve guide

#### **Caution**

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

Special Service Tool: 5.0mm valve guide reamer

Measure and record each valve guide inner diameters.

**Service limit: 5.030mm**

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→ 0.08mm**

**EX→ 0.10mm**

#### **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**

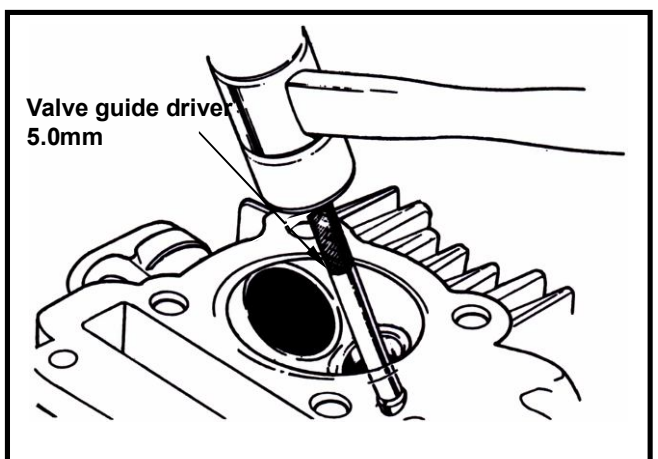
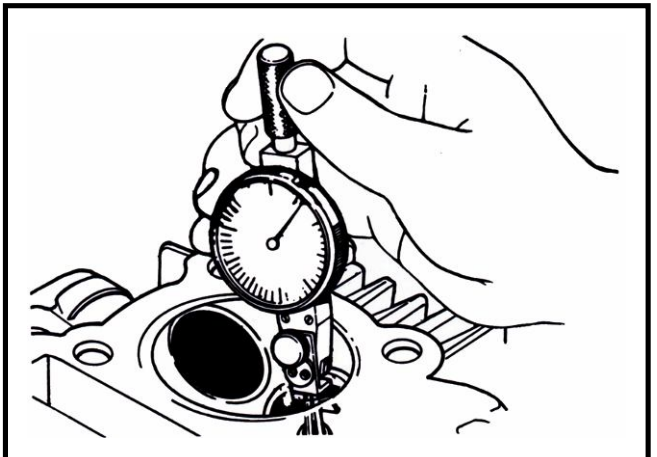
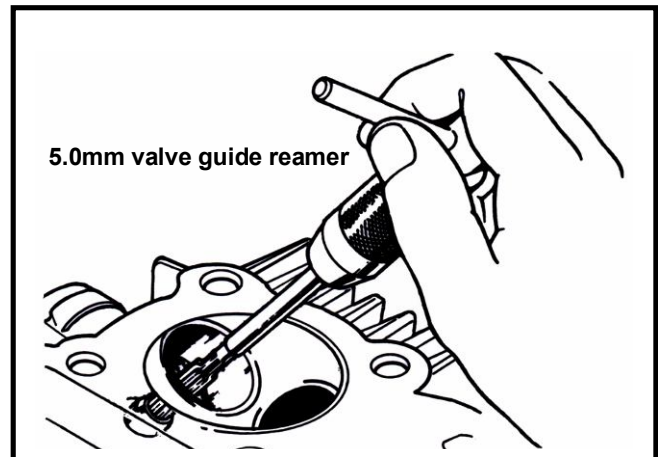
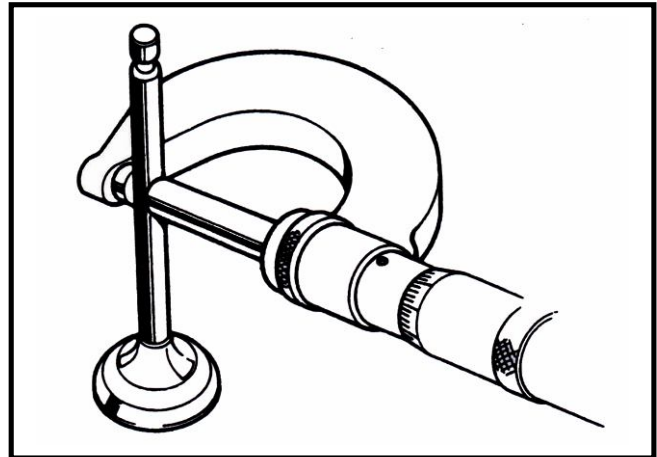
It must correct valve seat when replacing valve guide.

### Valve guide 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 mm**

### ⚠ Caution

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

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

Press in new valve guide from rocker arm side.

**Tool: Valve guide driver 5 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.

**Special tool: Valve guide reamer 5 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.

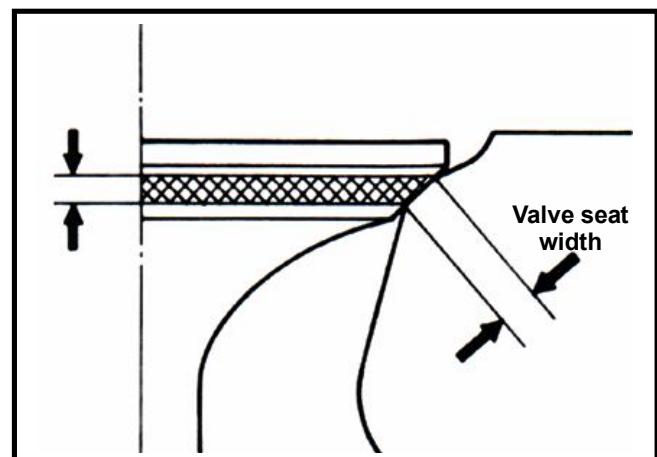
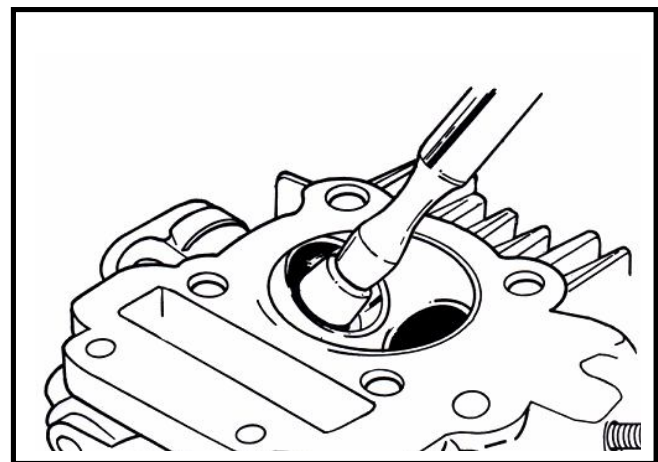
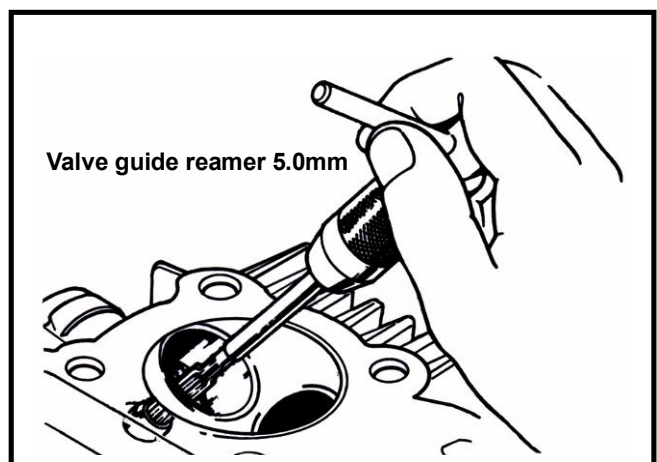
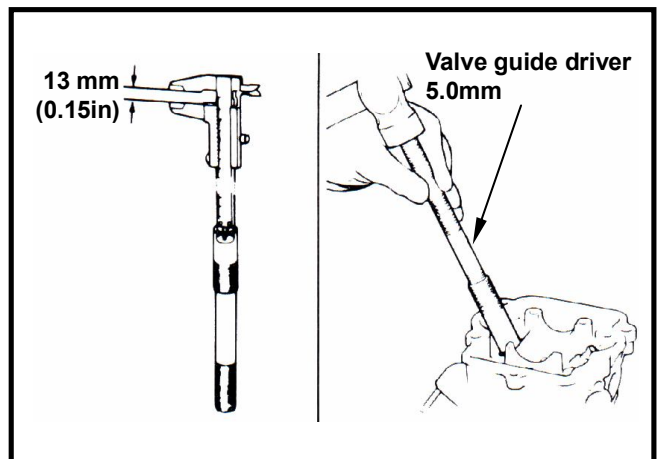
### ⚠ Caution

- Do not let emery enter into between valve stem and valve guide.
- Clean up the emery after corrected, and apply with red paint 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 seat is roughness, wear out, or incomplete contacted with valve seat. If the valve and the valve seat still can not be matched sealing after grinded, replace it with new one.



### Valve seat inspection

If the valve seat is too wide, narrow or rough, correct 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 grinded with 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 grinded with 45° valve seal chamfer cutter to correct its seat face.

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

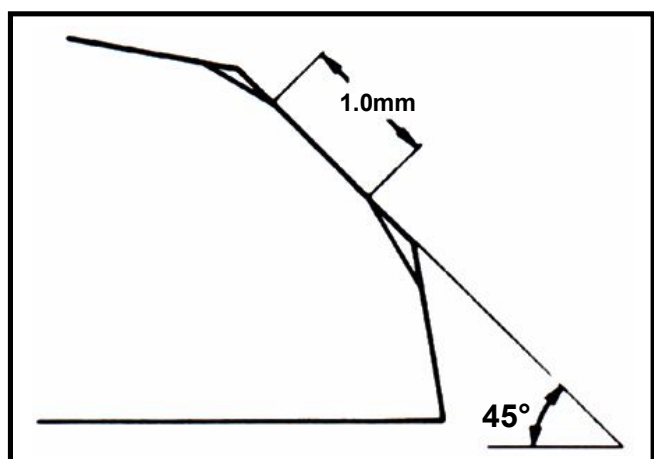
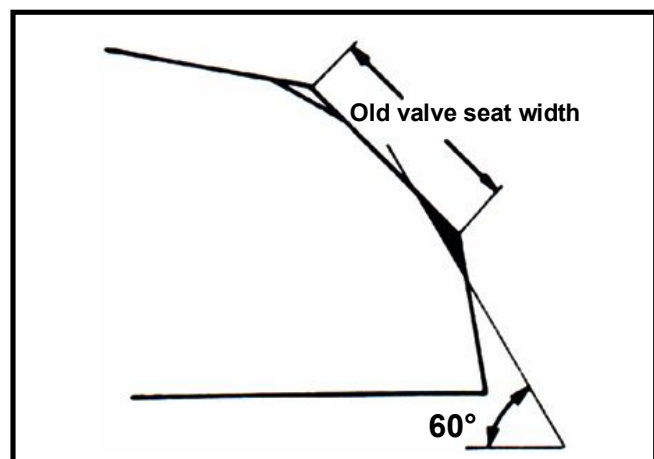
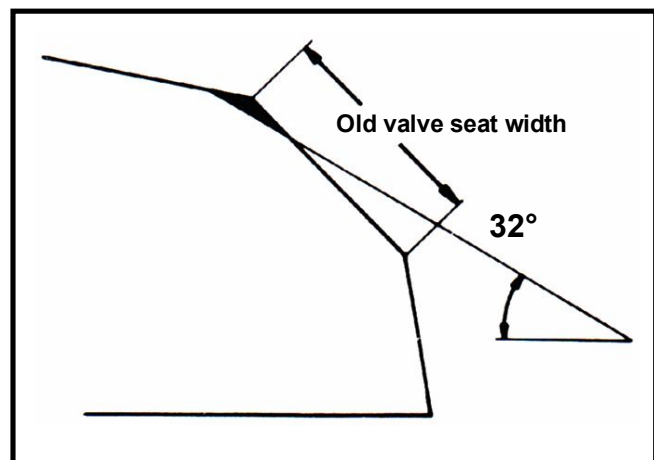
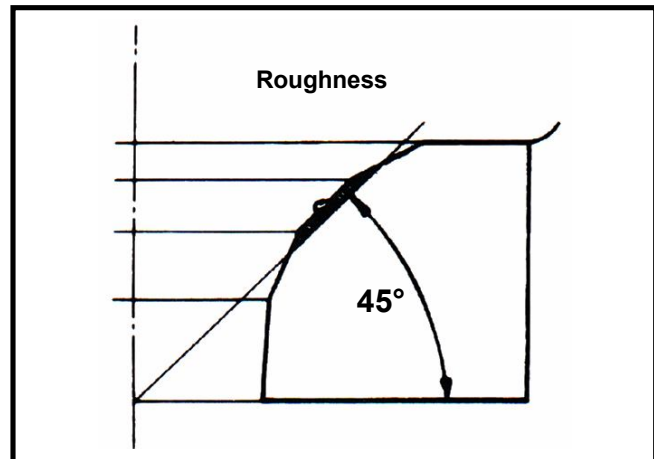
Use 60° cutter to cut a quarter lower part out. Remove the cutter and check new valve seat.

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

### Caution

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

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.

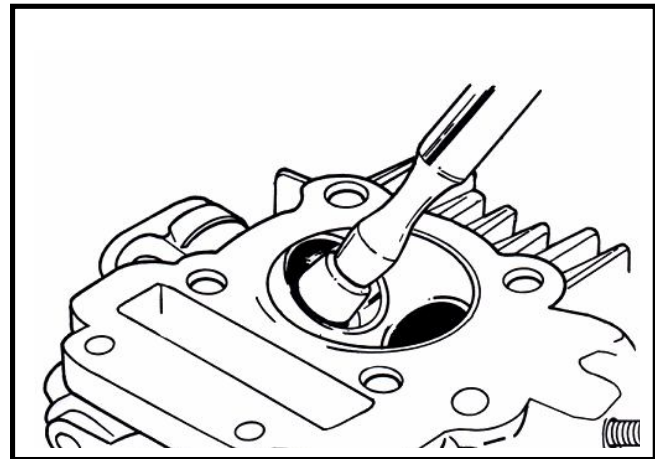
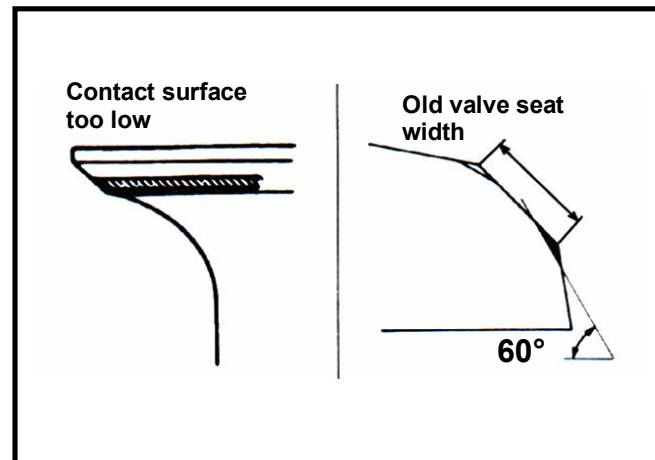
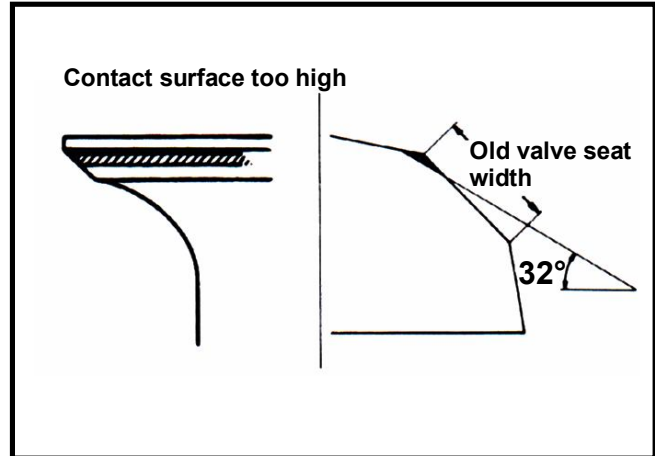
### Caution

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 with 45° cutter to specified width.

If the contact surface too low, grind the valve seat with 60° cutter. Then, grind the valve seat with 45° cutter to specified width.

After the valve seat grinded, coat valve seat surface with emery and then slightly press the grinded surface. Clean up all emery coated onto cylinder and valve after grinded.

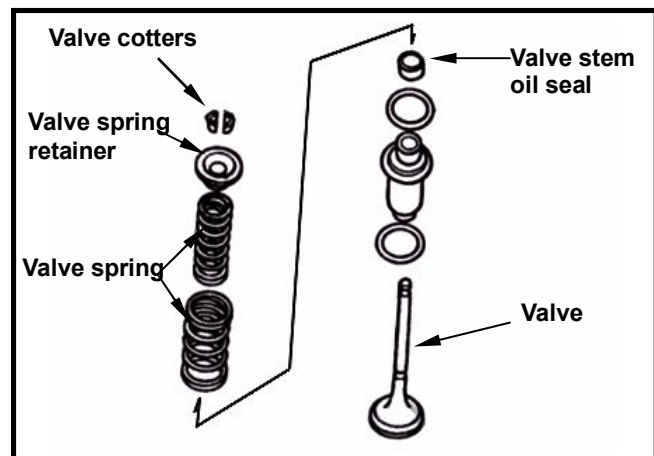


## CYLINDER HEAD REASSEMBLY

Lubricate valve stem with engine oil, and then insert the valve into valve guide. Install new valve stem oil seal. Install valve springs and retainers.

### Caution

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



Use valve spring compressor to press valve spring.  
Install valve split locks and release the valve compressor.

**⚠ Caution**

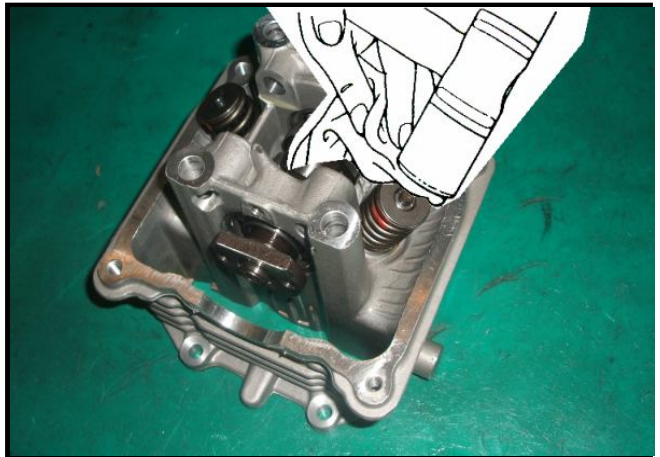
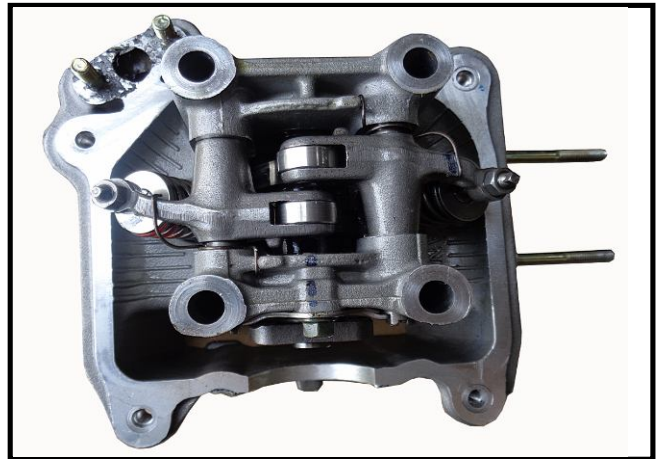
In order to avoid to losing spring tension, do not compress the spring too much. Its length is based on the installation of latch.

Special tool: valve spring compressor

Tap valve stem to make valve retainer and valve stem sealing properly.

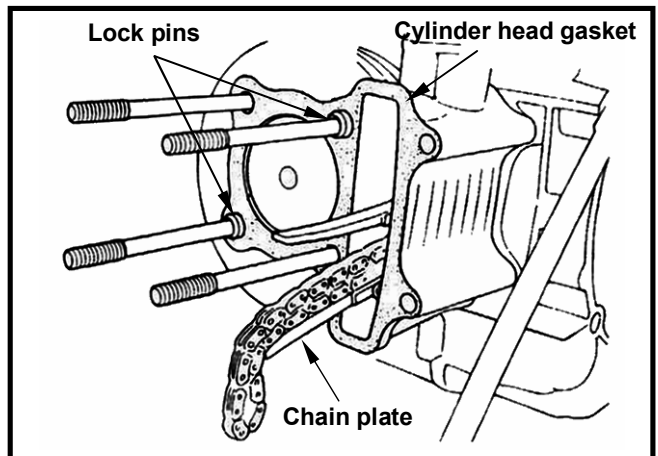
**⚠ Caution**

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



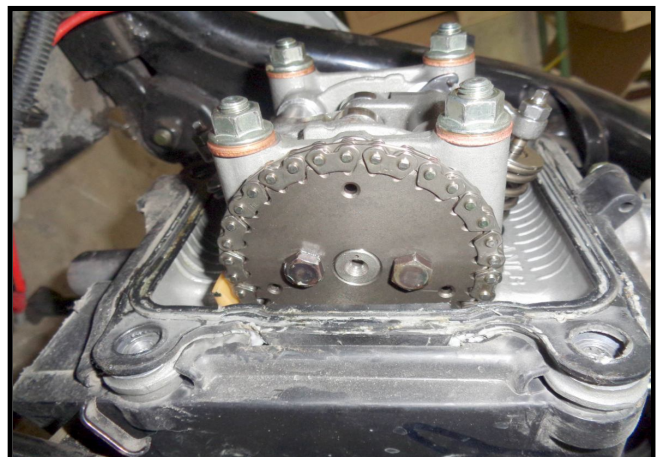
## CYLINDER HEAD INSTALLATION

Install the lock pins and new cylinder head gasket onto the cylinder head.  
Install the camshaft chain plate.



With T type wrench to turn crankshaft in a clockwise motion so that the "T" mark on the flywheel aligns with the mark on crankcase. (piston is at TDC position)  
Place the TDC marks of the cam sprocket at same level of the top-end of cylinder head. The other single hole of the cam sprocket is in upward. Then, install the cam chain onto the cam sprocket.

Install the cylinder head.



### VALVE CLEARANCE ADJUSTMENT

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:  $0.12 \pm 0.02\text{mm}$**

With flat screwdriver, turn the cam sprocket adjuster in counter-clockwise motion so that the adjuster is pushed out to contact the cam chain plate tightly. Apply with oil onto a new O-ring and then install it onto the adjuster hole. Tighten the bolt cap of the adjuster adjustment hole.

#### **Caution**

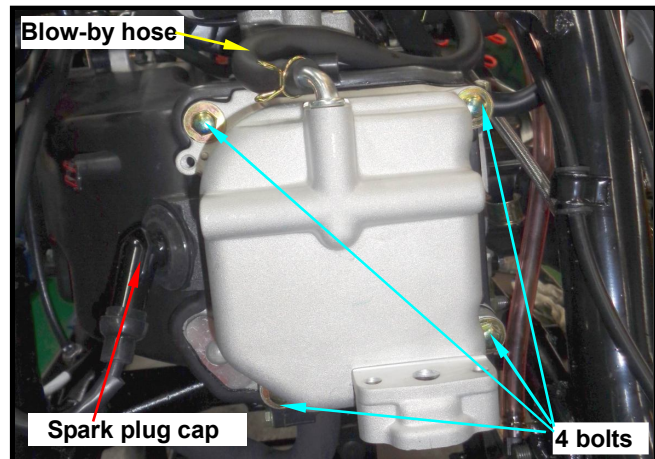
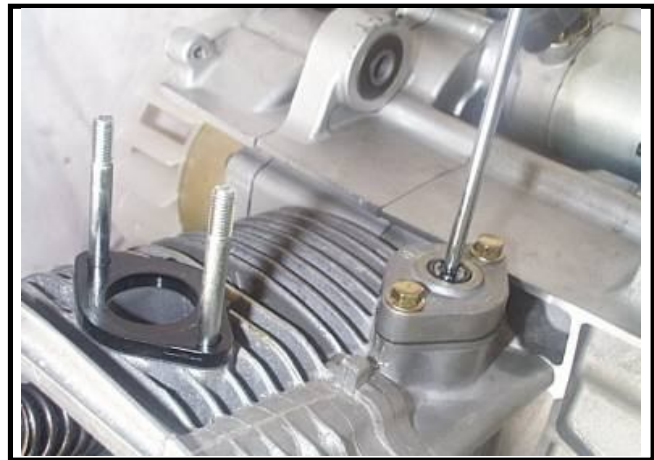
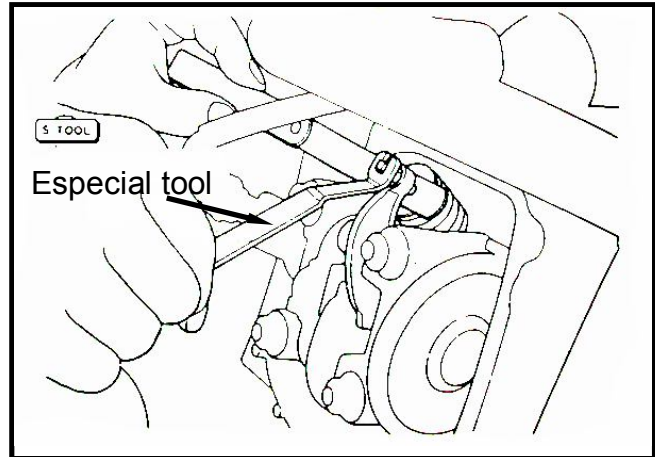
The O-ring must be installed into groove.

Replace the O-ring of the cylinder head with new one. Install the cylinder head.

Tighten the cylinder head lock bolts.

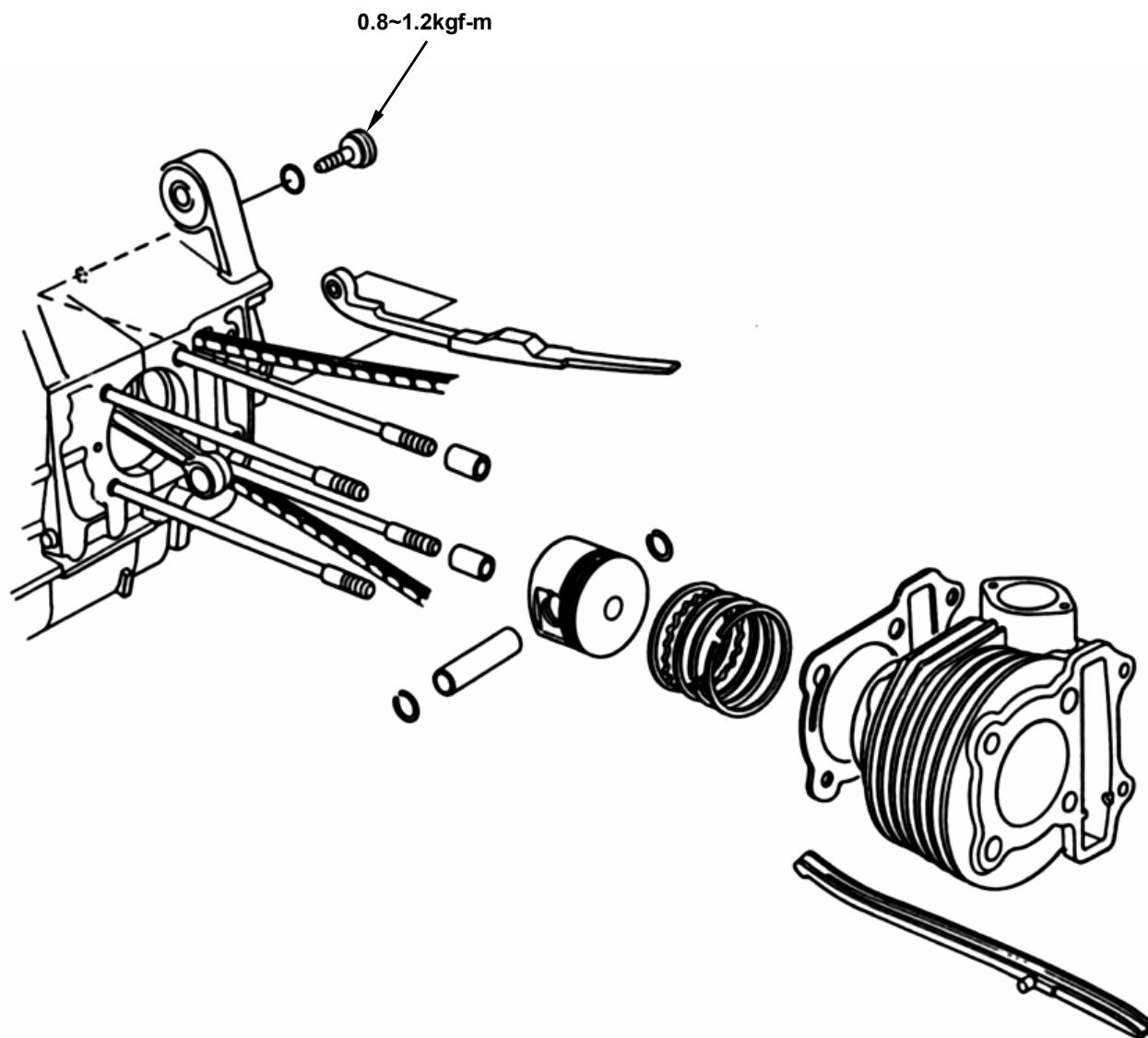
Connect the blow-by hose onto the cylinder head.

Install the engine onto the engine frame.  
(Refer to Chapter 5)



MECHANISM DIAGRAM .....	7-1	PISTON REMOVAL.....	7-5
PRECAUTIONS IN OPERATION .....	7-2	PISTON RING INSTALLATION.....	7-7
TROUBLE DIAGNOSIS.....	7-2	PISTON INSTALLATION.....	7-8
CYLINDER REMOVAL .....	7-3	CYLINDER INSTALLATION.....	7-8

## MECHANISM DIAGRAM



## 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		52.395~52.415	52.50
	Bend/wrap age		Less than 0.05	0.050
	Roundness		Less than 0.01	0.050
	Cylindrical		Less than 0.05	0.050
Piston/ Piston ring	Clearance between piston and rings	Top ring	0.05~0.105	0.145
		2 <sup>nd</sup> ring	0.05~0.105	0.145
	Ring-end gap	Top ring	0.100~0.2500	0.500
		2 <sup>nd</sup> ring	0.300~0.500	0.750
		Oil ring	0.200~0.700	-
	OD of piston		52.385~52.405	52.310
	Piston OD measurement position		Lower-end up 7mm of piston skirt	-
	Clearance between piston and cylinder		0.005~0.015	0.100
	ID of piston pin hole		15.002~15.008	15.040
	OD of piston pin			14.994~15.00
Clearance between piston and piston pin			0.002~0.014	0.020
ID of connecting rod small-end			15	15.06

## TROUBLE DIAGNOSIS

## Low Or Unstable Compression Pressure

- Cylinder or piston ring worn out.
- Compress pressure to high.
- Too much carbon deposited in combustion chamber and piston.

## Knock or Noise

- Cylinder or piston ring worn out.
- Carbon deposits on cylinder head top-side.

- Piston pin hole and piston pin wear out.

## Smoking in Exhaust Pipe

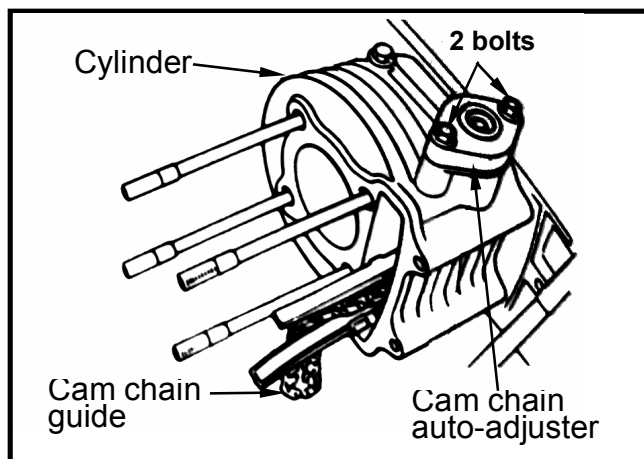
- Piston or piston ring worn out.
- Piston ring installation improperly.
- Cylinder or piston damage.

## Engine Overheat

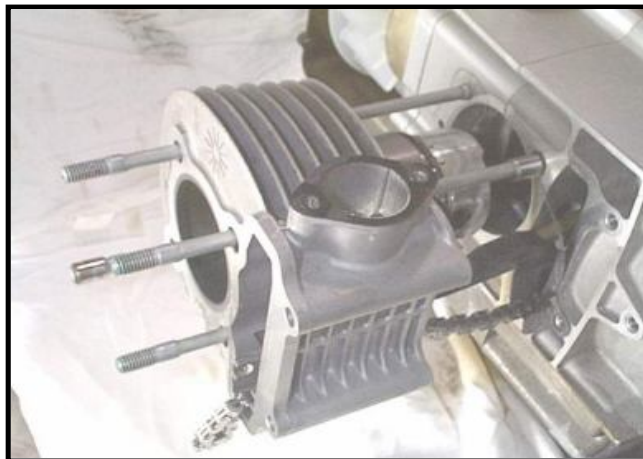
- Carbon deposits on cylinder head top side.

**CYLINDER REMOVAL**

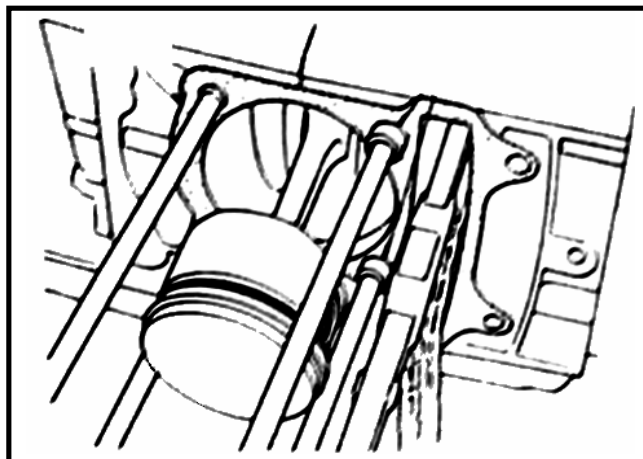
Remove cylinder head. (refer to chapter 6)  
Remove 2 bolts and then take out the cam chain auto-adjuster.



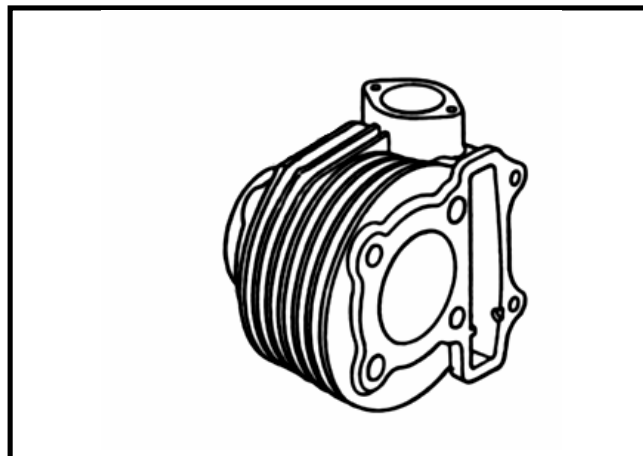
Remove cam chain plate.  
Remove cylinder.



Remove cylinder gasket and lock pins



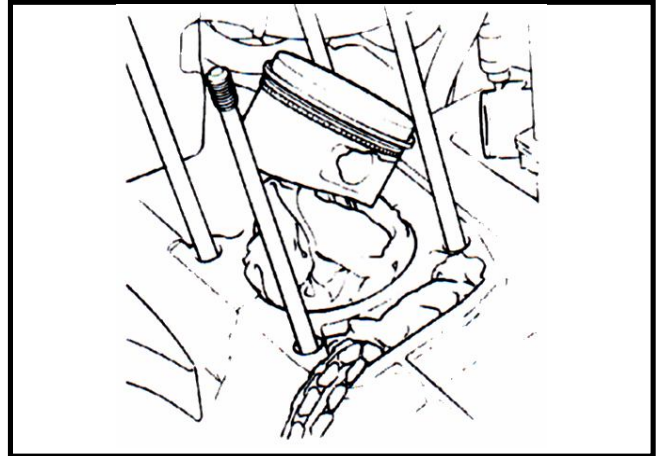
Clean the residues attached onto the matching surfaces of cylinder and crankcase.



Cover the holes of crankcase and cam chain with a piece of cleaning cloth.  
Clean up all residues or foreign materials from the two matching surfaces of cylinder and crankcase.

## ⚠ Caution

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



## INSPECTION

Check if the inner diameter of cylinder is worn out or damaged.  
In the 3 positions (top, center and bottom) of cylinder, measure the X and Y direction values respective in the cylinder.

**Service limit: 57.7mm**

Calculate both the real roundness (the difference between X and Y motion values) and the cylindrical roundness (the difference in the top, center or bottom positions of X or Y motion values.). Then, determinate by the max. value.

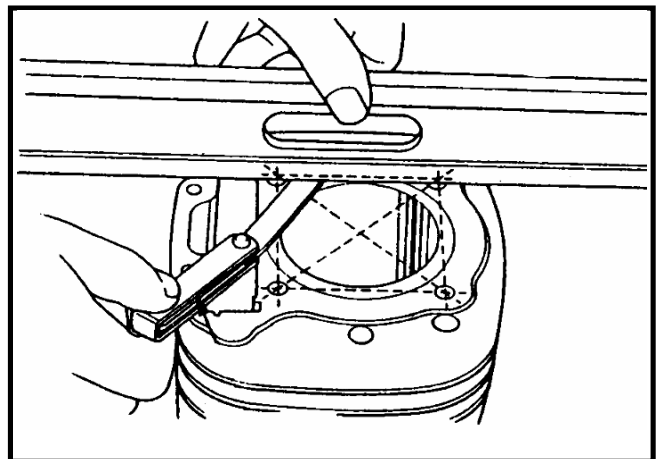
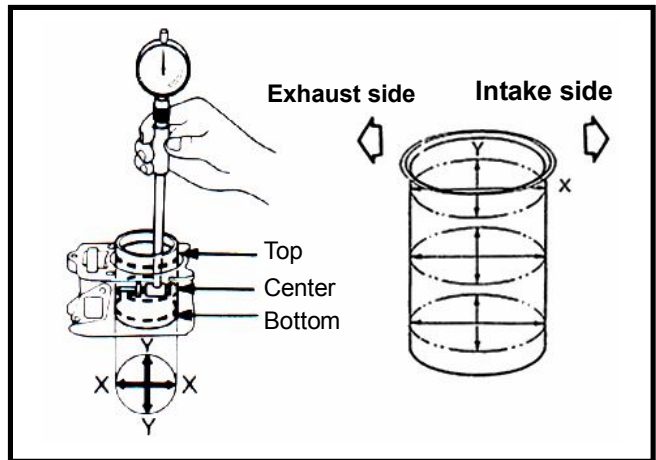
**Service limit**

**Real roundness: correct or replace as over 0.05 mm**

**Cylindrical roundness: correct or replace as over 0.05 mm**

Check Cylinder flat.

**Service limit: correct or replace as over 0.05 mm**

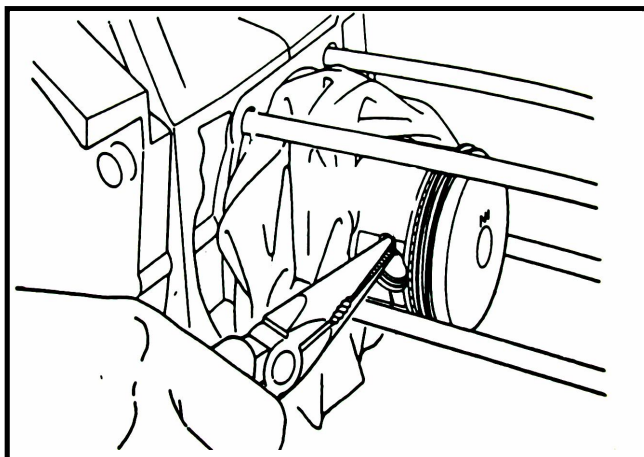


## PISTON REMOVAL

Plug crankcase opening with a cleaning cloth to prevent from piston pin snap ring or other parts falling into crankcase when disassembling.

Hold another snap ring with pliers.

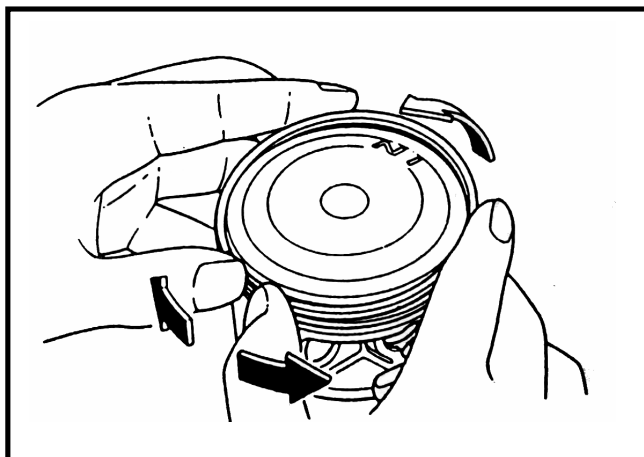
Push out the piston pin from the side that not removed the snap ring.



Remove piston rings.

### Caution

Pay attention to remove piston rings because they are fragile.



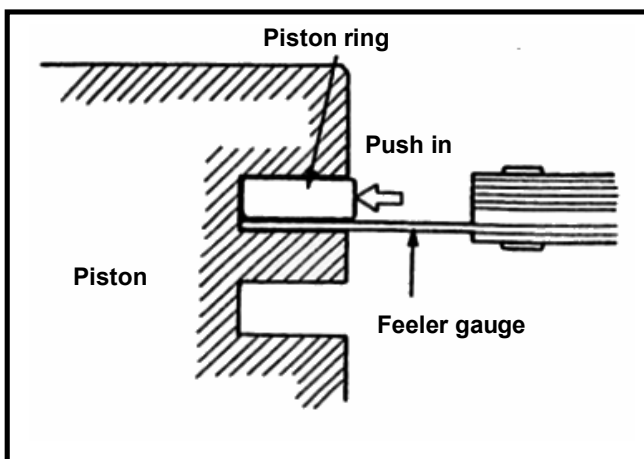
Disassemble the piston rings.

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

Cleaning the carbon in piston ring grooves.

Install the piston rings and then measure clearance between piston ring and its grooves.

**Service Limit:** Top ring: replace if over 0.145mm  
2nd ring: replace if over 0.145mm

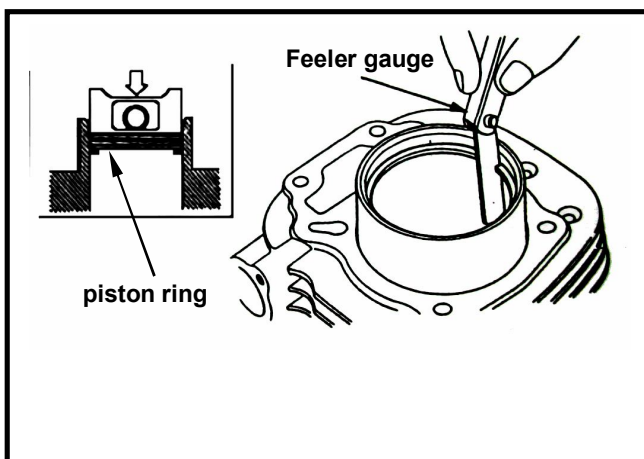


Take out the piston rings and place them respective into cylinder below 20mm of cylinder top. Measure each piston ring gaps.

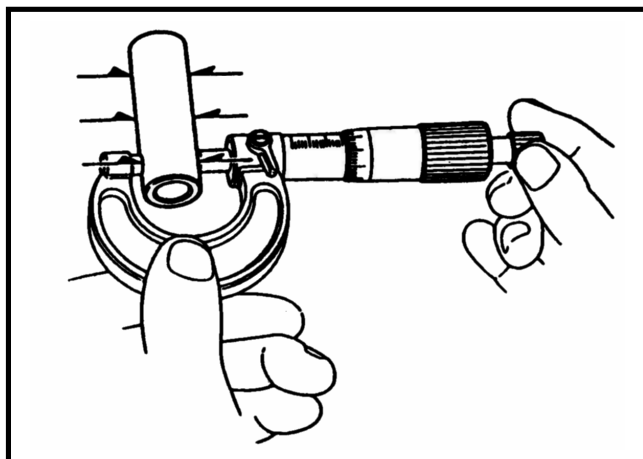
### Caution

Push the piston rings into cylinder with piston top-end in parallel motion.

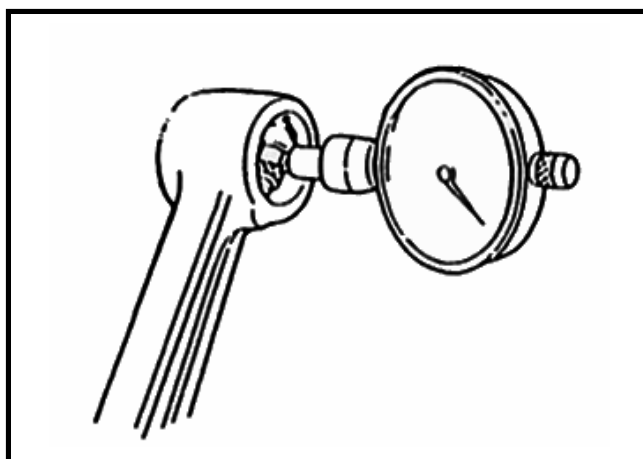
**Service Limit:** Top ring: replace if over 0.50mm  
2nd ring: replace if over 0.750mm



Measure the outer diameter of piston pin.  
**Service Limit: 14.96mm**

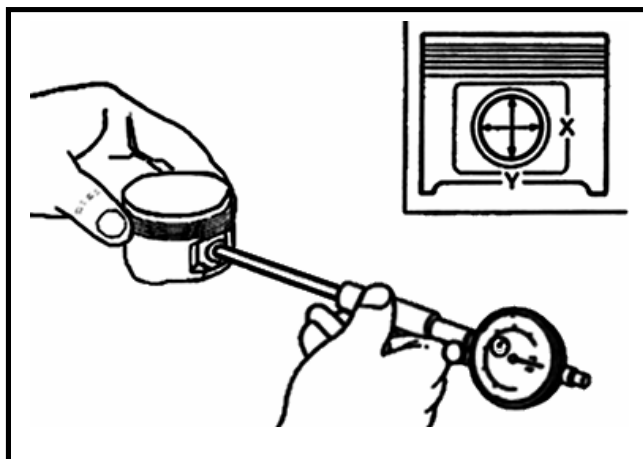


Measure the inner diameter of connecting rod small end.  
**Service Limit: 15.06mm**



Measure the inner diameter of piston pin hole.  
**Service Limit: 15.04mm**

Calculate clearance between piston pin and its hole.  
**Service Limit: 0.02mm**



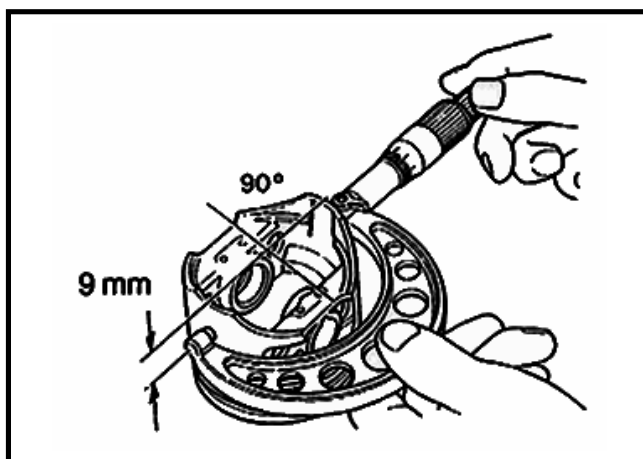
Measure piston outer diameter.

**⚠ Caution**

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

**Service limit: 52.310mm**

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

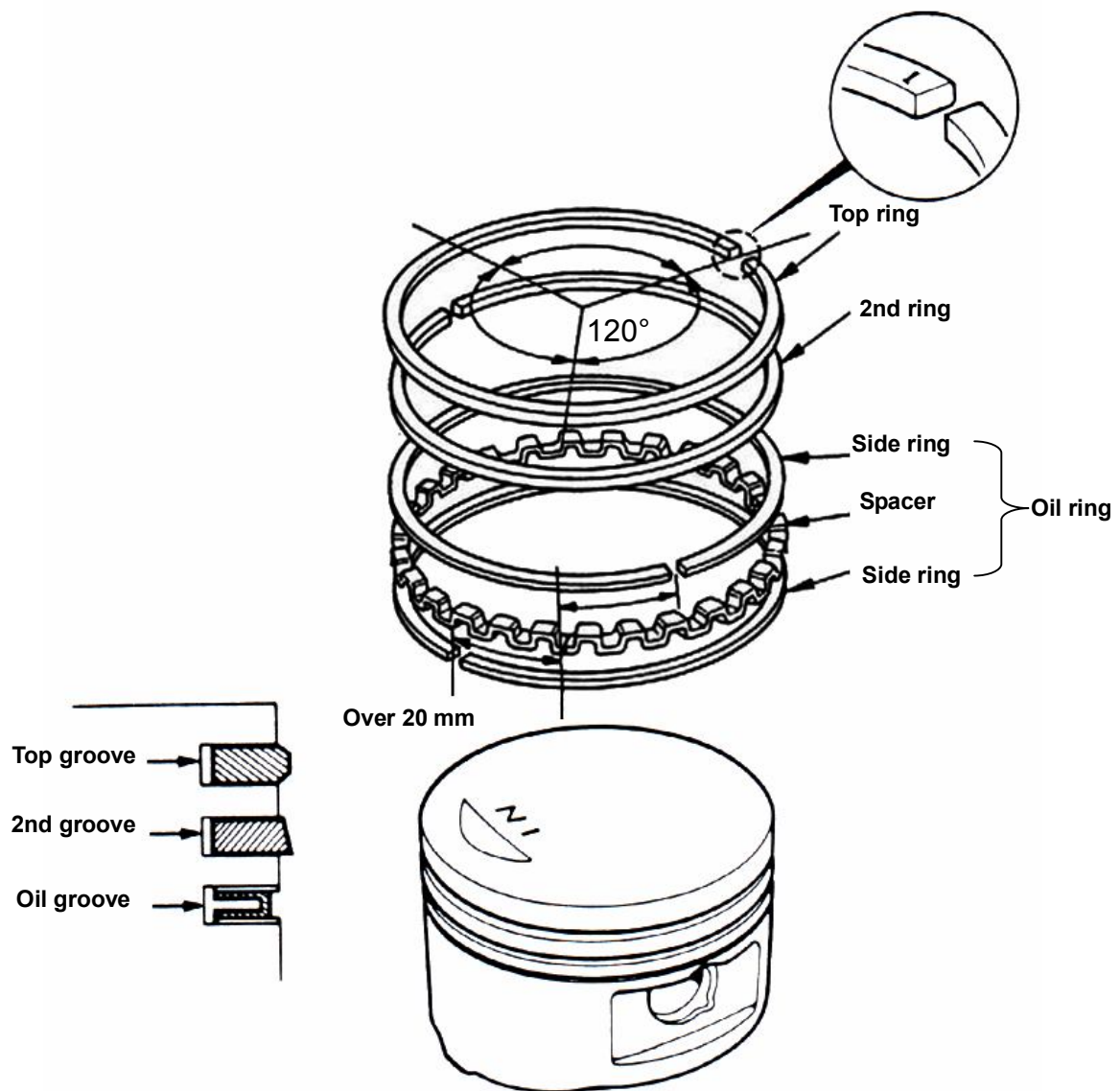


**PISTON RING INSTALLATION**

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



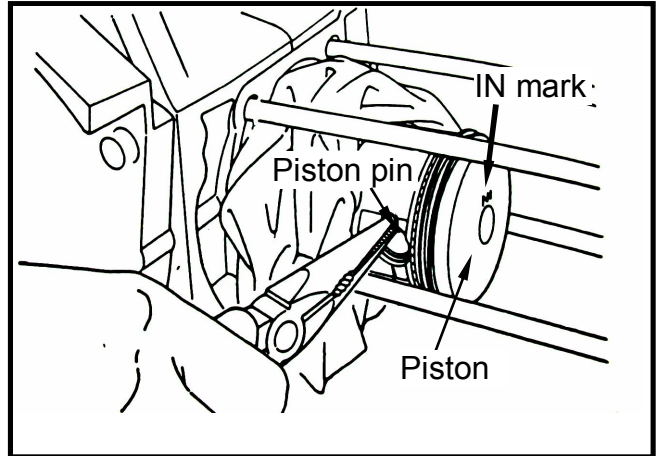
## PISTON INSTALLATION

Install piston and piston pin, and place the IN mark on the piston top side forward to intake valve.

Install new piston pin snap ring.

### ⚠ Caution

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



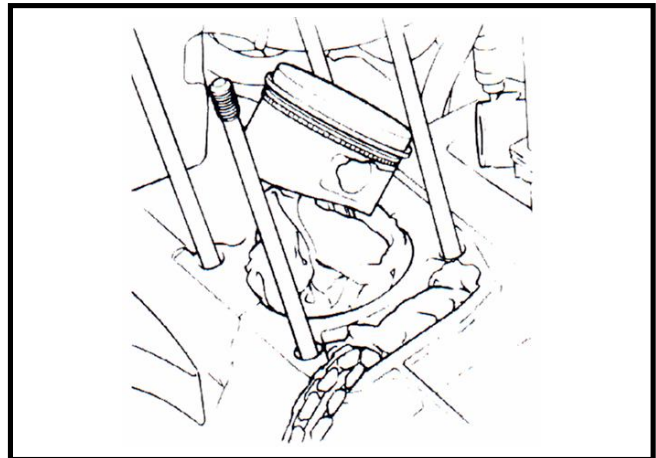
## CYLINDER INSTALLATION

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

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



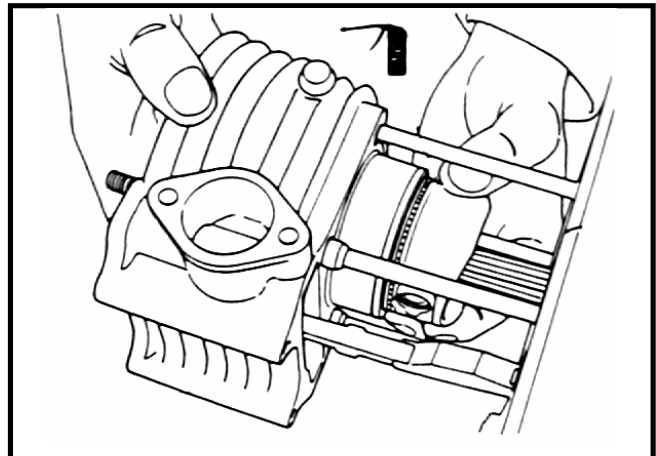
Install 2 lock pins and new gasket.

Coat 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

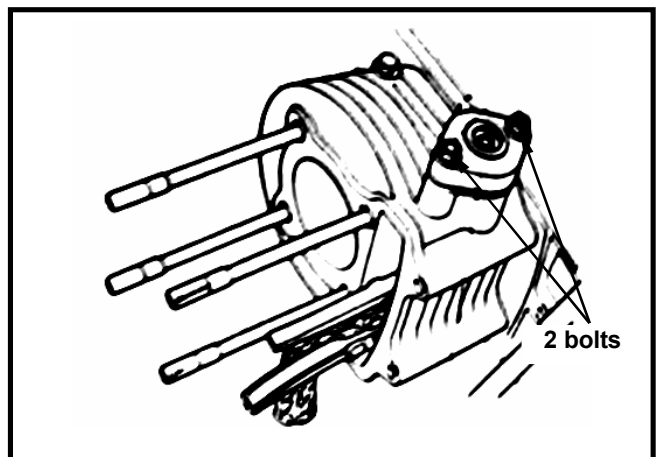
Do not push piston into cylinder forcefully because this will cause the piston and the piston rings to be damaged.



Install the cam chain plate, the cylinder head gasket and lock pins.

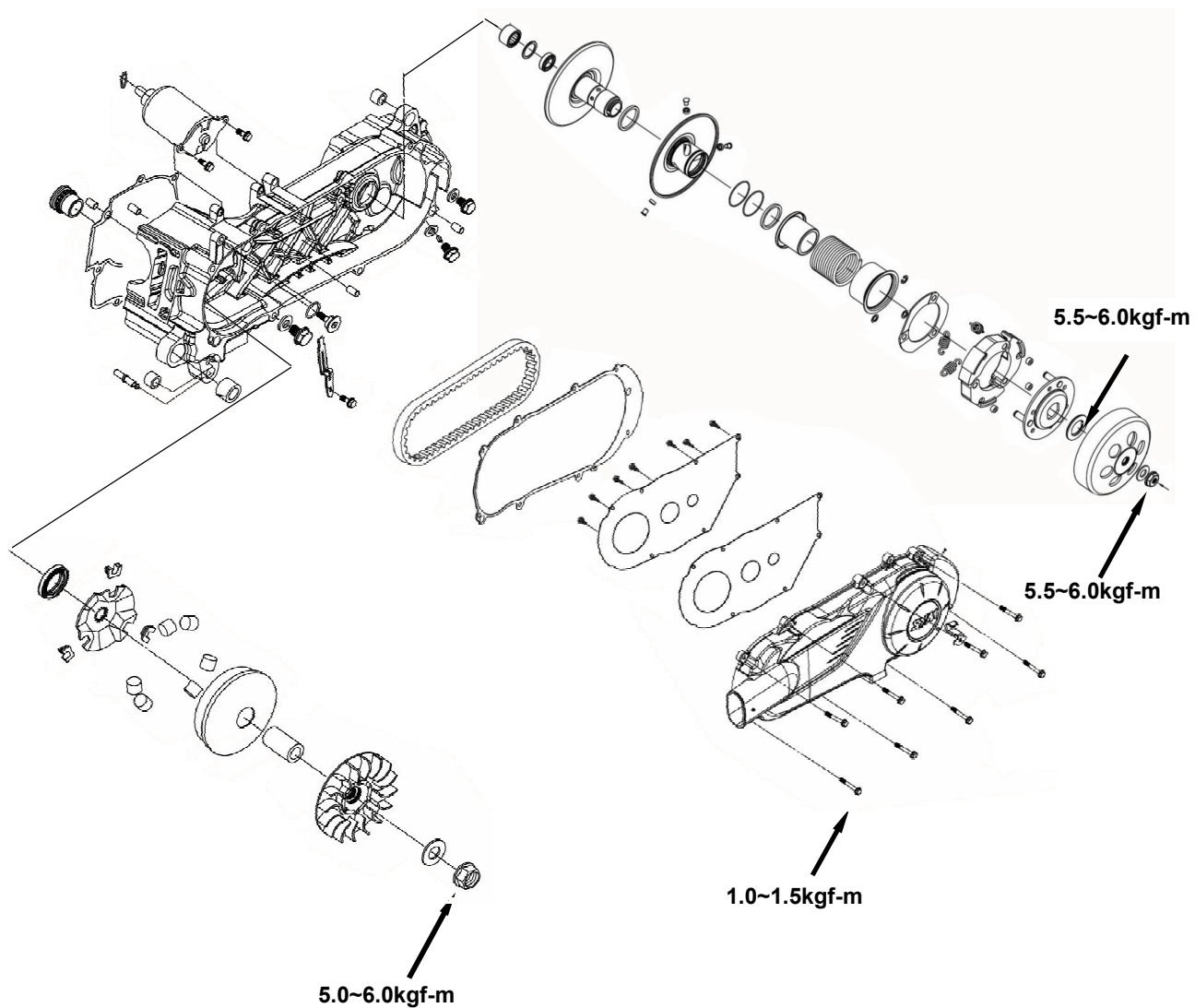
Install cylinder head. (refer to Chapter 6)

Install the cam chain auto-adjuster. (2 bolts)



MECHANISM DIAGRAM .....	8-1	KICK STARTER ARM.....	8-3
MAINTENANCE DESCRIPTION .....	8-2	DRIVING BELT.....	8-4
TROUBLE DIAGNOSIS.....	8-2	SLIDING PULLEY .....	8-6
LEFT CRANKCASE COVER.....	8-3	CLUTCH/DRIVEN PULLEY.....	8-9

## MECHANISM DIAGRAM



**MAINTENANCE DESCRIPTION****Precautions in operation****General information**

- Driving pulley, clutch, and driven pulley can be serviced on the motorcycle.
- Driving belt and driving pulley surface must be free of grease.

**Specification**

Unit: mm

Item	Standard value	Limit
Driving belt width	<b>19.50</b>	<b>18.50</b>
ID of sliding pulley bush	<b>23.989~24.052</b>	<b>24.060</b>
OD of sliding pulley hub	<b>23.960~23.974</b>	<b>23.940</b>
OD of roller	<b>15.92~16.08</b>	<b>15.400</b>
ID of clutch outer	<b>125.000~125.200</b>	<b>125.500</b>
Thickness of clutch lining	<b>3.000</b>	<b>2.500</b>
Free length of driving pulley spring	<b>168.900</b>	<b>163.700</b>
OD of driven pulley	<b>33.965~33.985</b>	<b>33.940</b>
ID of sliding pulley	<b>34.000~34.025</b>	<b>34.060</b>

ID: Inner Diameter

OD: Outer diameter

**Torque value**

Sliding pulley nut: 5.0~6.0kgf-m

Clutch outer nut: 5.5~6.0kgf-m

driving pulley nut: 5.5~6.0kgf-m

**Special Service Tools**

Clutch spring compressor

Bearing puller (inner type)

Clutch mounting nut wrench

Universal fixture

**TROUBLE DIAGNOSIS****Engine can be started but motorcycle can not be moved**

- Worn driving Belt
- Worn tilt plate
- Worn or damaged clutch lining
- Broken driven pulley

**Shudder or misfire when driving**

- Broken clutch lining
- Worn clutch lining

**Insufficient horsepower or poor high speed performance**

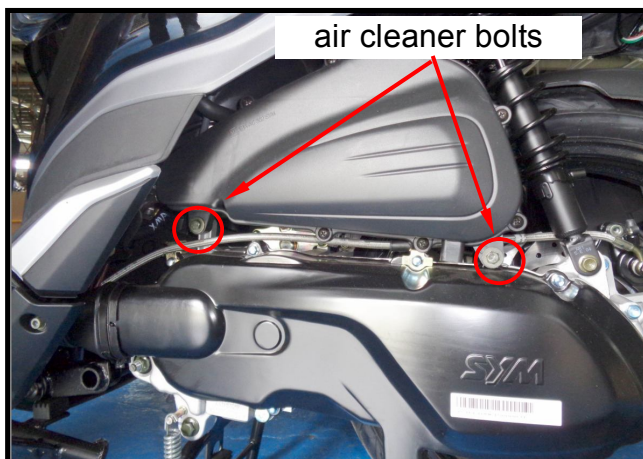
- Worn driving belt
- Insufficient spring capacity of driven pulley
- Worn roller
- Driven pulley operation un-smoothly

**LEFT CRANKCASE COVER****Left crankcase cover removal**

Remove air cleaner. (2 bolts)

Loosen vent strap on the front-left side of cover, and then remove the vent.

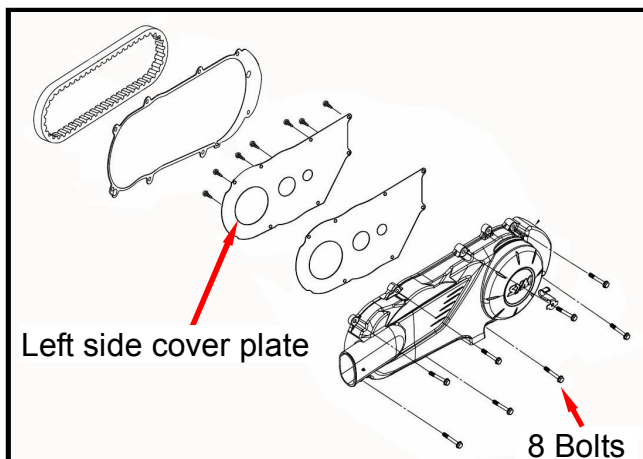
Remove engine left-side cover (8 bolts).

**Installation of the left crankcase cover**

Install the left crankcase cover. (8 bolts)

Install front vent tube of left cover and tighten the strap.

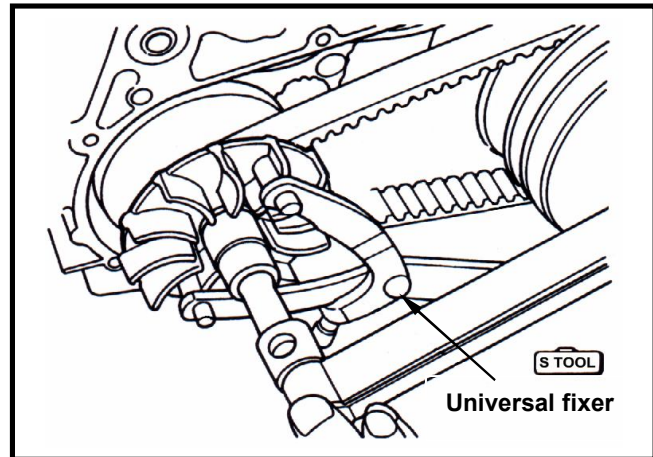
Tighten the air cleaner. (2 bolts)



**DRIVING BELT****Removal**

Remove left crankcase cover.

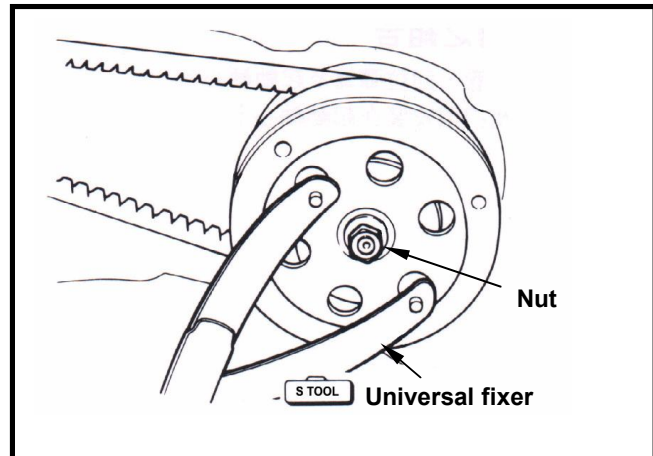
Hold the driving pulley with a universal fixture, and then remove the nut and driving pulley.



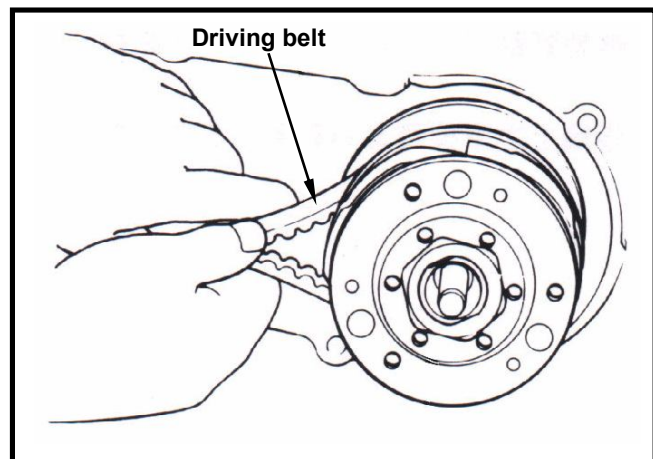
Hold driving pulley with universal fixture, and remove nut and clutch outer.

**⚠ Caution**

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



Push the driving belt into belt groove as diagram shown so that the belt can be loosened, and then remove driven belt and clutch at same time.

**Inspection**

Check the driving belt for crack or wear.

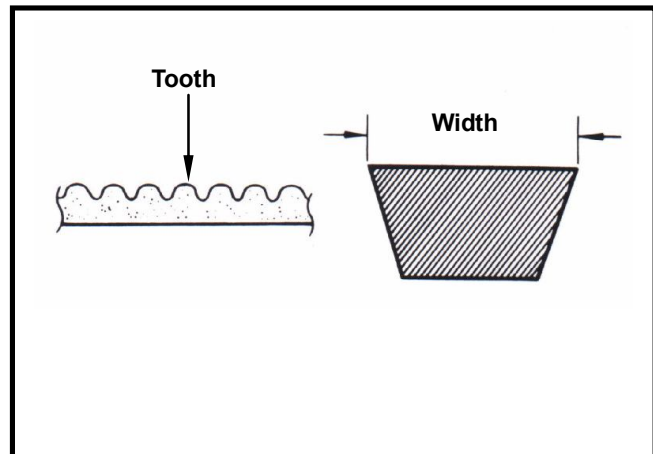
Replace it if necessary.

Measure the width of driving belt as diagram shown. Replace the driving belt if it exceed maintenance limited specification.

**Service Limit: 18.5mm**

**⚠ Caution**

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

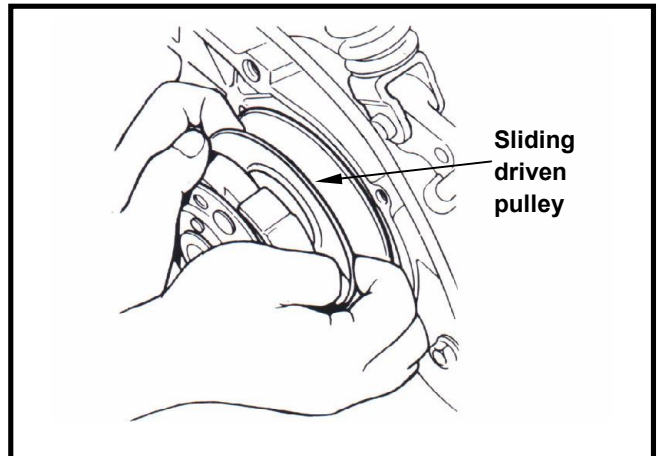


**Installation**

Pull out the driving pulley and then insert the driving belt into the driving pulley.

**Caution**

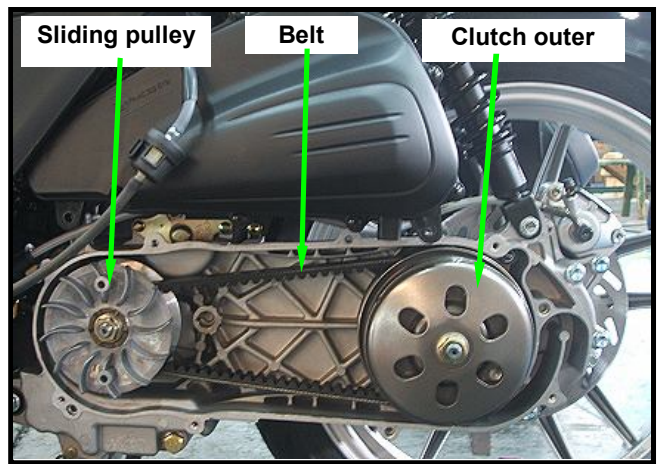
Pull out driving pulley and then insert the driving belt into the driving pulley so that the driving belt set can be installed onto sliding pulley more easily.



Install the clutch set with driving belt onto the driving shaft.

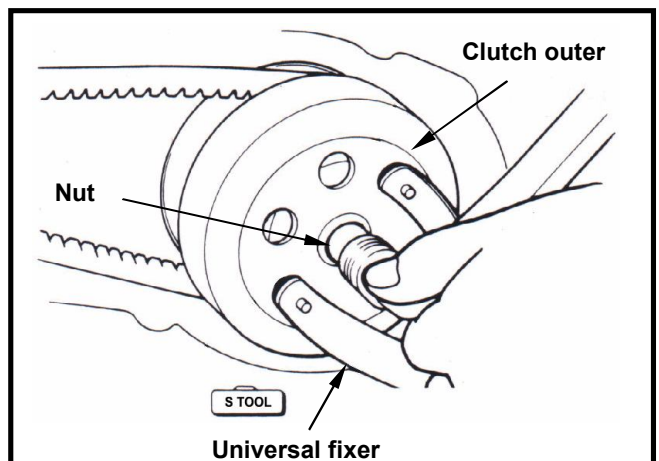
Install the sliding pulley on the other end of belt.

Install clutch outer.

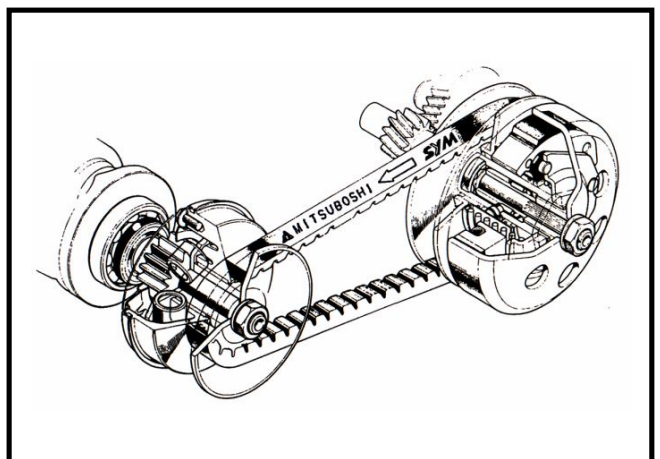


Install the clutch with universal fixture, and then tighten nut to specified torque value.

**Torque value: 5.5~6.0 kgf-m**

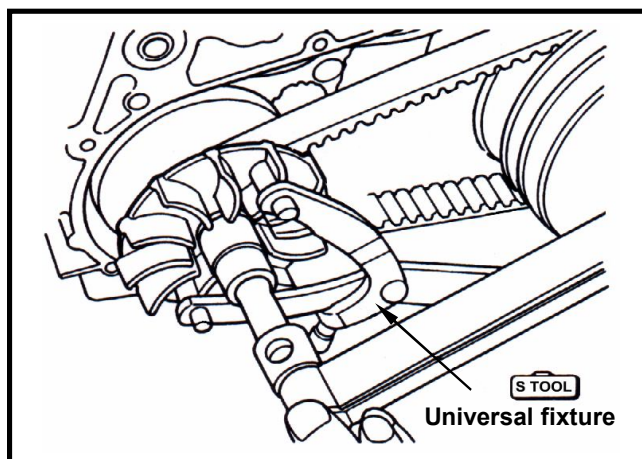
**Caution**

When install the driving belt, if there is a arrow mark, then the arrow mark must point to rotation motion. If not, the letters on the belt must be forwarded to assembly direction.

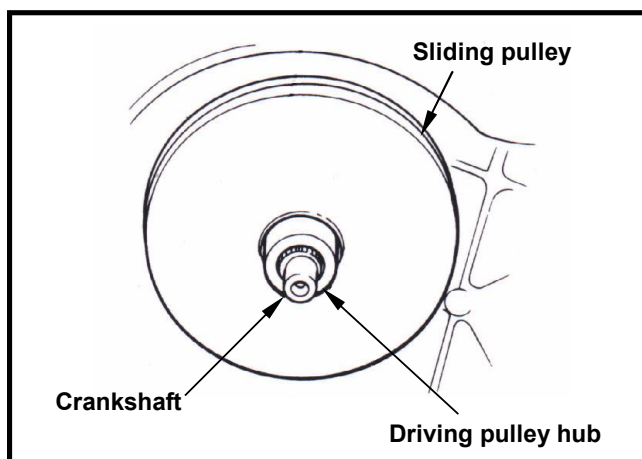


**SLIDING PULLEY****REMOVAL**

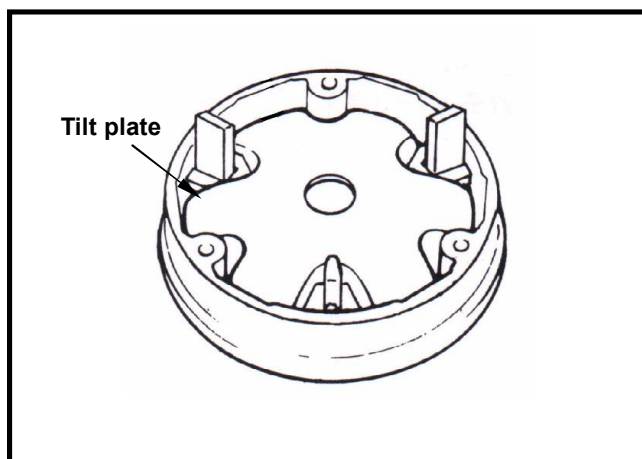
Remove left crankcase cover.  
Hold driving pulley with universal fixture, and  
then remove driving pulley nut.  
Remove driving pulley.



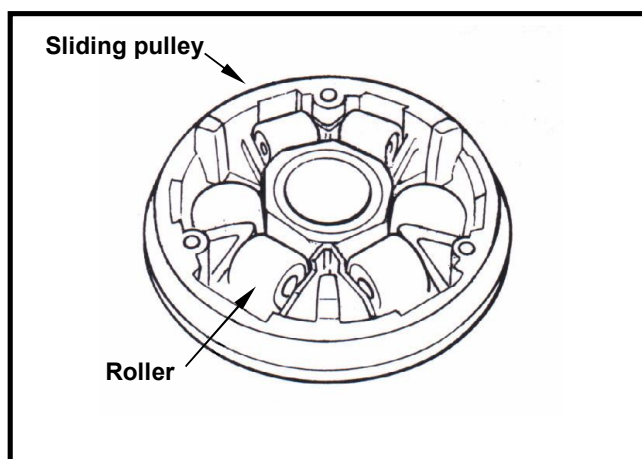
Remove the driving belt from the pulley.  
Remove sliding pulley set and driving pulley  
hub from crankshaft.



Remove tilt plate.



Remove weight rollers from sliding pulley.



### Inspection

The operation of sliding pulley is means of the weight roller to pressing on it with centrifuge force. And then the speed is changed by the title plate rotation. Thus, if weight rollers are wear out or damage, the centrifuge force will be effected.

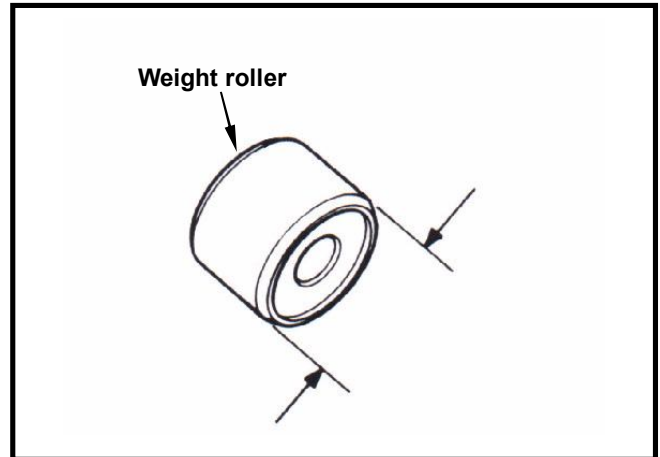
Check if rollers are wear out or damage.

Replace it if necessary.

Measure each rollers' outer diameter.

Replace it if exceed the service limit.

**Service limit:** 15.40 mm



Check the pulley hub if damaged or wear out. Replace it if necessary.

Measure the pulley hub's outer diameter.

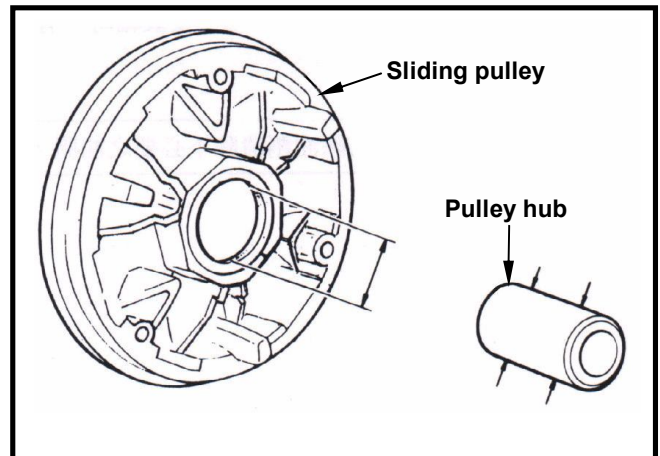
Replace it if exceed the service limit.

**Service limit:** 23.94 mm

Measure the inner diameter of the pulley bush.

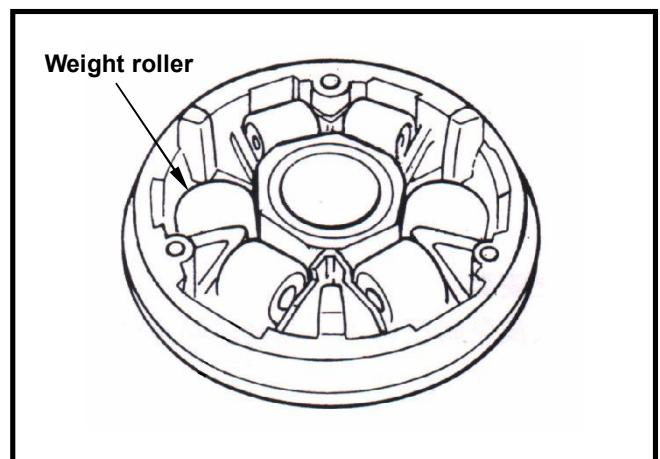
Replace it if exceed the service limit.

**Service limit:** 24.06 mm



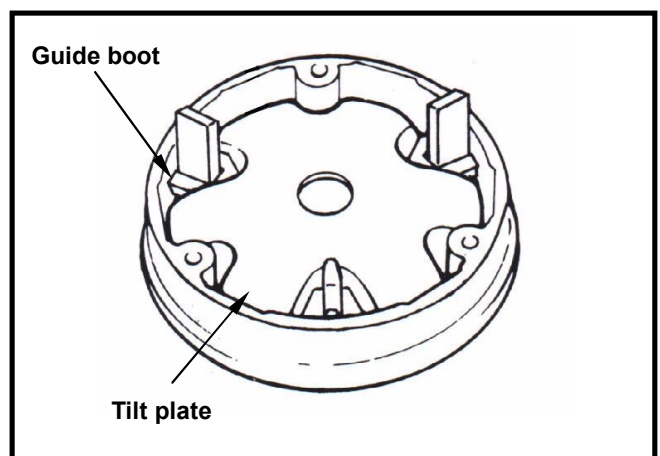
### Assembly/Installation

Install the weight rollers.



Install the title plate guide boot onto the title plate.

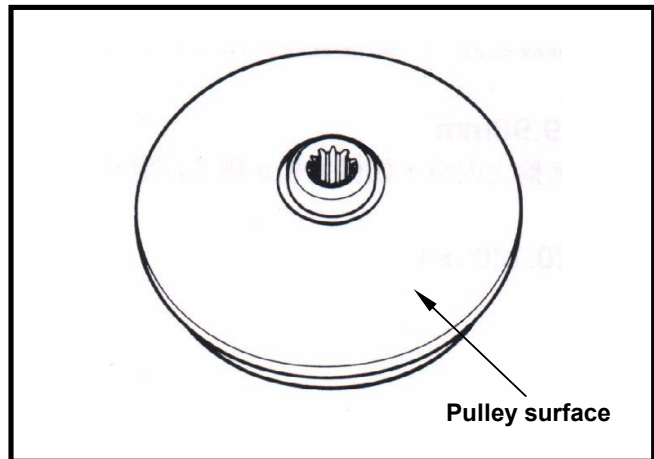
Install the title plate.



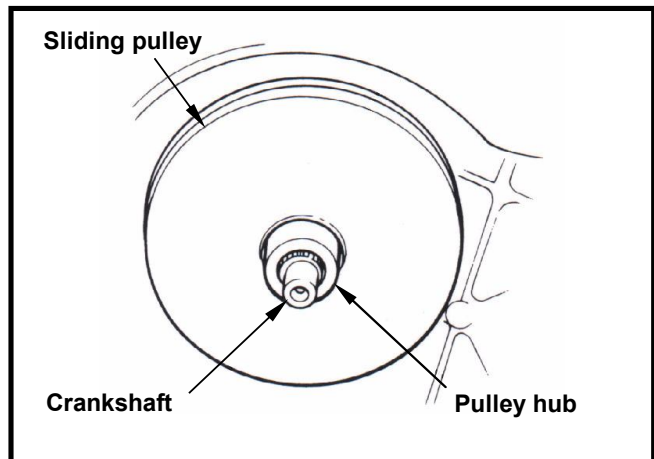
Apply with grease 4~5 g to inside of driving shaft hole, and install driving pulley hub.

## **Caution**

The pulley surface has to be free of grease. Clean it with cleaning solvent.



Install sliding pulley assembly onto crankshaft.

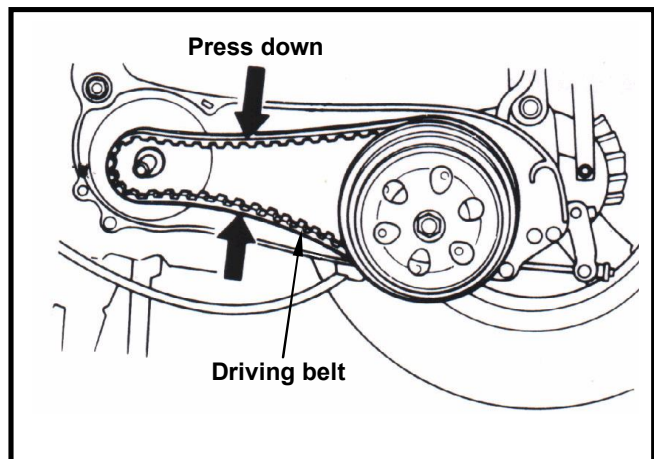


## **Driving pulley install**

Press driving belt into pulley groove, and then press down the up & down sides of the driving belt to separate it away from the driving pulley hub.

## **Caution**

To press down the up & down sides of the driving belt can avoid to pressing and damaging the belt when installing the driving pulley, and also can make sure that the driving pulley can be



Install driving pulley, washer and nut.

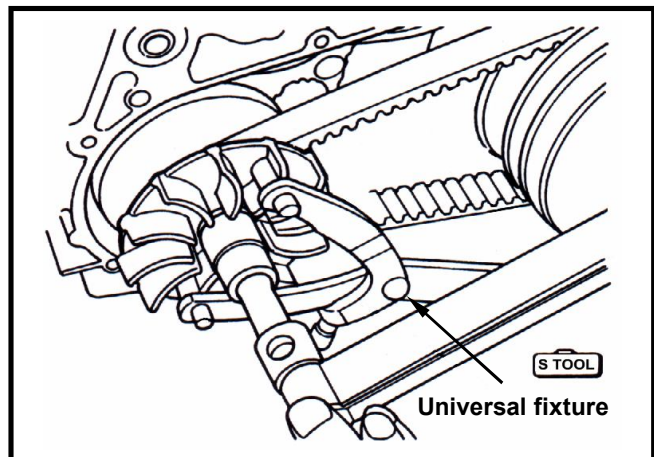
## **Caution**

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

Hold driving pulley with universal fixture. Tighten nut to specified torque.

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

Install left crankcase cover.



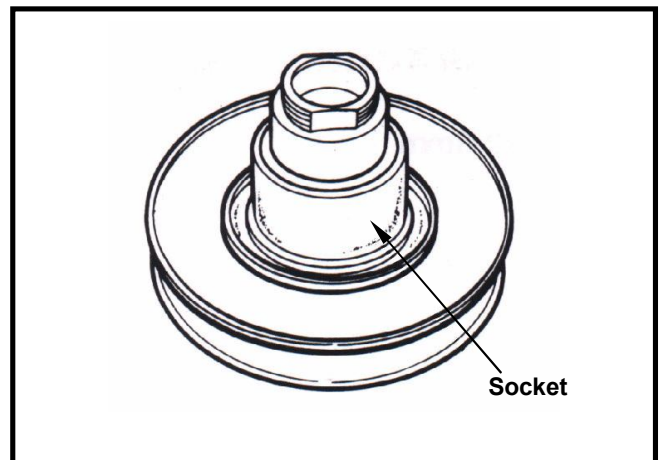
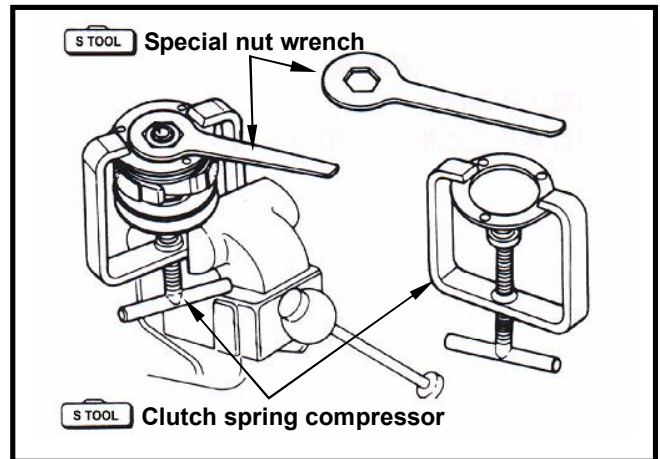
**CLUTCH/DRIVEN PULLEY****Disassembly**

Remove driving belt and clutch/driven pulley. Install clutch spring compressor onto the pulley assembly, and operate the compressor to let nut be installed more easily.

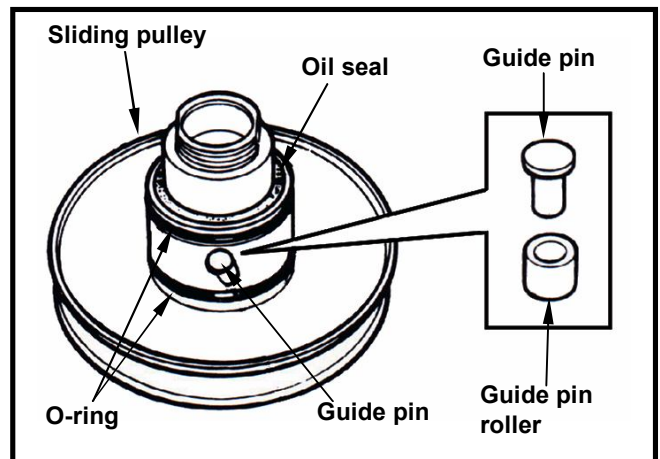
**Caution**

Do not press the compressor too much.

Hold the clutch spring compressor onto bench vise, and then remove mounting nut with special nut wrench. Release the clutch spring compressor and remove clutch and spring from driven pulley. Remove socket from driven pulley.

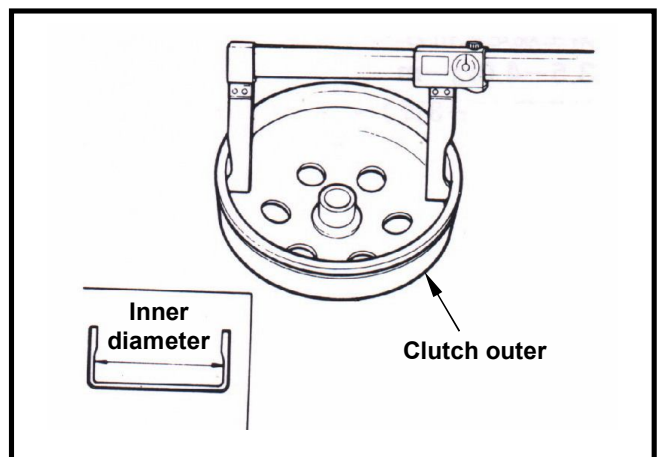


Remove oil seal from driven pulley. Remove guide pin, guide pin roller, and sliding pulley, and then remove O-ring & oil seal seat from sliding pulley.

**Inspection****Clutch outer**

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

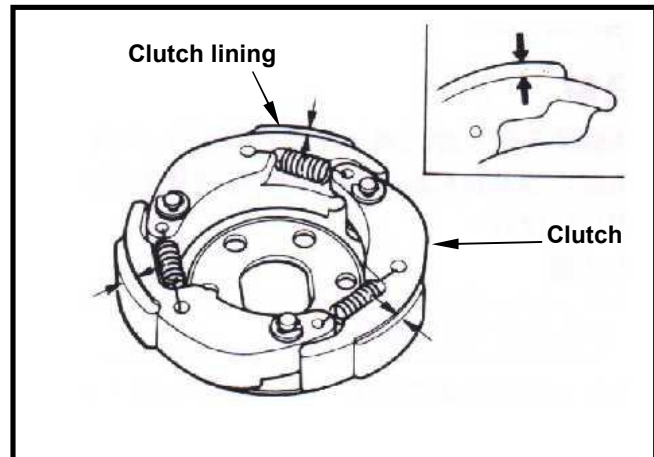
**Service limit: 125.5 mm**



## Clutch lining

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

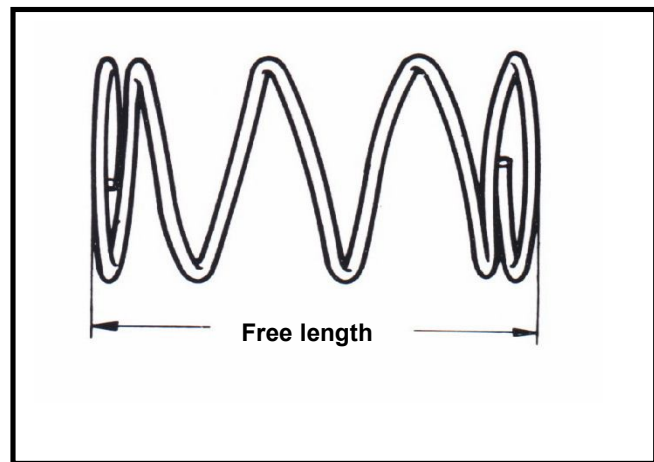
**Service limit: 2.5mm**



## Driven pulley spring

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

**Service limit: 163.7mm**



## Driven pulley

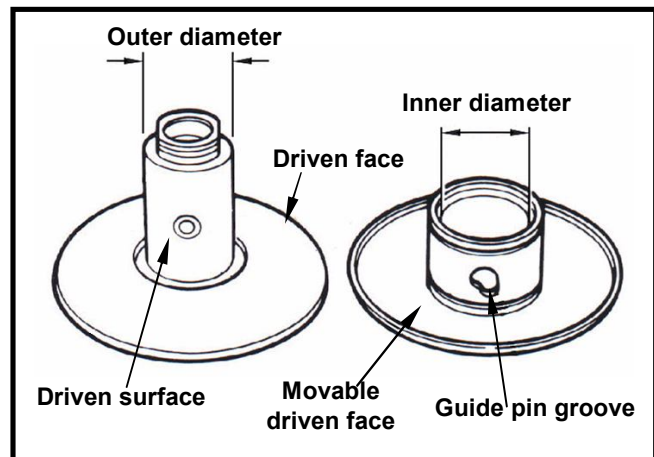
Check following items;

- If both surfaces are damage or wear.
- If guide pin groove is damage or wear.

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

**Service limit: Outer diameter 33.94mm**

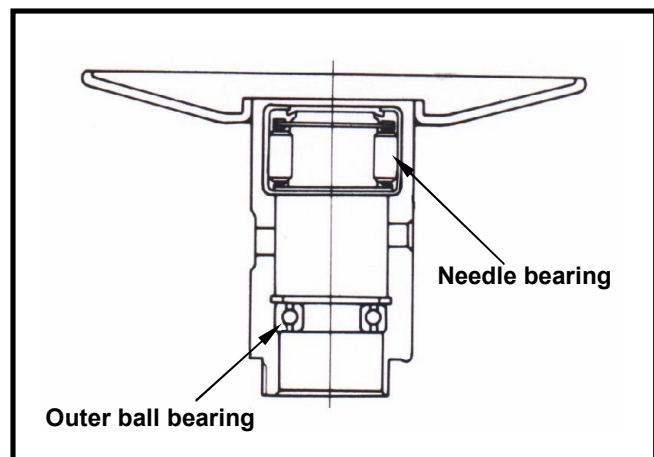
**Inner diameter 34.06mm**



## Driven Pulley Bearing Inspection

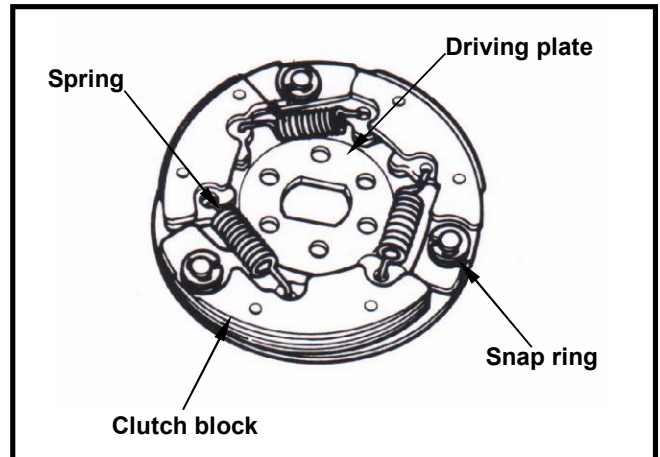
Check if the inner bearing oil seal is damage.  
Replace it if necessary.

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.

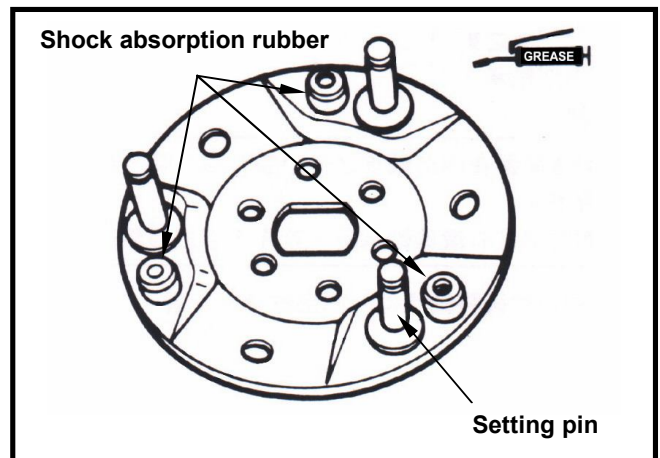


**Clutch Block Replacement**

Remove snap and washer, and then remove the clutch block and spring from the driving plate. Check if the spring is damaged or has insufficient elasticity.



Check if the shock absorption rubber is damaged or deformed. Replace it if necessary. Apply with grease onto the setting pins.

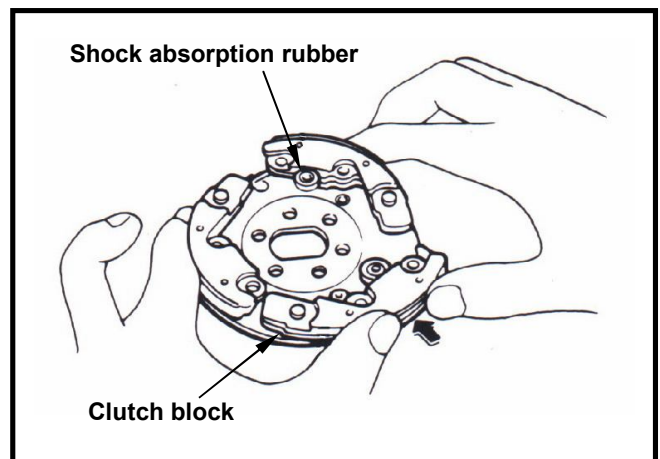


Apply with grease onto the setting pins. But, the clutch block should not be greased. If so, replace it.

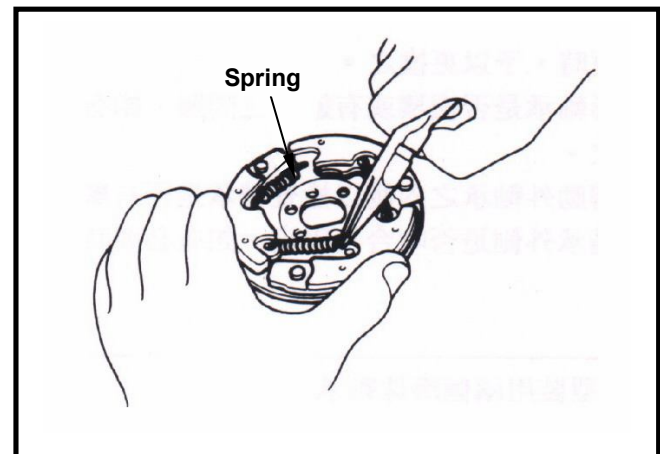
Install the new clutch block onto the setting pin and then push to the specified location.

**⚠ Caution**

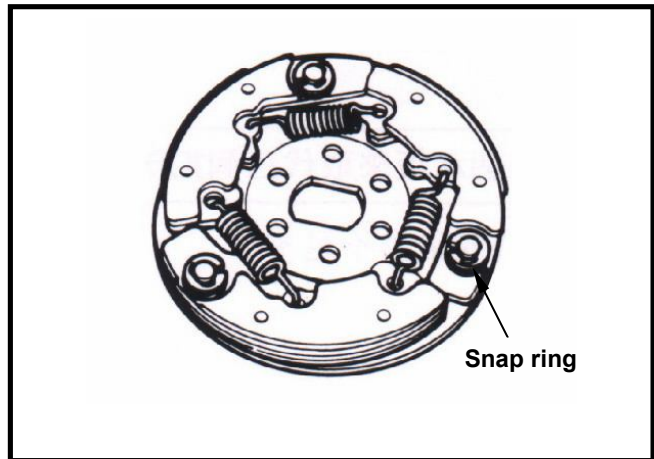
- Grease or lubricant will damage the clutch block and affect the block's connection capacity.



Install the spring snap into the groove with pliers.



Install snap ring and mounting plate onto setting pin.

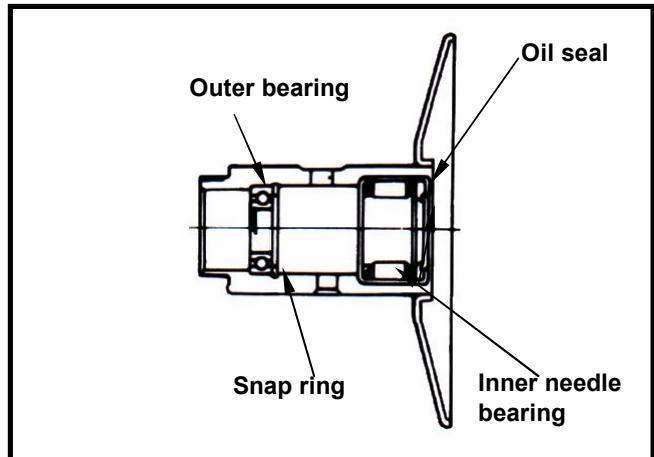


## Replacement of driven pulley bearing

Remove inner bearing.

### Caution

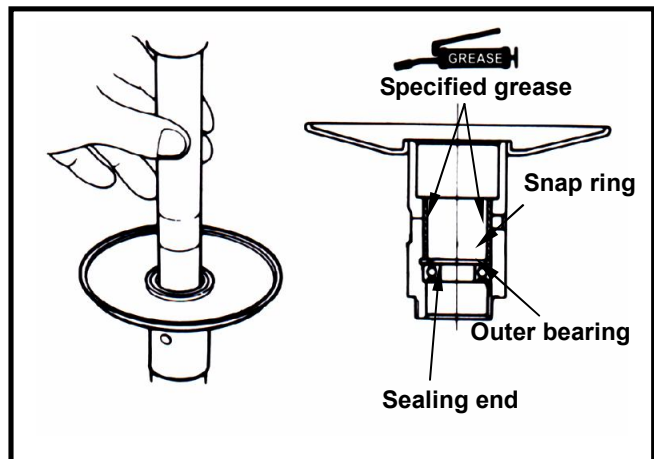
- If the inner bearing equipped with oil seal on one side in the driven pulley, then remove the oil seal firstly.
- If the pulley equipped with ball bearing, it has to remove snap ring and then the bearing.



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 grease.

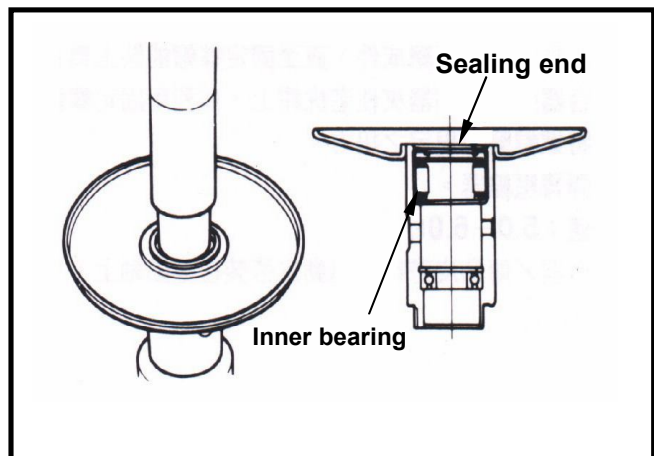
Recommended to use the KING MATE G-3. Install the snap ring and hold the bearing.



Install a new inner bearing.

### Caution

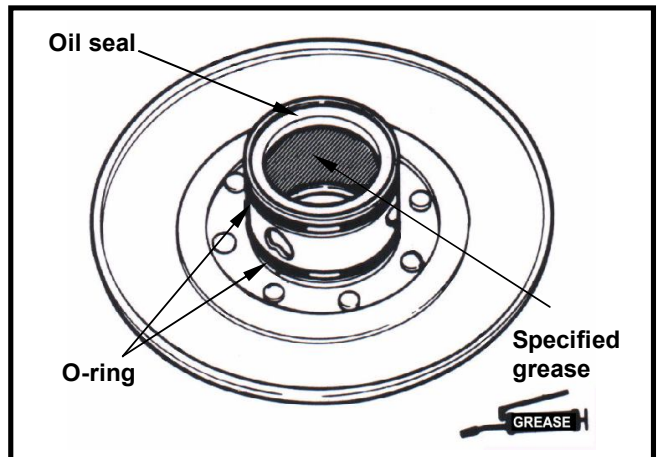
- Its sealing end should be forwarded to outside as bearing installation.
- Install needle bearing with hydraulic presser. Install ball bearing by means of hydraulic presser.



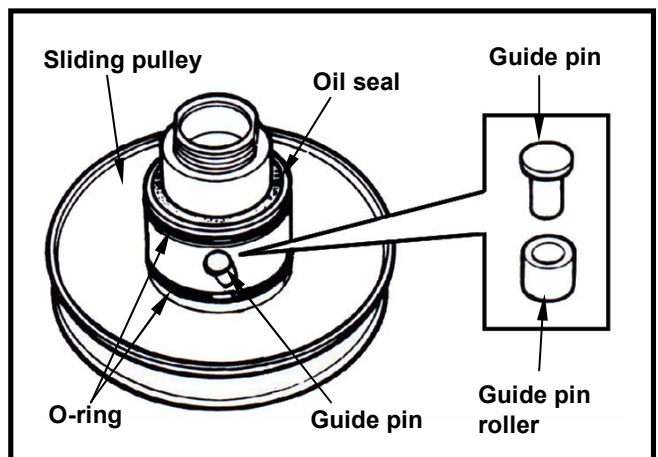
Align oil seal lip with bearing, and then install the new oil seal (if necessary).

**Installation of clutch/driven pulley**

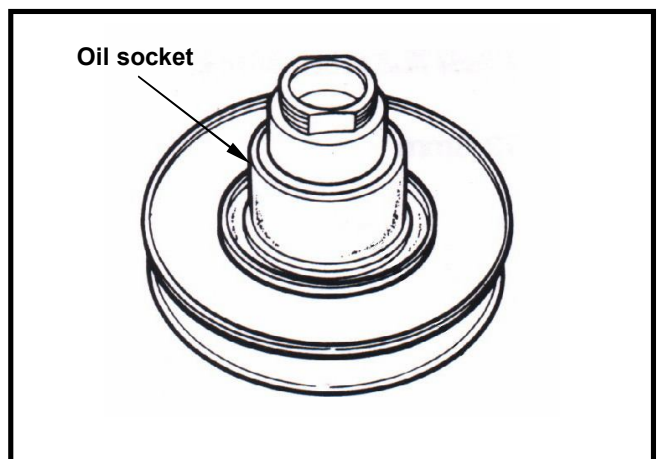
Install new oil seal and O-ring onto sliding pulley. Apply with specified grease to lubricate the inside of sliding pulley.



Install sliding pulley onto driven pulley. Install guide pin and guide pin roller.



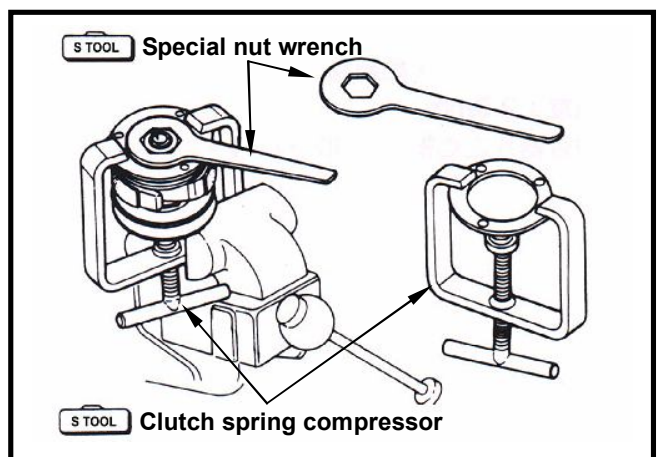
Install oil socket.



Install driven pulley, spring and clutch 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 special nut wrench. Remove the clutch spring compressor.

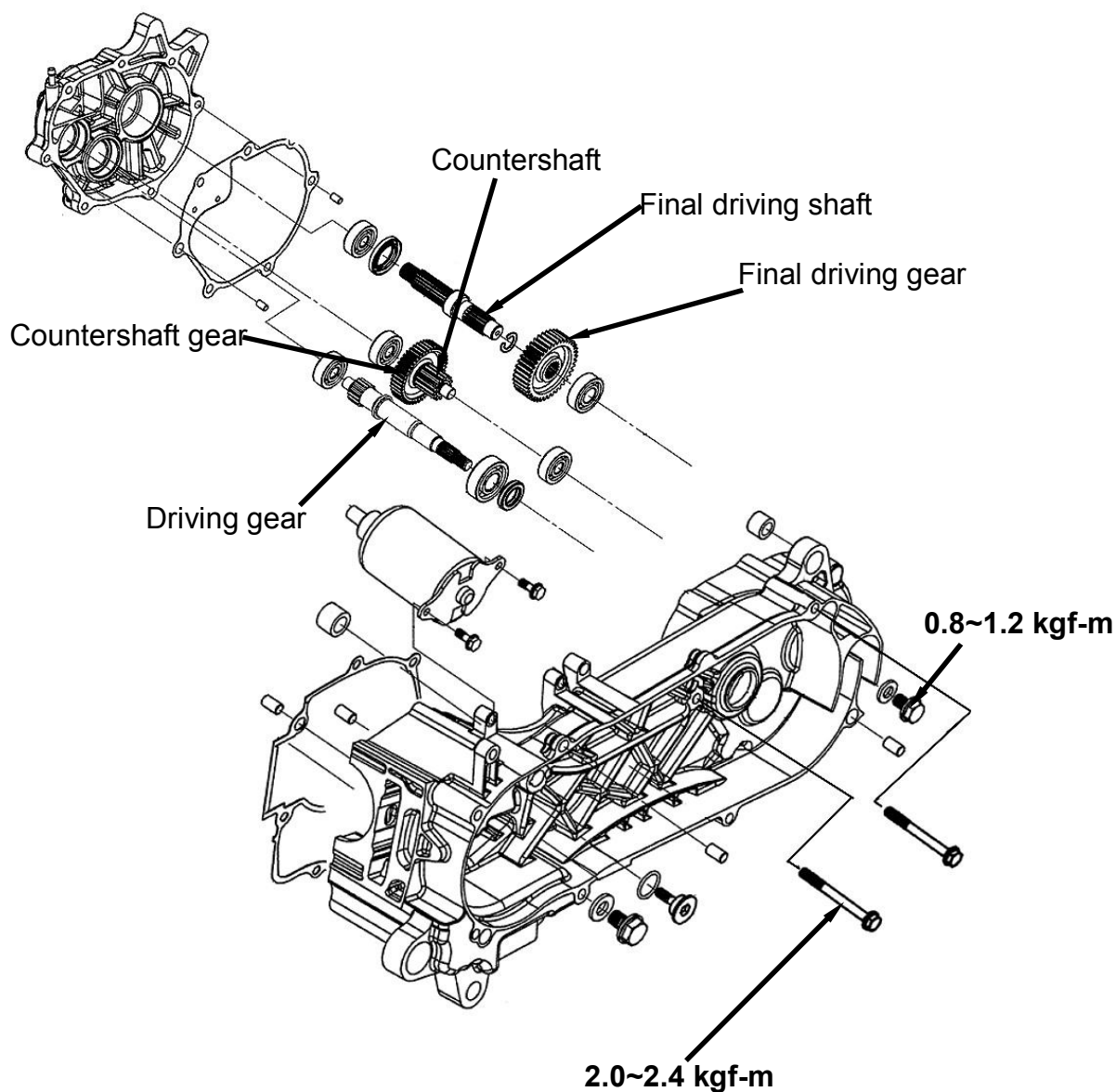
**Torque value: 5.5~6.0 kg-m**

Install clutch/driven pulley and driving belt onto driving shaft.



MECHANISM DIAGRAM .....	9-1	INSPECTION OF FINAL DRIVING	
OPERATIONAL PRECAUTIONS .....	9-2	MECHANISM.....	9-3
TROUBLE DIAGNOSIS .....	9-2	BEARING REPLACEMENT .....	9-4
DISASSEMBLY OF FINAL DRIVING		RE-ASSEMBLY OF FINAL DRIVING	
MECHANISM.....	9-3	MECHANISM.....	9-6

## MECHANISM DIAGRAM



### OPERATIONAL PRECAUTIONS

#### Specification

Application gear oil: 4-stroke lubricant  
Recommended gear oil: 85W-140  
Oil quantity: 100 c.c. (90 c.c. when replacing)

#### Torque value

Gear box cover	0.8~1.2 kgf-m
Gear oil drain plug	1.0~1.4 kgf-m
Gear oil filling bolt	0.8~1.2 kgf-m

#### Tools

##### Special service tools

Inner type bearing puller  
Outer type bearing puller  
Gear box oil seal installer  
Gear box bearing installer

### TROUBLE DIAGNOSIS

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

- Damaged driving gear
- Burnt out driving gear
- Broken driving belt

#### Gear oil leaks

- Excessive gear oil
- Worn or damaged oil seal

#### Noise

- Worn or burnt gear
- Worn gear

### DISASSEMBLY OF FINAL DRIVING MECHANISM

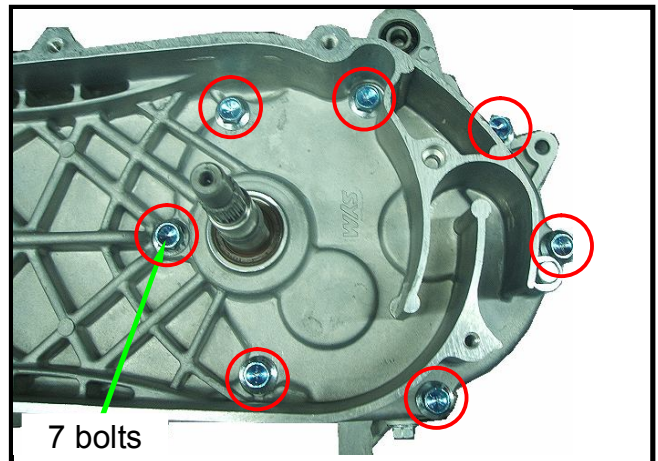
Remove the rear wheel. (refer to chapter 15)

Remove the clutch.

Drain gear oil out from gear box.

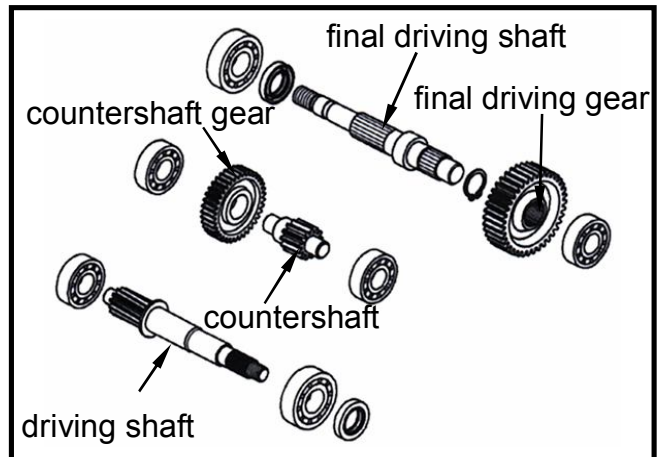
Remove gear box cover bolts (7bolts) and then remove the cover and the final driving shaft.

Remove gasket and setting pin.



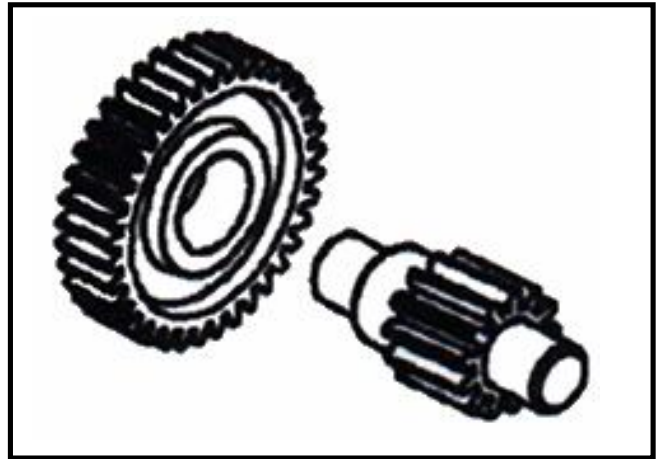
Remove countershaft and gear.

Remove final driving gear and shaft.

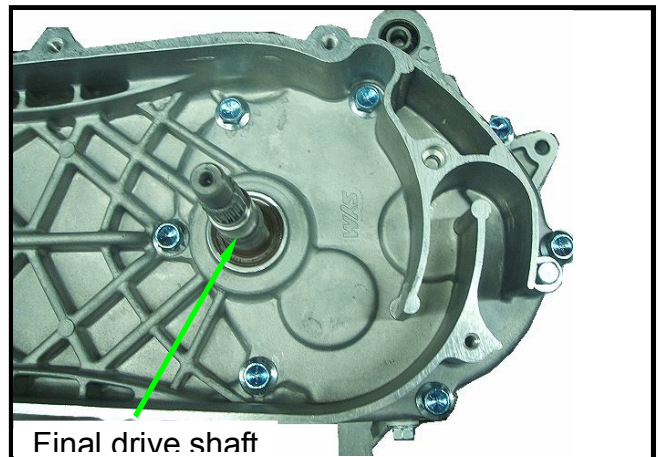


### INSPECTION OF FINAL DRIVING MECHANISM

Check if the countershaft and the gear are wear or damage.



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

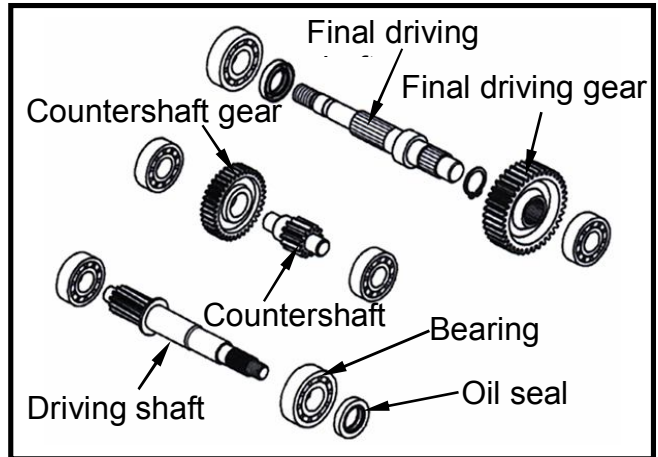


Check bearings on gear box and cover. Rotate each bearing's inner ring with fingers. Check if bearings can be turned in smooth and silent, and also check if bearing outer ring is mounted on gear box & cover tightly. If bearing rotation is uneven, noising, or loose bearing mounted, then replace it. Check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

### **Caution**

- Do not remove the driving shaft from the cover top side.
- If remove the driving shaft from the cover top side, then its bearing has to be replaced.

Check driving shaft and gear for wear or damage.

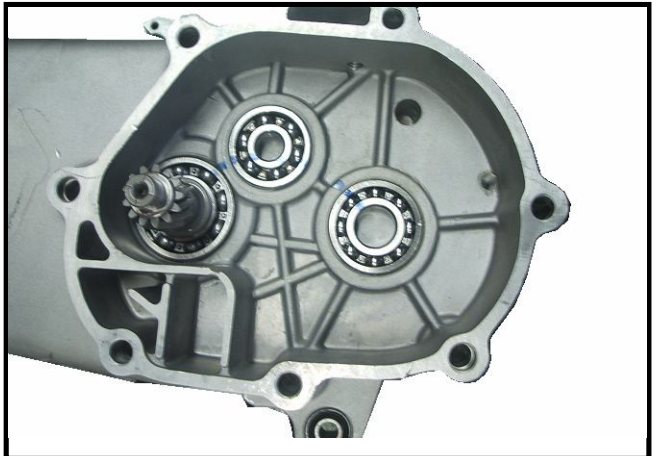


## BEARING REPLACEMENT

### **Caution**

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

Remove driving shaft bearing from left crankcase using following tools;  
Inner type bearing puller



Install new driving shaft bearing into left crankcase.

#### **Tool:**

Press the bearing into cover with C type hydraulic presser or bearing installer.



Press out the driving shaft from the crankcase.  
 Remove oil seal from the gear box.  
 Remove the driving shaft bearing from the gear box cover with the inner type bearing puller.

**⚠ Caution**

Using the bearing protector as pressing out the driving shaft from the left crankcase.

**Specified tool:**

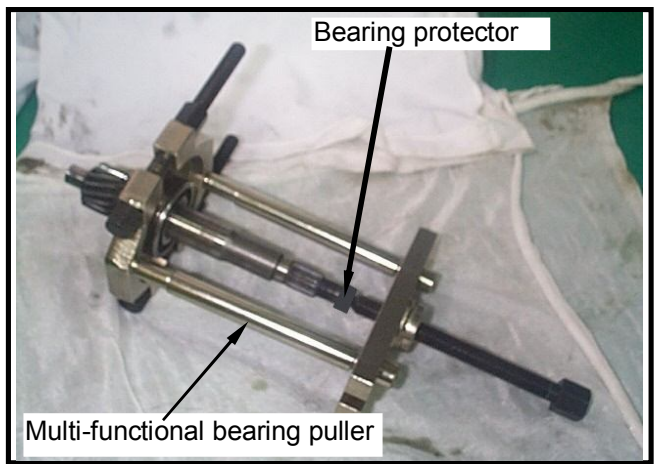
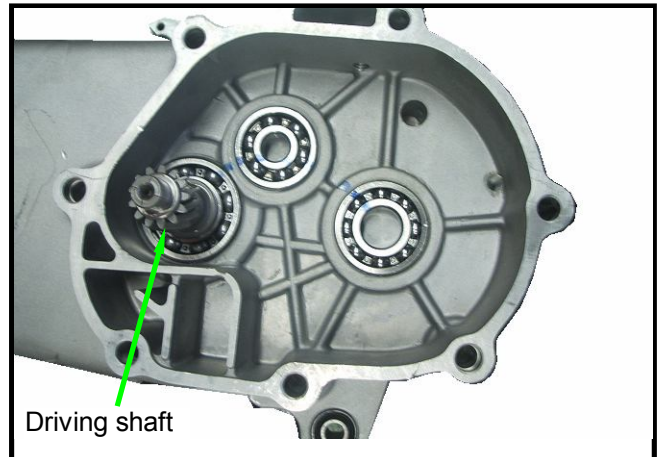
Inner type bearing puller.

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

**Tool:**

Multi-functional bearing puller

Bearing protector

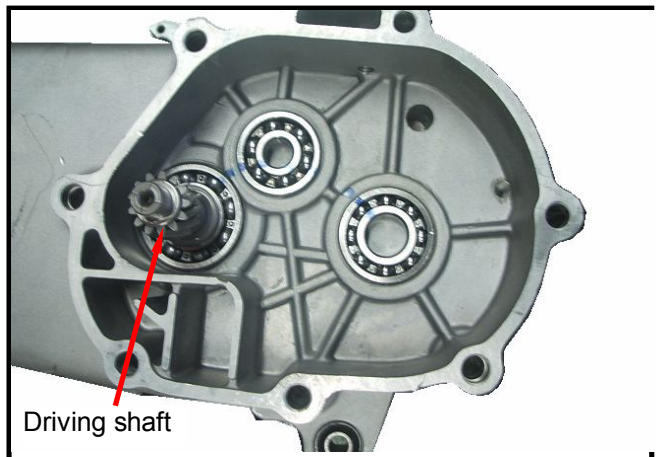


Install a new driving shaft bearing onto crankcase.

Then, install the driving shaft.

**Specified tool:**

Press the bearing in with C type hydraulic presser or bearing installer.

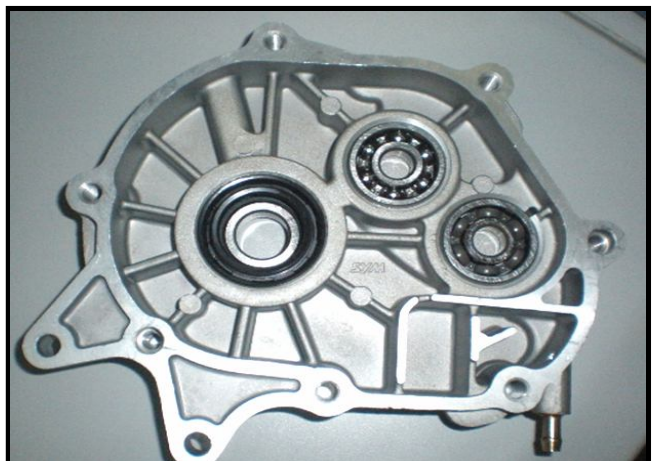


Install a new final driving shaft bearing onto gear box cover.

**Specified tool:**

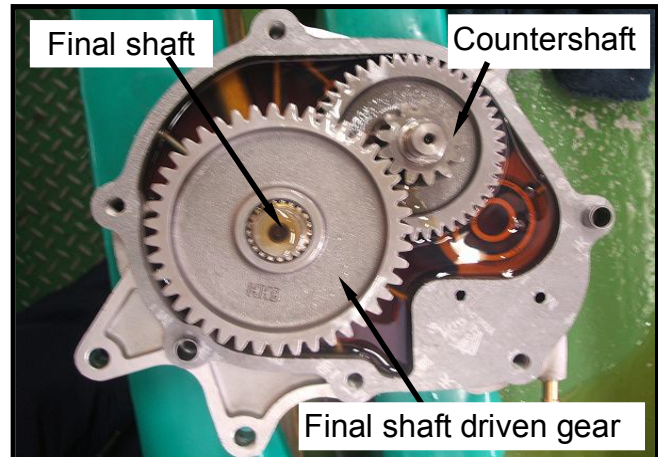
Press the bearing in with C type hydraulic presser or the bearing installer.

Apply with some grease onto the lip section of oil seal and then install the seal.

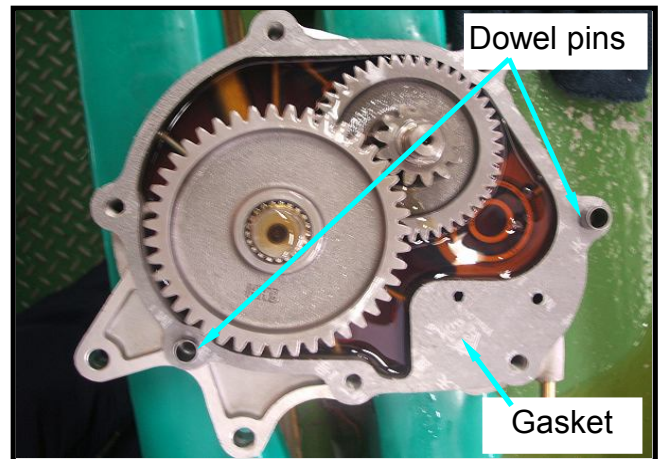


### RE-ASSEMBLY OF FINAL DRIVING MECHANISM

Install final shaft and final shaft driven gear, countershaft.



Install the setting pins(2 pins) and new gasket.



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

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

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

Install the clutch/sliding driving pulley.

Install the driving pulley, belt and left crankshaft cover.

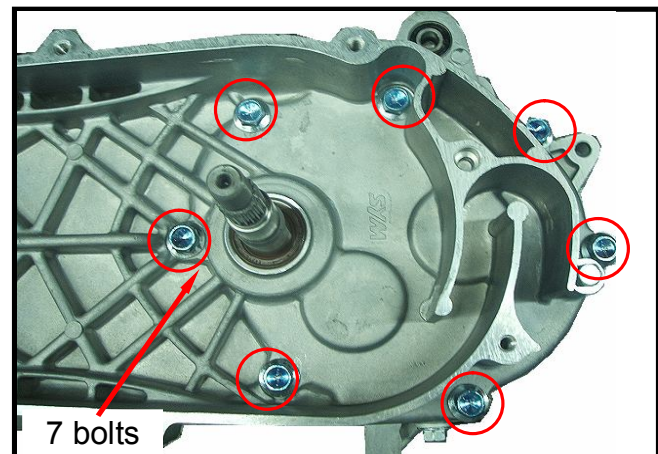
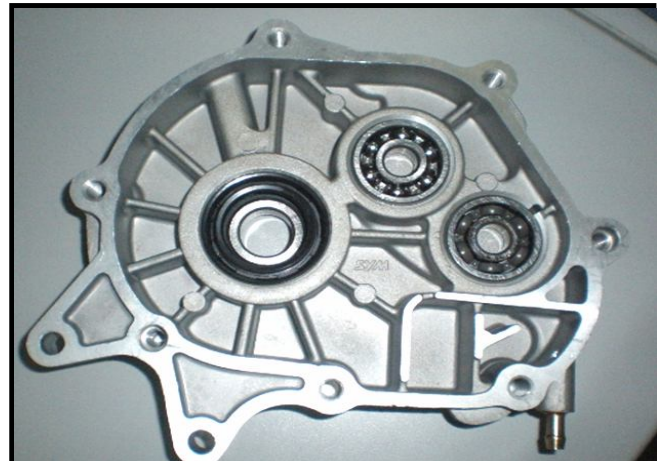
Install the rear wheel.

Add gear oil.

**Recommended usage: SAE 85W-140**

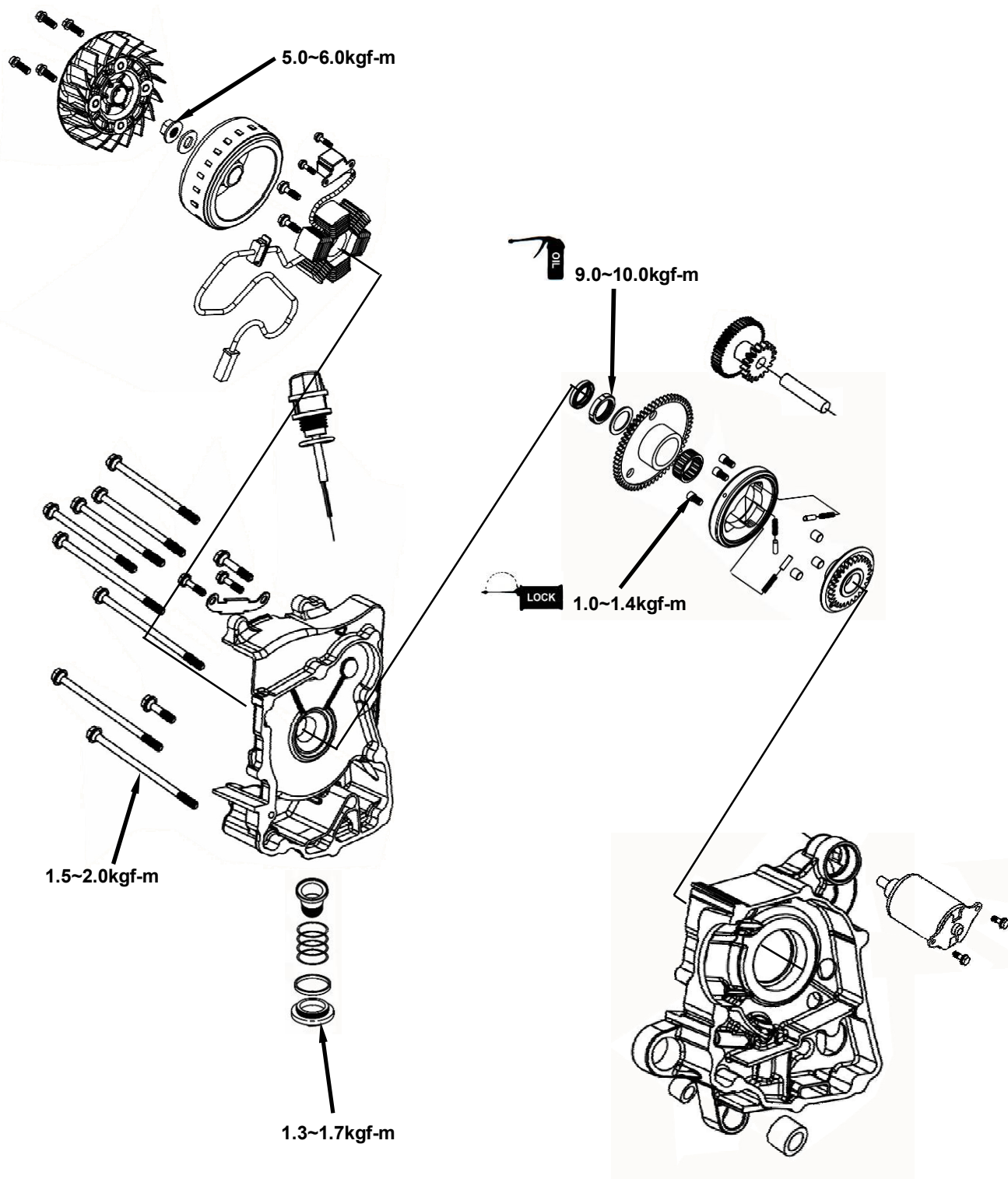
(180 cc: standard capacity)

(170 cc: when replacement)



MECHANISM DIAGRAM .....	10-1	RIGHT CRANKCASE COVER
PRECAUTIONS IN OPERATION .....	10-2	INSTALLATION.....
A.C.GENERATOR REMOVAL.....	10-3	MOUNTED COIL SET
RIGHT CRANKCASE COVER		INSTALLATION.....
REMOVAL .....	10-4	FLY WHEEL INSTALLATION.....
STARTING CLUTCH.....	10-5	

## MECHANISM DIAGRAM



**PRECAUTIONS IN OPERATION****General information**

- Refer to chapter 5: Engine removal and installation
- Refer to chapter 1: The troubleshooting and inspection of A.C. generator
- Refer to chapter 16: The service procedures and precaution items of starter motor

**Specification**

Unit: mm

Item	Standard value	Service Limit
ID of starting driven gear	32.0	32.060
OD of starting clutch cover	28.0	27.940

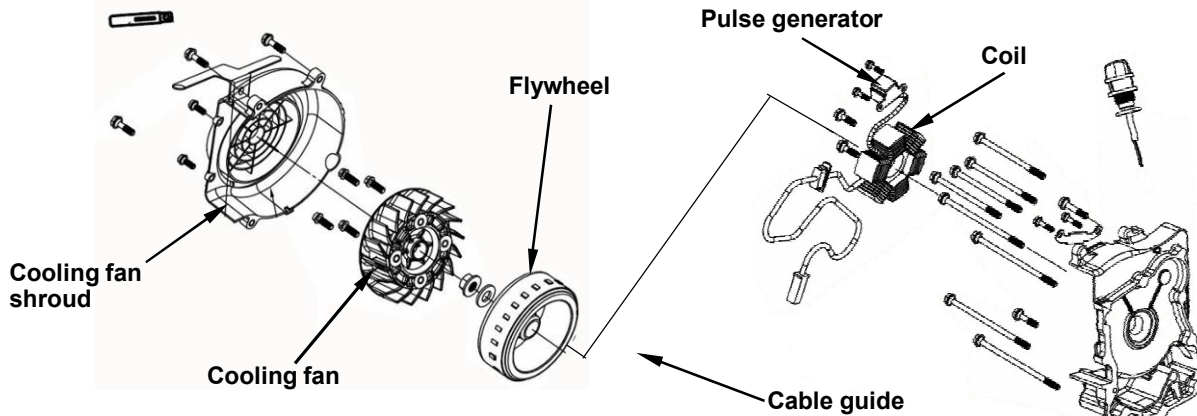
**Torque value:**

Flywheel nut	5.0~6.0kgf-m
Exhaust muffler bolt 8 mm	1.5~2.0kgf-m
Oil screen cover	1.3~1.7kgf-m
Starting clutch hex lock nut	9.0~10.0kgf-m with oil on the thread
Starting clutch hex socket bolt	1.0~1.4kgf-m with adhesive

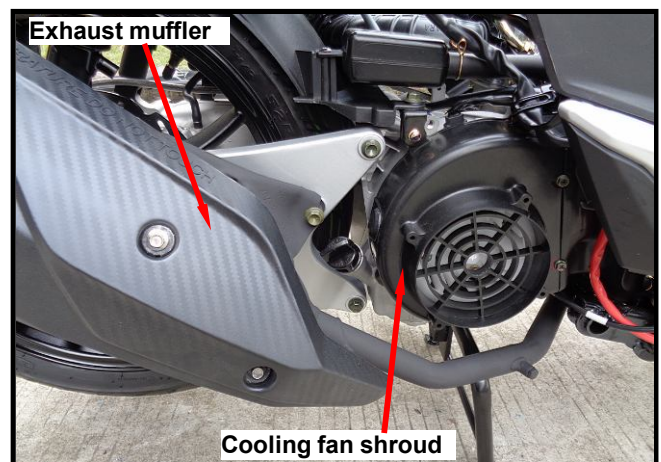
**Special service tools**

Flywheel puller  
Universal fixture

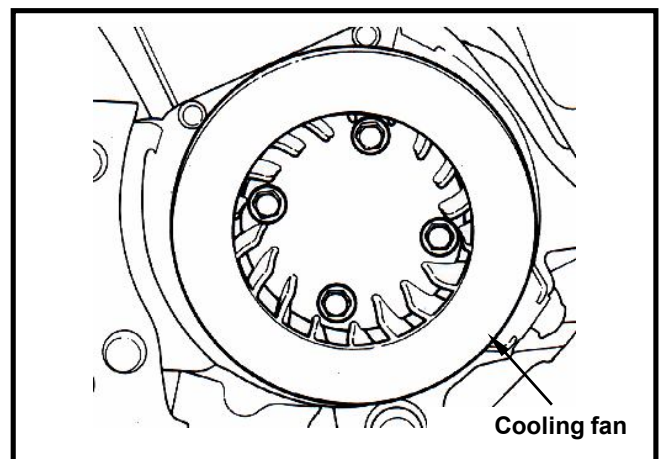
## A.C. GENERATOR REMOVAL



Drain out the engine oil.  
 Remove the body cover.  
 Remove the exhaust muffler. (3 bolts, 2 nuts)  
 Remove the fan shroud. (5 bolts)

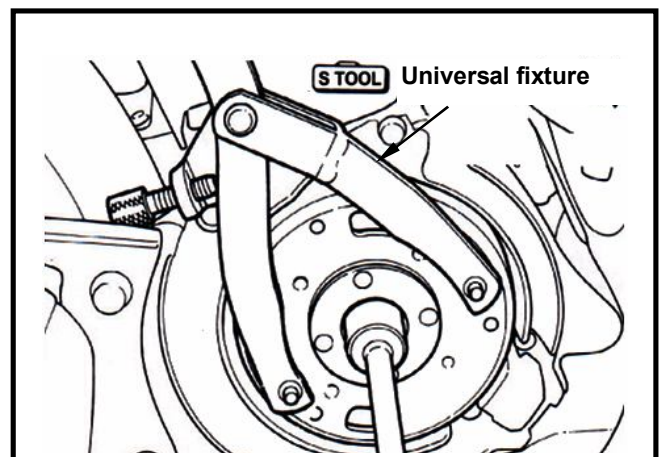


Remove the fan. (4 bolts)



Hold the flywheel with the universal fixture.  
 Remove the 10mm nut on the flywheel.

**Special Service Tools:**  
**Universal Fixture**



Remove the flywheel with the flywheel puller.

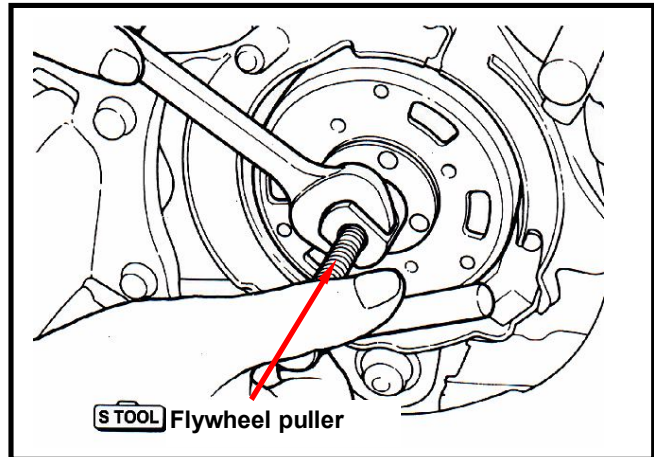
**Special service tools:**

**Flywheel puller**

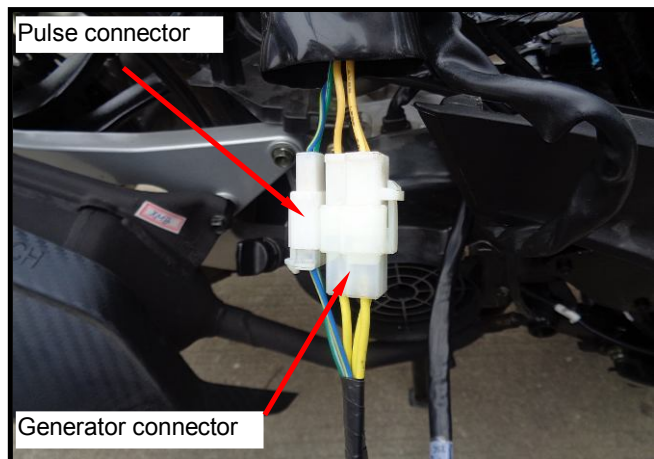
**Shaft protector**

**⚠ Caution**

Install a shaft protector on the right end of crankshaft to avoid damaging the crankshaft before installing the flywheel puller.



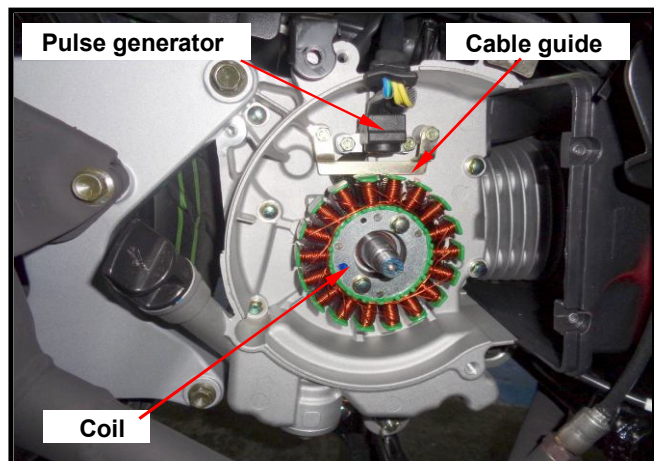
Remove the connectors of the A.C. generator and pulse generator.



Remove the 6 bolts for the pulse generator, the A.C. generator coil and cable guide. Then, remove the A.C. generator assembly.

**⚠ Caution**

Do not damage the alternator coil.

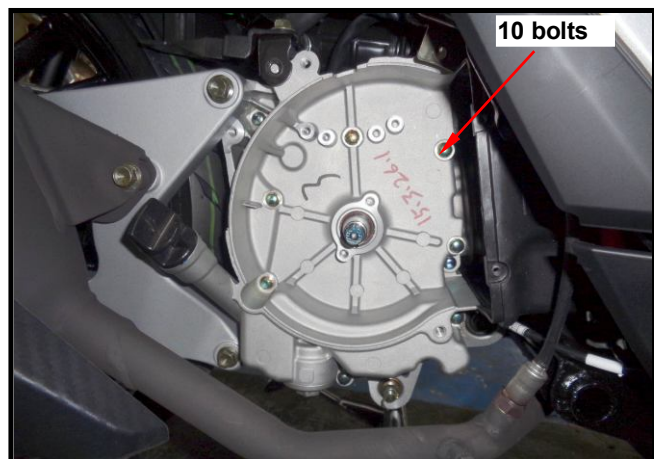


## RIGHT CRANKCASE COVER REMOVAL

Remove the right crankcase cover(10 bolts)  
Remove setting pin and gasket.  
Remove the gasket or foreign materials on the connection surfaces of both the cover and crankcase.

**⚠ Caution**

Do not damage the connection surfaces.



## STARTING CLUTCH

### Starting Clutch Removal

Hold the starting driven gear with the universal fixture.

Remove the 22mm anti-loosen lock nut and gasket.

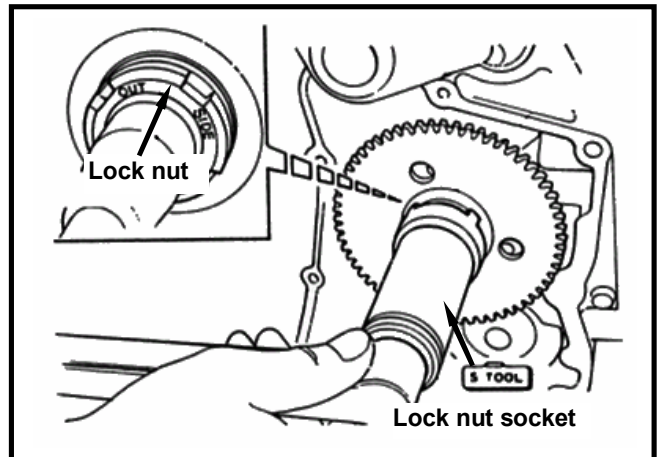
**Special service tools:**

**Anti-loosen lock nut socket**

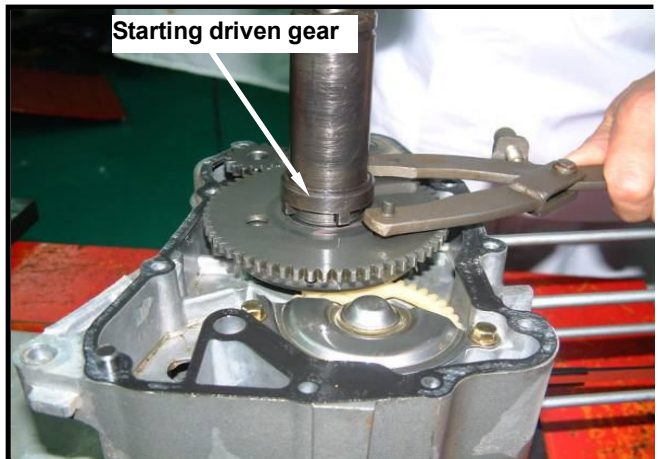
**Universal fixture.**

**⚠ Caution**

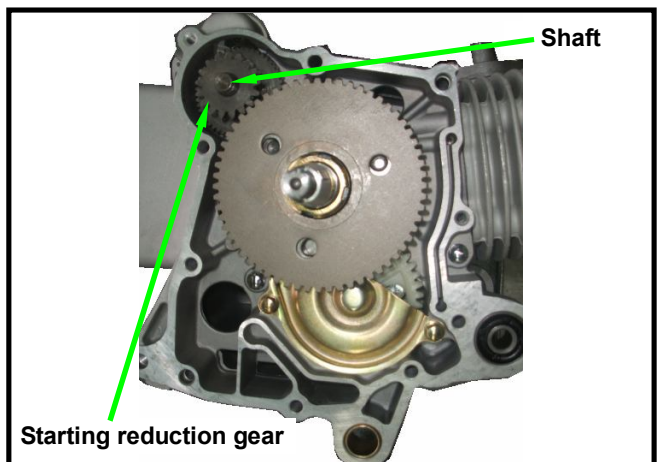
The mounting nut is left-turn thread.



Remove the starting driven gear.



Remove starting clutch, starting reduction gear, and shaft.

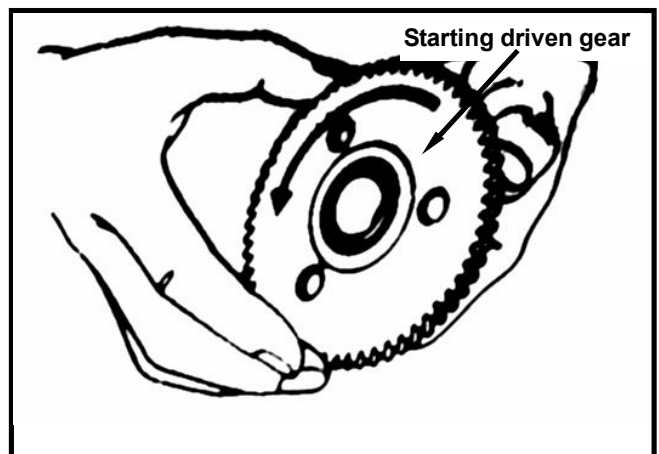


### Starting Clutch Inspection

Install the starting clutch onto the starting driven gear.

Hold the starting clutch and turn the starting driven gear.

The starting driven gear should can be turned in the motion of C.W. and can not be turned in C.C.W.

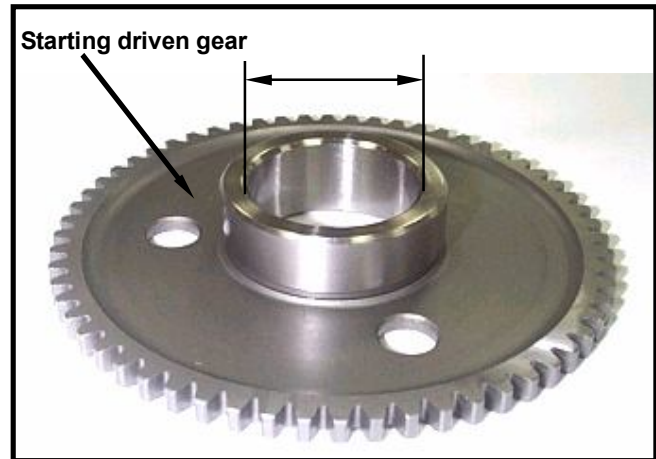


Check the starting driven gear for wear or damage.

Measure the ID of the starting driven gear.

**Service Limit:**

**ID: 32.06 mm or less**



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

Measure the ID of the starting reduction gear.

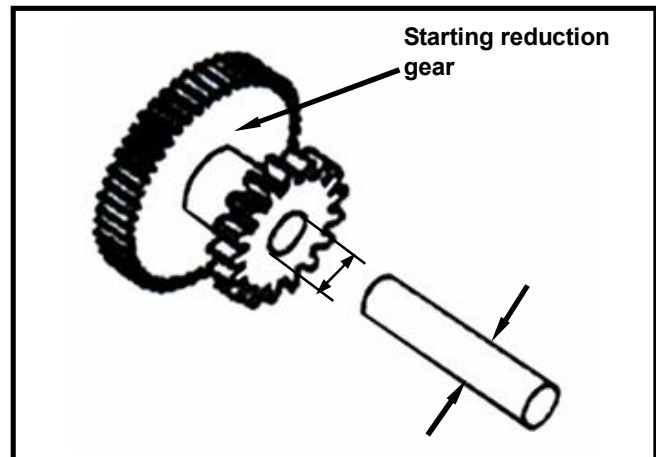
**Service Limit:**

**ID: 10.05 mm or less**

Measure the OD of the starting reduction gear shaft.

**Service Limit:**

**OD: 9.94 mm or above**



## Disassembly

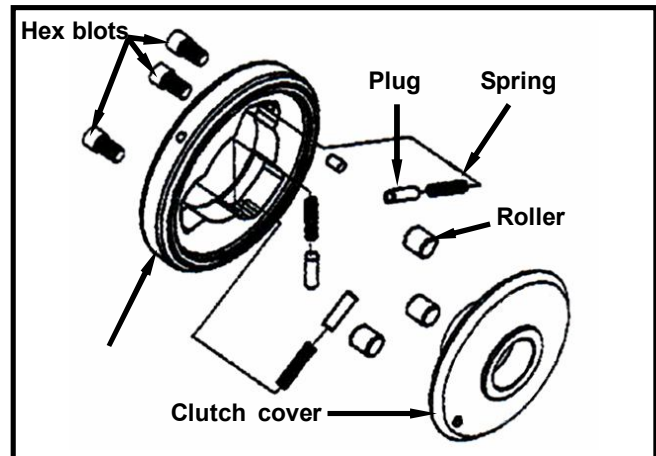
Remove the hex bolts (3 bolts) inside the starting clutch.

Separate the clutch body and the clutch cover.

Remove the rollers, plugs, and springs on the one way clutch.

Check each rollers and plugs for wear or damage.

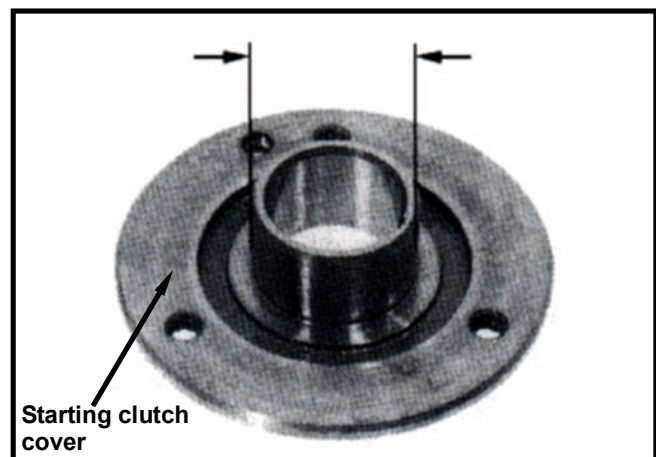
Install rollers, plugs and springs.



Measure the OD of the starting clutch cover.

**Service Limit:**

**OD: 27.94 mm or above**



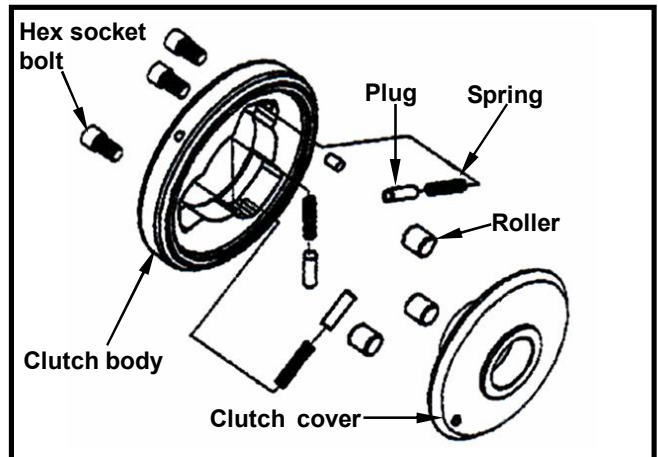
**Installation**

Install the components in the reverse procedures of removal.

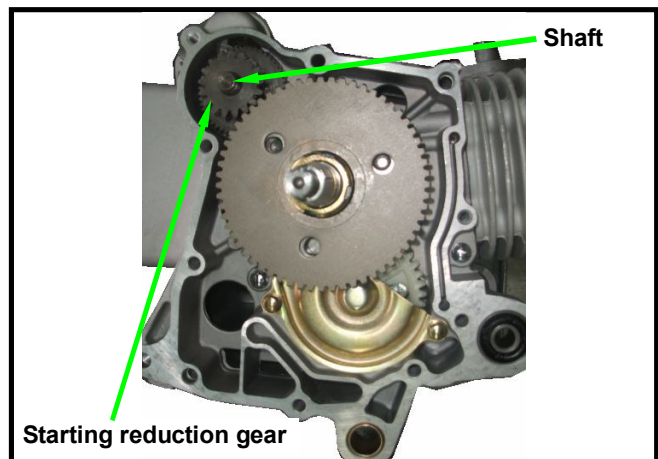
**Caution**

Add adhesive onto the thread of hex socket bolt.

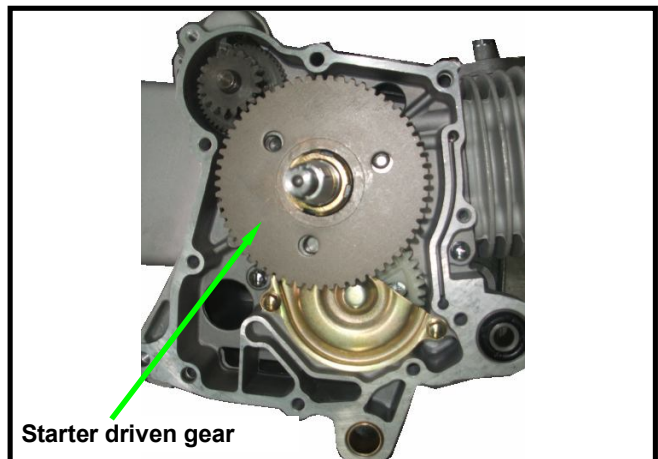
**Torque value: 1.0~1.4kgf-m**

**Starting clutch Installation**

Install reduction gear shaft and reduction gear.  
Install starting clutch.



Install the starting clutch outer and starter driven gear.



Hold the starting driven gear with the universal fixture.  
Tighten the 22mm anti-loosen lock nut and gasket.

**Caution**

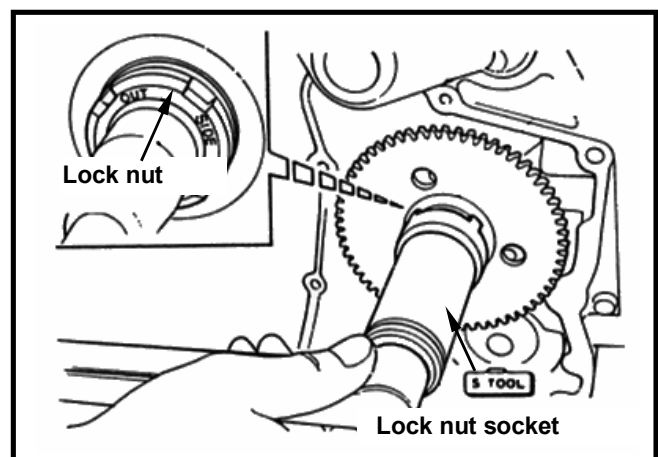
Add engine oil onto the thread of lock nut.

**Special service tools:**

**Anti-loosen lock nut socket**

**Universal fixture**

**Torque value: 9.0~10.0kgf-m**



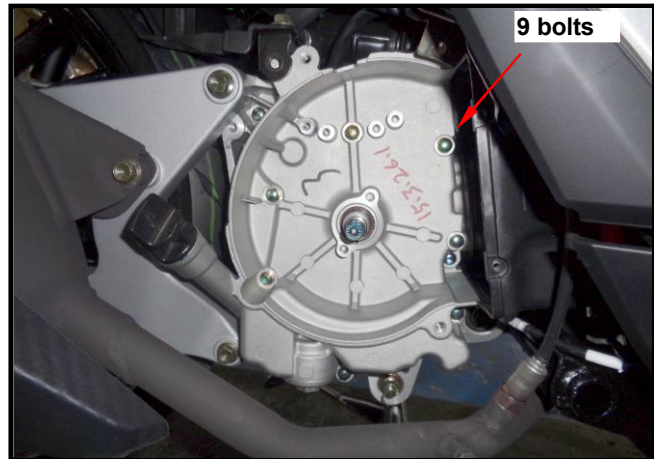
### RIGHT CRANKCASE COVER INSTALLATION

Install setting pin and new gasket on the crankcase.

Replace the right crankshaft oil seal of the crankcase and apply some oil onto the oil seal lip.

Install right crankcase cover onto the right crankcase. (9 bolts)

**Torque value: 1.5~2.0kgf-m**



### MOUNTED COIL SET INSTALLATION

Install the coil set onto right crankcase cover. (2 screws)

Install pulse generator. (2 screws)

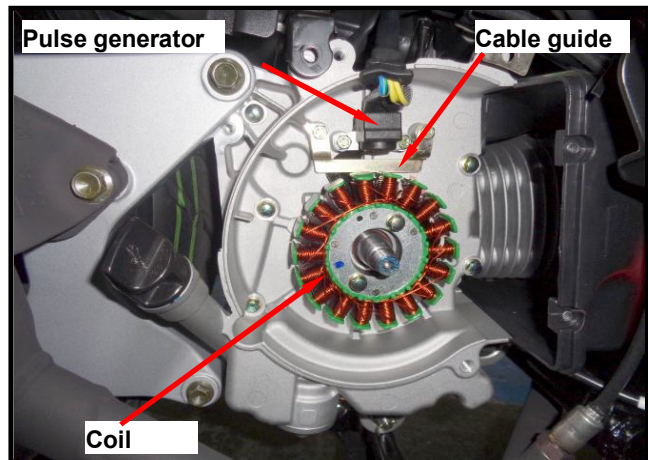
Tighten the cable guide. (2 screws)

**Torque: 1.5~2.0kgf-m**

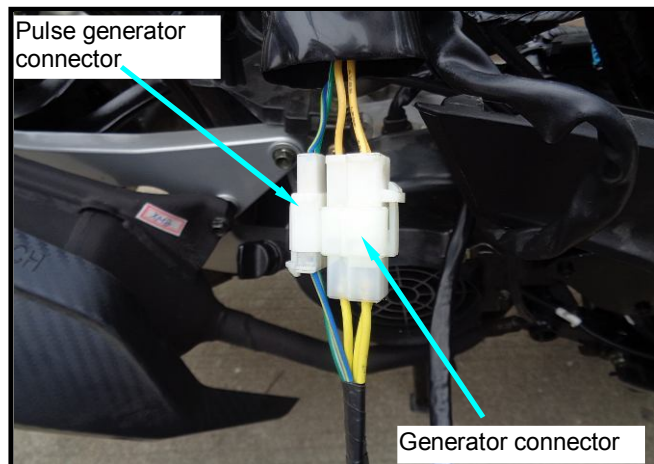
Tie the wire harness hose onto the indent of crankcase.

**⚠ Caution**

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



Install A.C. generator connector and pulse generator connector.



### FLYWHEEL INSTALLATION

Make sure that there is no magnetic powder. If so, clean up it.

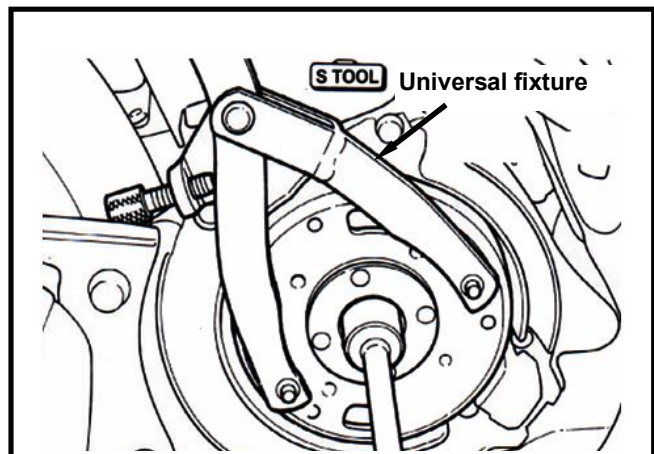
Align insert on crankshaft with the flywheel groove, and then install the flywheel.

Hold the flywheel with flywheel holder, and tighten its nut.

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

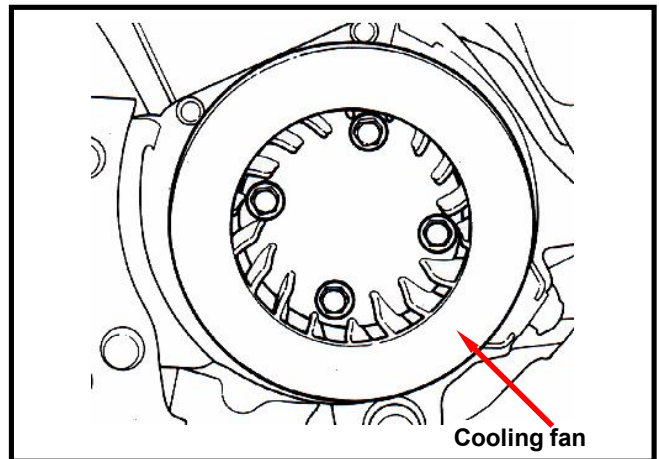
**Special service tool:**

**Universal fixture**



Install the cooling fan. (4 bolts)

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

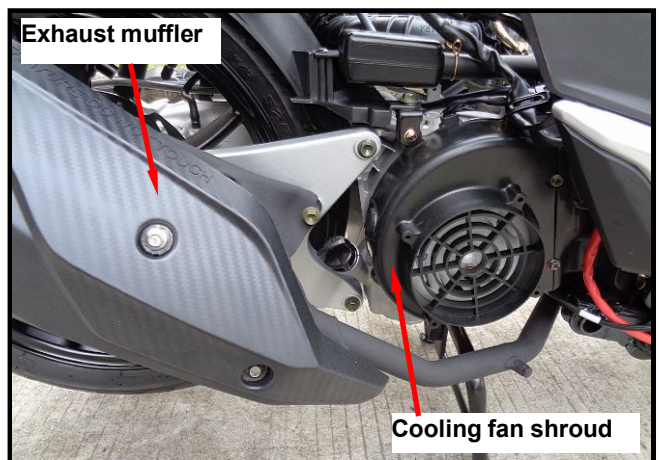


Install the cooling fan shroud. (4 bolts)

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

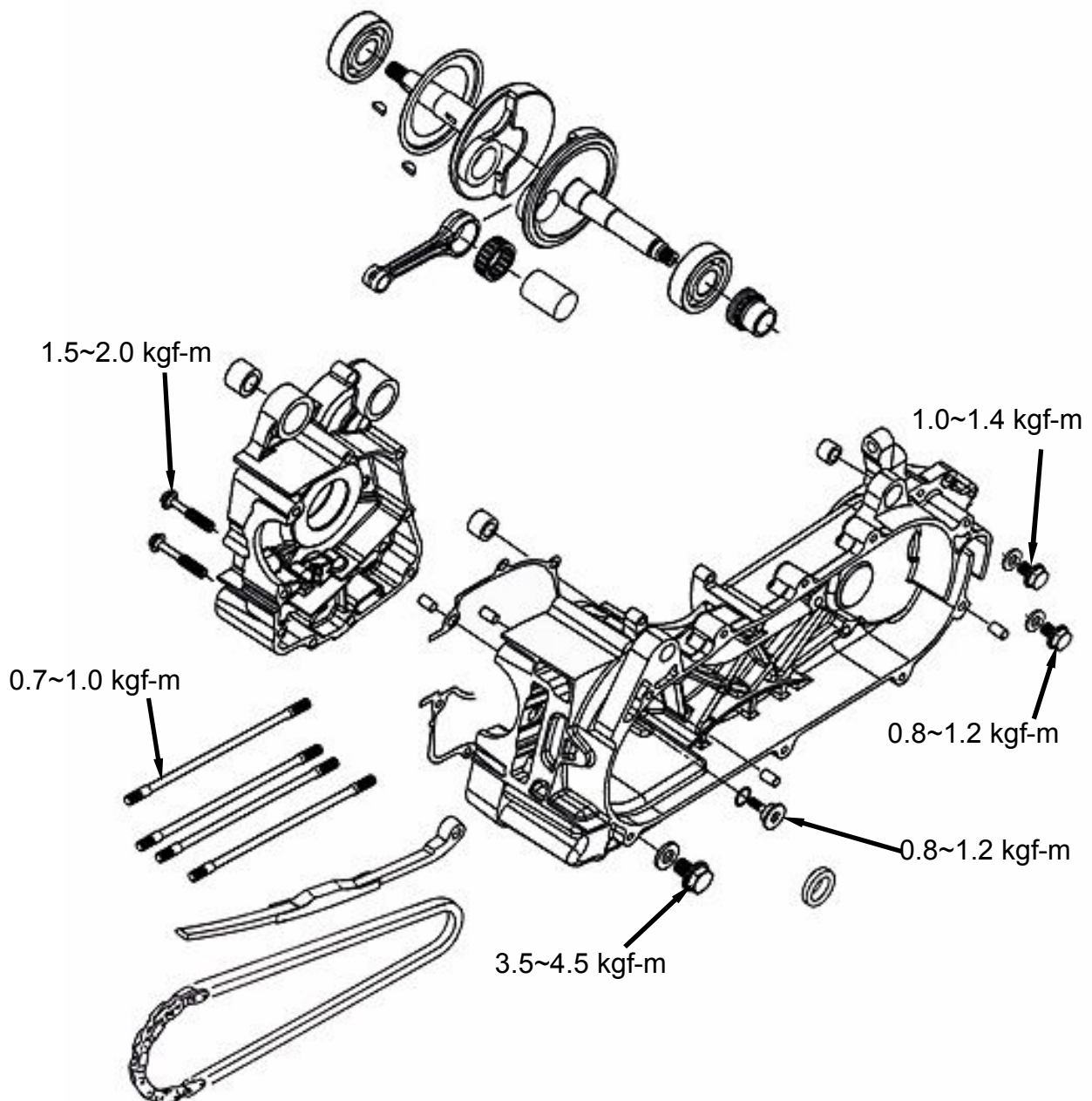
Install the body cover.

Add some engine oil according the specified quantity.



MECHANISM DIAGRAM ..... 11-1	DISASSEMBLY OF CRANKCASE 11-3
OPERATIONAL PRECAUTIONS... 11-2	CRANKSHAFT INSPECTION ..... 11-5
TROUBLE DIAGNOSIS..... 11-2	ASSEMBLY OF CRANKCASE ..... 11-6

**MECHANISM DIAGRAM**



**OPERATIONAL PRECAUTIONS****General Information**

- This Section contains descriptions concerning disassembly of the crankcase so that the crankshaft can be serviced.
- Complete following operations before disassembling crankcase.
 

Engine	Chapter 5
Cylinder head	Chapter 6
Cylinder and piston	Chapter 7
V-belt Drive pulley	Chapter 8
AC generator/ Starting Clutch	Chapter 10
Start motor	Chapter 16
- If the crankshaft bearing or timing sprocket need be replaced, then the crankshaft set have to replaced.

**Specification**

Unit: mm

Item	Standard	Limit
Left, right clearance of the big end of the connecting rod	0.100~0.350	0.550
Radial clearance of the big end of the connecting rod	0.000~0.008	0.050
Run-out	Left side: Below 0.035 Right side: Below 0.035	Left side: 0.035 Right side: 0.030

**Torque value**

Bolts for crankcase	1.5~2.0 kgf-m
Bolts for cylinder/cylinder head	0.7~1.0 kgf-m
Engine oil draining plug	3.5~4.5 kgf-m
Bolts for cam chain tensioner	0.8~1.2 kgf-m

**Special Service Tools**

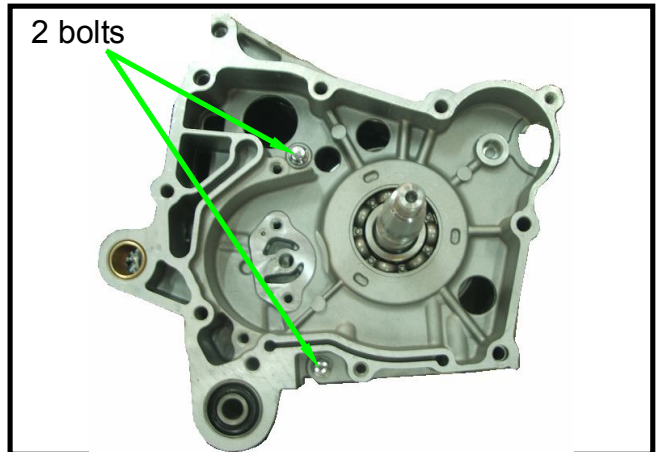
Crankcase remover/set  
 Crankshaft installation puller  
 Inner type bearing puller  
 Outer type bearing puller  
 Bearing pressing tools  
 Oil seal pressing tools

**TROUBLE DIAGNOSIS****Engine noise**

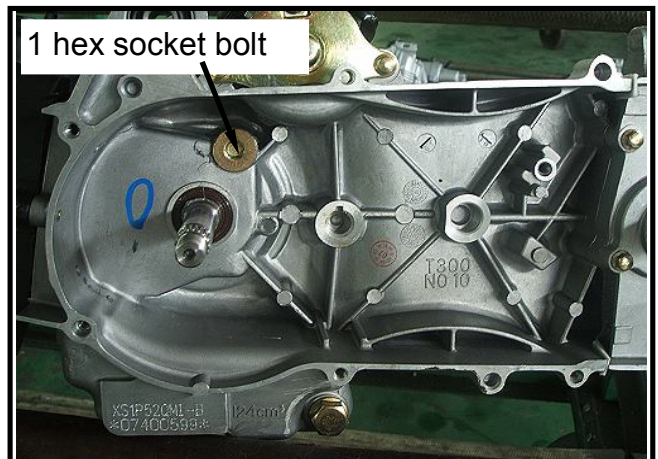
- Loose crankshaft bearing
- Loose crankshaft pin bearing
- Wear piston pin or piston pin hole

**DISASSEMBLY OF CRANKCASE**

Remove the 2 bolts from the right crankcase.



Remove the cam chain tensioner (hex socket bolt) from the left side of crankcase.



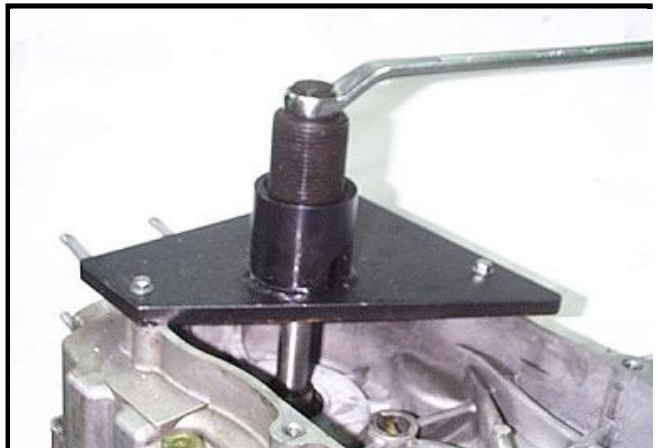
Place the left side of crankcase upward, and then install the crankcase remover/set onto the crankcase.

Drive the screw of the crankcase remover/set into the crankcase, and then separate the left and the right crankcases. Remove the cam chain.

**Caution**

- Never pry out the connection surfaces of crankcases as separating. Otherwise, the connection surfaces could be damaged and cause oil leaking.
- It have to separate the cam chain and the drive gear before pressing out the both left and right crankcases.

**Special Service Tools:**  
**Crankcase remover/set**



Remove the crankshaft from the right crankcase.

**⚠ Caution**

- The left and right bearings of crankshaft is to press-fit onto the crankshaft.



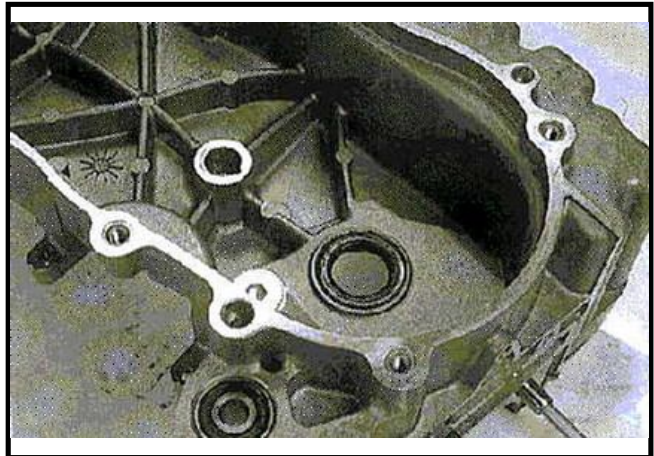
Remove gasket and dowel pins (2).  
Scrape gasket residues off the crankcase contact surface.

**⚠ Caution**

- Do not damage contact surface of the crankcase.
- Soap the gasket residues into solvent and the residues will be removed easily.



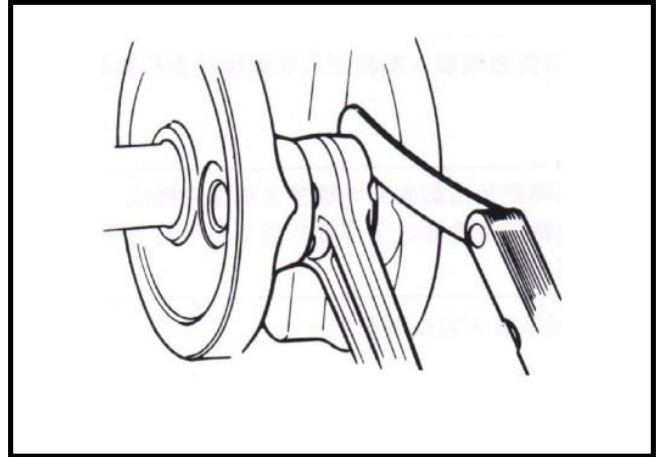
Remove oil seal from the left crankcase.



**CRANKSHAFT INSPECTION**

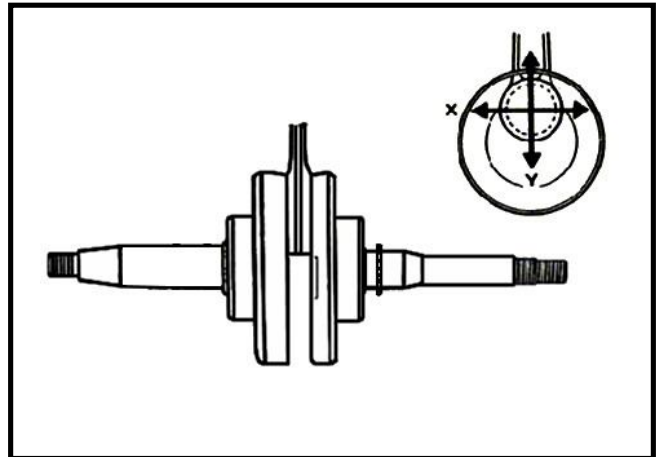
Measure left and right clearance of connecting rod big end.

**Service limit: Replace when it is more than 0.55 mm**



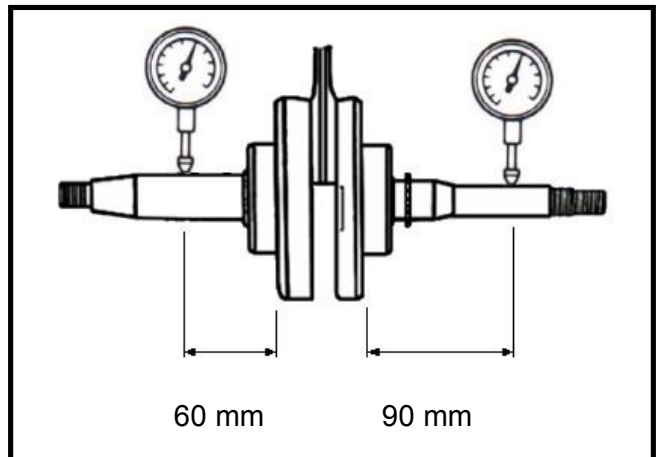
Measure the radial clearance of the big end at the vertical directions.

**Service limit : 0.05 mm**



Place the crankshaft onto a V-block and measure run-out of the crankshaft with dial gauge.

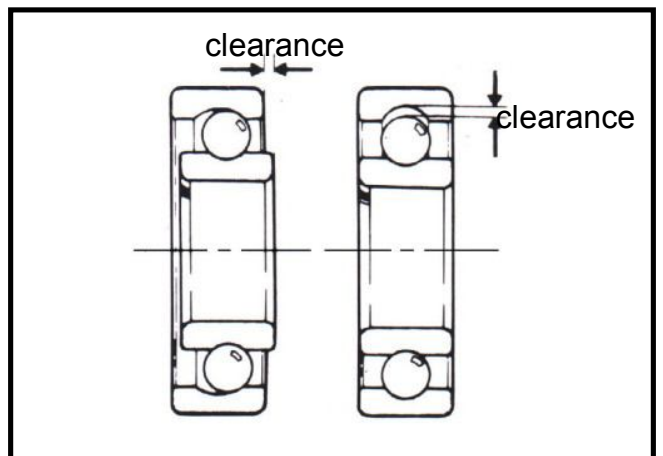
**Service limit: Left side: 0.035mm  
Right side: 0.030mm**

**Bearing Inspection**

Rotate the bearing with fingers and make sure the bearing can be rotated smoothly and quietly.

Check if the inner ring is connected onto the crankshaft tightly.

Replace crankshaft as a set when noise or looseness is detected.

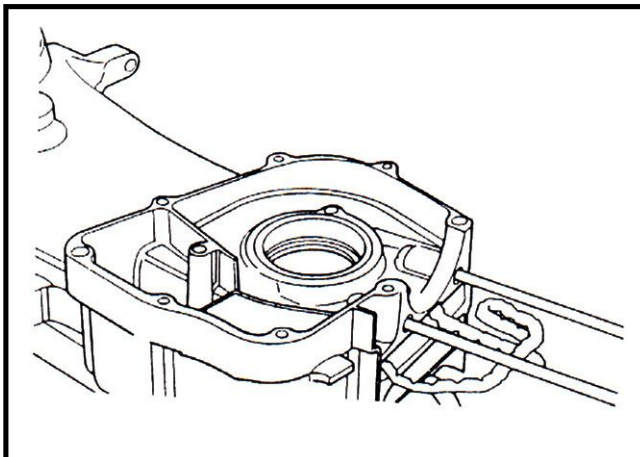


## ASSEMBLY OF CRANKCASE

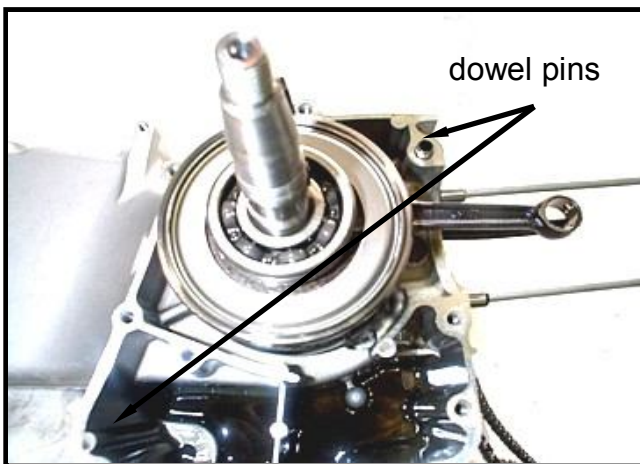
Install cam chain into the chain hole of the left crankcase, and then split out the cam chain.

### Caution

- Do not damage the cam chain as installing the crankshaft.

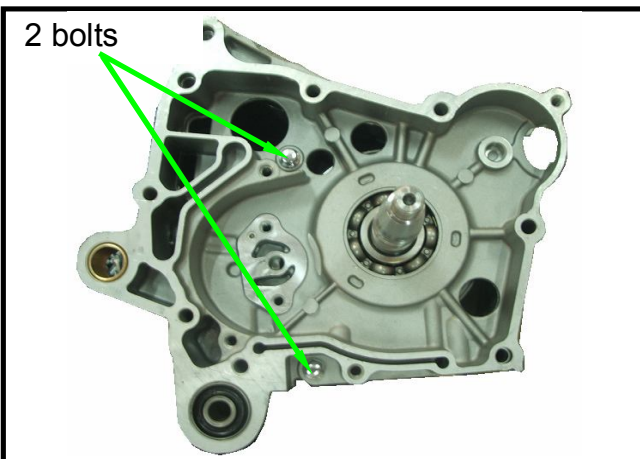


Install crankshaft into the left crankcase and then install two dowel pins and new crankcase gasket.



Install the right crankcase and tighten the crankcase bolts (2 bolts).

**Torque value: 1.5~2.0 kgf-m**

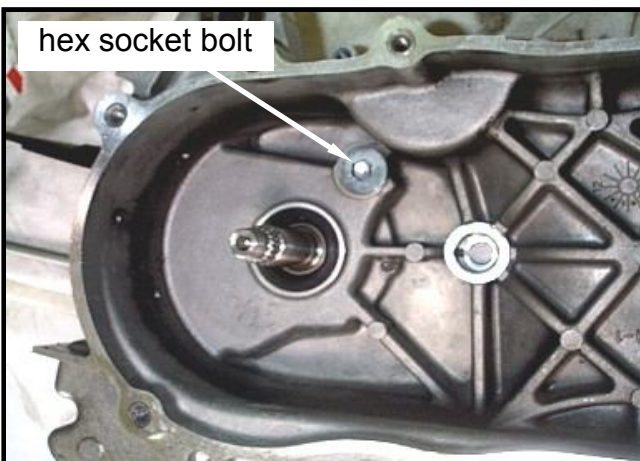


Install the cam chain tensioner. Install a new O-ring onto the mounting bolt of the chain tensioner. Apply some oil on the O-ring and tighten the bolt.

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

### Caution

- The O-ring must be installed into the bolt's groove.



Apply with some grease onto the oil seal lip and then install it onto the left crankcase.

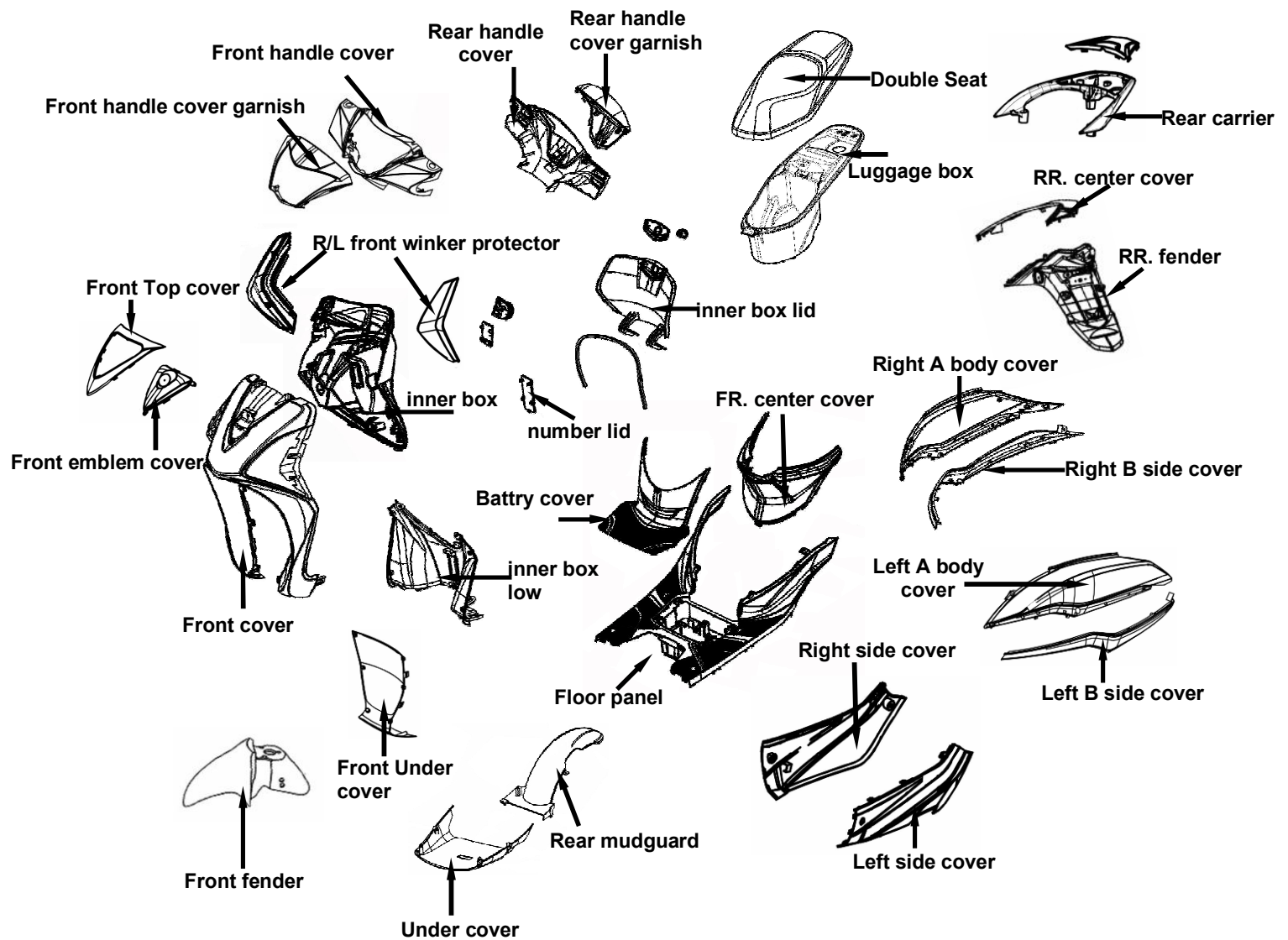


Press-fit the oil seal to specified position with the oil seal installer (19.8x30x5).

**Special service tools: the oil seal installer (19.8x30x5)**

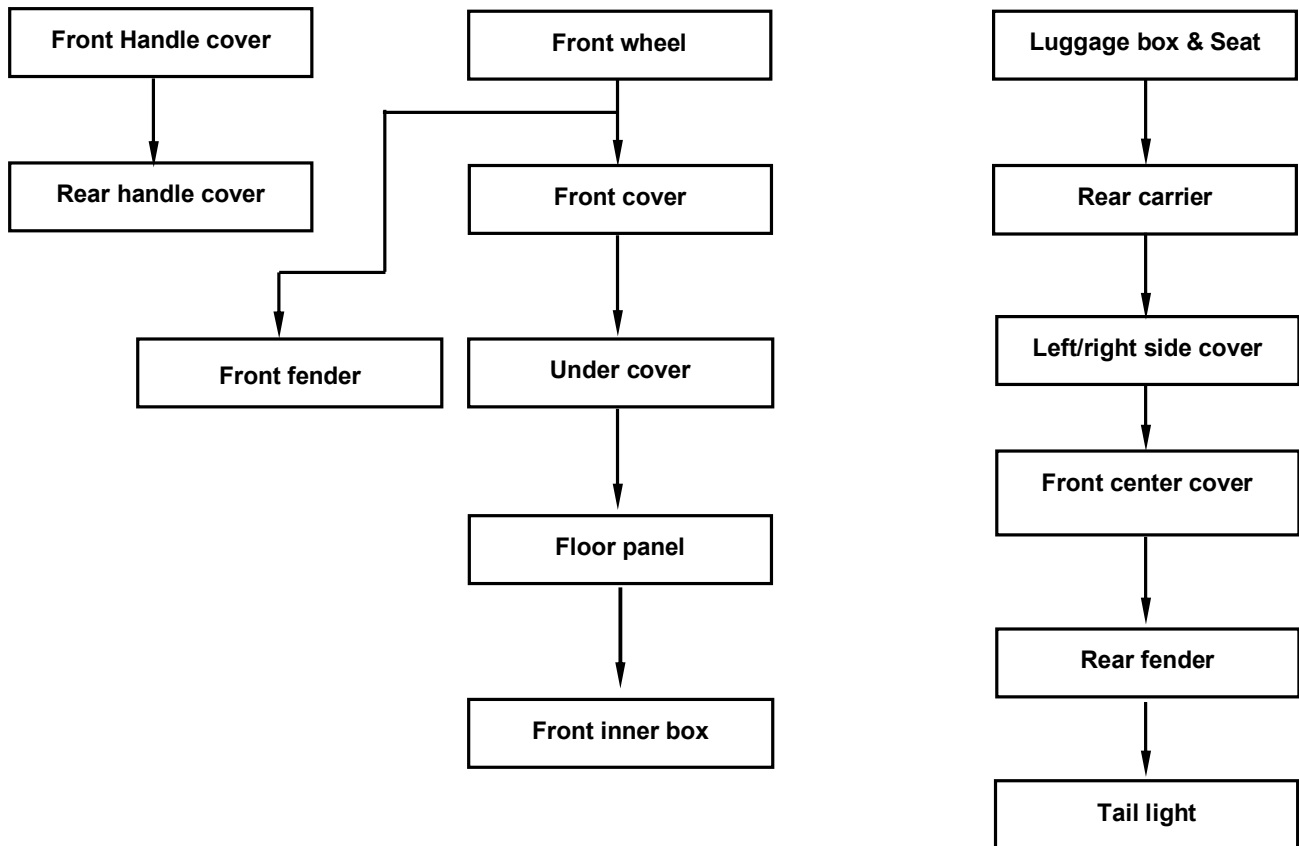


MAINTENANCE INFORMATION.....	12-2	FRONT CENTER COVER.....	12-8
HANDLE COVER .....	12-3	LUGGAGE BOX .....	12-8
FRONT COVER.....	12-4	FLOOR PANEL .....	12-8
FRONT INNER BOX.....	12-5	SIDE COVER .....	12-9
BODY COVER/REAR CENTER COVER/REAR FENDER .....	12-6	UNDER COVER.....	12-10



**MAINTENANCE INFORMATION**

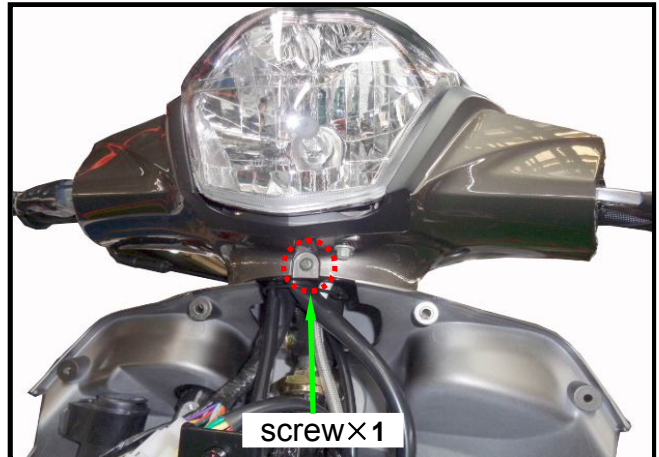
Body covers disassemble sequence:



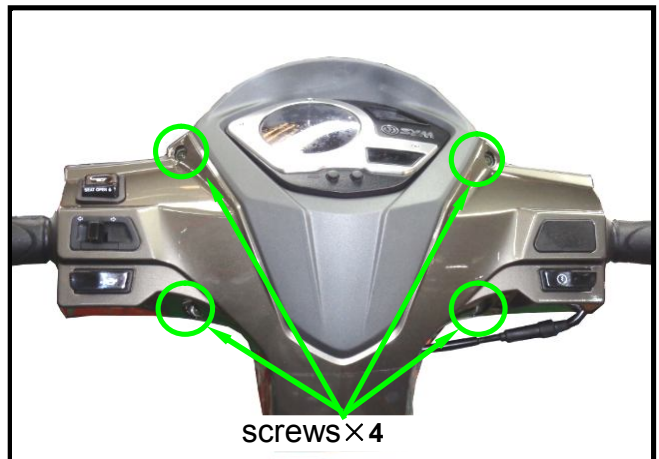
- Be careful not to damage various covers in disassembly or re-assembly operation.
- Never injure hooks molded on the body covers in disassembly or re-assembly operation.
- Align the buckles on the guards with slot on the covers.
- Make sure that each hook is properly installed during the assembly.
-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

**HANDLE COVER****Removal:**

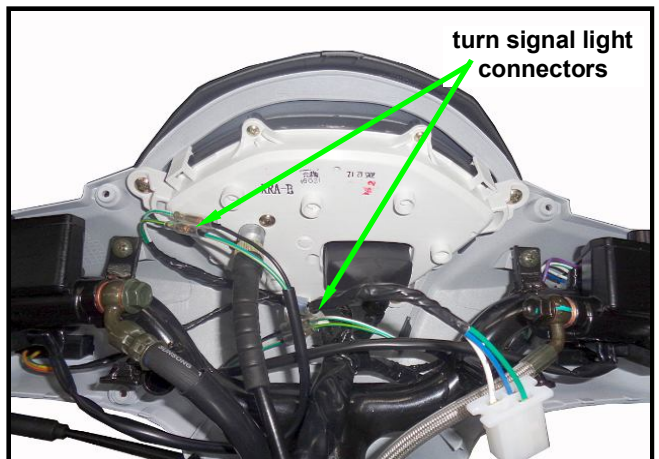
Remove 1 lower mounting screw of the handle front cover.



Remove the mounting screws (4 screws) between the front handle cover and the rear handle cover.



Removed the head light wire connectors.  
Removed the left/right turn signal light connectors.



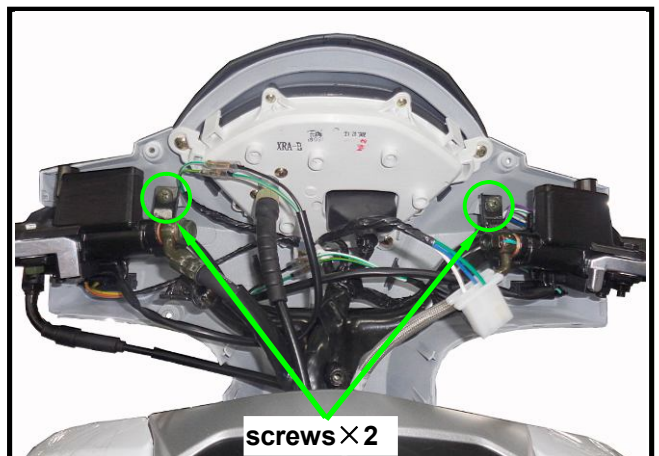
Remove the front handle cover.  
Remove the speedometer cable.  
Remove the rear handlebar cover. (2 screws)  
Removed the rear handle cover.

**Installation:**

Install according to the reverse procedure of removal.

**Caution**

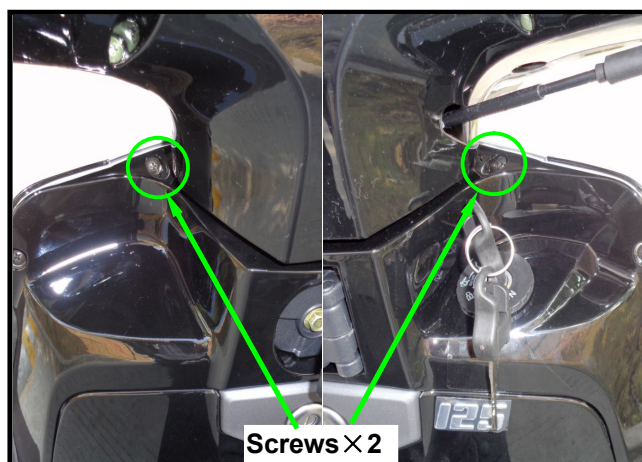
With the clipper to fix the end-section of the handlebar cover. Do not pull it forcedly to avoid to breaking the hooks.



### FRONT COVER

#### Removal

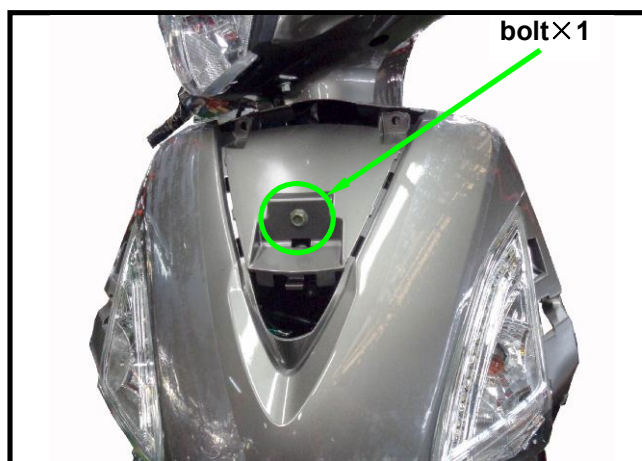
Remove the 2 mounting screws between the front cover and the inner box.



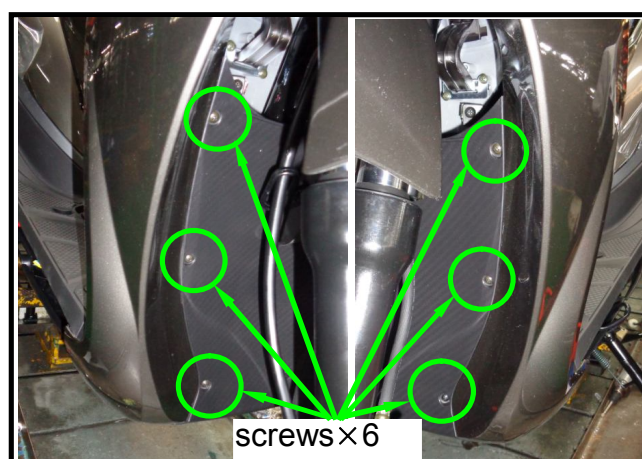
Remove the top cover.



Remove the 1 mounting bolt of front cover



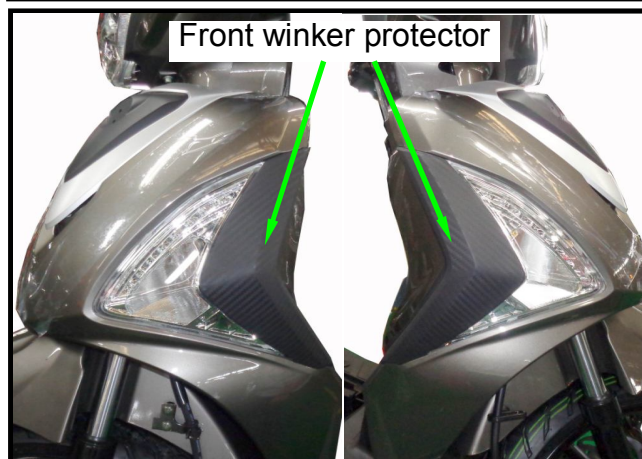
Remove the front under cover 6 mounting screws between the front under cover and the frame .



Remove the 2 mounting screws between the front cover and the left/right side cover.



Remove the left/right front winker protector of the front cover.



Remove the front cover from the frame.

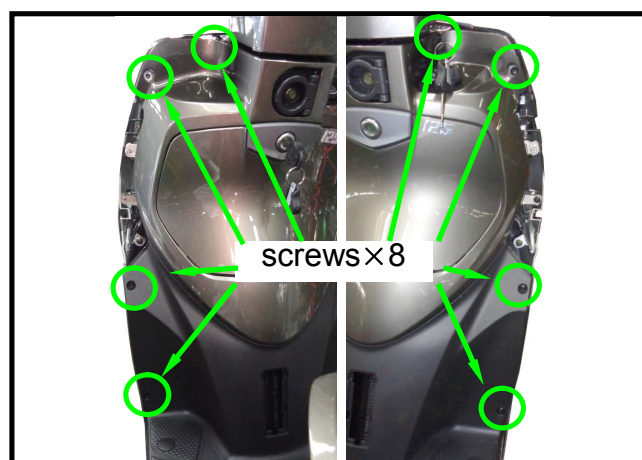
### Installation

Install according to the reverse procedure of removal.

## FRONT INNER BOX

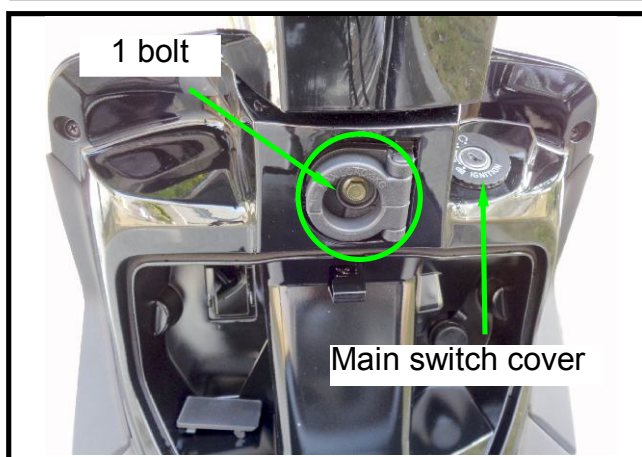
### Removal

Remove the 8 mounting screws of front cover and the inner box.

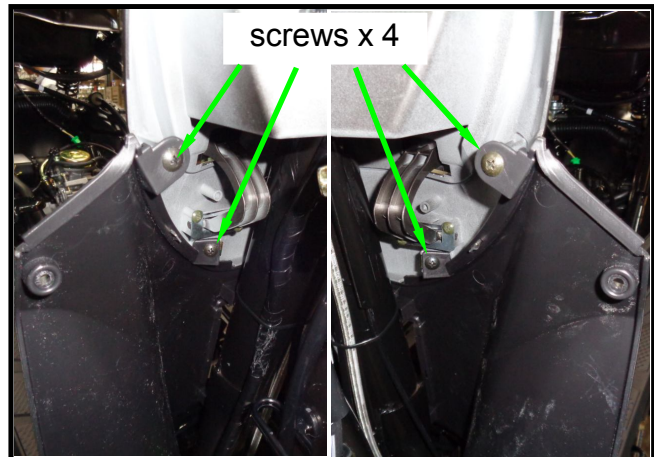


Remove the hook bolt from the front inner box.

Remove the main switch cover.



Remove the front cover and front under cover  
Remove the 4 screws between the inner box and the inner box low

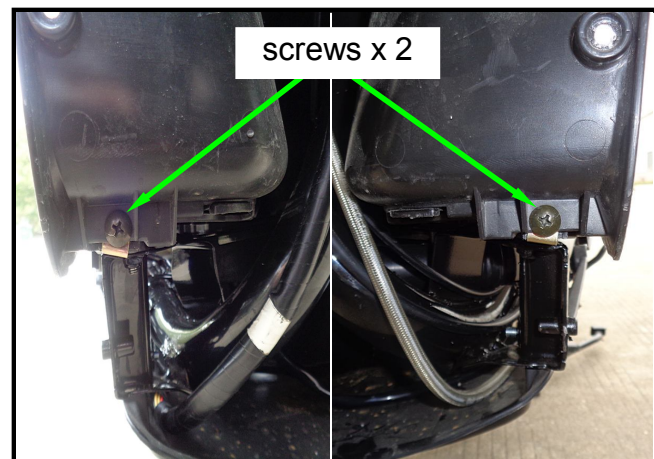


Remove the 2 screws between the floor panel and the inner box low

Remove the front inner box and inner box low

### Installation

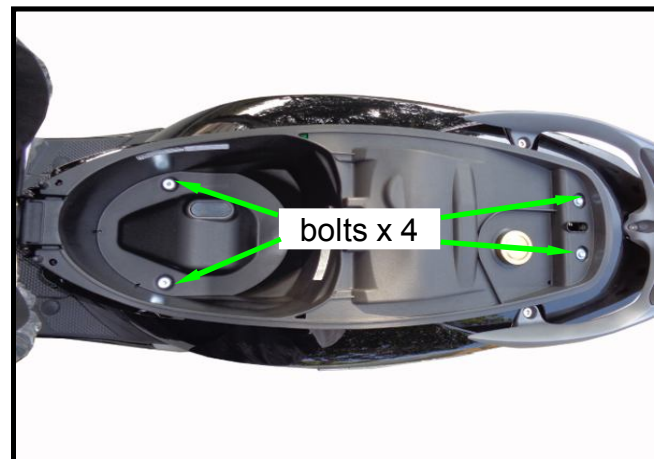
Install the front inner box and the inner box low according to the reverse procedure of removal.



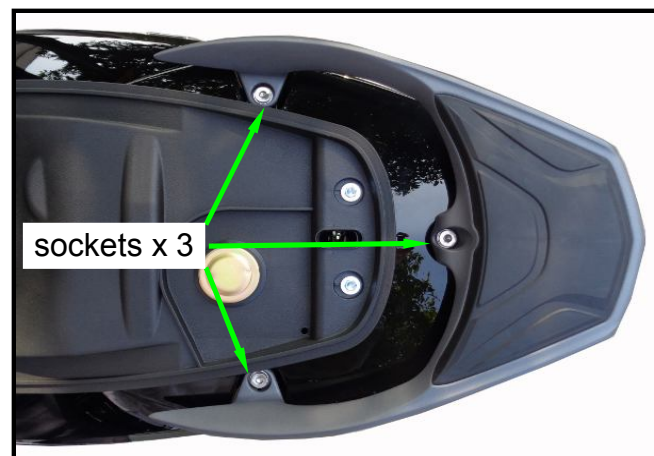
## BODY COVER/REAR CENTER COVER/REAR FENDER

### Removal

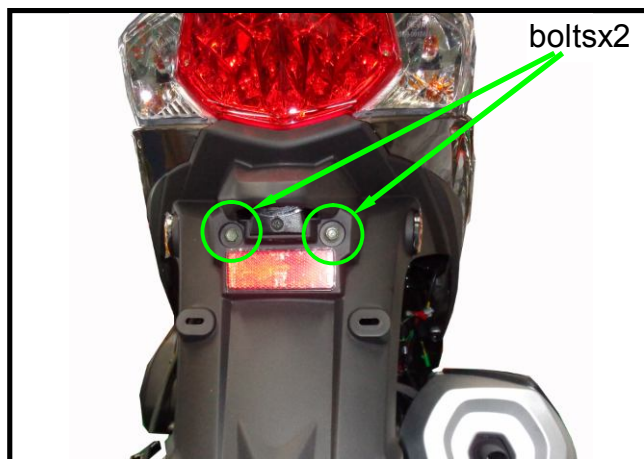
Open the seat.  
Remove 4 bolts of the luggage box.



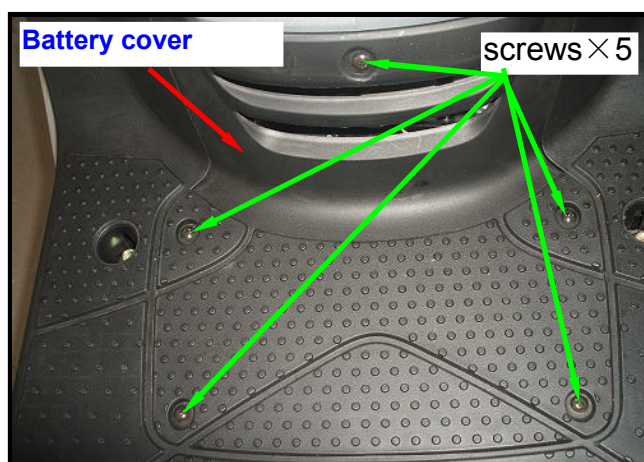
Remove the luggage box.  
Remove 3 sockets of the rear carrier.  
Remove the rear carrier.



Remove the 2 mounting bolts of the rear fender.

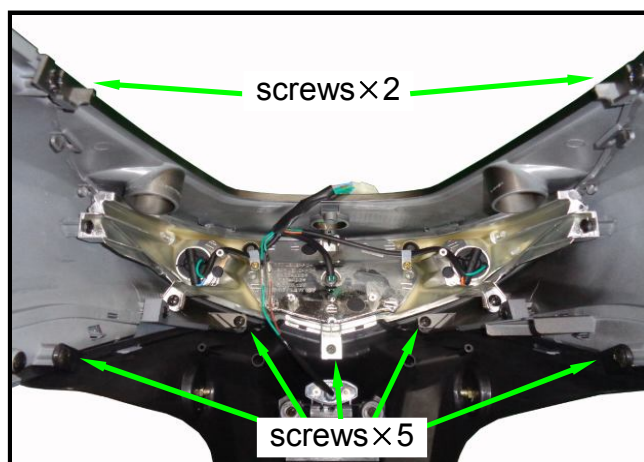


Remove the 5 mounting screws between the center cover and the floor panel.



Remove the 2 mounting screws between the rear center cover and the left/right body cover.

Remove the 5 mounting screws between the rear body cover and the rear fender.



Remove the rear fender.  
Remove the left/right body cover.

### Installation

Install the body cover and rear fender according to the reverse procedure of removal.

### FRONT CENCER COVER

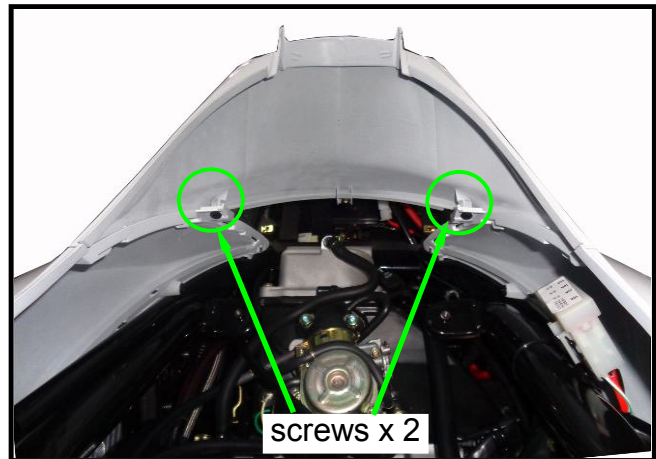
#### Removal

Remove the 2 tapping screws

Remove the front cencer cover.

#### Installation

Install the front center cover according to the reverse procedure of removal.

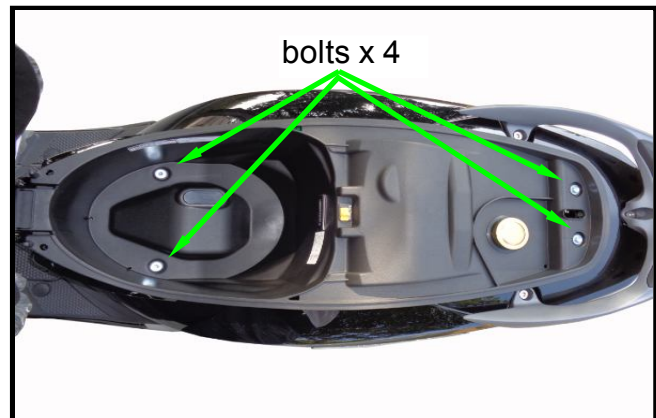


### LUGGAGE BOX

#### Removal

Open the seat.

Remove the 4 bolts from the luggage box.

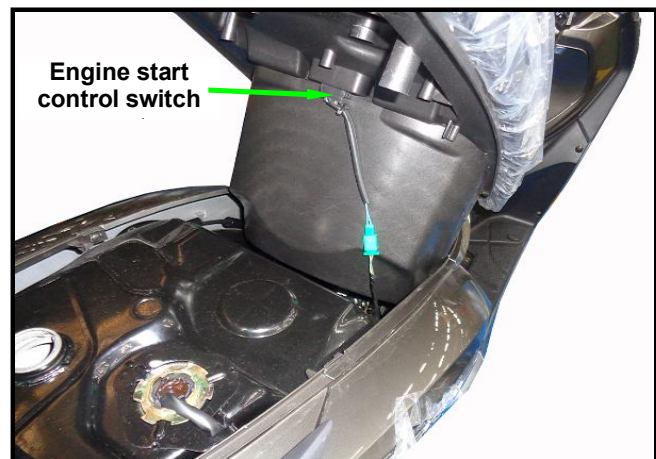


Removed the engine start control switch connectors.

Remove the luggage box and the double seat

#### Installation

Install the luggage box according to the reverse procedure of removal.



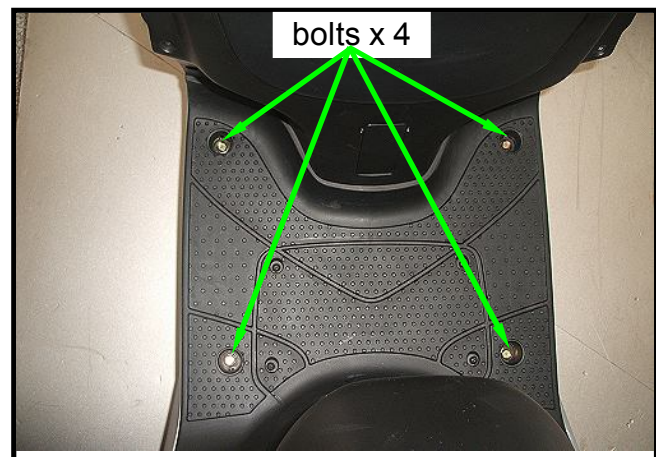
### FLOOR PANEL

#### Removal

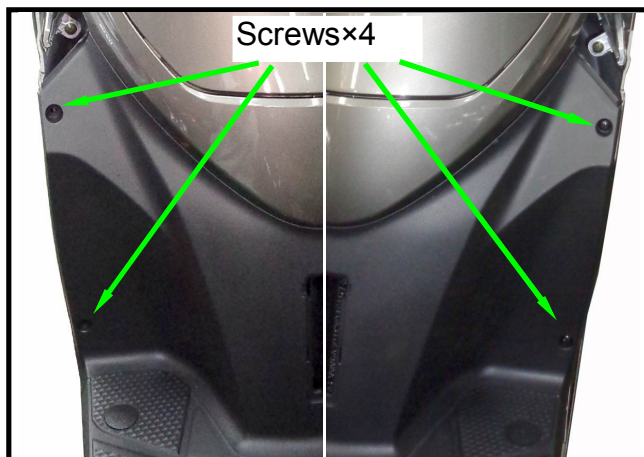
Remove the 4 bolts from the luggage box.

Remove the luggage box and the double seat.

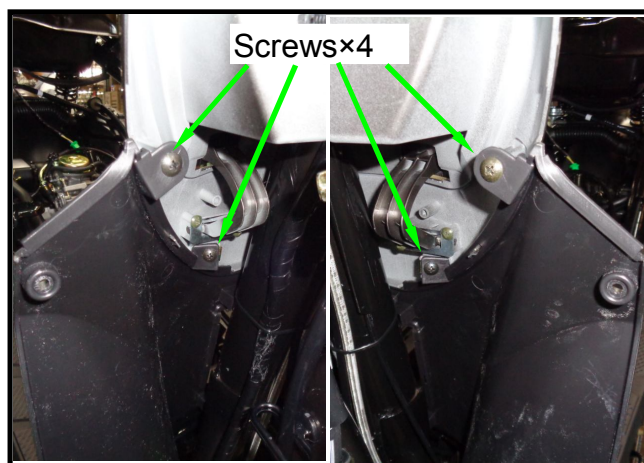
Remove the front center cover.



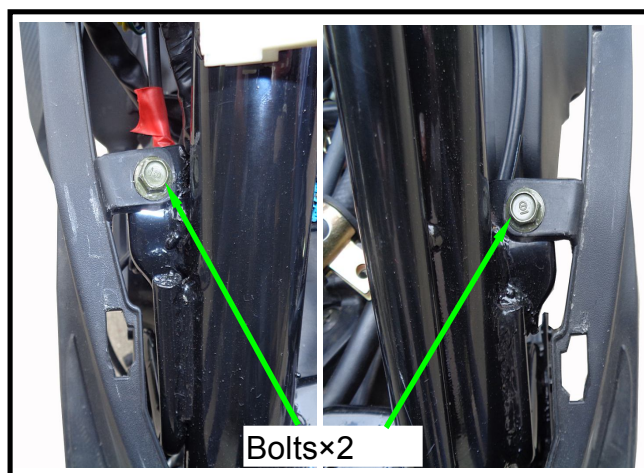
Remove the 4 screws between the floor panel and the inner cover.



Remove the front cover and front under cover.  
Remove the 4 mounting screws between the front inner box low and the front inner box.



Remove the 2 mounting bolts between the floor panel and the frame.  
Remove the floor panel.



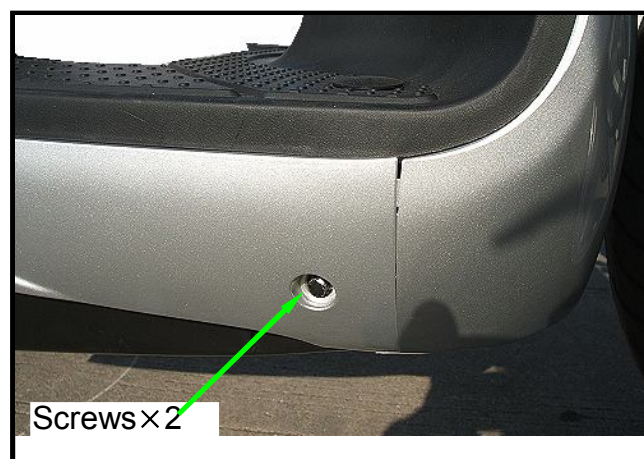
### Installation

Install the floor panel according to the reverse procedure of removal.

### SIDE COVER

#### Removal

Remove the left/right side 2 mounting screws in the front of the side cover.

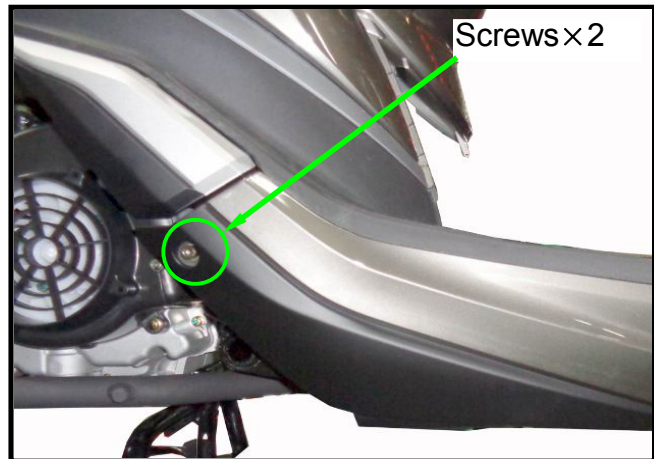


Remove the left/right side 2 mounting screws in the rear of the side cover.

Remove the left/right side cover.

### Installation

Install the side cover according to the reverse procedure of removal.



## UNDER COVER

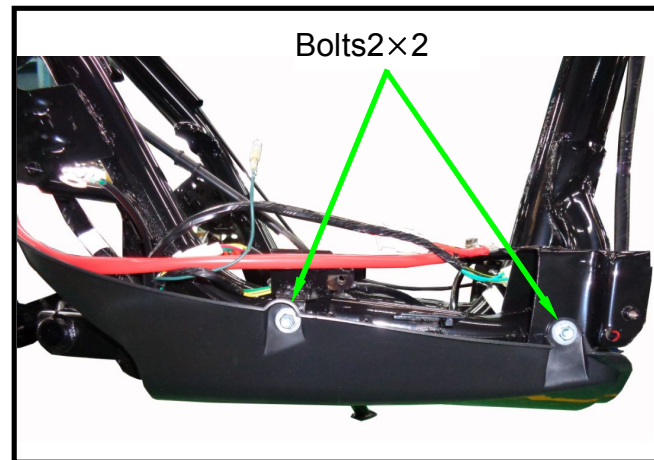
### Removal

Remove the floor panel.  
Remove the left/right side cover.  
Remove the left/right side 4 mounting bolts between the under cover and frame.

Remove the under cover.

### Installation

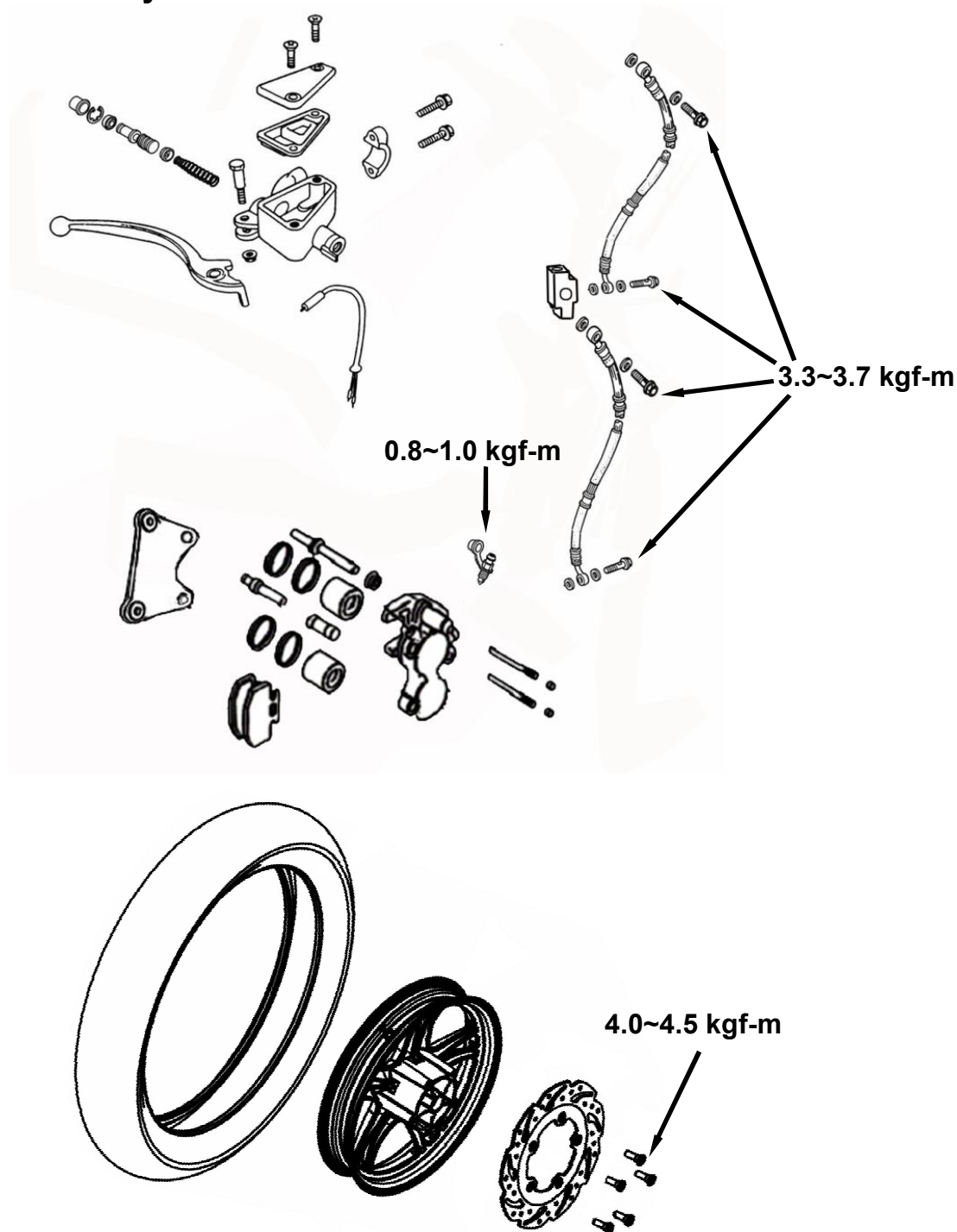
Install the under cover according to the reverse procedure of removal.

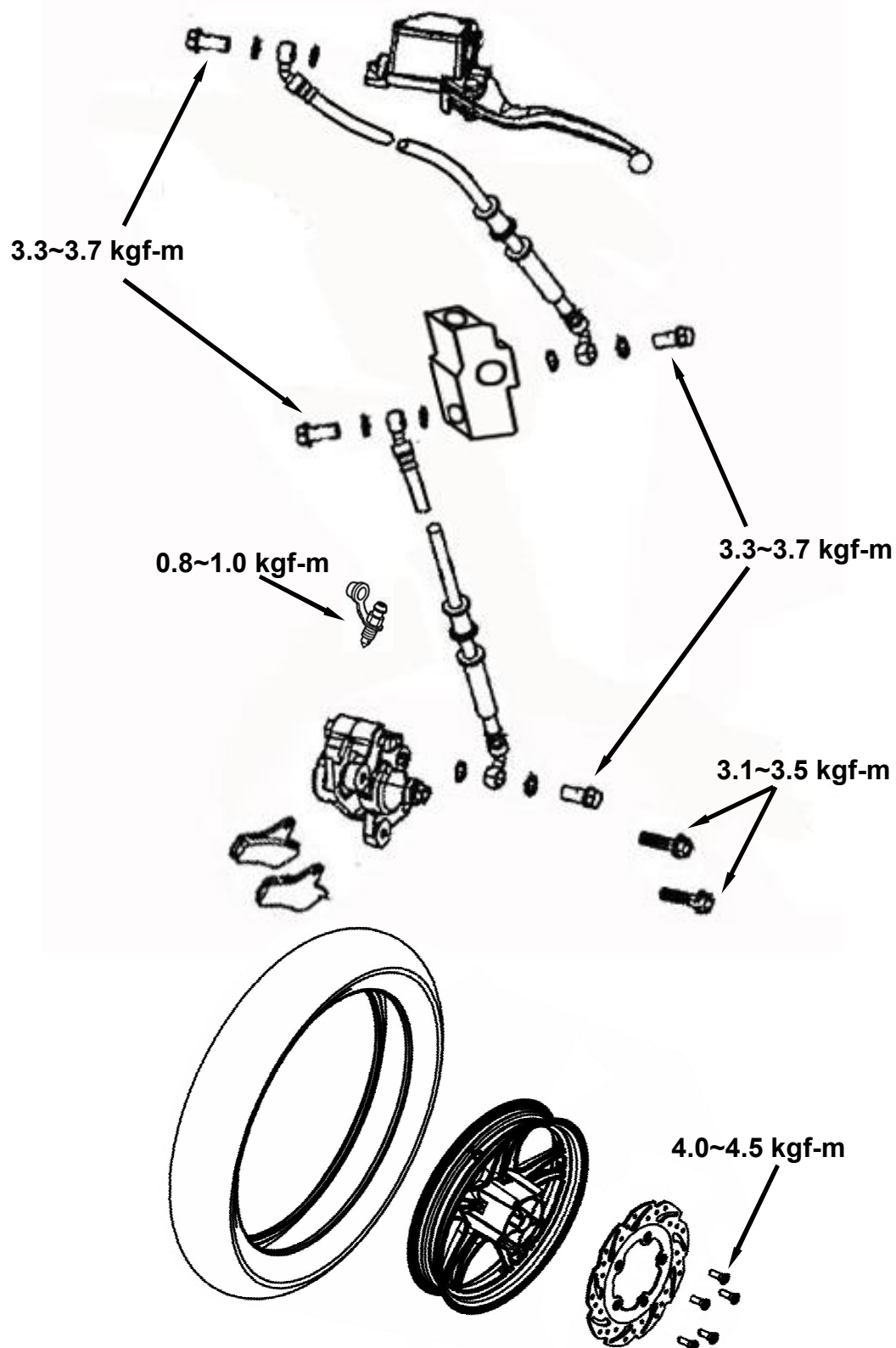


MECHANISM DIAGRAM-FRONT	
DISC BRAKE SYSTEM.....	13-1
MECHANISM DIAGRAM-REAR	
DRUM BRAKE SYSTEM.....	13-2
MAINTENANCE INFORMATION .....	13-3
TROUBLE DIAGNOSIS .....	13-4
HYDRAULIC BRAKE SYSTEM	
INSPECTION.....	13-5
BRAKE FLUID	
REPLACEMENT/AIR-BLEED .....	13-6
BRAKE CALIPER .....	13-7
BRAKE DISC .....	13-8
BRAKE MASTER CYLINDER.....	13-8
DRUM BRAKE-DRUM .....	13-11
BRAKE LING .....	13-11
BRAKE PANEL.....	13-12

## MECHANISM DIAGRAM

### Front Disc Brake System



**MECHANISM DIAGRAM**  
**Rear Disc Brake System**

**MAINTENANCE INFORMATION****Precautions in Operation****Caution**

Installing lining dusts 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 you go.

**Specifications****Unit: mm**

Item	Standard	Limit
The thickness of front brake disc	<b>3.50</b>	<b>2.00</b>
The thickness of rear brake disc	<b>3.50</b>	<b>2.00</b>
Front brake disc eccentricity	<b>0.15</b>	<b>0.30</b>
Rear brake disc eccentricity	<b>0.15</b>	<b>0.30</b>
Master cylinder inner diameter	<b>25.40</b>	—
OD of front brake disc	<b>260.00</b>	—
OD of rear brake disc	<b>240.00</b>	—
Thickness of front disc brake lining	—	As brake ling mark
Thickness of rear brake lining	—	2mm or As brake ling mark

**Torque values**

Bolt for front brake lever	0.8~1.2kgf-m
Bolt for rear brake lever	0.8~1.2kgf-m
Brake hose bolt	3.3~3.7kgf-m
Bolt for brake caliper	3.1~3.5kgf-m
Air-bleed valve	0.8~1.0kgf-m

### TROUBLE DIOGNOSIS

#### DISC BRAKE

##### Soft brake lever

- Air inside the hydraulic system
- Hydraulic system leaking
- Worn master piston
- Worn brake pad
- Poor brake caliper
- Worn brake lining/disc
- Low brake fluid
- Blocked brake pipe
- Warp/bent brake disc
- Bent brake lever

##### Hard operation of brake lever

- Blocked brake system
- Poor brake caliper
- Blocked brake pipe
- Seized/worn master cylinder piston
- Bent brake lever

##### Uneven brake

- Dirty brake lining/disc
- Poor wheel alignment
- Clogged brake hose
- Deformed or warped brake disc
- Restricted brake hose and fittings

##### Tight brake

- Dirty brake lining/disc
- Poor wheel alignment
- Deformed or warped brake disc

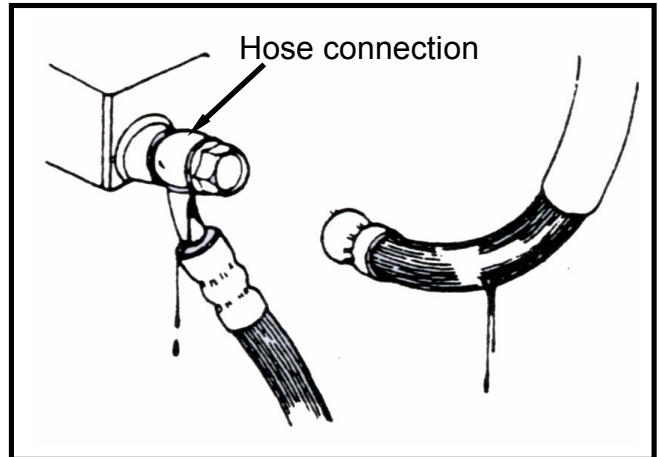
##### Brake noise

- Dirty lining
- Deformed brake disc
- Poor brake caliper installation
- Imbalance brake disc or wheel

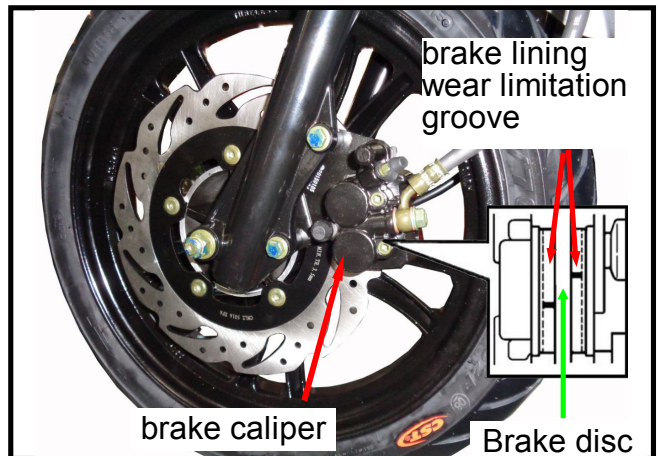
## HYDRAULIC BRAKE SYSTEM INSPECTION

### Inspection

Visual inspect for brake fluid leaking or damage. Check if brake hose connection loosen with wrench and turn the handlebar from right to left motion or press down the shock absorber to check if there is something is interfered with the brake system or brake components.



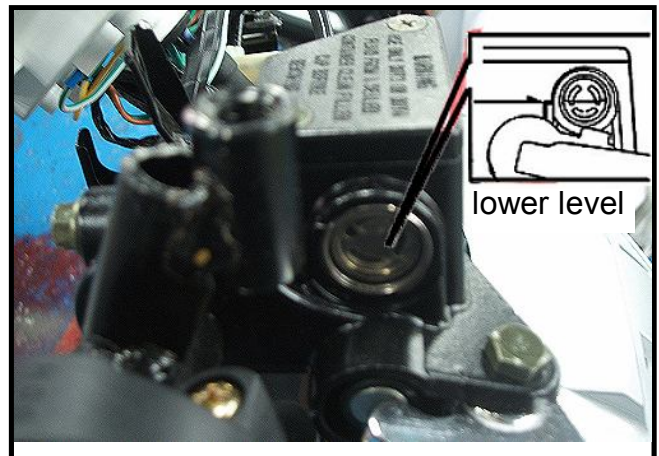
Operate the brake system and check the brake lining. Check the front brake from front side, and replace the brake lining with new one when the brake lining wear limitation groove reaches to the brake disc.



Park the motorcycle on a flat ground and check its brake fluid level.  
Recommended brake fluid: WELLRUN DOT 3 brake fluid

### ⚠ CAUTION

- The fluid level will not be correct if parking the motorcycle in title or just parking. It has to waiting for around 3~5 minutes.
- Never use faked brake fluid to prevent from chemical reaction.
- It has to apply with same brand brake fluid to sure the brake performance.

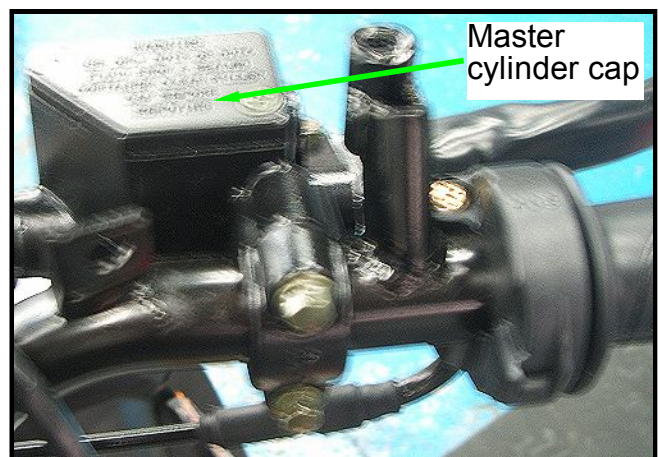


### Brake Fluid Add

Turn the handlebar to let the master cylinder in horizontal position before removed the master cylinder cap.  
Place a rag onto painting, plastic or rubber components when conduct brake system maintenance.

### ⚠ CAUTION

- Do not over the upper level when adding brake fluid and avoid to spilling brake fluid on painted surfaces, plastic or rubber components to result in their damages.



## 13. BRAKE

SYM

Remove the master cylinder cap and diaphragm.

Add good quality brake fluid and it has to add same brand brake fluid into the master cylinder. Clean dirty brake disc.

### ⚠ CAUTION

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

### BRAKE FLUID REPLACEMENT/ AIR-BLEED

Connect drain hose to drain valve. Open the drain valve on the caliper and hold and release the brake lever alternatively until the old brake fluid is entirely drained out. Close the drain valve and add specified brake fluid into the brake master cylinder.

### ⚠ CAUTION

To reuse the spent brake fluid will effect brake performance.

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 the 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

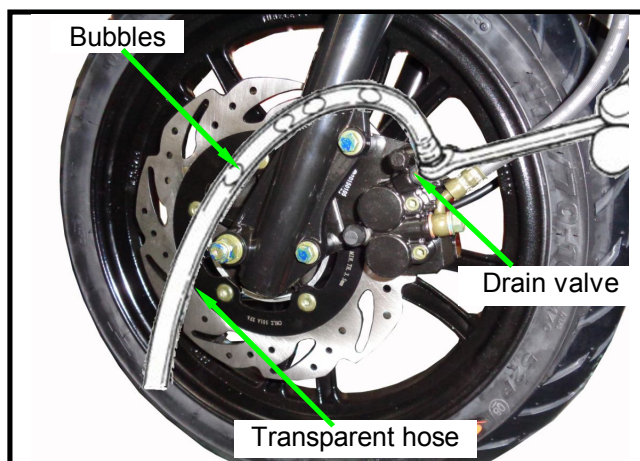
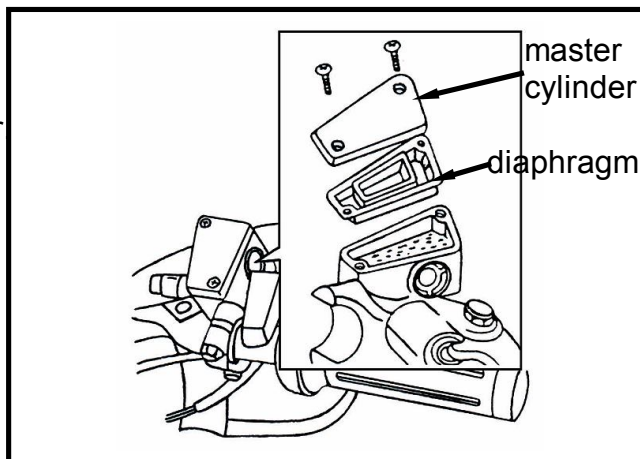
- Do not release the brake lever before the drain valve is closed.
- Always check the brake fluid level when carrying out the air bleeding procedure to avoid air entering into the system.

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. Tightly close the drain valve.

4. Make sure the brake fluid is in the UPPER level of the master cylinder, and refill the fluid if necessary.

5. Cover the cap.



## BRAKE CALIPER

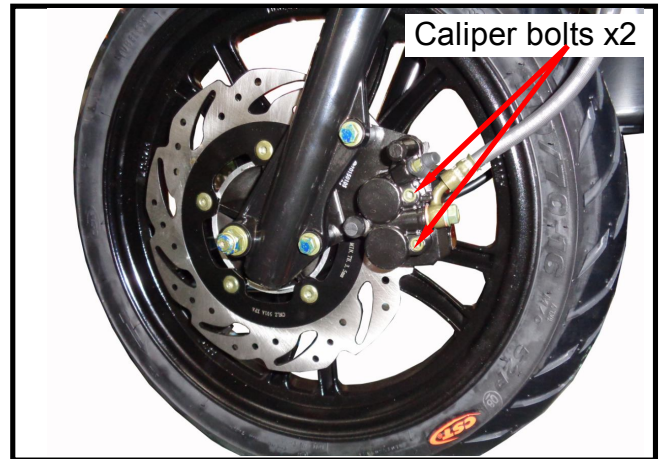
### Removal

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

### ⚠ CAUTION

- Do not spill brake fluid on painted surfaces.

Remove two caliper bolts and the caliper.

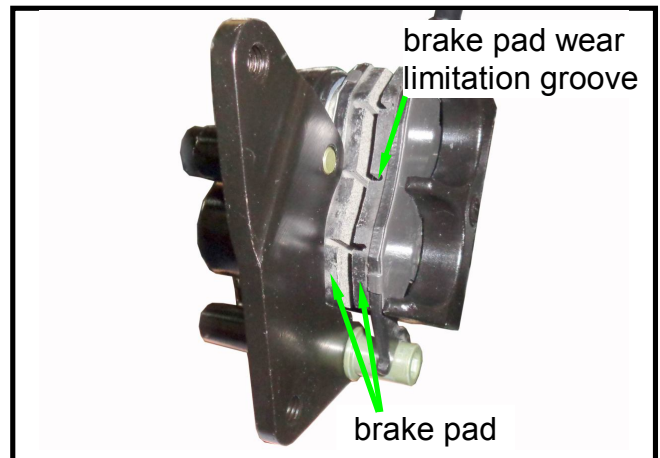


Make sure the brake lining condition. Replace the lining if the brake lining wear limitation groove close to the brake disc.

### Brake Lining Replacement

Compress the caliper and let the brake lining out of the caliper mounting plate. Compress the brake lining locking spring. Remove the inner brake lining firstly and then remove the outer brake lining.

Compress the brake caliper at first as installation. Install the inner brake lining firstly, and then install the outer brake lining.



## INSTALLATION

Install the brake caliper and tighten the attaching bolts securely.

**Torque: 3.3 kgf-m**

### ⚠ CAUTION

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

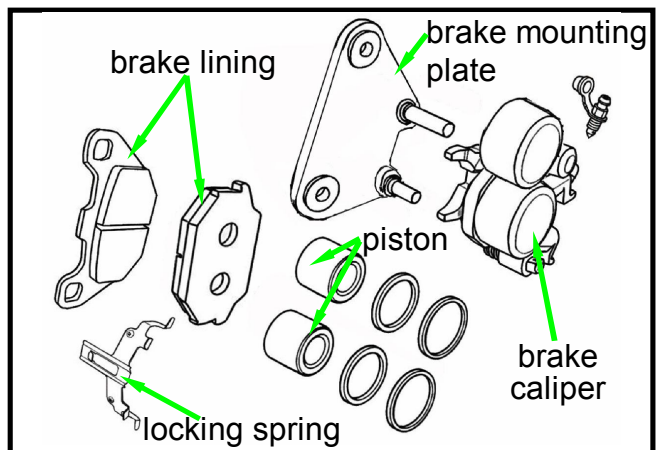
Tighten the lining guide bolt.

**Torque: 1.8 kgf-m**

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

**Torque: 3.5 kgf-m**

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



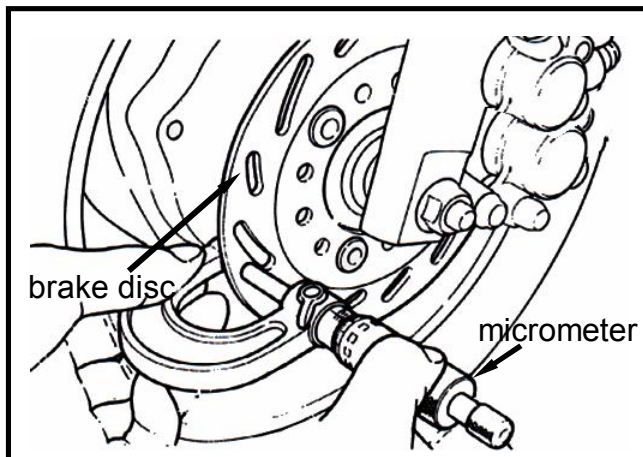
## BRAKE DISC

### Inspection

Visually check the brake disc for wear or break.

Measure the thickness of the disc at several places. Replace the disc if it has exceeded the service limit.

**Allowable limit: 2.0 mm**

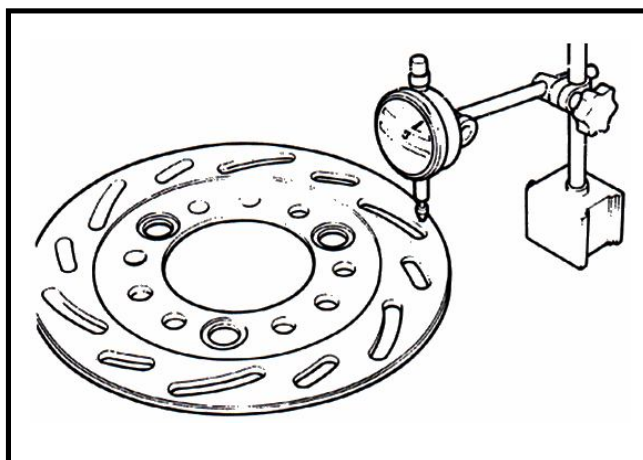


Remove the brake disc from wheel. Check the disc for deformation and bend.

**Allowable limit: 0.30 mm**

### ⚠ CAUTION

- Do not let grease touch to the brake disc that will cause brake performance.
- Do not clean the brake lining with air gun. Operator should wear mask & glove and use vacuum cleaner to clean the brake lining.



## BRAKE MASTER CYLINDER

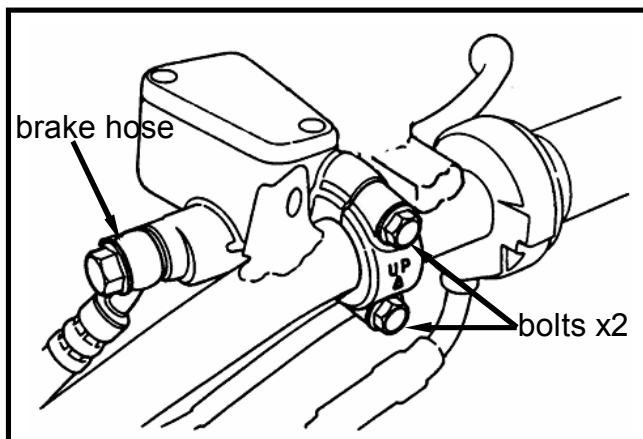
### Removal

### ⚠ CAUTION

Do not let foreign materials enter into the cylinder.

### ⚠ CAUTION

The whole set of master cylinder, piston, spring, diaphragm and circlip should be replaced after removal.



Remove the front and rear handlebar guards.

Remove the leads of brake lamp switch. Drain out the brake fluid.

Remove the brake lever from the brake master cylinder.

Remove the brake hose.

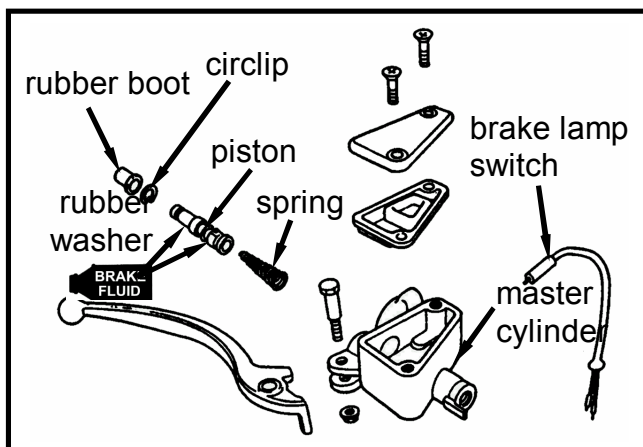
Remove the master cylinder seat and the master cylinder.

Remove the rubber pad.

Remove the circlip.

Remove the piston and the spring.

Clean the master cylinder with recommended brake fluid.

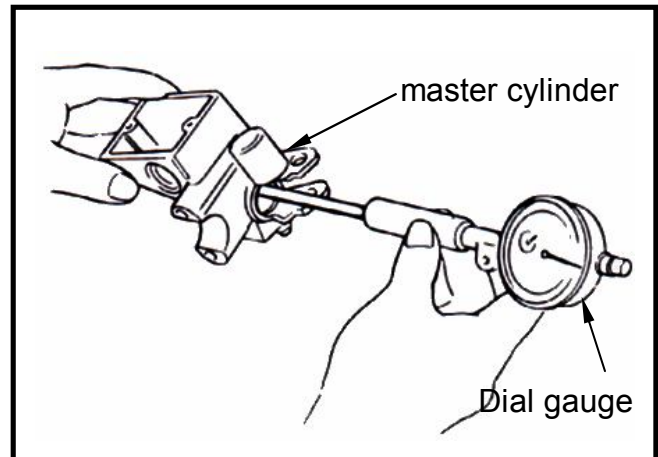


**Inspection**

Check the master cylinder for damage or scratch. Replace it if necessary.

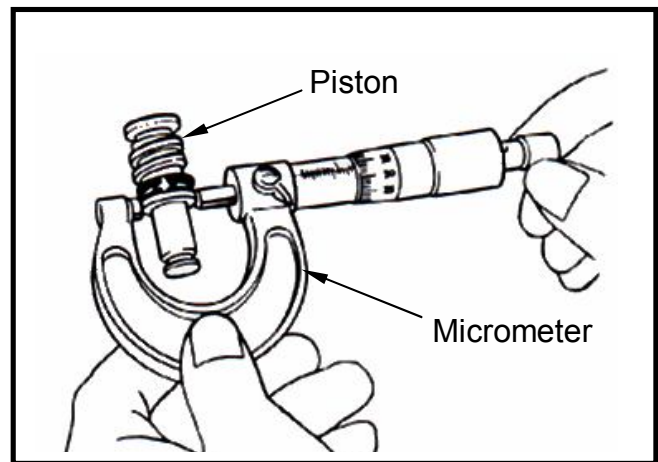
Measure the cylinder inner diameter at several points along both X and Y directions. Replace the cylinder if the measured values exceed allowable limit.

**Allowable limit: 11.055 mm**



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

**Allowable limit: 10.945 mm**

**Assembly**

**⚠ CAUTION**

- It is necessary to replace the whole set comprising piston, spring, piston cup, and circlip.
- 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.

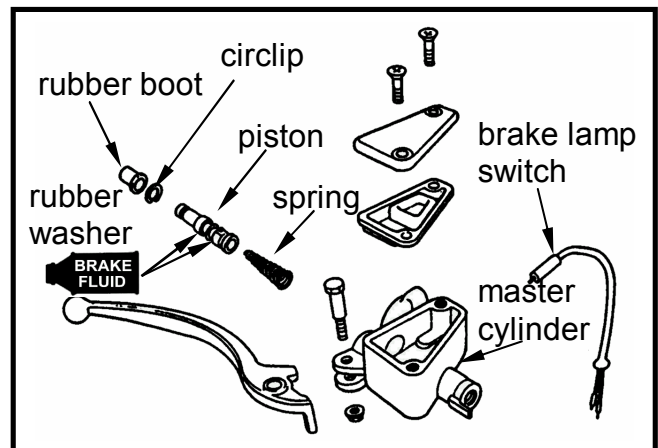
The master cup's cavity should be face inside of master cylinder when installing the master cup.

Install the circlip.

**⚠ CAUTION**

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

Install the rubber pad into groove properly.

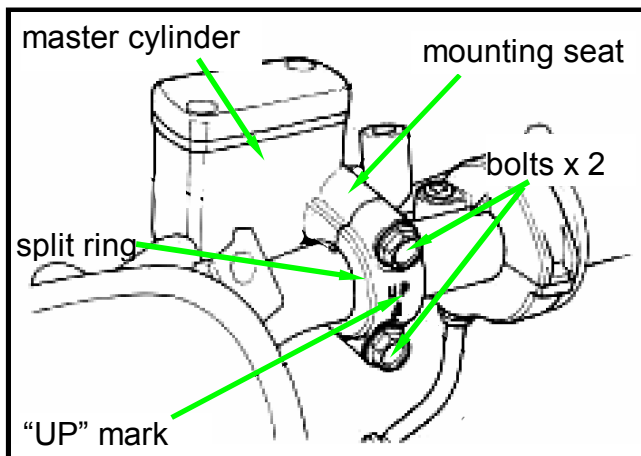


## INSTALLATION

Place the master cylinder onto handlebar, and install the split ring and bolts. The "UP" mark on the split ring should face upward.

Align the split ring on the master cylinder seat with the alignment point on the handlebar.

Tighten the upper bolt of the seat to specified torque value, and then tighten lower bolt to the same specified torque value.



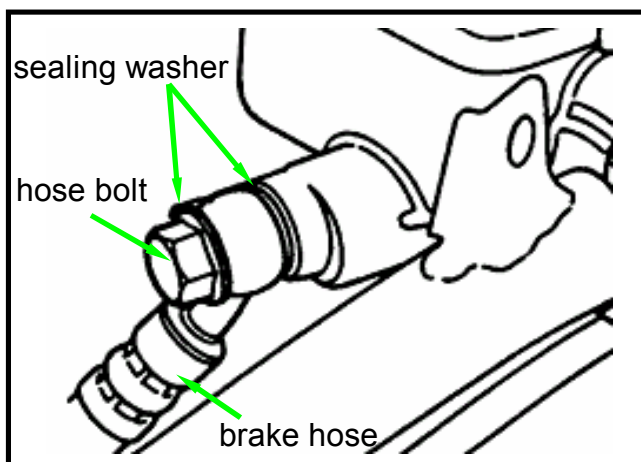
Install the brake lever, and connect leads to brake lamp switch.

Connect brake hoses with 2 new washes.

Tighten the brake hose bolt to the specified torque value.

**Torque value: 3.5 kgf-m**

Make sure the hose is installed correctly.



## CBS CONTROL VALVE ASSY

Removal the front under cover(6 screws)

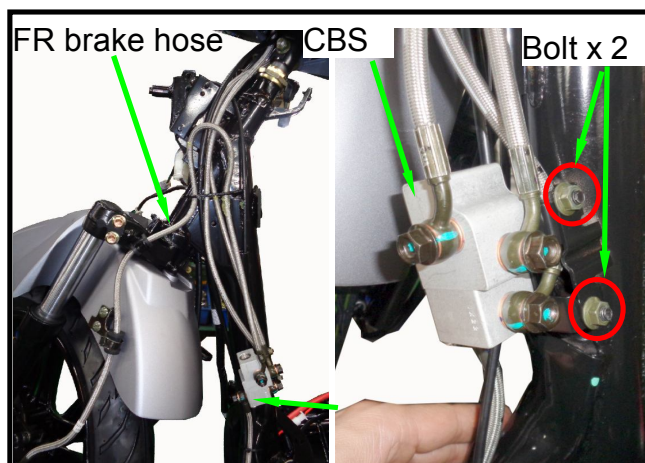
Removal the 2 bolts of frame

### ⚠ CAUTION

Improper routing may damage leads, hoses or pipes.

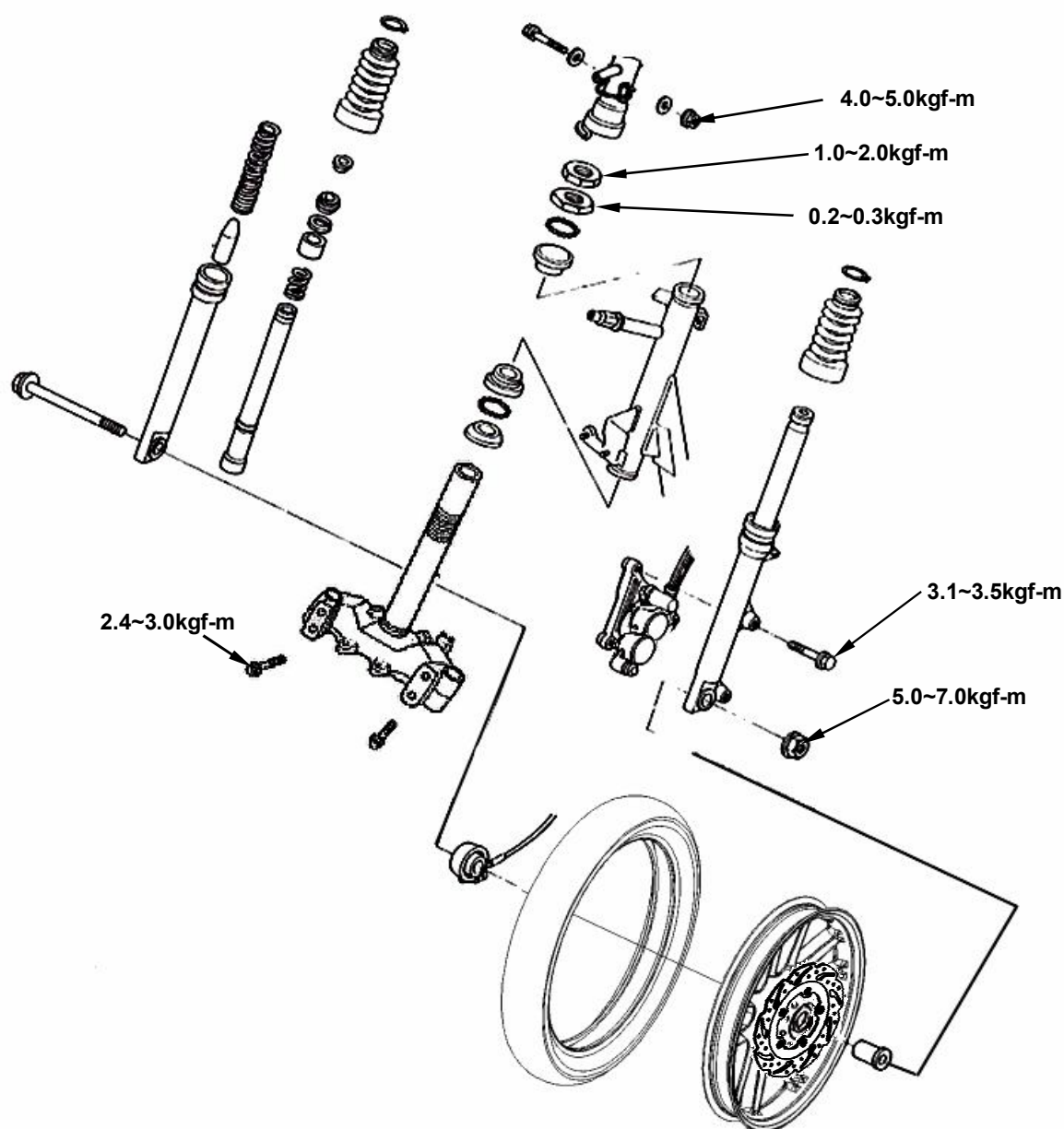
Kink of brake leads, hose or pipe may reduce brake performance.

Add specified brake fluid and bleed the system and conduct the air-bleeding job for the system.



MECHANISM DIAGRAM .....	14-1	FRONT WHEEL .....	14-4
PRECAUTIONS IN OPERATION .....	14-2	FRONT SHOCK ABSORBER .....	14-9
TROUBLE DIAGNOSIS.....	14-2	FRONT FORK/STEERING COLUMN	14-9
STEERING HANDLE.....	14-3		

## MECHANISM DIAGRAM



**PRECAUTIONS IN OPERATION****General Information**

- Before remove front wheel, use a jack to lift the body until front wheel free of ground, and take care not to rotate body in reverse.
- Be careful not to allow oil or grease get on brake drum or linings.

**Torque values**

Front wheel axle	5.0~7.0kgf-m
Steering handlebar nut	4.0~5.0kgf-m
Steering column top cone sliding ring	0.2~0.3kgf-m
Steering column lock nut	1.0~2.0kgf-m
Speedometer cable nut	0.15~0.3kgf-m
Front shock absorber: Upper nut	2.4~3.0kgf-m

**Tools****Special service tools**

Steering column wrench  
Bearing remover  
Inner type bearing remover  
Attachment, 32×35 mm  
Attachment, 42×47 mm  
Steering column nut wrench  
Steering column top cone ring nut wrench

**TROUBLE DIAGNOSIS****Hard steering stem**

- Over tightening of steering stem lock nut
- Broken steering stem steel ball and cone bearing seat
- Insufficient tire pressure

**Steering stem off center**

- Uneven left/right cushion
- Bend fork
- Bent front wheel/tire offset

**Front wheel wobbling**

- Deformed rim
- Front wheel bearing loose
- Faulty tire
- Wheel axle nut tightened improperly

**Soft front suspension**

- Weak fork springs
- Oil leakage of the shock absorber seal

**Front suspension noise**

- Cushion cover friction noise
- Cushion bolts loose

**STEERING HANDLE****REMOVAL**

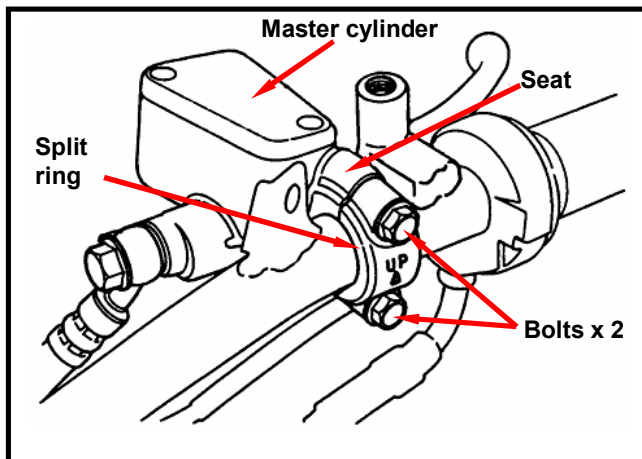
Remove handle front & rear covers and the front cover (refer to chapter 12).

**Disc Brake**

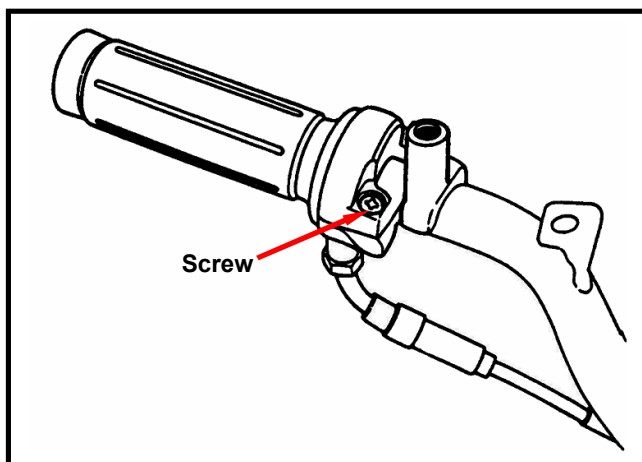
Remove the 2 bolts of the brake master cylinder, and then take out the master cylinder and the split ring.

**⚠ Caution**

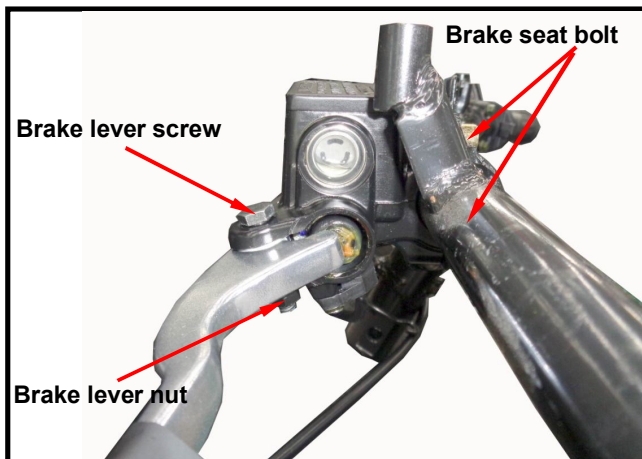
Do not operate the front brake lever to avoid pressing out the brake lining when removing the master cylinder.



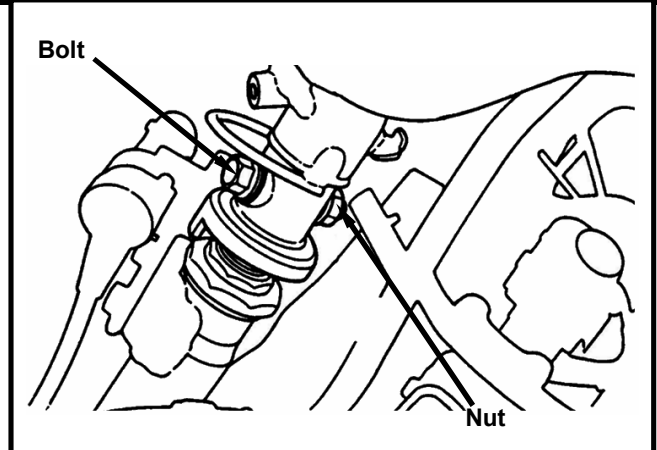
Remove acceleration handlebar screw and then remove the handlebar, acceleration cable, and handlebar cover & seat.



Remove the rear brake lever nut and screw, Remove the brake seat bolt, and then remove the seat.

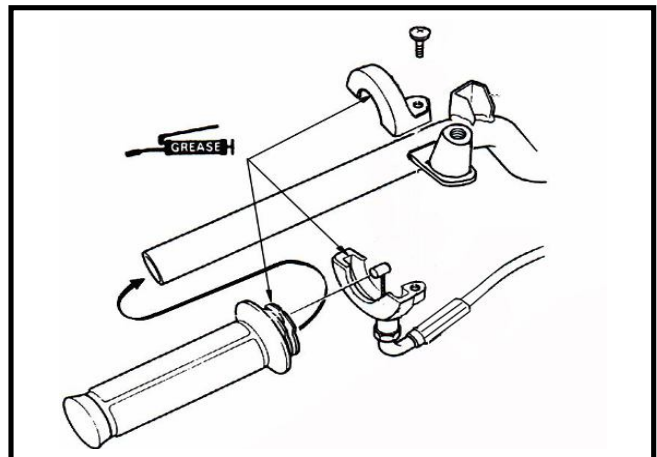


With a wrench to hold the handlebar bolt and then remove the nut.  
Take out the handlebar after removed the bolt.



## Installation

Install the handlebar according to the reverse procedure of removal.  
Apply with some grease onto the handlebar moving parts when installing the acceleration handlebar seat, acceleration handlebar, and acceleration cable.



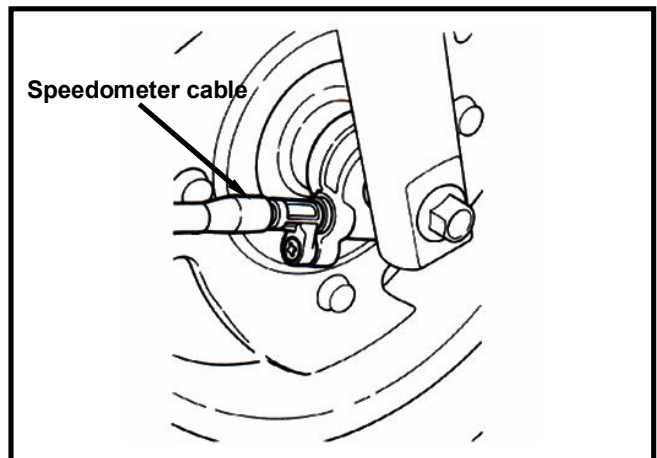
## FRONT WHEEL

### Removal

#### Disc Brake type

Support body bottom and lift front wheel free of ground.

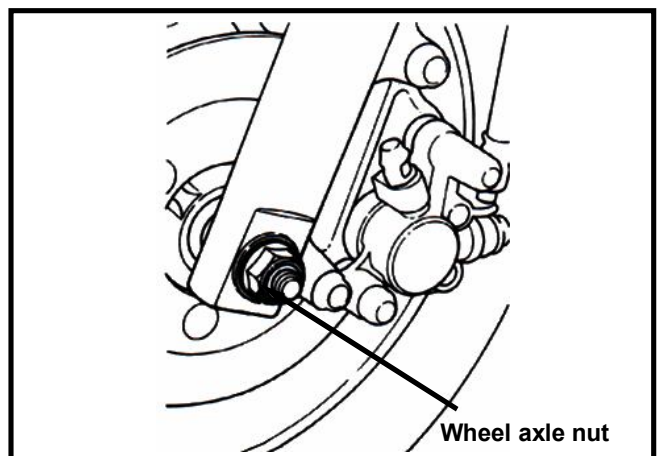
Remove the bolts, and disconnect speedometer cable from the gear box.



Remove the wheel axle nut and pull out the axle. Then, remove the front wheel.

### ⚠ Caution

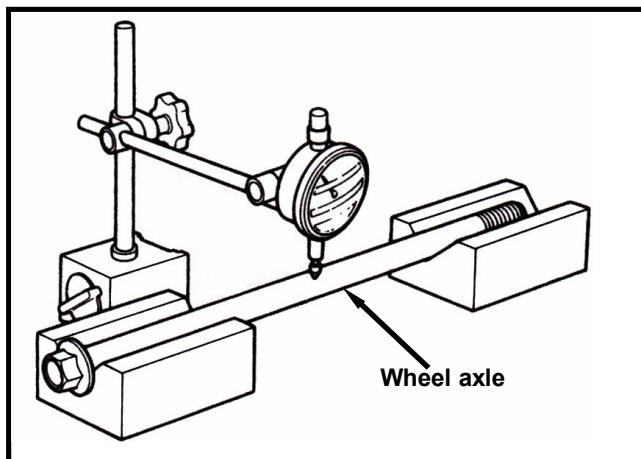
Do not operate the front brake lever to avoid pressing out the brake lining when removing the master cylinder.



**Inspection****Wheel axle**

Set the axle in V-blocks and measure the run-out.

**Service limit: 0.2 mm.**

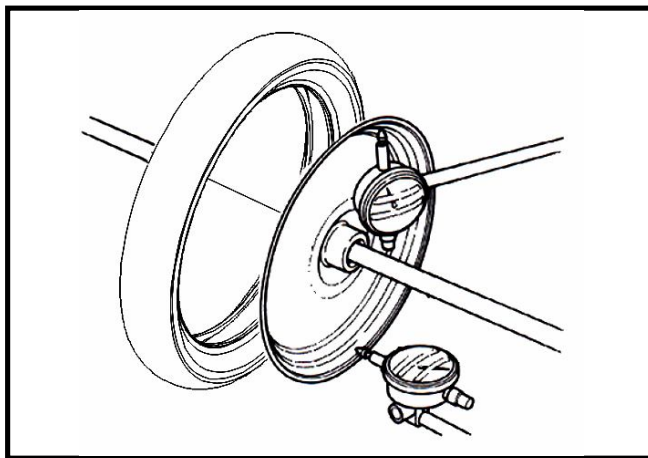
**Wheel Rim**

Place the wheel onto a rotated bracket.  
Turn the wheel with hand and measure its wobble value with a dial gauge.

**Service limit:**

**Radial : 2.0 mm**

**Axial : 2.0 mm**

**Disassembly (Disc type)**

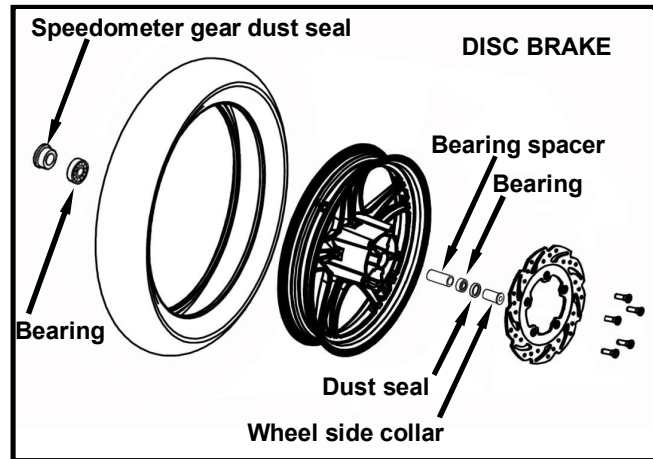
Remove 5 hex socket bolts and brake disc.



Remove the left axle ring and dust seal.  
 Remove the dust seal on the right side of speedometer gear.  
 Remove the bearing with the inner type bearing remover.  
 Take out the bearing spacer and then remove the other bearing.

**Tool:**

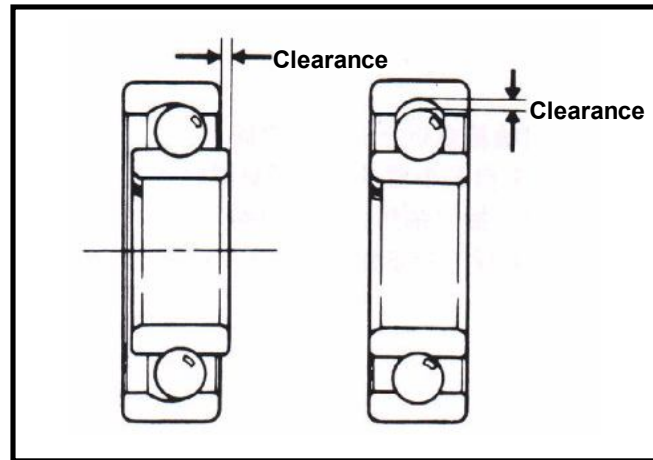
Inner type bearing remover

**Bearing Inspection**

Turn the inner race of bearing with fingers. The bearing should be turn smoothly. Also check if the outer collar is tightly connected to the wheel hub. If the bearing do not turn smoothly, or if they are too loose in the races, or damaged, then, remove and replace the bearings with new ones.

**Caution**

The bearing must be replaced in pair.

**Installation**

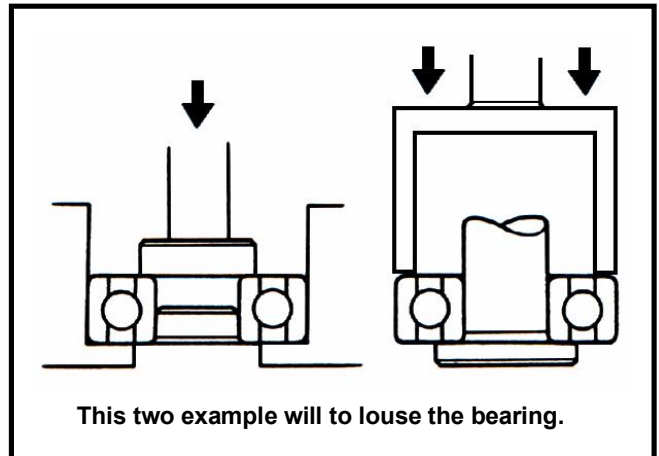
Install the bearing according to the reverse procedure of removal.  
 Apply some grease into the bearing seat of the wheel hub.  
 Install the left bearing onto the seat.  
 Install the bearing spacer and then install the right bearing onto the seat.

### Caution

- Do not install used bearing and replace the bearing once it has been removed.
- Do not the bearing in tile motion when installing.

### Tool:

C-type compressor or bearing compressor.

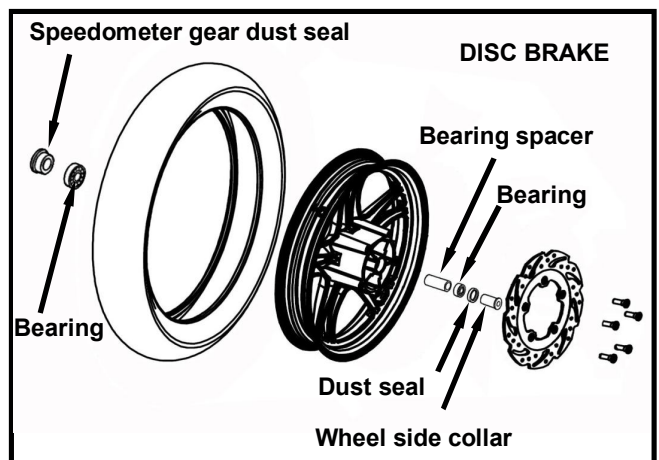


### Disc Brake

Apply with some grease inside of the dust bearing.

Install the dust seal and the front wheel side collar.

Apply with some grease on both side of the speedometer gear oil seal, and then install the seal.

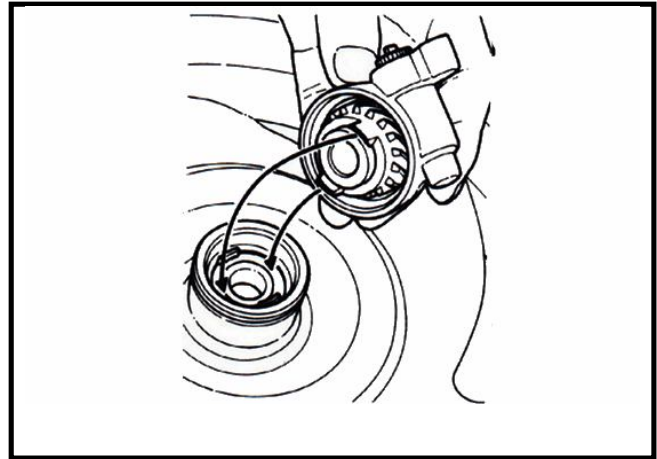


Align the flange part on the speedometer gear with the slot of wheel hub, and then install the brake disc (drum brake) or speedometer gear box.



### Caution

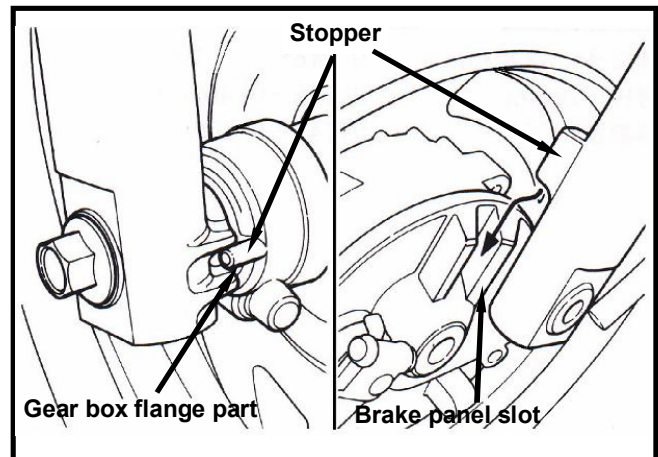
Contaminated brake lining will reduce brake performance so the brake lining, brake drum and disc must be free of grease.



Place the front wheel between the front shock absorbers.

### Disc Brake

Align the flange part on the speedometer gear with the slot of shock absorber stopper.



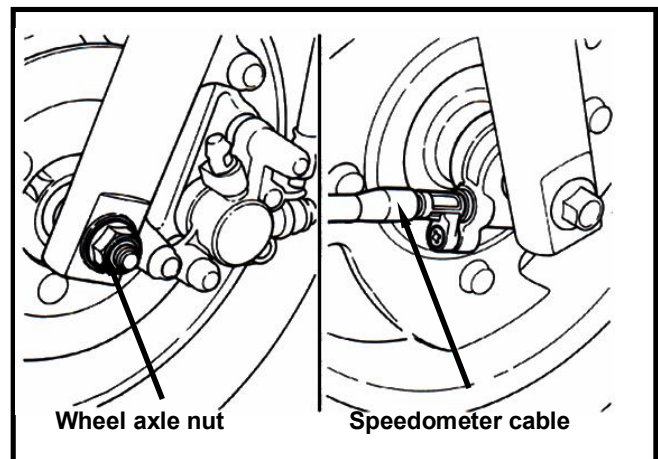
### Disc Brake

Install the front wheel axle from right shock absorber side.

Install the wheel axle nut, and tighten it to specified torque value.

**Torque value: 5.0~7.0kgf-m**

Connect the speedometer cable to the speedometer gear box.

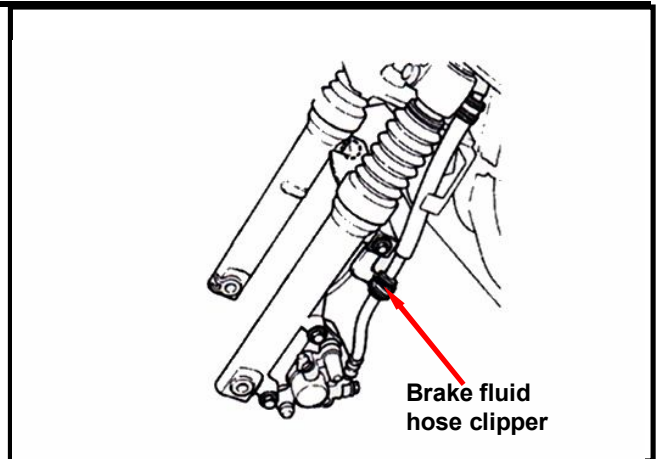


**FRONT SHOCK ABSORBER****Removal**

Remove the front fender, front lower spoiler, front guard, and front wheel as well as front brake components.

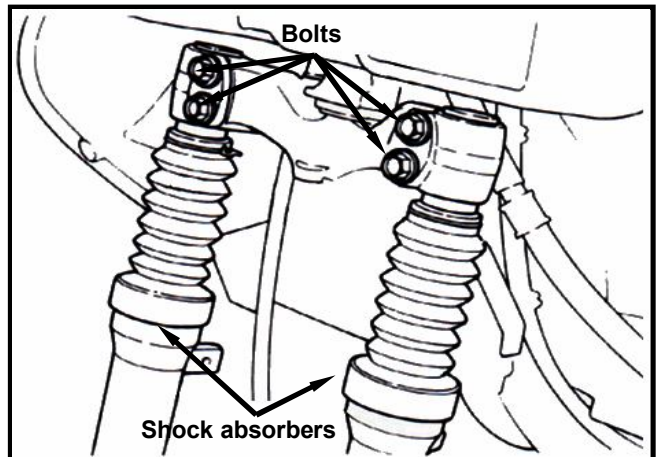
Remove the brake fluid hose clipper or cable guide on the left shock absorber. (bolt x 1)

As for disc brake, remove the cable guide on the right shock absorber. (bolt x 1)



Remove the top connection bolt of the right shock absorber. (bolt x 4)

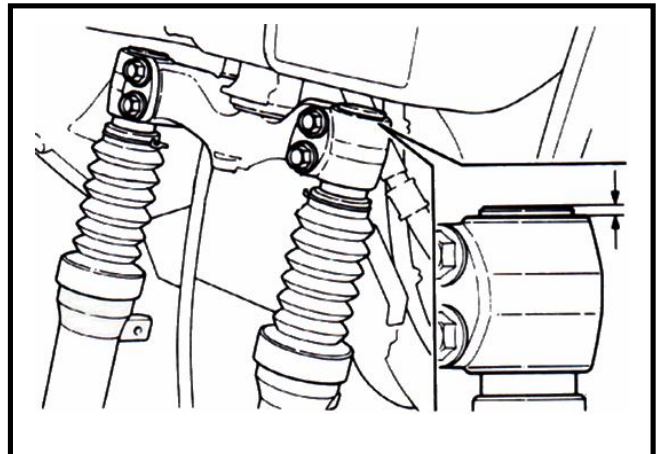
Remove the shock absorber from the front fork.

**Installation**

Install the shock absorbers according to the reverse procedure of removal.

Align the shock absorber top-edge with the top-end level of the front fork when installing the front shock absorber onto the front fork. Then, tighten the nut.

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

**FRONT FORK/STEERING COLUMN****Removal**

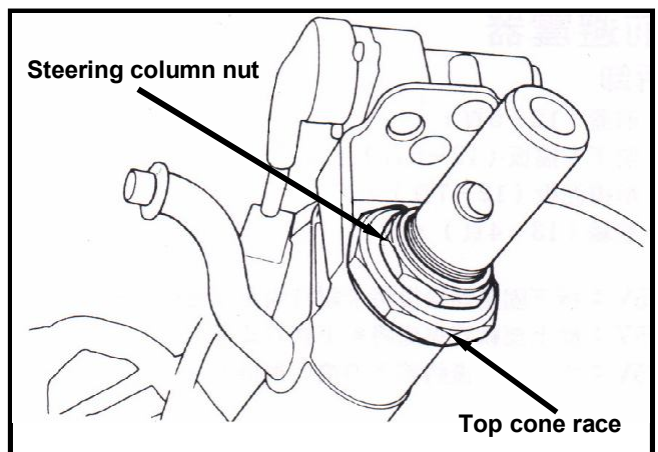
Firstly, remove the handlebar, front wheel, front brake set, and front shock absorbers.

Remove the steering column nut.

Remove the top cone ring, and then remove the steering column.

**⚠ Caution**

Place the steering column bearing balls into a parts container to avoid missing or shortage.



With a plastic hammer to tap the steering column slightly, and then remove the top ball bearing seat.

Remove the lower-end cone bearing seat on the frame with a punch.

### ⚠ Caution

Do not damage the frame and the steering column.

### Installation

Install a new top-cone bearing seat onto the top of steering column.

And then, push the lower-cone bearing seat from bottom until to locking position.

### ⚠ Caution

Do not let the ball bearing in title motion as installation.

Apply with some grease onto the top & bottom bearing balls, and then install the balls into bearing seat.

Press in a new lower cone-race onto the steering column, and lubricate it with grease. Install the steering column.

Lubricate the top-cone race with grease.

Drive the cone-race into the steering column until contact with the top bearing seat no clearance. Note, return 1/2 turn and then tighten the top cone race to specified torque. (tighten the race around 1/4~3/8 turn more.)

**Torque value: 0.2~0.3kgf-m**

### ⚠ Caution

Do not tighten the top cone race too tight to prevent from damage the ball bearing seat when tightening the top cone race.

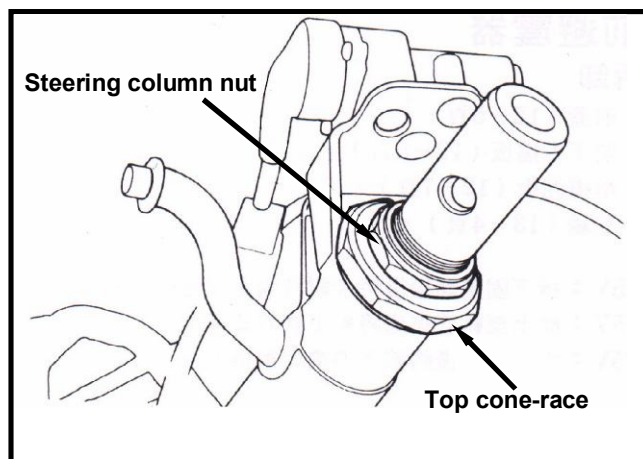
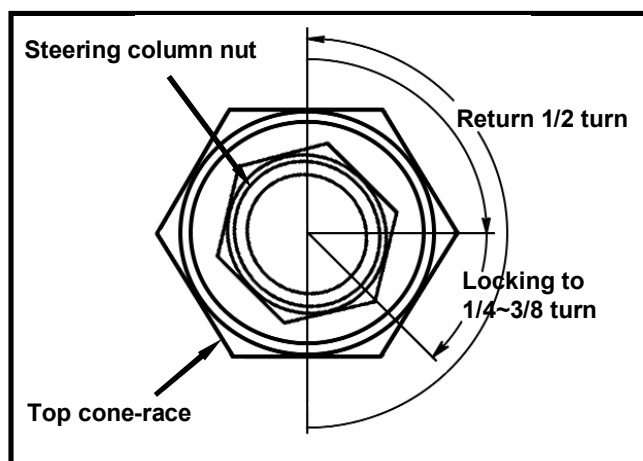
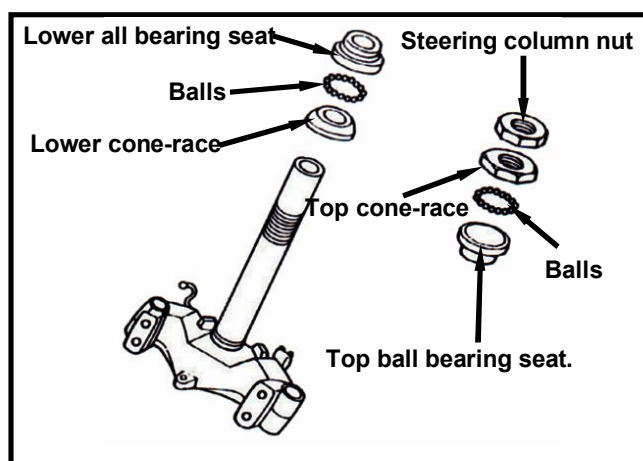
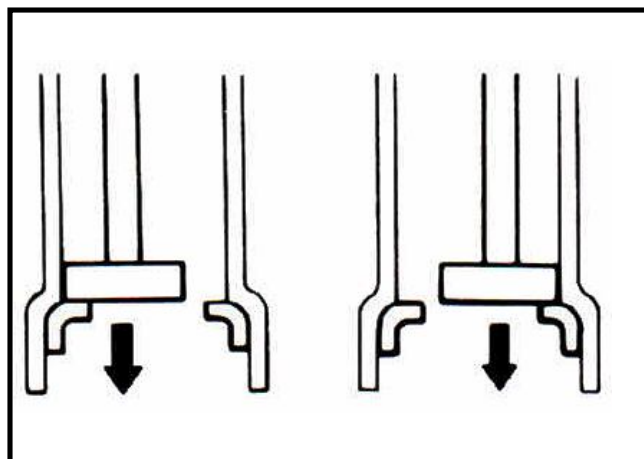
Install the steering column nut and lock the top cone race. Then, tighten the nut.

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

Install the bearing seat according to the reverse procedure of removal.

### ⚠ Caution

Check the steering column if it can be turned freely and no clearance in vertical motion.





**PRECAUTIONS IN OPERATION****General Information**

As for the wheel removal, service, and installation procedures, please refer to the service manual of high speed tire.

**Specification****Unit: mm**

Items		Standard	Limit
Wheel wobbling	Radial	-	2.0
	Axial	-	2.0
Thickness of rear brake lining		4.0	2.0

**Torque values:**

Rear axle nut	11.0~13.0kgf-m
Rear shock absorber upper mount bolt	3.5~4.5kgf-m
Rear shock absorber lower mount bolt	2.4~3.0kgf-m
Exhaust muffler connection nut	1.0~1.4kgf-m
Exhaust muffler connection bolt	3.0~3.6kgf-m

**TROUBLE DIAGNOSIS****Rear wheel wobbling**

- bend wheel rim
- poor tire
- loosen wheel shaft

**Shock absorber too soft**

- insufficient shock absorber spring force

**Braking Noise**

- worn brake lining
- brake disk deformation
- improperly brake disk installation
- unparalleled brake disk or wheel unparallel.

**Poor brake performance**

- Poor brake adjustment
- contaminated brake lining
- worn brake lining
- contaminated and seized brake disk
- worn brake disk
- improperly installation of brake caliper

**EXHAUST MUFFLER****Removal**

Remove the front-end nut of the exhaust muffler. (nuts x 2)

Remove the bolts. (bolts x 3)

Remove the exhaust muffler.

**Installation**

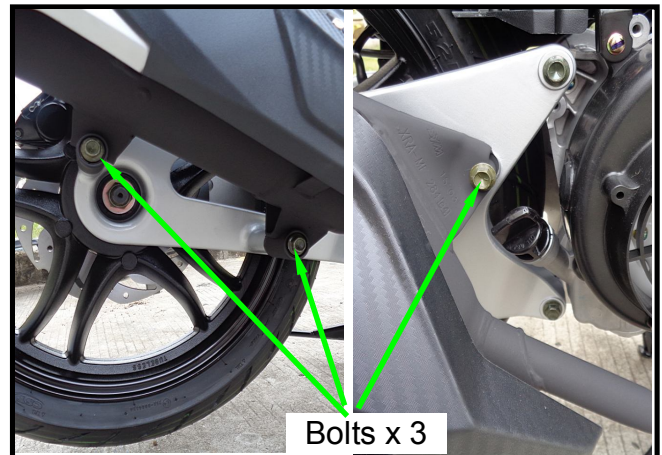
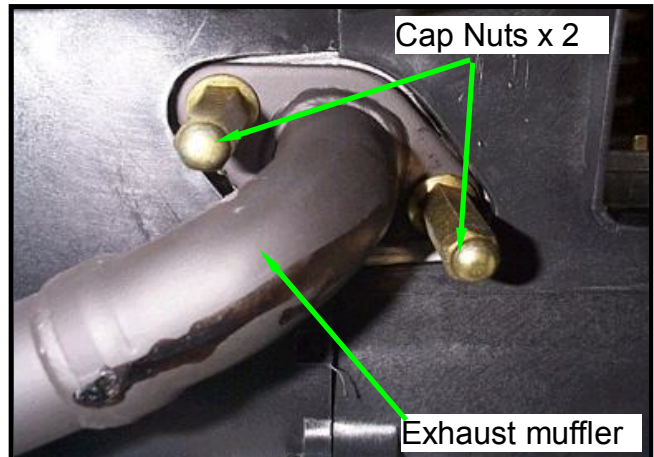
Install the exhaust muffler according to the reverse procedure of removal.

**⚠ Caution**

Replace the exhaust muffler gasket if it is broken or deformed.

**Torque value:**

Exhaust muffler connection bolt:  
3.0~3.6kgf-m

**REAR WHEEL****Inspection**

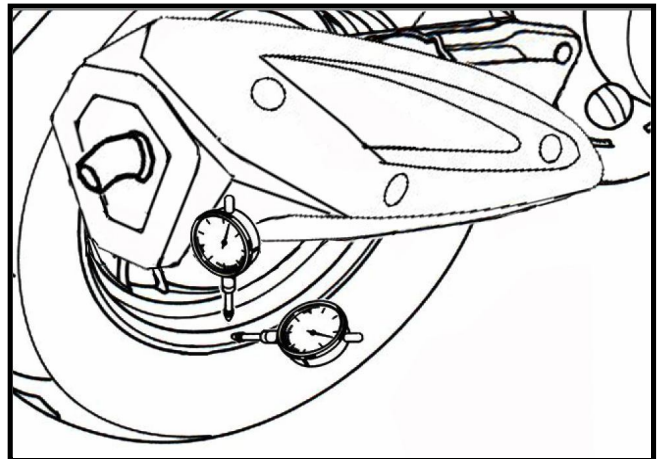
Measure wheel rim wobbling.

**Service limit:**

**Radial: 2.0mm**

**Axial: 2.0mm**

If the wheel rim wobbling out of the specification, except resulted from the wheel rim deformation, it might be loosen or worn final driving shaft bearing or bend, deformed driving shaft.

**Removal**

Remove the rear inner mudguard. (Bolt x 1)

Remove the exhaust muffler bracket. (bolts x 3)

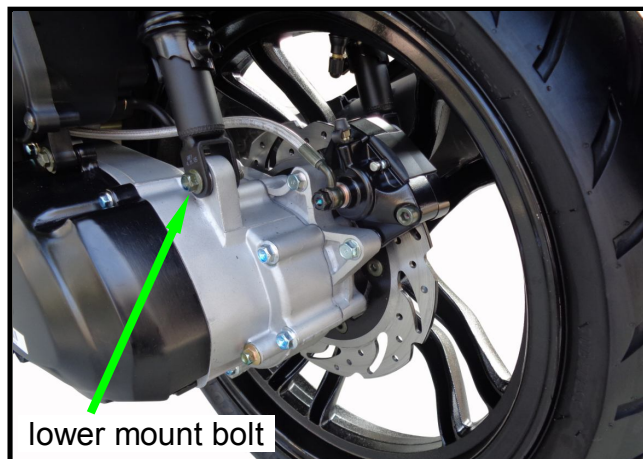
Remove the rear disk brake caliper. (bolts x2)

Remove the rear wheel. (wheel axle nut x1)



**REAR SHOCK ABSORBER****Removal**

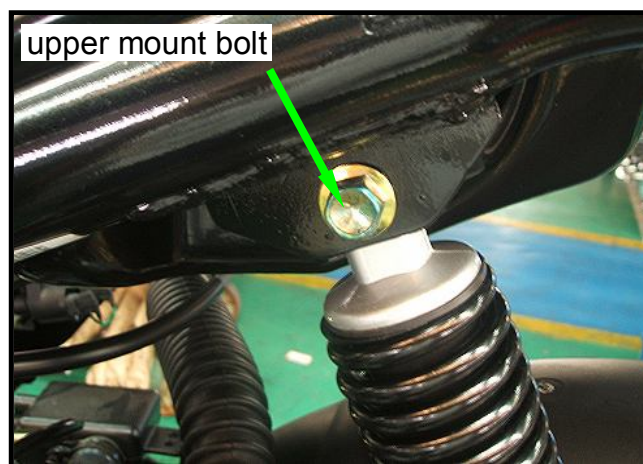
Remove the luggage box. (bolts x 4)  
Remove the rear carrier. (bolts x 3)  
Remove the left & right body covers. (screws x 4, bolts x 3)  
Remove the air cleaner bolts (bolts x2)  
Remove the lower nut of the rear shock absorber (bolt x 1)  
Remove the upper nut of the rear shock absorber (bolt x 1)  
Remove the rear shock absorber.

**Installation**

Install the rear shock absorber according to the reverse procedure of removal.

**⚠ Caution**

The rear shock absorber has to be replaced with one set and can not be replaced by unauthorized persons. Otherwise, it might damage the rubber bushing and construction.

**Torque values**

Rear shock absorber lower mount bolt:

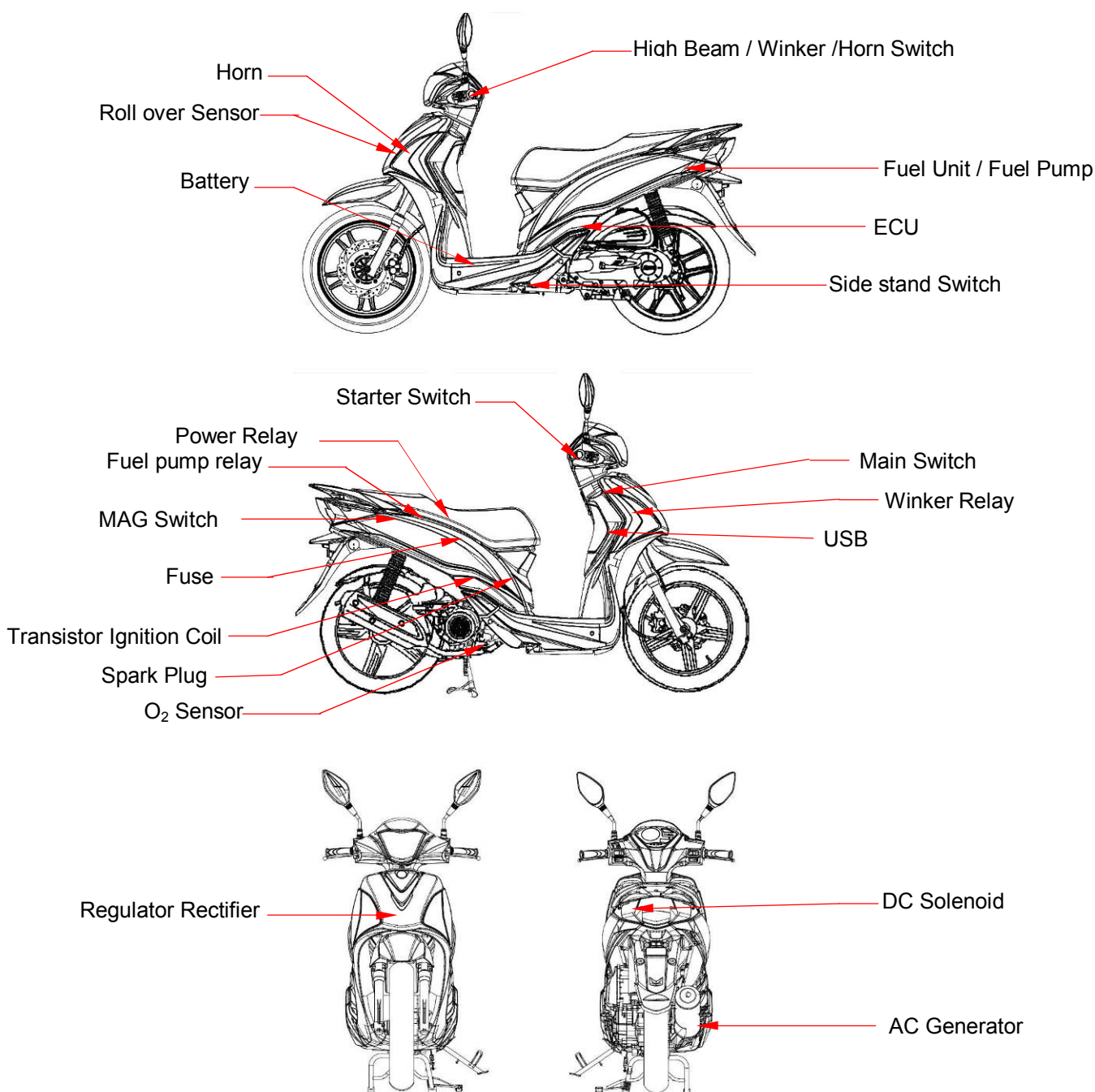
2.4~3.0 kgf-m

Rear shock absorber upper mount bolt:

3.5~4.5 kgf-m

<b>Mechanism Diagram</b> .....	<b>17-1</b>	<b>Meter</b> .....	<b>17-12</b>
<b>Precautions in Operation</b> .....	<b>17-2</b>	<b>Light / Bulb</b> .....	<b>17-13</b>
<b>Troubleshooting</b> .....	<b>17-3</b>	<b>Switch / Horn</b> .....	<b>17-18</b>
<b>Battery</b> .....	<b>17-4</b>	<b>Fuel Unit</b> .....	<b>17-20</b>
<b>Fuse</b> .....	<b>17-5</b>		
<b>Charging System</b> .....	<b>17-6</b>		
<b>Ignition System</b> .....	<b>17-9</b>		
<b>Starting System</b> .....	<b>17-10</b>		

## Mechanism Diagram



### Precautions in Operation

- 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 headlamp.
- 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 ECU does not require an ignition timing check. In case ignition timing is incorrect, check AC generator. Verify with an ignition timing lamp after replacement if necessary.
- Starter motor should be removed after the engine being removed from the frame.

### Specification

#### Charging system

Item		Specification
Battery	Capacity	12V 6Ah
	Charging rate	0.7A / 5~10hr (standard)    3A / 1hr (rapid)
Leaking current		Below 1mA
Charging current		1.2A / 1800 rpm
Charging control val.		14.5+0.5 V / 2000 rpm

#### Ignition system

Item		Specification
Spark plug	Type	NGK CR7HSA
	Gap	0.8 mm
Resistance	First winding	0.63±0.03Ω (27C)
CPS sensor resistance		120±10%Ω
Ignition time		7° BTDC / 1000 rpm
		13° BTDC / 1600 rpm
		24° BTDC / 6000 rpm

**Troubleshooting****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 regulator rectifier

**No spark**

- Poor spark plug
- The cable is poorly connected, open or short-circuited
- Poor connection between ECU and ignition coil
- Poor main switch
- Poor ECU
- Abnormal AC Generator

**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 voltage**

- The connector of the charging system becomes loose
- Poor connection of the battery cable
- Poor connection or short-circuit of the charging system
- Poor connection or short-circuit of the power generation system

**Abnormal charging system**

- Burnt fuse
- Poor contact, open or short circuit
- Poor regulator rectifier
- Poor AC Generator

**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 Generator
  - Improper installation of CPS
  - Poor ECU

**Weak starter motor**

- Poor charging system
- Battery is not fully charged
- Poor connection in the windings
- The motor gear is jammed by foreign material

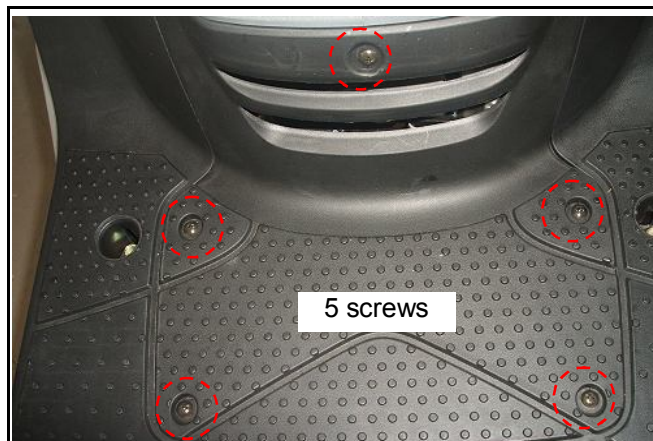
**Starter motor works but engine does not crank**

- Poor starter motor pinion
- The starter motor run in reverse direction
- Abnormal battery

## Battery

### Removal

Remove the battery cover (4 screws).  
Disconnect the negative pole first and then the positive pole.  
Remove the battery.



### Voltage inspection

Use the digital voltmeter to check the voltage of the battery.

Full charged : 12.8V ↑ (20°C)

Undercharged : 12.0 V ↓ (20°C)

### ⚠ Warning

- Keep flames away while recharging.
- Charging is completely controlled by the ON/OFF switch on the charger, not by battery cables.



### Charging

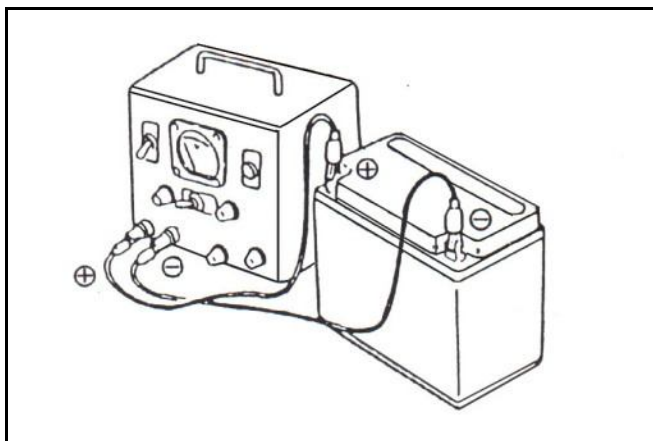
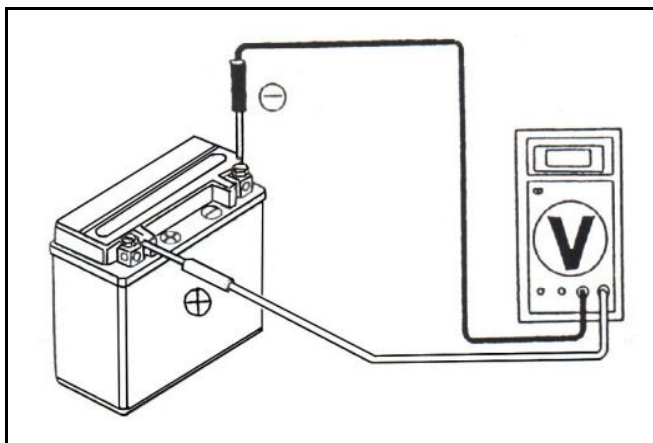
Connect the positive terminal (+) of the charger to the battery positive terminal.  
Connect the negative terminal (-) of the charger to the battery negative terminal.

	Standard	Maximum
Charging current	0.9A	4A
Charging time	5~10 hours	1 hour

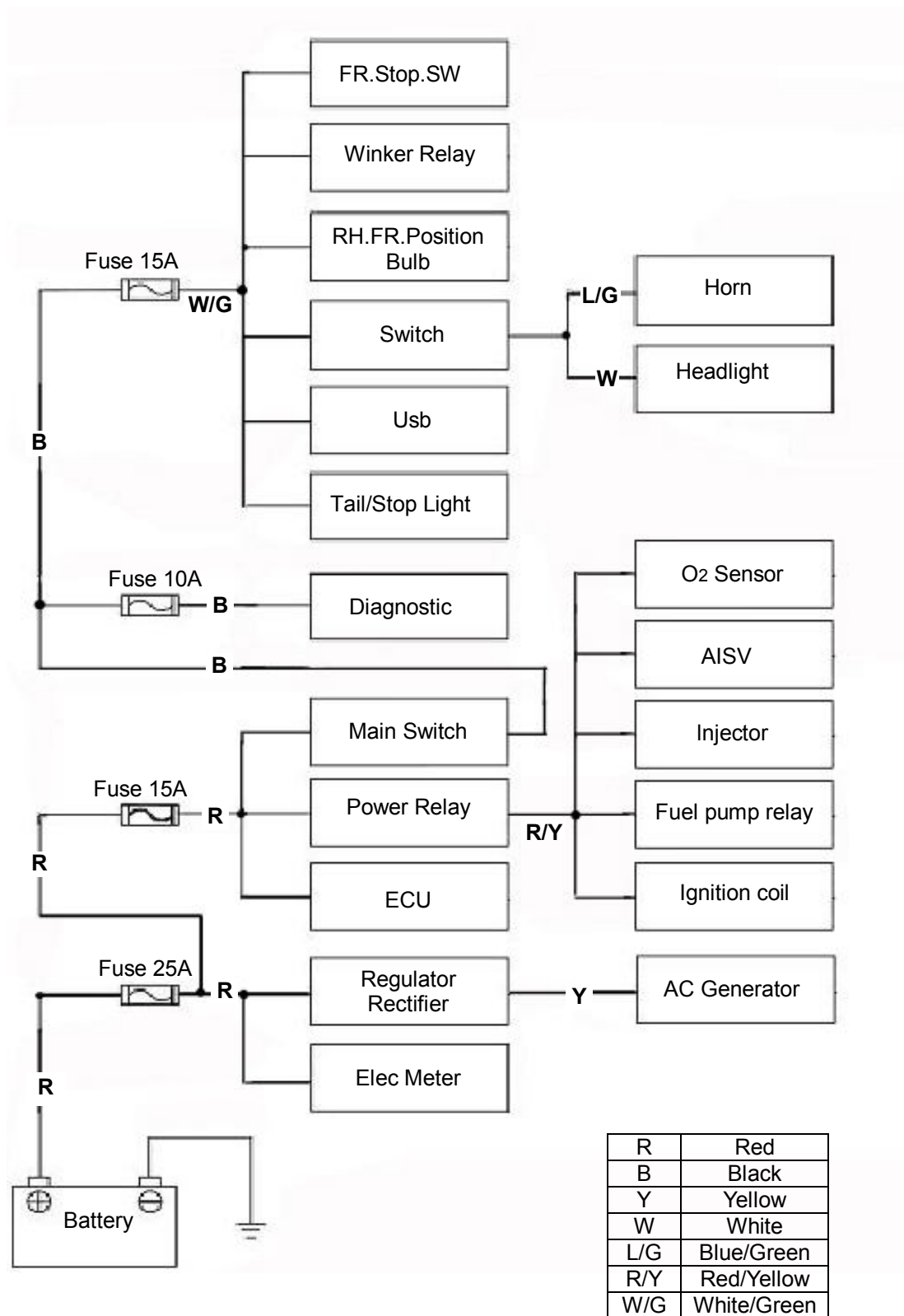
### ⚠ Caution

- 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.

After installing the battery, coat the cable terminal with grease.

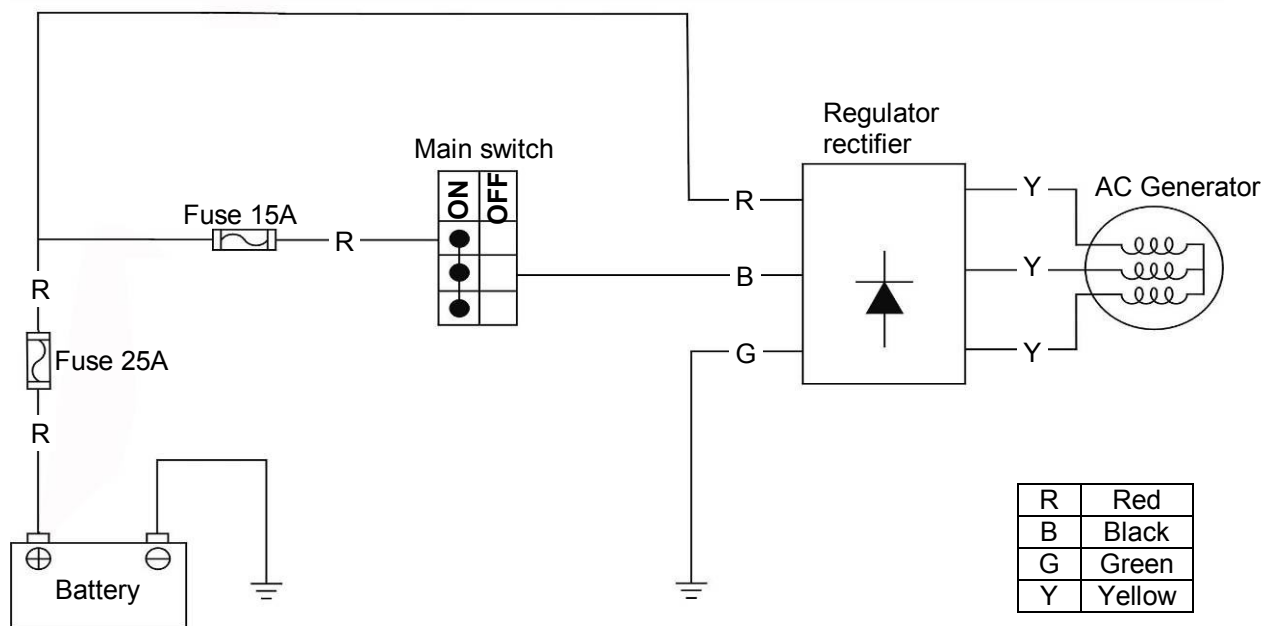


## Fuse



## Charging System

### Charging system circuit



### Regulator rectifier inspection

		(KΩ)				
	+	Yellow 1	Yellow 2	Yellow 3	Red	Black
Yellow 1			∞	∞	∞	∞
Yellow 2		∞		∞	∞	∞
Yellow 3		∞	∞		∞	∞
Red		∞	∞	∞		∞
Black		5~30	5~30	5~30	∞	
Green		2~20	2~20	2~20	∞	1~35

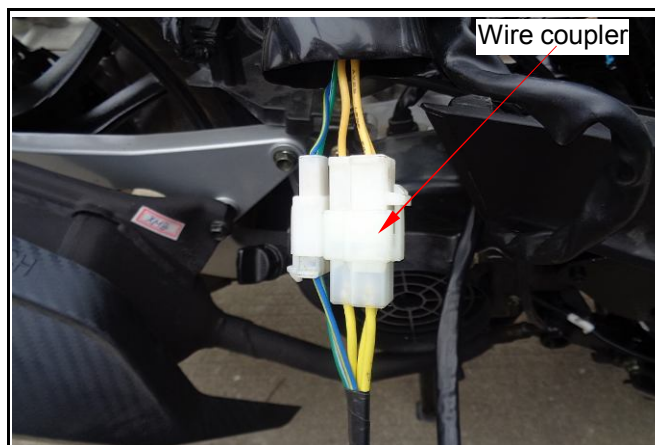
### Charging circuit inspection

Item	Check points	Standard value
Main switch connection	<b>R- B</b>	Battery voltage (ON)
Battery connection	<b>R- G</b>	Battery voltage
Charging coil	<b>Y- Y</b>	0.2~1.0 Ω

If the readings measured are abnormal, check parts in the circuit.

If the parts are normal, then trouble is in the wiring.

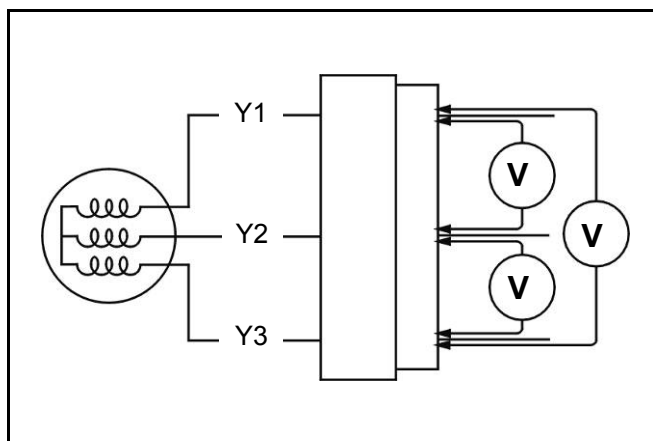
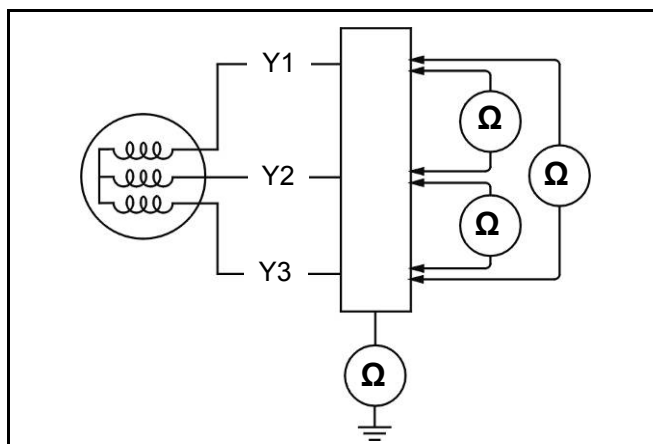
If there is nothing wrong with parts and wiring, replace the regulator rectifier.



### Charging coil inspection

Remove the luggage box and body cover. Disconnect the AC Generator wire coupler and measure the resistance value with ohmmeter.

	V	$\Omega$
Y1	70~80	0.2~1.0
Y2	70~80	0.2~1.0
Y3	70~80	0.2~1.0



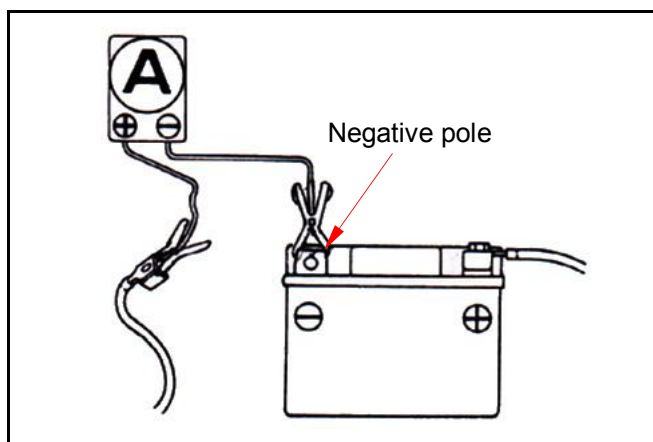
### Current leakage test

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.

#### ⚠ 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.

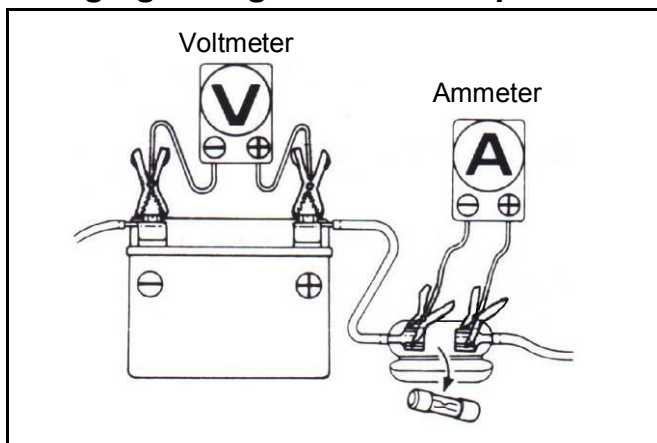


If the leaked current exceeds the specified value, it may indicate a short circuit.

**Allowable current leakage: Less than 1 mA**

Disconnect each cable one by one and take measurement of the current of each cable to locate the short circuit

## Charging voltage / current inspection



### ⚠ 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

- Do not use the 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.
- When the probe is reversibly connected, use a voltmeter with an indication current flows from the positive or the negative direction and the measurement should be at zero, ammeter at one direction only

Connect a tachometer.

Turn on the headlamp to high beam and start the engine.

Accelerate the engine to the specified revolution per minute and measure the charging voltage.

Charging current : 0.6A ↑ / 2500 rpm

1.2A ↑ / 6000 rpm

Charging control voltage : 14.5 V / 1500 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.

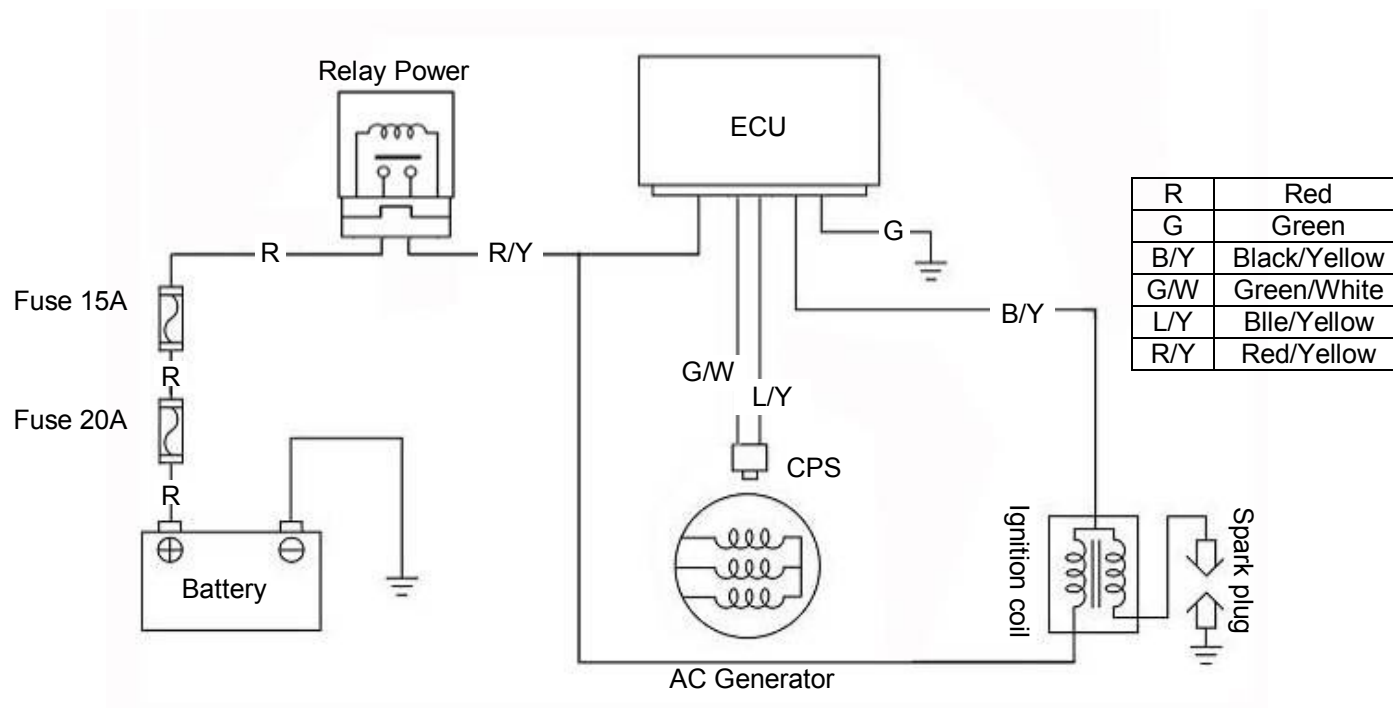
The following problems are not related to the charging system; correct it if any by following steps indicate in the checking list.

- (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

Fuse15A



### Ignition coil inspection

Remove the luggage box.

Disconnect the ignition coil and the spark plug cap.

Measure the resistance between the terminals of the primary winding.

**Standard resistance :  $0.63 \pm 0.03 \Omega$  (23°C)**

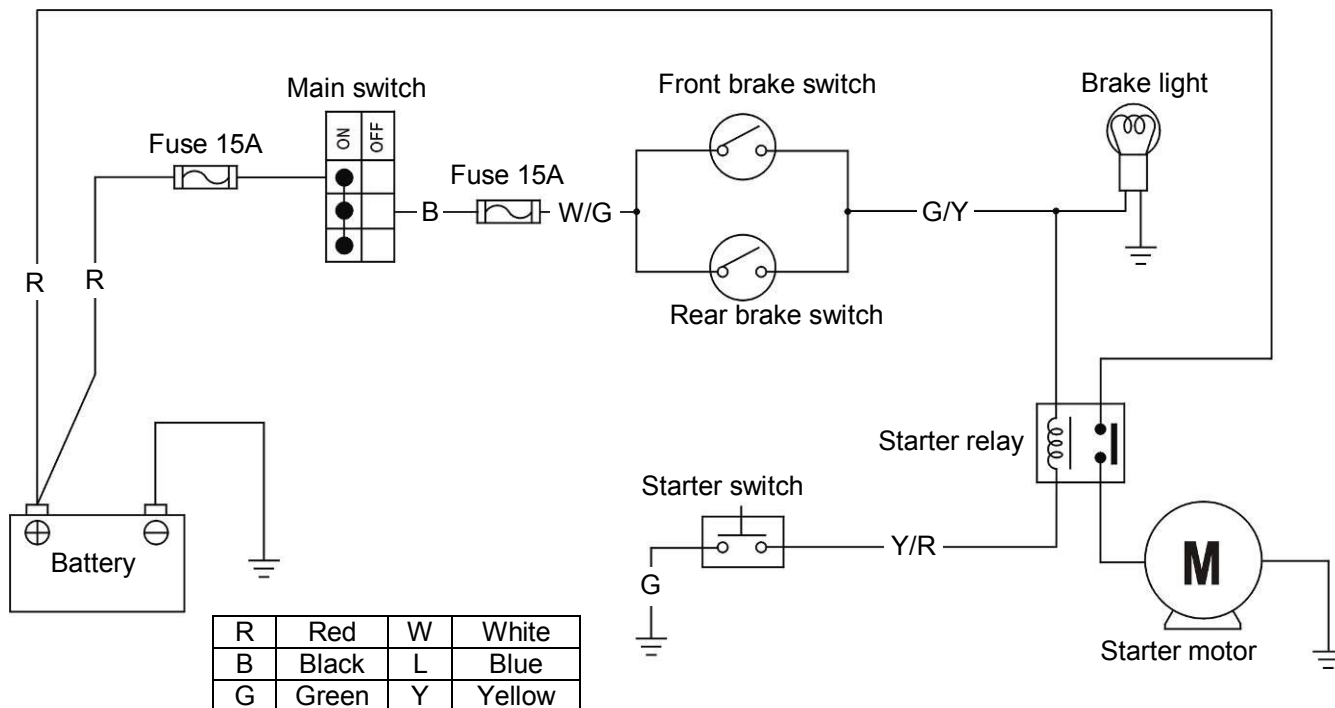
### ⚠ Caution

- Coil doesn't need to be removed before performing the inspection.



## Starting System

### Starting circuit



### Starter relay inspection

Remove the luggage box assembly.

Open the main switch

Press the brake

Push down the starter switch

If a sound of "Click Click" is heard, it indicates the relay function normally.

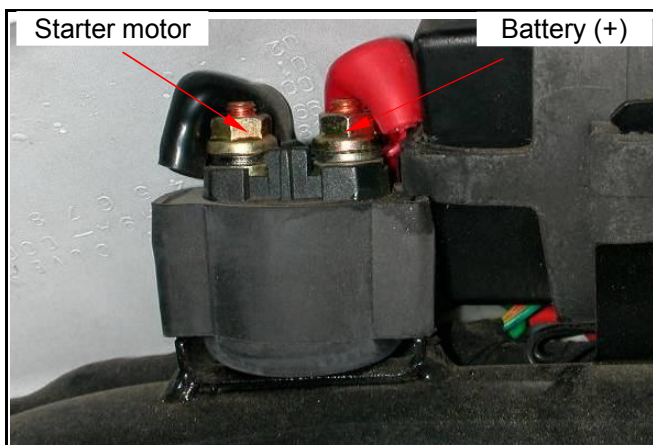


Disconnect the cable positive terminal from the relay.

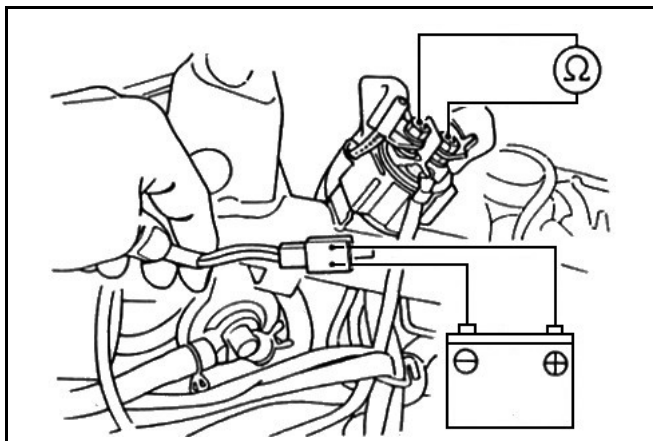
Disconnect the positive cable of the starter motor.

Disconnect the connector of the relay.

Connect an ohmmeter to the large terminal end.

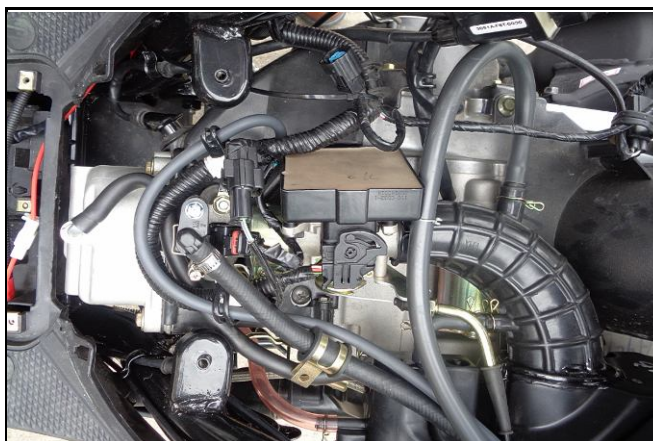


Connect the yellow/red cable to the battery positive terminal and the green/yellow cable to the battery negative terminal.  
Check the continuity of the large terminal end.  
If there is no continuity, replace the relay.



### Starter motor removal

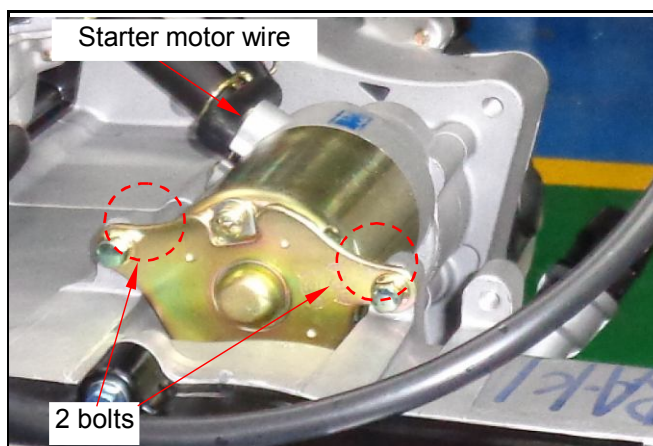
Turn off the main switch.  
Remove the luggage box.  
Disconnect the negative pole wire.  
Remove the air cleaner (2 bolts).



Remove the starter motor wire.  
Remove the starter motor (2 lock bolts).

### Starter motor installation

Install in the reverse order of removal.

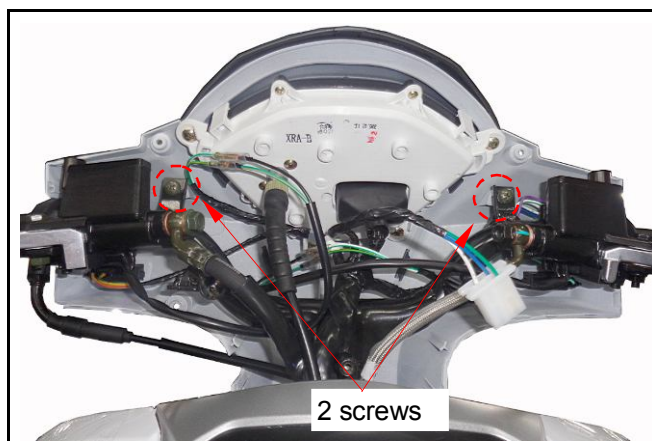


### Meter

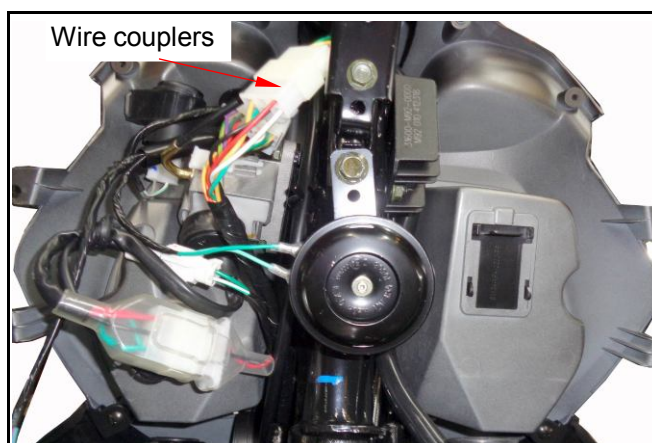
#### Removal

Remove the back mirror and front handle cover.

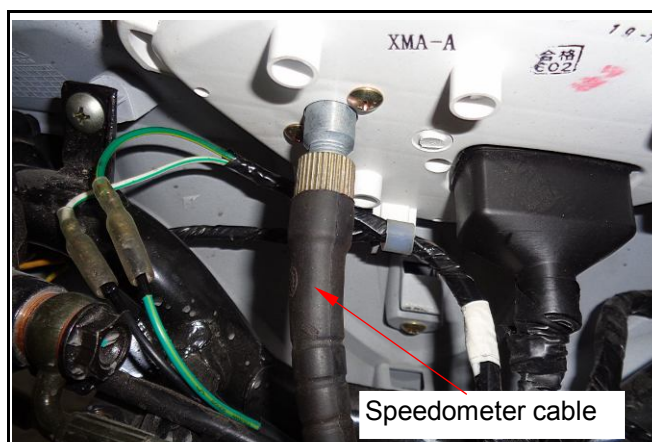
Remove the rear handle cover(2 screws).



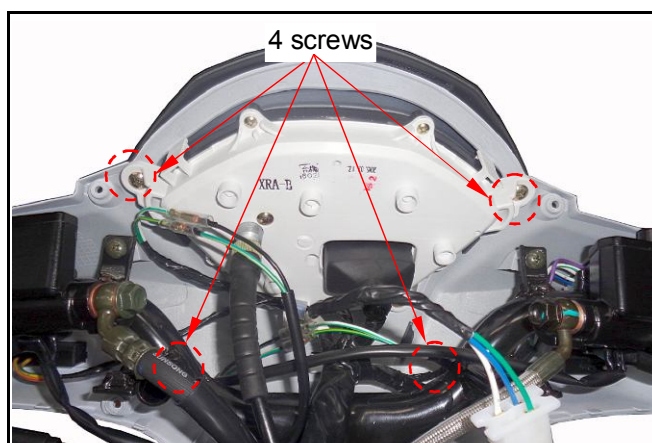
Disconnect the wire couplers.



Disconnect the speedometer cable



Disassemble the meter from the rear handle cover (4 screws).

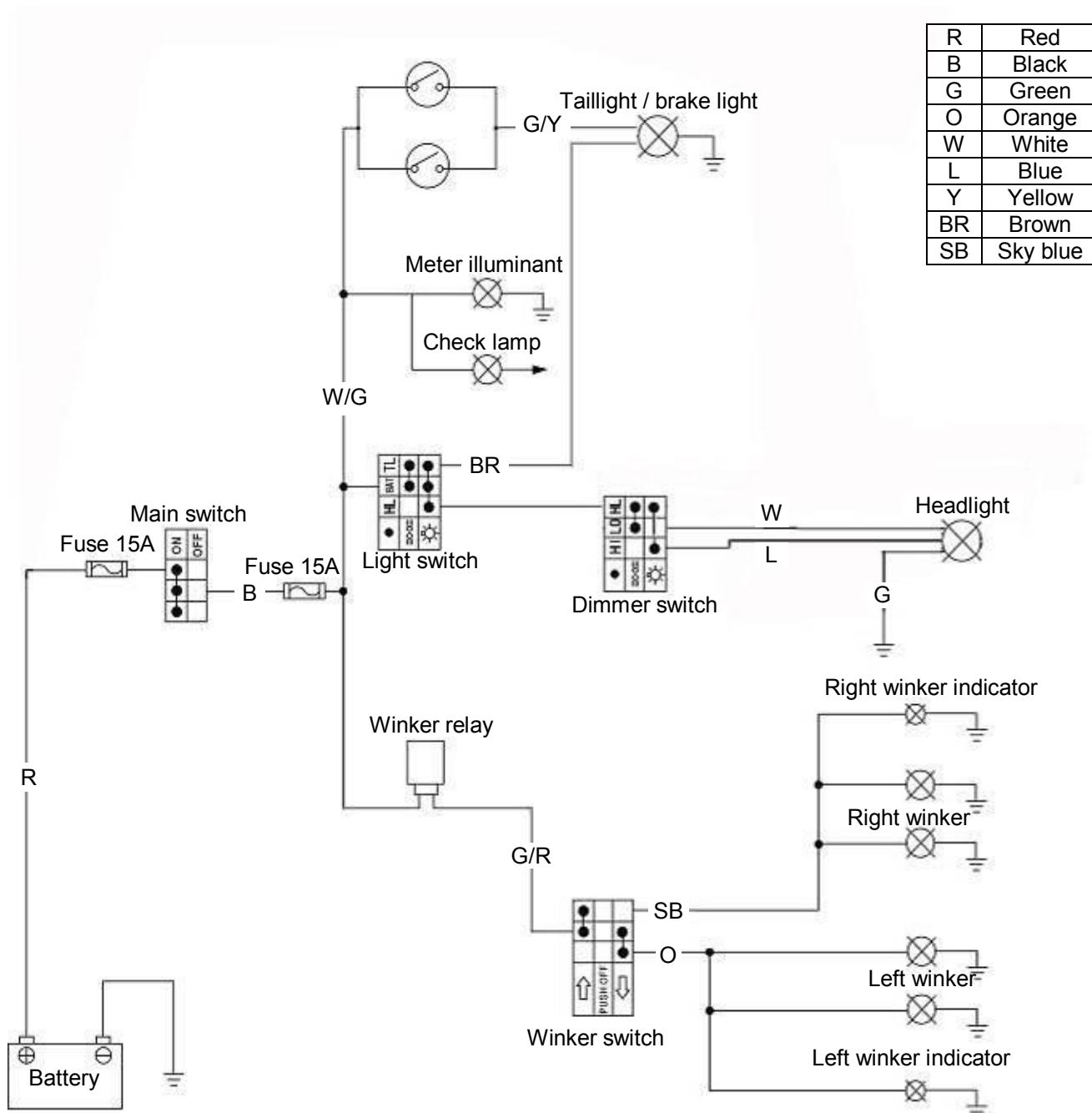


#### Installation

Install in the reverse order of removal.

## Light / Bulb

### Light system circuit



### Headlight

#### Removal

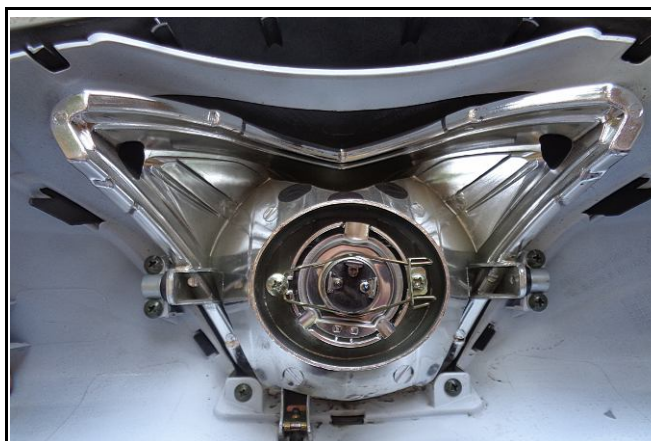
Remove the front cover.



Remove the headlight.

**Specification :**

**12V 35 W**



#### **Caution**

- Never touch the bulb with finger, which will create a heat point.
- Clean the fingerprint left on the bulb with alcohol.



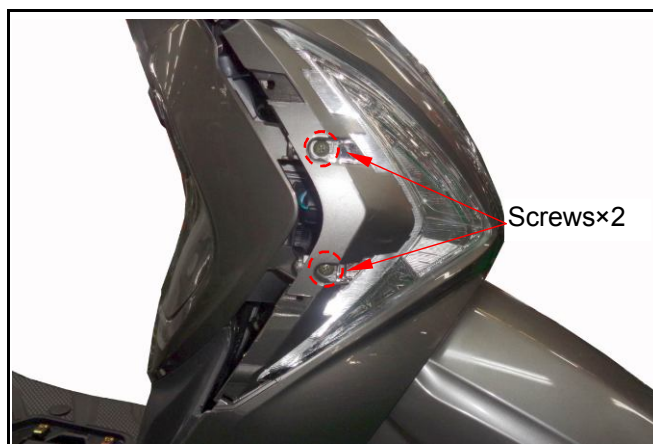
#### Installation

Install in the reverse order of removal.  
Make sure if the headlight works properly.  
Confirm and adjust headlight beam.

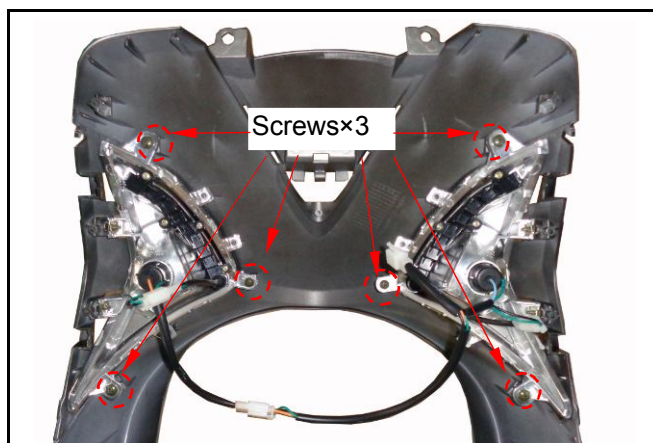


**Front winker bulb replacement**

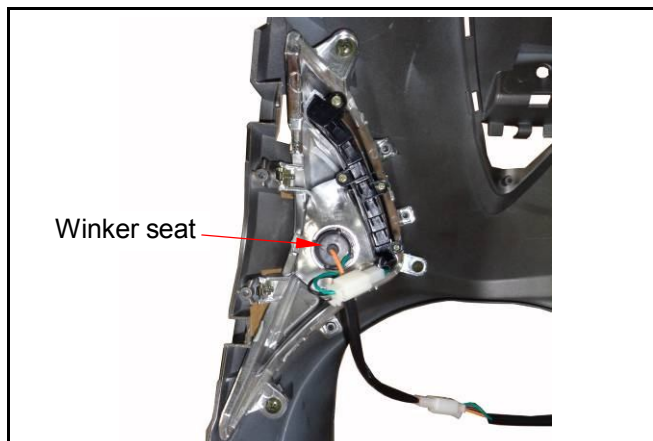
Remove the back mirror lock screws.



Remove the winker set.



Rotate the winker seat counterclockwise and pull out the winker seat.



Press the bulb and rotate it counterclockwise.  
Remove the bulb.  
Replace the bulb if necessary.

**Specification :**

**Winker bulb: 12V 10W**

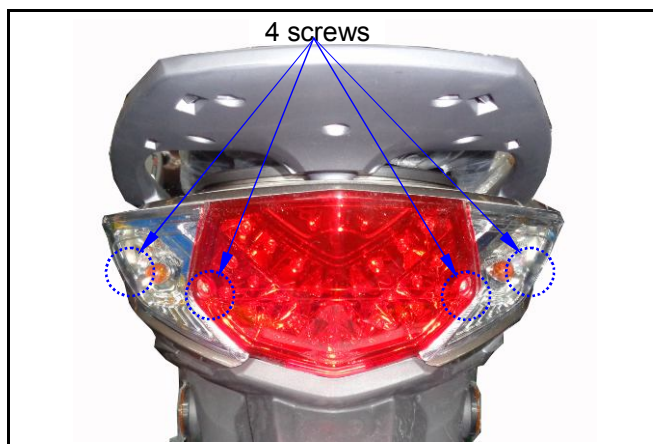
**Installation**

Install in the reverse order of removal.



### Rear winker / taillight bulb replacement

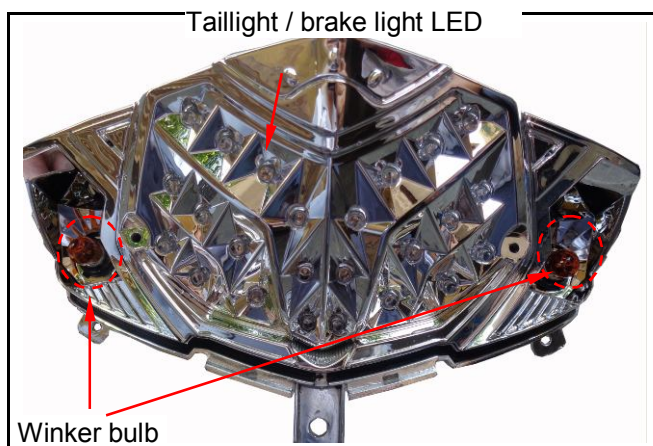
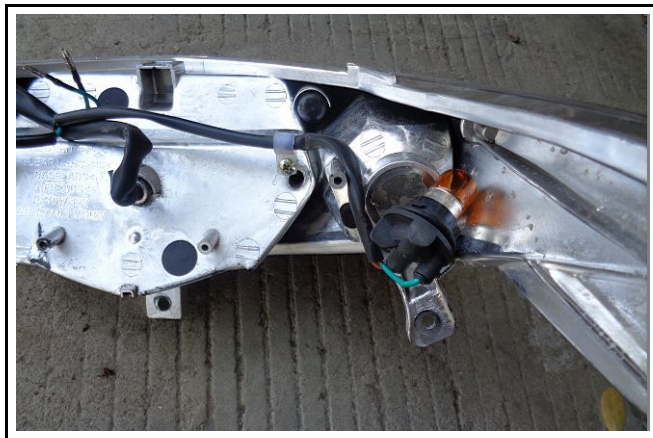
Remove the taillight cover (2 screws).



Press the winker bulb and rotate counterclockwise to remove the bulb. Replace the bulb if necessary.

**Specification :**

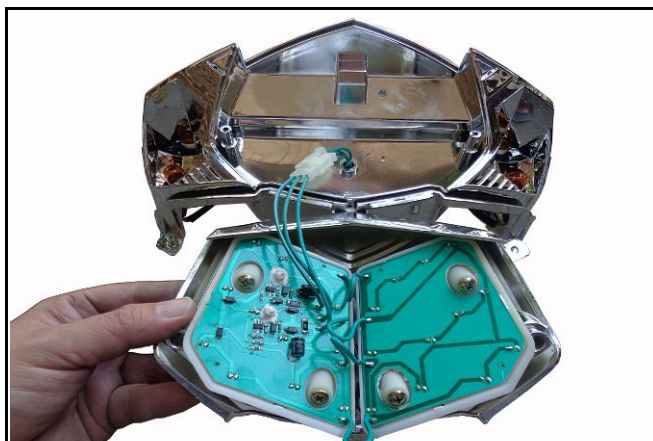
**Winker bulb 2: 12V 10W**



Taillight / brake light bulb: **LED**

### Installation

Install in the reverse order of removal.



**Switch / Horn****Main switch****Inspection**

Remove the front cover and inner cover.

Disconnect the main switch.

Check the following circuit.

Wire color position	Red	Black	Black
LOCK			
OFF			
ON	●	●	●

**Replacement**

Remove the front cover and inner cover.

Disconnect the main switch coupler.

Disconnect the seat-open cable (2 bolts).

Remove the main switch.

**Handlebar switch**

Remove the front handlebar cover and rear cover.

Disconnect the handlebar switch coupler.

Check the following switch circuit.

**Winker switch**

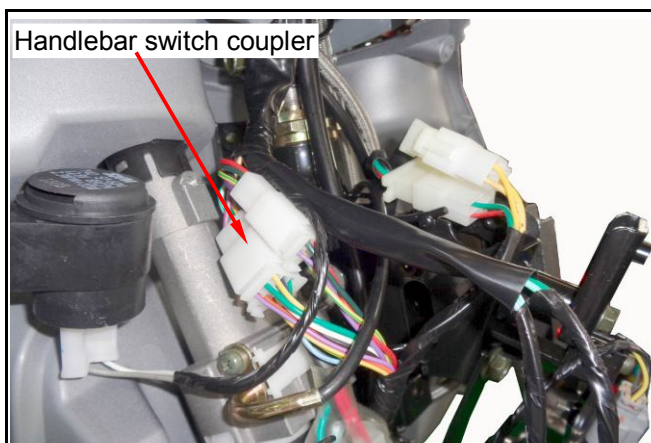
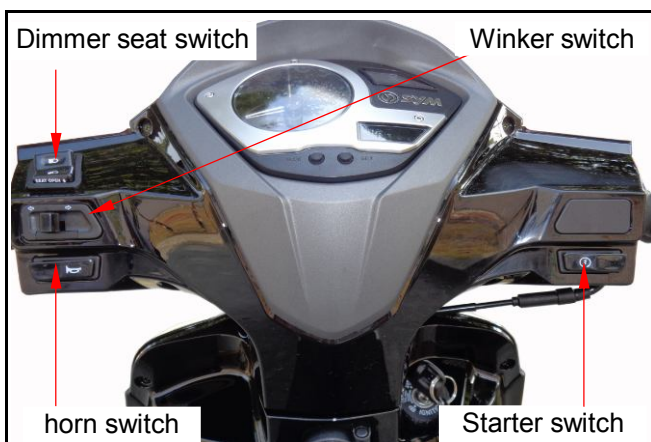
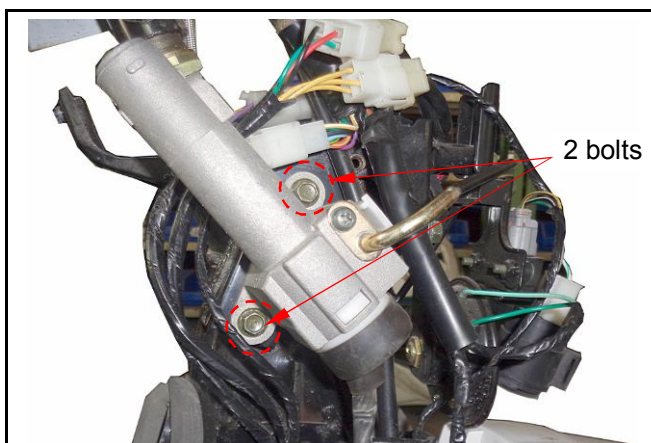
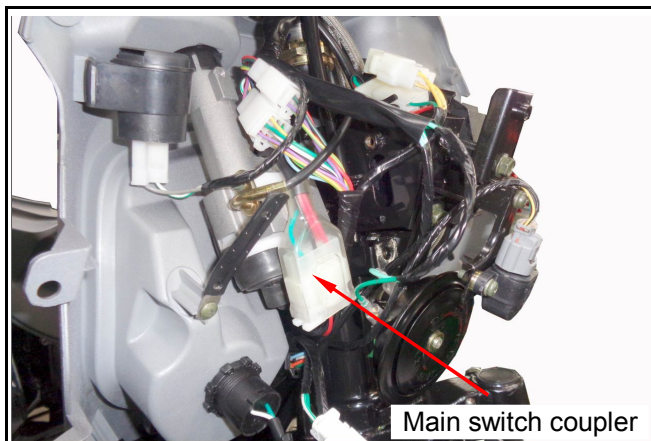
Wire color position	R	WR	L
➔	●	●	
N	FROM R	●	
	PUSH		
	FROM L		●
➔		●	●

**Dimmer seat switch**




Wire color position	W/G	W	L	W/G	PU
☰	●	●			
☷	●		●		
Seat open	●	●		●	●

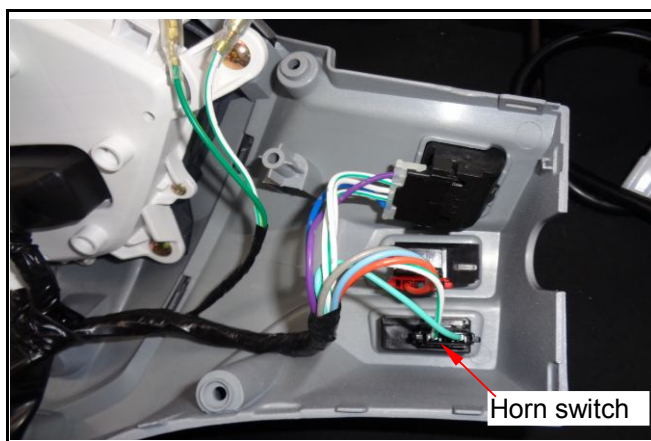
**Starter switch**

terminal position	Y/R	Y/G
FREE		
⚡	●	●



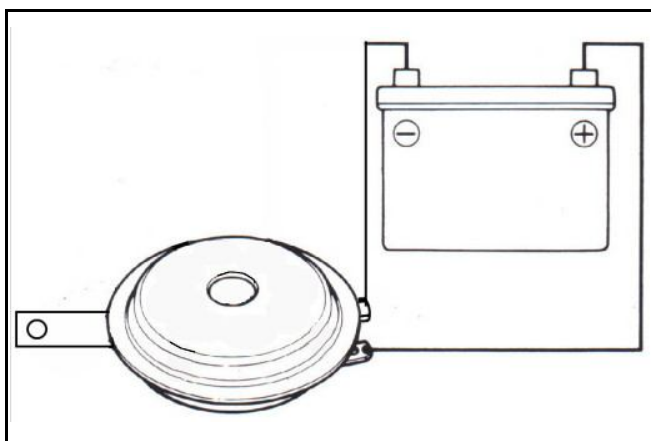
## Horn switch

terminal position	W/G	L/G
FREE		
		



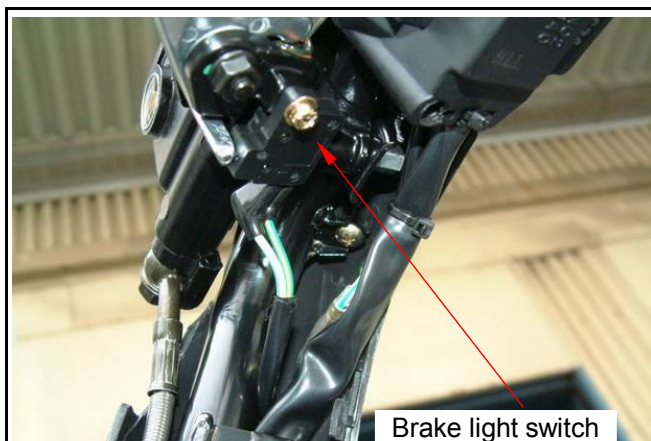
## Horn

Remove the front cover and front lower spoiler.  
Apply 12 V power source to two terminals of the horn and check if the horn makes sound or not.  
Replace the horn if necessary.



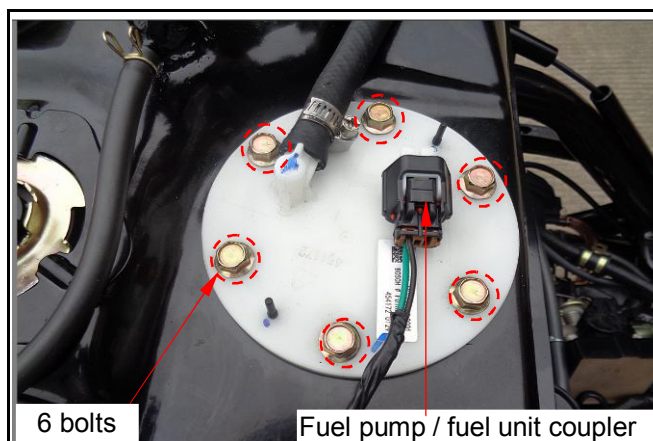
## Brake light switch

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.

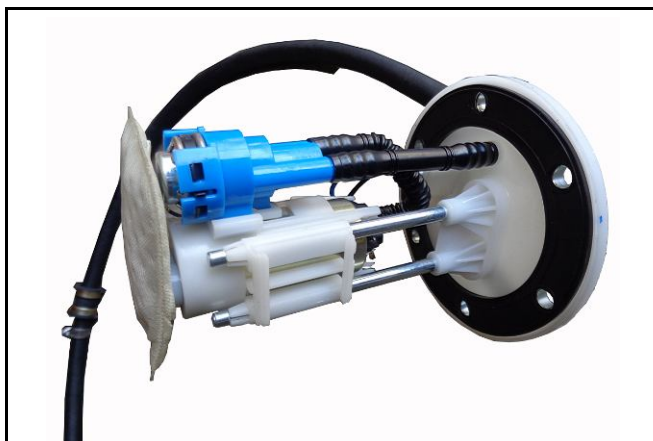


**Fuel pump**

Open the seat.  
 Remove the fuel filler cap  
 Remove the battery cover(screw x 5)  
 Remove the luggage box (bolt x 4, screw x 1).  
 Remove the rear carrier (bolt x 3).  
 Remove the rear fender (bolt x 2).  
 Remove the L/R body cover and rear fender  
 Disconnect the ENG control switch coupler  
 Disconnect the tail light coupler



Remove the fuel unit (bolts x 6).  
 Disconnect the terminals of the fuel pump

**Fuel Unit**

Turn on the main switch.  
 Move the fuel unit float up and down to check if the fuel gauge works properly.

**⚠ Caution**

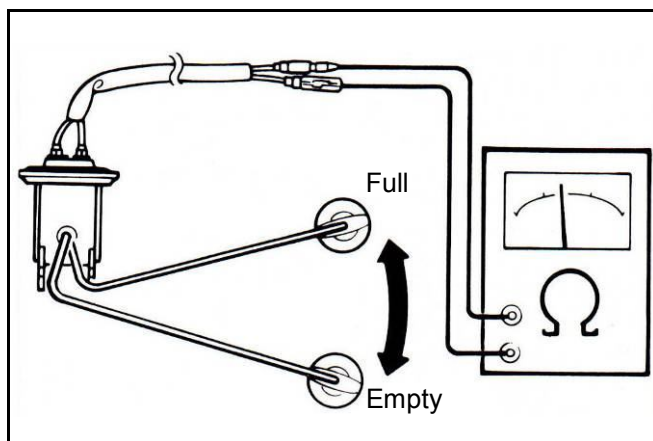
- Great care shall be taken not to damage or bend the float arm of the fuel unit.

Float location	Resistance
Upper	97.5~107.5 $\Omega$
Lower	4~10 $\Omega$

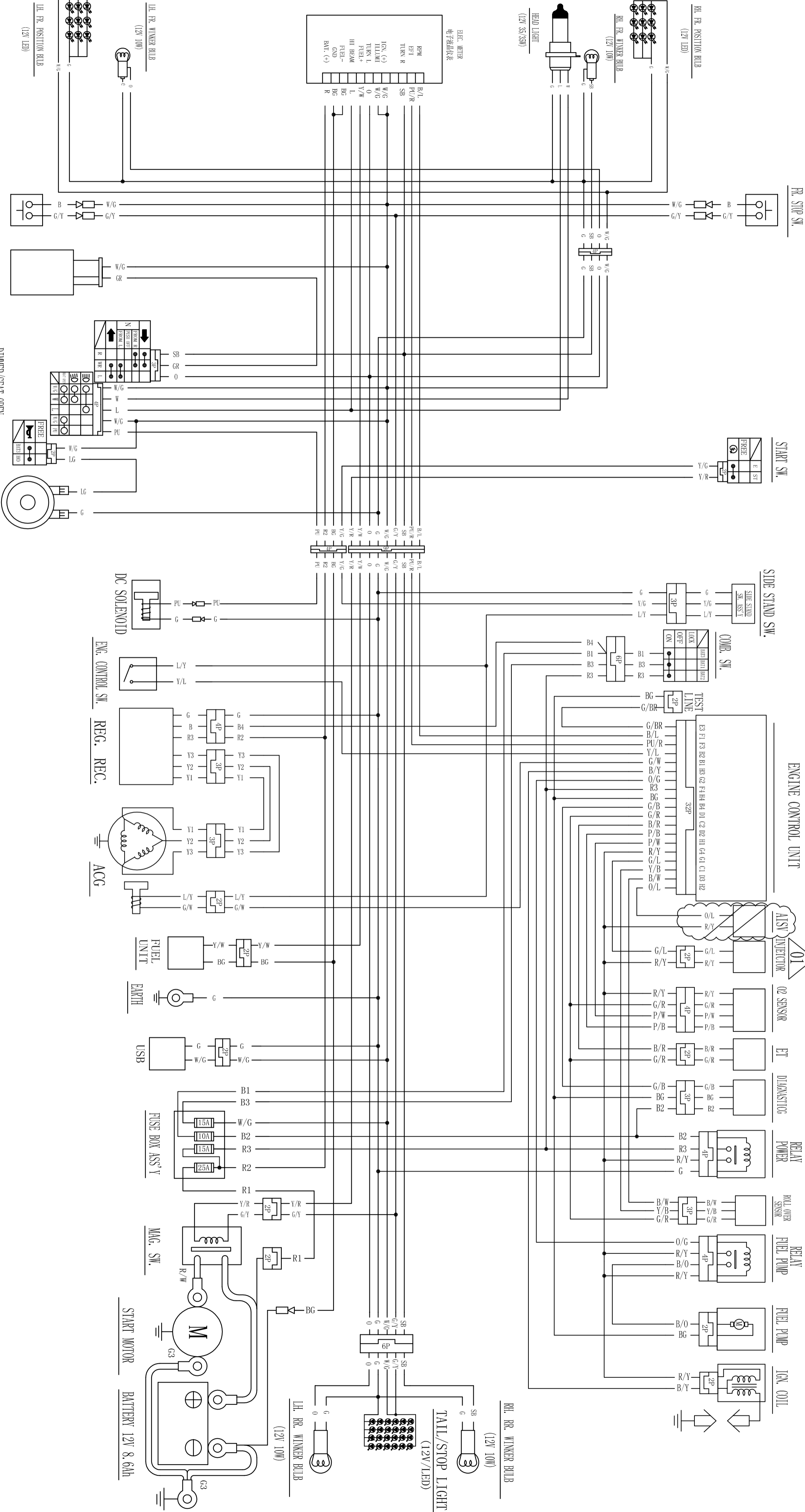
Float location	Fuel gauge
Upper	Full
Lower	Empty

**⚠ Caution**

- While conducting the test, turn on the direction indication lamp to make sure that the battery is in serviceable condition.







PR. STOP SW. WINNER RELAY

DINNER/SEAT OPEN WINNER/HORN SW.

HORN

WINNER SW.

HORN SW.

DINNER & SEAT OPEN

START SW.

COMB. & LOCK SW.

SIDE STAND SW.

CORD COLOR FULL NAME LIST:

R	WR	L
FROM R	●	●
FROM L	●	●
FROM L	●	●

BAT3 HO	●
FREE	●





W/G	W	L	W/G	PU
●	●	●	●	●
SEAT OPEN	●	●	●	●

ST	E
●	●
FREE	●

BAT1	BAT2	BAT3	BAT4
LOCK	OFF	ON	ON
●	●	●	●
线色	R	B	G

地线	G	L/Y	Y/G	地线
A	○	○	○	熄火
B	○	○	○	熄火
C	○	○	○	启动
D	○	○	○	熄火

代号	英文	中文	代号	英文	中文
BG	BOTTLE GREEN	深绿色	O	ORANGE	橙色
Y	YELLOW	黄色	GR	GRAY	灰色
L	BLUE	蓝色	SB	SKY BLUE	天蓝色
G	GREEN	绿色	LG	LIGHT GREEN	浅绿色
R	RED	红色	PU	PURPLE	紫色
W	WHITE	白色	P	PINK	粉红色
B	BLACK	黑色	BR	BROWN	棕色

<p>ITEM: ACG FLYWHEEL PULLER NO: SYM-3111000 PURPOSE: REMOVE ACG FLY WHEEL</p>	<p>ITEM: ONE-WAY CLUTCH &amp; STARTING GEAR LOCK NUT PULLER NO: SYM-9020100 PURPOSE: REMOVE ONE-WAY CLUTCH FIX NUT</p>
	
<p>ITEM: BEARING DISASSEMBLER NO: SYM- 6202Z / 6204 PURPOSE: REMOVE THE BEARING</p>	<p>ITEM: UNIVERSAL HOLDER NO: SYM-2210100 PURPOSE:HOLD THE MDF/CLUTCH OUTER</p>
	
<p>ITEM: CLUTCHSPRING COMPRESSOR NO: SYM-2301000 PURPOSE:DISASSEMBLE THE CLUTCH</p>	<p>ITEM: CLUTCH NUT WRENCH NO: SYM-9020200 PURPOSE:LOOSE THE CLUTCH NUT</p>
	

Special tools list..... 18-1	Crank case / transmission oil seal driver..... 18-8
How to use special tools..... 18-5	AC.G. flywheel puller..... 18-9
R/L. Crank case disassemble / install tools ..... 18-5	Valve cotter remover / install driver... 18-9
Bearing driver ..... 18-6	Outer / inner bearing puller..... 18-10
Water pump bearing / seal driver..... 18-7	Crank case bush puller ..... 18-11

## SPECIAL TOOLS LIST

1		2		3	
					
<b>NAME</b>	R/L. CRANK DISASS. TOOL	<b>NAME</b>	CRANK SHAFT PULLER	<b>NAME</b>	CRANK SHAFT BRG. FIXING SOCKET
<b>NO.</b>	SYM-1120000-H9A	<b>NO.</b>	SYM-1130000-H9A	<b>NO.</b>	SYM-9100210-H9A
<b>PRICE</b>	USD 14.53	<b>PRICE</b>	USD 5.96	<b>PRICE</b>	USD 8.94
4		5		6	
					
<b>NAME</b>	L. CRANK SHAFT BRG. DRIVER	<b>NAME</b>	BEARING DRIVER	<b>NAME</b>	BEARING DRIVER
<b>NO.</b>	SYM-9100200-H9A	<b>NO.</b>	SYM-9110400	<b>NO.</b>	SYM-9610000
<b>PRICE</b>	USD 10.80	<b>PRICE</b>	USD 5.21	<b>PRICE</b>	USD 4.10
7		8		9	
					
<b>NAME</b>	BEARING DRIVER	<b>NAME</b>	WATER PUMP BEARING DRIVER	<b>NAME</b>	WATER PUMP OIL SEAL DRIVER
<b>NO.</b>	SYM-9620000	<b>NO.</b>	SYM-9100100	<b>NO.</b>	SYM-9120500-H9A
<b>PRICE</b>	USD 5.21	<b>PRICE</b>	USD 3.72	<b>PRICE</b>	USD 2.98

## 18. SPECIAL TOOLS


SYM

10		11		12	
					
<b>NAME</b>	WATER PUMP MECHANICAL SEAL DRIVER	<b>NAME</b>	AC.G. FLYWHEEL PULLER	<b>NAME</b>	OIL SEAL DRIVER
<b>NO.</b>	SYM-1721700-H9A	<b>NO.</b>	SYM-3110A00	<b>NO.</b>	SYM-9125500
<b>PRICE</b>	USD 3.72	<b>PRICE</b>	USD 7.82	<b>PRICE</b>	USD 7.82
13		14		15	
					
<b>NAME</b>	OIL SEAL DRIVER	<b>NAME</b>	OIL SEAL DRIVER	<b>NAME</b>	UNIVERSAL HOLDER
<b>NO.</b>	SYM-9121600	<b>NO.</b>	SYM-9120200	<b>NO.</b>	SYM-2210100
<b>PRICE</b>	USD 7.82	<b>PRICE</b>	USD 6.70	<b>PRICE</b>	USD 11.17
16		17		18	
					
<b>NAME</b>	CLUTCH NUT WRENCH	<b>NAME</b>	CLUTCH SPRING COMPRESSOR	<b>NAME</b>	TAPPET ADJUSTING WRENCH
<b>NO.</b>	SYM-9020200	<b>NO.</b>	SYM-2301000	<b>NO.</b>	SYM-9001200
<b>PRICE</b>	USD 7.45	<b>PRICE</b>	USD 14.90	<b>PRICE</b>	USD 2.98

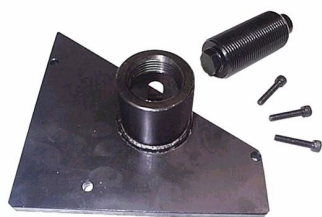
19		20		21	
					
<b>NAME</b>	VALVE SPRING COMPRESSOR	<b>NAME</b>	VALVE COTTER REMOVE & ASSEMBLY TOOL	<b>NAME</b>	UNIVERSAL HOLDER
<b>NO.</b>	SYM-1471100	<b>NO.</b>	SYM-1471110/20	<b>NO.</b>	SYM-9001210
<b>PRICE</b>	USD 16.02	<b>PRICE</b>	USD 8.19	<b>PRICE</b>	USD 17.88
22		23		24	
		 ( φ 30mm)		 ( φ 22mm)	
<b>NAME</b>	RR CUSHION ADJUSTING WRENCH	<b>NAME</b>	CRANK CASE BUSH PULLER	<b>NAME</b>	CRANK CASE BUSH PULLER
<b>NO.</b>	SYM-5320000	<b>NO.</b>	SYM-1120310	<b>NO.</b>	SYM-1120320
<b>PRICE</b>	USD 4.47	<b>PRICE</b>	USD 5.59	<b>PRICE</b>	USD 5.21
25		26			
					
<b>NAME</b>	OUTER BEARING PULLER	<b>NAME</b>	INNER BEARING PULLER		
<b>NO.</b>	SYM-6204010	<b>NO.</b>	SYM-6204020		
<b>PRICE</b>	USD 40.97	<b>PRICE</b>	USD 63.32		

## 18. SPECIAL TOOLS

SYM

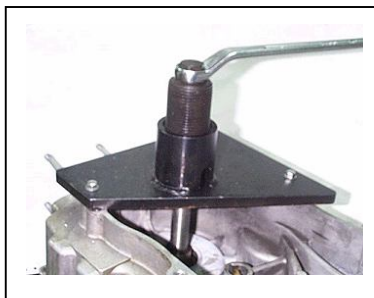
					
<b>NAME</b>	Vacuum pressure gauge	<b>NAME</b>	Fuel pressure gauge	<b>NAME</b>	Multi-meter
<b>MO.</b>	SYM-HT07011	<b>MO.</b>	SYM-HT07010	<b>MO.</b>	SYM-HE07007-01
					
<b>NAME</b>	Cylinder pressure gauge	<b>NAME</b>	Vehicle circuit test tool kit	<b>NAME</b>	Vehicle circuit test harness kit
<b>MO.</b>	SYM-HT07008	<b>MO.</b>	SYM-HE170008	<b>MO.</b>	SYM-HE170008-01
					
<b>NAME</b>	Efi System Diagnostic tool				
<b>MO.</b>					

How to use special tools:



### R/L. CRANK CASE TOOL

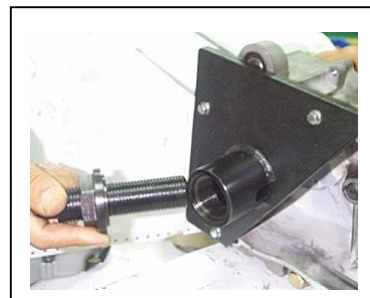
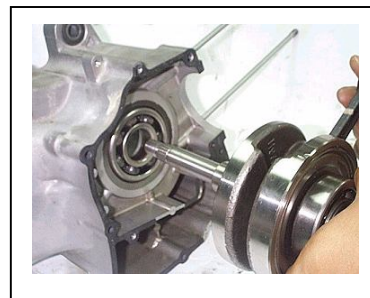
Disassemble the crankcase



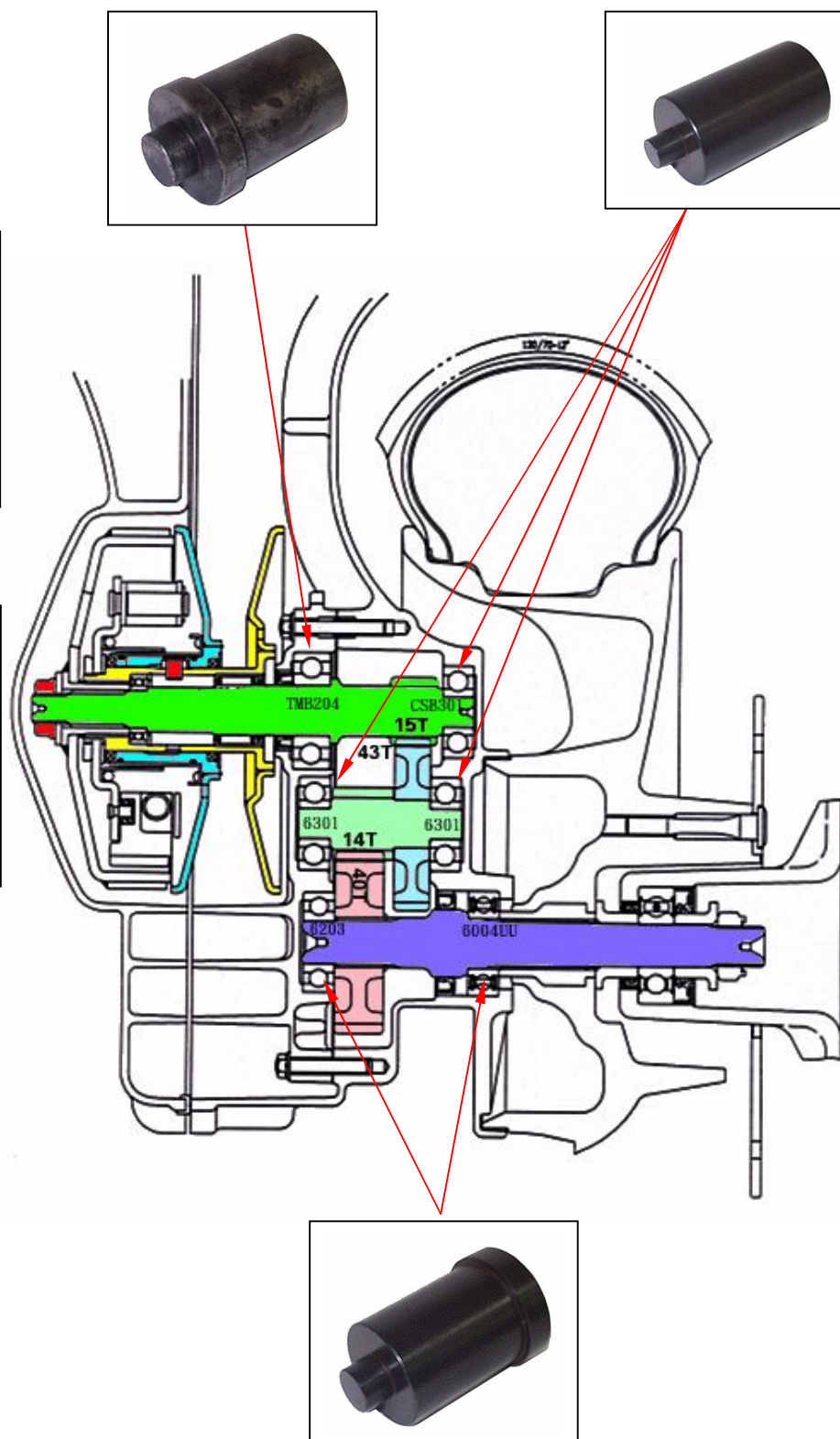
Install the left crank case bearing



Install the crankshaft



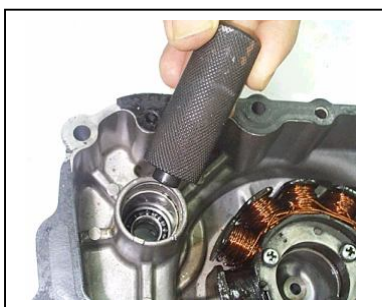
## BEARING DRIVER





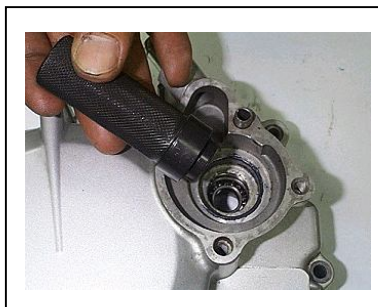
**WATER PUMP  
BEARING DRIVER**

**BEARING (6901)**

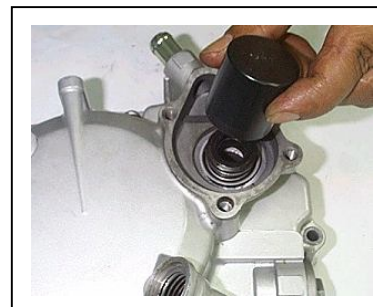
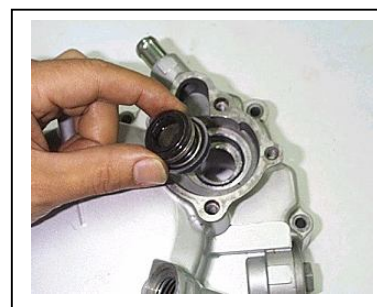


**WATER PUMP OIL SEAL DRIVER**

**INNER OIL SEAL**



**MECHANICAL SEAL**

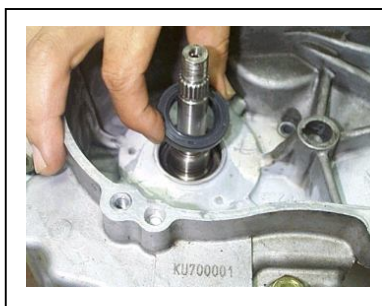




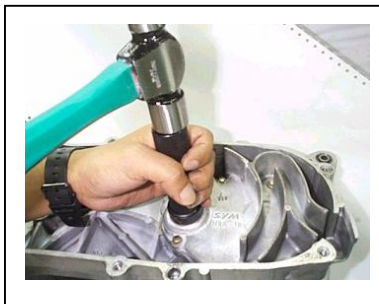
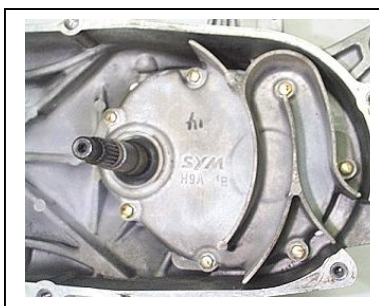
(Seal from transmission side install)

### CRANK CASE / TRANSMISSION OIL SEAL DRIVER

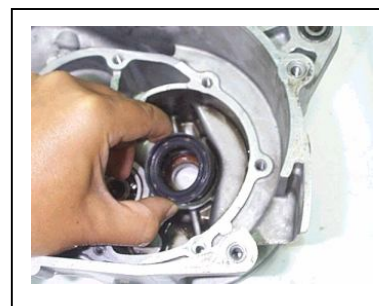
OIL SEAL (25\*40\*7)



OIL SEAL (20\*32\*6)



OIL SEAL (34\*52\*8)



**AC.G. FLYWHEEL PULLER****VALVE COTTER REMOVE /  
INSTALL DRIVER**

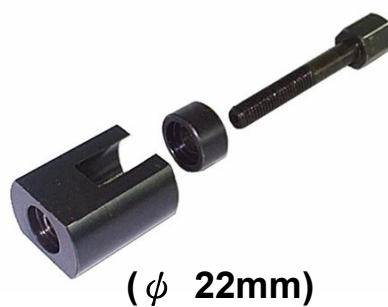
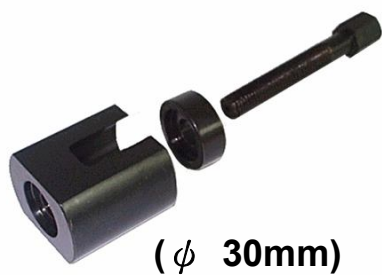


**OUTER BEARING PULLER**



**INNER BEARING PULLER**



**CRANK CASE BUSH PULLER / DRIVER****REMOVER****INSTALL**

**NOTE:**