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Symbols and Marks

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

	Warning	Means that serious injury or even death may result if procedures are not followed.
	Caution	Means that equipment damages may result if procedures are not followed.
	Engine oil	Limits to use SAE 10W-30/40 API SL class oil. Warranty will not cover the damage that caused by not apply with the limited engine oil. (Recommended oil: "SYMOIL " serial oil)
	Grease	High Temperature Lithium Complex E.P. Grease is recommended.
	Gear oil	"SYMOIL " gear oil serials are recommended. (GEAR OIL SAE 10W-30/40)
	Locking sealant	Apply sealant, medium strength sealant should be used unless otherwise specified.
	Oil seal	Apply with lubricant.
	Renew	Replace with a new part before installation.
	Brake fluid	Use recommended brake fluid DOT3 or 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

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

Caution

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

Gasoline

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

Caution

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

Used engine oil

Caution

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

Hot components

Caution

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

Battery

Caution

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

Brake shoe

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

Caution

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

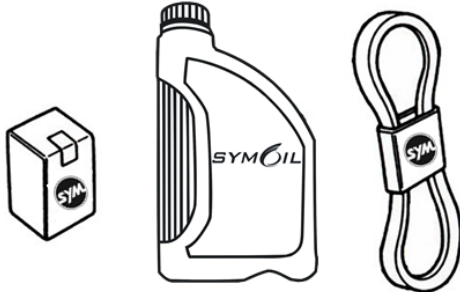
Brake fluid

Caution

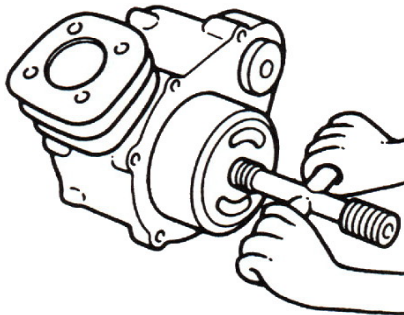
Spilling brake fluid on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the above-mentioned parts for protection when servicing the brake system. Keep the brake fluid beyond reach of children.

Service Rules

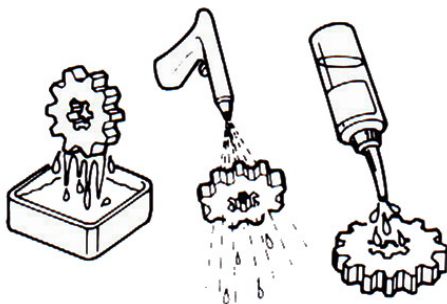
- Always use SANYANG genuine parts and recommended oil. Using improper parts may cause damage to or destruction of the vehicle.



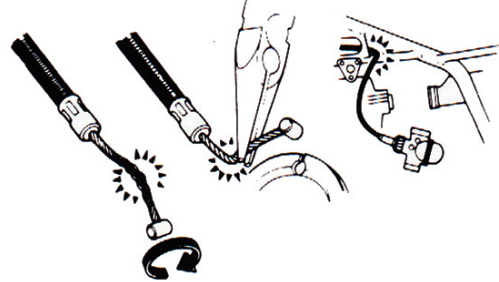
- Special tools are designed for removal and installation of component parts without damaging them. Using wrong tools may result in parts damage.



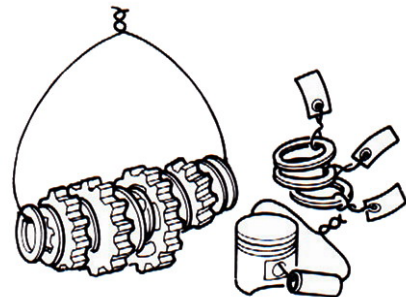
- When servicing this vehicle, use only metric tools. Metric bolts, nuts, and screws are not interchangeable with the Britain system, using wrong tools and fasteners may damage this vehicle.
- Clean the outside of the parts or the cover before removing it from the vehicle. Otherwise, dirt and deposit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



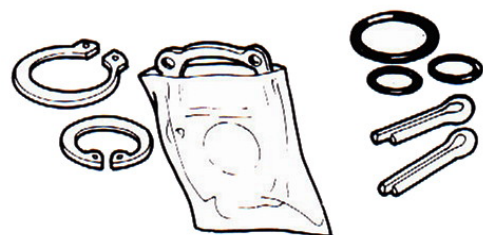
- Never bend or twist control cables to avoid unsmooth control and premature worn out.



- 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.



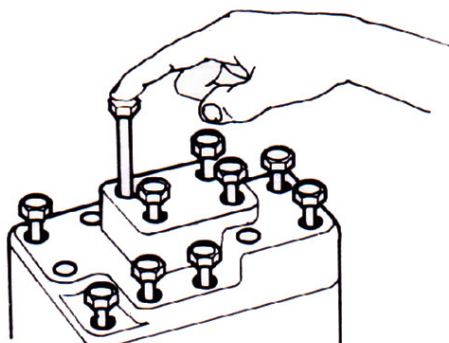
- Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).
- Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap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



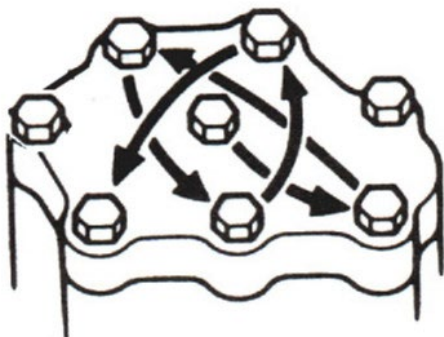
1. General Information



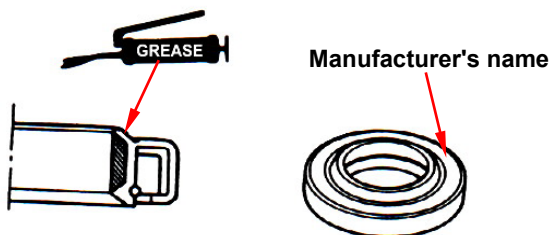
- The length of bolts and screws for assemblies, cover plates or boxes is different from one another, be sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length out side the hole is the same with other bolts, it is a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



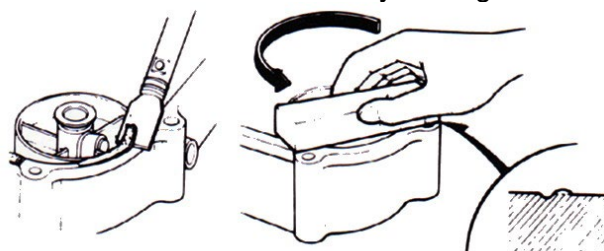
- Tighten assemblies with different dimension fasteners as follows: Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless otherwise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



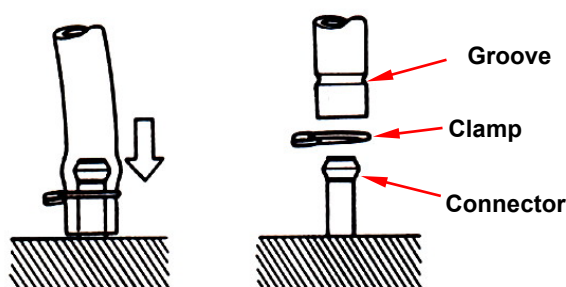
- When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, and check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.



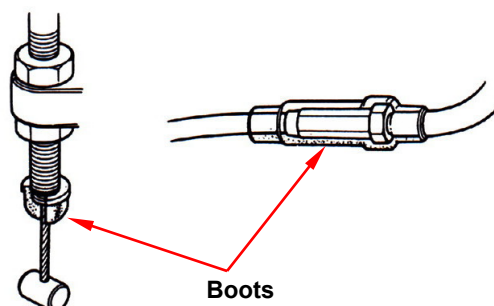
- Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any damage.



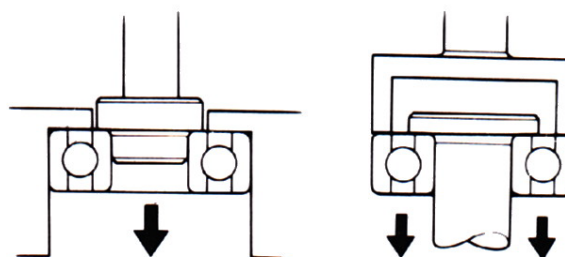
- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.



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

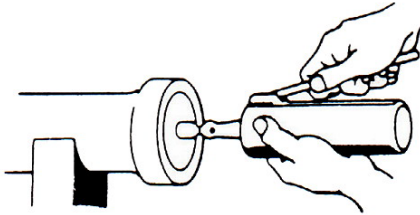


- The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both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

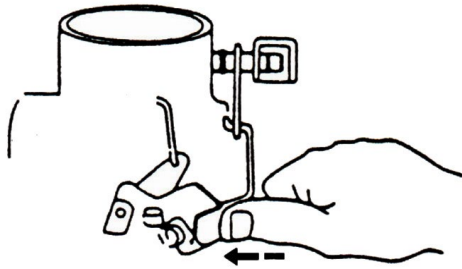


Both of these examples can result in bearing damage.

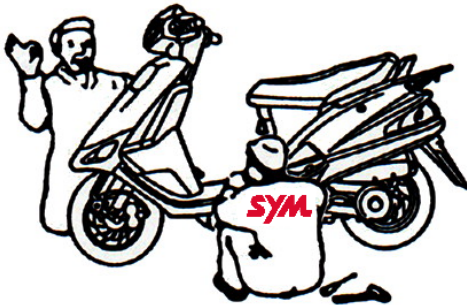
- Lubricate the rotation face with specified lubricant on the lubrication points before assembling.



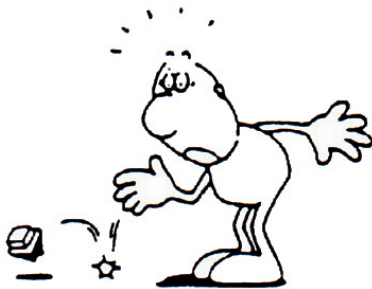
- Check if positions and operation for installed parts is in correct and properly.



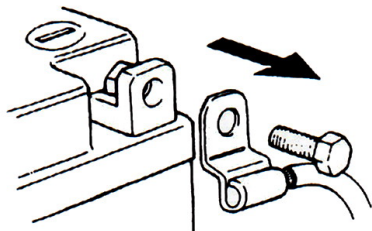
- Make sure service safety each other when conducting by two persons.



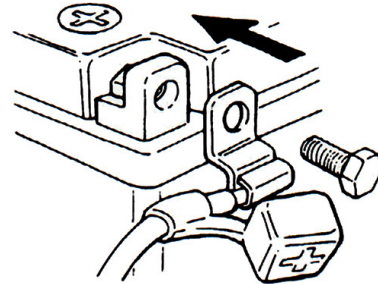
- Note that do not let parts fall down.



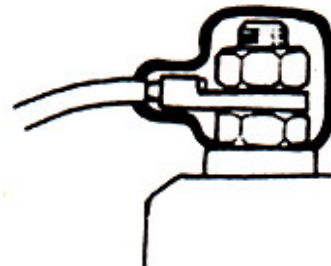
- Before battery removal operation, it has to remove the battery negative (-) cable firstly. Notre tools like open-end wrench do not contact with body to prevent from circuit short and create spark.



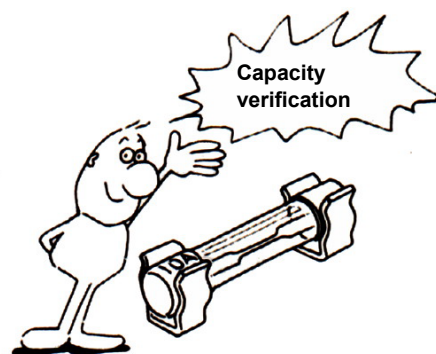
- After service completed, make sure all connection points is secured. Battery positive(+) cable should be connected firstly. And the two posts of battery have to be greased after connected the cables.



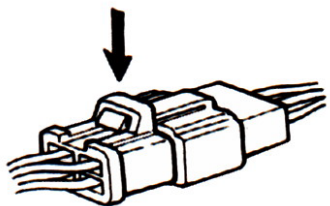
- Make sure that the battery post caps are located in properly after the battery posts had been serviced.



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



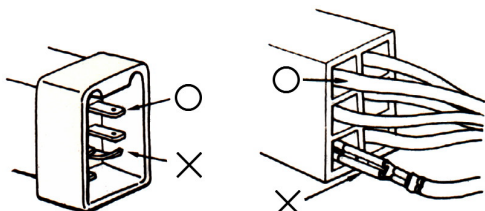
- When separating a connector, it locker has to be unlocked firstly. Then, conduct the service operation.



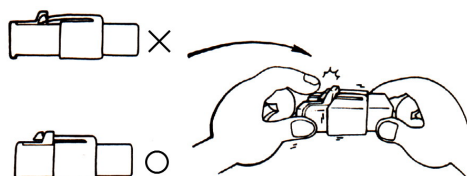
- Do not pull the wires as removing a connector or wires. Hold the connector body.



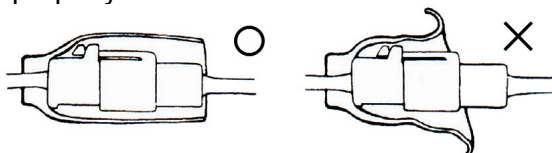
- Make sure if the connector pins are bent, extruded or loosen.



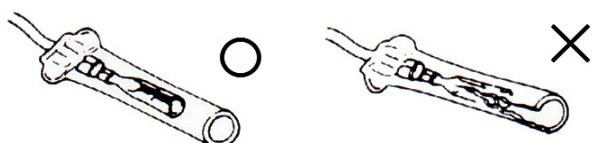
- Insert the connector completely. If there are two lockers on two connector sides, make sure the lockers are locked in properly. Check if any wire loose.



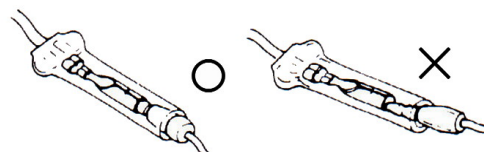
- Check if the connector is covered by the twin connector boot completely and secured properly.



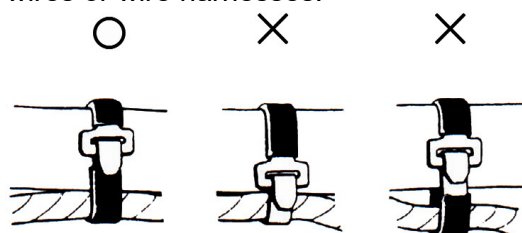
- Before terminal connection, check if the boot is crack or the terminal is loose.



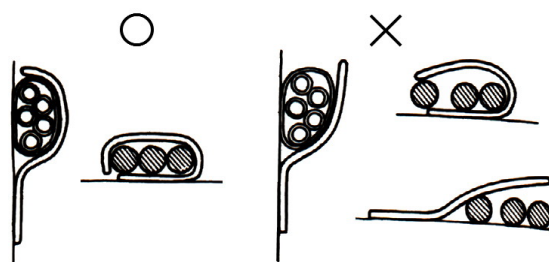
- Insert the terminal completely. Check if the terminal is covered by the boot. Do not let boot open facing up.



- 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.



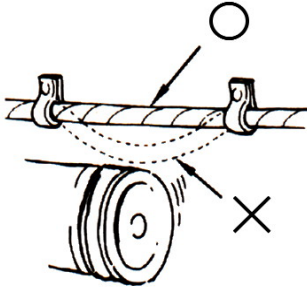
- Wire band and wire harness have to be clamped secured properly.



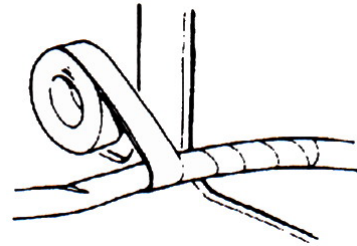
- Do not squeeze wires against the weld or its clamp.



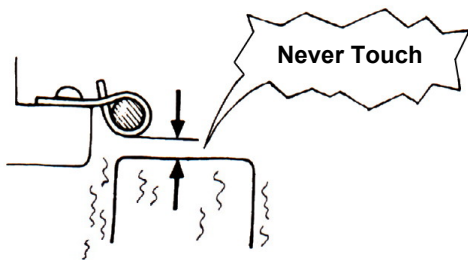
- Do not let the wire harness contact with rotating, moving or vibrating components as routing the harness.



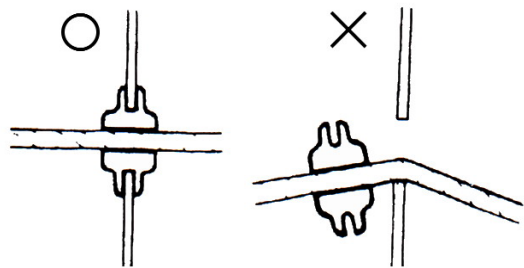
- Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.



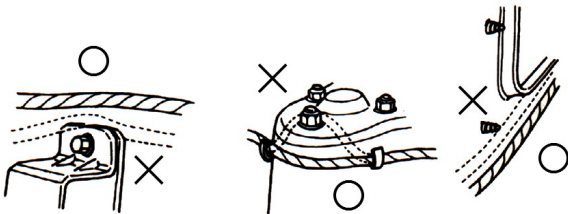
- Keep wire harnesses far away from the hot parts.



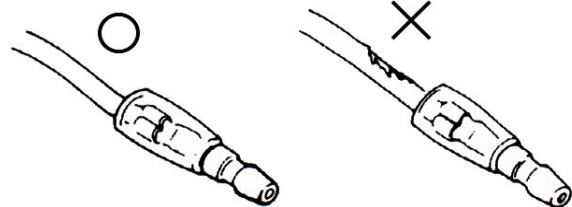
- Secure the rubber boot firmly as applying it on wire harness.



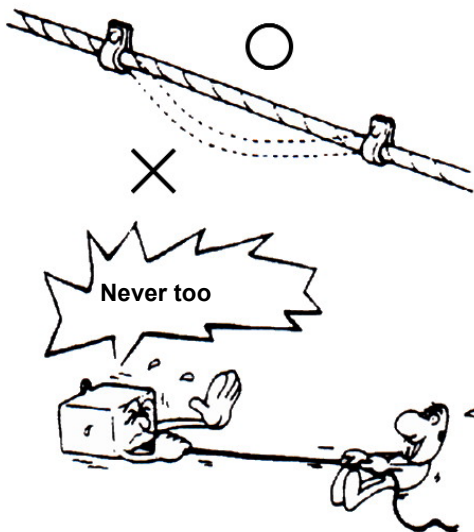
- Route wire harnesses to avoid sharp edges or corners and also avoid the projected ends of bolts and screws.



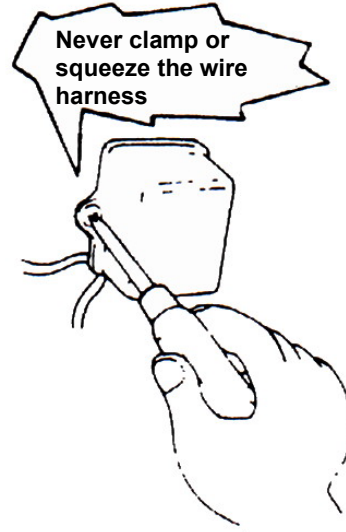
- Never use wires or harnesses which insulation has been broken. Wrap electrical tape around the damaged parts or replace them.



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

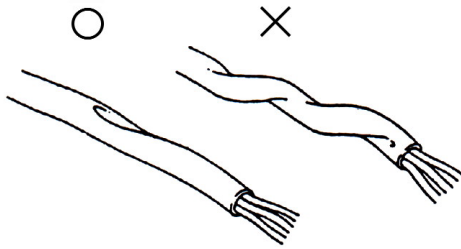


- Never clamp or squeeze the wire harness as installing other components.

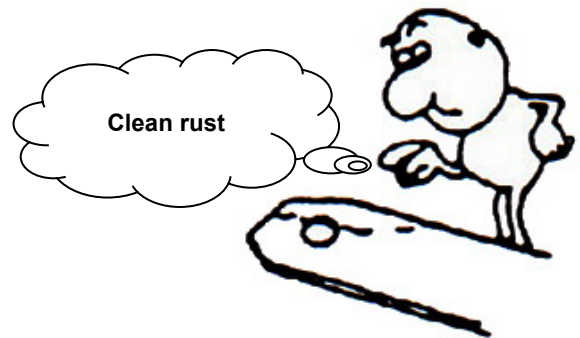


1. General Information

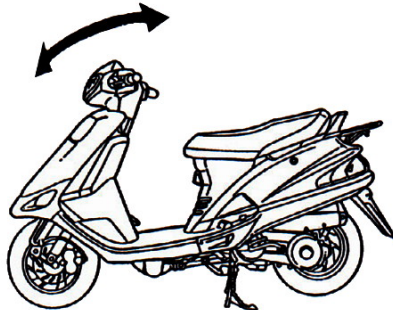
- Do not let the wire harness been twisted as installation.



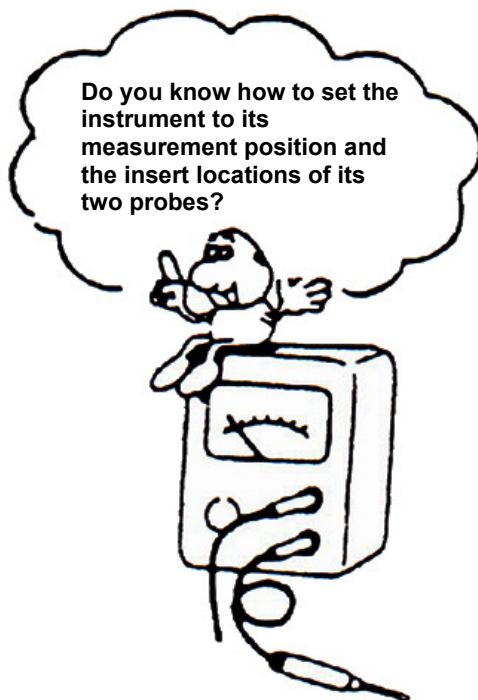
- With sand paper to clean rust on connector pins/terminals if found. And then conduct connection operation later.



- Wire harnesses routed along the handlebar should not be pulled too tight or have excessive slack, be rubbed against or interfere with adjacent or surrounding parts in all steering positions. Please make sure that the handle could be rotated freely.



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



Specifications

Maker			SANYANG		MODEL		TB16W2-EU		
WEIGHT DIMENSION	Overall Length		1990 mm		Suspension System	Front	Telescopic Fork		
	Overall Width		735 mm			Rear	Unit Swing		
	Overall Height		1130 mm		Tire Specifications	Front	120 / 70-13		
	Wheel Base		1380 mm			Rear	130 / 70-13		
	Curb Weight	Front	58 kg		Brake System	Front	Disk (ϕ 260mm)		
		Rear	77 kg			Rear	Disk (ϕ 230mm)		
		Total	135 kg						
	Passengers/Weight		Two /170 kg		PERFORMANCE		Max. Speed		107 km/hr
	Total Weight	Front	102 kg			Climb Ability		28°	
		Rear	203 kg			Primary Reduction		Belt	
Total		305 kg	Secondary Reduction			Gear			
			Clutch			3-piece centrifugal, dry type			
ENGINE	Type		4-STROKE ENGINE		Transmission		C.V.T.		
	Position and arrangement		Horizontal, below center, CYL incline 72°		Speed meter		0 ~ 188 km/hr		
	Fuel Used		>92 Unleaded gasoline		Horn		87 – 112 dB		
	Cycle/Cooling		4-stroke/water cooled		Muffler		Expansion & Pulse Type		
	Cylinder	Bore	Ø 59 mm		Exhaust Pipe Position and Direction		Right Side & Backward		
		Stroke	57.8 mm		Lubrication System		Forced Circulation & Splashing		
		Number/Arrangement	Single Cylinder		Exhaust Concentration		Co		
	Displacement		158 cc		HC		900 ppm		
	Compression Ratio		11.2 : 1		NOx		-		
	Max. HP		10.9 kW/ 8000 rpm		E.E.C.		Equipped		
	Max. Torque		1.48 kg-m / 6000 pm		P.C.V.		Equipped		
	Ignition		Full transistor ignition		Catalytic Converter		Equipped		
	Starting System		Electrical Starter						

Torque Values (engine)

Item	Q'ty	Thread Dia. (mm)	Torque Value (kgf-m)	Remarks
Cylinder head nut	4	8	2.4-2.8	Apply oil
Cylinder stud bolt	4	8	0.9-1.3	Stud side apply oil
Cylinder head cover bolt	4	6	0.8-1.2	
Valve clearance adjust nut	4	5	0.7~1.1	Apply oil
Spark plug	1	10	1.0-1.2	
Oil drain bolt	1	10	3.5-4.5	
Oil strainer cap	1	30	1.0-2.0	
Gear oil drain bolt	1	8	1.0-1.4	
Gear oil filler bolt	1	10	1.0-1.4	
Oil pump screw	3	3	0.7-1.1	
L. Crankcase cover bolts	10	6	1.0-1.4	
Cam chain tensioner pivot	1	6	0.8-1.2	
Cam chain adjuster bolt	2	6	0.8~1.2	
Clutch driver face nut	1	28	5.5-6.5	
Clutch outer cover nut	1	12	5.5-6.5	
Flywheel bolt	1	12	5.0-6.0	
L. outer cover bolt	10	6	0.7~1.1	
Gear box cap bolt	11	6	0.7-1.1	
Muffler bolts	2	8	2.4-3.0	
Mounting nut	2	8	2.4-3.0	
Camshaft bolt	1	12	2.0~3.0	

Torque Values (frame)

Item	Q'ty	Thread Dia. (mm)	Torque Value (kgf-m)	Remarks
Handle fix bolt	1	10	4.0~5.0	
Bolt for steering rod	1	25.4	1.0-2.0	
Lock nut for the steering shaft	1	25.4	0.2~0.3	
Front wheel shaft nut	1	12	5.0-7.0	
Rear wheel shaft nut	1	16	11.0-13.0	
Front shock absorber	4	8	2.4-3.0	
Bolt for rear shock absorber (upper)	1	10	3.5-4.5	
Bolt for rear shock absorber (under)	1	8	3.5-4.5	
Brake pump bolt	2	6	1.0~1.4	
Brake lever nut	2	6	0.5~0.7	
Brake hose bolts	2	10	3.3-3.7	
Release valve of front break	1	6	0.8~1.0	
Brake disk bolts	3	8	4.0-4.5	
Bolt for brake caliper	2	8	2.9-3.5	
Front brake lining bolt	2	6	1.5~2.0	
Brake arm bolts	2	6	0.8-1.2	
Bolt for engine hanger bracket	2	10	4.5-5.5	On the frame
Engine mounting bolt	1	10	4.5-5.5	On the engine
Nut for engine hanger bracket	1	10	3.4-4.5	
Air cleaner bolt	2	6	1.0~1.4	

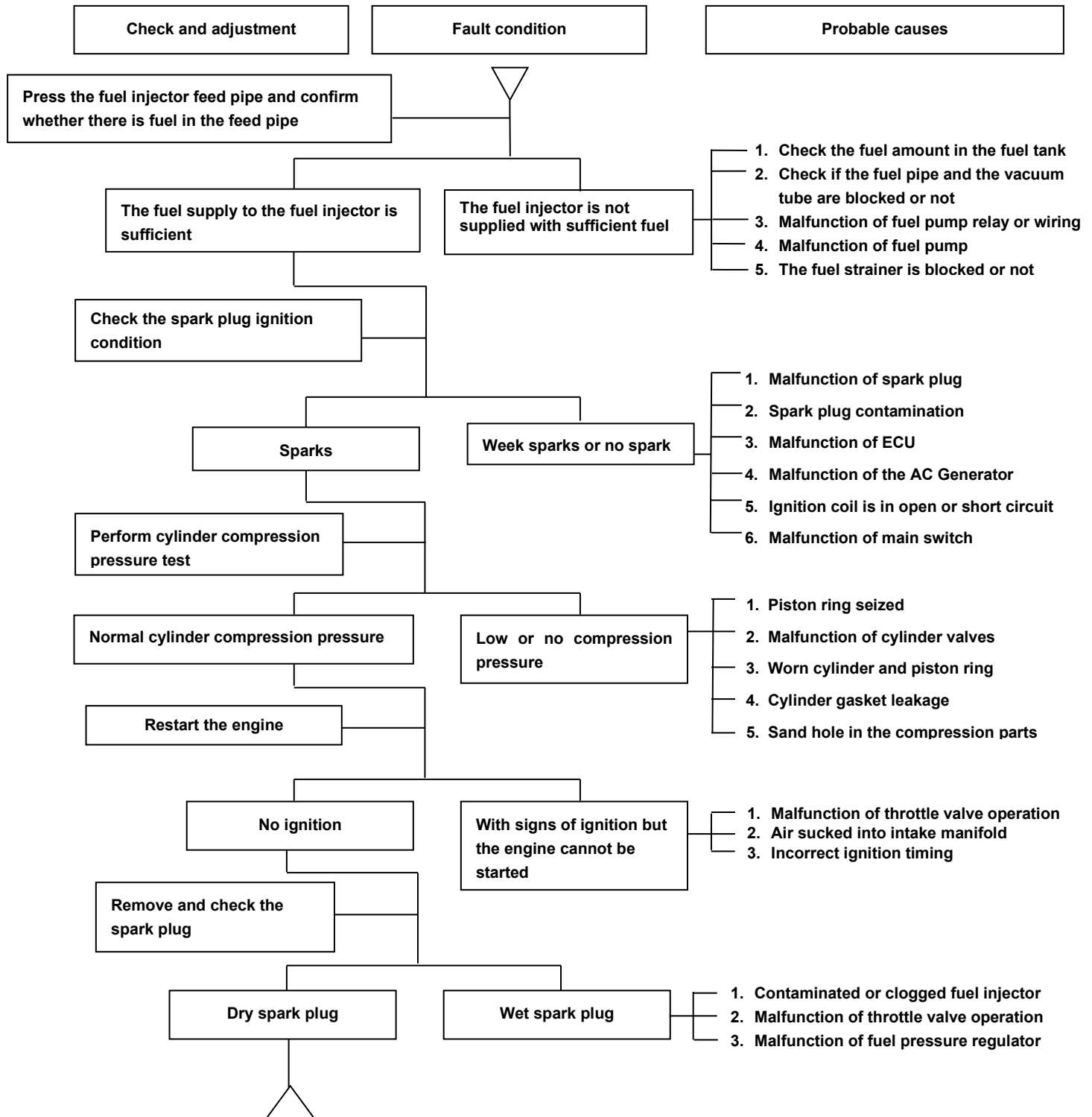
The torque values listed in the above table are for important parts, others not mentioned refer to the standard values table.

Standard Torque Values for Reference

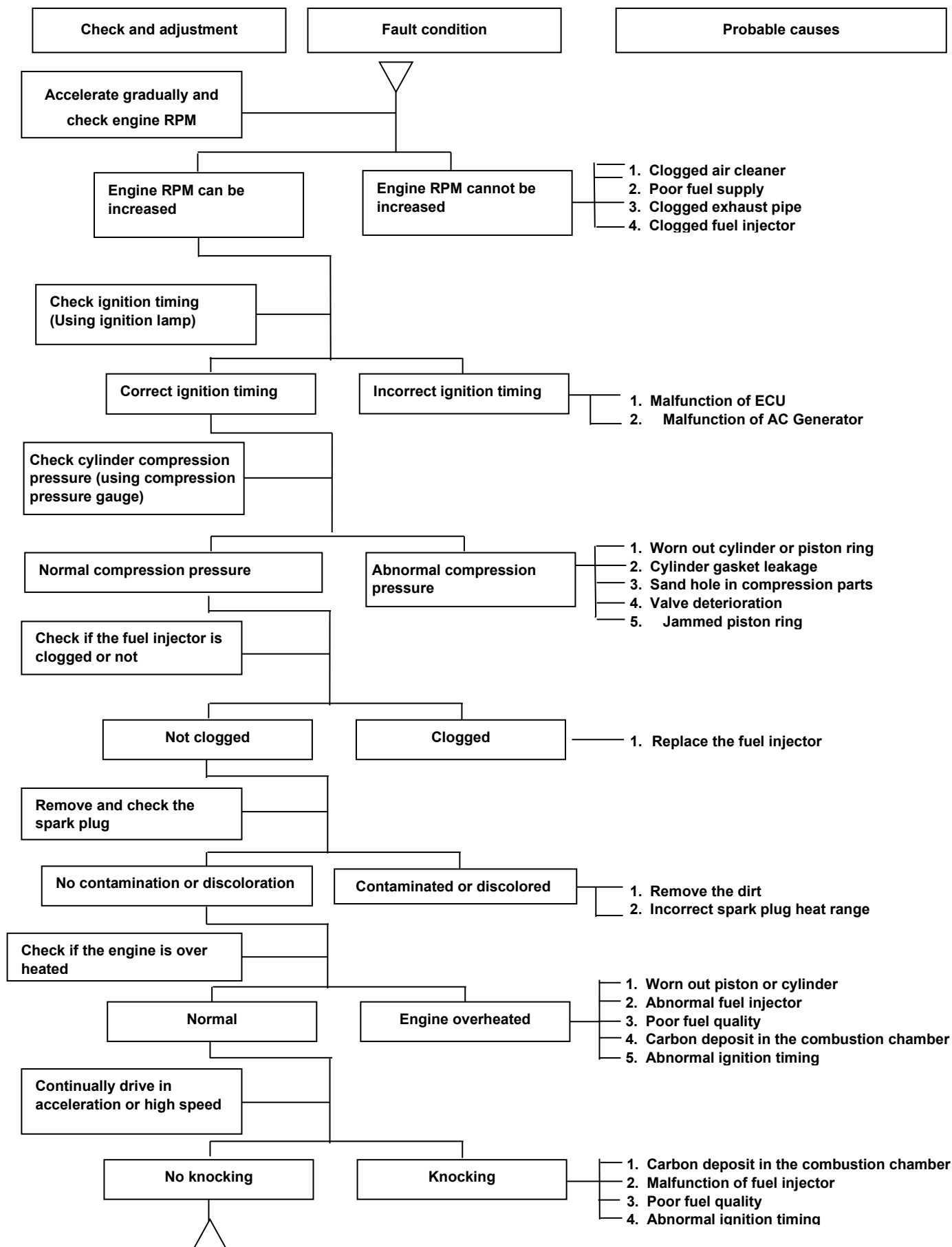
Type	Torque value (kgf-m)
5 mm bolt and nut	0.45 - 0.6
6 mm bolt and nut	0.8 - 1.2
8 mm bolt and nut	1.8 - 2.5
10 mm bolt and nut	3.0 - 4.0
12 mm bolt and nut	5.0 - 6.0
5 mm Screw	0.35 - 0.5
6 mm Screw and flange nut	0.7 - 1.1
6 mm Flange bolt and nut	1.0 - 1.4
8 mm Flange bolt and nut	2.4 - 3.0
10 mm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

Troubleshooting

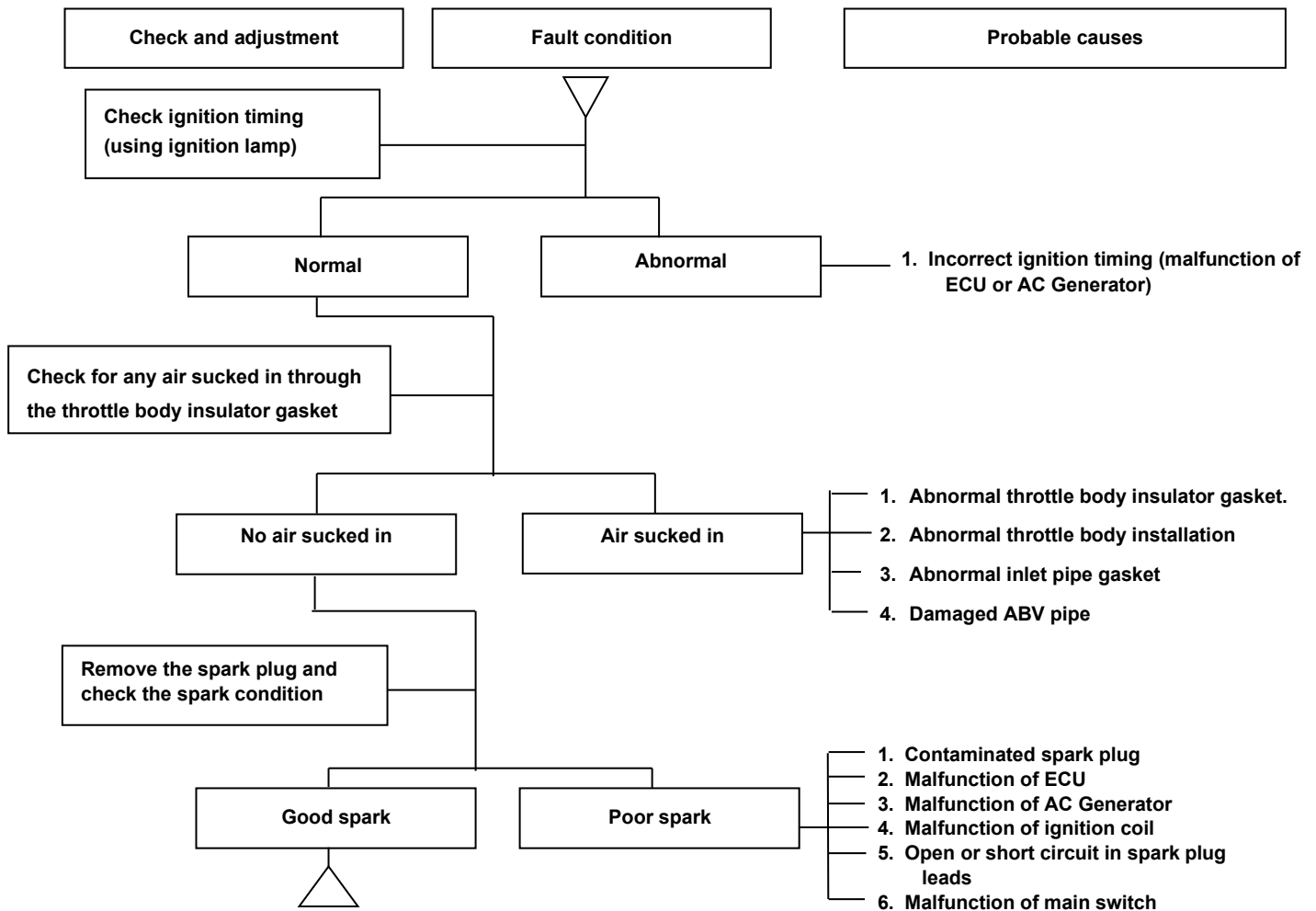
A. Engine cannot be started or difficult to be started



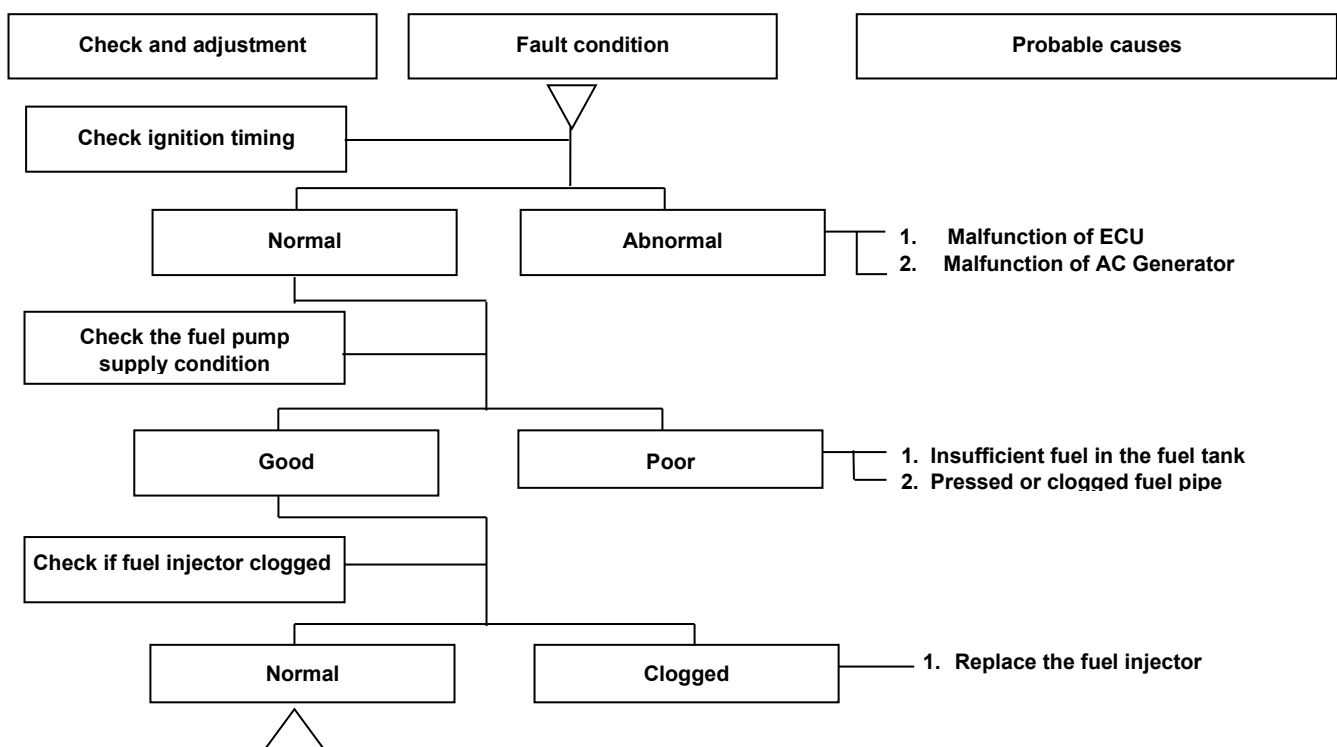
B. Engine runs sluggish (Speed does not pick up, lack of power)



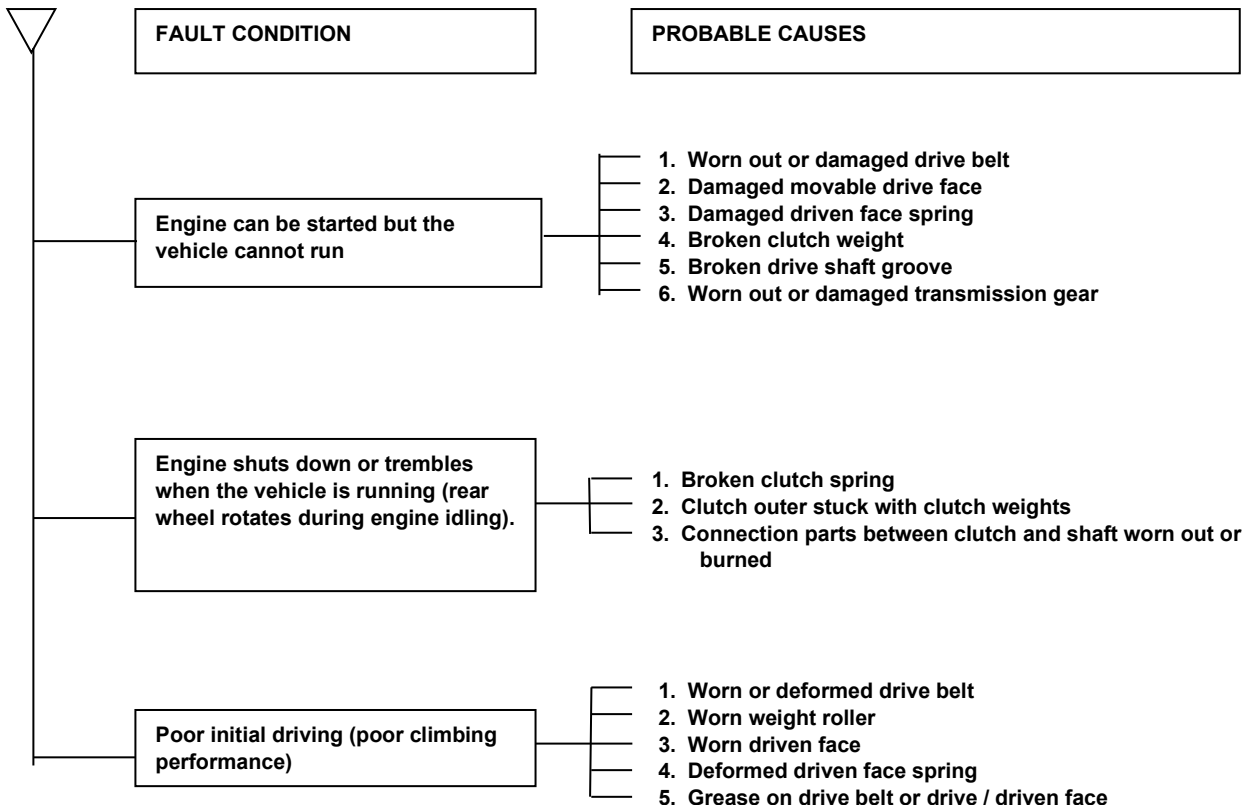
C. Engine runs sluggish (especially in low speed and idling)



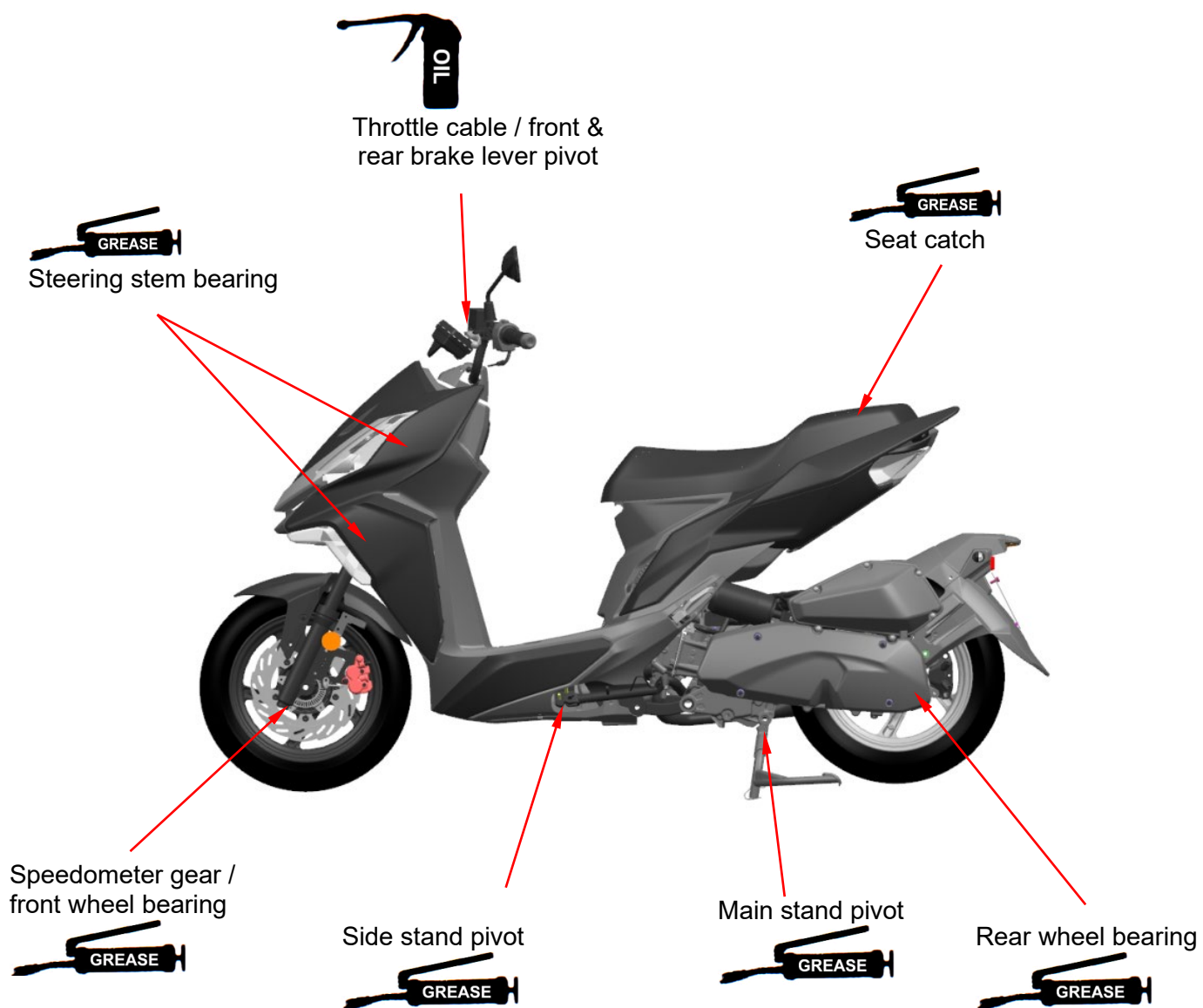
D. Engine runs sluggish (High speed)



E. CLUTCH AND DRIVING PULLEY



Lubrication Points



Precautions in Operation	2-1	Brake Fluid	2-7
Periodical Maintenance		Filling out brake fluid	2-7
Schedule	2-2	Air bleed operation	2-8
Fuel Lines	2-3	Add brake fluid	2-8
Throttle Operation	2-3	Brake lining	2-8
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Precautions in Operation

Fuel Tank Capacity		7,400±300 c.c.
Engine Oil	capacity	1,050 c.c.
	change	1,000 c.c.
Transmission Gear oil	capacity	110 c.c.
	change	100 c.c.
Clearance of throttle handle grip		2~6 mm
Spark plug		NGK CPR8EA-9 gap 0.8~0.9mm
“F” Mark in idling speed		BTDC 0 /1,750 rpm
Idling speed		1,700±150 rpm
Cylinder compression pressure		7.5 ± 1.5 kgf/cm ²
Valve clearance	IN	0.12±0.02 mm
	EX	0.12±0.02 mm
Tire dimension	Front	120/70-13
Tire dimension	Rear	130/70-13
Tire pressure (cold)	Front	1.8 kgf/cm ²
	Rear	2.3 kgf/cm ²
Battery		12V 4.0Ah (MF battery) GTX5L-BS/YTX5L-BS

2. Maintenance Information



Periodical Maintenance Schedule

Maintenance Code	item	Initial 300KM	1 Month or every 1000KM	3 months or every 3000KM	every 5000KM	6 months or every 6000KM	every 10000KM	1 year or every 12000KM
1	☆Air cleaner			C	R			
2	☆Fuel filter				C		R	
3	☆Oil filter	C				C		
4	☆Engine oil change	R	Replacement for every 1000 km					
5	Tire pressure		I					
6	Battery inspection	I	I					
7	Brake & fluid level	I	I					R
8	Steering handle check	I				I		
9	Cushion operation check	I		I				
10	Every screw tightening check	I	I					
11	Gear oil check for leaking	I	I					
12	☆Spark plug check or change	I		I		R		
13	☆Gear oil change	R	Replacement for every 3000 km					
14	Frame lubrication			L				
15	Exhaust pipe	I		I				
16	☆Ignition timing	I		I				
17	☆Emission check in Idling							S
18	☆Throttle operation	I		L				
19	☆Engine bolt tightening	I		I				
20	☆CVT driving device(belt)					I		R
21	☆CVT driving device(roller)					I		R
22	Lights/electrical equipment/multi-meters	I	I					
23	Main/side stands & springs	I				I		
24	Fuel lines	I					C	
25	Shock absorbers	I		I				
26	Cam chain	I		I				
27	☆Valve clearance	I		A				
28	Lines & connections in cooling system	I	I					
29	Coolant reservoir	I	I					
30	Coolant	I	I	Replacement for every 1 year				

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

Have your motorcycle checked, adjusted, and recorded maintenance data periodically by your SYM Authorized Dealer to maintain the motorcycle at the optimum condition

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

- Remarks*: 1. These marks "☆" in the schedule are emission control items. According to EPA regulations, these items must be performed normally periodical maintenance following the user manual instructions. They are prohibited to be adjusted or repaired by unauthorized people. Otherwise, SYM is no responsible for the charge.
2. Clean or replace the air cleaner element more often when the motorcycle is operated on dusty roads or in the Heavily- polluted environment.
3. Maintenance should be performed more often if the motorcycle is frequently operated in high speed and after the motorcycle has accumulated a higher mileage.
4. Preventive maintenance
- Ignition system – Perform maintenance and check when continuous abnormal ignition, misfire, after-burn, overheating occur.
 - Carbon deposit removal – Remove carbon deposits in cylinder head, piston heads, exhaust system when power is obvious lower.

Fuel Lines

Remove trunk

Remove side cover.

Remove central cover.

Remove body frame cover.

Remove pedal.

Remove front glove box.

Check all lines, and replace it when they are deterioration, damage or leaking.

⚠Caution

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

Throttle Operation

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

Check handle bar if its operation is smooth.

Check acceleration cable and replace it if deteriorated, twisted or damaged.

Lubricate the cable if operation is not smooth

Measure handle bar free play in its flange part.

Free play: 2~6mm.

Adjustment can be done in either end.

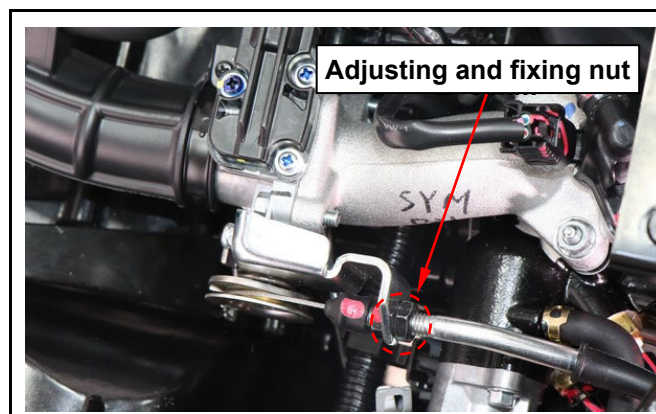
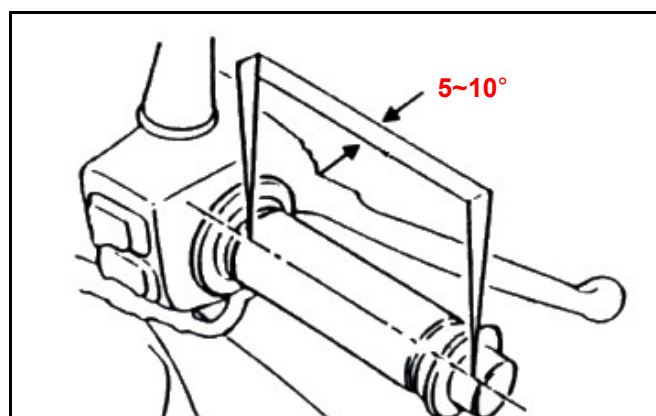
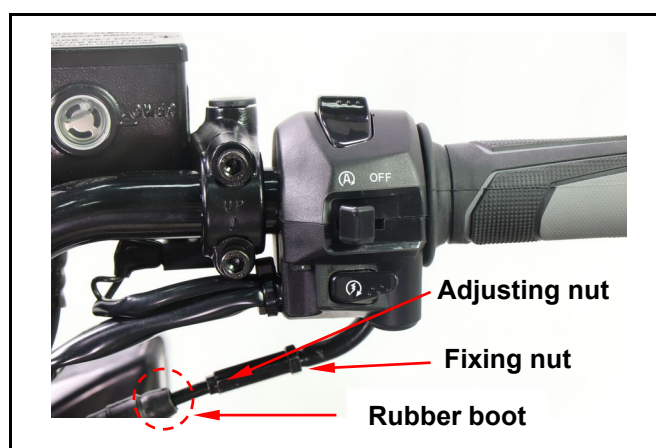
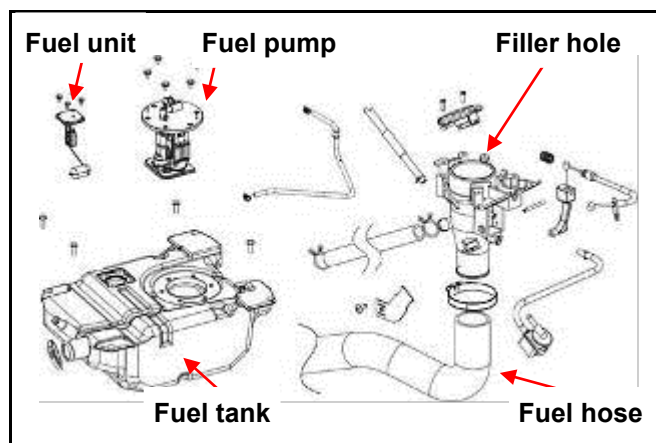
Secondary adjustment is conducted from top side.

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

Remove air cleaner cover. (6 screws)

Remove air cleaner element. (3 screws)

Check if air cleaner element is dirty or damaged, replace it if necessary.

⚠Caution

- The air cleaner element is made of paper and must not be soaked or washed; otherwise it will affect the engine performance.
- If the installation is not complete, the dust will be directly sucked into the cylinder, which will affect the life of the engine.



Spark Plug and Spark Gap

Recommended spark plug: CPR8EA-9

Remove luggage box.

Remove central cover.

Remove spark plug cap.

Clean the surface around spark plug hole.

Remove spark plug.

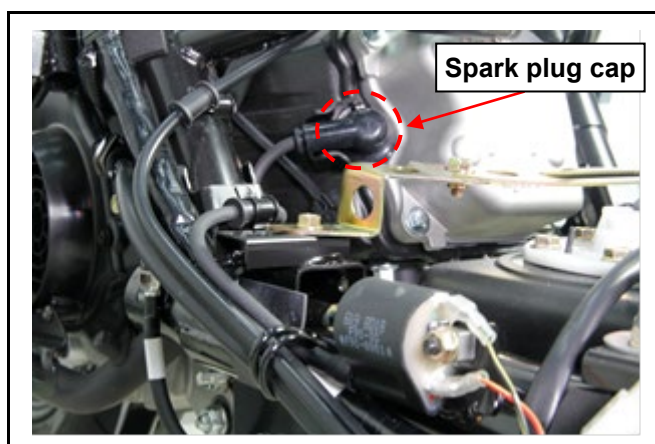
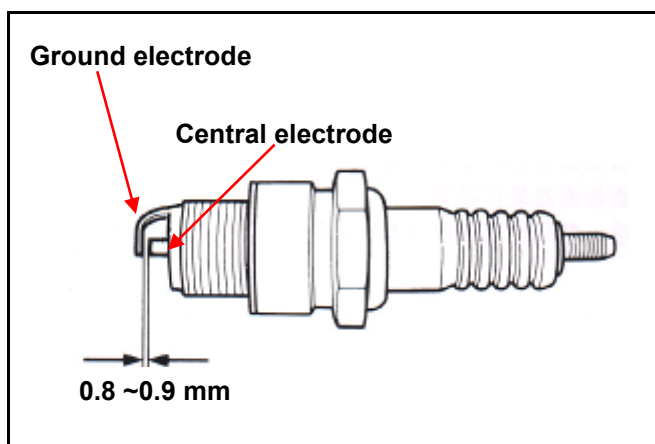
Measure spark plug gap.

- Spark plug gap : 0.8~0.9 mm

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

Screw the spark plug by hand first, then tighten it with tool.

Install spark plug cap.



Valve Clearance

Remove luggage box.

Remove central cover.

Remove cylinder head side cover.

Remove valve adjustment cap.

Remove radiator cover.

Remove radiator base.

Remove coolant fan.

Turn the flywheel, make the "T mark" can align the corresponding mark on the crankcase and the marking line of the cam sprocket must be parallel to the machined surface of the cylinder head (Piston is at TDC position in compression stroke.)

Caution

- Valve checking and adjustment only be conducted when the engine temperature is below 35°C.

Check & adjust valve clearance with feeler gauge.

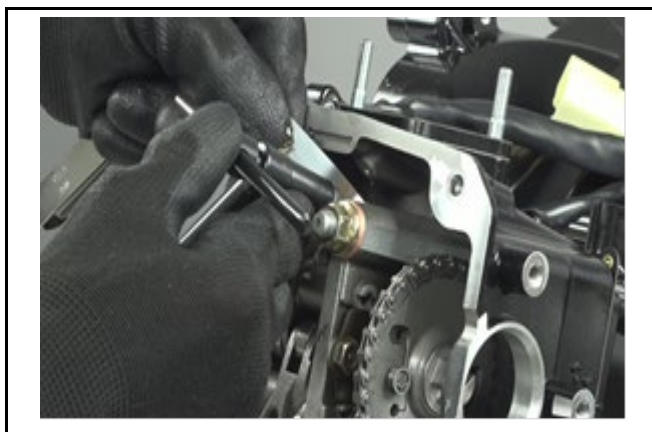
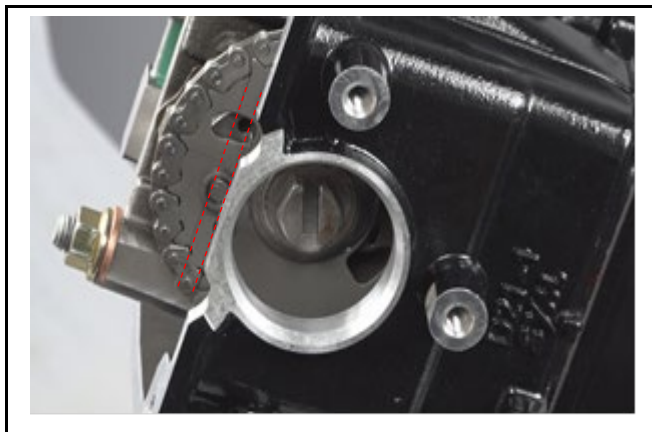
- Valve clearance (IN/EX): 0.12 ± 0.02 mm

Loosen fixing nut and turn the adjustment nut for adjustment.

Caution

For models with a decompression mechanism for engine starting

- Flywheel cannot be turned counterclockwise to prevent triggering the decompression mechanism, which causes valve clearance cannot be measured correctly.
- Before adjusting the valve clearance, the engine should be rotated forward at least two times to ensure that the (oneway) decompression mechanism does not work.



Cylinder Compression Pressure

Warm up the engine.

Turn off the engine.

Remove the luggage box.

Remove the central cover.

Remove spark plug cap and spark plug.

Install compression gauge.

Full open the throttle valve, and rotate the engine by starter motor.

Caution

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

- Compression pressure: $7.5 \pm 1.5 \text{ kgf/cm}^2$

•

Check following items if the pressure is too low:

- Incorrect valve clearance.
- Valve, cylinder head leaking.
- Piston, piston ring or cylinder is worn.

If the compression pressure is too high, it means there is too much carbon deposits forming on combustion chamber or piston head surface.

Drive Belt

Remove left side cover.

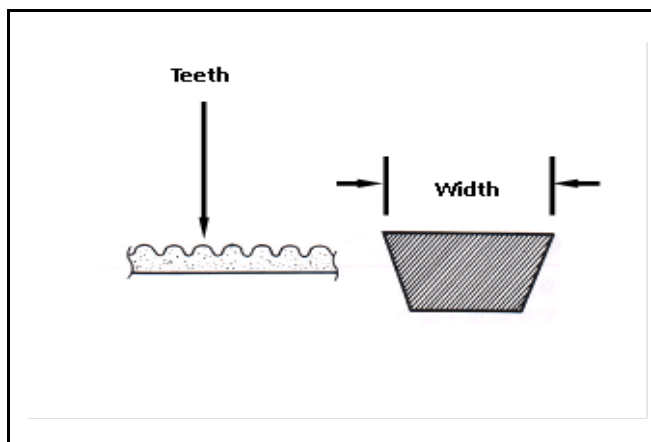
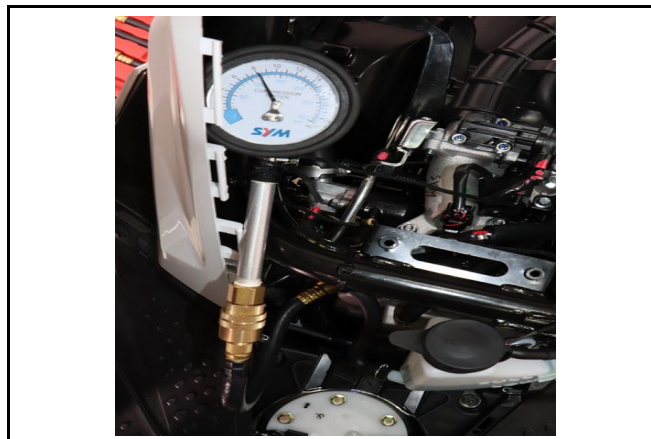
Remove mounting bolt for air cleaner.

Remove outer cover and crankcase cover on the left side of engine.

Check if the belt is crack or worn.

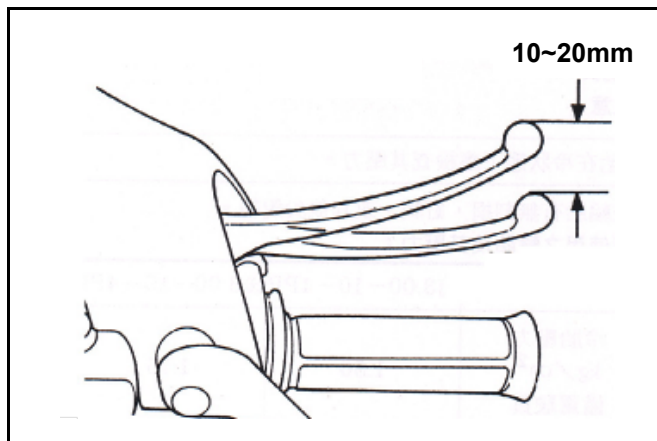
Replace the belt if necessary or follow the periodical maintenance schedule to replace it.

- Limitation of drive belt width: 21.4 mm above



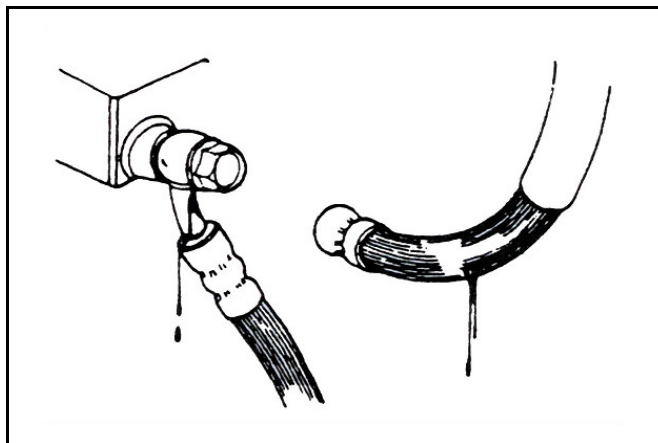
Brake System (Front/Rear disk brake)

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



Brake Hose

Confirm whether the brake hose is corroded or damaged, and check whether the brake system is leaking.



Brake Fluid

Check if brake fluid level through the inspection window on brake master cylinder. If the brake fluid level is lower than the mark, LOWER, refill brake fluid and check whether brake system is leaking.

⚠Caution

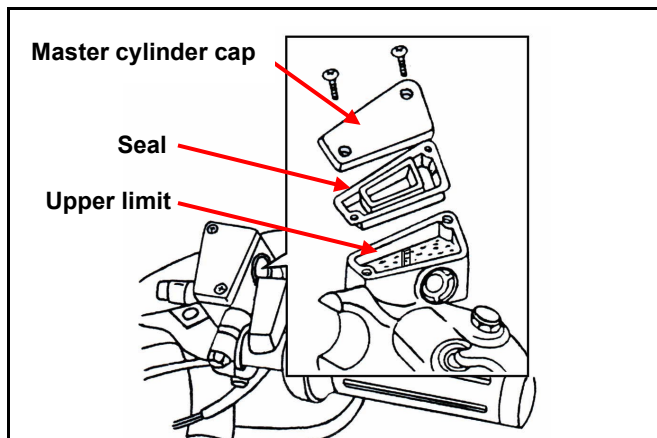
- Do not operate the brake lever after removing the master cylinder cap to avoid the brake fluid is spilt out.
- Do not mix non-compatible brake fluid together.



Filling Brake Fluid

Tighten the drain valve, and fill brake fluid from brake master cylinder.

Operate the brake lever for filling brake system hoses with brake fluid.



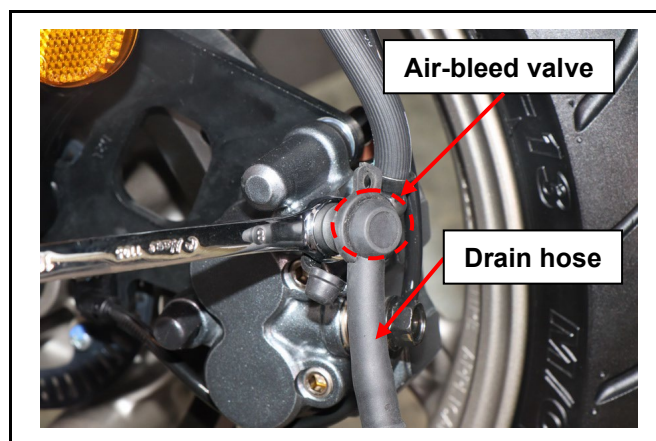
Air Bleed Operation

Connect a drain hose to air-bleed valve.

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

Caution

- Do not release the brake lever before the air-bleed valve is closed.



Add Brake Fluid

Close the air-bleed valve and add specified brake fluid into the brake master cylinder.

Make sure the level of brake fluid is to upper limit.

- Recommended brake fluid: DOT 3 or Dot4 brake fluid

Brake Lining

The mark on brake lining is the wear limitation.

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

Caution

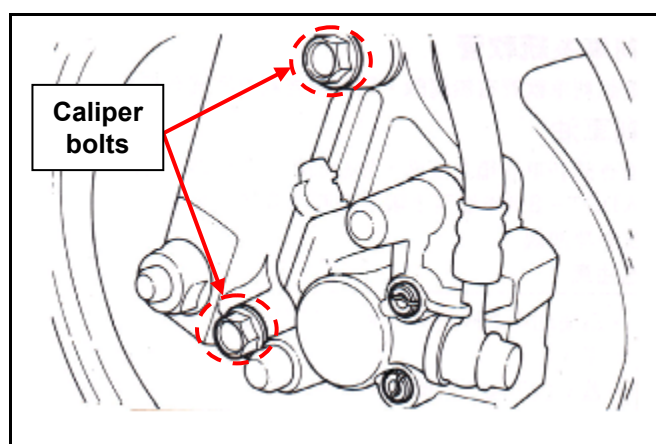
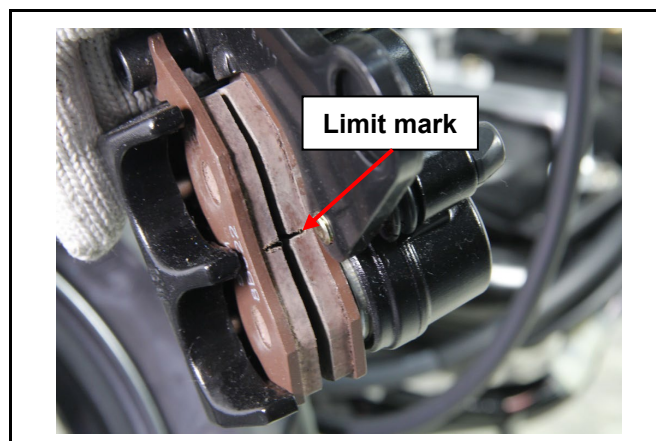
- It is not necessary to remove brake hose when replacing the brake lining.

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.

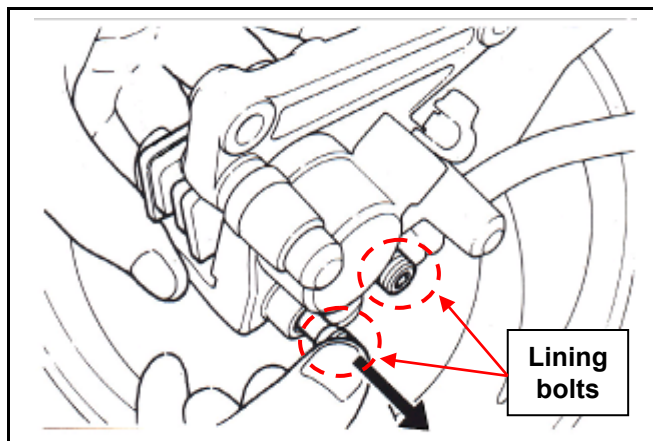
Pry out the brake lining with a flat driver if lining is clipped.



Remove brake lining bolt.
Take out the lining.

⚠Caution

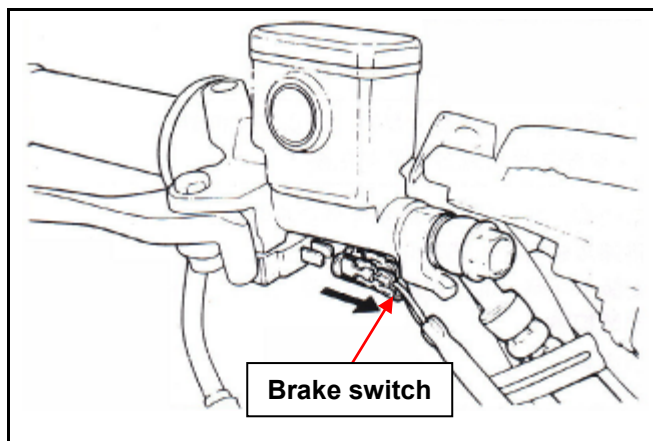
- In order to maintain brake power balance, the brake lining must be replaced with one set.



Brake Light Switch

The brake light switch is to light up brake lamp while brake applying.

Make sure that starter motor could be operated only under brake applying.



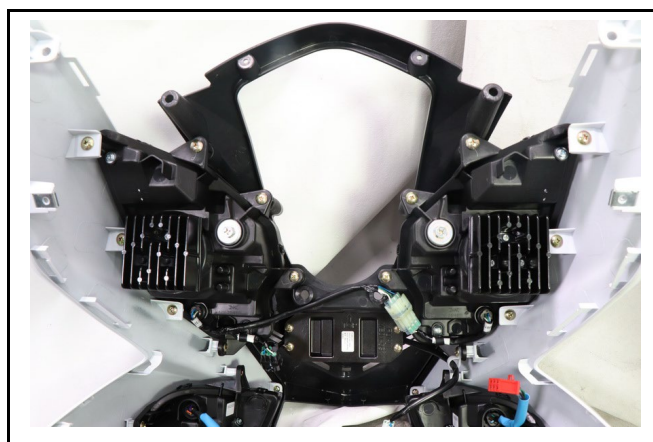
Headlight Beam Distance

Turn on main switch

Turn the headlight adjust screw with driver to adjust headlight beam height.

⚠Caution

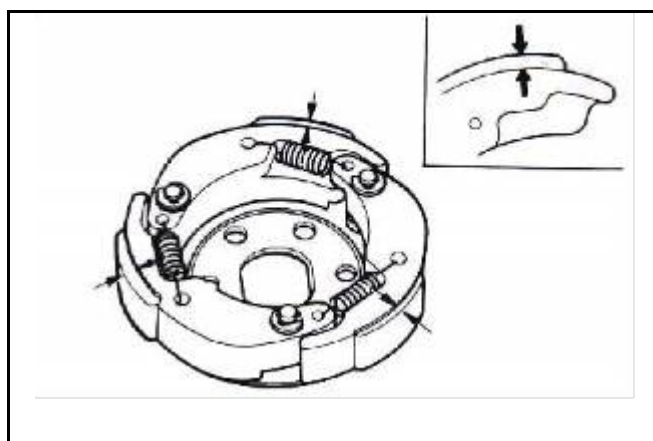
- The headlight beam has been adjusted in accordance with regulations. Please do not adjust it arbitrarily if it is not necessary.
- Inappropriate headlight beam adjustment can cause dazzling driving or insufficient lighting.



Clutch Weight

Start the vehicle and gradually increase the throttle opening to check the action of the clutch.

If juddering in driving, check the wear for the clutch plate and replace it if necessary.



Side Stand

Check if side stand spring is damaged or loose.

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

Check if side stand set is operated smoothly.

Make sure that side stand is not bending or deformed.

Front / Rear Cushion

⚠Caution

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

Front Cushion

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

Check if it is damaged.

Replace relative parts if necessary.

Tighten all nuts and bolts.

Rear Cushion

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

Check if it is damaged.

Replace relative parts if necessary.

Park the vehicle with main stand.

Start the engine and raise engine speed gradually to check if engine bracket bush is worn.

Replace the bushing if necessary.

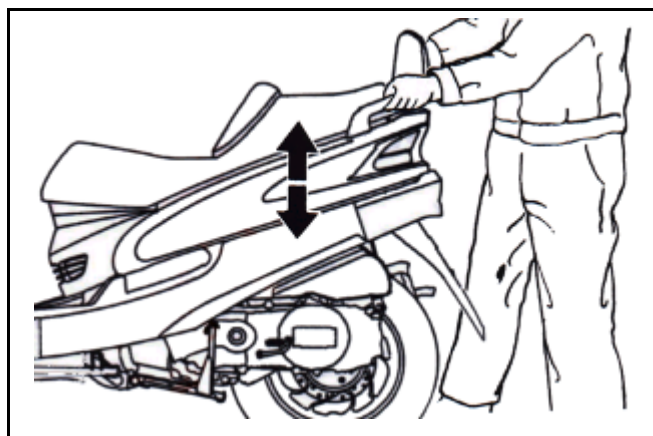
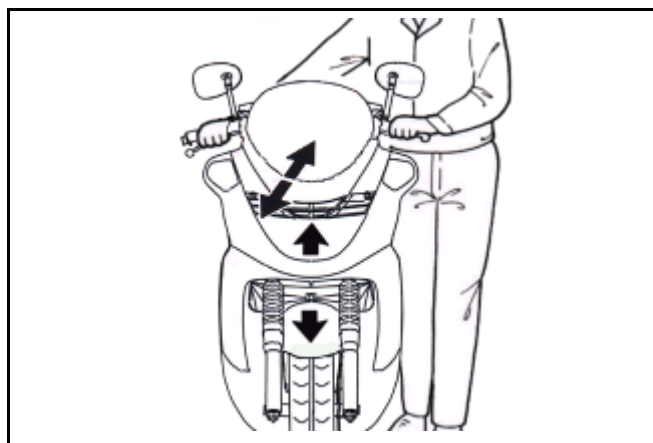
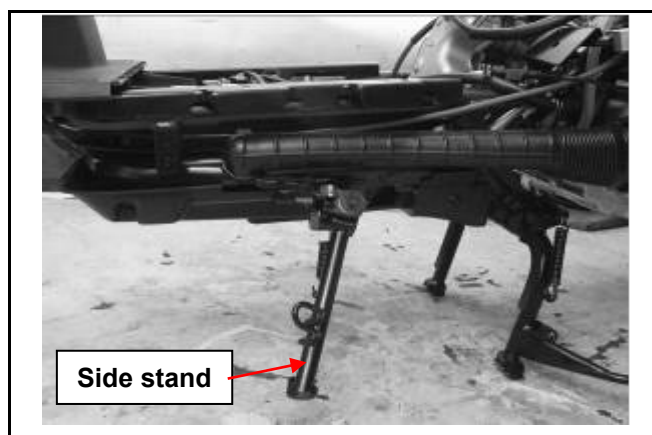
Tighten all nuts and bolts.

Nuts / Bolts Tightness

Run periodical maintenance according to the Periodical Maintenance Schedule.

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

Check if all fixing pins, snap rings, hose clamps, and wire holders are fixed securely.



Wheel and Tire

⚠ Caution

- Checking tire pressure should be carried out when tire is cold.

Check if tire surface is broken by nails, stones or other foreign materials.

Standard tire pressure

Tire size	Front tire	Rear tire
Tire pressure(cold) - kgf/cm ²	1.8	2.3

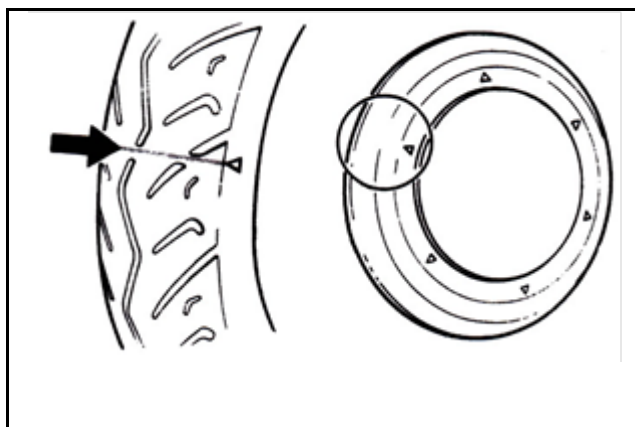
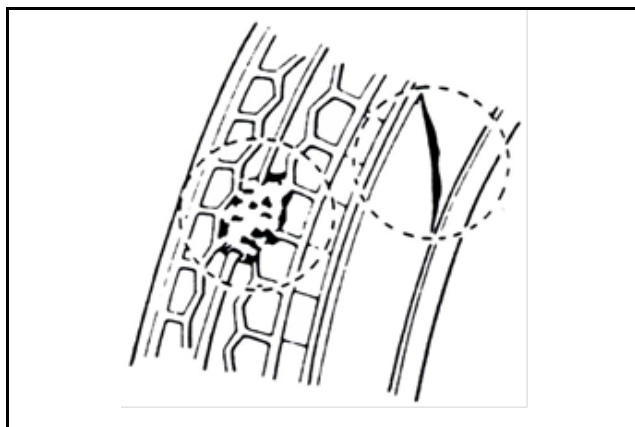
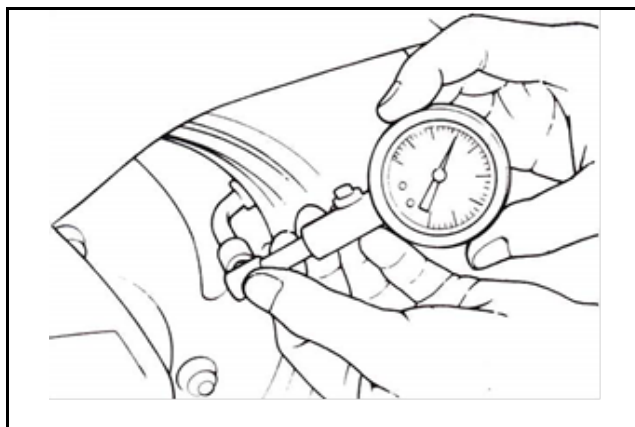
Check if front and rear tires' pressure meet the regulations

Measure tire thread depth from tire central surface.

- Replace it if the depth does not complies with the following specification:

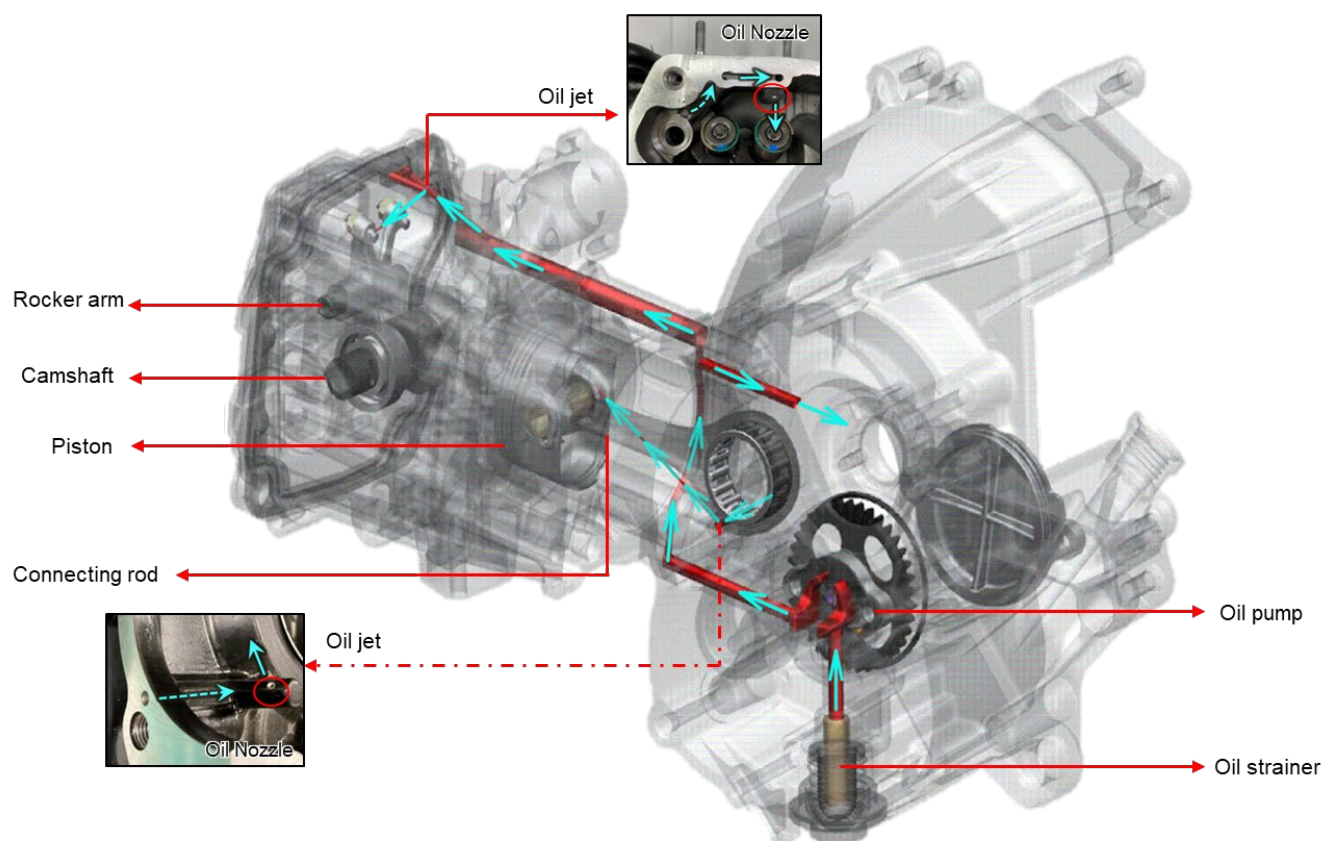
Front tire: 1.5 mm

Rear tire: 2.3 mm



Oil passage Diagram.....	3-1	Engine Oil Strainer Clean	3-4
Precaution in Operation	3-2	Oil Pump	3-5
Troubleshooting.....	3-2	Gear Oil.....	3-11
Engine oil	3-3		

Oil passage Diagram



Precautions in Operation

General Information

- This chapter contains service procedures for the engine oil pump and gear oil replacement.

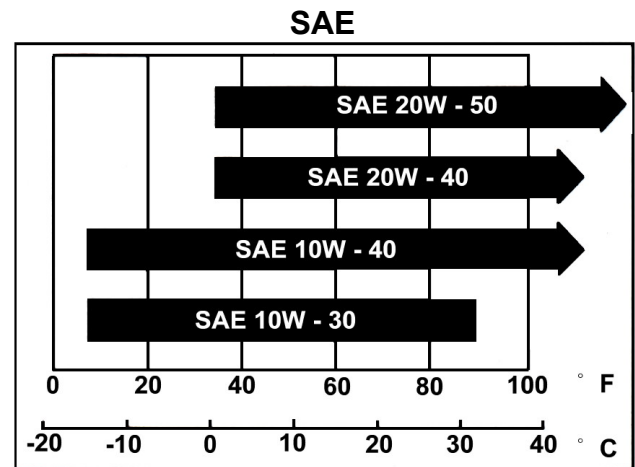
Specifications

Oil capacity Disassembly: 1050 c.c.
Change: 1000 c.c.

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

Oil Oil viscosity SEA 10W-30/40
(Recommend SYMOIL series oils)

Gear oil Gear oil viscosity SEA 10W-30
(Recommend SYMOIL series gear oils)



Unit : mm

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

Torque value

Oil strainer cap 1.3~1.7 kgf-m
 Oil drain bolt 3.5~4.5 kgf-m
 Gear oil drain plug 0.8~1.2 kgf-m
 Gear oil inspection bolt 1.0~1.4 Kgf-m
 Oil pump connection bolt 0.1~0.3 kgf-m

Troubleshooting

Low engine oil level

- Oil leaking
- Worn valve guide or seal
- Worn piston ring

Dirty oil

- Failure to change the oil regularly on time
- Damaged cylinder head gasket
- Worn piston ring

Low oil pressure

- Oil level low
- Clogged in oil strainer, circuits or pipes
- Damaged oil pump

Engine Oil

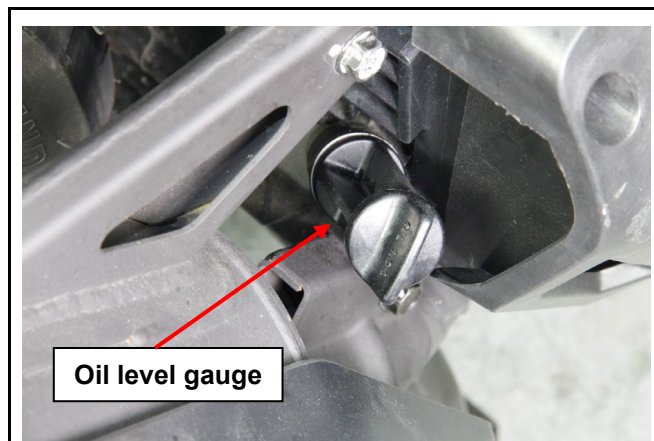
Oil inspection

Turn off engine, and park the scooter on flat ground with main stand for 3~5 minutes.

Check oil level with oil level gauge.

Do not screw oil level gauge while checking oil level.

If oil level is nearly lower limit, refill recommended oil to upper limit.



Oil replacement

⚠ Caution

- Warm up engine before replacing oil to ensure that oil drains smoothly and completely.

Place an oil pan under the scooter, and remove oil drain bolt for replacing oil.

Check if washer is worn or damaged, replace it if necessary.

Install oil drain bolt.

- Torque value: 3.5~4.5kgf-m

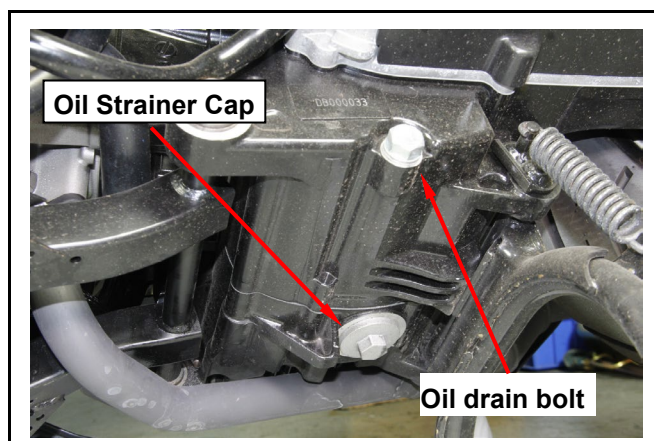
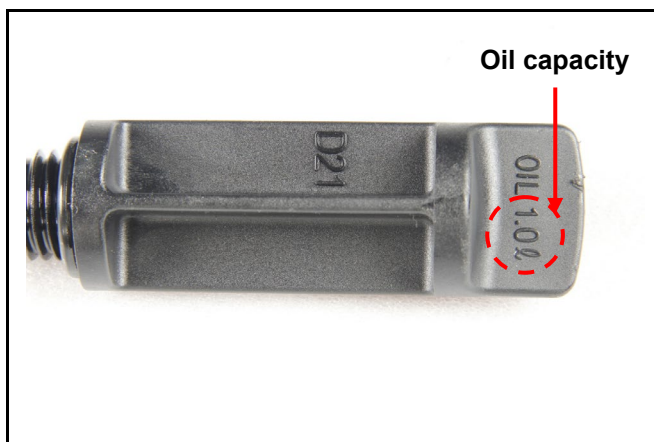
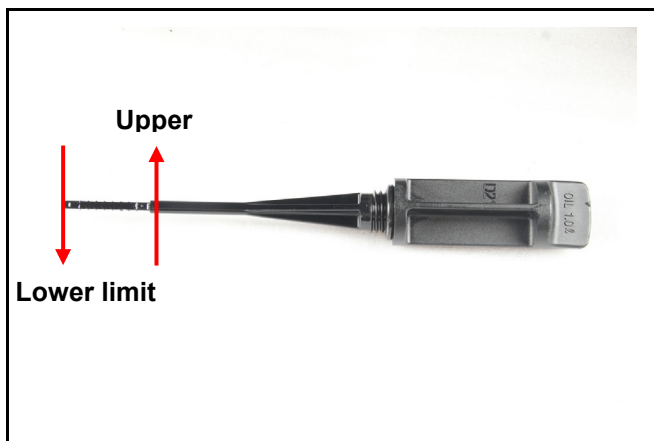
Refill engine oil, Oil viscosity SEA 10W-30.

- Recommend SYMOIL series oil.
- Oil capacity: 1.0L when replacing

Install oil level gauge, then start the engine to warm up for few minutes.

Turn off engine, and wait for 3~5 minutes to check oil capacity with oil level gauge.

Check if oil leaks.



Engine Oil Strainer Clean

Clean oil strainer while replacing engine oil.
Remove oil strainer cap, spring, and magnet.
Clean oil strainer.

Check if O-ring and strainer are damaged or worn,
replace them if necessary.

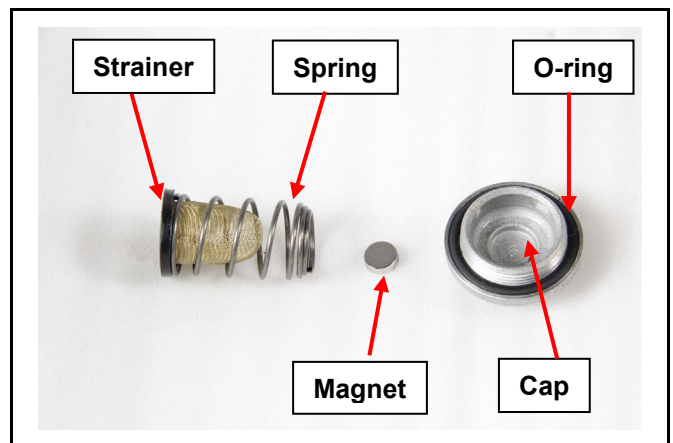
Installation is the reverse of the removal
procedure.

- Torque value: 1.3~1.7 kgf-m

Press the reset button on the dashboard, the
indicator light will go out and the oil mileage will be
reset to zero.

Caution

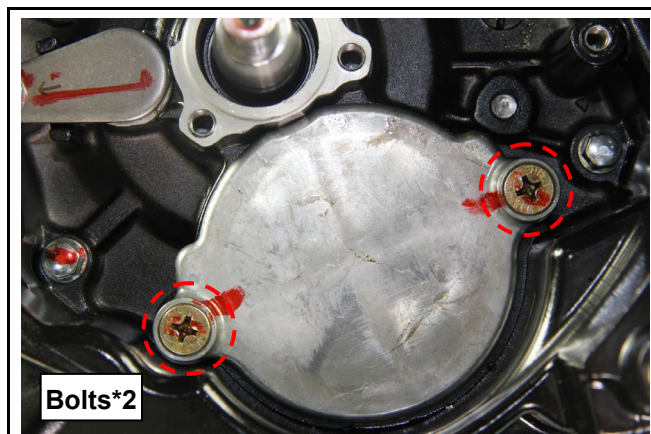
- Ensure that the installation position for the magnet is correct.
- Do not place the magnet into the strainer to avoid being sucked into the oil passage, which may cause the oil passage to jam and cause damage to the components.



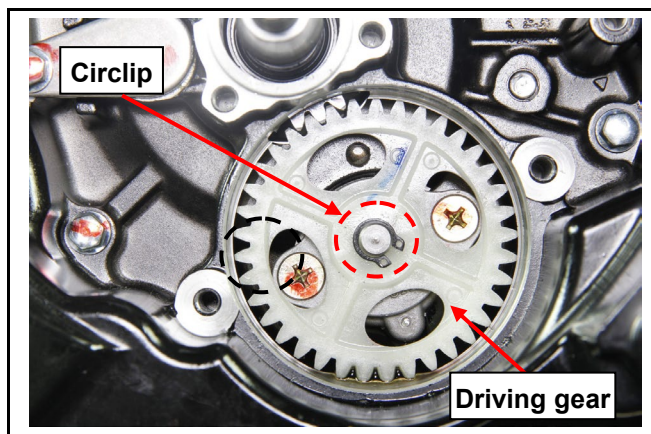
Oil Pump

Oil pump removal

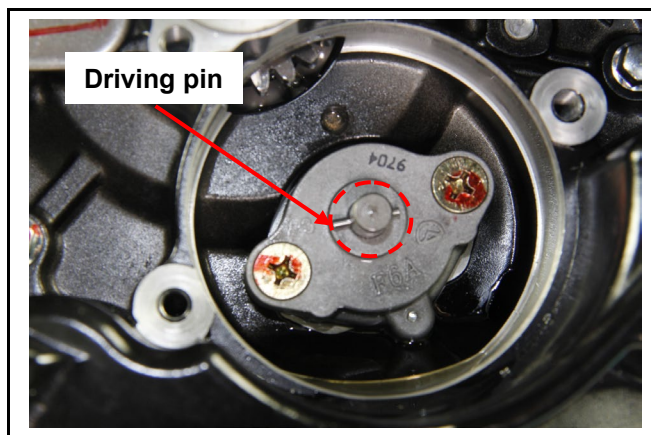
Remove oil pump cap.



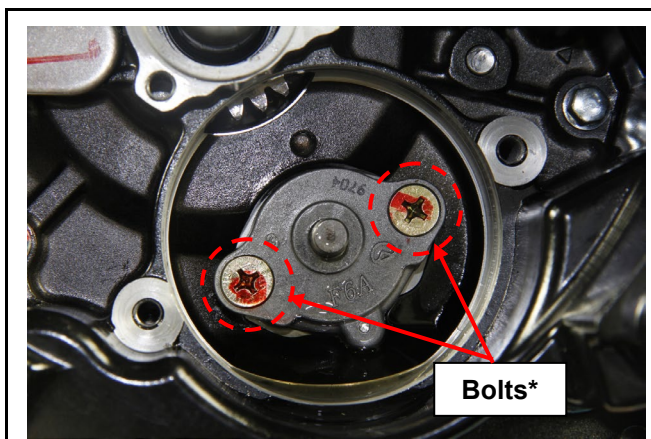
Remove circlip with circlip pliers for removing oil pump driving gear.



Remove oil pump driving pin.

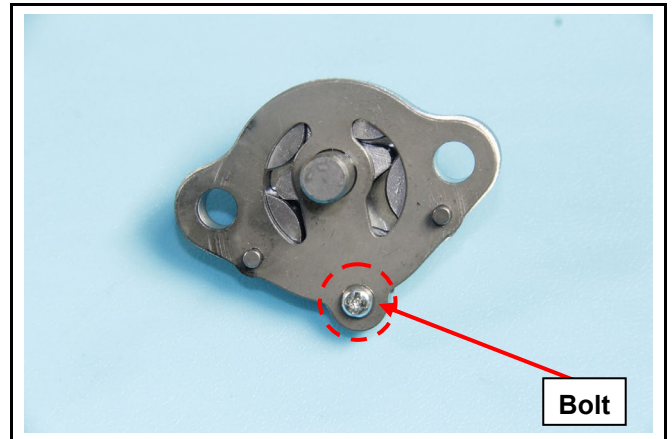


Remove the bolts and oil pump.

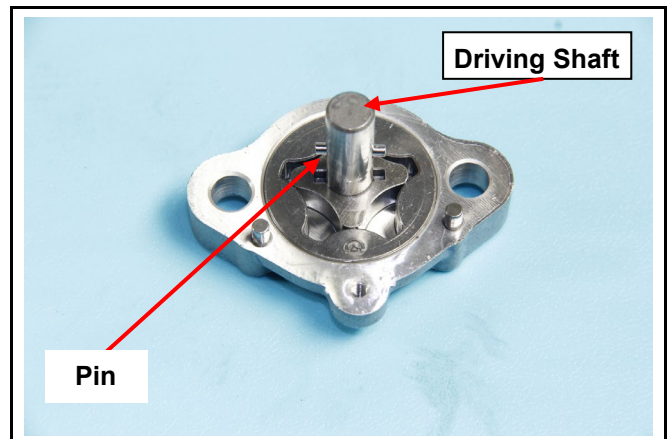


Oil Pump Disassembly

Remove the oil pump cover screws and oil pump cover.



Remove oil pump driving shaft and pin



Parts of the oil pump.



Oil Pump Inspection

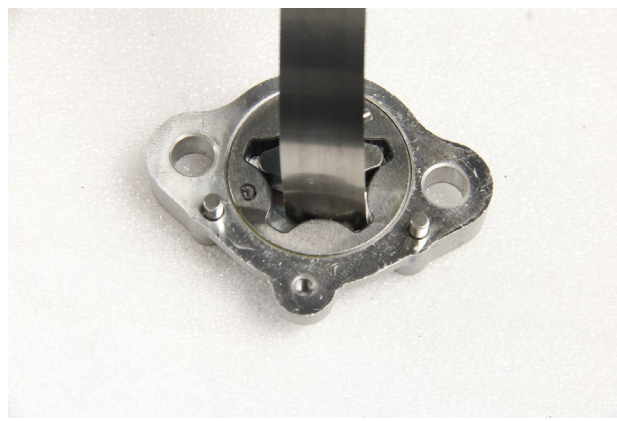
Check the clearance between oil pump body and outer rotor.

- Limit: 0.25mm



Check clearance between inner and outer rotors.

- Limit: 0.20 mm



Oil Pump Installation

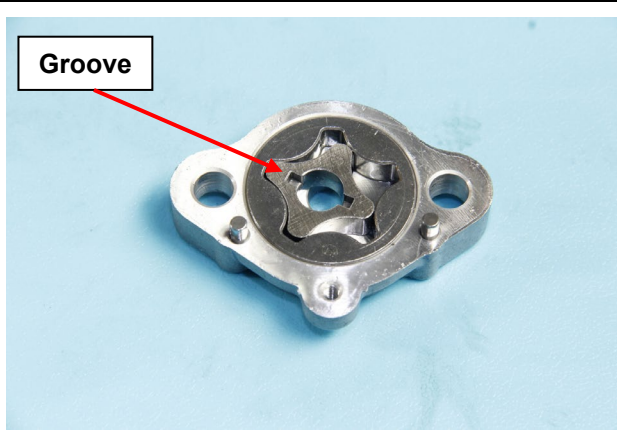
The oil pump body.



Install outer rotor into the pump body.

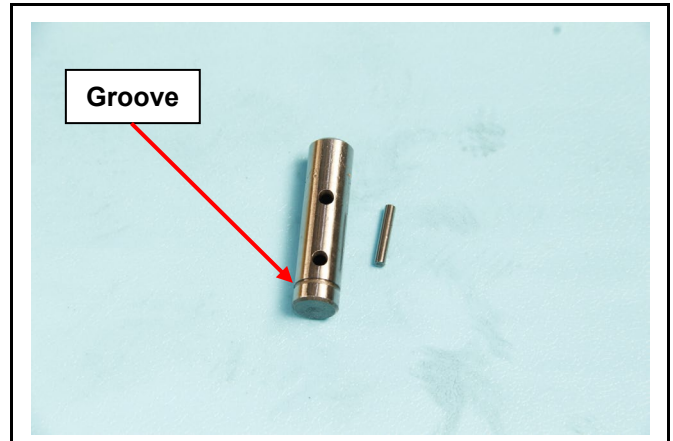


Install inner rotor into the pump body.
The groove of inner rotor face upwards.



3. Lubrication System

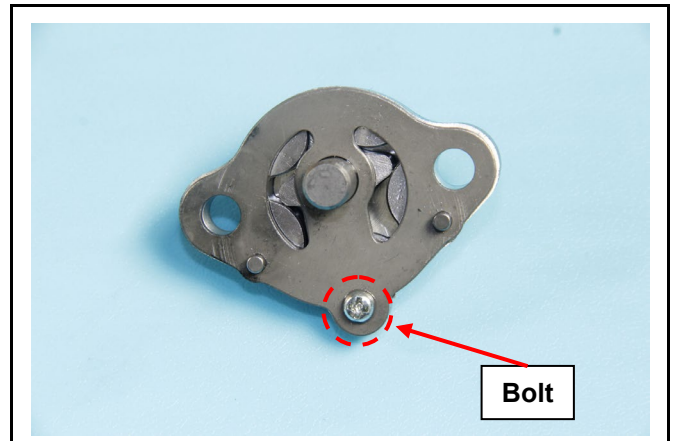
The groove of oil pump driving shaft face down.



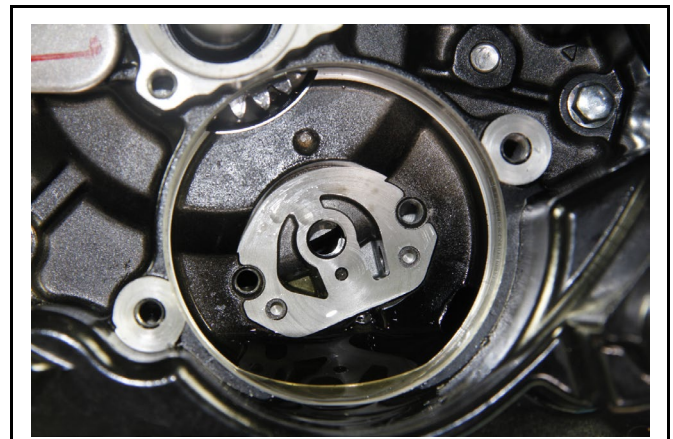
Combine oil pump driving shaft and inner rotor as picture shown.

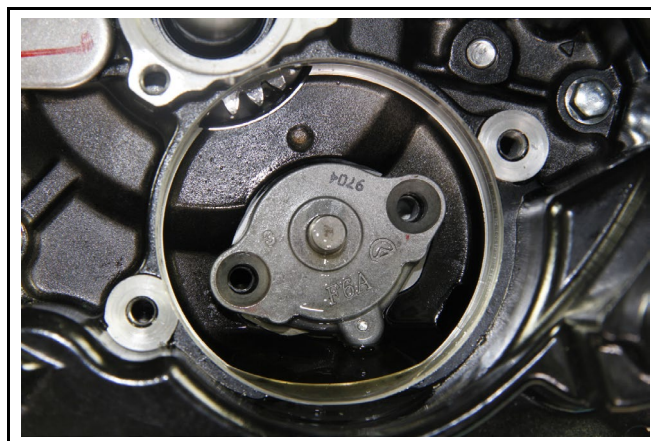


Install the oil pump cover and tighten screw.



Install oil pump.

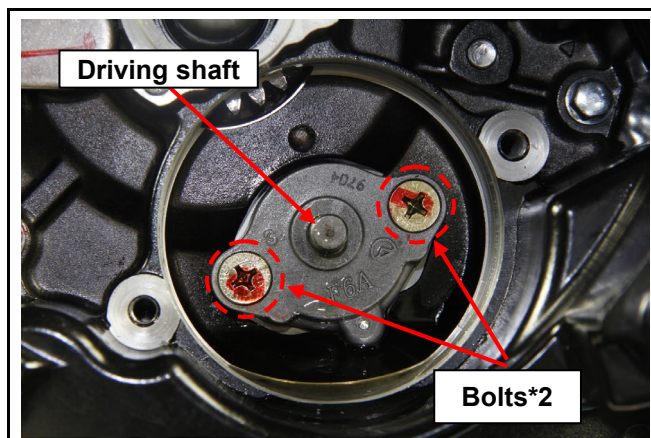




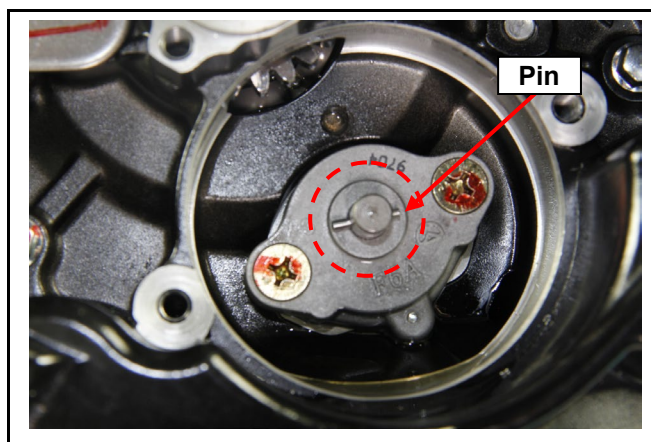
Tighten bolts.

- Torque value: 0.1~0.3 kgf-m

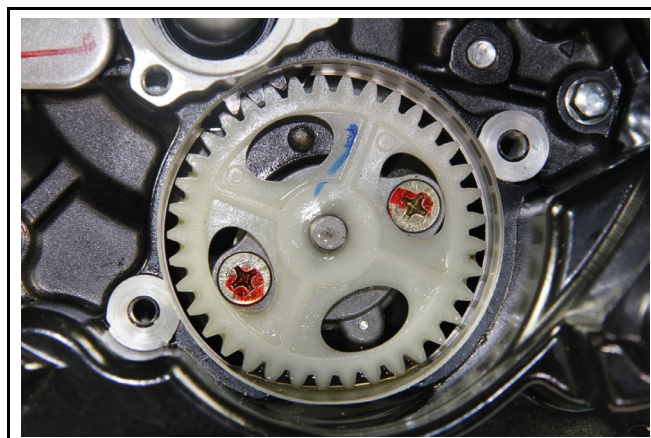
Ensure oil pump shaft can rotate freely.



Install the pin.

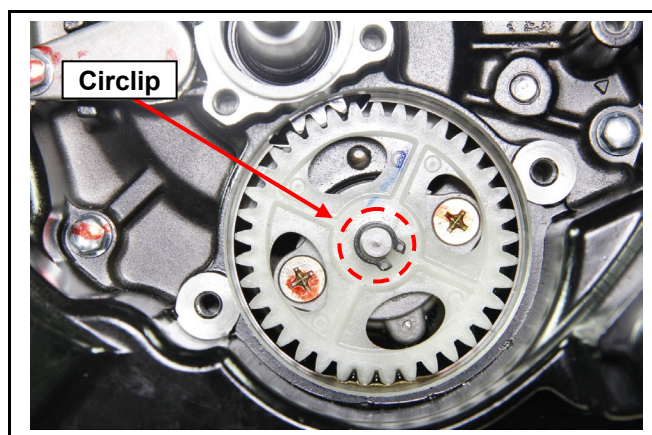


Install driving shaft gear.



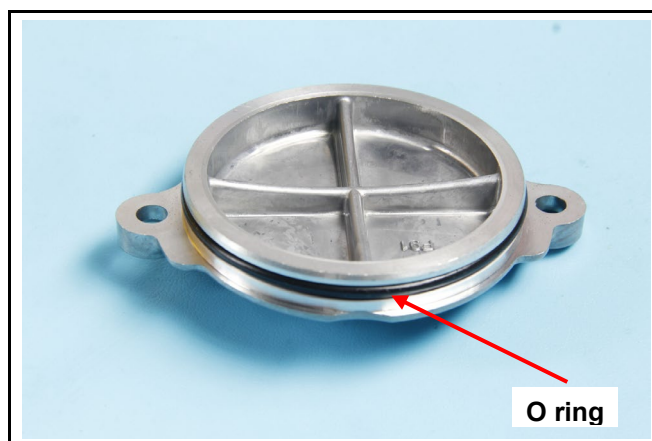
3. Lubrication System

Install circlip with circlip pliers.

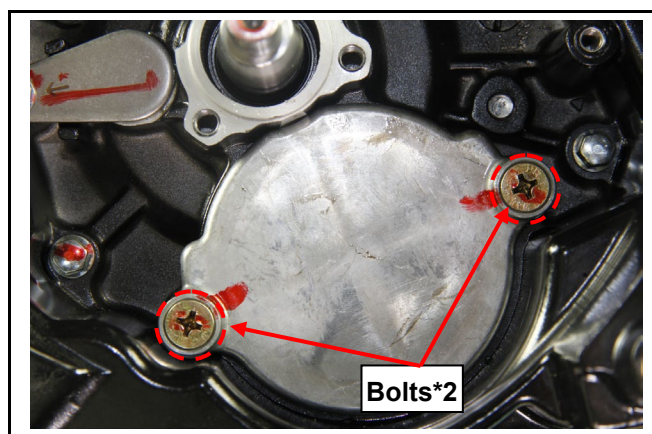


Install oil pump cover.

Check If the O-ring is damaged, replace it if necessary.



Tighten the bolts.



Gear Oil

Gear Oil Inspection

Park the scooter on flat ground with main stand.
Turn off engine, then remove filler bolt and drain bolt.

Use a measuring container to check if gear oil capacity meets the standard capacity.

If gear oil level is too low, fill gear oil to standard capacity.

Install gear oil filler bolt.

- Recommend SYM HYPOID GEAR OIL SAE 10W-30
- Torque value: 1.0~1.4 kgf-m

Gear Oil Replacement

Remove gear oil filler bolt and drain bolt to drain gear oil.

Install gear oil filler bolt and drain bolt.

Check if drain bolt washer is damaged, replace them if necessary.

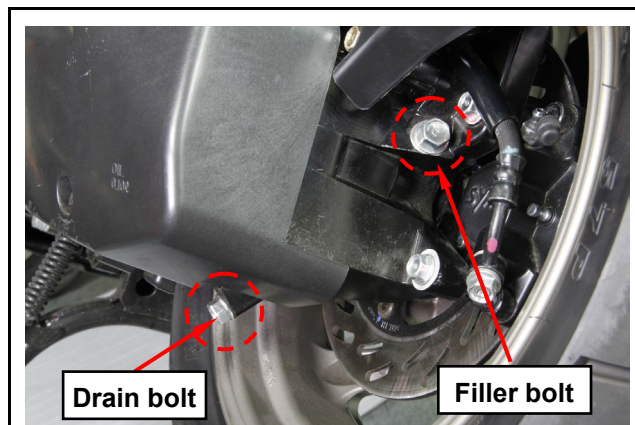
Fill gear oil to standard capacity from filler hole.

Gear Oil Capacity: 100 c.c. when replacing

Recommend SYM HYPOID GEAR OIL SAE

Start engine and run it for 2~3 minutes, then turn off engine to check if gear oil leak.

- Recommend SYM HYPOID GEAR OIL SAE 10W-30
- Torque value: 1.0~1.4 kgf-m

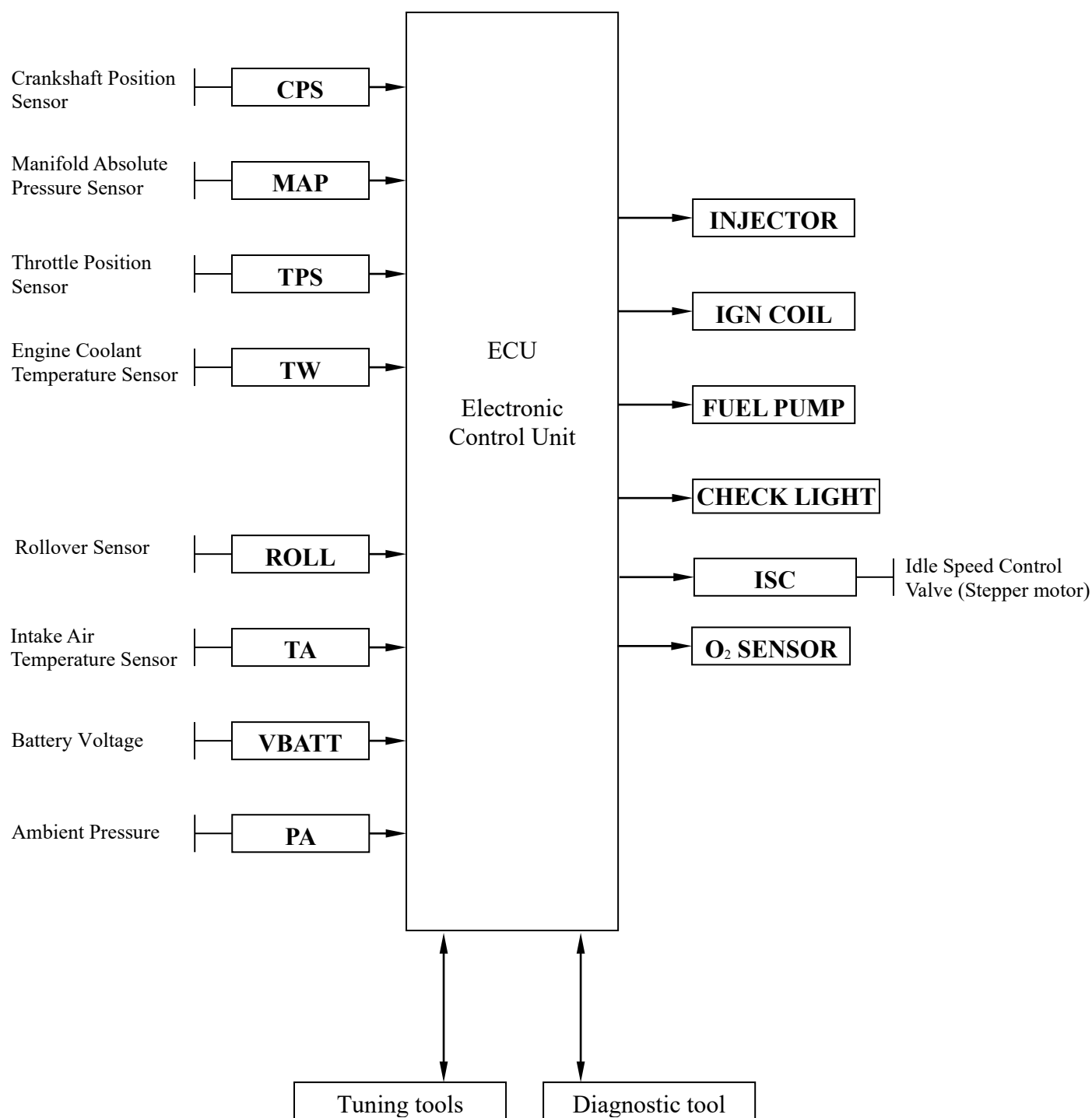


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EFi System Vehicle Configuration



Efi System Operation



EFi System Introduction

Based on 4-stroke SOHC engine, displacement **158 c.c. for D26** 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 O₂ 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 control devices: fuel injector and ECU.

The fuel is pumped from electrical fuel pump in the fuel tank, to the injector on the inlet pipe. The fuel pressure regulator keeps the 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.

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:

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.

The quantity of fuel injection, and the determination of injection time length, are all controlled by 32-bit microcomputer.

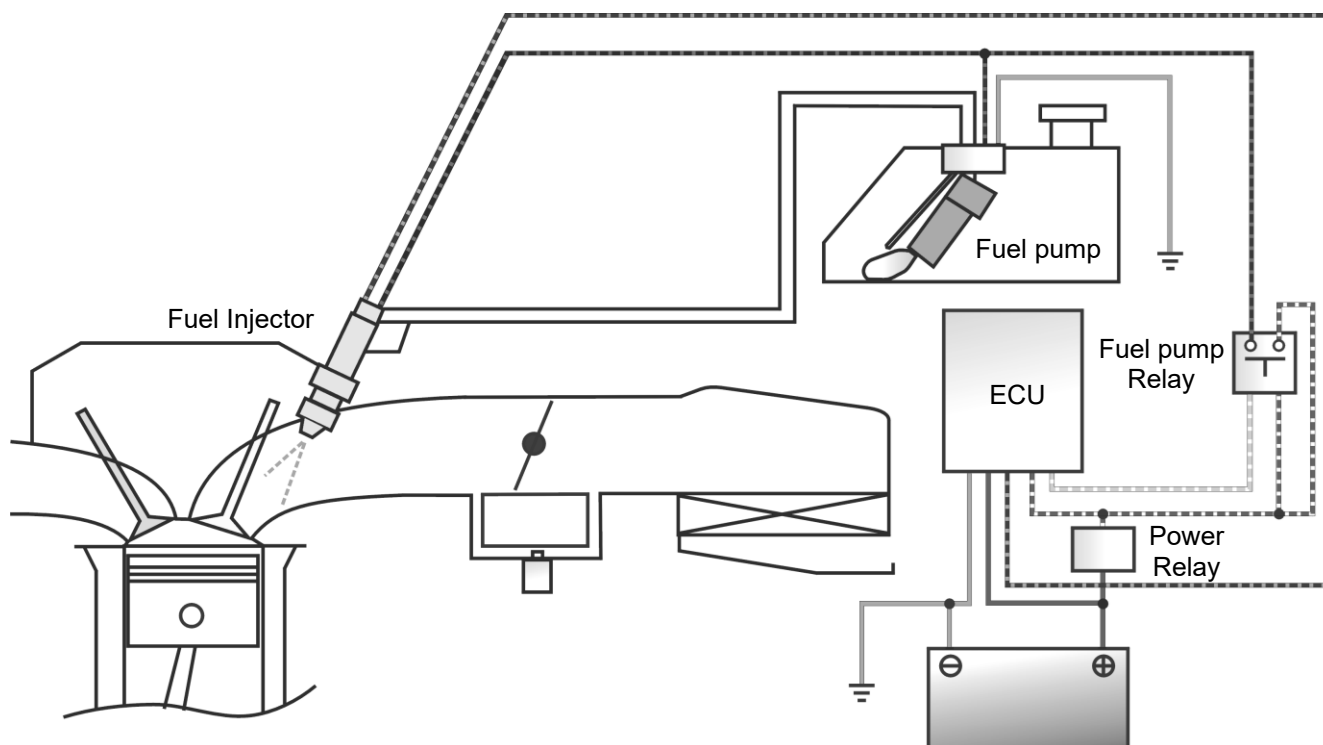
The fuel pressure regulator maintains a 294±6 kPa pressure difference between intake pipe and fuel pipe, raising the accuracy of fuel injection.

By measuring the air pressure of intake pipe, this system gives the vehicle better accommodation to the environment.

Idle air by-pass system supplies fuel and air to stabilize the idle running, and cold starting.

O₂ 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 3 to 5 seconds in order to save electricity.

Fuel pressure regulator maintains fuel pressure at $294 \pm 6\text{kPa}$ (about $3 \text{ kg} / \text{cm}^2$). 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 cannot 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

Injector 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 $294 \pm 6\text{kPa}$ (about $3 \text{ kg} / \text{cm}^2$), 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: $294 \pm 6\text{kPa}$ (about $3 \text{ kg} / \text{cm}^2$)

Ignition System

Principle

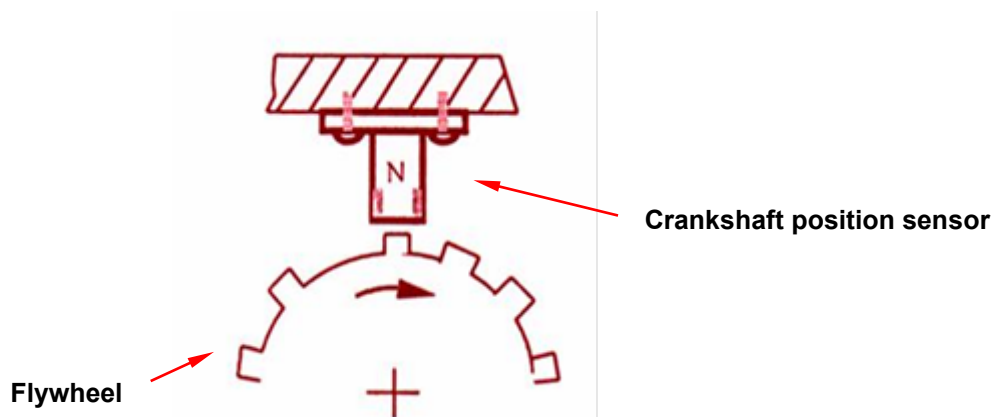
The computer programmed ignition system receives the signals from the Crankshaft position sensor, Throttle position sensor, O2 Sensor, MAP sensor, Intake air temperature sensor, Engine coolant temperature sensor. Calculating the engine RPM, the microcomputer determines the appropriate ignition timing, 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. Ignition timing: BTDC 0 ° / 1750RPM
2. Spark plug: NGK CPR8EA-9 Clearance: 0.8 to 0.9 mm
3. ACG crankshaft position sensor coil resistance: $120\Omega \pm 20\%$ (20 ° C) (G/ W - L/ Y)
4. Ignition coil primary circuit resistance: $2.8\Omega \pm 15\%$ (20 ° C) (R/Y - B/ Y)
5. Battery Type / Capacity: GTX5L-BS/YTX5L-BS / 12V 4.0Ah

Sensors / Drivers

Crankshaft Position Sensor (CPS)



Function

Detect the teeth sequence on the flywheel, and transmit the voltage (signal) to ECU.

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.

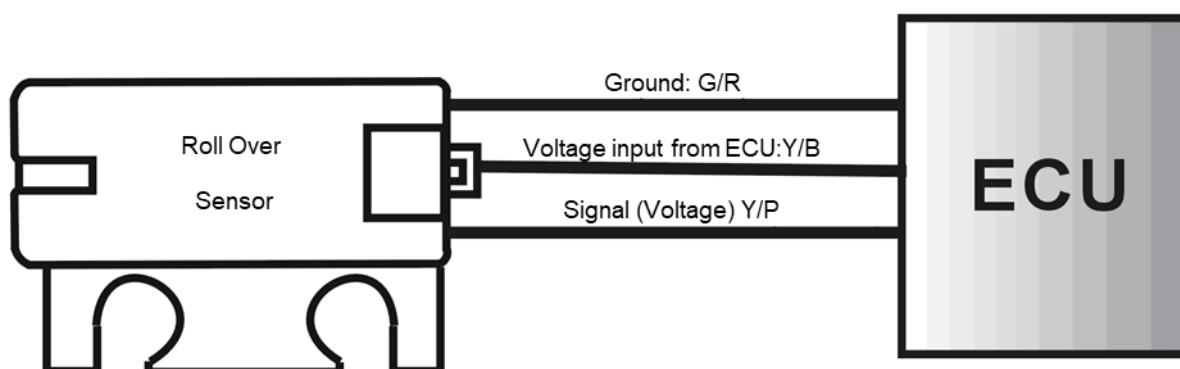
Rollover sensor

Function

A security equipment that informs ECU to shut the engine when the scooter is fell over.

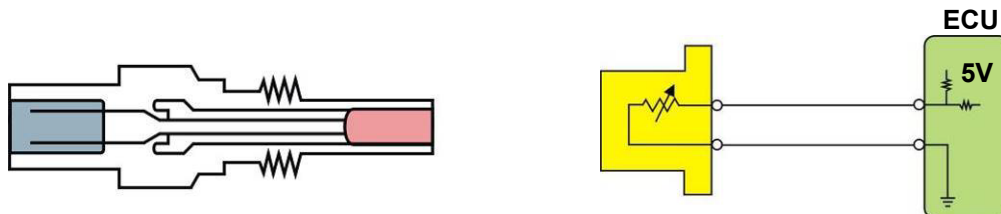
Description

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



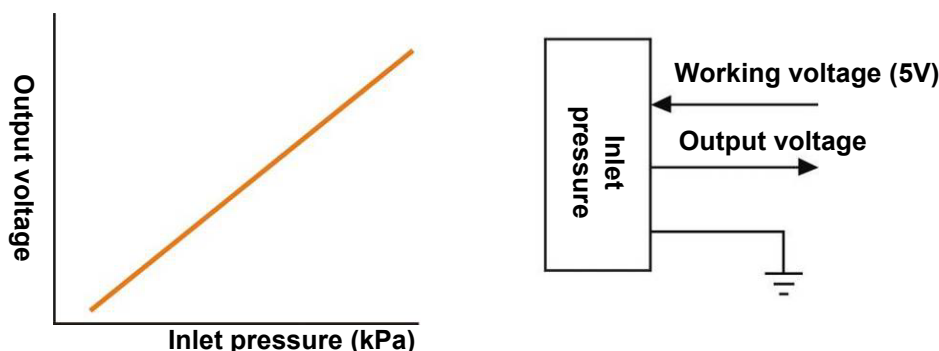
Coolant temperature / Intake air temperature sensor

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.

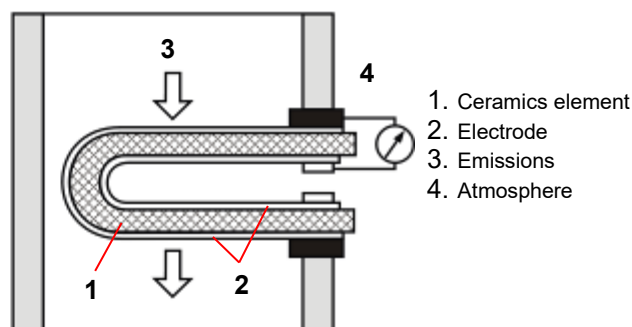
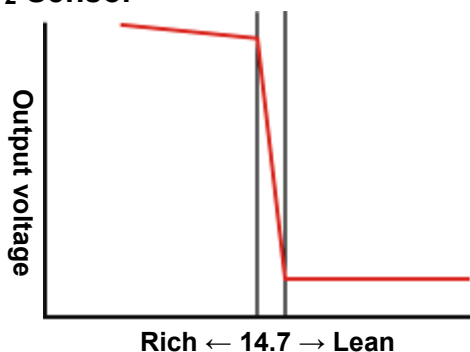


Manifold absolute pressure sensor

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.



O₂ Sensor

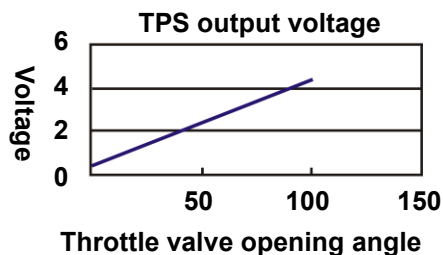
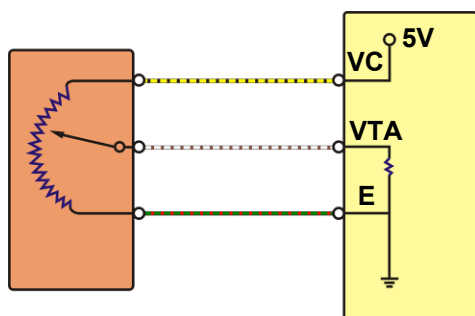


Function

O₂ 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 NO_x concentration.

1. O₂ Sensor outputs feedback signal to ECU which keeps the air-fuel mixture near the stoichiometric ratio approximately 14.6 and forms the closed loop control system.
2. When the air-fuel mixture is near the stoichiometric ratio, CO / HC / NO_x are converted most efficiently.
3. O₂ Sensor produces a rapidly fluctuating output voltage between approximately :100 ~ 900 mV

Throttle Position Sensor (TPS)



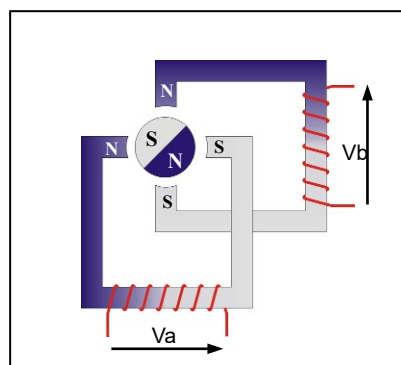
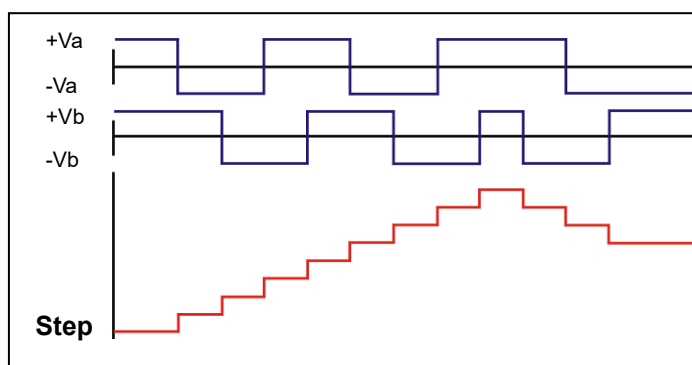
Basic Principle

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 stabilized the engine idle speed.

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.

Method of releasing fuel pressure:

Remove the fuel pump relay, and turn on the engine till it shuts down due to exhausted of fuel.

Specification

Item	Specifications
Engine idle speed	1700±150 rpm
Throttle handle free play	5~10 °
Fuel pressure	294±6kPa (about 3.0kg/cm ²)

Torque value

- Engine Temperature sensor 0.74~0.88 kgf-m
- O2 Sensor 3.6~4.6 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 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 with CAN bus box 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 which 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

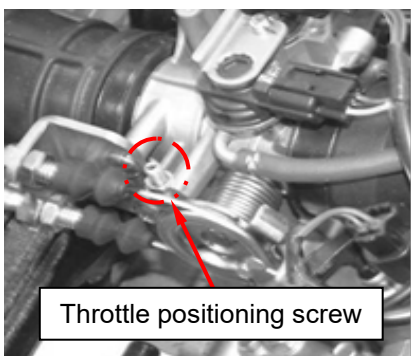
1. Disconnected→First, check whether the cartridge is correct and ECU is normal or not.
2. Unable to start→ECU or relevant parts abnormal. Re-confirm after the replacement of abnormal parts.
3. Fault codes appear→ECU or relevant parts abnormal. Troubleshoot and re-confirm.

Throttle Body



Functional Description

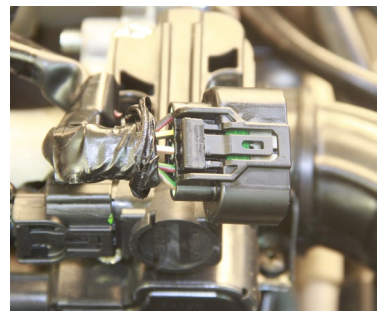
- Throttle body is the inlet air flow regulating device (similar to the carburetor).
- Throttle valve pivot drives the throttle position sensor synchronously and makes ECU detect the throttle opening immediately.
- Throttle valve positioning screw has been adjusted and marked on the production line. 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.

Manifold Absolute Pressure (MAP)



Working voltage measurement

Functional Description:

- Powered by 5V DC from ECU. It has 3-pin sockets on the sensor. One terminal is for power, and 1 terminal are for signal output. And, the last 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
Y/B	5V voltage input
B/R 、 W/BR 、 G/BR	Signal output
G/R	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 pin (G/R).
Voltage meter positive access to the inlet pressure sensor pin (Y/B).
5. Confirmed plains output voltage values:
Voltage meter negative access to the inlet pressure sensor pin (G/R).
Voltage meter positive access to the inlet pressure sensor pin (B/R)



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: $5.0 \pm 0.1V$
- Plains output voltage values: $2.87 \pm 0.03V$ (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.

Intake Air Temperature Sensor (TA)



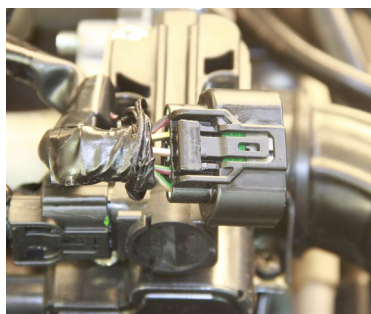
Functional Description:

- 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.

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 (°C)	Resistance value (KΩ)
-20	18.8 ± 2.1 (11.2%)
40	1.136 ± 0.1 (7.3%)
100	0.1553 ± 0.006 (3.8%)

Treatment of abnormal phenomena

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



Resistance value measurement

Throttle Position Sensor (TPS)



Working voltage measurement



Throttle output signal measurement - full close



Throttle output signal measurement - open

Functional Description:

- Use ECU provided DC 5V power supply, has the 3-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	W/ BR	Signal output
Center	Y/B	5V voltage input
Under	G/R	Ground

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 "voltage meter" DC stalls (DCV) to check sensor voltage.
4. Confirmed working voltage:
 - Voltage meter negative access to the inlet pressure sensor pin (G/R).
 - Voltage meter positive access to the inlet pressure sensor pin (Y/B).
5. Throttle output signal recognition (using the probe tool)
 - Voltage meter negative access to the sensor pin (G/ R).
 - Voltage meter positive access to the sensor pin (W/BR).
 - Measurements were full throttle at full throttle closed the values of the output voltage.

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
- Full throttle voltage value: 0.29~0.70V
- Full throttle closed voltage value: 4.13~4.76V

Engine coolant Temperature (TW)



Working voltage measurement



Resistance value measurement

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.
- have the most appropriate fuel injection and ignition timing control.

Testing Procedures:

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

Detection judge:

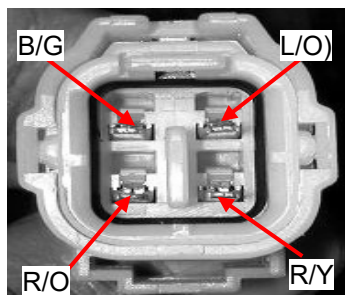
Resistance value and the temperature between relationships as follows:

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

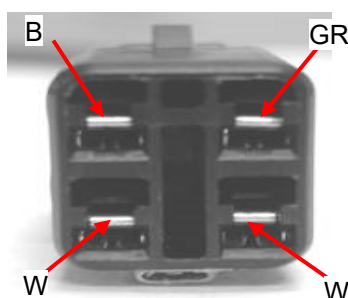
Treatment of abnormal phenomena:

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

O₂ Sensor



Working voltage measurement



Resistivity measurements

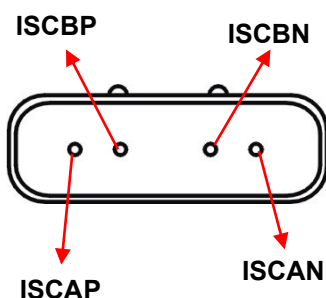
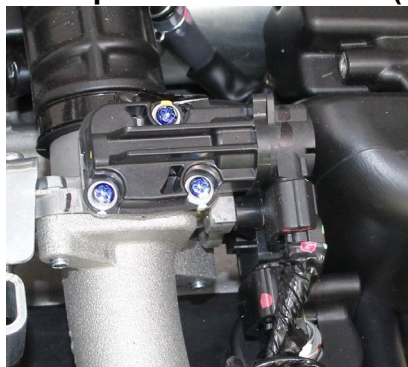
Functional Description

- Has 4 terminals connector on the sensor.
 - 1st terminal is for power input;
 - 2nd terminal is for heater.
 - 3rd and 4th terminals are for ground
- O₂ sensor produces feedback signal to the ECU which keeps the air/fuel mixture ratio control in the vicinity of 14.5 ~ 14.7 to minimize emissions, which is referred to as fuel "closed loop" control.
- When the air/fuel mixture ratio control in the near equivalent, CO / HC / NO_x to have the highest conversion efficiency.

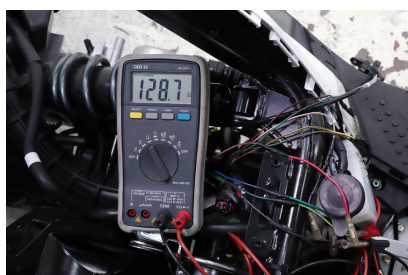
Testing Procedures

- Working voltage measurement
 - Disconnect the O₂ sensor coupler (wire harness side).
 - Opened the main switch, but do not to start engine.
 - Use "voltage meter" DC stalls (DCV) to check sensor voltage.
 - Confirmed working voltage:
 - Voltage meter negative access to the R/O pin.
 - Voltage meter positive access to the R/Y pin.
- Resistivity measurements
 - Disconnect the O₂ sensor couple (O₂ sensor side).
 - Use of the "Ohmmeter" Ohm stalls, inspection O₂ sensor resistance.
 - Confirmed working resistance:
 - Ohmmeter negative access to the W pin.
 - Ohmmeter positive access to the W pin.

Idle Speed Control Valve (ISC)



Phase A measurement of the resistance value



Phase B measurement of the resistance value

Functional Description

- Power supply from ECU, it has the four-pin socket.
- The sockets with 4 pins are the power and ground of the two sets of motor coils. The ECU manages the operation of the stepping motor through the control of the power grounding.
- ISC is a low power consumption DC motors, that drives the movement of the idle speed control valve (ISC) to adjust the idle air flow channel and control the idle speed when the car is cold or hot.

Testing Procedures

Resistance Confirmation:

- Disconnect the couplet of ISC (measurement directly on the ISC is also possible).
- Use of the "Ohmmeter" Ohm stalls (Ω), measurement of the two step motor coil resistance values.
Phase A: ISCAP and ISCAN
Phase B: ISCBP and ISCBN

Inspection of the actuation:

- Turn off the main switch.
- Use hand to touch Idle Air Control Valve body.
- Turn on the main switch.
- Feel whether the ISC is activated.



Cautions

- Dynamic checking for ISC, can only be tested on the engine, not a single test.

Detection judge

I. Resistance value:

Phase A: $120 \pm 10\Omega$ (Environmental conditions: $15 \sim 25^\circ\text{C}$)

Phase B: $120 \pm 10\Omega$ (Environmental conditions: $15 \sim 25^\circ\text{C}$)

II. Actuator inspection:

In the above checking steps for ISC Idling motor actuator control inspection, ISC will be slightly vibration or "... da... da..." continuous sound.

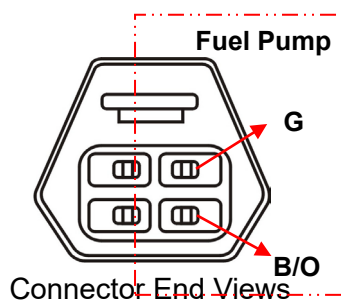
Treatment of abnormal phenomena

ISC damage, or bad contact connection.

Check whether the wire harness is abnormal.

Replace a new ISC if ISC

Fuel Pump



Fuel pump resistance measurement



Fuel system pressure measurement



Fuel system pressure measurement

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 electric consumption DC motor. Powered by 12V voltage and keep fuel pressure inside the fuel pump in $294 \pm 6 \text{ kPa}$ (about 3 kg / cm²).
- 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.

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).
- Turn on the main switch, but do not start engine.
- Use "voltage meter" DC stalls (DCV) to check fuel pump voltage.
- Confirmed working voltage:
- Voltage meter negative access to the wire harness fuel pump coupler G pin.
- Voltage meter positive access to the wire harness fuel pump coupler B/O pin.



Cautions

- Conducting fuel pump voltage measurement, if the main switch to open 5 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: $1.5 \pm 0.5 \Omega$

Testing Procedures 2

Fuel pressure measurement:

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

Detection judge 2:

Fuel pressure: $294 \pm 6 \text{ kPa}$ (about 3kg/cm²)



Fuel gauge resistance measurement (empty)



Fuel gauge resistance measurement (full)

Treatment of abnormal phenomena:

1. Fuel pump damages internal coil break, or bad contact connection.
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.

Testing Procedures 3

Fuel gauge working resistance measurement:

Check the resistance value of the fuel gauge (Y/W & G) using the ohm gear of the "three-purpose meter".

Detection judge 3:

When the arm is at full (F) and empty (E) positions, its resistance values are as follows:

Arm position	Resistance value
E (empty)	$2400 \pm 72\Omega$
F (full)	$100 \pm 3\Omega$

Fuel Injector



Functional Description

- Powered by DC 8~16V, and it has two-pin socket on the injector.
- Its major component is the solenoid valve of high resistance driven by electronic current.
- 2 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

Resistance Confirmation:

1. Use of the "Ohmmeter" Ohm stalls(Ω), measurement of the injector resistance value.
2. Injector injection status 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, inspect injection status of injector.



Injector resistance confirmation



Injection-state atomizing good



Injection-state unusual

Detection judge

1. Between the two pin resistance values: $10.5 \pm 0.53\Omega$
2. injection status:
 - Fuel atomizing good, with a clear scattering angle \rightarrow judged as normal.
 - Injection-state such as water, no obvious scattering angle \rightarrow found abnormal.

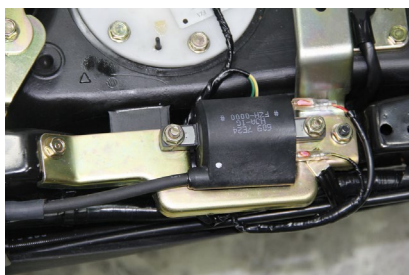
Treatment of abnormal phenomena

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

Warning

- Gasoline is low-flammable and explosive material. Work in the ventilation place, and prohibited fire.
- When inspecting the fuel injection status of the injector, the gasoline flowing out of the fuel injector should be collected in an appropriate container to avoid danger.

Ignition coil



1st circuit coil resistance
confirmation



2nd circuit coil resistance
confirmation

Functional Description:

Use 8 ~ 16V DC power supply, it has 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 O2 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 (wire R/Y & B/Y).

Use of the "Ohmmeter" Ohm stalls (Ω), measurement of the ignition coil resistance value.

Detection judge:

1st circuit coil resistance: $2.8\Omega \pm 15\%$ (20°C)

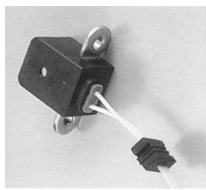
2nd circuit coil resistance: $19.8\Omega \pm 20\%$ (20°C)

Treatment of abnormal phenomena:

Ignition coil internal coil disconnection damaged, or plugs bad contact.

Ignition coil ignition is not abnormal, proposes to replace the ignition coil.

Crankshaft position sensor (CPS)



Resistance confirmation

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 (**18-1** tooth) rotary cutting induction coil changes in the magnetic field sensor with the inductive voltage signal for ECU judgment, 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 (**L/Y & G/W**).
- Use of the "Ohmmeter" Ohm stalls (Ω), measurement of the crankshaft position sensor resistance value.

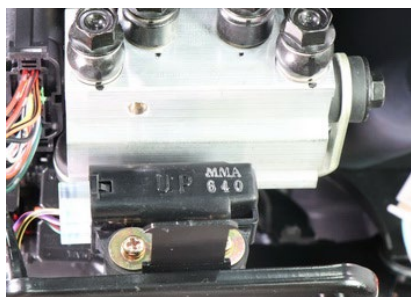
Detection judge:

Resistance value: **80~160 Ω (20°C)**

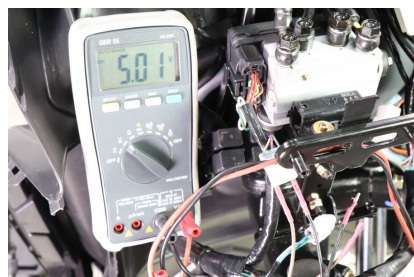
Treatment of abnormal phenomena:

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.

Rollover sensor



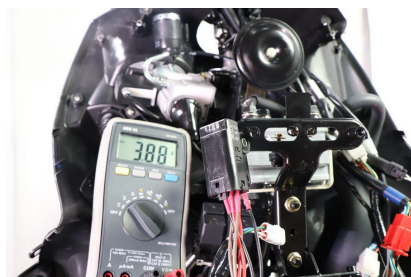
Roller sensor



Roller sensor voltage



Roller sensor voltage
when stands



Roller sensor voltage
when falls

Functional Description:

- Control the power of power relay with three-pin socket.
- When vehicles tilt angle is greater than 65 degrees, rollover sensor will cut off the power supply of ECU. If want to restart the engine, need to re-open the main switch.
- Rollover sensor is a safety device when the vehicle turnover. It will cut off the power supply of ECU, and stop the engine.

Testing Procedures:

- Rollover sensor is an electronic control device, cannot be measured after removal.
- Check the rollover sensor output voltage. Replace a new rollover sensor if the value is out of specification

Detection judge:

Voltage: Normal: 0.4~1.4V

Rollover: 3.7~4.4V

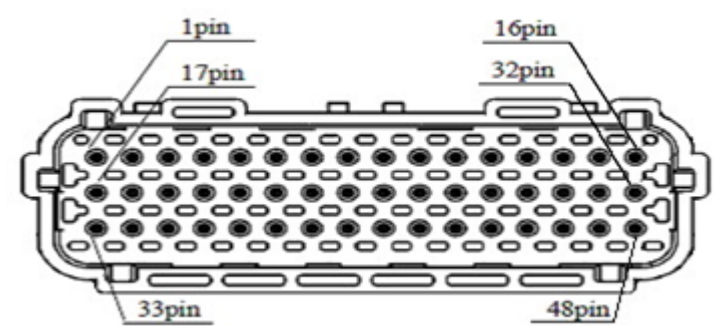
Treatment of abnormal phenomena:

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

- When the vehicle is upright, the feedback voltage should be low (1.5V↓).
- Rollover sensor internal short circuit or open circuit, or bad contact connection.
- Check whether the wire harness is abnormal.
- Replace a new rollover sensor if there is any damage.

ECU Pin Configuration

(ECU side)



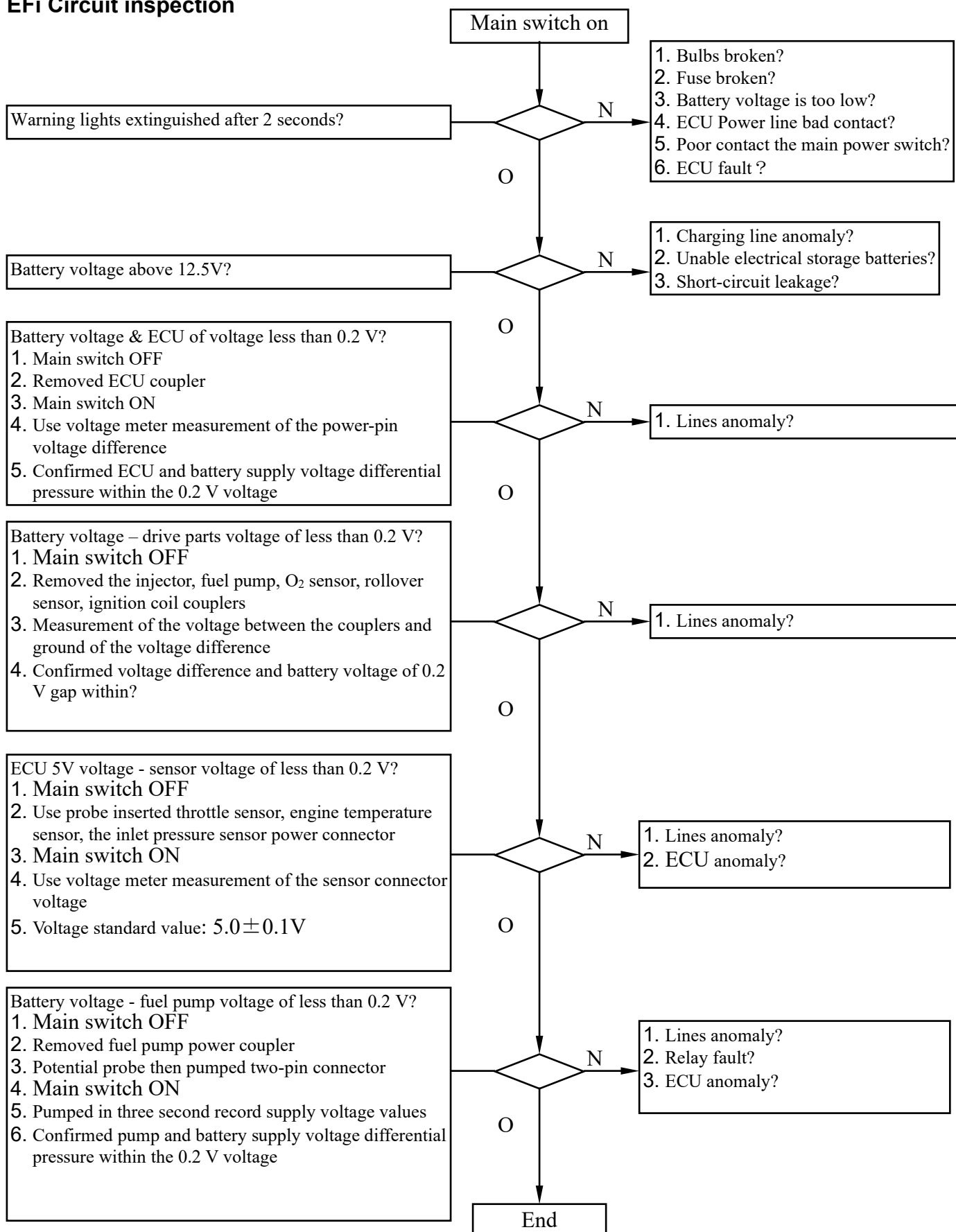
ECU Pin Note

Pin NO.	Pin code	Wire color	Note
1	IGP	R/Y	Ignition power input
2	LG	G4	Logic ground
3			
4	CAN-H	O/P1	High level CAN voltage
5	CAN-L	W/B1	Low level CAN voltage
6	IDL	G/PU	Idle stop indicator lamp output
7	CRK-M	L/Y	Crank pulse sensor GNS input
8	IDLSSW	W/B	Idle stop switch input
9			
10			
11			
12	O ₂ HT-F	R/O	O ₂ sensor heater front
13	INJ	L/G	Injector output
14	ISC AP	L/B	ISC AP output
15	PG1	G4	Power ground1
16	FPR	O/W	Fuel pump relay output
17	VCC	Y/B	Sensor power output (+5V)
18	SG	G/R	Sensor ground
19			
20	ROLL	Y/P	Rollover sensor input
21	TH	W/BR	Throttle position sensor input
22			
23	VSP2	O/B2	Vehicle speed sensor input2
24	VSP1	O/B1	Vehicle speed sensor input1
25	CRK-P	G/W	Crank pulse sensor input
26			
27	ICS BN	B/W	ISC BN output
28	ISC AN	BR/B	ISC AN output
29	ICS BP	G/B	ISC BP output
30	MIL	Y/G	Malfunction indicator lamp output
31	PG2	G4	Power ground
32	IG	B/Y	Ignition coil output
33	VBU	R3	Back up voltage input
34	ST SW	Y/R4	Starter switch input

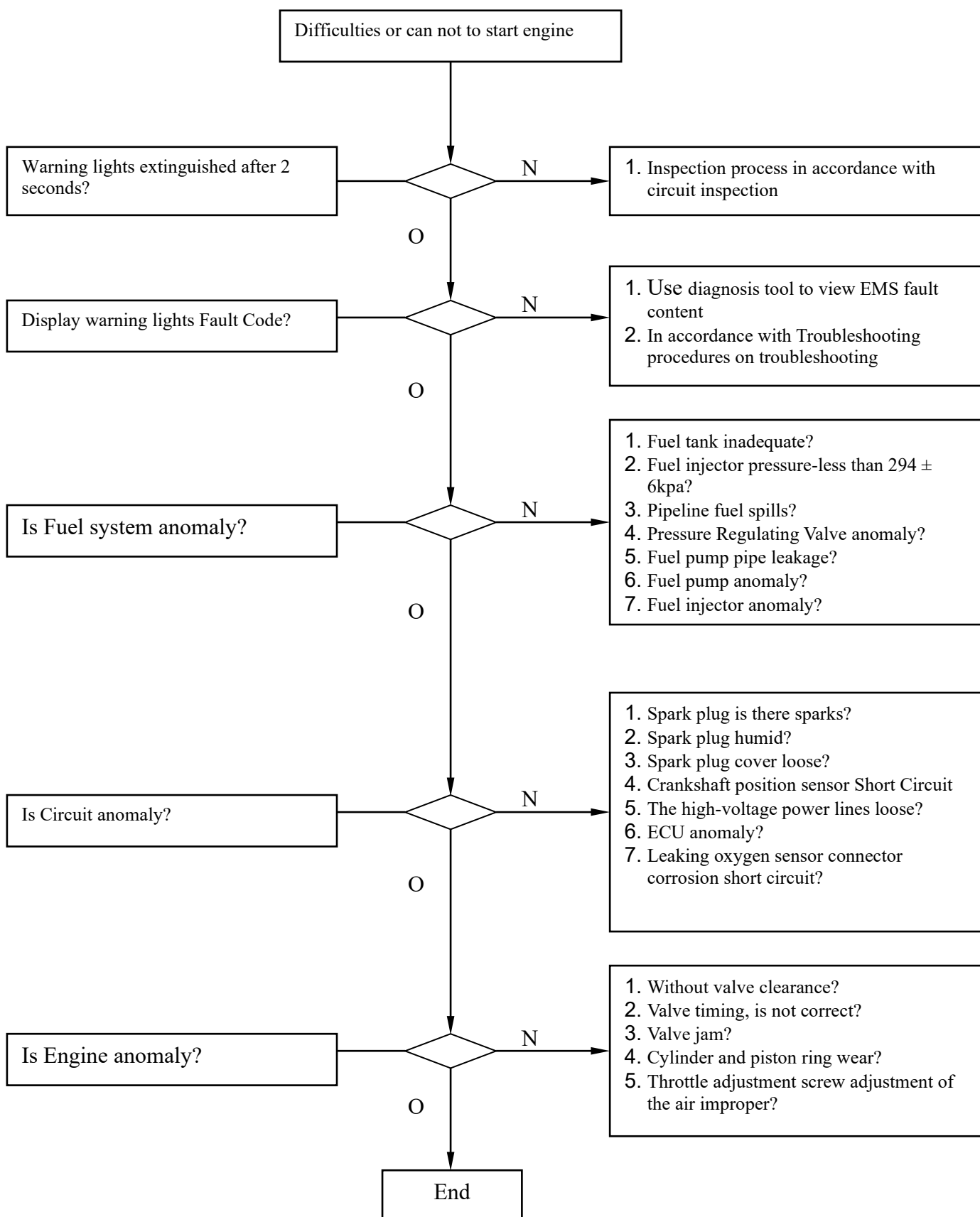
Pin NO.	Pin code	Wire color	Note
35	TA	G/BR	Air temp. sensor input
36	TW	R/GR	Water temp. sensor input
37	O ₂ F-GND	B/G	HEGO sensor front GND
38	O ₂ -F	L/O	HEGO sensor rear GND
39			
40	TEST	P/W	Test switch input
41			
42	PA	P/B	Air pressure sensor
43	PM	B/R	Manifold air pressure sensor input
44	BRK SW	G/Y	Brake switch input
45			
46	STR	Y/R2	Starter relay output
47			
48			

Troubleshooting

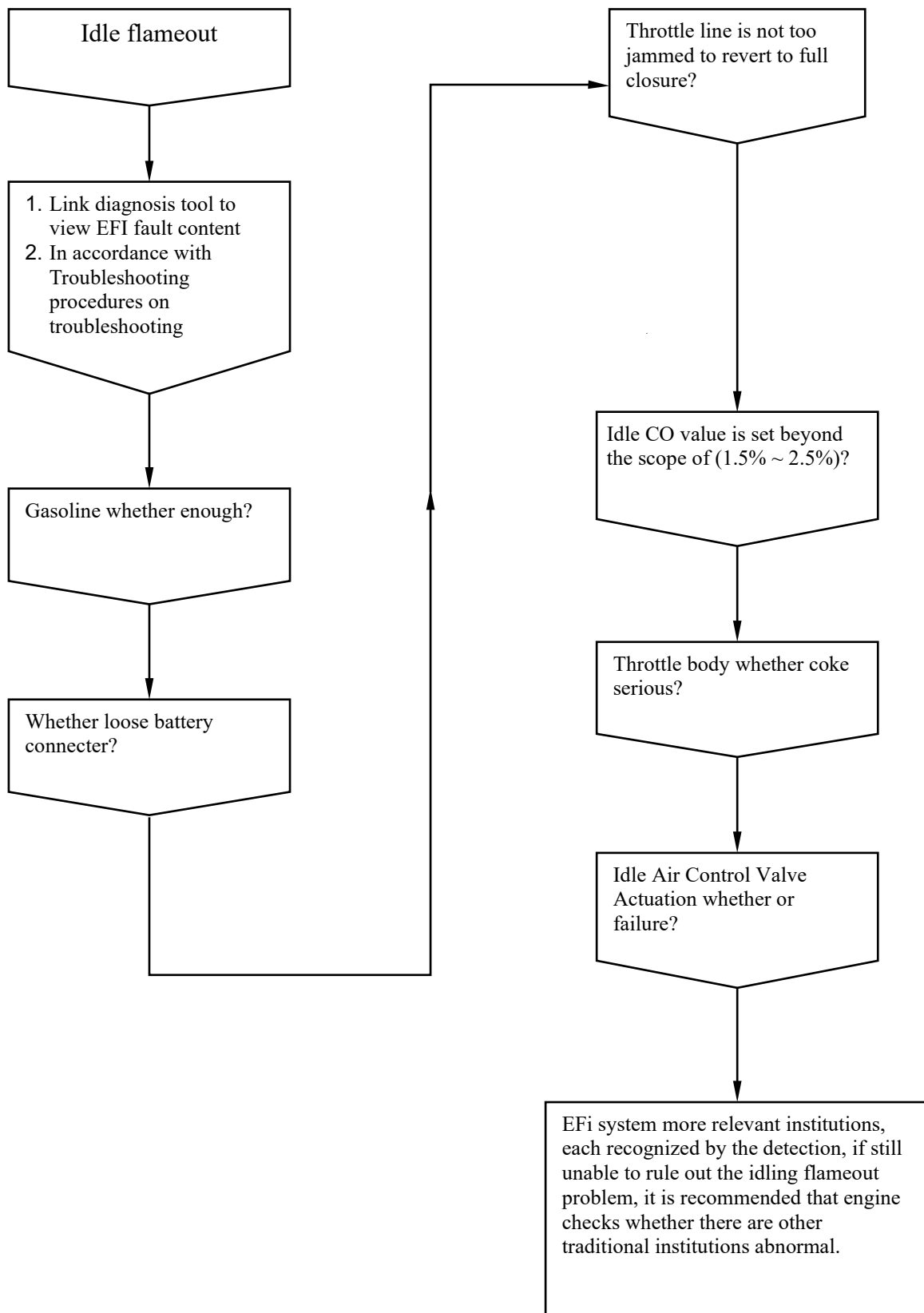
EFI Circuit inspection



Cannot Start the engine or difficult to start inspection

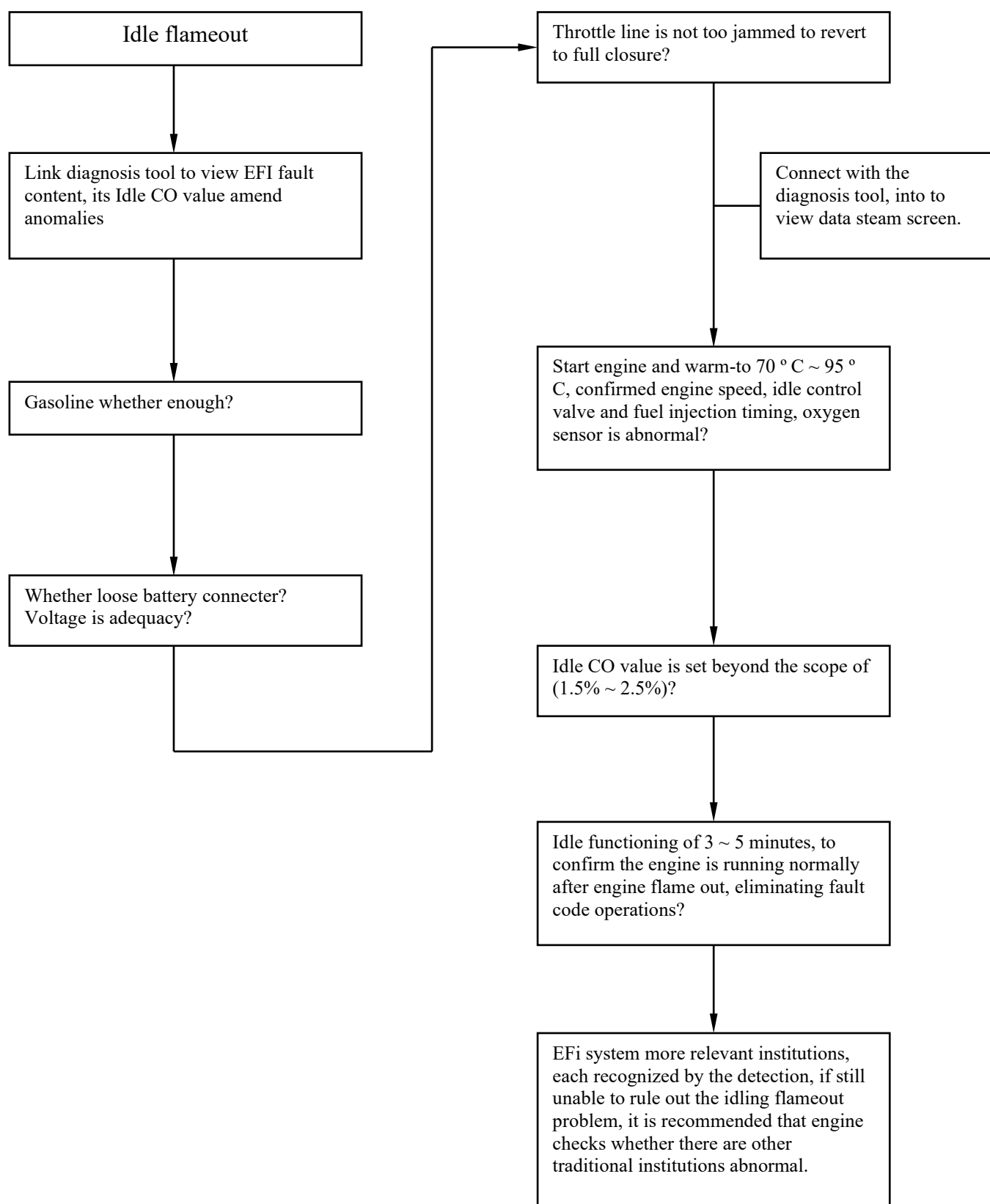


Idle flameout diagnosis

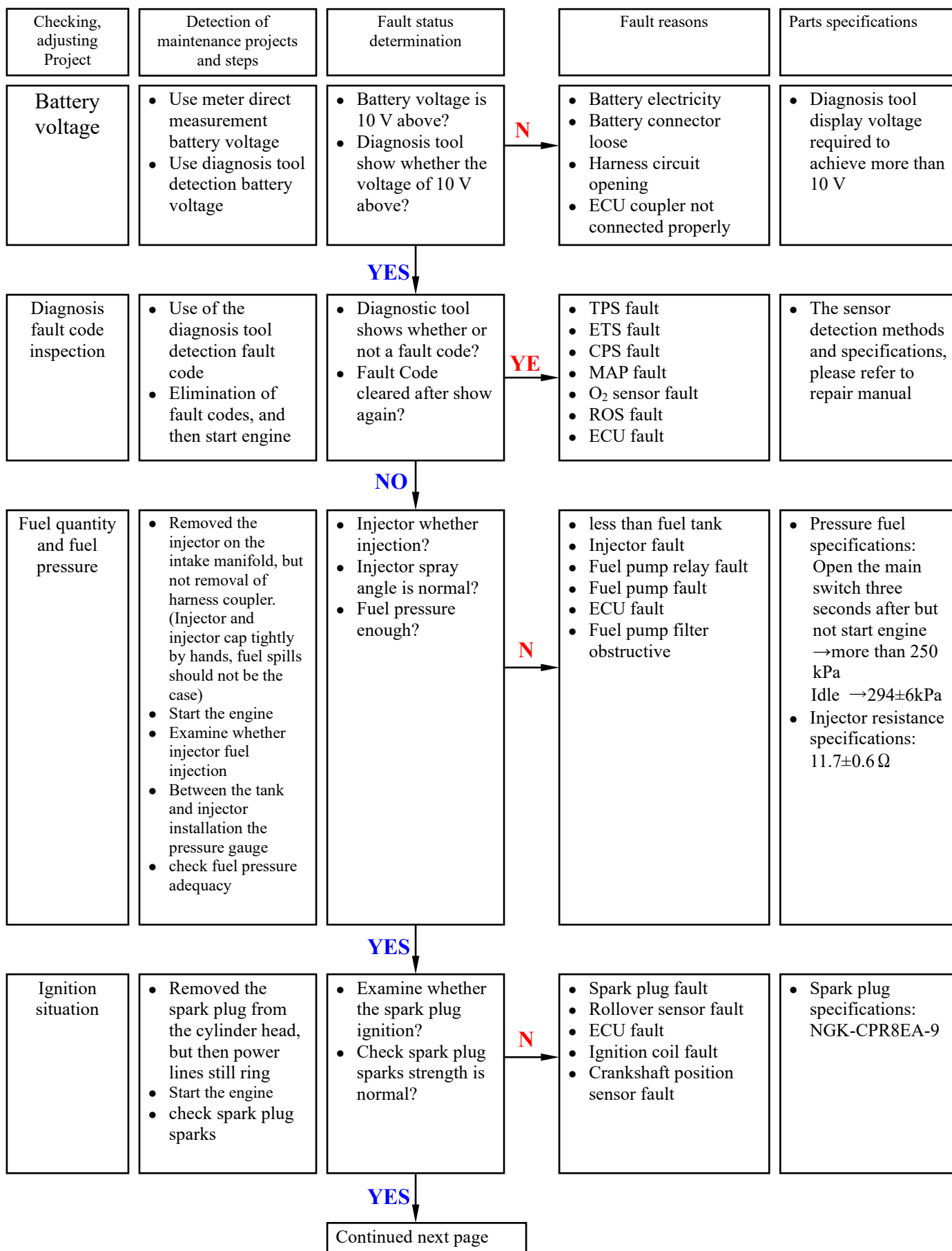


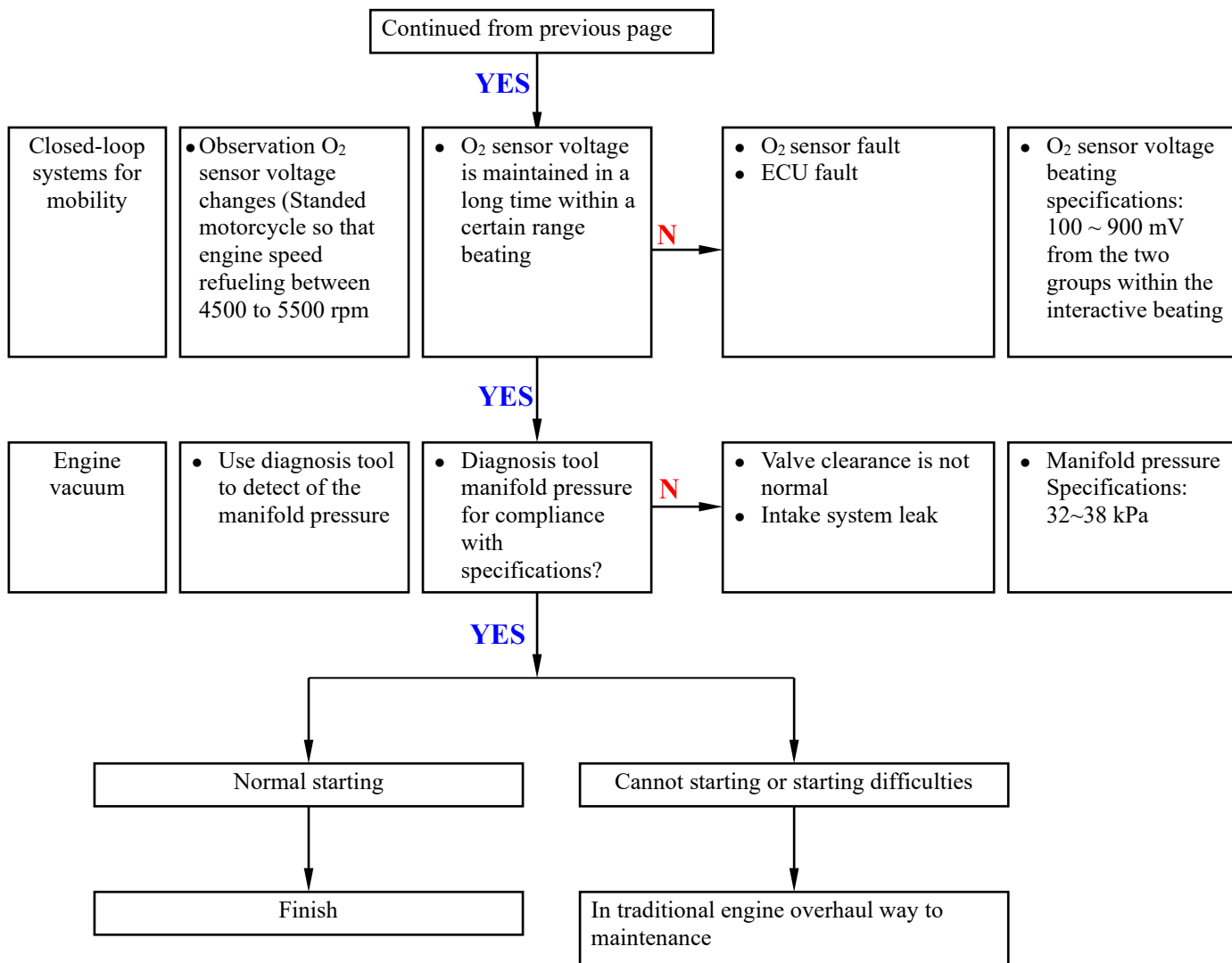
CO value revised anomaly

O₂ Sensor equipped with the system, in principle, not adjusted CO value; such as CO value deviated from the normal range, check O₂ Sensor and other agencies anomaly.



Integrated Troubleshooting Procedure





Fuel tank

Removal

Remove seat, luggage box, R/L carrier, R/L side cover, floor panel, rear body cover, and center cover (Refer to chapter 13)

Remove coupler for fuel pump.

Start the engine until it shut down to release the fuel pressure in the fuel tube.

Remove hose clamp.

Remove fuel tube with hose plier.

- Special tool: EFI hose plier set
NO. [SYM-1768100](#)
[SYM-1768110](#)
[SYM-1950500](#)

Remove coupler for fuel pump.

Remove fuel tubes for fuel tank.

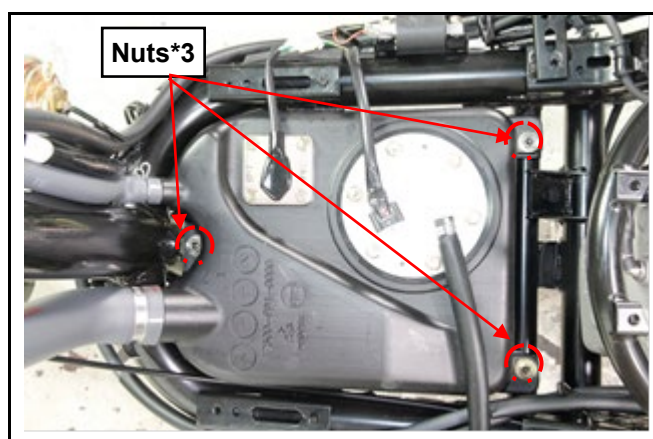
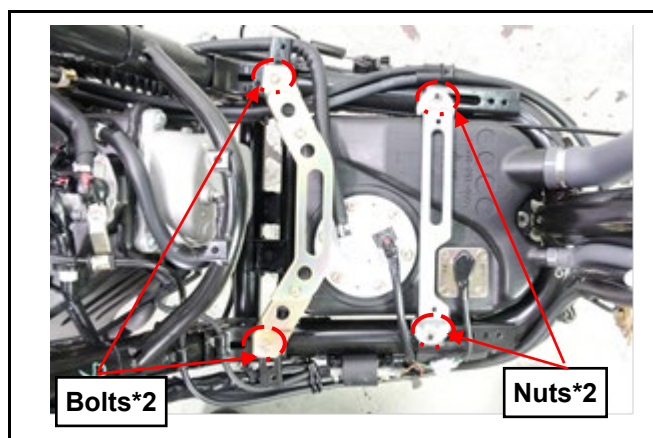
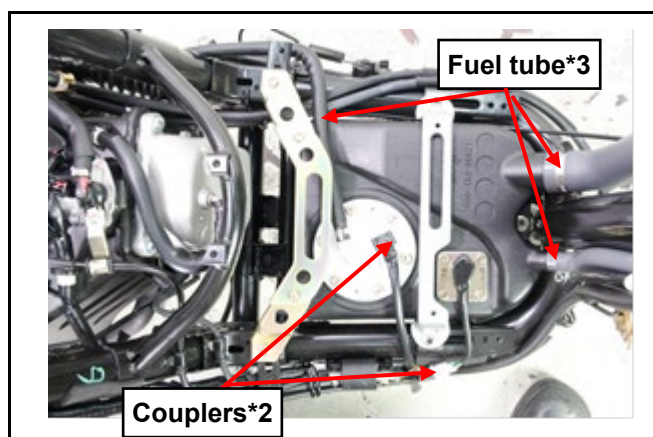
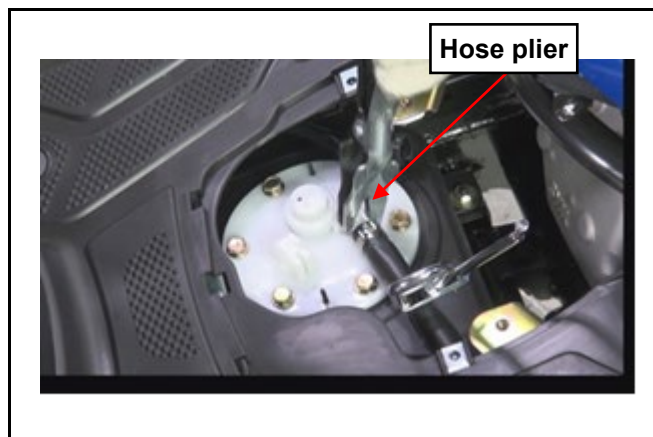
Remove nuts and bolts for floor panel plate.

Remove mounting nuts for fuel tank.

Remove the fuel tank.

Installation

Installation is the reverse of the removal procedures.



Fuel pump

Removal

Disconnect the coupler for fuel pump.

Start the engine until it shut down to release the fuel pressure in the fuel tube.

Disconnect the fuel tube.

- Special tool: EFI hose plier set
NO. [SYM-1768100](#)
[SYM-1768110](#)
[SYM-1950500](#)

Disconnect the coupler for fuel pump.

Remove the mounting bolts for fuel pump.

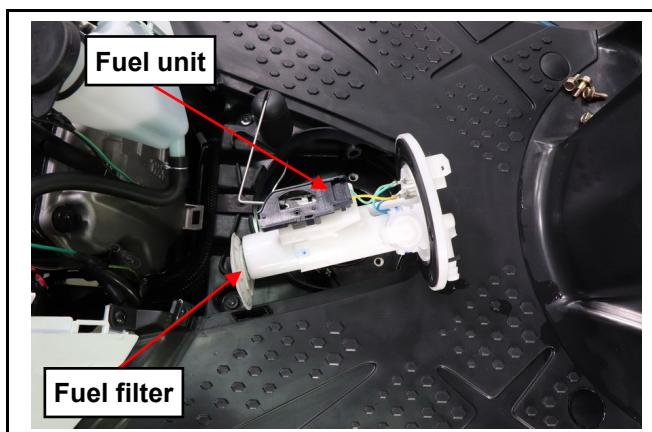
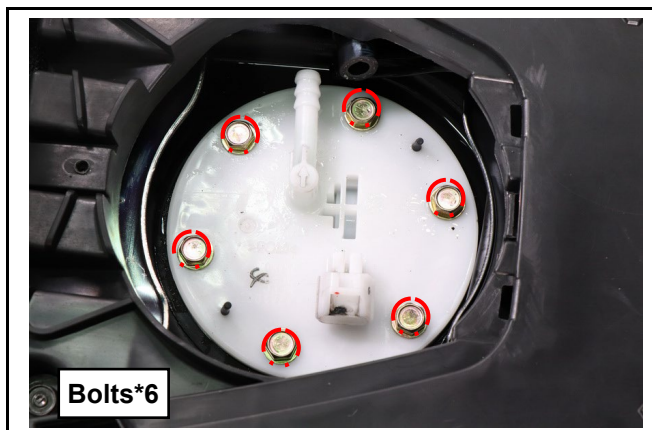
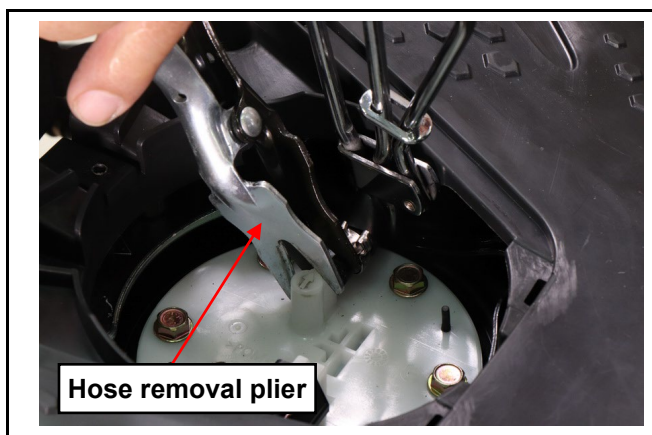
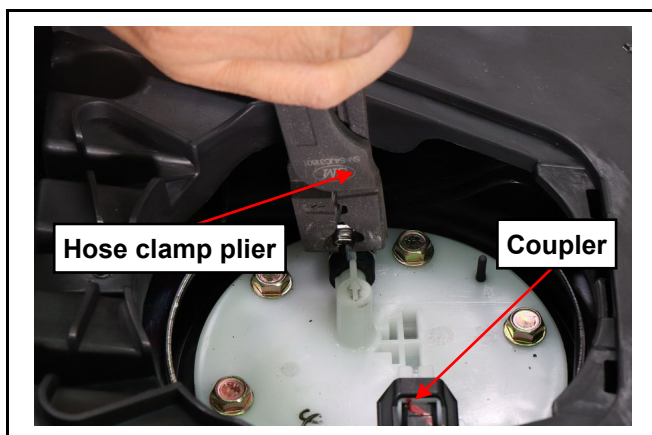
Remove the fuel pump.

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).

Installation

Installation is the reverse of the removal procedures.

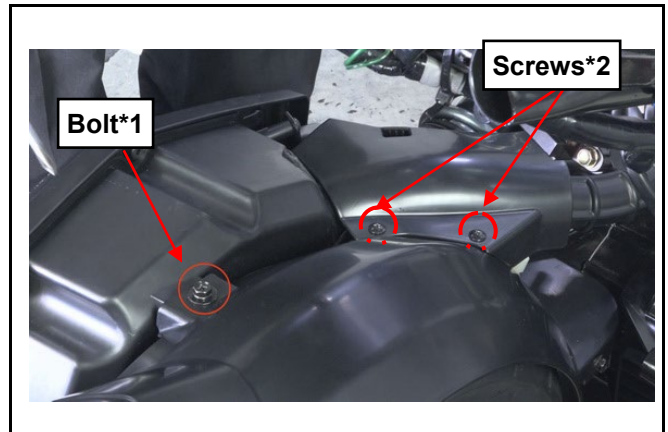


Air cleaner

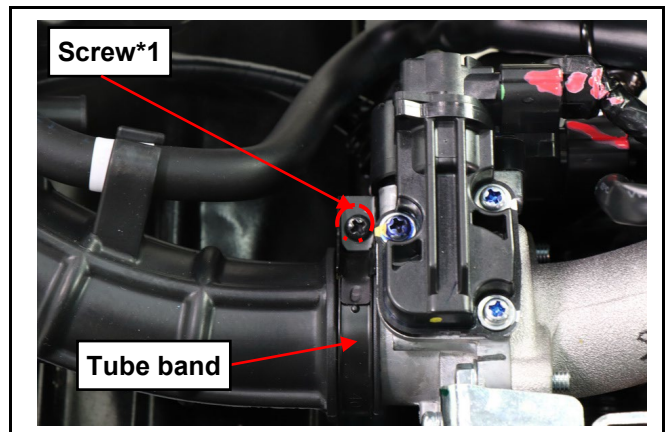
Removal

Remove L side cover and luggage box. (Refer to chapter 13)

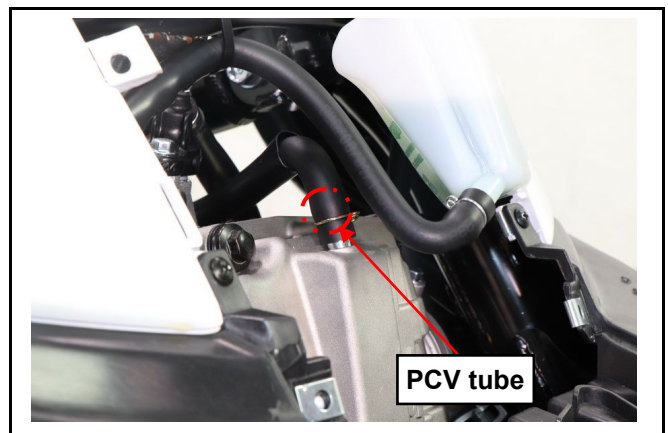
Remove bolt and screws.



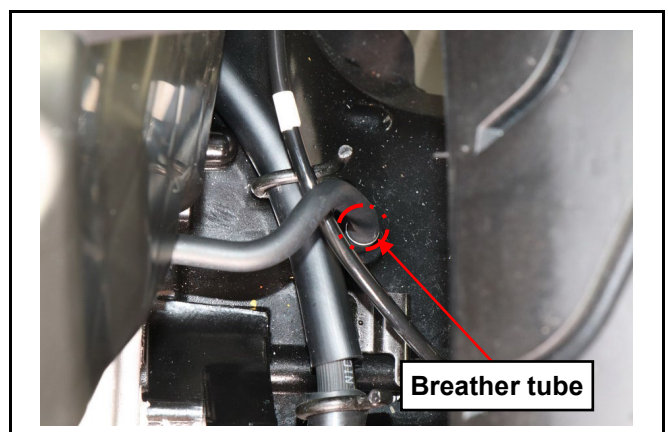
Loosen adjustment screw for tube band.



Disconnect the PCV tube.



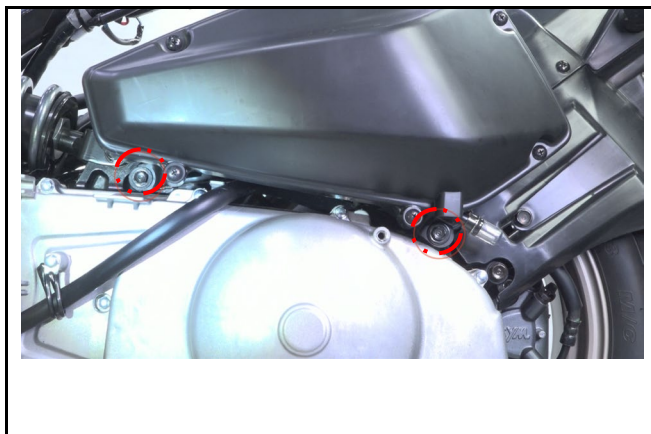
Disconnect breather tube.



Remove the mounting bolts for air cleaner.
Remove the air cleaner.

Installation

Installation is the reverse of the removal procedures.



Air Cleaner Element

Removal

Remove 6 screws for air cleaner cover.

Remove 3 screws for air cleaner element.
Take off the air cleaner element.

Replace a new one if air cleaner element is dirty.

Caution

- Do not soak air cleaner element.

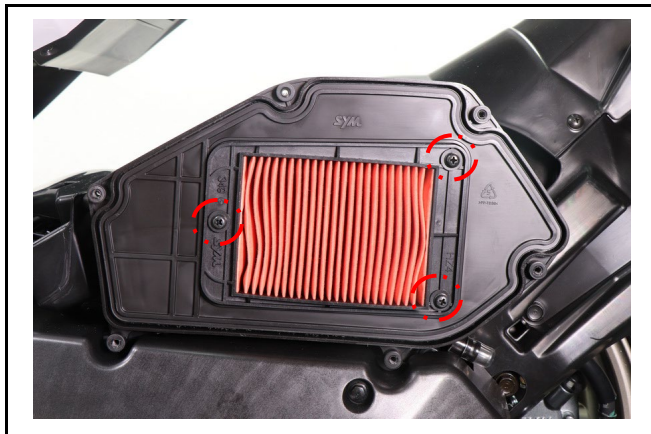


Installation

Installation is the reverse of the removal procedures.

Caution

- Make sure air cleaner element is installed properly.



EFi System Diagnosis Methods

When the motorcycle injection system in the wrong signal, causing abnormal functioning of the engine or cannot 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, or manually by the meter warning light inspection revealed that the fault codes (refer to checking signal fault codes discriminate method), the two methods for maintenance.

If the fault has been ruled out or repaired 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).

Trouble Code and Sensor Table

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

No.	DTC	Monitoring strategy	Component
1	P0335	The sensor circuit malfunction	CRANKSHAFT POSITION SENSOR
2	P0123	Too high input voltage	THROTTLE POSITION SENSOR
	P0120	Too low input voltage or open circuit	
3	P0107	Too low input voltage	MANIFOLD PRESSURE SENSOR
	P0105	Too high input voltage or open	
4	P0117	Too low input voltage	ENGINE COOLANT TEMPERATURE SENSOR
	P0115	Too high input voltage or open circuit	
5	P0112	Too low input voltage	INTAKE AIR TEMPERATURE SENSOR
	P0110	Too high input voltage	
6	P2228	Too low input voltage	BAROMETRIC PRESSURE SENSOR
	P2226	Too high input voltage or open circuit	
7	P0500	The sensor circuit malfunction (Front)	WHEEL SPEED SENSOR(FRONT)
	P2158	The sensor circuit malfunction (Rear)	WHEEL SPEED ENSOR(REAR)
8	P0130	Short circuit to battery or open circuit	O ₂ (BINARY) SIGNAL
	P0131	Short circuit to ground	
9	P0201	Injector circuit malfunction	FUEL INJECTOR
10	P0351	Ignition coil circuit malfunction	IGNITION COIL
11	P0030	Short circuit to ground or open circuit	O ₂ SENSOR HEATER
12	P0230	Fuel pump relay circuit malfunction	FUEL PUMP RELAY
13	P0480	Radiator fan relay circuit malfunction	FAN RELAY
14	P0511	Short circuit to ground or open circuit	IDLE AIR CONTROL SYSTEM
15	P1471	Short circuit to ground or open circuit	HEAD LIGHT RELAY
	P1472	Short circuit to battery	
16	P044F	Short circuit to battery	SECONDARY AIR INJECTION SYSTEM
	P0412	Short circuit to ground or open circuit	
17	P0301	Engine misfire	IGNITION SYSTEM

No.	DTC	Monitoring strategy	Component
18	P0134	Primary HEGO Sensor Circuit Inactive Malfunction	O ₂ SENSOR
	P0133	Primary HEGO Sensor deterioration	
19	P0053	Primary HEGO Sensor Heater Resistance	O ₂ SENSOR
20	P0068	Engine Load correlation - PM and TPS error	MAP/MAF
	P0069	PM and PA - Correlation error	MAP
21	P011B	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.	ENGINE COOLANT TEMPERATURE AND INTAKE AIR TEMPERATURE SENSOR
22	P0125	Estimation virtual coolant temperature greater than or equal to predetermined value.	ENGINE COOLANT TEMPERATURE SENSOR
	P050C	3. Soaked time is greater than or equal to predetermined value. 4. Coolant temperature is greater than predetermined value.	
23	P0111	When sensor input voltage within the range of Out of Range and the time has passed longer than predetermined value.	INTAKE AIR TEMPERATURE SENSOR
24	P0507	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.	IDEL AIR CONTROL SYSTEM
	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.	
25	P1630	Too low input voltage	ROLLOVER SENSOR

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	○	○	○	○	○		○	○		
	Difficult to start	○	○		○			○		○	○
Idle state	Without idle			○	○	○		○		○	○
	Idle not smooth					○	○	○	○	○	
	RPM NG							○	○		
	CO NG		○			○	○	○	○		
Acceleration	Not smooth		○	○	○	○		○	○	○	○
	Inability and slow		○	○	○	○		○	○	○	○
Flameout	Idle flameout				○			○			
	Acceleration flameout							○	○		
Related spare parts		Rollover sensor	Fuel pump	Ignition coil	Inlet pipe	Injector	O ₂ 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	<ul style="list-style-type: none"> • Use meter direct measurement battery voltage • Use diagnosis tool detection of battery voltage 	<ul style="list-style-type: none"> • Battery voltage 	<ul style="list-style-type: none"> • Battery voltage = 10V Above 	<ul style="list-style-type: none"> • Battery electricity • Battery connector loose • Harness circuit opening • ECU coupler not connected properly
2	Fuel pressure	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Open the main switch, but do not to start the engine of pressure • Pressure in idle • Rotating throttle, situation of pressure changes 	<ul style="list-style-type: none"> • Open main switch, but do not start the engine of pressure: = 250kPa (Stable value) • Idle state: pressure = 294±6kPa (Beating situation from top to bottom) • rotation throttle moment: pressure = 294±6kPa (Slightly beating) 	<ul style="list-style-type: none"> • Fuel not enough • Security switch not disarm • Fuel pump relay fault • Fuel pump fault • Injector fault • ECU fault
3	Ignition state	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Spark plug specifications • Whether the spark plug ignition • Spark plug sparks whether it is normal strength 	<ul style="list-style-type: none"> • Specifications: NGK-CPR8EA-9 • Ignition conditions: With traditional engines found ways 	<ul style="list-style-type: none"> • Spark plug fault • Rollover sensor fault • ECU No. 5 pin fault • Ignition coil fault • Crankshaft position sensor fault
4	Engine vacuum	<ul style="list-style-type: none"> • Diagnosis tool to detect the use of 	<ul style="list-style-type: none"> • Manifold pressure of diagnosis tool 	<ul style="list-style-type: none"> • Manifold pressure = 32~38kPa 	<ul style="list-style-type: none"> • Valve clearance abnormal • Intake system leak

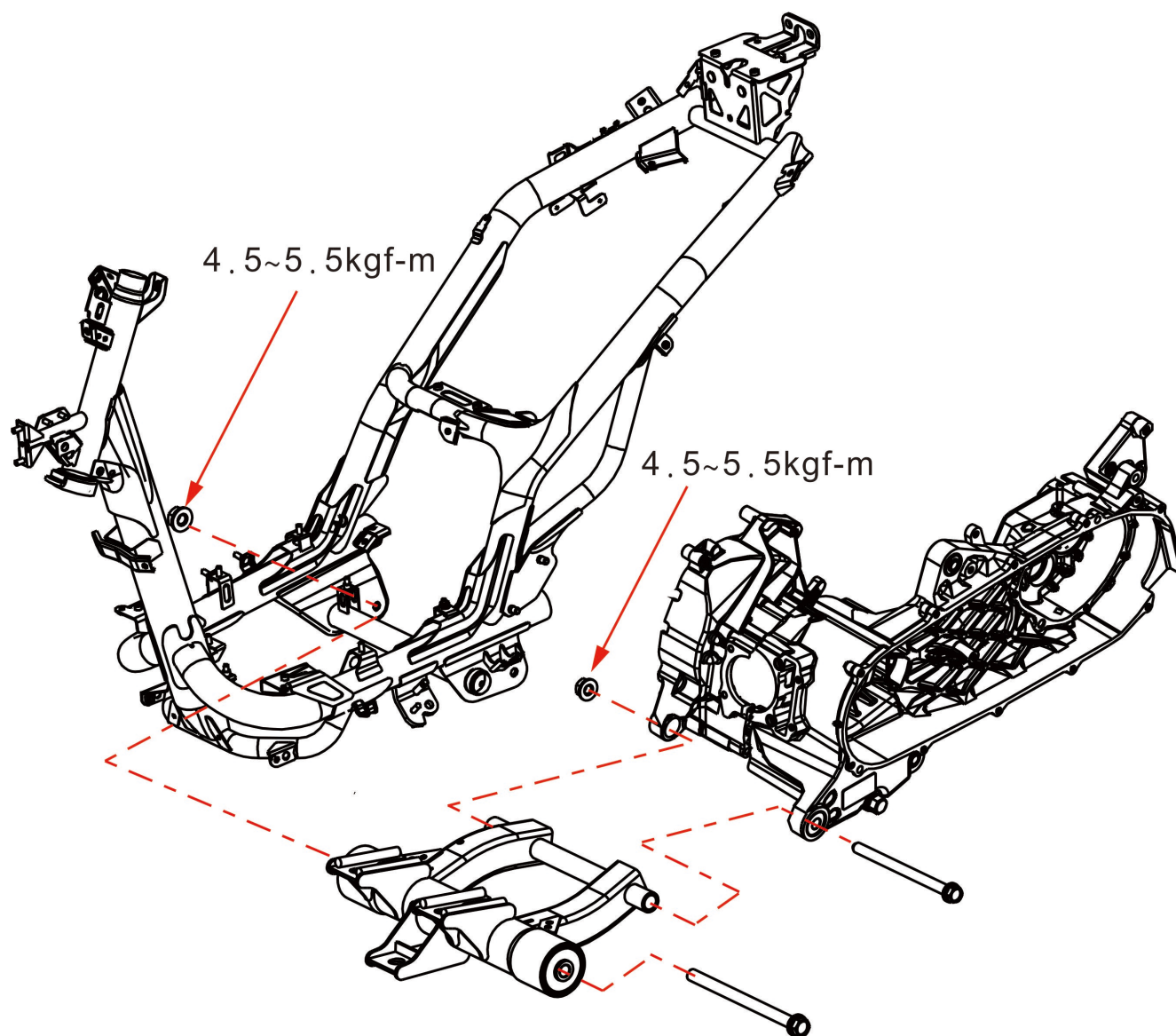
No.	Maintenance Project	Testing Procedures	Test items	Determine benchmarks	Fault reasons
5	Injection state	<ul style="list-style-type: none"> The injector removed from the throttle body, but not dismantle pipeline Main switch ON, but not start engine Investigation the injector it's leaking fuel? Once again start engines or use for the diagnosis tool of output function Check injector fuel injection and the injection situation 	<ul style="list-style-type: none"> Open the main switch, but did not start engine the injection situation Injector state when start 	<ul style="list-style-type: none"> Not started, injector not leaking fuel In started, the injection state must show fan shape 	<ul style="list-style-type: none"> Security unit is configured not disarm Fuel pump relay fault Fuel pump fault Injector fault ECU fault
6	Closed - loop control system	<ul style="list-style-type: none"> Use of diagnostic tool observation O₂ Sensor voltage changes 	<ul style="list-style-type: none"> Stable condition, sensor voltage variation (Idle continued 5 minutes later to measurement) 	<ul style="list-style-type: none"> Idle stable condition: O₂ Sensor voltage = 50 ~ 200mV (Show from top to bottom beating phenomenon) 	<ul style="list-style-type: none"> O₂ Sensor fault ECU fault
7	Fault Code Detection	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Diagnosis tool of the fault code is it can be eliminated Start again, the fault is it will happen again 	<ul style="list-style-type: none"> Without any residual Fault Code If residual Fault Code, according to the "Fault Code Maintenance Form" implementation of troubleshooting 	<ul style="list-style-type: none"> 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 Rollover 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

Mechanism Diagram	5-1	Engine Hanger Rubber Bush	5-11
Precautions in Operation.....	5-2	Engine Hanger.....	5-13
Engine Removal	5-3	Engine Installation	5-14

Mechanism Diagram



5. Engine Removal

Precautions in Operation

General Information

- The engine has to be supported with special service tools that can be lifted or adjustable.
- The following parts can be maintained without removing the engine from the frame.
 - 1.Carburetor or EFi injection system parts.
 - 2.Cylinder head, cylinder, and piston.
 - 3.Driving pulley, driving belt, clutch, and driving disc assembly.
 - 4.Final gear reduction mechanism.

Specification

Item		Capacity
Engine oil capacity	Replacement	1000 c.c.
	Disassembly	1050 c.c.
Gear oil capacity	Replacement	100 c.c.
	Disassembly	110 c.c.

Torque Value

Engine hanger bolt	4.5~5.5 kgf-m
Engine hanger nut	4.5~5.5 kgf-m
Rear cushion bolt (upper)	3.5~4.5 kgf-m
Rear cushion bolt (lower)	2.4~3.0 kgf-m
Rear wheel axle nut	2.4~3.0 kgf-m



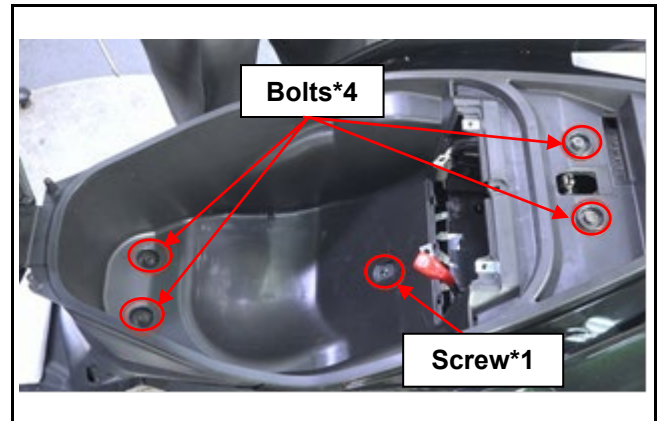
5. Engine Removal

Engine Removal

Remove the battery cover.

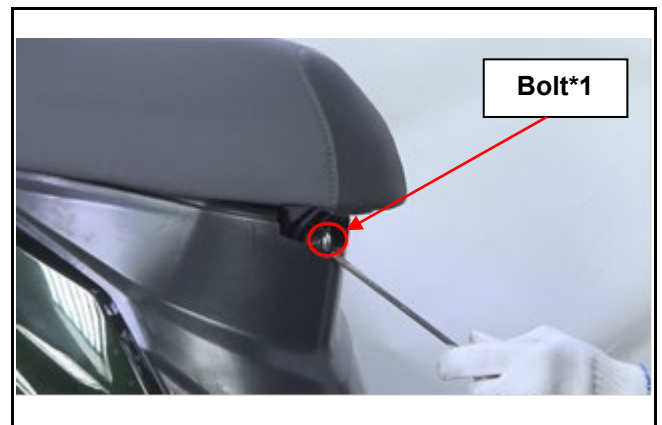
Remove the battery.

Remove the luggage box bolts.

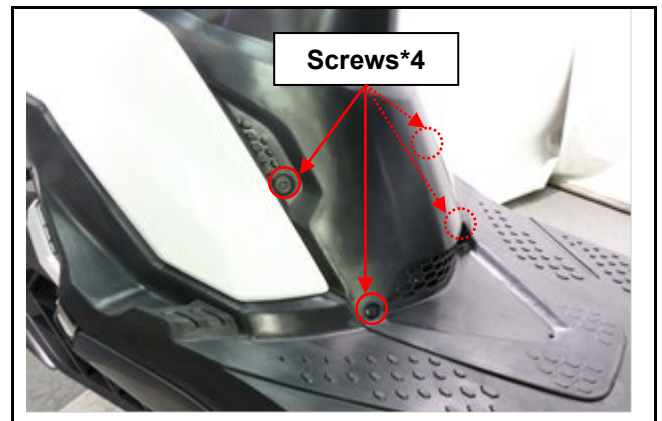


Remove the center cover bolt.

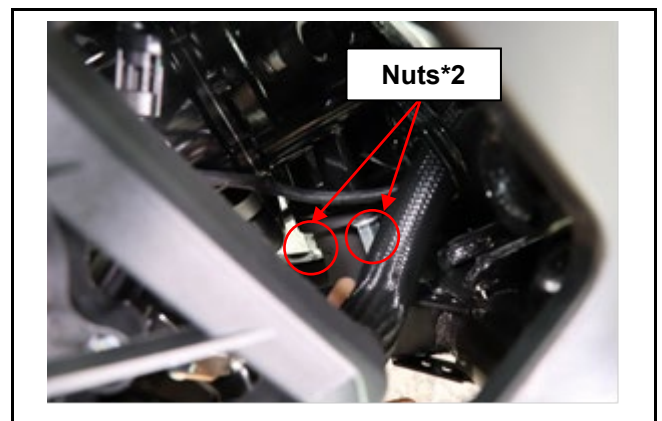
Remove the luggage box.



Remove the center cover.



Remove the nuts of exhaust muffler.



5. Engine Removal

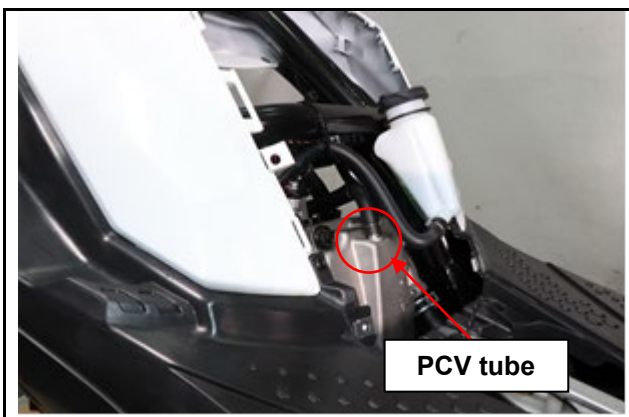
Remove the bolts for exhaust muffler.
Remove the exhaust muffler.



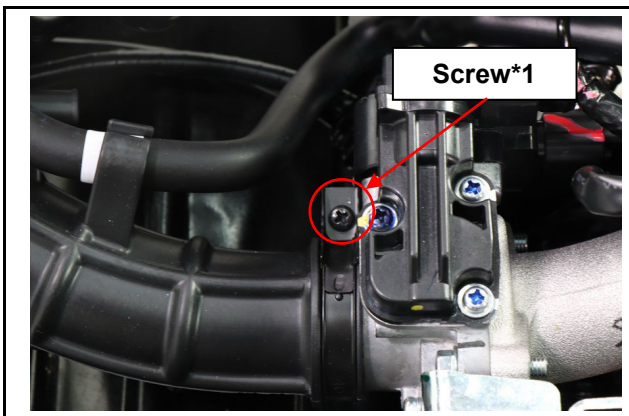
Remove the cover bolts on the left side of the engine.
Remove the air cleaner bolts.
Remove the rear fender.
Remove the rear brake caliper.
Remove the rear wheel.



Remove the PCV tube.



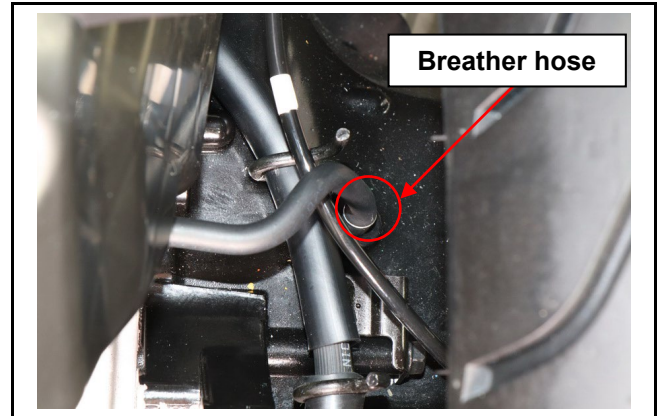
Loosen the screw of pipe connecting the throttle body.





5. Engine Removal

Separate the breather hose connecting crankcase.



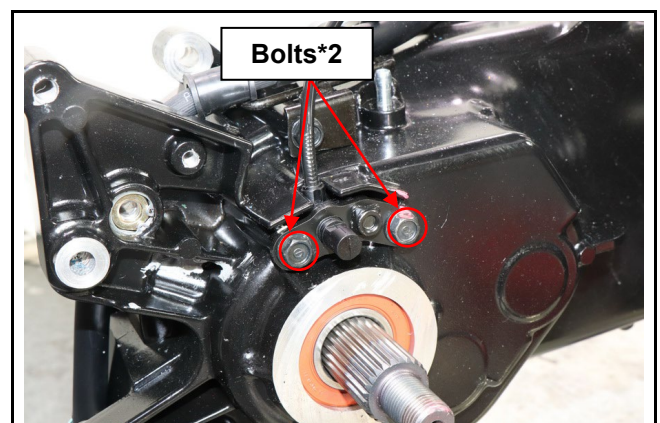
Remove the air cleaner.



Remove the rear brake disc.

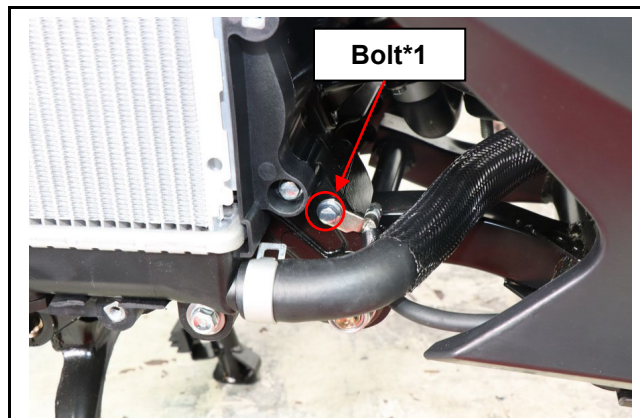


Remove speed sensor bolts and separate it from rear wheel.

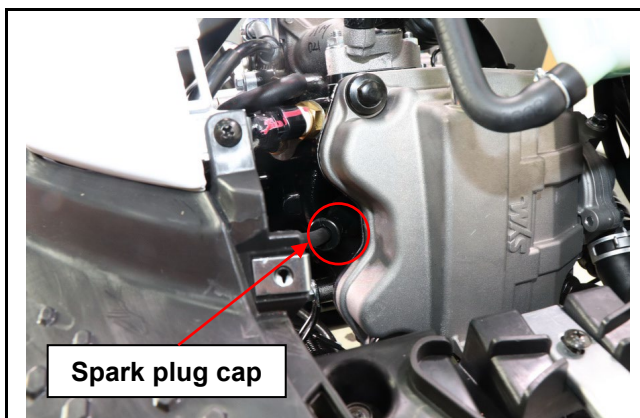


5. Engine Removal

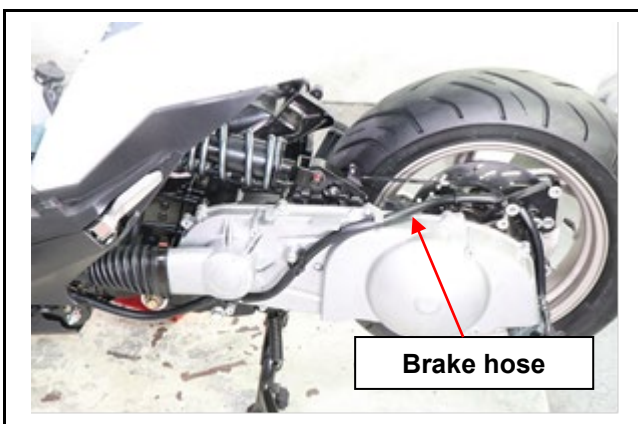
Remove the grounding wire.



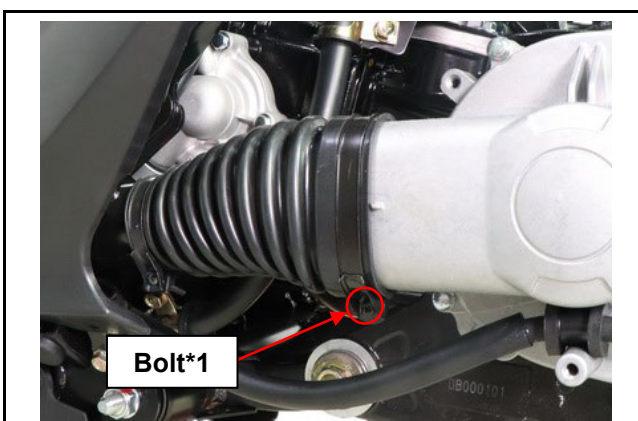
Remove the spark plug cap.



Remove the rear brake caliper and brake hose.



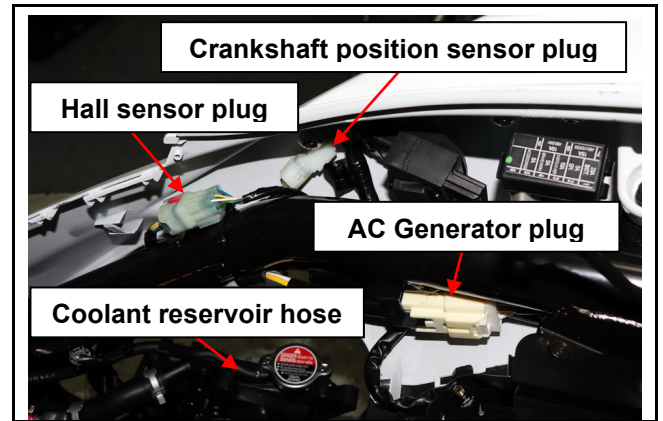
Remove the intake air duct bolt.



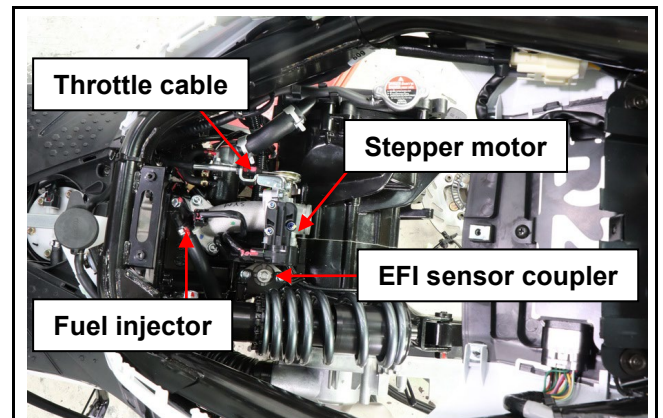


5. Engine Removal

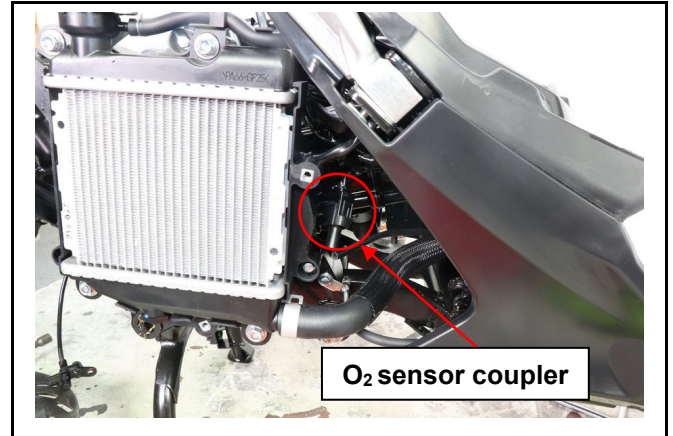
Detach the AC generator, hall sensor, and crankshaft position sensor plug.
Detach the coolant reservoir hose.



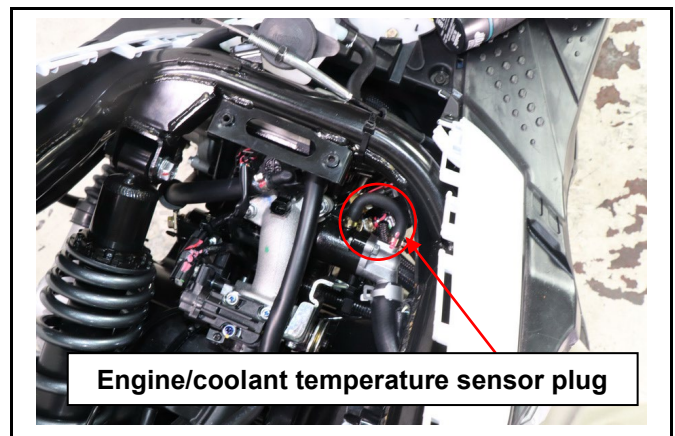
Detach the throttle cable.
Detach the fuel injector plug and hose.
Detach the intake air duct.
Detach the air pressure/temperature sensor, throttle position sensor, and stepper motor sensor plug.



Detach the O₂ sensor plug.



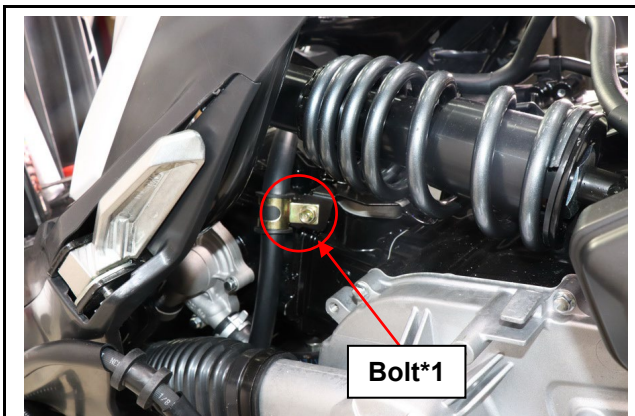
Detach the engine/coolant temperature sensor plug.



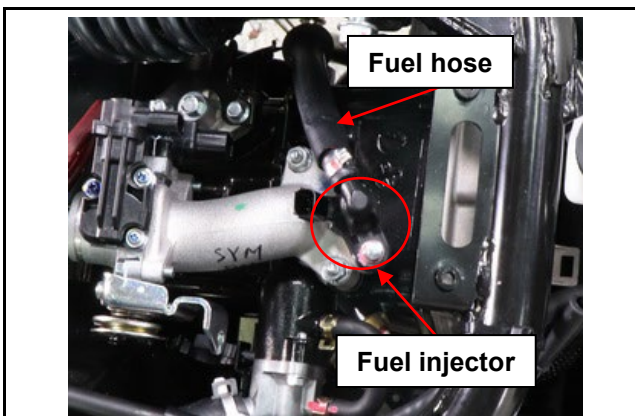
5. Engine Removal



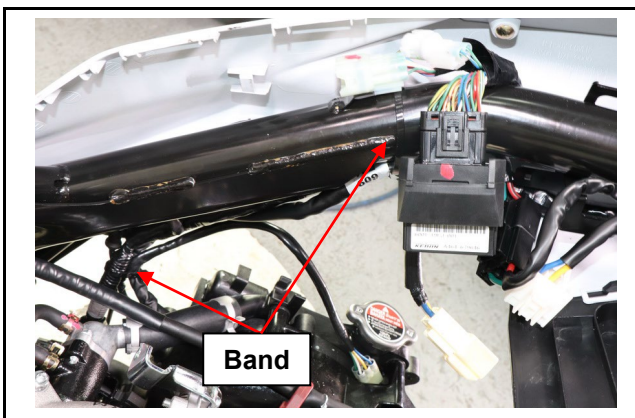
Remove the fuel pipe clip.



Separate fuel hose from fuel injector.



Remove the band for ACG cable.



Use the special tool, water pump pipe plier, to separate the coolant reservoir hose.



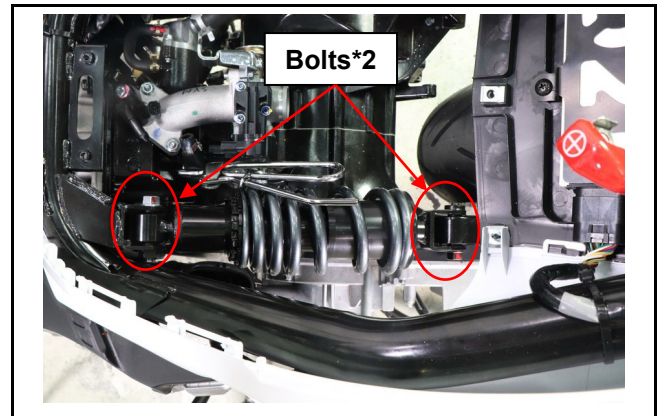


5. Engine Removal

Install the rear brake disc and rear wheel.



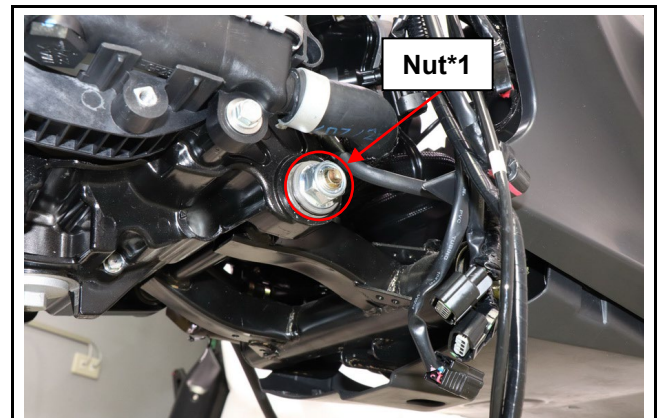
Remove rear cushion bolts.



Use a jack to hold the bottom cover.



Remove the lock nut for the engine hanger.



5. Engine Removal

Remove the engine.



Engine Hanger Rubber Bush

Inspection

Check if the rubber bush of the engine hanger and rear cushion is damaged.

Replace a new bush with the special tool (ø30 mm).

- **Special tool :**

Crankcase press out / in driver SYM-1120310

Pressing out

Place the groove of the bush remover toward the bush, then tighten in pressing ring and bolt to press the bush out.

Pressing in

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



5. Engine Removal

Lower bush removal:

Use flathead screwdriver to remove bush.

Inspection:

Check if bush is damaged, and replace it with a new one.

Check if oil seal is damaged, and replace it with a new one.

Check if grease is enough.

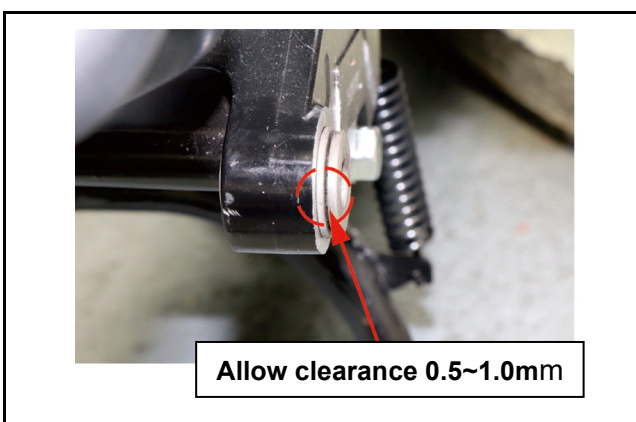
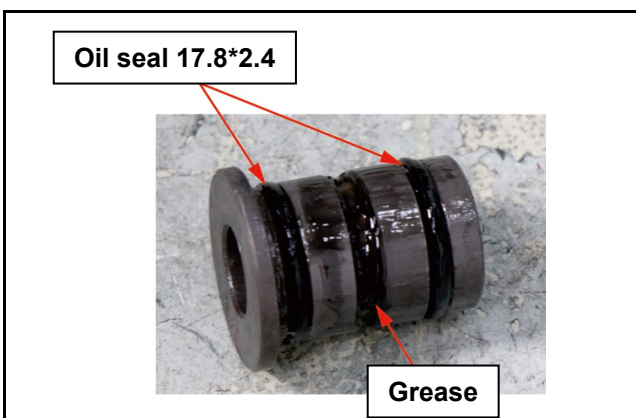
Wipe the residual grease and fill 4g in the second groove with grease.

- **Oil seal specification: 17.8*2.4**

Installation

Installation is in the reverse order of removal.

Allowable clearance: 0.5~1.0mm





5. Engine Removal

Engine Hanger

Removal

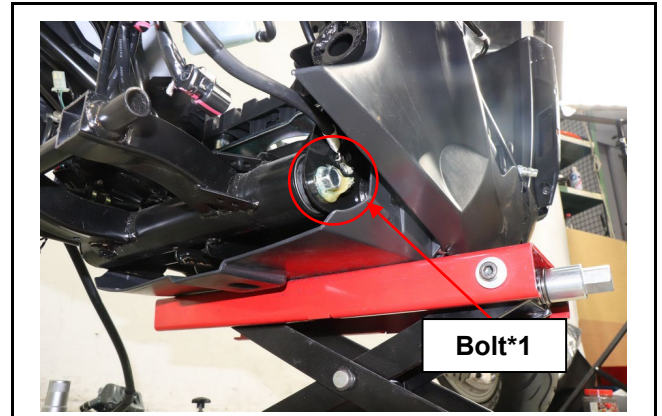
Remove the engine hanger bolts

Check if the rubber bush of engine hanger is damaged or not, replace it if necessary.

Installation

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

- Torque value: 4.5~5.5kgf-m



5. Engine Removal

Engine Installation

Installation is in the reverse order of removal.



Caution

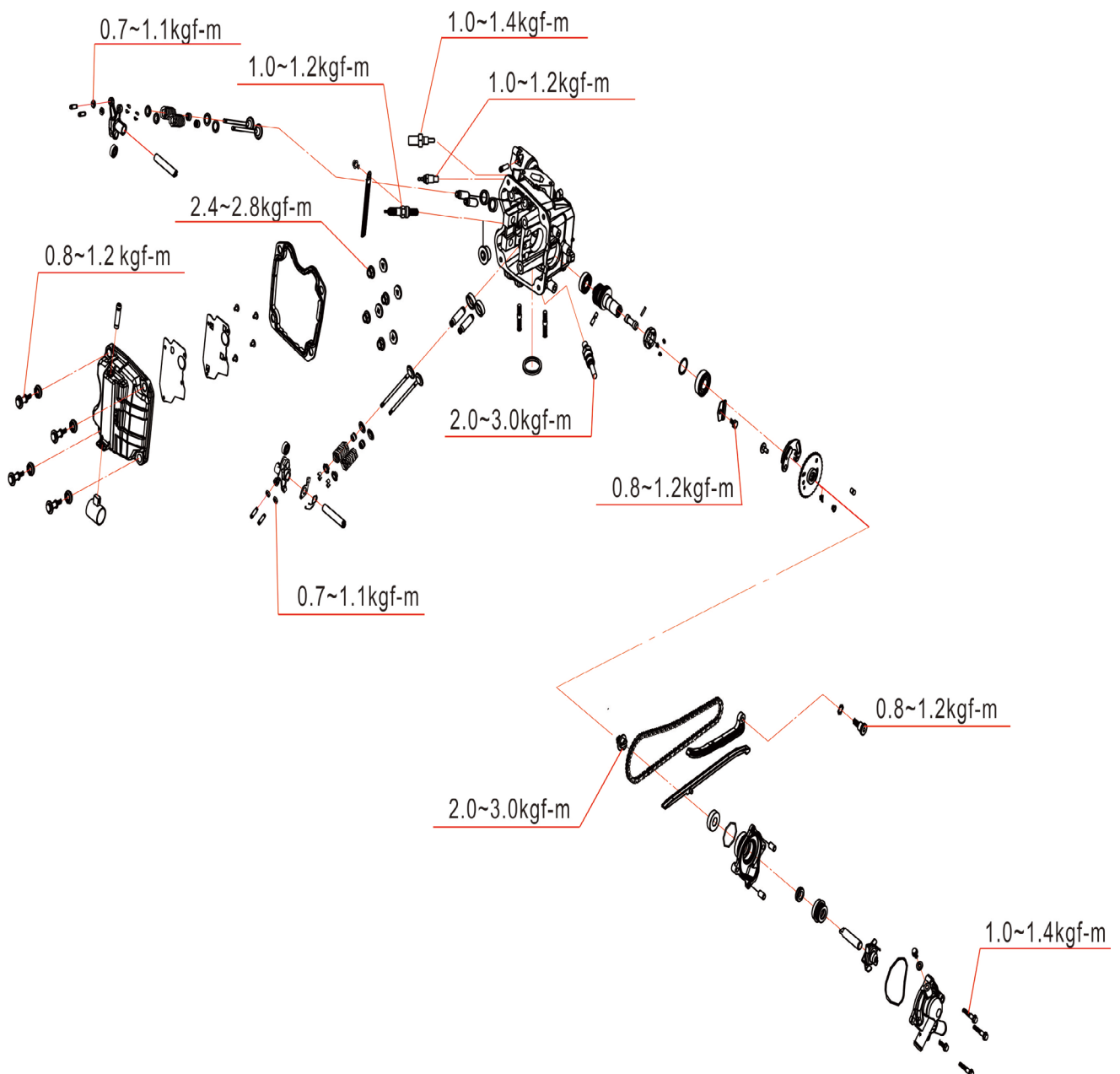
- Pay attention to foot & hand safety as engine installation to avoid hurting.
- Do not bend or twist wires.
- Cables and wires have to be routed in accordance with original layout.



- Torque value
Engine hanger bolt: 4.5~5.5kgf-m
Rear cushion bolt (upper): 3.5~4.5kgf-m
Rear cushion bolt (under): 2.4~3.0kgf-m
Wheel axle nut: 11.0~13.0kgf-m

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

Mechanism Diagram



6. Cylinder Head / Valve

Precautions in Operation

General Information

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

Troubleshooting

Engine performance will be affected by engine troubles. The problems usually can be diagnosed by performing a cylinder compression test or tracing unexpected noise.

Rough idle

Low cylinder compression

Low cylinder compression

Valve

- Incorrect valve adjustment
- Burned or bent valve
- Incorrect valve timing
- Broken valve spring
- Carbon deposit
- Uneven valve seating
- Incorrect spark plug installation

Cylinder head

- Leaking or damaged cylinder head gasket
- Skewed or cracked cylinder surface

Piston

- Broken Piston ring
- High cylinder compression
- Excessive carbon build-up on piston head or in combustion chamber

Excessive noise

- Incorrect valve clearance
- Burned valve or broken valve spring
- Timing chain looseness
- Worn or damaged timing chain
- Worn or damaged camshaft
- Worn or damaged Auto-tensioner
- Worn or damaged camshaft sprocket
- Worn or damaged rocker arm or rocker arm shaft

Excessive smoke

- Worn valve stem
- Damaged stem seal



6. Cylinder Head / Valve

Specification

Unit: mm

Item			Standard
Valve clearance			0.12±0.02
Compression pressure			7.5±1.5kgf/cm2
Camshaft	Intake		32.63 ±0.04
	Exhaust		32.49 ±0.04
Rocker arm	ID of valve rocker arm		10 -0~-0.015
	OD of valve rocker arm shaft		10 -0.013~-0.028
Valve	OD of valve stem	Intake	4.5 -0.01~-0.025
		Exhaust	4.5 -0.025~-0.050
Tilt angle of cylinder head			0.05
Free length of valve spring			32.4

Torque Value

Cylinder head bolt	0.8~1.2 kgf-m
Cylinder head nut	2.4~2.8 kgf-m
Timing sprocket bolt	2.0~3.0 kgf-m
Spark Plug	1.0~1.2 kgf-m

Special Tool

Tools of valve reassemble	SYM-1471110/20-ALL
Tool of valve clearance adjustment	SYM-1472100
Tools of rocker arm reassemble	SYM-1445100-ALL
Tools of camshaft reassemble	SYM-9000200-D21

6. Cylinder Head / Valve



Cylinder Head Removal

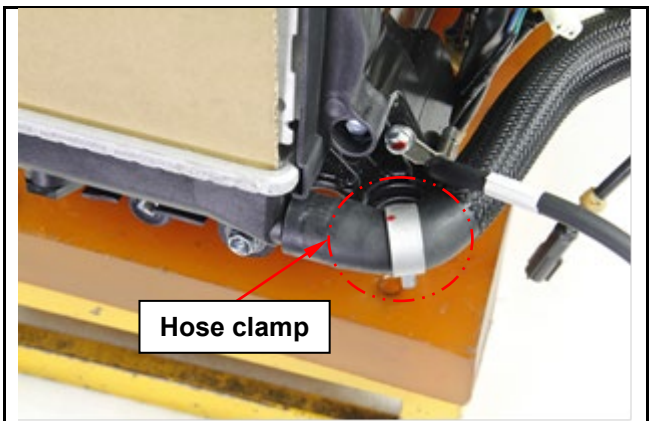
Remove the engine. (Refer to chapter 5)



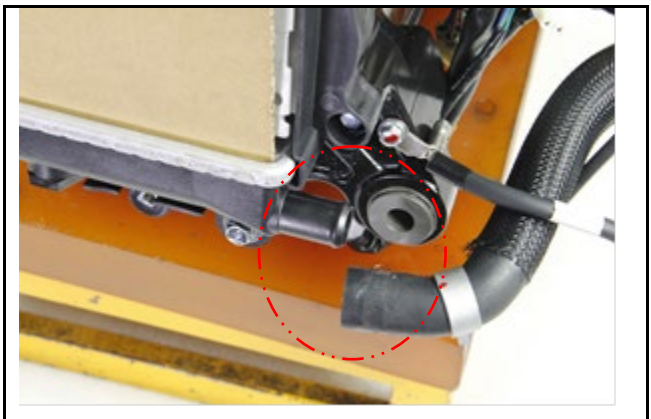
Protect the radiator with a cardboard.



Loosen the hose clamp.

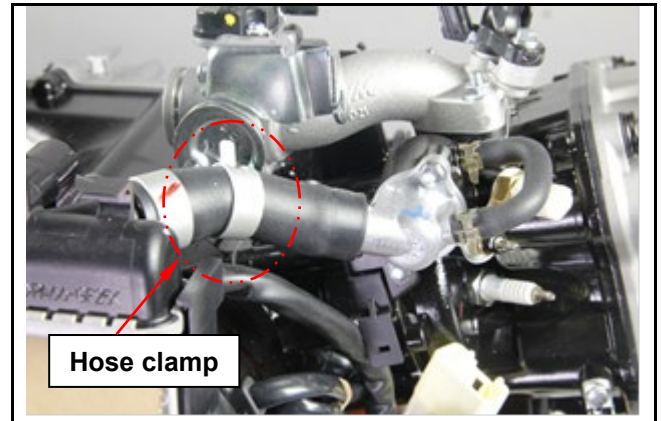


Detach the coolant hose (lower) and leak coolant.

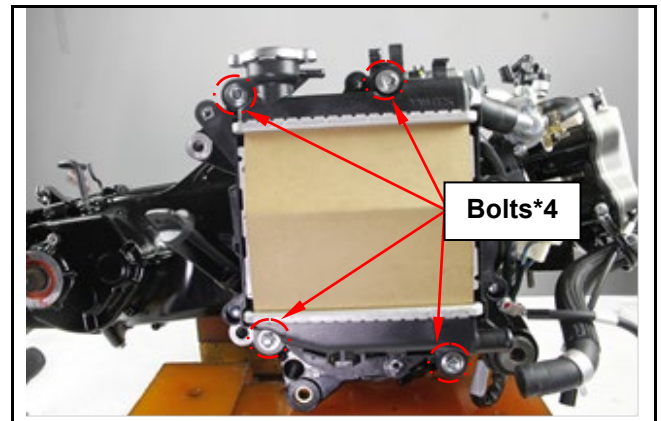


6. Cylinder Head / Valve

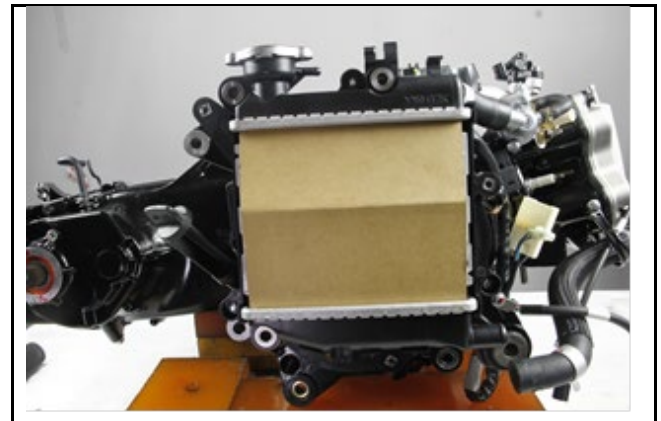
Loosen the hose clamp and detach the coolant hose (upper).



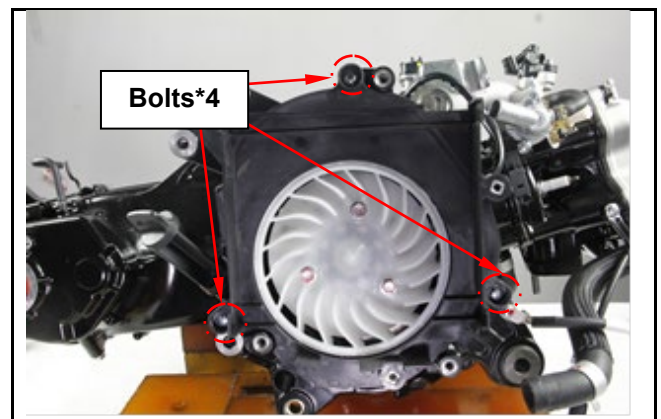
Remove the bolts.



Remove the radiator.



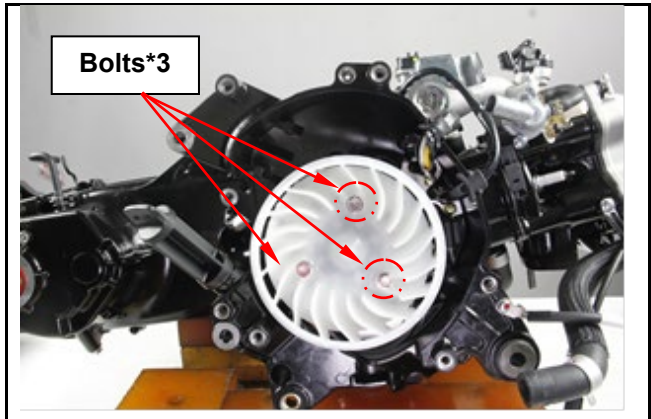
Remove the bolts.



6. Cylinder Head / Valve



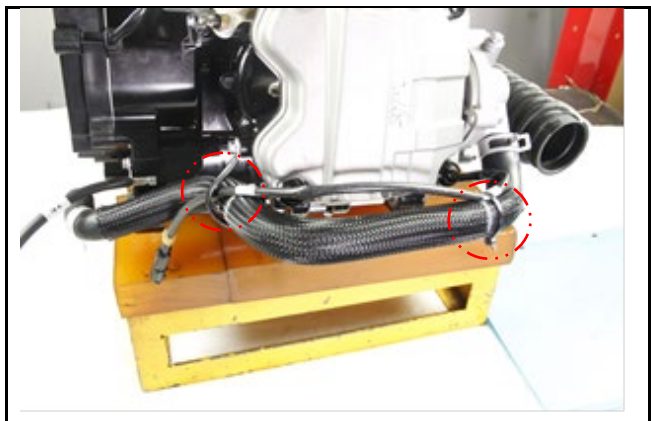
Remove a cover and bolts.



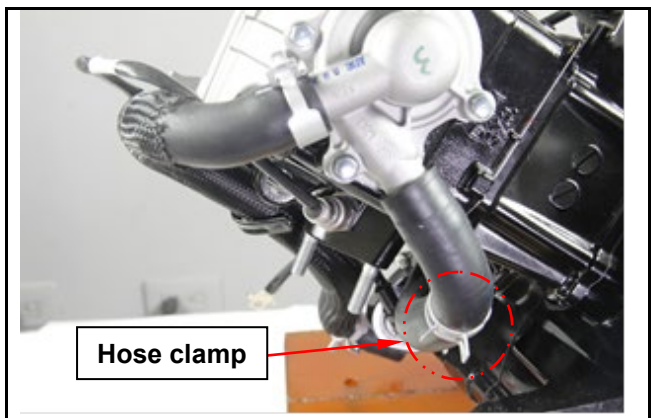
Remove the fan.



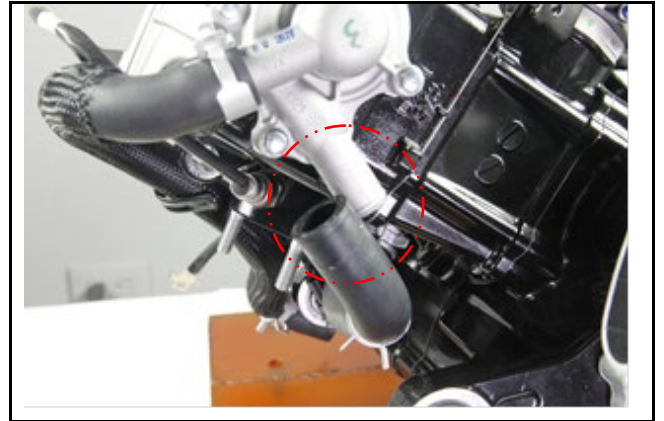
Loosen the wire holder and remove the cable tie.



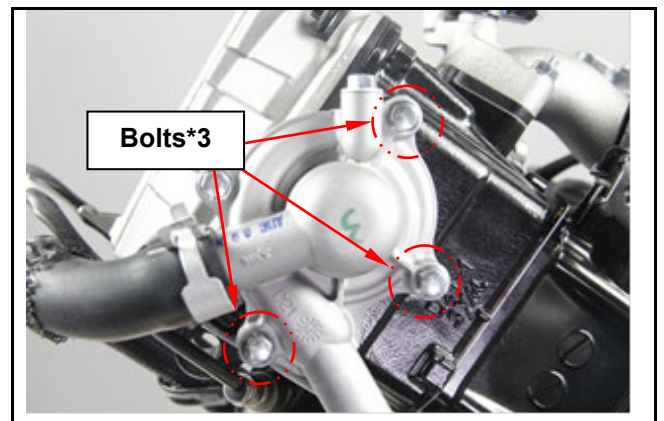
Loosen the hose clamp.



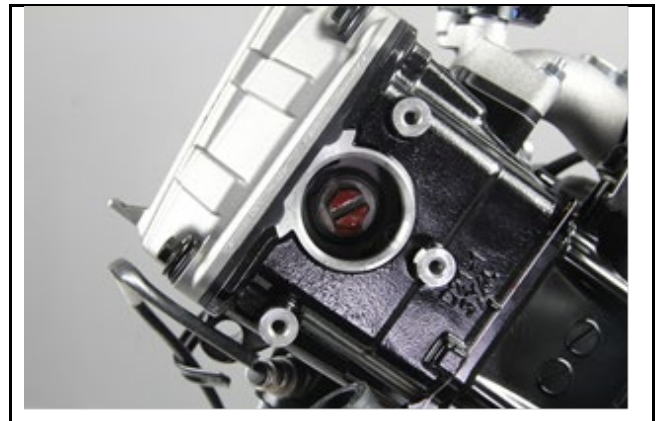
Remove the hose.



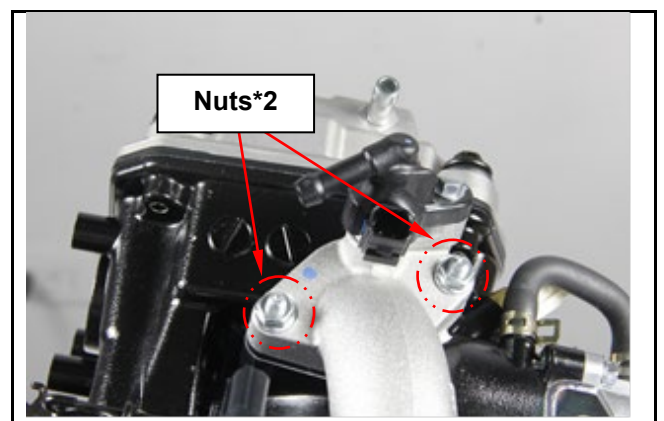
Remove the bolts.



Remove the water pump.



Remove the nuts for intake manifold.



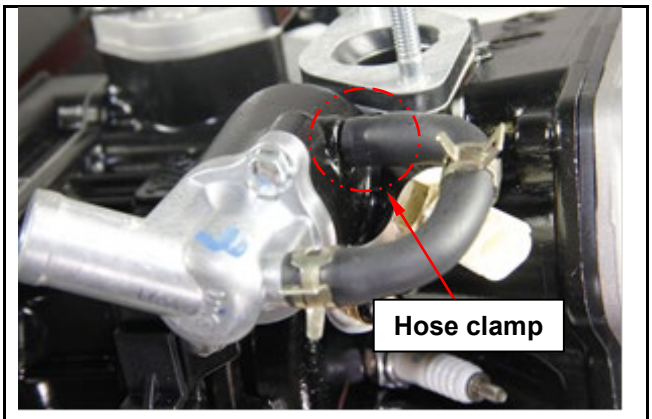
6. Cylinder Head / Valve



Remove the intake manifold.



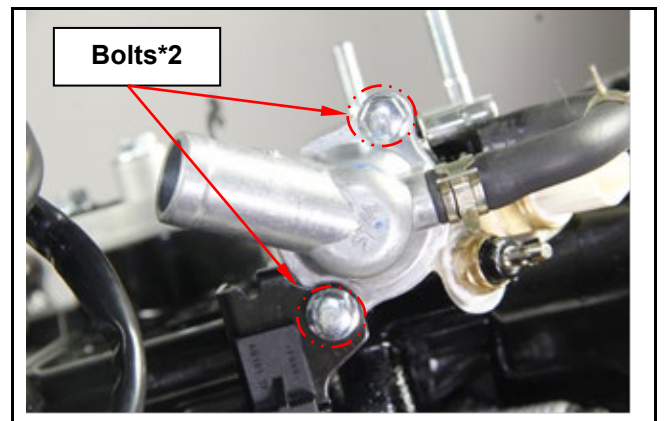
Loosen the hose clamp



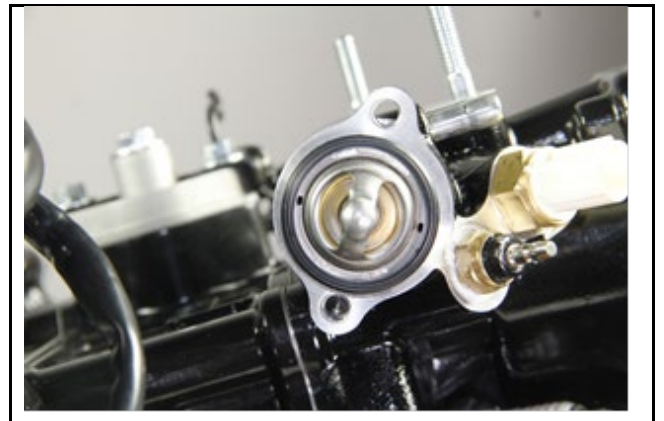
Remove the hose.



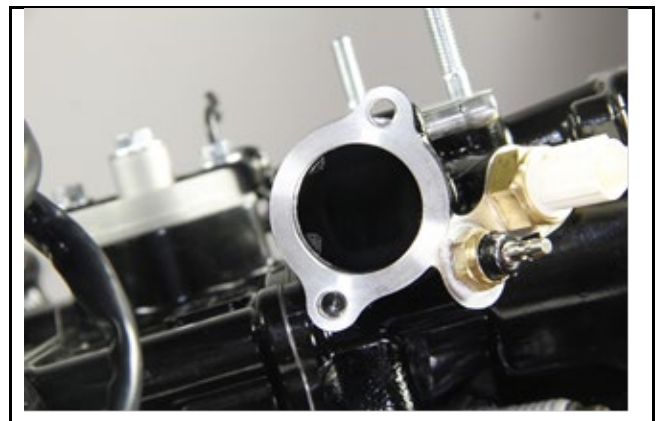
Remove the bolts.



Remove the thermostat cap.



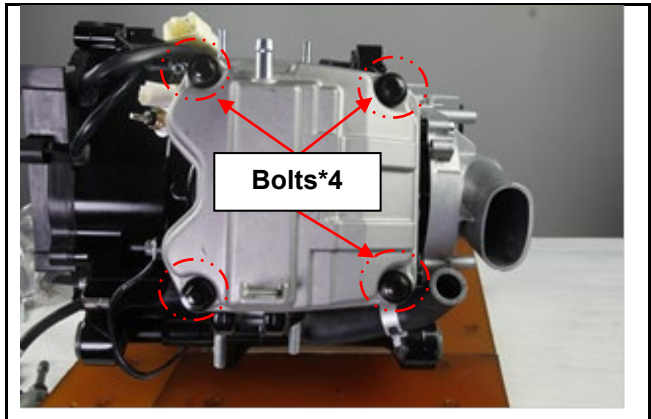
Remove the thermostat.



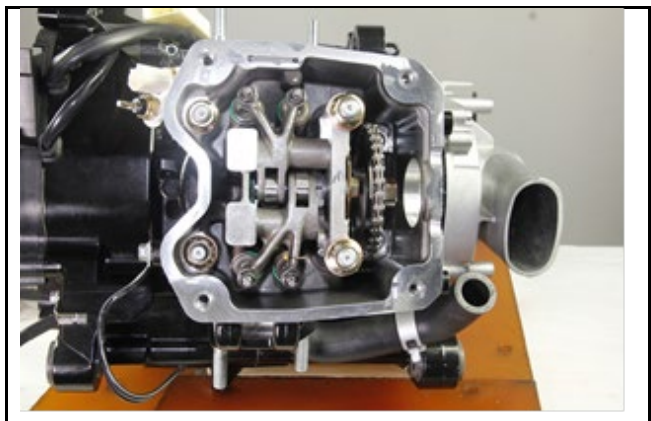
6. Cylinder Head / Valve



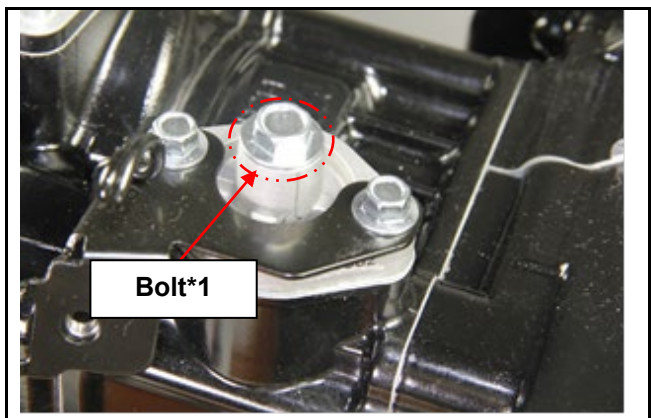
Remove the head cover bolts.



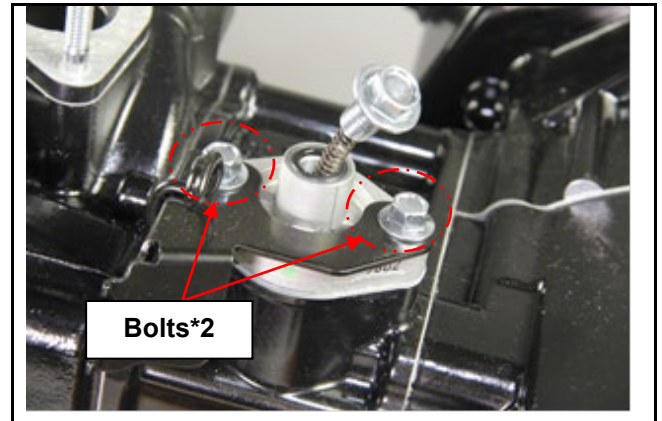
Remove the cylinder head cover.



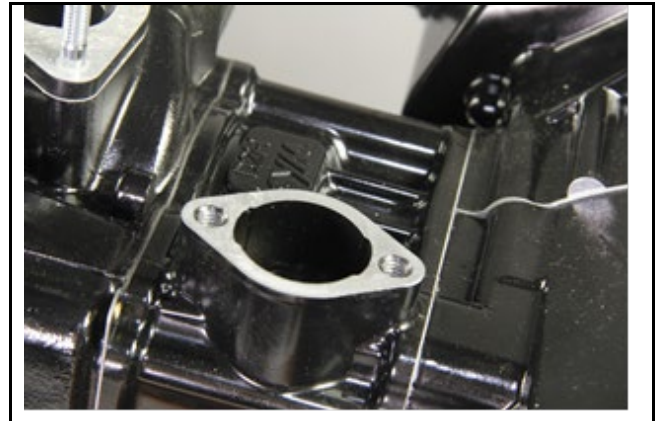
Remove the center bolt for tensioner adjuster.



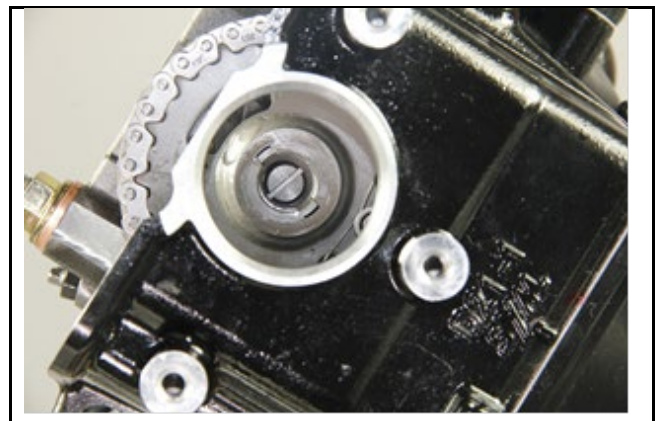
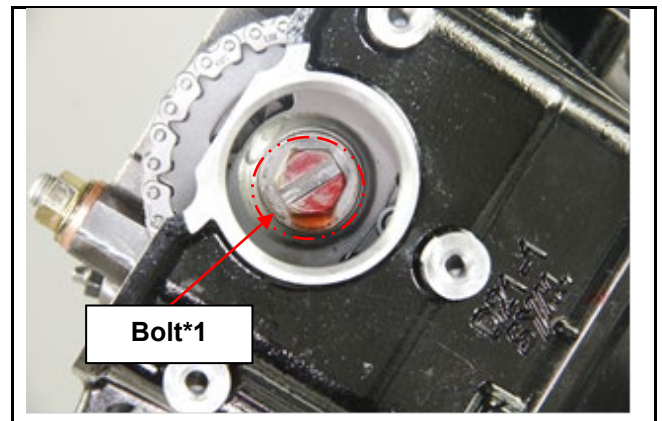
Remove the bolt on both sides for tensioner adjuster.



Remove the tensioner adjuster.



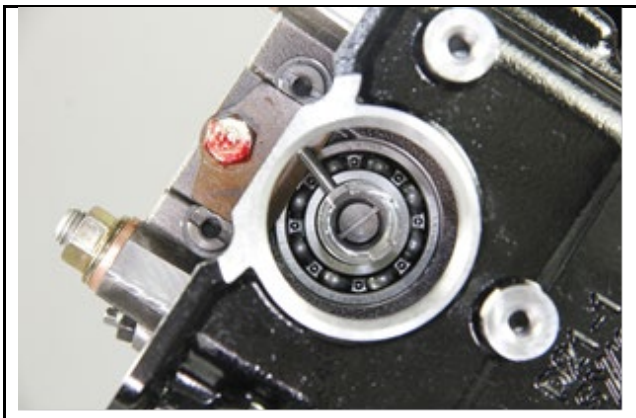
Remove the bolt.



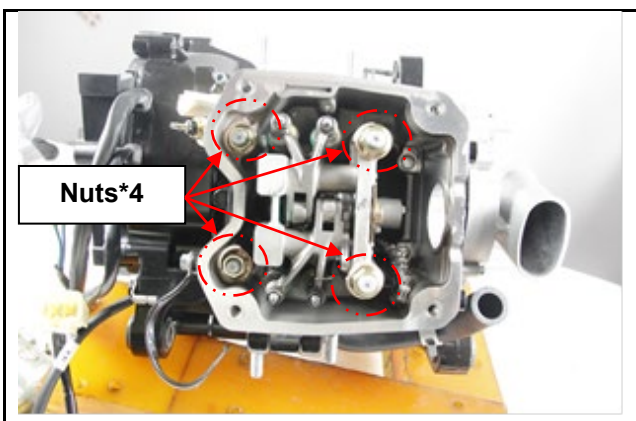
6. Cylinder Head / Valve



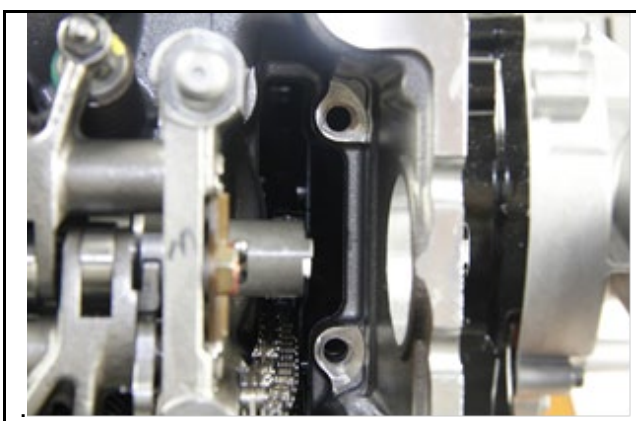
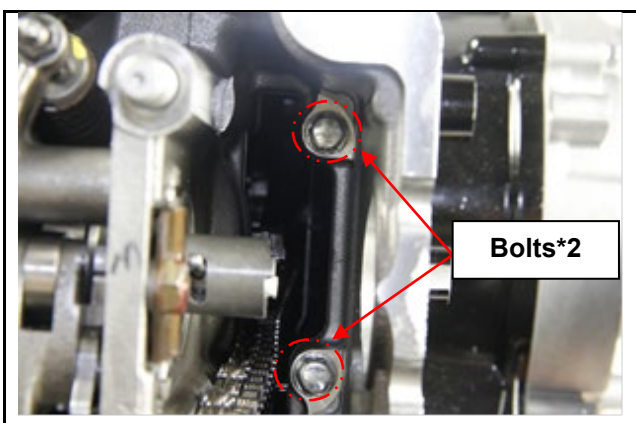
Remove the timing sprocket (cam sprocket).



Remove the cap nuts.



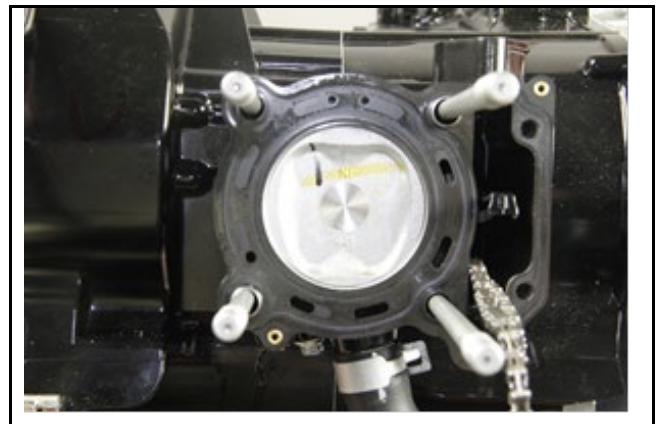
Remove the bolts.





6. Cylinder Head / Valve

Remove the cylinder head.

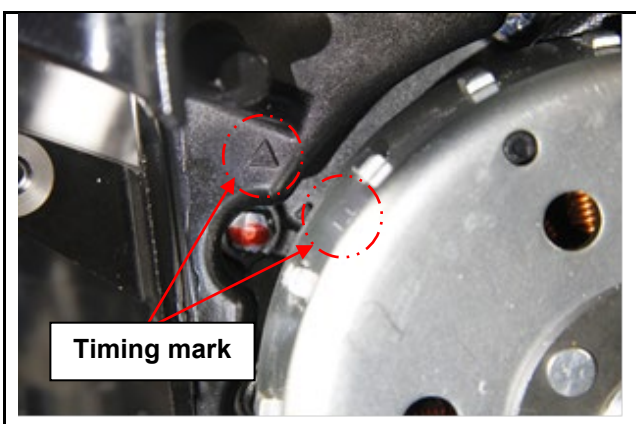


6. Cylinder Head / Valve



Cylinder Head Installation

Set timing mark on the flywheel aligning with the mark on the crankcase.

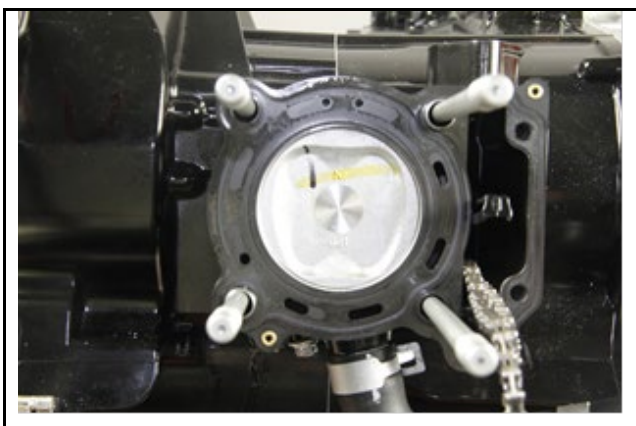


Install cylinder head gasket.

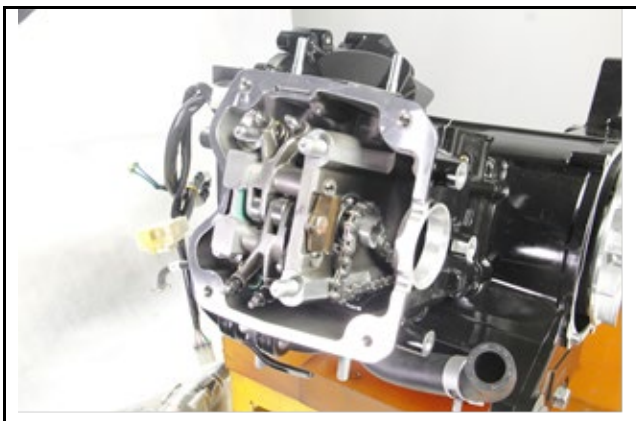


Caution

- Replace a new gasket after disassembling.

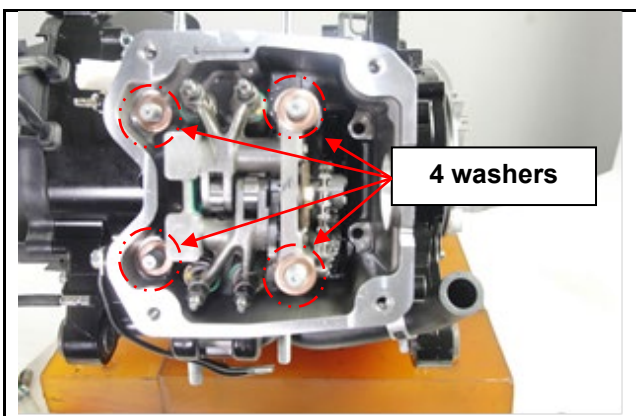


Install the cylinder head.



Install the sealing washers.

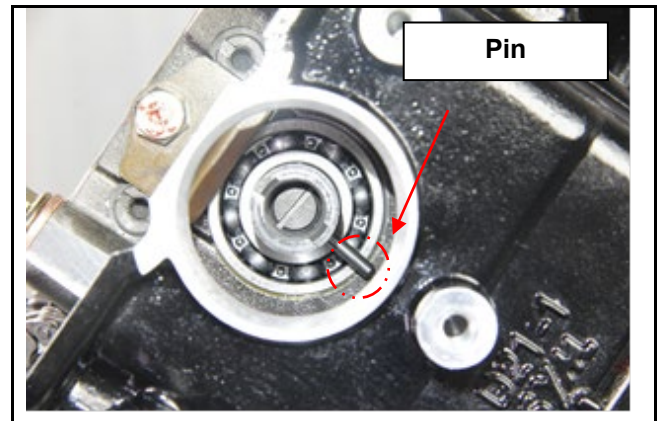
- Torque value:
Cylinder head nut 2.4~2.8 kgf-m
Cylinder head bolt 1.0~1.4 kgf-m



Install the cam sprocket.

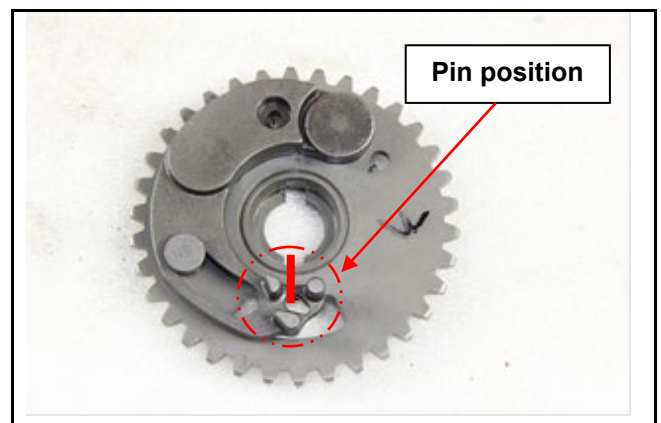
Caution

- Check if the pin of decompression mechanism aligning the direction as the diagram shown.

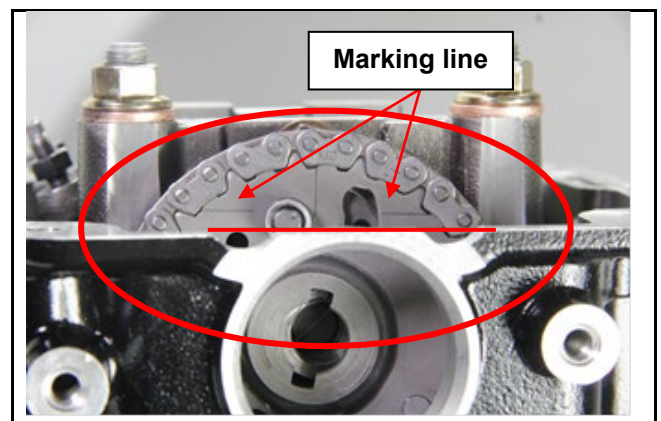


Caution

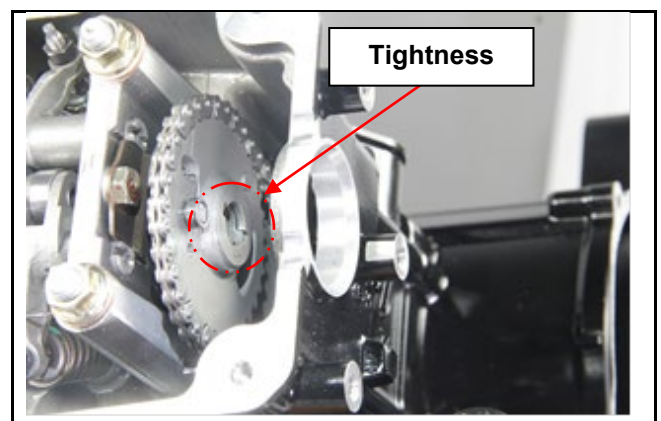
- After the cam sprocket is installed, check if the pin of decompression mechanism is located in the position in the middle of the three pillars as the diagram shown.



Confirm the marking line on the cam sprocket must be parallel to the machined surface of the cylinder head.



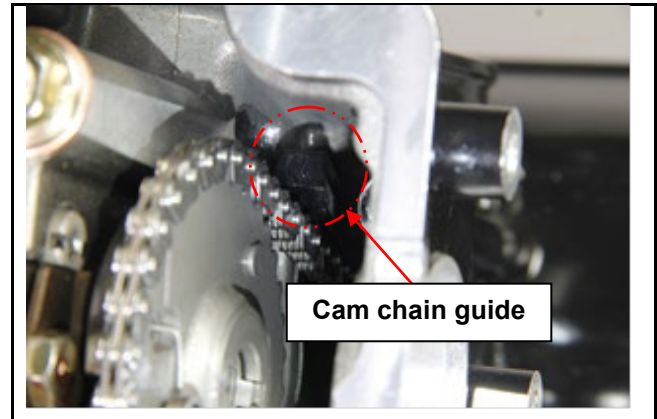
The surface between timing sprocket and camshaft should be tight and flat.



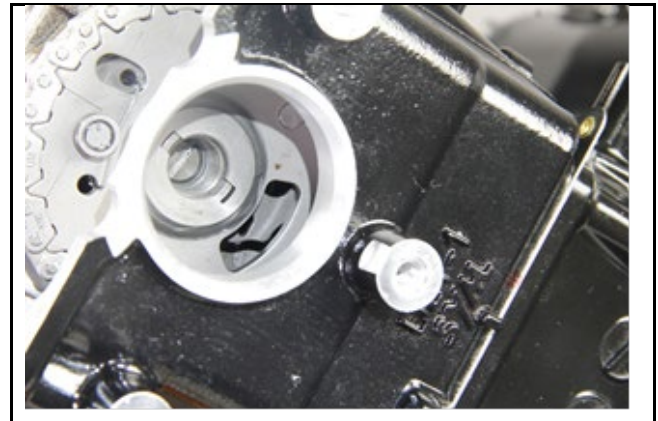
6. Cylinder Head / Valve

Caution

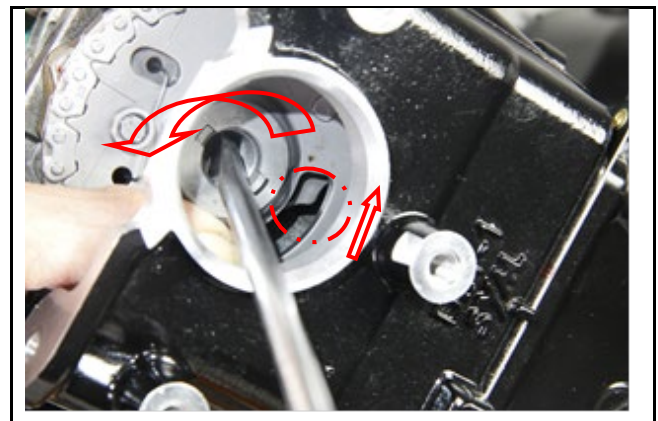
- If the combined surface between cam sprocket and camshaft bolt hole is not compact, check the installation of cam chain guide.



After the timing sprocket is installed and positioned, press it with your hands to check if it is loose.



Use a flat screwdriver to rotate a bolt inside the camshaft in a counterclockwise direction, and the sliding plate of decompression mechanism must rotate at the same time.



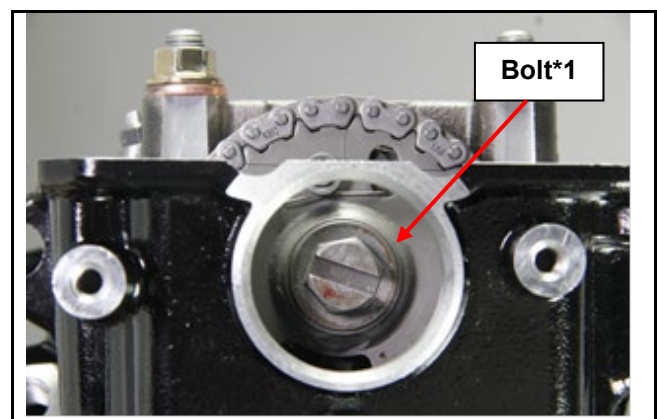
Tighten the cam sprocket mounting bolts.

Caution

- If the sliding plate of decompression mechanism cannot rotate at the same time, the pin is not in the right installation position.
- Please reinstall the timing sprocket.

Camshaft bolt installation

- Torque value: 2.0~3.0kgf-m

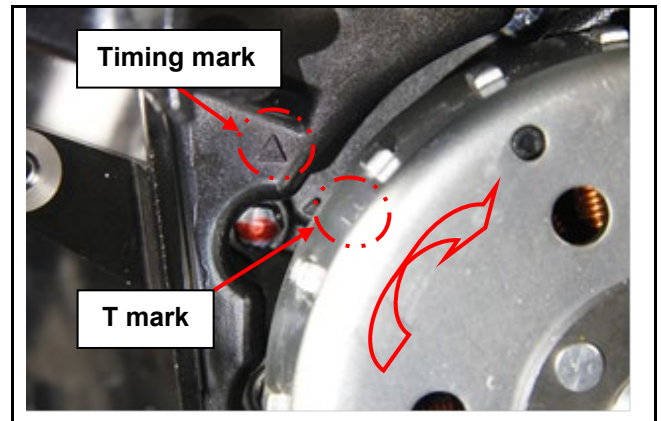


Turn the flywheel, make the “T mark” can align the corresponding mark on the crankcase.

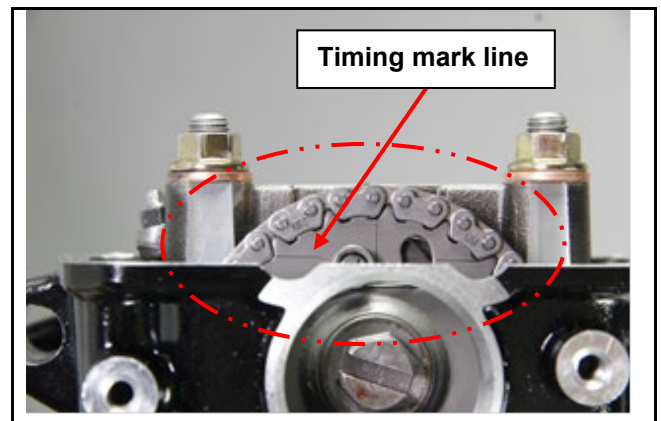


Caution

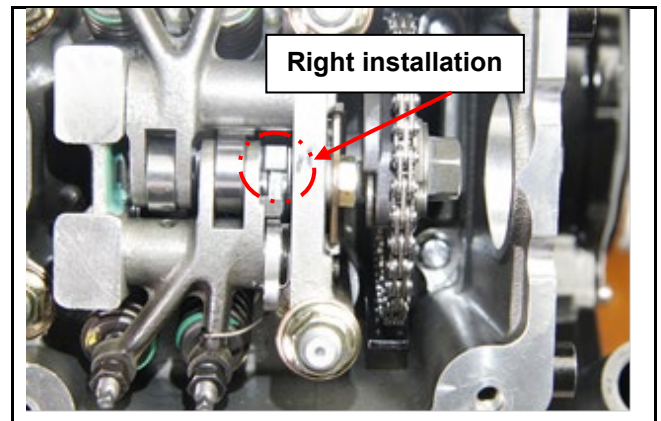
- Only rotate flywheel forward to ensure the right working condition of valves.



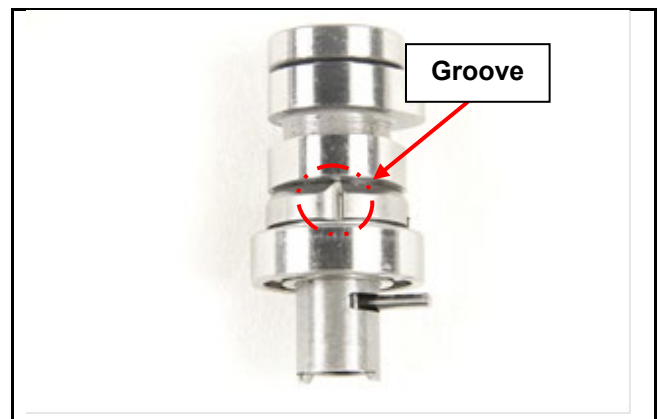
Ensure the timing mark line align with the cylinder head.



Ensure the decompression mechanism setting plate is in the corresponding groove of the camshaft.

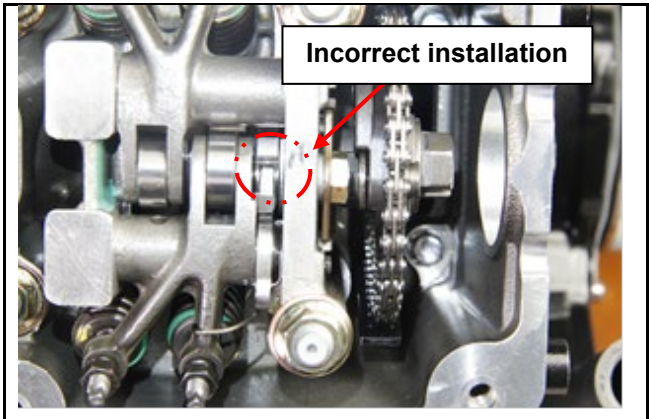


The groove position of the camshaft decompression mechanism.



6. Cylinder Head / Valve

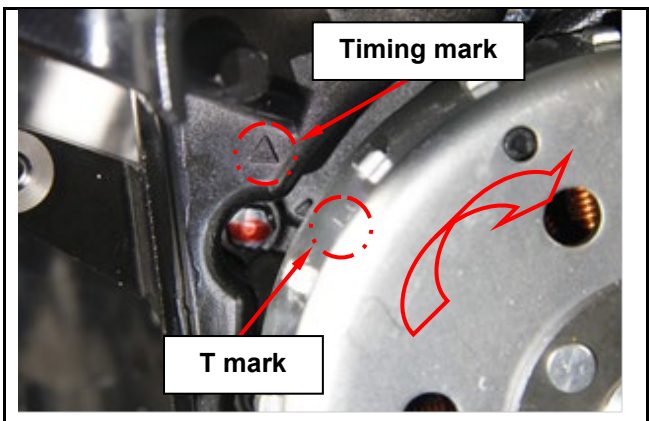
Please repeat the step of timing adjustment when the baffle is incorrect position.



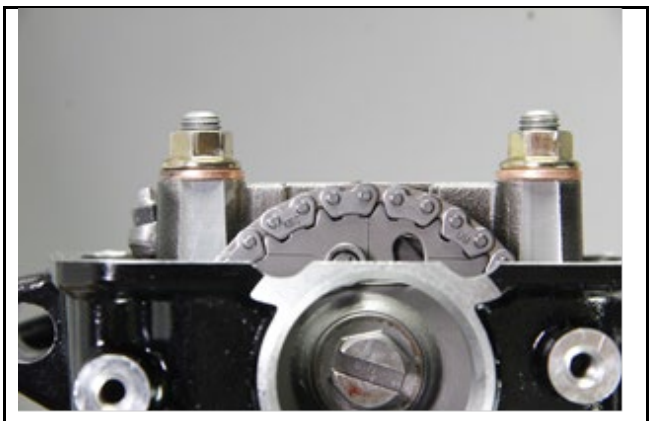
Turn the flywheel, make the "T mark" can align the corresponding mark on the crankcase.

Caution

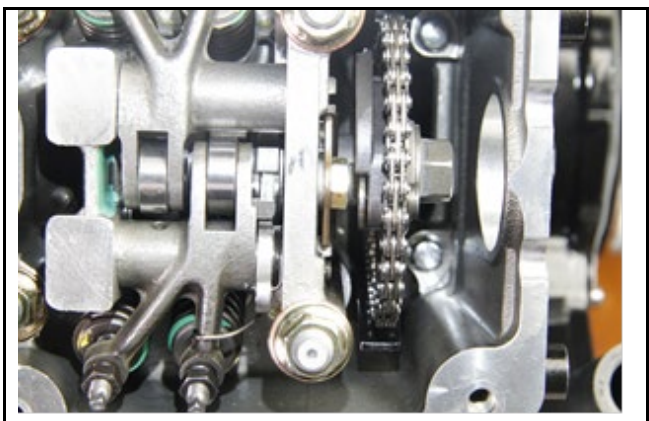
- Only rotate flywheel forward to ensure the right working condition of valves.



Ensure the timing mark line align with the cylinder head.



Ensure the decompression mechanism setting plate is in the corresponding groove of the camshaft.





6. Cylinder Head / Valve

Valve Adjustment

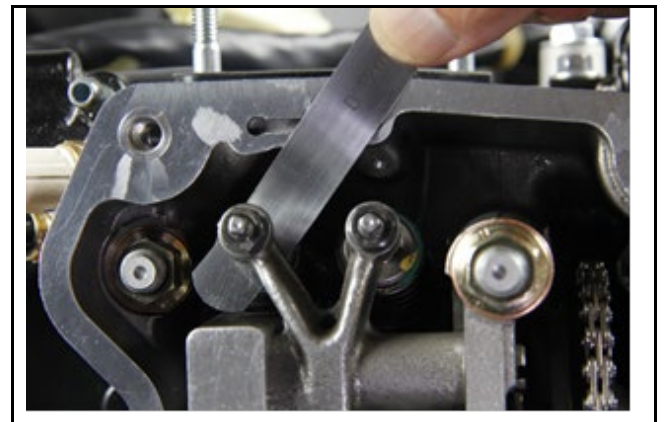
Valve clearance adjustment.

- Standard : $0.12 \pm 0.02\text{mm}$

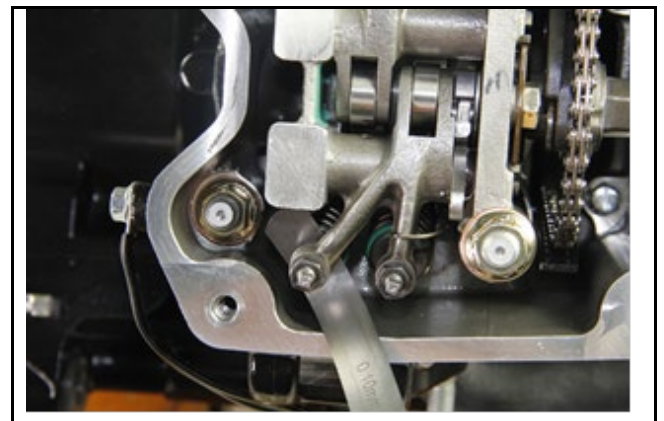
Special tool: Tappet adjusting wrench, NO. SYM-1472100.



Adjust the clearance for intake valves.



Adjust the clearance for exhaust valves.



Install the cylinder head cover.



6. Cylinder Head / Valve

Install the cylinder head bolts.

- Torque : 0.8~1.2kgf-m

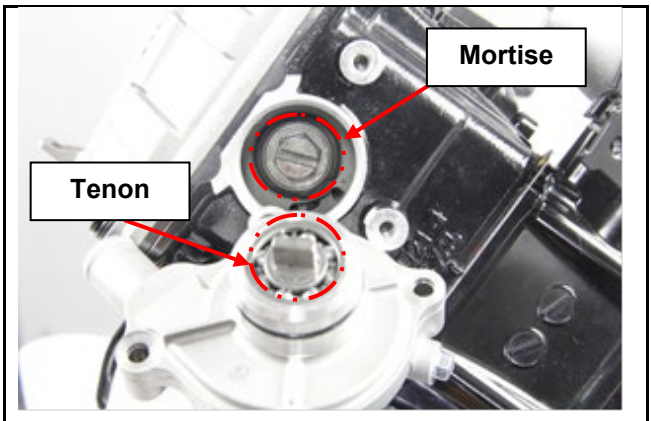


Install the water pump.

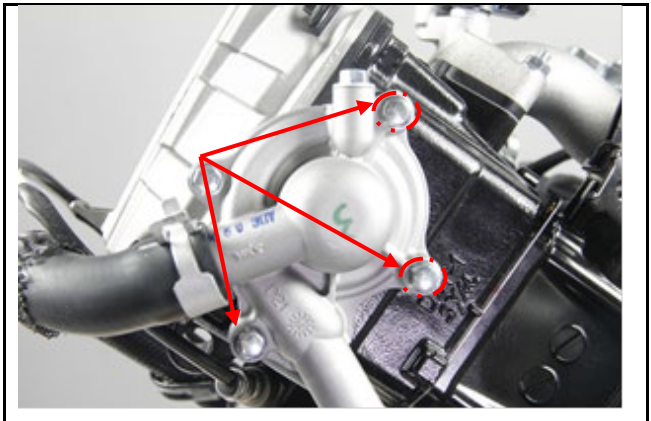


Caution

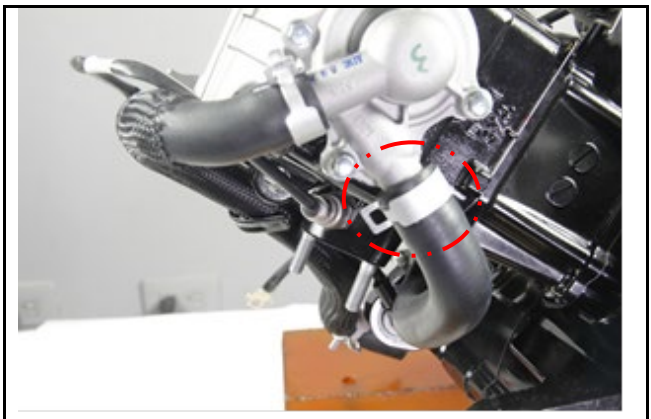
- Check if the water pump tenon aligned with corresponding mortise.



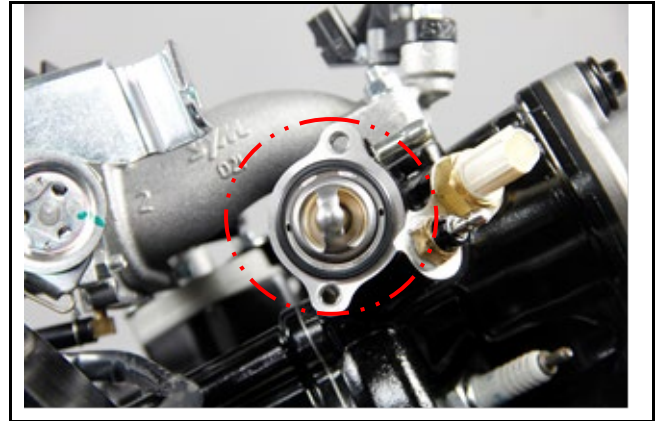
Screw the bolts.



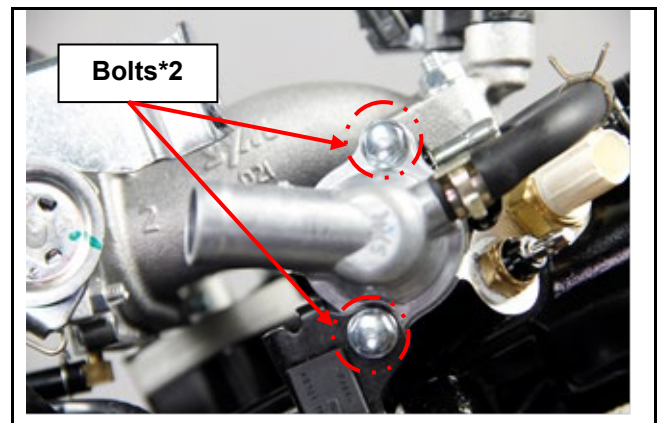
Install the hose and the hose clamp.



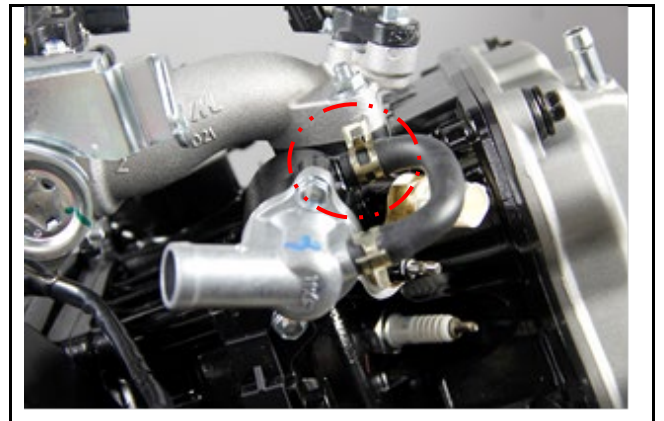
Install the thermostat.



Install the thermostat cap.



Install the hose and hose clamp.



6. Cylinder Head / Valve



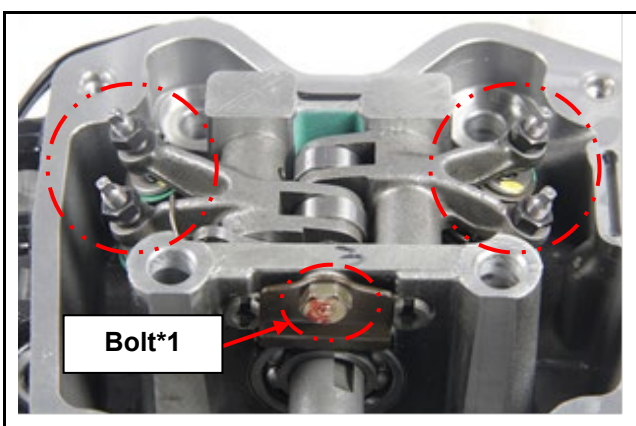
Cylinder Head Disassemble

Disassemble valve stem

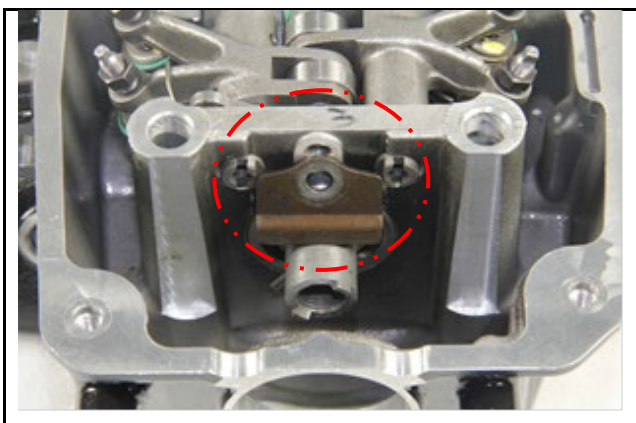
- Special tool :
Valve cotter & assemble tool.
No. SYM-1472100.



Loosen the intake and exhaust valves and remove the bolt.



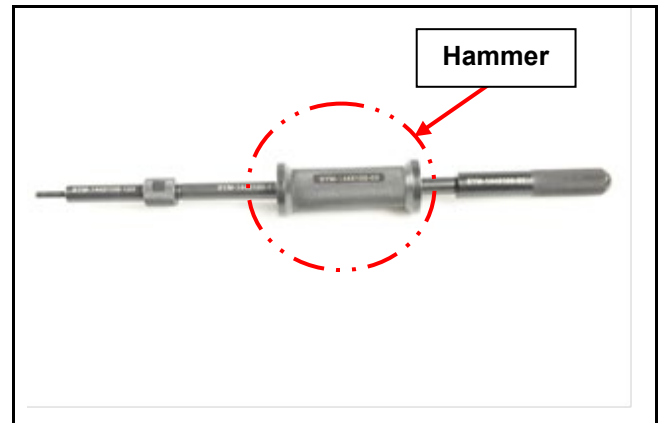
Remove the cam shaft setting plate.



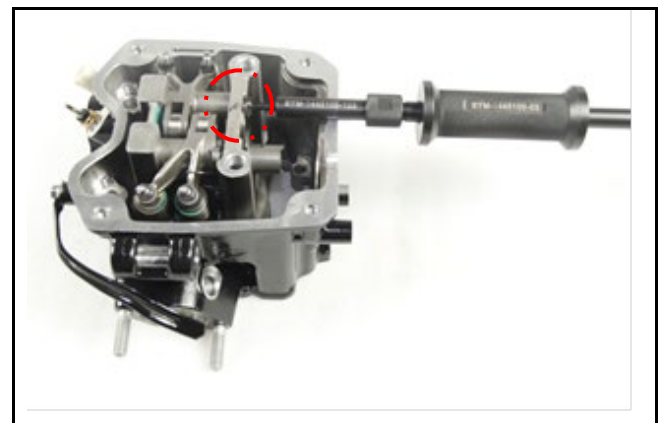
- Special tool:
Rock arm removal.
NO. YM-1445100-ALL



- Special tool: Combine tools.



Use the Combine tools to pull the rock arm shaft out by knocking the tool handle with the tool hammer toward the back.

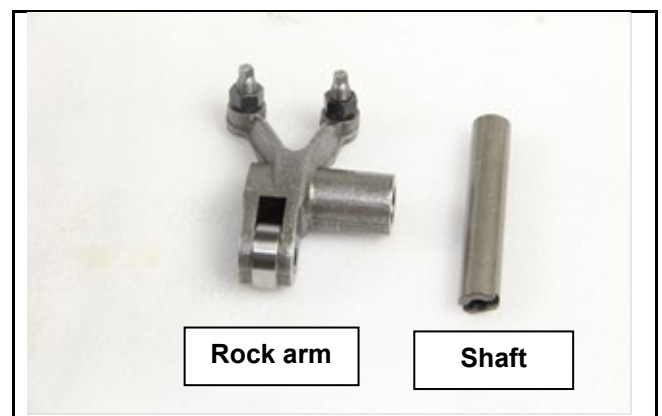


Pull the rock arm shaft out carefully.



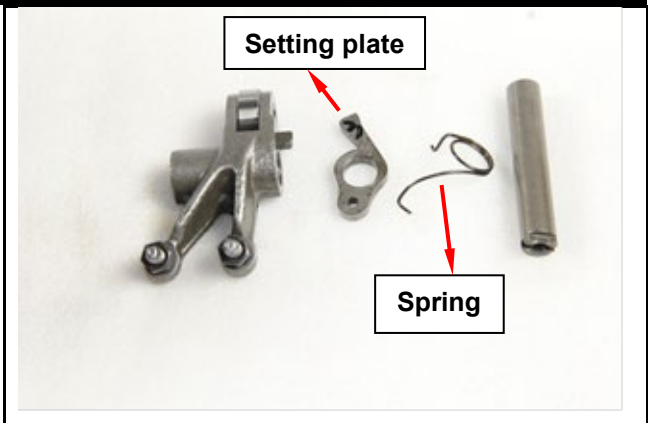
Disassemble the rock arm and shaft.

- Rock arm internal diameter :
10-0~-0.015mm
- Shaft external diameter :
10-0.013~-0.028mm



6. Cylinder Head / Valve

Remove the rock arm, setting plate, spring, and the shaft of the exhaust valve in the same way.



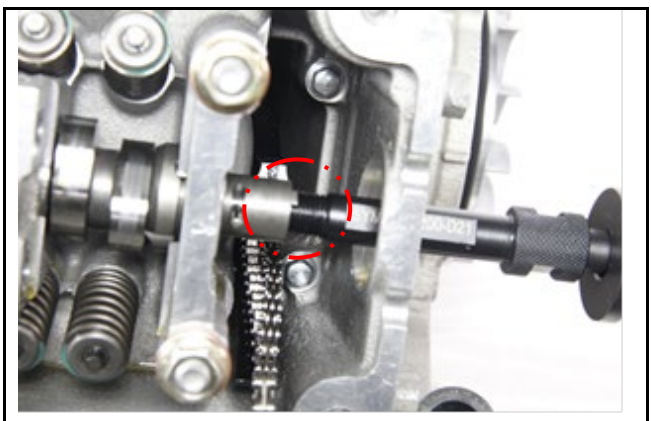
Disassemble camshaft



- Special tool :
Camshaft removal.
NO. SYM-9000200-D21



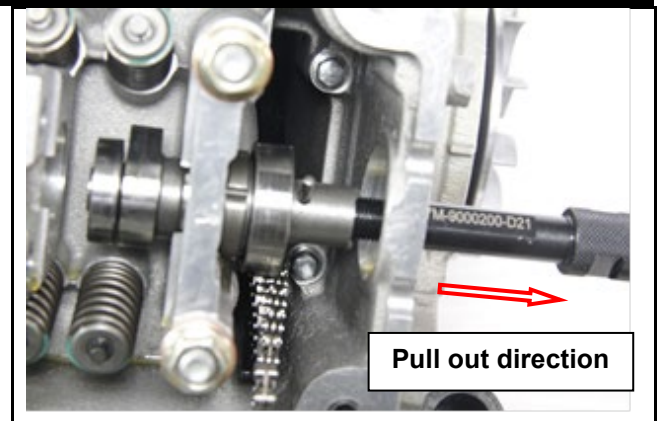
The way to pull the camshaft out is as the way of removing a rock arm shaft, but the tool is different.





6. Cylinder Head / Valve

Pull the camshaft out carefully.



Remove the camshaft.



Disassemble in/ex valve

- Special tool :
Valve cotter & assemble tool.
NO. SYM-1471110/20-ALL



- Special tool:
Valve guide driver

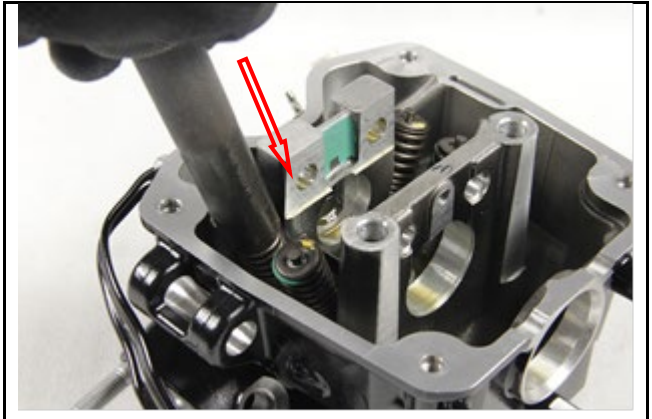


6. Cylinder Head / Valve

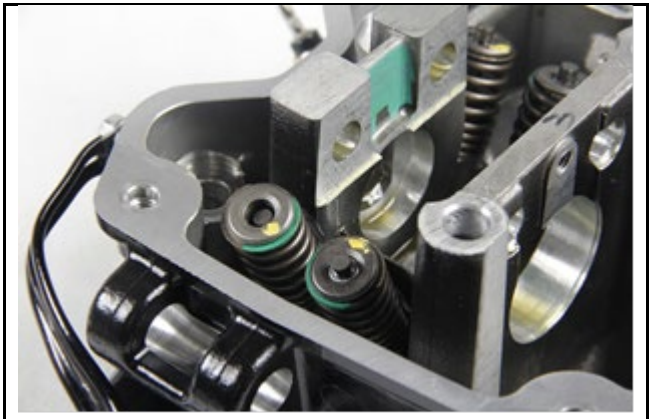
Caution

- When pushing down with the valve guide driver, place a soft thing like cloth under the combustion chamber surface to avoid valve stem bent or damaged.

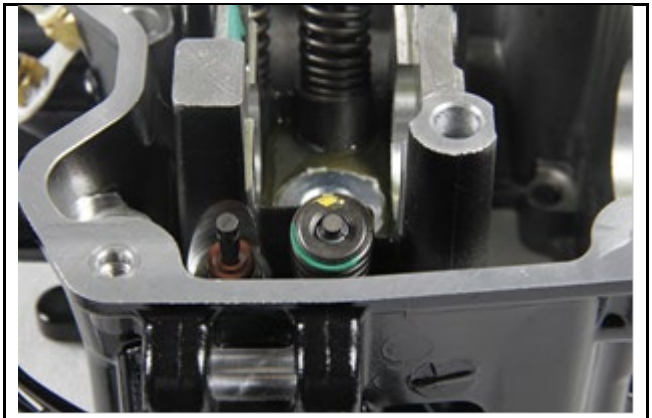
Push down.



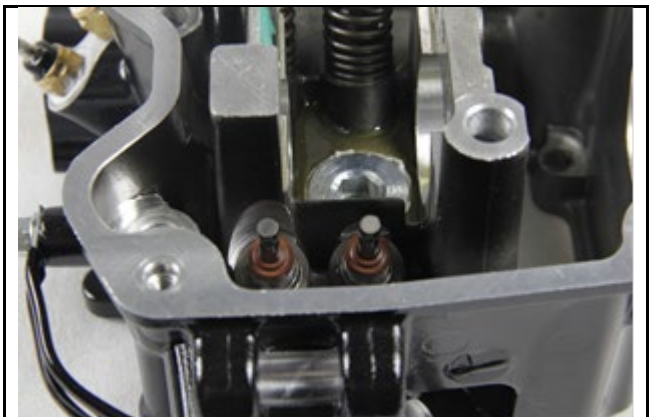
Remove the valve cotter.



Remove the valve spring seat and the valve spring.



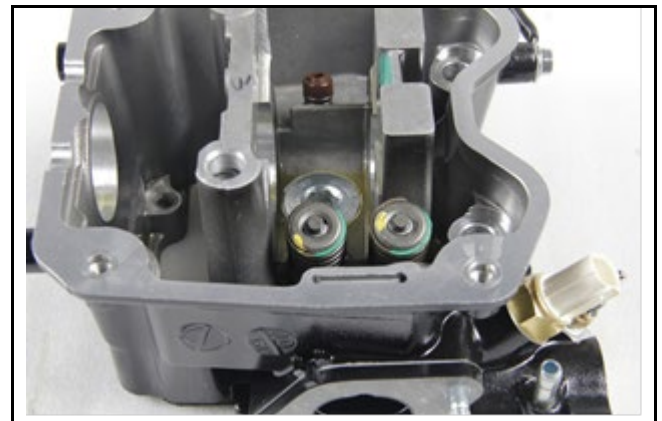
Use the same way for the other removal.



The arrangement of exhaust valve.



Use the same way for intake valve removal.



The arrangement of intake valve.

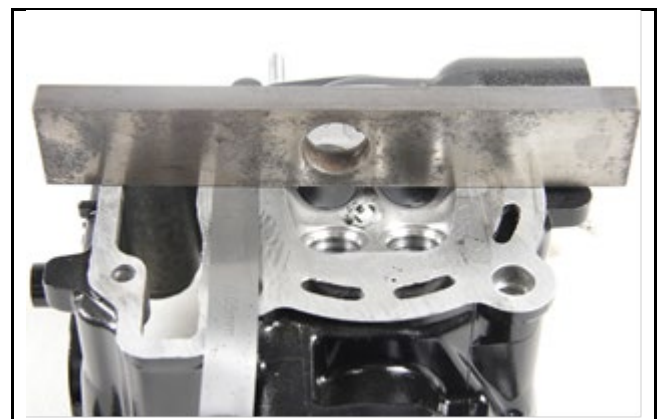


Valve Inspection

Check if the spark plug hole and the valve hole are cracked.

Check the flatness of the cylinder head with a ruler and a feeler gauge.

- Service limit : 0.05mm



6. Cylinder Head / Valve

Valve spring

Measure the free length of intake and exhaust valve springs.

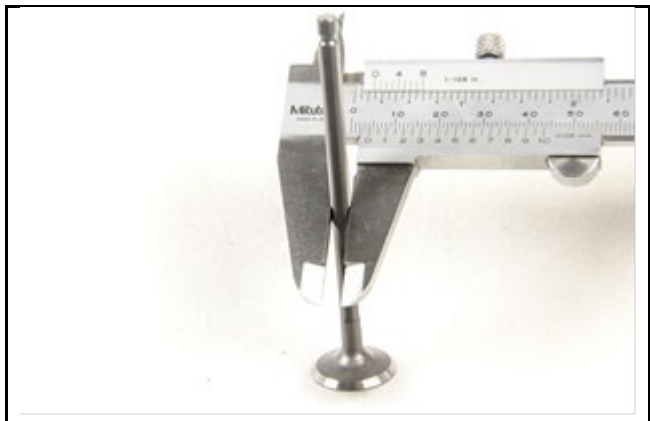
- Service limit : 32.4mm



Valve stem

Check if valve stems are bent, cracked, or burnt. Check if the operation condition of valve stem in valve guide, and measure also record the external diameter of valve stem.

- Service Limit:
IN: 4.5-0.01~-0.025 mm
EX: 4.5-0.025~-0.050 mm



Clean carbon deposit on the surface of cylinder head and valves.

Caution

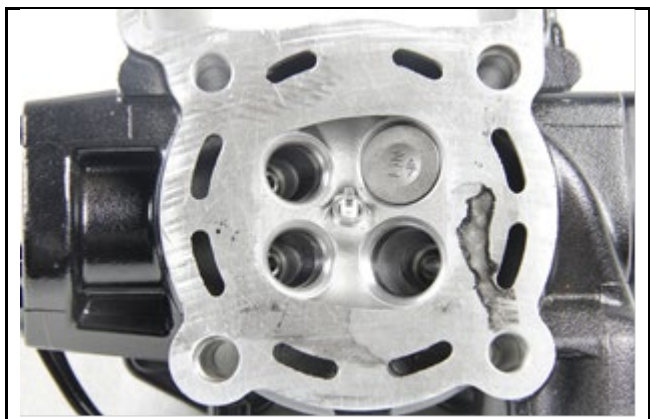
- Do not damage the contact surface of the cylinder head.



Cylinder Head Reassembly

Lubricate the valve stem with engine oil, then combine it with the cylinder head.

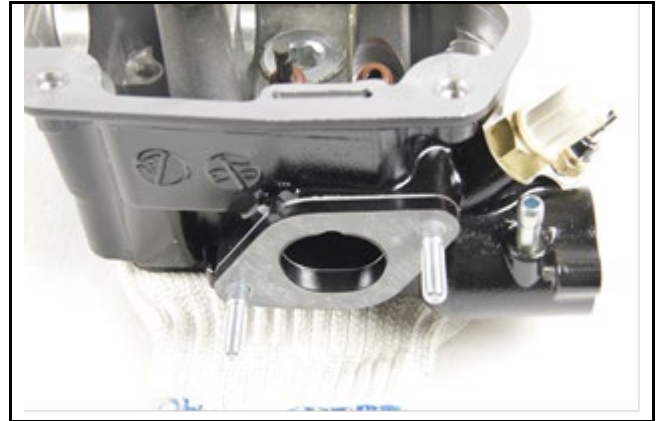
Install a new oil seal of valve.





Caution

- When assembling, place a soft thing like cloth under the combustion chamber surface to avoid valve stem bent or damaged.

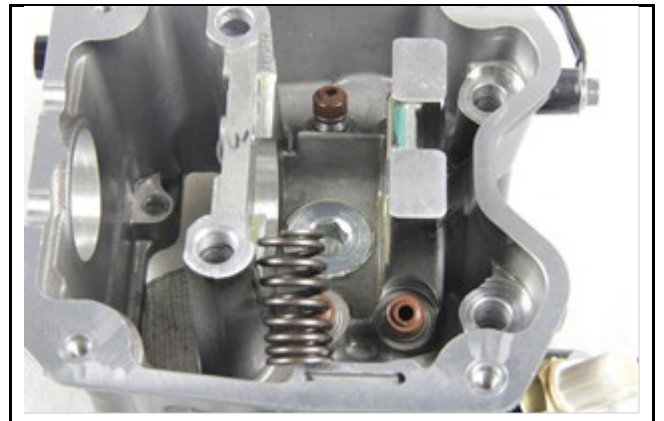


Install the valve spring.

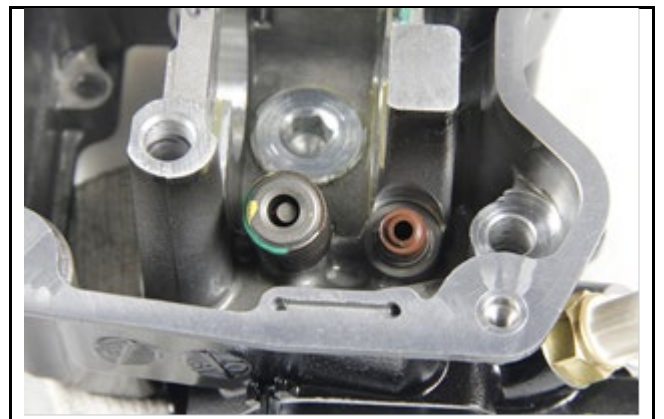


Caution

- The higher density end of spring coil must face the combustion chamber.



Install the valve spring seat.



6. Cylinder Head / Valve



Install the valve cotter.



- Special Service Tool:
Valve cotter remove & assembly tool



Push down.

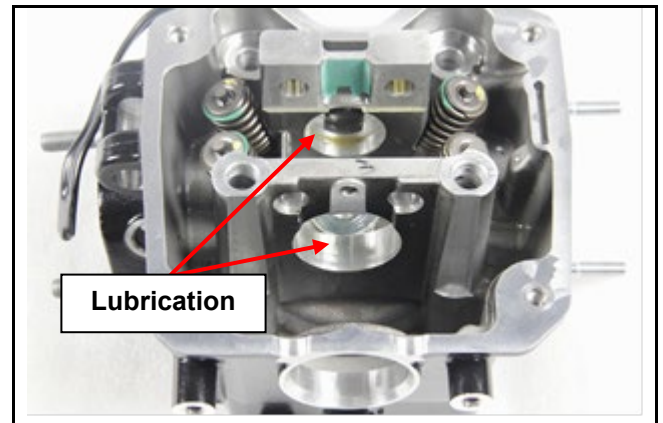


Ensure the valve installation is correct, especially the valve cotter.



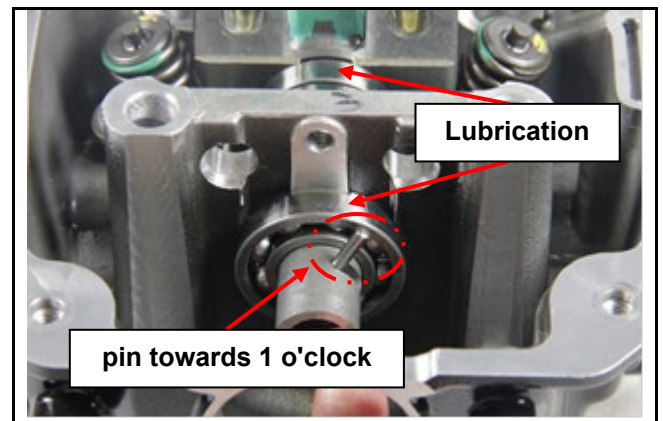
Install camshaft comp

Lubricate the surface of camshaft installation with engine oil.



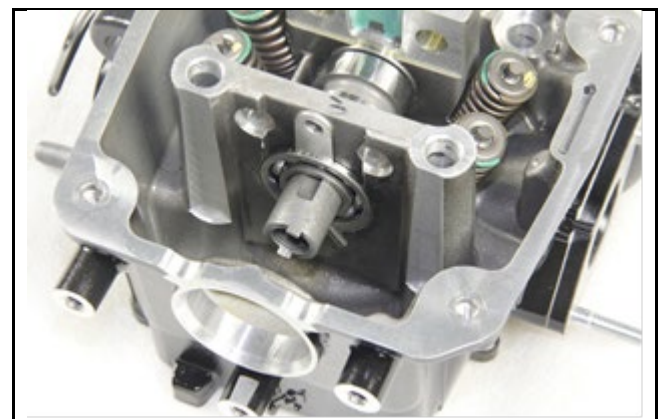
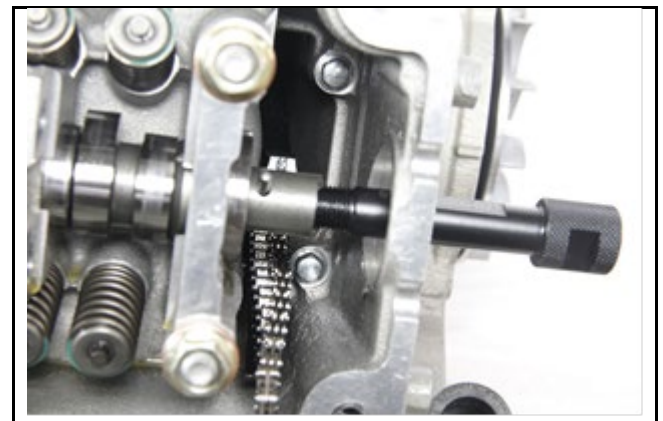
Place the camshaft.

Set the pin of decompression mechanism at 1 o'clock.



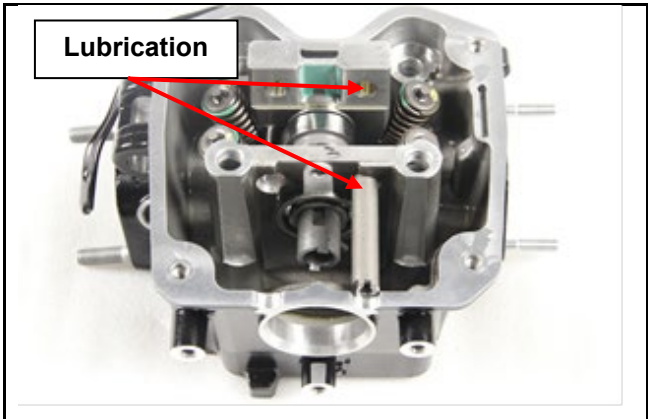
- Special tool: SYM-9000200-D21

Insert the camshaft with the special tool, and ensure it pushed to the bottom.

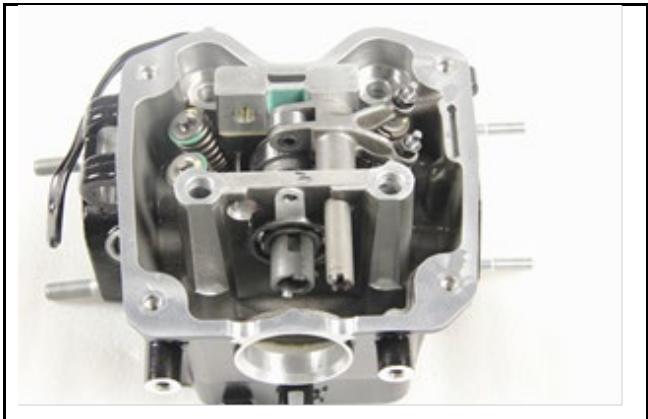


6. Cylinder Head / Valve

Install the rock arm shaft and lubricate it with some engine oil.



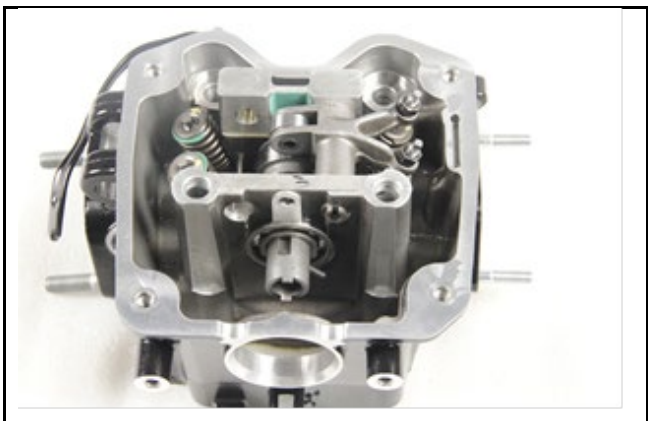
Install the rock arm.



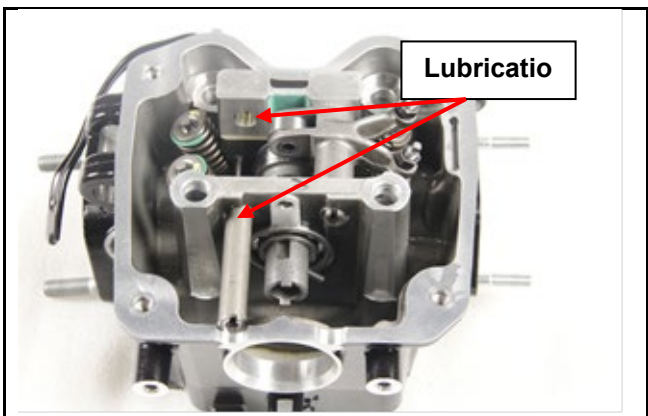
Push the rock arm shaft to the bottom.

Caution

- Gap of the shaft face to inside.



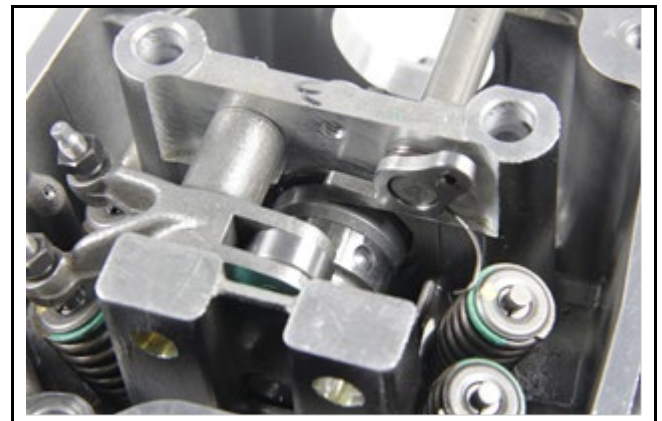
Lubricate another rock arm with some engine oil.



Combine the setting plate and the spring.



Place the combined parts (setting plate and the spring) between the rock arm and the cylinder head, and fix them with the rock arm shaft inserted.

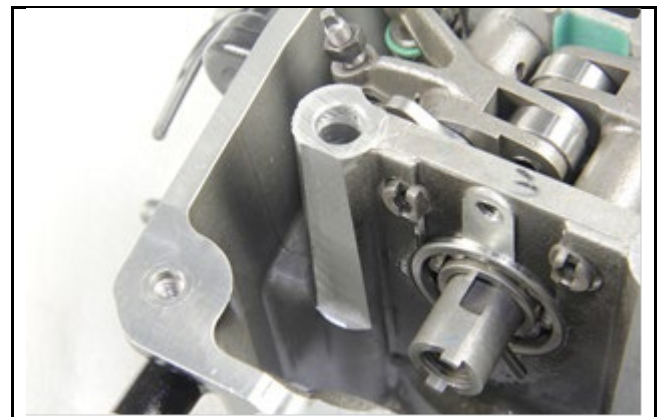


Push the rock arm shaft to the bottom.



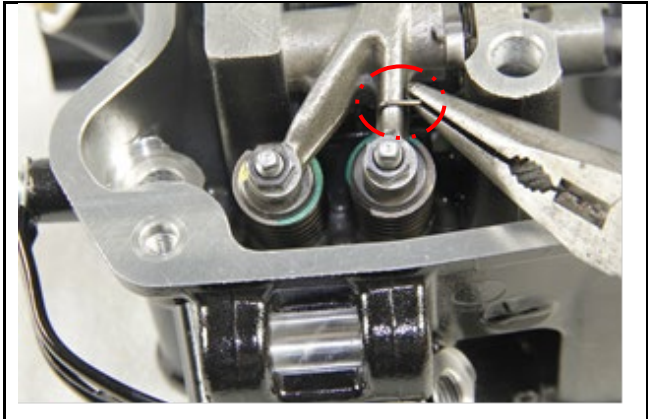
Caution

- Gap of the shaft face to inside.

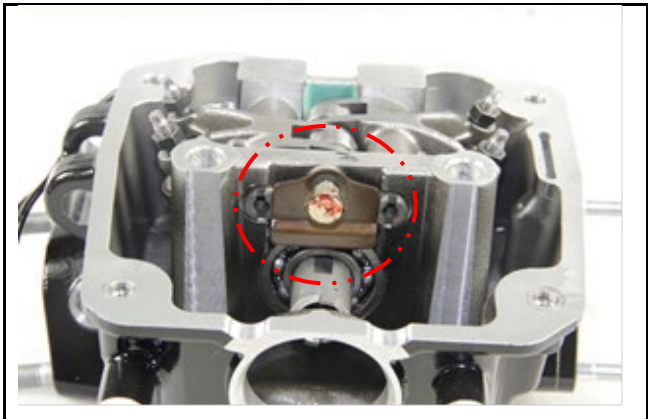


6. Cylinder Head / Valve

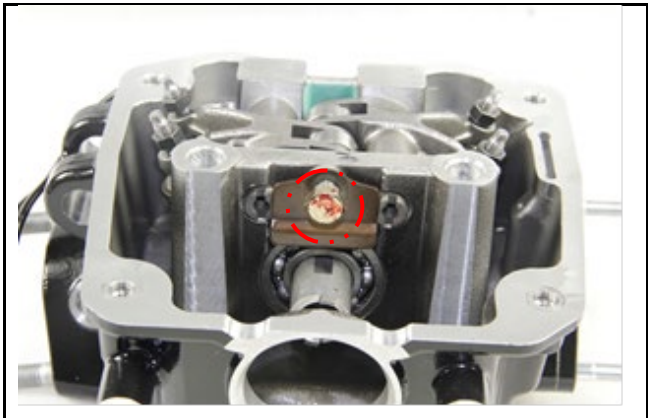
Use needle-nose pliers to clamp out the spring and hook it on the rocker arm.



Install the cam shaft setting plate.

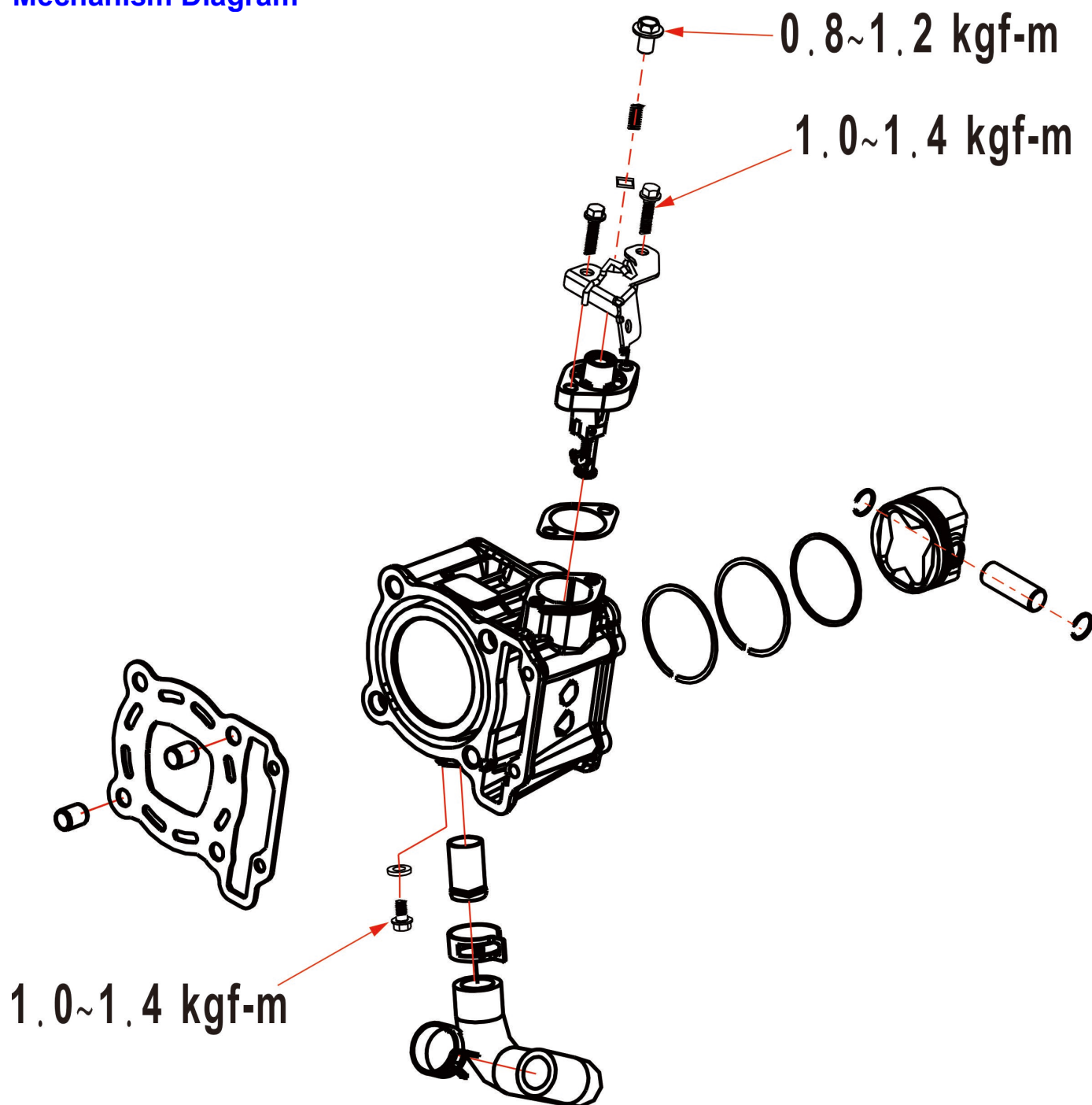


Screw the bolt.



Mechanism Diagram	7-1	Piston Installation	7-9
Precautions in Operation	7-2	Cylinder Installation	7-11
Troubleshooting	7-2	Piston Ring Removal	7-9
Cylinder Removal	7-3	Piston Ring Installation	7-11

Mechanism Diagram



Precautions in Operation

General Information

- Cylinder or piston service cannot be conducted when the engine is mounted on the frame.

Specification

Unit : mm

Item		Standard Value
Cylinder	I.D.	59 +0.015~-0.005
	Warpage	0.05
Piston	O.D.	58.65 0~-0.05
	Piston pin hole I.D.	15 +0.008~+0.002
Piston pin	O.D.	15 0~-0.006
	Length	43 ±0.1
Connecting rod small end	I.D.	15 +0.016~+0.034

Troubleshooting

Compression too low or poor performance

- Leaking cylinder head gasket
- Worn or damaged cylinder and piston

Excessive smoke

- Worn cylinder, piston or piston ring
- Improper installation of piston rings

Compression too high, overheating

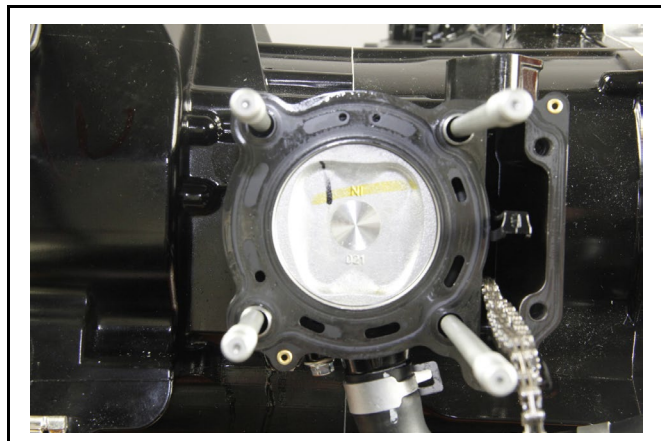
- Excessive carbon built-up on piston head or combustion chamber

Knocking or Abnormal noise

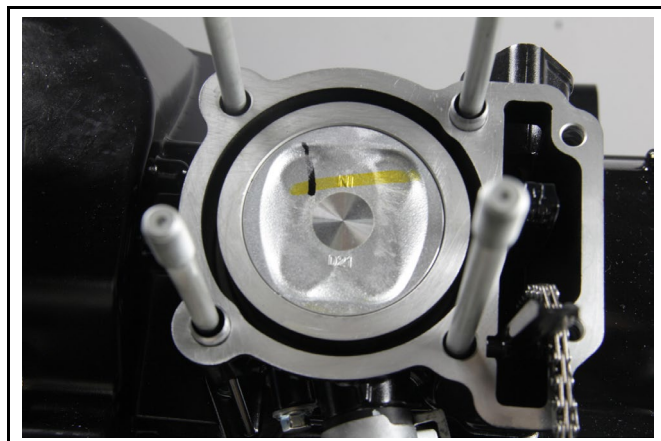
- Worn cylinder, piston or piston ring
- Worn piston pin or piston pin hole

Cylinder Removal

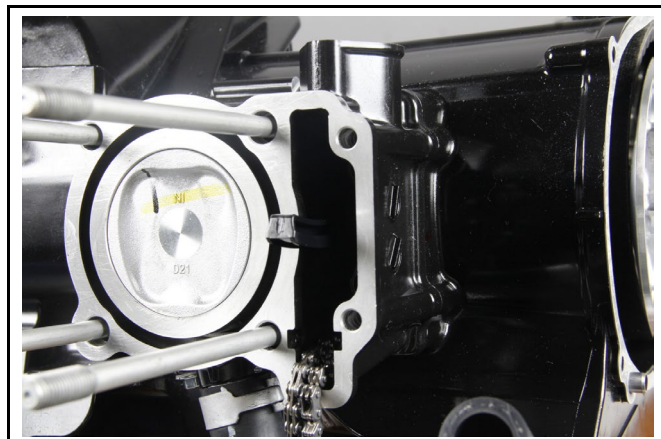
Remove cylinder head. (Refer to chapter 6)



Remove cylinder head gasket and dowel pin.

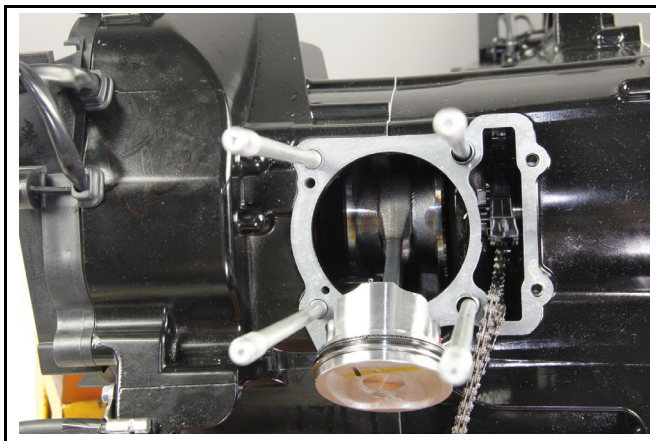


Remove cam chain guide.



7. Cylinder / Piston

Remove cylinder.



Use clean cloth blocking the crankcase hole to avoid piston pin clip dropping in crankcase hole.



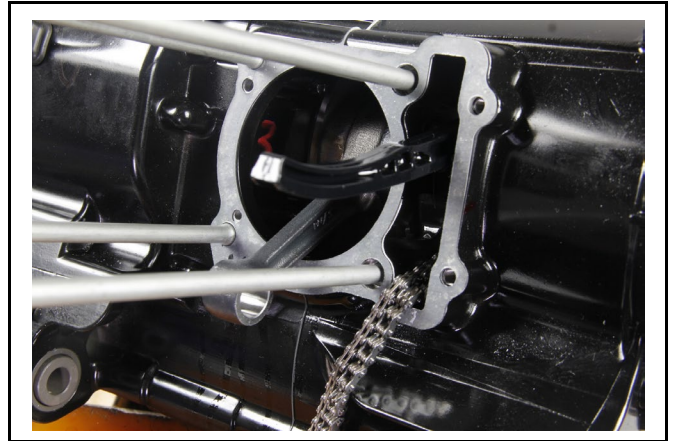
Remove one of piston pin clip with needle nose pliers.



Remove piston pin by pushing it.



Remove piston.



Remove cylinder head gasket.



Use scraper knife to scrape remains of cylinder head gasket.

Use clean cloth blocking the crankcase hole to avoid remains of cylinder head gasket dropping in crankcase hole

Caution

- Use some solution to wet remains of cylinder head gasket for easier clean.

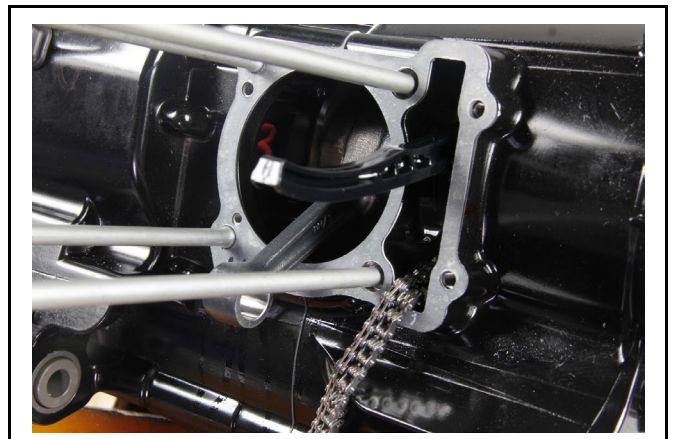


Piston Installation

Install cylinder head gasket.

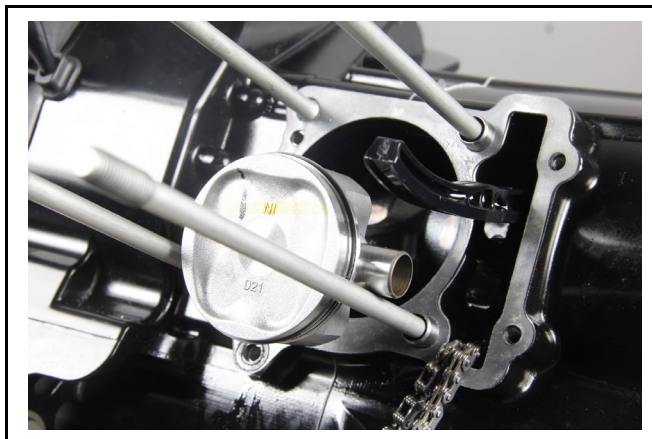
Caution

- Replace a new cylinder head gasket after service.



7. Cylinder / Piston

Install piston and piston pin.



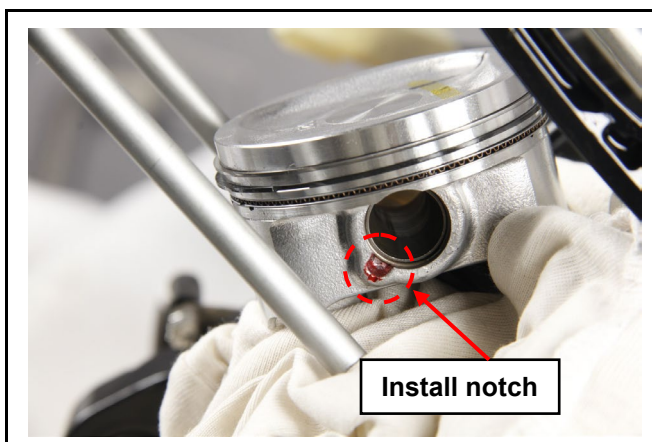
Use clean cloth blocking the crankcase hole to avoid piston pin clip dropping in crankcase hole. Install piston pin clip with needle nose pliers.



Ensure piston pin clip installed in groove.

Caution

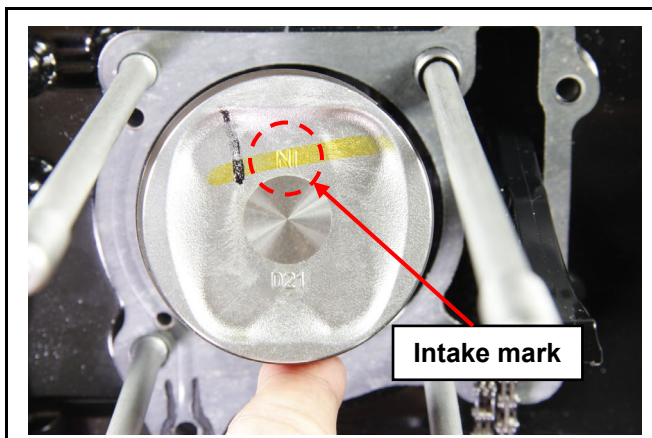
- Do not let the piston pin clip notch align with its install notch.



Ensure the installation direction of piston.

Caution

- The IN mark is installed on the top of piston face, aligning with the intake valve.



Ensure installation direction for piston rings.

Cylinder Installation

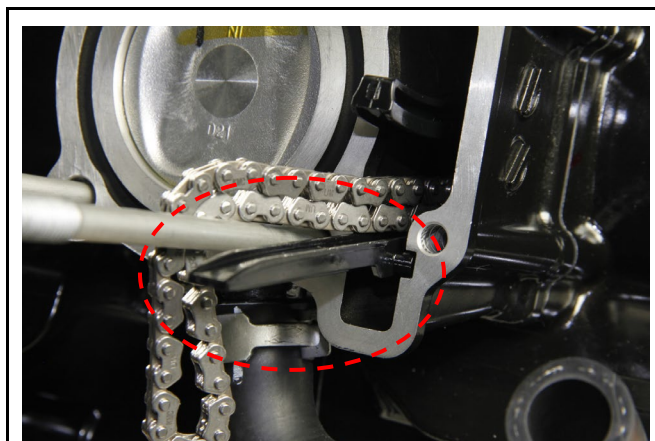
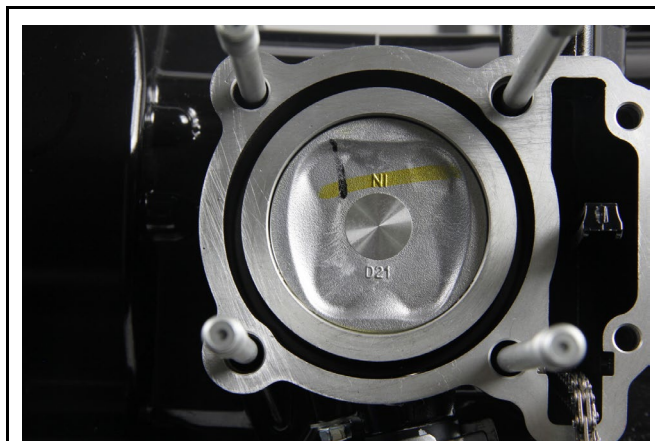
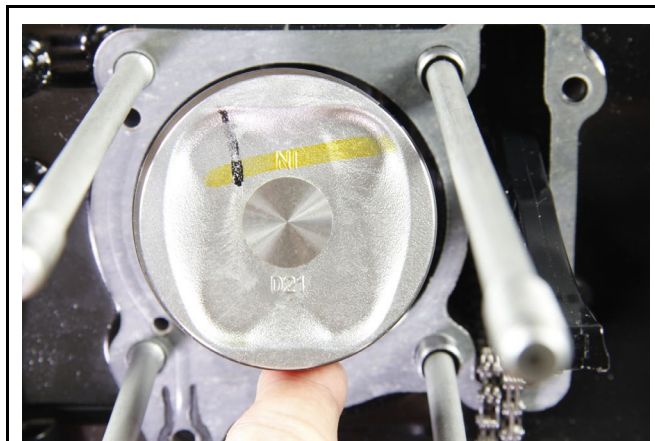
Lubricate cylinder wall and piston moderately.
Combine cylinder and piston carefully, especially piston ring pressed into cylinder step by step.

Caution

- Do not insert piston into cylinder forcefully to avoid piston or piston ring damaged.

Install cylinder

Install cam chain guide.

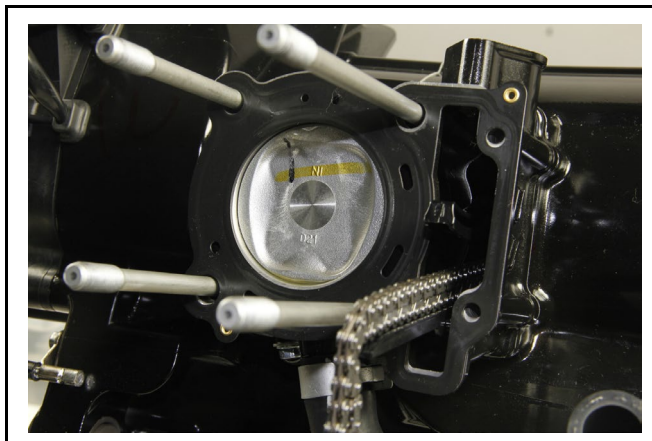


7. Cylinder / Piston

Install cylinder head gasket.

Caution

- Replace a new cylinder head gasket after service.



Piston Ring Removal and Inspection

Use clean cloth blocking the crankcase hole to avoid piston pin clip dropping in crankcase hole.
Remove piston pin clip with needle nose pliers.
Push piston pin out.

Remove piston ring.

Caution

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

Check if the piston rings are damaged or its installation grooves are worn.
Clean up the carbon built-up on installation grooves.

Install piston ring and measure the clearance between piston ring and its installation groove.

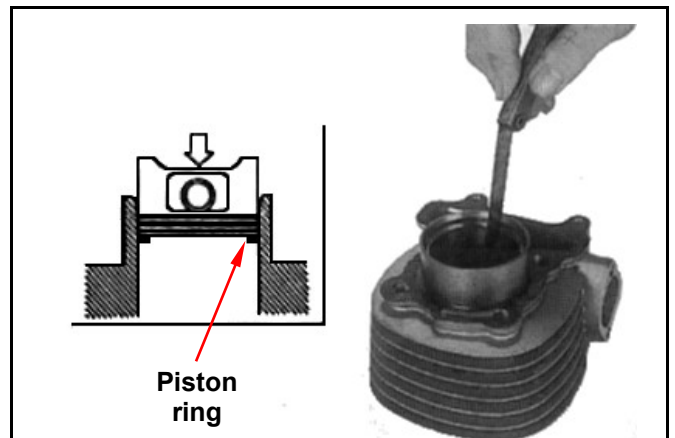
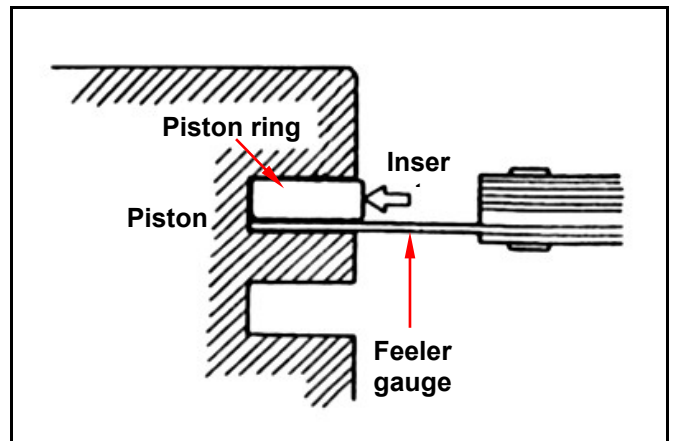
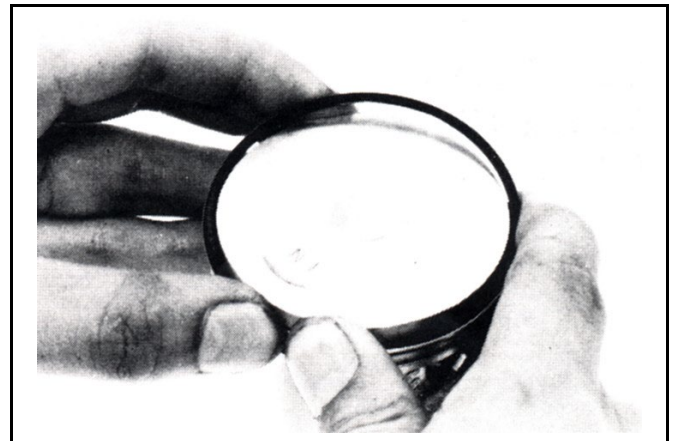
- Service limit
Top ring: 0.09 mm
2nd ring: 0.09 mm

Install piston rings into the bottom of cylinder respectively and push piston rings to a position below 20 mm of cylinder top with piston to keep the piston rings in a horizontal level in cylinder.
After that, measure the piston ring end gap.

Caution

- Use the surface of piston top to push piston ring into the cylinder in a horizontal way.

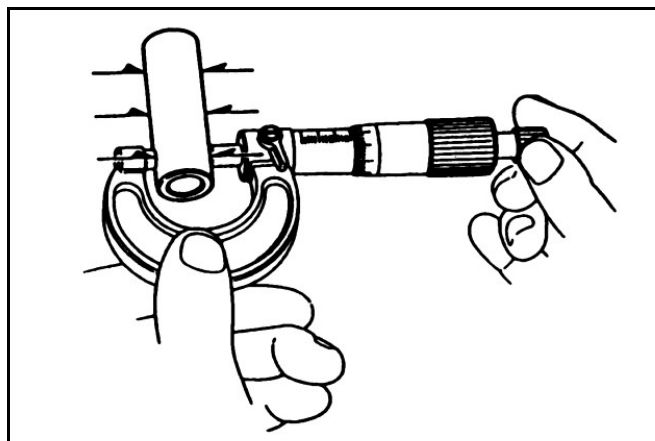
- Service limit
Top ring: 0.5 mm
2nd ring: 0.5 mm



7. Cylinder / Piston

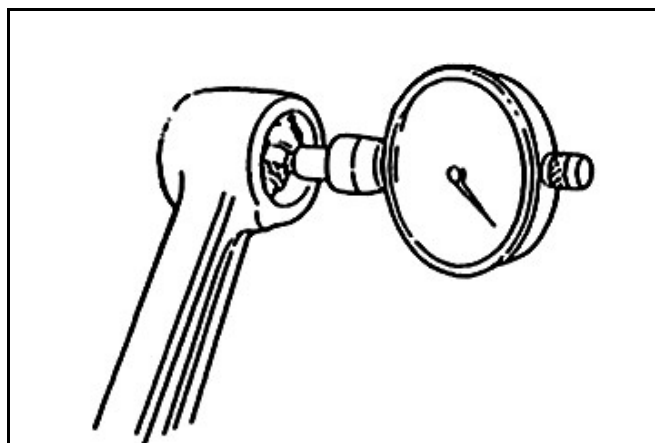
Measure the outer diameter of piston pin.

- Service limit: $15\ 0\sim-0.006\text{mm}$



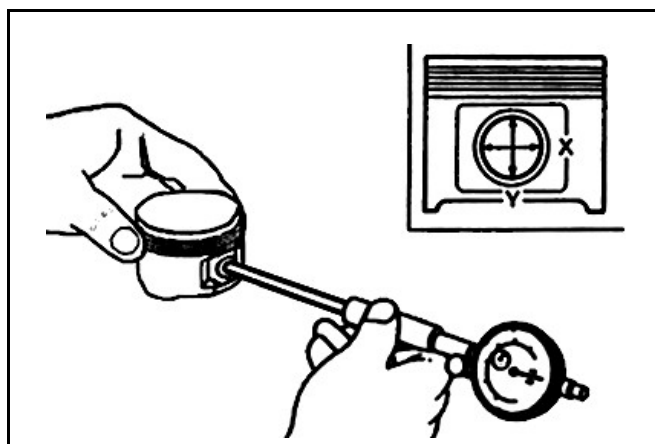
Measure the inner diameter of connecting rod small end.

- Service limit: $15\ +0.016\sim+0.034\text{mm}$



Measure the inner diameter of piston pin hole.

- Service limit: $15\ +0.008\sim+0.002\text{mm}$

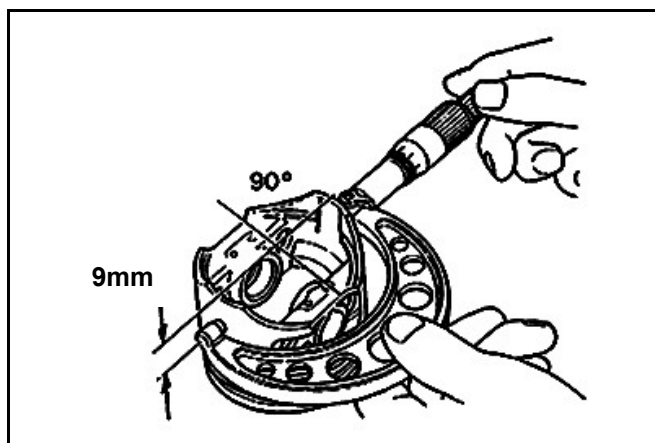


Measure the piston outer diameter.

- Service limit: $58.65\ 0\sim-0.05\text{mm}$

Caution

- Refer to chapter 2 to conduct measurement.



Piston Ring Installation

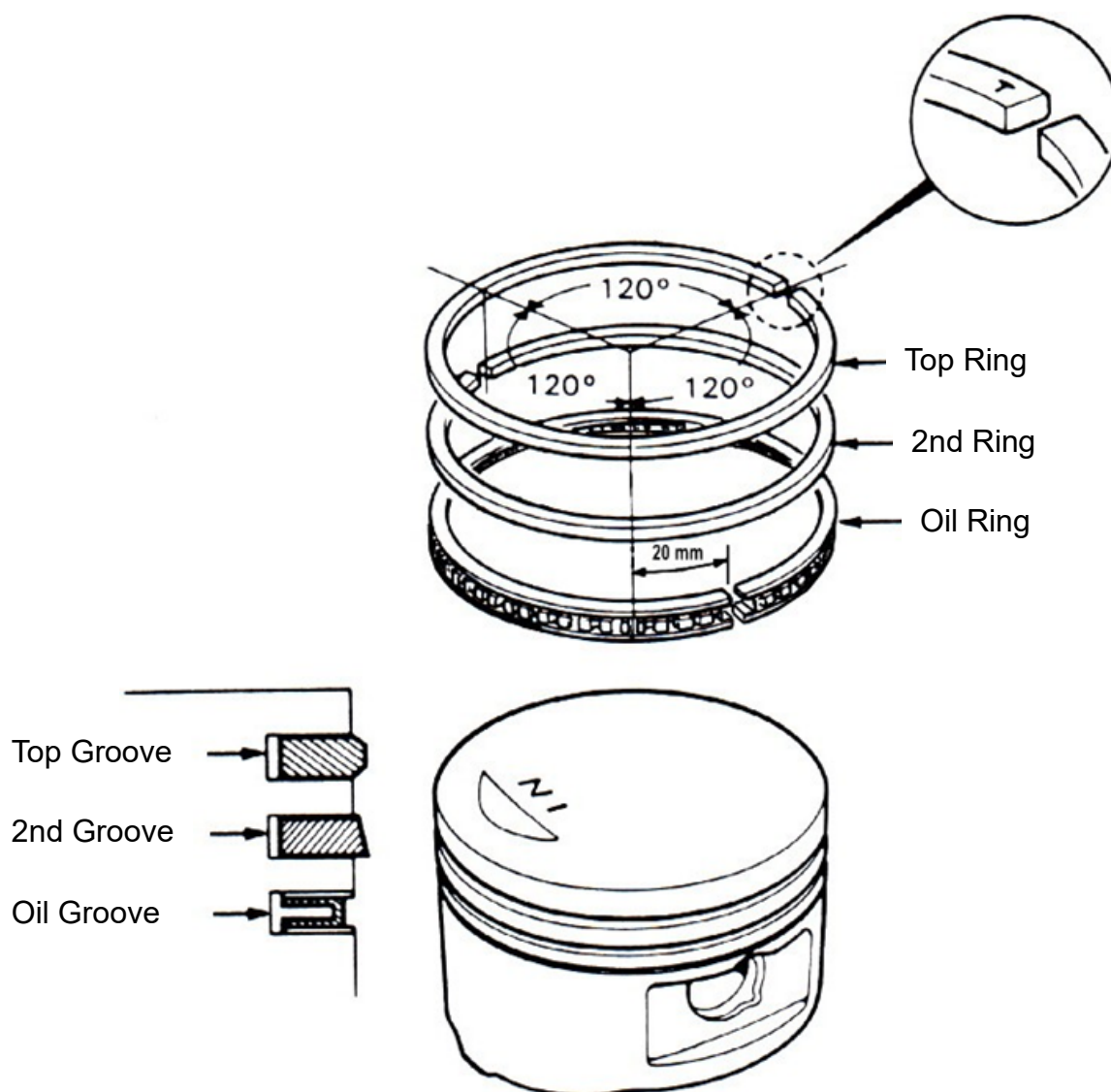
Clean up piston top, piston ring groove, and piston surface.

Install the piston ring into piston carefully.

Place the opening of piston ring as shown below.

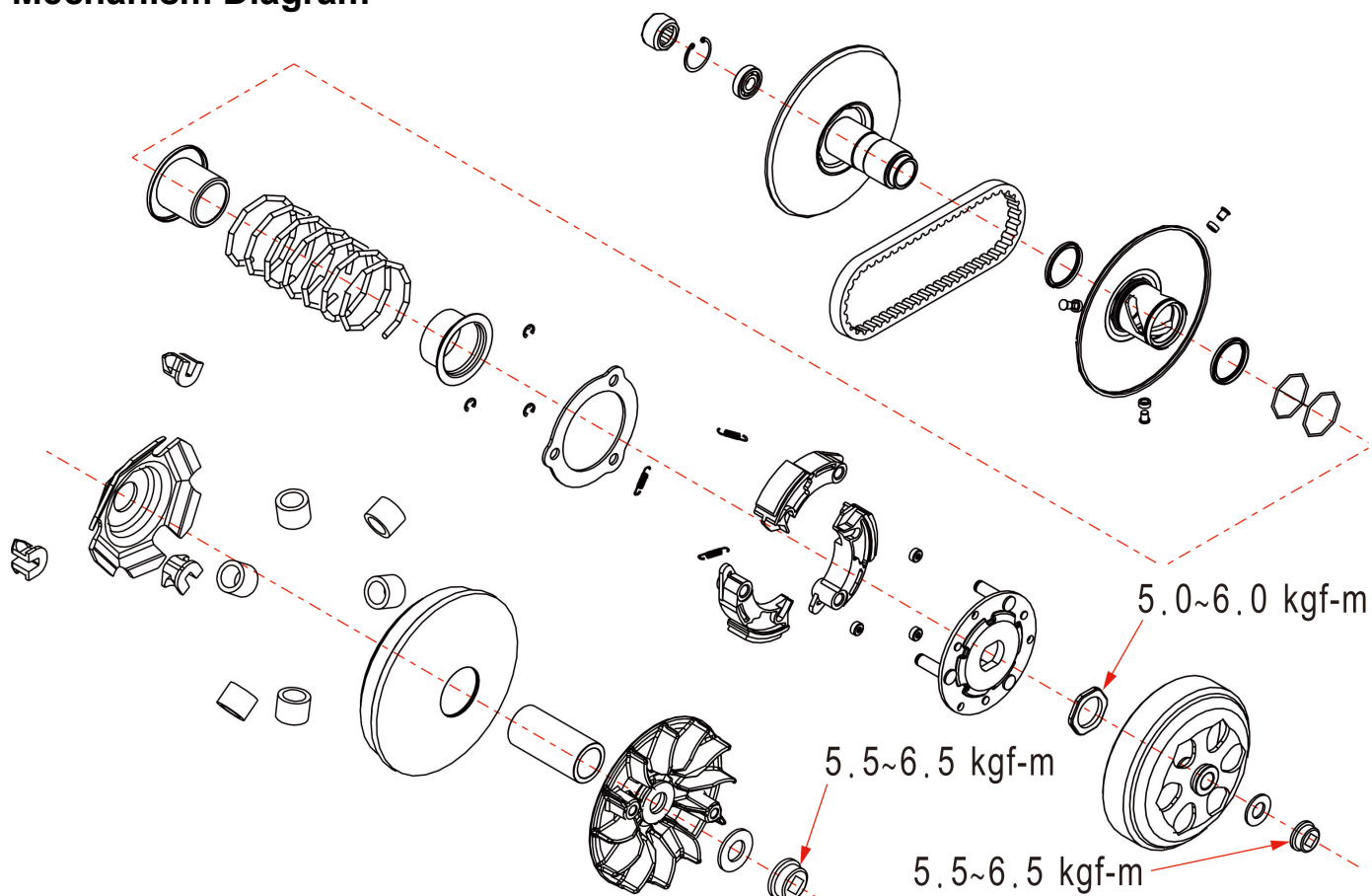
Caution

- Do not damage piston or piston rings while installing.
- All marks on the piston rings must face upwards.
- Having installed piston rings ensures each one can be rotated freely.



Mechanism Diagram.....8-1	Drive Belt/Drive System Removal..... 8-8
Precautions in Operation8-2	Drive Belt/ Drive System installation· 8-10
Troubleshooting8-2	Drive Belt Inspection 8-14
Left Crankcase Cover8-3	Clutch Outer / Driven Pulley..... 8-19
Left Crankcase Cover Bearing8-3	

Mechanism Diagram



8. V-Belt Drive System



Precautions in Operation

General Information

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

Specification

Item		Standard value Unit: mm
Driving belt width		22.4 \pm 0.4
Drive face boss	OD	27 -0.026~-0.040
	ID	20 +0.007~+0.002
	Length	57.6 \pm 0.05
OD of roller		18.0 \pm 0.3g
ID of clutch outer		134 +0.20~+0
Thickness of clutch weight		5
Free length of driven pulley spring		128.4

Torque value

Drive face nut	5.5~6.5kgf-m
Clutch outer nut	5.5~6.5kgf-m
Clutch nut	5.0~6.0kgf-m
Left crankcase cover bolt	1.0~1.5kgf-m

Special Tools

Clutch spring compressor	SYM-2301000
Inner bearing puller	SYM-6204025
Clutch nut wrench	SYM-9020200
Universal holder	SYM-2210100
Bearing driver	SYM-6204024

Troubleshooting

Engine can be started but motorcycle cannot be moved

- Worn driving Belt
- Worn drive face
- Worn or damaged clutch weight
- Broken driven pulley spring

Shudder or misfire when driving

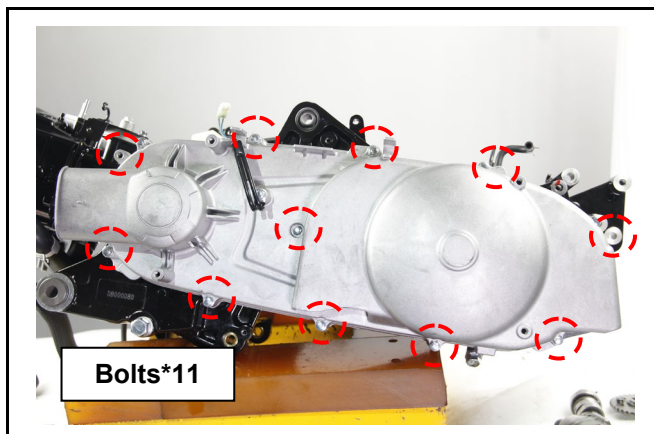
- Broken clutch weight
- Worn clutch weight

Insufficient horsepower or poor high speed performance

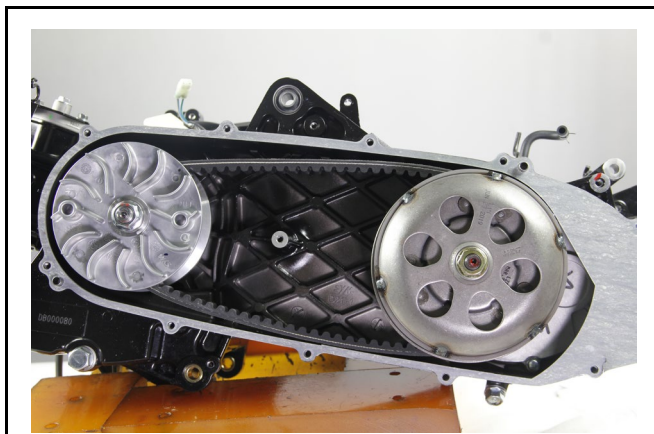
- Worn driving belt
- Insufficient spring force of driven pulley
- Worn roller
- Driven pulley does not move smoothly

Left crankcase cover

Remove left crankcase cover bolts.

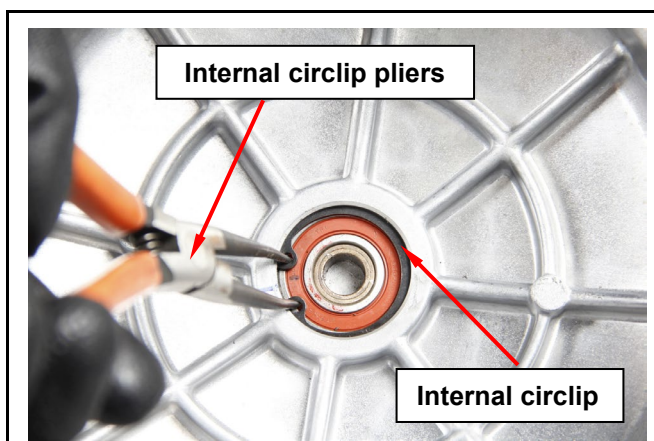


Remove the left crankcase cover



Left Crankcase Cover Bearing

Remove the internal circlip with internal circlip pliers.



8. V-Belt Drive System

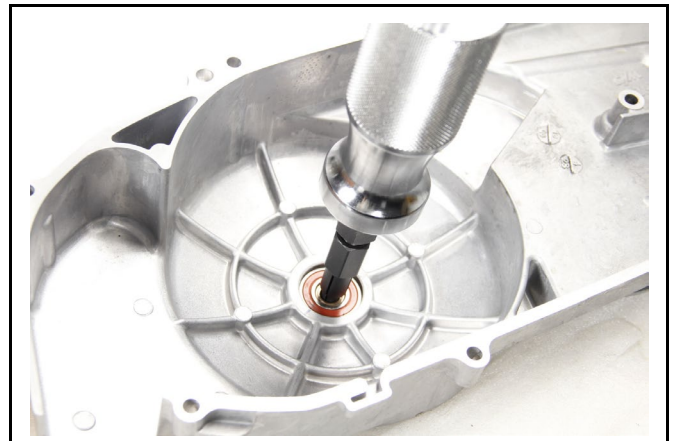


- Special tool: Bearing extractor
NO. SYM-6204025

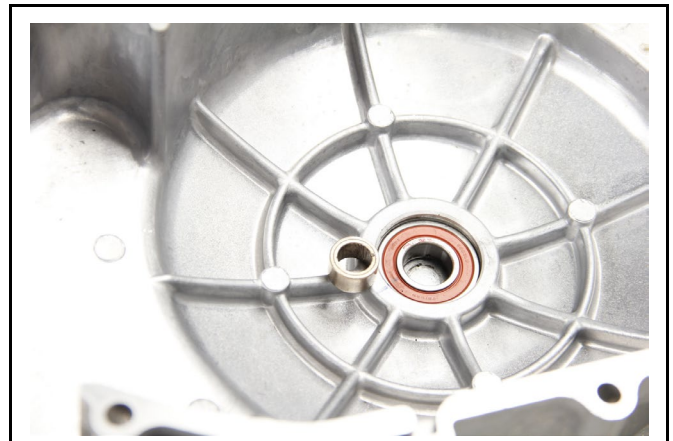
Use Impact bearing puller



Choose an appropriate size bearing extractor.
Screw the thread part of bearing extractor to combine bearing.

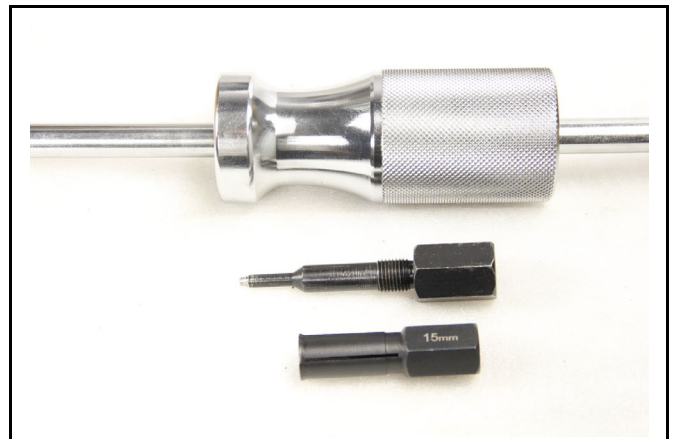


Use the impact bearing puller.
Pull out the bush.



- Special tool: Bearing extractor
NO.SYM-6204025

Use the impact bearing puller



Choose an appropriate size bearing extractor.
Screw the thread part of bearing extractor to combine bearing.



Use the impact bearing puller.
Pull out the bearing.



Left crankcase cover bearing installation

Lubricate the surface of bearing hole on the case before installing the bearing.

The side with the marking word should be toward top.

⚠Caution

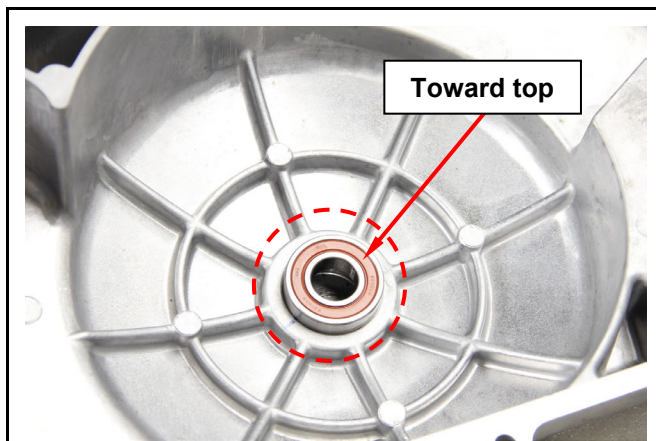
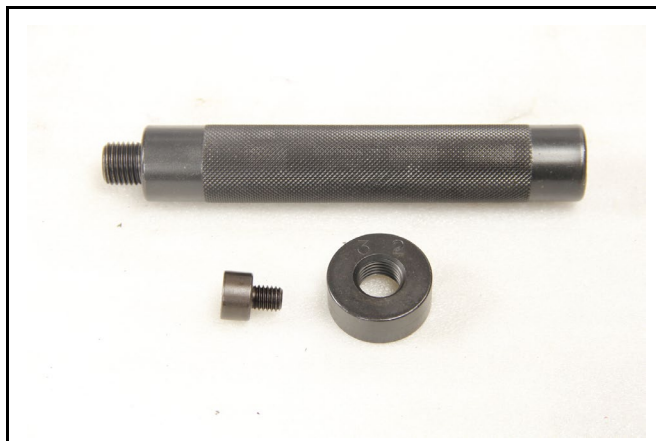
- Never install used bearings. Once remove the bearing, must replace a new one.

- Special tool: Bearing driver tool
NO. SYM-6204024

Assembly sequence: Impact tool + Impact ring + Locator

One side of the bearing surface is metal, and the other is plastic.

The surface with plastic cap should be toward the top.



8. V-Belt Drive System

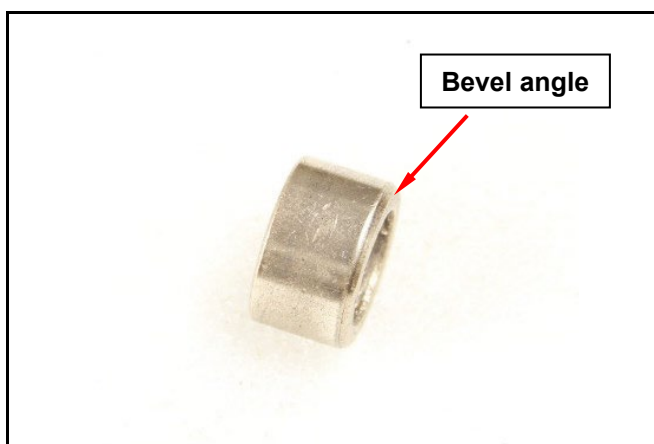
Put the bearing on the center of bearing hole, the install the bearing with impact tool.



Confirm that the bearing is knocked into the right position.



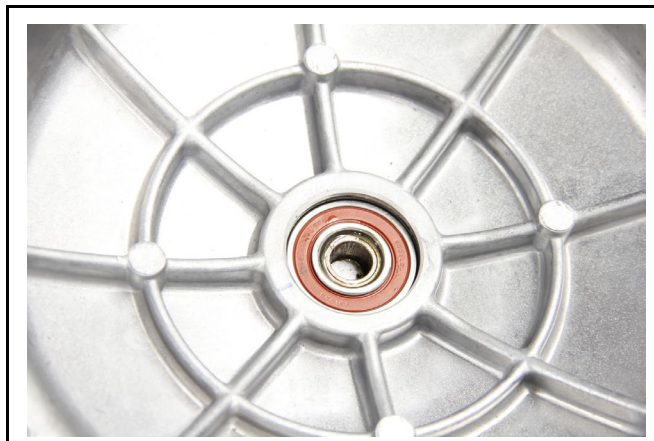
The side of bevel angle should be toward the bottom.



Use the impact tool.



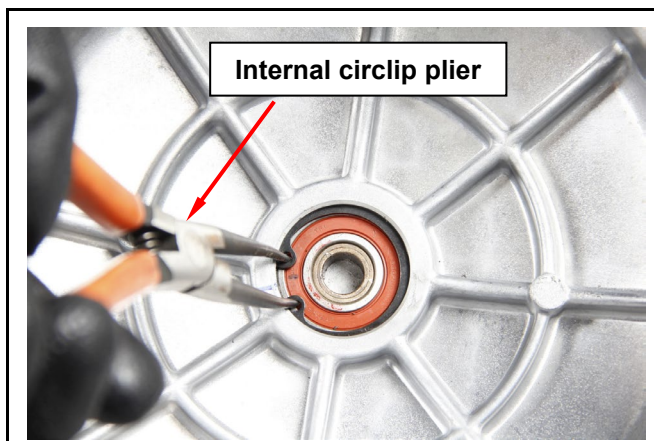
Install the bush.



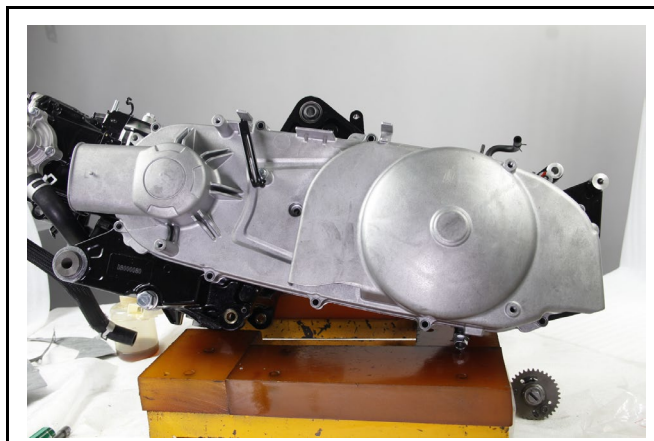
Use internal circlip pliers.
Install the internal circlip.

Caution

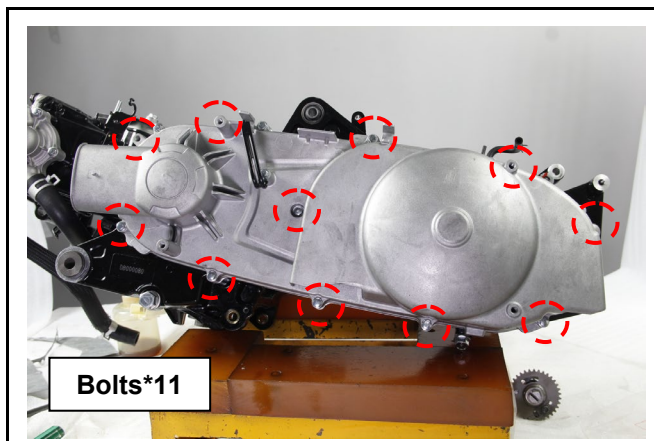
- Confirm the installation of circlip that must enter the groove.



Install the left crankcase cover.



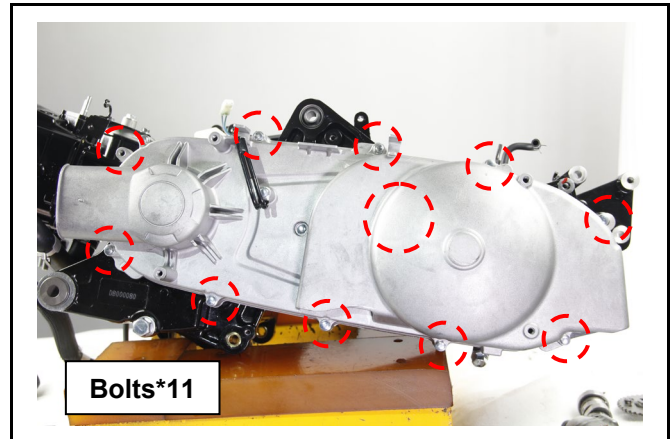
Tighten the left crankcase cover bolts.



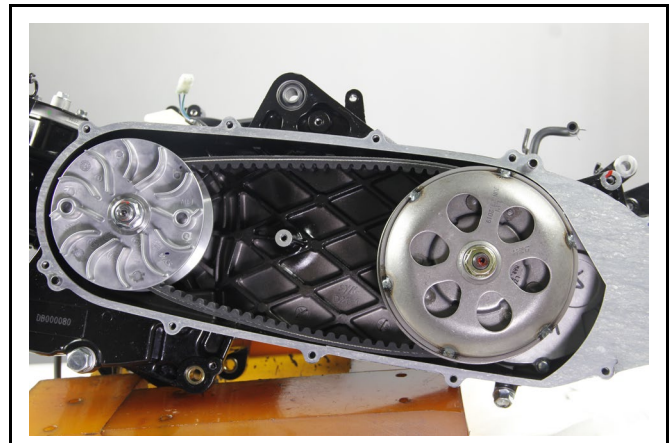
8. V-Belt Drive System

V-Belt/Drive System Removal

Remove left crankcase cover bolt.

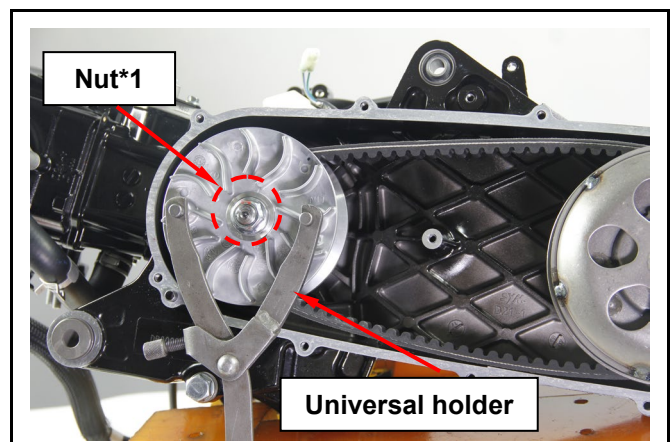


Remove the left crankcase cover.

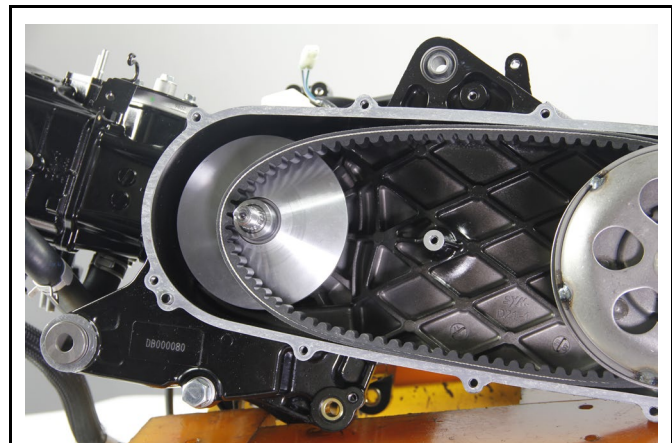


Hold the drive face with a universal holder, then remove the nut and washer.

- Special tool: Universal holder
NO. SYM-2210100



Remove drive face.



Hold the clutch outer with a universal holder, then remove the nut.

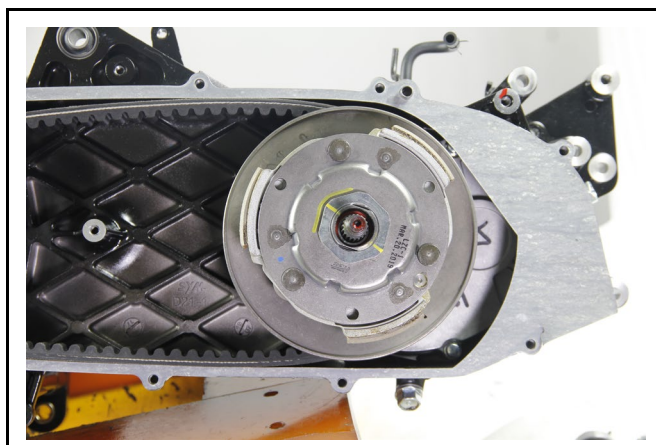
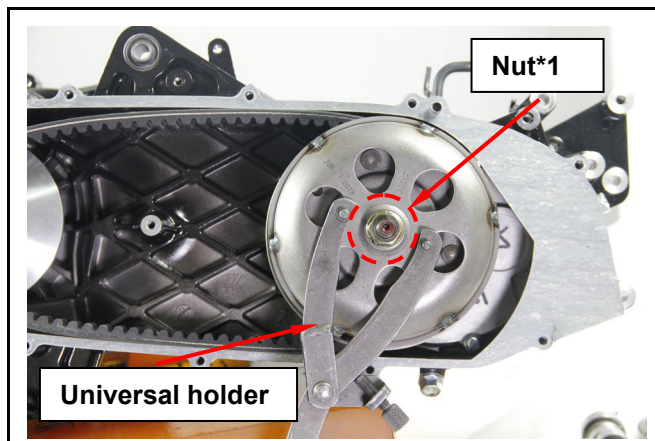
Caution

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

- Special tool: Universal holder
No. SYM-2210100

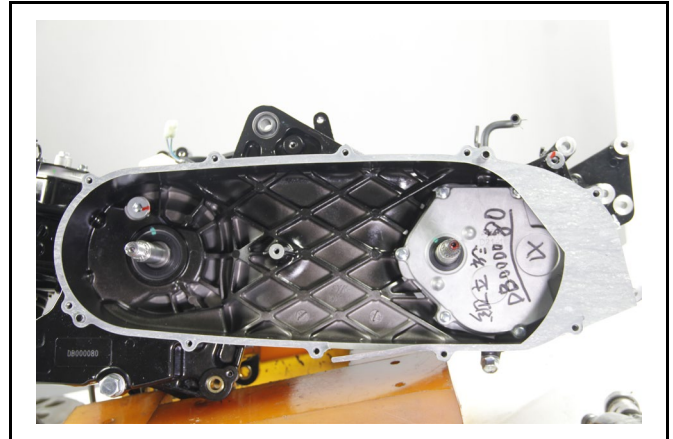
Remove the clutch outer.

Remove the clutch and drive belt.

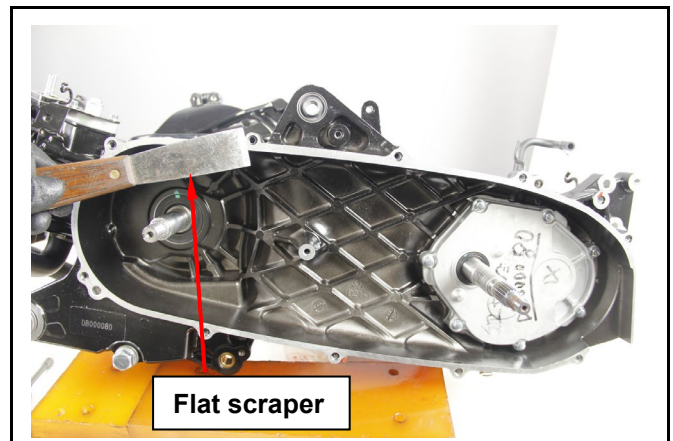


8. V-Belt Drive System

Remove the movable drive face.



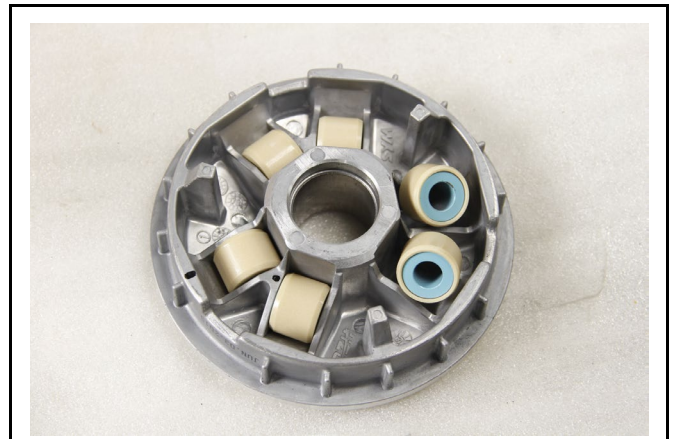
Remove the used gasket with a flat scraper



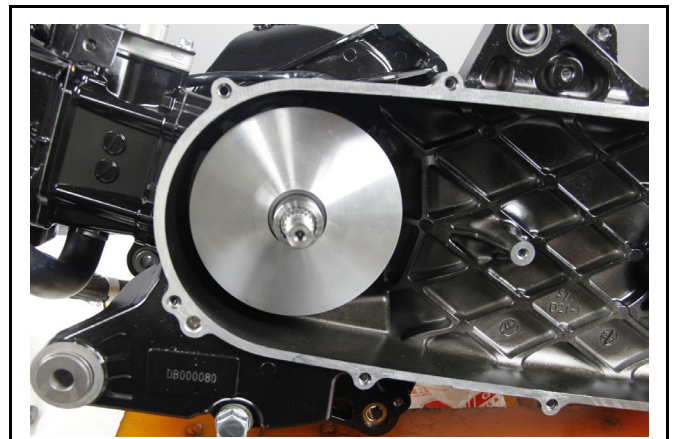
V-Belt/Drive System Installation

Ensure the installatino direction of weight roller.

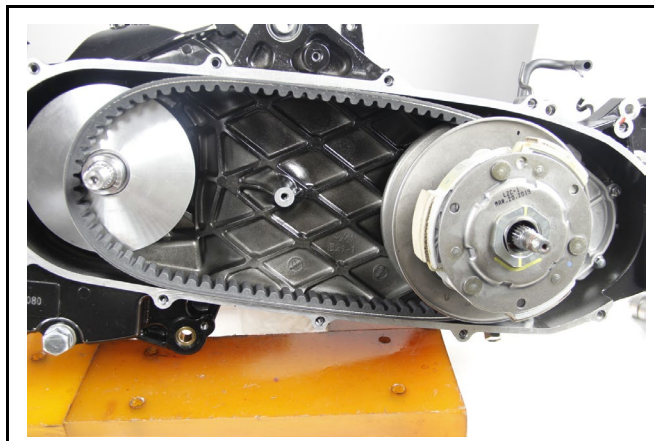
- Weight: $18.0 \pm 0.3g$



Install the movable drive face comp onto the crankshaft.

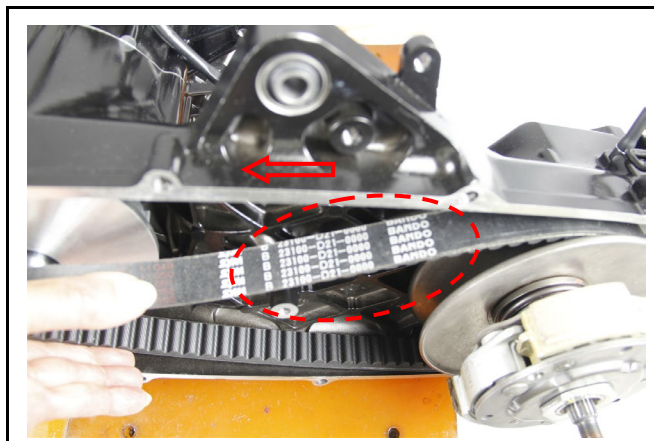


Install the drive belt onto the clutch.
Install the clutch onto the drive shaft.



Make sure the direction of drive belt.

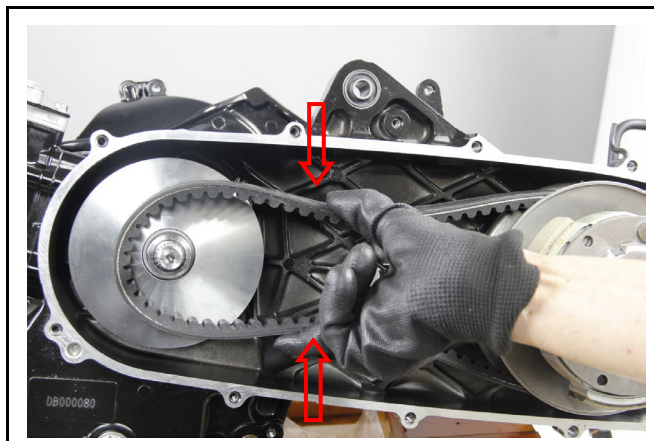
- Width : $22.4 \pm 0.4\text{mm}$



Press and put the drive belt into the pulley groove.

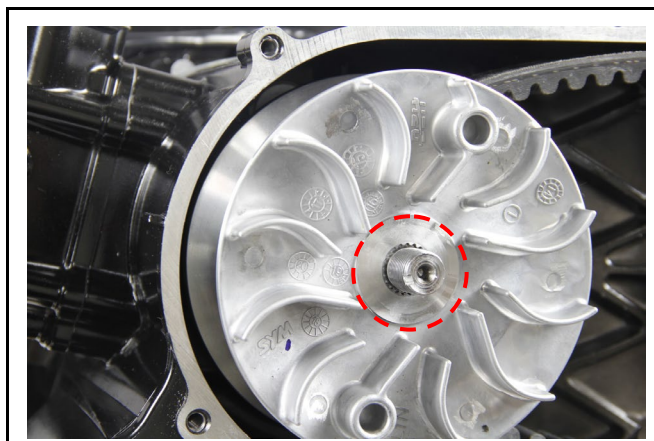
Caution

- Press down drive belt, make sure drive belt would not damage and tighten drive face indeed.



Install the drive face.

Make sure the drive face and crankshaft assemble tightly.

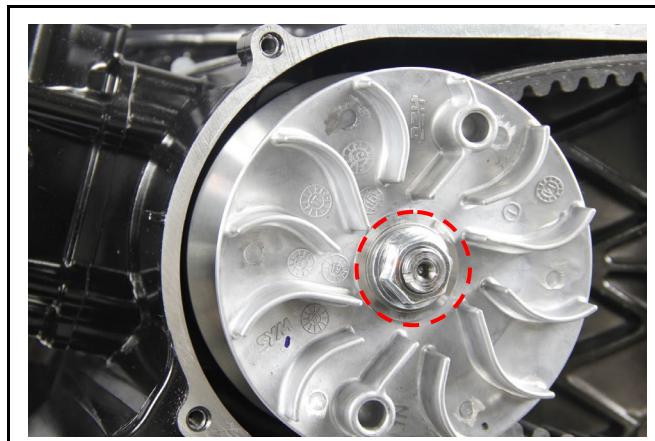


8. V-Belt Drive System

Install the washer and nut.

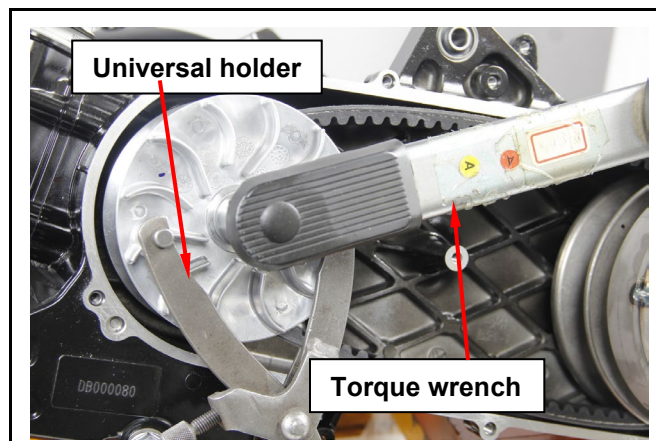
Caution

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

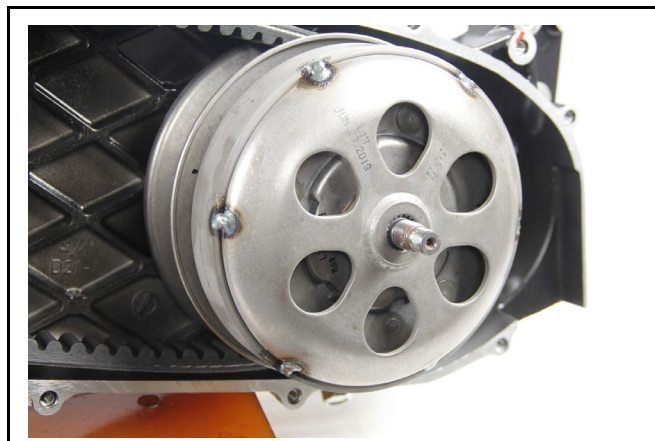


Hold drive face with universal holder.
Tighten nut to specified torque.

- Special tool: Universal holder
NO. SYM-2210100
- Torque wrench:
1800DB 200~1800kgf-cm
Torque: 550~650kgf-cm

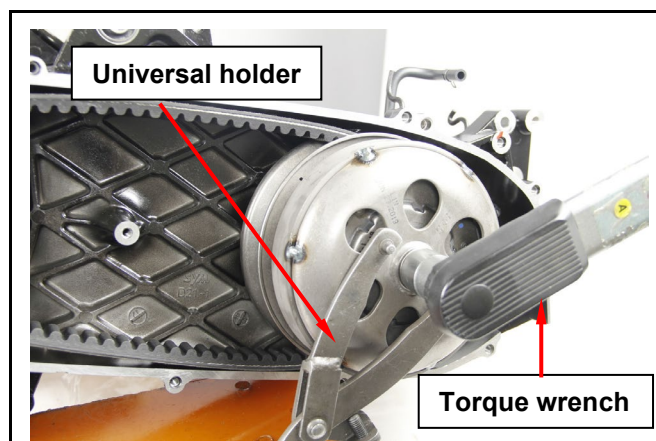


Install the clutch outer, washer and nut.

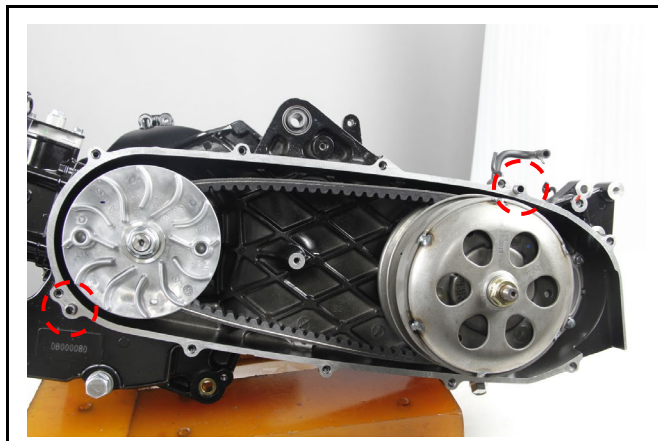


Hold the clutch outer with a universal holder.
Tighten the nut reaching specified torque value.

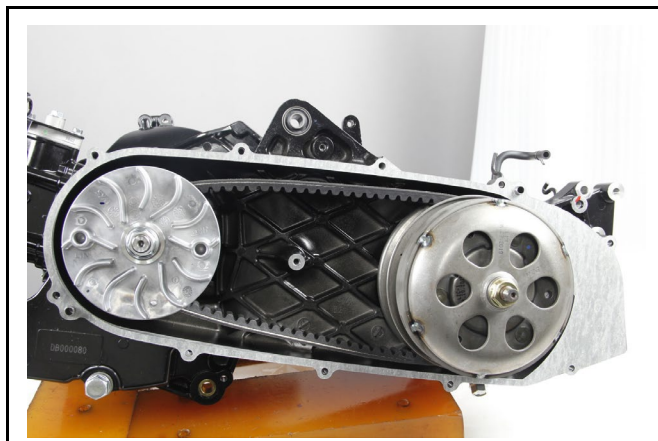
- Special tool: Universal holder
NO. SYM-2210100
- Torque wrench
1800DB 200~1800kgf-cm
Torque: 550~650kgf-cm



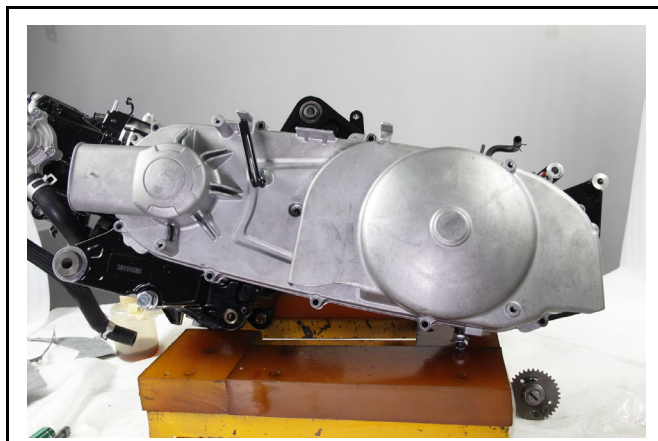
Install the dowel pin.



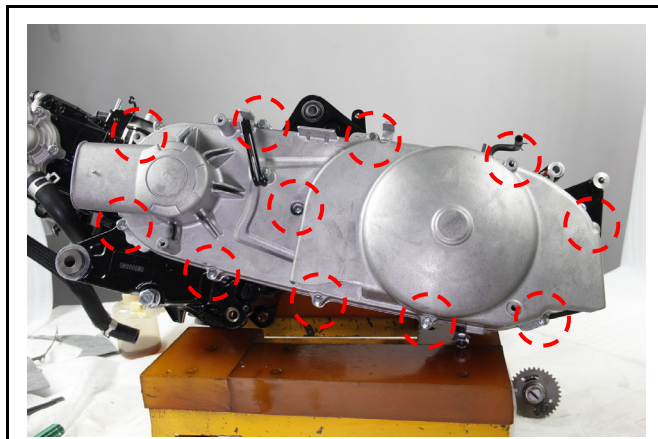
Install the new gasket.



Install the left crankcase cover.



Tighten the left crankcase cover bolts.



8. V-Belt Drive System

Drive Belt

Removal

Remove the left crankcase cover

Hold the drive face with a universal holder, and then remove the nut, washer and drive face.

- Special tool: Universal holder
No. SYM-2210100

Hold the clutch outer with a universal holder, and then remove nut and clutch outer.

Caution

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

Push the driving belt into the belt groove as the diagram shown, pinch the belt, and then pull the driven pulley out by pulling the driving belt.

Inspection

Check if the driving belt is cracked or worn, replace it if it's necessary.

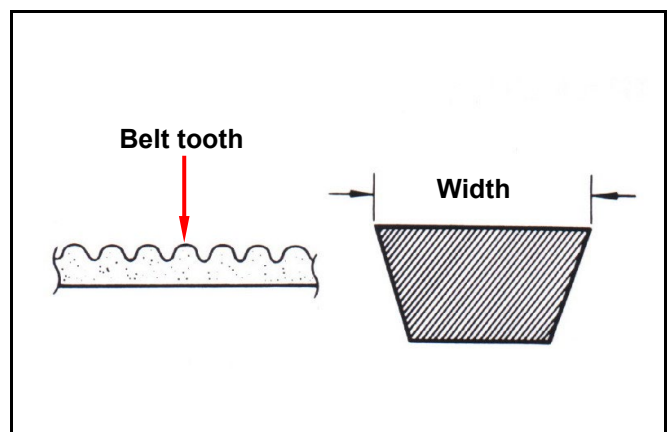
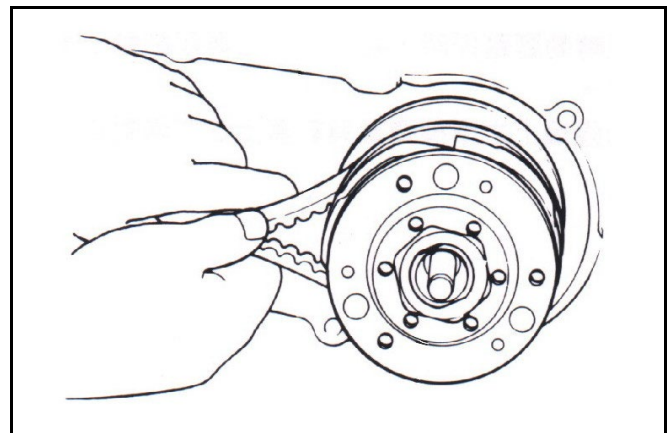
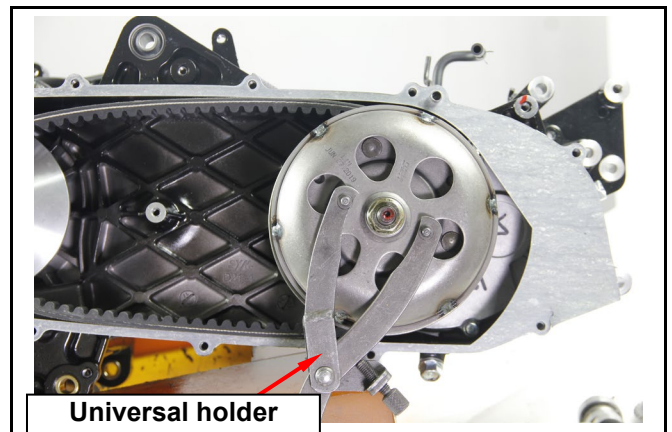
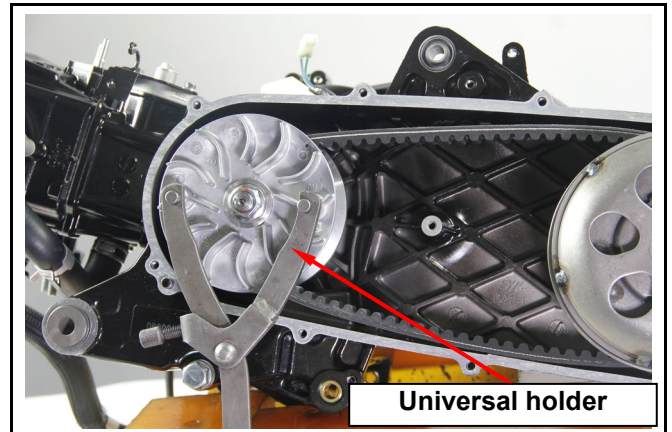
Measure the width of driving belt as the diagram shown.

Replace the belt if it exceeds the service limit.

- Service Limit: $22.4 \pm 0.4\text{mm}$

Caution

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

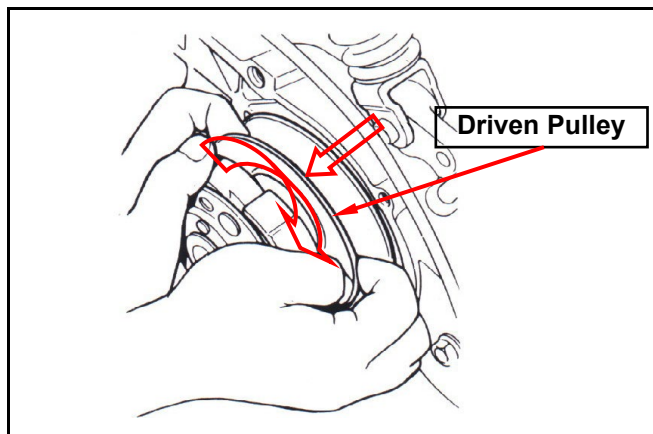


Installation

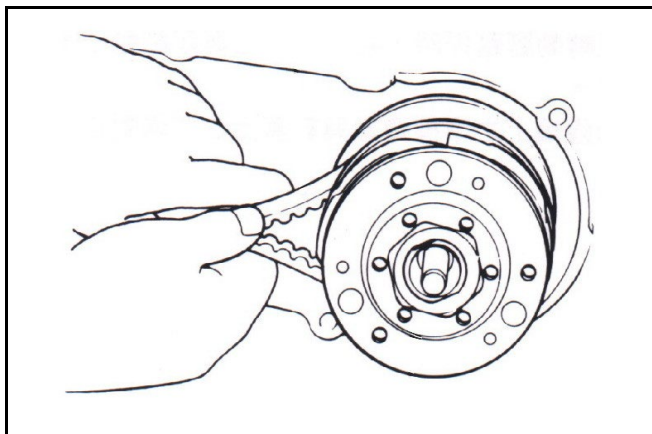
Pinch the driven pulley, then push the driving belt into the groove of driven pulley quickly.

⚠ Caution

- Pull driven pulley clockwise, and install driving belt into driven pulley. It would be easy to install driving belt onto drive face.

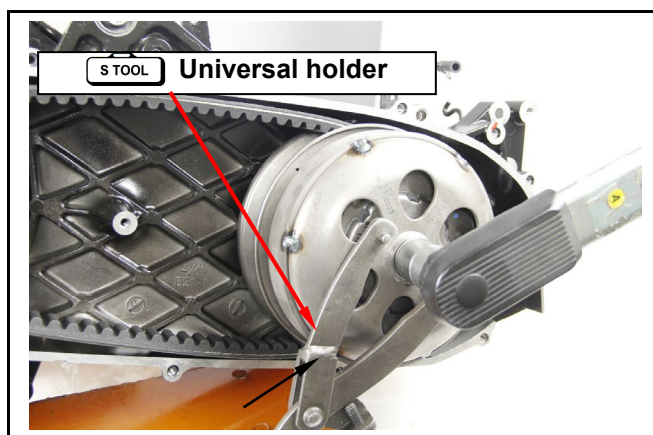


Install the driven pulley combined with the driving belt onto the drive shaft.



Install the clutch with a universal holder, then tighten the nut to standard torque value.

- Torque value: 550~650kgf-cm



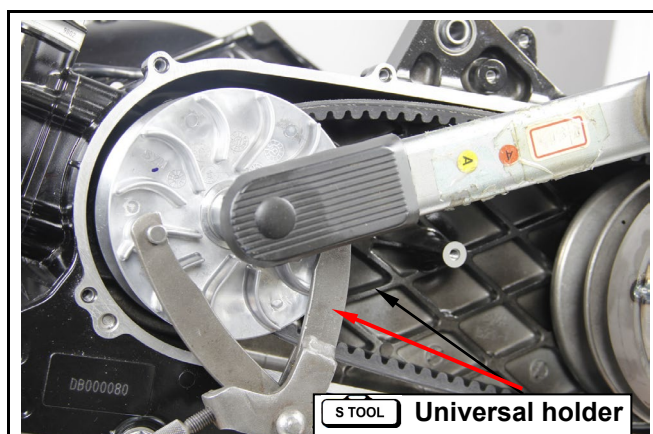
Install the drive face, washer and nut.

⚠ Caution

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

Install the drive face with a universal holder, then tighten nut to standard torque value.

- Torque value: 550~650kgf-cm



8. V-Belt Drive System



Drive Face

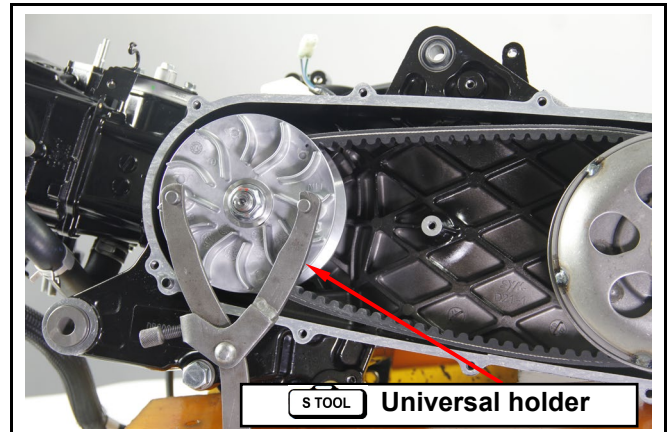
Removal

Remove the left crankcase cover.

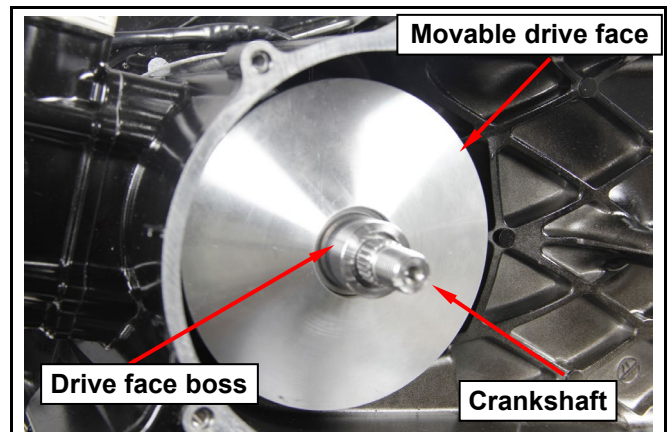
Hold the drive face with a universal holder, and then remove the nut and washer.

Remove drive face and drive belt.

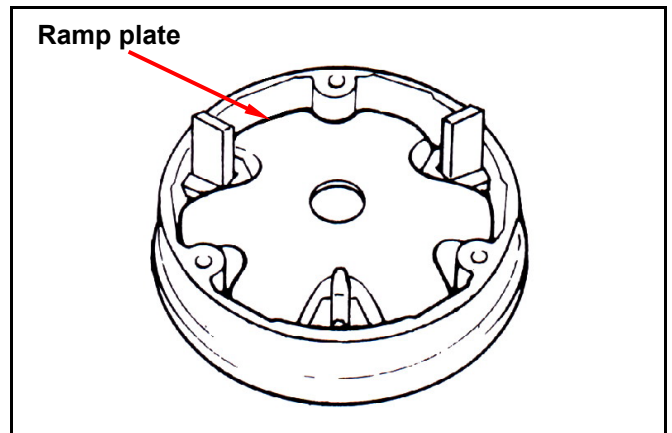
- Special tool: Universal holder
NO. SYM-2210100



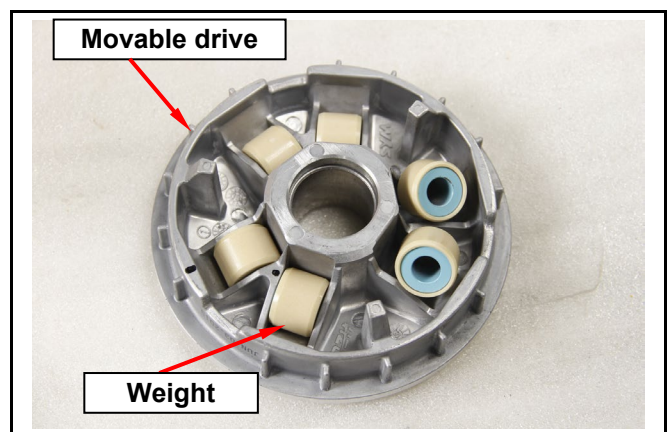
Remove the movable drive face comp from the crankshaft.



Remove the ramp plate.



Remove the weight rollers from movable drive face.



Inspection

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

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

Check if the rollers are worn out or damaged, replace them if it's necessary.

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

- Weight: $18.0 \pm 0.3g$

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

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

- Service limit: $27 -0.026 \sim -0.040mm$

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

- Service limit: $20 +0.007 \sim +0.002mm$

Reassembly/installation

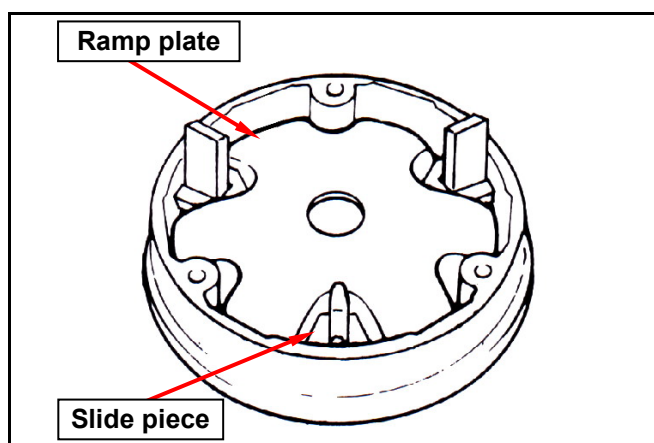
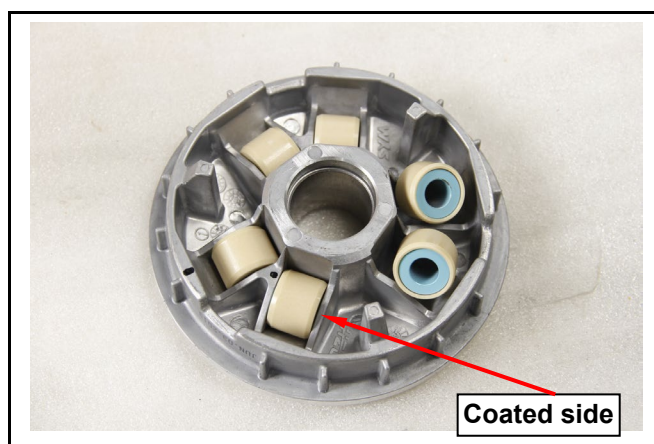
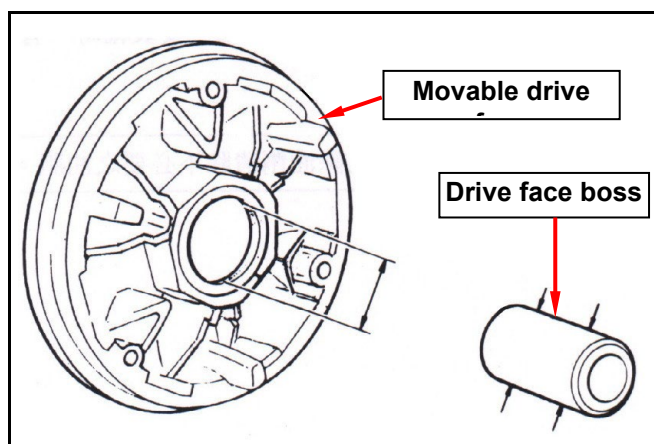
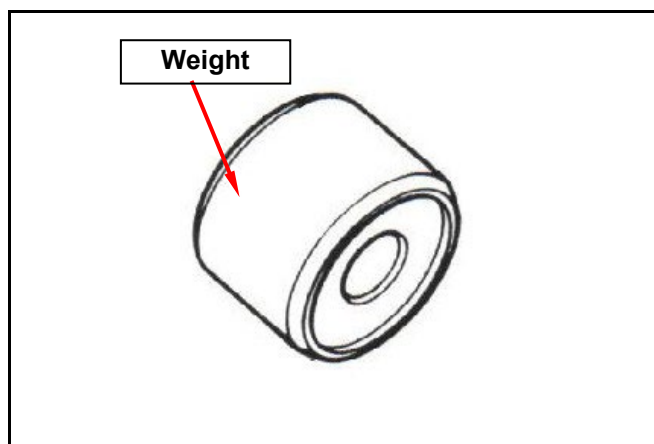
Install weight rollers.

Caution

- There are two different sides to weight roller. Install the coated side counterclockwise onto movable drive face, to avoid weight roller abnormal wear and extend useful life.

Install the slide piece onto the ramp plate.

Install the ramp plate.



8. V-Belt Drive System

Apply with a little grease onto the hole of movable drive face.

Caution

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

Install the movable drive face comp. onto crankshaft.

Drive pulley installation

Pinch the driving belt into the pulley groove.

Caution

- Press down drive belt, make sure drive belt would not damage and tighten drive face indeed.

Install the drive face, nut and washer.

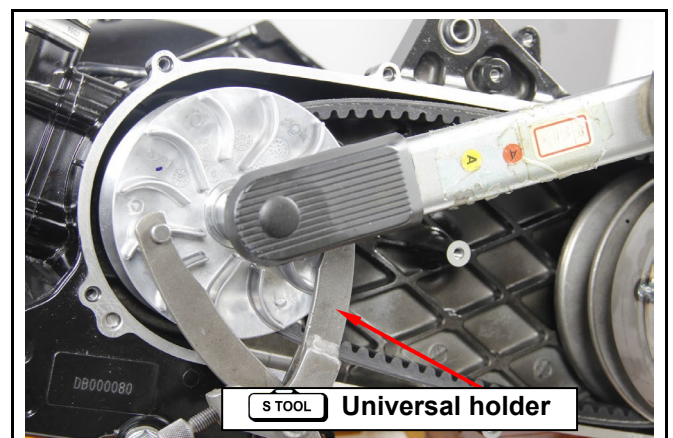
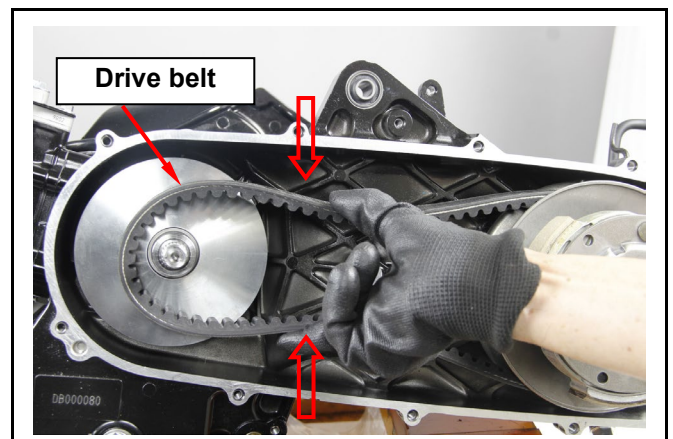
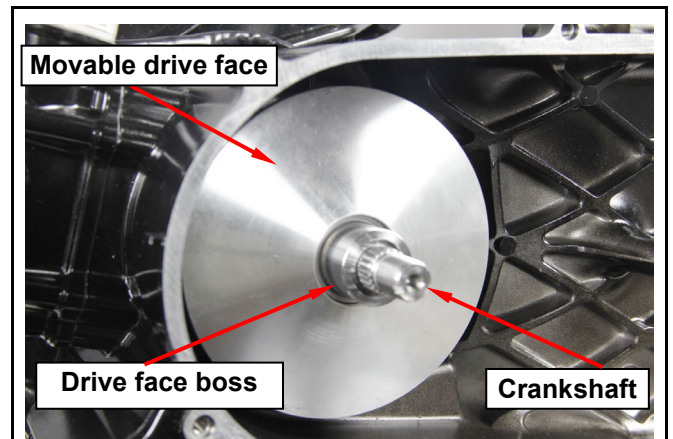
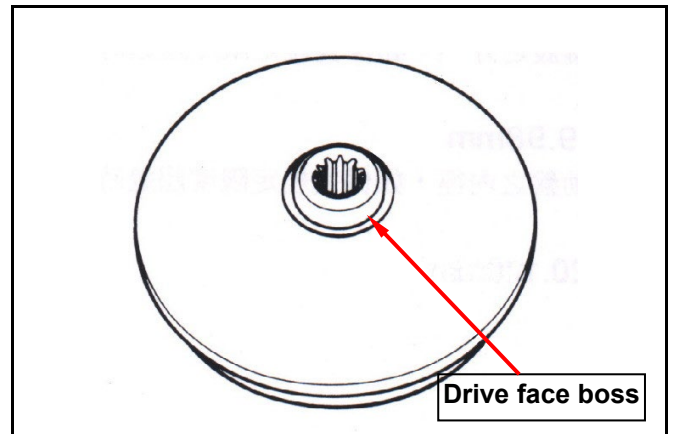
Caution

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

Hold the drive face with a universal holder.
Tighten the nut to standard torque value.

- Torque valve: 550~650kgf-cm

Install the left crankcase cover.



Clutch Outer / Driven Pulley

Disassembly

Remove the driving belt, clutch outer, and driven pulley.

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

⚠ Caution

- Do not press the compressor too much.

- Special tool: Clutch spring compressor
NO. SYM-2301000
- Special tool: Clutch nut wrench
NO. 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 clutch weight and spring from driven pulley.

Remove the collar from driven pulley.

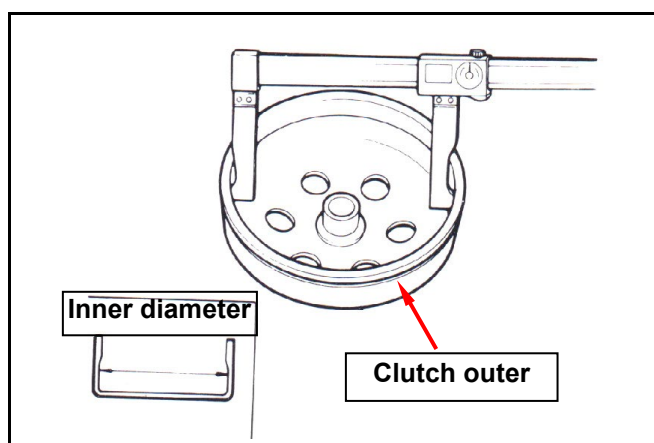
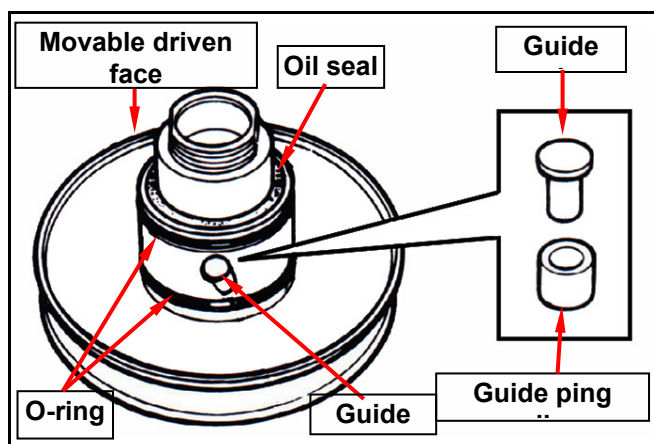
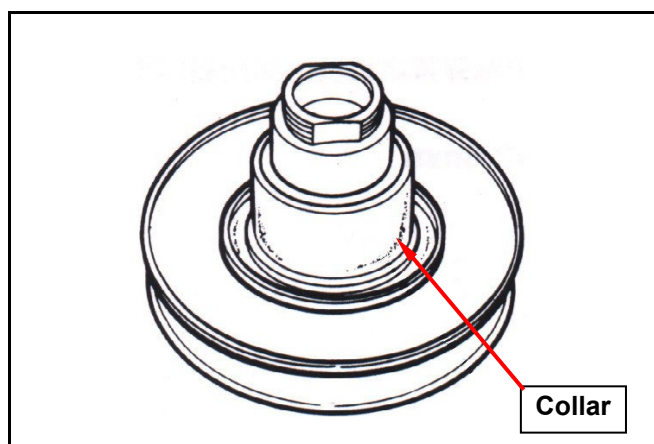
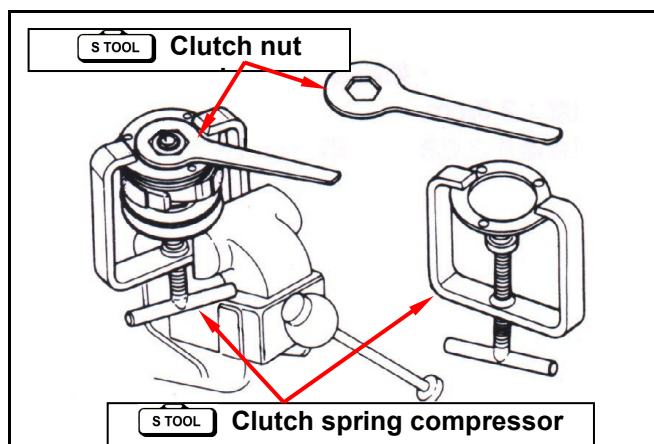
Remove guide pin, guide pin roller, and movable driven face, and then remove O-ring & oil seal seat from movable driven face.

Inspection

Clutch outer

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

- Service limit: $134 +0.20 \sim +0\text{mm}$

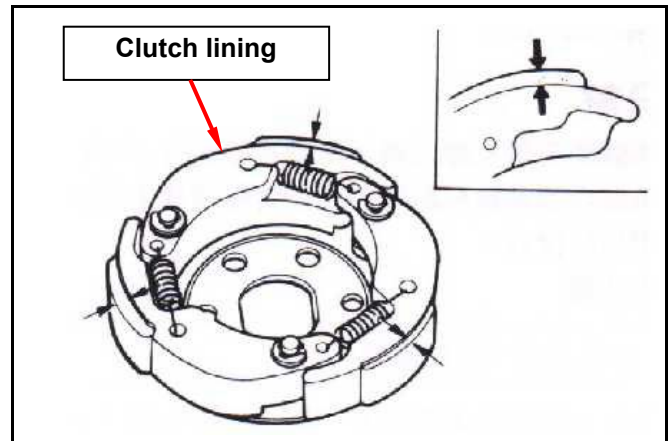


8. V-Belt Drive System

Clutch lining

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

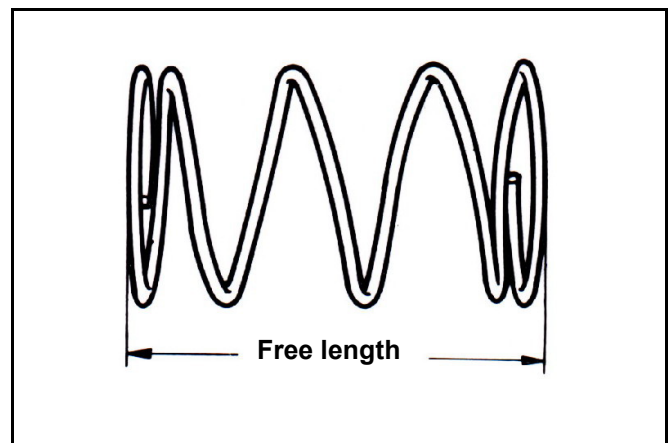
- Thickness : 5.0mm



Driven pulley spring

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

- Free length: 128.4 mm



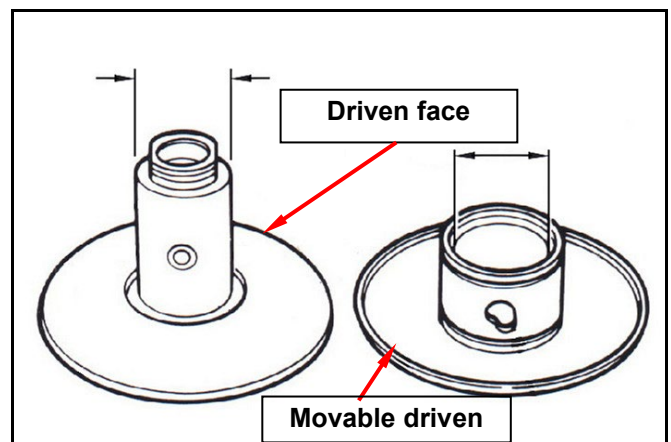
Driven pulley

Check following items:

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

Replace damaged or worn components.

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



Driven pulley bearing inspection

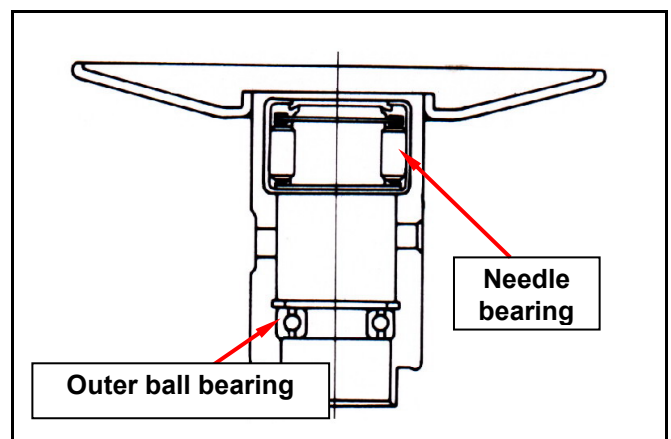
Check if the inner bearing oil seal is damaged.

Replace it if necessary.

Check if the 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 rotation is smooth and silent.

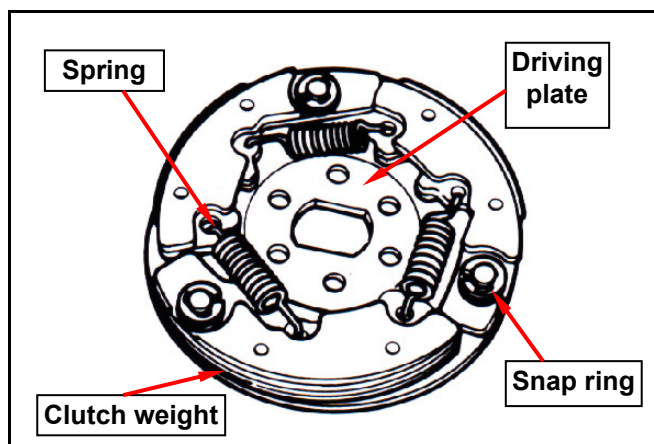
Check if the bearing outer parts are closed and fixed. Replace it if necessary.



Clutch weight replacement

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

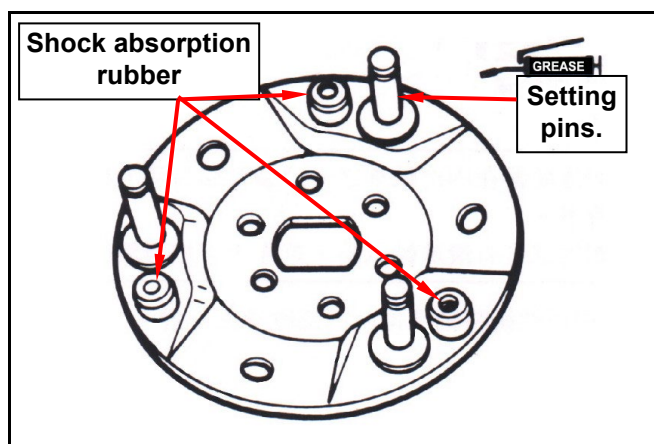
Check if the spring is damage or insufficient elasticity.



Check if the shock absorption rubber is damaged or deformation.

Replace it if necessary.

Apply with grease onto setting pins.

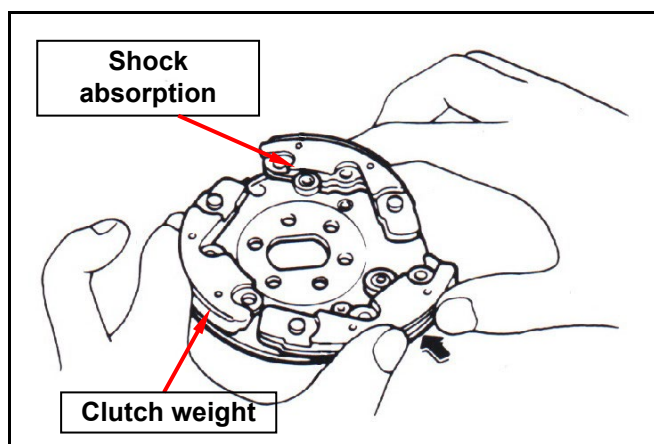


Apply with grease onto setting pins, but the clutch block should not be greased. If so, replace it.

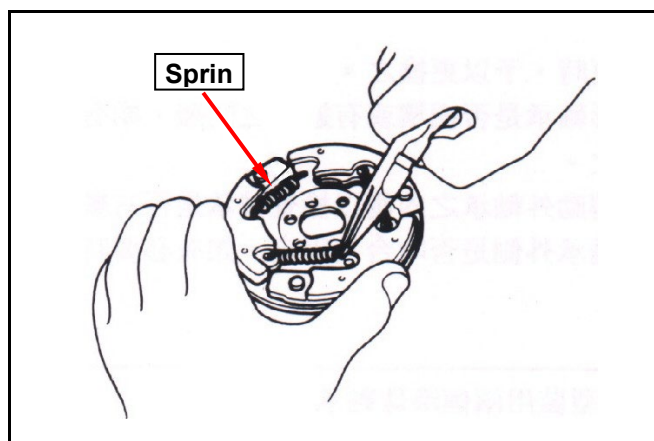
Install the new clutch weight onto setting pin and then push to the specified location.

⚠ Caution

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

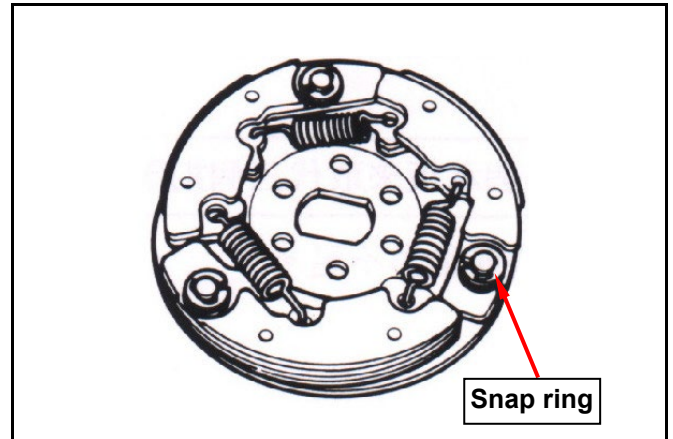


Install the spring into groove with pliers.



8. V-Belt Drive System

Install the snap ring and mounting plate onto setting pin.

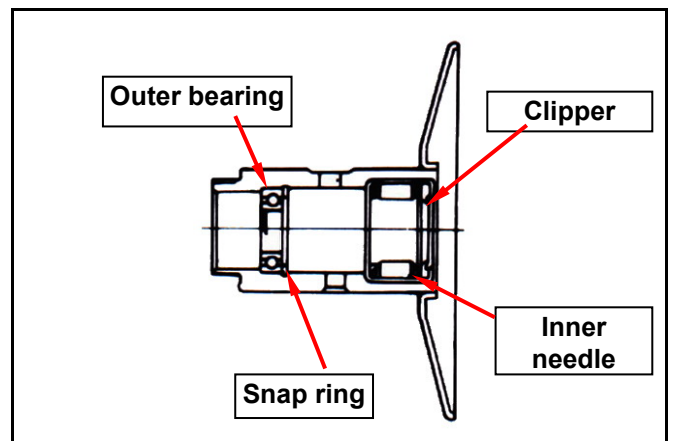


Driven pulley bearing replacement

Remove the inner bearing.

Caution

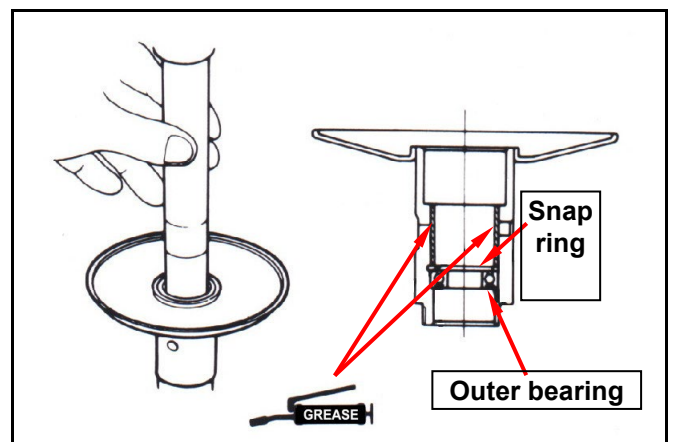
- If the inner bearing equipped with oil seal on side in the driven pulley, then remove the oil seal firstly.
- If the pulley equipped with ball bearing, it has to remove snap ring and then the bearing.



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

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

Fix the bearing with snap ring.

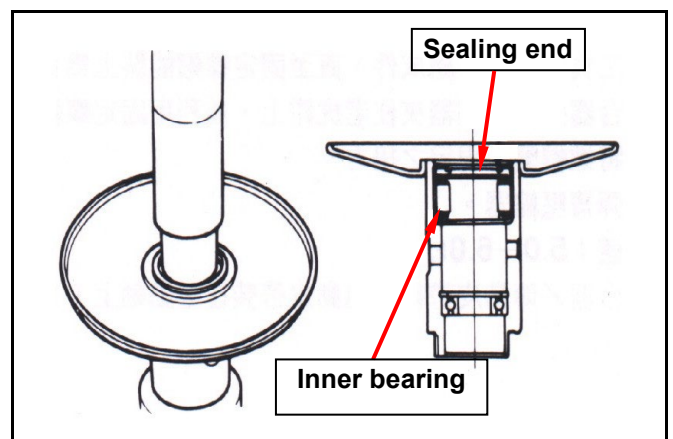


Install new inner bearing.

Caution

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

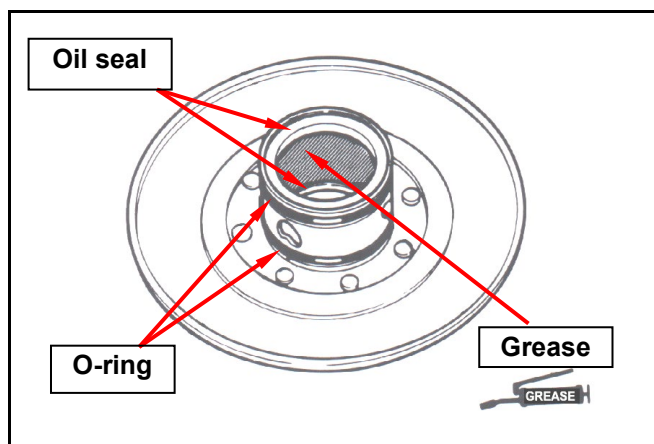
Align oil seal lip with bearing, and then install the new oil seal (if necessary).



Clutch / Driven Pulley Installation

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

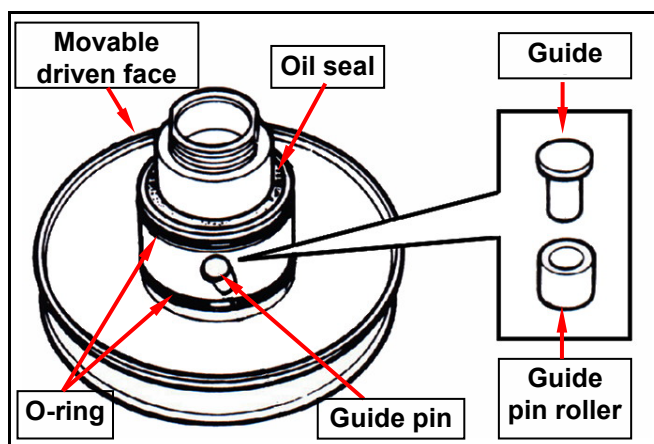
Apply with specified grease to lubricate the inside of movable driven face.



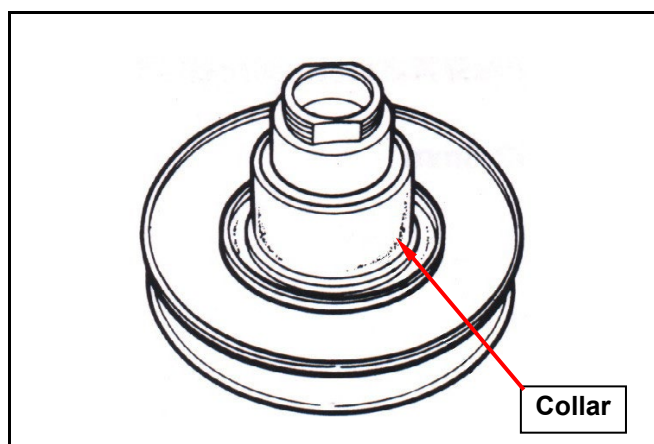
Install the movable driven face onto driven face.

Install the guide pin and guide pin roller.

Apply with specified grease to lubricate the guide pin and guide pin roller.



Install the collar.



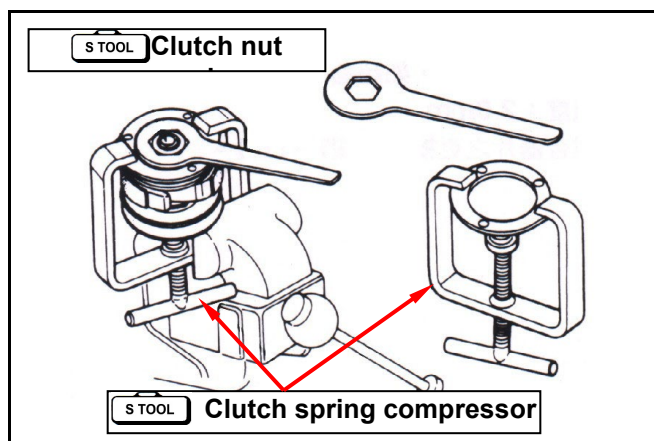
Install driving belt, spring and clutch weight COMP. into clutch spring compressor, and press down the assembly by turning manual lever until mounting nut that can be installed.

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

- Torque: 500~600kgf-cm

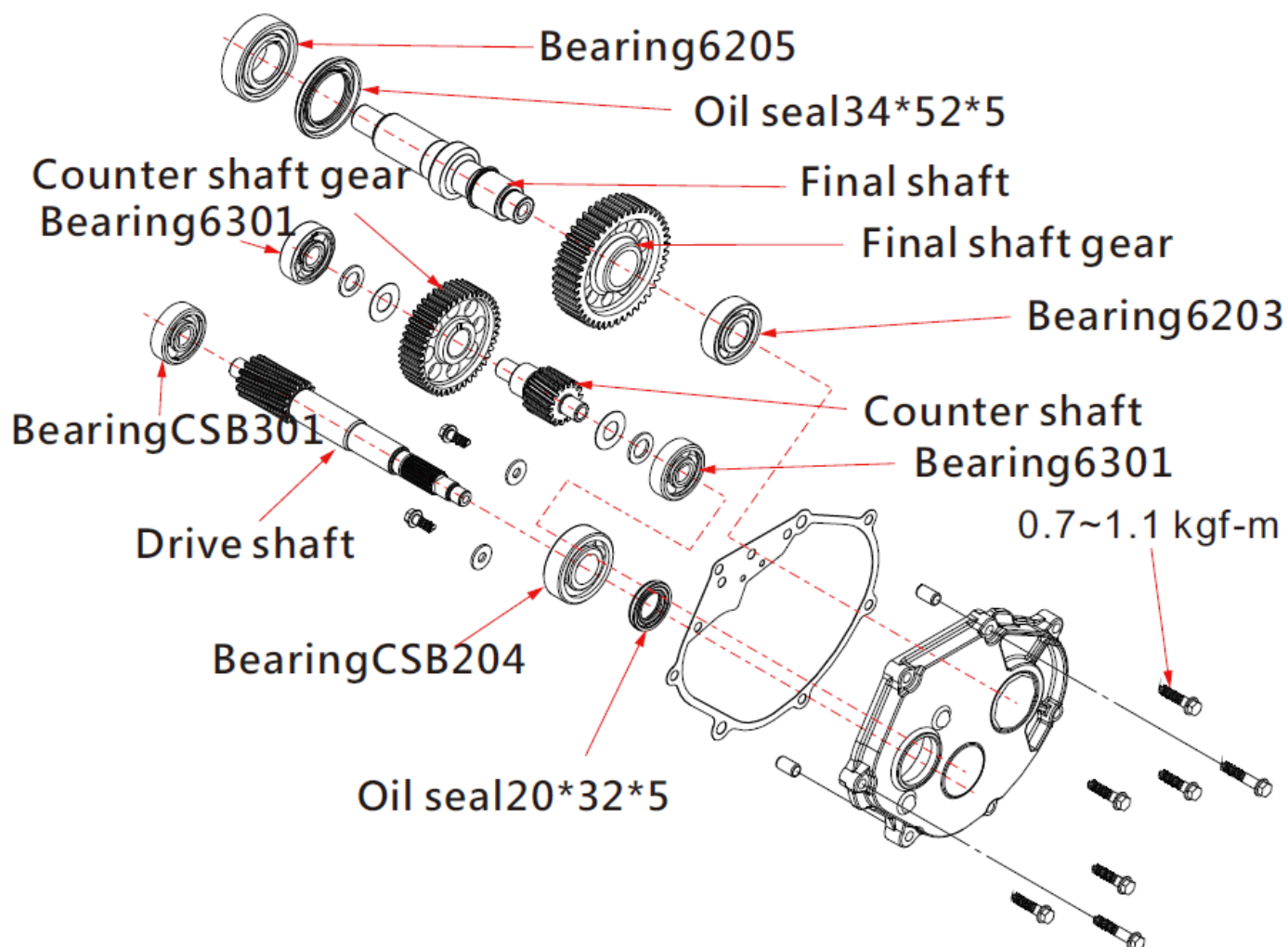
Install the clutch outer/driven pulley and driving belt onto driving shaft.

- Special tool: Clutch spring compressor
NO. SYM-2301000



Mechanism Diagram.....9-1	Final Drive Mechanism Disassembly 9-3
Precautions in Operation9-2	Final Drive Mechanism Reassembly 9-9
Troubleshooting9-2	Final Drive Mechanism Inspection 9-18

Mechanism Diagram



Precautions in Operation

Gear oil : SAE 10W-30

Specification

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

Special tools

Inner bearing puller	SYM-6204025
Outer bearing puller	SYM-6204010
Oil seal driver	SYM-6204024
Oil seal driver	SYM-1332100-HMA
Oil seal driver	SYM-9125500-HMA
Oil seal driver	SYM-9003200
Bearing driver	SYM-9100400-A6204

Torque value

Gear box cover	0.7~1.1 kgf-m
Gear oil intake bolt	1.0~1.4 kgf-m
Gear oil outtake bolt	0.8~1.2 kgf-m

Troubleshooting

Engine can be started but motorcycle can not be moved

- Damaged driving gear
- Burnt out driving gear
- Driving belt is broken

Gear oil leaks

- Excessive gear oil
- Worn or damage oil seal

Noise

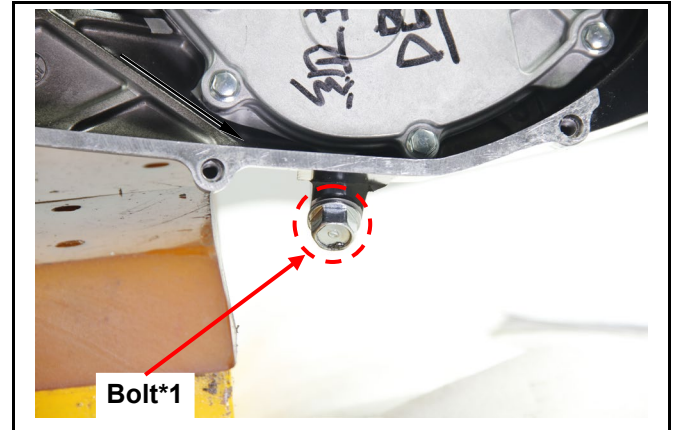
- Worn or burnt gear
- Worn gear

Final Drive Mechanism Disassembly

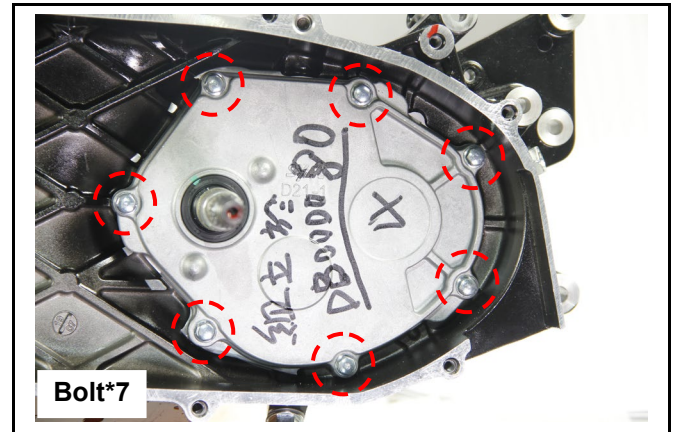
Remove rear wheel. (Refer to chapter 16)

Remove driven pulley.

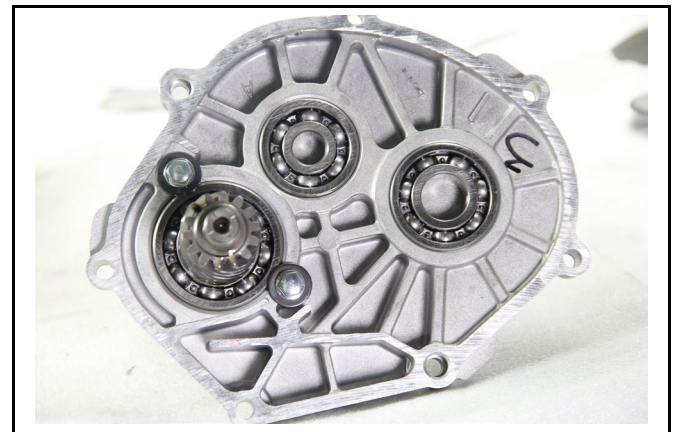
Drain gear oil out from gear box.



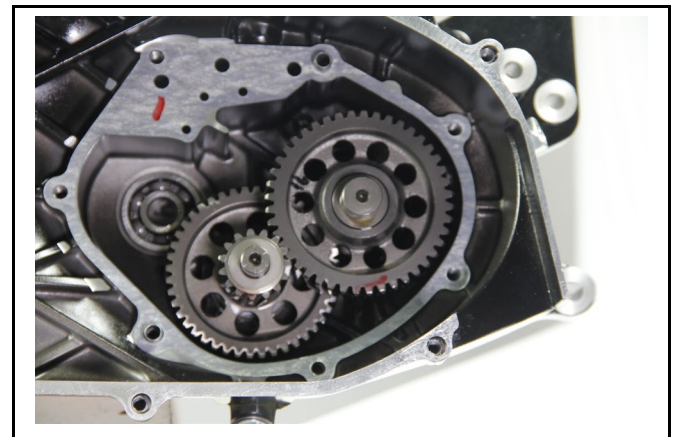
Remove gear box cover bolts and then remove the cover.



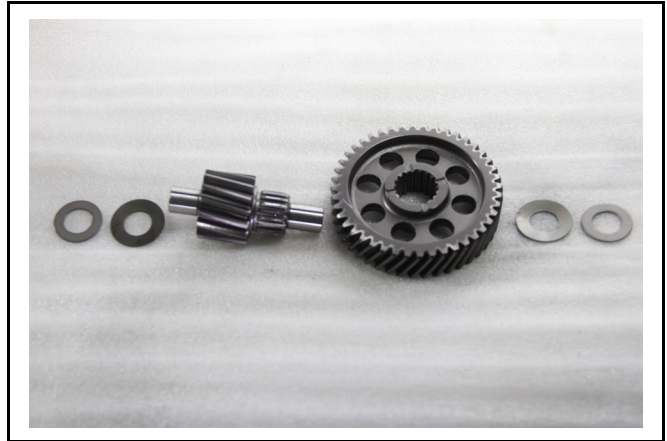
Remove drive shaft.



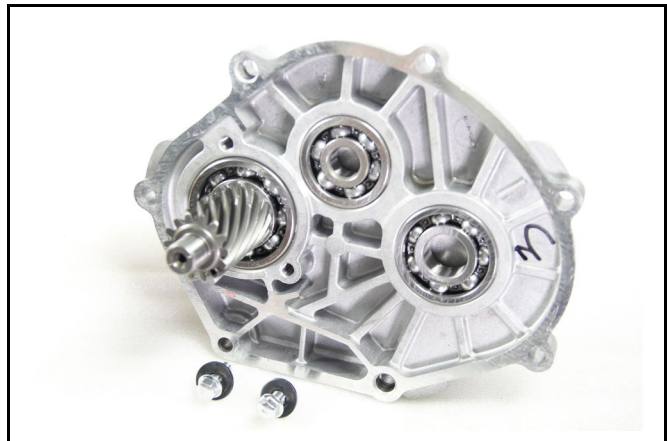
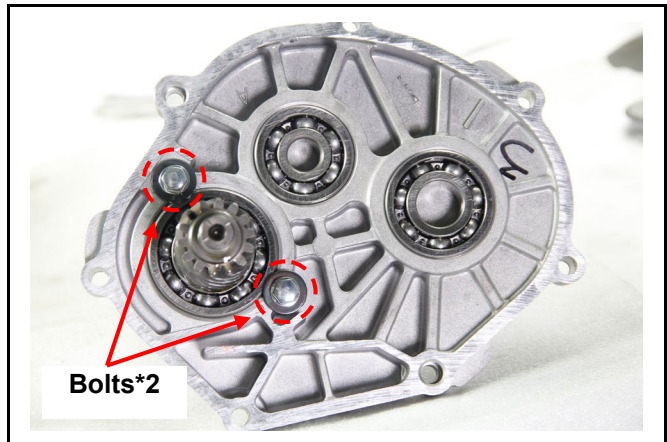
Remove final driving gear and shaft.
Remove countershaft and gear.



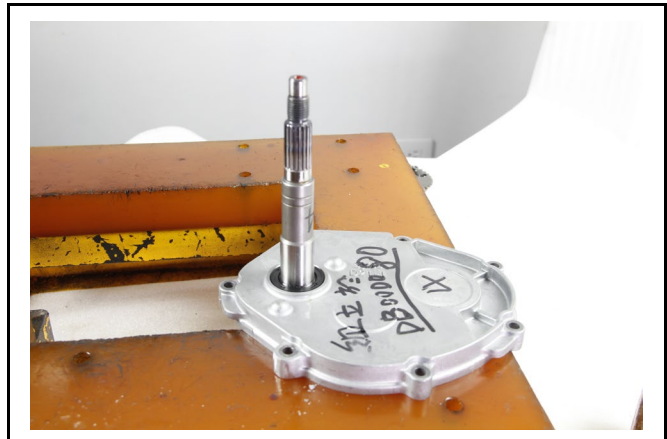
9. Final Drive Mechanism



Remove the bolts. °



Remove drive shaft.

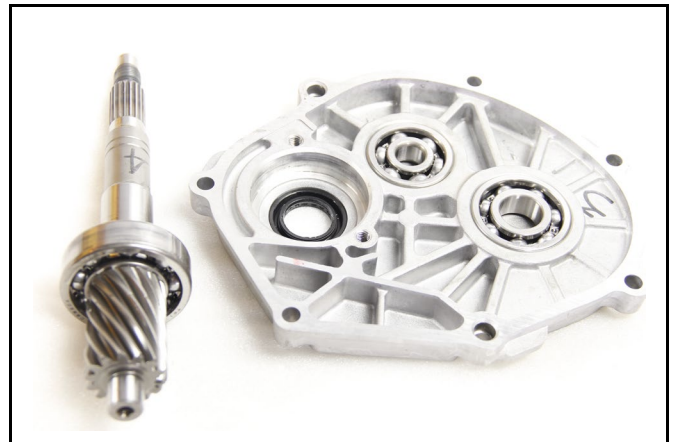


Caution

- Press out the driving shaft from gear box cover.
- Using bearing protector as operation.
- Use wood/plastic hammer when knocking.



Remove drive shaft and bearing.



- Special tool : Bearing driver
NO : SYM-6204010



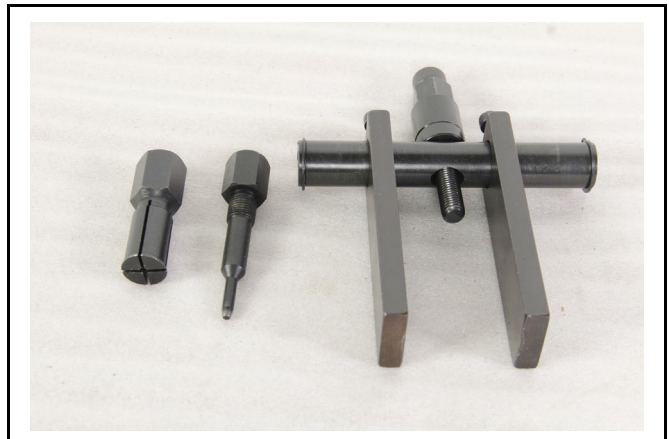
9. Final Drive Mechanism

Disassemble drive shaft and bearing.

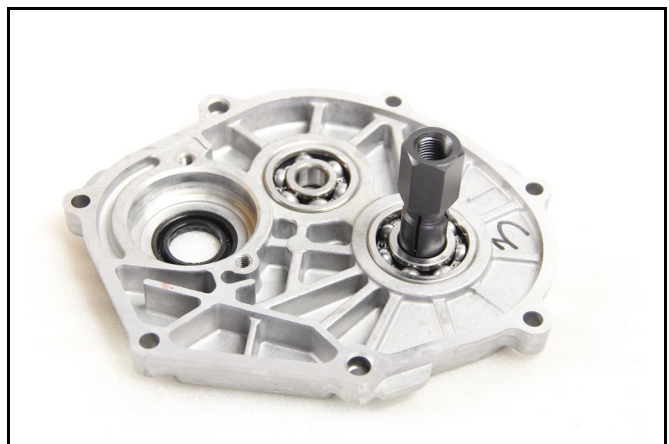


- Special tool : Radial Ball Bearing driver
NO : SYM-6204025

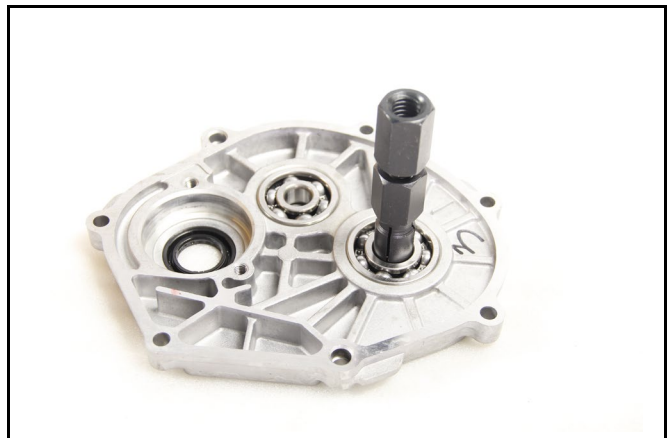
Use bearing puller to remove the final shaft bearing from the cover.



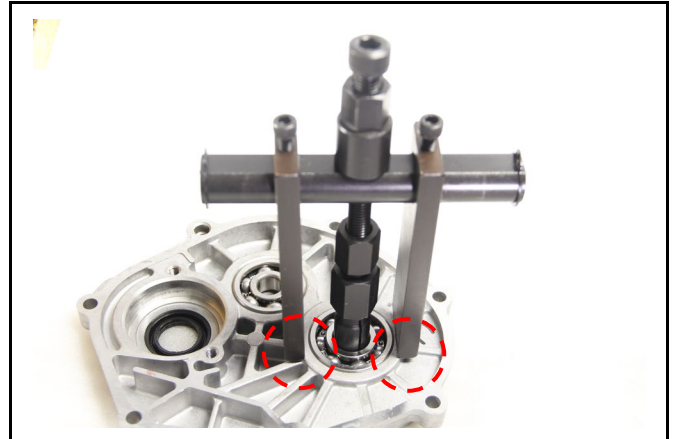
Install the radial Ball Bearing driver.



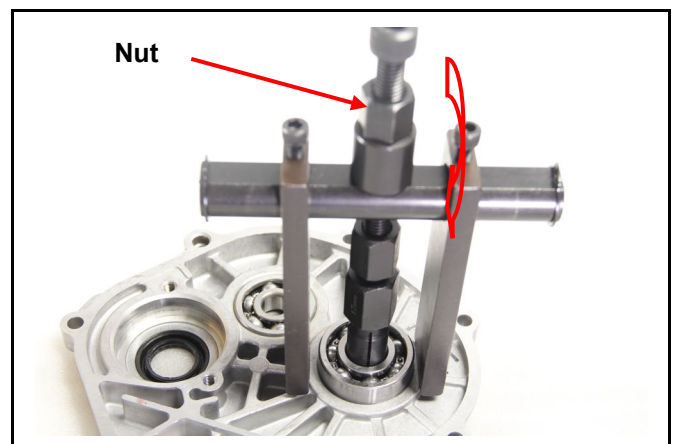
Screw tightly.



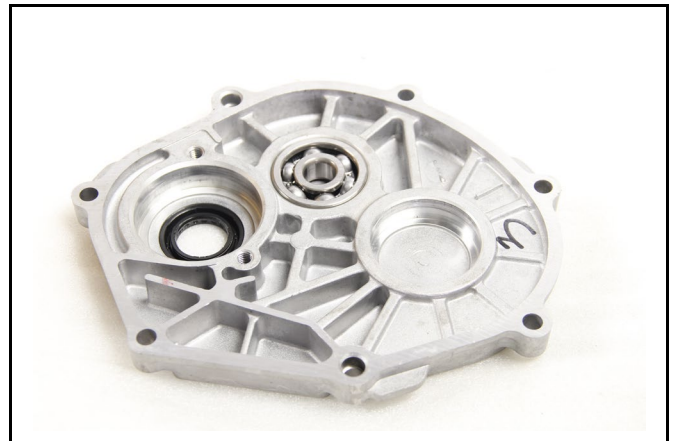
Use bearing puller to remove the final shaft bearing from the cover.



Use spanner, rotate clockwise to screw the nut.



Remove the bearing.
Same way for another bearing.

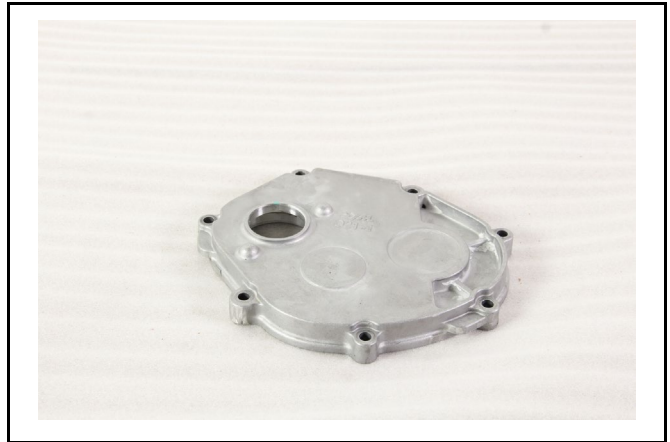


- Special tool : Oil Seal puller
NO : SYM-9003200

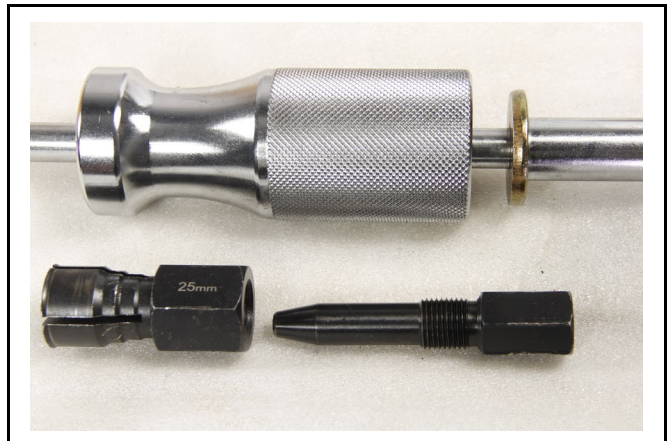


9. Final Drive Mechanism

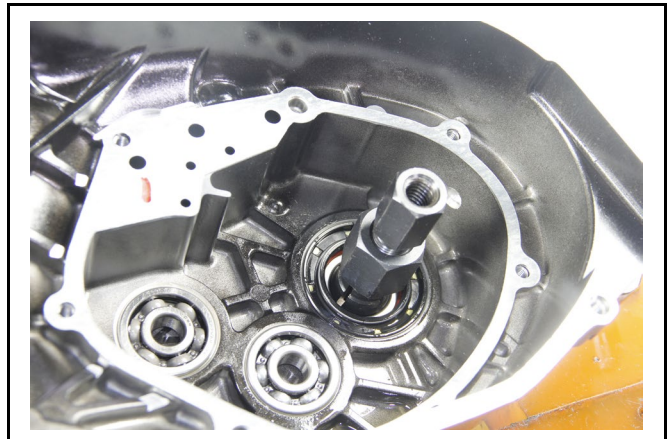
Remove the oil seal.



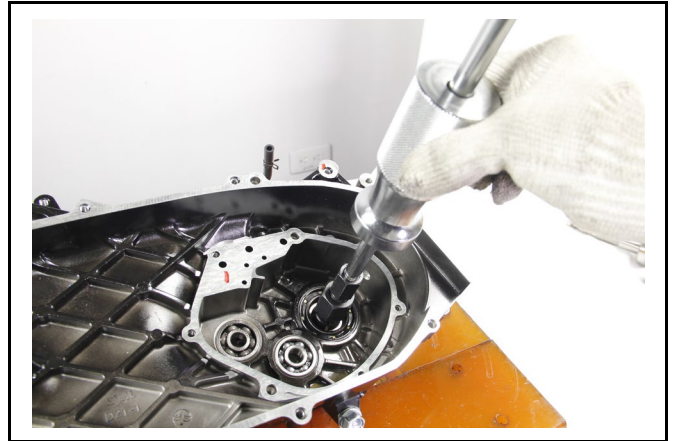
- Special tool : Bearing puller
NO : SYM-6204025



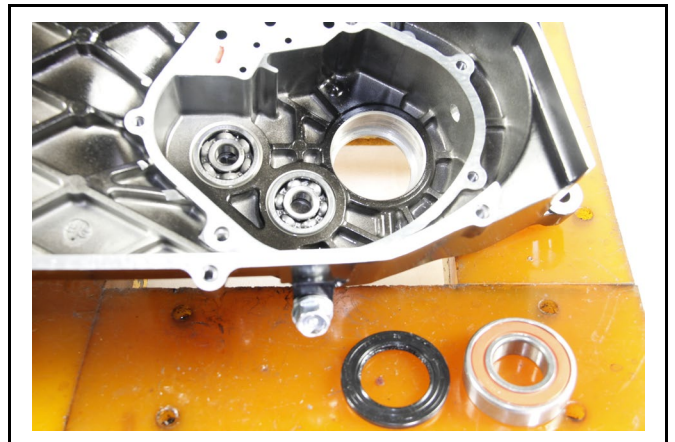
Install the radial Ball Bearing driver.



Use bearing puller to remove the bearing and oil seal.



Same way for another oil seal.



Final Drive Mechanism Reassembly

- Special tool : Bearing pusher
NO : SYM-6204024

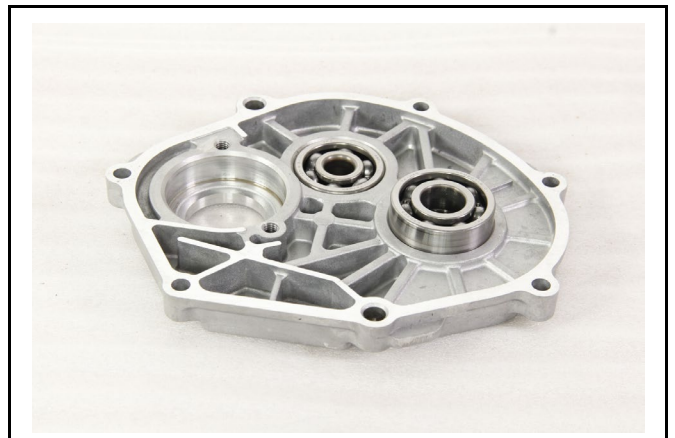


Caution

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



Install the new bearing.

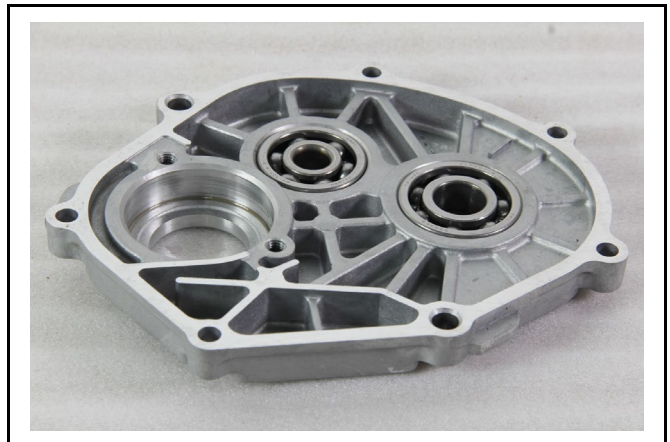


9. Final Drive Mechanism

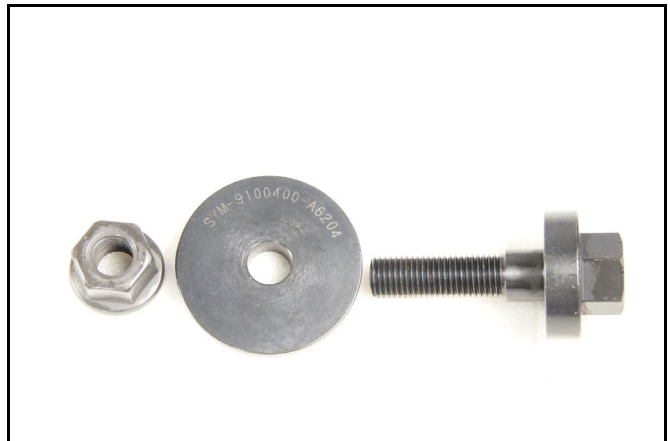
Use bearing pusher when knocking.



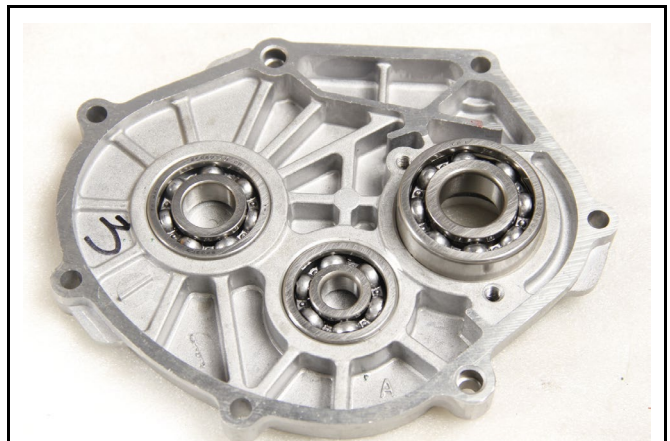
Check the bearing is in position.

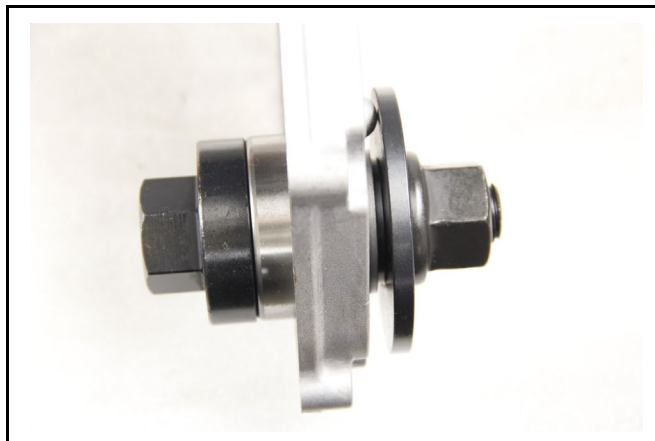


- Special tool : Bearing Driver
NO : SYM-9100400-A6204

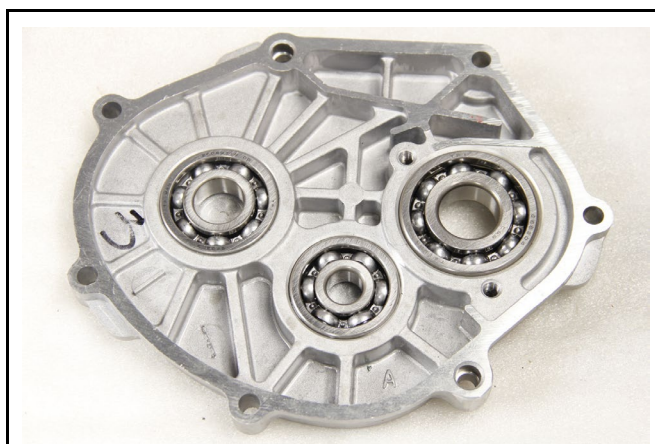


Install new bearing.

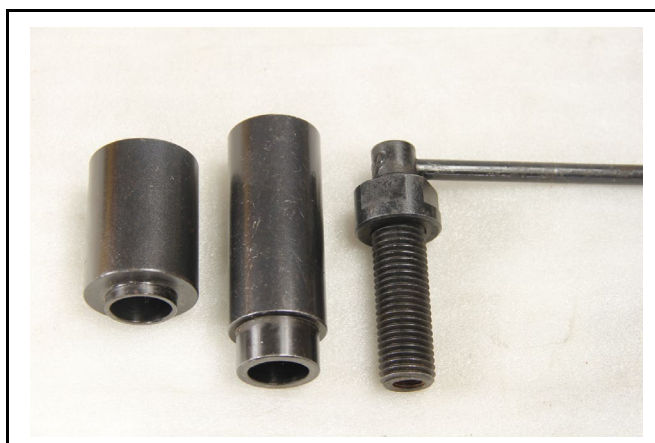




Check the bearing is in position.



- Special tool : Shaft puller

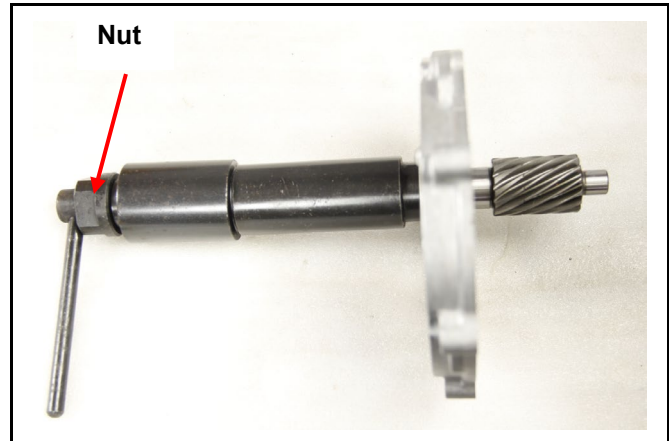


Pull drive shaft.

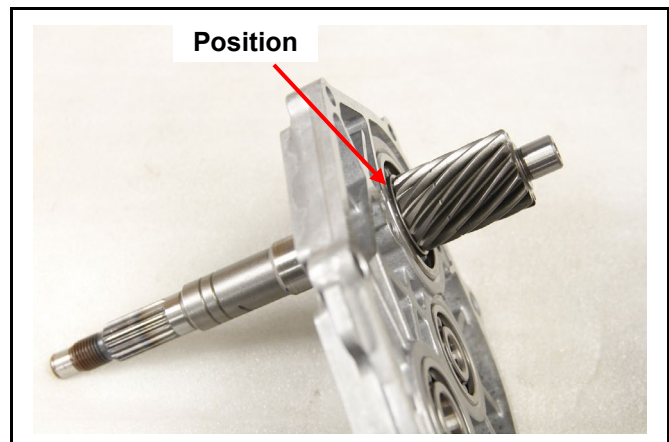


9. Final Drive Mechanism

Screw nut tightly.



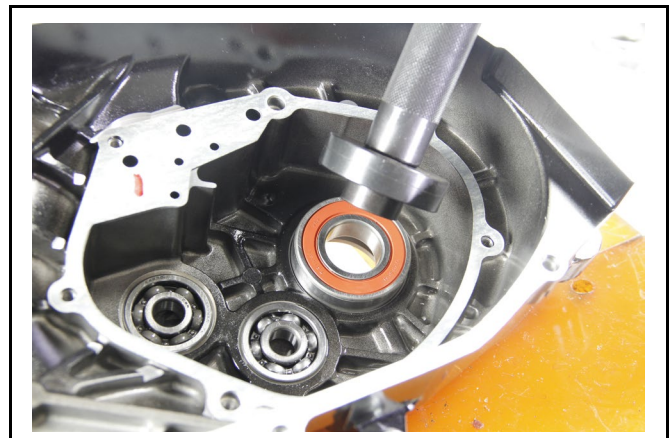
Check the drive shaft is in position.



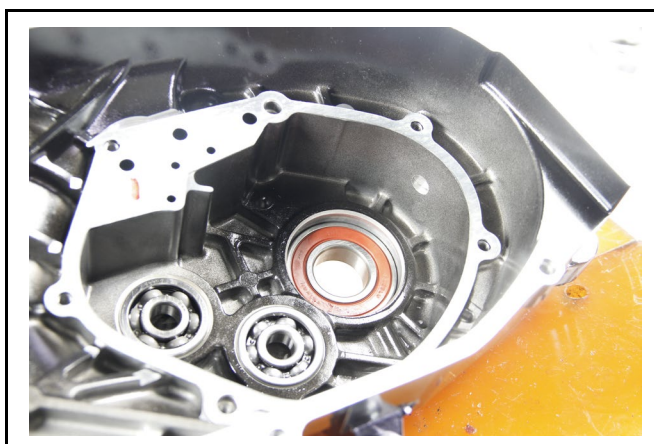
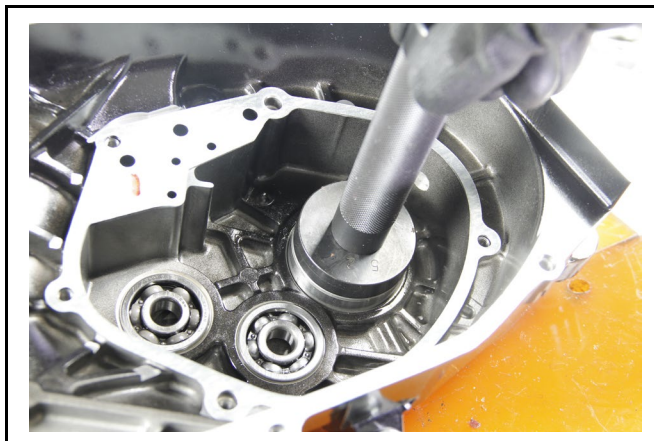
- Special tool : Bearing Pusher
NO : SYM-6204024



Check the bearing to be in position.



Same way for another bearing.

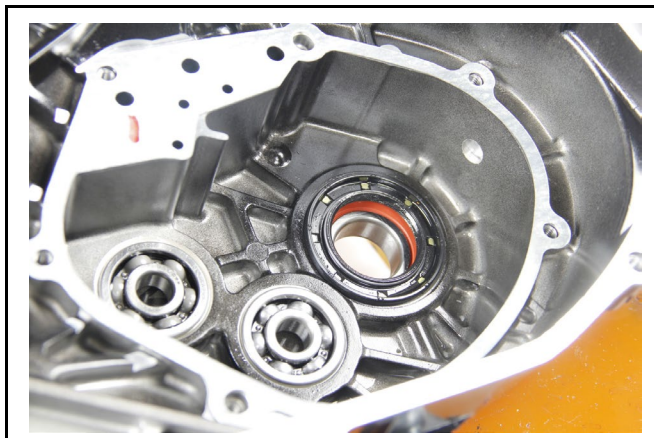


- Special tool : Oil Seal Pusher.
NO : SYM-9125500-HMA



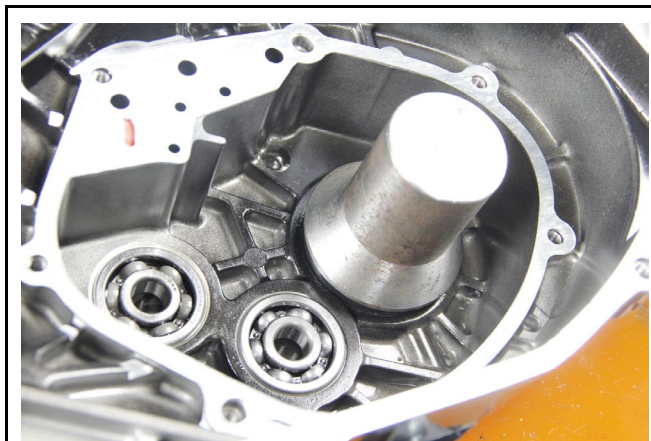
Caution

- The flat of oil seal is downward.

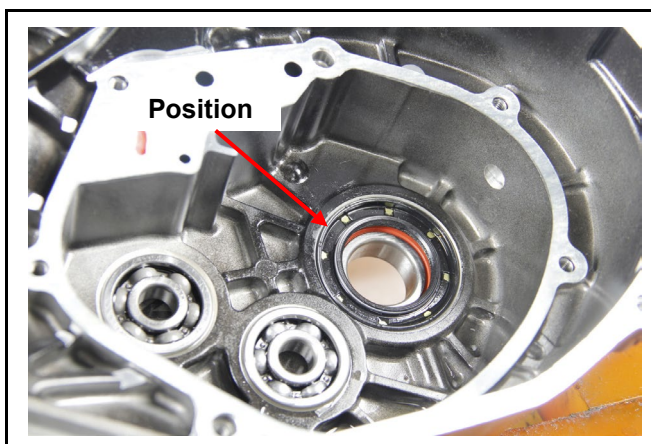


9. Final Drive Mechanism

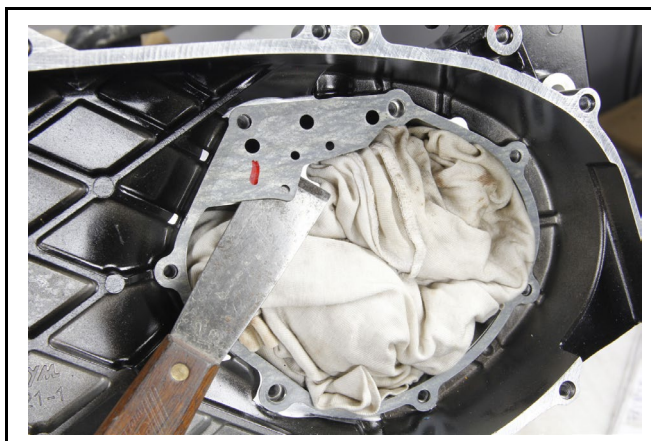
Install the oil seal.



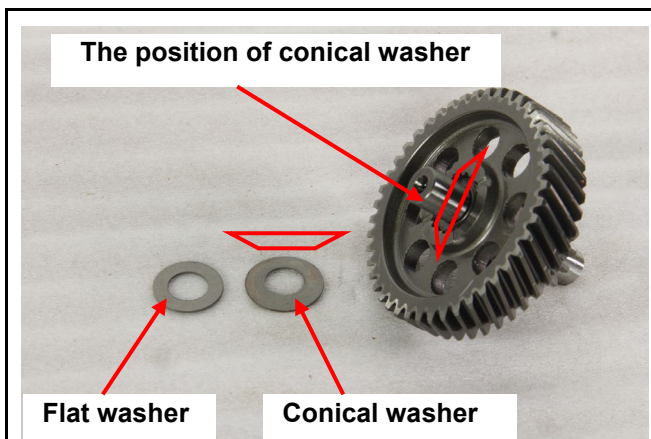
Check the oil seal to be in position.



Remove the gasket from left crankcase.



The final driving gear.



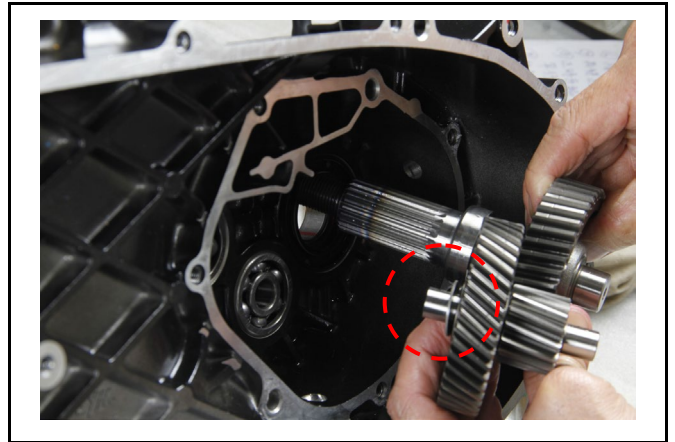
The order of assembling.



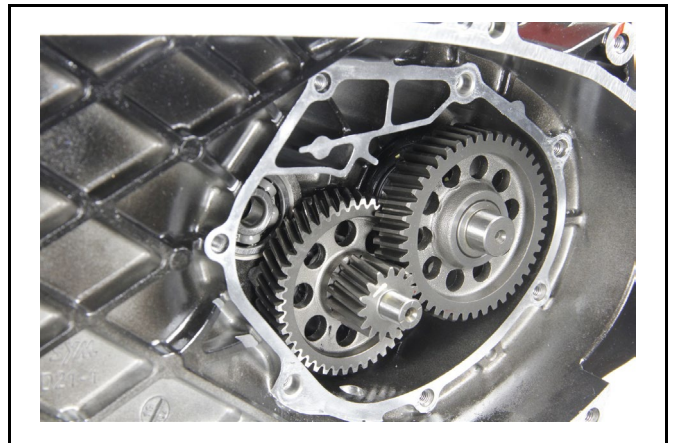
Install countershaft, final shaft and final driving gear.

⚠ Caution

- Do not miss the washer.



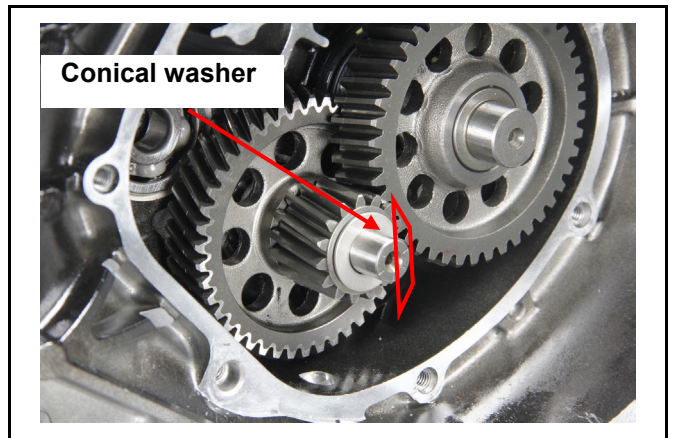
Make sure the gears are in position.



Install the flat washer and conical washer.

⚠ Caution

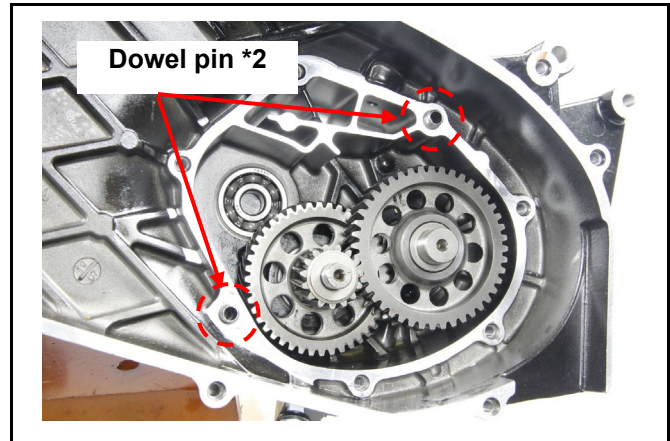
- The direction of conical washer assembling.



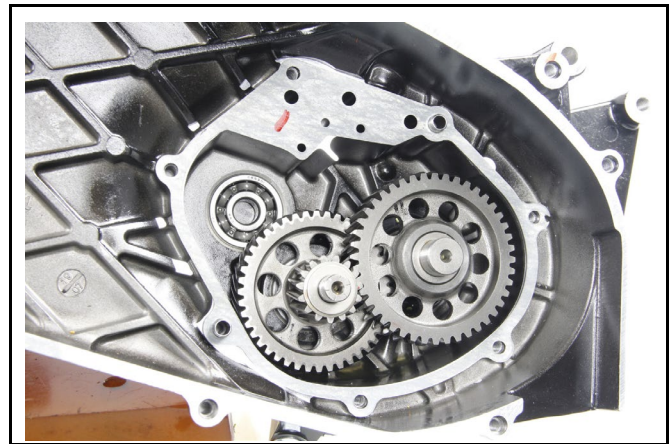
9. Final Drive Mechanism



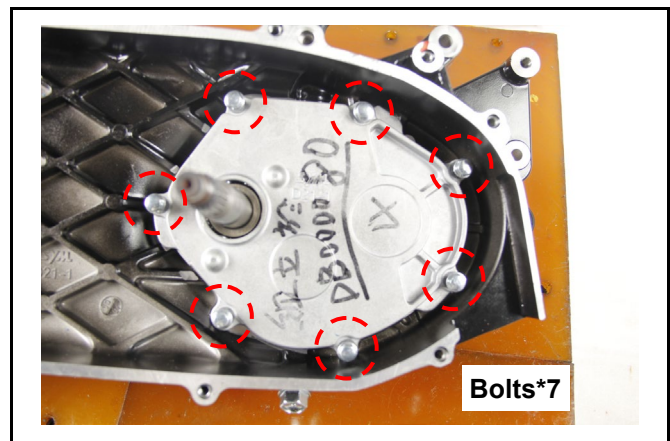
Install dowel pins.



Install new gasket.



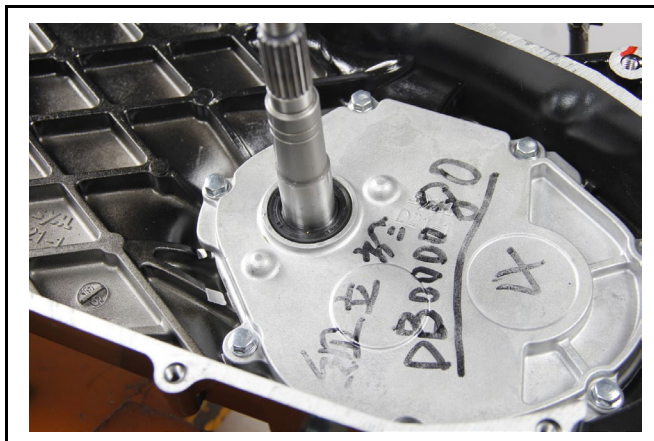
Install gear box cover and driving shaft.
Screw bolts.



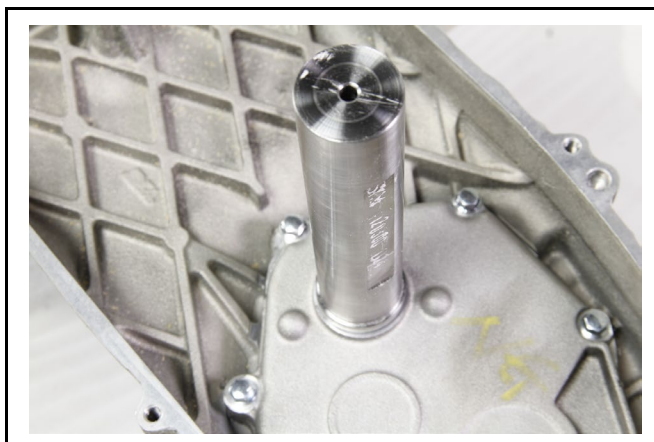
- Special tool : Oil Seal Pusher
NO : SYM-9120300-D24



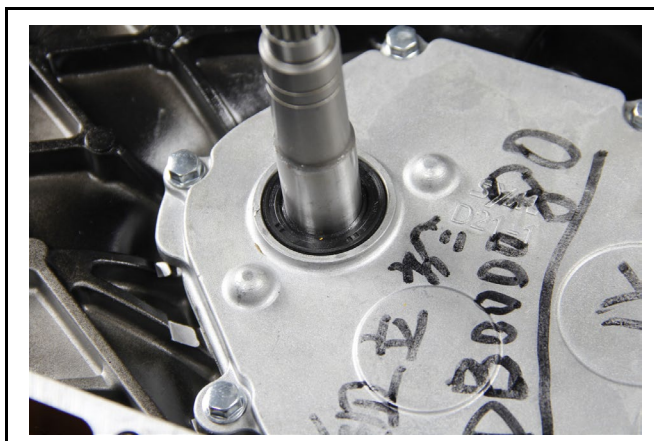
Put the oil seal of driving shaft.



Use the pusher and knock it.



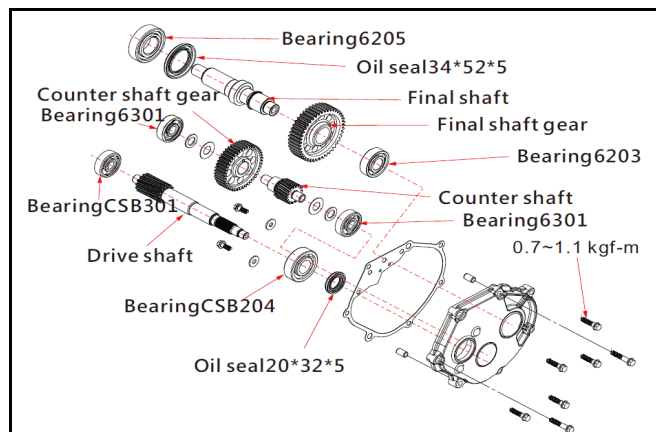
Make sure oil seal is in position.



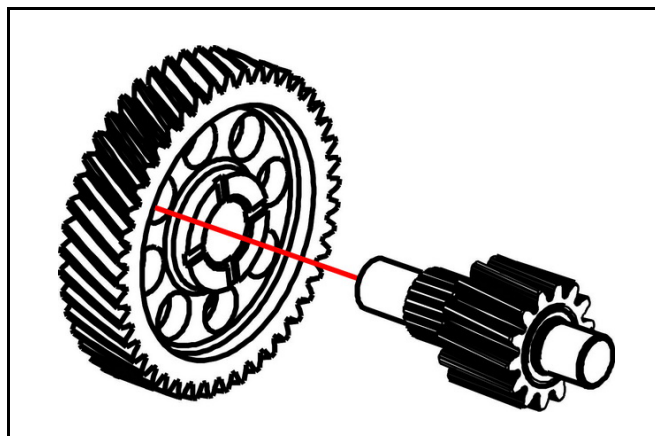
9. Final Drive Mechanism

Final Drive Mechanism Inspection

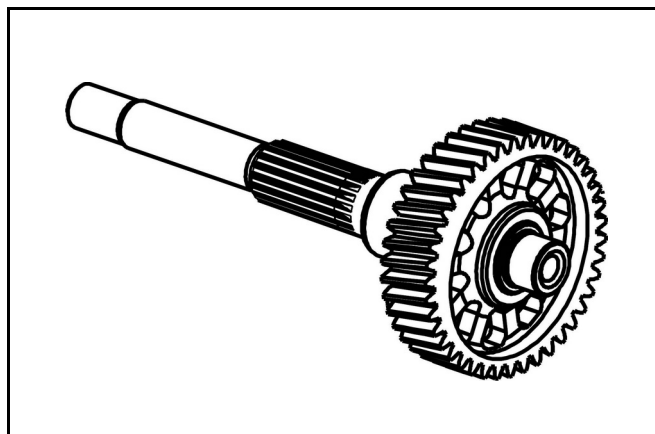
Be attention the direction of each part and gasket assembling.



Check if the countershaft is wear or damage.



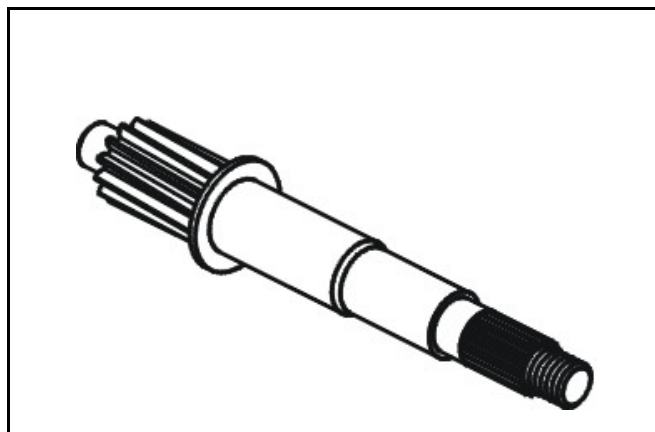
Check if the final shaft and gear are burn, wear or damage.



Check if the driving shaft is burn, wear or damage.

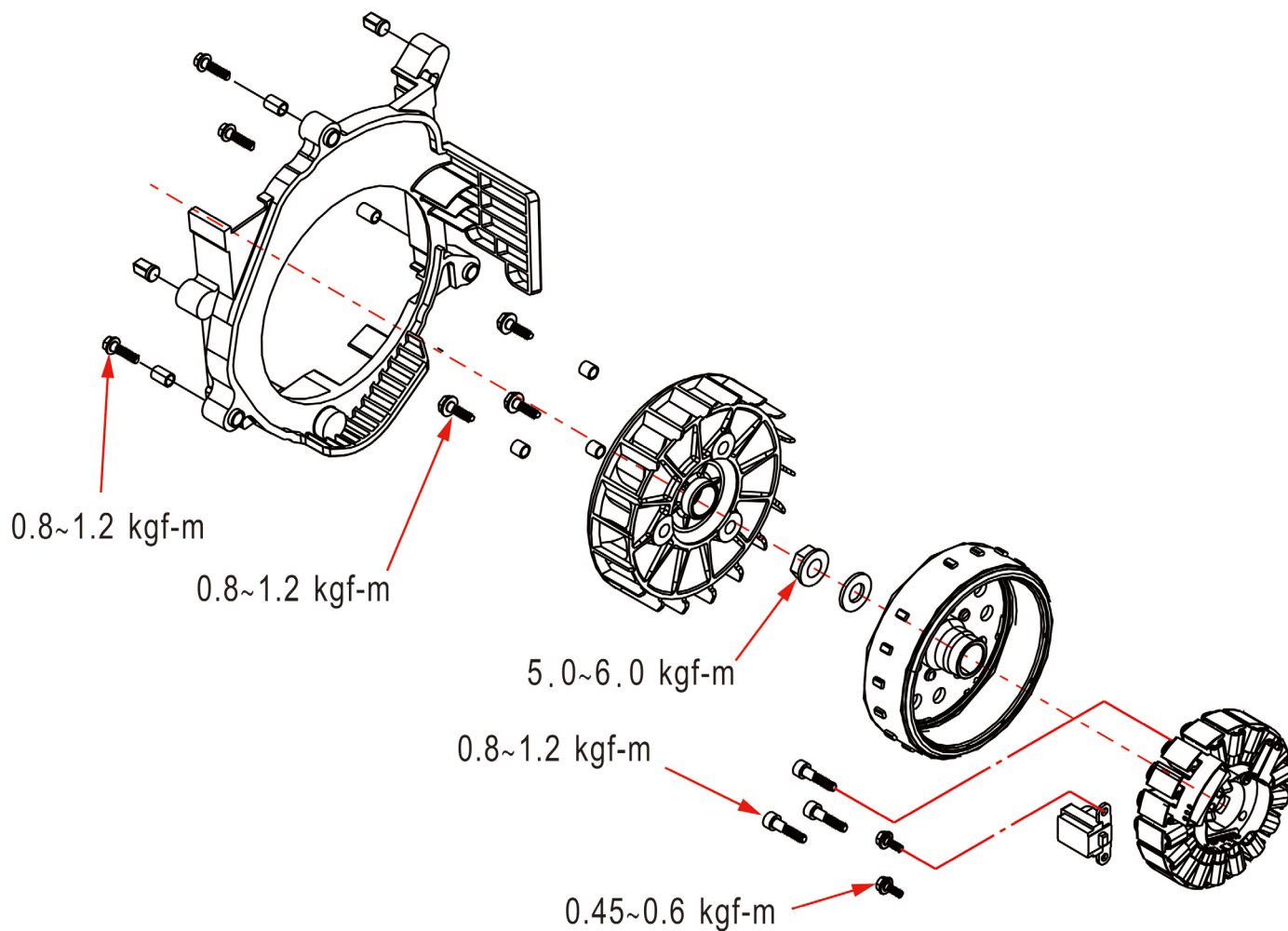
Caution

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



Mechanism Diagram.....	10-1	AC. Generator Removal.....	10-3
Precautions in Operation.....	10-2	AC. Generator Installation.....	10-12

Mechanism Diagram



Precautions in Operation

General information

- The service procedures for the alternator could be conducted without removing the engine from the frame.
- The troubleshooting and inspection information for alternator refer to section 1.

Torque wrench

1800DB 200~1800kgf-cm

Torque value

Flywheel nut 500~600kgf-cm

Starting clutch socket bolt 450~600kgf-cm

8 mm bolts 80~120kgf-cm

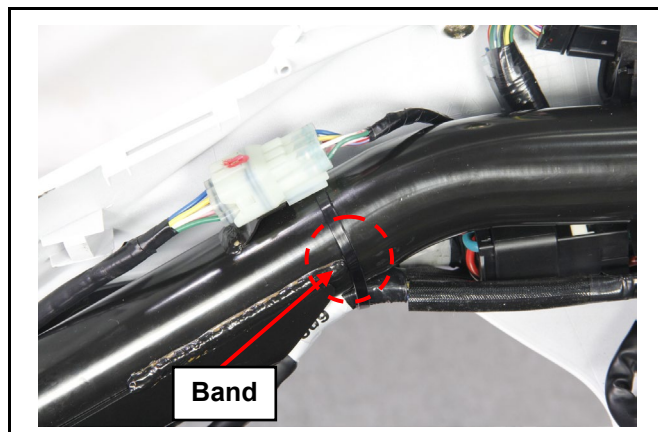
Special tools

A.C.G. flywheel puller : SYM-3110000

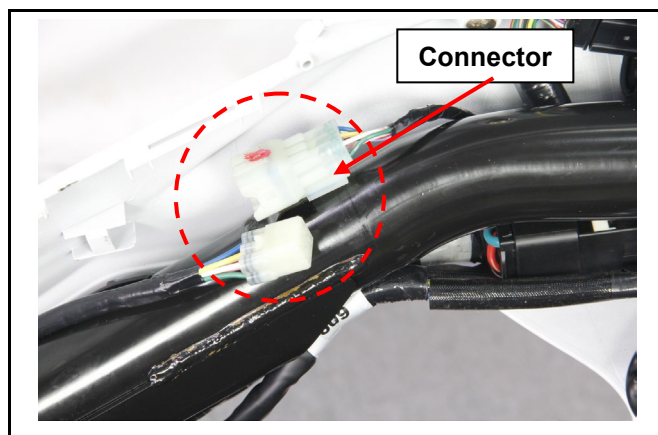
Universal holder : SYM-2210100

AC. Generator Removal

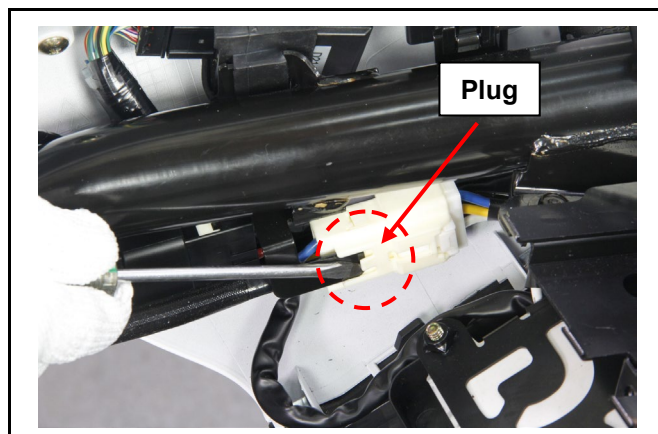
Remove seat, luggage box, and band.



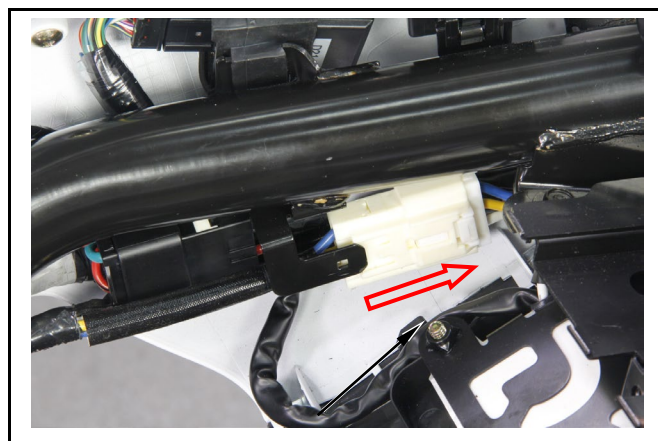
Disconnect the connector.



Pry the plug with flat screwdriver.

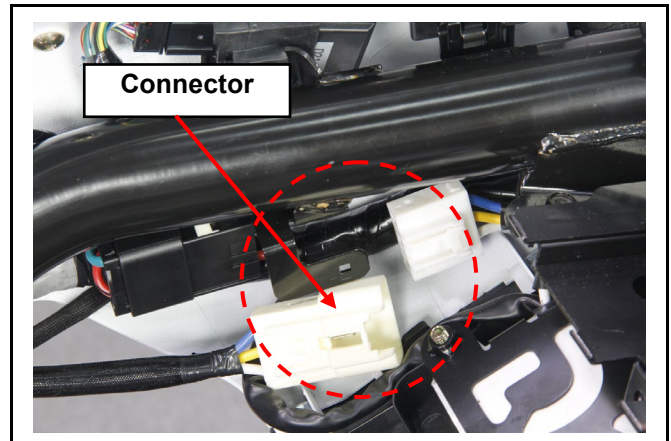


Remove the connector.

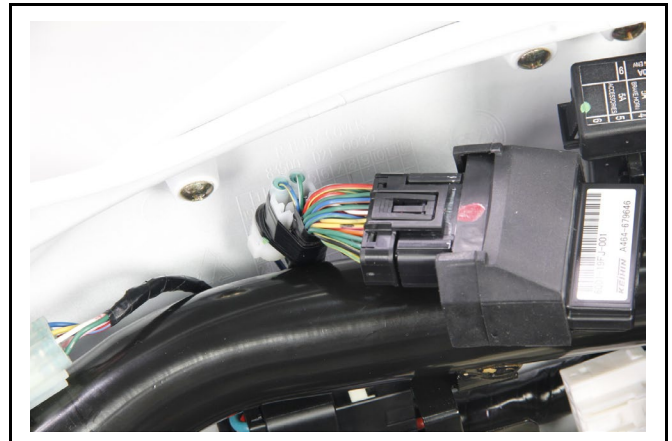


10. AC. Generator / Start Clutch

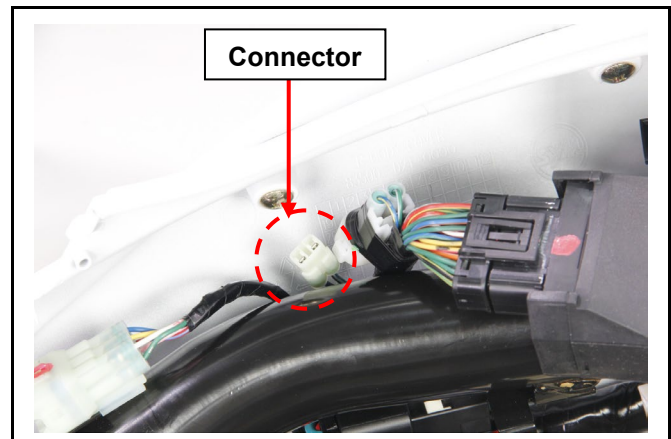
Disconnect the connector.



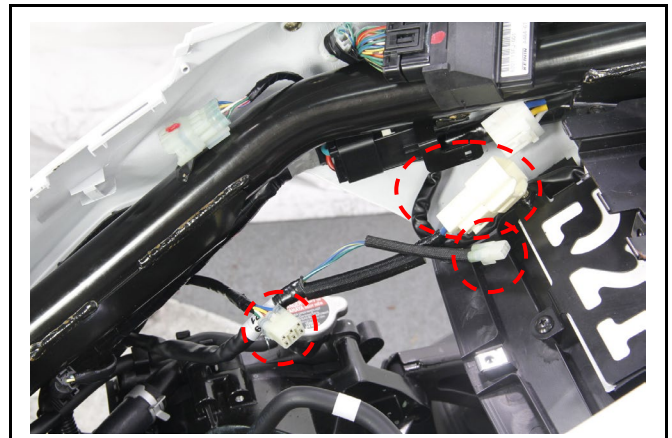
Remove the ECU.



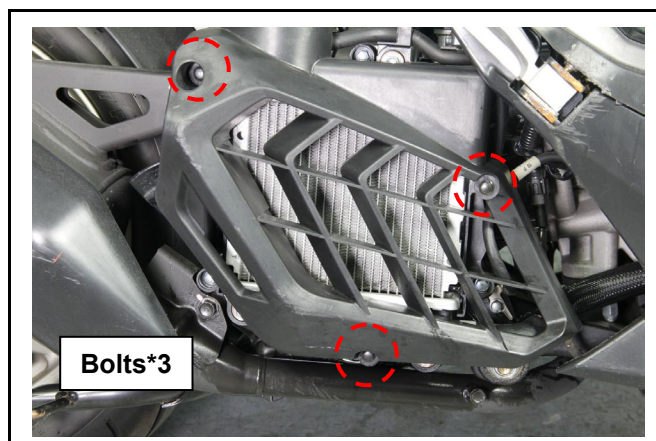
Disconnect the connector of crankshaft position sensor.



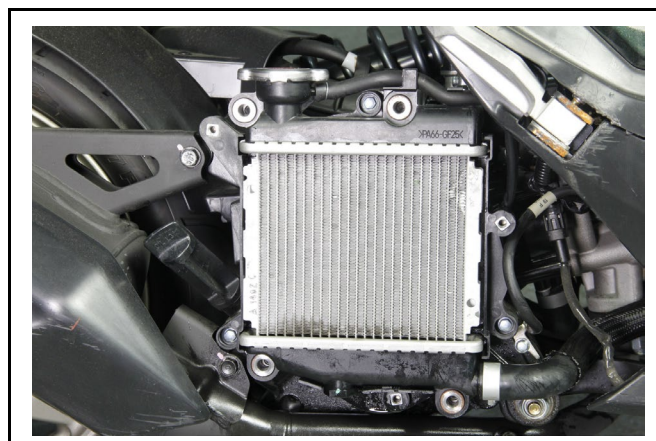
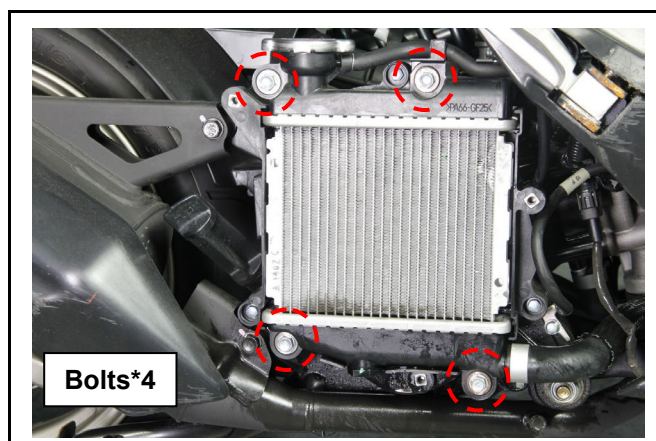
Remove all connectors.



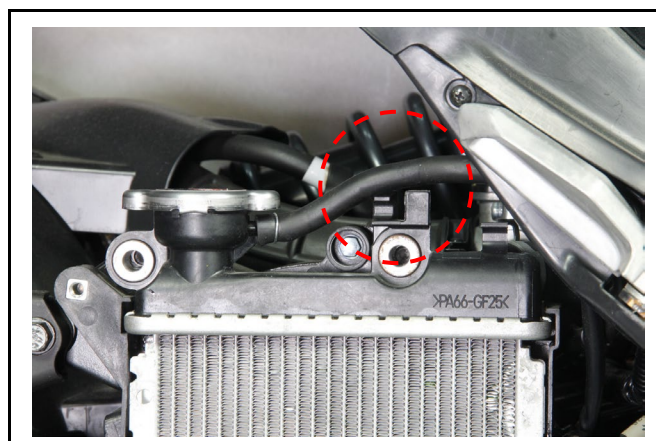
Remove the radiator protection cover bolts.
Remove the radiator protection cover.



Remove the radiator.

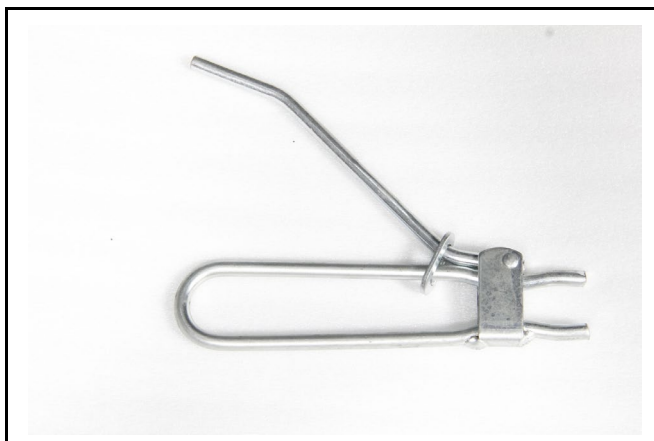


Remove the hose.

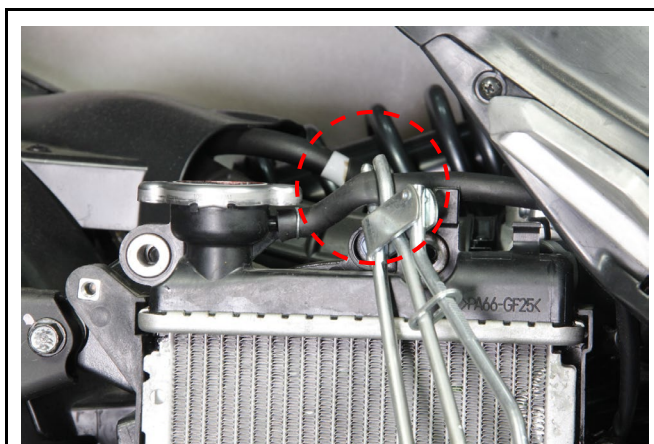


10. AC. Generator / Start Clutch

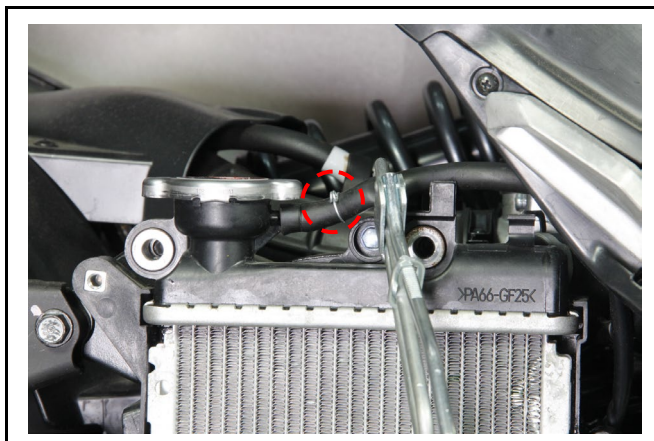
- Special tool : Oil pipe plier.



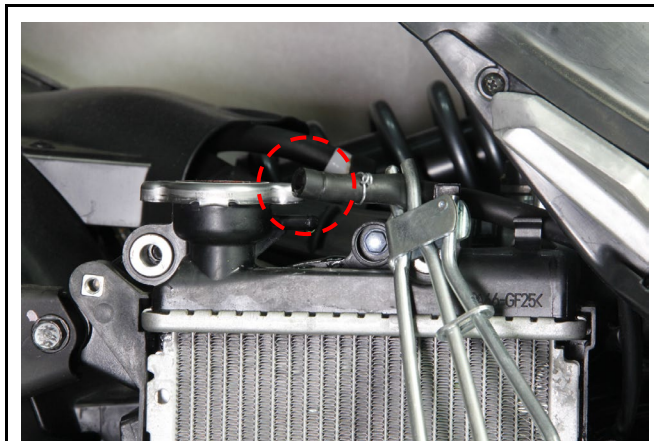
Clip the hose with plier.



Disassemble the circle clip.



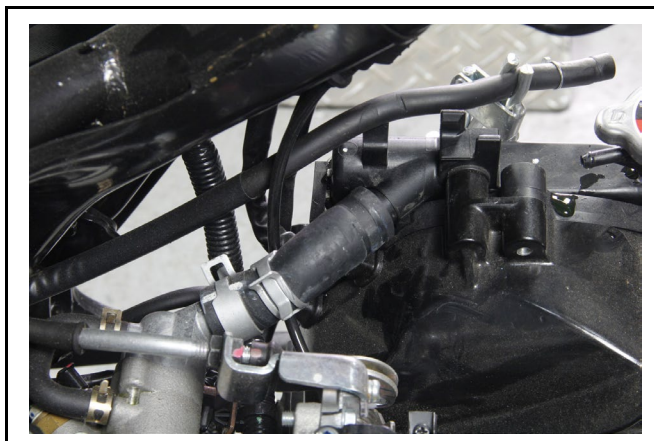
Remove the hose.



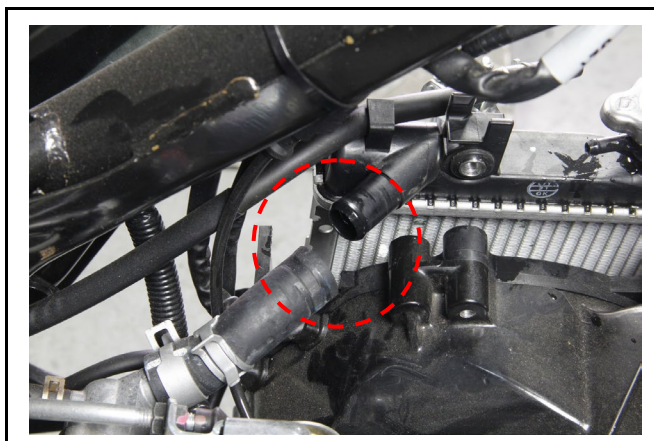
Put basin under the radiator to catch leaking coolant.



Remove the circle clamp.

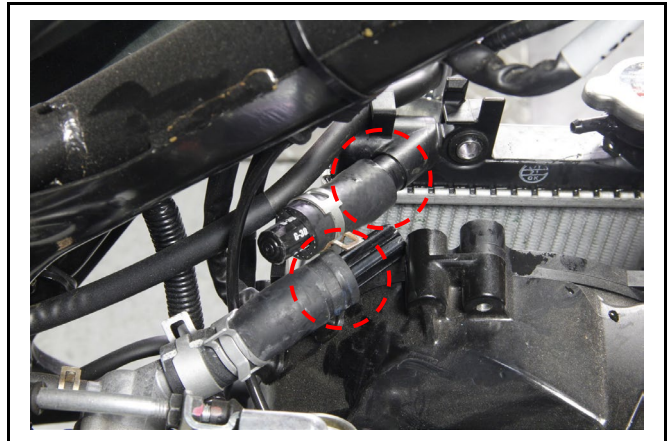


Disconnect the hose.



10. AC. Generator / Start Clutch

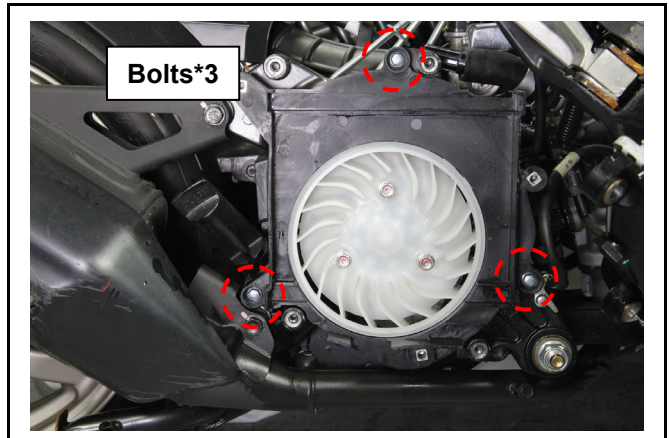
Block up the hose.



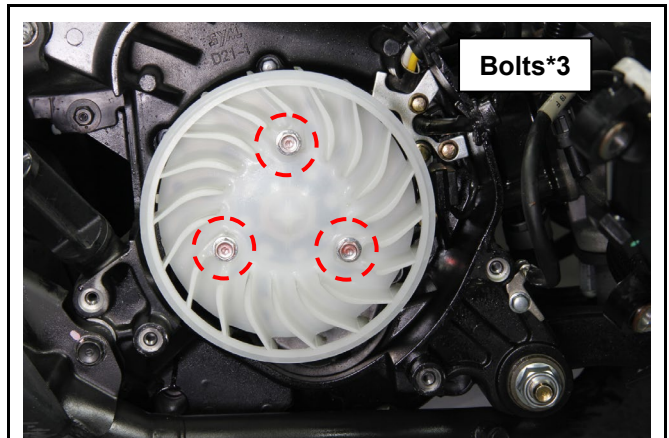
Remove the radiator.

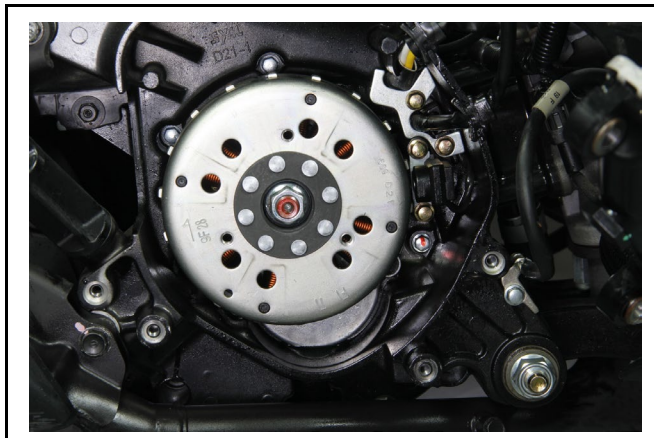


Remove the basic plate.



Remove the fan.

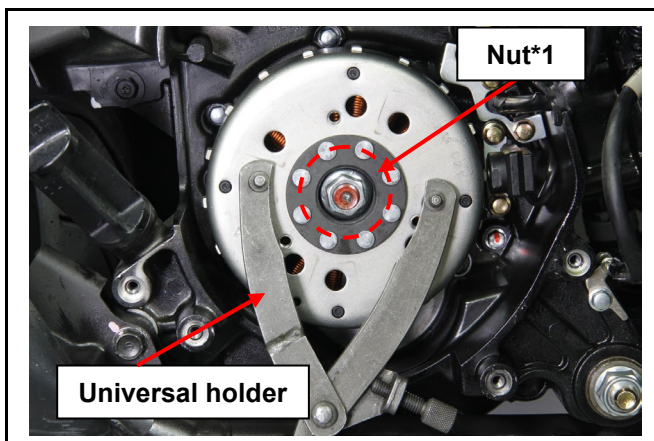




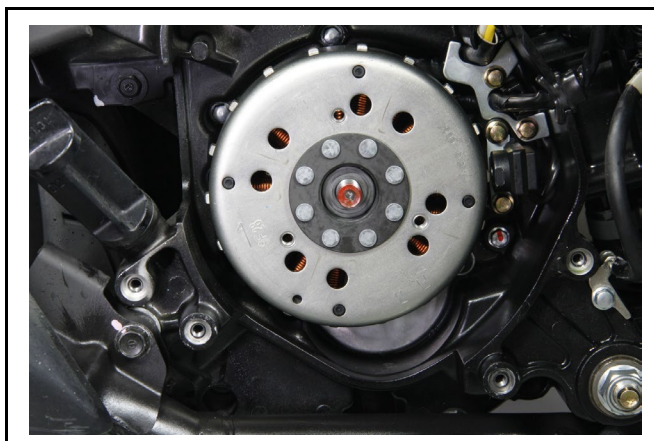
- Special tool: Universal holder
NO. SYM-2210100



Hold the flywheel with universal holder.



Remove the nut.

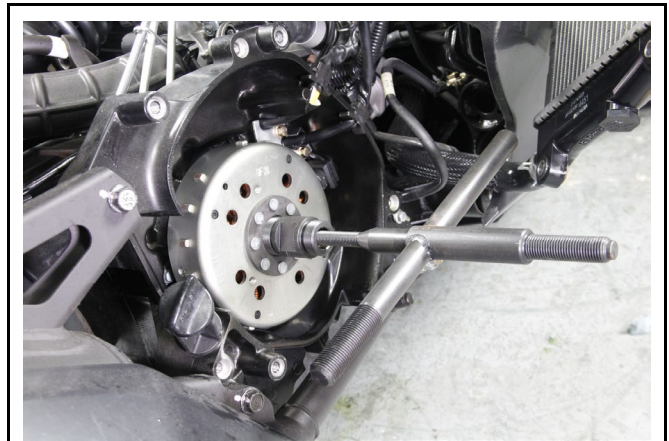
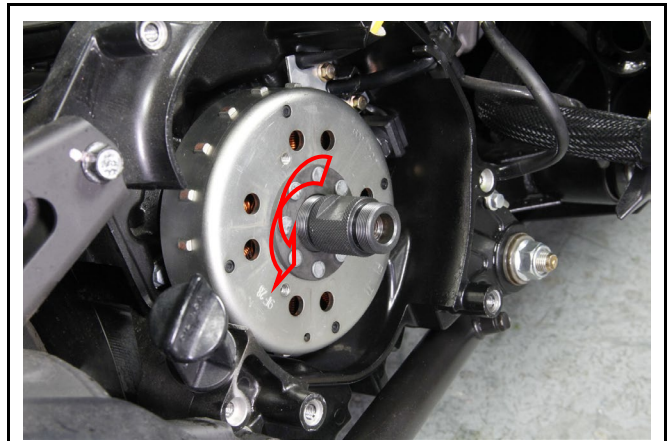


10. AC. Generator / Start Clutch

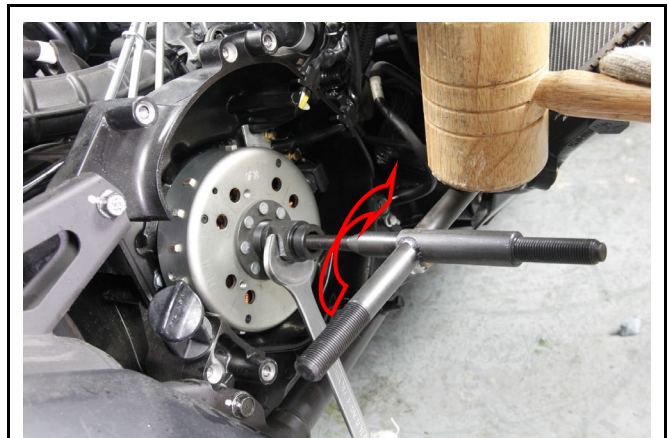
- Special tool: A.C.G. flywheel puller
NO. SYM-3110000



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

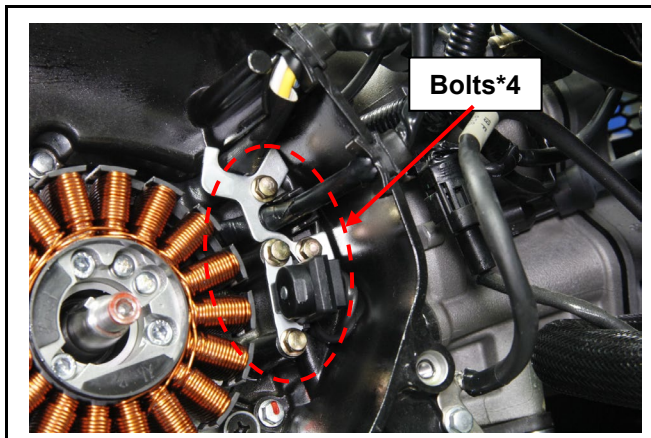


Pull out flywheel with A.C.G. flywheel puller.

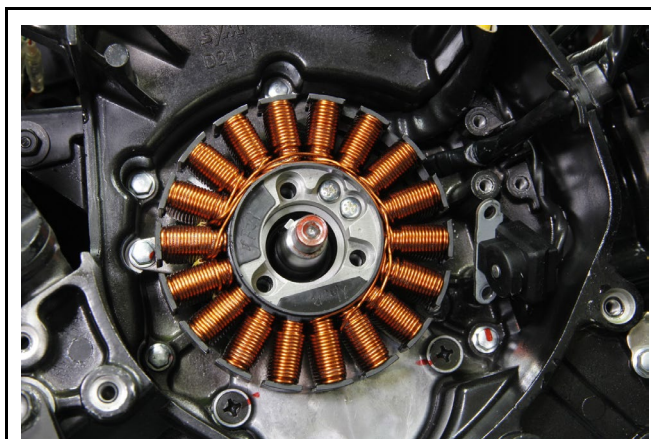
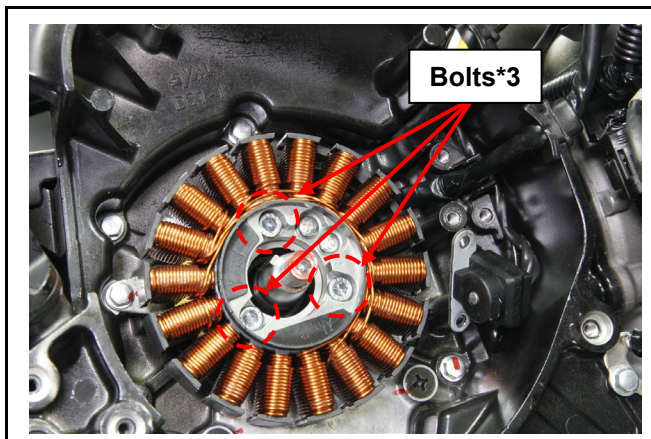




Remove crankshaft position sensor.



Remove A.C.G. set.



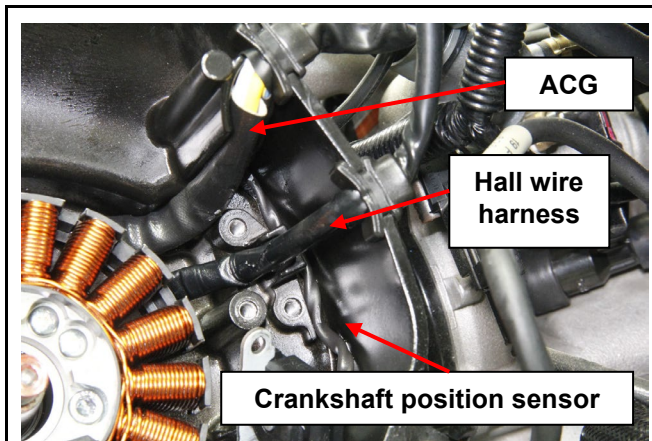
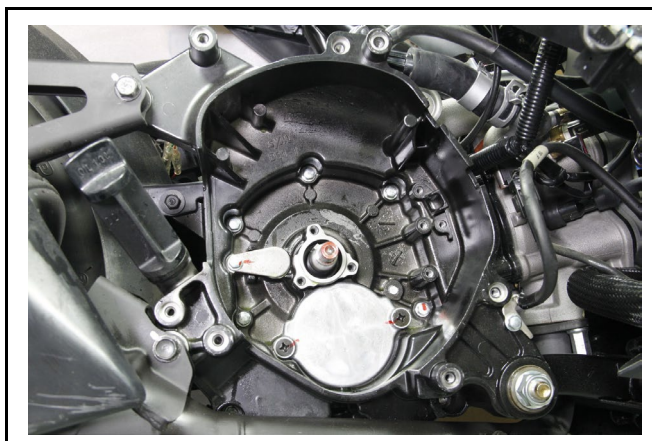
AC. Generator Installation

Installation is the reverse of the removal procedure.

- Torque value: 500~600kgf-cm

Caution

- Make sure that hall wire harness is placed under crankshaft position sensor.

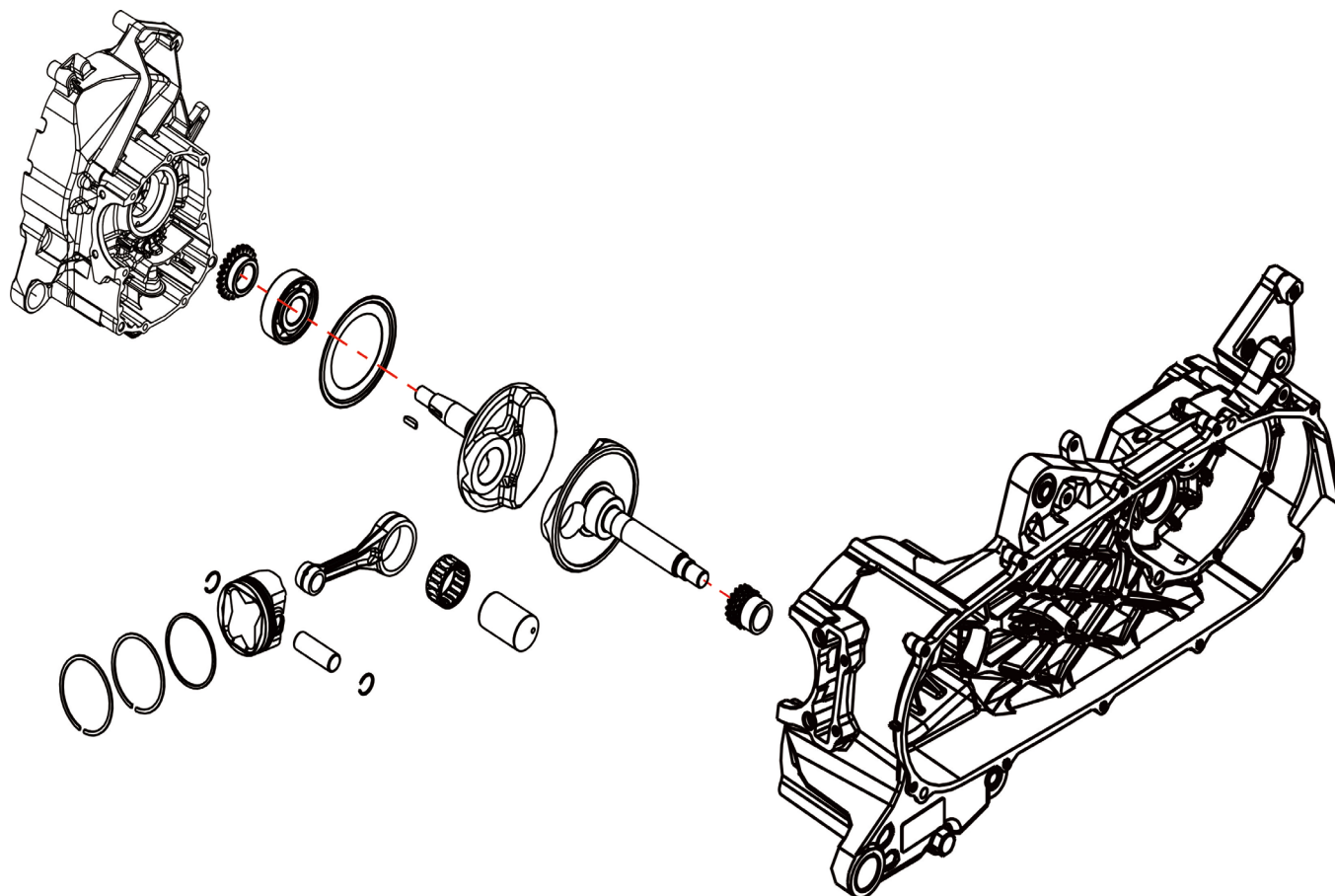


Check coolant is enough or not, if not, please add it.



Mechanism Diagram	11-1	Crankshaft Bearing Assembly	11-8
Precautions in operation	11-2	Crankshaft Assembly	11-11
Troubleshooting	11-2	R Crankcase Oil Seal Disassemble/Install ...	11-18
Crankcase Disassembly	11-3	Crankshaft Inspection	11-20
Crankshaft Disassembly	11-4	R Crankcase Push Plug Disassemble/Install	11-21

Mechanism Diagram



Precautions in operation

General Information

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

Engine	Chapter 5
Cylinder head	Chapter 6
Cylinder and piston	Chapter 7
Drive pulley and driven pulley	Chapter 8
AC generator/Start driven gear	Chapter 10

In case it requires replacing the crankshaft bearing, or the timing chain, it is preferably to replace crankshaft as a unit.

Service data

Unit: mm

Item	Standard	Limit
Connecting rod side clearance of the big end	0.100~0.350	0.550
Vertical clearance of the big end of the connecting rod	0.000~0.008	0.050
Run-out	—	0.100

Torque value

Crankcase bolts	0.7~1.1 kgf-m
Engine oil bolt	3.5~4.5 kgf-m
Cam chain adjuster bolt	0.8~1.2 kgf-m

Special tools

Oil seal installer (25×37×6)	SYM-1332100-HMA
Crankshaft disassemble/install tool	SYM-1120000-ALL
Outer bearing puller	SYM-6204010
Crankshaft bearing tool Positioner	SYM-1120000-F6A POS.
F6A FFA L. Crankshaft bearing driver	SYM-9100100-F6A FFA
F6A FFA Crankshaft/shaft installer	SYM-1130000-F6A F6B
F6A FFA Crankshaft/shaft installer extension	SYM-1130000-C.P
39-44 wrench	SYM-2301000- 44 -39 WRENCH
Oil seal guide tool	SYM-9120200-D24
Seal puller	SYM-9003200
Socket 、 Socket extension	23.7mm 、 28.9mm Socket

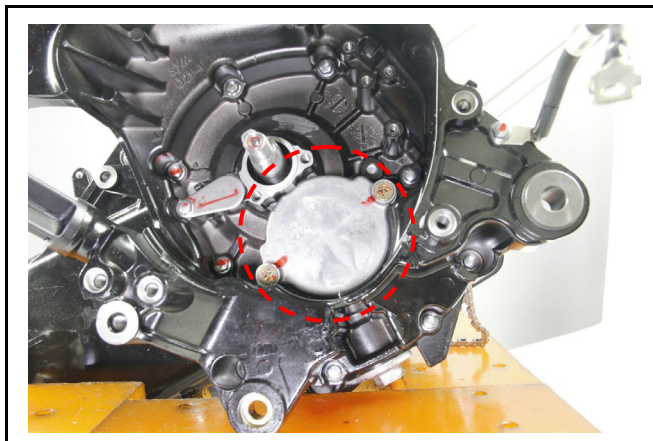
Troubleshooting

Excessive Engine noise

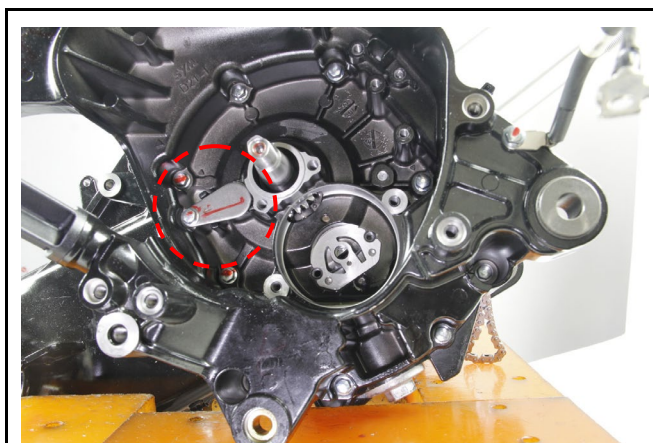
- Loose crankshaft bearing
- Loose crankshaft pin bearing
- Worn out piston pin and pin hole

Crankcase Disassembly

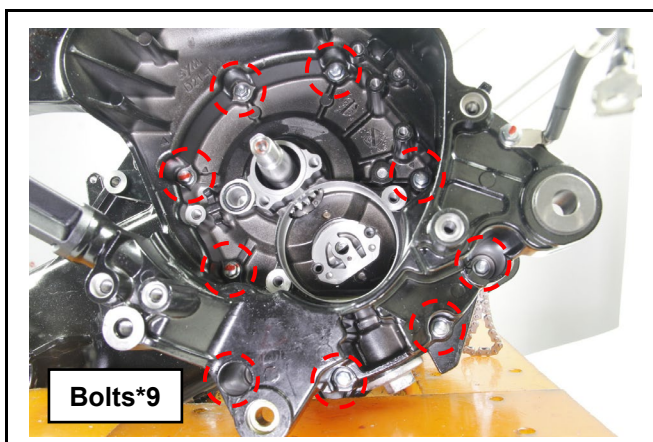
Remove the oil pump.



Remove the push plug.



Remove R. crankcase bolts.



Remove the R. crankcase.

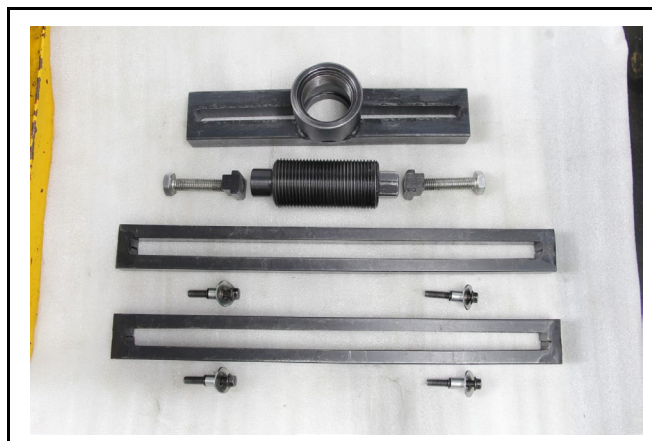


11. Crankshaft / Crankcase

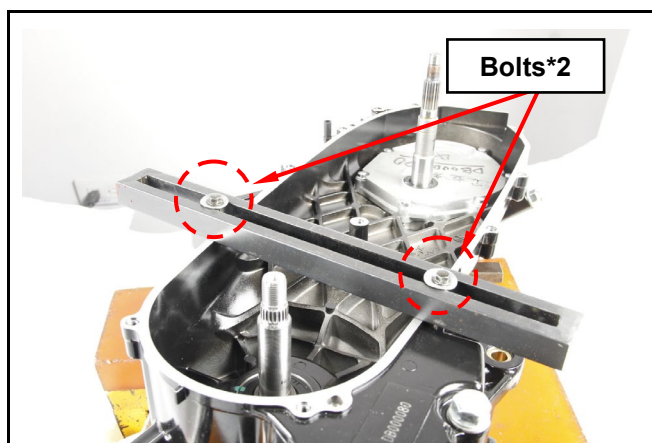


Crankshaft Disassembly

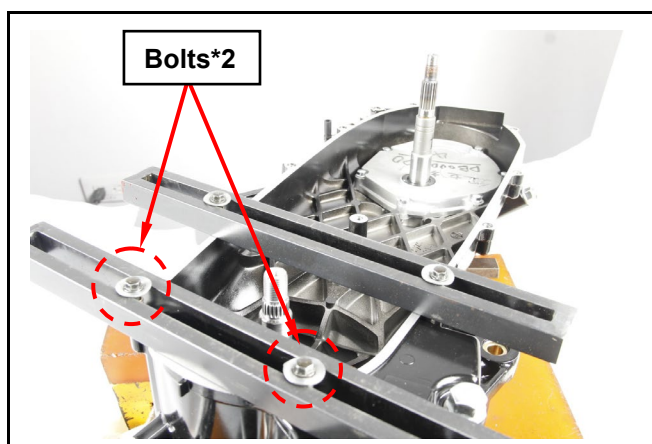
- Special tool:
Crankshaft disassemble/install tool
NO. SYM-1120000-ALL



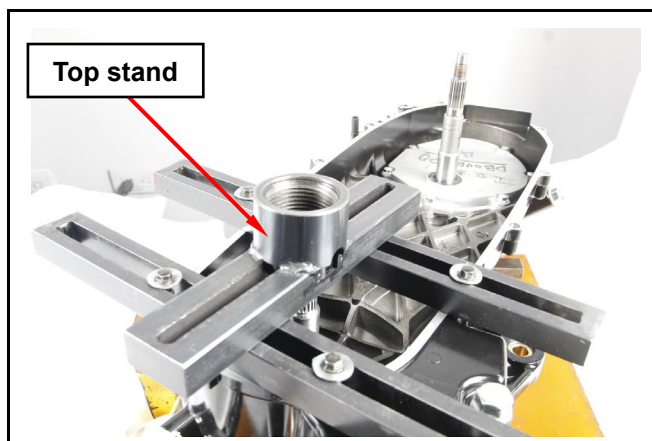
Fix the pedestal of crankshaft disassemble/install tool on L. crankcase.
Tighten the bolts.



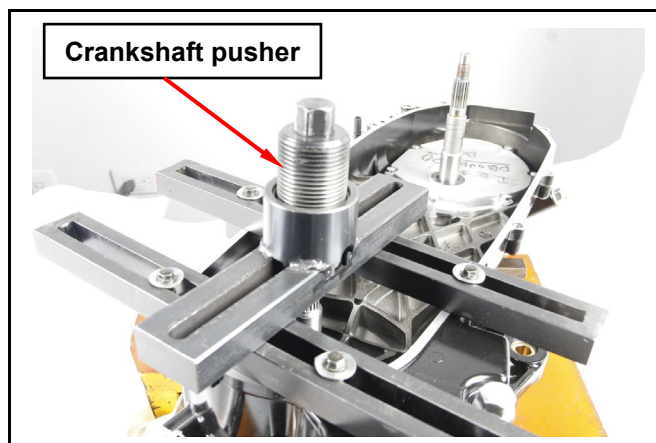
Fix the other pedestal following the same way.
Tighten the bolts.



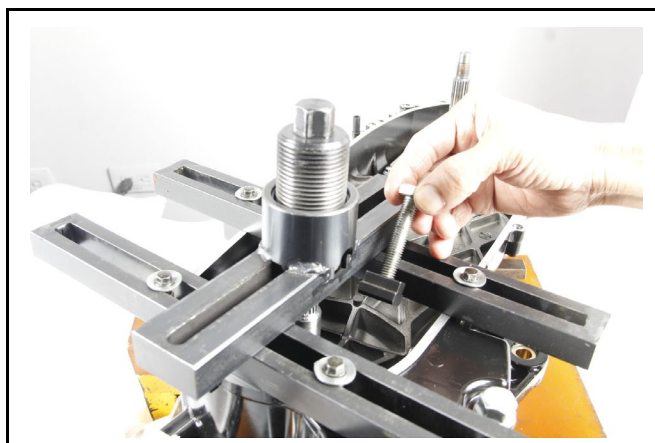
Place the top stand on pedestal.



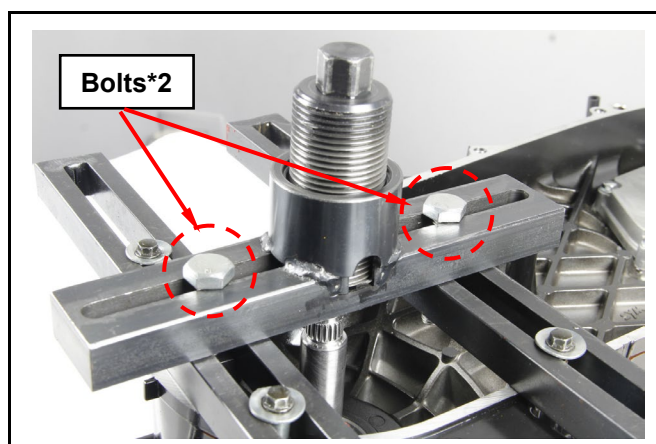
Install the crankshaft pusher.



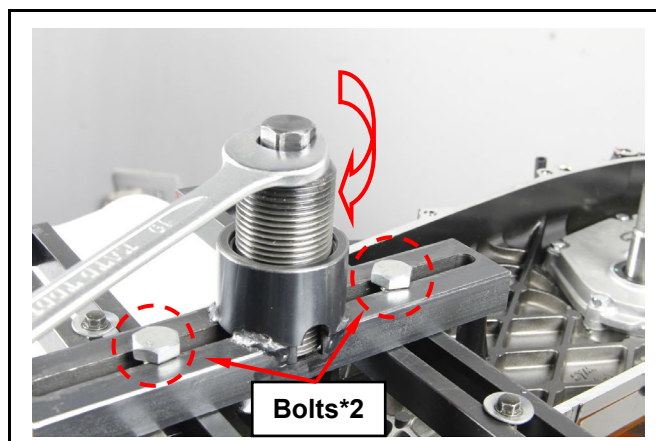
Pass the bolt through the top stand and pedestal.



Put the bolt on.

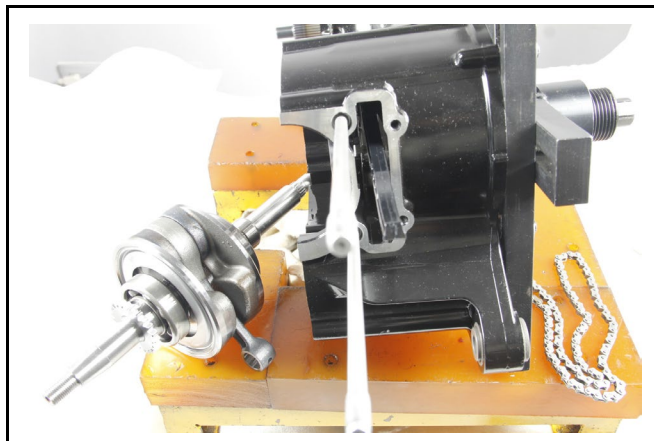


Tighten the crankshaft pusher clockwise.
Align crankshaft pusher with center of crankshaft.
Tighten the top stand bolts.
Screw the crankshaft pusher gradually.

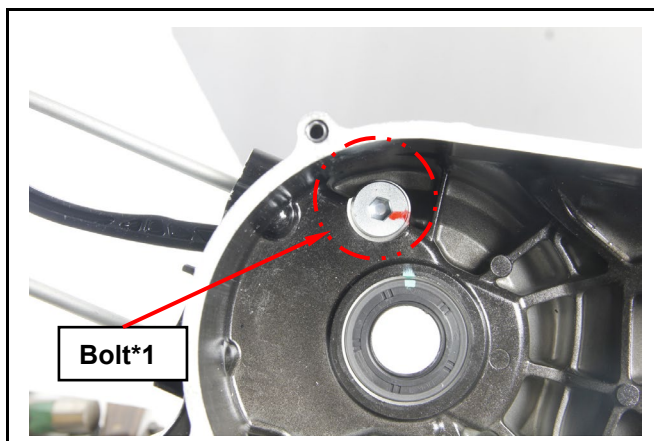


11. Crankshaft / Crankcase

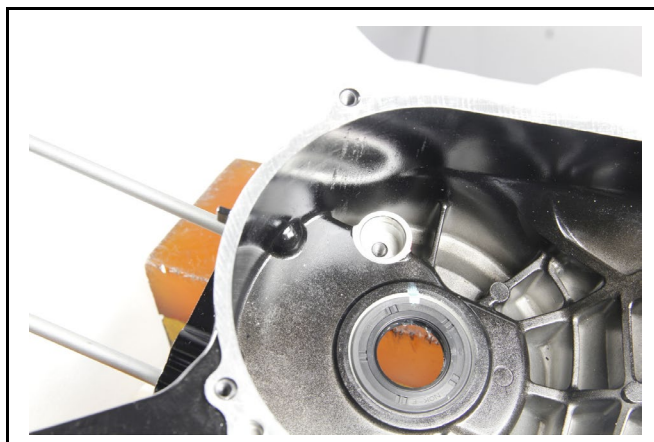
Remove crankshaft.
Remove the cam chain.



Remove the tensioner bolt.



Remove the tensioner.



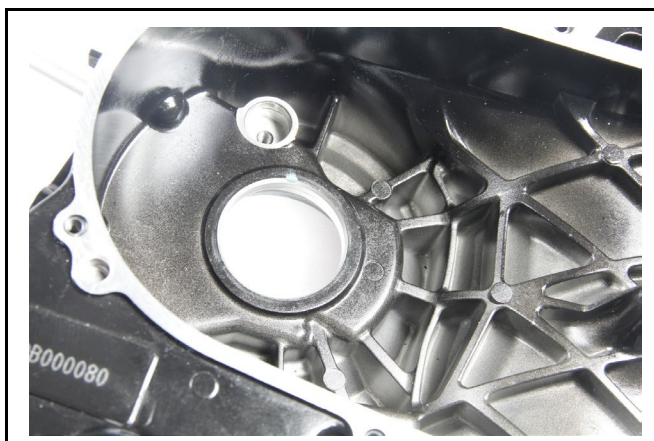
- Special tool: Seal puller
NO. SYM-9003200



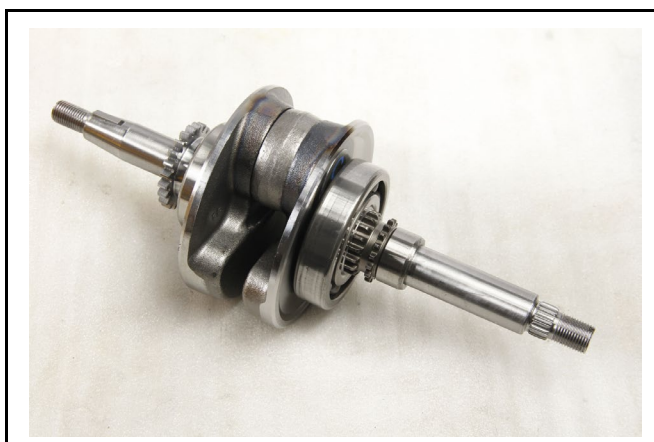
Hook the oil seal.



Remove oil seal.



Remove crankshaft bearing.



- Special tool: Outer bearing puller
No. SYM-6204010



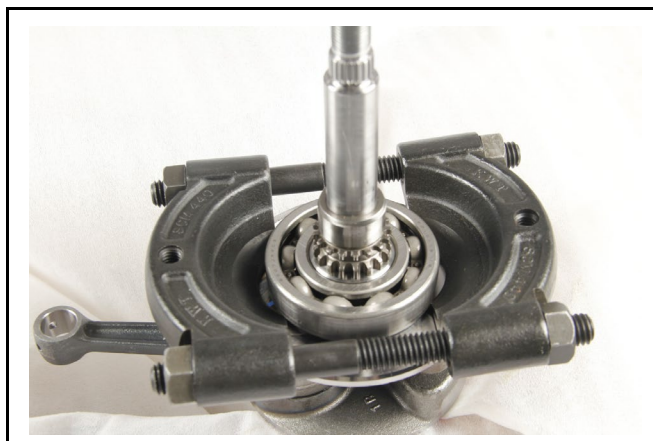
11. Crankshaft / Crankcase



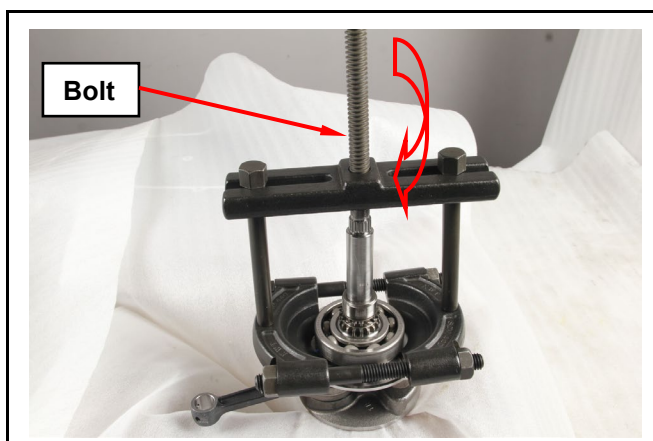
Tighten the outer bearing puller.

Caution

- Do not tighten too hard.
- Do not clamp the crankshaft.



Put top stand on.
Tighten the bolt.



Remove the bearing.

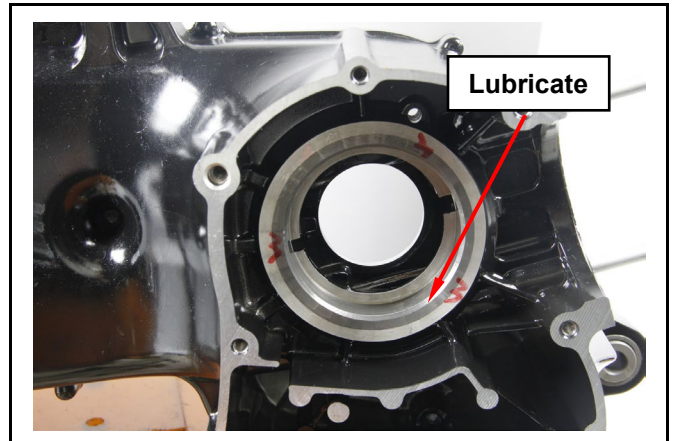


Crankshaft bearing assembly

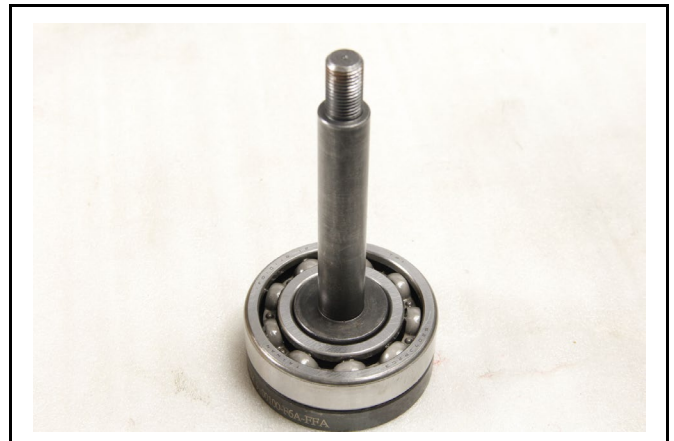
- Special tool:
F6A FFA L. crankshaft bearing driver
NO. SYM-9100100-F6A FFA



Lubricate the groove for crankshaft bearing installation with some lubricant.



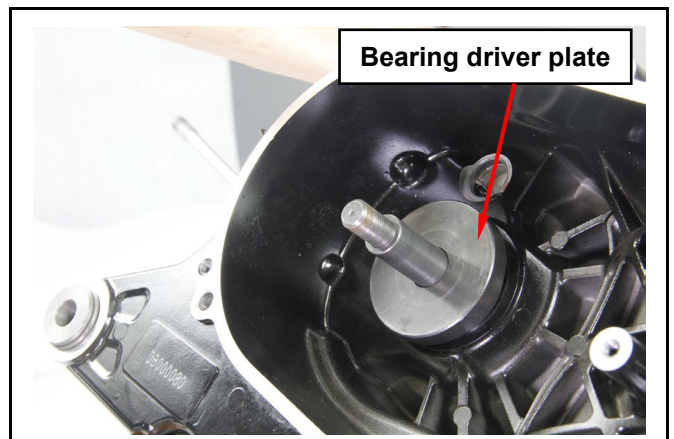
Put bearing onto crankshaft bearing driver.



Put the bearing driver onto the position of left crankshaft bearing.

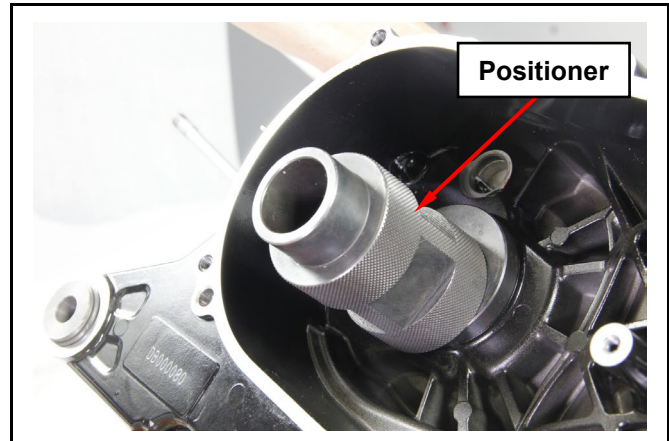


Put the bearing driver plate onto the position of left crankshaft seal.

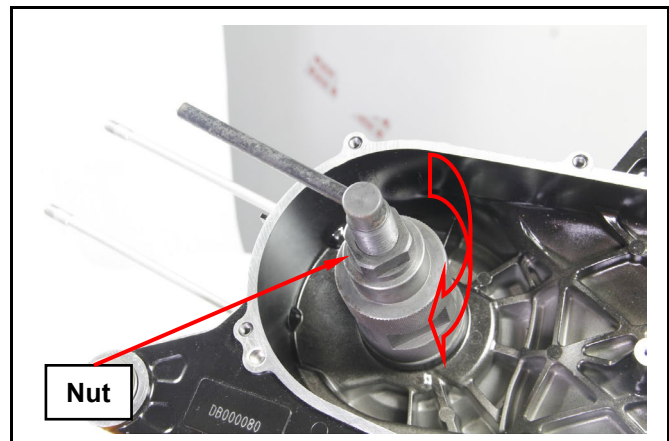


11. Crankshaft / Crankcase

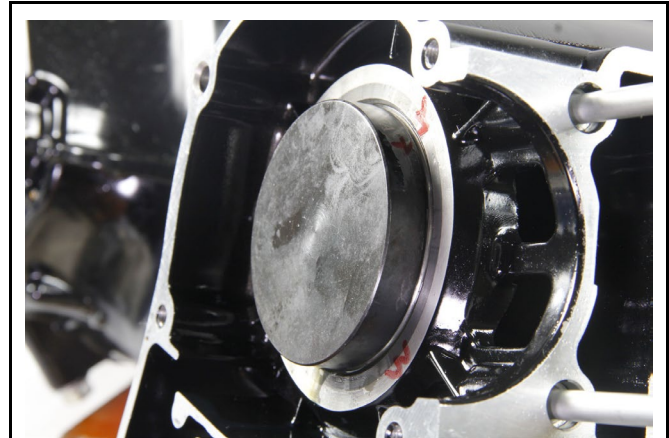
Put the positioner on the plate.



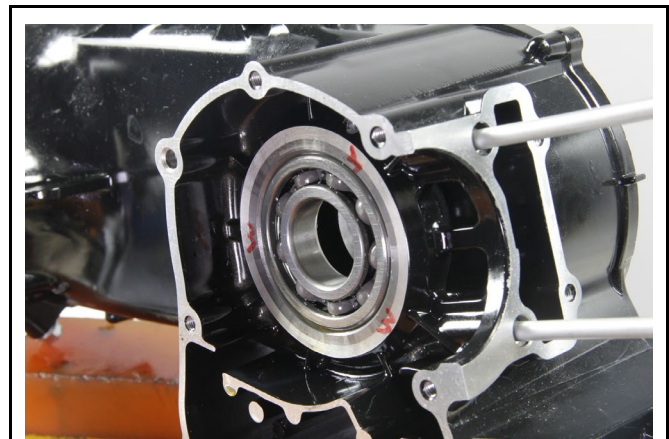
Pass crankshaft/shaft installer through the positioner, then connect with bearing driver. Rotate the nut clockwise with wrench.



Install bearing into position.



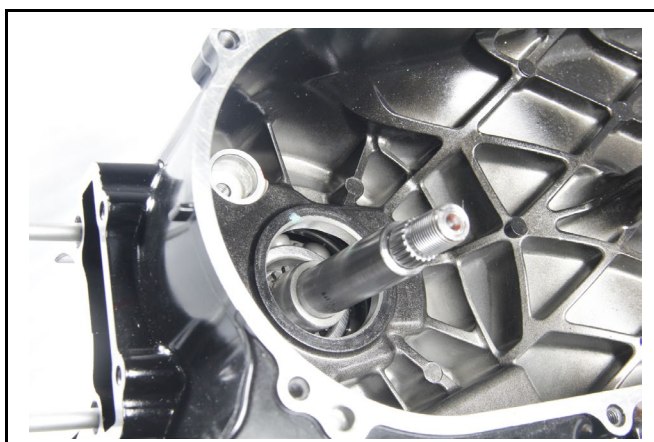
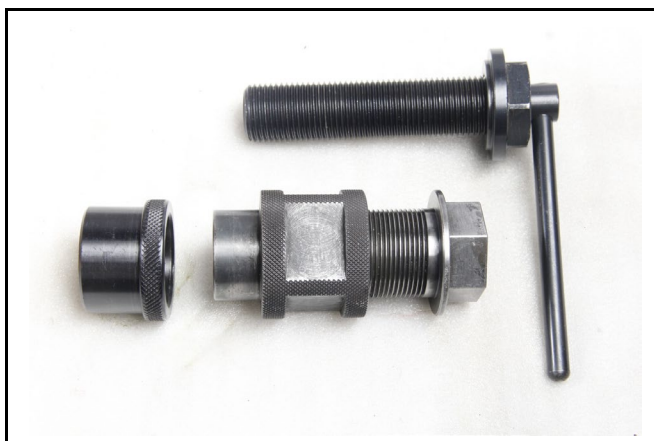
Make sure bearing in position.



Crankshaft assembly

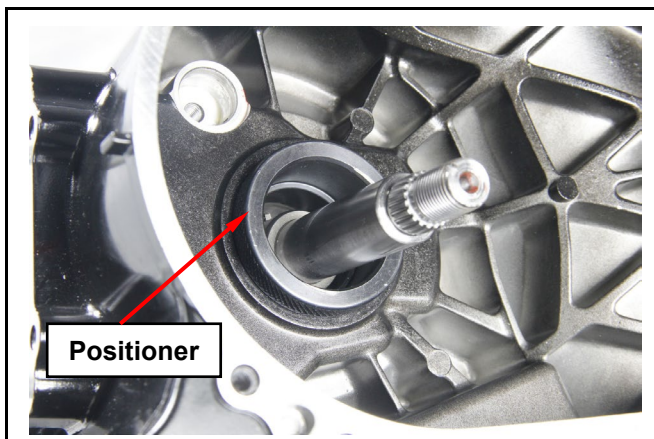


- Special tool:
Crankshaft disassemble/install tool
NO. SYM-1120000-ALL



Put crankshaft bearing tool positioner onto left crankcase.

- Special tool:
Crankshaft bearing positioner
NO. SYM-1120000-F6A POS

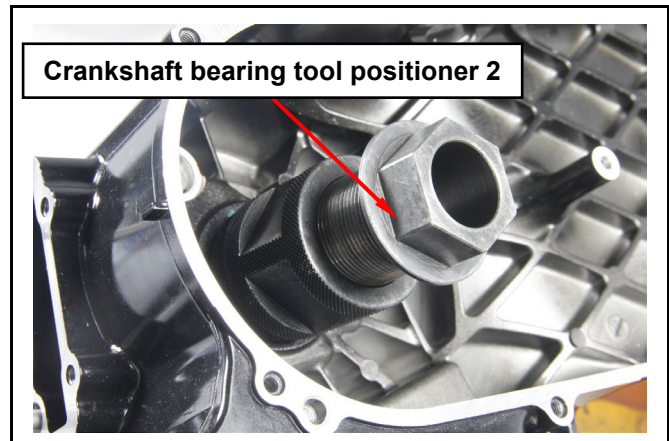


11. Crankshaft / Crankcase



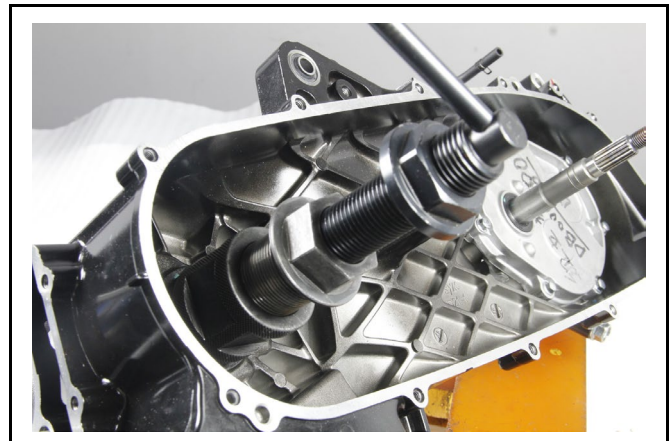
Install crankshaft bearing positioner 2.
Adjust height of crankshaft bearing positioner 2 by rotating the 39mm nut.

- Special tool:
Crankshaft bearing positioner 2
NO. SYM-1120000-B GUIDE

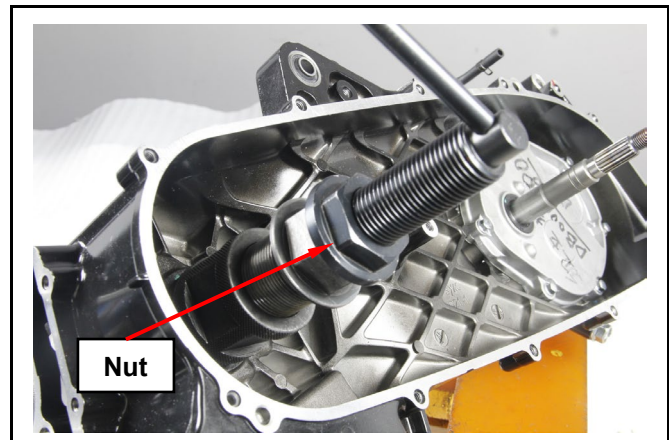


Pass crankshaft/shaft installer through the positioner, and install it on crankshaft.

- Special tool
F6A FFA Crankshaft/shaft installer
NO. SYM-1130000-F6A F6B



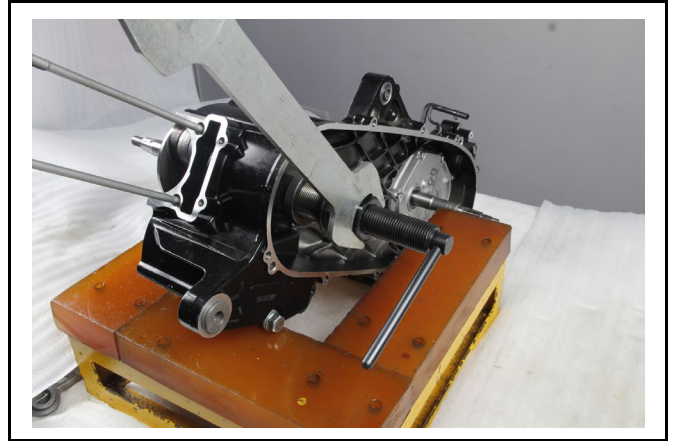
Adjust the nut of crankshaft/shaft installer.



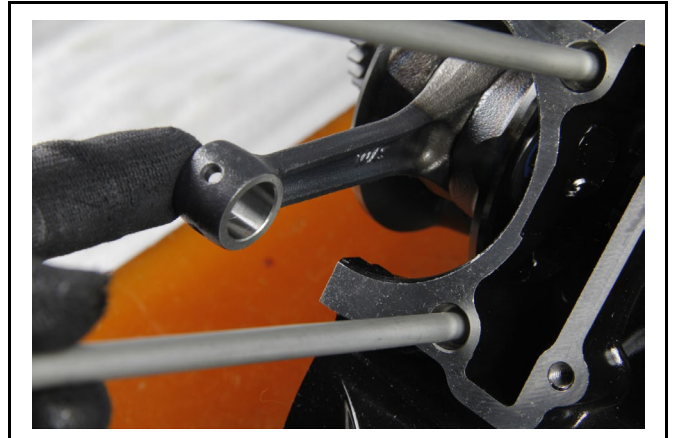
- Special tool: 44 -39 wrench
NO. SYM-2301000



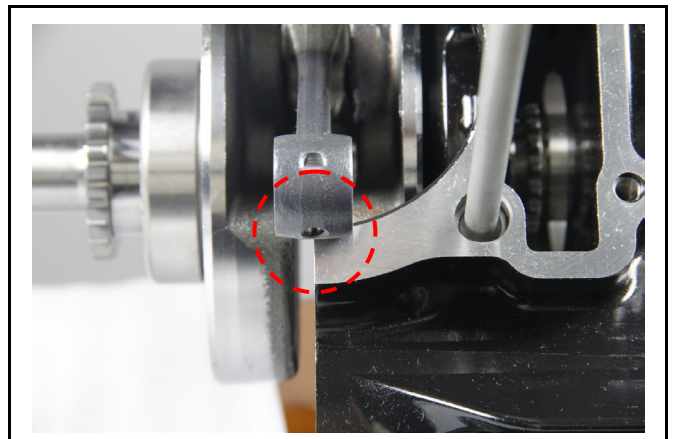
Rotate the 39mm nut clockwise with 44-39 wrench.
Install crankshaft in position.



Avoid a falling hit, use some clean rag to keep the gap between cylinder and connecting rod.



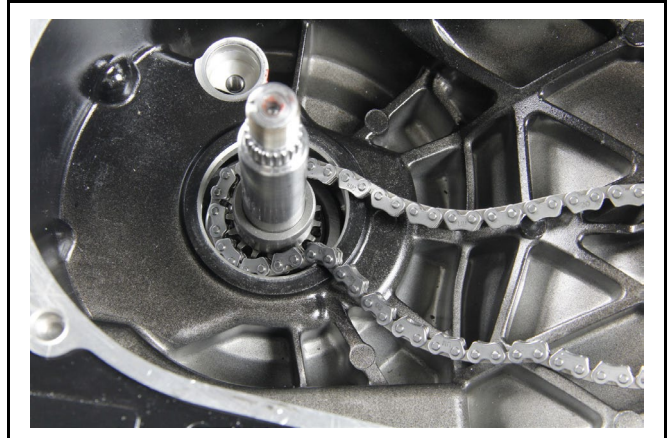
Having positioned the crankshaft, make sure the small end of connecting rod toward front of engine.



11. Crankshaft / Crankcase



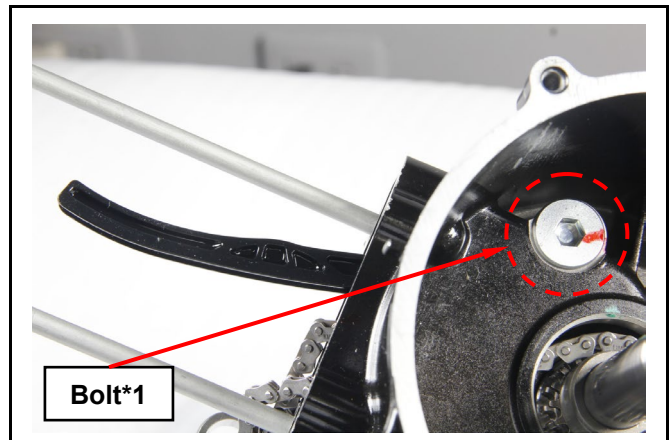
Install cam chain.



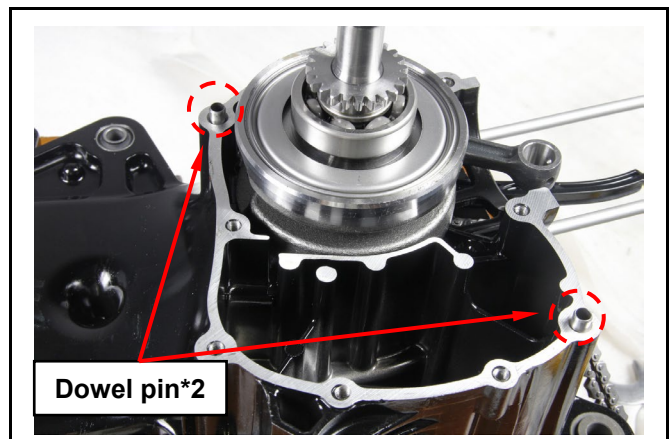
Make sure cam chain install into sprocket.



Install tensioner bolt.



Install dowel pins.



Install the gasket.



Position the right crankcase.



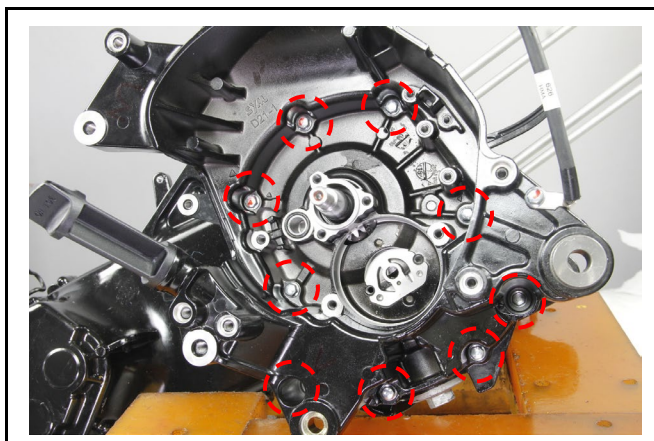
Position bolts.

Caution

- Position and length of bolt.

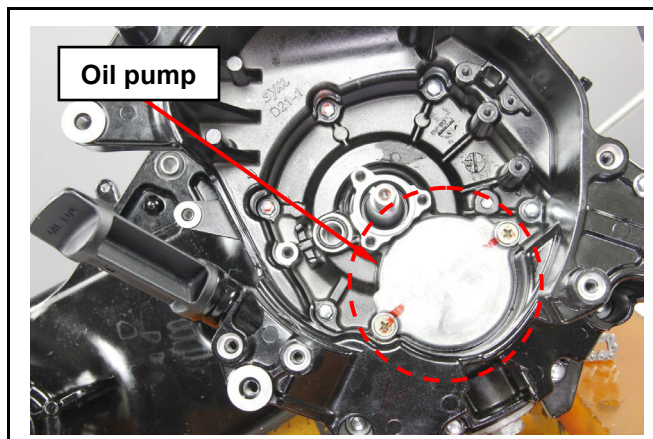


Tighten bolts. (Bolt x9)

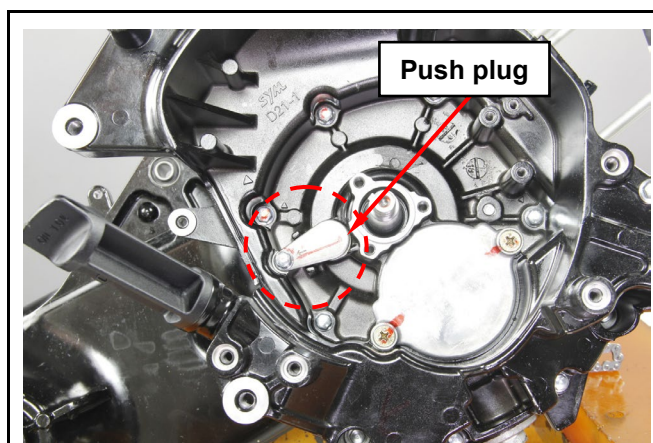


11. Crankshaft / Crankcase

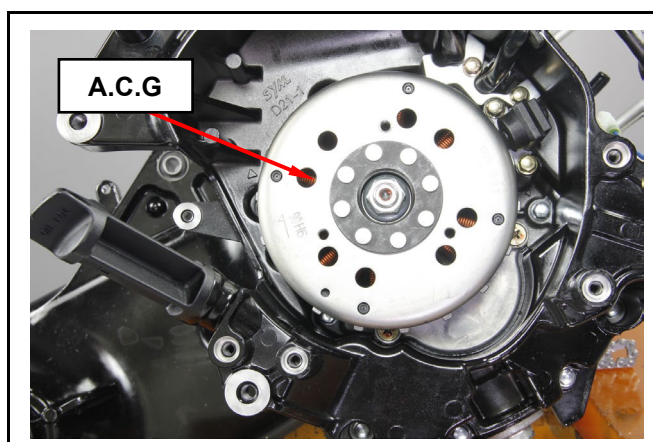
Install the oil pump.



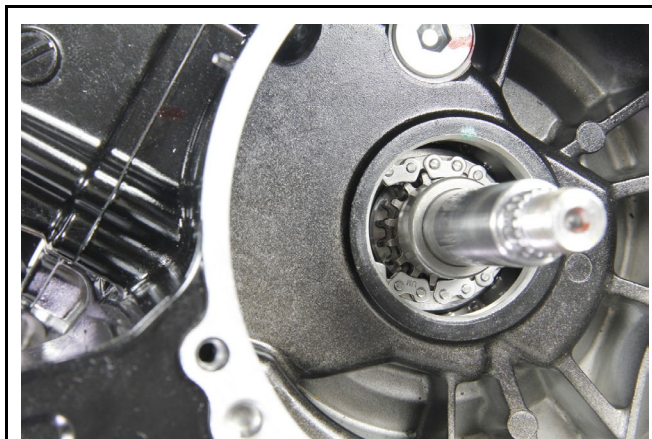
Install the push plug.



Install the A.C.G



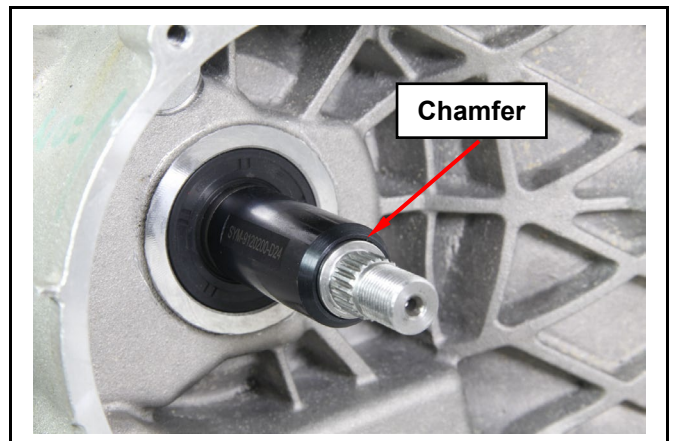
Install the oil seal of left crankcase.



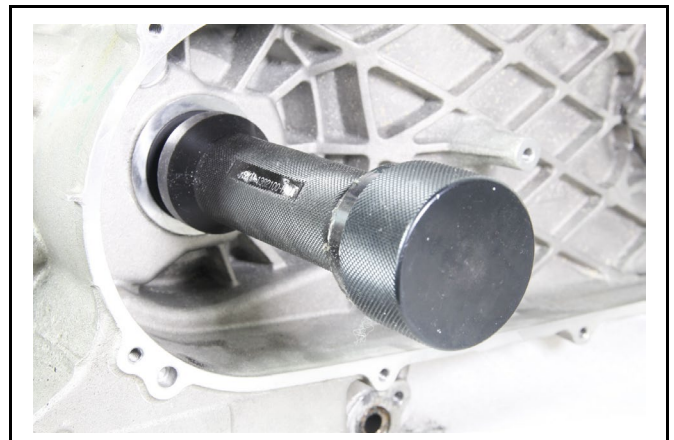
- Special Tool:
Oil seal installer
NO. SYM-1332100-HMA
Oil seal guide tool
NO. SYM-9120200-D24



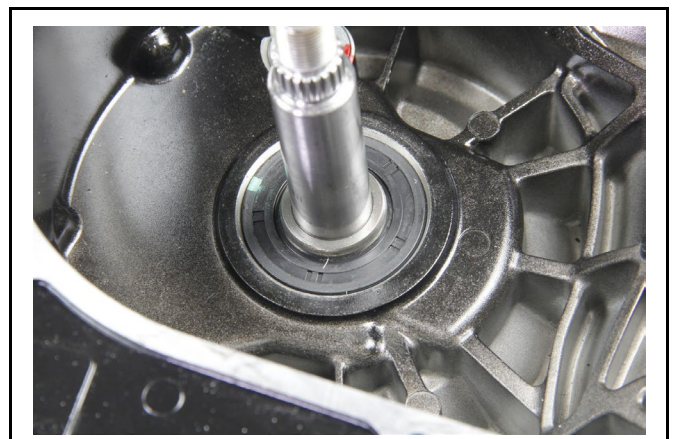
Install the oil seal guide tool on crankshaft, and make sure the chamfer face outward.
Install the oil seal with oil seal guide tool.



Knock in oil seal with oil seal installer.



Make sure oil seal in position.



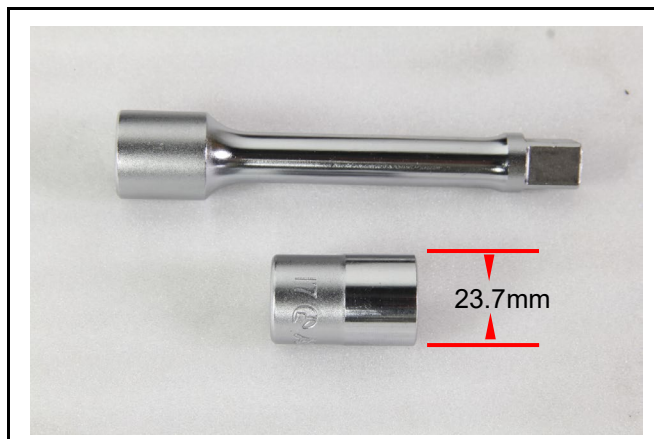
11. Crankshaft / Crankcase



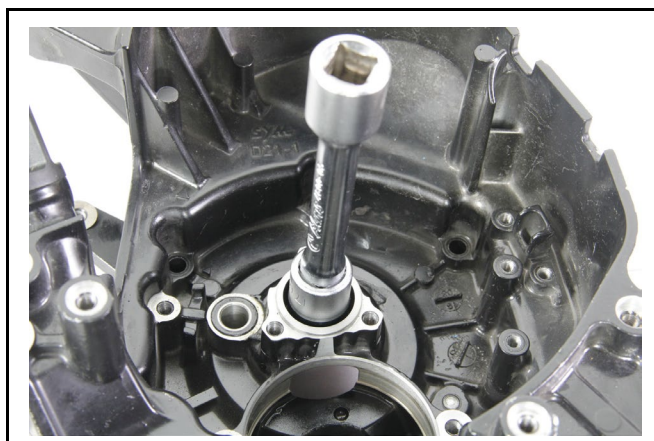
Right crankcase oil seal disassembly /assembly

Oil seal disassembly

Tool: Ø 23.7mm Socket, Socket extension



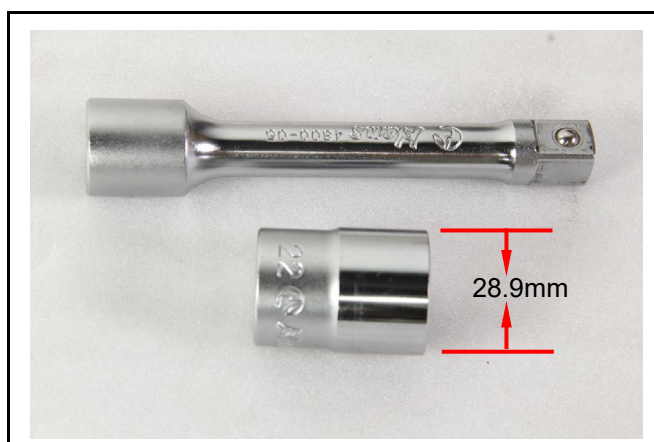
Knock the oil seal out.



Oil seal assembly

Tool:

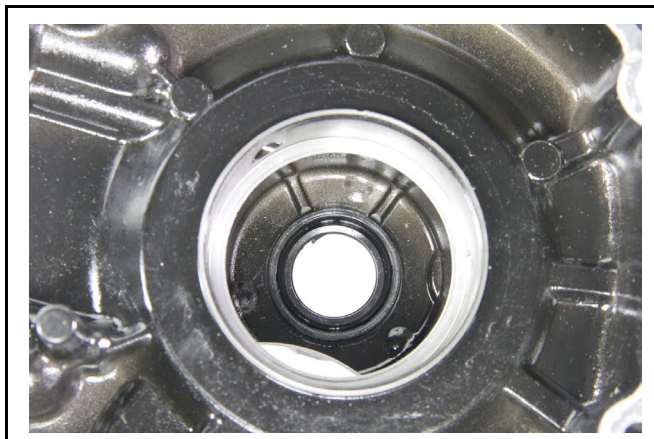
Ø 28.9mm Socket, Socket extension



Install the oil seal from inside of right crankcase.



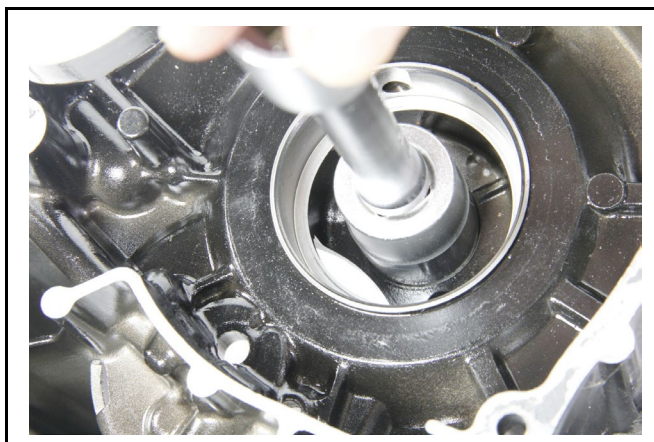
Put the oil seal in position.



Push in the oil seal by hand.



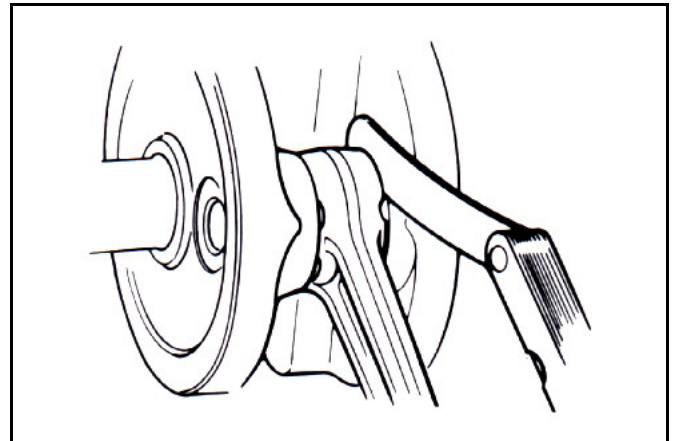
Knock in the oil seal.



Crankshaft Inspection

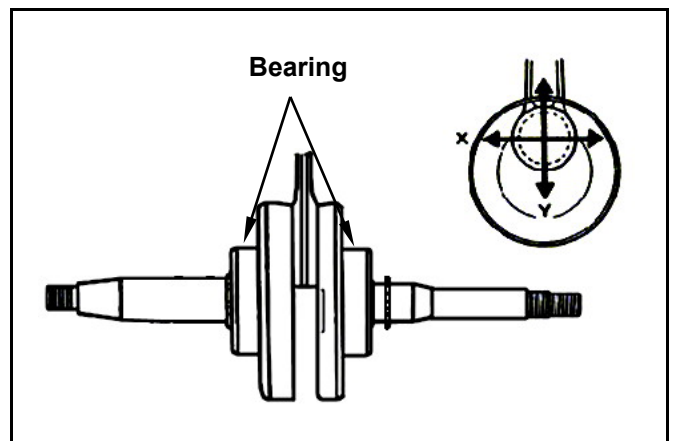
Use a feeler gauge to measure left and right clearance of connecting rod big end.

- Service limit: 0.55 mm



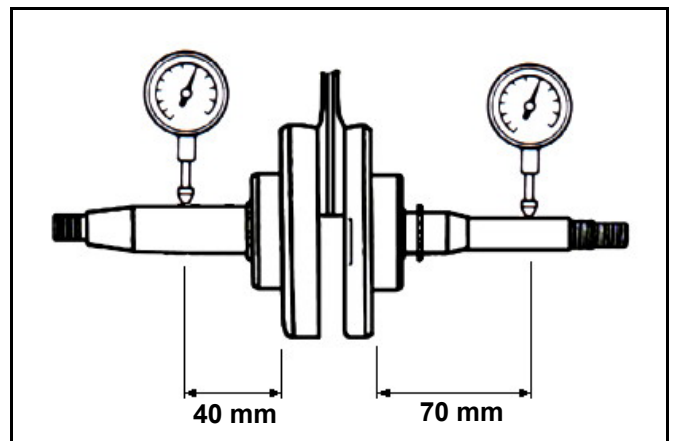
Measure the clearance of the big end at the vertical directions.

- Service limit: 0.05 mm



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

- Service limit: 0.10 mm

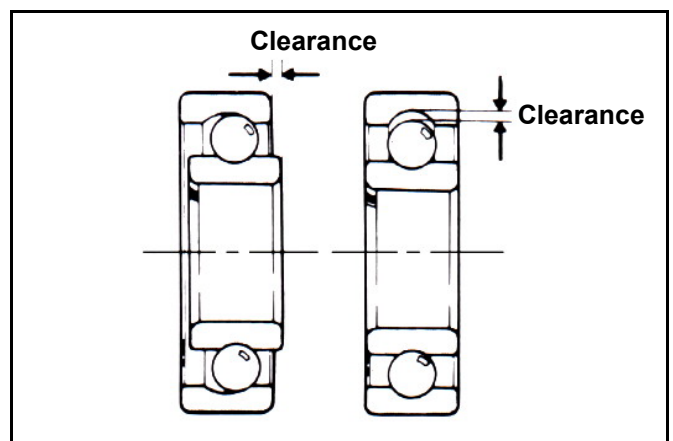


Check crankshaft bearing

Use hand to rotate the bearing to see it moves freely, smoothly and noiselessly.

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

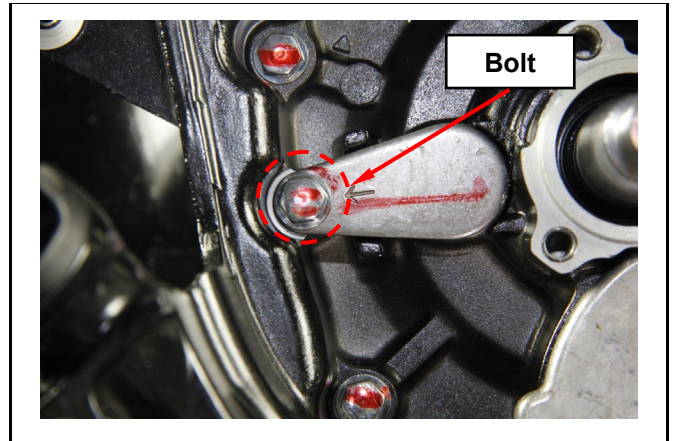
If any noise, weak combination, and difficult rotation are detected, replace a new bearing.



Right crankcase push plug disassembly /assembly

Disassembly

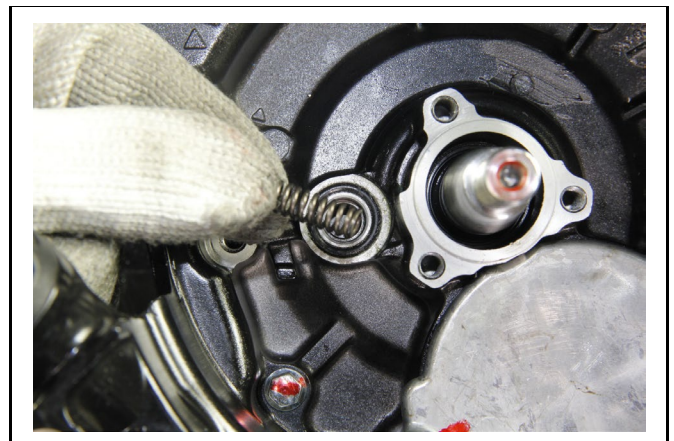
Remove the bolt for setting plate.



Remove the spring.

⚠ Caution

- Spring cannot be broken or deformation.
- Plug cannot be broken
- Oil seal cannot be broken



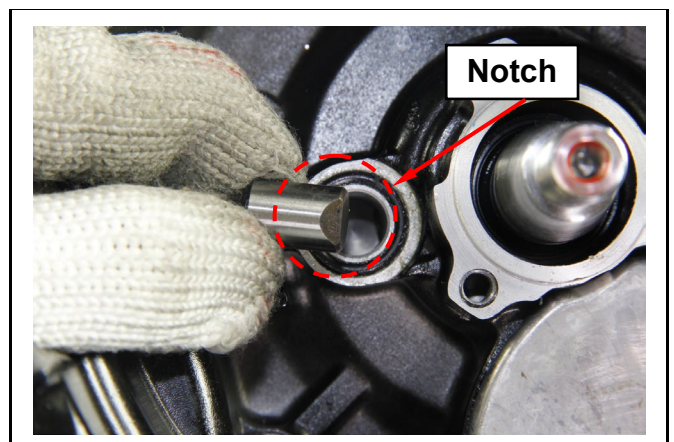
Remove the push plug.

Assembly

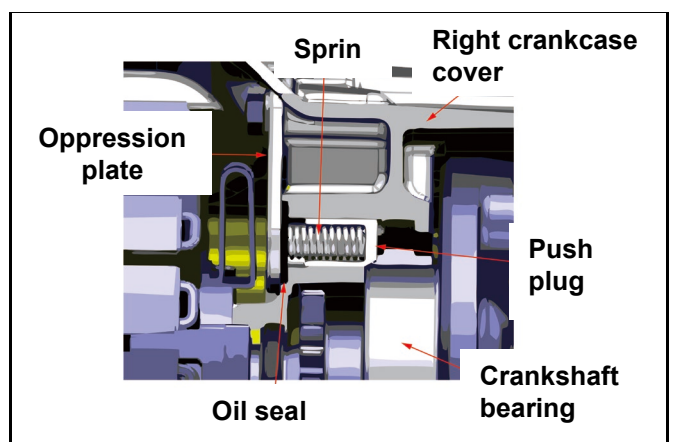
Install in the reverse order of removal.

⚠ Caution

- Notch must alignment to crankshaft.
- Oil seal cannot be broken or lost.

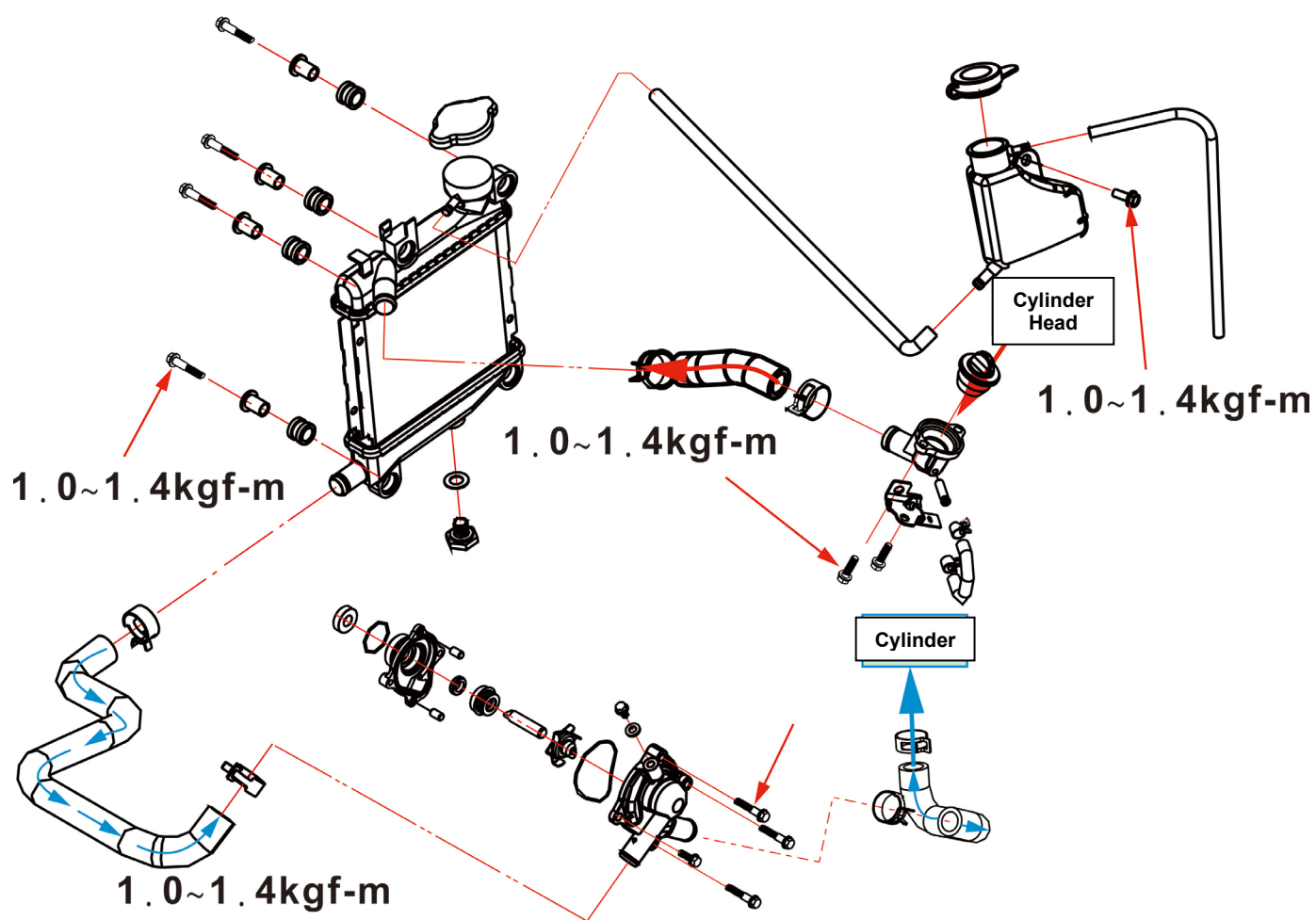


Principle of push plug.



Mechanism Diagram	12-1	Coolant Replacement	12-8
Precautions in Operation	12-2	Radiator Inspection	12-11
Troubleshooting	12-2	Water Pump Inspection	12-11
Radiator Disassembly	12-3	Thermostat Inspection	12-12
Thermostat Disassembly	12-6	Coolant Leve Inspection	12-12
Water Pump Disassembly	12-7		

Mechanism Diagram



Precautions in Operation

General Information

Caution

- 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.

- Only refill radiator with distilled water and specified additives.
- Fill coolant from 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 service.

Technical Specification

Item	Specification
Radiator cap relief pressure	1.1±0.15 Kgf/cm ²
Coolant Capacity: Engine + Radiator Reservoir	500c.c. Following the ruled mark
Thermostat	Begin to open: 82~95°C Stroke: 0.05~3.0mm

Torque Values

Radiator bolt	100~140kgf-cm
Water pump bolt	100~140kgf-cm
Thermostat bolt	100~140kgf-cm

Troubleshooting

Engine temperature too high

- The water thermometer and the temperature sensor do not work properly.
- Stuck thermostat closed
- Insufficient coolant
- Blocked passages in water hose, jacket or radiator
- Faulty fan motor
- Faulty water pump

Engine temperature too low

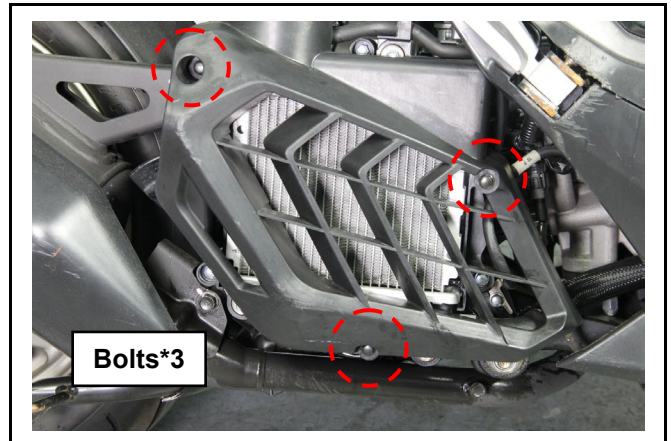
- Faulty water thermometer or temperature sensor
- Stuck thermostat open

Coolant leaks

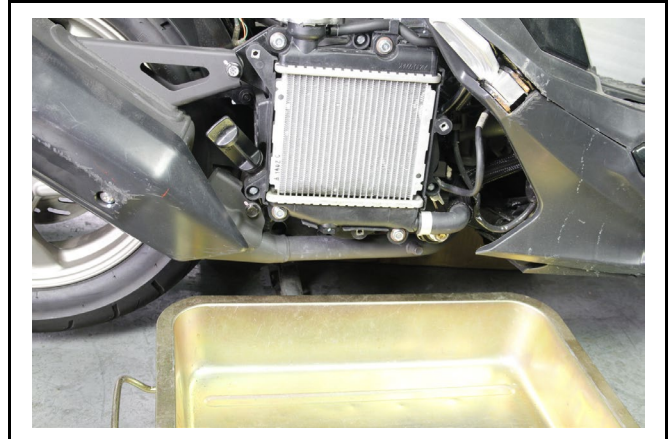
- Faulty water pump mechanical seal
- Deteriorated O rings
- Broken or aged water hose

Radiator Disassembly

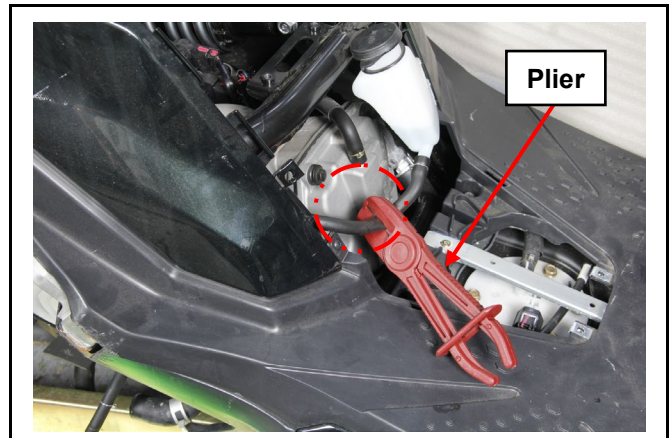
Remove seat, luggage box, and center cover.
Remove radiator protection cover.



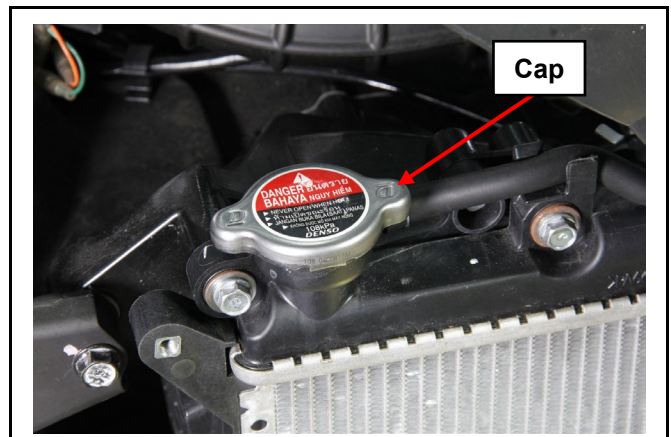
Put basin under the radiator to catch leaking coolant.



Clip reservoir hose with a plier.

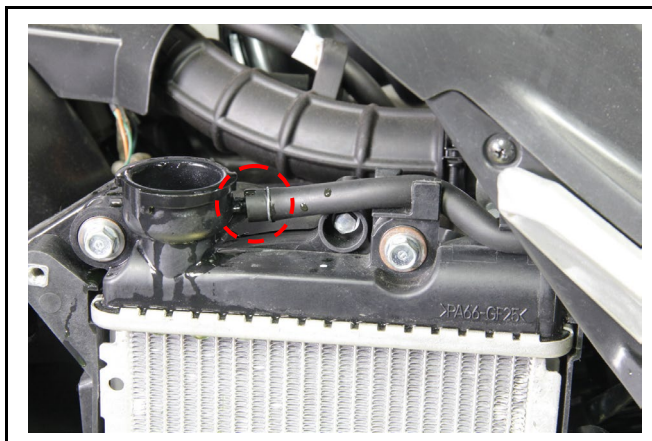


Open the radiator filler cap.

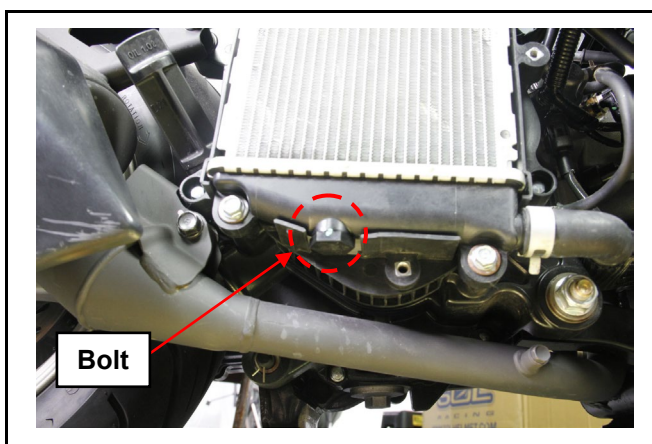


12. Cooling System

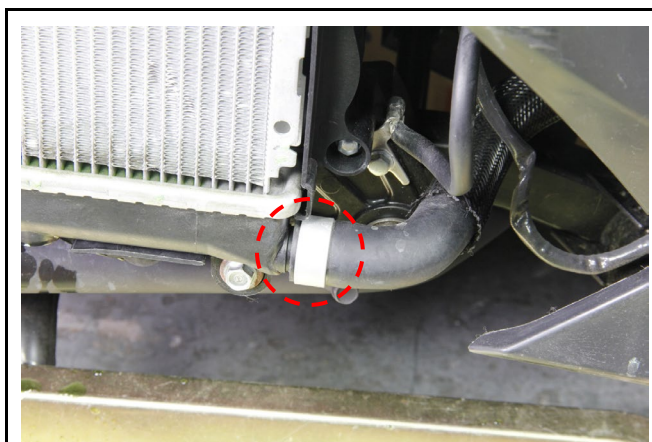
Disassemble the circle clamp.



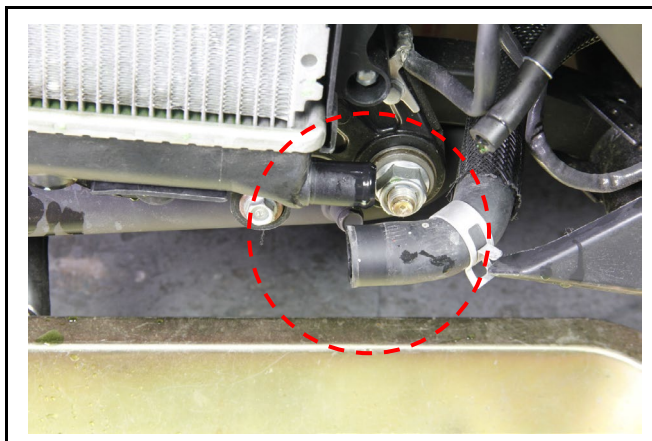
Remove drain bolt.



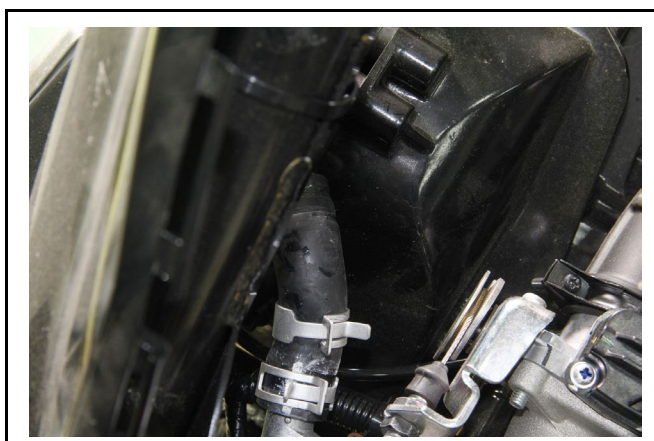
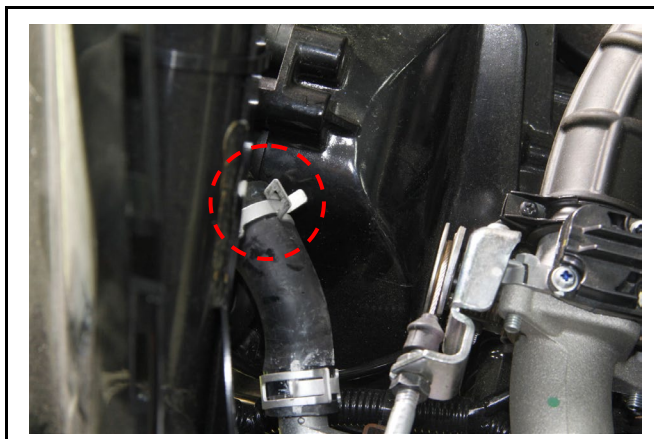
Remove the circle clamp.



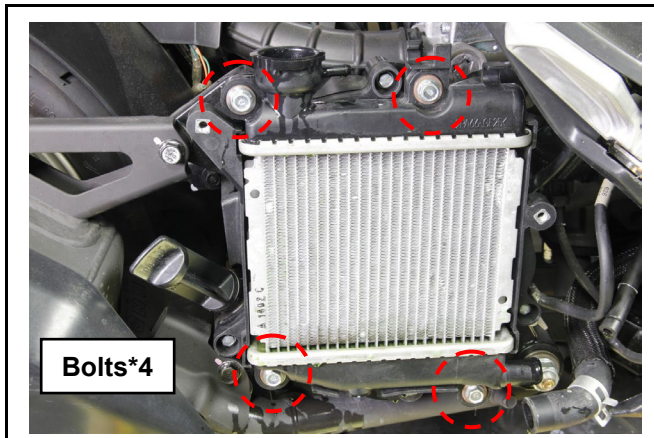
Remove the hose.



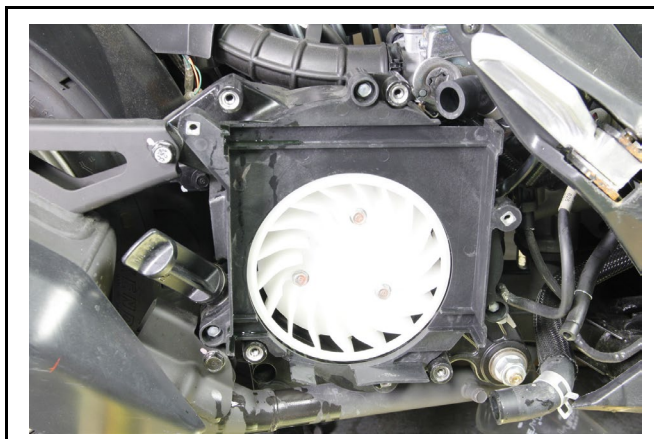
Remove the clamp.



Remove the bolts.



Remove the radiator.

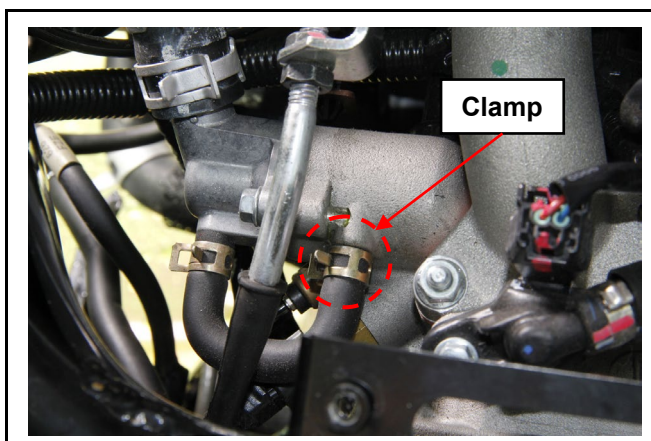


12. Cooling System

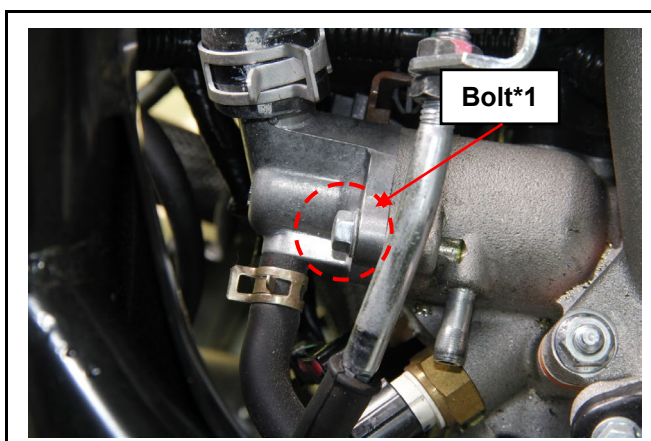
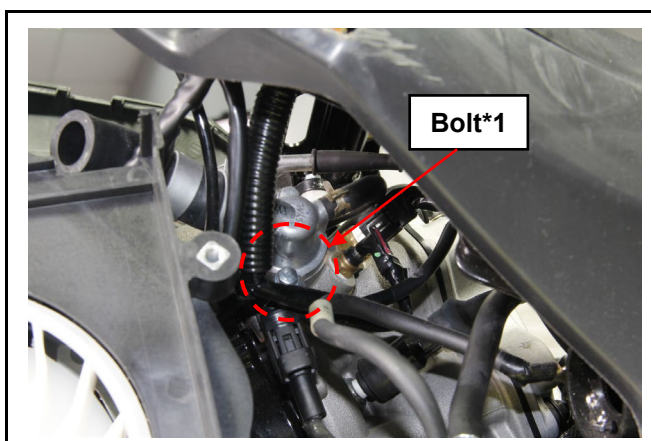


Thermostat Disassembly

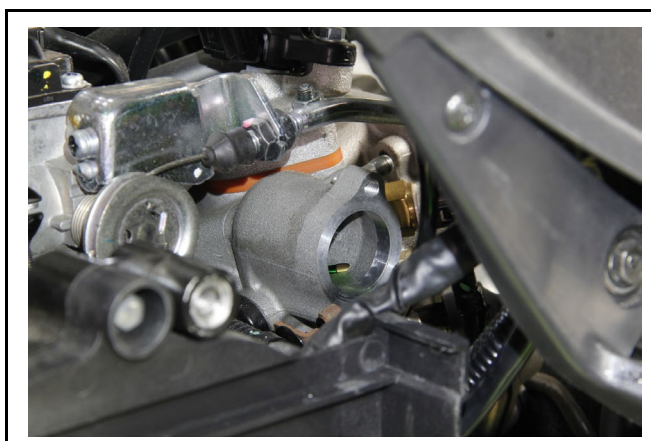
Remove the clamp and hose.

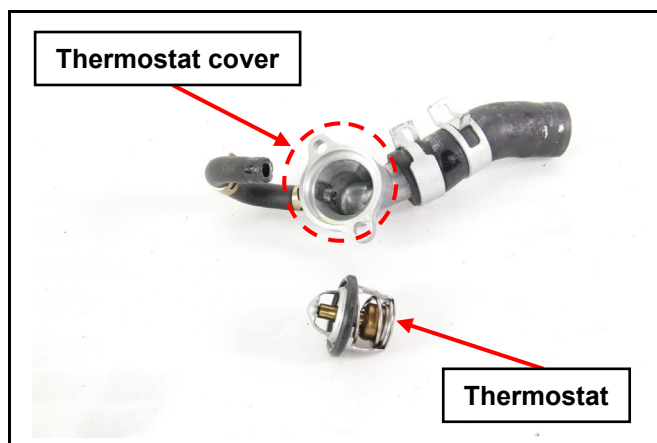


Remove the Thermostat cover bolts.



Remove the thermostat and thermostat cover.



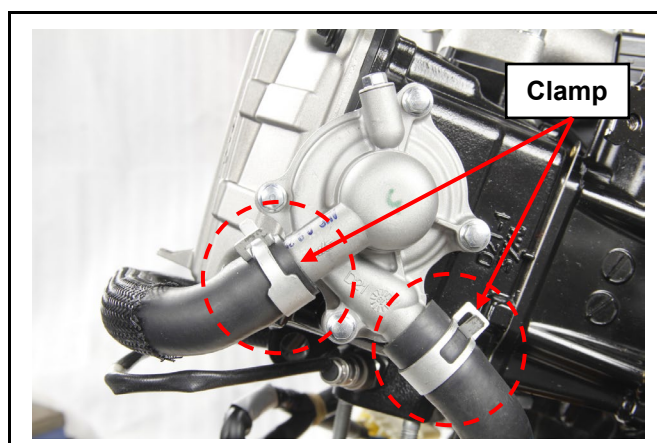


Water Pump Disassembly

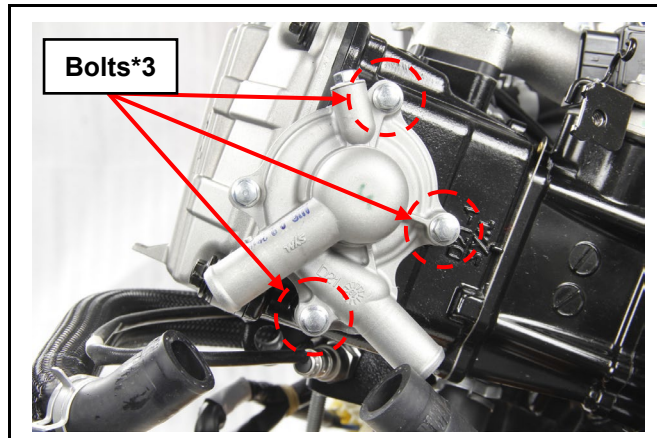
Remove clamps and tube.

Caution

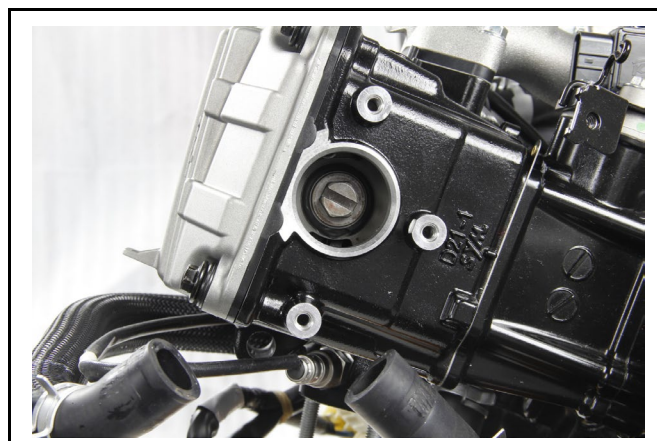
- Remove the water pump when need to service it.



Remove the water pump cover bolts.



Remove the water pump.



12. Cooling System



Coolant Replacement

Remove seat, luggage box, and center cover.

Remove radiator protection cover.

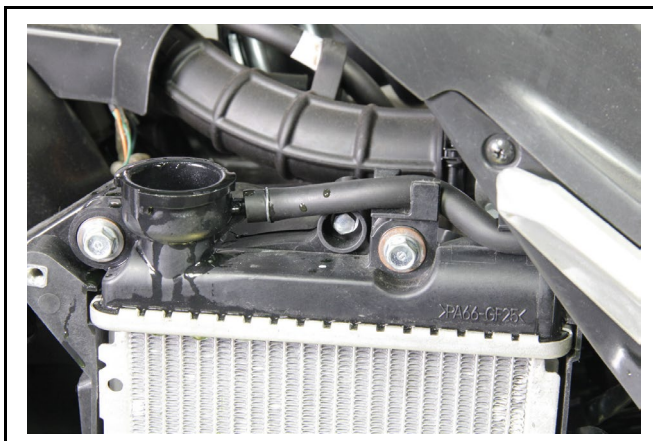
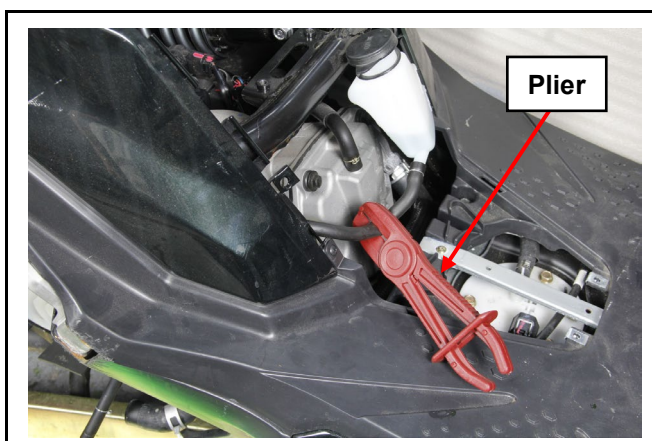
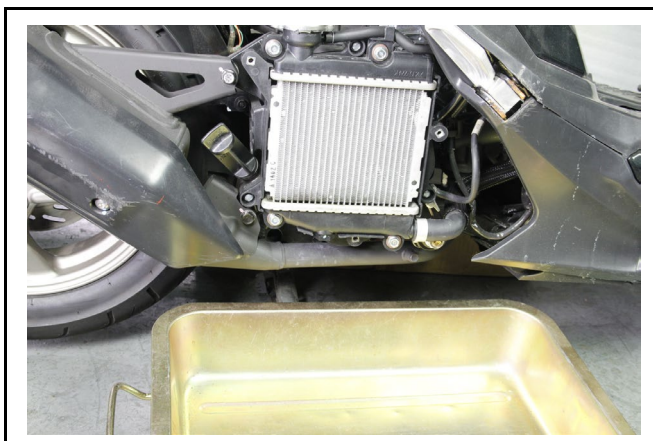
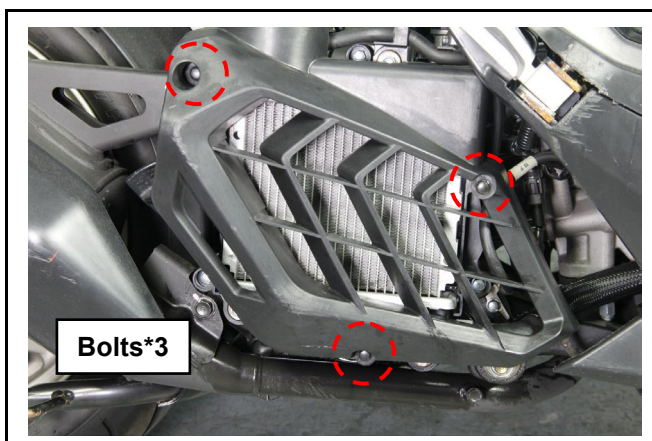
Caution

- Only replace coolant when the engine is cool, otherwise, get scald.

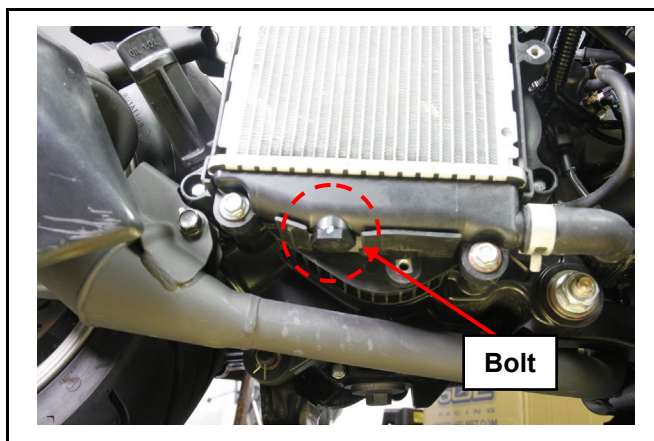
Put basin under the radiator to catch leaking coolant.

Clip reservoir hose with a plier.

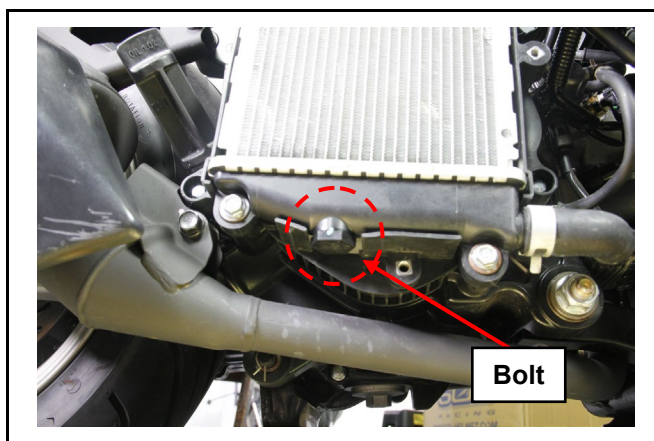
Open the radiator filler cap.



Remove drain bolt.



Having drained coolant, tighten the drain bolt.

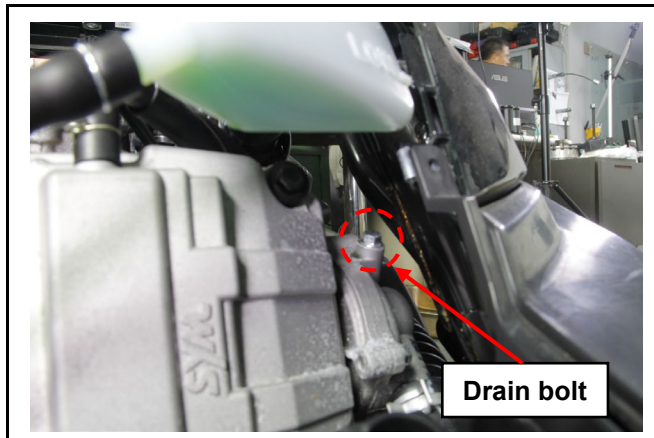


Loose drain bolt.

Refill coolant from radiator until coolant with air leaking from the drain bolt hole, then tighten drain bolt.

Caution

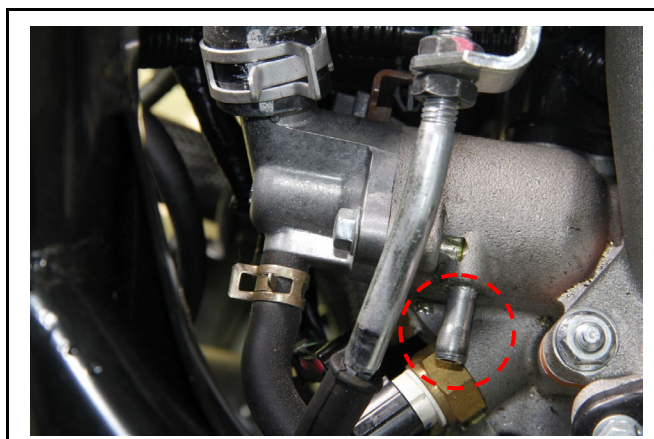
- In order to avoid cooling system getting rust, please do not use illegal or uncertified refrigerant.



Loose clip and water hose.

Refill coolant until coolant with air leaking from the tube.

Install clip and water hose.



12. Cooling System

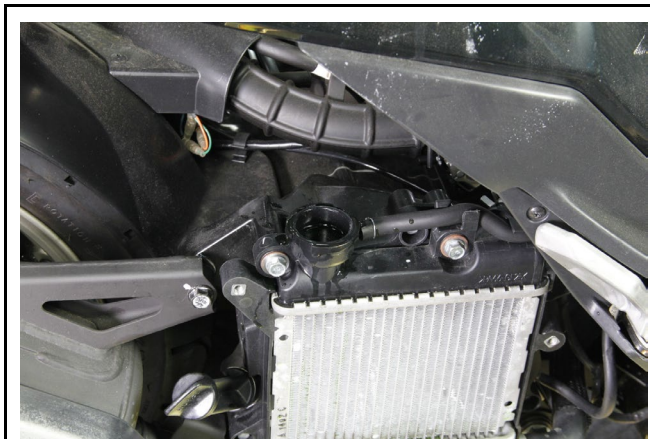


Refill up radiator with coolant.

Run the engine until coolant temperature is higher than 90 °C for releasing air.

Ensure no air left in the passages of cool system, then shut down engine.

Refill up radiator with coolant again.



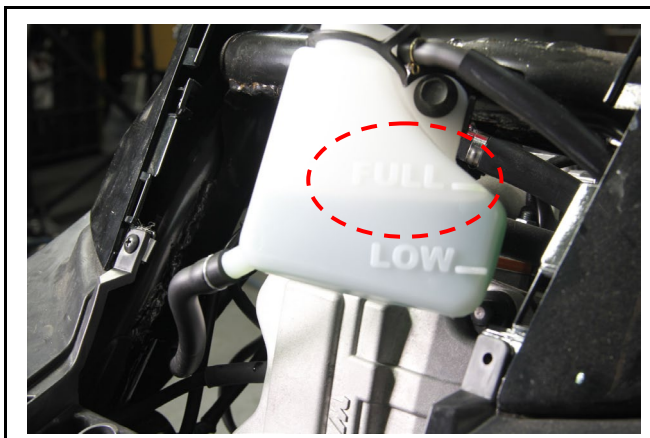
Install the radiator filler cap.



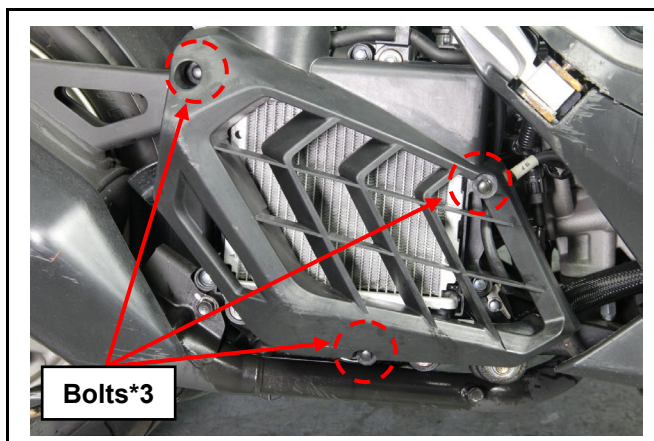
Remove plier.



Check if the level of coolant reaches the full mark on reservoir tank.

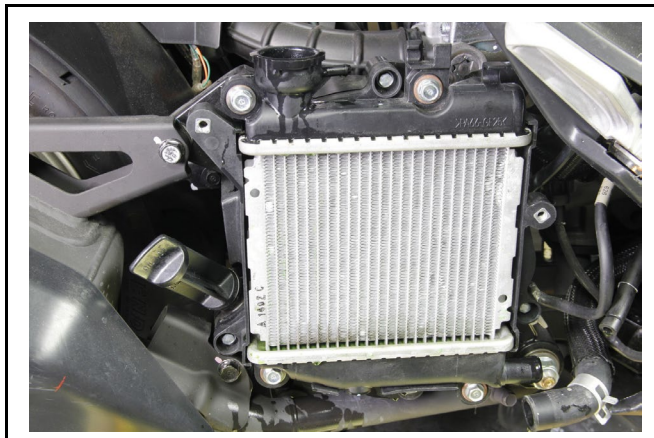


Install radiator protection cover bolts.
Install seat, luggage box, and center cover.



Radiator Inspection

Blow radiator with air to clean it.
If radiator is blocked by dust, use low-pressure water washing it.
Carefully clean radiator to protect radiator fins.
Check if any leakage from welds and seams.



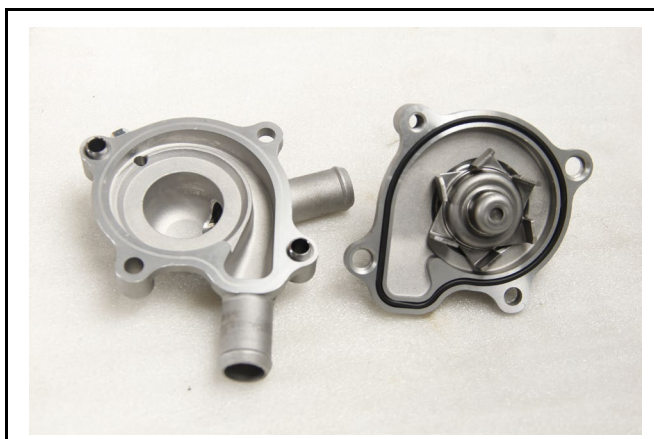
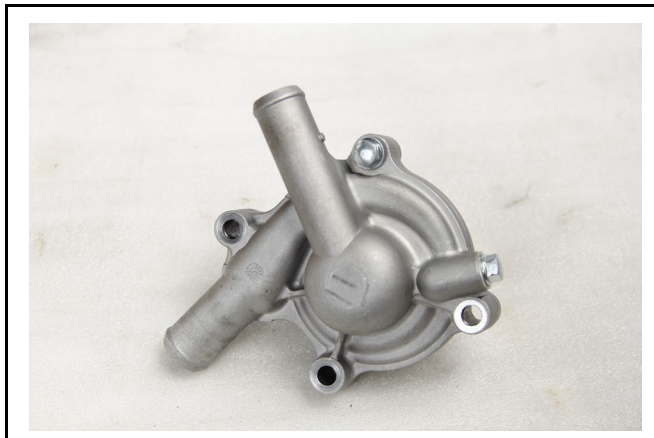
Water Pump Inspection

Water pump seal & water jacket leakage inspection

- Disassemble the drain bolt for coolant; release some coolant to check if oil is mixed.
- Check if oil is mixed by coolant by checking the oil color on oil level gauge.

If the above-mentioned problems happened, water pump seal, water jacket or cylinder head gasket are probably damaged. Please inspect water pump seal first, then check cooling system of head and cylinder head.

Water pump is an assembly that cannot be disassembled. Replace the entire water pump, if necessary.



Thermostat Inspection

Inspection

Check if thermostat is damaged.

Check the operation of thermostat by placing it in hot water.

Caution

- Whenever the thermostat or the thermometer contacts the wall of container, the reading display is incorrect.
- If the thermostat's valve remains open at room temperature, or the operation does not follow the rule of technical data, it must be replaced.

Technical Data

Begin to open	82~95°C
Stroke	0.05~3mm

Coolant Level Inspection

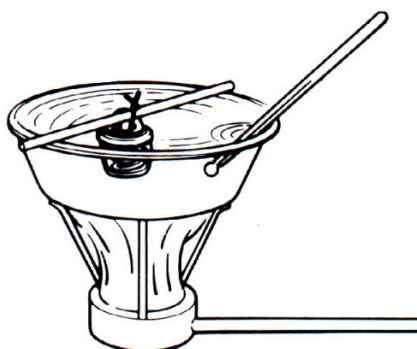
Check the coolant level on the reservoir from viewing window on center cover.

Remove seat, luggage box, and center cover for filling coolant.

Fill coolant to the proper level, Low to Full mark.

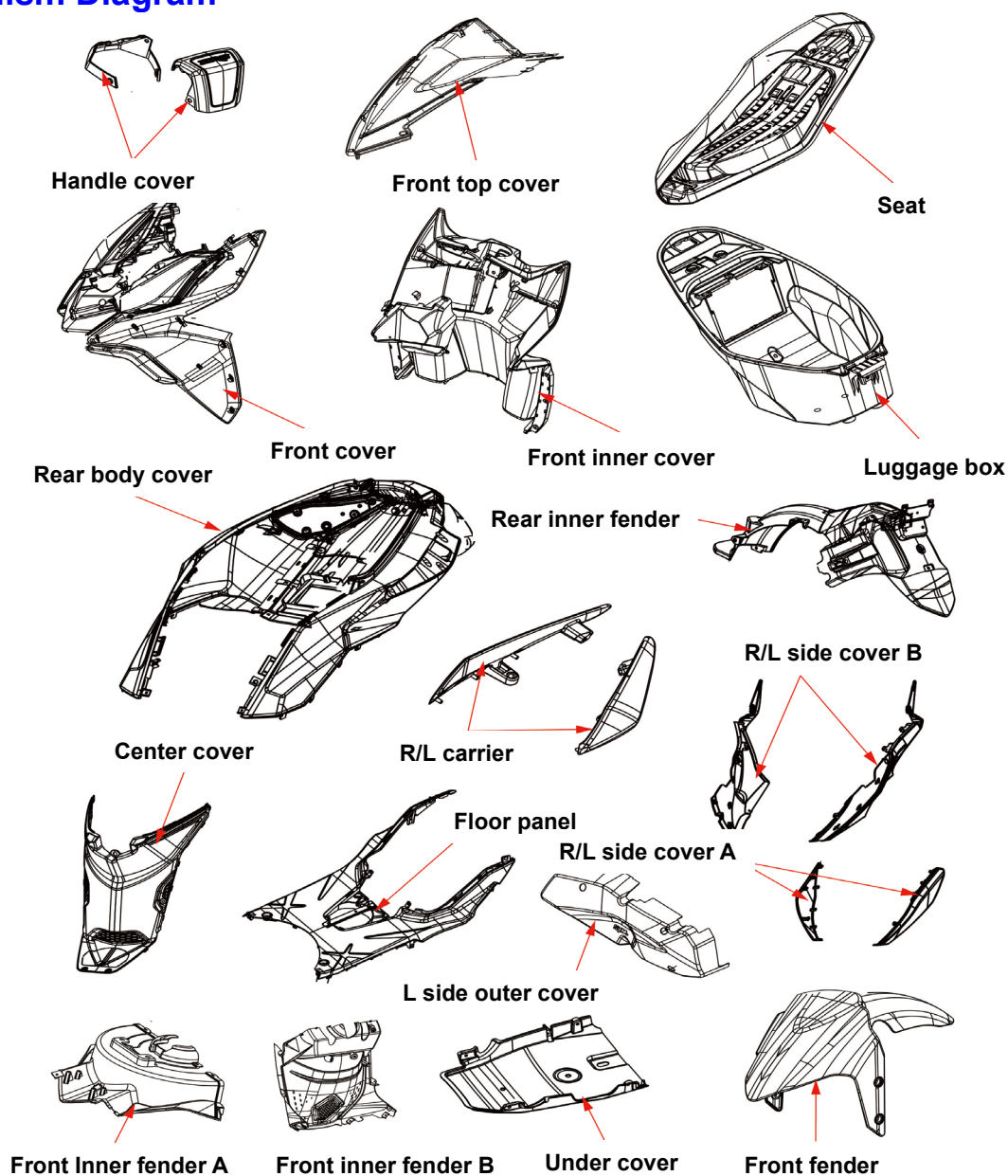
Caution

- Place keep the coolant level of reservoir tank between Low and Full marking to avoid leakage when coolant flows back to reservoir tank.



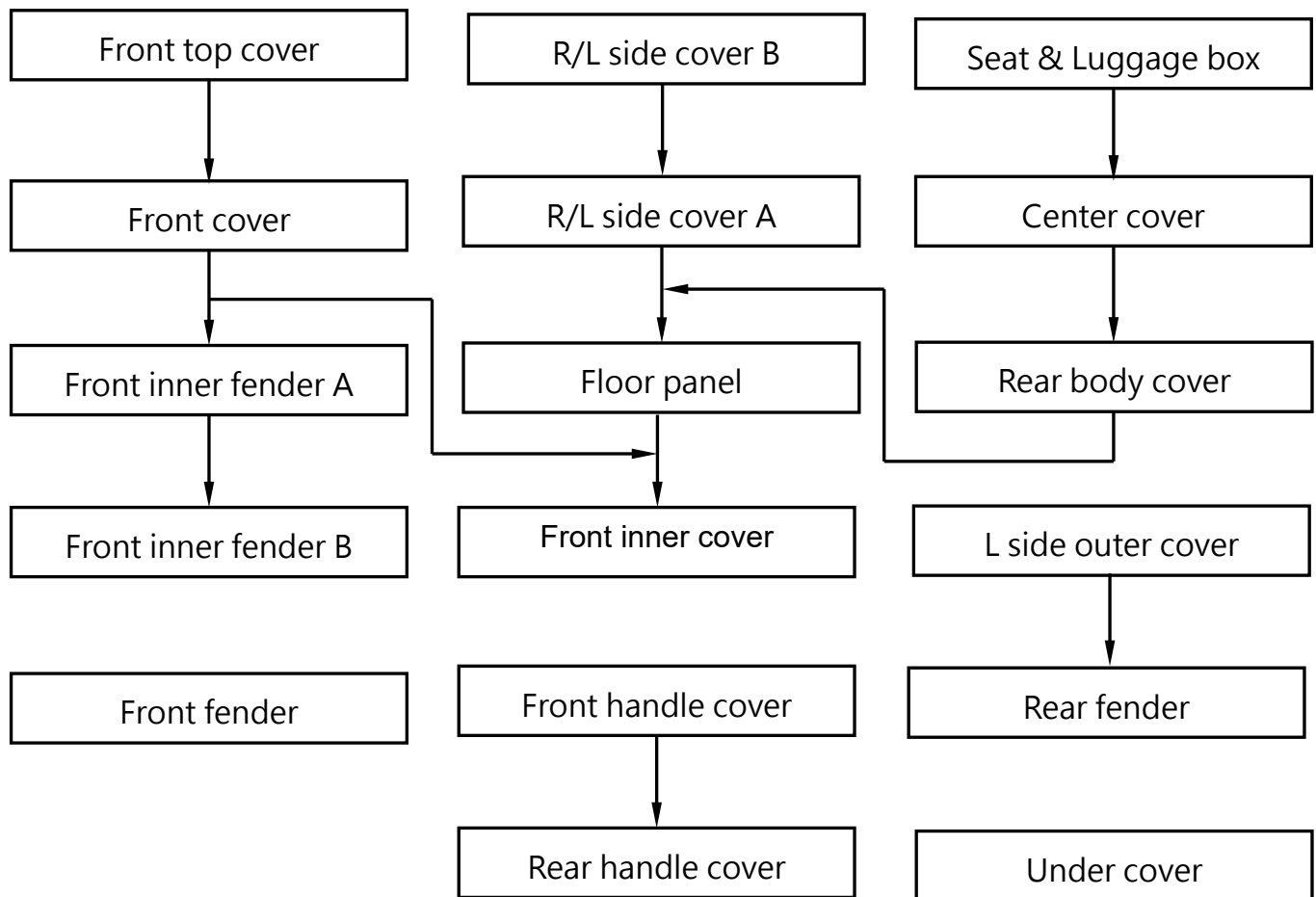
Mechanism Diagram	13-1	Floor Panel	13-10
Maintenance	13-2	Front Inner Cover	13-11
Front Top Cover	13-3	Under Cover	13-13
Front Cover	13-3	Front Cover	13-13
Luggage Box	13-5	Front Cover A	13-13
Center Cover	13-6	Front Cover B	13-14
Rear Body Cover	13-7	Rear Fender	13-15
Side Cover	13-9	Handle Cover	13-18

Mechanism Diagram



Maintenance

Body covers disassemble sequence



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

Front top cover

Removal

Remove screws from front inner cover side.

Separate front top cover from the front cover, then pull down front top cover to remove it.

Caution

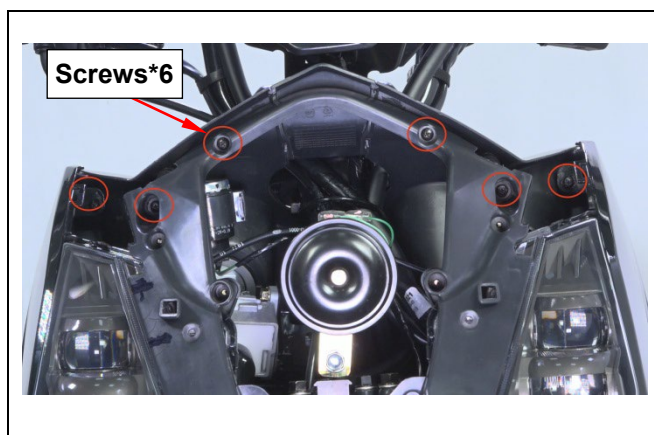
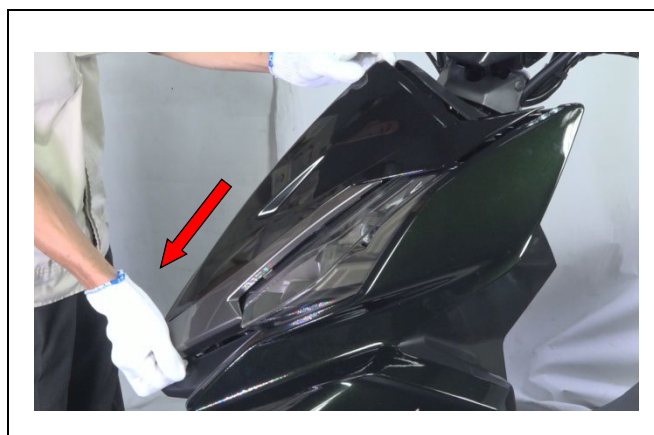
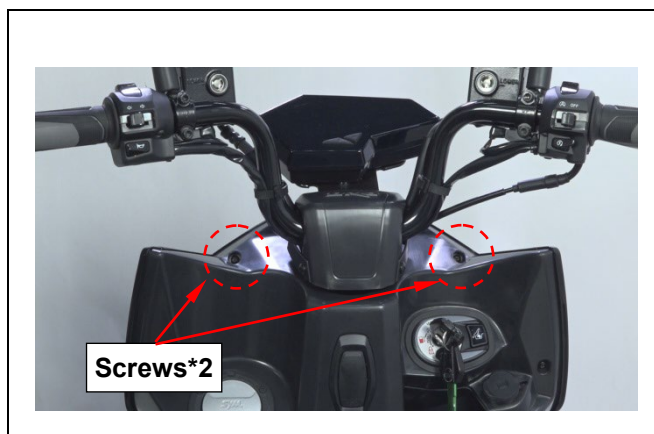
- Carefully remove covers to avoid damaging them.

Front Cover

Removal

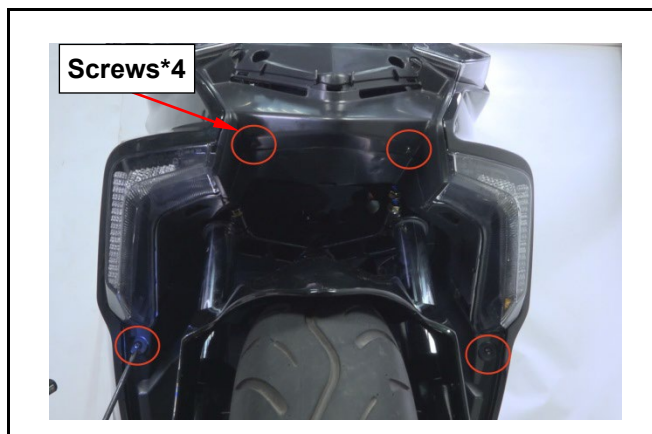
Remove 3 screws on R and L side of front inner cover. (Total 6 screws)

Remove screws on the upper side of front cover.

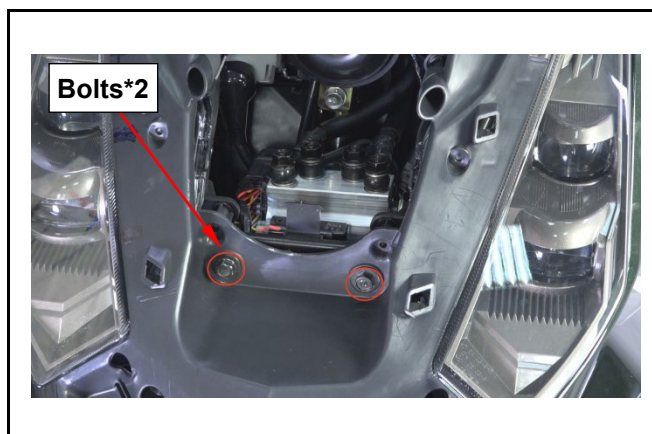


13. Body Cover

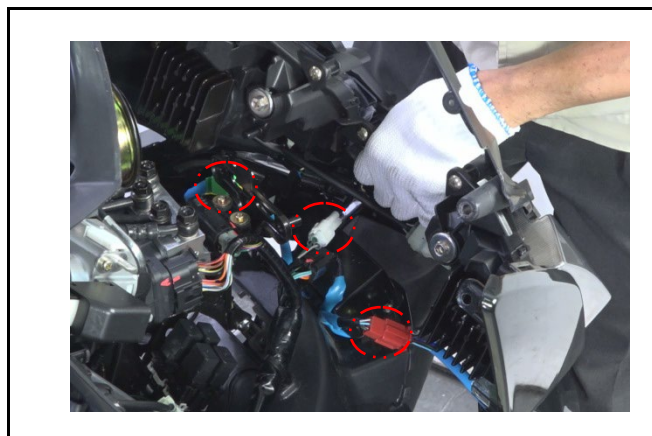
Remove screws on the lower side of front cover.



Remove front cover bolts.



Remove winker light and headlight coupler
Remove front cover.



Installation

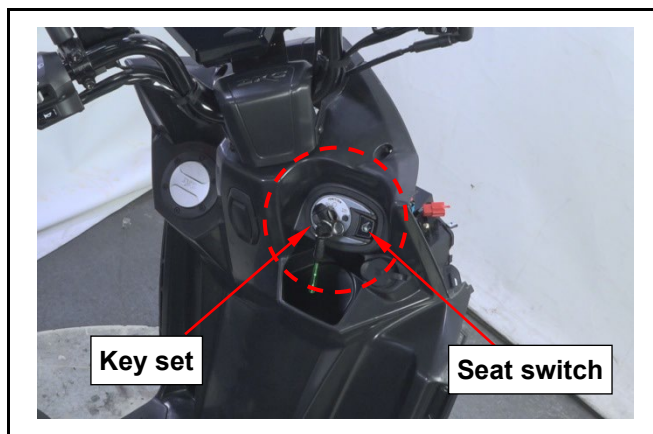
Installation is the reverse of the removal procedures.

Luggage Box

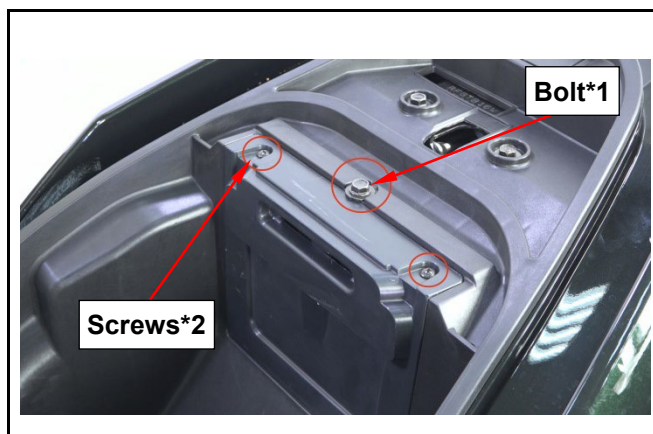
Removal

Turn on the key power, then push the seat switch to open the seat.

Turn off the key power.



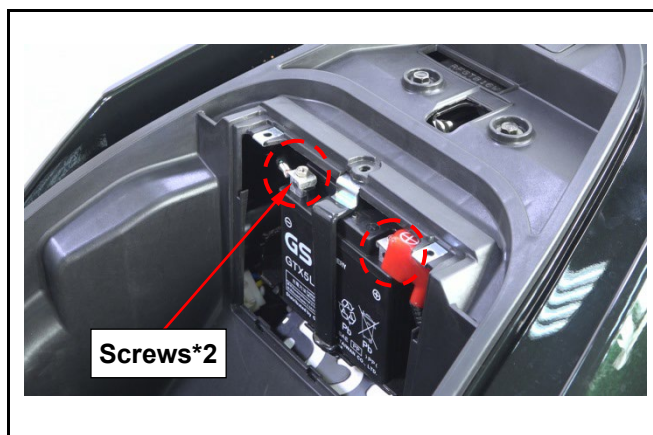
Remove bolt and screws for removing luggage box lid.



Remove battery screws for removing battery.
Remove battery.

⚠ Caution

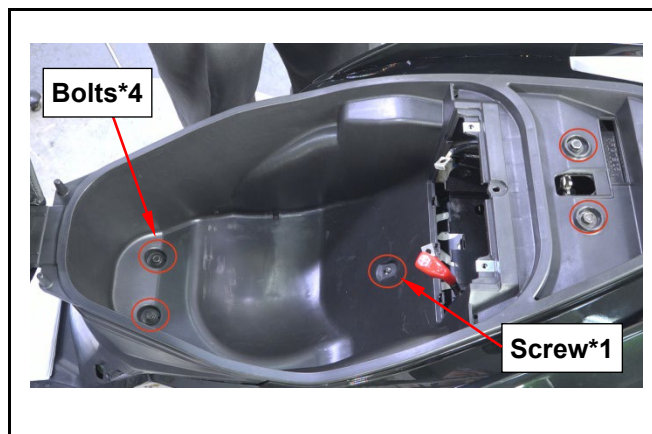
- Remove negative cable first, then remove positive cable.



13. Body Cover



Remove bolts and screw.



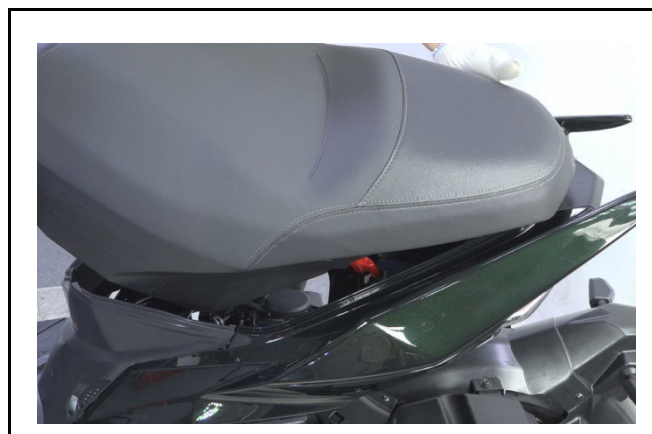
Remove bolt from luggage box front side



Remove luggage box.

Installation

Installation is the reverse of the removal procedures.



Center Cover

Removal

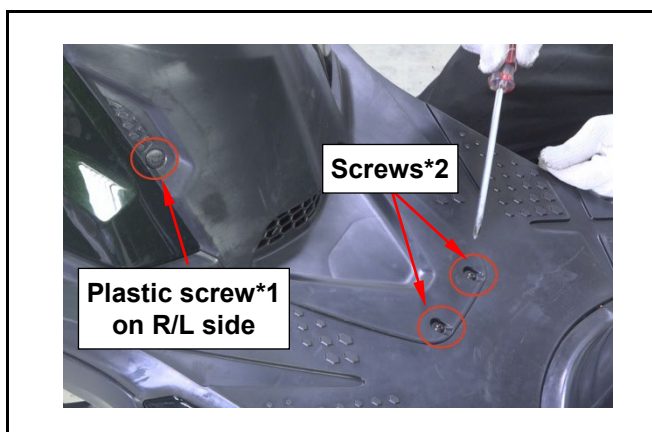
Remove screws.

Remove 1 plastic screw on R and L side. (Total 2 screws)

Remove center cover.

Installation

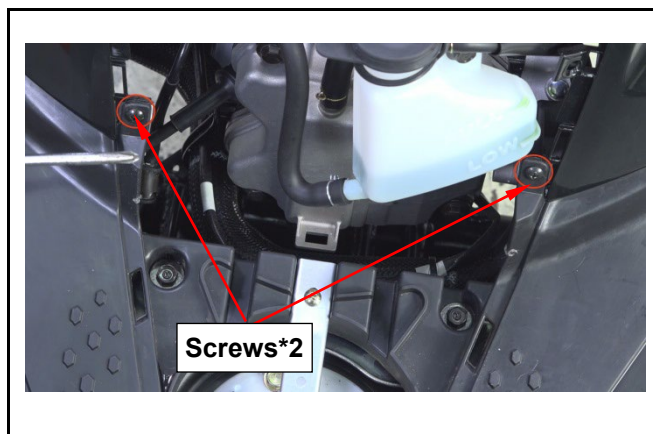
Installation is the reverse of the removal procedures.



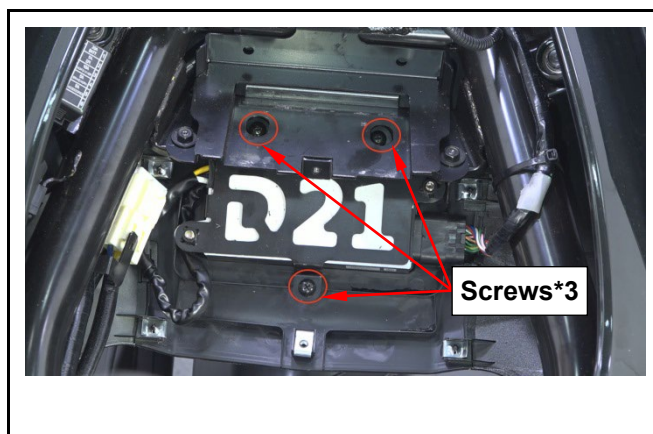
Rear Body Cover

Removal

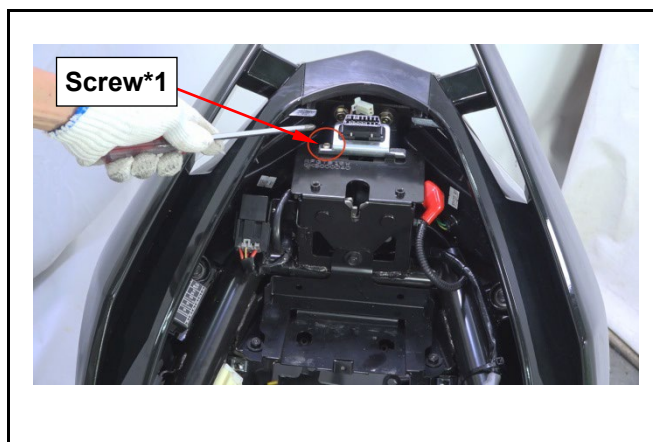
Remove screws near the floor panel.



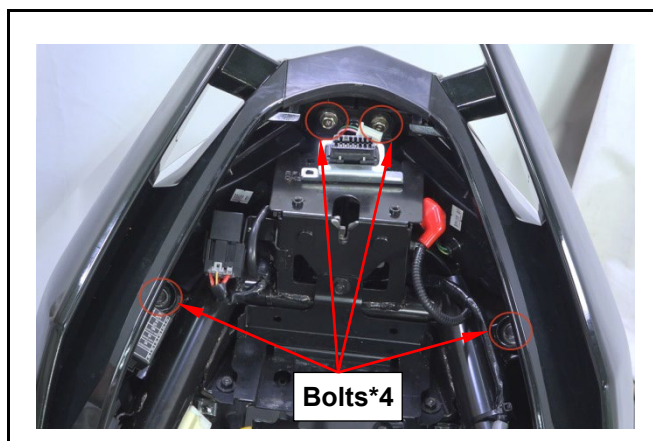
Remove screws for ZRSG controller.



Remove screw for ECU connector.



Remove bolts from rear side of body cover



13. Body Cover

Separate tenons of body cover from its mortises.



Pull backward to remove body cover.



Disconnect tail light and winker light couplers.
Remove rear body cover entirely.

Installation

Installation is the reverse of the removal procedures.



Side Cover

Removal For side cover B

Remove 1 plastic screw on R and L side. (Total 2 screws)

Carefully separate tenons of side cover B.

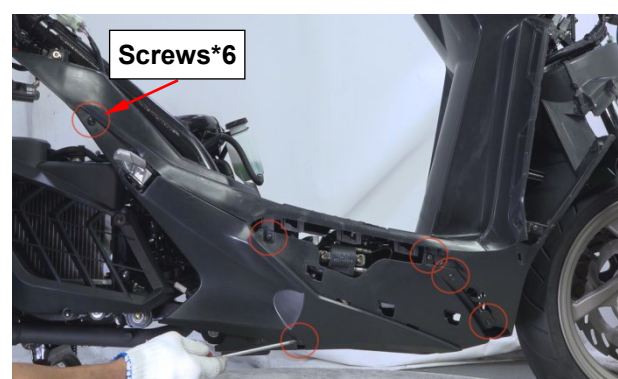
Remove center cover.

Pull frontward to remove side cover B.

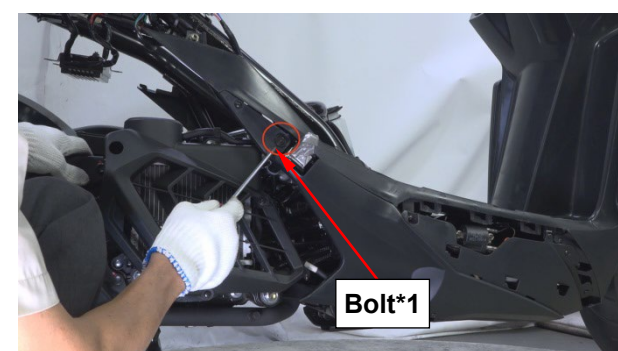


Removal For side cover A

Remove screws on R/L side.



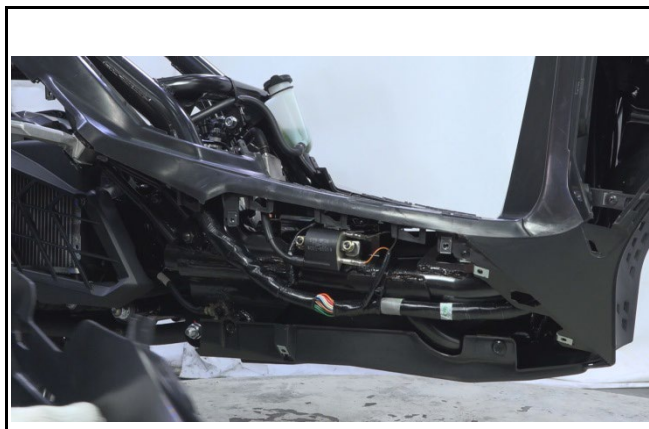
Remove bolt on R/L side.



Remove side cover A.

Installation

Installation is the reverse of the removal procedures.



13. Body Cover

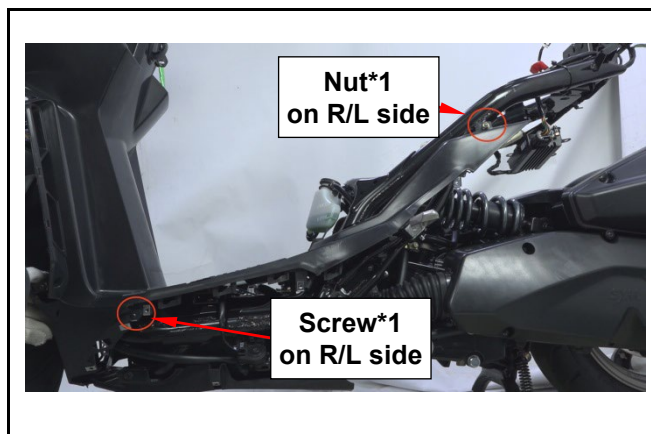


Floor Panel

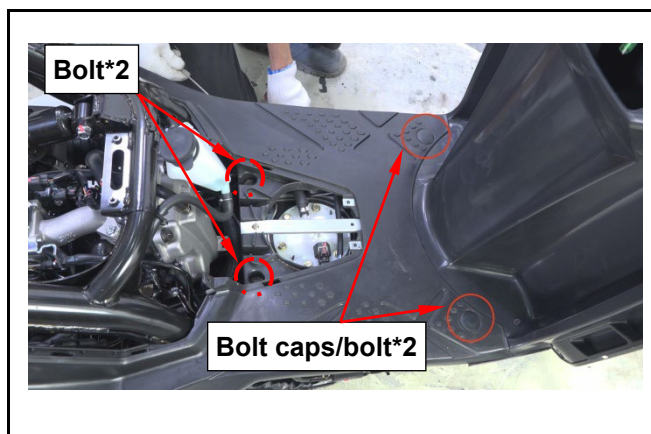
Removal

Remove 1 screw on R and L side. (Total 2 screws)

Remove 1 nut on R and L side. (Total 2 nuts)



Remove bolt caps on floor panel and bolts.



Remove floor panel.

Installation

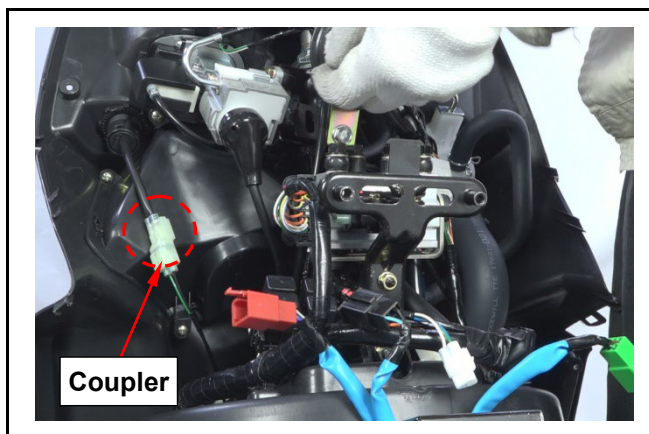
Installation is the reverse of the removal procedures.



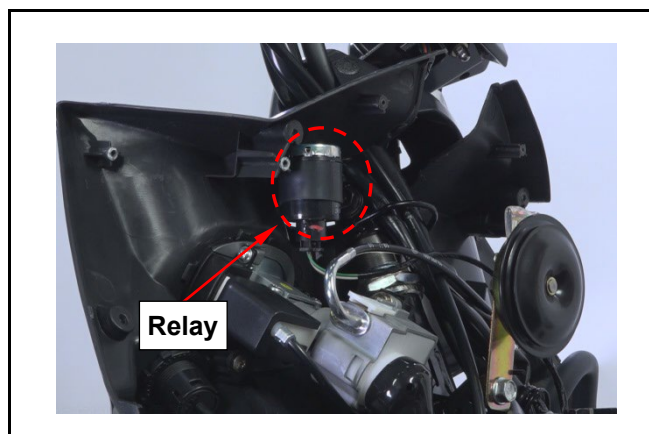
Front Inner Cover

Removal

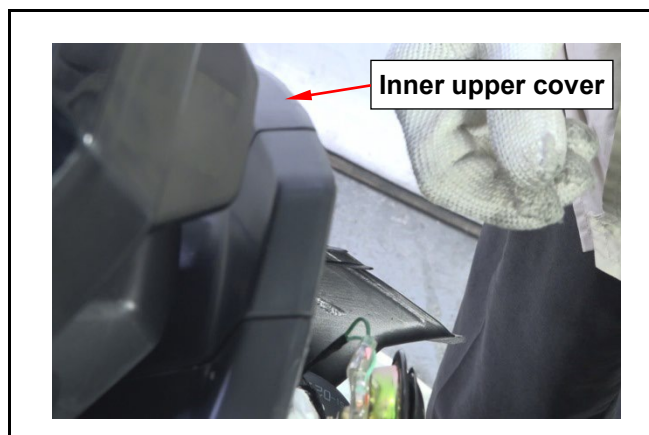
Disconnect power coupler for USB charge unit.



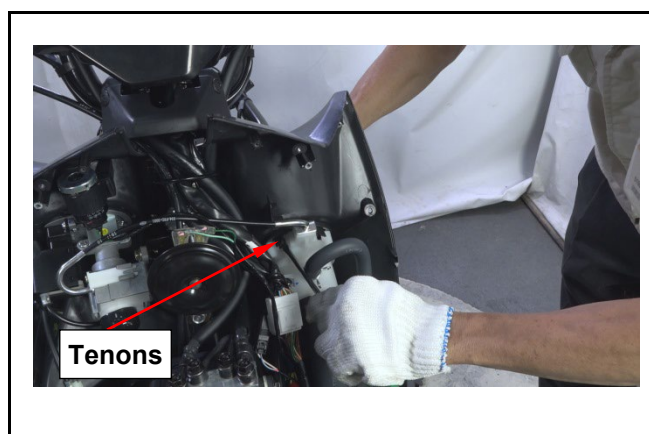
Remove relay for winker light.



Remove inner upper cover.



Separate tenons for front inner cover.



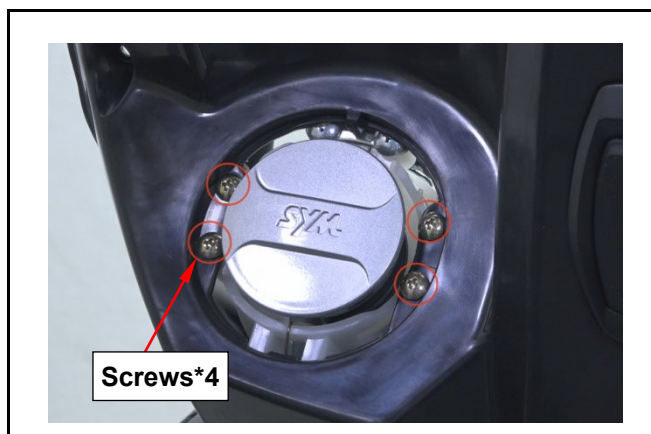
13. Body Cover



Separate the fuel cap garnish from front inner cover.



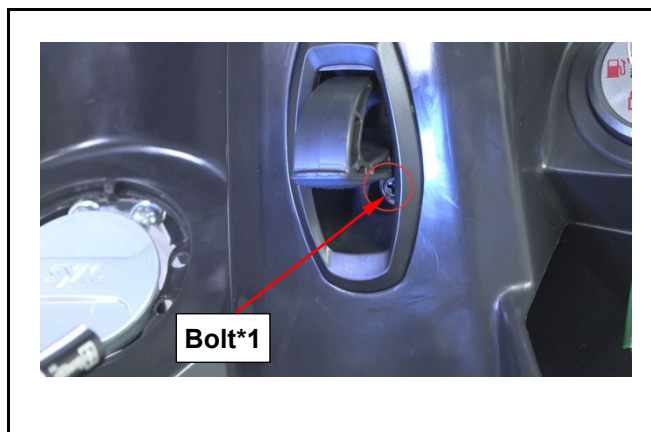
Remove screws.



Remove 1 screw on R and L side. (Total 2 screws)



Remove bolt for front hook.



Remove front inner cover.

Installation

Installation is the reverse of the removal procedures.

Under Cover

Removal

Remove bolts on R/L sides.

Remove under cover.

Installation

Installation is the reverse of the removal procedures.

Front Fender

Removal

Remove 2 bolts for front fender on R and L side.

(Total 4 bolts)

Remove front fender.

Installation

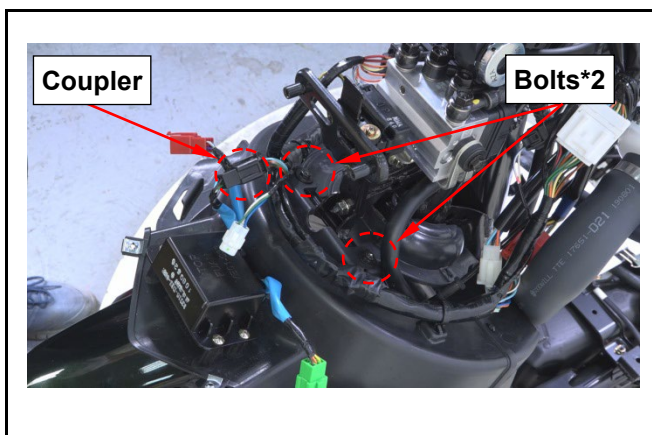
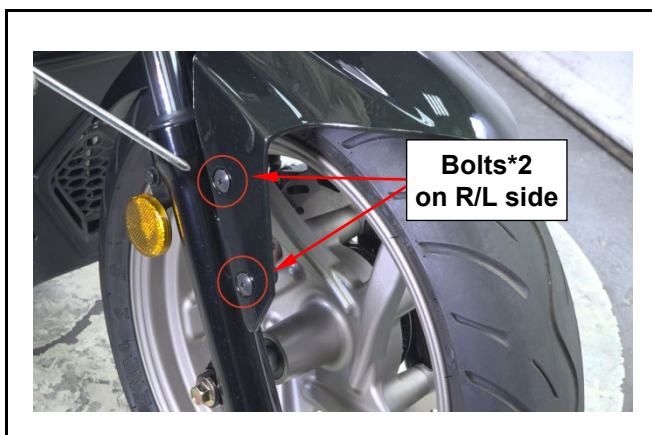
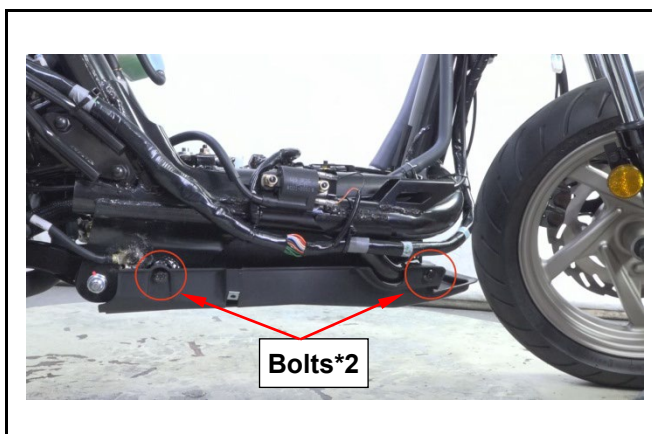
Installation is the reverse of the removal procedures.

Front Fender A.

Removal

Remove front winker light controller coupler.

Remove bolts.



13. Body Cover



Remove 1 screw on R and L side. (Total 2 screws)



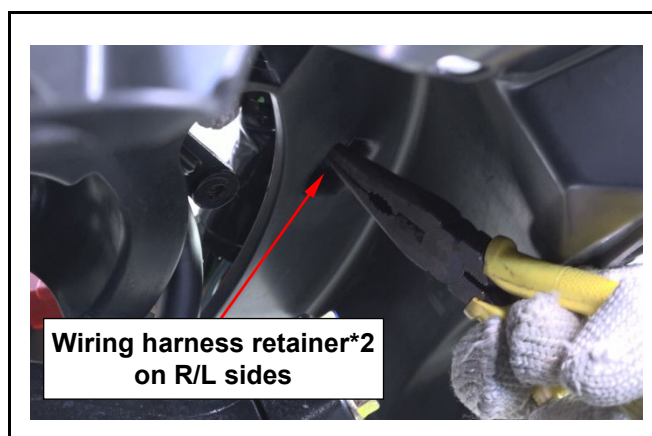
Separate tenons on each R/L sides.



Remove wiring harness retainer. (Total 2 retainers)
Remove front fender A.

Installation

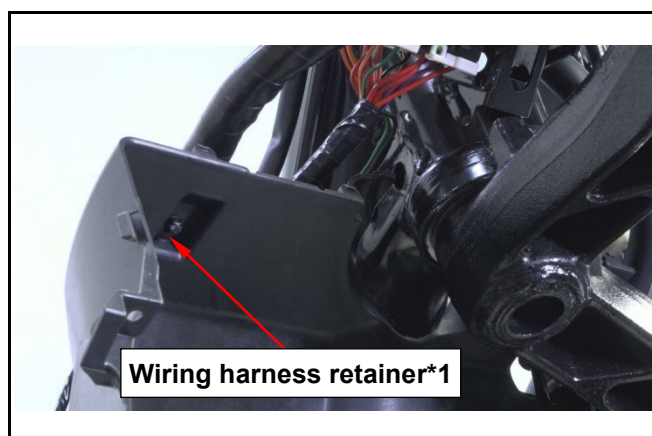
Installation is the reverse of the removal procedures.



Front Fender B

Removal

Remove wiring harness retainer.



Remove bolts.
Remove front fender B.

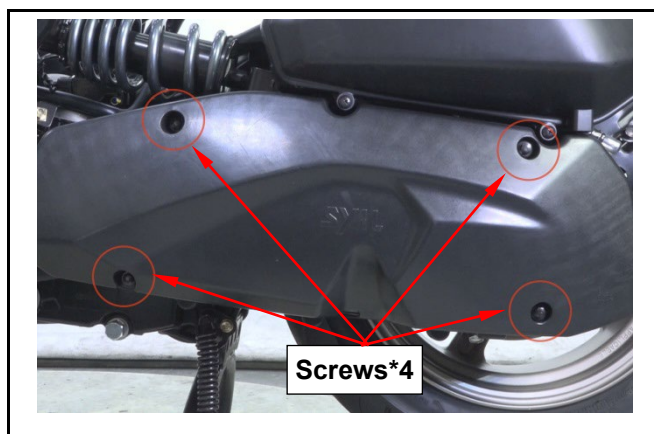
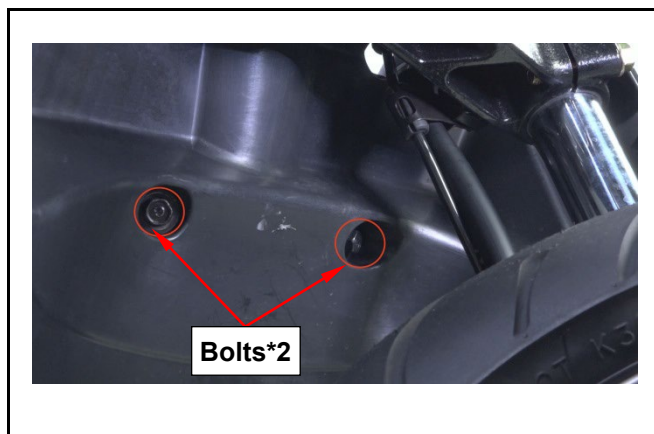
Installation

Installation is the reverse of the removal procedures.

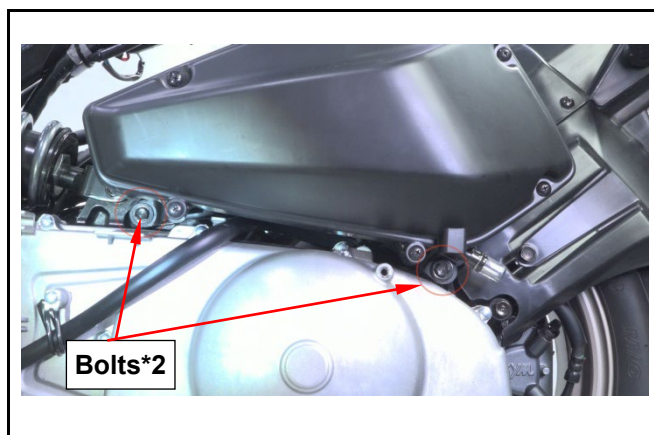
Rear Fender

Removal

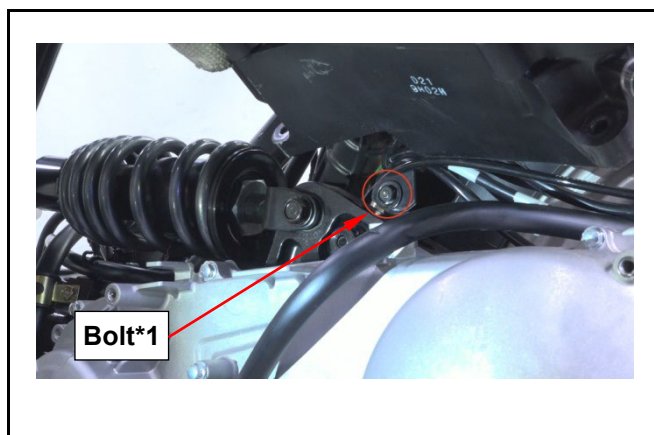
Remove screws for L side outer cover.



Remove bolts for air cleaner.



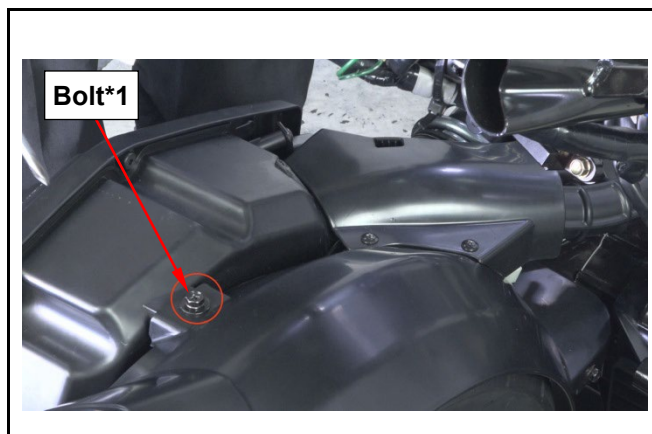
Remove bolt under air cleaner.



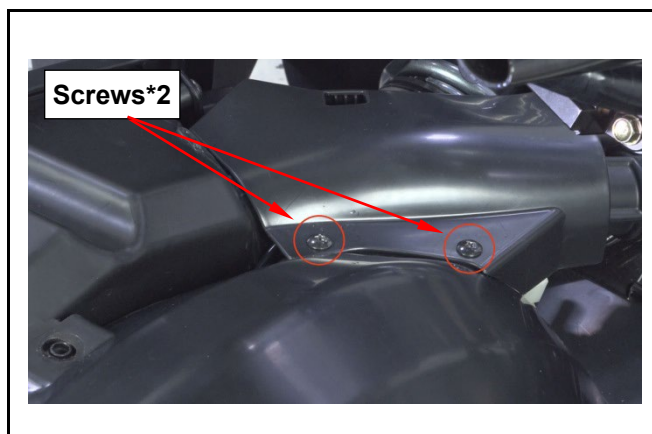
13. BODY COVER



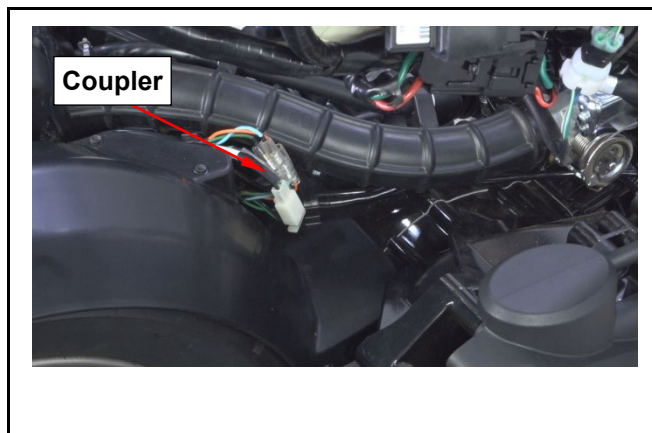
Remove screw on the top of rear fender.



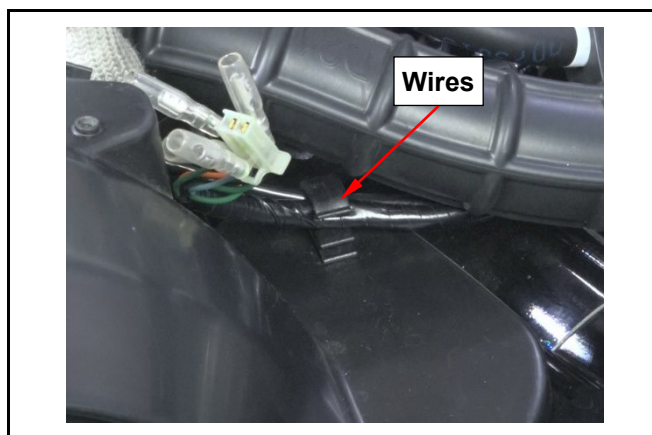
Remove screws for connect tube cover.
Remove connect tube cover.



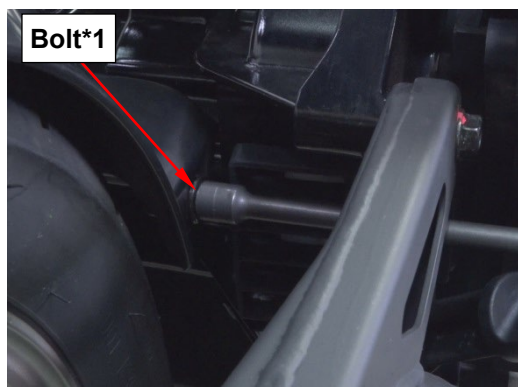
Disconnect tail light, rear winker light, and license light couplers.



Remove wires.



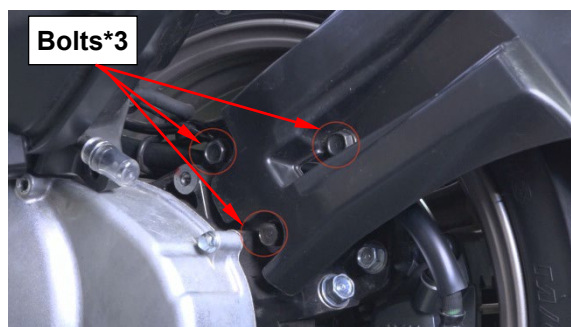
Remove bolt from the right side of rear inner fender.



Remove bolts from left side of rear fender.
Remove rear fender.

Installation

Installation is the reverse of the removal procedures.



13. BODY COVER



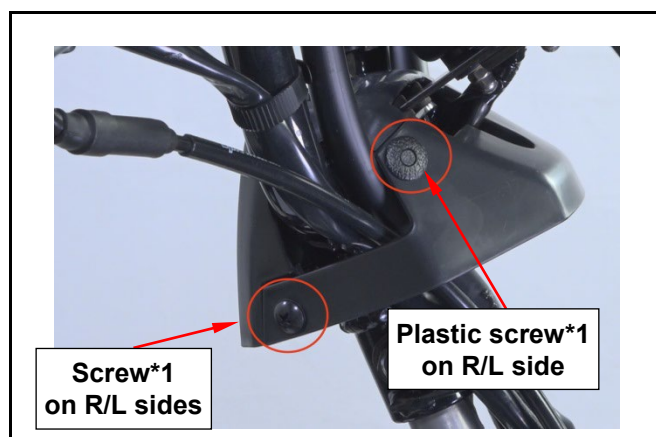
Handle Cover

Removal

Remove 1 plastic screw on R and L side. (Total 2)

Remove 1 screw on each R and L side. (Total 2)

Remove handle cover.

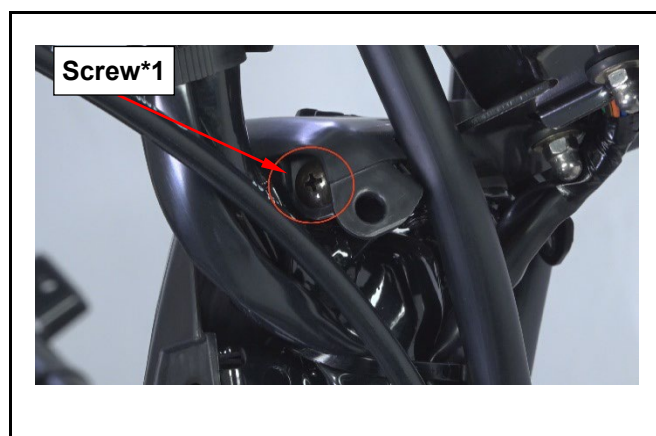


Remove screw for rear handle cover.

Remove rear handle cover.

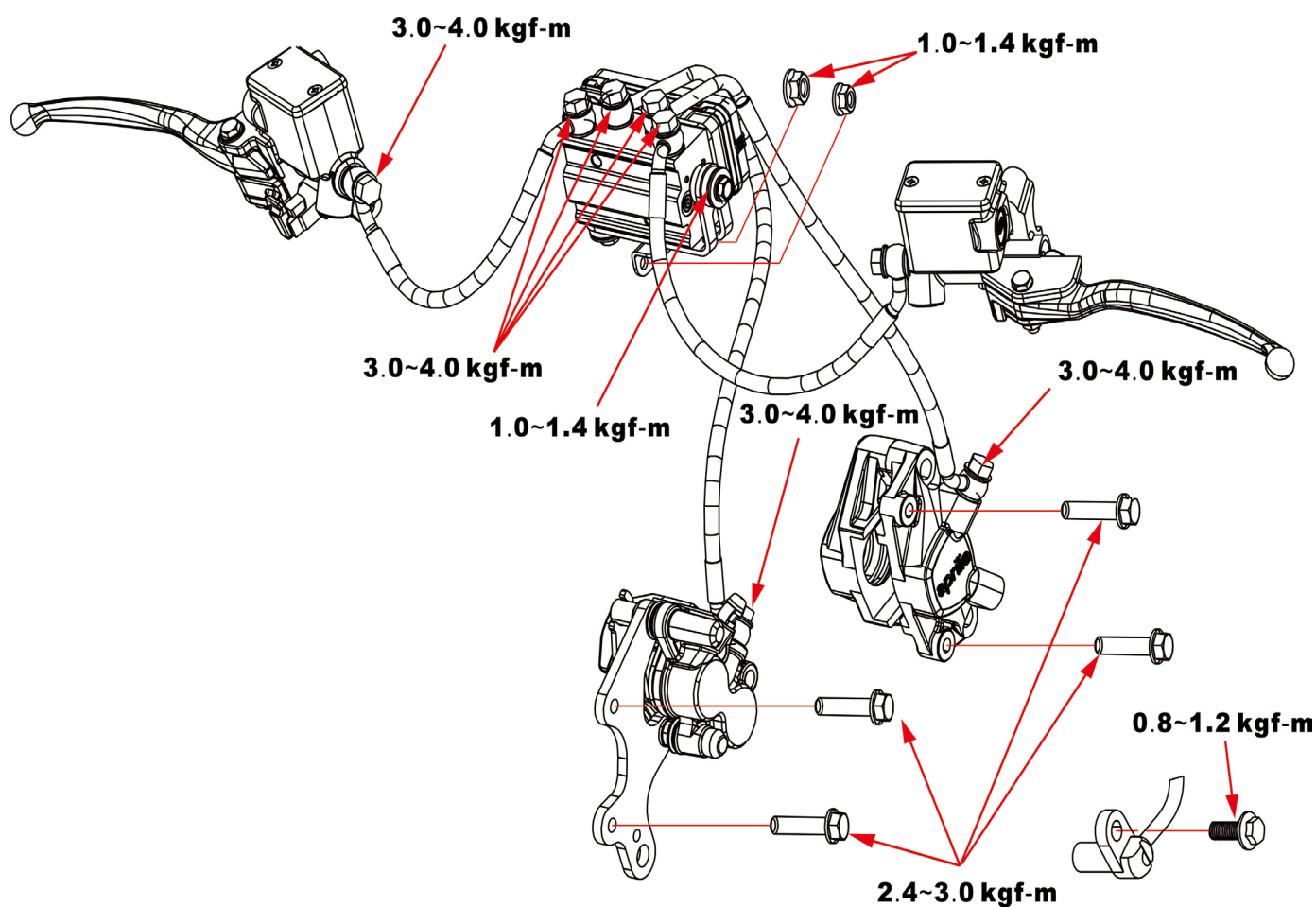
Installation

Installation is the reverse of the removal procedures.



Brake System Diagram	14-1	Front Brake Caliper	14-8
Maintenance Description	14-2	Rear Brake Caliper	14-9
Troubleshooting	14-3	Brake Disk	14-11
Disk Brake System Inspection	14-4	Anti-lock Brake System	14-15
Adding Brake Fluid	14-5	ABS ECU Replacement	14-18
Brake Fluid Replacement / Air-bleed	14-6		

Break System Diagram



Maintenance Description

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 disc	4.00	3.50
Front brake disc eccentricity	0.1	0.30
Master cylinder inner diameter	12.700~12.743	12.755
Master cylinder outer diameter	12.657~12.684	12.645
Diameter of front disc	260	—
The thickness of rear brake disc	4.00	3.50
Diameter of rear disc	240	—

Torque values

Brake hose bolts	3.0~4.0kgf-m
Master cylinder bolts	1.0~1.4kgf-m
Brake caliper bolts	2.9~3.5kgf-m
Brake pad pin bolt	1.6~2.0kgf-m
Air-bleed valve	0.8~1.0kgf-m

Troubleshooting

Disk brake

Soft brake lever

- Air inside the hydraulic system
- Hydraulic system leaking
- Worn master piston
- Worn brake pad

Poor brake caliper

- Worn brake pad/disc
- Low brake fluid
- Blocked brake hose
- Warp/bent brake disc
- Bent brake lever

Hard operation of brake lever

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

Uneven brake

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

Tight brake

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

Brake noise

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

Disk Brake System Inspection

Inspection

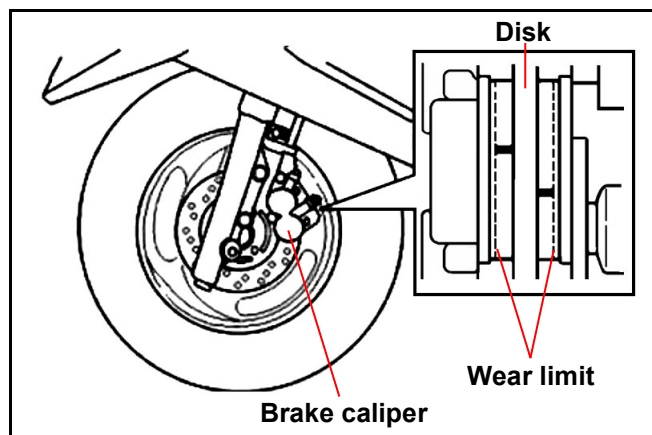
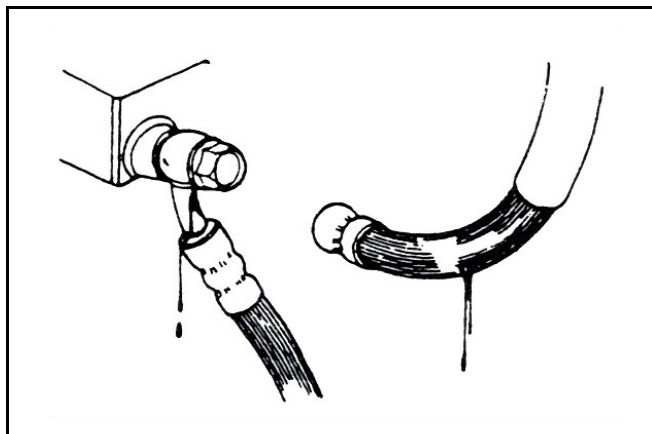
By visual examination whether divulges or the damage, with spanner inspection brake tube seam whether becomes less crowded, and the inspection handle bar turn right or turn left, or pressure the cushion, whether besides the pipeline protection department, whether there is interferes, contacts other parts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

Check the brake 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/ DOT 4).

⚠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 trademarks brake fluid.
- Uses by all means must with the trade mark brake fluid, guarantees the ghost vehicle efficiency.



Brake Fluid Replacement / Air-bleed

Connect drain hose to air-bleed valve.

Open the air-bleed valve on the calipers and pull the brake lever until the old brake fluid is entirely drained out.

Close the air-bleed valve and add specified brake fluid into the brake master cylinder.

- Recommended brake fluid: DOT 3 or Dot4 brake fluid

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

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

Close the air-bleed 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:

Caution

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

1. Tightly hold the brake lever and open the air-bleed valve around 1/4 turns, and then close the valve.
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 air-bleed 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 brake hose holder bolt.

Remove two caliper mounting bolts and the caliper.

Installation

Install the brake caliper and tighten the mounting bolts.

- Torque: 2.4~3.0kgf-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: 3.0~4.0 kgf-m

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

Brake pad replacement

Remove brake caliper.

Remove brake hose holder

Remove the brake pad pin bolts..

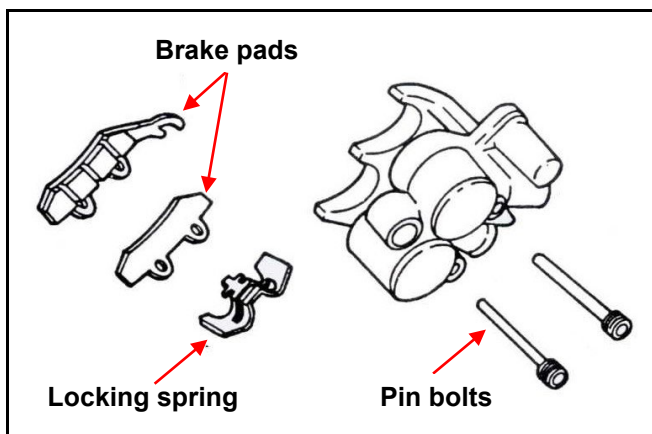
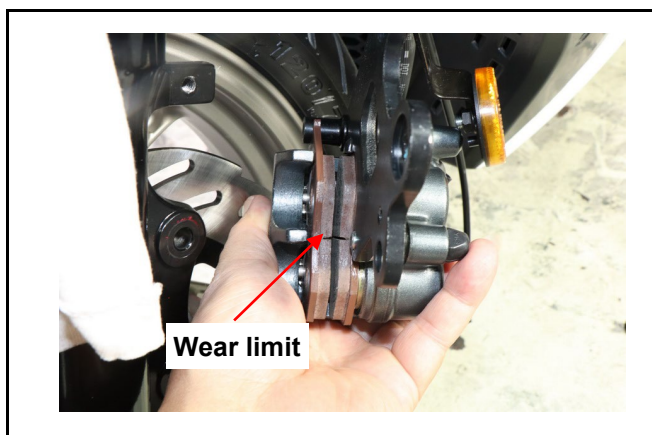
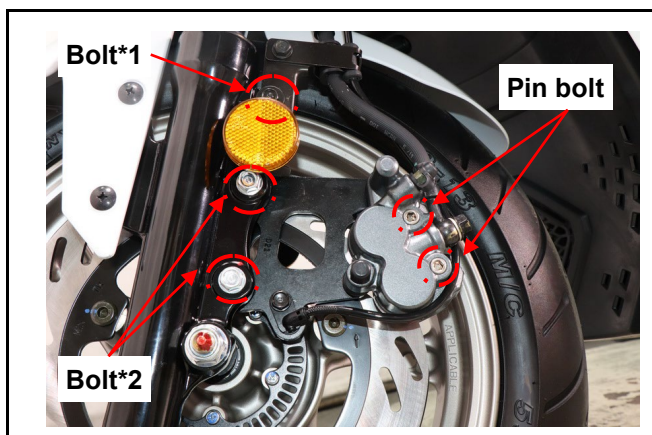
Remove the brake pad and locking spring.

Install the new brake pads onto brake caliper.

Install the locking spring and tighten brake pad pin bolts.

- Torque: 1.6~2.0kgf-m

Install the brake caliper and tighten the mounting bolts.



Rear Brake caliper

Removal

Remove the oil level gauge
Loosen cap nuts of muffler front pipe.
Remove muffler bolts.
Pull open the muffler.

Caution

- No necessary remove muffler.

Remove the rear wheel.

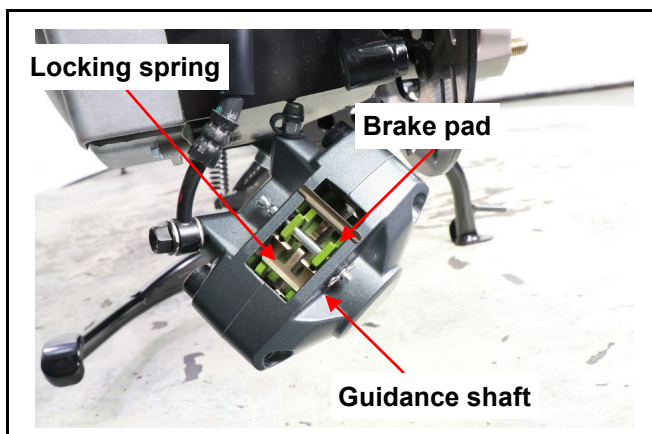
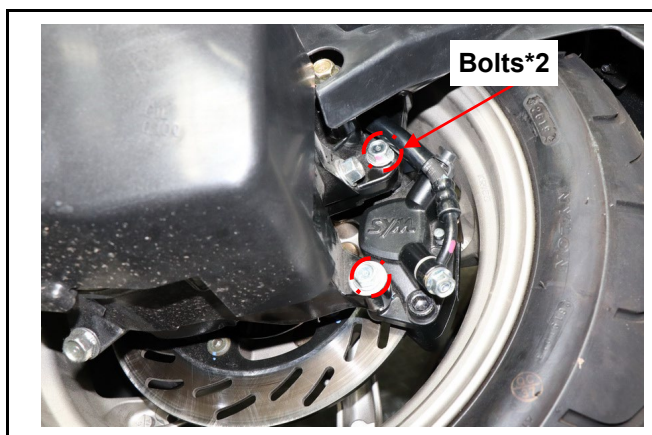
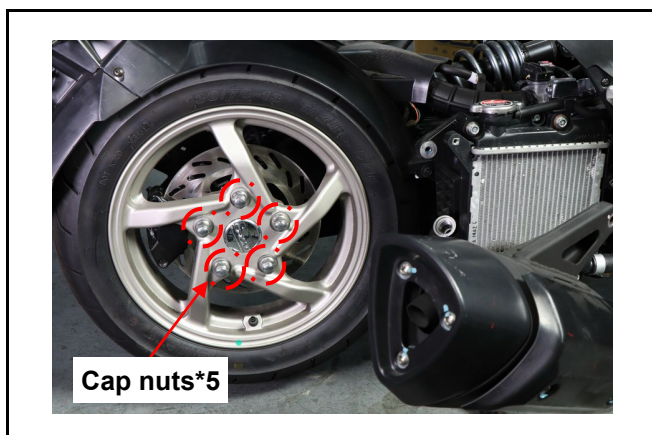
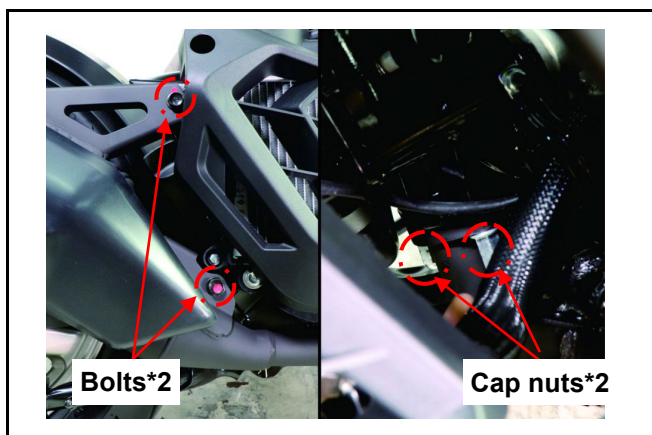
Place a container under the brake caliper, and loosen the brake hose bolts and finally remove the brake hoses.

Caution

- Do not spill brake fluid on painted surfaces.

Remove two caliper mounting bolts and the caliper.

Remove cotter pin and remove guidance shaft.
Remove locking spring and brake pad.



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

Installation

Install the brake caliper and tighten mounting bolts.

- Torque: 2.4~3.0kgf-m

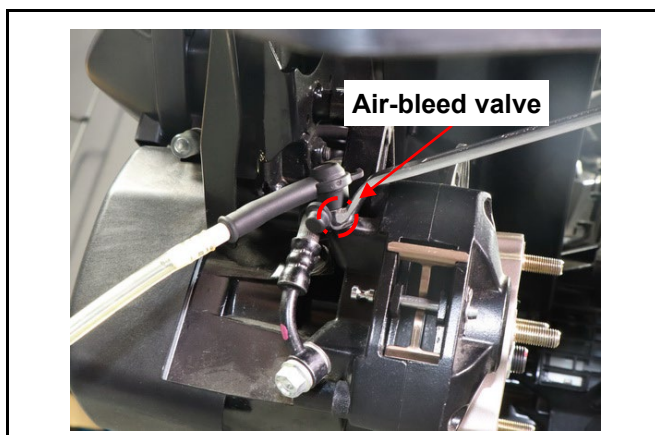
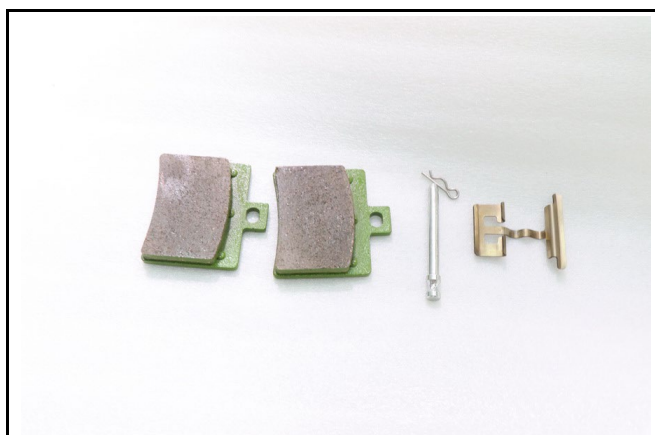
Use two seal washers and hose bolts to lock the hoses and brake caliper in place.

- Torque: 3.0~4.0kgf-m

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

⚠Caution

- Must be making the air-bleed valve perpendicular to the ground when air-bleeding.



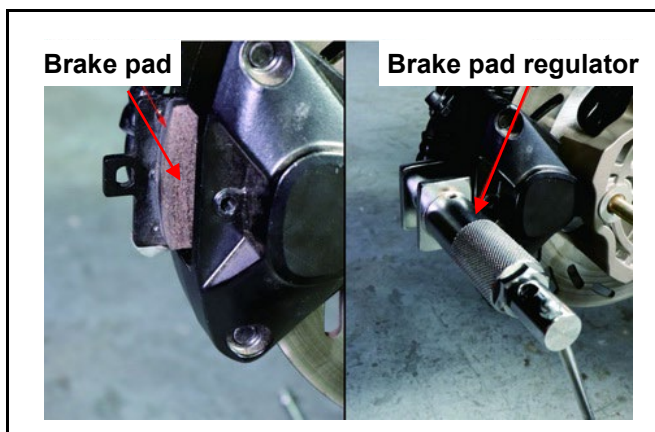
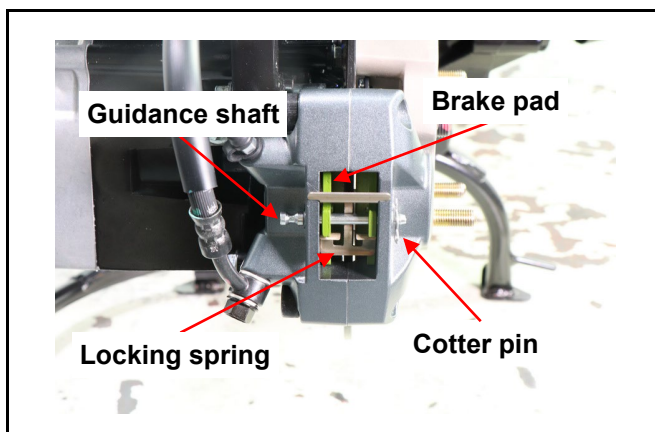
Brake pad replacement

Remove the rear wheel.

Remove the cotter pin and guidance shaft, and then take out brake pad and locking spring.

Pull the disk brake piston open with brake pad regulator.

Install the new brake pads onto brake caliper, and then install locking spring and guidance shaft.



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.

- Service limit: 3.5 mm

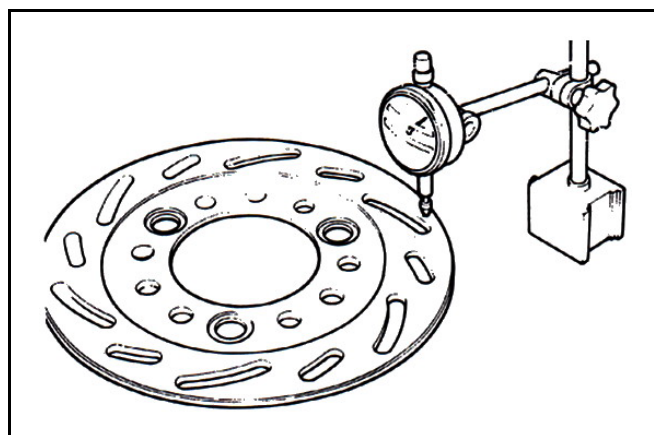
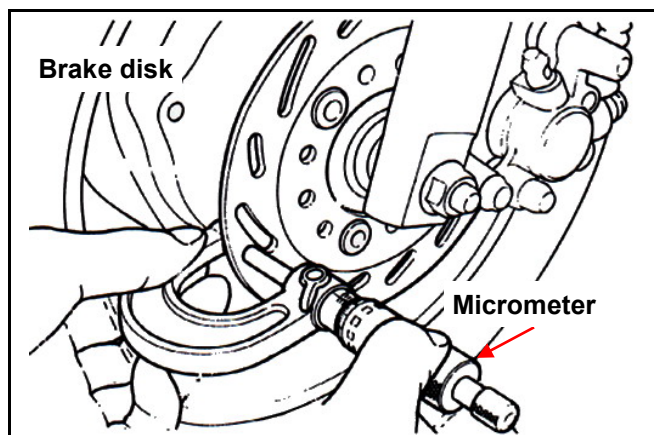
Remove the brake disk from wheel.

Check the disk for deformation and bend.

- Service limit: 0.30 mm

⚠Caution

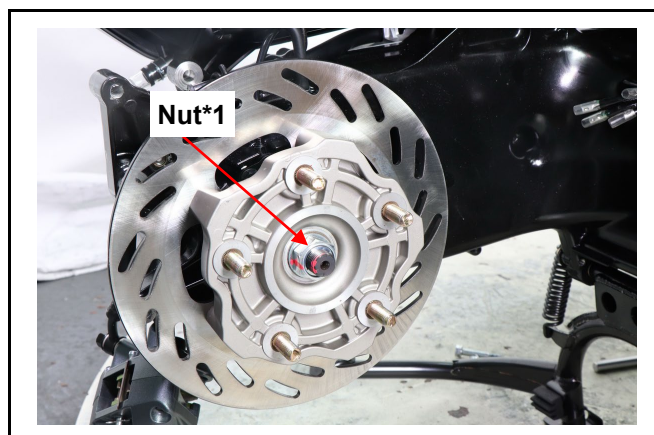
- The dirty brake lining or disk will reduce the brake performance.
- Brake lining cannot use the air-gun to be clean, the operator should dress the mouthpiece and the glove, use vacuum cleaner cleans it.



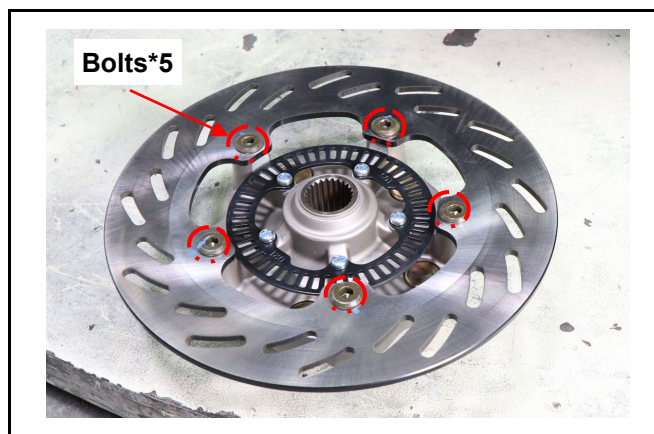
Rear wheel brake disk removal

Remove the rear brake caliper.

Remove the rear brake disk assy.



Remove rear brake disk bolt.



Installation

Install in the reverse order of removal.

- Torque: 2.4~3.0kgf-m

Brake Master Cylinder

Removal

⚠ Caution

- Do not let foreign materials enter into the cylinder.
- The whole set of master cylinder, piston, spring, diaphragm and circlip should be replaced as a set.

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.

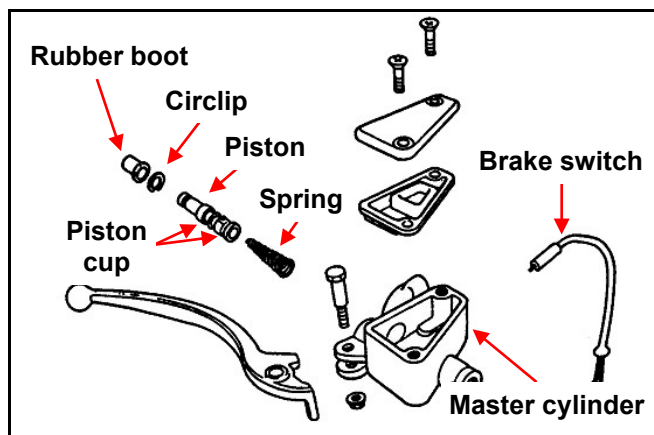
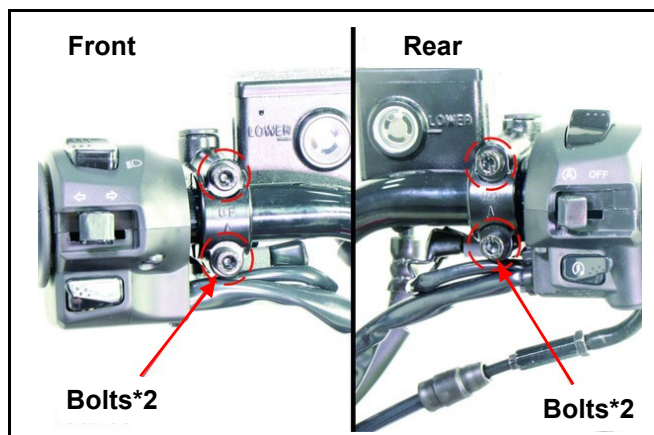
Remove the master cylinder bolts and the master cylinder.

Remove the rubber boot.

Remove the circlip

Remove the piston and spring.

Clean the 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 : 12.755 mm

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

- Allowable limit : 12.645 mm

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.

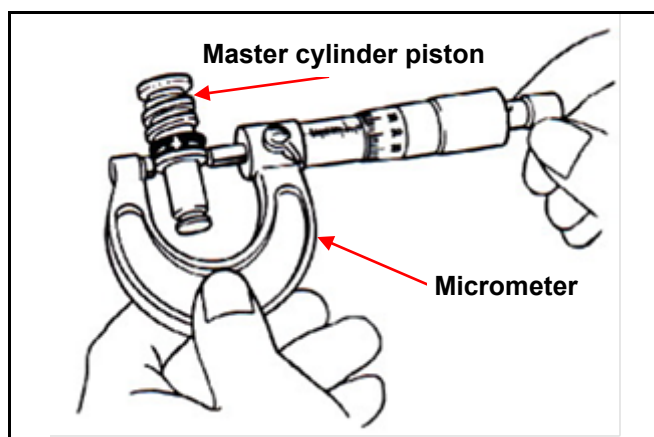
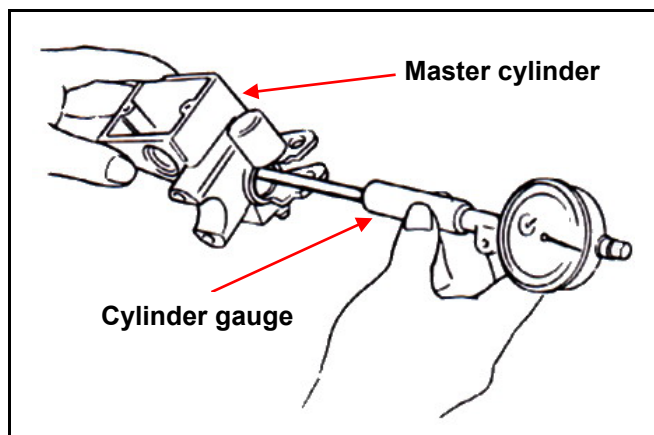
The master cup's cavity should be face inside of master cylinder when installing the master cup.

Install the circlip.

Caution

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

Install the rubber pad into groove properly.



Installation

Place the master cylinder onto handlebar, and install the bolts.

- Torque: 1.0~1.4kgf-m

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.

- Torque: 3.0~4.0kgf-m

Make sure the hose is installed correctly.

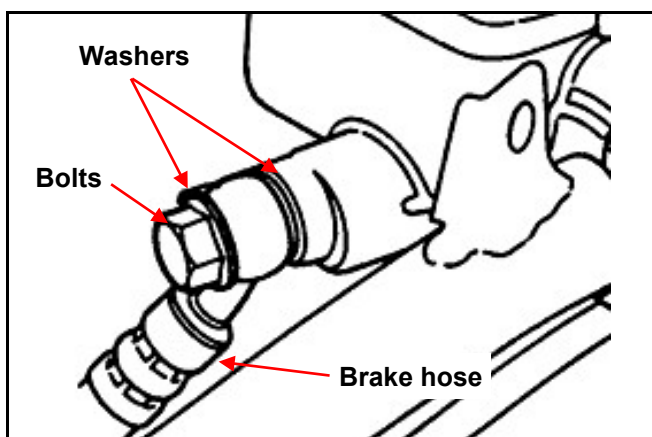
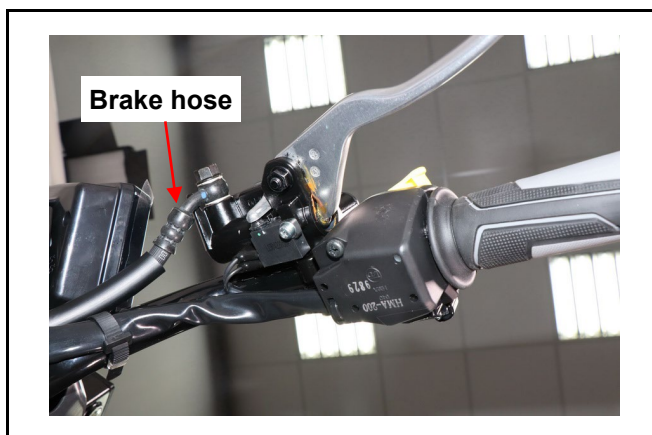
Caution

- 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.



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.

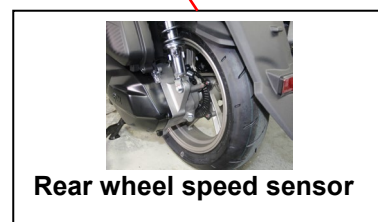
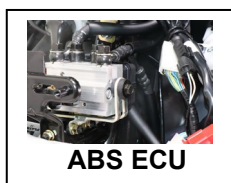
ABS does not function if the battery is discharged.

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.

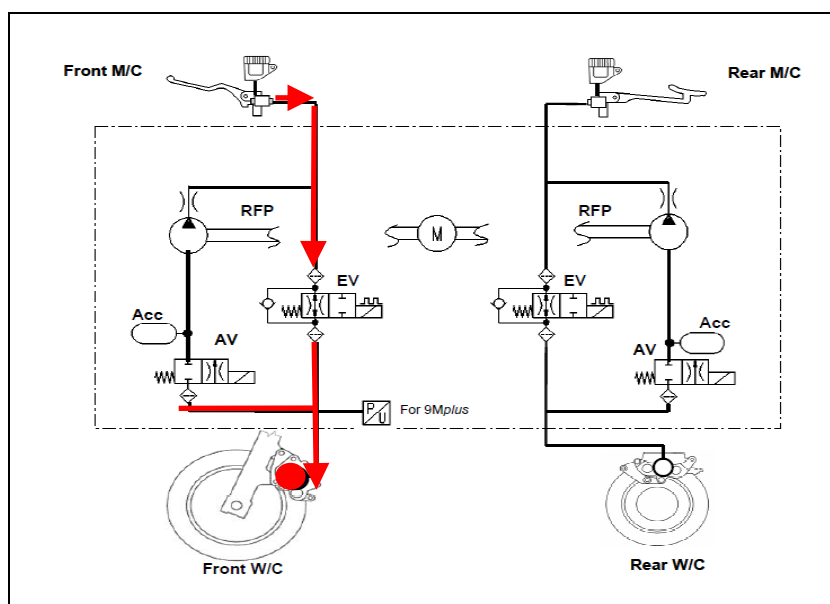


ABS Parts



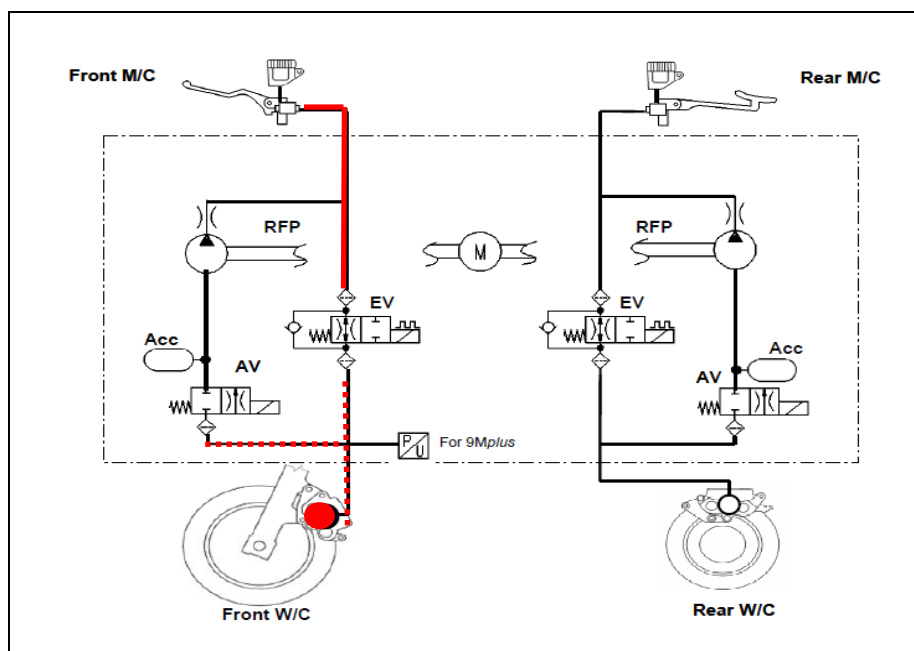
ABS Description

Normal brake



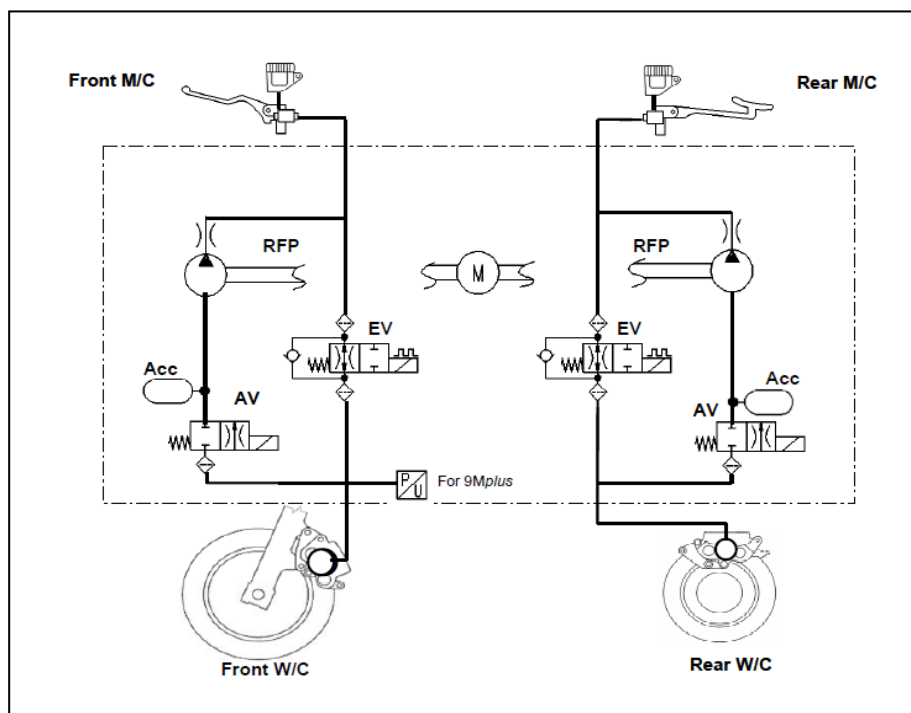
When the brake is applied, speed sensors detect the front and rear wheel speed. When there is no wheel slip, EV (inlet valve for maintaining pressure) keeps open and AV (outlet valve for pressure reduction) is closed. Brake calipers receive pressure for master cylinders and brake normally.

Initial wheel slip



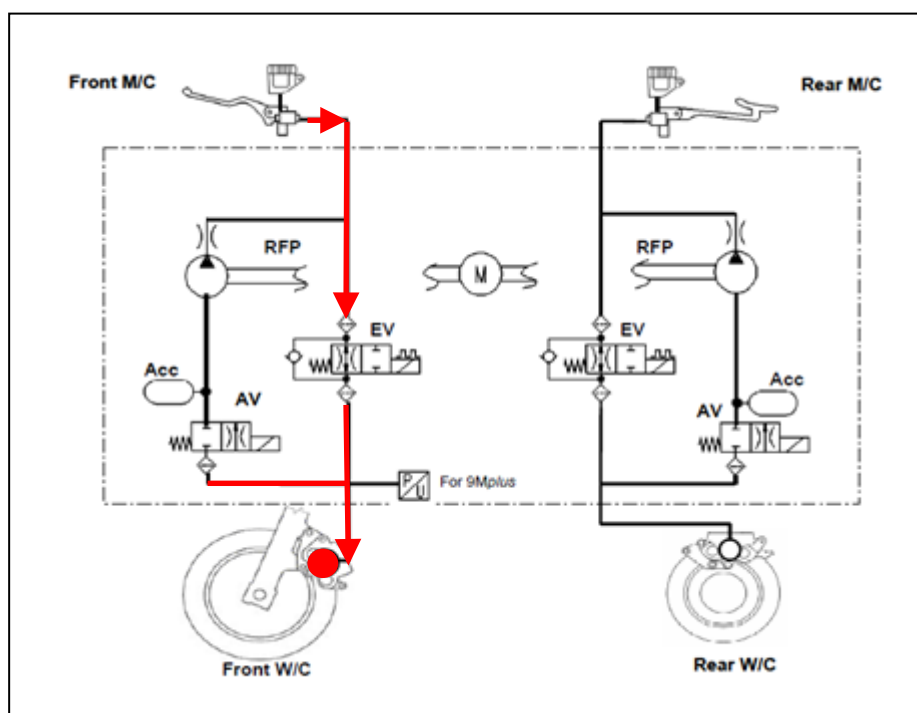
When the initial wheel slip is detected by the wheel speed sensors, EV and AV are both closed. Brake caliper keeps the pressure and brake continues.

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.

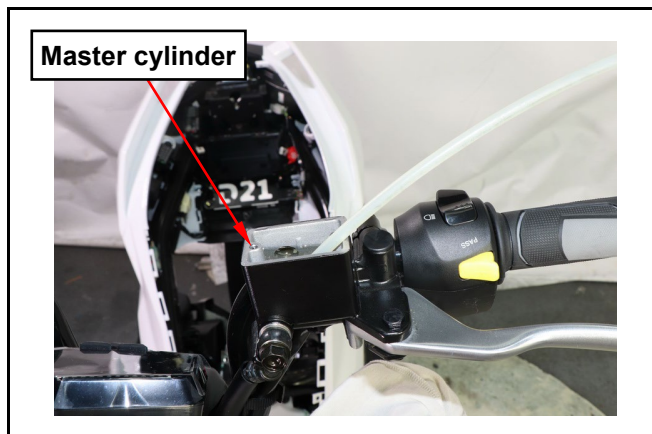
Diagnostic Trouble Codes

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

ABS ECU Replacement

Removal

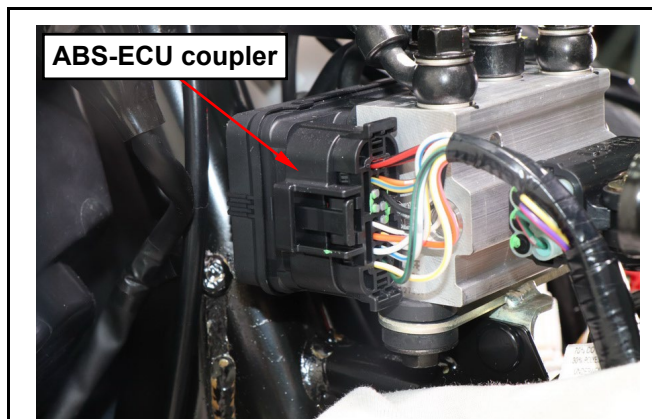
Cover plastic parts and wires with rag to avoid being corroded by brake oil.



Remove brake fluid from front, rear brake calipers and master cylinder.



Remove ABS-ECU coupler.



Remove brake hose bolts for ABS-ECU. (Bolts *4)

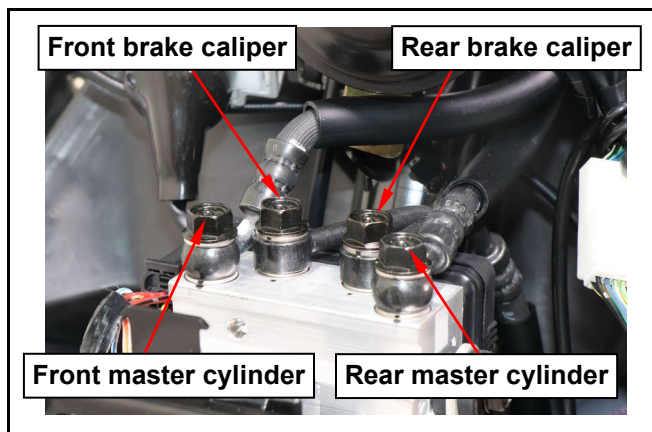
Installation

Install in the reverse order of removal.

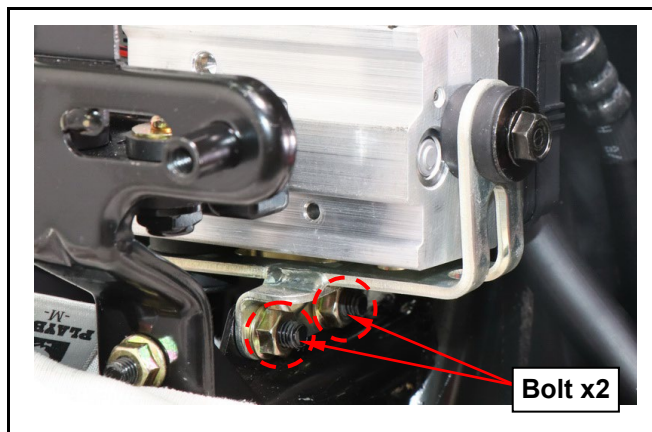
- Torque: 3.0~4.0 kgf-m

⚠ Caution

- Installation position of corresponding brake hose must be correct.



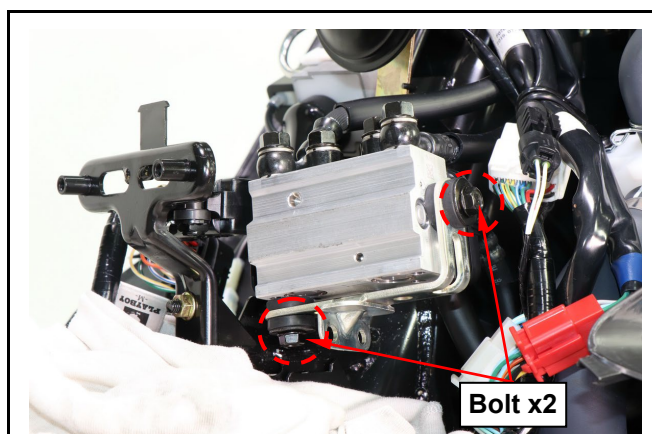
Remove AB- ECU mounting bolts.



Remove ABS-ECU.

Replace ABS ECU mounting bolts.

- Torque: 1.0~1.4 kgf-m

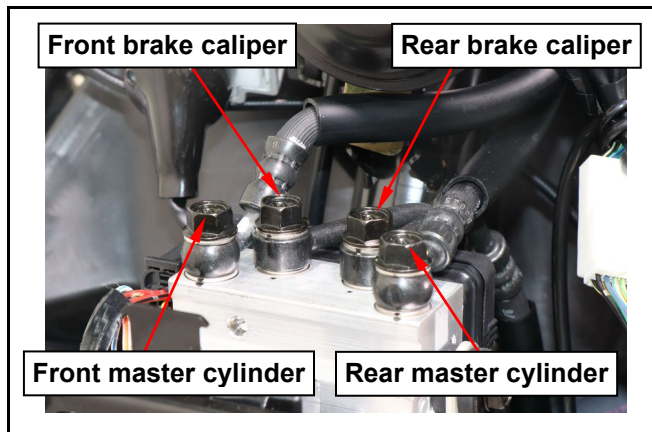


Tighten ABS ECU brake hose bolts. (Bolt x4)

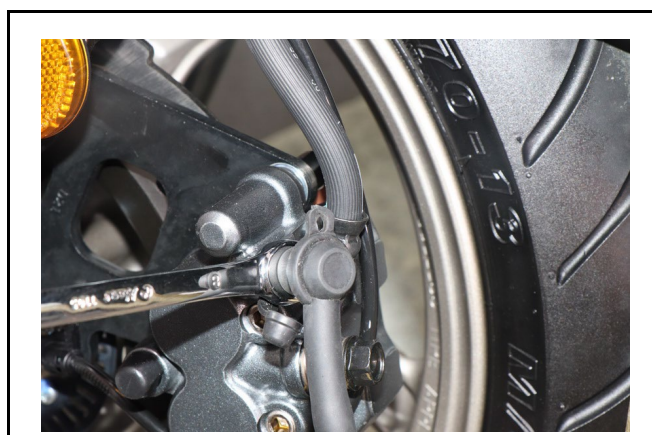
- Torque: 3.0~4.0 kgf-m

Caution

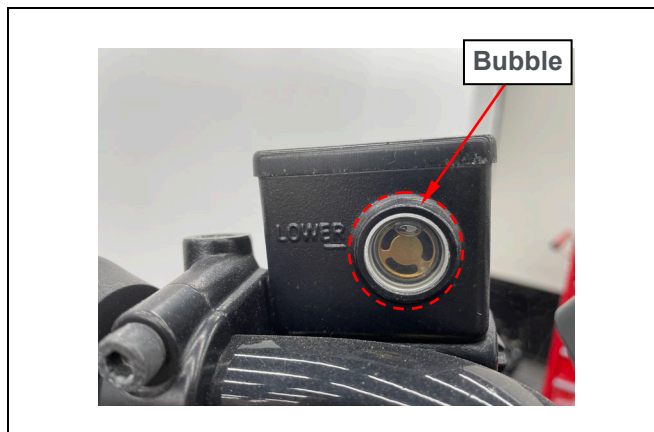
- Installation position of corresponding brake hose must be correct. Position of brake hose must be correct.



Refill the brake fluid to the master cylinders and make sure that air in the hoses is bled.



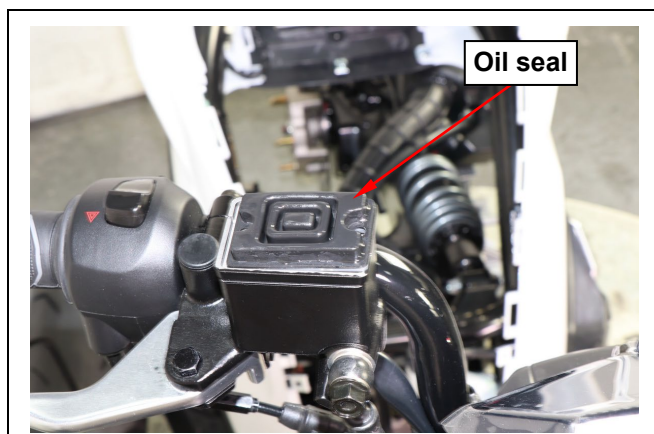
Refill brake fluid in master cylinder until the bubble in the inspection window appears and is located at 12 o'clock



Check if the oil seal is deformed or worn, replace it if necessary.

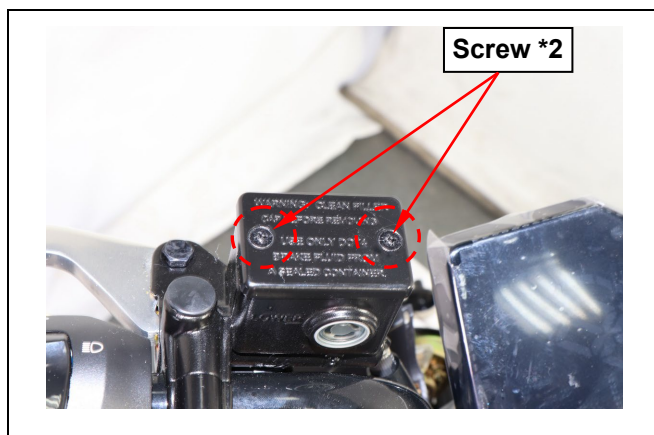
⚠ Caution

- The deformation or damage of oil seal will make brake fluid leak and leaking brake oil will damage other parts when it splashes onto them.



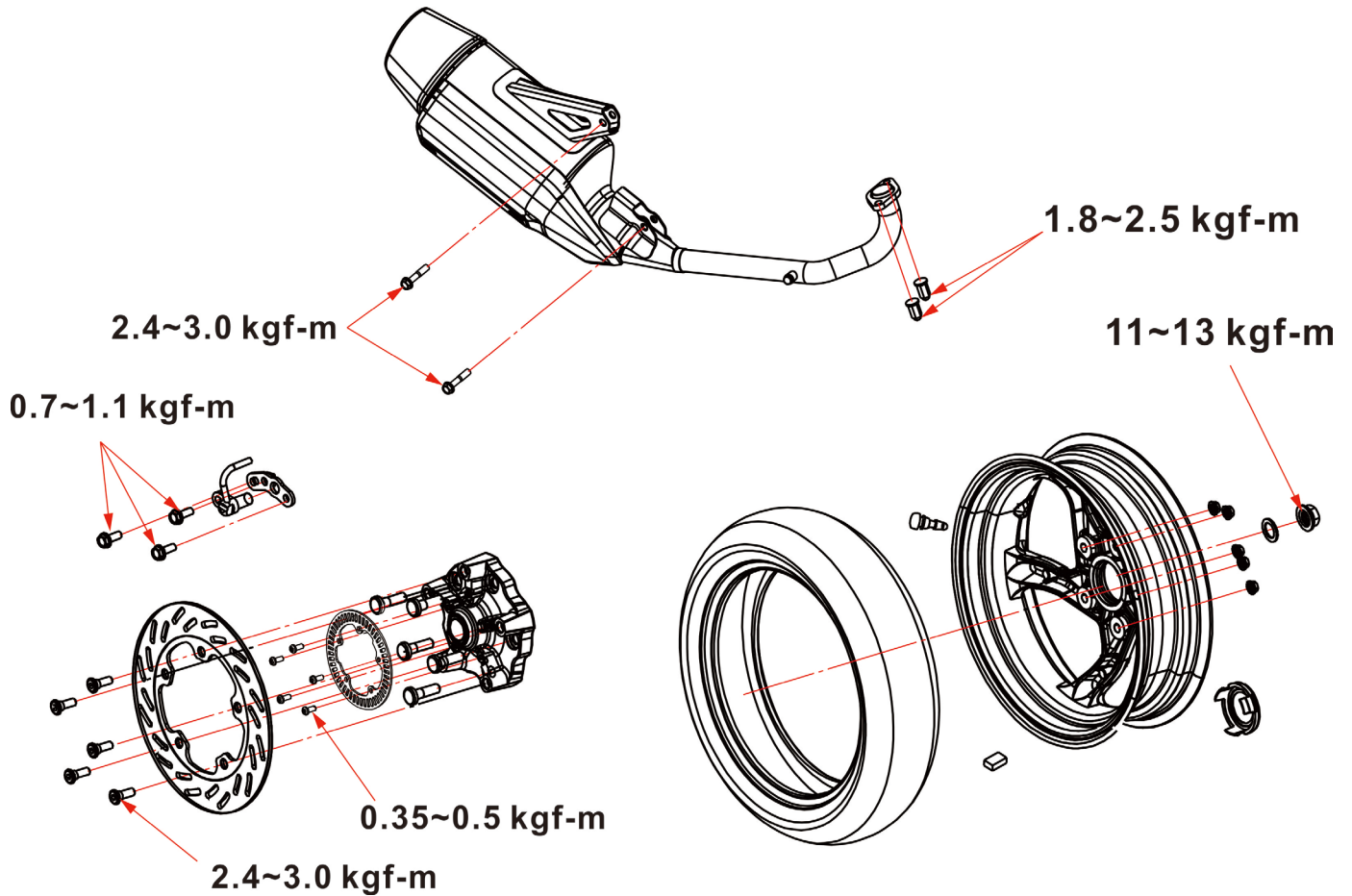
Install the oil seal and cover.

- Torque: 0.1~0.2 kgf-m



Mechanism Diagram	15-1	Muffler.....	15-3
Precautions in Operation.....	15-2	Rear Cushion	15-3
Troubleshooting.....	15-2	Rear Wheel	15-4

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	Limit
Run-out of rear rim	Radial	-	2.0
	Axial	-	2.0

Torque Value

Rear wheel axle nut	3.5~4.5kgf-m
Rear cushion bolt	3.5~4.5kgf-m
Muffler mounting nut	1.8~2.5kgf-m
Muffler mounting bolt	3.0~3.6kgf-m

Troubleshooting

Rear wheel wobbling

- Bent rim
- Faulty rear tire
- Loose wheel shaft

Soft suspension

- Weak shock absorber spring

Noisy Brake

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

Poor Brake Performance

- 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

Disconnect O2 sensor coupler.
Remove nuts from front side of muffler.

Remove bolts from rear side of muffler.
Remove muffler.

Installation

Installation is the reverse of the removal procedures.

⚠Caution

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

- Torque Value:
Muffler mounting bolt 2.4 ~ 3.0 kgf-m
Muffler mounting nut 1.8 ~ 2.5 kgf-m

Rear Cushion

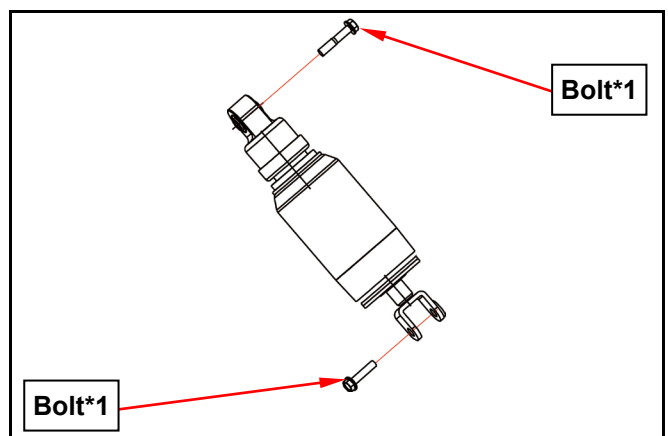
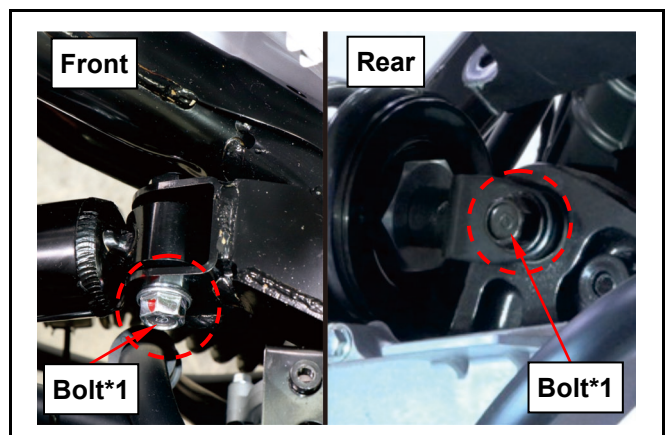
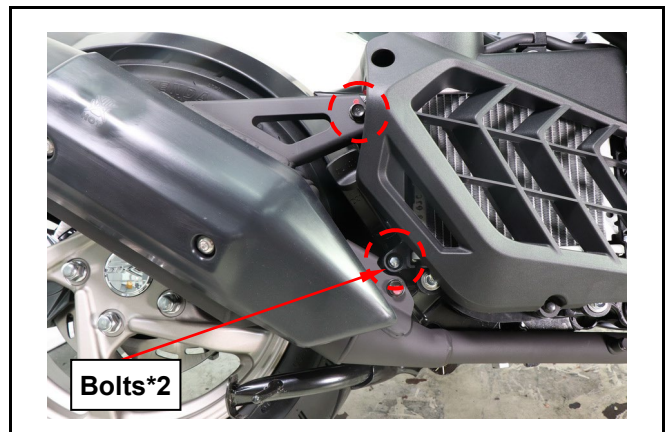
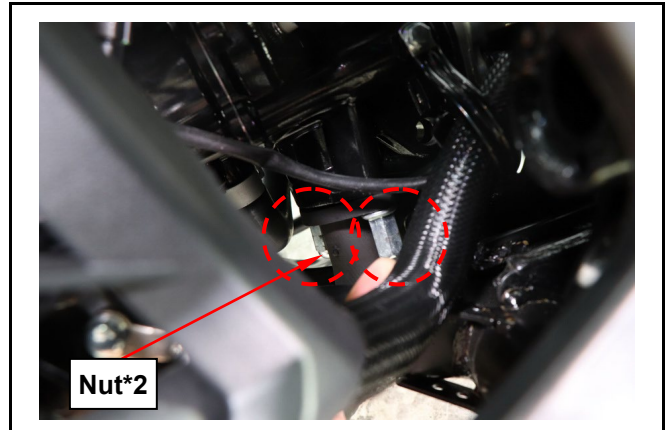
Removal

Remove the luggage box.
Remove L side outer cover.
Remove the air cleaner. (Refer to Rear fender)
Remove bolt on front and rear side of rear cushion.
Remove rear cushion.

Installation

Installation is the reverse of the removal procedures.

- Torque Value:
Rear cushion upper bolt 3.5 ~ 4.5 kgf-m
Rear cushion lower bolt 3.5 ~ 4.5 kgf-m



Rear wheel

Removal

Remove muffler.

Remove nuts for rear wheel.

Remove rear wheel.

Installation

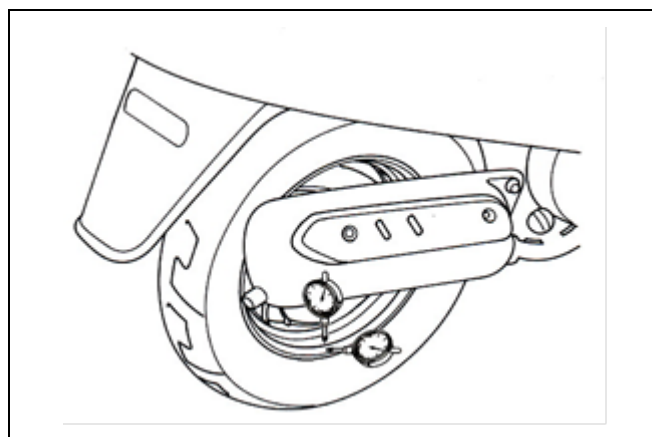
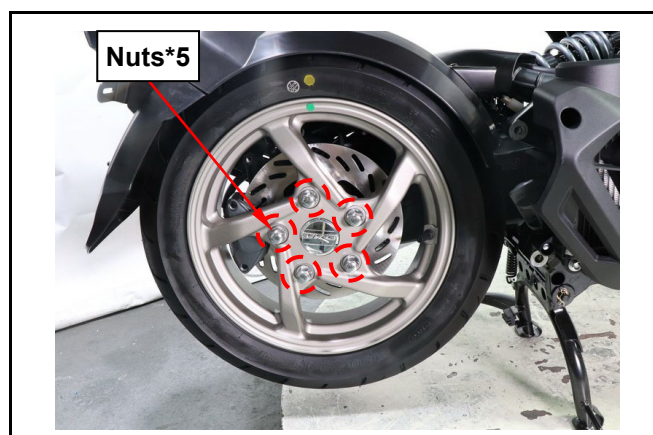
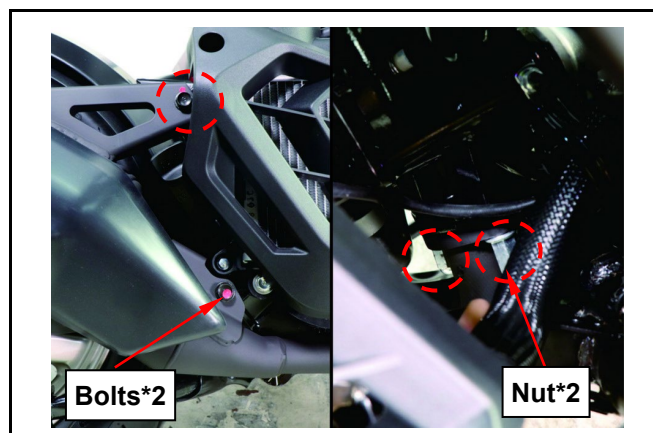
Installation is the reverse of the removal procedures.

- Torque Value:
Rear wheel axle nut: 3.5 ~ 4.5 kgf-m

Inspection

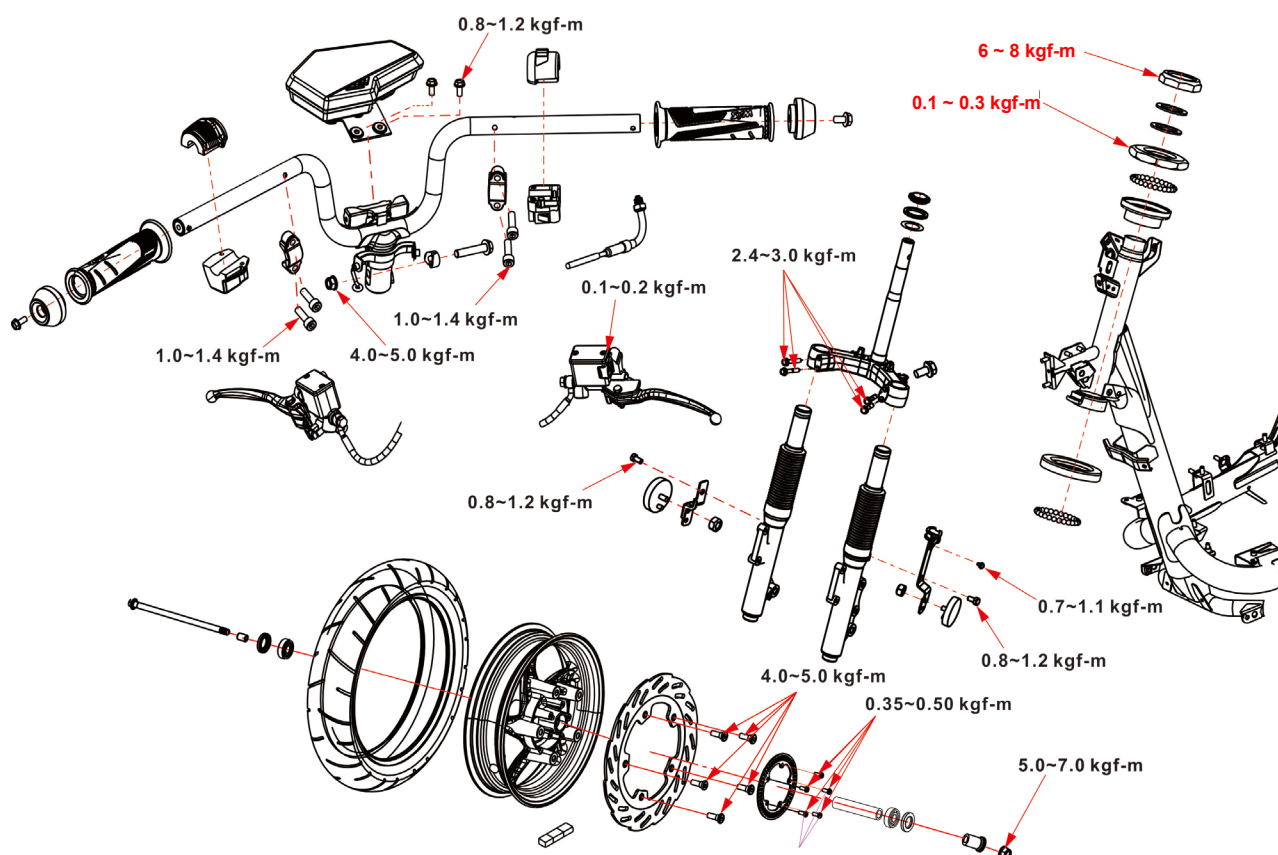
Rotate it by hand and measure the run-out with a dial indicator.

- Run-out limit: 2.0 mm



Mechanism Diagram..... 16-1	Front Wheel 16-5
Precautions in Operation 16-2	Front Cushion16-10
Troubleshooting 16-2	Front Fork / Steering Stem.....16-11
Steering Handlebar..... 16-3	

Mechanism Diagram



Precautions in Operation

General

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

The vehicle shall be supported by jack when remove the front tire.

Torque Values

Nut for the front wheel axle	5.0 ~ 7.0 kgf-m
Lock nut for the steering shaft	6.0 ~ 8.0 kgf-m
Top cone race for the steering shaft	0.1 ~ 0.3 kgf-m
Front shock absorber: Upper lock bolt	3.5 ~ 4.5 kgf-m
Bolt for front brake caliper	2.9 ~ 3.5 kgf-m

Tools

Bearing puller

Driver 32*35mm

Driver 42*47mm

Steering nut wrench

SYM-5320000

Inner bearing puller

SYM-6204025

Steering nut removal tool

SYM-5320010

Troubleshooting

Hard to steer

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

The steering handlebar is tilted

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

The front wheel run out

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

Soft shock absorber

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

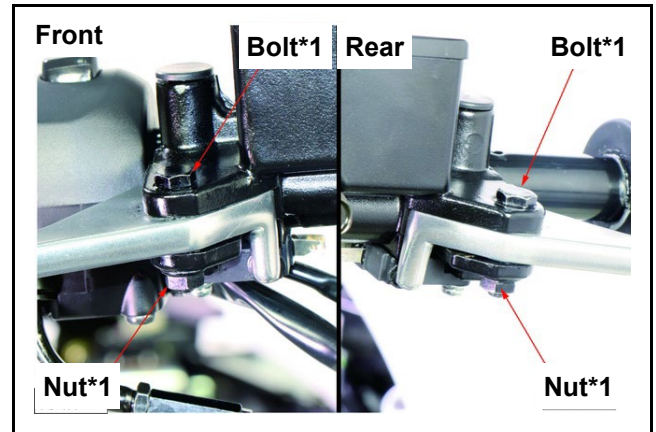
Noise in front shock absorber

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

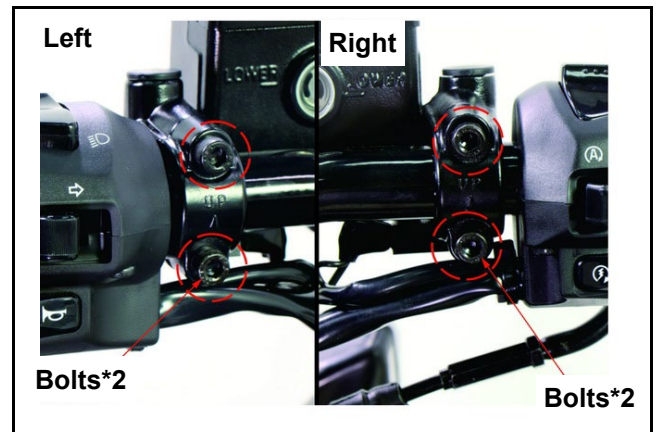
Steering Handlebar

Removal

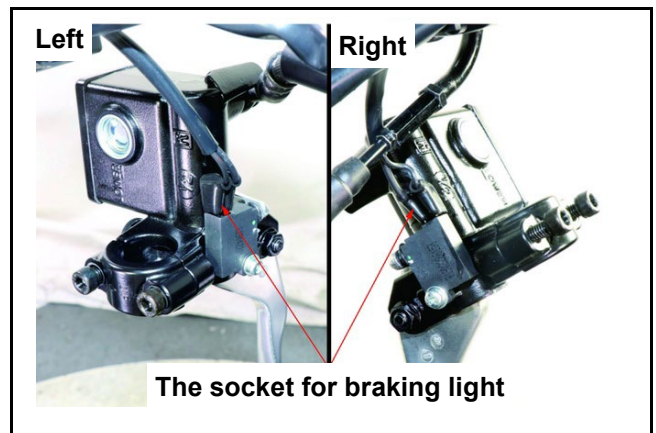
Remove the nut of front/rear brake lever.
Remove the bolt of front/rear brake lever.



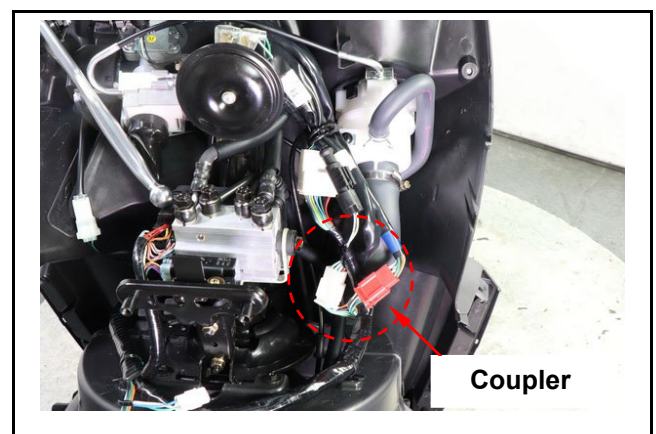
Remove the front cover.
Remove the bolts of front/rear brake master cylinder.
Remove the front/rear master cylinder.



Remove the coupler of left/right braking light switch



Remove 2 bolts for multi-meter.
Remove the multi-meter.



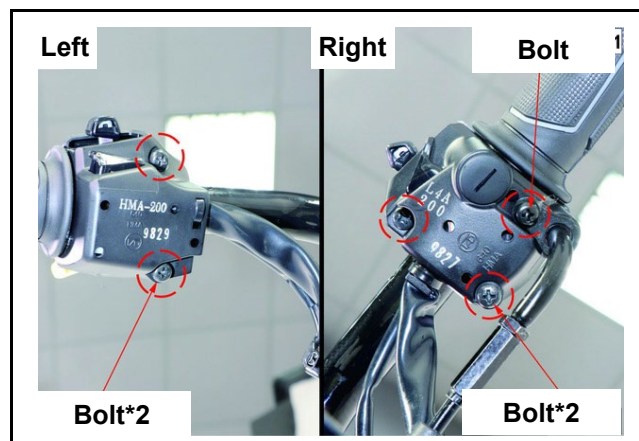
16. Steering / Front Wheel / Front Cushion



Remove left/right switch assembly.
Remove the throttle cable.

Installation

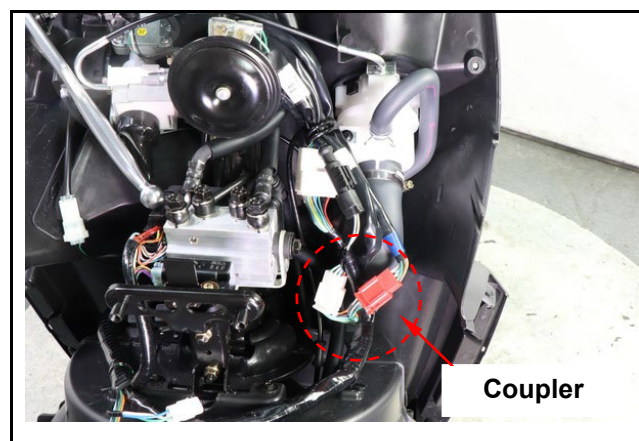
Installation is the reverse of the removal procedures.



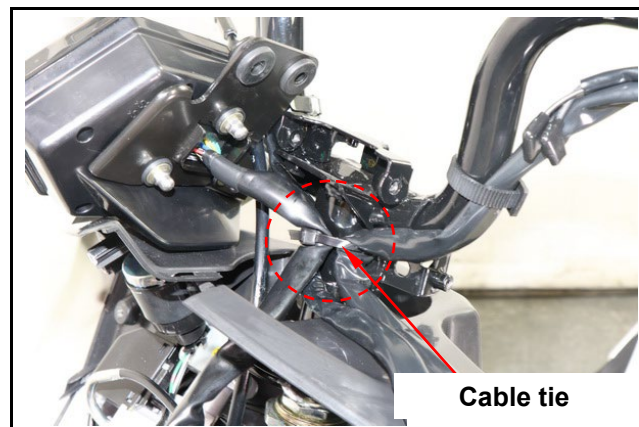
Multi-meter

Removal

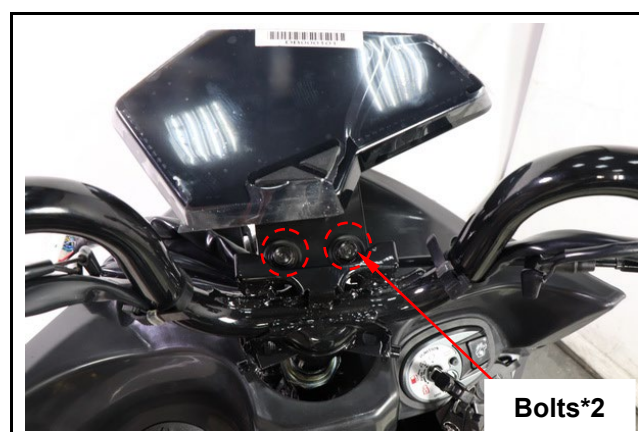
Remove the front handlebar cover.
Remove the multi-meter and the coupler of left/right switch.



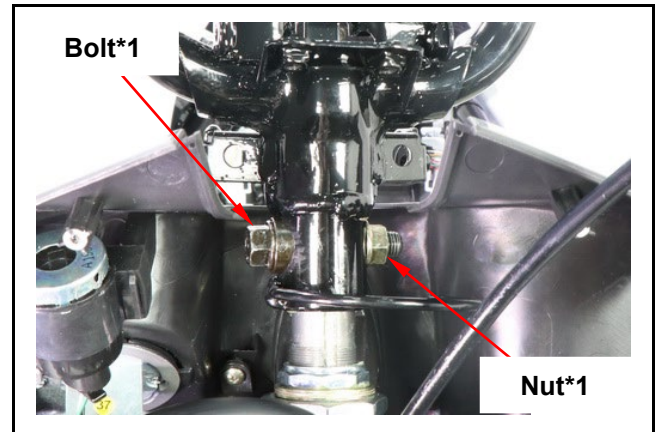
Take off the cable tie.



Remove the bolts of multi-meter.
Remove the multi-meter.



Remove the nut/bolt of handlebar.



Remove the handlebar.



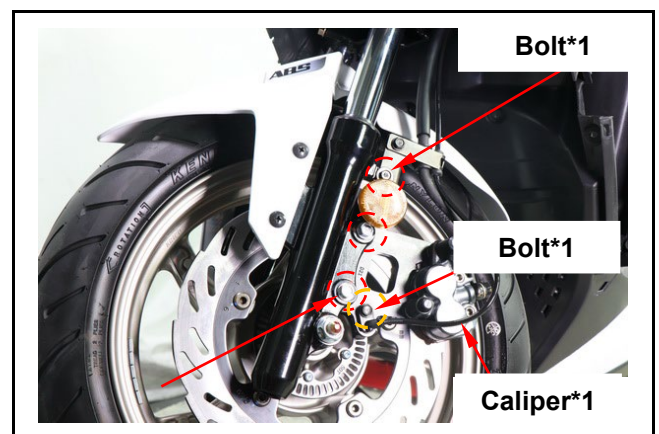
Front wheel Removal

Use a jack to hold the under cover.

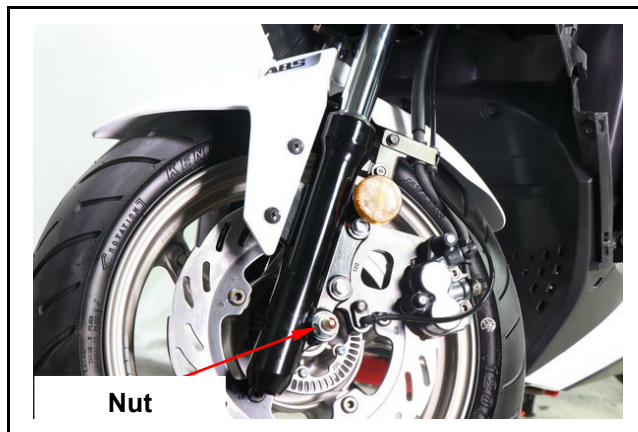
- Special tool: Engine jack
NO. SYM-HM17110



Remove the bolt of speed sensor of front wheel.
Remove 2 bolts for front caliper.
Remove the front caliper, reflector, brake hose,
speed sensor



Turn loose the nut and pull out the wheel axle.
Remove the front wheel.

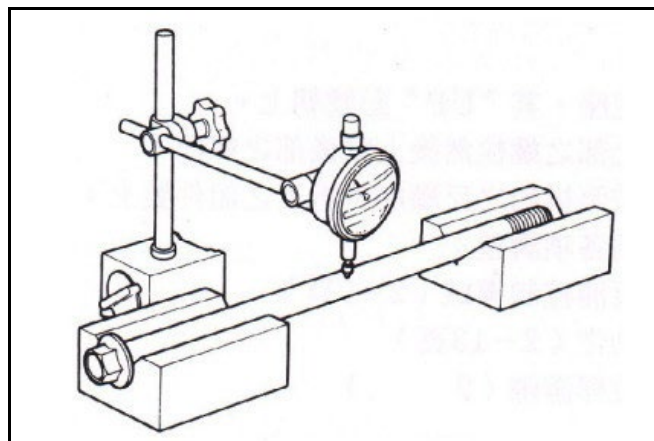


Inspection

Wheel axle

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

- Service limit: 0.2 mm

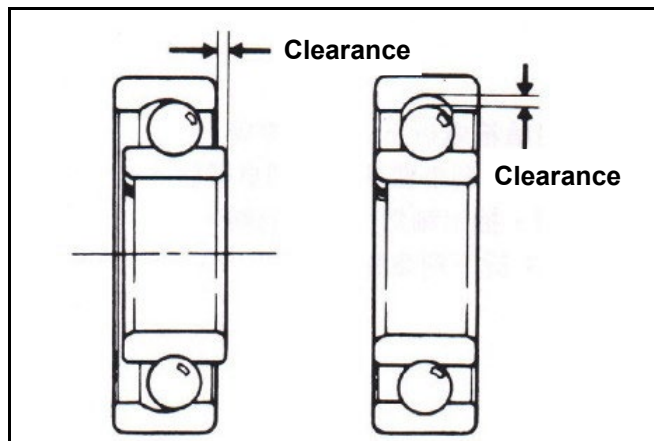


Bearing

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

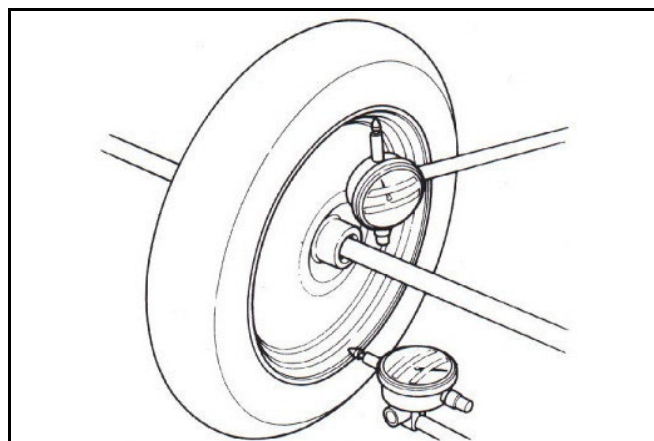
- The bearing shall be replaced in pair.



Wheel rim

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

- Service limit:
Radial: 2.0 mm
Axial: 2.0 mm



Disassembly (disc brake)

Remove the bolts of brake disc.

Take off the left dust-proofing oil seal. Insert the bearing puller into the bearing and pull out the left bearing.

Remove the spacer.

Take off right dust-proofing oil seal. Insert the bearing puller into the bearing and pull out the right bearing.

- Special tool: Inner bearing puller
NO. SYM-6204025

Assembly

Assemble is the reverse of the disassembly procedures.

Fill the bearing cap with grease.

Place the left bearing into the bracket.

Install the spacer and place the right bearing into the bracket.

⚠ Caution

- Never use the old bearing. It must be replaced with a new one once it was removed.
- Never incline the bearing when it is installed.

- Special tool: Hydraulic presser

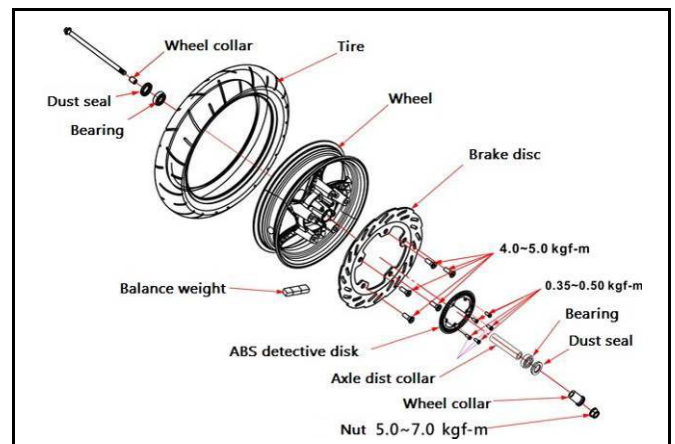
Front wheel installation (disc brake)

Apply a coat of grease on the inner side of the dust-proofing oil seal.

Install dust-proofing oil seal and bearing.

Install brake disc (5 bolts)

- Torque value: 4.0~5.0 kgf-m

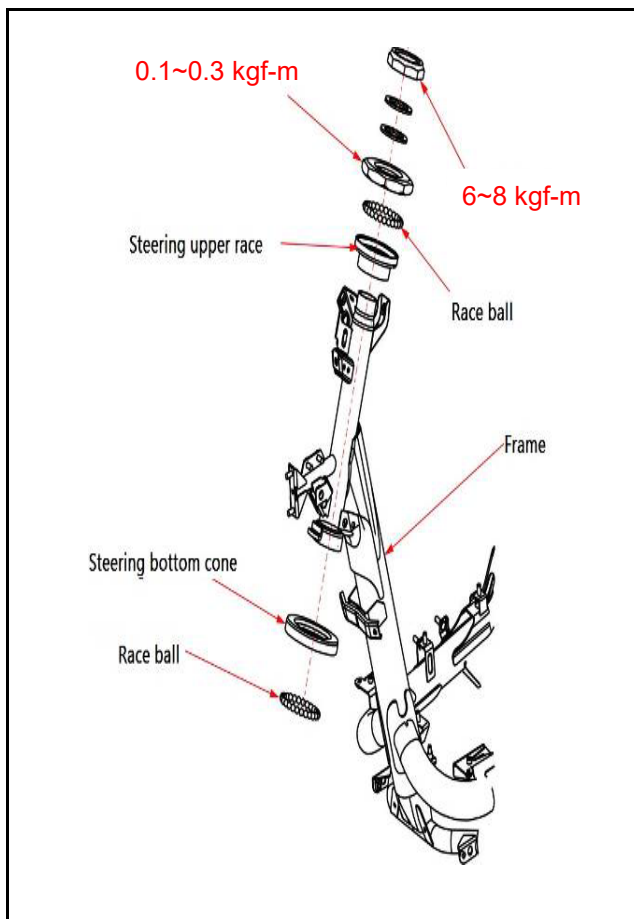
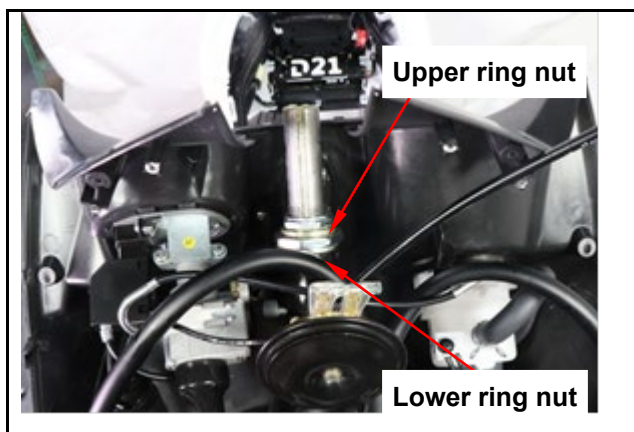
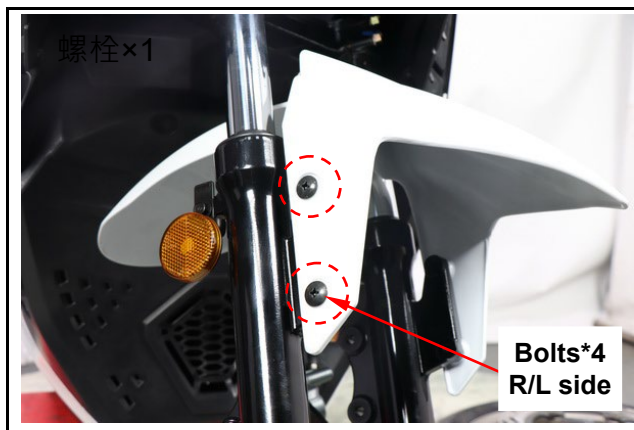


Remove 2 bolts for front fender on R/L sides.
 Remove the front inner fender. (screws and 2 bolts), please refer to chapter. 13 body cover.
 Remove 2 ring nuts of steering stem.

Take off steering stem.
 Take off balls.

⚠Caution

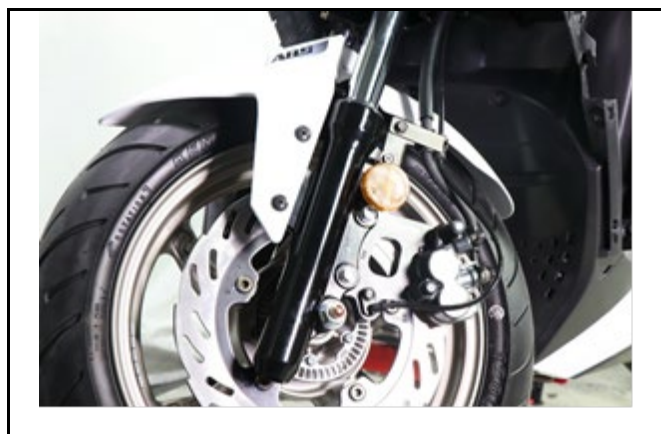
- Balls cannot be damaged or lost.
- Race balls cannot be attached to the front fork tube, which will cause handlebar to work un-smoothly.
- Spread grease evenly when assembling, and arrange balls in sequence.



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

Tighten the nut for the wheel axle.

- Torque value: 5.0 ~ 7.0 kgf-m



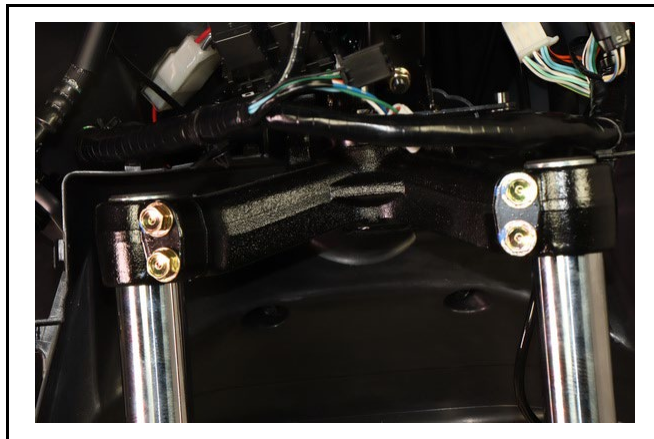
Front Cushion

Removal

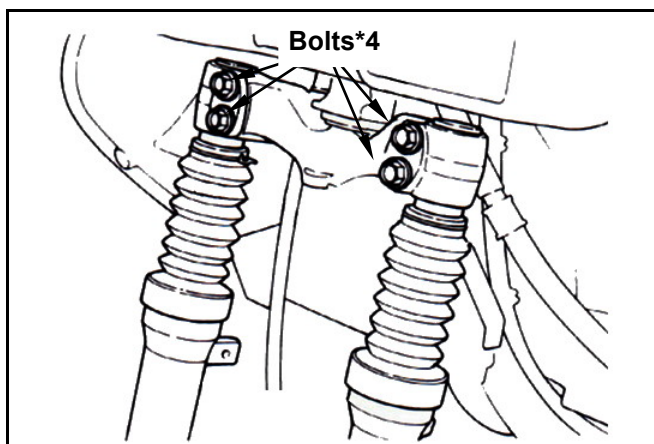
Remove the front wheel and front brake caliper and hose.

Remove the front inner fender.

Remove the brake hose clip.



Loosen the bolts and remove the front shock absorber.



Installation

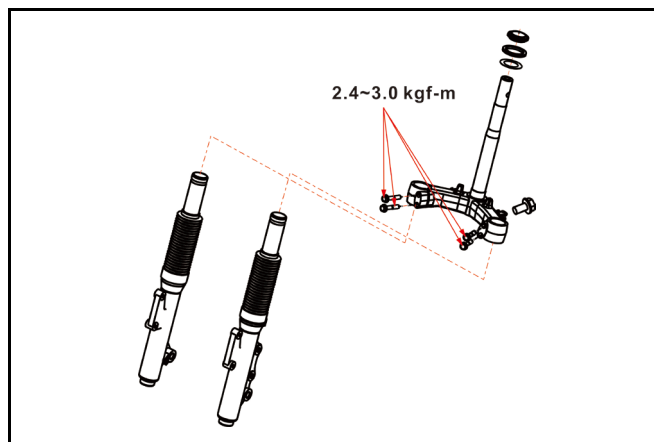
Install the front fork and front shock absorber.

Tighten the bolts.

Align the top of the cushion with the steering stem and tighten the bolt.

- Torque value: 2.4~3.0 kgf-m

Installation is the reverse of the removal procedures.



Front Fork and Steering Stem

Removal

Remove the following parts:

- The Steering handlebar
- The front wheel
- The front brake system
- The front fork

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

- Special tool: Steering nut wrench
NO. SYM-5320000
- Special tool: Steering nut removal tool
NO. SYM-5320010

Remove the top crown and front fork.

⚠Caution

- Place balls in a container to avoid missing.

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

⚠Caution

- Do not damage the steering stem.

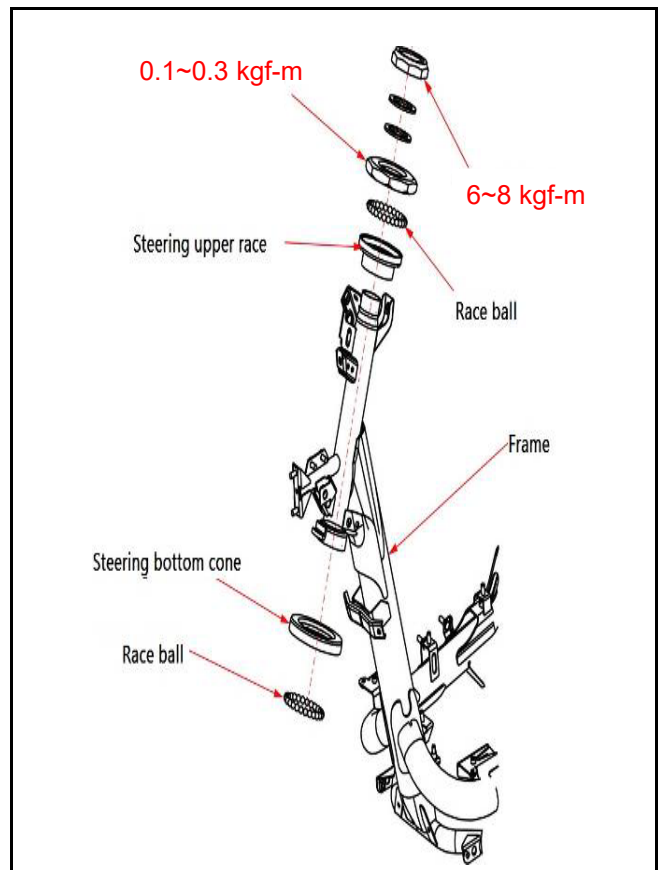
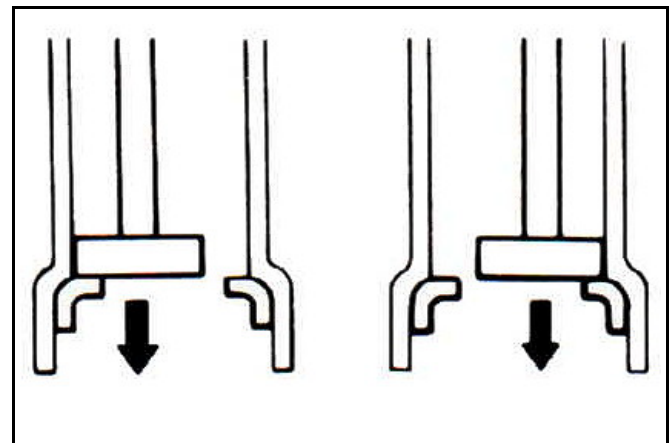
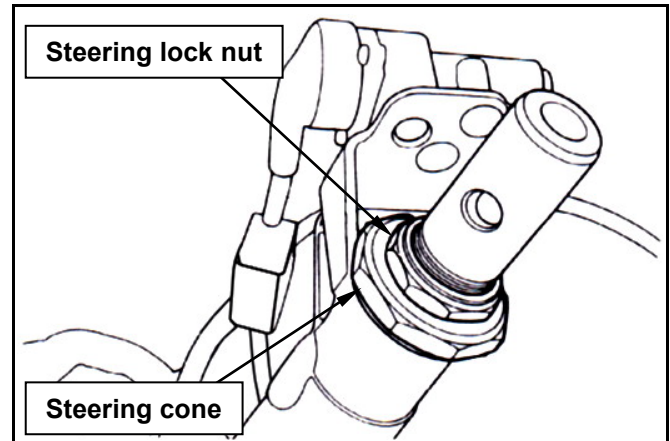
Installation

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

⚠Caution

- Do not tilt the ball bearing seats as installation

Apply with grease onto the ball bearing seats, and install balls onto the seats.



16. Steering / Front Wheel / Front Cushion

Lubricate the top cone race seat with grease. Screw the cone race into top ball bearing seat till touching. Then retract 1/2 turn, and screw out the cone race 1/4~3/8 turn.

- Torque value: 0.2~0.3 kgf-m

⚠ Caution

- Do not over screw the top cone race to avoid ball bearing damage.

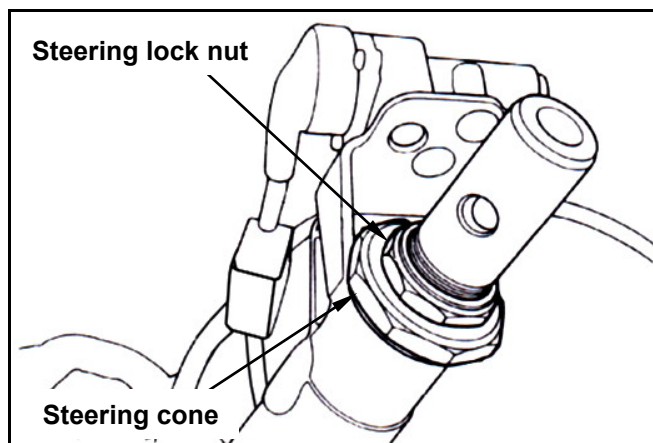
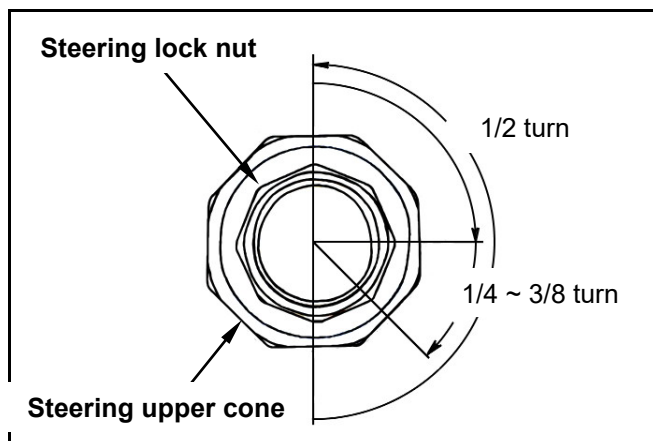
Install the steering stem mounting nut and tighten the nut by means of holding the top cone race body.

- Torque value: 1.0~2.0 kgf-m
- Special tool: Steering nut wrench
NO. SYM-5320000
- Special tool: Steering nut removal tool
NO. SYM-5320010

⚠ Caution

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

Installation is the reverse of the removal procedures.



Steering ball race

Removal

Install the jig of steering ball race puller and the removal ring.

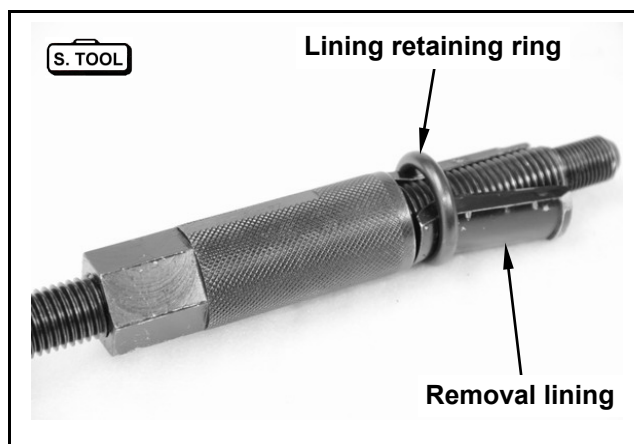
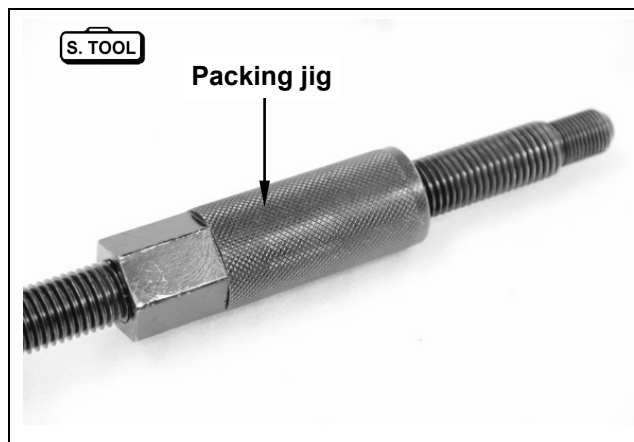
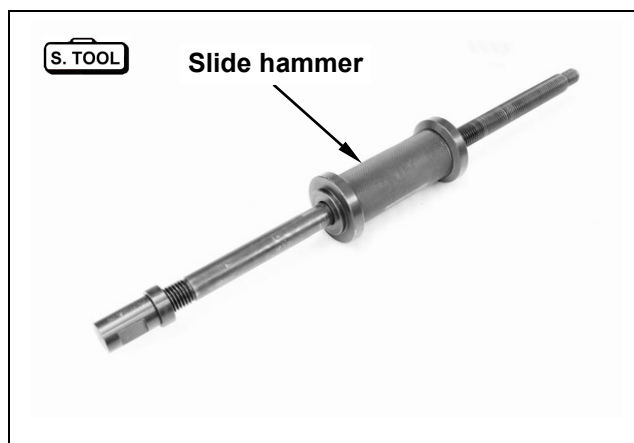
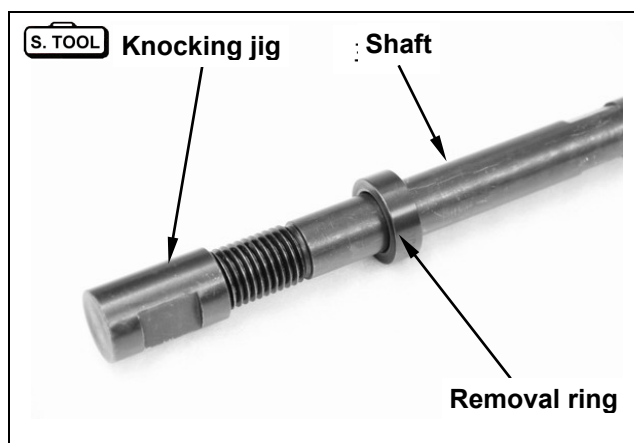
- Special tool: Steering ball race puller
NO. SYM-5021010
- Special tool: Steering ball race jig
NO. SYM-5021010-03
- Special tool: Packing jig
NO. SYM-5021010-02

Install the slide hammer.

- Special tool: Slide hammer
NO. SYM-5021020

Install the packing jig, and adjust the position for the removal lining.

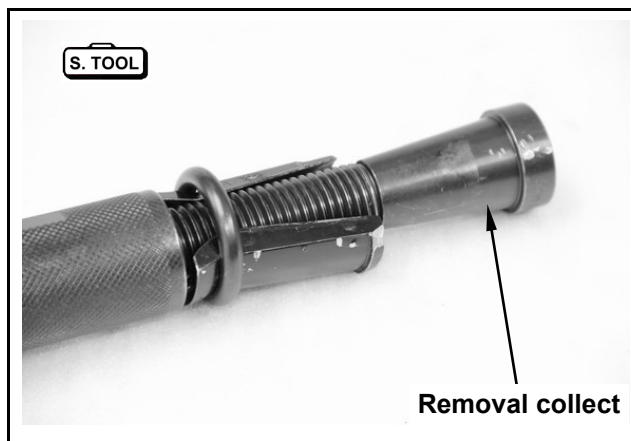
- Special tool: Lining retaining ring
NO. SYM-5021010-07
- Special tool: Removal lining
NO. SYM-5021010-06



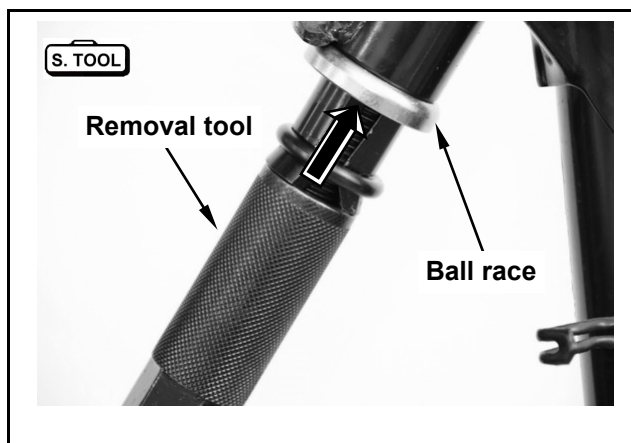
16. Steering / Front Wheel / Front Cushion

Install the removal head.

- Special tool: Removal collect
NO. SYM-5021010-05



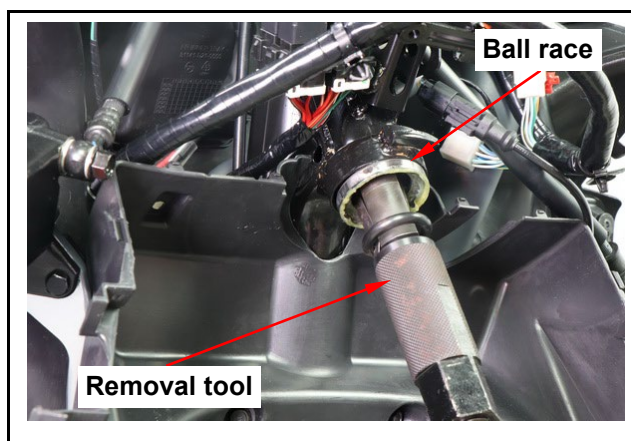
Insert the removal collet inside of ball race, and expand the collet properly.



Repeat downward motion of the slide hammer to remove the ball race.



Remove the ball race



Ball race removal

Install the slide hammer ball race puller and steering ball race jig.

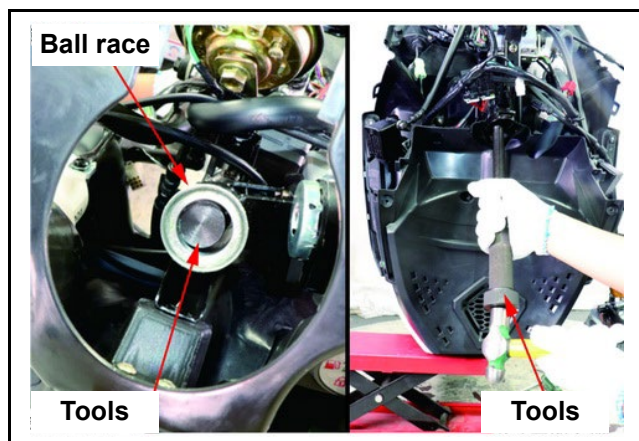
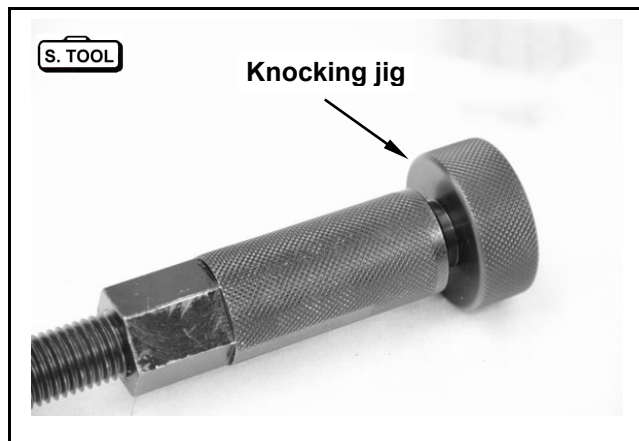
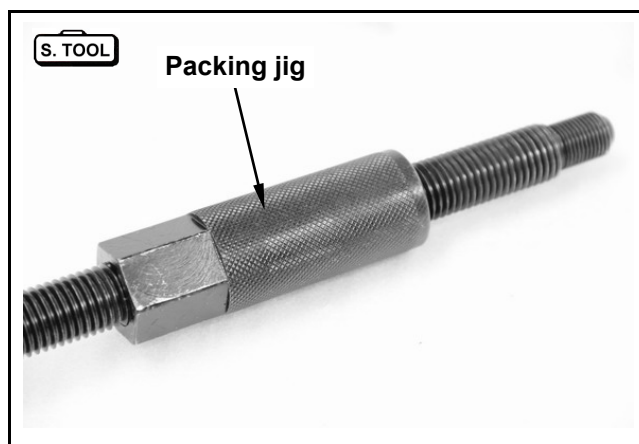
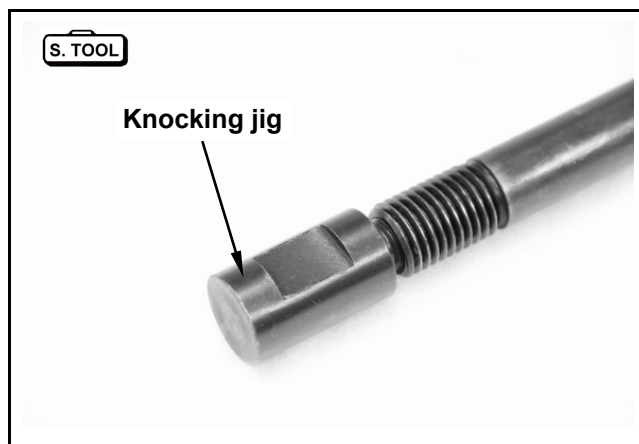
- Special tool: Steering ball race puller
NO. SYM-5021010
- Special tool: Steering ball race jig
NO. SYM-5021010-03

Install the packing jig

- Special tool: Packing jig
NO. SYM-5021010-02

Install the knocking jig.

Use above tools to remove the ball race.



Steering ball race installation

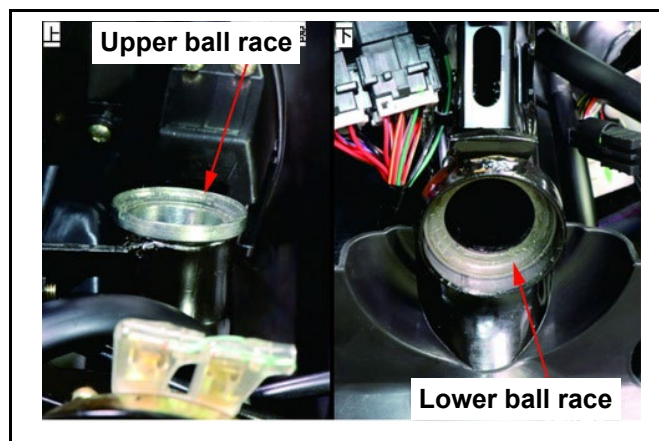
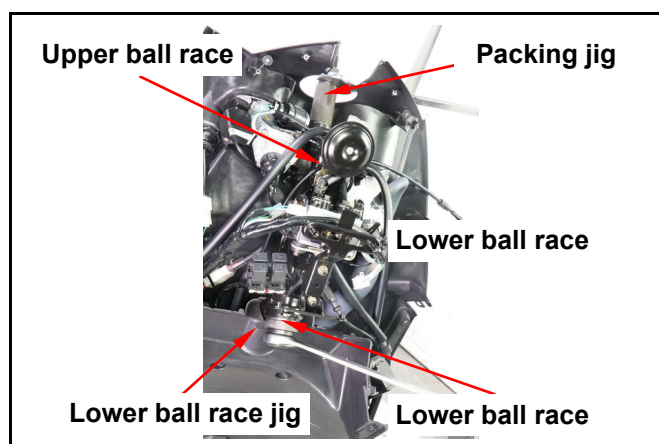
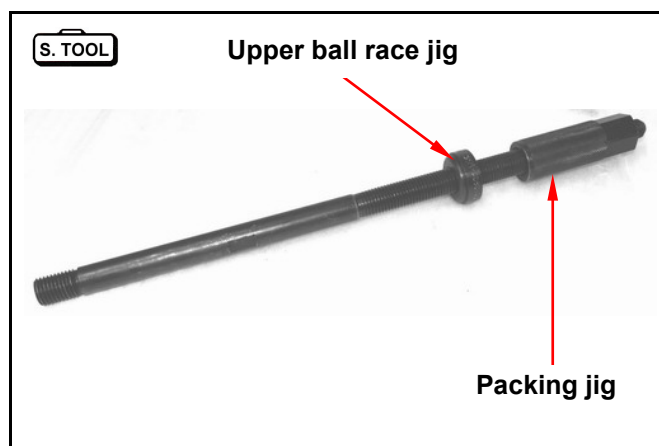
Install the packing and upper ball race jig.

- Special tool: Packing jig
NO. SYM-5021010-02

Insert the tool, and place the ball race and jig.

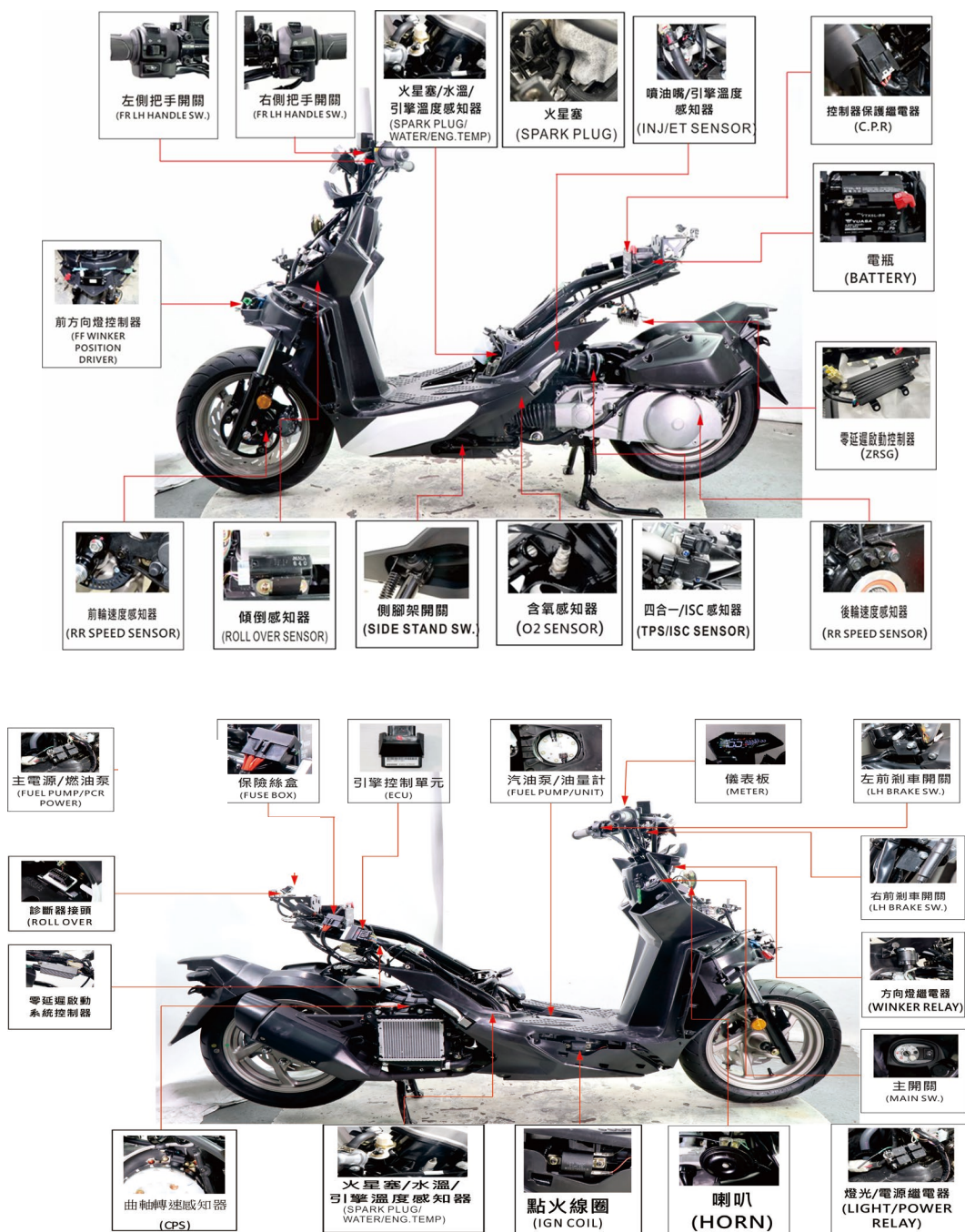
Use tools to install ball race.

Take off the tools, and make sure the ball race is installed properly.



Vehicle Configuration.....	17-1	Meter.....	17-12
Precautions in Operation.....	17-2	Light / Bulb	17-13
Troubleshooting.....	17-3	Switch / Horn.....	17-17
Charging System	17-4	Fuel Unit	17-20
ZRSG System	17-6		
Ignition System	17-11		

Electrical System Vehicle Configuration



Precautions in Operation

- While removing the battery, disconnect the negative cable terminal first, and then disconnect the positive cable terminal.
- The model of the spark plug and the tightening torque for spark plug .
- The Adjustment for ignition timing.
- The Adjustment for headlight beam.
- Removal and installation for AC generator.
- The maintenance-free battery does not require the inspection for electrolyte level and refill the distilled water.
- To recharge the battery, remove the battery from frame.
- Unless in emergency, never rapid-charge the battery.
- The voltage must be confirmed with the voltmeter while charging the battery.
- As ignition timing is controlled by ECU, if ignition timing is incorrect, check ECU and AC generator and verify it with ignition timing light.

Specification

Charging system

Description		D26
Battery	Capacity	12V4.0Ah
	Charging rate	0.9A / 5~10hr (Normal) 4.5A / 1hr (Boost)
Leak current		Below 10mA
Regulated voltage		14.5±0.5 V
Engine speed to start charging		below 2000 rpm

Ignition system

Description		D26
Spark plug	Model	NGK CPR8EA-9
	Gap	0.8~0.9 mm
Ignition coil and resistance	Primary winding	2.8Ω±10% (20°C)
Crankshaft position sensor resistance		120Ω±20% (20°C)
Ignition timing advance	At idle speed	0° BTDC / 1750 rpm

Starting System

Items		Specifications
Starting motor	Type	DC
	Output	0.5 KW

Troubleshooting

No voltage

- Battery discharged
- Cable disconnected
- Fuse blown
- Improper operation of main switch

Low voltage

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

No spark

- Spark plug out of work
- Cable poorly connected, open or short-circuited between ACG and ECU / between ECU and ignition coil / between ECU and main switch
- Poor main switch
- Poor ECU
- ACG out of work

Starter motor does not work

- Fuse blown
- Battery not fully charged
- Poor main switch
- Poor starter switch
- Poor front or rear brake switches
- Starter relay out of work
- Cable poorly connected, open or short-circuited
- starter motor out of work

Intermittent power supply

- Loose charging system connector
- Battery cable poor connection
- 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

- Fuse blown
- 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 cap
- Incorrect ignition timing
 - Poor ACG
 - Improper installation of CPS
 - Poor ECU

Weak starter motor

- Poor charging system
- Battery not fully charged
- Poor connection in the windings
- Motor gear 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

Charging system

Battery

Removal

Remove battery cover. (2 screws 、 1 bolt)

Remove battery band (1 screw)

Disconnect the negative cable terminal first, then remove the positive cable terminal.

Remove the battery.

⚠Caution

- Electrolyte contains sulfuric acid that causes severe damage; avoid any contact with human body or clothing.

Installation

Installation is the reverse of the removal procedures.

Voltage inspection

Use the digital voltmeter to check the battery voltage.

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 (-).

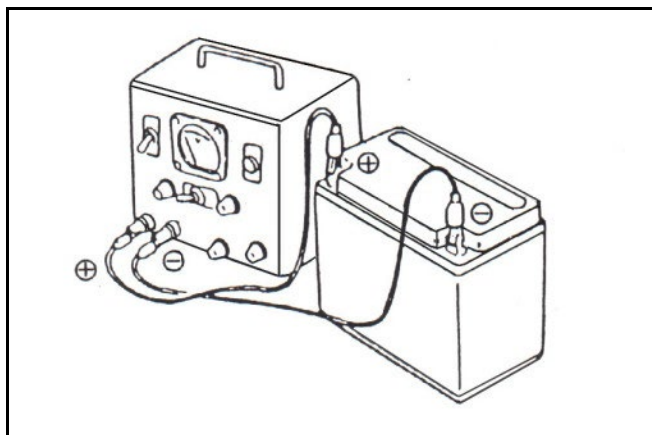
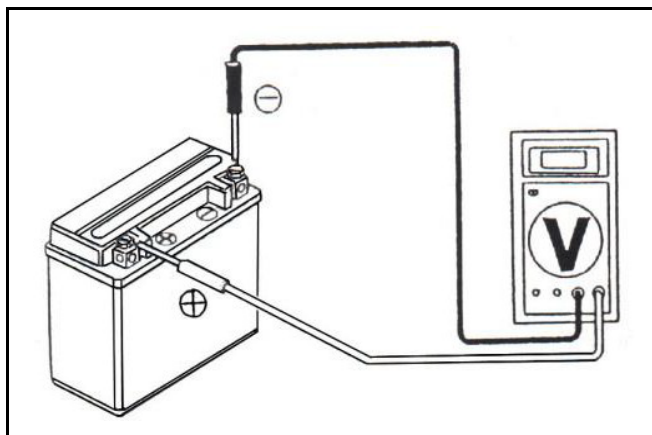
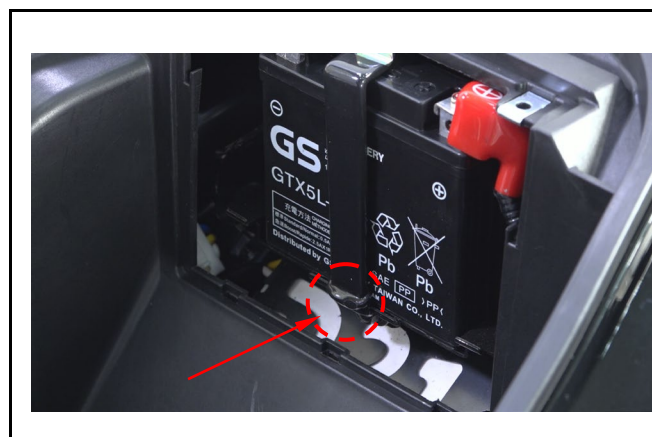
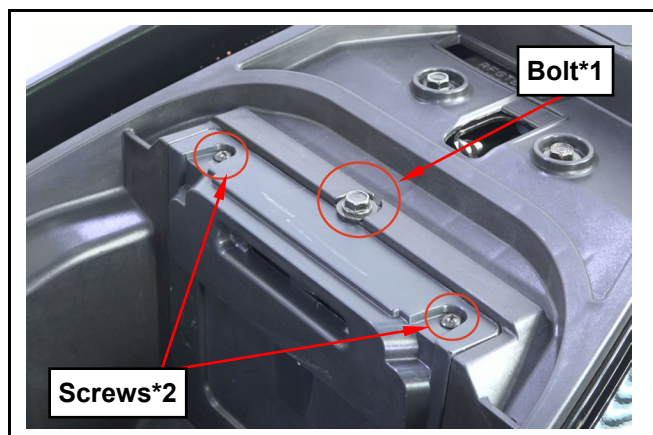
- Standard range of charging: 14.0~15.0V (under 20°C) °

⚠Caution

- Keep flames away while recharging.
- Charging shall be controlled by the ON/OFF switch of the charger, not by battery cables.

⚠Caution

- Never fast charge the battery unless in emergency.
- Large current and fast charging will damage battery.
- Check the battery capacity after completing charge for 3 hours later.
- When installing the battery, coat the cable terminal with grease to prevent oxidation



Leakage current inspection

Turn off the main switch, and remove the cable from terminal -.

Order of ammeter connection (as pictures shows):

Black cable of ammeter → Terminal -.

Green cable of ammeter → ground cable.

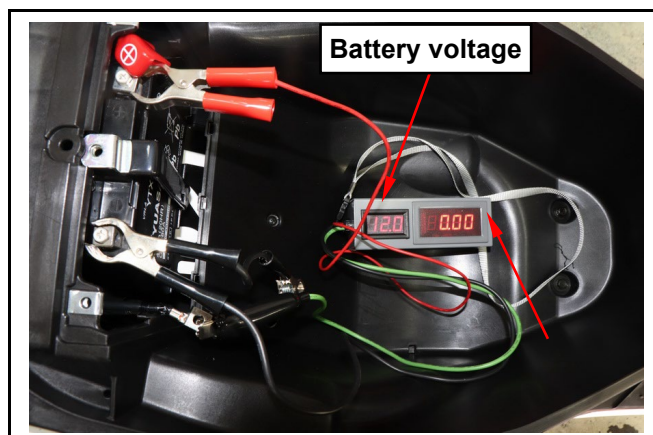
Red cable of ammeter → Terminal +.

- Maximum leakage current: below 10mA.

Short circuit might has occurred, if the current is more than 10mA

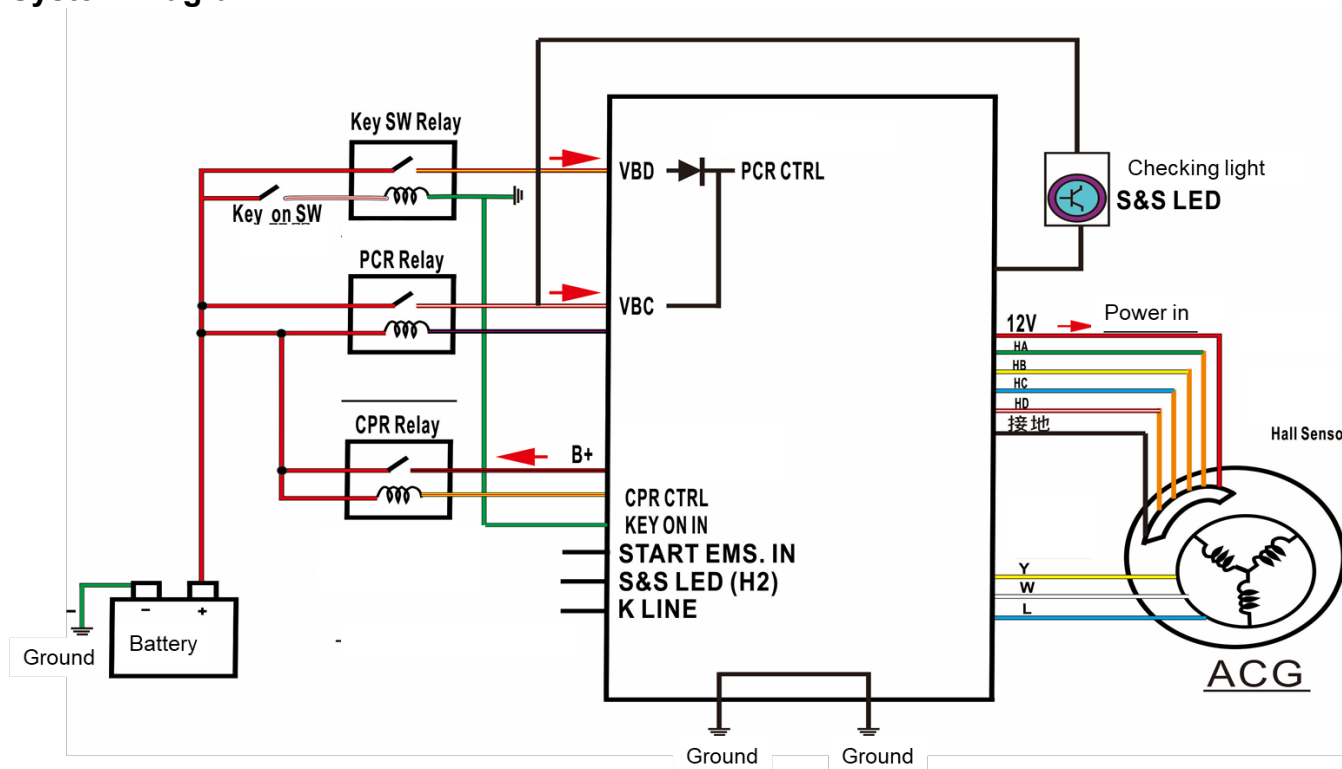
Caution

- Do not conduct “rapid charging”.
- Confirm the charging current first before recharging.
- Excessive recharge will damage battery.
- Only measure the voltage, after 30 minus of recharging.
- Battery should be lubricated with grease after installing.

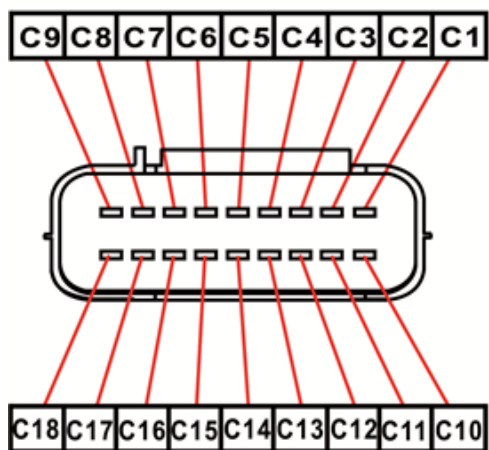


Zero-Resistance Starter & Generator System (ZRSG)

System Diagram



ZRSG controller pin diagram



PIN NO.	NAME
C1	VB
C2	VBD
C3	CPR CTRL
C4	S&S LED (SIL)
C5	PCR CTRL
C6	HD IN
C7	HC IN
C8	HB IN
C9	HA IN
C10	+5 VA
C11	KEY ON IN
C12	GND
C13	S&S LED (H2)
C14	GND
C15	STAR EMS IN
C16	GND
C17	K-LINE
C18	VBC

Before inspection

Remove all connectors for ZRSG and stand for more than 3 minutes.

Use a multimeter for inspection. (black wire to negative terminal, red wire to positive terminal.)

Zeroing multimeter first.

⚠ Caution

- Avoid short circuit when measuring each pin
- It is strictly forbidden to use sharp tools to directly damage the wire for measurement, so as to avoid the water proof of wires from failing, which may cause a short circuit.

Short circuit inspection

ISG power and ISG

Switch the meter to the "Ω" position for inspecting whether the wires are short-circuited.

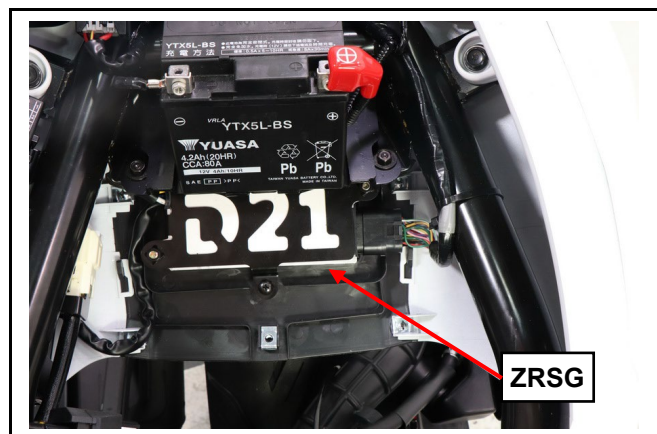
- ISG Power: Connect the positive and negative wires of the meter with red and green wires of ISG power plug separately.
- ISG: Connect the positive and negative wires of the meter with red and yellow/blue/white wires of ISG separately.

A large resistance value, over MΩ, can be measured, indicating that there is no short-circuit phenomenon.

If a short circuit is detected, replace the ZRSG.

Voltage inspection

- ISG Power: Connect the positive and negative wires of the meter with red and green wires of ISG power separately. There should be no voltage before the main switch is turned on.



ZRSG Terminal pin measurement

Remove the rear luggage box and body cover first for inspection operation.

- Refer to the table below to inspect the status of ZRSG circuit with measurement tool.
- Avoid short circuit when measuring each pin
- If the measured value is abnormal, check the parts of the abnormal circuit.
- If the parts are normal, the wires are might worn.
- If the above items are normal, replace the ZRSG.

Item	Position	Main switch	Positive terminal	Negative terminal	Standard value (Unit: volt)
Battery Volt	DCV	ON	VB/VBD/VBC	GND	10~14.5 V
Internal parts	DCV	ON	5V	GND	4.8~5.2 V
Checking light	DCV	ON	SIL	GND	Checking light on: below 1 V Checking light off: 10~14 V
No function	DCV	ON	H2	GND	No measurement confirmation
K-LIN communication	DCV	ON/OFF	K-LINE	GND	Main switch on: below 14 V Main switch off: below 1 V
Start signal (FOR EMS)	DCV	ON	START EMS	GND	Volts changing during starting engine: below 14 V
Hall signal	DCV	ON	HA/HB/HC/HD	GND	Volts changing during crank rotating: 0 ~ 14 V
Power charging relay control	DCV	ON/OFF	CPR	GND	Main switch on: below 1 V Main switch off: Same to battery
Power relay control	DCV	ON/OFF	PCR	GND	Main switch on: below 1 V Main switch off: Same to battery
MAIN SWITCH signal	DCV	ON/OFF	KEY ON IN	GND	Main switch on: below 1 V Main switch off: Same to battery

ZRSG Diagnostic Trouble Codes

DTC	Warning Light ON	Warning Light OFF	Description
P0C01	Malfunction	Return to normal and clear the DTC	Driving current of ISG controller exceeds the limited value. Please check ISG controller and motor.
P1002	Malfunction	Return to normal and clear the DTC	The rotor of motor is blocked. Maybe battery voltage is too low or decompression mechanism is abnormal. Please check battery, ISG controller, motor and decompression mechanism.
P0563	Malfunction	Return to normal and clear the DTC	ISG controller detects that battery voltage is too high. Please check battery and ISG controller.
P0A4B	Malfunction	Return to normal and clear the DTC	The hall sensor is abnormal. Please check ISG controller and motor.
P1006	Malfunction	Return to normal	The battery wire is not connected well or ISG controller is out of order. Please check the connection of battery wire and ISG controller.
P1008	Malfunction	Return to normal and clear the DTC	The current sensor of ISG controller is abnormal. Please check the connection between ISG controller and battery.

AC. generator coil inspection

Disconnect the couplers generator coil motor and check the resistance value between each wire with an ohmmeter and check whether a short circuit happened.

If there is any abnormality, please replace the generator coil.

Volt output circuit: yellow wire / yellow wire

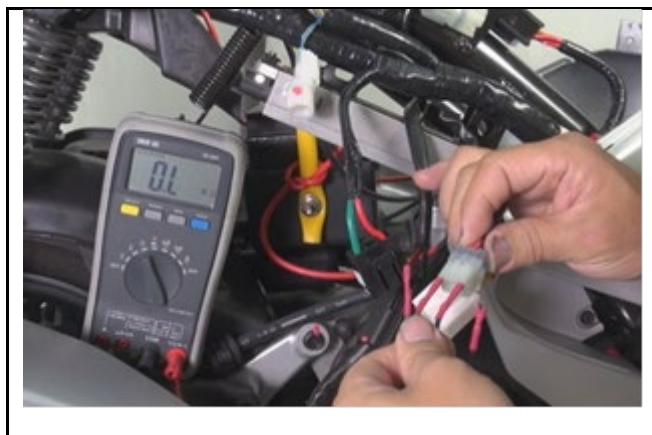
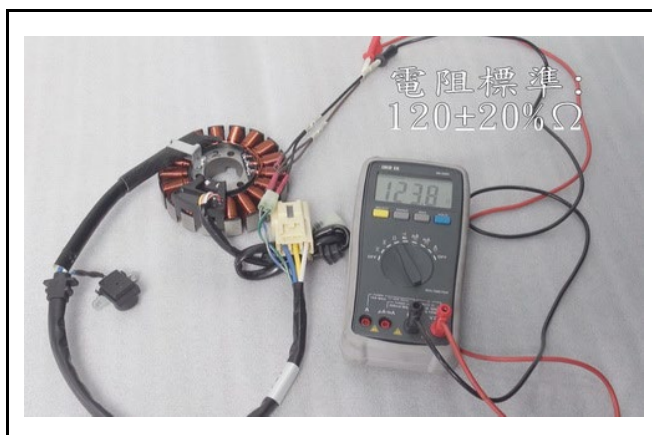
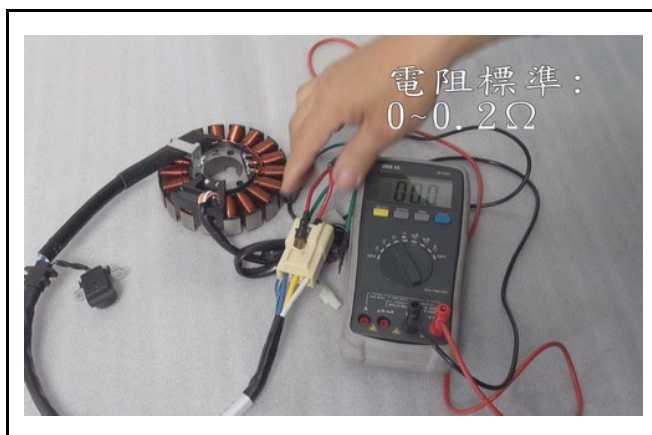
- Standard resistance value: $0 \sim 0.2 \Omega$

Signals circuit: blue-yellow wire / green-white wire

- Standard resistance value: $120 \pm 20\% \Omega$

None of the yellow/white/blue wires can be connected to the casing of the generator coil.

The Hall circuit (6 pins) of the generator coil shall not be conducted or short circuit to each other.



Ignition system

Ignition coil inspection

Remove wires for ignition coil

Remove ignition coil.

Measure the resistance between the terminals of the primary winding.

- Standard resistance: $2.8\Omega \pm 10\%$

Measure the resistance between the terminals of the secondary winding.

- Standard resistance (without cap):
 $19.8K\Omega \pm 20\%$

Spark plug inspection

Check the spark situation with a spark tester if the spark is not good, please replace it.

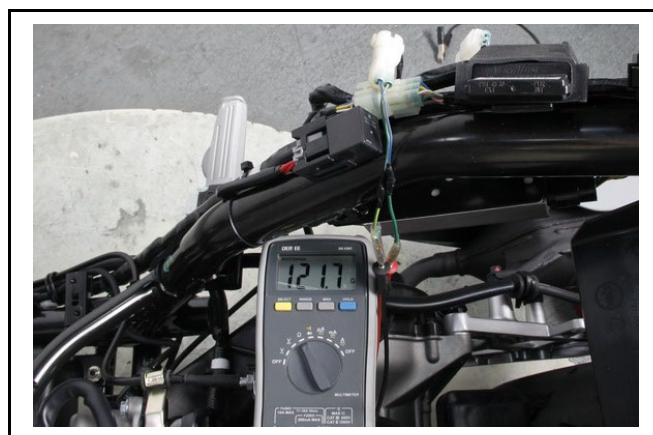
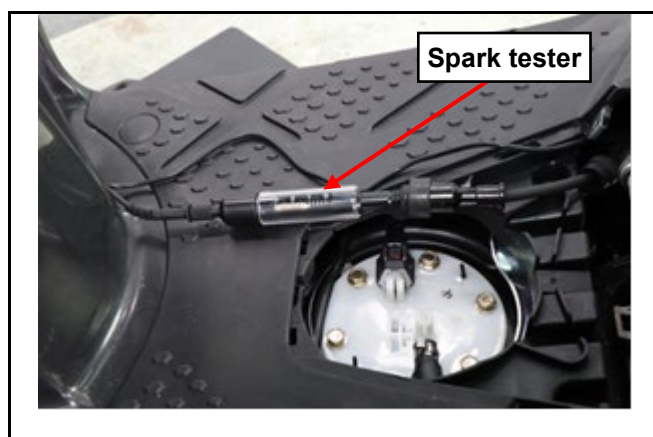
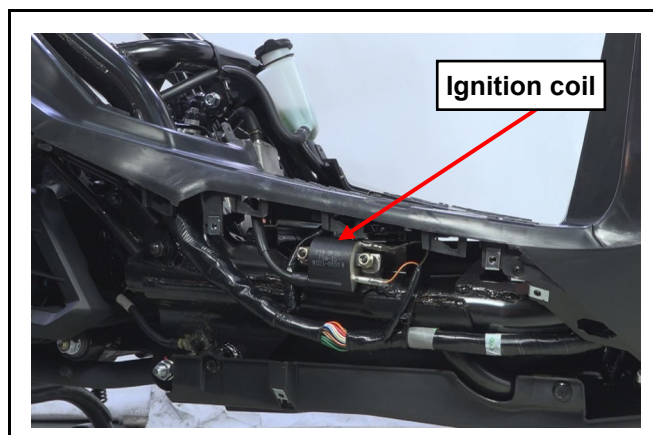
Crank position sensor inspection

Disconnect the 2pin connector for the crankshaft position sensor, and measure the resistance between the (green/white) and (blue/yellow) wires.

- Standard resistance: $120\Omega \pm 20\%$

Caution

- There is no need to remove the coil from the engine for this test.



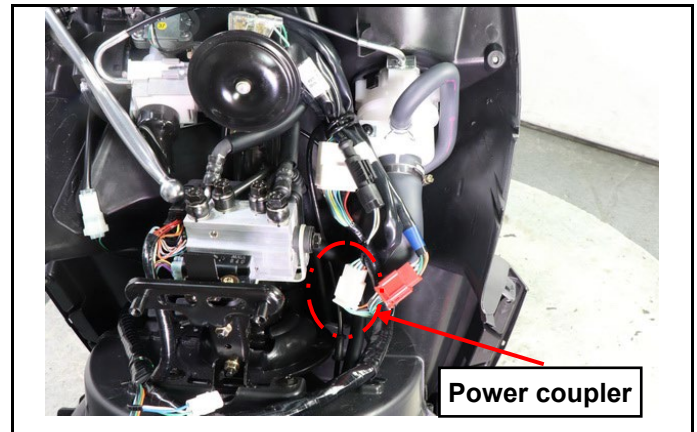
Meeter

Speedometer Removal

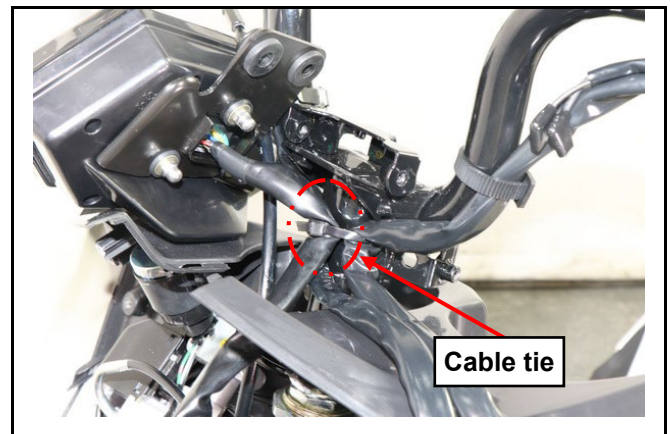
Remove front handle cover. (bolts*2, screws*2)

Remove rear handle cover. (screws*2)

Disconnect couplers for speedometer and power.

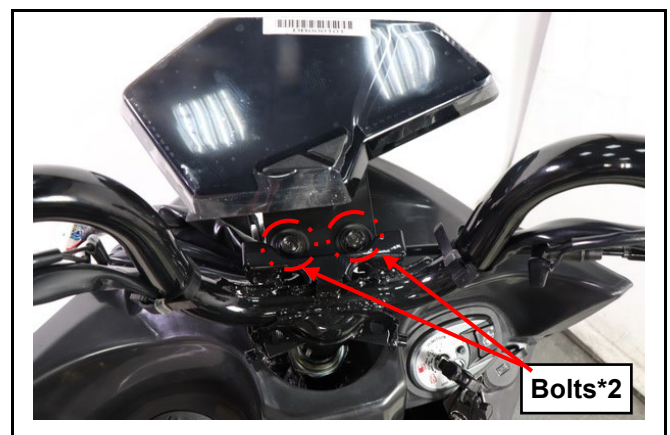


Remove the cable tie.



Remove the mounting bolts for speedometer.

Remove the speedometer.



Light/Bulb

Headlight driver inspection

Remove the front cover. (Refer to chapter 13)

Remove the coupler for headlight driver and apply additional wires to follow the original circuit connection to facilitate the following inspection with a digital multimeter.

⚠ Caution

- Ensure the connection of the wires and the gear position of the meter.

Set the meter to the DCA position.

Measure the current for the HI/LO beam light in a series connection.

- Standard current value:
LO beam light (white wire): 1.20~1.71A
HI beam light (blue wire): 1.71~2.32A

⚠ Caution

- When an abnormality is found, please replace it with a new headlight driver. If the function returns to normal, the headlight driver is malfunctional.
- The function cannot be restored after the new headlight driver is replaced, and then replace the headlight set.

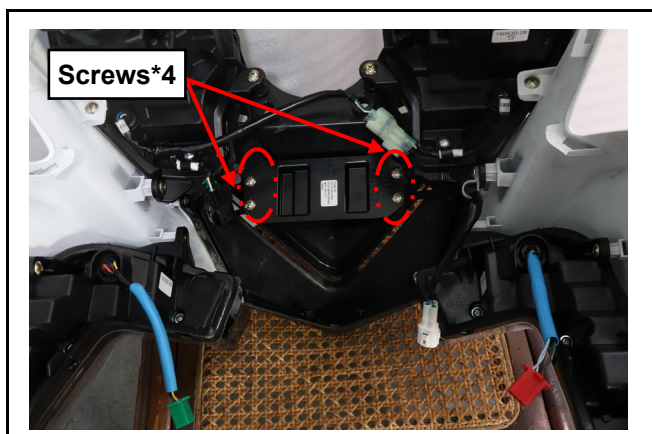
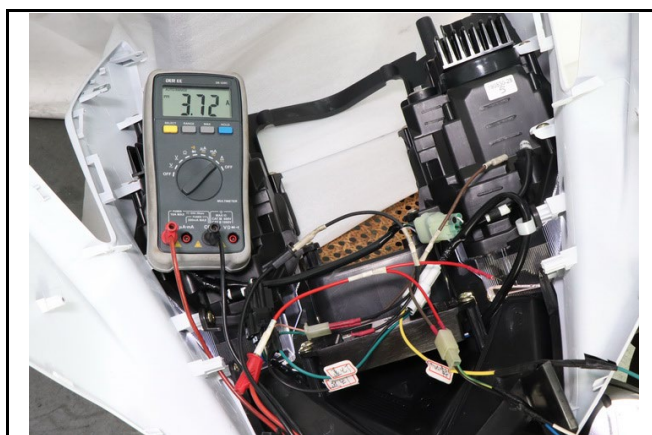
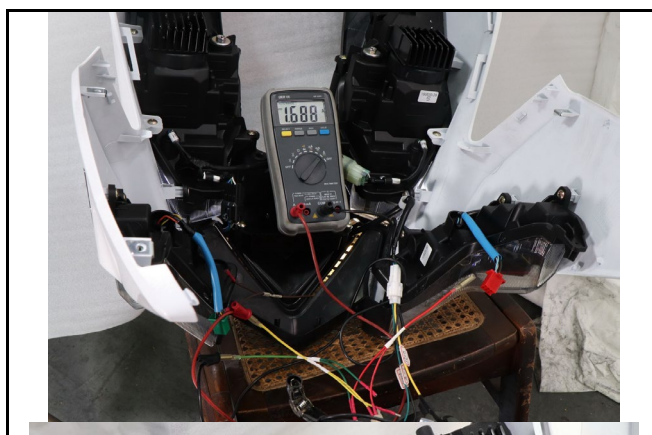
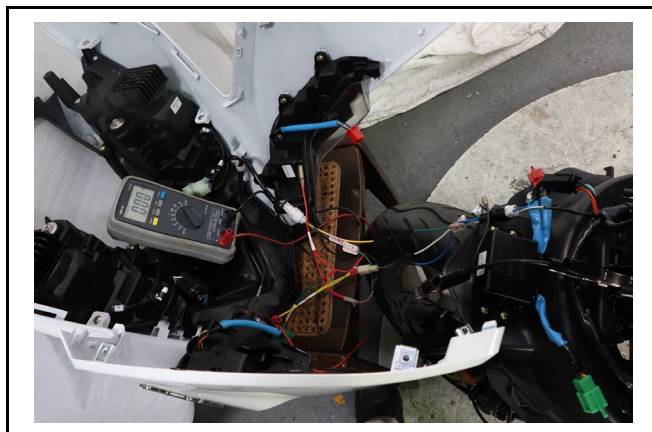
Headlight driver replacement

Remove the coupler for headlight driver

Remove the mounting screws.

Remove the headlight driver.

Installation is in reverse order of removal procedures.



Winker/Position driver inspection

Winker light

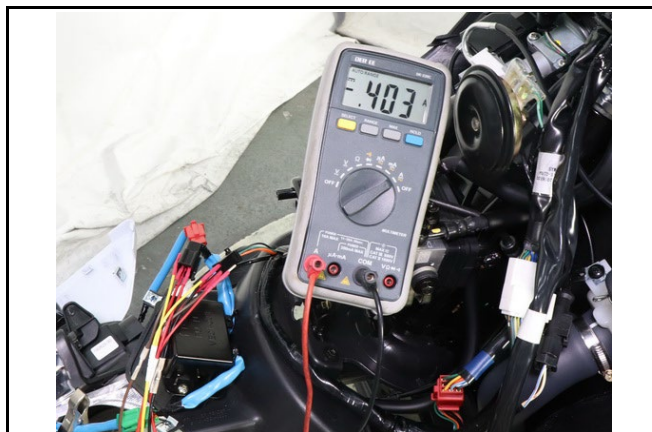
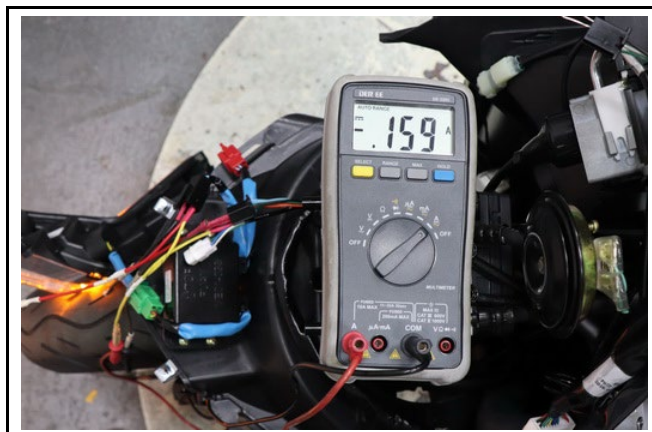
Set the meter to the DCA position.

Measure the current for the winker light (wire color: orange/sky blue) in a series connection.

- Conducting state of winker relay:
Gray wire: on
Black wire: on

- Standard current value:

DCV	mA
11	144.5
12	153.6
13	158.0
14	162.5



Position light

Set the meter to the DCA position.

Measure the current for the position light (wire color: orange/sky blue) in a series connection.

- Standard current value: 0.36~0.40A

Winker/Position driver replacement

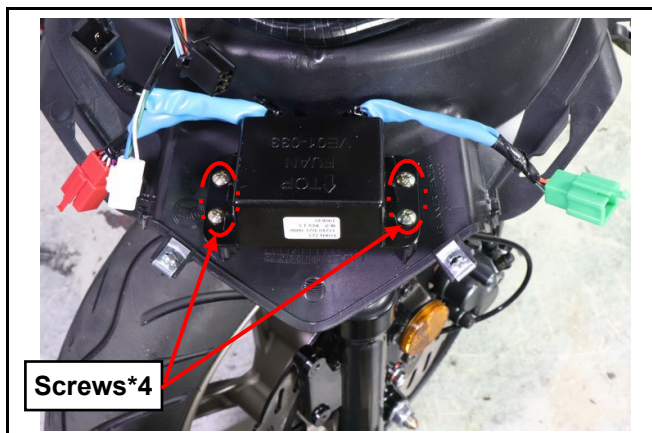
Remove the couplers for driver.

Remove the mounting screws.

Replace the driver.

Installation

Installation is the reverse of the removal procedures.



Headlight replacement

If the winker/position driver is functional, headlight still malfunction., replace the headlight set.

Remove the mounting screws.

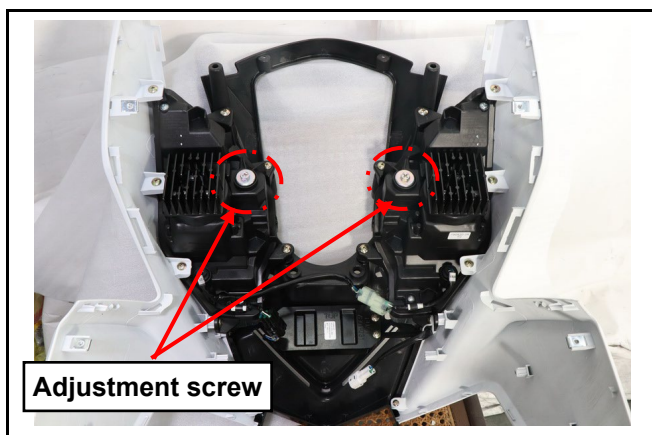
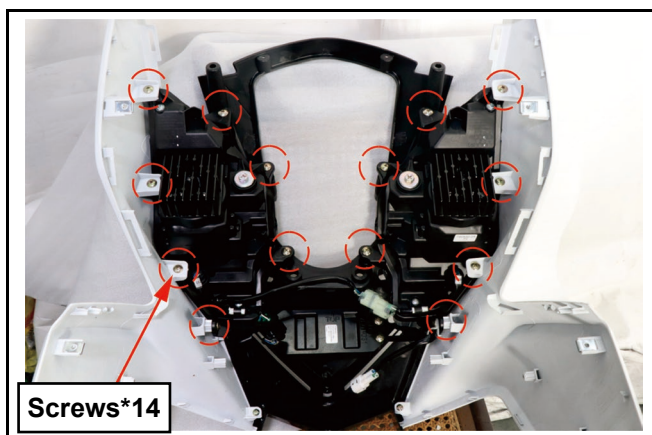
Replace the headlight set.

Installation

Installation is in reverse order of removal procedures.

HI/LO Beam adjustment

Rotate the adjustment screw to adjust the light height of HI/LO beam.



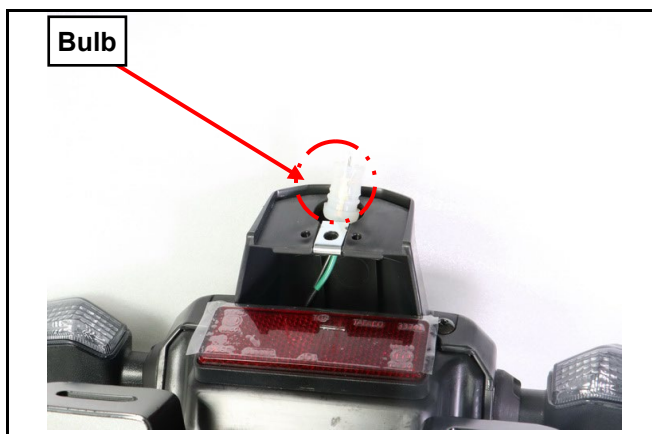
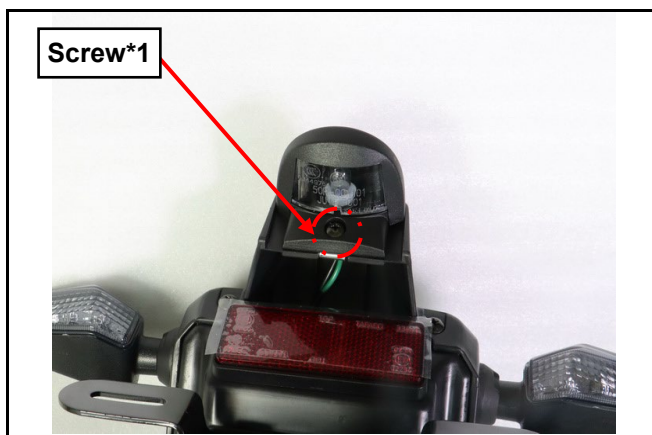
License light replacement

Remove the screw.

Replace the license light.

Installation

Installation is in reverse order of removal procedures.



Winker light replacement

Remove the front cover.

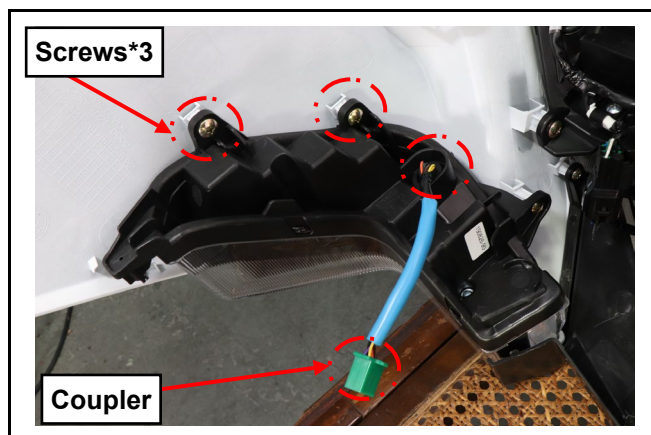
Remove the coupler for winker light.

Remove the mounting screws.

Replace the winker light.

Installation

Installation is in reverse order of removal procedures.



Tail light replacement

Remove luggage box.

Remove rear body cover (Refer to chapter 13)

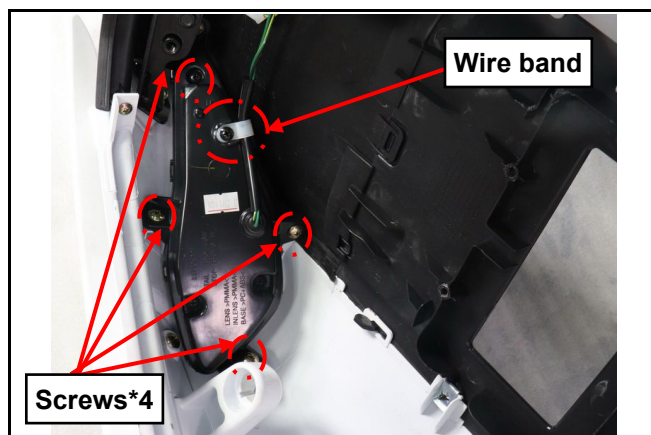
Remove the wire band and coupler.

Remove the mounting screws.

Replace the tail light.

Installation

Installation is in reverse order of removal procedures.



Switch and Horn

Main switch inspection

Remove the front cover. (Refer to chapter 13)

Disconnect the main switch coupler.

Check the conducting between two pins as the table shown below:

	BAT	BAT1	BAT2
LOCK			
OFF			
ON	●	●	●
Wire color	R	B	B

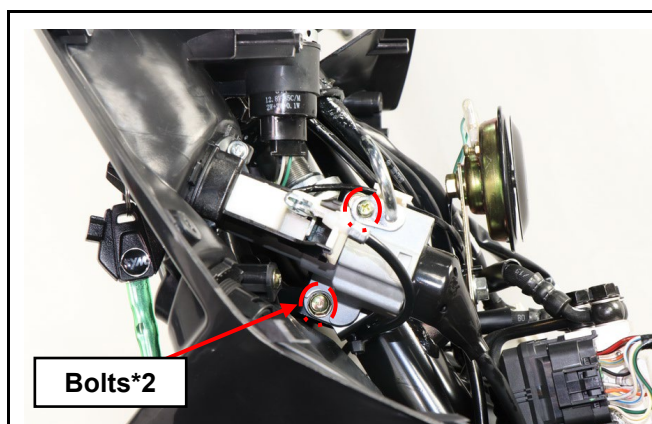
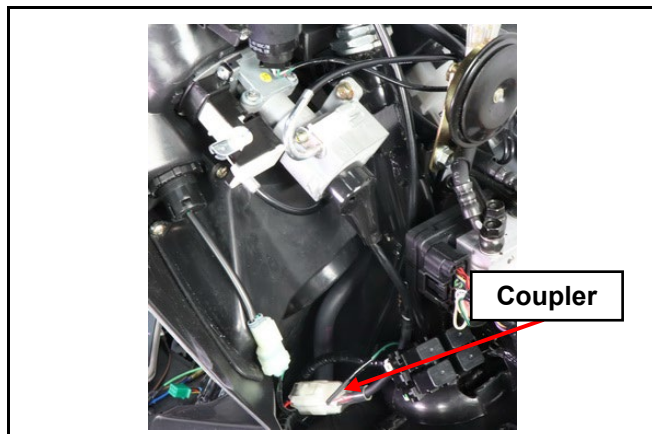
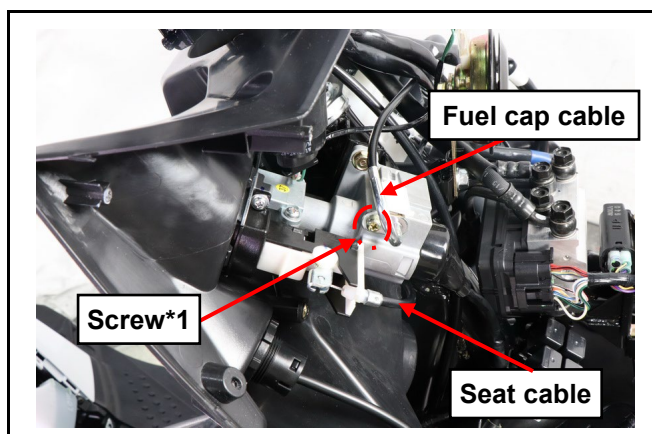
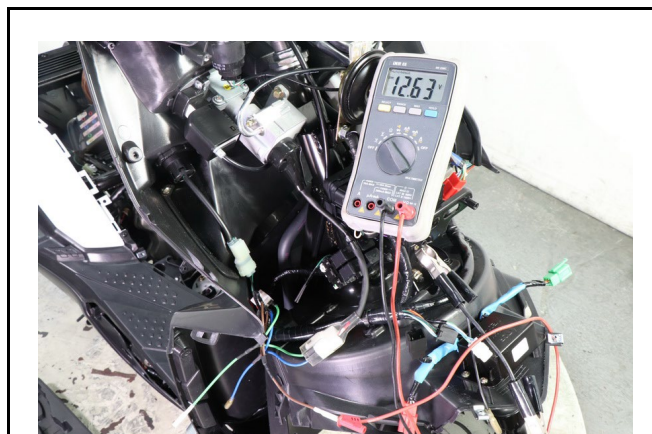
Main switch replacement

Remove cable cap.

Disconnect the coupler for the main switch, disconnect cables, and remove the mounting bolts. Remove the main switch.

Installation

Installation is in reverse order of removal procedures.



Right handle switch inspection

Remove the handlebar cover and front cover.
(Refer to chapter 13)

Disconnect the right handle switch coupler. Check the conducting for switch circuit as the table shown below.

Hazard Switch

(OFF)			
(HAZARD)	●	●	●
	L	R	W/R

Idle Stop Switch

	ST	E
● (OFF)		
(IDLE STOP)	●	●
	W/B	G

Starter Switch

	ST	E
FREE		
	●	●
	Y/R	G

Left handle switch Inspection

Remove the handlebar cover and front cover.
(Refer to chapter 13)

Disconnect the left handle switch coupler. Check the conducting for switch circuit as the table shown below.

High /Low beam switch

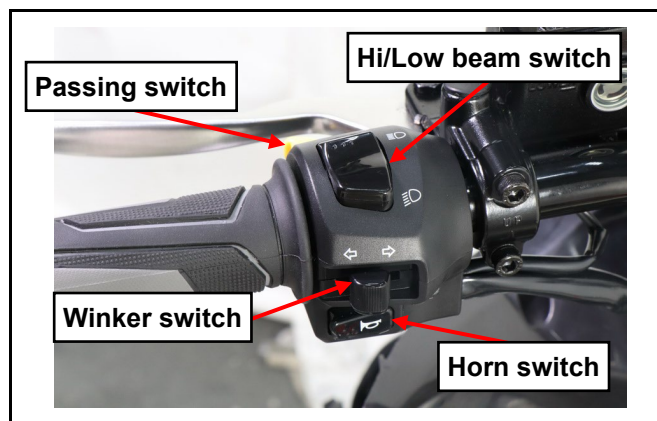
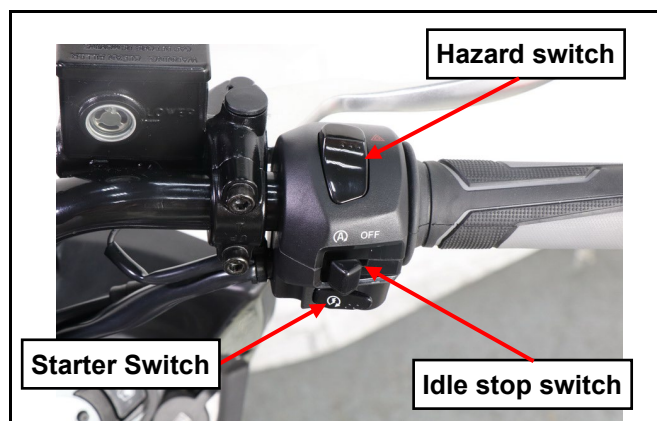
	Hi	HL	LO	B1	B2
		●	●		
	●	●			
Pass				●	●
Wire color	L	L/W	W	L	B

Winker switch

	●	●	
FROM R	●	●	
N PUSH OFF			
FROM L		●	●
		●	●
Wire color	SB	GR	O

Horn switch

Free		
	●	●
	BAT	HO
Wire color	B	LG

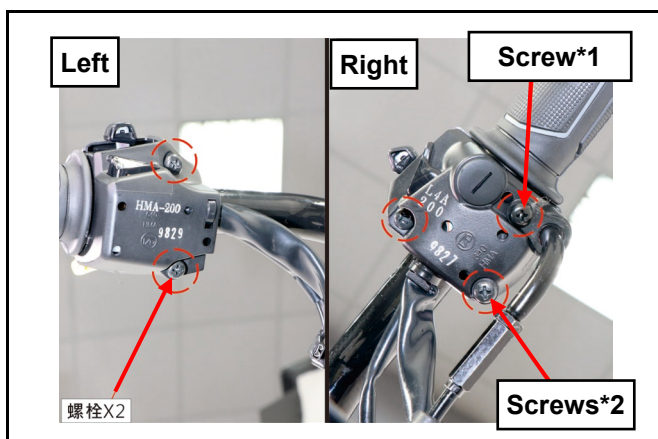
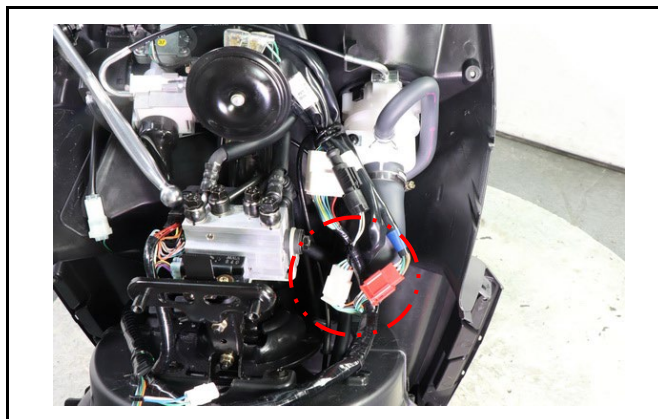


Removal

Remove the front cover. (Refer to the chapter 13)
 Disconnect the couplers for handle switch.
 Remove the mounting screws.
 Remove the throttle cable.

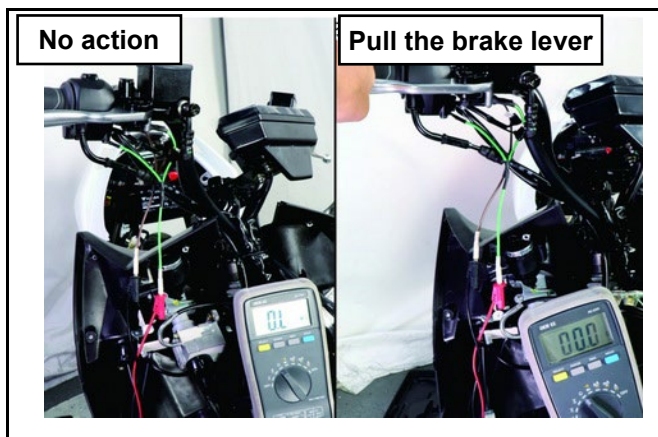
Installation

Installation is in reverse order of removal procedures.



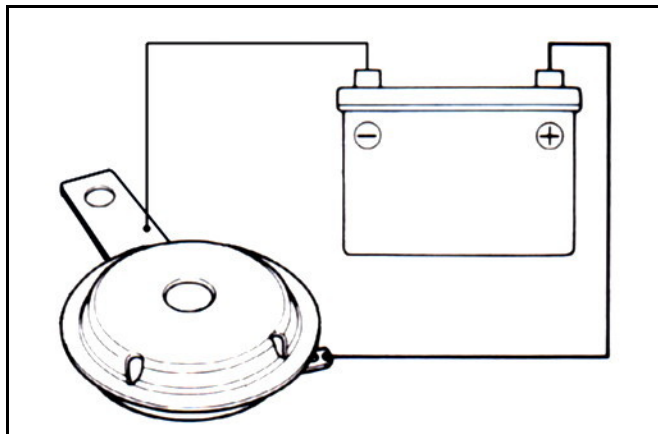
Brake light switch

When the brake lever is pulled, it is functional that the brake switch circuit is conducted (Wire color: green/yellow and black).
 If the switch is damaged, replace it with a new one.



Horn

Remove the front cover and the mounting screw.
 Connect 12 DCV power source with the horn as the diagram shown, the horn should sound.
 Replace the horn if necessary.



Fuel unit

Remove the luggage box and the centra cover.

Disconnect the coupler and tube.

Remove the fuel pump. (Bolts*6)

Caution

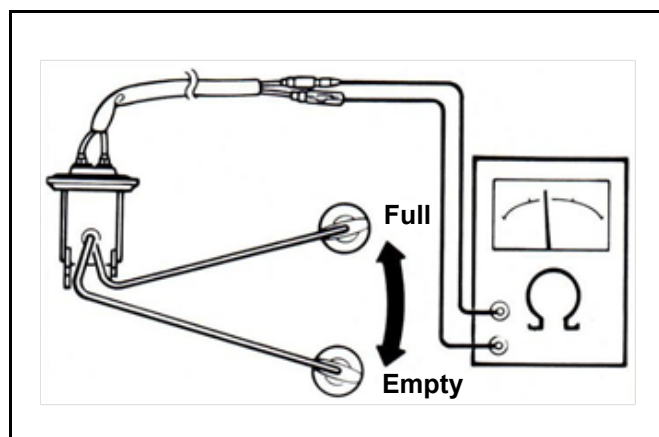
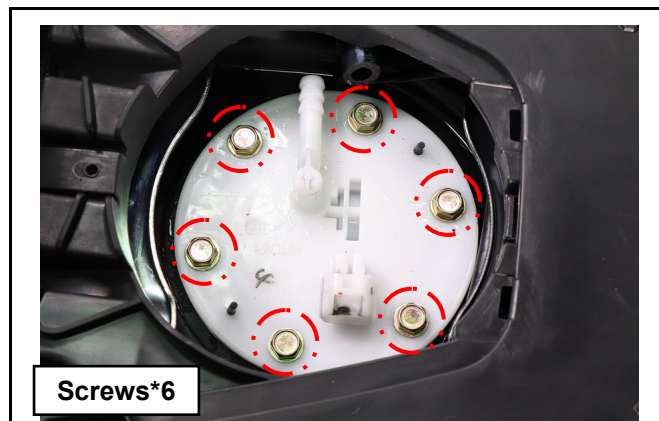
- Do not bend or damage the float arm when removing.

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

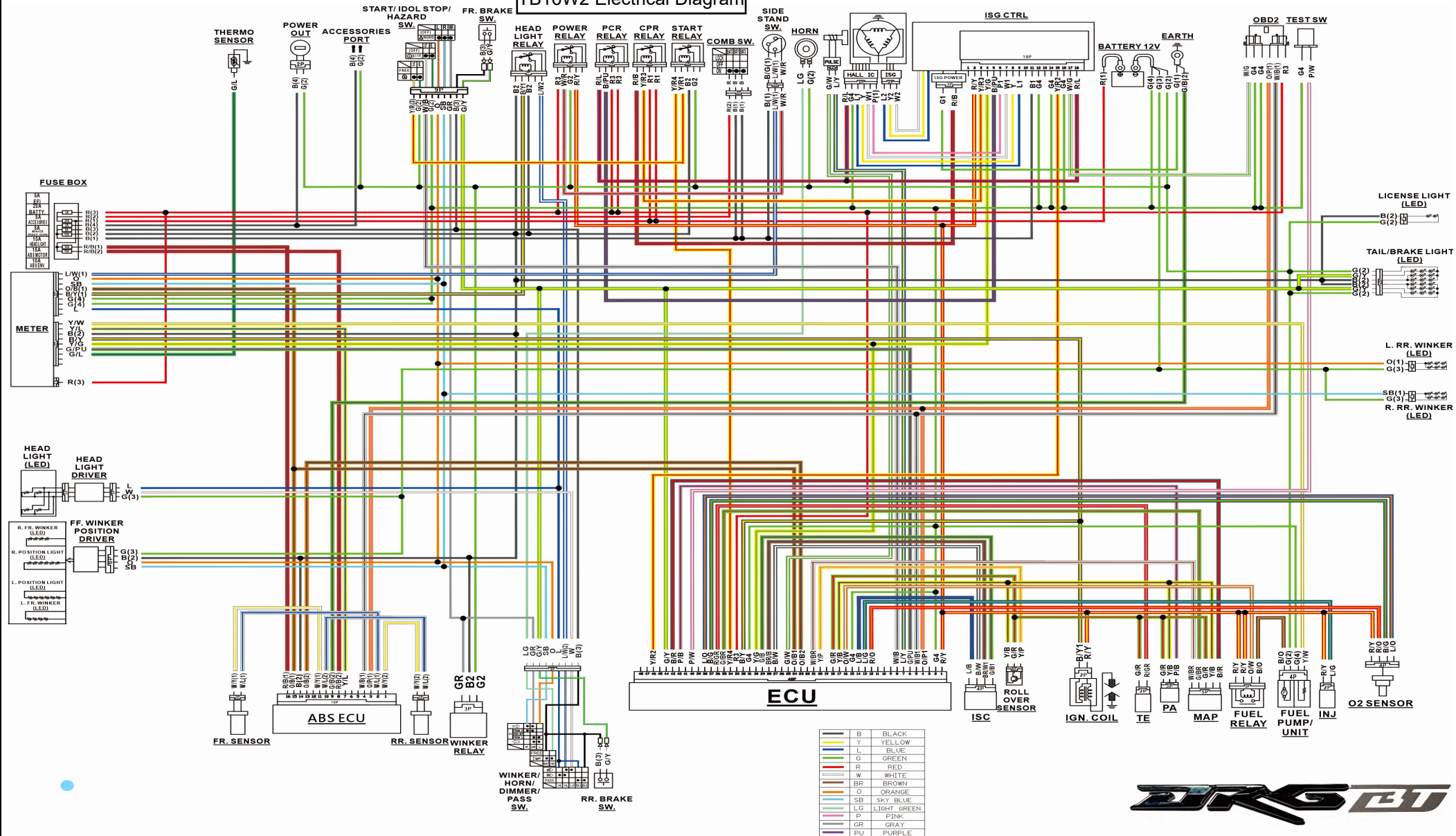
Arm Position	Resistance
E (Empty)	$2400 \pm 72 \Omega$
F (Full)	$100 \pm 3 \Omega$

Caution

- Before testing, confirm whether the battery power is sufficient.



TB16W2 Electrical Diagram



18. Electrical Diagram



NOTE: