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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.

<b>⚠</b> Warning	Means that serious injury or even death may result if procedures are not followed.
<b>⚠</b> Caution	Means that equipment damages may result if procedures are not followed.
Engine oil	Limits to use SAE 10W-30 API SH/CD class oil. Warranty will not cover the damage that caused by not apply with the limited engine oil.
Gear oil	Limits to use SAE 85W-140 class oil. Warranty will not cover the damage that caused by not apply with the limited gear oil.
GREASE Grease	King Mate G-3 is recommended.
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 Brake fluid	Use recommended brake fluid DOT3 or WELLRUN brake fluid.
Special tools	Special service tools.
Correct	Meaning correct installation.
× Wrong	Meaning wrong installation.
──► Indication	Indication of components.
Directions	Indicates position and operation directions.
	Components assembly directions each other.
	Indicates where the bolt installation direction, means that bolt cross through the component (invisibility).

### **GENERAL SAFETY**

### Carbon monoxide

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



# 

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

# Hot components



### Caution

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

### **Battery**



### ⚠ Caution

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

#### Brake shoe

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



## Caution

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

### **Brake fluid**

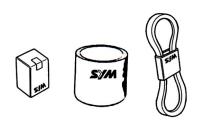


# ⚠ Caution

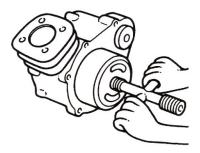
Spilling brake fluid on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the above-mentioned parts for protection when servicing the brake system. Keep brake fluid beyond reach of children.

### SERVICE PRECAUTIONS

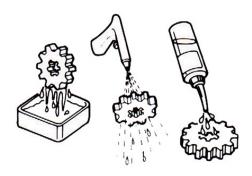
 Always use with SANYANG genuine parts and recommended oils. Using non-designed parts for SANYANG motorcycle may damage the motorcycle.



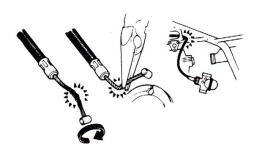
 Special tools are designed for remove and install of components without damaging the parts being worked on. Using wrong tools may result in parts damaged.



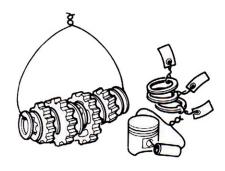
- When servicing this motorcycle, use only metric tools. Metric bolts, nuts, and screws are not interchangeable with the English system, using wrong tools and fasteners may damage this vehicle.
- Clean the outside of the parts or the cover before removing it from the motorcycle.
   Otherwise, dirt and 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.



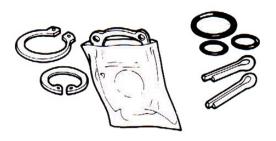
 Never bend or twist a control cable to prevent stiff control and premature worn out.



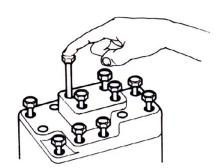
- Rubber parts may become deteriorated when old, and prone to be damaged by solvent and oil. Check these parts before installation to make sure that they are in good condition, replace if necessary.
- When loosening a component which has different sized fasteners, operate with a diagonal pattern and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



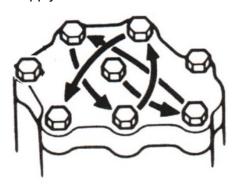
- Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).
- Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap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



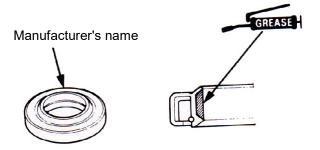
 The length of bolts and screws for assemblies, cover plates or boxes is different from one another, be sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length out side the hole is the same with other bolts, it is a correct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



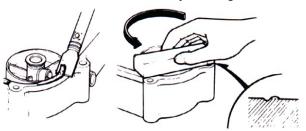
- Tighten assemblies with different dimension fasteners as follows:
- Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless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



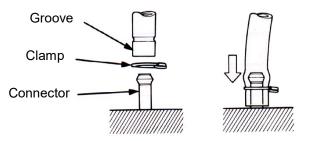
 When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.



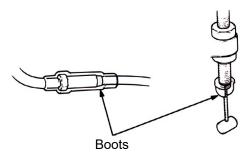
 Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any damage.



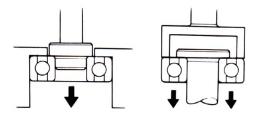
 The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.



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

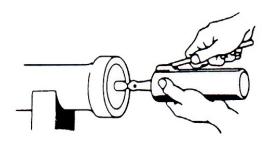


 The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both races.

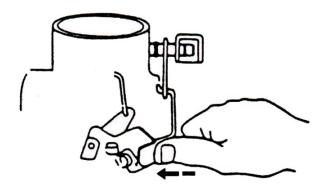


Both of these examples can result in bearing damage.

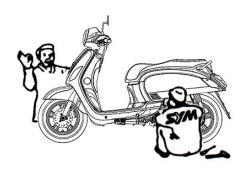
 Lubricate the rotation face with specified lubricant on the lubrication points before assembling.



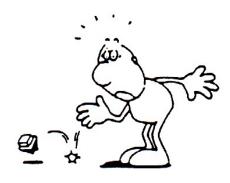
 Check if positions and operation for installed parts is in correct and properly.



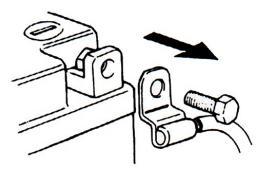
 Make sure service safety each other when conducting by two persons.



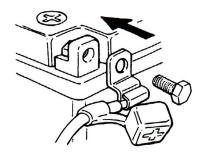
Note that do not let parts fall down



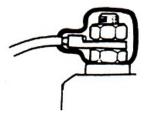
 Before battery removal operation, it has to remove the battery negative (-) cable firstly.
 Notre tools like open-end wrench do not contact with body to prevent from circuit short and create spark.



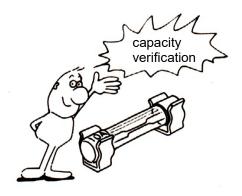
 After service completed, make sure all connection points is secured. Battery positive (+) cable should be connected firstly. And the two posts of battery have to be greased after connected the cables.



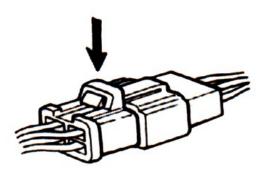
 Make sure that the battery post caps are located in properly after the battery posts had been serviced.



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



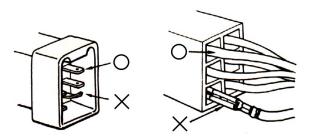
 When separating a connector, it locker has to be unlocked firstly. Then, conduct the service operation.



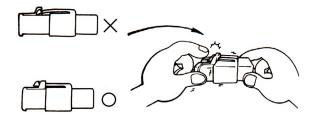
 Do not pull the wires as removing a connector or wires. Hold the connector body.



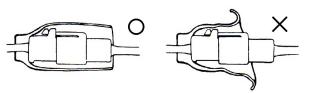
• Make sure if the connector pins are bent, extruded or loosen.



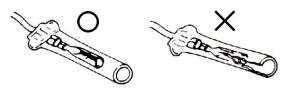
 Insert the connector completely. If there are two lockers on two connector sides, make sure the lockers are locked in properly. Check if any wire loose.



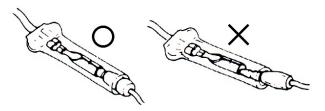
 Check if the connector is covered by the twin connector boot completely and secured properly.



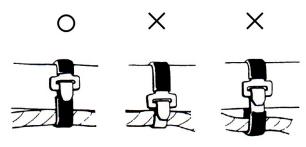
• Before terminal connection, check if the boot is crack or the terminal is loose.



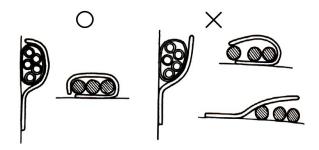
 Insert the terminal completely. Check if the terminal is covered by the boot. Do not let boot open facing up.



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



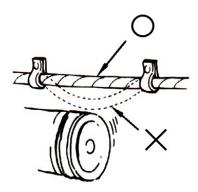
 Wire band and wire harness have to be clamped secured properly.



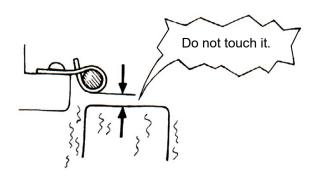
Do not squeeze wires against the weld or its clamp.



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



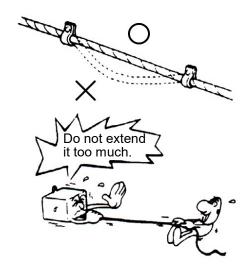
Keep wire harnesses far away from the hot parts.



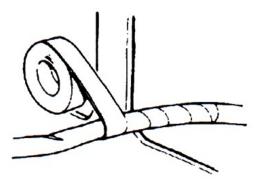
 Route wire harness to avoid sharp edges or corners and also avoid the projected ends of bolts and screws.



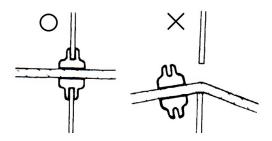
 Route harnesses so that they neither pull too tight nor have excessive slack.



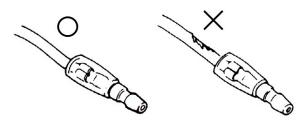
 Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.



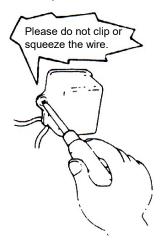
 Secure the rubber boot firmly as applying it on wire harness.



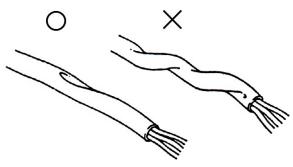
 Never use wires or harnesses which insulation has been broken. Wrap electrical tape around the damaged parts or replace them.



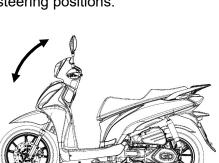
 Never clamp or squeeze the wire harness as installing other components.



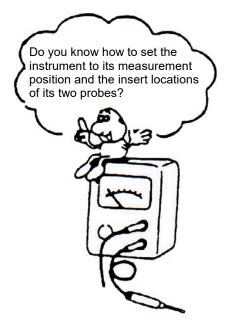
• Do not let the wire harness been twisted as installation.



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



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



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



# **SPECIFICATIONS**

	MAKER		SANYANG		MODEL		EL	XL20W1-EU/IT
z	С	overall Length	2070 mm	Suspen sion System			Front	Telescope fork
OISN	(	Overall Width	735mm				Rear	Double
DIMENSION	C	Overall Height	1190 mm	Tire	cations		Front	110/70-16
	,	Wheel Base	1385 mm	T Spe	cati		Rear	120/80-14
	ight	Front	51 kg		E		Front	Disk (ø 260 mm)
	Curb Weight	Rear	77 kg	Brake	yster		FIOIIL	טופע (ש 200 וווווו)
   <u>+</u>	Cur	Total	128 kg		S		Rear	Disk (ø 220 mm)
WEIGHT		Passengers/ Weight	Two men/150kg	Performa nce		Max.	Speed	99 km/hr
<b> </b>	ight	Front	85kg	Perfe		Climb Ability		32.5 %solp
	Total Weight	Rear	193kg	_		nary	Reduction	Belt,0.907~1.584
	Tota	Total	278g	ration		Secondary Reduction		GEAR
	Туре		4-STROKE ENGINE	Deceleration equipment		Clutch		
	Installation and arrangement		Vertical, below center, incline 80°			Trans	smission	C.V.T
İ	Fuel Used		Unleaded		Spe	edo	meter	0 ~ 199km/hr
	Cycle/Cooling		4-stroke/forced air cooled	Horn		n	87~112 dB/A	
	Bore		61 mm		Muffler		ler	Expansion & Pulse Type
	Cylinder	Stroke	57.8 mm	Exh			e Position ection	Right side, and Backward
  ш	Ó	Number/Arrang ement	Single Cylinder	Lu	bric	ation	System	Forced circulation & splashing
ENGINE		Displacement	169cc	1	haus		CO g/km	<1.0 g/km
	Compression Ratio		10.3±0.2 : 1	Emission HC g		HC g/km	<0.1 g/km	
	Idle speed		1800 rpm	F	uel t	ank (	capacity	7.0L±0.2L
	Max. HP		9 kw/7500rpm	Air Filtration		ation	Paper filter	
	Max. Torque		12.5N.m /6000 rpm	Noise Emission		nission	<74 dB(A)	
		Ignition	Transistorized coil ignition	Fuse		е	10A*1&15A*3&20A*1&25 A*1	
	St	tarting System	Electrical		Sp	ark	Plug	CR7HSA

TORQUE VALUES (ENGINE)

ITEM	Q'TY	THREAD DIA (mm)	TORQUE VALUE(Kg-m)	REMARKS
Cylinder head bolts	2	6	0.8~1.2	
Cylinder head left side cover bolts	2	6	0.8~1.2	
Cylinder head nuts	4	8	0.8~1.2	Apply oil to thread
Tappet adjust hole cap	2	30	1.0~2.0	
Cylinder/cylinder head two-ends bolts	4	6	0.7~1.1	Tighten to crankcase
Camshaft sprocket bolt	1	8	2.0~2.4	
Right crank case cover bolts	10	6	0.8~1.2	
Pulse generator bolts	2	5	0.35~0.5	
Valve adjustment fixing nuts	2	5	0.7~1.1	Apply oil to thread
Spark plug	1	10	1.0~1.4	
Engine oil filter screen cap	1	30	1.0~2.0	
Engine oil drain plug bolt	1	12	3.5~4.5	
Gear oil draining plug	1	8	1.0~1.5	
Gear oil filling bolt	1	8	1.0~1.5	
Oil pump flat screw	2	6	0.8~1.2	
Left crankcase cover bolts	10	6	0.8~1.2	
Camshaft chain tensioner pivot	1	6	0.8~1.2	Hex socket bolt
Camshaft chain adjuster bolts	2	6	1.0~1.4	
Cooling fan bolts	4	6	0.8~1.2	
Cooling fan cover bolt	2	6	0.7~1.1	
RR. brake shoe anchor fixing nut	1	8	1.5~2.0	
Shroud A/B	2	6	0.8~1.2	
Start clutch lock nut	1	20	9.0~10	
Flywheel nut	1	10	3.5~4.5	
Transmission(Gear box) bolts	7	8	2.6~3.0	
Movable drive face nut	1	12	5.0~6.0	
Drive pulley nut	1	10	3.5~4.5	
A.C. generator flange bolt	2	6	0.8~1.2	
Start motor bolts	2	6	0.8~1.2	
Crankcase bolts	1	6	0.8~1.2	
Air/C connect bracket bolts	2	6	0.8~1.2	
Kick starter arm bolt	1	6	0.8~1.2	
Carburetor nut	2	6	0.8~1.2	
Exhaust pipe bolts	2	8	3.0~3.6	
Exhaust pipe connecting nuts	2	6	1.0~1.4	

# **TORQUE VALUES (FRAME)**

ITEM	Q'TY	THREAD DIA (mm)	TORQUE VALUE(Kg-m)	REMARKS
Mounting Hex socket bolt for steering handlebar	4	10	4.0~5.0	
Mounting nut for steering rod	1	25.4	1.0~2.0	
Cone seat for steering rod	1	25.4	0.2~0.3	
Front wheel shaft nut	1	12	5.0~7.0	
Rear wheel shaft nut	1	16	11.0~13.0	
Wheel hub/rim mounting nuts	8	8	2.8~3.2	
Speedometer cable locking screw	1	5	0.15~0.3	
Front shock absorber mounting bolts	4	8	2.4~3.0	
Rear shock absorber upper connection bolt	1	10	3.5~4.5	
Rear shock absorber lower connection bolt	1	8	2.4~3.0	
Brake lever bolts	2	6	0.8~1.2	
Front brake hose bolts	2	10	3.3~3.7	
Front brake air-bleeding valve	1	6	0.8~1.0	
Front brake disc mounting bolts	4	10	4.0~4.5	
Front brake clipper mounting bolts	2	10	3.1~3.5	
Drum brake arm bolts (front/rear)	2	6	0.8~1.2	
Engine suspension bracket bolts	2	10	4.5~5.5	On frame side
Engine connection bolt	1	10	4.5~5.5	On engine side
Main standard nut	1	10	3.5~4.5	
Foot-starting lever bolt	1	6	1.6~1.8	
Air cleaner bolts	2	6	1.0~1.4	

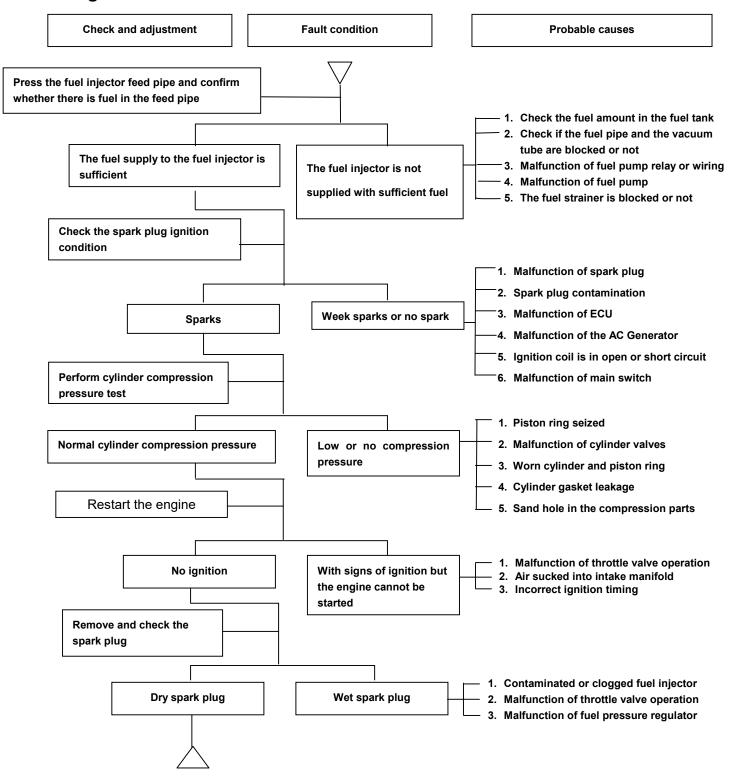
The torque values listed in above table are for more important tighten torque values. Please see standard values for not listed in the table.

### **Standard Torque Values for Reference**

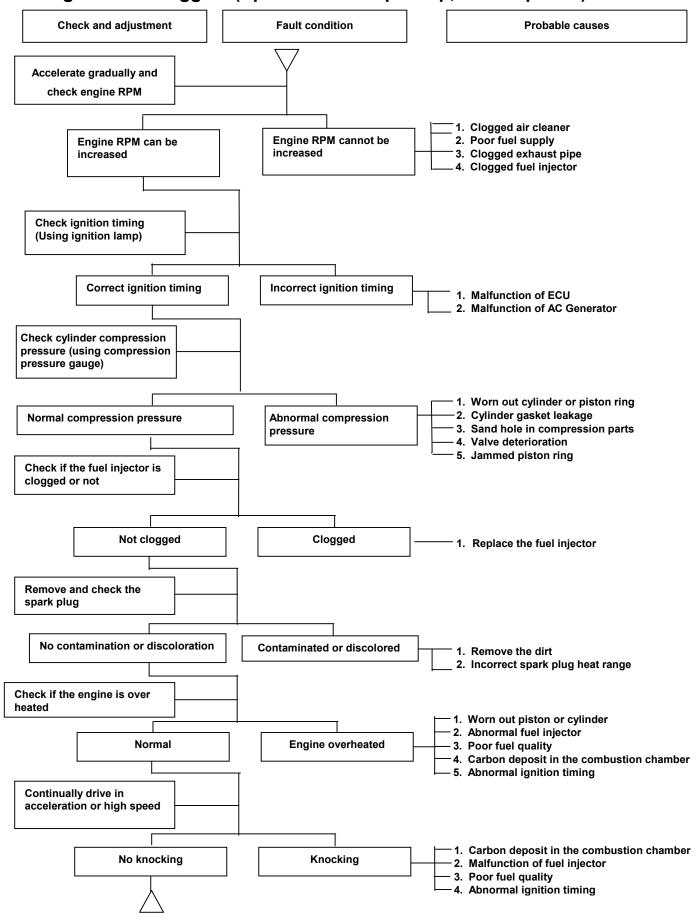
TYPE	TIGHTEN TORQUE	TYPE	TIGHTEN TORQUE
5mm bolt、nut	0.45~0.60kgf-m	3mm screw	0.05~0.08kgf-m
6mm bolt、nut	0.80~1.20kgf-m	4mm screw	0.10~0.15kgf-m
8mm bolt、nut	1.80~2.50kgf-m	5mm screw	0.35~0.50kgf-m
10mm bolt、nut	3.00~4.00kgf-m	6mm screw、SH nut	0.70~1.10kgf-m
12mm bolt、nut	5.00~6.00kgf-m	6mm bolt、nut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

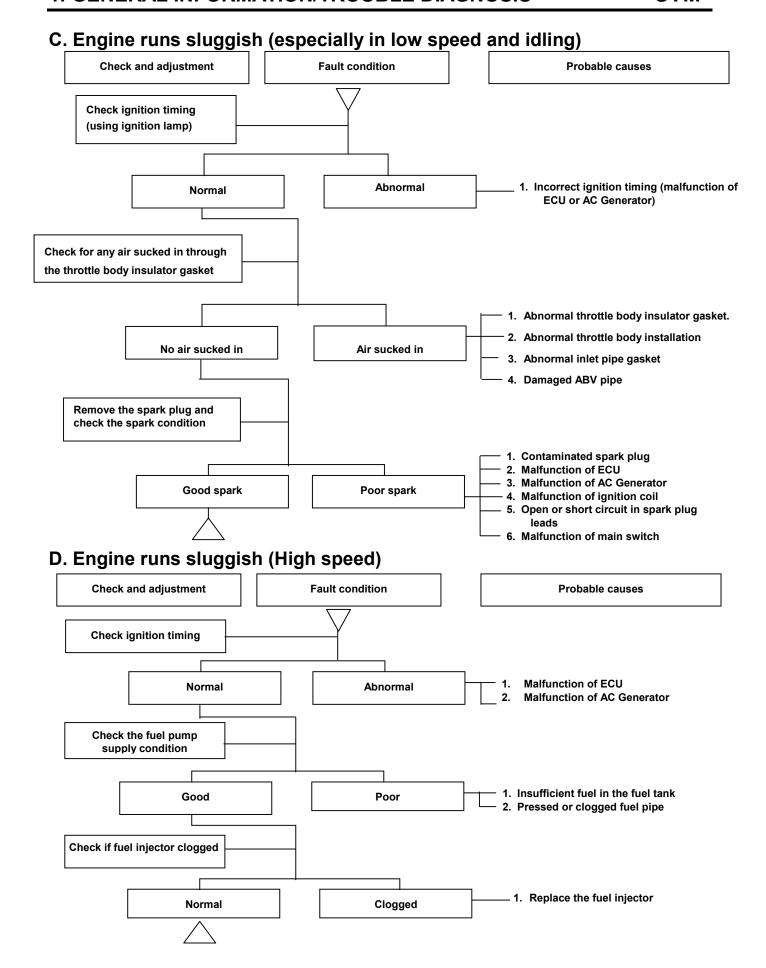
### **TROUBLES DIAGNOSIS**

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

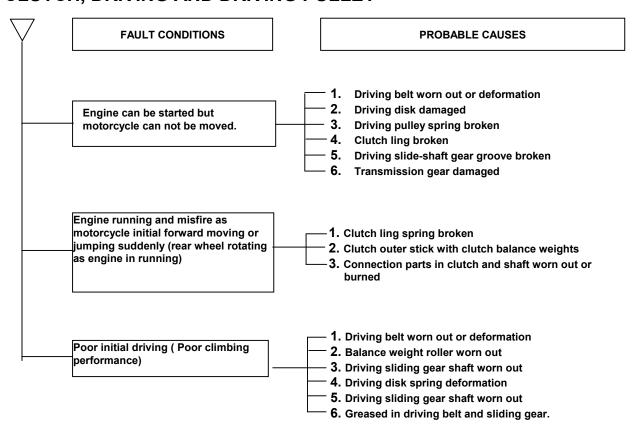


### B. Engine runs sluggish (Speed does not pick up, lack of power)

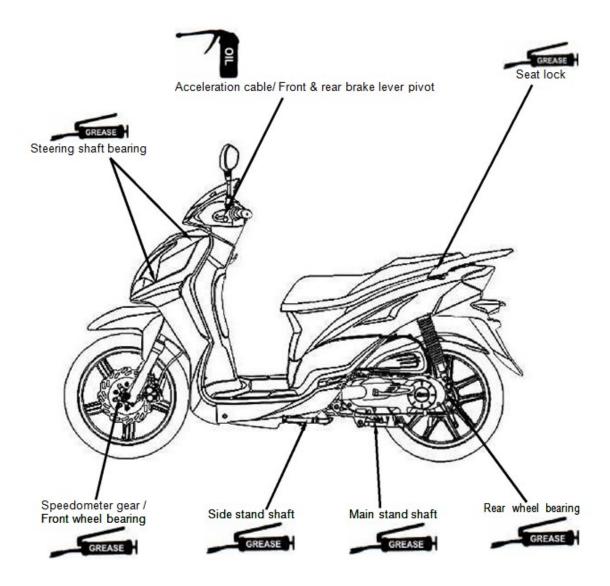




### E. CLUTCH, DRIVING AND DRIVING PULLEY



## **LUBRICATION POINTS**



# 2. MAINTENANCE INFORMATION

PRECAUTIONS IN OPERATION2-1	IGNITION SYSTEM/SPARK PLUG2-7		
PERIODICAL MAINTENANCE	CYLINDER COMPRESSION		
SCHEDULE2-2	PRESSURE2-8		
LUBRICATION SYSTEM2-3	DRIVING SYSTEM2-8		
FUEL SYSTEM2-4	STEERING SYSTEM2-9		
AIR CLEANER2-5	SUSPENSION SYSTEM2-9		
THROTTLE VALVE OPERATION2-5	FRONT DISK BRAKE SYSTEM2-10		
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## **PRECAUTIONS IN OPERATION**

**Specification** 

Opcomoution	1		
Fuel Tank Capacity	7.0±0.2L		
Engine Oil	capacity	950 c.c.	
Engine Oil	change	700 c.c.	
Transmission Coor oil	capacity	180 c.c.	
Transmission Gear oil	change	170 c.c.	
Clearance of throttle valve		2~6 mm	
Spark plug		CR7HSA	
Idling speed		1800 rpm	
Compression Ratio		10.3±0.2:1	
Valve clearance: IN/EX		0.12±0.02 mm/0.12±0.02 mm	
Tire dimension	front / rear	110/70-16 / 120/80-14	
Tire pressure (cold)		Front: 1.75 kg/cm <sup>2</sup> rear: 2.00 kg/cm <sup>2</sup>	
battery		12V6Ah	
Play of drum brake lever		10~20 mm	

### PERIODICAL MAINTENANCE SCHEDULE

Mainte nance Code	ltem	Initial 300KM	1 Month Every1000KM	3 month Every3000KM	6 month Every6000KM	1 year Every12000K M
1	☆ Air cleaner	I		С	С	R
2	☆ Fuel filter	I			I	R
3	☆ Oil filter	С			С	С
4	☆ Engine oil change	R	I	Replace	ement for every	3000km
5	Tire pressure	ı	I			
6	Battery inspection	I	I			
7	Brake & free play check	I	I			
8	Steering handle check	I	I			
9	Cushion operation check	I	I			
10	Every screw tightening check	I	I			
11	Gear oil check for leaking	l	l			
12	☆ Spark plug check or change	I		I	R	
13	☆ Gear oil change	R		Replacement fo	r every 5000km	
14	Frame lubrication				L	
15	Exhaust pipe	I	I			
16	☆ Ignition timing	I	I			
17	☆ Emission check in Idling	Α	I			
18	☆ Throttle operation	I		I		
19	☆ Engine bolt tightening	I		I		
20	☆ CVT driving device (belt)				ı	R
21	☆ CVT driving device (roller)				С	
22	Lights/electrical equipment/mutli-meters	ı	I	1		
23	Main/side stands & springs	I			ı	
24	Fuel pipes	I		I		
25	Cam chain	I		I		
26	☆Valve clearance	I		Α		
27	☆ Crankcase blow-by over-flow pipe	I		Replacement fo	r every 2000km	

Code: I ~ Inspection, cleaning, and adjustment R ~ Replacement C ~ Cleaning (replaced if necessary) L ~ Lubrication Have your motorcycle checked, adjusted, and recorded maintenance data periodically by your SYM Authorized Dealer to maintain the motorcycle at the optimum condition

The above maintenance schedule is established by taking the monthly 1000 kilometers as a reference which ever comes first.

#### Remarks:

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

#### **LUBRICATION SYSTEM**

### **Engine Oil Capacity**

### ⚠ Caution

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

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

### Oil change

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

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

Torque value: 3.5~4.5 kgf-m

# **⚠** Caution

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

Add oil to the specified capacity.

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

Engine oil capacity: Disassembly: 950cc Change: 700cc

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

### Cleaning the oil strainer

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

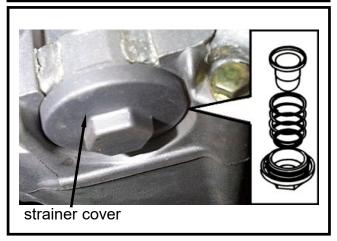
If there is an accumulation on the screen, wash it off with suitable solvent (recommended using compressed air). Check O-ring for damage, replace if necessary.

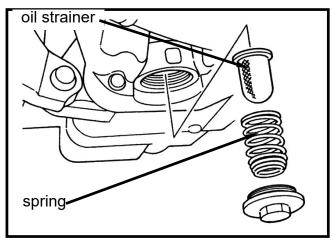
Reinstall strainer, spring, O-ring and strainer cover

Torque value: 1.3~1.7 kgf-m









### **GEAR OIL**

### Inspection

Check gear oil if leaking.

Park the motorcycle with main stand on flat level place.

Turn off engine and remove the gear oil draining plug.

Place a measurement cup under the draining hole.

Remove the oil drain plug and drain gear oil into a measurement cup.

Check gear oil if enough.

### Replacement

At first, remove the gear oil refilling bolt, and then remove the draining plug.

Install the draining plug after drained oil out.

Torque value: 0.8~1.2 kgf-m

# ⚠ Caution

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

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

Install the oil filling bolt.

Torque value: 0.8~1.2 kgf-m

Transmission oil capacity: 180 c.c.(170

c.c. for change)

Recommended: genuine SYM HYPOID gear

oil (SAE 85W-140).





### AIR CLEANER

#### **Element**

Remove frame body cover.

Remove 7 screws from the air cleaner cover. Remove element of air cleaner (2 screws). Check the element if dirt or damaged.

Replace it with new one if dirt or damaged.

# **⚠** Caution

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



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

Check handle bar if its operation is smooth. Check throttle valve cable and replace it if deteriorated, twisted or damaged.

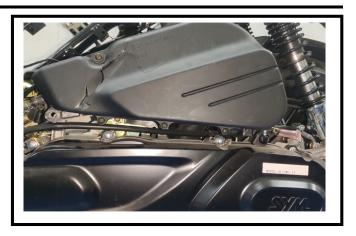
Lubricate the cable if operation is not smooth.

Measure handle bar free play in its flange

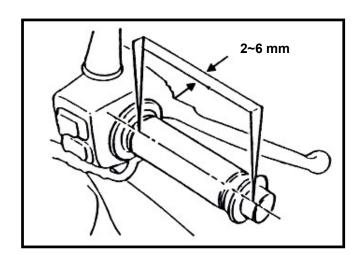
Free play: 2~6 mm

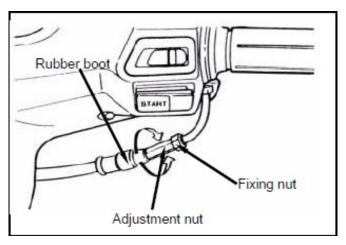
Adjustment can be done in either ends. Secondary adjustment is conducted from top side.

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









Primary adjustment is conducted from button side.

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

Tighten the fixing nut, and check acceleration operation condition.

# **⚠** Caution

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

# VALVE CLEARANCE ADJUSTMENT ^ Caution

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

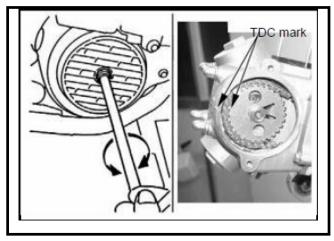
Remove luggage box and front center cover. Remove the left body cover & left side cover. Remove cylinder head cap.

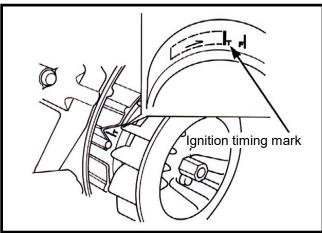
Remove the ignition timing check hole on the cooling fan cover.

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

# ⚠ Caution

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





# VALVE CLEARANCE INSPECTION AND ADJUSTMENT

Check & adjust valve clearance with feeler gauge.

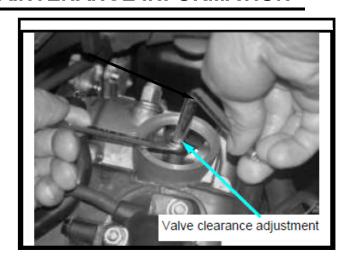
### Valve clearance (IN/EX):

### 0.12 mm/0.12 mm

Loosen fixing nut and turn the adjustment nut for adjustment.

# **⚠** Caution

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



### **SPARK PLUG**

### Appointed spark plug: CR7HSA

Remove luggage box.

Remove center cover..

Remove spark plug cap.

Clean dirt around the spark plug hole.

Remove spark plug.

Measure spark plug gap.

### Spark plug gap: 0.6~0.7 mm

Carefully bend ground electrode of the plug

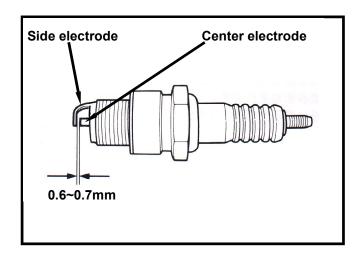
to adjust the gap if necessary.

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

thread.

Torque value: 1.0~1.4 kgf-m

Connect spark plug cap.



### CYLINDER COPMRESSION PRESSURE

Warn up engine and then turnoff the engine. Remove the luggage box and the center Cover.

Remove spark plug cap and spark plug. Install compression gauge.

Full open the throttle valve, and rotate the engine by means of stepping the kick-starting lever.

# **⚠** Caution

Rotate the engine until the reading in the gauge no more increasing.

Usually, the highest pressure reading will be obtained in 4~7 seconds.

**Compression pressure: 10.3**±0.2:1kg/cm2. Check following items if the pressure is too low:

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

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

### **DRIVING SYSTEM**

### **DRIVING BELT**

Remove left side cover.

Remove mounting bolt located under air cleaner

Remove 9 bolts of the engine left crankcase. Remove the left crankcase cover.

Check if the belt is crack or worn out.

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

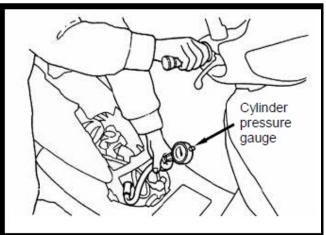
Width limit: above 18.5 mm

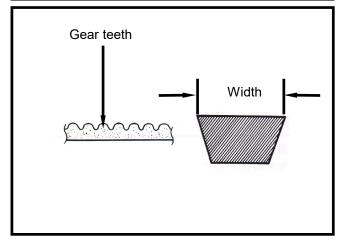
### Clutch pad

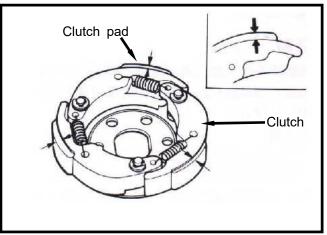
Start the motorcycle and gradually increase throttle valve openness to check clutch pad operation.

If the motorcycle moves with shaking, then check its clutch pad for wearing. Replace it if necessary.









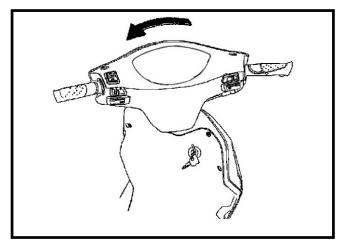
### STEERING SYSTEM

# **⚠** Caution

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

Lift the front wheel out of ground. Turn handle from right to left and check if turning is smoothly.

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



### SUSPENSION SYSTEM

# **⚠** Warning

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

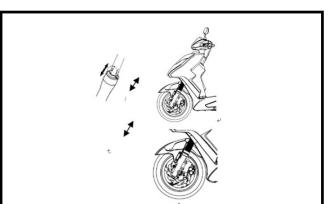


Hold front brake lever and press down the front shock absorber for several times to check its operation.

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

Check if it is scratched or leaking. Replace damaged and non-repairable components.

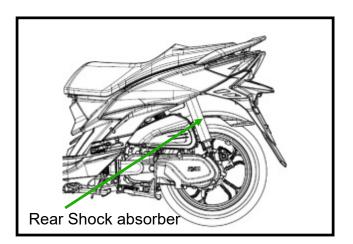
Tighten all nuts and bolts.



#### Rear Shock absorber

Press down the rear shock absorber for several times to check its operation. Check if it is scratched or leaking. Replace damaged and non-repairable components.

Park the motorcycle with main standard. Start engine and let the rear wheel rotate after increased engine rpm. Check engine for any parts loose or shaking. Also check the engine suspension bushing for wear out. Replace the bushing if worn out. Tighten all nuts and bolts.



### STEERING SYSTEM

# **⚠** Caution

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

Lift the front wheel out of ground. Turn handle from right to left and check if turning is smoothly.

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



### SUSPENSION SYSTEM



# **⚠** Warning

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

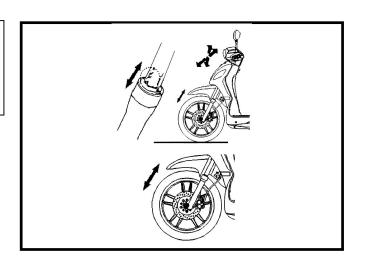


Hold front brake lever and press down the front shock absorber for several times to check its operation.

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

Check if it is scratched or leaking. Replace damaged and non-repairable components.

Tighten all nuts and bolts.



#### Rear Shock absorber

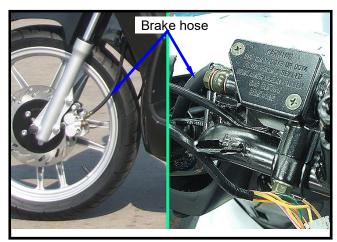
Press down the rear shock absorber for several times to check its operation. Check if it is scratched or leaking. Replace damaged and non-repairable components.

Park the motorcycle with main stand. Start engine and let the rear wheel rotate after increased engine rpm. Check engine for any parts loose or shaking. Also check the engine suspension bushing for wear out. Replace the bushing if worn out. Tighten all nuts and bolts.



# FRONT DISC BRAKE SYSTEM BRAKE SYSTEM HOSE

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



#### **BRAKE FLUID**

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

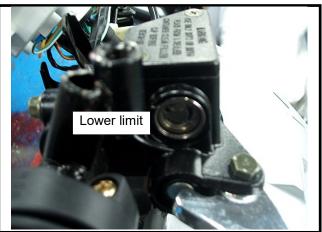
# ⚠ Caution

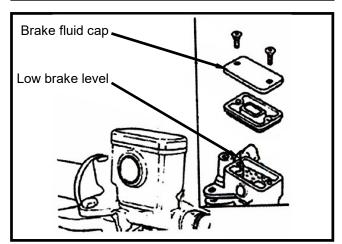
- In order to maintain brake fluid in the reservoir in horizontal position, do not remove the cap until handle bar stop.
- Do not operate the brake lever after the cap had been removed. Otherwise, the brake fluid will spread out if operated the lever.
- Do not mix non-compatible brake fluid together.

### FILLING OUT BRAKE FLUID

Tighten the drain valve, and add brake fluid. Place the diaphragm in.

Operate the brake lever so that brake fluid contents inside the brake system hoses.





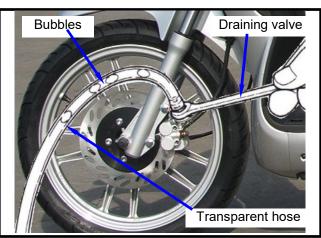
### **AIR BLEED OPERATION**

Connect a transparent hose to draining valve.

Hold the brake lever and open air bleeding valve. Perform this operation alternative until there is no air inside the brake system hoses.



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



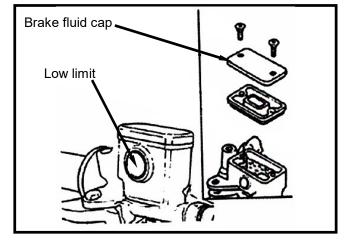
### ADDED BRAKE FLUID

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



# 🗥 Caution

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



#### **BRAKE LINING WEAR**

The indent mark on brake lining is the wear limitation.

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



# ⚠ Caution

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

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



## ⚠ Caution

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

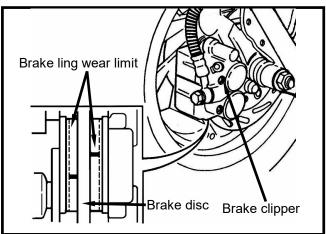
Pry out the brake lining with a flat driver if lining be clipped.

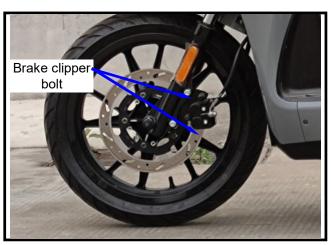
Remove brake lining bolt. Take out the lining.

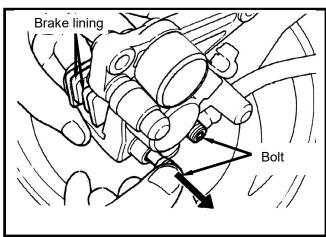


### ⚠ Caution

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



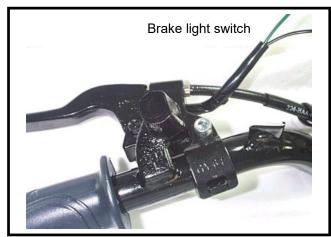




#### **BRAKE LIGHT SWITCH**

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

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



### WHEEL/TIRE

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



Tire pressure check should be done as cold tire.

Appointed tire pressure

, tppomitoe	appointed the process				
Tire	e size	Front tire	Rear tire		
Tire pressure	Load for single	1.75	2.0		
as cold tire (Kg/cm²)	Load for two persons	1.75	2.25		

### **Appointed Tire**

Front/Rear wheel: 110/70-16, 120/80-14

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

Check if tire surface or wall for crack or damaged, and replace it if necessary. The tire tread depth can be checked by visual inspection or depth gauge.

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

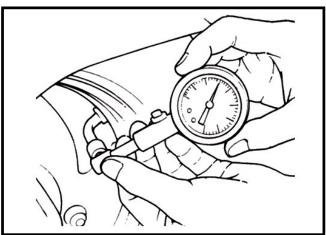
Measure tire thread depth from tire center surface.

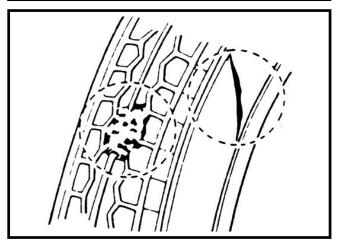
Replace the tire if the depth is not come with following specification:

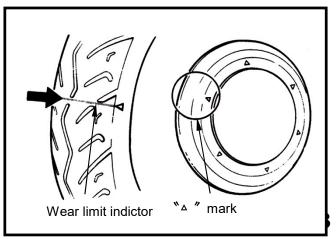
Front tire: 1.5 mm Rear tire: 2.0 mm



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







### **BATTERY**

### **Battery Removal**

Remove the luaage box.

Remove battery stay.

Battery cables removal:

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

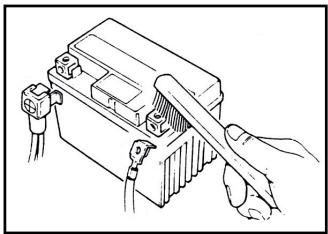
If there is some rust on battery posts, clean it with steel brush.

Install the battery in the reverse procedures of removal.

# **⚠** Caution

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





### **HEADLIGHT ADJUSTMENT**

Turn on the main switch.

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

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

# **⚠** Caution

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



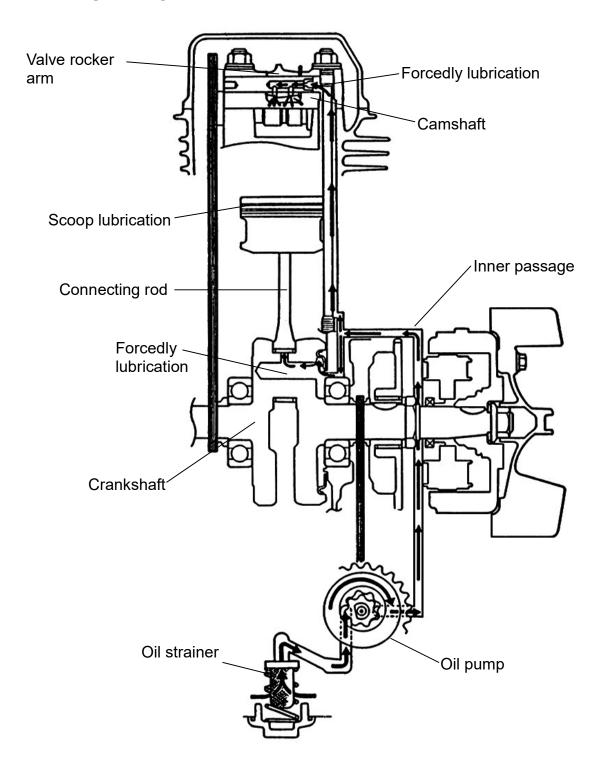
### **NUTS, BOLTS TIGHTENESS**

Perform periodical maintenance in accord with the Periodical Maintenance Schedule. Check if all bolts and nuts on the frame are tightened securely.

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

MECHANISM DIAGRAM3-1	CLEANING ENGINE OIL STRAINER3-3	
OPERATIONAL PRECAUTIONS3-2	OIL PUMP3-4	
TROUBLE DIAGNOSIS3-2	GEAR OIL3-6	
ENGINE OIL3-3		

### **MECHANISM DIAGRAM**



### **OPERATIONAL PRECAUTIONS**

### **General Information**

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

### **Specifications**

Engine oil quantity Disassembly 950 c.c.

Replacement 700 c.c.

Oil viscosity SAE 10W-30 or equivalent

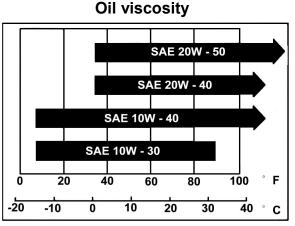
Use SAE 5W-40 when outside temperature is

below 0°C.

Gear Oil quantity Disassembly 180 c.c.

Replacement 170 c.c.

Oil viscosity of gear oil SAE 85W-140



unit : mm

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

### **Torque value**

Engine oil drain plug	3.5~4.5kgf-m
Engine oil filter screen cap	1.0~2.0kgf-m
Gear oil drain bolt	1.0~1.5kgf-m
Gear oil filling bolt	1.0~1.5kgf-m
Oil pump fixing screws	0.8~1.2kgf-m

### **TROUBLE DIAGNOSIS**

### Low engine oil level

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

### **Low Oil Pressure**

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

### Dirty oil

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

### **ENGINE OIL**

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

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

Do not rotate the dipstick into engine as checking.

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

# Oil Replacement Caution

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

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

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

Install the drain plug and tighten it.

Torque value: 3.5~4.5 kgf-m

### **CLEANING ENGINE OIL STRAINER**

Remove the oil strainer cap.

Remove oil strainer and spring.

Clean oil strainer (recommended using compressed air to clean dirty foreign). Check if the strainer and O-ring of the oil

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

Install the oil strainer and spring.

Install the oil strainer cap and tighten it.

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

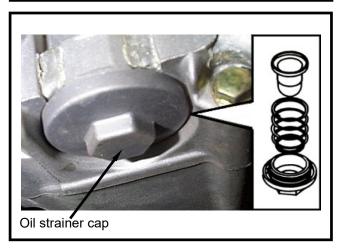
Fill out oil to the oil filler (Oil viscosity SAE 10W-30)

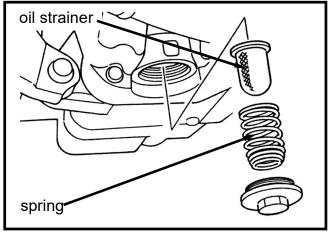
Use SAE 5W-40 when outside temperature is below 0°C.

Engine oil quantity: Replacement 700 c.c.







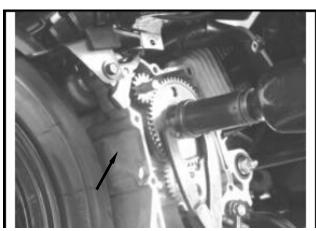


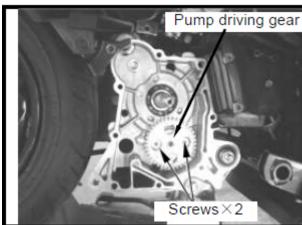
### **OIL PUMP**

### Oil Pump Removal

Remove the alternator (refer to chapter10). Remove the engine right crankcase cover. Make sure that the pump axle can be rotated freely.

Remove the oil pump driving gear nut. Remove the oil pump.





### **Oil Pump Inspection**

Check the clearance between oil pump body and outer rotor.

Limit: below 0.12 mm



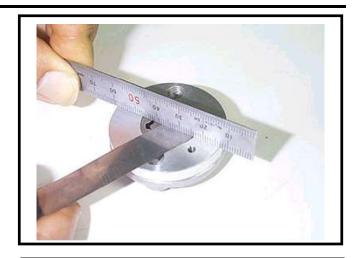
Check clearance between inner and outer rotors.

Limit: below 0.12 mm



Check clearance between rotor side face and pump body.

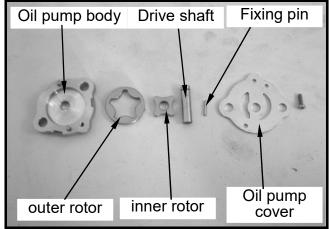
Limit: below 2.0 mm



### Oil Pump Re-assembly

Install inner and outer rotors into the pump body.

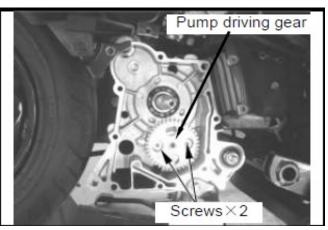
Align the indent on driving shaft with that of inner rotor. Install the driving shaft. Install the oil pump cover and fixing pin properly and then tighten screw. (1 screw)





### Oil Pump Installation

Install according to the reverse procedure of removal.



### **GEAR OIL**

### **Oil Level Inspection**

Park the motorcycle on flat ground with main stand.

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

Remove gear oil filling bolt and place a measurement cup under the draining plug. Remove the oil draining plug and the pour gear oil into the measurement cup. Measure the gear oil quantity if within standard value.

Add specified gear oil if the oil level too low. Standard quantity: 180 cc.

Replacement: 170 cc.



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

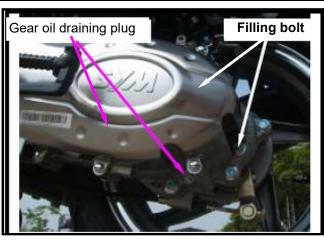
### Torque Value: 1.0~1.5 kgf-m

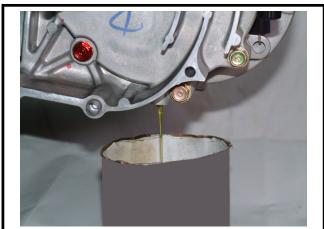
Add new gear oil (170 c.c.) from the gear oil filling hole and then install the gear oil filling hole bolt after added oil. And then, tighten the bolt.

Torque Value: 1.0~1.5 kgf-m

# **%**Recommended to apply with SAE 85W-140.

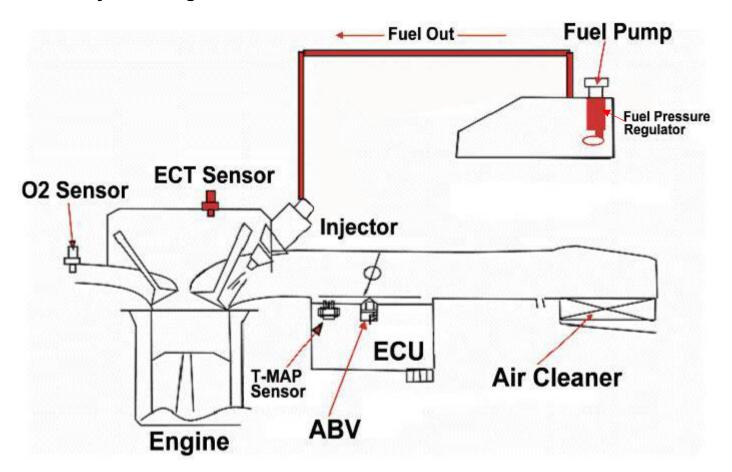
Start engine and run it for 2~3 minutes. Turn off engine and check if oil leaking.





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EFi System Component Description ··· 4-5	4-18
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## **EFi System Diagram**



### **EFi System Introduction**

Based on 4-stroke SOHC engine, displacement 125 c.c. electronically controlled fuel injection. The O2 sensor enhances the efficiency of the catalytic converter, by dynamically controlling the Fuel/Air ratio.

## **Electronic Fuel Injection Device**

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

Fuel control devices: fuel injector, and ECU.

The fuel is pumped from electrical fuel pump in the fuel tank, to the injector on the inlet pipe. The fuel pressure regulator keeps the pressure around 2.5 Bar. The signals from ECU enable the injector to spray fuel into the combustion chamber once each two crankshaft-revolutions. The excessive fuel flows back to the fuel tank through the fuel pressure regulator. Fuel pump is placed inside the fuel tank to reduce the working noise, and the complicity of fuel pipes. Electrically controlled ignition and injection system effectively reduce fuel consumption rate and pollution.

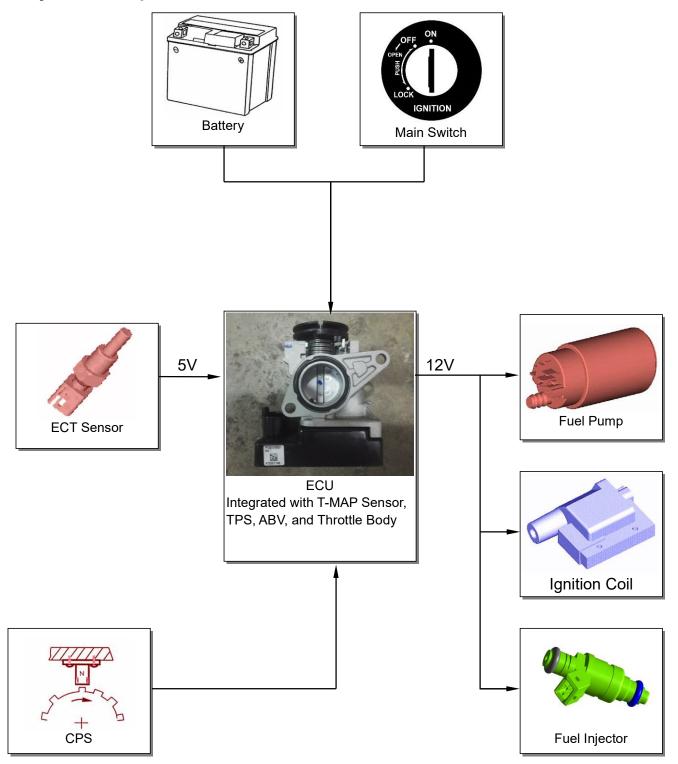
In traditional gasoline engine, carburetor supplies the fuel. The process is done by the engine vacuum, and the negative pressure in the carburetor mixes fuel with air. Under this condition, three major processes are done simultaneously in the carburetor: 1. air quantity measurement, the determination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

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

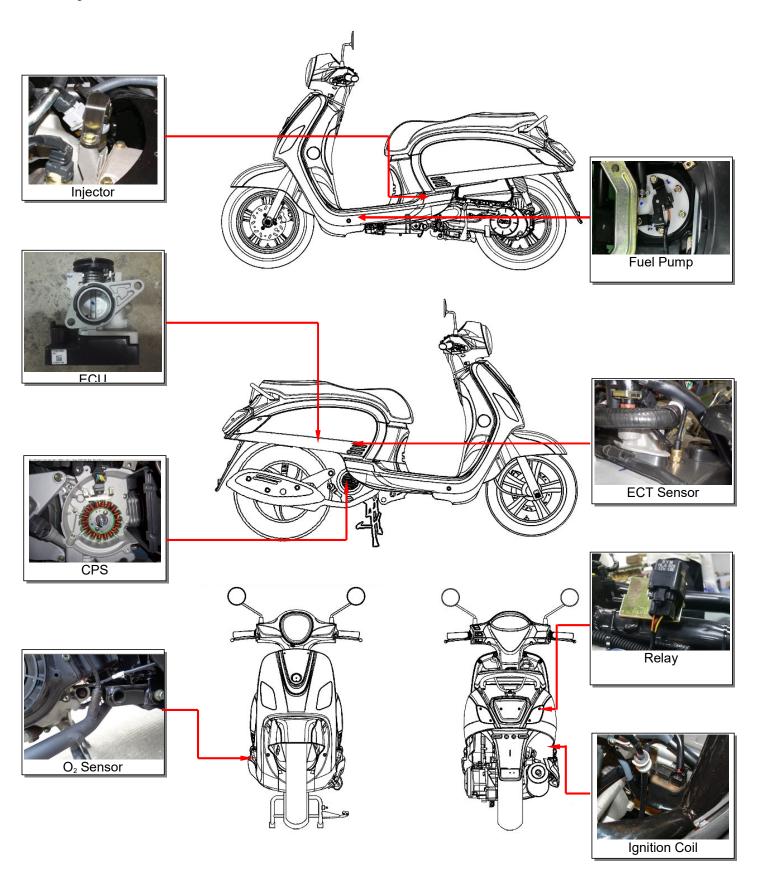
EFi engine uses computer-programmed fuel injection, the main features are:

- 1. The quantity of fuel injected is determined according to the condition of the engine. The engine RPM, and throttle position determines the fuel quantity and injection time-length.
- 2. The quantity of fuel injection, and the determination of injection time length, are all controlled by 16-bit microcomputer.
- 3. The fuel pressure regulator maintains a 2.5 Bar pressure difference between inlet pipe and fuel pipe, raising the accuracy of fuel injection.
- 4. By measuring the air pressure of inlet pipe, this system gives the vehicle better accommodation to the environment.
- 5. Air by-pass system supplies fuel and air to stabilize the idle running, and cold starting.

## **EFi System Components**



## **EFi System Location**



# **EFi System Component Description Integrated ECU Module**



Engine Control Unit (ECU)

- Powered by DC 8~16V, and has 32 terminals connector on the unit.
- The hardware component consists of an 16-bit computer that is its control center. It contains the functional circuit interface of engine condition sensing and the driving actuator for the air by-pass valve, fuel injector, and fuel pump, as well as transistor ignition coil.
- Its major software is a monitor strategy operation program that includes with controlling strategy, microarray profile and self-diagnosis programs.

#### Air Bypass Valve (ABV)

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

#### T-MAP Sensor

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

#### Throttle Position Sensor (TPS)

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

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

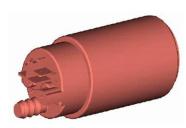
 If it's mainly low-power DC motors, drives idle speed control valve (ISC) of the movement to adjust the idle air flow channel size, control of idle speed of the engine in the cold or hot.

### Fuel Injector



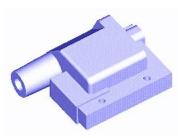
- Powered by DC 8~16V, and has 2 terminals connector on the injector.
- Its major component is the solenoid valve of high resistance driven by electronic current.
- The two terminals are connected to power source and ground respective. It is controlled by ECU to determine the injection timing, and the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

### **Fuel Pump**



- Powered by DC 8~16V, and has 2 terminals connector on the pump.
- The two terminals are connected to power source and ground respective. The ECU is to control and manage the operation of fuel pump through electrical power.
- Its major component is a driving fan pump that equipped with a low electrical consuming DC motor. Powered by 12V voltage and keep fuel pressure inside the fuel pump in 2.5 bars, which can offer 14 liters of fuel per hour.
- The fuel pump is located inside of the fuel tank, and installed a filter in front of its inlet so that can prevent from foreign materials sucking into the fuel pump to damage it and the fuel injector.

## **Ignition Coil**



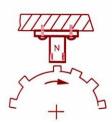
- Powered by DC 8~16V, and has 2 terminals connector on the coil.
- The two terminals are connected to power source and ground respective. Its major component is the high transferring rate transformer.
- Its ignition timing is controlled by computer program. From the signals of crankshaft position sensor,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

## ECT Sensor



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

### **CPS**



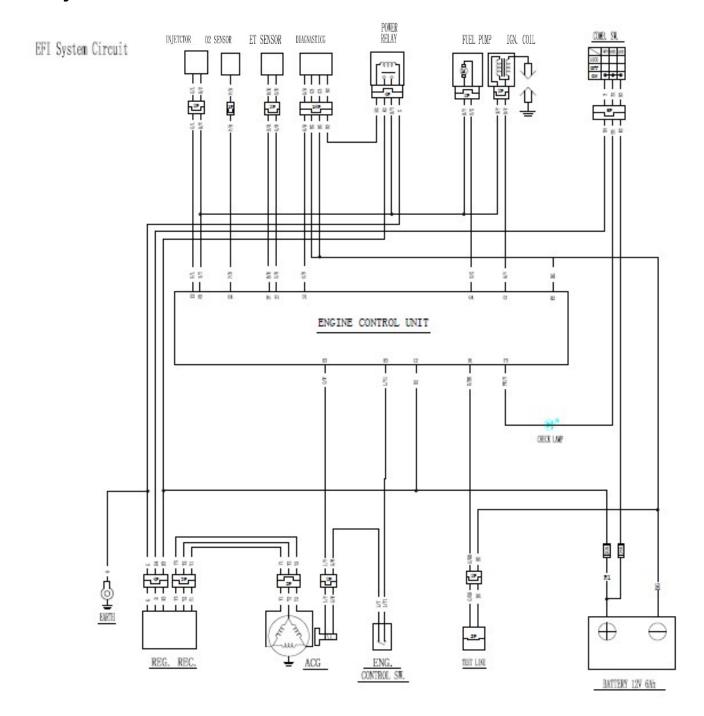
- It does not need power supply, and has 2-signal terminals connector on the sensor.
- Its major component is the magnetic pickup coil, and its output voltage range is ±0.8~100V.
- The air gap between the sensor and flywheel must have .07~1.1mm.
- By cutting the magnetic field, the magnetic sensor sends 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 1 terminals connector on the sensor. the one 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 <200kohm (30—45kohm)

## **EFi System Circuit**



# Precautions in Operation General information

## **⚠** Warning

- Gasoline is a low ignition point and explosive materials, so always work in a well-ventilated place and strictly prohibit flame when working with gasoline.
- Release the fuel pressure before removing the fuel pipe to prevent splashing the fuel.

## **⚠** Caution

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

Fuel pressure release procedure:

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

## **Specification**

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

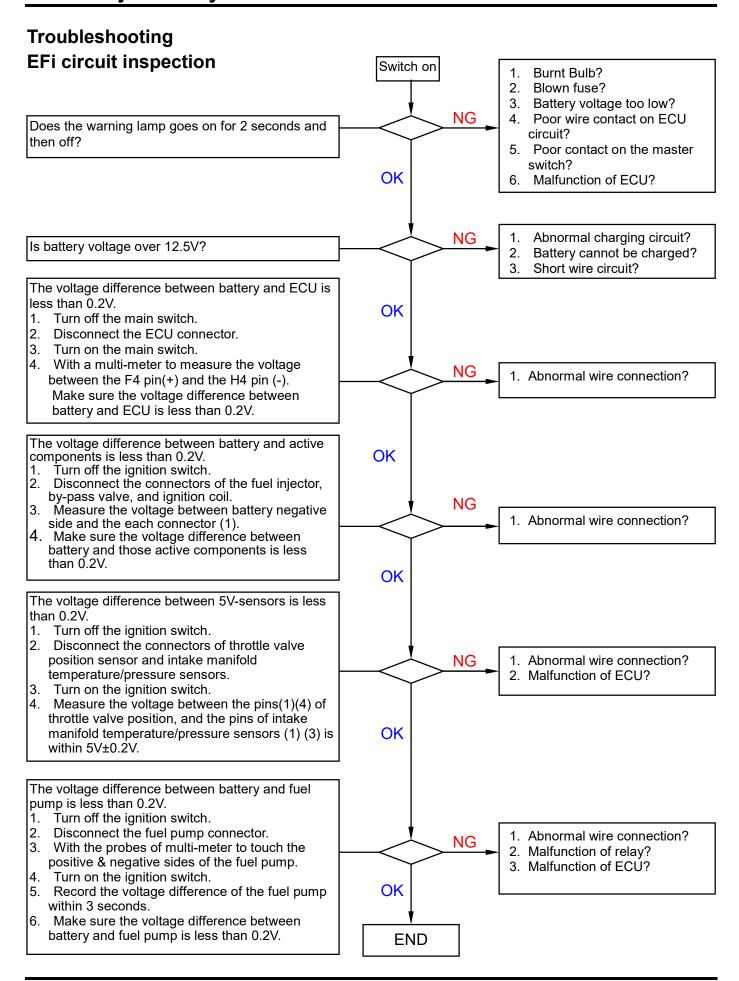
## Torque value

Engine temperature sensor: 0.74~0.88 kgf-m

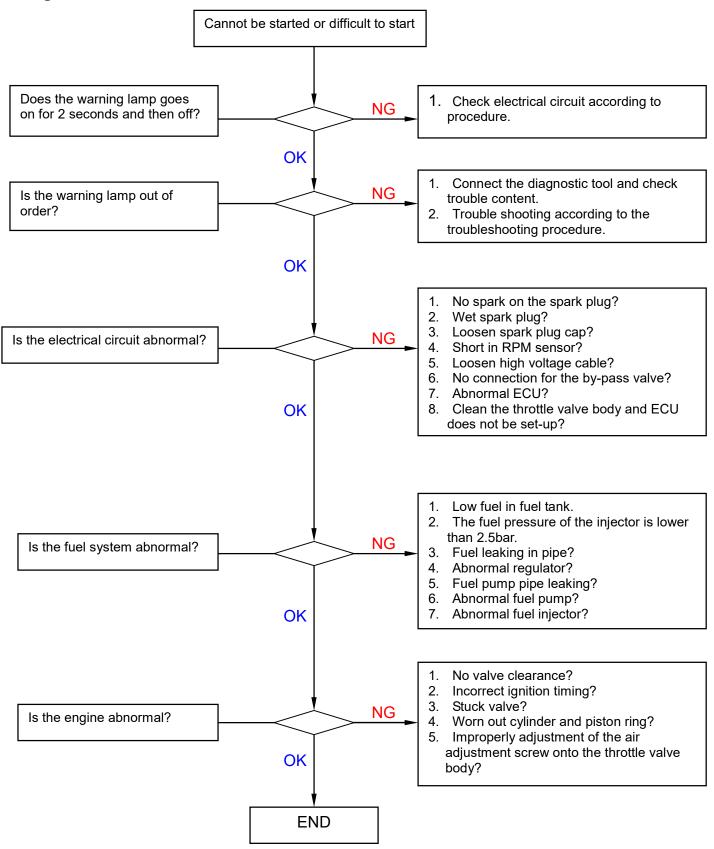
O2 sensor : 3.6~4.6 kgf-m

## Special tools

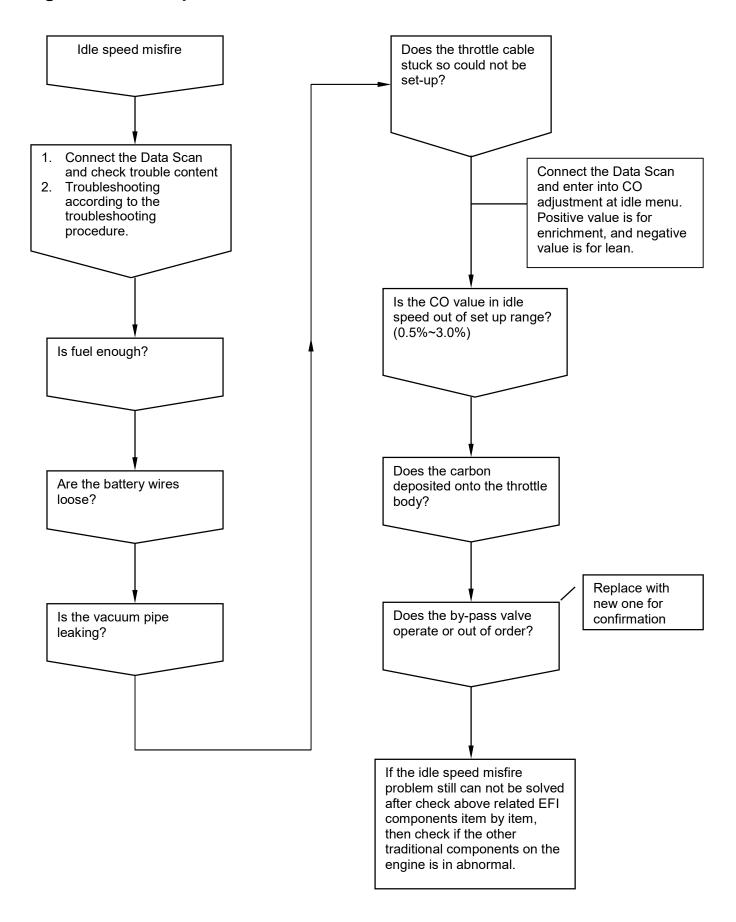
Injection system diagnostic tool Fuel pressure gauge SYM-HT07010



## Engine cannot be started or difficult to start.

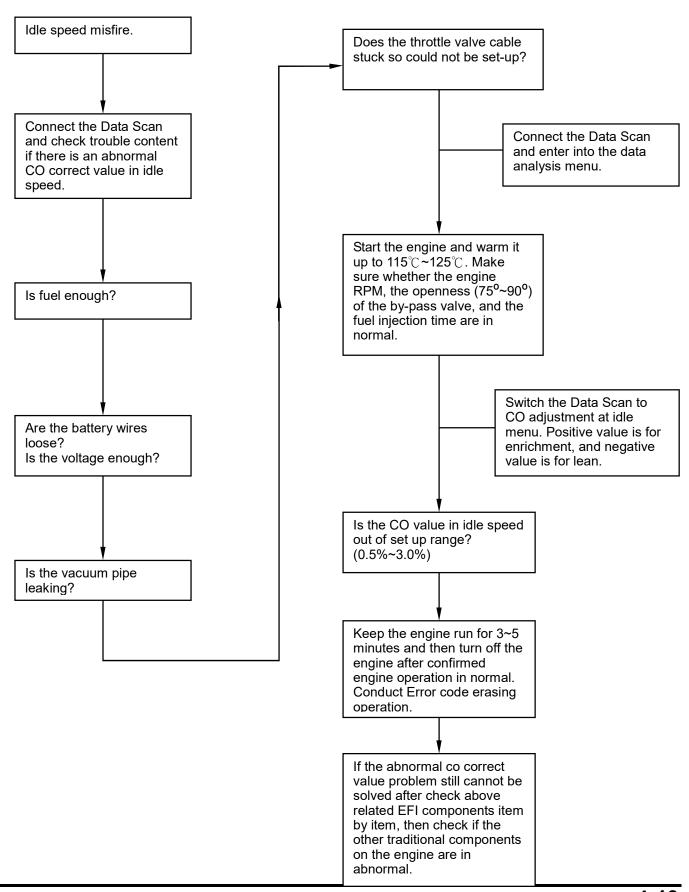


## **Diagnosis of Idle Speed Misfire**



#### **Abnormal CO value**

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



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





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

#### Clean procedure:

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

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

#### 2. Throttle body:

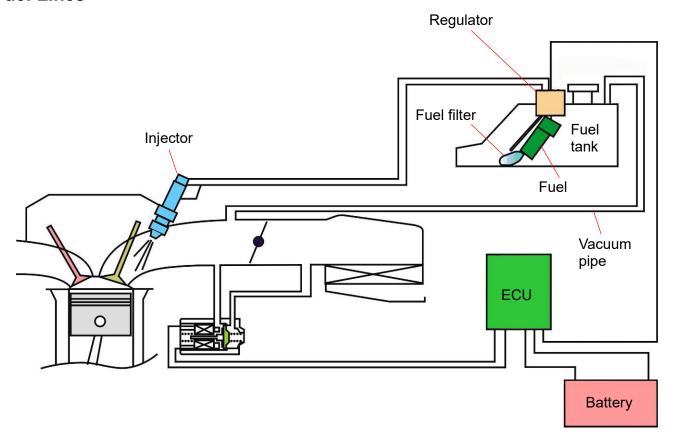
- 1. Switch off; remove the throttle body.
- 2. Spray a little carburetor cleaner into the throttle body.
- 3. Wipe off the dirty oil with clean cloth or tissue.
- 4. Dry the throttle body with compressed air and install the throttle body. Connect the diagnostic tool and switch on.

#### 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  $70^{\circ}\text{C} \sim 95^{\circ}\text{C}$ ), and then ECU will get the parameters from sensors.

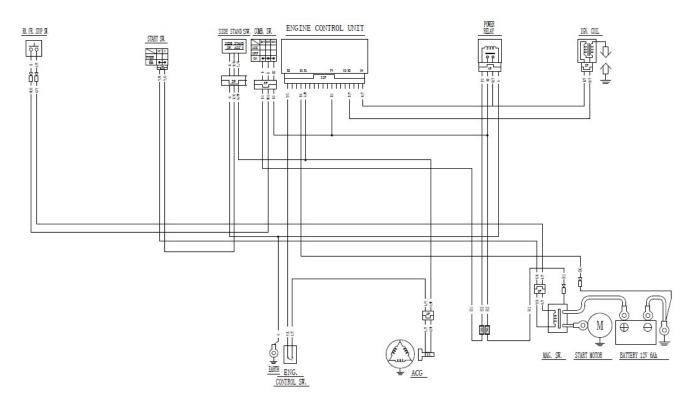
#### **Fuel Lines**



## System description:

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

## **Ignition System**



### Principle of operation

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

## **Specification**

1. Ignition timing: BTDC 10°/ 1700RPM

2. Spark plug: CR7HSA

Gap: 0.8mm

3. CPS pulse generator coil: 80~160  $\Omega$  / 20°C (G/W-LY)

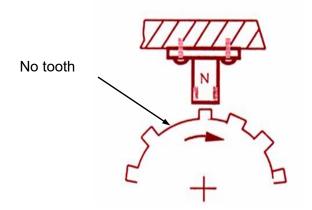
4. Ignition coil

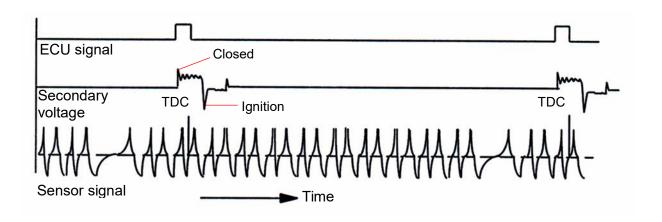
Primary circuit :  $0.63\pm0.03\Omega(23^{\circ}C)$ 

5. Battery:

Capacity: 12V 6Ah

## **Crankshaft Position Sensor**



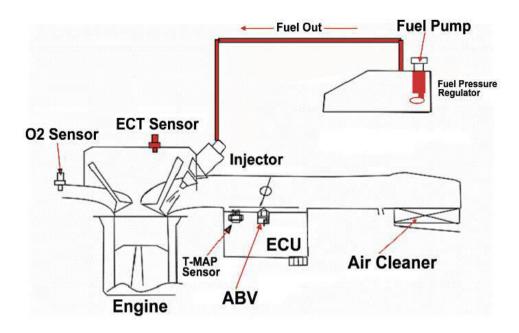


### **Description:**

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

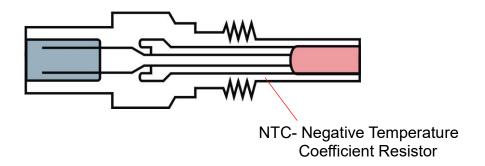
There is one tooth every 15 degree on the gear ring. But, one of the teeth is blank for the TDC calculating base.

## **Engine Temperature Sensor / T-Map Sensor**



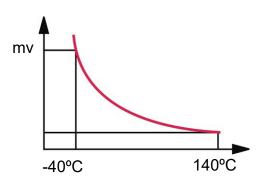
### Engine temperature sensor:

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

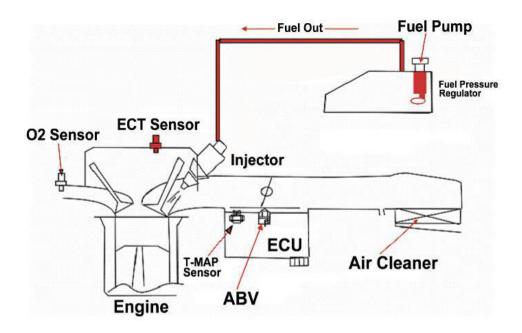


#### T-MAP Sensor:

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



## Air By-pass Valve



### **Description:**

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

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

## Fuel Injector

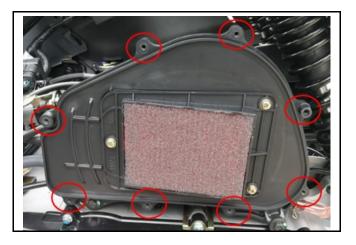
The injector provides intake valve a fuel jet. This can reduce the pollution of HC. The shortened version of fuel pump plate makes its size more compact, and sturdier against shocks. ECU signal controls the regulator to maintain 2.5 bars between the fuel pressure and the air pressure of inlet pipe. Through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

## **Fuel Pump**

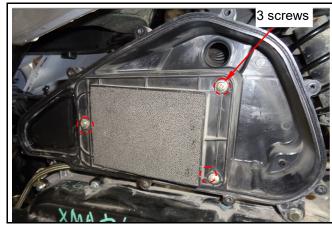
Electrical fuel pump is mounted inside the fuel tank. The power source is DC current provided and controlled by ECU; the pump can provide 14L/hour under the pressure of 2.5 bars.

## **Air Cleaner**

Remove the air cleaner cover (8 screws).



Remove the air cleaner element (3 screws).

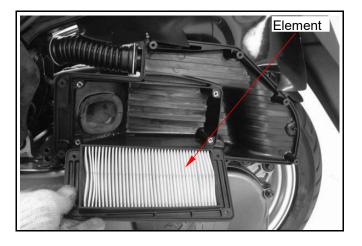


## **⚠** Caution

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

### Installation

Install in the reverse order of removal.



## **EFi Troubleshooting and Solution**

## •Electronic fuel injection (EFi) system fault warning light

After the main switch is on, the EFI indicator will be light. If the vehicle existing problems, the EFI indicator will light up all the time after the electrical starter button is on. When the problem is eliminated, restart the electrical starter button, the EFI indicator will light out automatically.

## **Error Code Message and Solution Operation**

	Component DTC		DTC Description	Monitoring Stratege
		P0117	Engine Coolant Temperature Circuit Low Input	Signal shorted to ground
1	Engine Coolant	P0118	Engine Coolant Temperature Circuit High Input	Signal shorted to Battery or circuit open
1	Temperature sensor	P0116	Engine coolant temperature sensor range problem	Tco out of range
		P0116	Engine coolant temperature sensor stuck problem	Stuck Tco Signal
		P0112	Intake Air Temperature Circuit Low Input	Signal shorted to ground
2	Intake Air Temperature sensor	P0113	Intake Air Temperature Circuit High Input	Signal shorted to Battery or circuit open
		P0111	Intake air temperature sensor range problem	TIA out of range
		P0111	Intake air temperature sensor performance problem	Stuck TIA Signal
		P0107	Manifold absolute pressure sensor Circuit Low Input	Signal shorted to ground
3	Manifold Absolute	P0108	Manifold absolute pressure sensor High Input	Signal shorted to Battery or ope
	Pressure sensor	P0106	Manifold absolute pressure sensor range problem	MAP Signal out of range
		P0106	Manifold absolute pressure sensor stuck problem	Stuck MAP Signal
4	02 Sensor	P0131	O2 Sensor Signals circuit low Voltage	Signal shorted to ground
4	Signals	P0132	O2 Sensor Signals circuit High Voltage	Signal shorted to Battery

## 5. Fuel Injection System

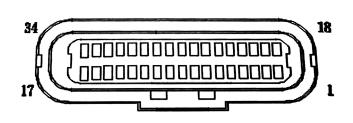
		P0134	02 Sensor Signals circuit open	Signal open circuit
	P2A00		02 Sensor Signals out problem	Signal out of range
		P0133	02 Sensor Circuit Slow Response	Signal Plausibility
5	Throttle Position	P0122	Throrrle position sensor circuit low or circuit open	Signal shorted to ground/circuit open
5	Sensor	P0123	Throrrle position sensor circuit high	Signal shorted to Battery
6	Fuel Injector	P0261	Fuel Injector circuit low	Signal shorted to battery or open
0	ruer injector	P0262	Fuel Injector circuit High	Signal shorted to ground
		P0508	Step motor circuit lower or circuit open	Signal shorted to ground or open
7	Idle Air Control system	P0509	Step motor circuit high	Signal shorted to Battery
		P0519	Step motor circuit Plausibility problem	Signal Plausibility
8	Ignition Coil Control	P2300	Primary coil low/ no current	Signal shorted to ground or open
	System	P2301	Primary coil overcurrent	Signal shorted to Battery
		P0031	02 sensor heater circuit lower	Signal shorted to ground
9	02 Sensor	P0032	02 sensor heater circuit high	Signal shorted to Battery
9	Heater System	P0131	02 sensor heater circuit open	Signal open circuit
		P0135	02 Sensor Heater Circuit Malfunction	O2 sensor heater Plausibility
10	CrankShaft Position Sensor	P0335	CrankShaft Position Sensorr circuit open	Present crank error
11	Fuel Dump	P0231	Ssignal shorted to groung or open	Signal shorted to ground or open
11	Fuel Pump	P0232	Steep motor circuit high	Signal shorted to Battery

## **SYM**

## 4. Fuel Injection System

12	Engine Over Temperature	PO217 Engine Overtemp Condition None		None
13			None	
13	Battery	P0563	System voltage high	None
14	Mis Fire A diagnosis	P0314	Cylinder Misfire Detected	Mis fire detected
15	Mis Fire B diagnosis	P0314	Single cylinder misfire	Mis fire detected

### **Electronic control unit connector illustration:**



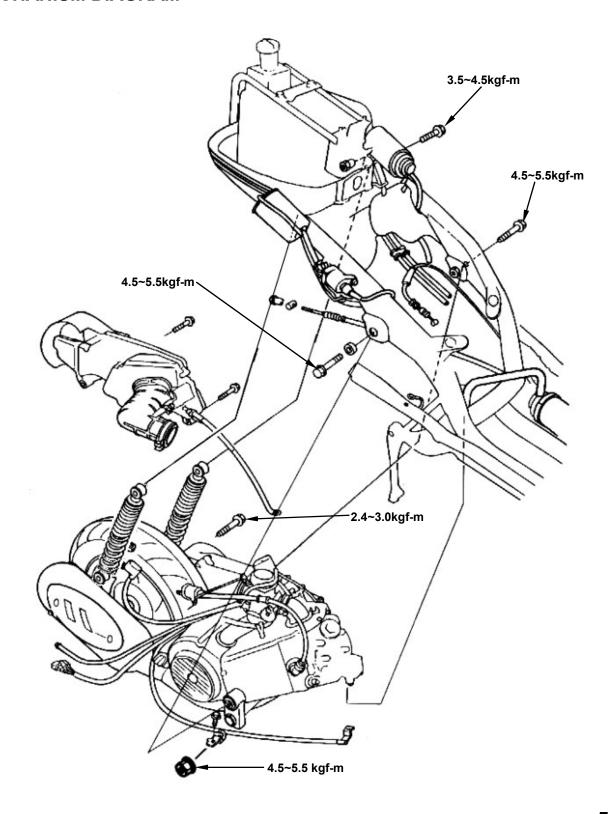
Power supplies	6
Sensors inputs	6
Logic inputs	4
Differential	2
inputs	
Power outputs	12
Communication	2
cConfigurable IO	2

X34	Х33	X32	X31	X30	X29	X28	X27	X26
Vehicle Speed		SENSOR supply	Kill Sw	VBD	CAN_L	SAV	(H)EGO SENS_UP	SENSOR GROUND
FAN relay	•	RPM OUT	-	FSU/FP relay	CAN_H	VBK	(H)EGO SENS_DN	•
X17	X16	X15	X14	X13	X12	X11	X10	Х9

X25	X24	X23	X22	X21	X20	X19	X18
VR-	start relay	СНТЅ	CPV	SSW	IGNITION COIL	MIL	PGND2
VR+	head lamp relay	START SW	Injector PI	-	HEGO HEAT_UP	-	PGND1
Х8	Х7	Х6	Х5	Х4	Х3	Х2	X1

MECHANISM DIAGRAM5-1	ENGINE SUSPENSION FRAME5-7
OPERATIONAL PRECAUTIONS5-2	INSTALLATION OF ENGINE5-8
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REMOVAL OF ENGINE SUSPENSION	
BUSHING5-6	

## **MECHANISM DIAGRAM**



## **OPERATIONAL PRECAUTIONS**

#### **General Information**

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

## **Specification**

Ite	m	Specification
Engine Oil Conceity	Replacement	950 c.c.
Engine Oil Capacity	Disassemble	700 c.c.
Coor Oil Consoity	Replacement	180 c.c.
Gear Oil Capacity	Disassemble	170 c.c.

## **Torque Values**

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

### **ENGINE REMOVAL**

Open the seat.

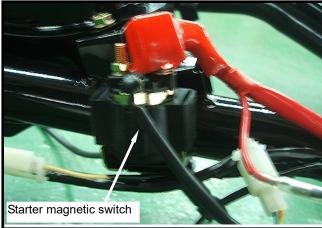
Remove the rear carrier (3 bolts). Remove the luggage box assembly (4 bolts).

Remove the body cover (4 screws, 3 bolts). Remove the power connector of ECU Remove the generator connector and pulse generator connector.

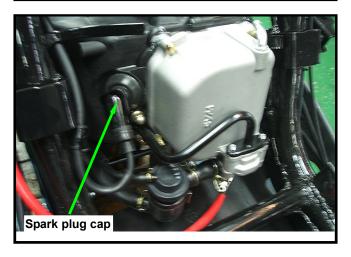
,

Generator connector

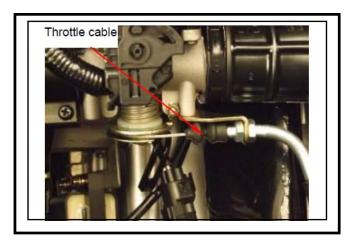
Remove the starter motor wire on the Starter magnetic switch.



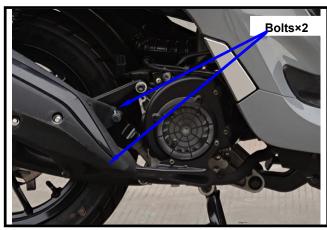
Remove the spark plug cap.



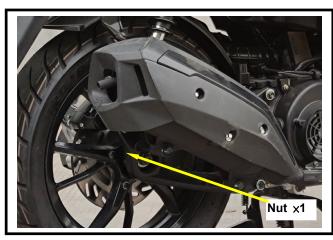
Remove the throttle cable.



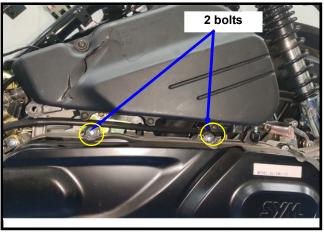
Remove the exhaust muffler (Bolts  $\times$  2, Nuts  $\times$  2).



Remove the rear wheel (Nut  $\times$  1).



Remove the air cleaner connection bolts (2 bolts).



Loosen the air cleaner connecting pipe screw.



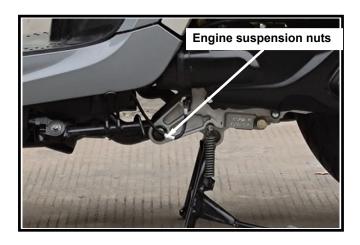
Loose the strap screw of engine left guide, and then remove the engine left guide.



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

## ⚠ Caution

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



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

# REMOVAL OF ENGINE SUSPENSION BUSHING

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

Engine suspension bushing:  $\Phi$ **28mm** Rear shock absorber bushing:  $\Phi$ **20mm** 

#### **Pressing out**

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

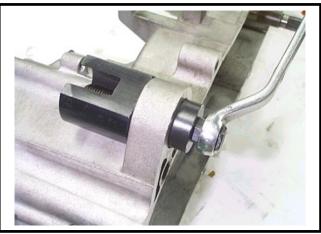




#### Pressing In

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



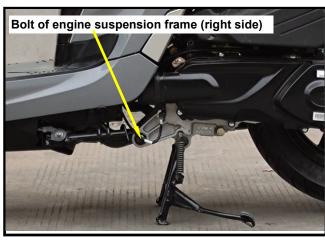


### **ENGINE SUSPENSION FRAME**

#### Removal

Remove the left side bolt of engine suspension frame.

Remove the right side bolt of engine suspension frame.



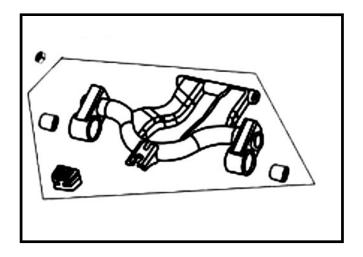


Check if the engine suspension frame bushing and cushion rubber for damage. If so, replace with new ones.

#### Installation

Tighten the bolts and nuts of engine suspension frame.

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



### **INSTALLATION OF ENGINE**

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

Install the engine according to the reversing order of removal.

## **⚠** Caution

#### Notice b

- th feet and hands safety for squeezing as engine installation.
- Do not bent or squeeze each wires or

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

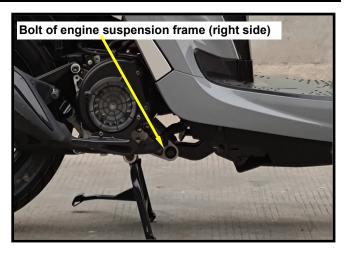
Rear shock absorber bolt:

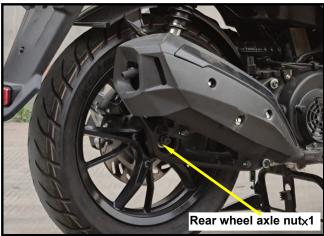
Torque Value: Top: 3.5~4.5kgf-m

lower: 2.4~3.0kgf-m

Rear wheel axle nut:

Torque Value: 11.0~13.0kgf-m



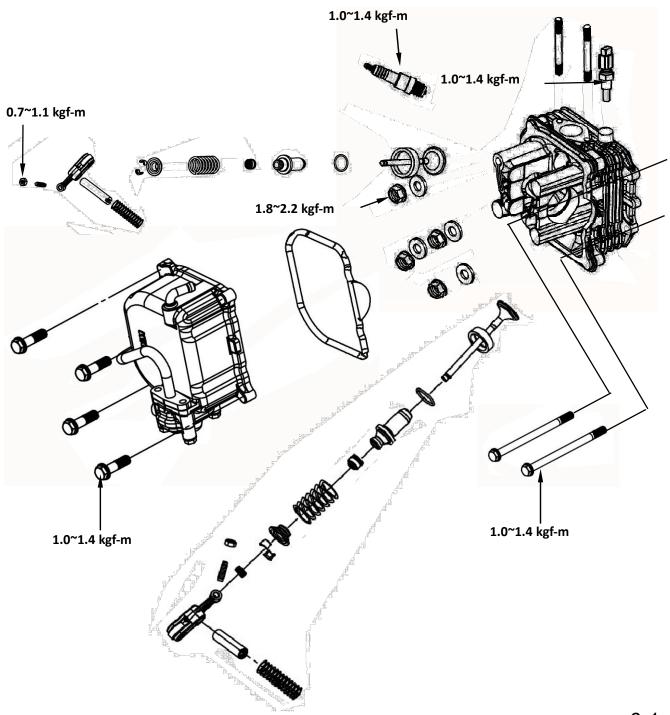


## **6. CYLINDER HEAD/VALVE**

## SYM

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CAMSHAFT REMOVAL	6-4	CYLINDER HEAD INSTALLATION 6-13
CYLINDER HEAD REMOVAL 6	6-6	CAMSHAFT INSTALLATION 6-13
CYLINDER HEAD DISASSEMBLY (	6-7	VALVE CLEARANCE ADJUSTMENT 6-14

## **MECHANISM DIAGRAM**



### PRECAUTIONS IN OPERATION

### **General Information**

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

Specification unit: mm

Item			Standard	Limit
Compression pressure			10.3±0.2:1 kg/cm²	-
Camshaft	Height of cam lobe	Intake	25.686~25.786	25.29
		Exhaust	25.50~25.60	25.12
Rocker arm	ID of valve rocker arm		10.000~10.015	10.10
	OD of valve rocker arm shaft		9.972~9.987	9.910
Valve	OD of valve stem	Intake	4.975~4.99	4.90
		Exhaust	4.955~4.97	4.90
	ID of Guide		5.000~5.015	5.030
	Clearance between valve stem and guide	Intake	0.050~0.020	0.080
		Exhaust	0.050~0.020	0.100
	Free length of valve spring	Outer	35.25	-
		Inner	32.26~32.56	-

## **Torque Value**

Cylinder head cover bolt	0.8~1.2kgf-m
Cylinder head bolt (LH)	0.8~1.2kgf-m
Bolt of timing chain auto-adjuster	0.8~1.2kgf-m
Spark plug	1.0~1.4kgf-m
Cylinder head nut	0.8~1.2kgf-m
Valve adjustment fixing nuts	0.7~1.1kgf-m

#### **TOOLS**

## **Special service tools**

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

#### TROUBLE SHOOTING

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

#### Rough Idle

Low compression pressure.

#### Low compression pressure

#### 1. Valve

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

#### 2. Cylinder head

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

#### 3. Piston

• Piston ring worn out.

#### High compression pressure

Too much carbon deposit on combustion chamber or piston head.

#### **Noise**

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

#### White smoke

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

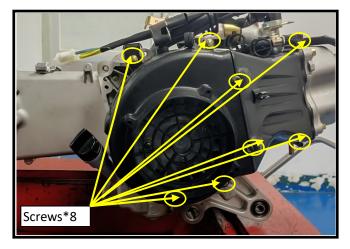
#### CYLINDER HEAD REMOVAL

Remove the engine from the vehicle (Refer to chapter 5).

Remove the shroud of the engine.

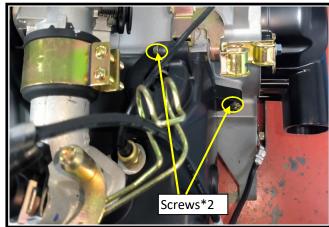
Remove the crankcase blow-by system hose from the cylinder head.

Remove the 10 screws of shroud ASSY.



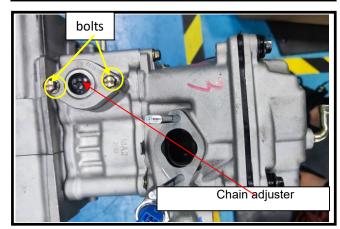
Remove the shroud ASSY.

.



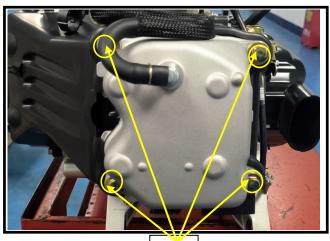
Removed cam chain adjustment bolt. And then removed the chain adjuster (bolts × 2)

Remove the cylinder head cover 4 bolts and then remove the cylinder head cover.



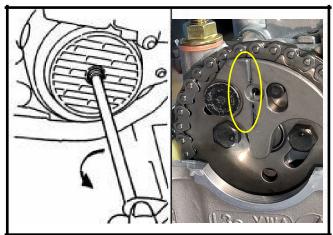
Remove the cylinder head cover 4 bolts and then remove the cylinder head cover.

Removed cylinder head cover.

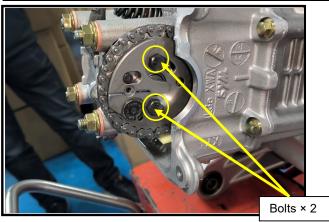


bolts

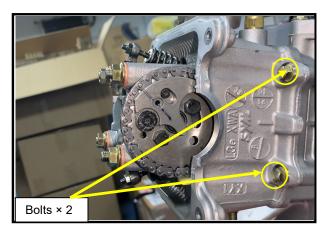
Turn the flywheel in counter-clockwise motion with T type wrench until the "T" mark on flywheel aligned with the mark on the crankcase so that the hole on the camshaft sprocket is forward up and piston is at TDC position.



Remove camshaft sprocket bolt(bolt × 2). Remove the cam sprocket and cam chain.



Removed the bolts of the left side of the cylinder head between cylinder head and cylinder(bolt × 2).

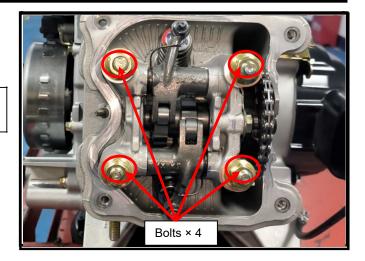


Remove 4 bolts of cylinder head.

Remove cylinder head.

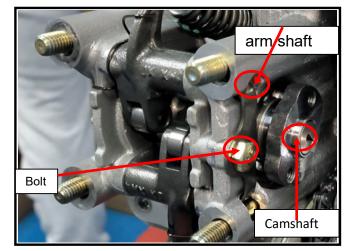
# **⚠** Caution

Loosen the nuts diagonally by 2-3 sequences.

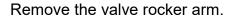


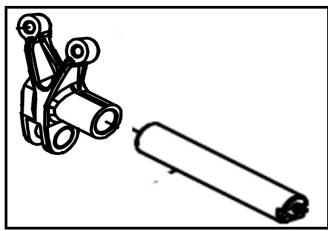
## **DISASSEMBLY CYLINDER HEAD**

Remove the fixed (bolt × 1), then remove the cam shaft setting plate.
Remove the setting plate.



Remove the valve rocker arm shaft.



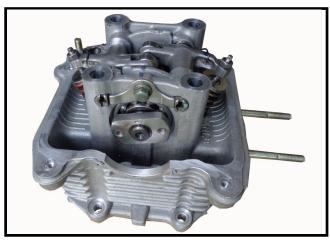


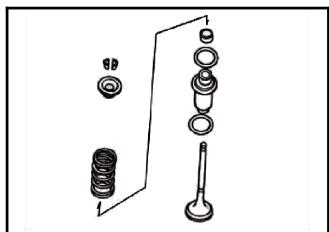
Use the special tool of compress valve springs.Remove valve spring removed location pin.



Do not over-compressed valve springs. Avoiding weaken the spring flexibility.

Put out the spring stopper, spring and valve. Remove the valve cotter, valve spring retainer, valve oil seal.

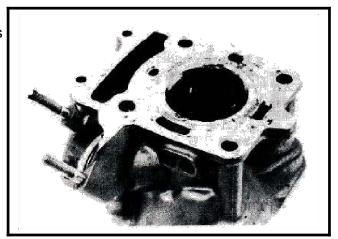




Clean carbon deposits in combustion chamber. Clean residues and foreign materials on cylinder head matching surface.

## ⚠ Caution

Do not damage the matching surface of cylinder head.



## **CAMSHAFT INSPECTION**

Inspect cam lobe height for damaged. Service Limit

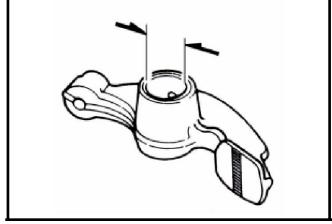
IN: Replacement when less than 25.57 mm EX:Replacement when less than 25.41 mm

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



# VALVE ROCKER ARM/ SHAFT INSPECTION

Measure the valve rocker arm I.D. Service Limit: Replace when it is above 10.100 mm

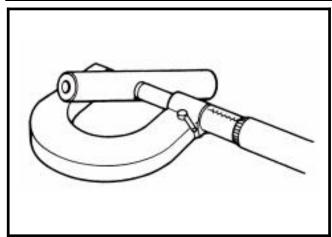


Measure the active O.D. of the valve rocker arm shaft.

Service Limit: Replace when it is above 9.910 mm

Calculate the clearance between the rocker arm shaft and the rocker arm. Service Limit: Replace when it is

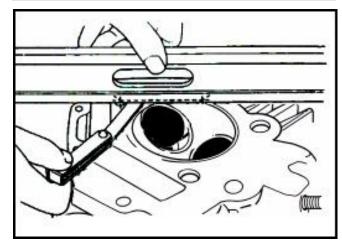
above 0.10 mm



## CYLINDER HEAD INSPECTION

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

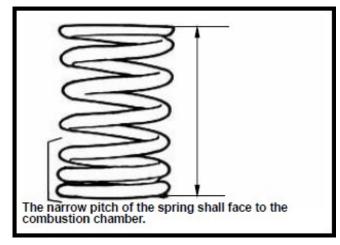
Service limit: below 0.05mm



## Valve spring free length

Measure the free length of intake and exhaust valve springs.

Standard: 35.250mm



#### Valve stem

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

Service Limit: IN→ 4.900mm EX→ 4.900mm

## Valve guide

# **⚠** Caution

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

Special Service Tool: 5.0mm valve guide reamer

Measure and record each valve guide inner diameters.

## Service limit: 5.300mm

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→ 0.12mm EX→ 0.12mm

# **△** Caution

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

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

## ⚠ Caution

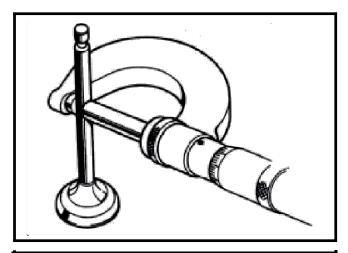
It must correct valve seat when replacing valve guide.

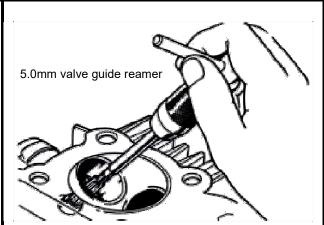
## Valve guide replacement

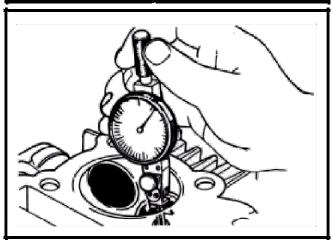
Heat up cylinder head to 100~150 °C with heated plate or toaster.

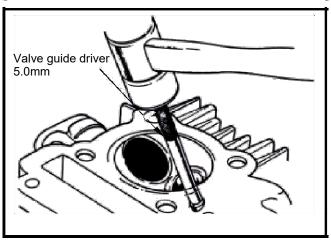
# **⚠** Caution

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









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

## Tool: Valve guide driver 5mm

# **⚠** Caution

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

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

Press in new valve guide from rocker arm side.

**Tool: Valve guide driver 5 mm**Wait for the cylinder head cooling down to room temperature, and then correct the new valve guide with reamer.

# **⚠** Caution

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

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

Special tool: Valve guide reamer 5 mm

# VALVE SEAT INSPECTION AND SERVICE

Clean up all carbon deposits onto intake and exhaust valves.

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

# ⚠ Caution

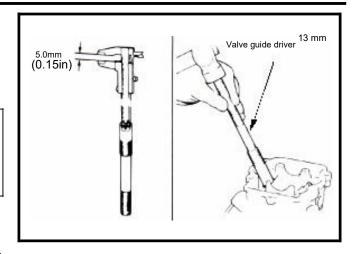
- Do not let emery enter into between valve stem and valve guide.
- Clean up the emery after corrected, and apply with red paint onto contact faces of valve and valve seat.

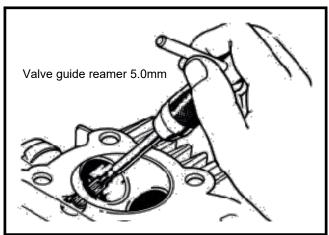
Remove the valve and check its contact face.

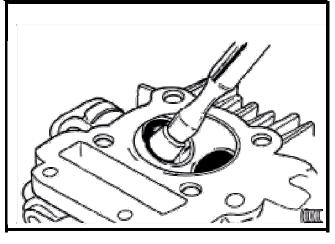
# **⚠** Caution

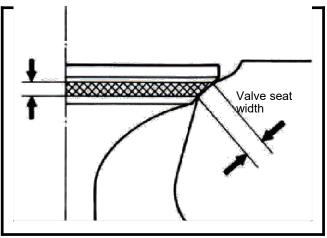
Replace the valve with new one if valve seat is roughness, wear out, or incomplete contacted with valve seat.

If the valve and the valve seat still can not be matched sealing after grinded, replace it with new one.









## Valve seat inspection

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

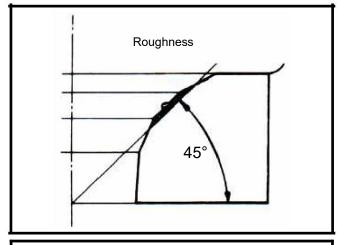
## Valve seat width Service limit:1.6mm

Check the contact condition of valve seat.

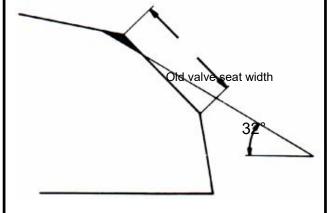
## Valve seat grinding

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

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



# d valve seat width

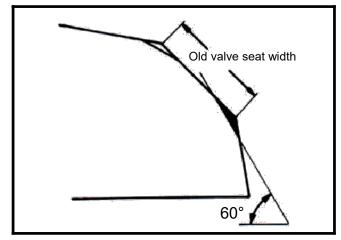


# ⚠ Caution

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

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

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

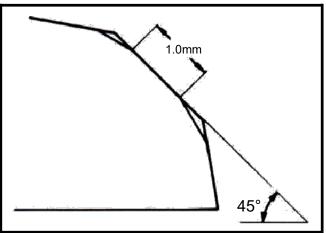


Use 45° cutter to grind the valve seat to specified width.

## ⚠ Caution

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

Grind valve seat again if necessary.



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



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

If the contact surface too high, grind the valve seat with 32° cutter.

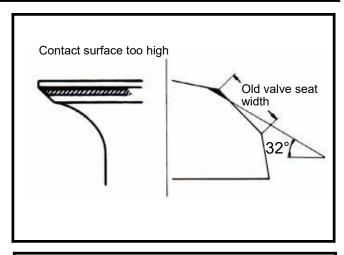
Then, grind the valve seat with 45° cutter to specified width.

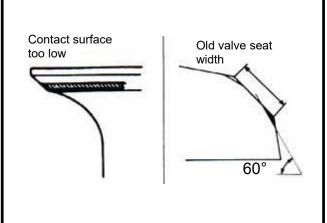
If the contact surface too low, grind the valve seat with 60° cutter.

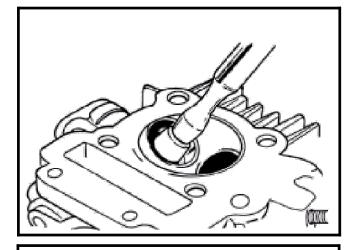
Then, grind the valve seat with 45° cutter to specified width.

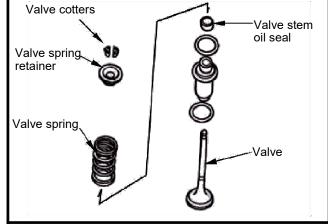
After the valve seat grinded, coat valve seat surface with emery and then slightly press the grinded surface.

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









## CYLINDER HEAD REASSEMBLY

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



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

Use valve spring compressor to press valve spring.

Install valve split locks and release the valve compressor.

# **A** Caution

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

Special tool: valve spring compressor

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

## ⚠ Caution

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

## CYLINDER HEAD INSTALLATION

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

At first, tighten the 4 nuts on the cylinder top and then tighten the 2 bolts on the left side of cylinder head.

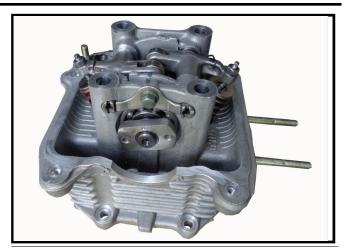
With T type wrench to turn crankshaft in a clockwise motion so that the "T" mark on the flywheel aligns with the mark on crankcase. (piston is at TDC position). Install the cylinder head nuts and tighten it.

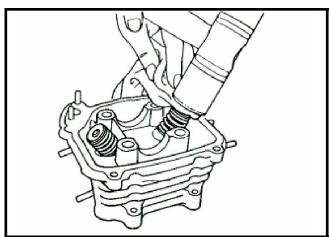
Torque value: 2.0~2.4 kgf-m

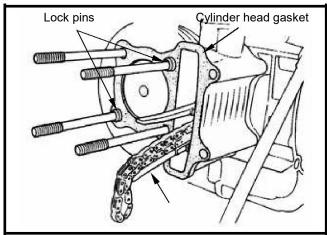
Install the cylinder head left side bolt

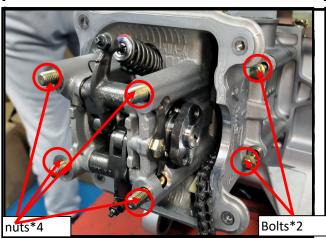
and tighten it.

Torque value: 0.8~1.2 kgf-m Install the spark plug and tighten it. Torque value: 1.0~1.2 kgf-m









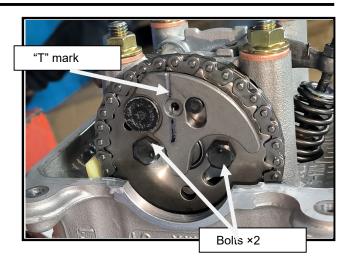
Apply with oil onto the thread of cylinder head bolts and tighten the bolts in diagonally for 2-3 sequences. Do not over tightening the bolts to avoid the cylinder head deformation, noise created or leaking so that effects motorcycle's performance.

Install the cam shaft. Place the TDC marks of the cam sprocket at same level of the top-end of cylinder head. The other single hole of the cam sprocket is in upward. Then, install the cam chain onto the cam sprocket. Tighten the 2 bolts of the cam sprocket. Install the cylinder head side cover.

Turn the cam chain adjuster in clockwise motion so that the adjuster is pushed out to contact the cam chain plate tightly. Tighten the bolt cap of the adjuster adjustment hole.

## ⚠ Caution

The O-ring must be installed into glove.





## **VALVE CLEARANCE ADJUSTMENT**

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

Measure and adjust valve clearance with feeler gauge.

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

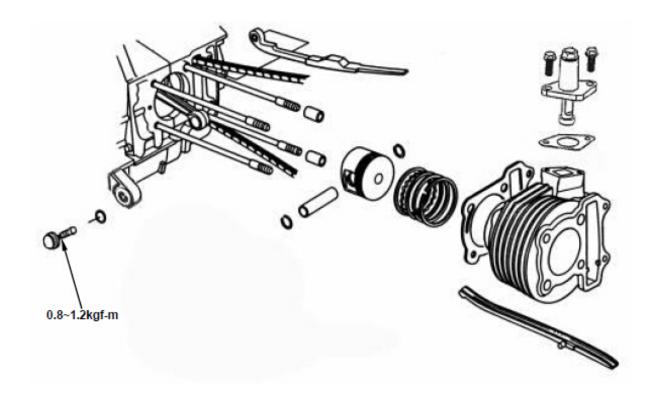
Standard Value: IN/EX 0.12±0.02mm



# 7. CYLINDER/PISTON

MECHANISM DIAGRAM7-1	PISTON REMOVAL7-5
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CYLINDER REMOVAL7-3	CYLINDER INSTALLATION 7-8

# MECHANISM DIAGRAM



## PRECAUTIONS IN OPERATION

## **General Information**

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

Specification unit: mm

Specification				unit. min
Item		Standard	Limit	
ID Cylinder Roundness		61.00		
		0.005	0.050	
	Cylindrical		0.005	0.050
Piston/ Piston ring	Clearance between piston and rings	Top ring	0.015~0.055	0.090
		2 <sup>nd</sup> ring	0.015~0.050	0.090
	Ring-end gap	Top ring	0.100~0.300	0.500
		2 <sup>nd</sup> ring	0.300~0.500	0.650
		Oil ring	0.200~0.700	
OD of piston			60.965~60.985	
	Clearance between piston and cylinder		0.025~0.035	0.100
ID of piston pin hole		15.002~15.008	15.010	
OD of piston pin		14.994~15.000	14.980	
Clearance between piston and piston pin		0.002~0.014	0.018	
ID of connecting rod small-end		15.016~15.034	15.040	

## **TROUBLE DIAGNOSIS**

## **Low Or Unstable Compression Pressure**

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

## **Knock or Noise**

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

## **Smoking in Exhaust Pipe**

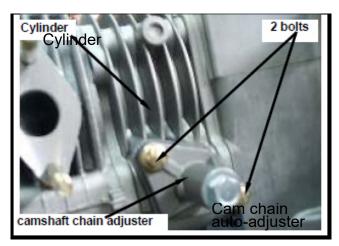
- Piston or piston ring worn out.
- Piston ring installation improperly.
- Cylinder or piston damage.

## **Engine Overheat**

Carbon deposits on cylinder head top side.

## **CYLINDER REMOVAL**

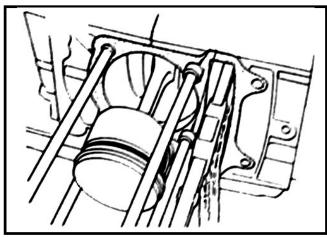
Remove cylinder head. (refer to chapter 6) Remove 2 bolts and then take out the cam chain auto-adjuster.



Remove cam chain plate. Remove cylinder.



Remove cylinder gasket and lock pins



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



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

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



## ⚠ Caution

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



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

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

## Service limit: 61.000mm

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

## **Service limit**

Real roundness: correct or replace as

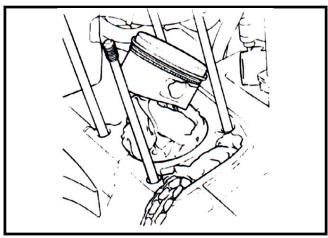
over 0.05 mm

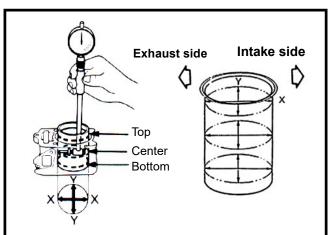
Cylindrical roundness: correct or replace

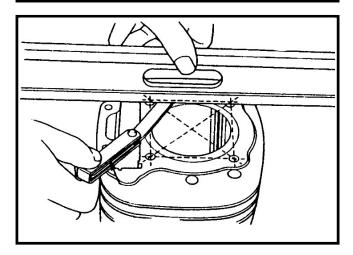
as over 0.05 mm

Check Cylinder flat.

Service limit: correct or replace as over 0.05 mm





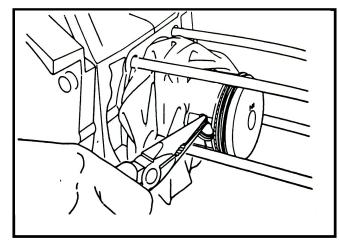


## **PISTON REMOVAL**

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

Hold another snap ring with pliers.

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



Remove piston rings.



## ⚠ Caution

Pay attention to remove piston rings because they are fragile.

Disassemble the piston rings.

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

Cleaning the carbon in piston ring grooves.

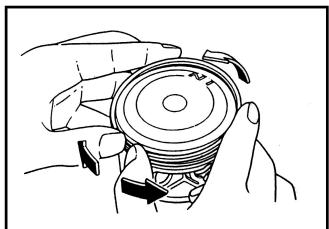
Install the piston rings and then measure clearance between piston ring and its grooves.

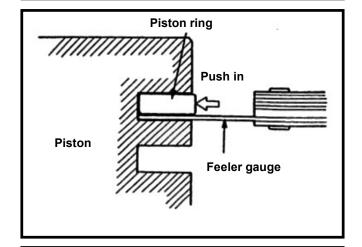
Service Limit: Top ring: replace if over

0.09mm

2nd ring: replace if over

0.09mm





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



# **⚠** Caution

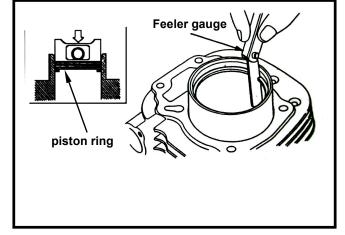
Push the piston rings into cylinder with piston top-end in parallel motion.

Service Limit: Top ring: replace if over

0.50mm

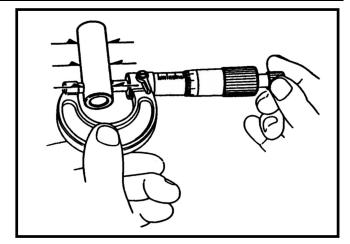
2nd ring: replace if over

0.650mm



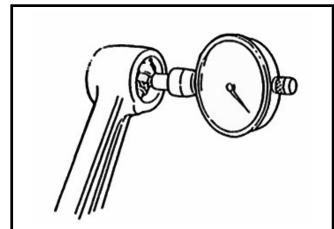
Measure the outer diameter of piston pin.

Service Limit: 14.980mm



Measure the inner diameter of connecting rod small end.

Service Limit: 15.040mm

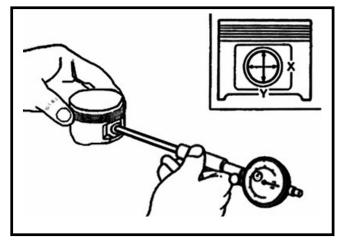


Measure the inner diameter of piston pin hole.

Service Limit: 15.010mm

Calculate clearance between piston pin and its hole.

Service Limit: 0.02mm



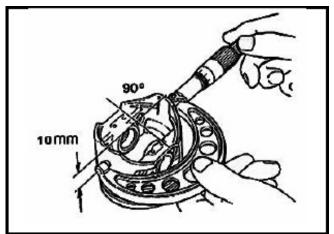
Measure piston outer diameter.



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

**Service limit:** 60.965~60.985mm

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

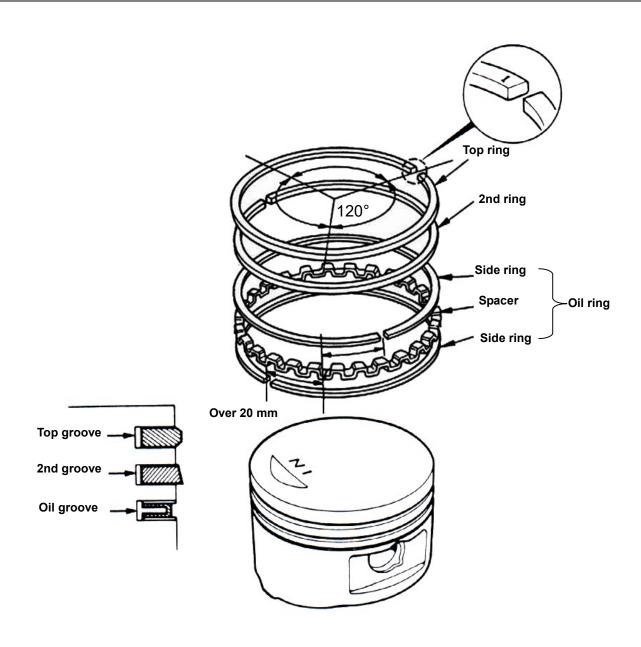


## PISTON RING INSTALLATION

Clean up piston top, ring groove, and piston skirt. Install the piston ring onto piston carefully. Place the openings of piston ring as diagram shown.

# **⚠** Caution

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



## **PISTON INSTALLATION**

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

Install new piston pin snap ring.

# **A** Caution

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



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

# **⚠** Caution

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

Install 2 lock pins and new gasket.

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

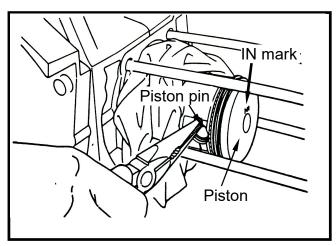
Care to be taken when installing piston into cylinder. Press piston rings in one by one as installation.

# ⚠ Caution

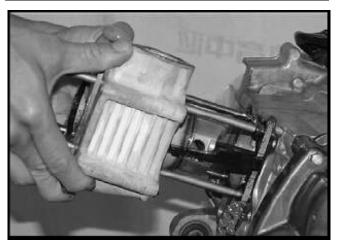
Do not push piston into cylinder forcefully because this will cause the piston and the piston rings to be damaged.

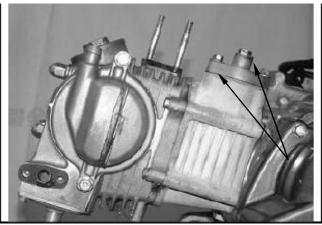
Install the cam chain plate, the cylinder head gasket and lock pins.

Install cylinder head. (refer to Chapter 6)
Install the cam chain auto-adjuster. (2 bolts)



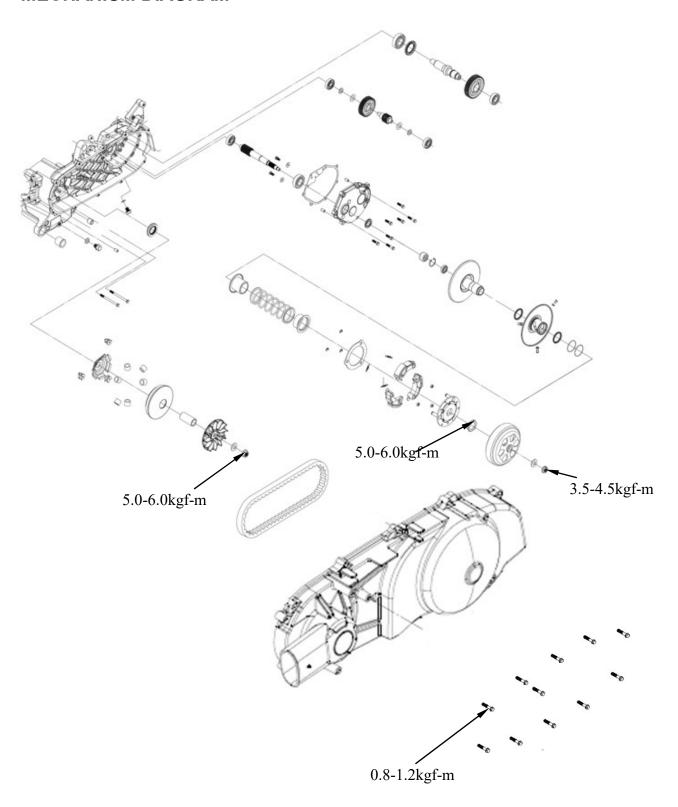






MECHANISM DIAGRAM8-1	KICK STARTER ARM8-3
MAINTENANCE DESCRIPTION8-2	DRIVING BELT8-4
TROUBLE DIAGNOSIS8-2	SLIDING PULLEY8-6
LEFT CRANKCASE COVER8-3	CLUTCH/DRIVEN PULLEY 8-9

# **MECHANISM DIAGRAM**



Unit: mm

33.940

34.060

## MAINTENANCE DESCRIPTION

## Precautions in operation

## **General information**

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

**Specification** 

Item Standard value Limit 17.50 16.8 Driving belt width 20.035~20.085 20.150 ID of sliding pulley bush OD of roller 15.920~16.080 15.570 107.00~107.20 107.50 ID of clutch outer Thickness of clutch pad 4.000 2.0 Free length of drive pulley 96.5 97.20 spring

33.965~33.985

34.000~34.025

ID: Inner Diameter OD: Outer diameter

ID of sliding pulley

OD of driven pulley

## **Torque value**

Sliding pulley nut: 5.0~6.0kgf-m Clutch outer nut: 5.5~6.0kgf-m driving pulley nut: 3.5~4.5kgf-m

## **TROUBLE DIAGNOSIS**

# Engine can be started but motorcycle can not be moved

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

## Shudder or misfire when driving

- Broken clutch pad
- Worn clutch pad

## **Special Service Tools**

Clutch spring compressor Bearing puller (inner type) Clutch mounting nut wrench Universal fixture

# Insufficient horsepower or poor high speed performance

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

## LEFT CRANKCASE COVER

## Left crankcase cover removal

Remove air cleaner. (2 bolts) Loosen vent strap on the front-left side of cover, and then remove the vent. Remove engine left-side cover (8 bolts).



# Installation of the left crankcase cover

Install the left crankcase cover. (8 bolts) Install front vent tube of left cover and tighten the strap.

Tighten the air cleaner. (2 bolts)

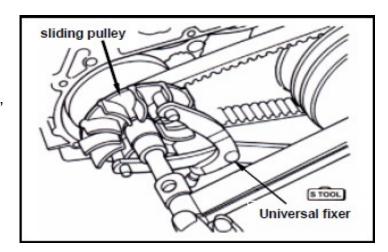


## **DRIVING BELT**

#### Removal

Remove left crankcase cover.

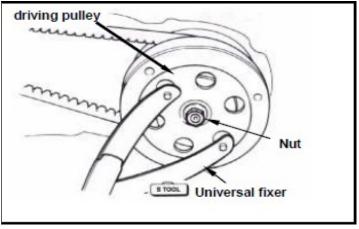
Hold the sliding pulley with a universal fixture, and then remove the nut and sliding pulley.



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

## **⚠** Caution

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



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

## Inspection

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

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

Service Limit: 16.80mm



# **⚠** 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.



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



# **⚠** Caution

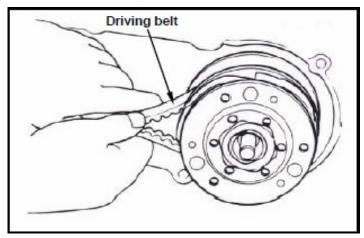
Pull out driving pulley and then insert the driving belt into the driving pulley so that the driving belt set can be installed onto sliding pulley more easily.

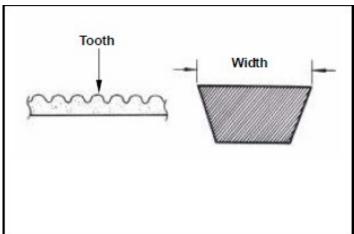
Install the starter clutch.

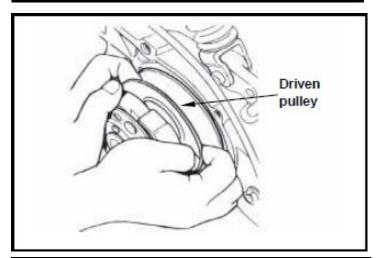
Install the clutch set with driving belt onto the driving shaft.

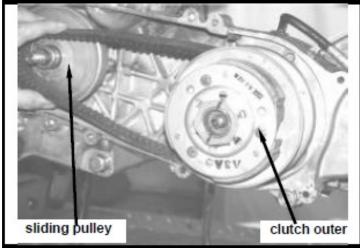
Install the sliding pulley on the other end of belt

Install clutch outer.



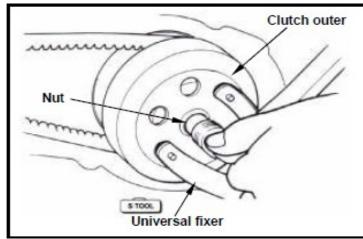






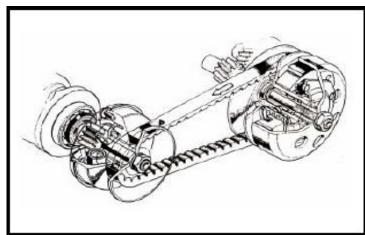
Install the clutch with universal fixture, and then tighten nut to specified torque value.

Torque value: 3.5~4.5 kgf-m



# **⚠** Caution

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

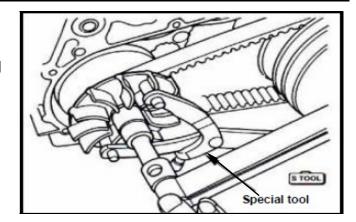


# SLIDING PULLEY REMOVAL

Remove left crankcase cover.

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

Remove driving pulley.

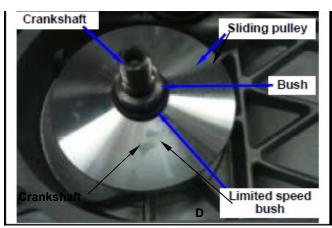


Remove the sliding pulley fixing nut and remove the driving belt from the sliding pulley.

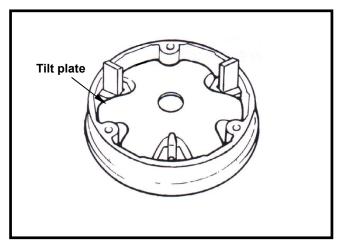
Remove the driving belt from the sliding pulley.

Remove the limited speed bush.

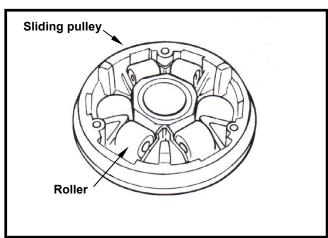
Remove the bush and remove the sliding pulley from the crankshaft.



Remove tilt plate.



Remove weight rollers from sliding pulley.



Weight roller

## Inspection

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

Check if rollers are wear out or damage. Replace it if necessary.

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

Service limit: 15.57 mm

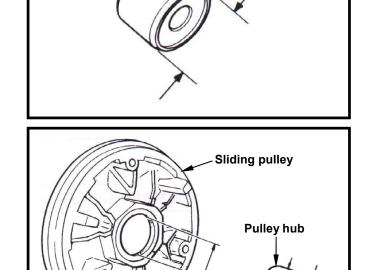
Measure the inner diameter of the sliding pulley.

Service limit: 34.06 mm

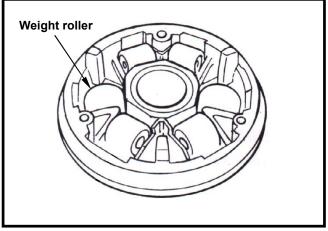
Measure the inner diameter of the pulley bush.

Replace it if exceed the service limit.

Service limit: 20.15 mm

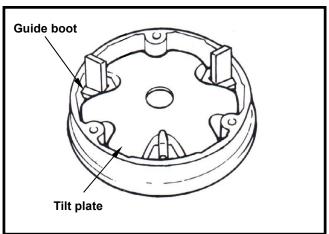


# Assembly/Installation Install the weight rollers.



Install the title plate guide boot onto the title plate.

Install the title plate.

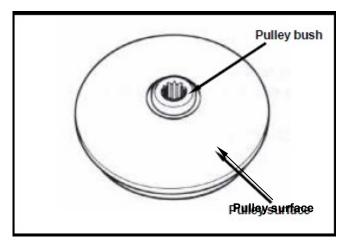


Apply with grease 4~5 g to inside of driving shaft hole, and install driving pulley hub.

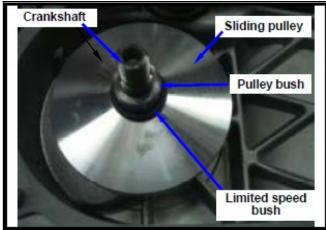


## ⚠ Caution

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



Install siding pulley assembly onto crankshaft.



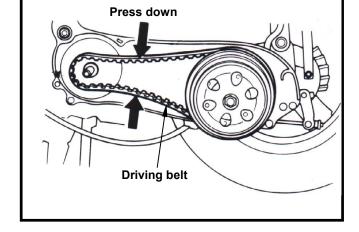
## **Driving pulley install**

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



# ⚠ Caution

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



Install driving pulley, washer and nut.

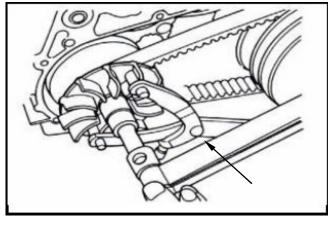


## ⚠ Caution

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

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

Torque value: 5.0~6.0 kgf-m Install left crankcase cover.



## **CLUTCH/DRIVEN PULLEY**

## **Disassembly**

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

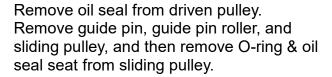


## $oldsymbol{\Lambda}$ Caution

Do not press the compressor too much.

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

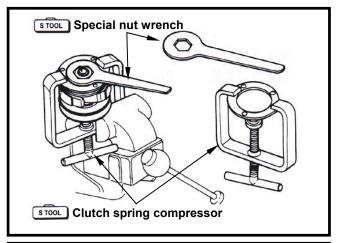
Release the clutch spring compressor and remove clutch and spring from driven pulley. Remove socket from driven pulley.

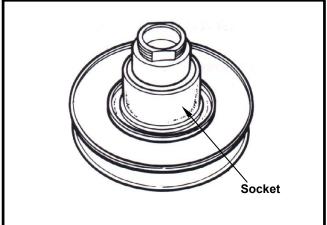


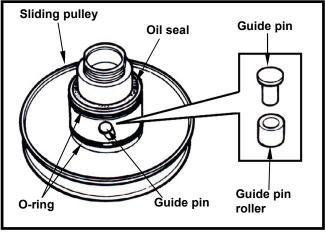


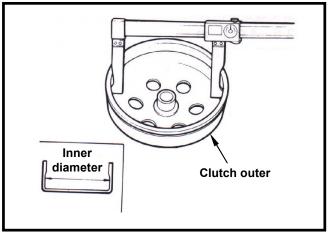
Measure the inner diameter of clutch outer friction face. Replace the clutch outer if exceed service limit.

Service limit: 107.5 mm





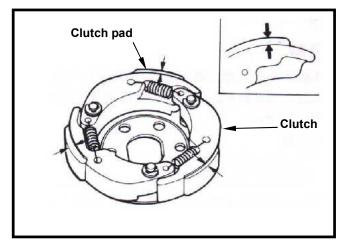




## **Clutch lining**

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

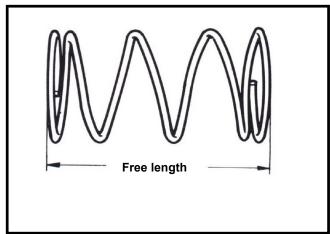
Service limit: 2.0mm



## **Driven pulley spring**

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

Service limit: 93.2mm

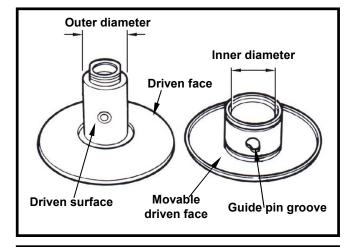


## **Driven pulley**

Check following items;

- · If both surfaces are damage or wear.
- If guide pin groove is damage or wear. Replace damaged or worn components. Measure the outer diameter of driven face and the inner diameter of movable driven face. Replace it if exceeds service limit.

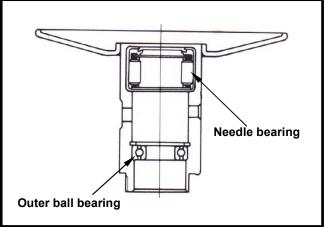
Service limit: Outer diameter 33.94mm Inner diameter 34.06mm



## **Driven Pulley Bearing Inspection**

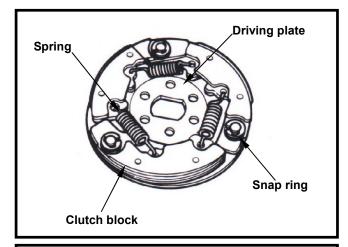
Check if the inner bearing oil seal is damage. Replace it if necessary.

Check if needle bearing is damage or too big clearance. Replace it if necessary. Rotate the inside of inner bearing with fingers to check if the bearing rotation is in smooth and silent

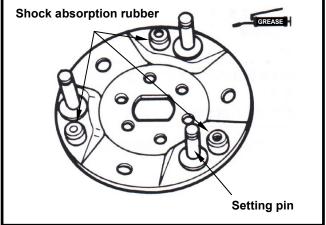


## **Clutch Block Replacement**

Remove snap and washer, and the remove clutch block and spring from driving plate. 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.



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

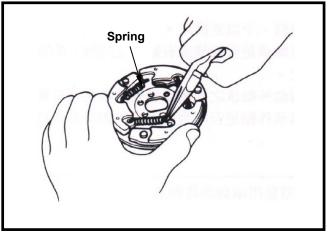
Install new clutch block onto setting pin and then push to specified location.

# ⚠ Caution

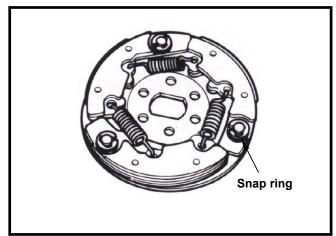
 Grease or lubricant will damage the clutch block and effect the block's connection capacity. Shock absorption rubber

Clutch block

Install the spring snap into groove with pliers.



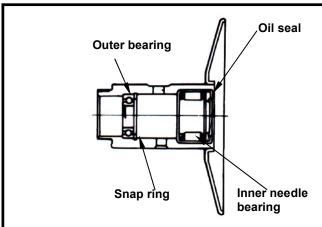
Install snap ring and mounting plate onto setting pin.



# Replacement of driven pulley bearing Remove inner bearing.

# **⚠** Caution

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

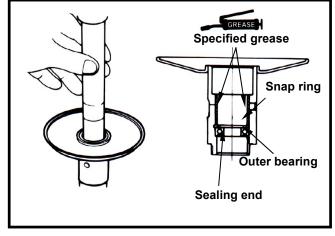


Remove snap ring and then push bearing forward to other side of inner bearing. Place new bearing onto proper position and its sealing end should be forwarded to outside.

Apply with specified grease.

Recommended to use G-3.

Install the snap ring and hold the bearing.

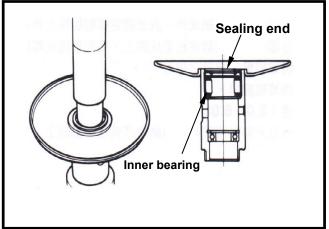


Install a new inner bearing.

# **⚠** Caution

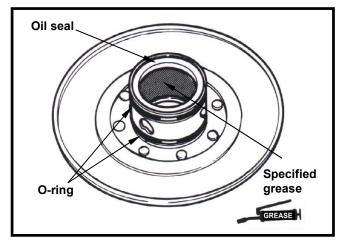
- Its sealing end should be forwarded to outside as bearing installation.
- Install needle bearing with hydraulic presser. Install ball bearing by means of hydraulic presser.

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

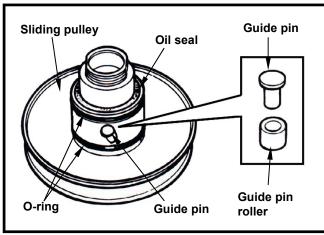


Installation of clutch/driven pulley

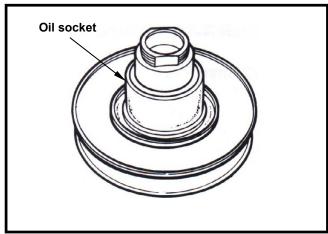
Install new oil seal and O-ring onto sliding pulley. Apply with specified grease to lubricate the inside of sliding pulley.



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



Install oil socket.

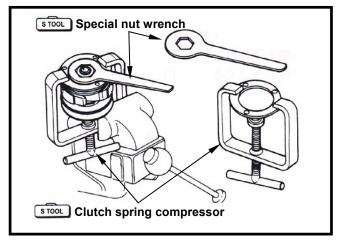


Install driven pulley, spring and clutch into clutch spring compressor, and press down the assembly by turning manual lever until mounting nut that can be installed. Hold the compressor by bench vise and tighten the mounting nut to specified torque with special nut wrench.

Remove the clutch spring compressor.

Torque value: 5.5~6.0 kg-m

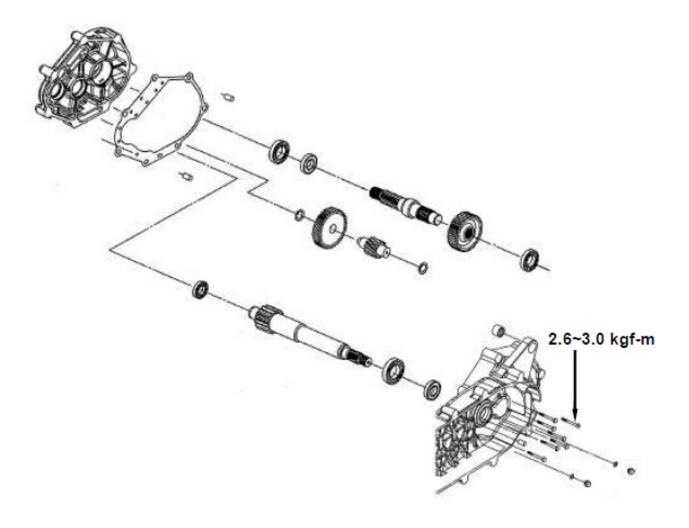
Install clutch/driven pulley and driving belt onto driving shaft.



# 9. FINAL DRIVING MECHANISM

MECHANISM DIAGRAM9-1	INSPECTION OF FINAL DRIVING	
OPERATIONAL PRECAUTIONS9-2	MECHANISM9-3	
TROUBLE DIAGNOSIS9-2	BEARING REPLACEMENT9-4	
DISASSEMBLY OF FINAL DRIVING	RE-ASSEMBLY OF FINAL DRIVING	
MECHANISM9-3	MECHANISM9-6	

## **MECHANISM DIAGRAM**



## **OPERATIONAL PRECAUTIONS**

## **Specification**

Application gear oil: 4-stroke lubricant Recommended gear oil:85W-140 Oil quantity: 180 c.c. (170 c.c. when

replacing)

## Torque value

 $\begin{array}{lll} \mbox{Gear box cover} & 2.6 \mbox{$\sim$} 3.0 \mbox{ kgf-m} \\ \mbox{Gear oil drain plug} & 1.0 \mbox{$\sim$} 1.5 \mbox{ kgf-m} \\ \mbox{Gear oil filling bolt} & 1.0 \mbox{$\sim$} 1.5 \mbox{ kgf-m} \\ \end{array}$ 

## **Tools**

## Special service tools

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

## **TROUBLE DIAGNOSIS**

# Engine can be started but motorcycle can not be moved

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

## Noise

- Worn or burnt gear
- Worn gear

## Gear oil leaks

- Excessive gear oil
- Worn or damage oil seal

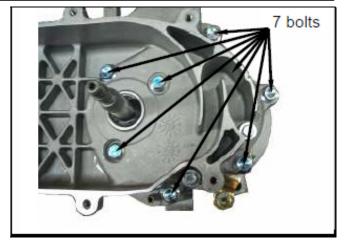
# DISASSEMBLY OF FINAL DRIVING MECHANISM

Remove the rear wheel. (refer to chapter 15) Remove the clutch.

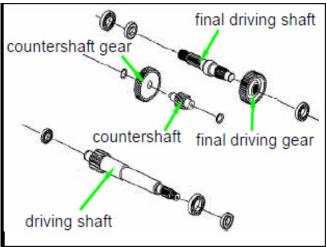
Drain gear oil out from gear box.

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

Remove gasket and setting pin.

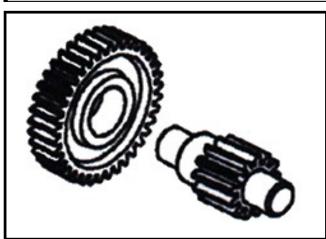


Remove countershaft and gear. Remove final driving gear and shaft.

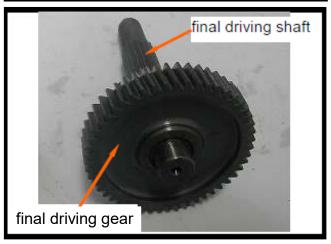


# INSPECTION OF FINAL DRIVING MECHANISM

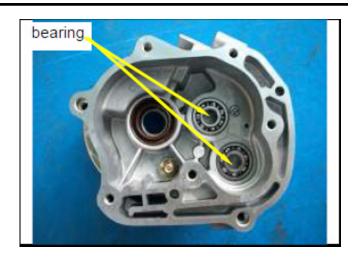
Check if the countershaft and the gear are wear or damage.



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



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



Check driving shaft and gear for wear or damage.

## **BEARING REPLACEMENT**



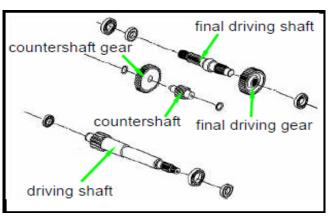
Never install used bearings. Once bearing removed, it has to be replaced with new one.

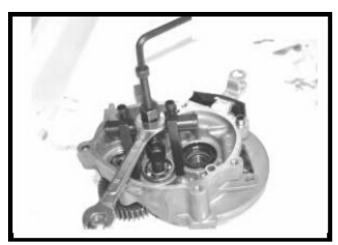
Remove driving shaft bearing from left crankcase using following tools; Inner type bearing puller

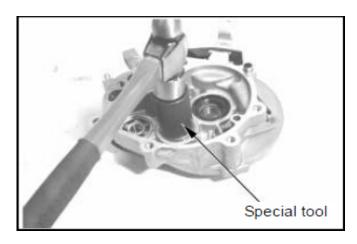
Install new driving shaft bearing into left crankcase.

#### Tool:

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







Press out the driving shaft from the crankcase.

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

# ⚠ Caution

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

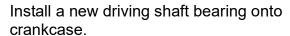


Inner type bearing puller.

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

#### Tool:

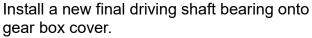
Multi-functional bearing puller Bearing protector



Then, install the driving shaft.

## **Specified tool:**

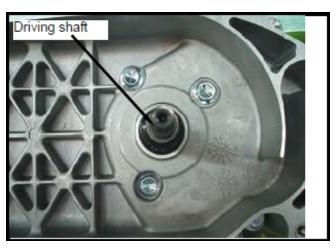
Press the bearing in with C type hydraulic presser or bearing installer.

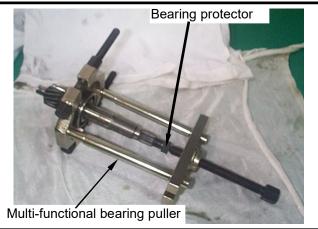


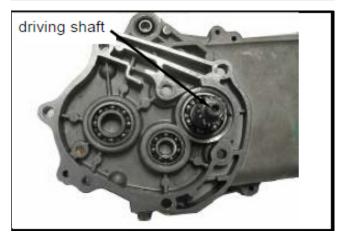
## Specified tool:

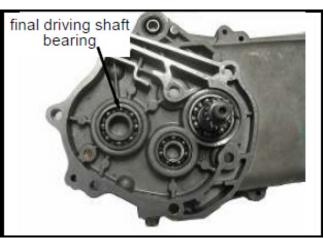
Press the bearing in with C type hydraulic presser or the bearing installer.

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



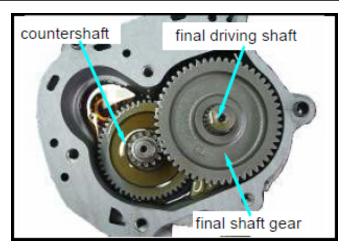




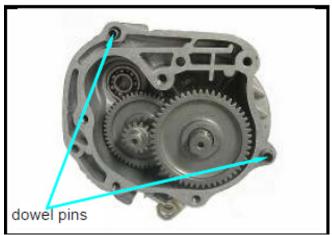


# RE-ASSEMBLY OF FINAL DRIVING MECHANISM

Install final driving shaft and final driving gear, countershaft, and countershaft gear.



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



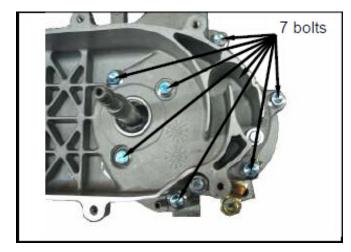
Apply with grease onto the oil seal lip of final driving shaft.

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

Torque: 2.6~3.0 kgf-m

Install the clutch/sliding driving pulley. Install the driving pulley, belt and left crankshaft cover.

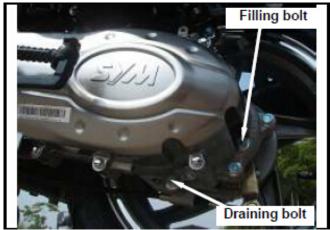
Install the rear wheel.



Add gear oil.

Recommended usage gear oil: SAE 85W-140

(180 cc: standard capacity) (170 cc: when replacement)



PRECAUTIONS IN OPERATION10-1	RIGHT CRANKCASE COVER
A.C.GENERATOR REMOVAL10-2	
RIGHT CRANKCASE COVER	MOUNTED COIL SET
REMOVAL10-3	INSTALLATION10-4
	FLY WHEEL INSTALLATION10-4

#### PRECAUTIONS IN OPERATION

#### **General information**

- Refer to chapter 5: Engine removal and installation
- Refer to chapter 1: The troubleshooting and inspection of A.C. generator

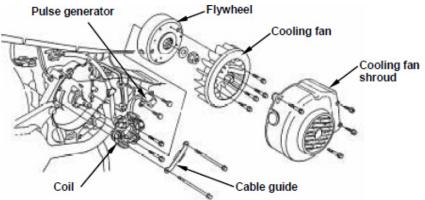
#### Torque value:

Flywheel nut	3.5~4.5kgf-m
Exhaust muffler bolt 8 mm	3.0~3.6kgf-m
Oil screen cover	1.0~2.0kgf-m

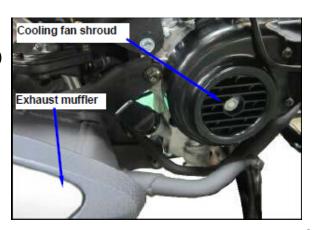
#### **Special service tools**

Flywheel puller Universal fixture

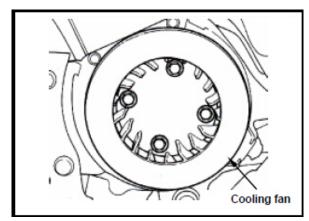
#### A.C. GENERATOR REMOVAL



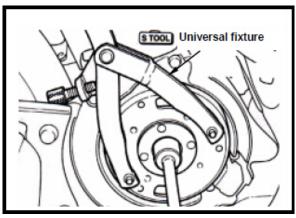
Drain out the engine oil.
Remove the exhaust muffler. (2 bolts, 2 nuts)
Remove the fan shroud. (4 bolts)



Remove the fan. (4 bolts)



Hold the flywheel with the universal fixture. Remove the 10mm nut on the flywheel. Special Service Tools: Universal Fixture



Remove the flywheel with the flywheel puller. Special service tools:

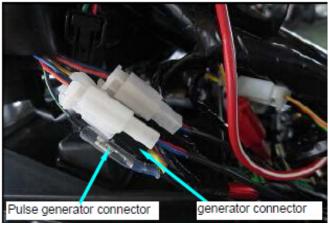
Flywheel puller **Shaft protector** 

## Caution

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

STOOL Flywheel puller

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

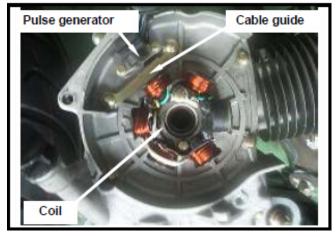


Remove the 6 bolts for the pulse generator, the A.C. generator coil and cable guide. Then, remove the A.C. generator assembly.



#### ⚠ Caution

Do not damage the alternator coil.



### RIGHT CRANKCASE COVER **REMOVAL**

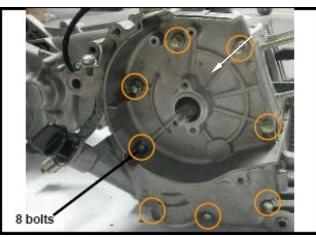
Remove the right crankcase cover. (8 bolts) Remove setting pin and gasket.

Remove the gasket or foreign materials on the connection surfaces of both the cover and crankcase.



## **⚠** Caution

Do not damage the connection surfaces.



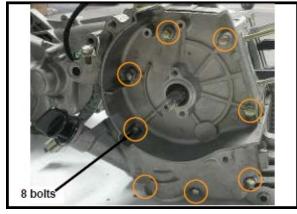
#### **RIGHT CRANKCASE COVER** INSTALLATION

Install setting pin and new gasket on the crankcase.

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

Install right crankcase cover onto the right crankcase. (8 bolts)

Torque value: 1.5~2.0kgf-m



#### **MOUNTED COIL SET INSTALLATION**

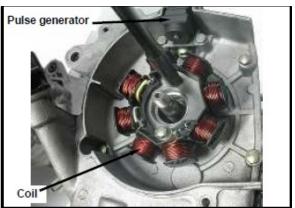
Install the coil set onto right crankcase cover. (2 bolts)

Install pulse generator. (2 bolts)

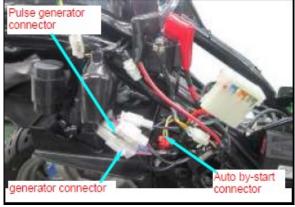
Torque: 0.8~1.2kgf-m

Tie the wire harness hose onto the indent of

crankcase.



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



#### **FLYWHEEL INSTALLATION**

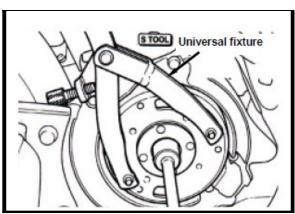
Make sure that there is no magnetic powder. If so, clean up it.

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

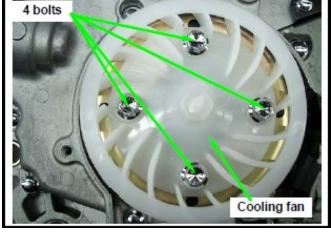
Hold the flywheel with flywheel holder, and tighten its nut.

Torque value: 3.5~4.5kgf-m

Special service tool: Universal fixture



Install the cooling fan.

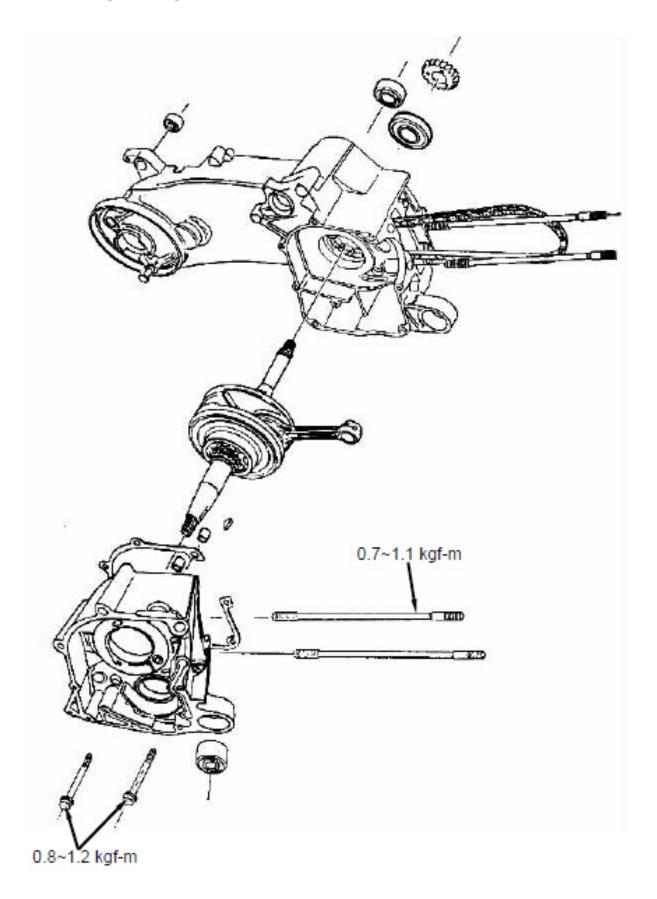


Install the cooling fan shroud. Install the exhaust muffler. Add some engine oil according the specified quantity.



MECHANISM DIAGRAM11-1	DISASSEMBLY OF CRANKCASE 11-3
OPERATIONAL PRECAUTIONS 11-2	CRANKSHAFT INSPECTION 11-5
TROUBLE DIAGNOSIS11-2	ASSEMBLY OF CRANKCASE 11-6

## **MECHANISM DIAGRAM**



#### **OPERATIONAL PRECAUTIONS**

#### **General Information**

 This Section contains descriptions concerning disassembly of the crankcase so that the crankshaft can be serviced.

• Complete following operations before disassembling crankcase.

Engine Chapter 5
Cylinder head Chapter 6
Cylinder and piston Chapter 7
V-belt Drive pulley Chapter 8
AC generator/ Starting Clutch Chapter 10

If the crankshaft bearing or timing sprocket need be replaced, then the crankshaft set have to replaced.

Specification Unit: mm

<u></u>		
Item	Standard	Limit
Left, right clearance of the big end of the connecting rod	0.100~0.350	0.550
Radial clearance of the big end of the connecting rod	0.000~0.008	0.050
Run-out	Below0.030	0.10

#### **Torque value**

Bolts for crankcase	0.8~1.2 kgf-m
Bolts for cylinder/cylinder head	0.7~1.1 kgf-m
Engine oil draining plug	3.5~4.5 kgf-m
Bolts for cam chain tensioner	0.8~1.2 kgf-m

#### **Special Service Tools**

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

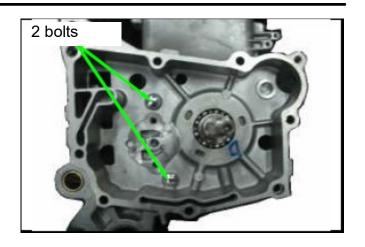
#### **TROUBLE DIAGNOSIS**

#### **Engine noise**

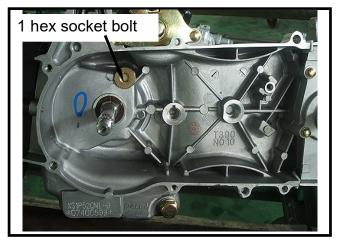
- · Loose crankshaft bearing
- Loose crankshaft pin bearing
- Wear piston pin or piston pin hole

#### **DISASSEMBLY OF CRANKCASE**

Remove the 2 bolts from the right crankcase.



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



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

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

## ⚠ Caution

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

Special Service Tools: Crankcase remover/set





Remove the crankshaft from the right crankcase.

## **⚠** Caution

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



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

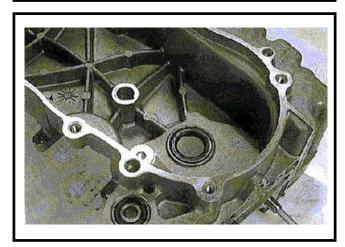


## **⚠** Caution

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



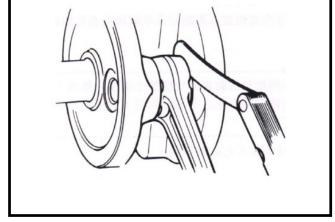




#### **CRANKSHAFT INSPECTION**

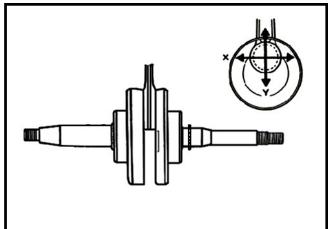
Measure left and right clearance of connecting rod big end.

Service limit: Replace when it is more than 0.55 mm



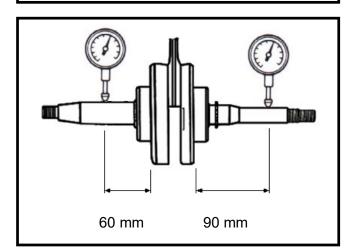
Measure the radical clearance of the big end at the vertical directions.

Service limit: 0.05 mm



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

Service limit: 0.10mm

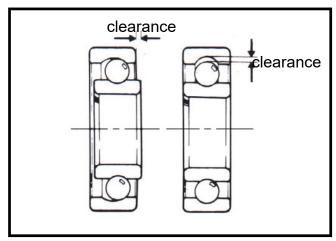


## **Bearing Inspection**

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

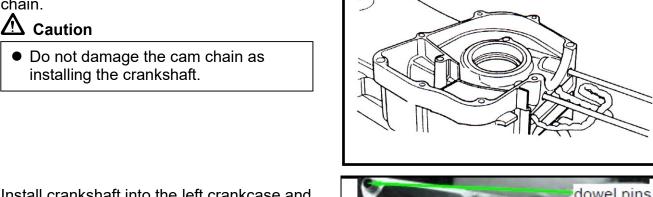
Check if the inner ring is connected onto the crankshaft tightly.

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

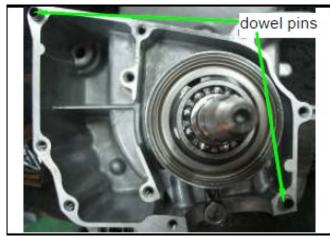


#### **ASSEMBLY OF CRANKCASE**

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

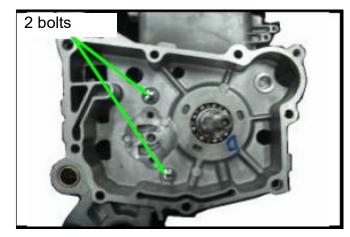


Install crankshaft into the left crankcase and then install two dowel pins and new crankcase gasket.



Install the right crankcase and tighten the crankcase bolts (1 bolts).

Torque value: 0.8~1.2 kgf-m



Install the cam chain tensioner.

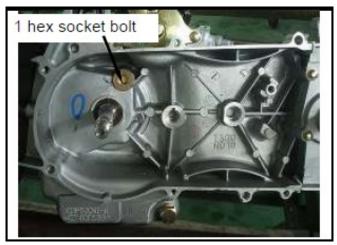
Install a new O-ring onto the mounting bolt of the chain tensioner.

Apply some oil on the O-ring and tighten the bolt.

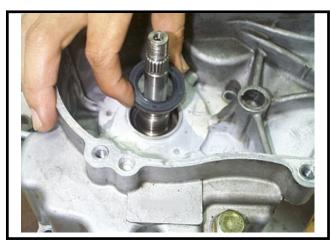
Torque value: 0.8~1.2 kgf-m



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



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

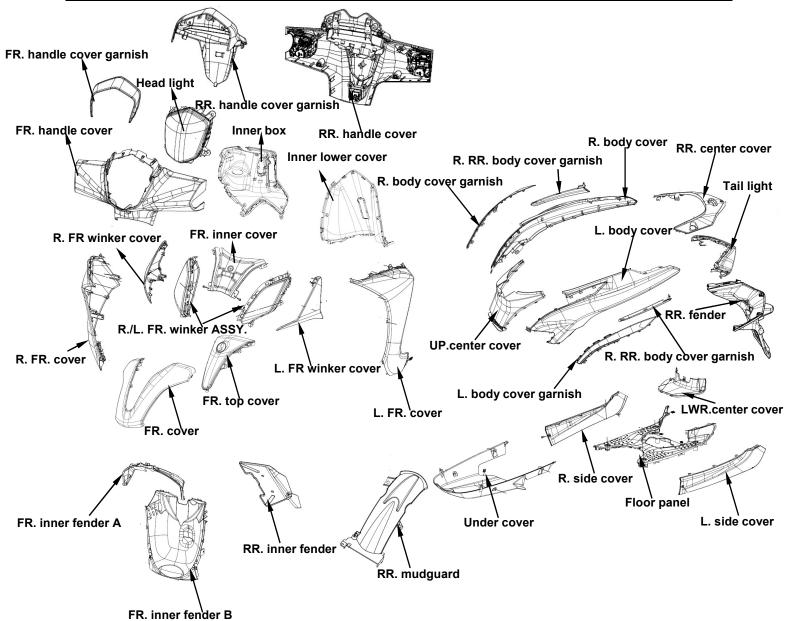


Press-fit the oil seal to specified position with the oil seal installer (25x37x6).

Special service tools: the oil seal installer (25x37x6)



MAINTENANCE INFORMATION12-1	FRONT COVER12-4
HANDLE COVER12-2	BODY COVER12-8



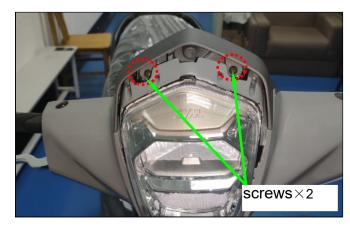
#### **HANDLE COVER**

#### Removal:

Remove handle front cover garnish.



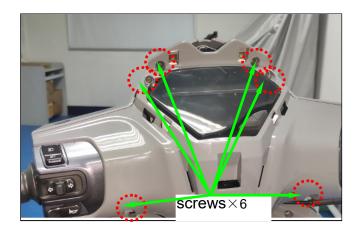
Remove the 2 mounting screws.



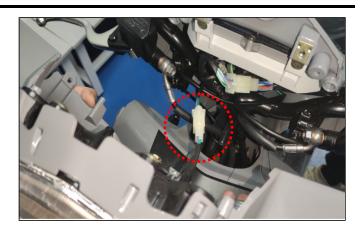
Removed handle rear cover garnish.



Remove the 6 mounting screws.



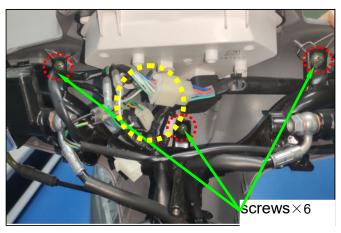
Remove the front handle cover. (Pay attention to pulling off the light connector)



Remove the front handle cover.



Remove the 3 mounting screw (Pay attention to pulling off the Meter)



Remove rear handle cover.

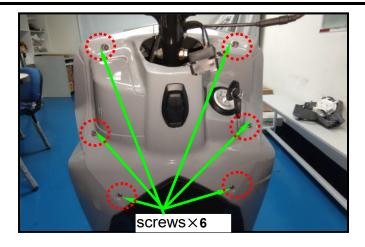
#### Installation:

Install according to the reverse procedure of removal.

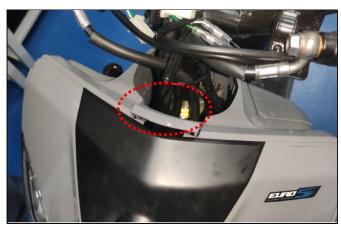


## FRONT COVER Removal

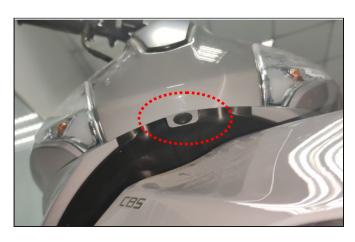
Remove the 4 mounting screws of the Inner fender A.



Remove the main pipe joint cap



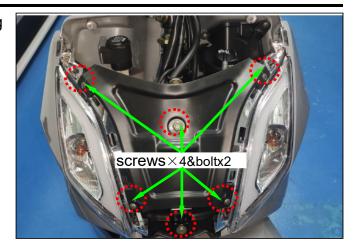
Remove plastic nut



Removel front cover



Remove the 4 mounting screws & 2 mounting Bolt.



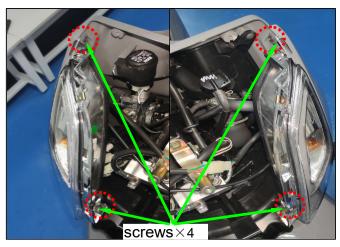
Remove front inner cover



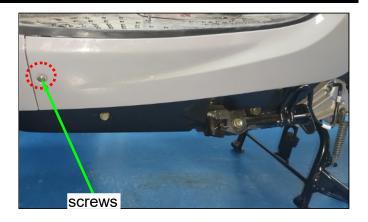
Remove the 2 mounting screws of inner lower cover



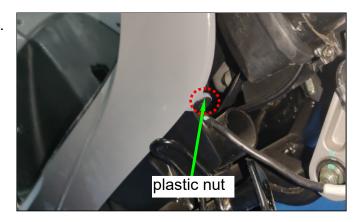
Remove the 4 mounting screws (both side)



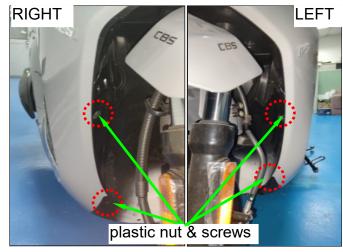
Remove the 2 mounting of both side cover



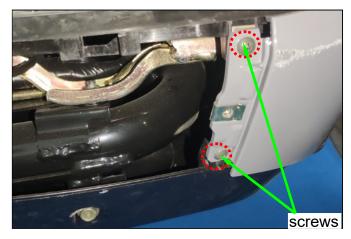
Remove the 2 plastic nut of both side cover.



Remove the 2 plastic nut and 2 screws.

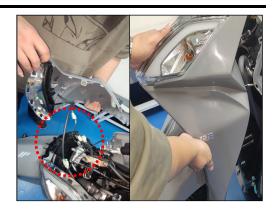


Remove the 4 mounting screws (both side)



Remove the FR. Right cover an left cover.

(Pay attention to pulling off the light connector)



#### Installation:

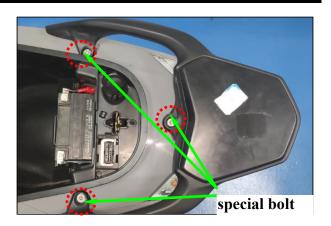
Install according to the reverse procedure of removal.

#### **BODY COVER**

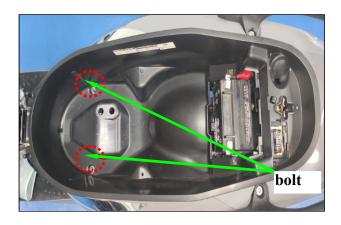
#### Removal

Remove the 3 special bolt of rear carrier.

Remove rear carrier.

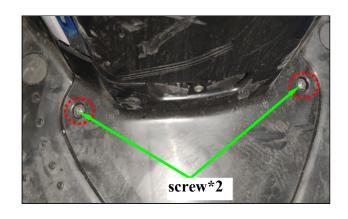


Remove the 2 bolt of the luggage box. Remove luggage box .



Remove the 2 screws of the lower center cover.

Remove the lower center cover.



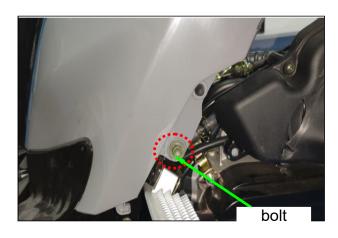
Remove the screw of under cover



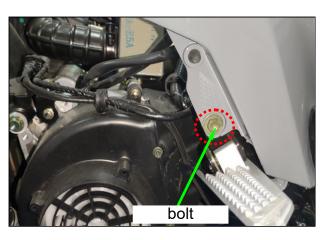
Remove the screw of under cover



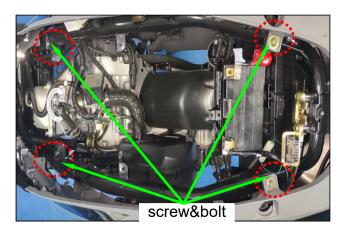
Open the left pillion step Remove the bolt of left body cover



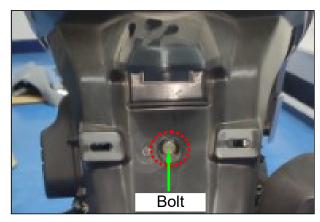
Open the right pillion step Remove the bolt of right body cover



Remove the 2 screws and 2 bolts



Remove the bolt.



Remove body cover.

### Installation:

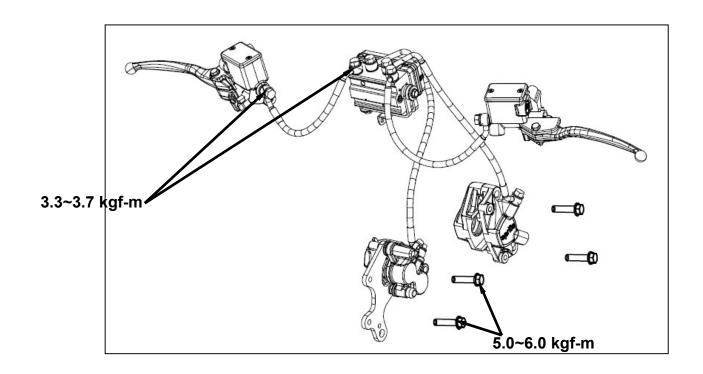
Install according to the reverse procedure of removal.

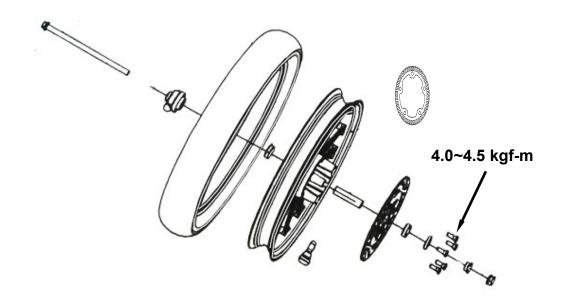


SYM 13. BRAKE

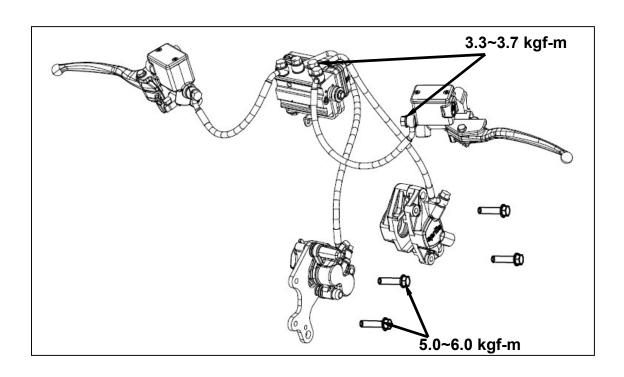
MECHANISM DIAGRAM-FRONT	BRAKE FLUID
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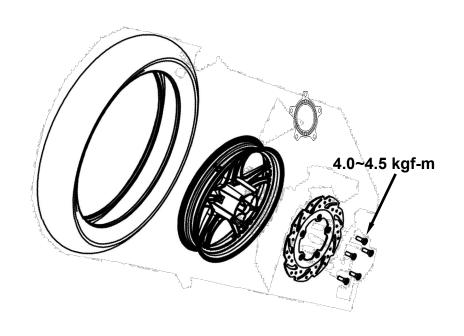
# MECHANISM DIAGRAM Front Disc Brake System





# **MECHANISM DIAGRAM Rear Disc Brake System**





SYM 13. BRAKE

#### MAINTENANCE INFORMATION

#### **Precautions in Operation**

## **⚠** Caution

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

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

Specifications Unit: mm

Standard	Limit
3.50	2.00
3.50	2.00
0.15	0.30
0.15	0.30
25.40	_
260.00	_
240.00	_
<del></del>	As brake ling mark
_	2mm or As brake ling mark
	3.50 3.50 0.15 0.15 25.40 260.00

#### **Torque values**

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

## TROUBLE DIOGNOSIS DISC BRAKE

#### Soft brake lever

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

#### Hard operation of brake lever

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

#### Uneven brake

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

#### **Tight brake**

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

#### Brake noise

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

SYM 13. BRAKE

## HYDRAULIC BRAKE SYSTEM INSPECTION

#### Inspection

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

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

Park the motorcycle on a flat ground and check its brake fluid level.

Recommended brake fluid: WELLRUN DOT 3 brake fluid

## **⚠** CAUTION

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

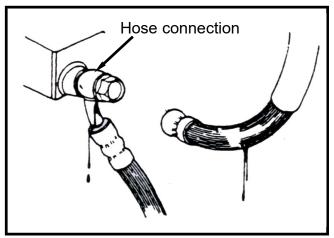
#### **Brake Fluid Add**

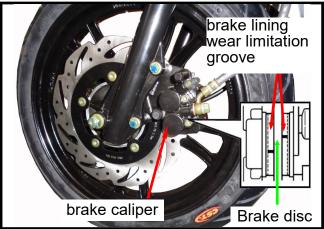
Turn the handlebar to let the master cylinder in horizontal position before removed the master cylinder cap.

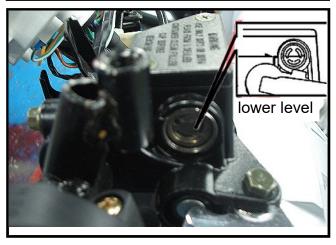
Place a rag onto painting, plastic or rubber components when conduct brake system maintenance.

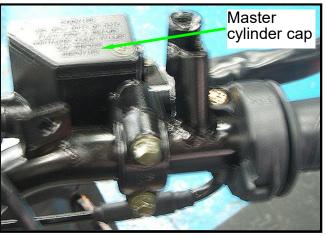
## **⚠** CAUTION

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









Remove the master cylinder cap and diaphragm.

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

### $oldsymbol{\Delta}$ CAUTION

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

#### BRAKE FLUID REPLACEMENT/ AIR-BLEED

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

## $oldsymbol{\Lambda}$ caution

To reuse the spent brake fluid will effect brake performance.

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

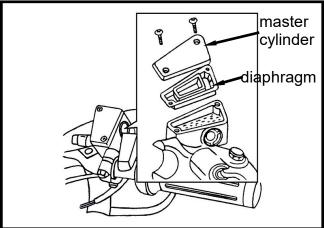
Open the drain valve around 1/4 turns, and at the same time hold the brake lever until the there is no air bubble in the drain hose and also feeling resistance on the brake lever.

Close the drain valve when finishing the brake system refilling fluid procedure, and operate the brake lever to check whether air bubble is in brake system or not. If brake is still soft, please bleed the system as described below.

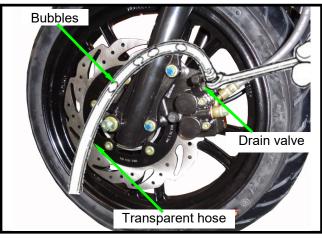
1. Tightly hold the brake lever and open the drain valve around 1/4 turns, and then close the valve.

## $oldsymbol{\Delta}$ CAUTION

- Do not release the brake lever before the drain valve is closed.
- Always check the brake fluid level when carrying out the air bleeding procedure to avoid air entering into the system.
- Slowly release the brake lever, and wait for a few seconds until it reaches its top position.
- 3. Repeat the steps 1 and 2 until there is no air bubble at the end of the hose. Tightly close the drain valve.
- 4. Make sure the brake fluid is in the UPPER level of the master cylinder, and refill the fluid if necessary.
- **5.** Cover the cap.







SYM 13. BRAKE

#### **BRAKE CALIPER**

#### Removal

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

## **⚠** CAUTION

 Do not spill brake fluid on painted surfaces.

Remove two caliper bolts and the caliper.

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

#### **Brake Lining Replacement**

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

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

#### **INSTALLATION**

Install the brake caliper and tighten the attaching bolts securely.

Torque: 3.3 kgf-m

CAUTION

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

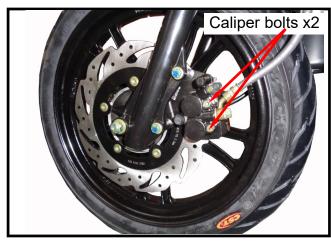
Tighten the lining guide bolt.

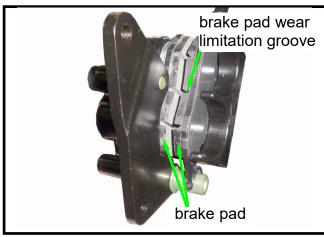
Torque: 1.8 kgf-m

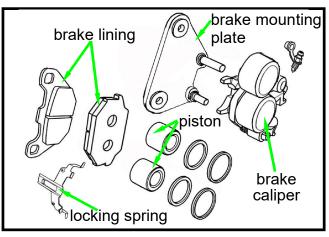
Use two seal washers and hose bolts to lock the hose and brake caliper in place.

Torque: 3.5 kgf-m

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







## Rear Brake Caliper Removal

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

#### **⚠** Caution

• Do not spill brake fluid on painted surfaces.

Remove two caliper mounting bolts and the caliper.

#### Installation

Install the brake caliper and tighten the mounting bolts.

Torque: 2.9~3.5kgf-m

#### 

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

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

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

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

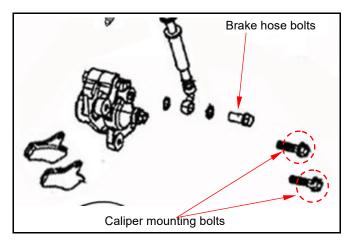
#### Brake pad replacement

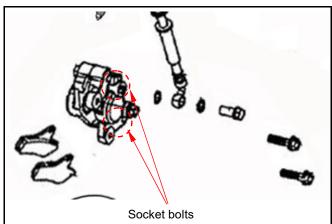
Remove the brake caliper upper parts (2 socket bolts).

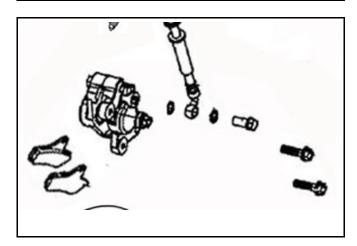
Take out the brake pads.

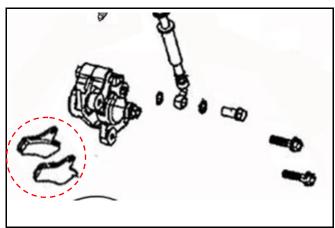
Install the new brake pads onto brake caliper bracket.

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









SYM 13. BRAKE

#### **BRAKE DISC**

#### Inspection

Visually check the brake disc for wear or

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

Allowable limit: 2.0 mm

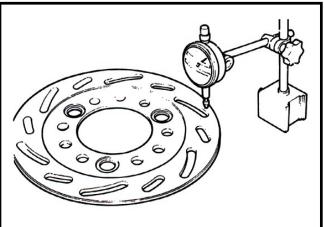
brake disc micrometer

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

#### Allowable limit: 0.30 mm

#### ⚠ CAUTION

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



#### **BRAKE MASTER CYLINDER** Removal



#### $\Delta$ CAUTION

Do not let foreign materials enter into the cylinder.



#### ⚠ CAUTION

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

Remove the front and rear handlebar

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

Remove the brake lever from the brake master cylinder.

Remove the brake hose.

Remove the master cylinder seat and the master cylinder.

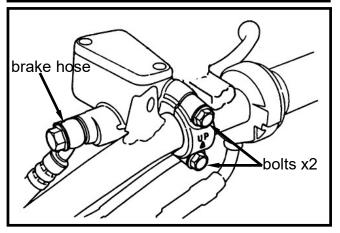
Remove the rubber pad.

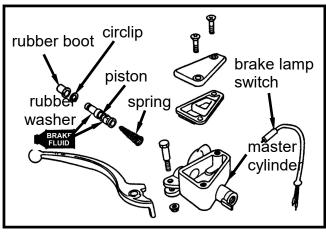
Remove the circlip.

Remove the piston and the spring.

Clean the master cylinder with

recommended brake fluid.





#### Inspection

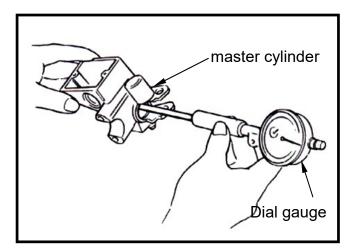
Check the master cylinder for damage or scratch. Replace it if necessary.

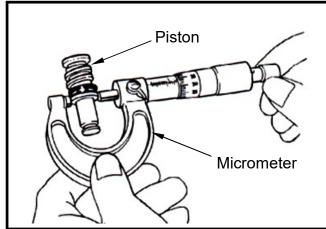
Measure the cylinder inner diameter at several points along both X and Y directions. Replace the cylinder if the measured values exceed allowable limit.

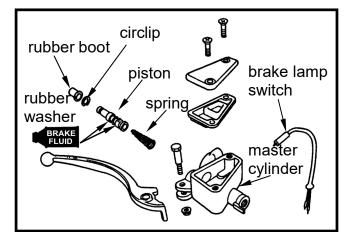
Allowable limit: 11.055 mm

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

Allowable limit: 10.945 mm







#### **Assembly**

### $oldsymbol{\Delta}$ CAUTION

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

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

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

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

Install the circlip.

## **⚠** CAUTION

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

Install the rubber pad into groove properly.

SYM 13. BRAKE

#### **INSTALLATION**

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

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

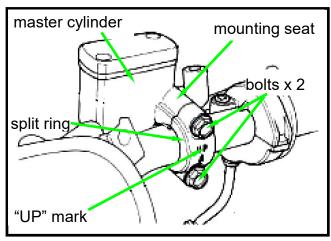
Tighten the upper bolt of the seat to specified torque value, and then tighten lower bolt to the same specified torque value.

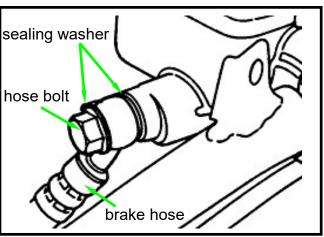
Install the brake lever, and connect leads to brake lamp switch.

Connect brake hoses with 2 new washes. Tighten the brake hose bolt to the specified torque value.

Torque value: 3.5 kgf-m

Make sure the hose is installed correctly.





#### **ABS (Anti-lock Brake System)**

ABS is designed to help prevent the wheel from locking up when hard brakes are applied while running straight. The ABS automatically regulates the brake force. Intermittently gaining gripping force and braking force helps prevent wheel lock-up and allows stable steering control while stopping. Brake control function is identical to that of a conventional scooter. The right brake lever is used for the front brake and the left brake lever for the rear brake.

Use of non-recommended tires may cause malfunctioning of ABS and can lead to extended braking distance. The rider could have an accident as a result. Always use recommended standard tires for this scooter.

When the ABS is functioning, rider may feel a pulsing in the brake lever. This is normal. ABS does not function at the speed of approx. 5 km/h or below. ABS does not function if the battery is discharged.



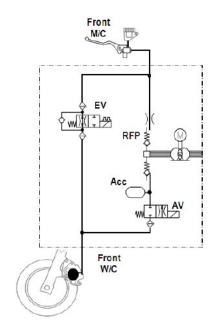
Single channel style (BOSCH)



double channel style (CONTI)

SYM 13. BRAKE

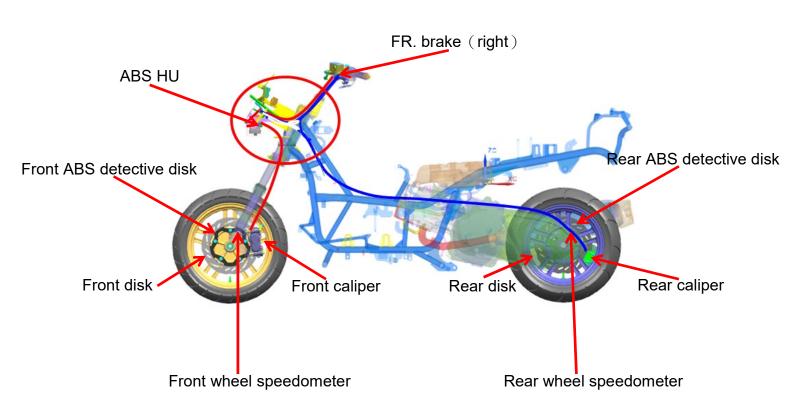
## Single channel style (BOSCH)



Front wheel oil pressure circuit diagram

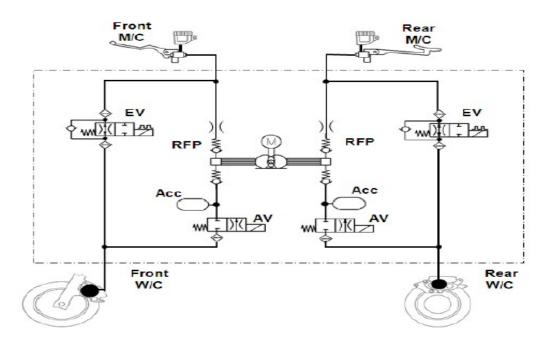
Single channel ABS only controls the front wheels, and the rear brakes are non ABS

Configuration diagram of single channel ABS



Single channel ABS rear brake system fails to pass HU

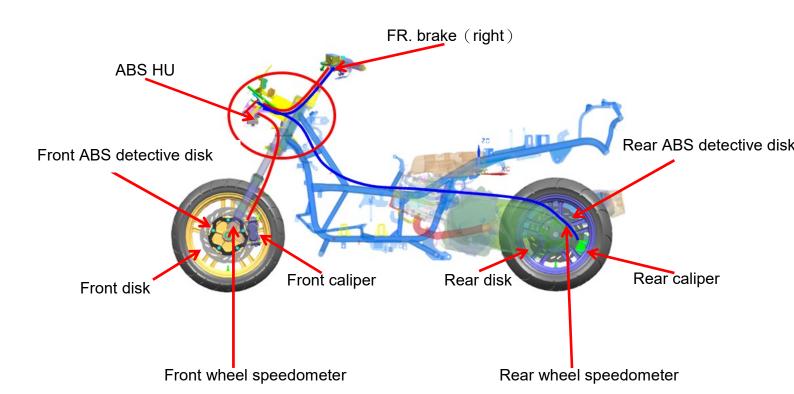
## Double channel style (CONTI)



Front wheel oil pressure circuit diagram

Rear wheel oil pressure circuit diagram

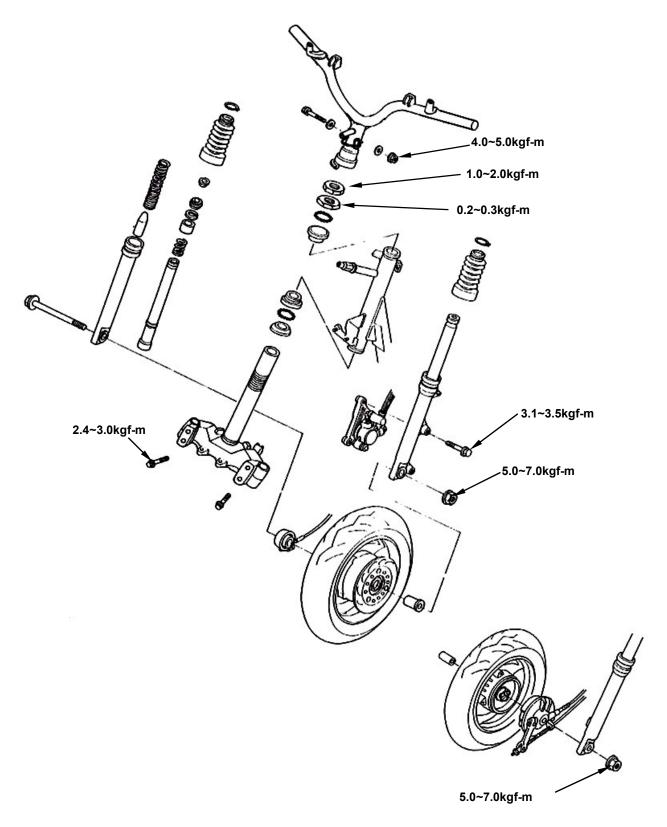
### Configuration diagram of double channel ABS



Dual channel ABS front and rear brake system passes HU

MECHANISM DIAGRAM14-1	FRONT WHEEL14-4
PRECAUTIONS IN OPERATION14-2	FRONT SHOCK ABSORBER14-9
TROUBLE DIAGNOSIS14-2	FRONT FORK/STEERING COLUMN 14-9
STEERING HANDLE14-3	

### **MECHANISM DIAGRAM**



#### PRECAUTIONS IN OPERATION

#### **General Information**

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

#### **Torque values**

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

#### **Tools**

#### Special service tools

Steering column wrench

Bearing remover

Inner type bearing remover

Attachment, 32×35 mm

Attachment, 42×47 mm

Steering column nut wrench

Steering column top cone ring nut wrench

#### **TROUBLE DIAGNOSIS**

#### Hard steering stem

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

#### Steering stem off center

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

#### Front wheel wobbling

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

#### Soft front suspension

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

#### Front suspension noise

- · Cushion cover friction noise
- Cushion bolts loose

#### STEERING HANDLE **REMOVAL**

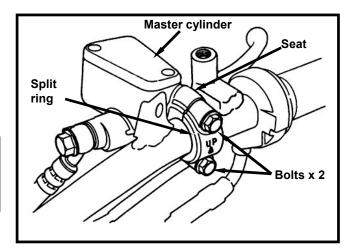
Remove handle front & rear covers and the front cover (refer to chapter 12).

#### **Disc Brake**

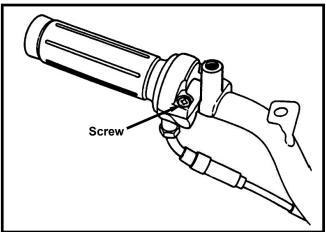
Remove the 2 bolts of the brake master cylinder, and then take out the master cylinder and the split ring.

#### Caution

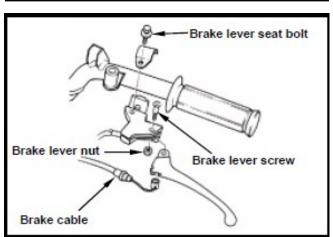
Do not operate the front brake lever to avoid to pressing out the brake lining when removing the master cylinder.



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

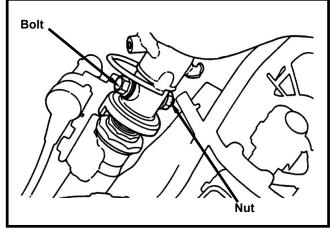


Remove the rear brake lever nut and screw. then take out the rear brake cable. Remove the brake lever seat bolt, and then remove the seat.



With a wrench to hold the handlebar bolt and then remove the nut.

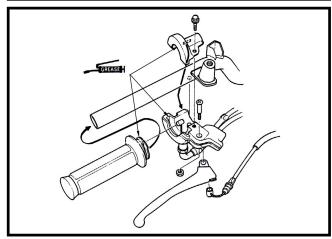
Take out the handlebar after removed the bolt.



#### Installation

Install the handlebar according to the reverse procedure of removal.

Apply with some grease onto the handlebar moving parts when installing the acceleration handlebar seat, acceleration handlebar, and acceleration cable.



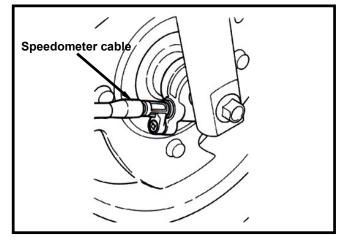
#### **FRONT WHEEL**

Removal

Disc Brake type

Support body bottom and lift front wheel free of ground.

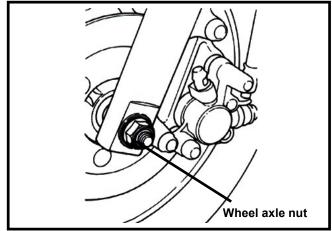
Remove the bolts, and disconnect speedometer cable from the gear box.



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



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

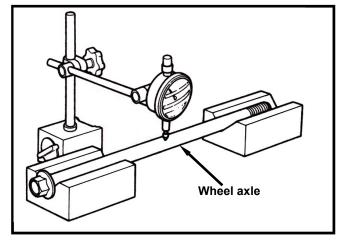


### Inspection

### Wheel axle

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

Service limit: 0.2 mm.

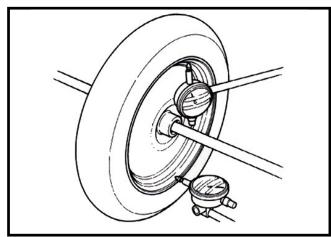


#### Wheel Rim

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

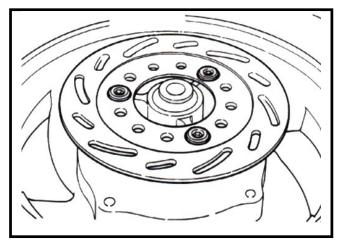
#### **Service limit:**

Radial : 2.0 mm Axial : 2.0 mm



## Disassembly (Disc type)

Remove 3 hex socket bolts and brake disc.



**DISC BRAKE** 

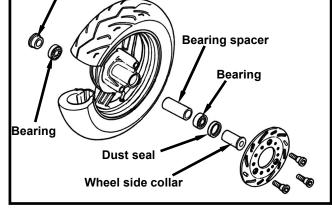
Remove the left axle ring and dust seal. Remove the dust seal on the right side of speedometer gear.

Remove the bearing with the inner type bearing remover.

Take out the bearing spacer and then remove the other bearing.

#### Tool:

Inner type bearing remover



Speedometer gear dust seal

#### **Bearing Inspection**

Turn the inner race of bearing with fingers. The bearing should be turn smoothly. Also check if the outer collar is tightly connected to the wheel hub.

If the bearing do not turn smoothly, or if they are too loose in the races, or damaged, then, remove and replace the bearings with new ones.

# **⚠** Caution

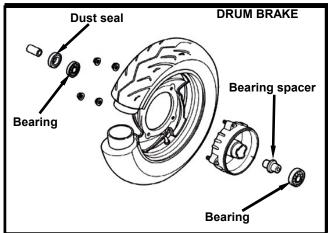
The bearing must be replaced in pair.

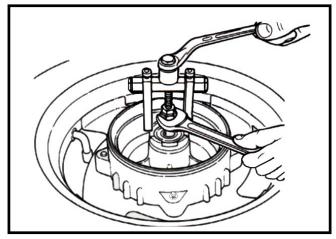
#### Installation

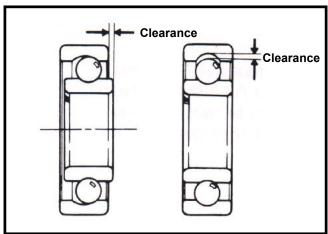
Install the bearing according to the reverse procedure of removal.

Apply some grease into the bearing seat of the wheel hub.

Install the left bearing onto the seat. Install the bearing spacer and then install the right bearing onto the seat.





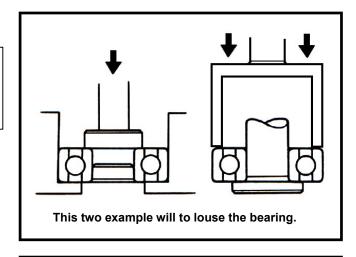


# **⚠** Caution

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

#### Tool:

C-type compressor or bearing compressor.

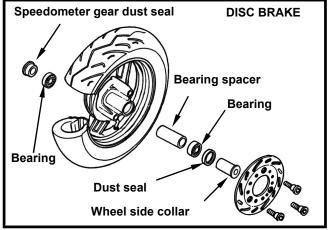


#### **Disc Brake**

Apply with some grease inside of the dust bearing.

Install the dust seal and the front wheel side collar.

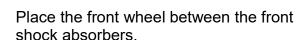
Apply with some grease on both side of the speedometer gear oil seal, and then install the seal.



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

## ⚠ Caution

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



#### **Disc Brake**

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

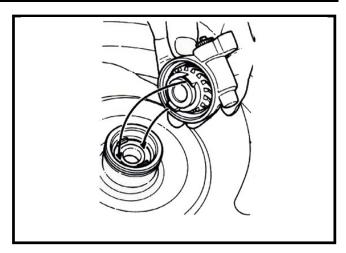
#### **Disc Brake**

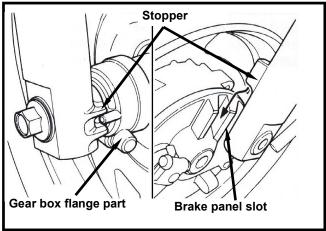
Install the front wheel axle from right shock absorber side.

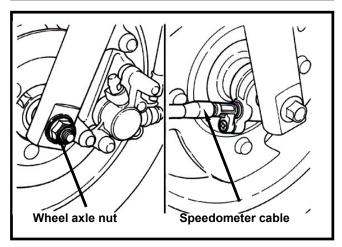
Install the wheel axle nut, and tighten it to specified torque value.

Torque value: 11.0~13.0kgf-m

Connect the speedometer cable to the speedometer gear box.





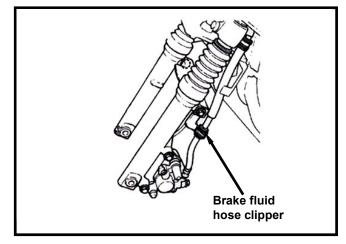


#### FRONT SHOCK ABSORBER

#### Removal

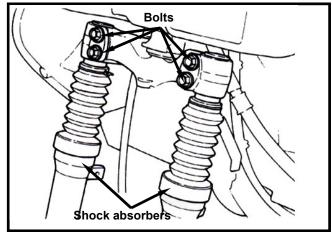
Remove the front fender, front lower spoiler, front guard, and front wheel as well as front brake components.

Remove the brake fluid hose clipper or cable guide on the left shock absorber. (bolt x 1) As for disc brake, remove the cable guide on the right shock absorber. (bolt x 1)



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

Remove the shock absorber from the front fork.

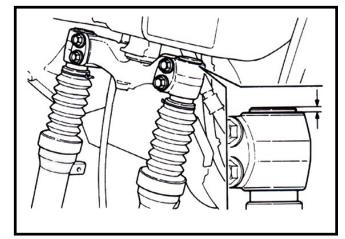


#### Installation

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

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

Torque value: 2.4~3.0kgf-m



# FRONT FORK/STEERING COLUMN

#### Removal

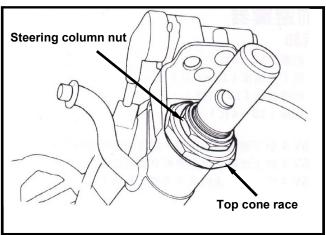
Firstly, remove the handlebar, front wheel, front brake set, and front shock absorbers. Remove the steering column nut.

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



# **⚠** Caution

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



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

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

# **⚠** Caution

Do not damage the frame and the steering column.

#### Installation

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

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

# ⚠ Caution

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

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

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

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

Torque value: 0.2~0.3kgf-m

# ⚠ Caution

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

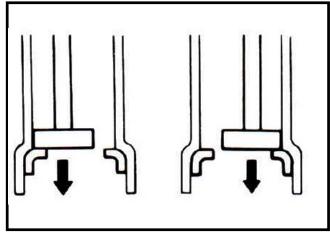
Install the steering column nut and lock the top cone race. Then, tighten the nut.

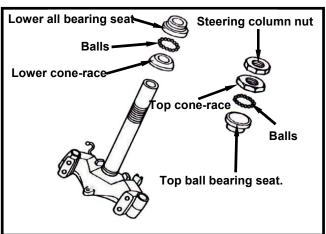
Torque value: 1.0~2.0kgf-m

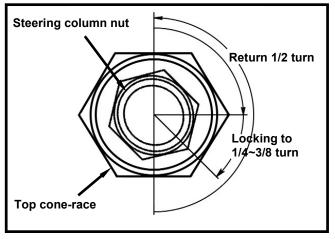
Install the bearing seat according to the reverse procedure of removal.

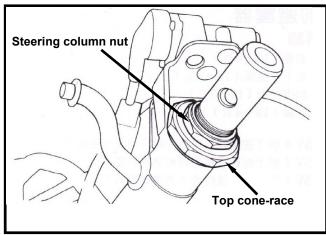
# ⚠ Caution

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



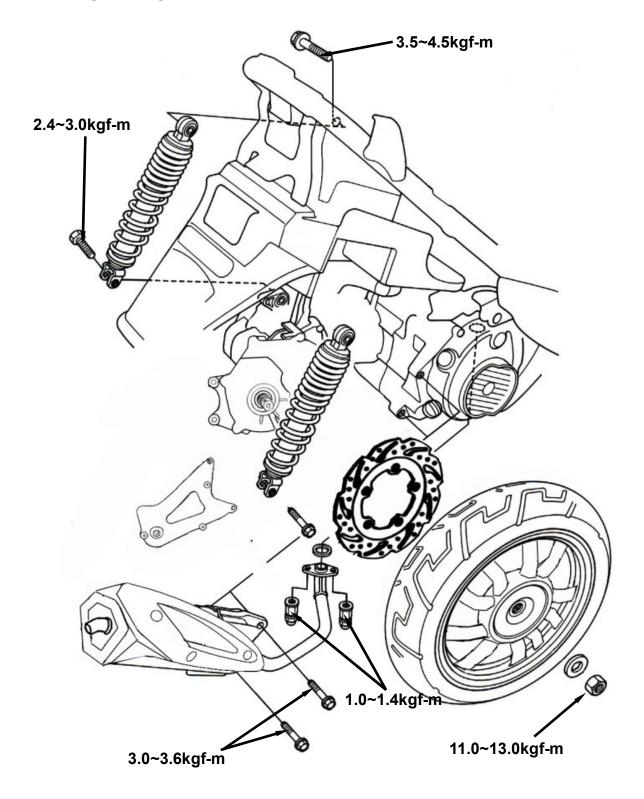






MECHANISM DIAGRAM15-1	EXHAUST MUFFLER15-3
PRECAUTIONS IN OPERATION 15-2	REAR WHEEL15-3
TROUBLE DIAGNOSIS15-2	REAR SHOCK ABSORBER15-4

### **MECHANISM DIAGRAM**



#### PRECAUTIONS IN OPERATION

#### **General Information**

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

Specification Unit: mm

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

#### **Torque values:**

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

### **TROUBLE DIAGNOSIS**

#### Rear wheel wobbling

- bend wheel rim
- poor tire
- loosen wheel shaft

#### Shock absorber too soft

 insufficient shock absorber spring force

#### **Braking Noise**

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

### Poor brake performance

- Poor brake adjustment
- contaminated brake lining
- worn brake lining
- greased brake drum
- contaminated and seized brake cable
- improperly installation of brake cable

#### **EXHAUST MUFFLER**

#### Removal

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

Remove the bolts. (bolts x 2) Remove the exhaust muffler.

#### Installation

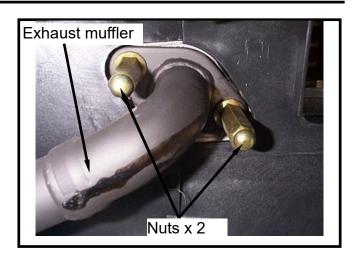
Install the exhaust muffler according to the reverse procedure of removal.

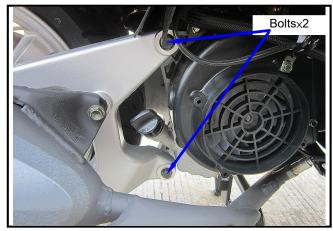
### Caution

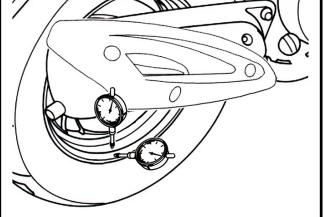
Replace the exhaust muffler gasket if it is broken or deformed.

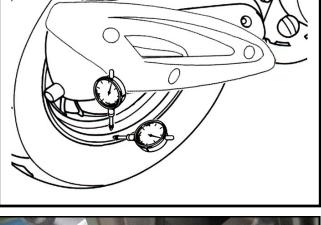
#### **Torque value:**

Exhaust muffler connection bolt: 3.0~3.6kaf-m Exhaust muffler connection nut: 1.0~1.4kgf-m









#### **REAR WHEEL**

#### Inspection

Measure wheel rim wobbling.

**Service limit:** Radial: 2.0mm Axial: 2.0mm

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



Remove the exhaust muffler . (bolts x 2) Remove the rear wheel. (wheel axle nut x1)



#### **REAR SHOCK ABSORBER**

#### Removal

Remove the luggage box. (bolts x 6) Remove the rear carrier. (bolts x 3)

Remove the left & right body covers. (screws x 4, bolts x 2)

Remove the air cleaner bolts (bolts x2) Remove the lower nut of the rear shock absorber (bolt x 1)

Remove the upper nut of the rear shock absorber (bolt x 1)

Remove the rear shock absorber.



#### Installation

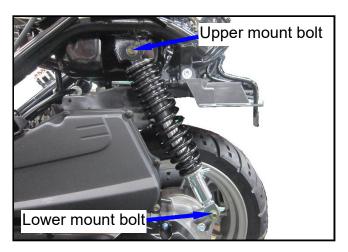
Install the rear shock absorber according to the reverse procedure of removal.



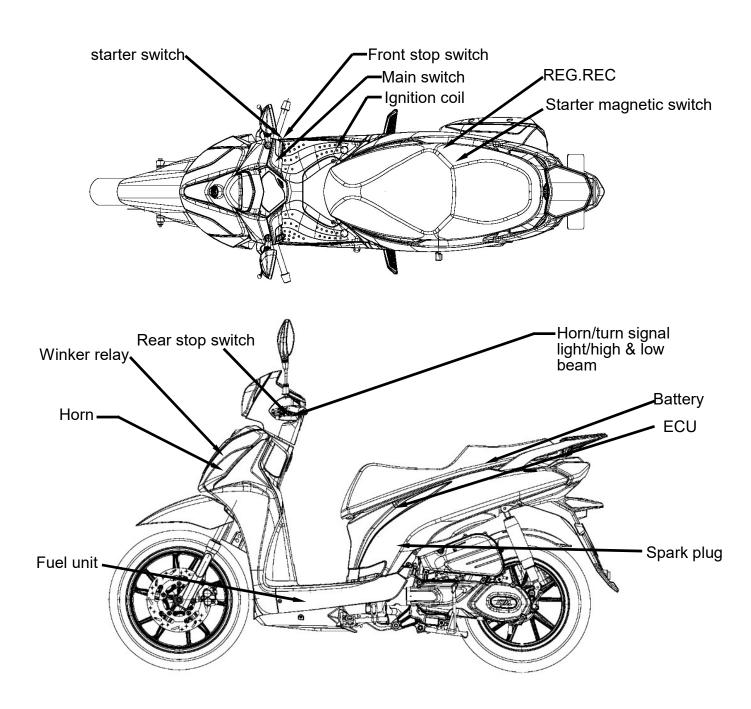
The rear shock absorber has to be replaced with one set and can not be replaced by unauthorized persons. Otherwise, it might damage the rubber bushing and construction.

#### **Torque values**

Rear shock absorber lower mount bolt: 2.4~3.0 kgf-m
Rear shock absorber upper mount bolt: 3.5~4.5 kgf-m



MECHANISM DIAGRAM16-1	STARTING SYSTEM16-14
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IGNITION SYSTEM16-11	FUEL UNIT16-21



#### PRECAUTIONS IN OPERATION

#### **Charging System**

- 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.)
- MF (Maintenance Free) battery does not need to check, add electrolyte or distilled water.
- Battery must be taken out from scooter when charging the battery. But do not open the battery caps.
- Do not quick charge the battery unless in emergency.
- A voltmeter must be used when checking battery charging condition.
- Battery can be charged or discharged alternately. To set a discharged battery idle for a prolonged period will shorten its service life and reduce its capacity. Usually, battery's capacity will reduce after 1~2 years. After low capacity battery was charged, its voltage will increase. If it connects to an additional load, the voltage will reduce suddenly, and then go up again.
- Over-charged battery. Usually, the over-charged battery can be seen externally. If a short circuit
  occurred inside the battery, there will be no voltage on the terminals of battery if voltage regulator does
  not operate. Then, the battery's voltage will be too high that may reduce battery's life.
- The battery will be self-discharged if it was set idle for a long time. An idle battery must be charged about every 2months.
- A new battery filled with electrolyte will generate a voltage after filled out electrolyte. The voltage should be in 12.5V or more after 10 minutes. When electrolyte is not enough, the battery must be filled with electrolyte and then charged to prolong the battery's life-span.
- Please check electrical device according to the procedure of diagnosis chart.
- Do not disconnect and connect the connector of electrical devices when current is passing these
  devices because this will generate high voltage and the electrical components in the voltage-current
  regulator will be damaged. The ignition switch must be turned OFF before performing any work.
- Please do not replace with traditional type battery as replacement.
- Please refer to the removal instruction when removing the alternator and the pulse generator.

#### **Precautions in Operation**

- When removing the battery, the disconnection sequence of cable terminals shall be strictly observed. (First disconnect the negative cable terminal, next, the positive cable terminal.)
- The model of the spark plug and the tightening torque.
- The ignition timing.
- Adjustment of headlight.
- Removal and installation of AC generator.
- The maintenance-free battery requires no inspection of electrolyte level and refilling of distilled water.
- To recharge the battery, remove the battery from rack without removing ventilation caps.
- Unless in emergency, never rapid-charge the battery.
- The voltage must be checked with the voltmeter while charging the battery.
- As ECU assembly does not require an ignition timing check. In case ignition timing is incorrect, check ECU and AC generator. Verify with an ignition timing light after replacement if necessary.

#### Starting System

- Starting motor can be removed directly from engine.
- Please refer to chapter 10 for starting clutch removal procedures.

**Specification Charging System** 

onarging oystem					
Items		8	Specification		
Capacity/type			12V 6Ah		
Battery	Charging rate		STD:0.6A/5~10hrs, emergency charging: 6A/0.5hrs		
	Voltage	Full charged	13.1V		
	(20℃)	Under charged	12.3V		
	Capacity		12V / 6.2A		
Alternator	Alternator Lighting coil resistance (20℃)		Between yellow-green: 0.8±0.1Ω		
Charging coil resistance (20℃)		resistance (20°ℂ)	Between white-green: 0.6 $\pm$ 0.1 $\Omega$		
Leaking current			Less 1mA		
RPM for starting charging			1700rpm(headlight ON)		
Voltage controlled by regulator		ulator	14.5±0.5 V		
Resistance (20°C) 5W5Ω		20°C) 5W5Ω	4.5~5.5Ω		
Resistor	Resistance (20°C) 30W7.5Ω		7.0~8.0Ω		

**Ignition System** 

Item		Specification		
	Standard	NGK CR7HSA (Recommended usage)		
Spork plug	Hot type	NGK CR8HSA		
Spark plug	Cold type	NGK CR6HSA		
	Spark plug gap	0.6~0.7 mm		
1 10 11 1	Primary	0.21±10%Ω		
lgnition coil resistance (20℃)	Secondary -	With plug cap : 7.6±10%KΩ		
(200)		Without plug cap : 3.1±10%KΩ		
	"F" Mark	Before TDC 13° / 1700 rpm		
Ignition timing	Timing advanced	Before TDC 28° / 4000 rpm		
	character	Before TDC 27° / 8000 rpm		
Pulse generator resistance (20°C)		50~200Ω		
Exciting coil resistance (20°C)		400~800Ω		
Ignition coil-primary max. voltage		95~400 V		
Pulse generator voltage		1.7 V above		
Exciting coil voltage		95~400 V		

**Starting System** 

Item		Specification		
Ctarting mater	type	DC TYPE		
Starting motor	capacity	0.5 KW		

#### **TROUBLE DIAGNOSIS**

#### No voltage

- · Battery discharged
- · The cable disconnected
- · The fuse is blown
- · Improper operation of the main switch
- · Low voltage
- The battery is not fully charged
- Poor contact
- Poor charging system
- · Poor voltage regulator

#### No spark produced by spark plug

- · The spark plug is out of work
- The cable is poorly connected, open or short-circuited
- Poor connection between ECU and ignition coil
- Poor connection between ECU and the main switch
- · Poor main switch
- · Poor ECU.
- · A.C.G. is out of work

#### Starter motor does not work

- · The fuse is blown
- · The battery is not fully charged
- · Poor main switch
- Poor starter switch
- The front and rear brake switches do not operate correctly
- Starter relay is out of work
- The ignition coil is poorly connected, open or short-circuited
- The starter motor is out of work

#### Intermittent power supply

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

#### Charging system does not operate properly

- · Burnt fuse
- · Poor contact, open or short circuit
- · Poor regulator rectifier
- Poor ACG

#### Engine does not crank smoothly

- · Primary winding circuit
  - Poor ignition coil
  - Poor connection of cable and connectors
  - Poor main switch
- · Secondary winding circuit
  - Poor ignition coil
  - Poor spark plug
  - Poor ignition coil cable
  - Current leakage in the spark plug
- · Incorrect ignition timing
  - Poor ACG
  - Improper installation of CPS
  - Poor ECU

#### Weak starter motor

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

# Starter motor is working, but engine does not crank

- Poor starter motor pinion
- The starter motor runs in reverse direction Poor battery

### 16. ELECTRICAL EQUIPMENT

# **Battery**

Removal

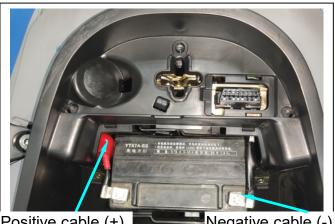
Open the battery cover.

# $oldsymbol{\Delta}$ CAUTION

- Electrolyte (diluted sulfuric acid) is very toxic. Once it spreading on clothes, skin, or eyes, it will cause burned or blind. In case of being spread, flush with great quantity of water immediately, and then send to hospital.
- When clothes is spread by electrolyte, it will contact with skin. So, it must flush with great quantity water to take off the clothes.

Remove the battery cover.





Positive cable (+) Negative cable (-)

Disconnect the negative (-) cable from the battery first, then the positive (+) cable. Remove the battery.

Install the battery in reverse order of removal.

# **△** CAUTION

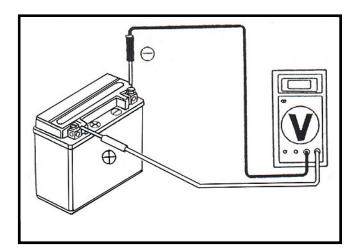
To prevent form circuit short, connect positive(+) terminal at first, and next negative (-) terminal.

#### **Voltage Check**

With a digital voltage meter or multi-meter to measure battery voltage.

Voltage:

Fully charged: 13.0 - 13.2 V (at  $20^{\circ}$ ) Undercharged: Below 12.3 V (at  $20^{\circ}$ )



#### **CHARGING**

Connect the Charger positive (+) to the battery positive (+) terminal.

Connect the Charger negative (-) to the battery negative (-) terminal.

	Standard	Max.
Charging current	0.6A	6.0A
Charging time	5~10H	1H

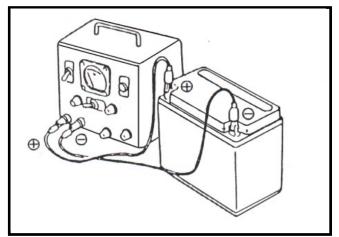
# **⚠** Warning

- Strictly keep flames away from a charging battery.
- The charging "ON"/ "OFF" is controlled by the charger's switch. Do not control the charging by battery jump wires.
- Turn the charger's switch "OFF" at first before or after charging to prevent from sparks created on the connectors and explosion.
- To charge a battery must be based on the battery's ampere-hour showed on label.

# $oldsymbol{\Lambda}$ caution

- Quick charge a battery should be used only in an emergency.
- Make sure the current and charging time of above description.
- The battery will be damaged by too much current or too rush charging.
- When finishing charge, it is necessary to measure voltage after 30 minutes.

After installing the battery, coat the terminals with clean grease.



## Charging Voltage/Current Inspection

### Caution

- Before conducting the inspection, be sure that the battery is fully charged. Use a fully charged battery having a voltage larger than 13.1 V. If undercharged, the current changes dramatically.
- While starting the engine, the starter motor draws large amount of current from the battery. Thus, do not start the engine with battery.

After the engine is warmed up, replace original battery with a fully charged battery. Connect a digital voltmeter to the battery terminals.

Connect an ammeter between both ends of the main fuse.

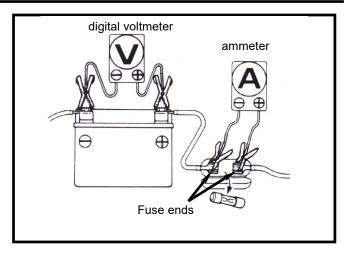


# ⚠ Caution

When the probe is reversibly connected, use a voltmeter having an indication that the current flows from the positive or the negative direction and the measurement should be at zero, ammeter at one direction only.

#### ∠¹\ Caution

- Do not use short-circuit cable.
- It is possible to measure the current by connecting an ammeter between the battery positive terminal and the cable position terminal, however, while the starter motor is activated, the surge current of the motor draws from the battery may damage the ammeter. Use the kick lever to start the engine.
- The main switch shall be turned to OFF position during the process of inspection. Never tamper with the ammeter and the cable while there is current flowing through. It may damage the ammeter.



Connect a tachometer.

Turn on the headlight to high beam and start the

Accelerate the engine gradually to the specified revolution per minute and measure the charging voltage/current.

Specified Charging Current:

(headlight OFF) 0.6 A or more/2500rpm

1.2 A or more / 6000 rpm 0.4 A or more/2500rpm

(headlight ON) 1.0 A or more / 6000 rpm

Control Charging Voltage:

14.0+/0.5 V / 2000 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.

- The charging voltage can not exceed the voltage between two battery terminals and the charging current is in the discharging direction.
- 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.

- 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.
- The charging voltage is normal, but the (2) 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.
- The charging current is normal, but the voltage is not.
  - The fuse of the voltmeter is blown.

#### **VOLTAGE REGULATOR INSPECTION**

Remove the front cover. (screws 4 x 2).
Remove the front cover mounting bolt(bolt x 1)and remove the left/right turnlight wiring connector.

Disconnect the 4P connector on the diode, and check the continuity between main wire terminals according to following method.

Main wire circuit inspection

Item (wire color)	Judgment
Check voltage between	
battery terminal (red) and	Battery voltage
ground (green).	
Check continuity between	Continuity
ground(green) and frame.	Continuity
Check illumination wire	
(yellow) to ground.	
(disconnect the connector of	Continuity &
the resistor's pin and	resistance
automatic by-starter pin.	
Illumination switch is in OFF)	
Check charging coil (white) to	Continuity &
ground)	resistance

If the measured value is abnormal, check the abnormal wire circuit. If components are good, it could be a poor wire circuit. If all items are in good condition, then replace the voltage regulator. If main wire circuit check is in normal and there is no loose in the pins of voltage regulator connector, then measure the resistance between the connector of voltage regulator.

Voltage Regulator Check Unit: Ω

totago itoguiato: oncok							
black		yellow	yellow	black	red	green	shell
yellow		∞	8	∞	8	4	8
yellow	∞		8	∞	8	5	8
yellow	∞	∞		∞	8	5	8
black	∞	∞	8		8	8	8
red	5	5	5	∞		12	∞
green	∞	∞	8	∞	∞		∞
shell	∞	××	∞	∞	∞	∞	

## **A** Caution

- Do not touch the probe of multi-meter by fingers, then the resistance values will be incorrect because there is some resistance existence in human body.
- To use the multi-meter recommended by SYM. Otherwise, the measured resistance might be different.



# Alternator charging coil

# ⚠ Cautio<u>n</u>

The check of alternator charging coil and illumination coil can be done when the alternator is mounted on engine.

#### Check

Remove the 3P connector of the alternator. Measure the resistance between the white wire on the alternator and frame ground with a multi-meter.

Standard:  $0.6\pm0.1\Omega$  (20°C)

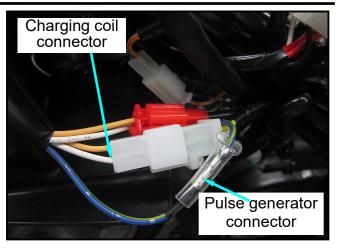
Replace the alternator charging coil if the measured value exceeds standard.

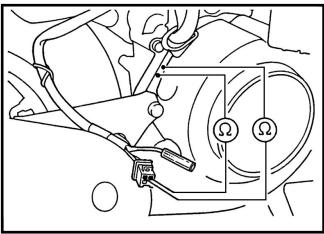
# Alternator lighting coil Check

Remove the 3P connector of the alternator. Measure the resistance between the yellow wire on the alternator and frame ground by multi-meter.

Standard:  $0.8\pm0.1\Omega$  (20°C)

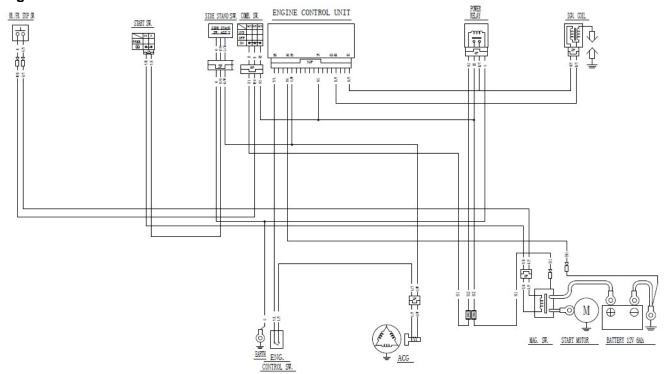
Replace the alternator lighting coil if the measured value exceeds standard.





#### **IGNITION SYSTEM**

# Ignition circuit diagram



#### ECU. coupler (ECU. side)

X10	X11	X12	X13	X14	X15	X16	X17	X18
gnition coil	MIL	(H)EGO Sensor	Crank Pulse Sensor(+)	VBD	CHTS	Veh Speed	Neutral Switch/ side stand switch	Fuel pump
PGND	Temperature gauae	SAI/CPV	Crank Pulse Sensor(-)	HEGO heat/fan relay	Tilt switch	VBK	Diagnostic Tool/ K-line	Injection
<b>X</b> 1	X2	X3	X4	X5	Х6	X7	Х8	Х9

Using  $9 \sim 16$  v direct current supply power source, a total of 18 pcs pin plug.

The hardware parts is controlled by a 16-bit microcomputer as its core, containing the processed interfacial functional loop of engine temperature sensor, and others driving components such as: transistor ignition coil, Solenoid valve, fault light.

The software parts' main composition is monitor strategic operational programme on the controller ,containing the control strategy, array data (MAP) and auto-diagnosis etc.

### **Ignition coil**

#### Removal

Remove the luggage box, center cover.

Remove spark plug cap.

Remove the primary coil wire of ignition coil. Remove the fix bolts for the ignition coil, and remove the ignition coil.

Install the ignition coil in reverse order of removal.

# ⚠ Caution

Install primary coil with black/yellow lead connected to black connector and green lead connected to green connector.

#### Spark plug confirmation

Remove the spark plug and install a good plug into plug cap, and then ground it to engine ground.

Make sure its spark condition. If it is in not good or burnt spark plug, replace the spark plug with new one.

#### ⚠ Caution

 Make sure each wire connection is correct, and test as required. Even the wire connection is in correct, sometimes, it might not be tested occurred.

Connect the high voltage shunt with a multi-meter or input a resistor in the 10M  $\Omega$ 100V of voltage meter.

Connect ignition coil wires, and connect a shunt between primary terminal (black/yellow and green) and frame ground.

Press the starting motor button, or starting lever to test the max. primary voltage of ianition coil.

Connection: connect (+) terminal to green side, and (-) to black/yellow side.

Min. voltage: Above 95 V.

# ⚠ Caution

Do not touch metal parts on the test probe with fingers to avoid electric shock.

#### Primary coil check

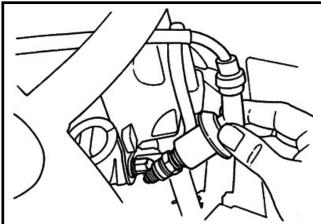
Disconnect the primary coil connector and check the resistance between primary coil terminals.

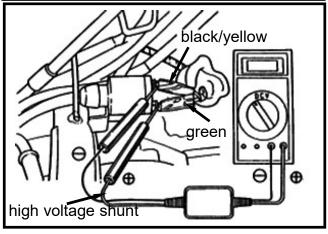
Standard:  $0.21 \Omega \pm 10\% \Omega$  (at  $20^{\circ}$ )

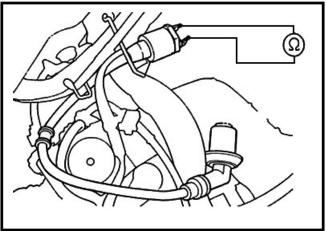
Primary coil is good if resistance within standard.

Primary coil is broken if resistance is infinite. Replace the coil.









#### Secondary coil

Attached the spark plug cap, measure the resistance between plug cap side and green terminal.

#### Standard value: 7-12 k $\Omega$ (20°C)

Remove the spark plug cap, measure the resistance between plug cap side and green terminal.

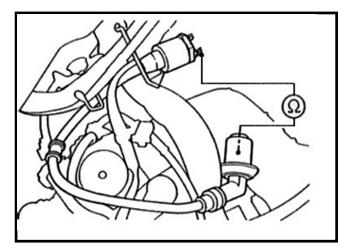
#### Standard value: 3-5 k $\Omega$ (20°C)

Secondary coil is good if resistance within standard.

Secondary coil is broken if resistance is infinite. If the spark plug cap attached and the measured value is exceed standard value, it means the spark plug cap is in not good.

#### Replacement

Remove the ignition coil bolt to replace the ignition coil if necessary.





### Pulse generator



Checking pulse generator can be done on engine. But, the spark plug must be installed onto the cylinder head, and cylinder compression pressure must be in normal condition.

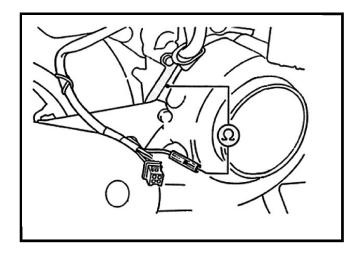
#### Check

Remove body cover.

Remove the pulse generator connector. Measure the resistance between blue/yellow terminal on engine side and frame ground.

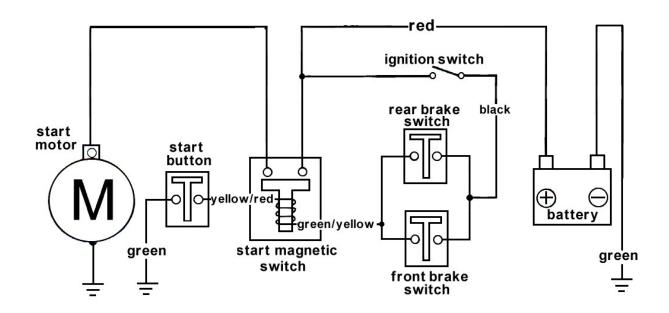
Standard:  $140\pm20\Omega(20^{\circ})$ 

Replace the alternator if the measured value exceeds standard value.



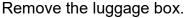
#### STARTING SYSTEM

#### **Starting Circuit**



#### Starter magnetic switch inspection

Turn main switch to "on", and operate the brake lever. Then press starting button to check if there a click sound. It is normal if there is a click sound.



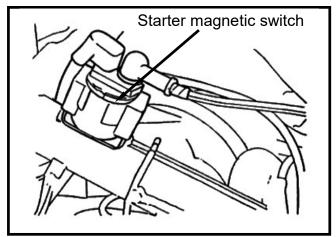
Disconnect the battery negative (-) terminal. Remove the battery positive (+) connection and starting motor wires from the starter magnetic switch large pin.

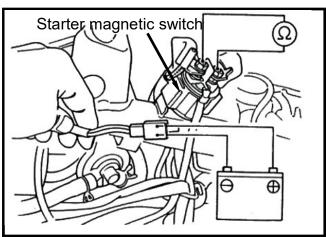
Remove the power control connector of the Starter magnetic switch.

Connect a Ohmmeter between the Starter magnetic switch large pins.

Connect the green/yellow wire to battery positive (+) terminal, and yellow/red to battery negative (-) terminal.

Check the continuity between the Starter magnetic switch large pins. If it is not continuity, then replace the starter magnetic switch.





# **Starting Motor Removal**

Remove the battery cover.

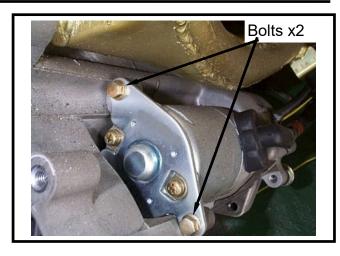
Firstly, remove the battery negative (-) terminal, and then remove the positive (+) terminal.

Remove the luggage box.

Remove the starting motor power wire. Remove the starting motor mounting bolts and motor.

#### **Starting Motor Installation**

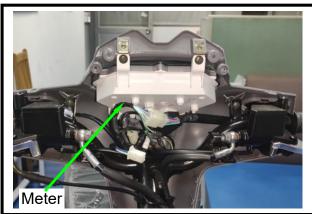
Install the motor in reverse order of removal.



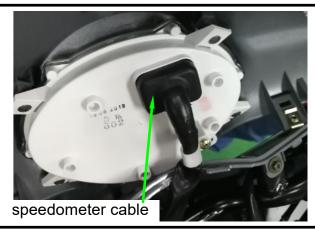
#### **METER**

#### Removal

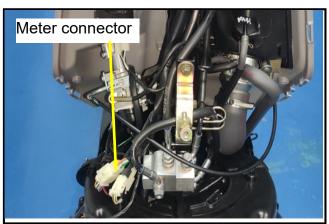
Remove the front handle cover.



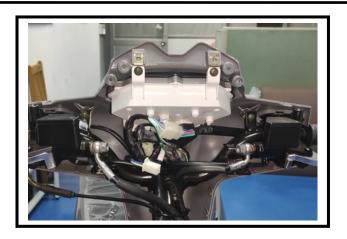
Remove the speedometer cable.



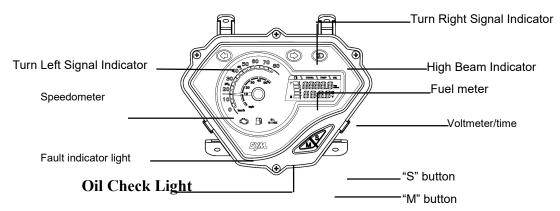
Remove the front cover. Remove the power connector of the meter.



Remove the rear handle cover. Remove the meter mounting screws. Take out the meter.



Model:50cc



# **⚠** Caution

Do not wipe the meter or headlight with organic solvent such as gasoline to prevent from damage these components.

#### Installation

Install the meter in reverse order of removal.

#### LIGHT/BULBS

# **Headlight Bulb Replacement** Rear the front handle cover.

Disconnect the headlight wire connector. Press down the bulb spring locker and then remove the locker with turning it left motion. Remove the bulb.

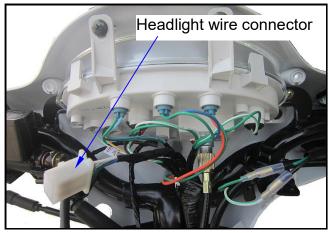
Replace the bulb with new one if necessary. (12V 16.8W/12W)

#### Caution

- Do not touch the bulb surface with fingers because the bulb will create hot-spot so that let it be burnt. It has to be package with cloth or wear glove as installing.
- Wipe the bulb with cloth to prevent from damaged if the bulb be touched by hands.

Install the bulb in reverse order of removal. Turn the main switch ON/OFF to check if the bulb has been installed properly after installation.





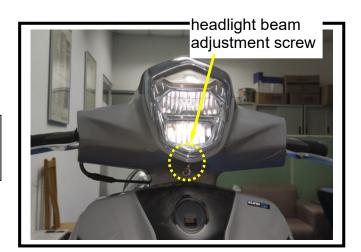
Please conduct the headlight beam adjustment job if replace the headlight bulb.

#### The headlight beam adjustment

Loosen the adjustment bolt located under the headlight.



 This outer cover of headlight is a fixed type so that the light seat will be moved only when adjusting.

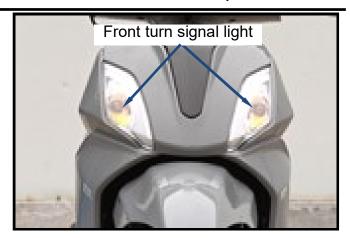


### **16. ELECTRICAL EQUIPMENT**

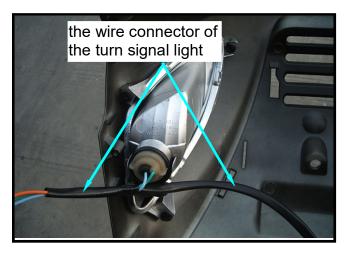
# Front Turn Signal Lamp Bulb Replacement

Remove the front handle cover.

Remove the wire connector of the turn signal light.



Pull out the bulb and replace it with new one. (12V 10W)



#### Installation

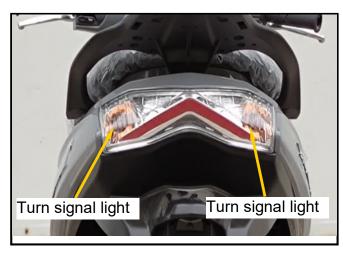
Install the bulb in reverse order of removal.

# Bulbs Replacement of tail light/brake light/rear turn signal light.

Remove the tail light assembly.

Replace the bulbs of the tail light, brake light (12V 3W/1.5W)

Replace the bulbs of the turn signal light (12V/10W).



#### MAIN SWITCH/HORN

#### **Main Switch**

#### Check

Remove the headlight connector and the front cover.

Disconnect main switch leads connector. Check connector terminals for continuity.

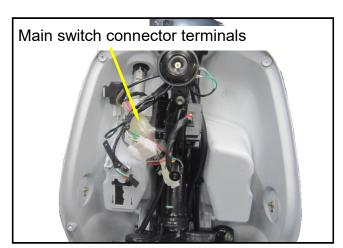
Official confined to the confi				
color Location	Black	Red		
LOCK				
OFF				
ON	•	•		

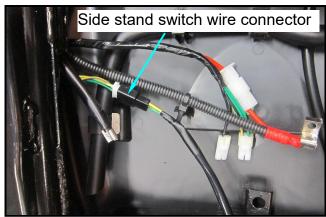
#### Replacement

Remove the main switch connector and fixing bolts (bolts x 2)

Remove the main switch.

Install a new main switch and tighten the bolts. (bolts x2)

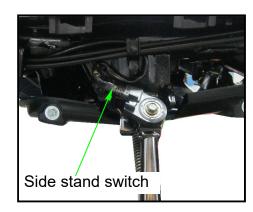




#### Side stand switch

Side stand switch is on the top of side stand.

color Location	Green	Blue/yellow	Yellow/green	Function
А	•	•		switch off
В	•	•	•	switch off
С	•		•	switch on
D		•	•	switch off

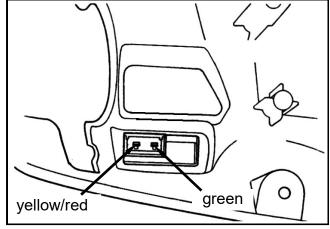


# **16. ELECTRICAL EQUIPMENT**

# **Starting switch**

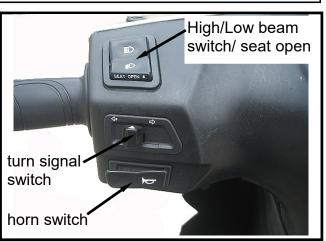


color Location	Yellow/red	green
FREE		
(3)	•	•



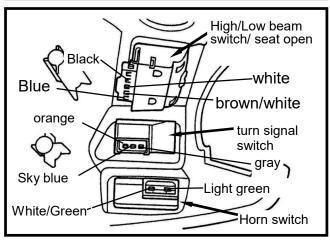
### High/Low beam switch/ seat open

ingii/Low beam switch/ seat open					
color Location		white	brown/ white	black	purple
	•		•		
		•	•		
seat open	•		•	•	•



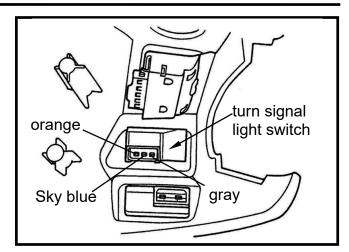
#### Horn switch

color Location	White/green	Light green
FREE		
<u>J</u>	•	•



Turn signal light switch

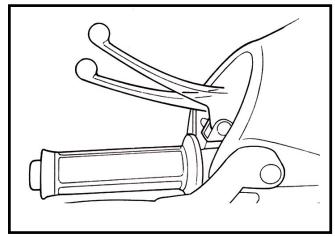
Tarri Signal light Switch					
color Location		Sky blue	Gray	orange	
	FROM R	•	•		
N	PUSH OFF				
Ī	FROM L		•	•	
•			•	•	



#### **Brake light switch**

The circuit of black wire and the green/yellow wire on the brake light switch should be in continuity when operating the brake lever.

If the switch damaged, replace it with new one.

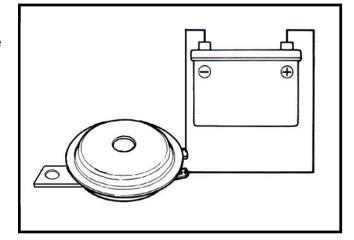


#### Horn

Remove the front cover.

Connect the light blue wire on the horn to the battery positive (+) terminal, and the green wire to the battery negative (-) terminal. Then, the horn should sound.

Replace it if necessary.



#### **FUEL UNIT**

Open the seat.

Remove the luggage box(bolts x 4).

Remove the R.R. carrier(bolts x 3).

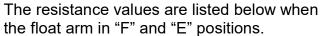
Remove the body cover.

Disconnect the fuel unit wire connector.



#### ⚠ Caution

Do not damage or bend the float arm as removing.



Float arm position	Resistance value
E(empty)	97.5~107.5 <b>Ω</b>
F(full)	4~10 <b>Ω</b>

DOWN(empty)Connect the fuel unit to the main harness.

Turn the main switch "ON" position. Move the float arm in "UP" & "DOWN", and then check if the fuel unit indication needle is in correct position.



Turn on the turn signal light to make sure battery is in good condition before this test.

Float arm position	Indicator needle
UP(full)	E(empty)
DOWN(empty)	F(full)



Install the fuel unit in reverse order of removal.

