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SERVICE MANUAL

LV12W3-EU / LV30W2-EU

CRUISYM α

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Symbols and Marks

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

Warning	Means that serious injury or loss of life may happen if procedures are not correctly followed.
Caution	Means that equipment damages may result if procedures are not followed.
Engine oil	Limits to use SAE 10W-30 or 10W-40 API SL class oil. Warranty will not cover the damage that caused by not apply with the limited engine oil. (Recommended oil: "**SYMOIL**" engine oil serials)
Grease	High Temperature Lithium Complex E.P. Grease is recommended.
Gear oil	"**SYMOIL**" gear oil serials are recommended. (GEAR OIL SAE 10W-30 or 85W-90)
Locking sealant	Apply sealant; medium strength sealant should be used unless otherwisespecified.
Oil seal	Apply with lubricant. ◦
Renew	Replace with a new part before installation.
Brake fluid	Use recommended brake fluid DOT3 or DOT4 brake fluid.
Special tools	Special tools
Correct	Meaning correct installation.
Wrong	Meaning wrong installation.
Indication	Indication of components.
Directions	Indicates position and operation directions
	Components assembly directions each other.
	Indicates where the bolt installation direction, --- means that bolt cross through the component (invisibility).

General Safety

Carbon Monoxide

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

⚠ Caution

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

Gasoline

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

⚠ Caution

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

Used Engine Oil

⚠ Caution

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

Hot Components

⚠ Caution

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

Battery

⚠ Caution

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

Brake Shoes

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

⚠ Caution

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

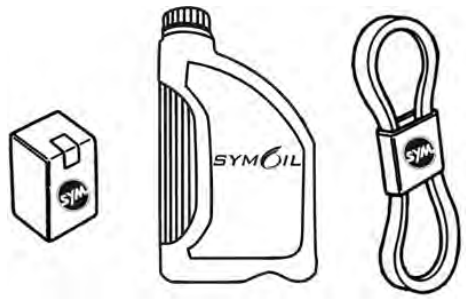
Brake Fluid

⚠ Caution

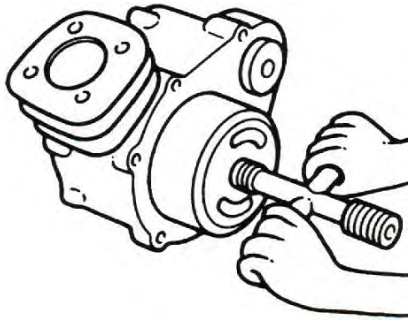
Brake fluid spilled on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the top of the parts for protection when servicing the brake system. Keep the brake fluid beyond reach of the children.

Before Servicing

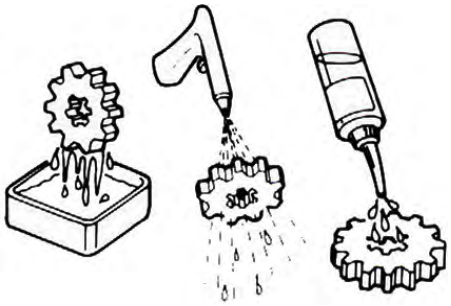
- Always use SANYANG genuine parts and recommended oil. Using improper parts may cause damage to or destruction of the vehicle.



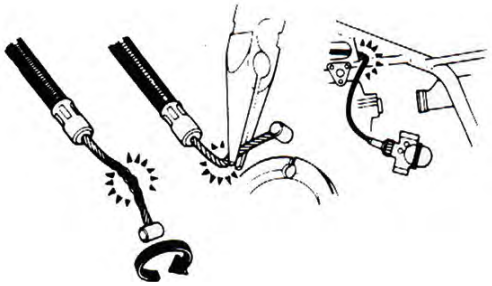
- Special tools are designed for removal and installation of component parts without damaging them. Using wrong tools may result in parts damage.



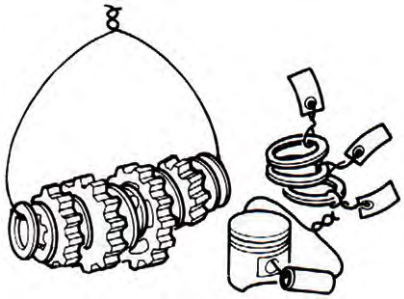
- When servicing this vehicle, use only metric tools. Metric bolts, nuts, and screws are not interchangeable with the Britain system, using wrong tools and fasteners may damage this vehicle.
- Clean the outside of the parts or the cover before removing it from the vehicle. Otherwise, dirt and deposit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



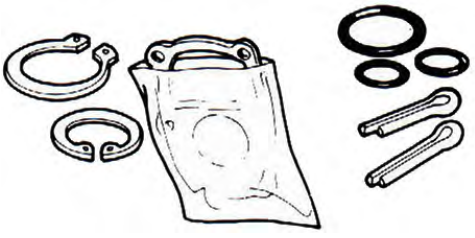
- Never bend or twist control cables to avoid unsmooth control and premature worn out.



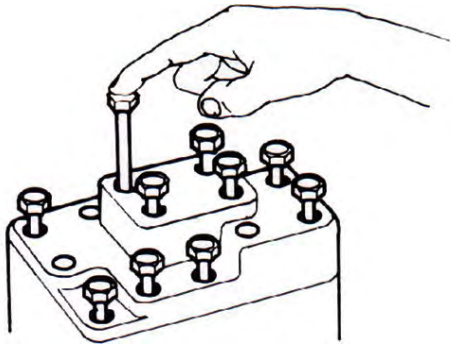
- Rubber parts may become deteriorated when old, and be damaged by solvent and oil easily. Check these parts before installation to make sure that they are in good condition, replace if necessary.
- When loosening a component which has different sized fasteners, operate with a diagonal pattern and work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



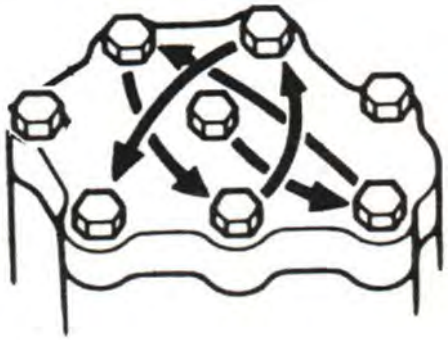
- Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).
- Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap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



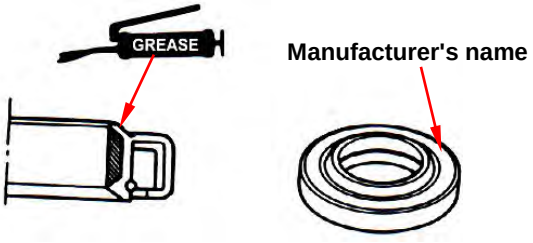
- The length of bolts and screws for assemblies, cover plates or boxes is different from one another, be sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length out side the hole is the same with other bolts, it is a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



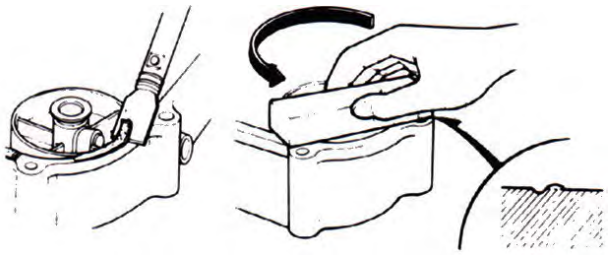
- Tighten assemblies with different dimension fasteners as follows: Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless otherwise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



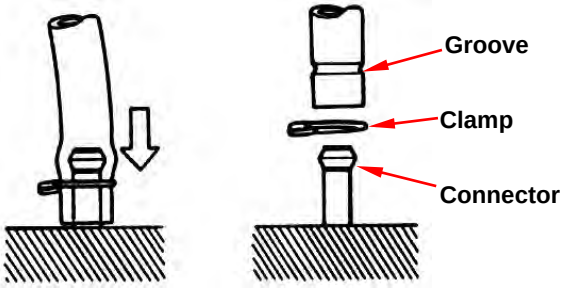
- When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, and check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.



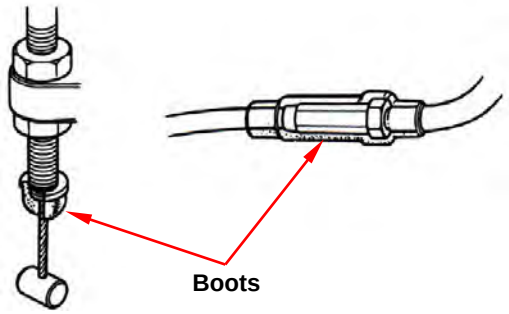
- Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any damage.



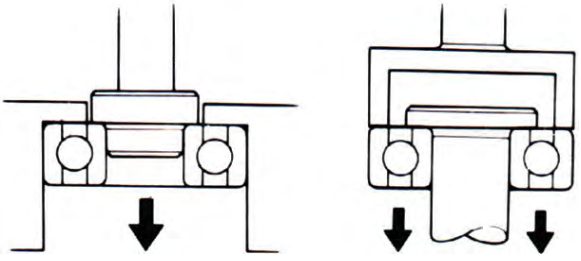
- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.



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

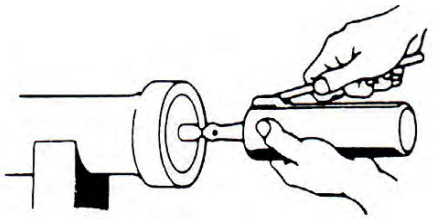


- The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both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



Both of these examples can result in bearing damage.

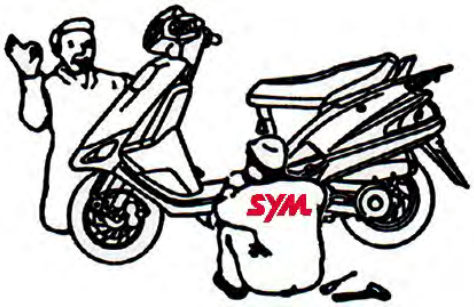
- Lubricate the rotation face with specified lubricant on the lubrication points before assembling.



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



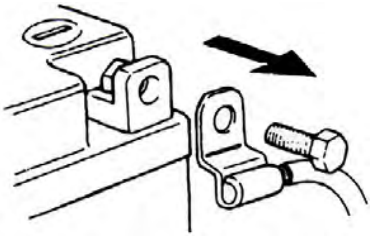
- Make sure service safety each other when conducting by two persons.



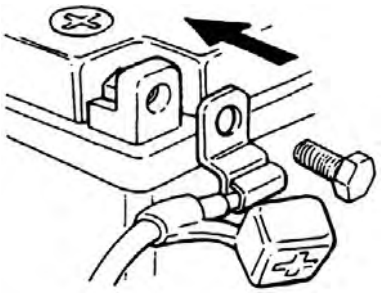
- Note that do not let parts fall down.



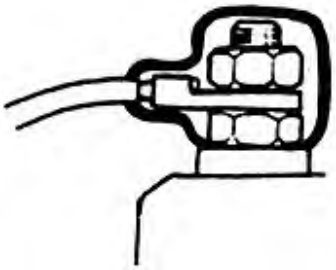
- Before battery removal operation, it has to remove the battery negative (-) cable firstly. Notre tools like open-end wrench do not contact with body to prevent from circuit short and create spark.



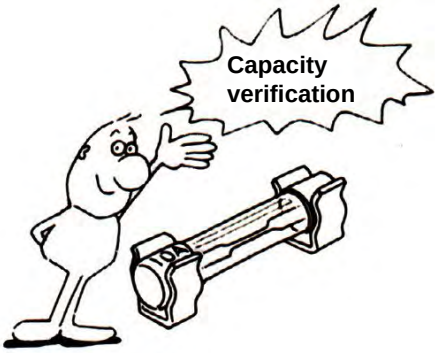
- After service completed, make sure all connection points is secured.
  Battery positive (+) cable should be connected firstly.
- And the two posts of battery have to be greased after connected the cables.



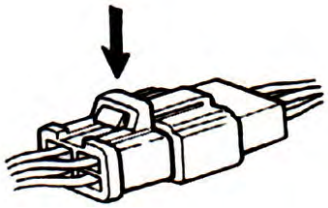
- Make sure that the battery post caps are located in properly after the battery posts had been serviced.



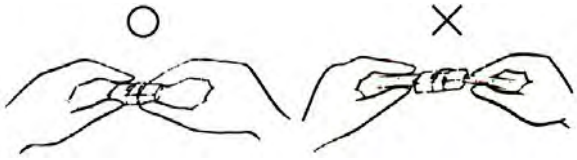
- If fuse burned, it has to find out the cause and solved it. And then replace with specified capacity fuse.



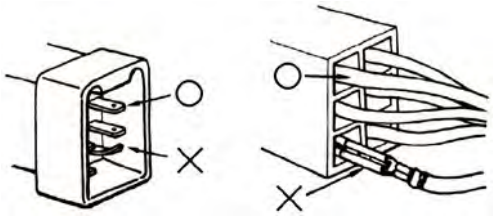
- When separating a connector, it locker has to be unlocked firstly. Then, conduct the service operation.



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



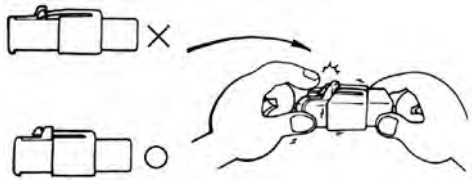
- Make sure if the connector pins are bent, extruded or loosen.



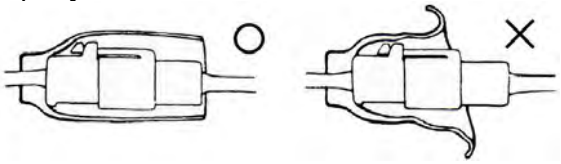
- Insert the connector completely.

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

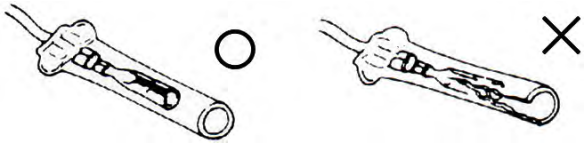
  Check if any wire loose.



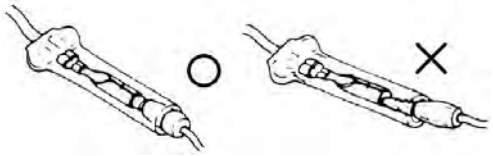
- Check if the connector is covered by the twin connector boot completely and secured properly.



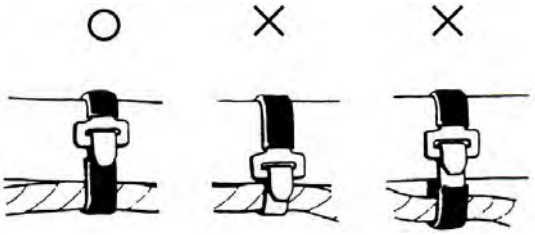
- Before terminal connection, check if the boot is crack or the terminal is loose.



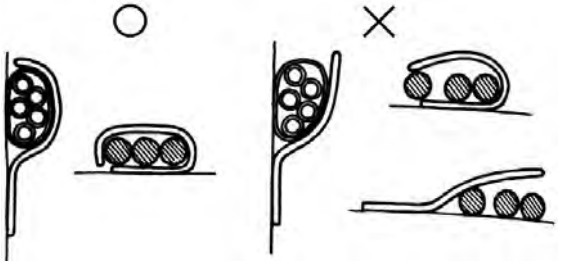
- Insert the terminal completely.
  Check if the terminal is covered by the boot.
  Do not let boot open facing up.



- 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.



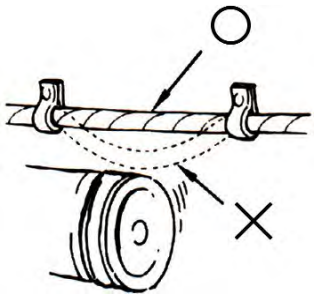
- Wire band and wire harness have to be clamped secured properly.



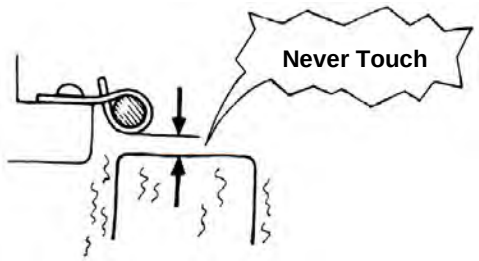
- Do not squeeze wires against the weld or its clamp.



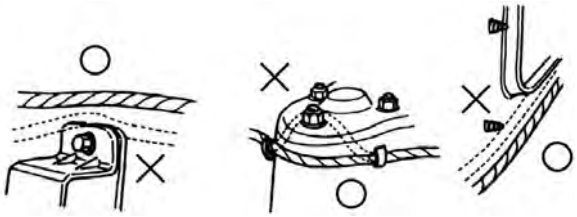
- Do not let the wire harness contact with rotating, moving or vibrating components as routing the harness.



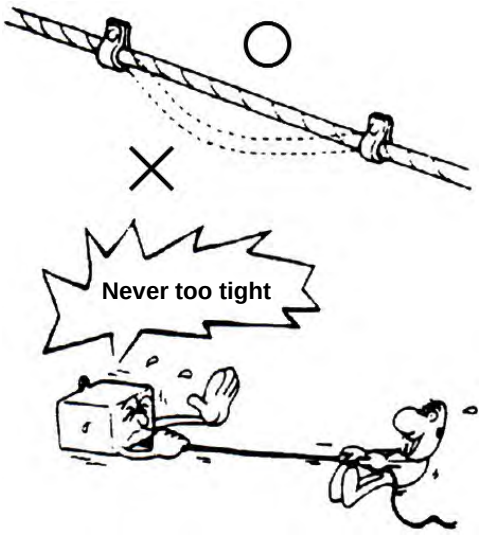
- Keep wire harnesses far away from the hot parts.



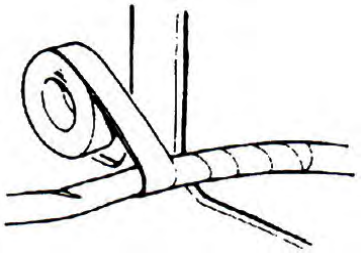
- Route wire harnesses to avoid sharp edges or corners and also avoid the projected ends of bolts and screws.



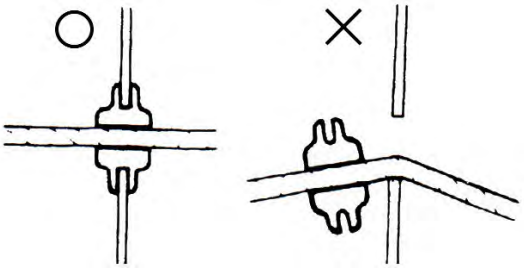
- Route harnesses so that they neither pull too tight nor have excessive slack.



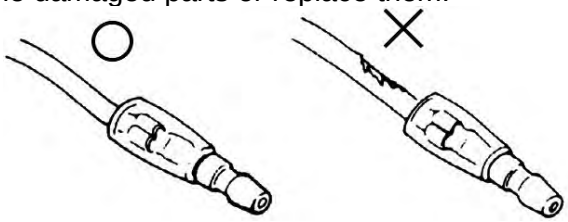
- Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.



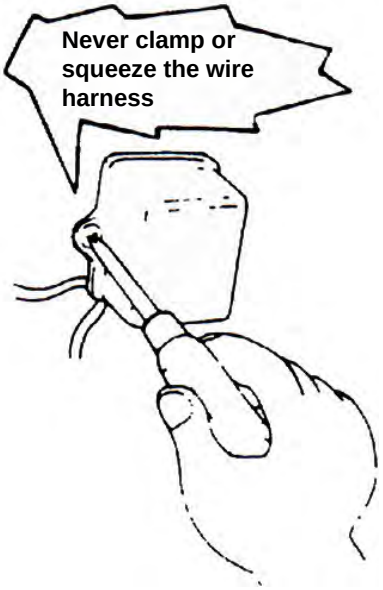
- Secure the rubber boot firmly as applying it on wire harness.



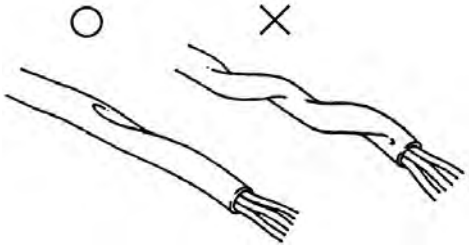
- Never use wires or harnesses which insulation has been broken. Wrap electrical tape around the damaged parts or replace them.



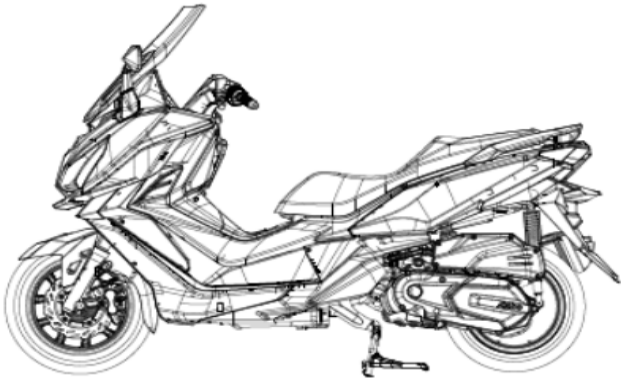
- Never clamp or squeeze the wire harness as installing other components.



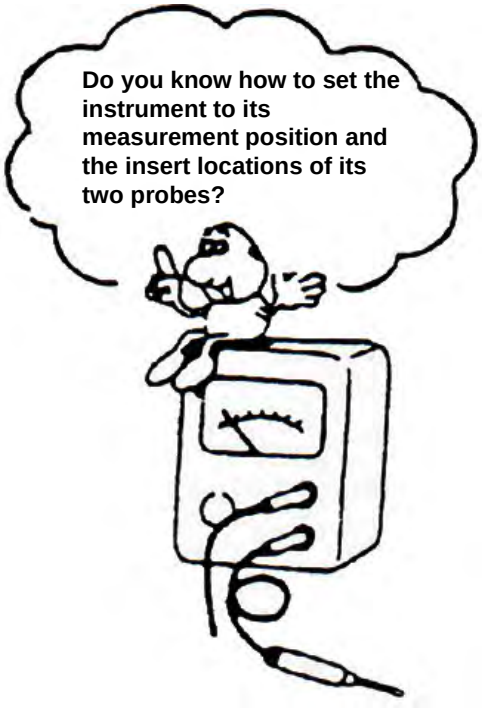
- Do not let the wire harness been twisted as installation.



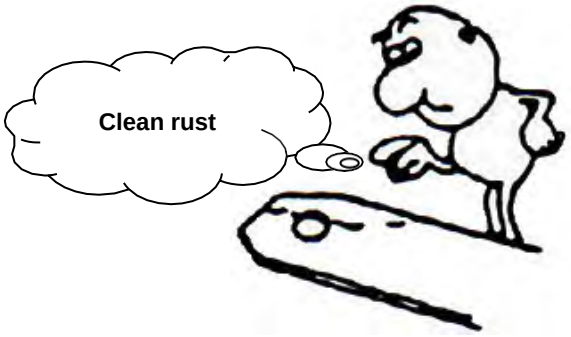
- Wire harnesses routed along the handlebar should not be pulled too tight or have excessive slack, be rubbed against or interfere with adjacent or surrounding parts in all steering positions.



- 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 MOTOR	MODEL		LV25W2-EU
Dimension	Overall Length		**2,175 mm**	Suspension System	Front	**TELESCOPIC FORK**
	Overall Width		**760 mm**		Rear	**UNIT SWING**
	Overall Height		**1,440 mm**	Tire Specifications	Front	**120 / 70-14 55P**
	Wheel Base		**1,550 mm**		Rear	**140 / 60-13 63P**
Weight	Curb Weight	Front	**84 kg**	Brake System	Front	**DISK (ø 260 mm) +ABS**
		Rear	**109 kg**			
		Total	**193 kg**		Rear	**DISK (ø 240 mm) +ABS**
	Passengers/Weight		**Two / 180 kg**	Performance	Max. Speed	**> 122 km/h**
	Total Weight	Front	**109kg**		Climb Ability	**>27°**
		Rear	**193 kg**	Reduction	Primary Reduction	**Belt**
		Total	**373 kg**		Secondary Reduction	**Gear**
Engine	Type		**4-STROKE ENGINE**		Clutch	**Centrifugal, dry type**
	Installation and arrangement		**Vertical, below center, incline 80°**		Transmission	**CVT**
	Fuel		**Above 92 octane unleaded**	Speedometer		**0 ~ 180 km/hr**
	Cycle/ Cooling		**4-stroke/ Liquid-cooled**	Horn		**93~112 dB/A**
	Cylinder	Bore	**φ 71 mm**	Muffler		**Expansion & Pulse Type**
		Stroke	**63 mm**	Exhaust Pipe Position and Direction		**Right side, and Backward**
		Number/Arrangement	**SINGLE CYLINDER**	Lubrication System		**Forced circulation & splashing**
	Displacement		**249.4 cc**	Exhaust Concentration	CO	**< 1000 mg/km**
	Compression Ratio		**10.5 : 1**		HC	**< 100 mg/km**
	Max. HP		**21.5ps(15.8kw) / 7,500 rpm**		NOx	**< 60 mg/km**
	Max. Torque		**2.28 kgf-m(22.34Nm) / 5,500 rpm**	E.E.C.		√
	Ignition system		**Full transistor ignition (ECU)**	P.C.V.		√
	Starting System		**Electrical starter**			

MAKER			SANYANG MOTOR	MODEL		LV30W2-EU
Dimension	Overall Length		**2,175 mm**	Suspension System	Front	**TELESCOPIC FORK**
	Overall Width		**760 mm**		Rear	**UNIT SWING**
	Overall Height		**1,440 mm**	Tire Specifications	Front	**120 / 70-14 55P**
	Wheel Base		**1,550 mm**		Rear	**140 / 60-13 63P**
Weight	Curb Weight	Front	**84 kg**	Brake System	Front	**DISK (ø 260 mm) +ABS**
		Rear	**110 kg**			
		Total	**194 kg**		Rear	**DISK (ø 240 mm) +ABS**
	Passengers/Weight		**Two / 180 kg**	Performance	Max. Speed	**> 127km/h**
	Total Weight	Front	**130 kg**		Climb Ability	**>27°**
		Rear	**244 kg**	Reduction	Primary Reduction	**Belt**
		Total	**374 kg**		Secondary Reduction	**Gear**
Engine	Type		**4-STROKE ENGINE**		Clutch	**Centrifugal, dry type**
	Installation and arrangement		**Vertical, below center, incline 80°**		Transmission	**CVT**
	Fuel		**Above 92 octane unleaded**	Speedometer		**0 ~ 180 km/hr**
	Cycle/ Cooling		**4-stroke/ Liquid-cooled**	Horn		**93~112 dB/A**
	Cylinder	Bore	**φ 75 mm**	Muffler		**Expansion & Pulse Type**
		Stroke	**63 mm**	Exhaust Pipe Position and Direction		**Right side, and Backward**
		Number/Arrangement	**SINGLE CYLINDER**	Lubrication System		**Forced circulation & splashing**
	Displacement		**278.3 cm³**	Exhaust Concentration	CO	**< 1000 mg/km**
	Compression Ratio		**10.5 : 1**		HC	**< 100 mg/km**
	Max. HP		**26.0 ps(19.1kw) / 7,500 rpm**		NOx	**< 60 mg/km**
	Max. Torque		**2.67kgf-m(26.2Nm)/ 6,750 rpm**	E.E.C.		√
	Ignition System		**Full transistor ignition (ECU)**	P.C.V.		√
	Starting System		**Electrical starter**			

Torque Values

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

Standard Torque Values for Reference

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

Engine Torque Values

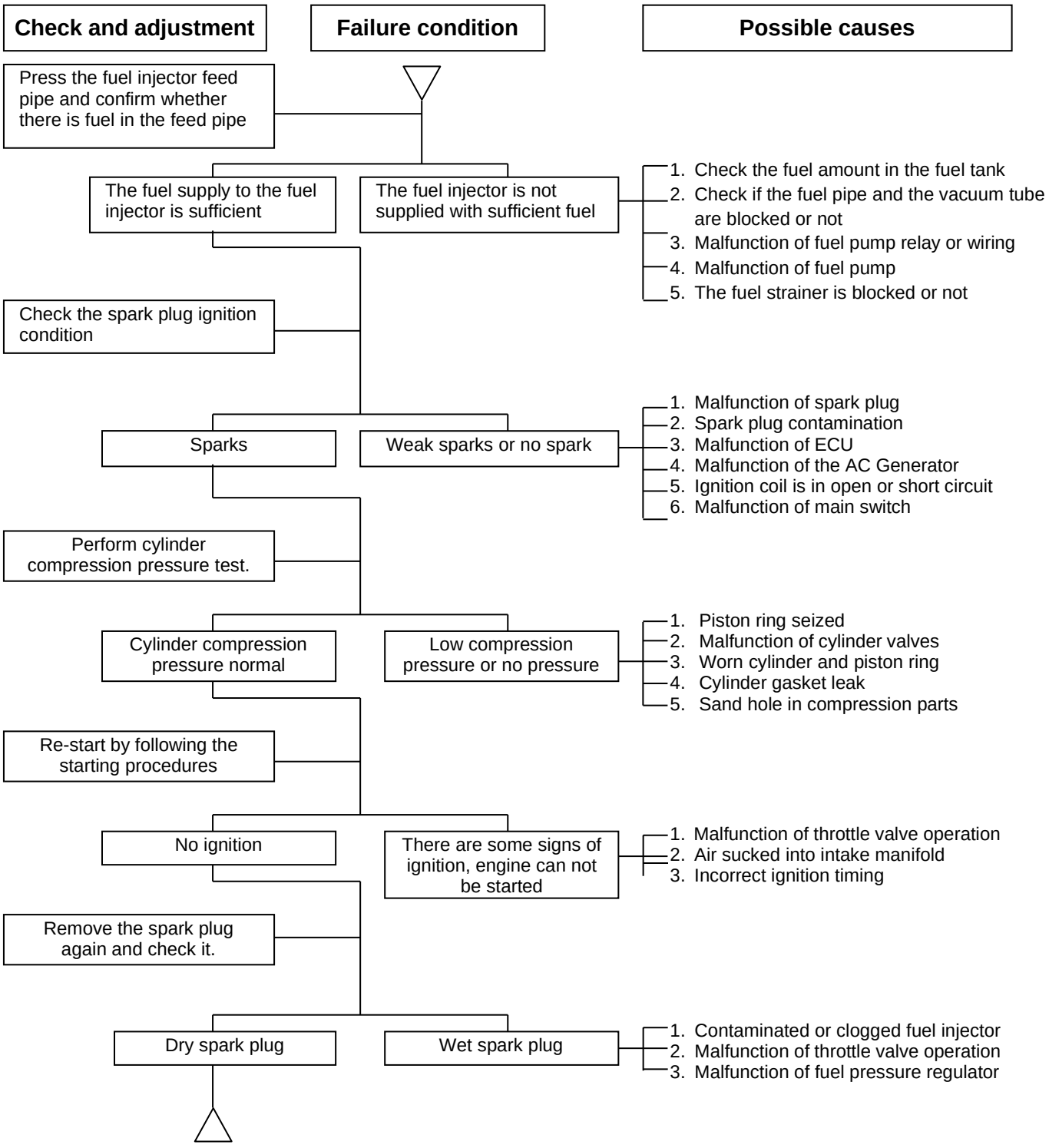
Item	Q'ty	Thread Dia. (mm)	Torque Value(kgf-m)	Remarks
Cylinder stud bolt	4	10	1.0~1.4	
Cylinder head nut	4	10	3.6~4.0	
Cylinder head right bolt	2	6	1.0~1.4	
Cylinder head side cover bolt	2	6	1.0~1.4	
Cylinder head cover bolt	4	6	0.8~1.2	
Cylinder head stud bolt (EX. pipe)	2	8	2.4~3.0	
Air inject pipe bolt	4	6	1.0~1.4	
Air inject reed valve bolt	2	6	0.07~0.09	
Tappet adjustment screw nut	4	5	0.7~1.1	
Spark plug	1	10	1.0~1.2	
Camshaft Chain Tensioner bolt	1	8	0.8~1.2	Apply oil to thread
Oil pump screw	2	3	0.1~0.3	
Water pump impeller	1	7	1.0~1.4	
Engine left cover bolt	9	6	1.0~1.4	
Engine oil draining bolt	1	12	3.5~4.5	
Engine oil strainer cap	1	30	1.0~2.0	
Mission draining bolt	1	8	0.8~1.2	
Mission filling bolt	1	10	1.0~1.4	
Clutch driving plate nut	1	36	8.0~10.0	
Clutch outer nut	1	14	6.0~7.0	
Drive face nut	1	14	8.5~10.5	
ACG. Flywheel nut	1	14	7.0~8.0	
Crankcase bolt	7	6	1.0~1.4	
Mission case bolt	7	8	2.4~3.0	
Muffler mounting bolt	3	10	4.0~5.0	
Muffler mounting nut	2	8	2.4 ~3.0	

Frame Torque Values

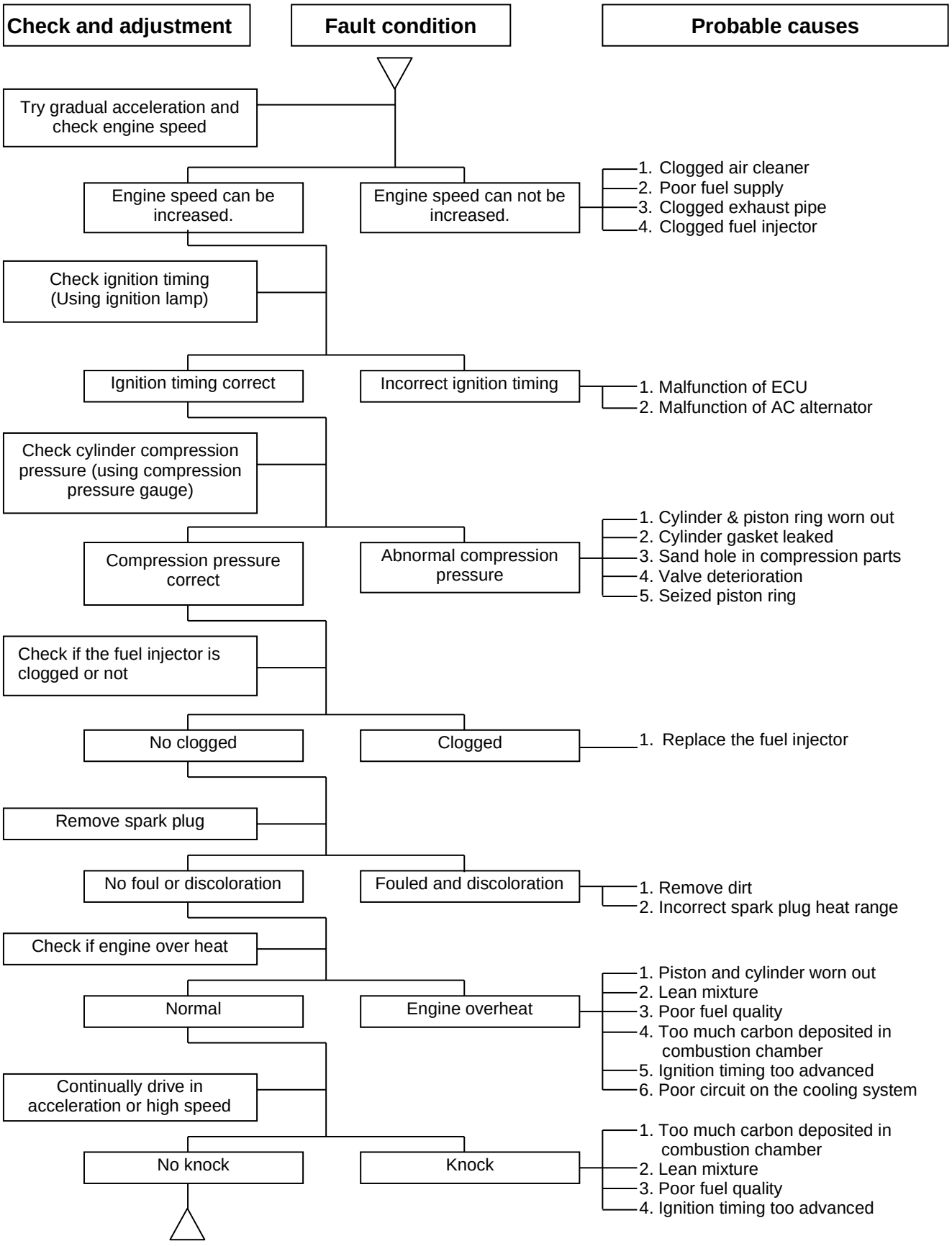
Item	Q'ty	Thread Dia. (mm)	Torque Value (Kg-m)	Remarks
Mounting bolt for steering handle post	1	10	4.0~5.0	
Lock nut for steering stem	1	BC1	6.0~8.0	
Steering top thread comp	1	BC1	1.0~1.1	
Front wheel axle nut	1	14	10.0~12.0	
Rear wheel axle nut	1	16	11.0~13.0	
Front cushion mounting bolt	4	10	4.0~4.5	
Rear cushion upper connection bolt	1	10	3.5~4.5	
Rear cushion under connection bolt	1	8	2.4~3.0	
Rear fork mounting bolt	2	10	4.0~5.0	
Brake hose bolt	2	10	3.0~4.0	
Brake air-bleeding valve	1	6	0.8~1.0	
Front brake disc mounting bolt	5	8	4.0~4.5	
Rear brake disc mounting bolt	5	8	4.0~4.5	
Brake clipper mounting bolt	2	8	2.9~3.5	
Engine hanger link bolt	2	12	7.5~9.5	On frame side
Engine hanger link nut	1	12	7.5~9.5	On engine side
Main standard nut	1	10	4.0~5.0	
Air cleaner bolts	2	6	1.0~1.4	

Trouble Diagnosis

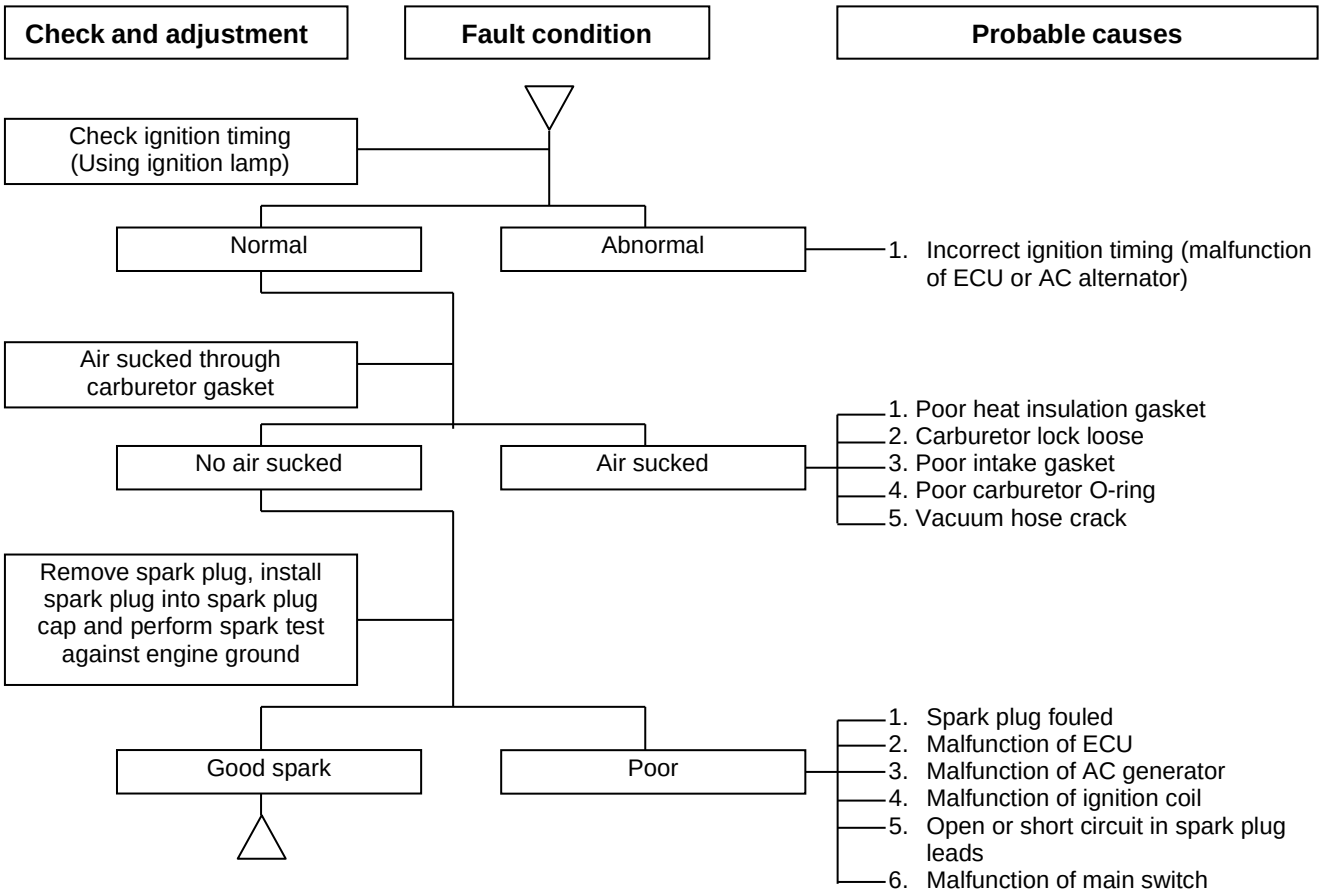
A. Engine hard to start or can not be started



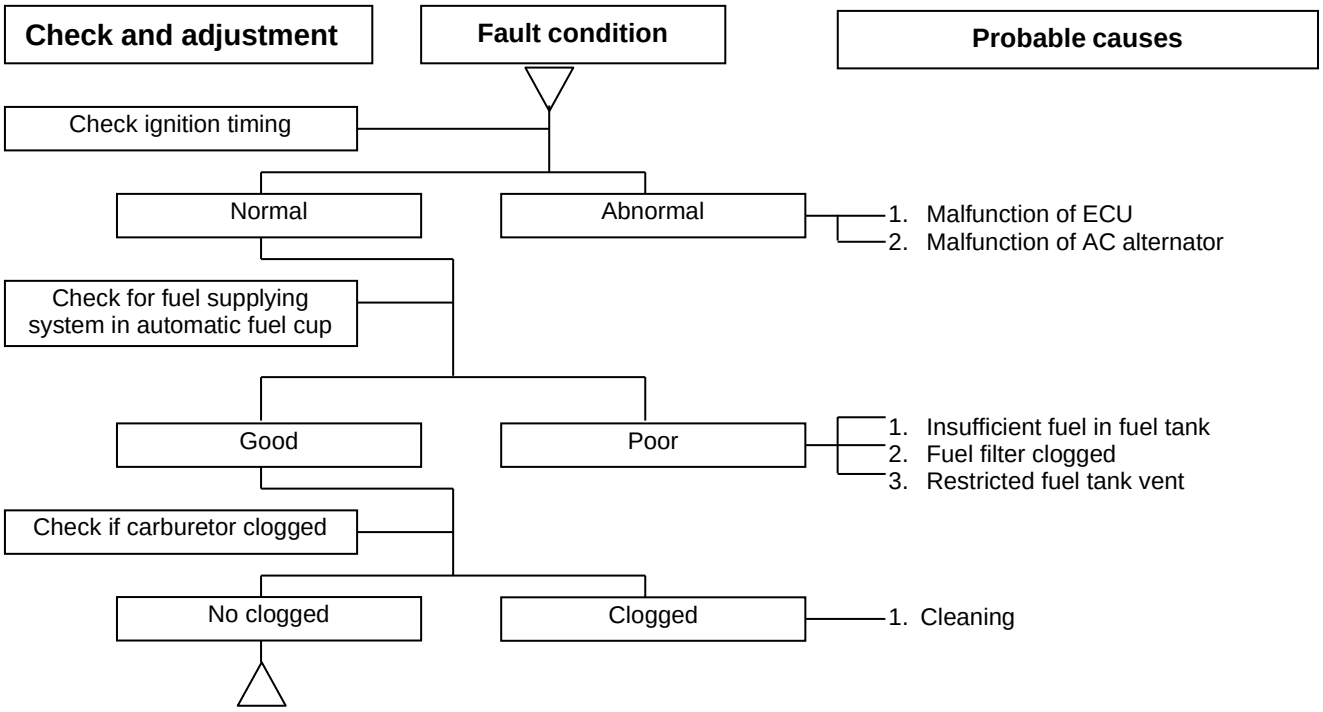
B. Engine run sluggish (Speed does not pick up, lack of power)



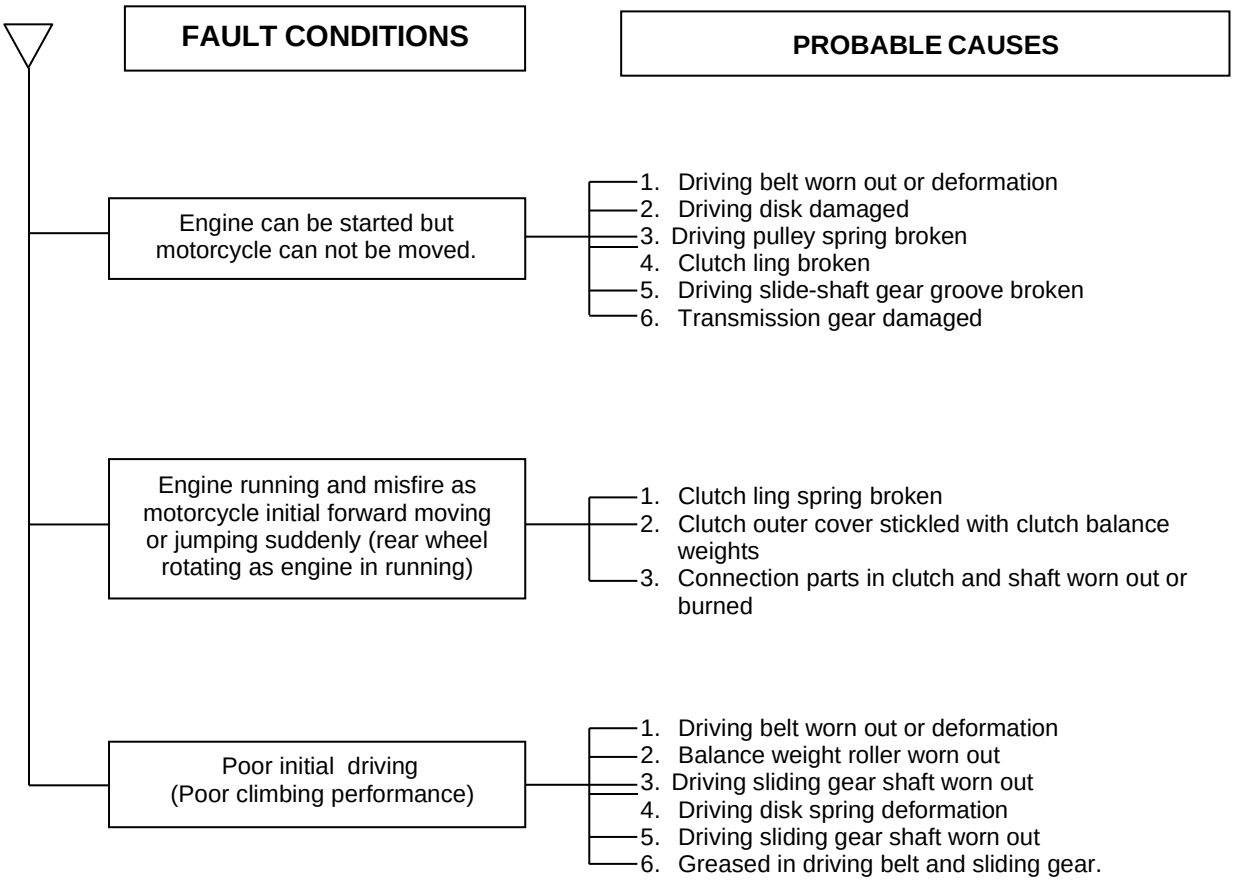
C. Engine runs sluggish (especially in low speed and idling)



D. Engine runs sluggish (High speed)



E. Clutch, Driving And Driving Pulley



Lubrication Points



NOTE:

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Precautions in Operation

Model		LV25W2	LV30W2
Fuel Tank Capacity		12000 c.c.	
Engine Oil	capacity	1,400 c.c.	
	change	1,200 c.c.	
Transmission Gear oil	capacity	180 c.c.	
	change	160 c.c.	
Capacity of coolant		1400 c.c.	
Clearance of throttle grip		5~10 º	
Spark plug		CR8E (gap:0.7~0.8 mm)	
Timing advance idle speed		BTDC 10º / 1,650±100rpm	BTDC 10º / 1,550±100rpm
Full timing advanced		30º	28º
Idling speed		1,650±100 rpm	1,550±100 rpm
Cylinder compression pressure		14± 2 kgf/cm²	
Valve clearance	IN	0.10±0.02 mm	
	EX	0.15±0.02 mm	
Tire dimension	Front	120/70-14 55P	
Tire dimension	Rear	140/60-13 63P	
Tire pressure	Standard	Front: 2.0 kgf/cm²	Rear: 2.5 kgf/cm²
Battery		12V10Ah (MFN) GT12A-BS	

Periodical Maintenance Schedule

	Maintenance Interval	Every 1,000km	Every 5,000km	Every 10,000km	Every 15,000km
		1 Month	3 Months	6 Months	1 Year
1	Air cleaner element*	I	C	R	
2	Oil filter（mesh filter）	I	Clean every 10,000km		
3	Engine oil	(initial at 1,000km, second at 6,000km and then replace every 5,000km thereafter)			
4	Tire, pressure	I	I		
5	Battery	I	I		
6	Spark plug	I	I		R
7	Carbon Deposit cleaning on Throttle valve	I		I	
8	Steering bearing and handles	I	I		
9	Check Transmission for leakage	I	I		
10	Check crankcase for leakage	I	I		
11	Transmission Oil	(initial replace at 1,000km, and then replace every 10,000km thereafter)			
12	Brake Fluid	I	Replace every 30,000km		
13	Drive Belt/roller/Drive Pulley			C	R
14	Fuel tank tubes and Fuel filter	I	I		
15	Throttle valve operation and cable	I	I		
16	Bolts and nuts	I	I		
17	Cam Chain	I		I	
18	Valve clearance	I		I	
19	Shock absorbers	I		I	
20	Front/rear suspension	I		I	
21	Main/side stand	I/L		I/L	
22	Crankcase Blow-by system (PCV)	I	C		
23	Coolant	I	I		R
24	Cooling fan, tubes	I	I		
25	Clutch, Clutch outer, Driven pulley			C	
26	Brake mechanism/brake lining (pads) **	I	I		
27	Light, Switches and Electrical system	I	I		

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

* Replace the filter every 5000km under dusty environment. Never use compressed air to clean the filter. Replace if necessary.

** Clean and replace the internal component of brake caliper, master cylinder every 10,000km if necessary.
Replace brake fluid every 2 years / 30,000km.
Replace brake hose every 4 years / 60,000km.

☆ The above maintenance schedule has to be done if either mileage or duration had reached its designated maintenance criteria.

If any problem or question raised about your scooter, please contact your SYM authorized dealer regardless the service schedule.

☆ Have your scooter checked and maintained periodically by your SYM Authorized Dealer or Franchised Dealer to keep the scooter at the optimum condition.

☆ Check and maintain your scooter more frequently if necessary, such as frequently high speed / long distance driving, dusty environment, etc.

Engine Oil Change

Turn off engine, and park the motorcycle in flat surface with main stand.
Check oil level with oil level window.
If oil level is nearly low level, fill out recommended oil to upper level.



Oil Change

⚠ Caution

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

Place an oil pan under the motorcycle, and remove oil drain bolt.
After drained, make sure washer can be re-used.
Install oil drain bolt.
Torque value: 3.5~4.5kgf-m
Add oil to crankcase (oil viscosity SAE 10W-40)
Recommended using "**SYMOIL**" engine oil.

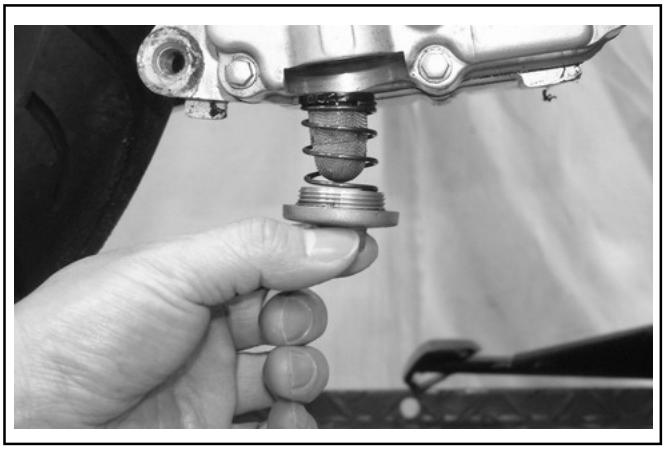


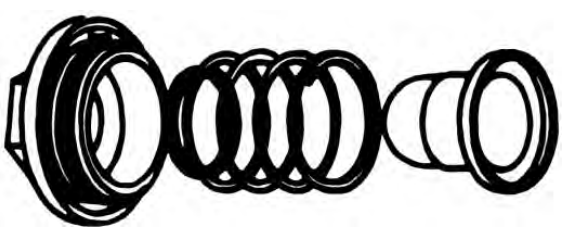
Install dipstick, start the engine for running several minutes.
Turn off engine, and check oil level again.
Check if engine oil leaks.

Engine Oil Strainer Clean

Drain engine oil out.
Remove oil strainer and spring.
Clean oil strainer.
Check if O-ring can be re-used.
Install oil strainer and spring.
Install oil strainer cap.

Torque value: 1.0~2.0kgf-m



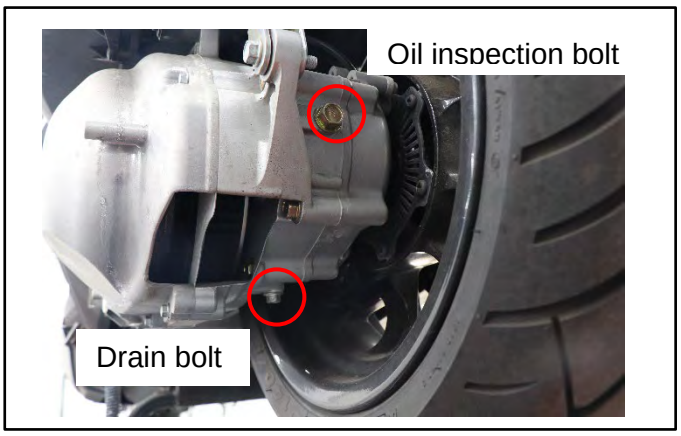


Gear Oil

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

Gear Oil Change

Remove left crankcase out cover.
Remove oil inspection bolt.
Remove drain plug and drain oil out.
Install the drain plug after drained.
Torque value: 0.8~1.2kgf-m
Add gear oil to specified quantity from the inspection hole.
Install the inspection bolt.
Torque value: 1.0~1.4kgf-m



Make sure that the bolt washer can be re-used, and install the bolt.
Start engine and run engine for 2-3 minutes.
Turn off engine and make sure that oil level is in correct level.
Make sure that no oil leaking.

Fuel Lines / Cable

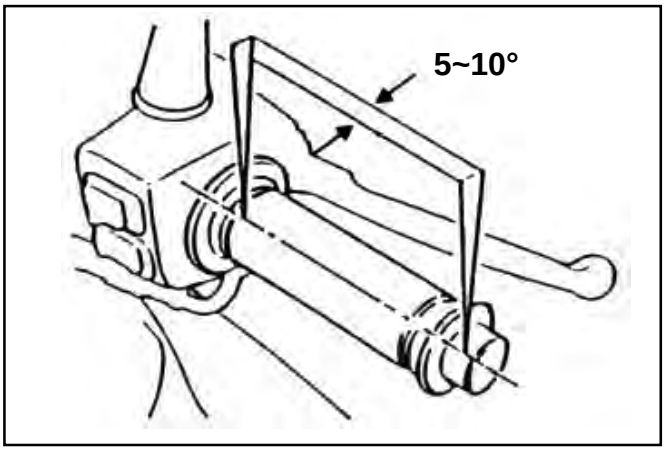
Remove luggage box.
Remove rear carrier.
Remove body covers.
Check all lines, and replace it when they are deterioration, damage or leaking.

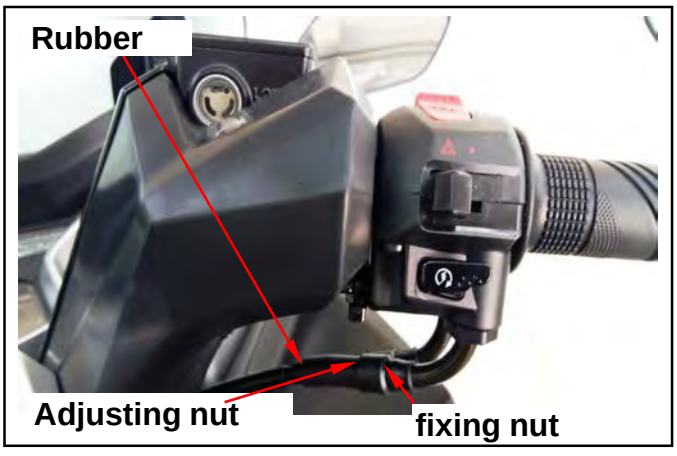
⚠ Warning

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

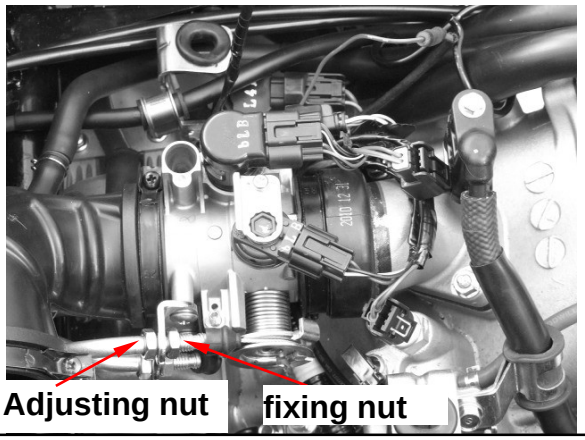
Acceleration Operation

Have a wide open of throttle valve as handle bar in any position and release it to let back original (full closed) position.
Check handle bar if its operation is smooth.
Check acceleration cable and replace it if deteriorated, twisted or damaged.
Lubricate the cable if operation is not smooth
Measure handle bar free play in its flange part.
Free play: 5~10°.
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.





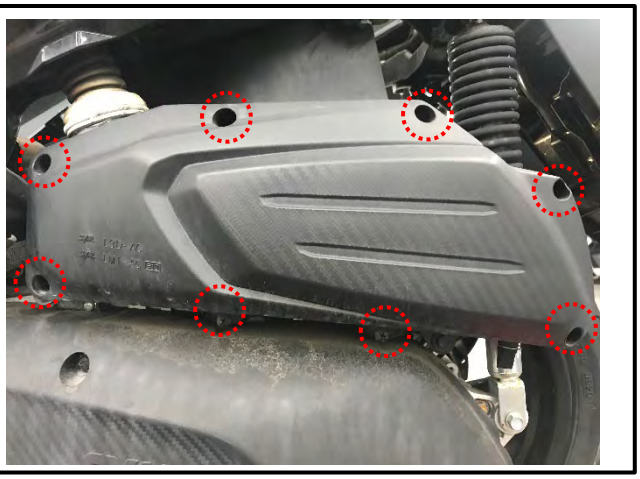
Primary adjustment is conducted from bottom side.
Loosen fixing nut, and adjust by turning the adjustment nut.
Tighten the fixing nut, and check acceleration operation condition.



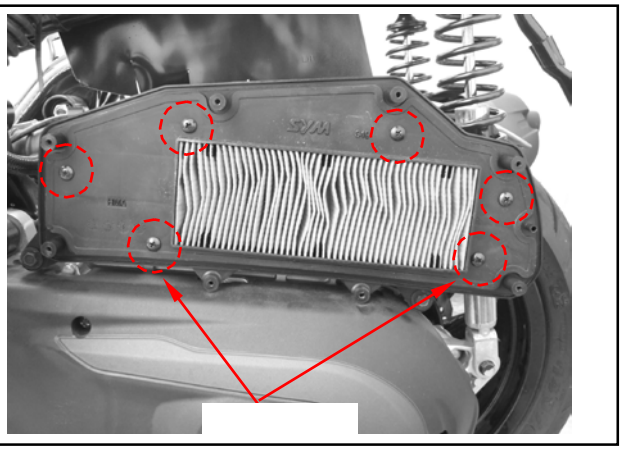
Air Cleaner

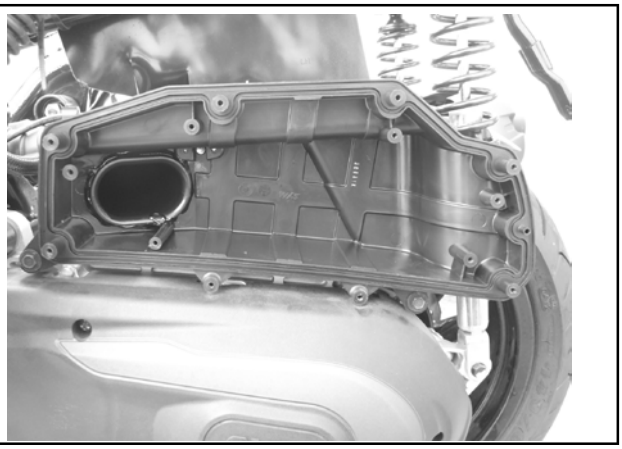
Air Cleaner Element

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



Remove 6 screws from the air cleaner element.





⚠ Caution

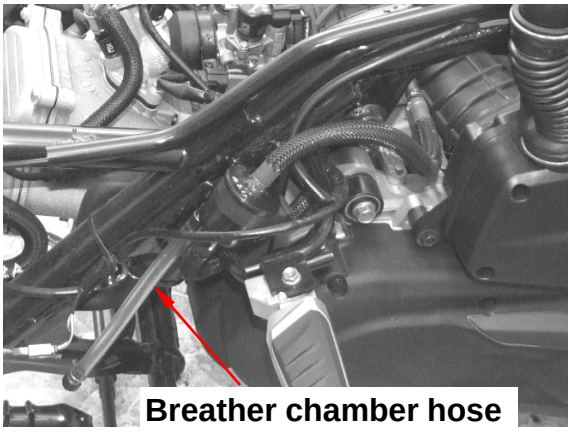
- The air cleaner element is made of paper so do not soap it into water or wash it with water.

P.C.V. system

Remove the plug from lower of the breather chamber hose.
Release the dry internal deposit.
Drain over-flow oil from tube while engine oil change

⚠ Caution

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

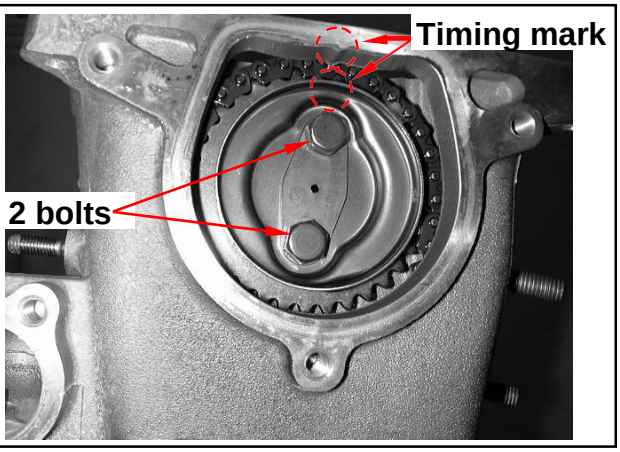


Valve Clearance

⚠ Caution

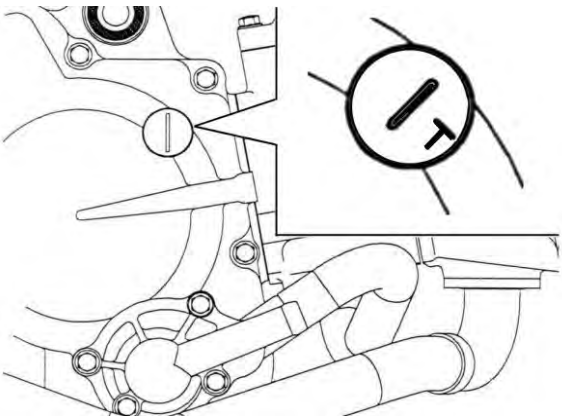
- Checks and adjustment must be performed when the engine temperature is below 35℃.

Remove luggage box.
Remove cylinder head cover & side cover.
Remove ignition timing hole cap located in front upper side of engine right cover
Turn camshaft bolt in C.W. direction and let the “T” mark on the camshaft sprocket aligns with cylinder head mark so that piston is placed at TDC position in compression stroke.



⚠ Caution

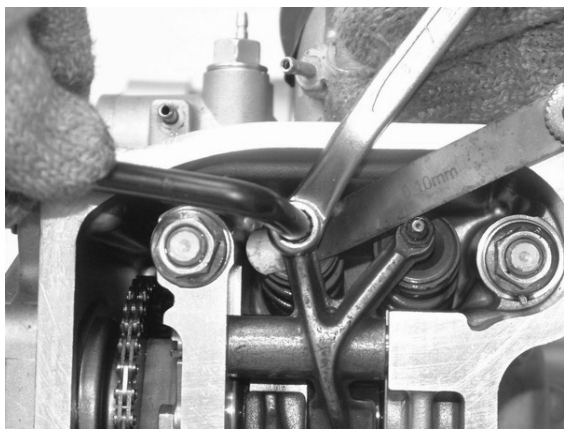
- Do not turn the bolt in C.C.W. direction to prevent from camshaft bolt looseness.



Valve clearance inspection and adjustment:
Check & adjust valve clearance with feeler gauge.
Valve clearance (IN)：0.10±0.02mm.
Valve clearance (EX)：0.15±0.02mm.
Loosen fixing nut and turn the adjustment nut for adjustment.

⚠ Caution

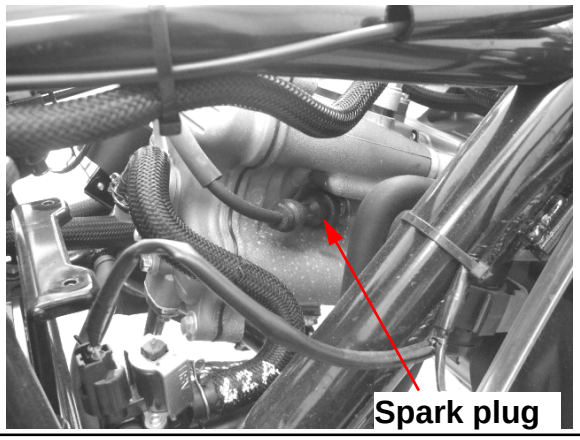
- Re-check the valve clearance after tightened the fixing nut.



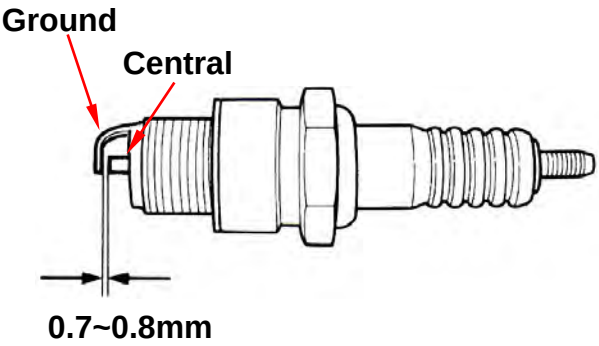
Special tool: Tappet adjuster
SYM-9001200-08
SYM-9001200-09
SYM-9001200-10
Special tool: Tappet adjuster wrench
SYM-9001200

Spark Plug

Recommended spark plug: CR8E
Remove luggage box
Remove central cover.
Remove spark plug cap.
Clean dirt around the spark plug hole.
Remove spark plug.
Measure spark plug gap.



Carefully bend ground electrode of the plug to adjust the gap if necessary.
Hold spark plug washer and install the spark plug by screwing it.
Tighten the plug by turning 1/2 turn more with plug socket after installed.
Tighten torque: 1.0~1.2kgf-m
Connect spark plug cap

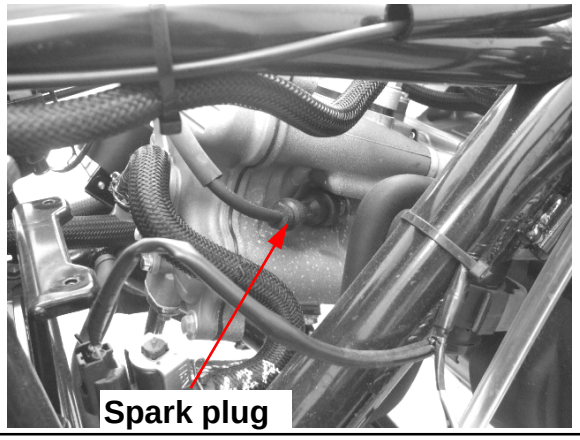


Cylinder Compression Pressure

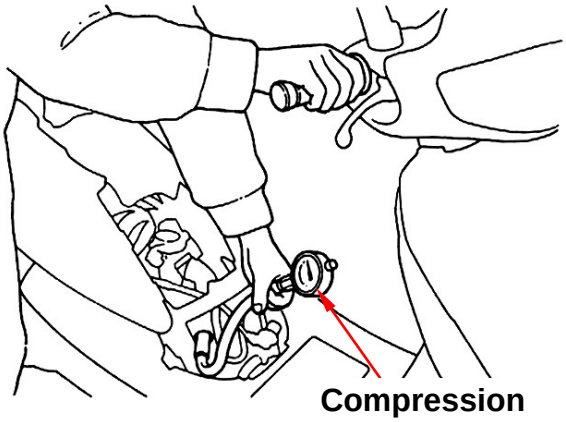
Warm up engine.
Turn off the engine.
Remove luggage box and central cover
Remove spark plug cap and spark plug.
Install compression gauge.
Full open the throttle valve, and rotate the engine by means of starter motor.

⚠ Caution

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

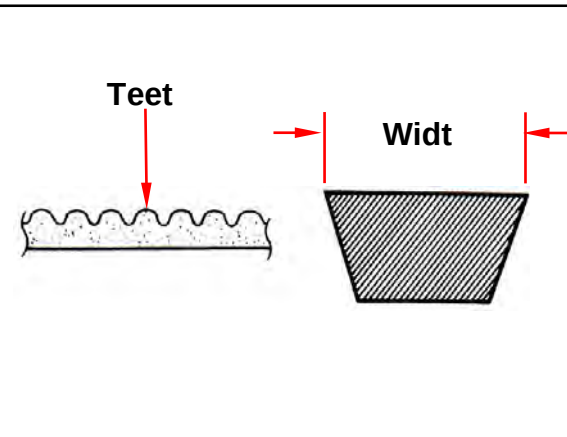


Check following items if the pressure is too low:
• Incorrect valve clearance.
• Valve leaking.
• Cylinder head leaking, piston, piston ring and cylinder worn out.
If the pressure is too high, it means carbon deposits in combustion chamber or piston head.

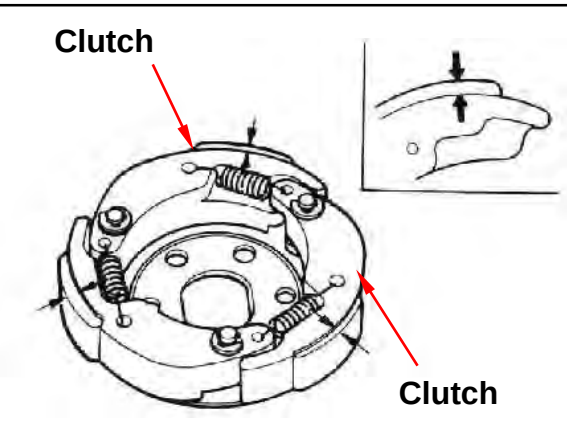


Drive Belt

Remove mounting bolt located under air cleaner.
Remove the engine left side cover and the cover.
Check if the belt is crack or worn out.
Replace the belt if necessary or in accord with the periodical maintenance schedule to replace it.
Width limit: 22.5 mm or above



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

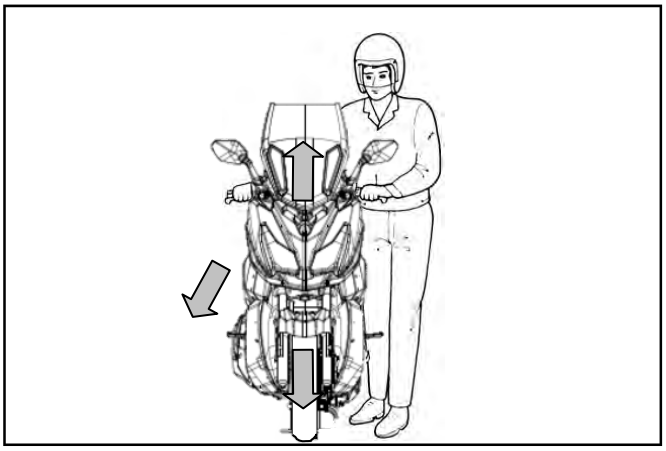


Steering Handle Top Bearing

⚠ Caution

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

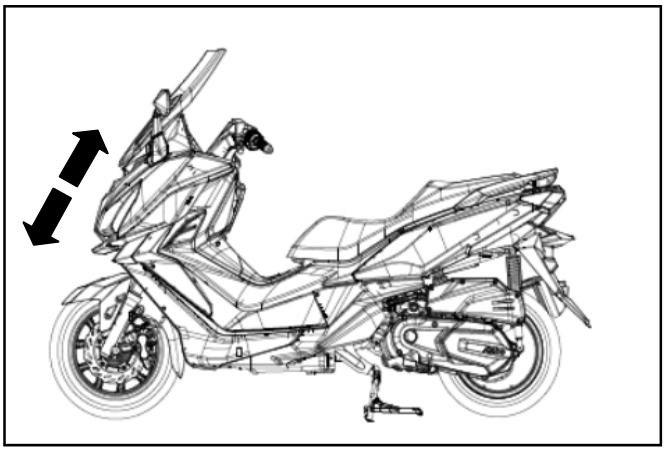
Lift the front wheel out of ground.
Turn handle from right to left alternative and check if turning is smoothly.
If handle turning is uneven and bending, or the handle can be operated in vertical direction, then adjust the handle top bearing.



Cushion

⚠ Caution

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

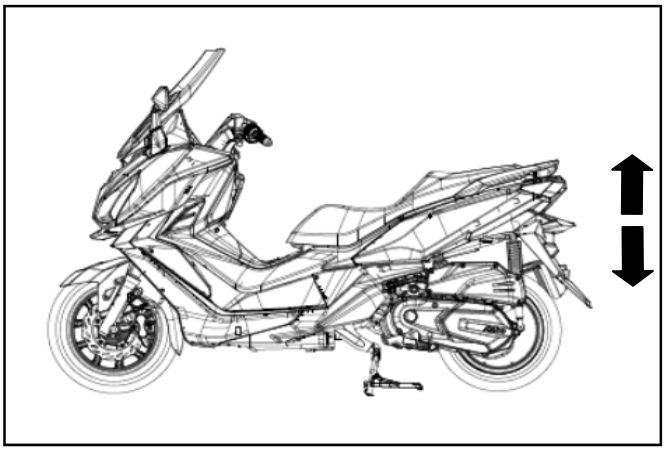


Front cushion

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

Rear Cushion

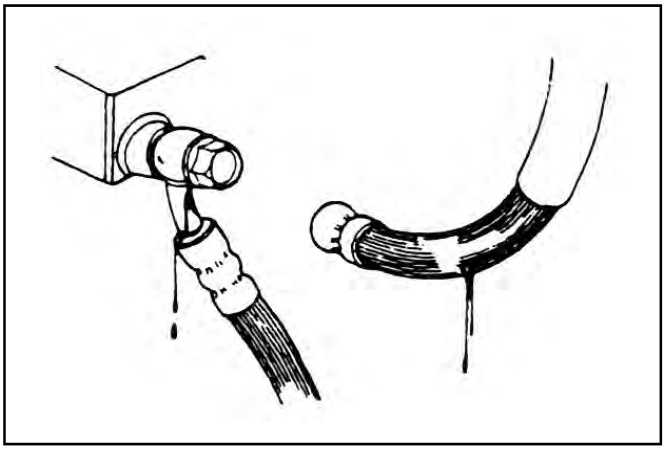
Press down the front cushion for several times to check it operation.
Check if it is damage
Replace relative parts if damage found.
Park the scooter with main stand.
Turn the rear wheel forcefully and check if engine bracket bushing worn out
Replace the bushing if looseness found.
Tighten all nuts and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



Disk Brake System

Brake System Hose

Make sure the brake hoses for corrosion or leaking oil.

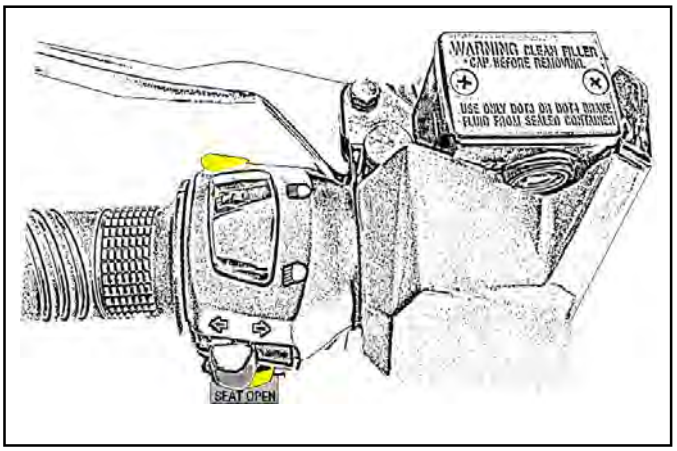


Brake Fluid

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

⚠ Caution

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



Filling Out Brake Fluid

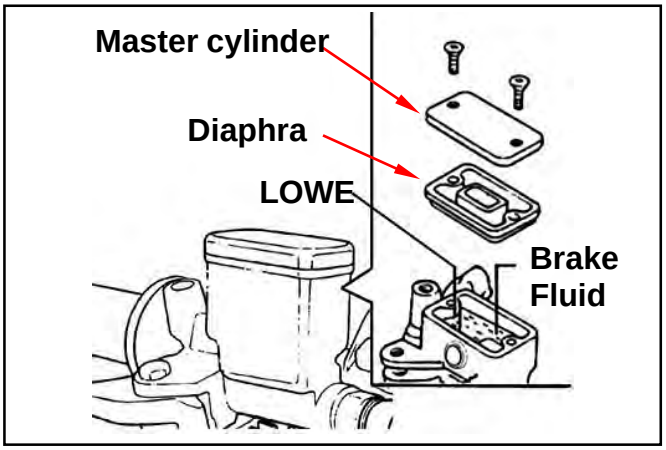
Tighten the drain valve, and add brake fluid. Operate the brake lever so that brake fluid contents inside the brake system hoses.

Added Brake Fluid

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

⚠ Caution

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

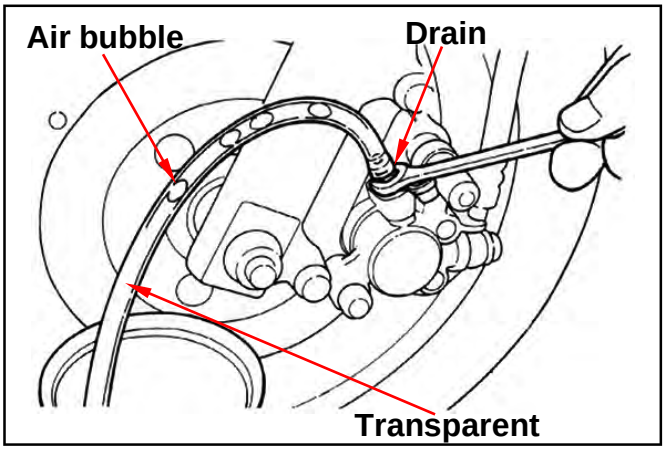


Air Bleed Operation

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

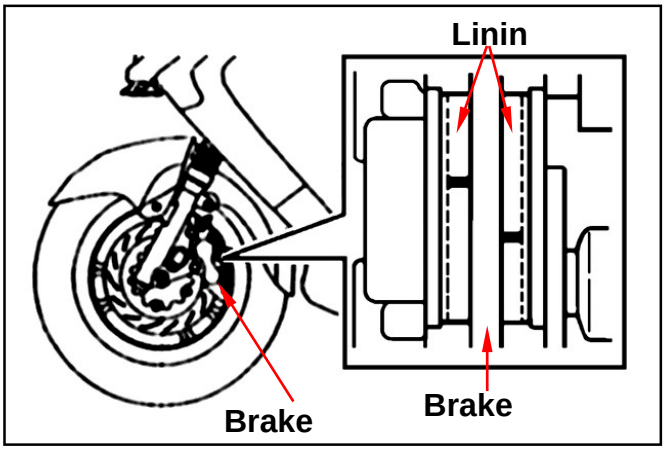
⚠ Caution

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



Brake Lining Wear

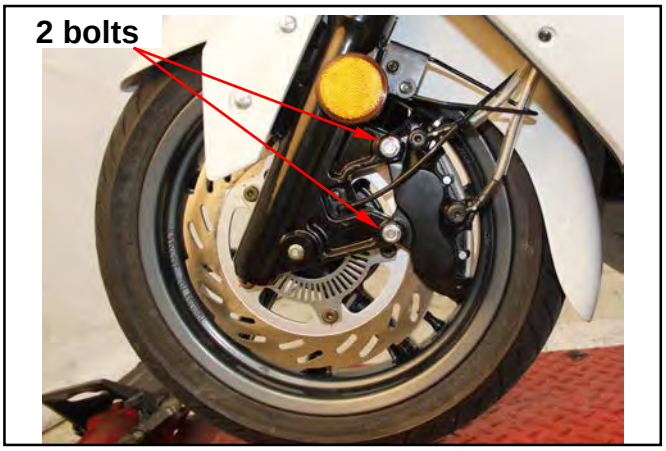
The indent mark on brake lining is the wear limitation.
Replace the brake lining if the wear limit mark closed to the edge of brake disc.



⚠ Caution

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

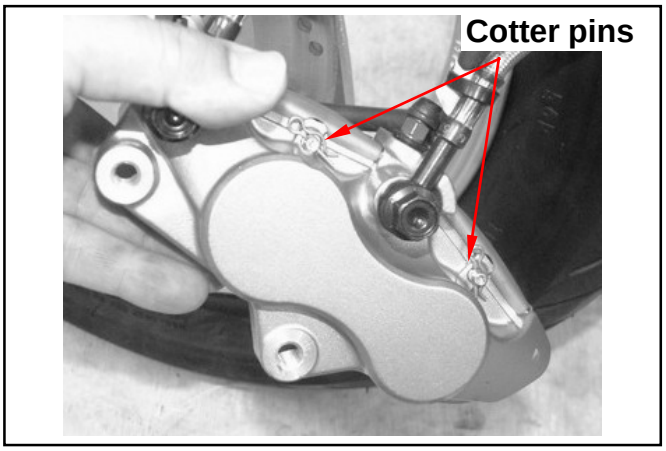
Remove the brake clipper bolt, and take out the clipper.



⚠ Caution

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

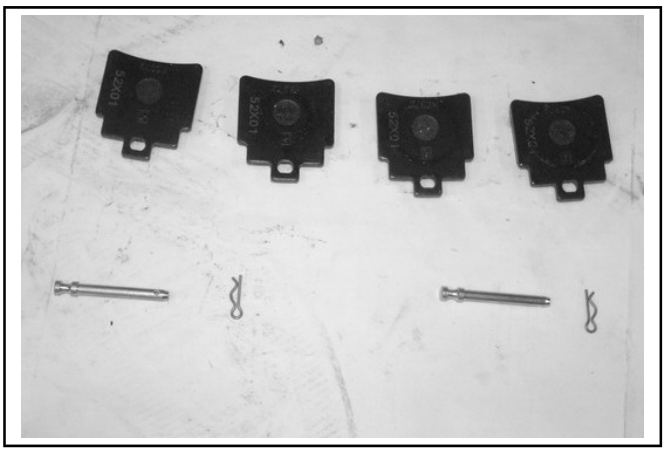
Pry out the brake lining with a flat driver if lining is clipped.
Remove 2 cotter pins



⚠ Caution

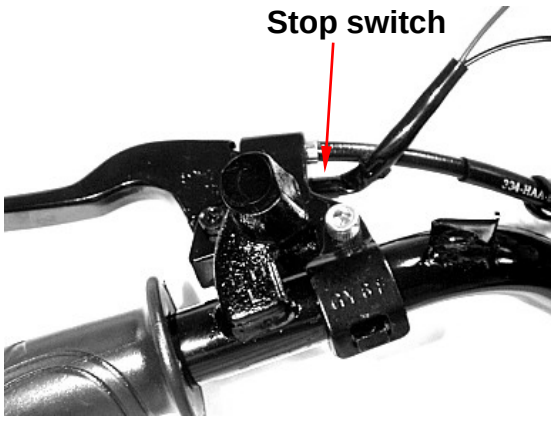
- In order to maintain brake power balance, the brake lining must be replaced with one set.

Remove the brake pad shafts and pads.



Brake Light Switch / Start Switch

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

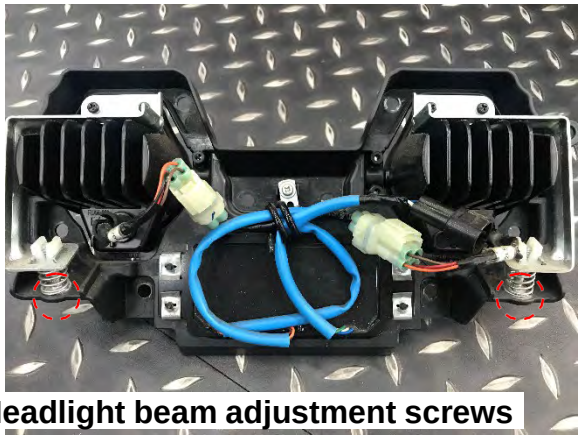


Headlight Distance Adjustment

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.


Headlight beam adjustment screws

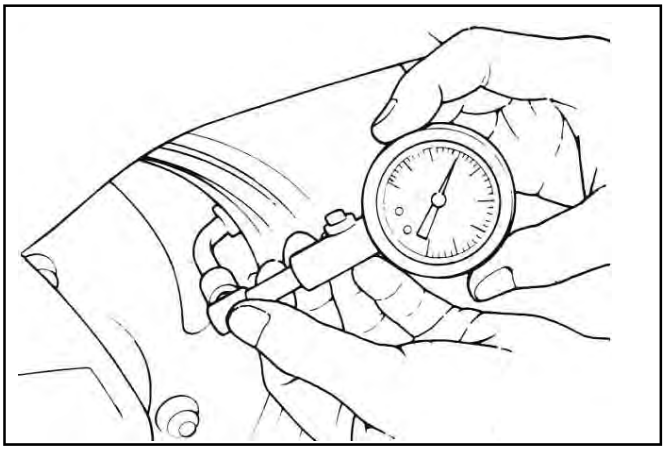
Wheel / Tire

⚠ Caution

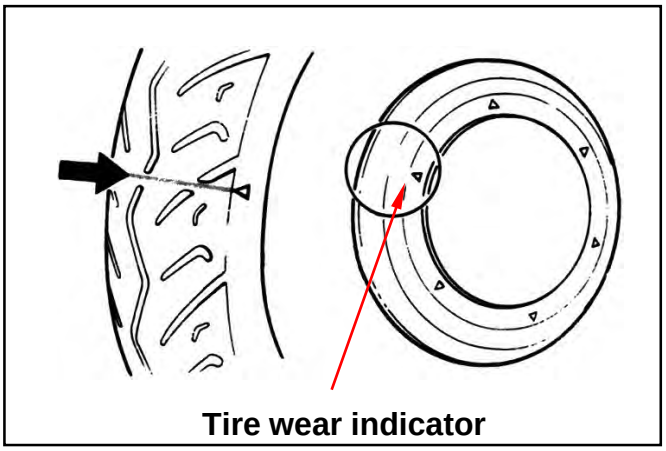
- Tire pressure check should be done as cold engine.。

Standard tire pressure

Tire size		Front tire	Rear tire
Tire pressure as cold engine (Kgf/cm²)	2 persons with full loaded	2.0	2.5



Check if tire surface is ticked with nails, stones or other materials.
Check if front and rear tires' pressure is in normal.
Measure tire thread depth from tire central surface.
Replace the tire if the tire tread depth is not come with following minimum tire tread depth.
Front tire：1.0 mm
Rear tire：1.0 mm


Tire wear indicator

Battery

Open the inner box lid.
Loosen screw & remove the battery cover

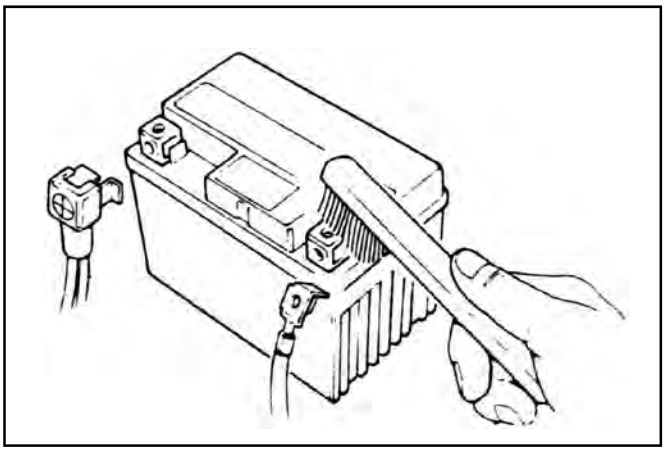


Battery cable remove：

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

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

Install the battery in the reverse procedures of removal



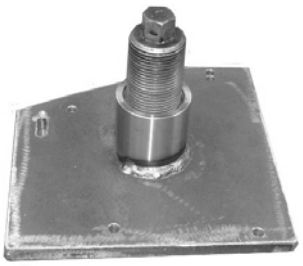
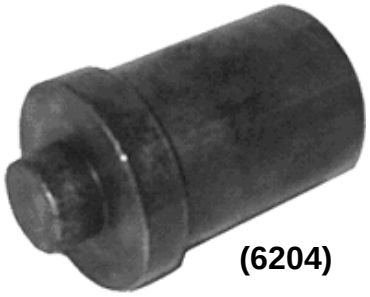
⚠ Caution

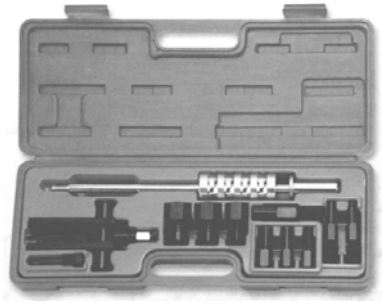
- If there is rust on the posts very serious, spray some hot water on the posts. Then, clean it with steel brush so that can remove rust for more easily.
- Apply some grease on the posts after rust removed to prevent from rust again.

Nuts, Bolts Tightness

Perform periodical maintenance in accord with the Periodical Maintenance Schedule.
Check if all bolts and nuts on the frame are tightened securely.
Check all fixing pins, snap rings, hose (pipe) clamps, and wire holders for security.

Special Tools List

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

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

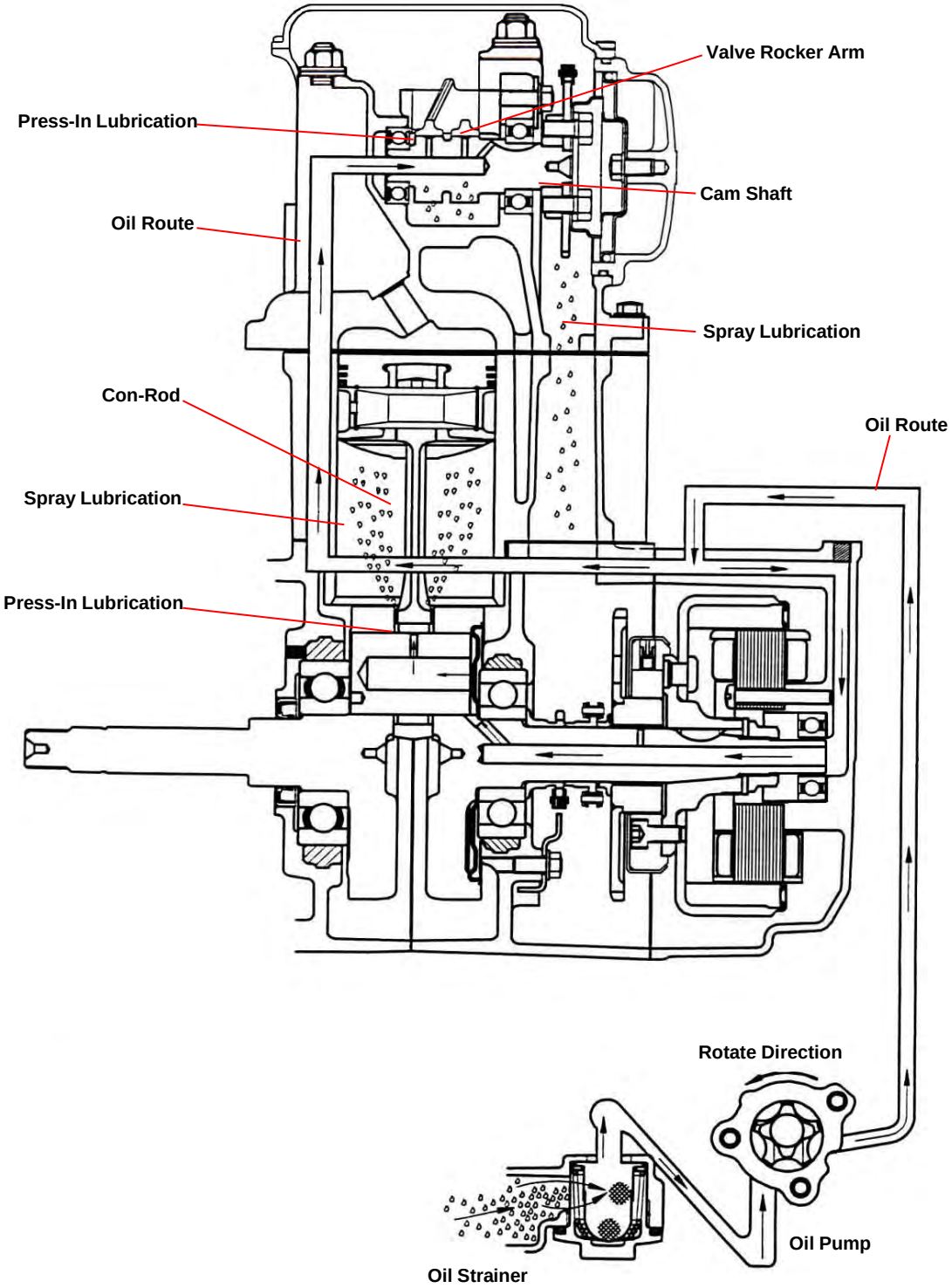
					
NAME	Bearing driver 6205	**NAME**	Drive shaft & oil seal (25*40*8) socket	**NAME**	Bearing puller 6303
NO	SYM-9615000-6205	**NO**	SYM-9120200-HMA	**NO**	SYM-6303000-HMA H9A 6303
		 **(Ø30mm)**		 **(Ø22mm)**	
NAME	Bearing driver 6201	**NAME**	Crankcase bush puller	**NAME**	Crankcase bush puller
NO	SYM-9614000-6201	**NO**	SYM-1120310	**NO**	SYM-1120320
					
NAME	Water pump mechanical seal driver	**NAME**	Water pump bearing driver 6901	**NAME**	Water pump oil seal driver (inner)
NO	SYM-1721700-H9A	**NO**	SYM-9100100	**NO**	SYM-9120500-H9A
					
NAME	Vacuum pressure gauge	**NAME**	Fuel pressure gauge	**NAME**	Multi-meter
NO	SYM-HT07011	**NO**	SYM-HT07010	**NO**	SYM-HE07007-01

					
NAME	Cylinder pressure gauge	**NAME**	Vehicle circuit test tool kit	**NAME**	Vehicle circuit test harness kit
NO	SYM-HT07008	**NO**	SYM-HE170008	**NO**	SYM-HE170008-01
					
NAME	EFi System Diagnostic tool				
NO					

NOTE:

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

Mechanism Diagram



Precautions in Operation

General Information:

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

Specifications

Engine oil capacity

LV25W / LV30W Disassembly:1400 c.c.

Replacement:1200 c.c.

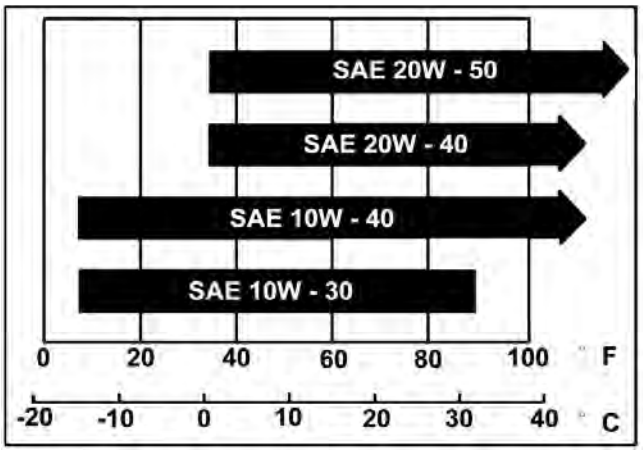
Oil viscosity: SAE 10W-30 or 10W-40 API SL class

Gear oil capacity

LV25W / LV30W Disassembly: 180c.c.

Replacement:160c.c.

Gear oil viscosity: SAE 10W-30 or 85W-90



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

Engine oil draining bolt	3.5~4.5kgf-m
Engine oil strainer cap	1.0~2.0kgf-m
Mission draining bolt	0.8~1.2kgf-m
Mission filling bolt	1.0~1.4kgf-m
Oil pump screw	0.1~0.3kgf-m

Ttrouble shooting

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 level window.

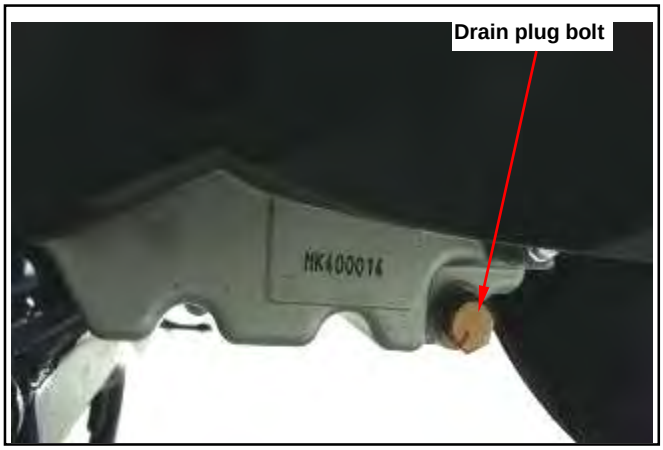
If oil level is nearly low level, fill out recommended oil to upper level.



Oil Change

⚠ Caution

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

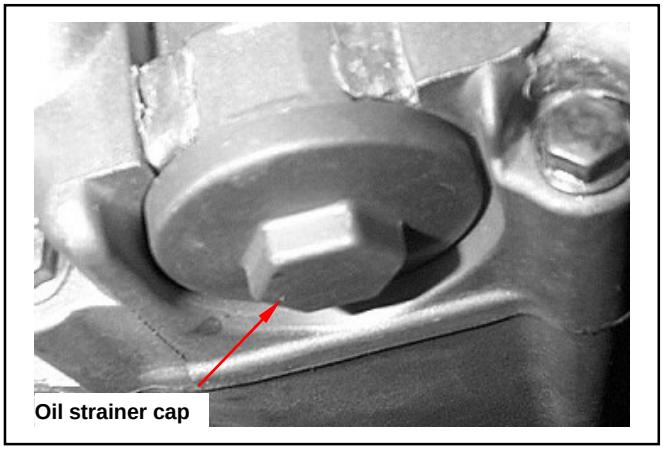


Place an oil pan under the scooter, and remove oil drain bolt.
After drained, make sure washer can be re-used.
Install oil drain bolt.

Torque value：3.5~4.5kgf-m

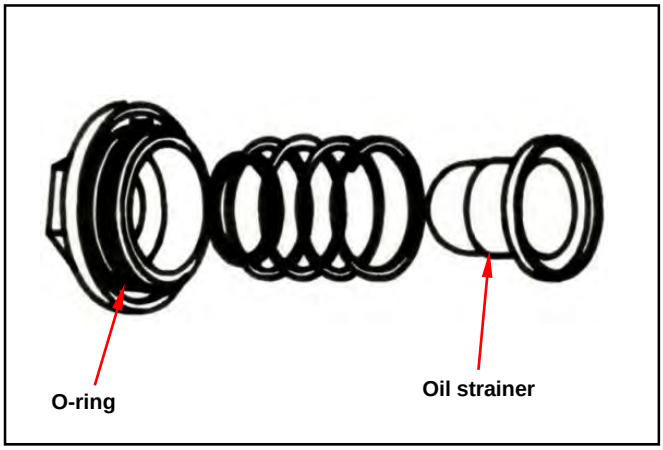
Engine Oil Strainer Clean

Drain engine oil out.
Remove oil strainer and spring.
Clean oil strainer.
Check if O-ring can be re-used.
Install oil strainer and spring.
Install oil strainer cap.



Torque value：1.0~1.2kgf-m
Add oil to crankcase (oil viscosity SAE 10W-40)
Recommended using King serial oil.

Install dipstick, start the engine for running several minutes.
Turn off engine, and check oil level again.
Check if engine oil leaks.



Oil Pump

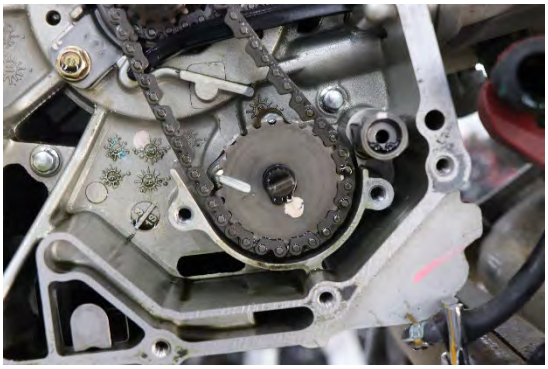
Oil Pump Removal

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

Remove oil pump gear protector

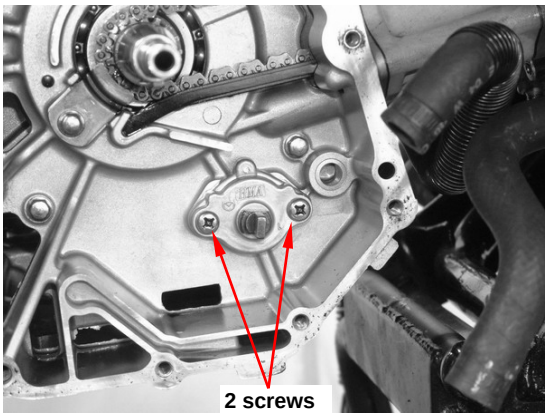


Remove cir clip and take out oil pump driving chain and sprocket.



Make sure that pump shaft can be rotated freely.

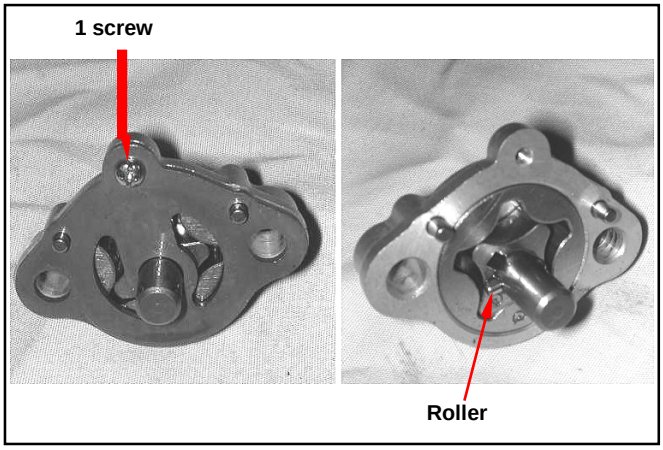
Remove 2 screws on the oil pump, and then remove oil pump.



Oil Pump Disassembly

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

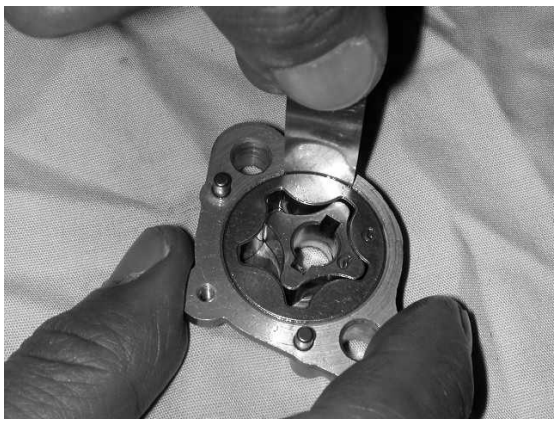
Remove oil pump shaft roller and shaft.



Oil Pump Inspection

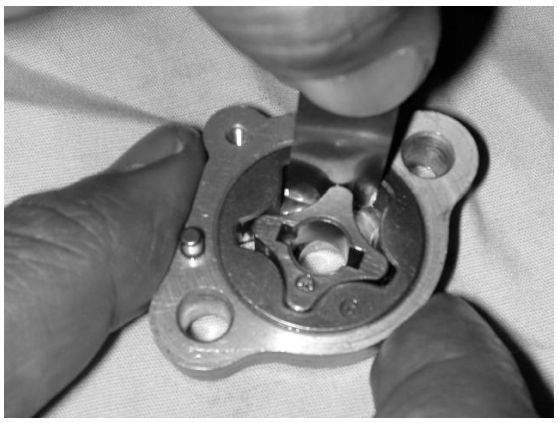
Check the clearance between oil pump body and outer rotor.

Limit: 0.25 mm



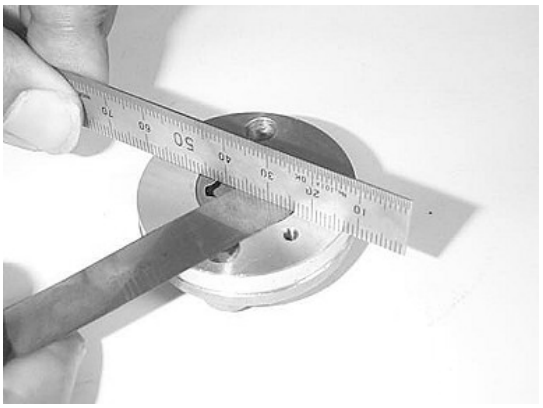
Check clearance between inner and outer rotors.

Limit: 0.20 mm



Check clearance between rotor side face and pump body

Limit: 0.12 mm

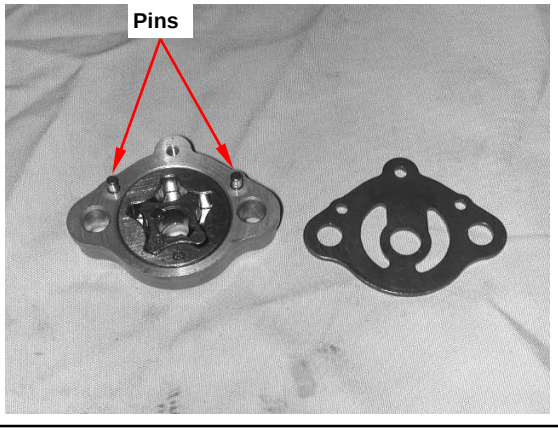


Oil Pump Re-assembly

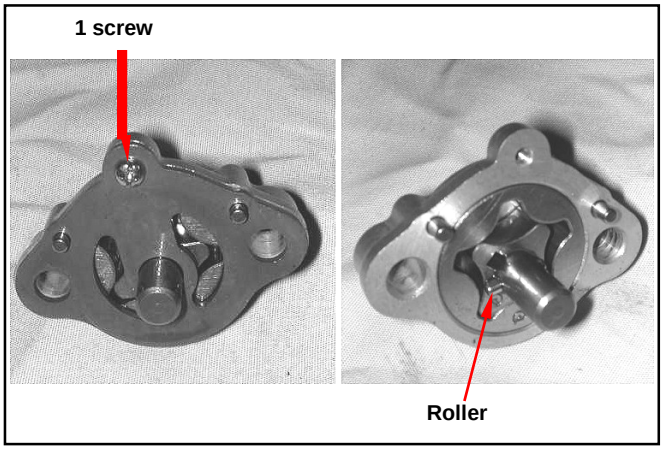
Install inner and outer rotors into the pump body. Align the indent on driving shaft with that of inner rotor.

Install the oil pump shaft and roller.

Install the oil pump cover and fixing pins properly.



Tighten the oil pump screw.

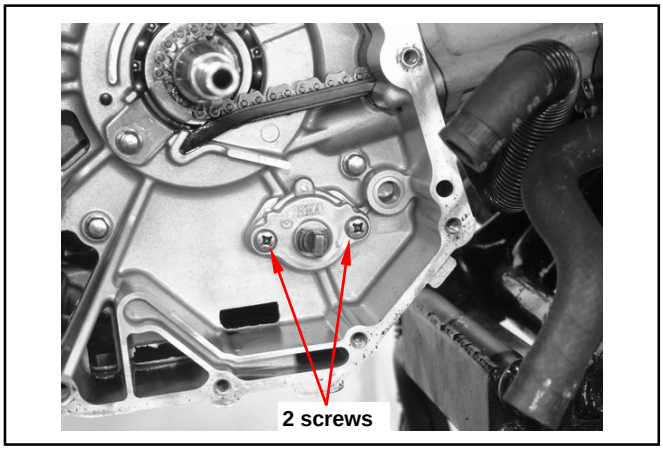


Oil Pump Installation

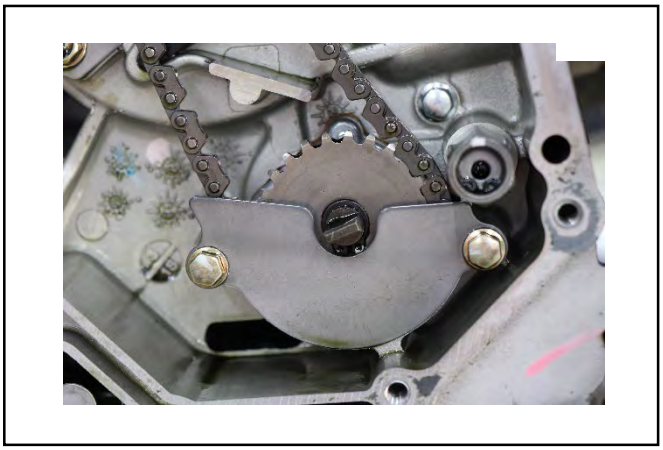
Install the oil pump, and then tighten screws.

Torque value：0.1~0.3kgf-m

Make sure that oil pump shaft can be rotated freely.



Install oil pump drive chain and sprocket, and then install cir clip onto oil pump shaft.



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



Gear Oil

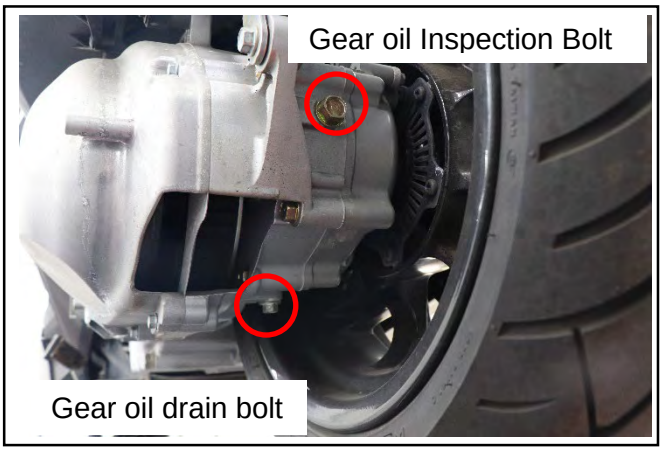
Gear Oil Change

Remove oil join bolt.
Remove drain bolt and drain gear oil out.
Install the drain bolt after drained.

Make sure that the drain bolt washer can be re-used.
Add oil to specified quantity from the join hole.

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

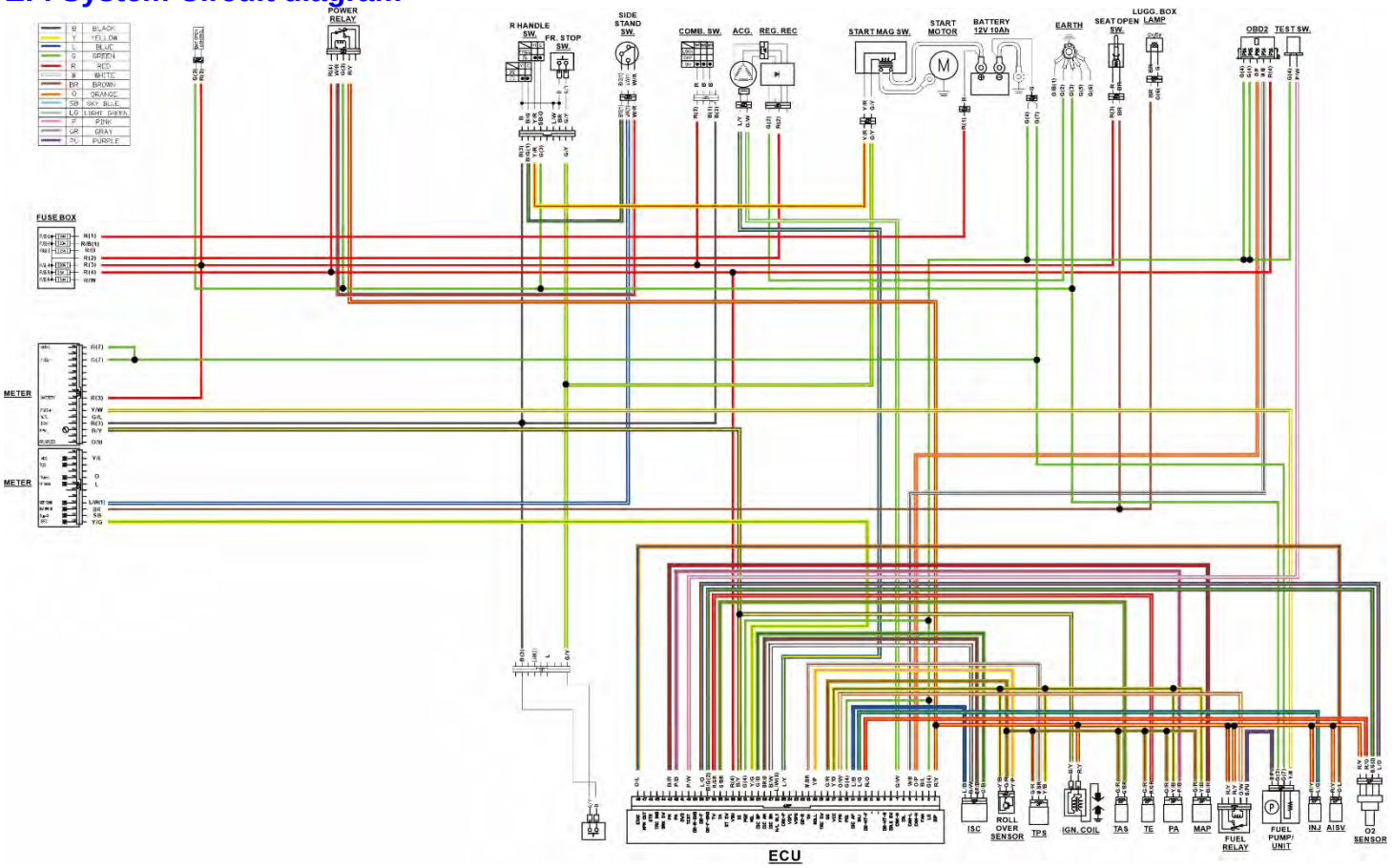
Start engine and run engine for 2-3 minutes.
Turn off engine and make sure that oil level is in correct level.
Make sure that no gear oil leaking.



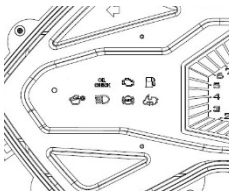
Notes:

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EFi System Operation ····· 4-3	Remove fuel pump/fuel unit ····· 4-37
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Sensors / Drives ····· 4-7	Troubleshooting Table ····· 4-43
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EFi System Circuit diagram



EFi System Vehicle Configuration


EFi check light


ISC/MAP


TPS


Fuel injector


Fuel pump


PA sensor


TA sensor


Diagnostic coupler and Test switch


ECU



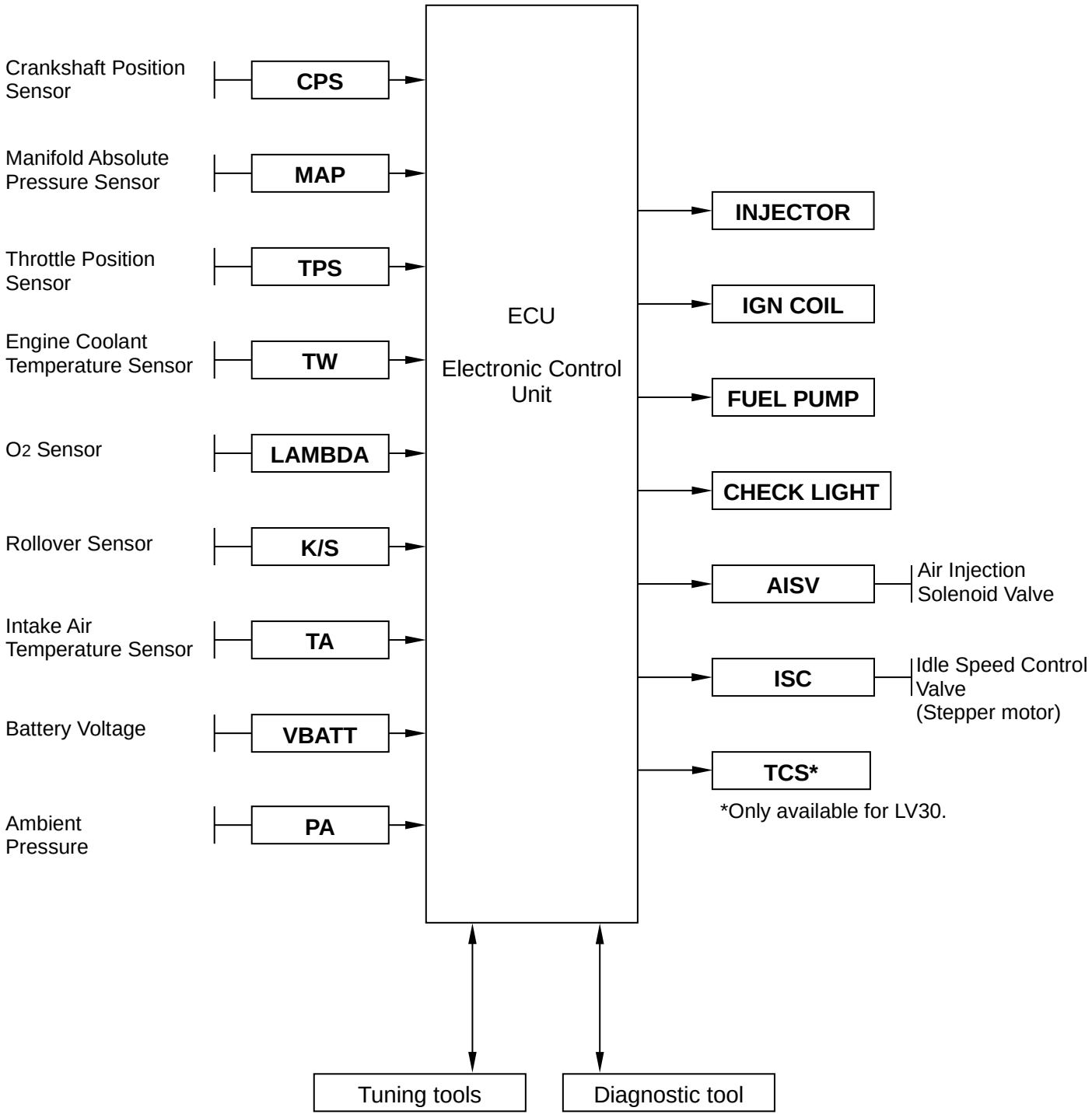



CPS


O2 sensor


TE sensor

EFi System Operation



EFi System Introduction

Based on 4-stroke SOHC engine, electronically controlled fuel injection, fuel vapor absorbed by activated carbon canister. The engine burns off the blow-by fuel-gas in the crankcase through the fuel-air separating device. The O^2 sensor enhances the efficiency of the catalytic converter, by dynamically controlling the Fuel/Air ratio.

Electronic Fuel Injection Devices

Consist of fuel supply devices: fuel tank, fuel pump, fuel filter and fuel pressure regulator.
And fuel controll devices: fuel injector and ECU (Engine Control Unit).
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 fuel pressure around 294±6kPa. The signals from ECU enable the injector to spray fuel into the combustion chamber once every two crankshaft revolutions. The excessive fuel flows back to the fuel tank through the fuel pressure regulator. Fuel pump is placed within the tank to reduce the working noise, and the complicity of fuel pipes. Electronically controlled ignition and injection system effectively reduce the fuel consumption rate and pollution.

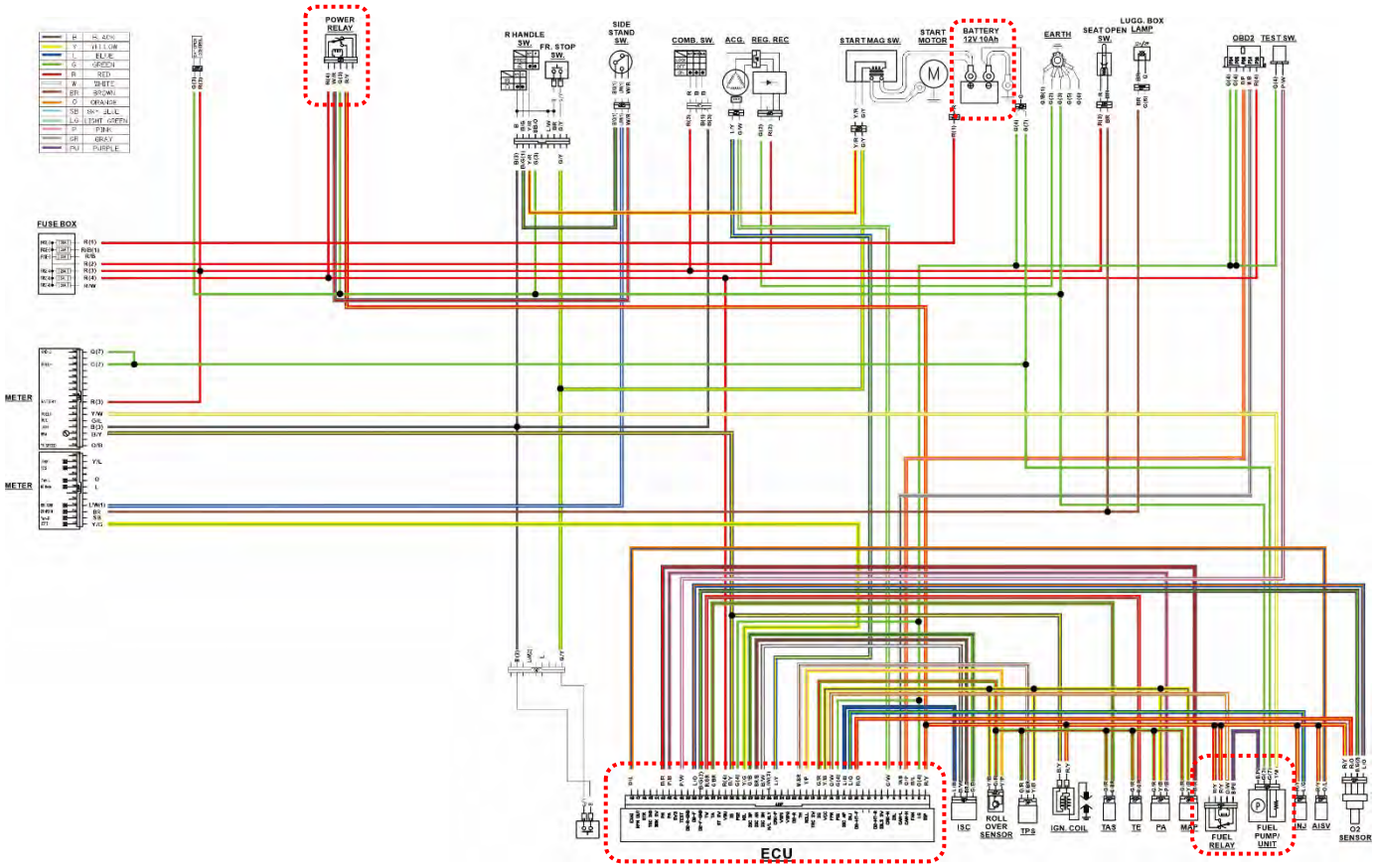
In the traditional gasoline engine, the carburetor supplies the fuel. The process is done by the engine vacuum and the negative pressure in the carburetor by mixing fuel and air. Under this condition, three major processes are done simultaneously in the carburetor: 1. Air quantity measurement. 2. Fuel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

Electronic Fuel Injection System distributes the three major processes to three different devices: 1. MAP / TA 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 decided according the condition of the engine. The engine RPM, and throttle position determines the fuel quantity and injection time-length. This throttle-controlled fuel injection is better responding and more accurate.
2. The quantity of fuel injection, and the determination of injection time length, are all controlled by 16-bit microcomputer.
3. The fuel pressure regulator maintains a 294±6 kPa pressure difference between intake pipe and fuel pipe, raising the accuracy of fuel injection.
4. By measuring the air pressure of intake pipe, this system gives the vehicle better accommodation to the environment.
5. Idle air by-pass system supplies fuel and air to stabilize the idle running, and cold starting.
6. O_2 sensor feeds back the signal to minimize the exhaust pollution.

Fuel System



System Description

1. After Key-on, the sensors signal to be sent to the ECU. ECU controls the fuel pump relay to make the fuel pump operate. If the engine is not started, the fuel pump will be shut down within 2 to 3 seconds in order to save electricity. Fuel pressure regulator maintains fuel pressure at 294 ± 6kPa (about 3 kg / cm ²). According to the operating conditions and environmental compensation coefficient, appropriate fuel will be injected. After Key-off or engine stopped operating, the fuel pump stops running.
2. Fuel impurities filtered by the fuel filter should be cleaned regularly.
3. When the engine can not be started, do not keep start motor running continuously which may lead to lack of battery power (less than 10 V) and the fuel pump will not be able to operate. The correct way is to use a new battery.

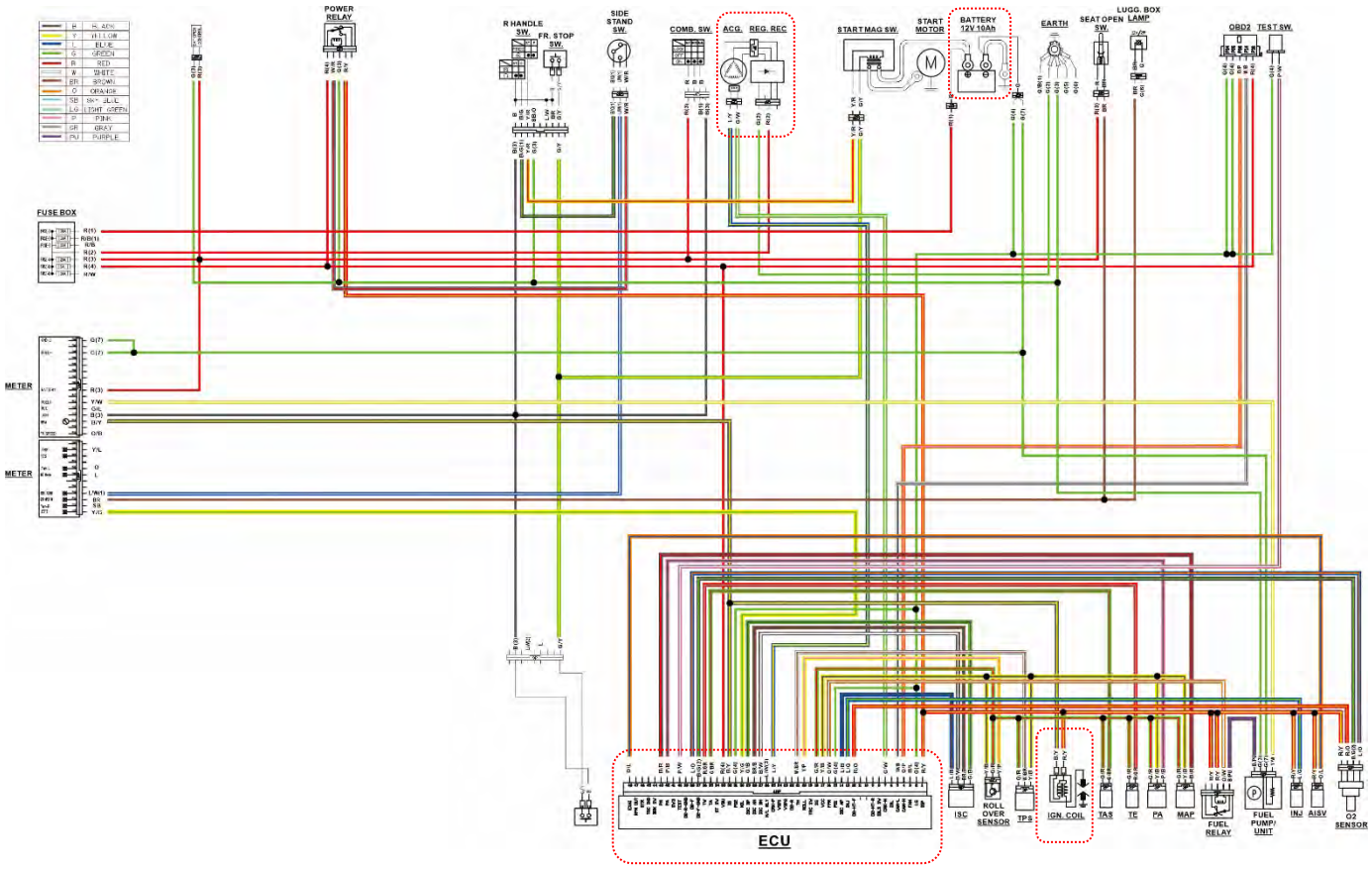
Injector

10-hole type injector provides two intake valves fuel injection quantity, enhances the effect of fuel atomization, and reduces HC emissions. Short-type injector cap can easily fix the injector, receive the fuel from the fuel pump, and limit injector rotation sliding. The signals from ECU control the fuel pressure regulator, using the diaphragm and spring to maintain the fuel pressure in 294 ± 6kPa (about 3 kg / cm ²), and determine the fuel injection quantity by adjusting injection time width under different engine conditions.

Fuel Pump

Electrical fuel pump is placed inside the fuel tank, powered by the battery and controlled by ECU.
Fuel pressure: 294 ± 6kPa (about 3 kg / cm ²)

Ignition System



Principle

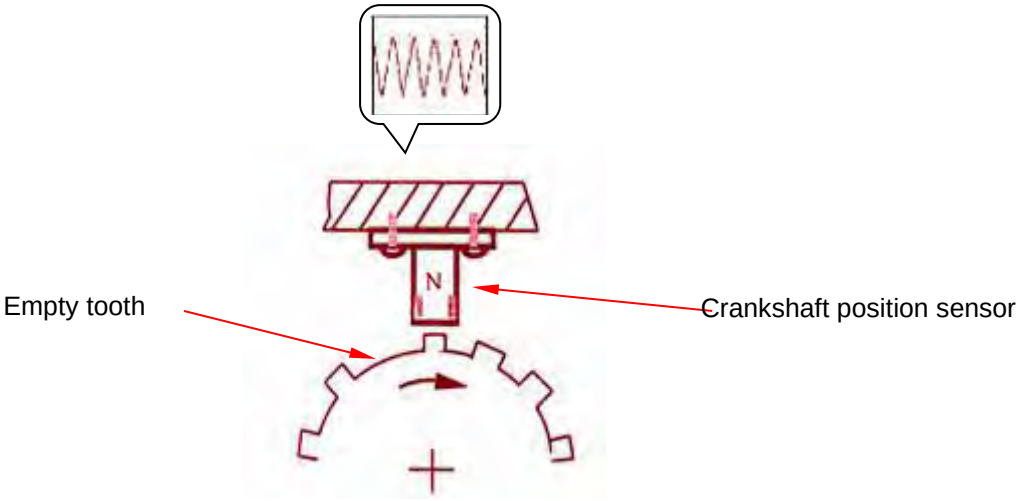
The computer programmed ignition system receives the signals from the Crankshaft position sensor, Throttle position sensor, O2 Sensor, MAP sensor, Intake air temperature sensor, Engine coolant temperature sensor. Calculating the engine RPM, the 16-bit microcomputer determines the appropriate ignition timing, controls the ignition coil and triggers the spark plug. This way can not only make the engine achieve the maximum power output, but also help improve fuel consumption rate.

Specifications

1. ACG crankshaft position sensor coil resistance: 120Ω±20% (20°C) (Green / White - Blue / Yellow)
2. Ignition coil primary circuit resistance: 2.8 Ω ± 15% (20 º C) (Red / Yellow - Black / Yellow)
3. Battery Type / Capacity: YTX9-BS/ GTX9-BS / 12V 8Ah

Sensors / Drives

Crankshaft Position Sensor (CPS)



Description

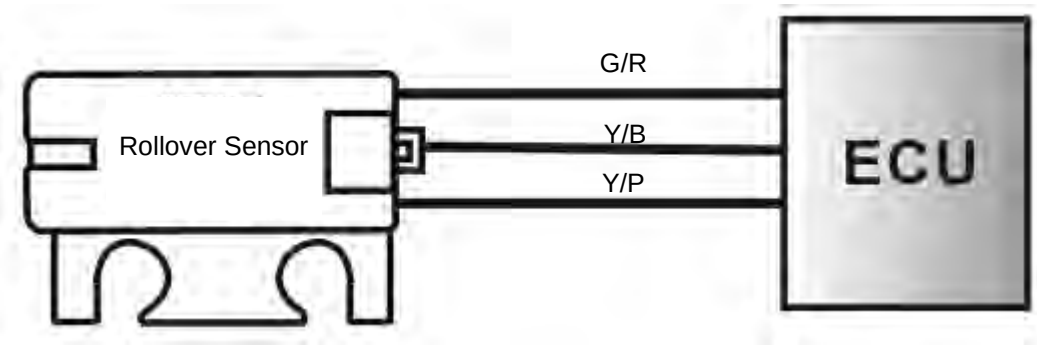
Right after the engine is started; the crankshaft position sensor identifies the TDC position by detecting the empty tooth on the flywheel and ignites at the fixed angle. When the engine RPM reaches the specified speed, the ignition timing will change to the software mode.

Function

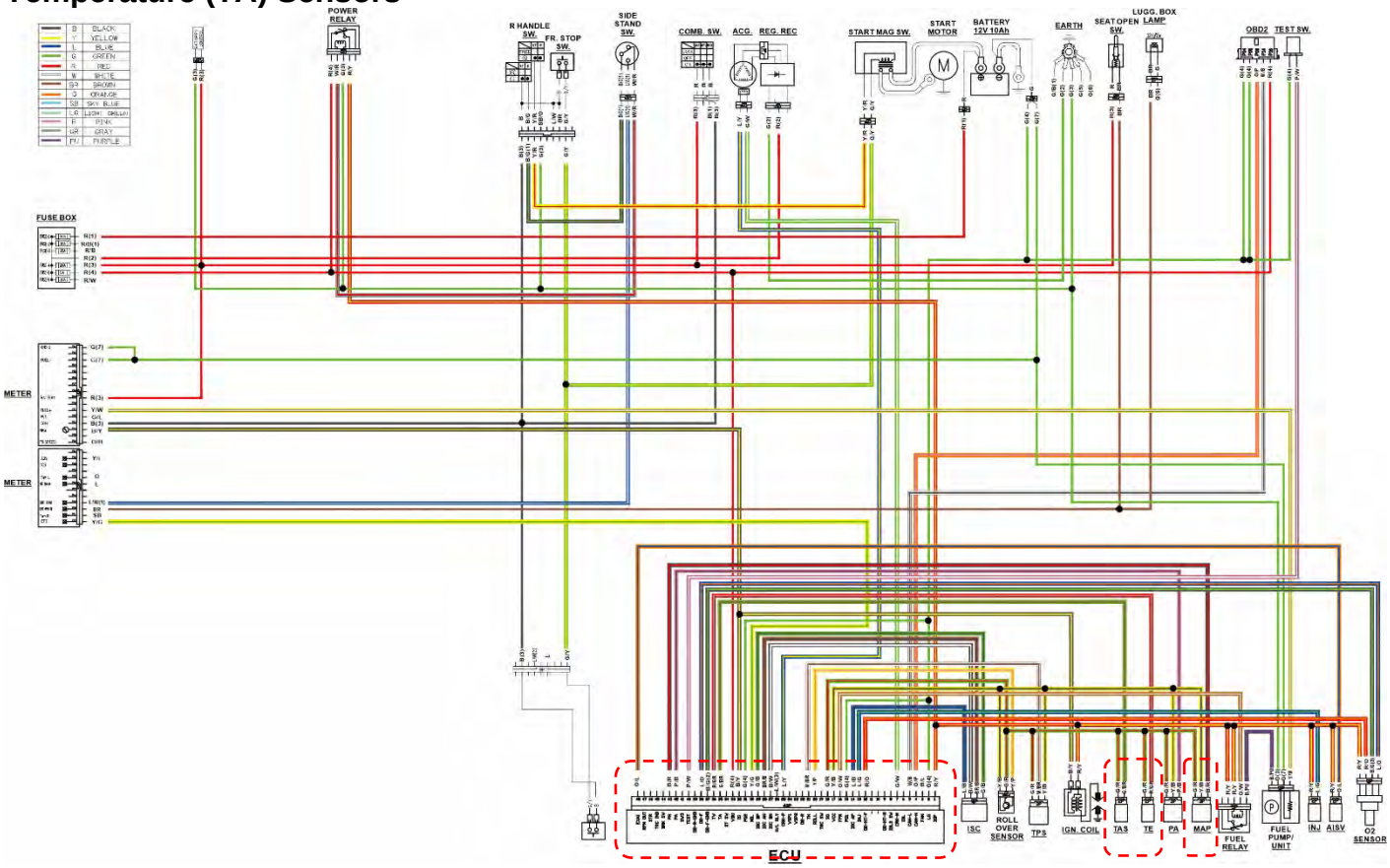
Inducting the teeth sequence on the flywheel, conveying the voltage signals to ECU.

Roll Over Sensor
Function
As a safety device, when the motocycle tips over, it will cut off power supply of ECU and shut down the engine.

Note
The pendulum-type roll over sensor will cut off the power supply of ECU. Main switch should be turned Key-on again before the engine can be restarted.

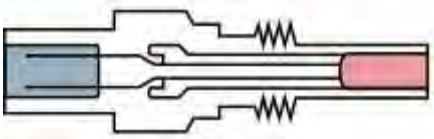


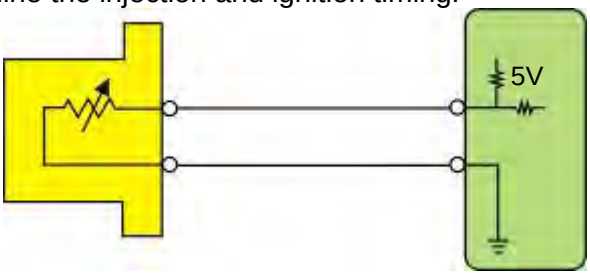
Manifold Absolute Pressure (MAP) / Engine Water Temperature (TE) / Intake Air Temperature (TA) Sensors



Engine water temperature / Intake air temperature sensor:

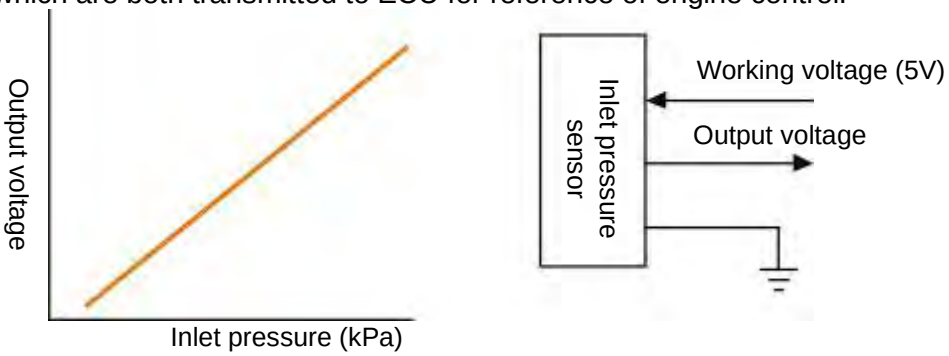
Use the variable resistor of negative temperature coefficient (thermistor) to sense the outside temperature. The electrical resistance value goes down when the temperature rises. On the contrary, the electrical resistance value becomes higher when the temperature falls. Sensors provide the temperature of the engine coolant and intake air to ECU to determine the injection and ignition timing.



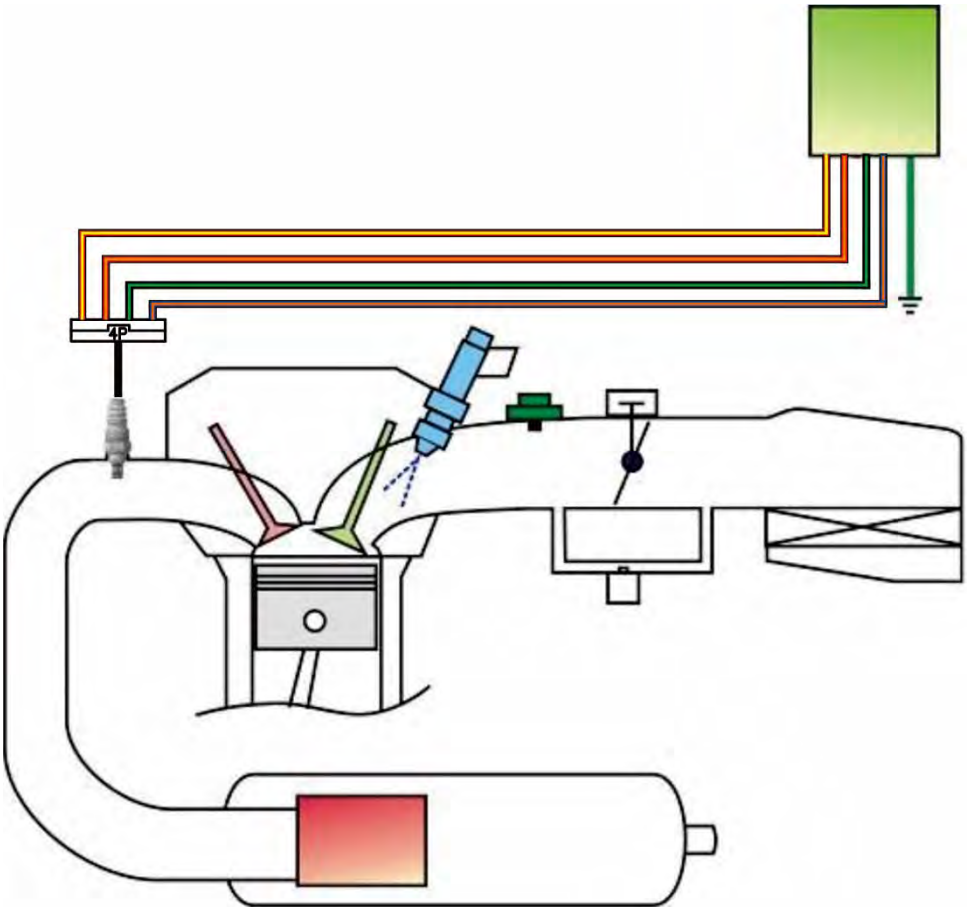


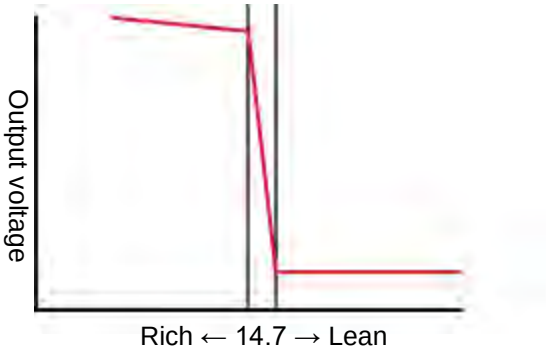
Manifold absolute pressure sensor:

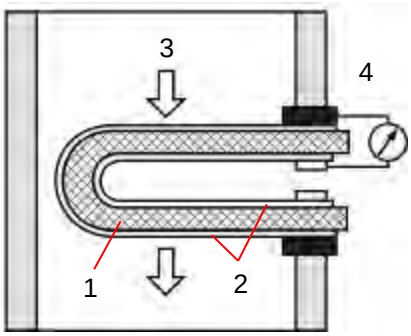
Manifold absolute pressure sensor (MAP Sensor) uses the piezoresistive resistor composed of silicon diaphragm, forming the Wheatstone bridge circuit to measure the atmospheric pressure and the intake manifold pressure, which are both transmitted to ECU for reference of engine control.



O^2 Sensor







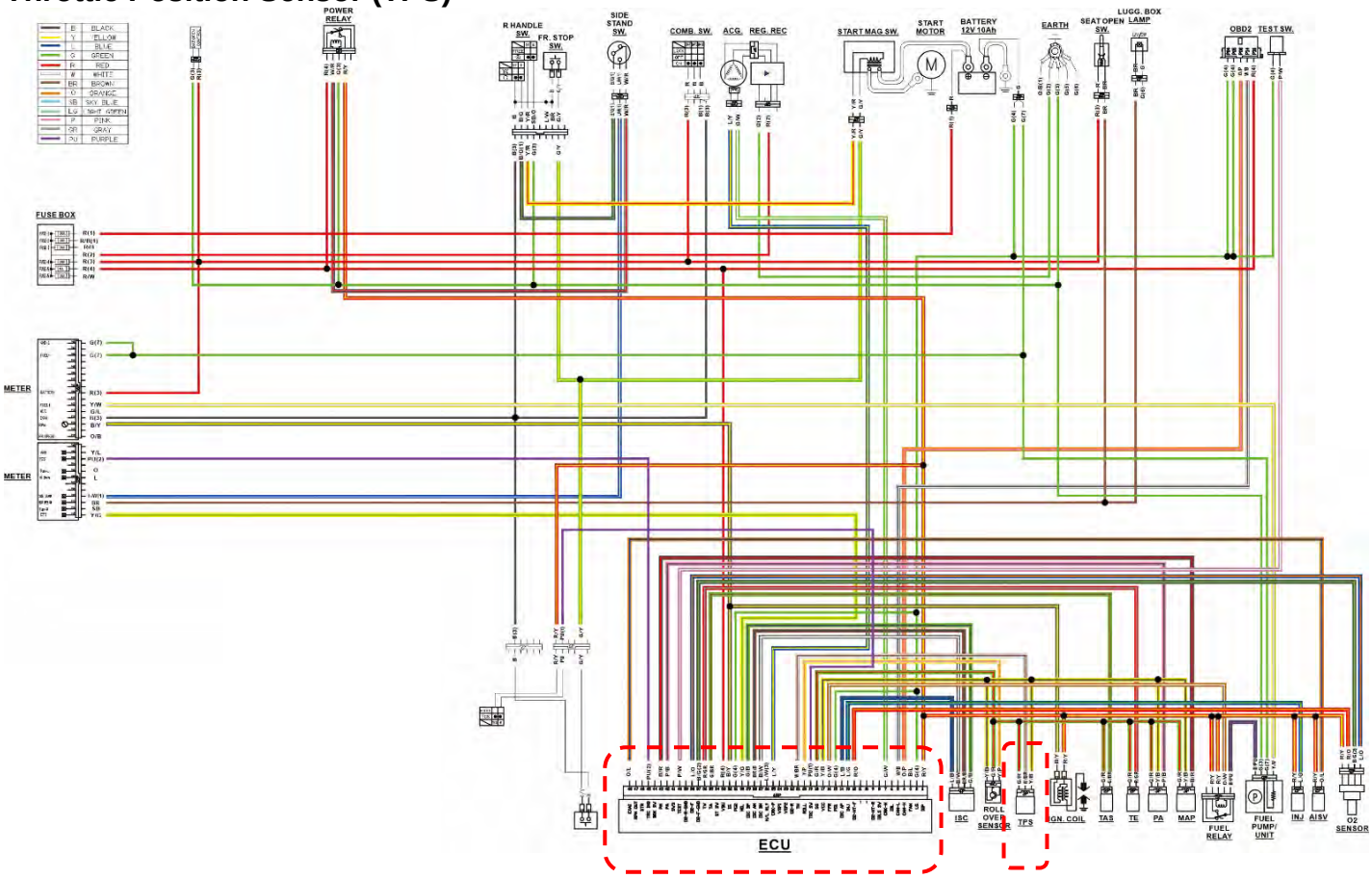
1. Ceramics element
2. Electrode
3. Emissions
4. Atmosphere

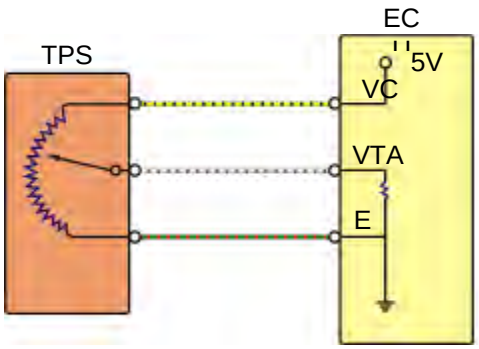
Function

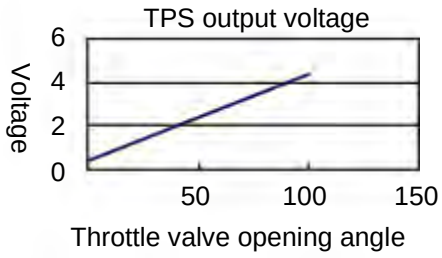
O_2 Sensor measures the proportion of oxygen in the exhaust gas, sending signals to ECU which adjusts the air-fuel ratio by changing the fuel injection time. If the proportion of oxygen is too low, it means the rich air-fuel mixture with higher HC & CO concentration in the exhaust gas. If the proportion of oxygen is too high, it means the lean air-fuel mixture with higher temperature and higher NOx concentration.

1. O_2 Sensor outputs feedback signal to ECU which keeps the air-fuel mixture near the stoichometric ratio approximately 14.7 and forms the closed loop control system.
2. When the air-fuel mixture is near the stoichometic ratio, CO / HC / NOx are converted most efficiently.
3. O_2 Sensor produces a rapidly fluctuating output voltage between approxiamately :1500~2500 mV

Throttle Position Sensor (TPS)







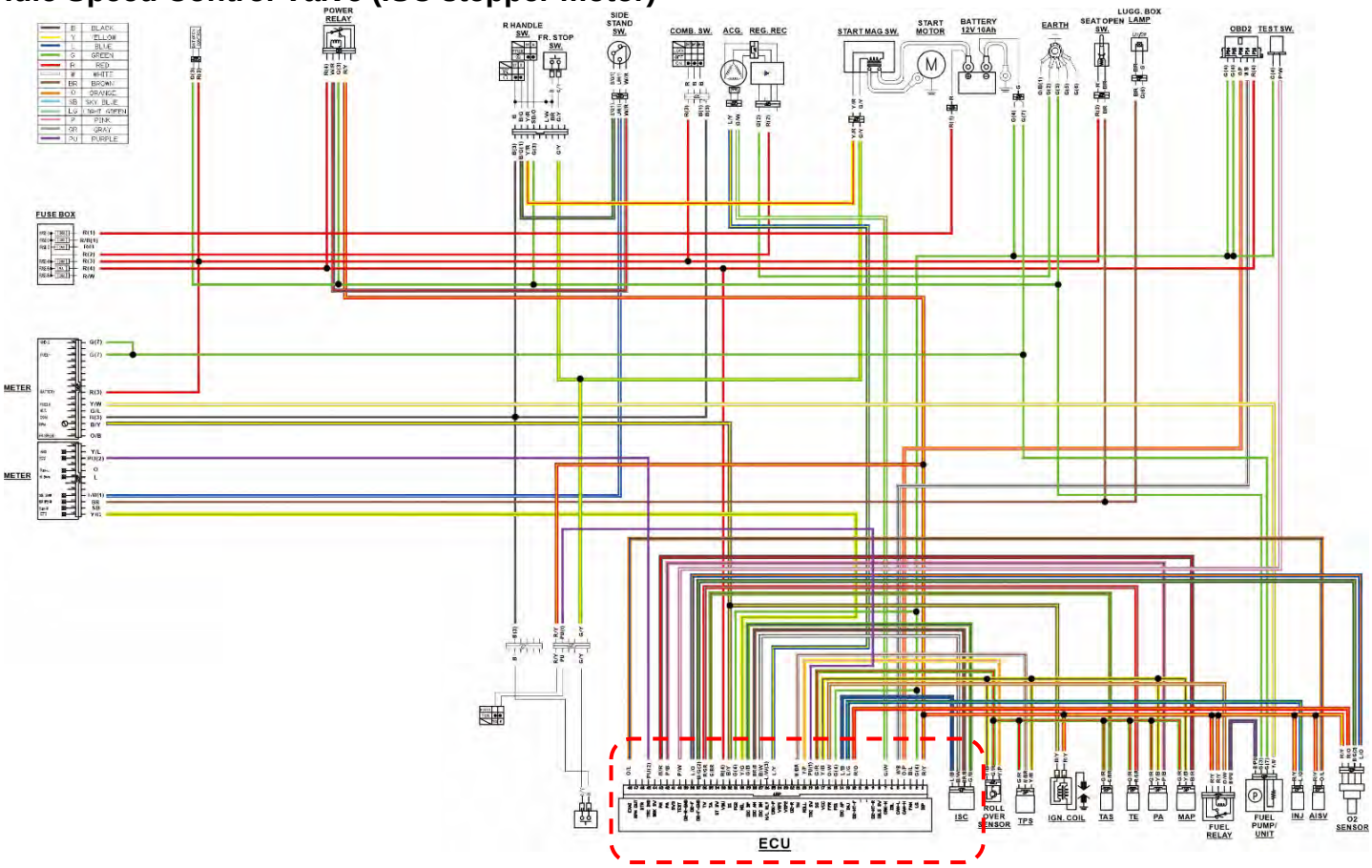
Basic Principle

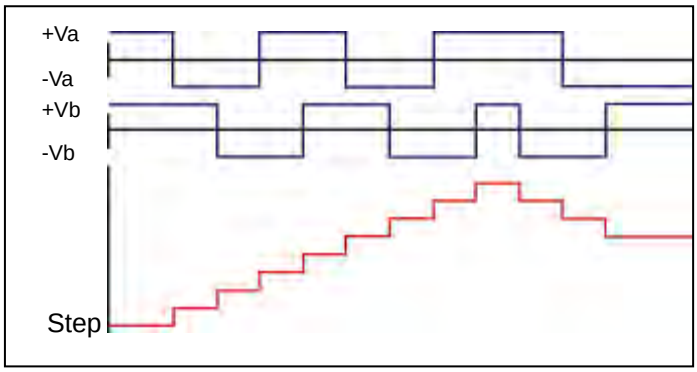
TPS is a rotary variable electric resistor. When it is rotated, both electric resistance and voltage value change, determining the throttle position.

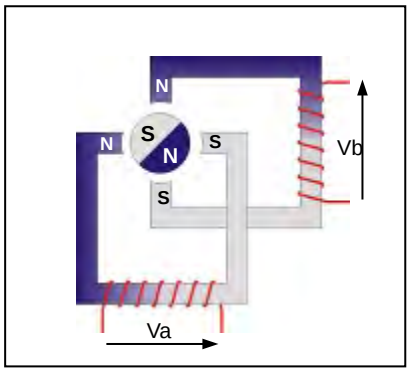
Function

TPS determines the throttle valve position and sends signal to ECU as reference of engine control.

Idle Speed Control Valve (ISC stepper motor)







Function

ECU controls ISC stepper motor to adjust the bypass intake air quantity and stabilize the idle speed.

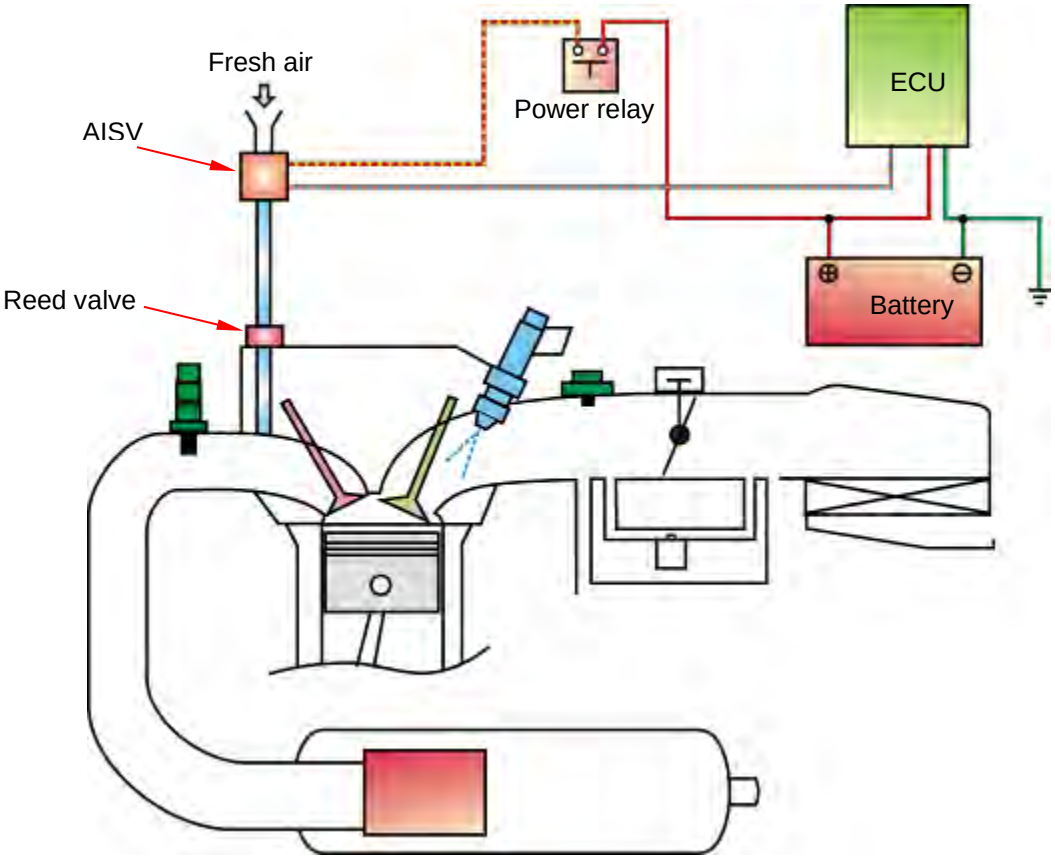
Air Injection Solenoid Valve (AISV)

Function

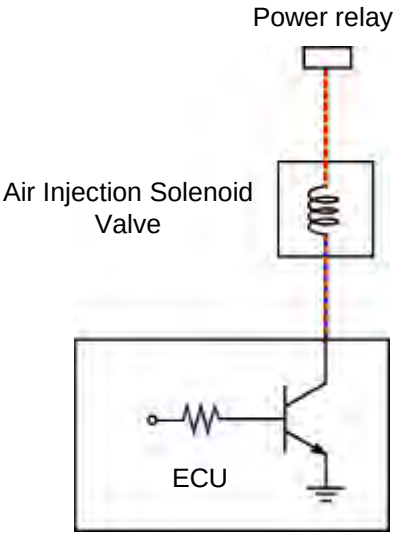
AISV introduces appropriate air quantity to reduce pollutant emission.

Basic Principle

When the engine RPM and throttle opening are higher than the default value, ECU controls AISV opening or closure.







Precautions in Operation

General information

Warning

- Gasoline is a low fire point and explosive material. Always work in a well-ventilated place and flame is strictly prohibited when working with gasoline.
- Before dismantling fuel system parts, leak fuel out first, or grip the fuel pipe by using pliers to prevent fuel from splashing.

Cautions

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

Specification

Item	Specifications
Idle RPM	1550 rpm
Throttle handle free play	5~10°
Fuel pressure	294±6kPa (about 3.0kgf/cm²)

Torque value

O^2 Sensor 2.0~3.0 kgf-m

Special Tools

Vacuum Gauge
Fuel Pressure Gauge
EFi System Diagnostic Scanner
Fuel Pipe Pliers

EFi System Components Description

ECU (Electronic Control Unit)



Functional Description:

- Powered by DC 8~16V, and has 48-pin socket on the unit.
- The hardware component consists of a 32-bit microcomputer that is its control center. It contains the functional circuit interface of engine condition sensing and the driving actuator for the fuel injector, fuel pump, as well as ignition coil.
- Its major software is a monitor strategy operation program that includes controlling strategy and self-diagnosis programs.

Testing Procedures:

1. Connect the diagnostic scanner to the diagnostic coupler on the vehicle.
2. Key-on but not to start engine, confirm ECU and the diagnostic scanner can be connected or not.
3. Diagnostic scanner will automatically display Version "certification" of the screen.
4. Confirm the application model, version is correct or not.
5. Check if the fault codes exist.
6. Remove the fault codes.
7. Start engine and check the parameters shown on the diagnostic scanner.

Detection judge:

- Fault codes can be read and cleaned, and the fault codes will not appear again after re-start.

Treatment of abnormal phenomena:

1. Cannot connect→ First check whether the cartridge is correct and ECU is normal or not.
2. Unable to start→ECU or relevant parts abnormal. Re-confirm after the replacement of abnormal parts.
3. Fault codes appear→ ECU or relevant parts abnormal. Troubleshoot and re-confirm.

Throttle Body





Throttle positioning screw

Functional Description:

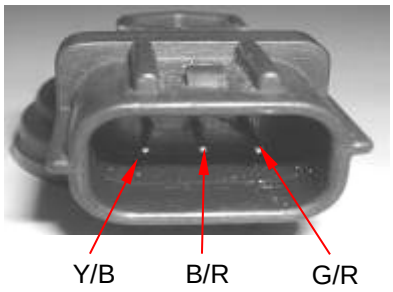
- Throttle body is the inlet air flow regulating device (similar to the carburetor).
- Throttle valve pivot drives the throttle position sensor synchronously and makes ECU detect the throttle opening immediately.
- Throttle valve positioning screw has been adjusted and marked on the production line. Readjustment is not suggested.

Treatment of abnormal phenomena:

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

MAP Sensor





Functional Description:

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

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

Testing Procedures:

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

Cautions

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

Detection judge:

- Working voltage value: **5.0±0.1V**
- Plains output voltage values: **2.87±0.03V** (Conditions: In the plains 101.3 kPa Measurement)

Cautions

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

Treatment of abnormal phenomena:

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

TA Sensor





Functional Description:

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

Testing Procedures:

Resistance Value Measurement:

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

Detection judge:

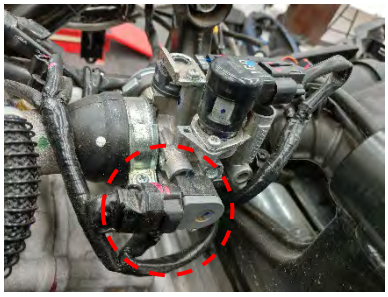
Resistance value and the temperature between relationships as follows

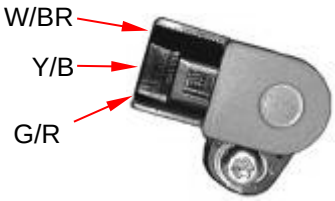
Temperature (℃)	Resistance value (KΩ)
-20	18.8 ± 2.4
40	1.136 ± 0.1
100	0.1553 ± 0.007

Treatment of abnormal phenomena:

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

TPS





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

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



Working voltage measurement

Testing Procedures:

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



Throttle output signal measurement - full closed

Cautions

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



Throttle output signal

Detection judge:

- Working voltage value: **5.0±0.1V**
- Full throttle voltage value: **0.6±0.02V**
- Full throttle closed voltage value: **3.78±0.26V**

Warning

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

Functional Description:

TW Sensor



Functional Description:

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

Testing Procedures:

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

Detection judge:

Resistance value and the temperature between relationships as follows:

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

Treatment of abnormal phenomena:

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

O2 Sensor



Functional Description:

- 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.

Testing Procedures

Sensor diagnosis:

- Use the "diagnosis tool" to read the oxygen sensor's voltage output.
- Connect the "diagnosis tool" to diagnosis coupler and open the main switch to start the engine.
- The sensor must be hot in order to meet the temperature requirements (idling "5 minutes" at least).
- Screen will switch to the "diagnosis tool" of "DATA STREAM 01/01" screen, select " O2 Sensor" project, next switches to a wave of images.
- Speed up the engine up to 4500 rpm, and watch the " O2 Sensor" voltage output waveform constant flip-flopping back and forth with different speeds.

Detection judge:

- Working voltage value: Above 10V
- Heating coil resistance value: 6.7~10.5Ω
- A good O2 sensor should produce an oscillating waveform at idle that makes voltage transitions from near 1500 mV to near 2500 mV, it means the sensor is doing its job on closed-loop control system.
- If it sees little or no change in level readings, it may set a trouble code and illuminate the EFi Check lamp.

Treatment of sensor abnormality:

When no signal is received from the O^2 sensor, check if circuit opens, shorts or goes out of range.

.

Roll over sensor





Functional Description:

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

Testing Procedures:

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

Detection judge:

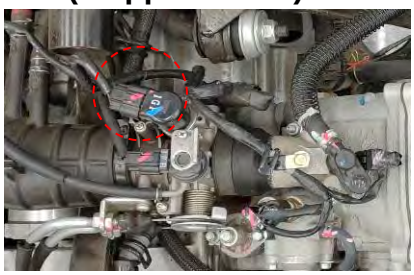
Voltage: Normal: **0.4~1.4V**
Roll over: **3.7~4.4V**

Treatment of abnormal phenomena:

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

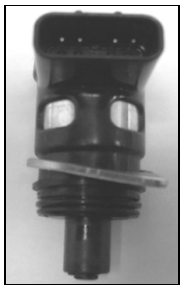
- Roll over sensor internal short circuit or open circuit, or coupler bad contact.
- Check whether the abnormal wire harness lines.
- Roll over sensor anomaly, the proposed replacement of the roll over sensor.

ISC (stepper motor)：



Functional Description:

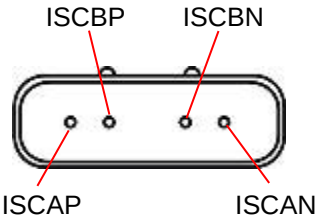
- Use ECU provided power, has the four-pin socket.
- 4-pin coupler for the two motor coils of the power supply and grounding wire, grounding ECU power through the control and management of the stepper motor actuators.
- If it's mainly low-power DC motors, drives idle speed control valve (ISC) of the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



Testing Procedures 1:

Resistance Confirmation:

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



ISC PINS

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

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

Cautions

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



A phase measurement of the resistance value

Detection judge:

1. Resistance value:
   A phase: 80 ± 10Ω (Environmental conditions: 15 ~ 25 ℃)
   B phase: 80 ± 10Ω (Environmental conditions: 15 ~ 25 ℃)
2. Actuator inspection:
   In the above steps Idle Air Control Valve (ISC) Idling motor actuator control of inspection, ISC will be slightly vibration or "… da… da…" continuous voice.



B phase measurement of the resistance value

Treatment of abnormal phenomena:

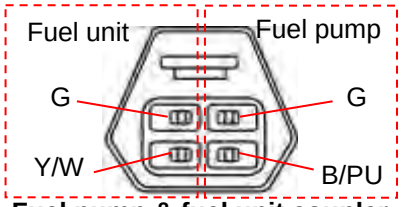
- Idle air control valve damage, or poor coupler contact.
- Check whether the abnormal wire harness lines.
- Idle Air Control Valve anomaly, the proposed replacement of the Idle Air Control Valve, further inspection of its actuator.

Fuel Pump



Functional Description:

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



Fuel pump & fuel unit coupler plan

Testing Procedures 1:

Fuel pump working voltage confirmed:

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



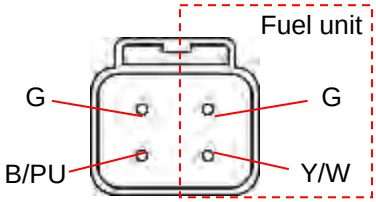
Confirmed working voltage

⚠ Cautions

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

Detection judge 1:

1. Working voltage value: Above 10V
2. Resistance value: 1.5±0.5Ω
3. Fuel pressure: 294±6kPa (about 3kgf/cm^2)

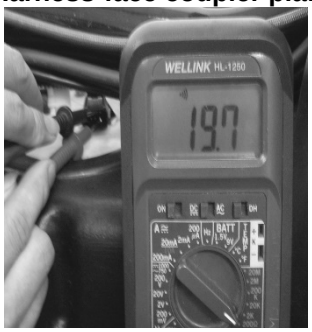


Harness-face coupler plan

Testing Procedures 2:

Resistance Confirmation:

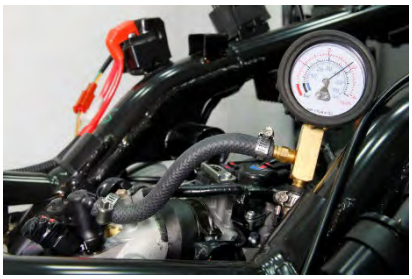
- Removed coupler on the fuel pump.
- Use of the "meter" Ohm stalls, Measurement fuel unit resistance (Yellow / White & Green).



Resistance Confirmation

Detection judge 2:

- Fuel unit resistance value: Full : 1150±20Ω Empty :100±5Ω



Fuel system pressure measurement

Testing Procedures 3:

Fuel pressure measurement:

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

Cautions

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

Detection judge 3:

1. Fuel pressure: 294±6kPa (about 3kgf/cm^2)

Treatment of abnormal phenomena:

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

Fuel Injector



Functional Description:

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

Testing Procedures:

1. Resistance Confirmation:
   Use of the "meter" Ohm stalls (Ω), measurement of the injector resistance value.



Injector resistance confirmation

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

Detection judge:

1. Between the two pin resistance values: 10.5±0.53Ω
2. injection state:
   - Fuel atomizing good, with a clear scattering angle → judged as normal.
   - Injection-state such as water, no obvious scattering angle → found abnormal.



Injection-state atomizing good

Treatment of abnormal phenomena:

1. Injector abnormal, the proposed replacement of the new one injector.
2. Injection-state abnormal, for the following reasons:
   - Injector obstructive→the proposed replacement of the new one injector.
   - Fuel pressure shortage → confirmed hydraulic pressure, the proposed replacement fuel pump to confirm.



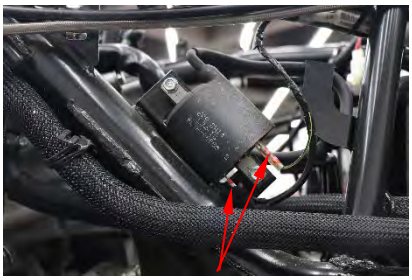
Injection-state unusual

⚠ Warning

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

Transistor ignition coil





First circuit coil resistance measurement

Functional Description:

- Use 8 ~ 16V DC power supply, has the two-pin socket.
- Two-pin socket for the power supply and grounding. Its main components for the high conversion ratio transformer.
- Through computer programs when the ignition is controlled, from ignition timing (TDC) / crank position sensor, the throttle valve position sensor, engine temperature sensor, the inlet pressure sensor and O_2 Sensor, issued by the signal, with the engine Speed through the ECU to determine the appropriate ignition is, by the current of a crystal intermittent control, a 25000-30000 volts of secondary hypertension, flashover triggered spark plug, this approach will not only enable the engine to achieve maximum output function, also help to improve the efficiency of fuel consumption and pollution improvements.

Testing Procedures:

Resistance Confirmation:

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

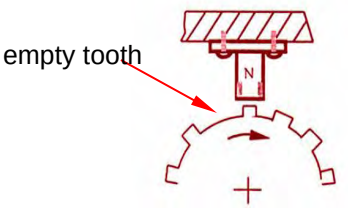
Detection judge:

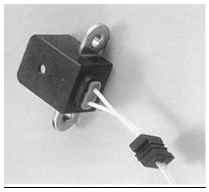
- Ignition coil primary circuit: 2.8Ω±15% (20ºC)

Treatment of abnormal phenomena:

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

Crankshaft position sensor







Measurement resistance value

Functional Description:

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

Testing Procedures:

Resistance Confirmation:

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

Detection judge:

- Resistance value: 120Ω±20% (20ºC)

Treatment of abnormal phenomena:

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

AISV



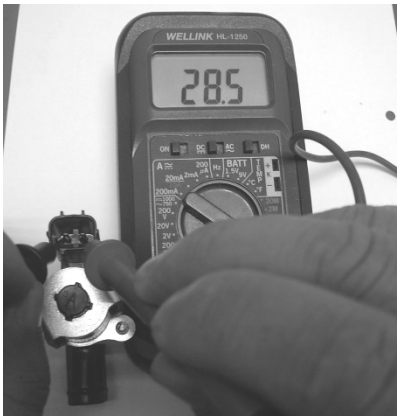
Functional Description:

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

Testing Procedures:

Resistance Confirmation:

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



Detection judge:

Resistance value =26 ± 2.6Ω (20°C)

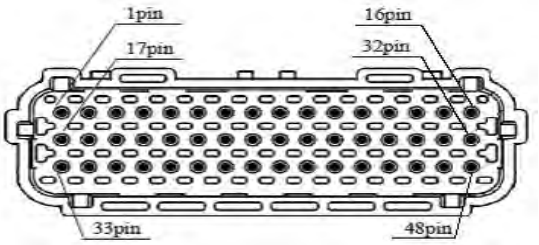
Treatment of abnormal phenomena:

1Secondary air injection solenoid valve internal short circuit or open circuit, or coupler bad contact.

- Check whether the abnormal wire harness lines.
- Secondary air injection solenoid valve anomaly, the proposed replacement of the new one.

ECU Pin Configuration

(ON ECU)



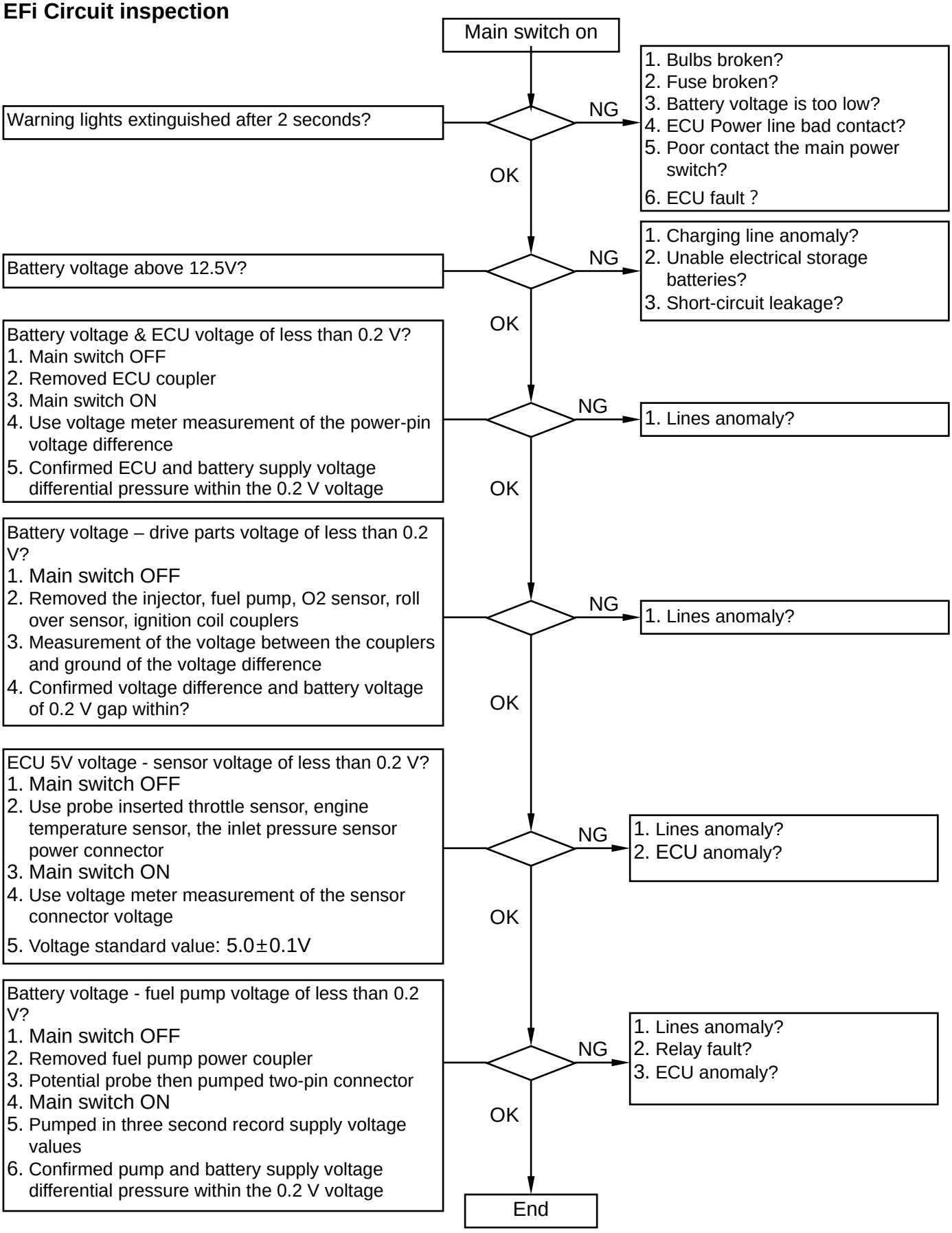
ECU Pin Note

Pin No.	Pin code	Wire color	Note	Pin No.	Pin code	Wire color	Note
1	IGP	R/Y	Ignition Power	34			
2	LG	G(4)	ECU Ground	35	TA	G/BR	Air Temp. sensor signal
3	FAN	B/L	Fan relay	36	TW	R/GR	Water temp. sensor signal
4	CAN-H	O/P	CAN signal	37	O2F-GND	B/G(2)	O2 sensor
5	CAN-L	W/B(2)	CAN signal	38	O2-F	L/P(1)	O2 sensor
6				39			
7	CRK-M	G/W	CPS	40	TEST	P/W	Test Switch
8				41			
9				42	PA	P/B	PA sensor signal
10				43	PM	B/R	MAP sensor signal
11				44			
12	O2HT-F	R/O(1)	O2 sensor heater	45	TRC-IND	PU(2)	Traction contral indicatorlamp out put
13	INJ	L/G	Fuel Injector	46			
14	ISC AP	L/B	Idle Speed Control ＋A	47			
15	PG1	G(4)	GND	48	EXAI	O/L	AISV
16	FPR	O/W	Fuel pump relay				
17	VCC	Y/B	Sensor 5V				
18	SG	G/R	GND				
19	TRC SW	PU(1)	Traction contral switch input				
20	ROLL	Y/P	Rollover sensor				
21	TH	W/BR	TPS				
22							
23							
24							
25	CRK-P	B/Y(1)	CPS				
26	H/L RLY	L/W(1)	Head light relay				
27	ICS BN	B/W(2)	Idle Speed Control －B				
28	ISC AN	BR/B(1)	Idle Speed Control －A				
29	ICS BP	G/B(1)	Idle Speed Control				
30	MIL	Y/G	EFi check light				
31	PG2	G(4)	GND				
32	IG	B/Y	Ignition Coil				
33	VBU	R(3)	ECU ＋12V				

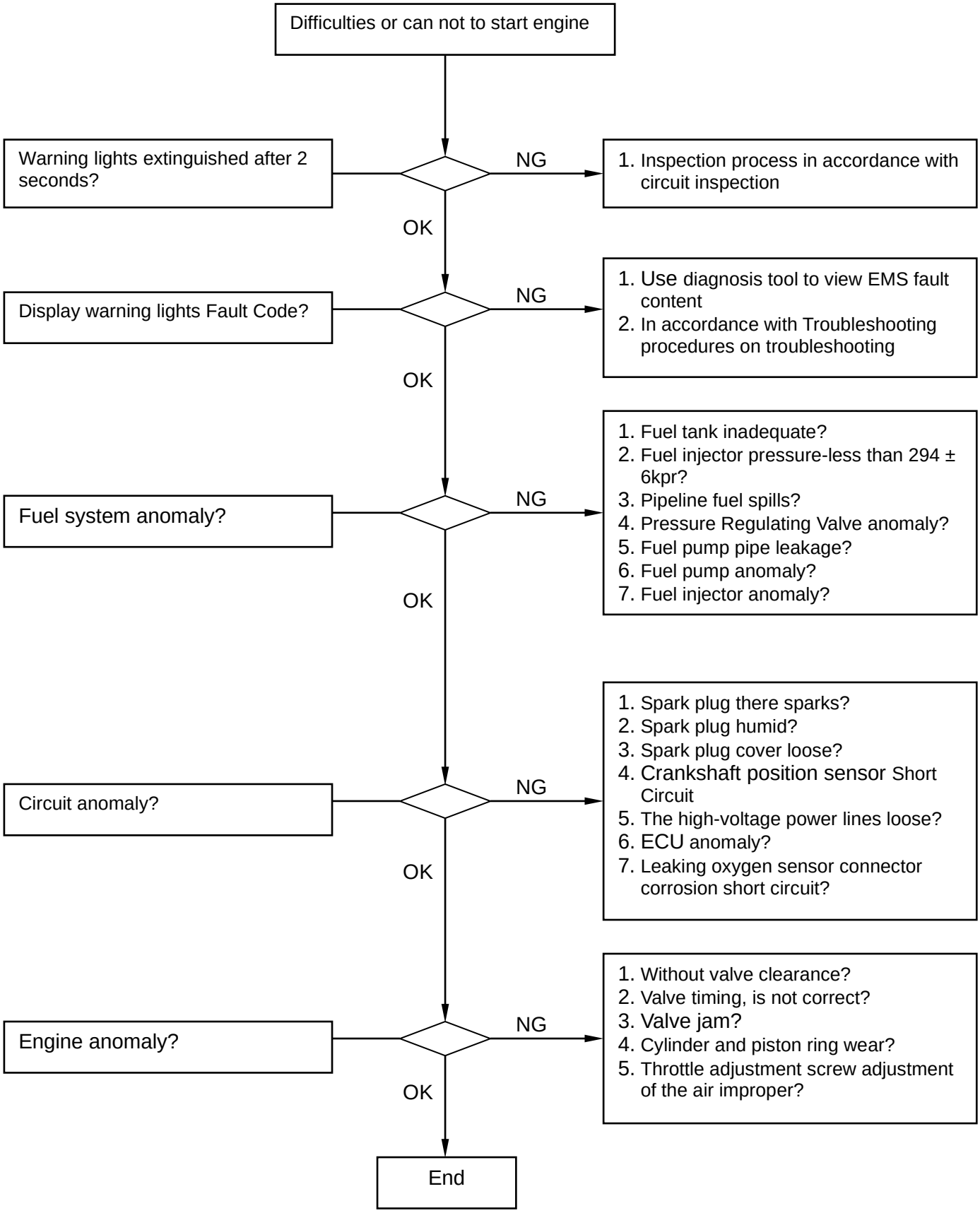
Note: Pin no.19&no.45 TCS system function only available on LV30 type.

Troubleshooting

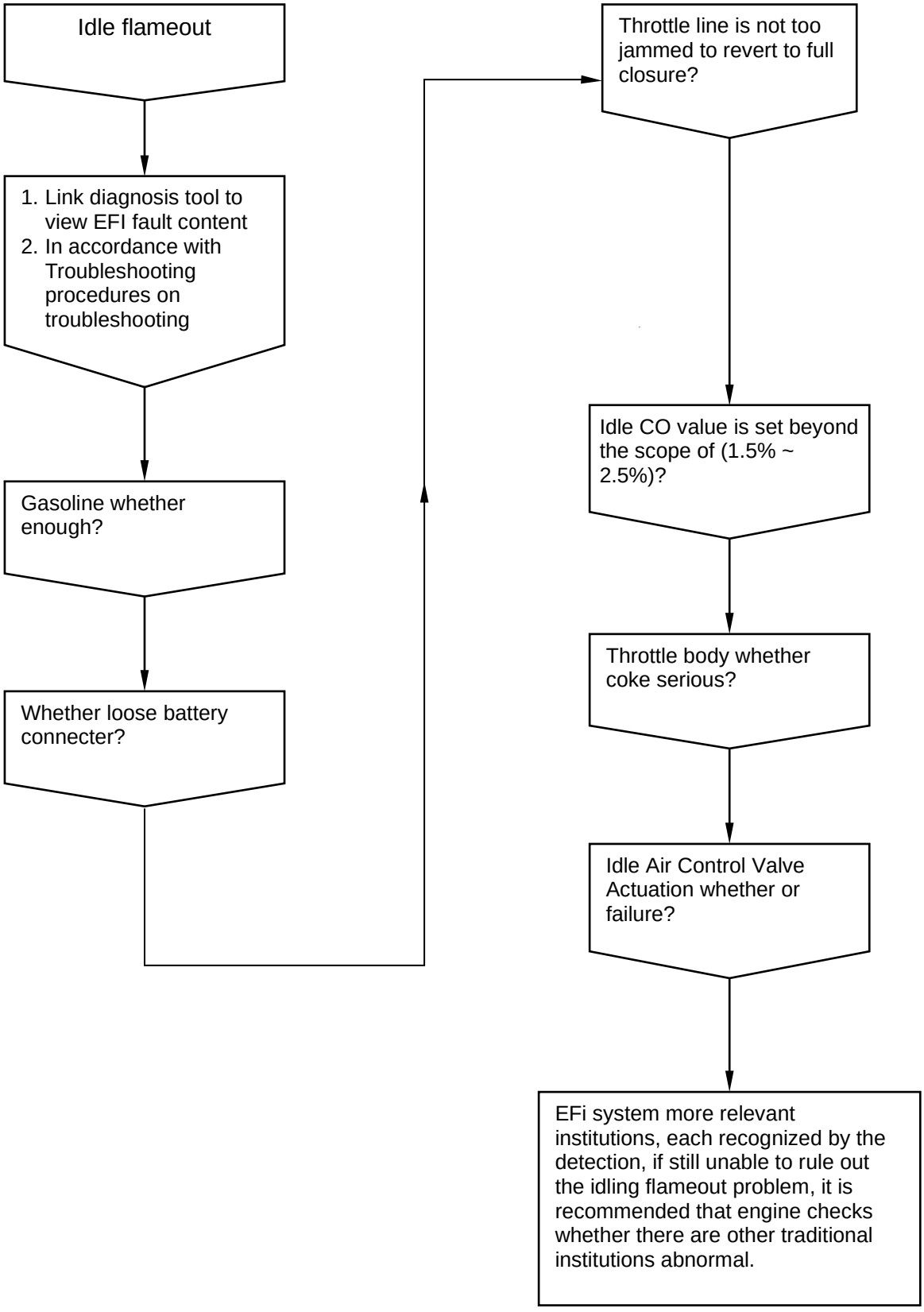
EFi Circuit inspection



Cannot Start the engine or difficult to start inspection

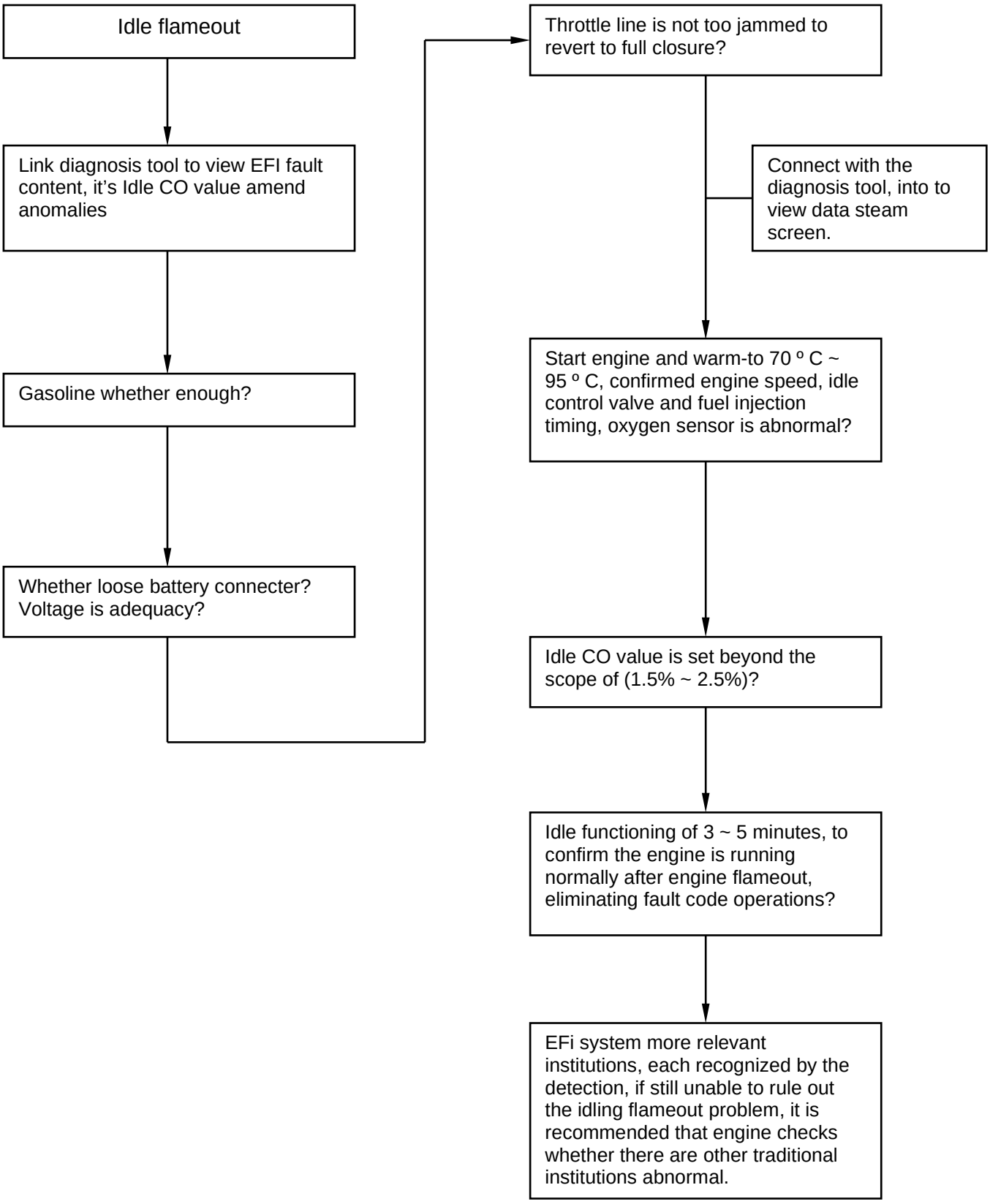


Idle flameout diagnosis



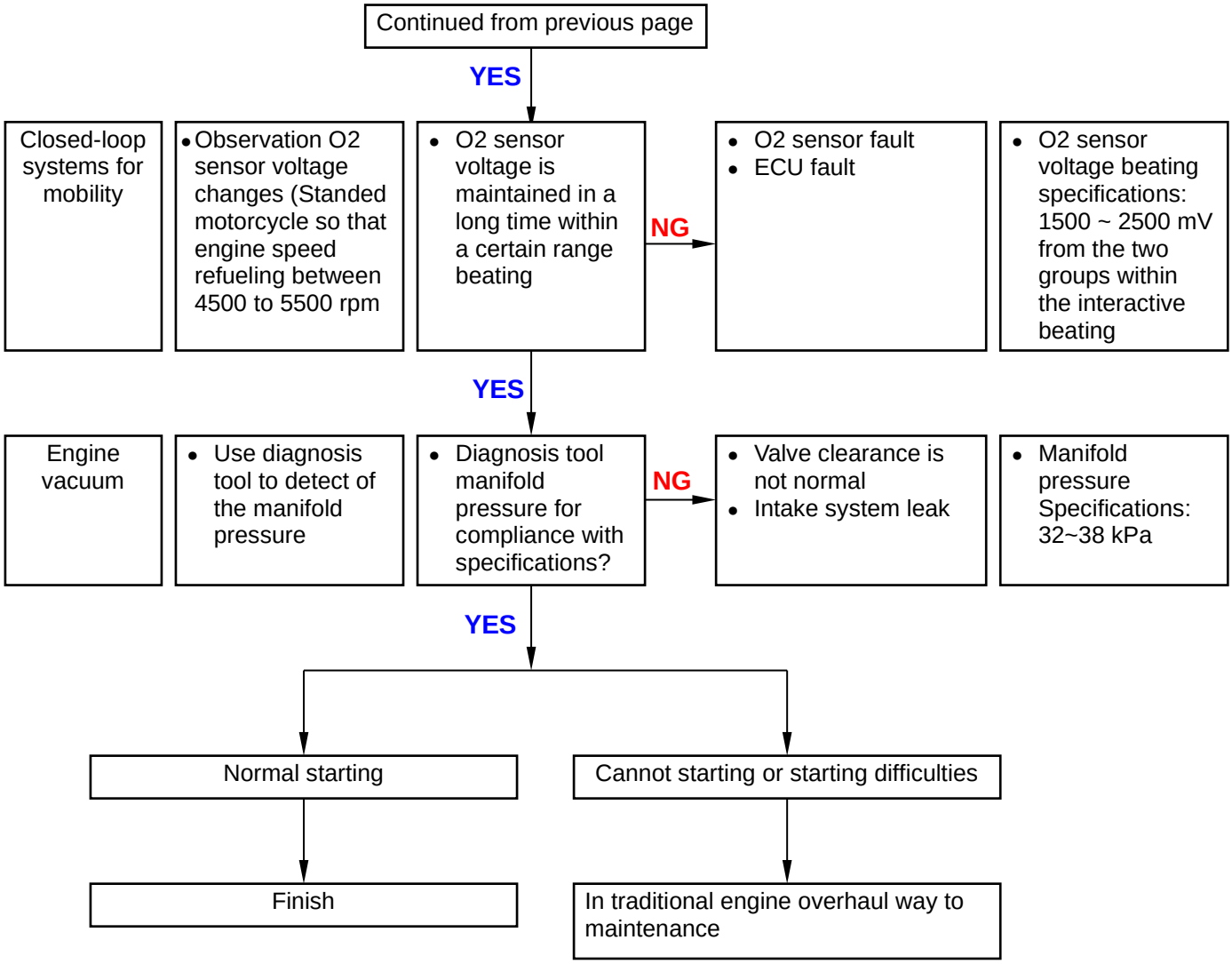
CO value revised anomaly

O_2 Sensor equipped with the system, in principle, not adjusted CO value, such as CO value deviated from the normal range, check O_2 Sensor and other agencies anomaly.



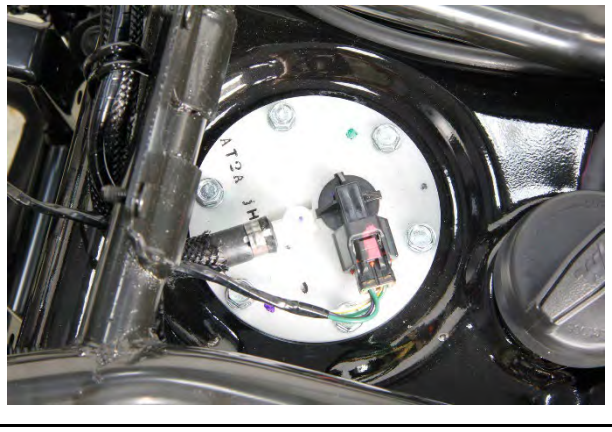
Integrated Troubleshooting Procedure

Checking, adjusting Project	Detection of maintenance projects and steps	Fault status determination		Fault reasons	Parts specifications
Battery voltage	• Use meter direct measurement battery voltage • Use diagnosis tool detection battery voltage	• Battery voltage is 10 V above? • Diagnosis tool show whether the voltage of 10 V above?	NO	• Battery electricity • Battery connector loose • Harness circuit opening • ECU coupler not connected properly	• Diagnosis tool display voltage required to achieve more than 10 V
		YES			
Diagnosis fault code inspection	• Use of the diagnosis tool detection fault code • Elimination of fault codes, and then start engine	• Diagnostic tool show whether or not a fault code? • Fault Code cleared after show again?	YES	• TPS fault • ETS fault • CPS fault • MAP fault • O2 sensor fault • ROS fault • ECU fault	• The sensor detection methods and specifications, please refer to repair manual
		NO			
Fuel quantity and fuel pressure	• Removed the injector on the intake manifold, but not removal of harness coupler. (Injector and injector cap tightly by hands, fuel spills should not be the case) • Start the engine • Examine whether injector fuel injection • Between the tank and injector installation the pressure gauge • check fuel pressure adequacy	• Injector whether injection? • Injector spray angle is normal? • Fuel pressure enough?	NO	• less than fuel tank • Injector fault • Fuel pump relay fault • Fuel pump fault • ECU fault • Fuel pump filter obstructive	• Pressure fuel specifications: Open the main switch three seconds after but not start engine →more than 250 kPa Idle → 294±6kPa • Injector resistance specifications: 10.5±0.53Ω
		YES			
Ignition situation	• Removed the spark plug from the cylinder head, but then power lines still ring • Start the engine • check spark plug sparks	• Examine whether the spark plug ignition? • Check spark plug sparks strength is normal?	NO	• Spark plug fault • Roll over sensor fault • ECU fault • Ignition coil fault • Crankshaft position sensor fault	• Spark plug specifications: NGK-CR8E
		YES			
		Continued next page			

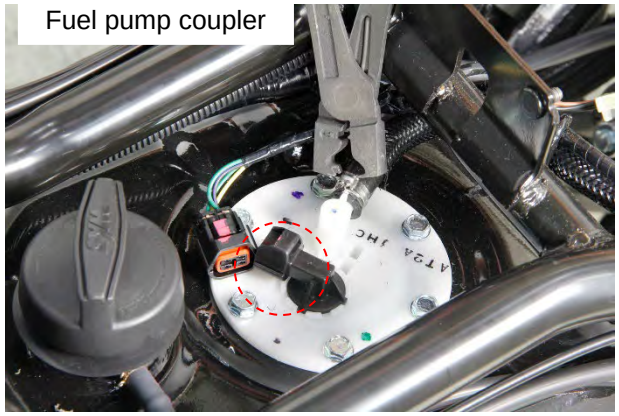

Continued from previous page
YES
Closed-loop systems for mobility
• Observation O2 sensor voltage changes (Standed motorcycle so that engine speed refueling between 4500 to 5500 rpm
• O2 sensor voltage is maintained in a long time within a certain range beating
NG
• O2 sensor fault
• ECU fault
• O2 sensor voltage beating specifications: 1500 ~ 2500 mV from the two groups within the interactive beating
YES
Engine vacuum
• Use diagnosis tool to detect of the manifold pressure
• Diagnosis tool manifold pressure for compliance with specifications?
NG
• Valve clearance is not normal
• Intake system leak
• Manifold pressure Specifications: 32~38 kPa
YES
Normal starting
Cannot starting or starting difficulties
Finish
In traditional engine overhaul way to maintenance

Remove fuel pump/fuel unit

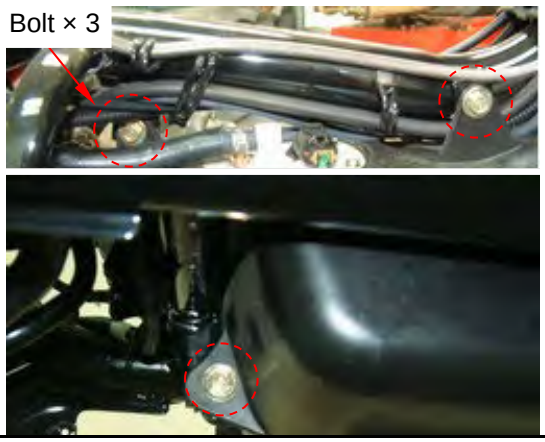
Remove side cover.
Remove rear carrier
Remove rear bodycover.
Remove floor panel.
Remove under cover.
(refer to chapter 14)



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



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

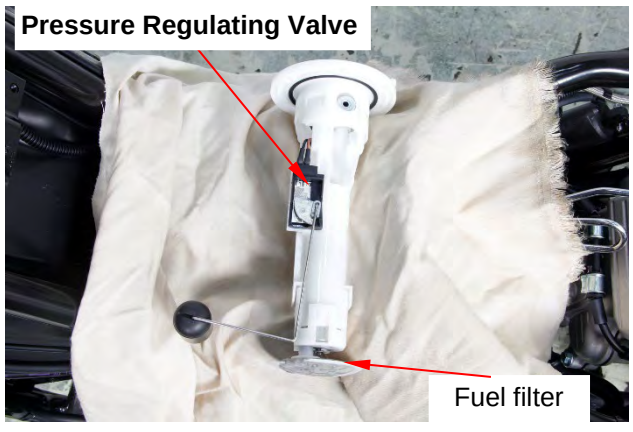


Remove / Install fuel pump and fuel unit

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

Cautions

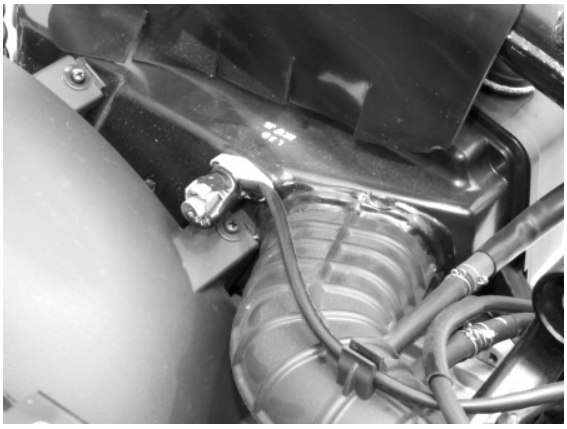
- Then remove fuel pump, fuel in fuel tank internal to confirm not excessive.
- Then install fuel pump and fuel unit, attention direction.
- Confirm whether the fuel filter dirt, obstructive.
- Fuel pump installation, to confirm whether it is normal to the fuel out (the pressure about 3 kg/cm2).



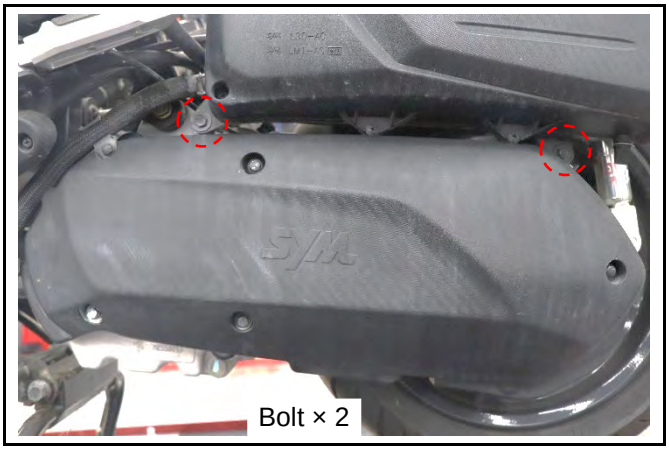
Air Cleaner

Remove

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



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

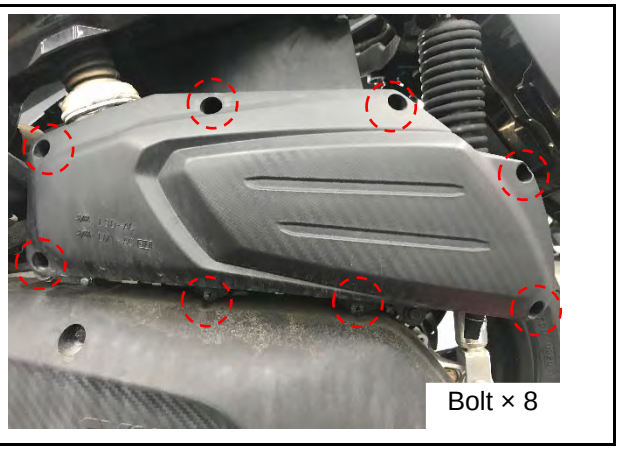


Install

Install In the anti-demolition order.

Clean air cleaner element

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

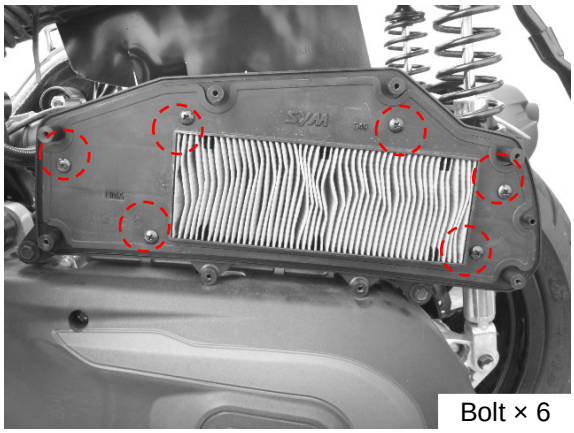


⚠ Cautions

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

Install air cleaner element

Install In the anti-demolition order.



⚠ Cautions

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

EFi System Diagnosis Methods

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

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

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

Using diagnostic tool for overhaul

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

Manual inspection

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

I

Trouble Code(s) and Sensor(s) Table

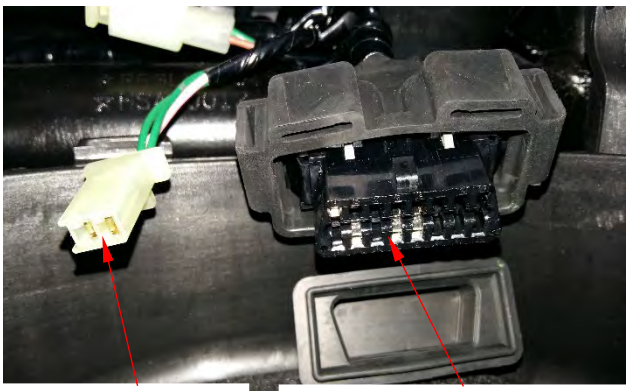
List of all active and stored trouble codes in the ECU and their description

OBJECT	DTC	COMPONENT	MONITORING STRATEGY
PRIMARY HEGO#1 HEATER	P0032	O2 SENSOR HEATER	Short circuit to battery
	P0030		Short circuit to ground or open circuit
PM#1	P0107	MANIFOLD PRESSURE SENSOR	Too low input voltage
	P0105		Too high input voltage or open
TW/TA	P011B	ENGINE COOLANT TEMPERATURE AND INTAKE AIR TEMPERATURE SENSOR	1. Soaked time is greater than or equal to predetermined value; 2. Engine coolant temperature sensor and Intake air temperature sensor deviation value is greater than predetermined value.
TA	P0112	INTAKE AIR TEMPERATURE SENSOR	Too low input voltage
	P0110		Too high input voltage
	P0111		When sensor input voltage within the range of Out of Range and the time has passed longer than predetermined value.
TW	P0117	ENGINE COOLANT TEMPERATURE SENSOR	Too low input voltage
	P0115		Too high input voltage or open circuit
	P0125		Estimation virtual coolant temperature greater than or equal to predetermined value.
	P050C		1. Soaked time is greater than or equal to predetermined value; 2. Coolant temperature is greater than predetermined value.
TPS#1	P0123	THROTTLE POSITION SENSOR	Too high input voltage
	P0120		Too low input voltage or open circuit
PRIMARY HEGO#1	P0130	O2 (BINARY) SIGNAL	Short circuit to battery or open circuit
	P0131		Short circuit to ground
FUEL INJECTOR	P0201	FUEL INJECTOR	Injector circuit malfunction
FUEL PUMP RELAY	P0230	FUEL PUMP RELAY	Fuel pump relay circuit malfunction
IGNITION COIL	P0351	IGNITION COIL	Ignition coil circuit malfunction
CRK	P0335	CRANKSHAFT POSITION SENSOR	The senor circuit malfunction
EXAI	P044F	SECONDARY AIR INJECTION SYSTEM	Short circuit to battery
	P0412		Short circuit to ground or open circuit
FAN RELAY	P0480	FAN RELAY	Radiator fan relay circuit malfunction
VSP	P0500	WHEEL SPEED SENSOR(FRONT)	The sensor circuit malfunciton (Front)
	P2158	WHEEL SPEED SENSOR(REAR)	The sensor circuit malfunciton (Rear)
IDLE AIR SYSTEM	P0507	IDEL AIR CONTROL SYSTEM	1. Engine is idling; 2. Engine temperature is more than or equal to predetermined value; 3. Below the prescribed vehicle speed; 4. Engine RPM is more than or equal to predetermined (high) value, is kept over predetermined time.

	P0506		1. Engine is idling; 2. Engine temperature is more than or equal to predetermined value; 3. Below the prescribed vehicle speed; 4. Engine RPM is more than or equal to predetermined (low) value, is kept over predetermined time.
IDLE SPEED CONTROL STEPPER MOTOR	P0511	IDLE AIR CONTROL SYSTEM	Short circuit to ground or open circuit
HEAD LIGHT RELAY	P1471	HEAD LIGHT RELAY	Short circuit to ground or open circuit
	P1472		Short circuit to battery
ROLL	P1630	ROLL OVER SENSOR	Too low input voltage
CAN	P1690	CAN COMMUNICATION	Can bus error
PA	P2228	BAROMETRIC PRESSURE SENSOR	Too low input voltage
	P2226		Too high input voltage or open circuit

Diagnostic Tool Use Note
Diagnosis of connectivity

1. For the diagnostic tool coupler access to the motorcycle injection system diagnostic signal coupler.
2. main switch ON.
3. Open the diagnosis left power switch, which turn on the LCD screen, the screen brightness adjustment knob to the appropriate brightness.



Troubleshooting Table

Test items / Abnormal phenomena		Comprehensive testing program							Parts		
		Power voltage	Fuel press.	Ignition state	Engine vacuum	Injection state	closed-loop control system	Fault Code Detection	ECU	Throttle position sensor	Engine temp. sensor
Start state	Can't start	O	O	O	O	O		O	O		
	Difficult to start	O	O		O			O		O	O
Idle state	Without idle			O	O	O		O		O	O
	Idle not smooth					O	O	O	O	O˅	
	RPM NG							O	O		
	CO NG		O			O	O	O	O		
Acceler-ation	Not smooth		O	O	O	O		O	O	O	O
	Inability and slow		O	O	O	O		O	O	O	O
Flameo-ut	Idle flameout				O			O			
	Acceleration flameout							O	O		

Related spare parts							
	Roll over sensor	Fuel pump	Ignition coil	Inlet pipe	Injector	O2 sensor	
	Power relay	Fuel pressure adjustment valve	Spark plug	Cylinder head	Fuel pump	Secondary air injection solenoid valve	
	Security unit	Fuel pump relay		Inlet pressure sensor	Fuel pressure adjustment valve		
	Main switch	Fuel filter					
	Battery						

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

Comprehensive Maintenance List

No.	Maintenance Project	Testing Procedures	Test items	Determine benchmarks	Fault reasons
1	**Power and voltage**	● Use meter direct measurement battery voltage ● Use diagnosis tool detection of battery voltage	● Battery voltage	● Battery voltage = 10V Above	● Battery electricity ● Battery connector loose ● Harness circuit opening ● ECU coupler not connected properly
2	**Fuel pressure**	● Use fuel pressure gauge, connected in series between the injector and the Pressure Regulating Valve ● Main switch ON, but not start engine ● Check fuel pressure ● Start engine (idle) ● Check change of the fuel pressure ● throttle several rotation ● check to the change of fuel pressure again	● Open the main switch, but not to start the engine of pressure ● Pressure in idle ● Rotating throttle, situation of pressure changes	● Open main switch, but not srart: pressure = 250kPa (Stable value) ● Idle state: pressure = 294±6kPa (Beating situation from top to bottom) ● rotation throttle moment: pressure = 294±6kPa (Slightly beating)	● Fuel not enough ● Security switch not disarm ● Ruel pump relay fault ● Ruel pump fault ● Injector fault ● ECU fault
3	**Ignition state**	● The spark plug removed from the cylinder head, but the power lines still ring ● Start engines or use for the diagnosis tool of output View spark plug ignition conditions	● Spark plug specifications ● Whether the spark plug ignition ● Spark plug sparks whether it is normal strength	● Specifications: NGK-CR8H ● Ignition conditions: With traditional engines found ways	● Spark plug fault ● Roll over sensor fault ● ECU No. 5 pin fault ● Ignition coil fault ● Crankshaft position sensor fault
4	**Engine vacuum**	● Diagnosis tool to detect the use of	● Manifold pressure of diagnosis tool	● Manifold pressure =32~38kPa	● Valve clearance abnormal ● Intake system leak
5	**Injection state**	● The injector removed from the throttle body, but not dismantle pipeline ● Main switch ON, but not start engine ● Investigation the injector it's leaking fuel? ● Once again start engines or use for the diagnosis tool of output function ● Check injector fuel injection and the injection situation	● Open the main switch, but did not start engine the injection situation ● Injector state when start	● Not started, injector not leaking fuel ● In started, the injection state must show fan shape	● Security unit is configured not disarm ● Fuel pump relay fault ● Fuel pump fault ● Injector fault ● ECU fault
6	**Closed - loop control system**	● Use of diagnostic tool observation O2 Sensor voltage changes	● Stable condition, sensor voltage variation (Idle continued 5 minutes later to measurement)	● Idle stable condition: O2 Sensor voltage = 50 ~ 200mV (Show from top to bottom beating phenomenon)	● O2 Sensor fault ● ECU fault
7	**Fault Code Detection**	● Use of the diagnosis tool existing fault-detection code or historical Fault Code ● Elimination of the implementation of fault codes, check can be eliminated ● Once again start engine ● Check fault is it happen again	● Diagnosis tool of the fault code is it can be eliminated ● Start again, the fault is it will happen again	● Without any residual Fault Code ● If residual Fault Code, according to the "Fault Code Maintenance Form" implementation of troubleshooting	● throttle position sensor fault ● Engine temperature sensor fault ● Intake temperature sensor fault ● Manifold pressure sensor fault ● O2 Sensor fault ● Crankshaft position sensor fault ● ECU fault ● Roll over sensor fault

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

Note:

Precautions in Operation ····· 5-1	Engine Bush····· 5-7
Engine Removal····· 5-2	Engine Installation ····· 5-8
Engine Hanger····· 5-7	

Precautions in Operation

General Information

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

Specification

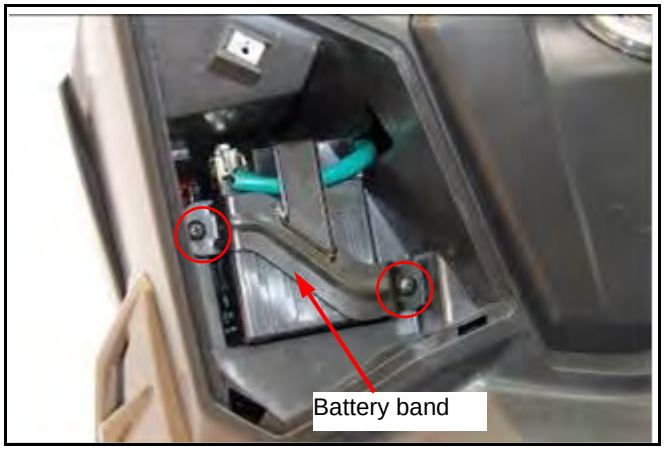
Item		LV25W / LV30W
Engine Oil Capacity	Replacement	1,200 c.c.
	Disassemble	1,400 c.c.
Gear Oil Capacity	Replacement	160 c.c.
	Disassemble	180 c.c.
Capacity of coolant		1400 c.c.

Torque Values

Engine hanger bolt (frame side)	7.5~9.5kgf-m
Engine hanger nut (engine side)	7.5~9.5kgf-m
Bolt of rear cushion upper connection	3.5~4.5kgf-m
Bolt of rear cushion lower connection	2.4~3.0kgf-m
Rear brake bolt	2.9~3.5kgf-m

Engine Removal

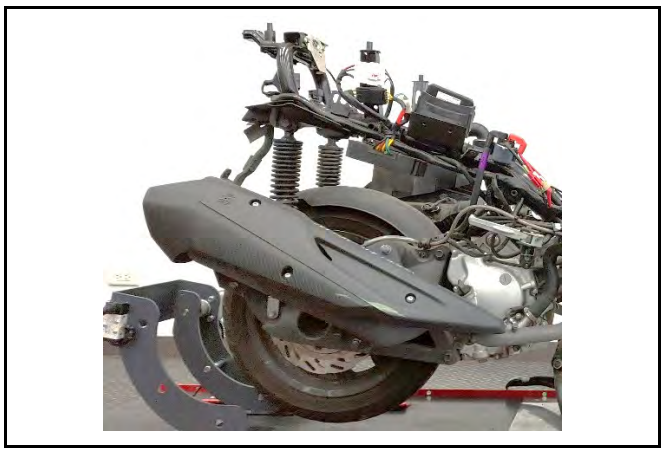
Remove battery cover (1 screw)
Remove battery band (2 screw)
Remove battery



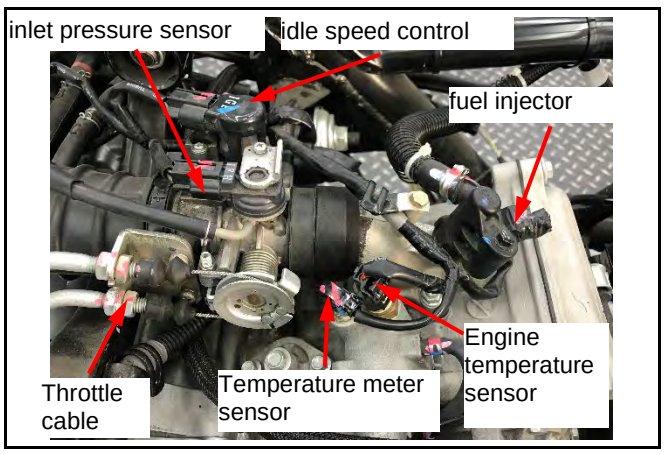
Remove the luggage box
(Refer to chapter 13)



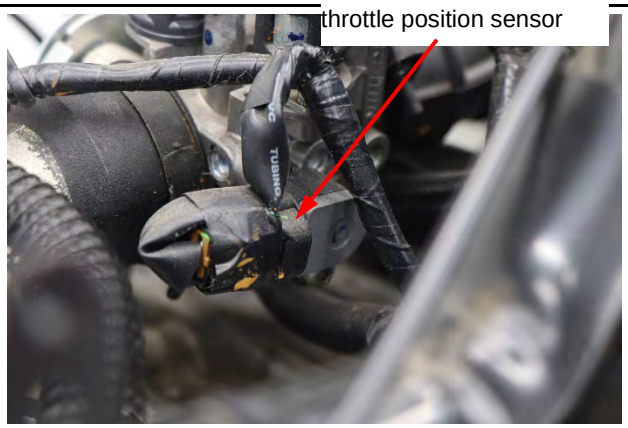
Remove right and left side covers
Remove body cover
(Refer to chapter 13)



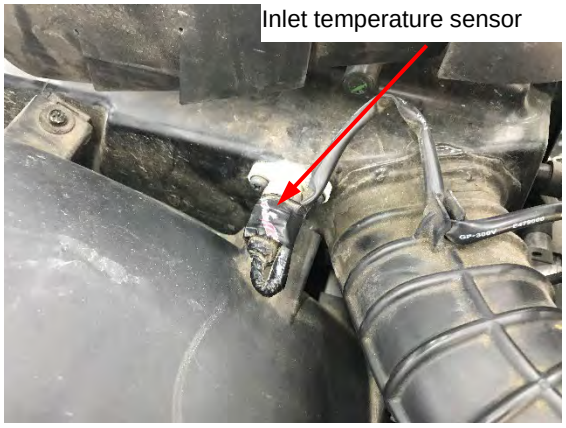
Remove couplers of idle speed control valve, inlet pressure sensor, fuel injector.
Remove couplers of temperature meter sensor and engine temperature sensor.
Remove throttle cable.



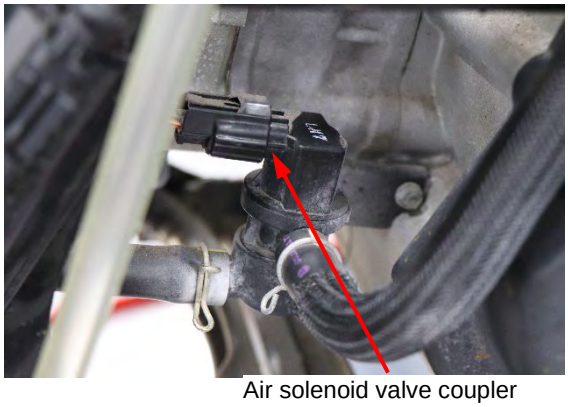
Remove throttle position sensor coupler.



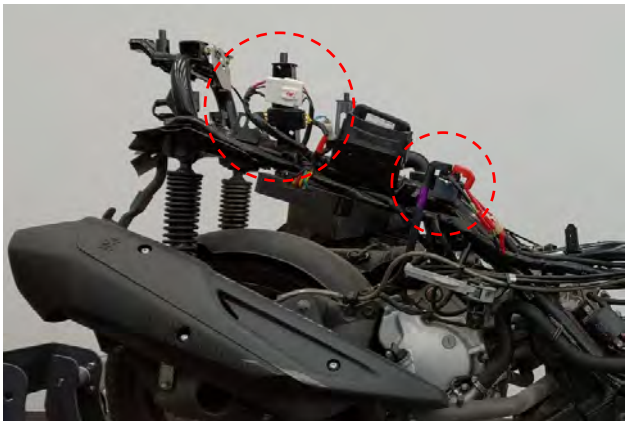
Remove inlet temperature sensor coupler.



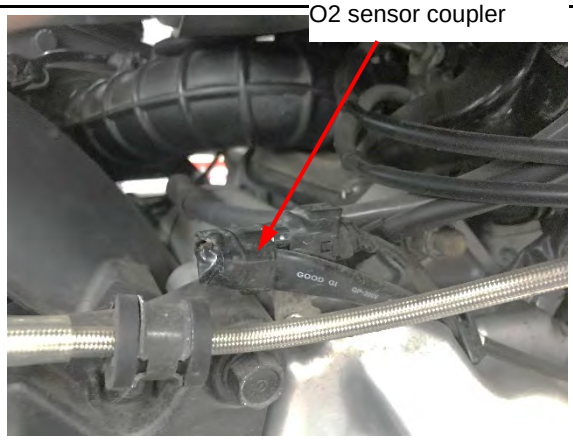
Remove secondary air solenoid valve coupler.



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



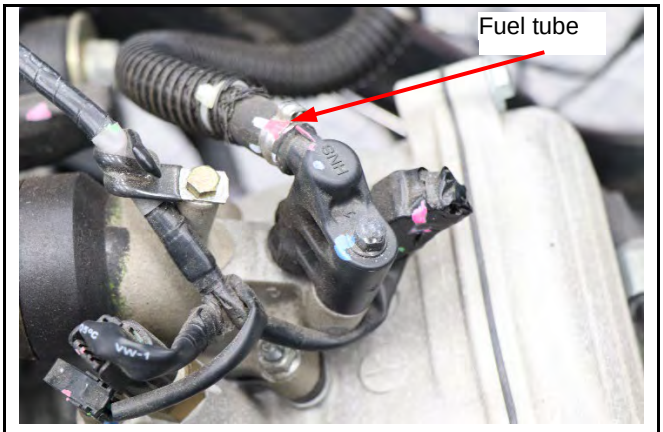
Remove O2 sensor wire coupler.



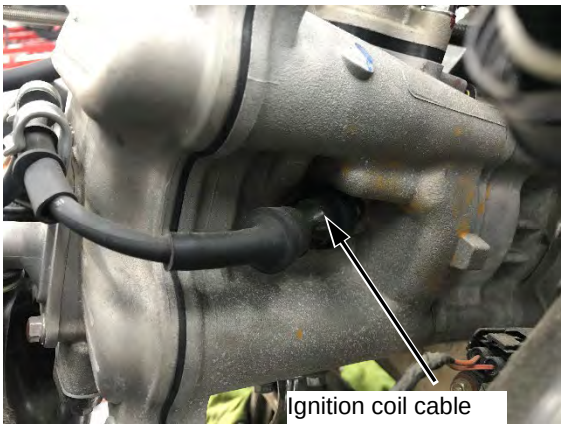
Start engine for the pipeline to be exhausted within the residual pressure, the engine flameout, relaxing fuel tube folder, open for fuel tube.

⚠ Caution

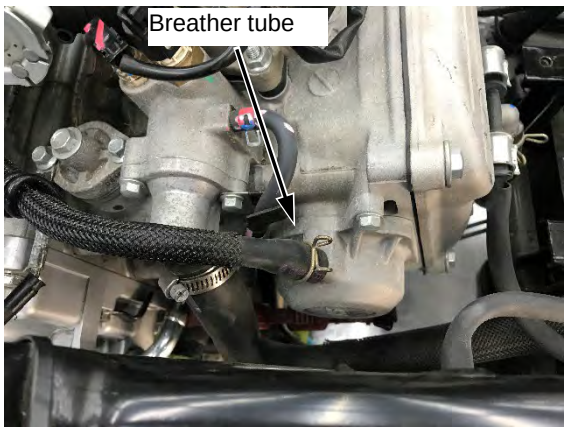
- Demolition for the pipeline, will be required for residual pressure in the pipeline to divest, or usethe folder surrounds the tubing to prevent petrol splash.



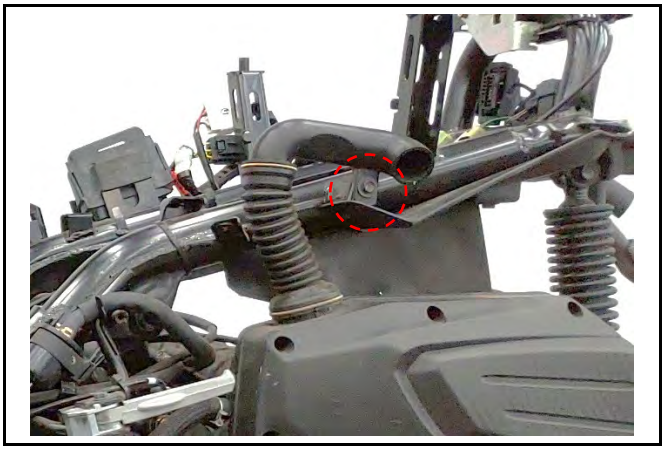
Remove ignition coil cable.



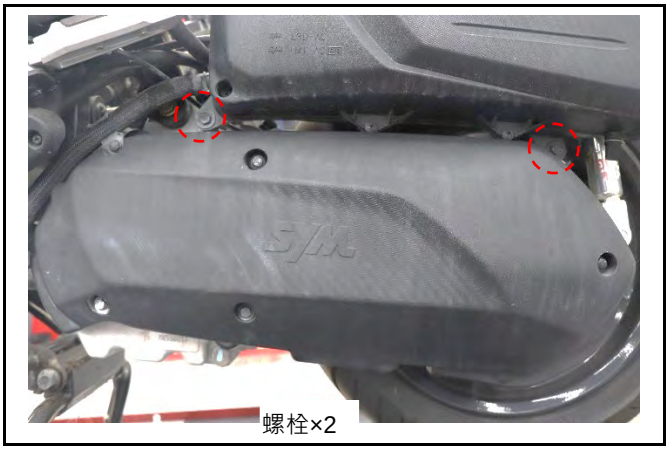
Remove breather tube.



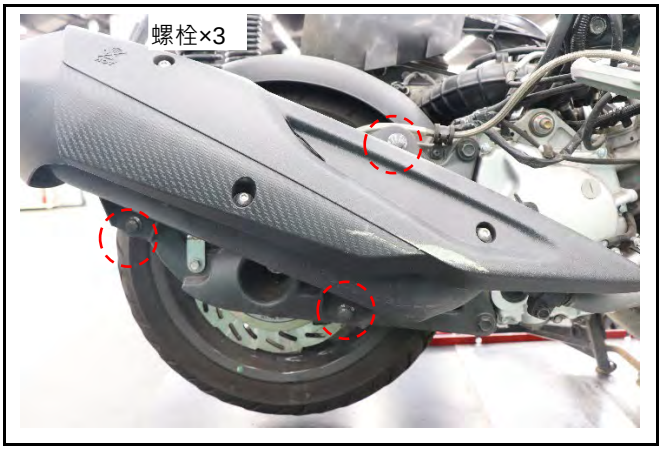
Remove the air cleaner inlet pipe connection bolt



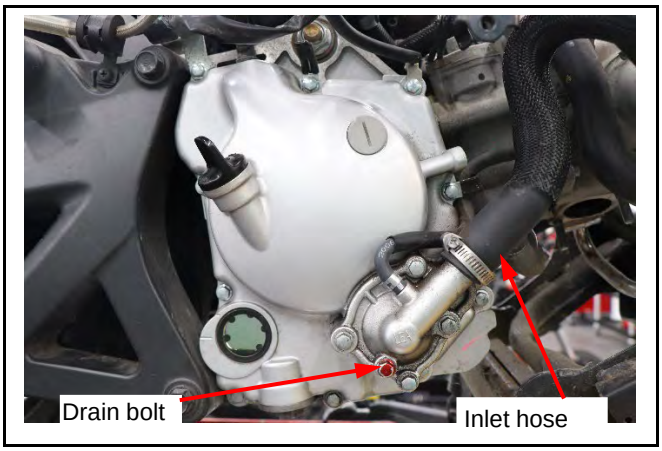
Remove the air cleaner connection bolts (2 bolts).Remove the air cleaner.



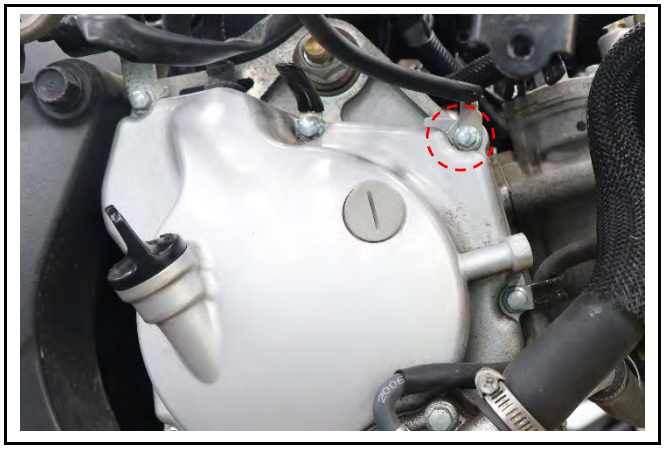
Remove the exhaust muffler (3 bolts, 2 nuts).



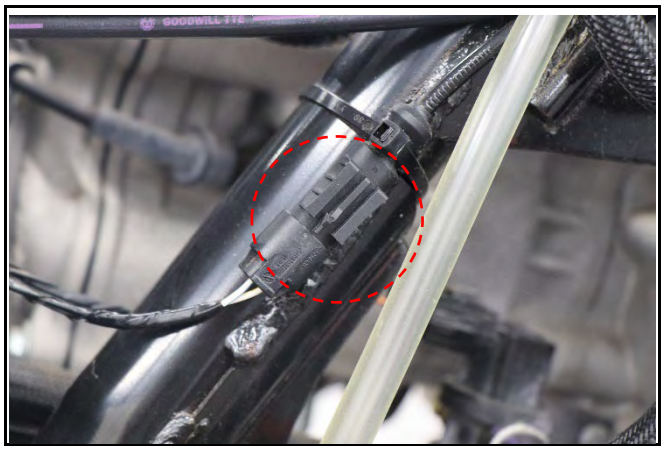
Drain out coolant, and remove coolant inlet hose.



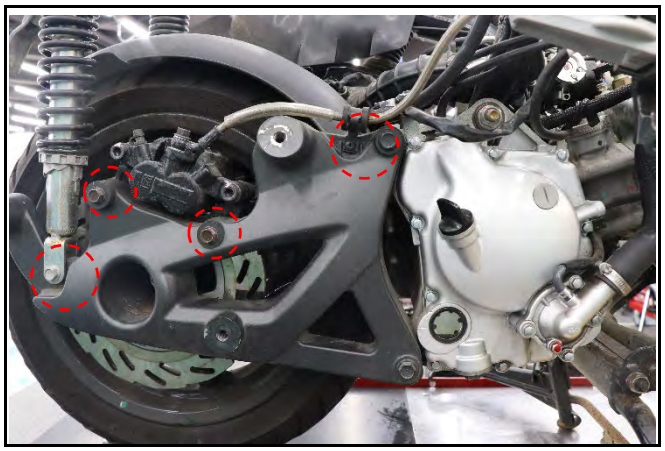
Remove the earth cable.



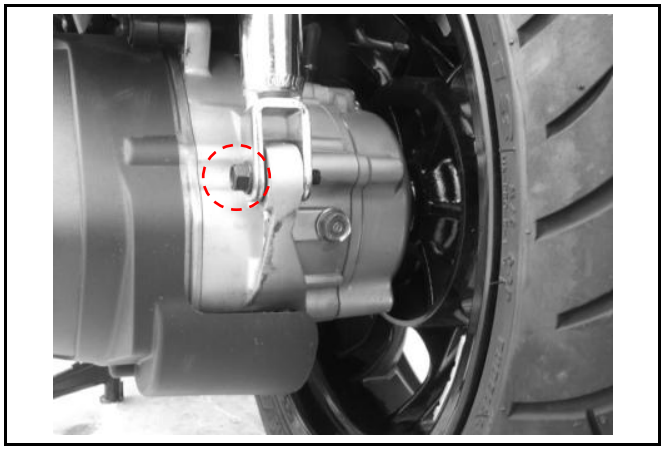
Remove the rear speed sensor coupler.



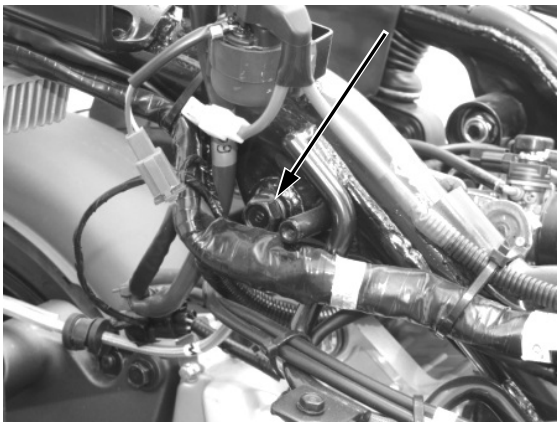
Remove rear brake hose clamp and rear brakecaliper.
Remove right rear cushion lower bolt.



Remove left rear cushion lower bolt (1 bolt).



With a bracket to support the engine to preventfrom it damage by falling down as removing theengine.



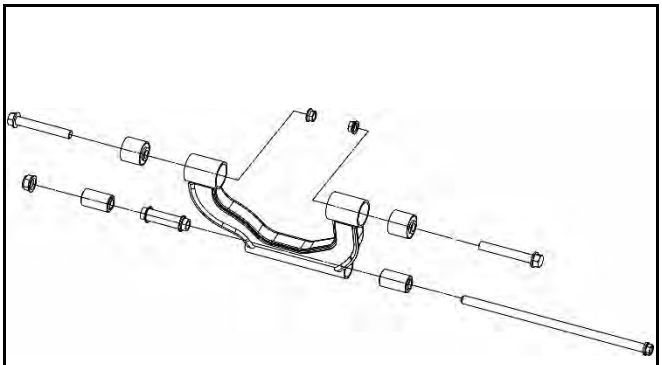
Engine Hanger

Removal

Remove the engine side bolts of engine hanger. (1bolt on each side)
Remove the engine hanger.
Check if the engine hanger bush and cushion rubber for damage. If so, replace with new ones.

Installation

Tighten the bolts and nuts of engine hanger.



Engine Bush

Inspection

If the engine hanger frame and the cushion rubberof rear cushion bush is damaged. With the bush remover / presser, to press thebush out, and replace it with new one.



Pressing out

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

Special tools

Crankcase bush remover/presser
SYM-1120310
Crankcase bush remover/presser
SYM-1120320



Pressing In

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

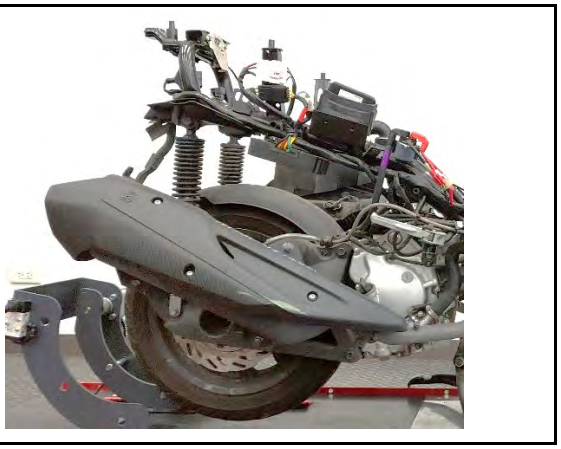


Engine Installation

Install the engine according to the reversing orderof removal.

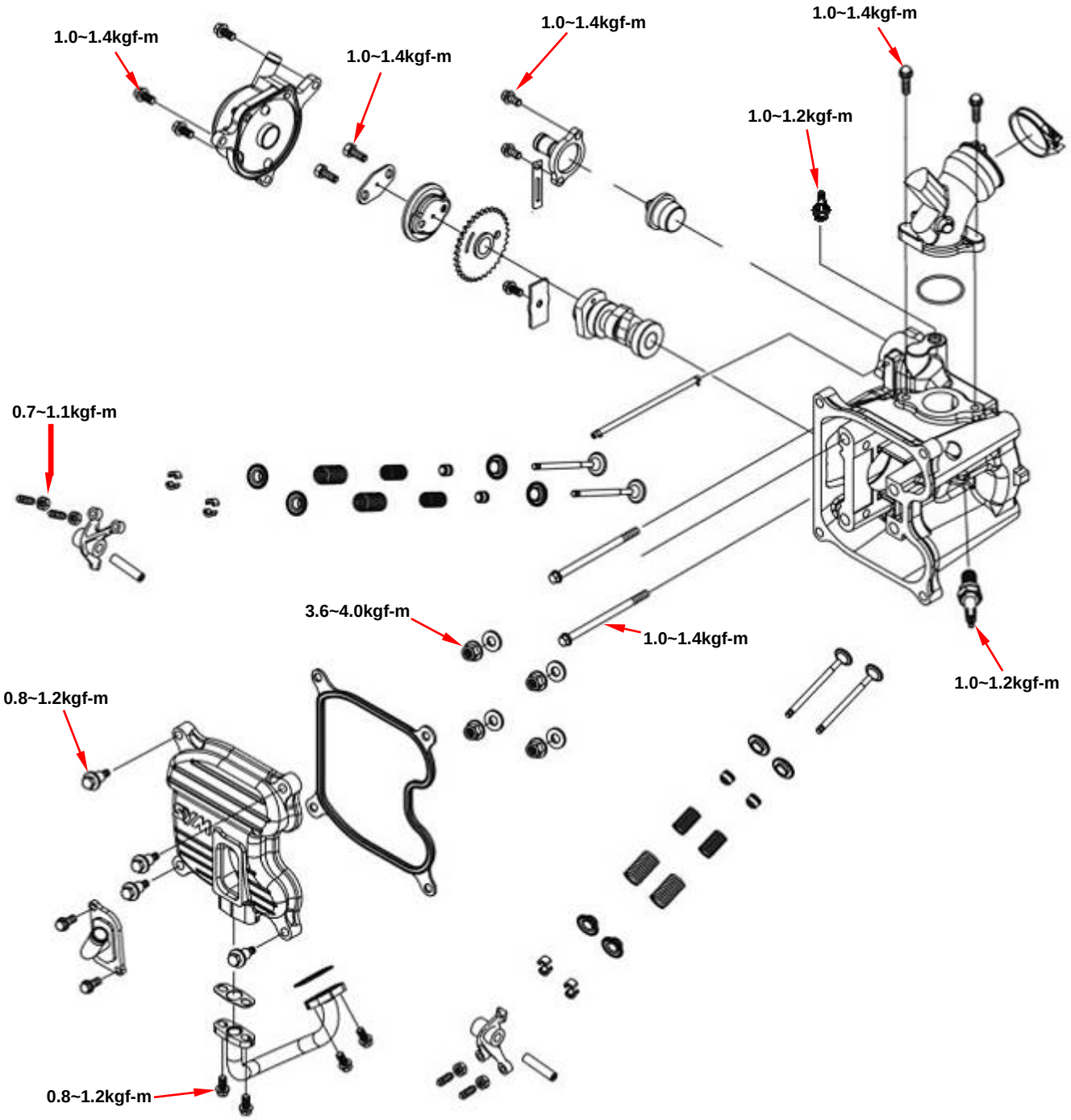
⚠ Caution

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



Mechanism Diagram ····· 6-1	Valve Stem Replacement····· 6-10
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Troubleshooting····· 6-3	Cylinder Head Reassembly····· 6-13
Cylinder Head Removal····· 6-4	Cylinder Head Installation ····· 6-14
Cylinder Head Disassembly····· 6-6	Valve Clearance Adjustment····· 6-16
Cylinder Head Inspection ····· 6-8	

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

Type			LW30		LW25	
Item			Standard	Limit	Standard	Limit
Compression pressure			12.5±2 kg/cm2	---	12.5±2 kg/cm2	---
Camshaft	Height of cam lobe	Intake	34.880	34.860	34.880	34.860
		Exhaust	34.740	34.725	34.740	34.725
Rocker arm	ID of valve rocker arm		11.982~12.000	12.080	11.982~12.000	12.080
	OD of valve rocker arm shaft		11.966~11.984	11.936	11.966~11.984	11.936
Valve	OD of valve stem	Intake	4.975~4.990	4.900	4.975~4.990	4.900
		Exhaust	4.950~4.975	4.900	4.950~4.975	4.900
	ID of valve guide		5.000~5.012	5.030	5.000~5.012	5.030
	Clearance between valve stem and guide	Intake	0.010~0.037	0.080	0.010~0.037	0.080
		Exhaust	0.025~0.062	0.100	0.025~0.062	0.100
	Free length of valvespring	Inner	38.700	35.200	38.700	35.200
		outer	40.400	36.900	40.400	36.900
	Valve seat width		1.600	---	1.600	---
	Valve clearance	Intake	0.10±0.02mm	---	0.10±0.02mm	---
		Exhaust	0.15±0.02mm	---	0.15±0.02mm	---
Flatness of cylinder head			---	0.050	---	0.050

Torque Value

Cylinder stud bolt	1.0~1.4kgf-m
Cylinder head nut	3.6~4.0kgf-m
Cylinder head right bolt	1.0~1.4kgf-m
Cylinder head side cover bolt	1.0~1.4kgf-m
Cylinder head cover bolt	0.8~1.2kgf-m
Cylinder head stud bolt (inlet pipe)	1.0~1.4kgf-m
Cylinder head stud bolt (EX. pipe)	2.4~3.0kgf-m
Air inject pipe bolt	0.8~1.2kgf-m
Head cover bolt	0.8~1.2kgf-m
Air inject reed valve bolt	0.07~0.09kgf-m
Tappet adjustment screw nut	0.7~1.1kgf-m
Spark plug	1.0~1.2kgf-m
Camshaft Chain Tensioner bolt	0.8~1.2kgf-m

Tools

Special service tools

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

Troubleshooting

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

Low compression pressure

1. Valve

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

2. Cylinder head

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

3. Piston

- Piston ring worn out.

High compression pressure

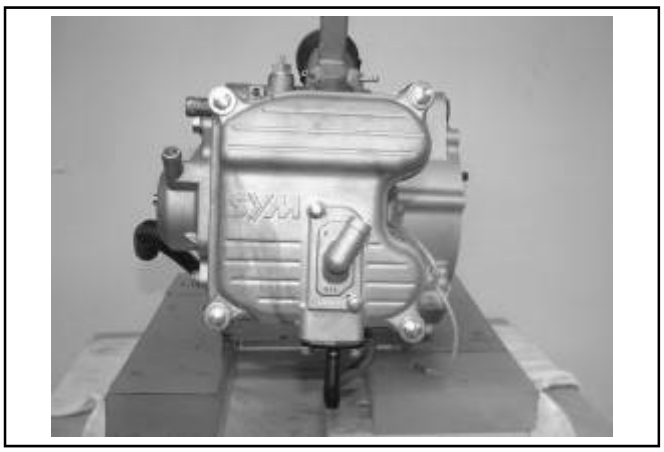
- Too much carbon deposit on combustion chamber or piston head

Noise

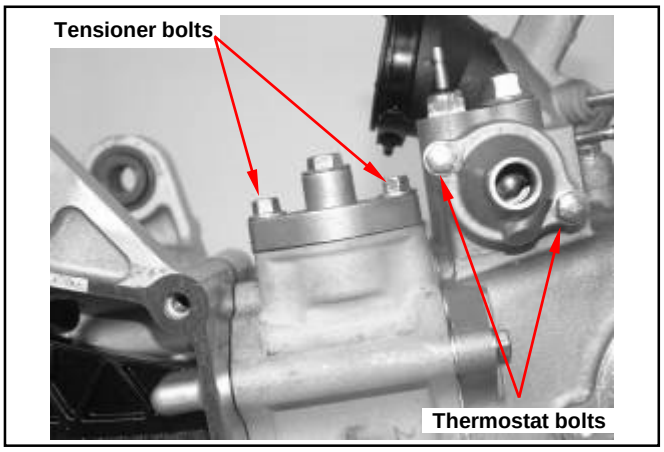
- Improper valve clearance adjustment
- Burnt valve or damaged valve spring
- Camshaft wear out or damage
- Chain wear out or looseness
- Auto-tensioner wear out or damage
- Camshaft sprocket
- Rocker arm or rocker arm shaft wear out

Cylinder Head Removal

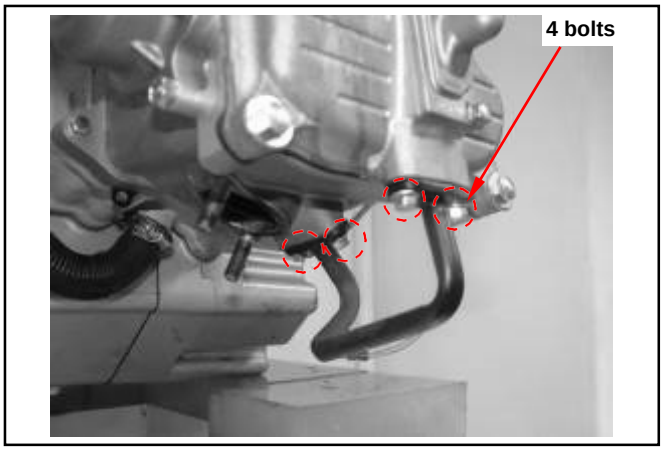
Remove engine. (Refer to chapter 5)



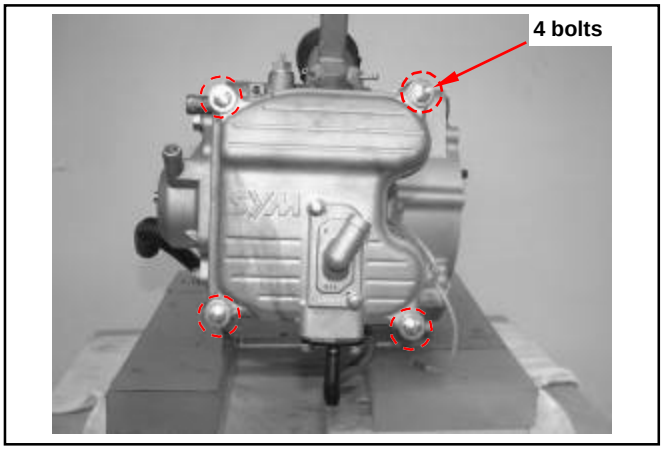
Remove 2 bolts of thermostat and then remove the thermostat.
Remove hole bolt and spring for the cam chain tensioner.
Loosen 2 bolts, and then remove tensioner.
Remove thermostat (2 bolts).



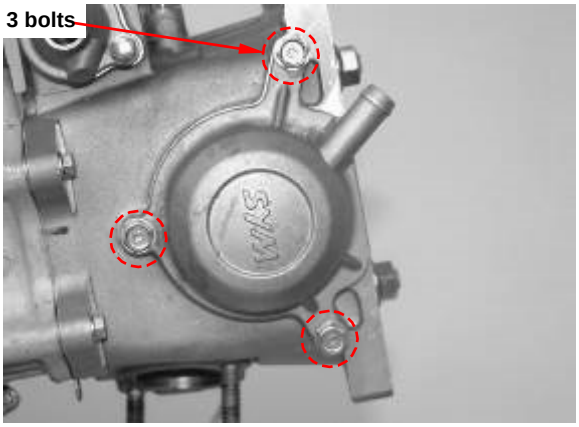
Remove Air Injection system (AI) pipe mounting bolts.
Remove spark plug.



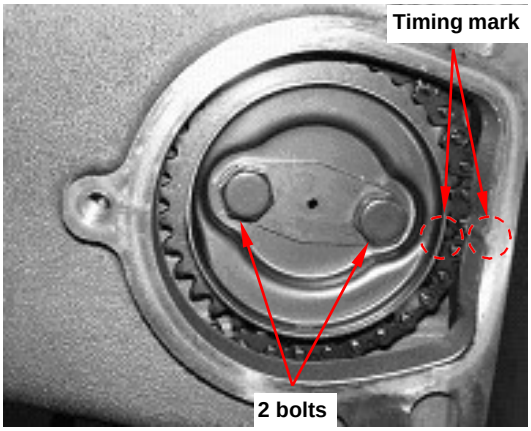
Remove cylinder head cover (4 bolts).



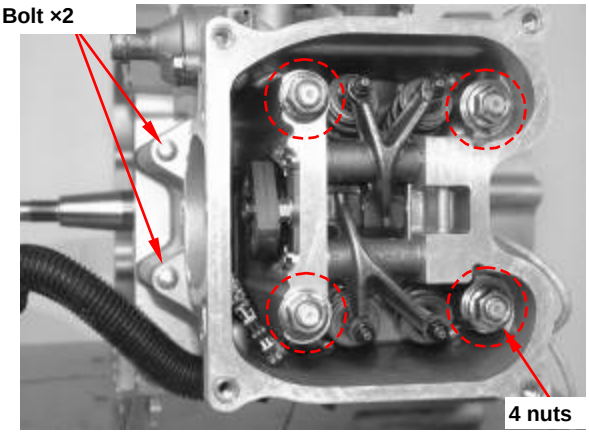
Remove the side cover mounting blots of cylinder head, and then take out the side cover.



Remove left crankcase cover, and turn the
Turn the drive face, and align the timing mark on the sprocket with that of cylinder head, piston is at TDC position.
Remove cam sprocket bolts and then remove the sprocket by prying chain out.



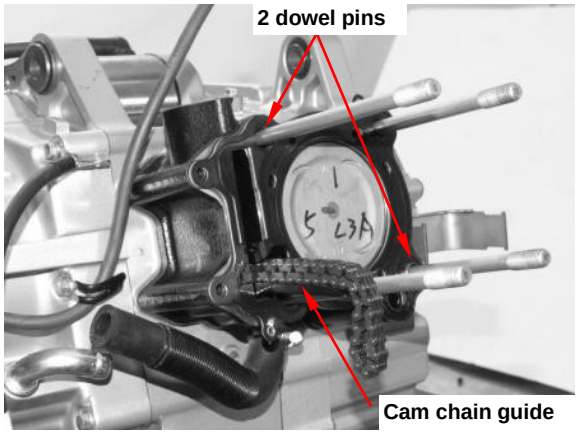
Remove the 2 cylinder head mounting bolts from cylinder head right side, and then remove 4 nuts and washers from cylinder head upper side.
Remove the cylinder head.



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

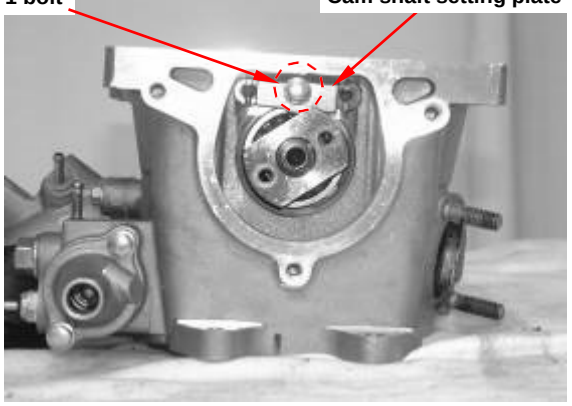
⚠ Caution

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

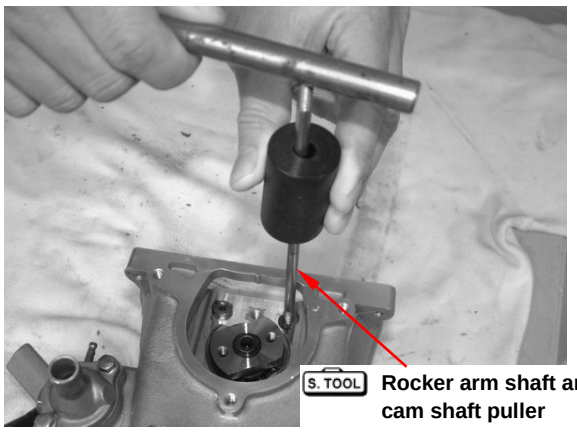


Cylinder Head Disassembly

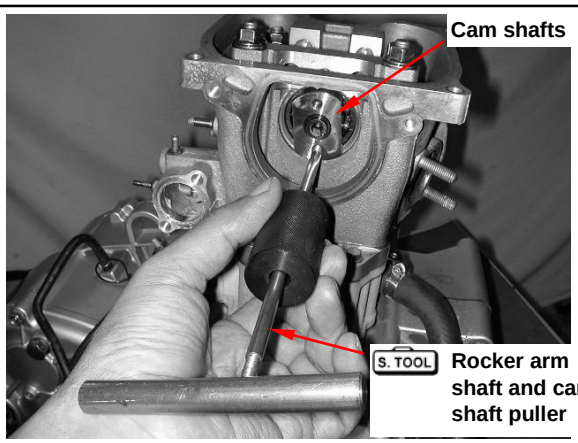
Remove cam shaft setting plate (1 bolt).



Remove rocker arm shafts and rocker arms.
Special Service Tool:
Rocker arm and cam shaft puller SYM-1445100



Remove cam shafts.
Special Service Tool:
Rocker arm and cam shaft puller SYM-1445100

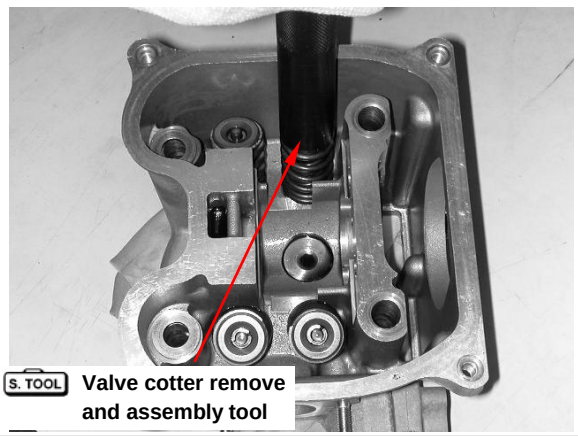


Use a valve cotter remove & assembly tool to press the valve spring, and then remove valves.

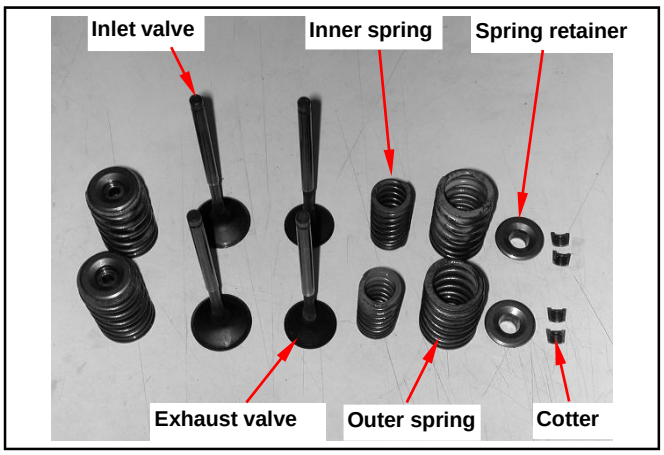
⚠ Caution

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

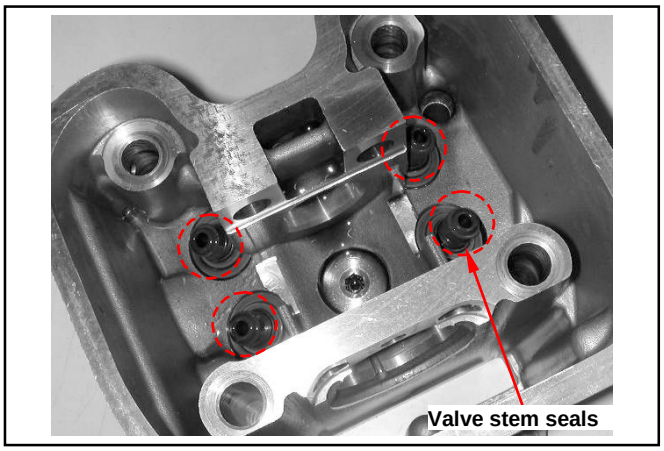
Special Service Tool:
Valve cotter remove & assembly tool SYM-1471110-SY125



Remove valve cotters, spring retainers, springs and valves.



Remove valve stem seals.



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

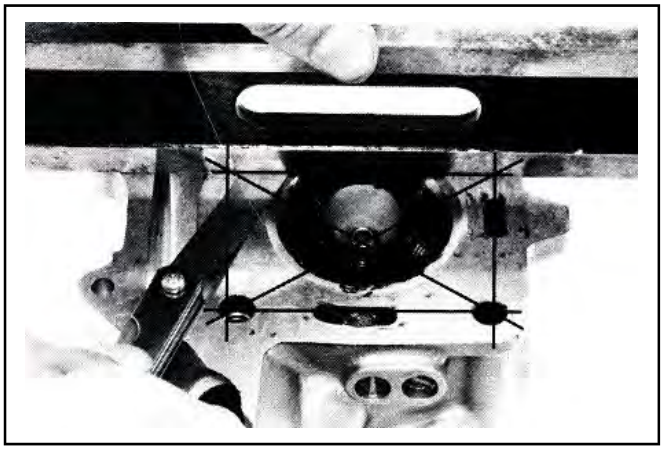


⚠ Caution

- Do not damage the matching surface of cylinder head.

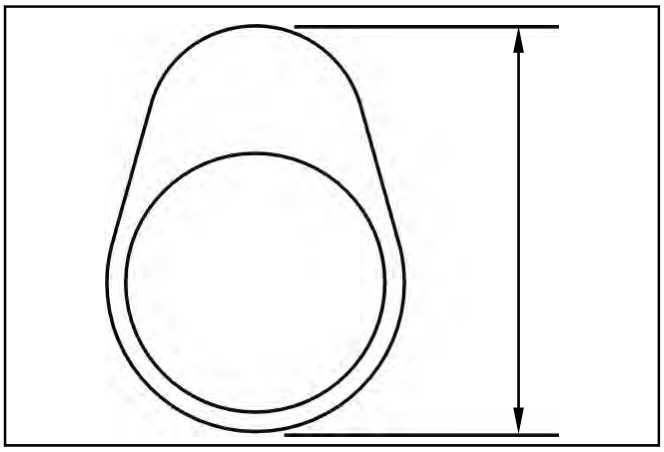
Cylinder Head Inspection

Check if spark plug and valve holes are cracked. Measure cylinder head warp with a straightedge and thickness gauge.
Service limit: 0.05 mm



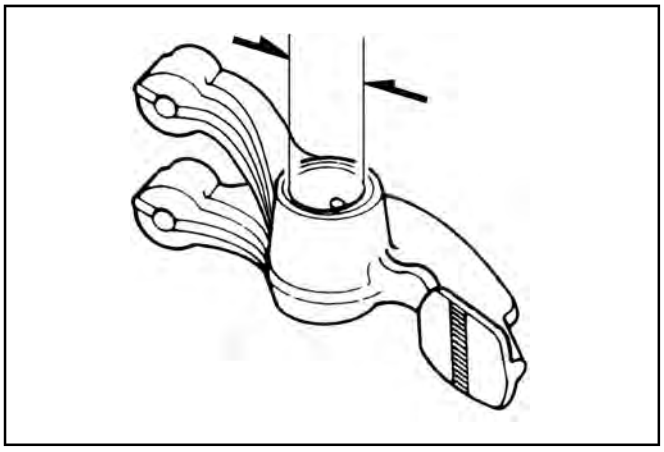
Camshaft

Inspect cam lobe height for damaged.
Service Limit:
IN: Replacement when less than 34.860mm
EX: Replacement when less than 34.725mm
Inspect the camshaft bearing for looseness or wear out. If any damage, replace whole set of camshaft and bearing.



Rocker Arm

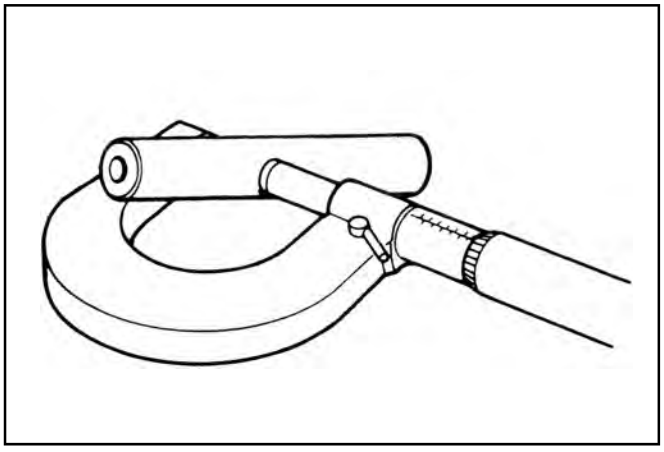
Measure the cam rocker arm I.D., and wear or damage, oil hole clogged?
Service Limit: Replace when it is less than 12.080 mm.



Rocker Arm Shaft

Measure the active O.D. of the cam rocker arm shaft and cam rocker arm.
Service Limit: Replace when it is less than 11.936 mm.

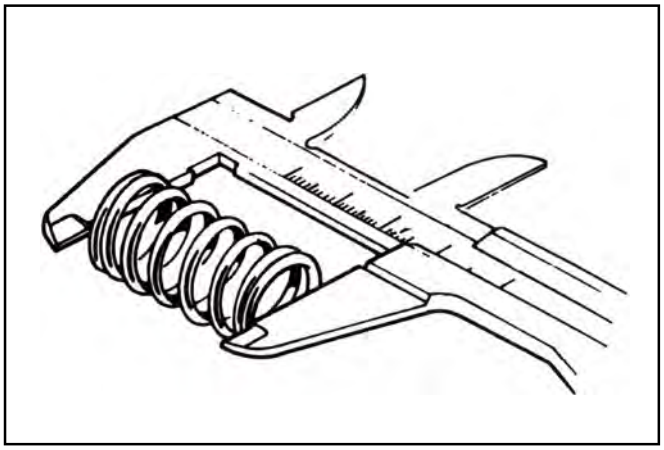
Calculate the clearance between the rocker arm shaft and the rocker arm.
Service Limit: Replace when it is less than 0.10 mm.



Valve spring free length

Measure the free length of intake and exhaust valve springs.

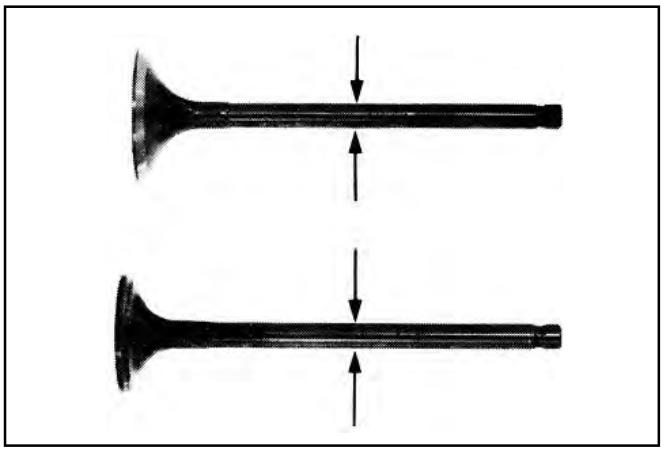
Service limit:
Inner spring 35.20 mm
Outer spring 36.90 mm



Valve stem

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

Service Limit: IN: 4.90 mm
EX: 4.90 mm

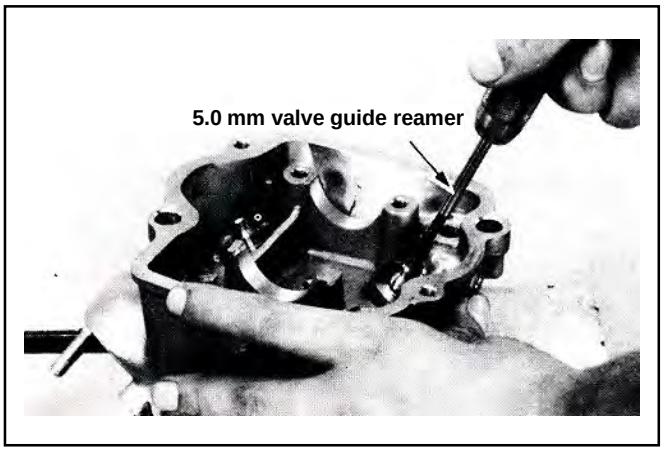


Valve guide

⚠ Caution

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

Tool: 5.0 mm valve guide reamer



Measure and record each valve guide inner diameters.

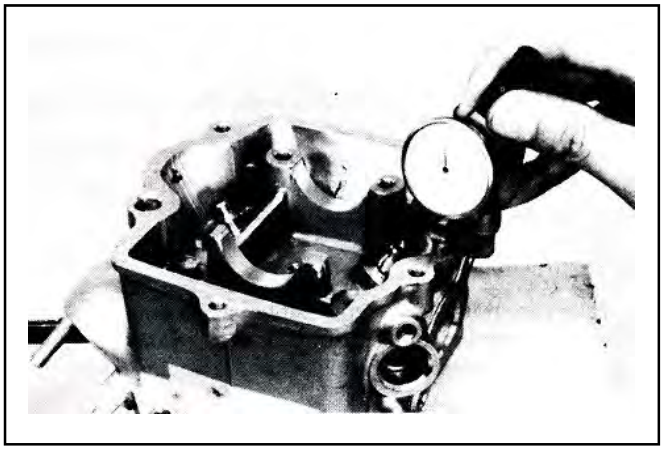
Service limit: 5.03 mm

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

Service Limit: IN→0.08 mm
EX→0.10 mm

⚠ Caution

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



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

⚠ Caution

- It has to correct valve seat when replacing valve guide.

Valve Stem Replacement

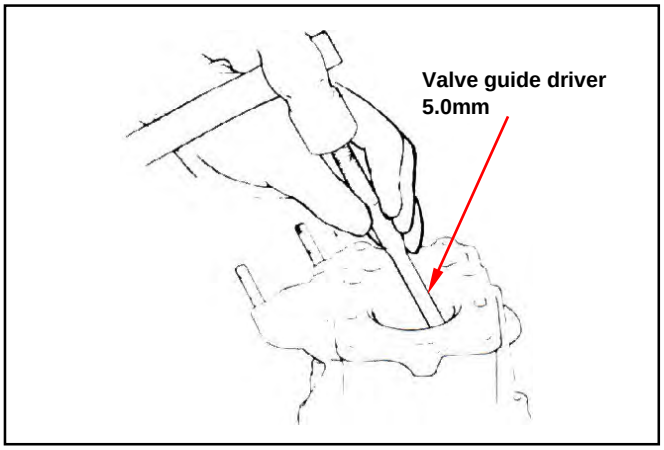
Heat up cylinder head to 100~150 ℃ with heated plate or toaster.

⚠ 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



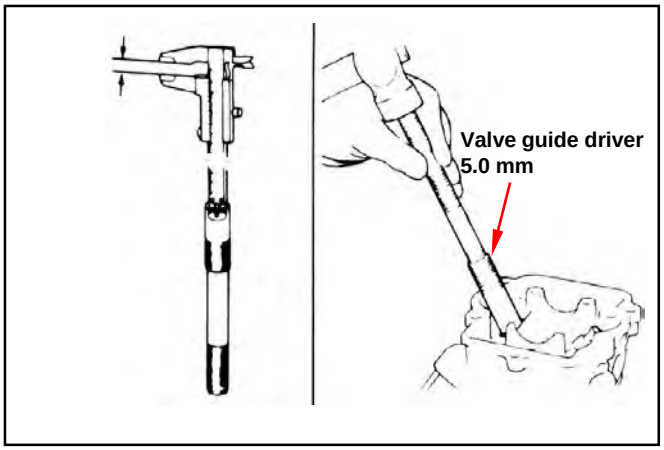
⚠ Caution

- 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.

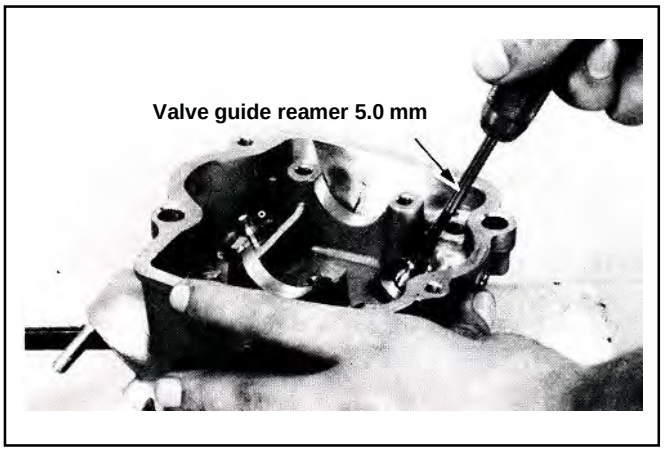
Tool: Valve guide driver: 5.0 mm



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, corrects it.

Valve seat width

Service limit: 1.6mm

Check the contact condition of valve seat.

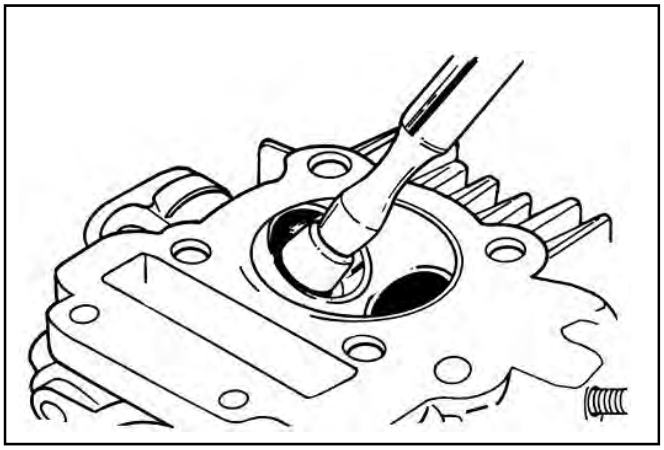
Valve seat grinding

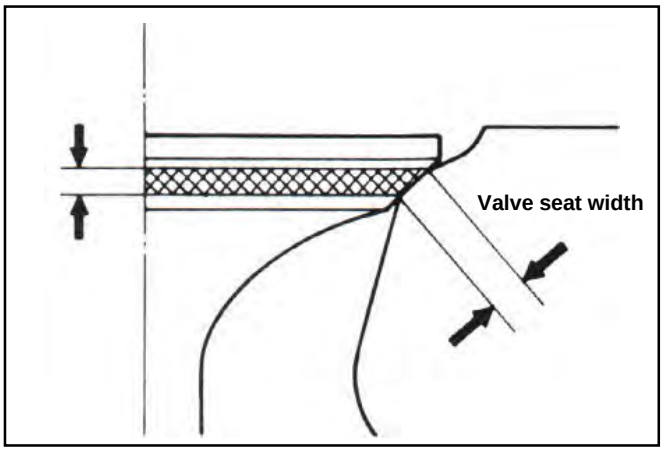
The worn valve seat has to be ground with valve seat chamfer cutter.
Refer to operation manual of the valve seat chamfer cutter.
Use 45° valve seat chamfer cutter to cut any rough or uneven surface from valve seat.

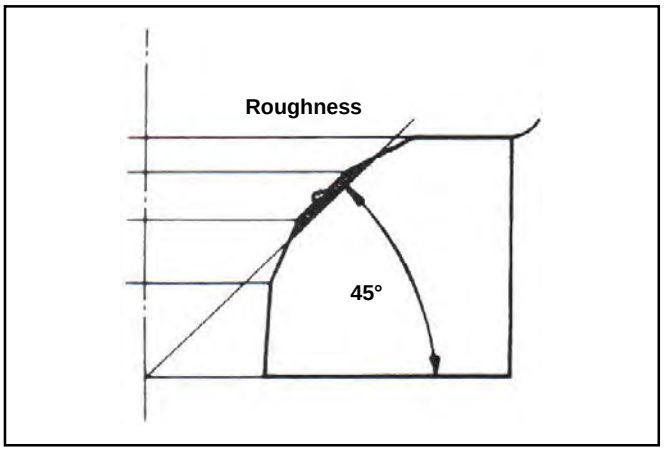
Caution

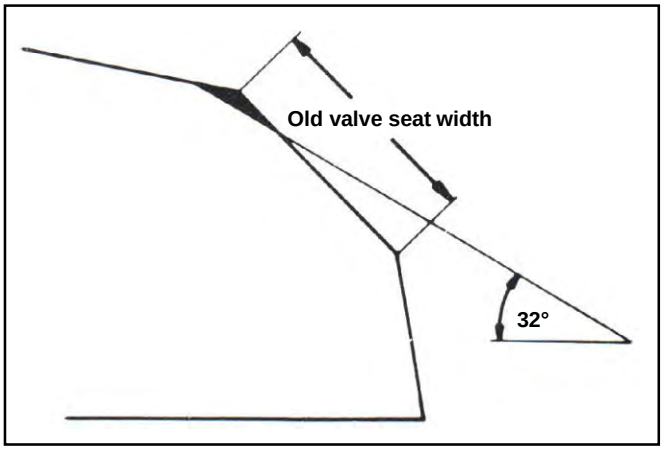
- After valve guide had been replaced, it has to be ground with 45° valve seal chamfer cutter to correct its seat face.

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

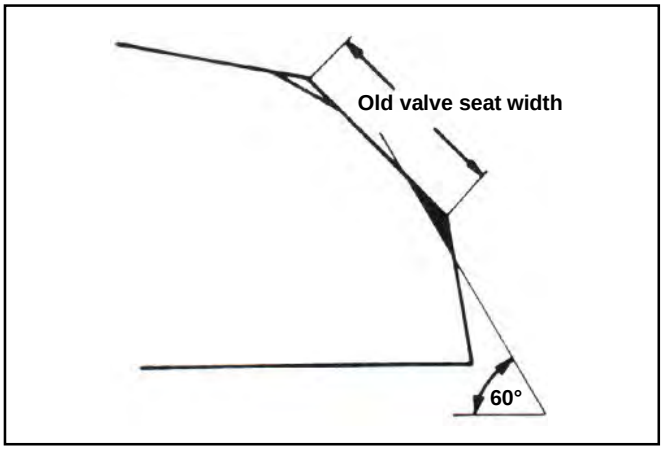








Use 60° cutter to cut a quarter lower parts out.
Remove the cutter and check new valve seat.

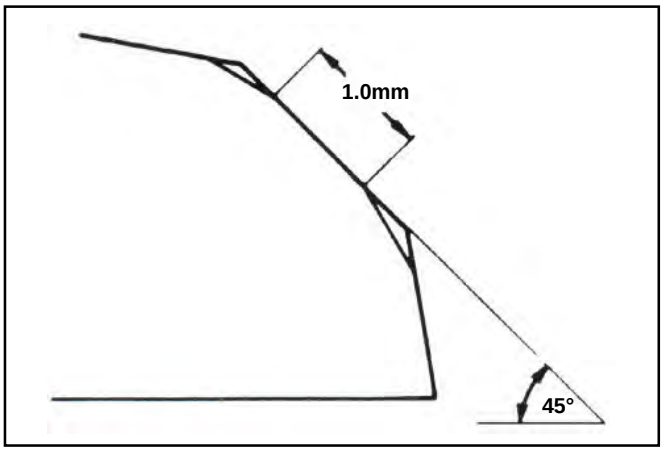


Use 45° cutter to grind the valve seat to specified width.

Caution

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

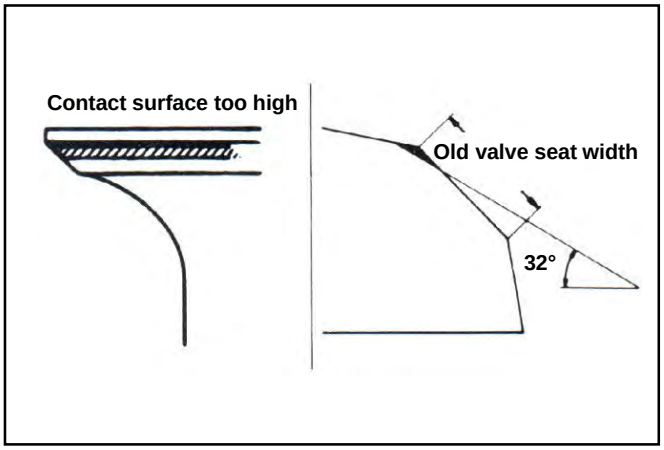
Grind valve seat again if necessary.



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

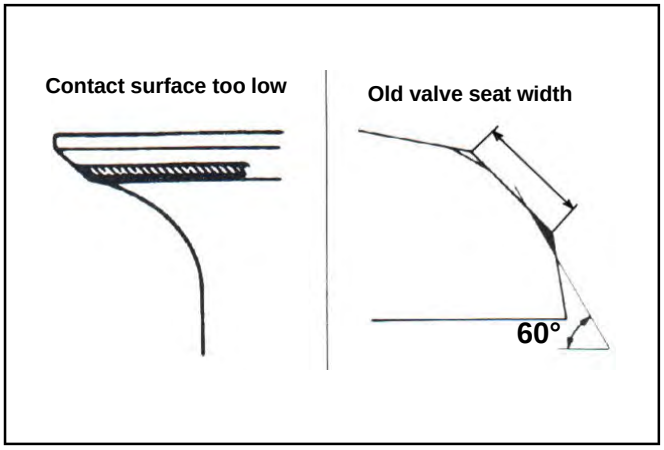
Caution

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

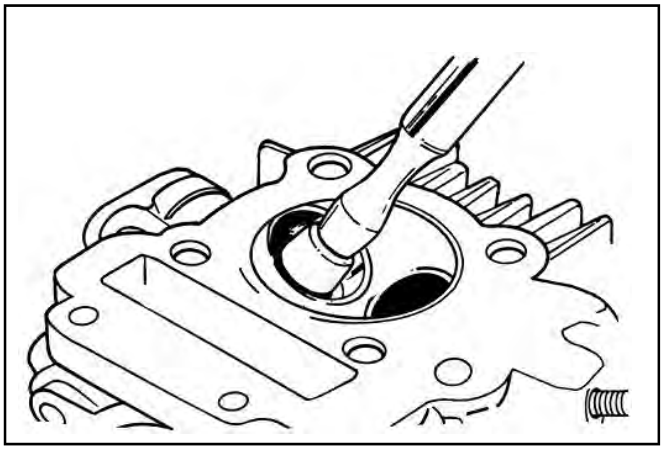


If the contact surface too high, grind the valve seat with 32° cutter.
Then, grind the valve seat to specified width.

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



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

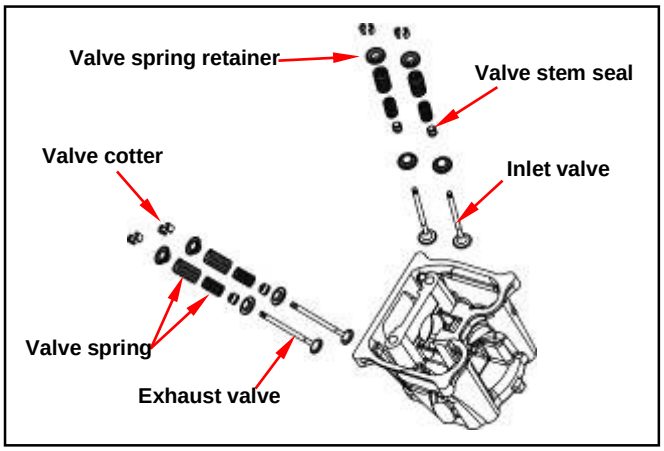


Cylinder Head Reassembly

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

⚠ Caution

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

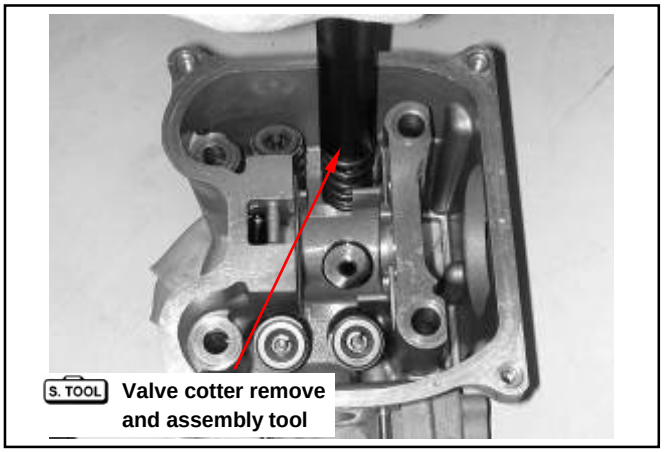


Put the valve cotters onto valve spring retainer.
Use a valve cotter remove & assembly tool to press the valve springs, and then install valves.

⚠ Caution

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

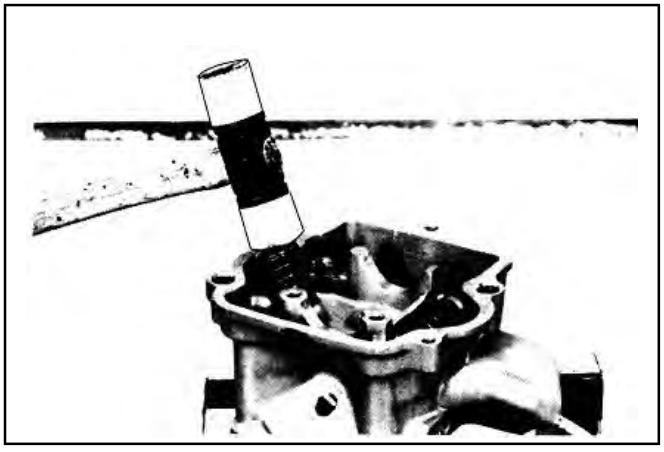
Special Service Tool:
Valve cotter remove & assembly tool
SYM-1471110-SY125



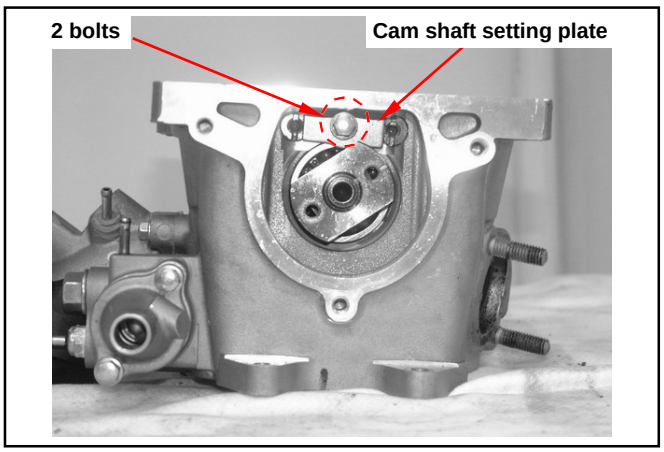
Tap the valve stems gently with a plastic hammer to make sure valve retainer and valve cotter is settled.

⚠ Caution

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



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

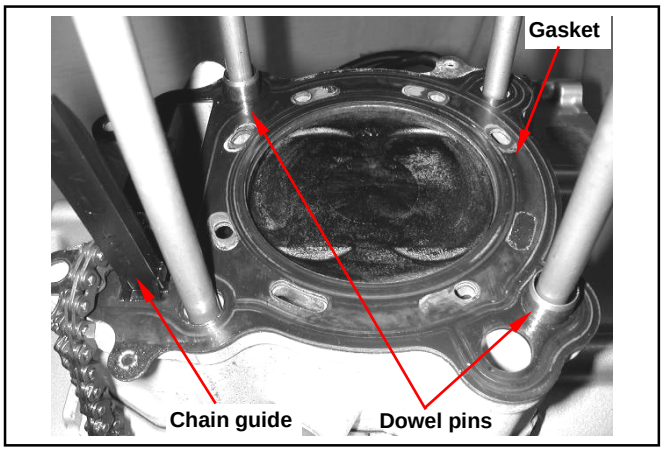


Cylinder Head Installation

Clean up all residues and foreign materials onto the matching surfaces of both cylinder and cylinder head.
Install chain guide, dowel pins and a new cylinder head gasket onto the cylinder.

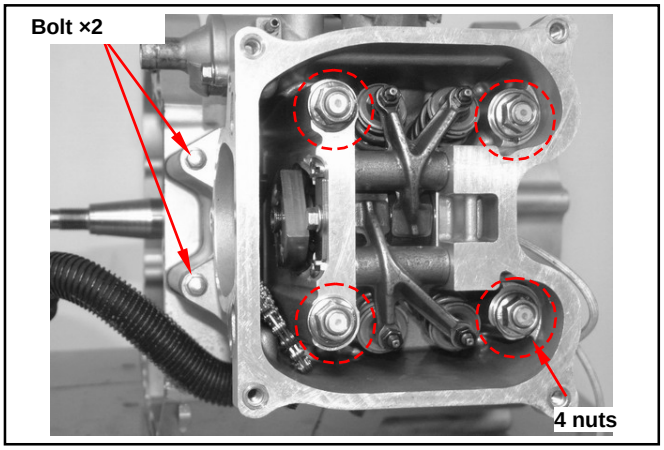
⚠ Caution

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



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

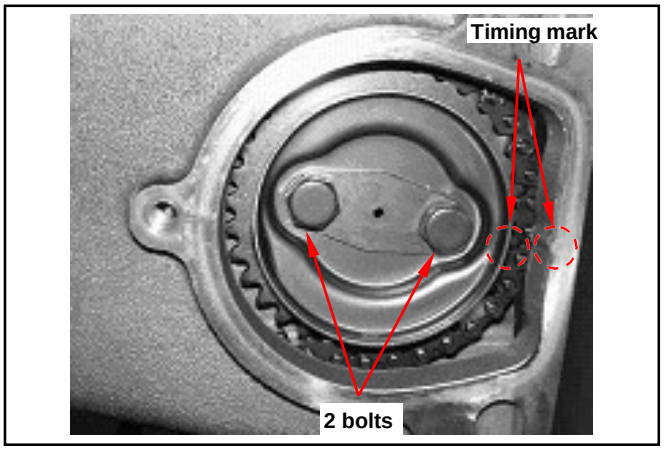
Torque value:
Nut 3.6~4.0kgf-m
Bolt 1.0~1.4kgf-m



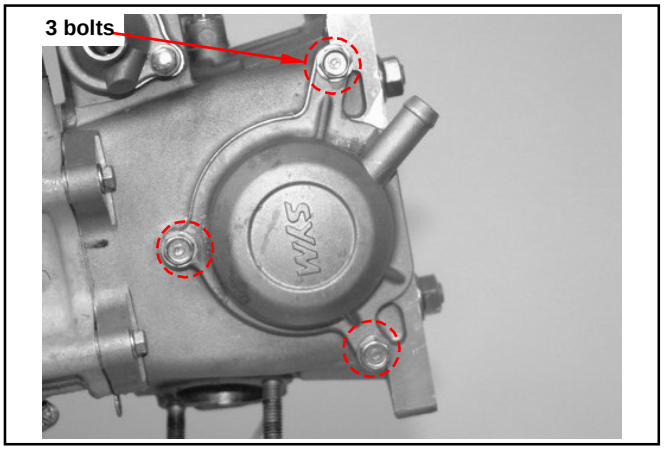
Install cam chain on to sprocket and align the timing mark on the sprocket with that of cylinder head.
Align sprocket bolt hole with camshaft bolt hole.
Tighten the sprocket mounting bolts.

⚠ Caution

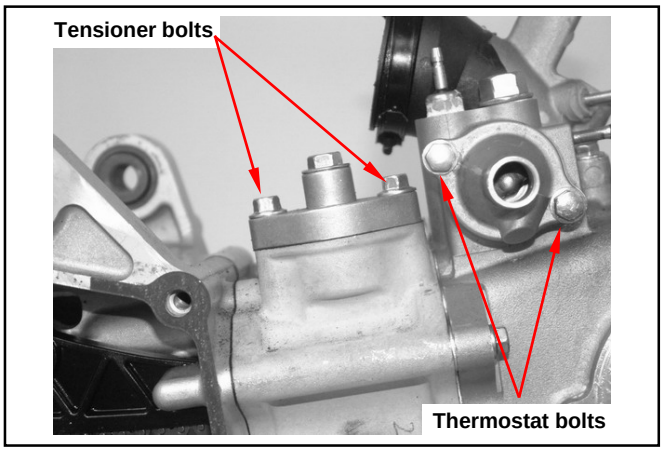
- Make sure timing marks are matched.



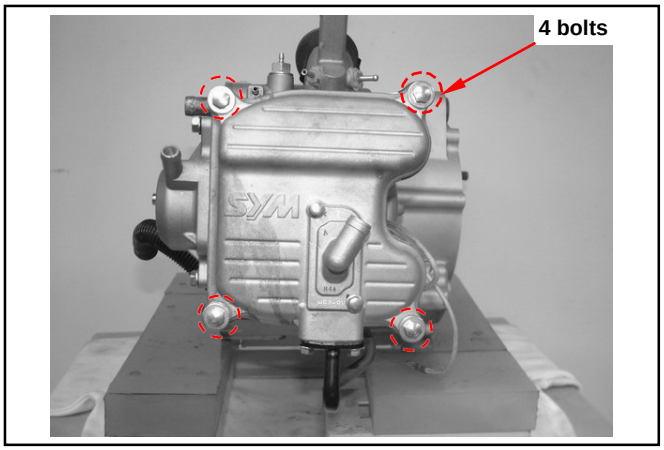
Install cylinder head side cover (3 bolts).



Install thermostat (2 bolts).
Loosen auto tensioner adjustment bolt and remove bolt and spring.
Install tensioner and install spring and adjustment bolt.



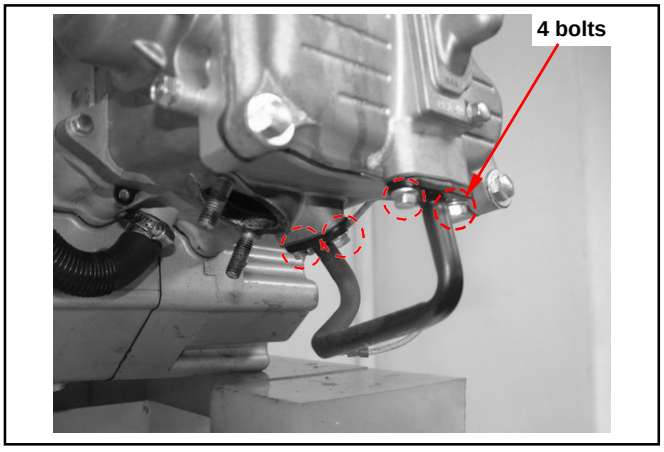
Install cylinder cover (4 bolts).



Install Air Injection system (AI) pipe. (4 bolts)
Install inlet pipe onto cylinder head.
Install and tighten spark plug.
Torque value: 1.0~1.4kgf-m

⚠ Caution

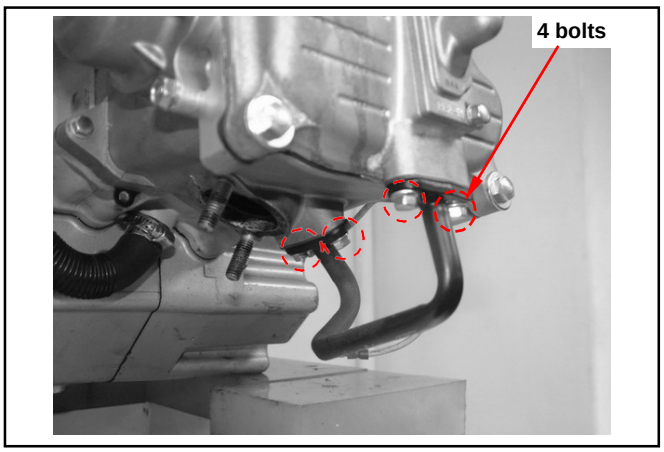
- This model is equipped with more precision 4-valve mechanism so its tighten torque can not be exceeded standard value in order to avoid causing cylinder head deformation, engine noise and leaking so that motorcycle's performance be effected.



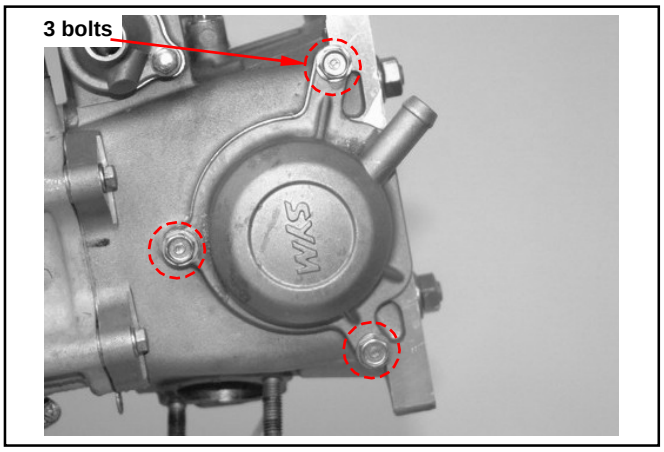
Install the engine onto frame (refer chapter 5).

Valve Clearance Adjustment

Loosen Air Injection system (AI) pipe upper side bolt (2 bolts).
Remove cylinder head cover.

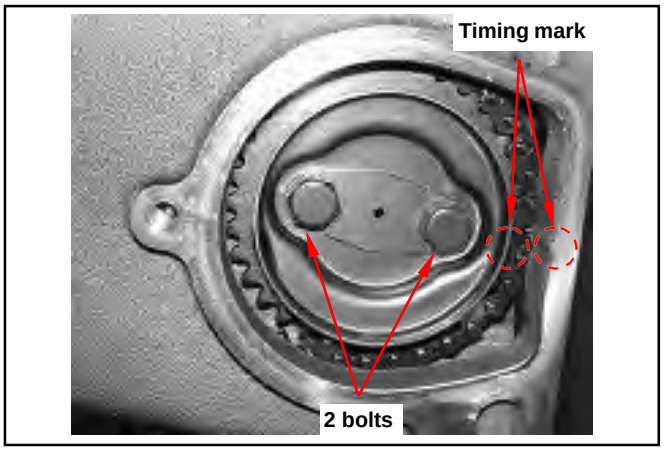


Remove the cylinder head side cover.

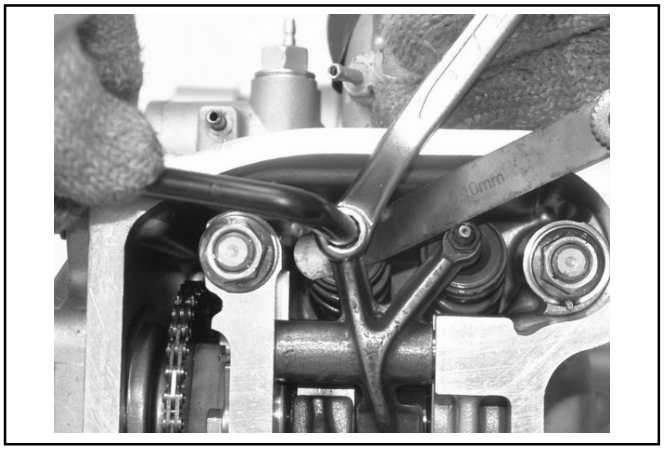


Remove left crankcase cover, and turn the drive face, and align the timing mark on the cam sprocket with that of cylinder head, piston is at TDC position.
Loosen valve clearance adjustment nuts and bolts located on valve rocker arm.
Measure and adjust valve clearance with feeler gauge.
After valve clearance had been adjusted to standard value, hold adjustment bolt and then tighten the Adjustment nut.

Standard Value: **IN 0.10 ± 0.02 mm**
EX 0.15 ± 0.02 mm



Install the cylinder head side cover.
Start the engine and make sure that engine oil flows onto the cylinder head.
Stop the engine after confirmed, and then install the cylinder head cover and AI pipe.



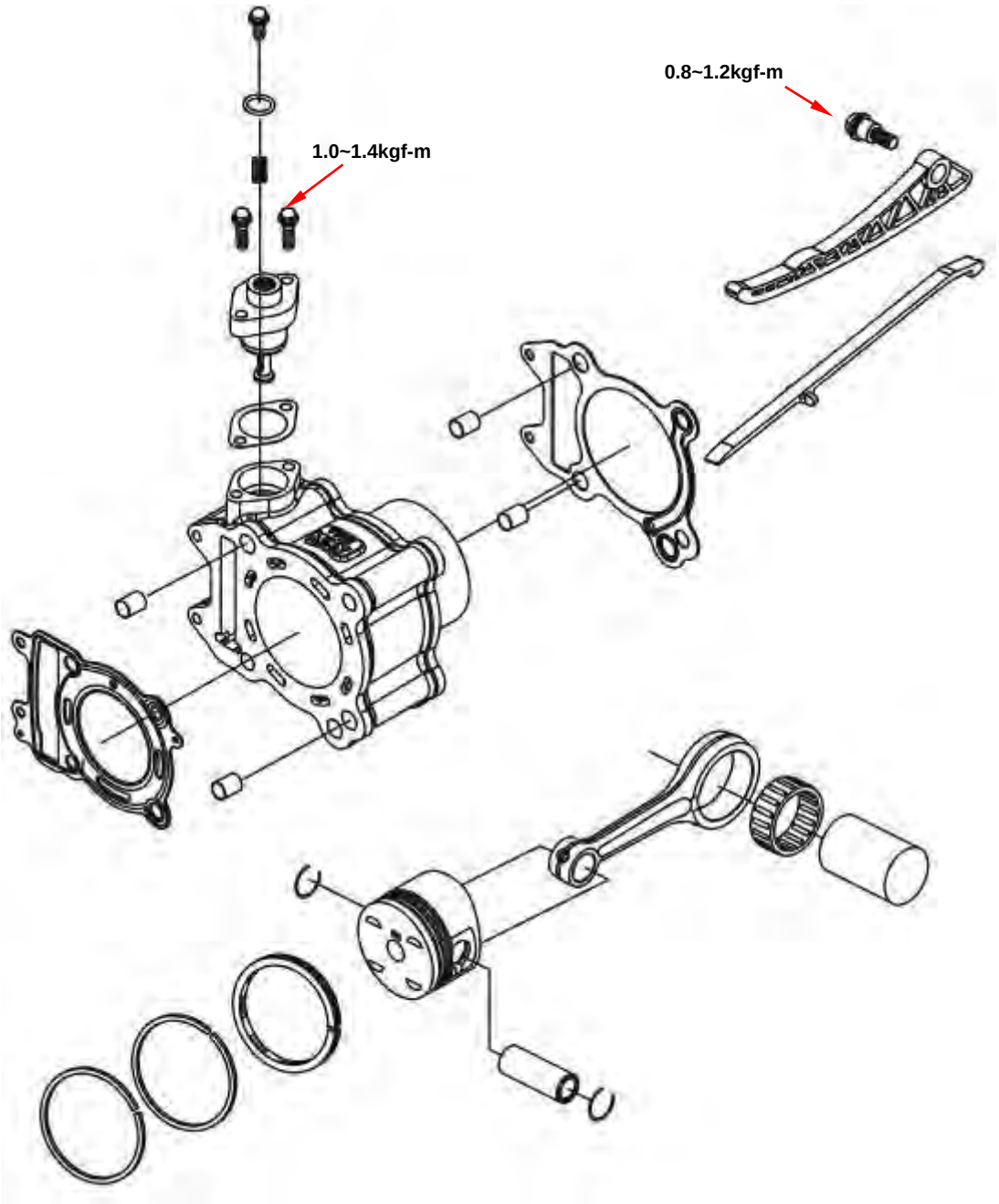
⚠ Caution

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

NOTE:

Mechanism Diagram ····· 7-1	Piston Ring Installation ····· 7-6
Precautions in Operation ····· 7-2	Piston Installation ····· 7-7
Troubleshooting ····· 7-2	Cylinder Installation ····· 7-7
Cylinder / Piston Removal ····· 7-3	

Mechanism Diagram



Precautions in Operation

General Information

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

Specification

Unit：mm

Item			LV25W		LV30W	
			Standard	Limit	Standard	Limit
Cylinder	I.D.		70.995~71.015	70.915	74.995~75.015	74.915
Piston/ Piston ring	Clearance between piston ring andring groove	Top	0.015~0.050	0.095	0.015 ~ 0.055	0.095
		2nd	0.015~0.050	0.095	0.015 ~ 0.055	0.095
	Piston ring end gap	Top	0.100~0.250	0.450	0.15 ~ 0.30	0.500
		2nd	0.250~0.400	0.600	0.30 ~ 0.45	0.650
		Oil (side rail)	0.200~0.700	0.900	0.20 ~ 0.70	0.900
	Piston O.D. (2nd)		70.985~71.005	70.915	74.985~75.005	74.915
	Clearance between pistonand cylinder		0.005~0.015	0.065	0.005~0.015	0.065
	ID of piston pin boss		17.002 ~ 17.008	17.040	17.002 ~ 17.008	17.040
Piston pin O.D.			16.994 ~ 17.000	16.96	16.994 ~ 17.000	16.960
Clearance between piston and piston pin			0.002 ~ 0.014	0.080	0.002 ~ 0.014	0.080
Connecting rod small end I.D.			17.016 ~ 17.034	17.066	17.016 ~ 17.034	17.066

Torque Value

- Cam chain adjuster bolt 1.0~1.4kgf-m
- Cam chain tensioner bolt 0.8~1.2kgf-m

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

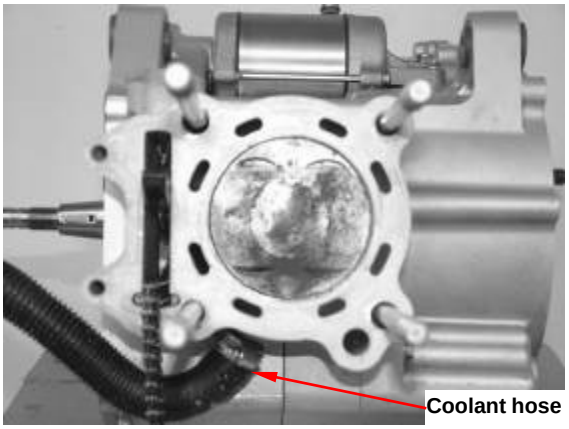
- Cylinder or piston ring worn out
- Carbon deposits on cylinder head top-side
- Piston pin hole and piston pin wear out

Engine Overheat

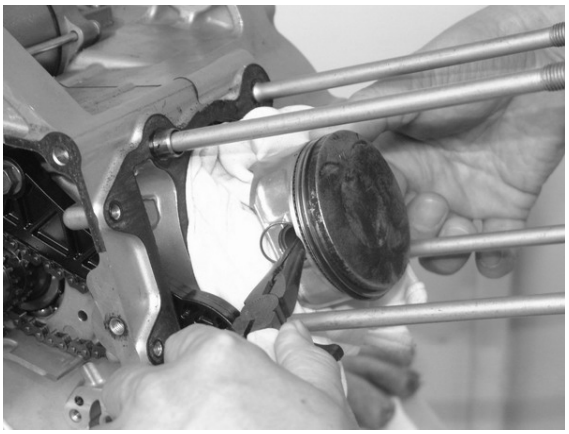
- Carbon deposits on cylinder head top side
- Cooling pipe clogged or not enough in coolantflow

Cylinder / Piston Removal

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



Cover the holes of crankcase and cam chain witha piece of cloth.
Remove piston pin clip, and then remove pistonpin and piston.



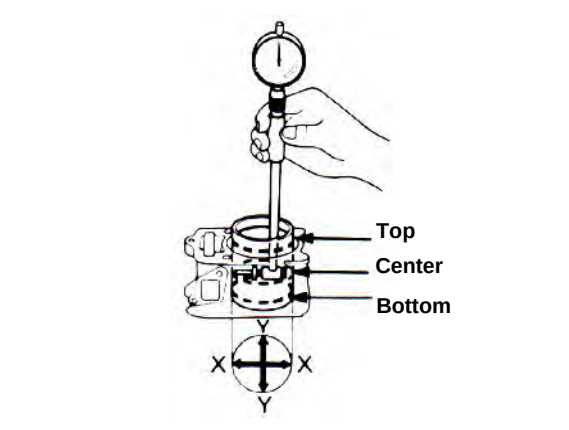
Remove cylinder gasket and dowel pin.
Clean up all residues or foreign materials from the two matching surfaces of cylinder and crankcase. **⚠ Caution**

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

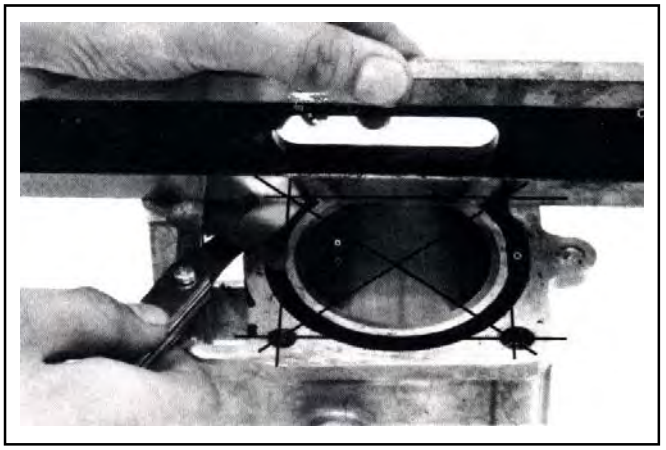


Inspection

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



Measure the cylinder upper surface for warpage.



Measure the clearance between piston rings andring grooves.



Remove piston rings

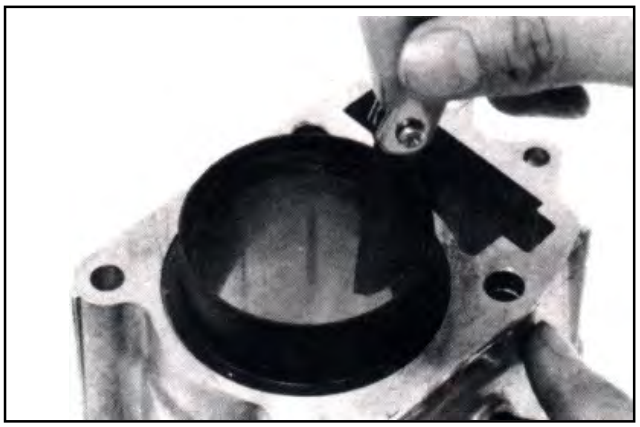
Check if the piston rings are damaged or itsgrooves are worn.

⚠ Caution

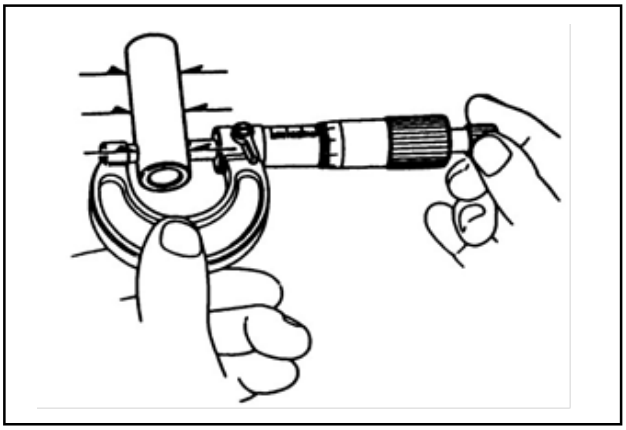
- Pay attention to remove piston rings because they are fragile.



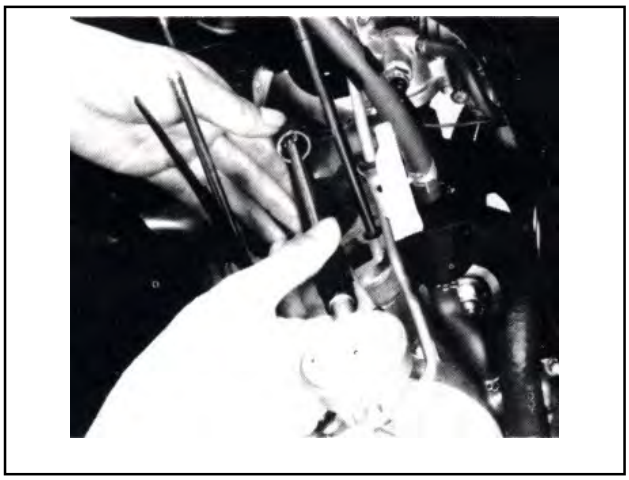
Place piston rings respective into cylinder below 20 mm of cylinder top. In order to keep the pistonrings in horizontal level in cylinder, push the ringswith piston. Measure the piston ring end gap.



Measure the outer diameter of piston pin.

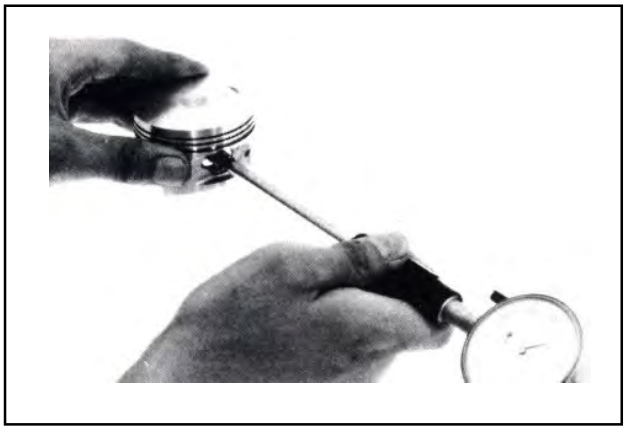


Measure the inner diameter of connecting rodsmall end.



Measure the inner diameter of piston pin hole.

Calculate clearance between piston pin and itshole.



Measure the piston outer diameter.

⚠ Caution

- The measurement position is 7mm distance from piston bottom side, and 90° to piston pin.



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

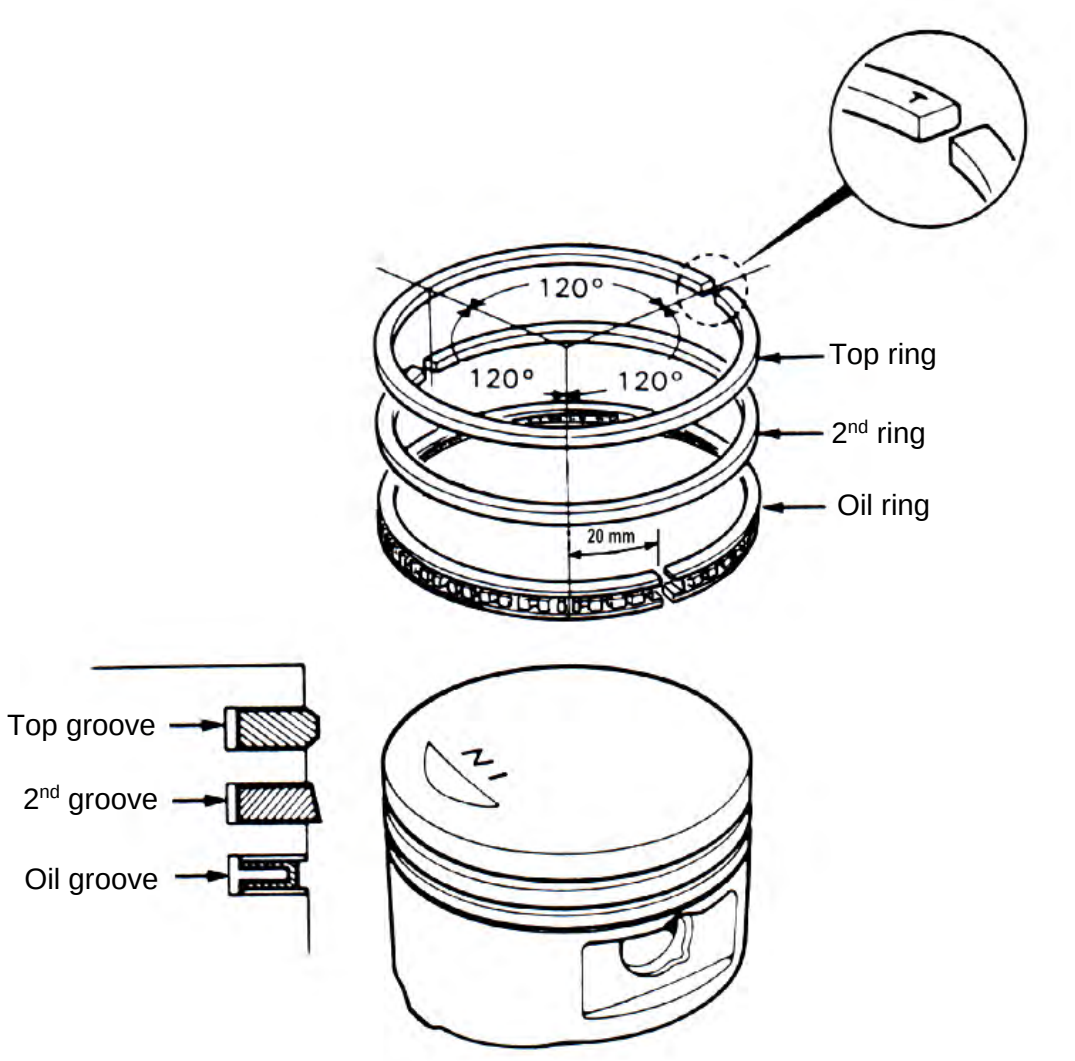
Piston Ring Installation

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.

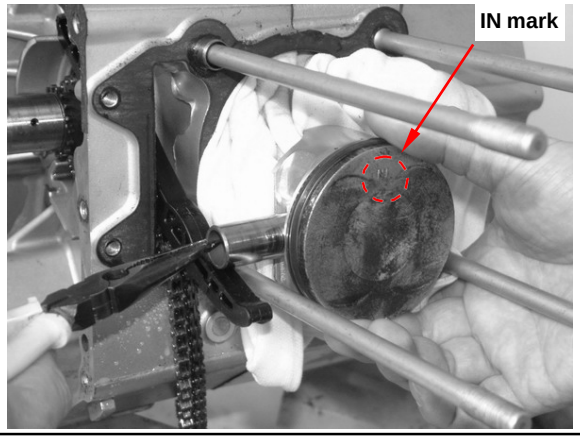
⚠ Caution

- 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

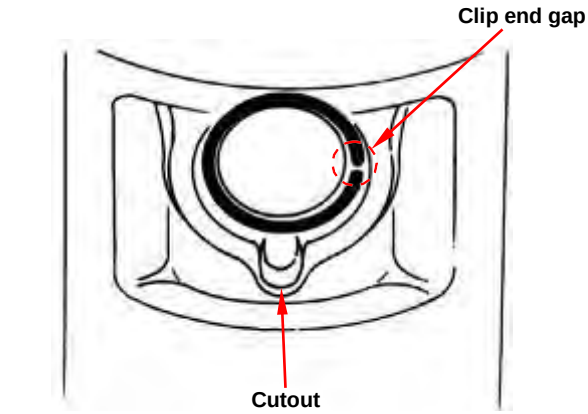
Install piston and piston pin, and place the IN marks on the piston top side forward to inlet valve.



Install new piston pin clip.

⚠ Caution

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



Cylinder Installation

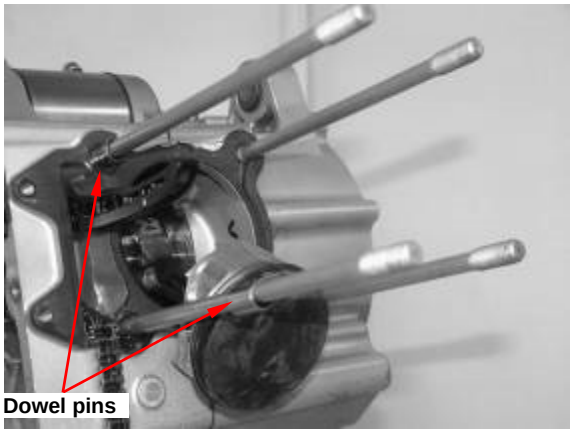
Clean up all residues and foreign materials on thematching surface of crankcase. Pay attention tonot let these residues and foreign materials fall into crankcase.

⚠ Caution

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



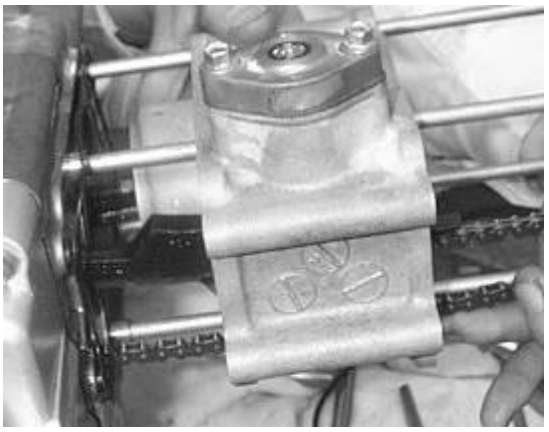
Install dowel pins and new cylinder gasket.



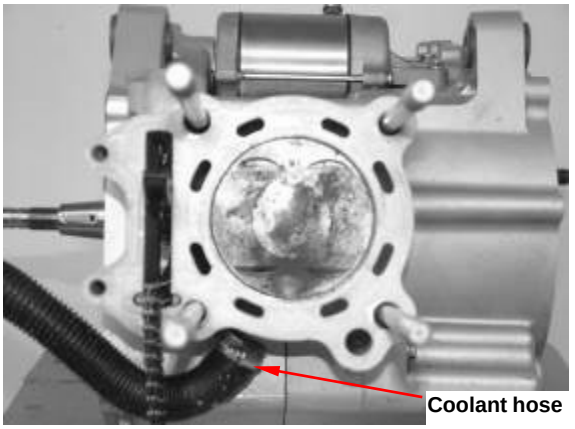
Coat some engine oil to inside of cylinder, pistonand piston rings.
Care to be taken when installing piston into cylinder. Press piston rings in one by one asinstallation.

⚠ Caution

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

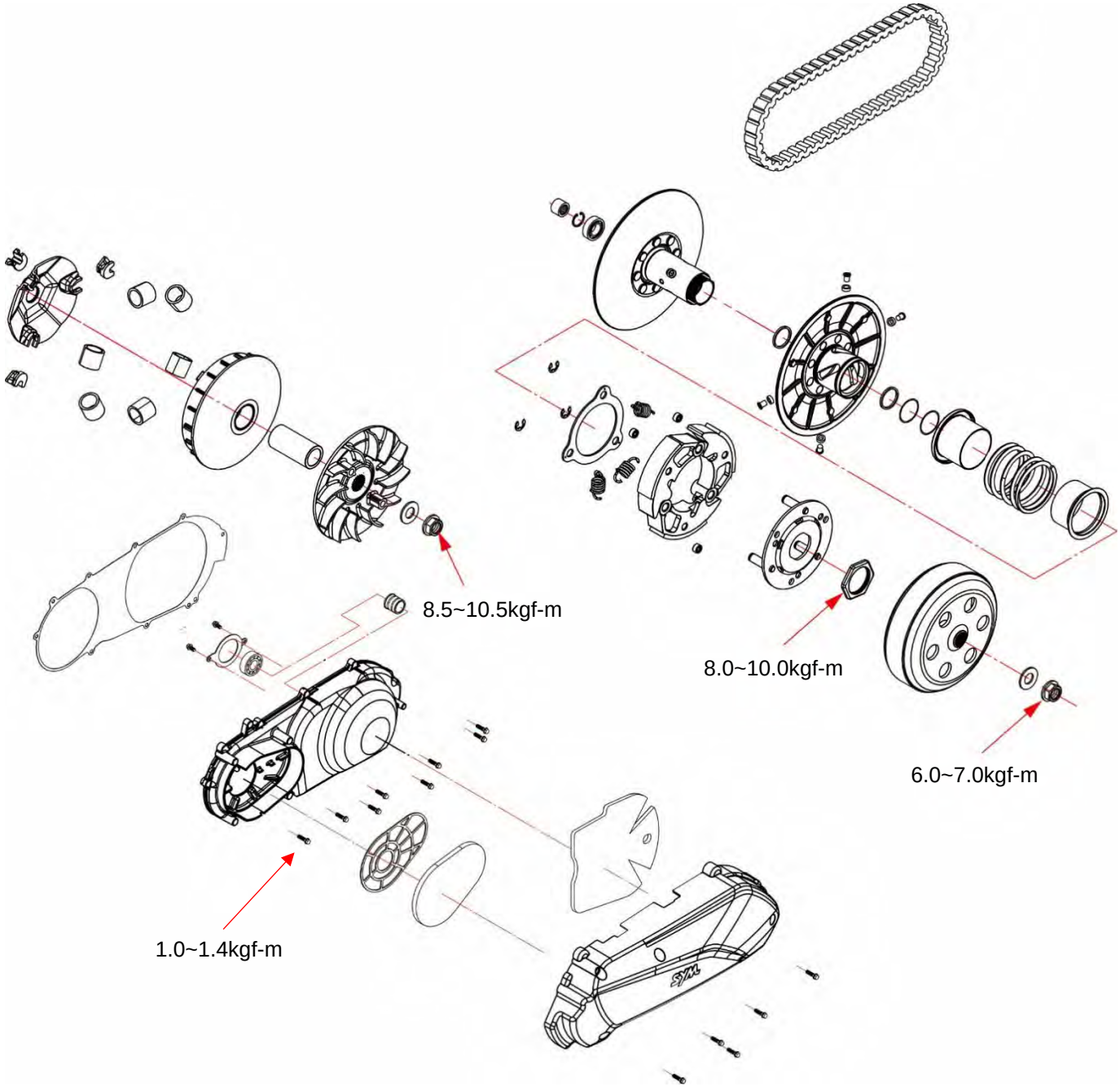


Install coolant hose onto cylinder.
Install cylinder head (refer to Chapter 6)

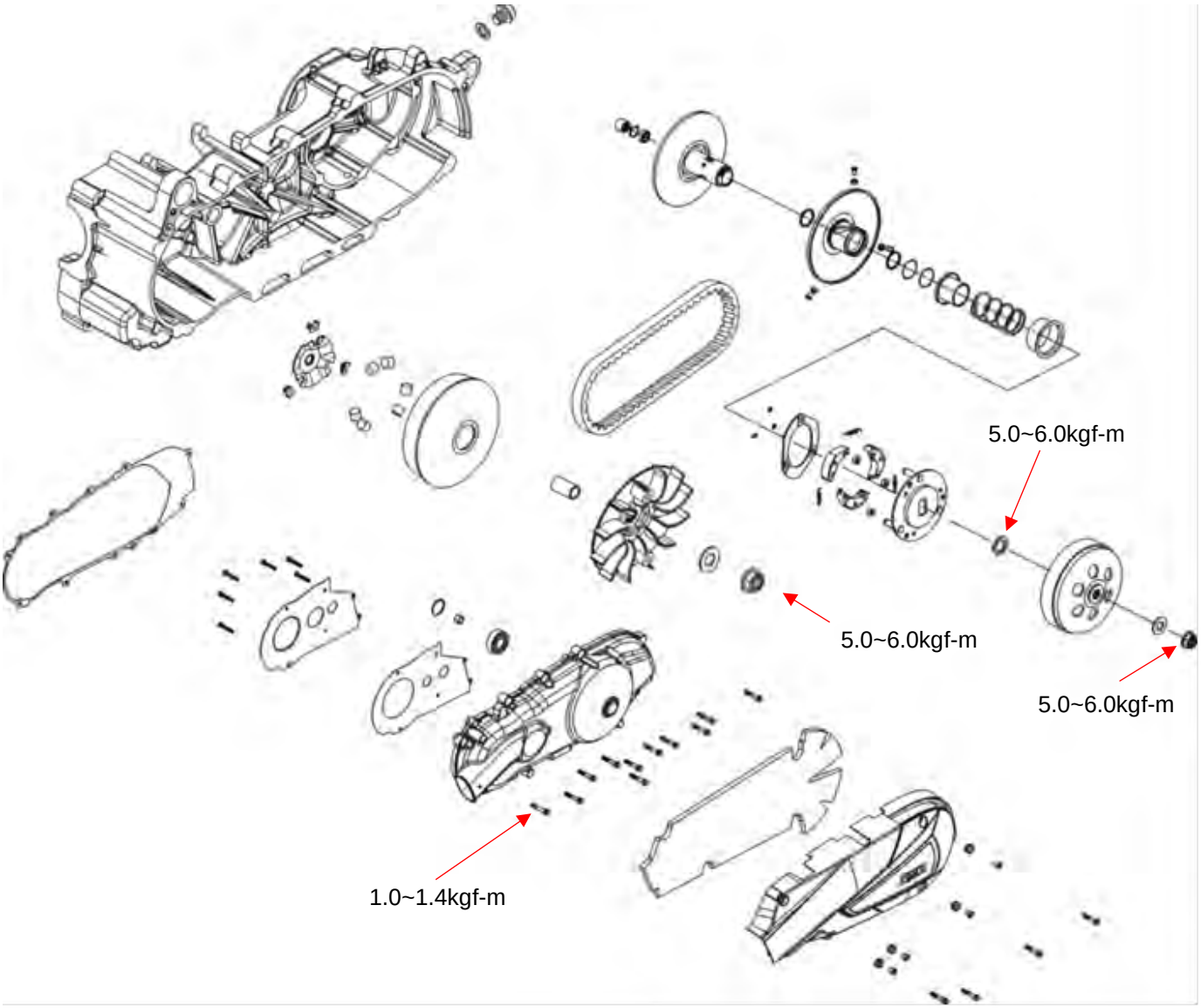


Mechanism Diagram (LV30. LV25 type) · 1	Left crankcase cover ····· 5
Mechanism Diagram (LV12 type) ····· 2	Drive belt ····· 9
Precautions in Operation ····· 3	Drive face ····· 11
Troubleshooting ····· 4	Clutch outer / Driven pulley ····· 14

Mechanism Diagram (LV30. LV25 type)



Mechanism Diagram (LV12 type)



Precautions in Operation

General Information

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

Specification (LV30 LV25 type)

Item	Standard value	Limit
Drive belt width	23.200 mm	22.200 mm
OD of movable drive face boss	29.946~29.980 mm	29.926 mm
ID of movable drive face	30.000~30.040 mm	30.060 mm
OD of weight roller	24.920~25.080 mm	24.500 mm
ID of clutch outer	144.900~145.100 mm	145.500 mm
Thickness of clutch weight	3.000 mm	2.000 mm
Free length of driven pulley spring	102.400 mm	98.800 mm
OD of driven pulley boss	40.950~40.990 mm	40.910 mm
ID of driven face	41.000~41.050 mm	41.080 mm
Weight of weight roller	18.00±0.30g	

Specification (LV12 type)

Item	Standard value	Limit
Driving belt width	22.000 mm	20.500 mm
OD of drive face boss	26.960~26.974 mm	26.940 mm
ID of movable drive face	26.989~27.052 mm	27.072 mm
OD of weight roller	20.100±0.08 mm	19.600 mm
ID of clutch outer	134.000~134.200mm	134.500 mm
Thickness of clutch weight	4.000~4.100 mm	2.000 mm
Free length of driven pulley	168.900 mm	163.900 mm
OD of driven pulley	33.965~33.985 mm	33.940 mm
ID of driven face	34.000~34.025 mm	34.060 mm
Weight of weight roller	12.50±0.30g	

Torque value (LV30 LV25 type)

Drive face nut	8.5~10.5kgf-m
Clutch outer nut	6.0 ~7.0kgf-m
Drive plate nut	8.0 ~10.0kgf-m

Torque value (LV12 type)

Drive face nut	5.0 ~6.0kgf-m
Clutch outer nut	5.0 ~6.0kgf-m
Drive plate nut	5.0 ~6.0kgf-m

Special Tools

Clutch spring compressor	SYM-2301000
Inner bearing puller	SYM-6204002
Clutch nut wrench	SYM-9020200
Universal holder	SYM-2210100
Bearing driver	SYM-9100100

Troubleshooting

Engine can be started but scooter cannot be moved

1. Broken drive belt.
2. Worn drive face.
3. Worn or damaged clutch weight.
4. Broken driven pulley spring.

Shudder or misfire when driving

1. Broken driven pulley spring.
2. Worn clutch weight.

Insufficient horsepower or poor high speed performance

1. Worn drive belt.
2. Insufficient spring force of driven pulley.
3. Worn roller.
4. Unsmooth driven pulley operation.

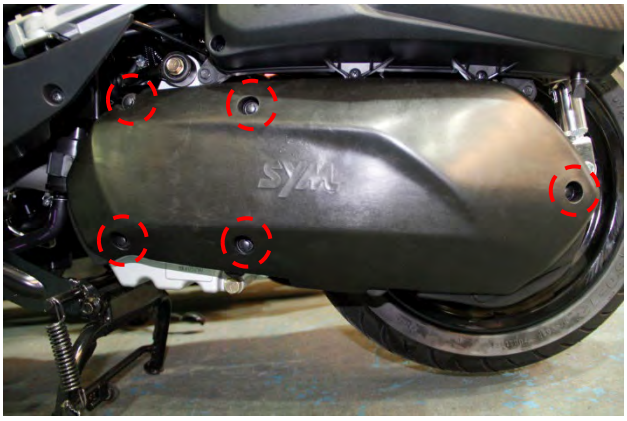
Left crankcase cover

(LV30 &LV25 type)

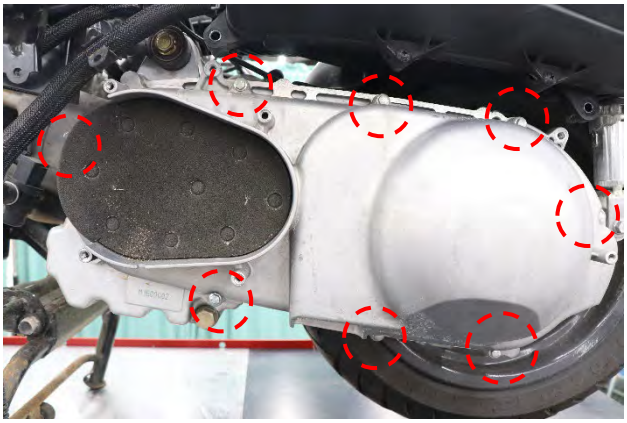
Removal

Remove left outer cover. (Bolt×5)

Remove air cleaner bolts (Bolt×2)



Remove left crankcase cover. (Bolt×8)



Inspection

Remove left crankcase cover bearing setting plate. (2 bolts)

Check bearing on left crankcase cover.

Rotate bearing's inner ring with fingers.

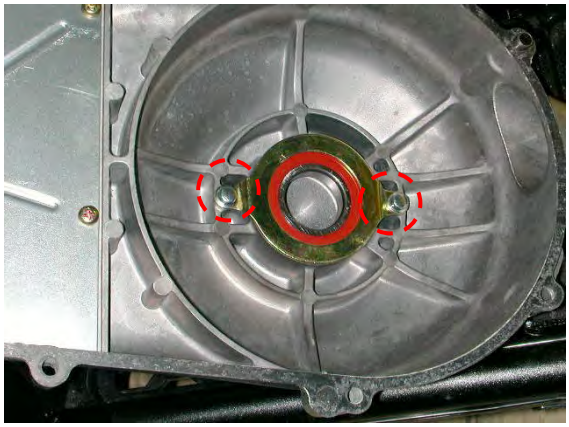
Check if bearings can be turned smoothly and silently, and also check if bearing outer ring is mounted on cover tightly.

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

Caution

- Do not remove bearing from left crankcase cover, if unnecessary.
- Replace the bearing, if it is removed fromleft crankcase cover.

Check if bearing stay collar on clutch outer worm or damage.



Bearing replacement

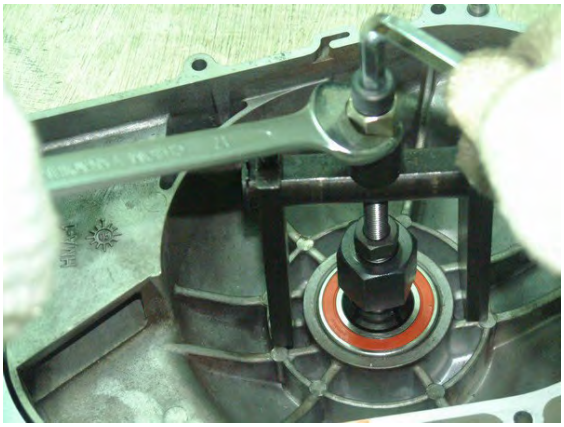
Caution

- Never use a used bearing. Replace with a new bearing, if the bearing is removed

Remove bearing with inner bearing puller.

Special tool

Inner bearing puller SYM-6204022
SYM-6204021



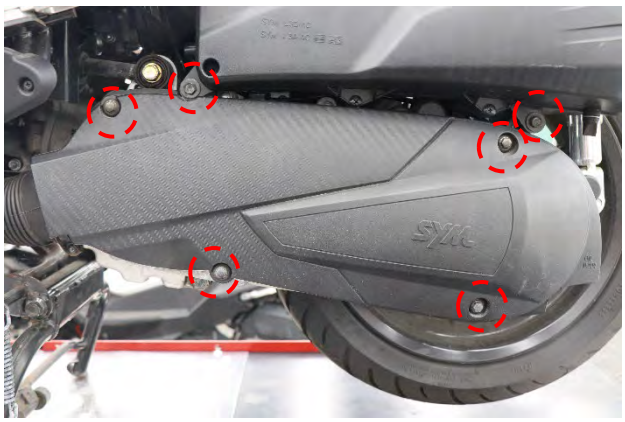
Install new bearing on left crankcase cover.



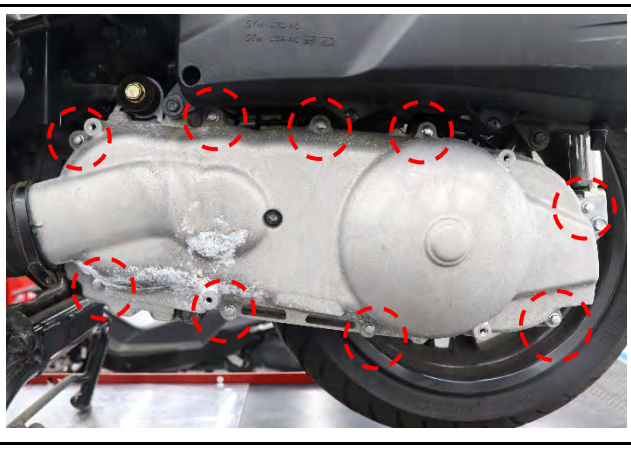
Left crankcase cover install
Install left crankcase cover in the reverse procedures of removal.

(LV12 type)

Remove left outer cover. (Bolt×4)
Remove air cleaner bolts (Bolt×2)



Remove left crankcase cover. (Bolt×9)



Inspection

Remove left crankcase cover bearing circlip.
Check bearing on left crankcase cover.
Rotate bearing's inner ring with fingers.
Check if bearings can be turned smoothly and silently, and also check if bearing outer ring is mounted on cover tightly.
If bearing rotation is uneven, noisy, or loose bearing mounted, replace it.

Caution

- Do not remove bearing from left crankcase cover, if unnecessary.
- Replace the bearing, if it is removed fromleft crankcase cover.



Bearing replacement

Caution

- Never use a used bearing. Replace with anew bearing, if the bearing is removed

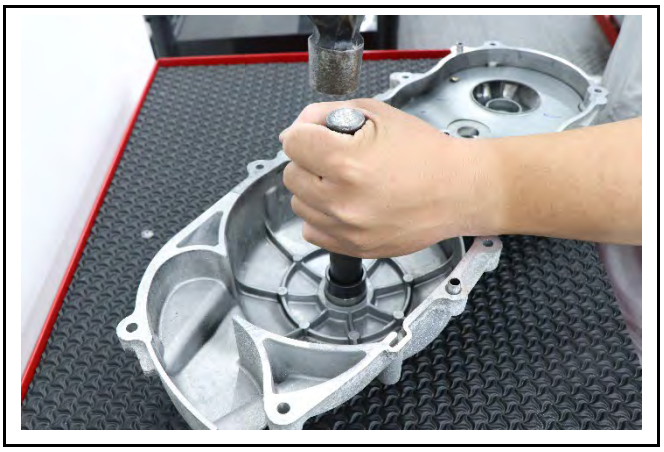
Remove bearing and collar with inner bearing puller.

Special tool

Inner bearing puller SYM-6204022
SYM-6204021



Install new bearing and collar on left crankcase cover.



Left crankcase cover install
Install left crankcase cover in the reverse procedures of removal.

Drive belt

Removal

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

Special tool

Universal holder SYM-2210100



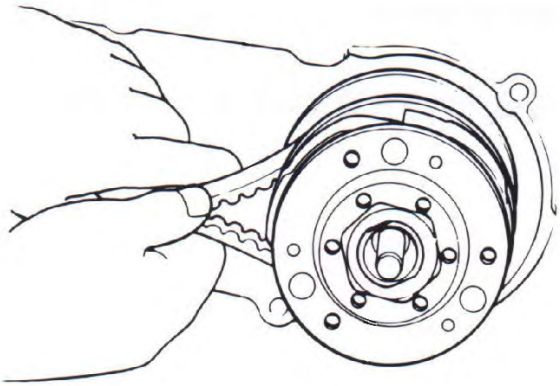
Hold clutch outer with universal holder, the remove nut.
Remove bearing stay collar. (LV30 LV25 type only)
Remove clutch outer.

Caution

- Use special service tools for tightening or loosening the nut. If only fix rear wheel orrear brake, the reduction gear system could be damaged.



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



Inspection

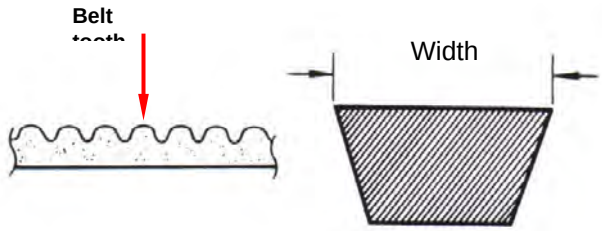
Check if the drive belt is cracked or worn. Replace it if necessary.
Measure the width of drive belt as diagram shown. Replace the belt if exceeds the service limit.

Service limit

22.2mm (LV30 LV25 type)
20.5mm (LV12 type)

Caution

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

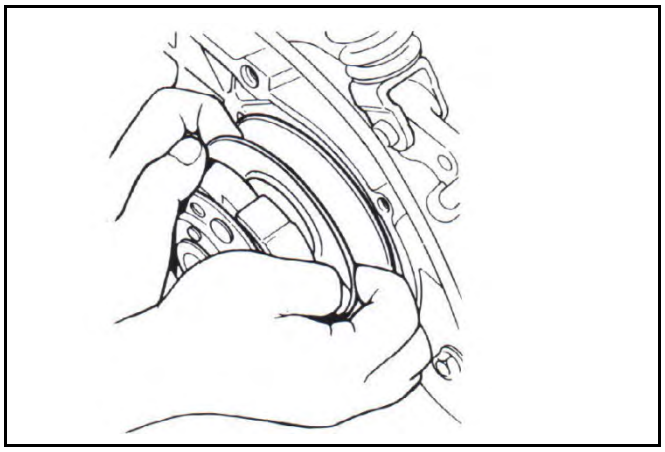


Installation

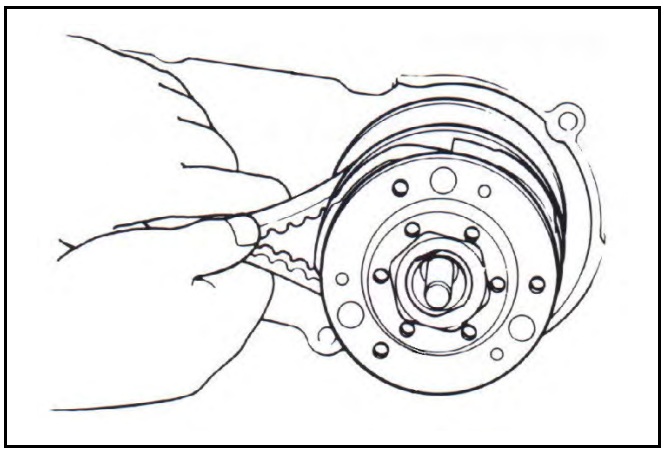
Pull open driven pulley and insert belt into driven pulley.

Caution

- Install belt into driven pulley first for easy installation of drive pulley.



Install the driven pulley that has installed the belt onto drive shaft.
Mount the other end of drive belt onto the movable drive face.



Install the clutch outer.
Install bearing stay collar. (LV30 LV25 type only)
Hold the clutch outer with universal holder, and then tighten nut to specified torque value.



Install the drive face, washer and drive face nut.

Caution

- Both drive faces must be free of grease. Clean up unnecessary grease.

Hold drive face with universal holder, and then tighten nut to specified torque value.
Install left crankcase cover.



Drive face

Removal

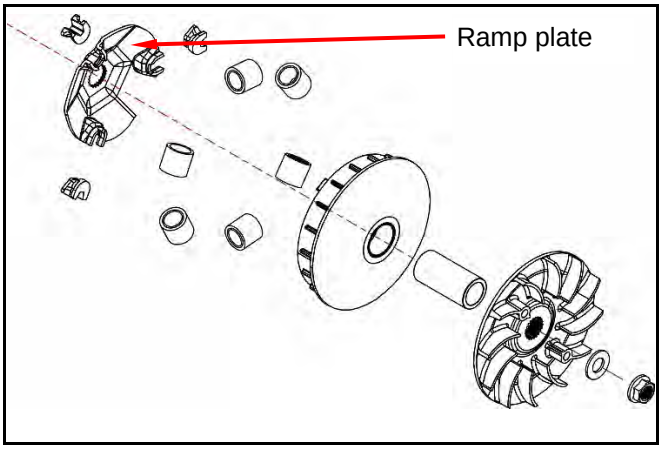
Remove left crankcase cover, drive face and drive belt.



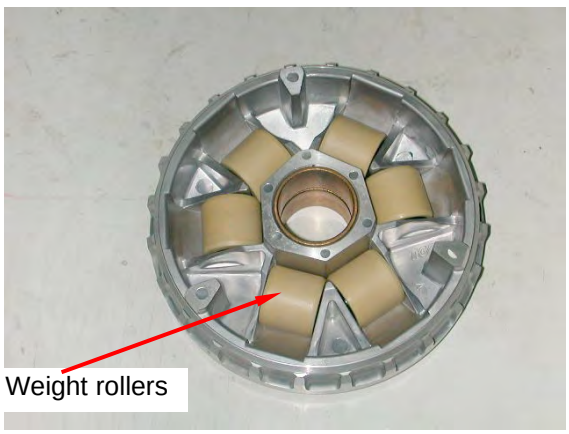
Remove movable drive face comp and drive face boss from crankshaft.



Remove ramp plate.

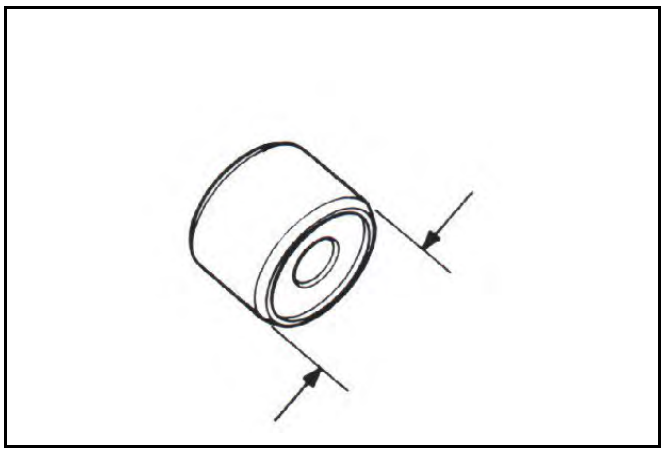


Remove weight rollers from movable drive face.

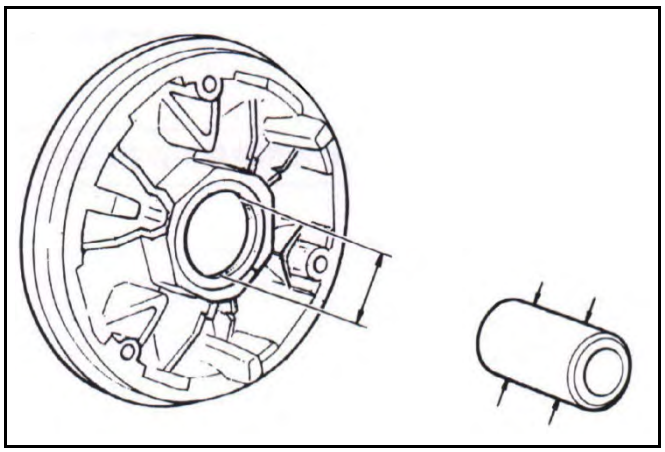


Inspection

The weight rollers are to press movable drive face by means of centrifuge force.
Thus, if weight rollers are worn out or damaged, the centrifuge force will be affected.
Check if rollers are worn or damaged, replace it if necessary.
Measure each roller's outer diameter. Replace it if exceed the service limit.



Check if drive face boss is worn or damaged and replace it if necessary
Measure the outer diameter of movable drive face boss, and replace it if it exceeds service limit.
Measure the inner diameter of movable drive face, and replace it if it exceeds service limit.



Installation

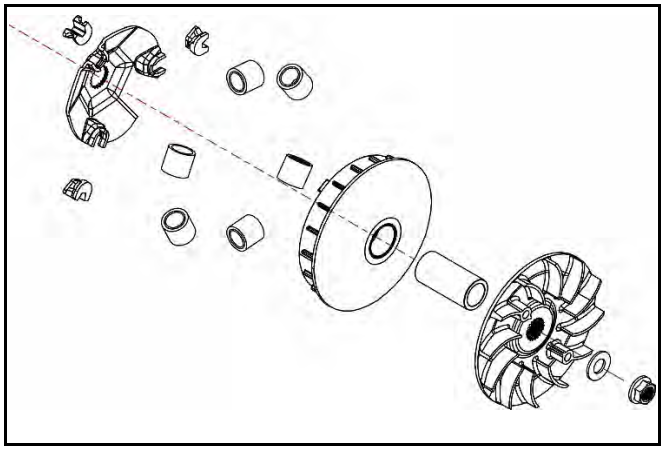
Movable drive face

Caution

- The weight roller two end surfaces are different. To lengthen the roller life and prevent exceptional wear, please install the closure surface onto movable drive face counter clock wise.



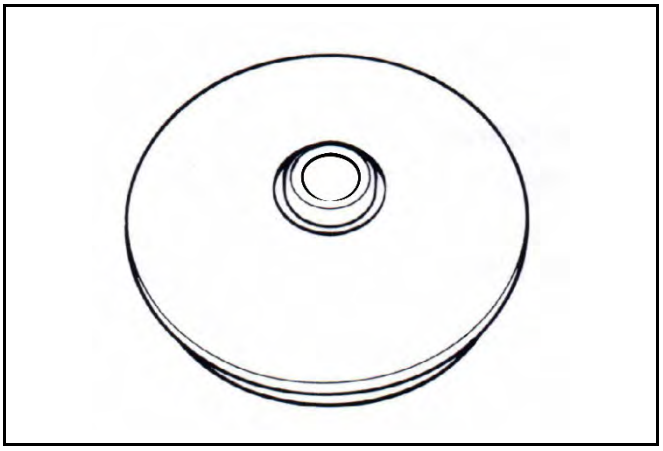
Install 3 slide pieces to ramp plate.
Install ramp plate.



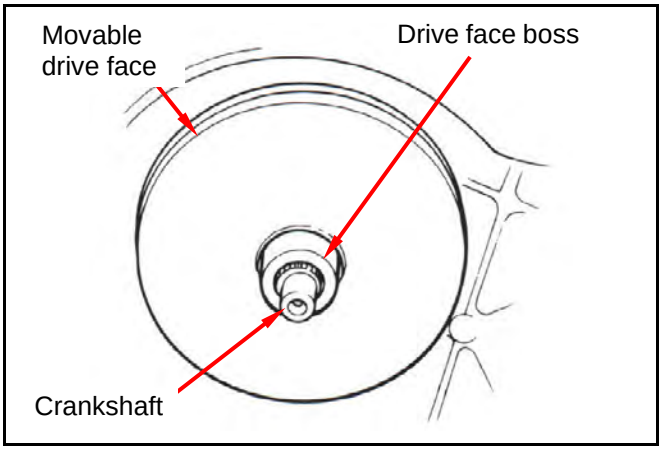
Lubricate movable drive face axis hole with grease.
Install drive face boss.

Caution

- Both drive faces must be free of grease. Clean up unnecessary grease.



Install movable drive face comp. onto crankshaft.

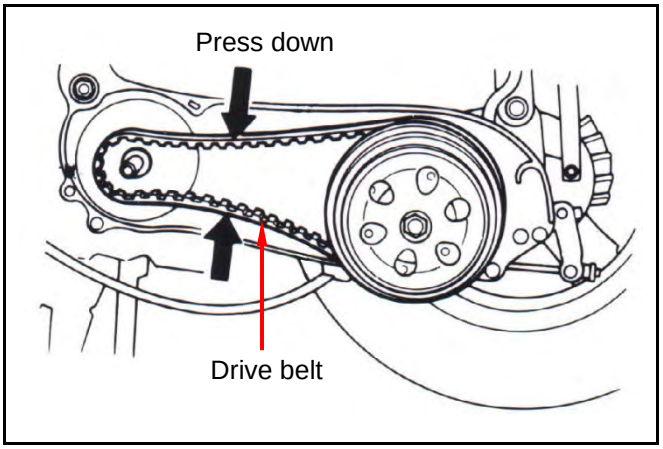


Driven pulley installation

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

Caution

- Pressing belt can avoid it from abnormal squeeze when installing drive face and ensure drive face to be tightened properly

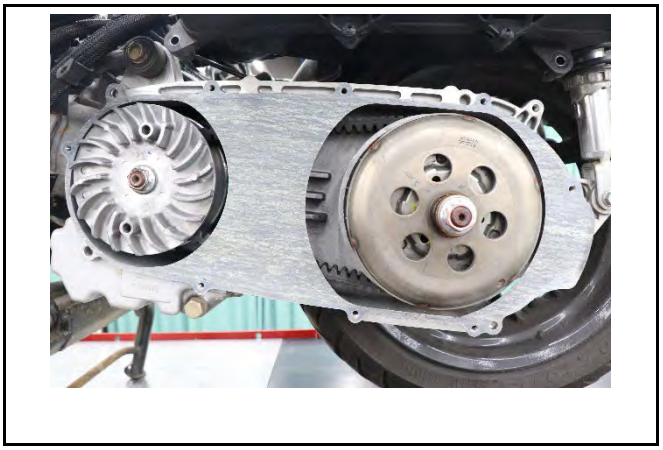


Install drive face, washer and nut.

Caution

- Both drive faces must be free of grease. Clean up unnecessary grease.

Hold drive face with universal holder.Tighten nut to specified torque value.



Install left crankcase cover.

Clutch outer / Driven pulley

Disassembly

Remove drive belt, clutch outer and driven pulley.

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

Caution

- Do not press the compressor too much.

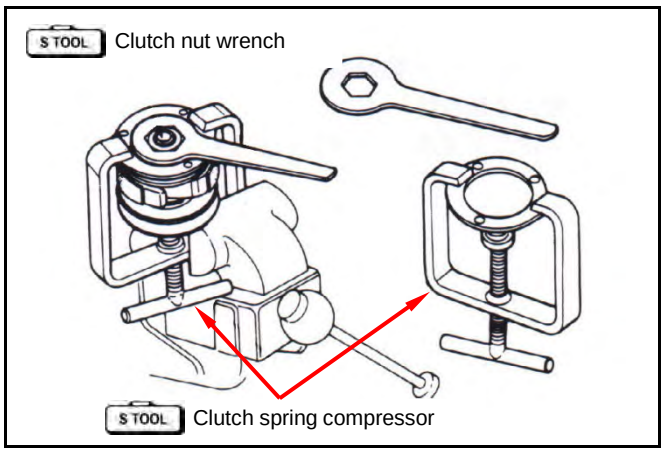
Special tool

Clutch spring compressor SYM-2301000

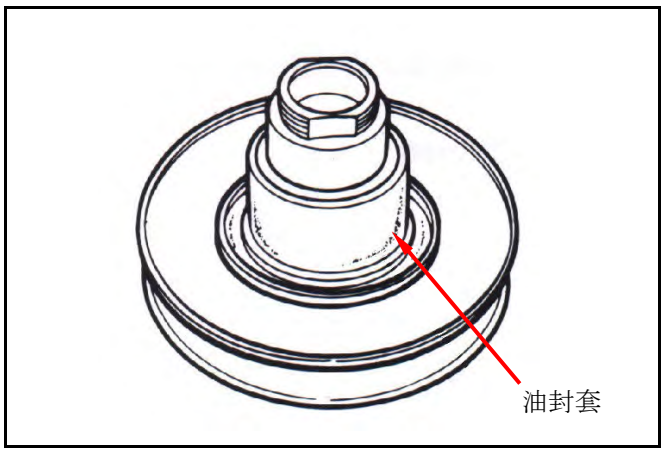
Clutch nut wrench SYM-9020200

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

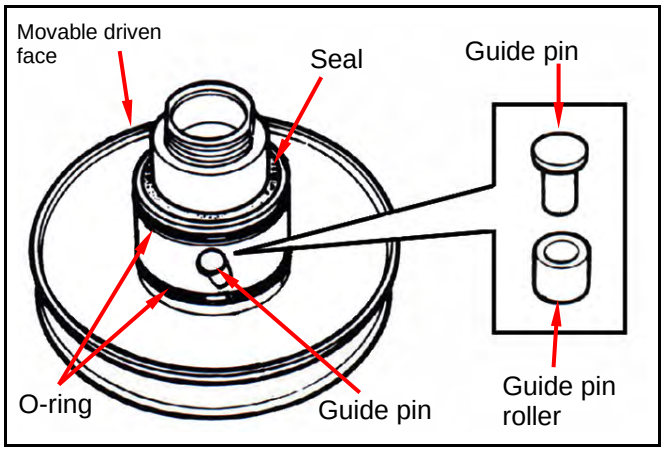
Release the clutch spring compressor and remove friction plate, clutch weight and spring from driven pulley.



Remove seal collar from driven pulley.



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

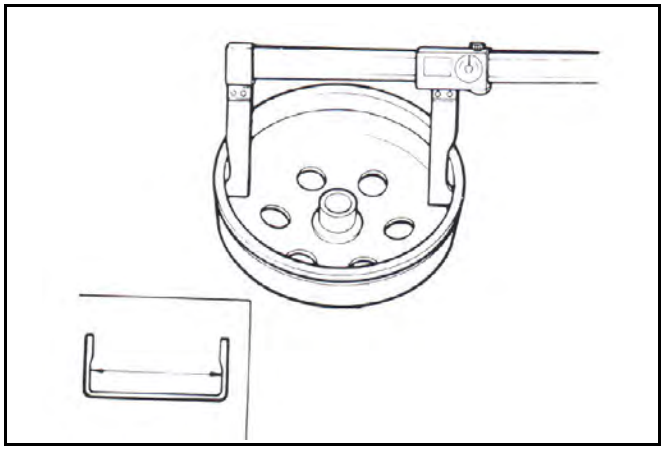


Inspection

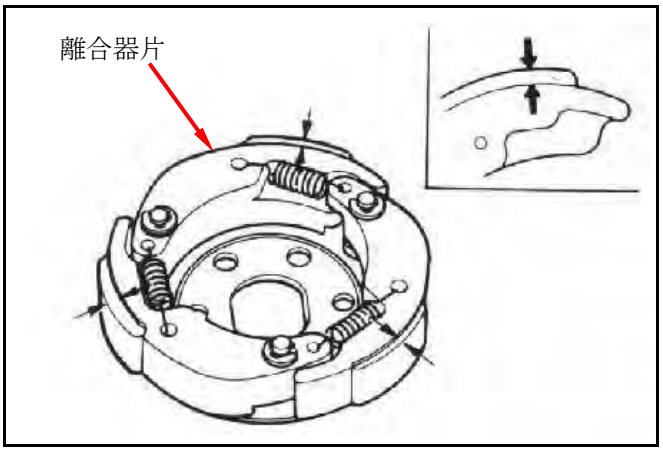
Clutch outer

Measure the inner diameter of clutch outer.

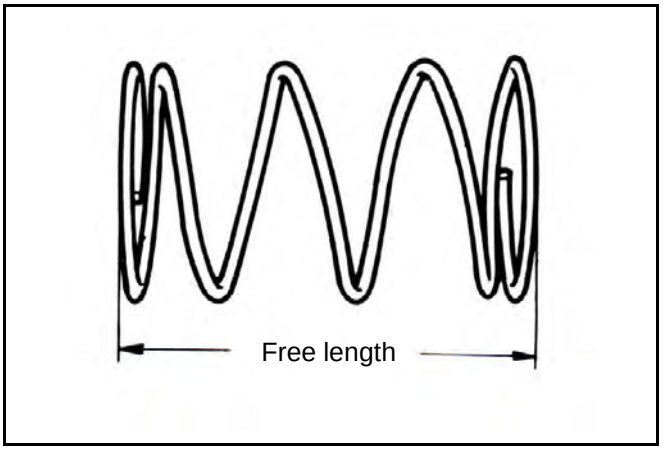
Replace the clutch outer if it exceeds service limit.



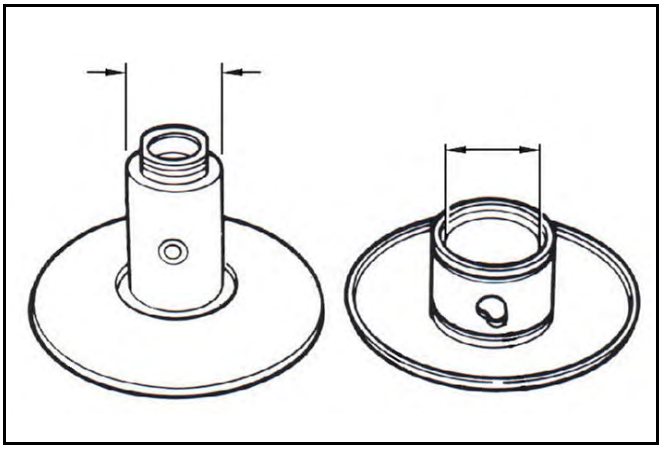
Clutch weight
Measure each clutch weight thickness.
Replace if it exceeds service limit.



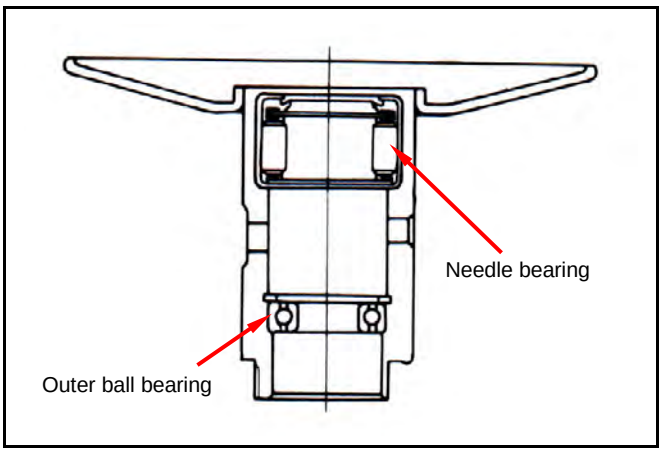
Driven pulley spring
Measure the length of driven pulley spring.
Replace if it exceeds service limit.



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 if it exceeds service limit.

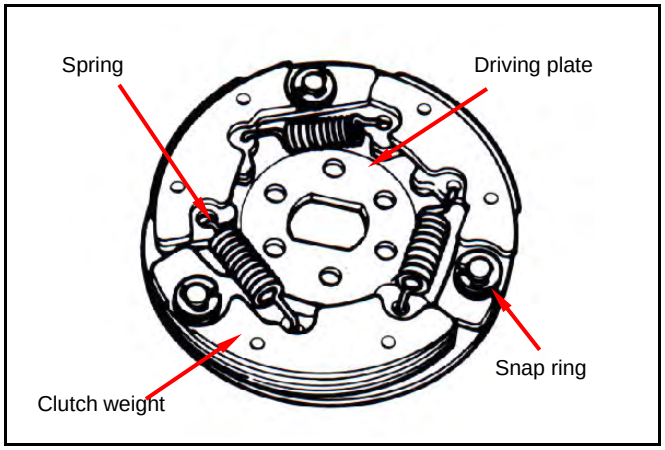


Driven Pulley Bearing Inspection
Check if the inner bearing oil seal is damaged.
Replace it if necessary.
Check if needle bearing is damaged or too big clearance. Replace it if necessary.
Rotate the inside of inner bearing with fingers to check if the bearing rotates smoothly and silently. Check if the bearing outer is fixed properly on driven pulley. Replace it if necessary.

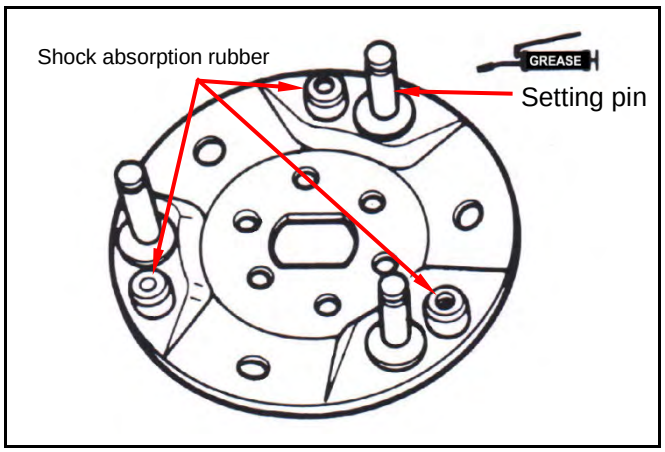


Clutch weight Replacement

Remove snap ring and washer, and then remove clutch weight and spring from drivingplate.
Check if spring is damaged or insufficient elasticity.



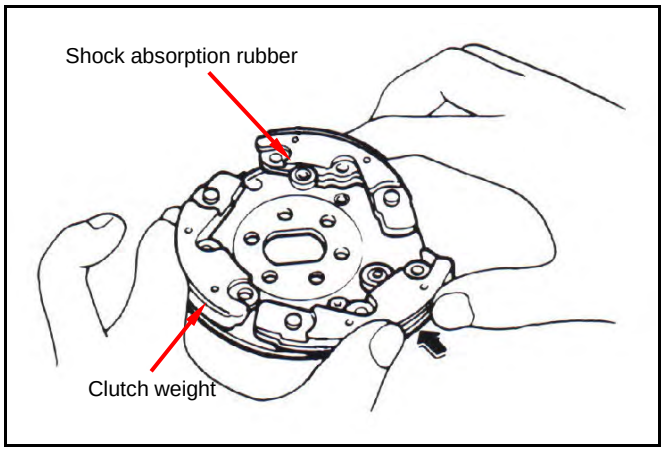
Check if shock absorption rubber is damaged or deformed.
Apply grease onto setting pins.



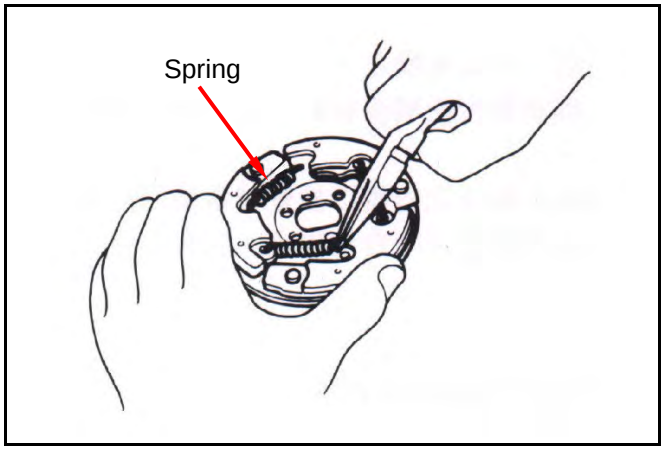
Apply grease onto setting pins. Clutch weight should be free of grease. Replace the clutch weight, if it is contaminated by grease.
Install new clutch weight onto setting pin and then push to the specified location.

Caution

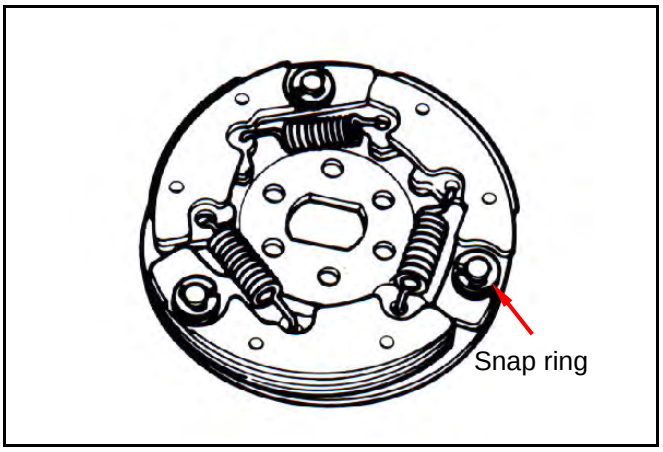
- Grease or lubricant will damage the clutchweight and reduce the friction capacity.



Install the spring into groove with pliers.



Install snap ring and mounting plate onto setting pin.



Replacement of Driven Pulley Bearing

Remove inner bearing.

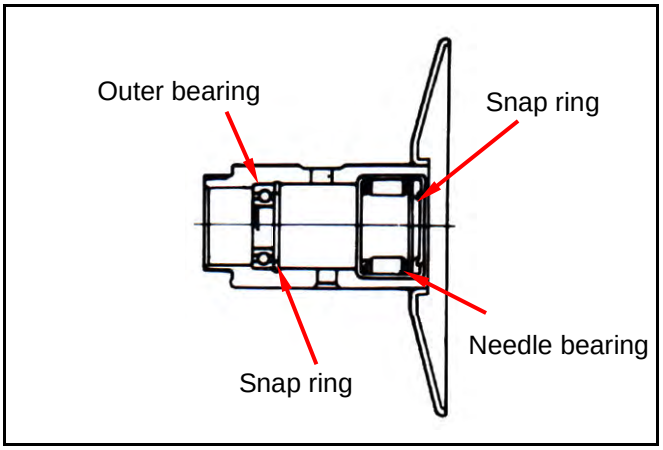
Caution

- If the oil seal is equipped on side of the driven pulley, remove the oil seal first.
- Remove the snap ring first, then the bearing.

Remove snap ring and then push bearing out toward other side of inner bearing.

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

Install snap ring.

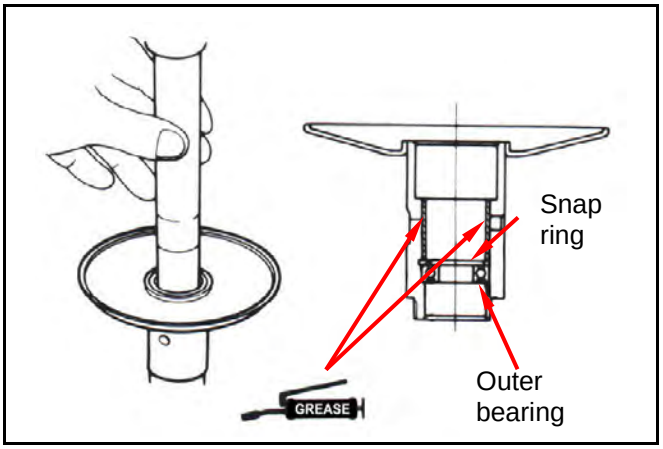


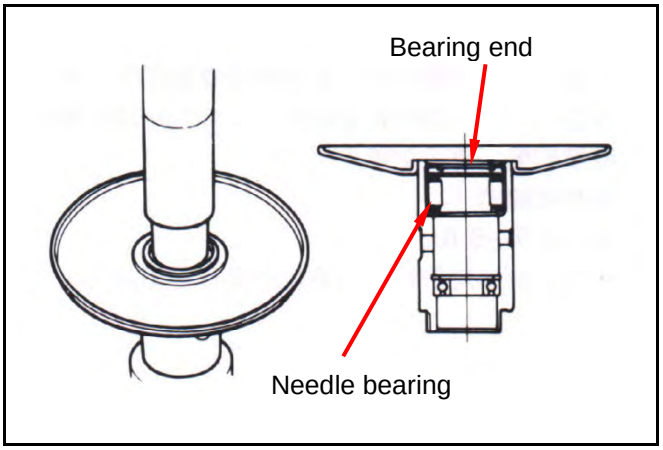
Install new inner bearing.

Caution

- The sealing end should be toward to outside as bearing installation.
- Install needle bearing with hydraulic presser.

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

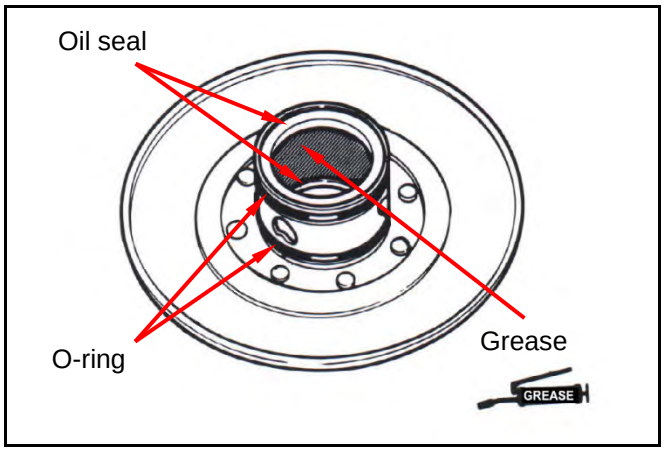




Installation of Clutch Outer/DrivenPulley Assembly

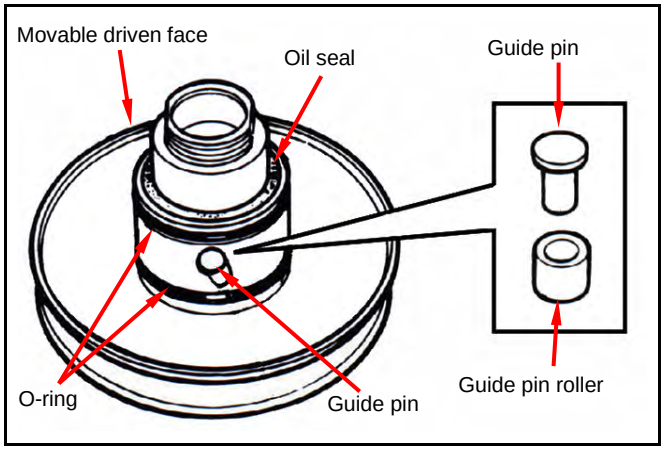
Install new oil seal and O-ring onto movabledriven face.

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

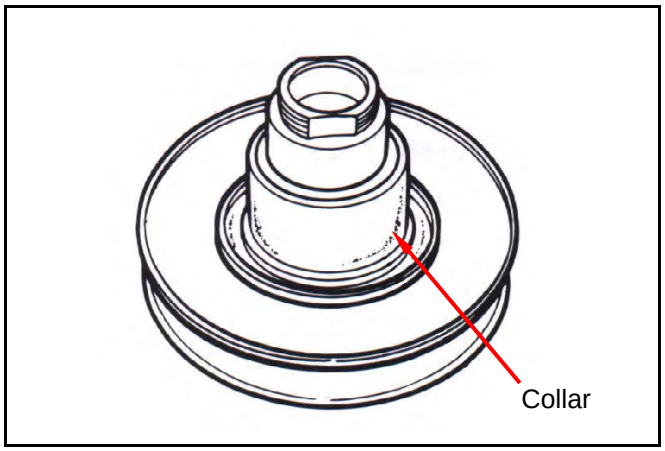


Install the movable driven face onto driven face.

Install the guide pin and guide pin roller.



Install the collar.

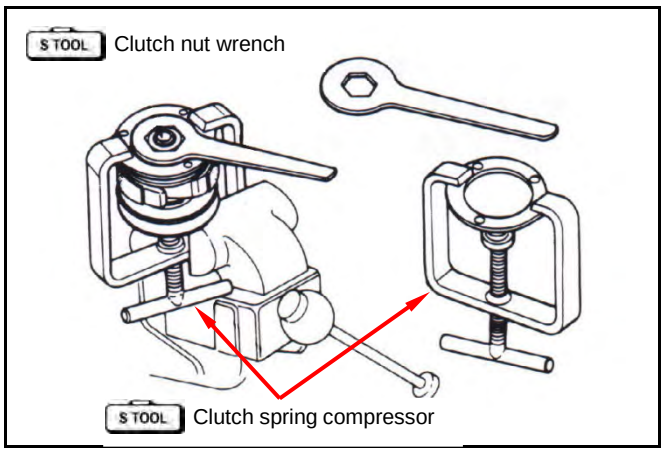


Install friction plate, spring and clutch weight into clutch spring compressor, and press down the assembly by turning manual lever until mounting nut that can be installed.

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

Remove the clutch spring compressor.

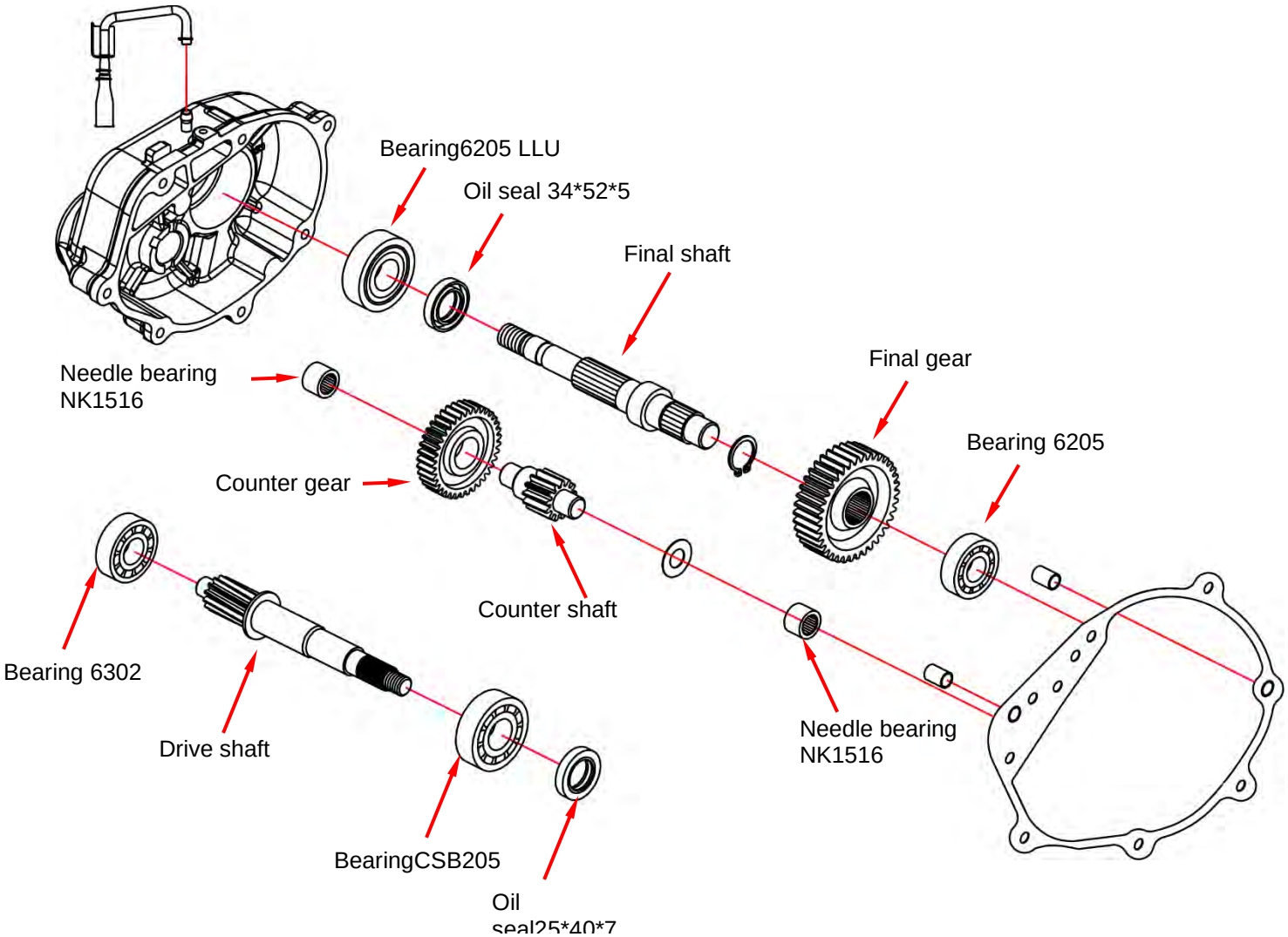
Install clutch outer/driven pulley and drive belt onto drive shaft.



Mechanism diagram ·····9-1	Final Drive Mechanism Disassembly ·····9-4
Mechanism diagram ·····9-2	Final Drive Mechanism Inspection·····9-6
Precautions in Operation·····9-3	Bearing Replacement ·····9-7
Troubleshooting·····9-3	Final Drive Mechanism Reassembly ····· 9-13

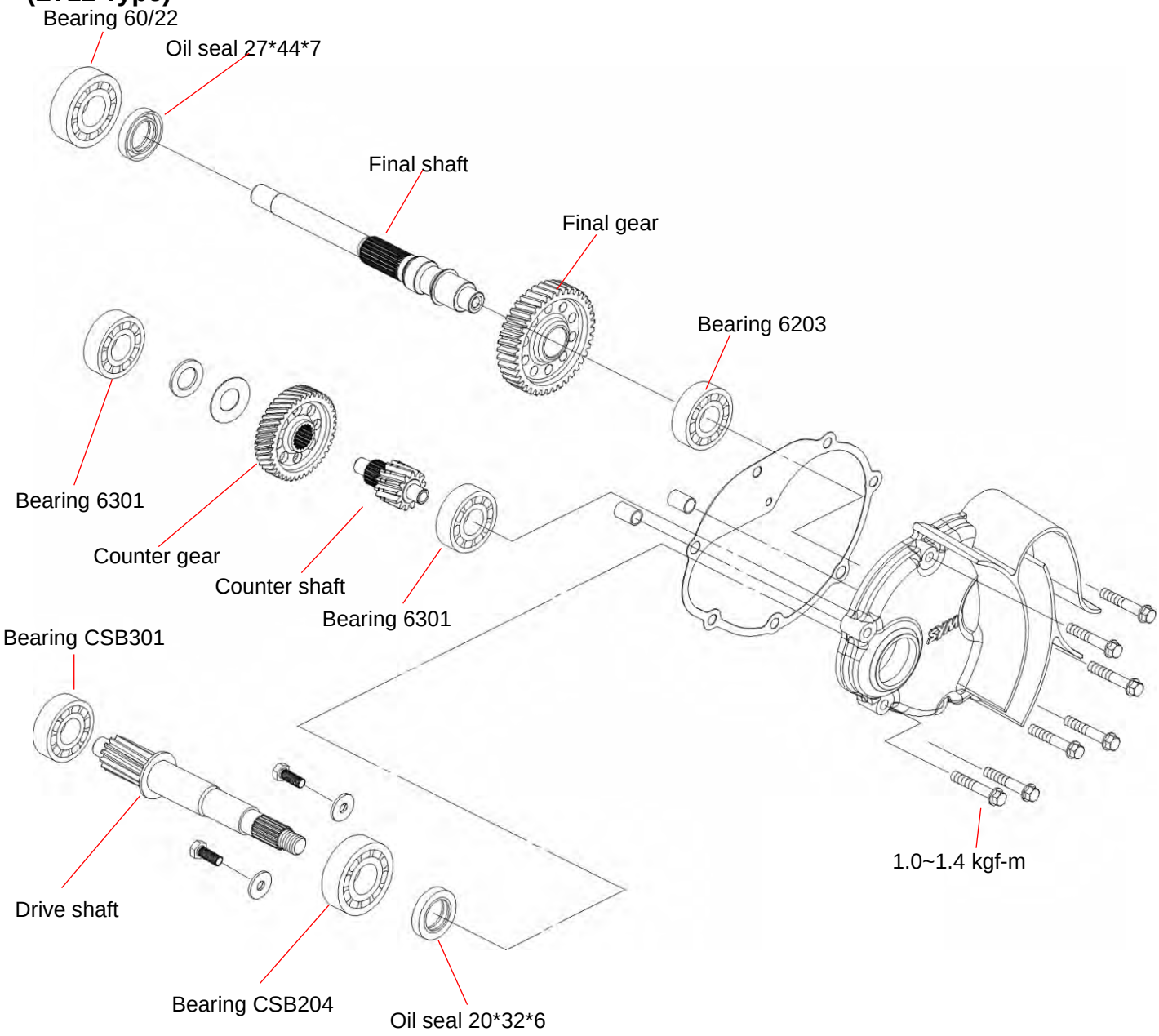
Mechanism diagram

(LV30 LV25 Type)



Mechanism diagram

(LV12 Type)



Precautions in Operation

Specification

Recommended oil: SYMOIL
Oil quantity (LV30 LV25 Type): 170cc. (replacement 160 c.c.)
Oil quantity (LV12 Type): 110cc. (replacement 100 c.c.)

Torque value

Gear box cover (LV30 LV25 Type)	2.4~3.0kgf-m
Gear box cover (LV12 Type)	1.0~1.4kgf-m

Special tools

Inner bearing puller	SYM-6204021 or SYM-6204022
Outer bearing puller	SYM-6204001
Bearing (6205) driver	SYM-9615000-6205
Bearing (6205) puller	SYM-9100400 HMA RA1 6205
Drive shaft & oil seal socket	SYM-9120200-HMA
Bearing (NK1516) driver	SYM-9100200-HMA NK1516
Oil seal drive 34*52*5	SYM-9125500-HMA
Drive shaft install puller	SYM-2341110-HMA RB1
Bearing install puller	SYM-2341100
Clutch nut wrench	SYM-9020200

Troubleshooting

Engine can be started but motorcycle cannot be moved.

- Damaged driving gear
- Burned driving gear
- Damaged driving belt.

Noise

- Worn or burned gear
- Worn bearing

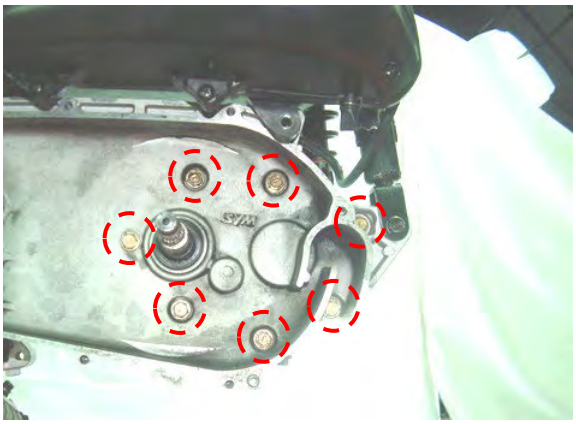
Gear oil leakage

- Excessive gear oil
- Worn or damaged oil seal

Final Drive Mechanism Disassembly

(LV30 LV25 Type)

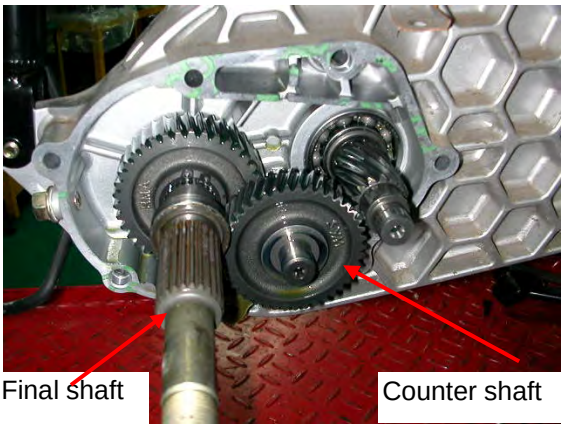
Remove the rear wheel. (refer to chapter 16)
Remove the clutch.
Drain out gear oil from gear box.
Loosen 7 bolts and remove gear box cover bolts.



Remove the gear box cover.



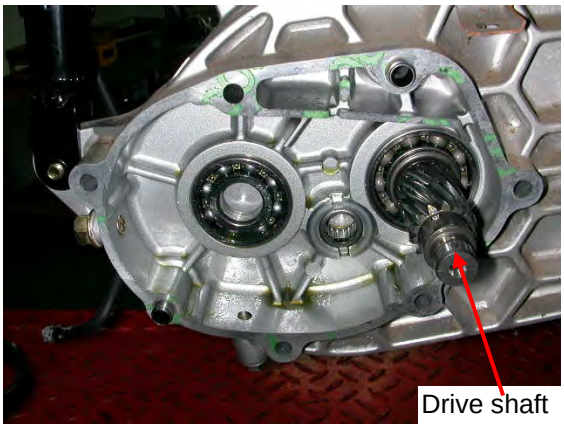
Remove counter shaft, gear, and 2 washers.
Remove final shaft and gear.



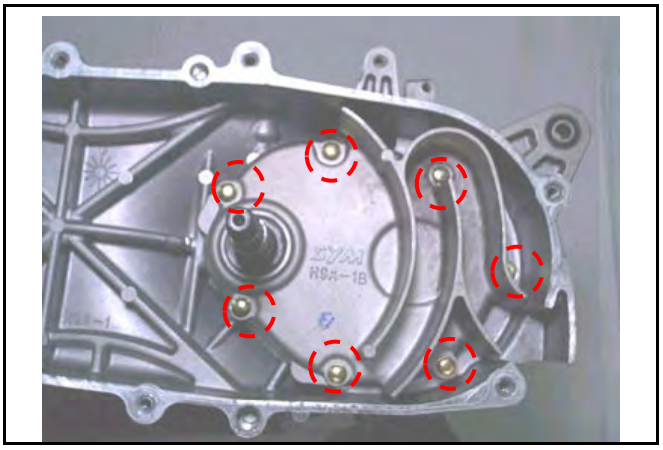
Remove the drive shaft.
Special tool
Shaft protector

⚠ Caution

- Do not remove drive shaft if not necessary.
- Replace the bearing, if drive shaft is removed.



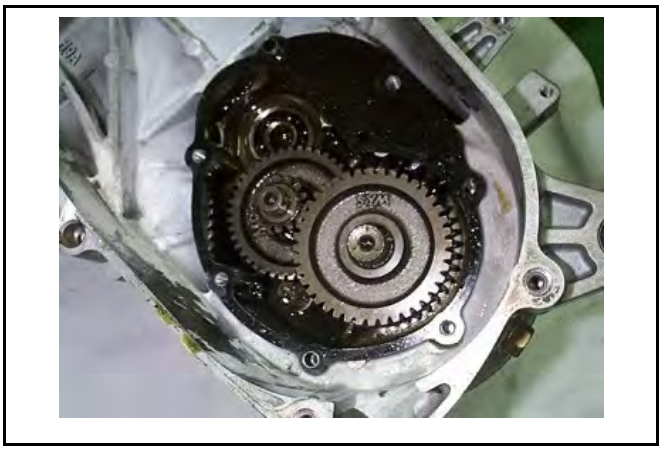
(LV12 Type)
Remove driven pulley.
Drain gear oil out from gear box.
Remove gear box cover bolts and then remove the cover.
Remove gasket and dowel pin.



Remove final driving gear and shaft.
Remove countershaft and gear.
Remove gasket and dowel pin.

⚠ Caution

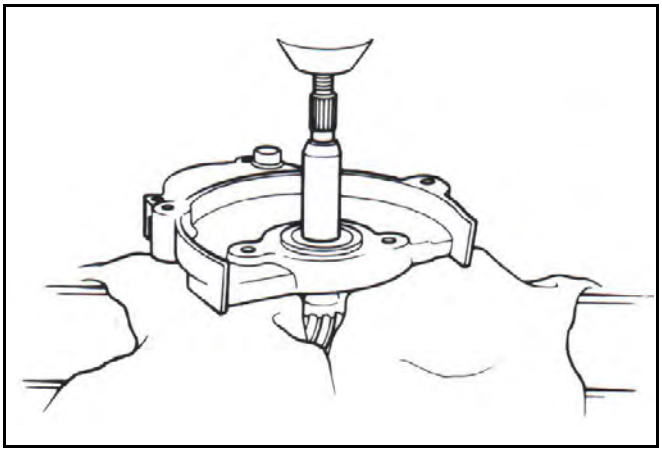
- When remove the gasket, then its gasket has to be replaced new gasket.



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

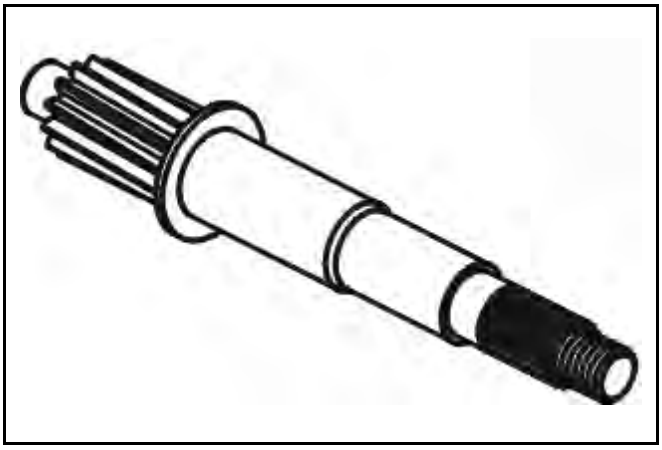
⚠ Caution

- 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.

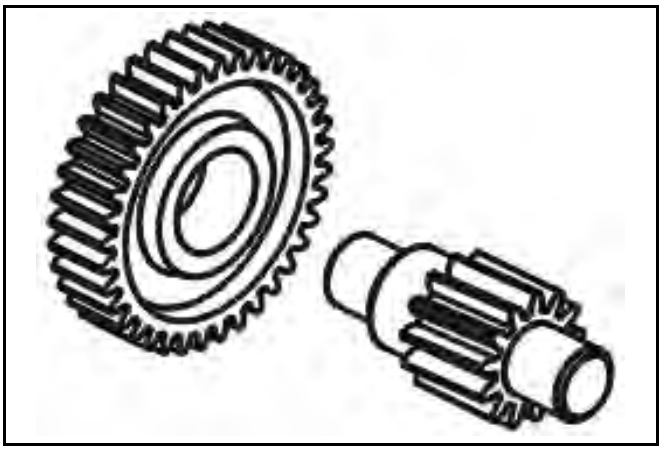


Final Drive Mechanism Inspection

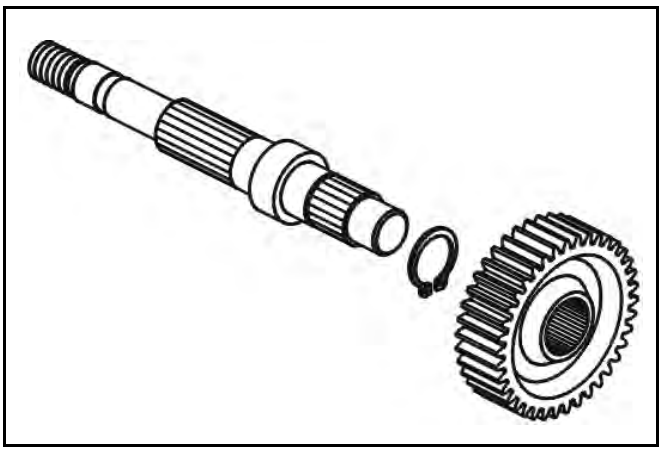
Check if the drive shaft is burned, worn or damaged.



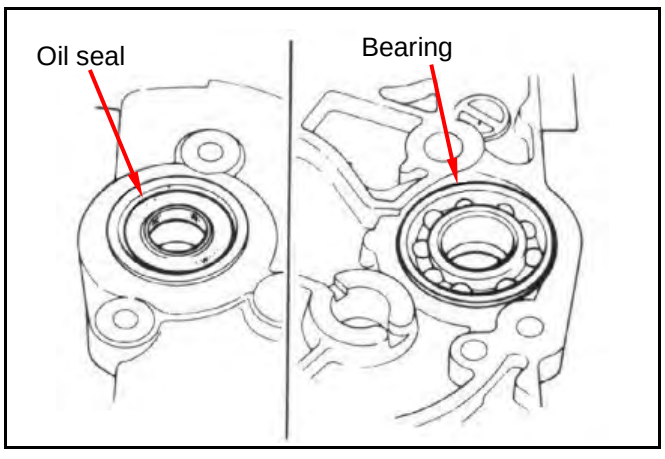
Check if the countershaft and gear are burned,worn, or damaged.



Check if the final shaft and gear are burned, worn, or damaged.



Check bearings on gear box cover.
Rotate each bearing's inner ring with fingers.
Check if bearings can be turned smoothly and silently, and also check if bearing outer ring is mounted tightly.
Replace the bearing, if the rotation is uneven, noisy, or loose bearing mounted
Replace the oil seal, if the oil seal is worn or damaged.
Check gear box bearing as the same way above, and replace if necessary.



Bearing Replacement

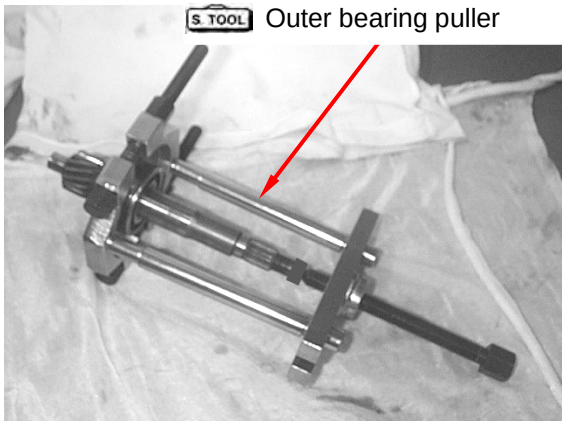
(LV30 LV25 Type)

Left crankcase side

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

Special tool

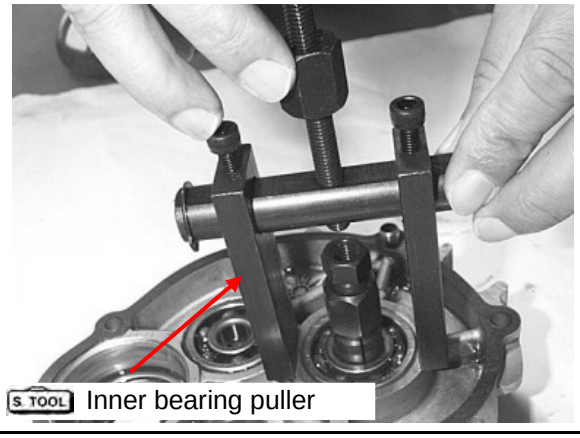
Outer bearing puller SYM-6204001
Shaft protector SYM-6204010



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

Special tool:

Inner bearing puller SYM-6204020
SYM-6204021



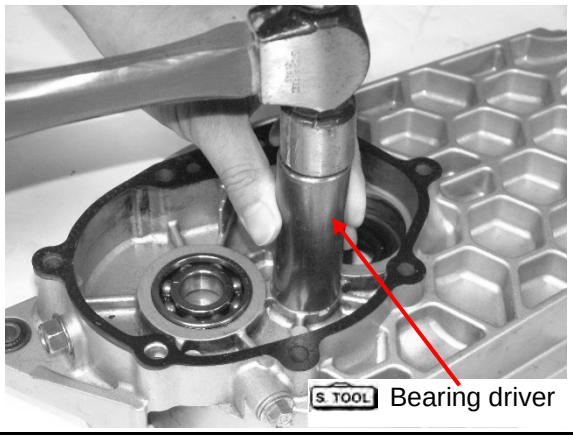
Caution

- Never use a used bearing. Replace with anew bearing, if the bearing is removed.

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

Special tool

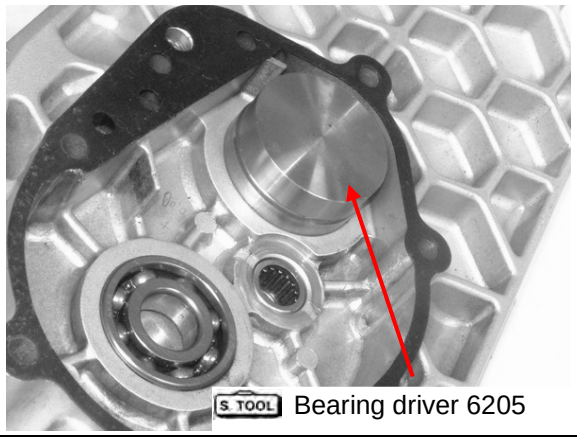
Bearing driver 6205 SYM-9615000-6205
Bearing driver HK1516 SYM-9100200-HK1516



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

Special tool

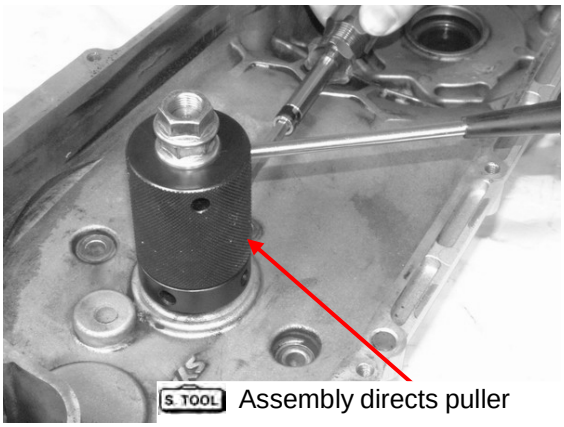
Bearing driver 6205 SYM-9100400-6205



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

Special tool

Assembly directs puller SYM-2341100



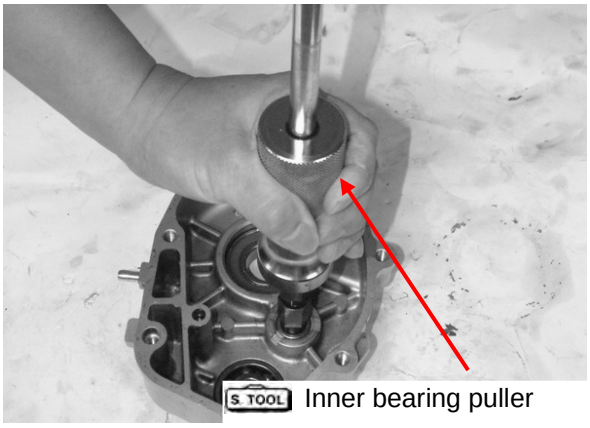
Assembly directs puller

Gear box cover side

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

Special tool

Inner bearing puller SYM-6204020 /SYM-6204021

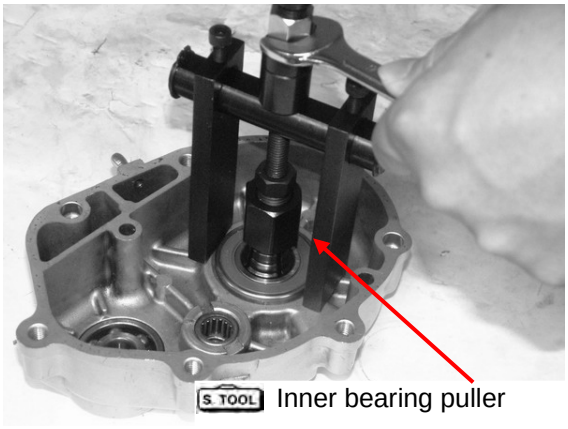


Inner bearing puller

Remove final shaft bearing from gear box cover by using following tools.
Remove oil seal.

Special tool

Inner bearing puller SYM-6204020 /SYM-6204021

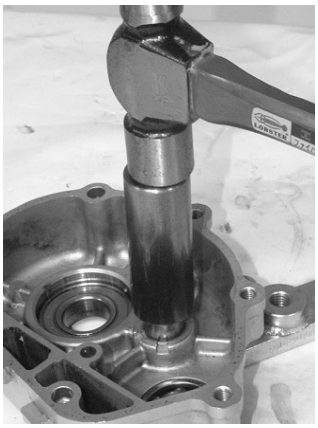


Inner bearing puller

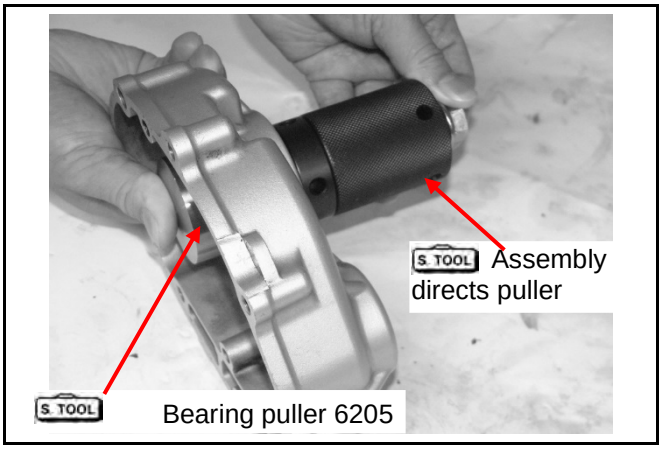
Install a new drive shaft bearing and counter shaft bearing into gear box cover.

Special tool

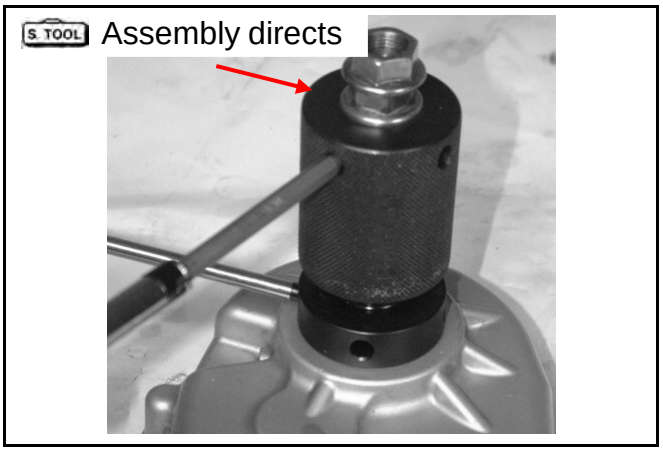
Bearing (6205) driverSYM-9615000-6205
Bearing (NK1516) driver SYM-9100200-HMA
NK1516



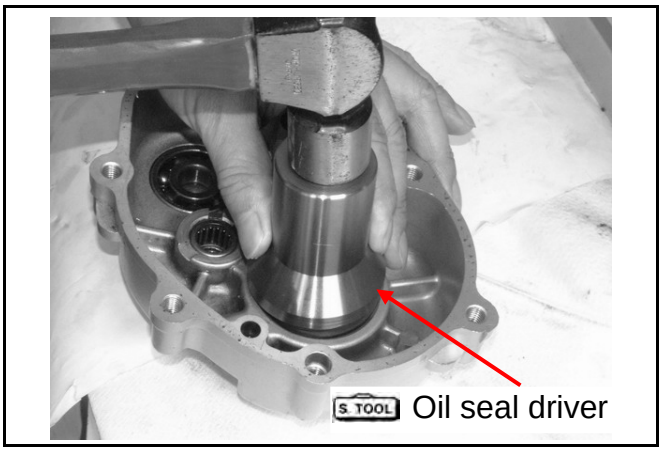
Install new final shaft bearing and bearing puller onto gear box cover.
Special tool
Bearing (6205) puller
SYM-9100400 HMA RA1 6205



Install assembly directs puller and the bearing. Use screw driver to hold bearing puller lower part, and turn the bearing puller upper part to install the bearing.
Special tool
Assembly directs puller SYM-2341110



Apply grease onto final shaft oil seal. Install the oil seal into gear box cover.
Special tool
Oil seal driver 34*52*5SYM-9125500-HMA



(LV12 Type)

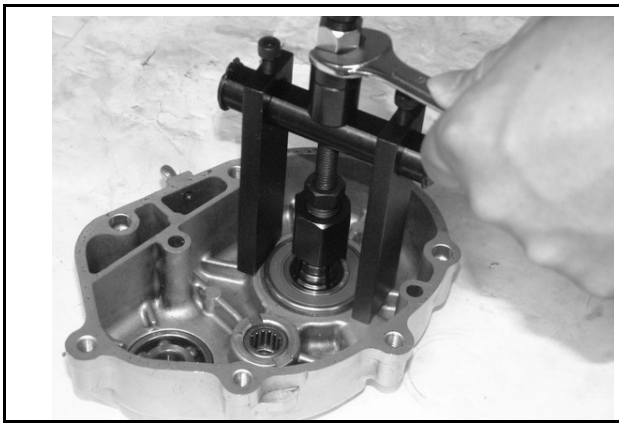
⚠ Caution

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

Remove driving shaft bearing from left crankcase

Special tool

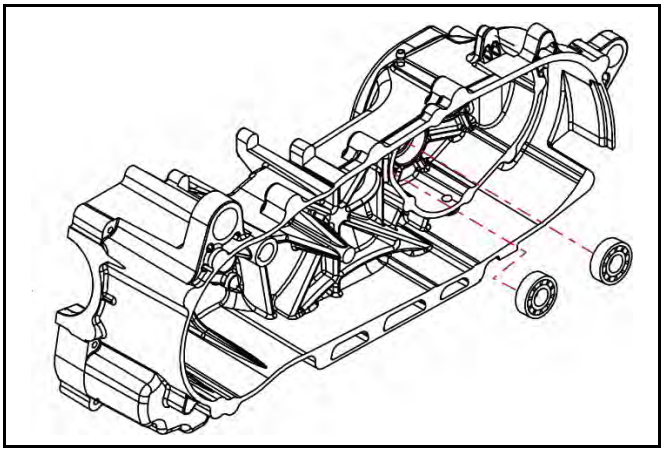
Inner bearing puller



Remove driving shaft bearing and counter shaft bearing from left crankcase using following tools:

Special tool:

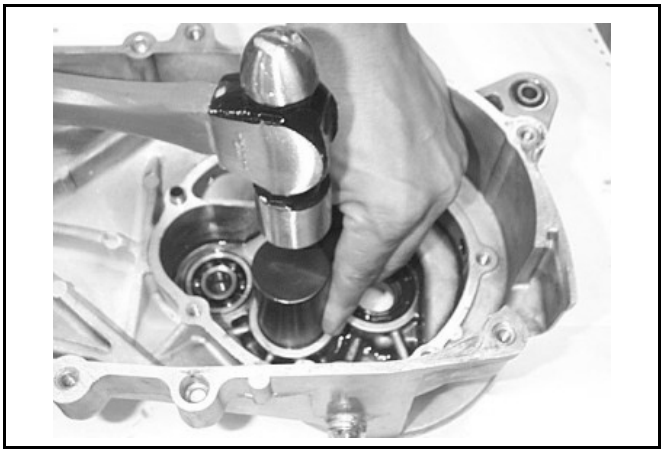
Inner bearing puller



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

Special tool:

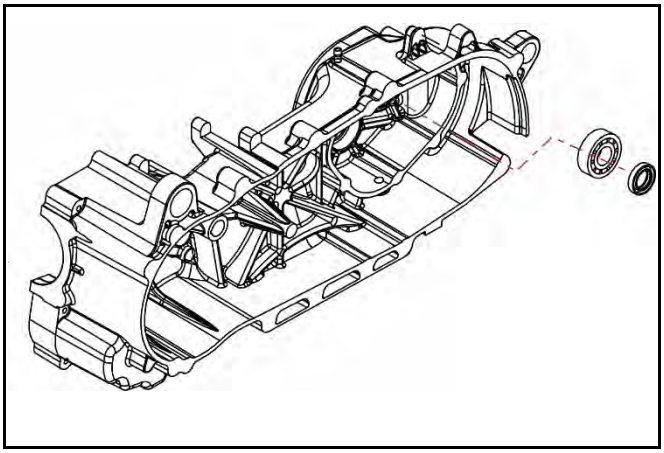
Bearing driver



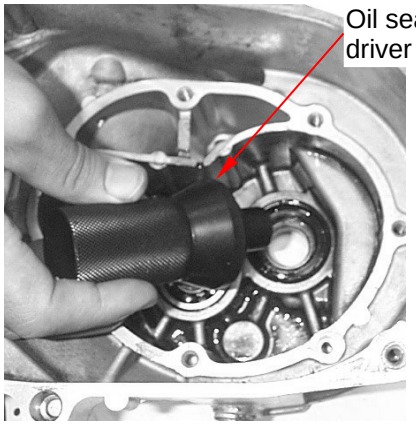
Remove oil seal, and then remove final shaft bearing from left crankcase.

Special tool:

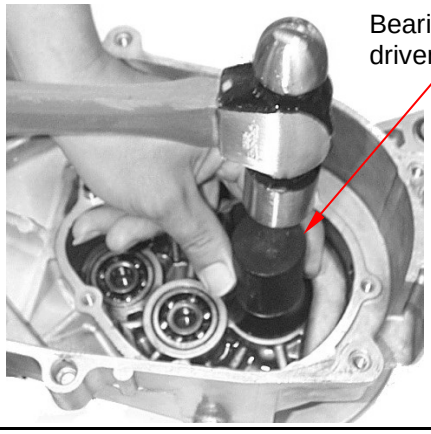
Inner bearing puller



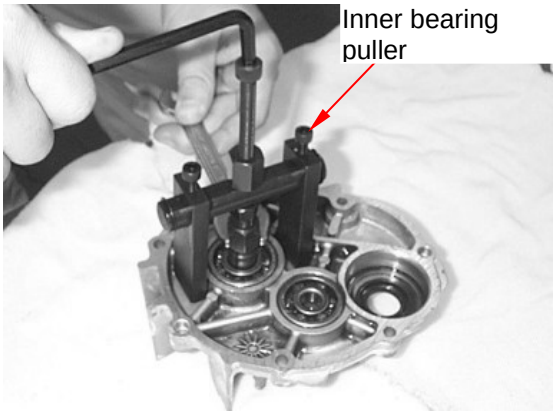
Install new final shaft seal.
Special tool:
Oil seal driver



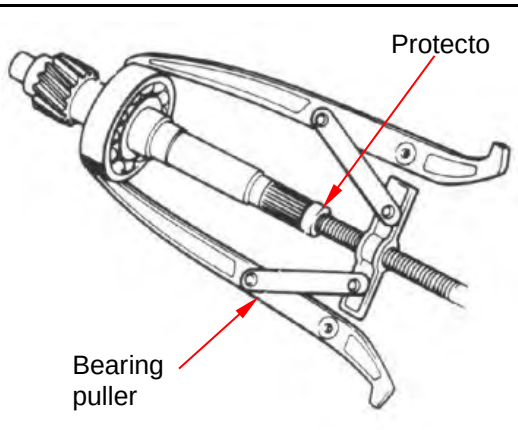
Install new final shaft bearing.
Special tool:
Bearing driver



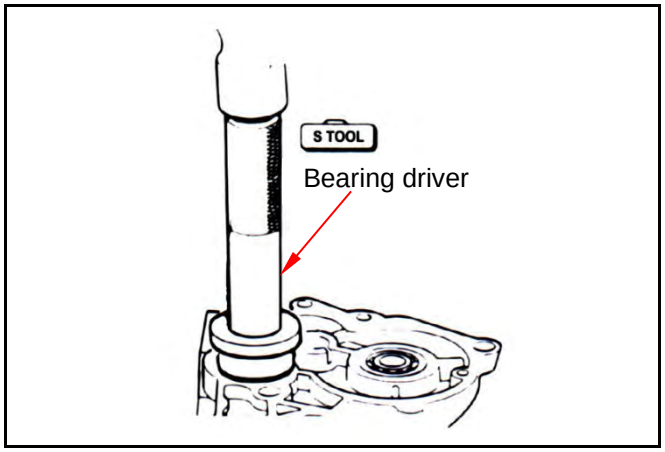
Press out the drive shaft from gear box cover.
Using shaft protector as operation.
Remove oil seal from gear box cover and discard the seal.
Use inner bearing puller to remove the final shaft bearing and counter shaft bearing from the cover.
Special tool:
Inner bearing puller



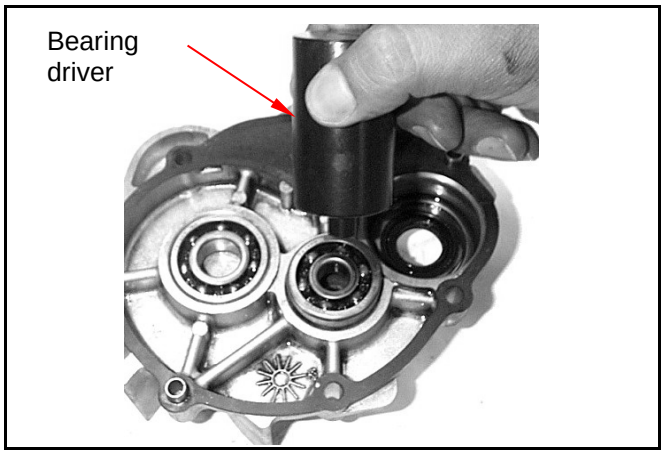
If the drive shaft is pulled out with its bearing, then remove the bearing with bearing puller and shaft protector.
Special tool:
Multi-functional bearing puller or Outer bearing puller
Shaft protector



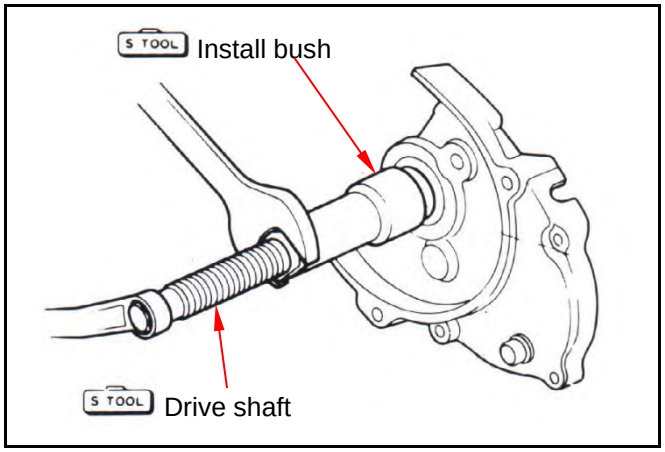
Install a new drive shaft bearing onto gear box cover.
Special tool:
Bearing driver



Install a new final shaft bearing and counter shaft bearing onto gear box cover.
Special tool:
Bearing driver



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



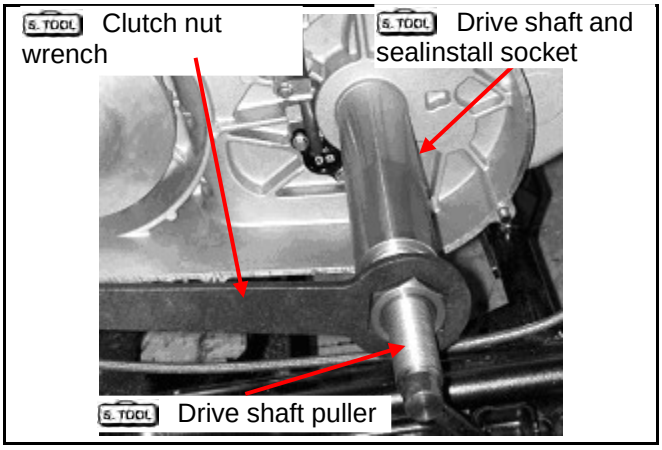
Final Drive Mechanism Reassembly

(LV30 LV25 Type)

Install drive shaft.

Special tool

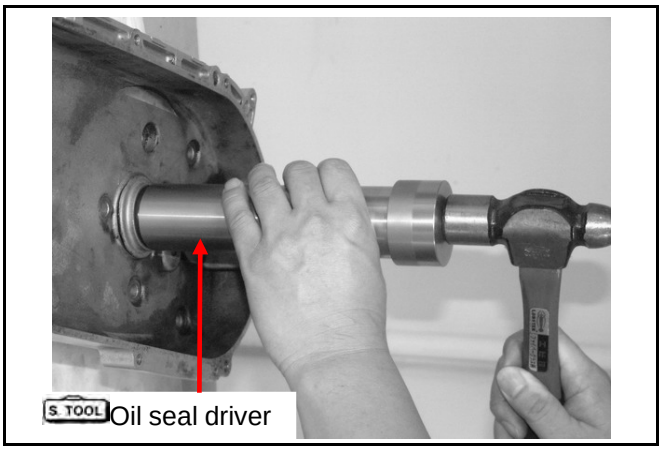
Drive shaft puller SYM-2341110- HMA RB1
Drive shaft socket & oil seal driver (25*40*8) SYM-9120200-HMA
Clutch nut wrench SYM-9020200



Apply grease onto drive shaft oil seal.Install the oil seal to left crankcase.

Special tool

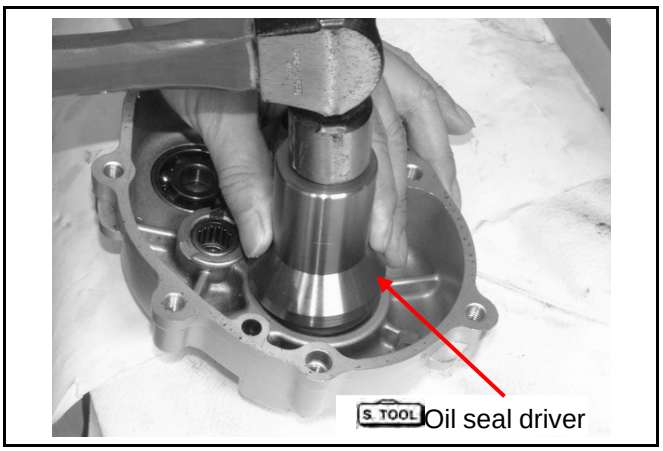
Drive shaft socket & oil seal driver (25*40*8) SYM-9120200-HMA



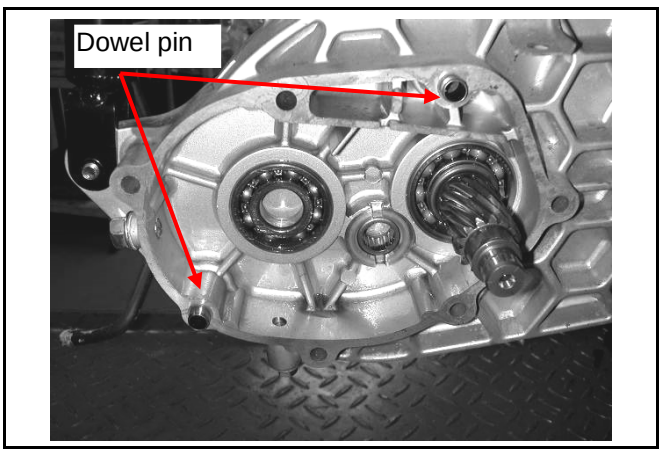
Apply grease onto final shaft oil seal andinstall the oil seal.

Special tool

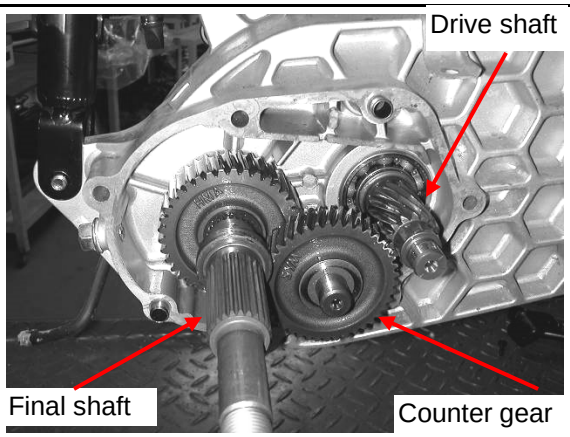
Oil seal drive 34*52*5
SYM-9125500-HMA



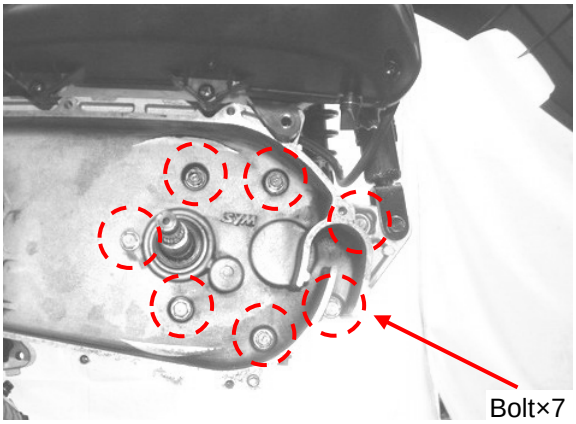
Install 2 dowel pins & new gasket.



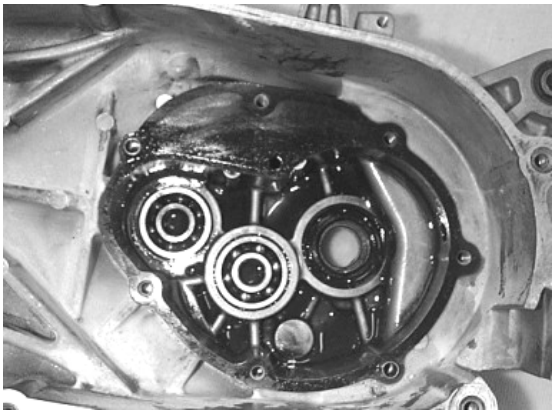
Install counter gear, 2 washers, final gear, and final shaft onto left crankcase.



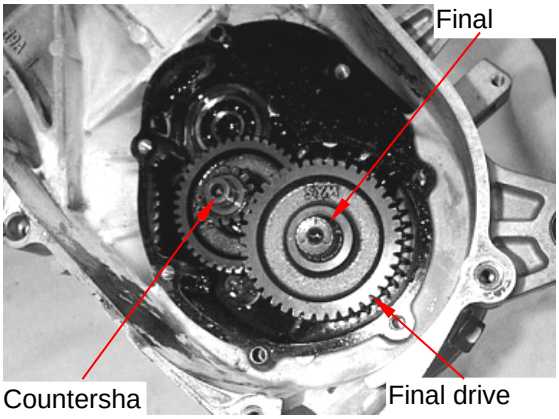
Install the gear box and tighten the bolts. (7 bolts)
Torque value: 2.4~3.0kgf-m
Install driven pulley / clutch outer / belt. Install movable drive face, drive face and left crankcase cover.
Install rear wheel.
Add gear oil



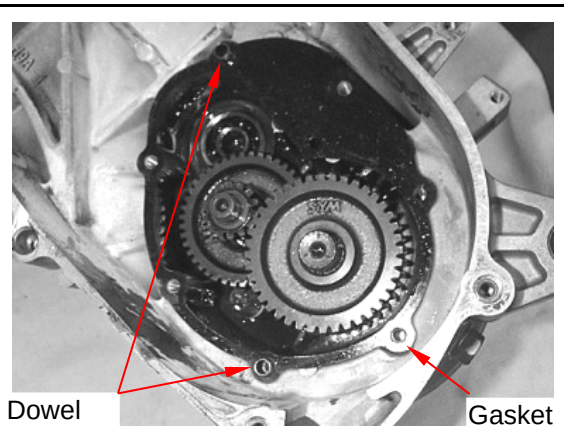
(LV12 Type)
Apply with grease onto the oil seal lip of final driving shaft.



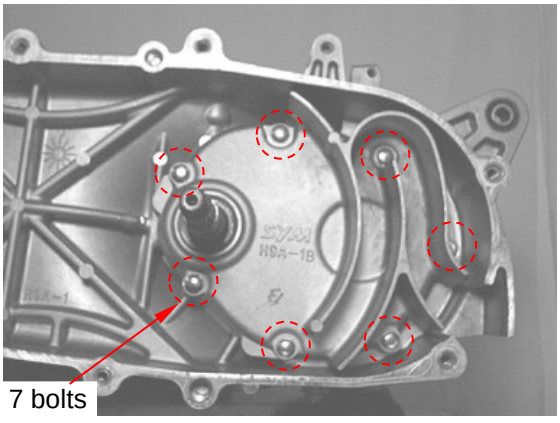
Install countershaft, counter gear, final shaft and final driving gear.



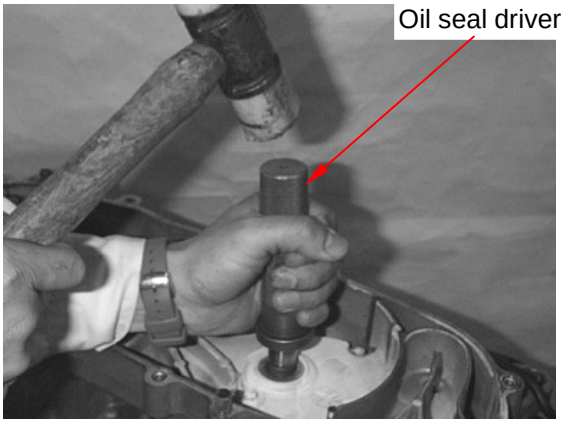
Install dowel pin and new gasket.



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



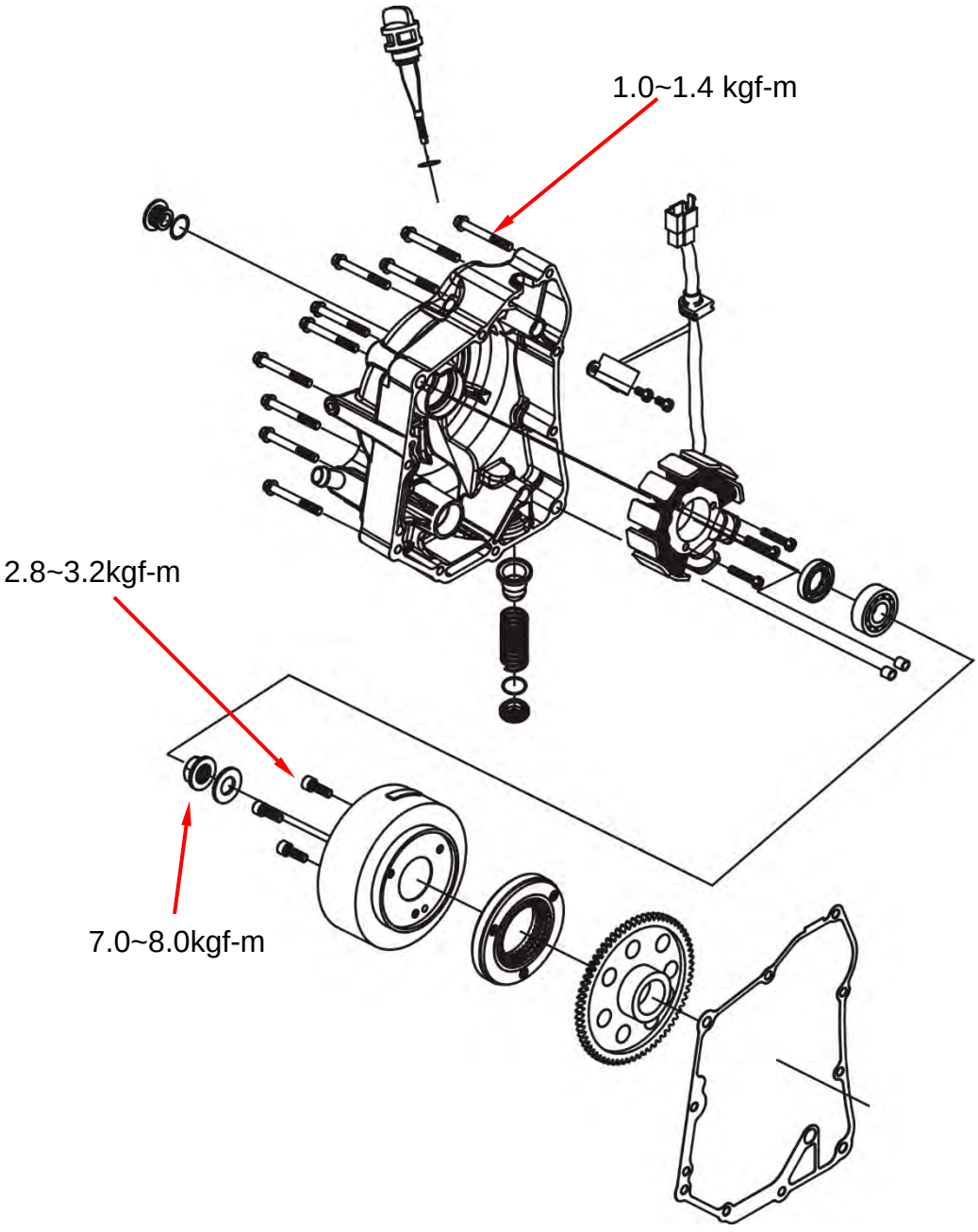
Apply with grease onto new oil seal lip, and then install the oil seal.
Special tool:
Oil seal driver



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

Mechanism diagram ····· 10-1	Flywheel Removal ····· 10-5
Precautions in Operation ····· 10-2	Start Clutch ····· 10-6
Right Crankcase Cover Removal ····· 10-3	Flywheel Installation ····· 10-8
AC. Generator Removal ····· 10-4	AC. Generator Installation ····· 10-9
Right Crankcase Cover Bearing ····· 10-4	Right Crankcase Cover Installation ····· 10-9

Mechanism diagram



Precautions in Operation

General information

- Refer to chapter 17: The troubleshooting and inspection of alternator.
- Refer to chapter 17: The service procedures and precaution items of starter motor.

Specification

Unit：mm

Item	Standard value (mm)	Limit (mm)
ID of starting clutch gear	25.026~25.045	25.100
OD of starting clutch gear	42.192~42.208	42.142

Torque value

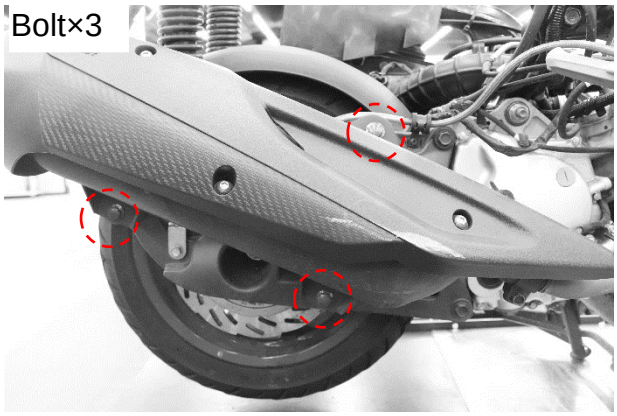
Flywheel nut	7.0~8.0kgf-m
Starting clutch hexagon bolt	2.8~3.2kgf-m with adhesive
6 mm bolts	1.0~1.4kgf-m

Special tools

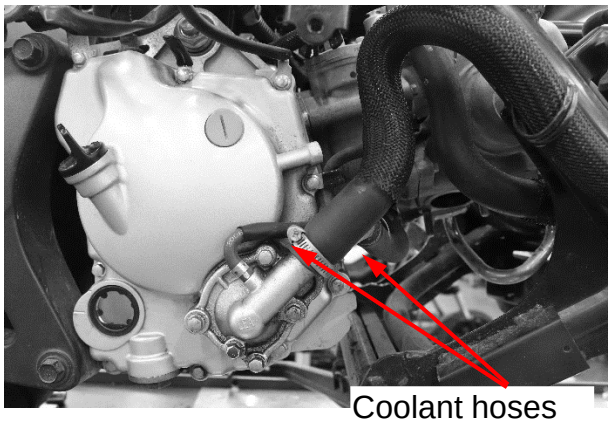
AC.G. flywheel puller	SYM-3110000-HMA
Left crank case cover 6201LUC3bearing puller	SYM-9614000-HMA RB1 6201
Inner bearing puller	SYM-6204022
Universal holder	SYM-2210100

Right Crankcase Cover Removal

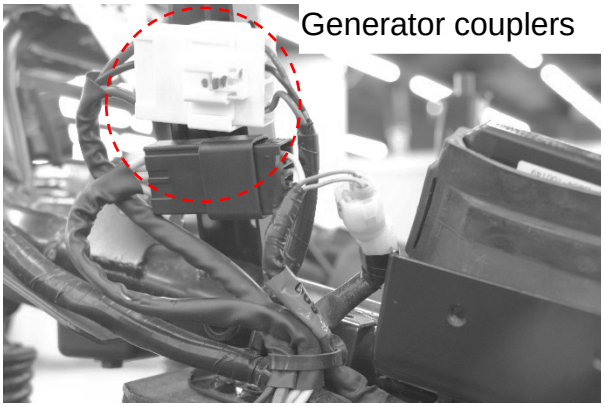
Remove left side cover. Remove seat and luggage box.(Refer chapter 13)
Remove the exhaust muffler (3 bolts, 2 nuts).



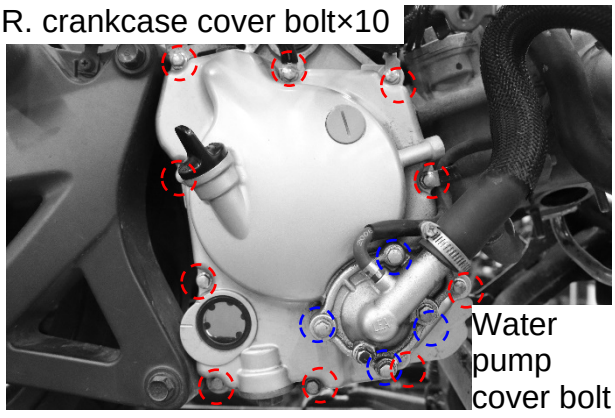
Drain out the engine oil and coolant (refer chapter5).
Remove coolant hoses.



Disconnect the couplers of the power source output line.

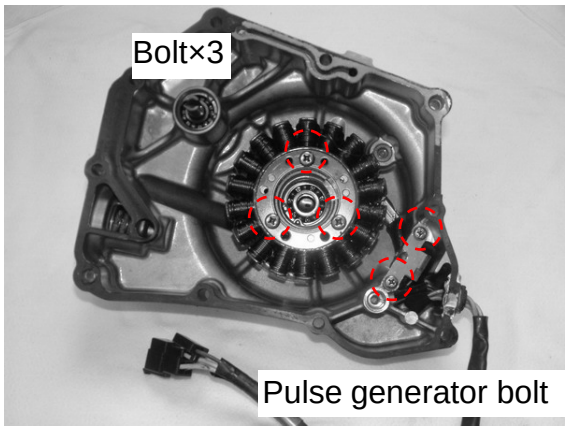


Remove water pump cover (4 bolts).
Remove 10 bolts from the right crankcase cover.Remove the right crankcase cover.
Remove dowel pin and gasket.



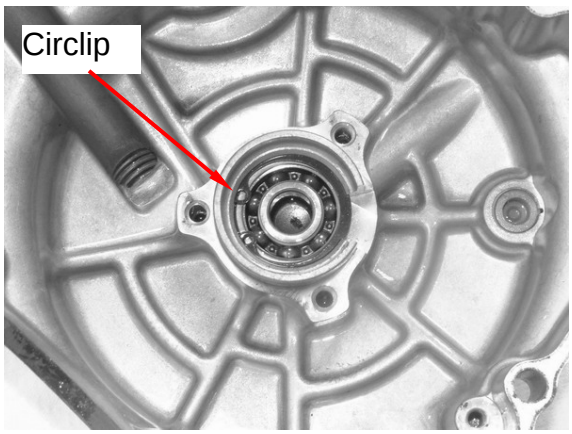
AC. Generator Removal

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

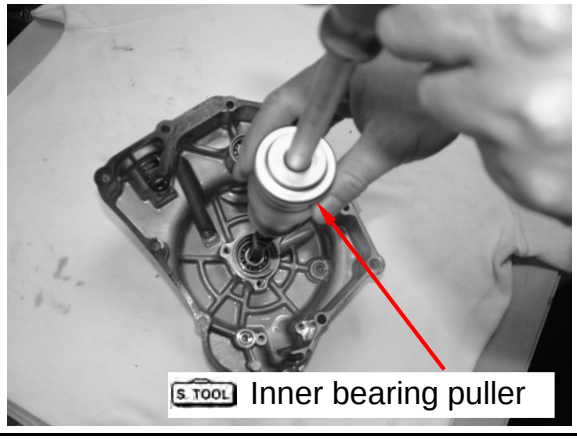


Right Crankcase Cover Bearing

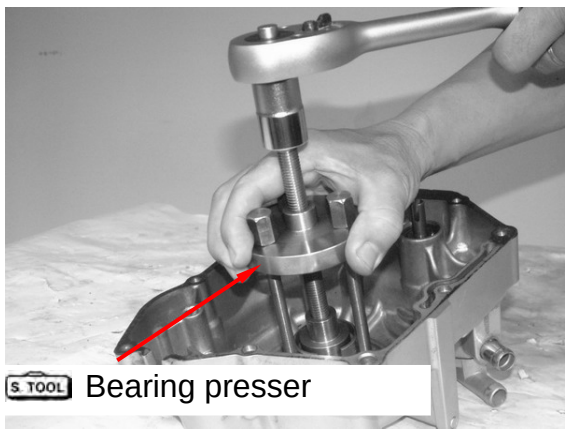
Rotate the bearing with finger to check if the bearing rotation is in smooth and silent.
Check if the bearing outer parts are closed andfixed.
Replace it if necessary.



Remove the bearing with inner bearing puller.
Special tool
Inner bearing puller SYM-6204022

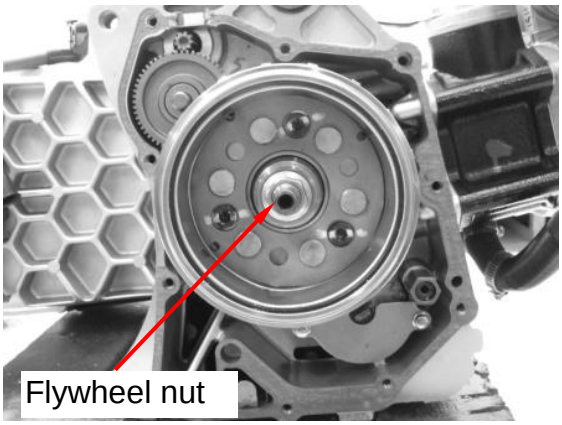


Install the bearing 6201 bearing with special tool.
Special tool
Right crankcase cover bearing 6201 presser
SYM-9614000-HMA RB1 6201

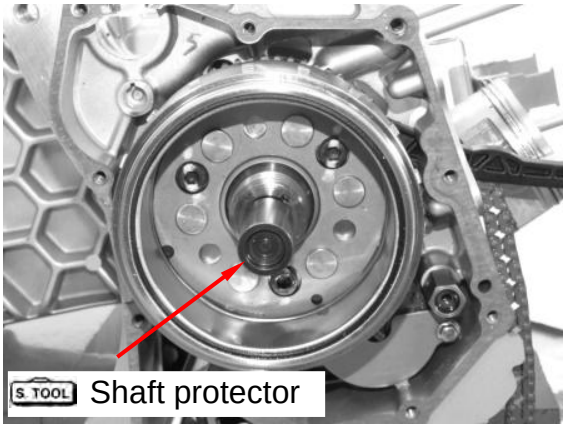


Flywheel Removal

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



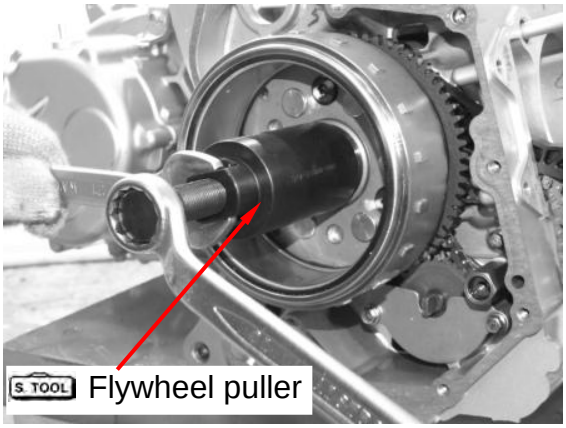
Installs shaft protector onto the crank shaft.



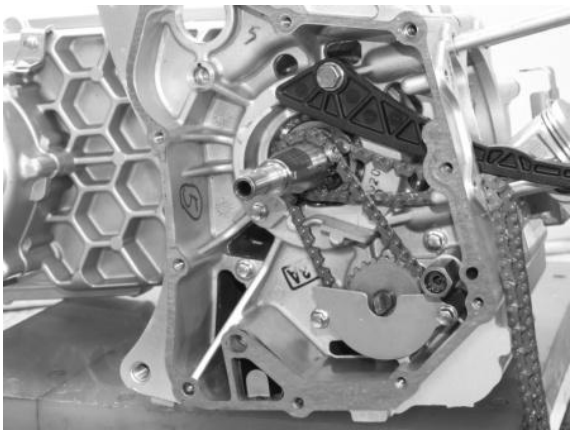
Remove starter reduction gear and shaft. Pull out flywheel with AC.G. flywheel puller.

Special tool

AC.G. Flywheel puller SYM-3110000-HMA



Remove flywheel and starting driven gear. ◦



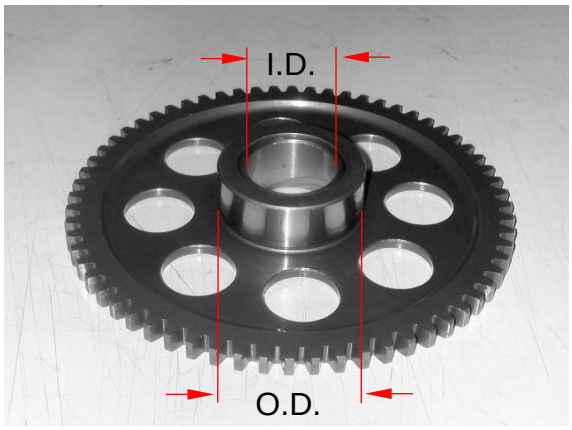
Start Clutch

Start Clutch Inspection

Remove start clutch driven gear. Check the gear for wear or damage.

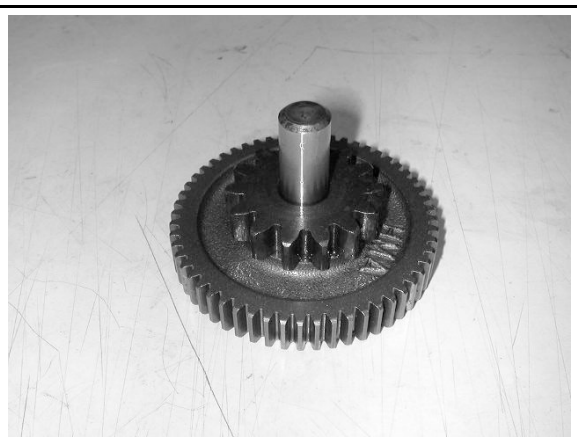
Measure the ID and OD of the start clutch drivengear.

Service Limit: **ID: 25.100 mm**
OD: 42.142 mm



.

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

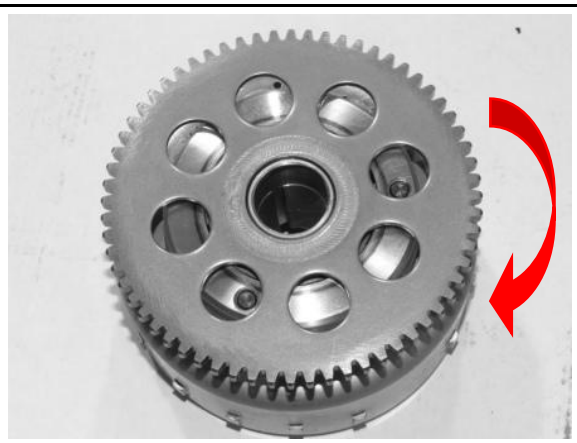


Check each roller for wear or damage.



Install start clutch driven gear onto one-way clutch.Hold flywheel and rotate start clutch gear.

The start clutch gear should be rotated in C.C.Wdirection freely, but not C.W direction. (View as shown in this figure).



One-way clutch disassembly

Remove the starting gear

Loosen 3 starting clutch socket bolts from one-wayclutch and remove one-way clutch.



Push out the roller set and check each roller forwear or damage.



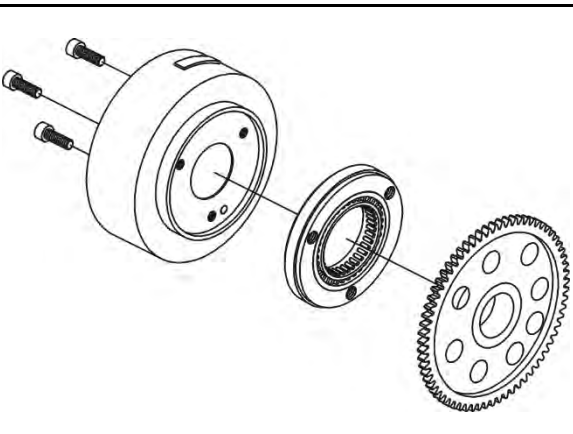
One-way clutch Installation

Install the components in the reverse proceduresof removal.

Torque value: 2.8~3.2kgf-m

Caution

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

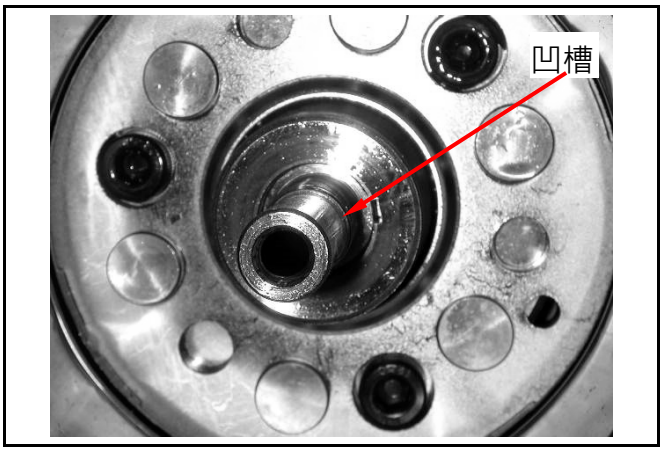


Flywheel Installation

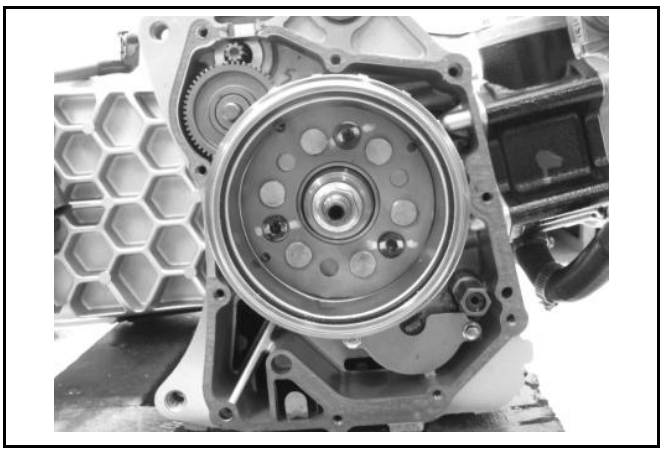
Install starting driven gear onto one-way clutch.



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



Hold the flywheel by drive face with universal holder, and tighten flywheel nut.
Torque value: 7.0~8.0kgf-m



Special tool
Universal Holder SYM-2210100

AC. Generator Installation

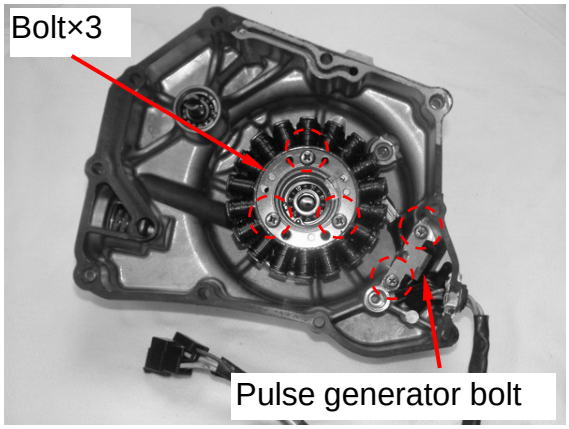
Install the AC.G. coil set onto right crankcase cover (3 bolts).

Install pulse generator (2 bolts). ◦

Tie the wire harness securely onto the indent ofcrankcase.

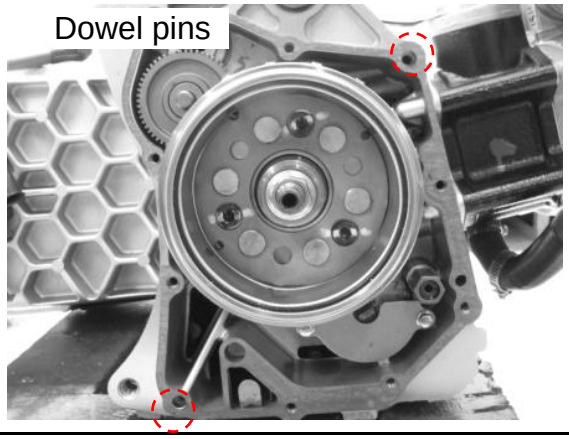
Caution

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

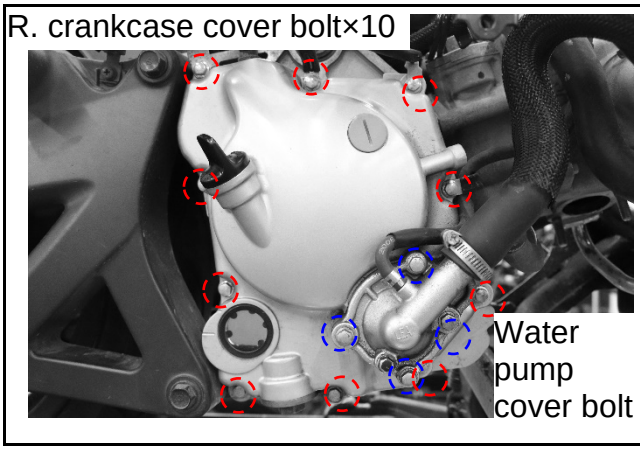


Right Crankcase Cover Installation

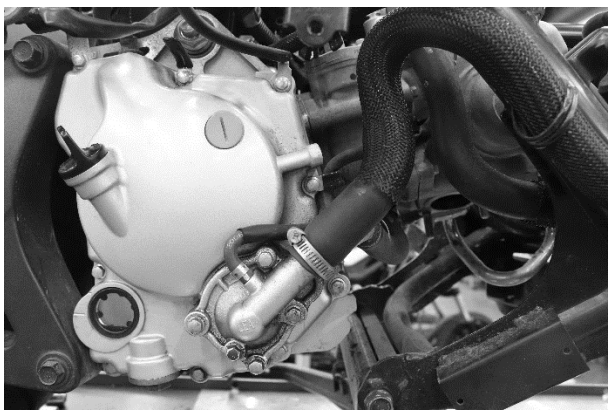
Install dowel pins and new gasket.
Remove water pump cover.
Install right crankcase cover onto the crankcase.
Align the water pump shaft indent with the oil pump shaft.



Install right crankcase cover (10 bolts).
Install the dowel pin, new gasket and water pumpcover onto crankcase cover.



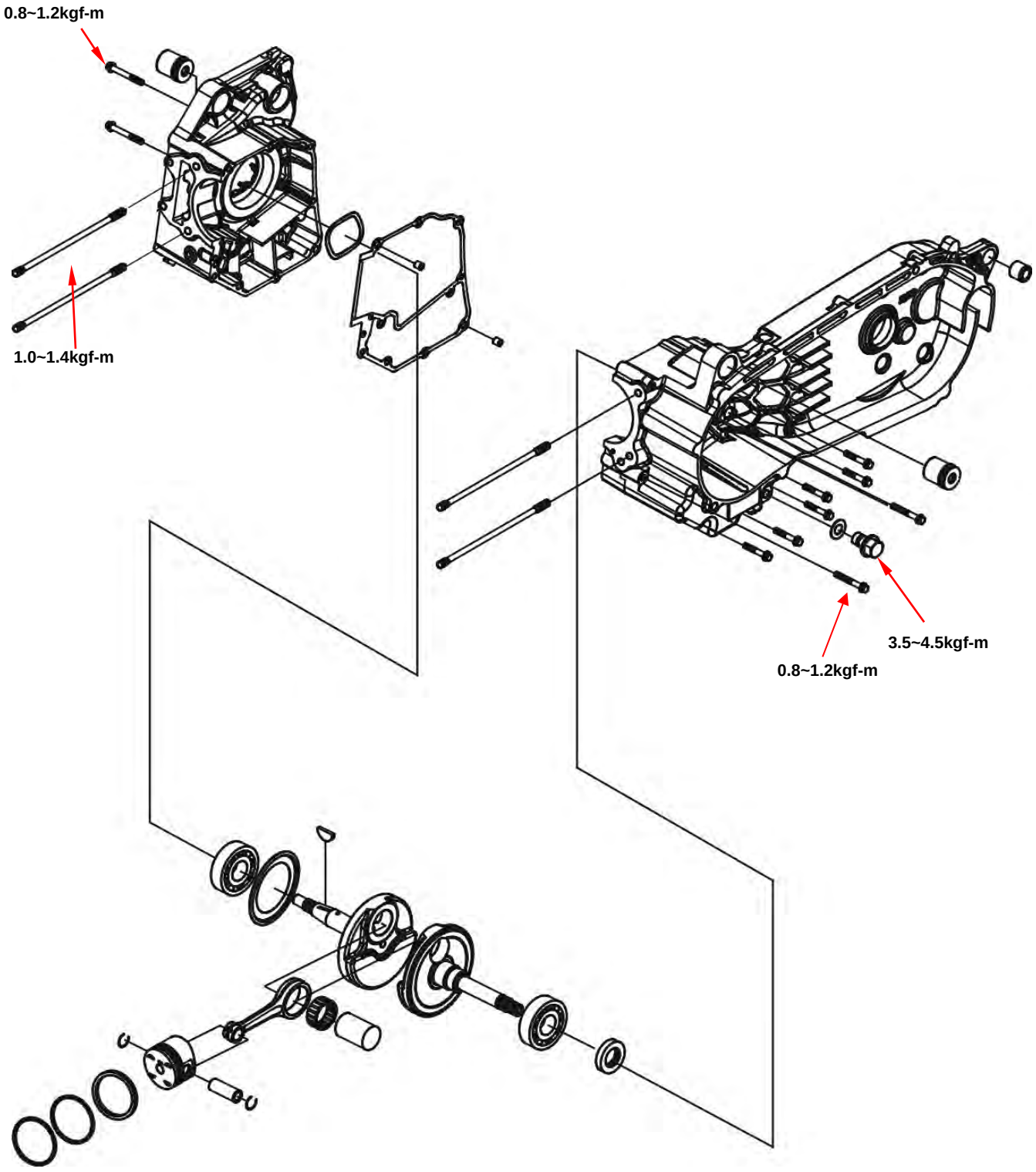
Connect coolant hoses onto the right crankcasecover.
Add engine oil and coolant.



NOTE:

Mechanism Diagram ····· 11-1	Crankcase Disassembly····· 11-3
Precautions in Operation····· 11-2	Crankshaft Inspection····· 11-4
Troubleshooting····· 11-2	Crankcase Assembly····· 11-6

Mechanism Diagram



Precautions in Operation

General Information

- This Section concerns disassembly of the crankcase for repair purpose.
- Remove following components before disassembling crankcase.
  - —Engine remove Chapter 5
  - —Cylinder head Chapter 6
  - —Cylinder and piston Chapter 7
  - —Drive face and driven pulley Chapter 8
  - —AC generator/Start one way clutch Chapter 10
- In case it requires replacing the crankshaft bearing, the driving chain of engine oil pump or the timing chain, it is preferably to replace crankshaft as a unit.

Specification

Unit: mm

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

Torque value

Bolts for crankcase	0.8~1.2kgf-m
Cylinder stud bolts	1.0~1.4kgf-m
Drain plug bolt	3.5~4.5kgf-m

Special tools

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

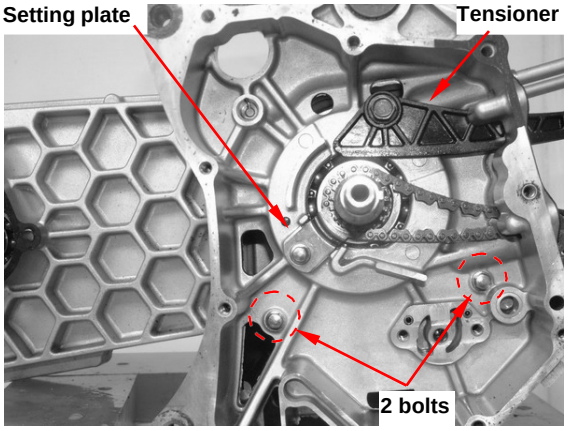
Troubleshooting

Engine noise

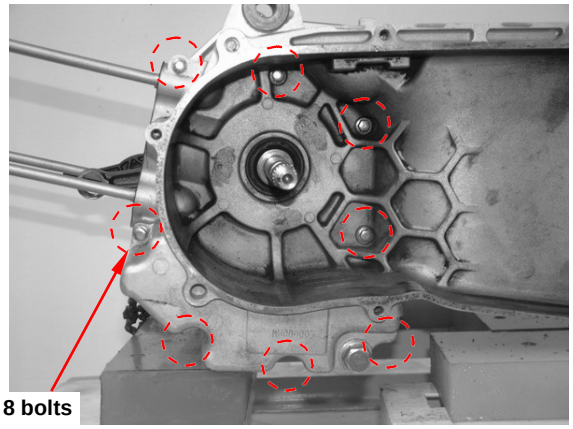
- Loose crankshaft bearing
- Loose crankshaft pin bearing
- Worn out piston pin and pin hole

Crankcase Disassembly

Remove the cam chain setting plate, and then remove cam chain.
Loosen the pivot bolt and remove the tensioner.
Loosen 2 bolts on the right crankcase.



Loosen 8 bolts on the left crankcase.



Place right crankcase downward and left crankcase upward.
Install crank disassemble tool onto left crankcase.

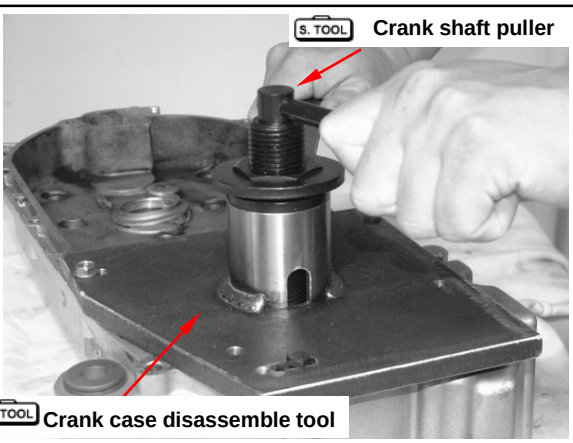
Caution

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

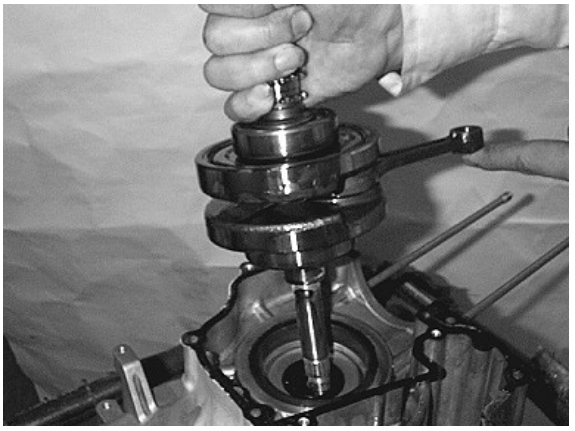


Install left crank shaft puller into crank case disassemble.
Hold left crank shaft puller nut by clutch nut wrench, and turn the shaft puller to press out crank shaft from left crankcase.

Special tool:
Crank case disassemble
SYM-1120000-HMA H9A
L. Crank shaft puller
SYM-1130000-HMA H9A
Clutch nut wrench SYM-9020200



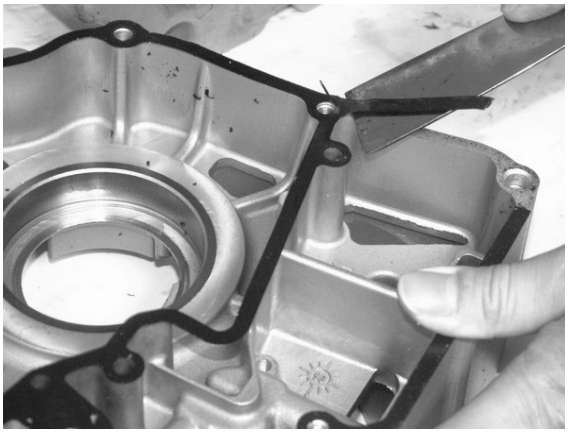
Remove crankshaft and wave washer from right crankcase.



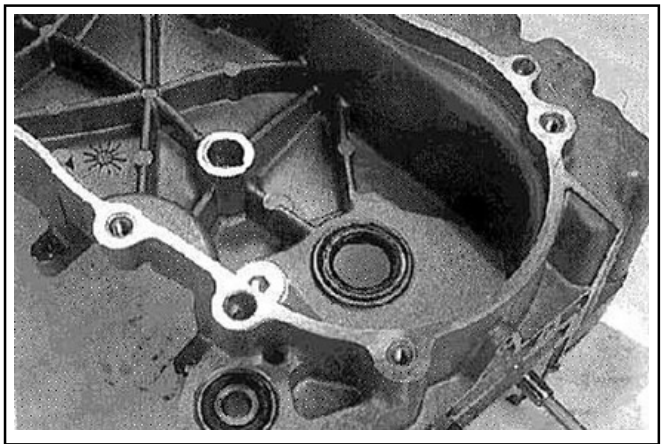
Remove gasket and dowel pins.
Scrape gasket residues off the crankcase contact surface.

⚠ Caution

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

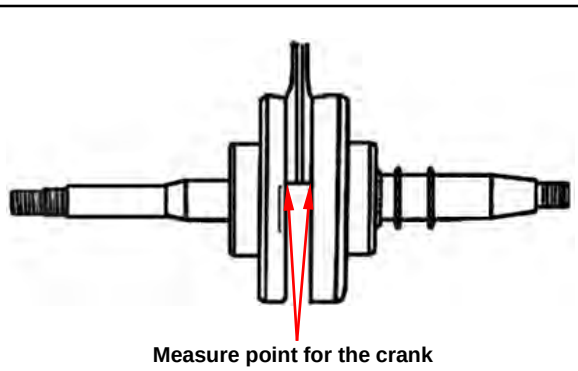


Drive out left crankcase oil seal.



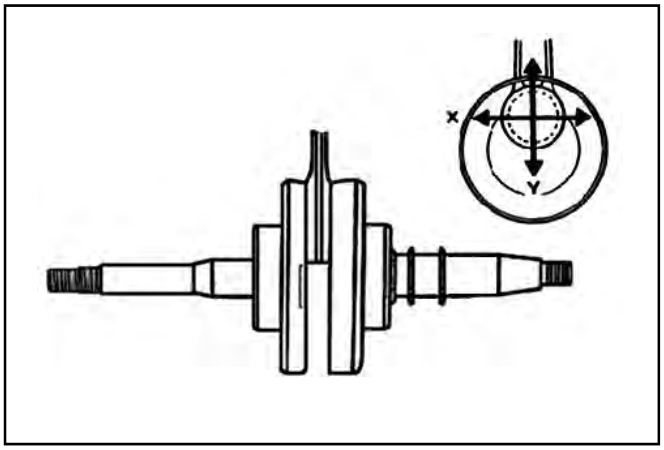
Crankshaft Inspection

Use a thickness gauge to measure left and right clearance of connecting rod big end.
Service limit: 0.4 mm

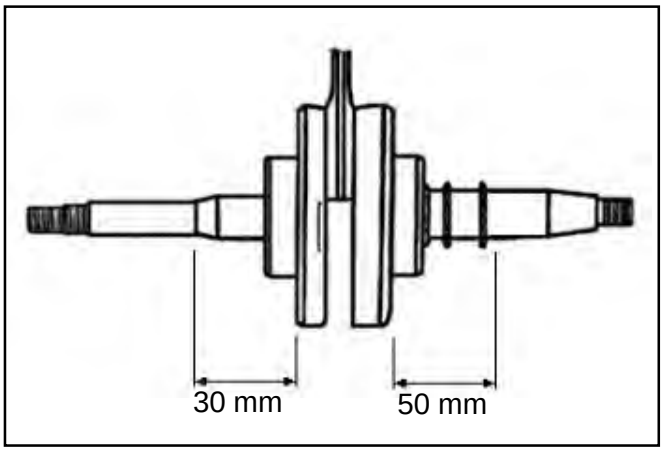


Measure point for the crank big end of the connecting rod.

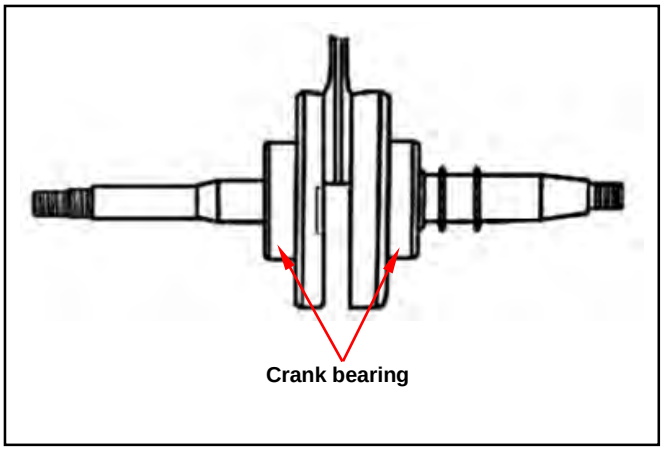
Measure the clearance of the big end at the vertical directions.
Service limit: 0.05 mm



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



Check crankshaft bearing
Use hand to crank the bearing to see it moves freely, smoothly and noiseless.
Check the inner ring to see it links firmly on the bearing.

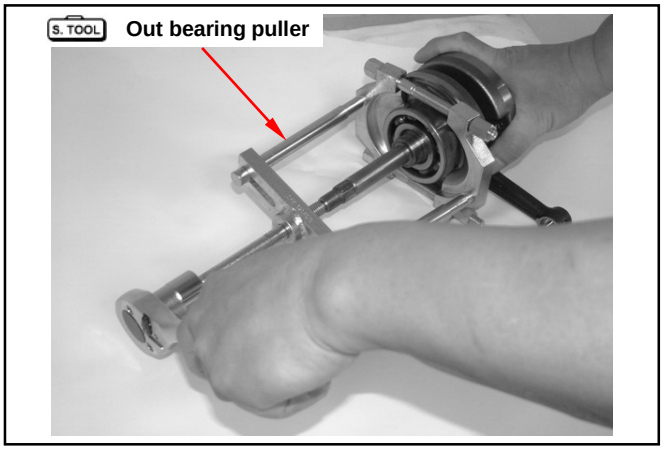


If any roughness, noise and loose linkage are detected, replace the bearing with new one.

Caution

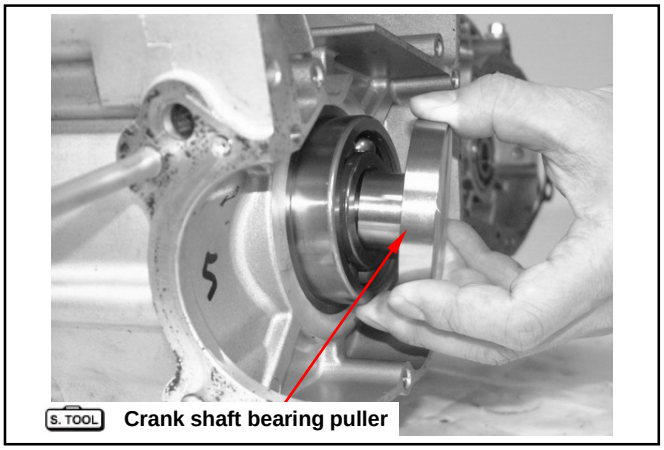
- The bearing shall be replaced in pair.

Special tool:
Outer bearing puller SYM-6204001

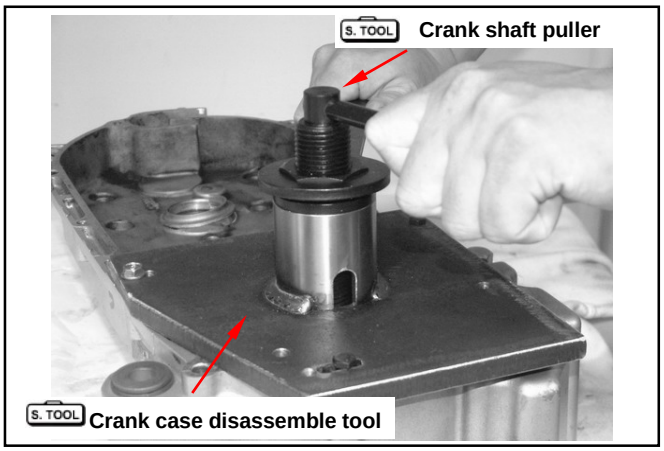


Crankcase Assembly

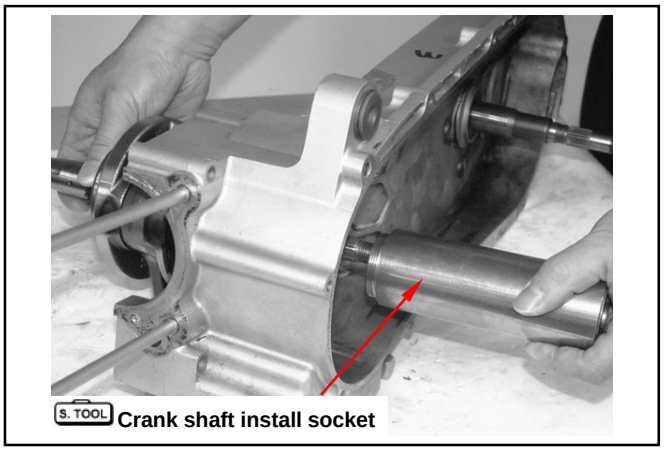
Install new bearing and bearing puller onto left crankcase bearing hole.
Special tool:
L. crank shaft bearing puller SYM-9100100



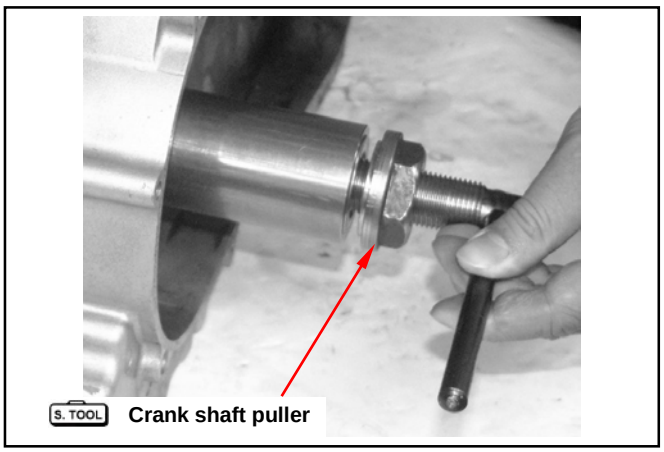
Install crank disassemble tool onto left crankcase.
Install left crank shaft puller into crank case disassemble.
Hold left crank shaft puller, and turn the shaft puller nut by clutch nut wrench to pull in crank shaft bearing into left crankcase.
Special tool:
Crank case disassemble SYM-1120000-HMA H9A
L. Crank shaft puller SYM-2341110-HMA
Clutch nut wrench SYM-9020200



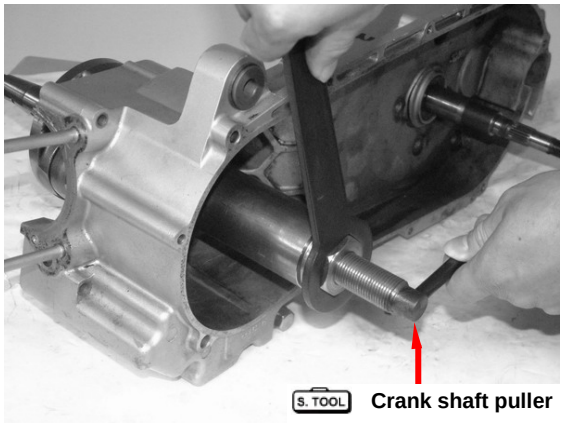
Install crank shaft onto the left crankcase and install crank shaft install socket.
Special tool:
Crank shaft install socket & oil seal driver SYM-2341110- HMA RB1



Turn in the crank shaft puller spiral tooth to the left crank shaft.
Special tool:
L. Crank shaft puller SYM-1130000-HMA H9A



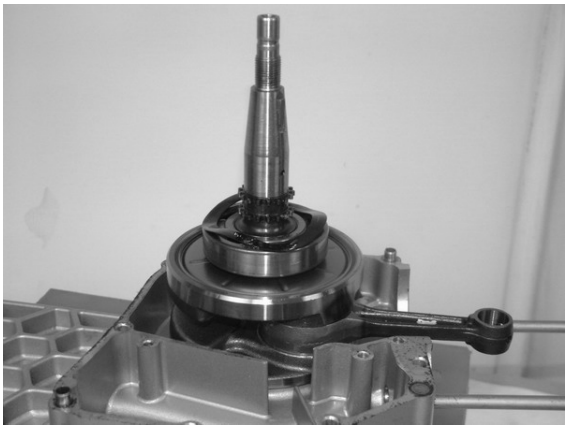
Hold left crank shaft puller, and turn the shaft puller nut by clutch nut wrench to pull in crank shaft into left crankcase.



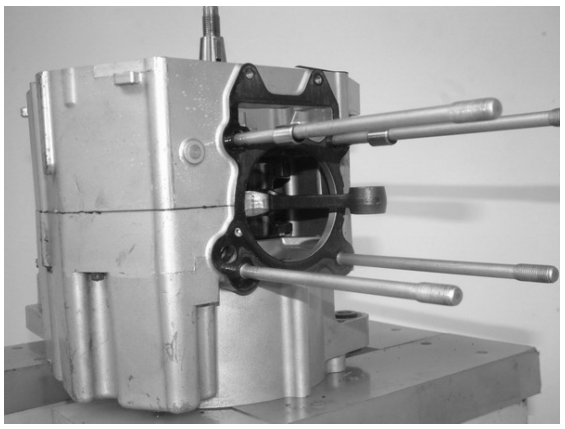
Put wave washer onto right crank bearing.

Caution

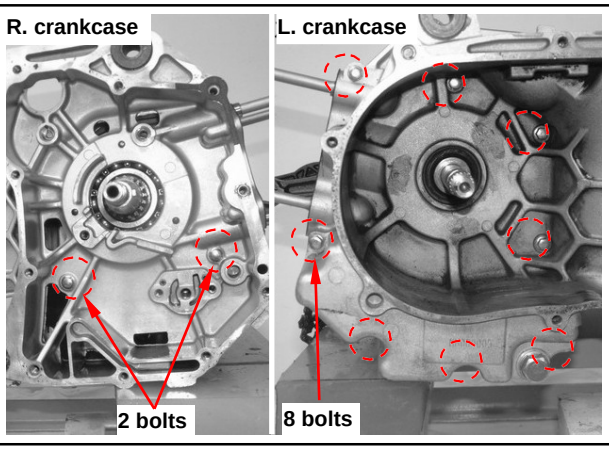
- Right flank the wave washer piece certainly must install. Cannot install the wrong position or leak the attire. Otherwise can cause the motorcycle to have the fierce vibration



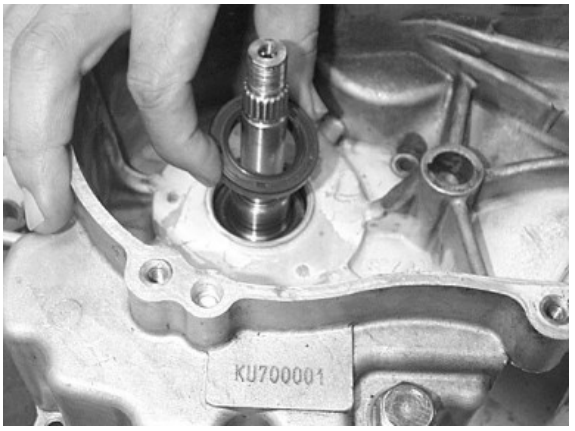
Install 2 dowel pins and new gasket.
Install the right crankcase onto the left crankcase



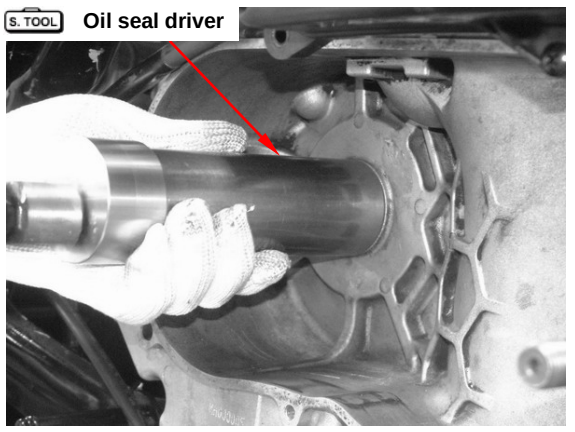
Tighten 8 bolts on the left crankcase.
Tighten 2 bolts on the left crankcase.
Torque value: 0.8~1.2kgf-m



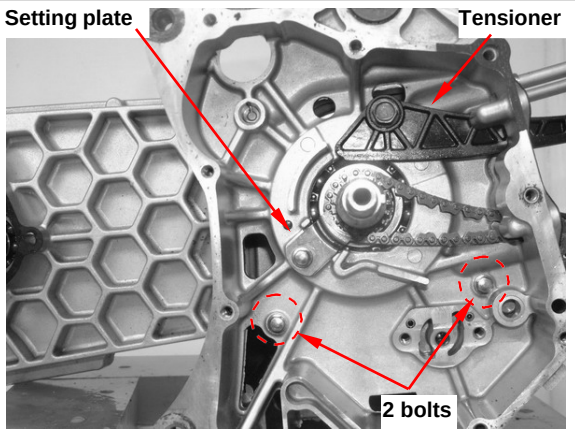
Apply a layer of grease on the lip of oil seal
Clean the crankshaft with clean solvent.



Install the oil seal in the left crankcase with special tool.
Special tool:
Crank shaft install socket & oil seal driver
SYM-2341110- HMA RB1



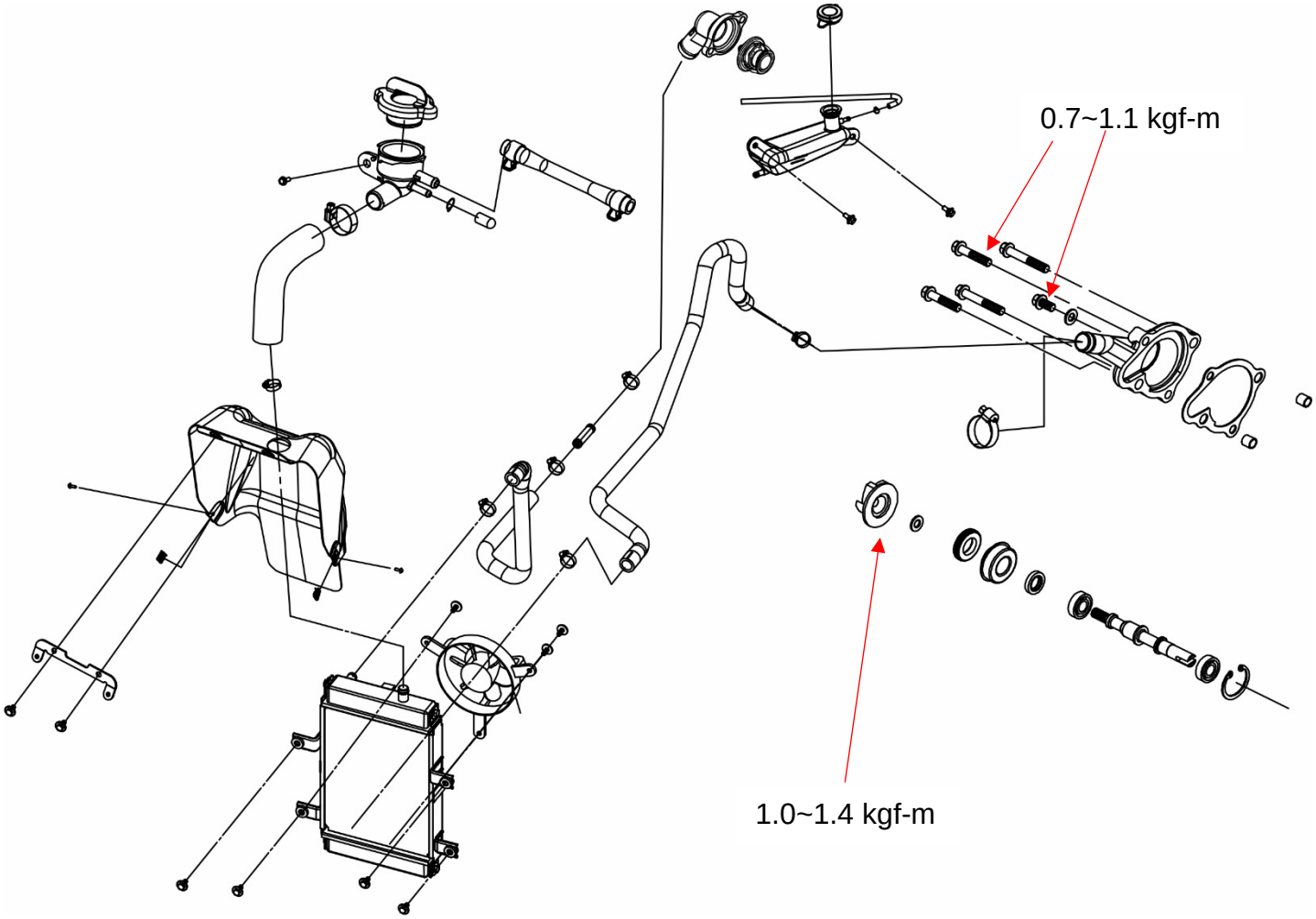
Install the cam chain tensioner & and tighten the bolts.
Torque value: 0.8~1.2kgf-m
Install the cam chain.
Install the cam chain setting plate.



NOTE:

Mechanism Diagram ····· 12-1	Change of Coolant ····· 12-5
Precautions in Operation ····· 12-2	Radiator ····· 12-6
Troubleshooting ····· 12-2	Water Pump ····· 12-8
Diagnosis for Cooling System ····· 12-3	Thermo Unit / Thermostat ····· 12-12

Mechanism Diagram



Precautions in Operation

General Information

Warning

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

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

Technical Specification

Item	Specification
Pressure to open filler cap	0.9±0.15 kgf/cm²
Capacity of coolant:	1400 c.c.
Thermostat	Begins to activate at : 71±1.5℃ Stroke :0.05~3.5mm / 80℃
Boiling point	Not-pressure : 107.7ºC Pressurized: 125.6ºC

Torque Value

Water pump impeller 0.8~1.2kgf-m
Water pump cover 0.8~1.2kgf-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.

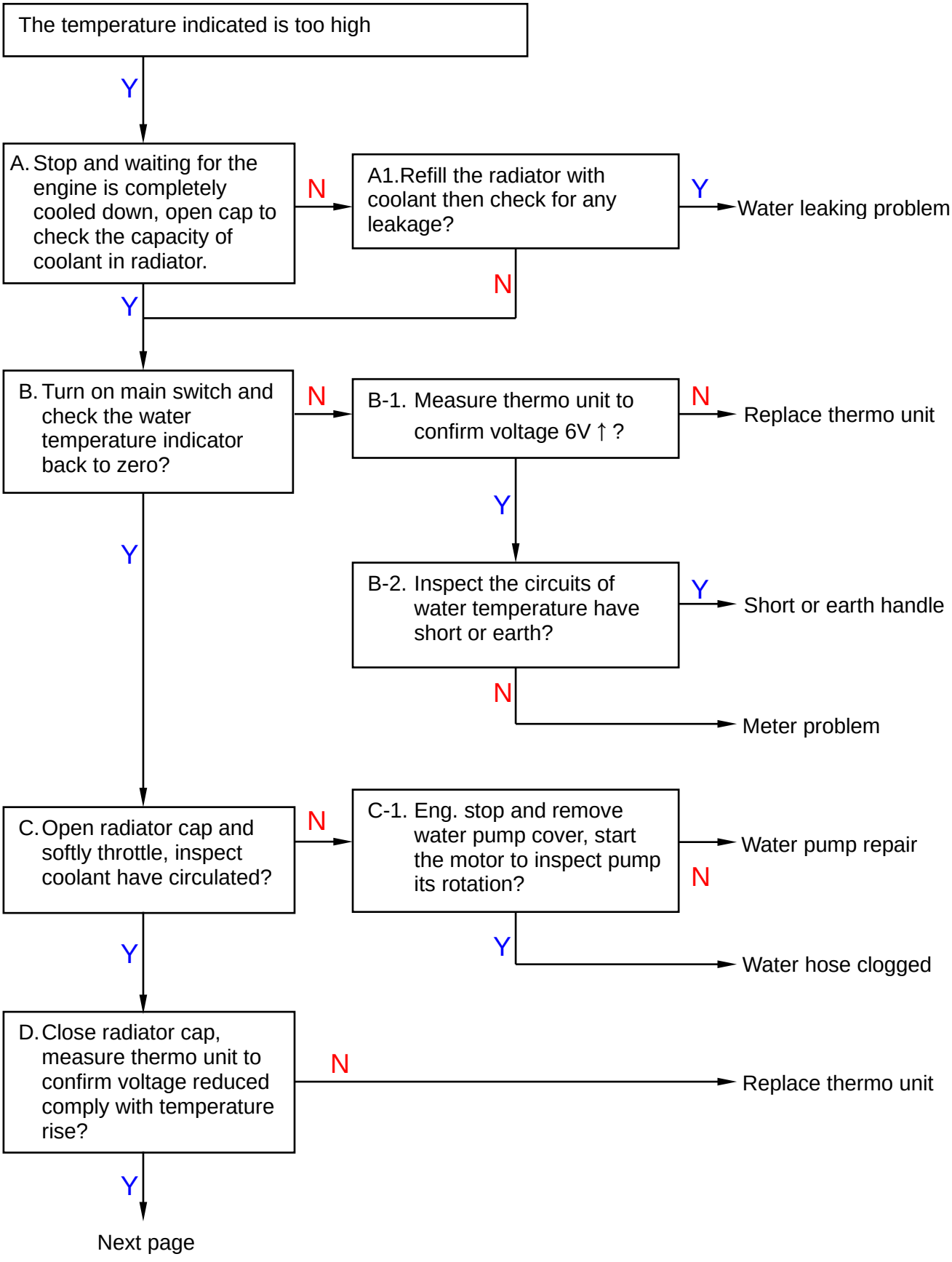
The engine temperature is too low

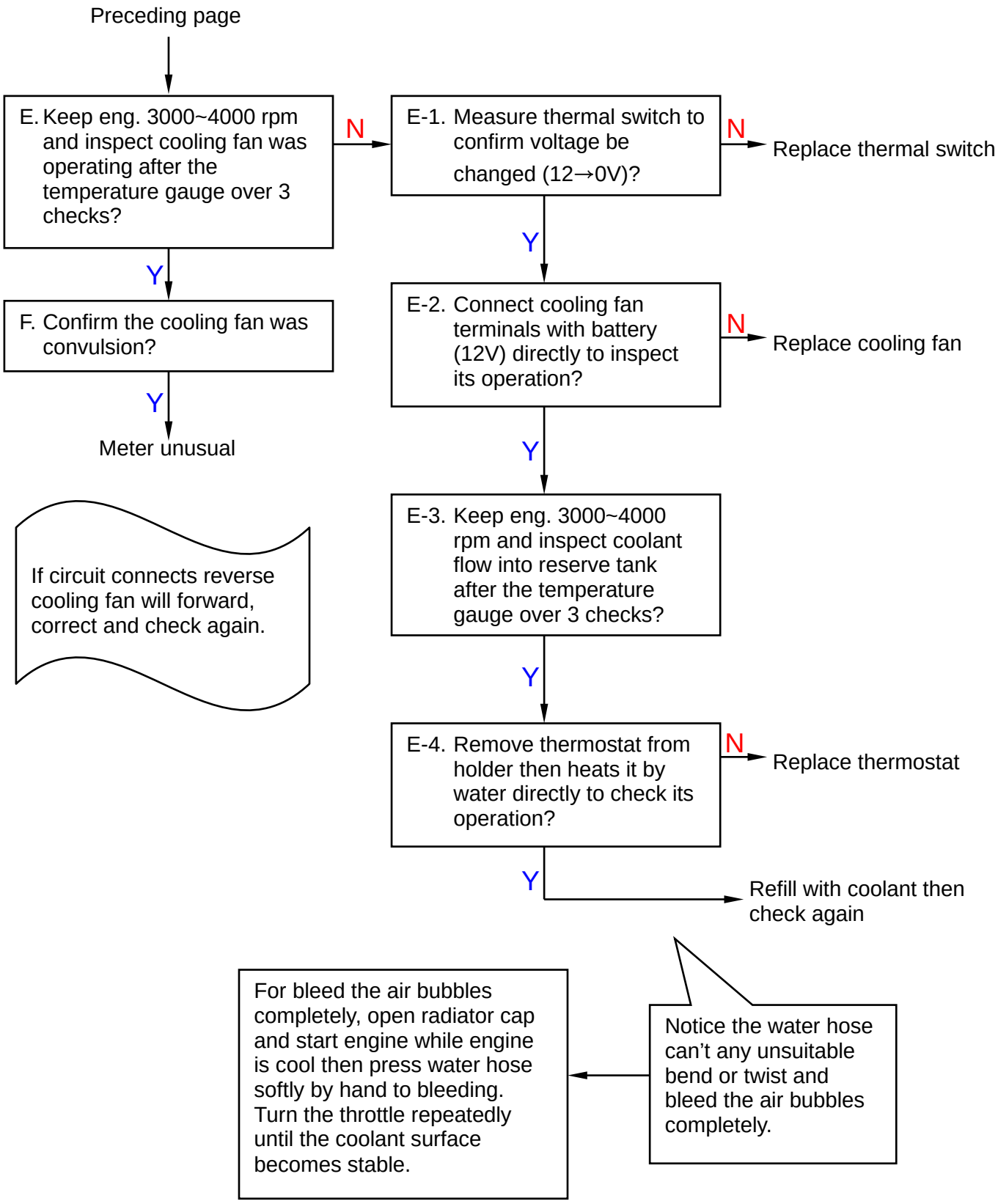
- The water thermometer and the temperature sensor malfunction.
- The thermostat is stuck to open.

Coolant is leaking

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

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
E-2. Connect cooling fan terminals with battery (12V) directly to inspect its operation?
N
Replace cooling fan
F. Confirm the cooling fan was convulsion?
Y
Y
Meter unusual
If circuit connects 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
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.
Notice the water hose can't any unsuitable bend or twist and bleed the air bubbles completely.

Change of Coolant

Warning

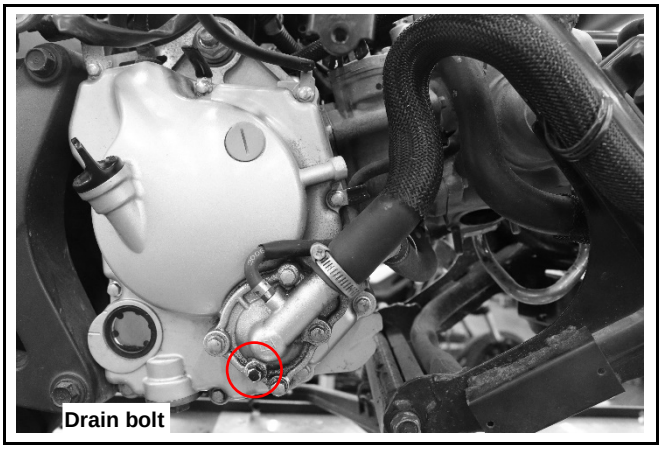
- Never attempt to carry out service work on the cooling system unless the engine is completely cooled down, otherwise, you may get scalded.

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



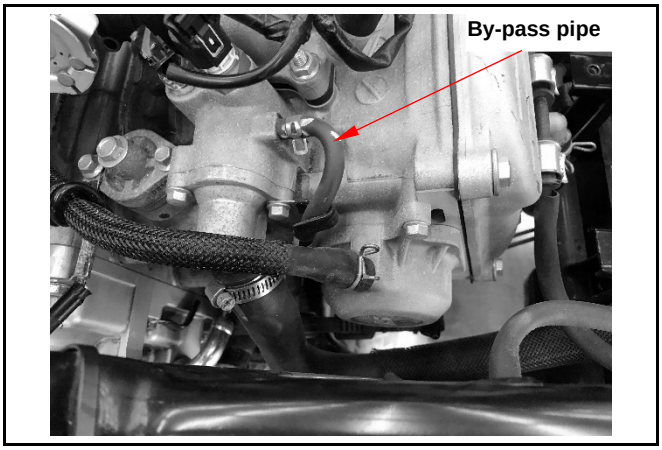
Place a water pan under the water pump; loosen the drain bolt to drain out the coolant.

Reinstall the drain bolt.



Refilling system with coolant and bleeding the air bubbles.

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



Caution

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

Coolant recommended: SYM radiator agent.
Concentration: 50%

Check reservoir tank

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

Caution

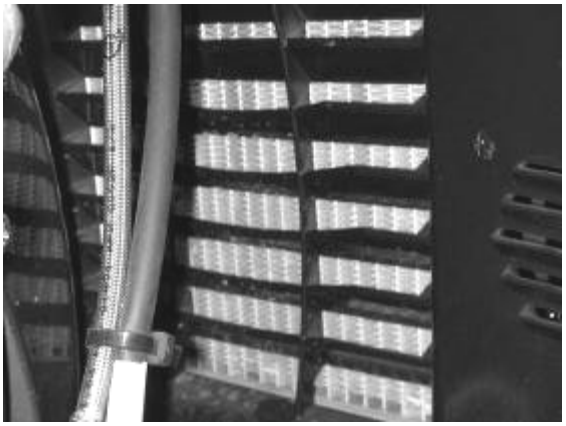
- The reserve tank liquid level coca too is not high, after avoids the water temperature elevating, in the cooling system the refrigerant backflow floods.



Radiator

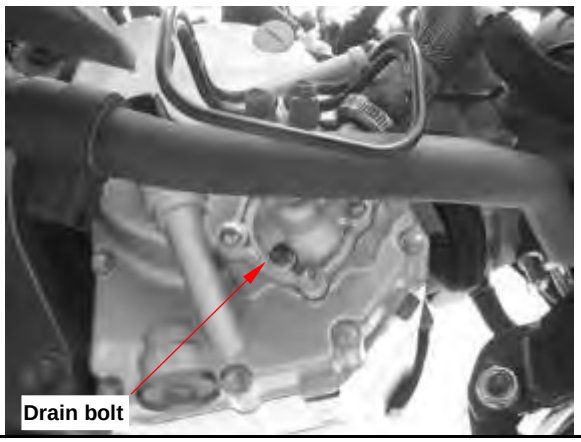
Check

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

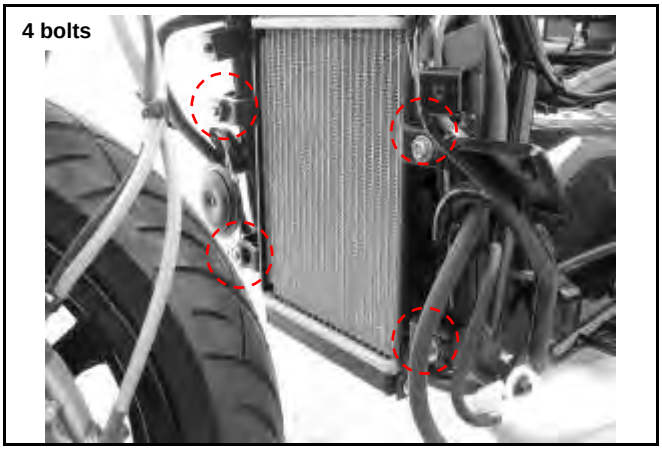


Remove

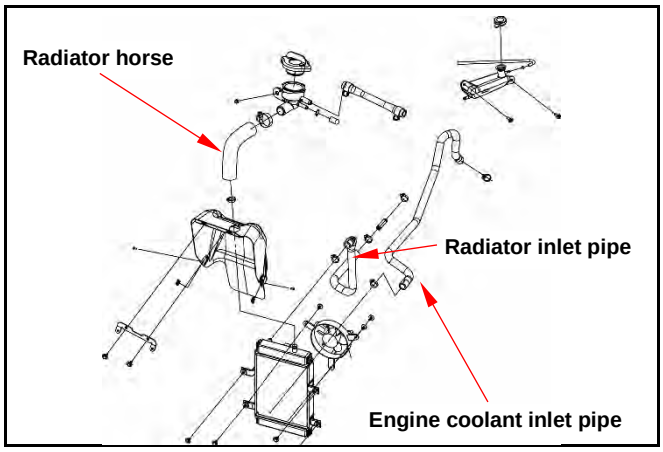
Place a water pan under the water pump; loosen the drain bolt to drain out the coolant.



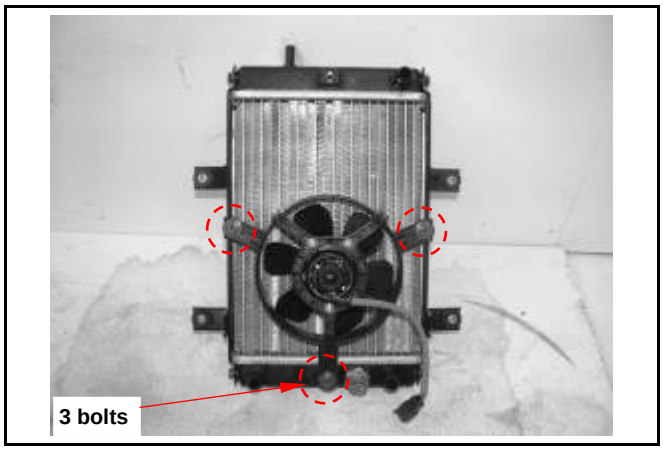
Remove the front cover and under spoiler (refer chapter 12).
Loosen the radiator mounting bolts (4 bolts).



Disconnect the couplers for the fan motor.
Remove engine coolant inlet pipe, radiator inlet pipe, and radiator hose.



Loosen the cooling fun mounting bolts (3 bolts).



Installation

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



Caution

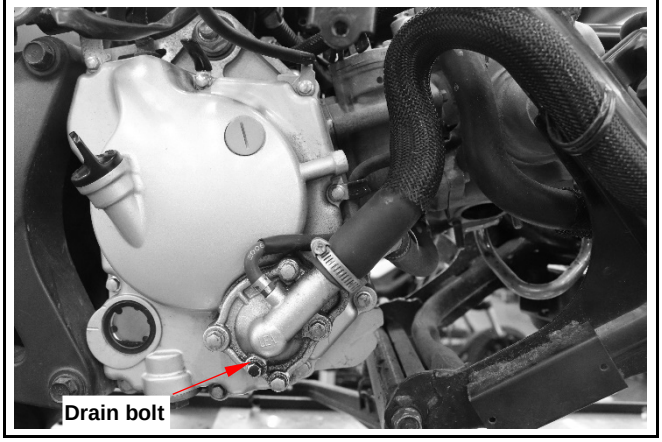
- Liquid packing must be applied to the thermo switch before installing to avoid damaging the radiator.

Water Pump

Check water pump seal / cooling system divulges inspection

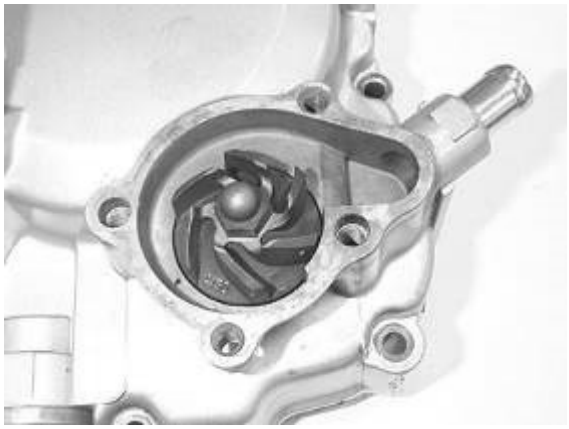
- Disassembles the refrigerant drain bolt, overflows little buckles the N actually fluid, confirmed overflows the refrigerant whether has the greasy dirt.
- Turns on lathe the engine oil gauge rule, the inspection engine oil whether does have bleaches situation of the emulsified.

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



Removal of water pump

Loosen the drain bolt to drain out the coolant.
Remove the water hose.
Loosen 4 bolts and remove the pump cover.
Loosen 10 bolts and remove the engine right cover.
Take off the gasket and dowel pins.



Turn pump impeller clockwise and remove.

Caution

- The impeller is provided with left turn thread.



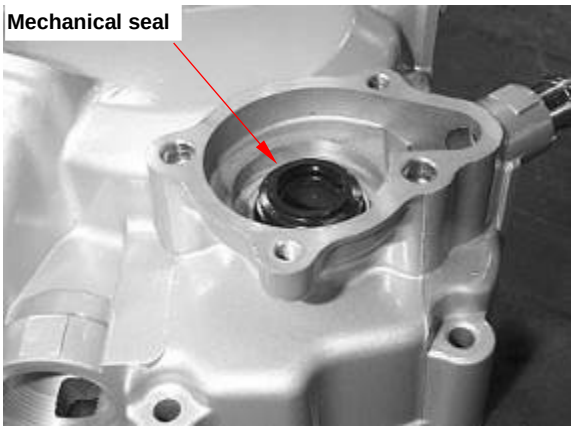
Remove the cir clip from the right crankcase cover.
Remove the water pump shaft and the inner bearing.
Remove the outside bearing by inner bearing puller.
Rotate the inner ring of bearing, the bearing shall move smoothly and quietly.
If the bearing does not rotate smoothly or produces a noise, replace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



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

Caution

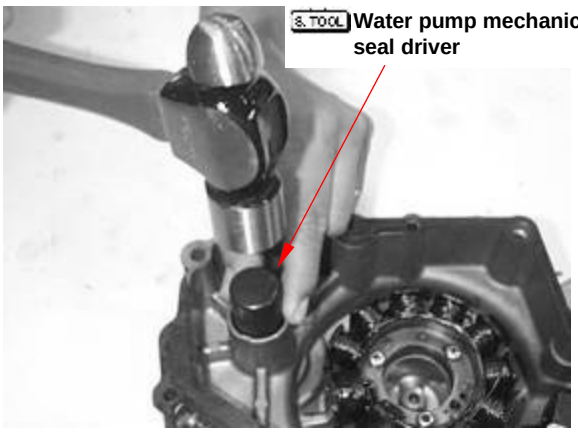
- The mechanical seal and inside seal must be replaced as a unit.



Replacement of Mechanical Seal

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

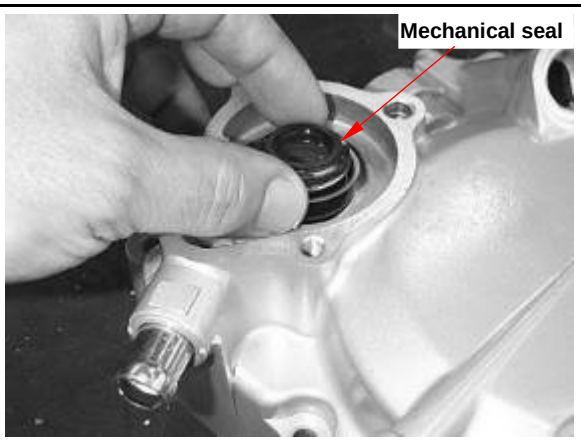
Special tools:
Inner bearing puller
Water pump bearing drive



Caution

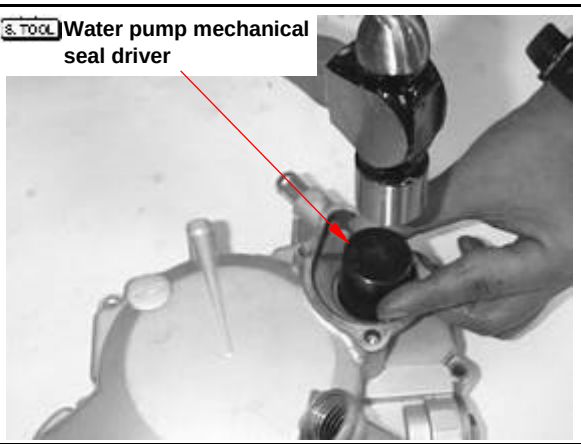
- Replace a new mechanical seal after removing it.

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

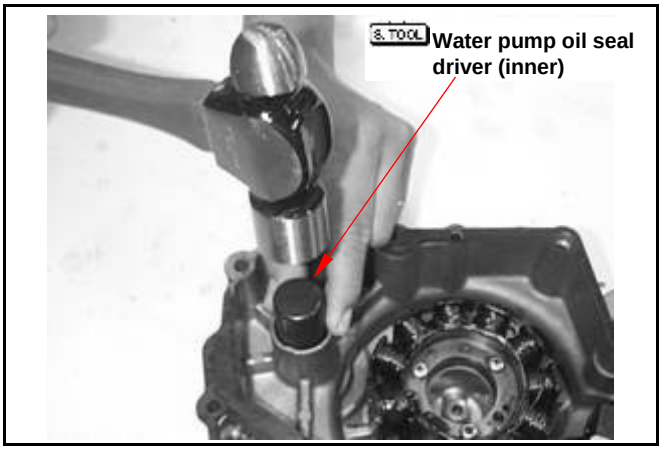


Install the mechanical seal onto the right crankcase.

Special tools:
Water pump mechanical seal driver



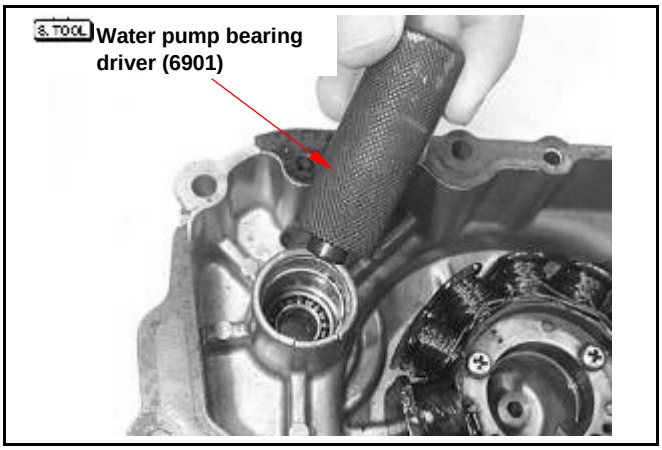
Install the new inner seal onto the right crankcase.
Special tools:
Water pump oil seal driver (inner)



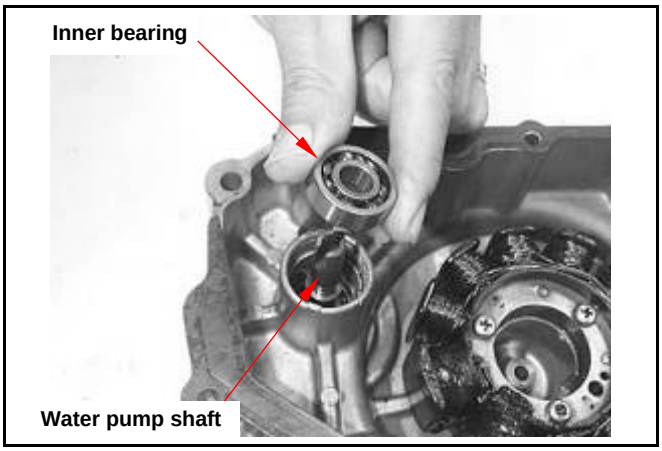
Install a new outside bearing to the right crankcase cover.
Special tools:
Water pump bearing driver (6901)

Caution

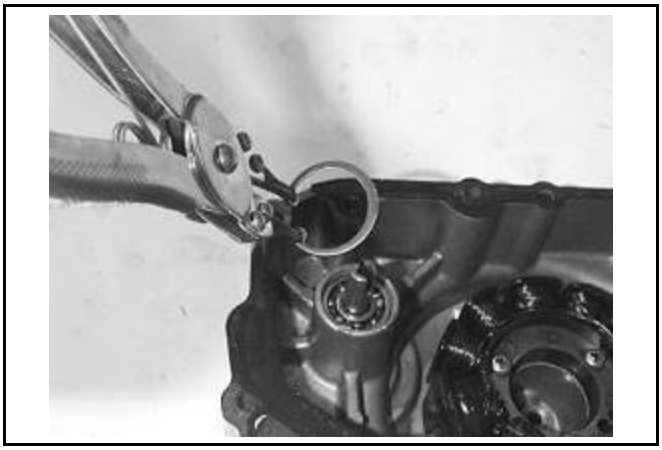
- Do not reuse old bearing. It must be replaced with a new one once it has been removed.



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



Install the cir clip to hold the inner bearing.



Install the seal washer into the impeller.

Caution

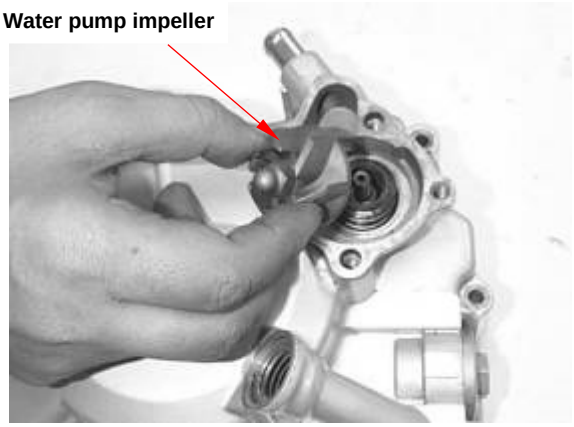
- Washer must be replaced together with the mechanical seal.



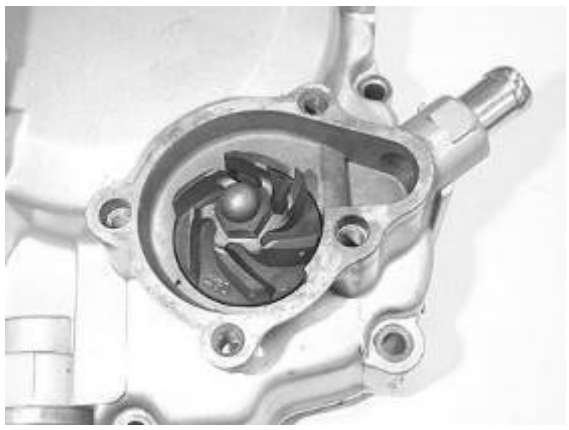
Install the impeller onto the water pump shaft and tighten.
Torque Value: 1.0~1.4kgf-m

Caution

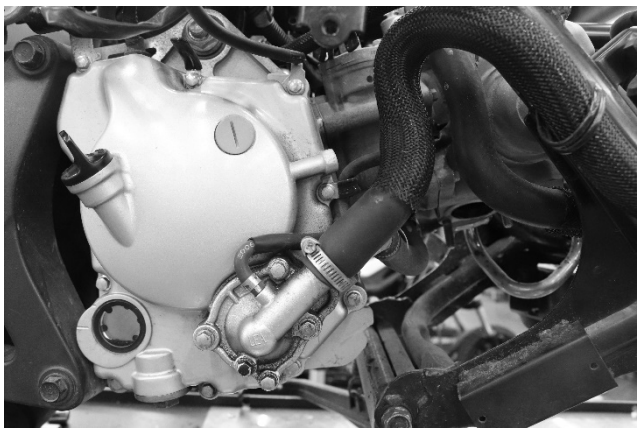
- The impeller is left thread.



Install the dowel pin and right cover gasket.
The rotation water pump impeller, causes the water pump drive shaft scoop channel, aligns the oil pump drive shaft flange, install the right crank case. (10 bolts)

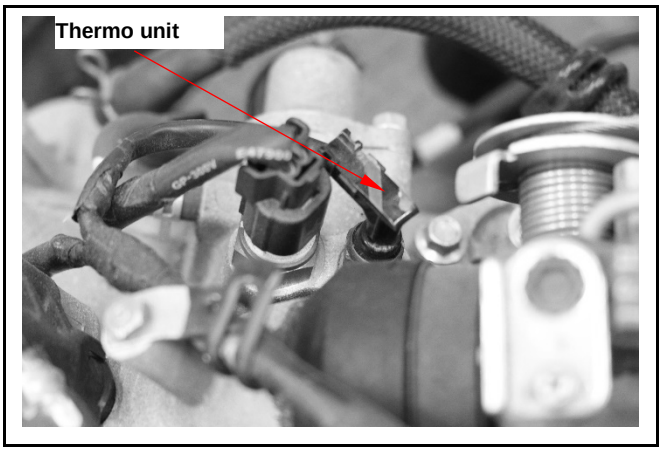


Install the dowel pin and new gasket.
Install the water pump cover with 4 bolts.



Thermo Unit

Please refer to chapter 17 for inspection of temperature sensor.



Removal

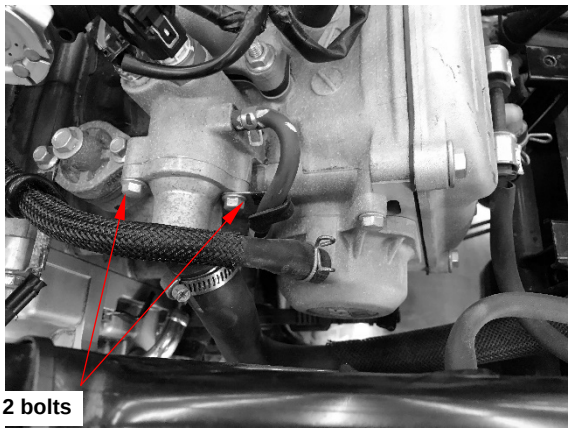
Remove the body cover.
Drain out the coolant.
Disconnect the cable of temperature sensor.
Remove the coolant temperature sensor.

Installation

Apply a coat of 3 Bond No. 1212 sealant or equivalent to the thread of temperature sensor and install it on the holder.
Connect the cable to the temperature sensor.
Refill the coolant and bleed out the air bubble (P12-5).
Install the right rear cover.

Thermostat

Please refer to chapter 17 for inspection of thermo unit.



Removal

Remove the luggage box and body cover.
Drain out the coolant.
Remove radiator inlet pipe and by-pass pipe.
Remove the thermostat cover. (2 bolts)
Remove the thermostat.

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

Caution

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





Technical Data

Valve begins to open	71±1.5℃
Valve stroke	0.05~3.5mm

Installation
Install the thermostat.
Install the thermostat cover. (2 bolts)
Refill the coolant and bleed out the air bubble (Page 12-5).

Caution

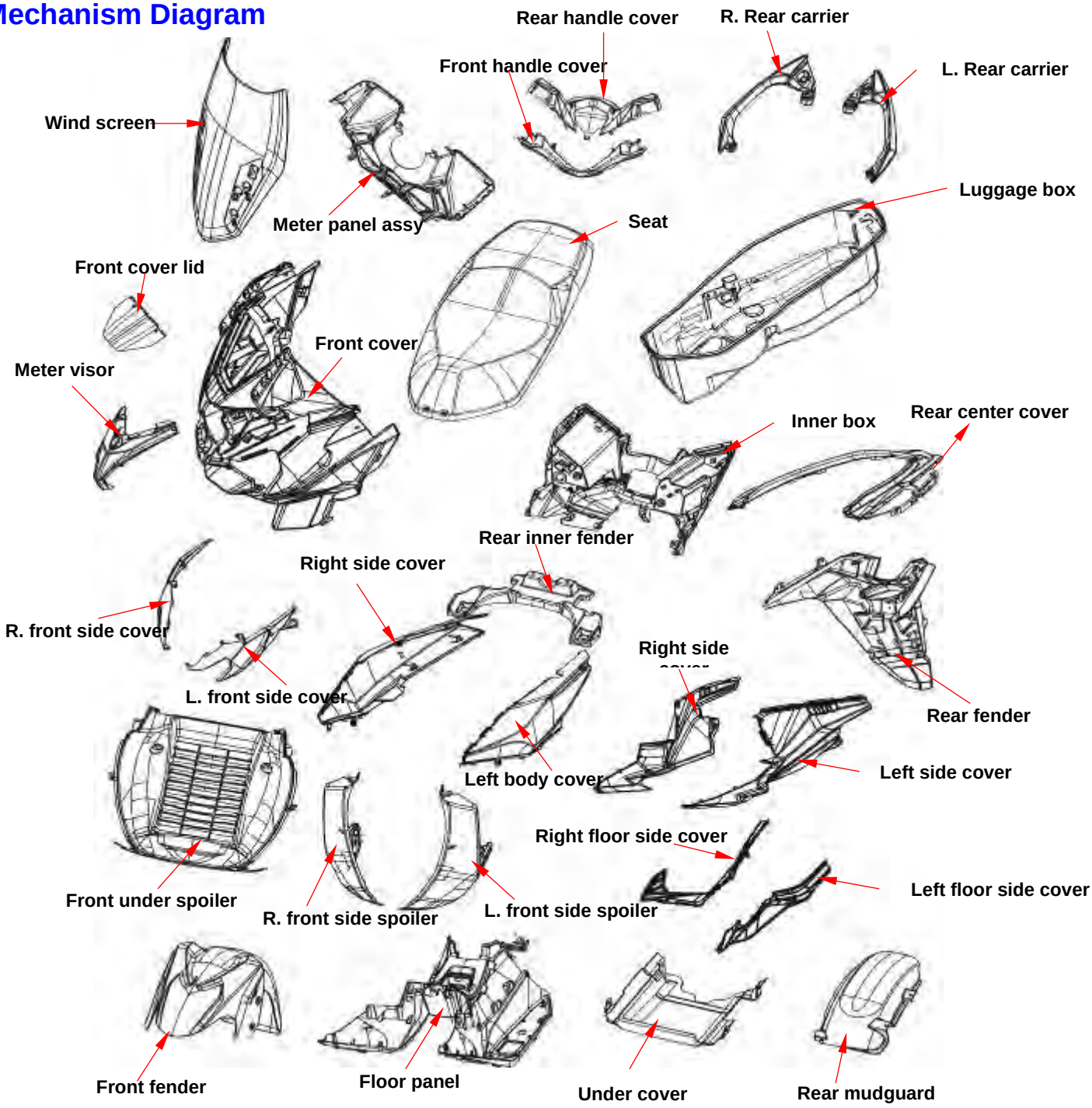
Always use a new oil ring and apply a coat of grease on it before installing.

Refill the specified coolant as necessary.

Notes:

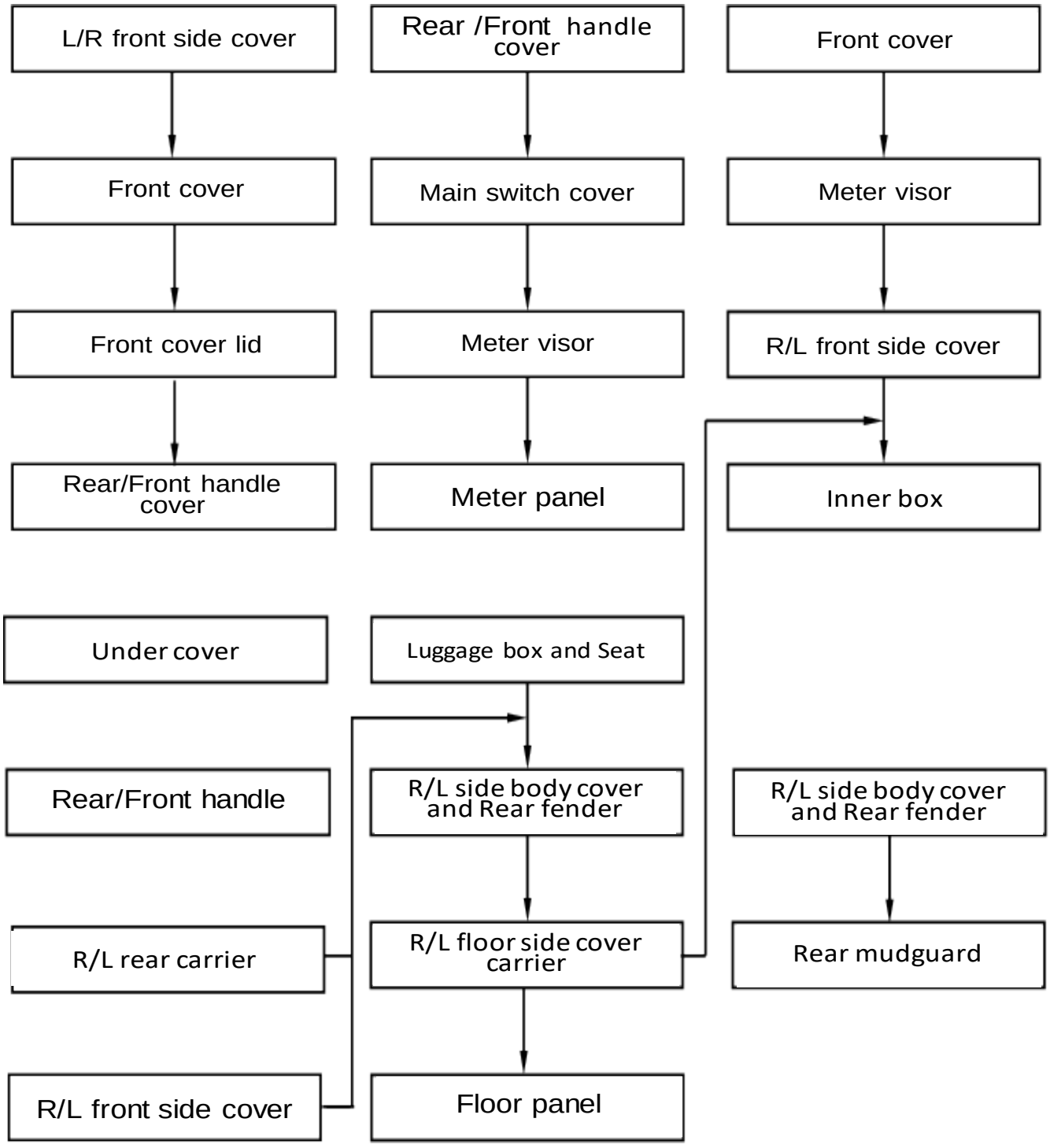
Mechanism Diagram ····· 13-1	Front Under Spoiler ····· 13-12
Maintenance ····· 13-2	Rear Carrier ····· 13-12
Handle Cover ····· 13-3	Luggage Box ····· 13-13
Front Cover ····· 13-4	Rear Body Cover ····· 13-14
Meter Panel ····· 13-6	Floor Panel ····· 13-15
Inner Box ····· 13-7	Front Fender ····· 13-15
Side Cover ····· 13-9	Inner Fender ····· 13-15

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.

Handle Cover

Remove

Remove 4 screws from the front side of handle side covers.



Remove 1 screws from the rear side of handle side covers.
Remove the right and left handle side covers.



Remove 2 screws from the rear side of handle upper cover.



Remove the handle upper cover.



Installation

Install in reverse order of removal procedures.

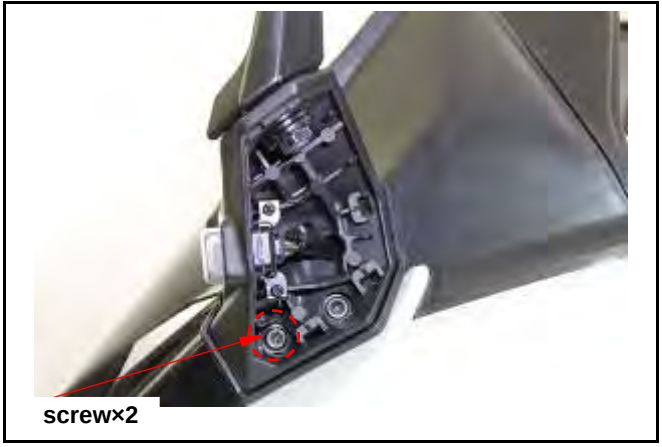
Front Cover

Remove

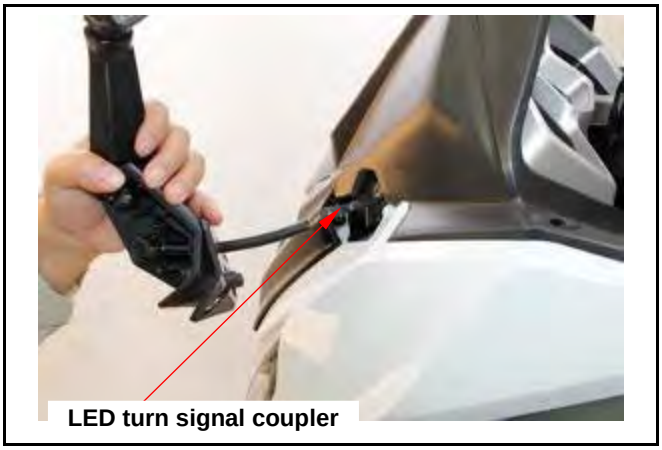
Remove back mirror base cover.



Remove 2 screws from the meter visor and remove the meter visor.



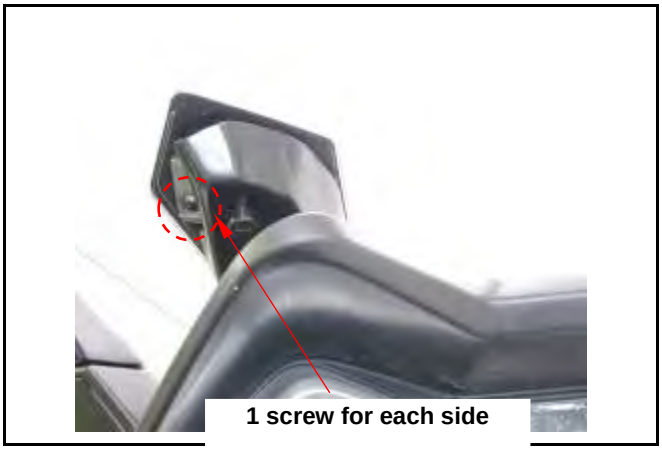
Disconnect the turn signal LED lamps coupler.



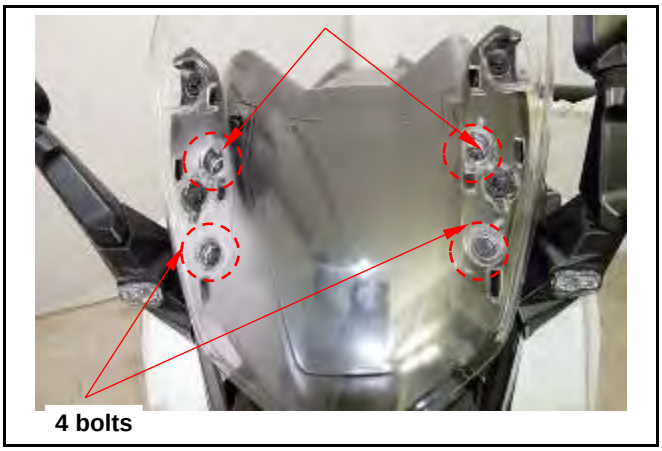
Remove the right and left back mirror from the front cover.



Remove wind screen R/L garnish 1 screw from each side.
Remove wind screen garnish.



Remove 4 flange bolts from the front cover.

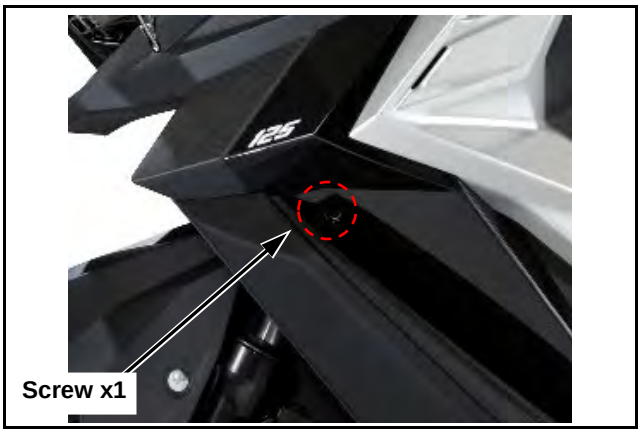


Remove the wind screen from the front cover.



Installation
Install in reverse order of removal procedures.

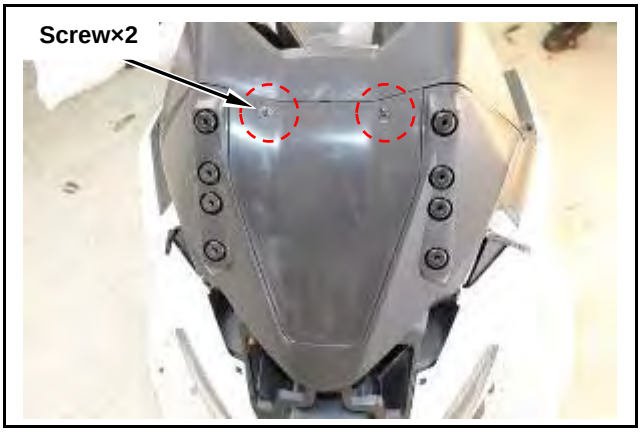
Remove front left and right side cover screw x1



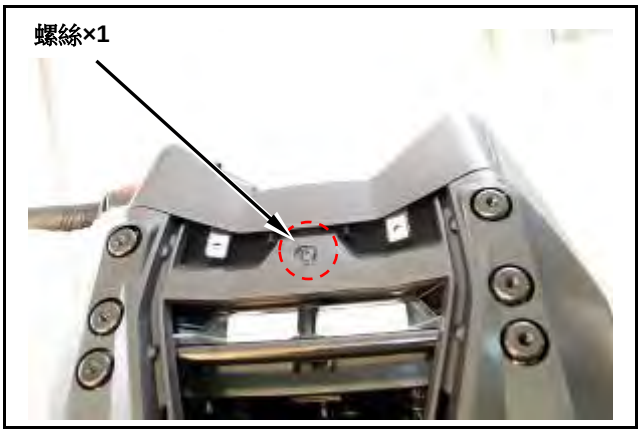
Remove R/L front side cover forward，and then push internal cantilever snap from counterpart.



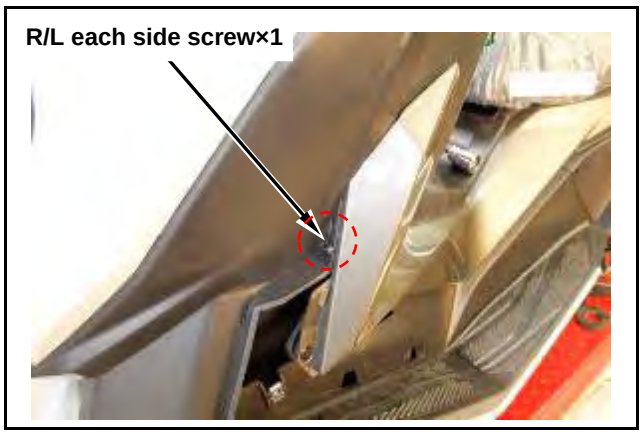
Remove front cover lid. (screwsx2)



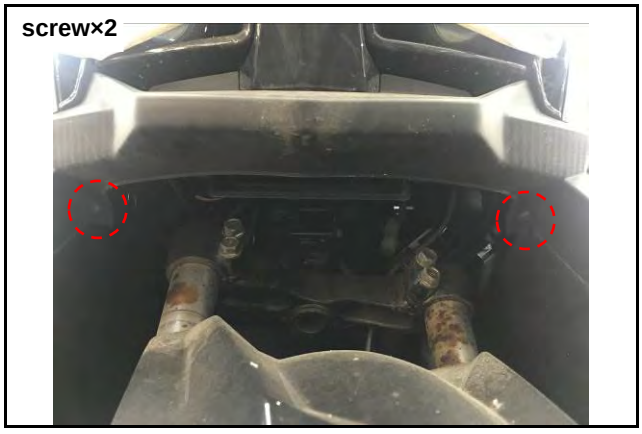
Remove front top cover. (screwx1)



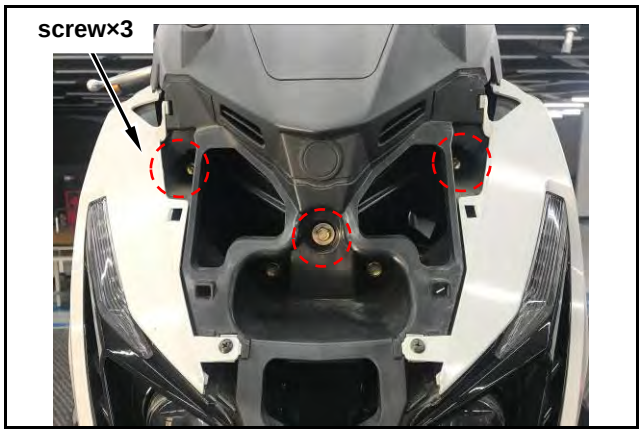
Remove R/L each side cover. (screwx1)



Remove screws under front cover. (screwx2)

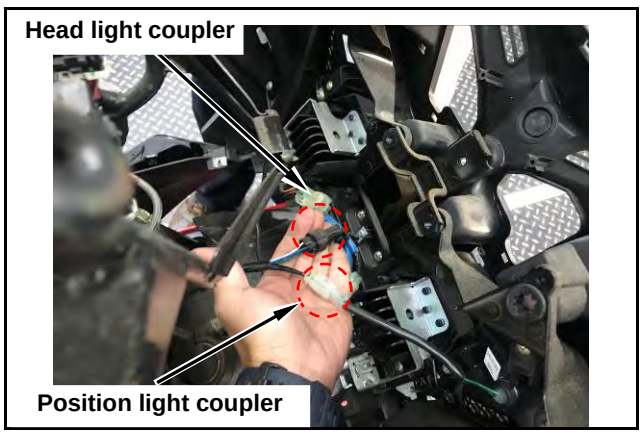


Remove inside front cover (screwx3)



Disconnect head light and position light coupler.

Remove front cover.

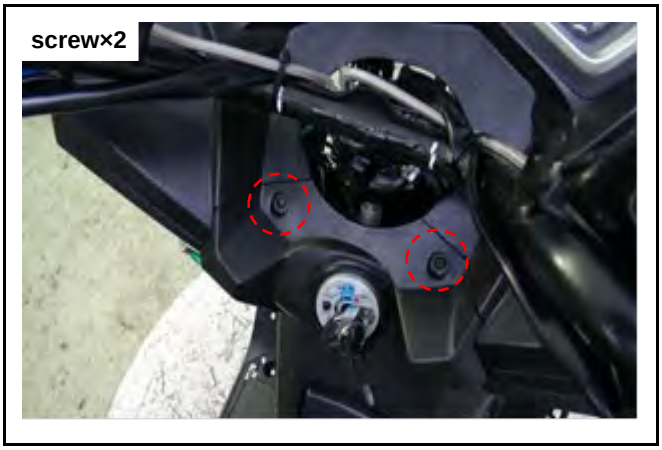


Meter Panel

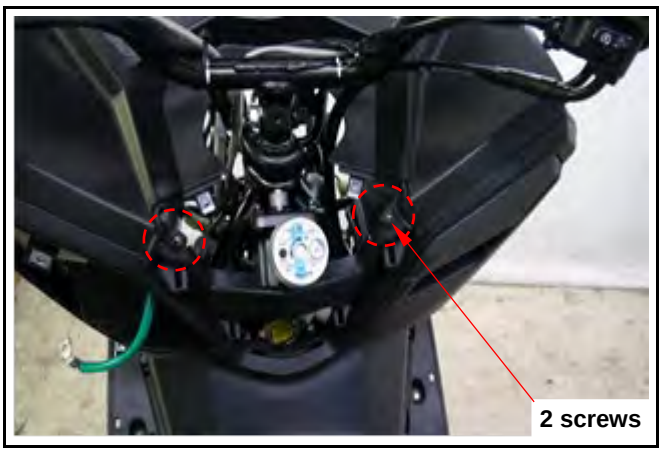
Remove

Remove the wind screen, meter visor and front cover.

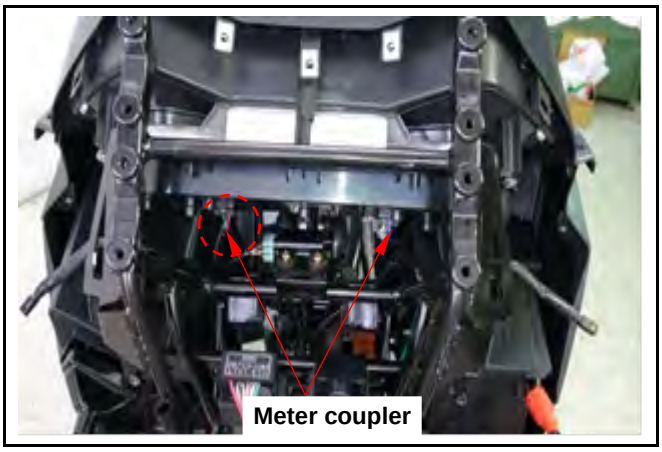
Loosen 2 screws from main switch top cover.



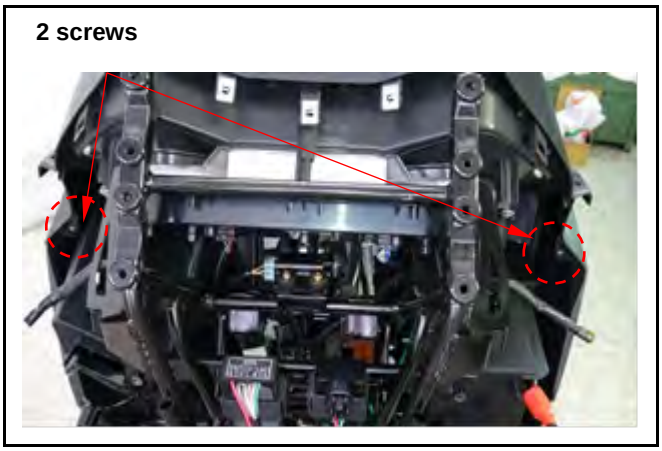
Remove 2 screws from the right and left front sides of meter panel.



Loosen the meter cord coupler.



Remove the meter panel.



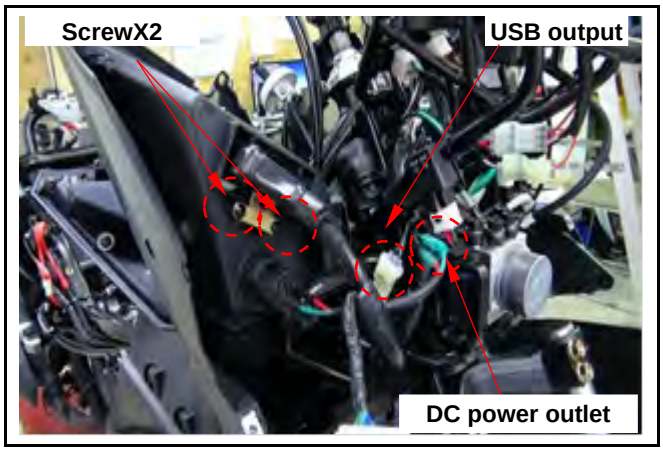
Installation

Install in reverse order of removal procedures.

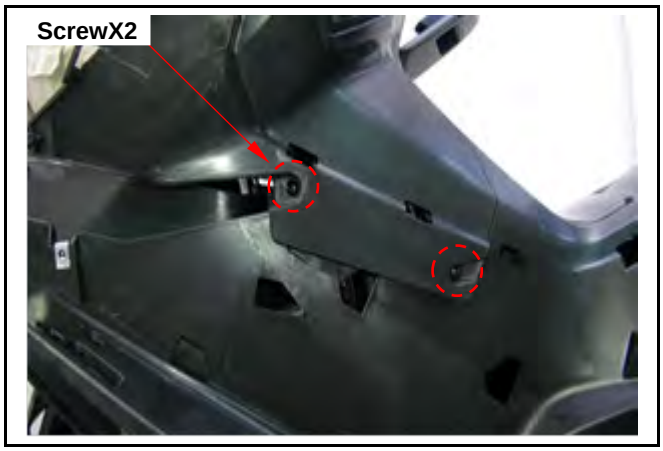
Inner Box

Remove

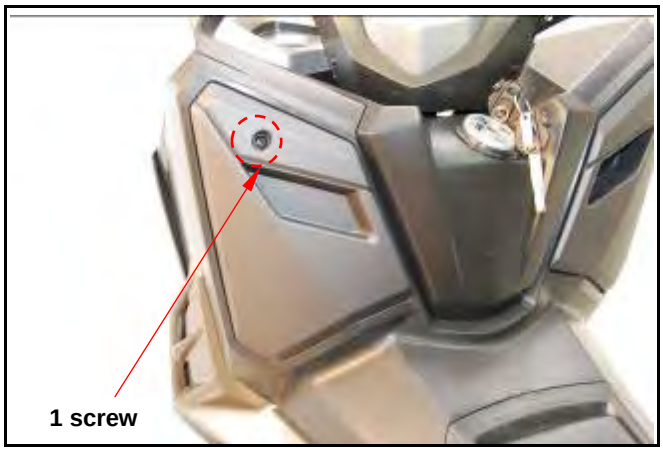
Remove wind screen garnish, wind screen, meter visor, front cover, meter panel, R/L side cover and front under spoiler.
Remove the main switch cover.
Remove 2 screws from fuse box and remove it.
Disconnect the DC power output and USB output couplers.



Remove 2 screws from R/L side of inner box assembly.



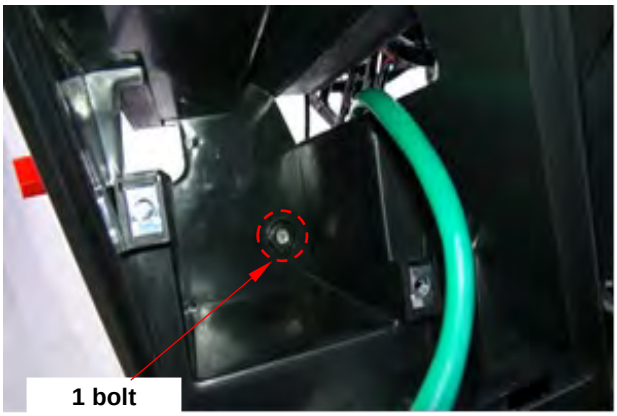
Remove 1 screw from battery cover and remove it.



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



Remove 2 bolts for the right and left sides of inner box.



Remove 2 bolts from the lower right and leaft sides of inner box.
Remove inner box.

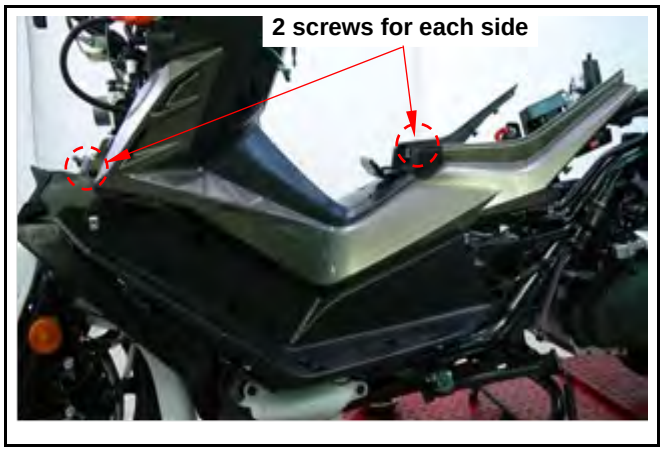


Installation
Install in reverse order of removal procedures.

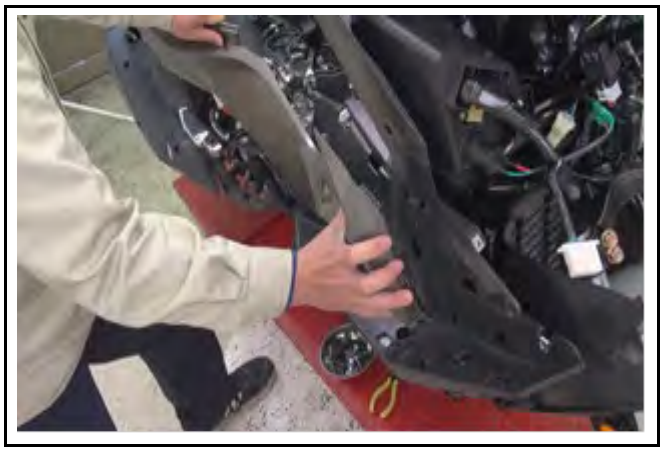
Floor Panel Side Cover

Remove

Remove 2 screws from the right and left side covers of body cover garnish.



Remove cantilever snap from the counterpart.
Remove R/L floor panel side cover



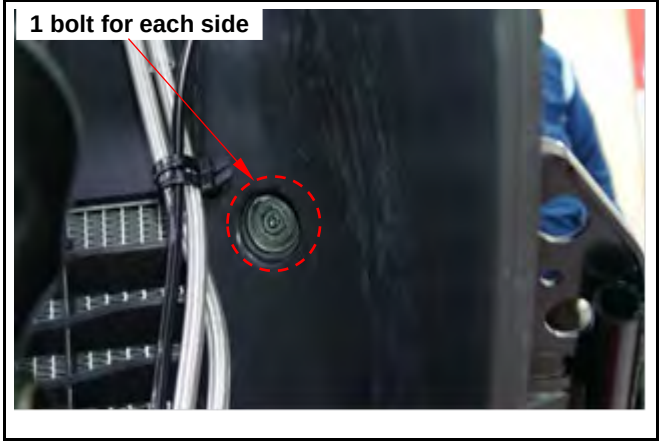
Installation

Install in reverse order of removal procedures.

Front Under Spoiler

Remove

Remove wind screen garnish, wind screen, meter visor, front cover and R/L side cover.
Loosen 1 bolt from the front under spoiler.



Remove the front spoiler.



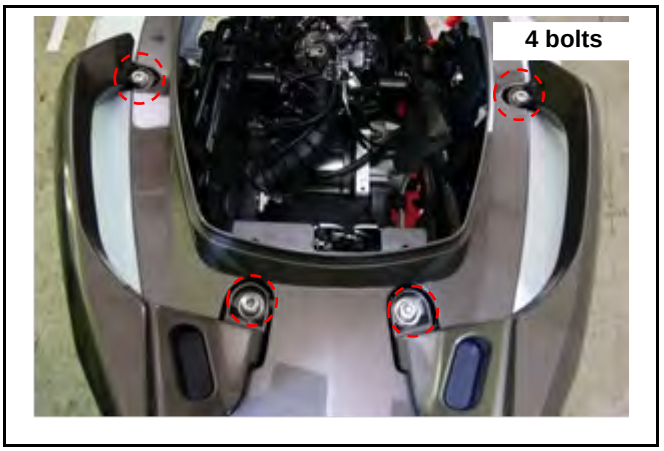
Installation

Install in reverse order of removal procedures.

Rear Carrier

Remove

Loosen 4 bolts from the rear carrier and remove it.



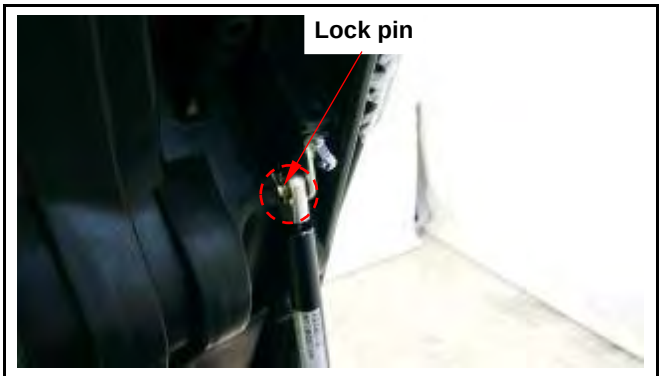
Installation

Install in reverse order of removal procedures.

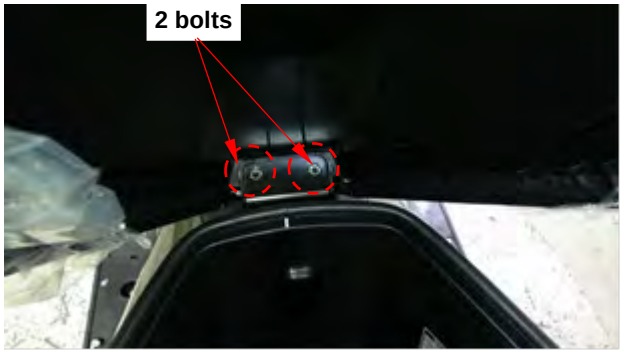
Luggage Box

Remove

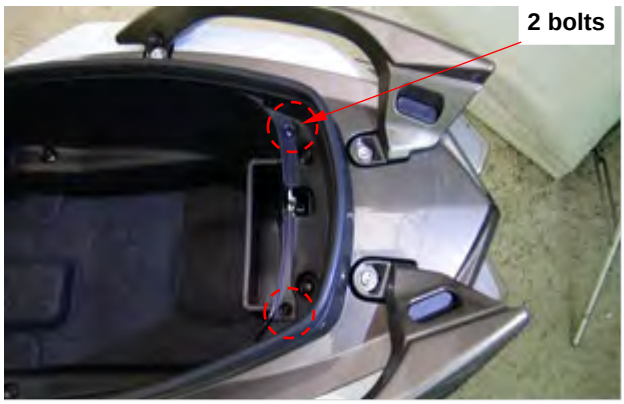
Open the seat.
Remove lock pin from the luggage box rear cover.
Disconnect the luggage box light and switch coupler.
Remove the luggage box rear cover.



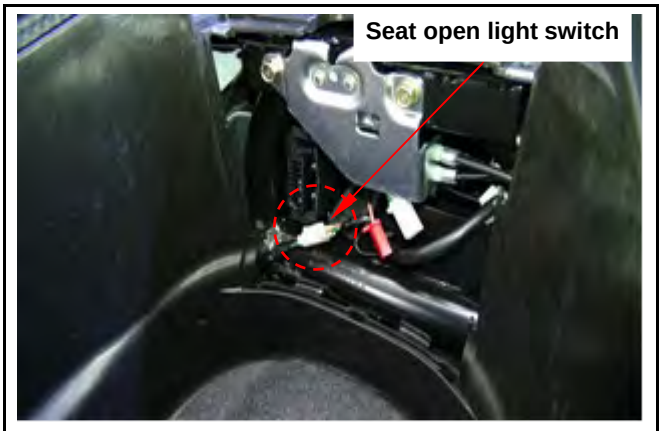
Remove 2 bolts from luggage box front side



Remove 2 bolts from luggage box rear side.



Remove the luggage box.



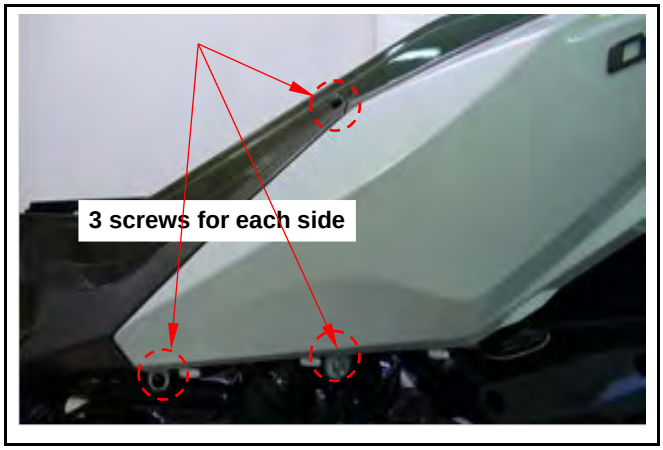
Installation

Install in reverse order of removal procedures.

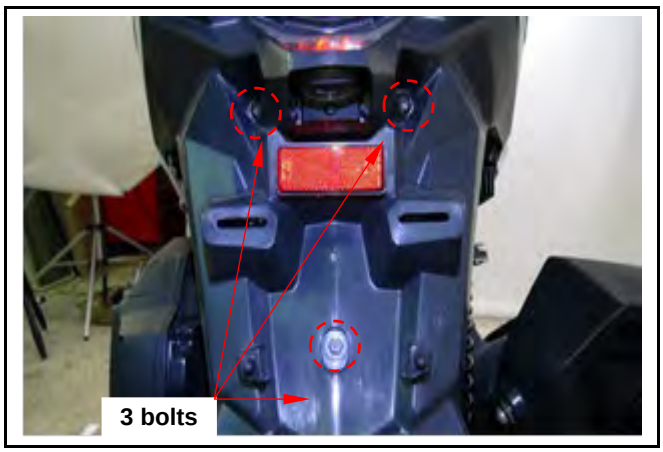
Rear Body Cover

Remove

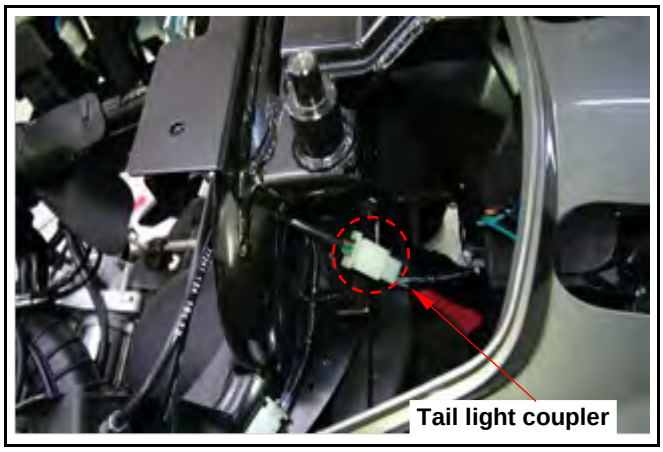
Remove 3 screws from the right and left sides of body cover.



Remove 3 bolts from the rear side of body cover / rear fender.



Disconnect the tail light coupler.



Remove the body cover.



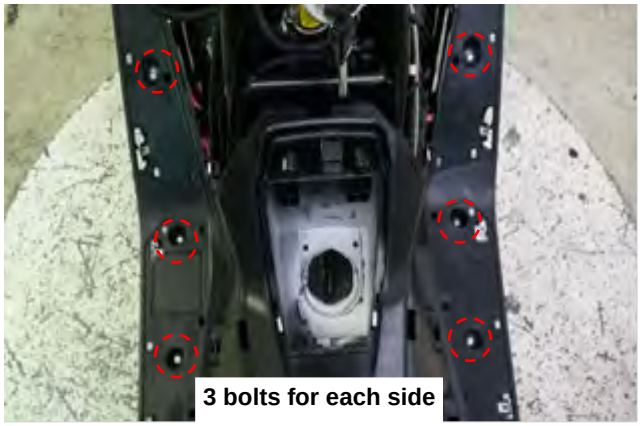
Installation

Install in reverse order of removal procedures.

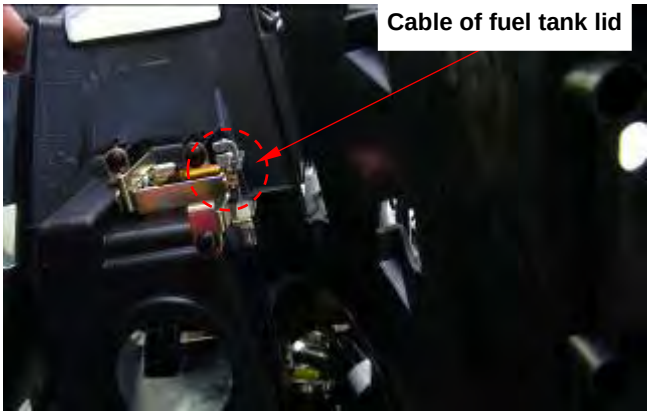
Floor Panel

Remove

Remove wind screen garnish, wind screen, meter visor, front cover, R/L side cover, front under spoiler, inner box, luggage box and body cover.
Remove 6 screws from the right and left side cover of floor panel.



Remove cable of fuel tank lid under floor panel.
Remove floor panel from the counterpart.



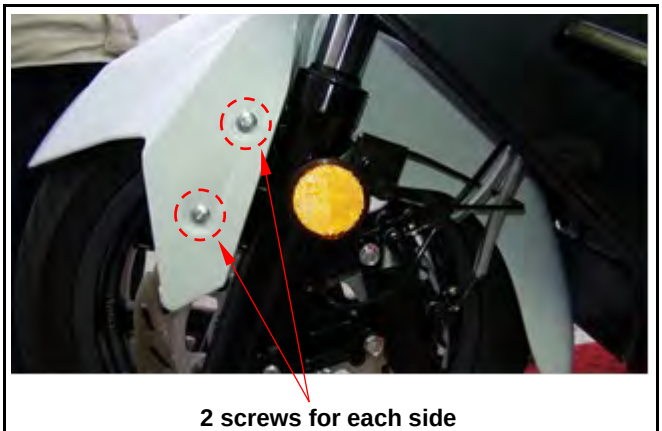
Installation

Install in reverse order of removal procedures.

Front Fender

Remove

Remove 2 screws from the right and left sides of front fender.



Remove the front fender.

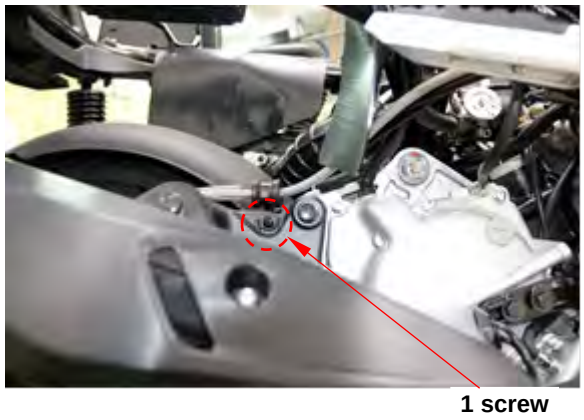


Installation

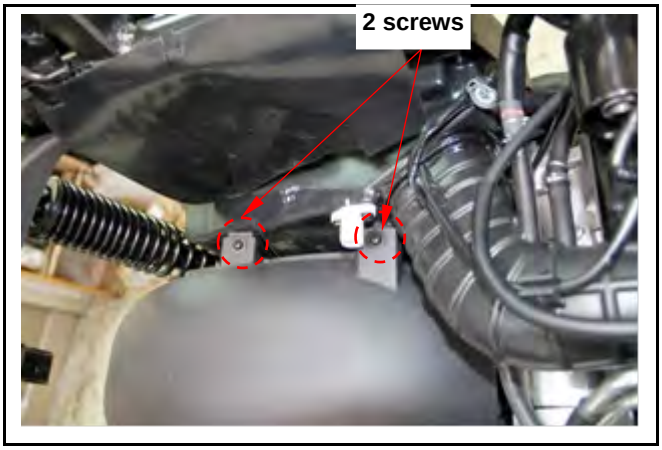
Install in reverse order of removal procedures.

Rear mudguard

Remove 1 screw from the right side of inner fender.



Remove 2 screws from the left side of inner fender.
Remove the inner fender.



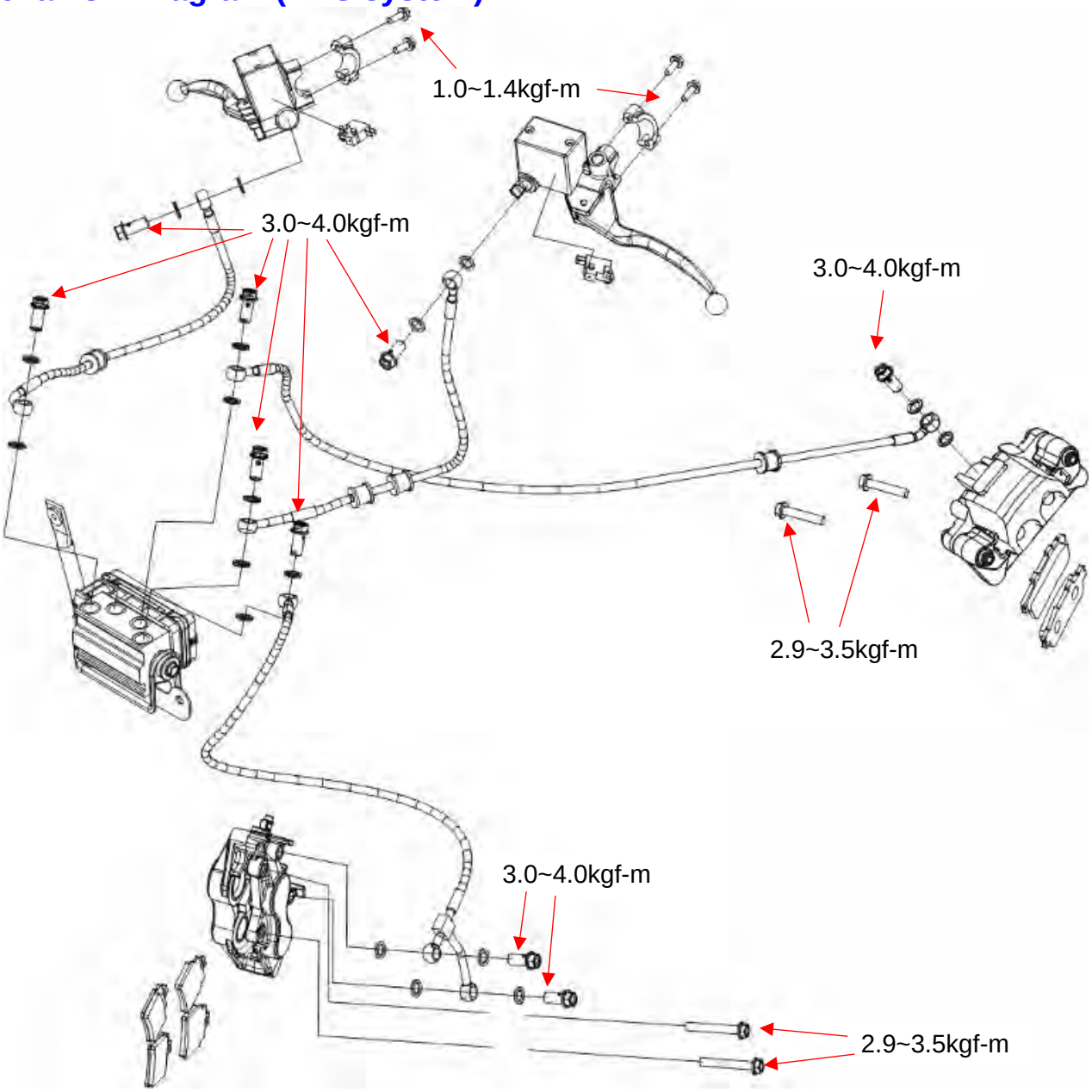
Installation

Install in reverse order of removal procedures.

NOTE:

Mechanism Diagram ····· 14-1	Front Brake Caliper ····· 14-7
Precautions in Operation ····· 14-2	Rear Brake Caliper ····· 14-8
Troubleshooting ····· 14-3	Brake Disk ····· 14-9
Disk Brake System Inspection ····· 14-4	Master Cylinder ····· 14-9
Adding Brake Fluid ····· 14-5	ABS (Anti-lock Brake System) ····· 14-12
Brake Fluid Replacement / Air-bleed · 14-6	

Mechanism Diagram (ABS system)



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

unit: mm

Item	Standard	Limit
The thickness of front brake disk	4.000	3.500
The thickness of rear brake disk	5.000	4.500
Front and rear brake disk eccentricity	< 0.100	0.300
Front brake master cylinder inner diameter	11.000~11.043	11.055
Front brake master cylinder piston outer diameter	10.957~10.984	10.945
Rear brake master cylinder inner diameter	14.000~14.043	14.055
Rear brake master cylinder piston outer diameter	13.957~13.984	13.945
Diameter of front disk	260.000	—
Diameter of rear disk	240.000	—
Thickness of front brake lining	5.000	2.000
Thickness of rear brake lining	6.000	2.000

Torque values:

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

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/disk
7. Low brake fluid
8. Blocked brake hose
9. Warp/bent brake disk
10. Bent brake lever

Hard operation of brake lever

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

Uneven brake

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

Tight brake

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

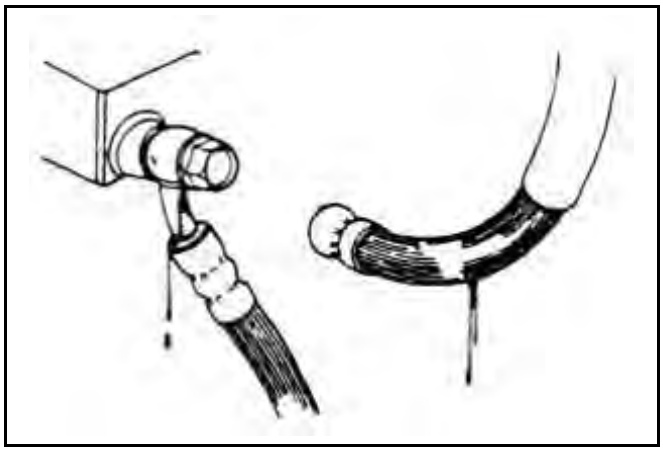
Brake noise

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

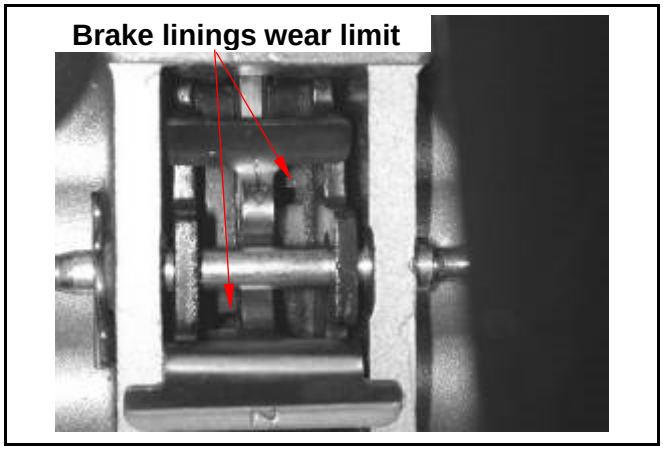
Disk Brake System Inspection

Inspection

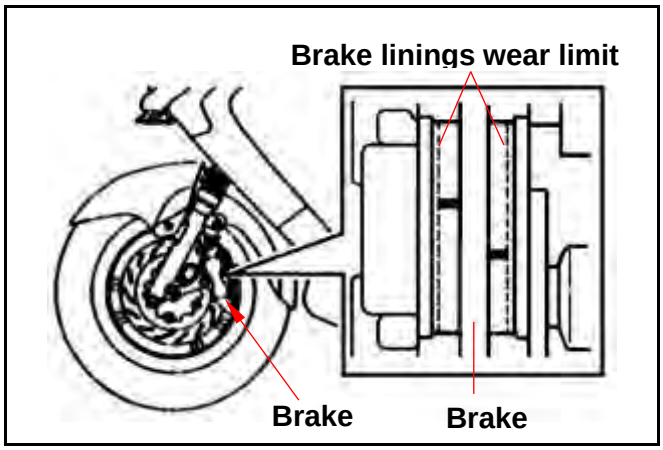
By visual examination whether divulges or the damage, with spanner inspection brake tube seam whether becomes less crowded, and the inspection handle bar turn right or turn left, or pressure the cushion, whether besides the pipeline protection department, whether there is interferes, contacts other parts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



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



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



Park the motorcycle on a level ground, and check if fluid level is under the “LOWER” mark.
Recommended Brake Fluid: BRAKE OIL (DOT 3 or DOT4).



Caution

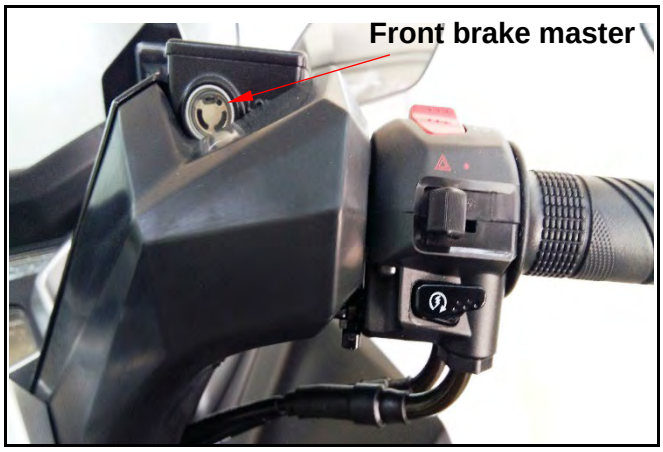
- The vehicles inclined or just stop, the survey oil level could not be accurate, had to settle the 3~5 minute.
- In order to prevent has the chemical change, please do not use counterfeiting or other unclear trade marks brake fluid.
- Uses by all means must with the trade mark brake fluid, guarantees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

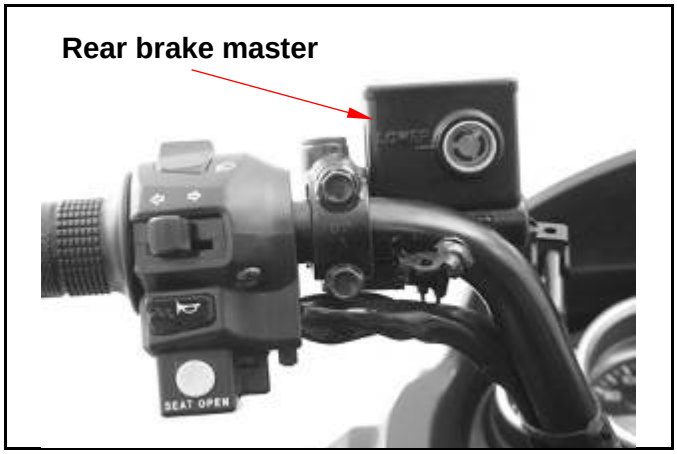
Adding Brake Fluid

Before the brake fluid reservoir is removed, turn the handle so that the brake fluid reservoir becomes horizontal, and then remove the brake fluid reservoir.
When maintenance brake system, will be supposed to paint the surface or the rubber parts catches up by the rags.

Caution

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

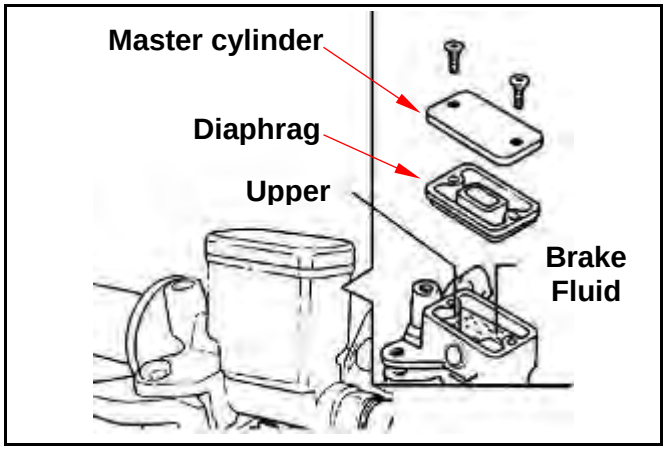




Remove the master cylinder cap and diaphragm.
Increases the high quality brake fluid, uses by all means must with the trade mark brake fluid joins in the master cylinder.
Clean the dirty brake disk.

Caution

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



Brake Fluid Replacement / Air-bleed

Connect drain hose to air-bleed valve.
Open the drain valve on the calipers and pull the brake lever until the old brake fluid is entirely drained out.
Close the drain valve and add specified brake fluid into the brake master cylinder.
Recommended brake fluid: DOT 3 brake fluid
Connect one end of transparent hose to the drain valve, and put the other end into a container.
Open the drain valve around 1/4 turns, and at the same time pull the brake lever until the there is no air bubble in the drain hose and also feeling resistance on the brake lever.
Close the drain valve when finishing the brake system refilling fluid procedure, and operate the brake lever to check whether air bubble is in brake system or not.
If brake is still soft, please bleed the system as described below:

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

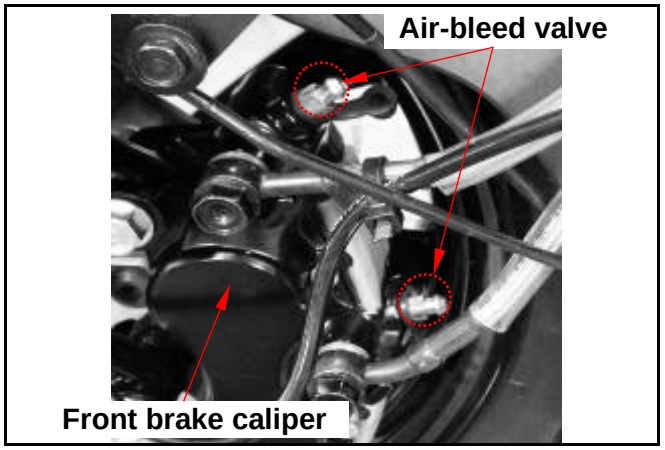
Caution

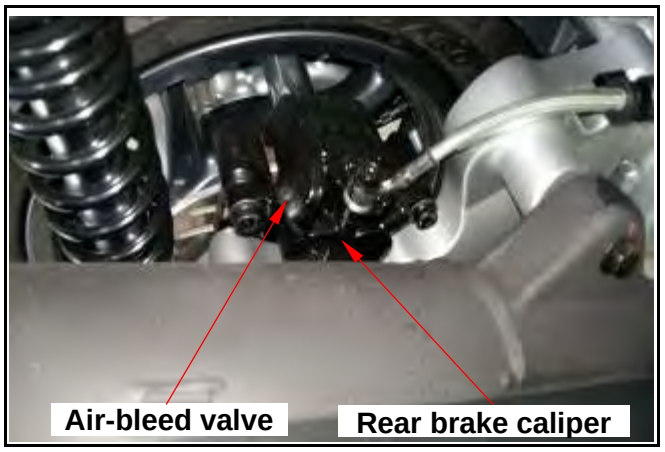
- Do not release the brake lever before the drain valve is closed.
- Always check the brake fluid level when carrying out the air bleeding procedure to avoid air enter into the system.

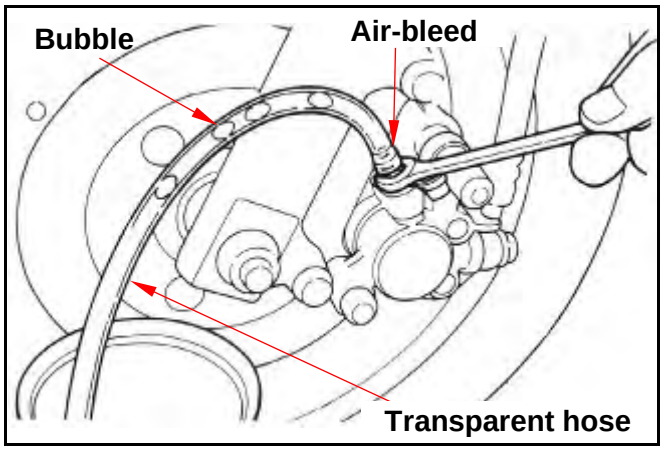
2. Slowly release the brake lever, and wait for a few seconds until it reaches its top position.
3. Repeat the steps 1 and 2 until there is no air bubble at the end of the hose.
4. Tightly close the drain valve.
5. Make sure the brake fluid is in the UPPER level of the master cylinder, and refill the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

Caution

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







Front Brake Caliper

Removal

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

Caution

- Do not spill brake fluid on painted surfaces.

Remove two caliper mounting bolts and the caliper.

Installation

Install the brake caliper and tighten the mounting bolts.

Torque: 2.9~3.5kgf-m

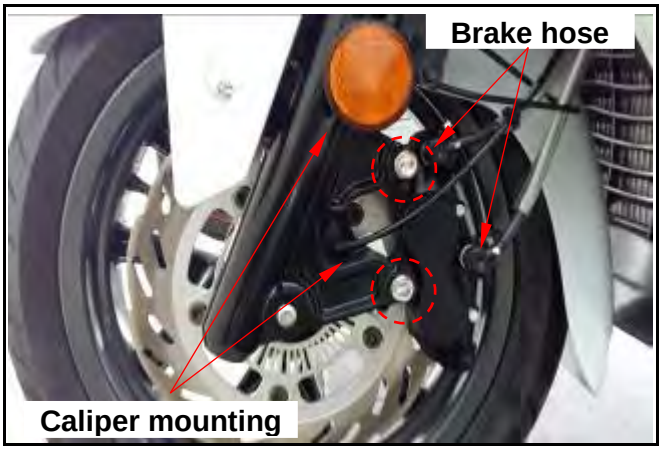
Caution

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

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

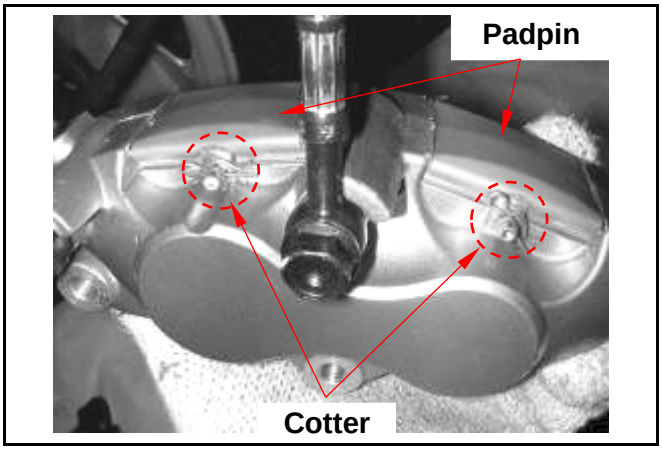
Torque: 3.0~4.0kgf-m

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

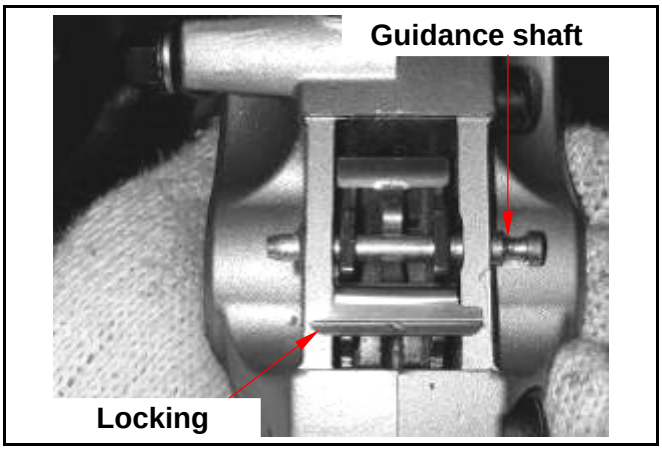


Brake pad replacement

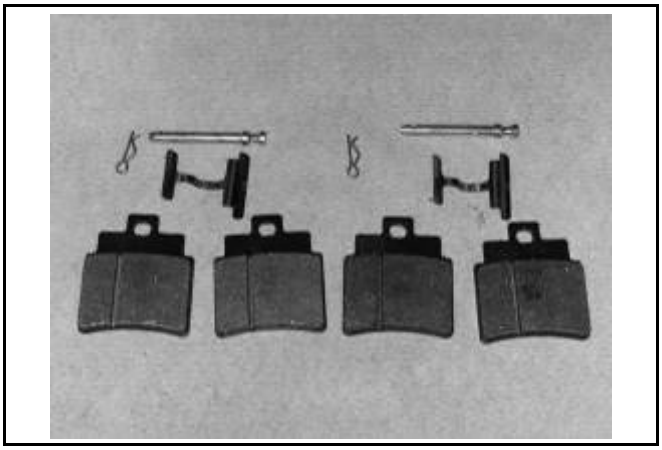
Remove brake caliper.
Remove brake pad caps.
Remove the brake pad guidance shafts cotter pins.



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



Install the new brake pads onto brake caliper.
Install the brake pad guidance shafts and locking springs.
Install the brake pad guidance shafts cotter pins.
Install the brake caliper and tighten the mounting bolts.



Rear Brake Caliper

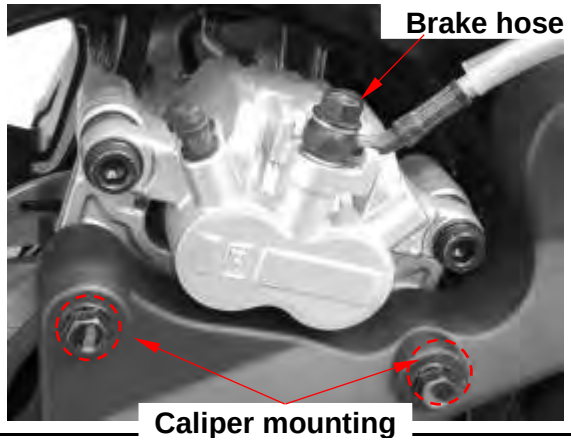
Removal

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

⚠ Caution

- Do not spill brake fluid on painted surfaces.

Remove two caliper mounting bolts and the caliper.



Installation

Install the brake caliper and tighten the mounting bolts.

Torque: 2.9~3.5kgf-m

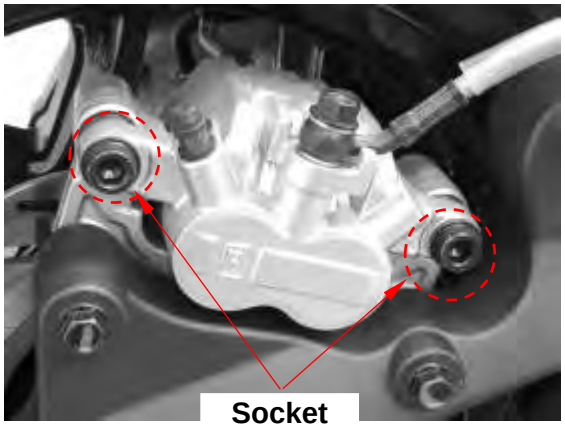
⚠ Caution

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

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

Torque: 3.0~4.0kgf-m

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



Brake pad replacement

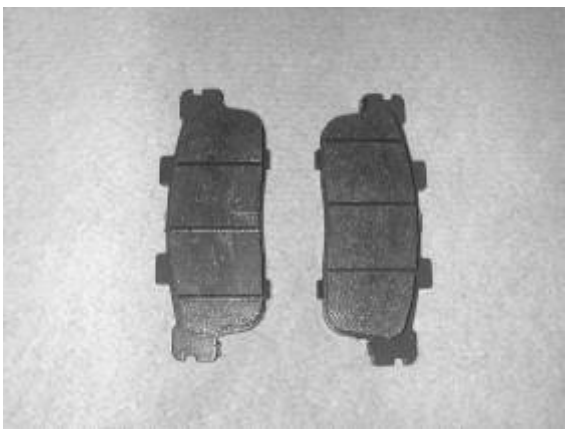
Remove the brake caliper upper parts (2 socket bolts).



Take out the brake pads.

Install the new brake pads onto brake caliper bracket.

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



Brake Disk

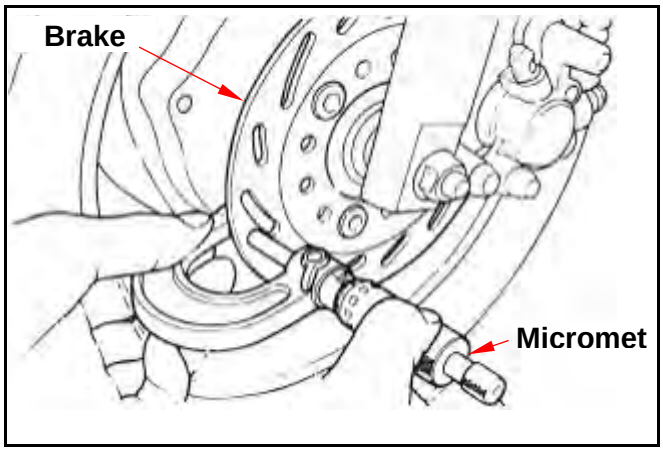
Inspection

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

Allowable limit:

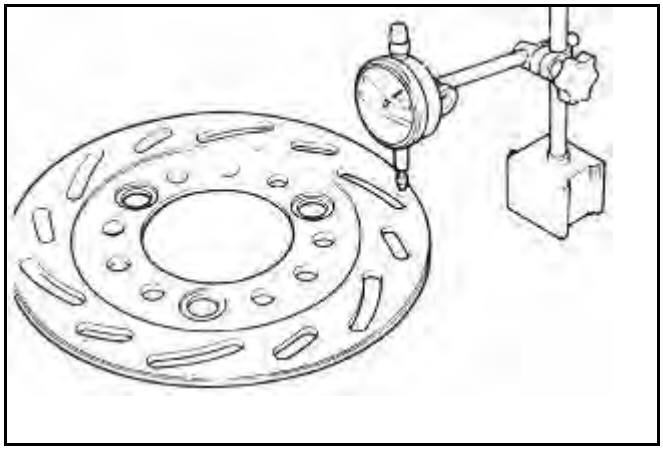
Front brake disk 3.5 mm

Rear brake disk 4.5 mm



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

Allowable limit: 0.30 mm



Caution

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

Master Cylinder

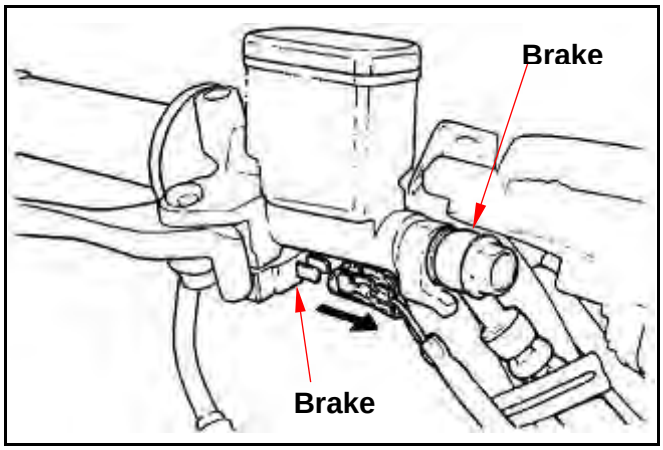
Master Cylinder Removal

Caution

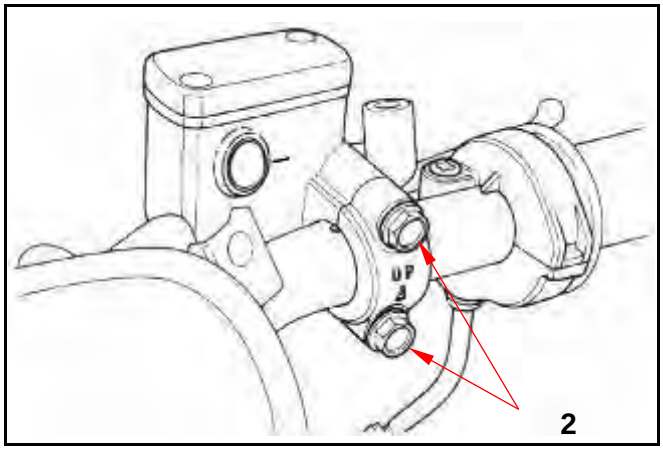
- Do not let foreign materials enter into the cylinder.

Caution

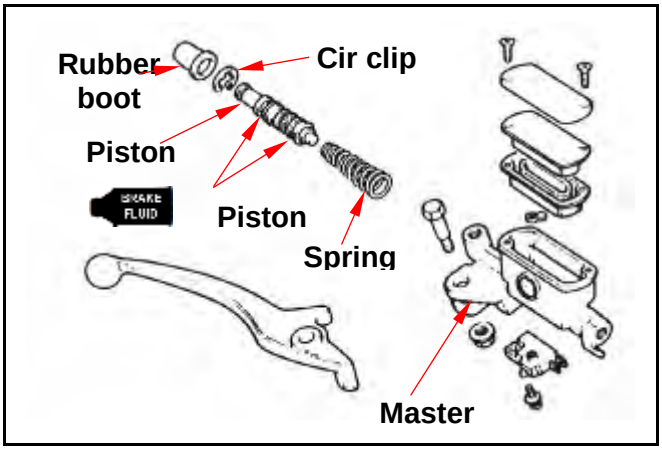
- The whole set of master cylinder, piston, spring, diaphragm and cir clip should be replaced as a set.



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

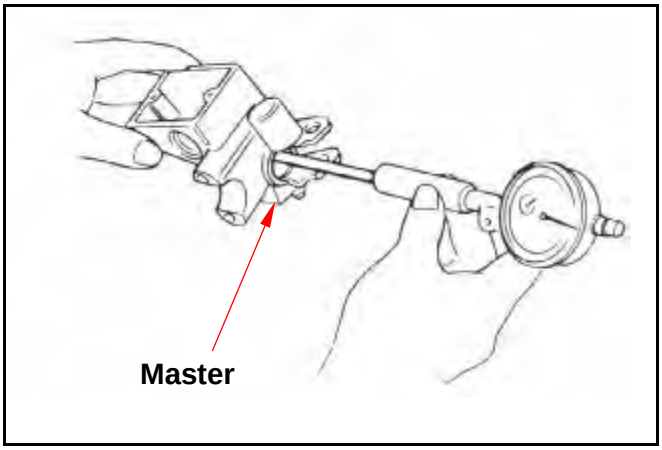


Remove the rubber pad.
Remove the cir clip.
Remove the piston and the spring.
Clean the master cylinder with recommended brake fluid.



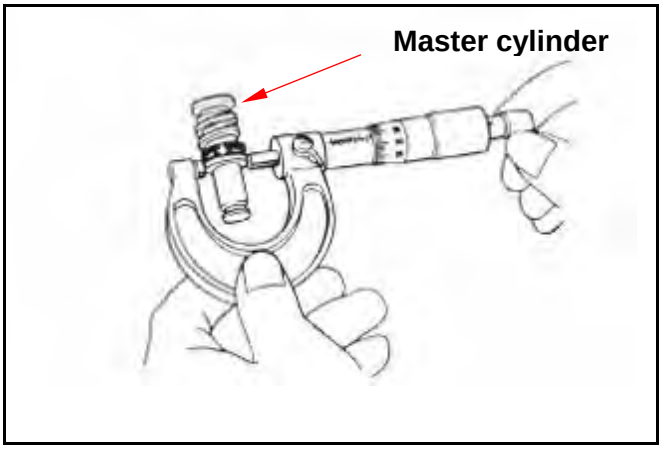
Master Cylinder Inspection

Check the master cylinder for damage or scratch. Replace it if necessary.
Measure the cylinder inner diameter at several points along both X and Y directions.
Replace the cylinder if the measured values exceed allowable limit.
Allowable limit:
Front brake: 11.055 mm
Rear brake: 14.055 mm



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

Allowable limit:
Front brake: 10.945 mm
Rear brake: 13.945 mm

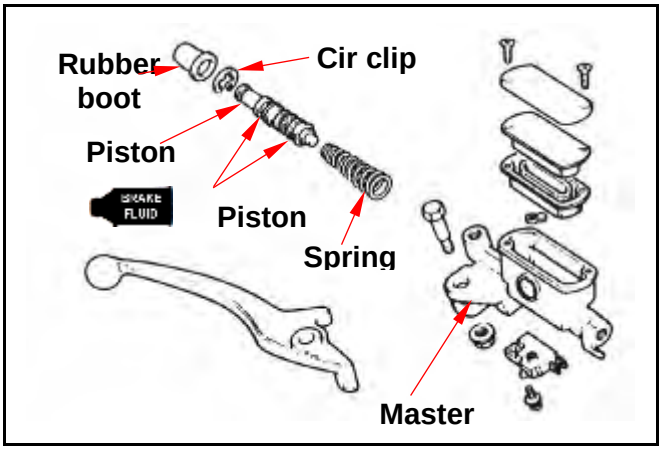


Master Cylinder Assembly

Caution

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

Apply clean brake fluid to the piston cup, and then install the cup onto the piston.
Install the larger end of the spring onto the master cylinder.
The master cup's cavity should be face inside of master cylinder when installing the master cup.
Install the cir clip.



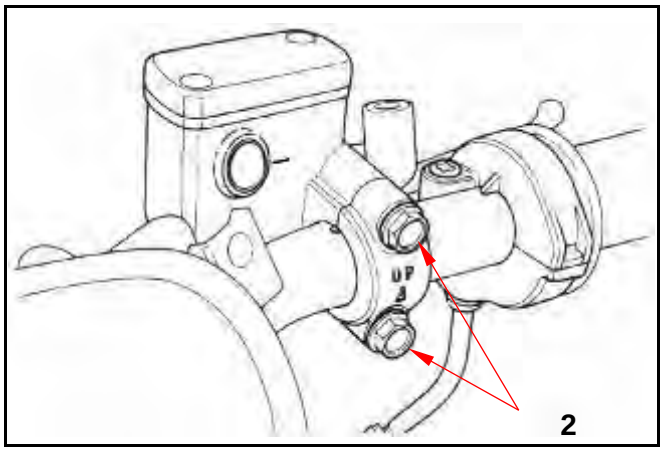
Caution

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

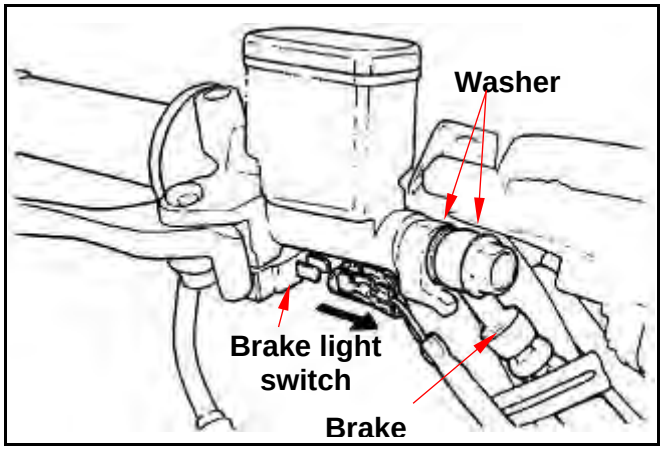
Install the rubber pad into groove properly.

Master Cylinder Installation

Install the rubber pad into the groove correctly.
Place the master cylinder onto handlebar, and install the bolts.
Install the brake lever, and connect leads to brake light switch.



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



Caution

- Improper routing may damage leads, hoses or pipes.

Caution

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

Add specified brake fluid and bleed the system.

ABS (Anti-lock Brake System)

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

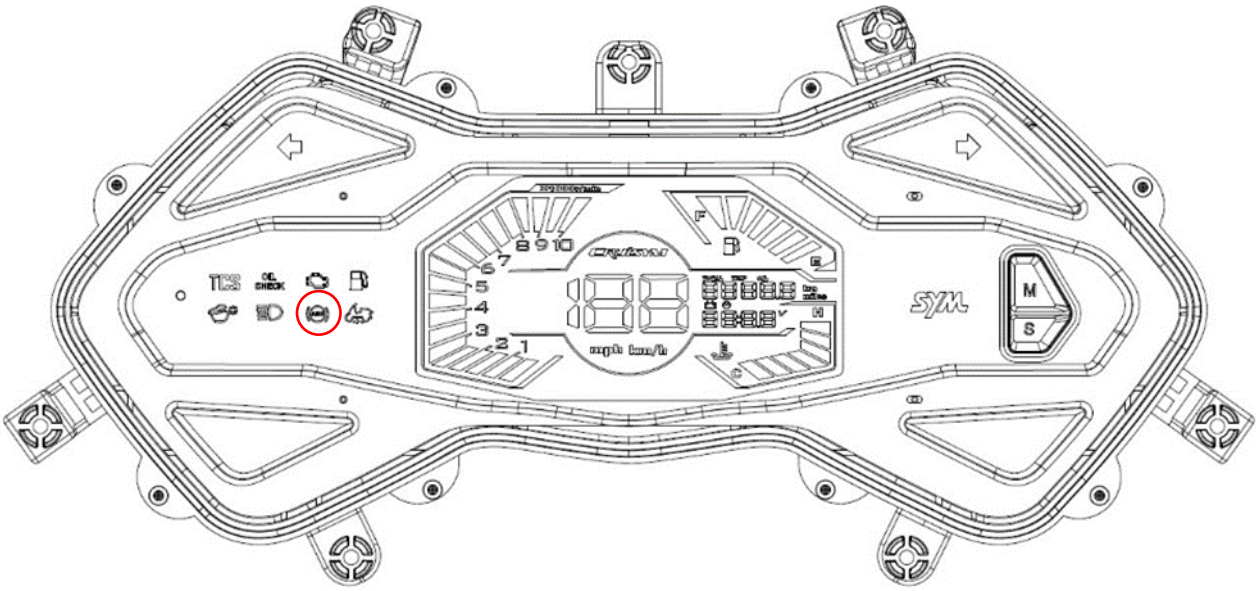
Use of non-recommended tires may cause malfunctioning of ABS and can lead to extended braking distance. The rider could have an accident as a result. Always use recommended standard tires for this scooter.

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

ABS indicator light:

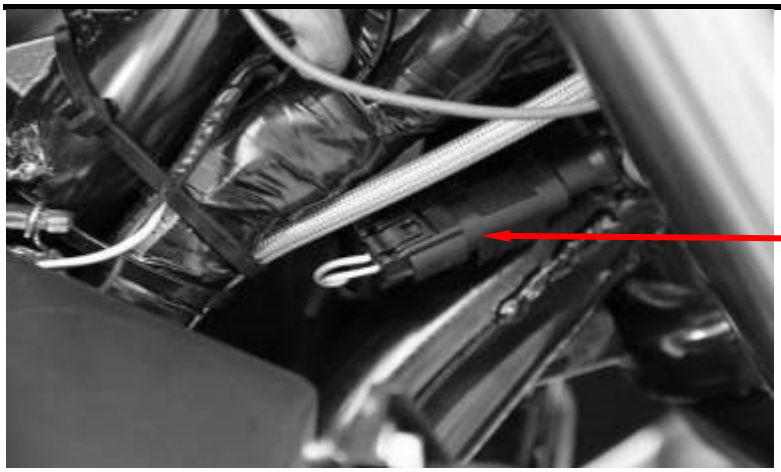
The ABS indicator light goes on when the ignition switch is turned on and goes off shortly after the scooter speed is over 5km/hr.

If the indicator light is on, ABS may be out of function. However, the brake system can still work properly. You should have the ABS checked.





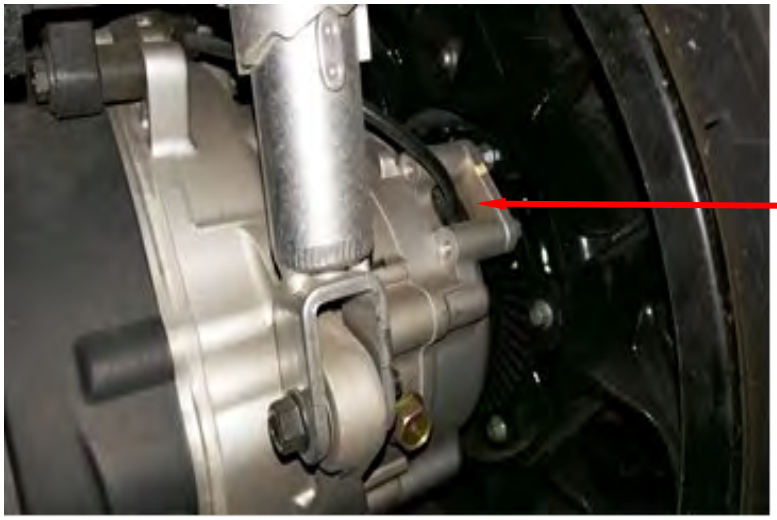
ABS. Hydraulic Circuit Unit with ECU



Speed sensor coupler



Front wheel speed sensor



Rear wheel speed sensor

⚠ Caution

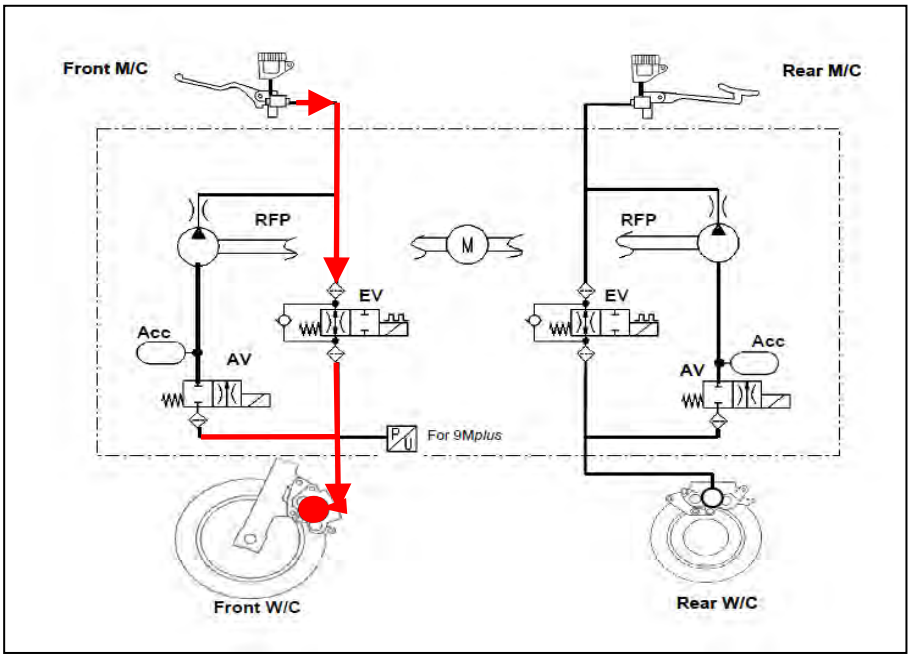
Do not remove the ABS control unit coupler when the main switch is ON, or the ABS control unit will be damaged.

ABS components location



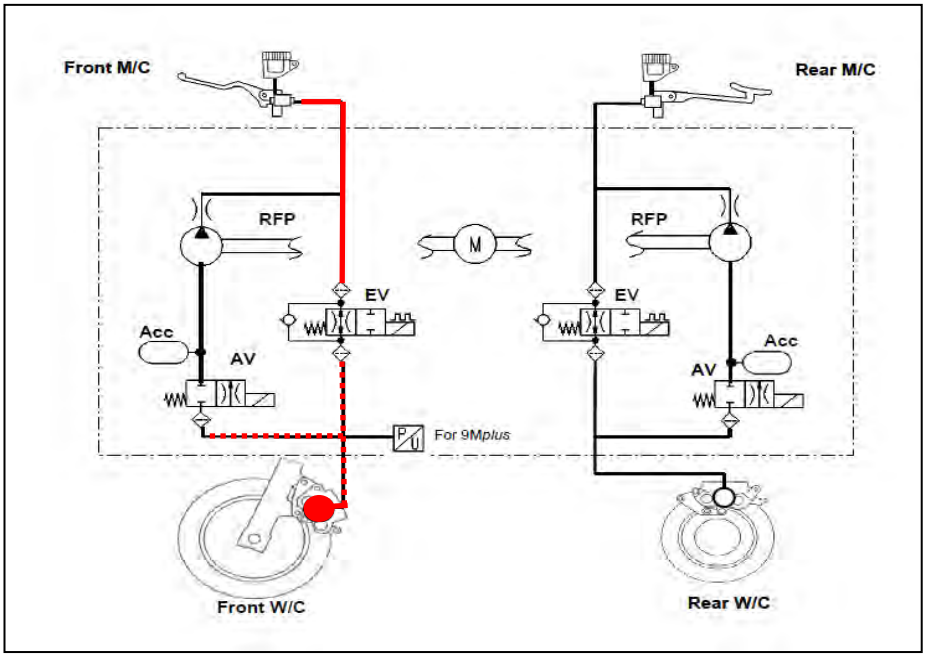
ABS description

Normal brake



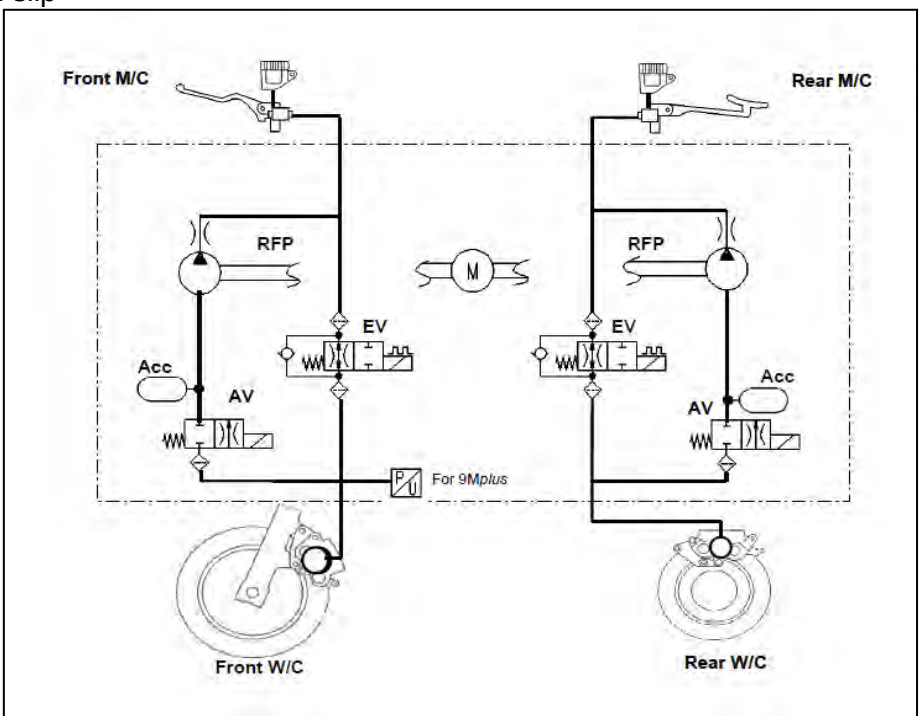
When the brake is applied, speed sensors detect the front and rear wheel speed. When there is no wheel slip, EV (inlet valve for maintaining pressure) keeps open and AV (outlet valve for pressure reduction) is closed. Brake calipers receive pressure for master cylinders and brake normally.

Initial wheel slip



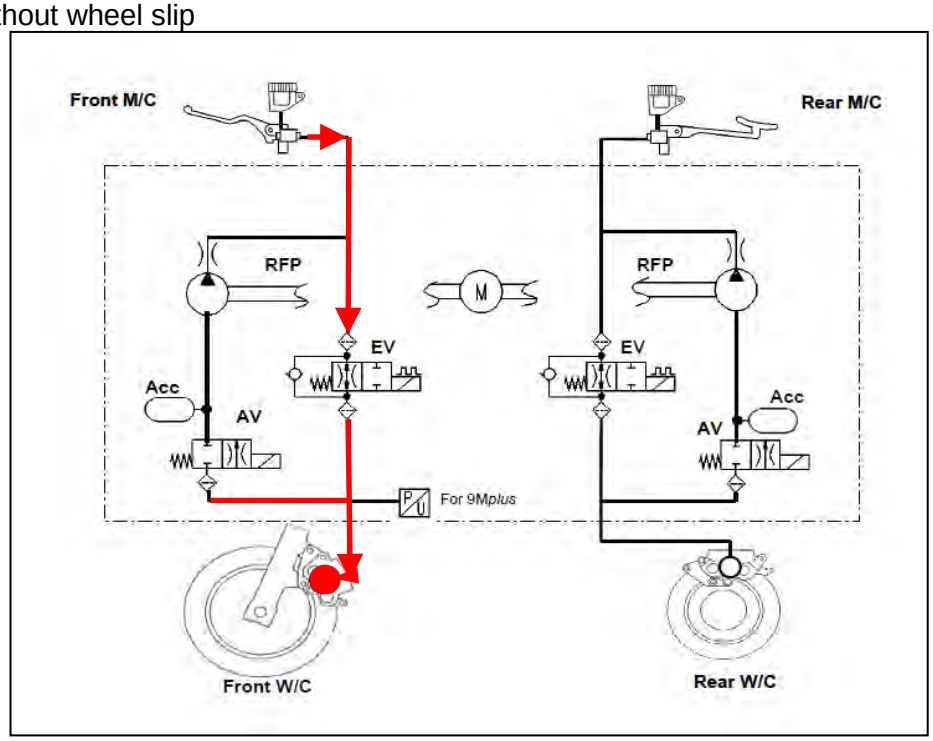
When the initial wheel slip is detected by the wheel speed sensors, EV and AV are both closed. Brake caliper keeps the pressure and brake continues.

Continuous wheel slip



When the wheel speed sensors detect continuous wheel slip, EV keeps closed and AV is open. Brake pressure is reduced (pulsing in the brake lever). Brake caliper lowers the pressure and braking force.

Normal brake without wheel slip



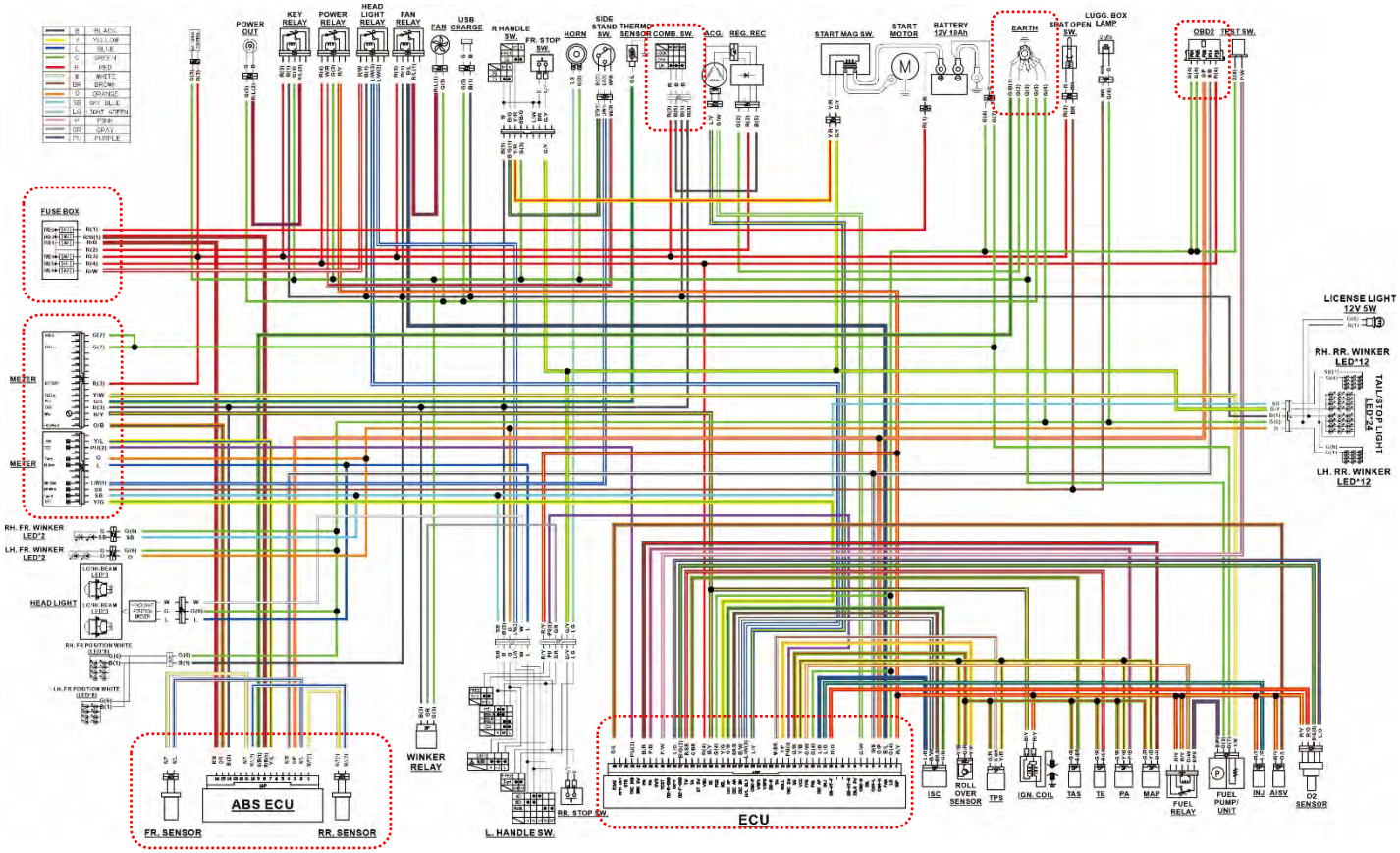
When the pressure reduction continues, the wheel speed sensors detect no wheel slip. EV keeps open and AV is closed. Brake caliper receives pressure from master cylinder and normal brake is applied.

Diagnostic Trouble Codes

Trouble Codes	Errors and Description
C1033	Front wheel speed sensor Disconnection/gnd Short/Uz Short
C1034	Front wheel speed sensor malfunction -Plausibility
C1031	Rear wheel speed sensor Disconnection/gnd Short/Uz Short
C1032	Rear wheel speed sensor malfunction- Plausibility
C1024	Deviation between Wheel speed(WSS_GENERIC)
C1054	Front Inlet Valve malfunction (EV)
C1049	Front Outlet Value malfunction(AV)
C1052	Rear Inlet Value malfunction(EV)
C1048	Rear Outlet Value malfunction(AV)
C1015	Pump Motor Malfunction
C1019	Value Relay malfunction(Failsafe relay)
C1021	ECU malfunction
C1058	Power Supply Malfunction(Low Voltage)
C1059	Power Supply Malfunction(High Voltage)

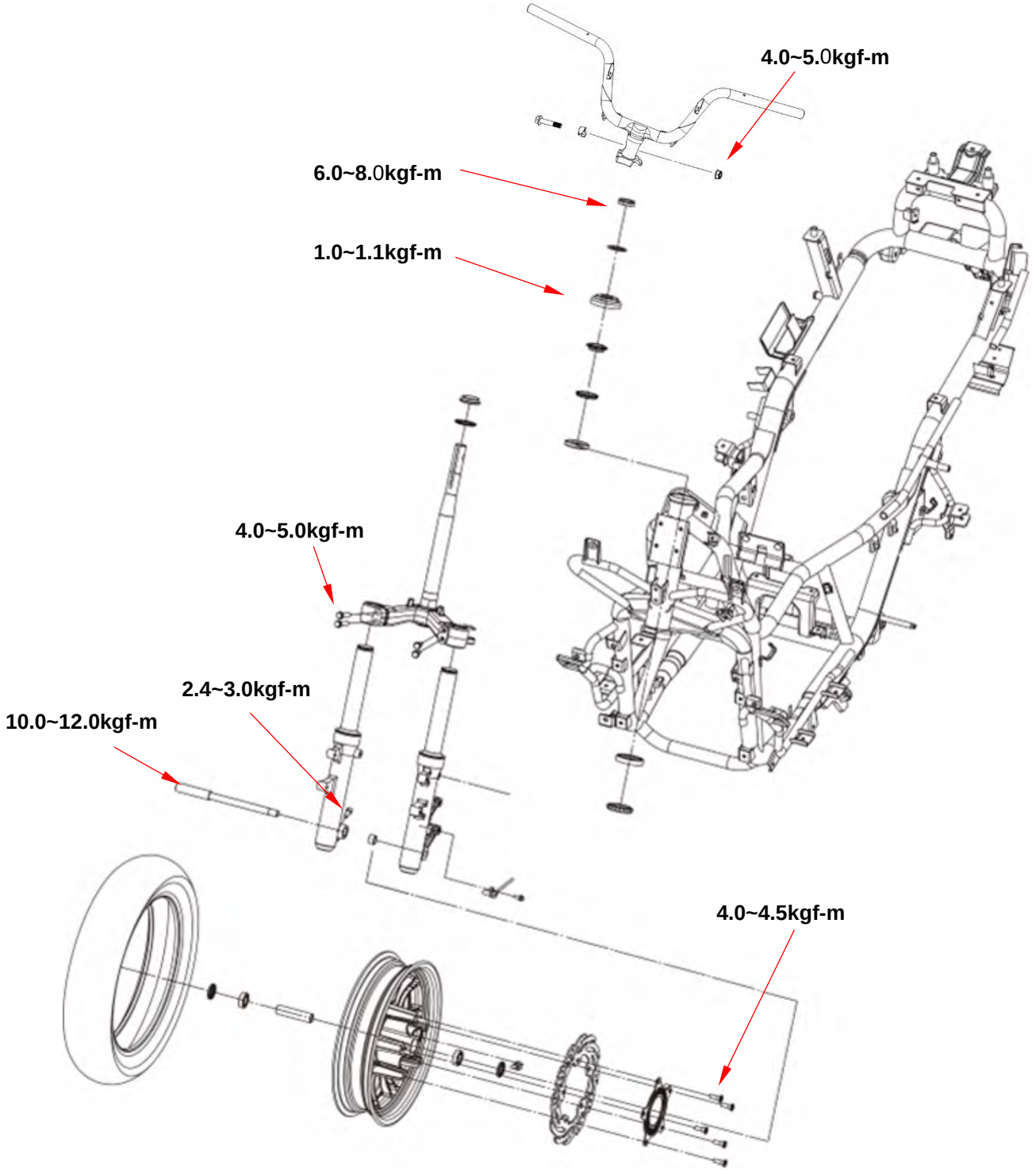
ABS System

ABS circuit



Mechanism Diagram ····· 15-1	Front Wheel ····· 15-5
Precautions in Operation ····· 15-2	Front Cushion ····· 15-8
Troubleshooting ····· 15-2	Steering Stem ····· 15-9
Steering Handle ····· 15-3	

Mechanism Diagram



Precautions in Operation

General information

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

Torque Values

Front wheel axle	10.0 ~ 12.0kgf-m
Nut for the steering handle	4.0 ~ 5.0kgf-m
Lock nut for the steering handle stem	6.0 ~ 8.0kgf-m
Top crown for the steering handle stem	1.0 ~ 1.1kgf-m
Locating screw for the speedometer cable	0.15 ~0.3kgf-m
Front cushion upper lock bolt	4.0~ 5.0kgf-m
Front brake disk	4.0~4.5kgf-m

Special Tools

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

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.

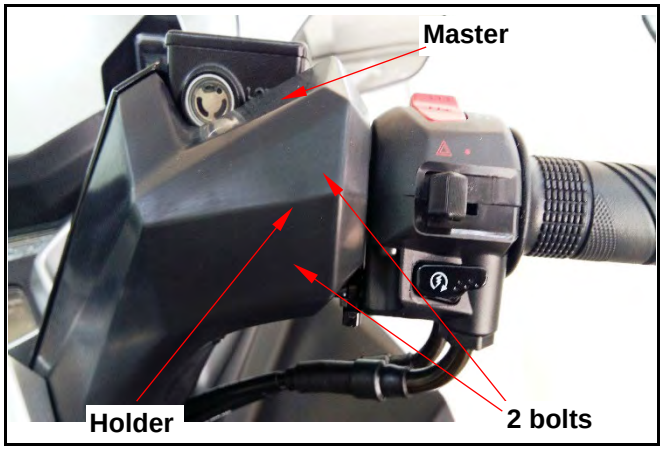
Noise in front cushion

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

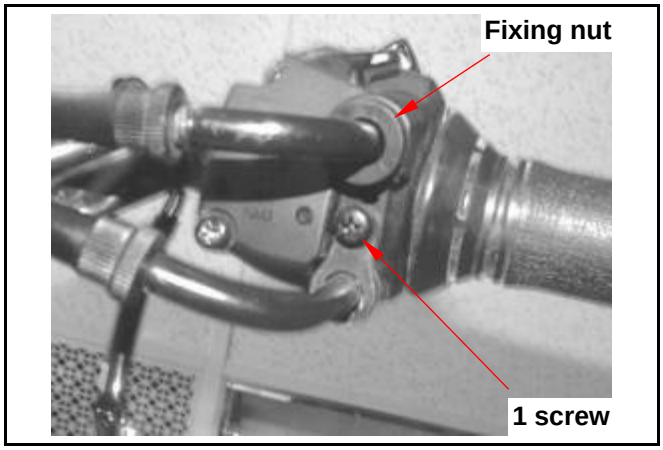
Steering Handle

Remove

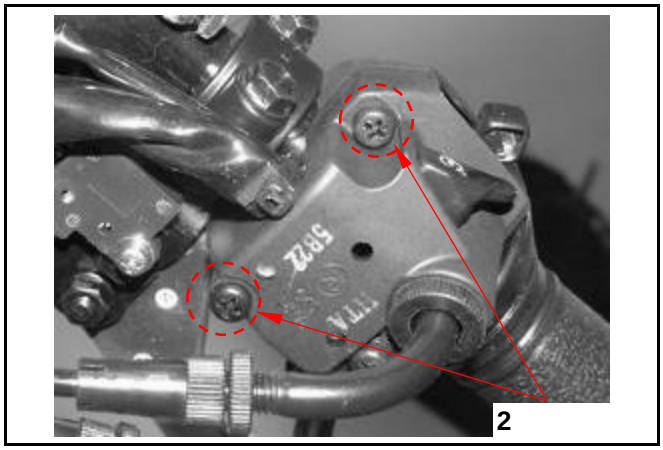
Remove the right and left handle side cover, handle upper cover and front cover. (Refer to chapter 13)
Loosen the lock bolts for the master cylinder of the front brake.



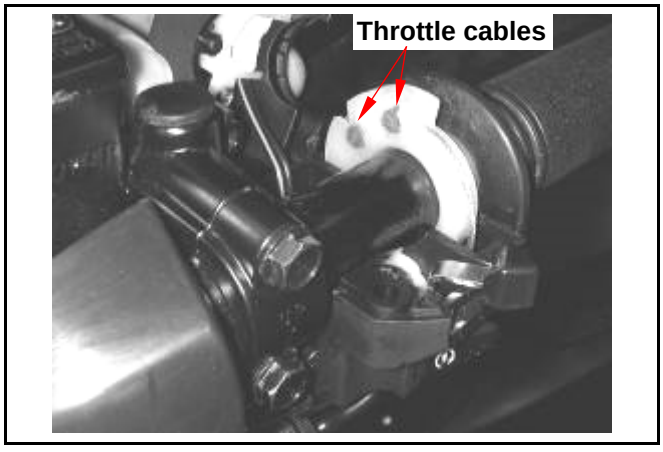
Loosen the deceleration throttle cable fixing nut.
Loosen 1 screw from the acceleration throttle fixing plate.



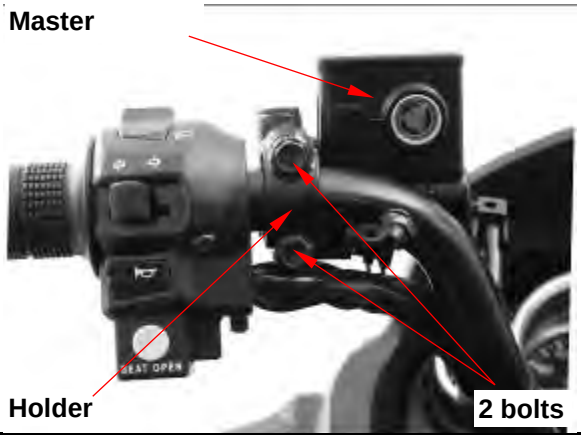
Loosen 2 screws from the throttle holder.



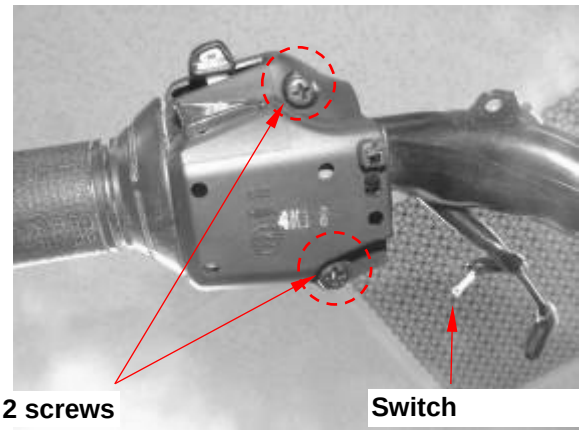
Remove throttle holder, handle switch, cables and grip.



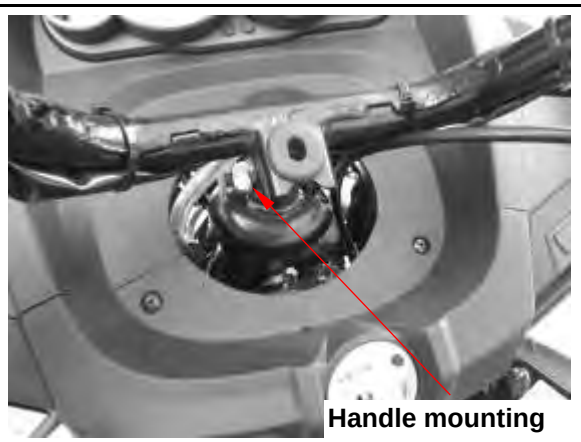
Loosen 2 bolts from the master cylinder of the rear brake.
Remove holder and master cylinder.



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



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

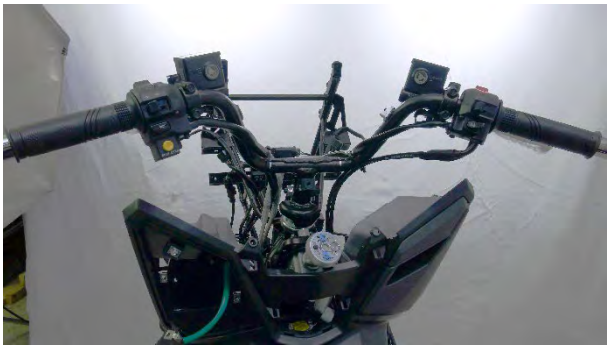


Installation

Install handle and align with bolt hole.
Install bolt and nut and then tighten it.
Torque value: 4.0~5.0kgf-m

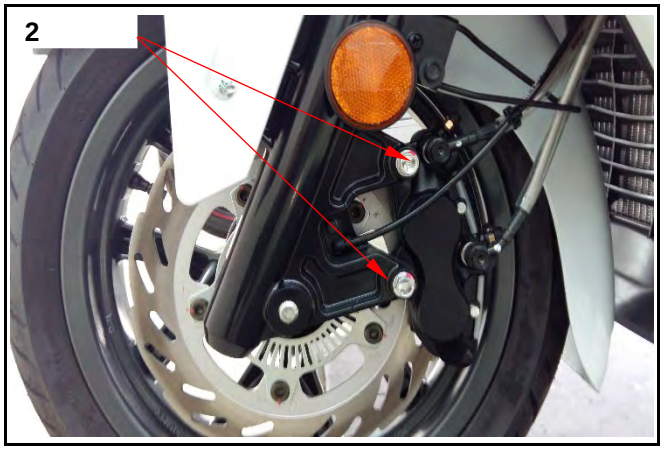
Apply with grease onto throttle cable and the sliding surface of handle.
Align the lock pin with the hole on the handle.
After the installment completes, carries on the following inspection and the adjustment:

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



Front Wheel

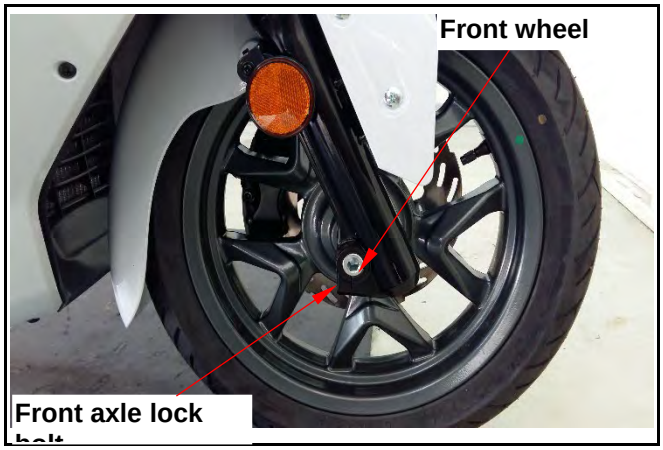
Loosen 2 bolts from the front brake caliper and remove it



⚠ Caution

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

Remove the front axle lock bolt.
Remove the front wheel axle.



Remove the front wheel and both side collar.

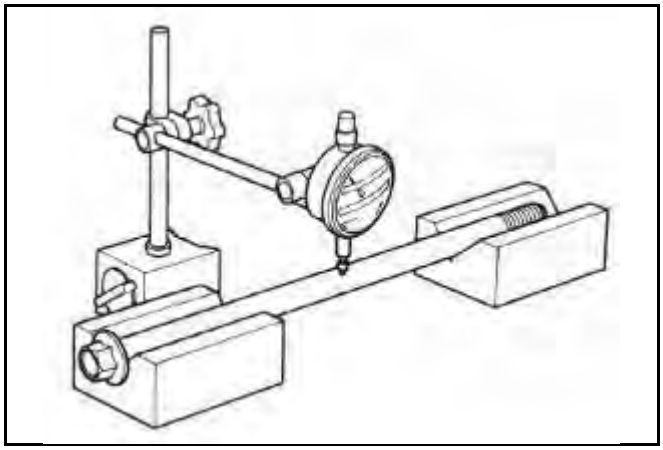


Inspection

Wheel axle

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

Service limit: 0.2 mm

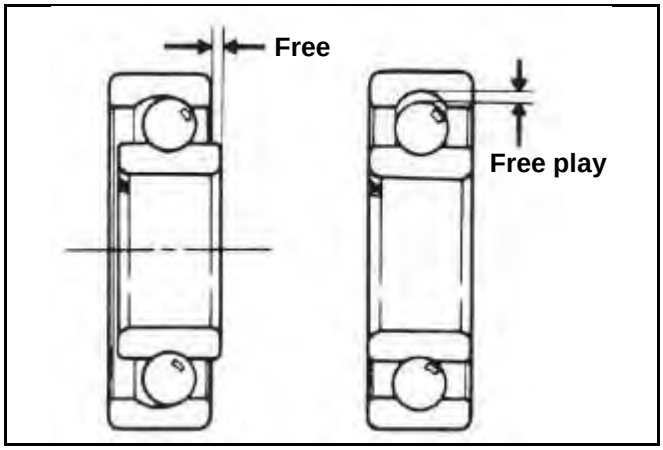


Bearing

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

⚠ Caution

- The bearing shall be replaced in pair.



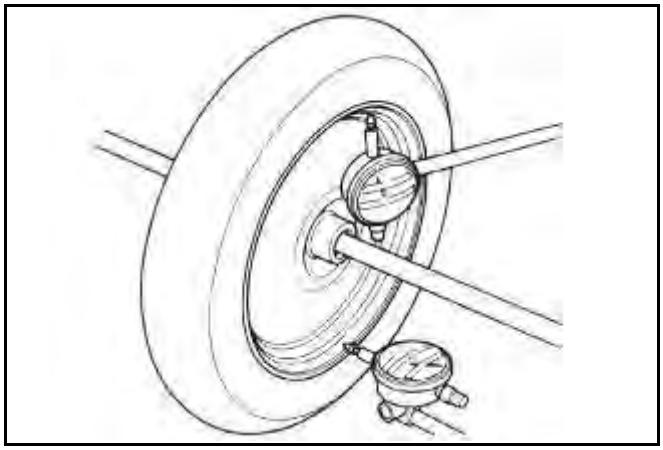
Wheel

Place the wheel on to a rotation seat to check its rim wobbling.
Turn the wheel with hand and measure its rim wobbling value with a dial gauge.

Service limit:

Radial: 2.0 mm (0.08 in)

Axial: 2.0 mm (0.08 in)



Disassembly

Remove brake disk (5 bolts).
Remove dust seal, bearing and dist collar from left side.
Remove dust seal and bearing.

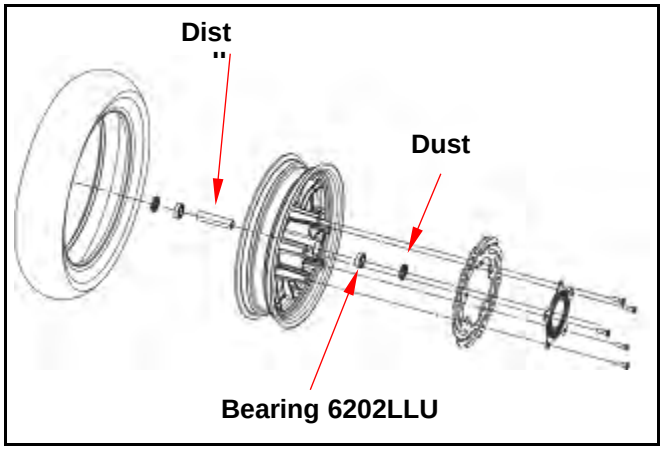
Special tools:

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.

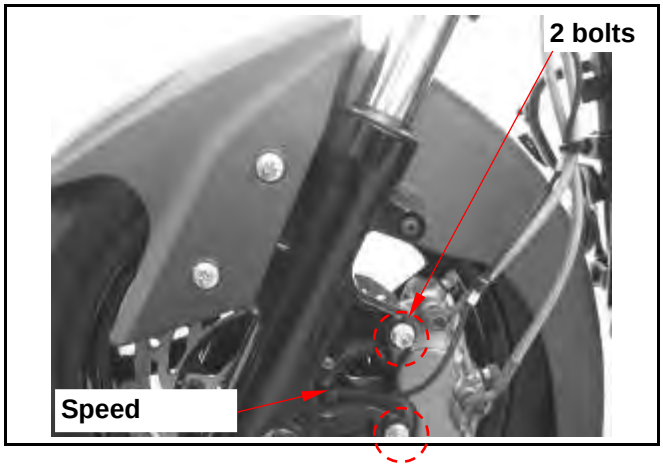
Torque value: 4.0~4.5kgf-m



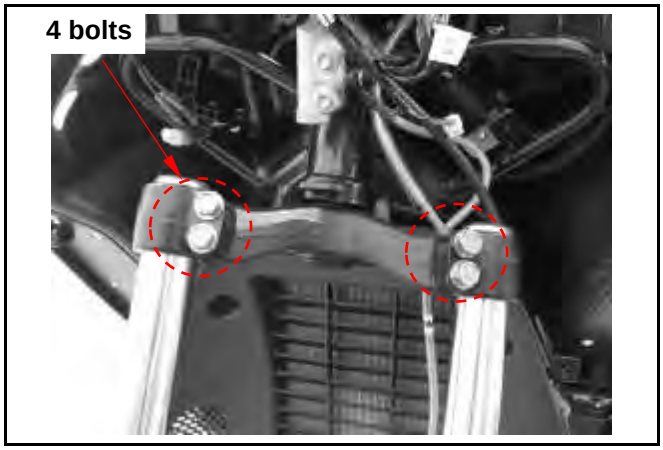
Front Cushion

Remove

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



Loosen 4 bolts from steering stem.
Remove the front cushions.

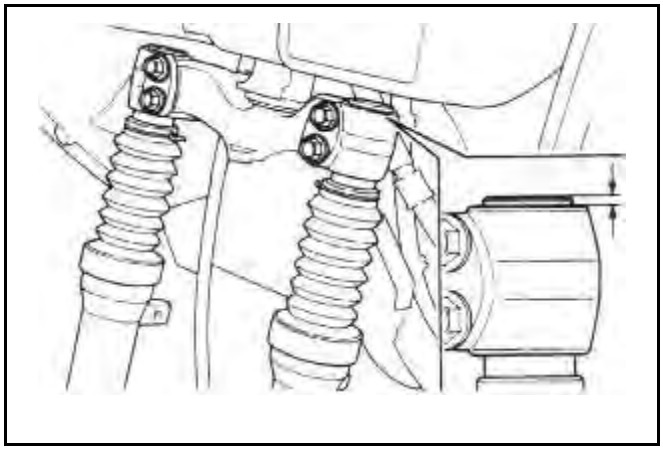


Installation

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

Torque value: 2.4~3.0kgf-m

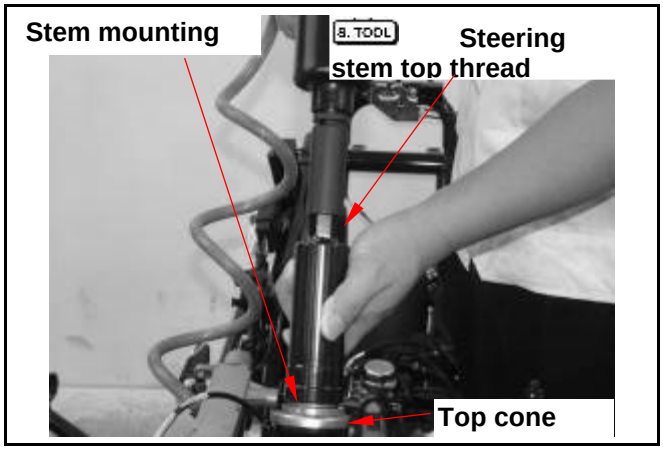
Install the removed components in reverse order of removal procedures.



Steering Stem

Remove

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

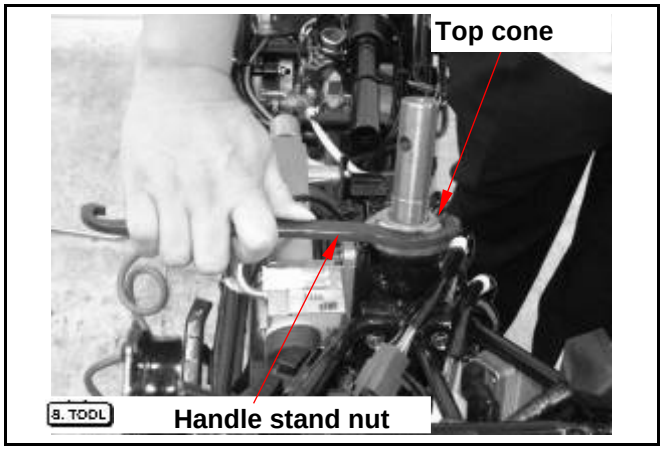


Remove top cone race and steering stem.

⚠ Caution

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

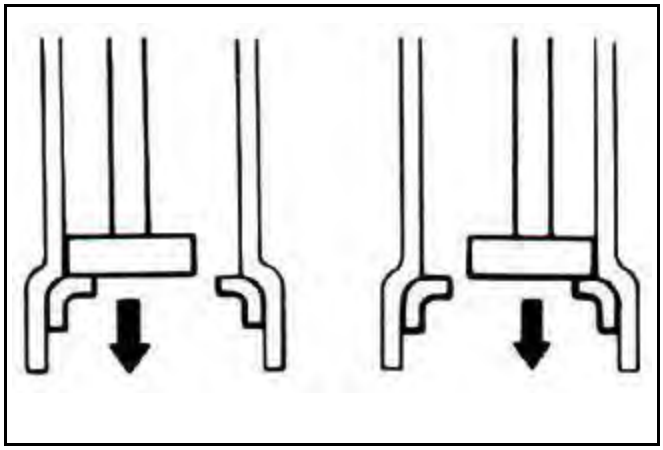
Special tools:
Steering stem top thread wrench SYM-5320010
Handle stand nut wrench SYM-5321100



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

⚠ Caution

- Do not damage the steering stem.



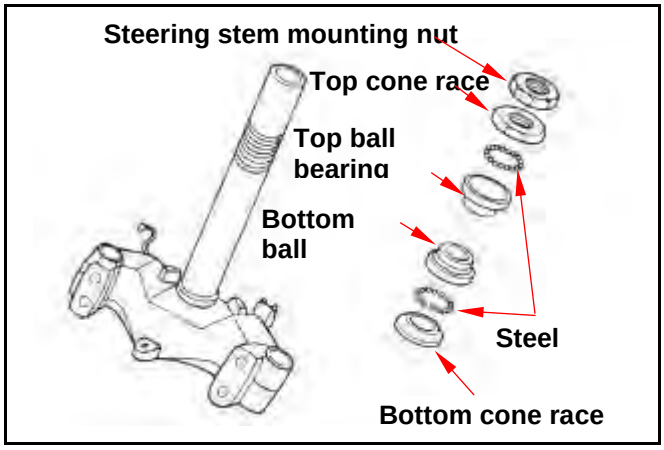
Installation

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

⚠ Caution

- Do not tilt the ball bearing seats as installation.

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

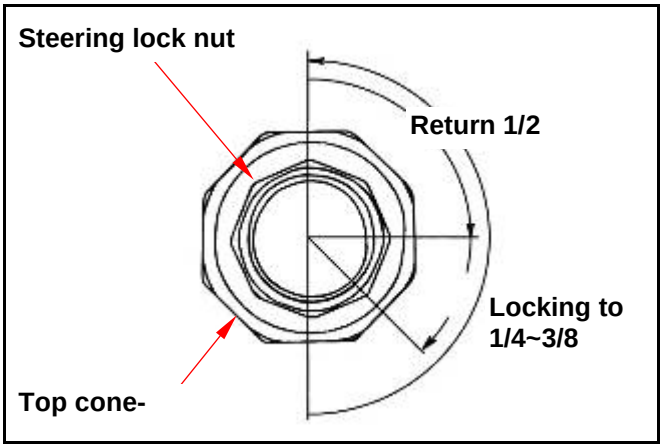


Lubricate the top cone race seat with grease. Screw the cone race in to top ball bearing seat till touching, and then screw out the cane race 1/4~3/8 turns.

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

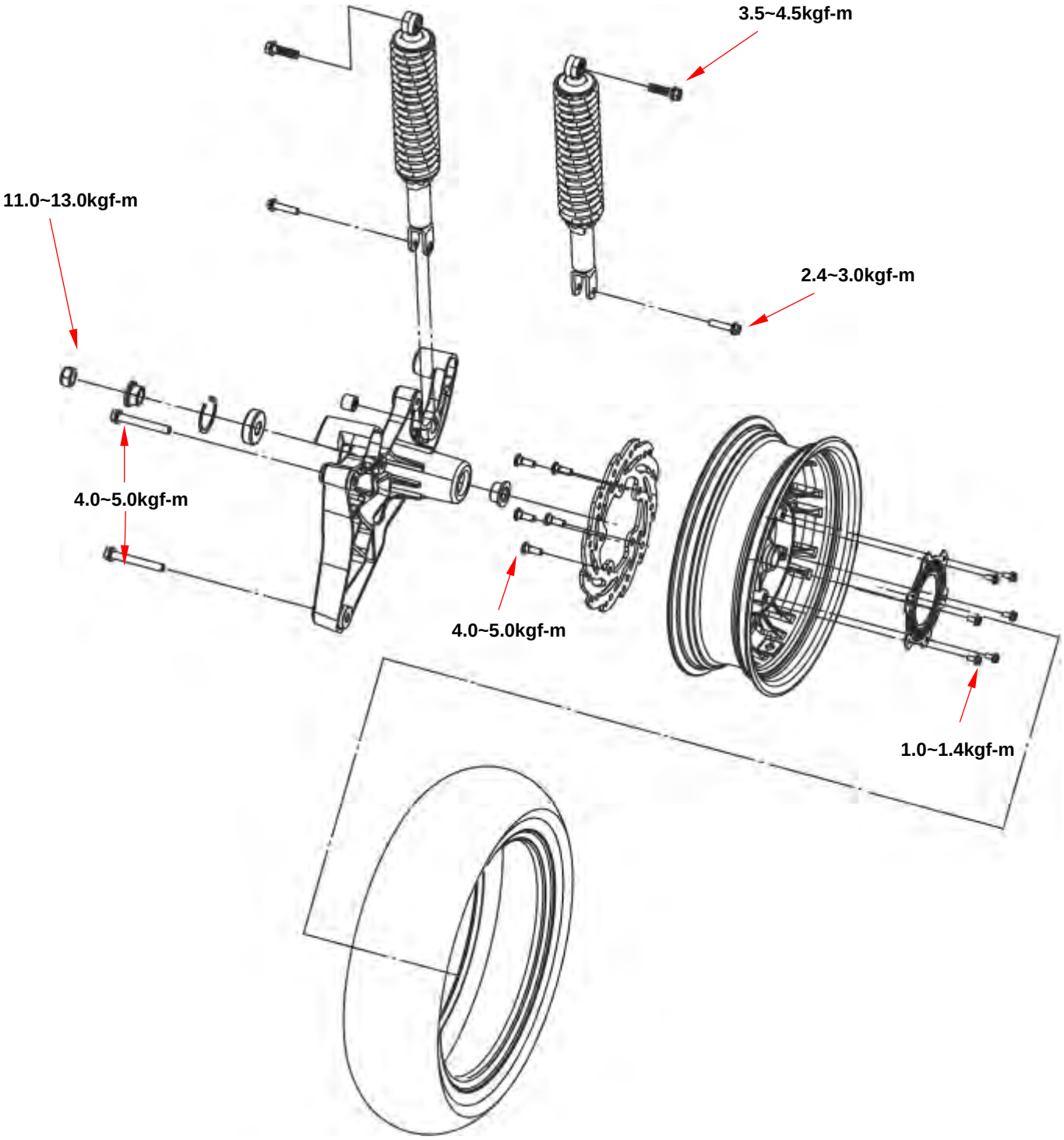


Install in reverse order of removal procedures.

NOTE:

Mechanism Diagram ····· 16-1	Rear Wheel ····· 16-3
Precautions in Operation ····· 16-2	Rear Fork ····· 16-5
Troubleshooting ····· 16-2	Rear Cushion ····· 16-6
Muffler ····· 16-3	

Mechanism Diagram



Precautions in Operation

General Information

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

Service data **Unit: mm**

Item		Standard	Allowable Limit
Run-out of rear rim	Radial	-	2.0
	Axial	-	2.0

Torque Value

Rear wheel axle nut	11.0~13.0kgf-m
Rear cushion upper bolt	3.5~4.5kgf-m
Rear cushion under bolt	2.4~3.0kgf-m
Rear fork mounting bolt	4.0~5.0kgf-m
Exhaust muffler mounting nut	2.4~3.0kgf-m
Exhaust muffler mounting bolt	4.0~5.0kgf-m
Brake clipper mounting bolts	2.9~3.5kgf-m
Brake disc mounting bolt	4.0~4.5kgf-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.
- The brake fluid pipe is deformed or bent.
- Insufficient amount of brake fluid in the reservoir

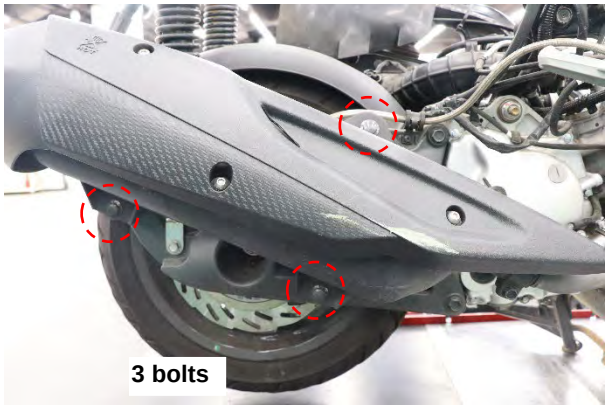
Muffler

Removal

Loosen the 2 nuts from exhaust muffler front side.



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



Installation

Install in reverse order of removal procedures.

⚠ Caution

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

Torque Value:

Muffler mounting bolt	**3.2 ~ 3.8kgf-m**
Muffler mounting nut	**1.0 ~ 1.2kgf-m**

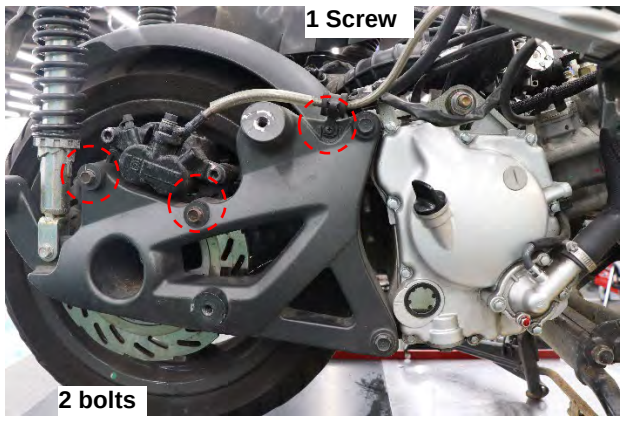
Rear Wheel

Removal

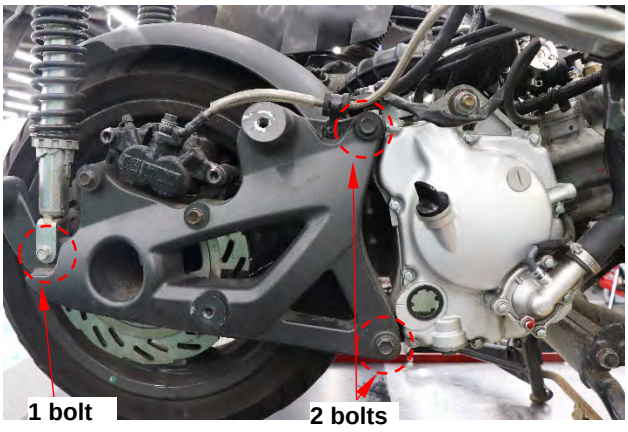
Remove the exhaust muffler.
Remove the rear brake caliper (2 bolts) and brake hose clamp (1 Screw).

⚠ Caution

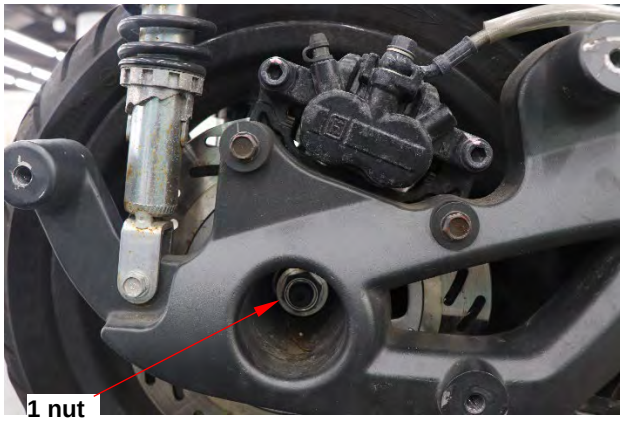
- Care shall be taken not to push the brake lever to avoid the brake pad being squeezed out. In case that the brake pad is accidentally squeezed out, use a screwdriver to force it back to the place.



Remove the lower bolt of the right side rear cushion.
Remove 2 bolts of the rear fork.



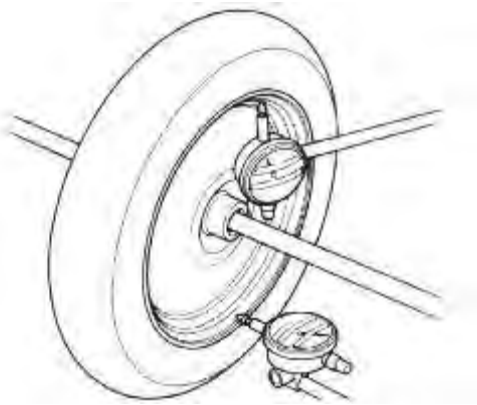
Remove rear wheel axle nut.



Remove rear fork and both side collars.
Remove the rear wheel.



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



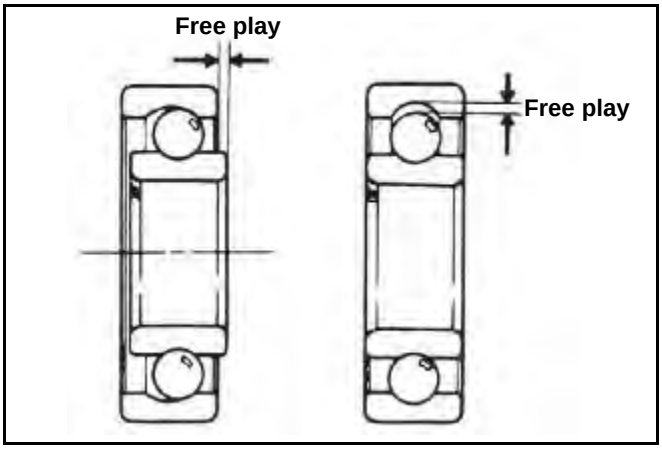
Installation
Install in reverse order of removal procedures.
Torque Value:

Rear wheel axle nut	**11.0~13.0kgf-m**
Rear cushion under bolt	**2.4~3.0kgf-m**
Rear fork mounting bolt	**4.0~5.0kgf-m**
Brake clipper mounting bolts	**2.9~3.5kgf-m**

Rear Fork

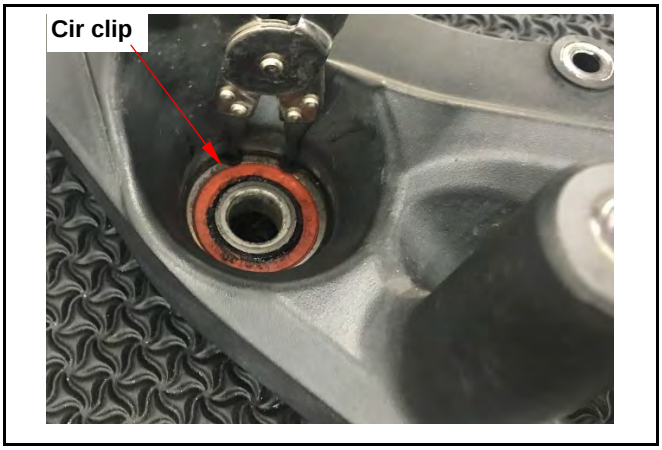
Inspection rear fork bearing

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



Replacement of rear fork bearing

Remove the bearing lock cir clip.



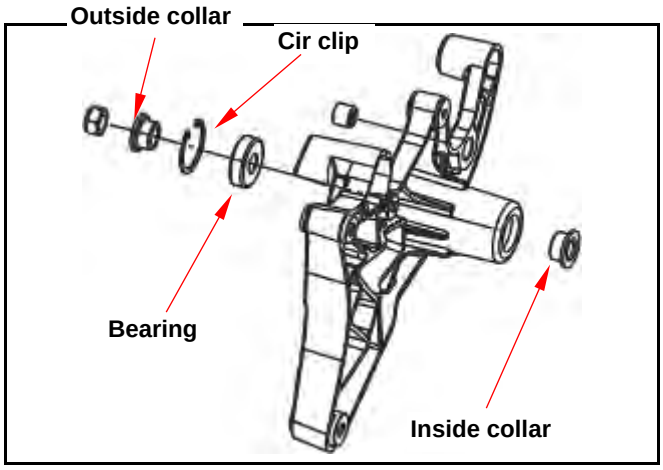
Uses the bearing driver; drive out the bearing.
Special tool
Bearing driver



Install new rear fork bearing.



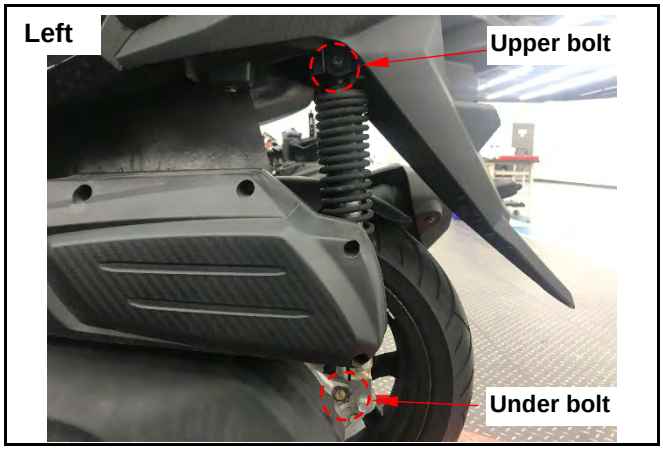
Install the bearing lock cir clip.



Rear Cushion

Removal

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

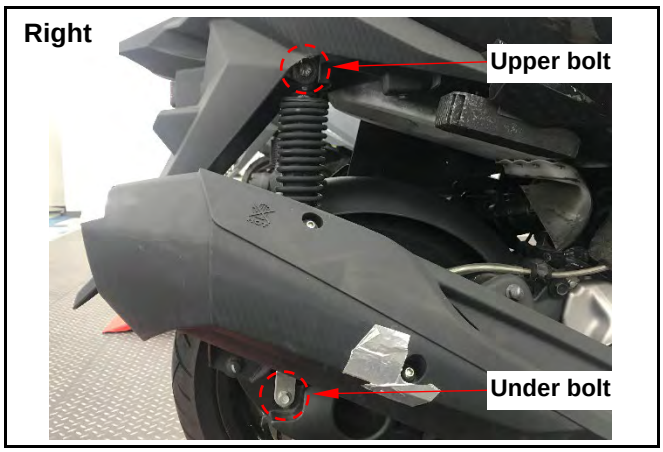


Installation

Install in reverse order of removal procedures.

⚠ Caution

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

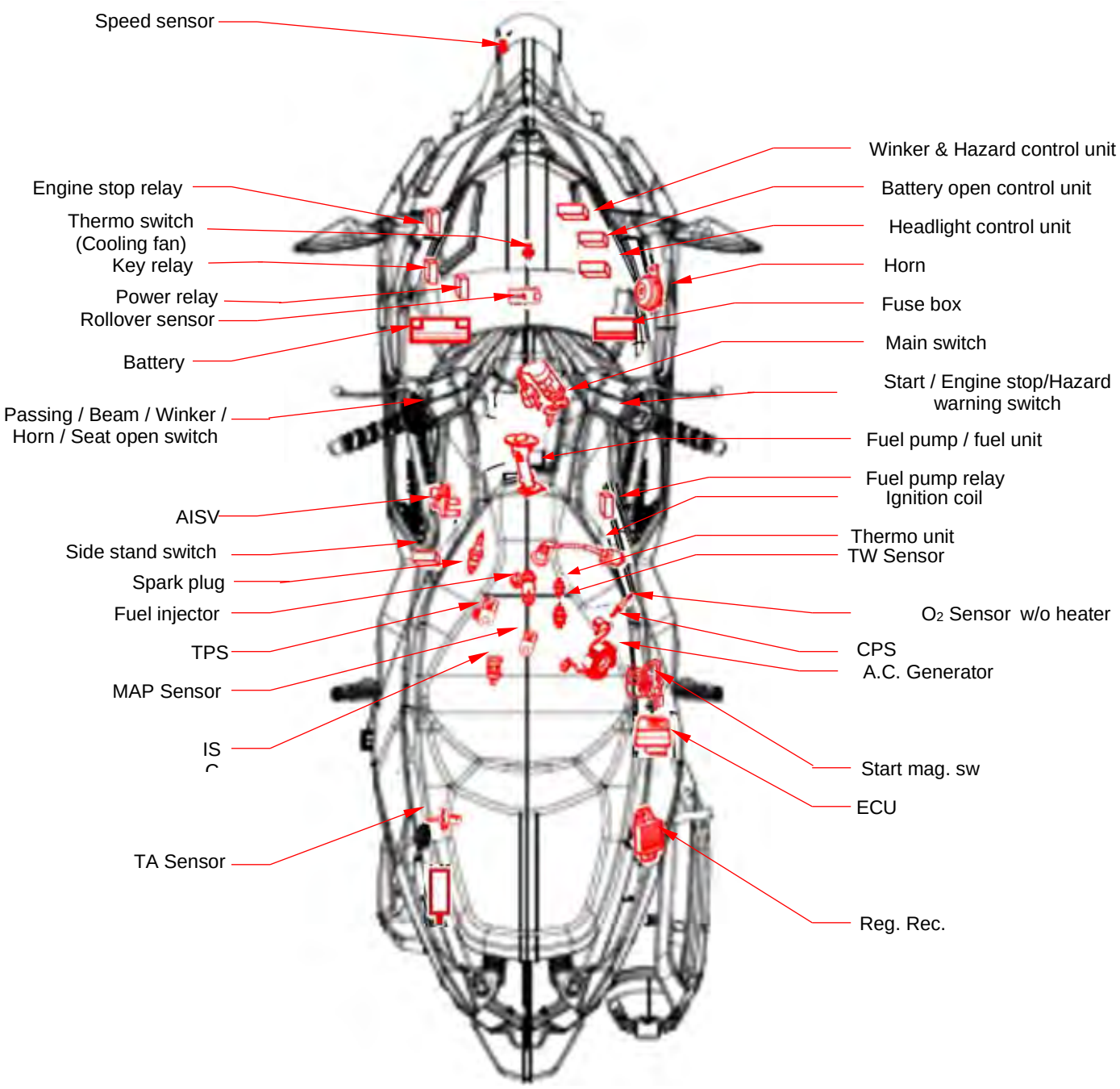


Torque Value
Rear cushion upper bolt: 3.5~4.5kgf-m
Rear cushion under bolt: 2.4~3.0kgf-m

NOTES:

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Precautions in Operation ····· 2	Light System ····· 14
Specification ····· 2	Switch / Horn ····· 18
Troubleshooting ····· 3	Fuel Unit ····· 20
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Fuse ····· 5	Water Temperature Meter ····· 21
Charging System ····· 6	Traction Control System (TCS) ····· 22
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Starting System ····· 10	

Mechanism Diagram



Precautions in Operation

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

Specification

Charging system

Description		Specification
Battery	Capacity	12V10Ah
	Charging rate	1.2A / 5~10hr (standard) 5A / 1hr (fast charging)
Leak current		Below 1mA
Charging current		1.2A / 1500 rpm
Control voltage in charging		14.5+0.5 V / 2,000 rpm

Ignition system

Description		Specification
Spark plug	Model	NGK CR8E (Recommended)
	Gap	0.7~0.8 mm
Ignition coil and resistance	Primary winding	2.8Ω±15%
	Secondary winding	Without cap:9.0 KΩ± 20%
		With cap:19.0 KΩ± 20%
Crankshaft position sensor resistance (20℃)		120Ω±20% (20°C)
Ignition timing advance	At idle speed	BTDC 10° / 1,550±100 rpm(for 300cc)
		BTDC 10° / 1,650±100 rpm(for 250cc)
	Full advanced	BTDC 30°

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 voltage regulator

No spark produced by spark plug

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

Starter motor does not work

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

Intermittent power supply

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

Charging system does not operate properly

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

Engine does not crank smoothly

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

Weak starter motor

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

Starter motor is working, but engine does not crank

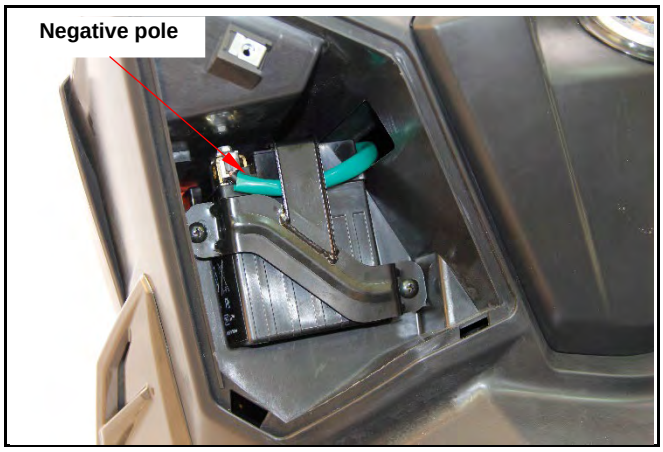
- Poor starter motor pinion
- The starter motor runs in reverse direction
- Poor battery

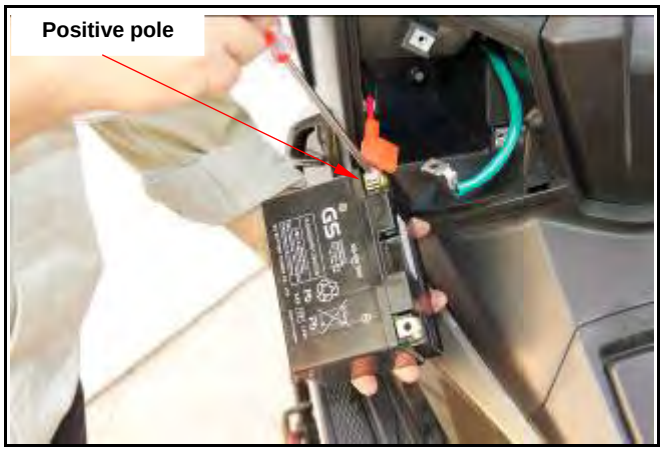
Battery

Removal

Loosen 1 screw and remove the battery cover.
Disconnect the negative cable terminal first, then the positive cable terminal.

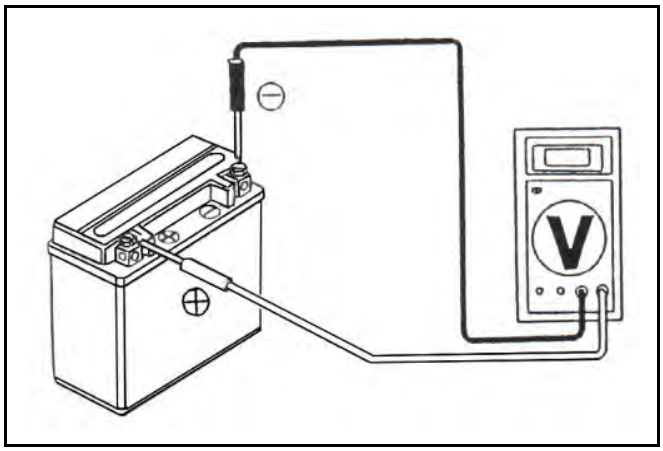
Remove the battery.





Voltage Check

Use the digital voltmeter to check the voltage of the battery.
Voltage:
Fully charged: 12.8V ↑ at 20℃
Undercharged: Below 12.0 V at 20℃



⚠ Warning

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

Charging

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

	Standard	Maximum
Charging current	1.2A	5A
Charging time	10 hr	1 hr

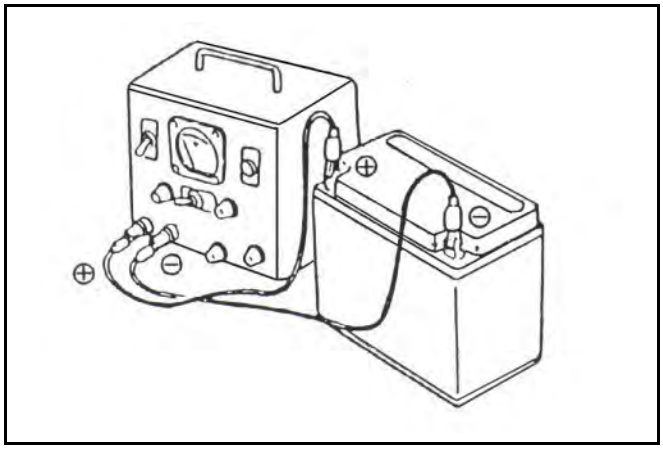
⚠ Warning

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

⚠ Caution

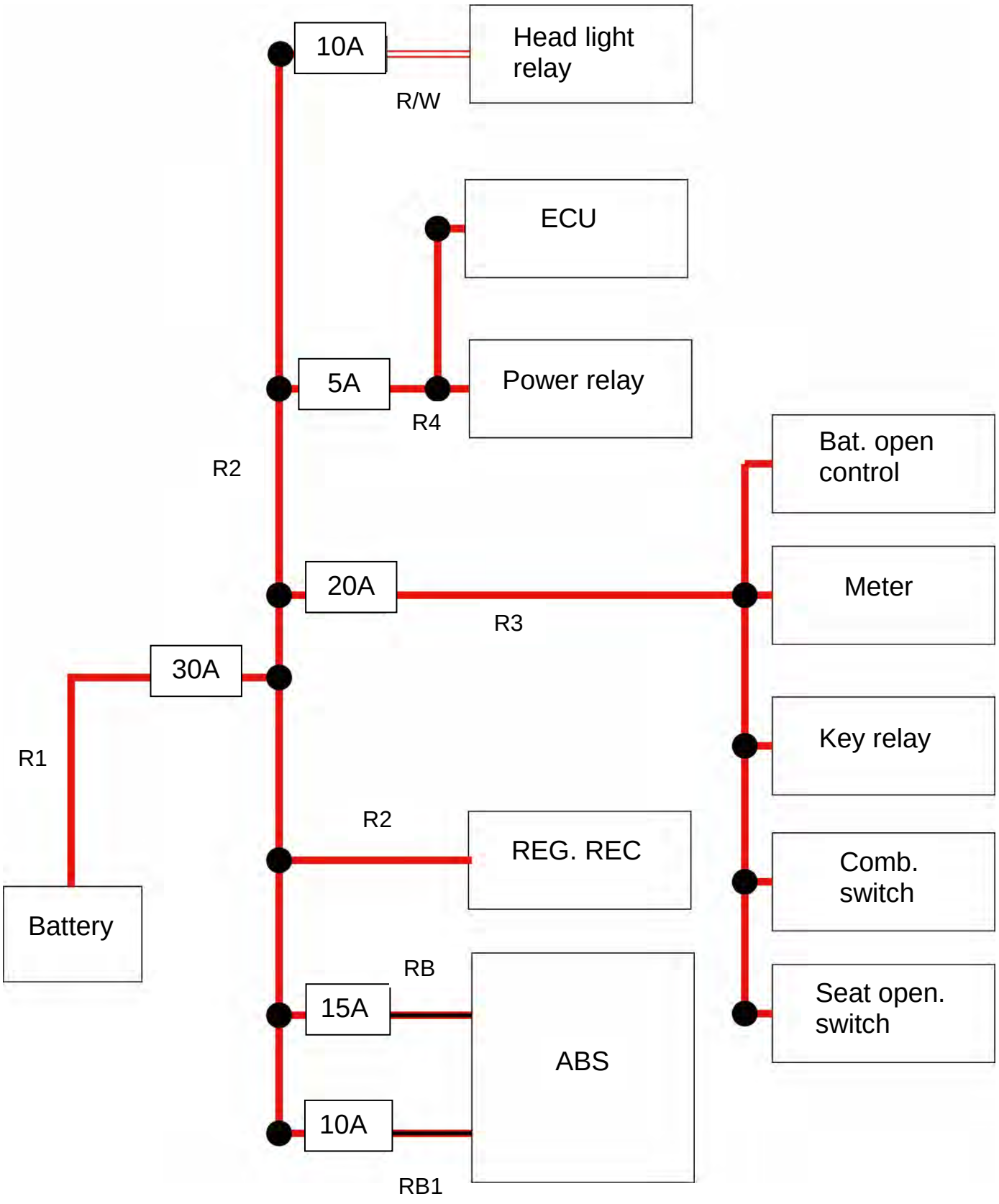
- Never rapid charge the battery unless in emergency.
- Verify the battery is recharged with current and duration prescribed above.
- Large current and fast time to charge will render damage to the battery.

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



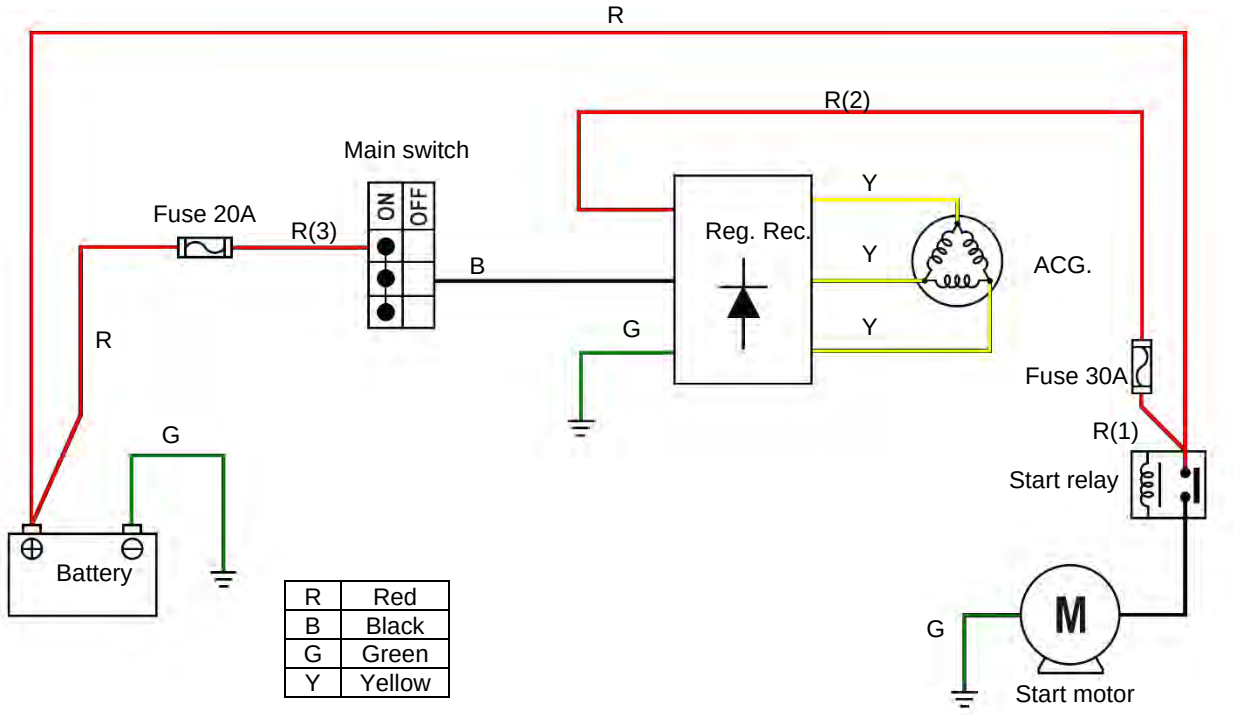
Fuse

Fuse circuit diagram



Charging System

Charging circuit



Regulator rectifier electrical impedance Inspection (series type)

+ / -	Y1	Y2	Y3	R	B	G
Y1		∞	∞	∞	∞	∞
Y2	∞		∞	∞	∞	∞
Y3	∞	∞		∞	∞	∞
R	∞	∞	∞		∞	∞
B	5MΩ~30 MΩ	5MΩ~30 MΩ	5MΩ~30 MΩ	∞		1KΩ~10KΩ
G	2MΩ~20 MΩ	2MΩ~20 MΩ	2MΩ~20 MΩ	∞	1KΩ~10KΩ	



Regulate voltage
14.5 ±0.5V
around 5,000rpm
Average rectified current :**35A**

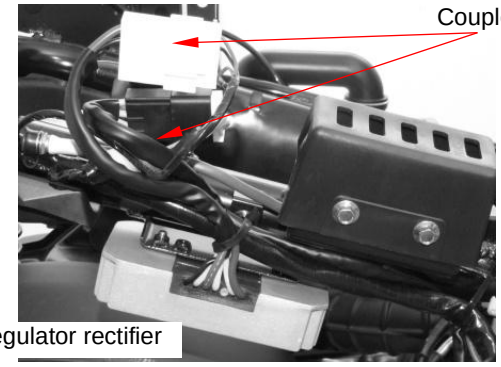
Inspection on regulator rectifier wire

Remove the luggage box, rear carrier and body covers.
Disconnect 3 pin coupler and 4 pin coupler 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 (12.5V↑)
Battery connection	R─G	Battery voltage (12.5V↑)
Charging coil	Y─Y	0.2~1.0 Ω

If the readings measured are not normal, check parts in the circuit.

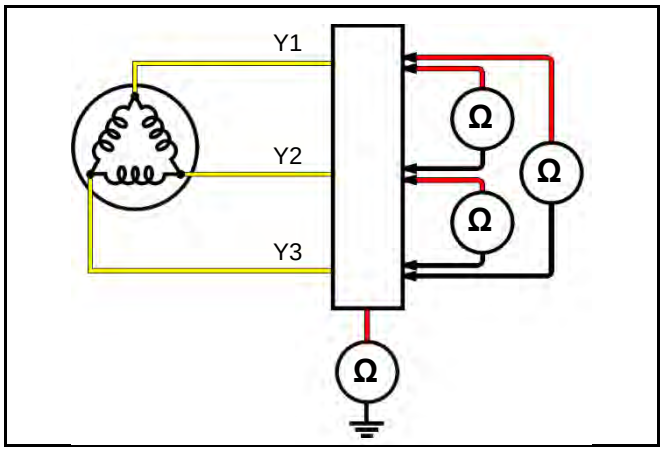
If the parts are normal, then trouble is in the wiring.
If there is nothing wrong with parts and wiring, replace the regulator rectifier.



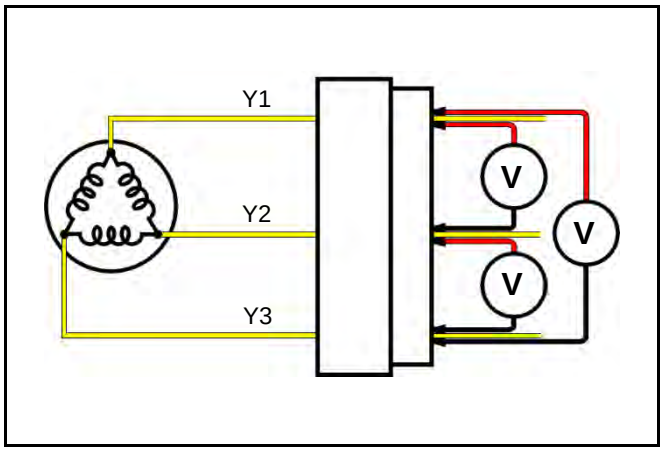
Inspection on AC. Generator charging coil

Remove the luggage box, rear carrier and body covers.
Disconnect 3 pin couplers of the generator coil.
Connect an ohmmeter to the each terminal end.
Check the continuity of the each terminal end, and engine ground with short circuit?
If there is no continuity or short circuit, replace the AC. Generator.

	V	Ω
Y1	70~80	0.24±20%
Y2	70~80	0.24±20%
Y3	70~80	0.24±20%

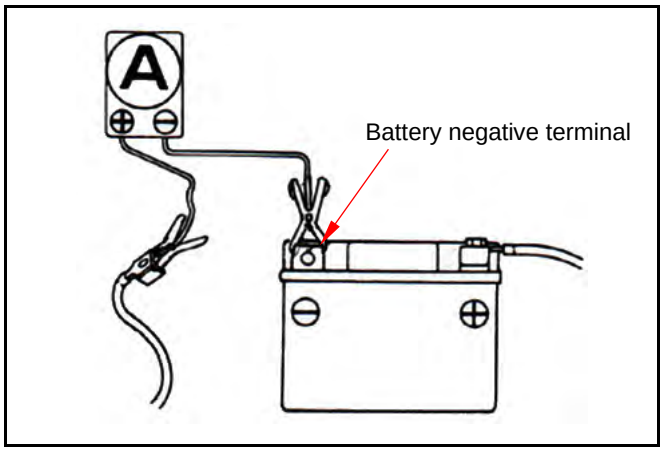


And you can check voltage by engine is running.



Current Leakage Inspection

Turn the main switch to OFF position, and remove the negative cable terminal (-) from the battery.
Connect an ammeter between the negative cable terminal and the battery negative terminal.
Disconnect each cable one by one and take measurement of the current of each cable to locate the short circuit.
Allowable current leakage: Less than 1mA

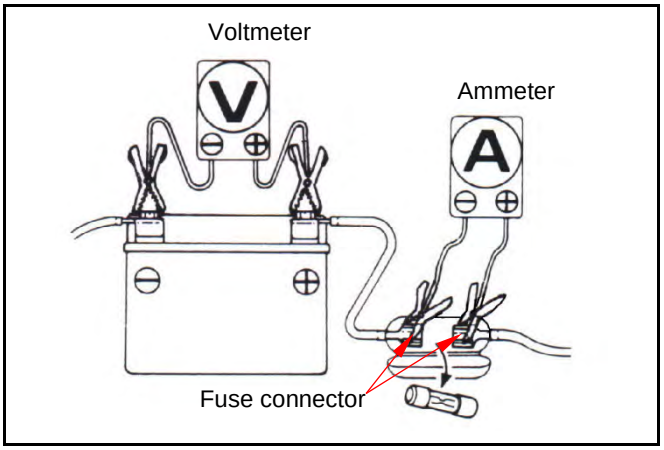


⚠ Caution

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

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

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.
Average Charging Current:
1.2 A / 6000 rpm
Regulate charging Voltage:
14.5±0.5 V /5000 rpm

⚠ Caution

- To replace the old battery, use a new battery with the same current and voltage.

The following problems are related to the charging system, follow the instructions provided in the checking list to correct it if any one of the problems takes place.

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

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

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

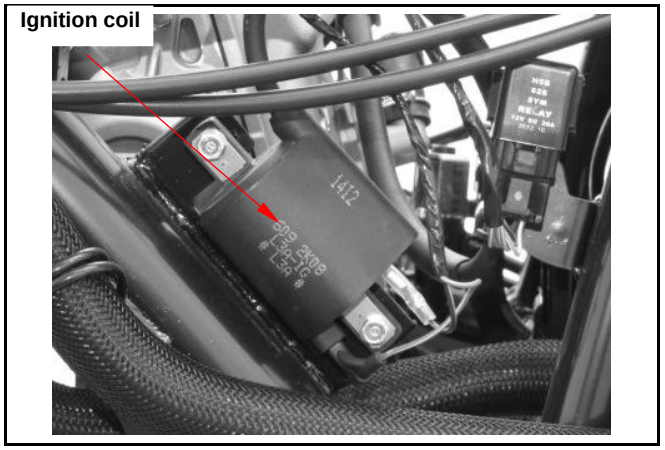
(2) The charging voltage is normal, but the current is not.
- The replacement battery is aged and does not have enough capacity.
- Battery used do not have enough electricity or is over charged.
- The fuse of the ammeter is blown.
- The ammeter is improperly connected.

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

Ignition System

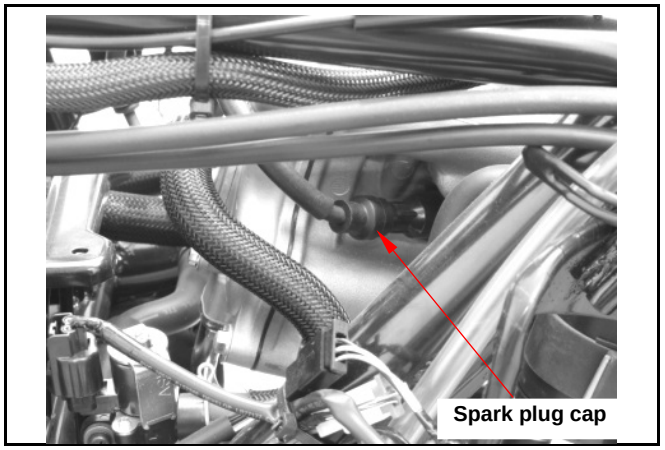
Inspection on ignition coil

Remove the right floor garnish.
Disengage the connector of the ignition coil.
Measure the resistance between the terminals of the primary winding.
Standard resistance: 2.8Ω±15% (20ºC)

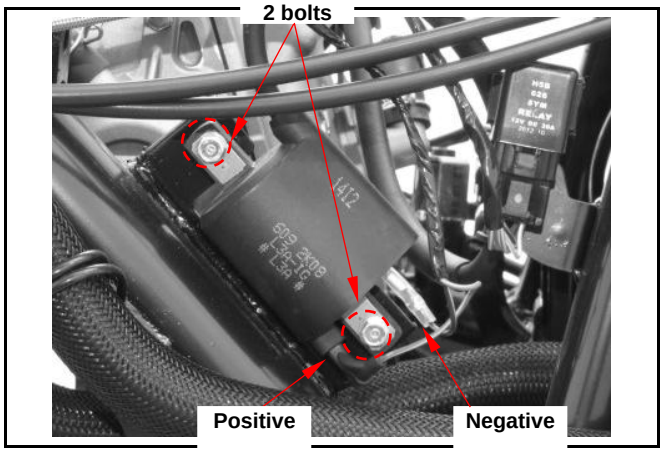


Replacement on ignition coil

Remove the cap from the spark plug.



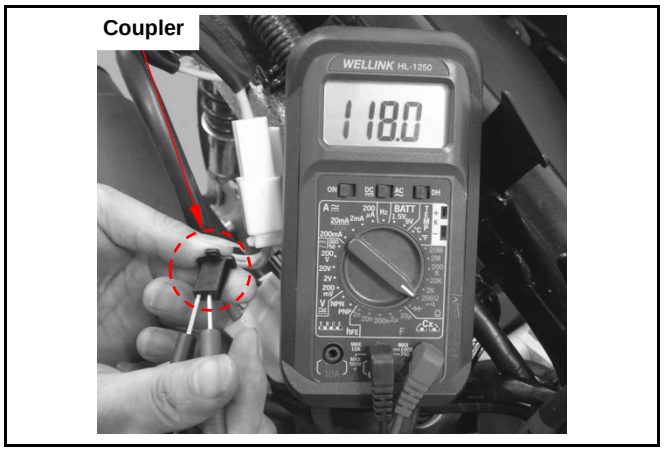
Loosen 2 bolts and replace the ignition coil if necessary.



Inspection of crank position sensor

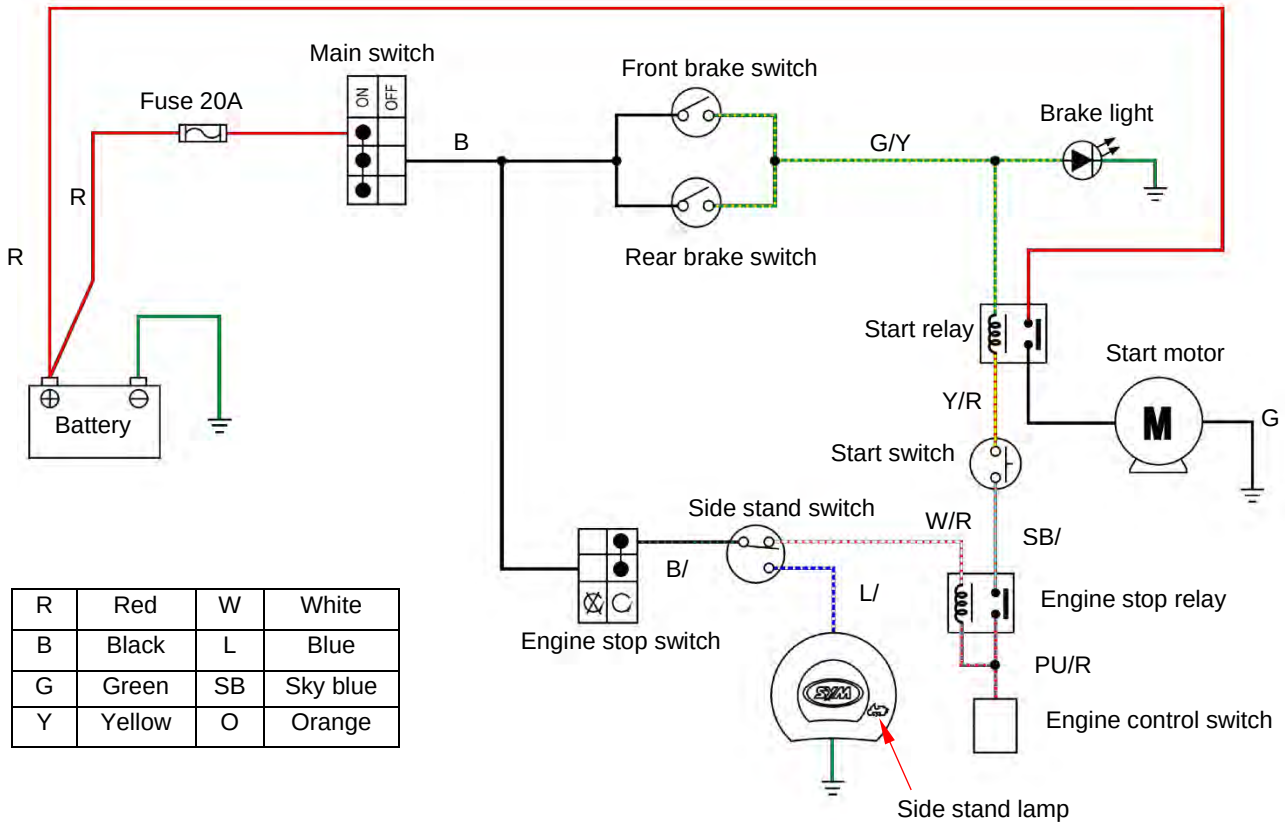
Remove luggage box (bolt×6).
Disconnect the coupler of the crank position sensor and measure the resistance between the terminals of green/white and blue/yellow.
Standard resistance: 120Ω±20% (20°C)

Please refer to the section 11 for disassembly of coil.



Starting System

Starting circuit diagram



R	Red	W	White
B	Black	L	Blue
G	Green	SB	Sky blue
Y	Yellow	O	Orange

Inspection on starter relay

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

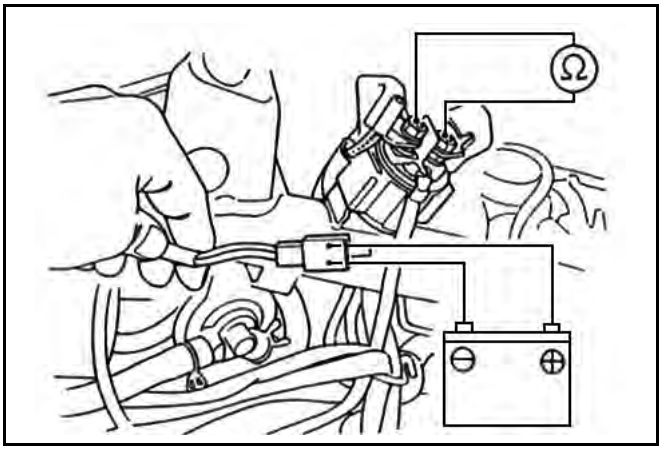


Open the inner box lid, and remove battery cover.
Disconnect the negative cable terminal of the battery.

Remove the luggage box.
Disconnect the cable positive terminal from the start relay.

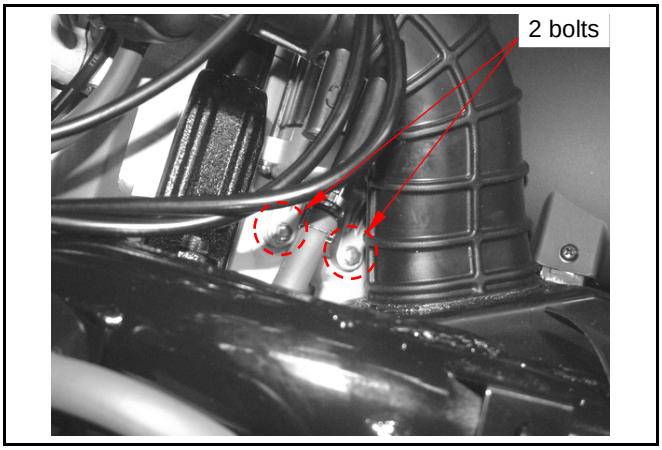


Disconnect the positive cable of the starter motor.
Disconnect the coupler of the relay.
Connect an ohmmeter to the large terminal end.
Connect the yellow/red cable to the battery positive terminal and the green/yellow cable to the battery negative terminal.
Check the continuity of the large terminal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



Removal of Starter motor

Turns off the main switch
Remove the luggage box.
Disconnect the coupler of the start relay.
Disconnect the cable negative terminal of the battery.
Disconnect the starter motor power cable.
Loosen 2 bolts & remove starter motor.

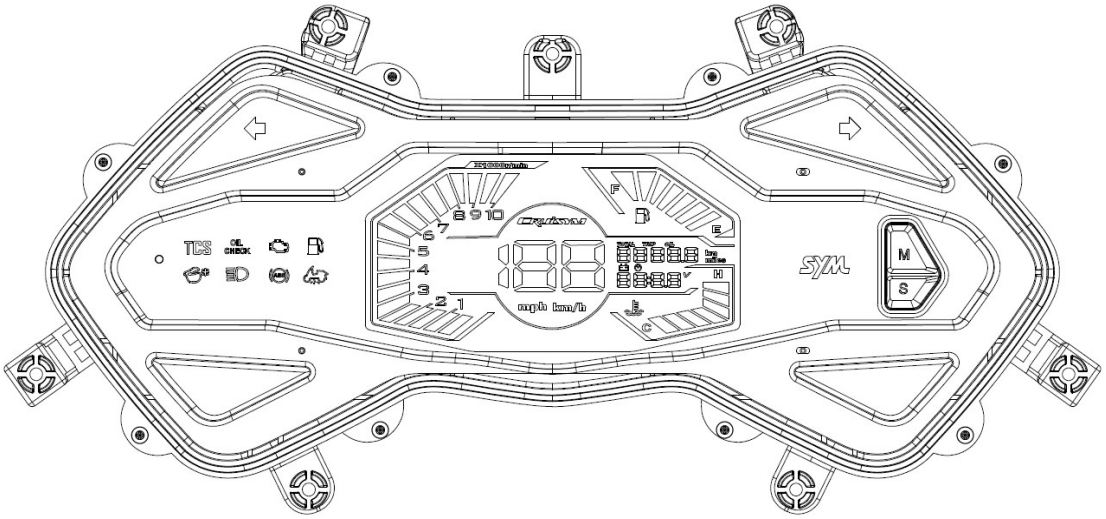


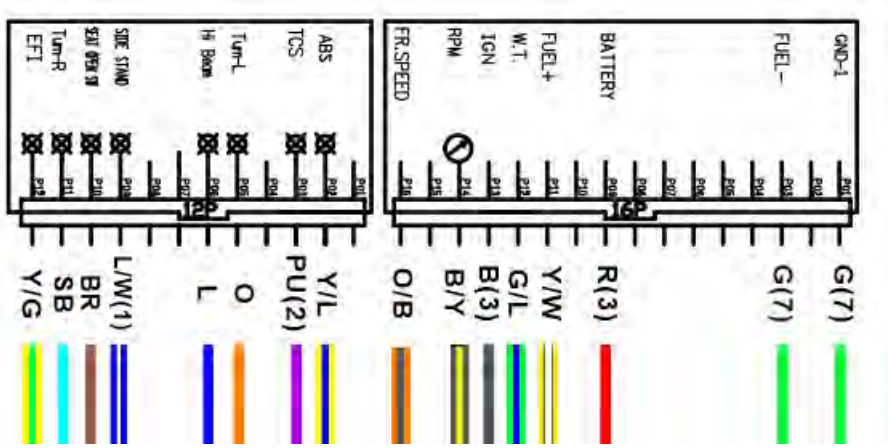
Installation of starter motor

Install in reverse order of removal procedures.

Meter

Meter circuit diagram

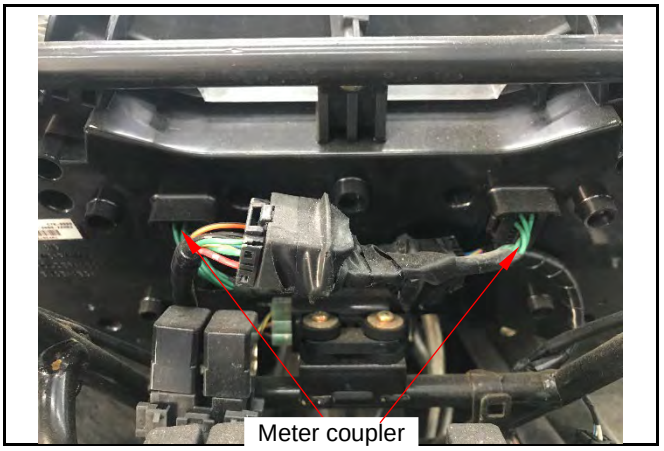




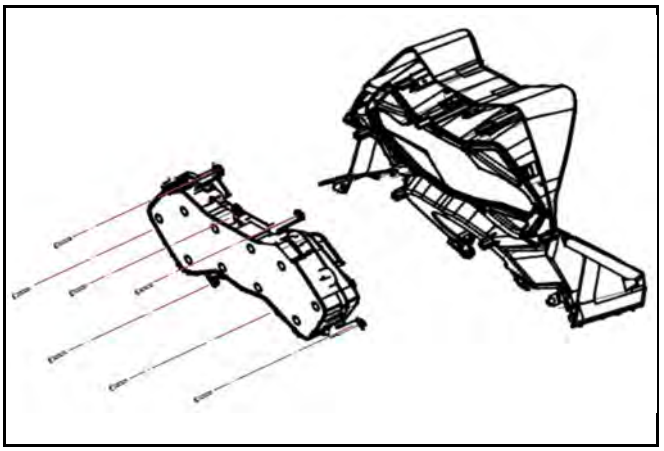
Note: TCS system function only available on LV30 type.

Removal of meter

Remove wind screen garnish, wind screen, meter visor, front cover, meter visor.
(Refer chapter 14)



Disconnect the coupler of the speedometer, and take off the meter panel and meter.



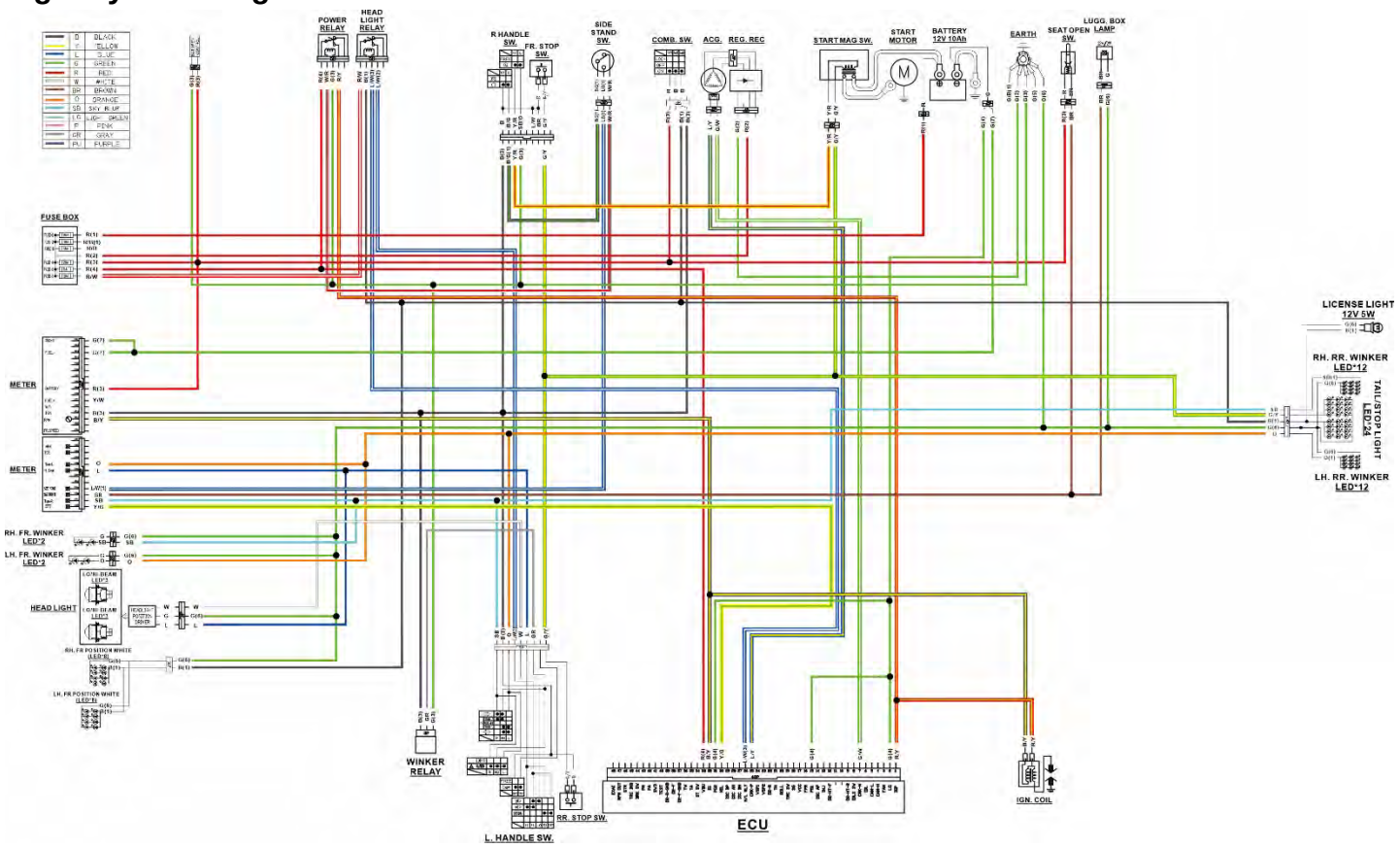
Loosen 7 screws from meter panel.
Remove the speedometer.

Installation of meter

Install in reverse order of removal procedures

Light System

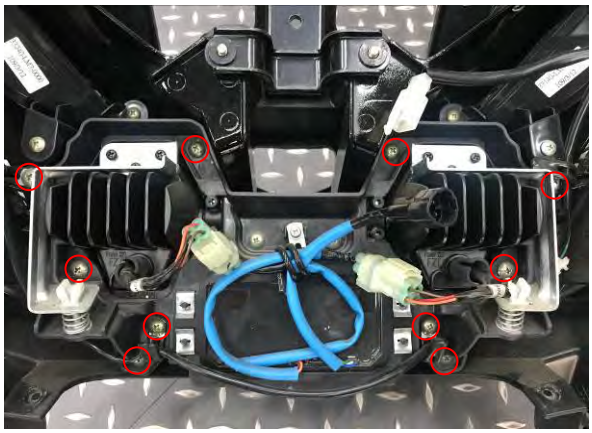
Light system diagram



Projection dual headlights replacement

Headlight set removal

Remove the wind screen and front cover.
Remove the headlight set. (screw×10)



Headlight removal

Remove screws behind the headlight. (screw×3)
Remove screws of headlight bracket (screw×4)
Disconnect the coupler.
Remove the headlight.



Headlight driver removal

Remove screws of headlight driver. (screw×4)
Remove the headlight driver.



Installation

Install the bulb of the headlight in reverse order of removal.

Rear LED Signal lights replacement

Remove the luggage box.
Rotate the winker bulb and remove it.
Replace with new bulb if necessary.



Installation

Install the bulb of the headlight in reverse order of removal.



LED Position lights replacement

Remove the front cover.
Remove the position light set. (screw×4) And disconnect coupler.
Replace with new position light if necessary.



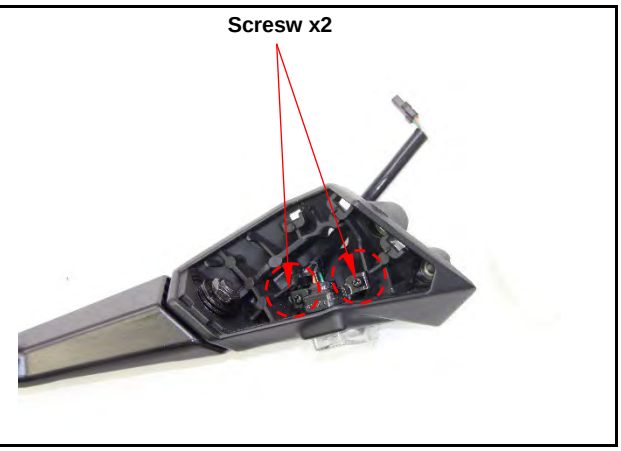
Installation

Install the bulb of the headlight in reverse order of removal.



Front LED Signal lights replacement

Remove the back mirror lid.
Disconnect the LED coupler.
Replace with new LED signal light if necessary.



Installation

Install the bulb of the headlight in reverse order of removal.

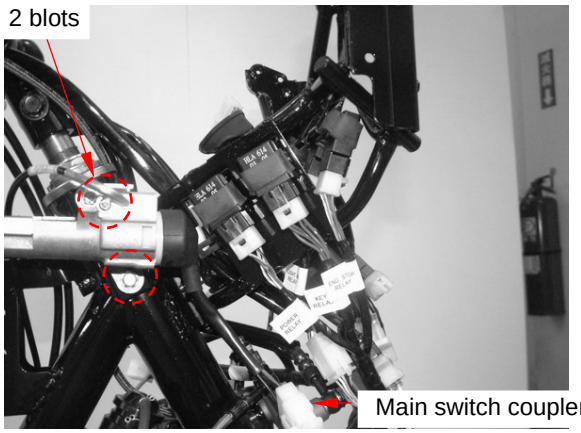
Switch / Horn

Main switch

Inspection

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

Pin / Position	BAT	BAT1	BAT2
LOCK			
OFF			
ON	●	●	●
Wire Color	R	B	B



Replacement of main switch

Remove main switch cap.
Disconnect the coupler of the main switch and loosen the mounting bolts (3 bolts).
Remove the main switch.
Install the new main switch and tighten the mounting bolts.
Install the main switch coupler and cap.

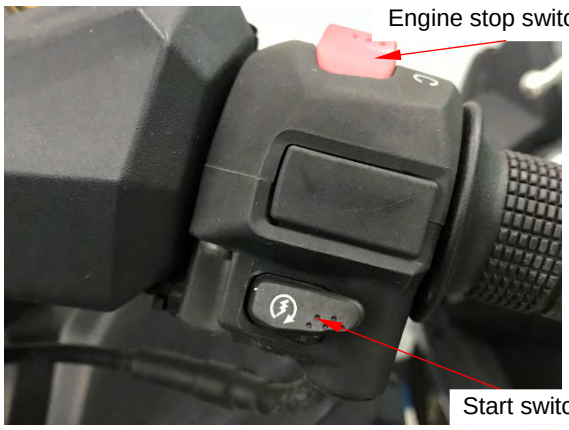


Right handlebar switch

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

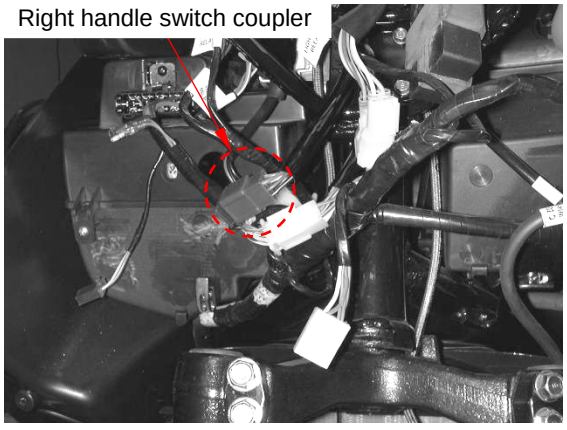
Engine stop switch

	ST	E
⊗		
⟲	●	●
Wire color	B	B/G



Starter switch

	ST	E
FREE		
⚡	●	●
Wire color	Y/R	SB/O



Left handle switch

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

High and low beam switch

	Hi	HL	LO	B1	BAT
		●	●		
	●	●			
Passing				●	●
Wire color	L	L/W	W	L	L/W

Winker switch

		R	WR	L
	⇨	●	●	
N	FROM R	●	●	
	PUSH OFF			
	FROM L		●	●
	⇦		●	●
Wire color		SB	GR	O

Hazard switch

	R	HZ	L
OFF			
HAZARD	●	●	●
Wire color	SB	GR	O

TCS switch

	TCS	E
FREE		
TCS	●	●
	R/Y	PU

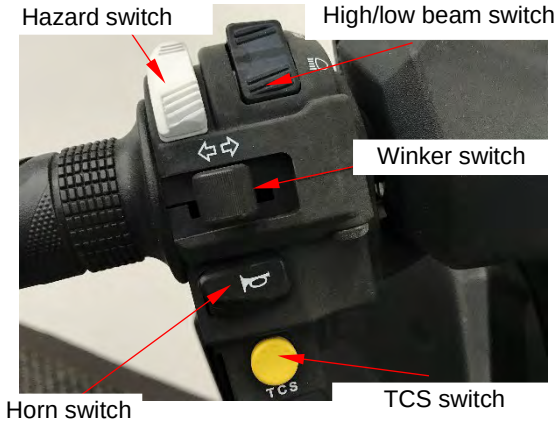
(TCS switch only available on LV30 type.)

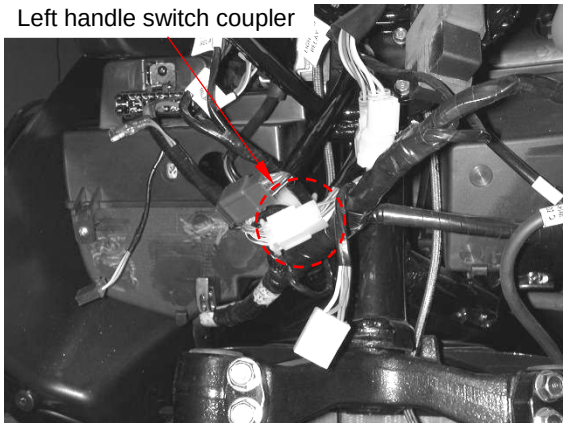
Brake Switch

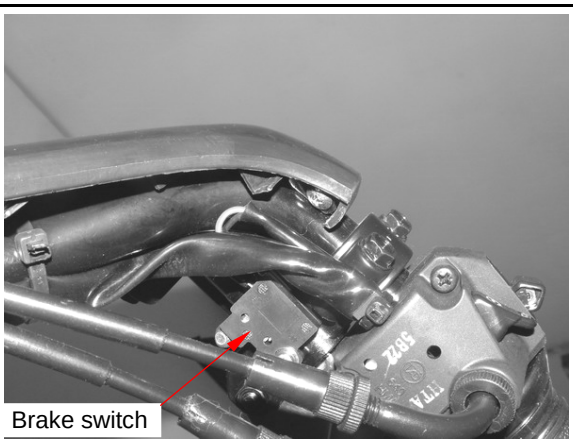
While grasp the brake lever firmly, the terminals of white/green and green/yellow of the brake should have continuity.
Replace the switch if damaged.

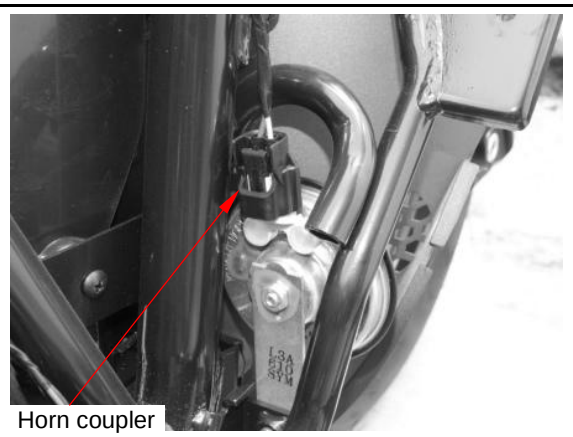
Horn

Remove the front cover and front under spoiler.
Apply 12 V power source to two terminals of the horn, the horn should sound.
Replace the horn if necessary.



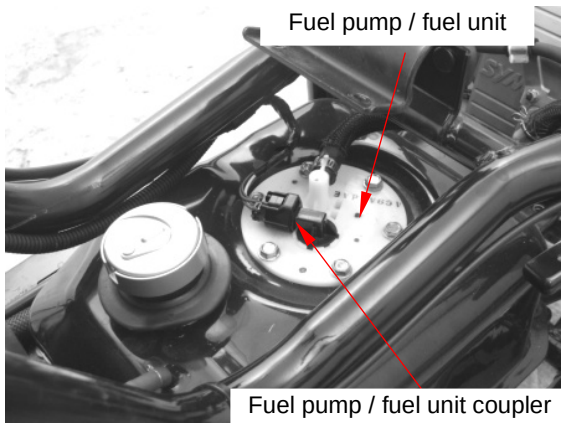






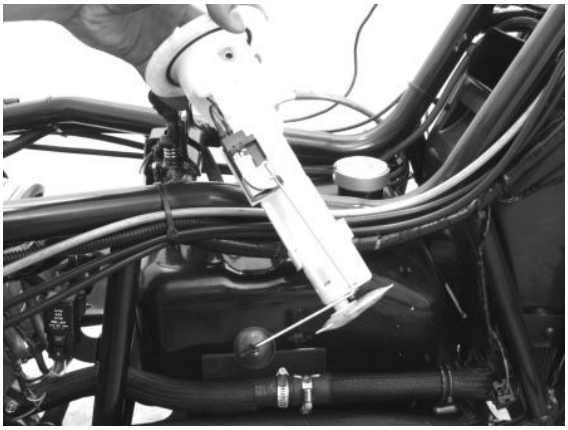
Fuel Unit

Open the seat.
Remove the luggage box.
Remove the rear carrier.
Remove right & left side cover.
Remove the body cover
Remove the floor panel.
Disconnect the coupler of the fuel unit.
Loosen 4 bolts from fuel unit and remove it.



⚠ Caution

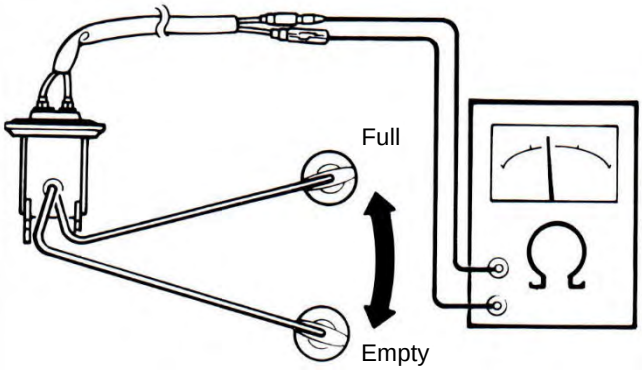
- Great care shall be taken not to damage or bend the float arm of the gauge.



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

Position	Resistance
E (Empty)	100±5 Ω
F (Full)	1150±20 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)

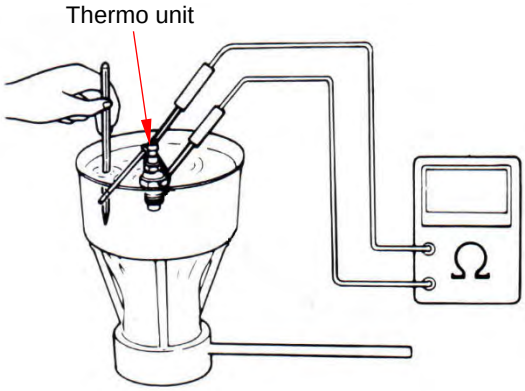
⚠ Caution

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

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

⚠ Caution

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


Thermo unit

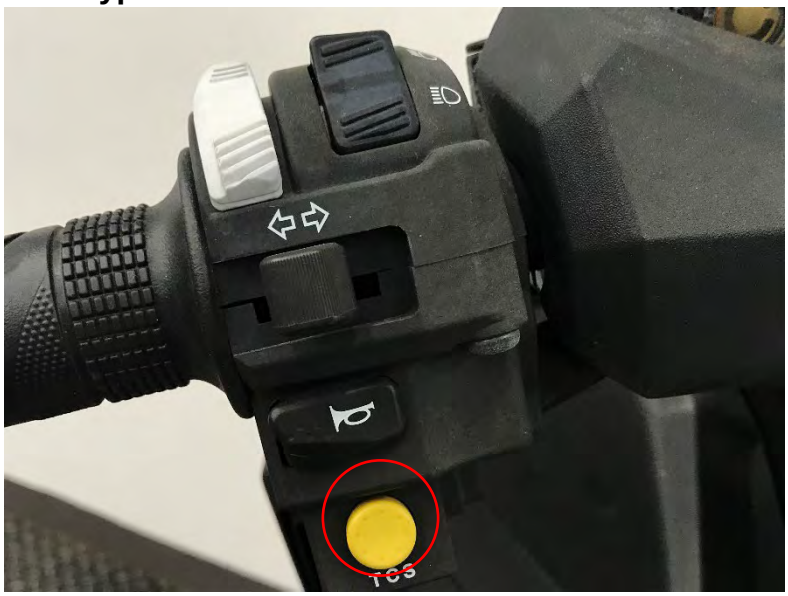
Traction Control System (TCS)

The TCS reduces engine power to help maintaining rear wheel traction when accelerating on low friction surfaces.
For Keihin ECU scooters, the ECU conducts the calculation process, the ABS module only provides wheel speed signals.
The ECU monitors wheel speed difference constantly, the engine power will be regulated once the difference is beyond the standard range. You may notice changes in response or exhaust sound when TCS is intervening.
The TCS indicator may blink when braking hard, simply due to the wheel speed difference is beyond standard, eg, only apply front brake for emergency braking.

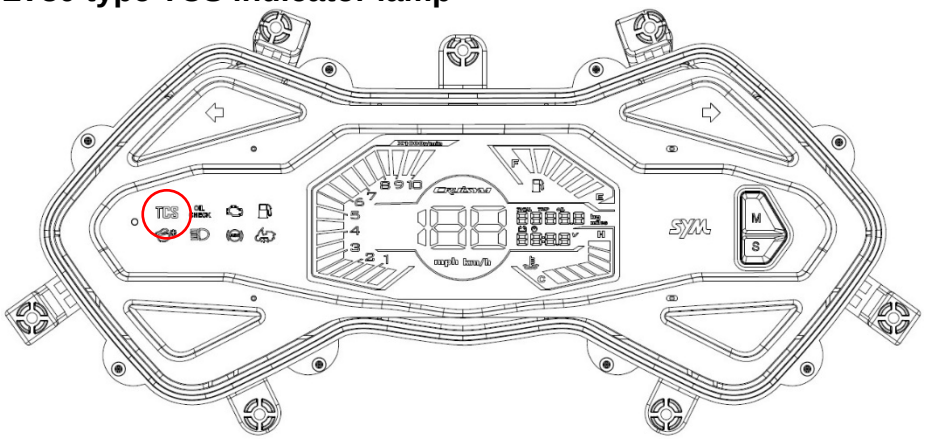
⚠ Caution

- TCS system it's not designed for regaining grip even "abuse" the system

LV30 type TCS switch



LV30 type TCS indicator lamp



Dangled the rear wheel in air with main stand, and start engine then rotate the throttle. Rear wheel rotating and TCS indicator blinking, the engine speed will not over 2000~2500 rpm, because wheel speed difference beyond the standard range.
Press the TCS switch button for 3 seconds and the meter TCS indicator lights up, TCS off and engine speed can be accelerated normally.
Press the TCS switch button for 3 seconds again and the meter TCS indicator off, TCS on

⚠ Caution

- TCS function cannot be switched while the vehicle is in motion, must be switched when the vehicle is stopped.

Trouble code

No specific DTC for traction control, the TCS indicator cannot represent system malfunction.

The following DTC will light up the check light and TCS indicator light. TCS may out of service

Item	DTC	Description	Note
1	P1690	Communication error or wrong instrument	
2	P0500	Vehicle speed sensor (Front) malfunction	Note.2
	P2158	Vehicle speed sensor (Rear) malfunction	
3	P0201	Injector circuit malfunction	
4	P0351	Ignition coil 1 circuit malfunction	
5	P0230	Fuel Pump Primary Circuit	
6	P0335	Crankshaft sensor circuit malfunction, open and short circuit can't be distinguished	
7	P1630	Roll over sensor circuit malfunction	
8		ABS ECU malfunction	Note.1

Note:
1.ABS detects abnormal wheel speed and abnormal operating voltage, ABS send fault signal to ECU, ECU receiving the fault signal then make TCS out of service.
2.Indicator light will not light up; diagnosis tool will show up trouble code.

NOTES:

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Functions of Mechanism in the Emission Control System ····· 18-1
Fuel Evaporative Emission Control System (E.E.C.) ····· 18-2
Catalytic Converter (CATA) ····· 18-4
Secondary Air Injection System ····· 18-5
Positive Crankcase Ventilation System (P.C.V.) ····· 18-8
Inspection Items ····· 18-9

Mechanisms in the Emission Control System

Four-Stroke Engine Model

1. Catalytic Converter (CATA)
2. Evaporative Emission Control System (E.E.C.)
3. Air Injection System (A.I.S.V.)
4. Positive Crankcase Ventilation System (P.C.V.)

Functions of Mechanism in the Emission Control System

General

The emission control strategy of this model is formulated based on a four-stroke SOHC single-cylinder engine. It adopts secondary air introducing device to purify the exhaust, in addition, it adopts an activated carbon canister to absorb the fuel vapor generated from the fuel system.

※ **Engine refinements** -

Four Valves designed combustion chamber, together with optimum compression ratio, ignition timing, intake and exhaust timing, have all contributed to maximize the intake/exhaust efficiency and combustion efficiency.

※ **Secondary air introducing system** -

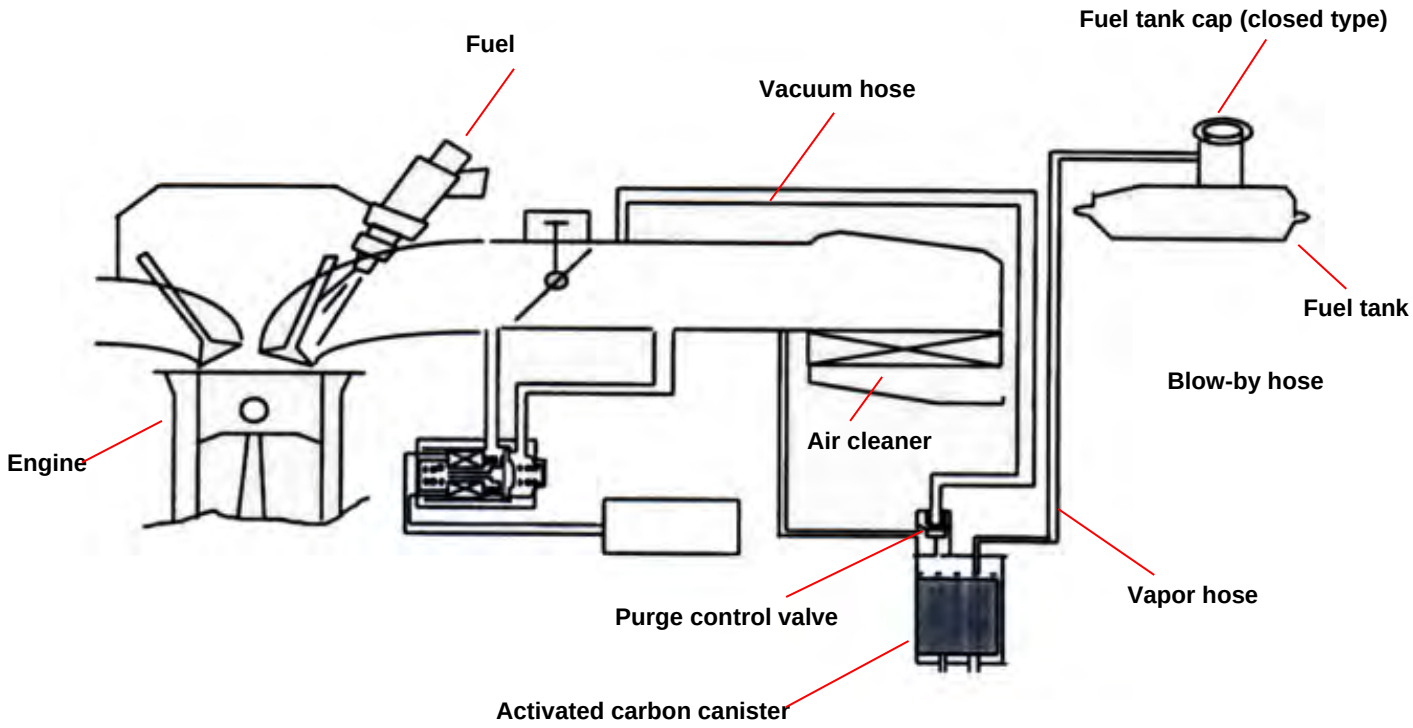
It is used to introduce secondary air into exhaust pipe so that unburned exhausts, CO & HC, may be burned again and to be harmless gases.

System	Device	Components	Purpose & function
Combustion system	Combustion chamber	4-valve combustion chamber	The semi-circular combustion chamber is designed to balance the air stream to achieve the combustion stability.
Exhaust system	Post-treatment device	Catalytic converter	Installed a three-way catalytic converter in the middle of exhaust pipe to oxidize the CO, HC in the exhaust gas.
E.E.C. system	Evaporative emission control system	Activated carbon canister Purge control valve	A carbon canister is used to absorb vapor from fuel tank and then transfer it into inlet pipe at right timed pulses.
A.I.S.V system	Secondary air-injection system	Air injection solenoid valve Secondary air filter	To introduce fresh air into exhaust manifold controlled by an air cut-valve to burn the exhaust again.
P.C.V. system	Crankcase blow-by introducing device	Vapor separator Drain pipe	To introduce blow-by into combustion chamber via a vapor separator for burning then discharging.

Fuel Evaporative Emission Control System (E.E.C.)

1. Construction:

- Reduce HC to pollute air.
- To absorber fuel vapor and saving fuel consumption



2. Principle of operation

- Vapor generated from the fuel tank and fuel system through evaporation is contained in the confined system to prevent it from escaping into the atmosphere, at the same time, the vapor will be introduced into an activated carbon canister where the hydrocarbon in the vapor will be absorbed by activated carbon.
- When the engine is running, the negative pressure of the intake manifold opens the purge line, release HC from the activated carbon and then sucks it into the engine together with air from the bottom of the canister.
- The canister can be used repeatedly without reducing its performance because of the system's purge function.

3. Troubleshooting:

Fuel can not flow to the fuel injector

- No fuel in the fuel tank
- Malfunction of the fuel pump/ fuel pressure regulator
- Clogged fuel system

4. Cautions:

- Do not exceed the reed valve of the fuel filler when filling out fuel.
- Do not have rush acceleration or running in high speed when applying the spare fuel.

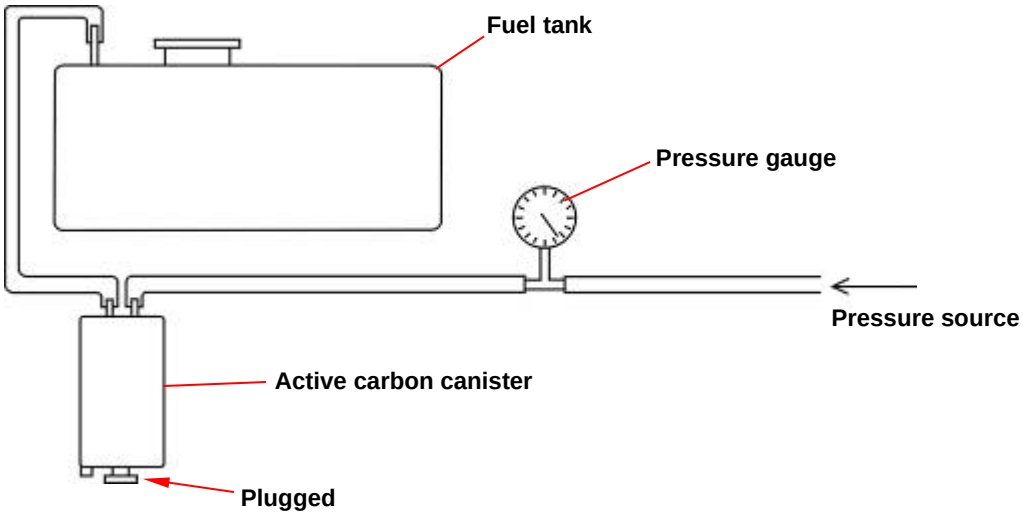
Evaporative Emission Control System (EEC)

1. Visual check:

1) Check the outside of canister for damage.
2) Check all hoses for breakage.

2. Leak test:

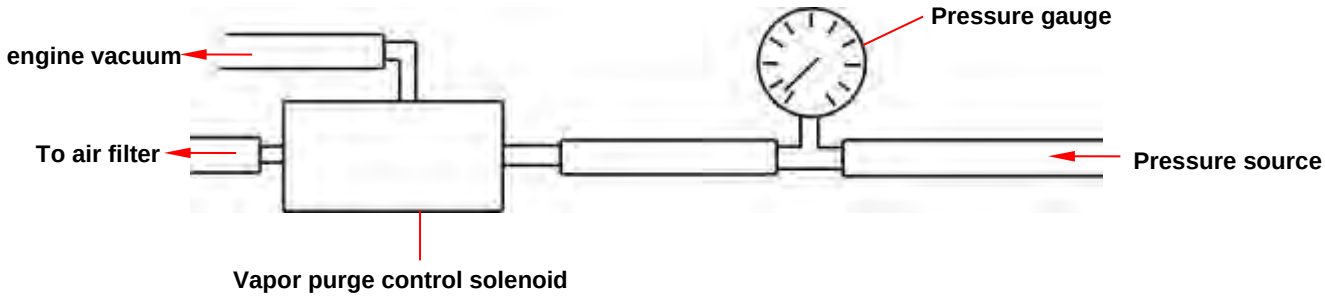
1) Disconnect the Vapor purge control solenoid hose, and connect a T-type hose connector to a pressure gauge and a pressure source as shown below:



2) Plug canister vent.
3) Apply 100mmAq into pressure source inlet then plug it. The pressure at the gauge should not drop to below 10mmAq within 10 seconds.

3. PCV Function Test

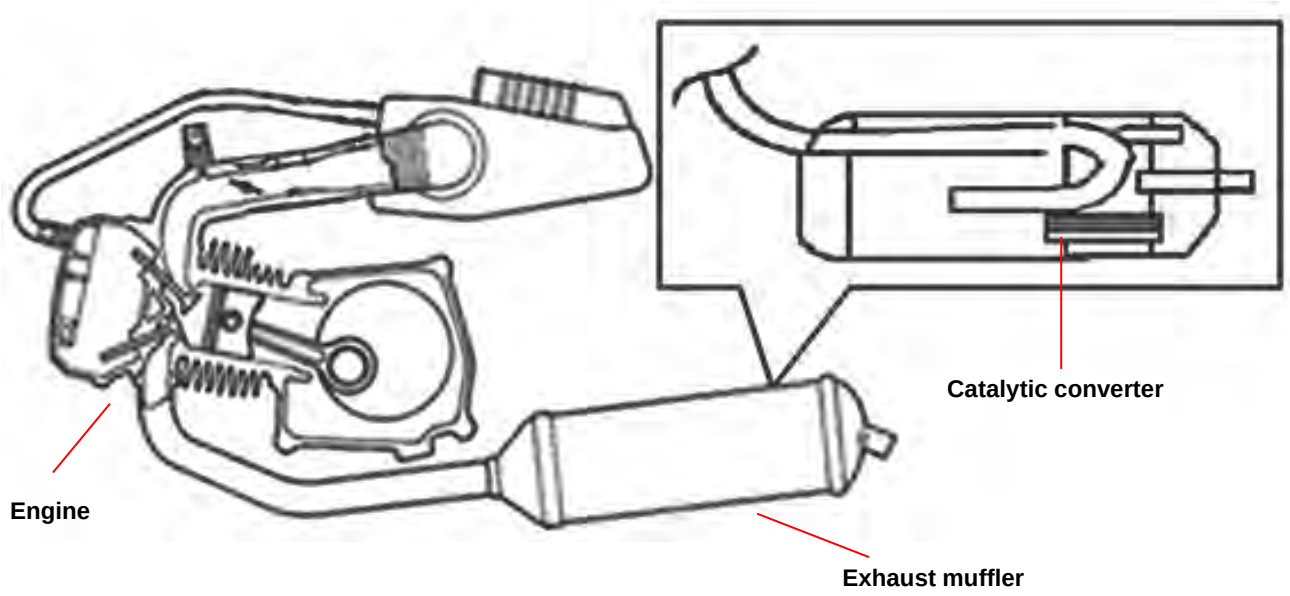
1) Disconnect the hose of connection to the active carbon canister, and then connect a T-type hose connector to pressure source as shown below:



2) Apply 100mmAq into pressure source inlet as engine stopped then plug it. The pressure at the gauge should not drop to below 10mmAq within 10 seconds.

Catalytic Converter (CATA)

1. Construction:

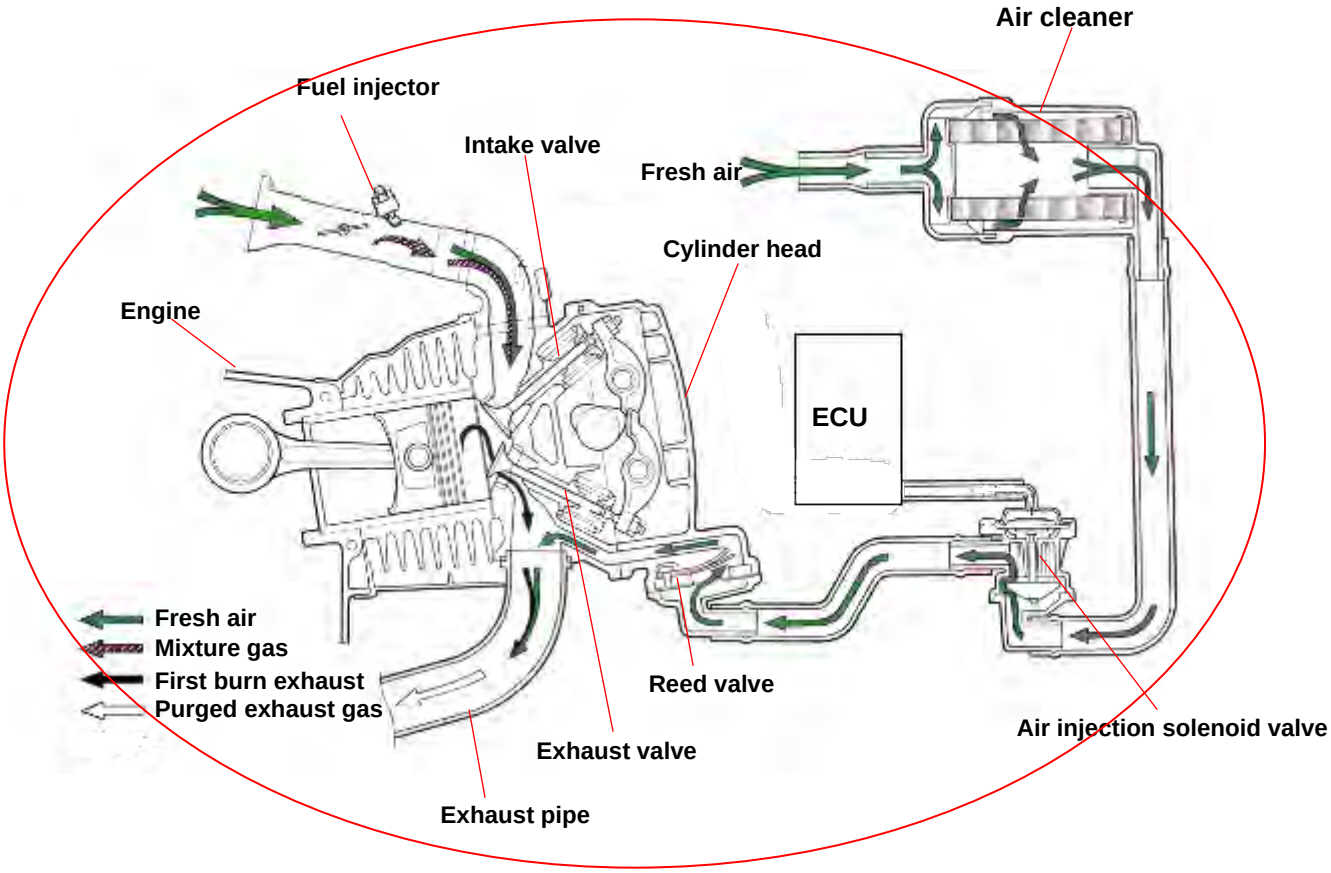


2. Description:

1) The function of the catalytic converter is to transfer unburned CO, HC, and NOx harmless CO_2, H_2O, N_2 gases.
2) Pt, Pd, Rh…etc. precious metals are used into the catalytic converter so use only unleaded gasoline to prevent from cause the catalytic converter to fail.

Secondary Air Injection System

1. Construction



This system contained AISV (air Injection Solenoid Valve), Reed Valve and other intake components.

2. Principle of operation:

- Secondary air is introduced into exhaust manifold so that CO and HC in the exhaust will be burned again under a state of rich oxygen and appropriate temperature and be turned into harmless CO_2, H_2O.
- The opening and closing of the exhaust valve can generate a positive or a negative pressure pulse inside a motorcycle's exhaust system. Exhaust gas is controlled by a reed valve. When pressure inside the exhaust manifold is negative, reed valve will be sucked open by the negative pressure and outside air will enter to mix with CO, HC, thus generating a secondary burn reaction and turning them into harmless gases. When pressure inside the exhaust manifold is positive, reed valve will close to prevent exhaust back up and enter into the secondary air cleaner.
- Air cut-off valve (AICV) will cut off the secondary air supply during engine fuel returning cycle to reduce after-burning noises.

3. Service Points/Trouble Diagnosis:

Diesel
a. Malfunction of air inject solenoid valve (AISV).
b. System hose leakage.
c. Abnormal ignition timing.
d. Lean mixture gas.
e. Abnormal fuel supply.

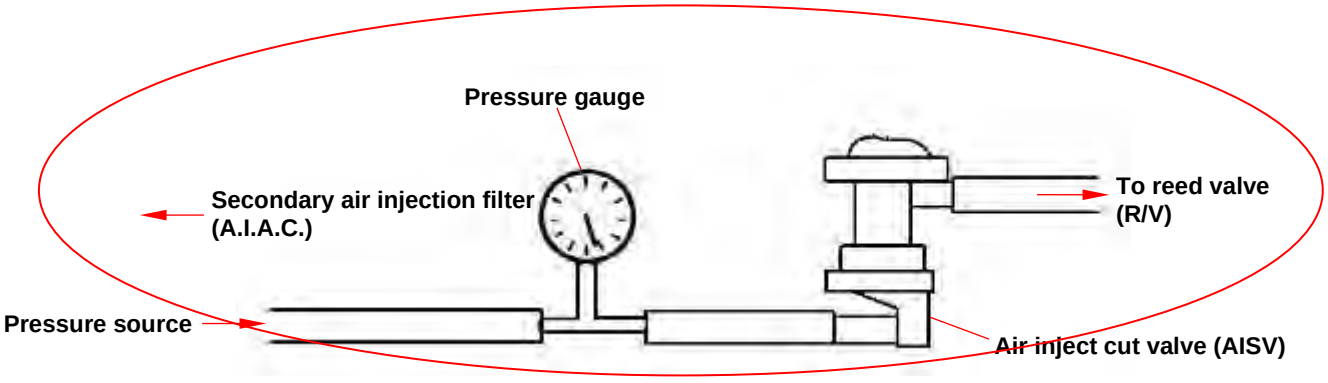
Rich Exhaust Gas:
a. plugged air-jet by dirty carburetor.
b. poor adjustment of air adjustment screw.
c. poor reed valve.
d. System hose leakage or plugged.

Noise:
a. System hose leakage.
b. Loosen secondary air injection filter.
c. Loosen secondary air injection filter hose.

4. AI System Service methods:

a. Visual check:
- Check reed valve, air cut-off valve, secondary air cleaner for outside damages.
- Check metal pipes and hoses for breakage and cracks.

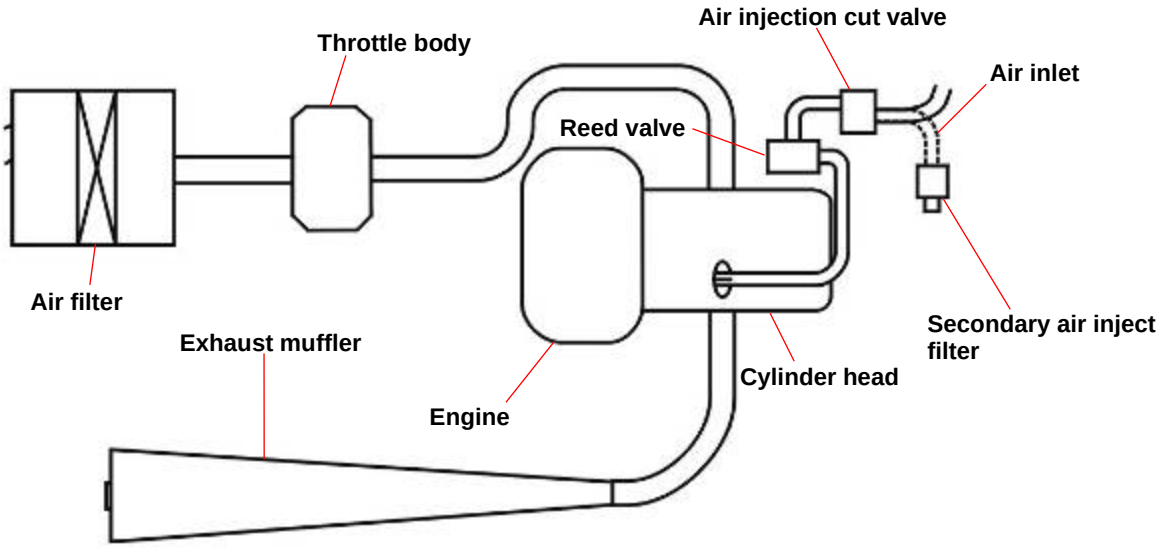
b. Leak test:



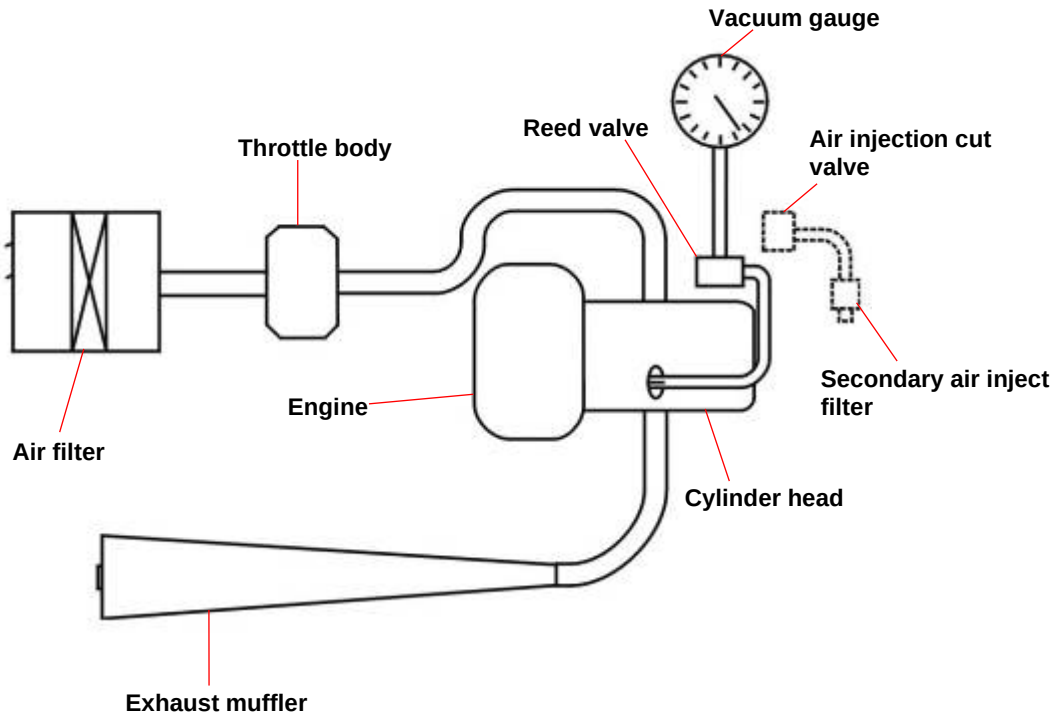
- Plug the hose leading to reed valve.
- Remove the hose of connection to air injection cut valve. Connect a T-type hose connector, pressure gauge and pressure source as shown above.
- With engine stopped, apply 1.0kg/cm2 pressure to inlet and then plug it. There should be no leakage.

1. Warm-up test:

- Start engine.
- Remove the air injection filter.
- Check the air inlet if there is air-sucking sounds during idling (should hear Bo-Bo-Bo sound).



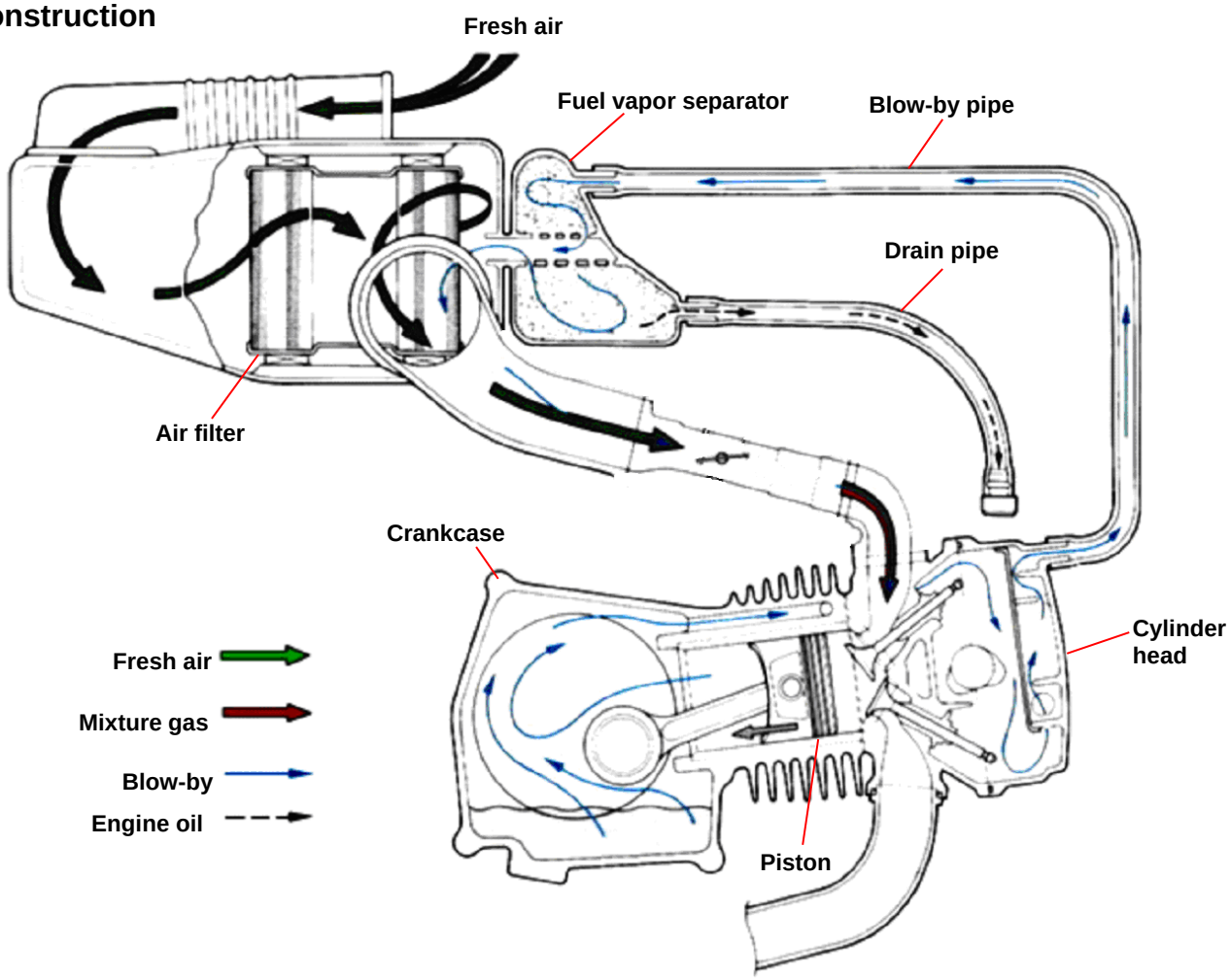
- If no sound is heard, remove air cut-off valve, and connect a vacuum meter to air pipe to check for leakage.



- If there is no vacuum, replace reed valve and test again.
- If there is no vacuum, check the air pipe for leakage, plugged or loose.

Positive Crankcase Ventilation System (P.C.V.)

1. Construction



2. Principle of operation:

- Install a separated chamber on cylinder head, and suck the blow-by gas to the fuel vapor separator by engine vacuum.
- Drill a hole in the air cleaner and install a vapor separator, so that blow-by from crankcase will flow through a cylinder check valve and then separated by the separator.
- The separated vapor will be sucked into combustion chamber by engine negative pressure to be burned again instead of discharging into atmosphere. Drain liquidized fuel in the drain pipe periodically.

3. Service Methods

Visual check:

- Remove drain plug to drain the fuel when fuel level on the drain pipe reaches 80 % full.
- Check connecting hose for damage and looseness.

Inspection Items

Secondary air injection system

1. Visually inspect the reed valve, air injection solenoid valve, and secondary air filter as well as hoses for damage.
2. Leaking check.
3. Warm-up running check.

Evaporative Emission Control System

1. Visually inspect the activated carbon canister and hoses for damage.
2. Leaking check.
3. Function test of the purge control valve.

Catalytic converter

1. Check if exhaust gas content is within standard.
2. Remove the exhaust pipe and shake it gently for abnormal noise.

Fuel Supply System

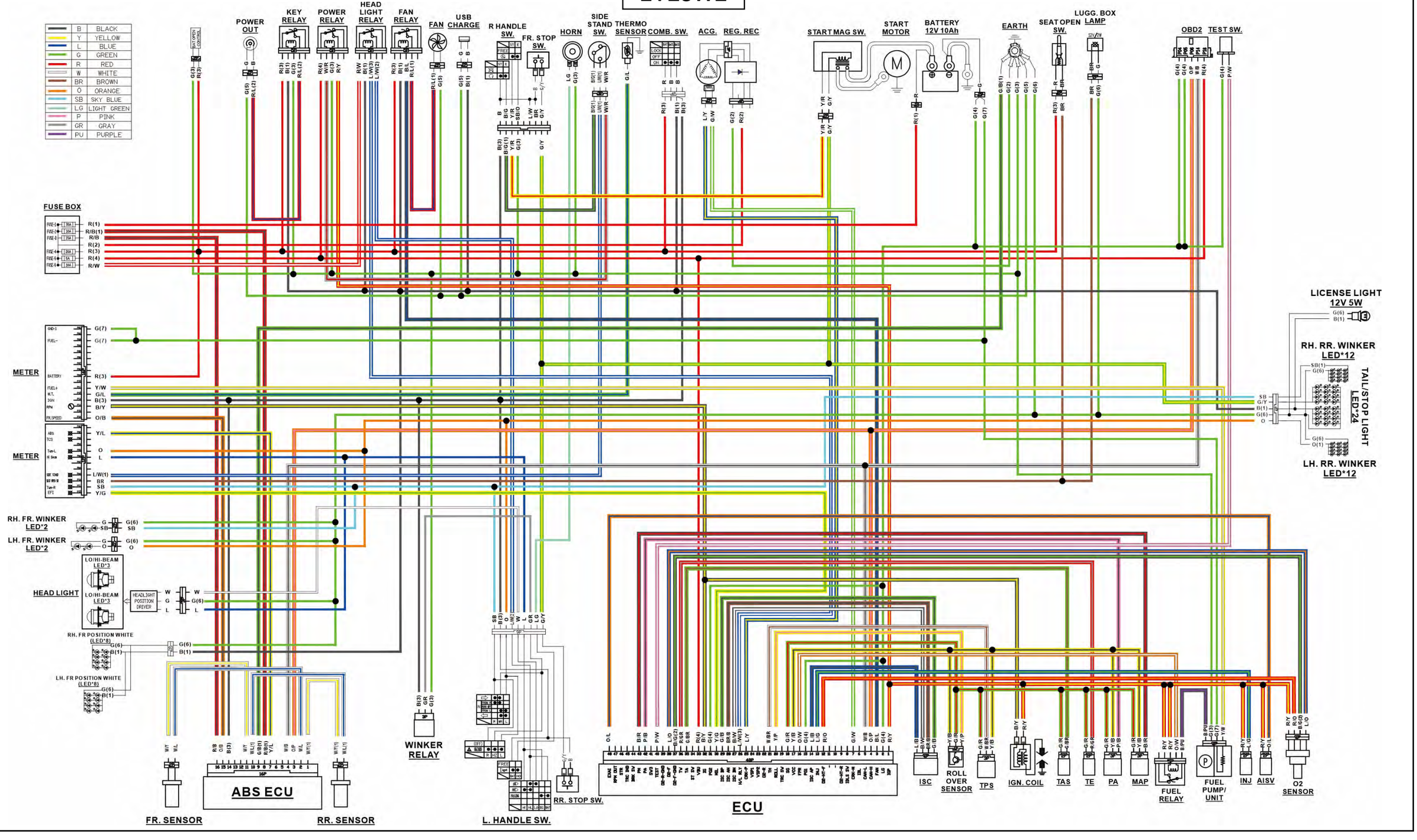
1. Clean the air filter.
2. Check the air filter.
3. Clean the fuel injector and all circuit with air gun or specified solvent.
4. Check the fuel pump/ fuel pressure regulator for malfunction.
5. Adjust CO/HC values at idling. (engine rpm must be within specification)

Ignition system

1. Spark plug check and replacement.
2. Ignition coil check and replacement.

Notes:

LV25W2


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
POWER OUT
KEY RELAY
POWER RELAY
HEAD LIGHT RELAY
FAN RELAY
FAN
USB CHARGE
R HANDLE SW.
FR. STOP SW.
HORN
SIDE STAND SW.
THERMO SENSOR
COMB. SW.
ACG.
REG. REC
START MAG SW.
START MOTOR
BATTERY 12V 10Ah
EARTH
SEAT OPEN SW.
LUGG. BOX LAMP
OBD2
TEST SW.
FUSE BOX
METER
METER
RH. FR. WINKER LED*2
LH. FR. WINKER LED*2
HEAD LIGHT
LO/HI-BEAM LED*3
LO/HI-BEAM LED*3
HEADLIGHT POSITION DRIVER
RH. FR POSITION WHITE (LED*8)
LH. FR POSITION WHITE (LED*8)
LICENSE LIGHT 12V 5W
RH. RR. WINKER LED*12
TAIL/STOP LIGHT LED*24
LH. RR. WINKER LED*12
WINKER RELAY
ABS ECU
FR. SENSOR
RR. SENSOR
L. HANDLE SW.
RR. STOP SW.
ECU
ISC
ROLL OVER SENSOR
TPS
IGN. COIL
TAS
TE
PA
MAP
FUEL RELAY
FUEL PUMP/ UNIT
INJ
AISV
O2 SENSOR

19.Electrical Diagram

LV30W2

