HD 200i

SERVICE MANUAL

This service manual contains the technical data of each component inspection and repair for the SANYANG HD 200i motorcycle. The manual is shown with illustrations and focused on “Service Procedures”, “Operation Key Points”, and “Inspection Adjustment” so that provides technician with service guidelines.

If the style and construction of the motorcycle, HD 200i is different from that of the photos, pictures shown in this manual, the actual vehicle shall prevail. Specifications are subject to change without notice.

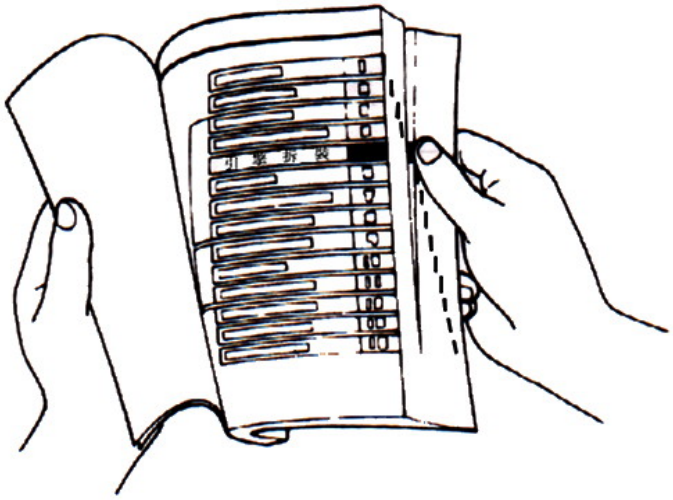
Service Department

SANYANG INDUSTRY CO., LTD.

HOW TO USE THIS MANUAL

This service manual describes basic information of different system parts and system inspection & service for SANYANG HD 200i motorcycle. In addition, please refer to the manual contents in detailed for the model you serviced in inspection and adjustment.

The first chapter covers general information and trouble diagnosis.
The second chapter covers service maintenance information and special tools manual.
The third to the 11th chapters cover engine and driving systems.
The 12th chapter is cooling system.
The 13th to the 16th chapter is contained the parts set of assembly frame body.
The 17th chapter is electrical equipment.
The 18th chapter is wiring diagram.
Please see index of content for quick having the special parts and system information.

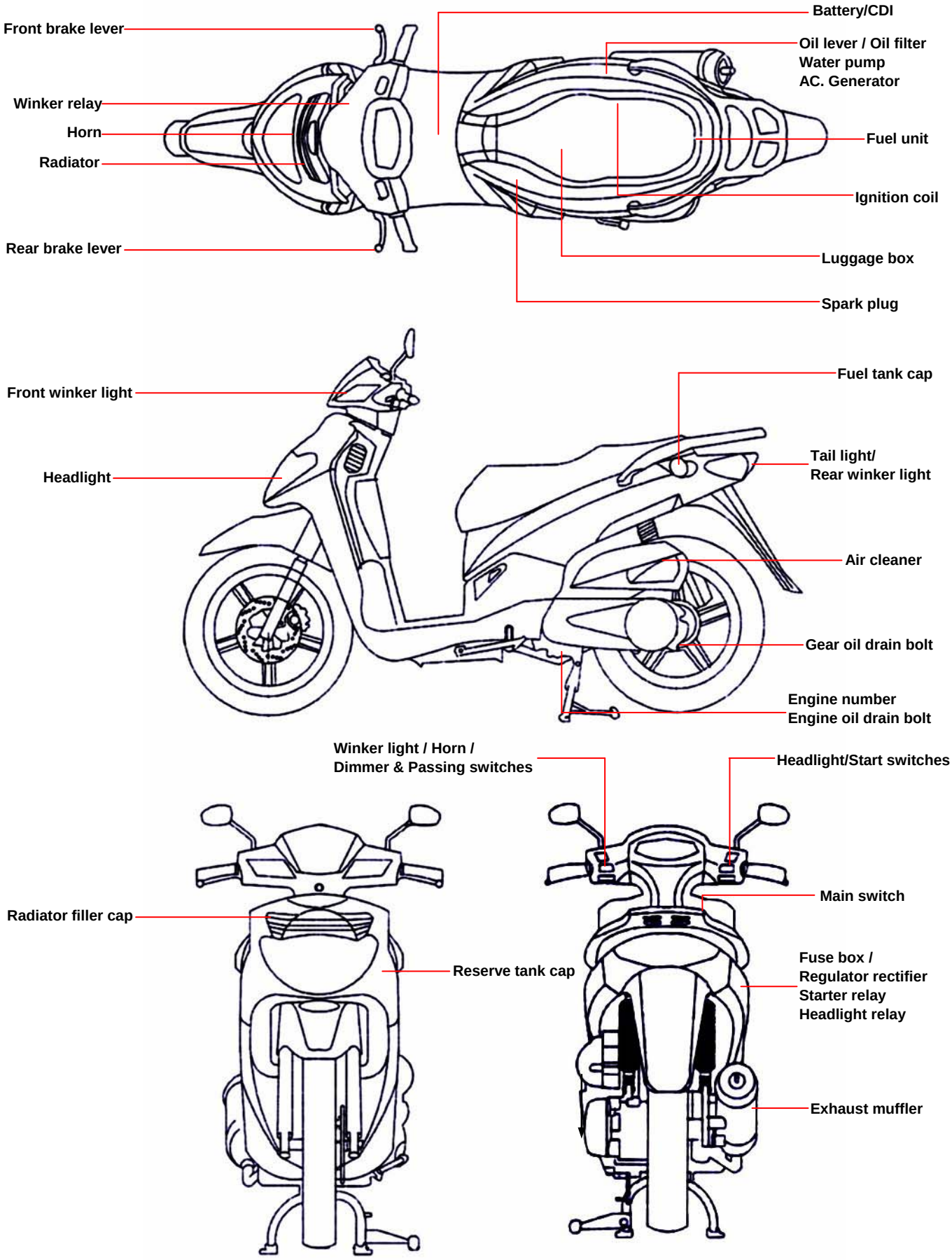


There are 4 buttons, “Foreword”, “Contents”, “How to use this manual” and “Mechanism Illustrations” on the PDF version, and can be access to these items by click the mouse.

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

MECHANISM ILLUSTRATIONS

HD 200i



Symbols and Marks

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

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

General safety

Carbon monoxide

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

⚠ Caution

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

Gasoline

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

⚠ Caution

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

Used engine oil

⚠ Caution

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

Hot components

⚠ Caution

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

Battery

⚠ Caution

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

Brake shoe

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

⚠ Caution

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

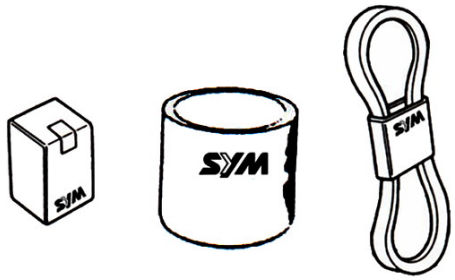
Brake fluid

⚠ Caution

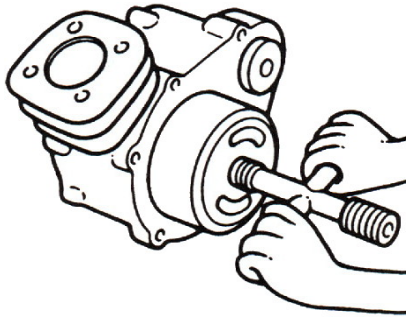
Spilling brake fluid on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the above-mentioned parts for protection when servicing the brake system.
Keep the brake fluid beyond reach of children.

Service Precautions

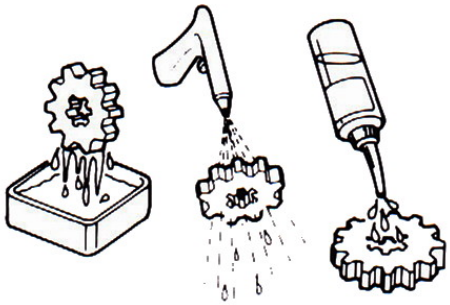
- Always use with Sanyang genuine parts and recommended oils. Using non-designed parts for Sanyang motorcycle may damage the motorcycle.



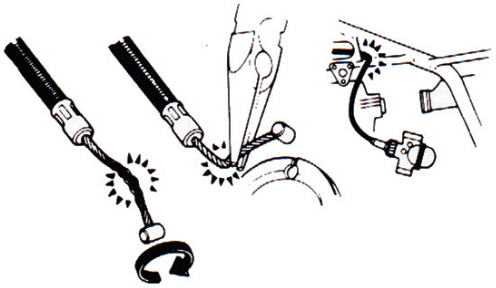
- Special tools are designed for remove and install of components without damaging the parts being worked on. Using wrong tools may result in parts damaged.



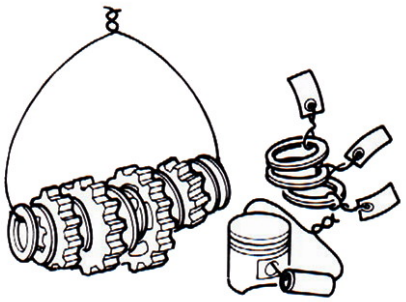
- When servicing this motorcycle, use only metric tools. Metric bolts, nuts, and screws are not interchangeable with the English system, using wrong tools and fasteners may damage this vehicle.
- Clean the outside of the parts or the cover before removing it from the motorcycle. Otherwise, dirt and deposit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



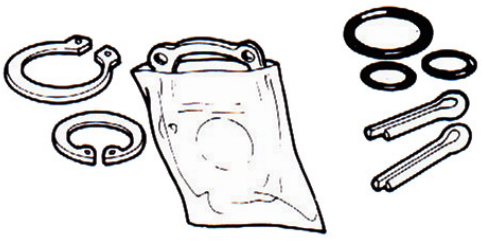
- Never bend or twist a control cable to prevent unsmooth control and premature worn out.



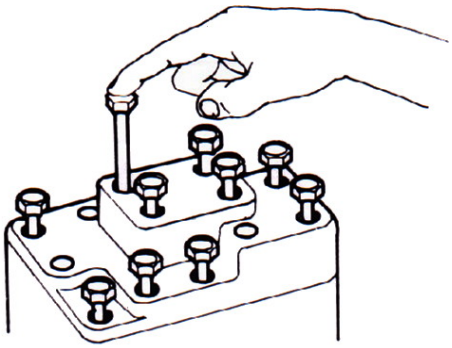
- Rubber parts may become deteriorated when old, and prone to be damaged by solvent and oil. Check these parts before installation to make sure that they are in good condition, replace if necessary.
- When loosening a component which has different sized fasteners, operate with a diagonal pattern and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



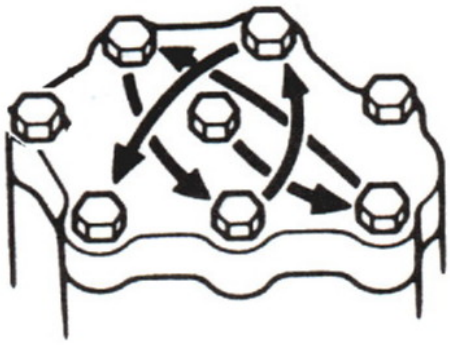
- Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).
- Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap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



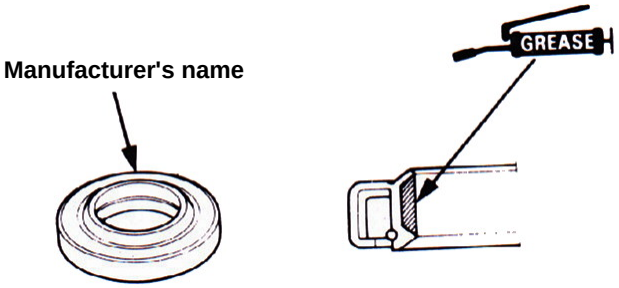
- The length of bolts and screws for assemblies, cover plates or boxes is different from one another, be sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length out side the hole is the same with other bolts, it is a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



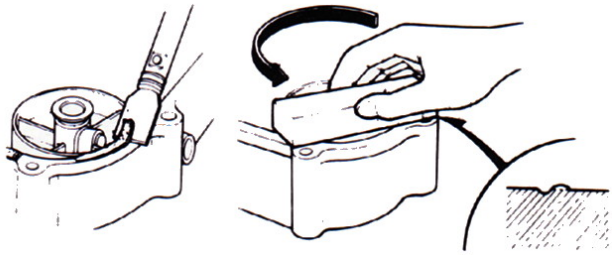
- Tighten assemblies with different dimension fasteners as follows: Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless otherwise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



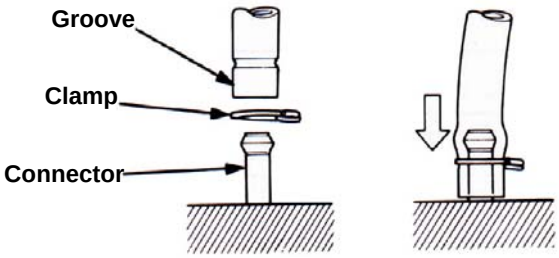
- When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.



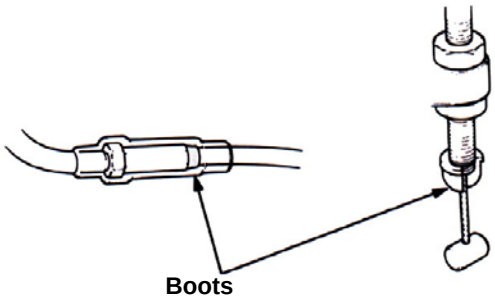
- Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any damage.



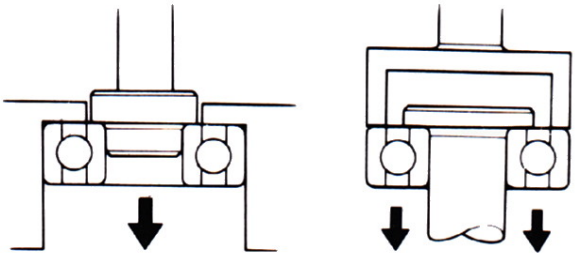
- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.



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

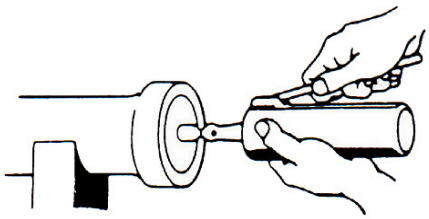


- The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both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

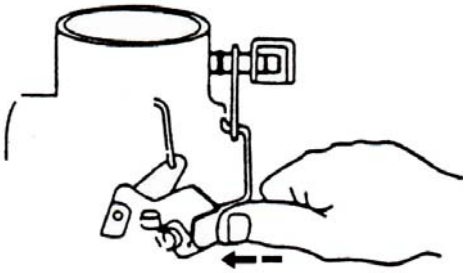


Both of these examples can result in bearing damage.

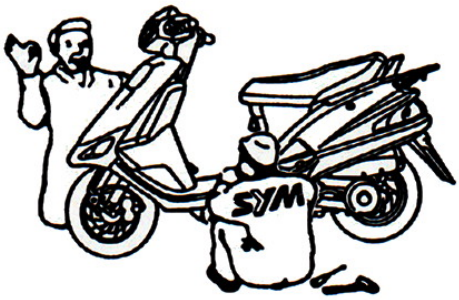
- Lubricate the rotation face with specified lubricant on the lubrication points before assembling.



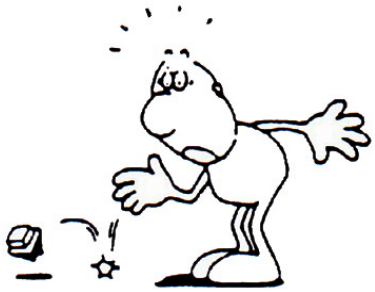
- Check if positions and operation for installed parts is in correct and properly.



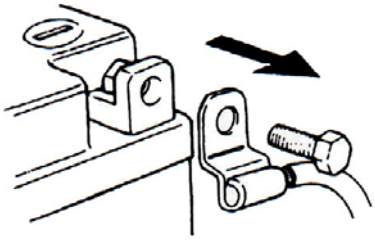
- Make sure service safety each other when conducting by two persons.



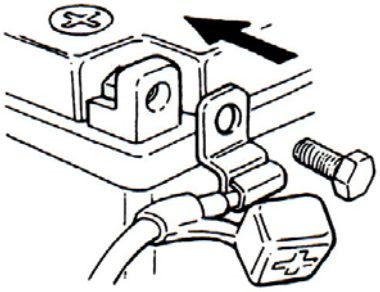
- Note that do not let parts fall down.



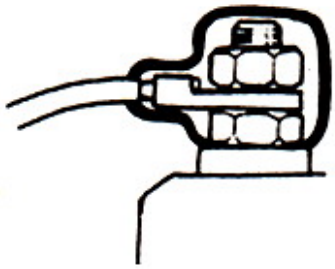
- Before battery removal operation, it has to remove the battery negative (-) cable firstly. Notre tools like open-end wrench do not contact with body to prevent from circuit short and create spark.



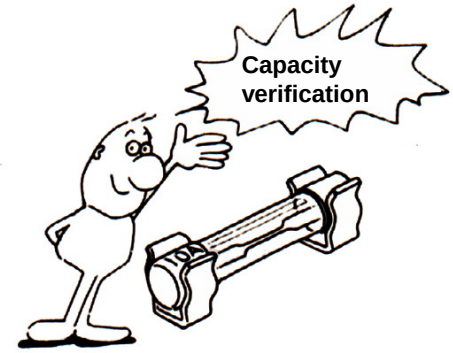
- After service completed, make sure all connection points is secured.
  Battery positive (+) cable should be connected firstly.
- And the two posts of battery have to be greased after connected the cables.



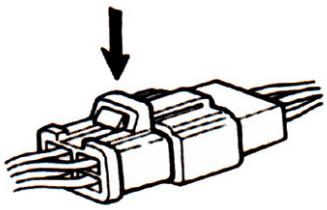
- Make sure that the battery post caps are located in properly after the battery posts had been serviced.



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

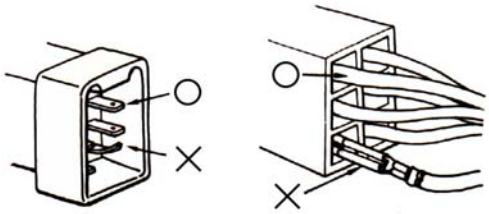


- When separating a connector, it locker has to be unlocked firstly. Then, conduct the service operation.



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

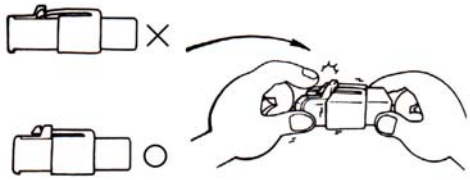
- Make sure if the connector pins are bent, extruded or loosen.



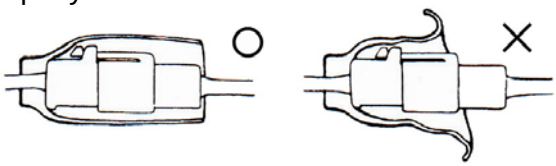
- Insert the connector completely.

  If there are two lockers on two connector sides, make sure the lockers are locked in properly.

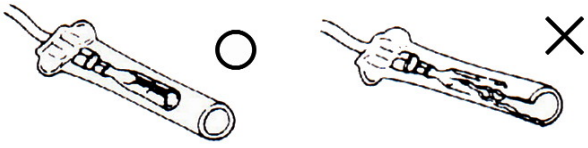
  Check if any wire loose.



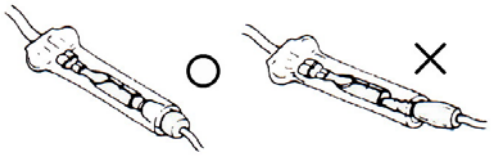
- Check if the connector is covered by the twin connector boot completely and secured properly.



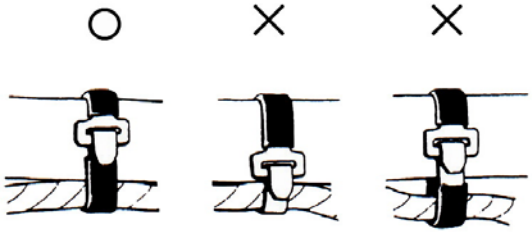
- Before terminal connection, check if the boot is crack or the terminal is loose.



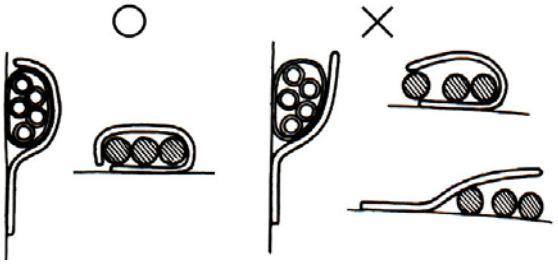
- Insert the terminal completely.
  Check if the terminal is covered by the boot.
  Do not let boot open facing up.



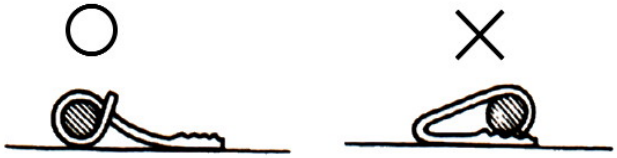
- Secure wires and wire harnesses to the frame with respective wire bands at the designated locations. Tighten the bands so that only the insulated surfaces contact the wires or wire harnesses.



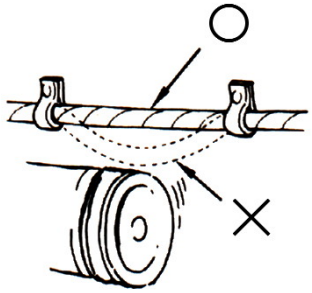
- Wire band and wire harness have to be clamped secured properly.



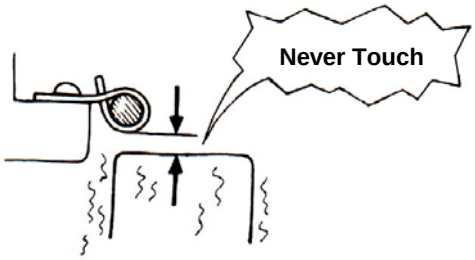
- Do not squeeze wires against the weld or its clamp.



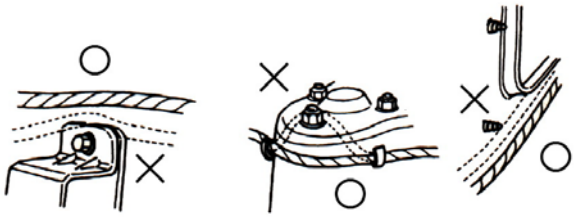
- Do not let the wire harness contact with rotating, moving or vibrating components as routing the harness.



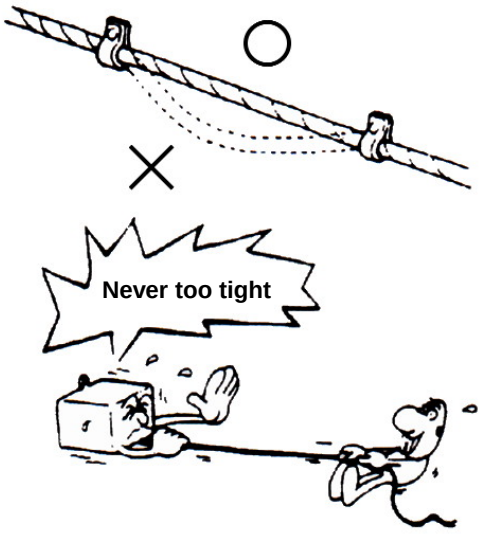
- Keep wire harnesses far away from the hot parts.



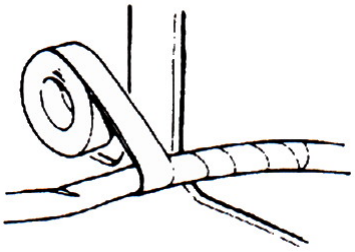
- Route wire harnesses to avoid sharp edges or corners and also avoid the projected ends of bolts and screws.



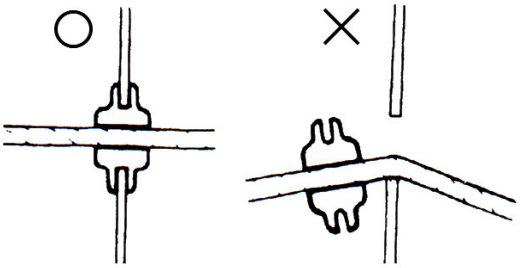
- Route harnesses so that they neither pull too tight nor have excessive slack.



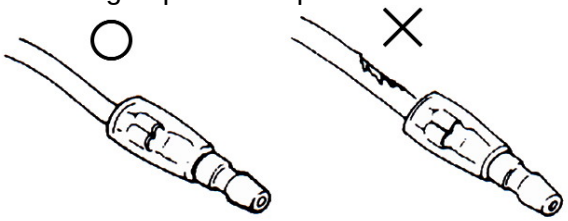
- Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.



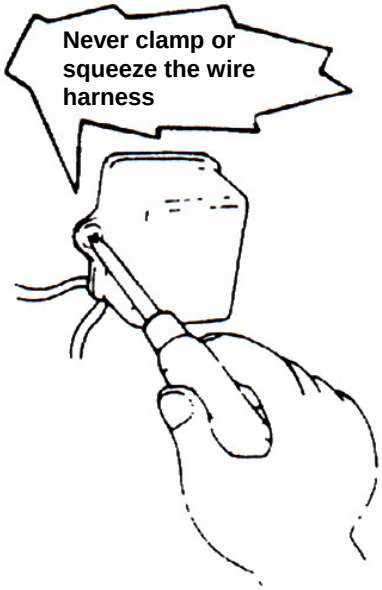
- Secure the rubber boot firmly as applying it on wire harness.



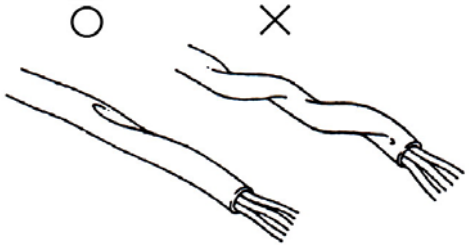
- Never use wires or harnesses which insulation has been broken. Wrap electrical tape around the damaged parts or replace them.



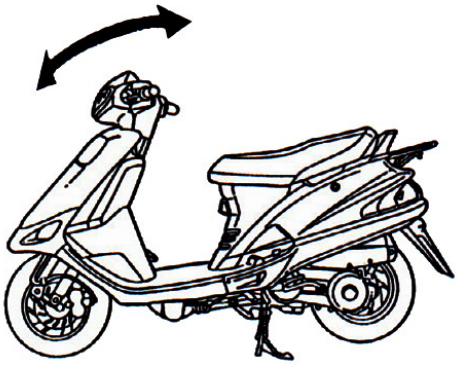
- Never clamp or squeeze the wire harness as installing other components.



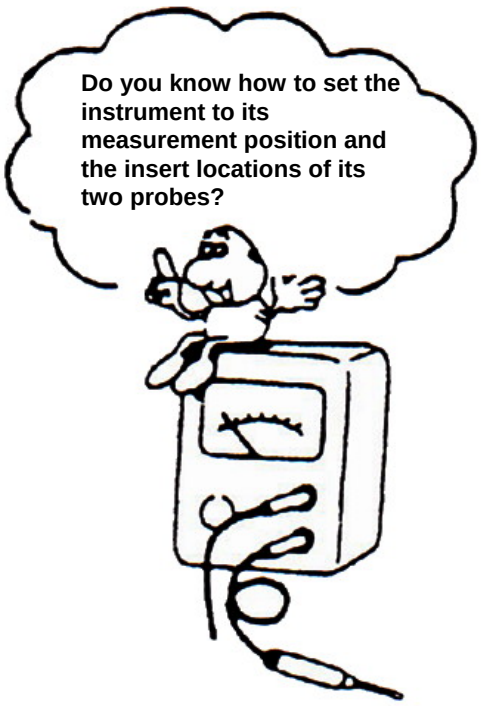
- Do not let the wire harness been twisted as installation.



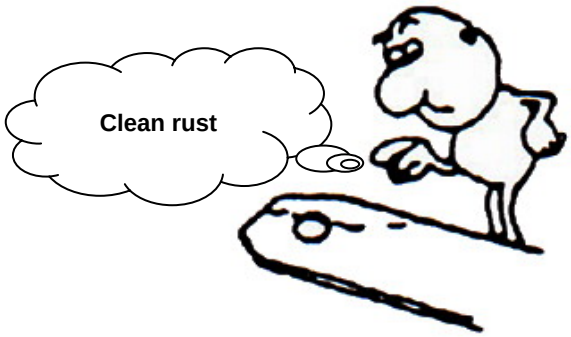
- Wire harnesses routed along the handlebar should not be pulled too tight or have excessive slack, be rubbed against or interfere with adjacent or surrounding parts in all steering positions.



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



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



Specifications

MAKER			SANYANG	MODEL		LH18W7-6
Dimension	Overall Length		2065 mm	Suspension System	Front	Telescopic Fork
	Overall Width		705 mm		Rear	Unit Swing
	Overall Height		1255 mm	Tire Specifications	Front	100 / 80-16 50P
	Wheel Base		1385 mm		Rear	120 / 80-16 60P
Weight	Curb Weight	Front	53 kg	Brake System	Front	Disk (ϕ 220mm)
		Rear	82 kg		Rear	Disk (ϕ 220mm)
		Total	135 kg			
	Passengers/Weight		Two /110 kg	Performance	Max. Speed	Above 108 km/hr
	Total Weight	Front	75 kg		Climb Ability	Below 28°
		Rear	170 kg	Reduction	Primary Reduction	Belt
		Total	245 kg		Secondary Reduction	Gear
Engine	Type		4-Stroke Engine		Clutch	Centrifugal, dry type
	Installation and arrangement		Vertical, below center, incline 80°		Transmission	C.V.T.
	Fuel Used		Unleaded	Speedometer		0 ~ 140 km/hr
	Cycle/Cooling		4-stroke/water cooled	Horn		93~112 dB/A
	Cylinder	Bore	61 mm	Muffler		Expansion & Pulse Type
		Stroke	58.6 mm	Exhaust Pipe Position and Direction		Right side, and Backward
		Number/Arrangement	Single Cylinder	Lubrication System		Forced circulation & splashing
	Displacement		171.2 cc	Exhaust Concentration	Solid Particulate	
	Compression Ratio		10.8 : 1		CO	Below 5.5 g/ km
	Max. HP		15.0 ps / 7,750 rpm		HC	Below 1.0g/ km
	Max. Torque		1.61 kg-m / 6,500 rpm	E.E.C.		—
	Ignition		Full Transistor Ignition	P.C.V.		—
	Starting System		Electrical Starter	Catalytic reaction control system		—

Torque Values

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

Engine Torque Values

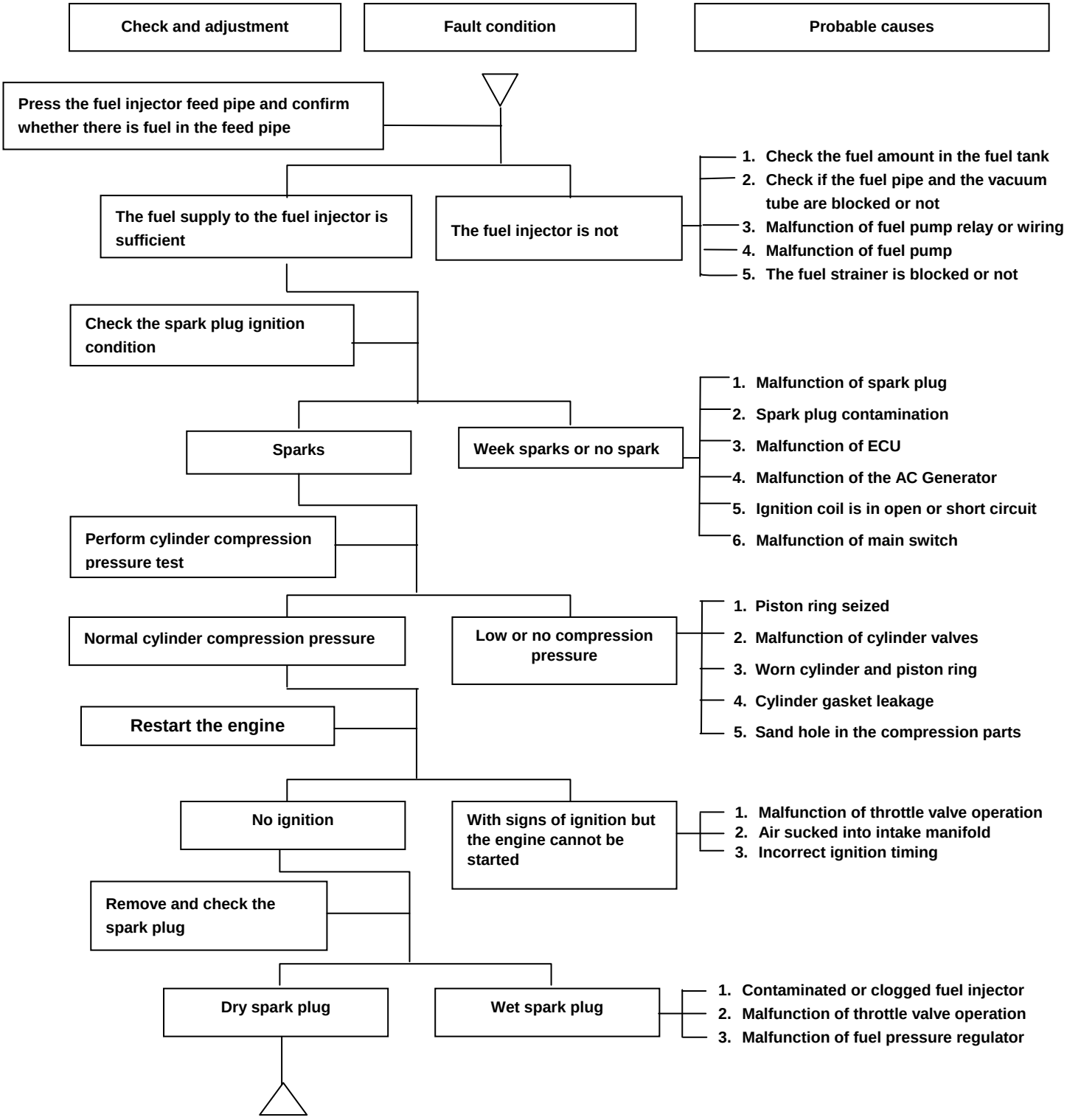
Item	Q'ty	Thread Dia. (mm)	Torque Value(kgf-m)	Remarks
Cylinder head nut	4	8	2.0~2.4	
Cylinder head right bolt	2	8	2.0~2.4	
Cylinder head stud bolt (inlet pipe)	2	6	0.7~1.1	
Cylinder head stud bolt (EX. pipe)	2	7	0.5~1.0	
Tappet adjustment hole cap bolt	6	6	1.0~1.4	
Tappet adjustment screw nut	4	5	0.7~1.1	Apply oil to thread
Spark plug	1	10	1.0~1.2	
Carburetor insulator bolt	2	6	0.7~1.1	
Cylinder stud bolt	4	8	0.7~1.1	
Engine left cover bolt	7	6	1.1~1.5	
Engine oil draining bolt	1	12	1.1~1.5	
Engine oil strainer cap	1	30	1.3~1.7	
Mission draining bolt	1	8	0.8~1.2	
Mission filling bolt	1	10	0.8~1.2	
Clutch driving plate nut	1	28	5.0~6.0	
Clutch outer nut	1	12	5.0~6.0	
Drive face nut	1	12	5.0~6.0	
Flywheel nut	1	12	5.0~6.0	
Crankcase bolts	7	6	0.8~1.2	
Mission case bolt	7	8	2.0~2.4	

Frame Torque Values

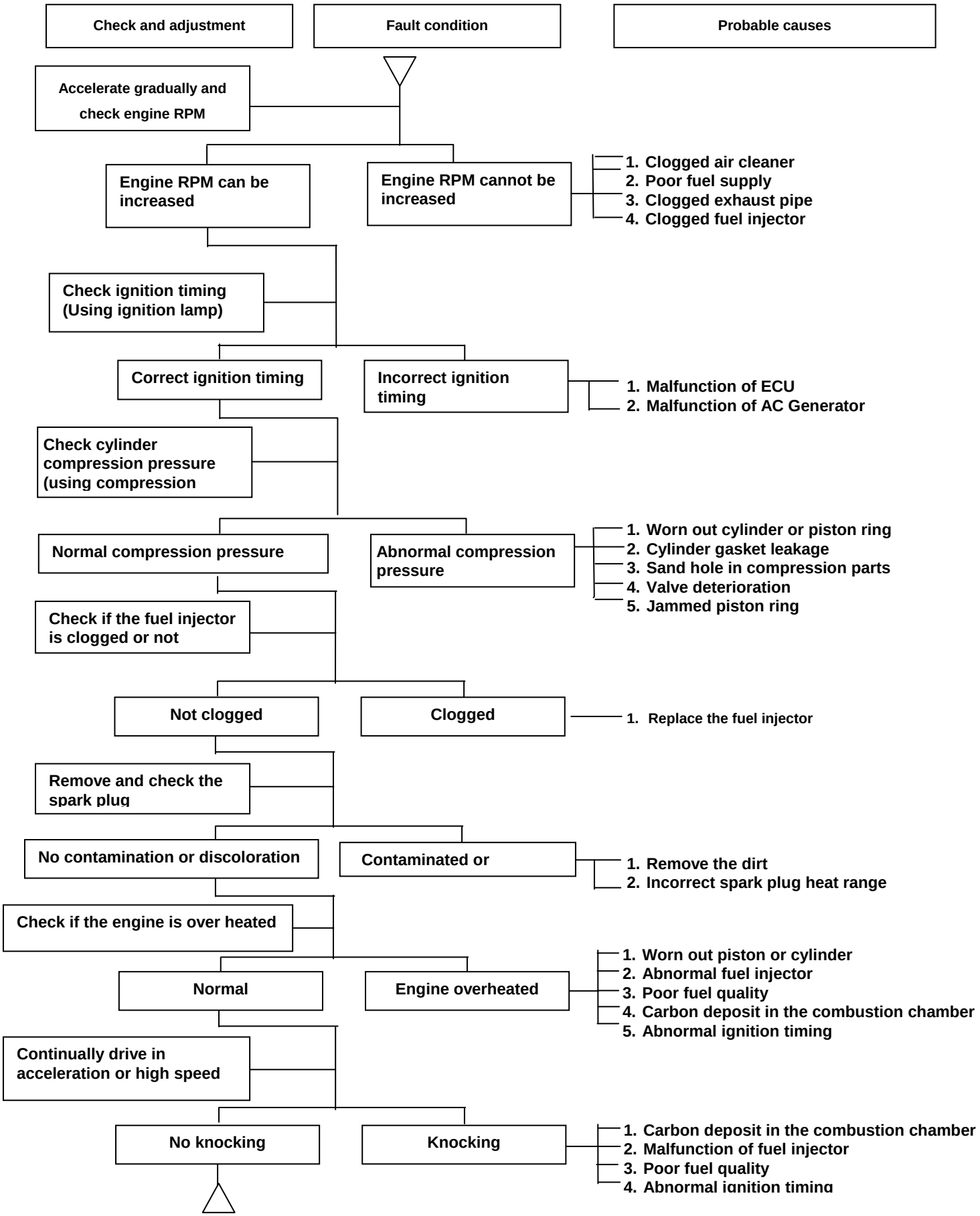
Item	Q'ty	Thread Dia. (mm)	Torque Value(kgf-m)	Remarks
Stopper nut for engine hanger rubber	1	8	1.8~2.2	
Engine hanger nut	2	12	4.0~5.0	
Engine hanger bolt	1	12	4.0~5.0	
Engine connection bolt	1	10	3.5~4.5	
Front wheel axle nut	1	12	5.0~7.0	
Rear wheel shaft nut	1	14	10.0~12.0	
Rear fork	2	8	4.0~5.0	
Rear cushion upper bolt	2	10	3.5~4.5	
Rear cushion under bolt	2	8	2.4~3.0	
Nut for steering post	1	10	4.0~5.0	
Front cushion	4	8	2.4~3.0	
Brake lever nut	2	6	0.8~1.2	
Nut for the rear brake arm	1	6	0.5~0.6	
Front brake hose bolt	4	10	3.0~4.0	
Front brake caliper bolt	4	6	3.0~3.5	
Front brake disk mounting bolt	7	8	4.0~4.5	
Air-bleed valve	1	5	0.5~0.6	
Speedometer cable locking screw	1	5	0.15~0.3	
Exhaust muffler bolt	3	8	3.2~3.8	
Exhaust muffler connection nut	2	7	1.0~1.2	

Troubleshooting

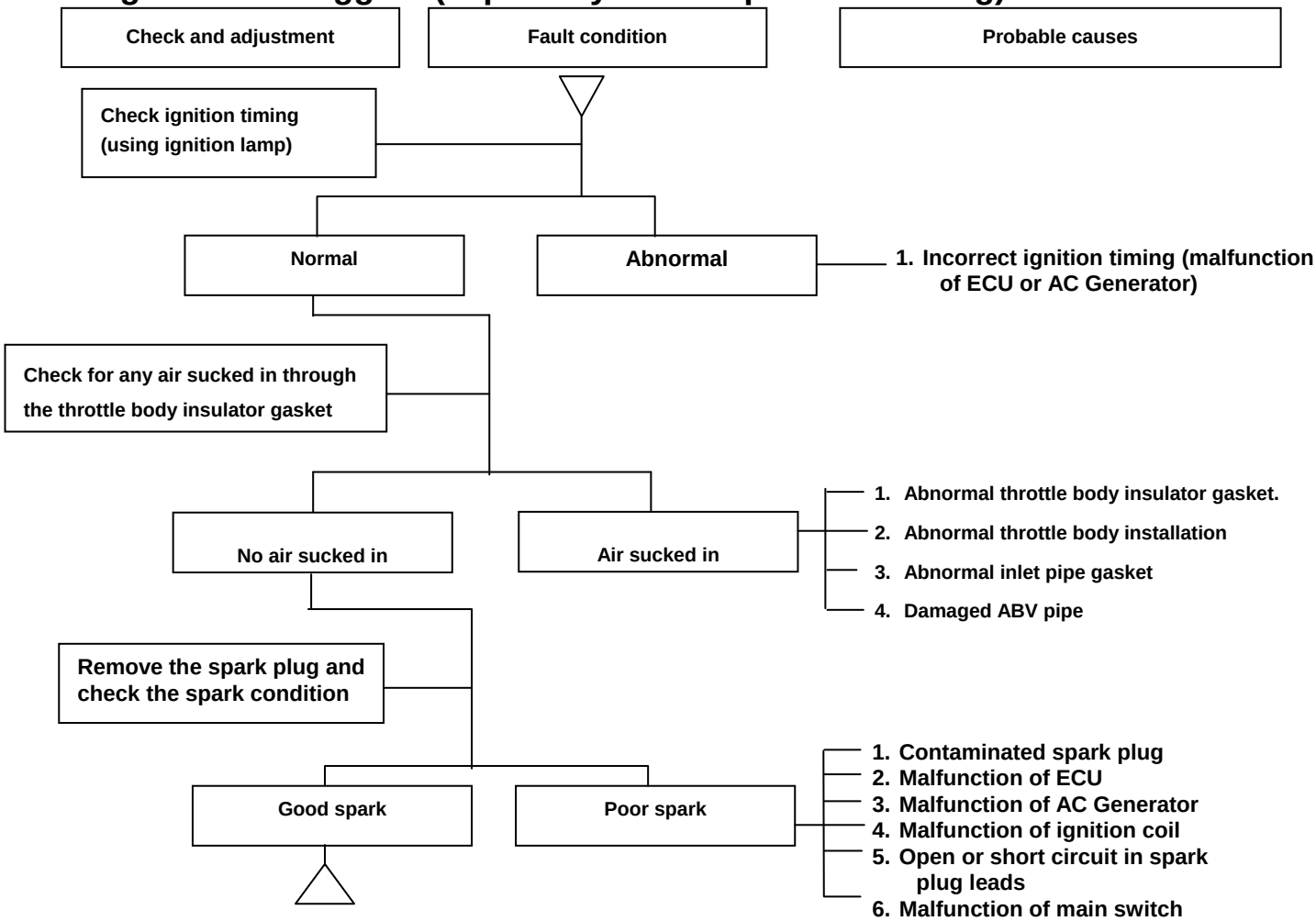
A. Engine cannot be started or difficult to be started



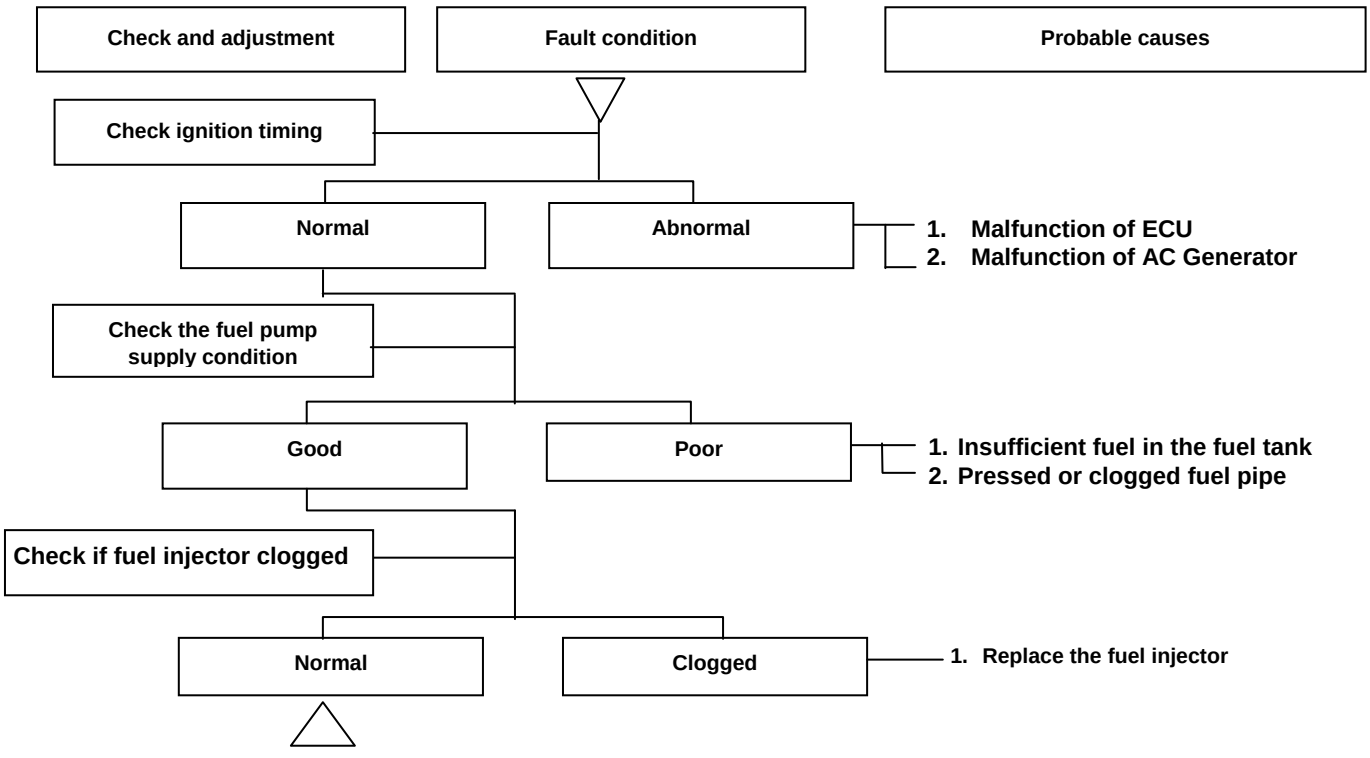
B. Engine runs sluggish (Speed does not pick up, lack of power)



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



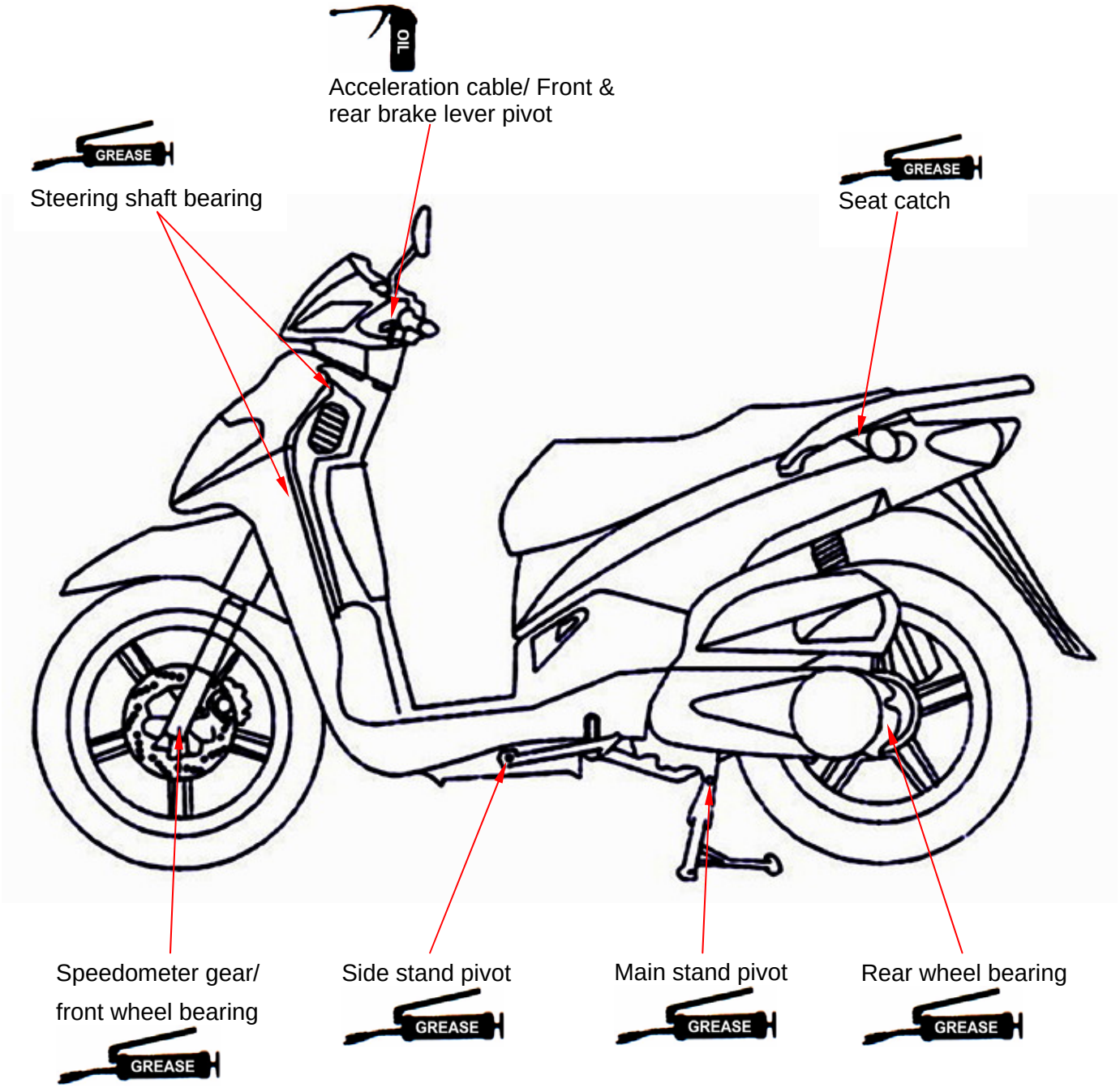
D. Engine runs sluggish (High speed)



E. CLUTCH AND DRIVING PULLEY

FAULT CONDITION	PROBABLE CAUSES
Engine can be started but the vehicle cannot run	1. Worn out or damaged drive belt 2. Damaged movable drive face 3. Damaged driven face spring 4. Broken clutch weight 5. Broken drive shaft groove 6. Worn out or damaged transmission gear
Engine shuts down or trembles when the vehicle is running (rear wheel rotates during engine idling).	1. Broken clutch spring 2. Clutch outer stuck with clutch weights 3. Connection parts between clutch and shaft worn out or burned
Poor initial driving (poor climbing performance)	1. Worn or deformed drive belt 2. Worn weight roller 3. Worn driven face 4. Deformed driven face spring 5. Grease on drive belt or drive / driven face

Parts to Be Greased



Precautions in Operation

Specification

Fuel Tank Capacity		7600 c.c.
Engine Oil	Capacity	1000 c.c.
	Change	800 c.c.
Transmission Gear oil	Capacity	110 c.c.
	Change	100 c.c.
Capacity of coolant	Engine + radiator	780 c.c.
	Reservoir upper	420 c.c.
Clearance of throttle valve		2~6 mm
Spark plug	Type	NGK CR7E
	Gap	0.8 mm
Ignition Timing Advance		BTDC 13º / 1000 rpm
Full Ignition Timing Advance		BTDC 24º / 6000 rpm
Idling speed		1600±100 rpm
Cylinder compression pressure		12.0 ±2 kgf/cm²
Valve clearance: IN/EX		0.12 ± 0.02 mm
Tire dimension	Front	100/80-16 50P
	Rear	120/80-16 60P
Tire pressure (cold)	Single	Front: 1.75 kg/cm² rear : 2.25 kg/cm²
	Two persons	Front: 1.75 kg/cm² rear : 2.50 kg/cm²
Battery		12V8Ah (MF battery) type: YTX9-BS

Periodical Maintenance Schedule

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

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

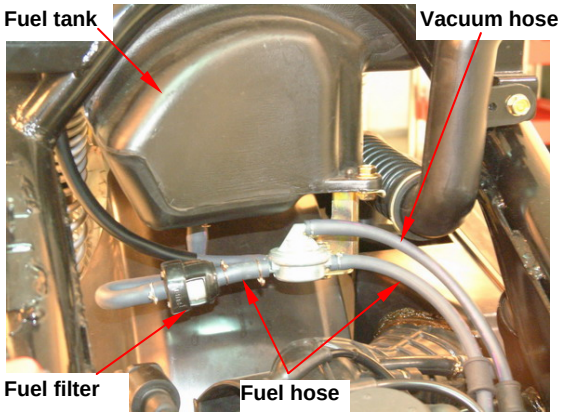
The above maintenance schedule is established by taking the monthly 1000 kilometers as a reference which ever comes first.
Remarks: 1. **These marks "☆" in the schedule are emission control items. According to EPA regulations, these items must be performed normally periodical maintenance following the 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.

Fuel Lines / Cable

Remove luggage box.
Remove rear carrier.
Remove body covers.
Check all lines, and replace it when they are deterioration, damage or leaking.

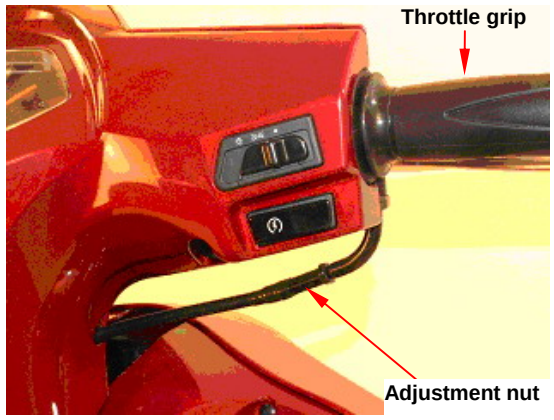
⚠ Warning

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



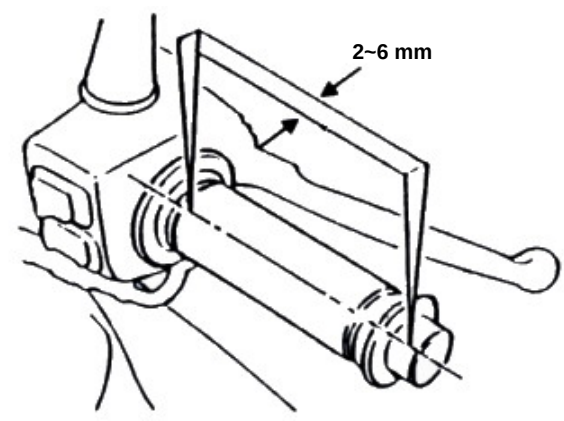
Acceleration Operation

Have a wide open of throttle valve as handle in any position and release it to let back original (full closed) position.
Check handle if its operation is smooth.
Check acceleration cable and replace it if deteriorated, twisted or damaged.
Lubricate the cable if operation is not smooth
Measure the throttle grip free play in its flange part.



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

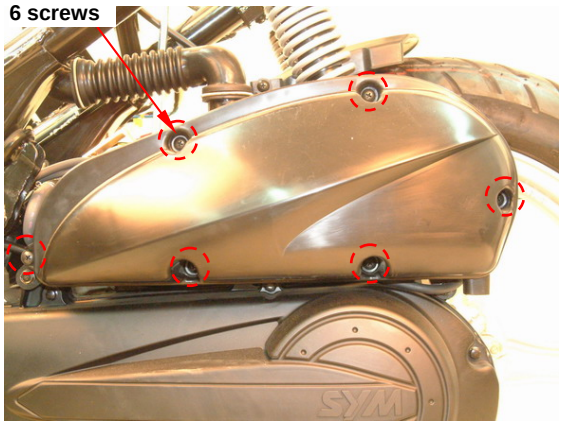
Primary adjustment is conducted from bottom side.
Loosen fixing nut, and adjust by turning the adjustment nut.
Tighten the fixing nut, and check acceleration operation condition.
Free play: 2~6 mm.



Air Cleaner

Air Cleaner Element

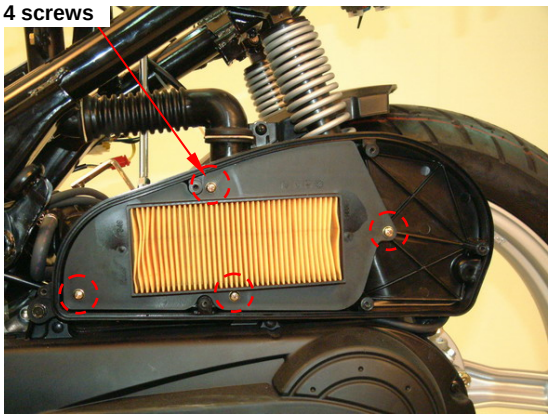
Remove 6 screws from the air cleaner cover and then remove the cover.



Remove 4 screws, and then remove the air cleaner element.

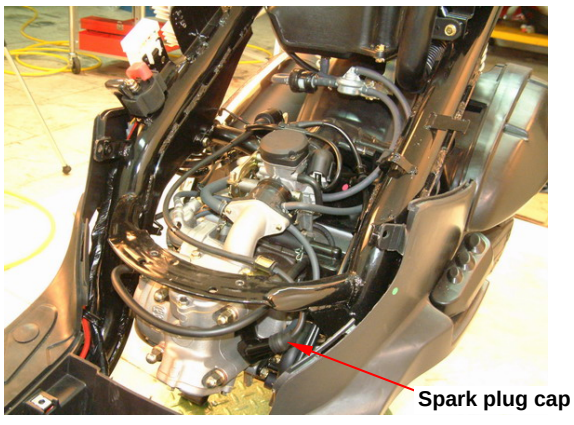
⚠ Caution

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

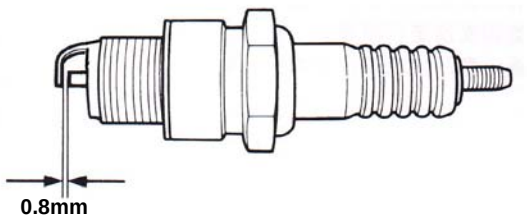


Spark Plug

Remove central cover.
Remove spark plug cap.
Clean dirt around the spark plug hole.
Remove spark plug.



Measure the spark plug gap.
Spark plug gap：0.8 mm
Carefully bend ground electrode of the plug to adjust the gap if necessary.
Hold spark plug washer and install the spark plug by screwing it.
Tighten torque: 1.0~1.2kgf-m
Connect spark plug cap.
Recommended spark plug: CR7E

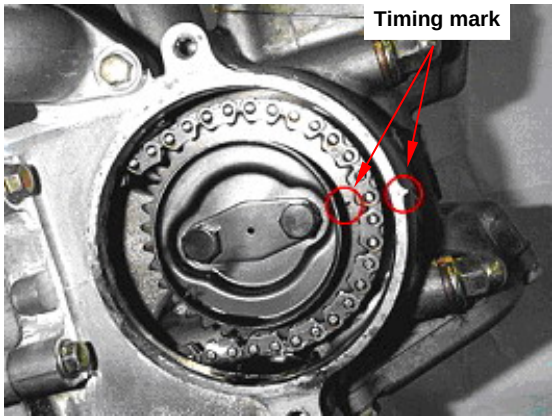


Valve Clearance

Caution

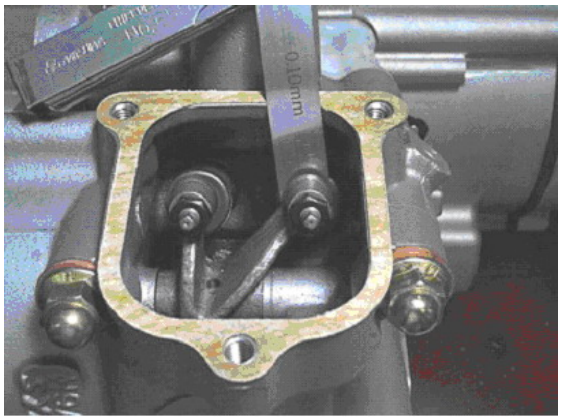
Checks and adjustment must be performed when the engine temperature is below 35℃.

Remove trunk.
Remove central cover.
Remove valve adjustment cap.
Remove cylinder head side cover.
Turn camshaft bolt in C.W. direction and let the “T” mark on the camshaft sprocket align with cylinder head mark so that piston is placed at TDC position in compression stroke.



Caution

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

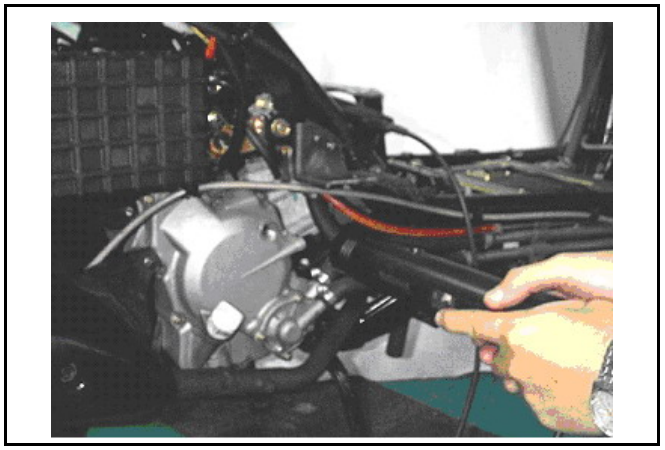


Valve clearance inspection and adjustment.
Check & adjust valve clearance with feeler gauge.
Valve clearance (IN/EX): 0.12 ± 0.02 mm
Loosen fixing nut and turn the adjustment nut for adjustment.

Caution

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

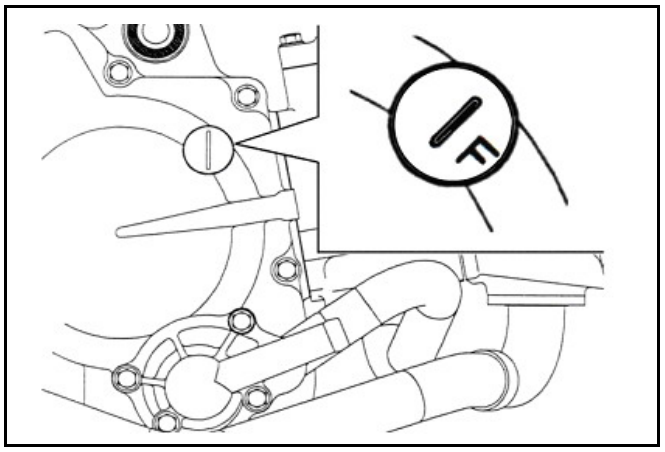
Ignition System



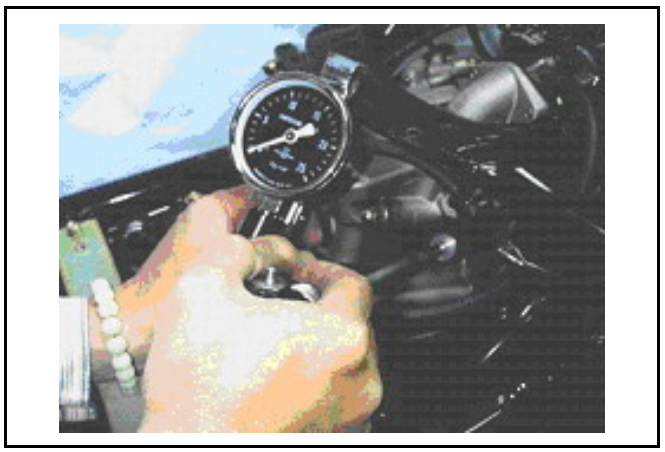
Caution

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

Remove right side cover.
Remove ignition timing hole cap located in front upper side of engine right cover.
Connect tachometer and ignition lamp.
Start engine.
As engine in idle speed: 1600 rpm, aim at the mark “F” with the ignition lamp. Then, it is means that ignition timing is correct.
Increase engine speed to 6000 rpm to check ignition advance degree. If indent is located within the ignition advance degrees, it is means that the ignition advance degree is in normal.
If ignition timing is incorrect, check ECU set, pulse rotor and pulse generator. Replace it if malfunction of these parts is found.



Cylinder Compression Pressure



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

Caution

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

Compression pressure: 12 ± 2 Kg/cm²
Check following items if the pressure is too low:

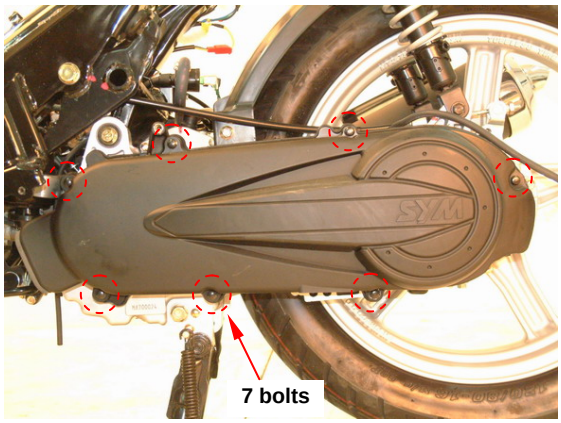
- Incorrect valve clearance.
- Valve leaking.
- Cylinder head leaking, piston, piston ring and cylinder worn out.

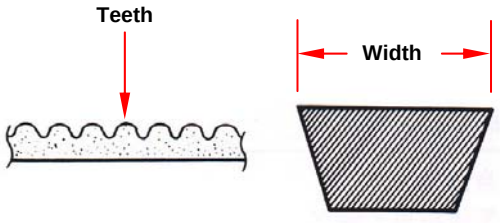
If the pressure is too high, it means carbon deposits in combustion chamber or piston head.

Drive Belt

Remove mounting bolt located under air cleaner.
Remove 7 bolts of the engine left side cover and the cover.
Check if the belt is crack or worn out.
Replace the belt if necessary or in accord with the periodical maintenance schedule to replace it.

Width limit: 18.5mm or above

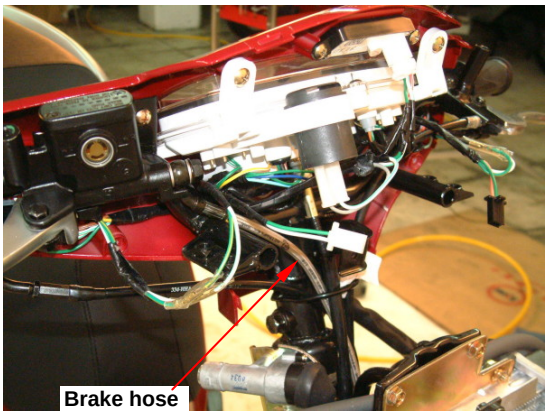




Brake System (Front Disk Brake)

Brake System Hose

Make sure the brake hoses for corrosion or leaking oil.

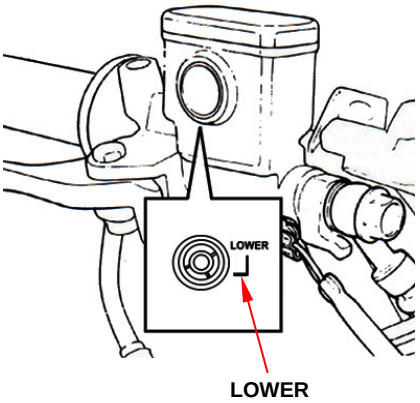


Brake Fluid

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

⚠ Caution

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



Filling Out Brake Fluid

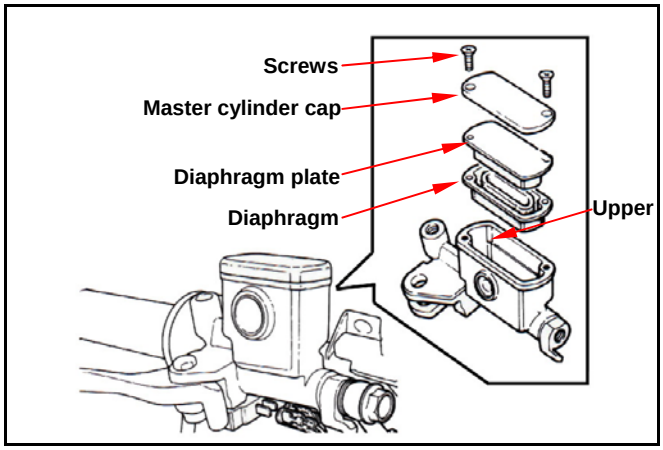
Tighten the drain valve, and add brake fluid. Operate the brake lever so that brake fluid contents inside the brake system hoses.

Air Bleed Operation

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

⚠ Caution

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

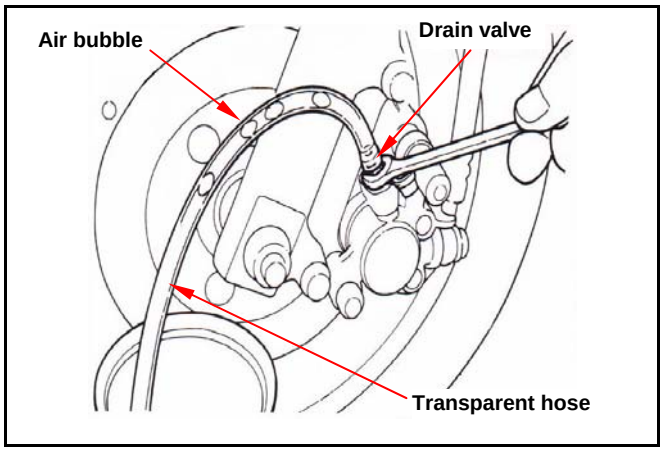


Added Brake Fluid

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

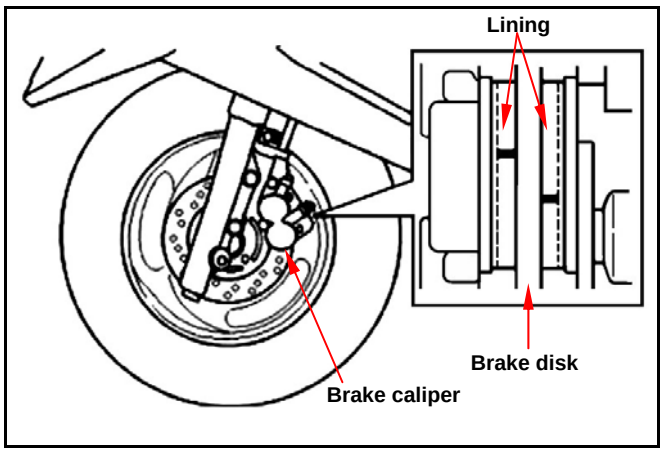
It is not necessary to remove brake hose when replacing the brake lining.

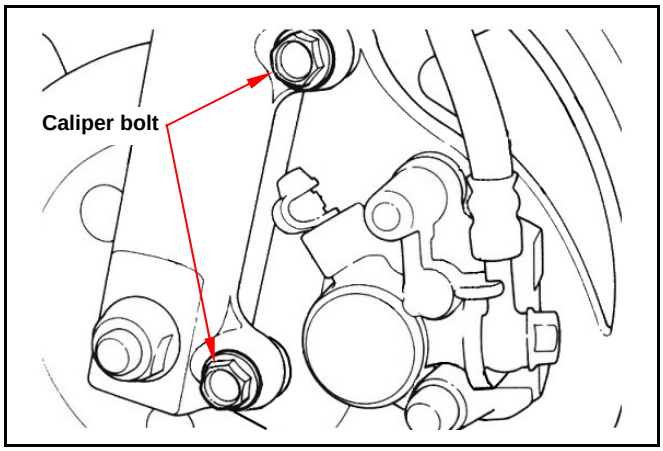
Remove the brake clipper bolt, and take out the clipper.

⚠ 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 is clipped.





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

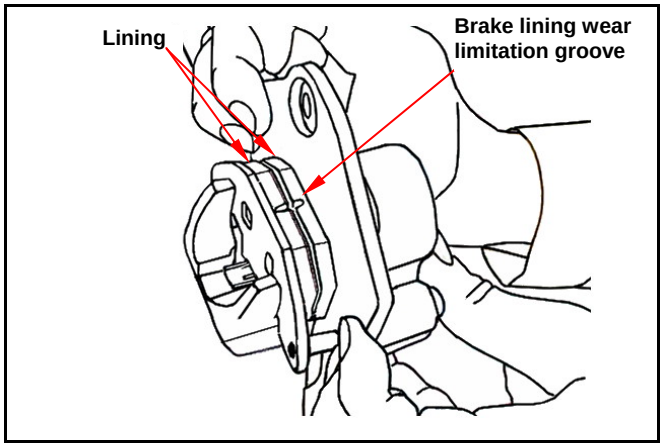
Brake Lining Replacement

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.

⚠ Caution

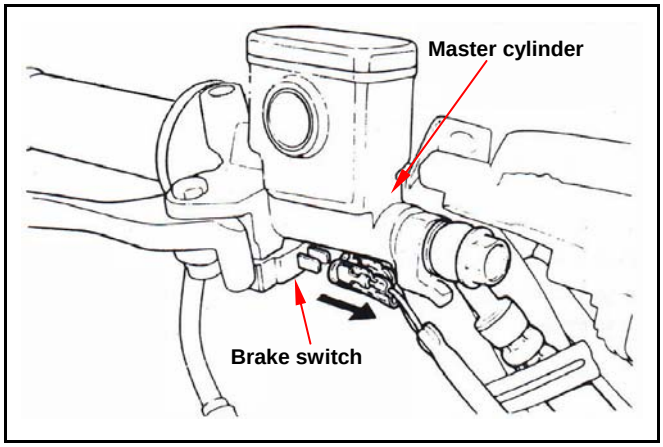
In order to maintain brake power balance, the brake lining must be replaced with one set.



Brake Light Switch/Starting Inhibitor Switch

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

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



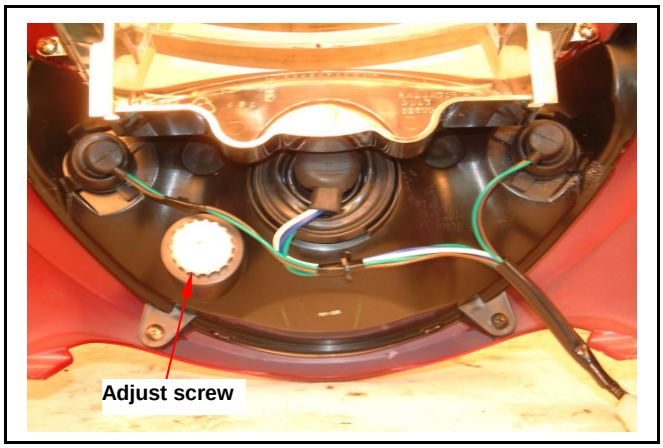
Headlight Beam Distance

Turn on main switch

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

⚠ Caution

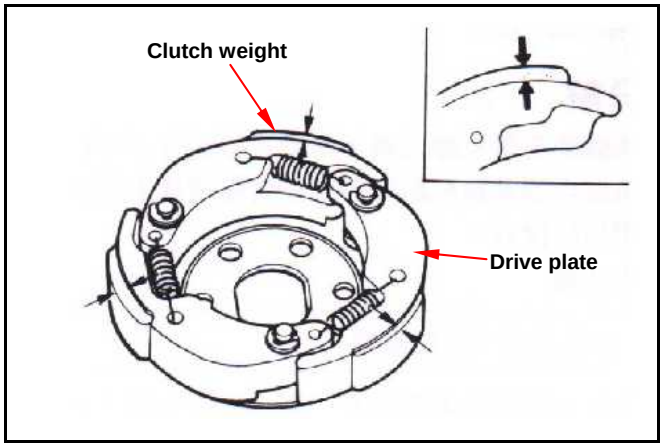
- To adjust the headlight beam follows related regulations.
- Improper headlight beam adjustment will make in coming driver dazzled or insufficient lighting.



Clutch Disc Wear

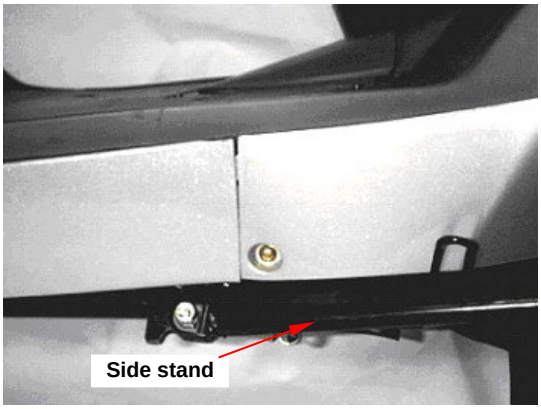
Run the motorcycle and increase throttle valve opening gradually to check clutch operation.

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



Side Stand

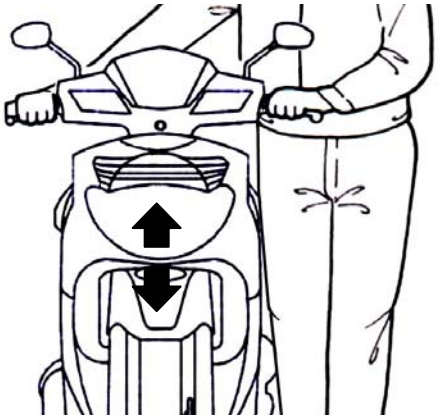
Check side stand spring for damage or looseness.
Press down side stand and pull it with spring gauge. If gauge reading is over 2 kg, it means that the spring capacity is in normal.
Check if side stand set is operated smoothly.
Make sure that side stand is no bending or deformation.



Cushion

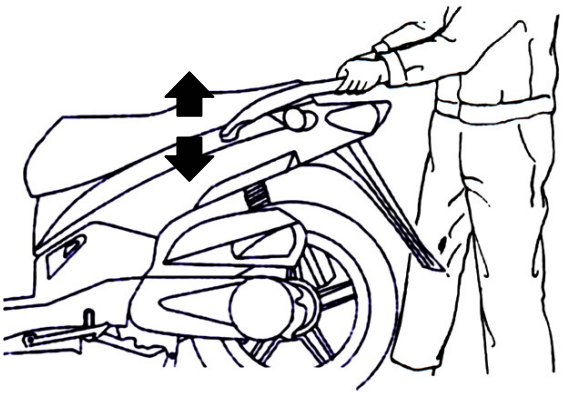
⚠ Warning

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



Front cushion

Press down the front cushion for several times to check it operation.
Check if it is damage
Replace relative parts if damage found.
Tighten all nuts and bolts.



Rear Cushion

Press down the front cushion for several times to check it operation.
Check if it is damage
Replace relative parts if damage found.
Park motorcycle with main stand.
Turn the rear wheel forcefully and check if engine bracket bushing worn out
Replace the bushing if looseness found.
Tighten all nuts and bolts.

Nuts, Bolts Tightness

Perform periodical maintenance in accord with the Periodical Maintenance Schedule

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

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

Wheel/Tire

Caution

Tire pressure check should be done as cold engine.

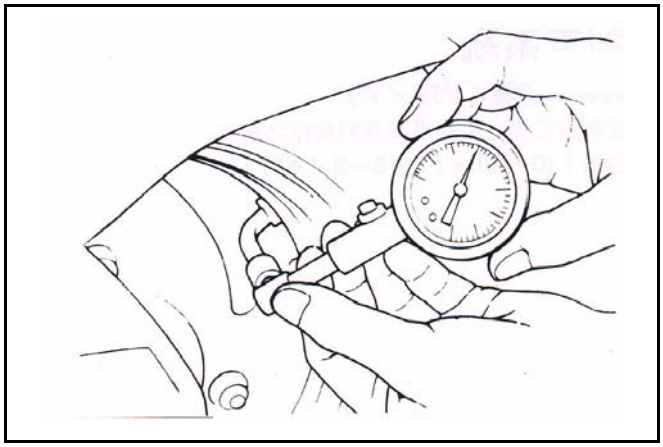
Check if tire surface is ticked with nails, stones or other materials.

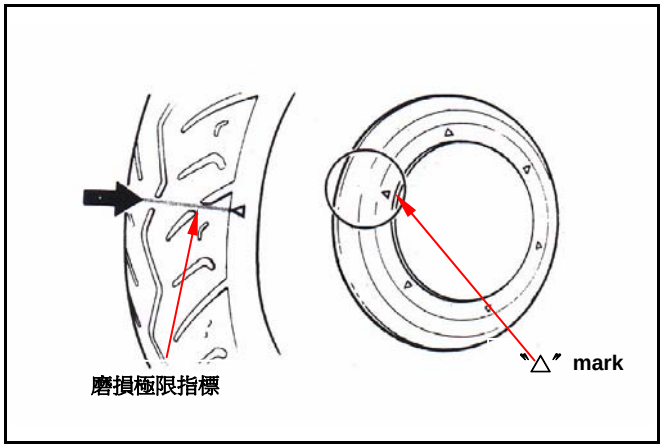
Appointed tire pressure

Tire size		Front tire	Rear tire
Tire pressure as cold engine (Kg/cm²)	Load for under 90 Kg	1.75	2.25
	Full loaded	1.75	2.5

Check if front and rear tires' pressure is in normal.
Measure tire thread depth from tire central surface.
Replace the tire if the depth is not come with following specification:

Front tire: 1.5 mm
Rear tire: 2.0 mm



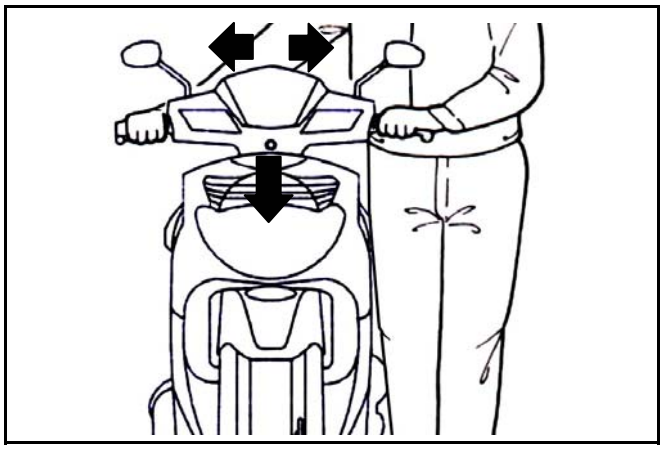


Steering Handle Top Bearing

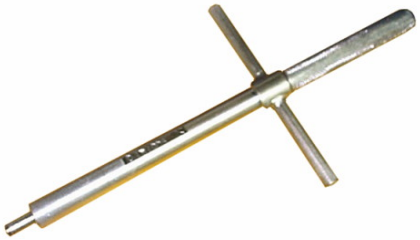
Caution

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

Lift the front wheel out of ground.
Turn handle from right to left alternative and check if turning is smoothly.
If handle turning is uneven and bending, or the handle can be operated in vertical direction, then adjust the handle top bearing.

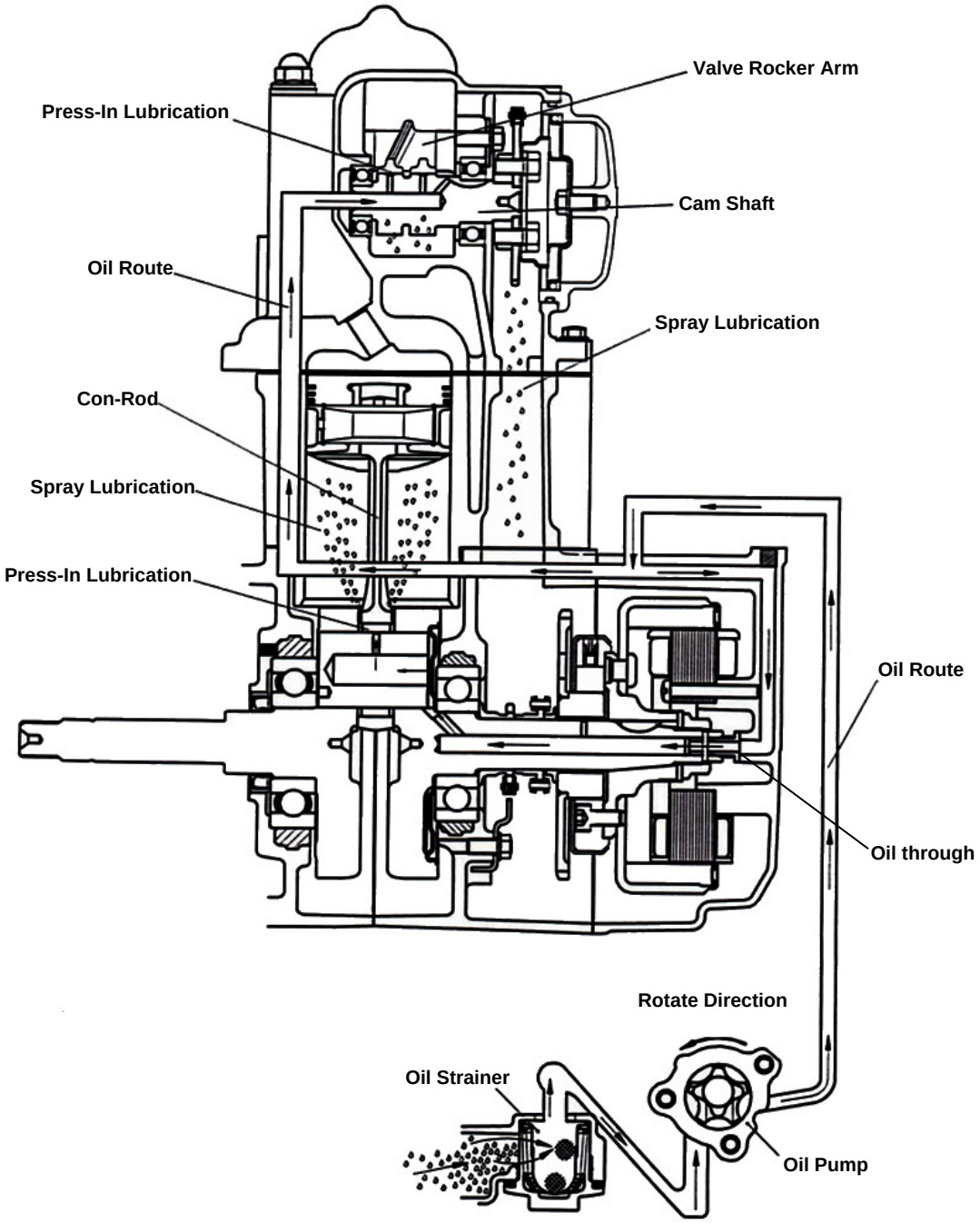


Special Tools List

					
NAME	R/L. CRANK DISASS. TOOL	NAME	CRANK SHAFT PULLER	NAME	L. CRANK SHAFT BRG. DRIVER
NO	SYM-1120000-H9A	NO	SYM-1130000-H9A	NO	SYM-9100200-H9A
		 (ϕ 30mm)		 (ϕ 22mm)	
NAME	CRANK SHAFT BRG. FIXING SOCKET	NAME	CRANK CASE BUSH PULLER	NAME	CRANK CASE BUSH PULLER
NO	SYM-9100210-H9A	NO	SYM-1120310	NO	SYM-1120320
					
NAME	VALVE COTTER REMOVE & ASSEMBLY TOOL	NAME	TAPPET ADJUSTING WRENCH	NAME	TAPPET ADJUSTER
NO	SYM-1471110/20	NO	SYM-9001200	NO	SYM-9001209
					
NAME	UNIVERSAL HOLDER	NAME	CLUTCH NUT WRENCH	NAME	CLUTCH SPRING COMPRESSOR
NO	SYM-2210100	NO	SYM-9020200	NO	SYM-2301000

					
NAME	INNER BEARING PULLER	NAME	OUTER BEARING PULLER	NAME	AC.G. FLYWHEEL PULLER
NO	SYM-6204002	NO	SYM-6204001	NO	SYM-3110A00
 **(12*20*5)**		 **(6901)**			
NAME	WATER PUMP OIL SEAL DRIVER	NAME	WATER PUMP BEARING DRIVER	NAME	WATER PUMP MECHANICL SEAL DRIVER
NO	SYM-9120500-H9A	NO	SYM-9100100	NO	SYM-1721700-H9A
 **(6301)**		 **(6204)**		 **(6203/6004UZ)**	
NAME	BEARING DRIVER	NAME	BEARING DRIVER	NAME	BEARING DRIVER **Ø17mm**
NO	SYM-9610000	NO	SYM-9110400	NO	SYM-9620000
 **(20*32*6)**		 **(25*40*8)**		 **(27*42*7)**	
NAME	OIL SEAL DRIVER	NAME	OIL SEAL DRIVER	NAME	OIL SEAL DRIVER
NO	SYM-9120200	NO	SYM-9121600	NO	SYM-9125500

					
NAME	Drive shaft puller	NAME	Drive shaft install bush	NAME	Extension bush (long)
NO	SYM-1130000-L	NO	SYM-1130010	NO	SYM-1130031
					
NAME	Extension bush (short)	NAME	Vacuum pressure gauge	NAME	Fuel pressure gauge
NO	SYM-1130032	NO	SYM-HT07011	NO	SYM-HT07010
					
NAME	Multi-meter	NAME	Cylinder pressure gauge	NAME	Vehicle circuit test tool kit
NO	SYM-HE07007-01	NO	SYM-HT07008	NO	SYM-HE170008
					
NAME	Vehicle circuit test harness	NAME	EFi System Diagnostic tool	NAME	
NO	SYM-HE170008-01	NO		NO	



Precautions in Operation

General Information:

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

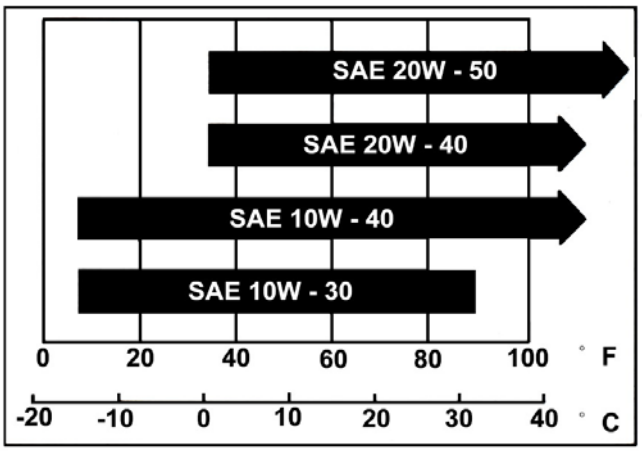
Specifications

Engine oil quantity Disassembly: 1000 c.c.
Change: 800 c.c.

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

Gear oil Disassembly: 110 c.c.
Change: 100 c.c.

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



unit: mm

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

Torque value

Torque value oil strainer cap	1.5~3.0kgf-m
Gear oil drain plug	1.0~1.5kgf-m
Gear oil inspection bolt	1.0~1.5kgf-m
Oil pump connection bolt	0.8~1.2kgf-m

Troubleshooting

Low engine oil level

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

Low oil pressure

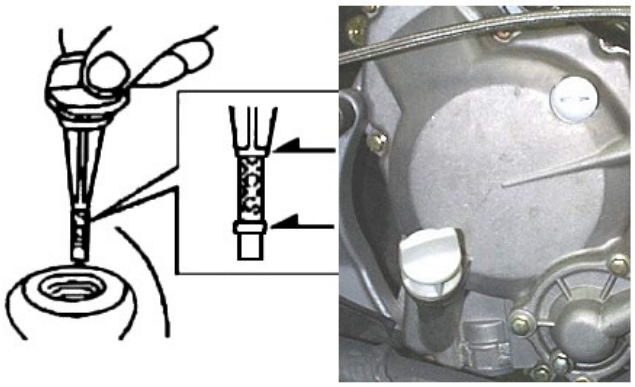
- Low engine oil level
- Clogged in oil strainer, circuits or pipes
- Oil pump damage

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 surface with main stand.
Check oil level with oil dipstick
So not screw the dipstick into engine as checking.
If oil level is nearly low level, fill out recommended oil to upper level.



Oil Change

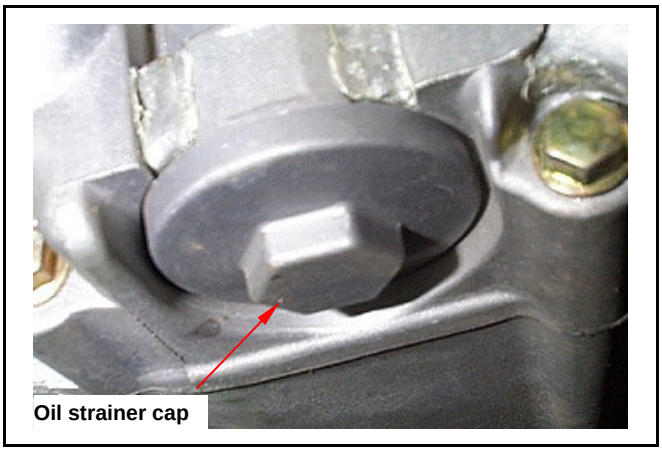
⚠ Caution

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

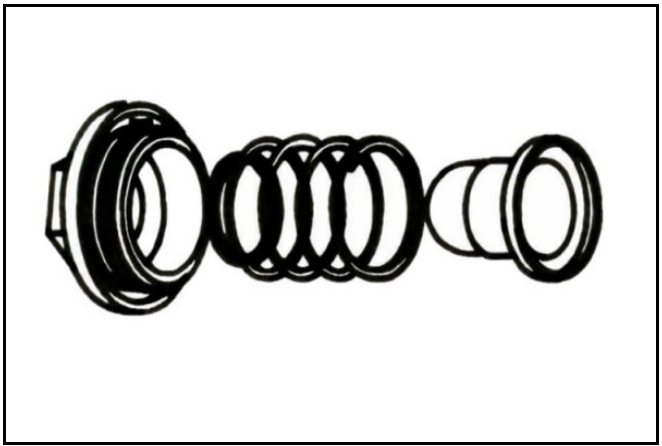
Place a oil pan under the motorcycle, and remove oil drain bolt.
After drained, make sure washer can be re-used.
Install oil drain bolt.
Torque value：1.9~2.5kgf-m

Engine Oil Strainer Clean

Drain engine oil out.
Remove oil strainer and spring.
Clean oil strainer.
Check if O-ring can be re-used.
Install oil strainer and spring.
Install oil strainer cap.
Torque value：1.9~2.5kgf-m
Add oil to crankcase (oil viscosity SAE 10W-30)
Recommended using King serial oil.



Engine oil capacity: 0.8L when replacing
Install dipstick, start the engine for running several minutes.
Turn off engine, and check oil level again.
Check if engine oil leaks.

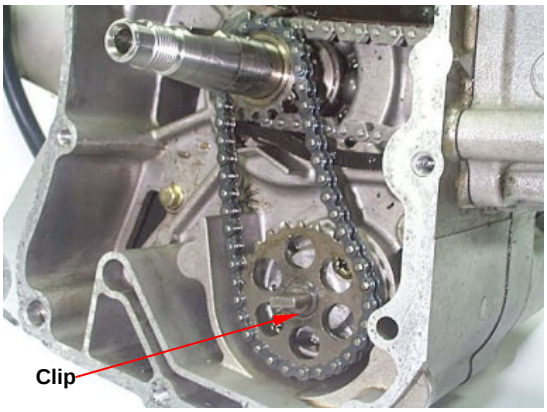


Oil Pump

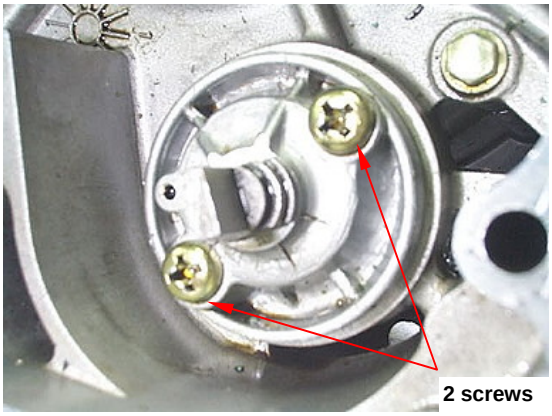
Oil Pump Removal

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

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

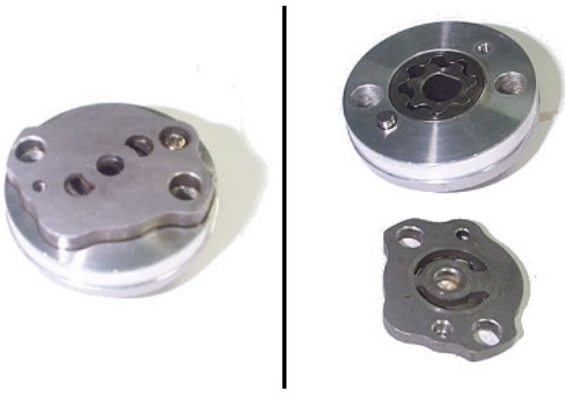


Make sure that pump shaft can be rotated freely. Remove 2 bolts on the oil pump, and then remove oil pump.



Oil Pump Disassembly

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



Oil Pump Inspection

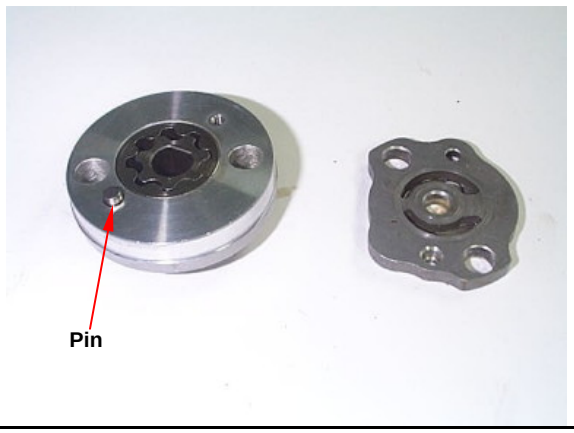
Check the clearance between oil pump body and outer rotor.

Limit: 0.25 mm

Check clearance between inner and outer rotors.
Limit: 0.20 mm

Check clearance between rotor side face and pump body
Limit: 0.12 mm

Oil Pump 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 fixing pin

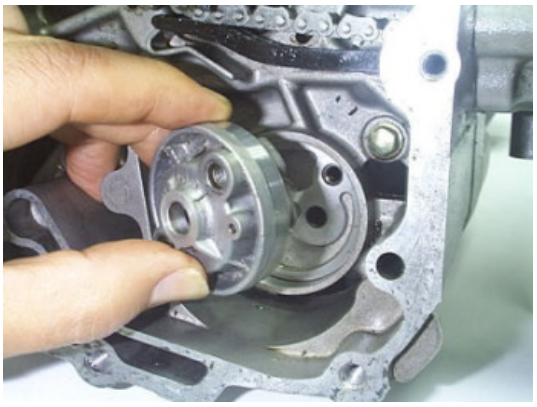


Install the oil pump cover and fixing pin properly

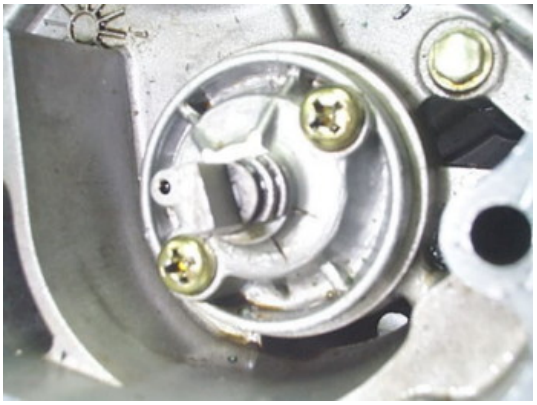
Oil Pump Installation

Install the oil pump, and then tighten bolts.

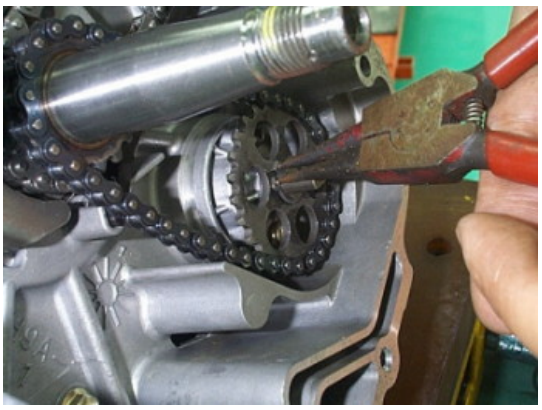
Torque value：0.8~1.2kgf-m



Make sure that oil pump shaft can be rotated freely.



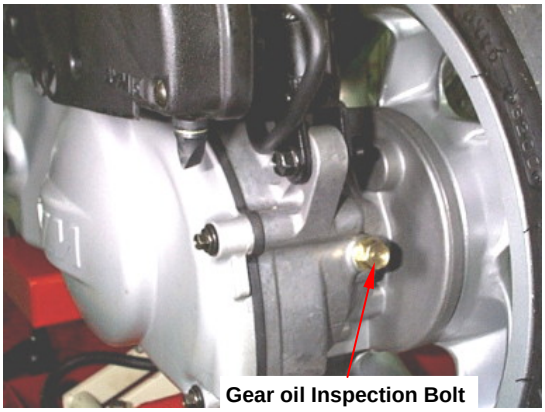
Install oil pump driving chain and sprocket, and then install snap ring onto oil pump shaft.



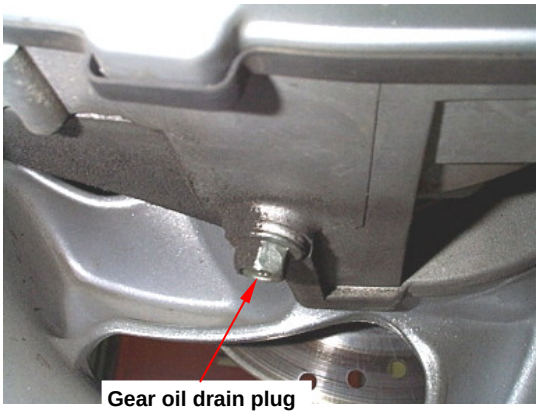
Install starting gear and generator.
(Refer to chapter 10)

Gear Oil

Oil level inspection
Park the motorcycle on flat surface with main stand.
Turn off engine and remove oil inspection bolt.


Gear oil Inspection Bolt

Gear lubrication oil quantity has to be measured with measure device.
If oil level is too low, add gear oil. Recommended using King series oils.
Install oil inspection bolt.

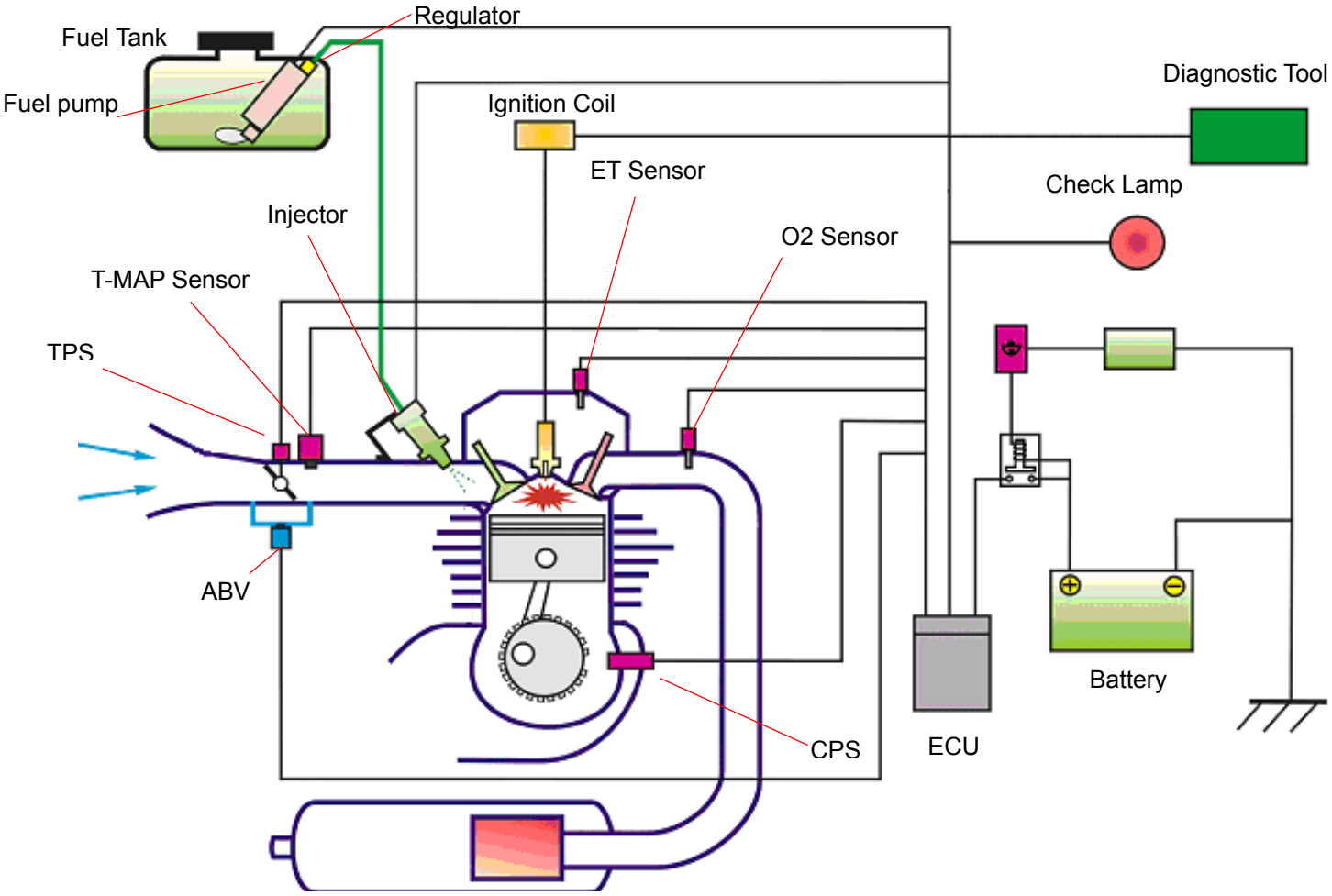

Gear oil drain plug

Gear Oil Change

Remove oil level inspection bolt.
Remove drain plug and drain oil out.
Install the drain plug after drained.
Torque value: 1.0~1.4kgf-m
Make sure that the drain plug washer can be re-used.
Add oil to specified quantity from the inspection hole.
Gear Oil Quantity: 100 c.c. when replacing
Make sure that the bolt washer can be re-used, and install the bolt.
Start engine and run engine for 2-3 minutes.
Turn off engine and make sure that oil level is in correct level.
Make sure that no oil leaking.

Notes:

EFi System Diagram



EFi System Introduction

Based on 4-stroke SOHC engine, displacement 180 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 294±6kpr. 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.

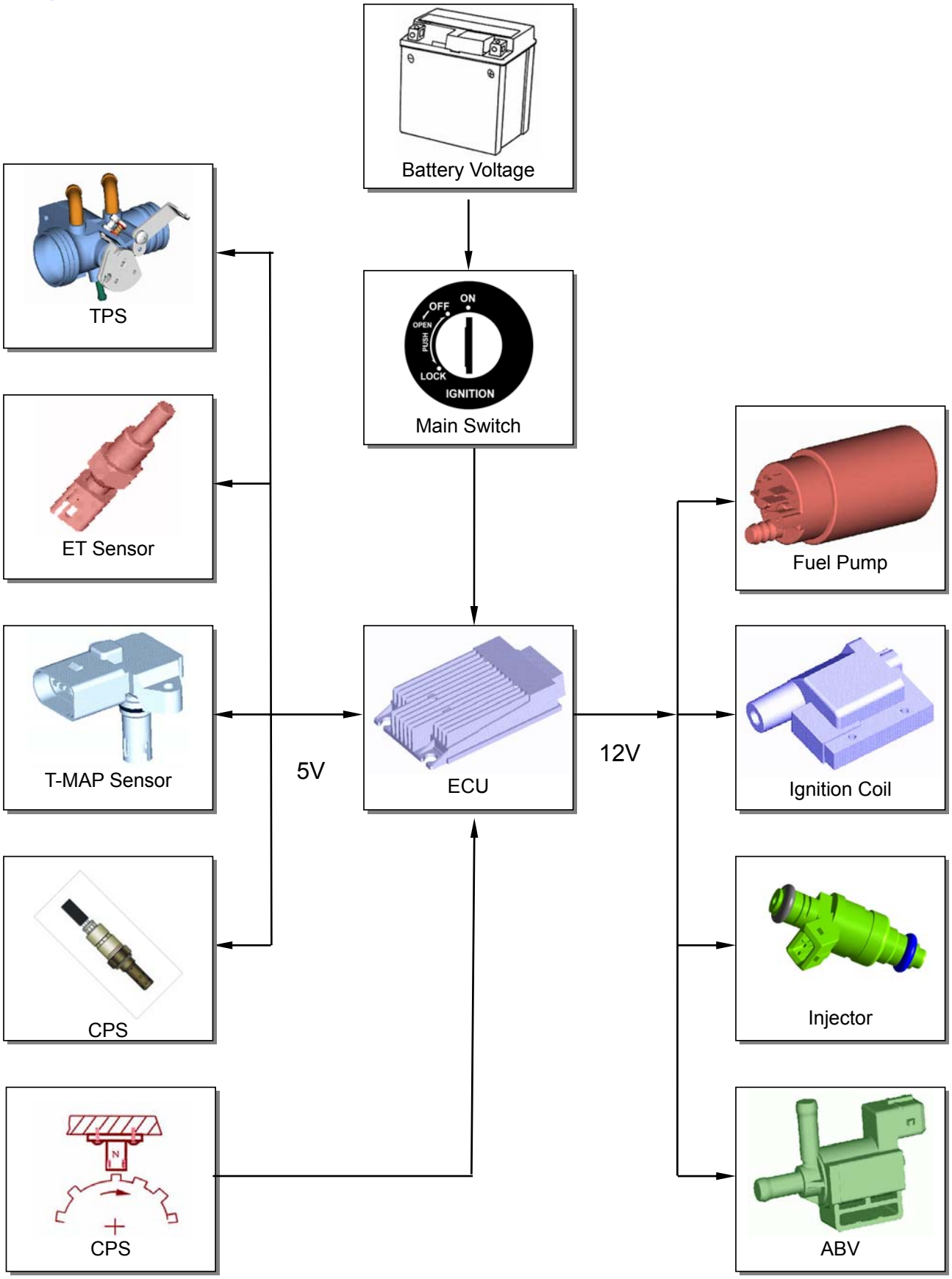
In traditional gasoline engine, carburetor supplies the fuel. The process is done by the engine vacuum, and the negative pressure in the carburetor mixes fuel with air. Under this condition, three major processes are done simultaneously in the carburetor: 1. air quantity measurement, the determination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

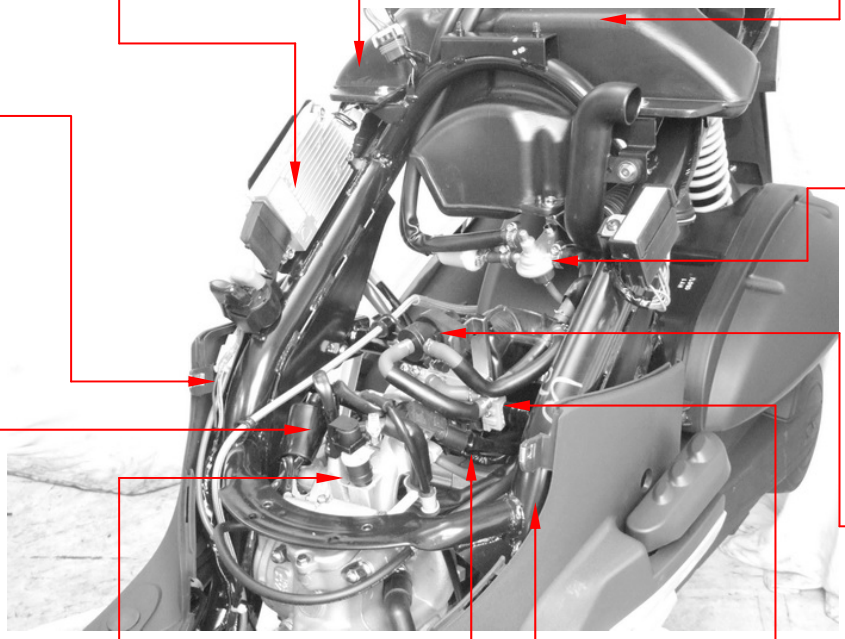
EFi engine uses computer-programmed fuel injection, the main features are:

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 8-bit microcomputer.
3. The fuel pressure regulator maintains a 294±6kpr 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

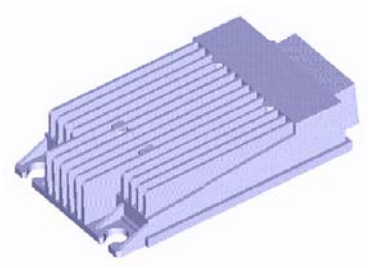


EFi System Location



EFi System Component Description

ECU

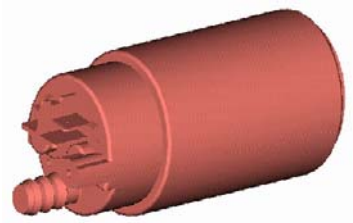


- Powered by DC 8~16V, and has 22 terminals connector on the unit.
- The hardware component consists of an 8-bit computer that is its control center. It contains the functional circuit interface of engine condition sensing and the driving actuator for the air by-pass valve, fuel injector, and fuel pump, 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.

Fuel Injector

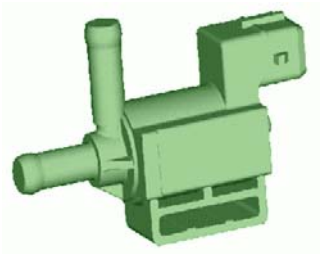
- Powered by DC 8~16V, and has 2 terminals connector on the injector.
- Its major component is the solenoid valve of high resistance driven by electronic current.
- The two terminals are connected to power source and ground respective. It is controlled by ECU to determine the injection timing, and the injector pulse width. Working with 4-valve engine, the unique 2-hole designed injector can provide each intake valve with suitable fuel quantity to reduce HC emission.

Fuel Pump



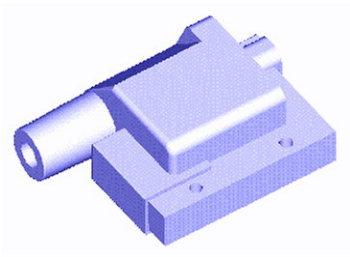
- Powered by DC 8~16V, and has 2 terminals connector on the pump.
- The two terminals are connected to power source and ground respective. The ECU is to control and manage the operation of fuel pump through electrical power.
- Its major component is a driving fan pump that equipped with a low electrical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

ABV



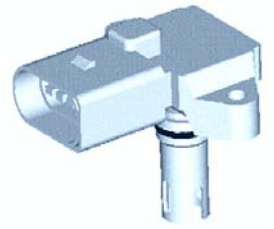
- Powered by DC 8~16V, and has 2 terminals connector on the pump.
- The two terminals are connected to power source and ground respective. Its major component is the high transferring rate transformer.
- Its major component is the solenoid valve of high resistance driven by electric current.
- By means 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.

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.

T-MAP Sensor

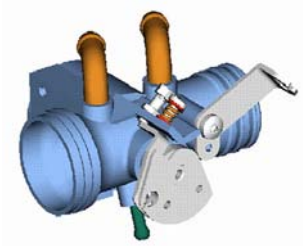


- Powered by 5V DC from ECU. It has 4 terminals on the sensor. One terminal is for power, and 2 terminals are for signal output. And, the rest one is for ground.
- The major component of the T-MAP sensor is a variable transistor IC. Its reference voltage is DC 5V, and output voltage range is DC 0~5V.
- 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.

ET 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.

TPS

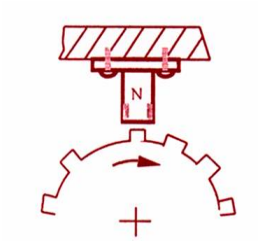


- Powered by 5V DC from ECU, and has 3-terminal connector on the sensor. One terminal is for power, and one for voltage output, and then the last one is for ground.
- Its major component is a highly variable resistor. The input voltage range: 5V DC.
- Located on the side of throttle body. By means of 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.

Throttle Body

- The throttle body is the air flow adjustment mechanism of the fuel injection. (Its function is like the carburetor.)
- The throttle valve shaft is to turn the throttle position sensor in synchronously so the ECU that can detect the throttle valve openness in time.
- The air by-pass valve controls the pipe on the throttle body. ECU adjusts the air by-pass valve to stabilize the idle speed.

CPS

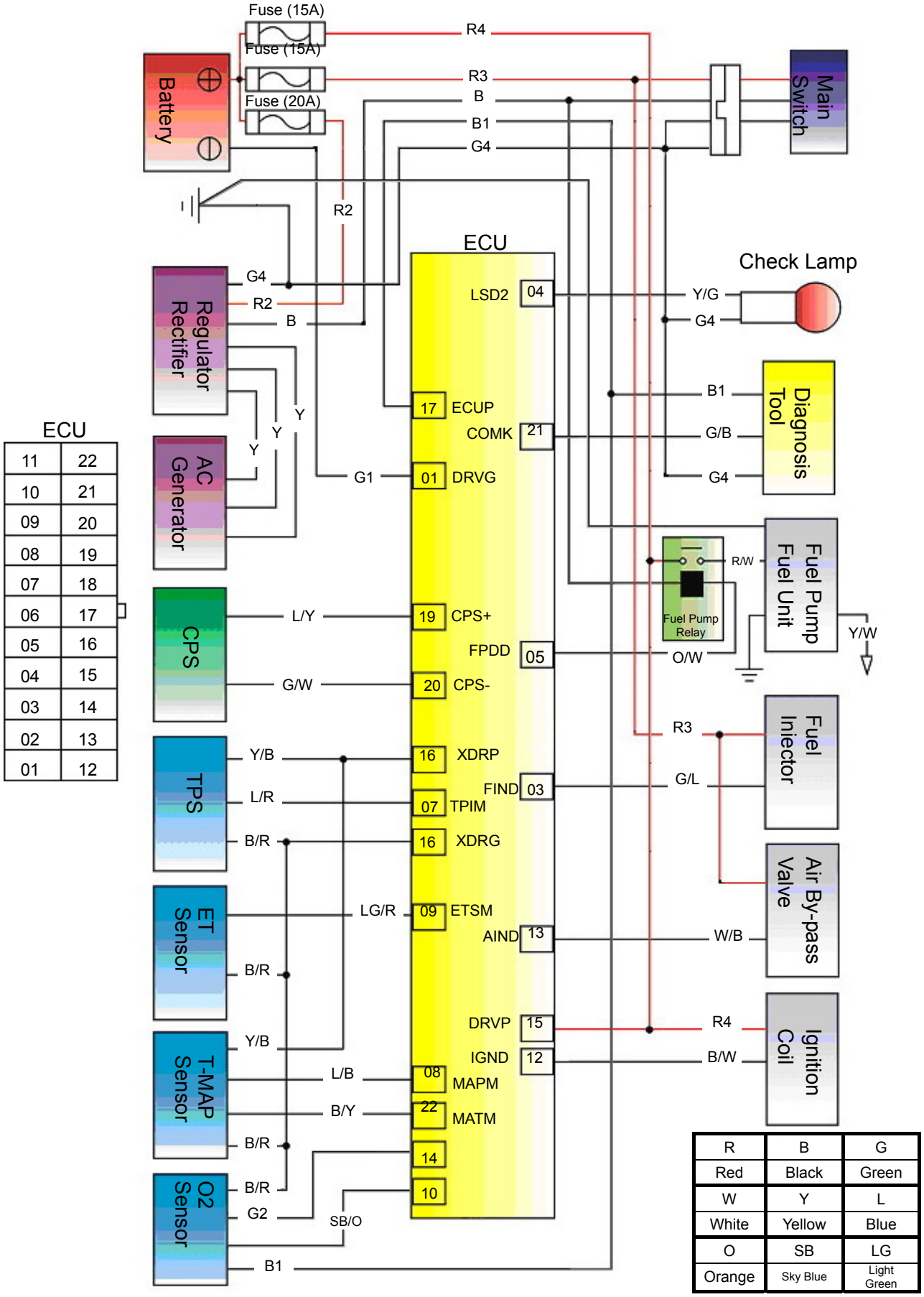


- It does not need power supply, and has 2-signal terminals connector on the sensor.
- Its major component is the magnetic pickup coil, and its output voltage range is ±0.8~100V.
- The air gap between the sensor and flywheel must have .07~1.1mm.
- By cutting the magnetic field, the magnetic sensor sends 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 4 terminals connector on the sensor. The first terminal is for power input; the second is for heating coil. The third is for ground, and the last is for signal output.
- The O2 sensor feeds signal to ECU, and the ECU can control the air/fuel rate around 14.6. It's a close –loop control system.
- The catalytic converter reaches the best converting rate when this 14.6 A/F ratio is maintained.
- The heating coil resistance <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	1600±100 rpm
Throttle grip free play	2~6 mm
Fuel pressure	2.5 bar

Torque value

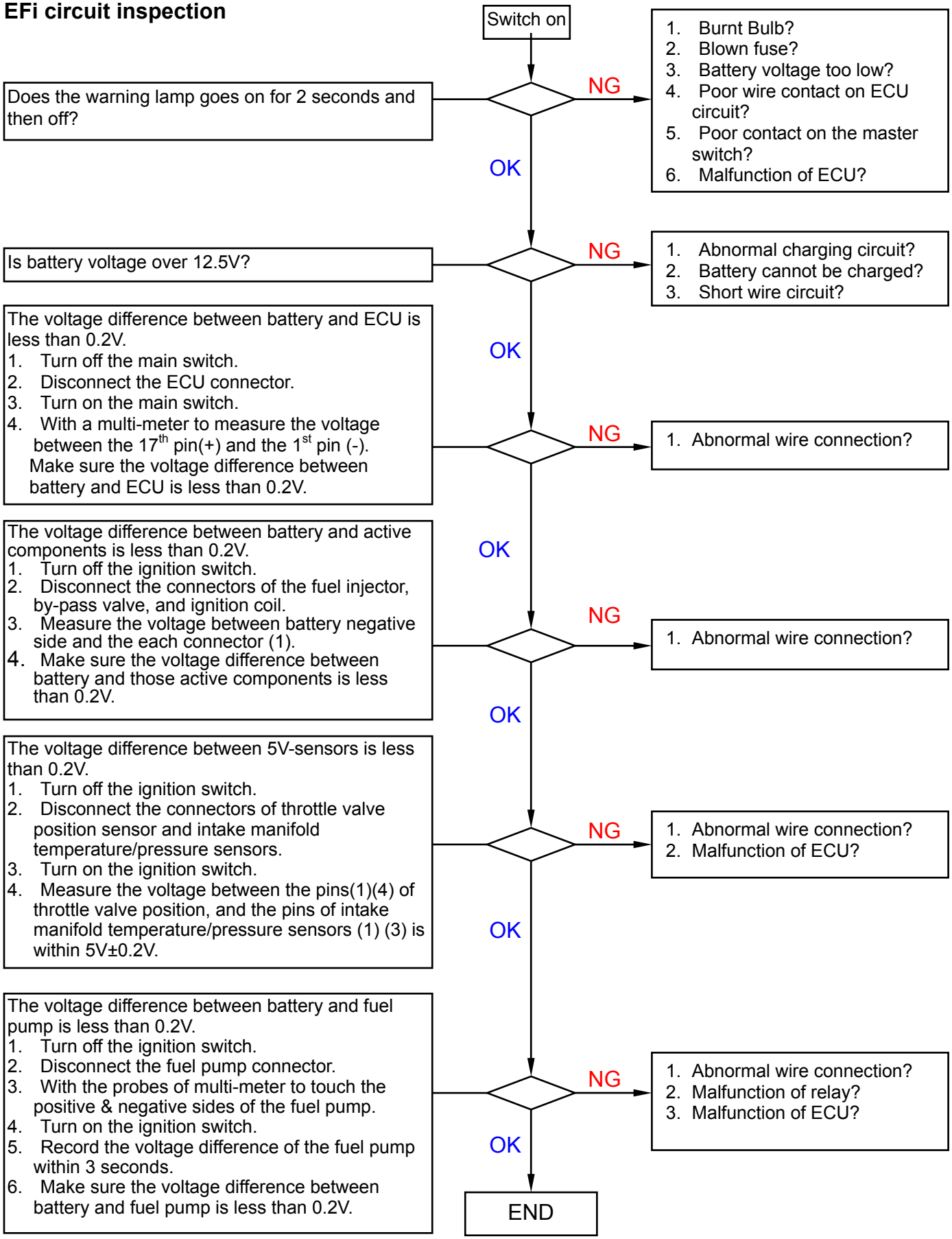
Engine temperature sensor：0.74~0.88 kgf-m
O2 sensor：3.6~4.6 kgf-m

Special tools

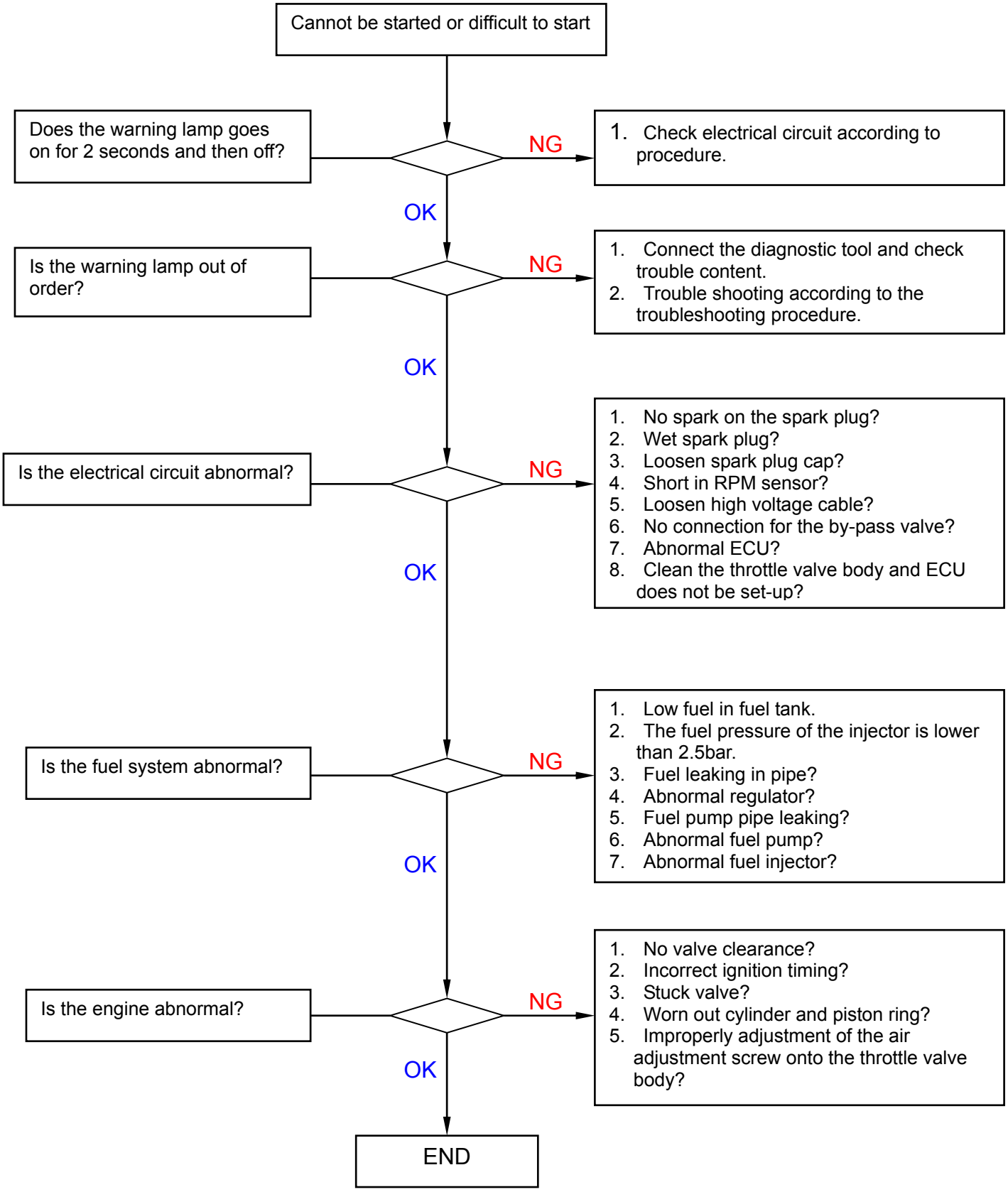
Injection system diagnostic tool
Fuel pressure gauge　SYM-HT07010

Troubleshooting

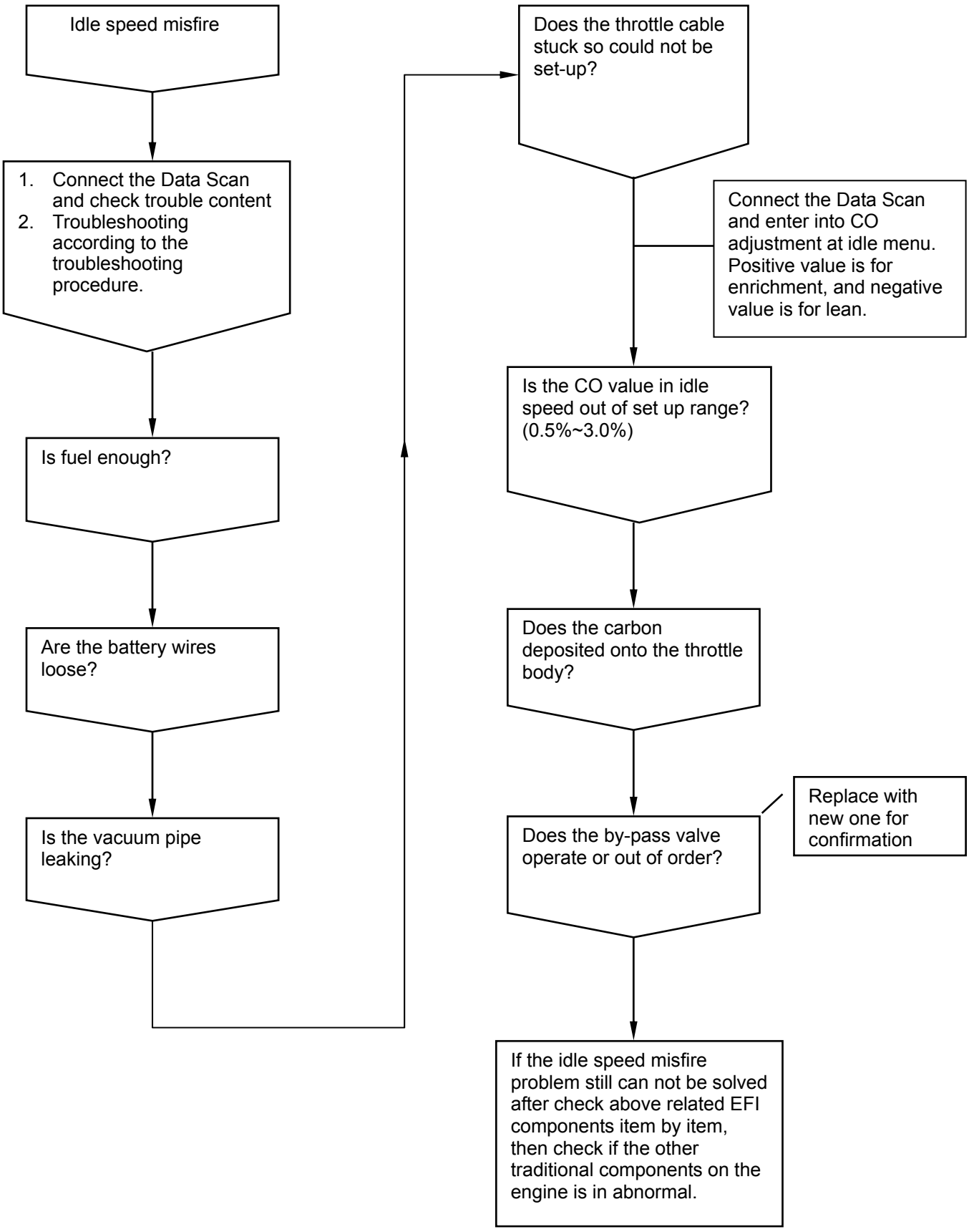
EFi circuit inspection



Engine cannot be started or difficult to start.

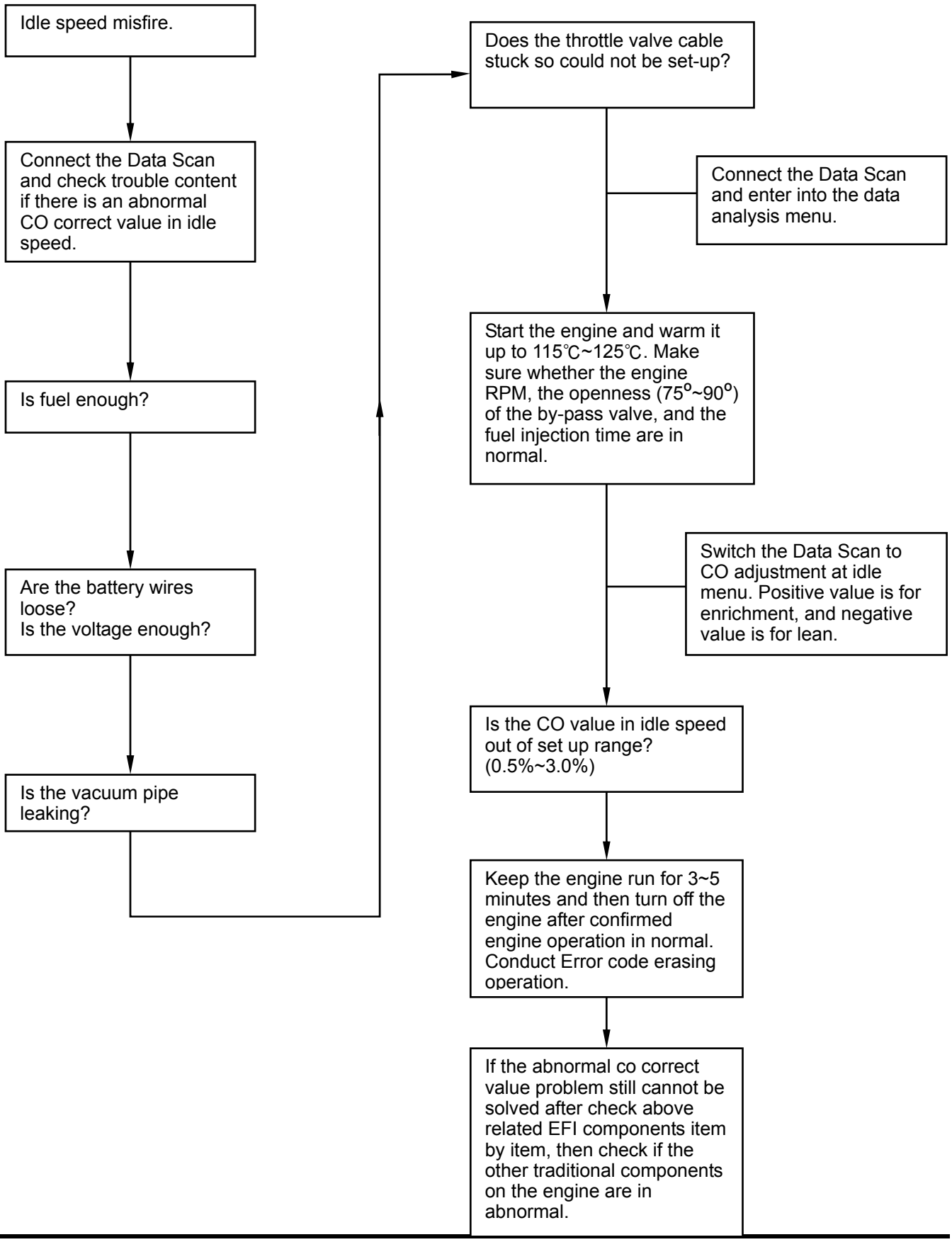


Diagnosis of Idle Speed Misfire



Abnormal CO value

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



Throttle Body & By-pass Valve Clean Procedure

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

Clean procedure:

1. Air by-pass valve：

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

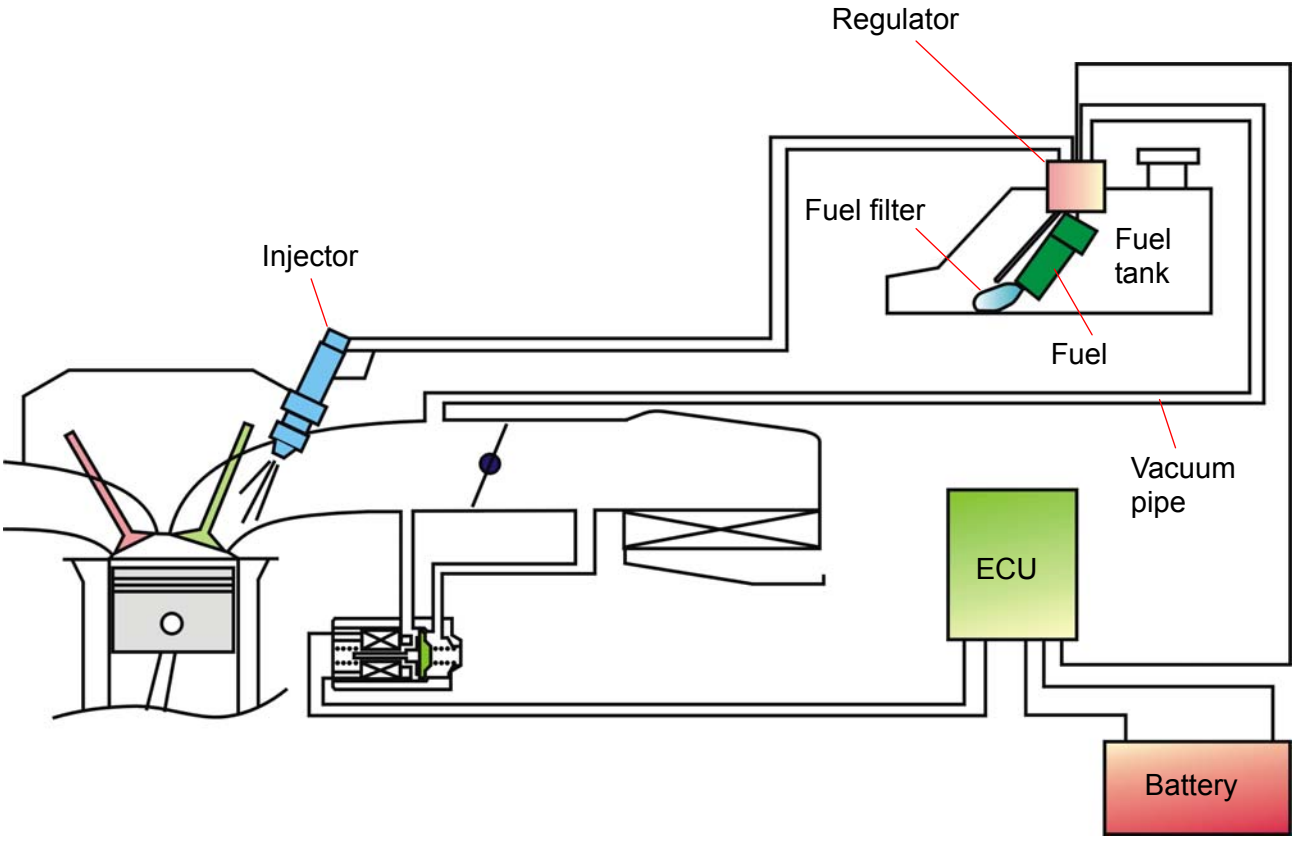
2. Throttle body:

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℃~95℃), and then ECU will get the parameters from sensors.

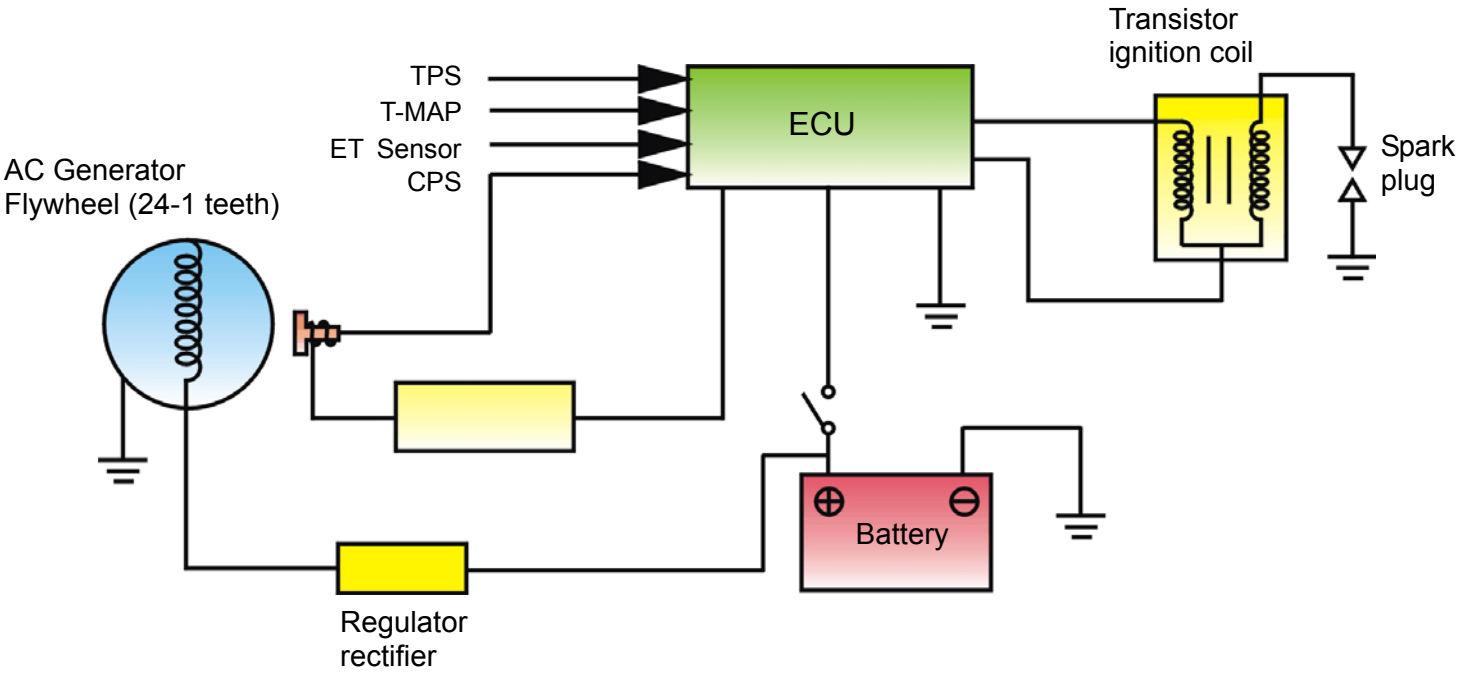
Fuel Lines



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 2.5bar, 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 13° / 1600 rpm**

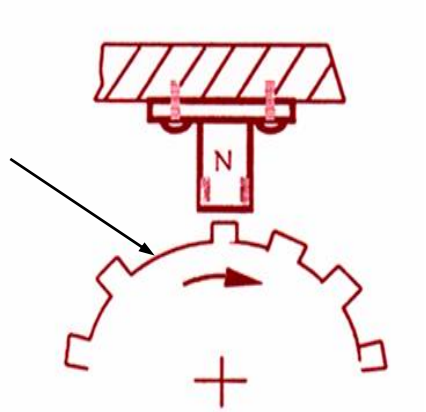
2. **Spark plug: NGK CR7E**
   Gap: 0.8mm

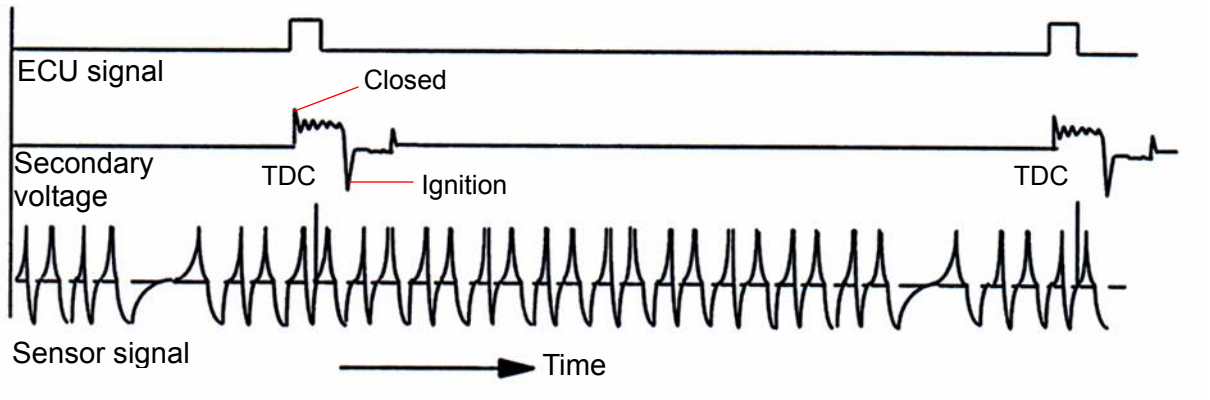
3. **CPS pulse generator coil: 120±10%Ω(G/W-LY)**

4. **Ignition coil**
   Primary circuit：0.63±0.03Ω(23ºC)

5. **Battery:**
   Type: YTX9-BS 或 GTX9-BS
   Capacity: 12V 8Ah

Crankshaft Position Sensor

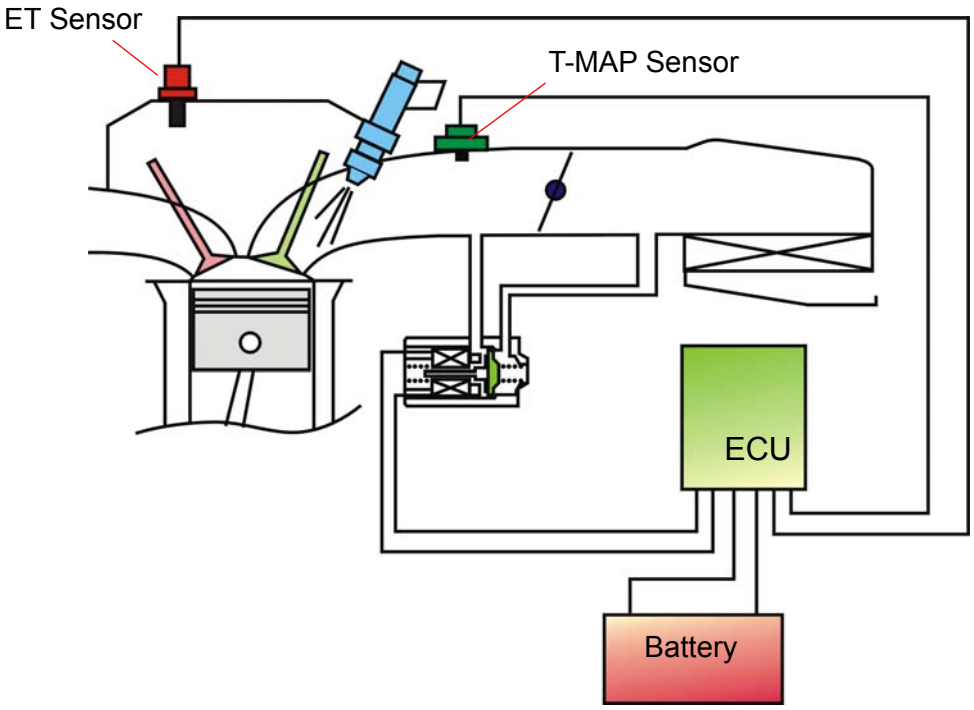




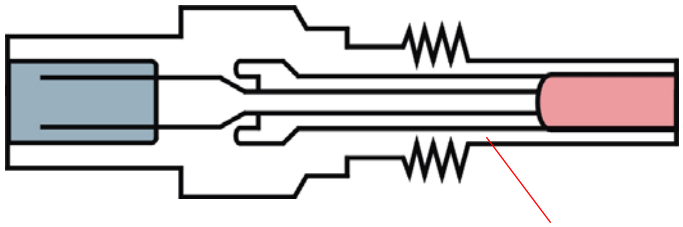
Description:
The magnetic field type sensor generates a voltage signal to calculate engine speed with ACG gear ring (24-1 tooth).

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

Engine Temperature Sensor / T-Map Sensor

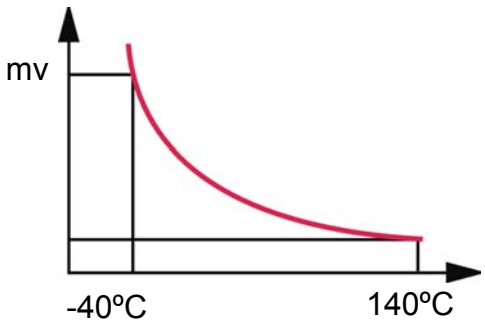


Engine temperature sensor:
According to the semiconductor's characteristic, the sensor detects the temperature of engine oil and metal parts and then sends a voltage signal to the ECU. On this base, the ECU can correct fuel injection and ignition timing.

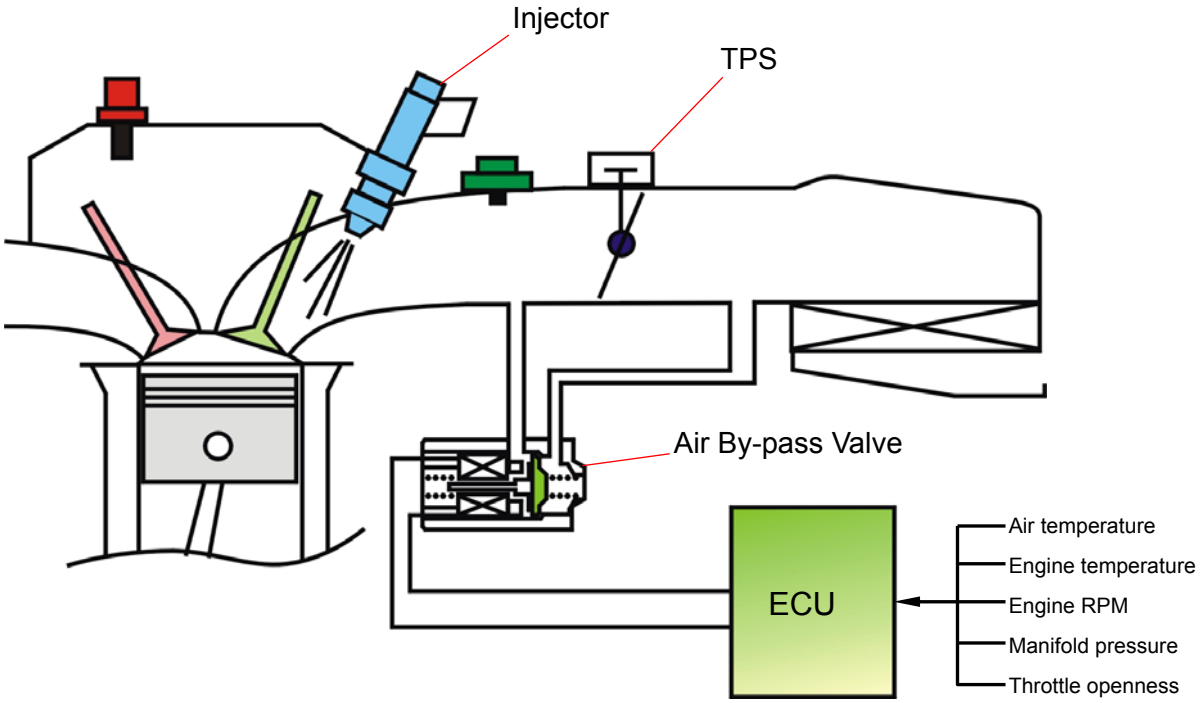


NTC- Negative Temperature Coefficient Resistor

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



Air By-pass Valve



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

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

Fuel Injector

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

Fuel Pump

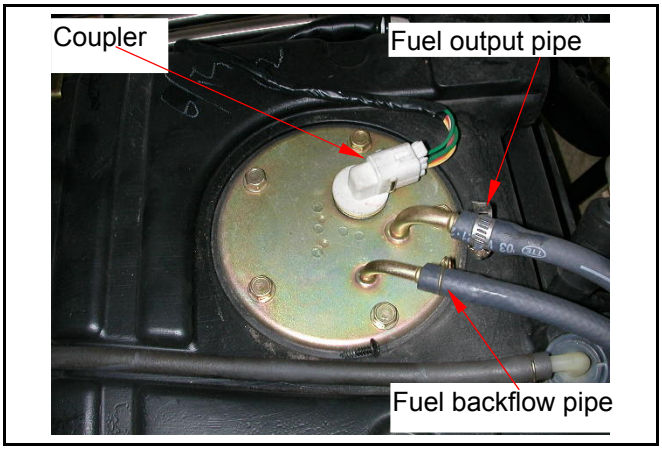
Electrical fuel pump is mounted inside the fuel tank. The power source is DC current provided and controlled by ECU; the pump can provide 14L/hour under the pressure of 2.5 bars.

Fuel Pump / Fuel Unit

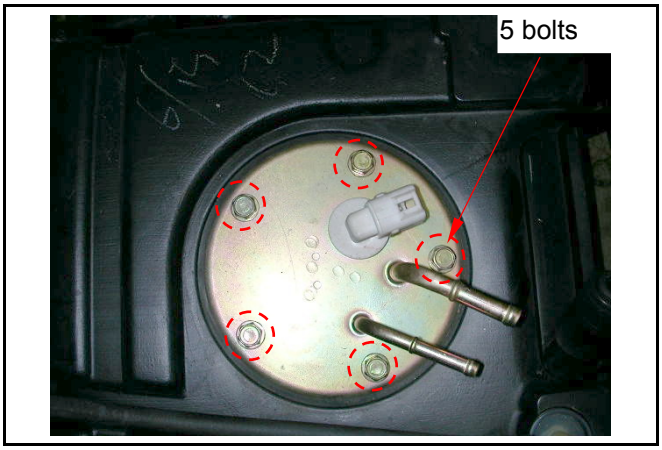
Removal

Remove the front cover and right/ left side covers.
Remove the luggage box.
Remove the right/ left body covers.
Remove the central cover and footrest.
Remove the front inner cover.

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



Remove the fuel pump lock bolts.

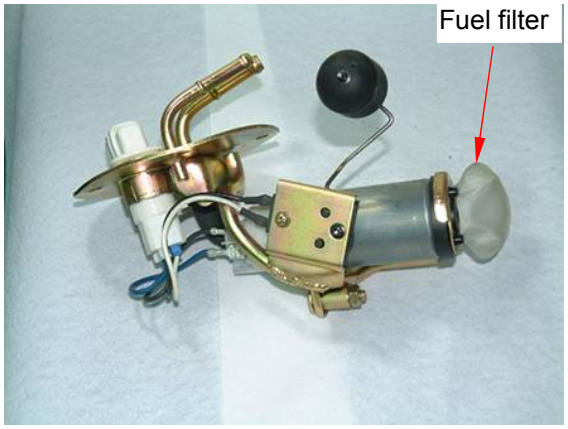


Remove the fuel pump and fuel unit.

⚠ Caution

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

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



Installation

Install in the reverse order of removal.

⚠ Caution

- Do not bend the fuel unit float arm
- Do not fill out too much fuel in the tank.
- Align the assembly mark when installing the fuel pump.

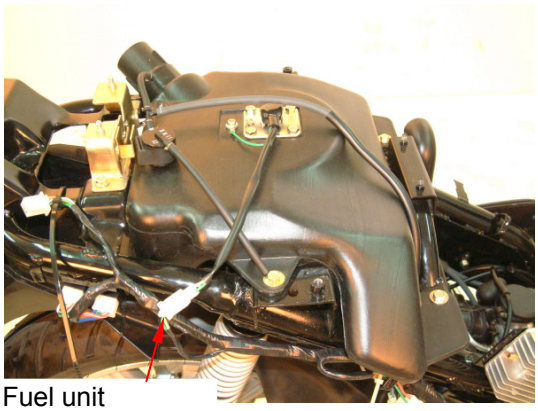
Fuel Tank

Fuel unit removal

Open the seat.
Remove the luggage box (6 bolts and 1 screw).
Remove rear carrier (4 bolts).)
Remove body cover.
Disconnect fuel unit connector.
Remove fuel unit (4 screws).

⚠ Caution

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


Fuel unit

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

Fuel unit installation

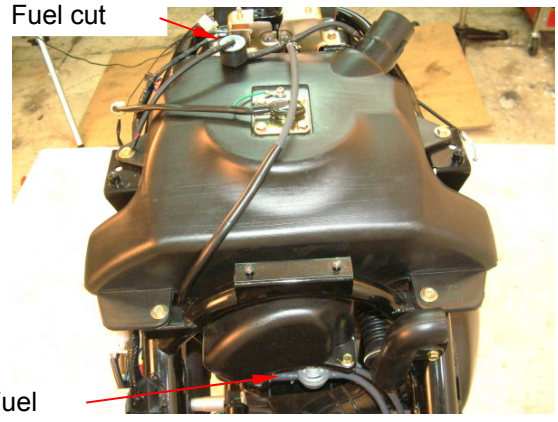
Install the gauge in the reverse order of removal.

⚠ Caution

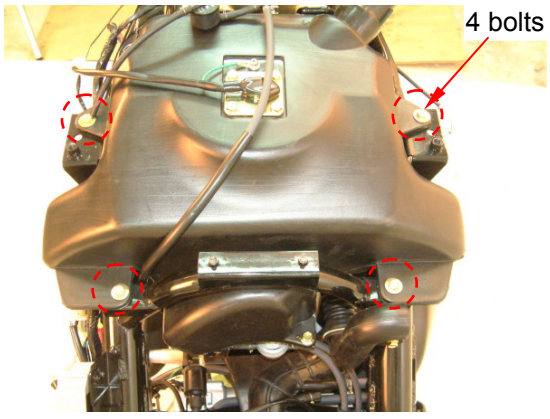
Do not forget to install the gasket of fuel unit or damage it.

Fuel tank removal

Remove the Fuel cut valve assembly and Fuel tube.



Remove fuel tank (4 screws).



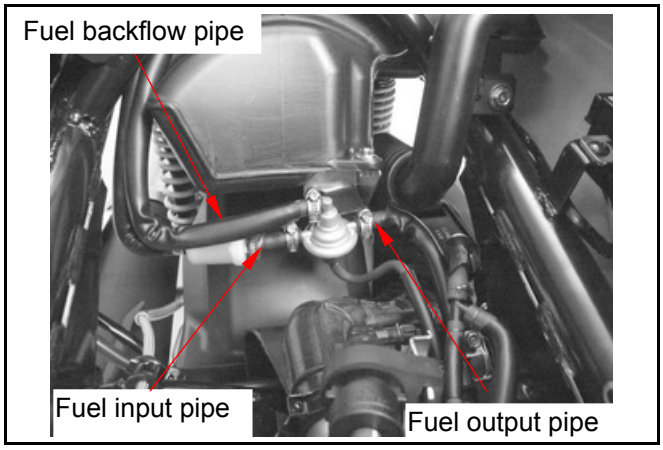
Installation

Install the tank in the reverse order of removal.

Fuel Pressure Regulator

Inspection

Remove the left side cover.
Check the fuel output/ input/ backflow pipes connecters to see if there's leakage.

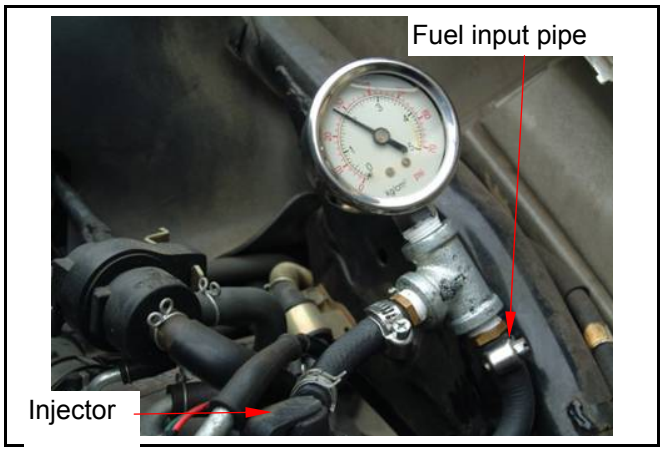


The valve must be intact and no leakage.

Remove the fuel pump relay and press the starter switch for a few seconds to release the fuel pressure.
Disconnect the fuel pipe from the injector and connect the fuel pressure gauge.

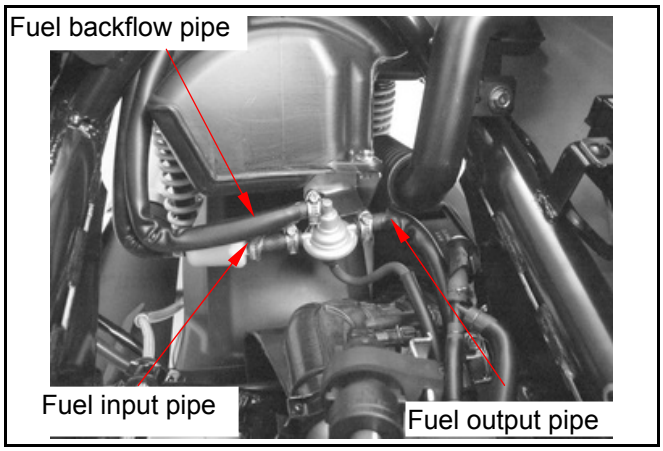
⚠ Caution

- Check if the fuel pressure if normal or not (2.5 bar).
- Always release the fuel pressure before removing the fuel pipe.



Special tool：
Fuel pressure gauge SYM-HT07010

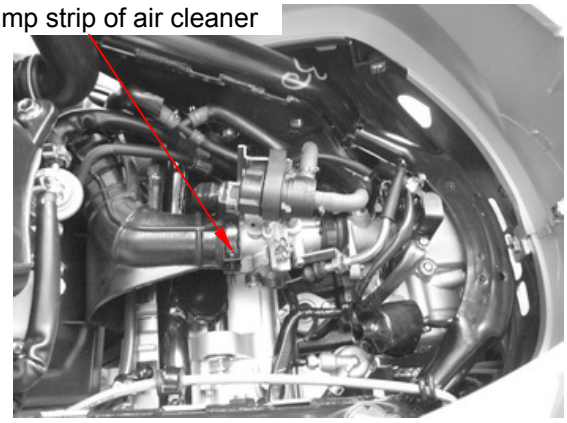
Replace the regulator if it cannot function properly.



Air Cleaner

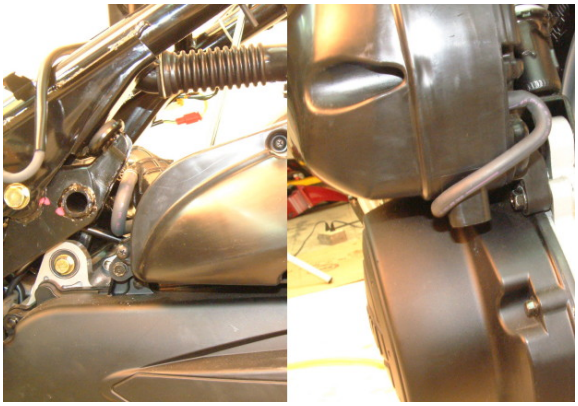
Removal

Open the seat.
Remove the luggage box (6 bolts and 1 screw).
Loosen the clamp strip of air cleaner.
Remove the Vapor hose.
Remove the Air cleaner (2 bolts).



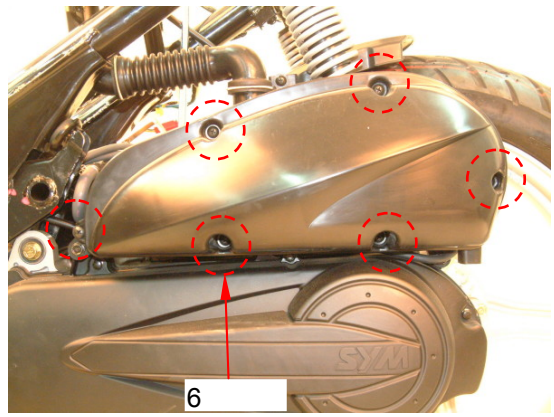
Installation

Install the tank in the reverse order of removal.

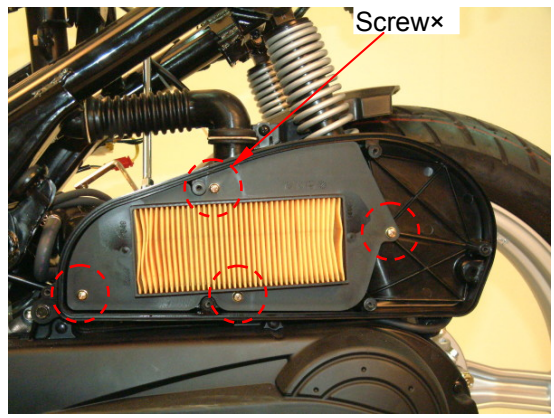


Cleaning air cleaner element

Remove air cleaner cover (6 screws).



Remove the Air cleaner element. (Screw×4)
With compressed air to cleaning dirty around the element. Replace it if it is too dirty to clean.



⚠ Caution

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

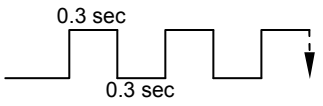
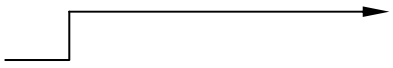
EFi Troubleshooting and Solution

Readings of Trouble Code through Check Lamp

When the engine might have problem and there is no diagnostic tool to determine, the problem can be judged by reading the flash times of Check lamp on the speedometer. And then, we can know the service priority level, or the FLASH CODE. Then we can try to fix the problem.
Here are the two descriptions for the two ways:

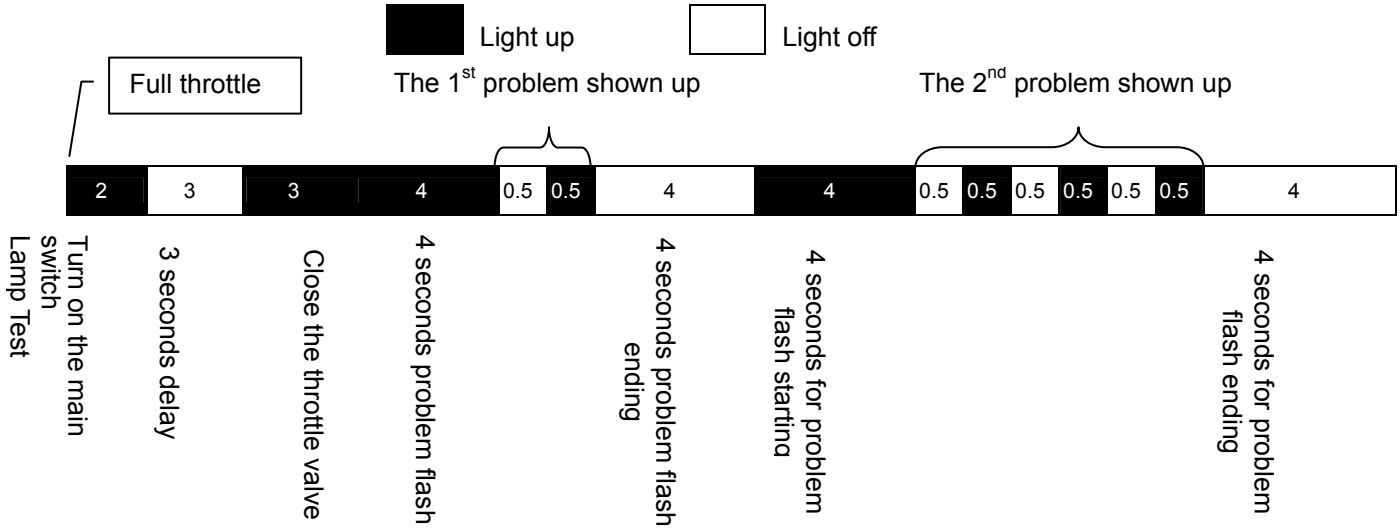
To show "Service Priority"

Turn the KEY ON directly, and the CHK lamp goes up for 2 seconds. Then, the CHK lamp will lit up by 3 types for showing the priority of problem solution so that reminds the rider to have the motorcycle conduct troubleshooting.
The 1st Priority: the CHK lamp lit up by every 0.3 second.
The 2nd Priority: the CHK lamp lit up continuously.
The 3rd Priority: the CHK lamp is not lit up.

Priority	Light up types
1	ON / OFF 
2	ON / OFF 
3	ON / OFF

To show "FLASH CODE"

Before turning the KEY ON, wide open the throttle valve. Then, turn the KEY ON, the CHK lamp lit up for 2 seconds and off. But, the CHK lamp will light up again after 3 seconds. In the means time, close the throttle valve. Finally, it is to determine what problem occurred based on the flash time of CHK lamp.
Before show up, CHK lamp will light up for 4 seconds first. Then, according to the lamp flash times (every 0.5 second), the problem will be determined by comparing with the operation message table. If there has the 2nd problem in the system, the CHK lamp will have flash operation again after its light up for 4 seconds.



Error Code Message and Solution Operation

DTC code	Flash code	Service priority	Message	Solution operation
P0217	**1**	**1**	Engine temperature overheat	Stop the vehicle immediately, and solve it with priority. Check the lubricant system for malfunction. Check if the ignition or fuel supply system is in normal. Check if the engine is burnt. Make sure if the engine temperature sensor is in normal. Make sure if the connector is in normal.
P0335	**2**	**2**	Abnormal crankshaft position sensor	Check if the connection of the crank position sensor is open-circuit. Check if the gap between the sensor and gear tooth is within specification. Check if the crank rotation is run-out. Check if the sensor is in normal according to the new component replacement procedure.
P1120	**3**	**2**	Poor contact of the throttle position sensor	Connect the diagnostic and reset the throttle valve position. Make sure if the idle speed position is within standard range. Make sure if the wire circuit of the throttle valve position sensor is loosen or short. Check if the openness of idle speed by-pass valve is within specification. (40~100%) Adjust the idle speed CO value to specified range. (0.5%~2.0%) If this problem symptom still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P1121	**4**	**2**	Application malfunction of the throttle position sensor	Make sure if the wire circuit of the throttle valve position sensor is loosen or short. If this problem symptom still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P1122	**5**	**2**	Rotation speed malfunction of the throttle position sensor	Make sure if the wire circuit of the throttle valve position sensor is loosen or short. If this problem still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P0560	**6**	**1**	Abnormal battery voltage warning	Make sure if the battery voltage is too low or high (below 10V or exceed 16V) Make sure if the ACG generator charging system circuit is short or abnormal. Check if the 15th terminal on the ECU to battery positive post is short. Make sure if the battery is in normal. Replace it with new if the battery is out or order.
P0110	**7**	**2**	Abnormal intake temperature sensor	Make sure if the sensor resistor is in normal (20℃ 2353~2544Ω). Make sure if the sensor's wire is in open-circuit (the 22nd terminal on ECU). Make sure if the sensor is normal according to the new component replacement procedure.
P0410	**8**	**2**	Abnormal air by-pass valve	Make sure if the sensor's resistor is open or short circuit. Make sure if the sensor's wire is in open-circuit (the 13th terminal on ECU) Make sure if the by-pass valve is normal according to the new component replacement procedure

DTC code	Flash code	Service priority	Message	Solution operation
P0505	**9**	**2**	Application range abnormal of the air by-pass valve	Check if the openness of idle speed by-pass valve is within specification. (40~100%) Make sure if the idle speed valve openness is in normal. Make sure if the intake manifold is leaking.
P0251	**10**	**2**	Abnormal fuel injector	Make sure if the fuel injector resistance is within specification. (12Ω, 20℃) Check if the connector or wire is in open-circuit. (The 3rd terminal of ECU) Make sure if the fuel injector power supplied is normal. (12~15V)
P0350	**11**	**2**	Abnormal ignition circuit	Make sure if the ignition coil resistor is within specification. (0.63Ω, 23℃) Make sure if the connector or wire is in open-circuit. (The 12th terminal of ECU) Make sure if the ignition coil's power supplied is in normal. (12~15V)
P0230	**12**	**2**	Abnormal fuel pump relay	Make sure if the connector or wire is in open-circuit. Replace with new relay to make sure if this abnormal is disappeared.
P0219	**13**	**2**	Engine over-RPM	Engine speed exceed safety limit. Decrease the speed and then the DTC code disappeared. Check if the CVT belt is broken.
P1560	**14**	**2**	Abnormal 5V driving voltage	Make sure if the 18th terminal of ECU is 5V. Make sure if the sensor's power voltage is 5V. (The 16th & 18th terminals) Replace the ECU and confirm again.
P0700	**15**	**2**	Too high RPM when starting engine	If the engine RPM exceeds 3000rpm as starting, in order to prevent run-away accident, the ECU will decrease engine speed or stop the engine. Rider should avoid to starting engine with WOT suddenly. Check if acceleration cable is stuck. Re-set the idle speed adjustment position.
P0115	**16**	**2**	Abnormal engine temperature sensor	Make sure if the sensor's resistor is within specification. (60℃, 703.8±40.9Ω) Make sure if the sensor's wire is in open-circuit. (9th terminal of ECU)
P0650	**18**	**3**	Abnormal check lamp	Check if the check lamp is burnt. Check if the check lamp circuit is open. (4th terminal of ECU)
P0105	**20**	**2**	Abnormal MAP sensor	Check if the sensor's voltage is within specification. (101kpa, 3.925V) Check if the sensor circuit is open. (the 8th terminal of ECU)

EFi Component Malfunction Check& Replacement Procedure

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

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

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

Precautions in Operation

General Information

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

Specification

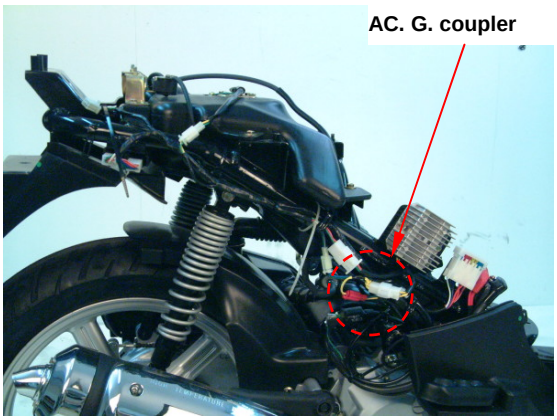
Item		Capacity
Engine oil capacity	Replacement	800 c.c.
	Disassembly	1000 c.c.
Gear oil capacity	Replacement	100 c.c.
	Disassembly	110 c.c.
Coolant capacity	Engine & radiator	780 c.c.
	Reservoir	420 c.c. AS indicator shown
	Total	1200 c.c.

Torque Value

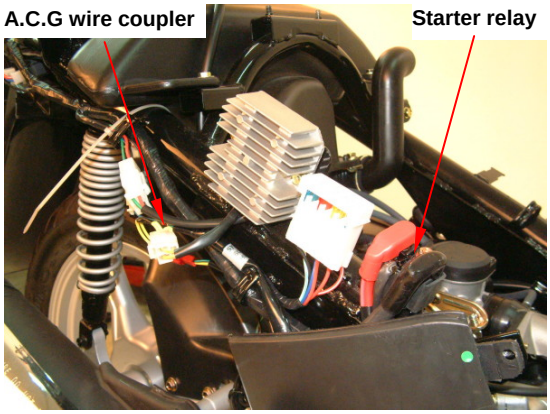
Engine mounting bolt	4.0~5.0kgf-m
Rear cushion upper connection bolt	3.5~4.5kgf-m
Rear cushion under connection bolt	2.4~3.0kgf-m
Engine hanger bolt	4.0~5.0kgf-m
Rear wheel axle nut	11.0~13.0kgf-m

Removal of Engine

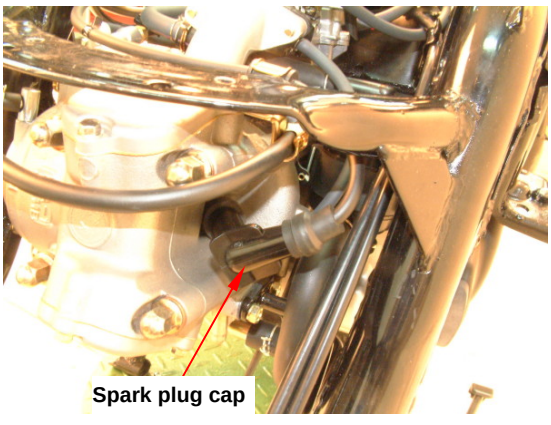
Open seat and remove the luggage box (6 bolts and 1 screw).
Remove rear carrier (4 bolts).
Remove battery cover (2 screws).
Remove battery negative (-) post.
Remove battery positive (+) post.
Remove tail light connector.
Remove right and left body cover (2 bolts).
Disconnect the auto by-starter wire connector.
Disconnect A.C.G wire connectors.



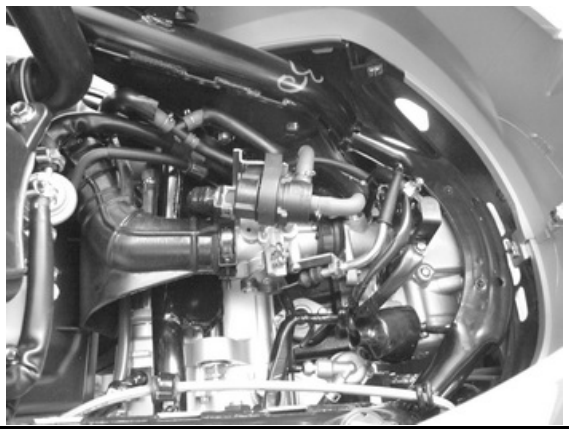
Remove starter motor wire from relay.



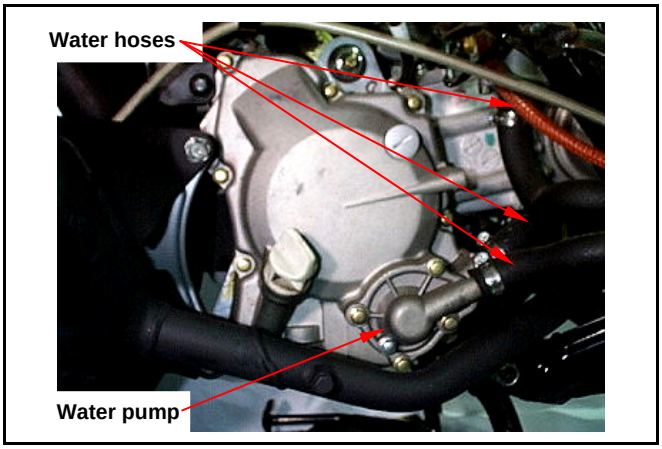
Remove spark plug cap.



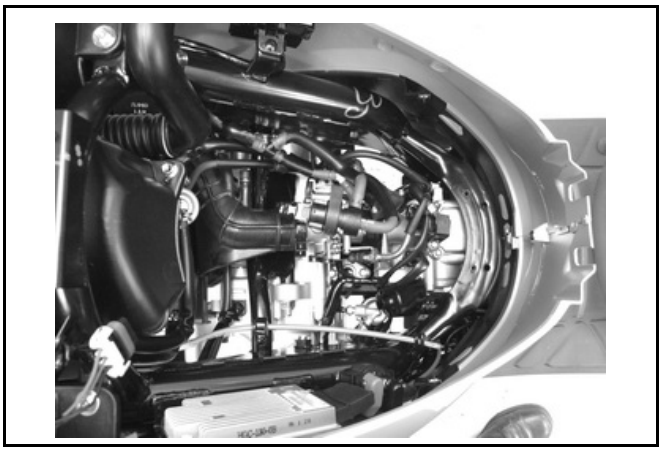
Remove fuel pipe, vacuum tube and throttle valve wire from carburetor.
Loosen the screw of air cleaner duct strip, and then remove the duct.



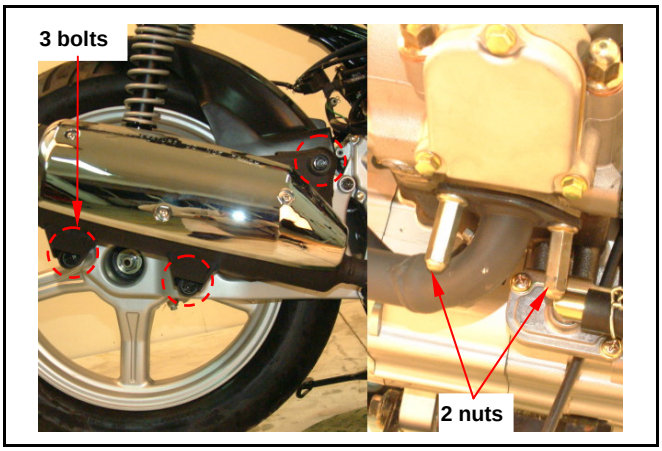
Remove water hoses from water pump.



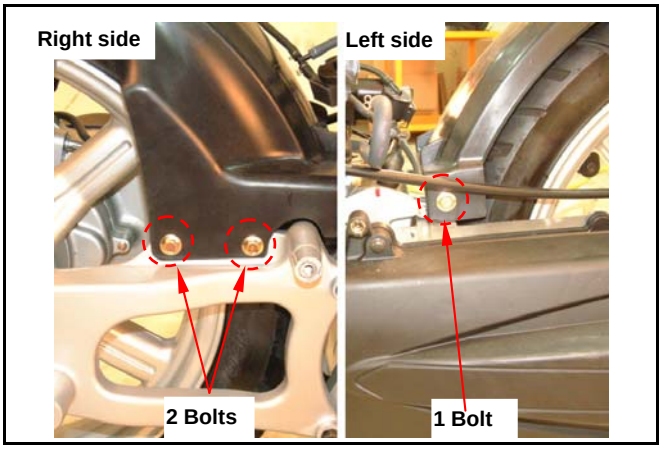
Remove the thermo-sensor wire.



Remove the muffler (3 bolts, 2 nuts).



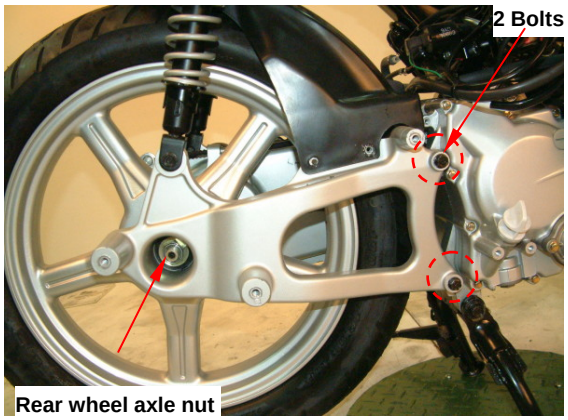
Remove rear inner fender



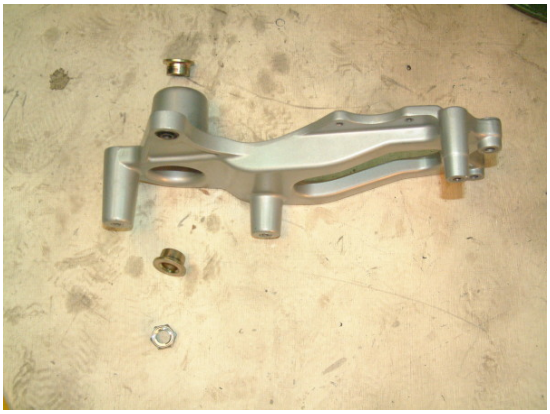
Remove the mounting bolt of right-rear cushion.

Remove the rear fork mounting bolt. (2 bolts)

Remove rear wheel mounting nut.

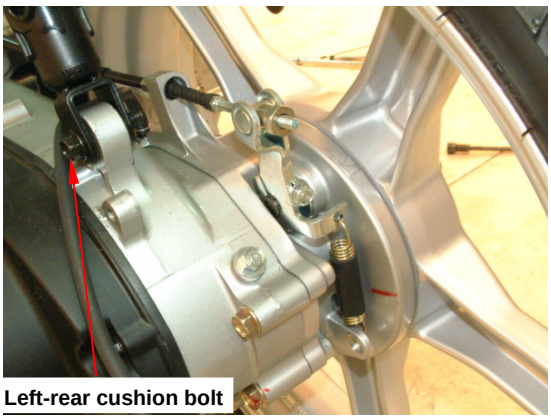


Remove rear fork and collars.



Remove rear wheel.

Remove the mounting bolt of left-rear cushion.

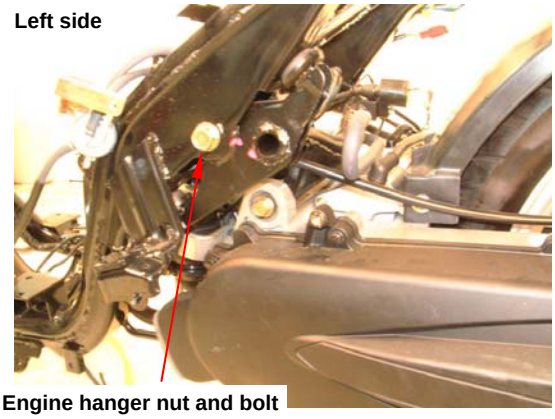


Remove the right and left side engine hanger mounting bolts and nuts, then remove engine.

⚠ Caution

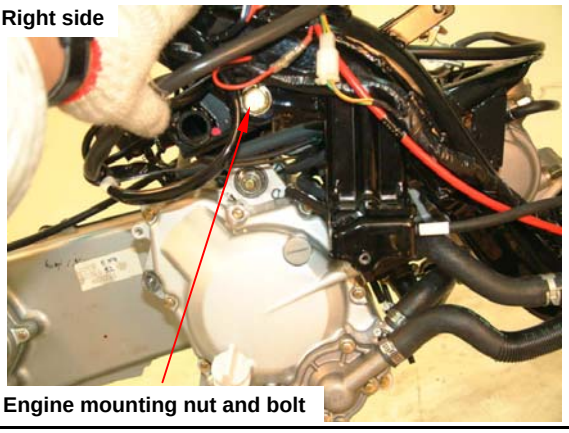
- Support engine and frame separately with special supporters to prevent from engine or frame falling down.

Left side



Engine hanger nut and bolt

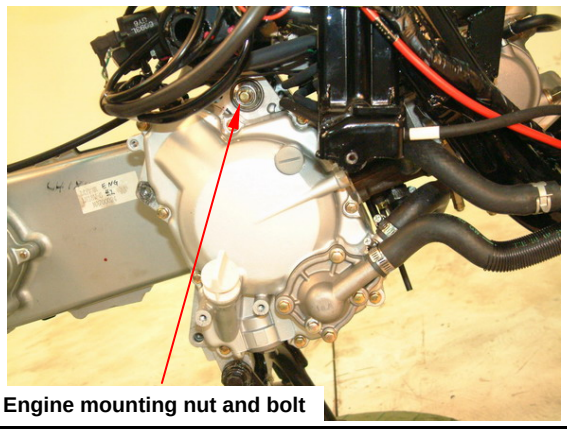
Right side



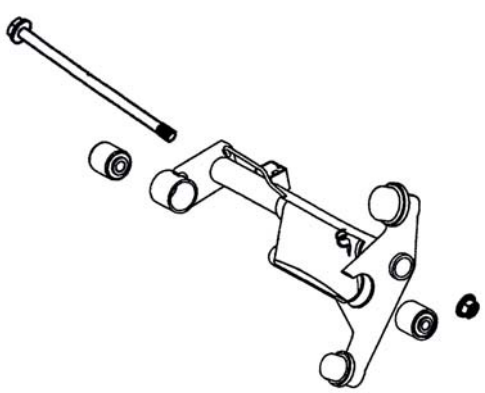
Engine mounting nut and bolt

Engine Hanger removal

Remove the engine mounting bolt and nut, then remove engine hanger.

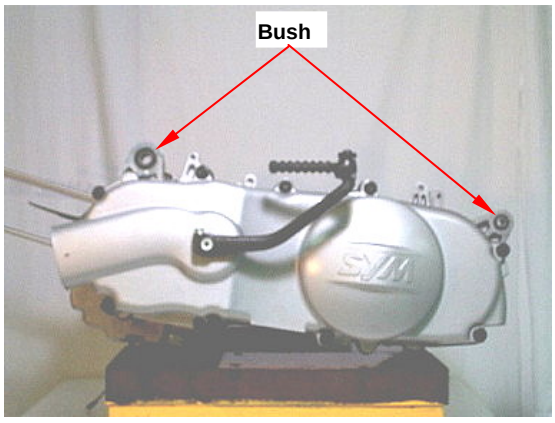


Engine mounting nut and bolt



Engine Hanger Bush Removal

Check if engine hanger bush and cushion rubber bush for damage.



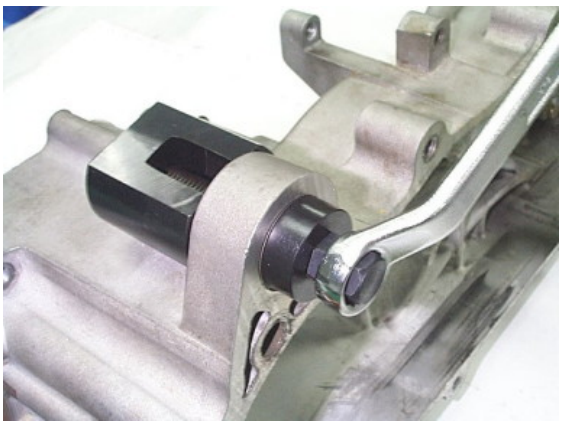
Pressing out

If engine hanger and the rear cushion rubber bush damaged. Then, with the bush remover / presser, Ø 30mm & Ø 22mm, to press the bush out, and replace it with new one.

Engine hanger bush: ϕ **30mm**

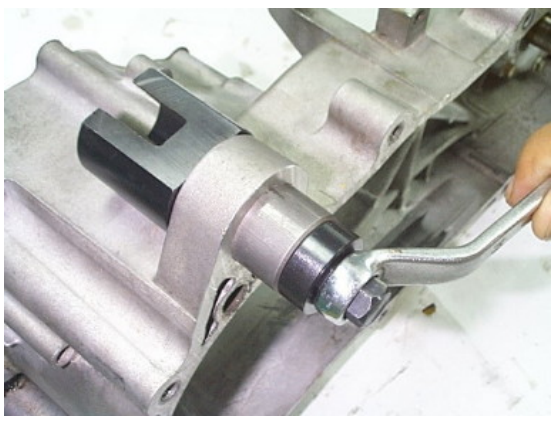
Rear cushion bush: ϕ **22mm**

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



Pressing In

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



Engine Hanger Installation

Install engine hanger onto engine.

Install engine mounting bolts & nuts and then tighten the nuts.

Torque value: 4.0~5.0kgf-m

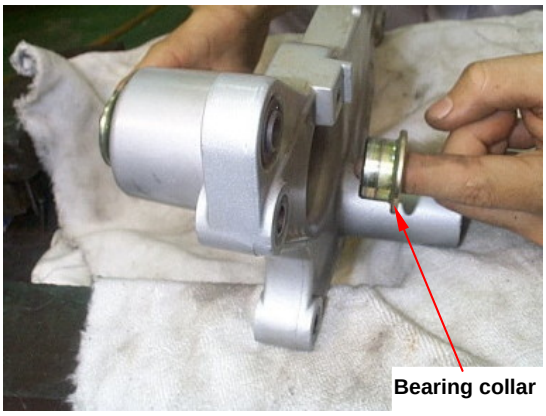
Engine Installation

Check if the bush of engine hanger parts and cushion for damage.

Install engine in the reverse procedures of removal.

Caution

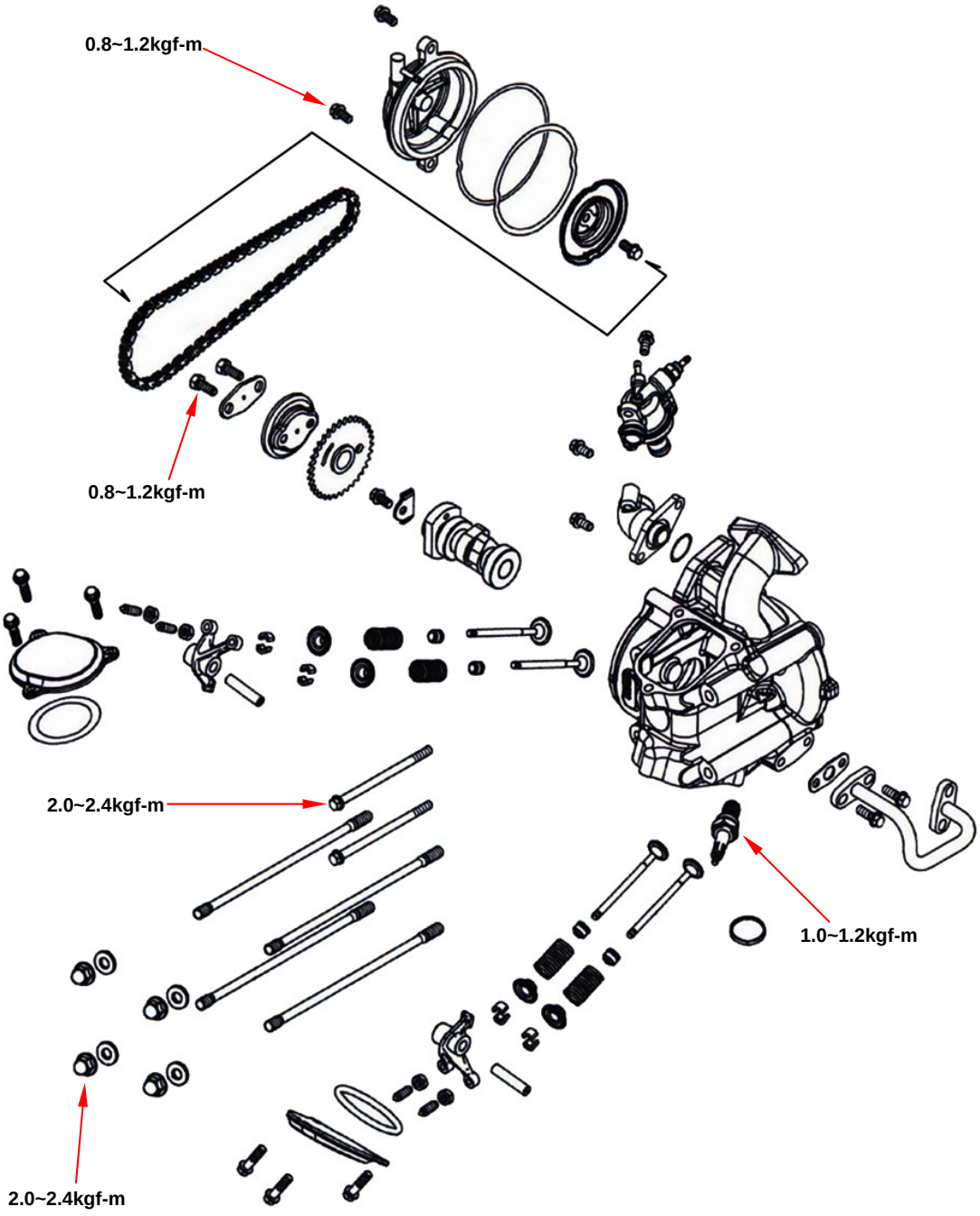
- Pay attention of foot & hand safety as engine installation to avoid hurting.
- Do not bend or twist wires.
- Cables wires have to be routed in accordance with normal layout.
- Small-end bearing collar has to forward to inside (bearing) as assembling the rear fork.



Engine hanger Bolt:
Torque value: 4.0~5.0kgf-m
Rear cushion bolt:
Torque value: upper：3.5~4.5kgf-m
under：2.4~3.0kgf-m
Rear wheel axle nut:
Torque value: 11.0~13.0kgf-m

Note:

Mechanism Diagram



Precautions in Operation

General Information

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

Specification

Item			Standard	Limit
Compression pressure			12±2 kg/cm2	---
Camshaft	Height of cam lobe	Intake	30.800~30.920	3.075
		Exhaust	30.411~30.531	30.26
Rocker arm	ID of valve rocker arm		12.000~12.018	12.10
	OD of valve rocker arm shaft		11.966~11.984	11.910
Valve	OD of valve stem	Intake	4.975~4.990	4.900
		Exhaust	4.955~4.970	4.900
	Guide seat		5.000~5.012	5.030
	Clearance between valve stem and guide	Intake	0.010~0.037	0.080
		Exhaust	0.030~0.057	0.100
	Free length of valve spring		35.000	31.500
	Valve seat width		1.000	1.6
Tilt angle of cylinder head			---	0.05

Torque Value

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

Tools

Special service tools

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

Troubleshooting

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

Low compression pressure

1. Valve

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

2. Cylinder head

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

3. Piston

- Piston ring worn out.

High compression pressure

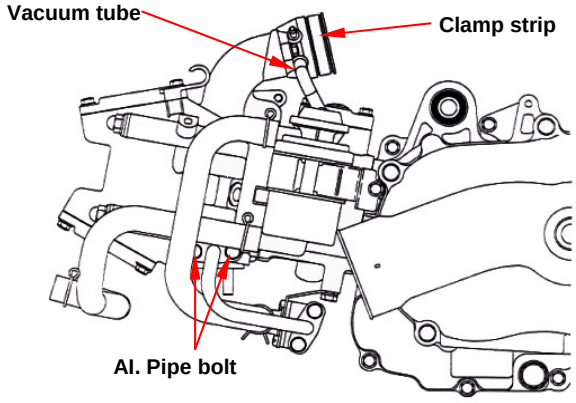
- Too much carbon deposit on combustion chamber or piston head

Noise

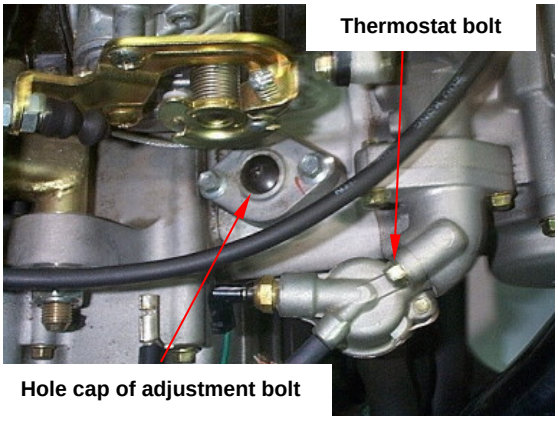
- Improper valve clearance adjustment
- Burnt valve or damaged valve spring
- Camshaft wear out or damage
- Chain wear out or looseness
- Auto-tensioner wear out or damage
- Camshaft sprocket
- Rocker arm or rocker arm shaft wear out

Cylinder Head Removal

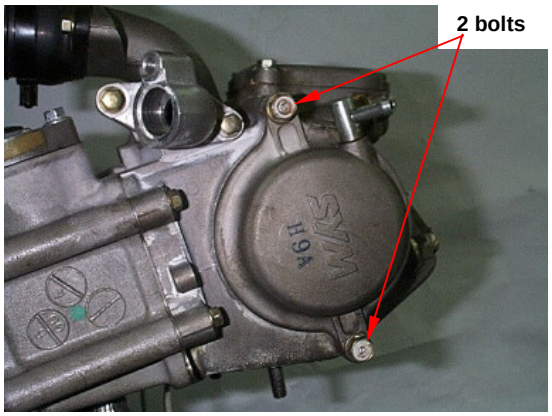
Remove seat, luggage box and body cover.
Remove engine. (Refer to chapter 5)
Remove the clamp strip bolt of carburetor, and disconnect vacuum tube from the carburetor insulator.
Remove Air Injection system (AI) pipe mounting bolt.



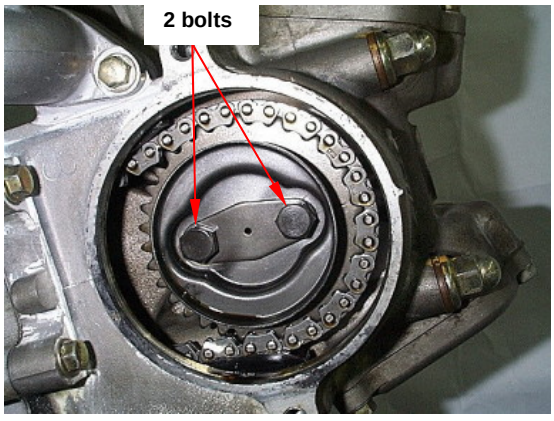
Remove 1 bolt of thermostat and then remove the thermostat.
Remove hole cap for the adjustment bolt of cam chain tensioner, and then loosen the tensioner by turning a flat-driver in C.W direction.



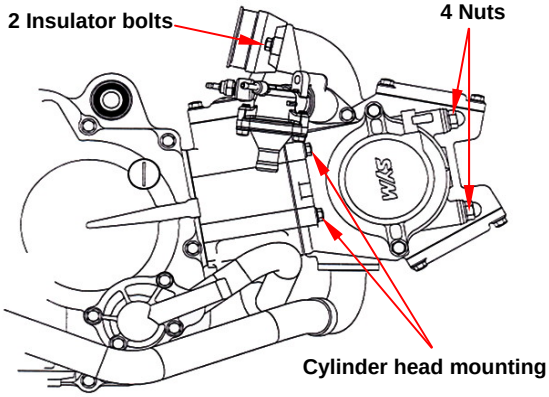
Remove the side cover mounting blots of cylinder head, and then take out the side cover.



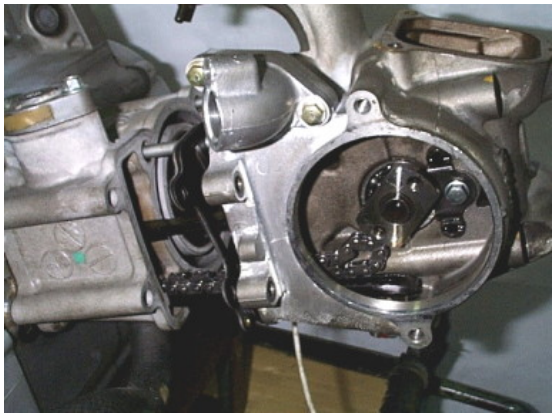
Remove cam sprocket bolts and then remove the sprocket by prying chain out.



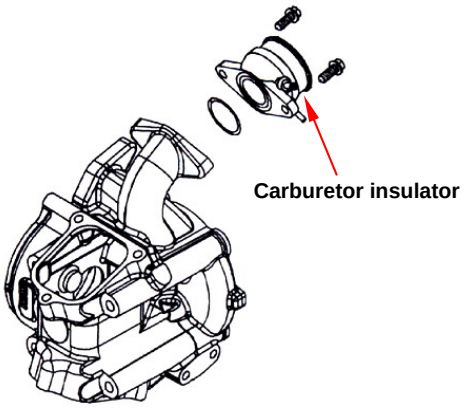
Remove the 2 cylinder head mounting bolts from cylinder head right side, and then remove 4 nuts and washers from cylinder head upper side.



Remove the cylinder head.



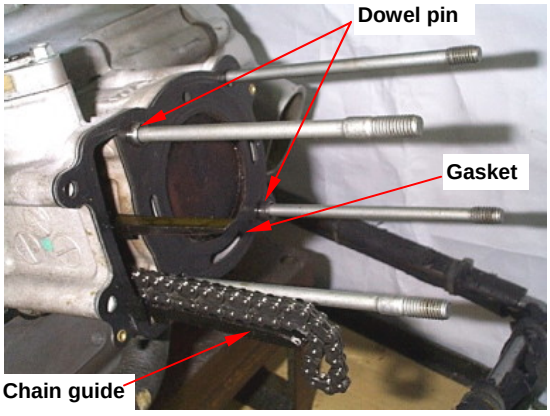
Remove 2 bolts of carburetor insulator and then take the insulator out.



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

⚠ Caution

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

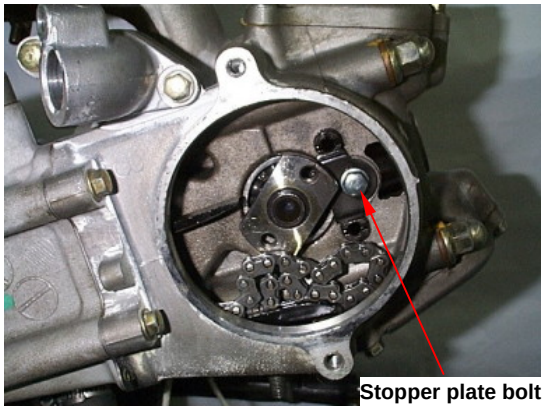


Cylinder Head Disassembly

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

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

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



Use a valve compressor to press the valve spring.

⚠ Caution

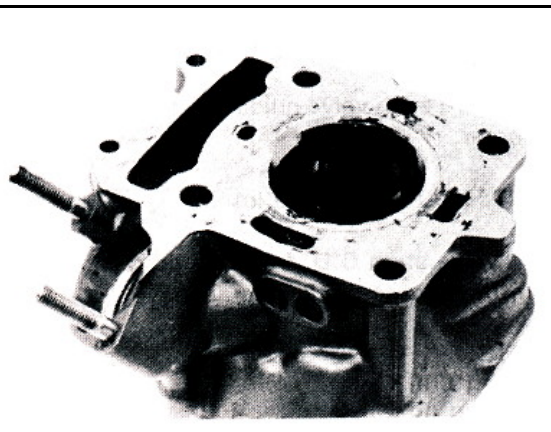
- In order to avoid loosing spring elasticity, do not press the spring too much. Thus, press length is based on the valve cotter in which can be removed.

Special Service Tool:
Valve spring remover (SYM-1471110)
Valve spring installer (SYM-1471120)

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

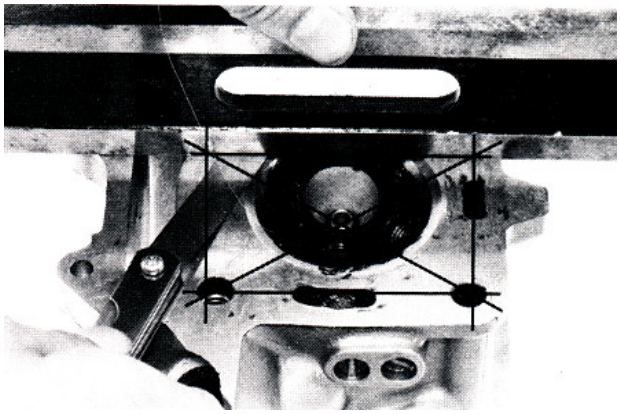
⚠ Caution

Do not damage the matching surface of cylinder head.



Cylinder Head Inspection

Check if spark plug and valve holes are cracked.
Measure cylinder head warp with a straightedge and thickness gauge.
Service limit: 0.5 mm

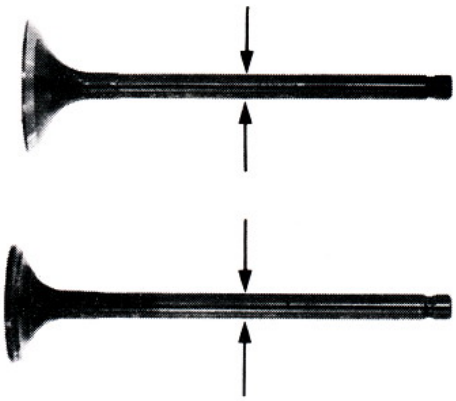


Valve spring free length

Measure the free length of intake and exhaust valve springs.
Service limit: 28.90 mm

Valve stem

Check if valve stems are bend, crack or burn.
Check the operation condition of valve stem in valve guide, and measure & record the valve stem outer diameter.
Service Limit: IN: 4.90 mm
EX: 4.90 mm

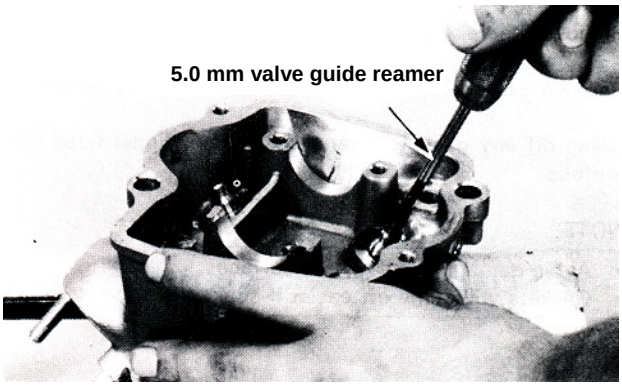


Valve guide

⚠ Caution

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

Tool: 5.0 mm valve guide reamer
Measure and record each valve guide inner diameters.
Service limit: 5.03 mm
The difference that the inner diameter of valve guide deducts the outer diameter of valve stem is the clearance between the valve stem and valve guide.
Service Limit: IN→0.08 mm
EX→0.10 mm



Caution

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

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

Caution

It has to correct valve seat when replacing valve guide.

Valve Stem Replacement

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

Caution

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

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

Tool: Valve guide driver: 5.0 mm

Caution

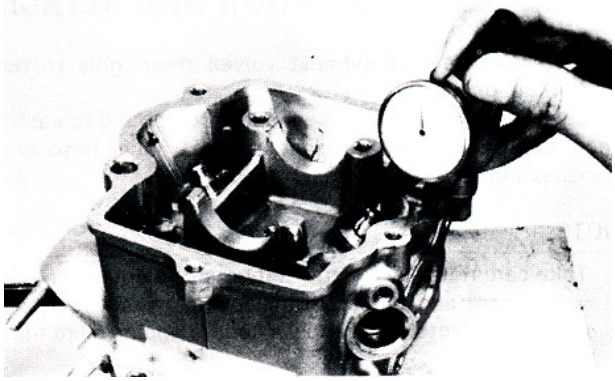
- Check if new valve guide is deformation after pressed it in.
- When pressing in the new valve guide, cylinder head still have to be kept in 100~150℃.

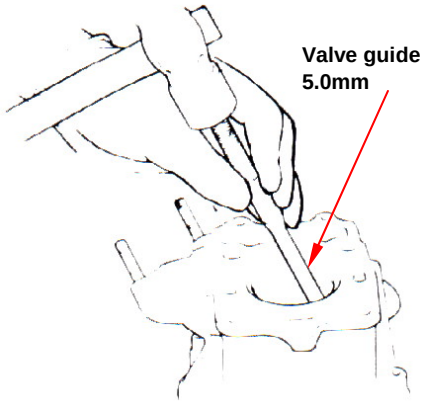
Adjust the valve guide driver and let valve guide height is in 13 mm.
Press in new valve guide from rocker arm side.
Tool: Valve guide driver: 5.0 mm
Wait for the cylinder head cooling down to room temperature, and then correct the new valve guide with reamer.

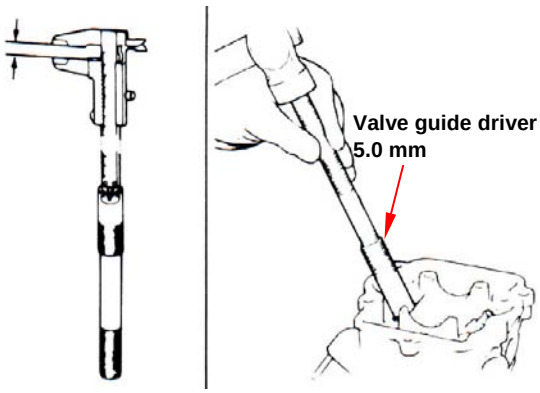
Caution

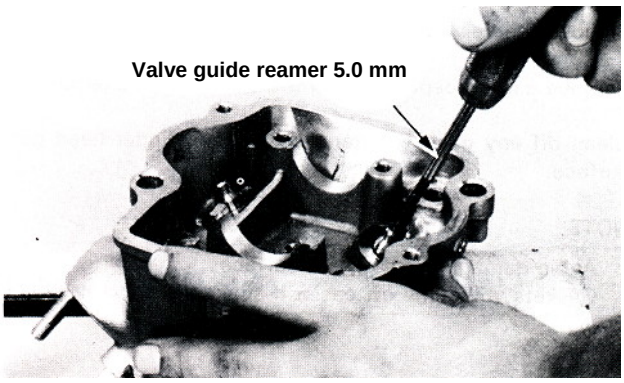
- Using cutting oil when correcting valve guide with a reamer.
- Turn the reamer in same direction when it be inserted or rotated.

Correct valve seat, and clean up all metal residues from cylinder head.
Tool: Valve guide reamer: 5.0 mm









Valve Seat Inspection and Service

Clean up all carbon deposits onto intake and exhaust valves.
Apply with emery slightly onto valve contact face.
Grind valve seat with a rubber hose or other manual grinding tool.

Caution

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

Remove the valve and check its contact face.

Caution

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

Valve seat inspection

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

Valve seat width

Service limit: 1.6mm
Check the contact condition of valve seat.

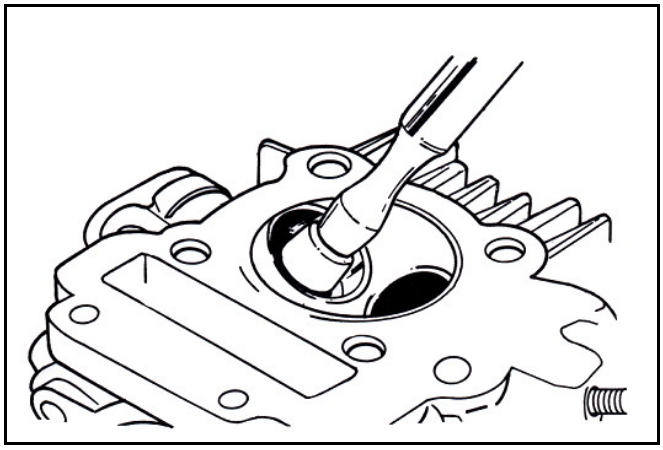
Valve seat grinding

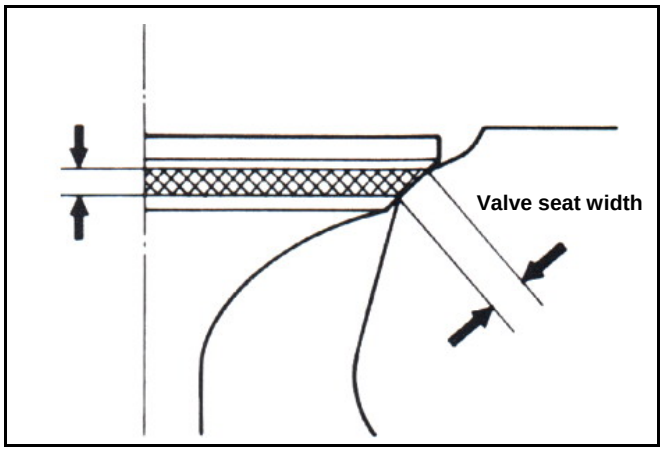
The worn valve seat has to be ground with valve seat chamfer cutter.
Refer to operation manual of the valve seat chamfer cutter.
Use 45° valve seat chamfer cutter to cut any rough or uneven surface from valve seat.

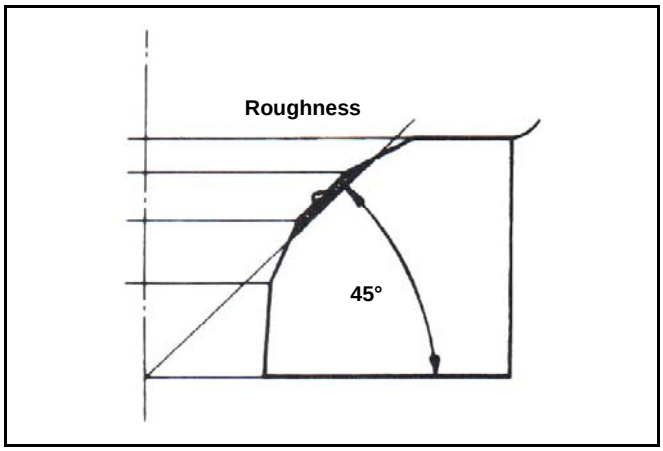
Caution

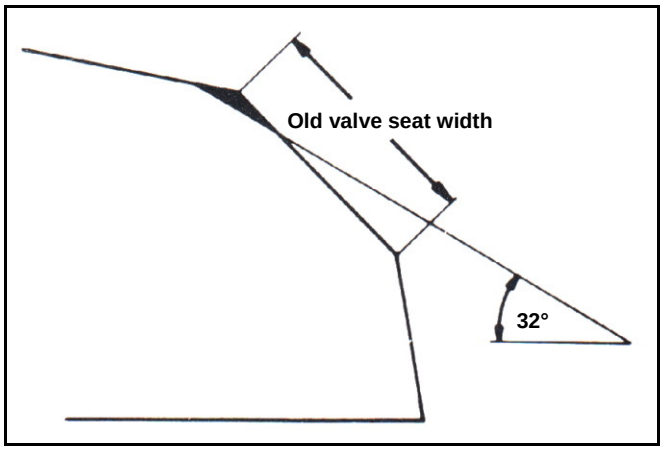
After valve guide had been replaced, it has to be ground with 45° valve seal chamfer cutter to correct its seat face.

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

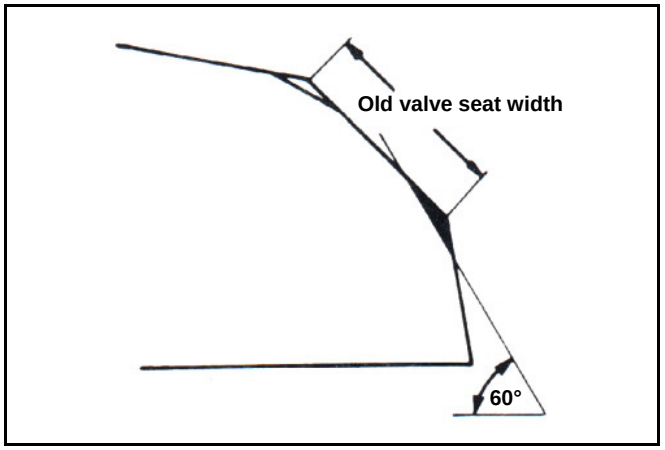








Use 60° cutter to cut a quarter lower part out.
Remove the cutter and check new valve seat.

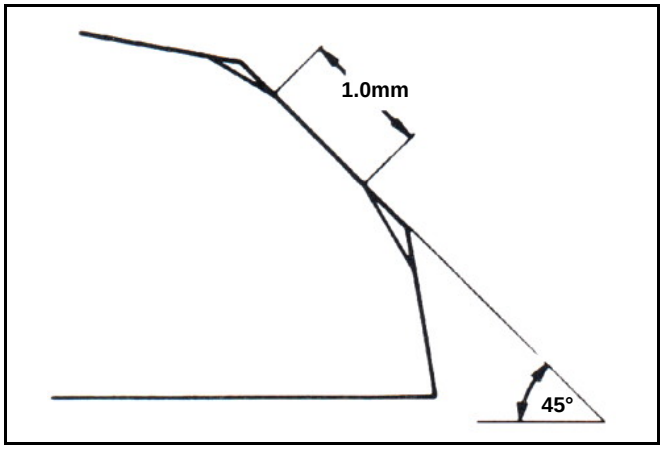


Use 45° cutter to grind the valve seat to specified width.

Caution

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

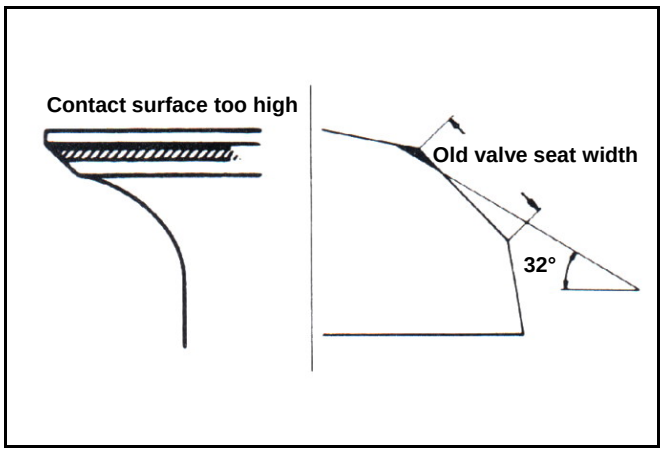
Grind valve seat again if necessary.



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

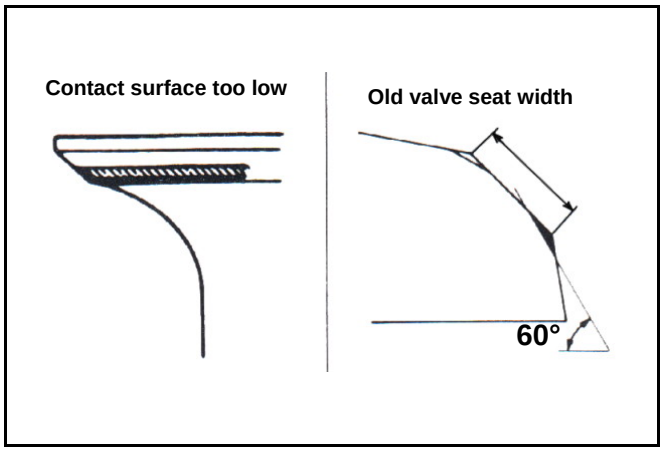
Caution

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

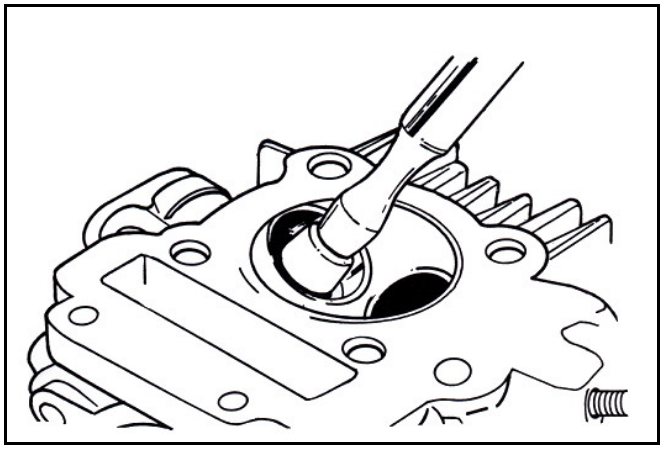


If the contact surface too high, grind the valve seat with 32° cutter.
Then, grind the valve seat to specified width.

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



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

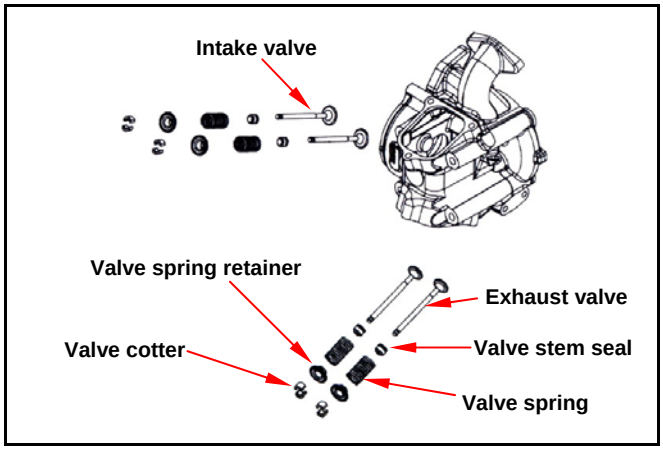


Cylinder Head Reassembly

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

⚠ Caution

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



Use valve spring compressor to press valve spring.

⚠ Caution

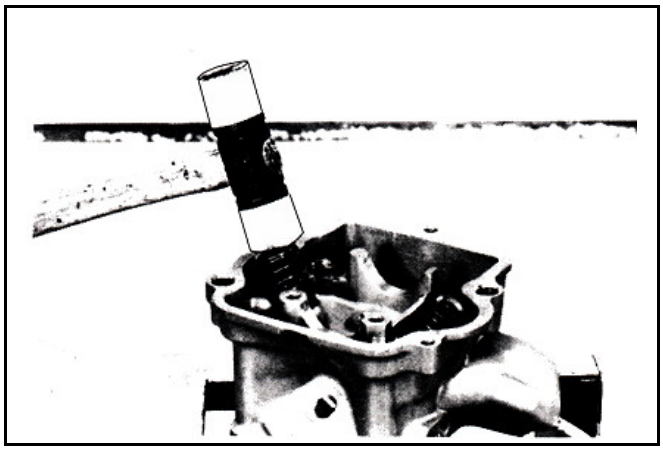
In order to avoid damaging the valve stem and the cylinder head, in the combustion chamber place a rag between the valve spring remover/installer as compressing the valve spring directly.

Special Service Tool:
Valve spring remover (SYM-1471110)
Valve spring installer (SYM-1471120)

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

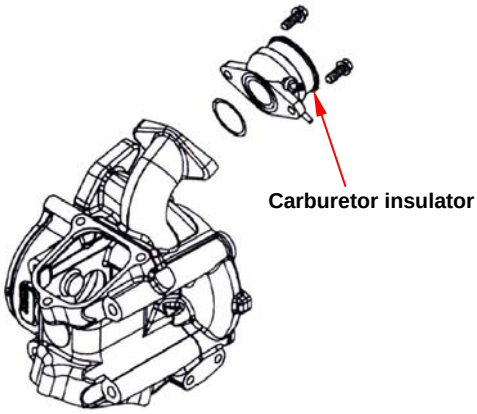
⚠ Caution

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

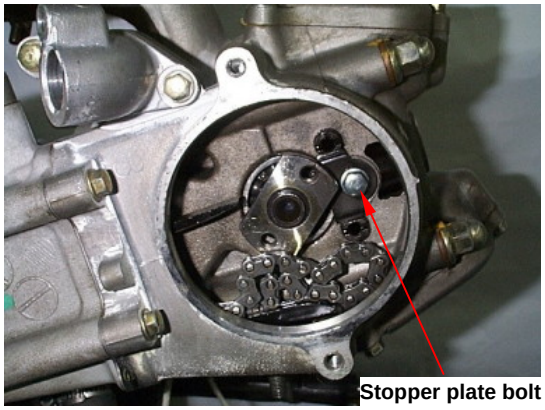


Cylinder Head Installation

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



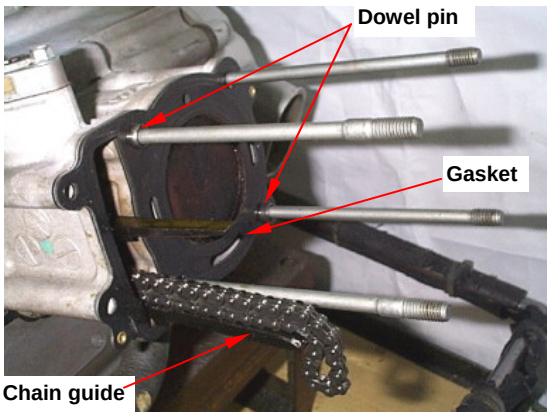
Install camshaft into cylinder head, and align rocker pin with rocker arm pin hole. Then, insert the rocker arm pin.
Install rocker arm pin mounting plate.



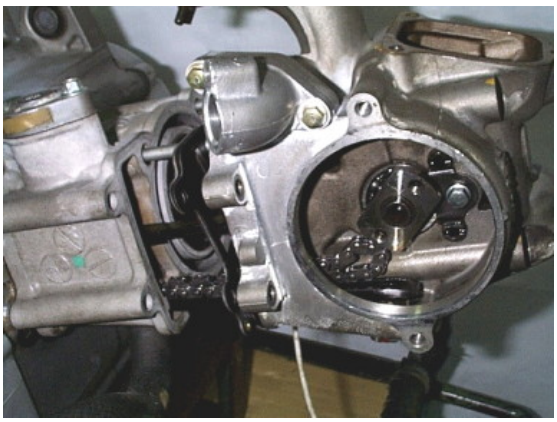
Clean up all residues and foreign materials onto the matching surfaces of both cylinder and cylinder head.
Install chain guide.
Install 2 set pins and cylinder head gasket.

⚠ Caution

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



Loosen the tensioner by turning a flat-driver in C.W direction.
Install cylinder head.

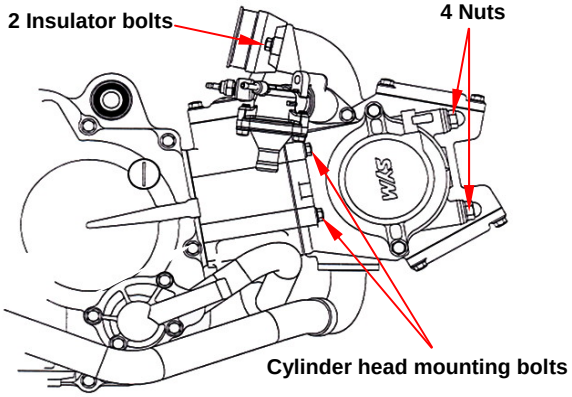


Tighten 4 nuts and washers on the cylinder head upper side, and then tighten 2 cylinder head mounting bolts of cylinder head side cover.
Torque value: 2.0~2.4kgf-m

Install and tighten spark plug
Torque value: 2.0~2.4kgf-m

⚠ Caution

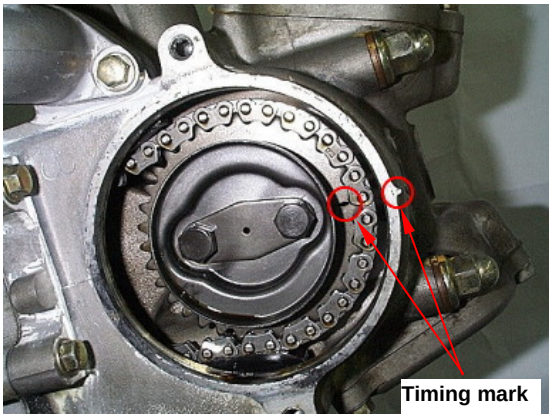
This model is equipped with more precision 4-valve mechanism so its tighten torque can not be exceeded standard value in order to avoid causing cylinder head deformation, engine noise and leaking so that motorcycle's performance be effected.



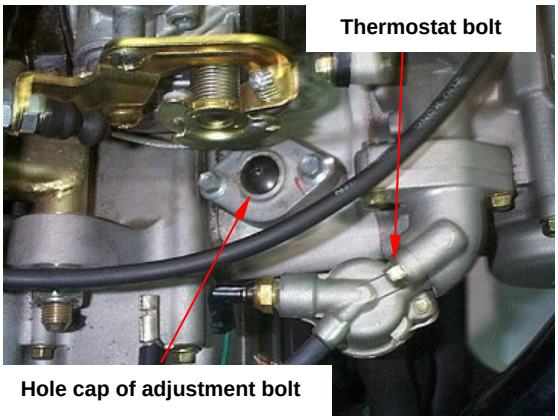
Install cam chain on to sprocket and align the timing mark on the sprocket with that of cylinder head.
Align sprocket bolt hole with camshaft bolt hole.
Tighten the sprocket mounting bolt.

⚠ Caution

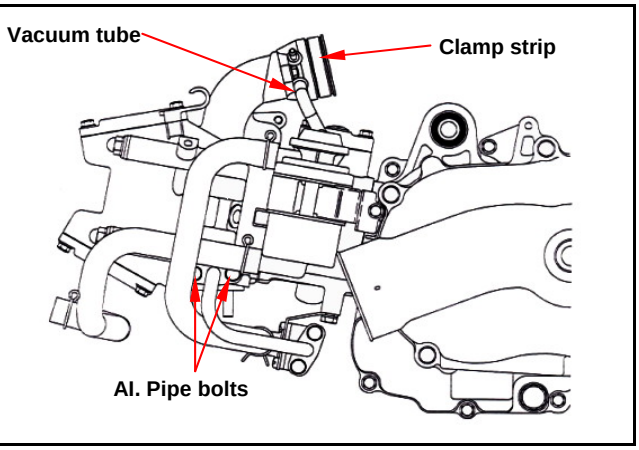
Make sure timing marks are matched.



Install a new O-ring onto thermostat and tighten its mounting bolts.
Loosen sprocket chain tensioner and let it contact with chain plate tightly. Tighten the bolt cap of tensioner adjustment hole.



Install Air Injection system (AI) pipe. (2 bolts)
Install carburetor insulator onto carburetor and tighten clamp strip bolt. Install the vacuum hose of carburetor insulator.

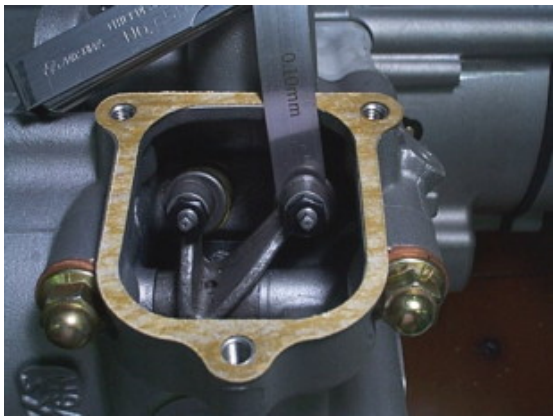


Valve Clearance Adjustment

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.

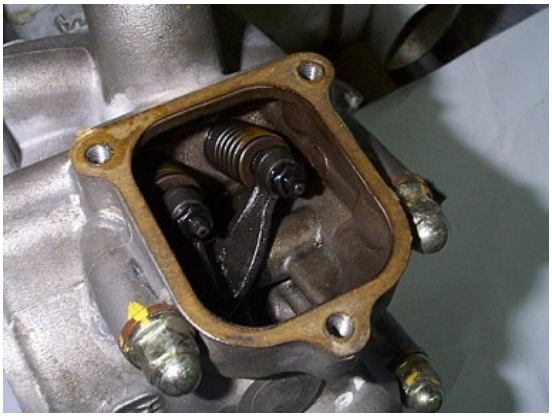
Standard Value: **IN 0.12 ± 0.02 mm**
EX 0.12 ± 0.02 mm

Install the valve clearance adjustment hole cap. (3 bolts)



⚠ Caution

The gasket is paper type. In case of broken, replace it and clean the Remnant gasket.



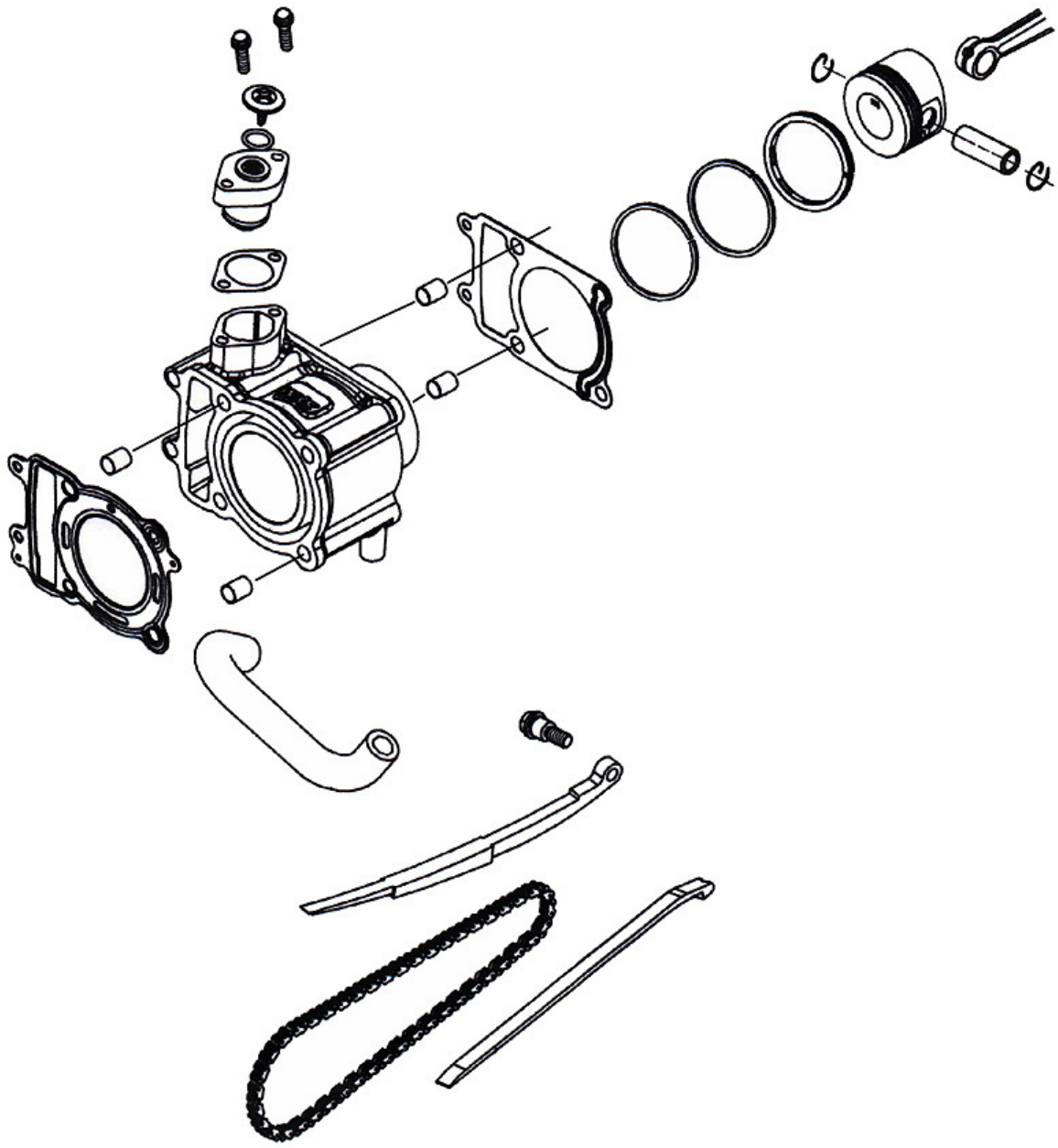
Start the engine after assembly. Remove the intake valve adjustment hole cap and make sure that engine oil flows onto the cylinder head.
Stop the engine after confirmed, and then install the intake valve adjustment hole cap.

Install the seat, luggage box and the body cover.

⚠ Caution

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

Mechanism Diagram



Precautions in Operation

General Information

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

Specification Unit：mm

LH18W7-6

Item			Standard	Limit
Cylinder	ID		60.995~61.015	61.016
	Bend		-	0.050
Piston/ Piston ring	Clearance between piston rings	Top ring	0.015~0.050	0.090
		2nd ring	0.015~0.050	0.090
	Ring-end gap	Top ring	0.150~0.300	0.500
		2nd ring	0.300~0.450	0.650
		Oil ring side rail	0.200~0.700	-
	OD of piston		60.985~61.005	60.900
	Clearance between piston and cylinder		0.010~0.040	0.100
	ID of piston pin boss		15.002~15.008	15.040
OD of piston pin			14.960~15.000	14.930
Clearance between piston and piston pin			0.002~0.014	0.020
ID of connecting rod small-end			15.016~15.034	15.060

Troubleshooting

Low or Unstable Compression Pressure

- Cylinder or piston ring worn out

Smoking in Exhaust Pipe

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

Knock or Noise

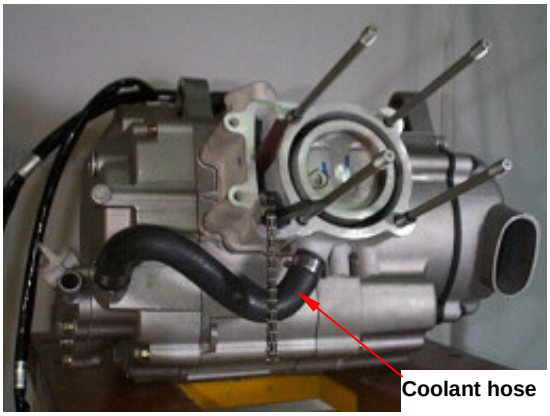
- Cylinder or piston ring worn out
- Carbon deposits on cylinder head top-side
- Piston pin hole and piston pin wear out

Engine Overheat

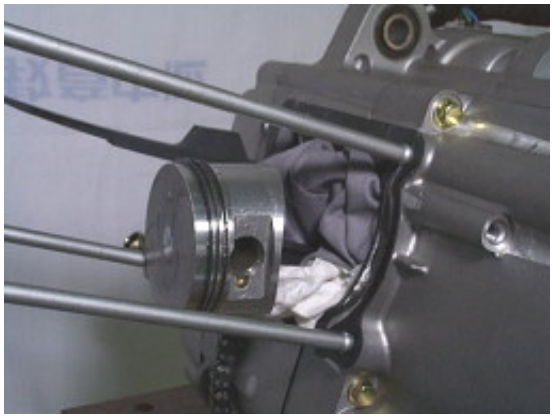
- Carbon deposits on cylinder head top side
- Cooling pipe clogged or not enough in coolant flow

Cylinder Removal

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



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



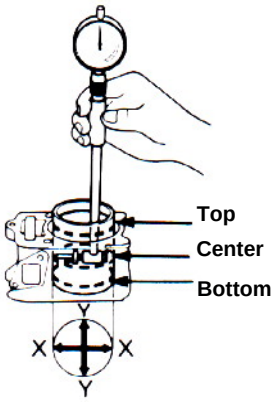
⚠ Caution

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

Inspection

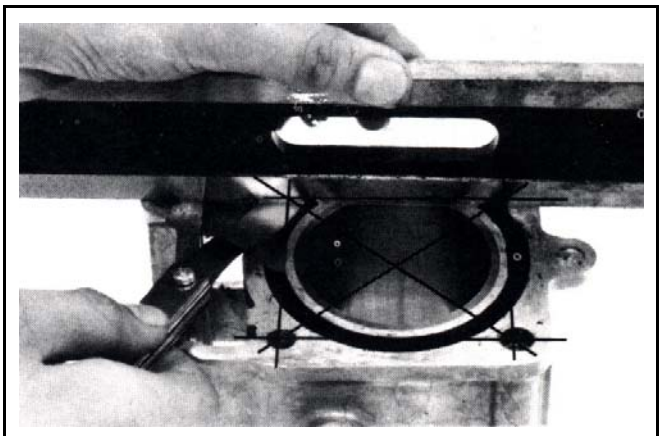
Check if the inner diameter of cylinder is wear out or damaged.
In the 3 positions, top, center and bottom, of cylinder, measure the X and Y values respective in the cylinder.

Service limit: 61.10 mm



Check cylinder if warp.

Service limit: 0.05 mm



Piston Removal

Plug crankcase opening with a cleaning cloth to prevent from piston pin snap ring or other foreign materials falling into crankcase when disassembling.
Hold another snap ring with pliers.
Push out the piston pin from the side that not removed the snap ring.

Inspection

Measure clearance between piston ring and its grooves.

Service Limit: Top ring: 0.09 mm
2nd ring: 0.09 mm

Remove piston rings

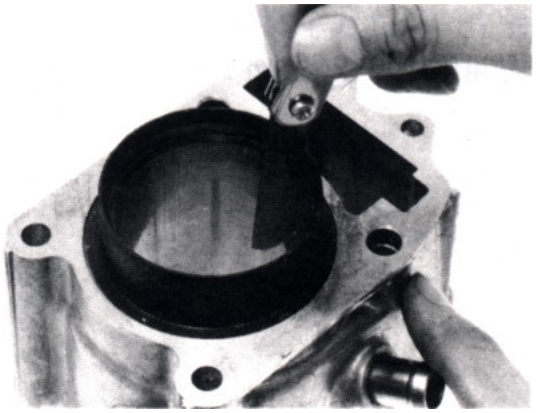
Check if the piston rings are damaged or its grooves are worn.

⚠ Caution

Pay attention to remove piston rings because they are fragile.

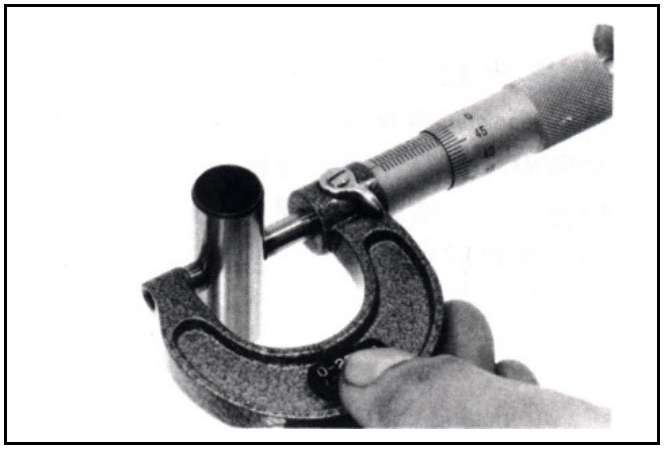
Place piston rings respective into cylinder below 20 mm of cylinder top. In order to keep the piston rings in horizontal level in cylinder, push the rings with piston.

Service Limit: Top ring: 0.50 mm
2nd ring: 0.65 mm



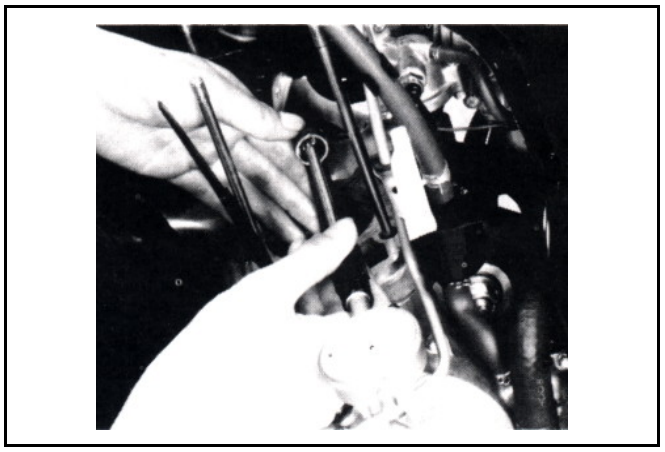
Measure the outer diameter of piston pin.

Service Limit: 15.040 mm



Measure the inner diameter of connecting rod small end.

Service Limit: 15.06 mm

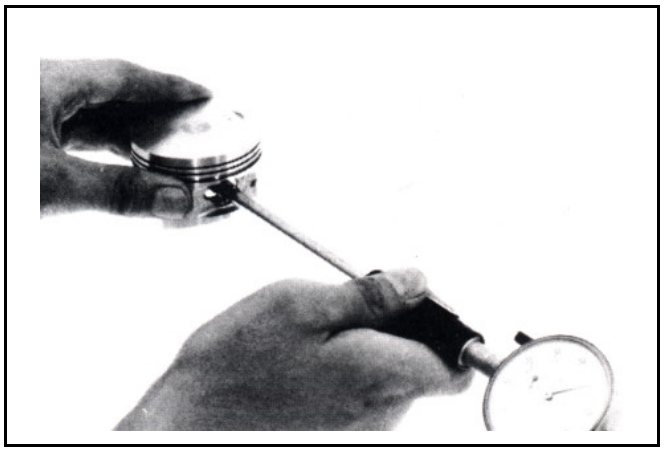


Measure the inner diameter of piston pin hole.

Service Limit: **15.04 mm**

Calculate clearance between piston pin and its hole.

Service Limit: **0.02 mm**



Measure piston outer diameter.

⚠ Caution

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

Service limit：60.90 mm

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

Piston Ring Installation

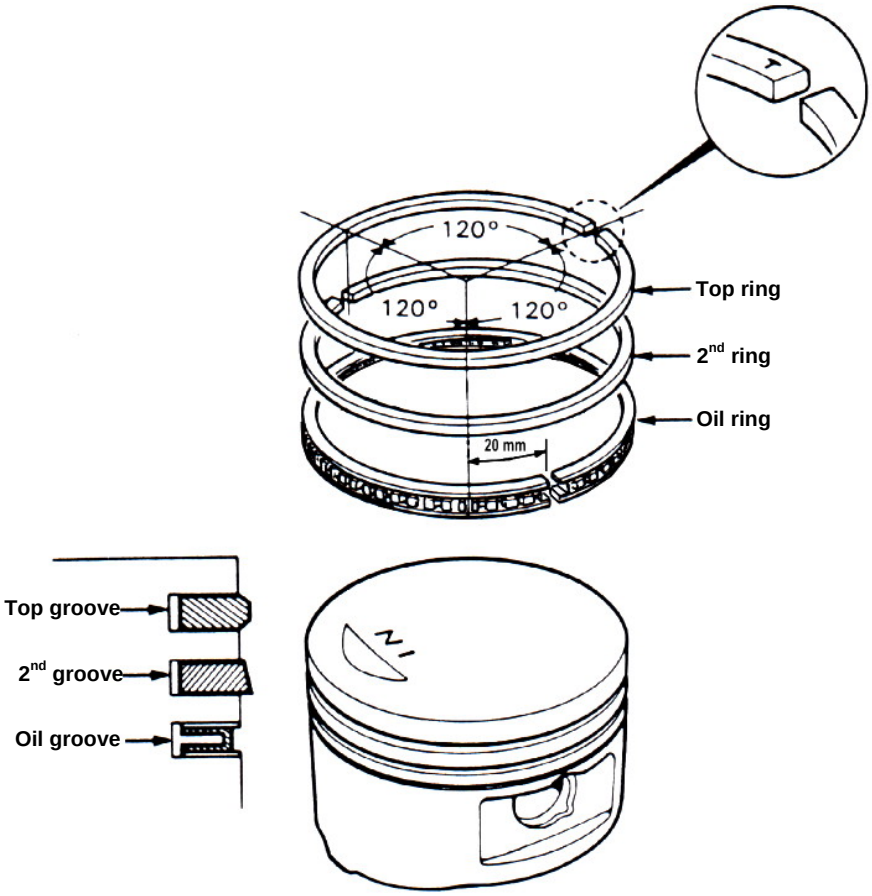
Clean up piston top, ring groove, and piston surface.

Install the piston ring onto piston carefully.

Place the openings of piston ring as diagram shown.

⚠ Caution

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



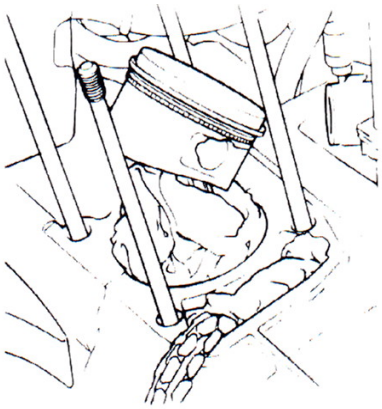
Piston Installation

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

Install new piston pin snap ring.

⚠ Caution

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

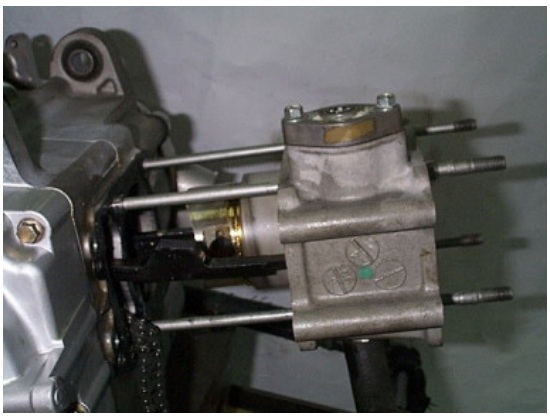


Cylinder Installation

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

⚠ Caution

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



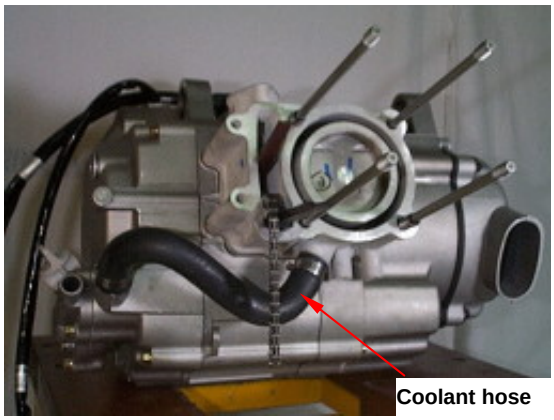
Install dowel pins and new gasket.

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

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

⚠ Caution

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

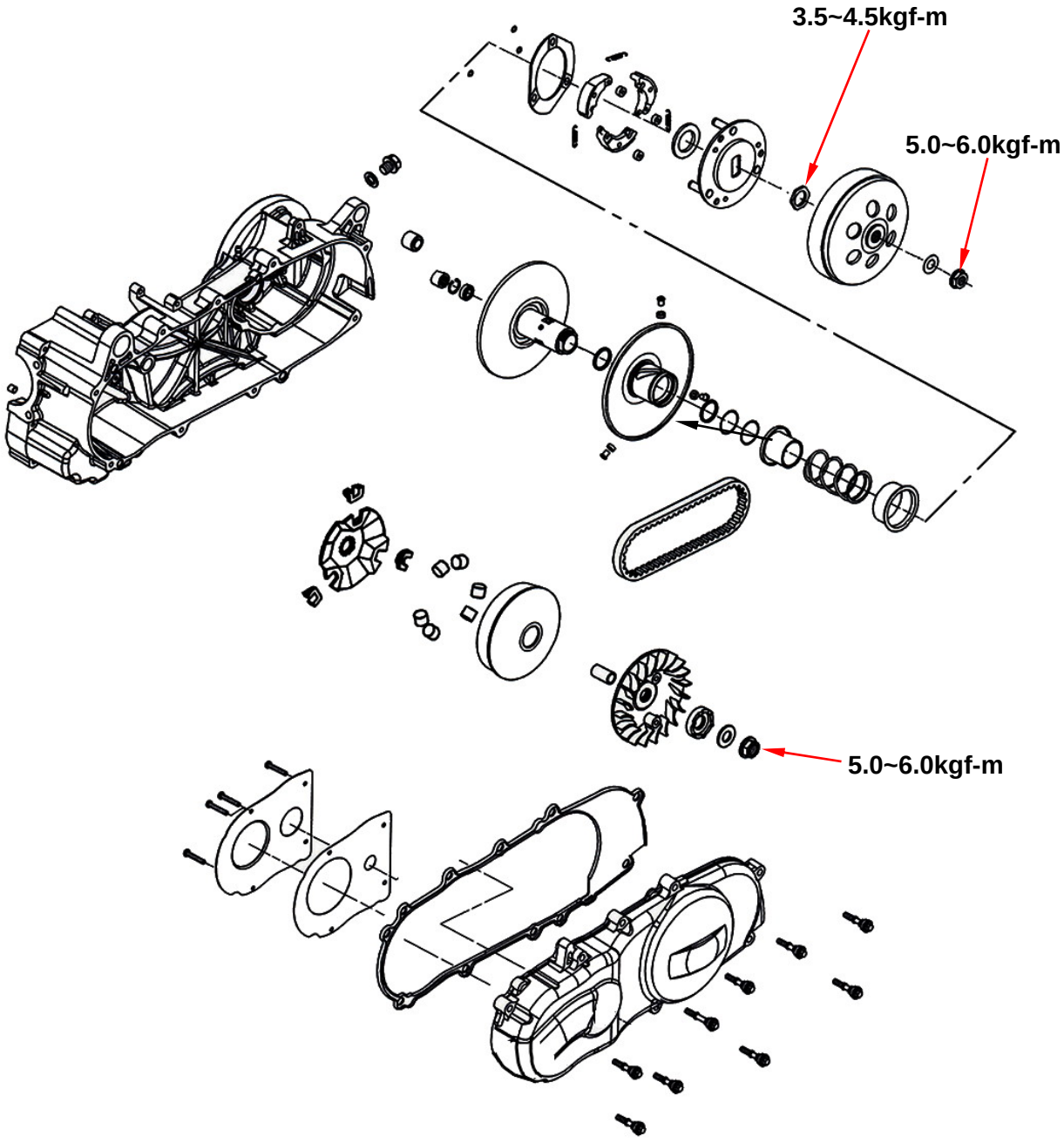


Install coolant hose onto cylinder.

Install cylinder head (refer to Chapter 6).

Notes:

Mechanism Diagram



Precautions in Operation

General Information

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

Specification Unit：mm

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

Torque value

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

Special Service Tools

Clutch spring compressor: SYM-2301000
Inner bearing puller: SYM-6204002
Clutch nut wrench 39 x 41 mm: SYM-9020200
Universal holder: SYM-2210100
Bearing driver: SYM-9100100

Troubleshooting

Engine can be started but motorcycle can not be moved

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

Insufficient horsepower or poor high speed performance

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

Shudder or misfire when driving

1. Broken clutch weight
2. Worn clutch weight

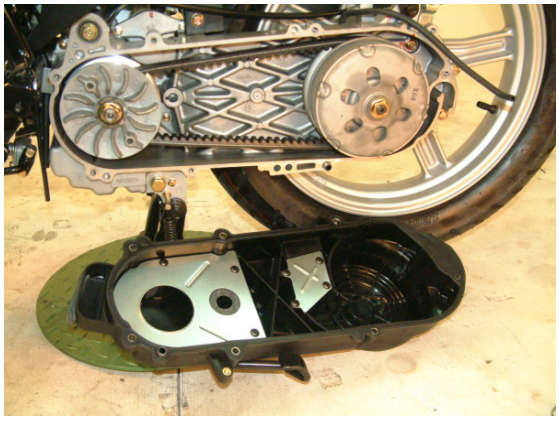
Left Crankcase Cover

Left crankcase cover removal

Remove body cover.
Remove air cleaner. (2 bolts)
Remove L crankcase cover. (7 bolts)

Left crankcase cover install

Install left crankcase cover in the reverse procedures of removal.

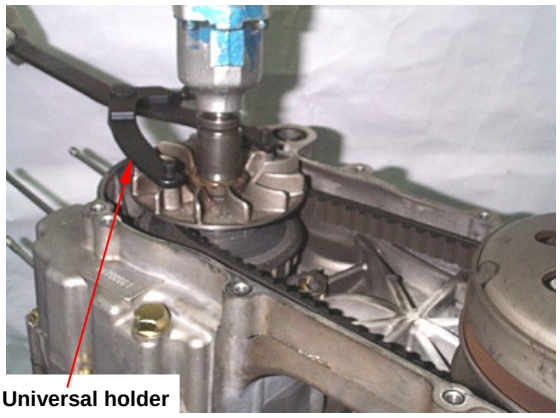


Driving Belt

Removal

Remove left crankcase cover

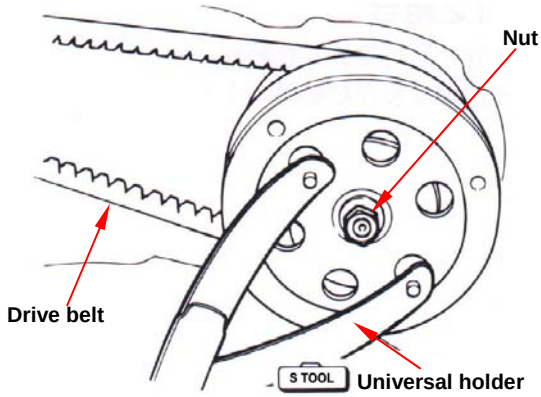
Hold drive face with universal holder, and remove nut and drive face.



Hold clutch outer with universal holder, and remove nut and clutch outer.

Caution

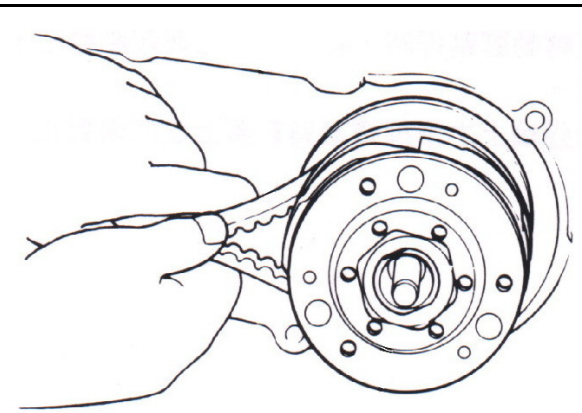
- Using special service tools for tightening or loosening the nut.
- Fixed rear wheel or rear brake will damage reduction gear system.



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

Remove driven pulley. Do not remove driving belt.

Remove the driving belt from the groove of driven pulley.



Inspection

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

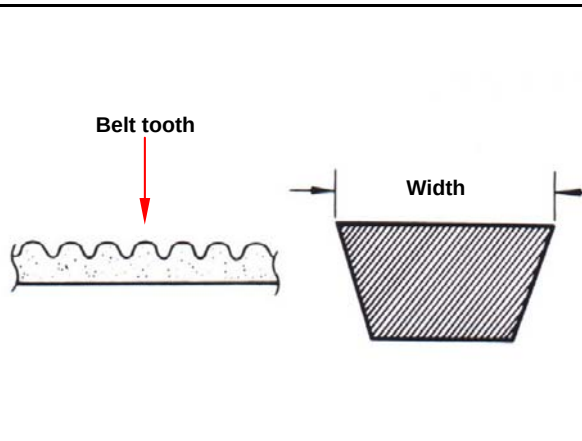
Measure the width of driving belt as diagram shown.

Service Limit: 17.5 mm

Replace the belt if exceeds the service limit.

Caution

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

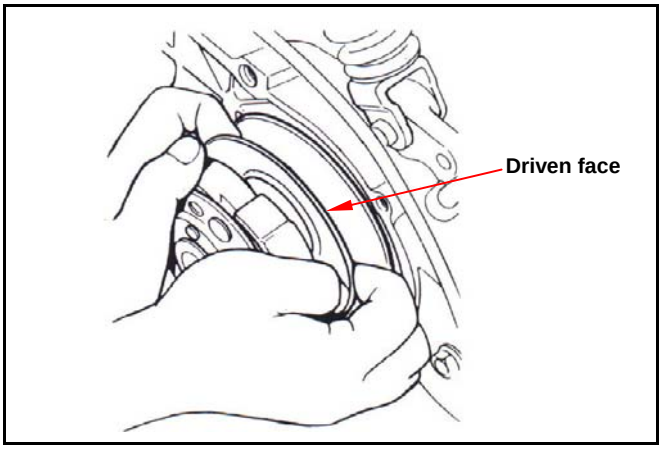


Installation

⚠ Caution

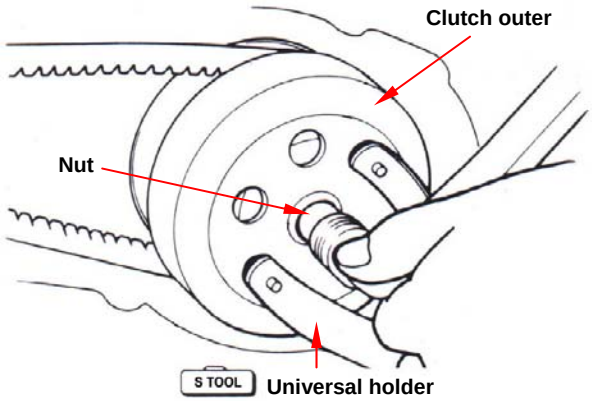
Pull out driven face to avoid it closing.

Install driving belt onto driven pulley.

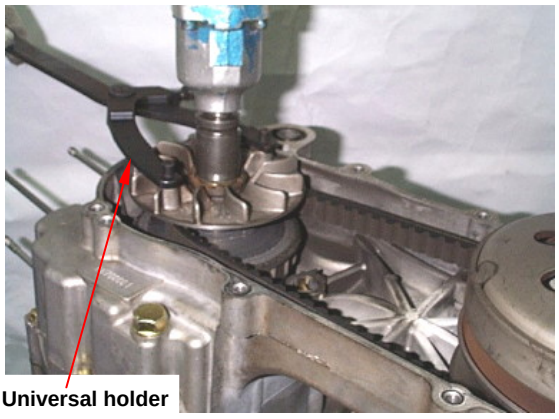


Install the driven pulley that has installed the belt onto drive shaft.
On the drive belt another end to the movable drive face.

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



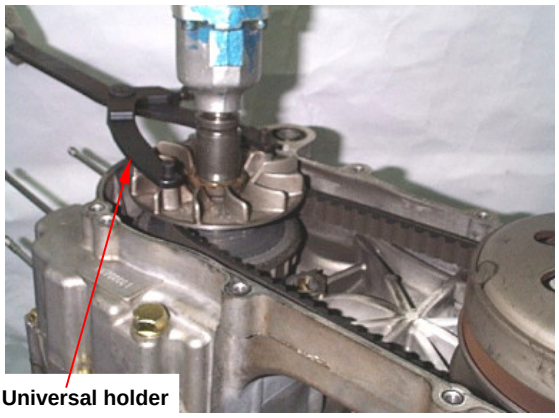
Install the drive face with universal holder, and then tighten nut to specified torque value.
Torque value: 5.0~6.0kgf-m



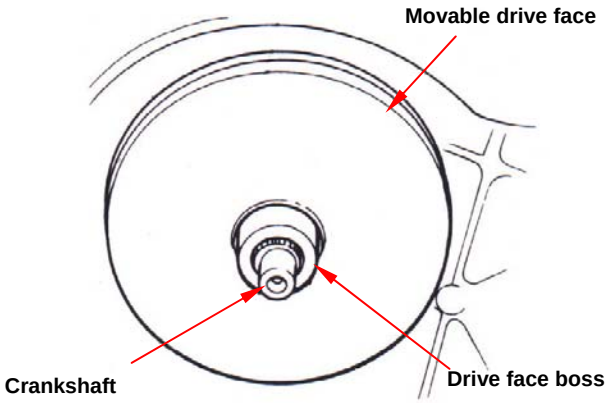
Drive Face

Removal

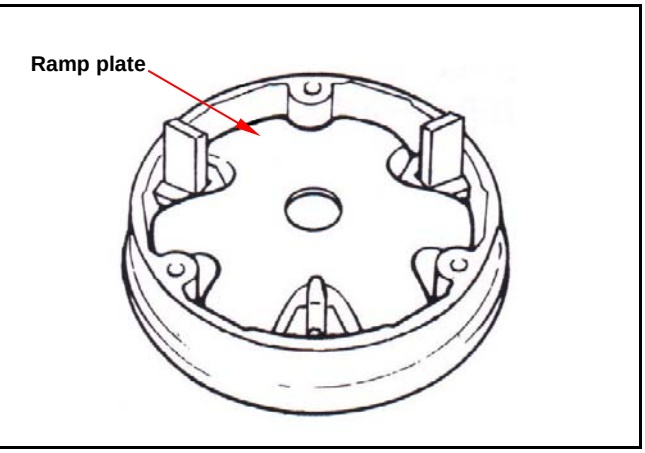
Remove left crankcase cover.
Hold generator flywheel with universal holder, and then remove drive face nut.
Remove drive face.



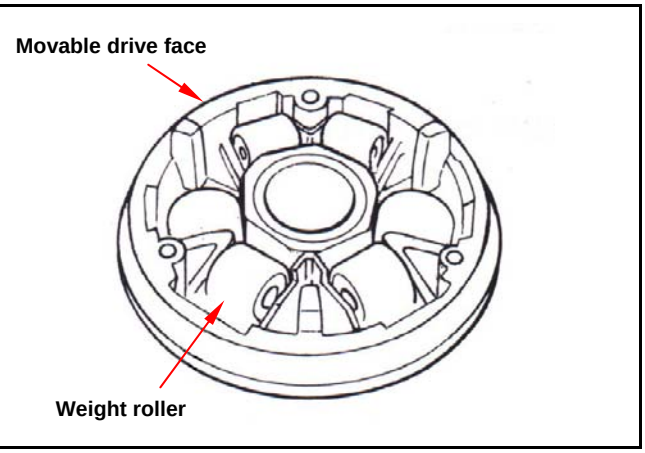
Remove driving belt and movable drive face comp from crankshaft.



Remove ramp plate.



Remove weight rollers from movable drive face.



Inspection

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

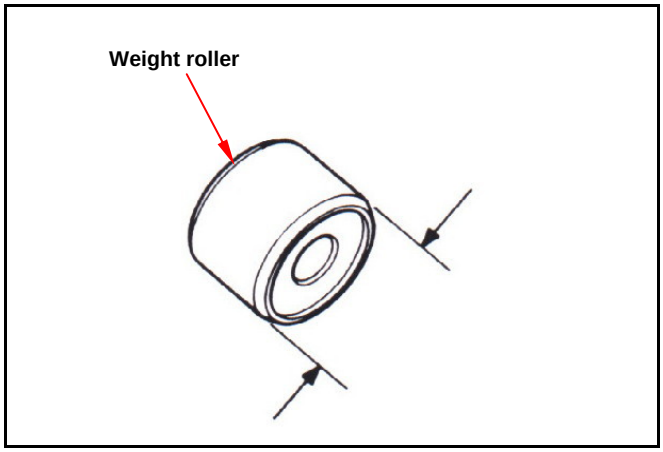
Thus, if weight rollers are worn out or damaged, the centrifuge force will be effected.

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

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

Service limit: 19.50 mm

Weight: 14.5g



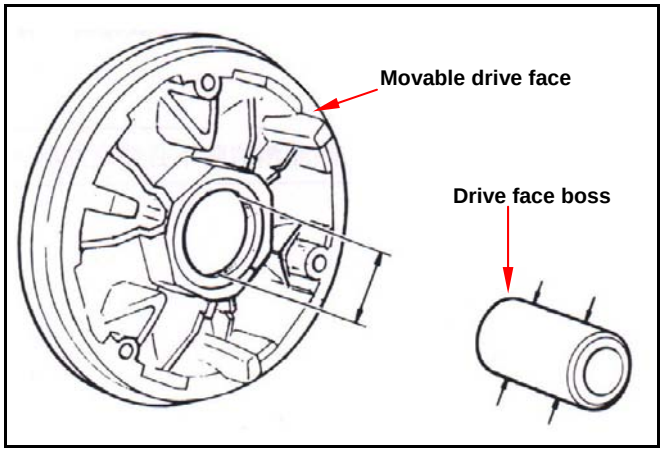
Check if drive face boss is worn or damaged and replace it if necessary.

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

Service limit: 26.94 mm

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

Service limit: 27.06 mm

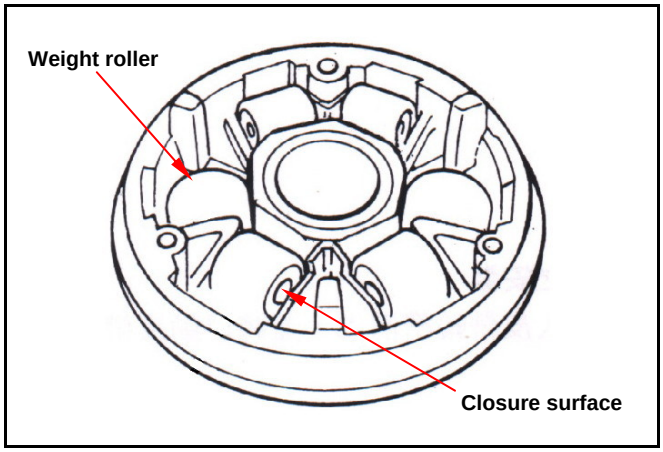


Reassembly/installation

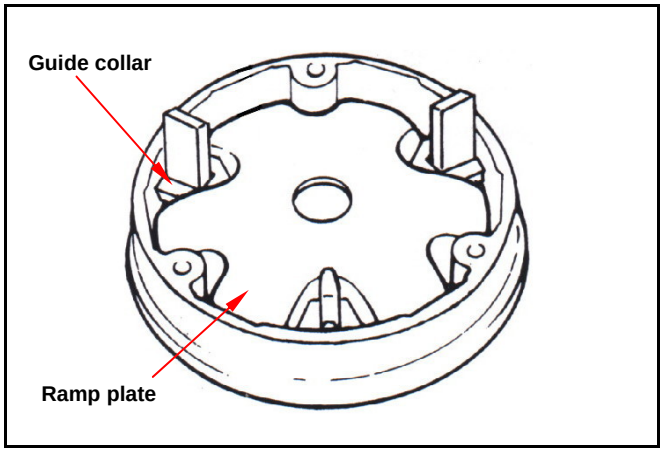
Install weight rollers.

⚠ Caution

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



Install ramp plate.

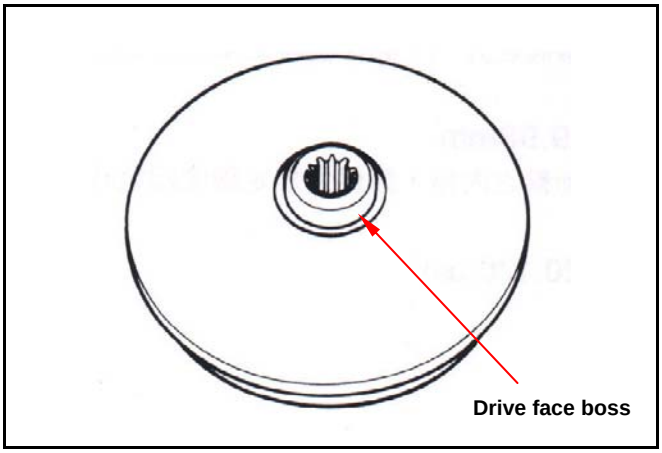


With 4~5g grease spreads wipes drives in the movable drive face axis hole.

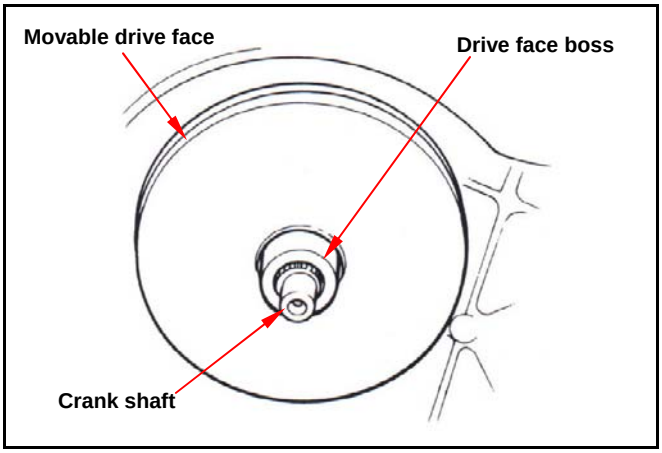
Install drive face boss.

⚠ Caution

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

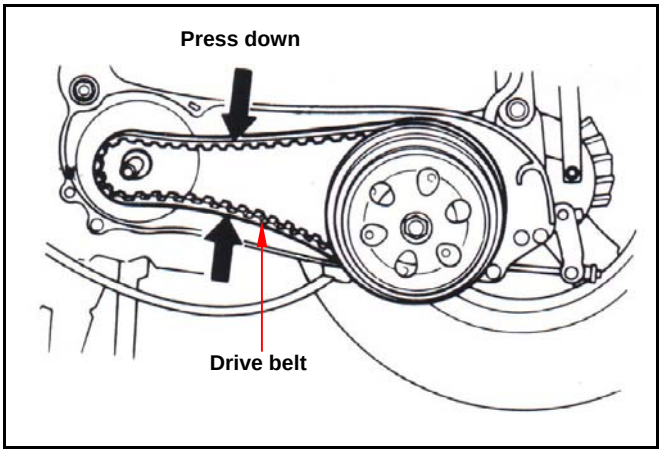


Install movable drive face comp. onto crankshaft.



Driven pulley installation

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



Install drive face, washer and nut.

⚠ Caution

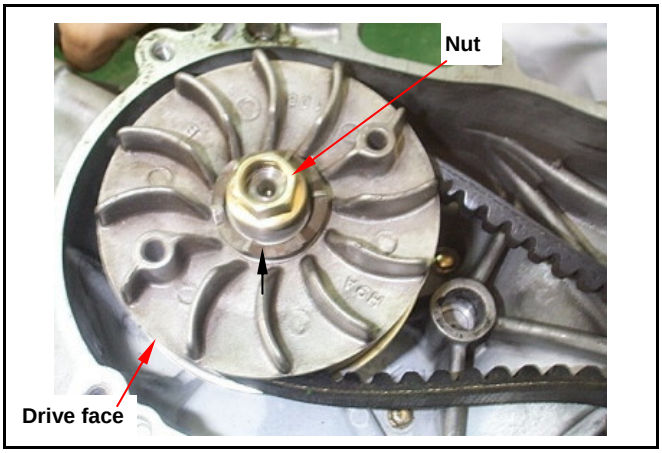
Make sure that two sides of pulley surfaces have to be free of grease. Clean it with cleaning solvent.

Hold drive face with universal holder.

Tighten nut to specified torque.

Torque value: 5.0~6.0kgf-m

Install left crankcase cover.



Clutch Outer/Driven Pulley

Disassembly

Remove drive belt and clutch outer/driven pulley.

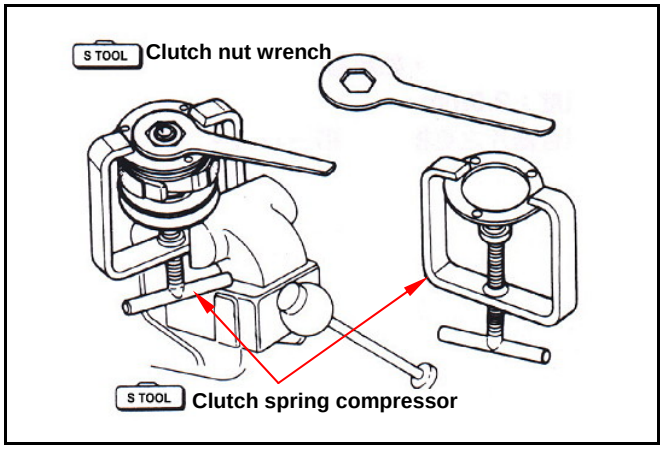
Install clutch spring compressor onto the pulley assembly, and operate the compressor to let the wrench be installed more easily.

⚠ Caution

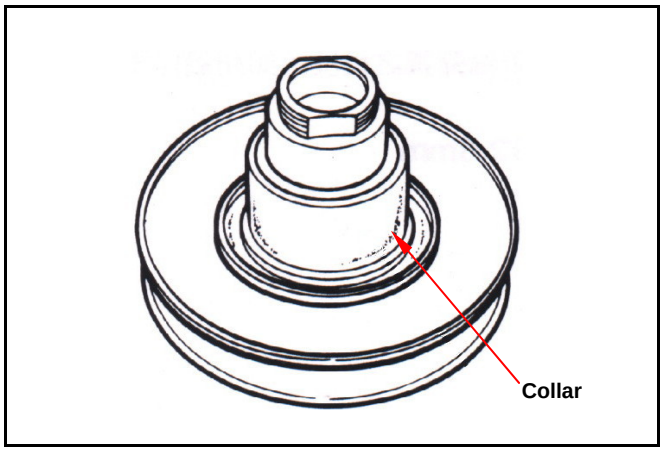
Do not press the compressor too much.

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

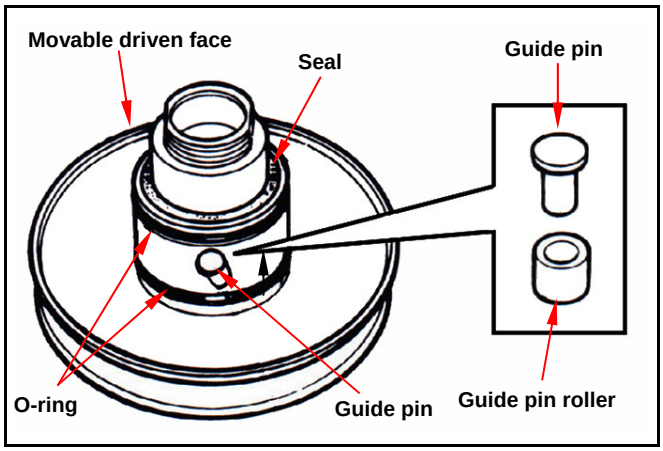
Release the clutch spring compressor and remove clutch weight and spring from driven pulley.



Remove seal collar from driven pulley.



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



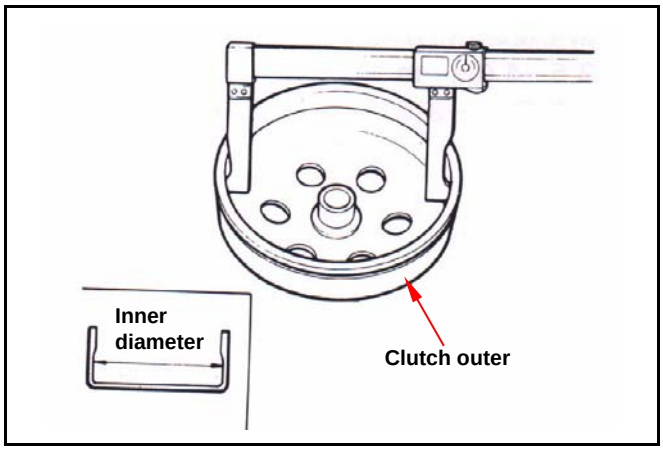
Inspection

Clutch outer

Measure the inner diameter of clutch outer.

Replace the clutch outer if exceed service limit.

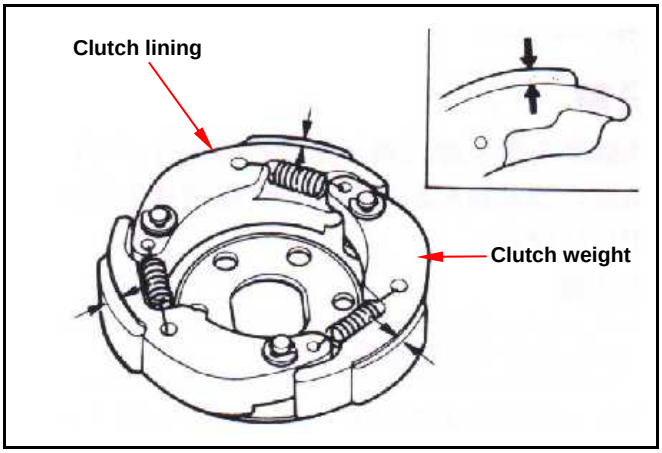
Service limit: 130.5 mm



Clutch lining

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

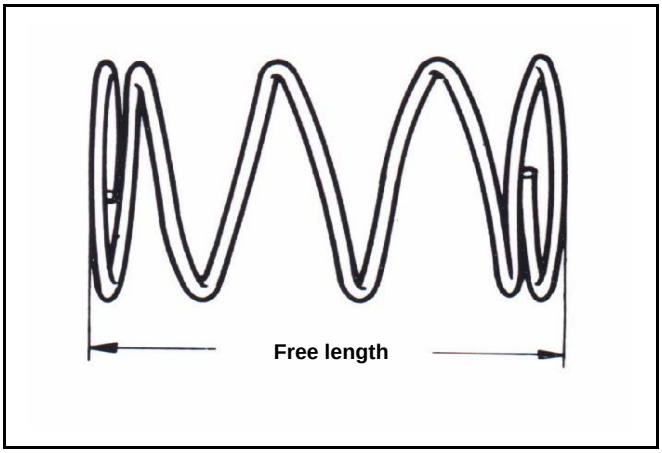
Service limit: 2.0 mm



Driven pulley spring

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

Service limit: 83.2 mm



Driven pulley

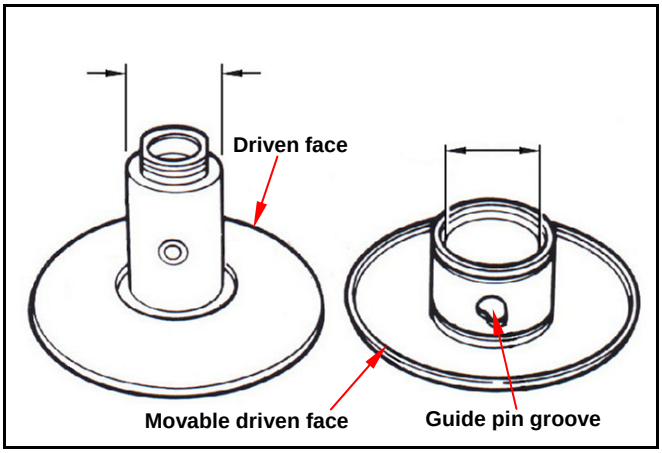
Check following items:

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

Replace damaged or worn components.

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

Service limit: Outer diameter 33.94 mm
Inner diameter 34.06 mm



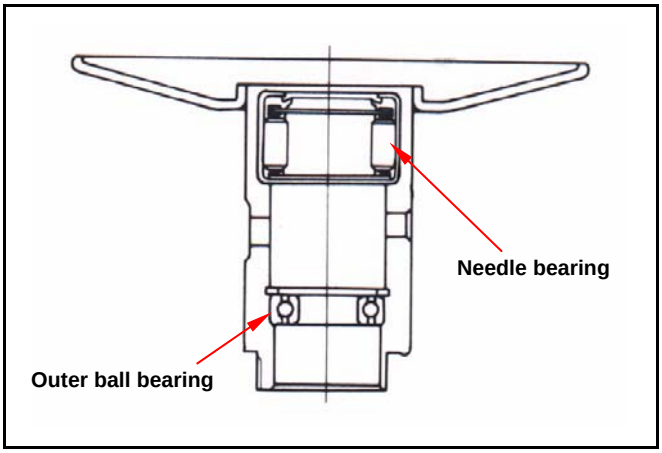
Driven Pulley Bearing Inspection

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

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

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

Check if the bearing outer parts are closed and fixed. Replace it if necessary.



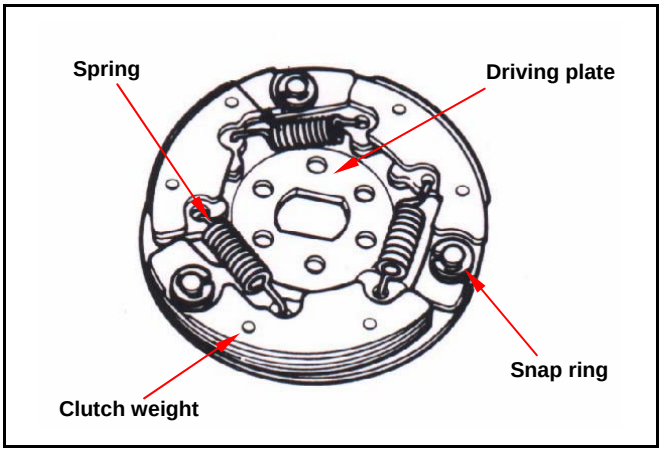
Clutch weight Replacement

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

⚠ Caution

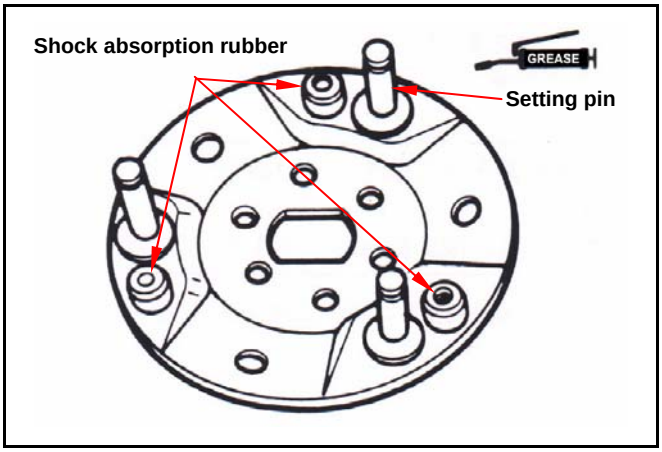
Some of models are equipped with one mounting plate instead of 3 snap rings.

Check if spring is damage or insufficient elasticity.



Check if shock absorption rubber is damage or deformation. Replace it if necessary.

Apply with grease onto setting pins.



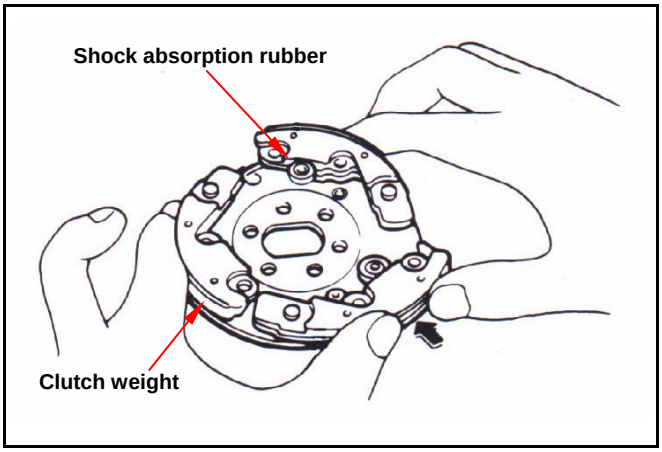
Install new clutch weight onto setting pin and then push to the specified location.

Apply with grease onto setting pins.

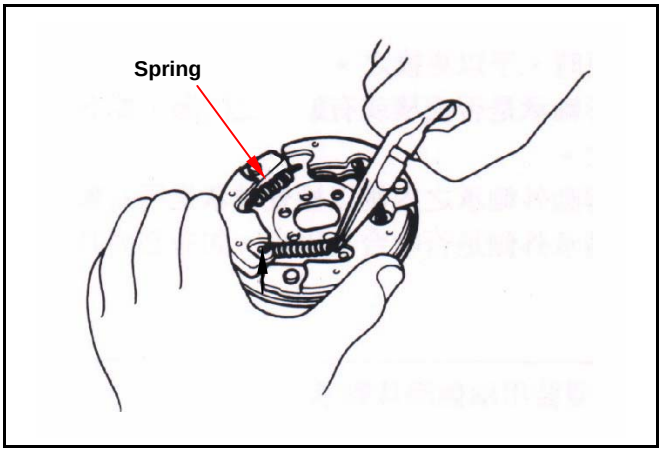
But, the clutch block should not be greased. If so, replace it.

⚠ Caution

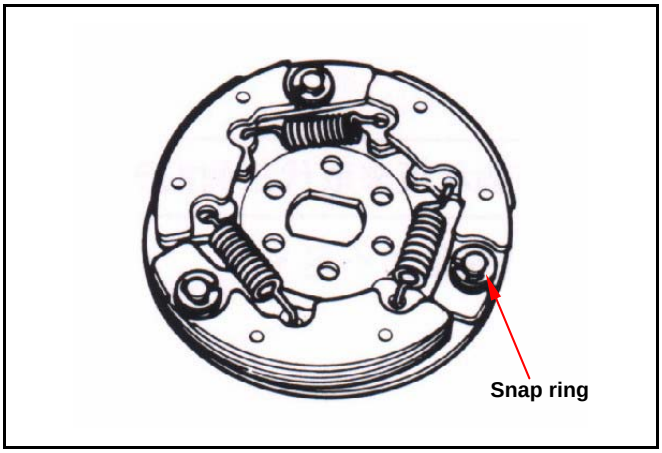
Grease or lubricant will damage the clutch weight and effect the block's connection capacity.



Install the spring into groove with pliers.



Install snap ring and mounting plate onto setting pin.

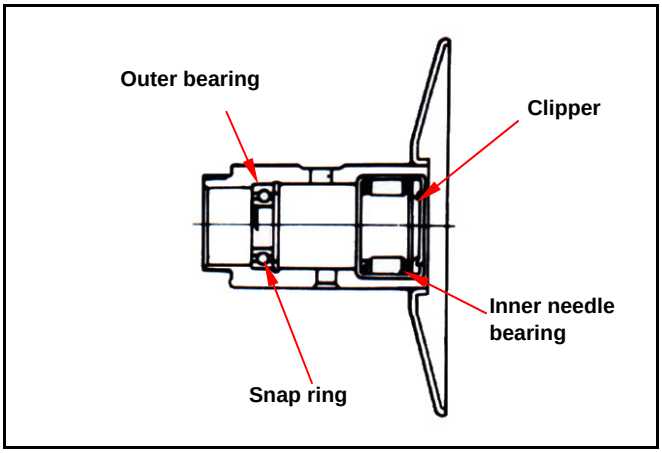


Replacement of Driven Pulley Bearing

Remove inner bearing.

Caution

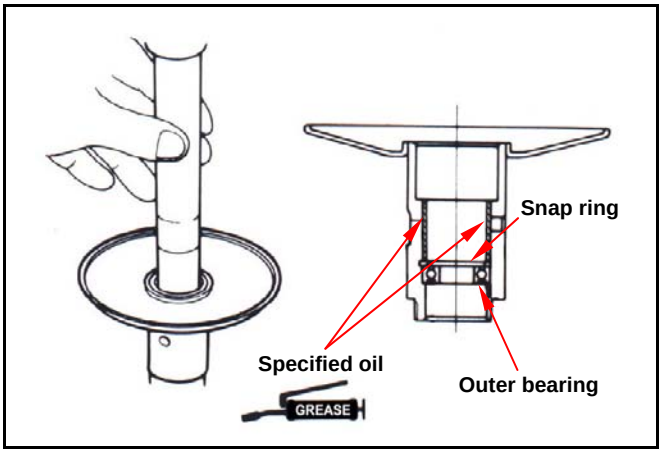
- If the inner bearing equipped with oil seal on side in the driven pulley, then remove the oil seal firstly.
- If the pulley equipped with ball bearing, it has to remove snap ring and then the bearing.



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

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

Apply with specified oil.



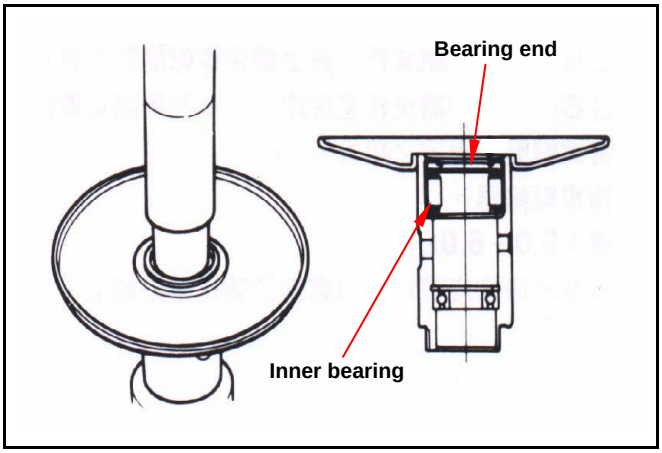
Install new inner bearing.

Caution

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

Install snap ring into the groove of driving face.

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

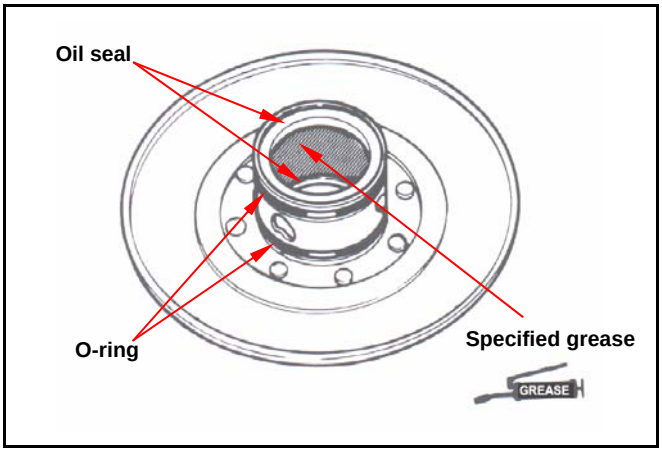


Installation of Clutch OUTER/Driven Pulley

Assembly

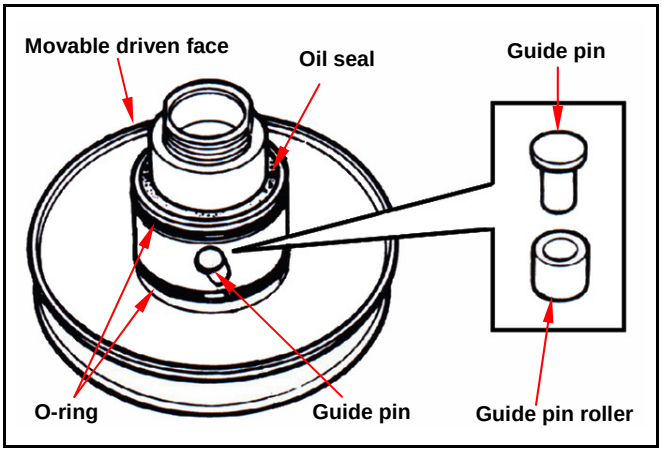
Install new oil seal and O-ring onto movable driven face.

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

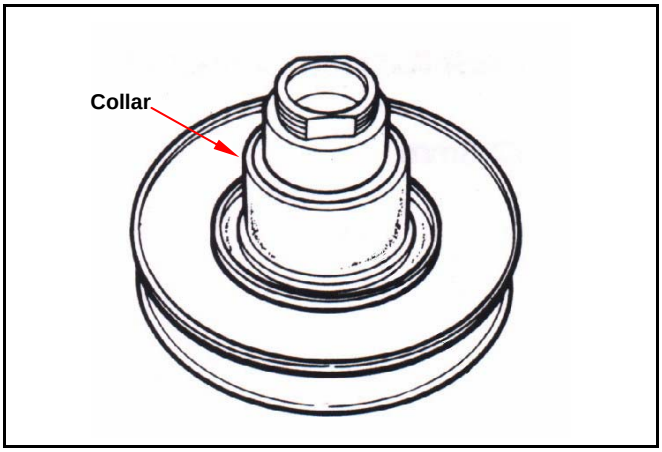


Install the movable driven face onto driven face.

Install the guide pin and guide pin roller.



Install the collar.



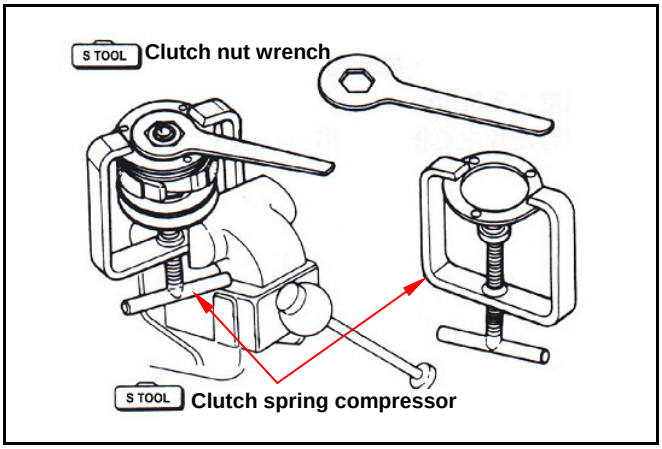
Install driving belt, spring and clutch weight COMP. into clutch spring compressor, and press down the assembly by turning manual lever until mounting nut that can be installed.

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

Remove the clutch spring compressor.

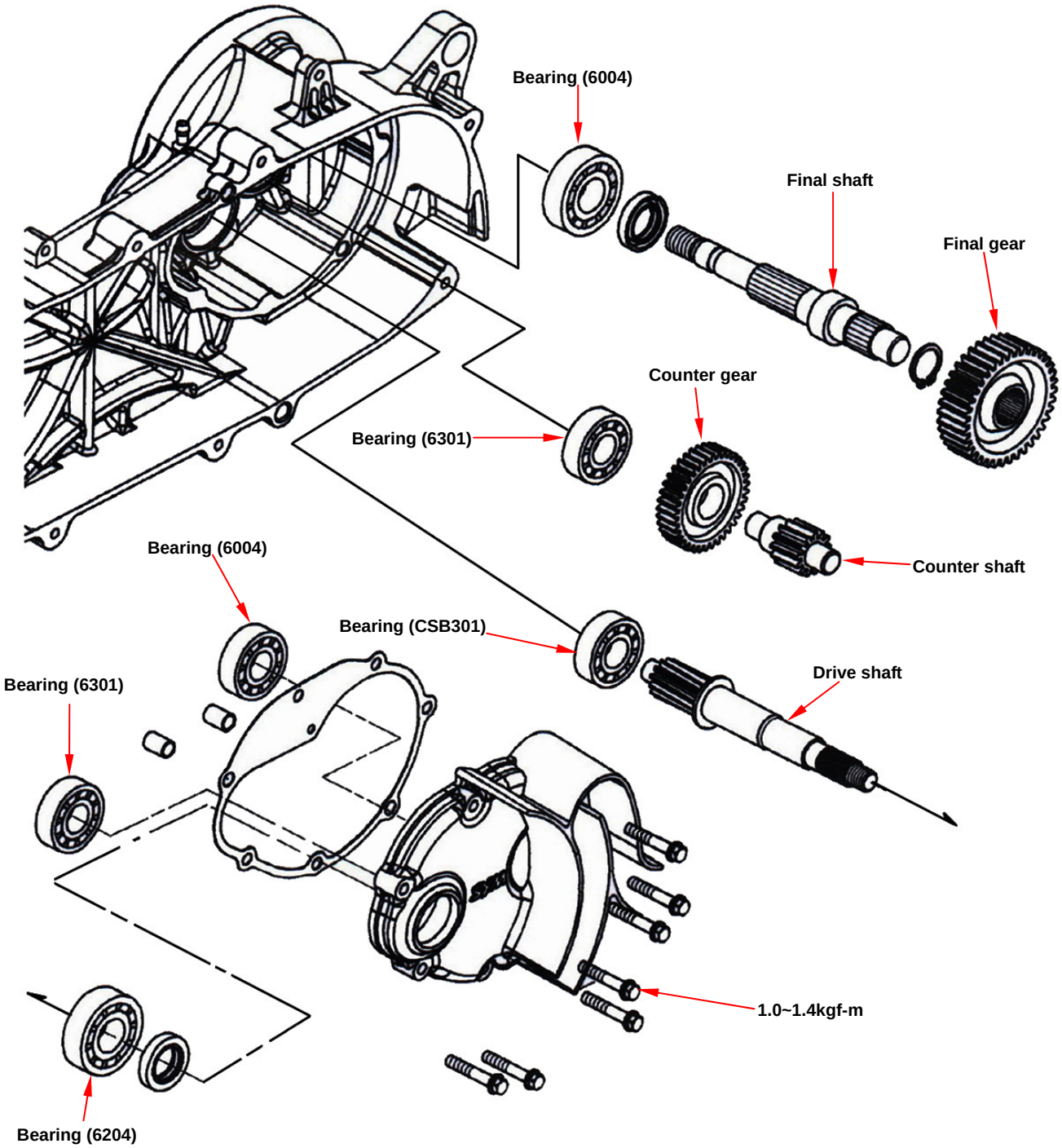
Torque value: 5.0~6.0kgf-m

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



Notes:

Mechanism Diagram



Precautions in Operation

Specification

Application oil: scooter gear oil
Recommended oil: KING MATE serial gear oils
Oil quantity: 110 c.c. (100 c.c. when replacing)

Torque value

Gear box cover 1.0~1.4kgf-m

Tools

Special tools

Bearing (6203/6004UZ) driver: SYM-9620000
Bearing (6204) driver: SYM-9110400
Bearing (6301) driver: SYM-9610000
Oil seal (27*42*7) driver: SYM-9125500
Oil seal (20*32*6) driver: SYM-9120200
Inner bearing puller: SYM-6204002
Outer bearing puller: SYM-6204001
Drive shaft puller: SYM-1130000-L
Drive shaft install bush: SYM-1130010
Extension bush (long): SYM-1130031
Extension bush (short): SYM-1130032

Troubleshooting

Engine can be started but motorcycle can not be moved.

- Damaged driving gear
- Burnt out driving gear

Noise

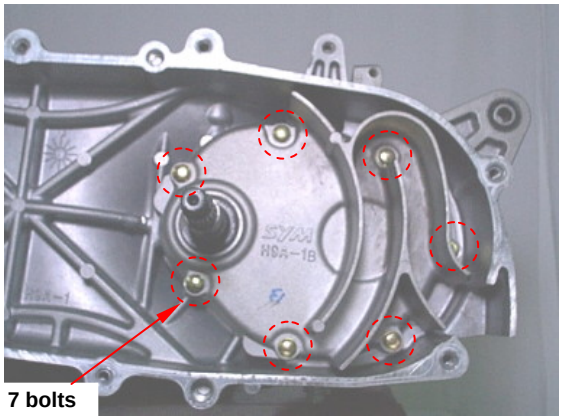
- Worn or burnt gear
- Worn gear

Gear oil leaks

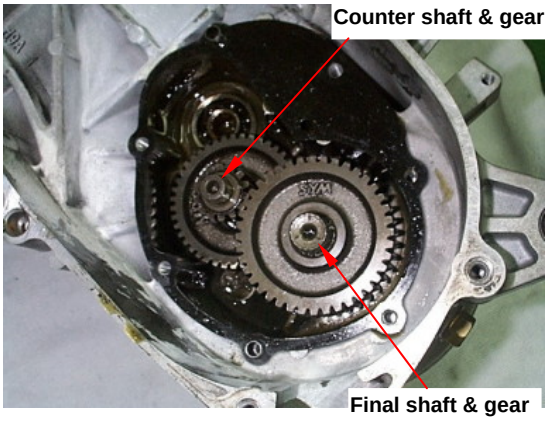
- Excessive gear oil.
- Worn or damage oil seal

Final Drive Mechanism Disassembly

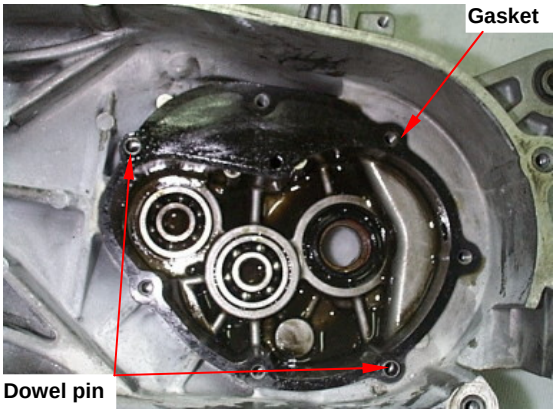
Remove driven pulley.
Drain gear oil out from gear box.
Remove gear box cover bolts and then remove the cover and drive shaft.



Remove final gear and shaft.
Remove counter shaft and gear.



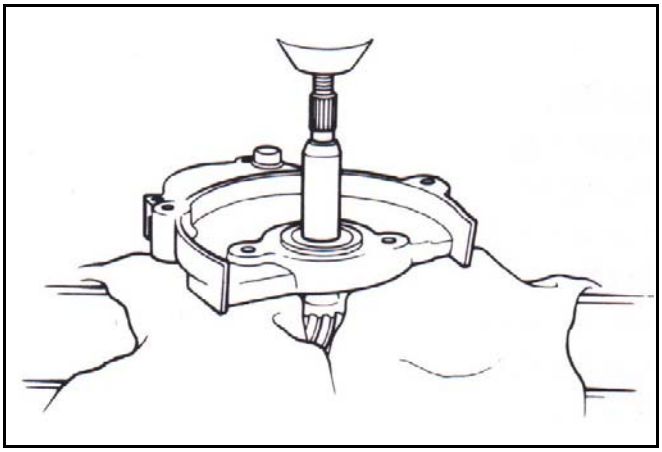
Remove gasket and dowel pin.



Remove the drive shaft.
In order to avoid damaging the gear box cover, in the cover place a rag between the cover and table.

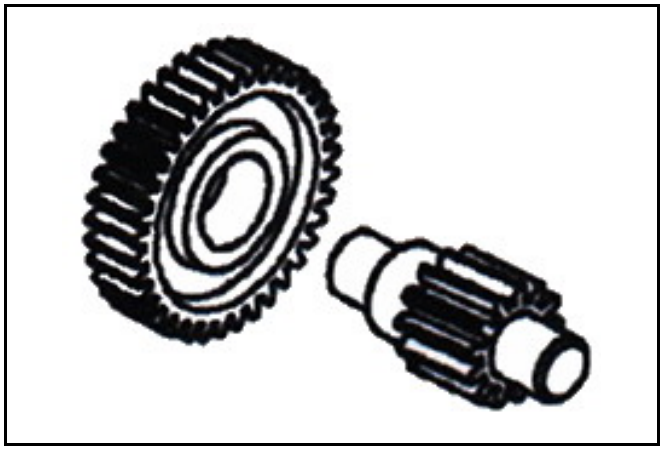
⚠ Caution

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

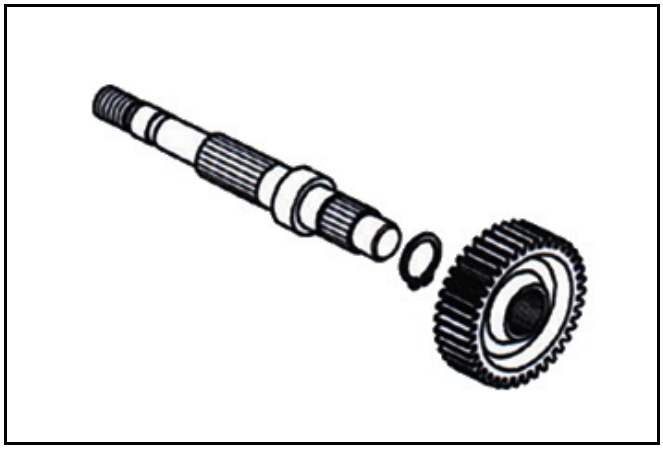


Final Drive Mechanism Inspection

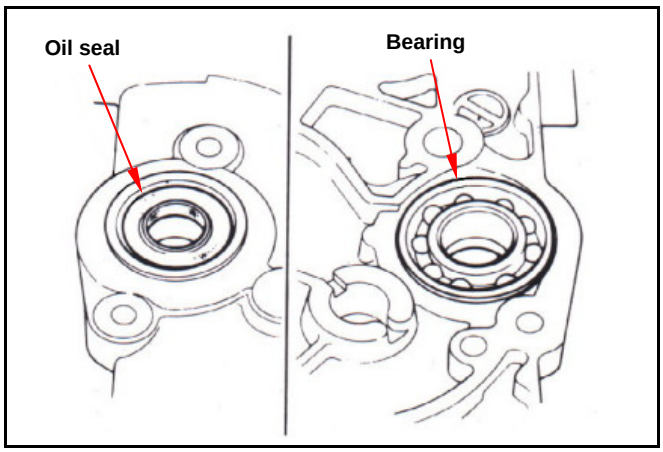
Check if the countershaft is wear or damage.



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



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

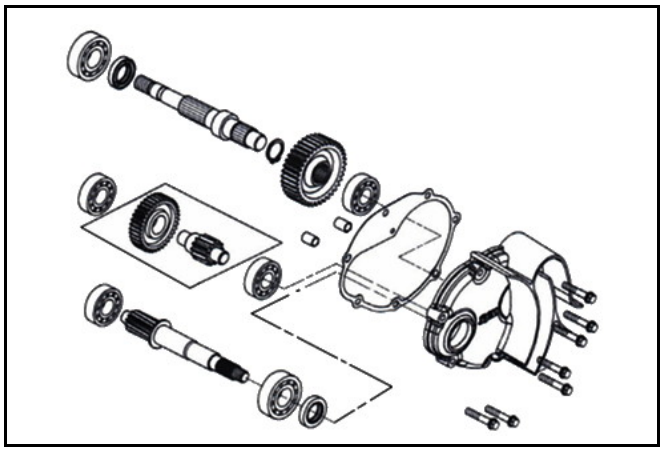


Check gear box cover bearing as the same way above, and replace it if necessary.

Caution

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

Check drive shaft and gear for wear or damage.

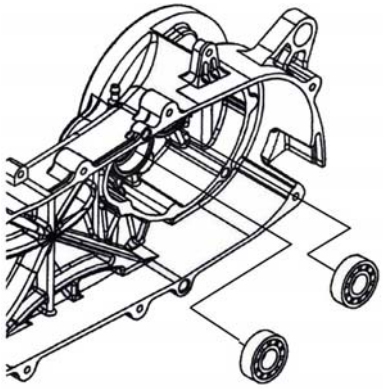


Bearing Replacement

⚠ Caution

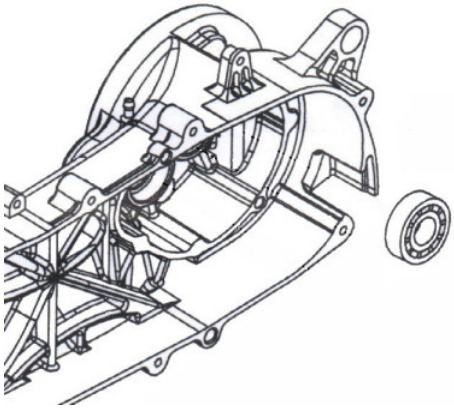
- Never install used bearings. Once bearing removed, it has to be replaced with new one.

Remove driving shaft bearing and counter shaft bearing from left crankcase using following tools:
Special tool:
Inner bearing puller

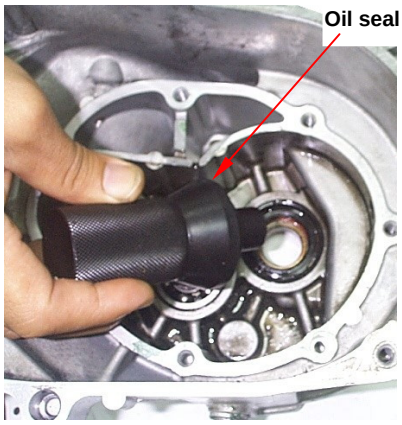


Install new drive shaft bearing and counter shaft bearing into left crankcase.
Special tool:
Bearing driver (6301)

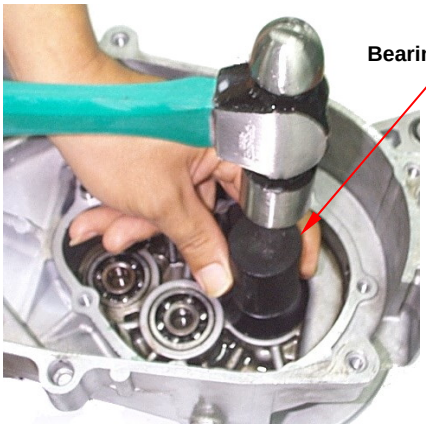
Remove oil seal, and then remove final shaft bearing from left crankcase.
Special tool:
Inner bearing puller



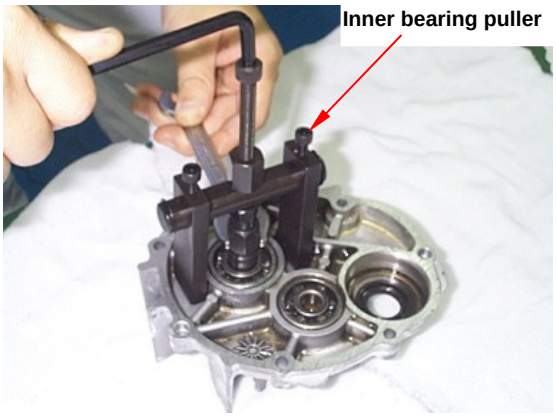
Install new final shaft seal.
Special tool:
Oil seal driver (27*42*7)



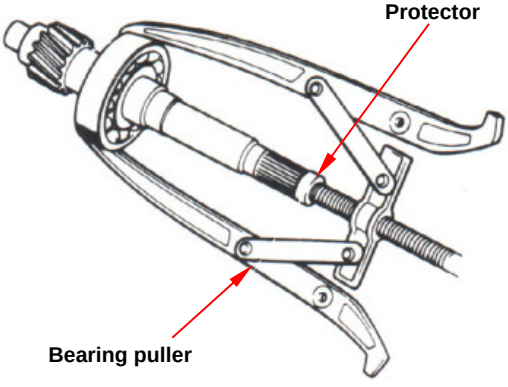
Install new final shaft bearing.
Special tool:
Bearing driver (6203/6004UZ)



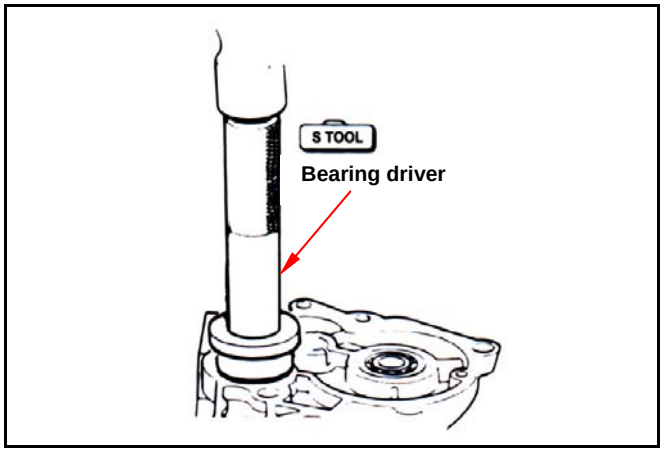
Press out the drive shaft from gear box cover.
Using shaft protector as operation.
Remove oil seal from gear box cover and discard the seal.
Use inner bearing puller to remove the final shaft bearing and counter shaft bearing from the cover.
Special tool:
Inner bearing puller



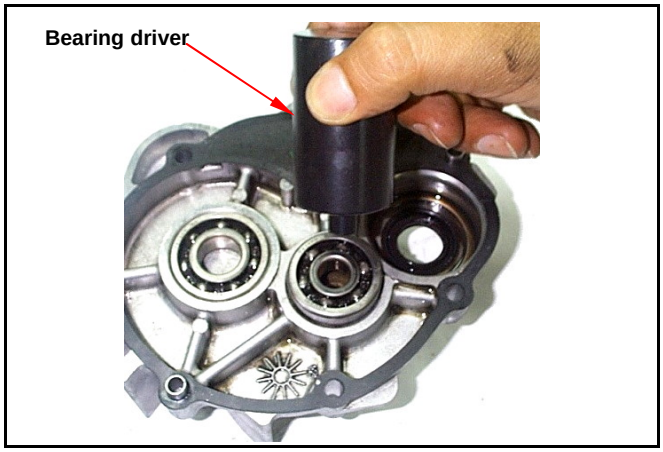
If the drive shaft is pulled out with its bearing, then remove the bearing with bearing puller and shaft protector.
Special tool:
Multi-functional bearing puller or Outer bearing puller
Shaft protector



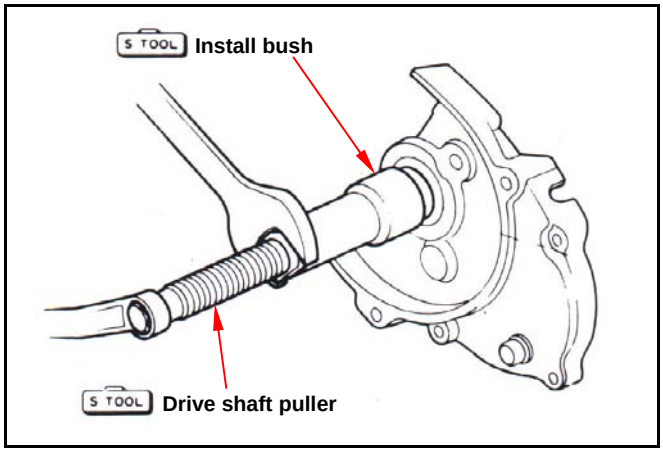
Install a new drive shaft bearing onto gear box cover.
Special tool:
Bearing driver (6204)

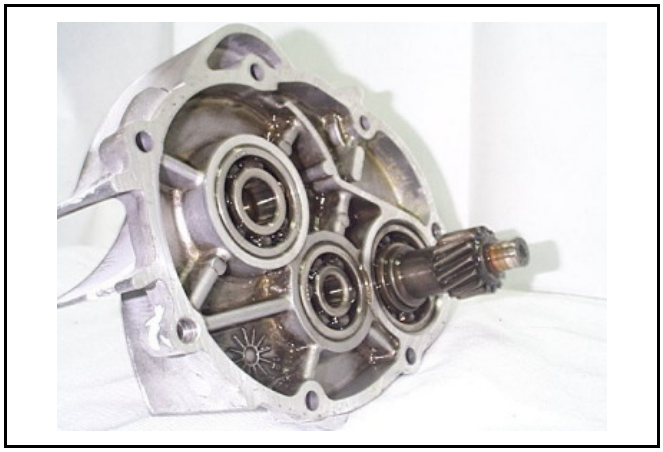


Install a new final shaft bearing and counter shaft bearing onto gear box cover.
Special tool:
Bearing driver (6203/6004UZ)
Bearing driver (6301)



Install drive shaft.
Special tool:
Drive shaft puller
Drive shaft install bush
Extension bush (long)
Extension bush (short)

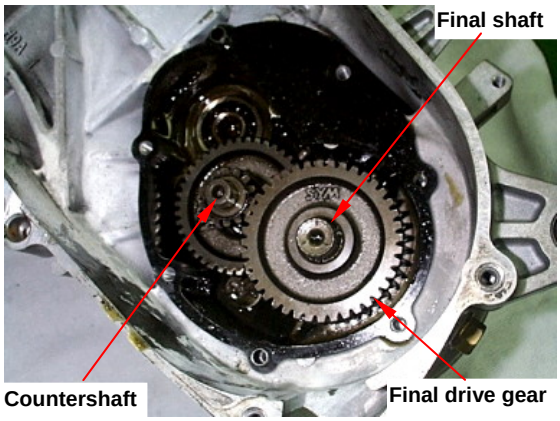




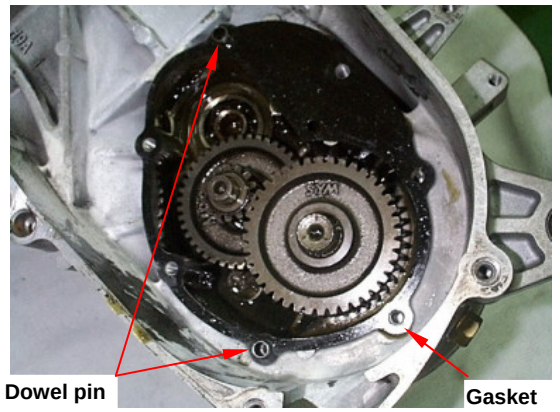
Final Drive Mechanism Reassembly

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

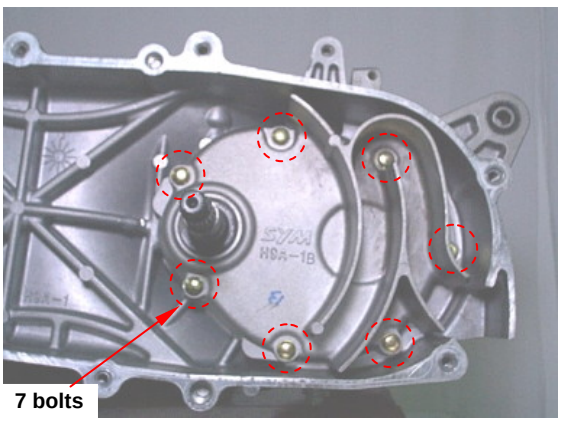
Install countershaft, counter gear, final shaft and final driving gear.



Install dowel pin and new gasket.

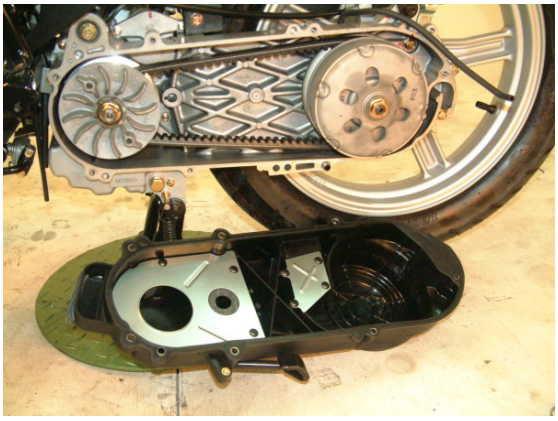


Install gear box cover and bolts, and tighten.
Torque value: 1.0~1.4kgf-m



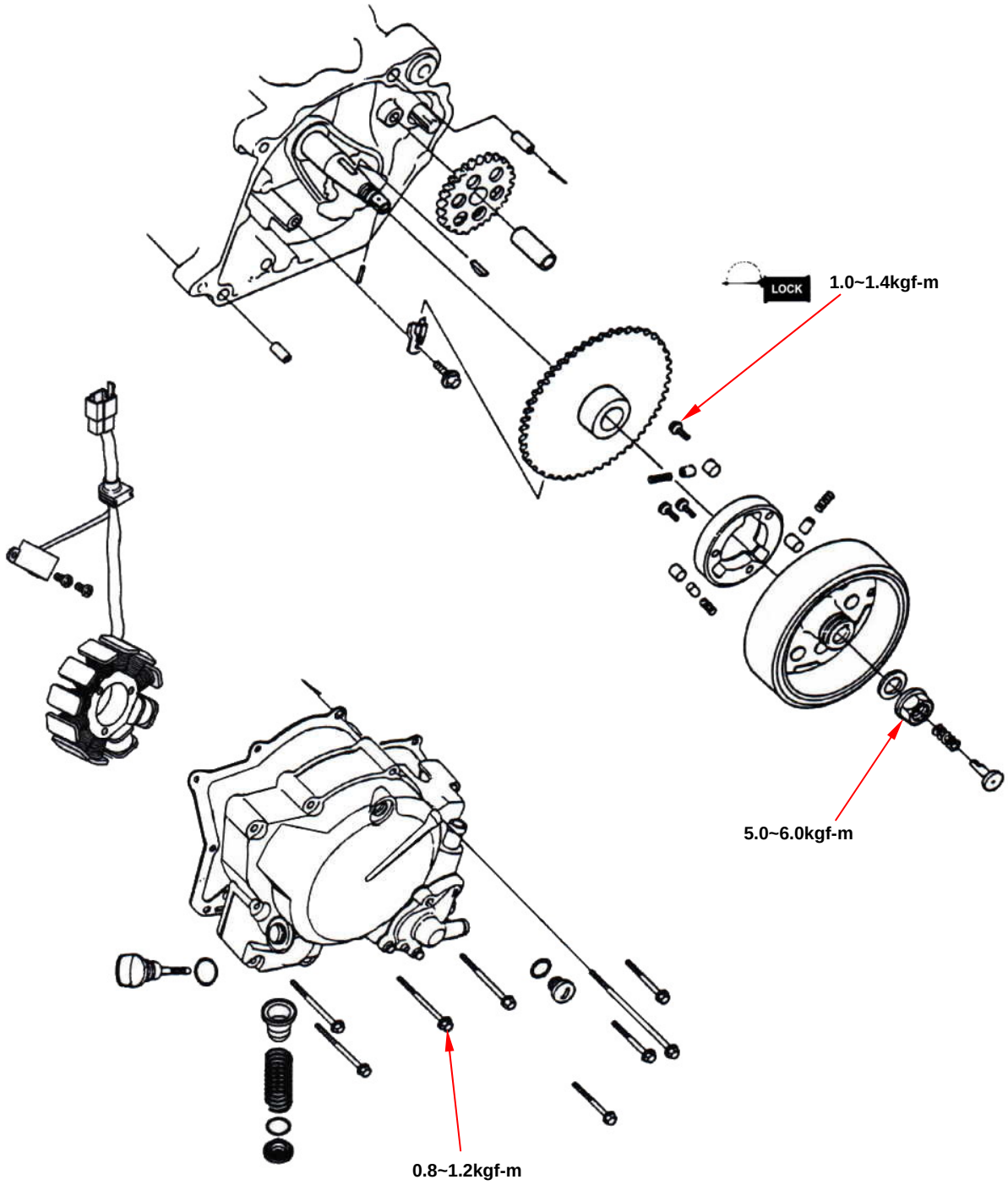
Apply with grease onto new oil seal lip, and then install the oil seal.
Special tool:
Oil seal driver (20*32*6)

Install driven pulley/clutch outer/belt.
Install movable drive face, drive face and left crankcase.
Install rear wheel.
Add gear oil.



Notes:

Mechanism Diagram



Precautions in Operation

General information

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

Specification

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

Torque value

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

Tools

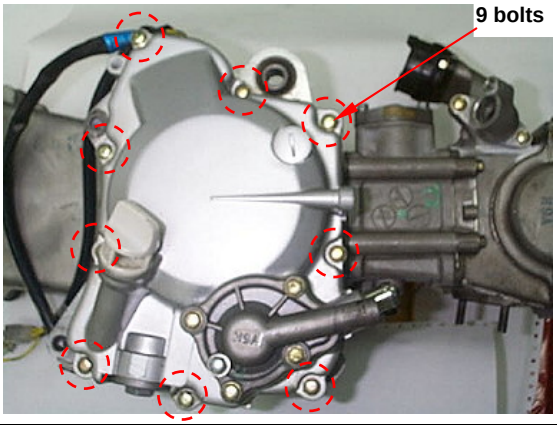
Special tools

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

Universal holder: SYM-2210100

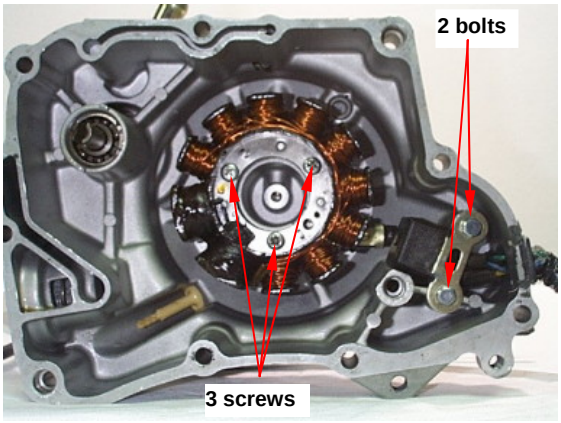
Right Crankcase Cover Removal

Remove 9 bolts from the right crankcase cover.
Remove the right crankcase cover.
Remove dowel pin and gasket.



ACG. Set Removal

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



Flywheel Removal

Remove left crankcase cover.
Remove oil through from crankshaft.

Hold the flywheel by drive face with universal holder, and remove its nut.
Special tool:
Universal Holder

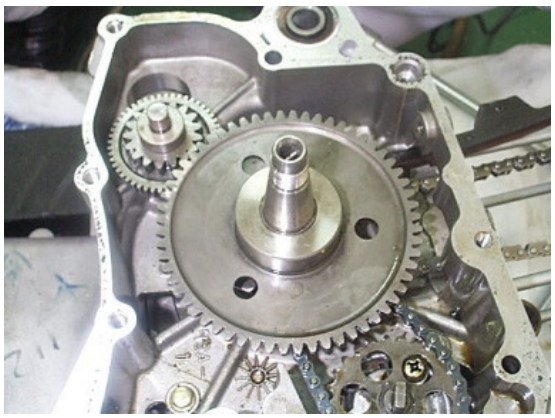
Remove the oil through guide pin from crankshaft.

Pull out flywheel with A.C.G. flywheel puller.
Special tool:
A.C.G. Flywheel puller

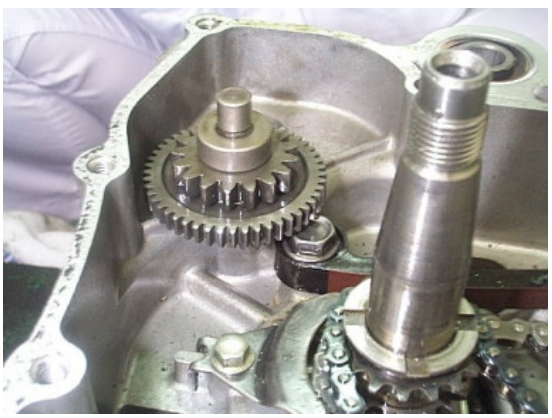
Start Clutch

Removal

Remove starting driven gear.

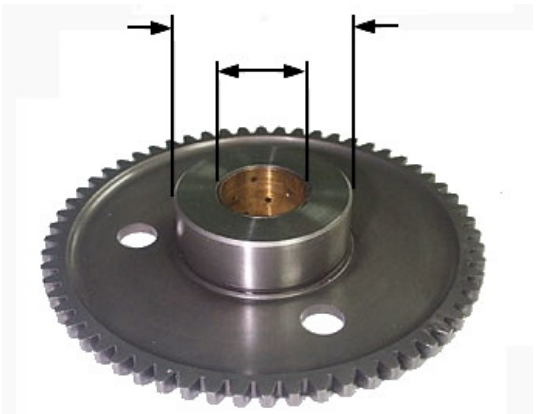


Remove mounting plate, starter reduction gear, and the shaft.



Starting Clutch Inspection

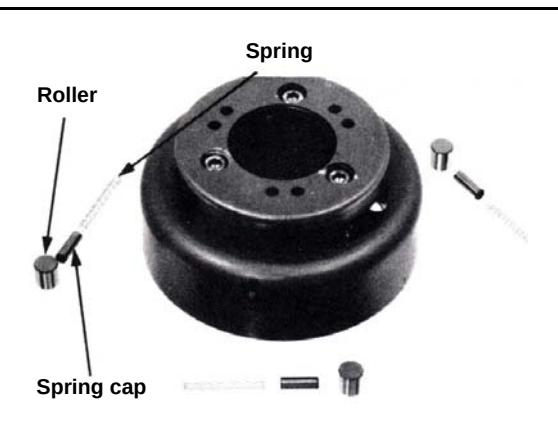
Check the starting clutch gear for wear or damage.
Measure the ID and OD of the starting clutch gear.
Service Limit: ID: 20.1 mm
OD: 42.10 mm



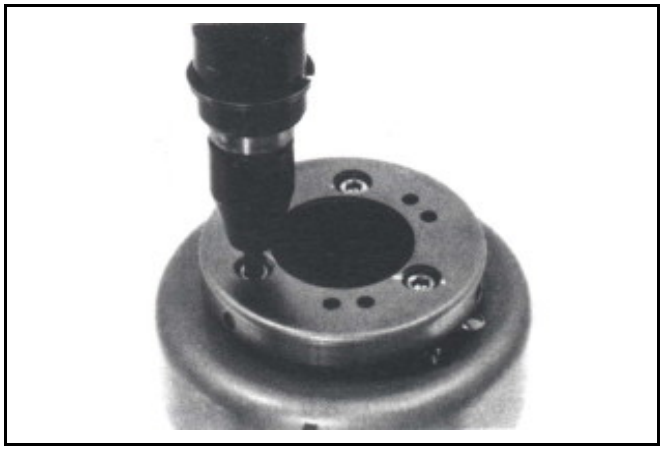
Check the starting reduction gear and shaft for wear or damage.

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

Remove the rollers, spring caps, and springs of clutch on the one way clutch that located on the back of flywheel.
Check each roller and plug for wear or damage.
Install rollers, plugs and springs.



Remove 3 hexagon bolts with air and hex socket wrenches.



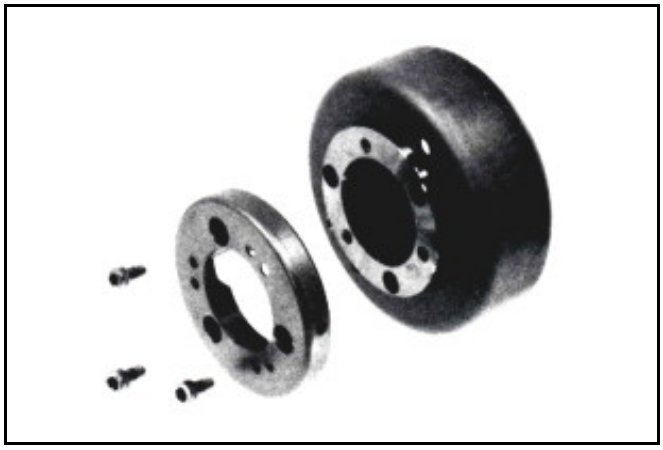
Disassembly

Install the components in the reverse procedures of removal.

⚠ Caution

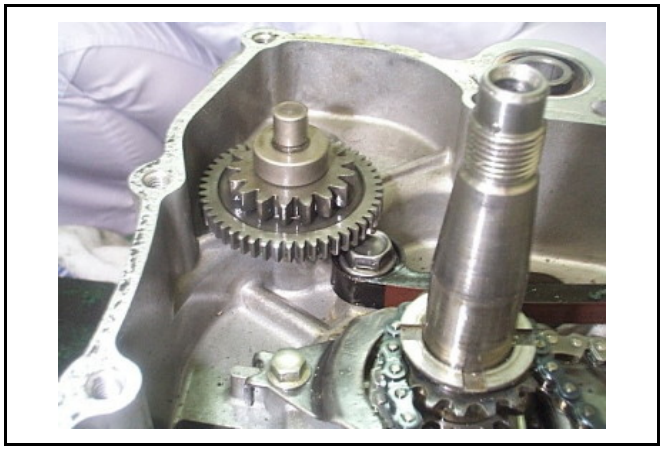
Tape a tightening tape onto the thread of hexagon bolt.

Torque value: 1.0~1.4kgf-m

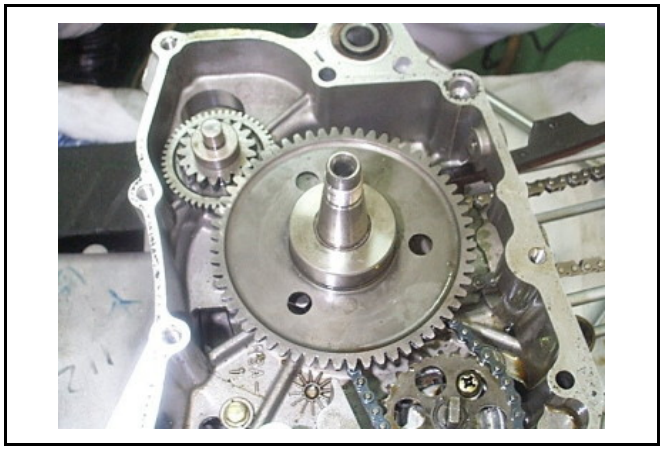


Installation

Install reduction gear shaft and reduction gear.



Install starting clutch gear onto crankshaft.



Flywheel Installation

Align the key on crankshaft with the flywheel groove, and then install the flywheel.
Insert the oil through guide pin onto crankshaft.
Make sure that there is no other material stock on it. If so, clean it up.

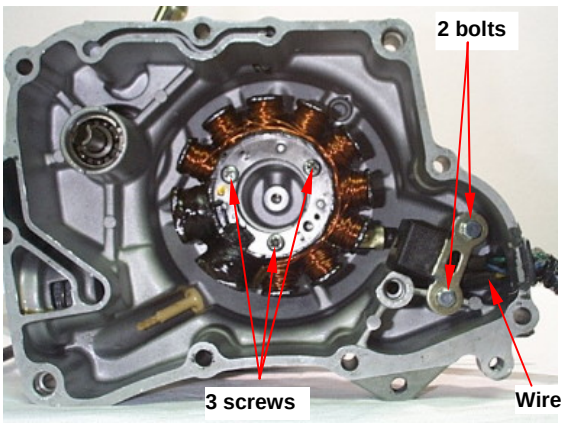
Hold the flywheel with flywheel holder, and tighten its nut.
Torque value: 5.0~6.0kgf-m
Tool:
Flywheel holder
Install spring and oil through.

ACG. Set Installation

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

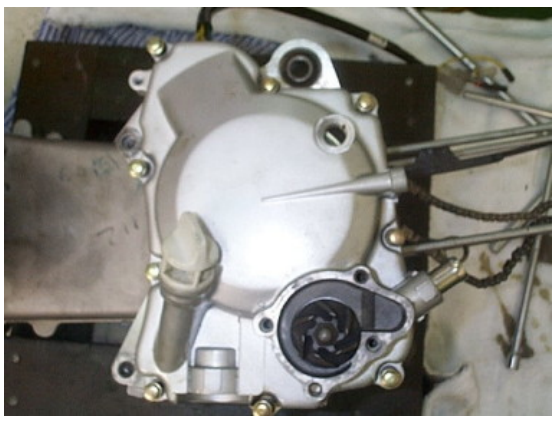
Caution

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

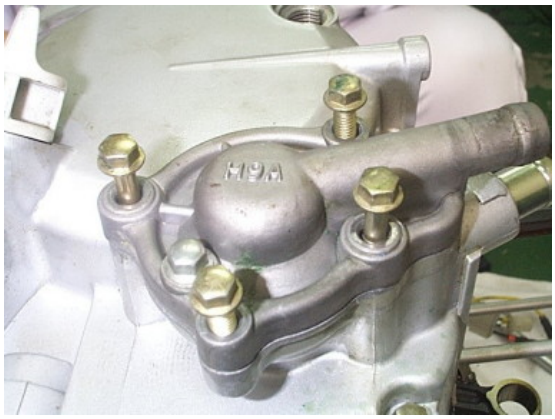


Right Crankcase Cover Installation

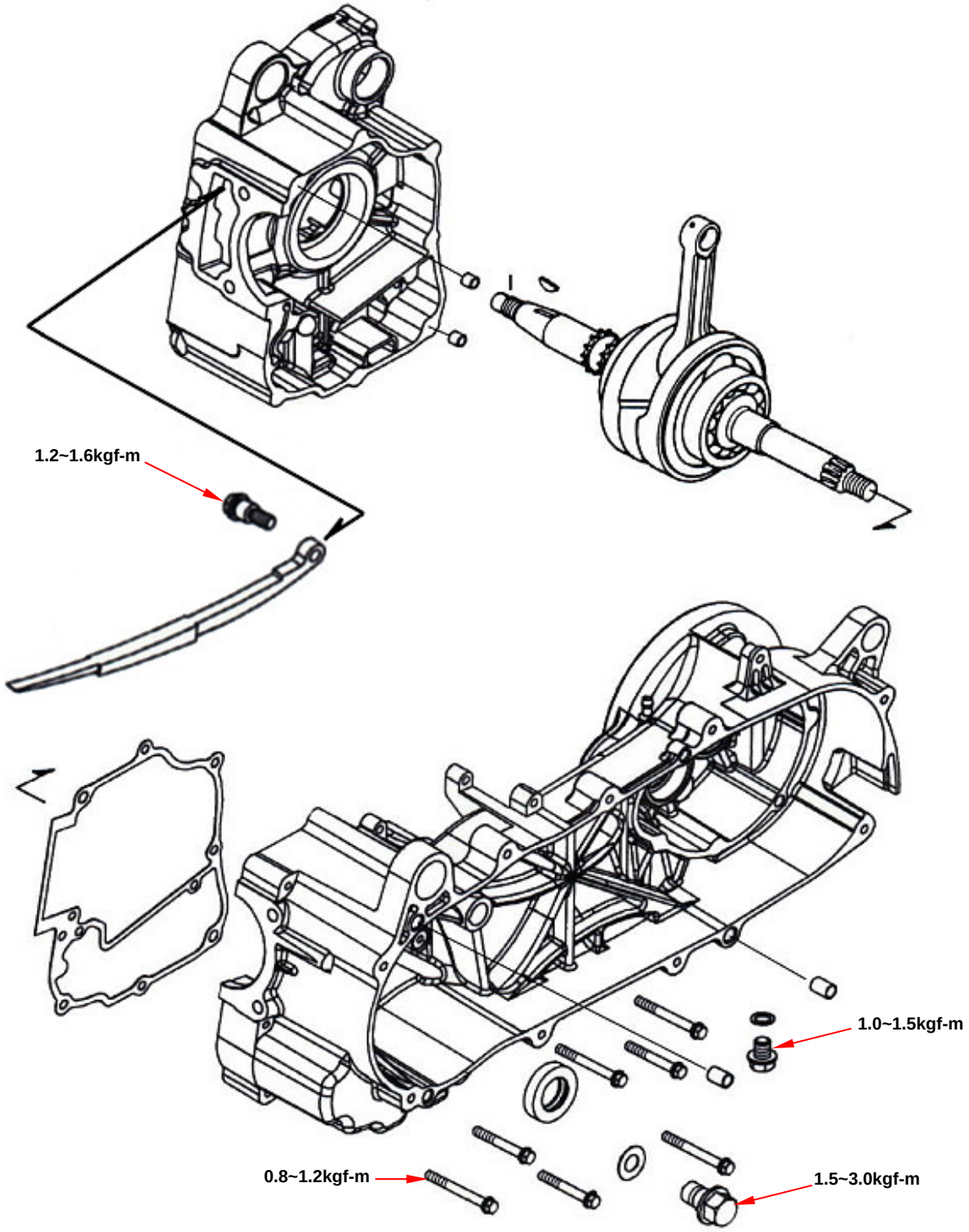
Install dowel pin and new gasket.
Install right crankcase cover onto the crankcase.
Note: Align the water pump shaft indent with the oil pump shaft.
Install right crankcase cover (9 screws).



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



Mechanism Diagram



Precautions in Operation

- This Section concerns disassembly of the crankcase for repair purpose.
- Remove following components before disassembling crankcase.
  - —Engine Section 5
  - —Cylinder head Section 6
  - —Cylinder and piston Section 7
  - —Drive pulley and driven pulley Section 8
  - —AC generator/Start driven gear Section 10
  - —Starting motor Section 16

- In case it requires replacing the crankshaft bearing, the driving chain of engine oil pump or the timing chain, it is preferably to replace crankshaft as a unit.

Specification

Unit: mm

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

Torque value

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

Tools

Special tools

R/L. crank disassemble/ install tool: SYM-1300001-H9A
L. crank shaft bearing driver: SYM-9100200-H9A
Crank shaft bearing fixing socket: SYM-9100210-H9A
Crank shaft puller: SYM-1130000-H9A
L. crank shaft oil seal driver (25*40*8): SYM-9121600
Outer bearing puller: SYM-6204010
Inner bearing puller: SYM-6204020
Clutch nut wrench: SYM-9020200

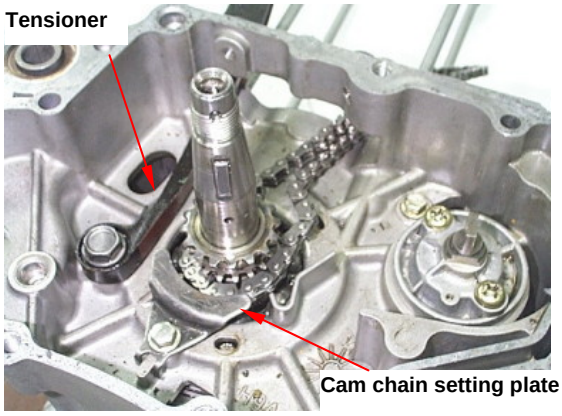
Troubleshooting

Engine noise

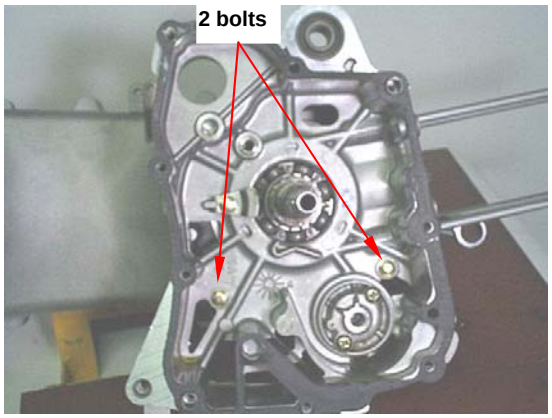
- Loose crankshaft bearing
- Loose crankshaft pin bearing
- Worn out piston pin and pin hole

Crankcase Disassembly

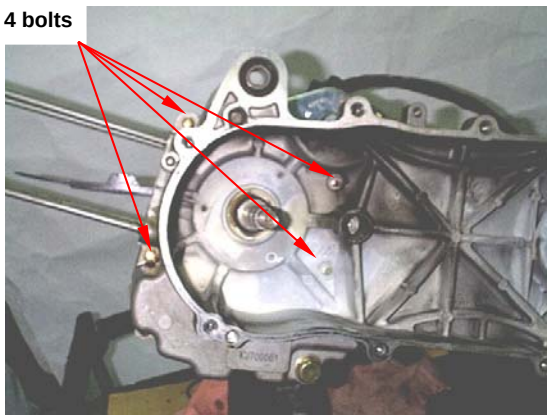
Remove the cam chain setting plate, and then remove cam chain.
Loosen the bolt and remove the tensioner.



Loosen 2 bolts on the right crankcase.



Loosen 4 bolts on the left crankcase.



Place right crankshaft case downward and left up crankcase.

Caution

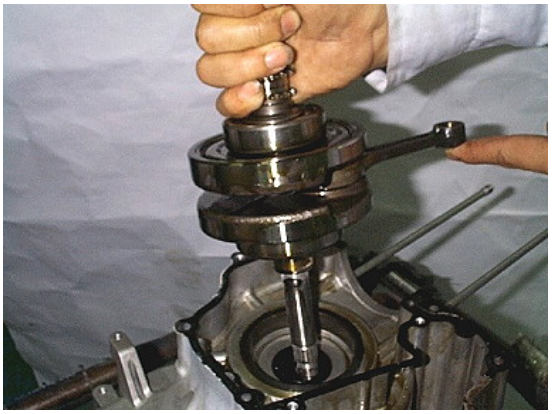
Care should be taken not to damage the contact surfaces.

Remove crank by left crank shaft.
Refer to chapter 2: Special tools

Special tool:

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

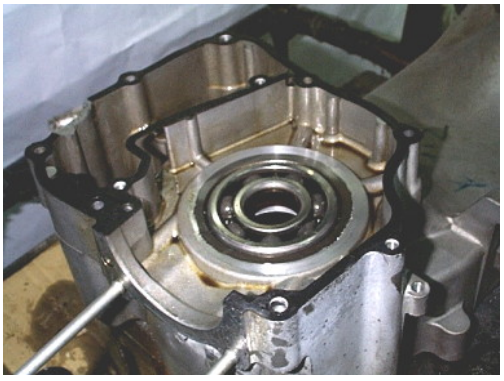
Remove crankshaft from right crankcase.



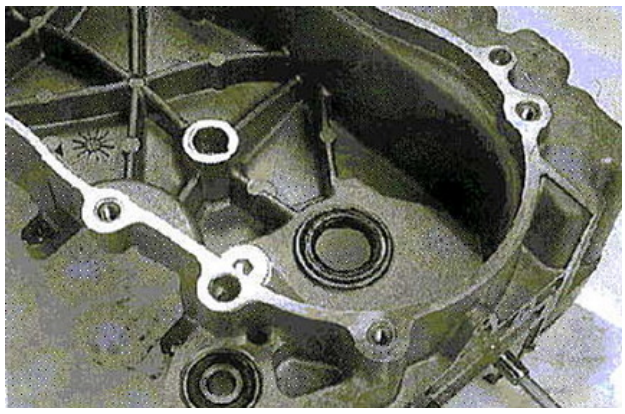
Remove gasket and dowel pins.
Scrape gasket residues off the crankcase contact surface.

⚠ Caution

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

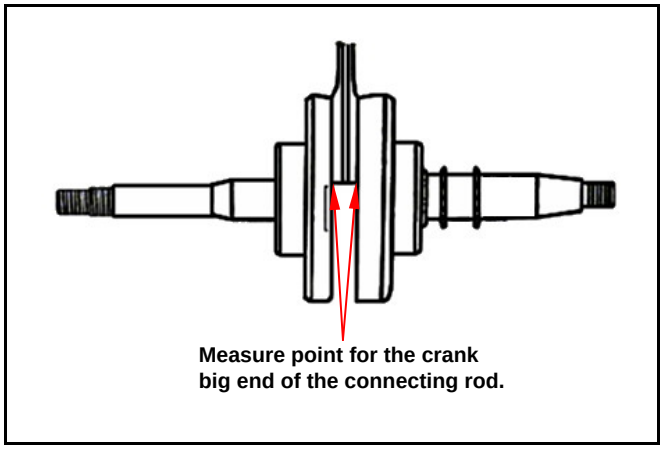


Check any damage in oil seal.
Replace with new one if damaged.

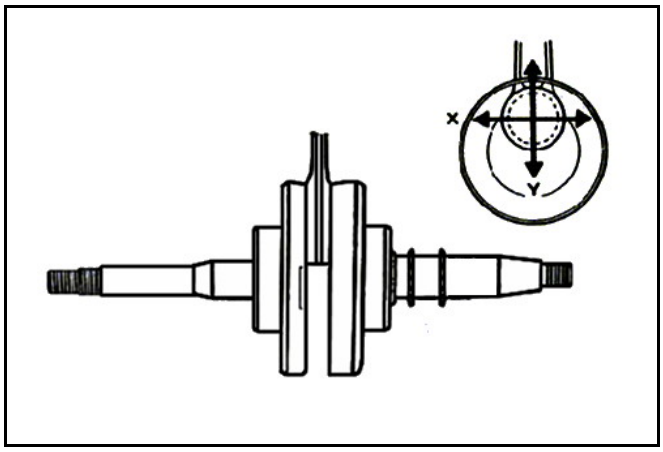


Crankshaft Inspection

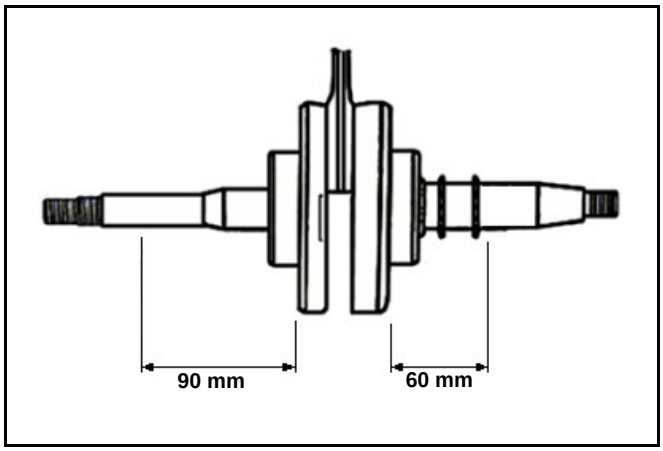
Use a thickness gauge to measure left and right clearance of connecting rod big end.
Service limit: 0.6 mm



Measure the clearance of the big end at the vertical directions.
Service limit: 0.05 mm



Place the crankshaft on a V-block, measure run-out of the crankshaft.
Service limit: 0.10 mm



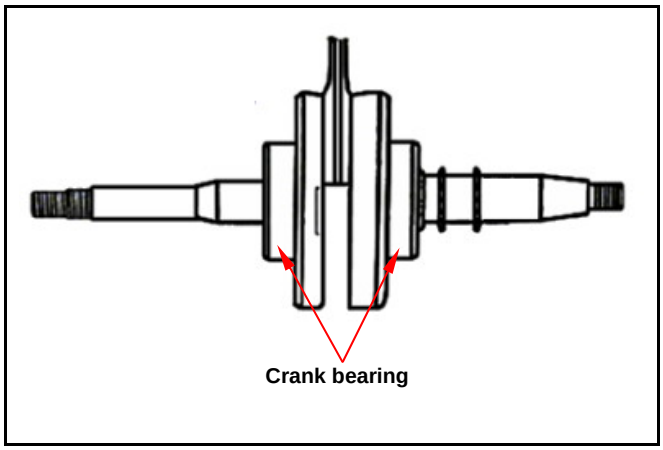
Check crankshaft bearing

Use hand to crank the bearing to see it moves freely, smoothly and noiseless.
Check the inner ring to see it links firmly on the bearing.
If any roughness, noise and loose linkage are detected, replace the bearing with new one.

⚠ Caution

The bearing shall be replaced in pair.

Special tool: outer bearing puller



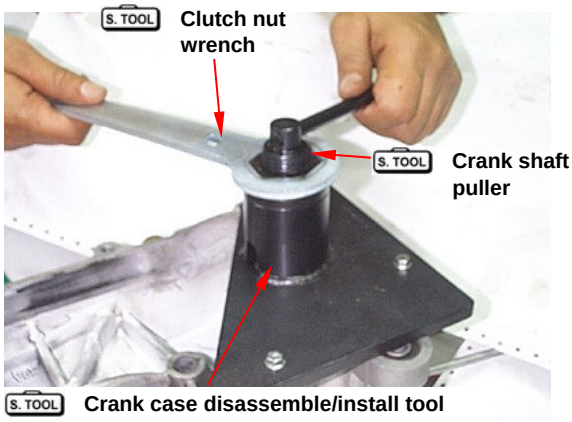
Crankcase Reassembly

Special tool:

R/L. crank case disassemble/install tool
L. crank shaft bearing driver
Crank shaft bearing fixing socket
Crank shaft puller
Clutch nut wrench

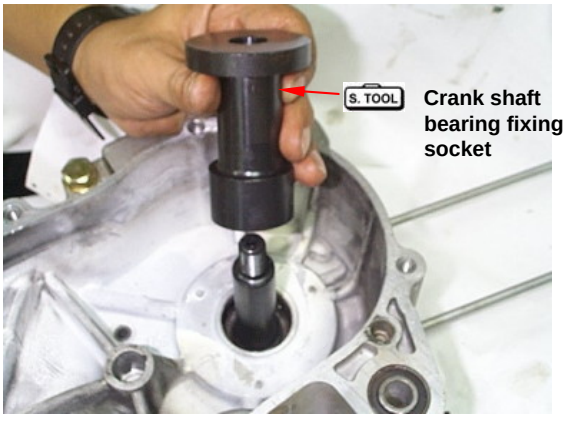
The new bearing and bearing driver, puts on the left crank case.

Install R/L. crank case disassemble/install tool on the left crank case.
Again turns on crank shaft puller on the bearing driver spiral tooth.
Gradually tightens the crank shaft puller upper cap nut, presses in the bearing to locate.
After the bearing presses in to locate, opens the R/L. crank case disassemble/install tool, takes down the bearing driver.



Installs crank to the left crank case.

Direct the crank shaft bearing fixing socket to crank shaft.



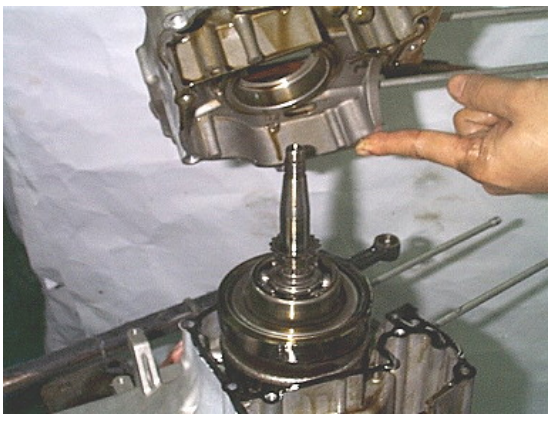
Install R/L. crank case disassemble/install tool on the left crank case.
Again turns on crank shaft puller on the crankshaft spiral tooth.

⚠ Caution

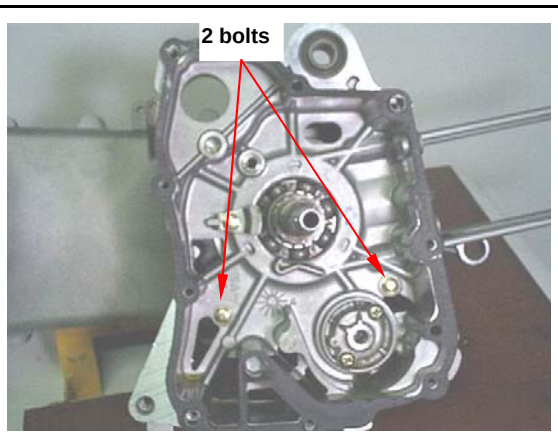
Crank shaft puller lock into on as far as possible the crank spiral tooth, prevented pulls the bad crank spiral tooth.

Gradually tightens the crank shaft puller upper cap nut, drags into the crank to locate.

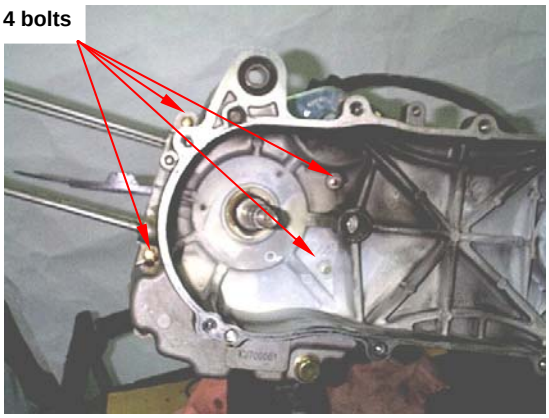
Install 2 new dowel pin and new gasket.
Install the right crankcase onto the left crankcase.



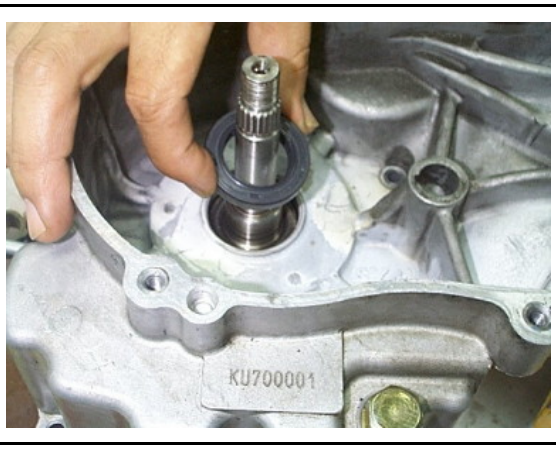
Tighten 2 bolts on the crankcase.
Torque value: 0.8~1.2kgf-m



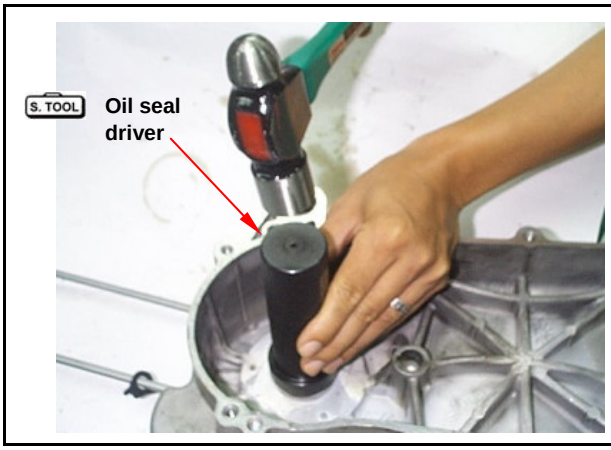
Tighten 4 bolts on the crankcase.
Torque value: 0.8~1.2kgf-m



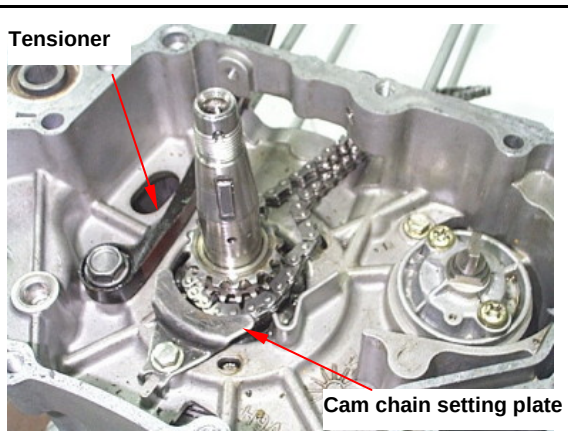
Clean the crankshaft.
Apply a layer of grease on the lip of oil seal, Puts on the left crank shaft.
Install the oil seal in the left crankcase with care not to damage the lip of the oil seal.



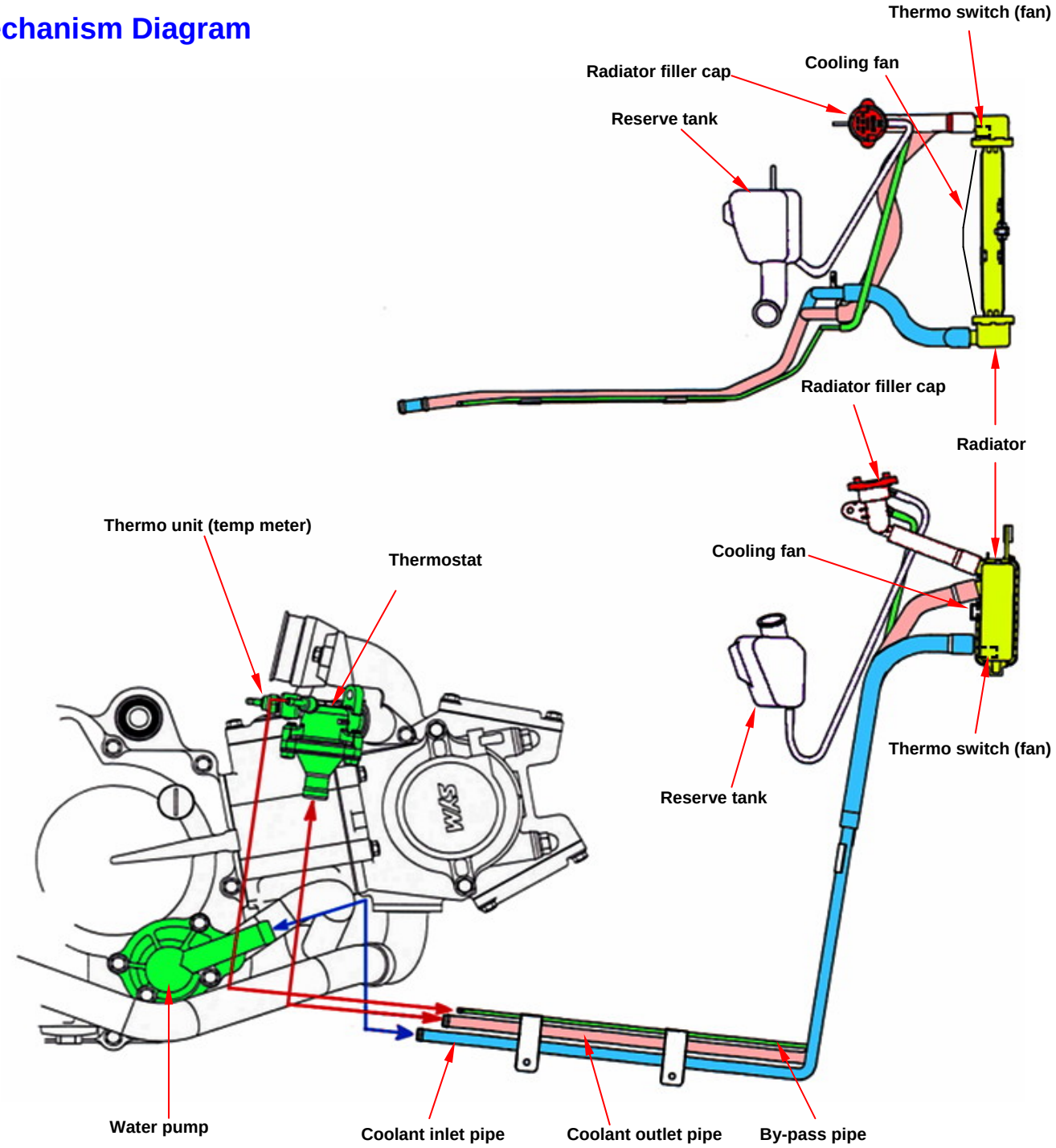
By oil seal driver (25×40×8), oil seal will knock into locate.
Special tool:
Oil seal driver (25*40*8)



Install the tensioner and tighten the bolts.
Torque value: 1.2 ~1.6kgf-m
Install the cam chain.
Install the cam chain setting plate.



Mechanism Diagram



Precautions in Operation

General

Warning:

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

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

Technical Specification

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

Torque Value

For water pump rotor 1.0~1.4kgf-m

Tools Requirement

Special tools

Water pump bearing driver (6901): SYM-9100100
Water pump oil seal driver (Inner): SYM-9120500-H9A
Water pump mechanical seal driver: SYM-1721700-H9A
Inner bearing puller: SYM-6204020

Troubleshooting

The engine temperature is too high

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

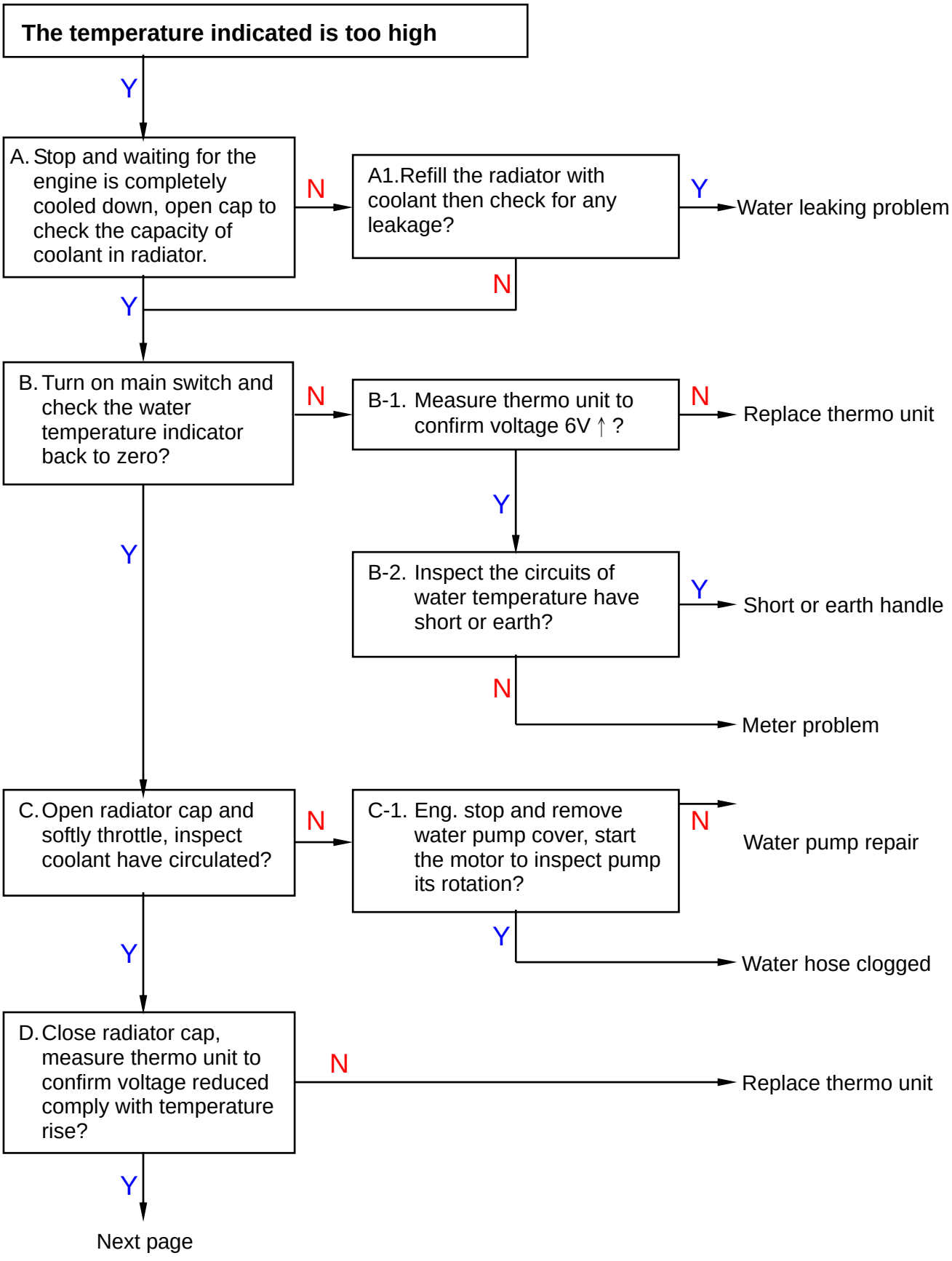
The engine temperature is too low

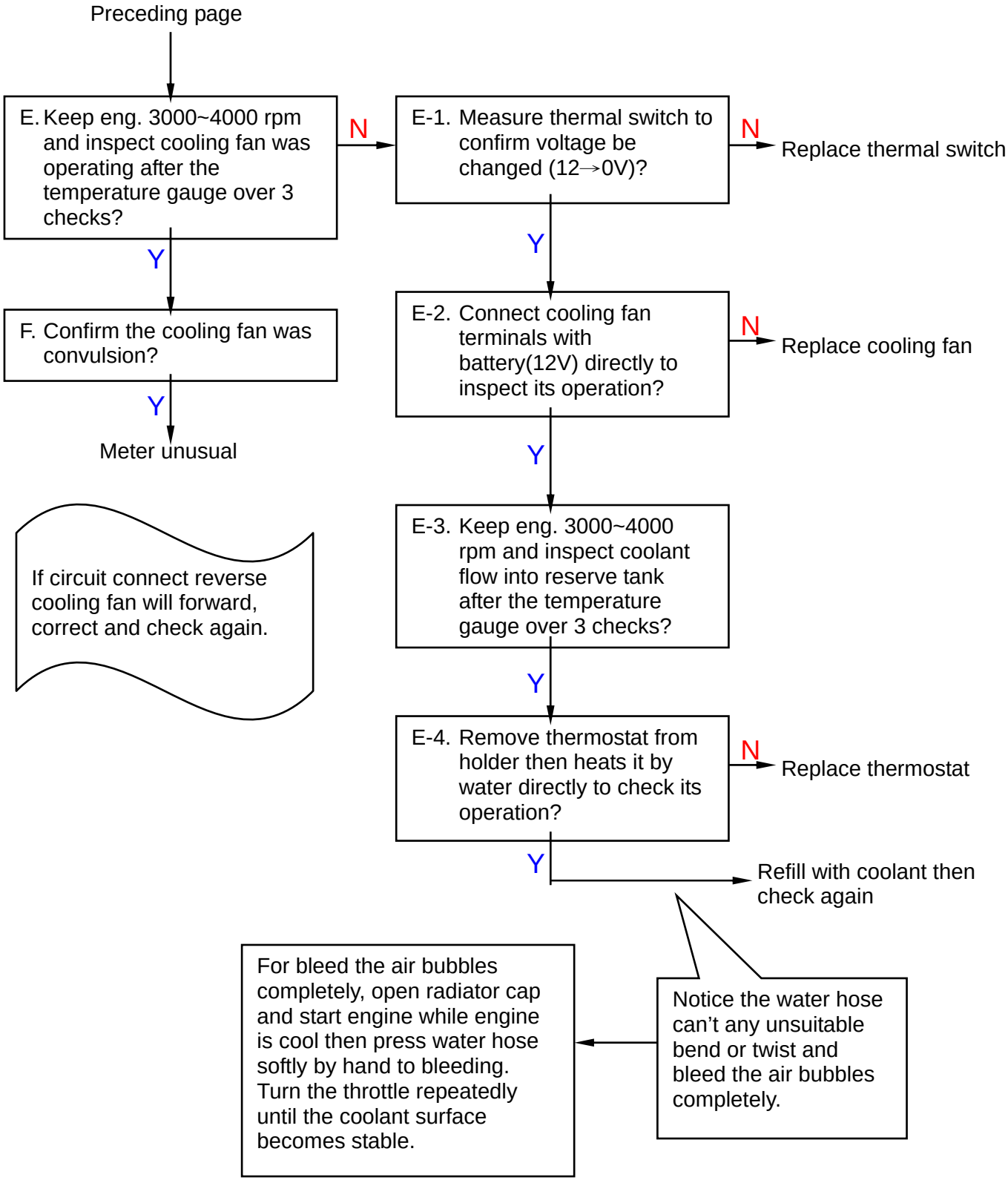
- The water thermometer and the temperature sensor malfunction.
- The thermostat is stuck to open.

Coolant is leaking

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

Trouble Diagnosis for Cooling System




Preceding page
E. Keep eng. 3000~4000 rpm and inspect cooling fan was operating after the temperature gauge over 3 checks?
N
E-1. Measure thermal switch to confirm voltage be changed (12→0V)?
N
Replace thermal switch
Y
Y
F. Confirm the cooling fan was convulsion?
E-2. Connect cooling fan terminals with battery(12V) directly to inspect its operation?
N
Replace cooling fan
Y
Y
Meter unusual
If circuit connect reverse cooling fan will forward, correct and check again.
E-3. Keep eng. 3000~4000 rpm and inspect coolant flow into reserve tank after the temperature gauge over 3 checks?
Y
E-4. Remove thermostat from holder then heats it by water directly to check its operation?
N
Replace thermostat
Y
Refill with coolant then check again
Notice the water hose can't any unsuitable bend or twist and bleed the air bubbles completely.
For bleed the air bubbles completely, open radiator cap and start engine while engine is cool then press water hose softly by hand to bleeding. Turn the throttle repeatedly until the coolant surface becomes stable.

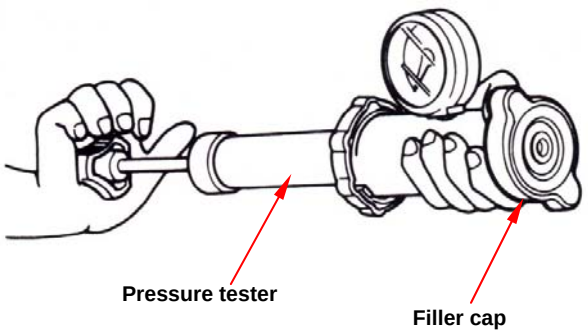
System Test

Test on the filler cap

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

Relief pressure for the filler cap: 0.75-1.05 kg/cm^2

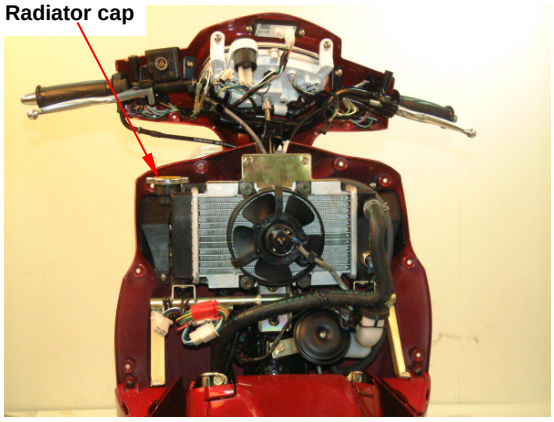
Apply pressure to the radiator, engine and water hose to check for any leakage



⚠ Caution

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

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



Change of coolant

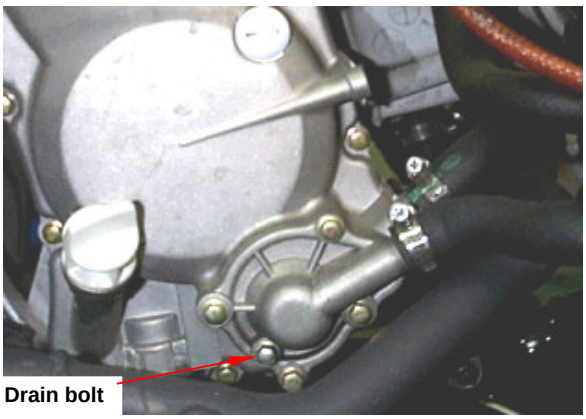
⚠ Warning

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

Remove the front cover, and then remove filler cap.

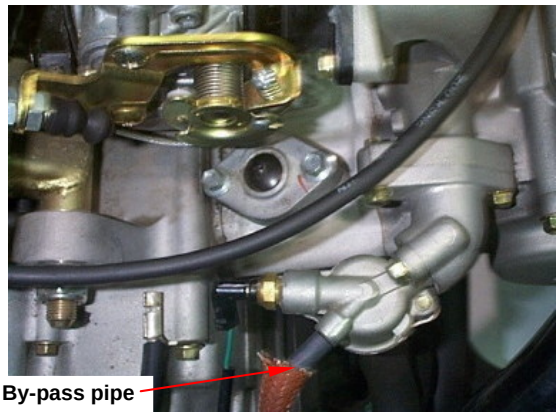
Place a water pan under the water pump, loosen the drain bolt to drain out the coolant.

Reinstall the drain bolt.



Refilling system with coolant and bleeding the air bubbles.

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



⚠ Caution

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

Coolant recommended: SYM Bramax radiator agent.

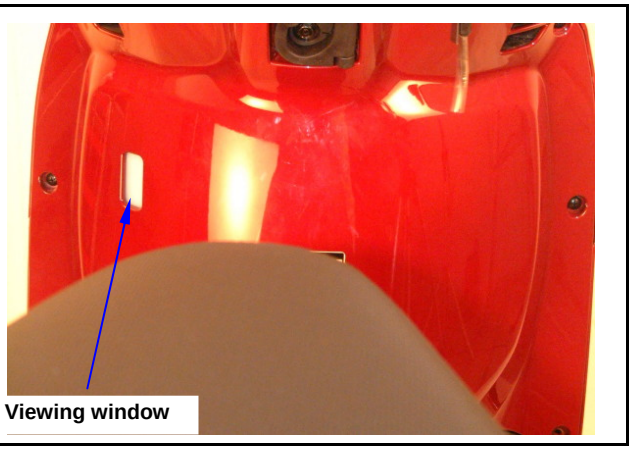
Concentration: 50%

Check reserve tank

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

Caution

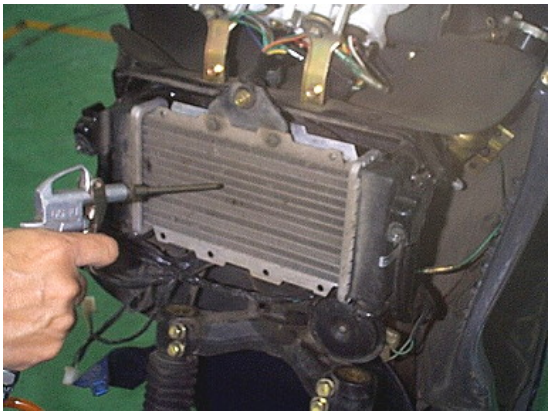
The reserve tank liquid level coca too is not high, after avoids the water temperature elevating, in the cooling system the refrigerant backflow floods.



Radiator

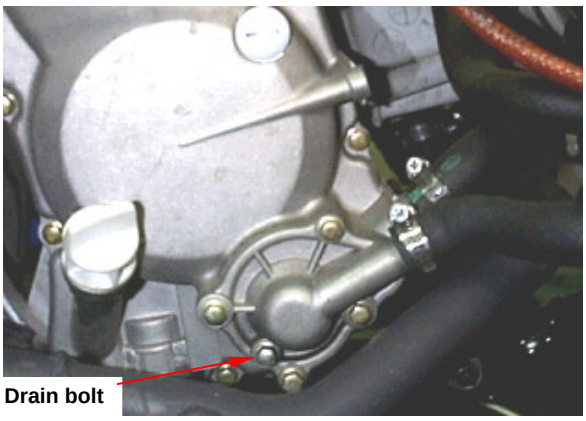
Check

Remove the front cover, check for any leakage from weld seam.
Blow radiator clean using compressed air. If the radiator is blocked by dirt, use low pressure water jet to clean it.
Care shall be taken when straightening the sink fan.

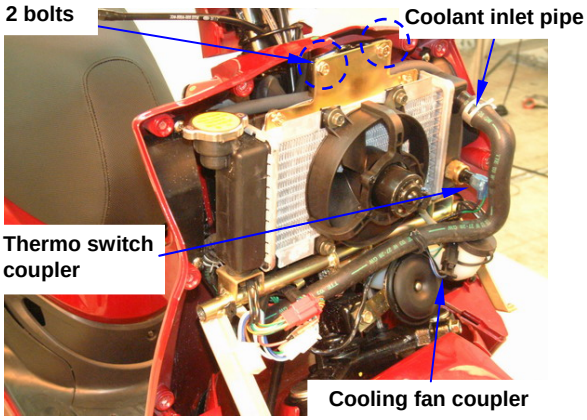


Removal

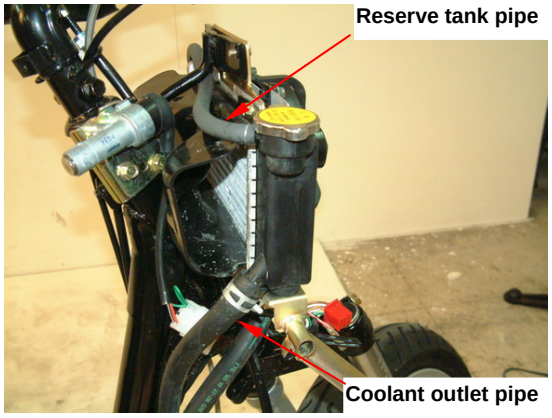
Coolant leakage
Sets at a vessel underneath the water pump, dismantles the drain bolt to leak off in the cooling system refrigerant.



Remove front cover.
Disconnect the couplers for the thermo switch and fan motor.
Remove coolant inlet pipe.
Loosen the radiator 2 bolts.

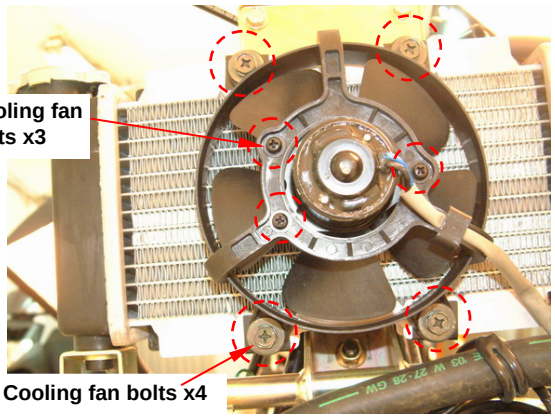


Remove coolant outlet pipe and reserve tank pipe, and then remove radiator and cooling fan.



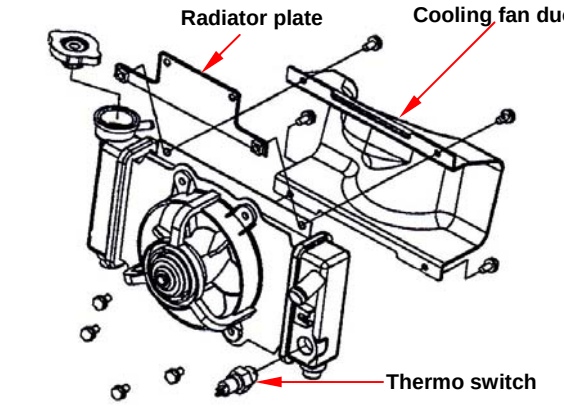
Disassembly

Loosen the 4 bolts from the fan duct, and then remove the fan duct and radiator plate.
Loosen the 4 bolts from the fan and remove the fan.
Loosen 3 screws from the fan motor, and take off the fan motor.
Remove nut to remove the fan from fan motor.



Assembly

Install fan motor onto fan shroud and insert the fan into the motor shaft.
Apply a coat of the adhesive to the shaft thread of the motor, and then install the washer and the lock nut.
Tighten the fan shroud onto the radiator with four bolts. Please refer to chapter 17 for the inspection of the thermo switch.



⚠ Caution

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

Installation

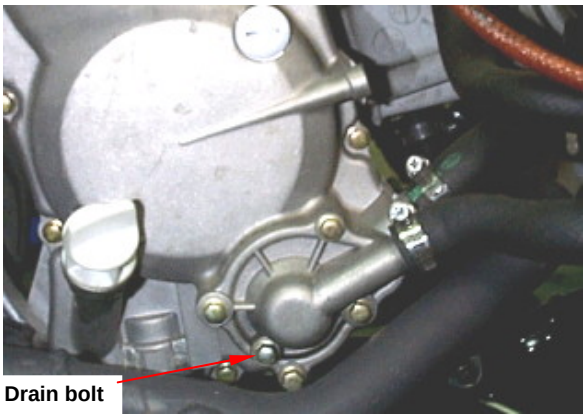
Install the removed parts in the reverse order of removal.
Install radiator in the reverse order of removal.
Upon completion, check for any leakage.

Water Pump

Check water pump seal / cooling system divulges inspection

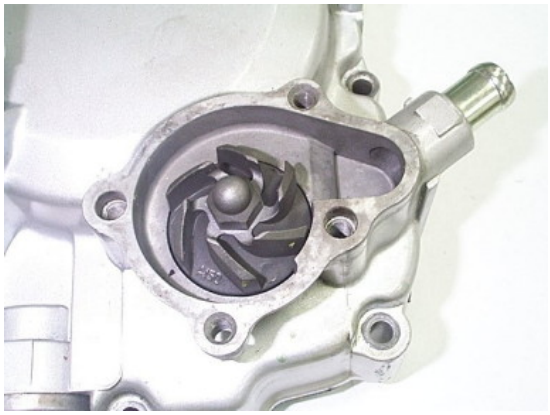
- Disassembles the refrigerant drain bolt, overflows little buckles the N actually fluid, confirmed overflows the refrigerant whether has the greasy dirt.
- Turns on lathe the engine oil gauge rule, the inspection engine oil whether does have bleaches situation of the emulsified.

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



Removal of water pump

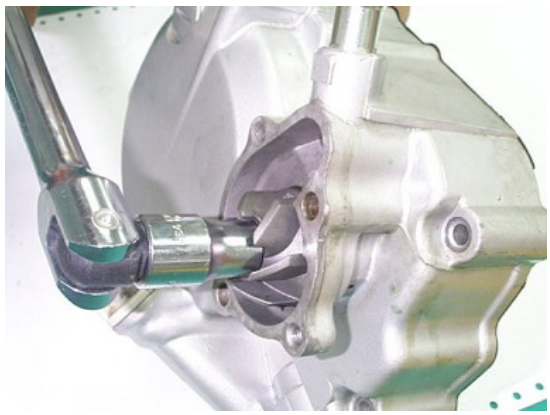
Loosen the drain bolt to drain out the coolant.
Remove the water hose.
Loosen three bolts and remove the pump cover.
Loosen 9 bolts and remove the right cover.
Take off the gasket and dowel pin.



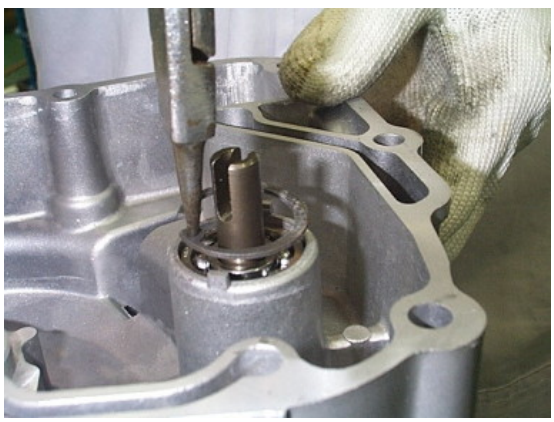
Turn pump rotor clockwise and remove.

⚠ Caution

The rotor is provided with left turn thread.



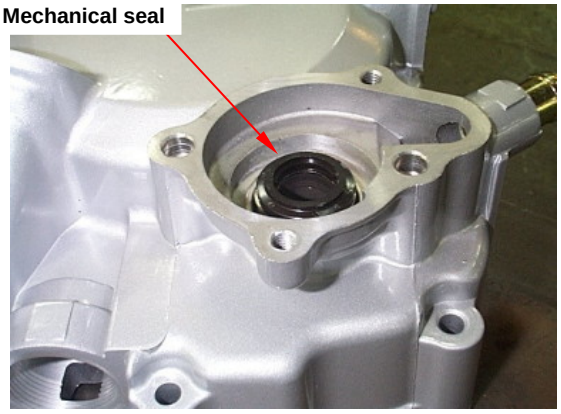
Remove the circlip from the right crankcase cover.
Remove the water pump shaft and the inner bearing.
Remove the outside bearing by inner bearing puller.
Rotate the inner ring of bearing, the bearing shall move smoothly and quietly.
If the bearing does not rotate smoothly or produces a noise, replace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



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

⚠ Caution

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



Replacement of Mechanical Seal

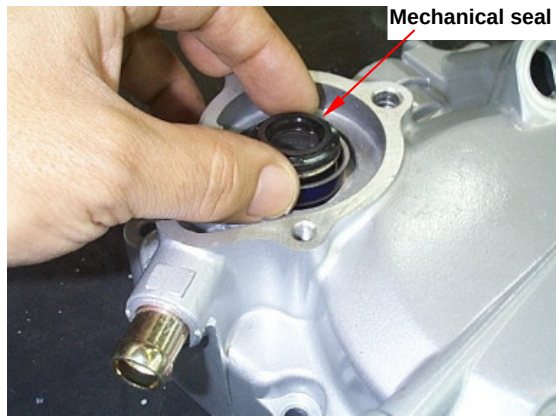
Remove the inside bearing by inner bearing puller. Drive the mechanical seal and inner seal out of the right crankcase.

Special tools:
Inner bearing puller
Water pump bearing driver

⚠ Caution

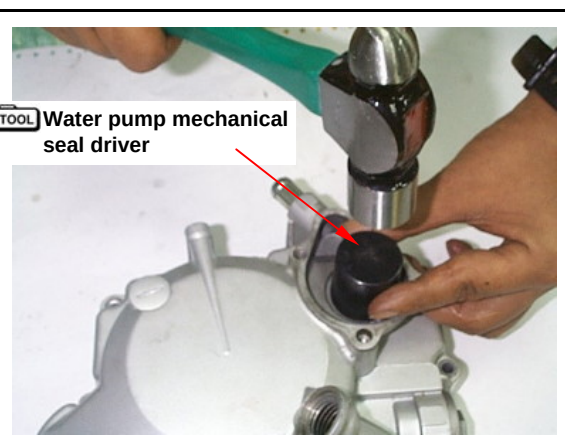
Replace a new mechanical seal after removing it.

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



Install the mechanical seal onto the right crankcase.

Special tools:
Water pump mechanical seal driver

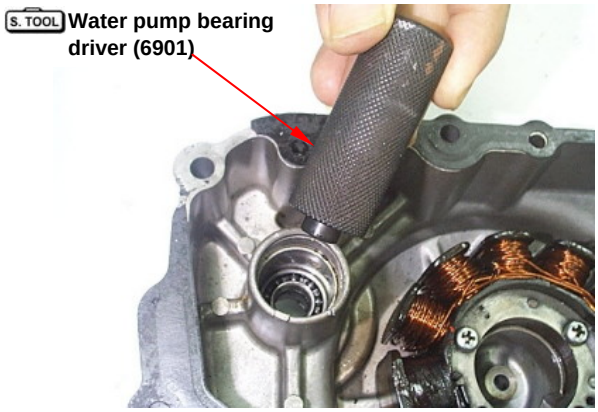


Install the new inner seal onto the right crankcase.
Special tools:
Water pump oil seal driver (inner)

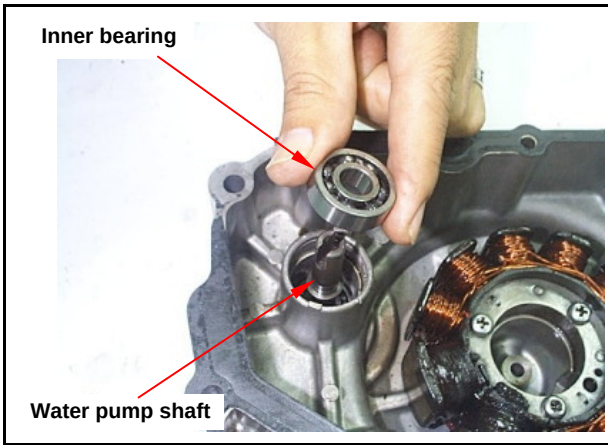
Install a new outside bearing to the right crankcase cover.
Special tools:
Water pump bearing driver (6901)

⚠ Caution

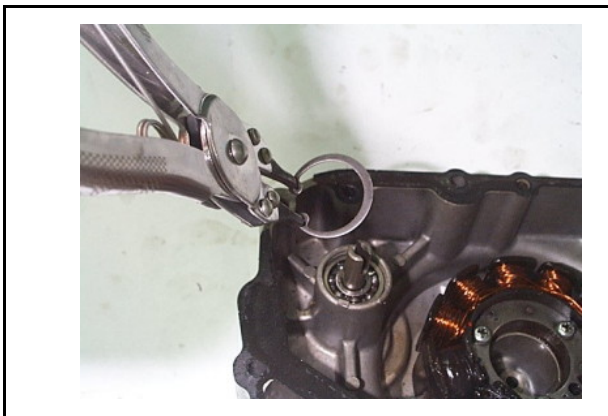
Do not reuse old bearing. It must be replaced with a new one once it has been removed.



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



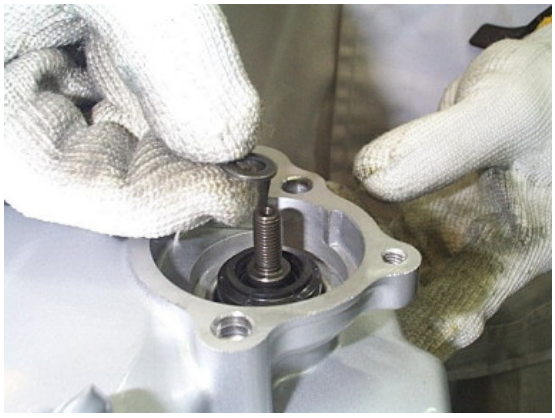
Install the circlip to hold the inner bearing.



Install the seal washer into the rotor.

Caution

Washer must be replaced together with the mechanical seal.

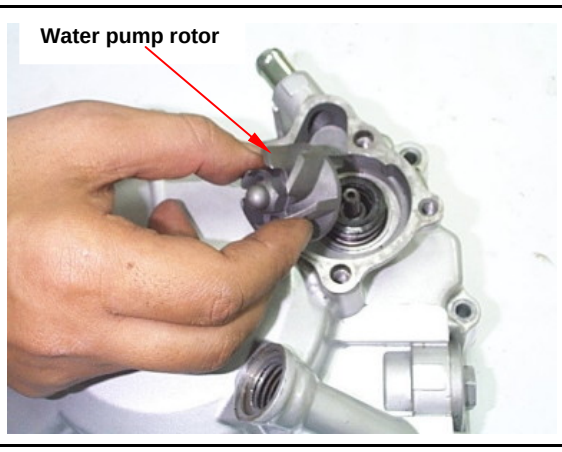


Install the rotor onto the water pump shaft and tighten.

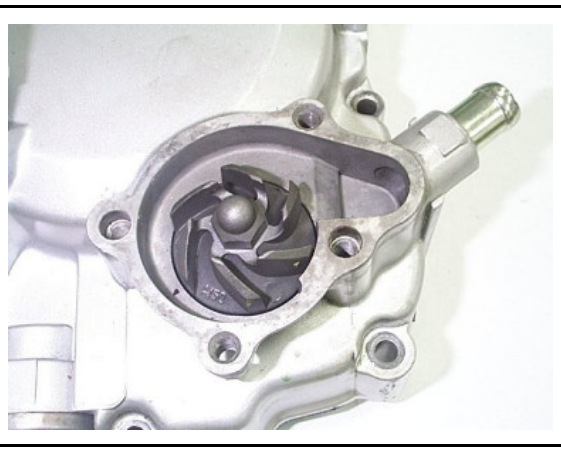
Torque Value: 1.0~1.4kgf-m

Caution

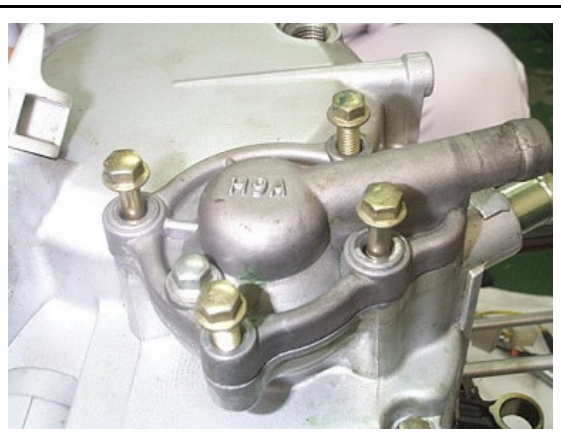
The rotor is left thread.



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



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

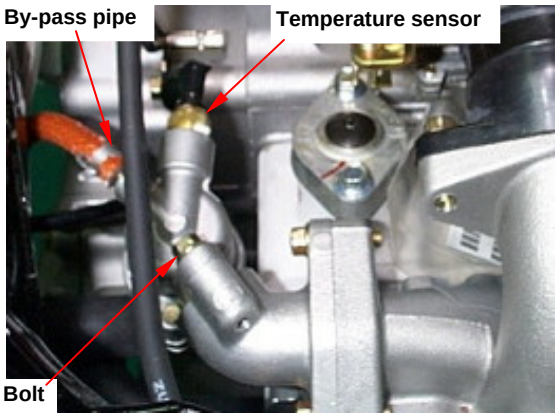


Thermostat

Please refer to chapter 17 for inspection of temperature sensor.

Removal

Remove the luggage box and body cover.
Drain out the coolant.
Disconnect the cable of temperature sensor.
Disconnect the by-pass pipe.
Remove the thermostat set. (1 bolt)

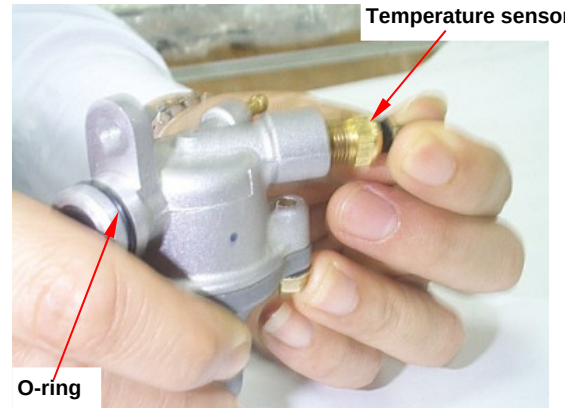


Installation

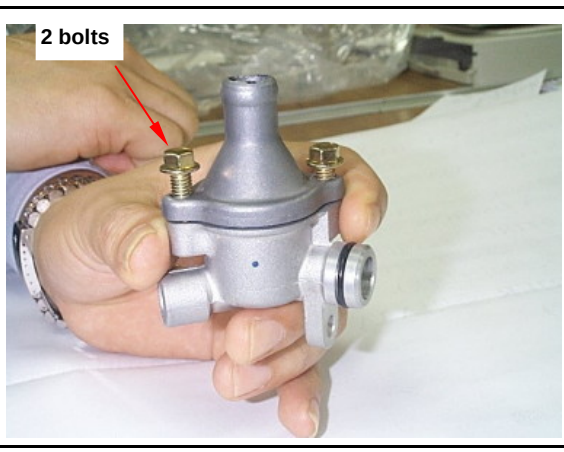
Apply a coat of sealant or equivalent to the thread of temperature sensor and install it on the holder.
Connect the cable to the temperature sensor.
Refill the coolant and bleed out the air bubble (Page 12-5).
Install the luggage box and body cover.

Disassembly

Remove the temperature sensor and O-ring from the thermostat body.



Remove 2 bolts and separate the thermostat body from the cover.



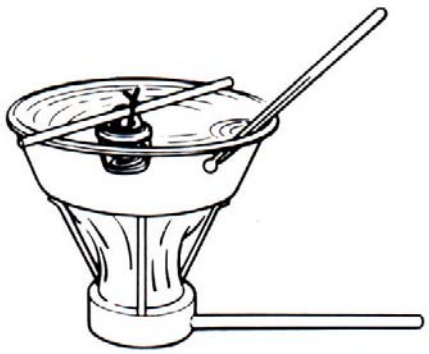
Remove the thermostat.

Inspection
Visually inspect thermostat for any damage.

Place the thermostat into heated water to check its operation.

⚠ Caution

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



Technical Data

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

Assembly
Install in reverse order of removal.

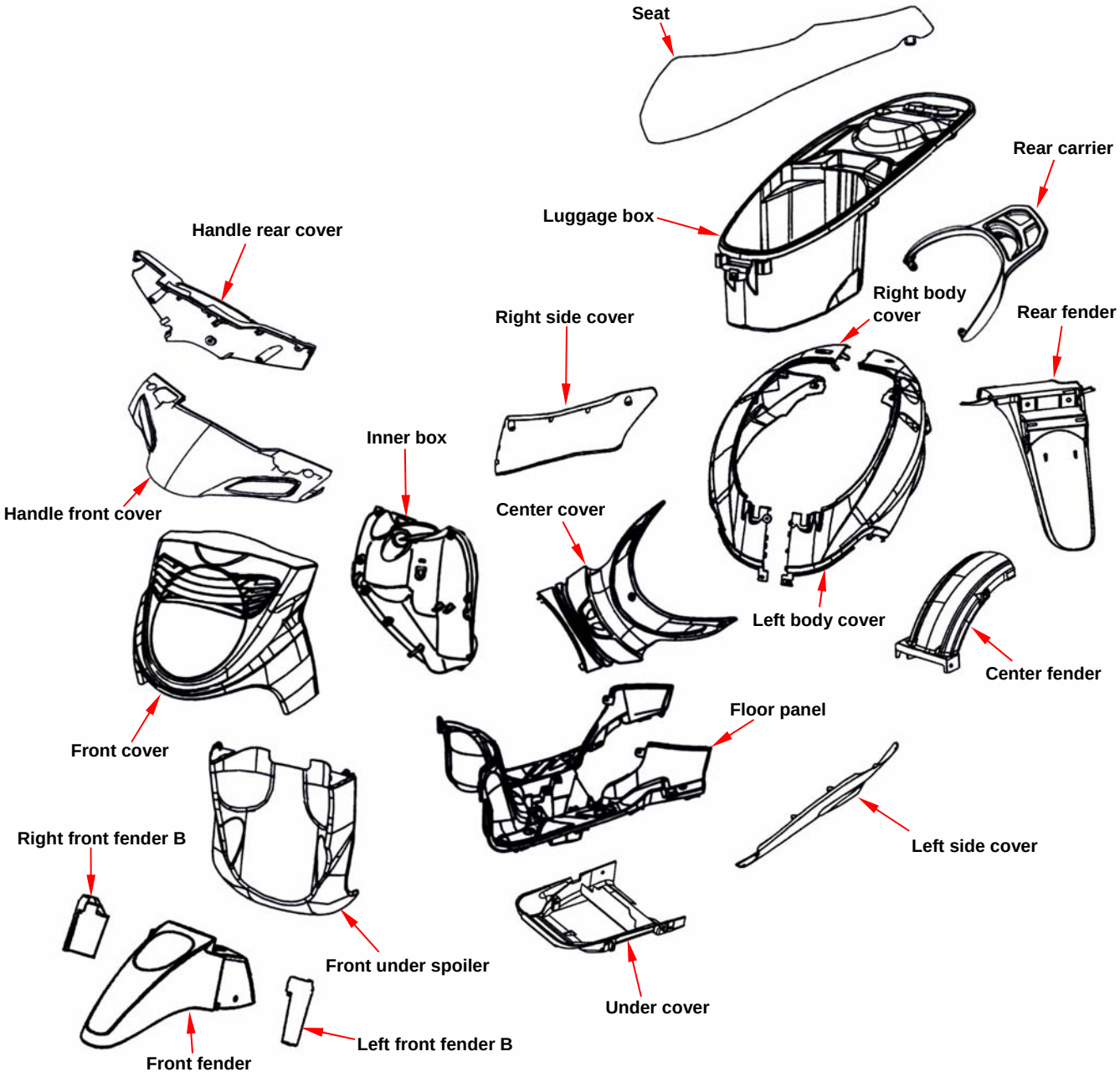
⚠ Caution

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

Refill the specified coolant as necessary.

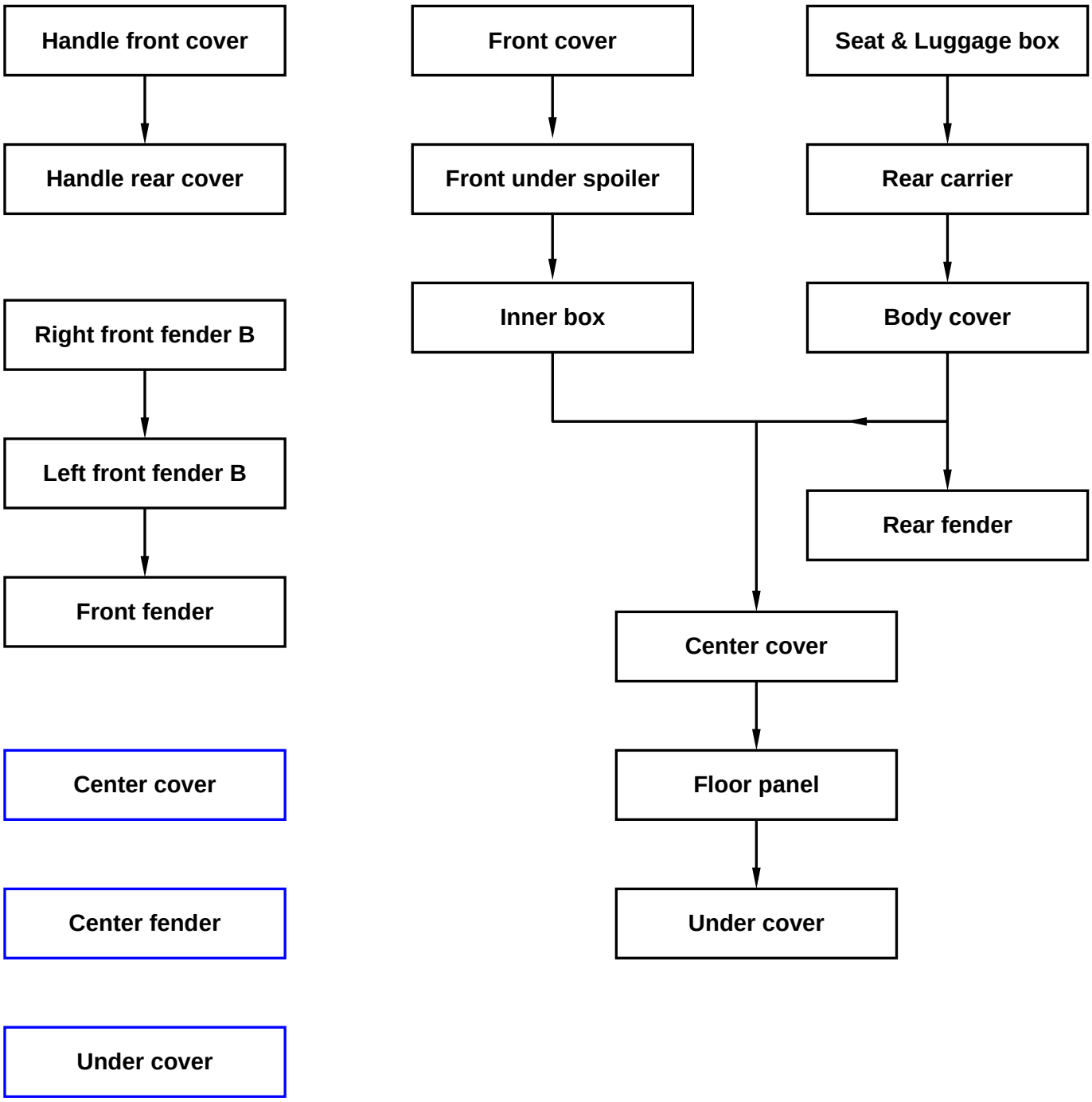
Notes:

Mechanism Diagram



Maintenance

Body covers disassemble sequence:

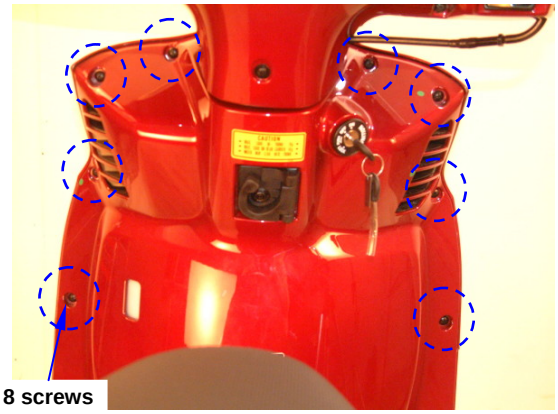


- Be careful not to damage various covers in assembly or disassembly operation.
- Never injure hooks molded on the body covers.
- Align the buckles on the guards with slot on the covers.
- Make sure that each hook is properly installed during the assembly.
- Never compact forcefully or hammer the guard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

Front Cover

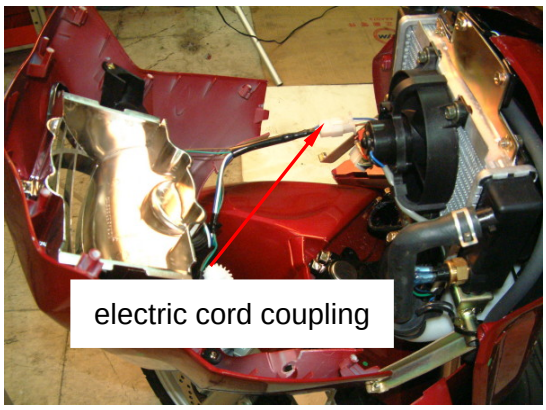
Removal

Loosen 8 screw frome the front cover.



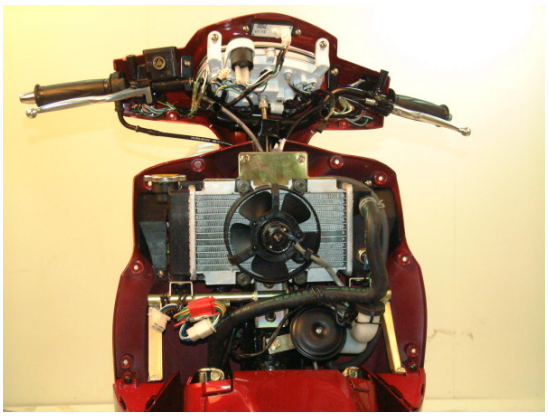
Loosen 2 screw bottom of front handle cover.

Remove headlight coupler, and then remove front cover.



Installation

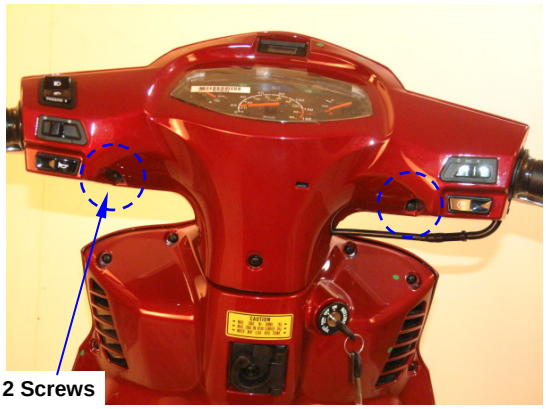
Install in reverse order of removal procedures.



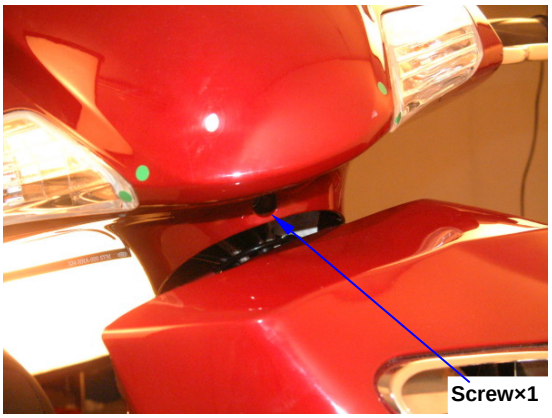
Handle Front Cover

Disassembly

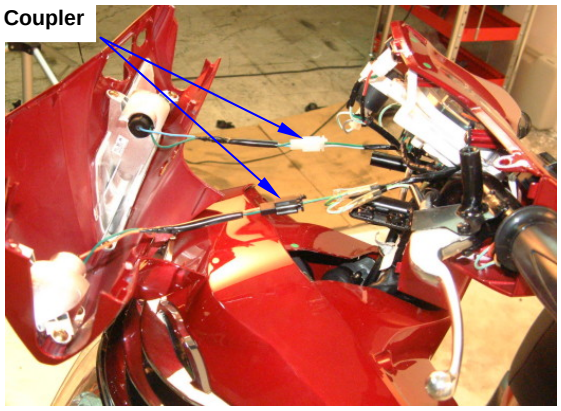
Loosen 2 screws from handle rear cover rear side.



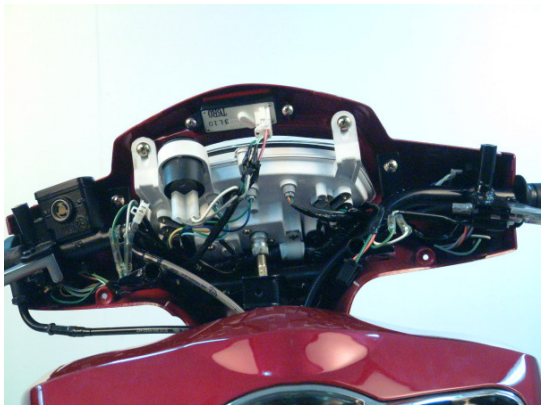
Loosen 1 screw from front handle cover.



Remove front winker light cord coupler.



Remove the handle front cover.



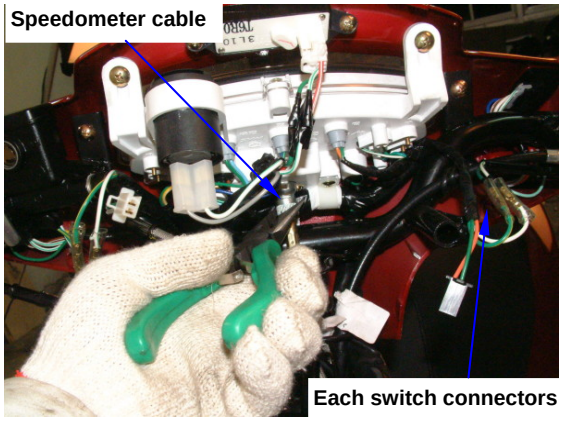
Handle Rear Cover

Remover

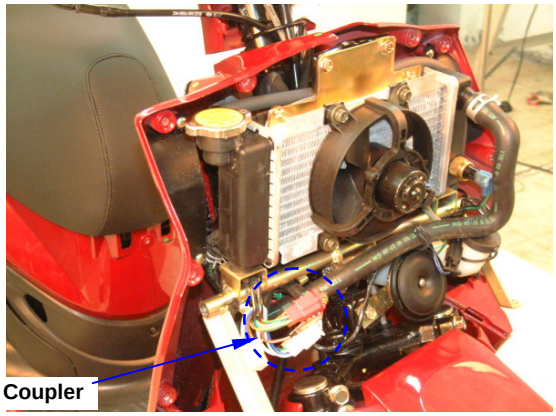
Remove front cover.

Remove speedometer cable.

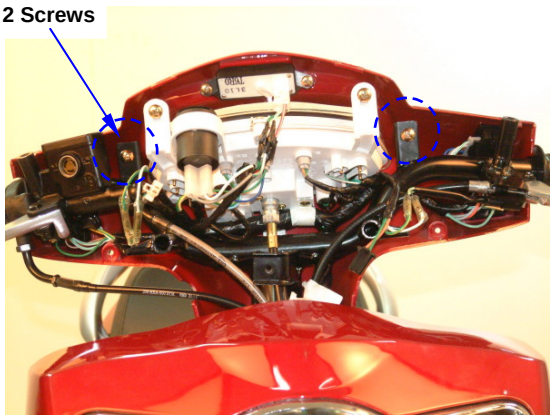
Disconnect each switch connectors.



Remove electric line coupler from the radiator.



Loosen 2 screws from the handle rear cover.



Loosen 1 screw from backside of the handle rear cover.

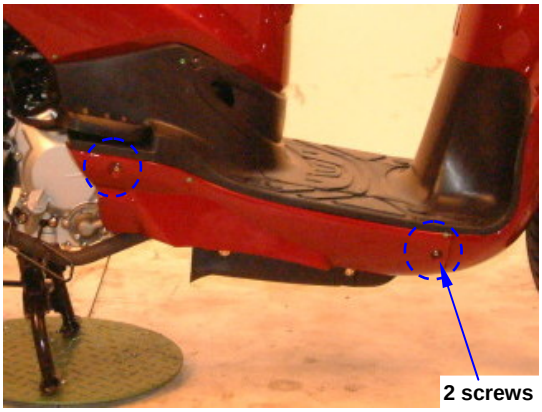
Remove handle rear cover.

Side Cover

Remove

Loosen 2 screws from the lift side cover.

Loosen 2 screws from the right side cover.



Remove the right & left side cover.

Installation

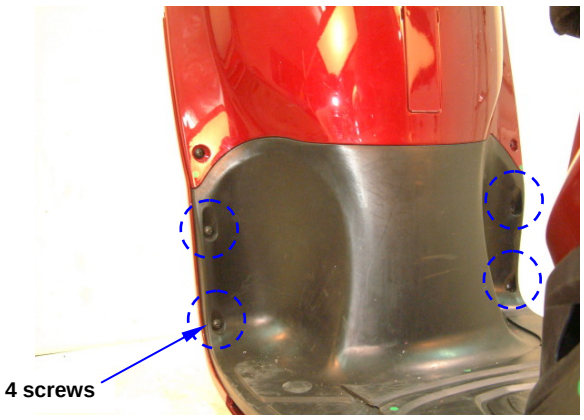
Install in reverse order of removal procedures.

Front Under Spoiler

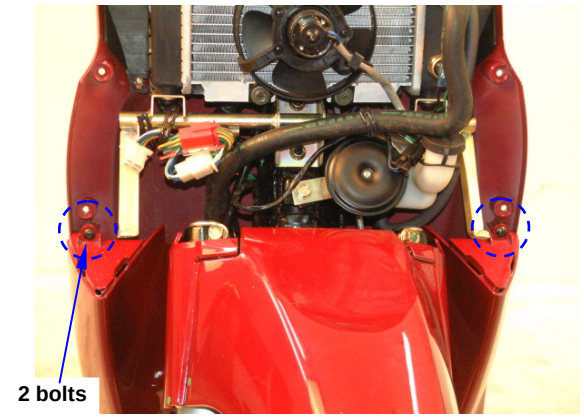
Remove

Remove front cover.

Loosen 4 screw of the inner box side.



Loosen 2 screws from front side of the front under spoiler.



Remove the front under spoiler.

Installation

Install in reverse order of removal procedures.

Luggage Box

Remove

Open seat.

Loosen 4 nuts & 2 bolt of the luggage box.

Loosen 1 screw from front side of the body cover.

Remove the luggage box.

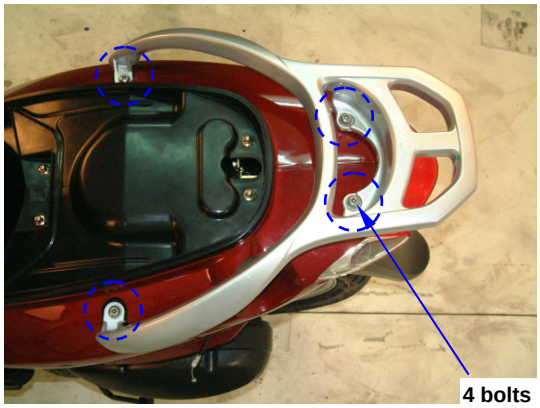
Installation

Install in reverse order of removal procedures.

Rear Carrier

Remove

Loosen 4 bolts from the rear carrier.



Remove the rear carrier.

Installation

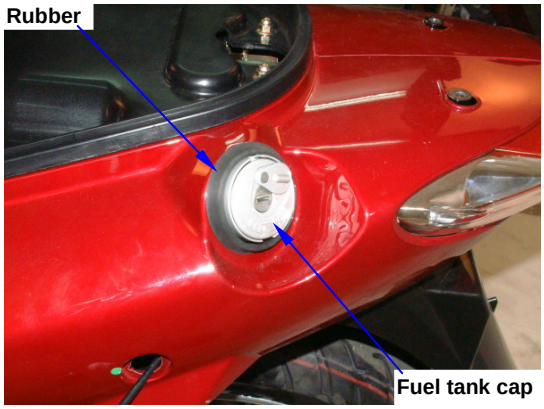
Install in reverse order of removal procedures.

Body Cover

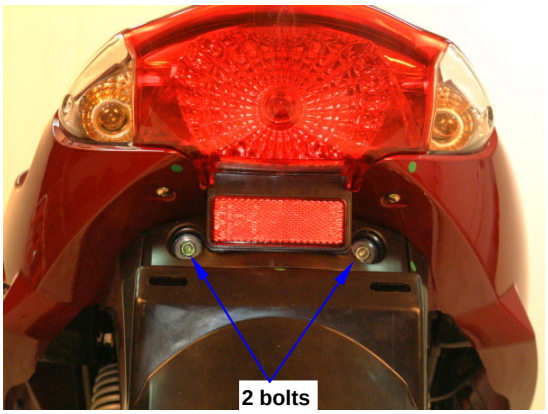
Remove

Remove luggage box and rear carrier.

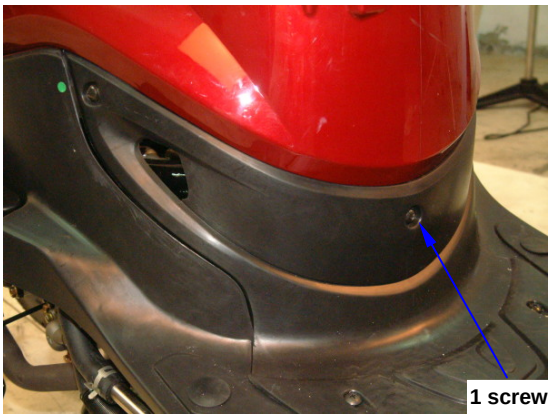
Remove the fuel tank cap and rubber.



Loosen 2 bolts from the taillight underneath.

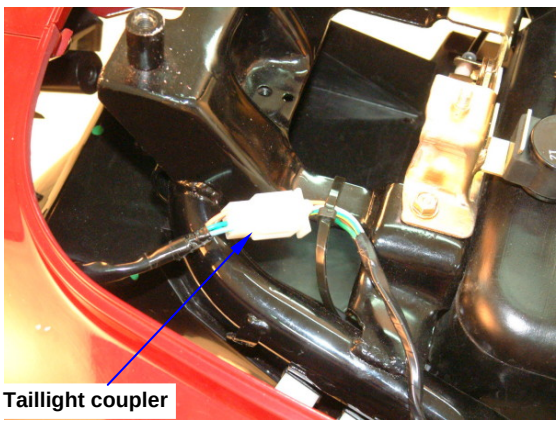


Loosen 1 screw from the center cover.



Remove electric line coupler from the taillight and seat look cable.

Remove right and left body covers.



Installation

Install in reverse order of removal procedures.

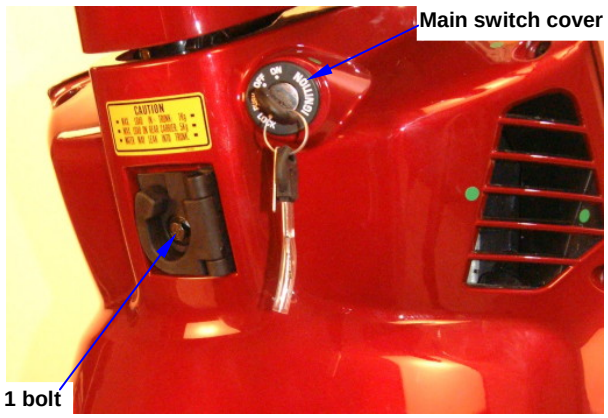
Inner Box

Remove

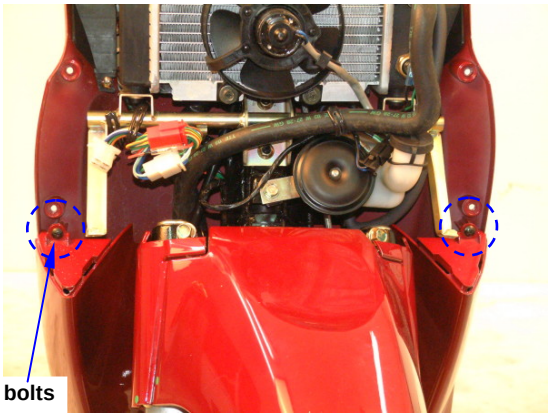
Remove the front cover.

Loosen 1 bolt from the setting at hook and remove the hook.

Remove main switch cover.



Loosen 2 screws from the under spoiler.



Remove the inner box.

Installation

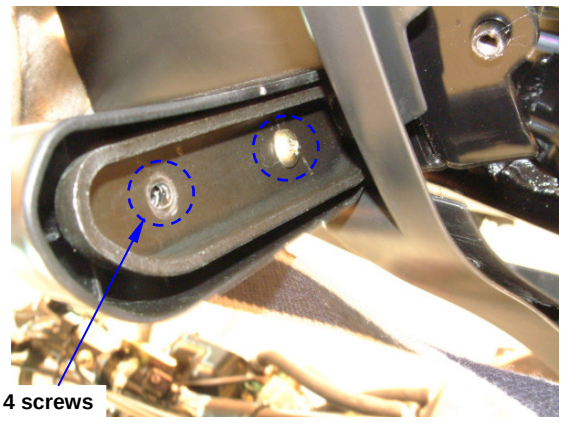
Install in reverse order of removal procedures.

Floor Panel

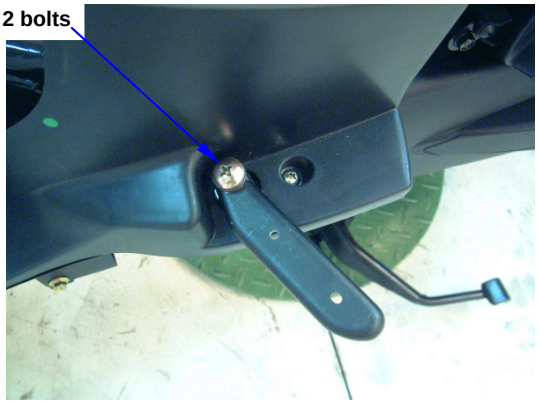
Remove

Loosen 4 screws from the right & left step bar.

Remove the right & left step bar covers.

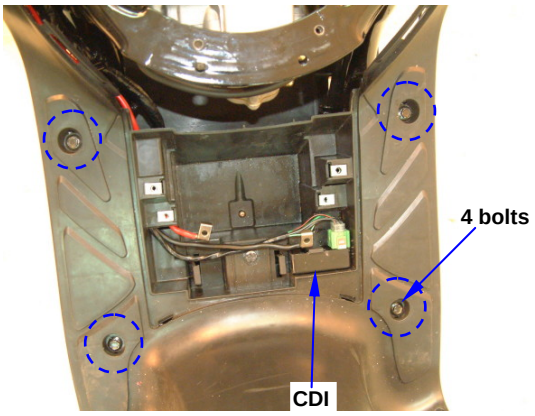


Loosen 2 screws from the right & left step bar, and then remove step bars.

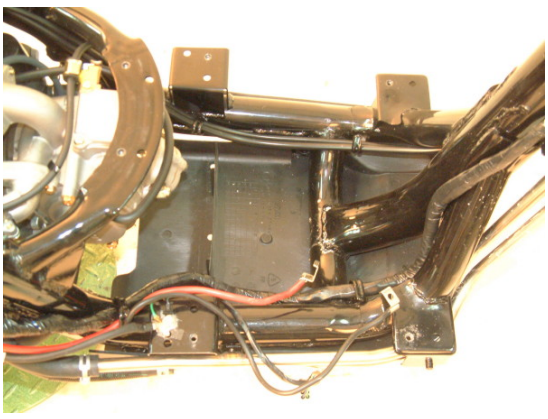


Remove the battery and CDI.

Loosen 4 bolts from the floor panel.



Remove the floor panel.



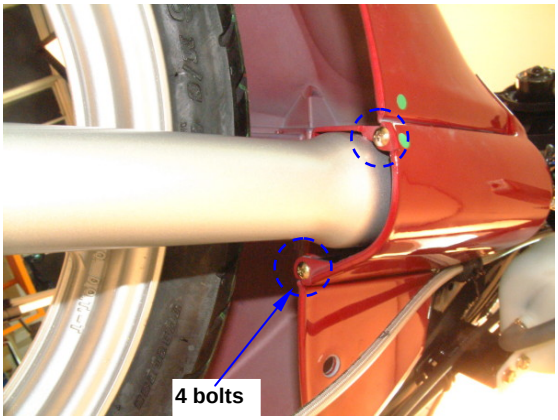
Installation

Install in reverse order of removal procedures.

Front Fender

Remove

Remove right & left front fender B. (4 bolts)

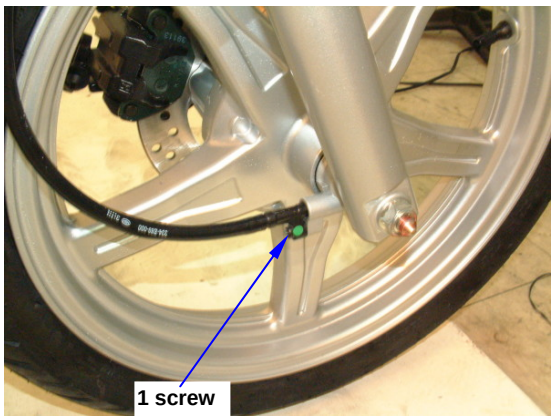


Upward pushes, after causes the tenon to fall off front, again takes out the front fender B.

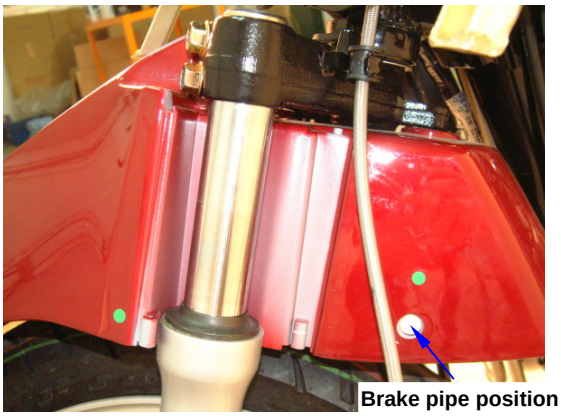
⚠ Caution

- When disassemble age must pay attention, whether the tenon is separated from.
- Cannot hardly pull out, is easy to create the tenon to break off.

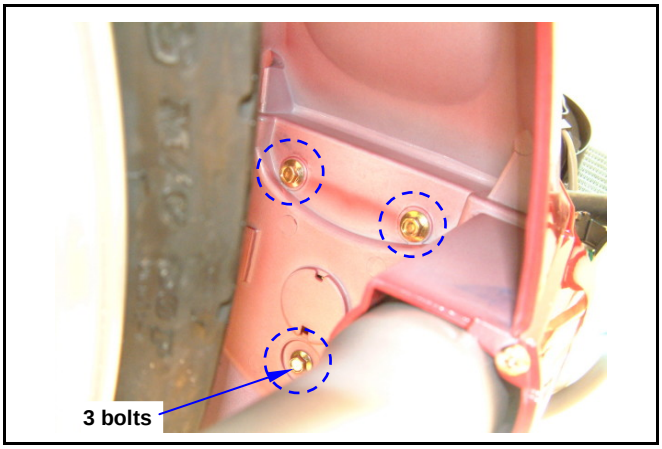
Remove speedometer cable. (1 screw)



From front fender left side remove brake pipe clip.



Use T flex socket wrench, remove front fender in upside bolt. (3 bolts)



Downward presses the front fender, will cause it to be separated from the front cushion, and then take down to front.

Installation

Install in reverse order of removal procedures.

Rear Fender

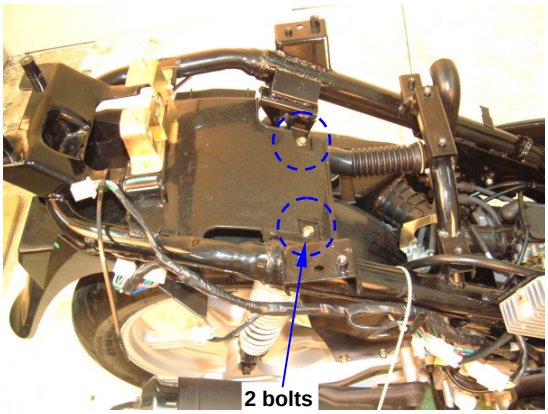
Remove luggage box and seat.

Remove rear carrier.

Remove body cover.

Remove fuel tank.

Remove rear fender upper side bolts. (2 bolts)



Remove rear fender.

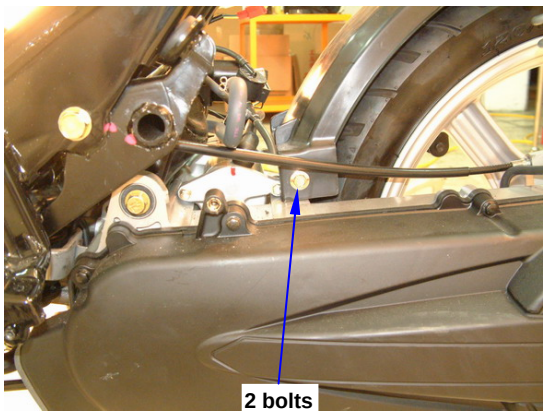
Installation

Install in reverse order of removal procedures.

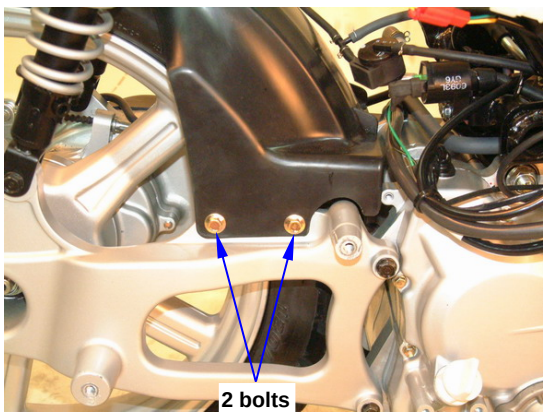
Center Fender

Remove air cleaner.

Remove center fender left side bolt. (1 bolt)



Remove center fender right side bolts, and then remove center fender. (2 bolts)

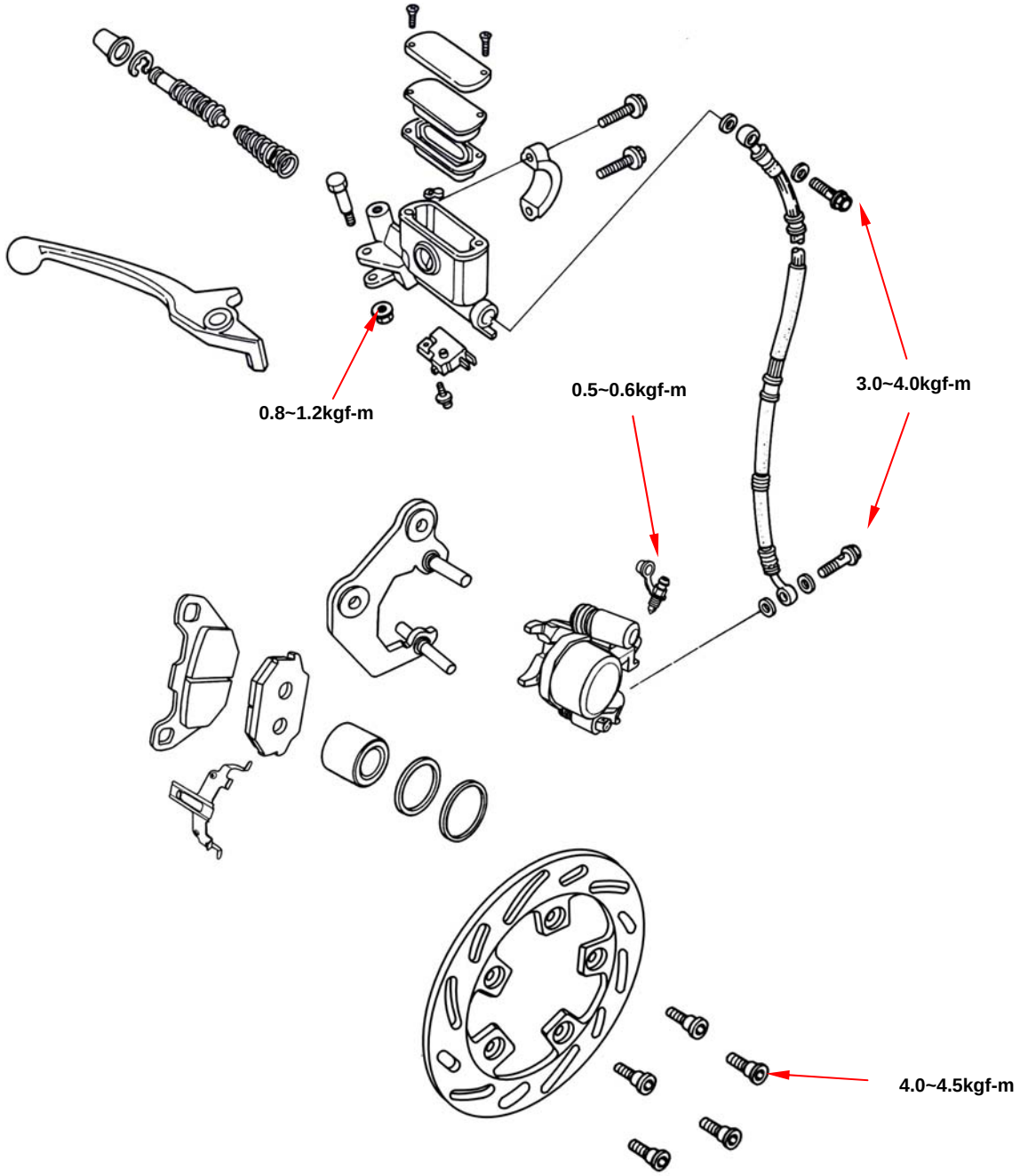


Installation

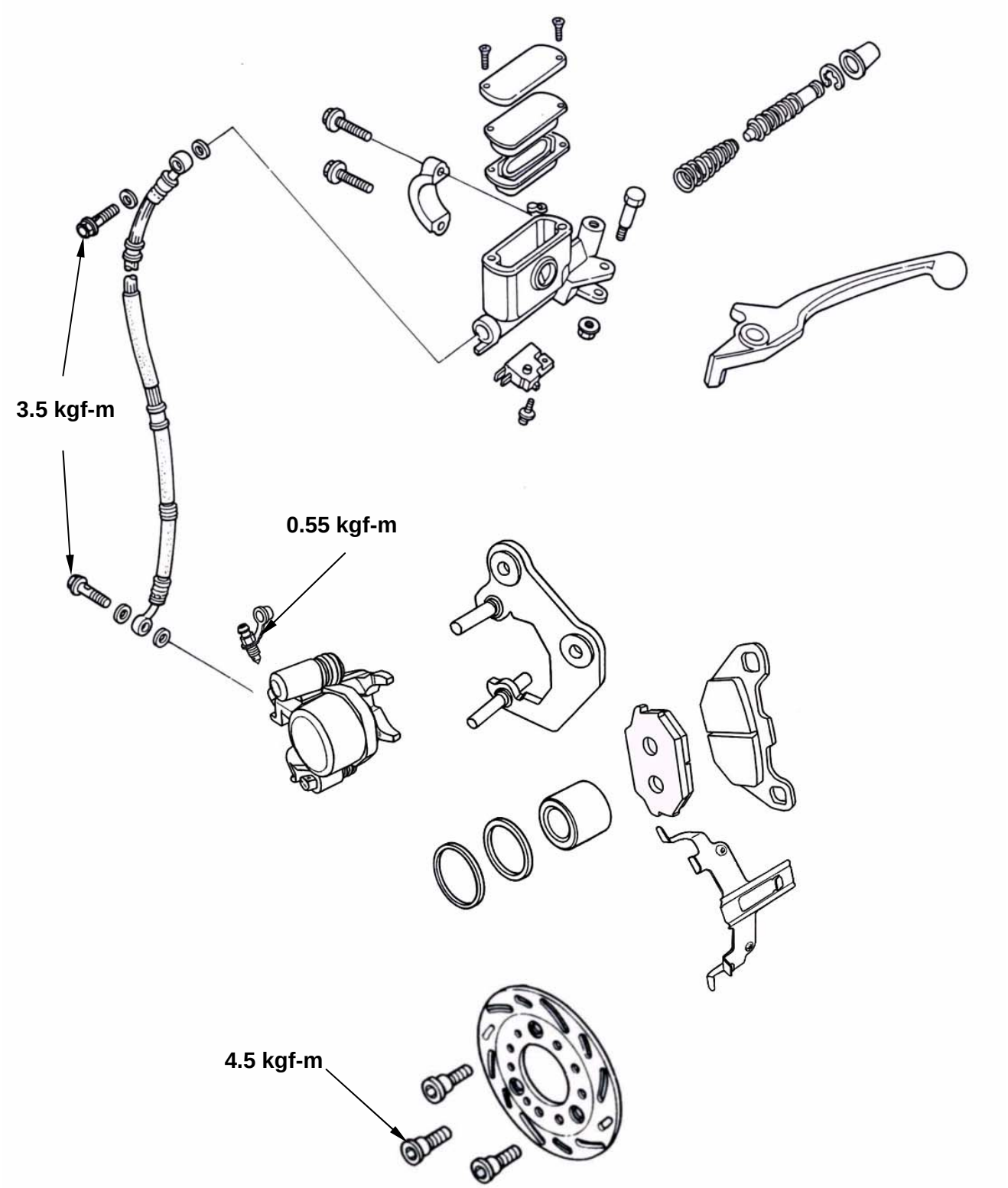
Install in reverse order of removal procedures.

Note:

Front Brake System Diagram



Rear Brake System Diagram



Precautions in Operation

⚠ Caution

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

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

Specifications

Item	Standard (mm)	Limit (mm)
The thickness of front and rear brake disk	4.000	2.500
Front and rear brake disk eccentricity	< 0.100	0.300
Master cylinder inner diameter	11.000 - 11.043	11.055
Master cylinder outer diameter	10.957 - 10.984	10.945
Diameter of front disk	220.000	-
Diameter of rear brake drum	130.000	-
Thickness of front brake lining	5.100	2.000
Thickness of rear brake lining	5.100	2.000

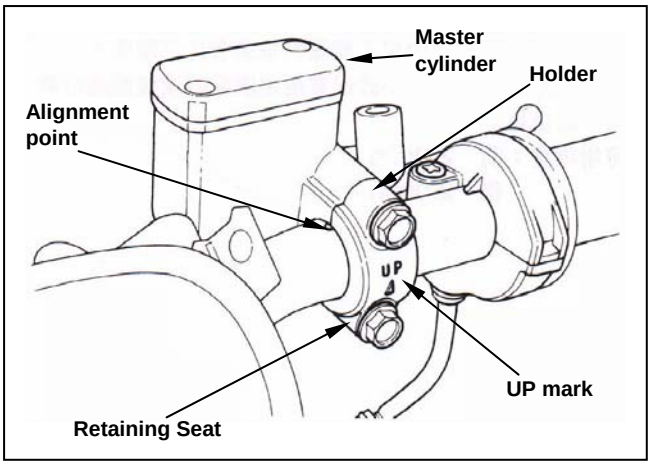
Torque values

Front brake hose bolts	3.0~4.0kgf-m
Bolt for front brake caliper	3.0~3.5kgf-m
Bolts for the front brake disk	4.0~4.5kgf-m
Brake lever nut	0.8~1.2kgf-m
Nut for the rear brake arm	0.5~0.6kgf-m
Air-bleed valve	0.5~0.6kgf-m

Troubleshooting

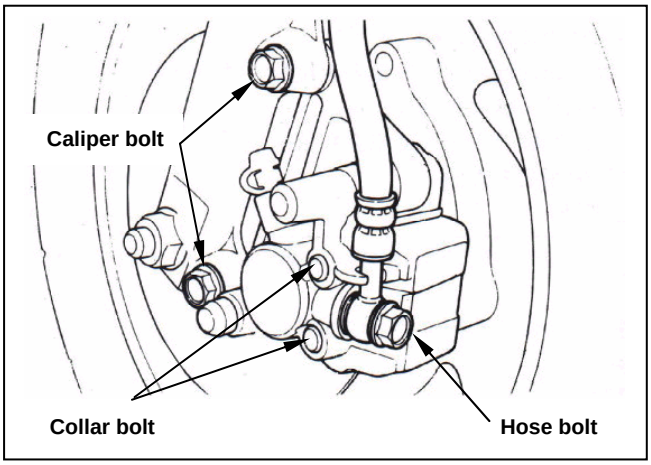
Soft brake lever

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



Hard operation of brake lever

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



Uneven brake

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

Tight brake

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

Brake noise

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

Hydraulic Disk Brake

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

Before the brake fluid reservoir is removed, turn the handle so that the brake fluid reservoir becomes horizontal, then remove the brake fluid reservoir.
Cover the painted surfaces, plastic or rubber components with a rag when servicing brake system.

⚠ CAUTION

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

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

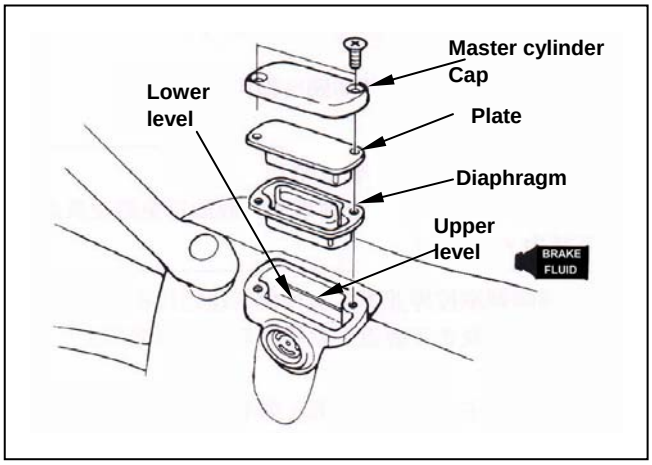
⚠ CAUTION

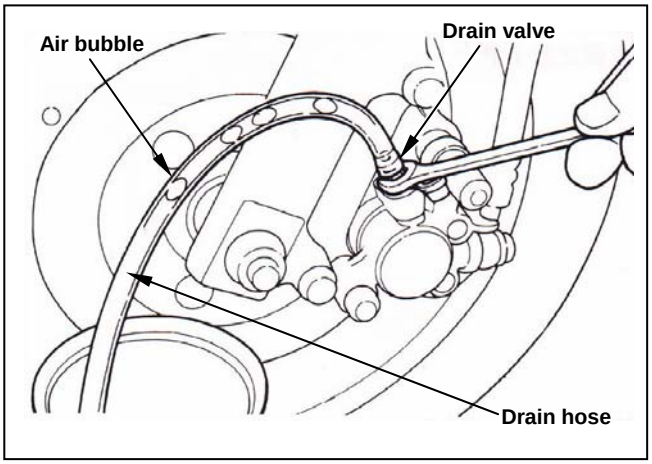
The dirty brake lining or disc will reduce the brake performance.

Refill up same brand brake fluid into the reservoir.

⚠ CAUTION

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





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

Recommended brake fluid: WELLRUN DOT 3 brake fluid

⚠ CAUTION

To reuse the spent brake fluid will effect brake performance.

Connect one end of transparent hose to the drain valve, and put the other end into a container.
Open the drain valve around 1/4 turns, and at the same time hold the brake lever until 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.

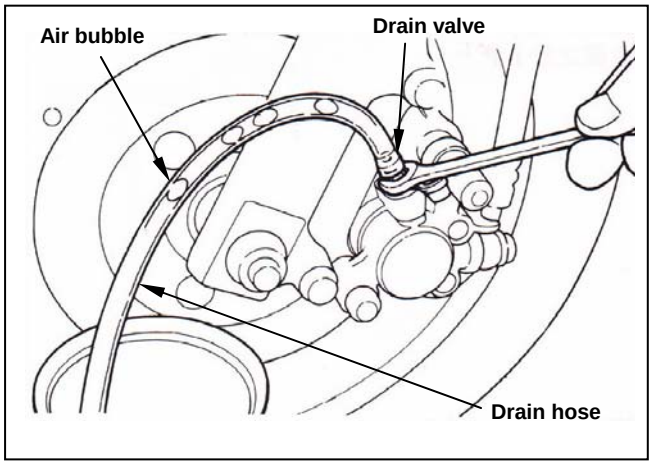
Air Bleed

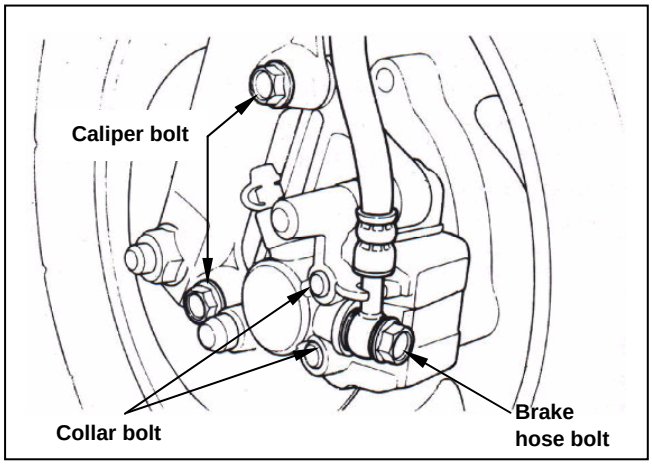
1. Tightly hold the brake lever and open the drain valve around 1/4 turns, and then close the valve.

⚠CAUTION

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

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





Brake Caliper

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

⚠ CAUTION

Do not spill brake fluid on painted surfaces.

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

Brake Caliper Installation

Install the brake caliper and tighten the attaching bolts securely.
Torque: 3.3 kg-m

⚠ CAUTION

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

Tighten the lining guide bolt.
Torque: 1.8 kg-m

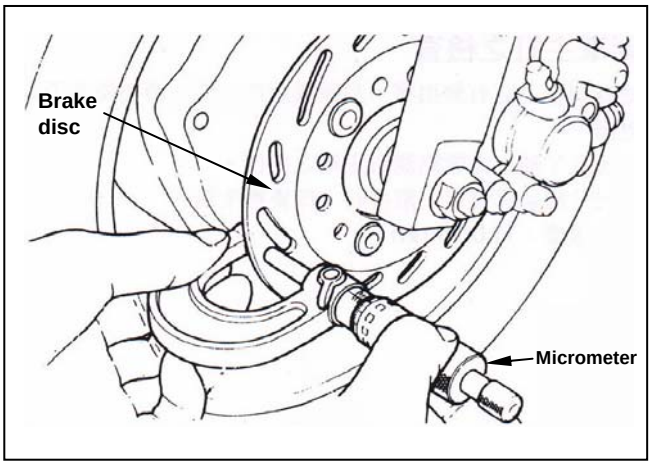
Install bolt cap.
Torque: 1.0 kg-m

Use two seal washers and hose bolts to lock the hose and brake calliper in place.
Torque: 3.5 kg-m

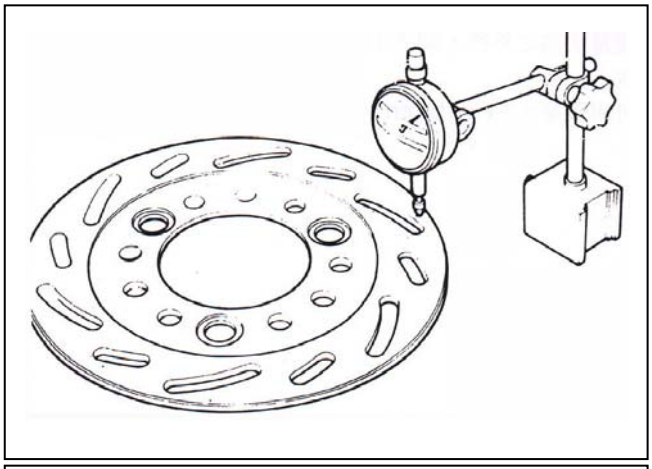
Refill up the brake fluid to the reservoir and make necessary air bleeding.

Brake Disk Inspection

Visually check the brake disc for wear or break.
Measure the thickness of the disc at several places. Replace the disc if it has exceeded the service limit.
Allowable limit: 2.0 mm



Remove the brake disc from wheel.
Check the disc for deformation and bend.
Allowable limit: 0.30 mm



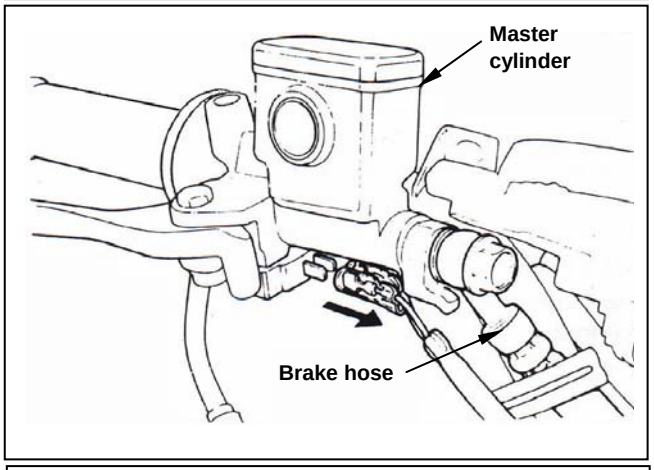
Brake Master Cylinder

⚠ CAUTION

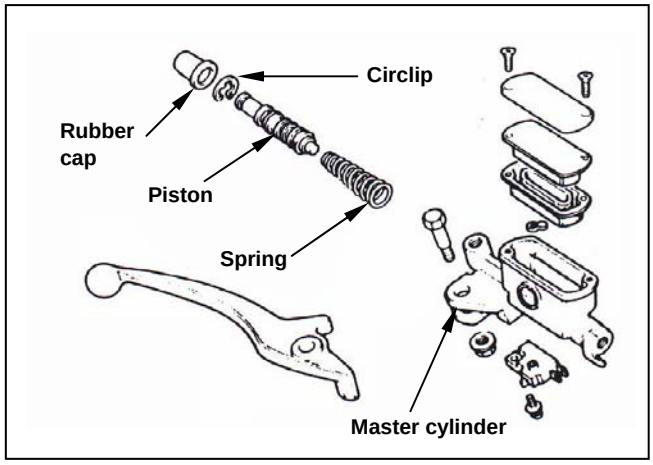
Do not let foreign materials enter into the cylinder.

⚠ CAUTION

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

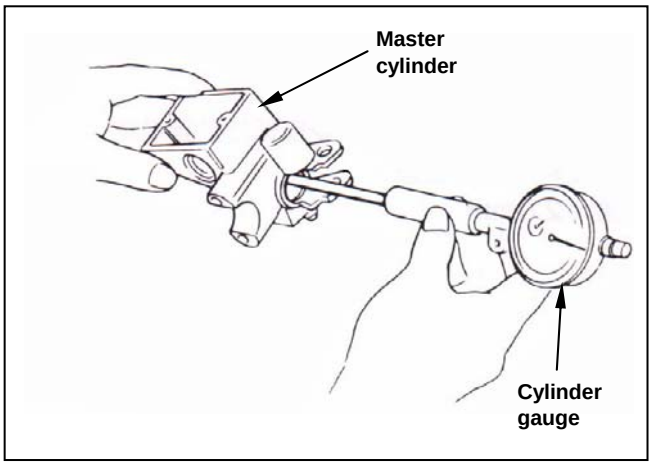


Remove the front and rear handlebar guards.
Remove the wires of brake lamp switch.
Drain out the brake fluid.
Remove the brake lever from the brake master cylinder.
Remove the brake hose.
Remove the master cylinder seat and the master cylinder.
Remove the rubber pad.
Remove the circlip.
Remove the piston and the spring.
Clean the master cylinder with recommended brake fluid.

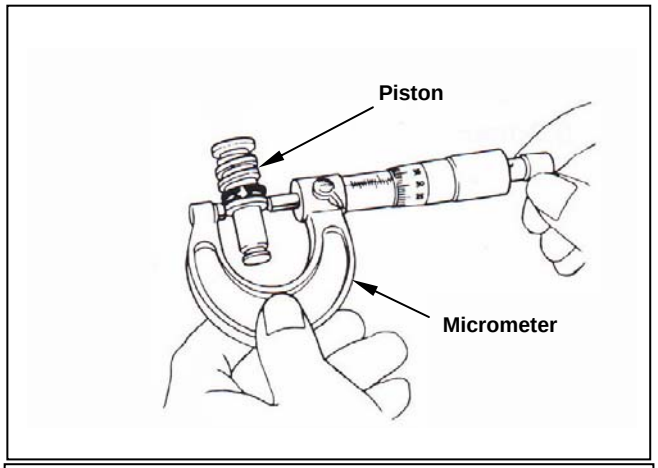


Master Cylinder Inspection

Check the master cylinder for damage or scratch. Replace it if necessary.
Measure the cylinder inner diameter at several points along both X and Y directions.
Replace the cylinder if the measured values exceed allowable limit.
Allowable limit: 11.055 mm



Measure the outer diameter of the piston.
Replace the piston if its measured value exceeds allowable limit.
Allowable limit: 10.945 mm

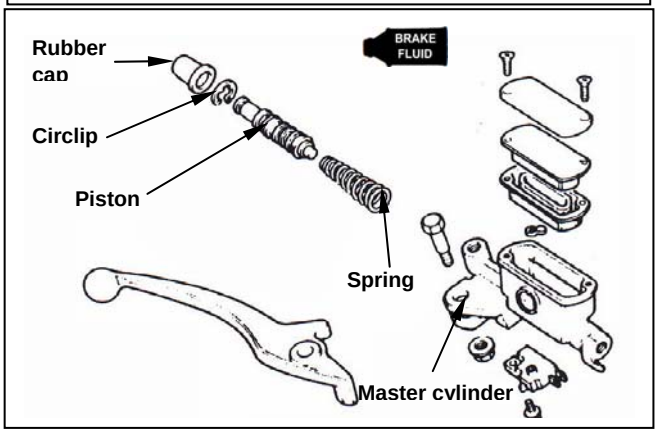


Master Cylinder Assembly

⚠ CAUTION

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

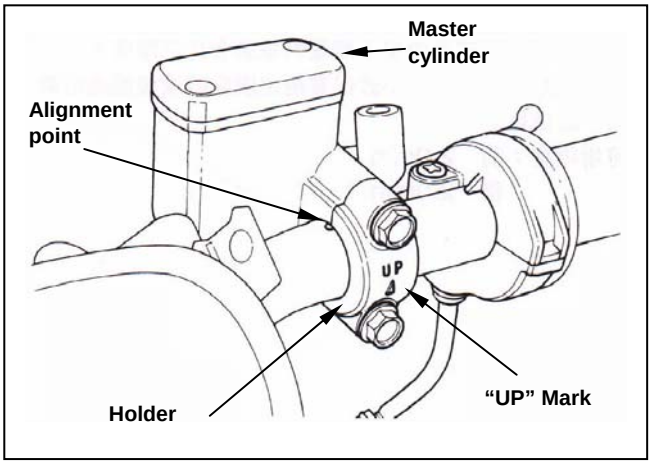
Apply clean brake fluid to the piston cup, and then install the cup onto the piston.
Install the larger end of the spring onto the master cylinder.
Note the direction of the piston when installing.

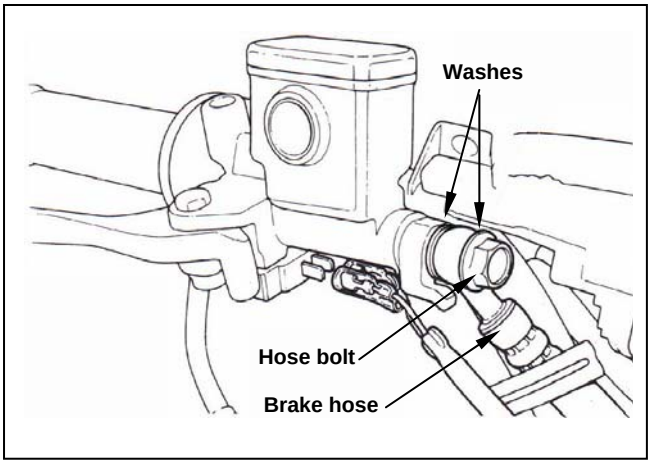


⚠ CAUTION

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

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





⚠ CAUTION

Improper routing may damage leads, hoses or pipes.

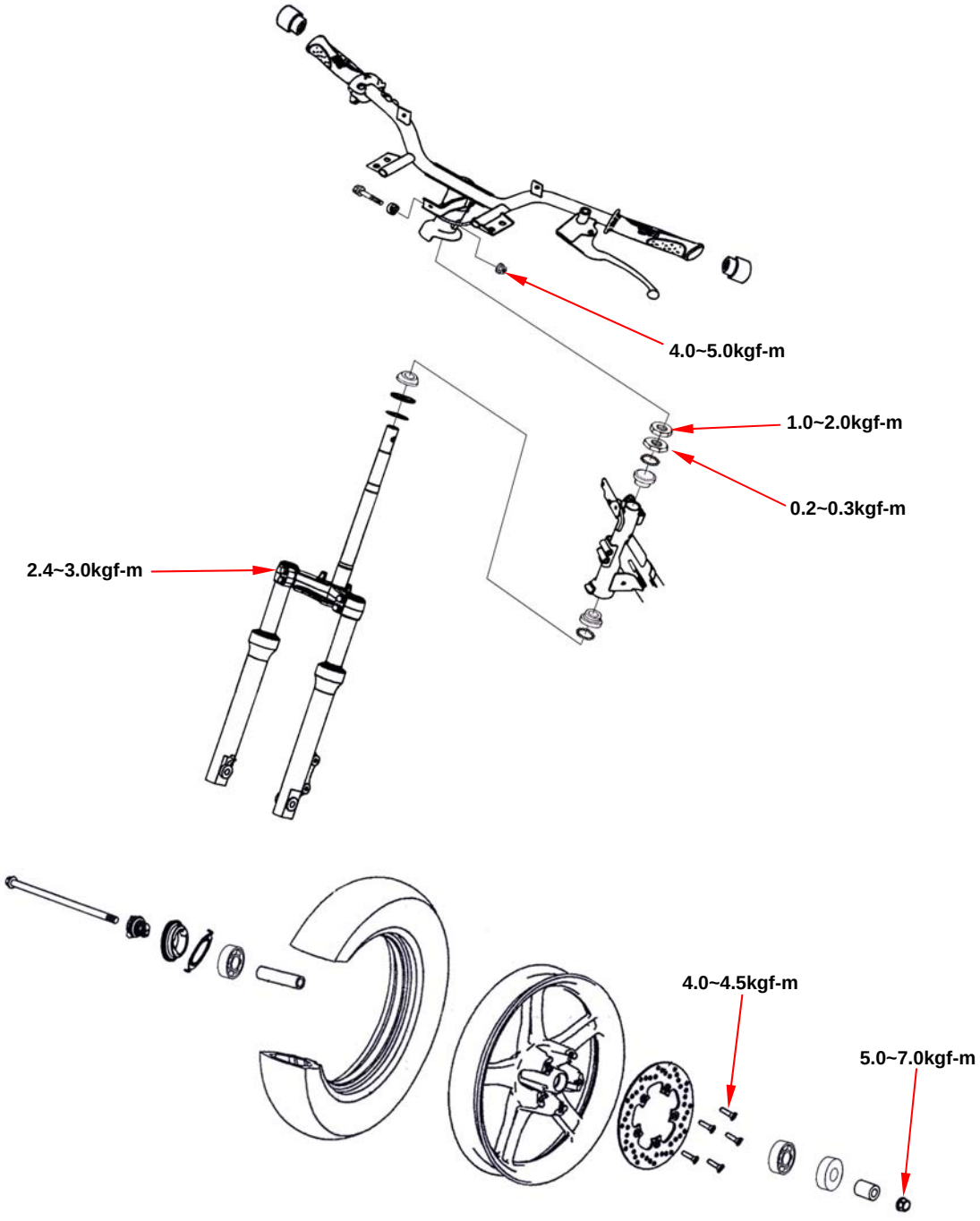
⚠ CAUTION

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

Add specified brake fluid and bleed air from the system.

Notes

Mechanism Diagram



Precautions in Operation

General

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

Torque Values

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

Special Tools

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

Troubleshooting

Hard to steer

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

The steering handlebar is tilted

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

The front wheel rim run-out

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

Soft front cushion

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

Noise in front cushion

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

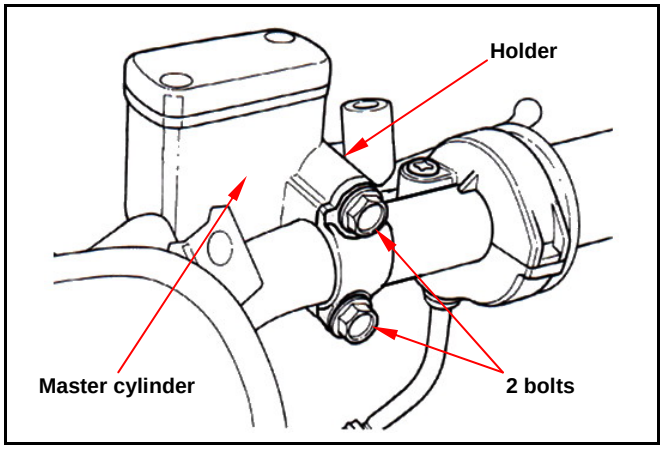
Steering Handle

Removal

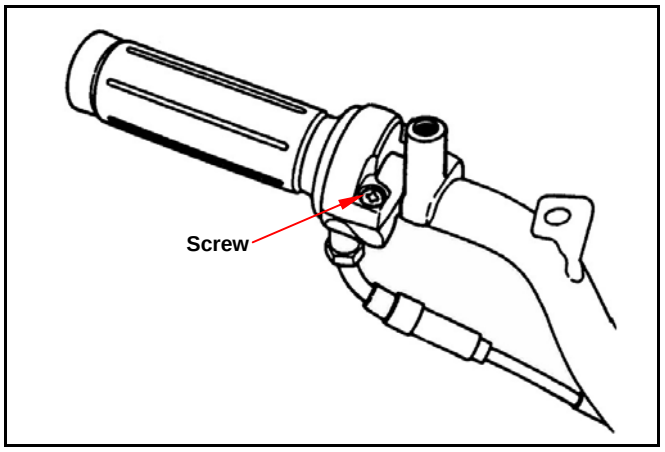
Remove the handle front cover, handle rear cover and front cover. (Refer to chapter 13)
Loosen the lock bolts for the master cylinder of the front brake.

⚠ Caution

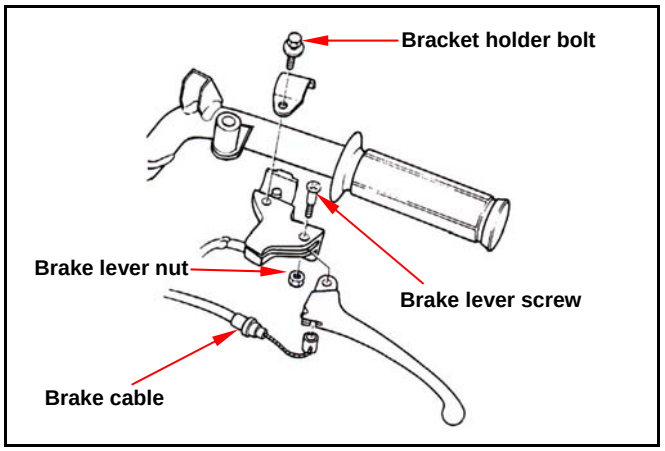
Do not let foreign materials enter into the cylinder.



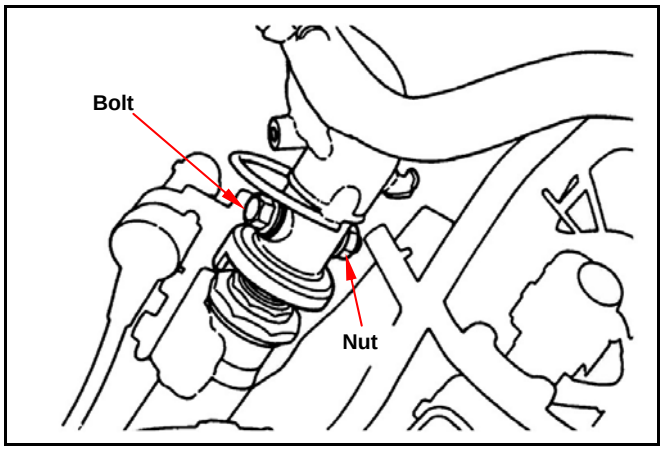
Remove throttle holder, cap, cable and grip after mounting screw removed.



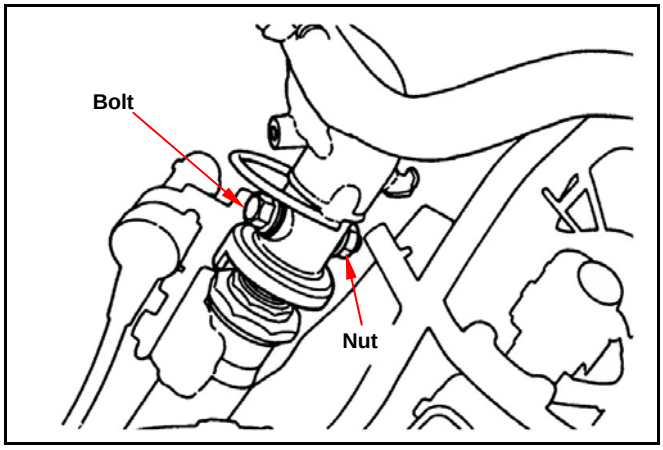
Remove rear brake lever mounting nut and bolt, and then remove brake lever and cable.
Remove rear brake lever bracket after mounting bolt removed.



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



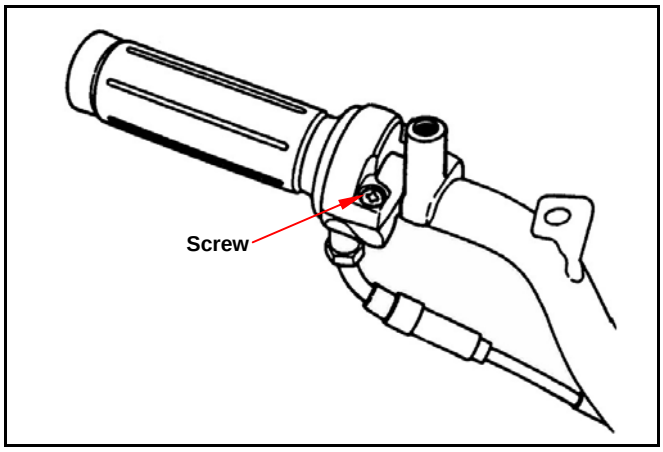
Installation
Install handle and align with bolt hole.
Install bolt and nut and then tighten it.
Torque value: 4.5kgf-m



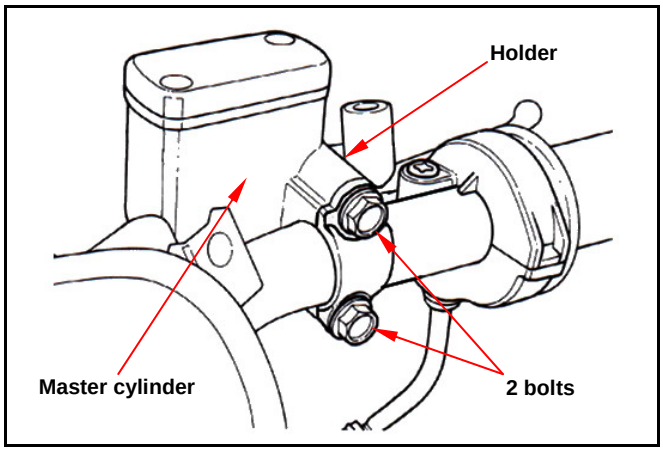
Apply with grease onto throttle cable and the sliding surface of handle.
Align the lock pin of the throttle bracket with the hole on the handle, and then install the throttle bracket.

⚠ Caution

When installs the throttle cable, first spreads the grease in the terminal to receive the throttle grip again.
- After installs the handle, inspects the throttle grip, whether may change to in the direction the handle time the free position, the freedom does moves.

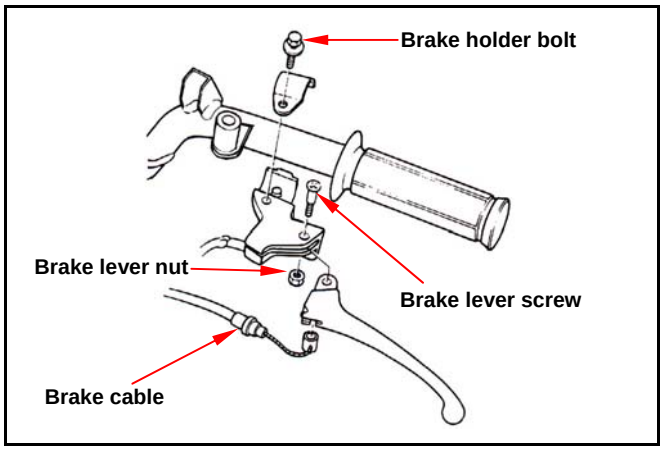


Install the lock bolts for the master cylinder of the front brake.



Align the lock pin with the hole on the handle and also install brake lever bracket. Then, tighten the brake lever bracket bolt.
Install brake cable, lever on to bracket, and then tighten lever screw and nut.

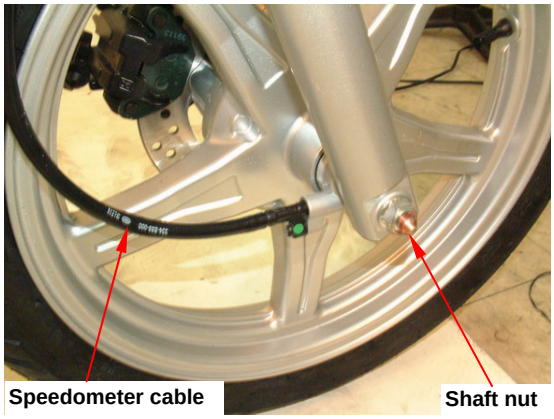
After the installment completes, carries on the following inspection and the adjustment:
- Throttle grip operation.
- All electric appliances, the meter function.



Front Wheel

Remove

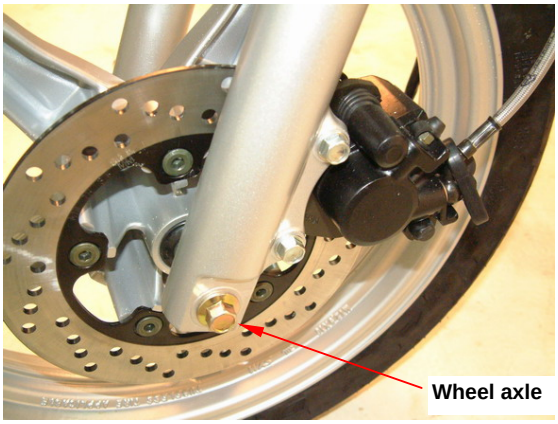
First by the bracket strut frame base, causes the front wheel to float off.
Remove the speedometer cable.
Turn loose the axle nut.



Pull out the front wheel axle.
Remove the front wheel.

⚠ Caution

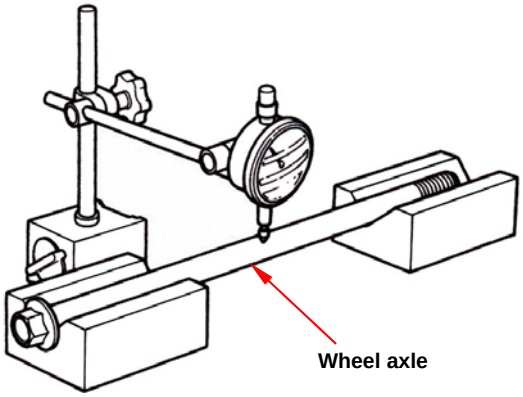
Care shall be taken not to push the brake lever to avoid the brake pad being squeezed out. In case that the brake pad is accidentally squeezed out, use a screwdriver to force it back to the place.



Inspection

Wheel axle

Place the wheel axle on a V block, measure its run out.
Service limit: 0.2 mm

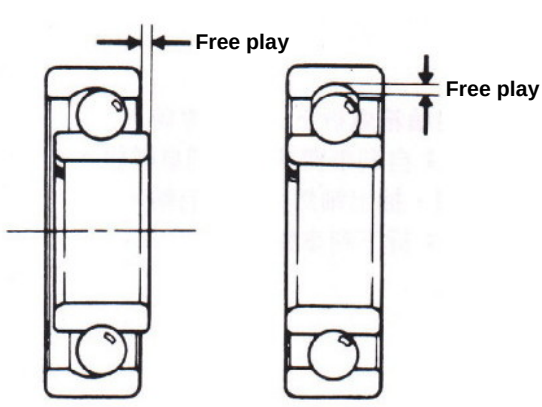


Bearing

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

⚠ Caution

The bearing shall be replaced in pair.



Wheel

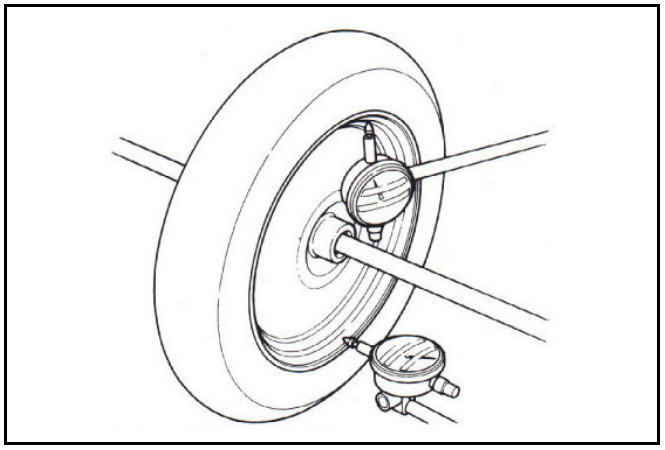
Place the wheel on to a rotation seat to check its rim wobbling.

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

Service limit:

Radial: 2.0 mm (0.08 in)

Axial: 2.0 mm (0.08 in)



Disassembly

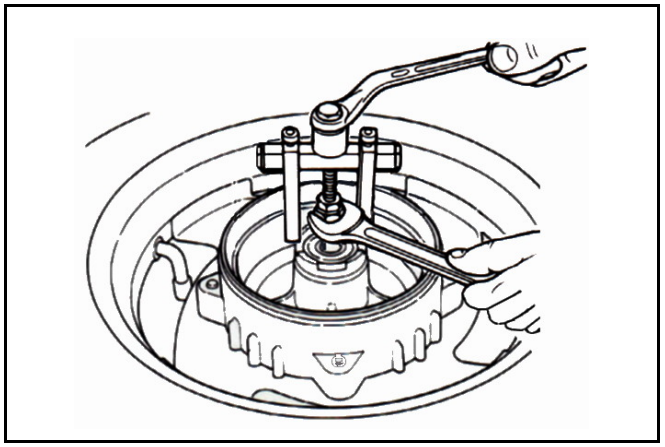
Remove 5 bolts and brake disk.

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

Remove dust seal, bearing and retainer hear box from right side.

Special tools:

Inner bearing puller (SYM-6204020)



Assembly

Fill out the block of bearing by grease.

Drive the left bearing, dust seal and install the dist. collar.

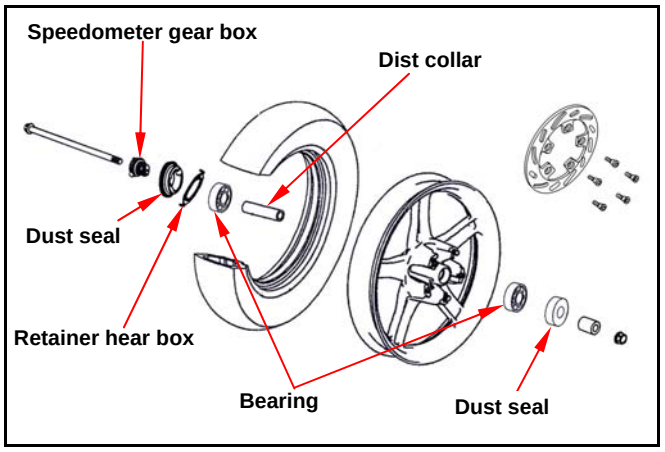
Install the right side bearing.

⚠ Caution

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

Install the brake disk and then tighten the bolts

Torque value: 4.5kgf-m



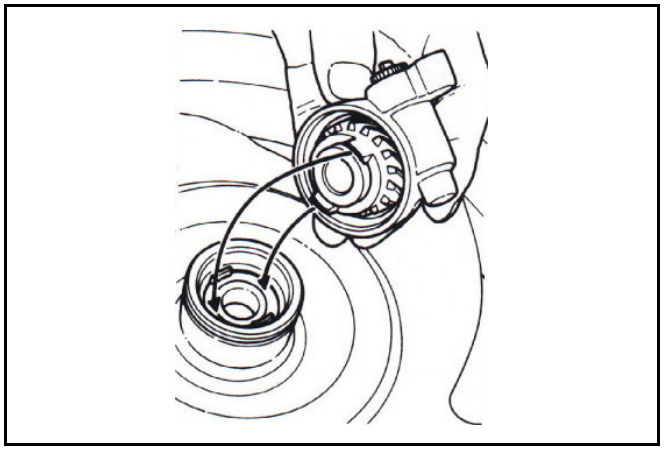
Install right side dust seal.

Lubricate the retainer with grease and install into the wheel hub.

Align the flange part on the speedometer gear with the slot of wheel hub.

⚠ Caution

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

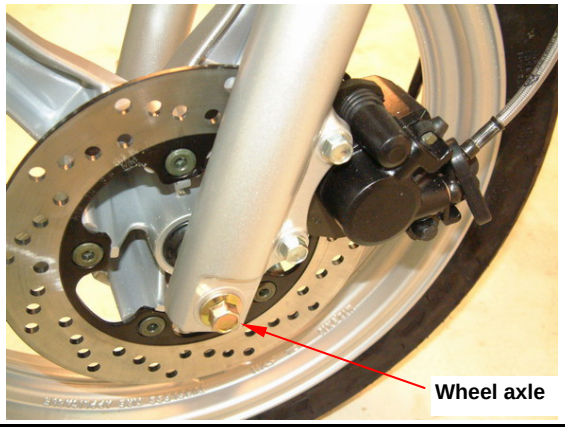


Apply with grease onto the left side dust seal.

Install the dust seal and side collar.

Installation

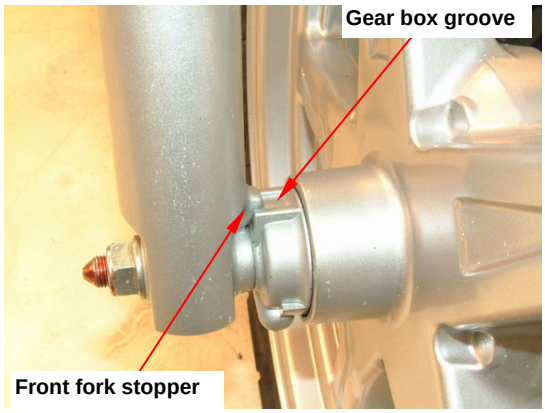
Open out brake lining with brake caliper.
Place the front wheel between the front cushion.



⚠ Caution

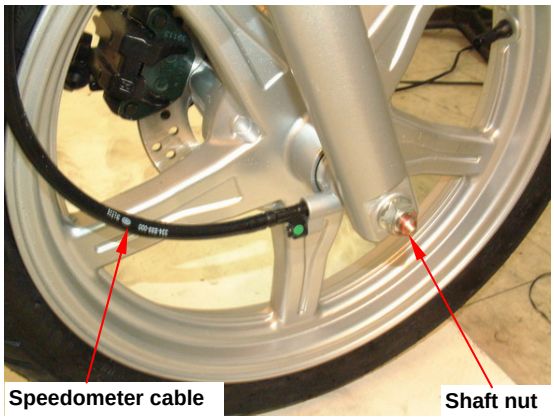
Align the gear box groove with the stopper flange.

Insert the wheel axle into the wheel and the install the wheel axle nut.



Tighten the nut.
Torque value: 5.0~7.0kgf-m

Connect the speedometer cable to the speedometer gear box.

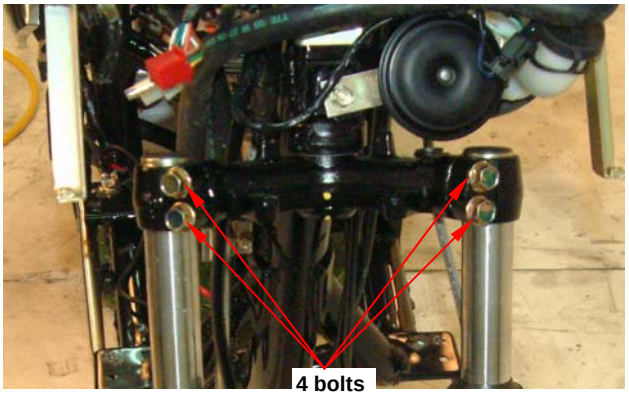


Front Cushion

Remove

Remove front cover, front under spoiler and front fender.
Remove front brake caliper.
Remove front wheel.

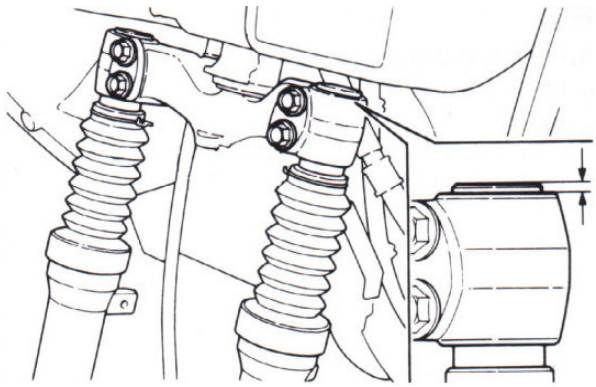
Remove front cushion upper mounting bolts, and then remove front cushion.



Installation

Align the cover flange with upper level of the cushion clamp, and then tighten bolts.
Torque value: 2.7kgf-m

Install the removed components in reverse order of removal procedures.



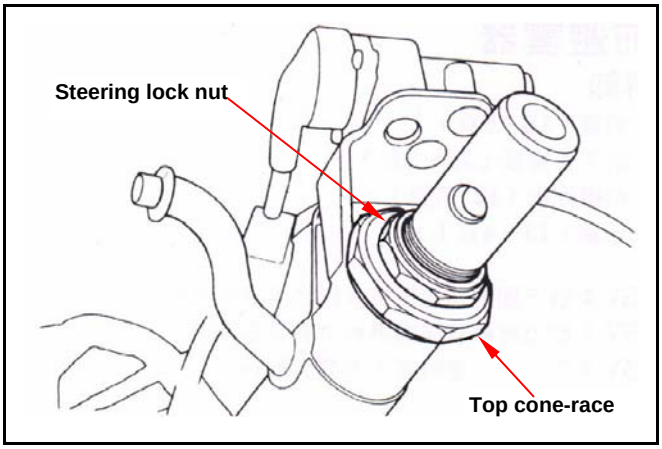
Steering Stem

Remove

Remove handle, front wheel and front cushion.
Remove the steering stem mounting nut.
Remove top cone race and front fork.

⚠ Caution

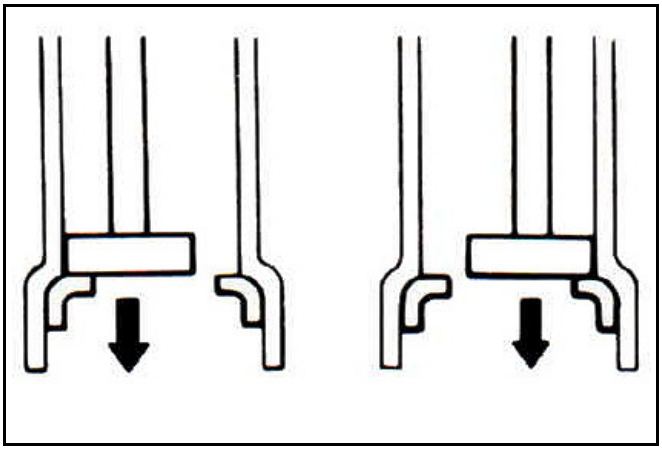
Place the steel ball onto a parts container to prevent from missing.



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

⚠ Caution

Do not damage the steering stem.

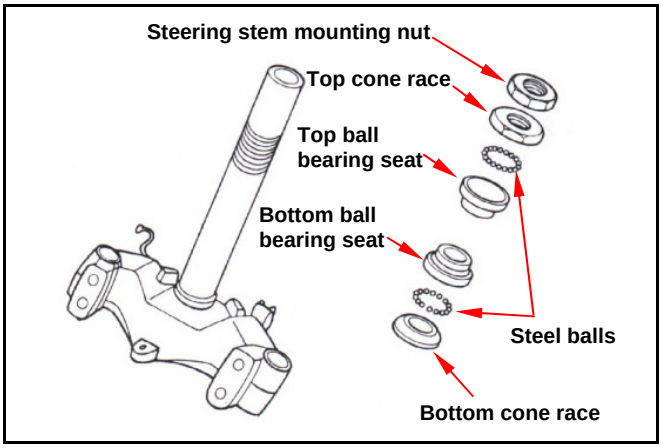


Installation

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

⚠ Caution

Do not tilt the ball bearing seats as installation.

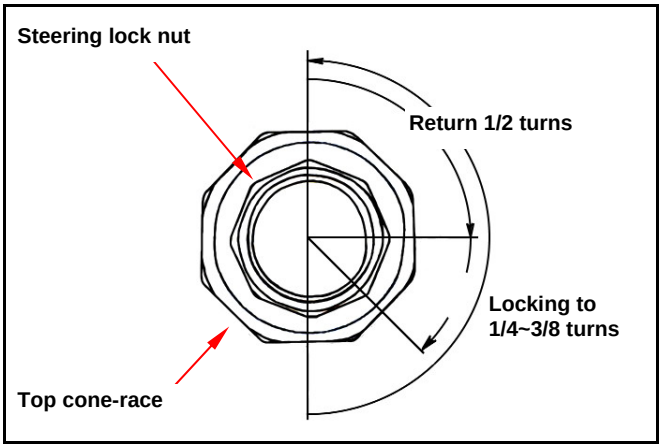


Apply with grease onto the ball bearing seats, and install steel balls onto the seats.
(Top: 26 balls, bottom: 29 balls)

Lubricate the top cone race seat with grease.
Screw the cone race in to top ball bearing seat till touching, and then screw out the cane race 1/4~3/8 turns.
Torque value: 0.25kgf-m

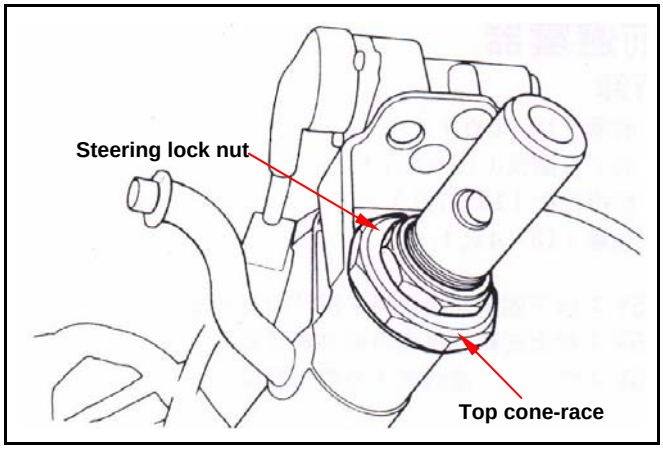
⚠ Caution

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

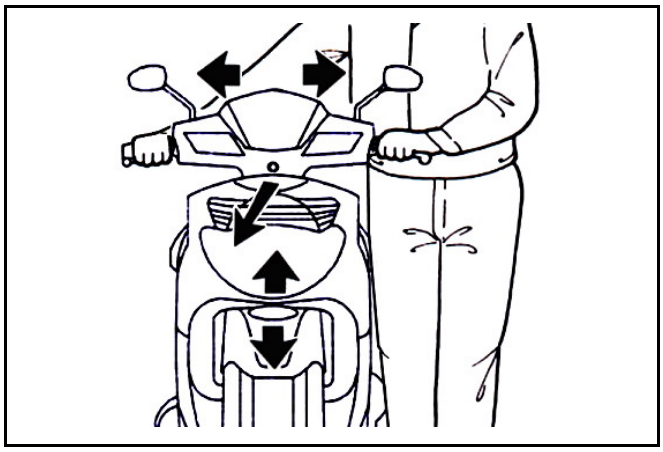


Install the steering stem mounting nut and tighten the nut by means of holding the top cone race body.
Torque value: 1.0~2.0kgf-m

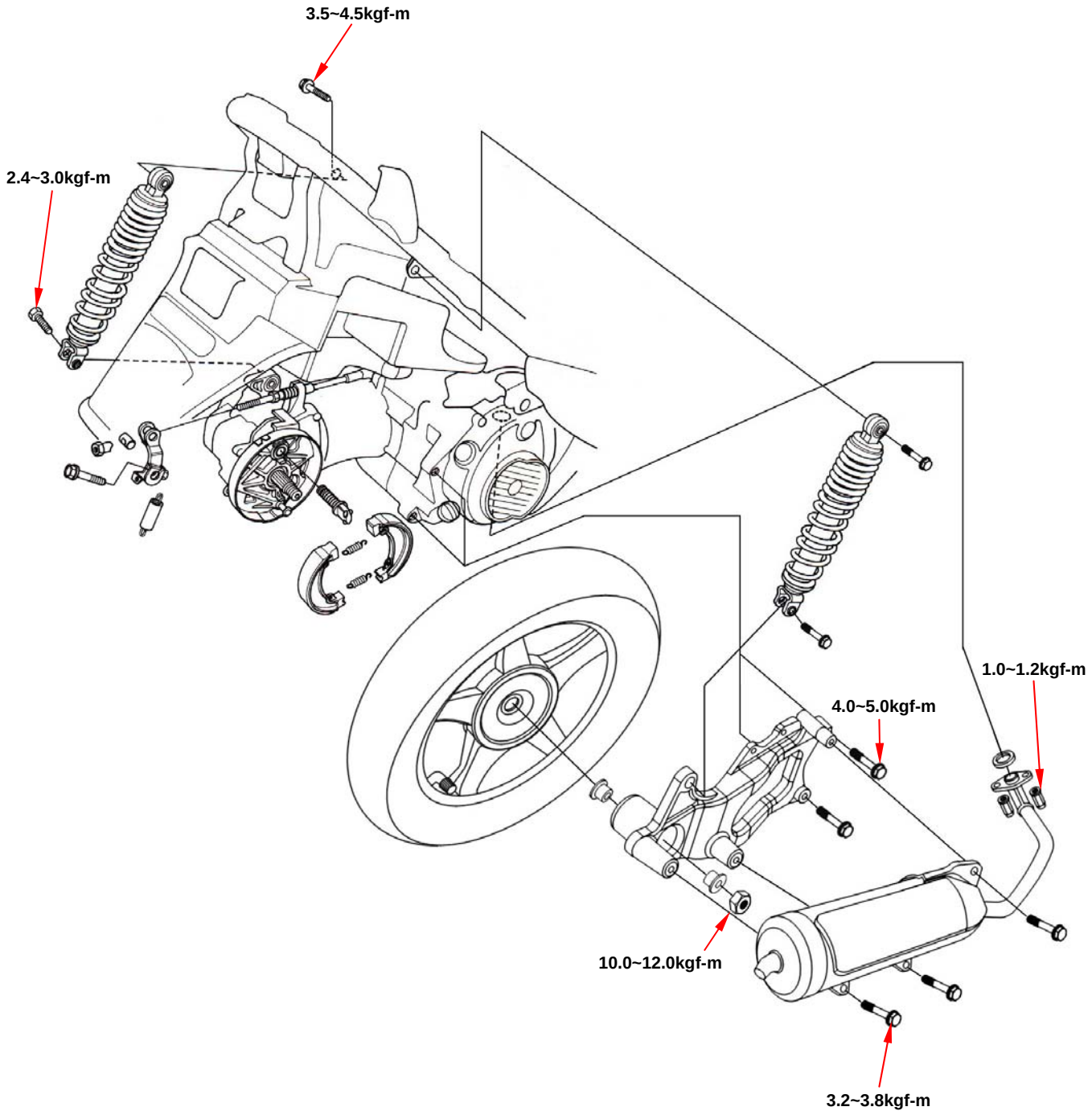
Install in reverse order of removal procedures.



Shake steering handle up & down, left & right, and front & rear to check if it is loosen, has too much resistance and pulls to one side.
Check steering handle if it is being pulled too tight by the brake cables.



Mechanism Diagram



Precautions in Operation

General

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

Service data

Unit: mm

Item		Standard	Allowable Limit
Run-out of rear rim	Radial	-	2.0
	Axial	-	2.0
Thickness of rear brake lining		5.1	2.0
Sustaining stroke of rear cushion		72	-

Torque Value

Rear wheel shaft nut	10.0~12.0kgf-m
Rear cushion upper bolt	3.5~4.5kgf-m
Rear cushion under bolt	2.4~3.0kgf-m
Rear fork mounting bolt	4.0~5.0kgf-m
Exhaust muffler mounting nut	1.0~1.2kgf-m
Exhaust muffler mounting bolt	3.2~3.8kgf-m

Troubleshooting

Run-out of rear wheel

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

Soft Cushion

- The spring is too weak.

Noisy Brake

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

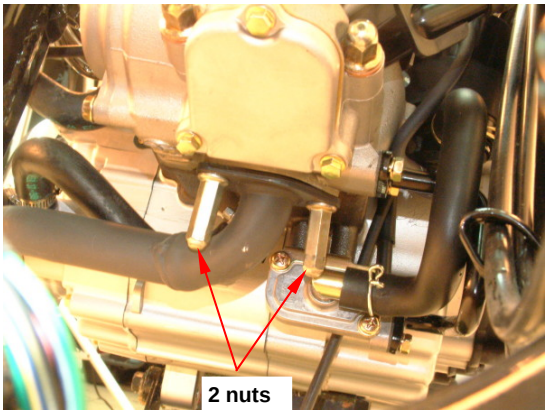
Poor Performance of Brake

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

Muffler

Removal

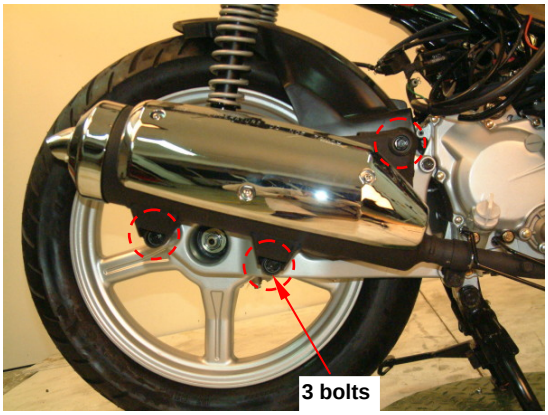
Loosen the 2 nuts from exhaust muffler front side.



⚠ Caution

Disconnect the O2 sensor coupler before removing the exhaust pipe.

Loosen the 3 mounting bolts by exhaust muffler right side.
Remove the exhaust muffler.



Installation

Install in reverse order of removal procedures.

⚠ Caution

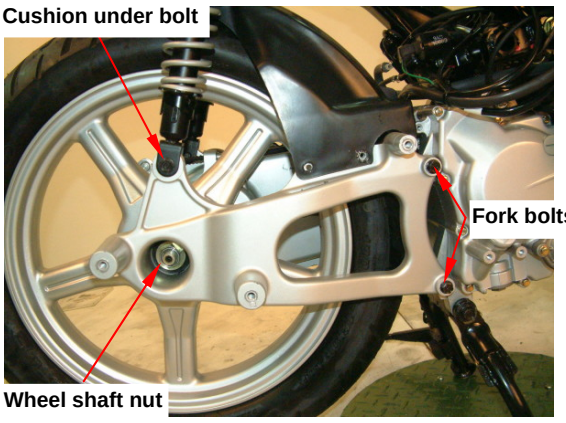
Replace the front side muffler pipe gasket if worn or deformed.

Torque Value
For mounting bolt: 3.2 ~ 3.8kgf-m
For mounting nut: 1.0 ~ 1.2kgf-m

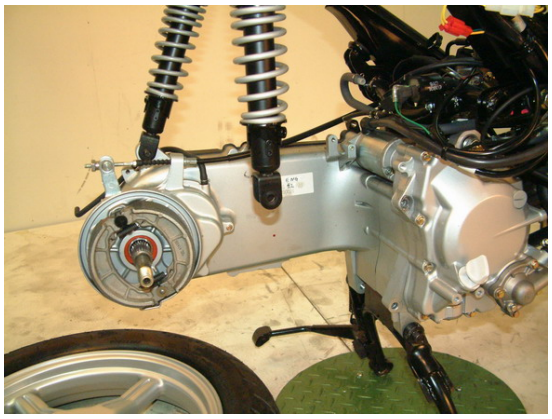
Rear Wheel

Removal

Remove the exhaust muffler.
Remove the lower bolt of the right side rear cushion.
Remove 2 bolts of the rear fork.
Remove 1 nut of the rear wheel shaft, and then remove outside collar.



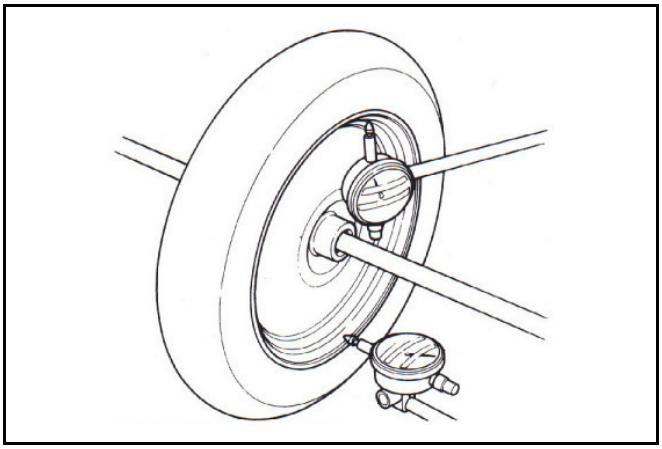
Remove the rear fork, fork inside collar, and then remove the rear wheel.



Inspection

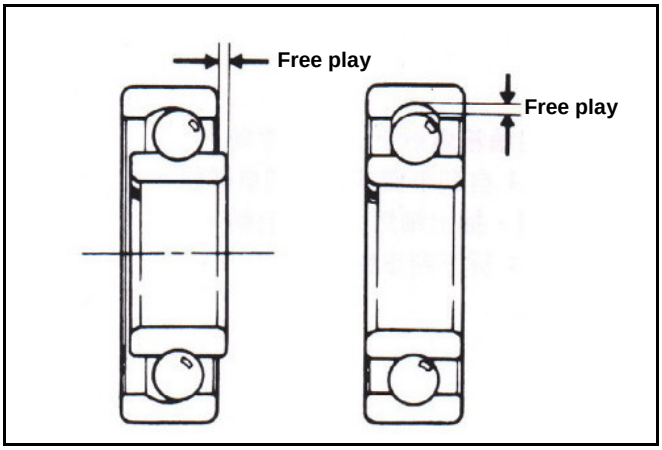
Rear wheel rim

Place the wheel rim on a rotational support.
Rotate it by hand and measure the run-out with a dial indicator.
Run-out limit: 2.0 mm



Rear fork bearing

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

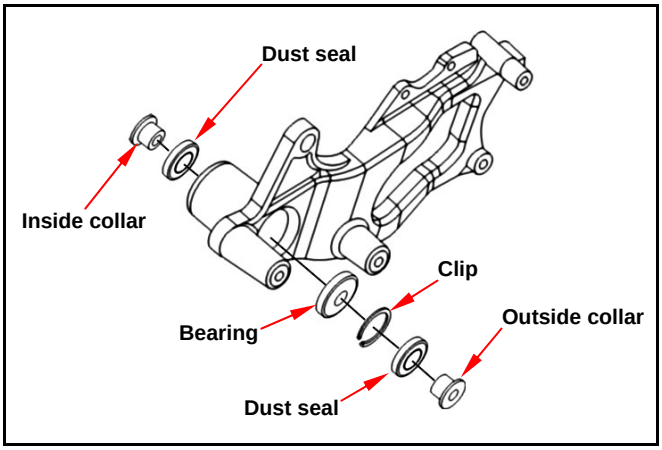


Replacement of rear fork bearing

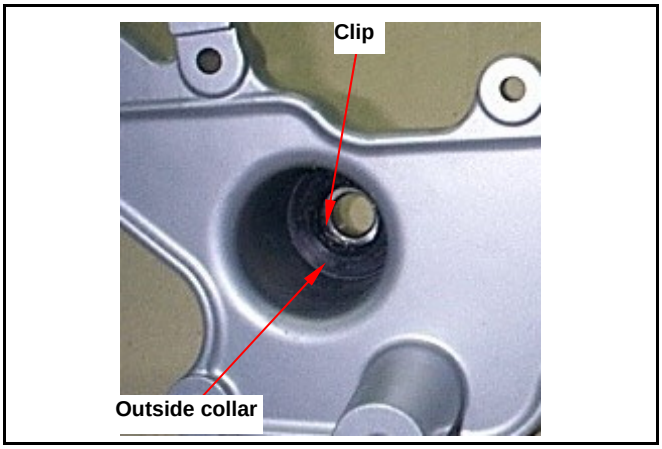
Remove the outside dust seal of the rear fork.
Use inner cir clip plier to remove the bearing lock clip.
Pull off the rear fork bearing by means of the inner bearing puller.
Remove the inside dust seal.

⚠ Caution

Never reuse the old dust seal on the bearing.



Press in the bearing into the rear fork by bearing driver.
Install the oil bearing lock clip.
Install new dust seals into rear fork two side.



Installation

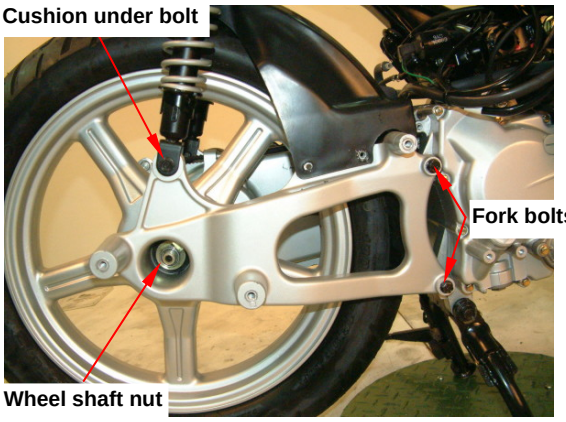
Install the rear wheel.
Install the inside collar on the rear fork.
Install the rear fork onto the rear wheel shaft.
Mount the outside collar on the rear fork.
Tighten the rear wheel shaft nut.

Install the rear fork mounting bolts and tighten the bolts.
Align the rear cushion with the rear fork hole; tighten the cushion with bolts.
Install the exhaust muffler, first tighten front side mounting nuts, and then tighten the mounting bolts.

Torque Value
Rear wheel shaft nut: 10.0~12.0kgf-m
Rear cushion under bolt: 2.4~3.0kgf-m
Rear fork mounting bolt: 4.0~5.0kgf-m
Exhaust muffler mounting nut: 1.0~1.2kgf-m
Exhaust muffler mounting bolt: 3.2~3.8kgf-m

⚠ Caution

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



Rear Cushion

Removal

Remove the luggage box, rear carrier and body covers.
Loosen the mounting bolts of the air cleaner (2 bolts).
Remove the exhaust muffler (3 bolts, 2 nuts).
Remove the under bolts by left / right rear cushions.
Remove the upper bolts by left / right rear cushions, and then remove the cushion.

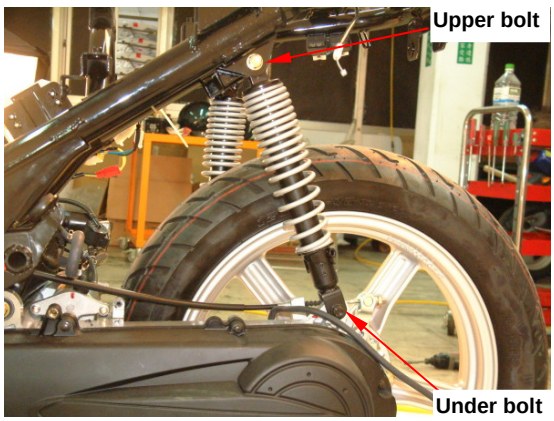
Installation

Install in reverse order of removal procedures.

⚠ Caution

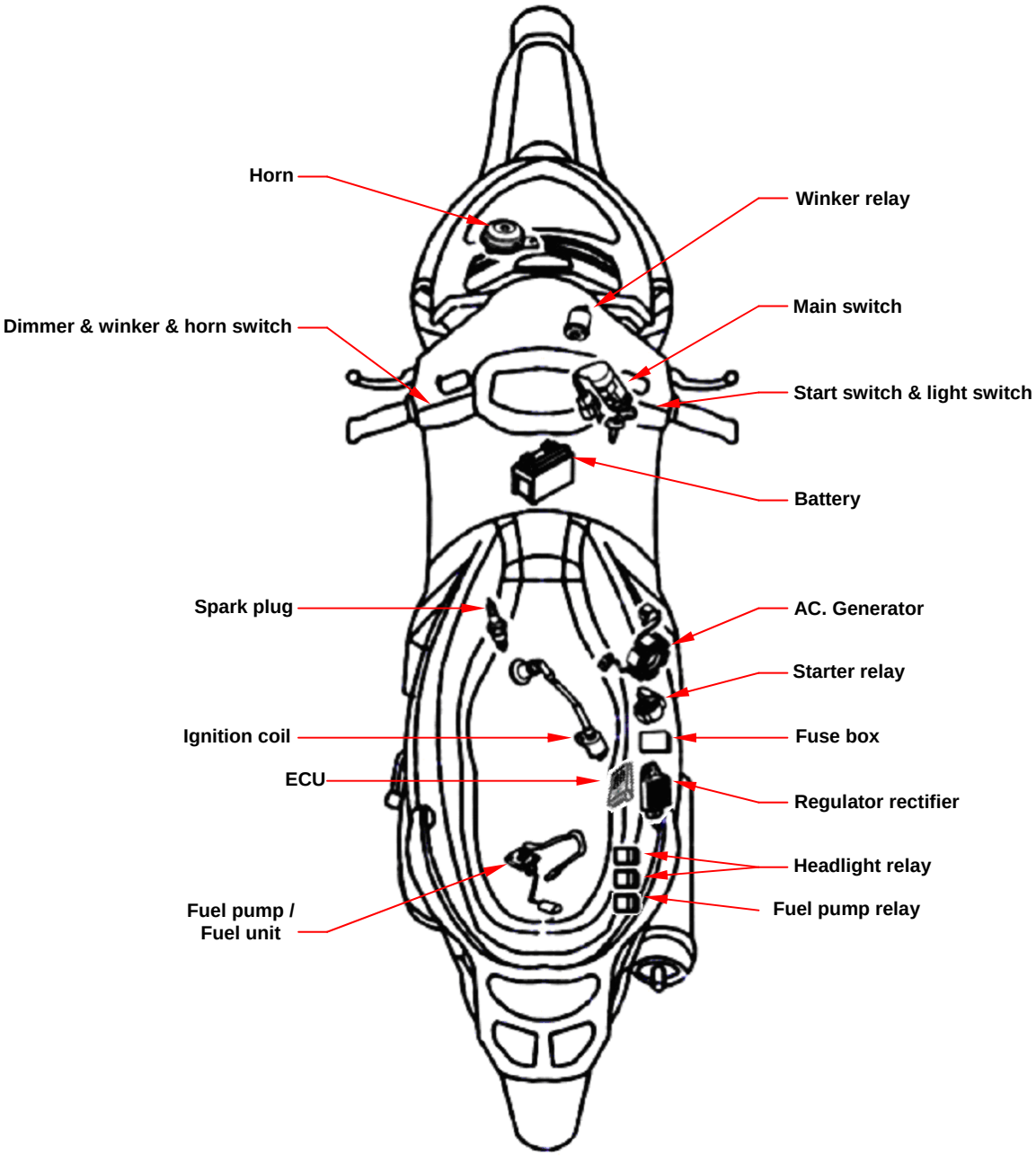
The rear cushion must be replaced as a unit. Never disassemble the rear cushion as that would damage the structure.

Torque Value
Rear cushion upper bolt: 3.5~4.5kgf-m
Rear cushion under bolt: 2.4~3.0kgf-m



Notes:

Mechanism Diagram



Precautions in Operation

- When remove the battery, the disconnection sequence of cable terminals shall be strictly observed. (First disconnect the negative cable terminal, next, the positive cable terminal.)
- The model of the spark plug and the tightening torque.
- The ignition timing.
- Adjustment of 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 E.C.U. assembly does not require an ignition timing check. In case ignition timing is incorrect, check E.C.U. and AC generator. Verify with an ignition timing light after replacement if necessary.

Technical Specification

Charging system

Description		Specification
Battery	Capacity	12V8Ah
	Charging rate	0.9A / 5 hours (standard) 4A / 1 hour (fast charging)
Leak current		< 5 mA
Charging current		1.2 A / 6000 rpm
Control voltage in charging		14.5 ± 0.5 V / 2000 rpm

Ignition system

Description		Specification
Spark plug	Model	NGK CR7E (Recommended)
	Gap	0.8 mm
Ignition coil resistance	Primary winding	0.63±0.03Ω
CPS sensor resistance		120±10%Ω
Ignition timing		BTDC 13° / 1600 rpm
		BTDC 24° / 6000 rpm

Troubleshooting

No voltage
- Battery discharged
- The cable disconnected
- The fuse is blown
- Improper operation of the main switch

Low voltage
- The battery is not fully charged
- Poor contact
- Poor charging system
- Poor regulator rectifier

No spark
- Poor spark plug
- The cable is poorly connected, open or short-circuited
- Poor connection between ECU and ignition coil
- Poor main switch
- Poor ECU
- Abnormal AC Generator

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

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

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

Engine does not crank smoothly
- Primary winding circuit
  - Poor ignition coil
  - Poor connection of cable and connectors
  - Poor main switch
- Secondary winding circuit
  - Poor ignition coil
  - Poor spark plug
  - Poor ignition coil cable
  - Current leakage in the spark plug
- Incorrect ignition timing
  - Poor AC Generator
  - Improper installation of CPS
  - Poor ECU

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

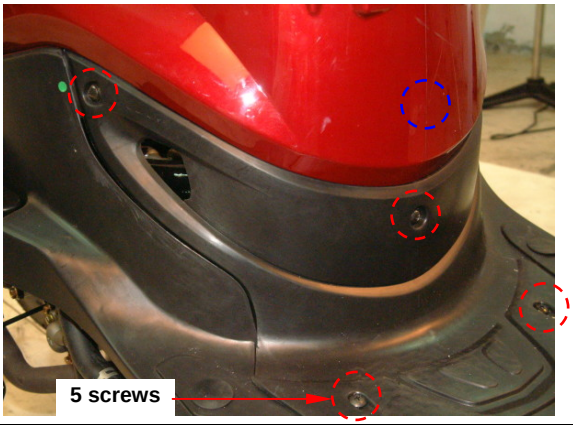
Starter motor works but engine does not crank
- Poor starter motor pinion
- The starter motor run in reverse direction

Abnormal battery

Battery

Removal

Loosen 5 screws and remove the battery cover.
Disconnect the negative cable terminal first, then the positive cable terminal.
Remove the battery from the motorcycle.



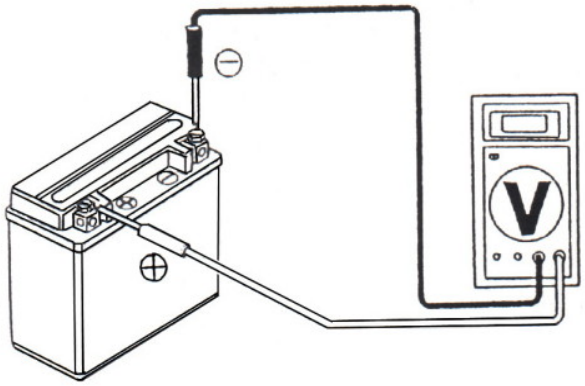
Voltage Check

Use the digital voltmeter to check the voltage of the battery.
Voltage:
Fully charged: 13.0~13.2 V at 20℃
Undercharged: Below 12.3 V at 20℃

Charging

Connect the positive terminal (+) of the charger to the battery positive terminal (+).
Connect the negative terminal (-) of the charger to the battery negative terminal (-).

	Standard	Maximum
Charging current	0.9A	4.0A
Charging time	5H	1H

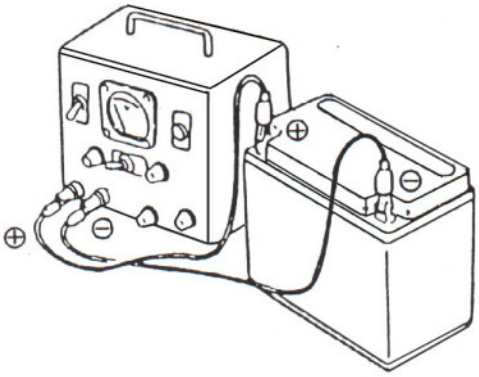


⚠ Warning

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

⚠ Caution

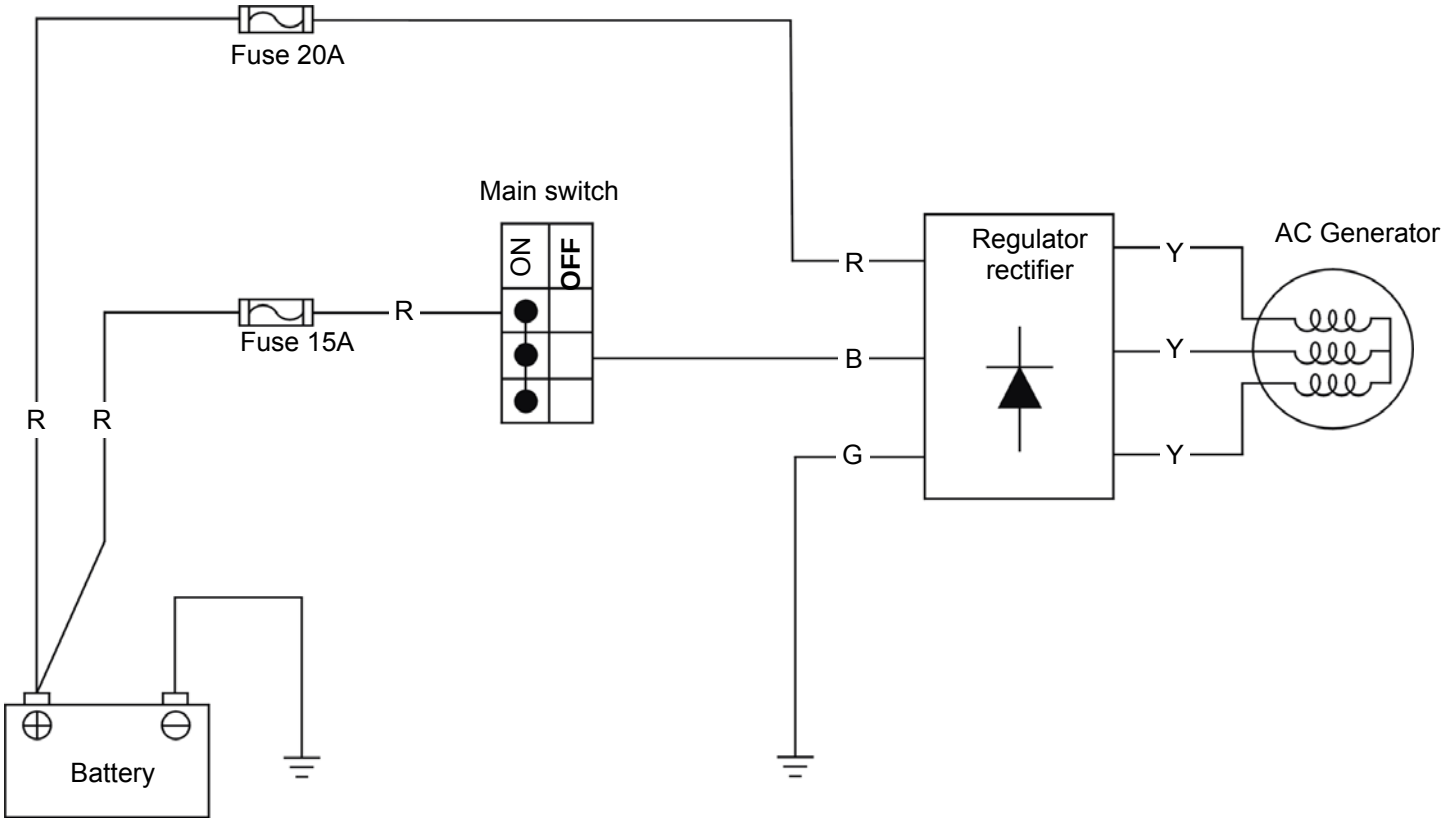
- Never rapid charge the battery unless in emergency.
- Verify the battery is recharged with current and duration prescribed above.
- Large current and fast time to charge will render damage to the battery.



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

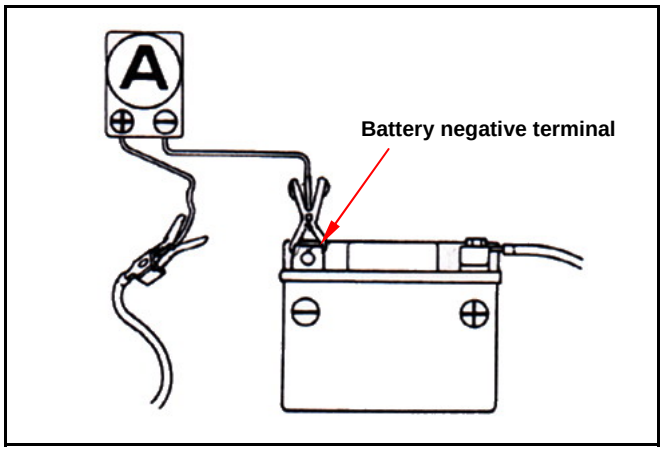
Charging System

Charging circuit



Current Leakage Inspection

Turn the main switch to OFF position, and remove the negative cable terminal (-) from the battery. Connect an ammeter between the negative cable terminal and the battery negative terminal.



⚠ Caution

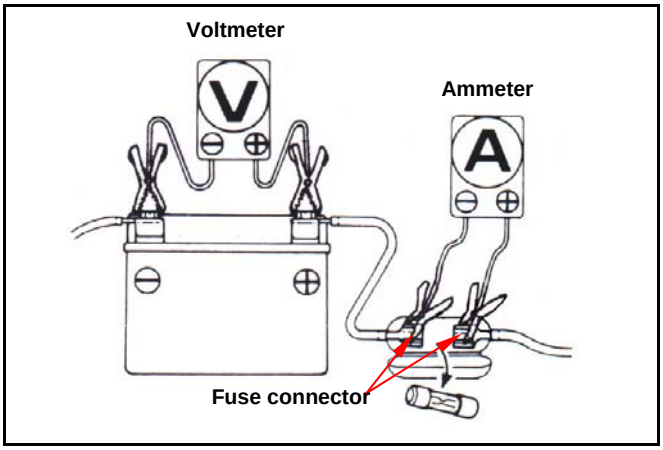
- In the current leakage test, set the current range at the largest scale, then gradually decrease to the lower scale as the test process goes to avoid possible damage to the ammeter and the fuse.
- Do not turn the main switch to ON position during test.

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

Allowable current leakage: Less than 5mA

Disconnect each cable one by one and take measurement of the current of each cable to locate the short circuit.

Inspection on Charging Voltage



⚠ Caution

- Before conducting the inspection, be sure that the battery is fully charged. If undercharged, the current changes dramatically.
- Use a fully charged battery having a voltage larger than 13.0 V
- While starting the engine, the starter motor draws large amount of current from the battery.

After the engine is warmed up, replace original battery with a fully charged battery.
Connect a digital voltmeter to the battery terminals.
Connect an ammeter between both ends of the main fuse.

⚠ Caution

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

⚠ Caution

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

Connect a tachometer.
Turn on the headlight to high beam and start the engine.
Accelerate the engine to the specified revolution per minute and measure the charging voltage.
Specified Charging Current:
1.2 A / 6000 rpm
Control Charging Voltage:
14.5 ± 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.

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

The following problems are not related to the charging system; correct it if any by following steps indicate in the checking list.

(1) The standard charging voltage and current can only reach when the revolution of the engine exceeds the specified rpm.
- Bulbs used exceed their rate and consume too much power.
- The replacement battery is aged and does not have enough capacity.

(2) The charging voltage is normal, but the current is not.
- The replacement battery is aged and does not have enough capacity.
- Battery used do not have enough electricity or is over charged.
- The fuse of the ammeter is blown.
- The ammeter is improperly connected.

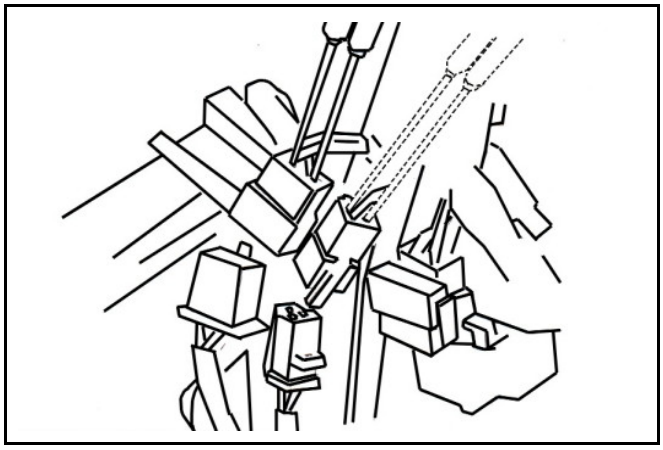
(3) The charging current is normal, but the voltage is not.
- The fuse of the voltmeter is blown.

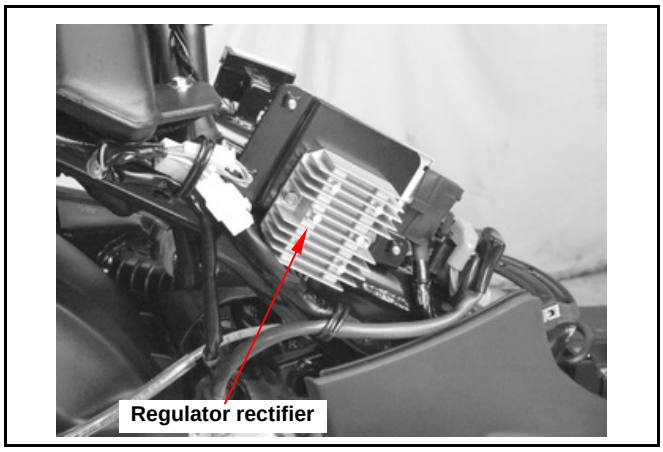
Inspection on regulator rectifier

Remove the luggage box, rear carrier and body covers.
Disconnect two 3 pin couplers of the regulator rectifier.
Inspection the rectifier coupler to the wire harness passes the condition.

Item	Check points	Standard value
Main switch connection	**R—B**	Battery voltage (ON)
Battery connection	**R—G**	Battery voltage
Charging coil	**Y—Y**	0.2~1.0 Ω

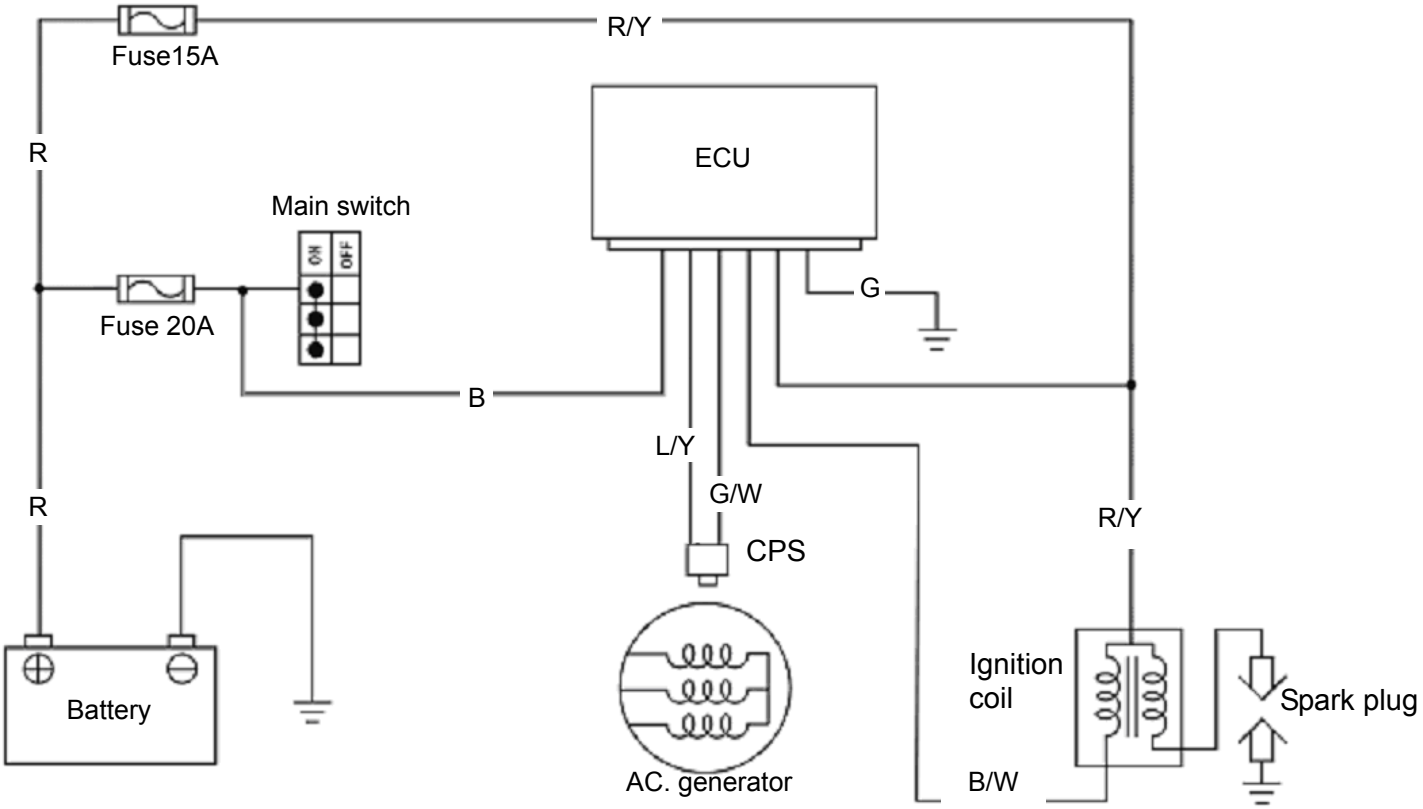
If the readings measured are not normal, check parts in the circuit.
If the parts are normal, then trouble is in the wiring.
If there is nothing wrong with parts and wiring, replace the regulator rectifier.





Ignition System

Ignition circuit diagram



Ignition coil inspection

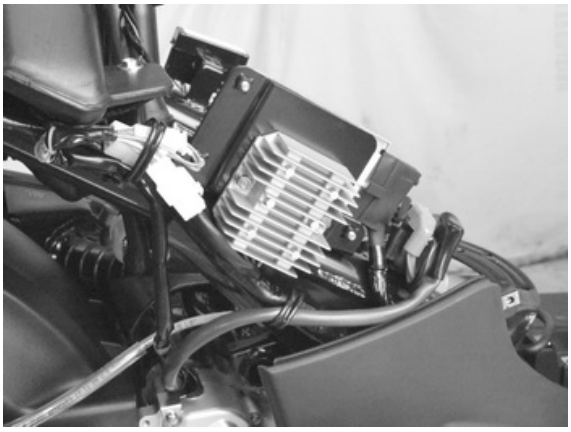
Remove the luggage box.
Disconnect the ignition coil and the spark plug cap.
Measure the resistance between the terminals of the primary winding.
Standard resistance：0.63±0.03Ω(23ºC)

CPS inspection

Remove the right body side cover.
Disconnect the CPS coupler and measure the resistance between G/W and L/Y wire terminals.
Standard resistance：120±10%Ω

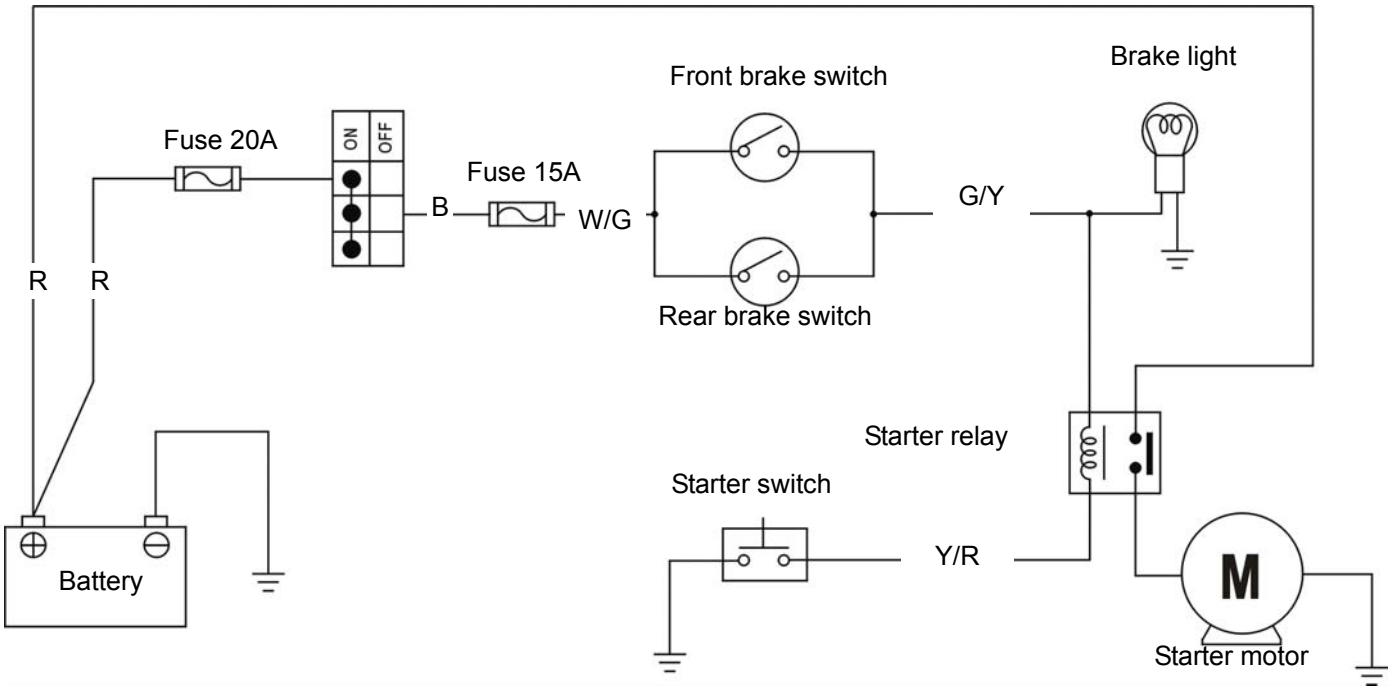
⚠Caution

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



Starting System

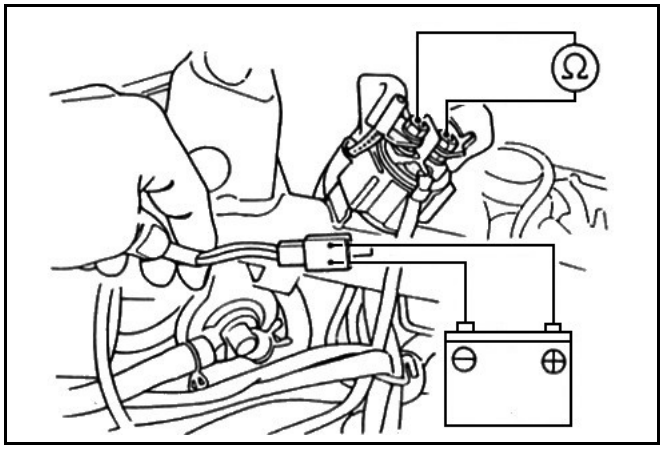
Starting circuit diagram



Inspection on starter relay

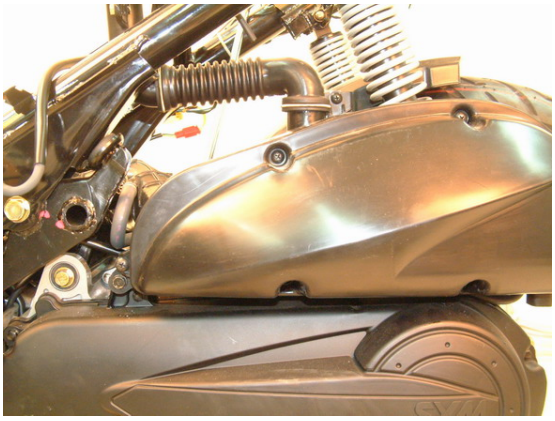
Open the main switch.
Press the brake.
Push down the starter switch.
If a sound of “Looh Looh” is heard, it indicates the relay function normally.

Remove the luggage box.
Disconnect the negative cable terminal of the battery.
Disconnect the cable positive terminal from the relay.
Disconnect the positive cable of the starter motor.
Disconnect the coupler of the relay.
Connect an ohmmeter to the large terminal end.
Connect the yellow/red cable to the battery positive terminal and the green/yellow cable to the battery negative terminal.
Check the continuity of the large terminal end.
If there is no continuity, replace the relay.

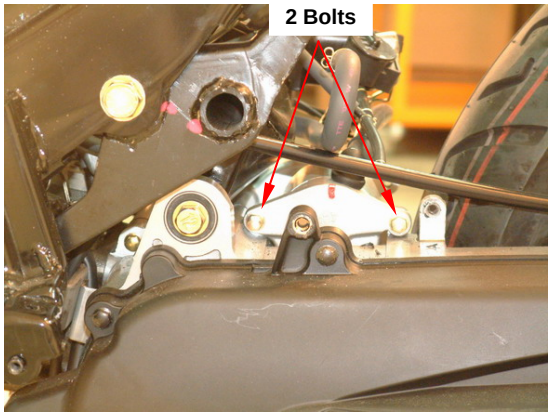


Removal of Starter motor

Remove the battery cover (5 screws).
Disconnect the cable negative terminal (-), then the cable positive terminal (+).
Remove the luggage box.
Remove the air cleaner.



Loosen the lock bolts and remove the starter motor.



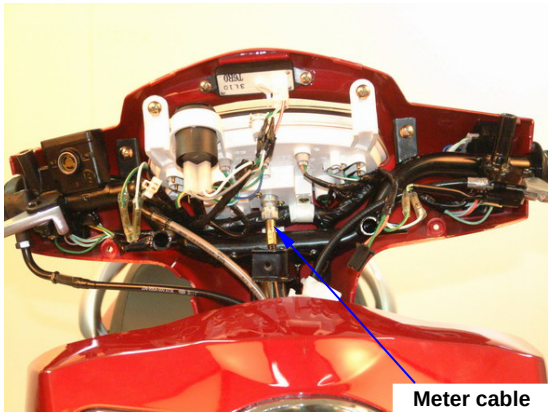
Installation of Starter motor

Install in reverse order of removal procedures.

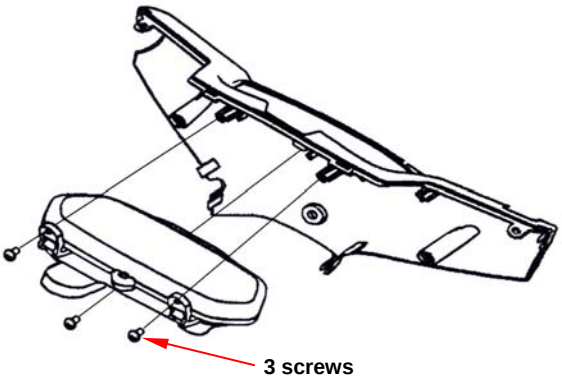
Meters

Removal

Remove handle front cover.
Remove the front cover, and then remove meter coupler and handle switch coupler.
Remove speedometer cable.



Remove handle rear cover and speedometer.
Loosen 3 screws, and then remove speedometer from handle rear cover.



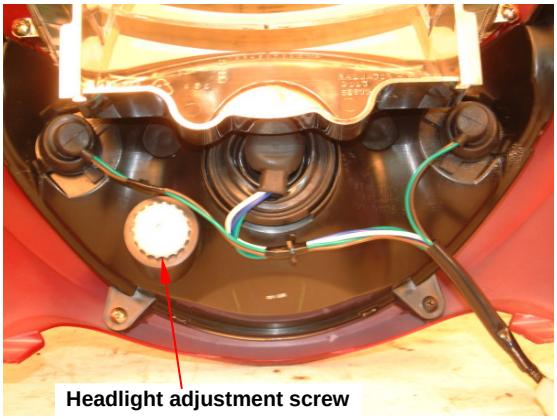
Installation of Starter motor

Install in reverse order of removal procedures.

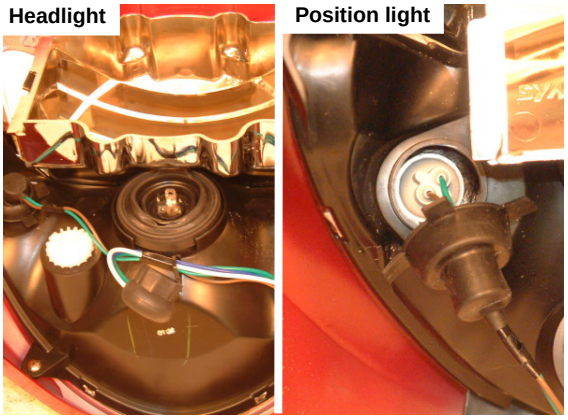
Light / Bulb

Replacing bulb for headlight

Remove the front cover.



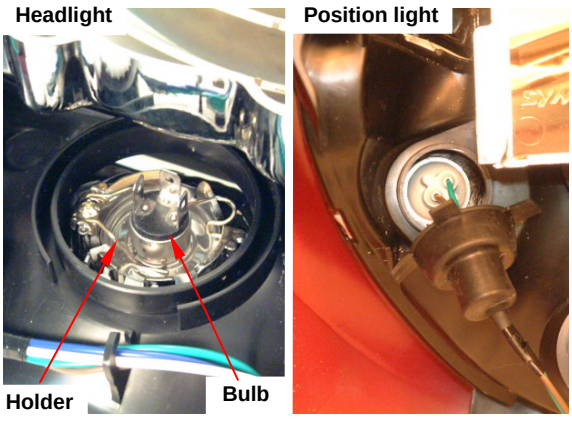
Disconnect the terminal coupler and the rubber sleeve from the headlight.



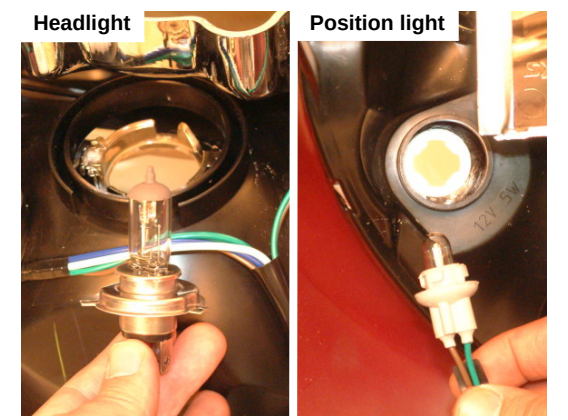
Remove the bulb spring holder and the bulb.
Replace with new bulb if necessary.

⚠ Caution

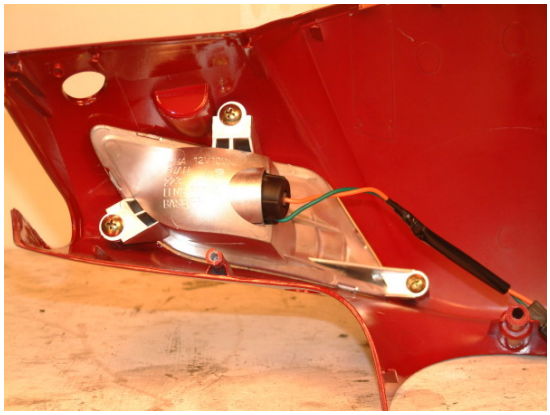
- Never touch the bulb with finger, which will create a heat point.
- Clean the fingerprint left on the bulb with alcohol.



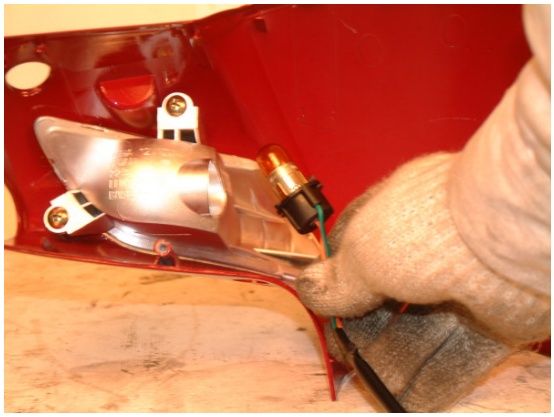
Install the bulb of the headlight in reverse order of removal.
Upon completion of replacement, turn on the main switch to ensure the headlight works well.
Adjust the beam and distance of the headlight if necessary.



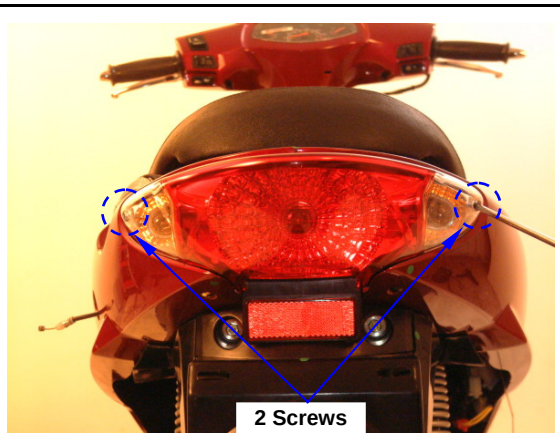
Replacing the Front winker light Bulb
Loosen fixing screws and remove the handle front cover (screw x 3).



Replace with new front winker light bulb.



Replacing Bulb of taillight
Remove the taillight lens (2 screws).



Replace taillight or winker light bulb.

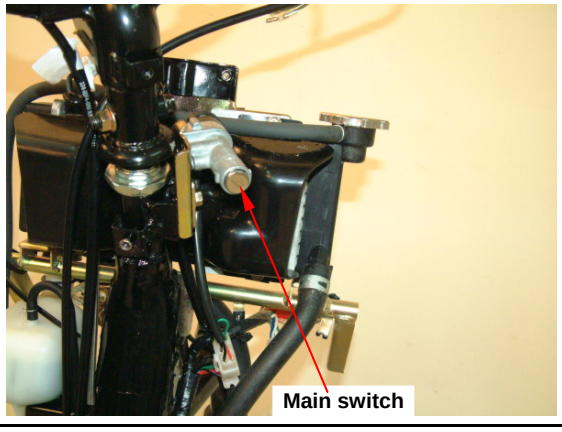
Switch / Horn

Main Switch

Inspection

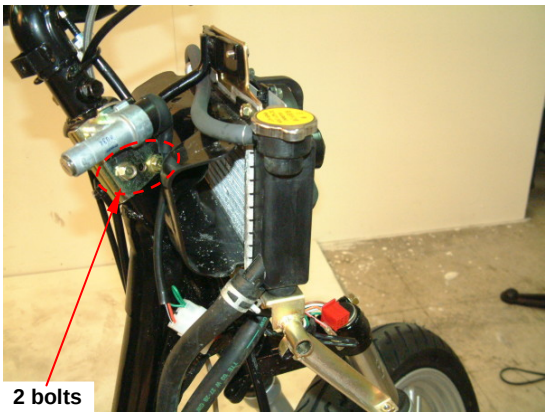
Remove the front cover.
Disconnect the main switch coupler.
Check the continuity between two points as indicted below:

Pin / Position	BAT1	BAT2	I	E
LOCK			○	○
OFF			○	○
ON	○	○		
Wire Color	Red	Black	Black / White	Green



Replacement of main switch

Disconnect the coupler of the main switch and loosen the lock bolts (bolt x 2).
Remove the main switch.
Install the new main switch and tighten the lock bolts (bolt x 2).
Install the main switch coupler.

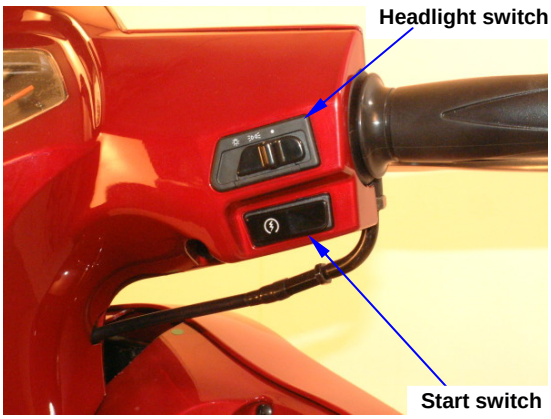


Handle switch

Remove the handle front cover and rear cover.
Disconnect the coupler of handle.
Check the continuity between two points as indicated in the table below.

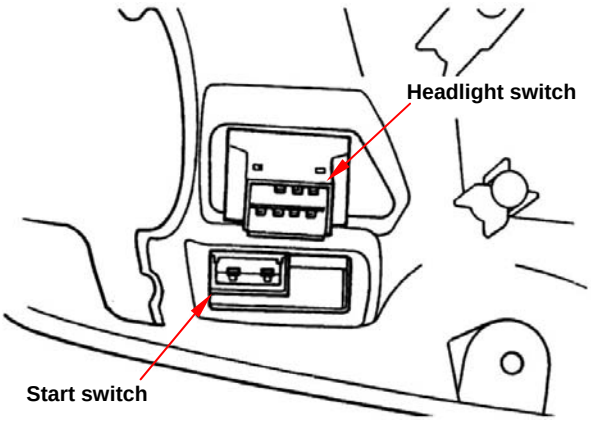
Start Switch / Headlight Switch

Pin / Position	ST	BAT2
FREE		
⚡	○	○
Wire Color	Yellow / Red	Green



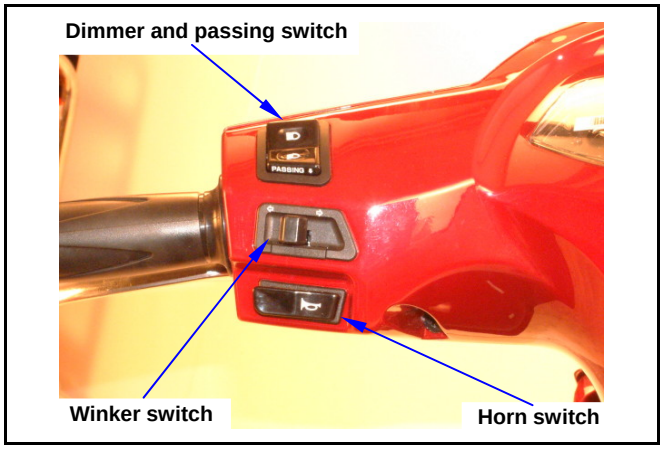
Headlight Switch

Pin / Position	BAT3	TL	HL
●			
≡D	○	○	
☼	○	○	○
Wire color	White / Green	Brown	Blue / White



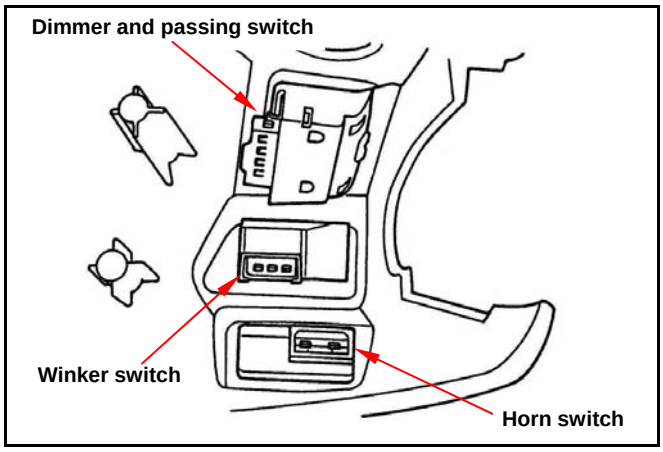
Dimmer and Passing switch

Position \ Pin	HL	LO	HI	PASS
	○		○	
	○	○		
PASSING	○	○		
			○	○
Wire color	Brown / White	White	Blue	White / Green



Winker switch

Position \ Pin		R	WR	L
⇨		○	○	
N	FROM R	○	○	
	PUSH OFF			
	FROM L		○	○
⇦			○	○
Wire color		Light green	Gray	Orange

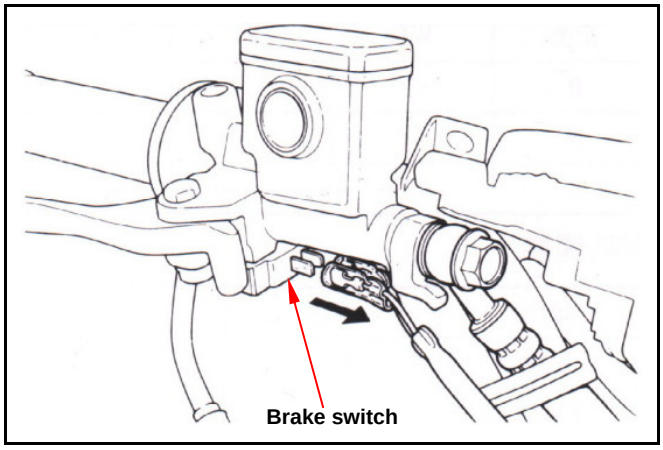


Horn switch

Position \ Pin	BAT3	HO
FREE		
📯	○	○
Wire Color	White/ Green	Light green

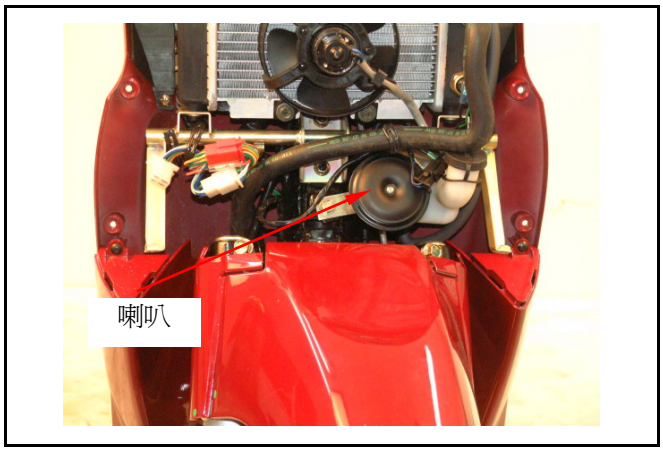
Brake Switch

While grasp the brake lever firmly, the terminals of white/green and green/yellow of the brake should have continuity.
Replace the switch if damaged.

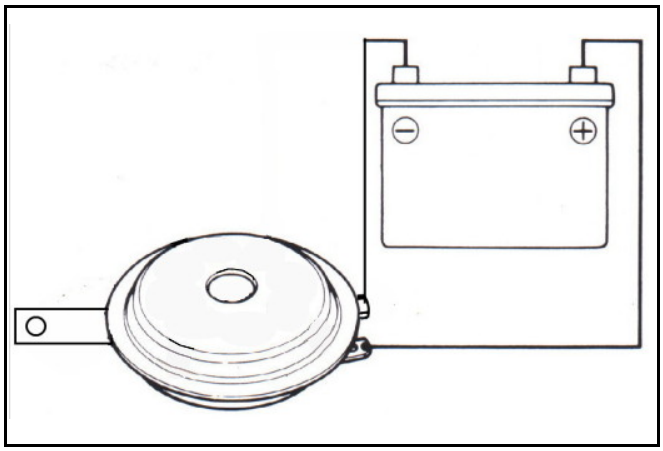


Horn

Remove the front cover.

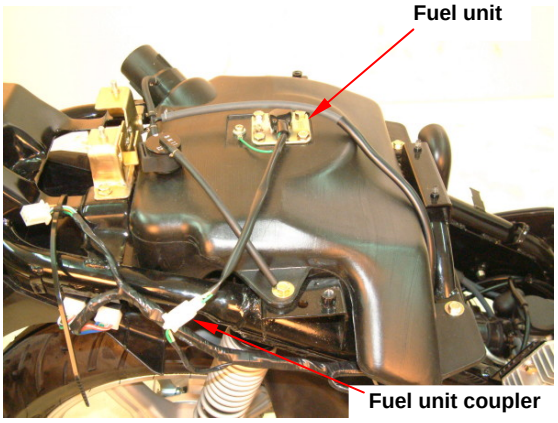


Apply 12 V power source to two terminals of the horn, the horn should sound.
Replace the horn if necessary.



Fuel Unit

Open the seat.
Remove the luggage box.
Remove the rear carrier.
Remove the body cover.
Disconnect the coupler of the fuel unit.



Remove the fuel unit (screw x 4).

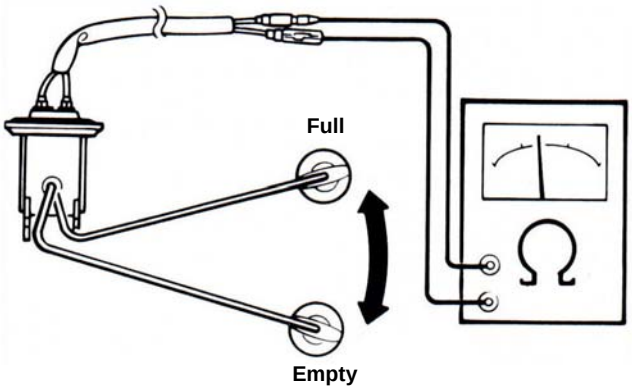
⚠ Caution

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

When the float arm shifts to the F position or the E position, the resistance measured shall be as follows:

Position	Resistance
E (Empty)	97.5~107.5 Ω
F (Full)	4~10 Ω

Connect the wiring to the fuel unit and the ohmmeter as shown.



Connect the fuel unit coupler to the wire harness.
Turn on the main switch.
Move the float arm to verify the proper position the fuel gauge needle indicates.

Arm Position	Needle Position
Up (Full)	F (Full)
Down (Empty)	E (Empty)

⚠ Caution

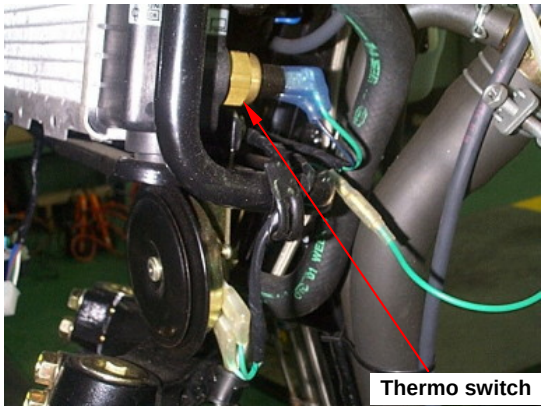
While conducting the test, turn on the direction indication lamp to make sure that the battery is in serviceable condition.

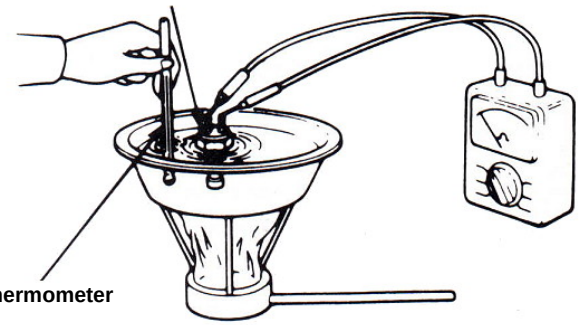
Cooling Fan Thermo Switch

The thermo switch mounted on the radiator controls the operation of the cooling fan motor.
In case that the fan motor fails to work, disconnect the green and black/blue leads and connect jump wires to the terminals, then, turn on the main switch, the fan motor should operate.
If the fan motor still fails to run, measure battery voltage between the green and black/blue leads.
If there is no voltage, check for blown fuse, loose connection or short-circuit.
If the fan motor runs, check the thermo switch in the manner as described below:
Hang the thermo switch on the bowl filled with coolant to check the switch's opening and closing temperatures, confirm the switch is open circuited at room temperature, increase the coolant temperature gradually. The switch should have a continuity at 98-102℃.

⚠ Caution

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

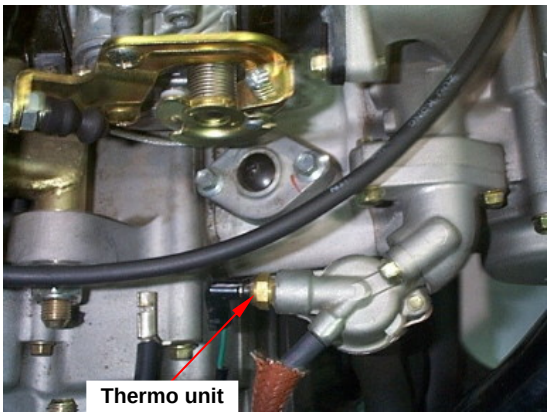




Thermo unit

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

Temperature	50°C	80°C	100°C	120°C
Standard (Ω)	134~149	47.5~57.0	26~29	14.8~17.2

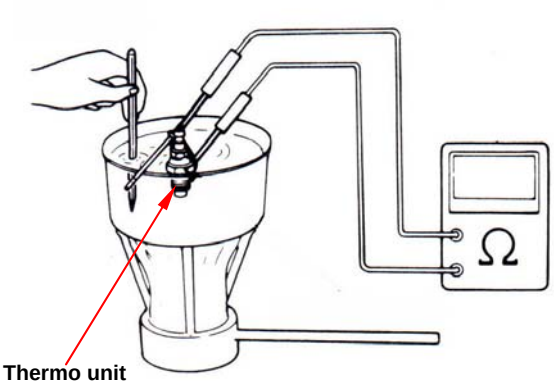


⚠ Caution

- Wear gloves and goggles when performing this test.

⚠ Caution

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

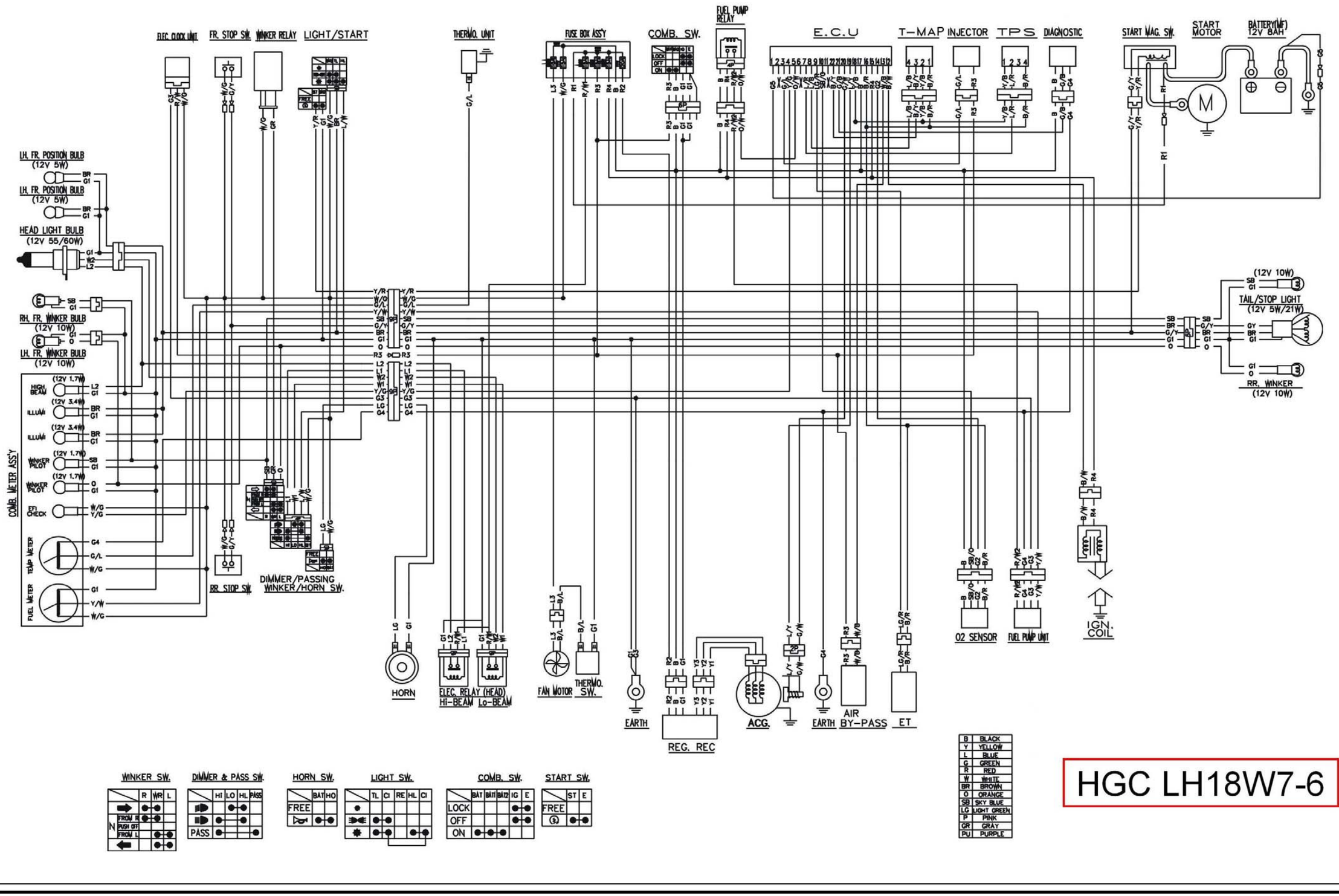


Water Temperature Meter

Disconnect the water temperature meter and connect it to engine ground.
Turn on the main switch.
The needle of the meter should move to other end, H position.

⚠ Caution

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


ELEC. CLOCK UNIT
FR. STOP SW.
WINKER RELAY
LIGHT/START
THERMO. UNIT
FUSE BOX ASSY
COMB. SW.
FUEL PUMP RELAY
E.C.U
T-MAP
INJECTOR
TPS
DIAGNOSTIC
START MAG. SW.
START MOTOR
BATTERY(MF) 12V 8AH
LH. FR. POSITION BULB (12V 5W)
LH. FR. POSITION BULB (12V 5W)
HEAD LIGHT BULB (12V 55/60W)
RH. FR. WINKER BULB (12V 10W)
LH. FR. WINKER BULB (12V 10W)
COMB. METER ASS'Y
HIGH BEAM (12V 1.7W)
ILLUM (12V 3.4W)
ILLUM (12V 3.4W)
WINKER PILOT (12V 1.7W)
WINKER PILOT (12V 1.7W)
FI CHECK
TEMP METER
FUEL METER
BR. STOP SW.
DIMMER/PASSING WINKER/HORN SW.
HORN
ELEC. RELAY (HEAD) HI-BEAM Lo-BEAM
FAN MOTOR
THERMO. SW.
EARTH
REG. REC
ACG.
EARTH
AIR BY-PASS
ET
O2 SENSOR
FUEL PUMP UNIT
IGN. COIL
(12V 10W)
TAIL/STOP LIGHT (12V 5W/21W)
RR. WINKER (12V 10W)
WINKER SW.
DIMMER & PASS SW.
HORN SW.
LIGHT SW.
COMB. SW.
START SW.
B BLACK
Y YELLOW
L BLUE
G GREEN
R RED
W WHITE
BR BROWN
O ORANGE
SB SKY BLUE
LG LIGHT GREEN
P PINK
GR GRAY
PU PURPLE

HGC LH18W7-6

Note: