



**SYM**

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*Joyride 125 / 200i EVO*

*X'PRO RV125 / 200 EFI*

# SERVICE MANUAL





This service manual contains the technical data of each component inspection and repair for the Sanyang JOYRIDE 125/200i EVO, X'PRO RV 125/200 EFi 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, JOYRIDE 125/200i EVO, X'PRO RV 125/200 EFi, are different from that of the photos, pictures shown in this manual, the actual vehicle shall prevail. Specifications are subject to change without notice.

**Service Department  
Sanyang Industry Co., LTD.**

## How to Use This Manual

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This service manual describes basic information of different system parts and system inspection & service for Sanyang JOYRIDE 125/200i EVO, X'PRO RV 125/200 EFi 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 thirteenth chapter covers the engine and driving systems.

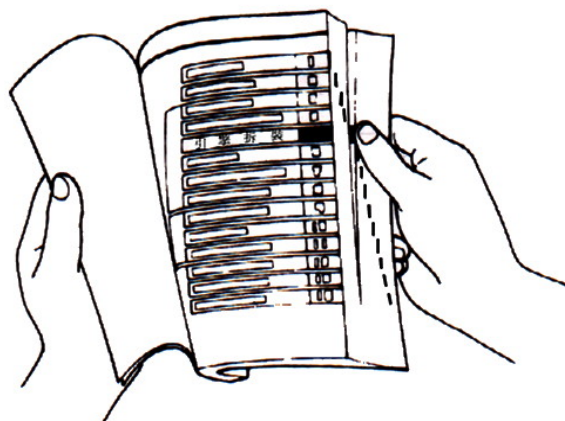
The fourteenth to the seventeenth is contained the parts set of assembly body.

The eighteenth chapter is electrical equipment.

The nineteenth chapter is special tool.

The twentieth chapter is wiring diagram

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



There are 4 buttons, "[Foreword](#)", "[Contents](#)", "[How to Use This Manual](#)" and "[Mechanism Illustration](#)" in the PDF version, and can be access to these items by clicking on the buttons.

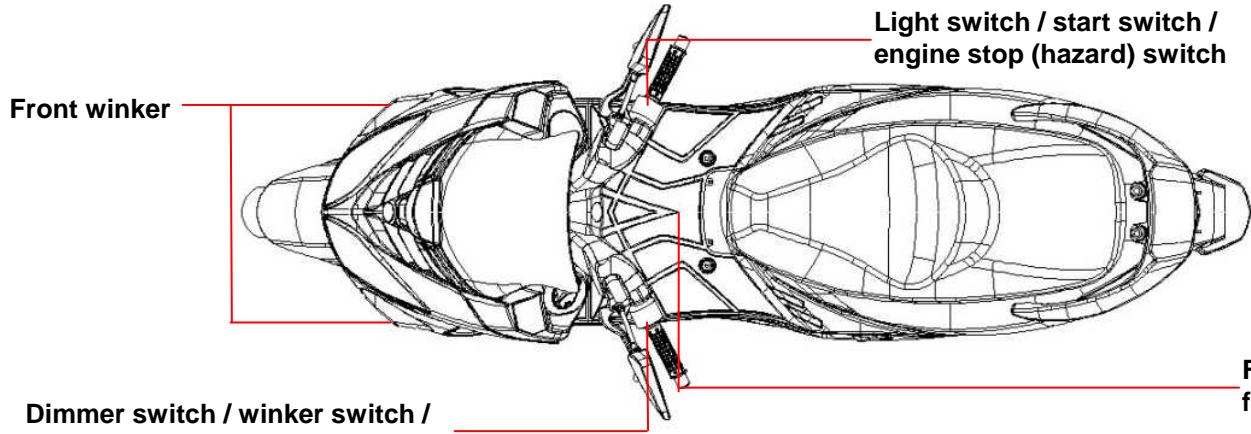
If user wants to look for the content of each chapter, selecting the words of each chapter on the contents can reach to each chapter. There are two buttons, "Homepage and contents, on the top line of first page of the each chapter. Thus, if the user needs to check other chapters, he can click the top buttons to back the homepage or contents. The content of each chapter can be selected too. Therefore, when needs to checking the content inside of the chapter, click the content words of the chapter so that can back to the initial section of the content. In addition, there is a "[To this Chapter Contents](#)" button at the second page of each content so that clicking the button can back to the contents of this chapter.

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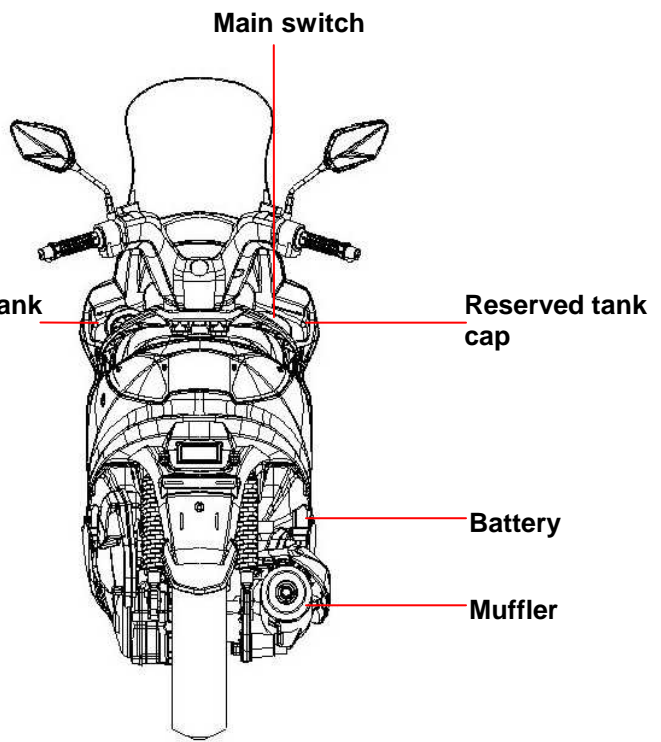
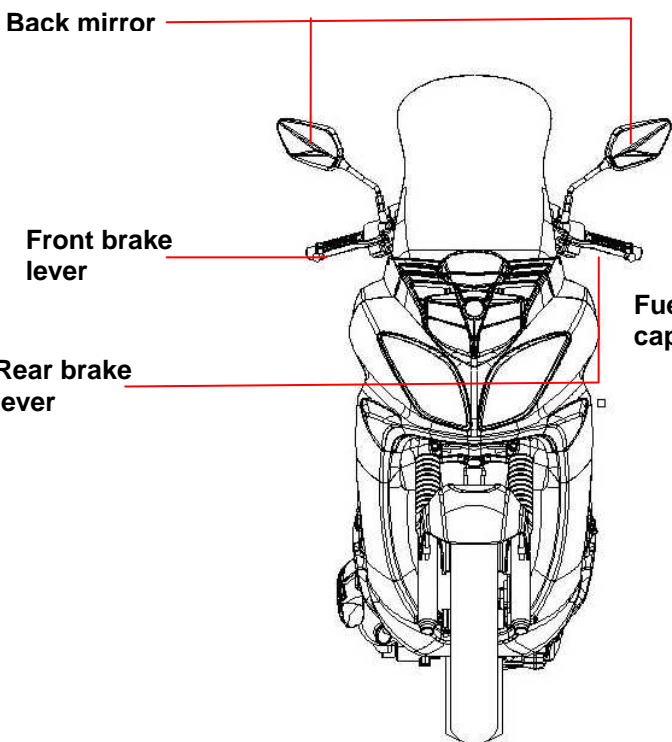
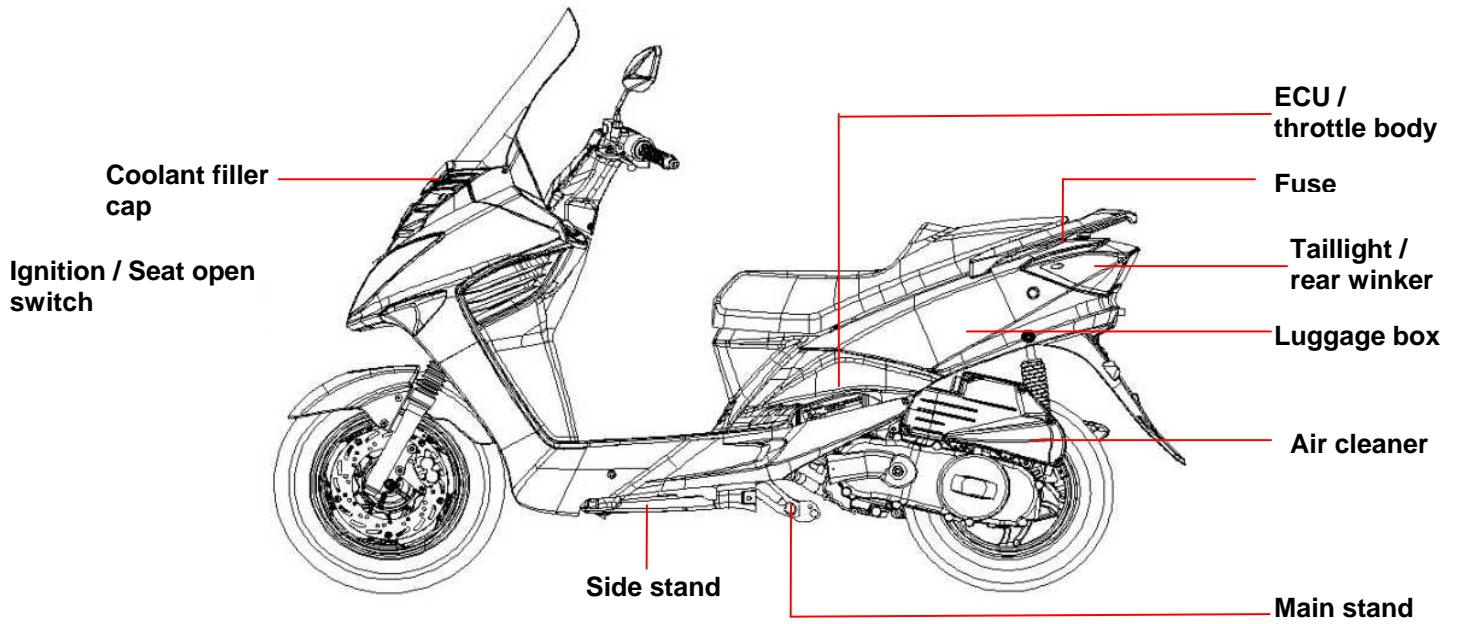




# Mechanism Illustration



Dimmer switch / winker switch / horn switch / seat open (passing) switch



# 1. GENERAL INFORMATION

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## 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.

	Warning	Means that serious injury or even death may result if procedures are not followed.
	Caution	Means that equipment damages may result if procedures are not followed.
	Engine oil	Limits to use SAE 20 JASO FC class oil. Warranty will not cover the damage that caused by not apply with the limited engine oil. (Recommended oil: MAX-2 serial oils)
	Grease	King Mate G-3 is recommended.
	Gear oil	King Mate gear oil serials are recommended. (Bramax HYPOID GEAR OIL # 140)
	Locking sealant	Apply sealant, medium strength sealant should be used unless otherwise specified.
	Oil seal	Apply with lubricant.
	Renew	Replace with a new part before installation.
	Brake fluid	Use recommended brake fluid DOT3 or WELLRUN brake fluid.
	Special tools	Special tools.
	correct	Meaning correct installation.
	wrong	Meaning wrong installation.
	Indication	Indication of components.
	directions	Indicates position and operation directions.
		Components assembly directions each other.
		Indicates where the bolt installation direction, --- means that bolt cross through the component (invisibility).

# 1. GENERAL INFORMATION

## 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 verified. We recommend that you wash your hands with soap and water right after contacting. Keep the used oil beyond reach of children.

### 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 and 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 air hose or a dry brush to clean components of the brake system, use a vacuum cleaner or the equivalent to avoid dust flying.

#### Caution

Inhaling brake shoe or pad ash may cause disorders and cancer of the breathing system.

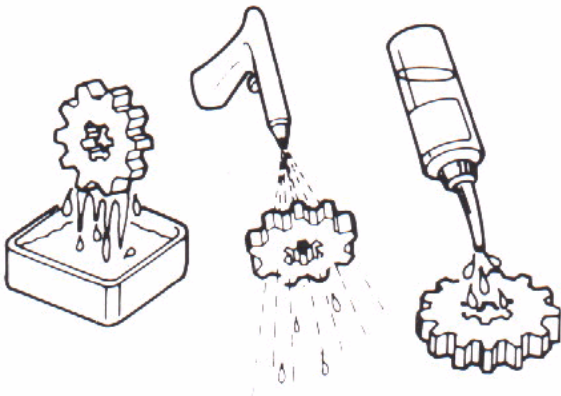
### Brake fluid

#### 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 the brake fluid beyond reach of children.

## Service Precautions

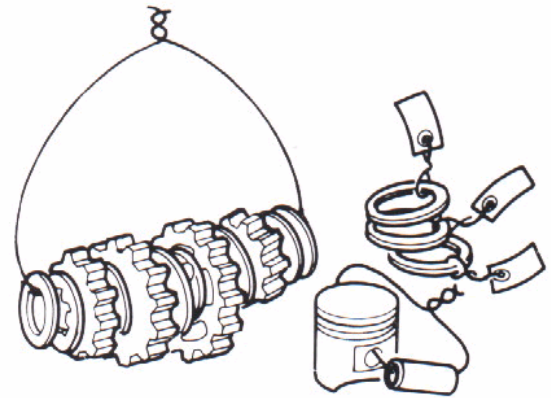
- Always use with Sanyang genuine parts and recommended oils. Using non-designed parts for Sanyang motorcycle may damage the motorcycle.
- Special tools are designed for remove and install of components without damaging the parts being worked on. Using wrong tools may result in parts damaged.
- When 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 unsmooth 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.



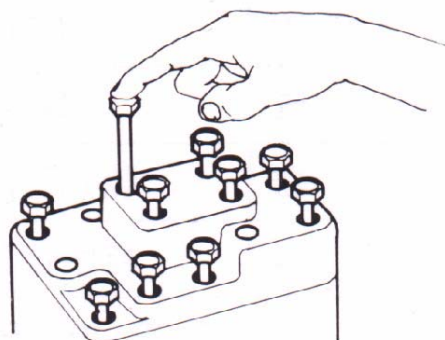
### ⚠ Caution

In addition to damaging paint finish, brake oil can also damage the structural integration of plastic or rubber parts.



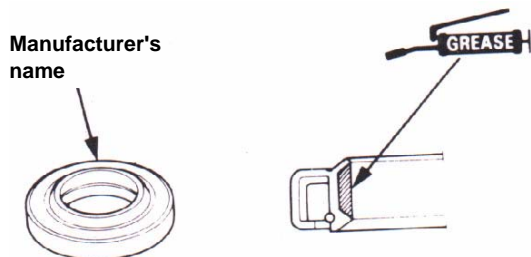
# 1. GENERAL INFORMATION

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

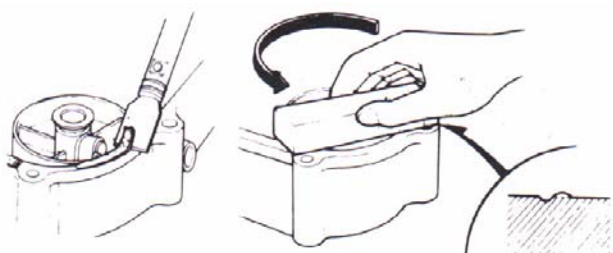


- Tighten assemblies with different dimension fasteners as follows: Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless otherwise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

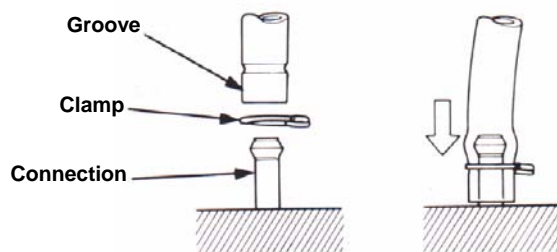
- When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.



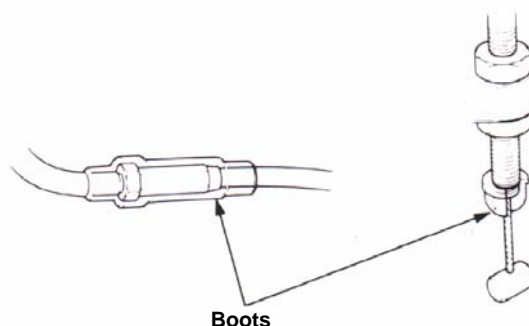
- Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any damage.



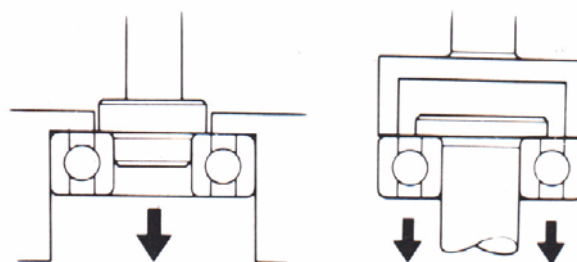
- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.



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



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



Both of these examples can result in bearing damage.

- Lubricate the rotation face as assembling. Check if positions and operation for installed parts is in correct and properly.

## Specifications

Maker		SANYANG		MODEL		LF12W-6/F		
WEIGHT DIMENSION	Overall Length	2100 mm		Suspension System	Front	Telescopic Fork		
	Overall Width	760 mm			Rear	Unit Swing		
	Overall Height	1390 mm		Tire Specifications	Front	110 / 90-13 56P		
	Wheel Base	1440 mm			Rear	130 / 70-12 64L		
	Curb Weight	Front	63 kg		Brake System	Front	Disk (φ 273mm)	
		Rear	93 kg			Rear	Disk (φ 200mm)	
		Total	156 kg					
	Passengers/Weight	Two /170 kg		PERFORMANCE	Max. Speed	>100 km/hr		
	Total Weight	Front	97 kg		Climb Ability	28°		
		Rear	229 kg		Primary Reduction	Belt		
Total		326 kg			Secondary Reduction	Gear		
Type	Gasoline		Clutch	3-piece centrifugal, dry type				
Position and arrangement	Horizontal, below center, CYL incline 80°		Transmission	C.V.T.				
Fuel Used	>92 Unleaded gasoline		Speed meter	0 ~ 140 km/hr				
Cycle/Cooling	4-stroke/water cooled		Horn	93 – 112 dB/A				
Cylinder	Bore	Ø 57 mm		Muffler	Expansion & Pulse Type			
	Stroke	48.8 mm		Exhaust Pipe Position and Direction	Right Side & Backward			
	Number/Arrangement	Single Cylinder		Lubrication System	Forced Circulation & Splashing			
Displacement	124.5 cc		Exhaust Concentratio	Co	< 2.0 g/km			
Compression Ratio	10.5 : 1			HC	< 0.8 g/km			
Max. HP	13 ps / 8500 rpm			NOx	< 0.15 g/km			
Max. Torque	1.1 kg-m / 6500 pm		E.E.C.	-				
Ignition	C.D.I		P.C.V.	-				
Starting System	Kick & Electrical Starter		Catalytic Converter	Equipped				

# 1. GENERAL INFORMATION

## Specifications

Maker		SANYANG	MODEL		LF12W2-7		
WEIGHT DIMENSION	Overall Length	2100 mm	Suspension System	Front	TELESCOPIC FORK		
	Overall Width	760 mm		Rear	Unit SWING		
	Overall Height	1390 mm	Tire Specifications	Front	110 / 90-13 56P		
	Wheel Base	1440 mm		Rear	130 / 70-12 64L		
	Curb Weight	Front	63 kg	Brake System	Front	DISK (φ 273mm)	
		Rear	93 kg		Rear	DISK (φ 200mm)	
		Total	156 kg				
	Passengers/Weight		Two /170 kg	PERFORMANCE	Max. Speed		>100 km/hr
	Total Weight	Front	97 kg		Climb Ability		28°
		Rear	229 kg		Primary Reduction		BELT
Total		326 kg	Secondary Reduction		GEAR		
Type		Gasoline	Clutch		3-piece centrifugal, dry type		
Position and arrangement		Horizontal, below center, CYL incline 80°	Transmission		C.V.T.		
Fuel Used		>92 Unleaded gasoline	Speed meter		0 ~ 140 km/hr		
Cycle/Cooling		4-stroke/water cooled	Horn		93 – 112 dB/A		
ENGINE	Cylinder	Bore	∅ 57 mm	Muffler		Expansion & Pulse Type	
		Stroke	48.8 mm	Exhaust Pipe Position and Direction		Right Side & Backward	
		Number/Arrangement	Single Cylinder	Lubrication System		Forced pressure and wet sump	
	Displacement		124.5 cc	Exhaust Concentration	Co	< 2.0 g/km	
	Compression Ratio		10.5 : 1		HC	< 0.8 g/km	
	Max. HP		13 ps / 8500 rpm		NOx	< 0.15 g/km	
	Max. Torque		1.1 kg-m / 6500 pm	E.E.C.		-	
	Ignition		Full Transistor Ignition	P.C.V.		Equipped	
	Starting System		Electrical Starter	Catalytic converter		Equipped	

## Specifications

Maker		SANYANG		MODEL		LF18W-A/W3-H/W5-C		
WEIGHT DIMENSION	Overall Length	2100 mm		Suspension System	Front	TELESCOPIC FORK		
	Overall Width	760 mm			Rear	UNIT SWING		
	Overall Height	1390 mm		Tire Specifications	Front	110 / 90-13 56P		
	Wheel Base	1440 mm			Rear	130 / 70-12 64L		
	Net Weight	Front	63 kg		Brake System	Front	DISK (φ 273mm)	
		Rear	93 kg			Rear	DISK (φ 200mm)	
		Total	156 kg					
	Passengers/Weight		Two /170 kg		PERFORMANCE	Max. Speed	>109 km/hr	
	Total Weight	Front	97 kg			Climb Ability	28°	
		Rear	229 kg			Primary Reduction	BELT	
Total		326 kg		Secondary Reduction		GEAR		
Type		Gasoline		Clutch	3-piece centrifugal, dry type			
Position and arrangement		Horizontal, below center, CYL incline 80°		Transmission	C.V.T.			
Fuel Used		>92 Unleaded gasoline		Speed meter	0 ~ 140 km/hr			
Cycle/Cooling		4-stroke/water cooled		Horn	93 – 112 dB/A			
ENGINE	Cylinder	Bore	Ø 61 mm		Muffler	Expansion & Pulse Type		
		Stroke	58.6 mm		Exhaust Pipe Position and Direction	Right Side & Backward		
		Number/Arrangement	Single Cylinder		Lubrication System	Forced pressure and wet sump		
Displacement		171.2 cc		Exhaust Concentration	Co	< 12.0 g/km		
Compression Ratio		10 : 1			HC	< 1.0 g/km		
Max. HP		13 / 8000 ps/rpm			NOx	-		
Max. Torque		1.2 / 6000 kg-m/rpm		E.E.C.	-			
Ignition		C.D.I.		P.C.V.	Equipped			
Starting System		Kick & Electrical Starter		Catalytic converter	Equipped			



# 1. GENERAL INFORMATION

## Specifications

Maker		SANYANG	MODEL		LF18W-6/W1-9/W2-7/W4-8	
WEIGHT DIMENSION	Overall Length	2100 mm	Suspension System	Front	TELESCOPIC FORK	
	Overall Width	760 mm		Rear	UNIT SWING	
	Overall Height	1390 mm	Tire Specifications	Front	110 / 90-13 56P	
	Wheel Base	1440 mm		Rear	130 / 70-12 64L	
	Curb Weight	Front	63 kg	Brake System	Front	DISK (φ 273mm)
		Rear	93 kg		Rear	DISK (φ 200mm)
		Total	156 kg			
	Passengers/Weight		Two /170 kg	PERFORMANCE	Max. Speed	>109 km/hr
	Total Weight	Front	97 kg		Climb Ability	28°
		Rear	229 kg		Primary Reduction	BELT
Total		326 kg	Secondary Reduction		GEAR	
Type		Gasoline	Clutch		3-piece centrifugal, dry type	
Position and arrangement		Horizontal, below center, CYL incline 80°	Transmission		C.V.T.	
Fuel Used		>92 Unleaded gasoline	Speed meter		0 ~ 140 km/hr	
Cycle/Cooling		4-stroke/water cooled	Horn	93 – 112 dB/A		
ENGINE	Cylinder	Bore	∅ 61 mm	Muffler	Expansion & Pulse Type	
		Stroke	58.6 mm	Exhaust Pipe Position and Direction	Right Side & Backward	
		Number/Arrangement	Single Cylinder	Lubrication System	Forced pressure and wet sump	
	Displacement	171.2 cc	Exhaust Concentration	Co	< 2.0 g/km	
	Compression Ratio	10 : 1		HC	< 0.3 g/km	
	Max. HP	15 / 8000 ps/rpm		NOx	< 0.15 g/km	
	Max. Torque	1.35 / 6500 kg-m/rpm	E.E.C.		-	
	Ignition	Full Transistor Ignition	P.C.V.		- / Equipped	
	Starting System	Electrical Starter	Catalytic converter		Equipped	

## 1. GENERAL INFORMATION

### Torque Values

Item	Q'ty	Thread Dia. (mm)	Torque Value (Kgf-m)	Remarks
Cylinder head bolt	4	8	2.0-2.4	Apply oil to thread
Valve clearance adjust nut	4	5	0.7-1.1	
Spark plug	1	10	1.0-1.4	
L. Crankcase cover bolts	7	6	1.1-1.5	
Crankcase bolts	7	6	0.8-1.2	
Oil drain bolt	1	8	1.1-1.5	
Oil strainer cap	1	30	1.3-1.7	
Gear oil drain bolt	1	6	1.0-1.4	
Gear oil inspection bolt	1	6	1.0-1.4	
Transmission cover bolt	7	6	1.0-1.4	
Flywheel bolt	1	14	5.0-6.0	
Clutch driving plate bolt	1	28	5.0-6.0	
Driving disc nut	1	12	5.0-6.0	
Clutch outer cover nut	1	10	3.5-4.5	
Transmission cover bolts	7	6	1.0-1.4	
Stopper nut for engine hanger bracket	1	8	1.8-2.2	
Nut for engine hanger bracket	1	10	4.0-5.0	
Bolt for engine hanger bracket	1	10	4.0-5.0	
Engine mounting bolt	1	10	3.5-4.5	
Front wheel shaft nut	1	12	5.0-7.0	
Rear wheel shaft nut	1	14	11.0-13.0	
Bolt for rear shock absorber (upper)	2	10	3.5-4.5	
Bolt for rear shock absorber (under)	2	8	2.4-3.0	
Bolt for steering rod	1	10	4.0-5.0	
Front shock absorber	4	8	2.4-3.0	
Brake arm bolts	2	6	0.8-1.2	
Brake hose bolts	4	10	3.3-3.7	
Bolt for brake caliper	4	10	3.0-3.5	
Bolts for the lining guide pin	4	6	1.6-2.0	
Brake disk bolts	7	10	4.0-4.5	
Mounting screw for speedometer cable	1	5	0.15-0.3	
Muffler bolts	4	8	3.2-3.8	
Mounting bolts for exhaust pipe connection	2	7	1.0-1.2	

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

## 1. GENERAL INFORMATION

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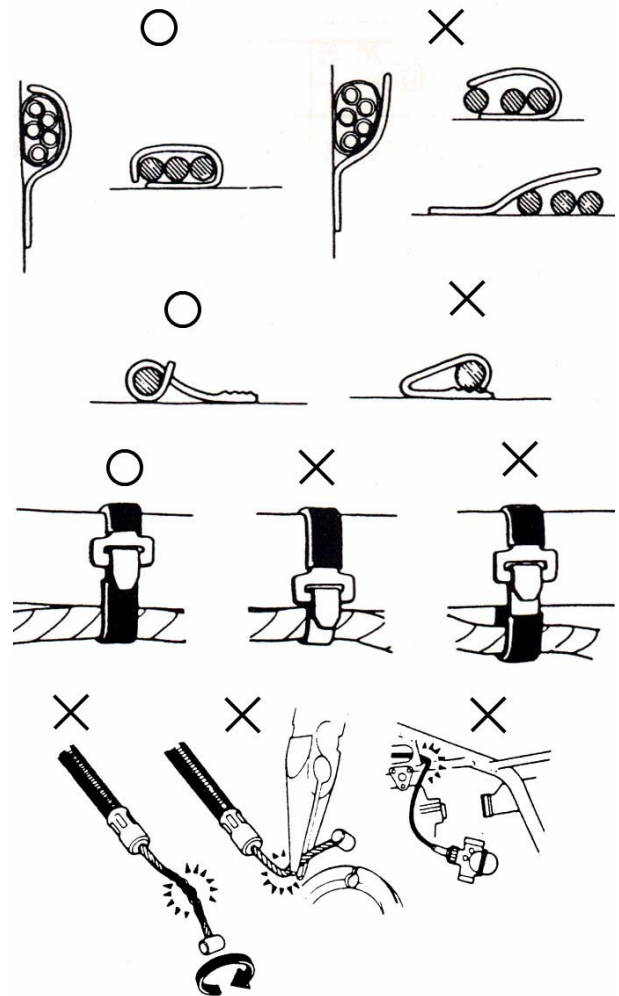
### Standard Torque Values for Reference

Type	Torque value kgf-m
5 mm Bolt, Nut	0.45 - 0.6
6 mm Bolt, Nut	0.8 - 1.2
8 mm Bolt, Nut	1.8 - 2.5
10 mm Bolt, Nut	3.0 - 4.0
12 mm Bolt, Nut	5.0 - 6.0
5 mm Screw	0.35 - 0.5
6 mm Screw & 6mm bolt with 8mm head	0.7 - 1.1
6 mm Flange bolt, nut	1.0 - 1.4
8 mm Flange bolt, nut	2.4 - 3.0
10 mm Flange bolt, nut	3.5 - 4.5

## Cables and Harness Routing

Note the following when routing cables and wire harnesses:

- A loose wire, cable or harness may cause safety hazard. After clamping, check each wire to make sure it is secured.
- Do not squeeze wires against the weld or its clamp.
- 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.
- 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.
- Route wire harnesses to avoid sharp edges or corners.
- Avoid the projected ends of bolts and screws.
- Keep wire harnesses far away from the exhaust pipes and other hot parts.
- Be sure grommets are seated in their grooves properly.
- After clamping, check each harness to be certain that it is not interfered with any moving or sliding parts.
- After routing, check that the wire harnesses are not twisted or kink.
- 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.
- Thoroughly clean the surface where tape is to be applied.
- Wrap electrical tape around the damaged parts or replace them.

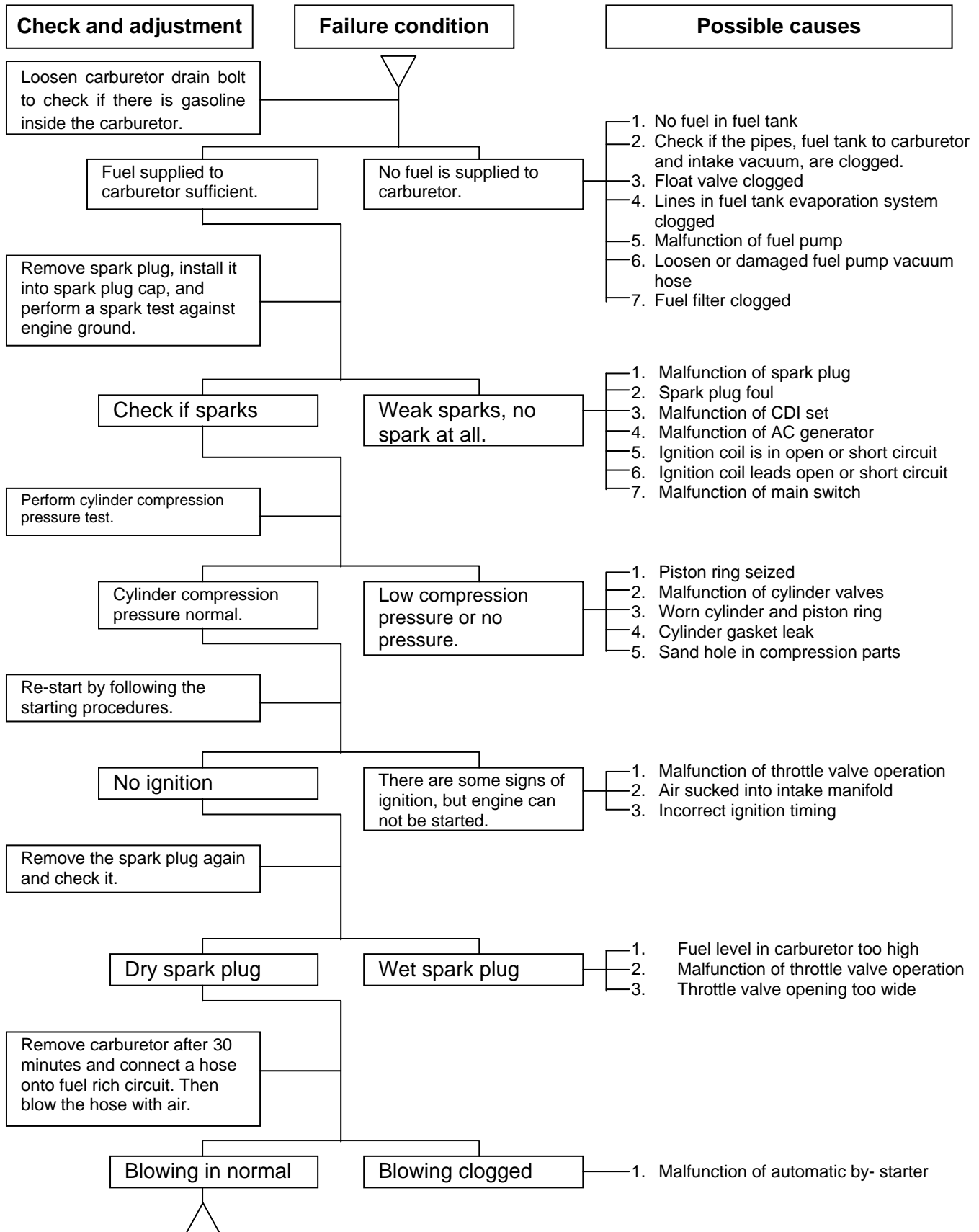


○ : correct  
 × : wrong

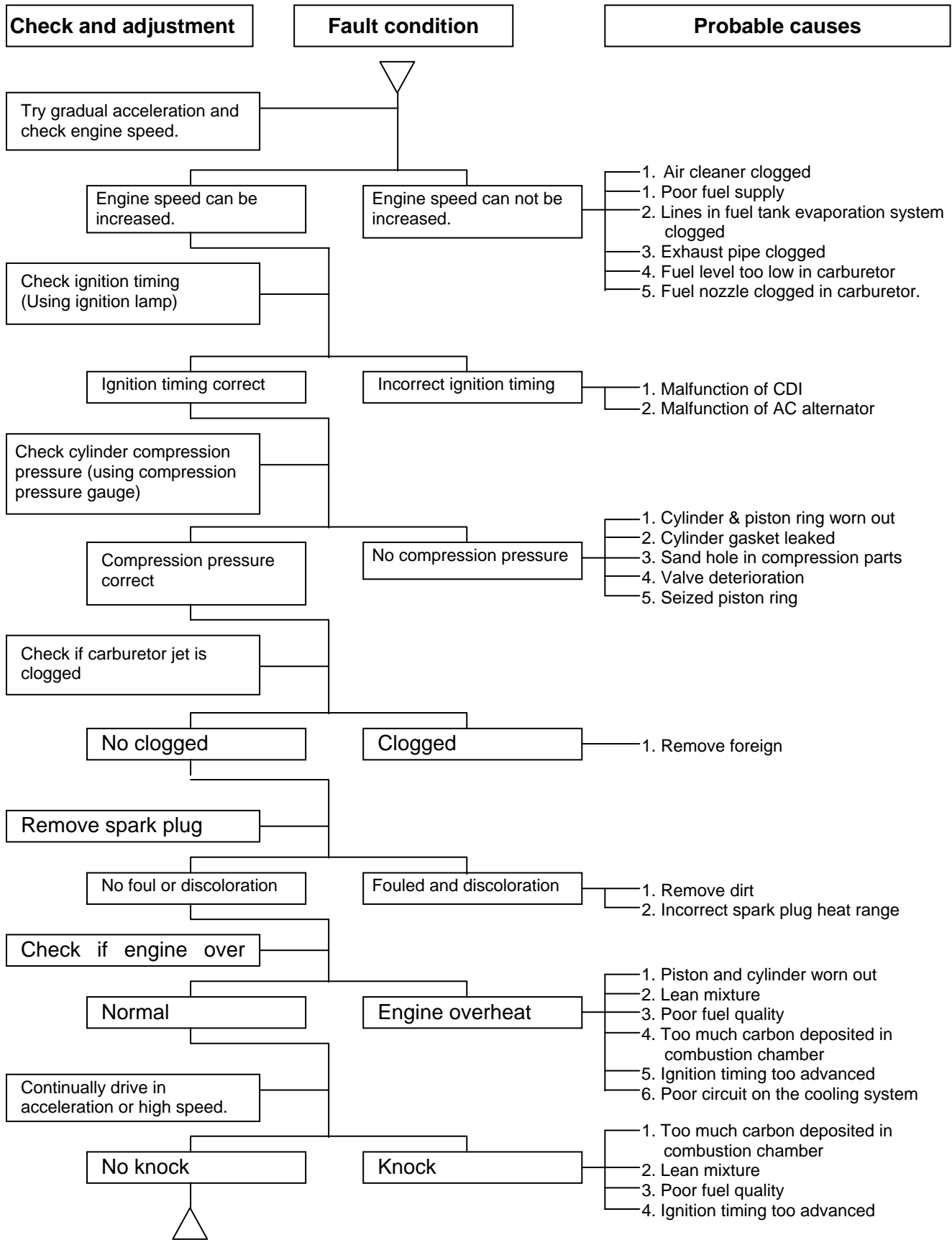
# 1. GENERAL INFORMATION

## Troubleshooting-Carburetor model

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

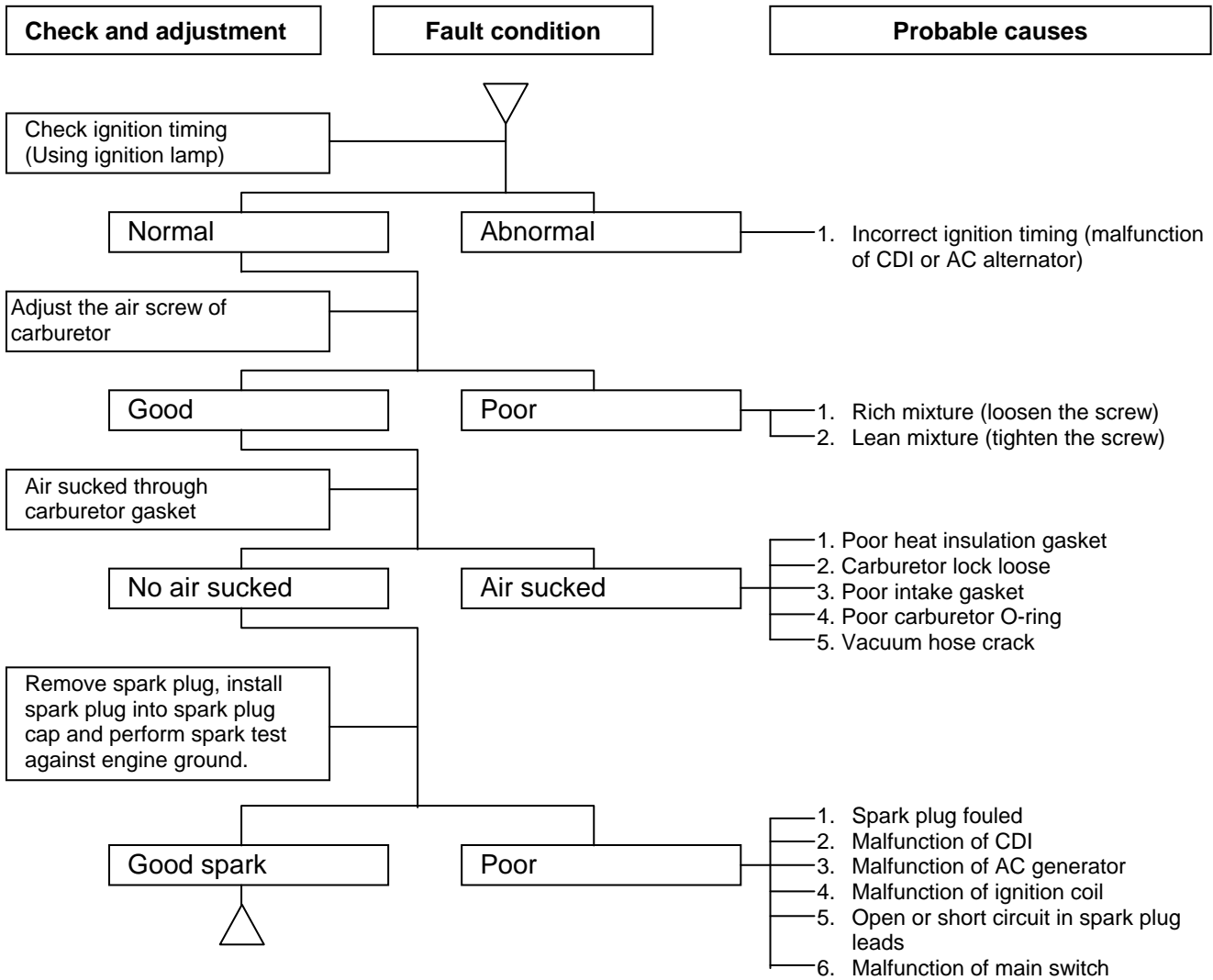


**B. Engine run sluggish (Speed does not pick up, lack of power)**

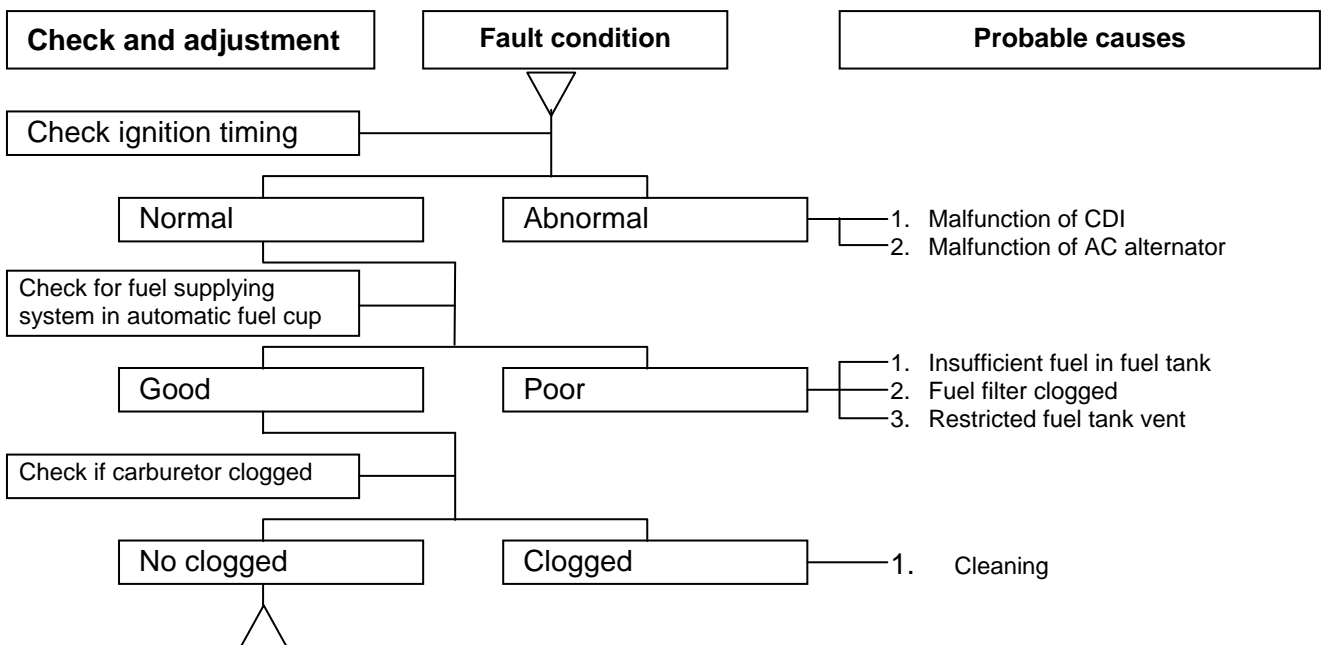


# 1. GENERAL INFORMATION

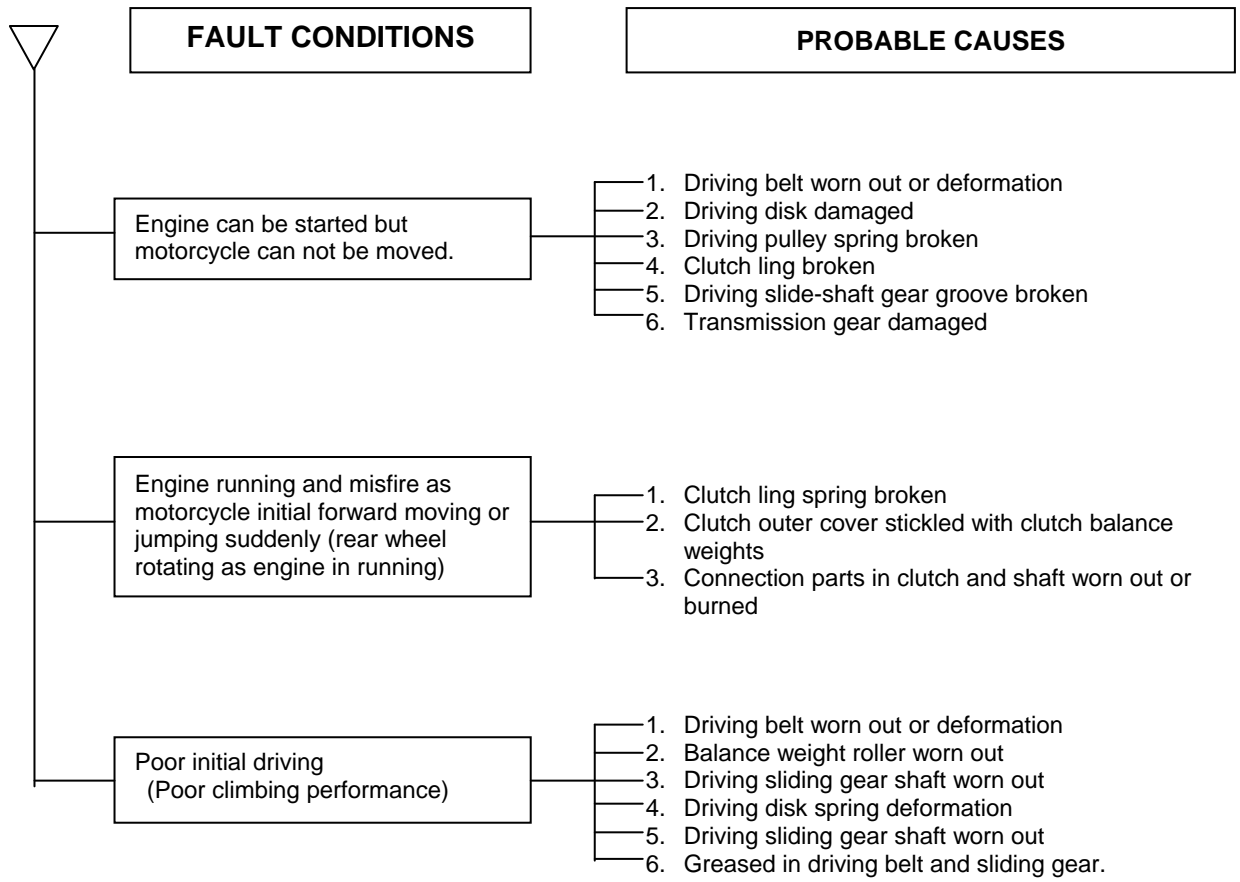
## C. Engine runs sluggish (especially in low speed and idling)



## D. Engine runs sluggish (High speed)



E. Clutch, Driving And Driving Pulley

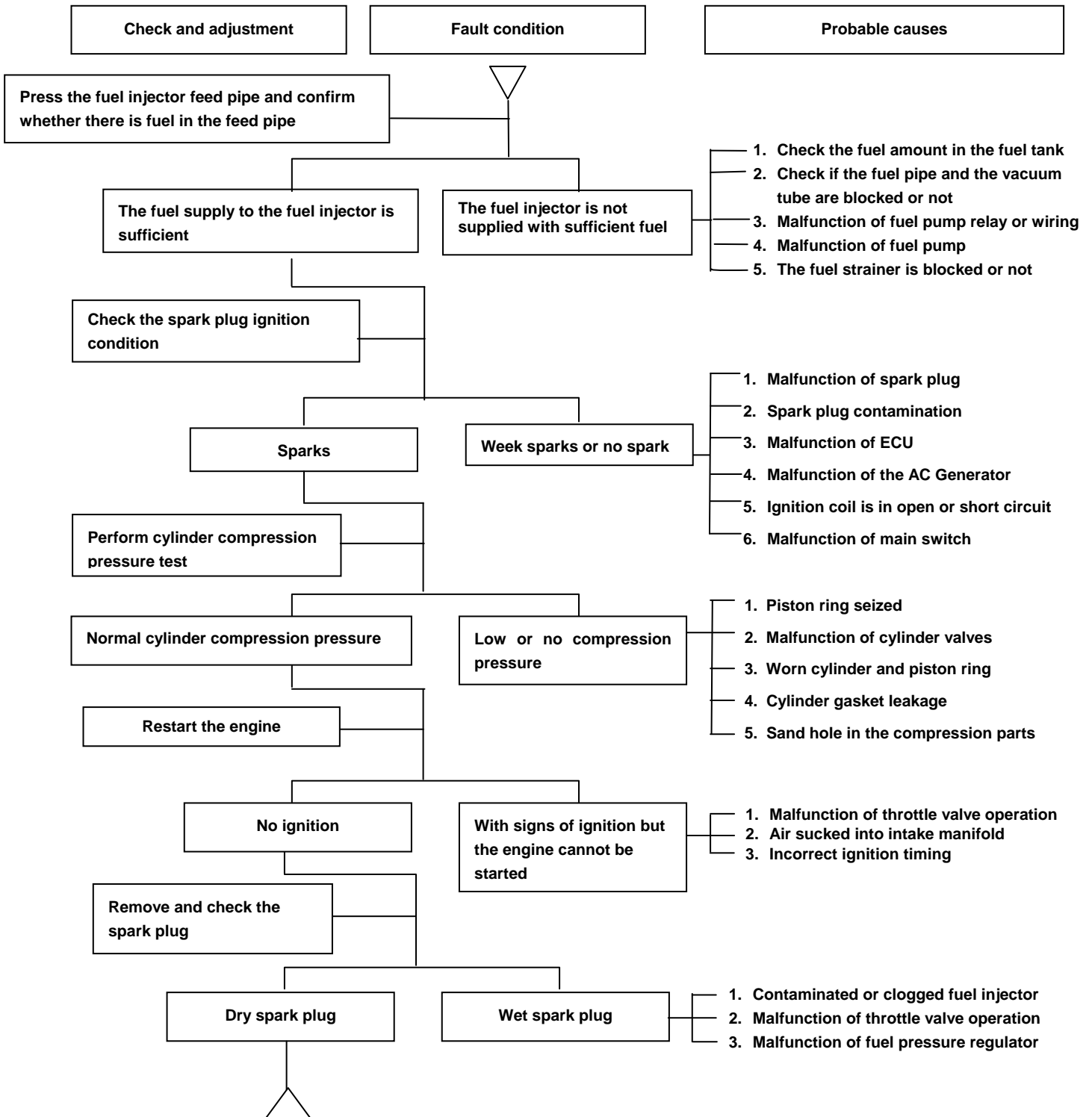




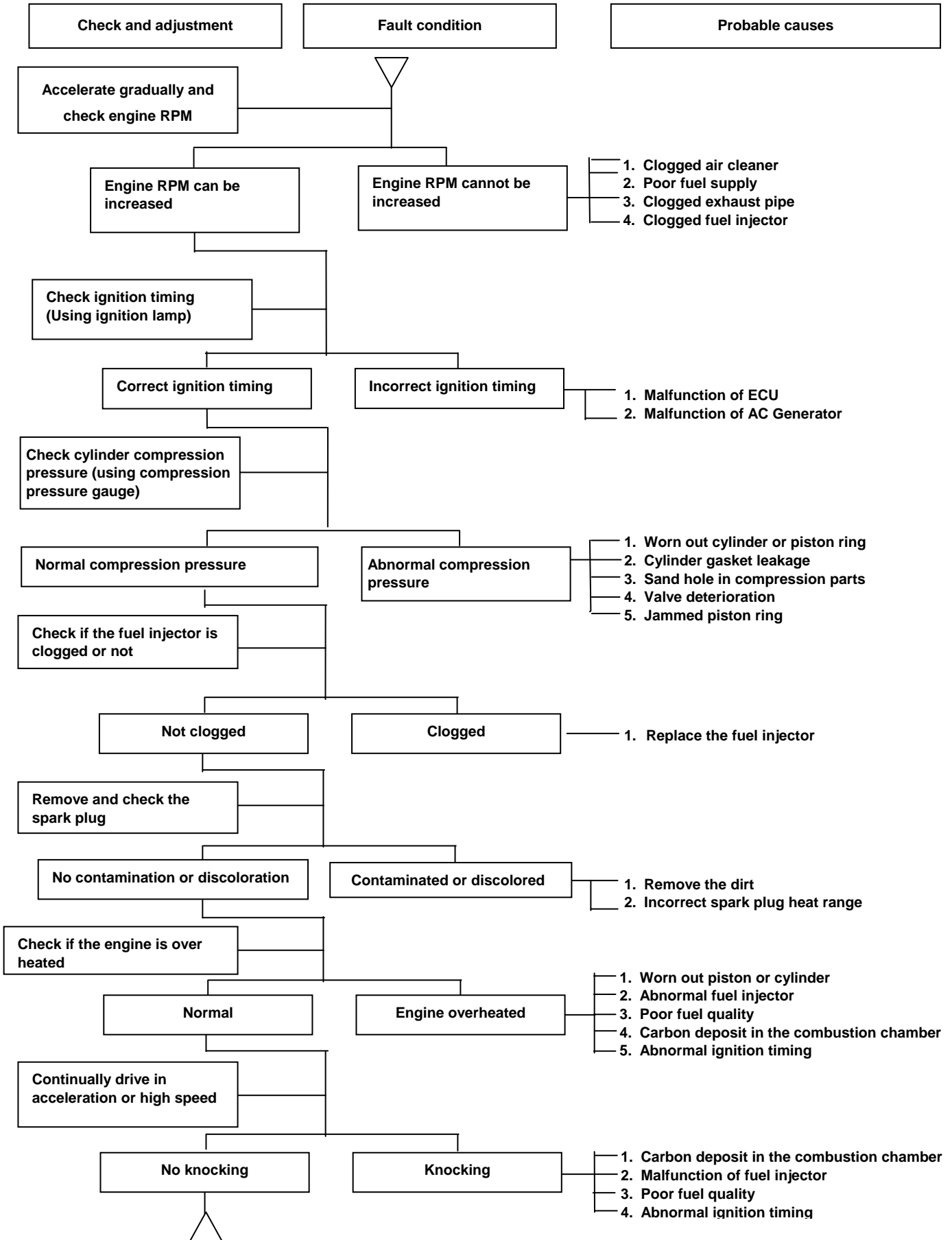
# 1. GENERAL INFORMATION

## Troubleshooting-EFi model

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

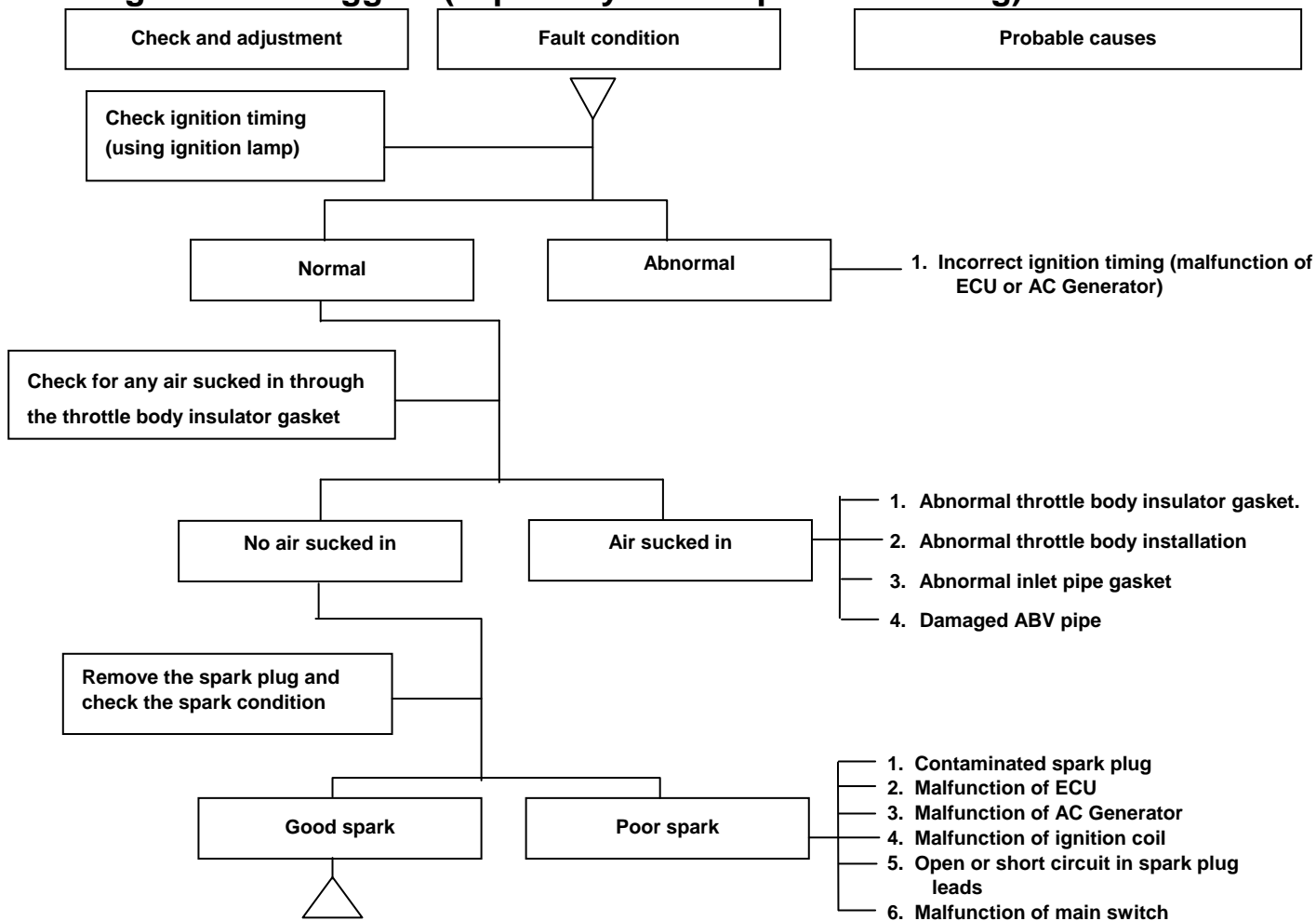


**B. Engine runs sluggish (Speed does not pick up, lack of power)**

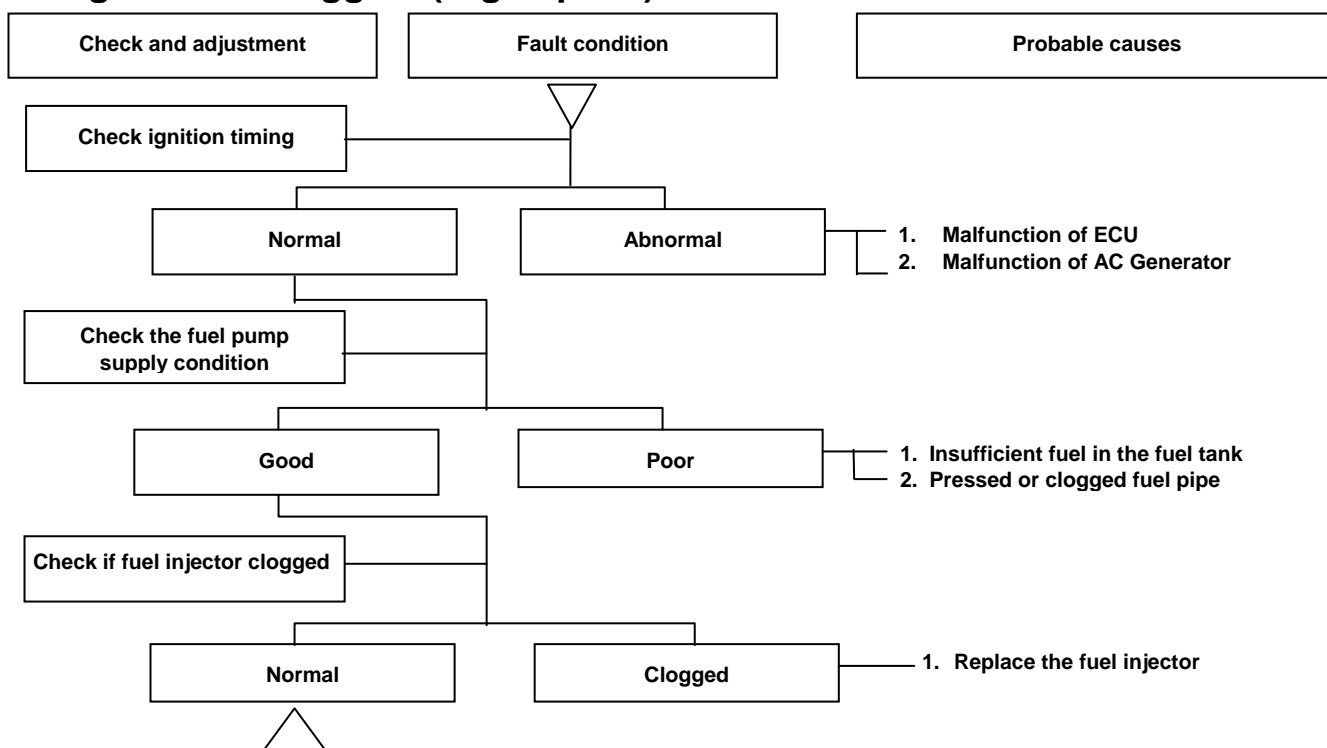


# 1. GENERAL INFORMATION

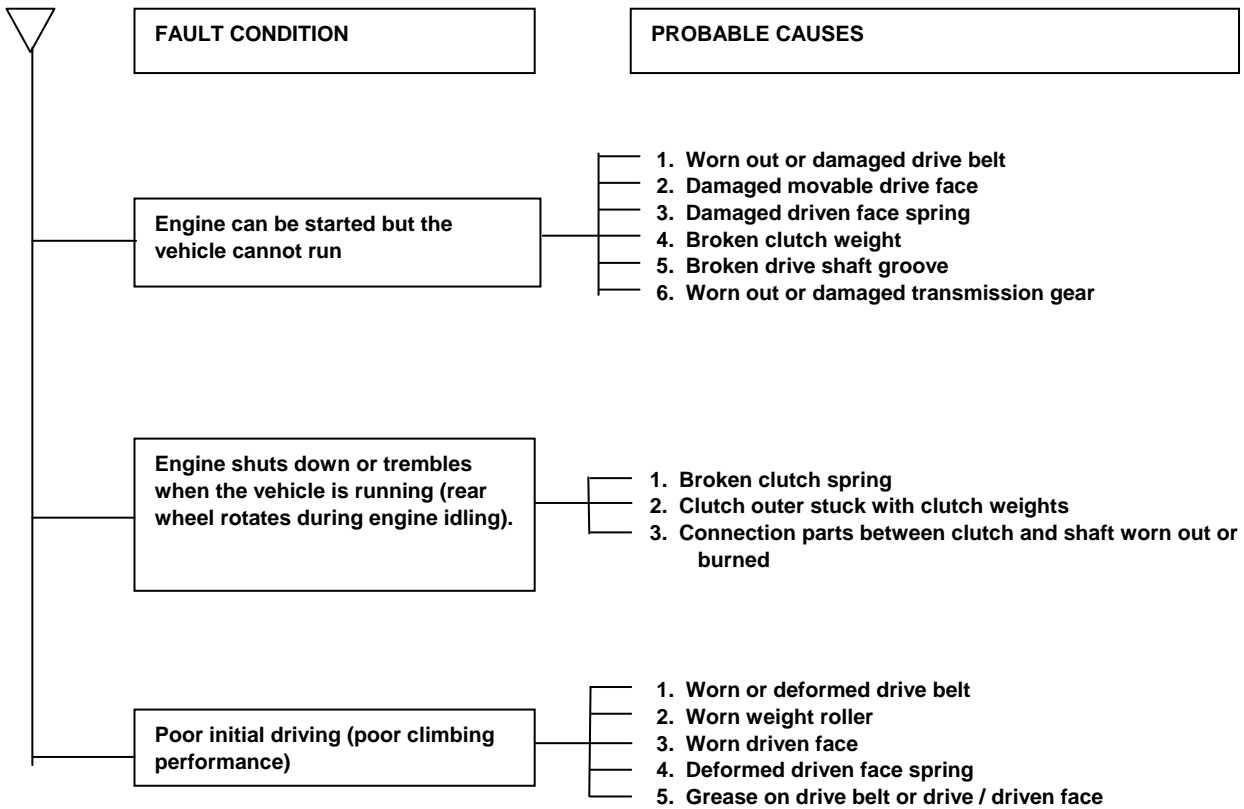
## C. Engine runs sluggish (especially in low speed and idling)



## D. Engine runs sluggish (High speed)

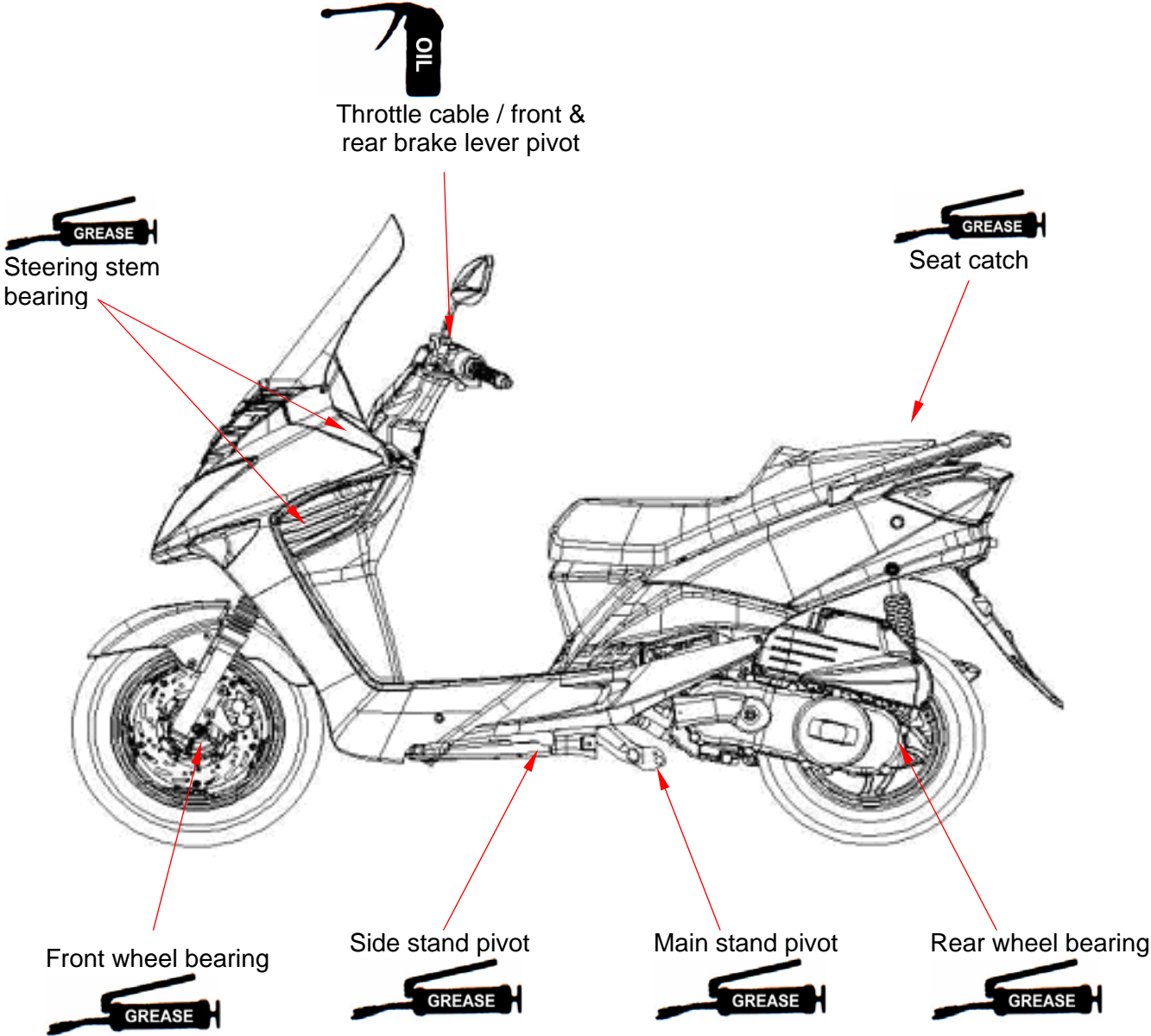


E. CLUTCH AND DRIVING PULLEY



# 1. GENERAL INFORMATION

## Lubrication Points





## 2. Maintenance Information

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### Precautions in Operation

Model		LF12W-6/F	LF12W2-7	LF18W-A/W3-H /W5-C	LF18W-6/W1-9 /W2-7/W4-8
Fuel Tank Capacity		7,600 c.c.			
Engine Oil	capacity	1,000 c.c.			
	change	800 c.c.			
Transmission Gear oil	capacity	110 c.c.			
	change	100 c.c.			
Capacity of coolant	Engine + radiator	780 c.c.			
	Reservoir upper	420 c.c.			
Clearance of throttle valve		2~6 mm			
Spark plug		CR7E	CR7E	CR8E	CR7E
"F" Mark in idling speed		BTDC 13° / 1800rpm	BTDC 10° /1800rpm	BTDC 13° /1800rpm	BTDC 10° /1800rpm
Full timing advanced		BTDC 27°	BTDC 24°	BTDC 27°	BTDC 24°
Idling speed		1,800±100 rpm			
Cylinder compression pressure		12 ± 2 Kg/cm <sup>2</sup>			
Valve clearance	IN	0.12±0.02 mm			
	EX	0.12±0.02 mm			
Tire dimension	Front	110/90-13 56P			
Tire dimension	Rear	130/70-12 64L			
Tire pressure (cold)	single	Front: 1.75 Kg/cm <sup>2</sup> Rear: 2.25 Kg/cm <sup>2</sup>			
	Load 90 Kg (full load)	Front: 1.75 Kg/cm <sup>2</sup> Rear: 2.5 Kg/cm <sup>2</sup>			
Battery		12V8Ah (MF battery) YTX9-BS / GTX9-BS			

## 2. Maintenance Information

### Periodical Maintenance Schedule

Maintenance Code	item	Every 300KM	1 Month every 1000KM	3 month every 3000KM	6 month every 6000KM	1 year every 12000KM	15 month every 14500KM
1	☆Air cleaner	I		C	C	R	C
2	☆Fuel filter	I			I	R	
3	☆Oil filter	C			C	C	
4	☆Engine oil change	R	Replacement for every 1000 km				
5	Tire pressure	I	I	I	I	I	I
6	Battery inspection	I	I	I	I	I	I
7	Brake & free play check	I	I	I	I	I	I
8	Steering handle check	I			I	I	
9	Cushion operation check	I			I	I	
10	Every screw tightening check	I	I	I	I	I	I
11	Gear oil check for leaking	I	I	I	I	I	I
12	☆Spark plug check or change	I		I	R	R	R
13	☆Gear oil change	R	Replacement for every 5000 km				
14	Frame lubrication				L	L	
15	Exhaust pipe	I	I	I	I	I	I
16	☆Ignition timing	I	I	I	I	I	I
17	☆Emission check in Idling	A	I	I	I	I	I
18	☆Throttle operation	I		I	I	I	I
19	☆Engine bolt tightening	I		I	I	I	I
20	☆CVT driving device(belt)				I	R	I
21	☆CVT driving device(roller)				C	C	C
22	Lights/electrical equipment/multi-meters	I	I	I	I	I	I
23	Main/side stands & springs	I			I	I	
24	Fuel lines	I		I	I	I	I
25	Shock absorbers			I	I	I	I
26	Cam chain	I		I	I	I	I
27	☆Valve clearance	I		A	A	A	A
28	Lines & connections in cooling system	I	I	I	I	I	I
29	Coolant reservoir	I	I	I	I	I	I
30	Coolant	I	Replacement for every 1 year				

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 no 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 obvious lower. Than ever
    - c. Replace worn out pistons, cylinder head.





## 2. Maintenance Information

### Fuel Lines

Remove trunk  
 Remove side cover.  
 Remove central cover.  
 Remove body frame cover.  
 Remove pedal.  
 Remove front glove box.  
 Check all lines, and replace it when they are deterioration, damage or leaking.

### Warning

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

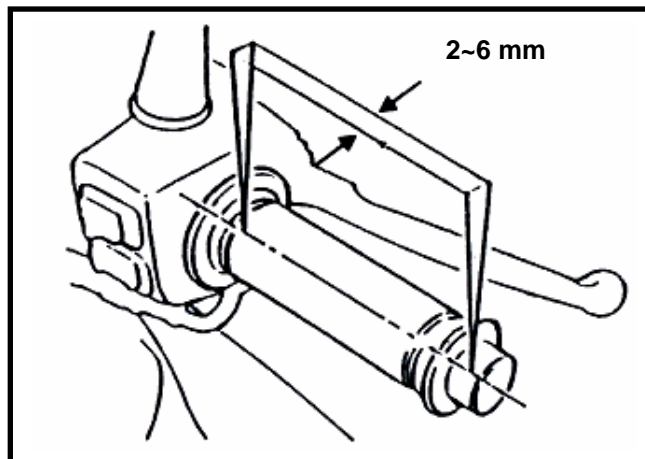
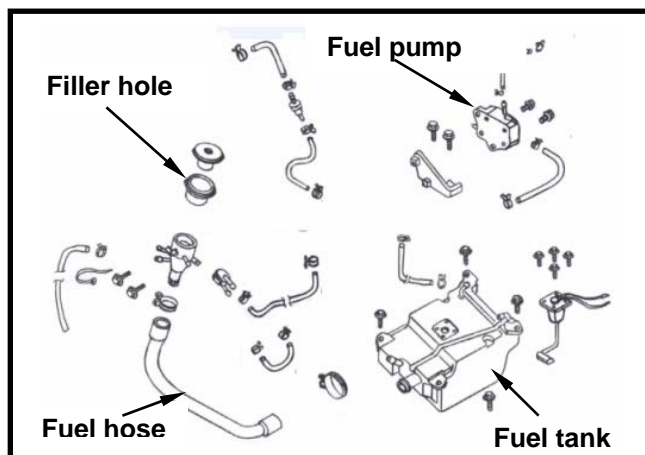
### Throttle Operation

Have a wide open of throttle valve as handle bar in any position and release it to let back original (full closed) position.  
 Check handle bar if its operation is smooth.  
 Check acceleration cable and replace it if deteriorated, twisted or damaged.

Lubricate the cable if operation is not smooth  
 Measure handle bar free play in its flange part.  
**Free play: 2~6 mm.**

Adjustment can be done in either end.  
 Secondary adjustment is conducted from top side.  
 Remove rubber boot, loosen fixing nut, and then adjust it by turning the adjustment nut.

Primary adjustment is conducted from bottom side.  
 Loosen fixing nut, and adjust by turning the adjustment nut.  
 Tighten the fixing nut, and check acceleration operation condition.





## 2. Maintenance Information

### Air Cleaner

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

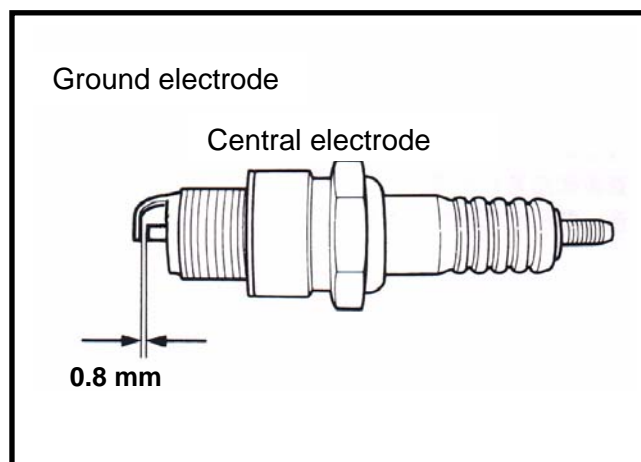
#### Caution

Air cleaner element contains a paper made filter so do not try to clean it.



### Spark Plug

Recommended spark plug: CR7E / CR8E  
Remove trunk.  
Remove central cover.  
Remove spark plug cap.  
Clean dirt around the spark plug hole.  
Remove spark plug.  
Measure spark plug gap.  
Spark plug gap : 0.8 mm  
Carefully bend ground electrode of the plug to adjust the gap if necessary.  
Hold spark plug washer and install the spark plug by screwing it.  
Tighten the plug by turning 1/2 turn more with plug socket after installed.  
Connect spark plug cap.



## Valve Clearance

### Caution

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

Remove trunk.  
Remove central cover.  
Remove valve adjustment cap.  
Remove cylinder head side cover.

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

### Caution

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

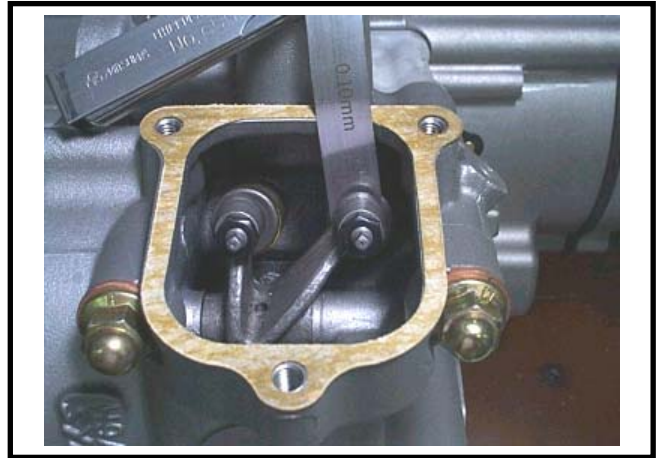
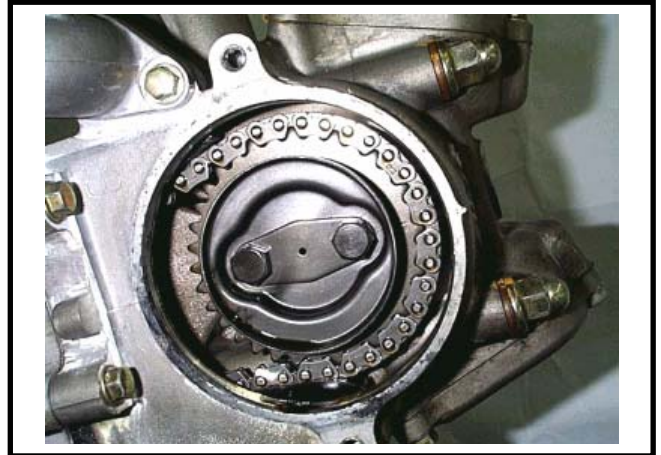
Check & adjust valve clearance with feeler gauge.

**Valve clearance (IN/EX): 0.12 ± 0.02 mm**

Loosen fixing nut and turn the adjustment nut for adjustment.

### Caution

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



## 2. Maintenance Information

### Ignition System

#### ⚠ Caution

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

Remove right side cover.

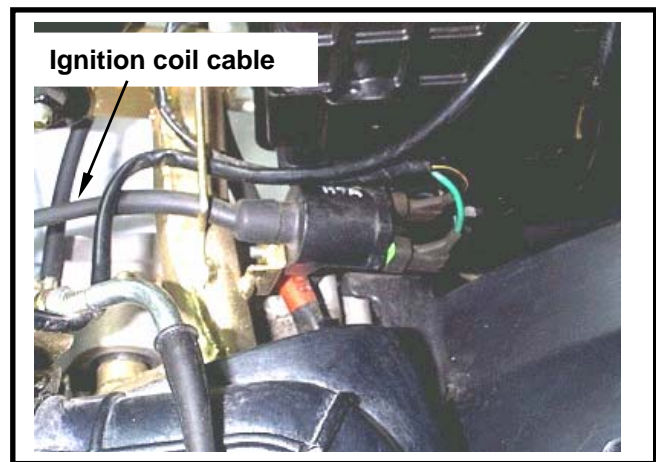
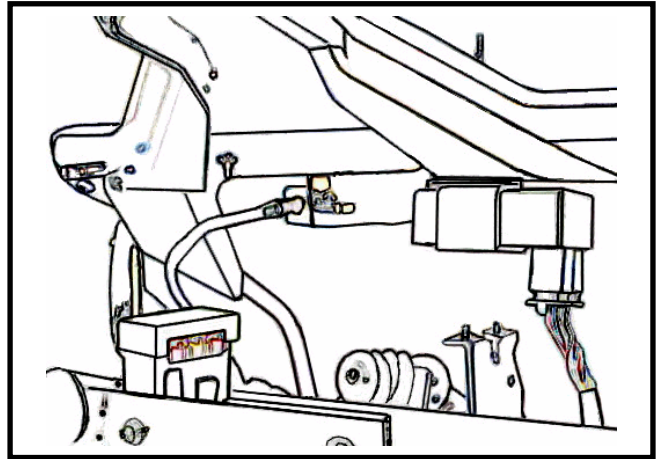
Remove ignition timing hole cap located in front upper side of engine right cover.

Connect tachometer and ignition lamp.

Start engine.

As engine in idle speed: 1600 rpm, aim at the mark "F" with the ignition lamp. Then, it means that ignition timing is correct.

Increase engine speed to 6000 rpm to check ignition advance degree. If indent is located within the ignition advance degrees, it means that the ignition advance degree is in normal. If ignition timing is incorrect, check ECU, pulse rotor and pulse generator. Replace it if malfunction of these parts is found.



## Cylinder Compression Pressure

Warm up the engine.  
 Turn off the engine.  
 Remove the trunk.  
 Remove the central cover.  
 Remove spark plug cap and spark plug.  
 Install compression gauge.  
 Full open the throttle valve, and rotate the engine by means of starter motor.

### Caution

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

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

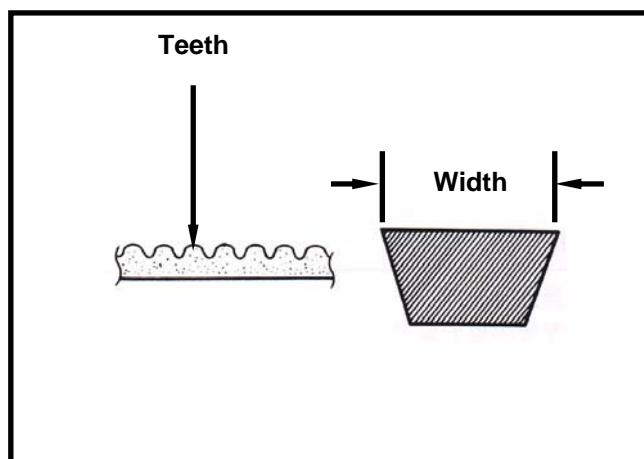
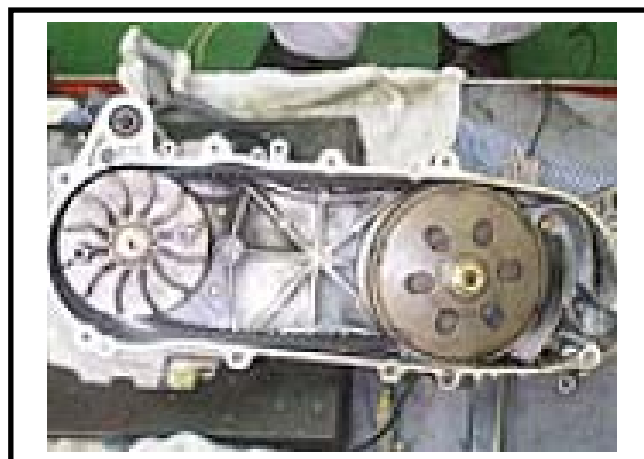
Check following items if the pressure is too low:

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

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

## Drive Belt

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

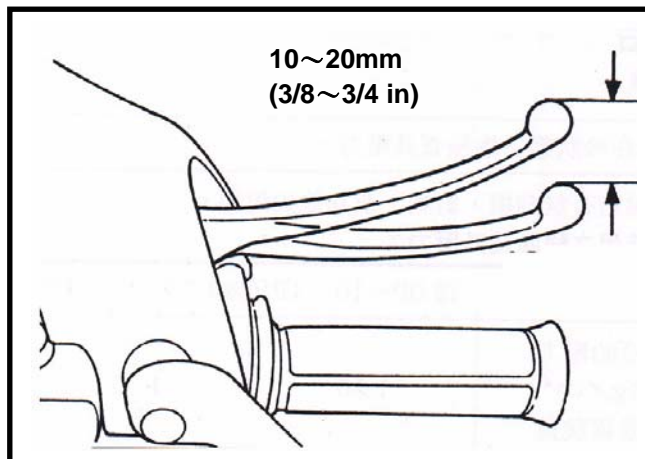




## 2. Maintenance Information

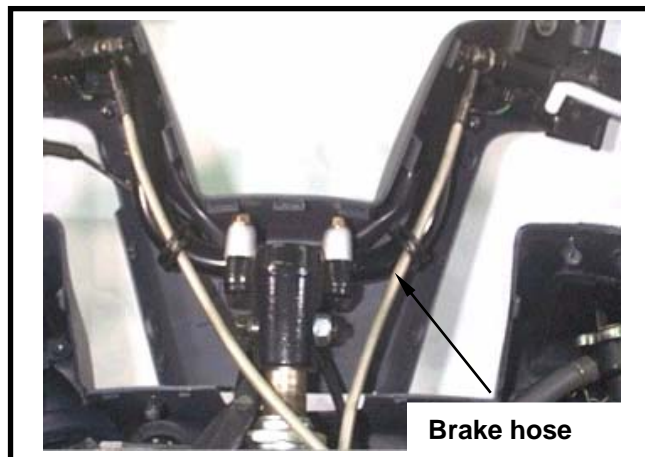
### Brake System (FRONT/REAR DISK BRAKE)

Free play of front/rear brake: 10~20 mm



### Brake Hose

Make sure the brake hoses for corrosion or leaking oil.

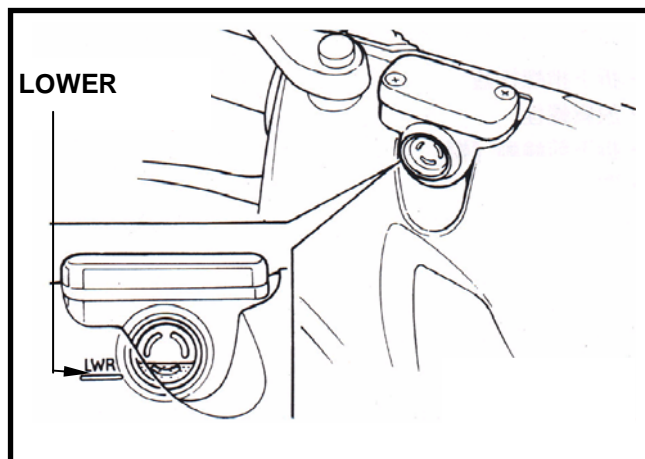


### Brake Fluid

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

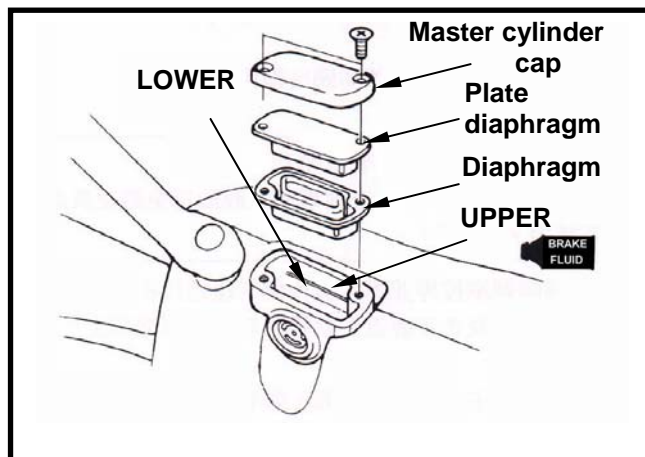
#### Caution

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





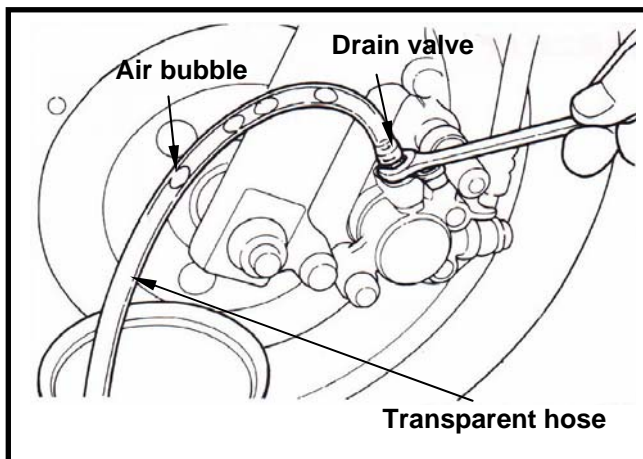
## 2. Maintenance Information

### 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.

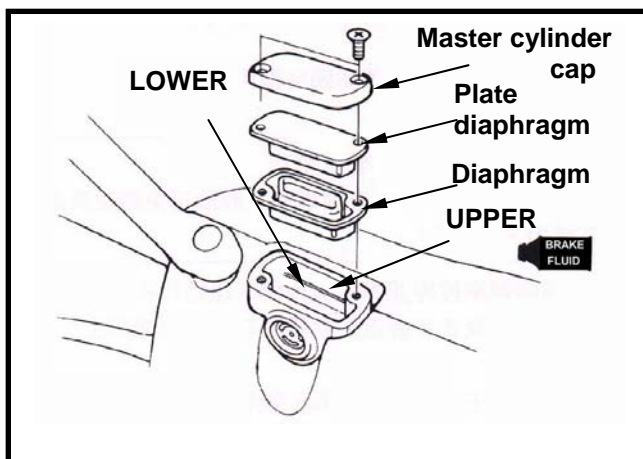


### Add Brake Fluid

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

The indent mark on brake lining is the wear limitation. Replace the brake lining if the wear limit mark closed to the edge of brake disc.

#### ⚠ Caution

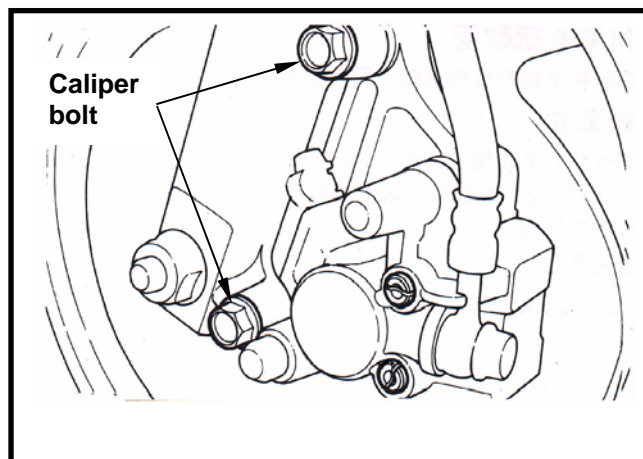
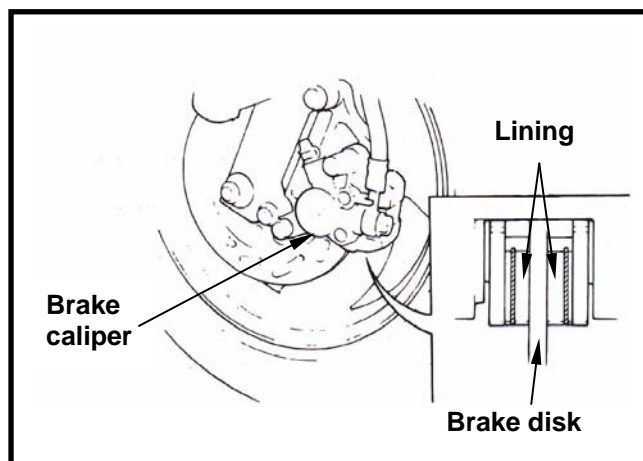
It is not necessary to remove brake hose when replacing the brake lining.

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

#### ⚠ Caution

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

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

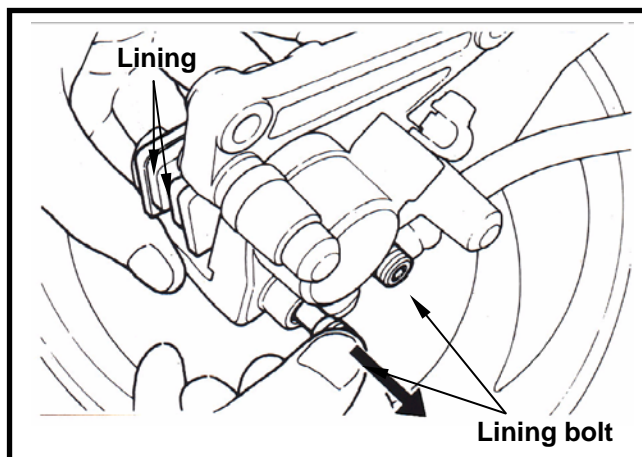


## 2. Maintenance Information

Remove brake lining bolt.  
Take out the lining.

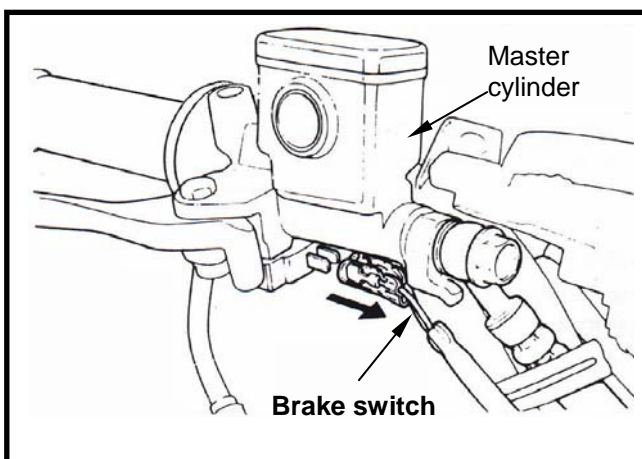
### Caution

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



### Brake Light Switch

The brake lamp switch is to light up brake lamp as brake applied.  
Make sure that electrical starter can be operated only under brake applying.



### Headlight Beam Distance

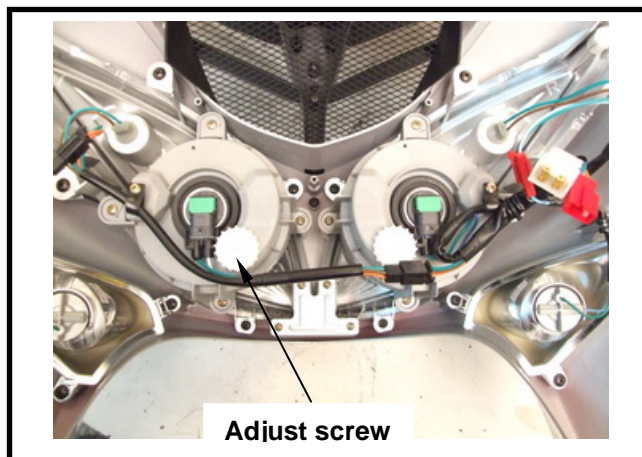
Turn on main switch  
Turn the headlight adjust screw with driver to adjust headlight beam high.

### Caution

To adjust the headlight beam follows related regulations.

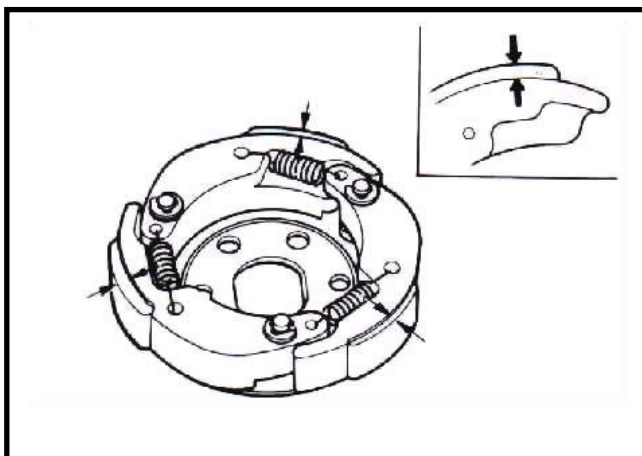
### Warning

Improper headlight beam adjustment will make in coming driver dazzled or insufficient lighting.



### Clutch Weight

Run the motorcycle and increase throttle valve opening gradually to check clutch operation.  
If the motorcycle is in forward moving and shaking, check clutch disc condition. Replace it if necessary.



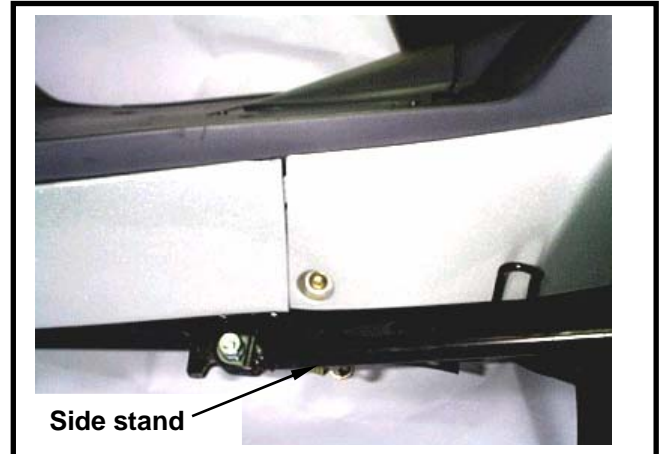


### Side Stand

Check side stand spring for damage or looseness.

Press down side stand and pull it with spring gauge. If gauge reading is over 2 kg, it means that the spring capacity is in normal.

Check if side stand set is operated smoothly. Make sure that side stand is no bending or deformation.

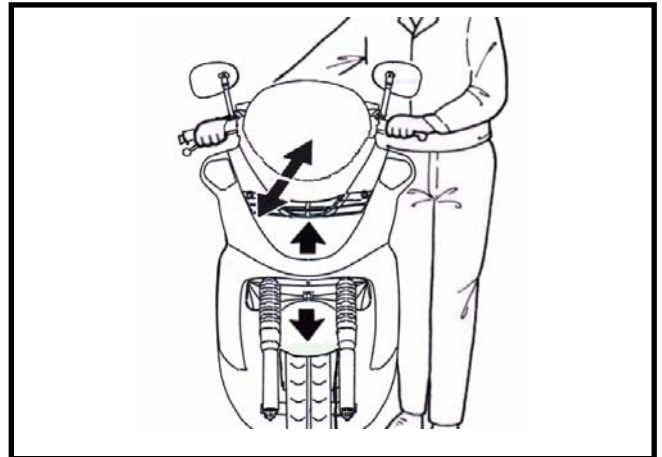


### Front / Rear Cushion

#### Warning

Do not ride the motorcycle with poor shock absorber.

Looseness, wear or damage shock absorber will make poor stability and drive-ability.



#### Front Cushion

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

Check if it is damage

Replace relative parts if damage found.

Tighten all nuts and bolts.

#### Rear Cushion

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

Check if it is damage

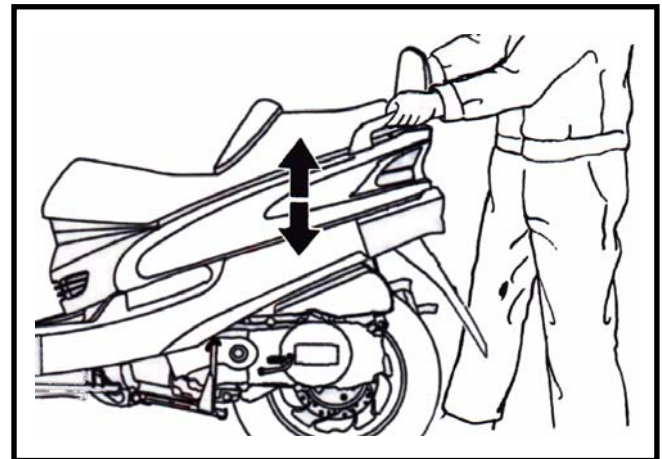
Replace relative parts if damage found.

Park the vehicle with main stand.

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

Replace the bushing if looseness found.

Tighten all nuts and bolts.



### Nuts / Bolts Tightness

Perform periodical maintenance in accord with the Periodical Maintenance Schedule

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

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



## 2. Maintenance Information

### Wheel / Tire

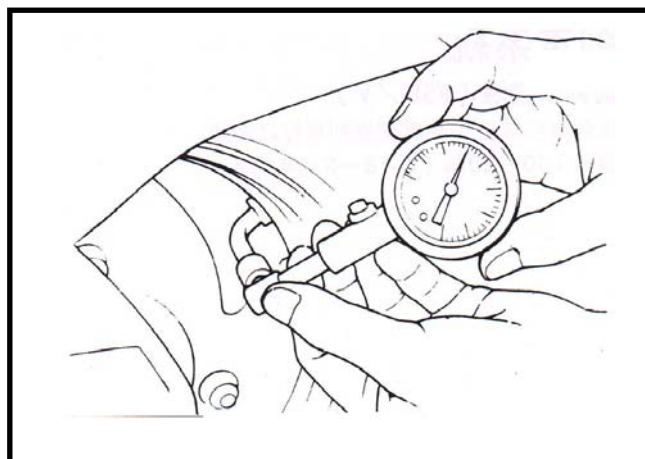
#### Caution

Tire pressure check should be done as cold engine.

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

#### Appointed tire pressure

Tire size		Front tire	Rear tire
Tire pressure as cold engine (Kg/cm <sup>2</sup> )	Load for under 90 Kg	1.75	2.25
	Full loaded	1.75	2.5



Check if front and rear tires' pressure is in normal.

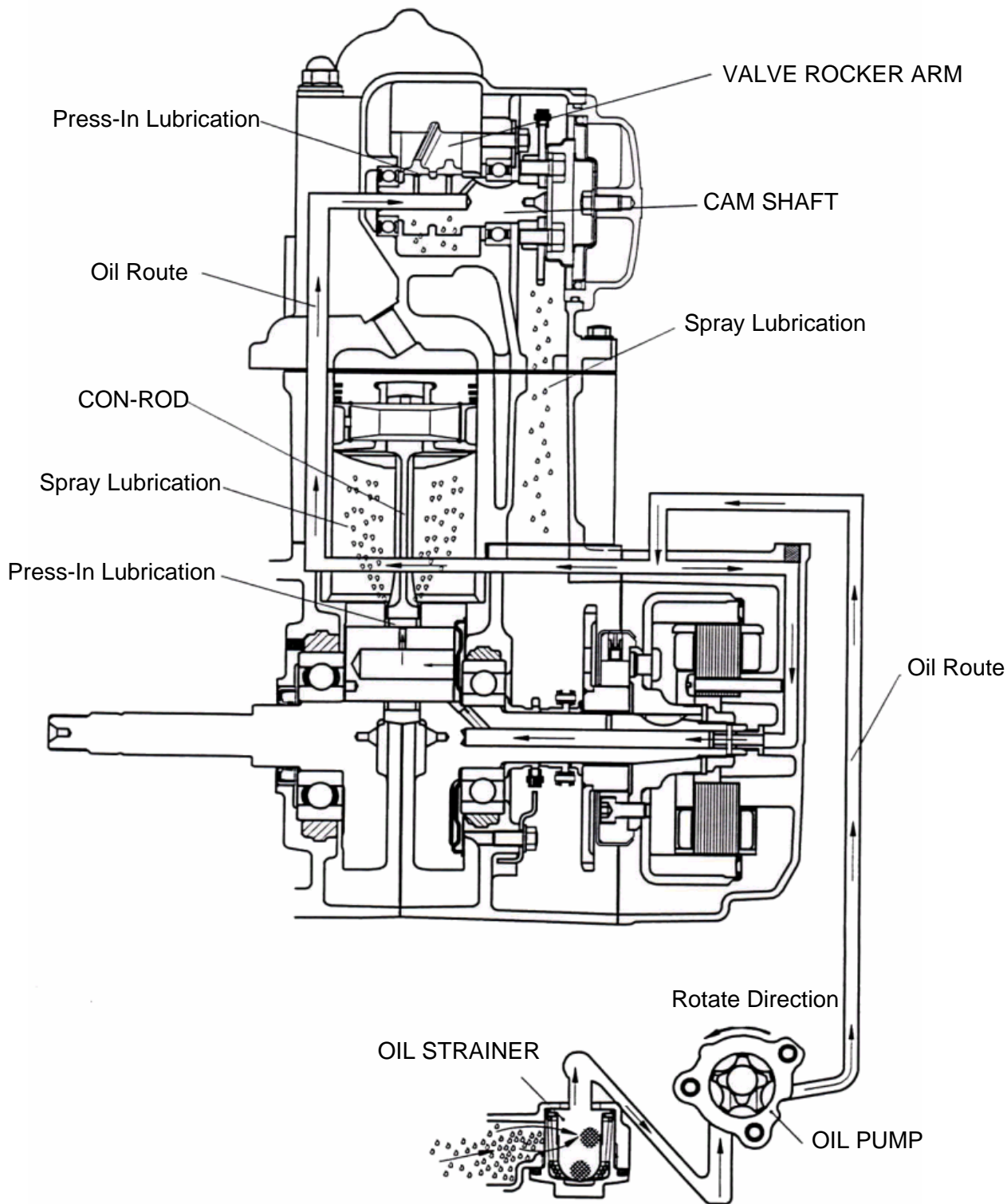
Measure tire thread depth from tire central surface.

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

Front tire: 1.5 mm

Rear tire: 2.0 mm

Precautions in Operation.....3-2	Oil Pump Disassembly ..... 3-4
Troubleshooting.....3-2	Oil Pump Inspection ..... 3-5
Engine Oil .....3-3	Oil Pump Reassembly ..... 3-5
Engine Oil Strainer Clean .....3-3	Oil Pump Installation ..... 3-6
Oil Pump Removal.....3-4	Gear Oil..... 3-7



### 3. LUBRICATION SYSTEM

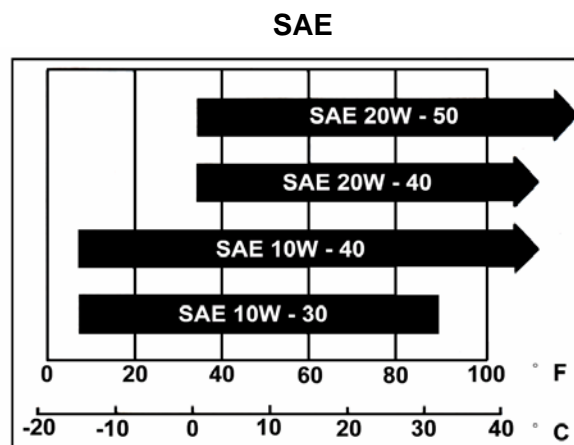
#### Precautions in Operation

##### General Information

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

##### Specifications

Engine oil quantity	Disassembly: 1000 c.c. Change: 800 c.c.
Gear oil	Disassembly: 110 c.c. Change: 100 c.c.
Oil	Oil viscosity SEA 10W-30 (Recommended King serial oils)
Gear oil	Gear oil viscosity SEA 85W-140 (Recommended SYM Hypoid gear oils)



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

Torque value oil strainer	1.3~1.7 Kgf-m
Engine oil drain bolt	1.9~2.5kgf-m
Gear oil drain plug	1.1~1.4 Kgf-m
Gear oil inspection bolt	1.1~1.4 Kgf-m
Oil pump connection bolt	0.8~1.2 Kgf-m

#### Troubleshooting

##### Low engine oil level

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

##### Dirty oil

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

##### Low oil pressure

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

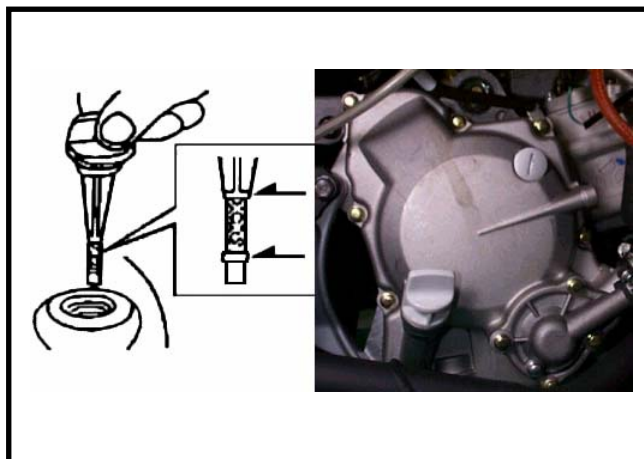
## Engine Oil

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

Check oil level with oil dipstick

So not screw the dipstick into engine as checking.

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



## ⚠ Caution

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

Place a oil pan under the motorcycle, and remove oil drain bolt.

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

Install oil drain bolt.

**Torque value: 1.1~1.5 Kgf-m**

Fill out engine oil (oil viscosity SEA 10W-30).

Recommended using King serial oil.

**Engine oil capacity: 0.8L when replacing**



Install dipstick, start the engine for running several minutes.

Turn off engine, and check oil level again.

Check if engine oil leaks.



## Engine Oil Strainer Clean

Drain engine oil out.

Remove oil strainer and spring.

Clean oil strainer.

Check if O-ring can be re-used.

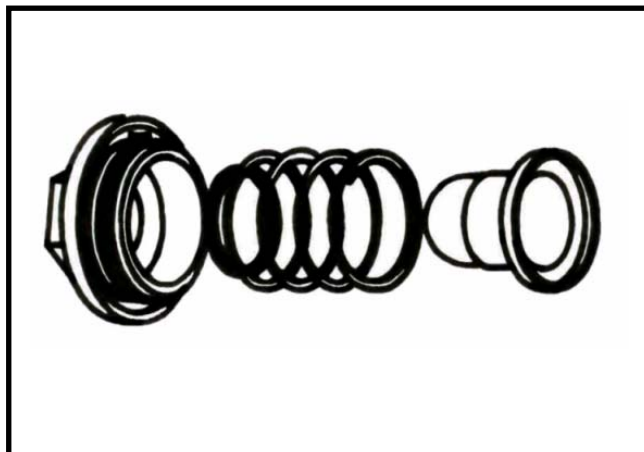
Install oil strainer and spring.

Install oil strainer cap.

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

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

Recommended using King serial oil.





### 3. LUBRICATION SYSTEM

#### Oil Pump Removal

Remove generator and starting gear.



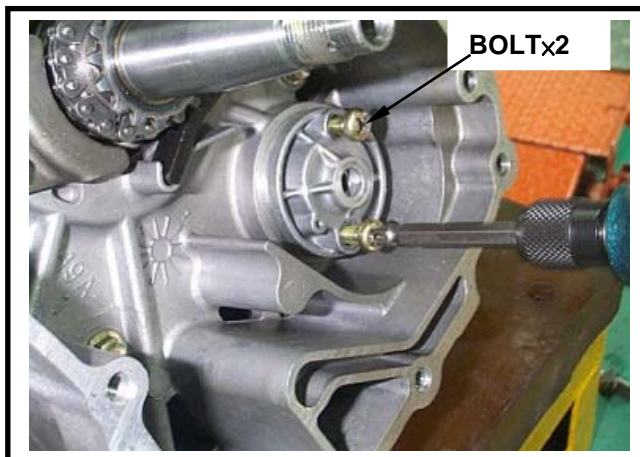
Remove snap ring and take out oil pump driving chain and sprocket.

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

Make sure that pump shaft can be rotated freely.

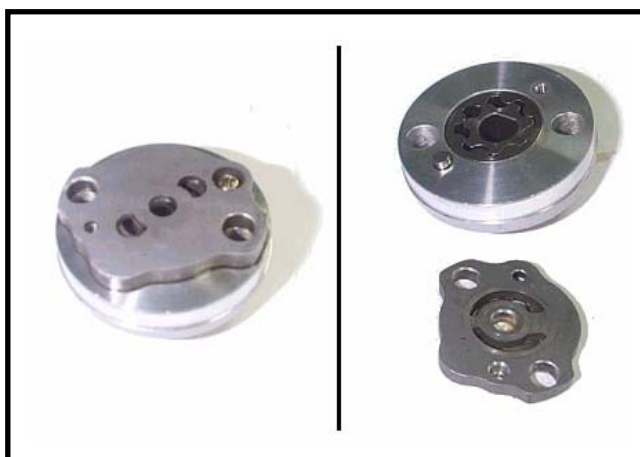


Remove 2 bolts on the oil pump, and then remove oil pump.



#### Oil Pump Disassembly

Remove the screws on oil pump cover and disassemble the pump as illustration shown.



#### Oil Pump Inspection

Check the clearance between oil pump body and outer rotor.

Limit: 0.25 mm



Check clearance between inner and outer rotors.

Limit: 0.20 mm



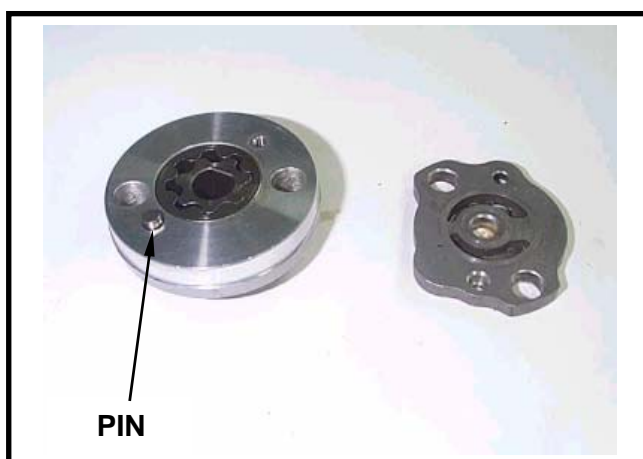
Check clearance between rotor side face and pump body

Limit: 0.12 mm



#### Oil Pump Reassembly

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 fixing pin





### 3. LUBRICATION SYSTEM

Install the oil pump cover and fixing pin properly



Tighten screw  
Make sure that oil pump shaft can be rotated freely.



#### Oil Pump Installation

Install the oil pump, and then tighten bolts.

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

Make sure that oil pump shaft can be rotated freely.

Install oil pump driving chain and sprocket, and then install snap ring onto oil pump shaft.



Install starting gear and generator.

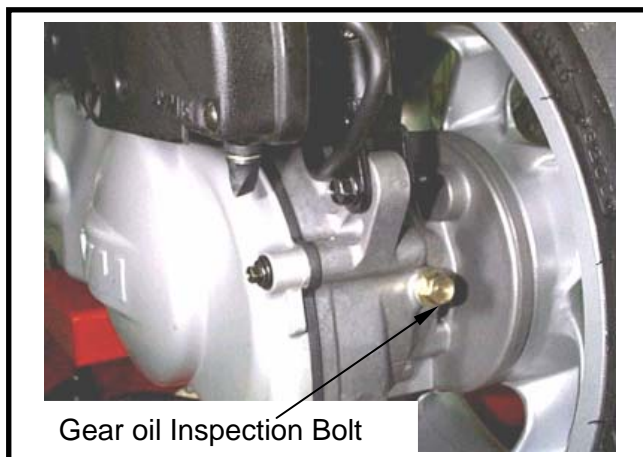


## Gear Oil

Oil level inspection

Park the motorcycle on flat surface with main stand.

Turn off engine and remove oil inspection bolt.



Gear oil Inspection Bolt

Gear lubrication oil quantity has to be measured with measure device.

If oil level is too low, add gear oil.

Recommended using King serial oils.

Install oil inspection bolt.

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



Gear oil drain plug

## Gear Oil Change

Remove oil level inspection bolt.

Remove drain plug and drain oil out.

Install the drain plug after drained.

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

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

Add oil to specified quantity from the inspection hole.

**Gear Oil Quantity: 100 c.c. when replacing**

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

Start engine and run engine for 2-3 minutes.

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

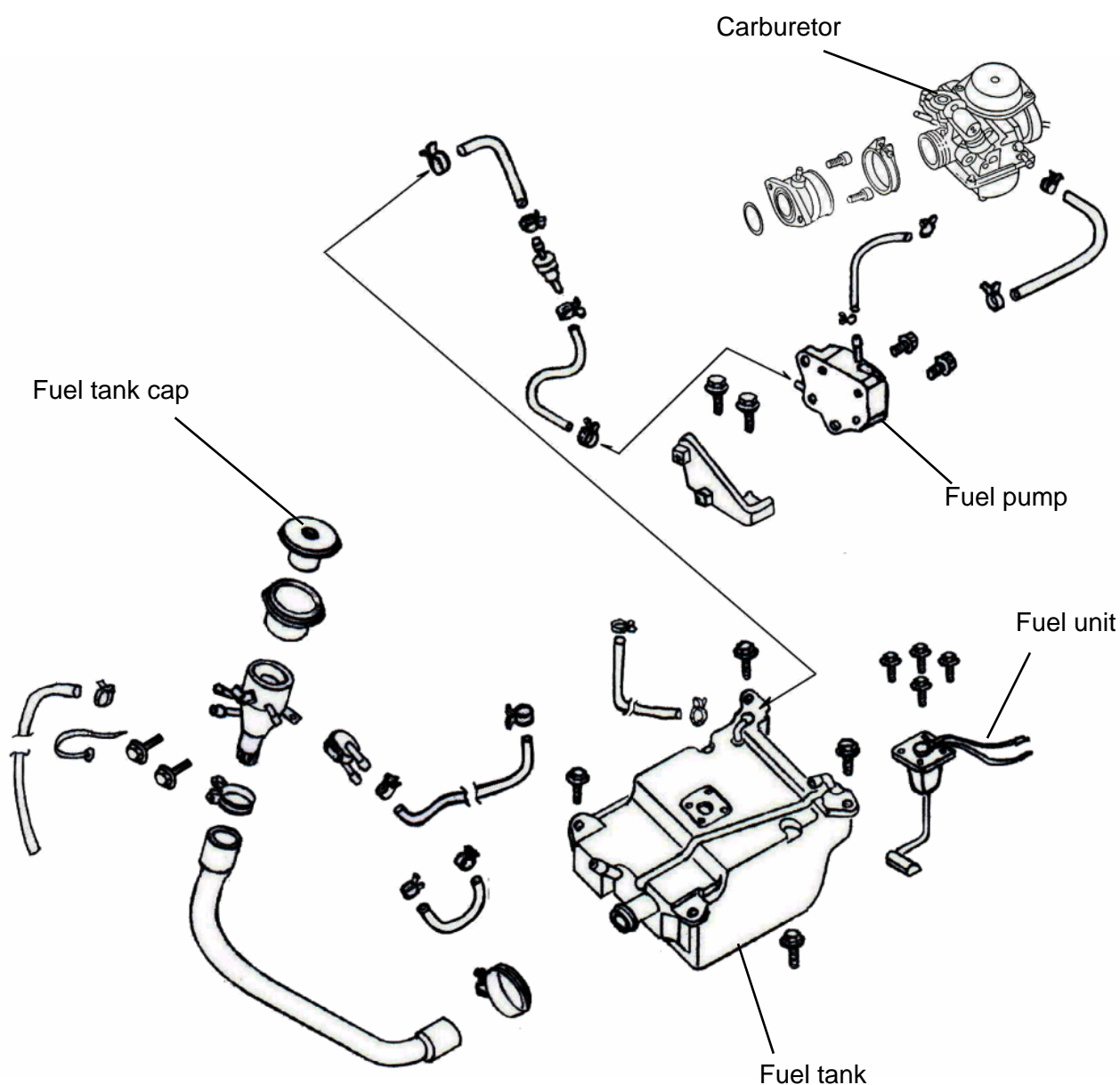
Make sure that no oil leaking.

### 3. LUBRICATION SYSTEM

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NOTES:

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Air cut-off valve .....4-4	Adjustment of pilot screw ..... 4-10
Auto by-starter .....4-5	Fuel tank ..... 4-11
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Vacuum chamber .....4-6	



## 4. FUEL SYSTEM

### PRECAUTIONS IN OPERATION

#### General Information

#### Warning

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

#### Cautions

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

### Specification

Item	LF12W-6/F	LF18W-A/W3-H/W5-C
Carburetor diameter	24 mm	25 mm
I.D. number	CVK039	CVK066
Fuel level	20.5 mm	20.5 mm
Main injector	#105	#108
Idle injector	#35	#35
Idle speed	1600±100 rpm	1600±100 rpm
Throttle handle clearance	2~6 mm	2~6 mm
Pilot screw	2 1/4 turns	1 1/2 turns

### Torque value

Fuel valve tightening nut: 1.5~2.0Kgf-m

### Tool

#### Special service tools

Vacuum/air pressure pump

#### General service tool

Fuel level gauge

## **TROUBLE DIAGNOSIS**

### **Poor engine start**

- No fuel in fuel tank
- Clogged fuel tube
- Too much fuel in cylinder
- No spark from spark plug(malfunction of ignition system)
- Clogged air cleaner
- Malfunction of auto by-starter
- Malfunction of throttle operation
- Malfunction of purge control valve

### **Stall after started**

- Malfunction of auto by-starter
- Incorrect ignition timing
- Malfunction of carburetor
- Dirty engine oil
- Air existing in intake system
- Incorrect idle speed
- Malfunction of purge control valve

### **Rough idle**

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

### **Intermittently misfire as acceleration**

- Malfunction of ignition system

### **Late ignition timing**

- Malfunction of ignition system
- Malfunction of carburetor

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

- Fuel system clogged
- Malfunction of ignition system

### **Mixture too lean**

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

### **Mixture too rich**

- Clogged air injector
- Malfunction of float valve
- Fuel level too high in float chamber
- Malfunction of auto by-starter
- Dirty air cleaner



## 4. FUEL SYSTEM

### AIR CUT-OFF VALVE

#### Inspection

Disconnect vacuum hose and air vent hose from the air cut-off valve.

Connect a hose from vacuum hose connector to vacuum pump.

Connect air pump to air vent hose.

Apply with specified vacuum to air cut-off valve.

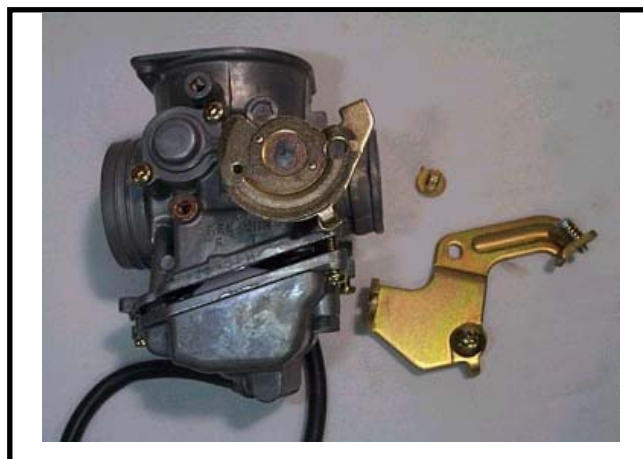
**Vacuum value: 420~500 mm-Hg**

Pump compressed air from air pump to air vent hose.

#### Caution

The vacuum can not be over 600 mm-Hg. Or the air cut-off will be damaged.

If the valve is in normal, it will restrict air-flow. If air-flow is no restrict, replace carburetor assembly.



## AUTO BY-STARTER

### Inspection

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

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

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

Replace the auto starter with a new one if resistance value exceeds standard.

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

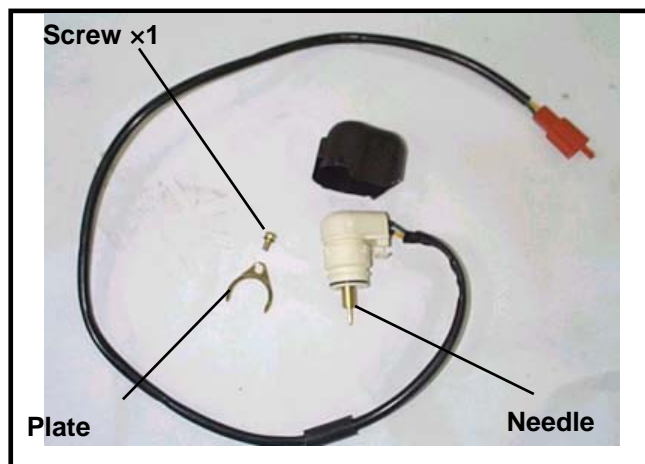
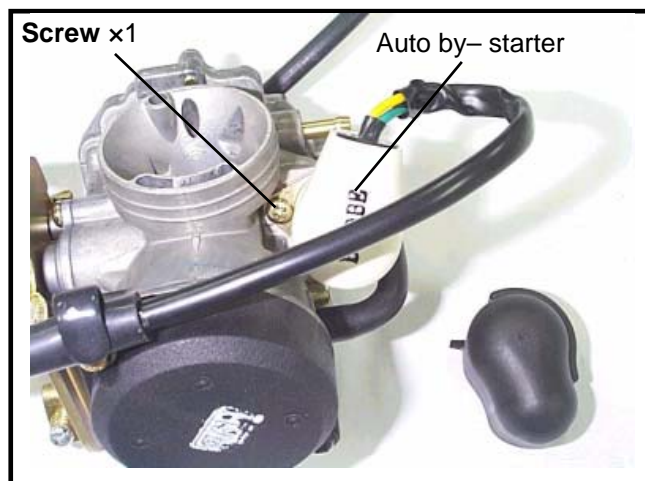
Connect a pressure tester from air pump.

Connect by-starter circuit.

Pump compressed air to the circuit.

Replace the auto by-starter if the circuit clogged.

Connect battery posts (12V) to starter's connectors. After 5 minutes, test the by-starter circuit with compressed air. If air flows through the circuit, then, replace the starter.



### Removal

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

### Valve inspection

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

### Installation

Install auto by-starter to the bottom of carburetor body.

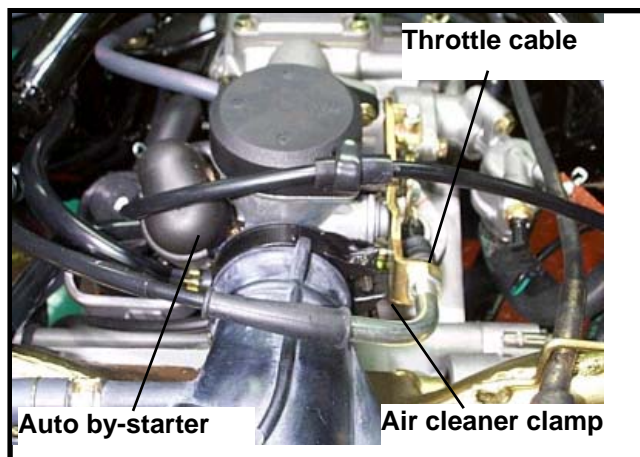
Install fixing plate to the upper groove of auto by-starter, and install its flat surface to carburetor. Install screw and tighten it.



## 4. FUEL SYSTEM

### Carburetor removal

Remove the luggage box.  
 Loosen the adjustment nut and fixing nut of throttle valve cable, and release the cable from carburetor.  
 Remove air cut-off valve hose.  
 Remove fuel pipe, vacuum hose.  
 Disconnect automatic by-starter connectors.  
 Release the clamp strip of carburetor isolation.  
 Release the clamp strip of air cleaner.



### Vacuum chamber

#### Removal

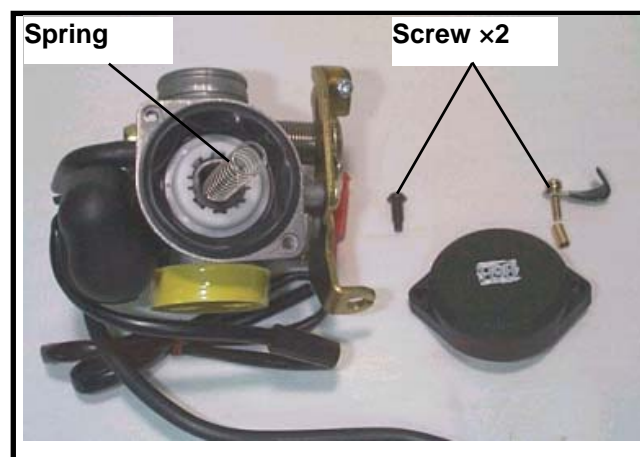
Loosen drain screw, and drain out residual fuel in float chamber.  
 Remove 2 screws of vacuum chamber cover and the cover.



Remove compress spring and vacuum piston.

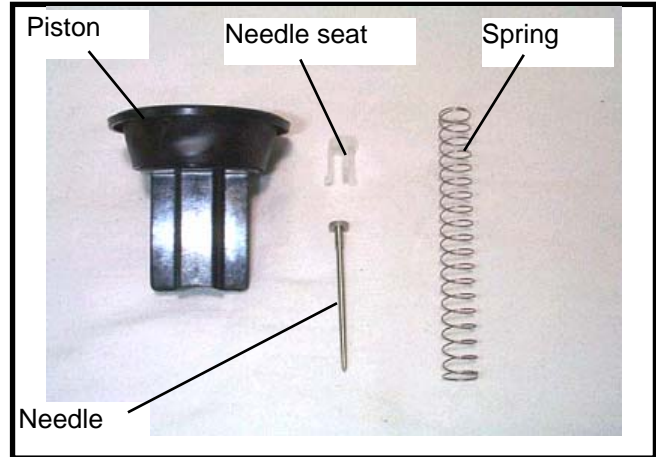


Check if the vacuum piston for wear out, crack or other damage.  
 Check if the diaphragm for damage or crack.



**Installation**

Install needle, spring and needle seat to vacuum piston.



Install vacuum piston to carburetor body and align the indent on the diaphragm.

Install compress spring.



Install vacuum chamber cover and tighten 2 screws.

**⚠ Caution**

- Do not damage vacuum diaphragm.
- When tightening the vacuum chamber screw, hold down vacuum piston.





## 4. FUEL SYSTEM

### FLOAT CHAMBER

#### Disassembly

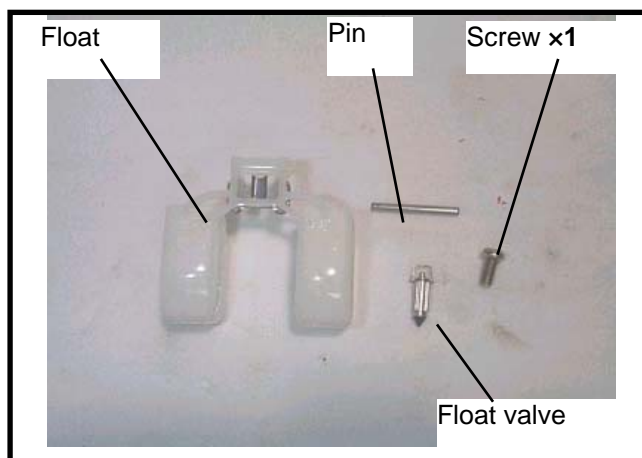
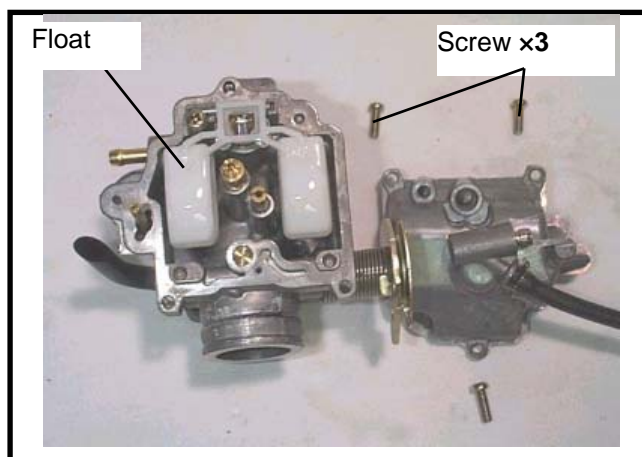
Remove 4 mounting screws and remove float chamber cover.  
Remove the float pin and float.

#### Checking

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

#### Caution

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



Remove main jet, fuel needle jet holder, needle jet, slow jet, pilot screw.

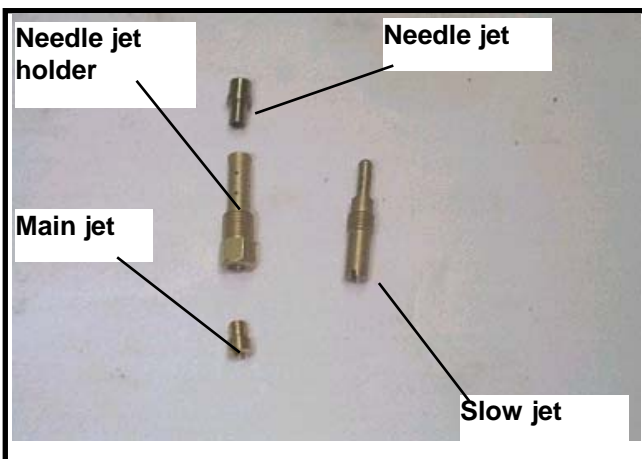
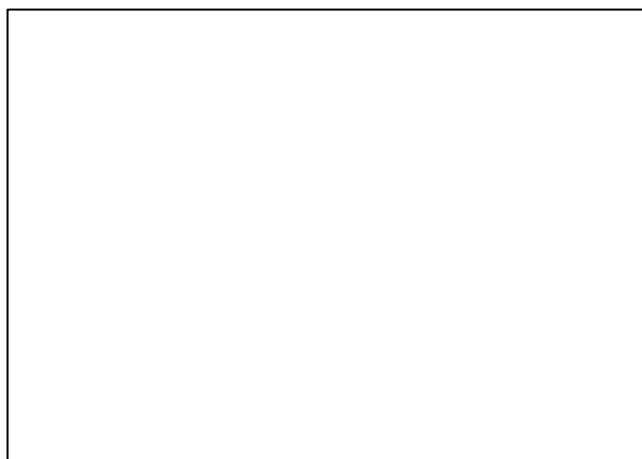
#### Caution

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

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

#### Caution

Remove vacuum chamber and air cut-off valve as a set.



### Assembly

Install main jet, fuel needle jet holder, fuel needle jet slow jet and pilot screw.

#### Caution

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

Install the float valve, float, and float pin.

### Checking fuel level

#### Caution

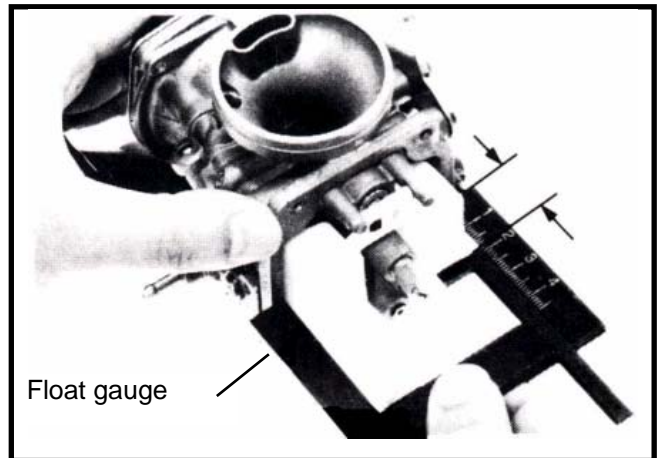
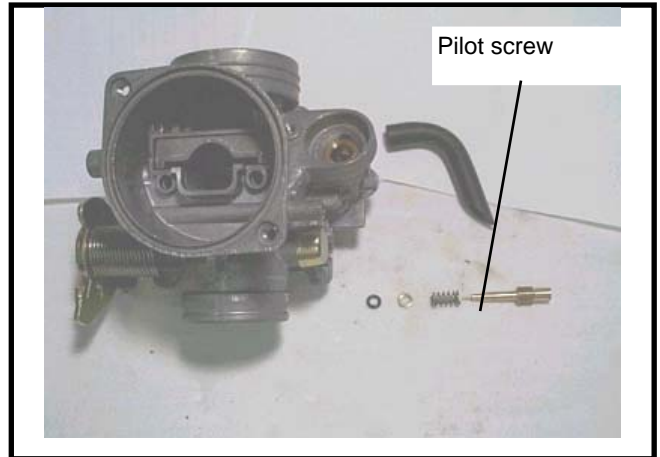
- Check again to ensure float valve, float for proper installation.
- To ensure correct measurement, position the float meter in such a way so that float chamber face is vertical to the main jet.

Fuel level: 20.5 mm

### Installation of carburetor

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

- Throttle cable adjustment.
- Idle adjustment





## 4. FUEL SYSTEM

### Adjustment of pilot screw

#### Caution

- Pilot screw was set at factory, so no adjustment is needed. Note the number of turns it takes to screw it all the way in for ease of installation.
- The main stand must be used to support the motorcycle to perform the adjustments.

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

#### Standard turns:

LA12W :  $2 \pm 1/4$  turns

LA15W :  $2 \pm 1/2$  turns

LA18W :  $1 \pm 1/2$  turns

#### Caution

Do not screw in forcefully to avoid damaging screw seat face.

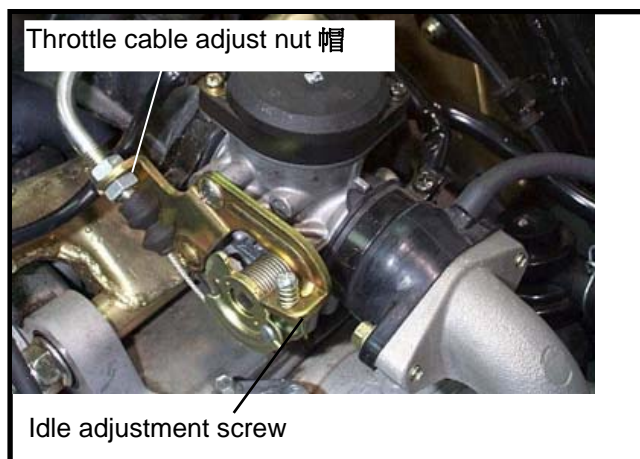
Warm up engine, adjust the stopper screw of throttle valve to standard RPM.

#### Idle speed rpm: $1600 \pm 100$ rpm

Connect the hose of exhaust analyzer to exhaust front end. Press test key on the analyzer. Adjust the pilot screw and read CO reading on the analyzer

#### CO standard value: 1.0~1.5 %

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



## FUEL TANK

### Fuel unit removal

Open the seat.  
 Remove the luggage box (6 bolts and 1 screw).  
 Remove rear carrier (3 bolts).  
 Remove rear bracket (2 bolts).  
 Remove the rear central cover (4 screws).  
 Remove the left and right pedals (1 bolt).  
 Remove the left and right covers (4 bolts).  
 Remove the central cover (6 screws).  
 Remove the left & right body covers and the central upper cover (4 screws and 2 bolts).  
 Remove pedal (4 bolts and 4 screws).  
 Disconnect fuel unit connector.  
 Remove fuel unit (4 screws).

### Caution

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

Fuel unit inspection (Refer to electrical equipment 17-15).

### Fuel unit installation

Install the gauge in the reverse order of removal.

### Caution

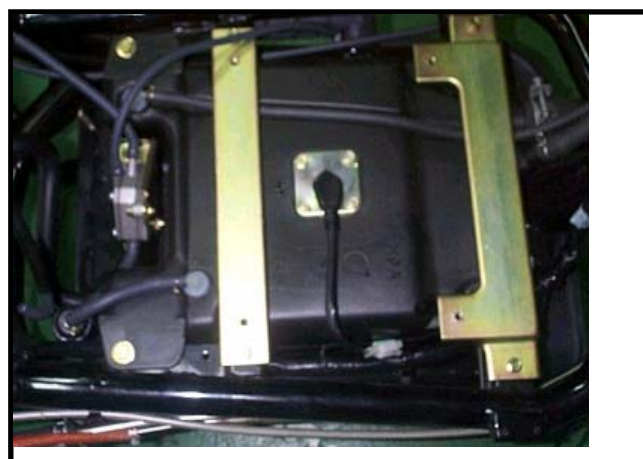
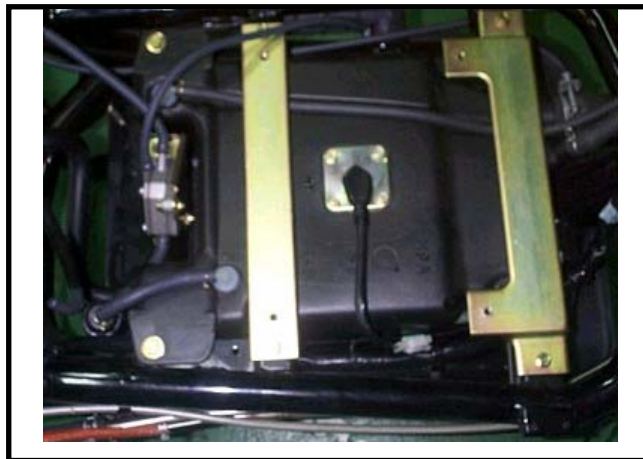
Do not forget to install the gasket of fuel unit or damage it.

### Fuel tank removal

Open the seat.  
 Remove the luggage box (6 bolts and 1 screw).  
 Remove the rear central cover (4 screws).  
 Remove the left and right pedals (1 bolt).  
 Remove the left and right covers (4 bolts).  
 Remove the central cover (6 screws).  
 Remove pedal (4 bolts and 4 screws).  
 Disconnect fuel unit connector.  
 Remove fuel unit (4 screws).  
 Remove fuel pump (2 bolts).  
 Remove fuel tank bracket (4 bolts).  
 Remove vacuum tube and fuel filter.  
 Remove fuel tank

### Installation

Install the tank in the reverse order of removal.



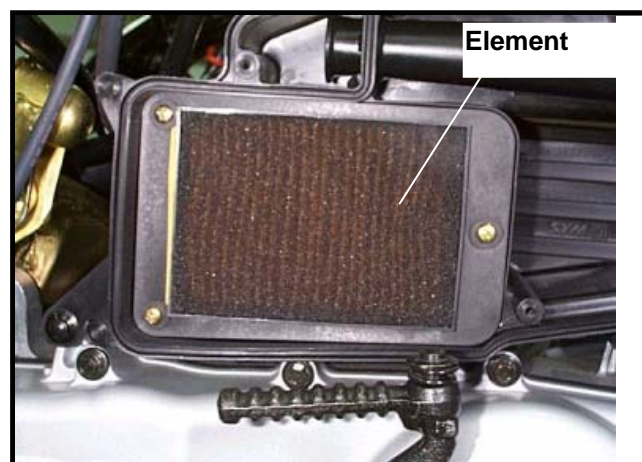
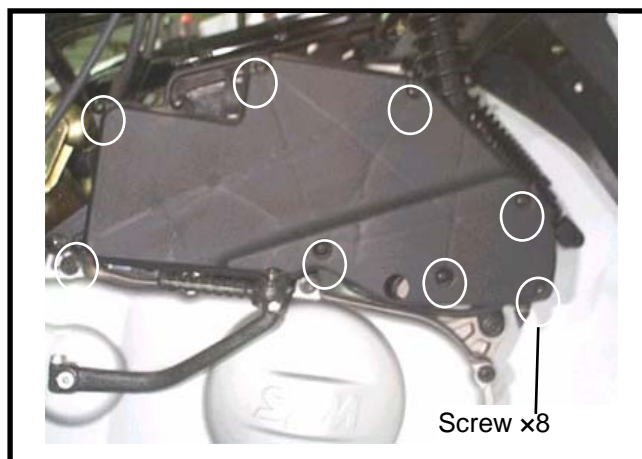
## 4. FUEL SYSTEM

### AIR CLEANER

Open the seat.  
Loosen the clamp strip of air cleaner.  
Remove left cover (2 screws).  
Remove mounting bolts for crankcase and gear box (2 bolts).  
Remove air cleaner cap (8 screws).  
Remove air cleaner set (4 screws).

#### Caution

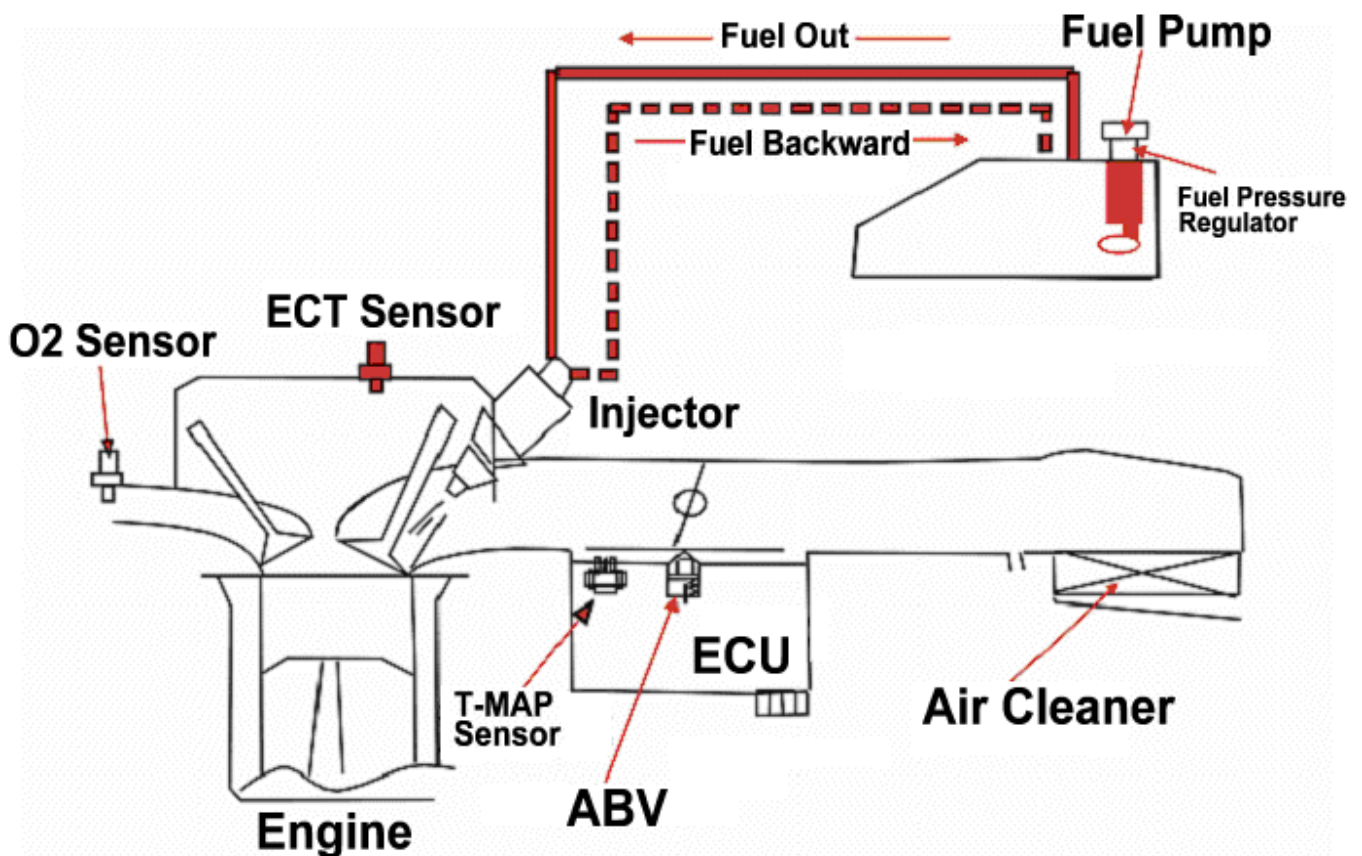
The air cleaner element is made of paper so do not soap it into water or wash it with water.





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EFi System Diagram



## 5. Fuel Injection System

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### EFi System Introduction

Based on 4-stroke SOHC engine, displacement 180 c.c. electronically controlled fuel injection. The O<sub>2</sub> 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.

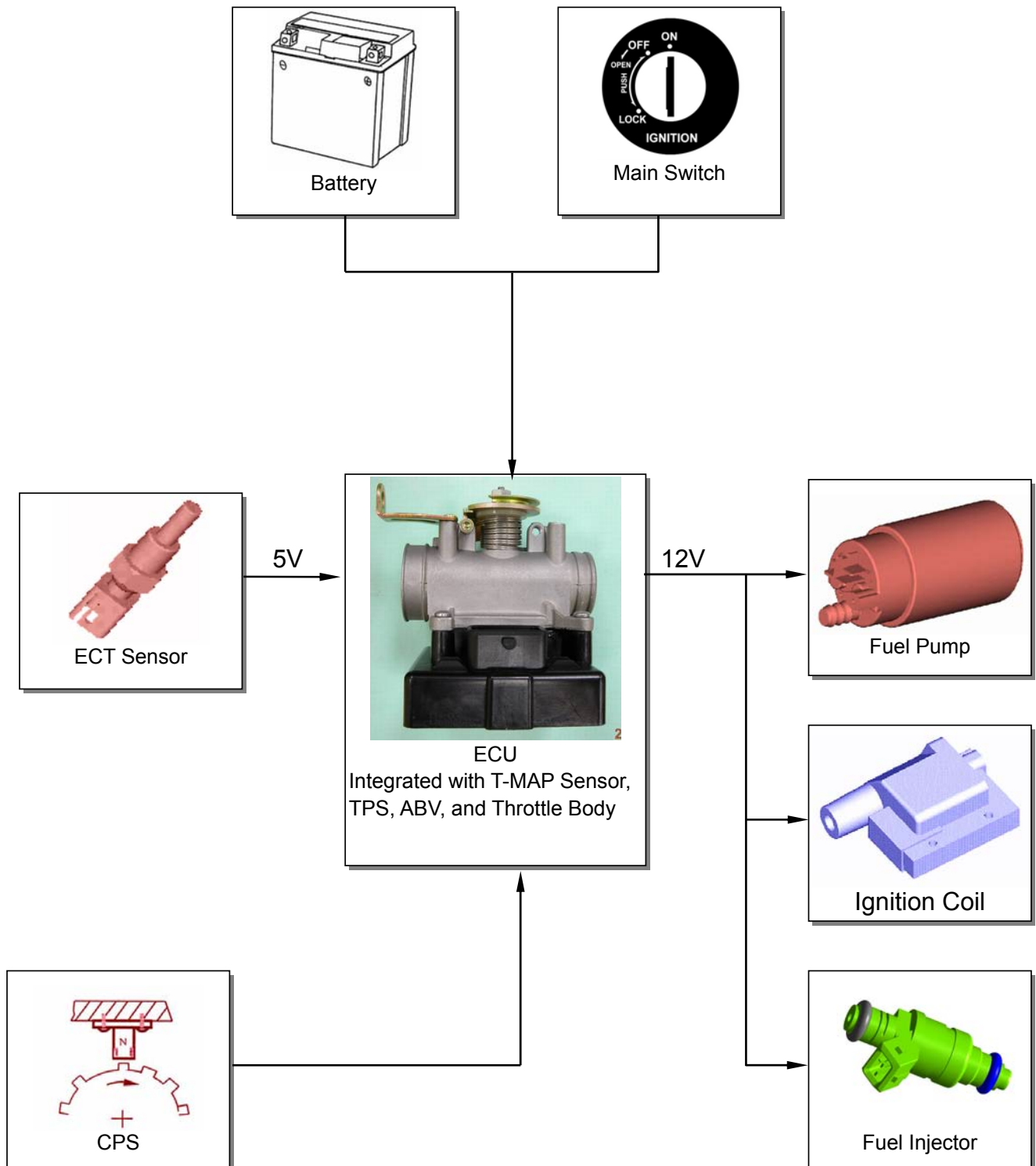
In traditional gasoline engine, carburetor supplies the fuel. The process is done by the engine vacuum, and the negative pressure in the carburetor mixes fuel with air. Under this condition, three major processes are done simultaneously in the carburetor: 1. air quantity measurement, the determination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

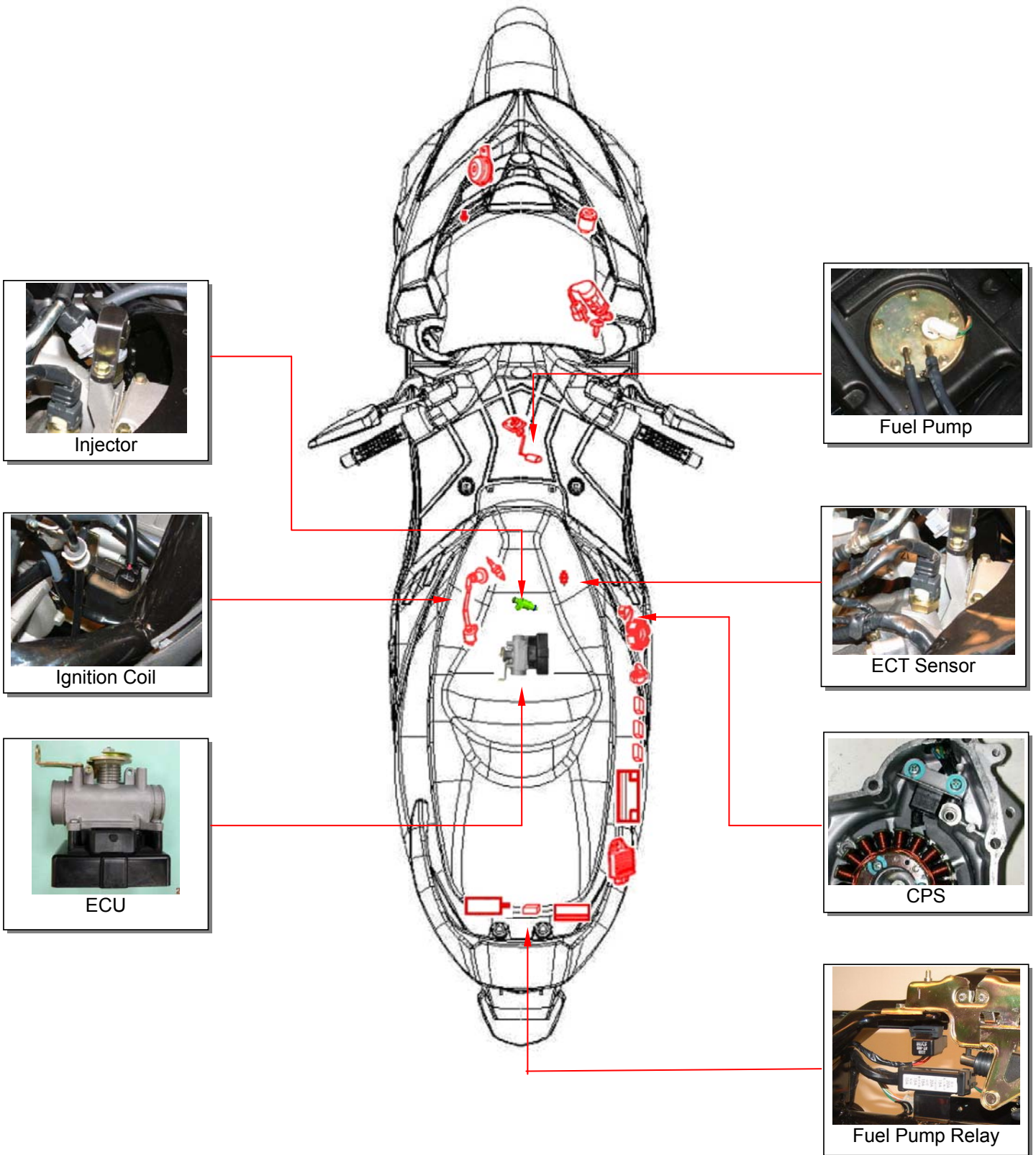




# 5. Fuel Injection System



## 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.

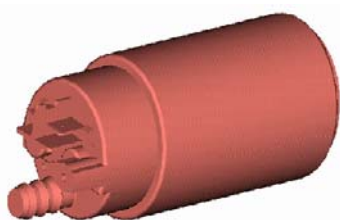
## 5. Fuel Injection System

### Fuel Injector



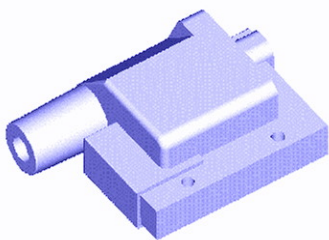
- Powered by DC 8~16V, and has 2 terminals connector on the injector.
- Its major component is the solenoid valve of high resistance driven by electronic current.
- The two terminals are connected to power source and ground respective. It is controlled by ECU to determine the injection timing, and the injector pulse width. Working with 4-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



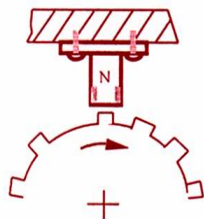
- Powered by DC 8~16V, and has 2 terminals connector on the coil.
- The two terminals are connected to power source and ground respective. Its major component is the high transferring rate transformer.
- Its ignition timing is controlled by computer program. From the signals of crankshaft position sensor, 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



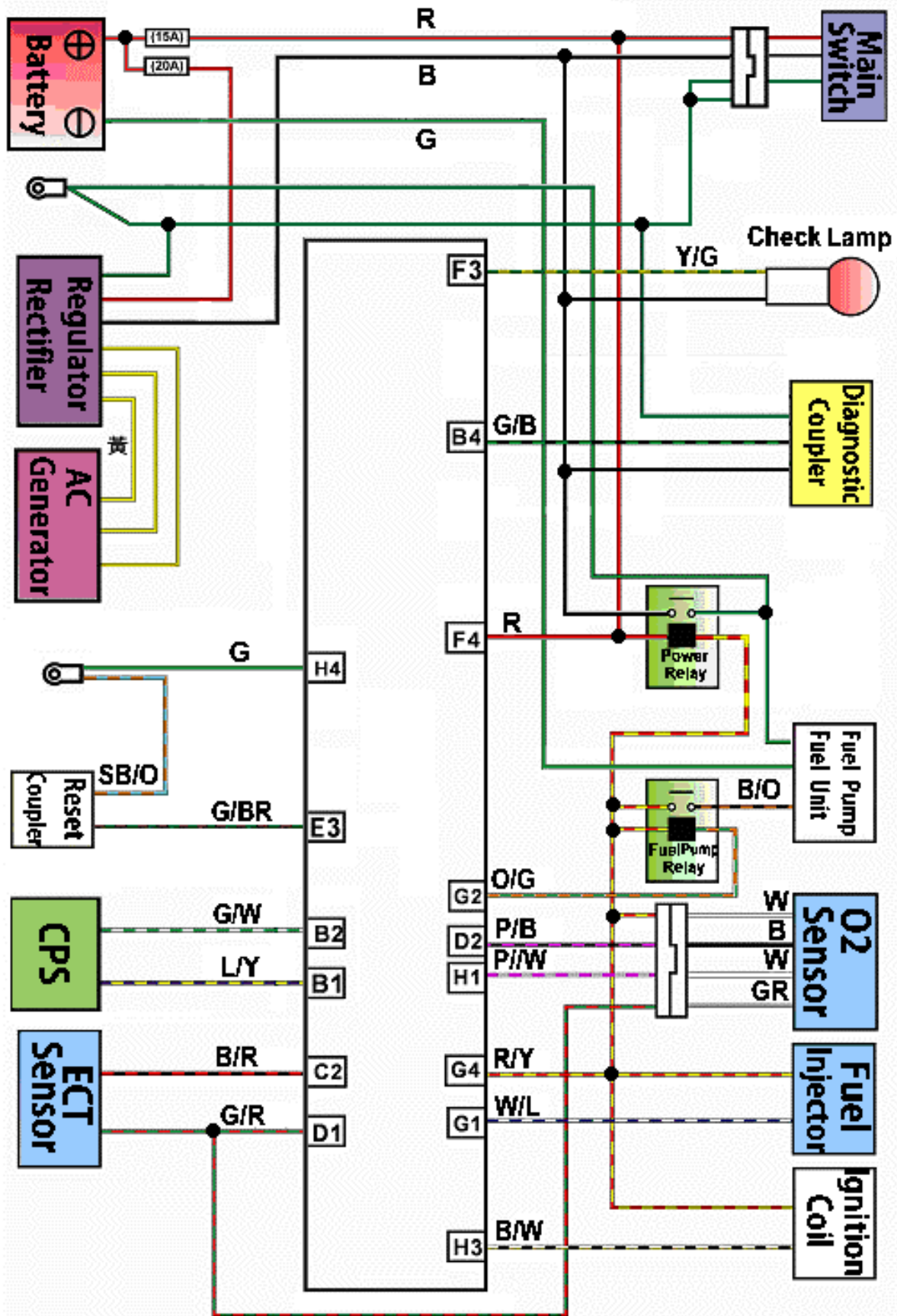
- Powered by DC 8~16V, and has 4 terminals connector on the sensor. The first terminal is for power input; the second is for heating coil. The third is for ground, and the last is for signal output.
- The O2 sensor feeds signal to ECU, and the ECU can control the air/fuel rate around 14.6. It's a close-loop 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 $\Omega$ )



# 5. Fuel Injection System



## 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	1800±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

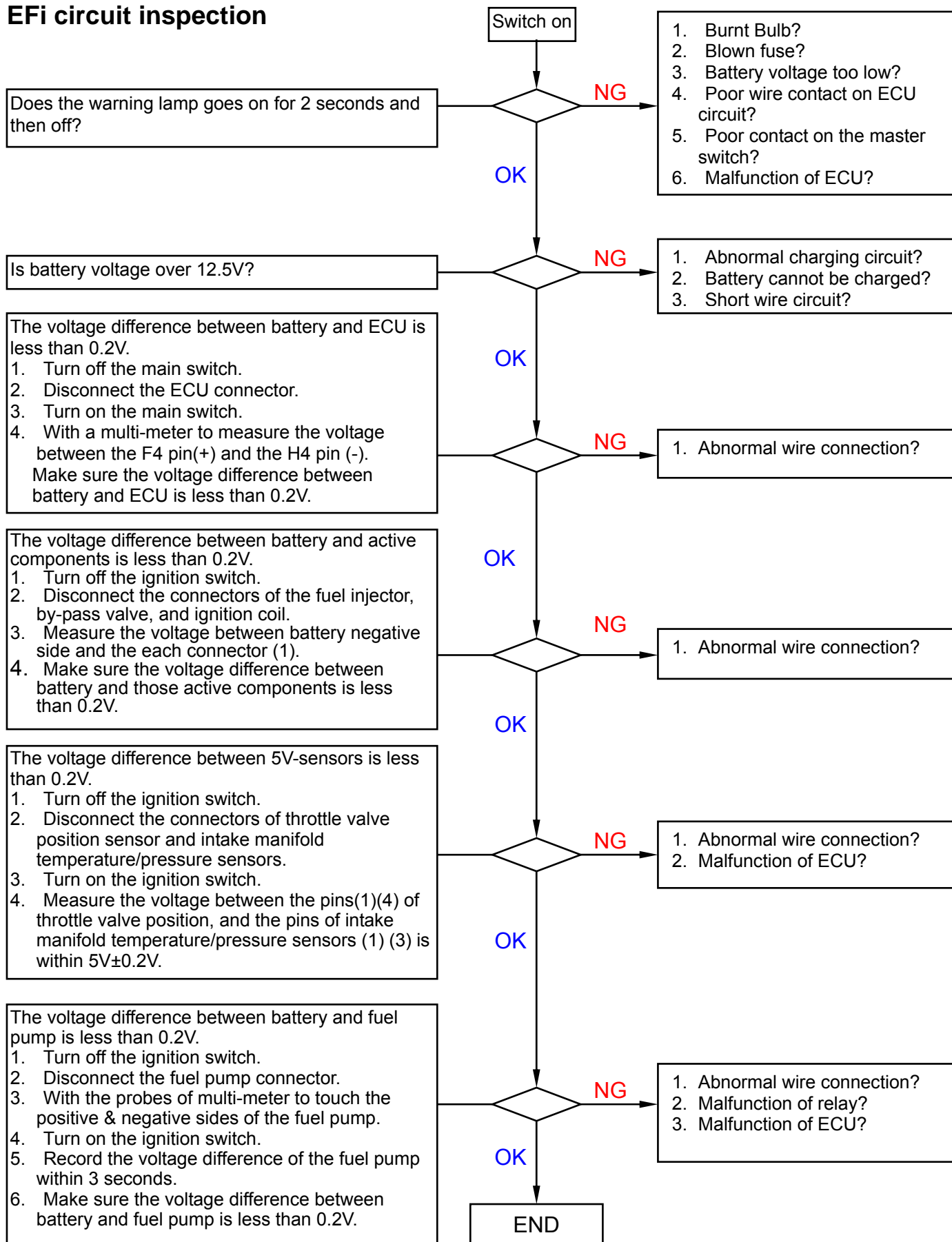
Injection system diagnostic tool

Fuel pressure gauge SYM-HT07010

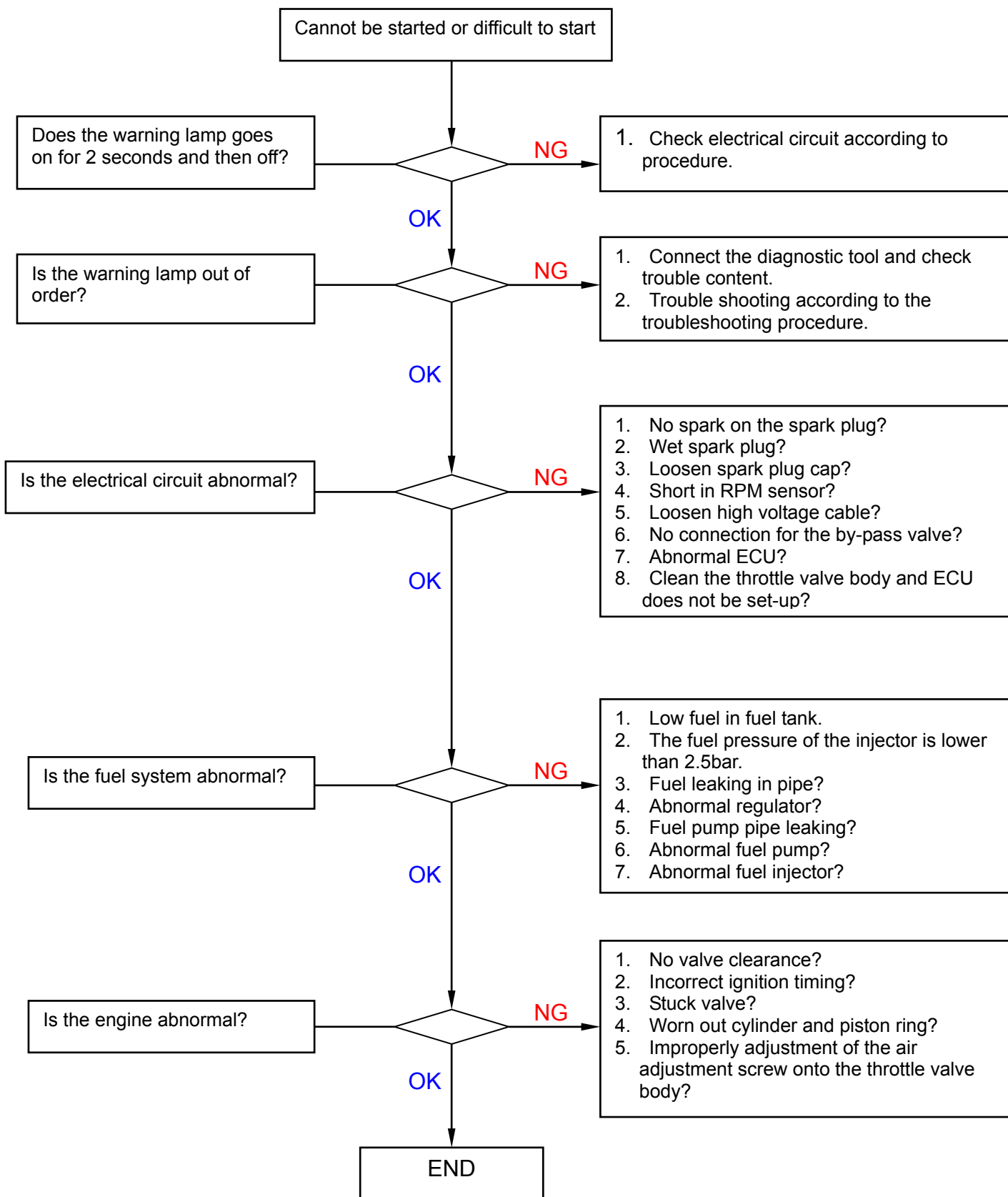
# 5. Fuel Injection System

## Troubleshooting

### EFi circuit inspection

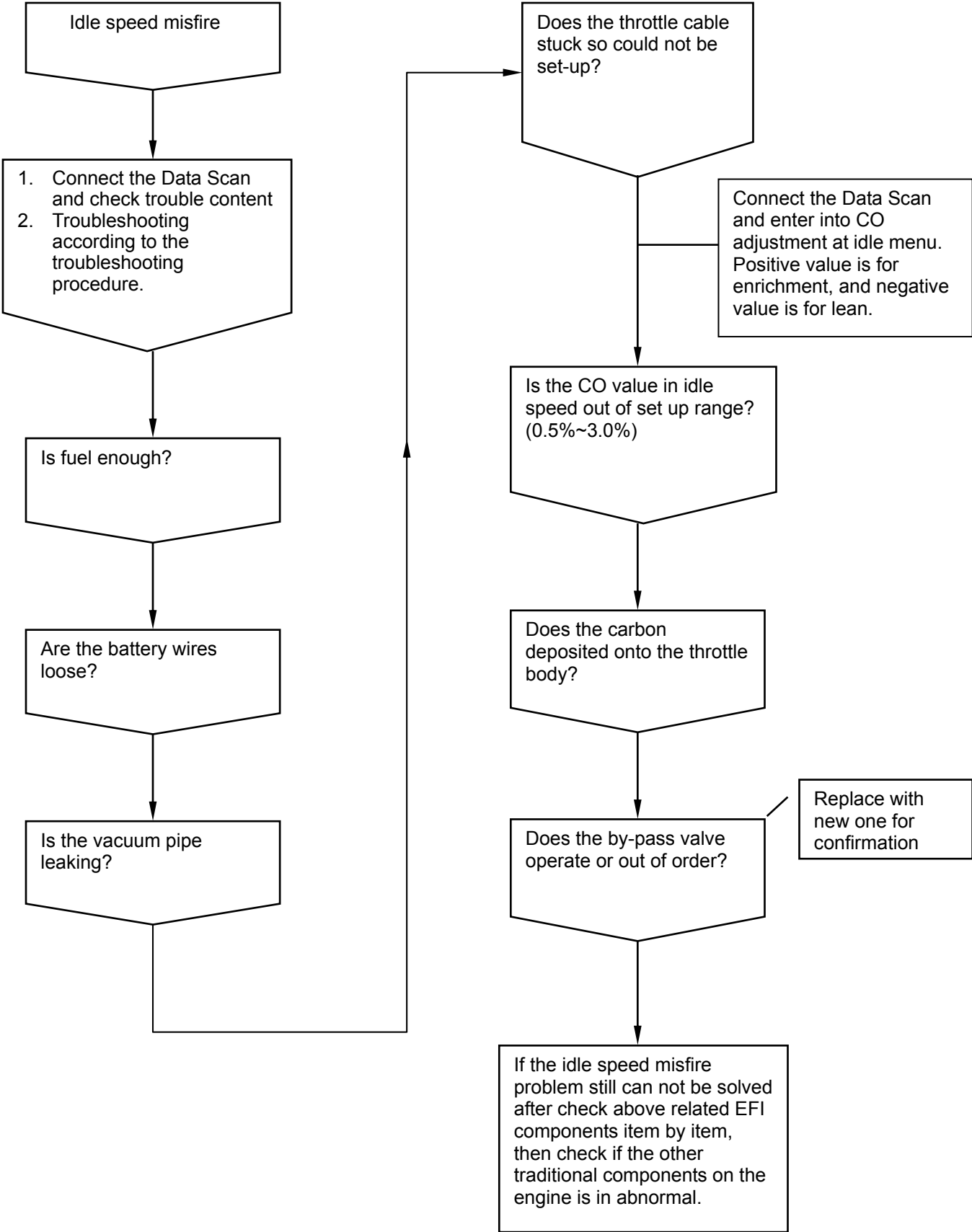


## Engine cannot be started or difficult to start.



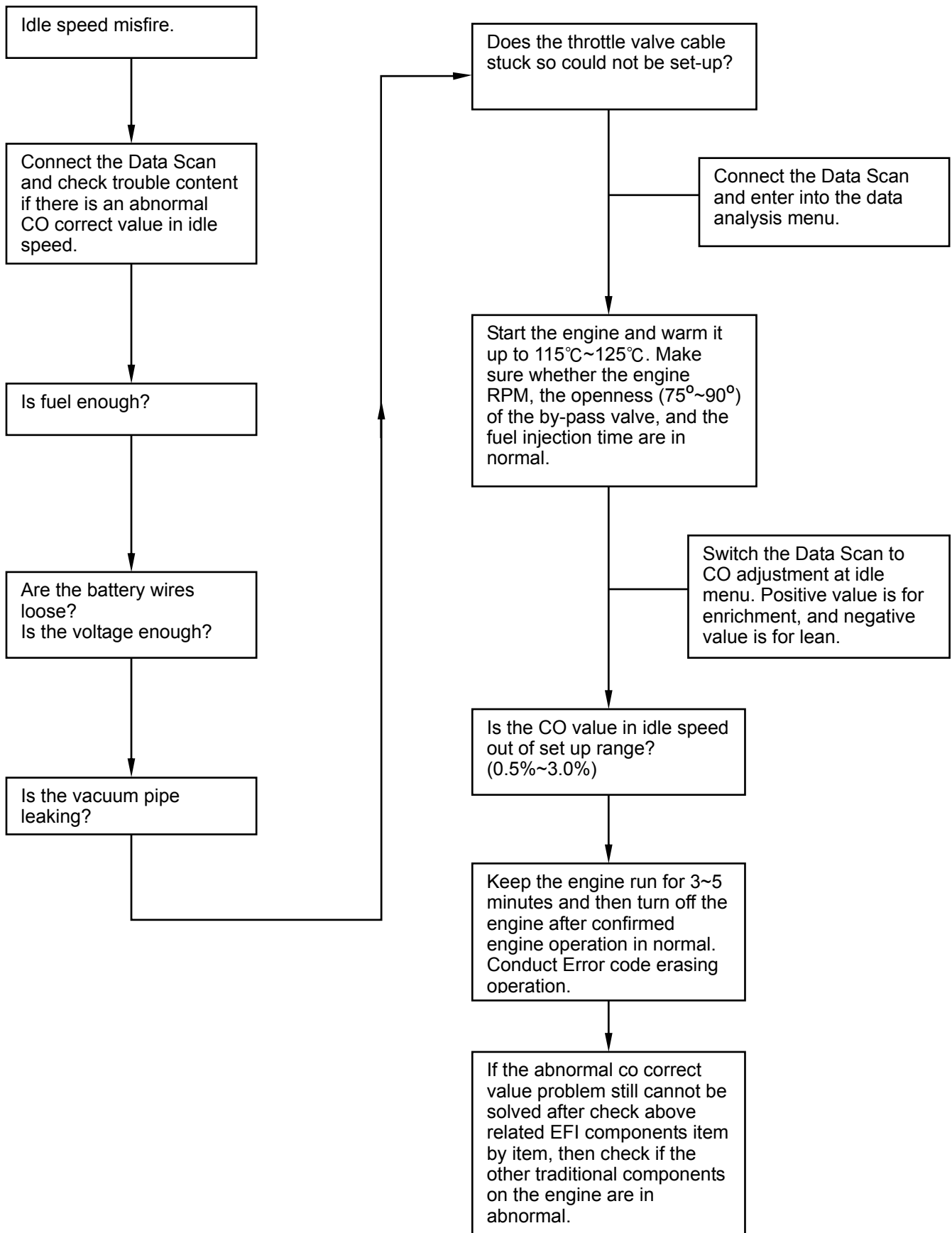
# 5. Fuel Injection System

## 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.





## 5. Fuel Injection System

### 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:

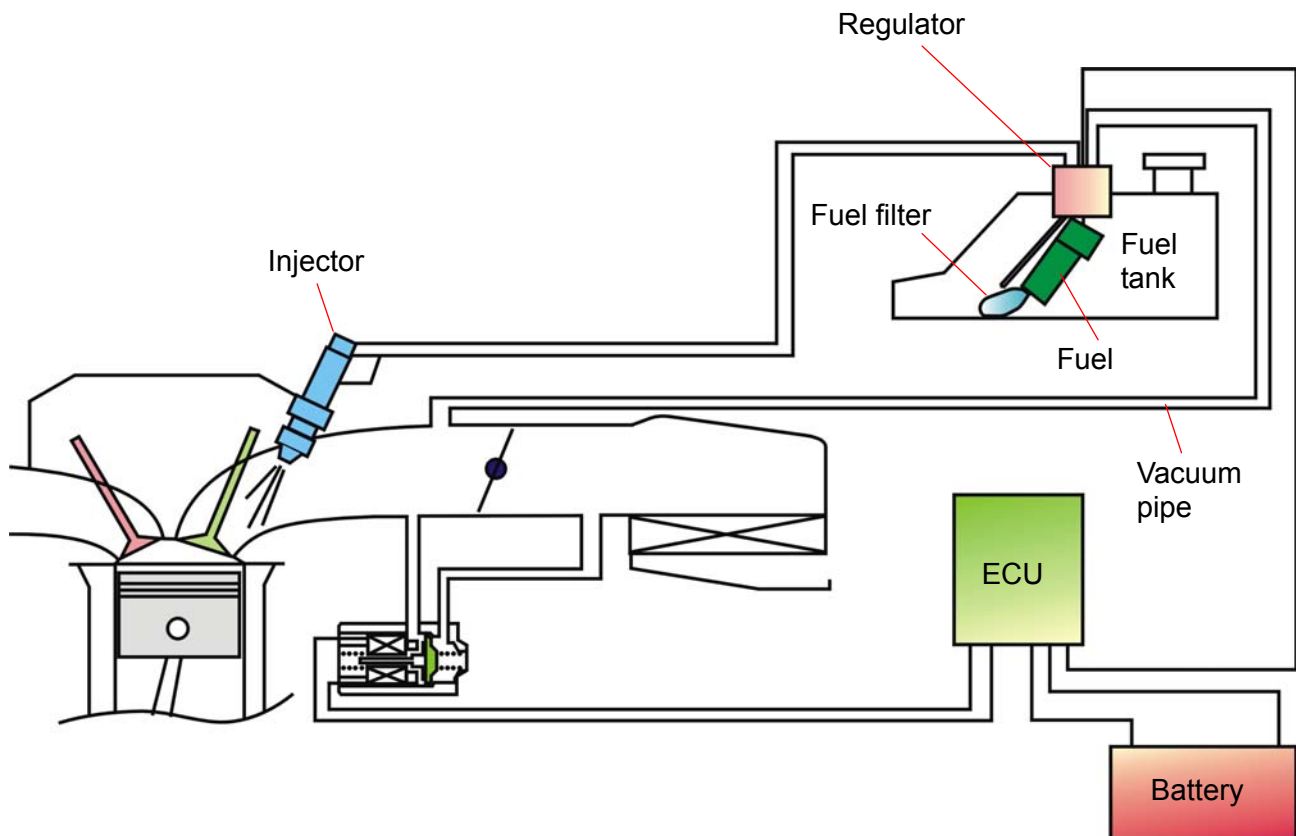
1. Switch off; remove the throttle body.
2. Spray a little carburetor cleaner into the throttle body.
3. Wipe off the dirty oil with clean cloth or tissue.
4. Dry the throttle body with compressed air and install the throttle body. Connect the diagnostic tool and switch on.

#### 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.

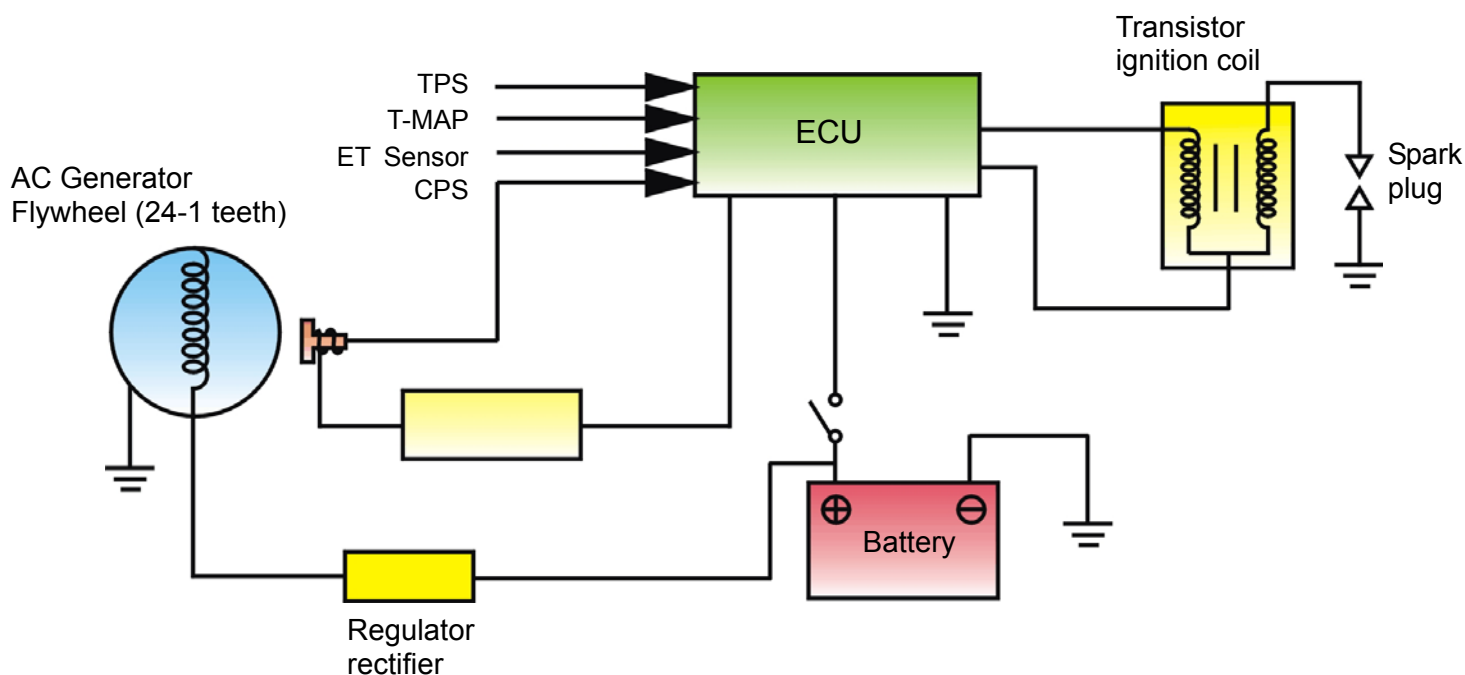
## Fuel Lines

**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.

## 5. Fuel Injection System

### Ignition System



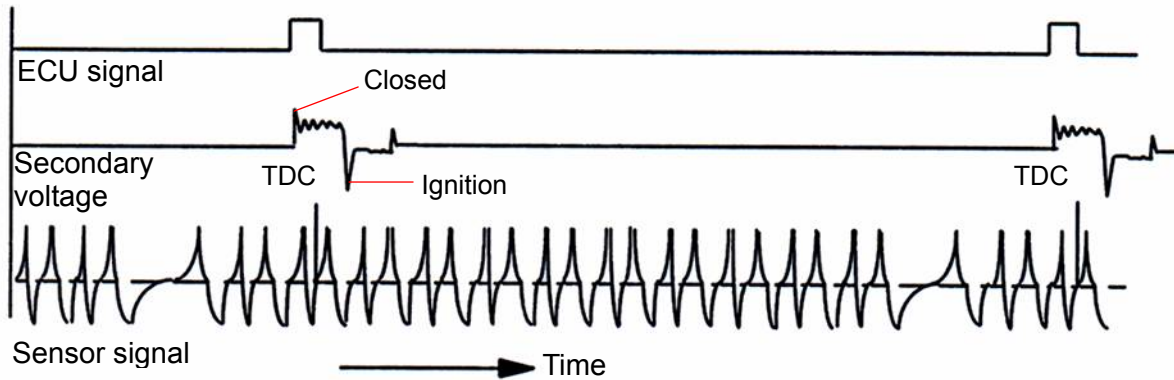
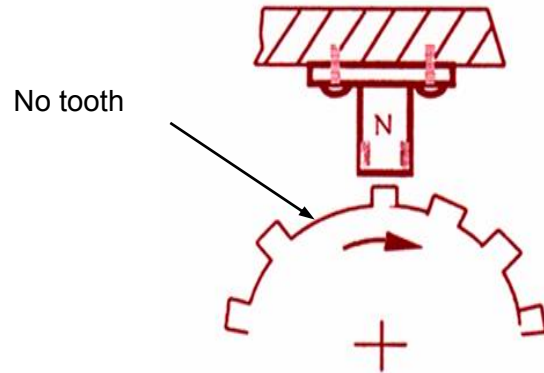
### Principle of operation

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° / 1800RPM
2. Spark plug: NGK CR8E  
Gap: 0.8mm
3. CPS pulse generator coil: 80~160 Ω / 20°C (G/W-LY)
4. Ignition coil  
Primary circuit :  $0.63 \pm 0.03 \Omega$  (23°C)
5. Battery:  
Type: YTX9-BS / GTX9-BS  
Capacity: 12V 8Ah

Crankshaft Position Sensor



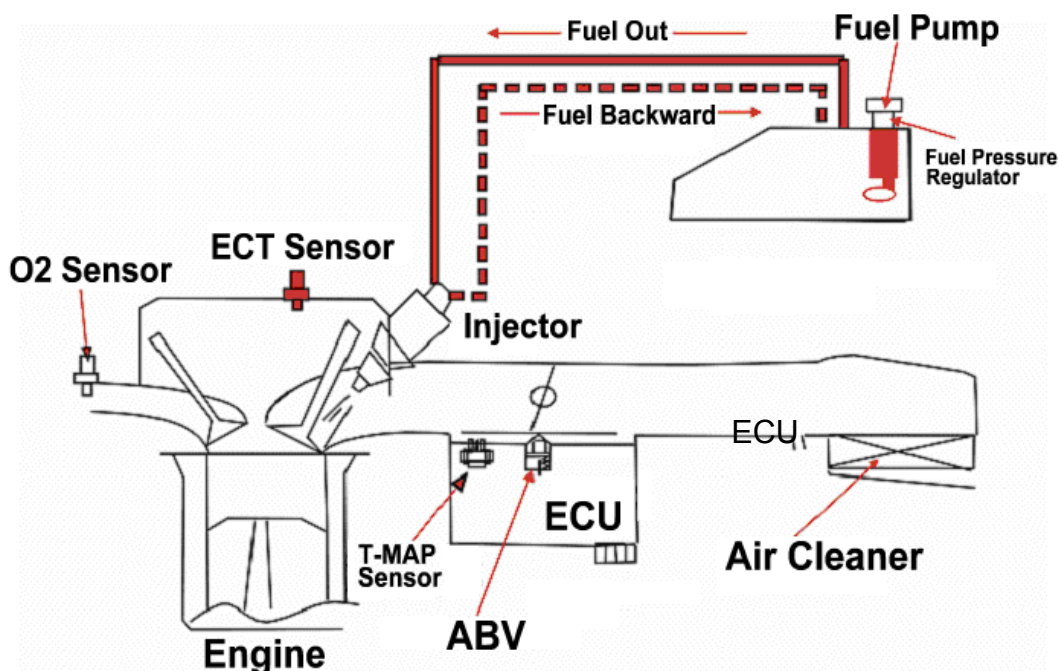
**Description:**

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.

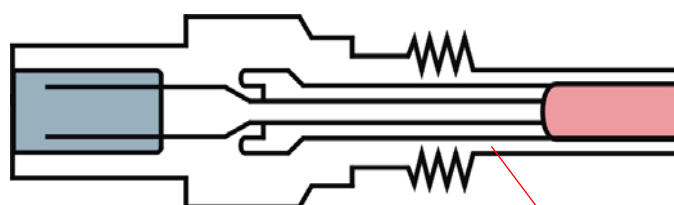
## 5. Fuel Injection System

### Engine Temperature Sensor / T-Map Sensor



Engine temperature sensor:

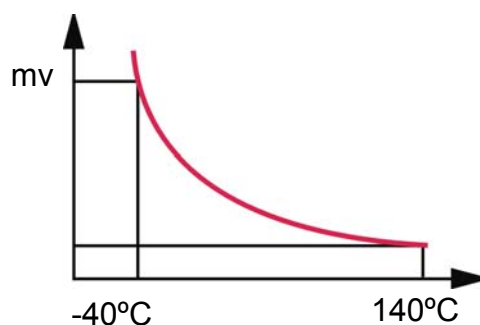
According to the semiconductor's characteristic, the sensor detects the temperature of engine oil and metal parts and then sends a voltage signal to the ECU. On this base, the ECU can correct fuel injection and ignition timing.



NTC- Negative Temperature Coefficient Resistor

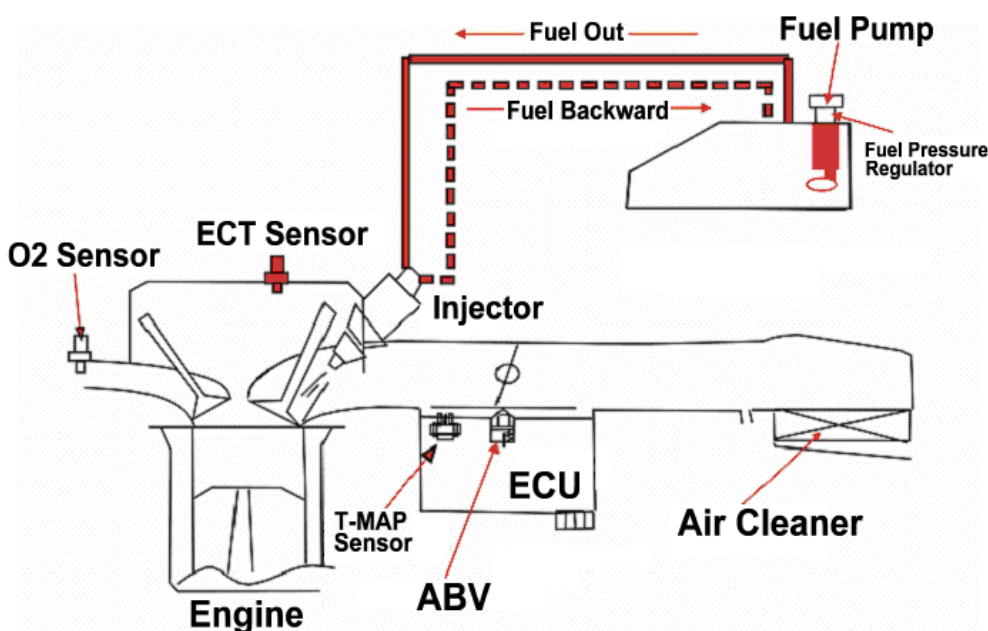
T-MAP Sensor :

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 double-hole injector provides each 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.

## 5. Fuel Injection System

### Fuel Pump / Fuel Unit

#### Removal

Remove the front cover and right/ left side covers.

Remove the luggage box.

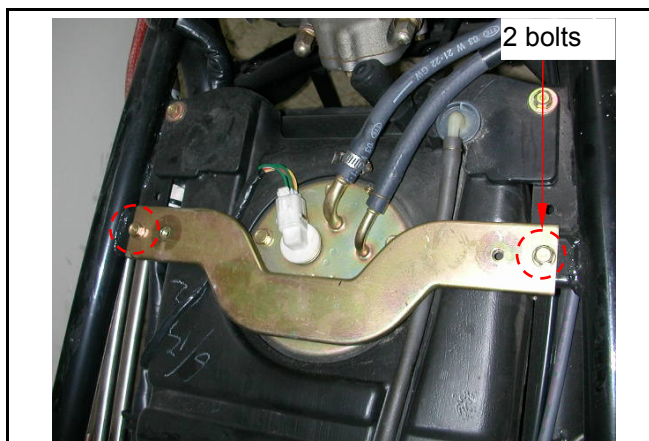
Remove the right/ left body covers.

Remove the central cover and footrest.

Remove the front inner cover.

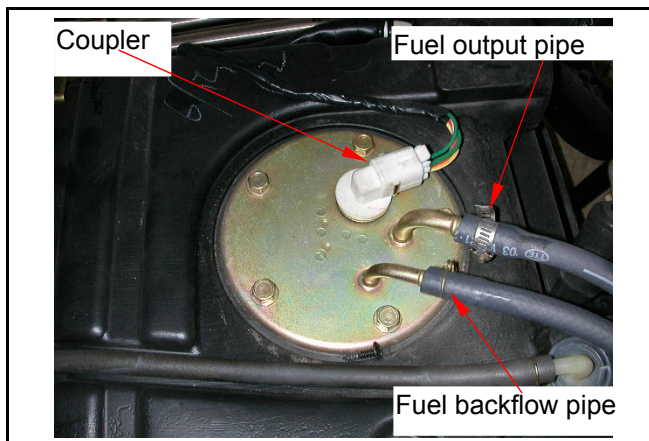


Remove the fuel tank fixing bracket (2 lock bolts).

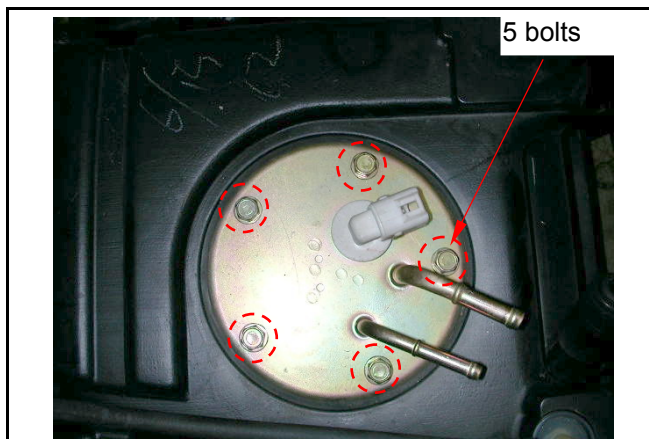


Disconnect the fuel pump and fuel unit couplers.

Remove the fuel pipes.



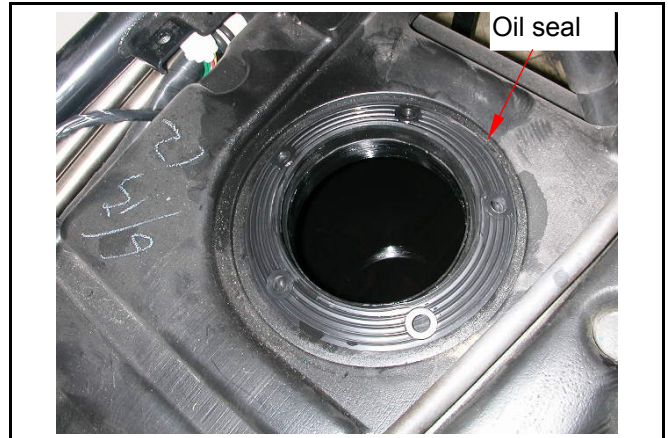
Remove the fuel pump lock bolts.



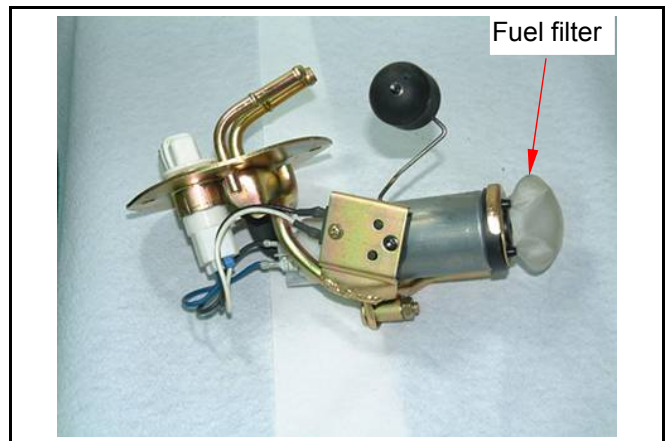
Remove the fuel pump and fuel unit.

**⚠ 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.



**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.





## 5. Fuel Injection System

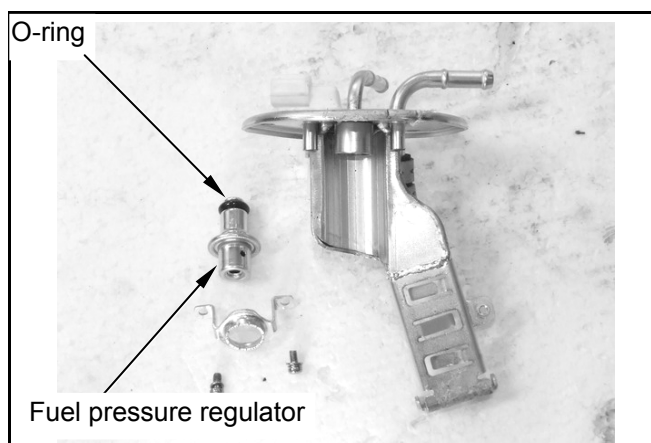
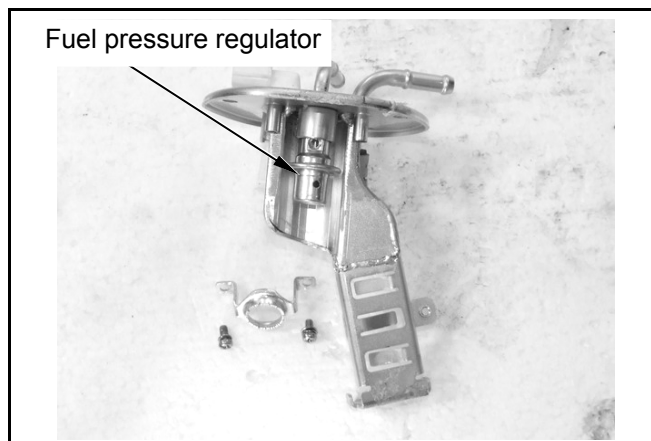
Check the oil seal of fuel pressure regulator for any damage or deformation.

### Caution

- Replace the oil seal if any damage or deformation is found.

### Installation

Install in the reverse order of removal.

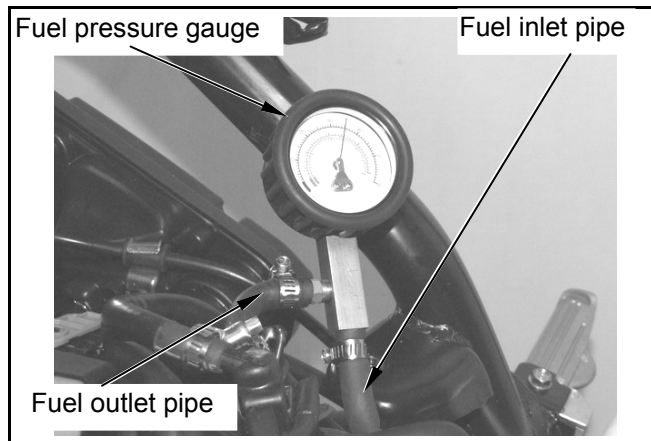


### Inspection :

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 pressure regulator with new one if malfunction is confirmed.



## 5. Fuel Injection System

### Fuel Tank Removal

#### Caution

- Make sure the fuel in the tank is not too much before removing the fuel tank.

Remove the fuel tank fixing brackets (4 bolts).

Disconnect the fuel pump/ unit coupler, fuel output/ backflow pipes and fuel tank ventilation pipe.

Remove the fill-in pipe and overflow pipe.

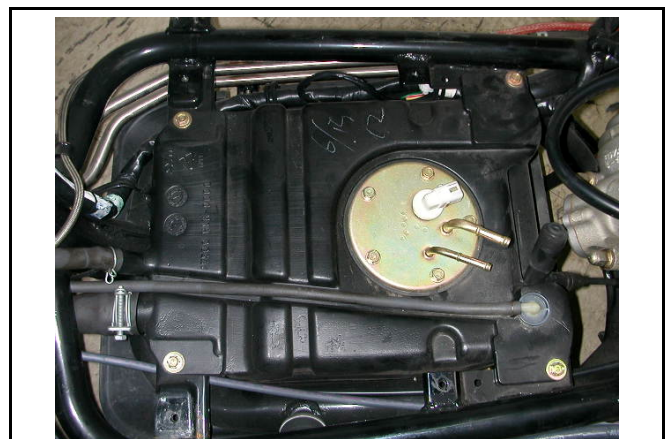
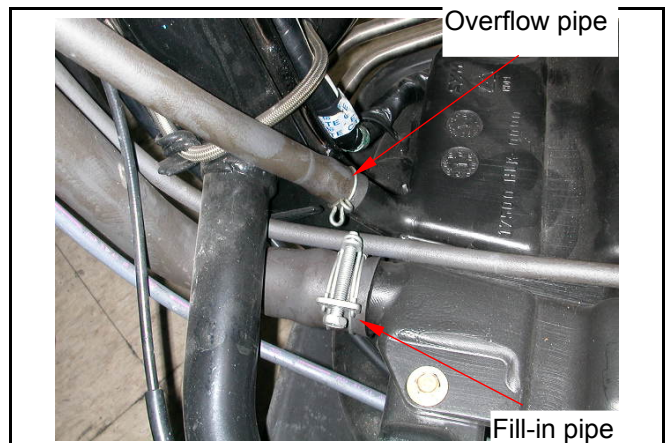
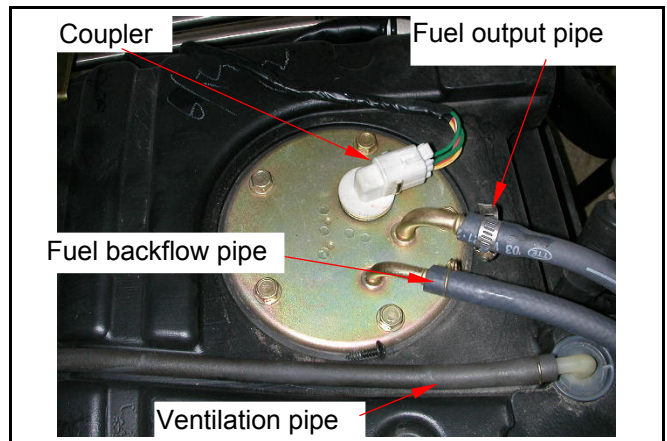
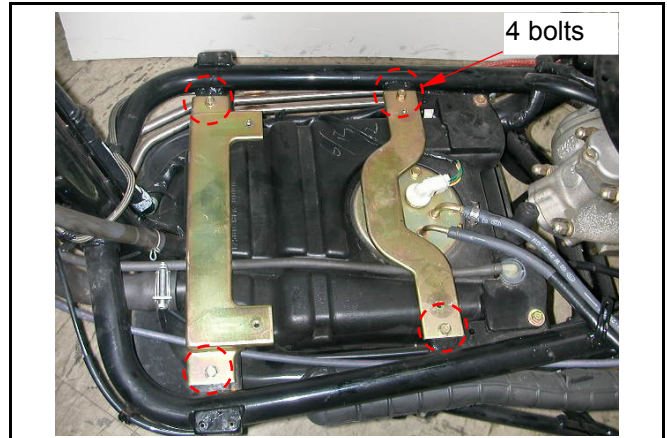
Remove the fuel tank (4 lock bolts).

#### Caution

- Replace the fuel tank if there is any damage or leakage.

### Installation

Install in the reverse order of removal.

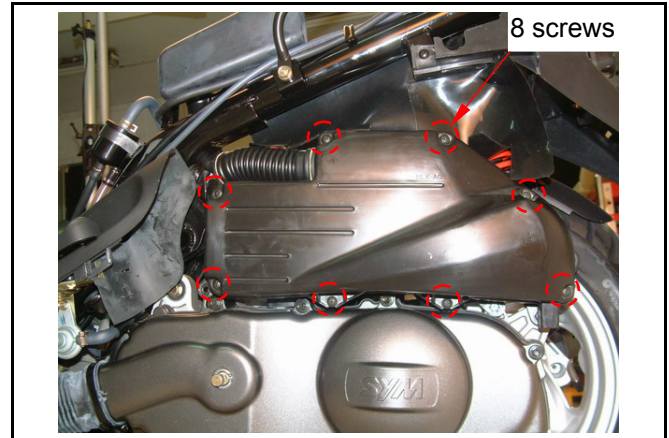




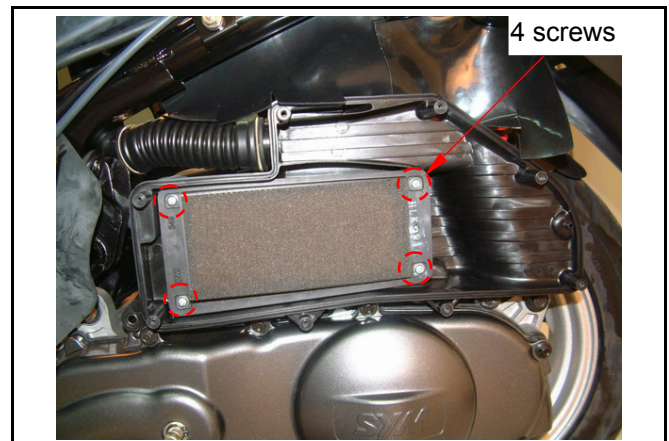
## 5. Fuel Injection System

### Air Cleaner

Remove the air cleaner cover (8 screws).



Remove the air cleaner element (4 screws).

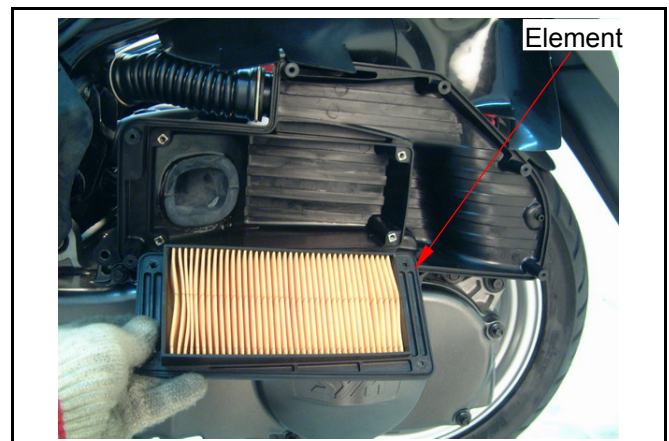


### Caution

- 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**.

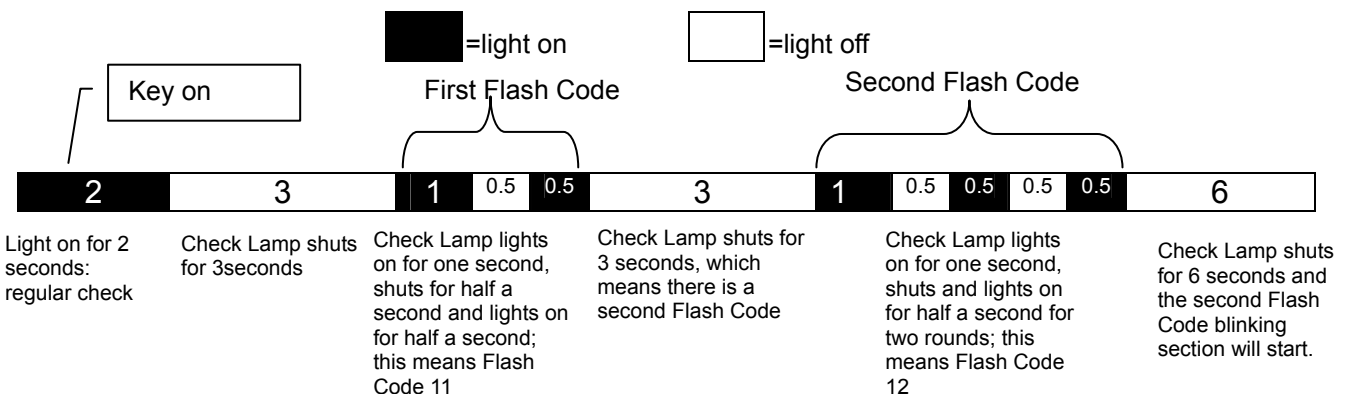
Service Priority 2 : Check Lamp keeps lighting up: to warn the driver that the vehicle should be checked as soon as possible, yet the vehicle has **no immediate problem**.

Service Priority	Light up types
1	<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;">ON</div> </div> <div style="display: flex; align-items: center; margin-top: 5px;"> <div style="margin-right: 10px;">OFF</div> </div>
2	<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;">ON</div> </div> <div style="display: flex; align-items: center; margin-top: 5px;"> <div style="margin-right: 10px;">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.

## 5. Fuel Injection System



### 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.

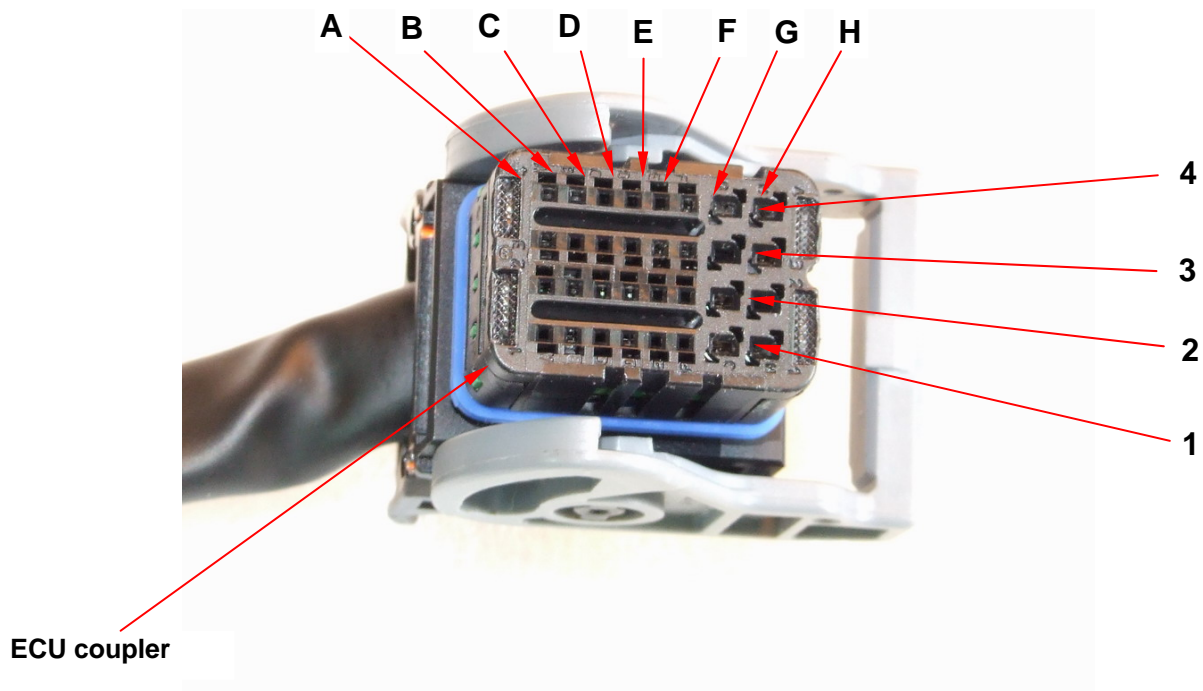
DTC code	Flash code	Service priority	Message	Solution operation
P0505	9	2	Abnormal air bypass valve learning value	Check if the air bypass valve openness is in normal. Check if the intake manifold is leaking.
P0200	10	2	Abnormal fuel injector	Make sure if the fuel injector resistance is within specification. (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.

## 5. Fuel Injection System



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.

## 5. Fuel Injection System



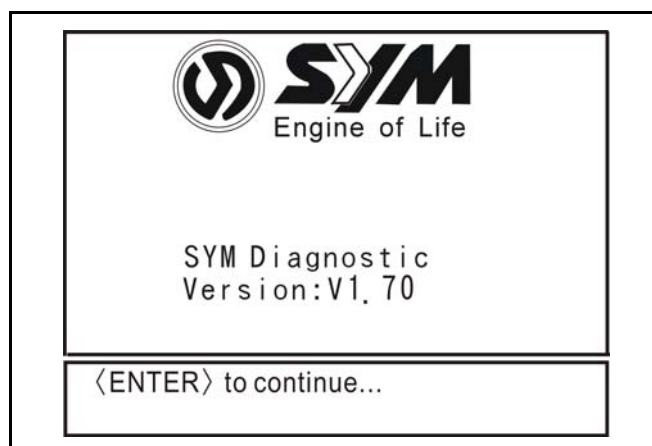
### Diagnostic tool illustration

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

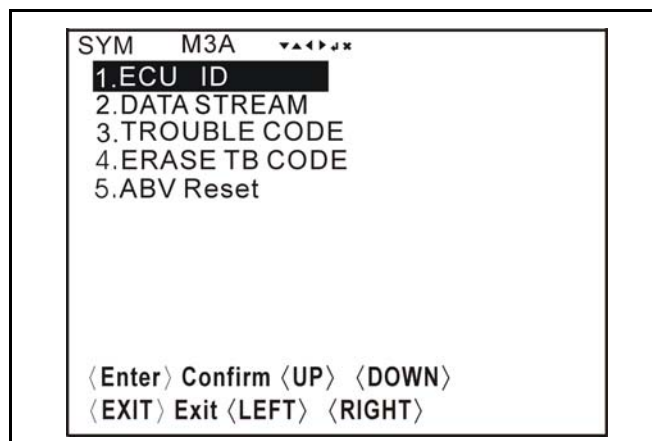
Press <Enter> button to proceed.



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

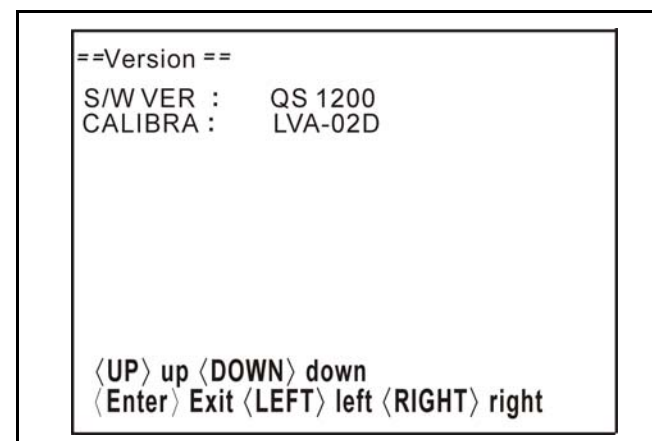


Press <Enter> button to enter ECU ID version page.



### System Information

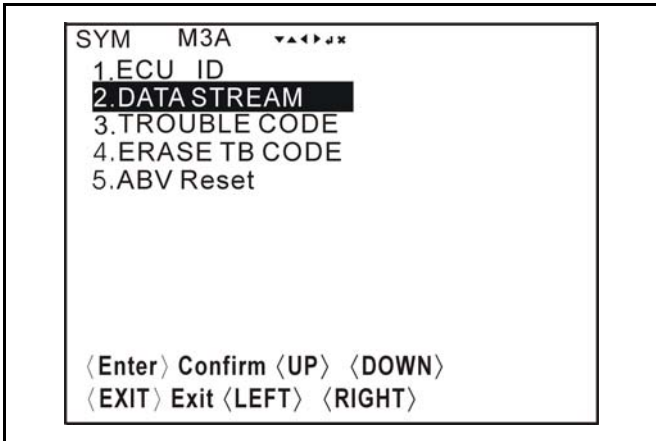
Press <Enter> button to get back to the function-options page.



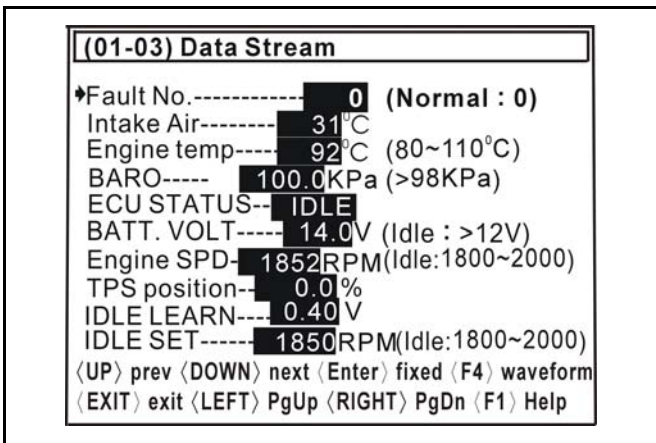


**DATA STREAM**

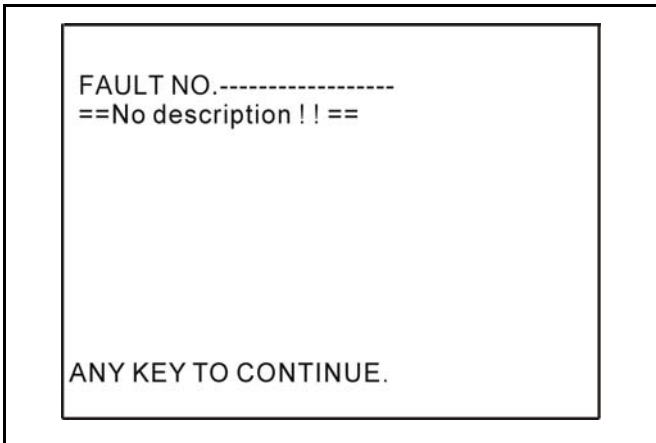
Press <Enter> button to enter Data Stream page.



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



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





# 5. Fuel Injection System

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.

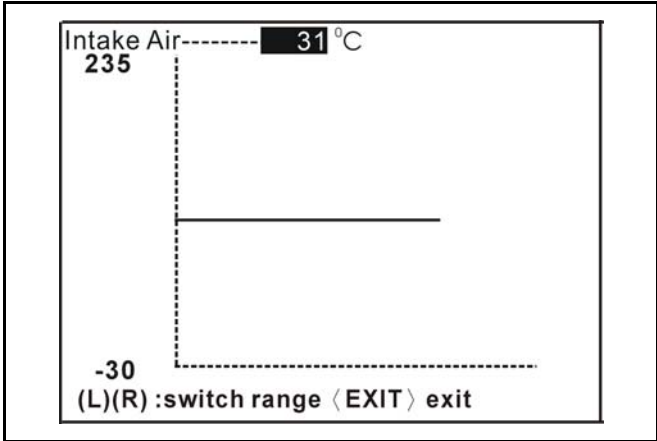
```

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.





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

**(01-03) Data Stream**

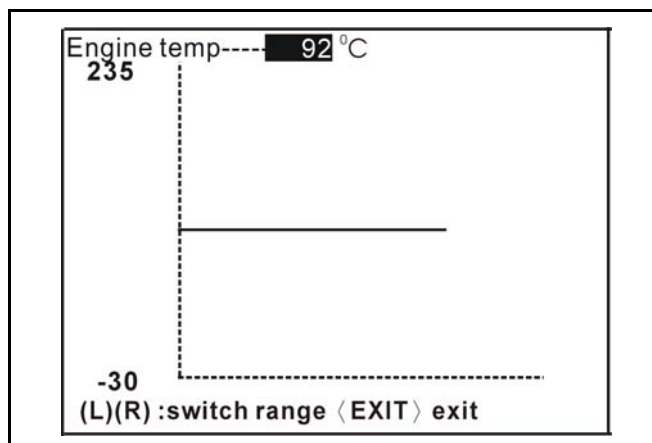
Fault No.----- **0** (Normal : 0)  
 Intake Air----- **31**°C  
 ↗Engine temp---- **92**°C (80~110°C)  
 BARO----- **100.0**KPa (>98KPa)  
 ECU STATUS-- **IDLE**  
 BATT. VOLT---- **14.0**V (Idle : >12V)  
 Engine SPD- **1852**RPM(Idle:1800~2000)  
 TPS position-- **0.0**%  
 IDLE LEARN---- **0.40**V  
 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.

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







# 5. Fuel Injection System

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.

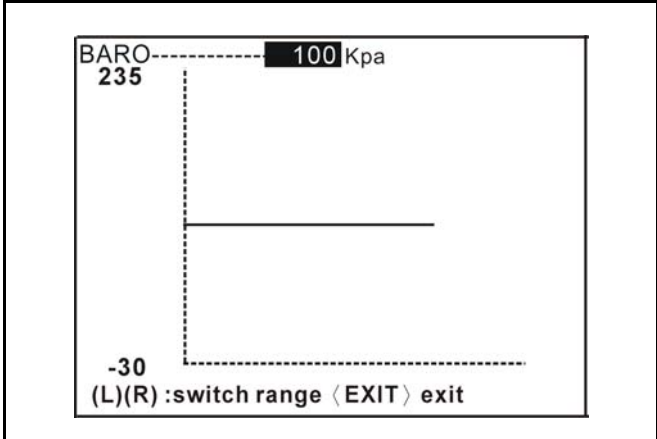
```

BARO-----
Under different height above sea level, atmospheric pressure will lead to the fact air thin, so will need a compensation 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.





## 5. Fuel Injection System

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

**(01-03) Data Stream**

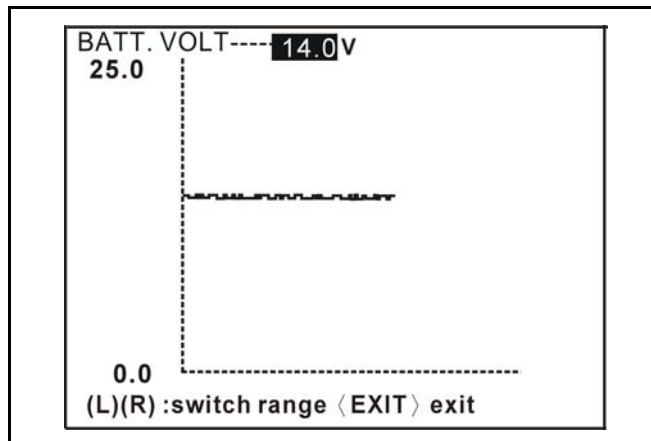
Fault No.----- **0** (Normal : 0)  
 Intake Air----- **31**°C  
 Engine temp----- **92**°C (80~110°C)  
 BARO----- **100.0**KPa (>98KPa)  
 ECU STATUS-- **IDLE**  
 ↗BATT. VOLT----- **14.0**V (Idle : >12V)  
 Engine SPD- **1852**RPM(Idle:1800~2000)  
 TPS position-- **0.0**%  
 IDLE LEARN---- **0.40**V  
 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.

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.



## 5. Fuel Injection System



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

**(01-03) Data Stream**

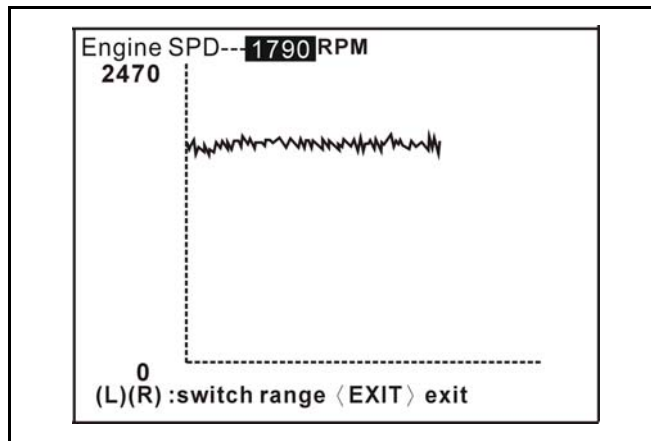
Fault No.----- **0** (Normal : 0)  
 Intake Air----- **31**°C  
 Engine temp----- **92**°C (80~110°C)  
 BARO----- **100.0**KPa (>98KPa)  
 ECU STATUS-- **IDLE**  
 BATT. VOLT----- **14.0**V (Idle : >12V)  
 ▶Engine SPD-- **1852**RPM(Idle:1800~2000)  
 TPS position-- **0.0**%  
 IDLE LEARN---- **0.40**V  
 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.

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.





## 5. Fuel Injection System

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% i  
 n full speed.

ANY KEY TO CONTINUE.

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

TPS position---- **0.0** %  
**128.0**

**0.0**  
 (L)(R) :switch range <EXIT> exit



# 5. Fuel Injection System

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

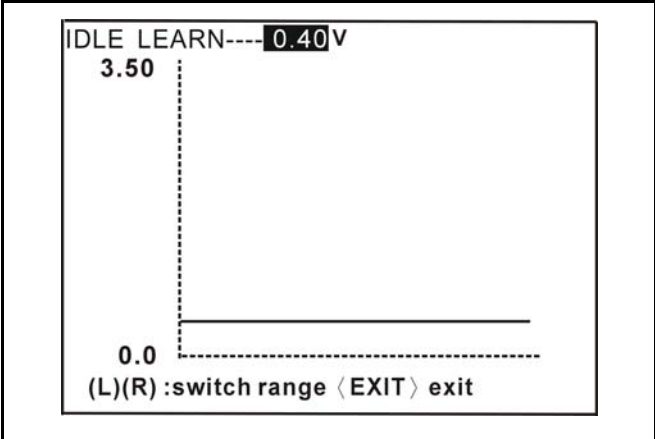
```

IDLE LEARN-----
==No description !!==

ANY KEY TO CONTINUE.

```

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







## 5. Fuel Injection System

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

**(01-03) Data Stream**

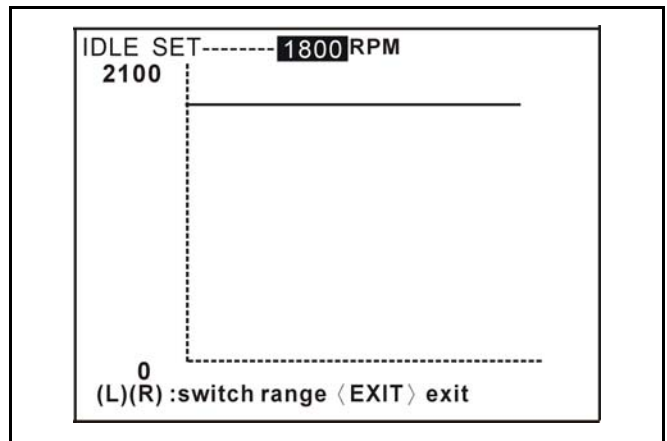
Fault No.----- **0** (Normal : 0)  
 Intake Air----- **31**°C  
 Engine temp----- **92**°C (80~110°C)  
 BARO----- **100.0**KPa (>98KPa)  
 ECU STATUS-- **IDLE**  
 BATT. VOLT----- **14.0**V (Idle : >12V)  
 Engine SPD- **1852**RPM(Idle:1800~2000)  
 TPS position-- **0.0**%  
 IDLE LEARN---- **0.40**V  
 ▶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.





# 5. Fuel Injection System

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

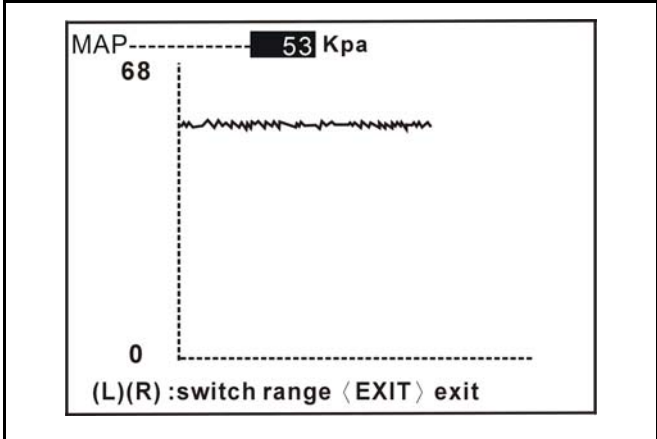
```

MAP-----
This data used for measure manifold v
acuity to calculate fuel amount and i
gnition angle.

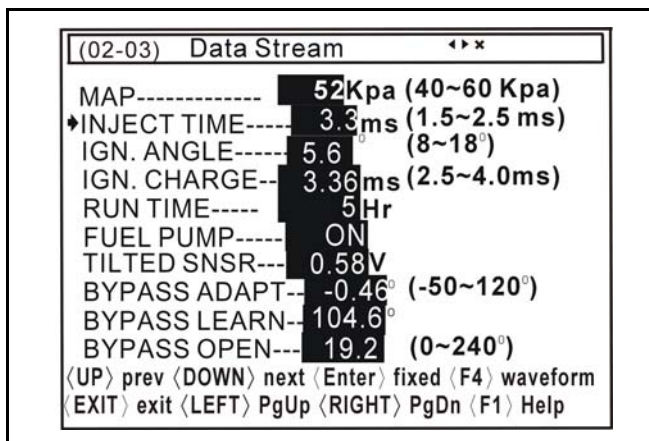
ANY KEY TO CONTINUE.

```

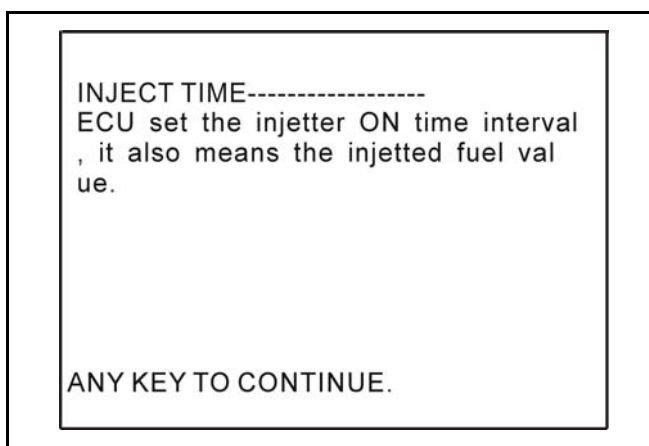
Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.



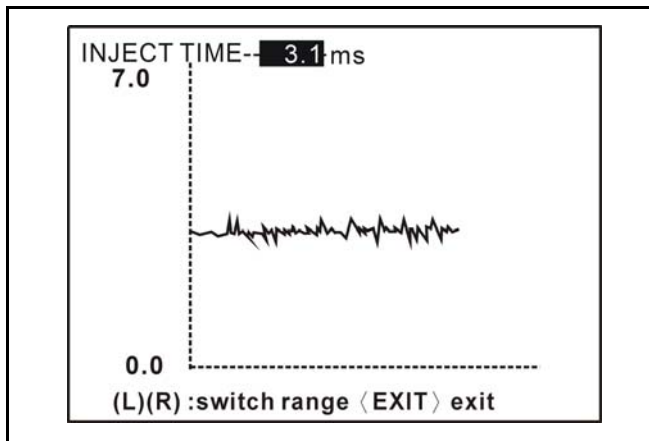
Press <UP> or <DOWN> button to choose INJECT TIME item.



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



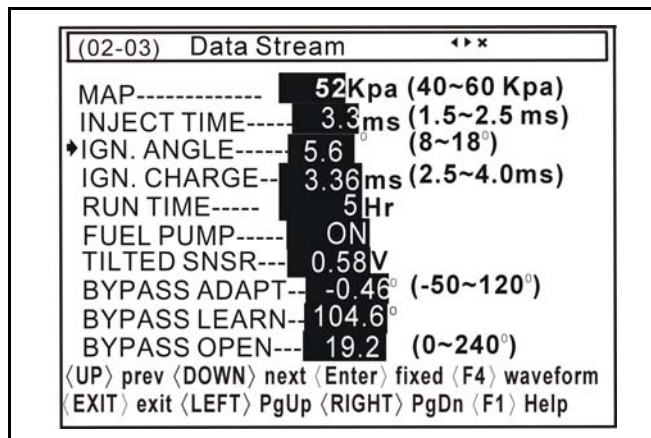
Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.



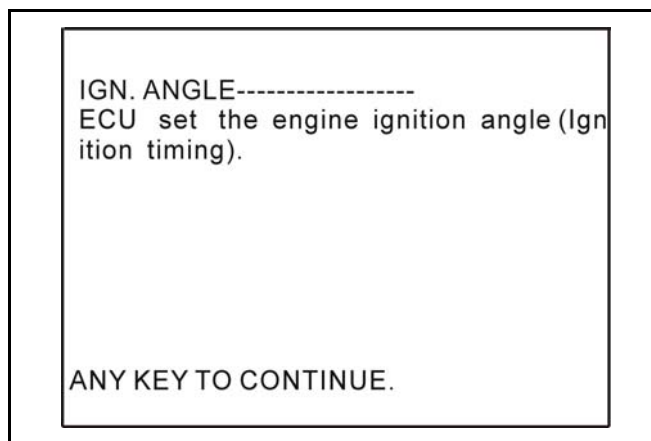
## 5. Fuel Injection System



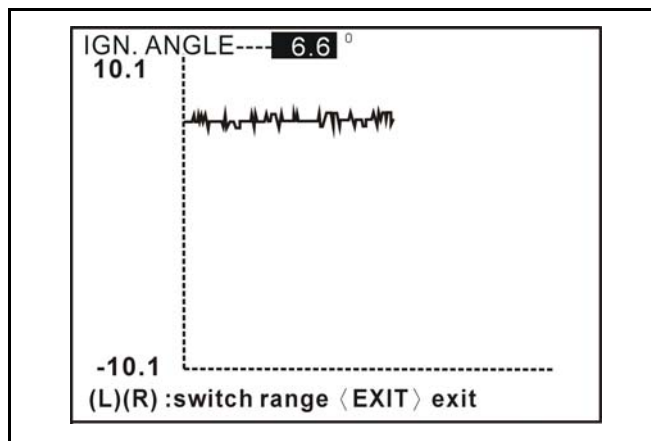
Press <UP> or <DOWN> button to choose IGN. ANGLE item.



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



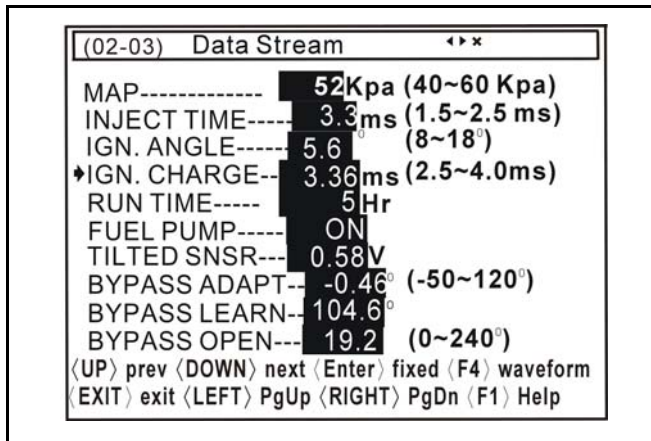
Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.



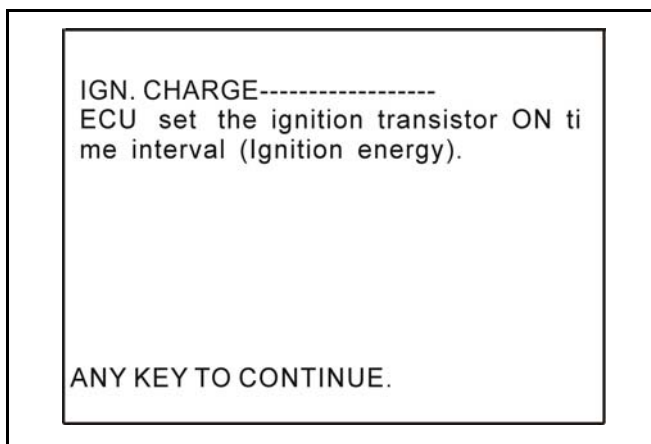


## 5. Fuel Injection System

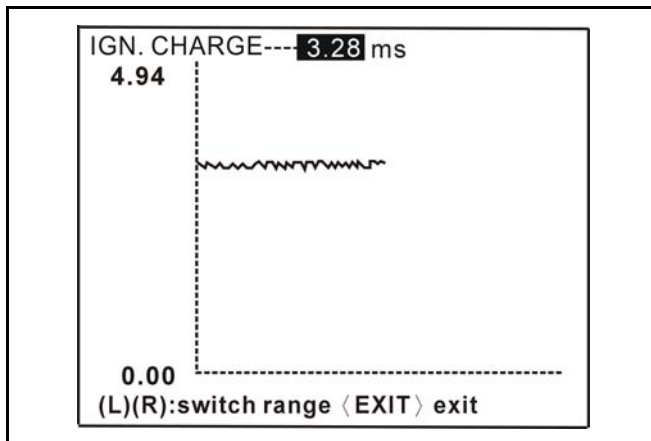
Press <UP> or <DOWN> button to choose IGN. CHARGE item.



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.





## 5. Fuel Injection System

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

```
RUN TIME-----
ECU interval timer to count key-on ad
d up time.

ANY KEY TO CONTINUE.
```

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

```
FUEL PUMP-----
==No description !! ==

ANY KEY TO CONTINUE.
```



## 5. Fuel Injection System

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

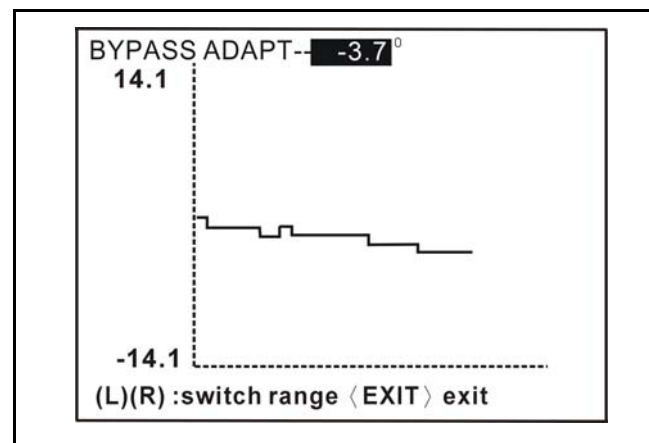
(02-03) Data Stream	
MAP-----	52Kpa (40~60 Kpa)
INJECT TIME----	3.3ms (1.5~2.5 ms)
IGN. ANGLE-----	5.6° (8~18°)
IGN. CHARGE--	3.36ms (2.5~4.0ms)
RUN TIME-----	5Hr
FUEL PUMP-----	ON
TILTED SNSR---	0.58V
▶BYPASS ADAPT--	-0.46° (-50~120°)
BYPASS LEARN--	104.6°
BYPASS OPEN---	19.2 (0~240°)
<UP> prev <DOWN> 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.



## 5. Fuel Injection System

Press <UP> or <DOWN> button to choose BYPASS LEARN 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 LEARN-----
==No description !! ==

ANY KEY TO CONTINUE.
    
```

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

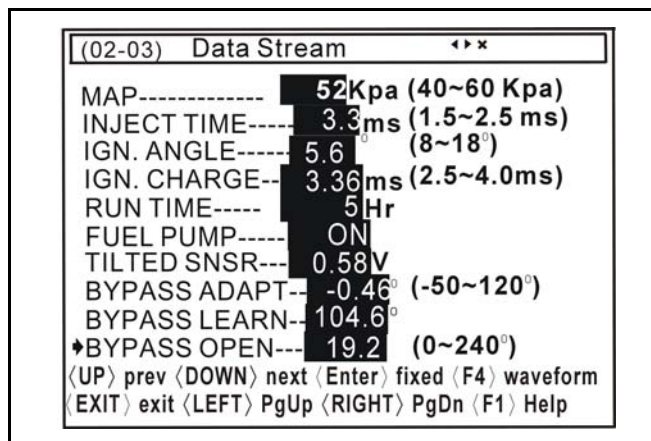
```

BYPASS LEARN-- 100.3°
120.0
-----
-120.0
(L)(R) :switch range <EXIT> exit
    
```

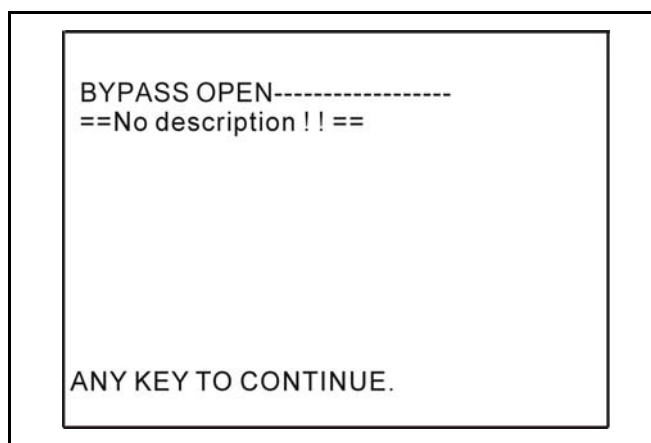


## 5. Fuel Injection System

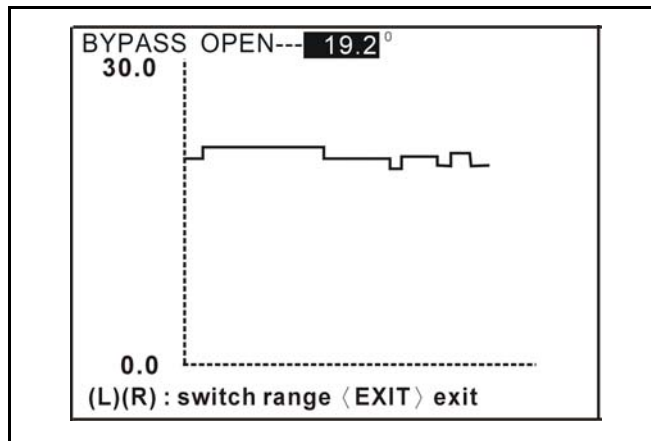
Press <UP> or <DOWN> button to choose BYPASS OPEN item.



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

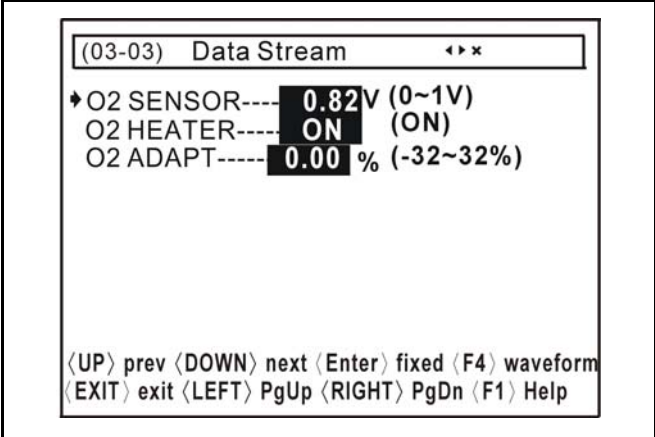


Press <F4> button to enter waveform page.  
Press <EXIT> button to get back to Data Stream page.

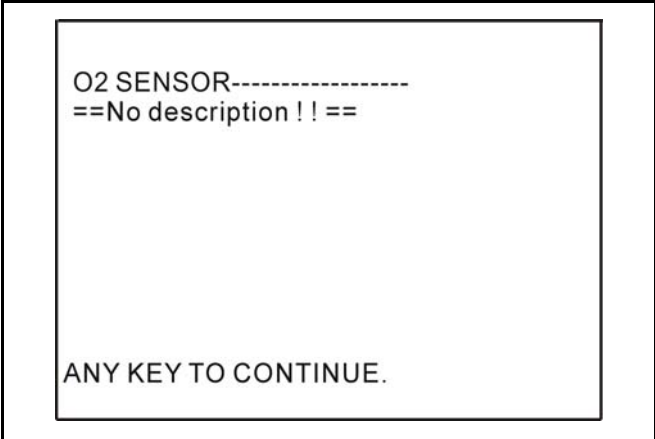


# 5. Fuel Injection System

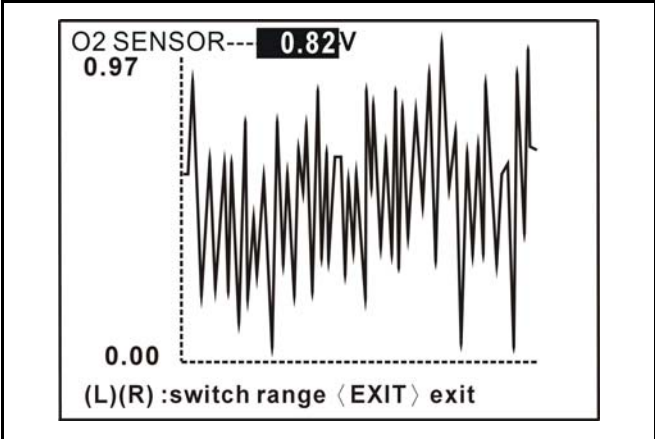
Press <RIGHT> button to get to next page to choose O2 SENSOR item.



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.

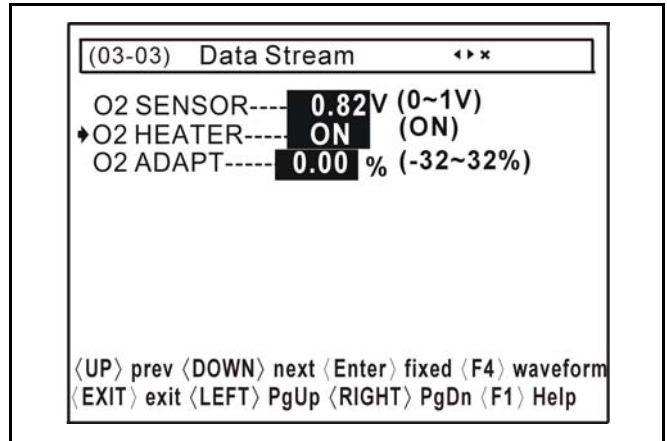




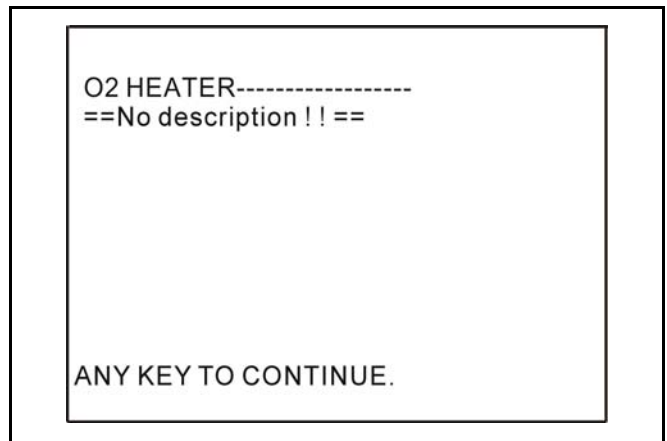


## 5. Fuel Injection System

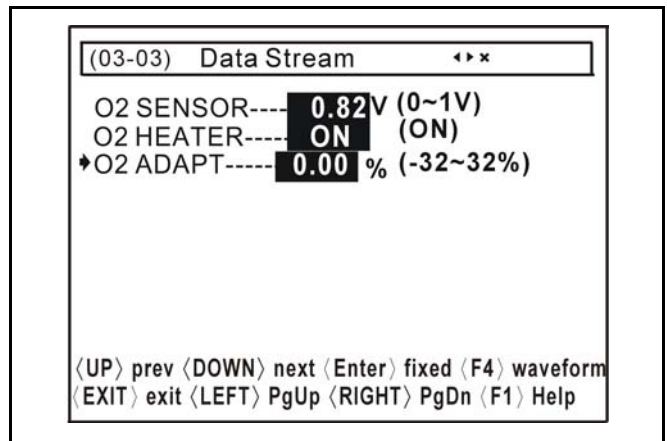
Press <UP> or <DOWN> button to choose O2 HEATER item.



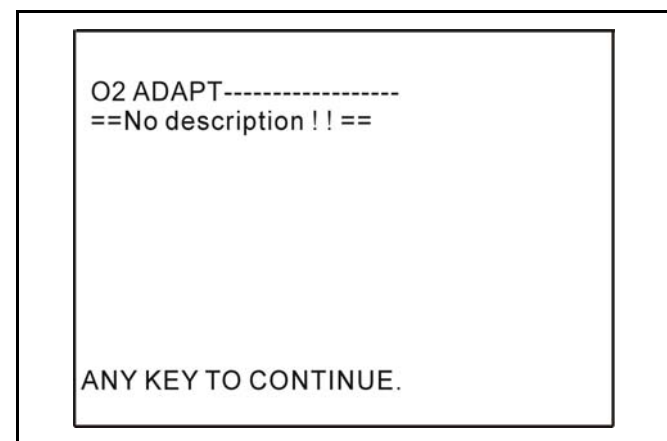
Press <F1> button to enter description page.  
 Press any key to get back to Data Stream page.



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.





# 5. Fuel Injection System

## Read Trouble Code

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

```

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

```

System is OK

<Exit> to leave---

```

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

```

SYM M3A ▼▲◀▶↵×

```

● P0115		

```

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

```

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

```

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>
  
```

## 5. Fuel Injection System



### 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.



## 5. Fuel Injection System



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

## 5. Fuel Injection System

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**NOTE:**

Precautions in Operation .....6-1	Engine Hanger..... 6-11
Engine Removal – Carburetor Model ...6-2	Engine Hanger Rubber Bush ..... 6-12
Engine Removal – EFi Model .....6-6	Engine Installation ..... 6-13

## Precautions in Operation

### General Information

- The engine has to be supported with special service tools that can be lifted or adjustable.
- The following parts can be serviced as engine mounted on frame.
- Carburetor.
- Cylinder head, cylinder, and piston.
- Driving pulley, driving belt, clutch, and driving disc assembly.
- Final gear reduction mechanism.

### Specification

Item		Capacity
Engine oil capacity	Replacement	800 c.c.
	Disassembly	1000 c.c.
Gear oil capacity	Replacement	100 c.c.
	Disassembly	110 c.c.
Coolant capacity	Engine & radiator	780 c.c.
	Reservoir	420 c.c. AS indicator shown
	Total	1200 c.c.

### Torque Value

Engine mounting bolt	4.0~5.0kgf-m
Engine hanger bolt	3.5~4.5kgf-m
Rear shock absorber connection bolt(under)	2.4~3.0kgf-m
Engine hanger stopper nut	1.8~2.2kgf-m
Engine bracket nut	4.0~5.0kgf-m

## 6. Engine Removal

### Engine Removal-Carburetor Model

Open seat cushion.

Remove the luggage box (6 bolts and 1 screw).

Remove rear carrier (3 bolts).

Remove rear bracket (2 bolts).

Remove the rear central cover (4 screws).

Remove the left and right pedals (1 bolt).

Remove the left and right covers (4 screws).

Remove the central cover (6 screws).

Remove the left & right body covers and the central upper cover (4 screws and 2 bolts).

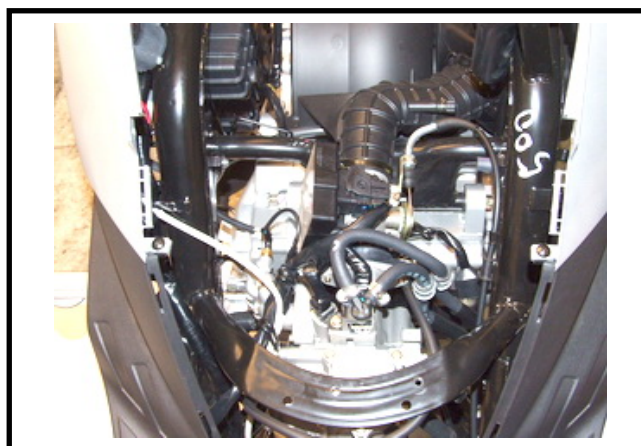
Remove the battery negative (-) post.

Remove the battery positive (+) post.

Remove ignition coil cable.

Disconnect the auto by-starter wire connector.

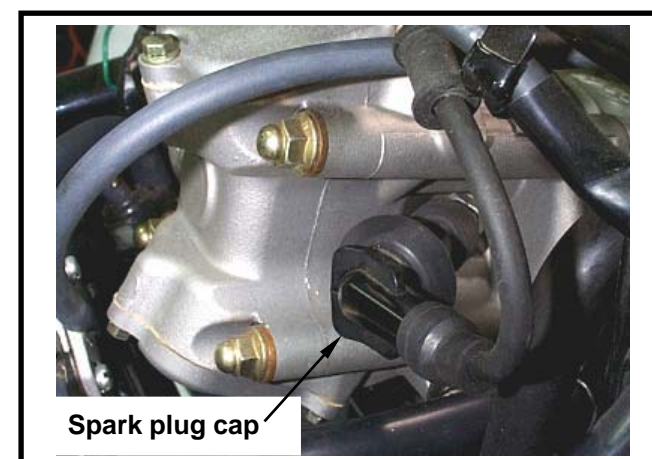
Disconnect A.C.G wire connectors.



Remove starter motor wire from relay.



Remove spark plug cap.

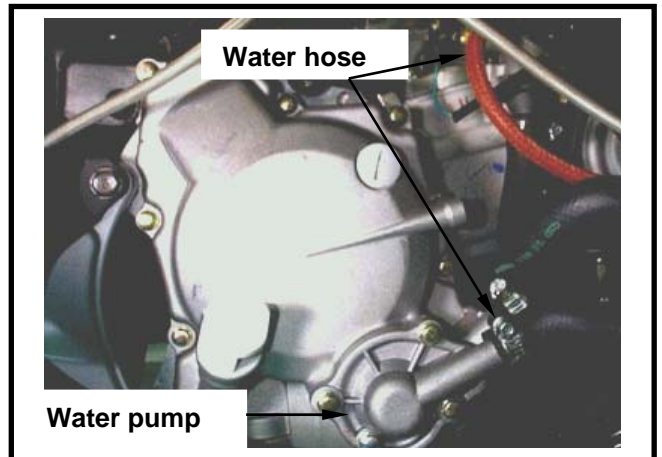




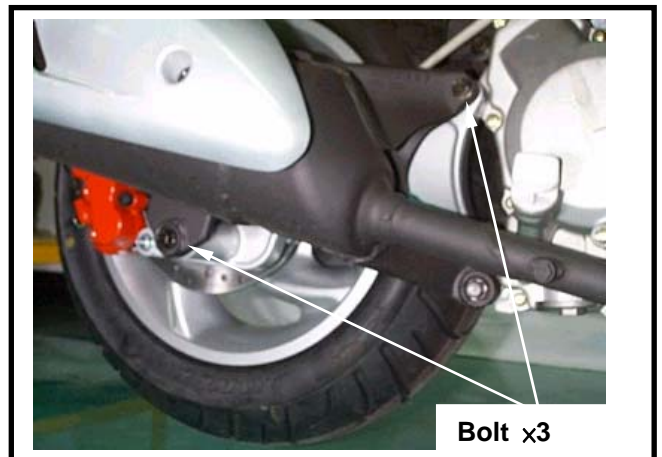
Remove fuel pipe, vacuum tube and throttle valve wire from carburetor.  
Loosen the screw of air cleaner duct strip, and then remove the duct.



Remove water hose from water pump.  
Remove the thermo-sensor wires.



Remove the muffler (3 bolts, 2 nuts).



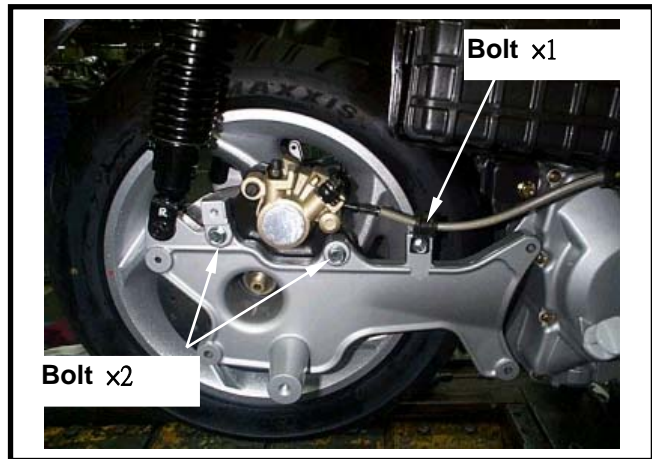


## 6. Engine Removal

Remove brake hose bracket (1 bolt).  
Remove rear brake calliper (2 bolts).

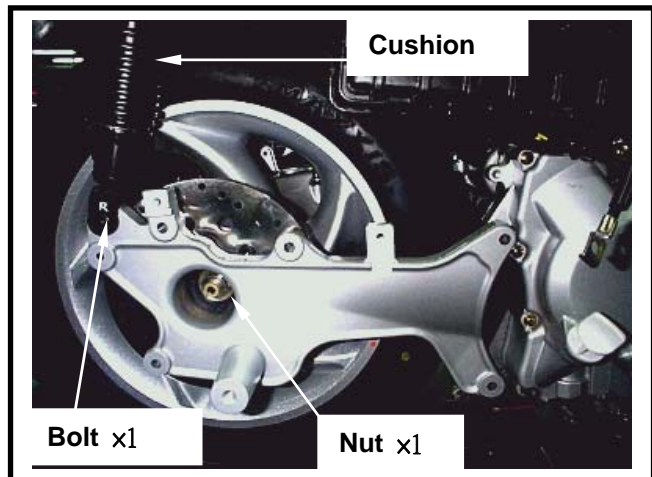
### Caution

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



Remove the mounting bolt of right-rear shock absorber and the shock absorber.

Remove rear wheel mounting nut.



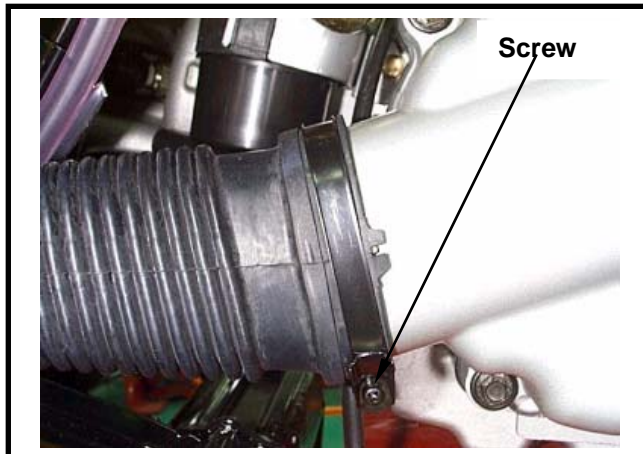
Remove swing arm.



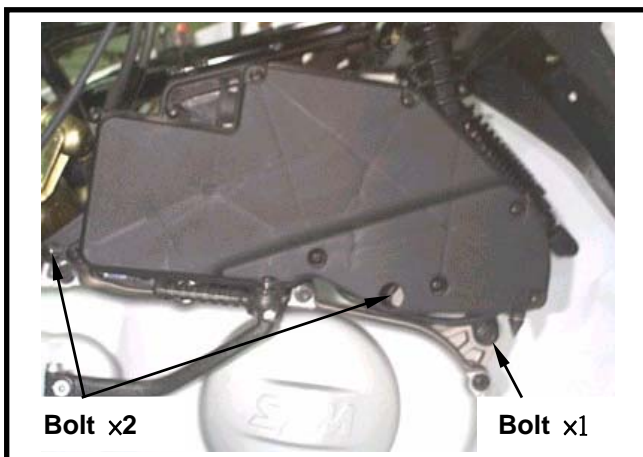
Remove rear wheel.



Loosen the mounting screw of left crankcase duct, and then remove the duct.



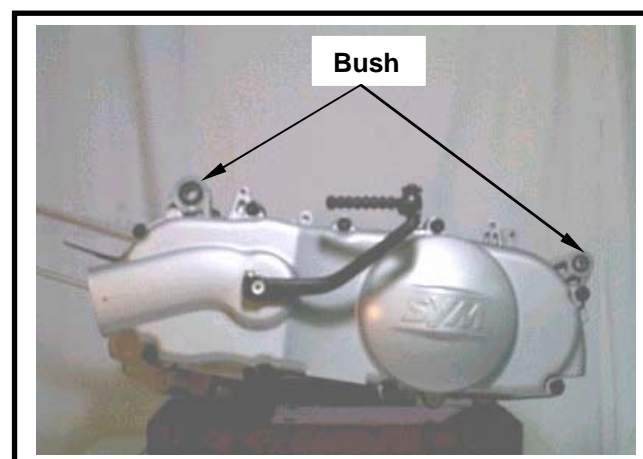
Remove the mounting bolts (2 bolts) of air cleaner.



Remove the lower mounting bolt of left shock absorber.



Check if engine mounting bracket bushing and cushion rubber for damage.

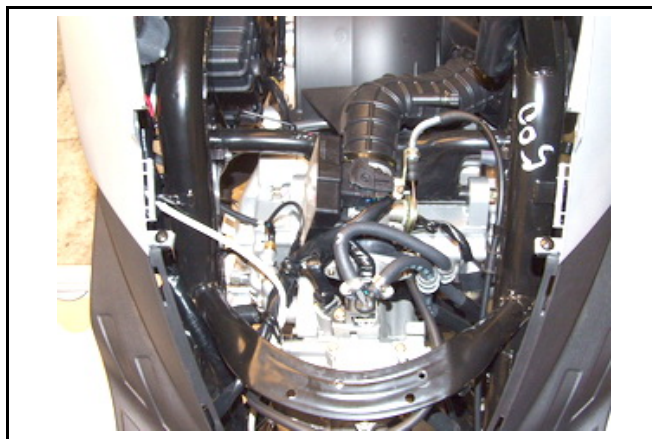




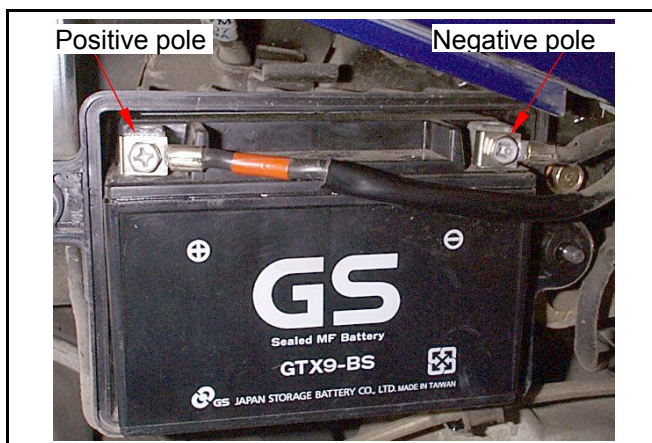
## 6. Engine Removal

### Engine Removal-EFi Model

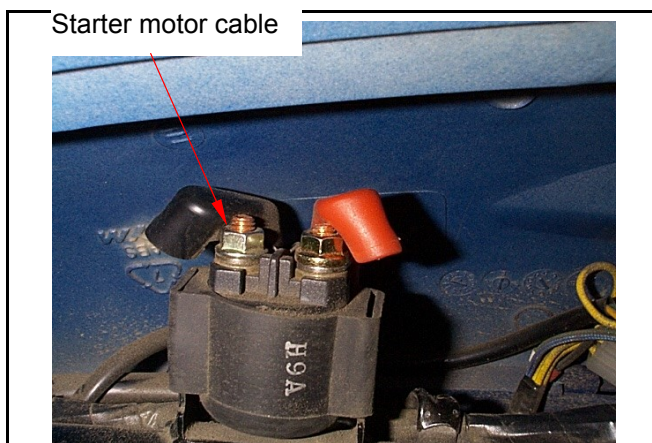
Remove the seat and luggage box.  
Remove the rear carrier.  
Remove the side covers.  
Remove the center cover.  
Remove the body cover.  
(Refer to chapter 14).



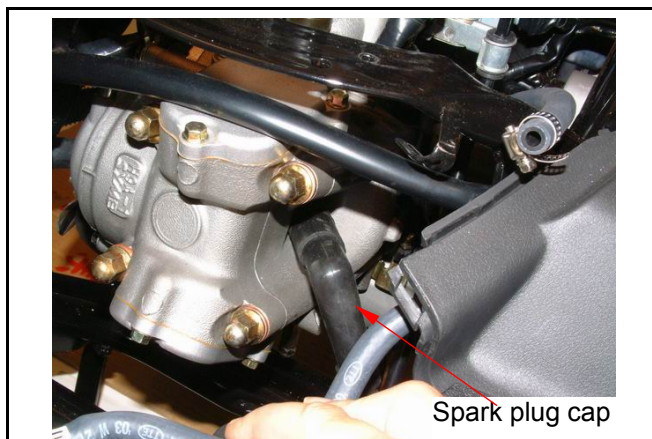
Remove the battery cover (2 nuts).  
Remove the negative cable.  
Remove the positive cable.



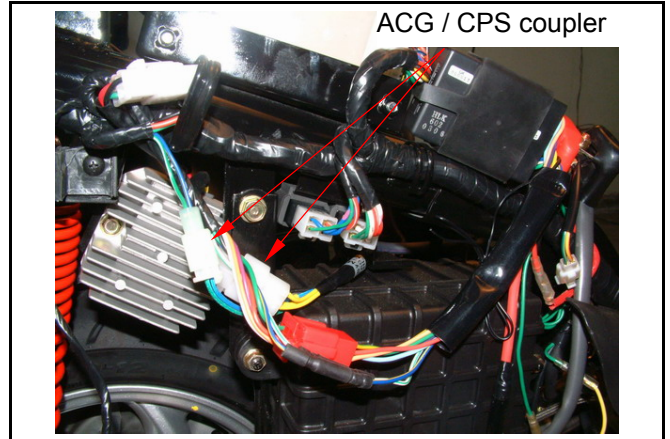
Remove the starter motor cable from the starter relay.



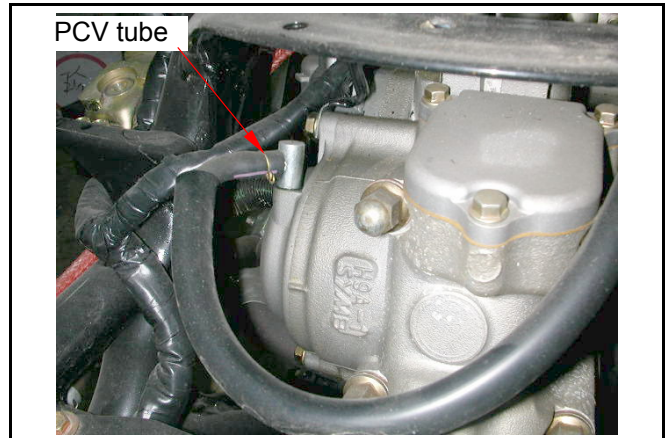
Remove the spark plug cap.



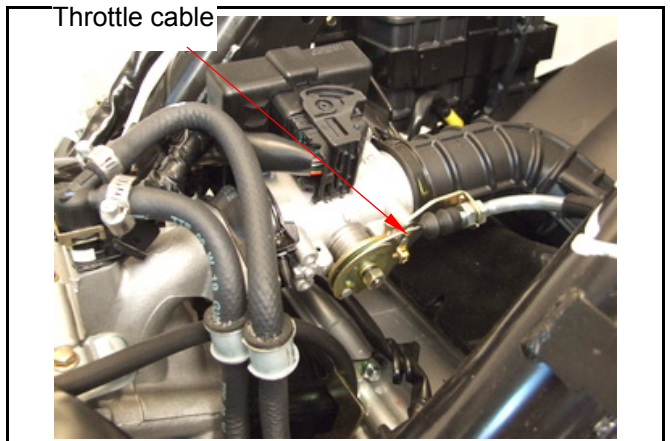
Remove the ac generator and crankshaft position sensor couplers.



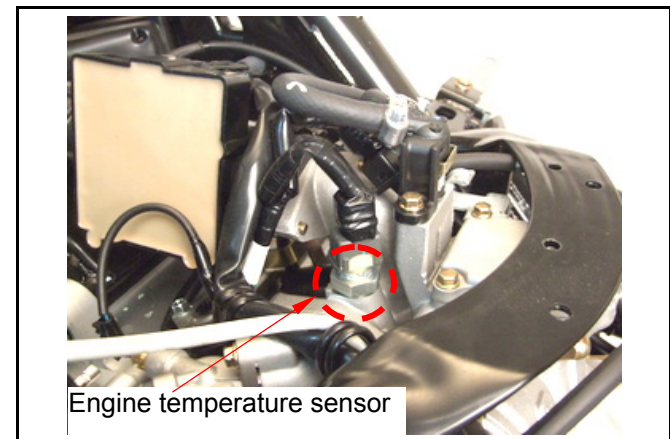
Remove the PCV tube.



Remove the throttle cable.



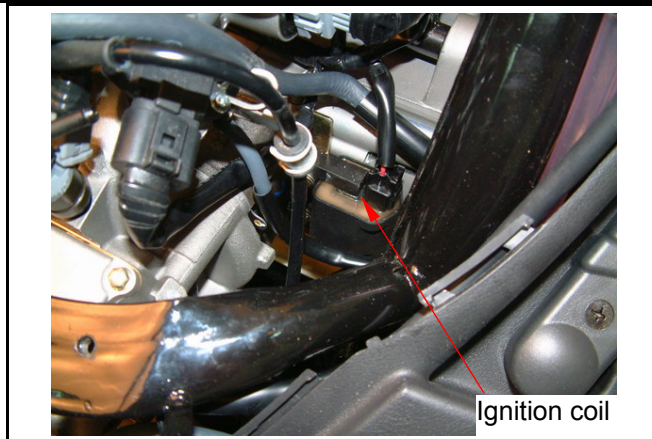
Remove the engine temperature sensor coupler.



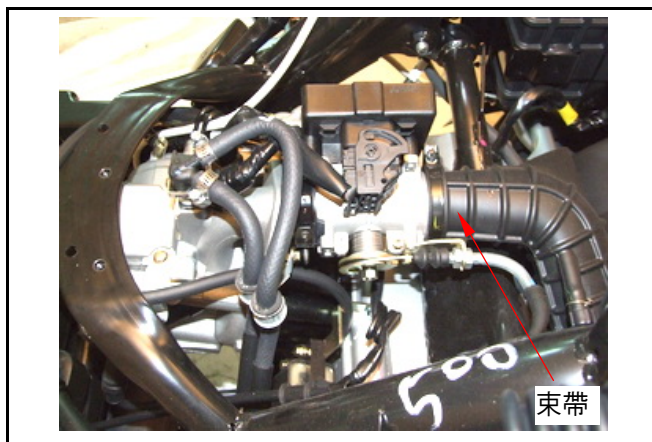


## 6. Engine Removal

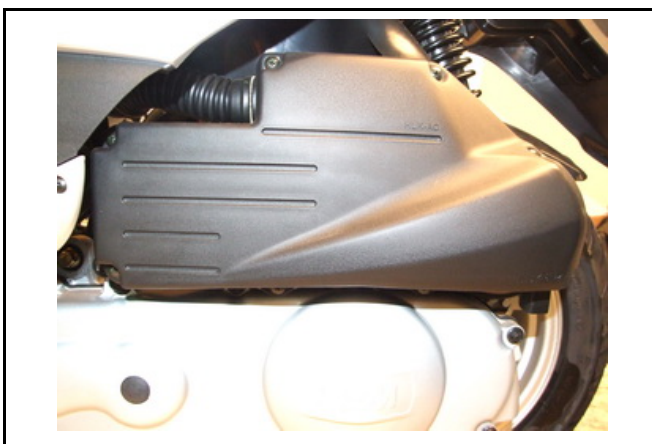
Remove the ignition coil coupler.



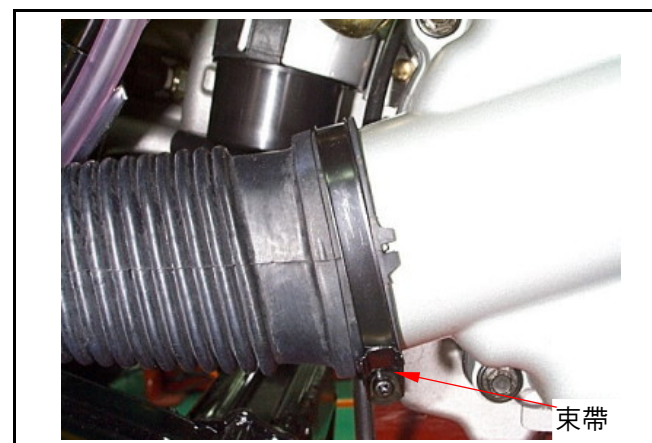
Loosen the air cleaner connecting pipe screw.



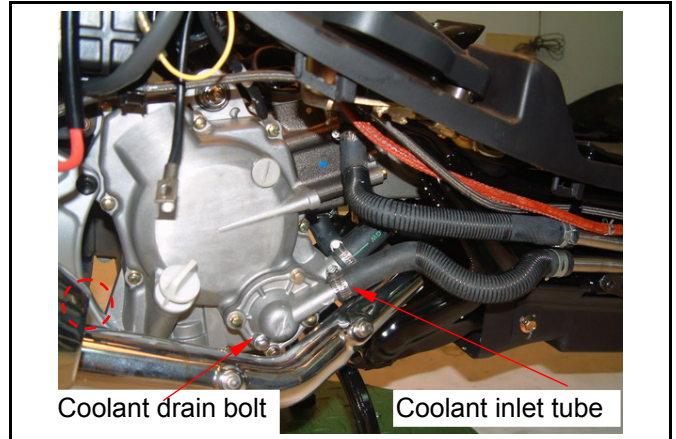
Remove the air cleaner (2 bolts).



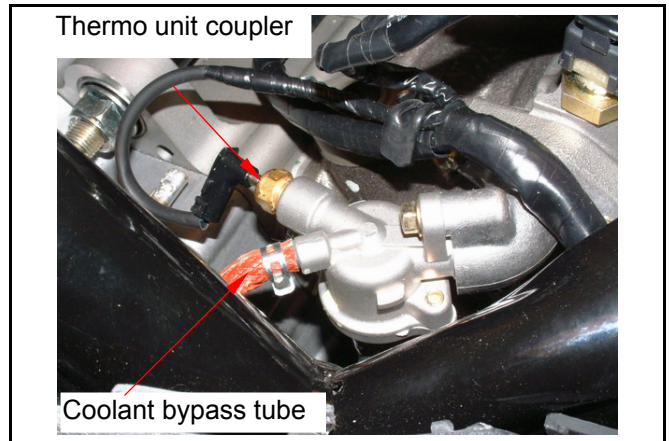
Remove the left crankcase duct.



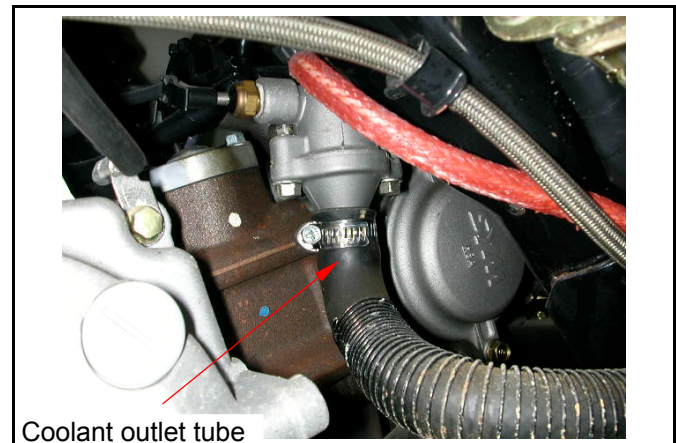
Drain out the coolant.  
Remove the coolant inlet tube.



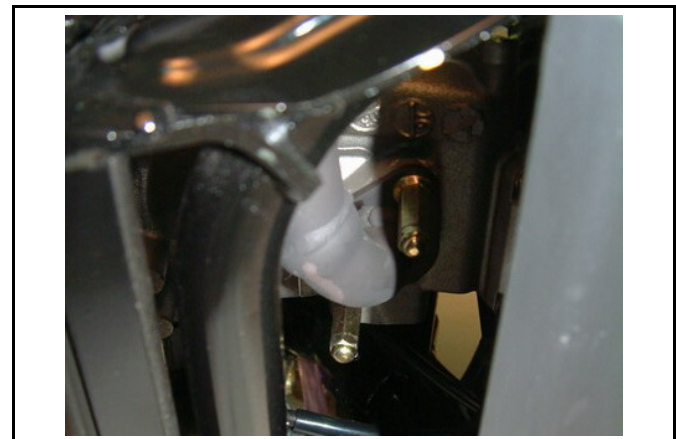
Remove the thermo unit and coolant bypass tube from the thermostat.



Remove the coolant outlet tube from the thermostat.



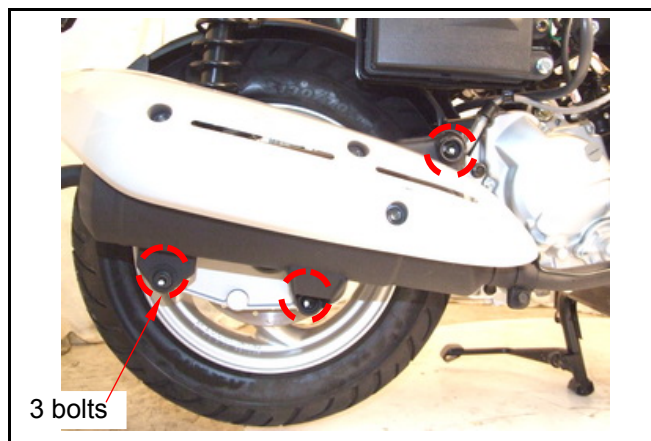
Remove the exhaust pipe front locknuts.



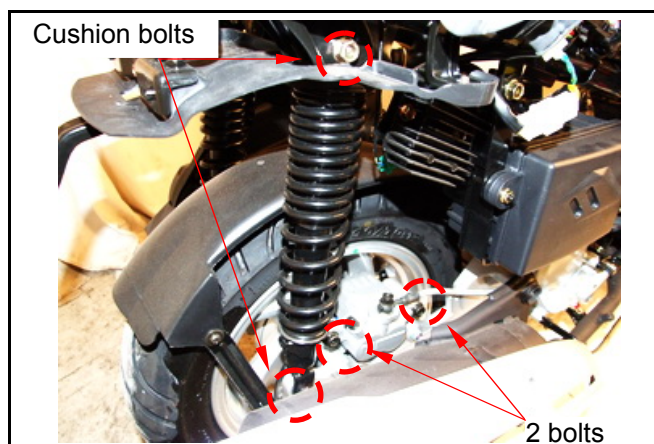


## 6. Engine Removal

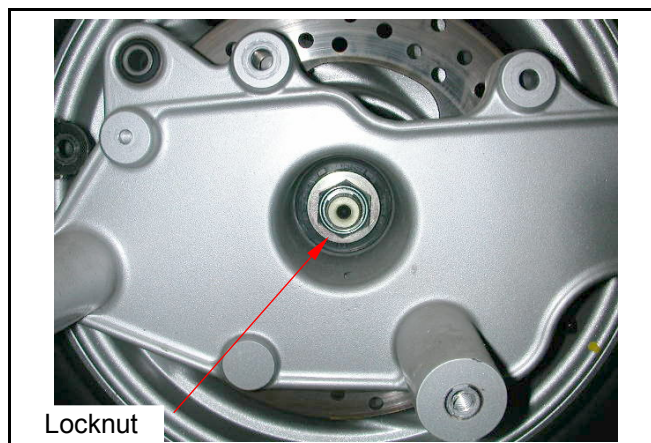
Remove the exhaust pipe rear bolts.



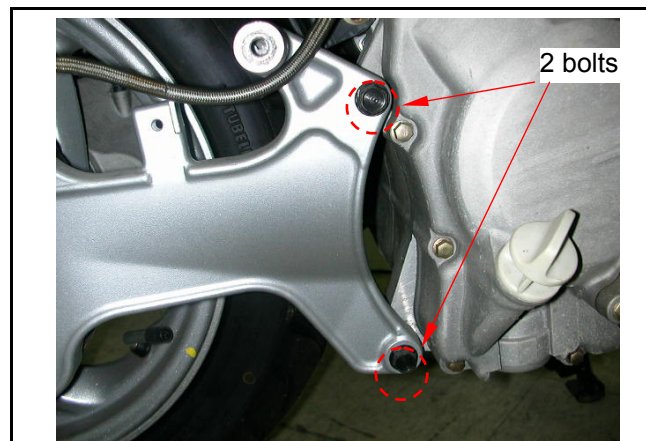
Remove the rear brake caliper (2 bolts).  
Remove the right rear cushion lower bolt.  
Remove the rear inner fender bolt.



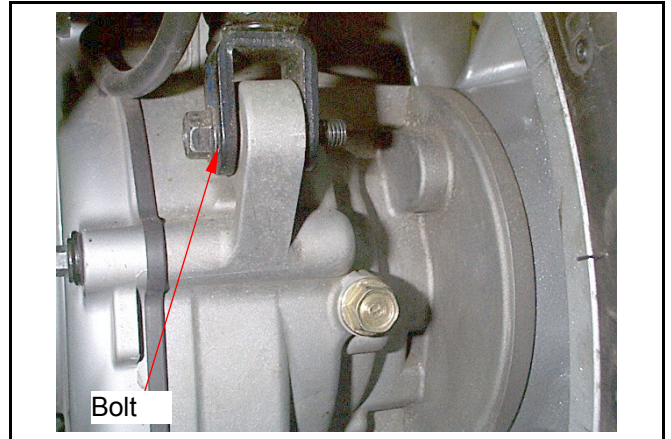
Remove the rear wheel locknut.



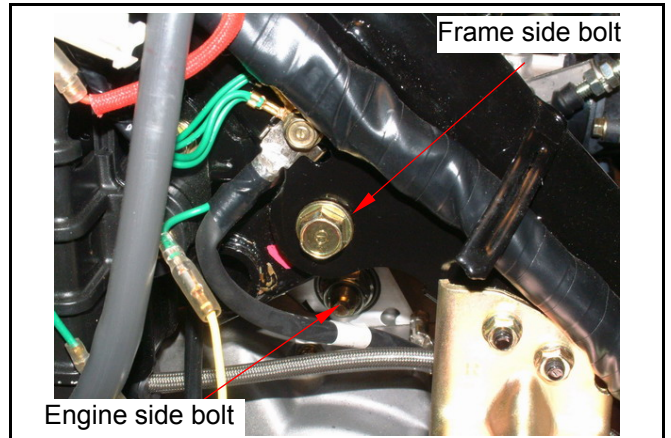
Remove the rear fork bolts.



Remove the left rear cushion lower bolt.



Remove the engine hanger lock bolts from the frame side.  
Remove the engine and hanger.



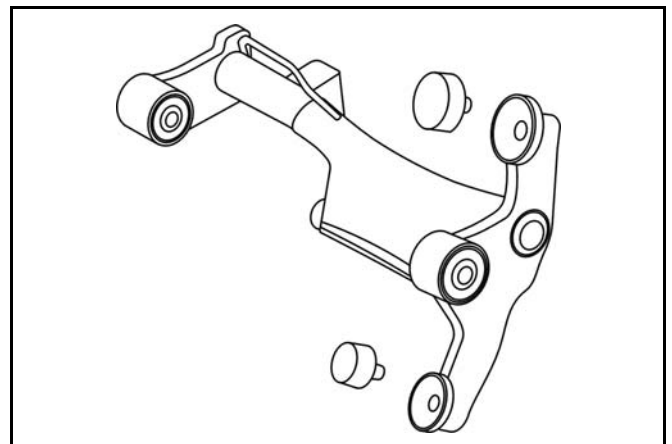
### Engine Hanger Removal

Remove the engine hanger bolts from the engine side.  
Check if the engine hanger rubber bush is damaged or not.  
Replace it if necessary.

### Installation

Install the engine hanger onto the engine and make sure the locknut and bolt are locked properly.

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



## 6. Engine Removal

### Engine Hanger Rubber Bush

#### Inspection

Check the engine hanger rubber bush for any damage.

Replace the rubber bush if necessary.

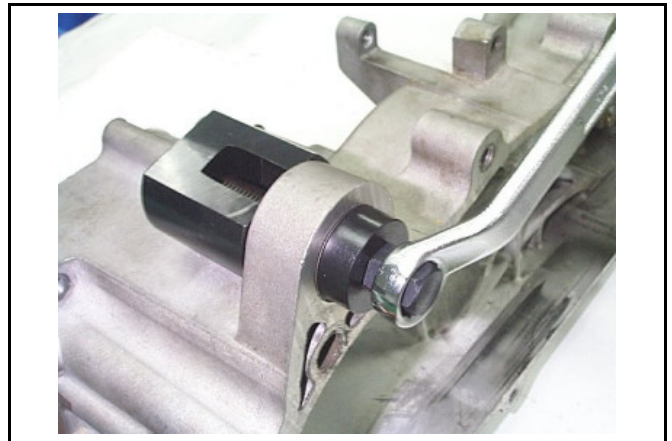


#### Removal

Use the special tool to press out the rubber bush.

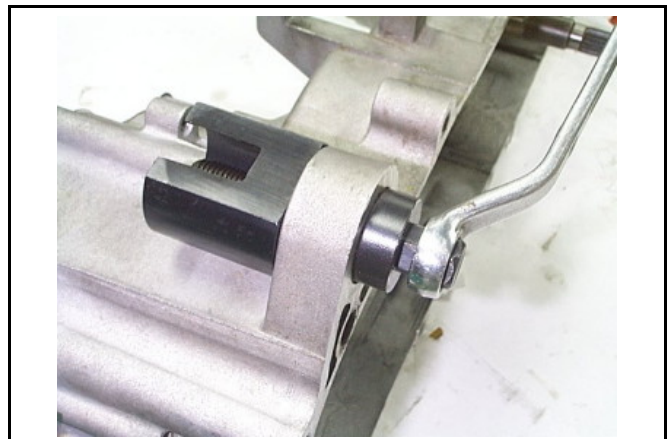
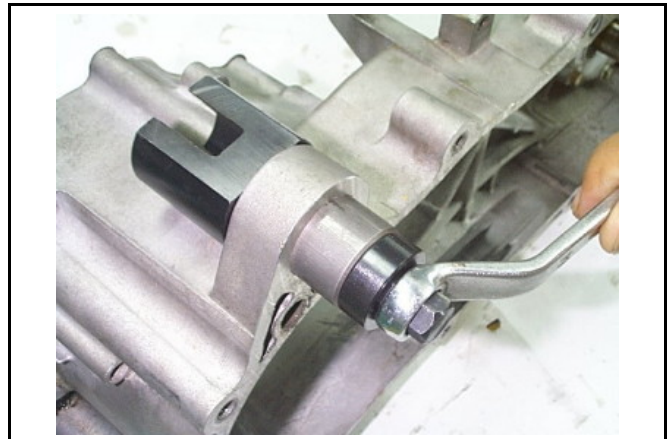
**Special tool :**

**Crankcase press out / in driver** SYM-1120310  
SYM-1120320



#### Installation

Press in the rubber bush with the special tool.



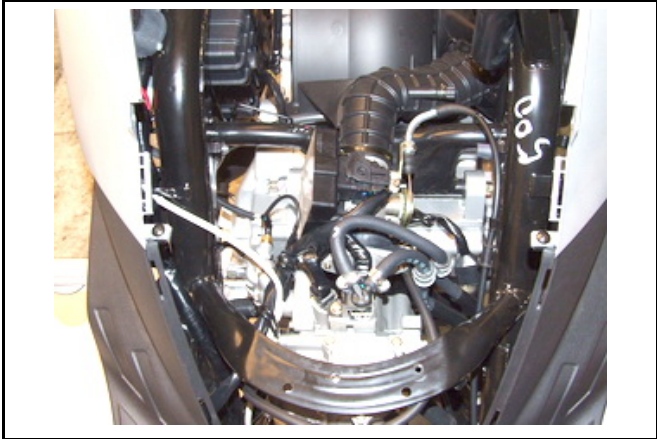


### Engine Installation

Check if the bushings of engine suspension parts and shock absorber for damage.  
Install engine in the reverse procedures of removal.

**⚠ Caution**

- Pay attention to foot & hand safety as engine installation to avoid hurting.
- Do not bend or twist wires.
- Cables wires have to be routed in accordance with original layout.
- Small-end bearing ring has to forward to inside (bearing) as assembling the swing arm.



**Torque value :**

<b>Engine hanger locknut</b>	<b>4.0~5.0kgf-m</b>
<b>Rear cushion upper bolt</b>	<b>3.5~4.5kgf-m</b>
<b>Rear cushion lower bolt</b>	<b>2.4~3.0kgf-m</b>
<b>Rear wheel shaft locknut</b>	<b>11.0~13.0kgf-m</b>

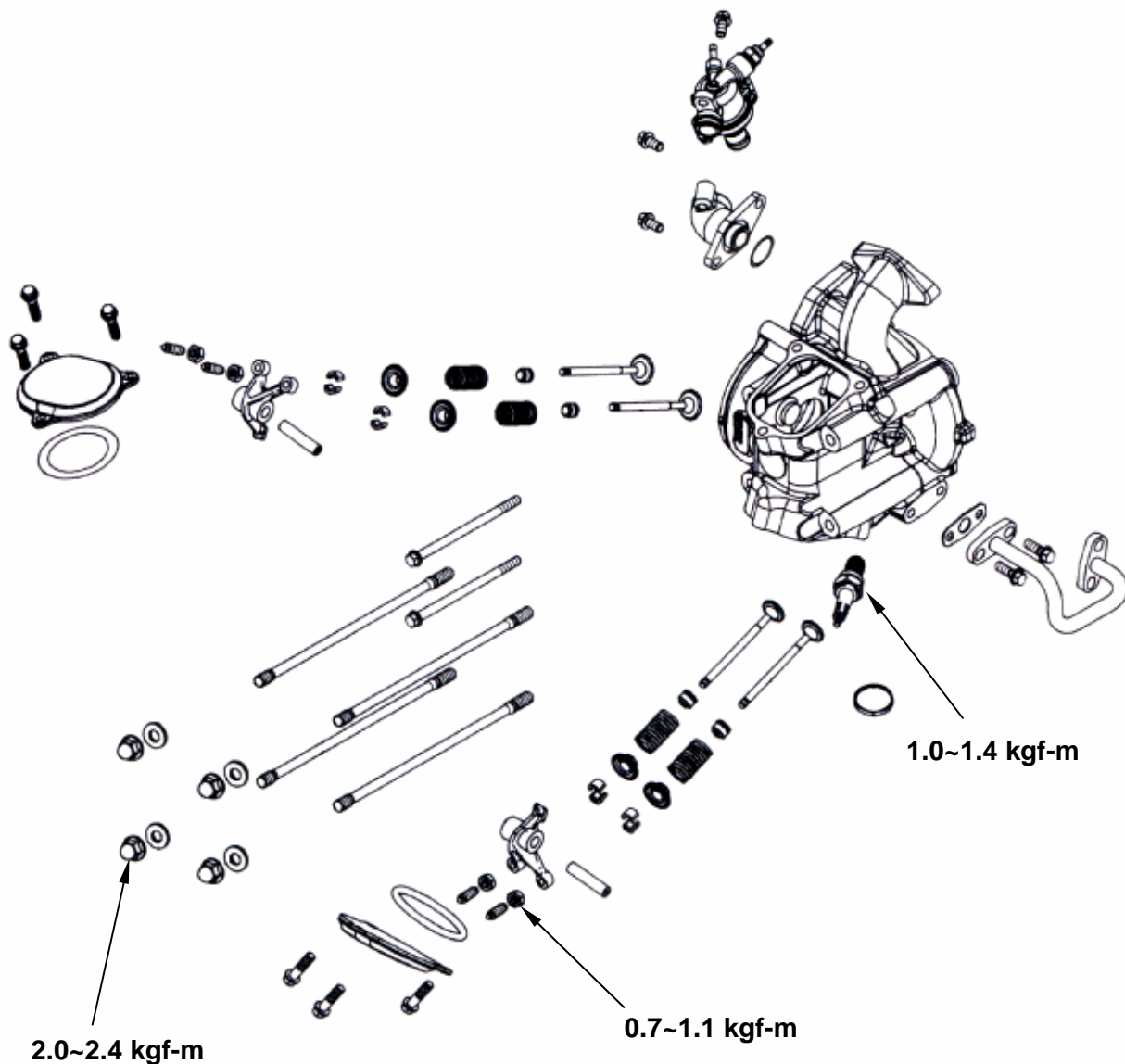
## 6. ENGINE REMOVAL

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Mechanism Diagram ..... 7-1	Valve Stem Replacement ..... 7-8
Precautions in Operation ..... 7-2	Valve Seat Inspection ..... 7-9
Cylinder Head Removal ..... 7-4	Cylinder Head Reassembly ..... 7-11
Cylinder Head Disassembly ..... 7-6	Cylinder Head Installation ..... 7-12

## Mechanism Diagram



## 7. Cylinder Head / Valve

### Precautions in Operation

#### General Information

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

#### Specification

Item		Standard	Limit	
Compression pressure		12+/-2 kg/cm <sup>2</sup>	---	
Camshaft	Height of cam lobe	Intake	30.800~30.920	
		Exhaust	30.411~30.531	
Rocker arm	ID of valve rocker arm	12.000~12.018	12.10	
	OD of valve rocker arm shaft	11.966~11.984	11.910	
Valve	OD of valve stem	Intake	4.975~4.990	
		Exhaust	4.955~4.970	
	Guide seat		5.000~5.012	5.030
	Clearance between valve stem and guide	Intake	0.010~0.037	0.080
		Exhaust	0.030~0.057	0.100
	Free length of valve spring		35.000	31.500
	Valve seat width		1.000	1.6
Tilt angle of cylinder head		---	0.05	

#### Torque Value

Cylinder head bolt (LH)	2.0~2.4 kg-m
Cylinder head Nut	2.0~2.4 kg-m
Sealing bolt of cam chain auto-tensioner	0.8~1.2 kg-m
Bolt of cam chain auto-tensioner	1.2~1.6 kg-m
Cam sprocket cover bolts	0.8~1.2 kg-m
Cam sprocket bolt	1.0~1.2 kg-m

## TOOLS

### Special service tools

Valve reamer: 5.0mm

Valve guide driver: 5.0mm

Valve spring compressor

### Troubleshooting

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

### Low compression pressure

#### Valve

- Improper valve adjustment
- Burnt or bent valve
- Improper valve timing
- Valve spring damage

#### Cylinder head

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

### High compression pressure

- Too much carbon deposit on combustion chamber or piston head

### Noise

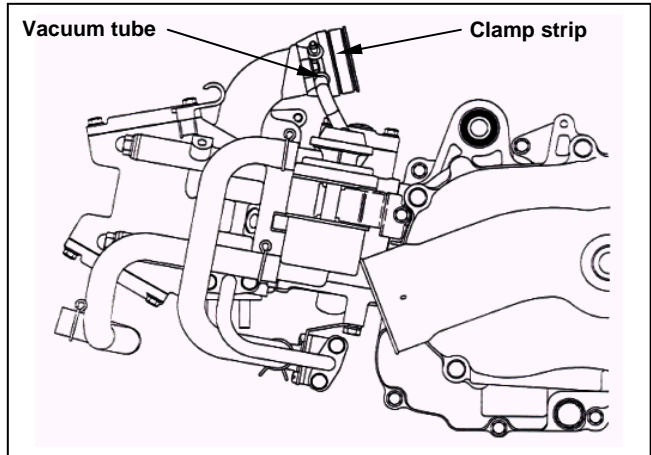
- Improper valve clearance adjustment
- Burnt valve or damaged valve spring
- Camshaft wear out or damage
- Chain wear out or looseness
- Auto-tensioner wear out or damage
- Camshaft sprocket
- Rocker arm or rocker arm shaft wear out

## 7. Cylinder Head / Valve

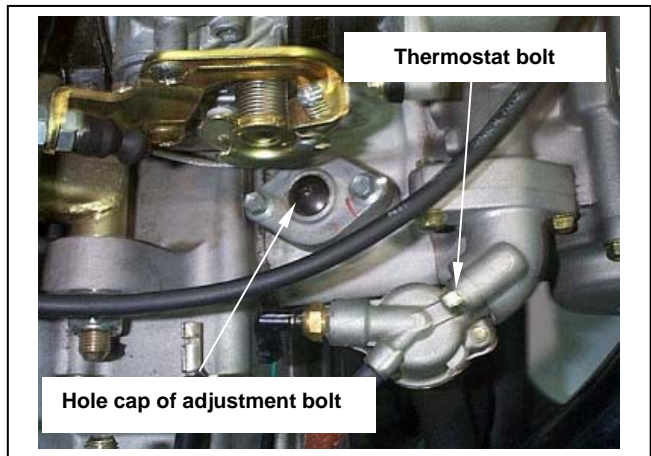
### Cylinder Head Removal

Remove cushion and body center cover.

Remove the clamp strip bolt of carburetor, and disconnect vacuum tube from the carburetor insulator.

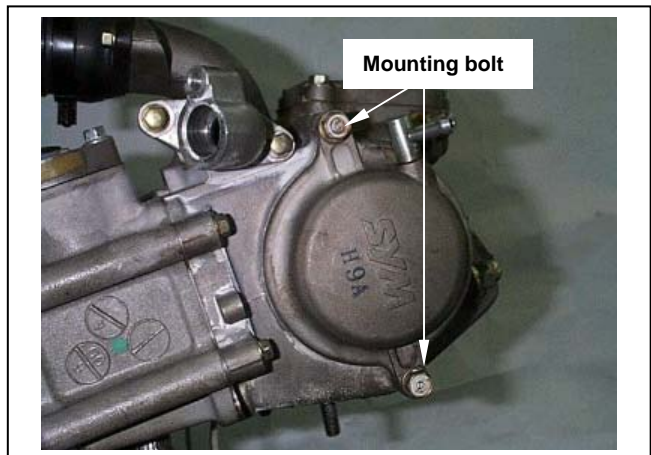


Remove 1 bolt of thermostat and then remove the thermostat.



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

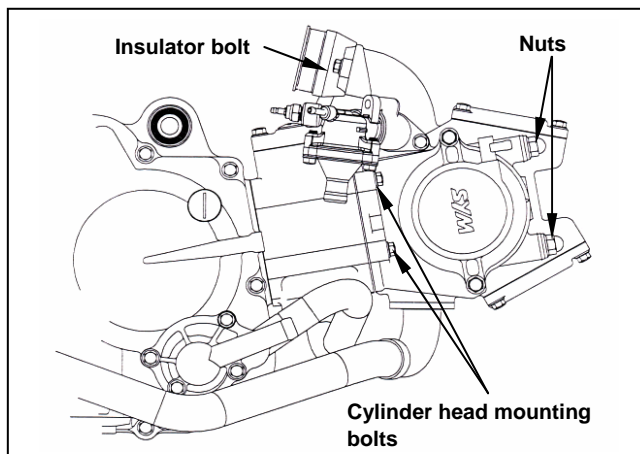
Remove hole cap for the adjustment bolt of cam chain tensioner, and then loosen the tensioner by turning a flat-driver in C.W direction.



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



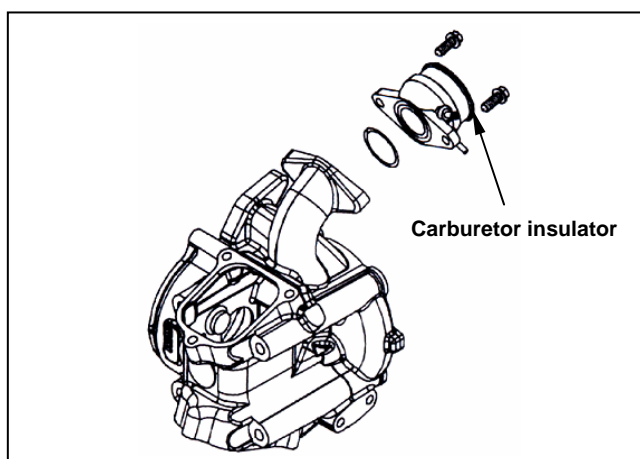
Remove the 2 cylinder head mounting bolts from cylinder head side cover, and then remove 4 nuts and washers from cylinder head upper side.



Remove the cylinder head.



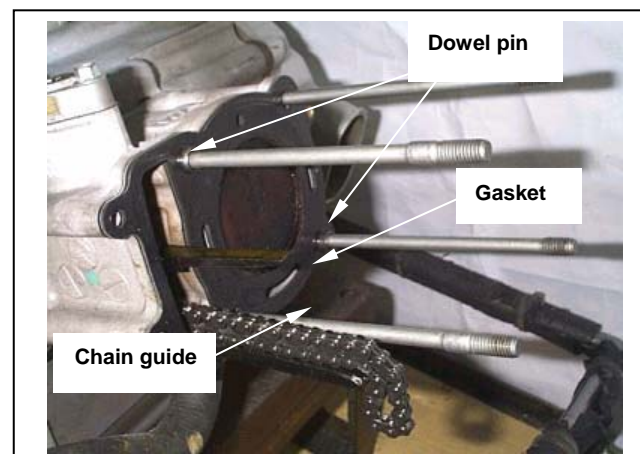
Remove 2 bolts of carburetor insulator and then take the insulator out.



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

**⚠ Caution**

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





## 7. Cylinder Head / Valve

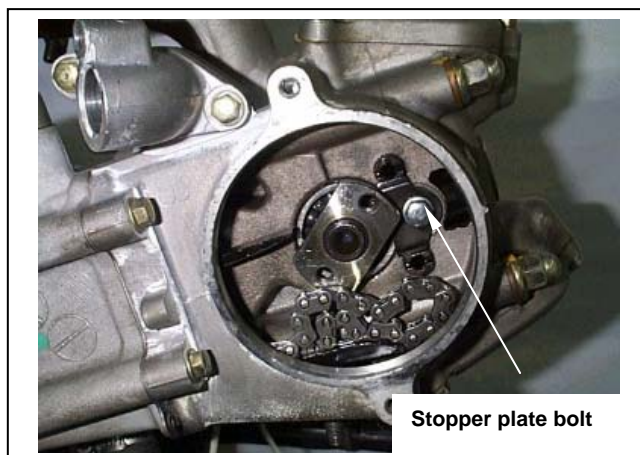
### Cylinder Head Disassembly

Remove the hole cap of intake & exhaust valve clearance adjustment. There are 6 bolts. Then, remove the cap.



Remove the rocker arm pin stopper plate, and then screw a 5mm bolt into the rocker arm pin. Finally, remove the pin and the rocker arm.

Screw a 6 mm bolt into cam sprocket mounting bolt hole, and then pull the camshaft out.



Use a valve compressor to press the valve spring. After removed valve cotter, release the compressor and then take out spring retainer, valve spring and valves.

#### ⚠ Caution

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

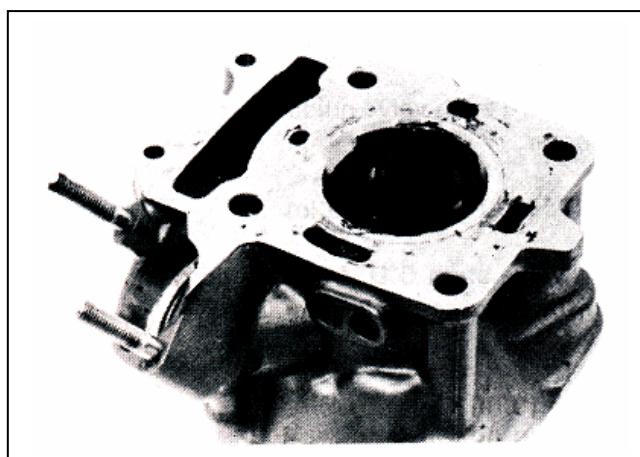
Tool: Valve spring compressor



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.

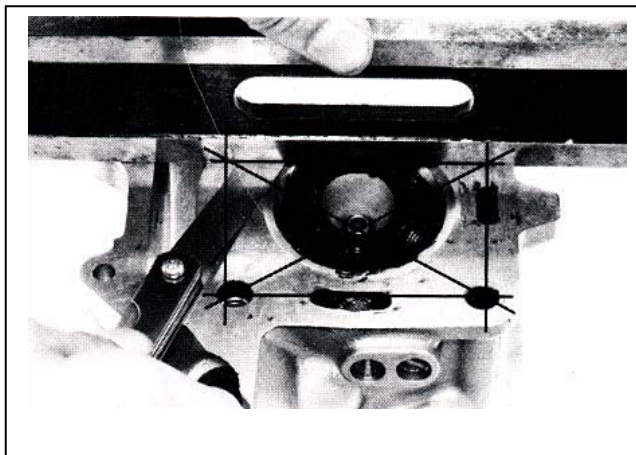


## INSPECTION

### CYLINDER HEAD

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

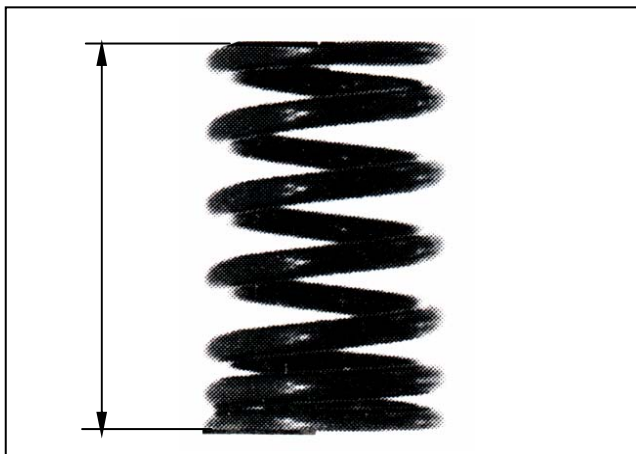
**Service limit: 0.5 mm**



### Valve spring free length

Measure the free length of intake and exhaust valve springs.

**Service limit: 31.5 mm**

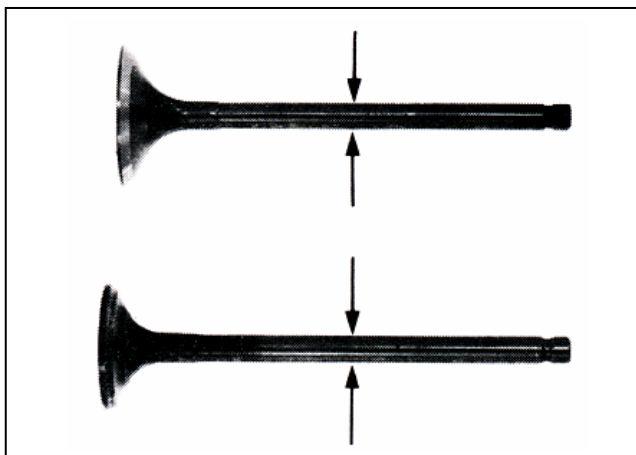


### Valve stem

Check if valve stems are bend, crack or burn. Check the operation condition of valve stem in valve guide, and measure & record the valve stem outer diameter.

**Service Limit: IN: 4.90 mm**

**EX: 4.90 mm**



### Valve guide

#### ⚠ Caution

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

Tool: 5.0 mm valve guide reamer

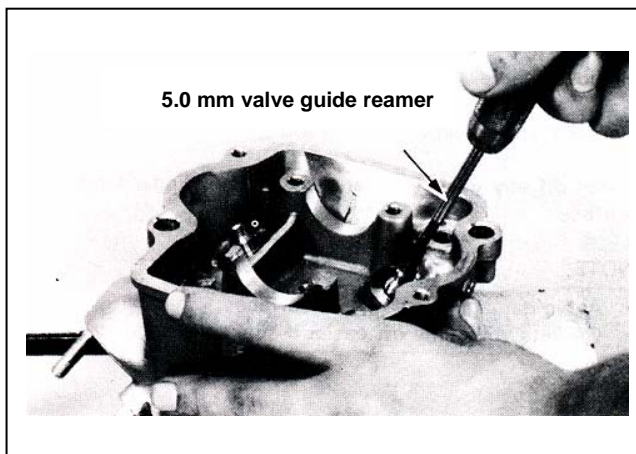
Measure and record each valve guide inner diameters.

**Service limit: 5.03 mm**

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

**Service Limit: IN→0.08 mm**

**EX→0.10 mm**



## 7. Cylinder Head / Valve

### ⚠ Caution

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

Correct it with reamer after replacement.  
If clearance still exceeds service limit after replaced valve guide, replace valve stem too.

### ⚠ Caution

It has to correct valve seat when replacing valve guide.

### Valve Stem Replacement

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

### ⚠ Caution

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

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

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

### ⚠ Caution

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

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

Press in new valve guide from rocker arm side.

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

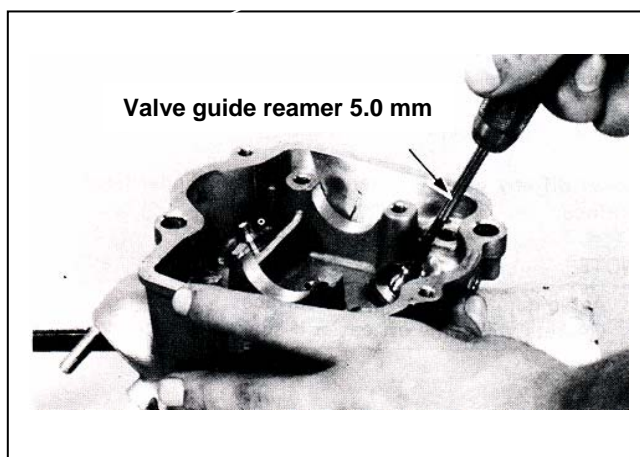
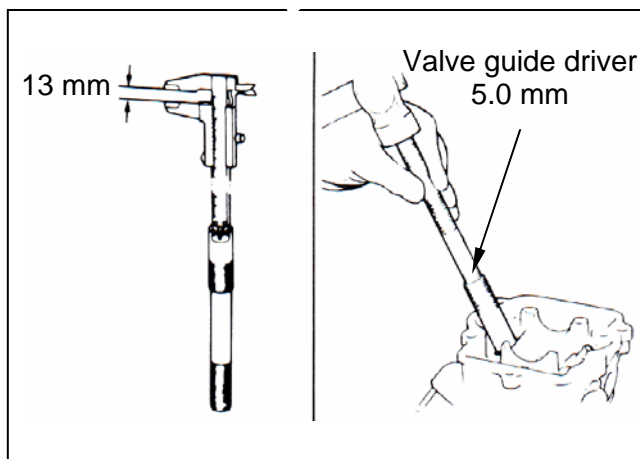
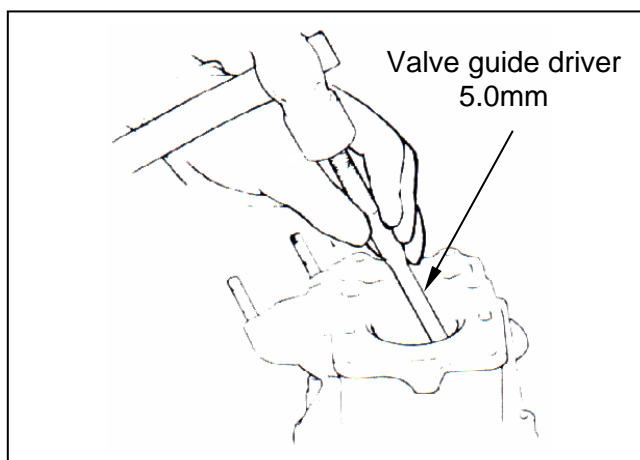
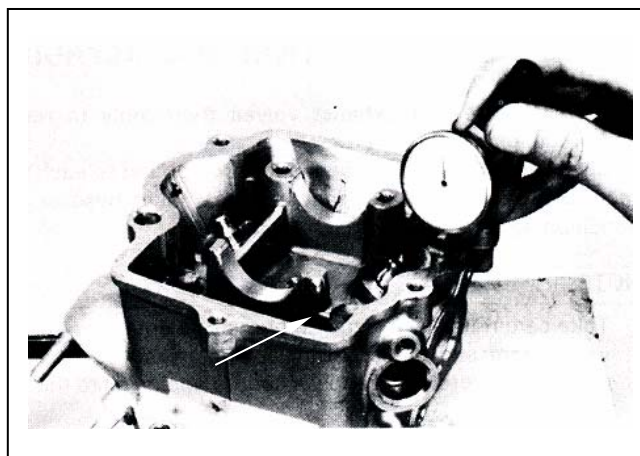
Wait for the cylinder head cooling down to room temperature, and then correct the new valve guide with reamer.

### ⚠ Caution

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

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

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





## Valve Seat Inspection

Clean up all carbon deposits onto intake and exhaust valves.

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

### ⚠ Caution

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

Remove the valve and check its contact face.

### ⚠ Caution

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

## Valve seat inspection

If the valve seat is too width, narrow or rough, 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 ground with valve seat chamfer cutter.

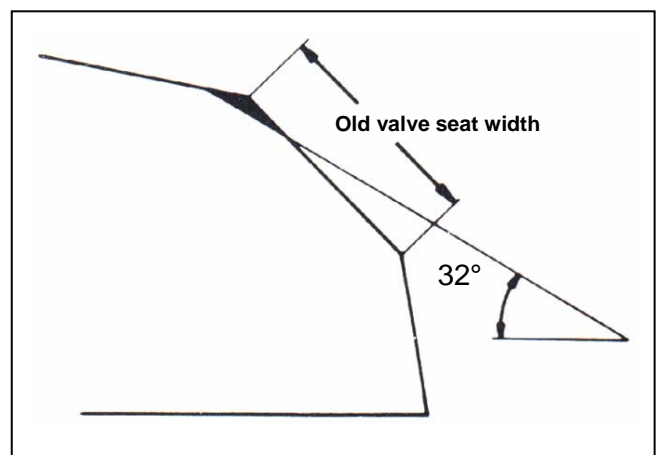
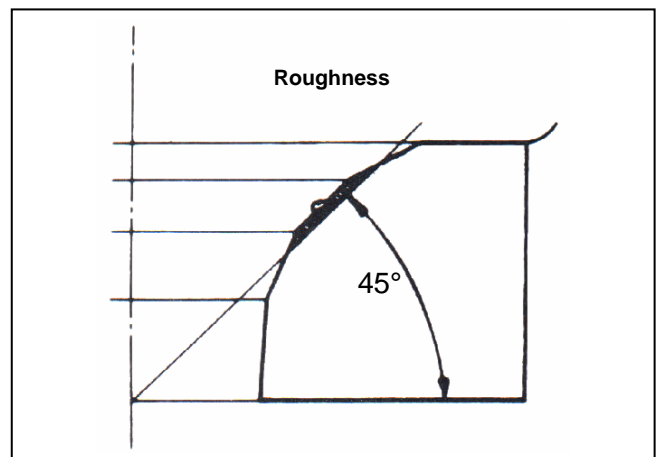
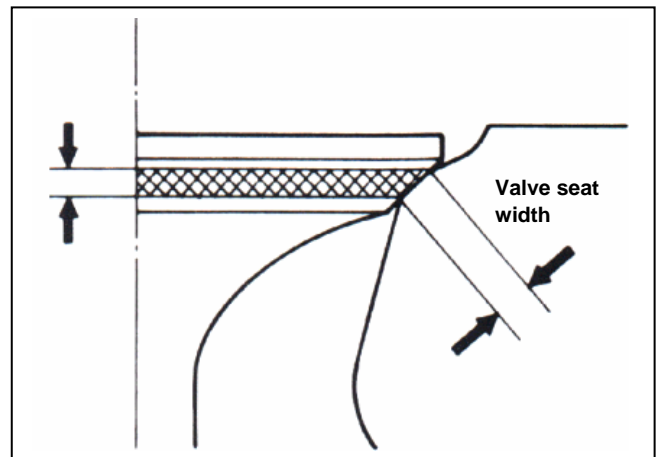
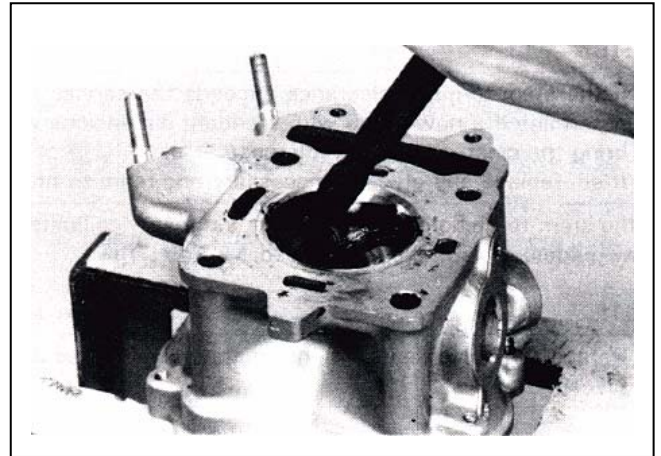
Refer to operation manual of the valve seat chamfer cutter.

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

### ⚠ Caution

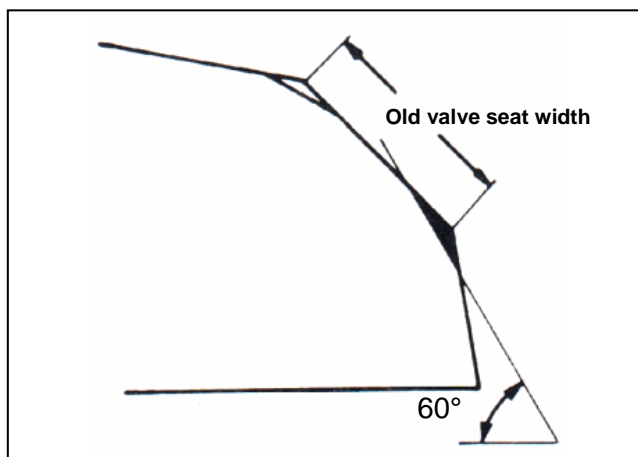
- After valve guide had been replaced, it has to be ground with 45° valve seal chamfer cutter to correct its seat face.

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



## 7. Cylinder Head / Valve

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

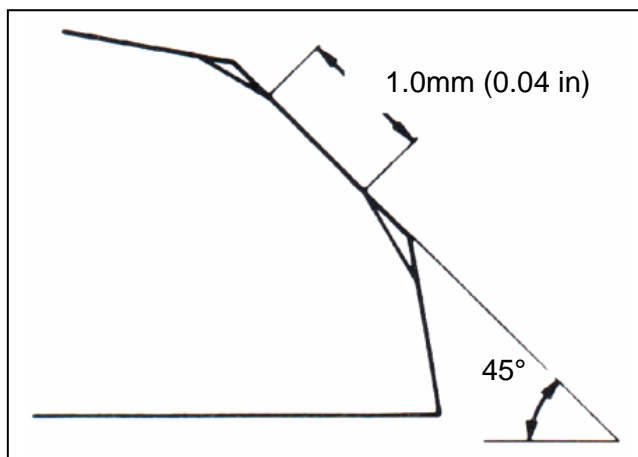


Use 45° cutter to grind the valve seat to specified width.

**⚠ Caution**

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

Grind valve seat again if necessary.

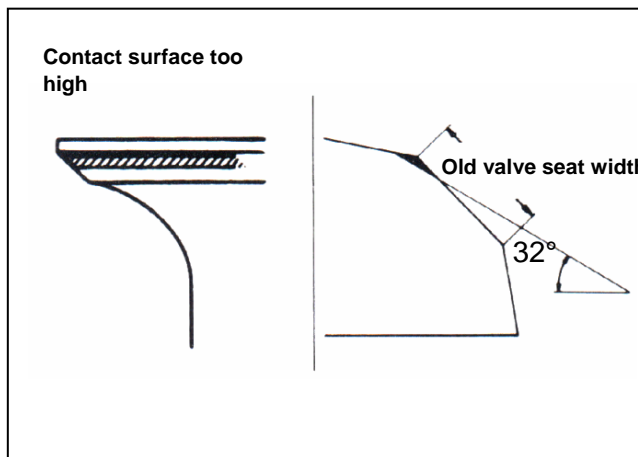


Coat the valve seat surface with red paint.  
Install the valve through valve guide until the valve contacting with valve seat, slightly press down the valve but do not rotate it so that a seal track will be created on contact surface.

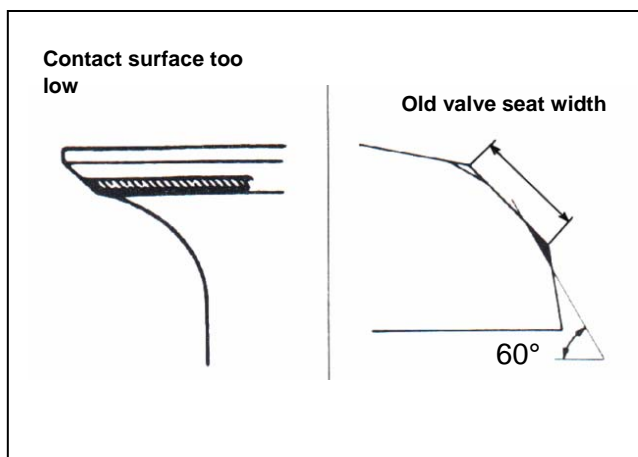
**⚠ Caution**

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

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



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





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

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

### Cylinder Head Reassembly

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

Install new valve stem oil seal.

Install valve springs and retainers.

#### ⚠ Caution

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

Use valve spring compressor to press valve spring.

Install valve cotter and release the valve compressor.

#### ⚠ Caution

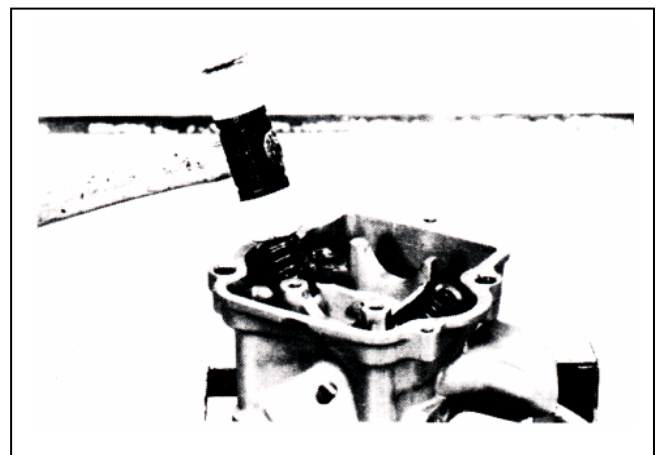
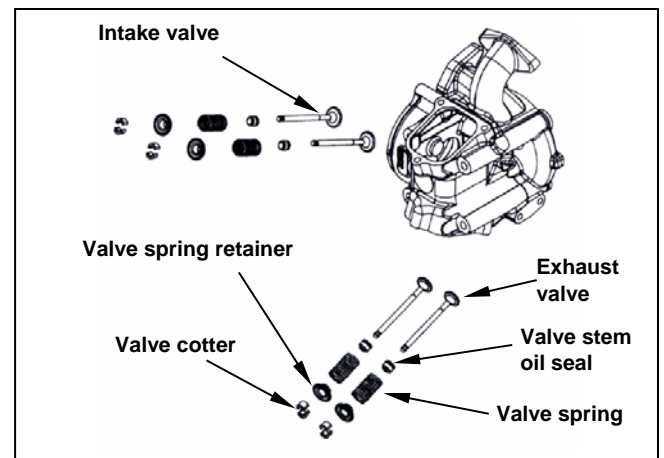
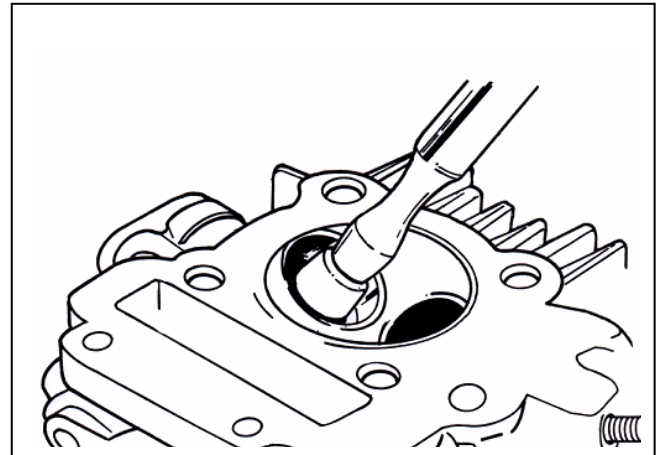
- In order to avoid losing spring elasticity, do not press the spring too much. Thus, press length is based on the valve cotter in which can be removed.

Tool: valve spring compressor.

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

#### ⚠ Caution

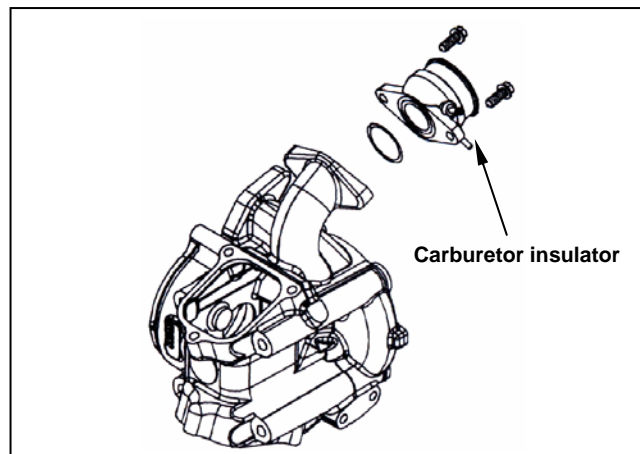
- Place and hold cylinder head on to working table so that can prevent from valve damaged.



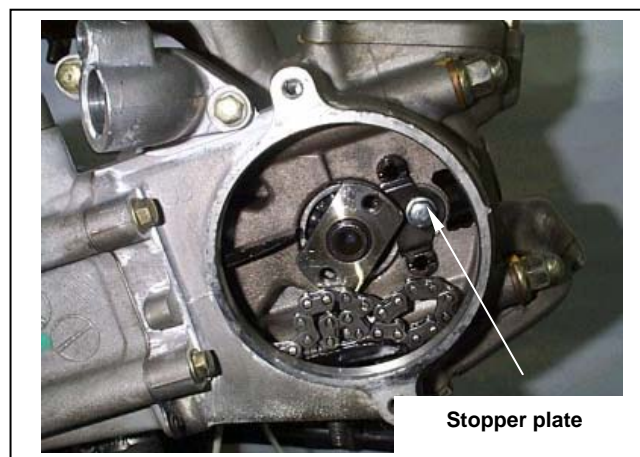
## 7. Cylinder Head / Valve

### Cylinder Head Installation

Install a new O-ring into the indent of carburetor insulator, and then install the insulator onto cylinder head with 2 bolts.



Install camshaft into cylinder head, and align rocker pin with rocker arm pin hole. Then, insert the rocker arm pin. Install rocker arm pin mounting plate.

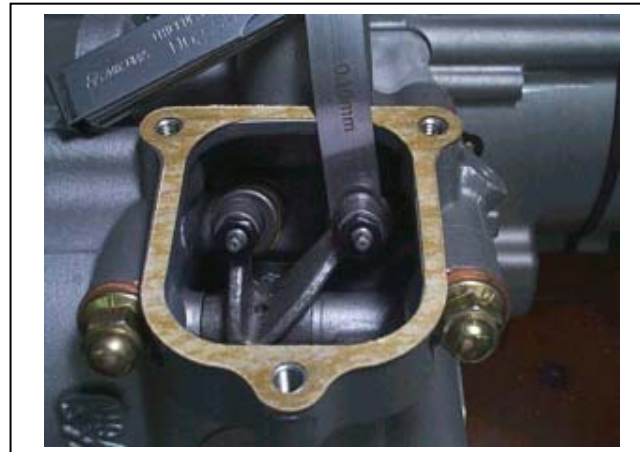


Loosen valve clearance adjustment nuts and bolts located on valve rocker arm. Measure and adjust valve clearance with thickness gauge.

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

**Valve clearance:** Intake: 0.12 +/- 0.02 mm  
Exhaust: 0.12 +/- 0.02 mm

Install valve clearance adjustment hole cap with 3 bolts and tighten the bolts.



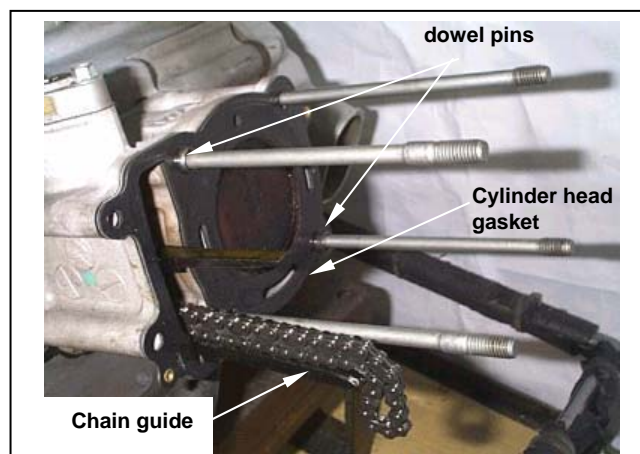
Clean up all residues and foreign materials onto the matching surfaces of both cylinder and cylinder head.

Install chain guide.

Install 2 set pins and cylinder head gasket.

#### ⚠ Caution

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



Install cylinder head.



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

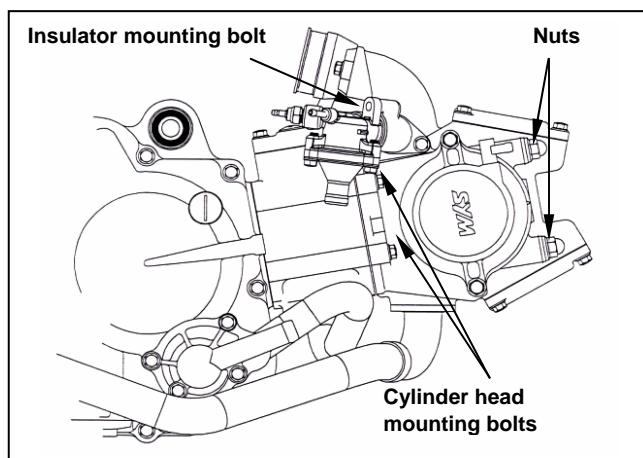
**Torque value: 2.0~2.4 kgf-m**

Install and tighten spark plug

**Torque value: 2.0~2.4 kgf-m**

**⚠ Caution**

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

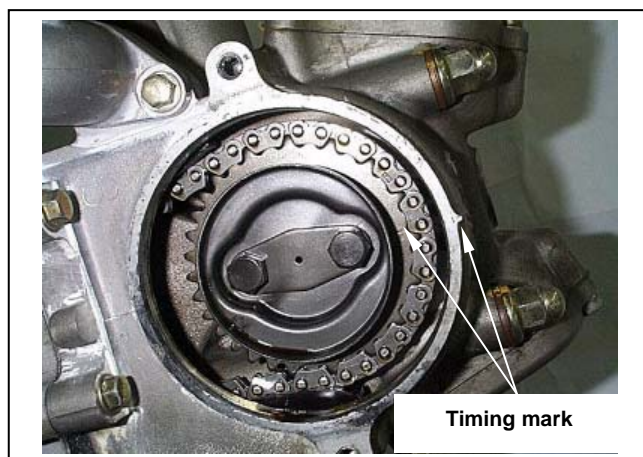


Install cam chain on to sprocket and align the timing mark on the sprocket with that of cylinder head.

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

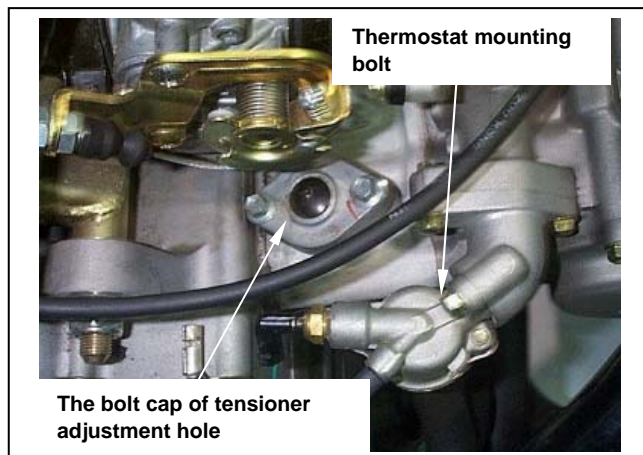
**⚠ Caution**

- Make sure timing marks are matched.



Install a new O-ring onto thermostat and tighten its mounting bolts.

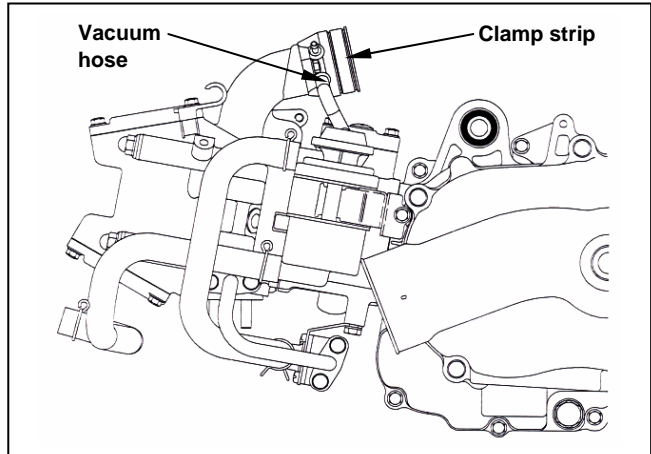
Loosen sprocket chain tensioner and let it contact with chain plate tightly. Tighten the bolt cap of tensioner adjustment hole.





## 7. Cylinder Head / Valve

Install carburetor insulator onto carburetor and tighten clamp strip bolt. Install the vacuum hose of carburetor insulator.



Remove the intake valve adjustment hole cap  
Start engine, and make sure that lubricant flows to cylinder head.

Turn off engine after confirmed, and install the intake valve adjustment hole cap.

Install seat cushion and body center cover.

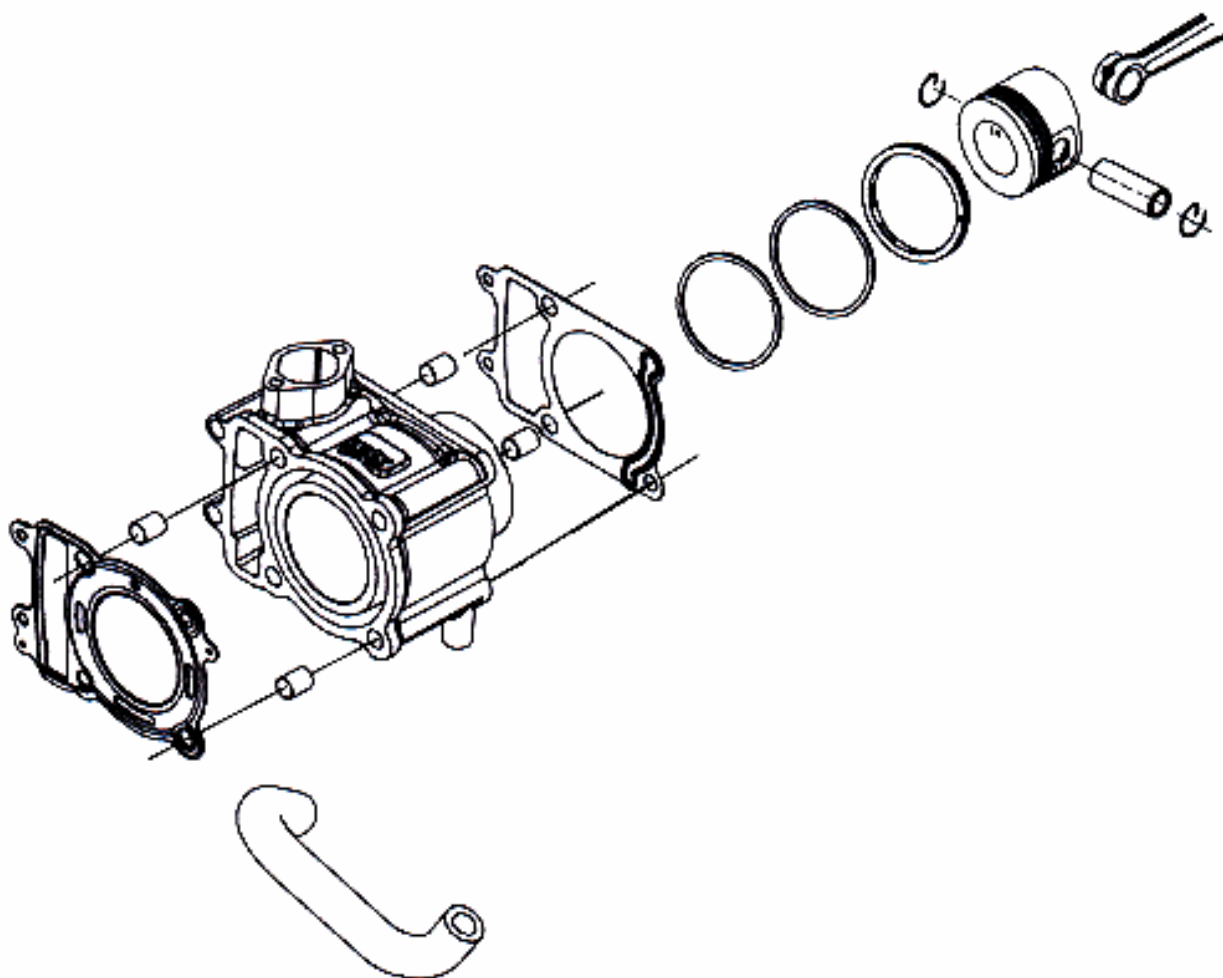
### ⚠ Caution

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



Mechanism Diagram .....8-1	Piston Removal.....8-4
Precautions in Operation .....8-2	Piston Ring Installation.....8-6
Troubleshooting.....8-2	Piston Installation.....8-7
Cylinder Removal.....8-3	Cylinder Installation .....8-7

## Mechanism Diagram





## 8. Cylinder / Piston

### Precautions in Operation

#### General Information

- Both cylinder and piston service can be carried out when engine mounted on frame.

#### Specification

##### LF12 & LF18

Item		Standard	Limit	
Cylinder	ID ( LF18 not included)	56.995~57.015	57.016	
	Bend	-	0.050	
Piston/ Piston ring	Clearance between piston rings	Top ring	0.015~0.050	
		2 <sup>nd</sup> ring	0.015~0.050	
	Ring-end gap	Top ring	0.150~0.300	
		2 <sup>nd</sup> ring	0.300~0.450	
		Oil ring side rail	0.200~0.700	
	OD of piston ( LF18 not included)		56.985~57.005	56.900
	Clearance between piston and cylinder		0.010~0.040	0.100
ID of piston pin boss		15.002~15.008	15.040	
OD of piston pin		14.960~15.000	14.930	
Clearance between piston and piston pin		0.002~0.014	0.020	
ID of connecting rod small-end		15.016~15.034	15.060	

##### LF18

Item		Standard	Limit
Cylinder	ID	60.995~61.015	61.016
Piston	OD of piston	60.985~61.005	60.900

### Troubleshooting

#### Low or Unstable Compression Pressure

Cylinder or piston ring worn out

#### Smoking in Exhaust Pipe

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

#### Knock or Noise

Cylinder or piston ring worn out  
Carbon deposits on cylinder head top side  
Thermostat burnt

#### Engine Overheat

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

### Cylinder Removal

Remove cylinder head (refer to chapter 6).  
 Remove coolant hose from cylinder head.  
 Remove cylinder.



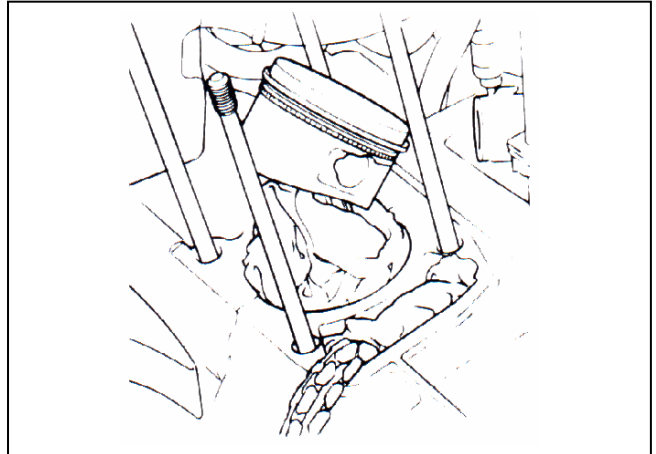
Remove cylinder gasket and dowel pin.



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

**⚠ Caution**

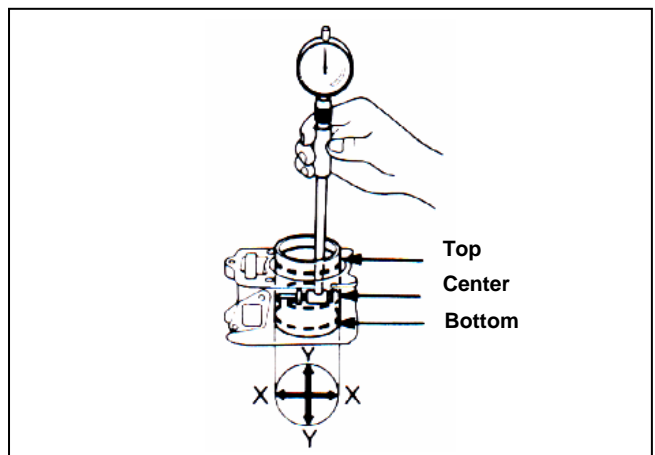
Soap the residues into solvent so that the residues can be removed more easily.



### Inspection

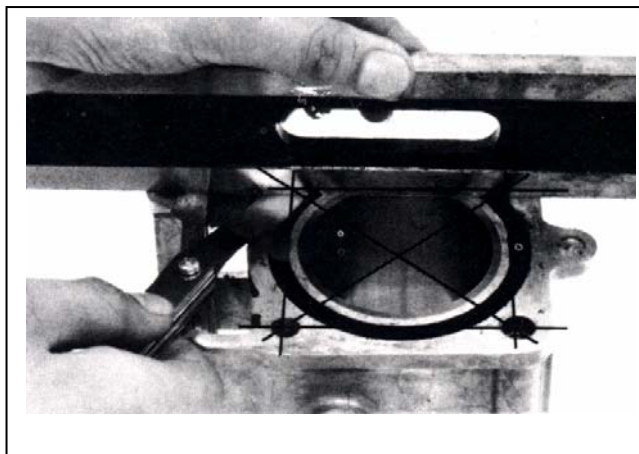
Check if the inner diameter of cylinder is wear out or damaged.  
 In the 3 positions, top, center and bottom, of cylinder, measure the X and Y values respective in the cylinder.

**Service limit:**  
**LA18W:61.016 mm**



## 8. Cylinder / Piston

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



### Piston Removal

Plug crankcase opening with a cleaning cloth to prevent from piston pin snap ring or other foreign materials 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.



### Inspection

Measure the clearance between piston ring and its grooves.

**Service Limit:**    **Top ring: 0.09 mm**  
                               **2<sup>nd</sup> ring: 0.09 mm**

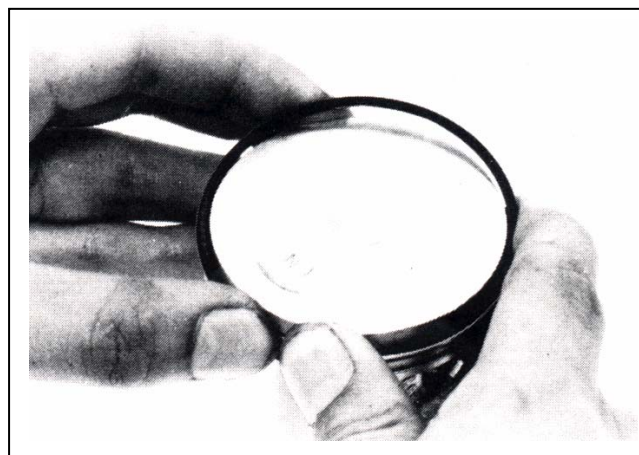


### Remove piston rings

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

#### **⚠ Caution**

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

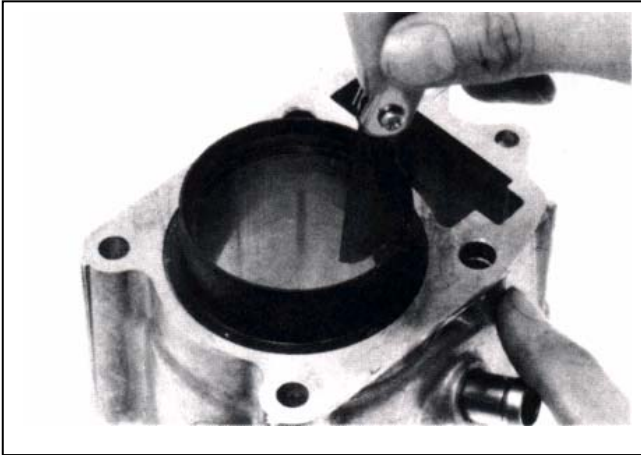




## 8. Cylinder / Piston

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

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



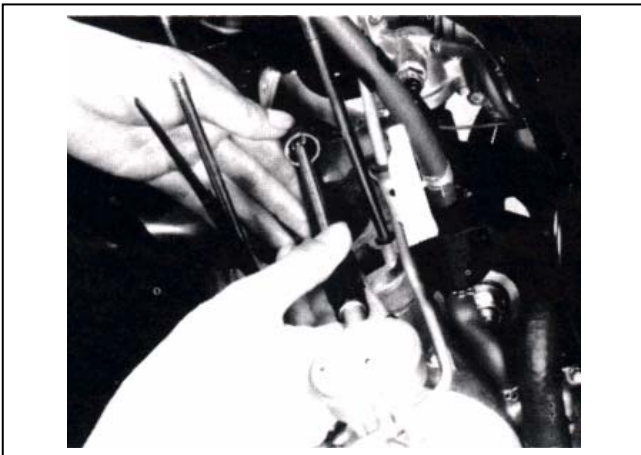
Measure the outer diameter of piston pin.

**Service Limit: 14.93 mm**



Measure the inner diameter of connecting rod small end.

**Service Limit: 15.06 mm**

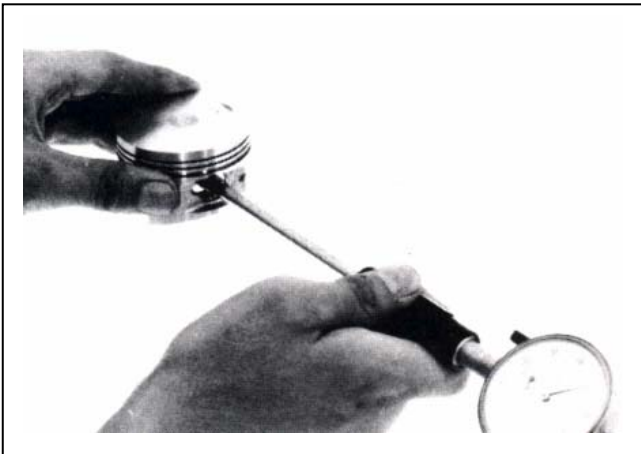


Measure the inner diameter of piston pin hole.

**Service Limit: 15.04 mm**

Calculate clearance between piston pin and its hole.

**Service Limit: 0.02 mm**





## 8. Cylinder / Piston

Measure the piston outer diameter.

### ⚠ Caution

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

### Service limit:

**LA18W: 60.9 mm**

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



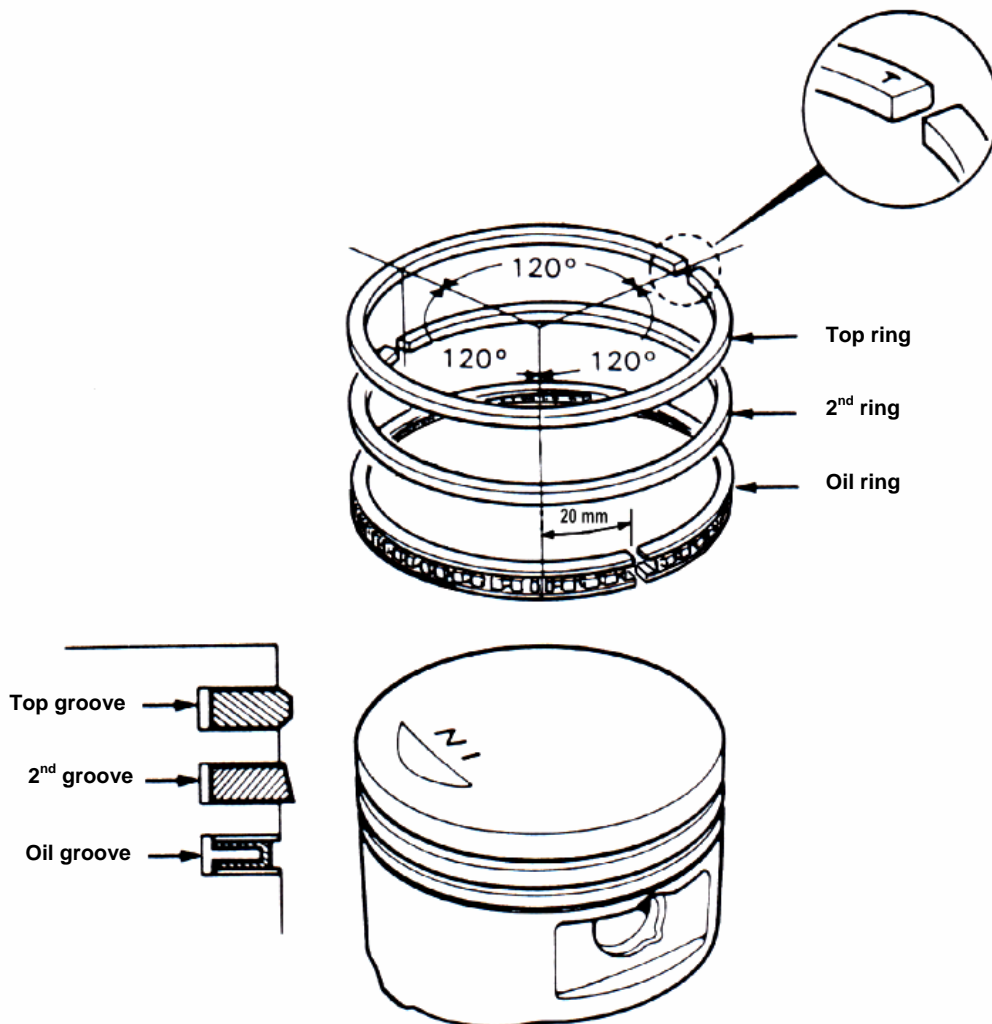
## Piston Ring Installation

Clean up piston top, ring groove, and piston surface.  
Install the piston ring onto piston carefully.

Place the openings of piston ring as diagram shown.

### ⚠ Caution

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





## Piston Installation

Install piston and piston pin, and place the IN marks on the piston top side forward to 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 cloth between piston and crankcase in order to prevent snap ring from falling into crankcase as operation.



## Cylinder Installation

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

### ⚠ Caution

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

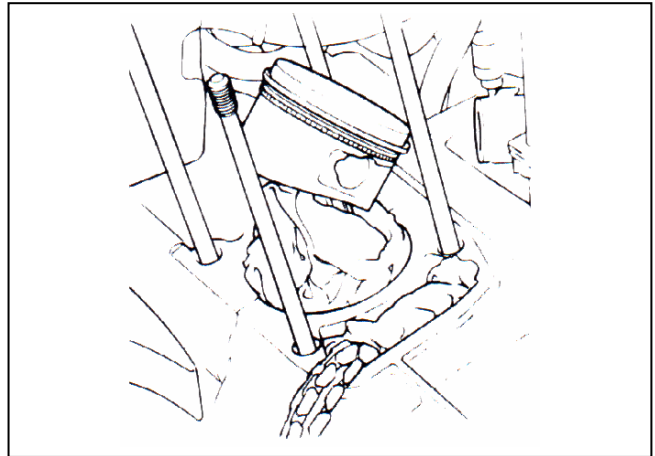
Install dowel pins and new gasket.

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

Care to be taken when installing piston into cylinder. Press piston rings in one by one as installation.

### ⚠ Caution

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



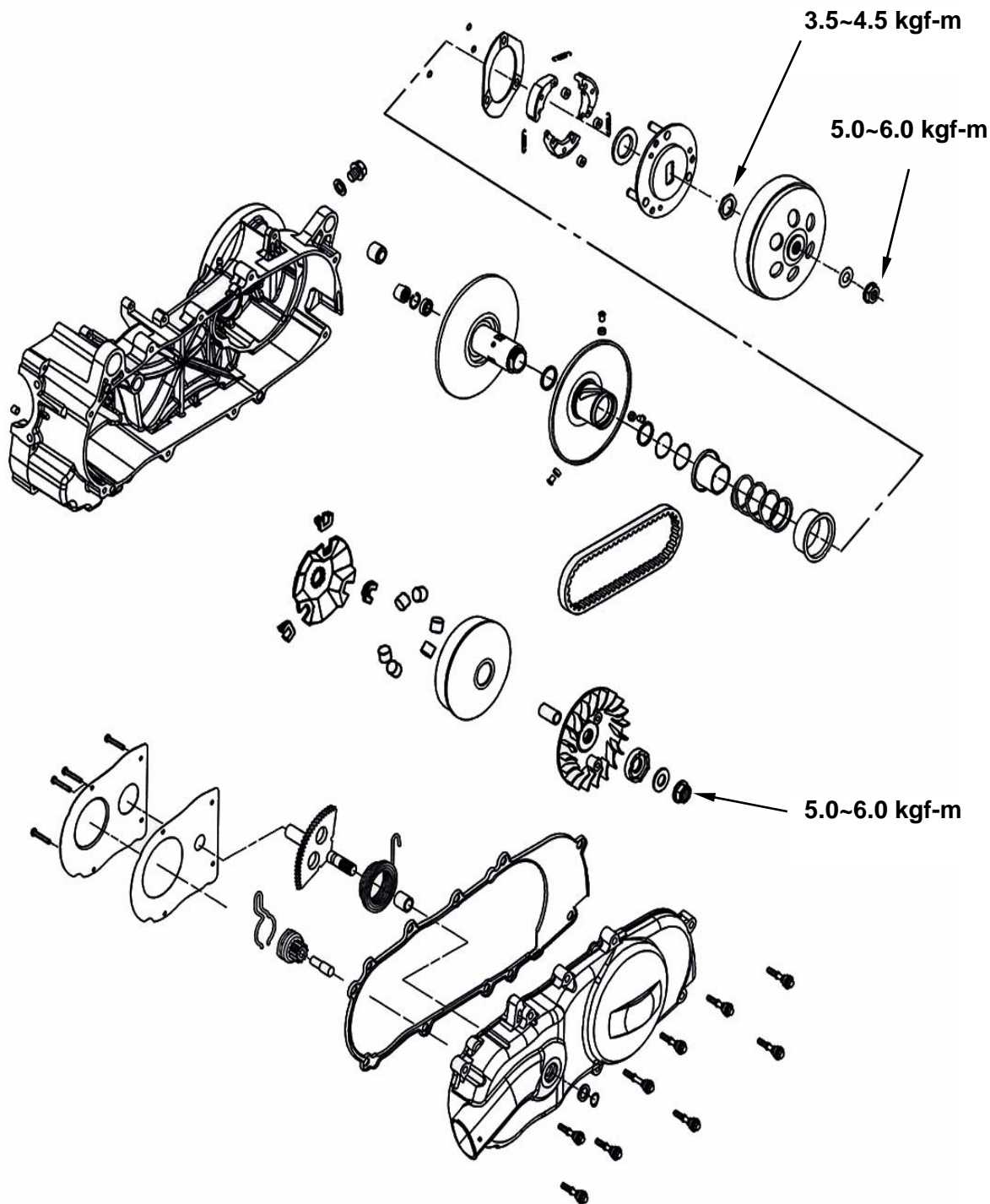
Install coolant hose onto cylinder.  
Install cylinder head (refer to Chapter 6).



**NOTES:**

Mechanism Diagram ..... 9-1	Drive Belt..... 9-5
Precautions in Operation ..... 9-2	Drive face..... 9-6
Troubleshooting..... 9-2	Clutch outer / Driven pulley ..... 9-10
Left Crankcase Cover ..... 9-3	

Mechanism Diagram



## 9. V-Belt Drive System

### Precautions in Operation

#### General Information

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

Item	Standard value (mm)	Limit (mm)
Driving belt width	19.000	17.500
ID of drive face boss	27.000~27.021	27.060
OD of drive face	26.970~26.990	26.940
OD of roller	19.950~20.100	19.500
ID of clutch outer	130.000~130.200	130.500
Thickness of clutch weight	4.000~4.100	2.000
Free length of driven pulley spring	88.300	83.200
OD of driven pulley	33.965~33.985	33.940
ID of drive face	34.000~34.025	34.060

#### Torque value

- Driven face nut: 5.0~6.0 kgf-m
- Clutch outer nut: 5.0~6.0 kgf-m

#### Special Service Tools

- Clutch spring compressor
- Inner bearing puller
- Bearing driver
- Clutch nut wrench 39 x 41 mm
- Universal holder

### Troubleshooting

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

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

#### Insufficient horsepower or poor high speed performance

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

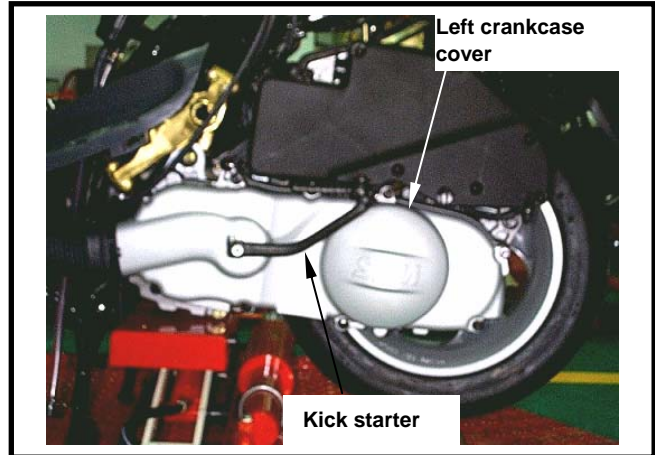
#### Shudder or misfire when driving

1. Broken clutch weight
2. Worn clutch weight

## Left Crankcase Cover

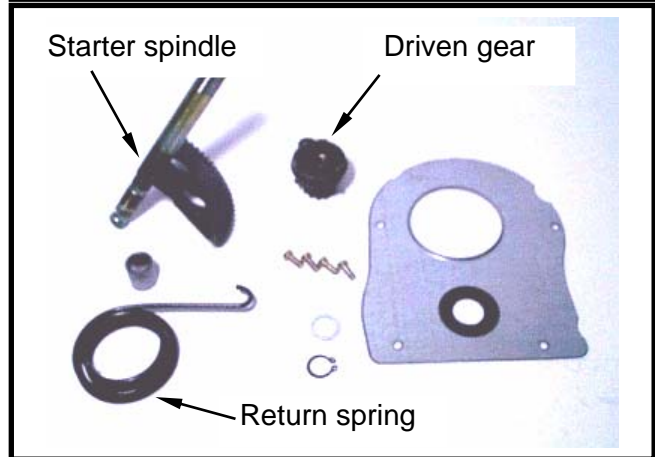
### Left crankcase cover removal

- Remove body cover.
- Remove air cleaner (2 bolts).
- Remove kick starter (1 bolt).
- Remove L crankcase cover (9 bolts).



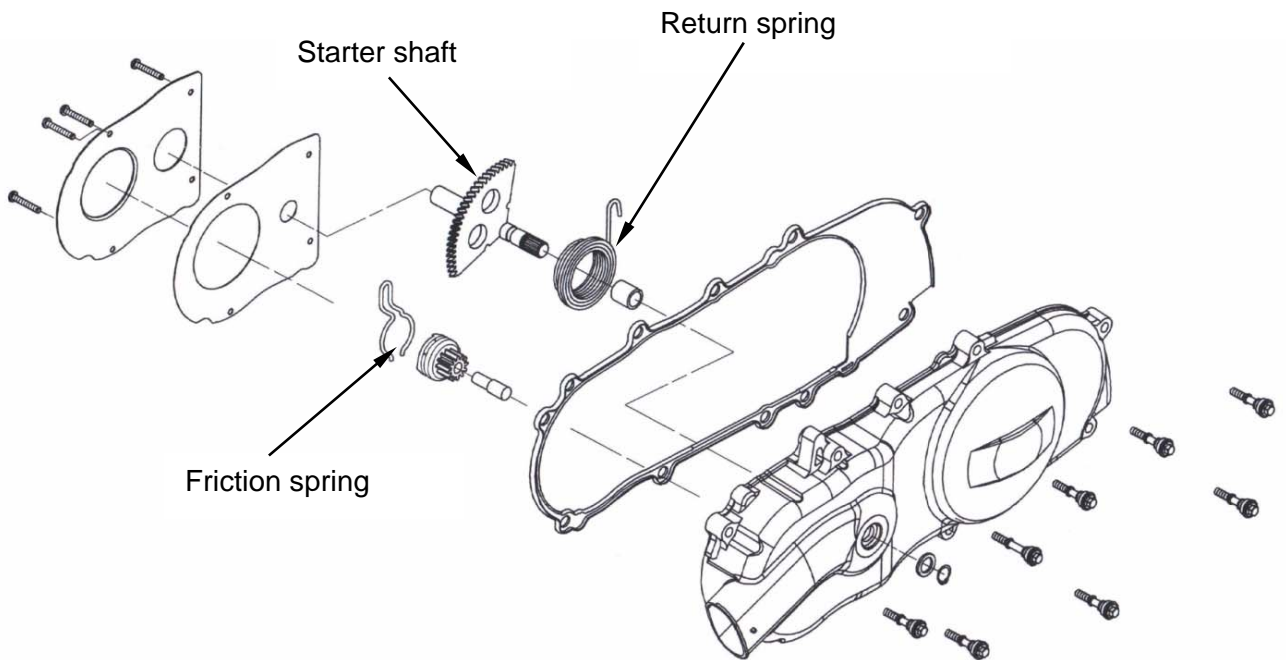
### Disassembly of Kick Starter

- Remove snap ring and thrust washer from L crankcase cover.
- Install kick starter arm, rotate the arm slightly and then remove driven gear and washer. Remove the kick starter arm, starter spindle, and return spring as well as socket.



### Inspection of Kick Starter

Check if starter spindle, driven gear, socket and bearing hole for wear or damage.

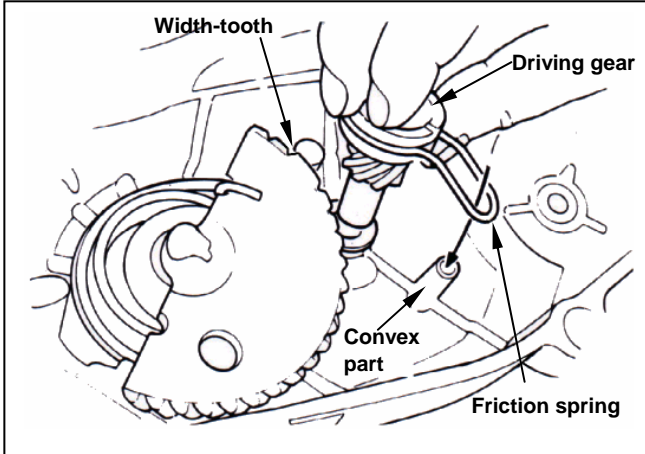
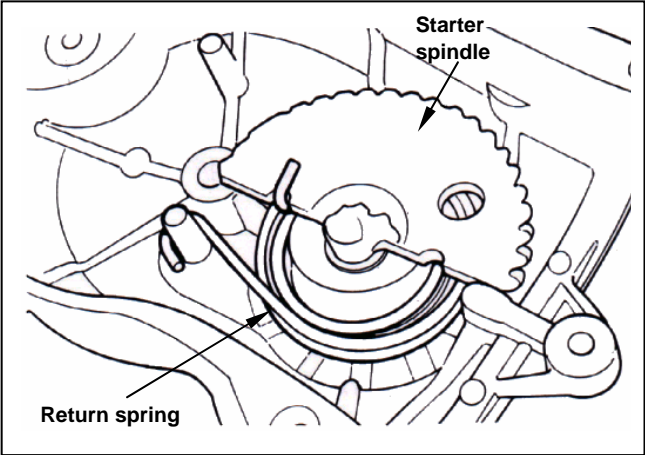




# 9. V-Belt Drive System

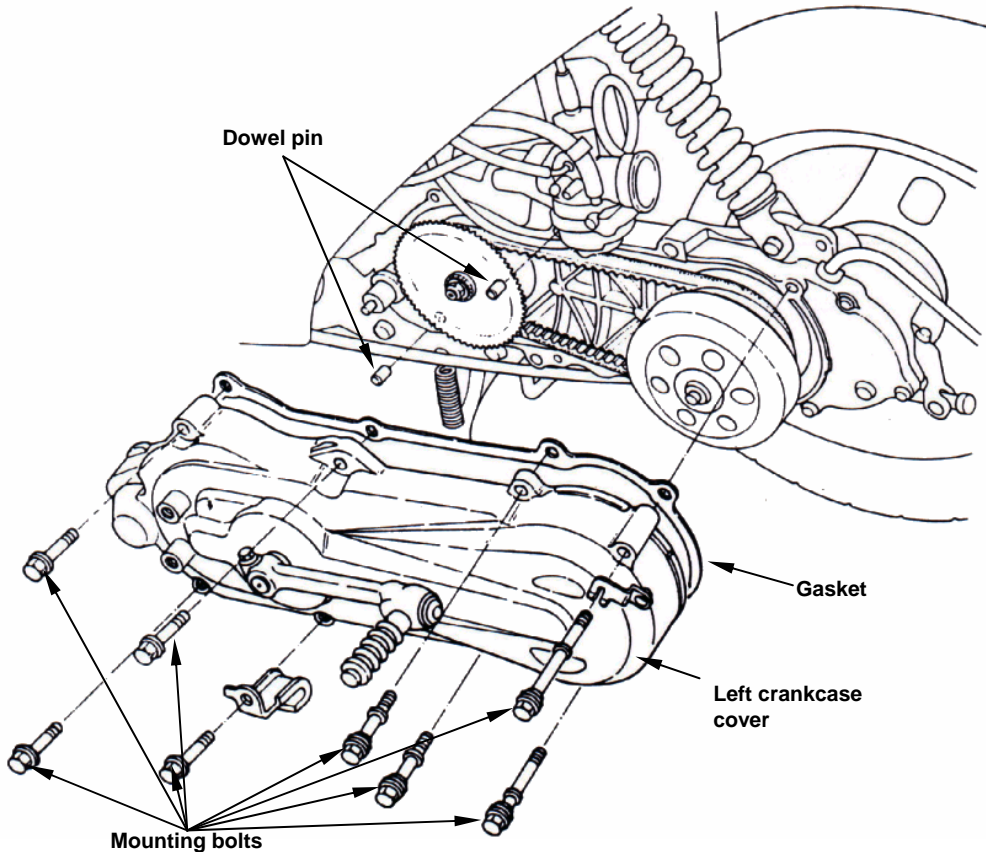
## Reassembly of Kick Starter

Install socket, return spring and starter spindle as diagram shown.  
Install thrust washer and snap ring onto starter spindle.  
Install kick starter arm temporary.  
Rotate the arm and then align driven gear with width-tooth on the starter spindle.  
Install the friction of driving gear onto convex part of the cover.



## Installation of the left crankcase cover

Install the left crankcase cover  
Install kick starter arm



## Drive Belt

### Removal

Remove left crankcase cover  
Hold clutch outer with universal holder, and remove nut and clutch outer.

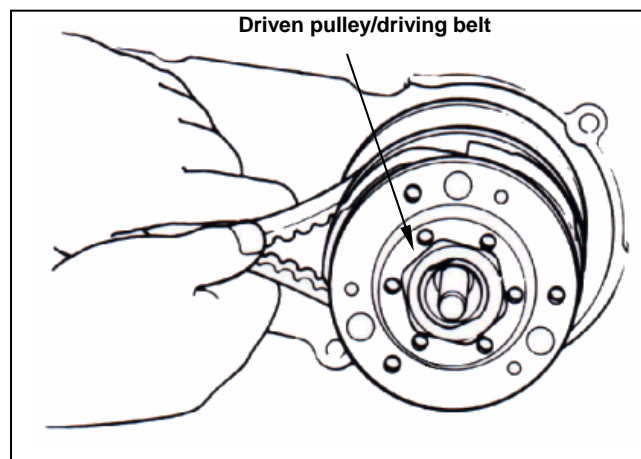
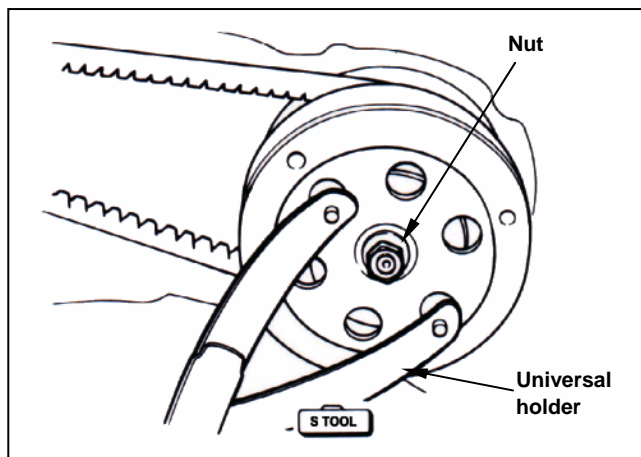
#### Caution

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

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

Remove driven pulley. Do not remove driving belt.

Remove the driving belt from the groove of driven pulley.



### Inspection

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

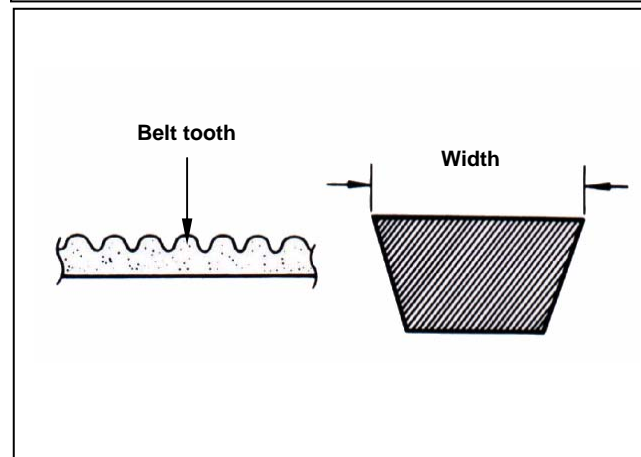
Measure the width of driving belt as diagram shown.

#### **Service Limit: 17.5 mm**

Replace the belt if exceeds the service limit.

#### 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.



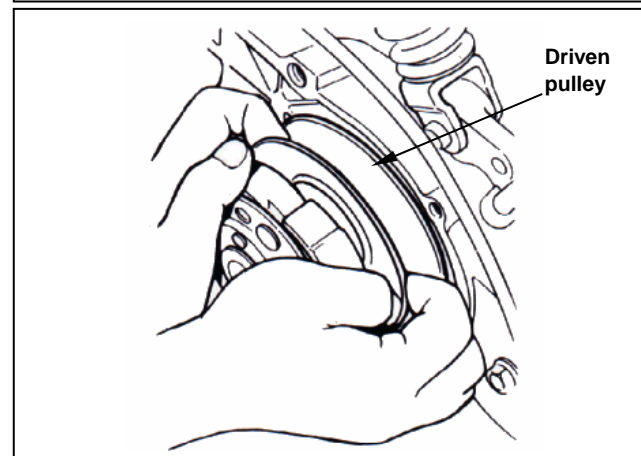
### Installation

#### Caution

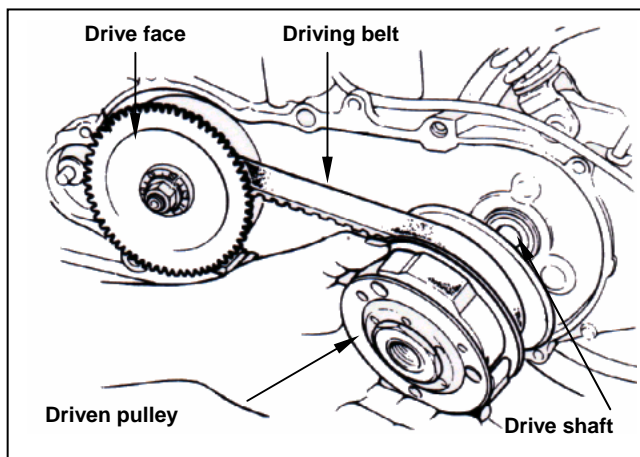
Pull out driven pulley to avoid it closing.

Install driving belt onto driven pulley.

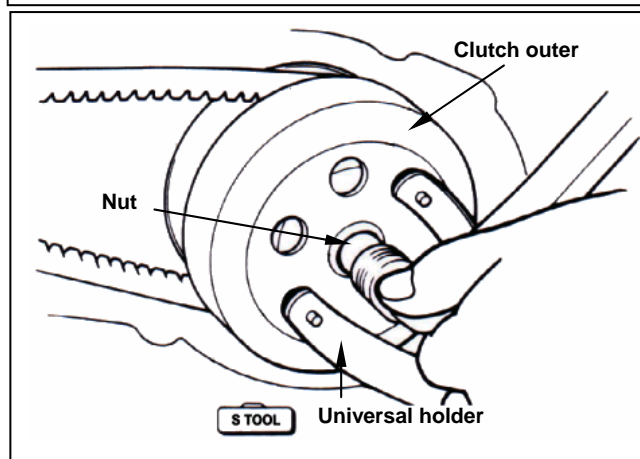
Install the driven pulley that has installed the belt onto drive shaft.



## 9. V-Belt Drive System



Install the clutch with universal holder, and then tighten nut to specified torque value.  
**Torque value: 5.0~6.0 kgf-m**



### Drive Face

#### Removal

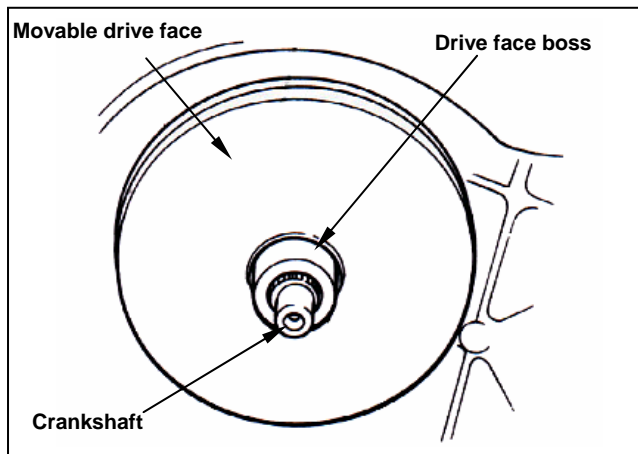
Remove left crankcase cover.



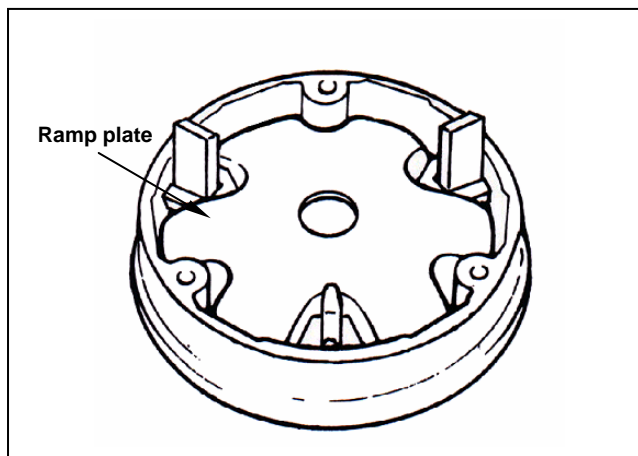
Hold generator flywheel with universal holder, and then remove drive face nut.  
 Remove drive face.

### Removal

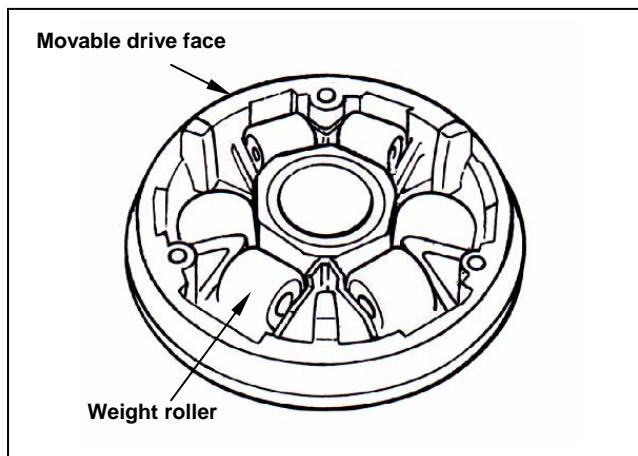
Remove movable drive face comp. and driving belt from crankshaft.



Remove ramp plate.



Remove weight rollers from movable drive face.



### Inspection

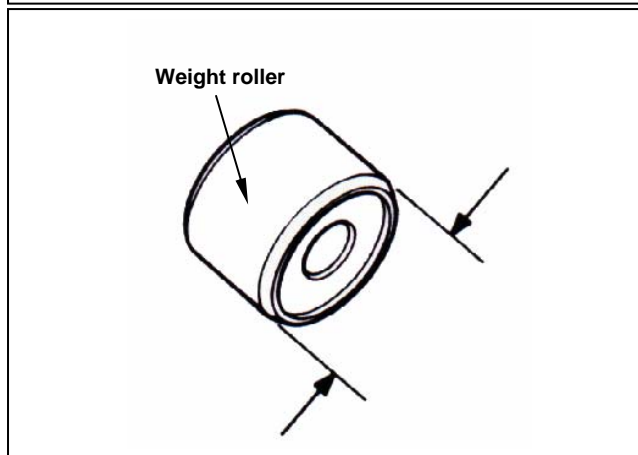
The weight rollers are to press movable drive face by means of centrifuge force. Thus, if weight rollers are worn out or damaged, the centrifuge force will be effected.

Check if rollers are wear out or damage.

Replace it if necessary.

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

**Service limit: 19.50 mm**







# 9. V-Belt Drive System

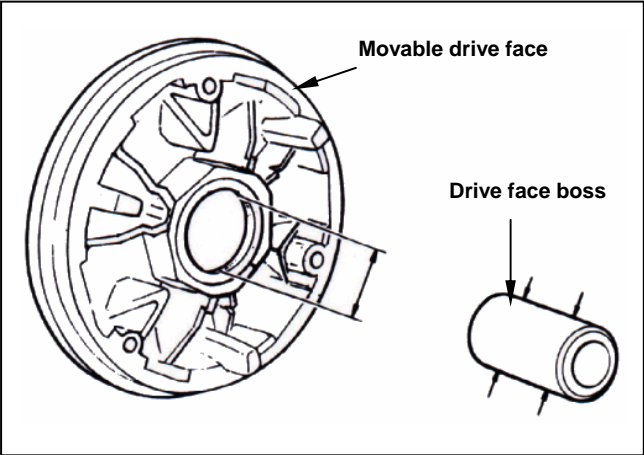
Check if drive face boss is worn or damaged and replace it if necessary.

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

**Service limit: 26.94 mm**

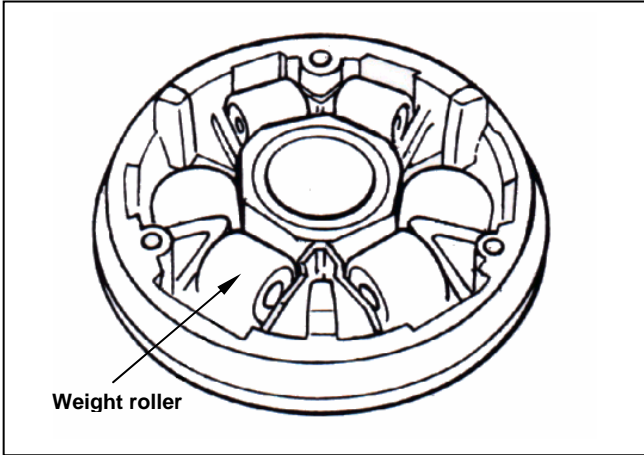
Measure the inner diameter of movable drive face, and replace it if it exceed service limit.

**Service limit: 27.06 mm**

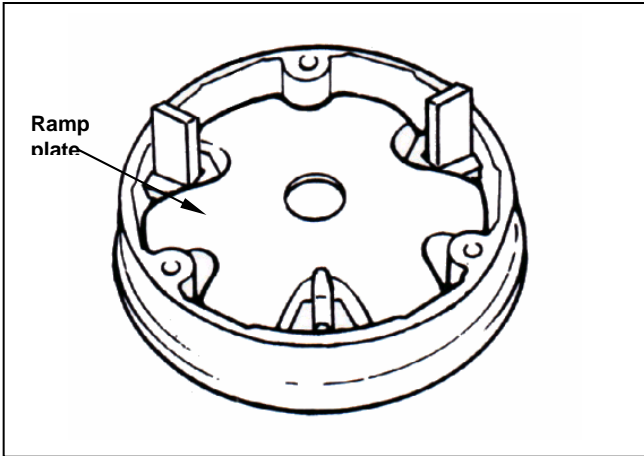


## Reassembly/installation

Install weight rollers.

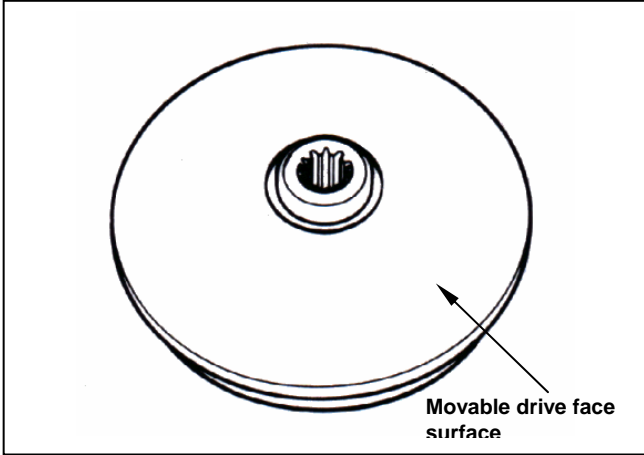


Install ramp plate.



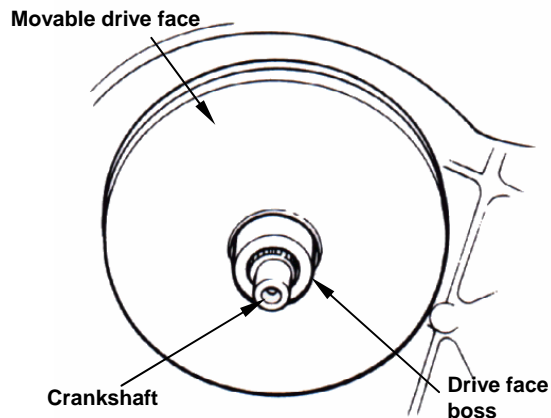
### Caution

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



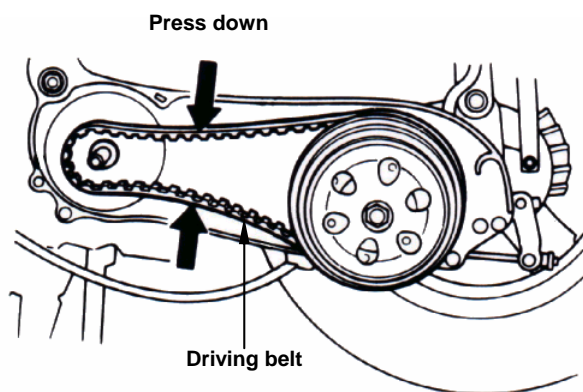


Install movable drive face comp. onto crankshaft.



### Driven pulley installation

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



Install driven pulley, washer and nut.

### Caution

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

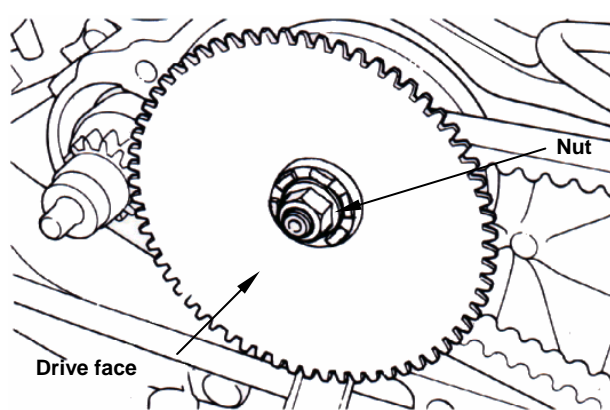
Hold crankshaft with universal holder.



Tighten nut to specified torque.

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

Install left crankcase cover.



## 9. V-Belt Drive System

### Clutch Outer / Driven Pulley

#### Disassembly

Remove driving belt and clutch outer/driven pulley.

Install clutch spring compressor onto the pulley assembly, and operate the compressor to let the wrench be installed more easily.

#### Caution

Do not press the compressor too much.

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

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

Remove collar from driven pulley.

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

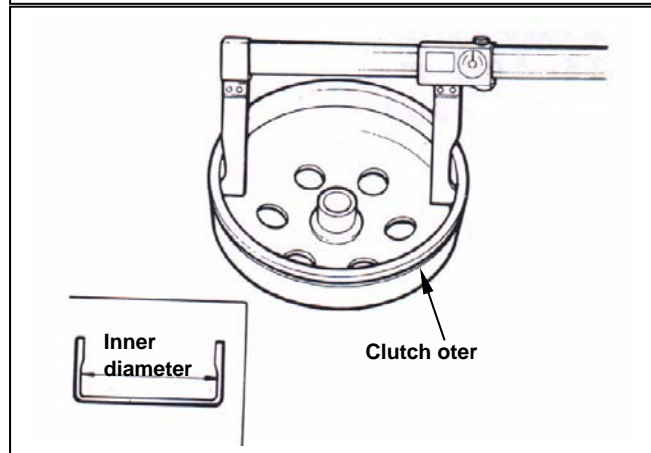
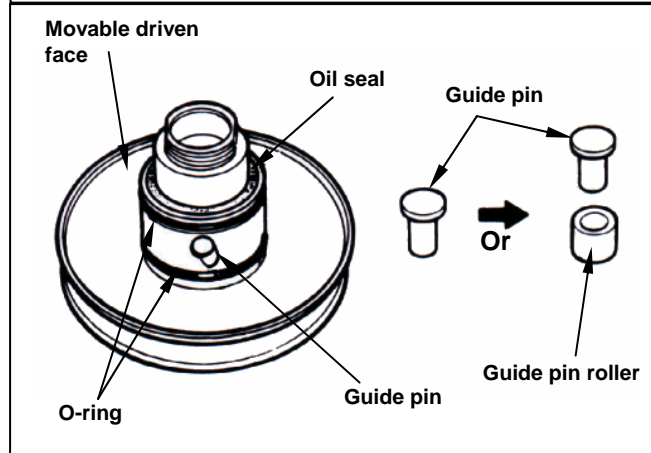
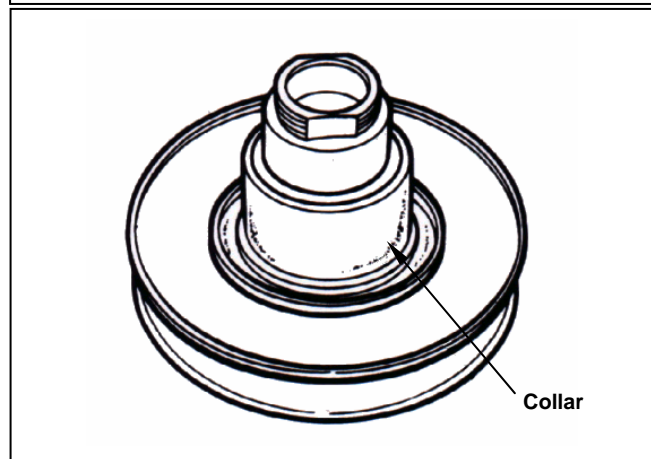
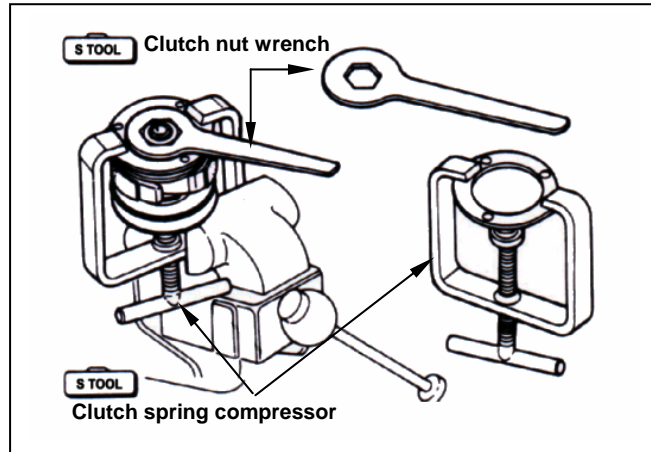
#### Inspection

##### Clutch outer

Measure the inner diameter of clutch outer.

Replace the clutch outer if exceed service limit.

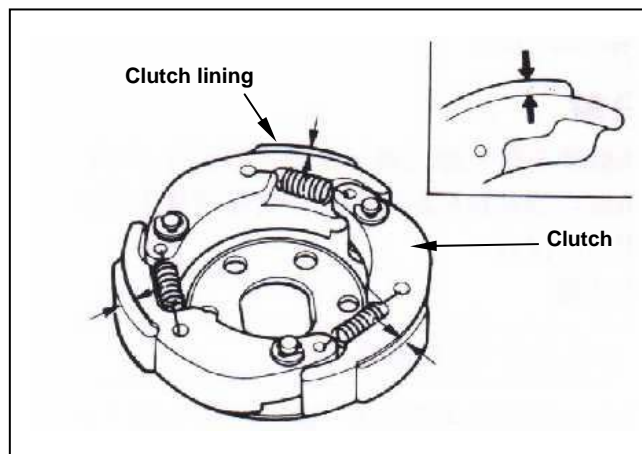
**Service limit: 130.5 mm**



### Clutch lining

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

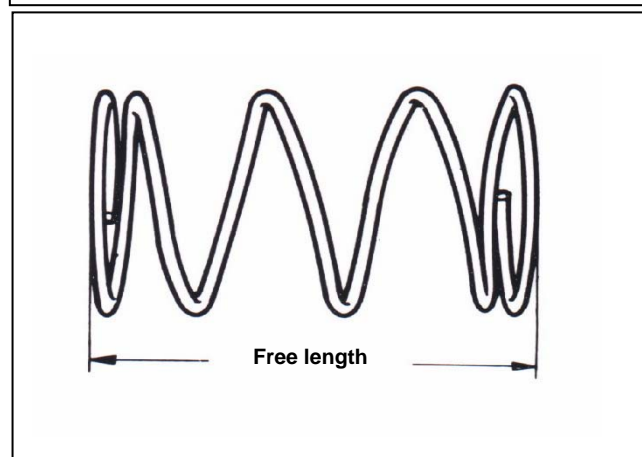
**Service limit: 2.0 mm**



### Driven pulley spring

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

**Service limit: 83.2 mm**



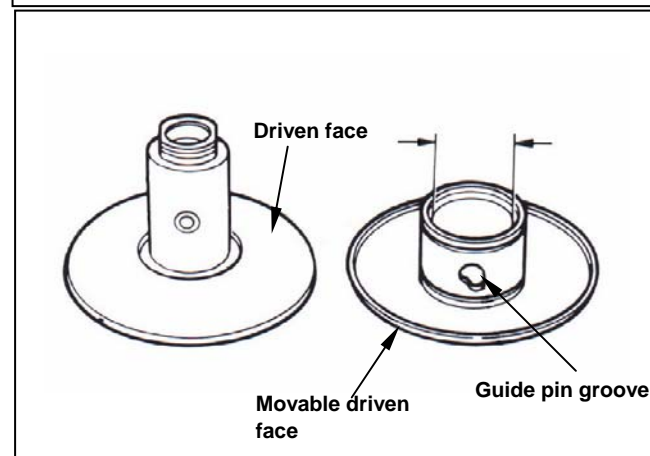
### Driven pulley

Check following items:

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

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

**Service limit: Outer diameter 33.94 mm**  
**Inner diameter 34.06 mm**

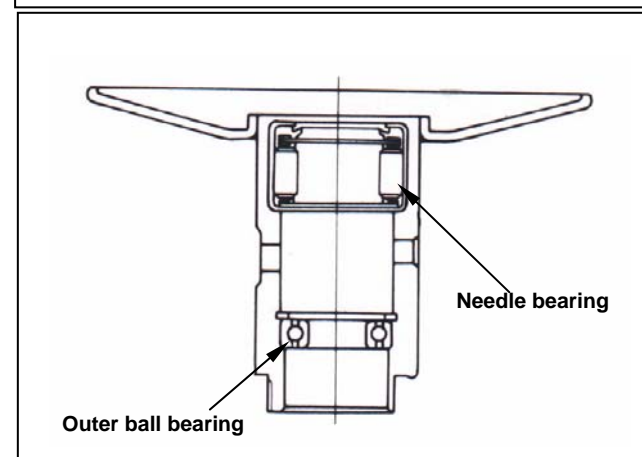


### Driven pulley bearing inspection

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

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

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



## 9. V-Belt Drive System

### Clutch weight replacement

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

#### Caution

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

Check if spring is damage or insufficient elasticity.

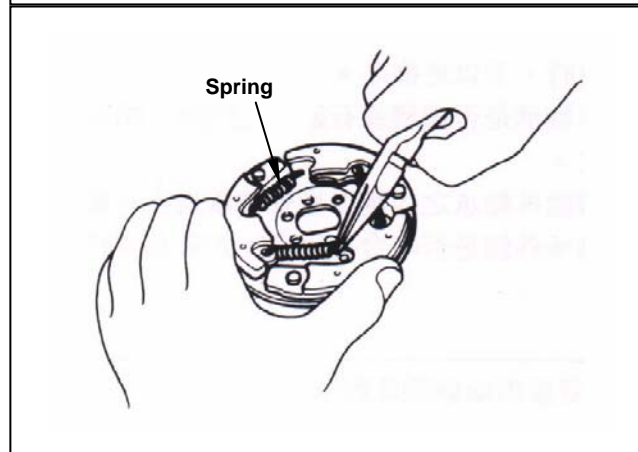
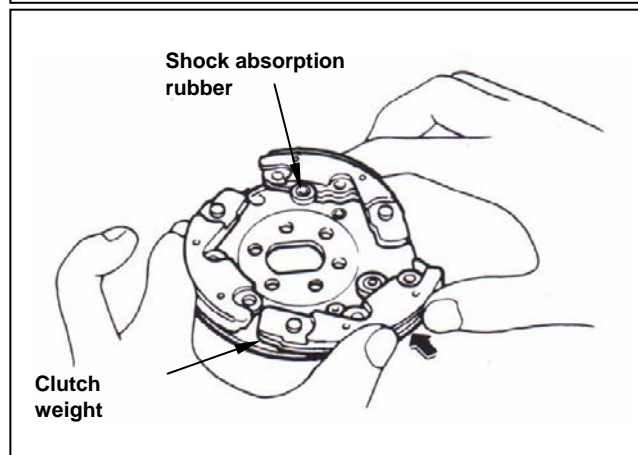
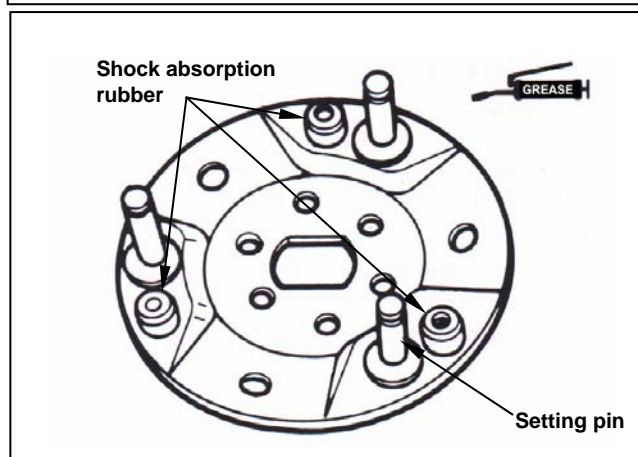
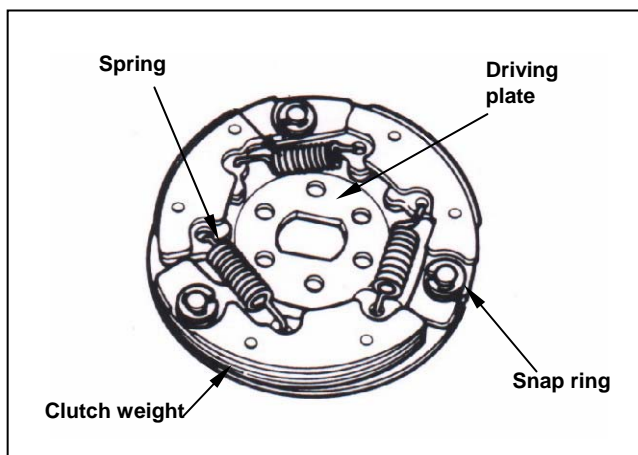
Check if shock absorption rubber is damage or deformation. Replace it if necessary. Apply with grease onto setting pins.

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

#### Caution

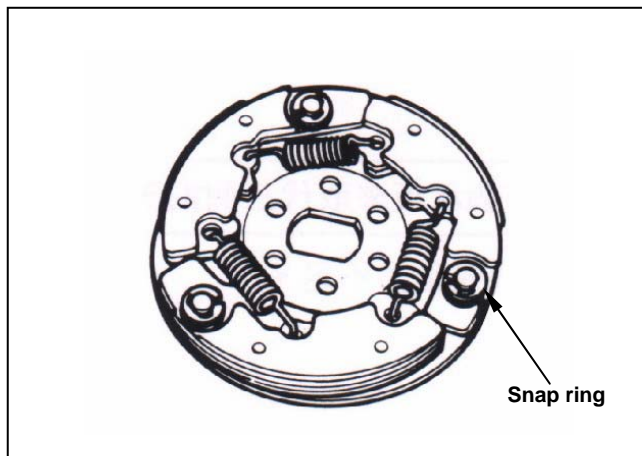
Grease or lubricant will damage the clutch weight and effect the block's connection capacity.

Install the spring into groove with pliers.





Install snap ring and mounting plate onto setting pin.

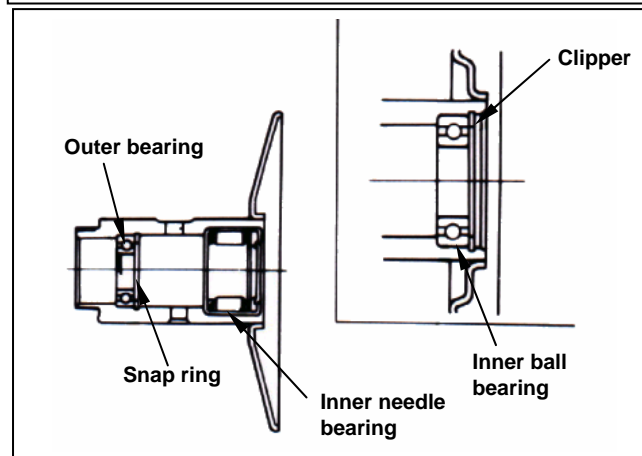


### Driven pulley bearing replacement

Remove inner bearing.

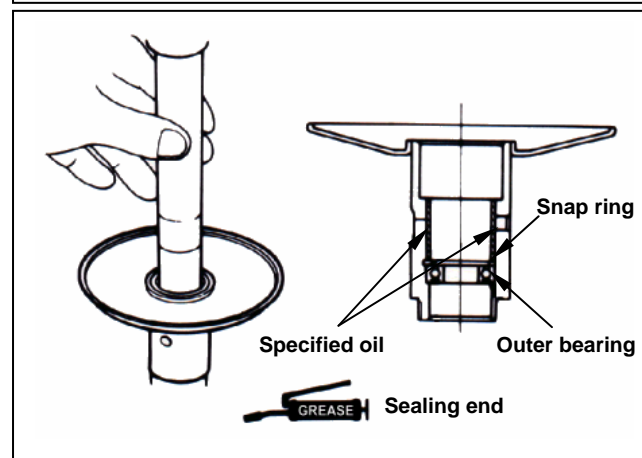
**⚠ Caution**

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



Remove snap ring and then push bearing forward to other side of inner bearing.

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

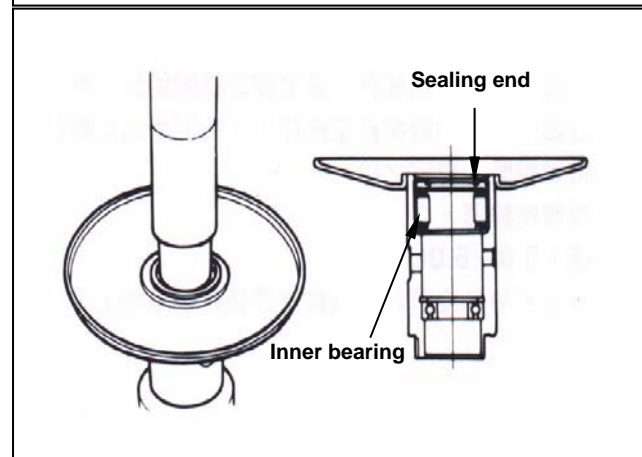


Install new inner bearing.

**⚠ Caution**

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

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

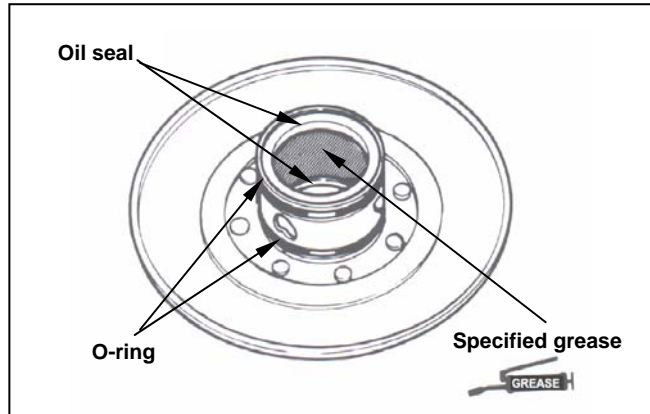




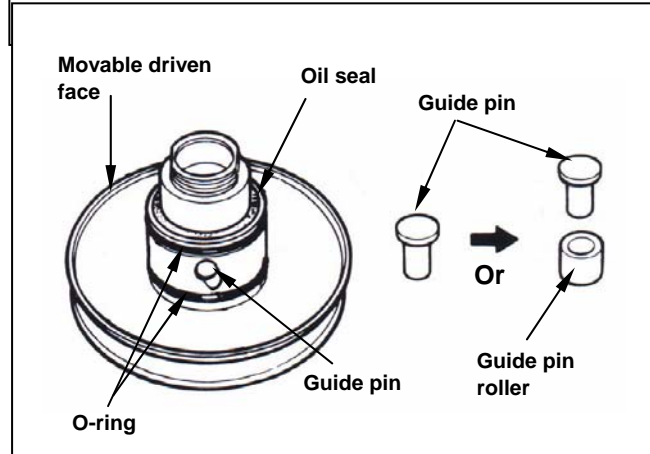
## 9. V-Belt Drive System

### Clutch Outer / Driven Pulley Installation

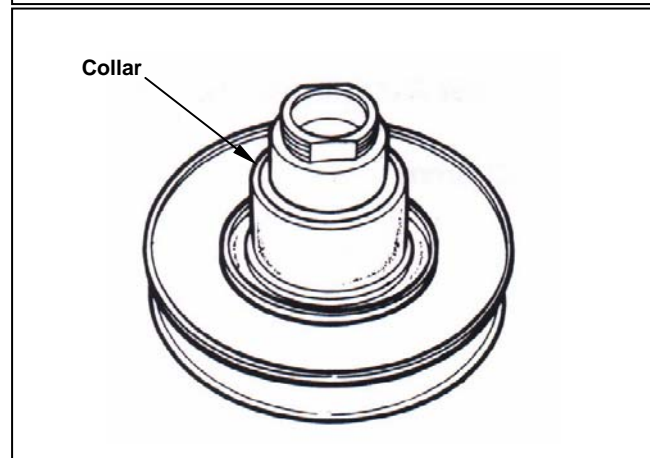
Install new oil seal and O-ring onto movable driven face.  
Apply with specified grease to lubricate the inside of movable driven face..



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



Install the collar.



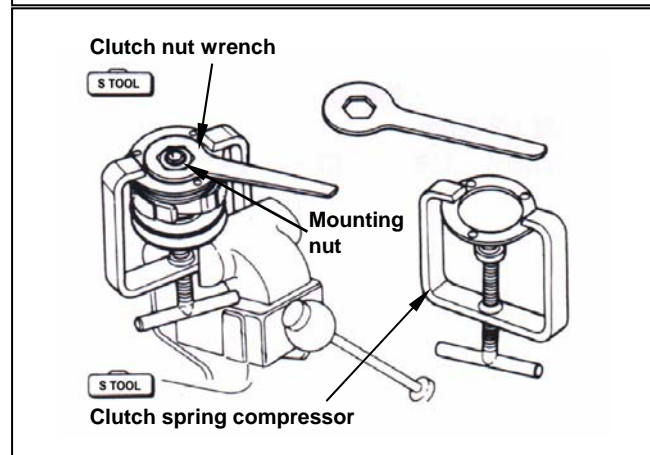
Install driving belt, spring and clutch weight COMP. into clutch spring compressor, and press down the assembly by turning manual lever until mounting nut that can be installed.

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

Remove the clutch spring compressor.

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

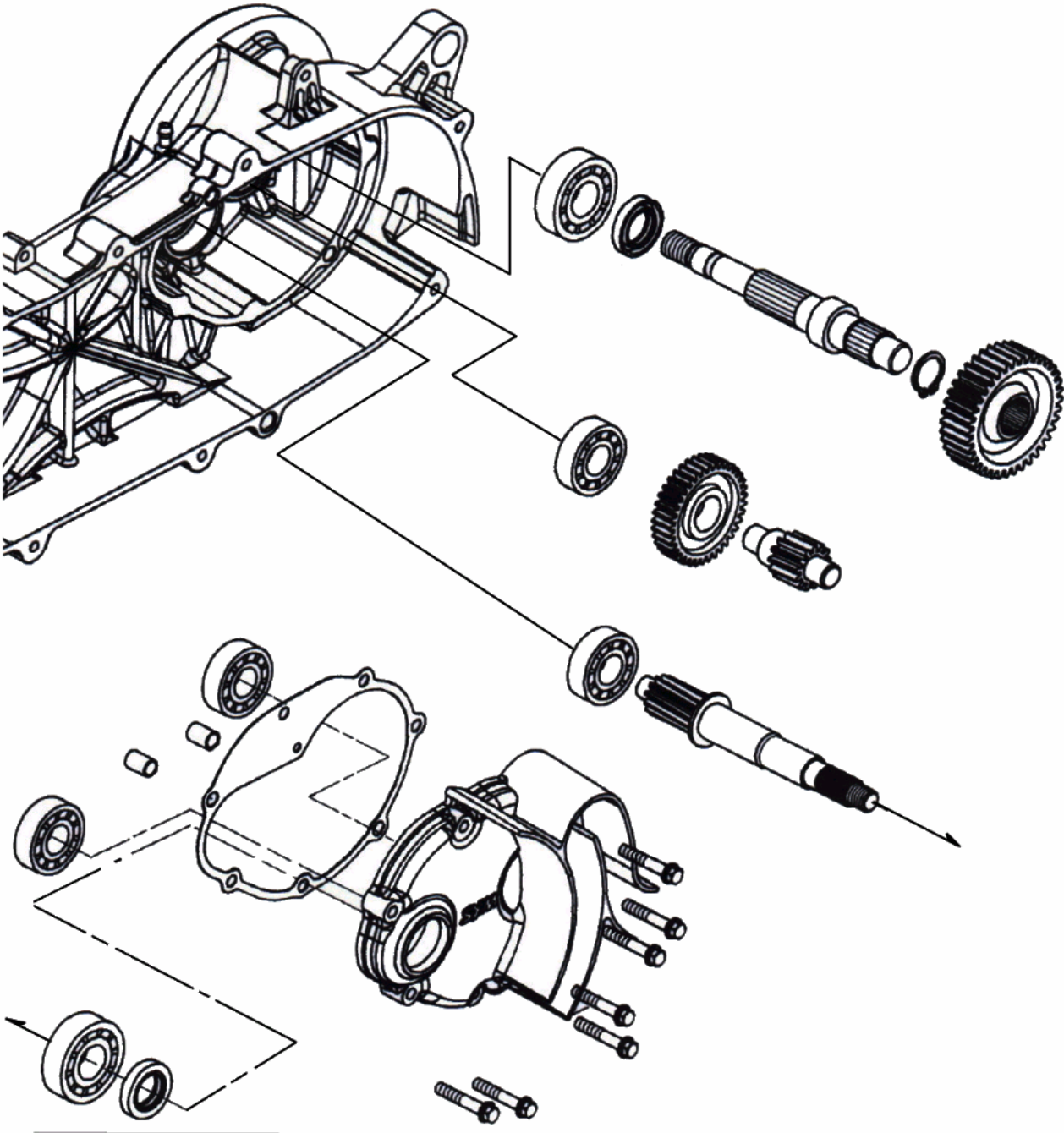
Install clutch outer/driven pulley and driving belt onto driving shaft.



# 10. Final Drive Mechanism

Mechanism Diagram .....10-1	Final Drive Mechanism Inspection..... 10-3
Precautions in Operation .....10-2	Bearing Replacement..... 10-4
Troubleshooting.....10-2	Final Drive Mechanism Reassembly....10-6
Final Drive Mechanism Disassembly ...10-3	

## Mechanism Diagram



## 10. Final Drive Mechanism

### Precautions in Operation

#### Specification

Application oil: scooter gear oil

Recommended oil: KING MATE serial gear oils

Oil quantity: 110 c.c. (100 c.c. when replacing)

#### Torque value

**Gear box cover**                    **1.0~1.4 kg-m**

#### Tools

##### Special tools

Bearing (6203/6004UZ) driver

Bearing (6204) driver

Bearing (6301) driver

Oil seal (27\*42\*7) driver

Oil seal (20\*32\*6) driver

Inner bearing puller

Outer bearing puller

### Troubleshooting

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

- Damaged driving gear
- Burnt out driving gear

#### Noise

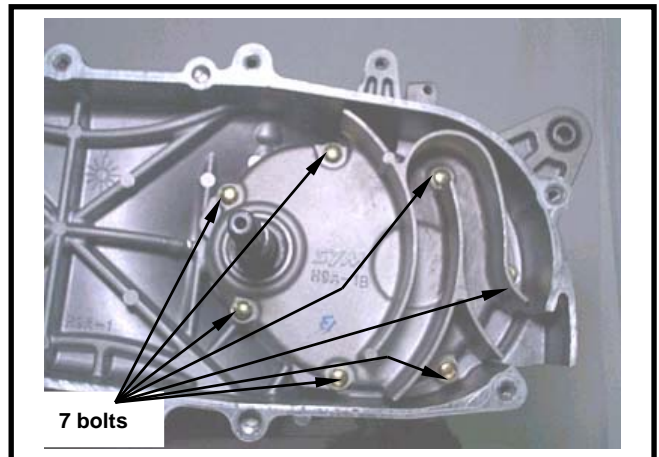
- Worn or burnt gear
- Worn gear

#### Gear oil leaks

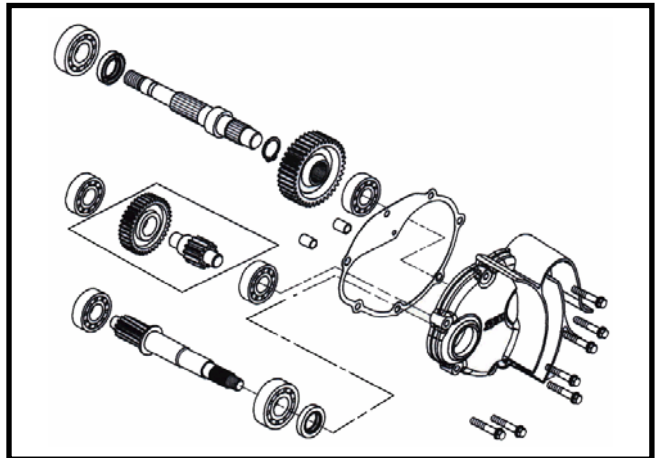
- Excessive gear oil.
- Worn or damage oil seal

### Final Drive Mechanism Disassembly

Remove driven pulley.  
 Drain gear oil out from gear box.  
 Remove gear box cover bolts and then remove the cover.  
 Remove gasket and dowel pin.

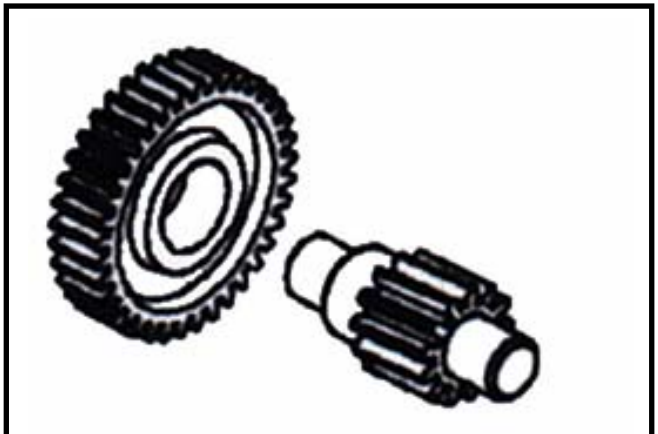


Remove drive shaft.  
 Remove final driving gear and shaft.  
 Remove countershaft and gear.

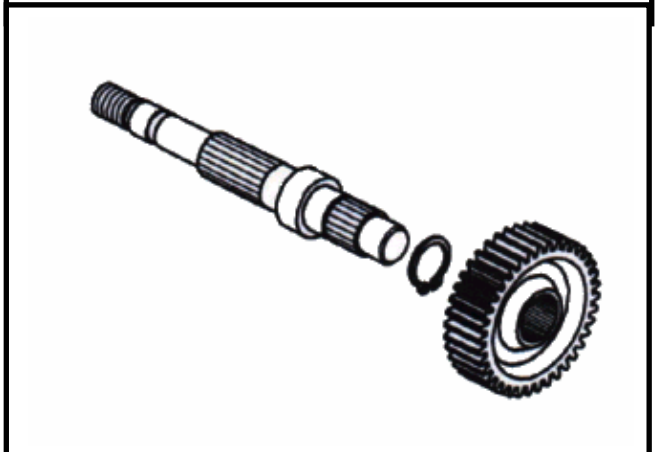


### Final Drive Mechanism Inspection

Check if the countershaft is wear or damage.



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





## 10. Final Drive Mechanism

Check bearings on gear box.

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

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

Check oil seal for wear or damage, and replace it if necessary.

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

### Caution

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

Check drive 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:

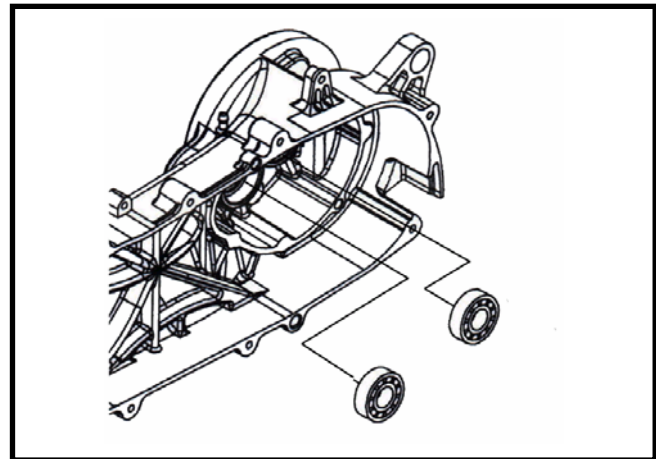
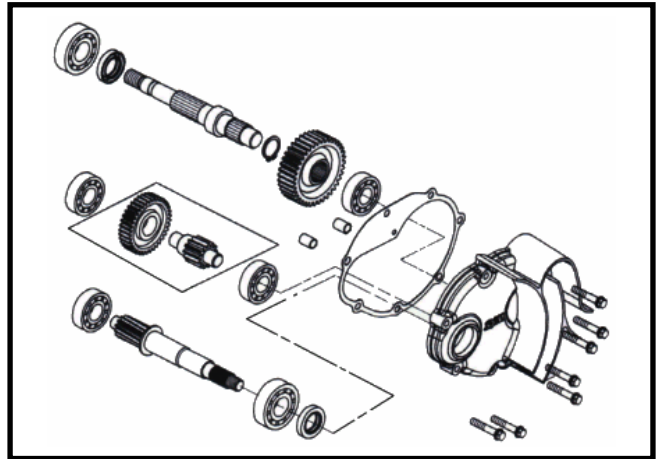
**Inner bearing puller**

Install new driving shaft bearing into left crankcase.

**Tool:**

**Bearing (6301) driver**

Press the bearing into cover with hydraulic presser.







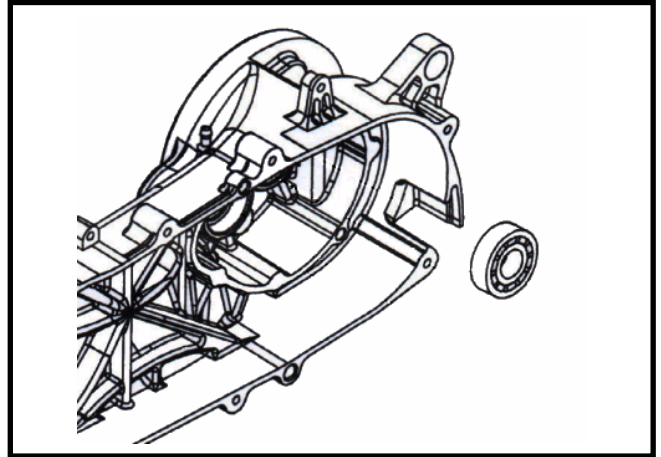
# 10. Final Drive Mechanism

Remove oil seal, and then remove final shaft bearing from left crankcase.  
Install new final shaft bearing.  
Press the bearing in with hydraulic presser.

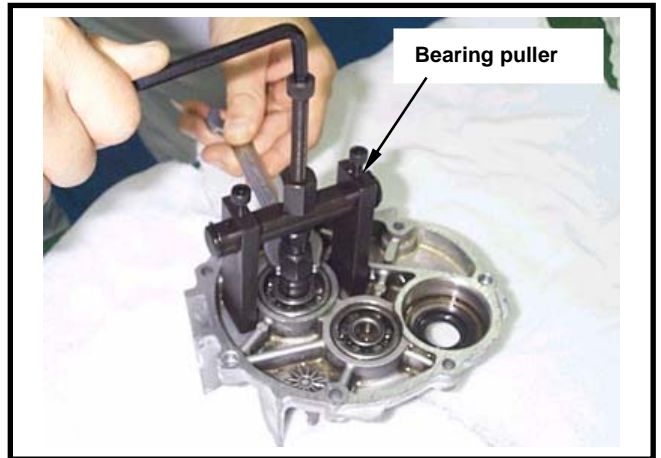
**Tool:**

**Bearing (6203/6004UZ) driver**

**Oil seal (27\*42\*7) driver**



Press out the driving shaft from gear box cover.  
Using bearing protector as operation.  
Remove oil seal from gear box cover and discard the seal.  
Use bearing puller to remove the final shaft bearing from the cover.



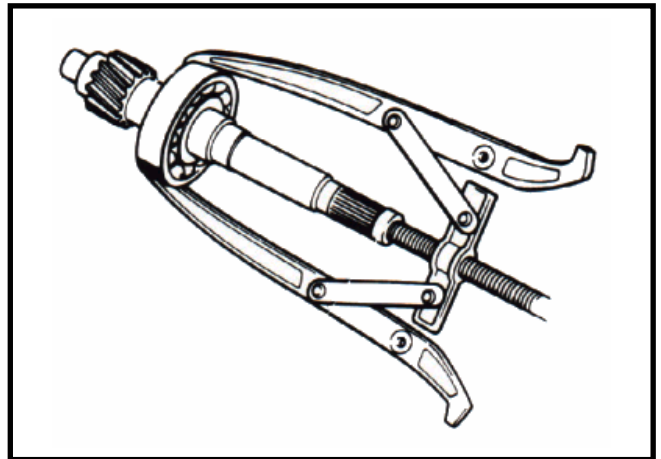
If the driving shaft is pulled out with its bearing, then remove the bearing with bearing puller and bearing protector.

**Tool:**

**Bearing (6204)driver or**

**Multi-functional bearing puller**

**Bearing protector**



Install a new driving shaft bearing onto gear box cover.

**Tool:**

**Bearing (6204) driver**

Press the bearing in with hydraulic presser.



## 10. Final Drive Mechanism

Install a new final shaft bearing onto gear box cover.

**Tool:**

**Bearing (6203/6004UZ) driver**

Press the bearing in with hydraulic presser.



Install the driving shaft onto gear box cover and then place it to proper position.

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

**Tool:**

**Oil seal (20\*32\*6) driver**

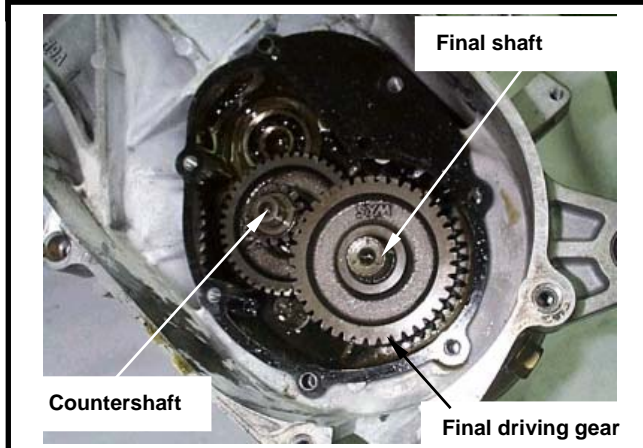


### Final Drive Mechanism Reassembly

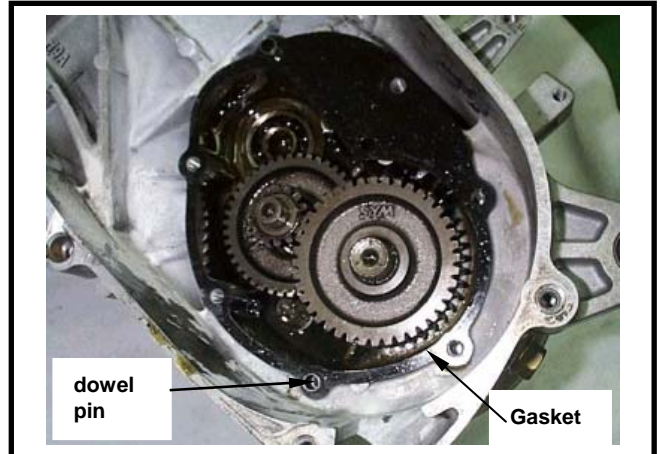
Apply with grease onto the oil seal lip of final driving shaft.



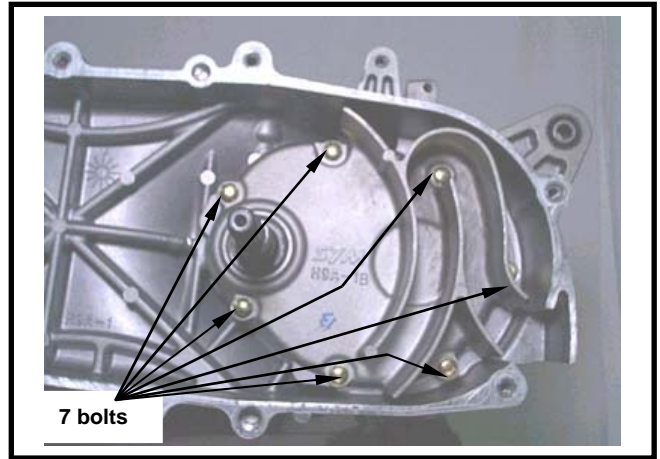
Install countershaft, final shaft and final driving gear.



Install dowel pin and new gasket.



Install gear box cover and bolts, and tighten.  
**Torque value: 1.0~1.4 kgf-m**  
Install driven pulley/clutch outer/belt.  
Install movable drive face, drive face and left crankcase.  
Install rear wheel.  
Add gear oil.



## 10. Final Drive Mechanism

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**NOTES:**

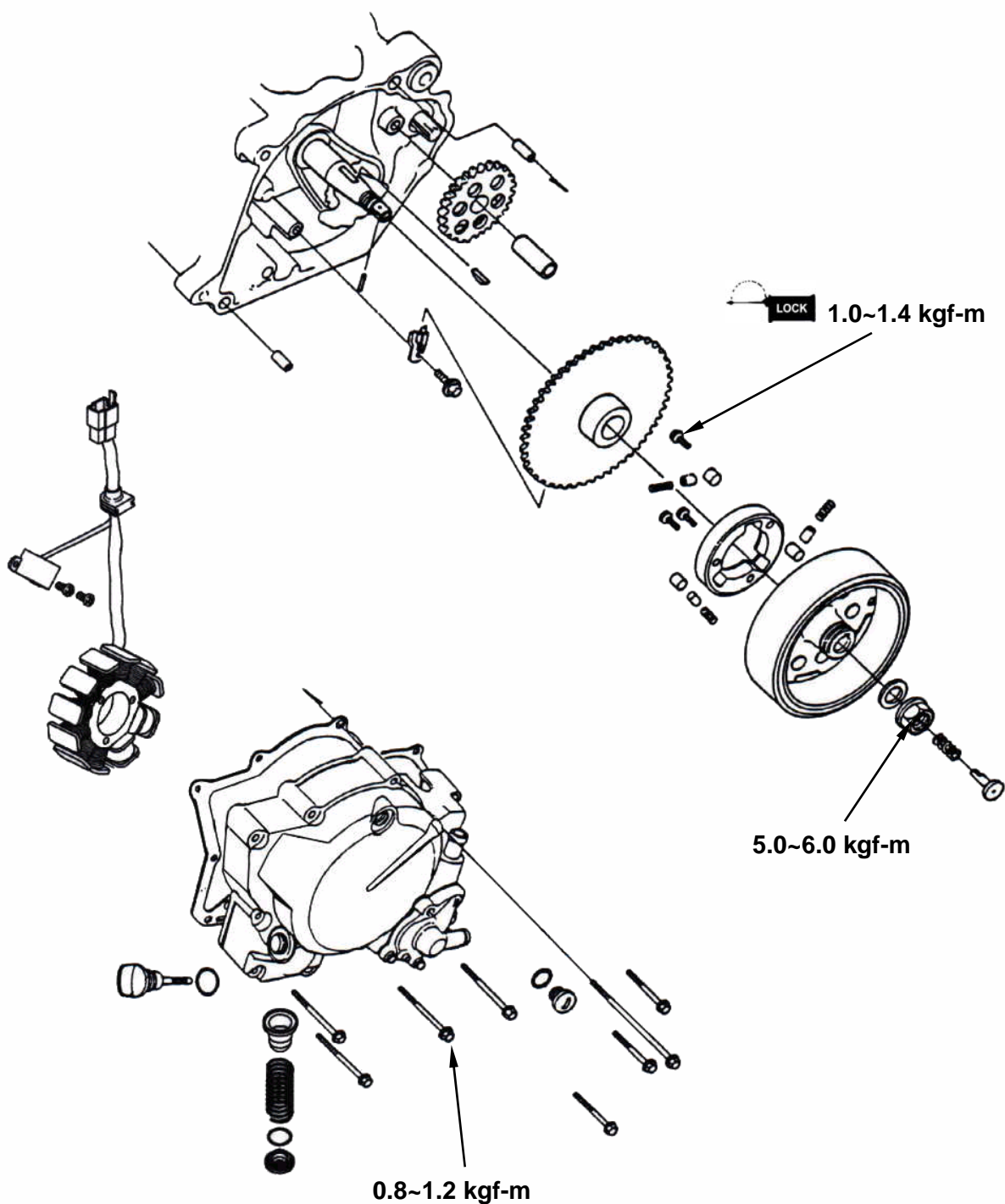




# 11. AC. Generator / Start Clutch

Mechanism Diagram .....	11-1	Start Clutch .....	11-4
Precautions in Operation .....	11-2	Flywheel Installation.....	11-7
Right Crankcase Cover Removal.....	11-3	AC. Generator Installation.....	11-7
AC. Generator Removal.....	11-3	Right Crankcase Cover Installation .	11-7
Flywheel Removal .....	11-3		

## Mechanism Diagram





## 11. AC. Generator / Start Clutch

### Precautions in Operation

#### General information

- Refer to chapter 5: Engine removal and installation
- Refer to chapter 16: The troubleshooting and inspection of alternator
- Refer to chapter 16: The service procedures and precaution items of starter motor

#### Specification

Item	Standard value (mm)	Limit (mm)
ID of starting clutch gear	20.026~20.045	20.100
OD of starting clutch gear	42.175~42.200	42.100

#### Torque value

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

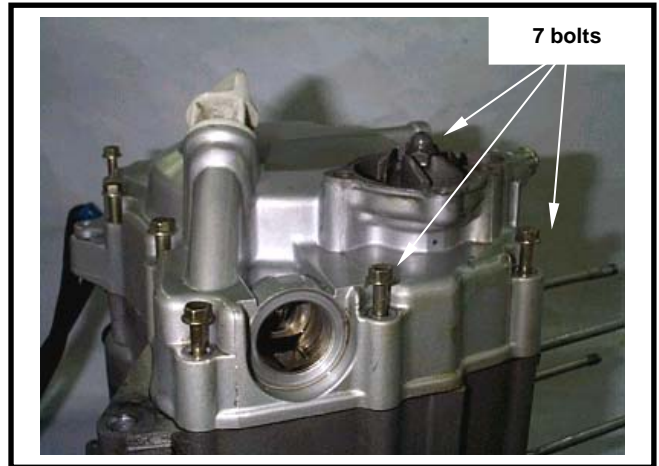
#### Tools

##### Special tools

A.C.G. flywheel puller  
Universal holder

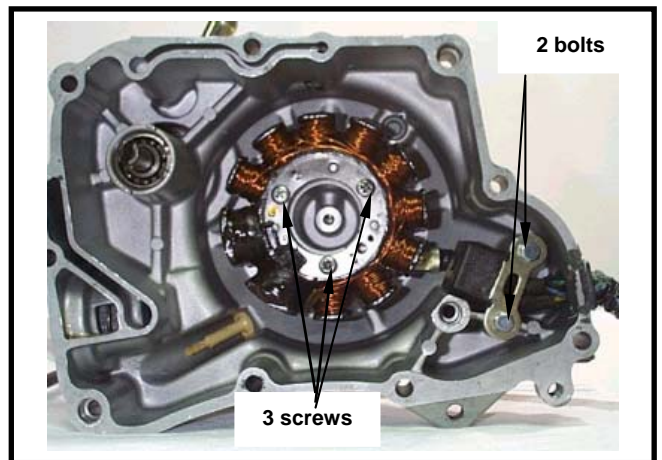
## Right Crankcase Cover Removal

Remove 7 bolts from the right crankcase cover.  
 Remove the right crankcase cover.  
 Remove dowel pin and gasket.



## AC. Generator Removal

Remove 2 mounted bolts from pulse generator and then remove it.  
 Remove 3 screws from right crankcase cover and A.C.G. set.



## Flywheel Removal

Remove oil through from crankshaft.



Remove the pin from crankshaft.



## 11. AC. Generator / Start Clutch

Hold flywheel with flywheel holder, and then remove flywheel nut.

**Tool:**

**Multi-functional holder**



Pull out flywheel with A.C.G. flywheel puller.

**Tool:**

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



### Start Clutch

#### Removal

Remove starting driven gear.



Remove mounting plate, starter reduction gear, and the shaft.





### Start Clutch Inspection

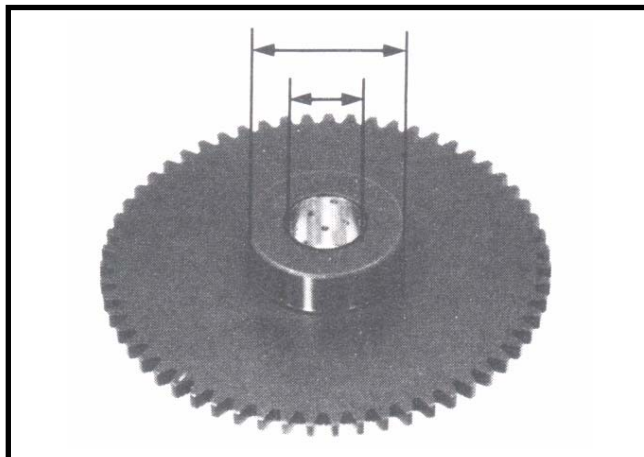
Check the starting clutch gear for wear or damage.

Measure the ID and OD of the starting clutch gear.

**Service Limit:**

**ID: 20.1 mm**

**OD: 42.10 mm**



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



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



### Disassembly

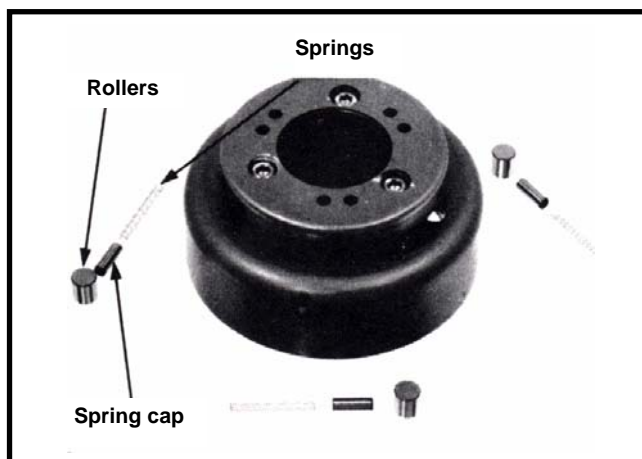
Remove 3 hexagon bolts with air and hex socket wrenches.



## 11. AC. Generator / Start Clutch

Remove the rollers, spring caps, and springs of clutch on the one way clutch that located on the back of flywheel.

Check each roller and plug for wear or damage. Install rollers, plugs and springs.



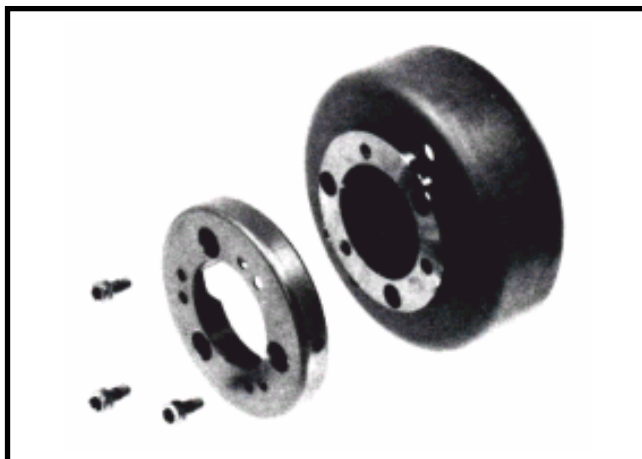
### Installation

Install the components in the reverse procedures of removal.

#### Caution

Tape a tightening tape onto the thread of hexagon bolt.

Torque value: 1.0~1.4 kg-m



### Installation

Install reduction gear shaft and reduction gear.



Install starting clutch gear onto crankshaft.





### Flywheel Installation

Insert the pin onto crankshaft.  
 Make sure that there is no other material stock on it. If so, clean it up.  
 Align the key on crankshaft with the flywheel groove, and then install the flywheel.  
 Hold the flywheel with flywheel holder, and tighten its nut.

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

**Tool:**

Flywheel holder  
 Install spring and oil through.

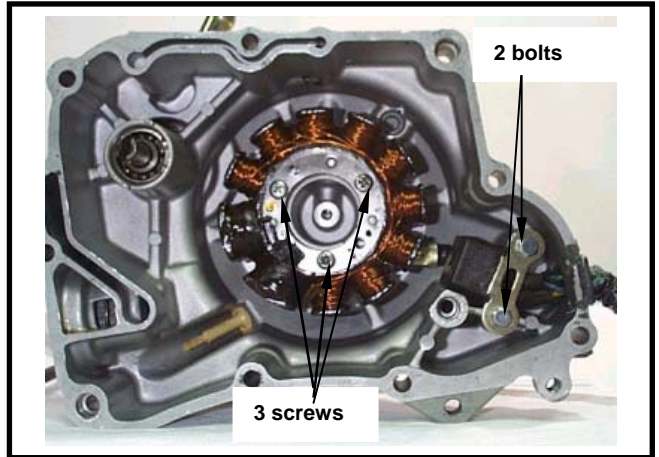


### AC. Generator Installation

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

**⚠ Caution**

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



### Right Crankcase Cover Installation

Install dowel pin and new gasket.  
 Install right crankcase cover onto the crankcase.  
 Note that align the water pump shaft indent with the oil pump shaft.  
 Install right crankcase cover (9 screws).



Connect water hose to the right crankcase cover.  
 Install the water pump cover onto crankcase cover.



## 11. AC. Generator / Start Clutch

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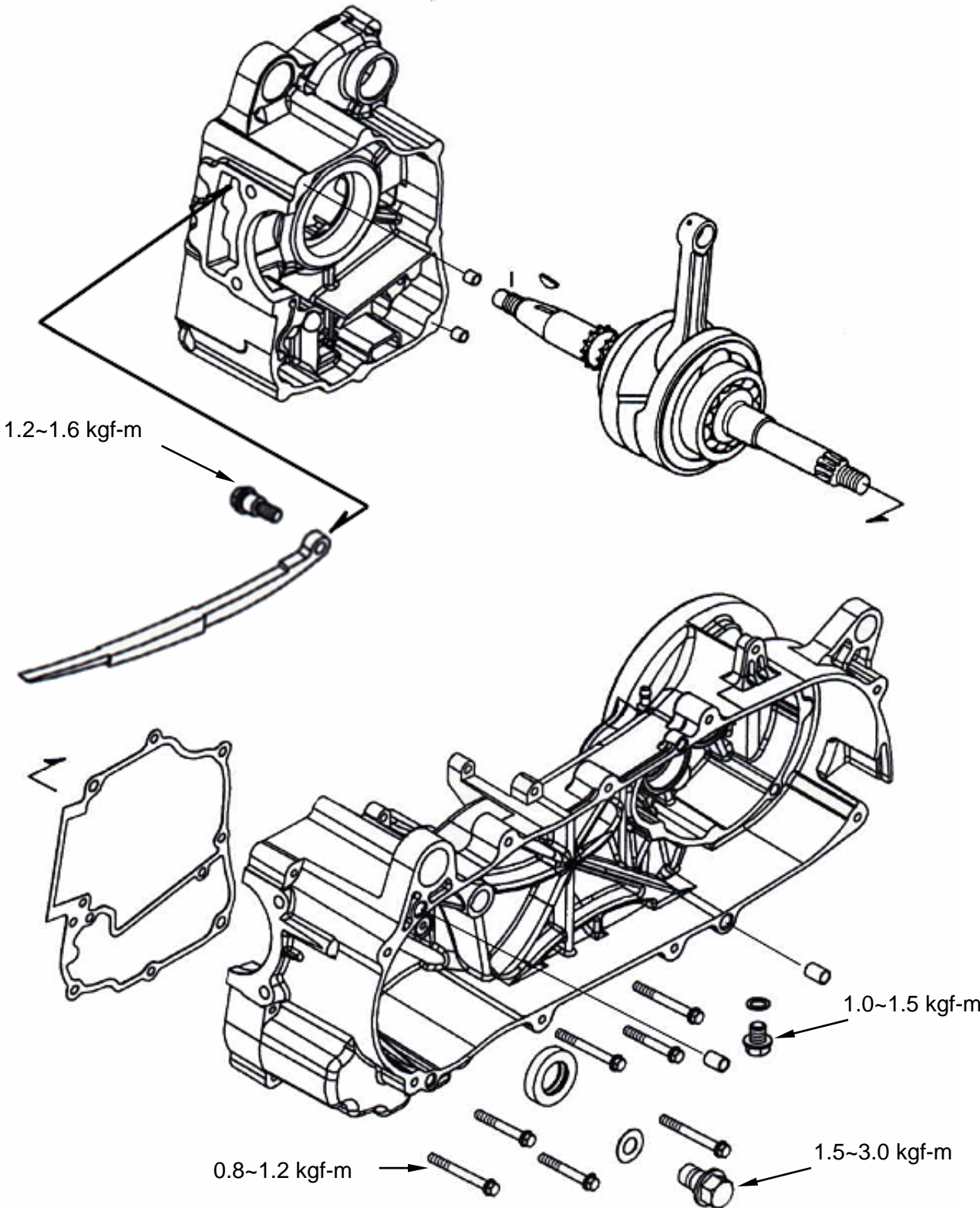
**NTOES:**



# 12. Crankshaft / Crankcase

Mechanism Diagram ..... 12-1	Crankcase Disassembly ..... 12-3
General Information ..... 12-2	Crankshaft Inspection ..... 12-5
Troubleshooting..... 12-2	Crankcase Assembly ..... 12-6

## Mechanism Diagram



## 12. Crankshaft / Crankcase

### General Information

#### Operational precautions

- This Section concerns disassembly of the crankcase for repair purpose.
- Remove following components before disassembling crankcase.
 

—Engine	Section 5
—Cylinder head	Section 6
—Cylinder and piston	Section 7
—Drive pulley and driven pulley	Section 8
—AC generator/Start driven gear	Section 10
—Starting motor	Section 16
- In case it requires replacing the crankshaft bearing, the driving chain of engine oil pump or the timing chain, it is preferably to replace crankshaft as a unit.

#### Service data

Unit: mm

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

#### Torque value

Bolts for crankcase	0.8~1.2kgf-m
Bolts for cam chain adjuster	1.2~1.6kgf-m

#### Tools

##### Special tools

R/L. crank disassemble/ install tool  
 L. crank shaft bearing driver  
 Crank shaft bearing fixing socket  
 Crank shaft puller  
 Outer bearing puller  
 Inner bearing puller

### Troubleshooting

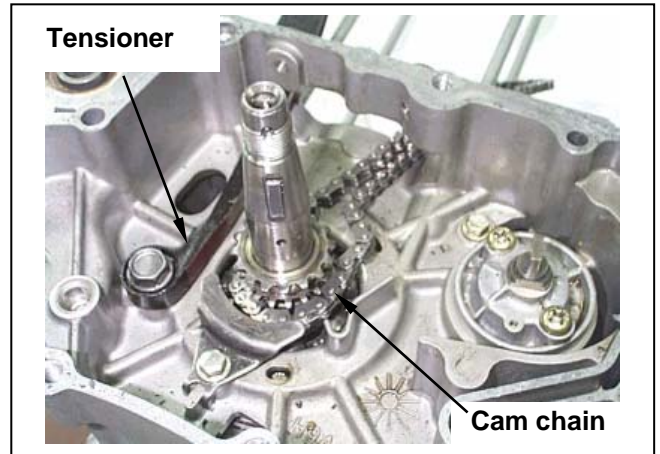
#### Engine noise

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

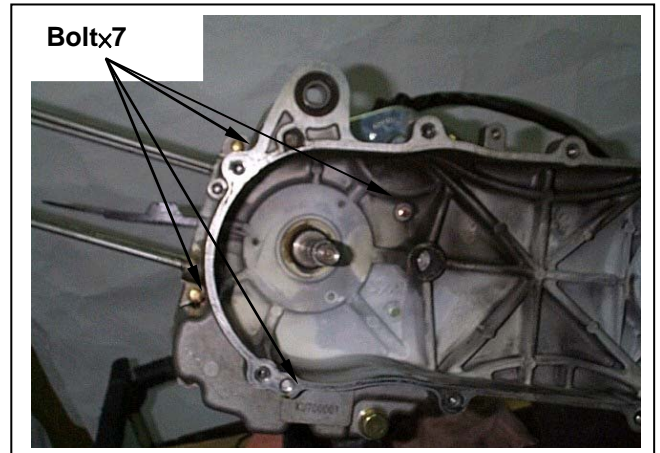


### Crankcase Disassembly

Remove the cam chain.  
Loosen the bolt and remove the tensioner.



Loosen seven bolts on the crankcase.



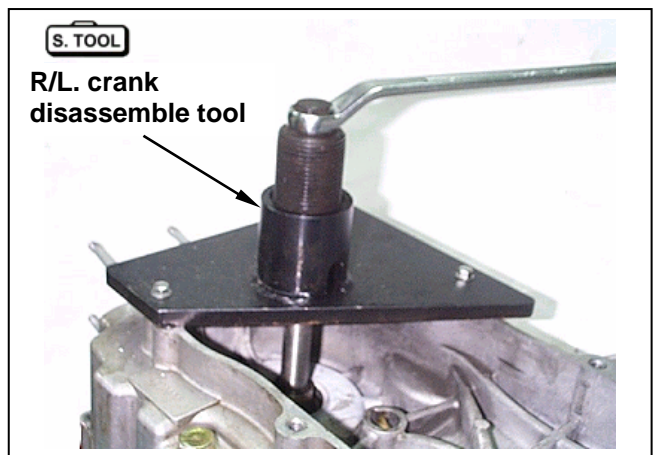
Place right crankshaft case downward and lift up crankcase.

#### **⚠ Caution**

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



Refer to chapter 18: Special tools  
**Special tool : R/L. crank case  
disassemble/install tool  
SYM-1120000-H9A**





## 12. Crankshaft / Crankcase

Remove crankshaft from right crankcase.



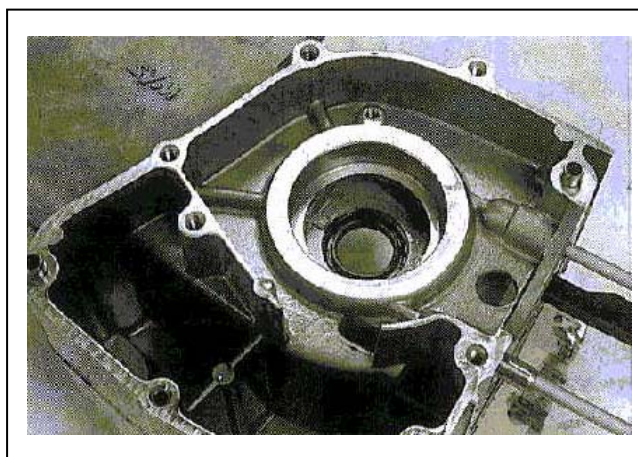
Remove gasket and dowel pins.



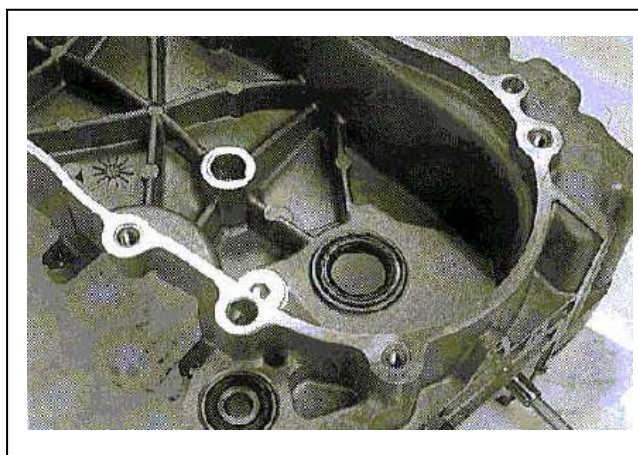
Scrape gasket residues off the crankcase contact surface.

### **⚠ Caution**

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



Check any damage in oil seal.  
Replace with new one if damaged.



## Crankshaft Inspection

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

**Service limit: 0.6 mm**

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

**Service limit: 0.05 mm**

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

**Service limit: 0.10 mm**

Check crankshaft bearing.

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

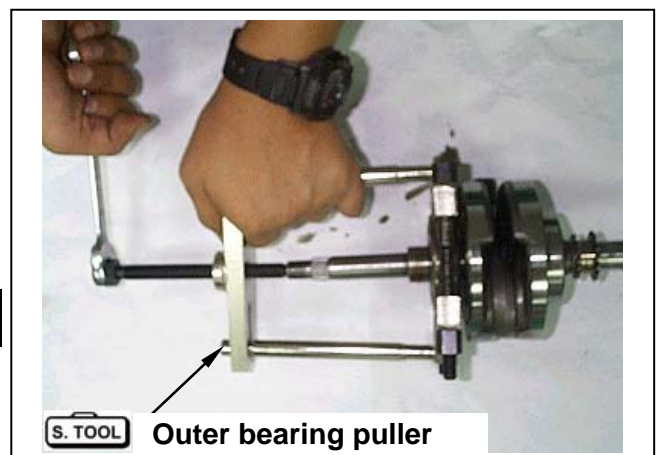
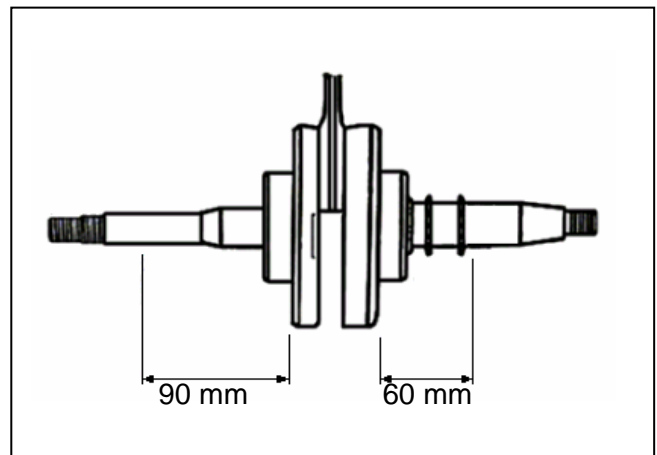
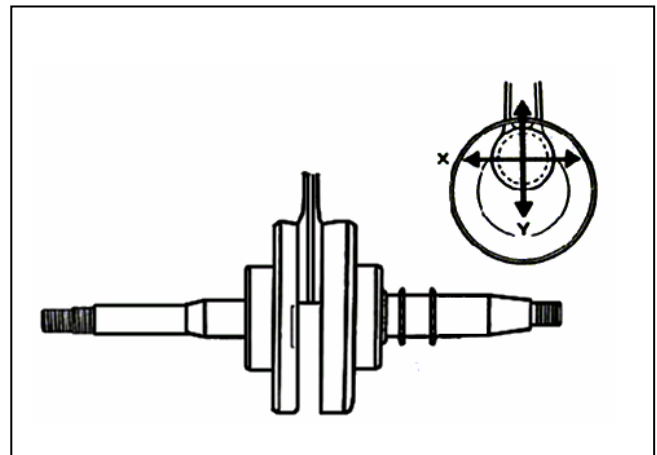
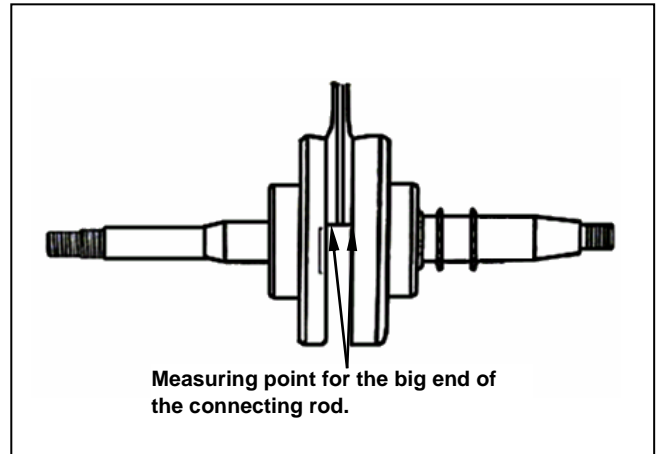
Check the inner ring to see it links firmly on the bearing.

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

### ⚠ Caution

- The bearing shall be replaced in pair.

**Special tool : outer bearing puller  
SYM-6204010**



## 12. Crankshaft / Crankcase

### Crankcase Assembly

Install a new bearing onto the left crankcase.

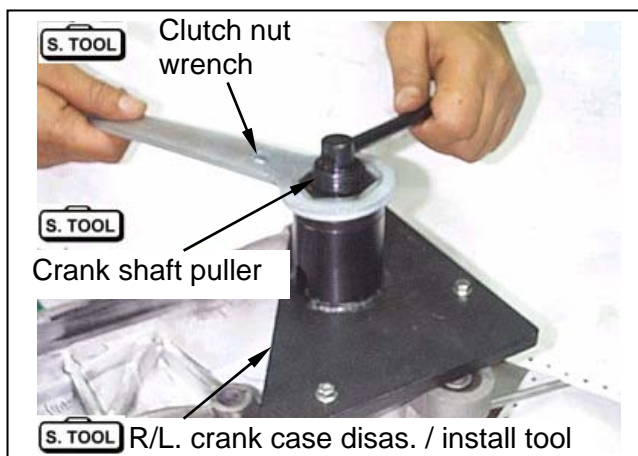
**Special tool: left crank shaft bearing driver**

**SYM-9100200-H9A**

**R/L. crank case  
disassemble/install tool  
SYM-1120000-H9A**

**Crank shaft puller  
SYM-11130000-H9A**

**Clutch nut wrench  
SYM-9020200**



Install crank shaft onto the left crankcase.

**Special tool: R/L. crank case**

**disassemble/install tool  
SYM-1120000-H9A**

**Crank shaft puller  
SYM-11130000-H9A**

**Crank shaft bearing fixing socket  
SYM-9100210**

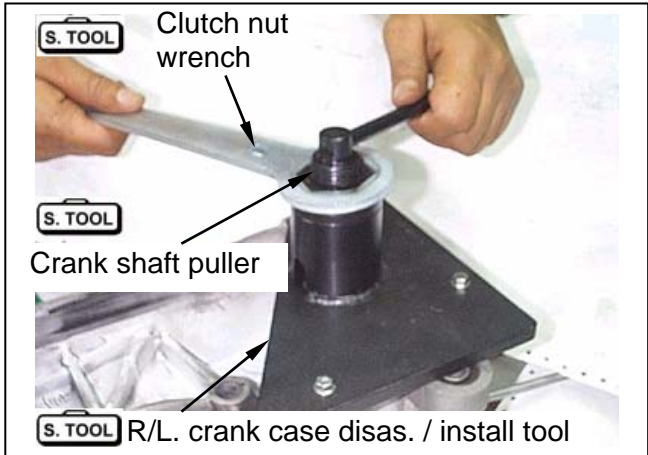
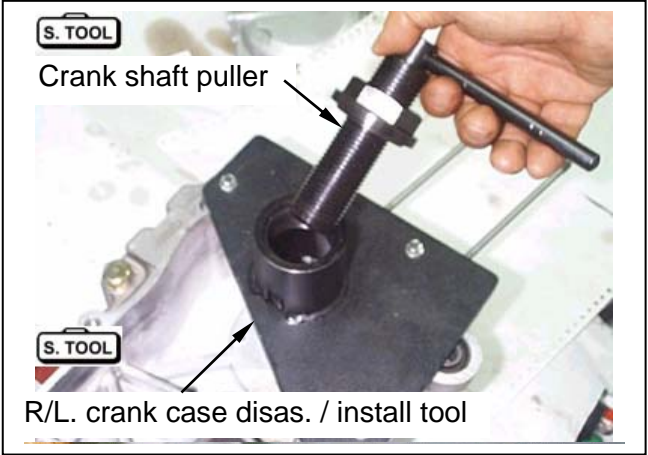
**Clutch nut wrench  
SYM-9020200**







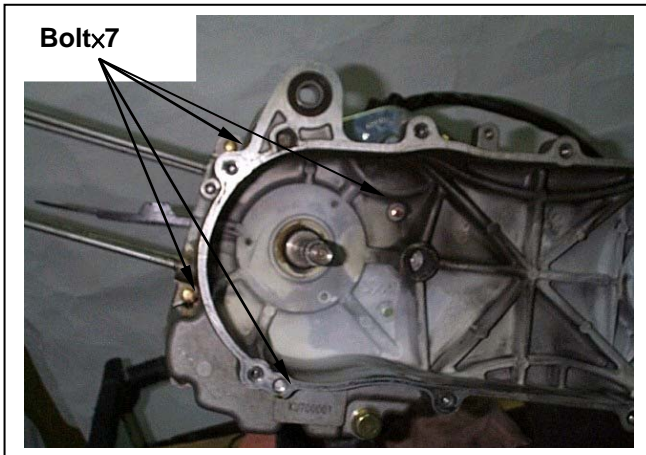
## 12. Crankshaft / Crankcase



Install new dowel pin and new gasket.  
Install the right crankcase onto the left crankcase.



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



## 12. Crankshaft / Crankcase

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

**Special tool:**

**Oil seal driver (25\*40\*8)**

**SYM-9121600**

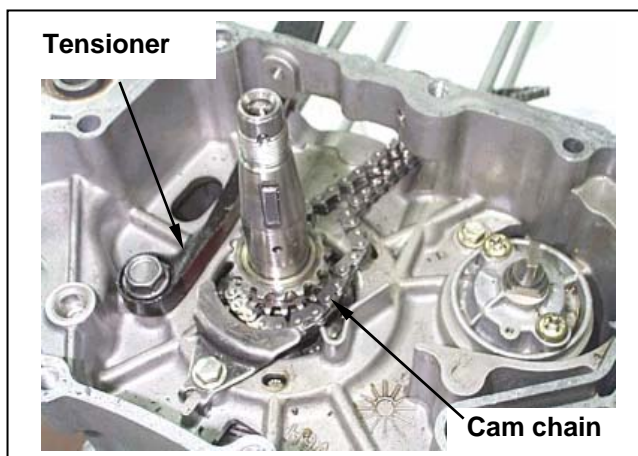
Install the oil seal in the left crankcase with care  
not to damage the lip of the oil seal.



Install the tensioner and tighten the bolts.

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

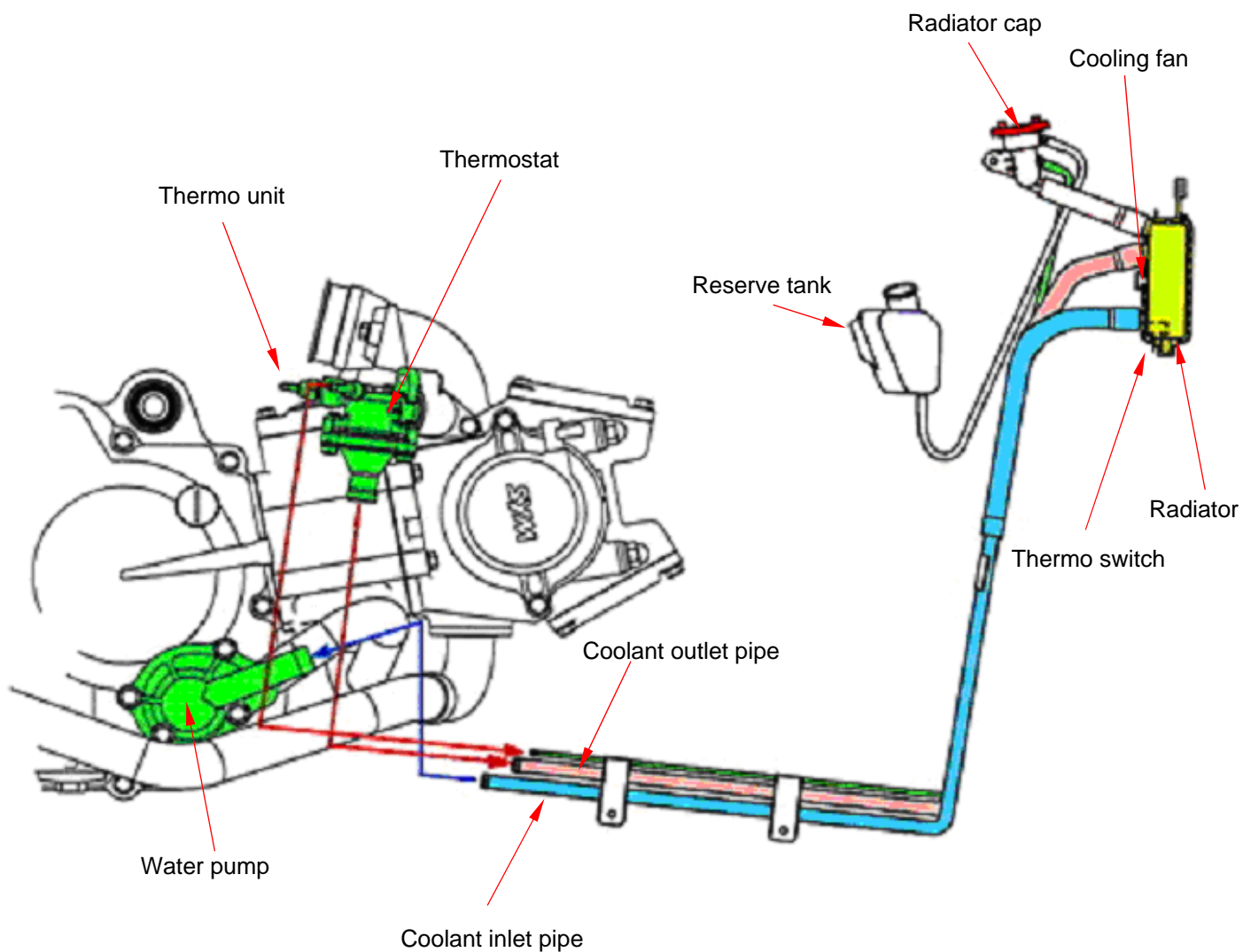
Install the cam chain.





Mechanism Diagram .....	13-1	Radiator .....	13-5
General Information .....	13-2	Water Pump .....	13-6
Troubleshooting .....	13-3	Temperature Sensor .....	13-10
System Test .....	13-4	Thermostat .....	13-11
Coolant Change .....	13-4		

## Mechanism Diagram



## 13. Cooling System

### General Information

#### Warning:

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

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

### Technical Specification

Item	Specification
Pressure to open filler cap	0.75~1.05 kg/cm <sup>2</sup>
Capacity of coolant:	780 c.c.
Engine + radiator	420 c.c.
Reservoir upper	
Thermostat	Begins to activate at 71-80°C Stroke: 3.5 ~ 4.5 mm/80°C
Boiling point	Not-pressure: 107.7°C Pressurized: 125.6°C

#### Torque Value

For water pump rotor 1.0~1.4kgf-m

#### Tools Requirement

##### Special tools

Water pump bearing driver (6901)  
Water pump oil seal driver (Inner)  
Water pump mechanical seal driver  
Inner bearing puller

### Troubleshooting

#### The engine temperature is too high

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

#### The engine temperature is too low

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

#### Coolant is leaking

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

## 13. Cooling System

### System Test

#### Test on the filler cap

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

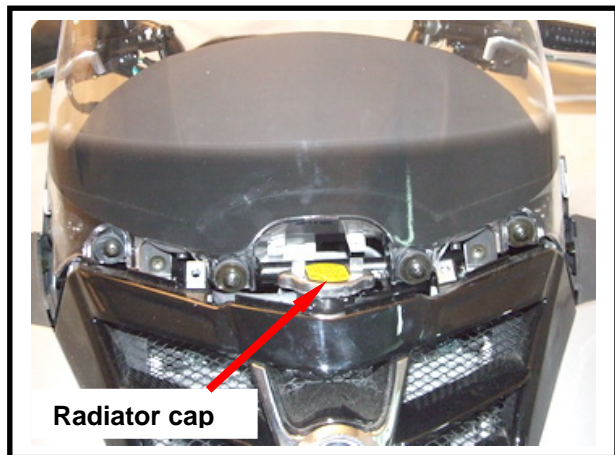
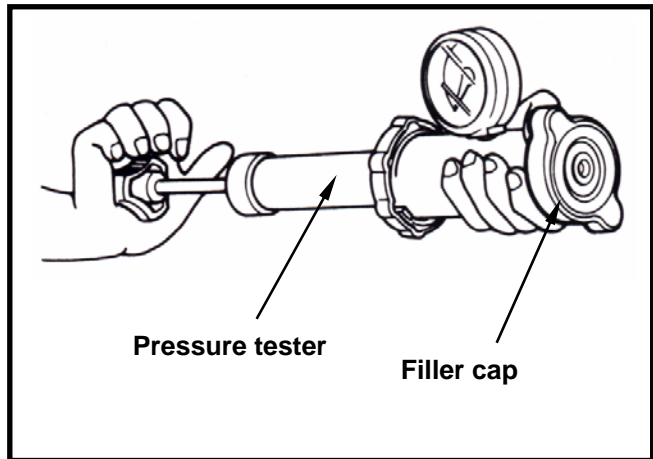
Relief pressure for the filler cap: 0.75-1.05 kg/cm<sup>2</sup>

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

#### Caution

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

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



### Coolant Change

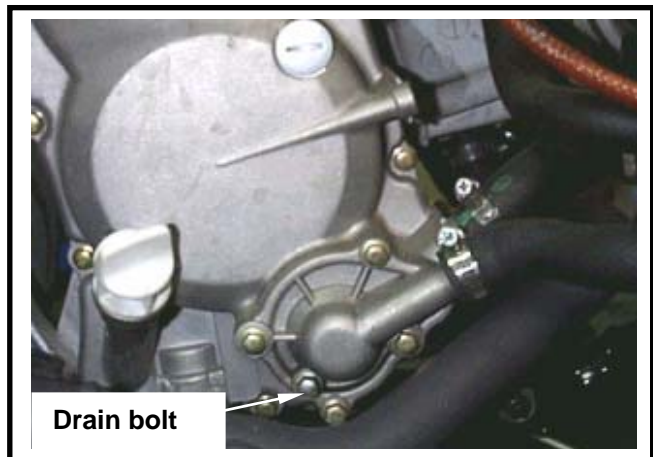
#### Warning

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

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

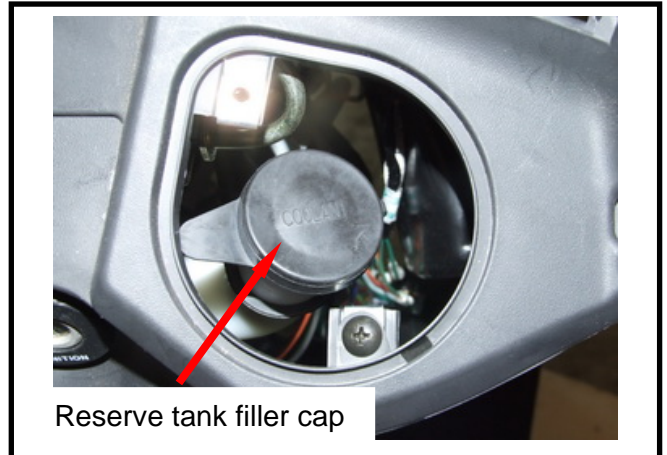
Refilling system with coolant and bleeding the air bubbles.

- Run the engine until the coolant surface becomes stable and there is bubble coming out.
- Stop the engine. Add coolant to proper level if necessary.
- Screw and tighten up the filler cap.



Removing the reserve tank filler cap.

- Check the liquid level in the reservoir. Add coolant to proper level if too low.
- Reinstall the reserve tank filler cap.



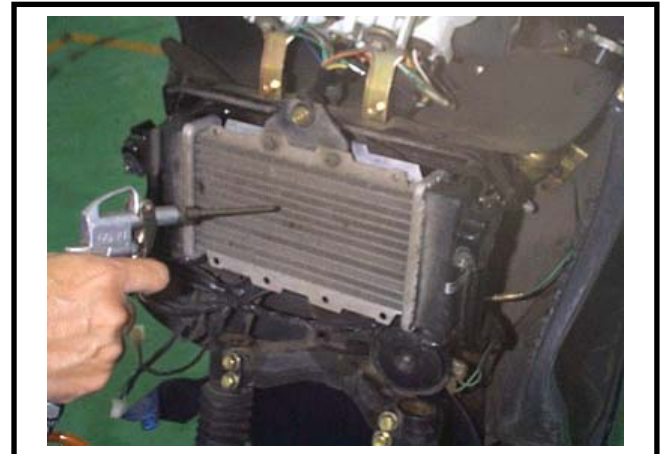
## Radiator

### Removal

Remove the front guard, check for any leakage from weld seam.

Blow cooling fan clean using compressed air. If the cooling fan is blocked by dirt, use low pressure water jet to clean it.

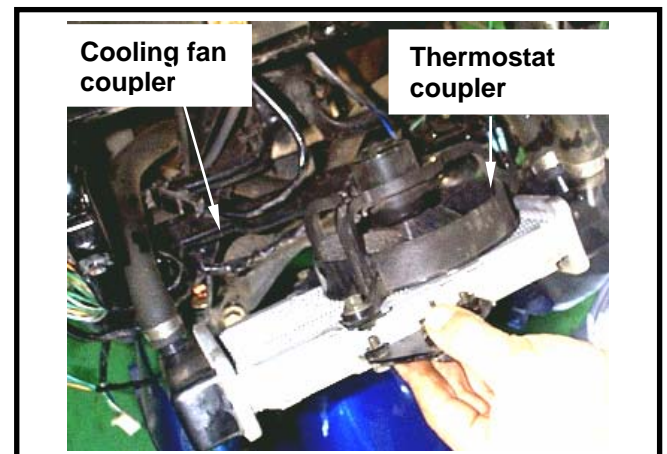
Care shall be taken when straightening the sink fan.



Coolant leakage



Loosen 2 nuts and 4 screws.  
Remove the front mudguard by pulling it forward.





## 13. Cooling System

Loosen the hose clamp and remove the upper water hose.

Disconnect the connectors for the thermostat and fan motor.

Loosen the hose clamp and remove the lower water hose.

Disconnect the horn.

Loosen four screws and air duct.

Remove radiator and the fan motor.

### Disassembly

Loosen the lock bolt from the fan and remove the fan.

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

### Assembly

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

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

Tighten the fan shroud onto the radiator with four bolts. Please refer to Page 16-20 for the inspection of the temperature sensor switch.

### Caution

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

Install the removed parts in the reverse order of removal.

### Installation

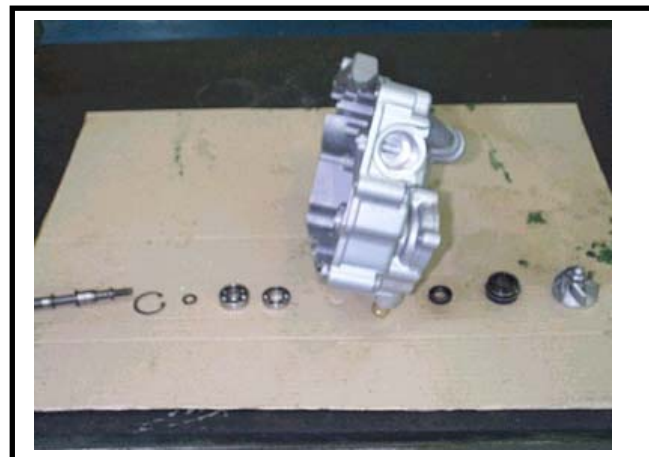
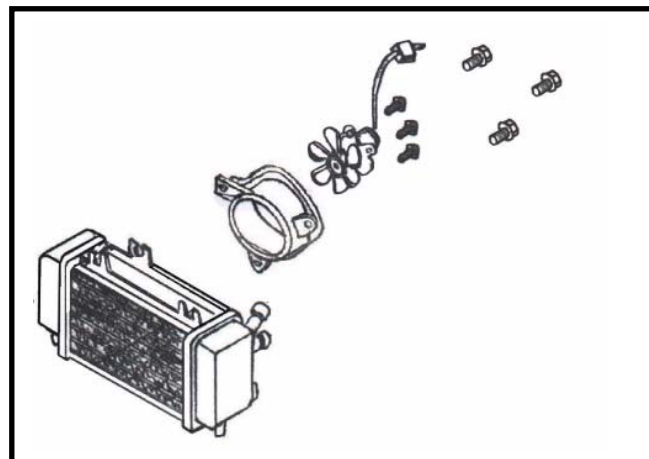
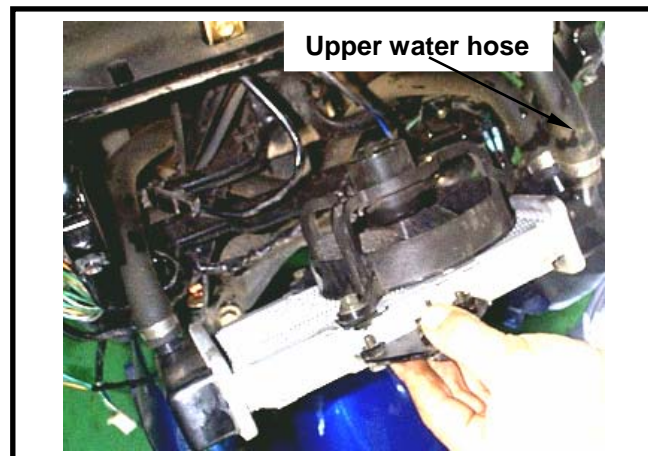
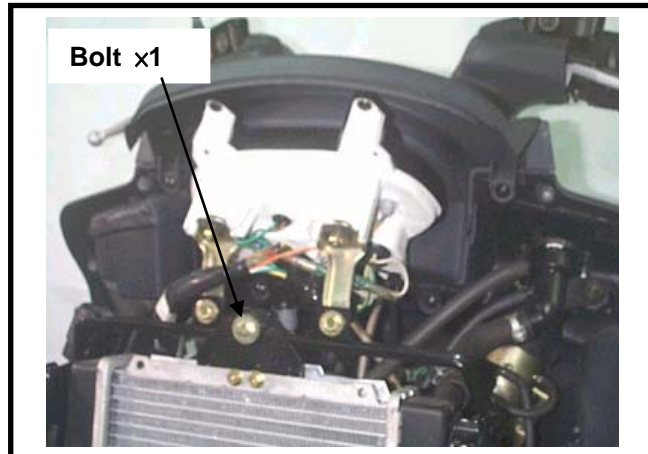
Install radiator in the reverse order of removal. Upon completion, check for any leakage.

### Water Pump

Inspect the mechanical seal.

Check mechanical seal inspection holes for any leakage.

If there is leakage, remove the right crankcase to replace the mechanical seal.



## Removal of water pump

Remove the water hose.  
Loosen three bolts and remove the pump cover.  
Loosen 9 bolts and remove the right cover.  
Take off the gasket and dowel pin.



Turn pump rotor clockwise and remove.

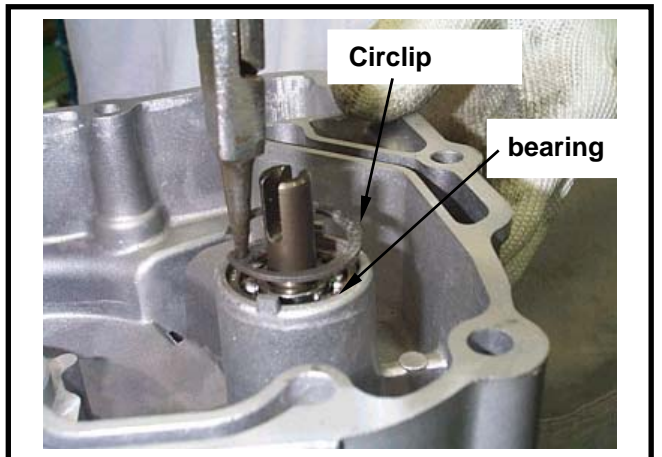
### Caution

The rotor is provided with left turn thread.



## Removal of Water Pump Shaft

Remove the circlip from the right crankcase cover.  
Remove the water pump shaft and the inner bearing.  
Remove the outside bearing by inner bearing puller.  
Rotate the inner ring of bearing, the bearing shall move smoothly and quietly.  
If the bearing does not rotate smoothly or produces a noise, replace it with new one.



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

### Caution

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



## 13. Cooling System

### Replacement of Mechanical Seal

Drive the mechanical seal and inner seal out of the right crankcase.

Tools required

Water pump bearing driver

#### Caution

Replace a new mechanical seal after removing it.



Install the new inner seal onto the right crankcase.

Tools required

Water pump mechanical seal driver

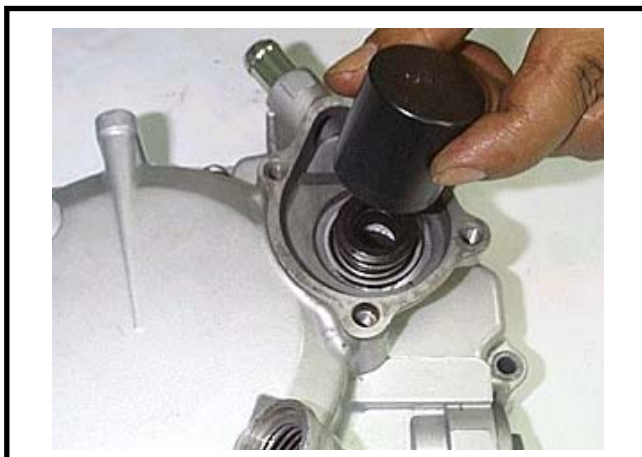


Apply a coat of sealant to the mating surfaces of the right crankcase before installing the new oil seal.

Install the mechanical seal onto the right crankcase.

Tools required

Water pump mechanical seal driver



Install a new outside bearing to the right crankcase cover.

Tool required

Water pump bearing (6901) driver

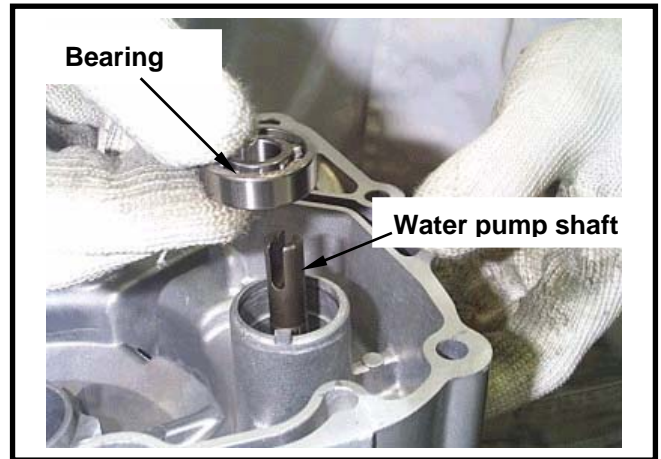
#### Caution

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





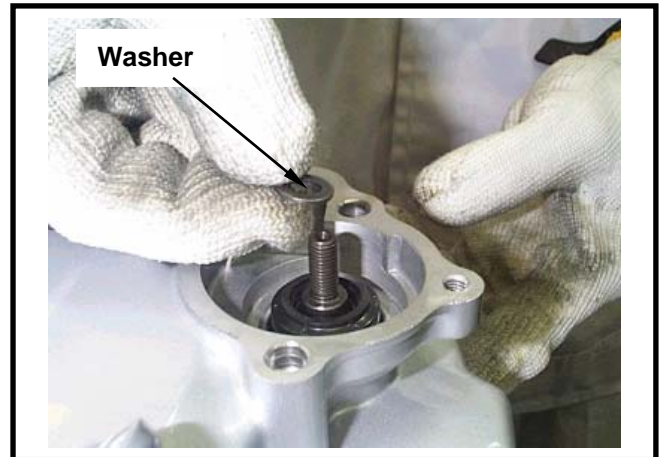
Mount the water pump shaft and the inner bearing to the right crankcase cover.  
Install the circlip to hold the inner bearing.



Install water pump rotor  
Install the seal washer into the rotor.

**⚠ Caution**

Washer must be replaced together with the mechanical seal.

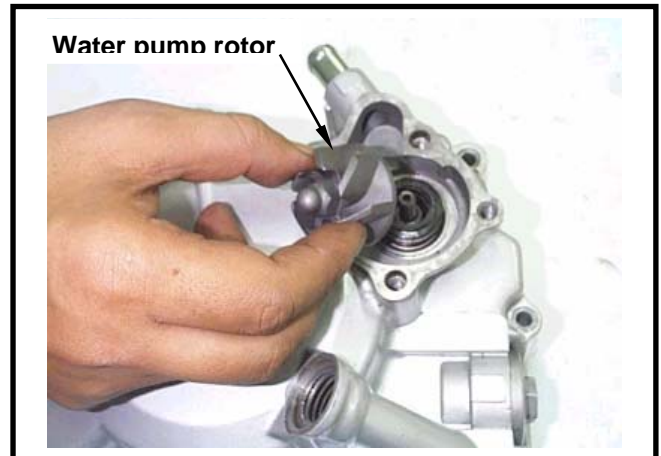


Install the rotor onto the water pump shaft and tighten.

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

**⚠ Caution**

The rotor is left thread.



## 13. Cooling System

Install the right crankcase cover.(bolt × 9)



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



### Temperature sensor

Please refer to chapter 17 for inspection of temperature sensor.

#### Removal

Remove the body cover.  
Drain out the coolant.  
Disconnect the cable of temperature sensor.  
Remove the temperature sensor.



#### Installation

Apply a coat of 3 Bond No. 1212 sealant or equivalent to the thread of temperature sensor and install it on the holder.  
Connect the cable to the temperature sensor.  
Refill the coolant and bleed out the air bubble (P12-4).  
Install the right rear cover.





## Thermostat

### Removal

Remove the rear cover.  
 Drain out the coolant.  
 Disconnect the cable from the thermostat.  
 Remove the water hose from the thermostat holder.  
 Remove the air vent hose from the holder.  
 Remove the holder and lock bolt from the cylinder head.  
 Remove the temperature sensor and O ring from the holder.

Remove two bolts and separate the holder from the cover.

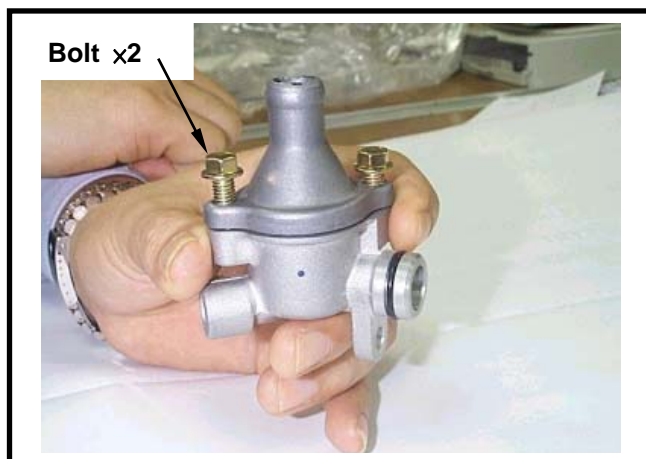
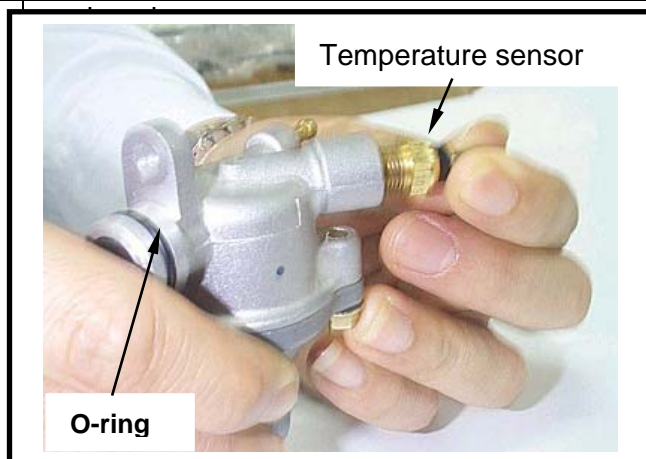
Remove the thermostat.

### Inspection

Visually inspect thermostat for any damage.  
 Place the thermostat into heated water to check its operation.

### Caution

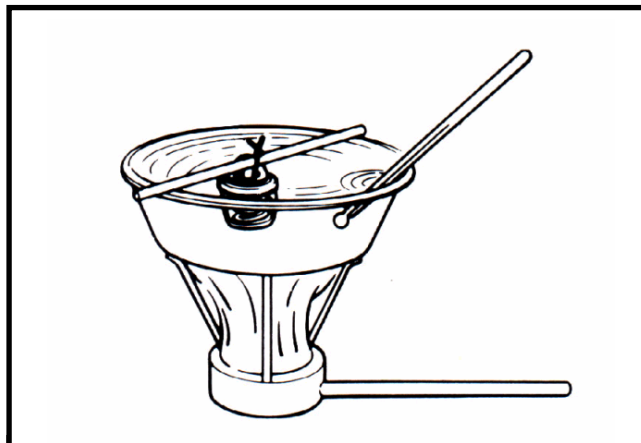
Whenever the thermostat and the thermometer are in contact to the wall of heated water container, the reading displayed is incorrect. If the valve of the thermostat remains open at room temperature or the valve operation is not corresponding to the temperature change, then it must be



## 13. Cooling System

### Technical Data

Valve begins to open	71 ~ 80°C
Valve stroke	3.5 ~ 4.5 mm at 80°C



### Installation

Install in reverse order of removal.

### Caution

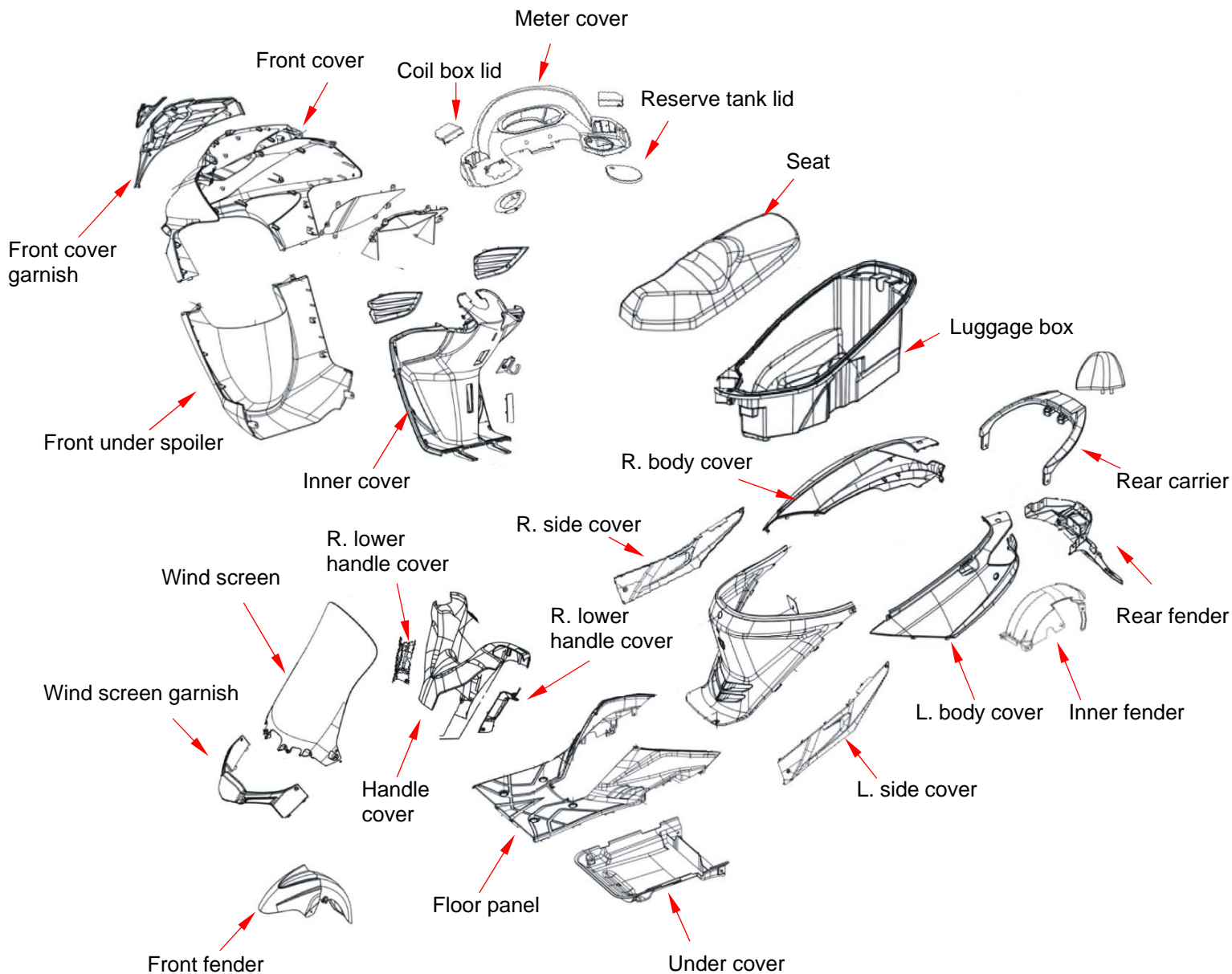
Always use a new oil ring and apply a coat of grease on it before installing.

Refill the specified coolant as necessary.



<b>Mechanism Diagram</b> .....	<b>14-1</b>	<b>Rear Carrier</b> .....	<b>14-7</b>
<b>Maintenance</b> .....	<b>14-2</b>	<b>Center Cover</b> .....	<b>14-8</b>
<b>Steering Handle Cover</b> .....	<b>14-3</b>	<b>Body Covers / Rear Fender</b> .....	<b>14-8</b>
<b>Wind Screen</b> .....	<b>14-4</b>	<b>Floor Panel</b> .....	<b>14-9</b>
<b>Front Cover</b> .....	<b>14-4</b>	<b>Under Cover</b> .....	<b>14-9</b>
<b>Meter Cover</b> .....	<b>14-5</b>	<b>Inner Cover</b> .....	<b>14-10</b>
<b>Side Cover</b> .....	<b>14-6</b>	<b>Front Fender</b> .....	<b>14-10</b>
<b>Front Under Spoiler</b> .....	<b>14-6</b>	<b>Rear Fender</b> .....	<b>14-10</b>
<b>Luggage Box</b> .....	<b>14-7</b>		

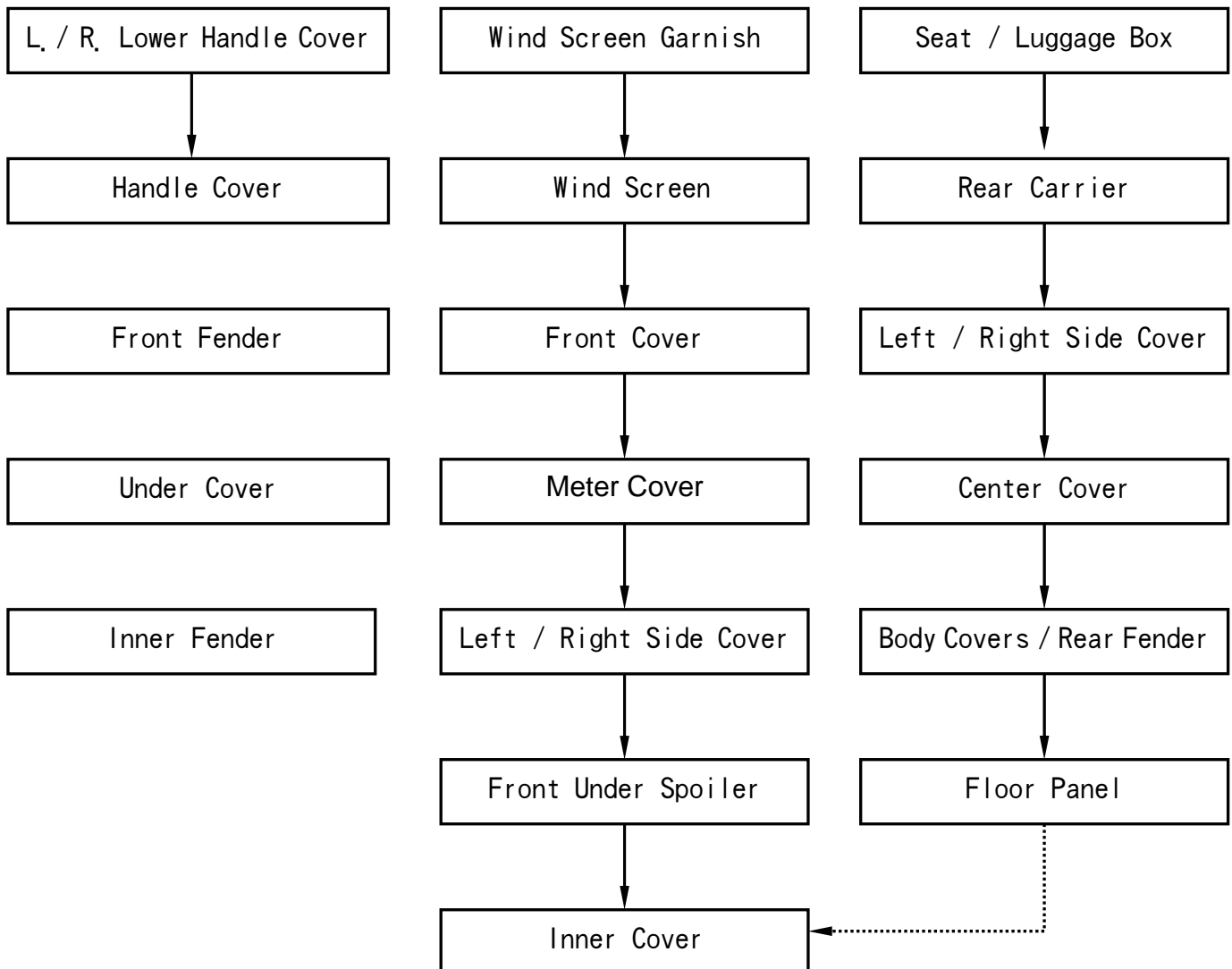
**Mechanism Diagram**



## 14. Body Cover

### Maintenance

Body covers disassemble sequence:



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



### Steering Handle Cover

#### Removal

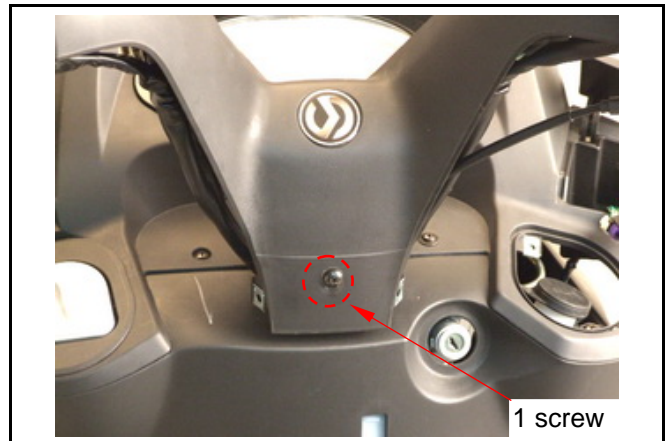
Remove the left / right lower handle cover screws on the front side.



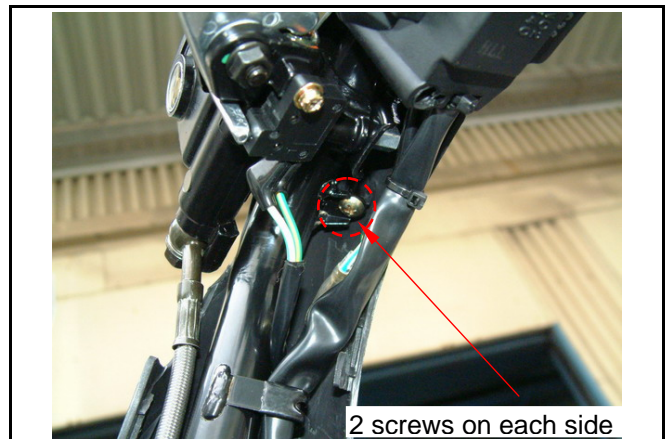
Remove the left / right lower handle cover screws on the rear side.  
Remove the left / right lower handle cover.



Remove the handle cover screw on the rear side.



Remove the handle cover screws from the inner side.  
Remove the handle cover.



#### Installation

Install in the reverse order of removal.



## 14. Body Cover

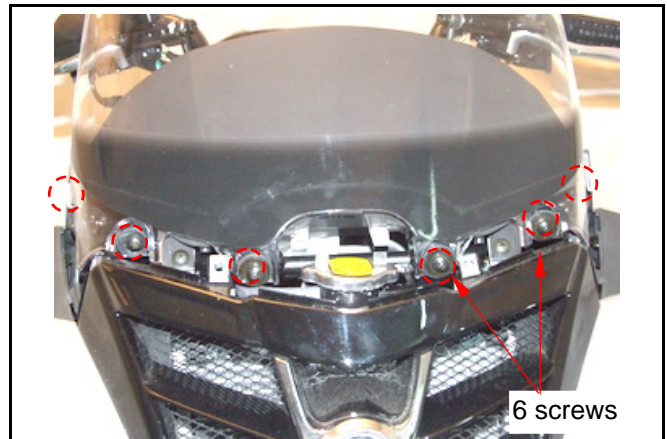
### Wind Screen

#### Removal

Remove the wind screen garnish (2 screws).



Remove the wind screen (6 screws).



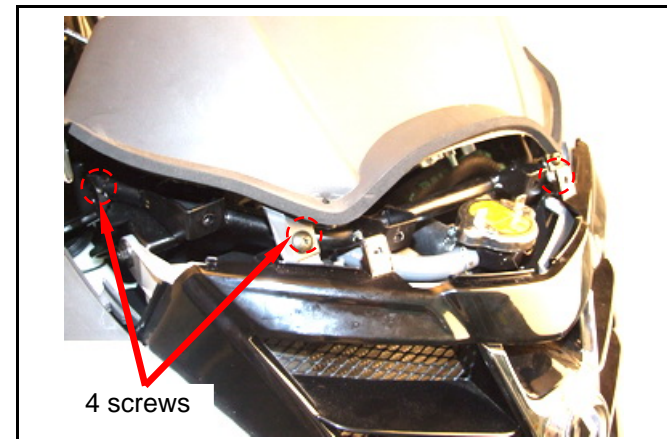
#### Installation

Install in the reverse order of removal.

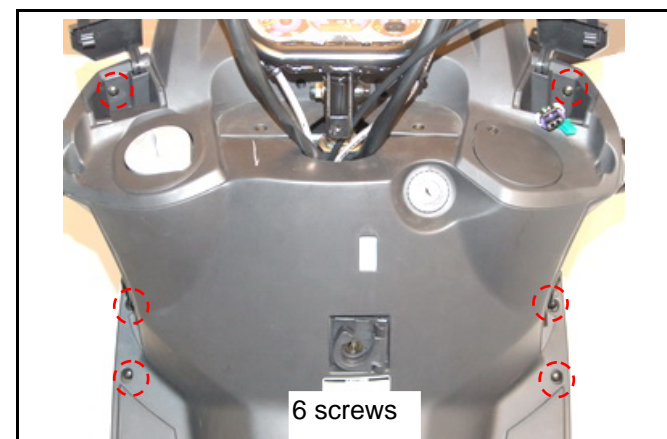
### Front Cover

#### Removal

Remove the wind screen.  
Remove the front cover screws on the front side.



Remove the front cover screws on the rear side.  
Remove the front cover.



#### Installation

Install in the reverse order of removal.

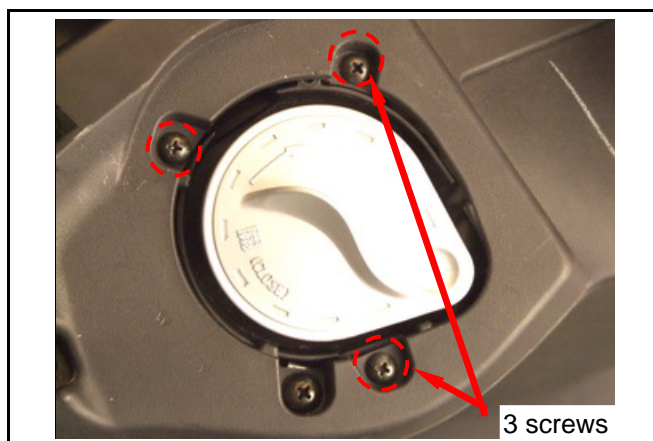
**Meter Cover**

**Removal**

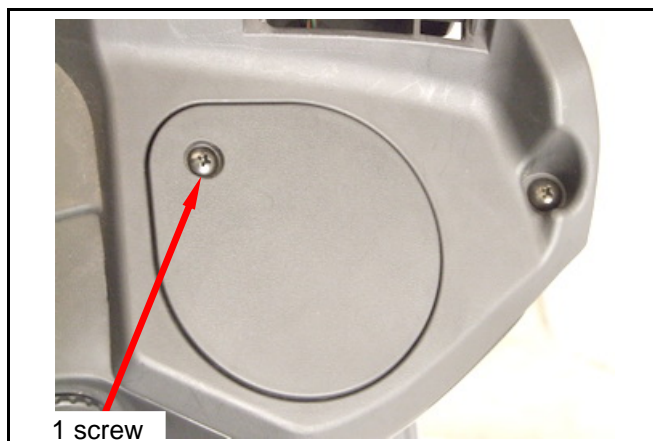
Remove the fuel tank cap rubber.



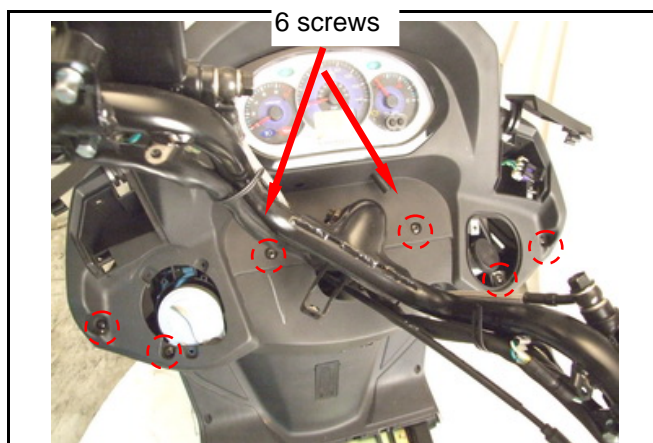
Remove the fuel filler pipe screws.



Remove the reserve tank lid (1 screw).



Remove the meter cover screws.  
Disconnect the meter wire coupler.  
Remove the meter cover assembly.



**Installation**

Install in the reverse order of removal.

## 14. Body Cover

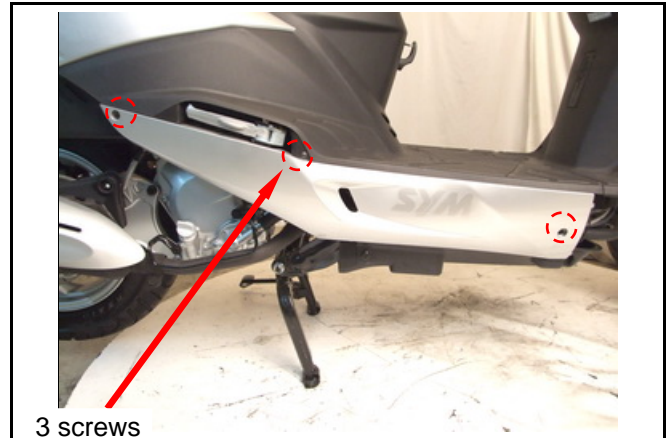
### Side Cover

#### Removal

Remove the left / right side cover.

#### Installation

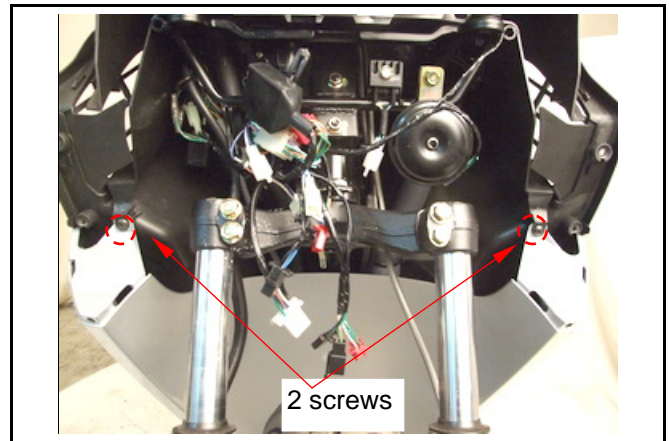
Install in the reverse order of removal.



### Front Under Spoiler

#### Removal

Remove the front under spoiler screws on the front side.

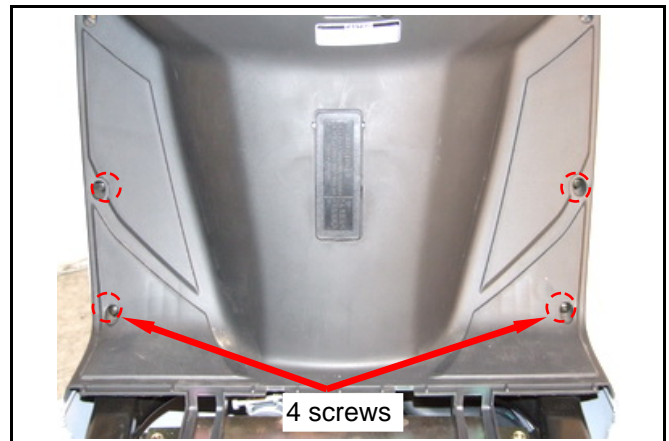


Remove the front under spoiler screws on the rear side.

Remove the front under spoiler.

#### Installation

Install in the reverse order of removal.

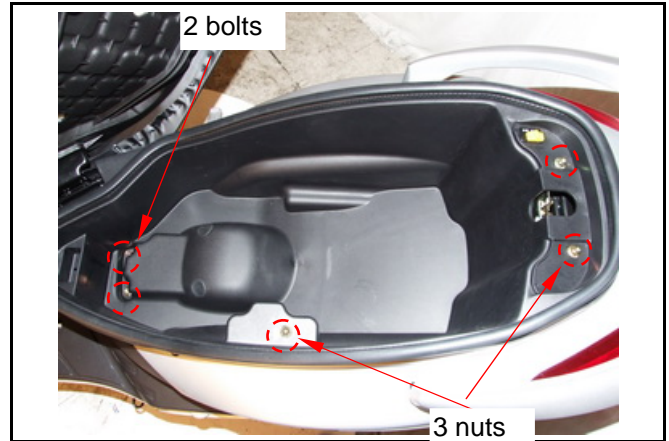




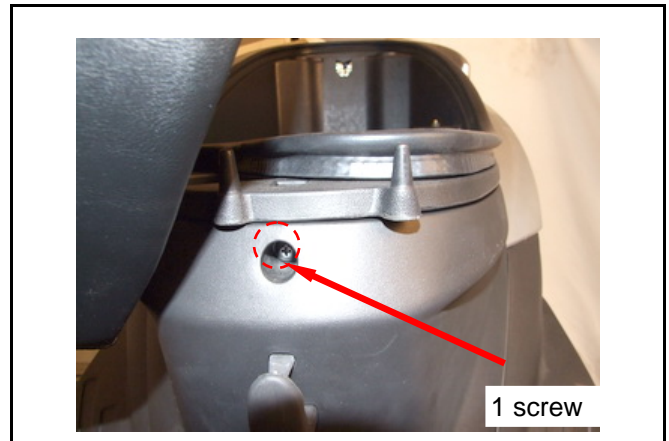
### Luggage Box

#### Removal

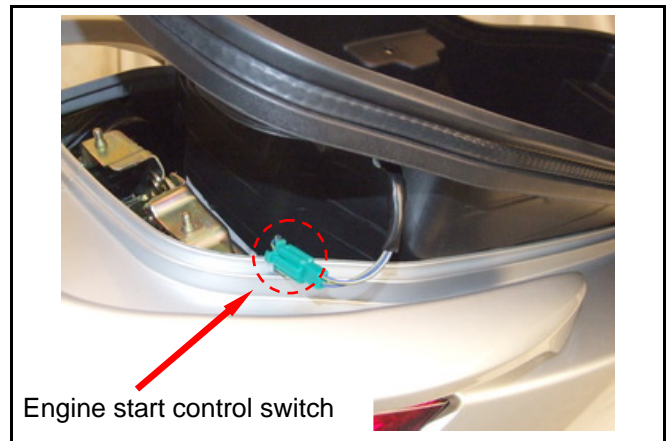
Remove the luggage box locknuts and bolts on the inner side.



Remove the luggage box screw on the front side.



Disconnect the engine start control switch.  
Remove the luggage box assembly.



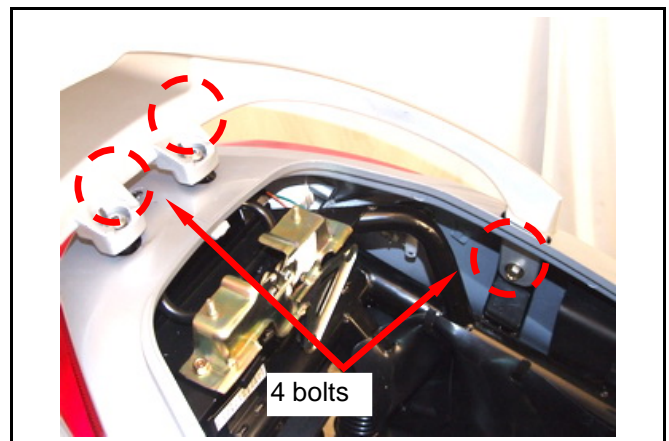
#### Installation

Install in the reverse order of removal.

### Rear Carrier

#### Removal

Remove the rear carrier bolts.  
Remove the rear carrier.



#### Installation

Install in the reverse order of removal.

# 14. Body Cover

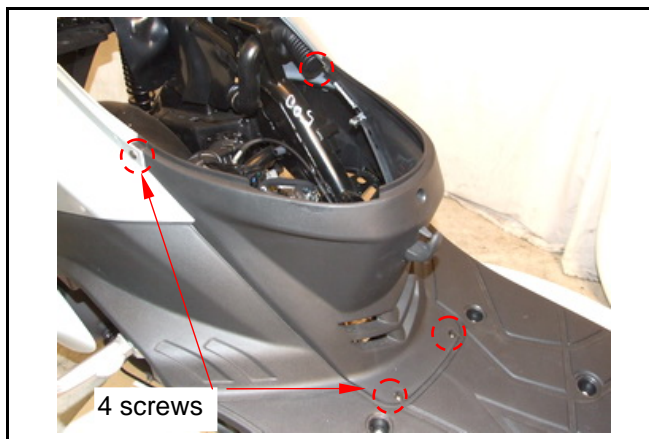
## Center Cover

### Removal

Remove the center cover screws.  
Remove the center cover.

### Installation

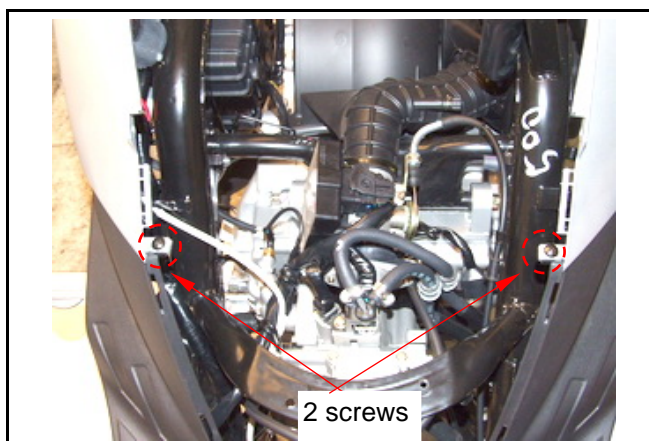
Install in the reverse order of removal.



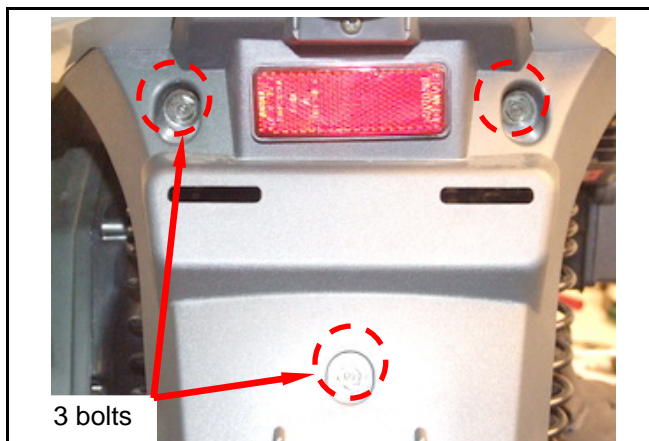
## Body Covers / Rear Fender

### Removal

Remove the body cover screws on the front side.



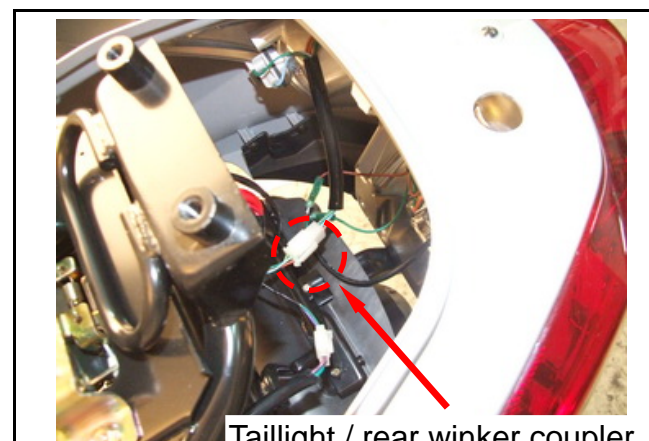
Remove the body cover bolts on the rear side.



Disconnect the taillight / rear winker coupler.  
Remove the body cover / rear fender assembly.

### Installation

Install in the reverse order of removal.

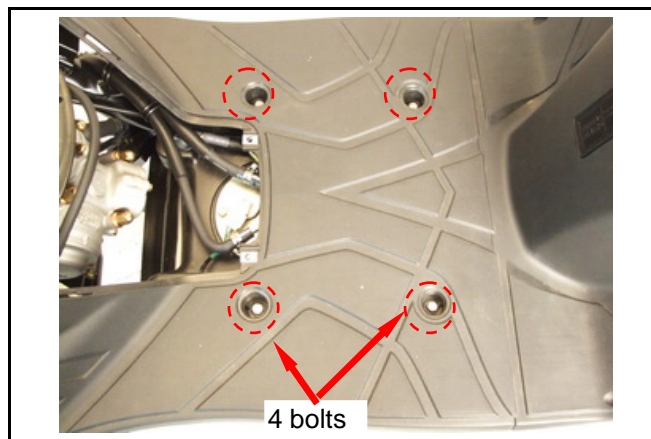




### Floor Panel

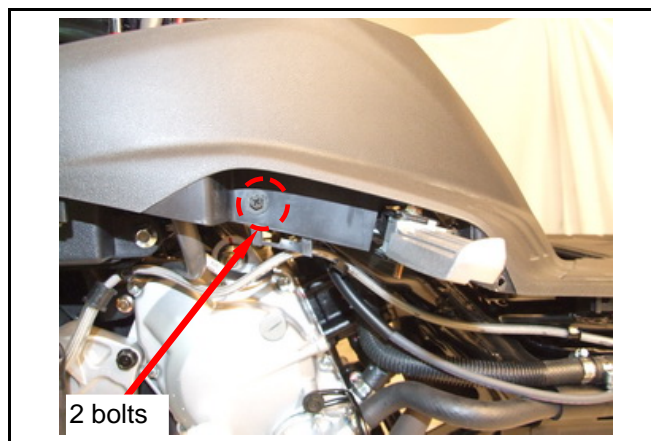
#### Removal

Remove the floor panel bolts on the upper side.



Remove the floor panel bolts on the left / right side.

Remove the floor panel.



#### Installation

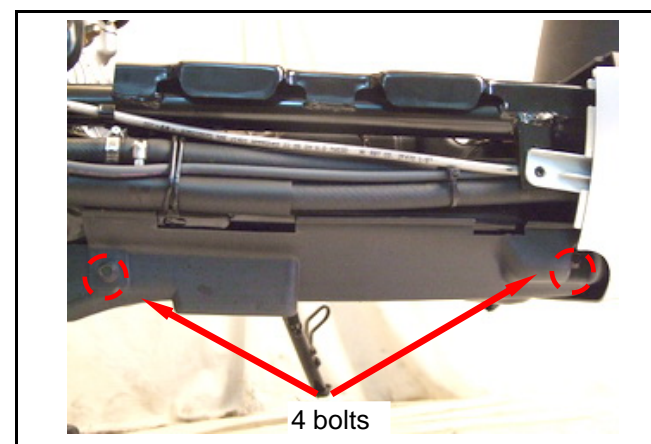
Install in the reverse order of removal.

### Under Cover

#### Removal

Remove the under cover bolts.

Remove the under cover.



#### Installation

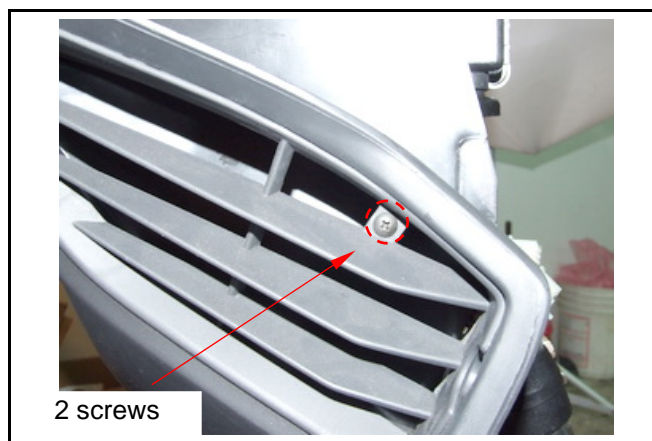
Install in the reverse order of removal.

## 14. Body Cover

### Inner Cover

#### Removal

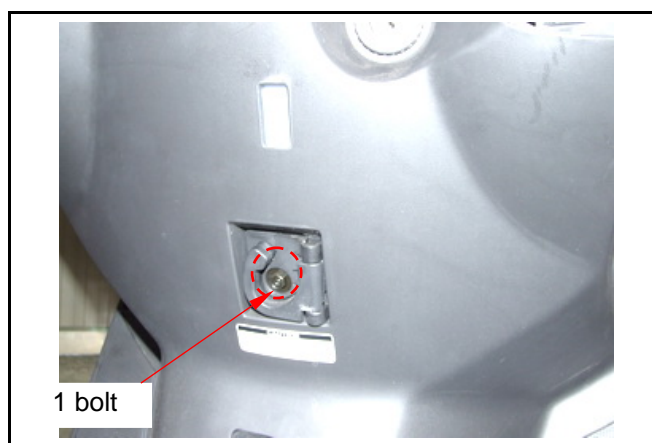
Remove the front under spoiler.  
Remove the floor panel.  
Remove the inner cover screws on the left / right side.



Remove the inner cover bolt on the inner side.  
Remove the inner cover.

#### Installation

Install in the reverse order of removal.



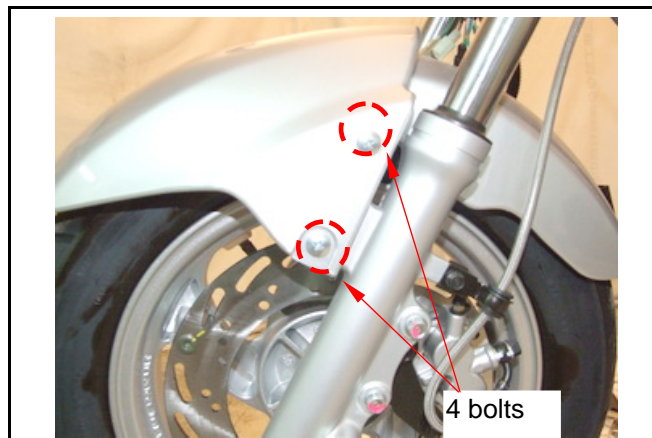
### Front Fender

#### Removal

Disconnect the speedometer cable.  
Remove the front fender bolts on the left / right sides.  
Remove the front fender.

#### Installation

Install in the reverse order of removal



### Rear Fender

#### Removal

Remove the body covers.  
Remove the taillight / rear winker assembly.  
Remove the rear fender.

#### Installation

Install in the reverse order of removal.







## Maintenance Description

### Operational precautions

 **Caution**

Inhaling asbestos may cause disorders of respiration system or cancer, therefore, never use air hose or dry brush to clean brake parts. Use vacuum cleaner or other authorized tool instead.

- The brake calliper can be removed without removing the hydraulic system.
- After the hydraulic system is removed, or the brake system is felt to be too soft, bleed the hydraulic system.
- While refilling brake fluid, care should be taken not to let the foreign material entering into the brake system.
- Do not spill brake fluid on the painted surfaces, plastic or rubber parts to avoid damage.
- Check the operation of the brake system before riding.

### Specifications

Item	Standard (mm)	Limit (mm)
The thickness of front and rear brake disc	4.000	2.500
Front and rear brake disc eccentricity	< 0.100	0.300
Master cylinder inner diameter	11.000 - 11.043	11.055
Master cylinder outer diameter	10.957 - 10.984	10.945
Diameter of front disc	273.000	-
Diameter of rear brake drum	200.000	-
Thickness of front brake lining	5.100	2.000
Thickness of rear brake lining	5.100	2.000

### Torque values

Brake hose bolt	:	3.5 kg-m
Bolt for brake caliper	:	3.3 kg-m
Bolts for the lining guide pin	:	1.8 kg-m
Bolts for the lining guide pin cap	:	1.0 kg-m
Air-bleed valve	:	0.55 kg-m

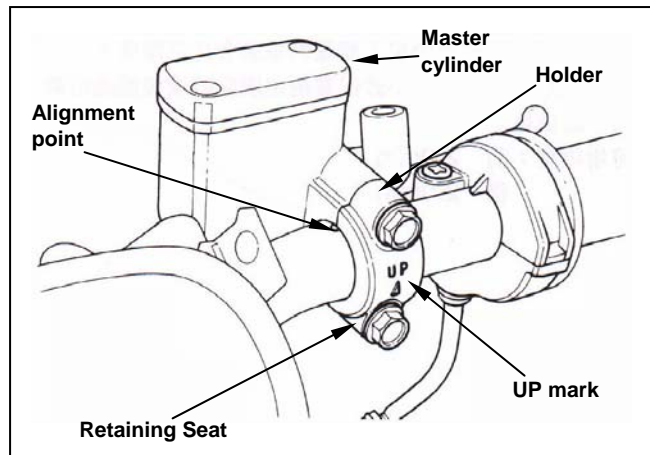


## 15. Brake System

### Troubleshooting

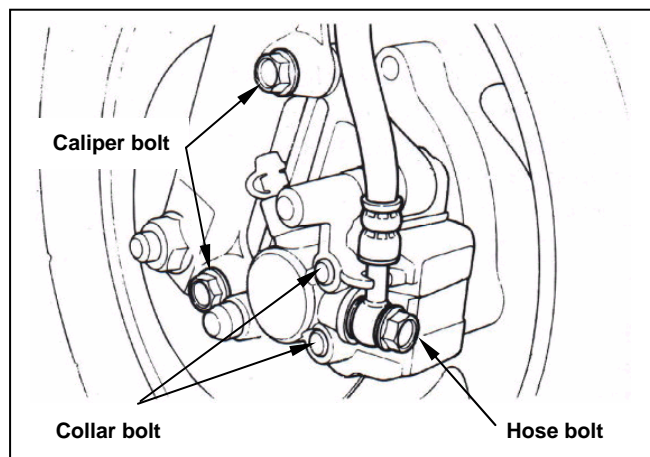
#### Soft brake lever

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



#### Hard operation of brake lever

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



#### Uneven brake

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

#### Tight brake

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

#### Brake noise

1. Dirty lining
2. Deformed brake disc
3. Poor brake calliper installation
4. Imbalance brake disc or wheel

## Hydraulic Disk Brake

- Close the drain valve of the hydraulic disc brake.
- Replace the brake fluid.

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

Cover the painted surfaces, plastic or rubber components with a rag when servicing brake system.

### ⚠ CAUTION

Spilled brake fluid on painted surfaces, plastic or rubber components may result in their damages.

Remove the master cylinder cap and diaphragm. Use high quality brake solvent to clean the dirty brake disc.

### ⚠ CAUTION

The dirty brake lining or disc will reduce the brake performance.

Refill up same brand brake fluid into the reservoir.

### ⚠ CAUTION

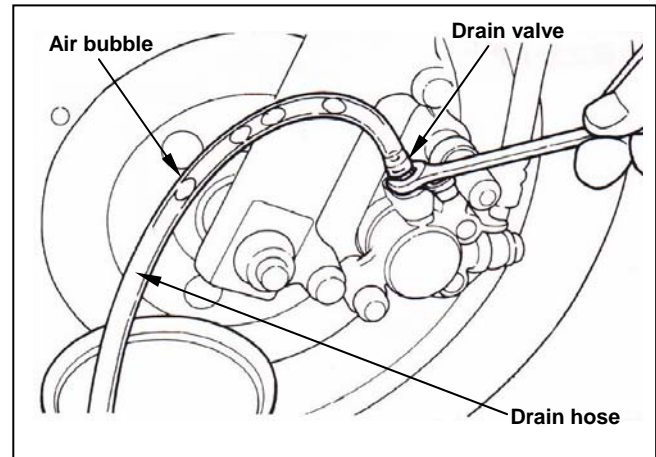
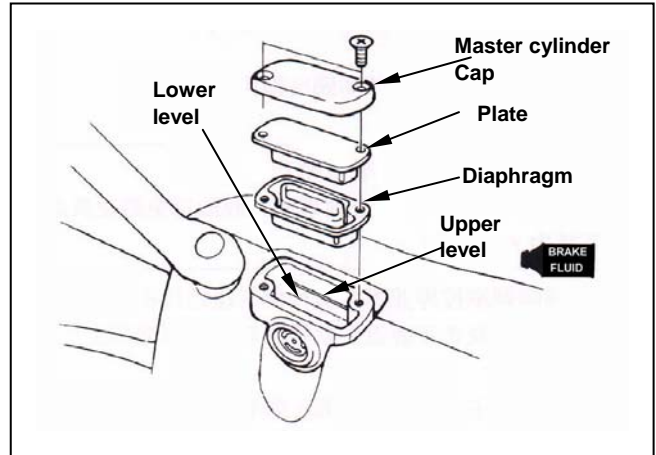
The mixed non-compatible brake fluid will reduce brake performance. Foreign materials will block the system causing brake performance to be reduced or totally lost.

Connect drain hose to drain valve.  
Open the drain valve on the calliper 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.

**Recommended brake fluid: WELLRUN DOT 3 brake fluid**

### ⚠ 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 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.

## 15. Brake System

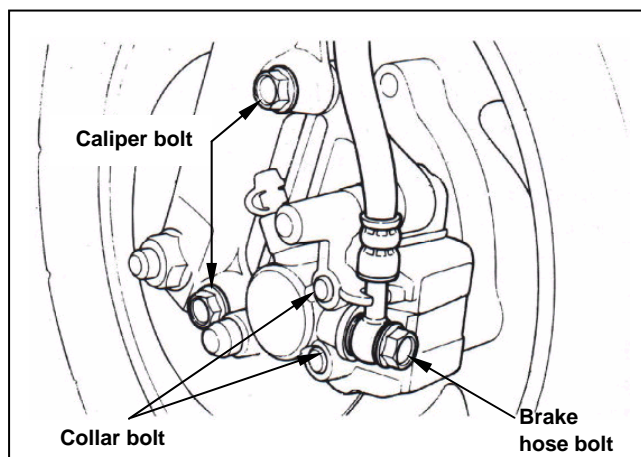
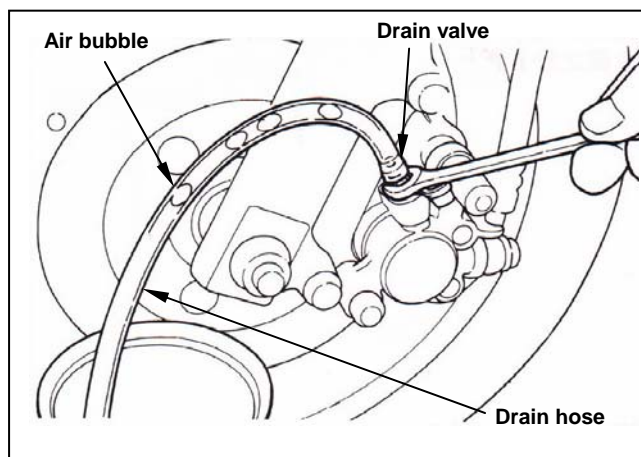
### Air Bleed

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

#### ⚠ CAUTION

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

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



### Brake Caliper

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 the bolt cap and loosen the lining guide bolts.  
Remove two calliper bolts and the calliper.

### Brake Caliper Installation

Install the brake caliper and tighten the attaching bolts securely.

**Torque: 3.3 kg-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 kg-m**

Install bolt cap.

**Torque: 1.0 kg-m**

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

**Torque: 3.5 kg-m**

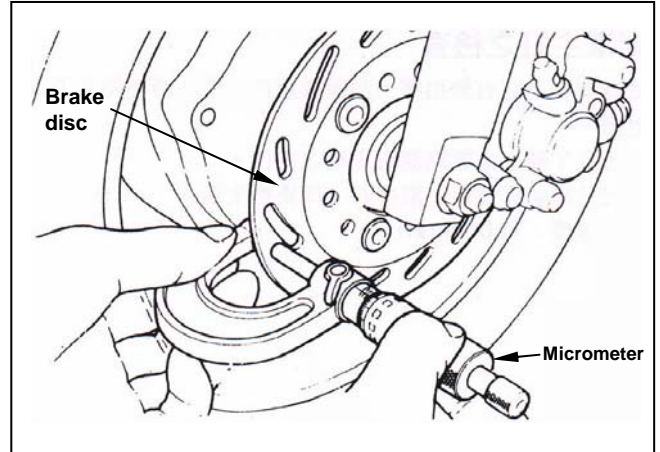
Refill up the brake fluid to the reservoir and make necessary air bleeding.

## Brake Disk 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.

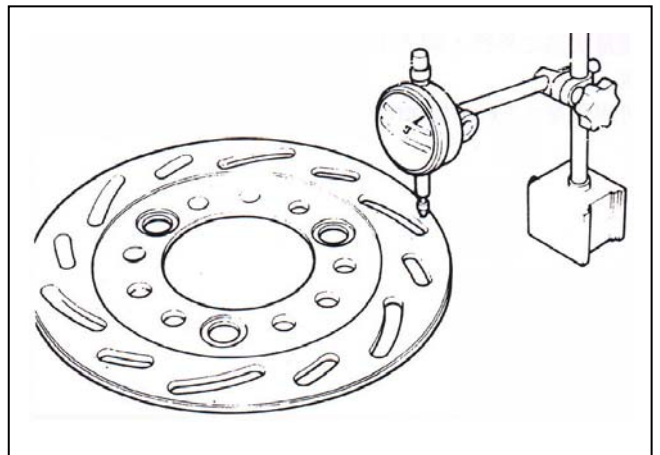
**Allowable limit: 2.0 mm**



Remove the brake disc from wheel.

Check the disc for deformation and bend.

**Allowable limit: 0.30 mm**



## Brake Master Cylinder

### ⚠ CAUTION

Do not let foreign materials enter into the cylinder.

### ⚠ CAUTION

When replacement, the whole set of master cylinder, piston, spring, diaphragm and circlip should be replaced in a set.

Remove the front and rear handlebar guards.

Remove the wires of brake lamp switch.

Drain out the brake fluid.

Remove the brake lever from the brake master cylinder.

Remove the brake hose.

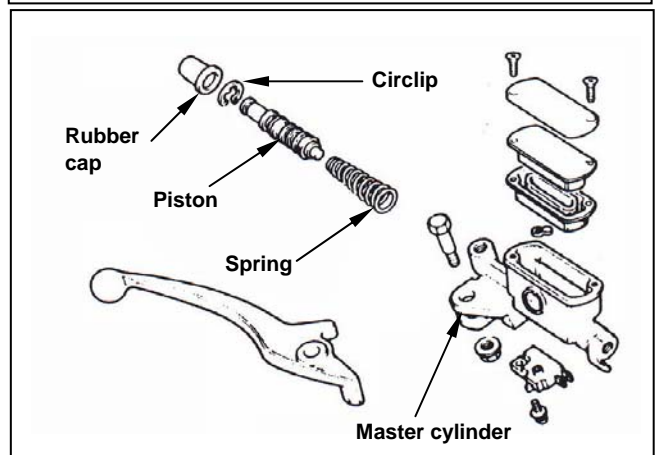
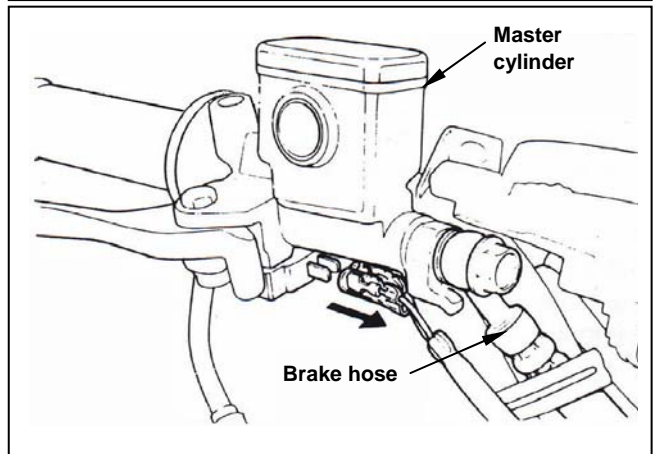
Remove the master cylinder seat and the master cylinder.

Remove the rubber pad.

Remove the circlip.

Remove the piston and the spring.

Clean the master cylinder with recommended brake fluid.



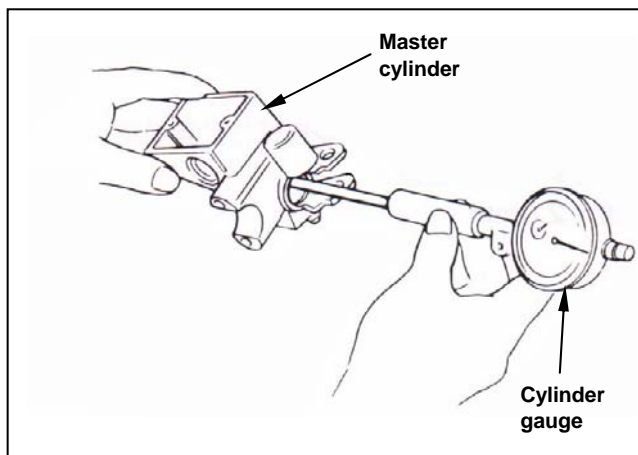


## 15. Brake System

### Master Cylinder Inspection

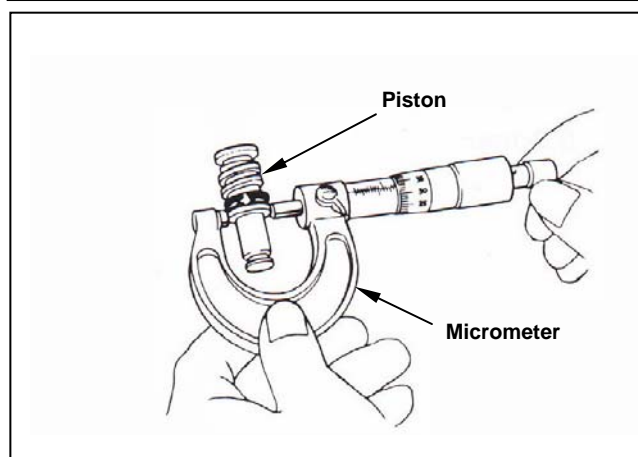
Check the master cylinder for damage or scratch. Replace it if necessary. Measure the cylinder inner diameter at several points along both X and Y directions. Replace the cylinder if the measured values exceed allowable limit.

**Allowable limit: 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**

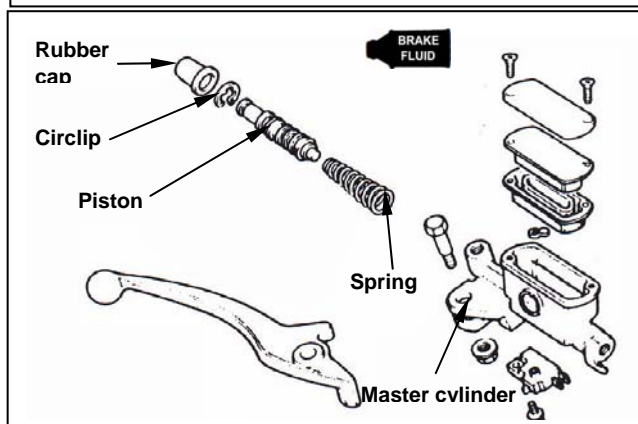


### Master Cylinder Assembly

#### ⚠ 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. Note the direction of the piston when installing.



#### ⚠ CAUTION

- Never install the piston in the opposite direction. (Refer to the diagram.)
- Make sure the circlip is seated securely in the groove.



Install the rubber cap into the groove correctly. Place the master cylinder onto handlebar, and install the master cylinder seat and its bolts. The "UP" mark on the seat should face upward. Align 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 wires to brake lamp switch. Connect brake hoses with 2 new washes. Tighten the brake hose bolt to the specified torque value. Make sure the hose is installed correctly. Install all wires, hoses, and components carefully so avoid to twisting them together.

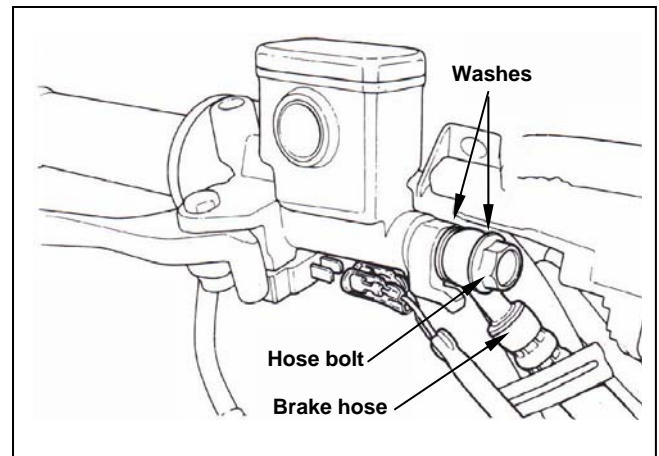
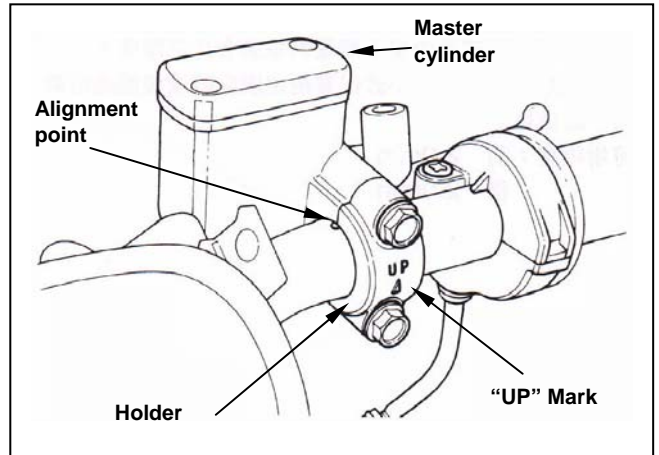
**⚠ CAUTION**

Improper routing may damage leads, hoses or pipes.

**⚠ CAUTION**

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

Add specified brake fluid and bleed air from the system.



## 15. Brake System

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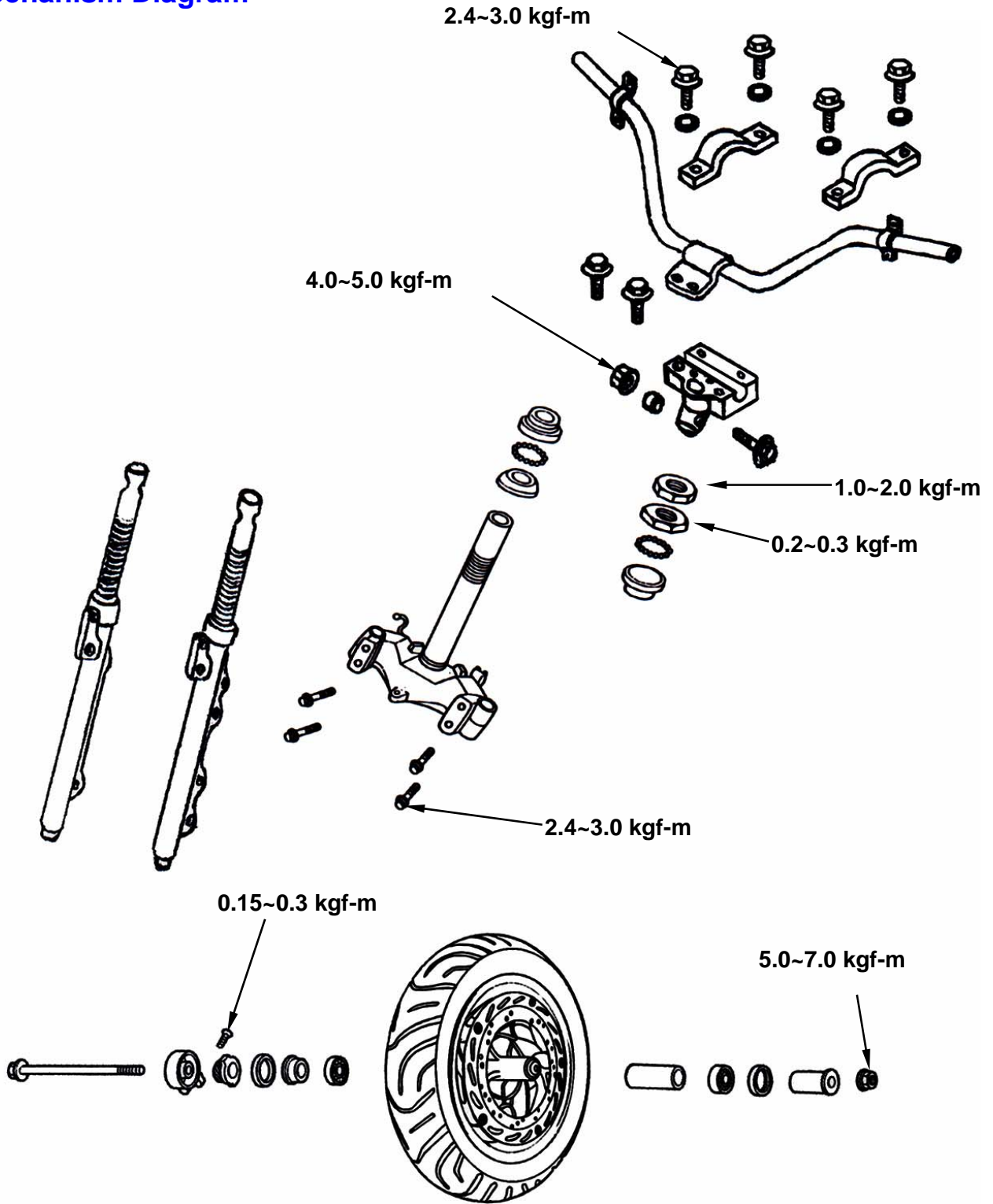
### Notes



16. Steering / Front Wheel / Front Cushion

Mechanism Diagram ..... 16-1	Front Wheel..... 16-6
Precautions in Operation ..... 16-2	Front Cushion..... 16-10
Troubleshooting..... 16-2	Front Fork / Steering Stem ..... 16-11
Steering Handlebar ..... 16-3	

Mechanism Diagram



## 16. Steering / Front Wheel / Front Cushion

### Precautions in Operation

#### General

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

#### Torque Values

Nut for the front wheel axle	5.0 ~ 7.0 kgf-m
Nut for the steering shaft	4.0 ~ 5.0 kgf-m
Lock nut for the steering shaft	1.0 ~ 2.0 kgf-m
Top crown for the steering shaft	0.2 ~ 0.3 kgf-m
Locating screw for the speedometer cable	0.15 ~ 0.3 kgf-m
Front shock absorber: Upper lock bolt	2.4 ~ 3.0 kgf-m

#### Tools

##### Special Tools

Inner bearing puller  
Steering nut wrench  
Driver 32\*35mm  
Driver 42\*47mm

### Troubleshooting

#### Hard to steer

- The steering shaft bolt is too tight.
- The ball and the top crown of the steering shaft are damaged.
- Insufficient tire pressure.

#### The steering handlebar is tilted

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

#### The front wheel run out

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

#### Soft shock absorber

- The front fork spring is worn out.
- The oil seal of the front shock absorber is leaking.

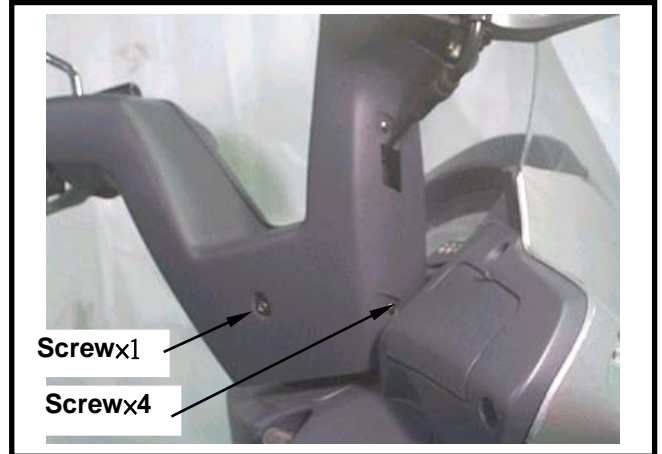
#### Noise in front shock absorber

- The connecting rod of the shock absorber is warped.
- The joint of the shock absorber gets loose.

### Steering Handlebar

#### Removal

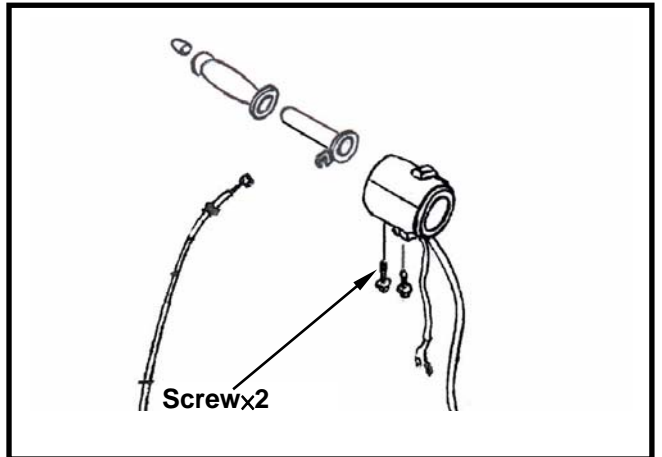
Remove the front handle cover. (Screw x4)



Remove the rear handle cover. (Screw x3)

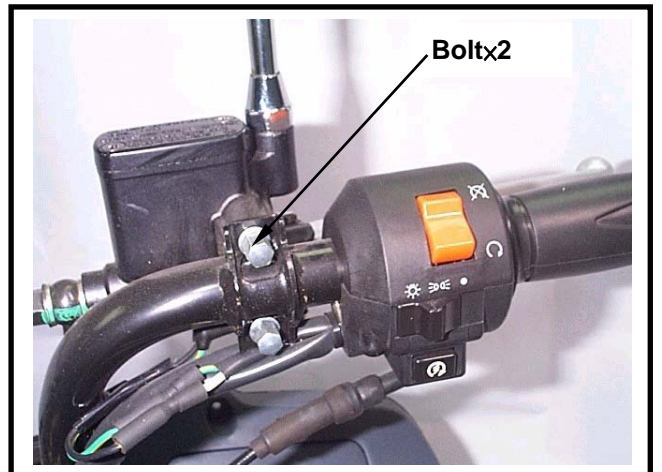


Remove the right switch assembly by loosening two screws.  
Remove the acceleration cable and take off the handlebar.



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

Remove the master cylinder of the front brake.

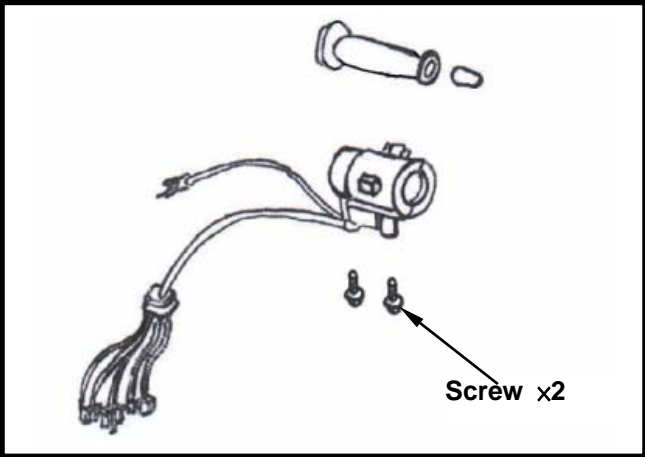






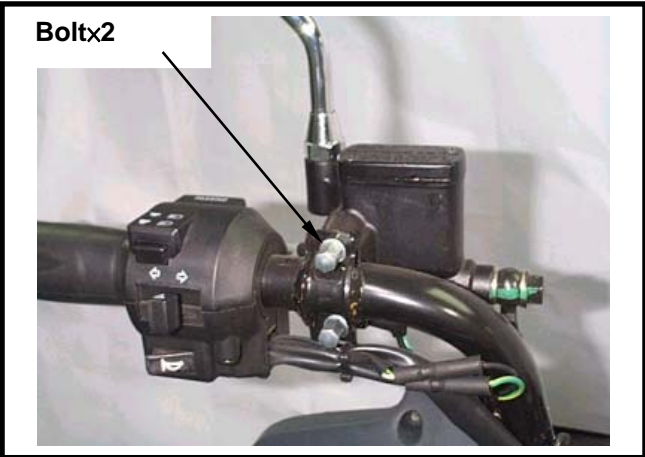
# 16. Steering / Front Wheel / Front Cushion

Remove the left switch assembly by loosening two screws.



Loosen the lock bolt for the master cylinder of the rear brake.

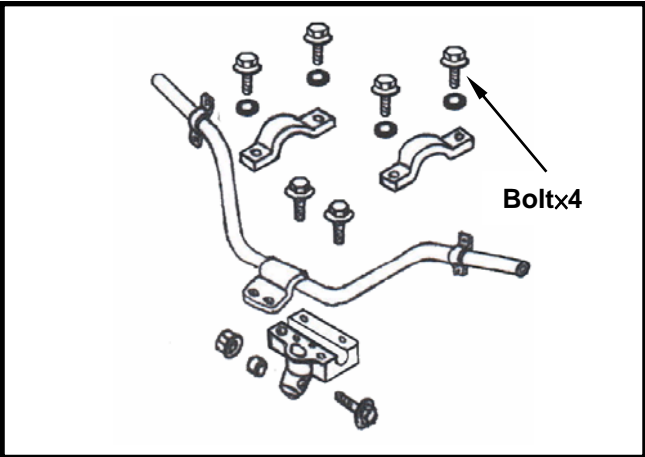
Remove the master cylinder of the rear brake.



Loosen the lock bolt for the handle fix bolts. (Bolt x4)



Loosen the lock bolts for the handle holder of the handlebar. (Bolt x4)



Loosen nuts and locating sleeve from the handlebar.  
Remove the handlebar.



### Installation

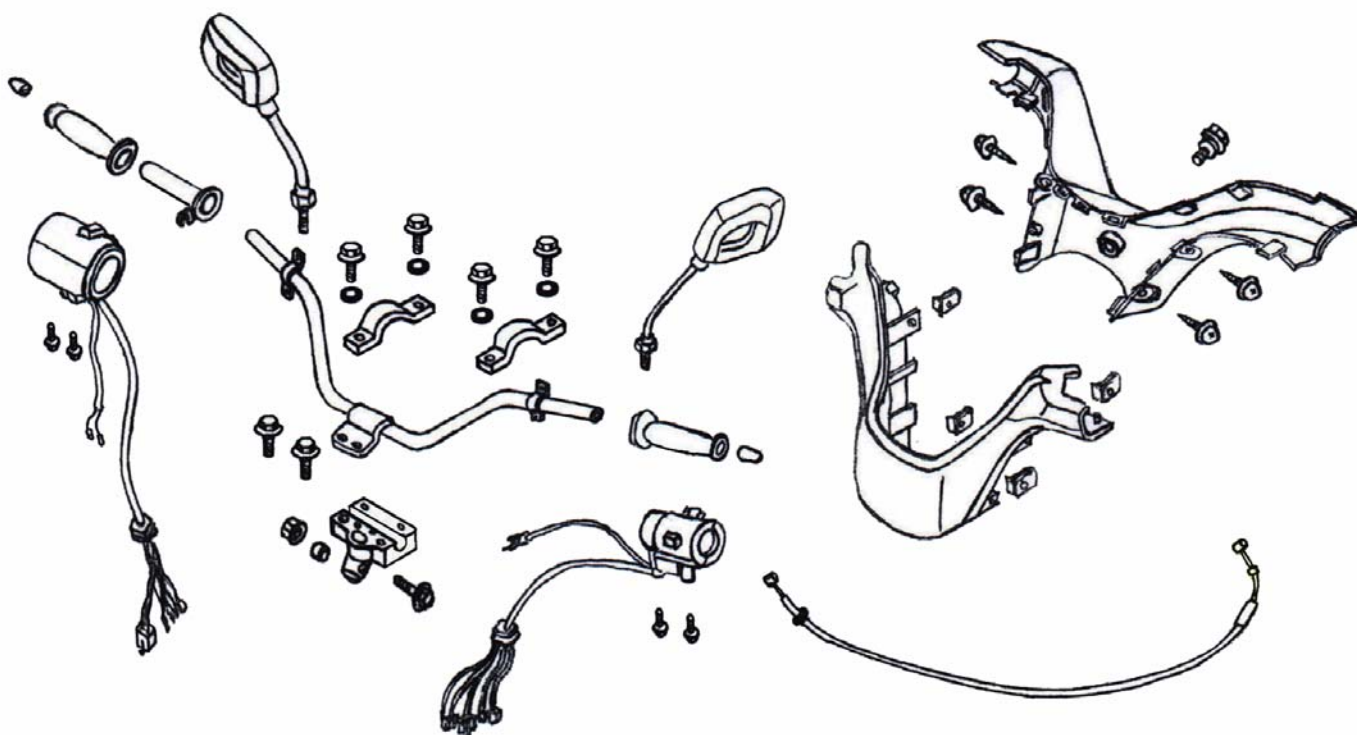
In reverse order of the disassembly.

### ⚠ Caution

Apply grease to the throttle cable end and connect it to the throttle holder.  
After the steering handlebar is installed, check the throttle cable for free movement.

Carry out the following inspection and adjustment:

- Operation of the throttle.
- Brake level free travel.
- Operation of all meters.



## 16. Steering / Front Wheel / Front Cushion



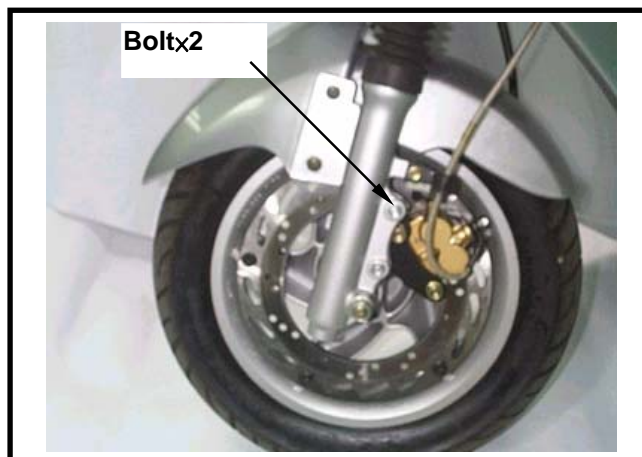
## Front Wheel

## Removal

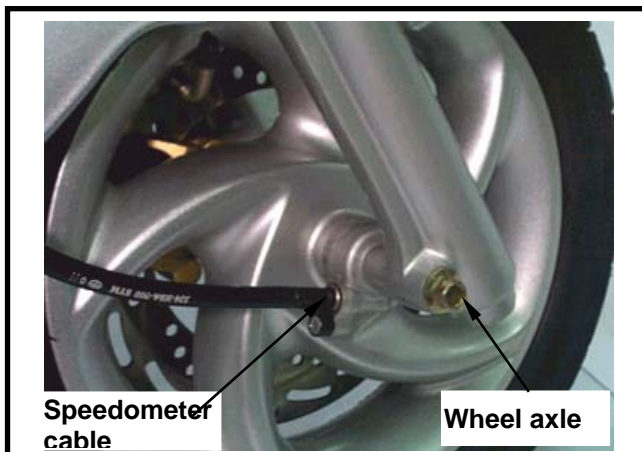
Loosen two screws from the front brake calliper.  
Remove the front brake calliper.

**⚠ Caution**

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



Remove the speedometer cable.  
Turn loose the nuts and pull out the wheel axle.  
Remove the front wheel.

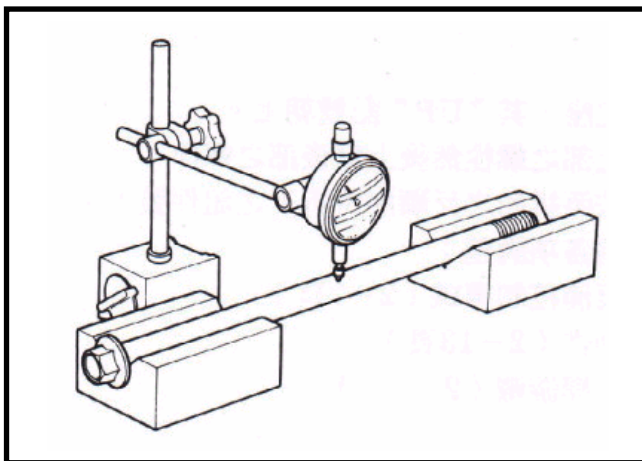


## Inspection

## Wheel axle

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

**Service limit: 0.2 mm**

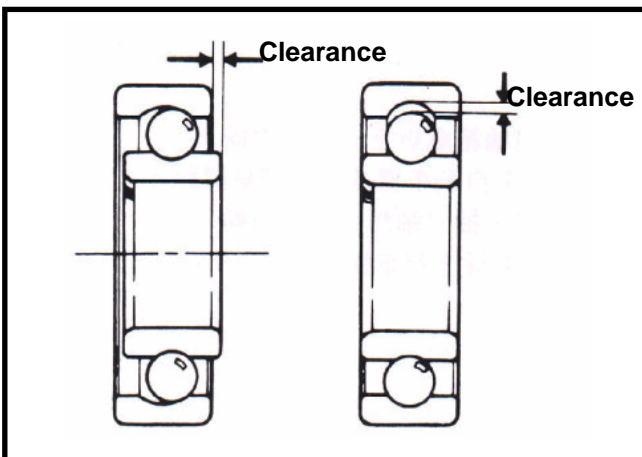


## Wheel axle

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

**⚠ Caution**

The bearing shall be replaced in pair.



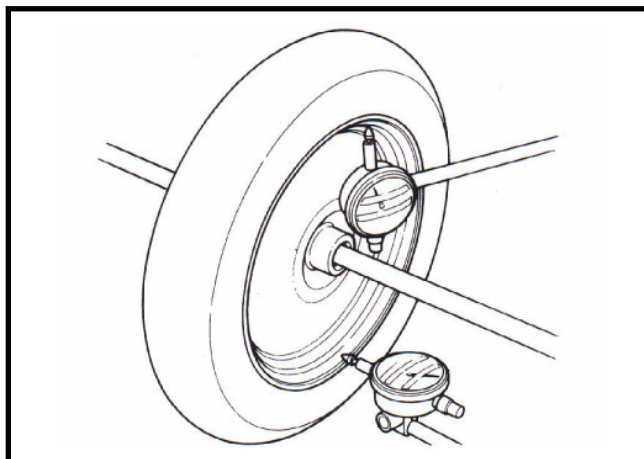
### Wheel rim

Place the wheel rim on a rotary rack.  
Rotate the wheel rim and measure the runout.

### Service limit:

Radial: 2.0 mm

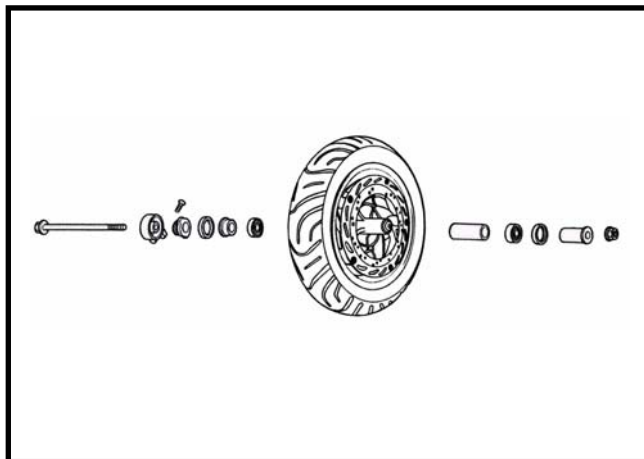
Axial: 2.0 mm



### Disassembly

Remove the bushes and dust-proofing oil seal.

Insert the bearing puller into the bearing and pull out the bearing.  
Remove the spacer and take off the bearing itself.



### Tools

Bearing puller (Inner)

### Assembly

Fill the bearing cap with grease  
Place the left bearing into the bracket.  
Install the spacer and place the right bearing into the bracket.

### ⚠ Caution

Never incline the bearing when it is installed.

### ⚠ Caution

Never use the old bearing. It must be replaced with a new one once it was removed.

### Tools

Hydraulic presser



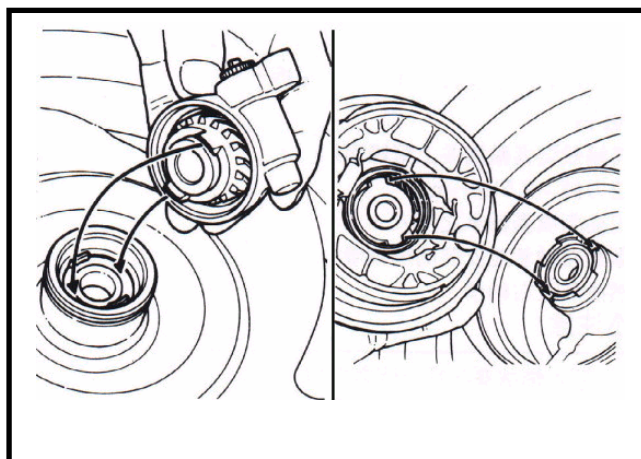
## 16. Steering / Front Wheel / Front Cushion

### Assembly

Assemble in reverse order of disassembly.



Apply a coat of grease on the inner side of the dust-proofing oil seal.  
Install the dust proofing oil seal and the left and right bushes.



### Installation

Insert the wheel axle through the front shock absorber and wheel.



Tighten the nut for the wheel axle.  
**Torque value: 10.0 ~ 12.0 kgf-m**





Install the speedometer cable.



Press the brake pad to open.  
Install the brake caliper and tighten the lock  
screw.

**Torque value: 3.3 kgf-m**



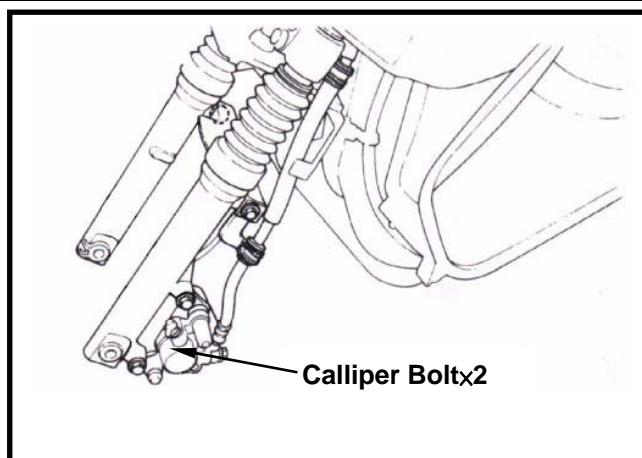
## 16. Steering / Front Wheel / Front Cushion



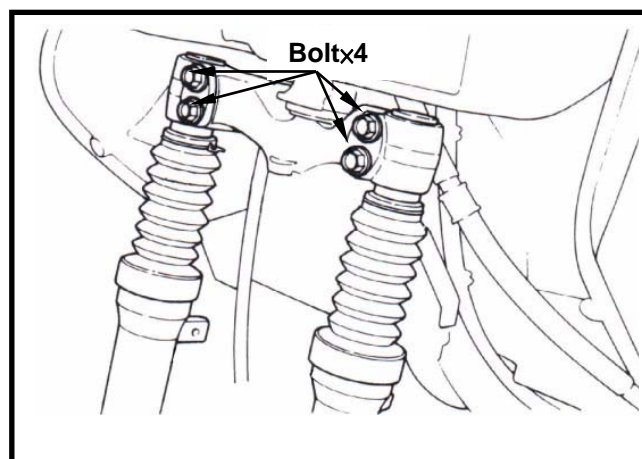
### Front Cushion

#### Removal of front shock absorber

Loosen two bolts from the front brake calliper.  
Remove the front brake calliper and hose.

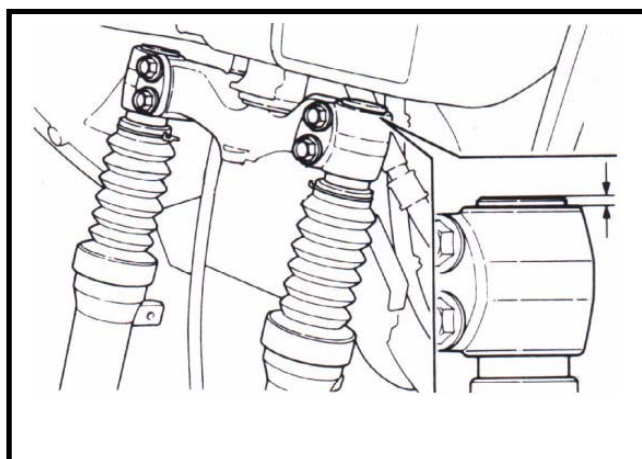


Loosen the bolts and remove the front shock absorber.



#### Installation

Install the front fork and front shock absorber.  
Tighten the bolts.  
Align the top of the cushion with the steering and  
tighten the bolt. (Note not to interference the  
cushion oil installing bolt.)



## Front Fork / Steering Stem

### Removal of the front fork

Remove the following parts:

- The instrument panel assembly
- The Steering handlebar
- The front wheel

Use the steering nut wrench to loosen the lock nut from the steering.

### Tools

#### Steering head top thread wrench

Remove the top crown and front fork.

#### ⚠ Caution

Place balls in a container to avoid missing.

Check the top crown to see any wear and damage. If affirmative, replace it.

### Replace the lower bearing for the top crown

Use the proper tool to remove the lower bearing and discard it.

Install a new top crown bearing to the steering shaft.

Place the new bearing on the old bearing, use driver to drive the new bearing into the bearing carrier.

### Inspection of bearing carrier

Check the upper and lower bearing carriers to see any wear and damage. If found, replace them.

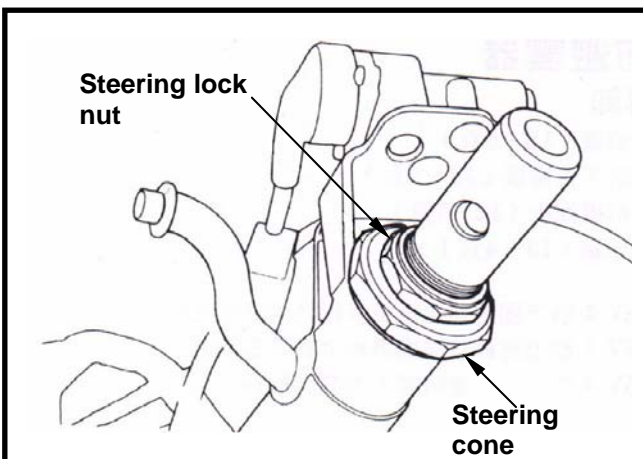
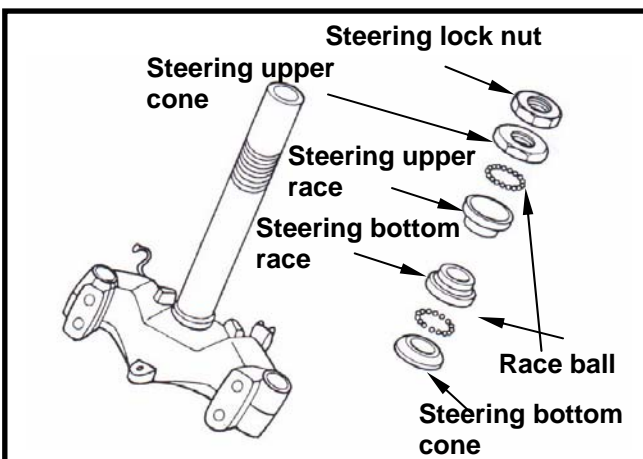
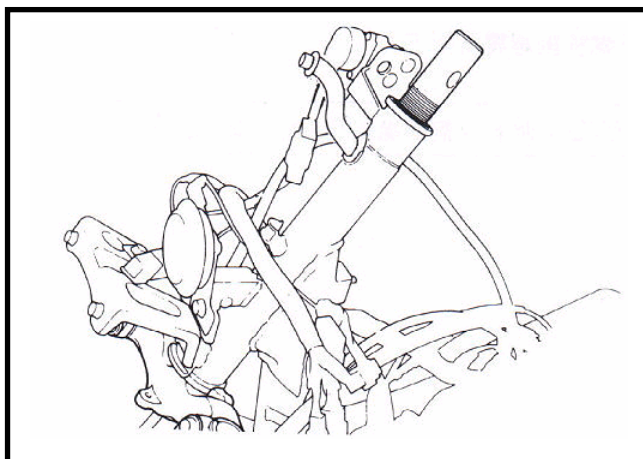
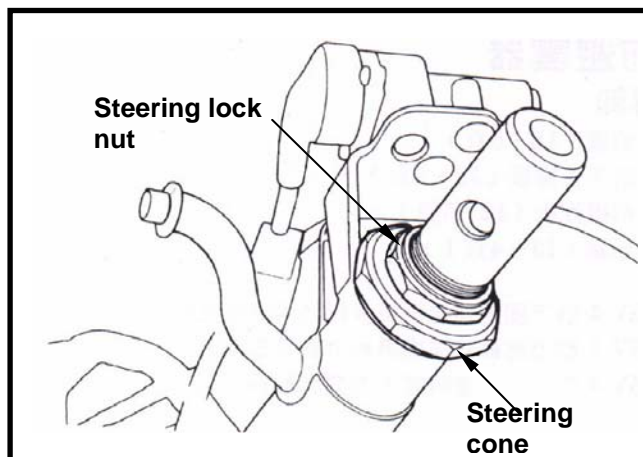
### Replacement of ball race

Use the puller and punch to force the ball race from the steering shaft.

### Tools

#### Ball race puller

Use the ball race puller and punch to force ball race out off the steering shaft.



## 16. Steering / Front Wheel / Front Cushion

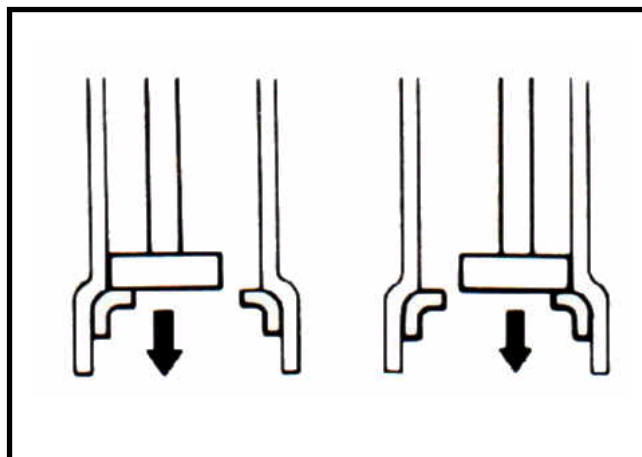


Use the punch and the drive to press the ball race into the steering shaft end.

**Tools**  
**Driver**  
**Punch**

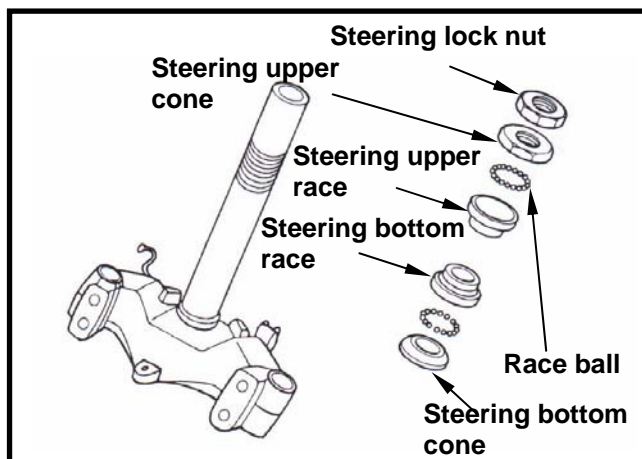
Use the punch and the driver to press the bottom ball race into the steering shaft end.

**Tools**  
**Driver**  
**Punch**



### Installation of front fork

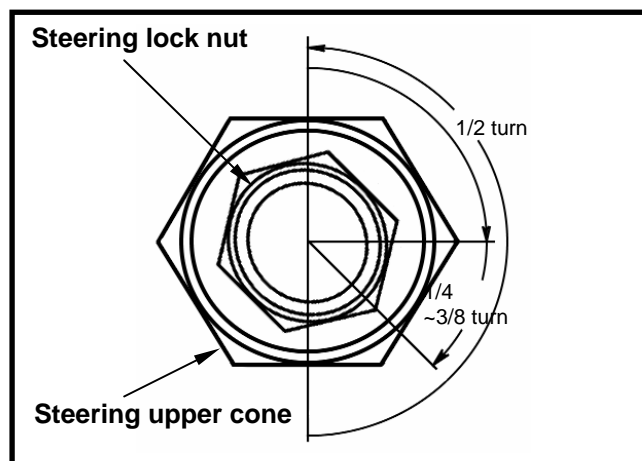
Fill the upper and lower ball race with grease, and load each carrier with balls. Install the front fork into the steering shaft. Care shall be exercised not to lose the balls.



Apply a coat of grease to the top crown. Lock the top crown in place by bolts.

#### **⚠ Caution**

Check the free play and vertical clearance of the steering shaft.



Tighten the nut of the steering shaft and lock up nuts of the top crown.

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

**Tools**  
**Steering shaft wrench**

Installing the following parts:

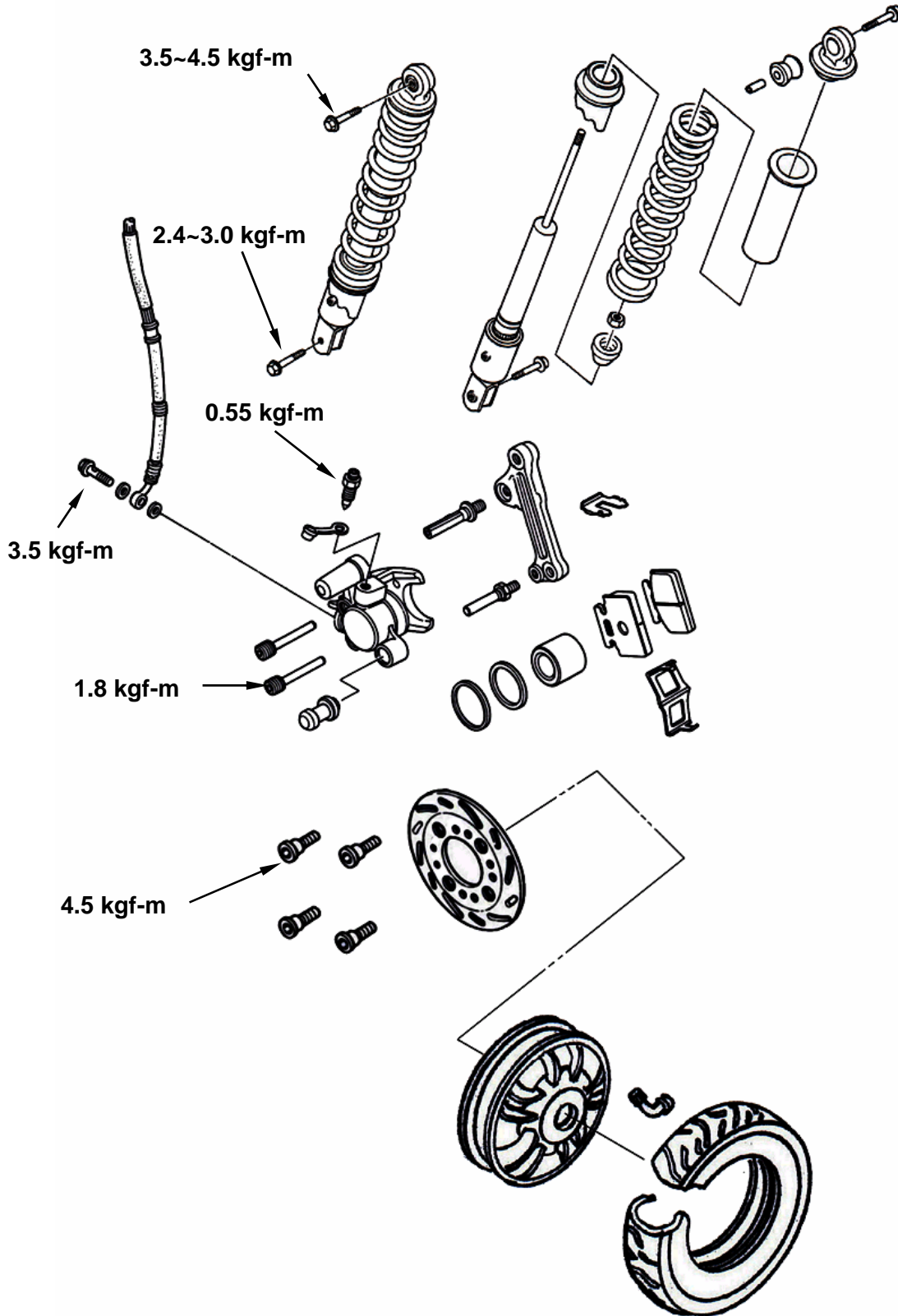
- The front wheel
- The steering handlebar
- The body covers



# 17. Muffler / Rear Wheel / Rear Cushion

Mechanical Illustration .....	17-1	Muffler .....	17-3
Precautions in Operation .....	17-2	Rear Wheel .....	17-3
Troubleshooting.....	17-2	Rear Cushion.....	17-5

## Mechanism Diagram





## 17. Muffler / Rear Wheel / Rear Cushion

### Precautions in Operation

#### General

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

#### Service data

Unit: mm

Item		Standard	Allowable Limit
Run-out of rear rim	Radial	-	2.0
	Axial	-	2.0
Thickness of rear brake lining		4.0	3.0
Free length of rear shock absorber		238.6	233.6

#### Torque Value

Rear shaft nut	10.0-12.0 kgf-m	Rear cushion bolt	2.4-3.0 kgf-m
Rear brake calliper bolt	2.9-3.5 kgf-m	Exhaust pipe attaching nut	1.0~1.2 kgf-m
Rear cushion upper bolt	3.5-4.5 kgf-m	Exhaust pipe attaching bolt	2.7-3.3 kgf-m

### Troubleshooting

#### Run-out of rear wheel

- Deformed or bent wheel hub.
- Improper tires.
- Loose wheel shaft.

#### Soft Shock Absorber

- The spring is too weak.

#### Noisy Brake

- Worn brake lining.
- Offset brake disc.
- Improper assembly of brake caliper.
- Brake disc or wheel imbalance.

#### Poor Performance of Brake

- Improperly adjusted brake.
- Contaminated brake disc.
- Worn brake lining.
- Air inside brake fluid pipe.
- Grease on brake disc.
- The brake fluid piping is clogged.
- The brake fluid pipe is deformed or bent.
- Insufficient amount of brake fluid in the reservoir.

## Muffler

### Removal

Loosen the front lock nuts of the muffler (nut x2).  
Loosen the lock bolts (bolt x 3).  
Remove the exhaust pipe.

### Installation

In reverse order of the removal.

#### ⚠ Caution

Replace the front gasket if worn or deformed.

### Torque Value

**For lock bolt:** 3.2 ~ 3.8 kgf-m

**For lock nut:** 2.7 ~ 3.3 kgf-m



## Rear Wheel

### Removal

Remove the rear cover (screw x 4).  
Remove the right side cover (screw x 3).  
Remove the muffler (bolt x 3, nut x 2).  
Remove the brake hose clamp (bolt x 2).  
Remove the brake clipper (bolt x 2).  
Remove the lower bolts of the rear cushion (bolt x 1).  
Remove the nut of the rear wheel shaft (nut x 1).  
Remove the rear rocker arm.  
Remove the rear wheel.

#### ⚠ Caution

When the brake caliper is removed, never tamper with the brake lever to avoid that the brake pad is being squeezed out.



## Inspection

### Inspection on Brake Disc

Visually check disc for any deformation and damage.  
Measure the thickness of the lining at several places. Replace if wear is beyond the specified value.

**Allowable thickness: 2.0 mm**



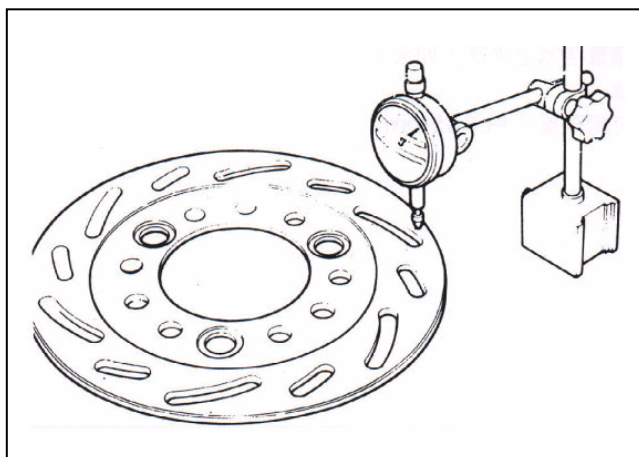
## 17. Muffler / Rear Wheel / Rear Cushion

Check any deformation and warping of the brake disc.

**Allowable limit: 0.3 mm**

### ⚠ Warning

- Never contaminate the brake disc with grease. The contaminated brake disc will reduce its performance.
- The brake disc contains asbestos. Never use air jet to clean it. Preferably, the operator shall wear respirator and gloves, and use the vacuum cleaner to clean the brake disc.



### Inspection of Rear Wheel

#### Wheel Rim

Place the wheel rim on a rotational support. Rotate it by hand and measure the run-out with a dial indicator.

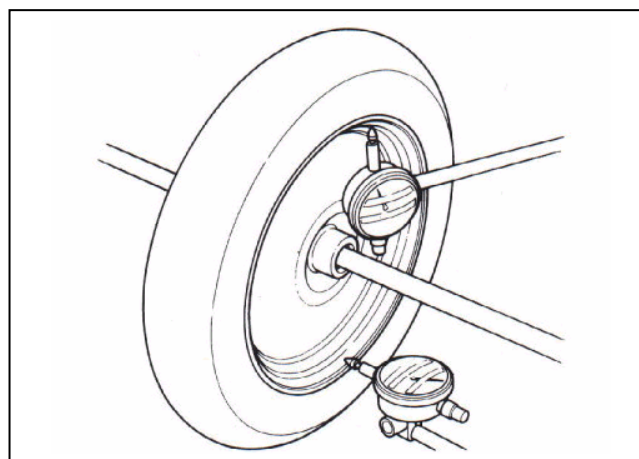
**Run-out limit: 2.0 mm**

#### Bearing

Rotate the inner ring of the bearing with a finger. The bearing should move smoothly and quietly. Check the fit of the bearing and rim. Replace the bearing if its motion is not smooth or noisy.

### ⚠ Caution

The bearing must be replaced in pair.



### Replacement of Rear Wheel Bearing

Remove the collar and oil seal from the rocker arm.

Pull off the rear wheel bearing by means of the bearing puller.

Remove the outer oil seal.

### ⚠ Caution

Never reuse the old oil seal on the bearing.

Press in the oil seal and bearing into the rocker arm by employing a hydraulic presser. Install the oil seal and collar onto the rocker arm.

### Installation

Install the rear wheel.

Install the collar on the rocker arm.

Install the rocker arm onto the rear wheel shaft.

Mount the outer washer on the rocker arm.

Tighten the rear wheel nuts.

Align the rear shock absorber with the rocker arms hole; tighten the cushion with bolts.  
Install the brake calliper and tighten the lock bolts.  
Install the muffler and tighten the lock bolts.  
Install the guards and cover in reverse order of removal.

### Torque Value

<b>Cushion bolt:</b>	<b>2.4 ~ 3.0 kgf-m</b>
<b>Nuts of rear wheel shaft:</b>	<b>10.0 ~ 12.0 kgf-m</b>
<b>Bolts for the brake calliper:</b>	<b>2.9 ~ 3.5 kgf-m</b>
<b>Bolts for the muffler:</b>	<b>3.2 ~ 3.8 kgf-m</b>
<b>Nuts for the muffler:</b>	<b>2.7 ~ 3.3 kgf-m</b>

### ⚠ Caution

Attention must be paid to their direction when rocker arm collars are installed. The small ends of inner and outer collars must face to rocker arm bearing.

## Rear Cushion

### Removal

Remove the rear cover (screw x 4).  
Remove the right side cover (screw x 3).  
Remove the luggage box (bolt x 6, screw x 1).  
Remove the body cover (bolt x 2, screw x 2).  
Loosen the lock bolts of the air filter (bolt x 2).  
Remove the muffler (bolt x 3, nut x 2).  
Remove the rear fender assembly (bolt x 2, screw x 2).  
Remove the left / right rear cushions.

### Removal

Remove a lower bolt from the shock absorber (bolt x 1).



## 17. Muffler / Rear Wheel / Rear Cushion

Remove an upper bolt from the shock absorber (bolt x 1).  
Remove the rear shock absorber.



### Installation

In reverse order of removal.

#### **⚠ Caution**

The shock absorber must be replaced as a unit. Never disassemble the shock absorber as that would damage the structure.

### Torque Value

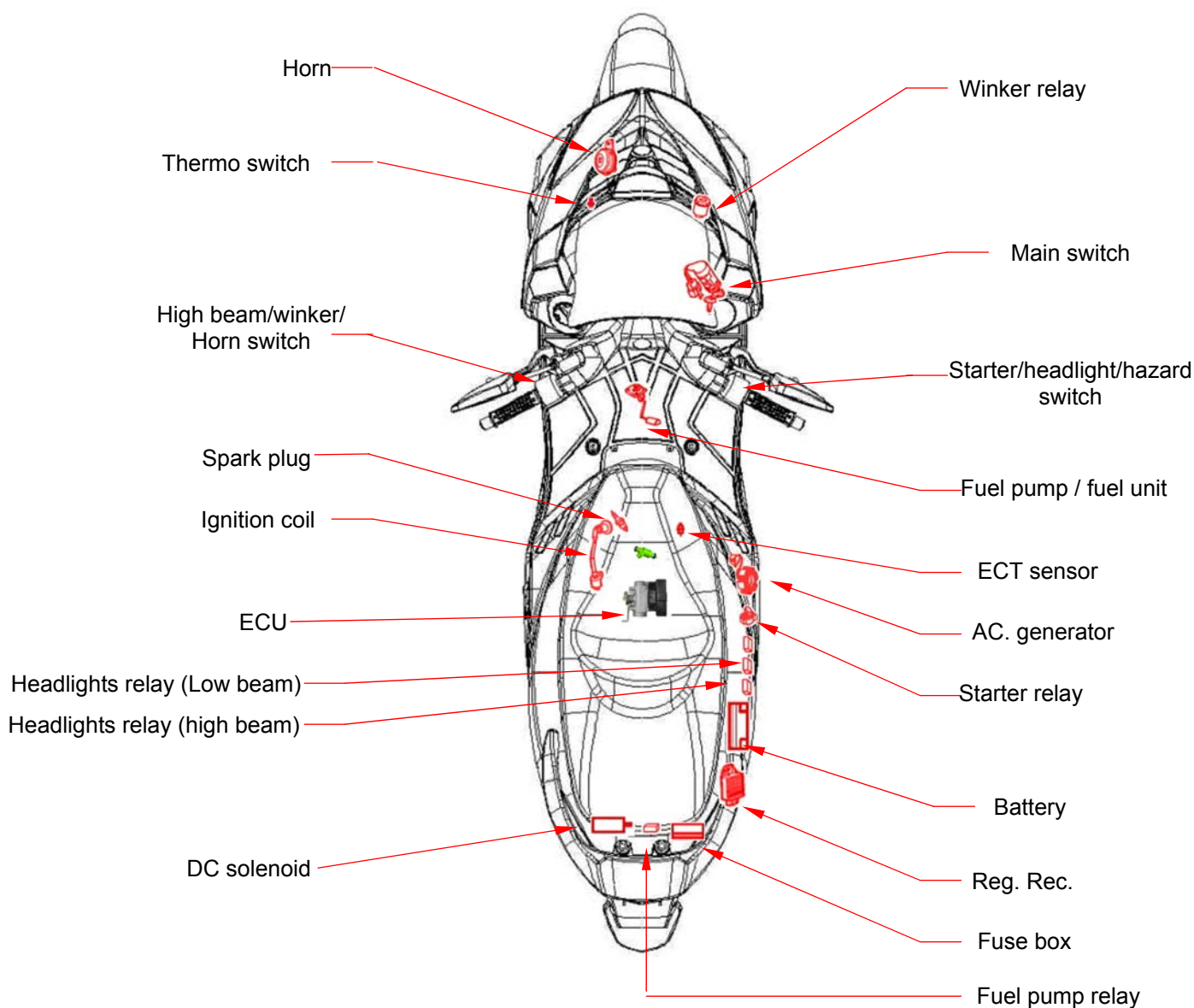
Absorbing bolt: 2.4 ~ 3.0 kgf-m

Lock nut: 3.5 ~ 4.5 kgf-m



<b>Mechanism Diagram</b> .....	<b>18-1</b>	<b>Meter</b> .....	<b>18-12</b>
<b>Precautions in Operation</b> .....	<b>18-2</b>	<b>Light / Bulb</b> .....	<b>18-13</b>
<b>Troubleshooting</b> .....	<b>18-3</b>	<b>Switch / Horn</b> .....	<b>18-18</b>
<b>Battery</b> .....	<b>18-4</b>	<b>Fuel Unit</b> .....	<b>18-20</b>
<b>Fuse</b> .....	<b>18-5</b>	<b>Thermo Switch</b> .....	<b>18-21</b>
<b>Charging System</b> .....	<b>18-6</b>	<b>Thermo Unit</b> .....	<b>18-22</b>
<b>Ignition System</b> .....	<b>18-9</b>	<b>Thermo Guage</b> .....	<b>18-22</b>
<b>Starting System</b> .....	<b>18-10</b>		

## Mechanism Diagram



## 18. Electrical System

### 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 8Ah
	Charging rate	0.9A / 5~10hr (standard)    4A / 1hr (rapid)
Leaking current		Below 5 mA
Charging current		1.2A / 1600 rpm
Charging control val.		14.5+0.5 V / 2000 rpm

#### Ignition system

Item		Specification
Spark plug	Type	NGK CR7E recommended)
	Gap	0.8 mm
Resistance	First winding	$0.63 \pm 0.03 \Omega$ (27C)
CPS sensor resistance		$120 \pm 10\% \Omega$
Ignition time		10° 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

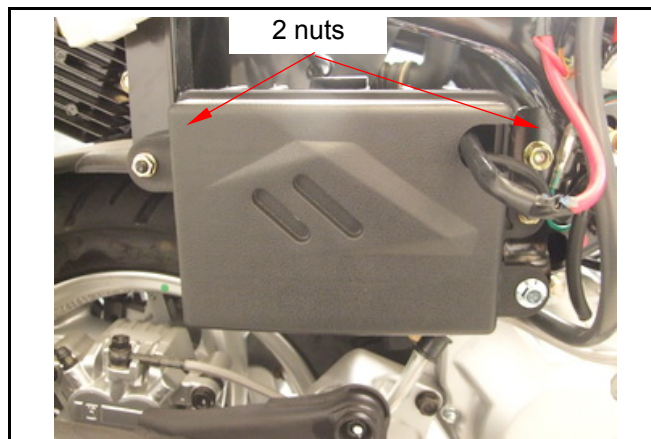
- Poor starter motor pinion
- The starter motor run in reverse direction
- Abnormal battery

# 18. Electrical System

## Battery

### Removal

Remove the battery cover (2 nuts).  
 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

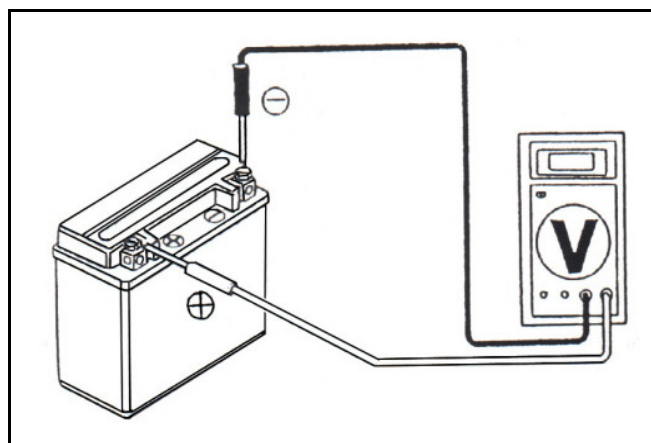
- Keep flames away while recharging.
- Charging is completely controlled by the ON/OFF switch on the charger, not by battery cables.



### 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.

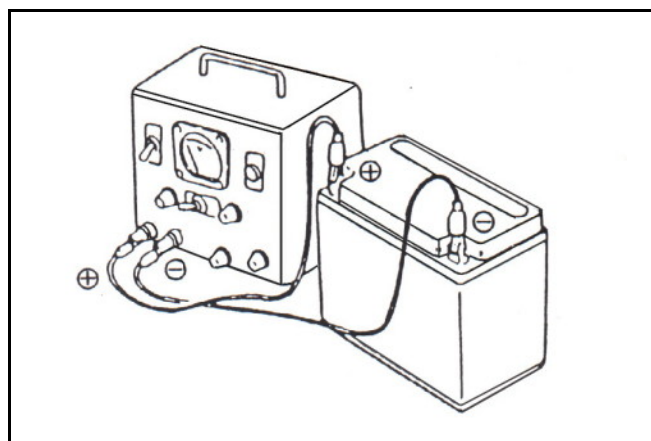
	Standard	Maximum
Charging current	0.9A	4A
Charging time	5~10 hours	1 hour



### ⚠ Caution

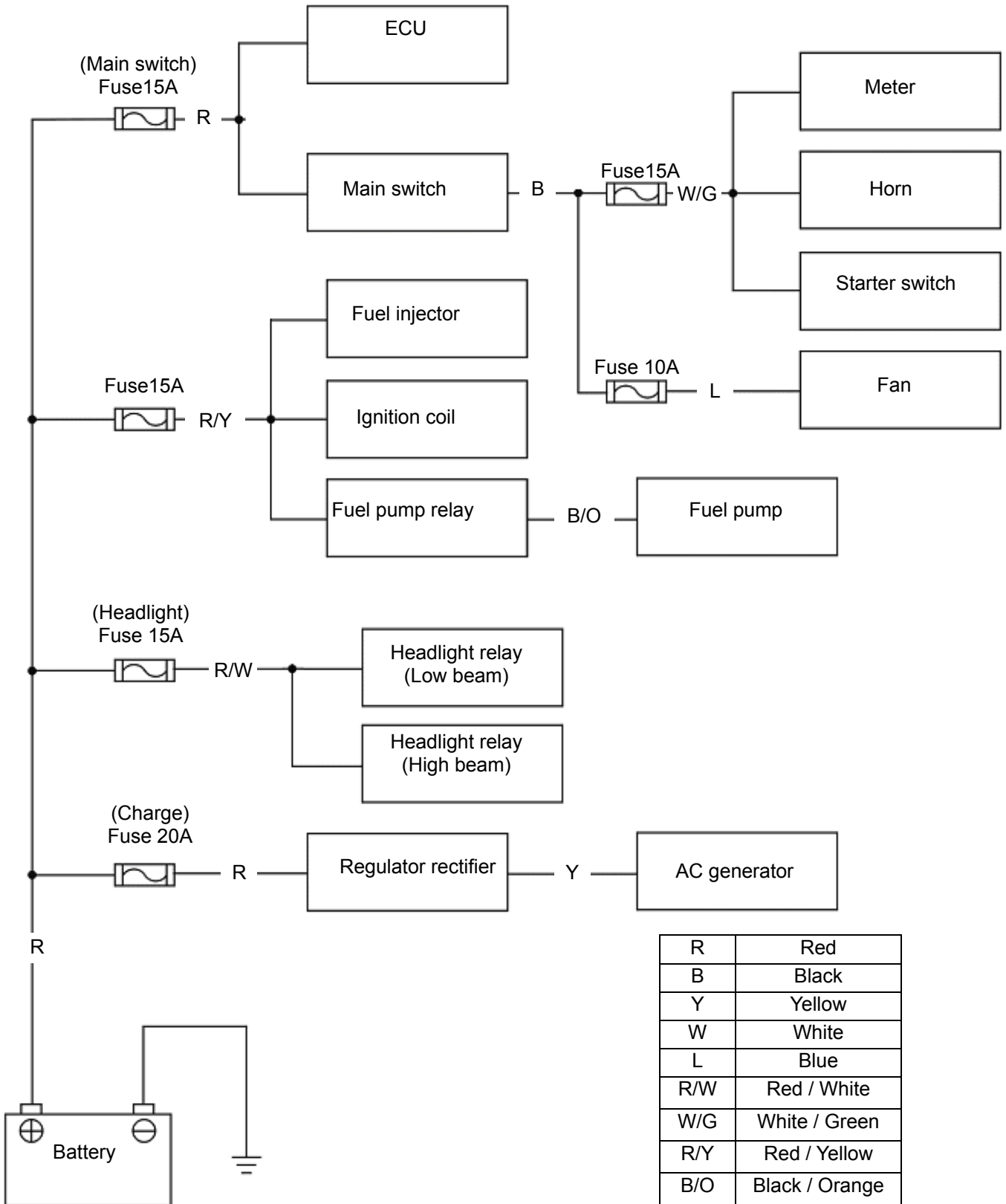
- Never rapid charge the battery unless in emergency.
- Verify the battery is recharged with current and duration prescribed above.
- Large current and fast time to charge will render damage to the battery.

After installing the battery, coat the cable terminal with grease.



## Fuse

### Fuse circuit



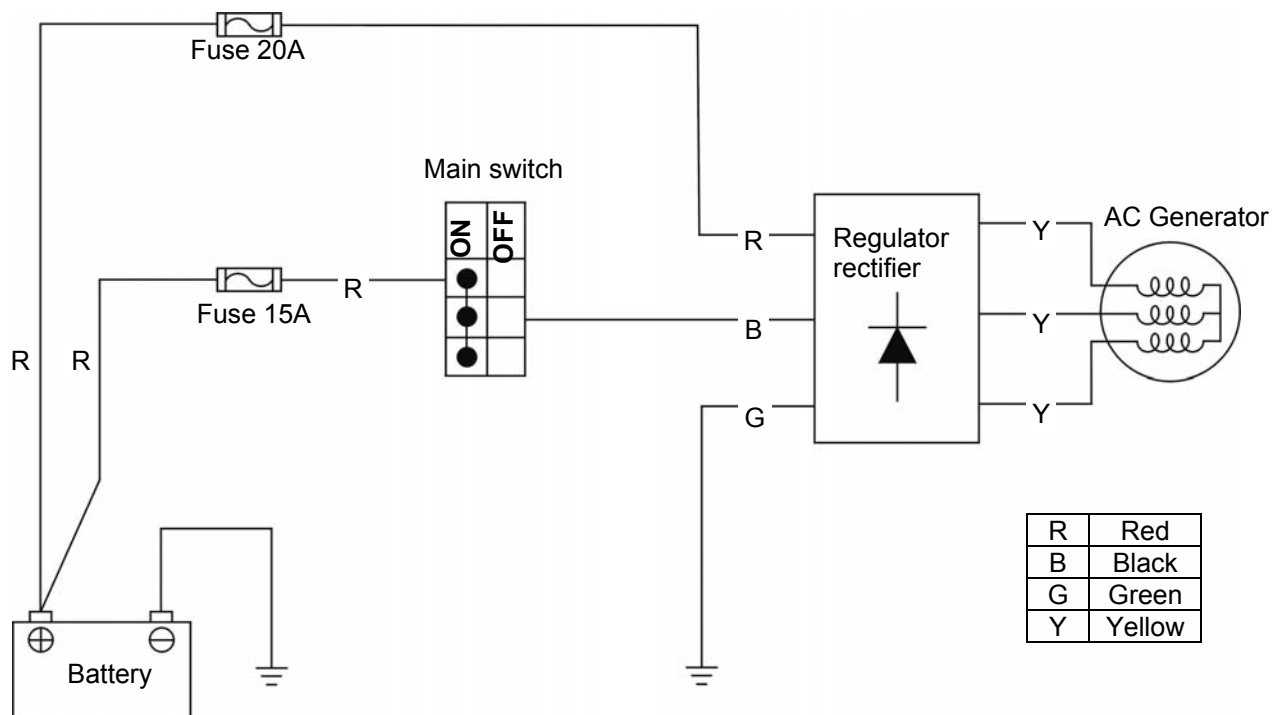


# 18. Electrical System



## Charging System

### Charging system circuit



### Regulator rectifier inspection

	(KΩ)					
	Yellow 1	Yellow 2	Yellow 3	Red	Black	Green
<b>Yellow 1</b>	∞	∞	∞	∞	∞	∞
<b>Yellow 2</b>	∞	∞	∞	∞	∞	∞
<b>Yellow 3</b>	∞	∞	∞	∞	∞	∞
<b>Red</b>	∞	∞	∞	∞	∞	∞
<b>Black</b>	5~30	5~30	5~30	∞		1~35
<b>Green</b>	2~20	2~20	2~20	∞	1~35	

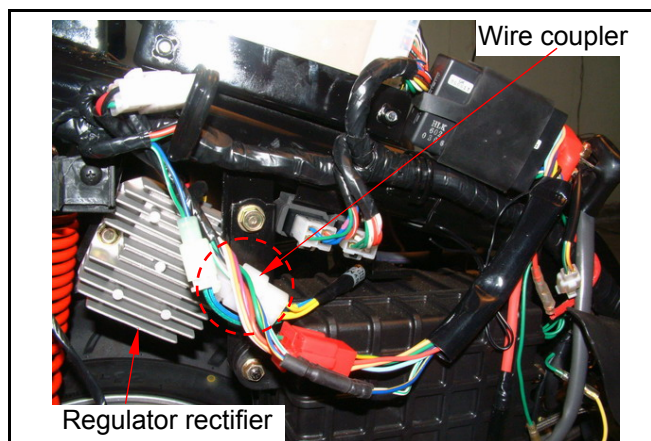
### Charging circuit inspection

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.

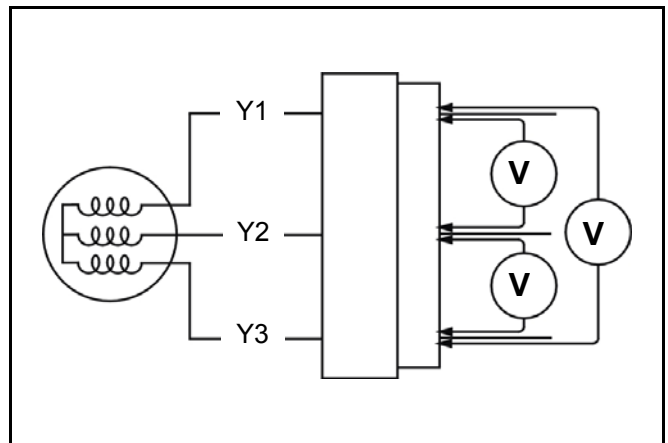
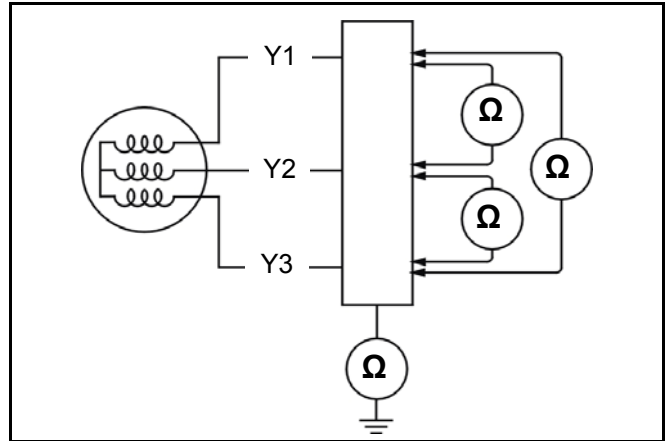
If there is nothing wrong with parts and wiring, replace the regulator rectifier.



### 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



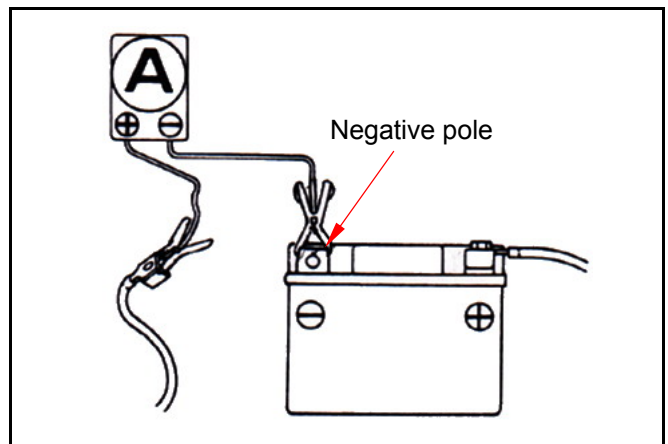
### Current leakage test

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.



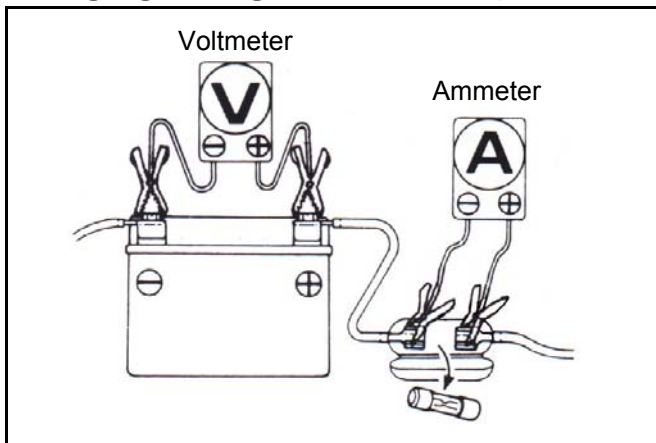
If the leaked current exceeds the specified value, it may indicate a short circuit.

**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

## 18. Electrical System

### 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.

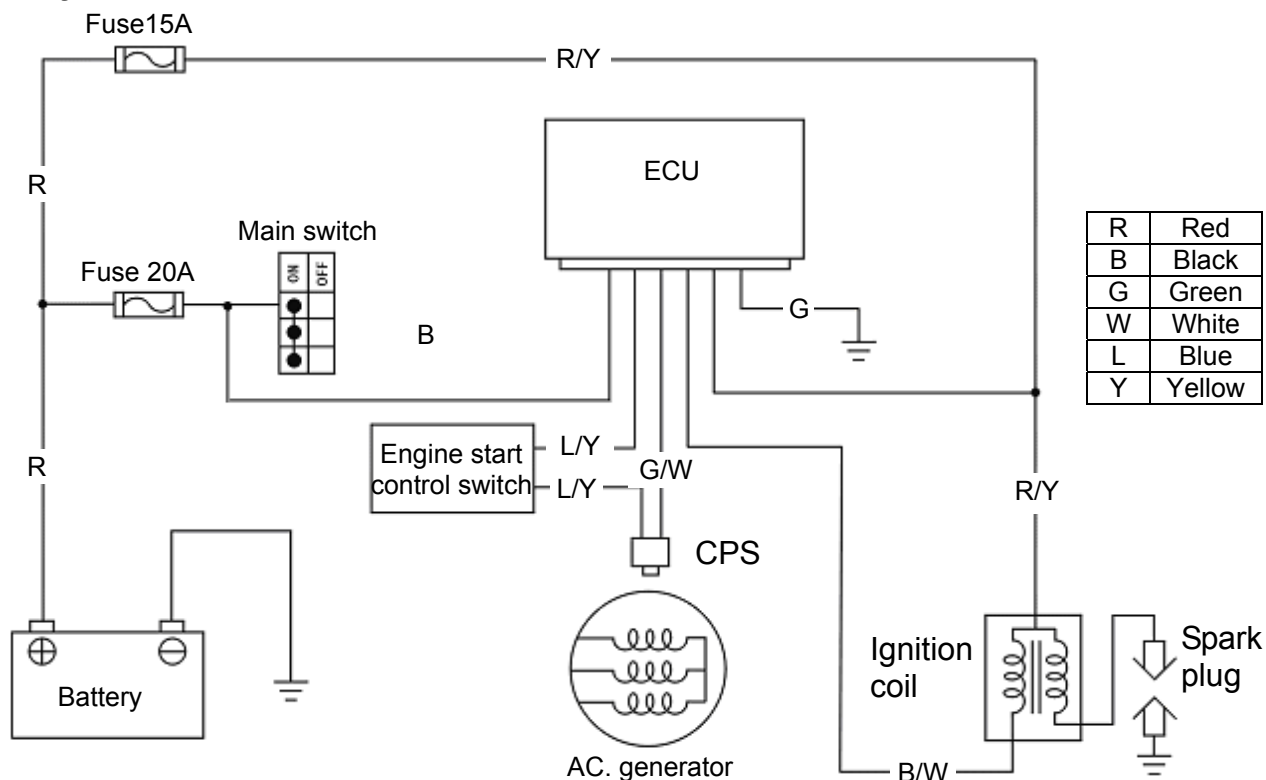
- (1) The charging voltage can not exceed the voltage between two battery terminals and the charging current is in the discharging direction.
- (2) The charging voltage and current are too much higher than the standard values.

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 system circuit



### 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)**



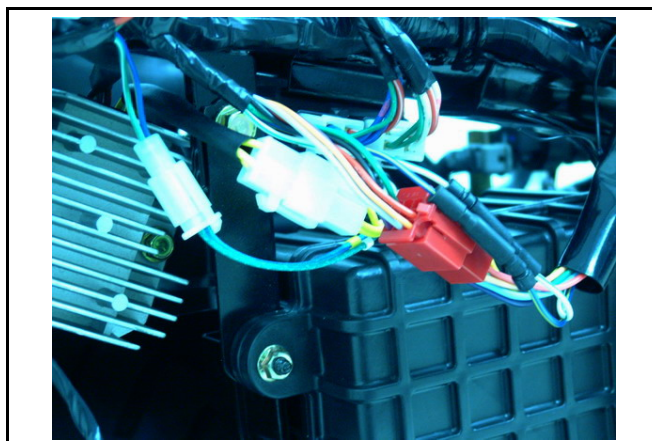
### CPS inspection

Remove the right body side cover.  
Disconnect the CPS coupler and measure the resistance between G/W and L/Y wire terminals.

**Standard resistance :  $120 \pm 10\% \Omega$**

### ⚠ Caution

- Coil doesn't need to be removed before performing the inspection.

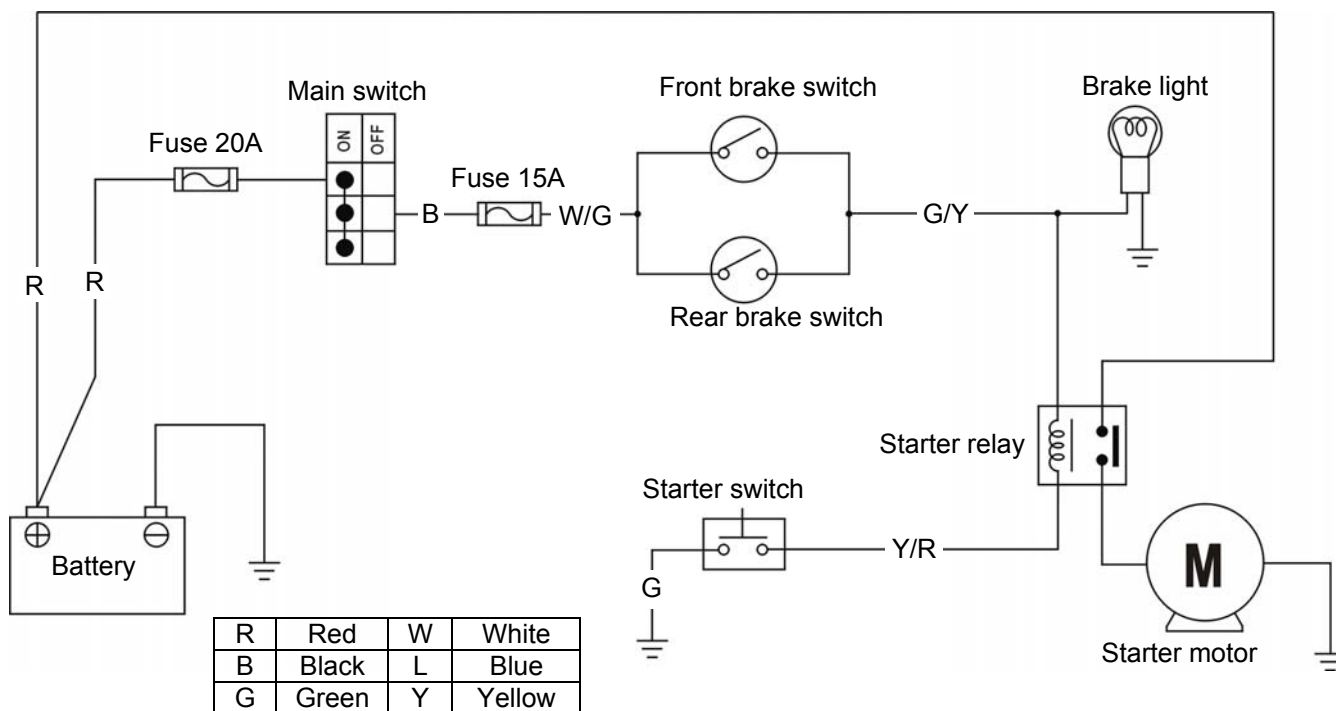




# 18. Electrical System

## Starting System

### Starting circuit

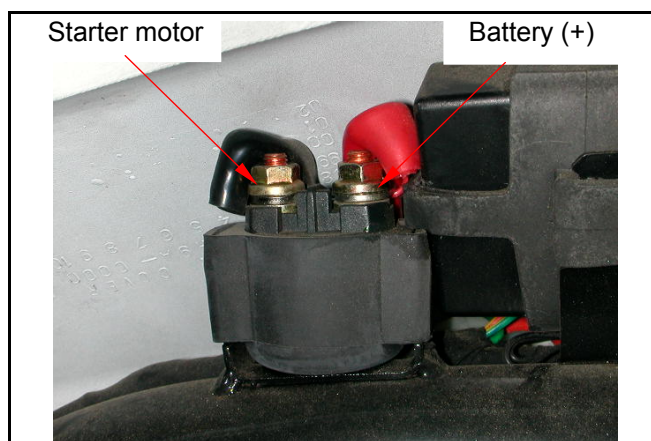


#### Starter relay inspection

- 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.

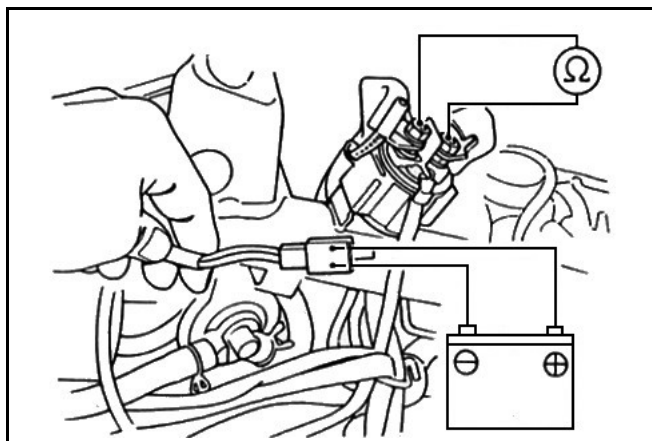


- Disconnect the cable positive terminal from the relay.
- Disconnect the positive cable of the starter motor.
- Disconnect the connector of the relay.
- Connect an ohmmeter to the large terminal end.



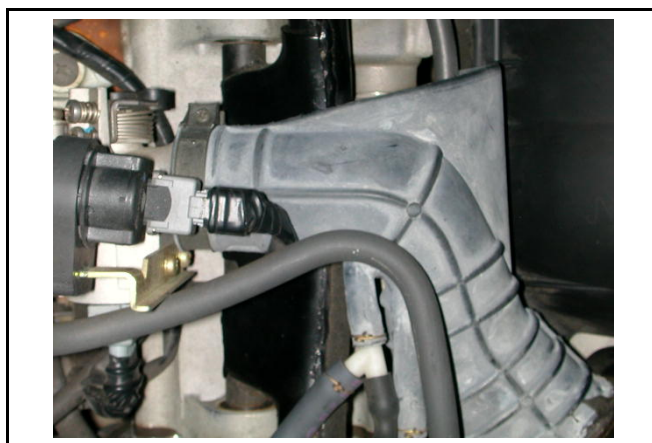


Connect the yellow/red cable to the battery positive terminal and the green/yellow cable to the battery negative terminal.  
Check the continuity of the large terminal end.  
If there is no continuity, replace the relay.



### Starter motor removal

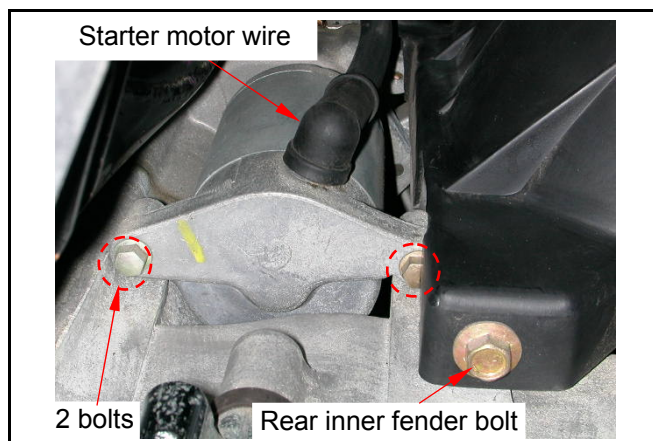
Turn off the main switch.  
Remove the luggage box.  
Disconnect the negative pole wire.  
Remove the air cleaner (2 bolts).



Remove the starter motor wire.  
Remove the rear inner fender lock bolt.  
Remove the starter motor (2 lock bolts).

### Starter motor installation

Install in the reverse order of removal.

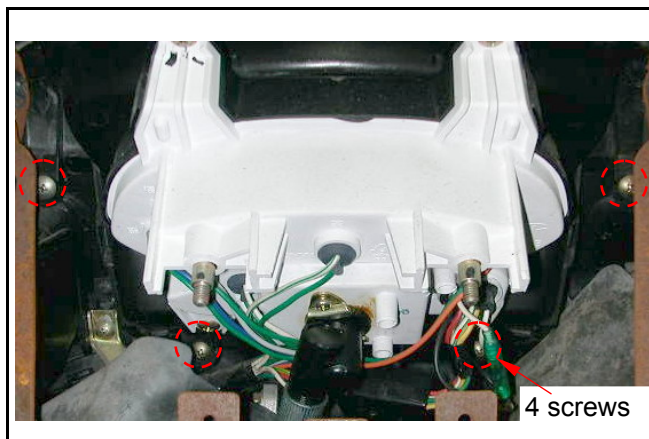


# 18. Electrical System

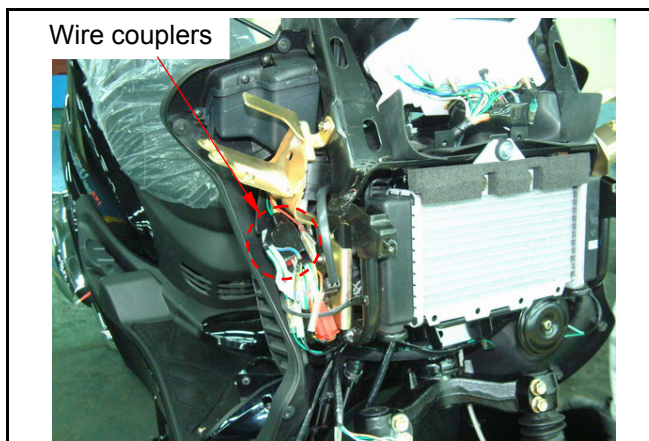
## Meter

### Removal

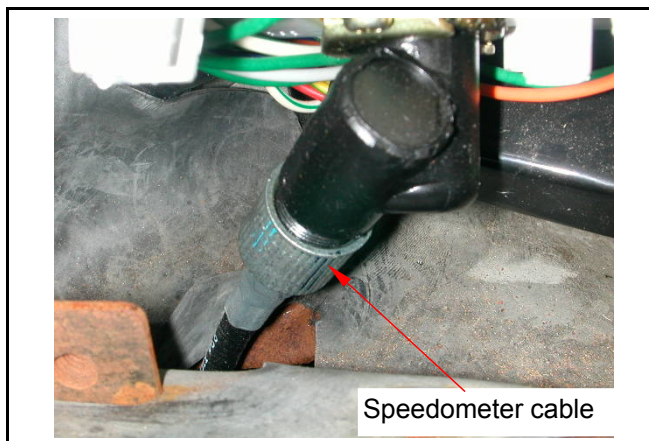
Remove the back mirror and front cover.  
Remove the meter locknuts.



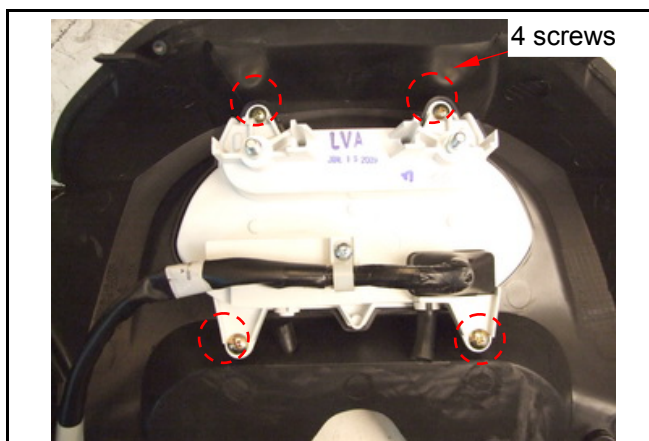
Disconnect the wire couplers.



Disconnect the speedometer cable and remove the meter.



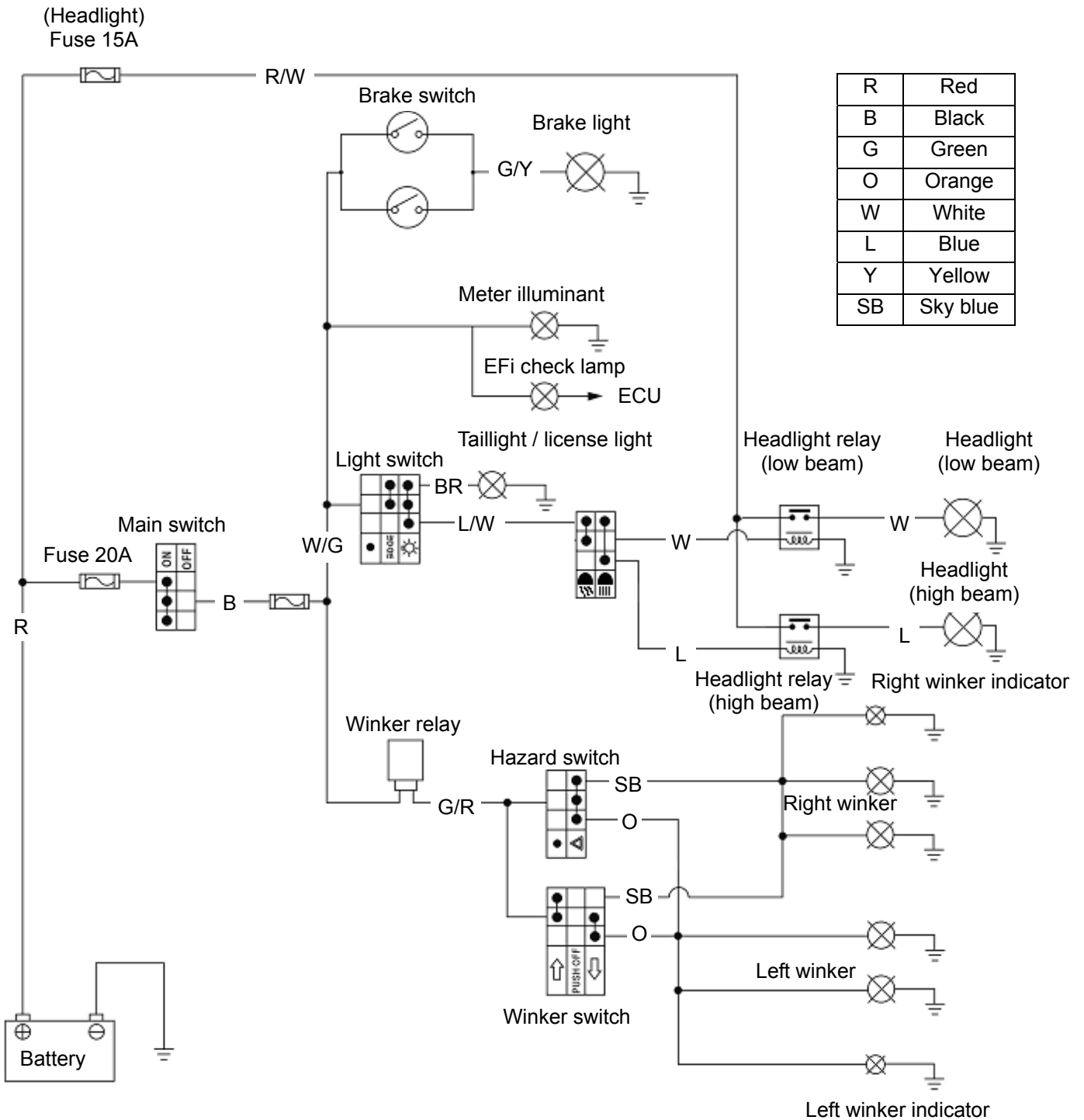
Disassemble the meter from the upper cover (4 screws).



### Installation

Install in the reverse order of removal.

## Light / Bulb Light system circuit

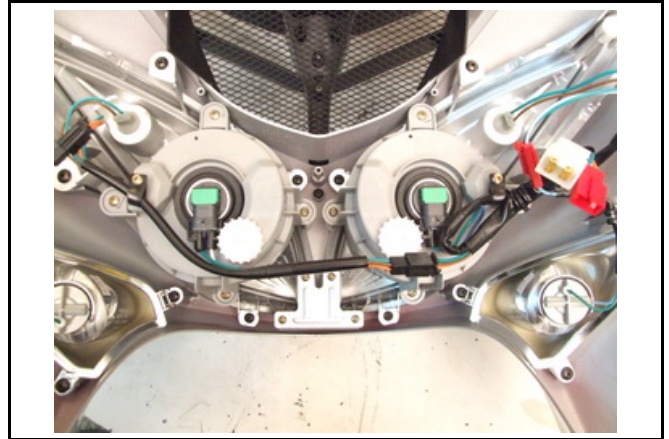




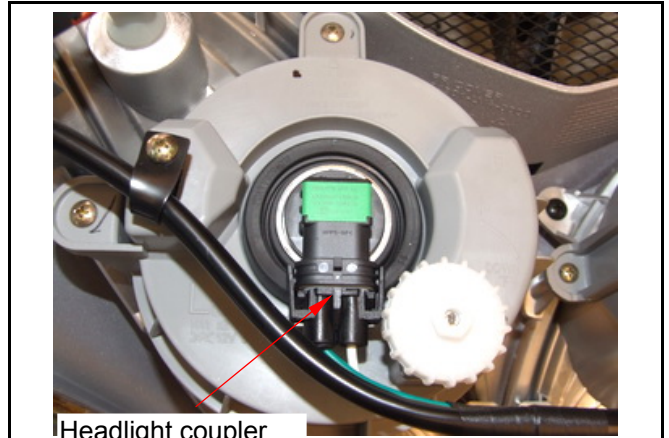
## 18. Electrical System

### Headlight bulb replacement

Remove the front cover.  
(Refer to chapter 14)



Remove the headlight coupler.



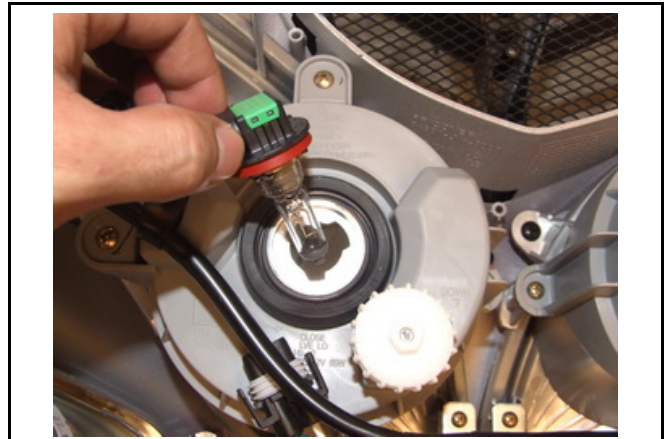
Rotate the headlight bulb and remove it.  
Replace the headlight bulb if necessary.

**Specification :**

**H11 12V 55W**

**⚠ Caution**

- Never touch the bulb with finger, which will create a heat point.
- Clean the fingerprint left on the bulb with alcohol.

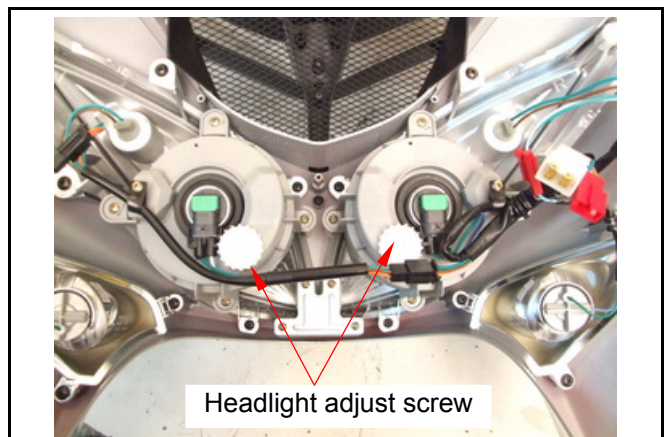


### Headlight bulb installation

Install in the reverse order of removal.

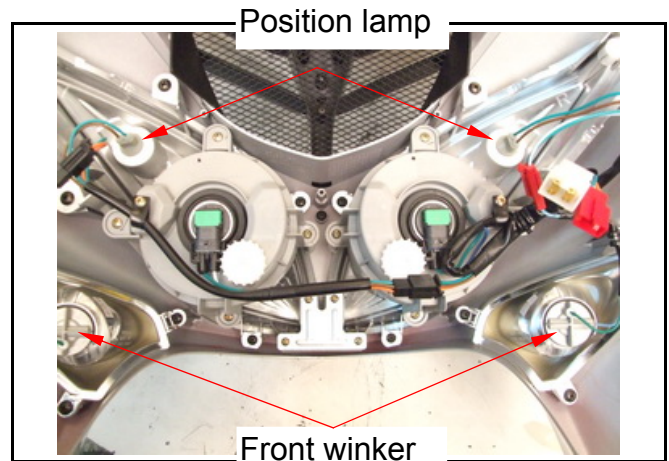
Upon completion of replacement, turn on the main switch to ensure the headlight works well.

Adjust the beam and distance of the headlight if necessary.



### Front winker / position lamp bulb replacement

Remove the front cover.  
(Refer to chapter 14)



Rotate the winker bulb and remove it.  
Replace the winker bulb if necessary.



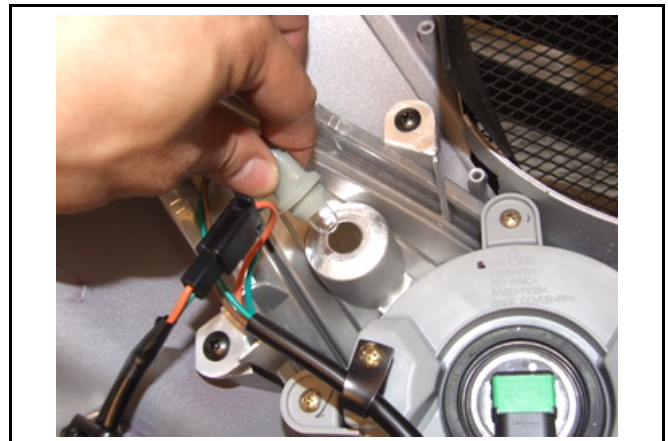
Rotate the position lamp bulb and remove it.  
Replace the position lamp bulb if necessary.

#### Specification :

Winker bulb            12V 21W  
Position lamp bulb    12V 5W

#### Installation

Install in the reverse order of removal.





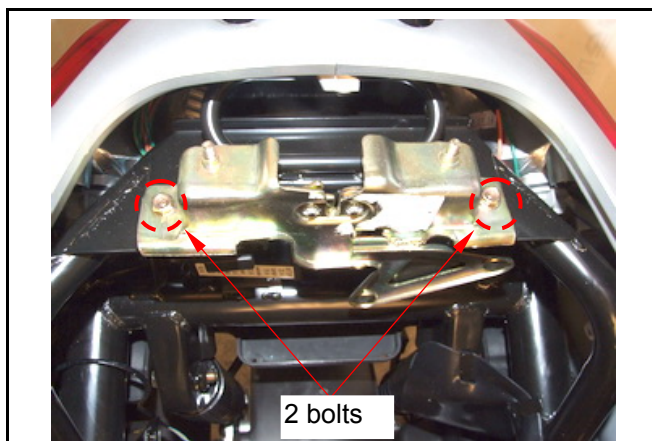
## 18. Electrical System

### Taillight / brake light / rear winker replacement

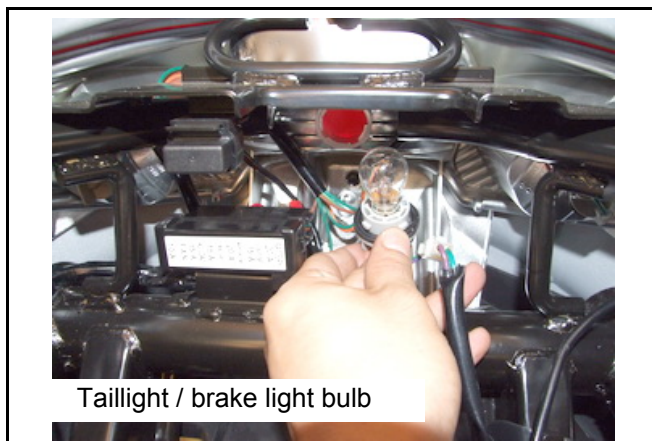
Remove the seat / luggage box.  
(Refer to chapter 14)



Remove the seat open solenoid valve assembly (2 bolts).



Rotate the brake light bulb and remove it.  
Replace the brake light bulb if necessary.



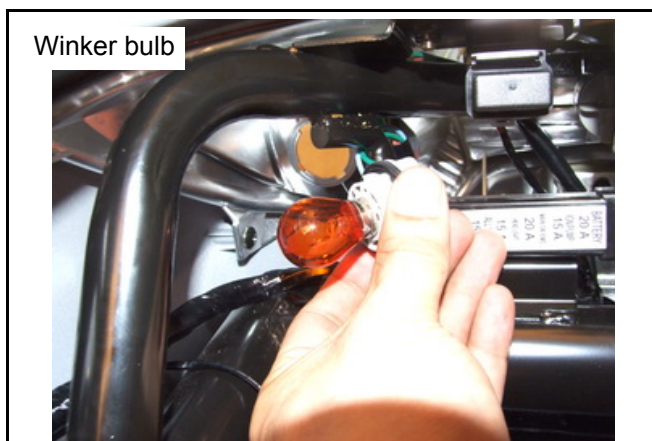
Rotate the rear winker bulb and remove it.  
Replace the winker bulb if necessary.

#### Specification :

Taillight / brake light 12V 5W / 21W  
Winker bulb 12V 21W

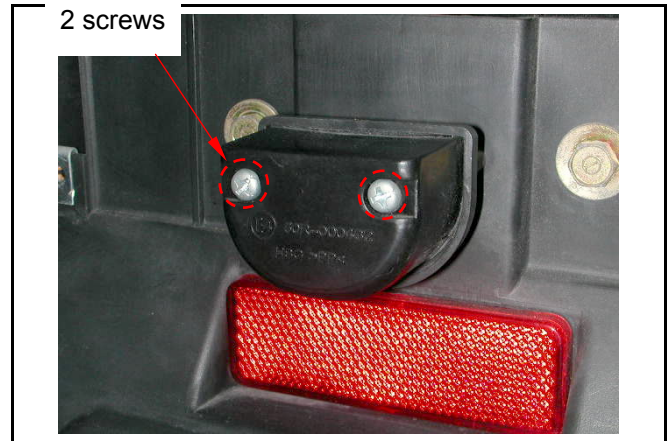
#### Installation

Install in the reverse order of removal.



## License light bulb replacement

Remove the rear center cover (4 screws).  
Remove the license light cover (2 screws).



Replace the license light bulb if necessary.

### Specification :

**License light bulb 12V 5W**



### Installation

Install in the reverse order of removal.

# 18. Electrical System

## Switch / Horn

### Main switch

#### Inspection

Remove the front cover and inner cover.  
Disconnect the main switch.  
Check the following circuit.

terminal position	BAT1	BAT2	BAT3
LOCK			
OFF			
ON	●	●	●
Wire color	Red	Black	Black

#### Replacement

Remove the front cover and inner cover.  
Disconnect the main switch coupler.  
Disconnect the seat-open cable (2 bolts).  
Remove the main switch.

### Right handlebar switch

Remove the handlebar cover and front cover.  
Disconnect the right handlebar switch coupler.  
Check the following switch circuit.

### Headlight switch

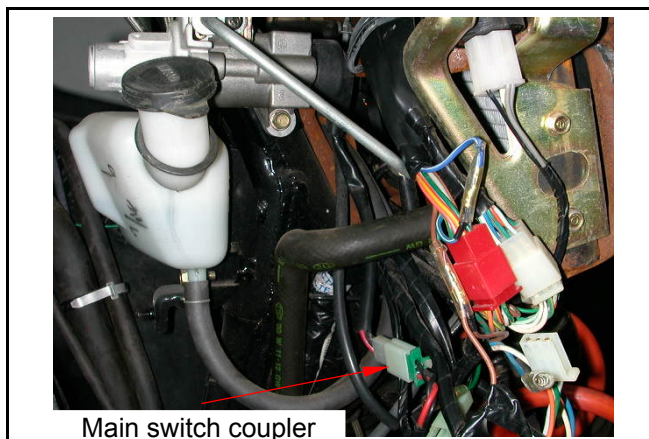
terminal position	BAT3	TL	HL
●			
	●	●	
	●	●	●
Wire color	W / G	BR	L / W

### Hazard light switch

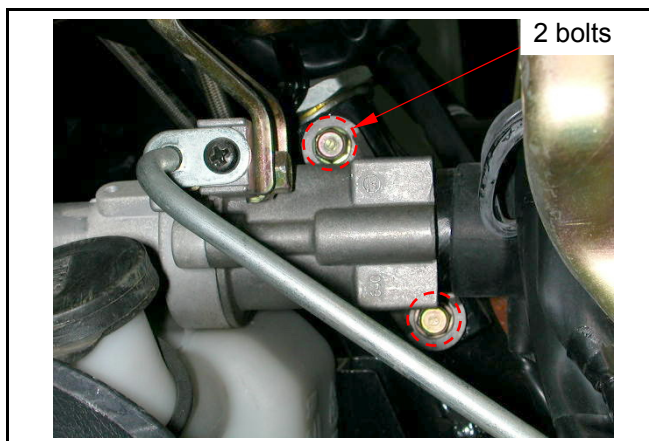
terminal position	R	W	L
●			
	●	●	●
Wire color	SB	GR	O

### Starter switch

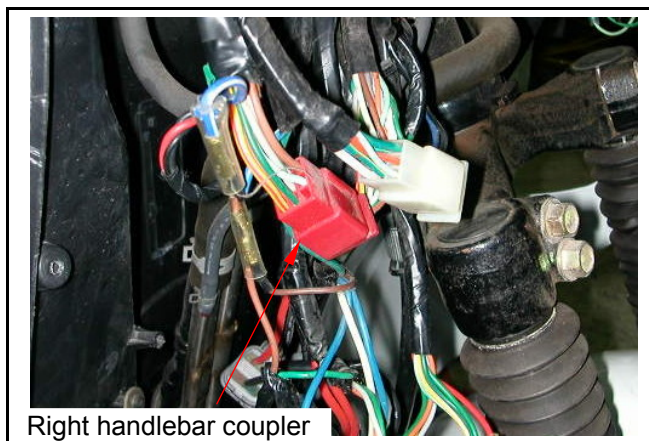
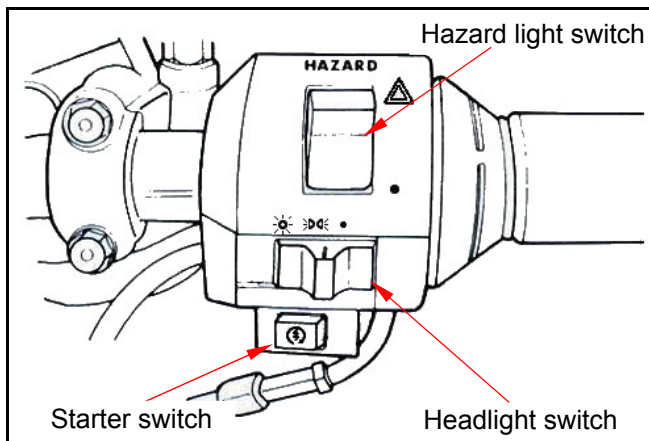
terminal position	ST	BAT2
FREE		
	●	●
Wire color	Y / R	G



Main switch coupler



2 bolts



Right handlebar coupler



## Left handlebar switch

Remove the handlebar cover and front cover. Disconnect the left handlebar switch couplers. Check the following switch circuit.

### Winker switch

terminal position	L	WR	R
		● — ●	
N	FROM R	● — ●	
	PUSH OFF		
	FROM L	● — ●	
	● — ●		
Wire color	O	GR	SB

### Horn switch

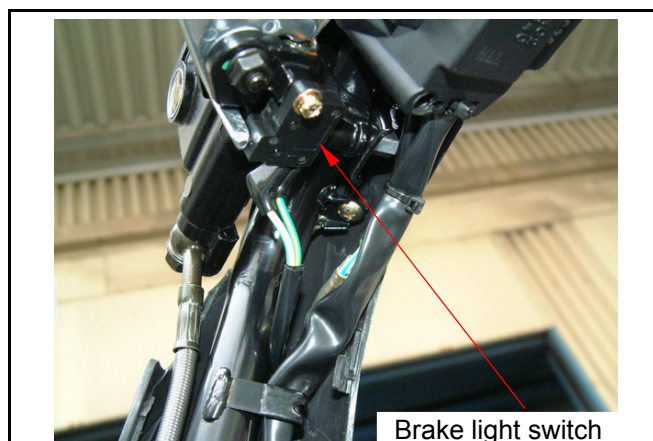
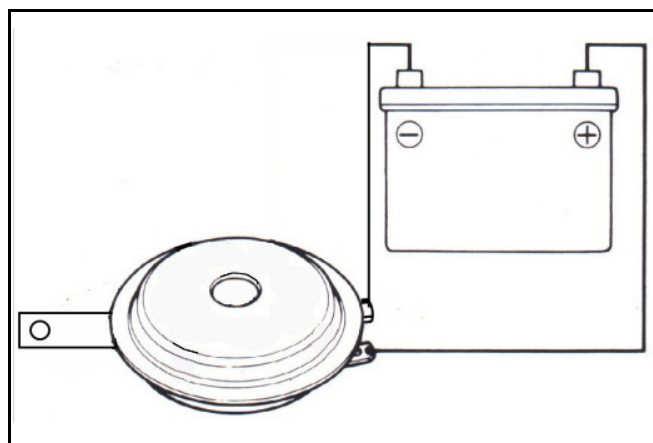
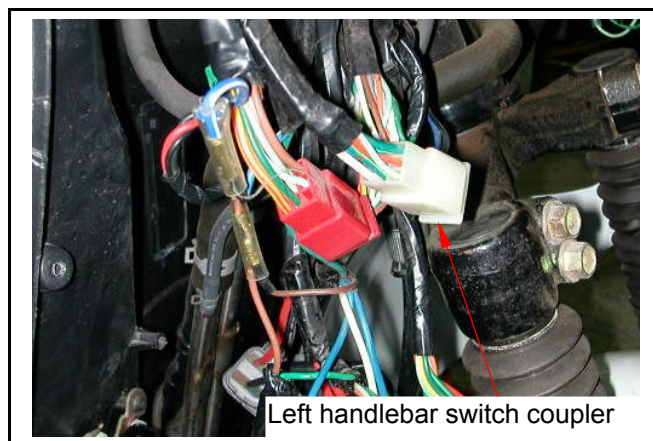
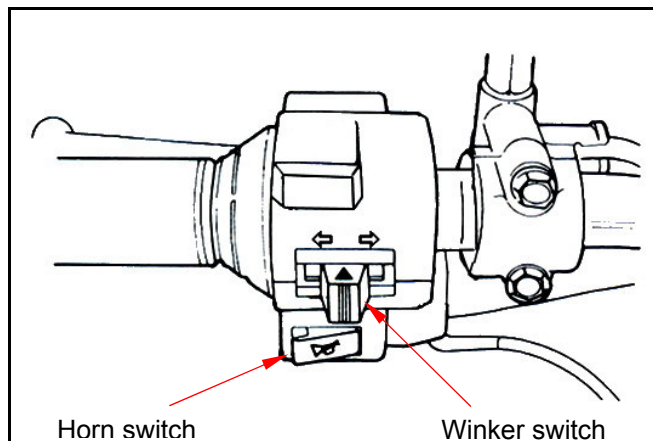
terminal position	BAT3	HO
FREE		
	● — ●	
Wire color	W / G	LG

### 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.



# 18. Electrical System

## Fuel Unit

- Open the seat.
- Remove the luggage box (bolt x 6, screw x 1).
- Remove the rear carrier (bolt x 3).
- Remove the rear carrier seat (bolt x 2).
- Remove the rear center cover (screw x 4).
- Remove the left and right rear foot rest (bolt x1).
- Remove the left and right side cover (screw x 4).
- Remove the central cover (screw x 6).
- Remove the left and right body cover, the center cover (screw x 4, bolt x 4).
- Remove the foot rest (bolt x 4, screw x 4).
- Disconnect the terminals of the fuel unit.
- Remove the fuel unit (screw x 4).

### ⚠ Caution

- Great care shall be taken not to damage or bend the float arm of the fuel unit.

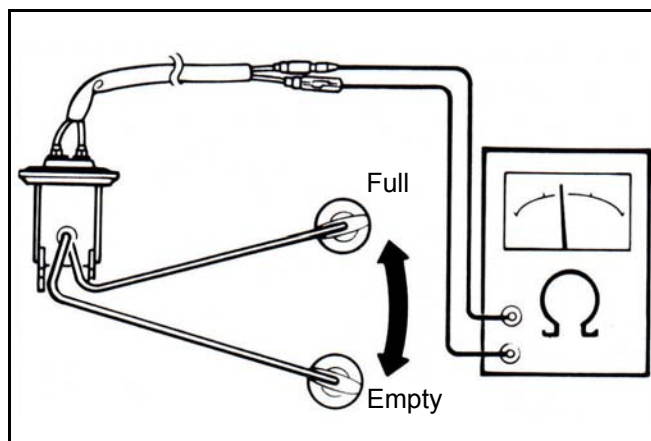
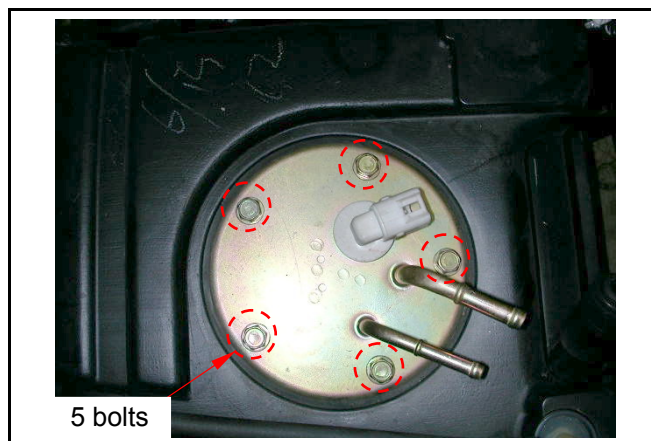
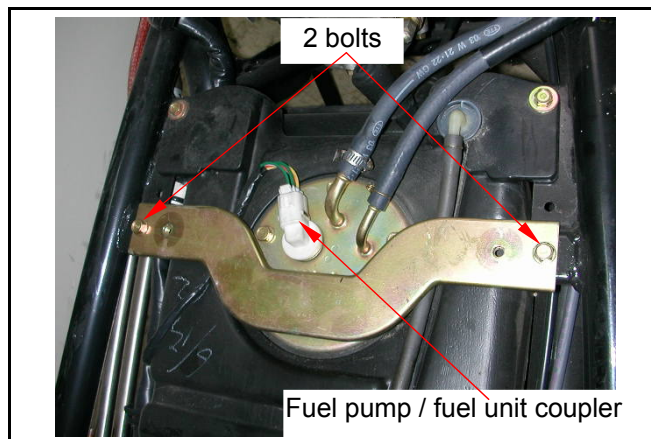
Float location	Resistance
Upper	97.5~107.5 Ω
Lower	4~10 Ω

Turn on the main switch.  
Move the fuel unit float up and down to check if the fuel gauge works properly.

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.
- 





### Thermo Switch

The thermo switch mounted on the radiator controls the operation of the cooling fan motor. In case that the fan motor fails to work, disconnect the green and black/blue leads and connect jump wires to the terminals. Turn on the switch and check if the fan motor operates.

If the fan motor fails to run, measure the battery voltage between the green and black/blue leads.

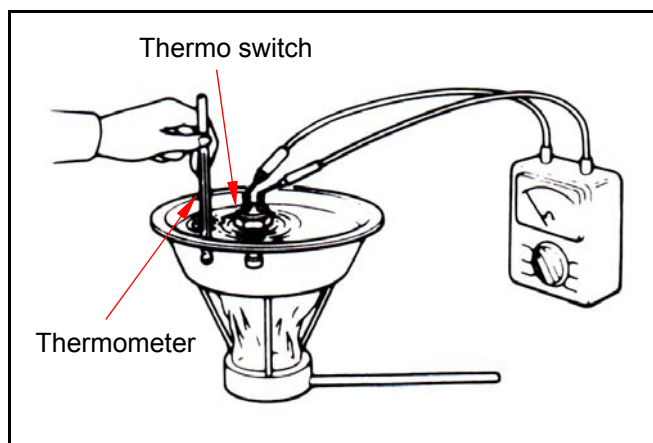
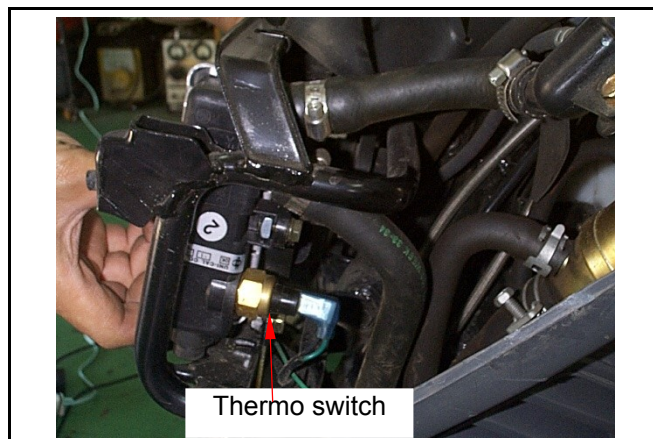
If there is no voltage, check for blown fuse, loose connection or short-circuit.

If the fan motor runs, check the thermo switch in the manner as described below:

Hang the thermo switch on the bowl filled with coolant to check the switch's opening and closing temperatures, confirm the switch is open circuited at room temperature. Increase the coolant temperature gradually. The switch should have a continuity at 98-102°C.

#### Caution

- Keep the coolant at a constant temperature at least for three minutes. Sudden increase the coolant temperature will cause the thermometer and the thermo switch to indicate wrong readings.
- Never let the thermometer and the thermo switch contact the wall of the bowl, which may result in wrong readings.
- The thermo switch shall be placed in the coolant until the teeth are completely submerged.



## 18. Electrical System

### Thermo Unit

Remove the thermo unit.

Hang the thermo unit in an oil heater, heat the oil and measure the resistance at each temperature.

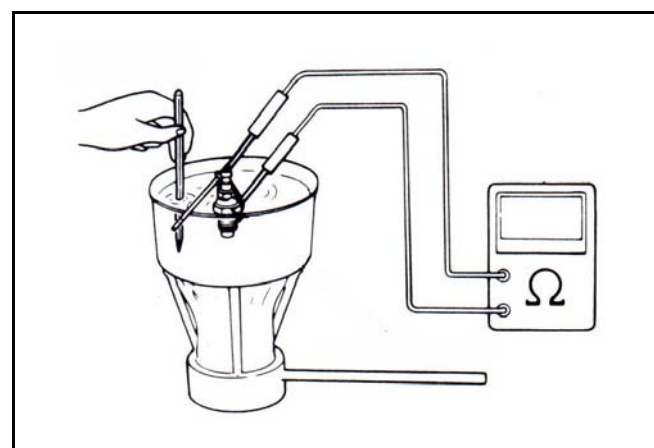
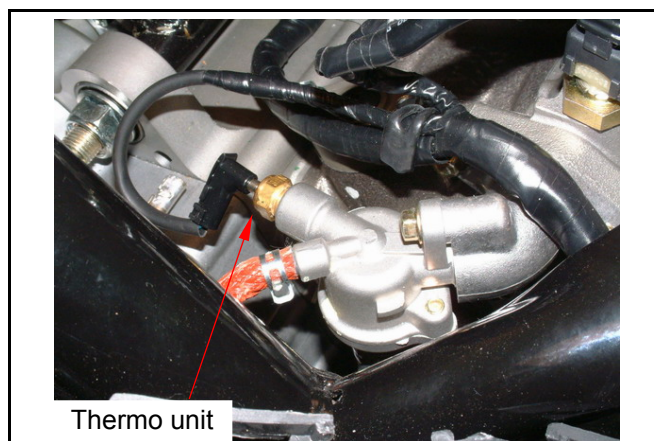
Temperature	50°C	80°C	100°C	120°C
Resistance ( $\Omega$ )	134~149	47.5~57.0	26~29	14.8~17.2

#### Caution

- Wear gloves and goggles when performing this test.

#### Caution

- Engine oil should be used as a heating medium as the test temperature must be higher than 100°C.
- Contacting the container wall by the thermometer and the sensor may result in wrong readings.



### Thermo Gauge

Disconnect the thermo unit coupler and connect it to engine ground.

Turn on the main switch.

The needle of the thermo gauge should move to other end, H position.

#### Caution

- Do not ground the thermo gauge more than 5 seconds, or the meter will be damaged.

Special tools list.....	19-1	Crank case / transmission oil seal driver.....	19-8
How to use special tools .....	19-5	AC.G. flywheel puller.....	19-9
R/L. Crank case disassemble / install tools .....	19-5	Valve cotter remover / install driver ...	19-9
Bearing driver .....	19-6	Outer / inner bearing puller.....	19-10
Water pump bearing / seal driver .....	19-7	Crank case bush puller .....	19-11

**SPECIAL TOOLS LIST**

<b>1</b>		<b>2</b>		<b>3</b>	
<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
<b>4</b>		<b>5</b>		<b>6</b>	
<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
<b>7</b>		<b>8</b>		<b>9</b>	
<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

## 19. SPECIAL TOOLS

<b>10</b>		<b>11</b>		<b>12</b>	
					
<b>NAME</b>	WATER PUMP MECHANICL 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
<b>13</b>		<b>14</b>		<b>15</b>	
					
<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
<b>16</b>		<b>17</b>		<b>18</b>	
					
<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



<b>19</b>		<b>20</b>		<b>21</b>	
					
<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
<b>22</b>		<b>23</b>		<b>24</b>	
		 <p style="text-align: center;">( φ 30mm)</p>		 <p style="text-align: center;">( φ 22mm)</p>	
<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
<b>25</b>		<b>26</b>			
					
<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		



# 19. SPECIAL TOOLS



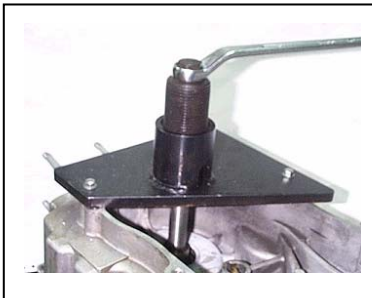
					
<b>NAME</b>	Vacuum pressure gauge	<b>NAME</b>	Fuel pressure gauge	<b>NAME</b>	Multi-meter
<b>MO.</b>	SYM-HT07011	<b>MO.</b>	SYM-HT07010	<b>MO.</b>	SYM-HE07007-01
					
<b>NAME</b>	Cylinder pressure gauge	<b>NAME</b>	Vehicle circuit test tool kit	<b>NAME</b>	Vehicle circuit test harness kit
<b>MO.</b>	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

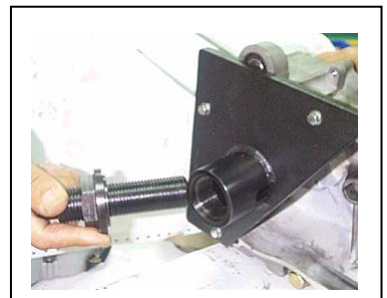
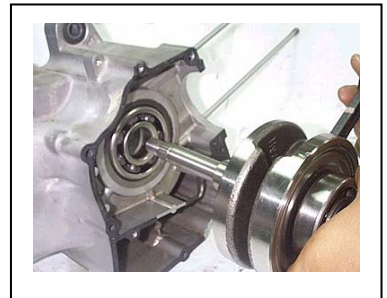
Disassemble the crankcase



Install the left crank case bearing

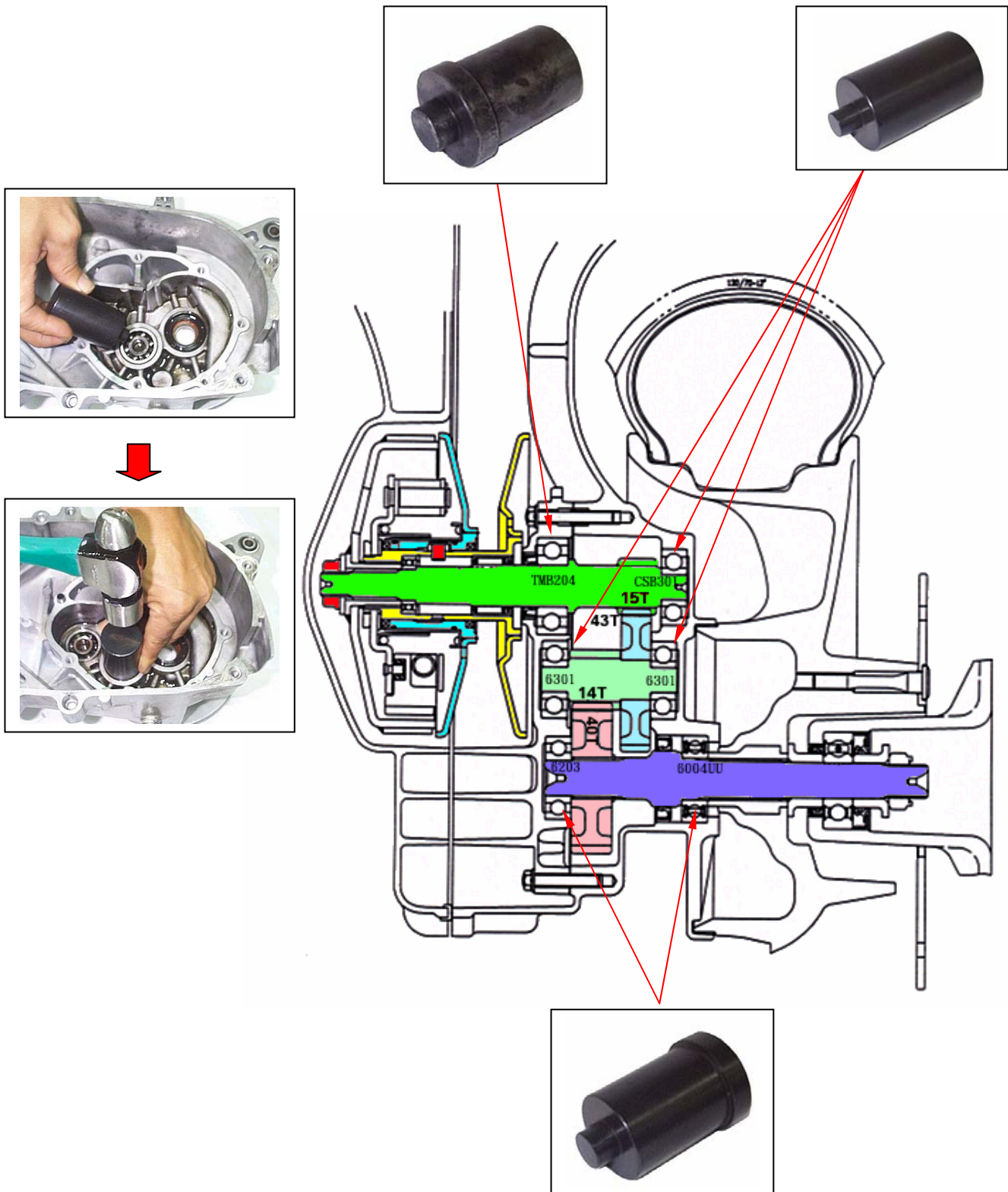


Install the crankshaft



# 19. SPECIAL TOOLS

## BEARING DRIVER

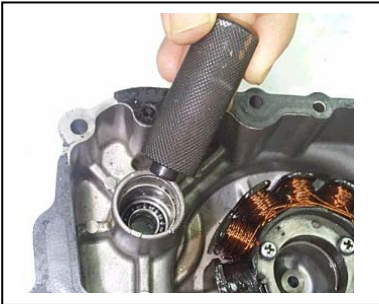






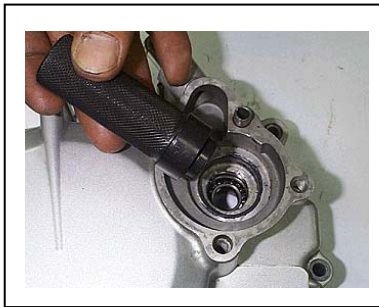
**WATER PUMP BEARING DRIVER**

**BEARING (6901)**

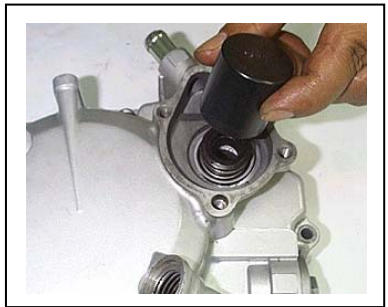
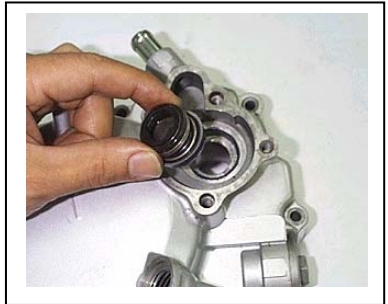


**WATER PUMP OIL SEAL DRIVER**

**INNER OIL SEAL**



**MECHANICAL SEAL**





# 19. SPECIAL TOOLS



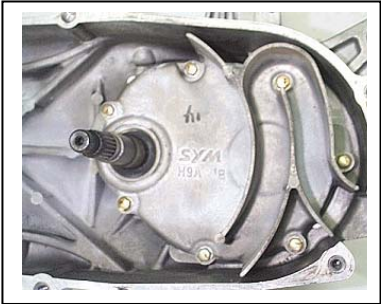
(Seal from transmission side install)

## CRANK CASE / TRANSMISSION OIL SEAL DRIVER

OIL SEAL (25\*40\*8)



OIL SEAL (20\*32\*6)



OIL SEAL (25\*42\*7)





AC.G. FLYWHEEL PULLER



VALVE COTTER REMOVE /  
INSTALL DRIVER



# 19. SPECIAL TOOLS



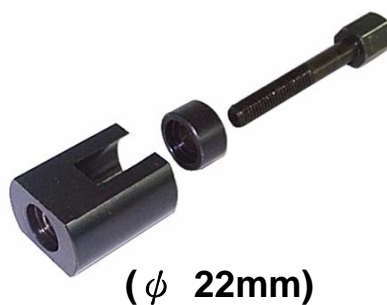
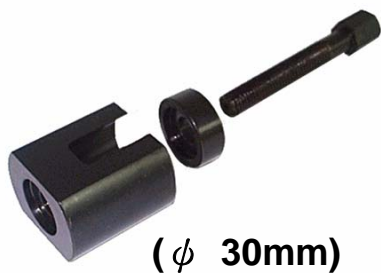
**OUTER BEARING PULLER**



**INNER BEARING PULLER**







CRANK CASE BUSH PULLER / DRIVER

REMOVER

INSTALL

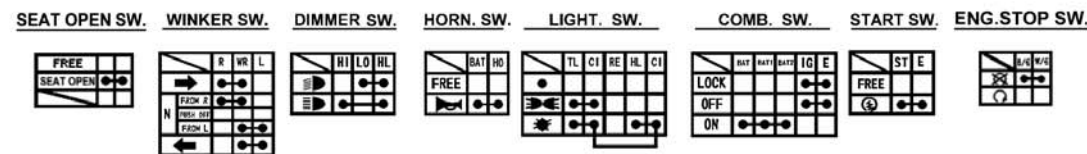
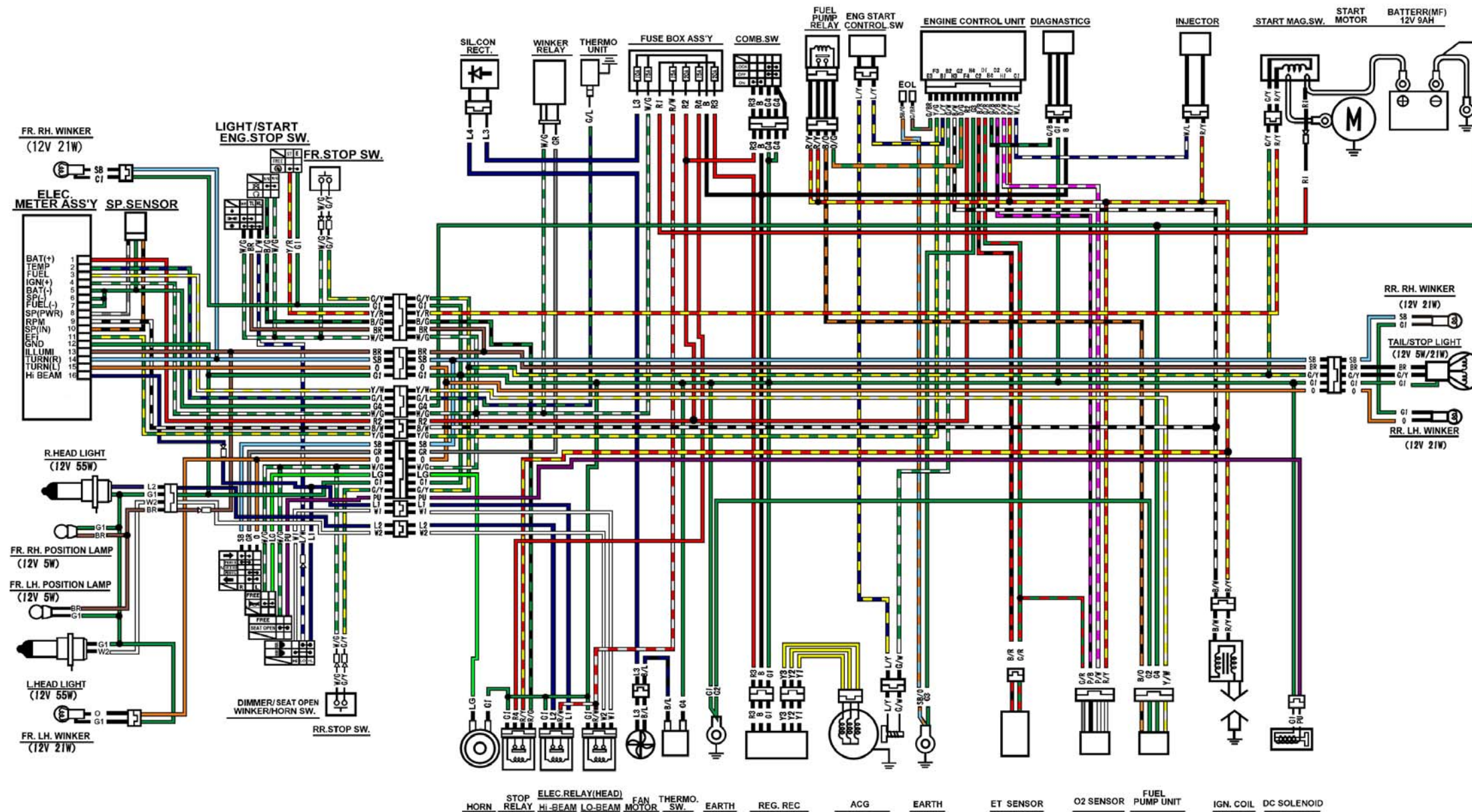




## 19. SPECIAL TOOLS

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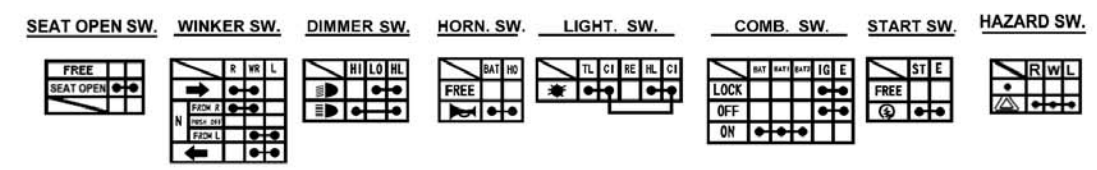
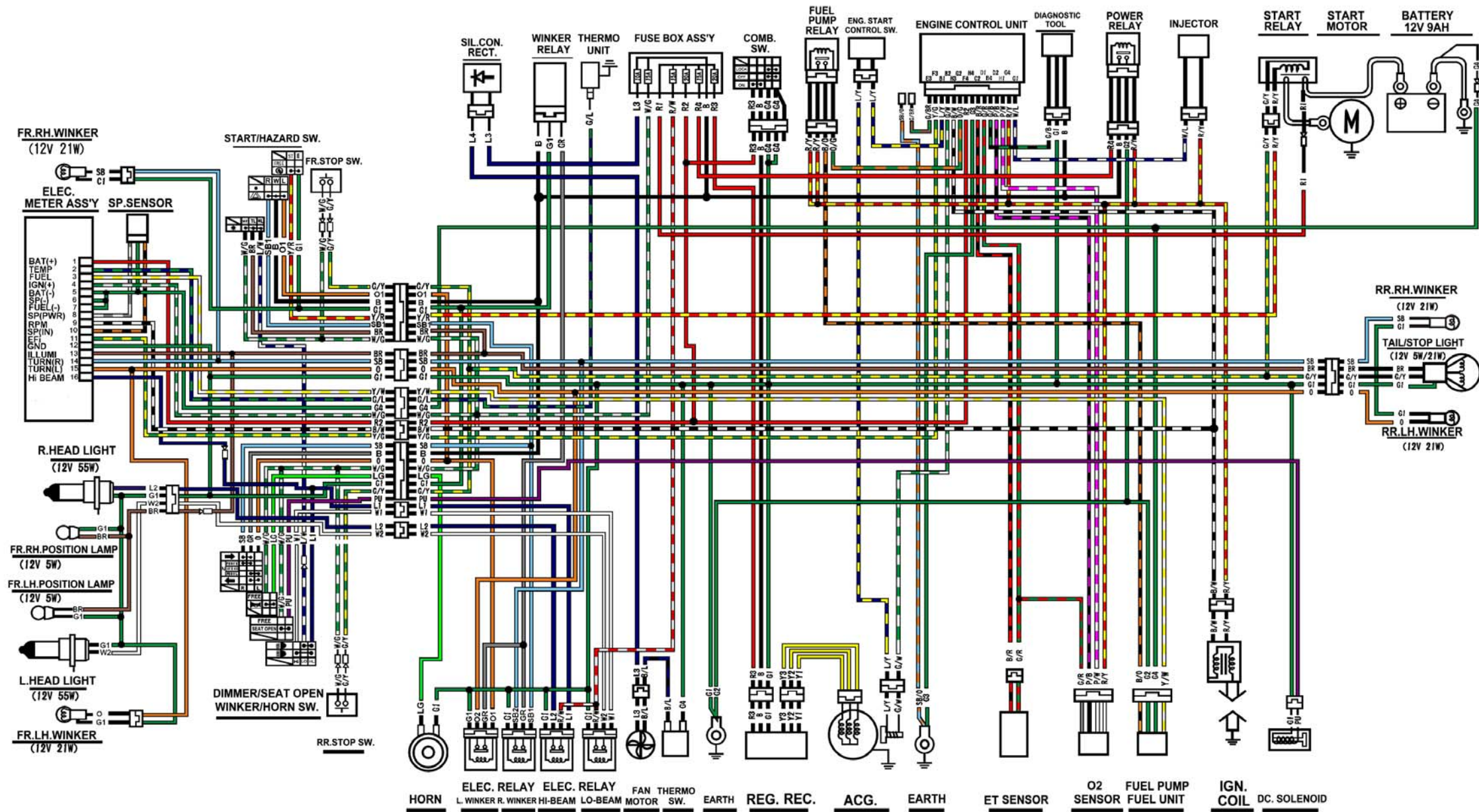
**NOTE:**

**EFi Model Joyride 200i / Super Joyride 200i / Joyride 200i EVO**


B	BLACK
Y	YELLOW
L	BLUE
G	GREEN
R	RED
W	WHITE
BR	BROWN
O	ORANGE
SB	SKY BLUE
LG	LIGHT GREEN
P	PINK
GR	GRAY
PU	PURPLE



Efi Model X Pro RV125 / 200 EFi



B	BLACK
Y	YELLOW
L	BLUE
G	GREEN
R	RED
W	WHITE
BR	BROWN
O	ORANGE
SB	SKY BLUE
LG	LIGHT GREEN
P	PINK
GR	GRAY
PU	PURPLE