PD12A

SERVICE MANUAL

FOREWORD

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HOW TO USE THIS MANUAL

MECHANISM ILLUSTRATION

20110311

This service manual contains the technical data of each component inspection and repair for the SANYANG PD12A series motorcycle. The manual is shown with illustrations and focused on “Service Procedures”, “Operation Key Points”, and “Inspection Adjustment” so that provides technician with service guidelines.

If the style and construction of the motorcycle, PD12A series motorcycle, are different from that of the photos, pictures shown in this manual, you should follow the actual vehicle layout. Specifications may be changed without notice.

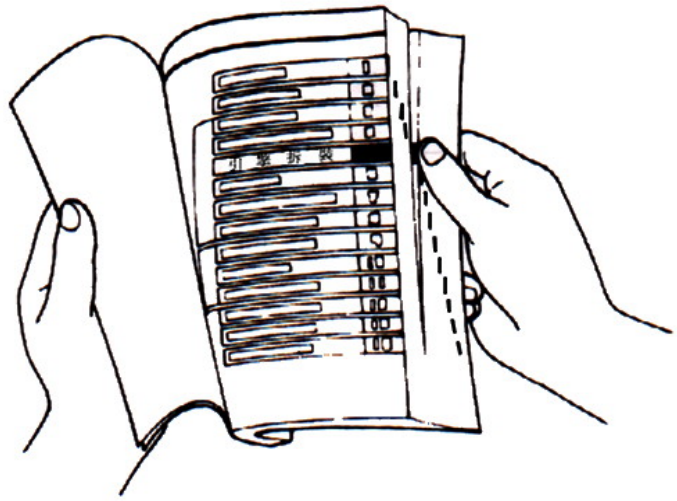
Service Department

SANYANG INDUSTRY CO., LTD.

How To Use This Manual

This service manual describes basic information of individual parts and system inspection & service for SANYANG PD12A series motorcycle. In addition, please refer to the manual contents for detailed information for the model year.

The first chapter covers general information and trouble diagnosis.
The second chapter covers service maintenance information and special tools manual.
The third to the 9th chapters cover engine and driving systems.
The 10th to the 12th chapters contain the parts of vehicle frame.
The 13th chapter is electrical appliances.
The 15th chapter is wiring diagram.
Please see index of content for brief information and quick guide.



There are 4 buttons, “Foreword”, “Contents”, “How to Use This Manual” and “Mechanical Layout” on the PDF version homepage, and can access these items by clicking of the mouse.

If technician wants to see the content of one specific chapter, click on the title of each chapter on the Index page. There are two buttons on the upper part of each page, “Homepage” and “contents”. The user can click on the “Homepage” button or the “Contents” button to go back to the homepage or contents index. Therefore, to check one paragraph inside the chapter, click on the paragraph index to go to the desired paragraph. In addition, there is a “To This Chapter Contents” button at the upper side of each page, by clicking the button; you can go back to the paragraph selection index of this specific chapter.

Homepage

SYM

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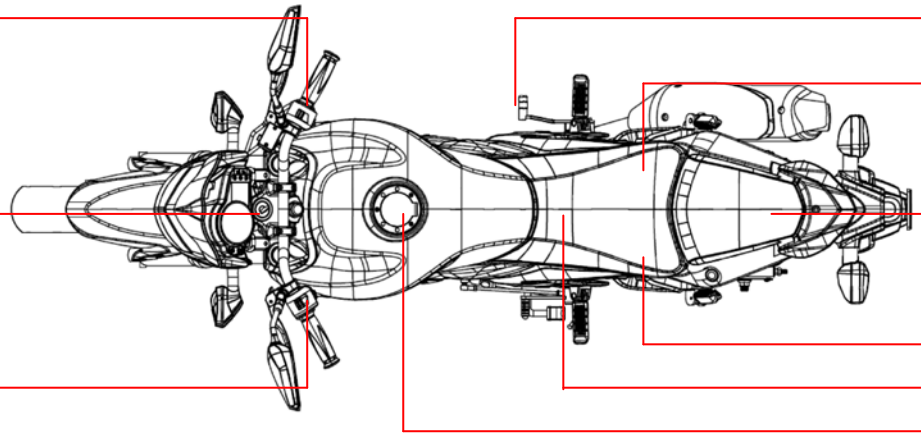
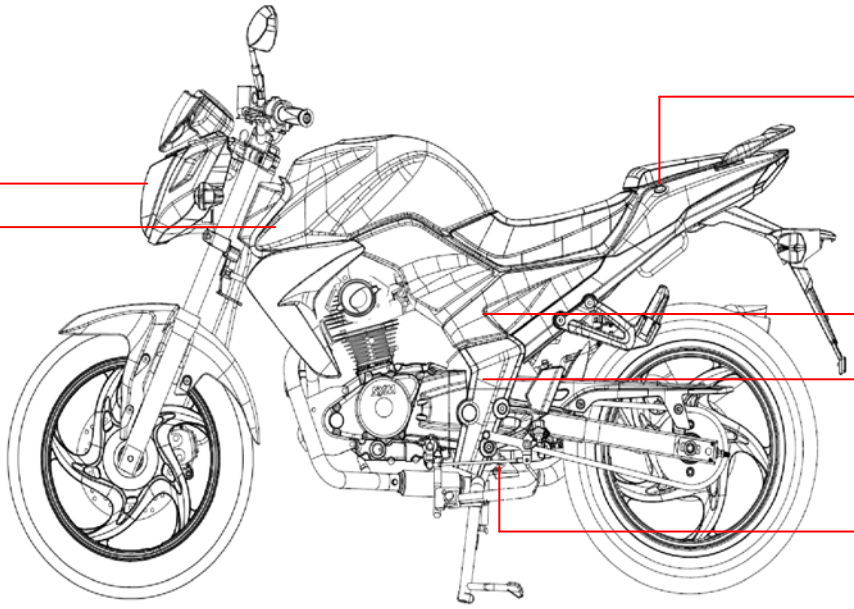
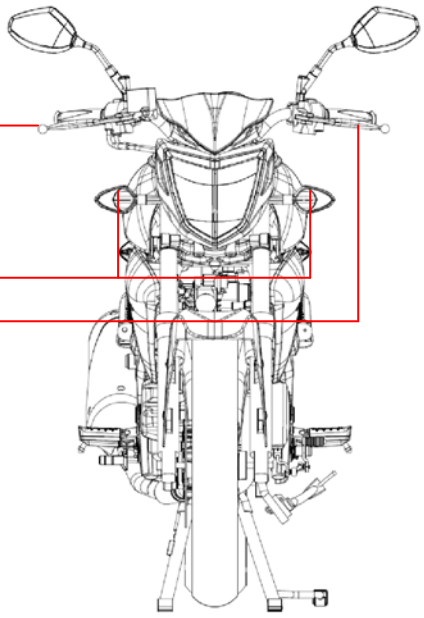
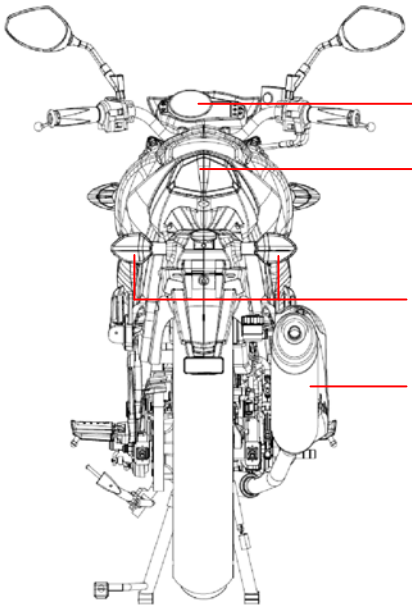
Mechanism Illustration









Symbols and Marks

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

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

⚠ 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 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 you to 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 the vehicle is cooling down.

Battery

⚠ Caution

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

Brake shoe

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

⚠ Caution

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

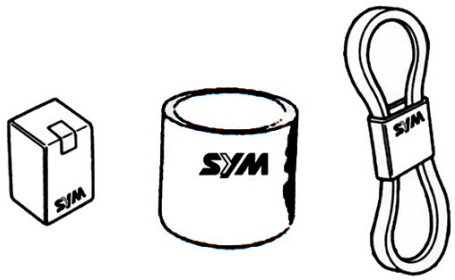
Brake fluid

⚠ Caution

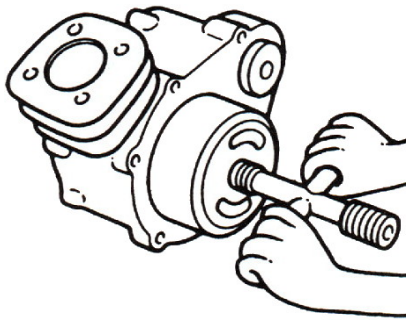
Spilling brake fluid on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the above-mentioned parts for protection when servicing the brake system.
Keep the brake fluid beyond reach of children.

Service Precautions

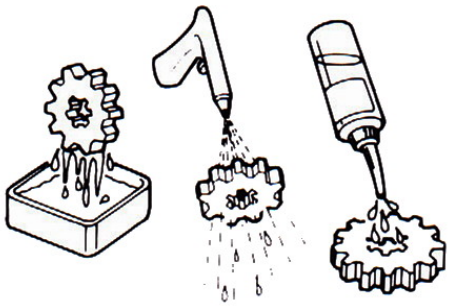
- Always use with SANYANG genuine parts and recommended oils. Using non-genuine parts for SANYANG vehicle may damage it.



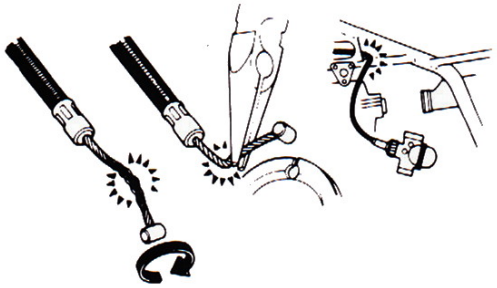
- Special tools are designed for remove and install of components without damaging the part. Using wrong tools may result in damage.



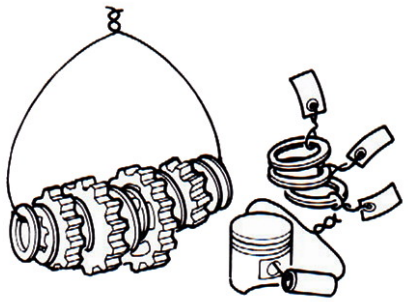
- When servicing this bike, use only metric tools. Metric bolts, nuts, using wrong tools and fasteners may damage this vehicle.
- Clean the outside of the parts or the cover before removing it from the bike. Otherwise, dirt and deposit accumulated on the part's surface may fall into the engine, chassis, or brake system, and cause damage.
- Wash and clean parts with high ignition point solvent, and blow-dry with compressed air. Pay special attention to O-rings or oil seals because most cleaning agents have an adverse effect on them.



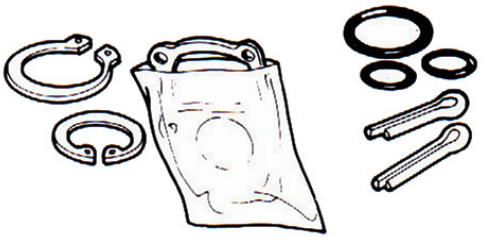
- Never bend or twist a control cable to prevent unsmooth control and premature worn out.



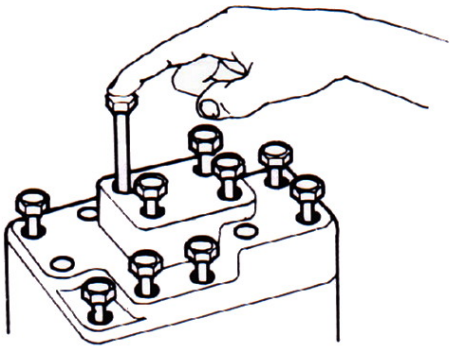
- Rubber parts may become deteriorated when old, and easy to be damaged by solvent and oil. Check these parts before installation to make sure that they are in good condition, replace if necessary.
- When loosening a component, which has different sized fasteners, operate with a diagonal pattern and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



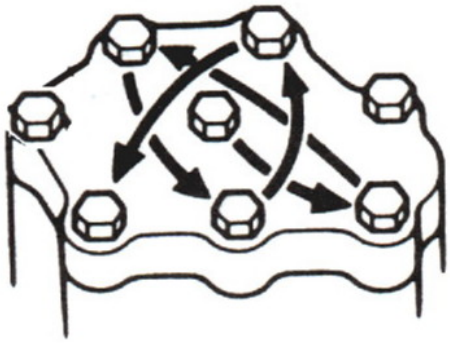
- Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).
- Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap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



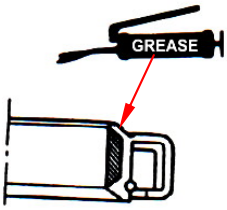
- The length of bolts and screws for assembly, cover plates or boxes is different from one another, make sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length out side the hole is the same with other bolts, it is a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



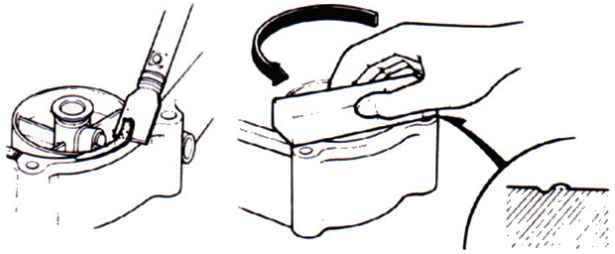
- Tighten assemblies with different dimension fasteners as follows: Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless otherwise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



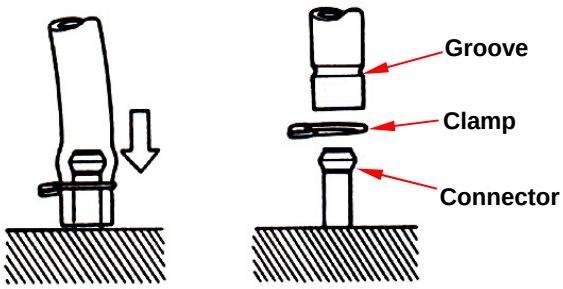
- When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, and check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.



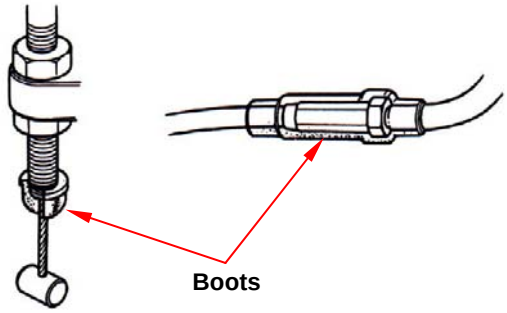
- Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any damage.



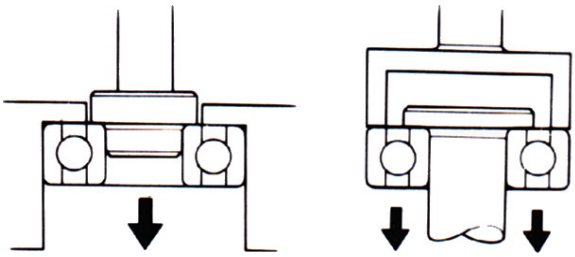
- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.



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

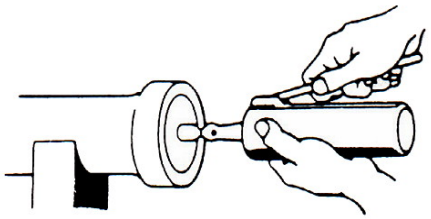


- The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both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

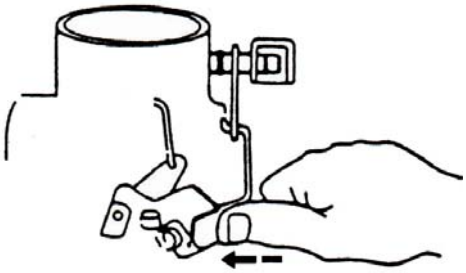


Both of these examples can result in bearing damage.

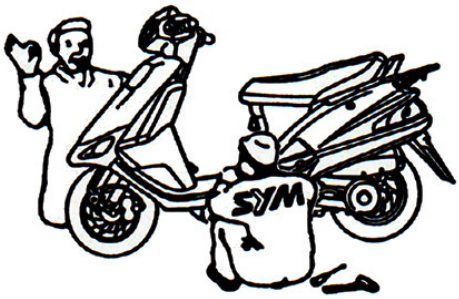
- Lubricate the rotation face with specified lubricant on the lubrication points before assembling.



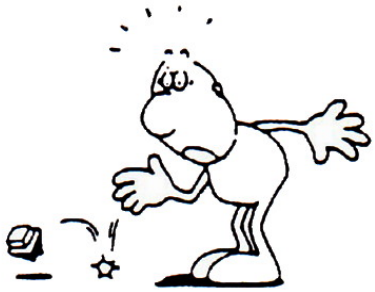
- Check if positions and operation for installed parts is in correct and properly.



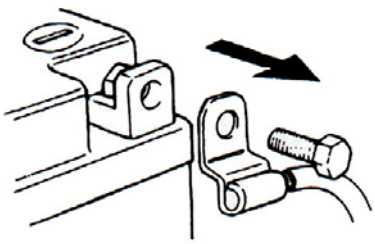
- Make sure service safety each other when conducting by two persons.



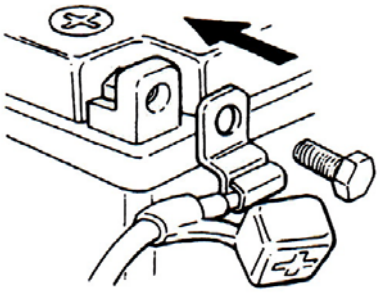
- Note that do not let parts fall down.



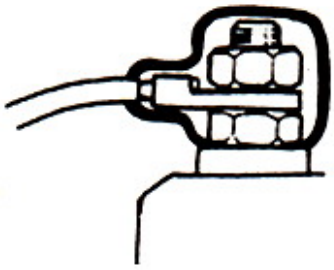
- Before battery removal operation, you have to remove the battery negative (-) cable first. Avoid using tools like open-end wrench, which may contact with body or create spark.



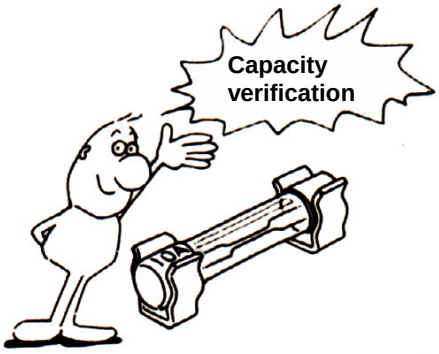
- After service completed, make sure all connection points is secured. Battery positive (+) cable should be connected firstly.
- And the two posts of battery have to be greased after connected the cables.



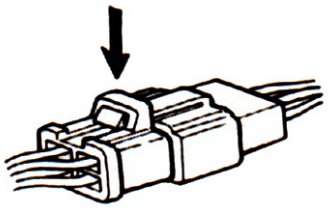
- Make sure that the battery post caps are located in properly after the battery posts had been serviced.



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

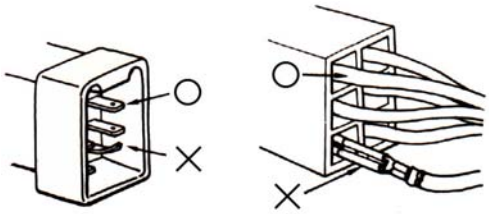


- When separating a connector, it locker has to be unlocked first. Then, conduct the service operation.



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

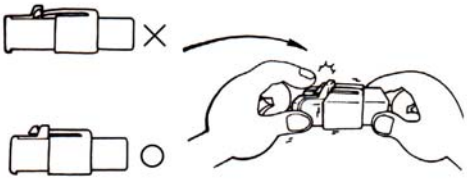
- Make sure if the connector pins are bent, extruded or loosen.



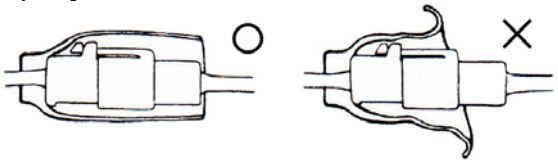
- Insert the connector completely.

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

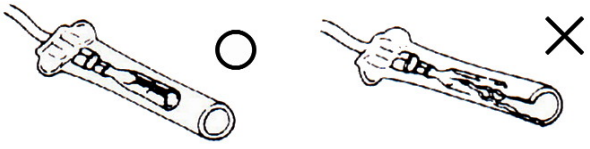
  Check if any wire loose.



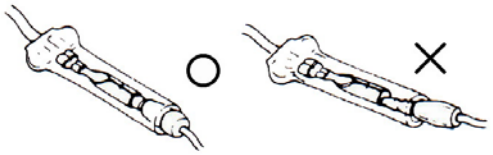
- Check if the connector is covered by the twin connector boot completely and secured properly.



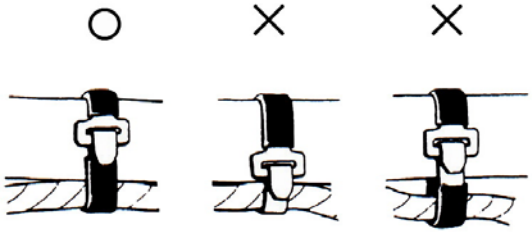
- Before terminal connection, check if the boot is crack or the terminal is loose.



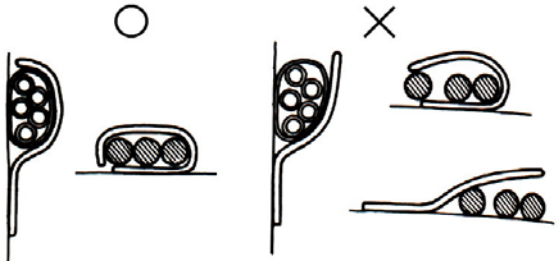
- Insert the terminal completely.
  Check if the boot covers the terminal.
  Do not let boot open facing up.



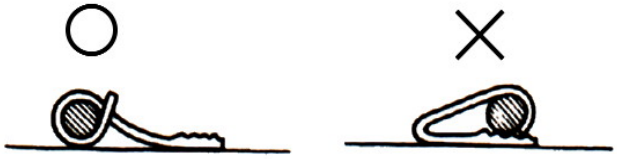
- Secure wires and wire harnesses to the frame with respective wire bands at the designated locations. Tighten the bands so that only the insulated surfaces contact the wires or wire harnesses.



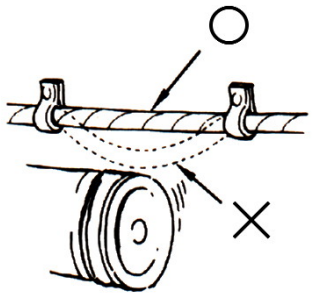
- Wire band and wire harness have to be clamped secured properly.



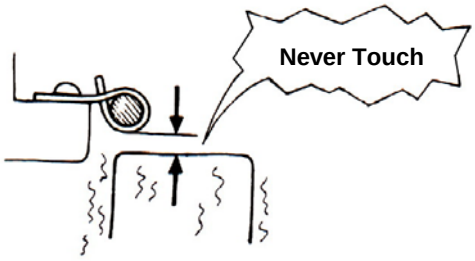
- Do not squeeze wires against the weld or its clamp.



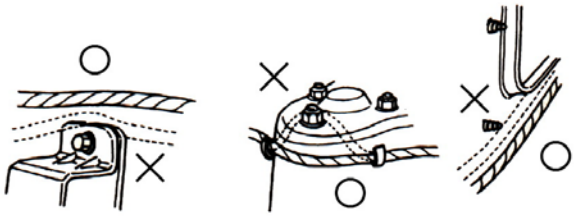
- Do not let the wire harness contact with rotating, moving or vibrating components when routing the harness.



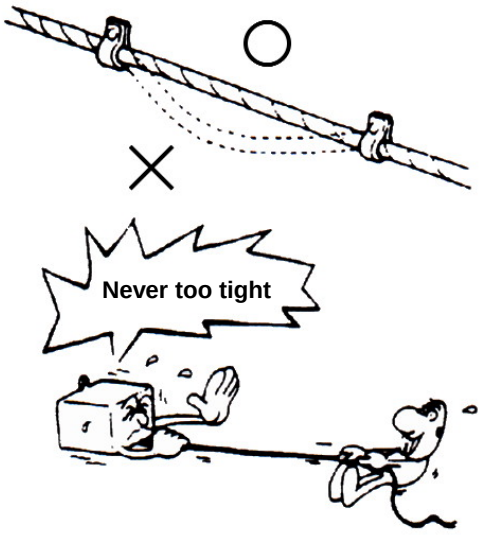
- Keep wire harnesses far away from the hot parts.



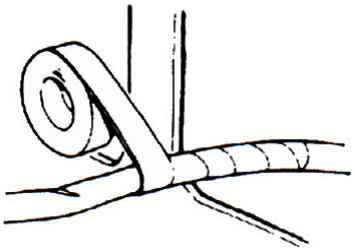
- Avoid wire harnesses from sharp edges or corners, and also avoid the jutted-out ends of bolts and screws.



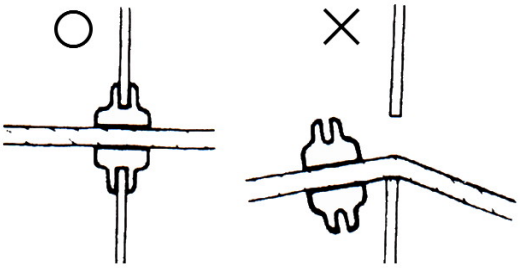
- Route harnesses so that they neither pull too tight nor have excessive slack.



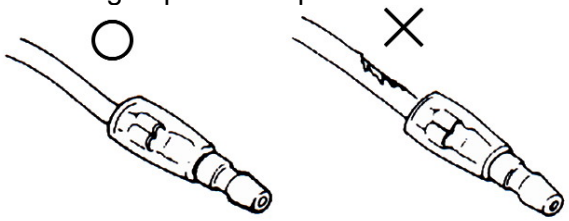
- Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.



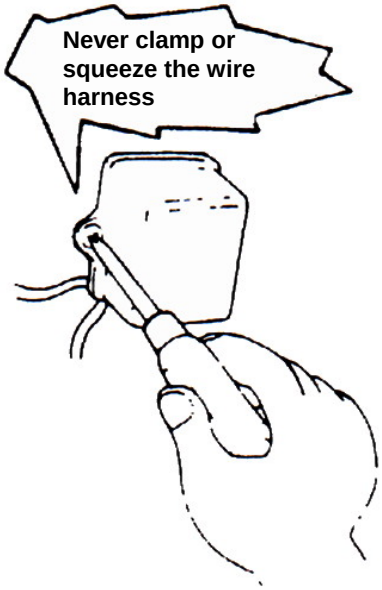
- Secure the rubber boot firmly as applying it on wire harness.



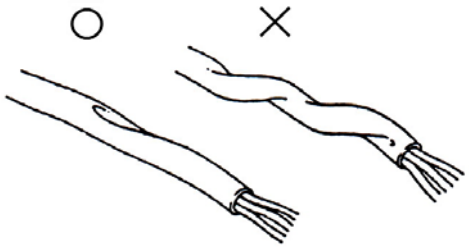
- Never use wires or harnesses which insulation has been broken. Wrap electrical tape around the damaged parts or replace them.



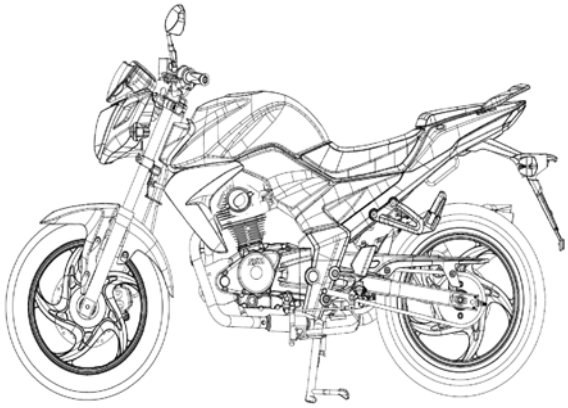
- Never clamp or squeeze the wire harness when installing other components.



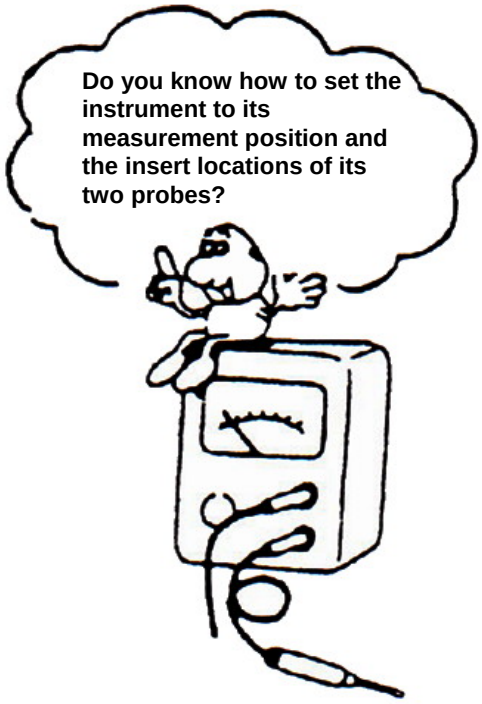
- Do not let the wire harness been twisted when installation.



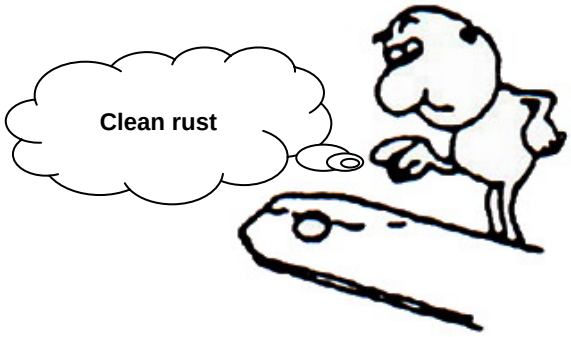
- Wire harnesses routed along the handlebar should not be pulled too tight or have excessive slack, use rubber covering against adjacent or surrounding parts in all steering perimeters.



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



- Use sand paper to clean connector pins/terminals if rust is found. And then continue the connection operation.



Specifications

MAKER			SANYANG	MODEL		PD12A1-6
Dimension	Overall Length		2005 mm	Suspension System	Front	TELESCOPIC FORK
	Overall Width		790 mm		Rear	UNIT SWING
	Overall Height		1050 mm	Tire Specifications	Front	110/70-17 54H
	Wheel Base		1320 mm		Rear	130/70-17 62H
Weight	Curb Weight	Front	72 kg	Brake System	Front	DISK (ø 260 mm)
		Rear	83 kg			
		Total	155 kg		Rear	DISK (ø 220 mm)
	Passengers/Weight		Two / 150 kg	Performance	Max. Speed	> 105 km/hr
	Total Weight	Front	117 kg		Climb Ability	> 28˚
		Rear	188 kg	Reduction	Primary Reduction	4.06 (73/18T)
		Total	305 kg		Final Reduction	2.56 (41/16T)
Engine	Type		Air cooled 4-stroke gasoline engine		Clutch	Wet multi-plate
	Installation and arrangement		Vertical, below center, incline 15˚		Transmission	5 speed, circulated
	Fuel Used		Above 92 unleaded	Speedometer		0 ~ 199 km/hr
	Cycle/Cooling		4-stroke/ forced air cooled	Horn		93~112 dB/A
	Cylinder	Bore	Ø 56.5 mm	Muffler		Expansion & Pulse Type
		Stroke	49.5 mm	Exhaust Pipe Position and Direction		Right side, and Backward
		Number/Arrangement	SINGLE CYLINDER	Lubrication System		Forced / Wet sump
	Displacement		124 cc	Exhaust Concentration	Solid Particulate	-
	Compression Ratio		9: 1		CO	< 3.0 %
	Max. HP		10.8 ps / 9000 rpm		HC	< 1600 PPM
	Max. Torque		0.97 kg-m / 7000 rpm	E.E.C.		√
	Ignition		Full transistor Ignition	P.C.V.		√
	Starting System		Electrical starter	Catalytic reaction control system		√

Torque Values

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

Standard Torque Values for Reference

Type	Tighten Torque	Type	Tighten Torque
5 mm bolt、nut	0.45~0.6kgf-m	4 mm screw	0.10~0.15kgf-m
6 mm bolt、nut	0.8~1.2kgf-m	5 mm screw	0.35~0.5kgf-m
8 mm bolt、nut	1.8~2.5kgf-m	6 mm screw、SH nut	0.7~ 1.10kgf-m
10 mm bolt、nut	3.0~4.0kgf-m	6 mm bolt、nut	1.0 0~1.40kgf-m
12 mm bolt、nut	5.0~6.0kgf-m	8 mm bolt、nut	2.40 ~3.00kgf-m
3 mm screw	0.05~0.08kgf-m	10 mm bolt、nut	3.50~4.50kgf-m

Engine Torque Values

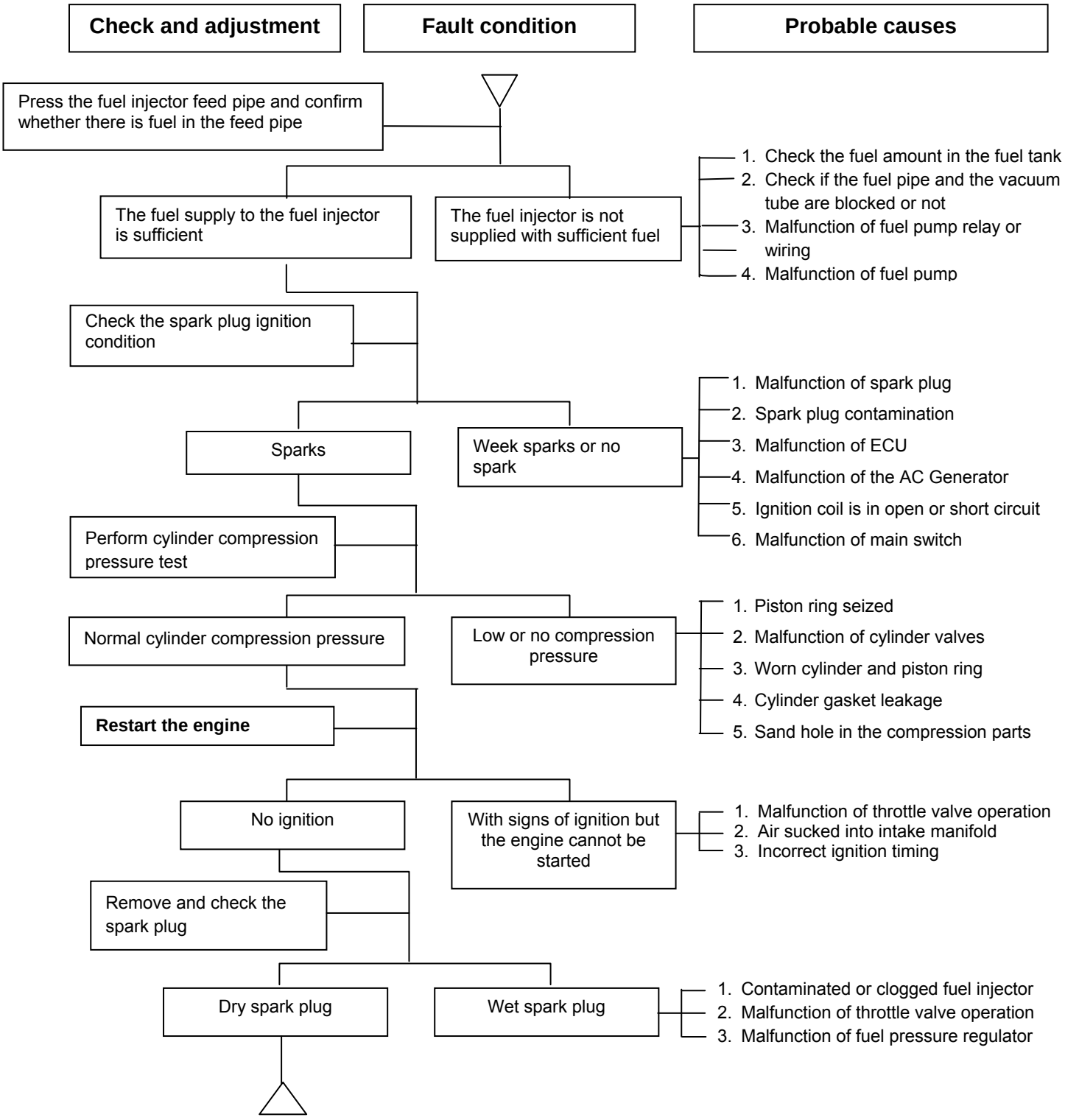
Item	Q'ty	Thread Dia. (mm)	Torque Value(kgf-m)	Remarks
Cylinder head nut	4	8	2.8~3.0	
Cylinder head left bolt	1	6	0.8~1.2	
Cylinder stud bolt	4	8	0.7~1.0	
Cylinder head side cover bolt	2	6	0.8~1.2	
Cylinder head cover bolt	2	30	1.3~1.7	
Cylinder head stud bolt (inlet pipe)	2	6	1.0~1.4	
Cylinder head stud bolt (EX. pipe)	2	8	2.4~3.0	
Air inject pipe bolt	4	6	1.0~1.4	
Air inject reed valve bolt	2	3	0.07~0.09	
Tappet adjustment screw nut	4	5	0.7~1.1	Apply oil to thread
Spark plug	1	10	1.0~1.2	
Tensioner lifter bolt	2	6	1.0~1.4	
Carburetor insulator bolt	2	6	0.7~1.1	
Oil pump screw	2	6	0.3~0.4	
	1	7	1.0~1.4	
Engine left cover bolt	9	6	1.1~1.5	
Engine oil draining bolt	1	12	3.5~4.5	
Engine oil strainer cap	1	30	1.3~1.7	
Mission draining bolt	1	8	0.8~1.2	
Mission filling bolt	1	10	1.0~1.4	
Clutch driving plate nut	1	28	5.0~6.0	
Clutch outer nut	1	14	5.0~6.0	
Drive face nut	1	14	8.5~10.5	
ACG. Flywheel nut	1	14	5.0~6.0	
Crankcase bolt	7	6	0.8~1.2	
Mission case bolt	7	8	2.6~3.0	
Muffler mounting bolt	3	10	3.2 ~3.8	
Muffler mounting nut	2	8	1.0 ~1.2	

Frame Torque Values

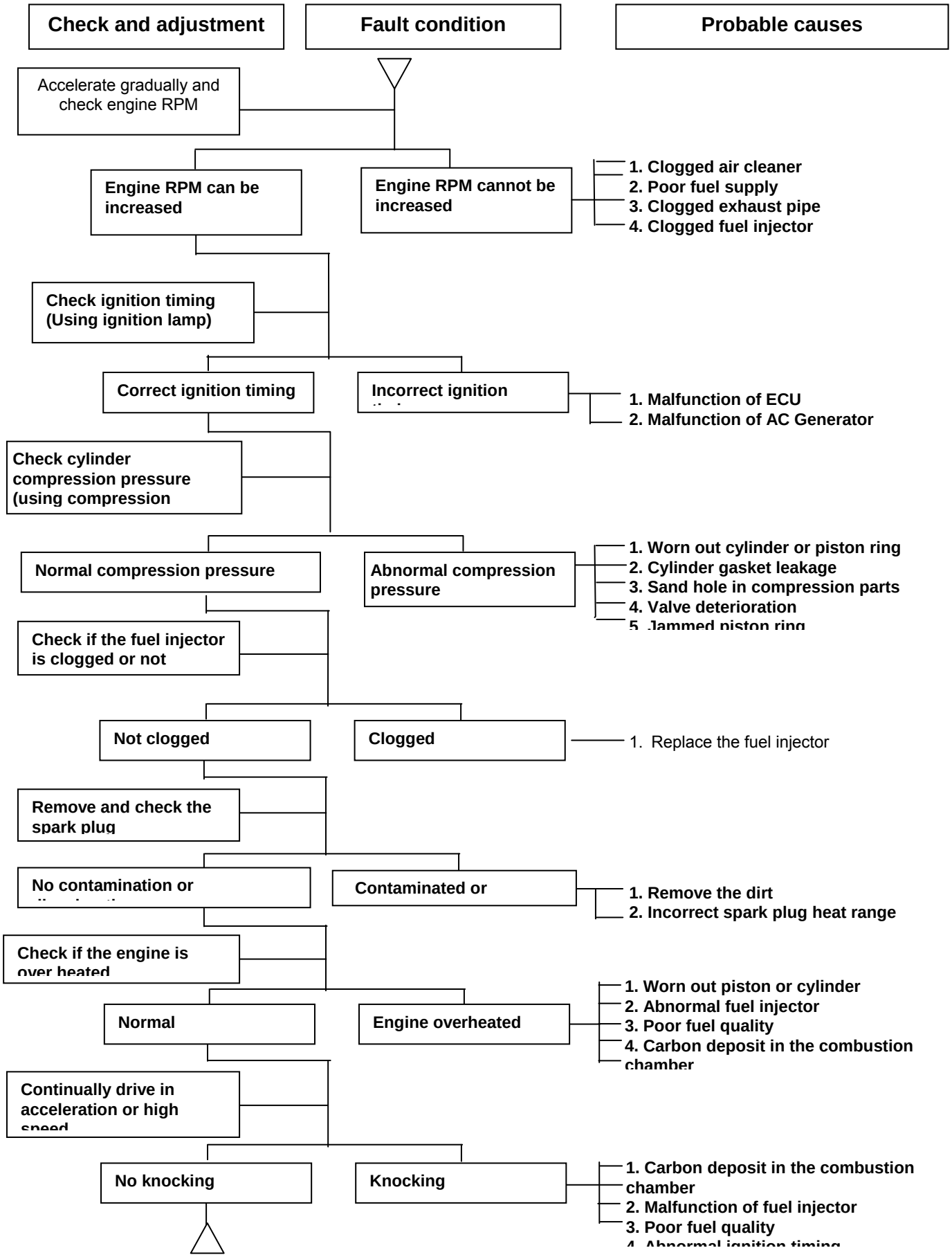
Item	Q'ty	Thread Dia. (mm)	Torque Value (Kg-m)	Remarks
Mounting bolt for steering handle post	4	8	3.0~3.5	
Lock nut for steering stem	1	BC1	1.0~2.0	
Steering top cone race	1	BC1	2.0~3.0	
Front wheel axle nut	1	12	5.0~7.0	
Rear wheel axle nut	1	16	11.0~13.0	
Front cushion mounting bolt	4	10	3.5~4.5	
Rear cushion upper connection bolt	1	10	3.5~4.5	
Rear cushion under connection bolt	1	8	2.4~3.0	
Rear fork mounting bolt	2	10	4.0~5.0	
Brake hose bolt	2	10	3.0~4.0	
Brake air-bleeding valve	1	6	0.8~1.0	
Front brake disc mounting bolt	5	8	4.0~4.5	
Rear brake disc mounting bolt	5	8	4.0~4.5	
Brake clipper mounting bolt	2	8	2.9~3.5	
Engine hanger link bolt	2	12	7.5~9.5	On frame side
Engine hanger link nut	1	12	7.5~9.5	On engine side
Main standard nut	1	10	4.0~5.0	
Air cleaner bolts	2	6	1.0~1.4	

Troubleshooting

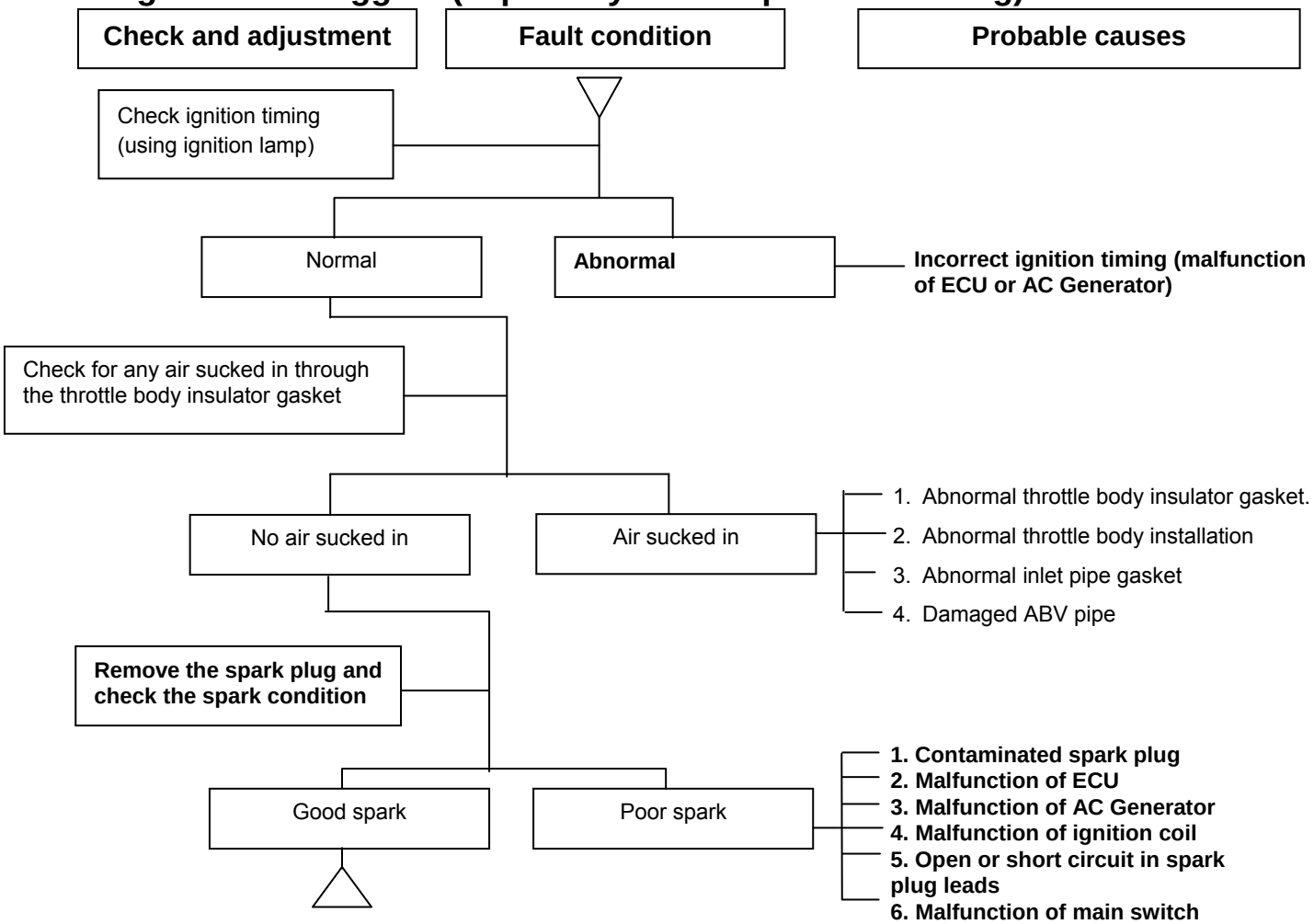
A. Engine cannot be started or difficult to be started



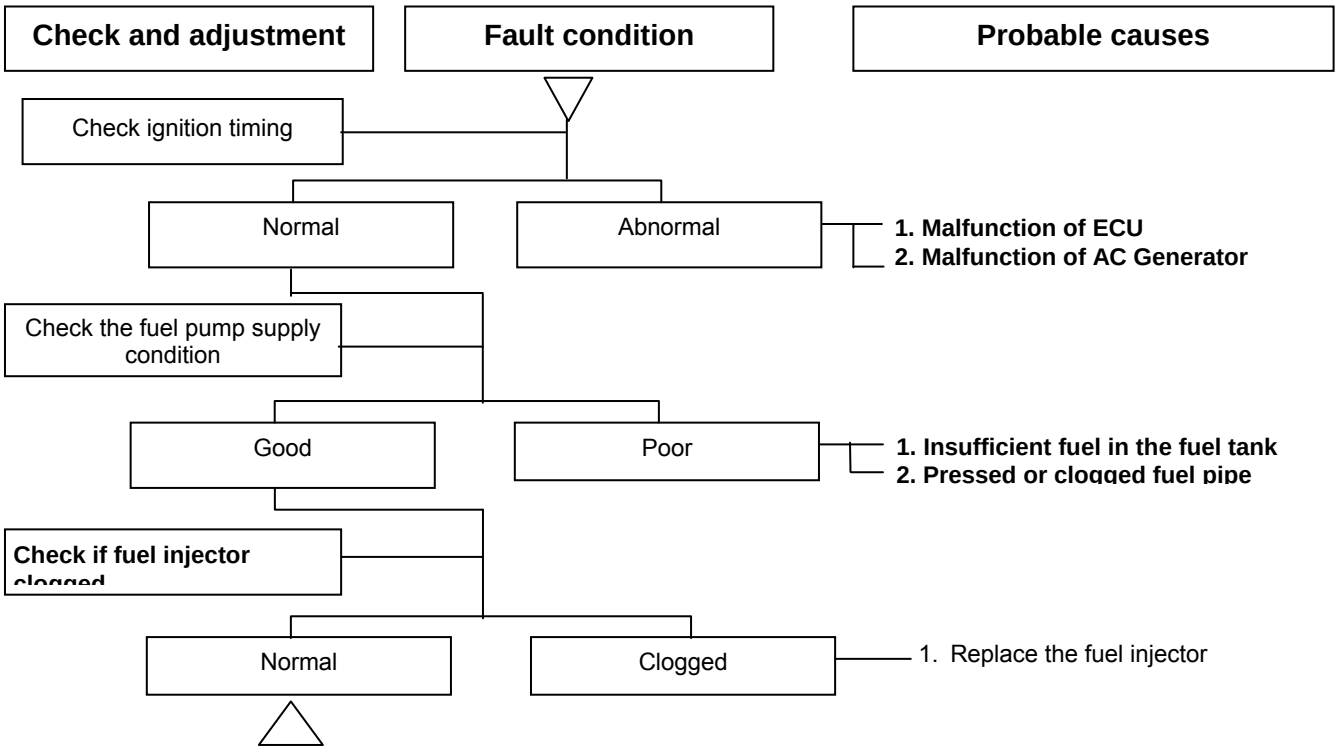
B. Engine runs sluggish (Speed does not pick up, lack of power)



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

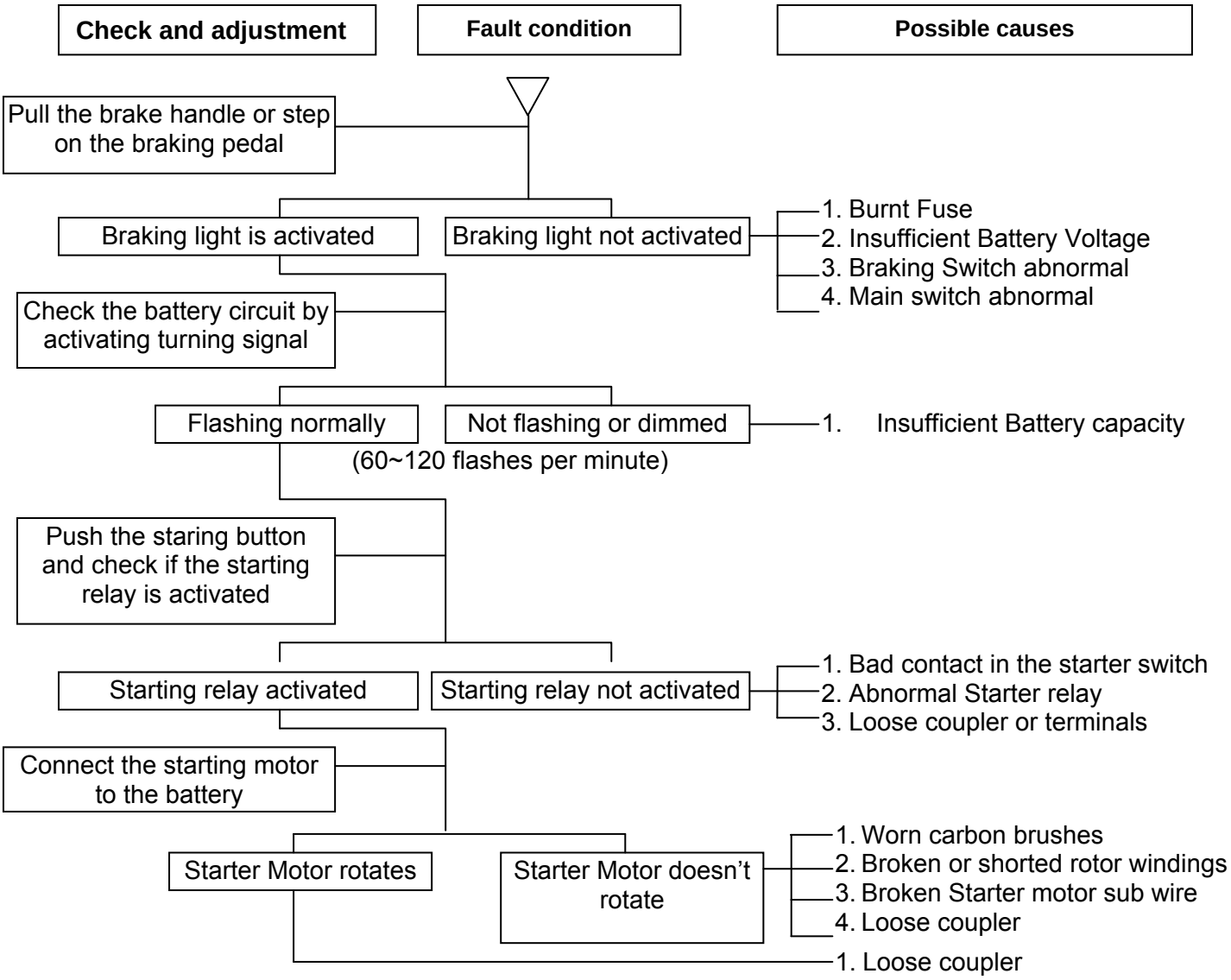


D. Engine runs sluggish (High speed)

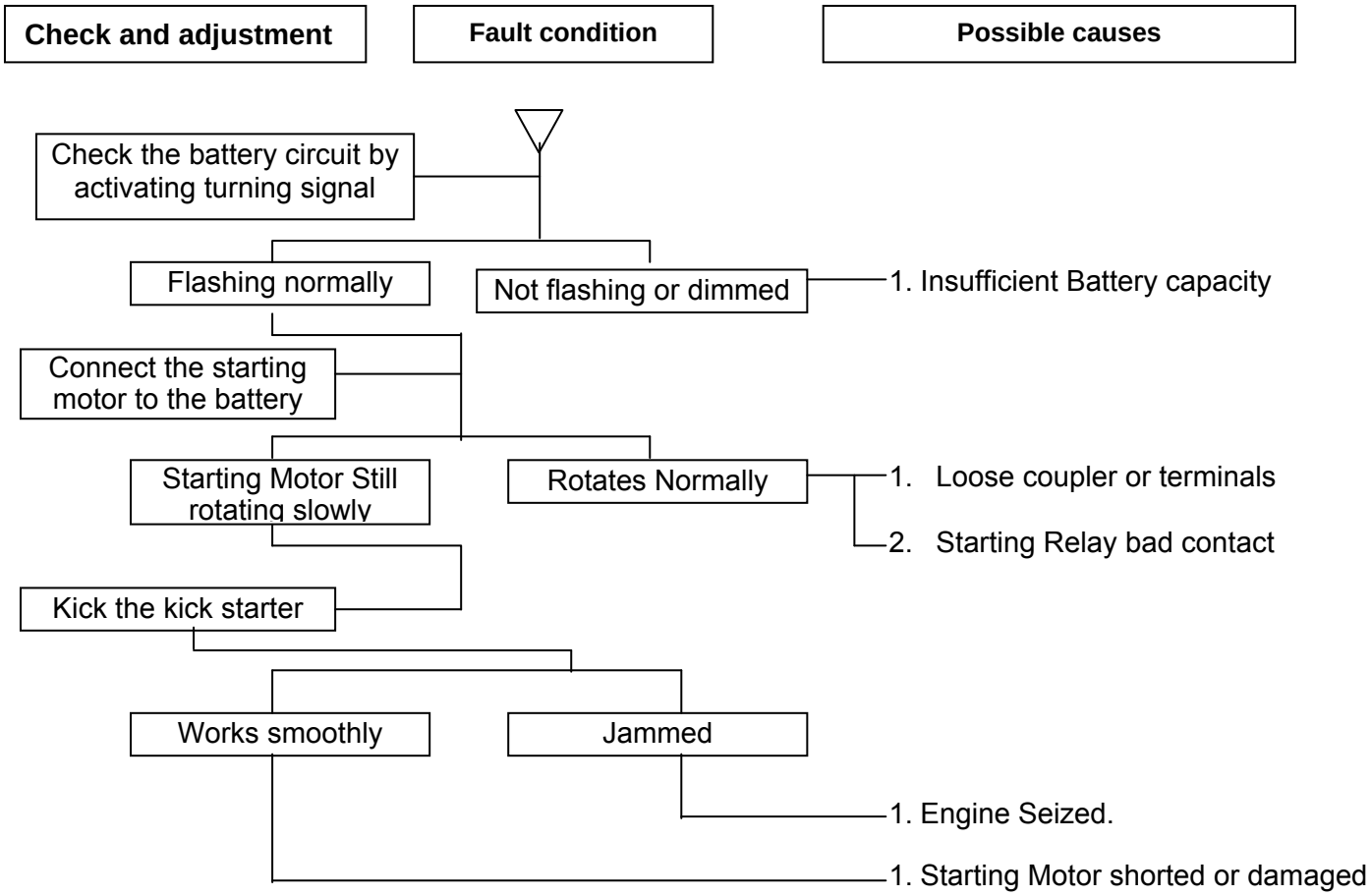


E. Starter Motor Malfunction

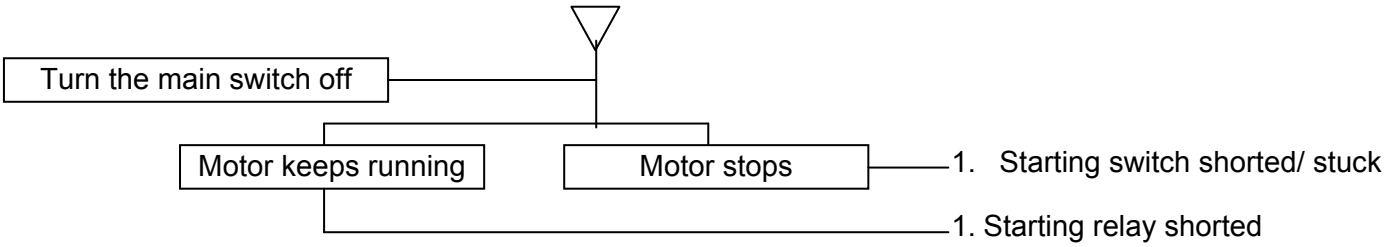
1. Starter Motor doesn't rotate



2. Starting Motor rotates slowly or spins without engagement with crankshaft



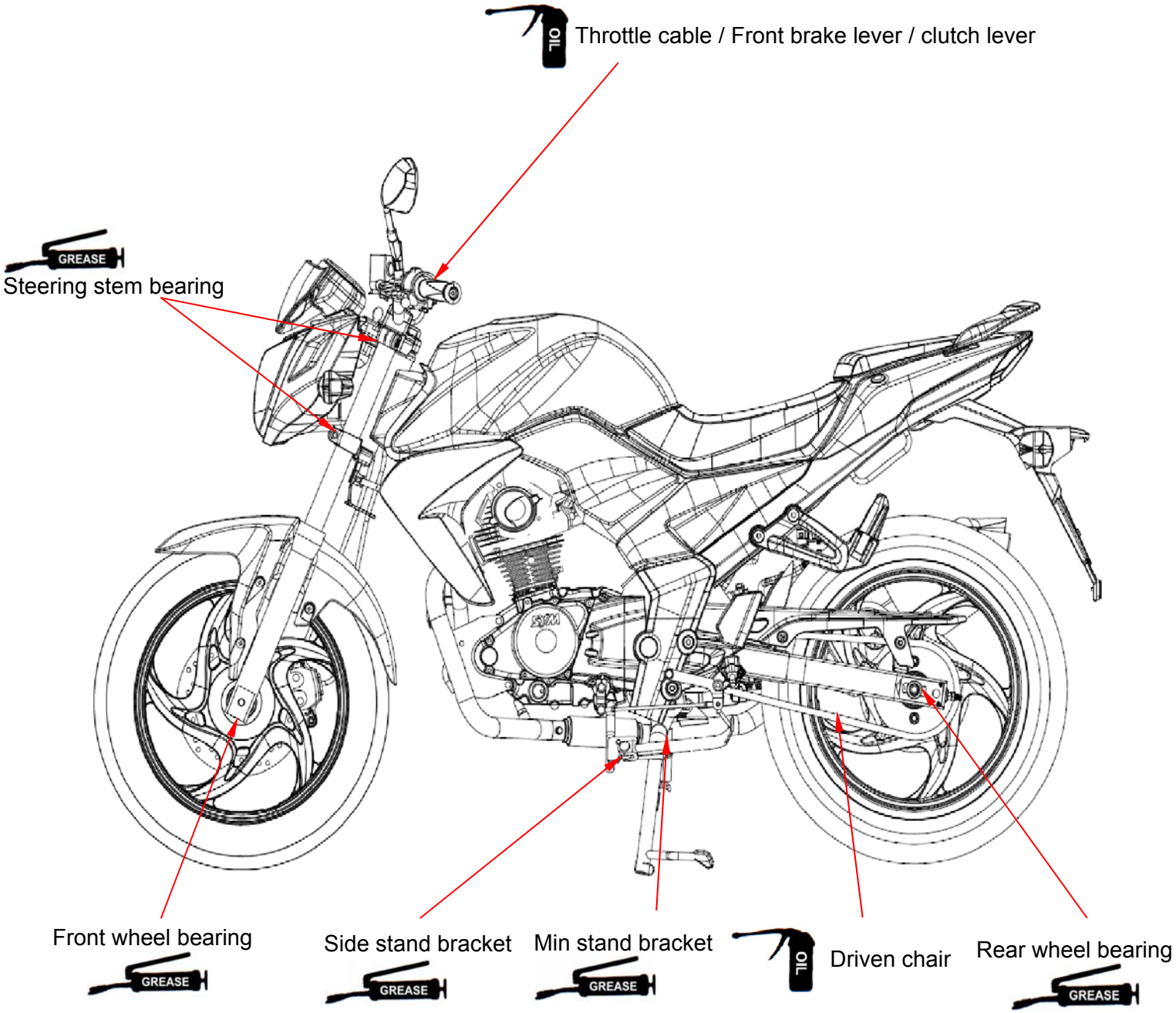
3. Starter motor won't stop rotating



F. Abnormal Engine Noise

Fault condition	Possible causes
Rocker arm noise	1. Excessive valve clearance 2. Worn rocker arm 3. Worn camshaft
Piston slapping	1. Worn piston and cylinder 2. Carbon deposit in the combustion chamber 3. Worn piston pin or connecting rod lower end
Cam chain noise	1. Worn camshaft bearings. 2. Worn cam sprocket. 3. Loose or worn cam chain.
Clutch knocking	1. Excessive clutch plate clearance
Transmission gear noise	1. Worn or deteriorated rear wheel damping rubber. 2. Gear surface worn 3. Worn transmission gear set

Lubrication Points



Precautions in Operation

Specification

Items		Specification
Fuel tank capacity	Capacity	14000 c.c.
	Reserve	700 c.c.
Engine oil	Capacity	1200 c.c.
	Exchange	1000 c.c.
Throttle grip free play		2~6 mm
Spark Plug		NGK DPR7EA-9
Spark plug gap		0.6~0.7 mm
Ignition timing		BTDC 8º / 1700 rpm
Idle speed		1700±100 rpm
Cylinder compression pressure		12±1 kgf/cm²
Valve clearance	In	0.05±0.02 mm
	Ex	0.15±0.02 mm
Tire size	Front	110/70-17 54H
	Rear	130/70-17 62H
Tire pressure (Cold)	Single ride	Front：2.0 kg/cm² / Rear：2.0 kg/cm²
	Tandem ride	Front：2.0 kg/cm² / Rear：2.25 kg/cm²
Battery	Type	YTX9-BS / GTX9-BS (12V 8Ah)

Periodical Maintenance Schedule

NO	Items	Initial 300KM	1 month or every 1000KM	3 months or every 3000KM	6 months or every 6000KM	1 year or every 12000KM
1	☆Air filter element	I		C	C	R
2	☆AICV filter	I		C	C	R
3	☆Gasoline filter	I			I	R
4	☆Engine oil filter	C			C	C
5	☆Engine oil replacement	R	Exchange every 3000 km			
6	Tire pressure	I	I			
7	Battery Inspection	I	I			
8	Brake lever free play check	I	I			
9	Steering handle integrity check	I	I			
10	Shock absorber performance check	I		I		
11	Bolts tightening check	I	I			
12	Check the engine for oil leakage	I	I			
13	☆Spark plug inspection or replacement	I		I	R	
14	☆Change gear oil	R	Exchange every 5000 km			
15	Lubrication of the whole bike				L	
16	Exhaust pipe	I	I			
17	☆Ignition timing	I	I			
18	☆Idle emission check	A	I	A		
19	☆Throttle operation	I		I		
20	☆Engine bolts torque	I		I		
21	☆Transmission / Chain	I	I/L			R
22	☆Clutch free play inspection	I	I			
23	Light/ electrical system/ instrument readings.	I	I			
24	Main stand/ side stand springs.	I			I	
25	Fuel lines	I		I		
27	Cam chain	I		I		
28	☆Valve clearance	I		A		
29	☆PCV system integrity	I		C		
30	☆Crankcase blow-by over-flow pipe	I	Drain every 2000km			
31	☆Second air injection system (filter)	I		I	C	
32	☆E.E.C. Device check			I		

Note：I- inspection A- Adjust R- Replace C-Clean L-Lubrication

Please have your periodical maintenance data recorded by your SYM Authorized Dealer to maintain the motorcycle in excellent condition. The above maintenance schedule is established by taking the monthly 1,000 kilometers as a reference. Whichever- time or mileage- comes first will be regarded as an index for maintenance.

Remark： **These marks "☆" in the schedule are emission control items. According to EPA regulations, these item checks must be performed periodically following the use r manual instructions. It's prohibited to adjust or repair these emission control items by unauthorized people. Otherwise, SYM is no responsible.**

1. Clean or replace the air cleaner element more often when the motorcycle is operated on dusty roads or in the Heavily- polluted environment.
2. Maintenance should be performed more often if the motorcycle is frequently operated in high speed and after the motorcycle has accumulated a higher mileage.
3. Preventive maintenance：
   a. Ignition system—Perform maintenance or check when continuous abnormal ignition, misfire, after-burn, overheating occur.
   b. Carbon deposit removal—Remove carbon deposits in cylinder head, piston heads, exhaust system when power is decreasing.
   c. Replace worn out pistons, cylinder head.

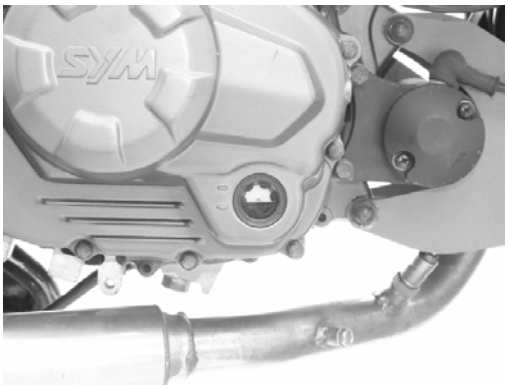
Lubrication System

Engine oil quantity

⚠ Caution

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

If oil level is near lower limit, fill in the recommended engine oil to upper limit.



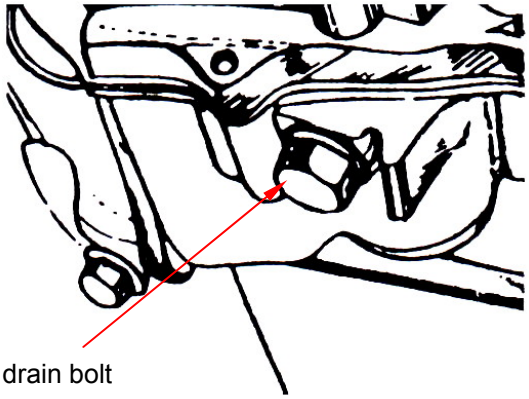
Exchange the engine oil

Engine off and disassemble the oil dipstick.

Remove the oil drain bolt under the crankcase to drain the engine oil.

After completely drain the engine oil, clean the drain bolt and the washer. If the washer is deformed or cracked, please change a new one

Engine oil drain bolt torque：**3.5~4.5kgf-m**



Oil drain bolt

⚠ Caution:

- Warm up the engine before drain oil, that will make engine oil easily drained thoroughly

Fill in the engine oil to the standard quantity.

Add oil to crankcase (oil viscosity SAE 10W-30) Recommended using Bramax series engine oil.

Engine oil exchange volume

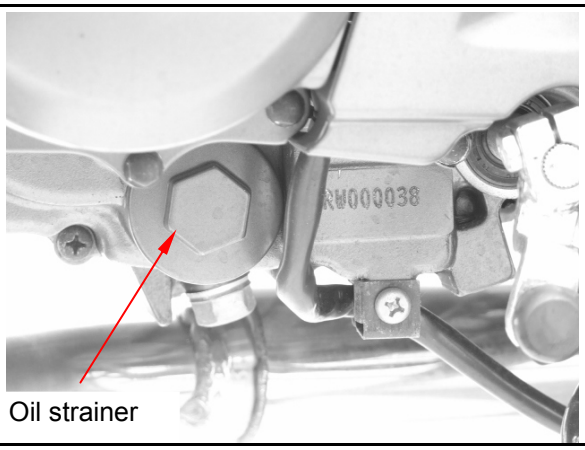
Full disassembly：1200 c.c.

Regular exchange：1000c.c.

Install the dipstick, run the engine for several minutes.

Turn off the engine, and check oil level again.

Check if engine oil leaks.



Oil strainer

Engine Oil Strainer Cleaning

Drain engine oil completely.

Remove oil strainer and spring.

Clean oil strainer.

Check if O-ring is deformed or damaged.

If not, it can be re-used.

Install oil strainer and spring.

Install oil strainer cap.

Torque value：1.3~1.7kgf-m

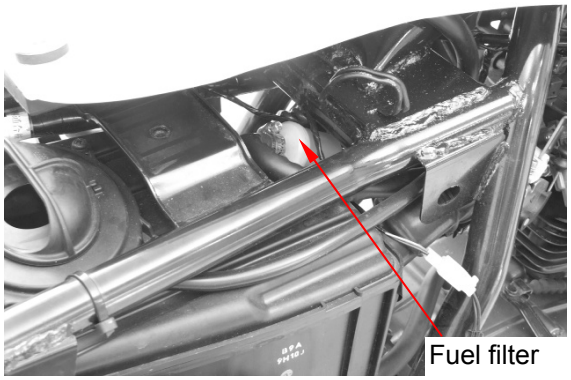
Fuel System

Fuel Lines

Check all fuel lines, and replace when they are deteriorated, damaged or leaking.

⚠ Caution

- Gasoline is a highly flammable substance, so any source of fire or spark is strictly prohibited when operation.



Fuel filter cleaning

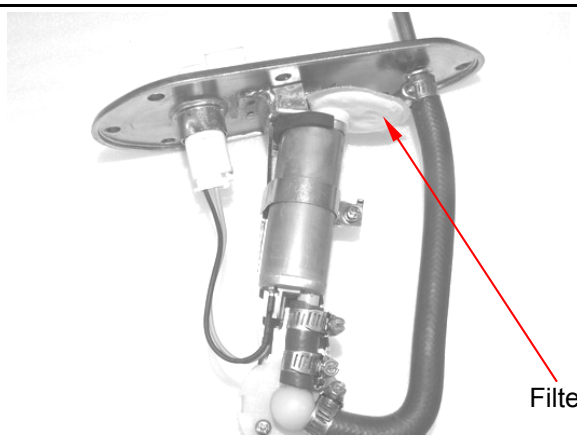
⚠ Warning:

- Any source of fire or spark is strictly prohibited when operation.

If gasoline filter is clogged, please drain all the gasoline into a clean container, and wash the fuel tank.

After the cleaning of filter and fuel tank, refill the tank with clean gasoline.

Check the fuel line for leakage.

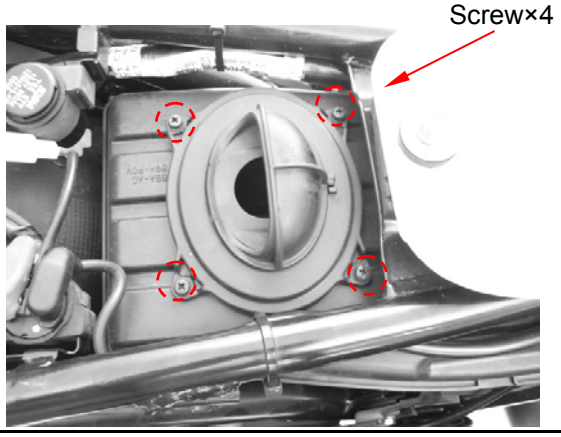


Air Filter

Air filter element

Remove the seat.

Remove the air filter cover (4 Screws)



Remove the air filter element

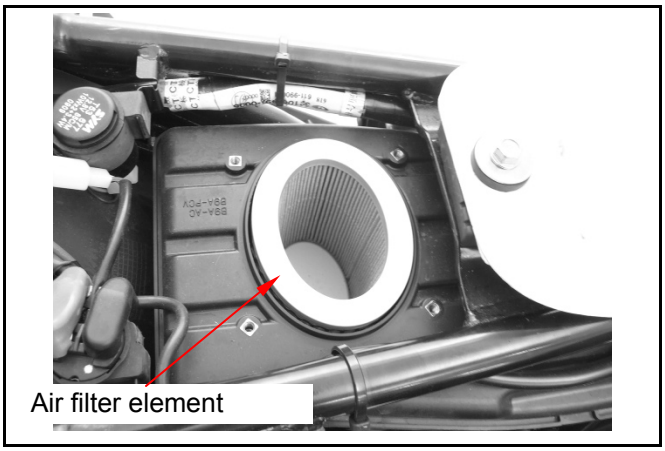
Check the filter element for dirty or damaging.

Wash the air cleaner filter with high flash point solvent (for example, kerosene or diesel)

Squeeze out the cleaning solvent thoroughly, soak the element into gear oil, and squeeze out the excessive.

Re-install the filter and the cover.

If the air cleaner filter element is too dirty or damaged, please exchange with new parts.



⚠ Caution:

- Never use gasoline or other low-flash point solvent for cleaning the element.

Throttle Operation

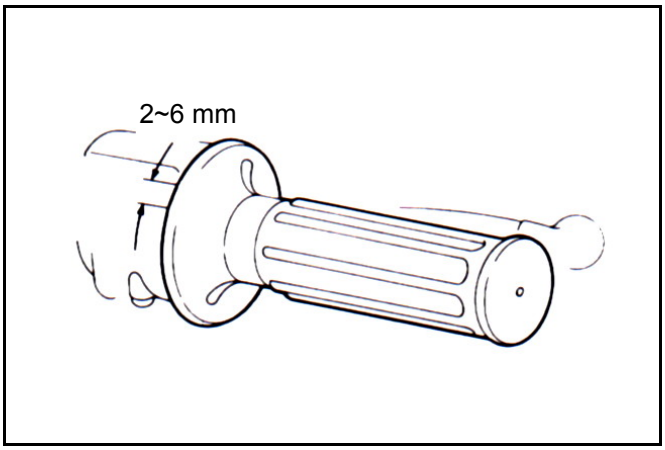
Operate the throttle grip to see if the throttle cable is going smoothly.

If the throttle cable is deteriorated, twisted or damaged, please exchange it.

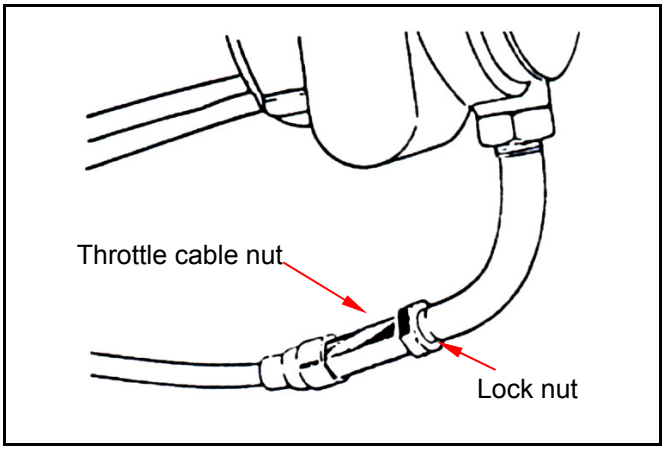
If the cable is not going smoothly, apply some lubrication oil onto it.

Measure the free play of the throttle grip, through the inner side flange of it.

Free play：2~6 mm



Please loosen the lock nut and adjust the throttle cable nut to reach the normal free play.



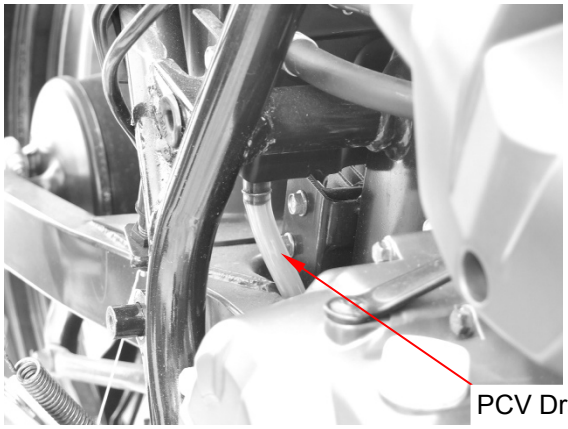
PCV System

Unplug the drain tube, and leak the deposit off.

Drain the tube every 2,000 km.

⚠ Caution:

- Under rainy or full- throttle situation, the maintenance period should be shortened. You can check the deposit amount through the transparent tubes.



Valve Clearance Adjustment

⚠ Caution:

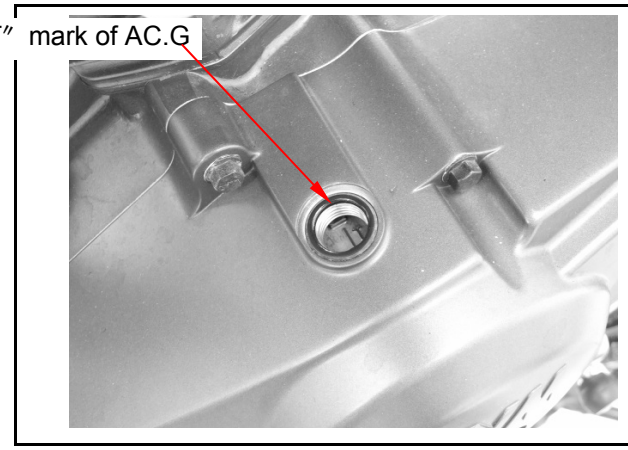
- The valve clearance should be adjusted when the engine is cold. (Under 35 degrees Celsius)

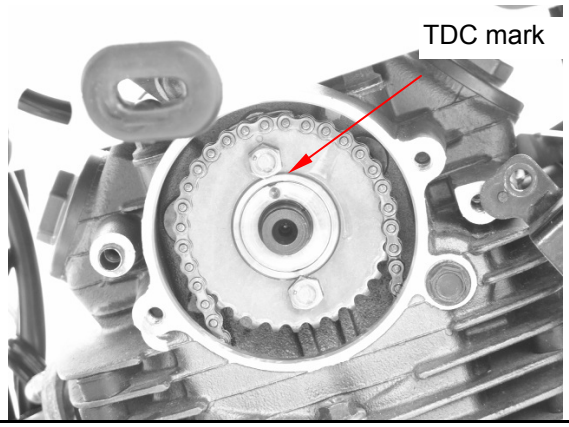
Remove the valve clearance-adjusting cap.

Remove the cylinder head side cover.

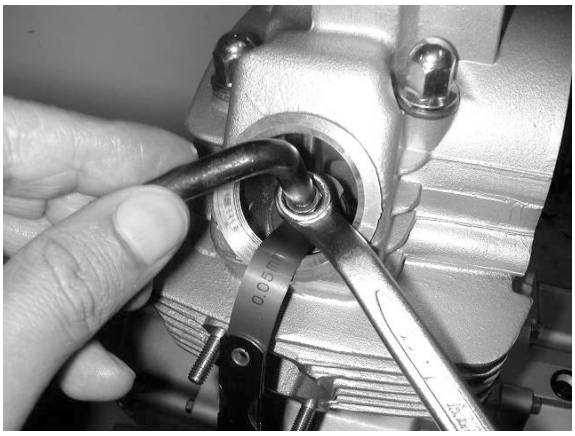
Remove the timing inspection cap and the AC.G cap on the crankcase L cover.

Use a T socket wrench to rotate the crankshaft counterclockwise. Align the “T” mark on the AC.G flywheel with the crankcase sign, and simultaneously, the cam- chain sprocket TDC mark aligning with the cylinder head mark (That means the piston is in the upper end of compression stroke)





Valve clearance inspection and adjustment.



Check the intake and exhaust valve clearance by inserting the feeler gauge between the adjusting screw and the lock nut.

Valve clearance：

IN	**0.05±0.02 mm**
EX	**0.15±0.02 mm**

Adjust by loosening the lock nut first, and turning the adjusting screw until you feel slight drag on the feeler gauge.

Hold the adjusting screw and tighten the lock nut.

⚠ Caution:

- Check the valve clearance after the adjustment.

Install the valve clearance-adjusting cap, cylinder head side cover, and the timing inspection cap and the AC.G cap on the crankcase L cover.

⚠ Caution:

- Before installing the O-ring, you should check if the O-ring is damaged, and apply some oil on it to prevent damage when assembly.

Spark Plug

Recommended spark plug: **DPR7EA-9**

Remove spark plug cap.

Clean dirt around the spark-plug hole.

Remove spark plug.

Measure spark plug ignition gap.

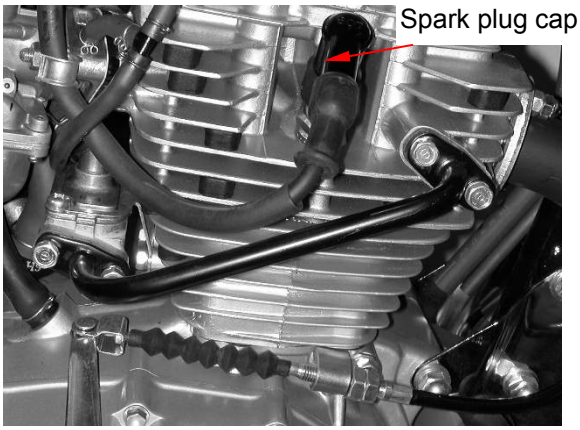
Spark plug gap：0.6~0.7 mm

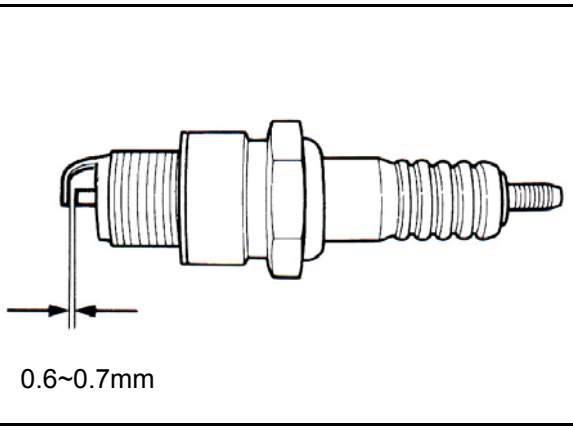
Carefully bend ground electrode of the plug to adjust the gap if necessary.

Hold spark plug and install the spark plug by screwing it with hand, after tightening the plug by hands, use plug socket to tighten it to the standard torque value.

Standard torque：1.0~1.2kgf-m

Re- install the spark plug cap.





Cylinder Compression Test

Warm up engine and turn it off.

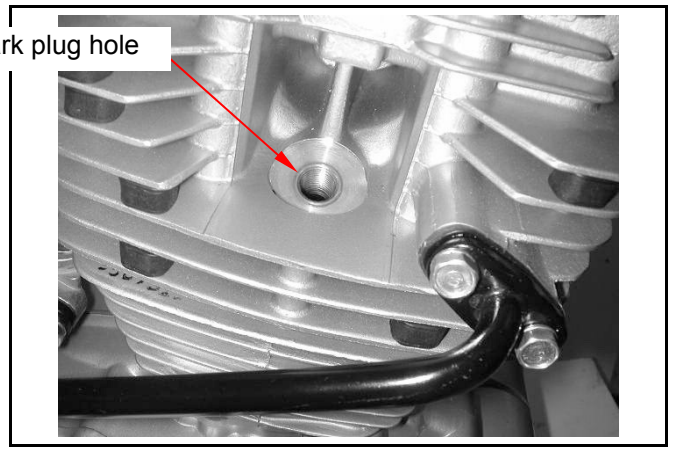
Remove spark plug cap and spark plug.

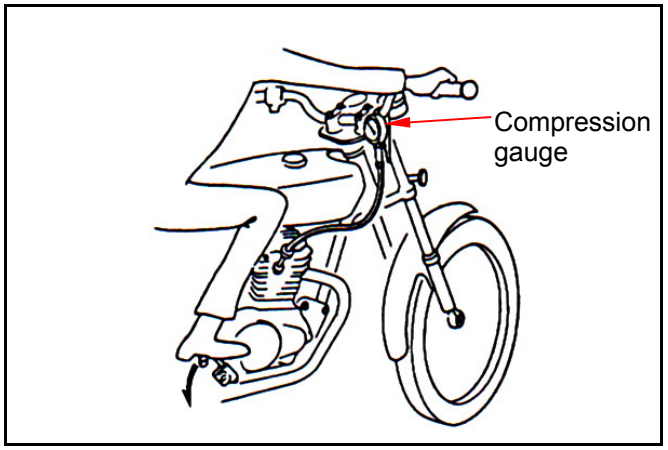
Install compression gauge into the spark plug hole, full open the throttle, and kick the kick starter for several times.

⚠ Caution:

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

- Usually, the highest-pressure reading will appear in 4~7 seconds.





Compression pressure：12 ±1 Kg/cm²

Check the following items if the pressure reading is too low:

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

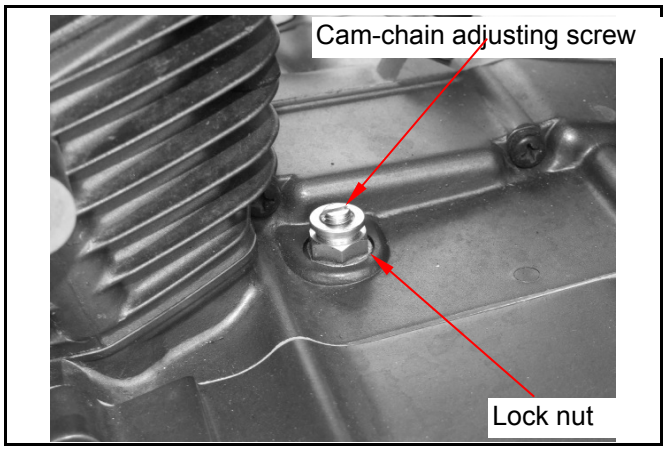
If the pressure is too high, it means carbon deposits in combustion chamber or piston head.

Cam Chain Adjustment

Start the engine, and let the engine idle.

Remove the rubber cap of the adjusting screw and loosen the lock nut. Turn the adjusting screw in or out to find a most silent cam chain setting.

If you want to tighten the chain, turn the screw counterclockwise, or turn the screw clockwise to loosen the cam chain. After finding a best set of cam chain, tighten the lock nut and re-install the rubber cap.

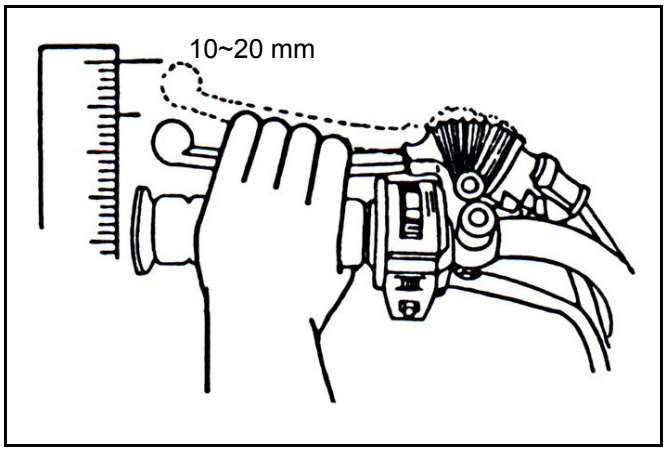


Clutch Adjustment

Clutch lever free play inspection

Slightly pull the clutch lever to check the free play before clutch disengagement.

Free play：10~20 mm



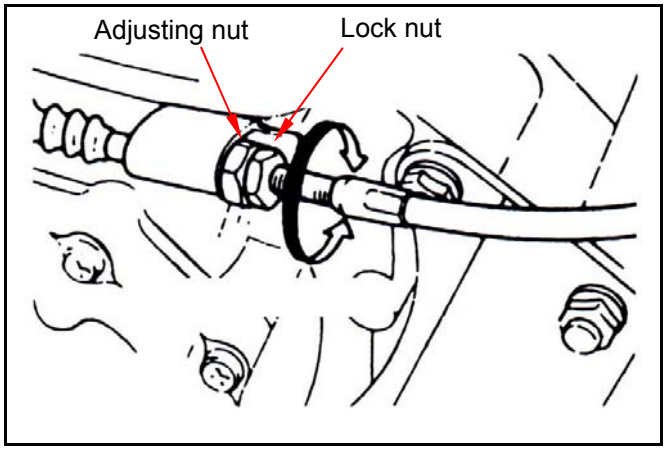
Clutch lever free play adjustment

Before adjusting the clutch lever free play, please loosen the lock nut first. Then turn the adjusting screw to achieve the recommended clutch free play.

If you want to decrease the free play of clutch lever, turn it clockwise. If you want to increase the free play, turn it counterclockwise.

After adjustment, tighten the adjusting nut with lock nut.

Lubricate the clutch cable.



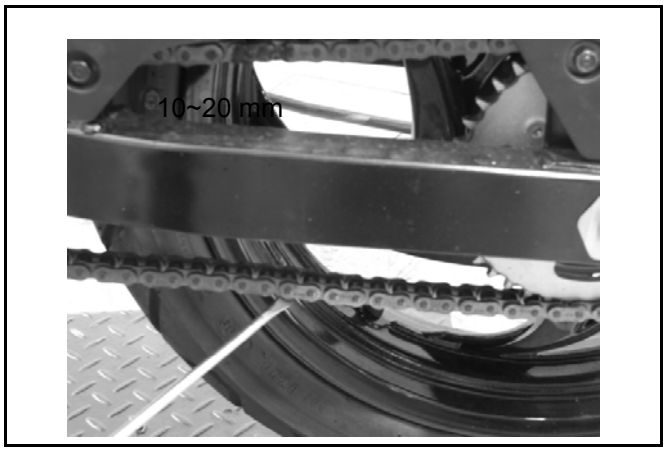
Drive Chain Adjustment

Drive chain inspection.

Place the bike on its main-stand with its neutral gear.

Check the drive chain slack by moving the chain up and down by fingers, and measure the amount of chain slack.

Standard chain slack：10~20 mm



⚠ Caution:

- Because the front and rear sprocket has different wearing situation, so please rotate the rear wheel to find the minimum chain slack for the measurement.

Drive chain adjustment

If you need to adjust the chain slack, please loosen the rear axle nut and sleeve nut first.

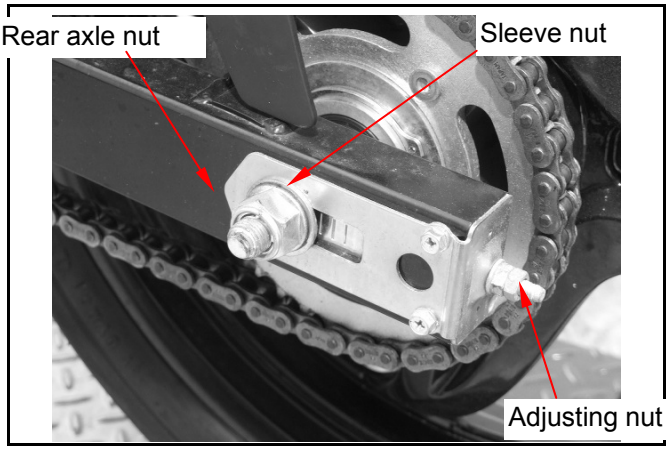
Turn the left side and the right side adjusting nut evenly to make the chain slack within the standard range. (Turn the nuts clockwise to tighten the chain, or counterclockwise to loosen the chain)

Tighten the sleeve nuts, then the rear axle nut.

Torque value：4.0~5.0kgf-m

After tightening the rear axle nut, please check the sleeve nuts to prevent them from loosening.

Check the chain slack again, and make sure the rear wheel rotates smoothly.

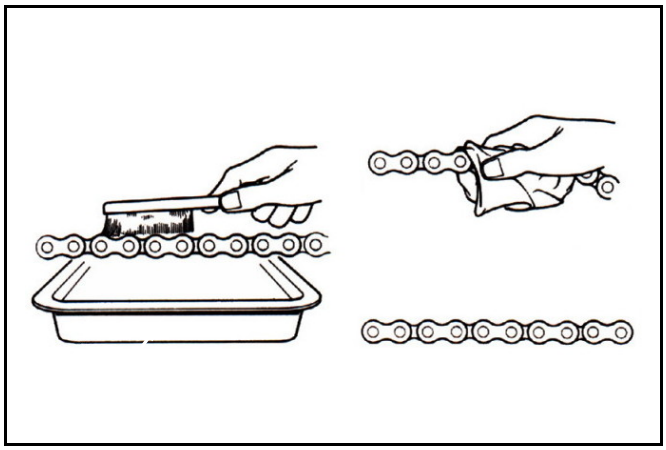


If the chain is too dirty, use high-flash point solvents to clean the chain. (Kerosene or Diesel.)

⚠ Caution:

- Don't use gasoline when cleaning the chain. The gasoline will damage the O-ring in the chain.

After cleaning, lubricate the chain with chain lubricant.



Steering Mechanism

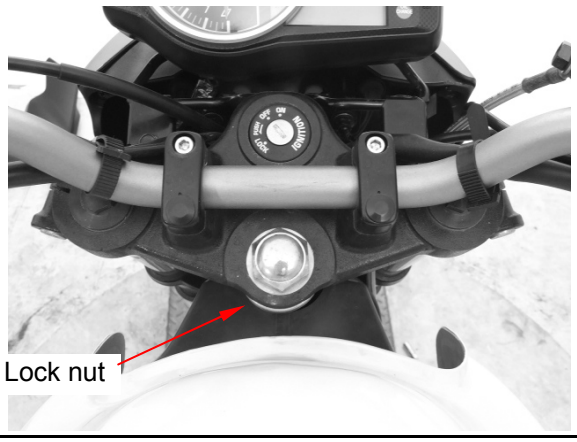
⚠ Caution:

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

Lift the front wheel off the ground.

Turn handle from right to left and check if turning is smoothly.

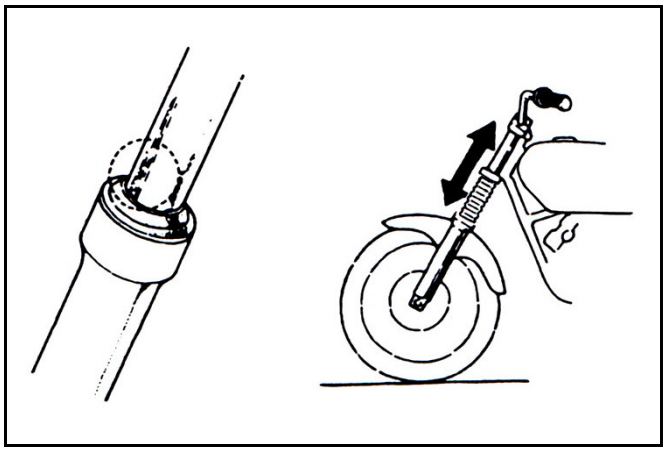
If handle is uneven or bending, or the handle can be lifted through vertical direction, adjust the handle top bearing.



Suspension System

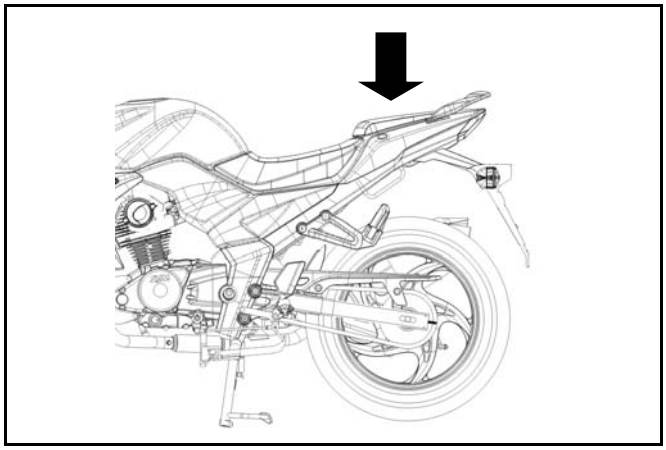
Caution:

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



Front cushion

Press down the front cushion for several times to check its integrity.
Check if any oil leaks or damage found.
Replace relative parts if damage found.
Tighten all nuts and bolts.



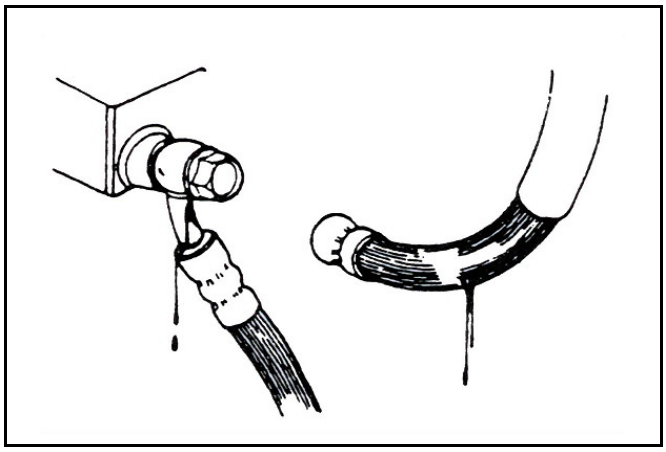
Rear Cushion

Press down the rear cushion for several times to check its integrity.
Check if any oil leaks or damage found.
Replace rear cushion if any damage found.
Park motorcycle with main stand.
Move the rear wheel sideways forcefully to see if the swing arm bushing and pivot nut are loosened.
Tighten all nuts and bolts.

Disk Brake System

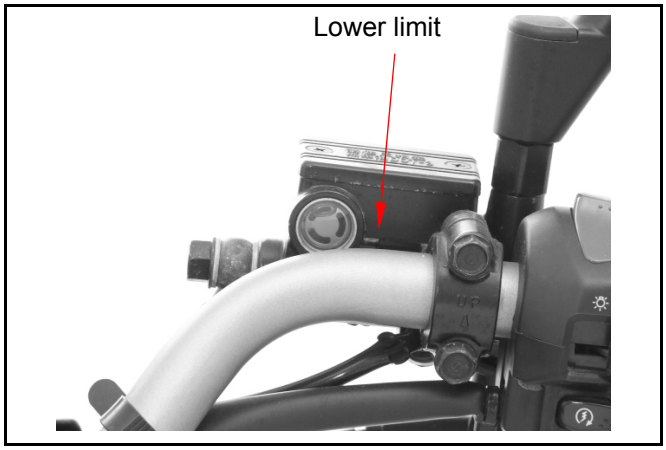
Brake System Hose

Check the brake hoses for corrosion or brake fluid leaking.



Brake Fluid

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



⚠ Caution:

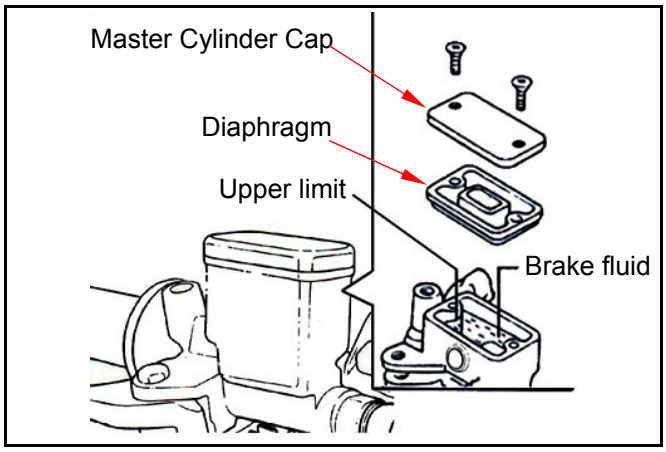
- In order to prevent the brake fluid overflow by accidental shaking of the steering handle, keep the reservoir in horizontal position and hold the steering handle firmly. Don't take off the brake fluid cap before keeping the steering handle steady.
- Do not operate the brake lever after the cap had been removed. Otherwise, the brake fluid will spray out.
- Do not mix non-compatible brake fluid together.

Air Bleed Operation

Connect a transparent hose to draining valve. Hold the brake lever and turn the air-bleeding valve open. Perform this operation several times until there is no air bubble inside the transparent hoses.

⚠ Caution:

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

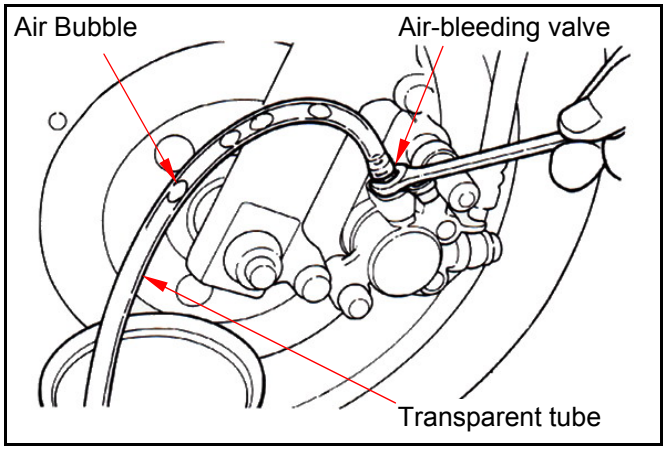


Add Brake Fluid

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

⚠ Caution:

- Never mix or use dirty brake fluid to prevent braking system deterioration or reducing brake performance.



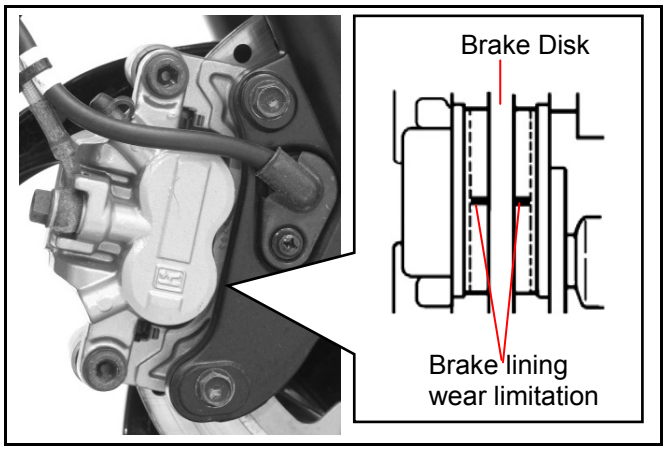
Brake Lining Wear

The indent mark on brake lining is the wear limitation.

If the wear limit mark approximates the edge of brake disc, replace the brake lining.

⚠ Caution:

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



Tire

Check the pressure of the tire to see if it's in the specified pressure range.

⚠ Caution:

- Tire pressure check should be done when the tire is cold.

Specified tire pressure range

Tire pressure		FR	RR
Tire pressure when cold (Kg/cm²)	Single ride	2.0	2.0
	With passenger	2.0	2.15

Specified tire：

Front wheel：110/70-17 54H

Rear wheel：130/70-17 62H

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

Check if front and rear tires pressure is normal.

If the wearing of the tire thread reaches triangle TWI mark index, the tire also have to be changed.

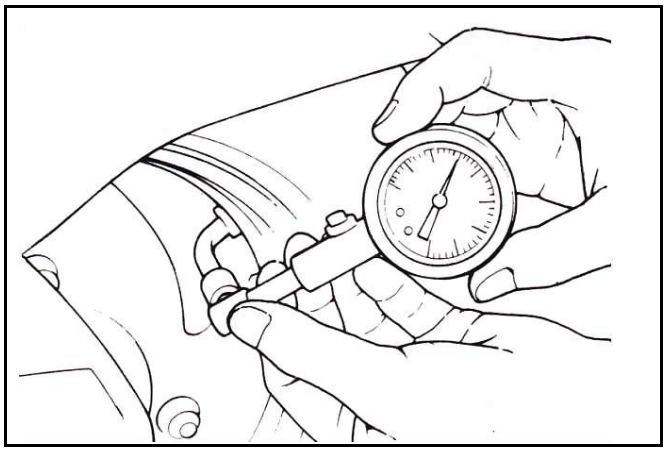
Measure tire thread depth from tire central surface, and if the depth is not enough, please change the tire.

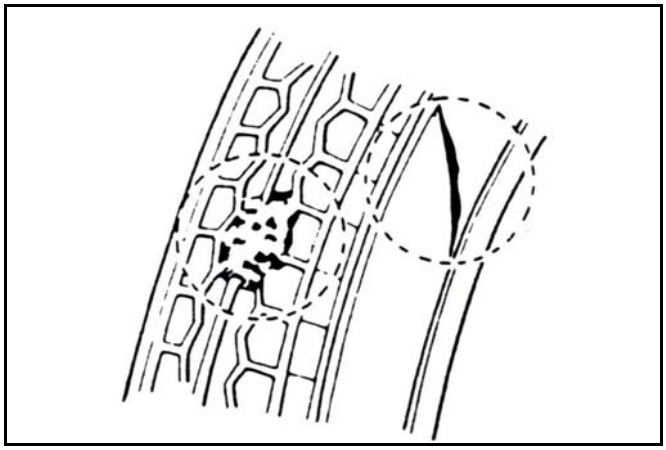
Front tire thread：1.5 mm

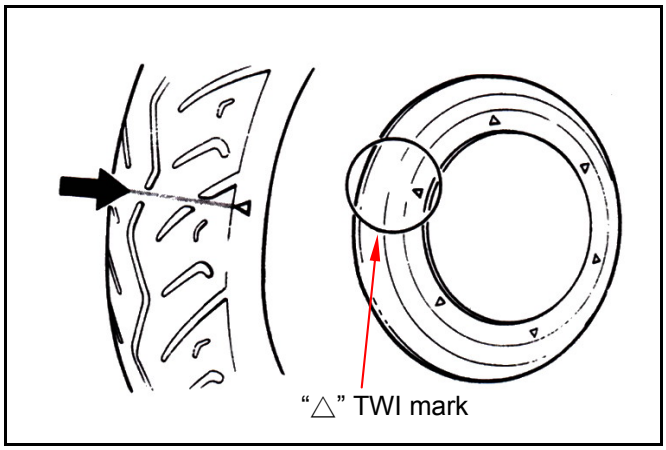
Rear tire thread：2.0 mm

⚠ Caution:

- The triangle TWI mark index is located along the tire wall.



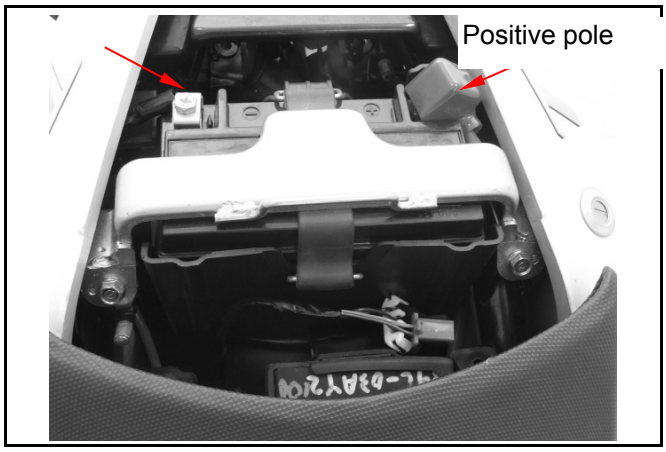




Battery

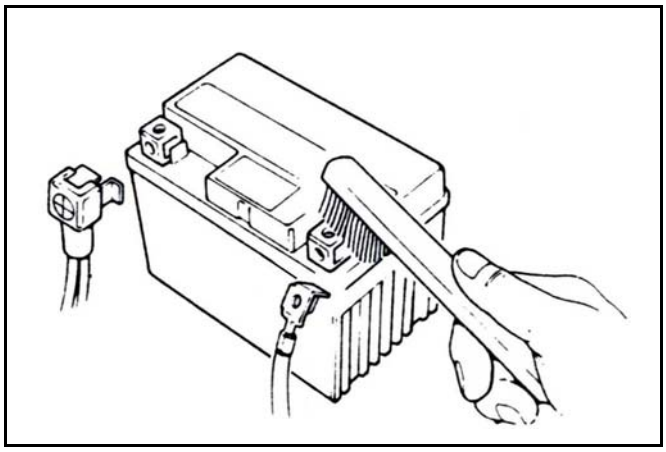
Battery removal

Remove the left side cover.
Remove the 〝—〞 negative pole first, then remove the 〝＋〞 positive pole.
Unplug the ventilation tube
Remove the battery holder and take out the battery.



⚠ Warning:

- The electrolyte contained sulfuric acid. Please avoid touching the eyes, skin, or clothes. If any contact by accident, please flush with plenty of water.



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

Install the battery in the reverse procedures of removal

⚠ Caution:

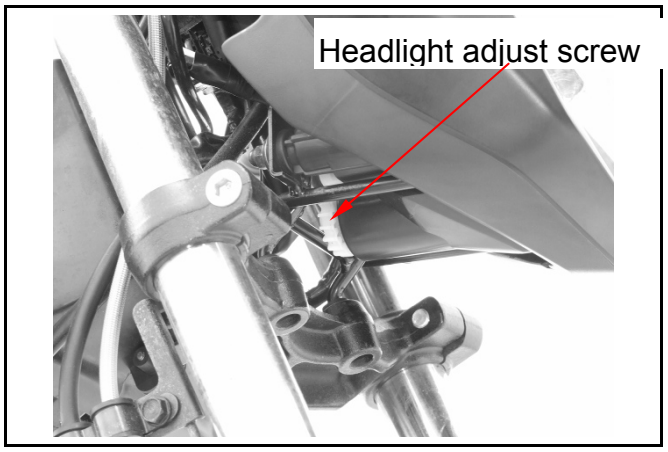
- If the rust on the posts is very serious, spray some hot water on them. Then, more easily you can remove the rust by steel brush.
- Apply some grease on the posts after cleaning rust to prevent from happening again.

Headlight Adjustment

Turn on main switch. Loosen the headlight adjustment screw to adjust headlight beam height.

⚠ Caution:

- The factory setting of the beam height is consistent with government orders.
- Improper headlight beam setting will make driver in the opposite lane dazzled and cause danger.

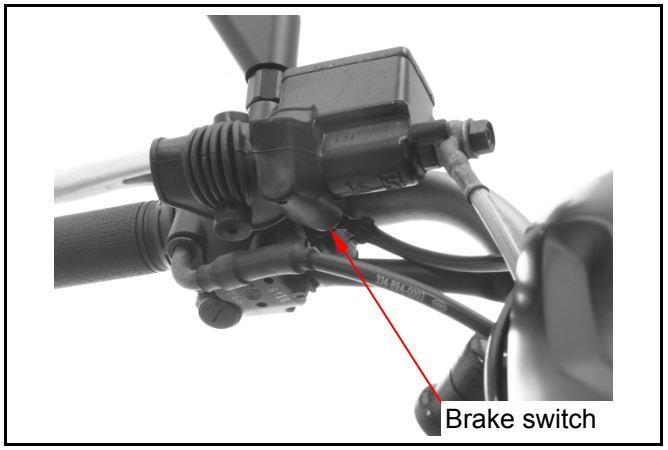


Brake Switch

Inspection on the brake switch

When brake lever is pulled, brake switch will light up the brake lamp.

Make sure that electrical starter can be activated only under braking condition.



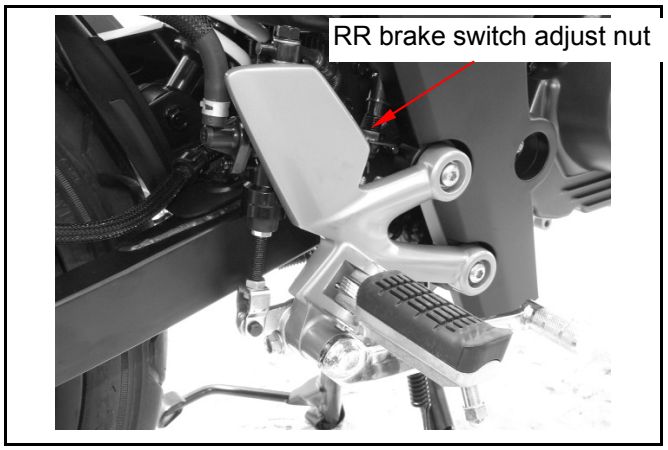
Adjustment of rear brake switch.

Turn on the main switch.

When the brake pedal is stepped down for 20mm，the brake lamp should be activated.

If the brake lamp is not activated or activated too early, please adjust through the rear-brake-switch adjusting nut.

Turning clockwise will decrease the free play, and counterclockwise to increase the free play.



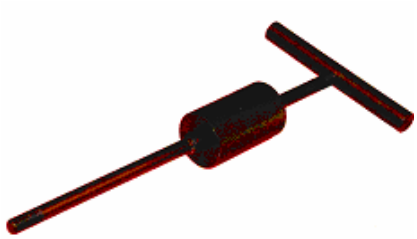
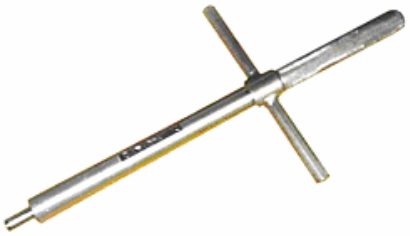
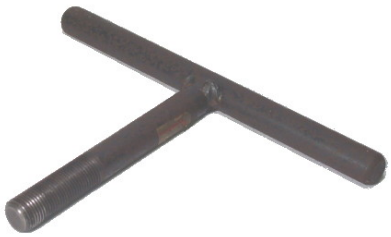
Nuts, Bolts Tightness

Apply periodical maintenance in according with the Periodical Maintenance Schedule.

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

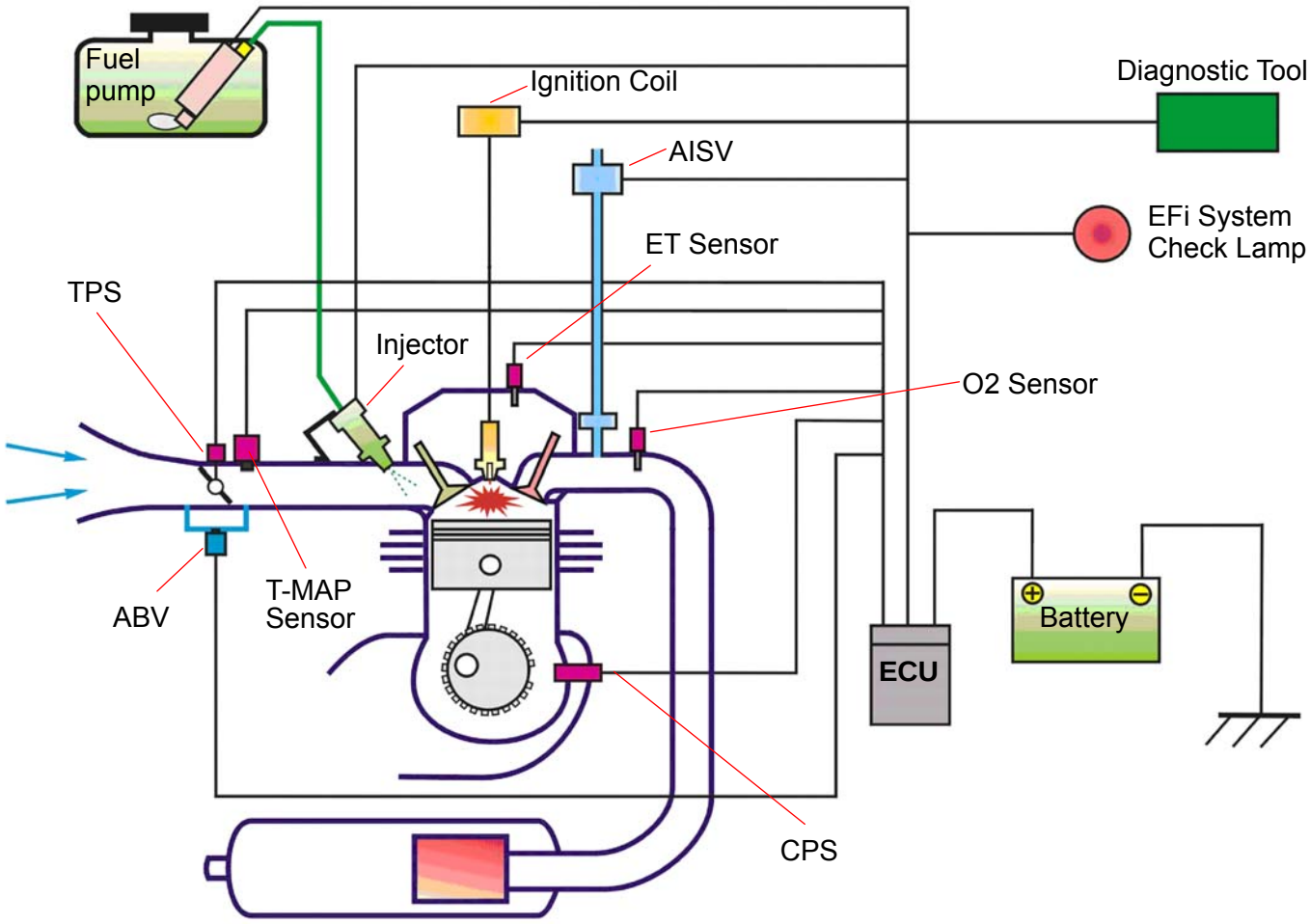
Check all fixing pins, snap rings, hose (pipe) clamps, and wire holders for security.

Special Tools

		
Name: Rocker arm shaft disassemble tool SY No.: SYM-1445100	Name: Valve cover wrench SY No.: SYM-1236100	Name: Valve remove and assemble tool SY No.: SYM-1471110/20
		
Name: Valve spring compressor SY No.: SYM-1471100	Name: Tappet adjusting wrench SY No.: SYM-9001200	Name: TAPPET ADJUSTING TOOLS SY No.: SYM-9001210
		 (20*32*6)
Name: ACG Puller SY No.: SYM-3111000	Name: Oil pump fix nut socket SY No.: SYM-9023100-SY125	Name: 20*32*6 oil seal driver SY No.: SYM-9120200
 (6204)	 (6301)	 (6203/6004UZ)
Name: 6204 Bearing Driver SY No.: SYM-9110400	Name: 6301 Bearing Driver SY No.: SYM-9610000	Name: 6203/6004UZ bearing Driver SY No.: SYM-9620000

					
Name	Inner bearing puller set	Name	Outer bearing puller	Name	Steering Nut Wrench
SY No.	SYM-6204025	SY No.	SYM-6204001	SY No.	SYM-5320000
					
NAME	Extension bush (short)	NAME	Vacuum pressure gauge	NAME	Fuel pressure gauge
NO	SYM-1130032	NO	SYM-HT07011	NO	SYM-HT07010
					
NAME	Multi-meter	NAME	Cylinder pressure gauge	NAME	Vehicle circuit test tool kit
NO	SYM-HE07007-01	NO	SYM-HT07008	NO	SYM-HE170008
					
NAME	Vehicle circuit test harness	NAME	EFi System Diagnostic tool	NAME	
NO	SYM-HE170008-01	NO		NO	

EFi System Diagram



EFi System Introduction

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

Electronic Fuel Injection Device

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

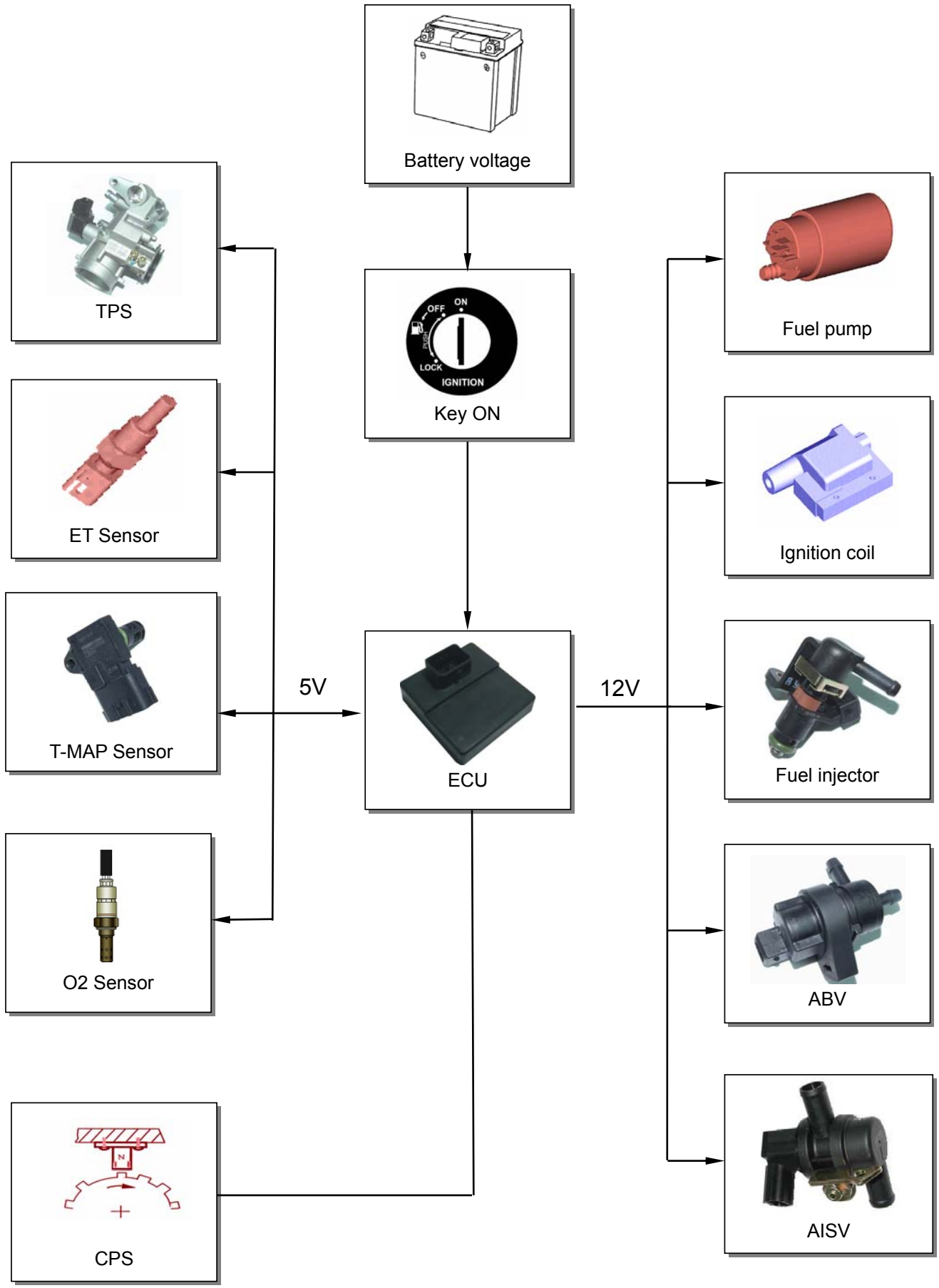
In traditional gasoline engine, carburetor supplies the fuel. The process is done by the engine vacuum, and the negative pressure in the carburetor mixes fuel with air. Under this condition, three major processes are done simultaneously in the carburetor: 1. air quantity measurement, the determination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

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

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

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

EFi System Components

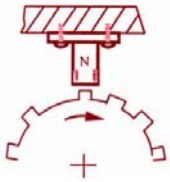


EFi System Component Description

ECU

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

CPS



- It does not need power supply, and has 2-signal terminals connector on the sensor.
- Its major component is the magnetic pickup coil.
- The air gap between the sensor and flywheel must have 07~1.1mm.
- By cutting the magnetic field, the magnetic sensor sends an inductive voltage that is created with the rotation gear (24-1 tooth) on the flywheel, and the pulse will be sent to the ECU. Then, the ECU calculates current engine speed and crank position based on the voltage so that controls fuel injection quantity and ignition timing properly.

T-MAP Sensor

- Powered by 5V DC from ECU. It has 4 terminals on the sensor. One terminal is for power, and 2 terminals are for signal output. And, the rest one is for ground
- It is a sensor of combination by both sensing pressure and temperature, and can measure the absolute pressure and temperature in intake process. It also conducts the fuel injection quantity correction based on environmental temperature and position level

TPS

- Powered by 5V DC from ECU, and has 3-terminal connector on the sensor. One terminal is for power, and one for voltage output, and then the last one is for ground
- Located on the side of throttle body. By means of the throttle valve rotation to cause voltage change in linear, it provides ECU with current throttle valve openness information. And also, the ECU determines the most properly fuel injection and ignition timing

Ignition Coil

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

Fuel Pump

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

Throttle Body

- The throttle body is the air flow adjustment mechanism of the fuel injection. (Its function is like the carburetor.
- The throttle valve shaft is to turn the throttle position sensor in synchronously so the ECU that can detect the throttle valve openness in time.

ET Sensor

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

Fuel Injector

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

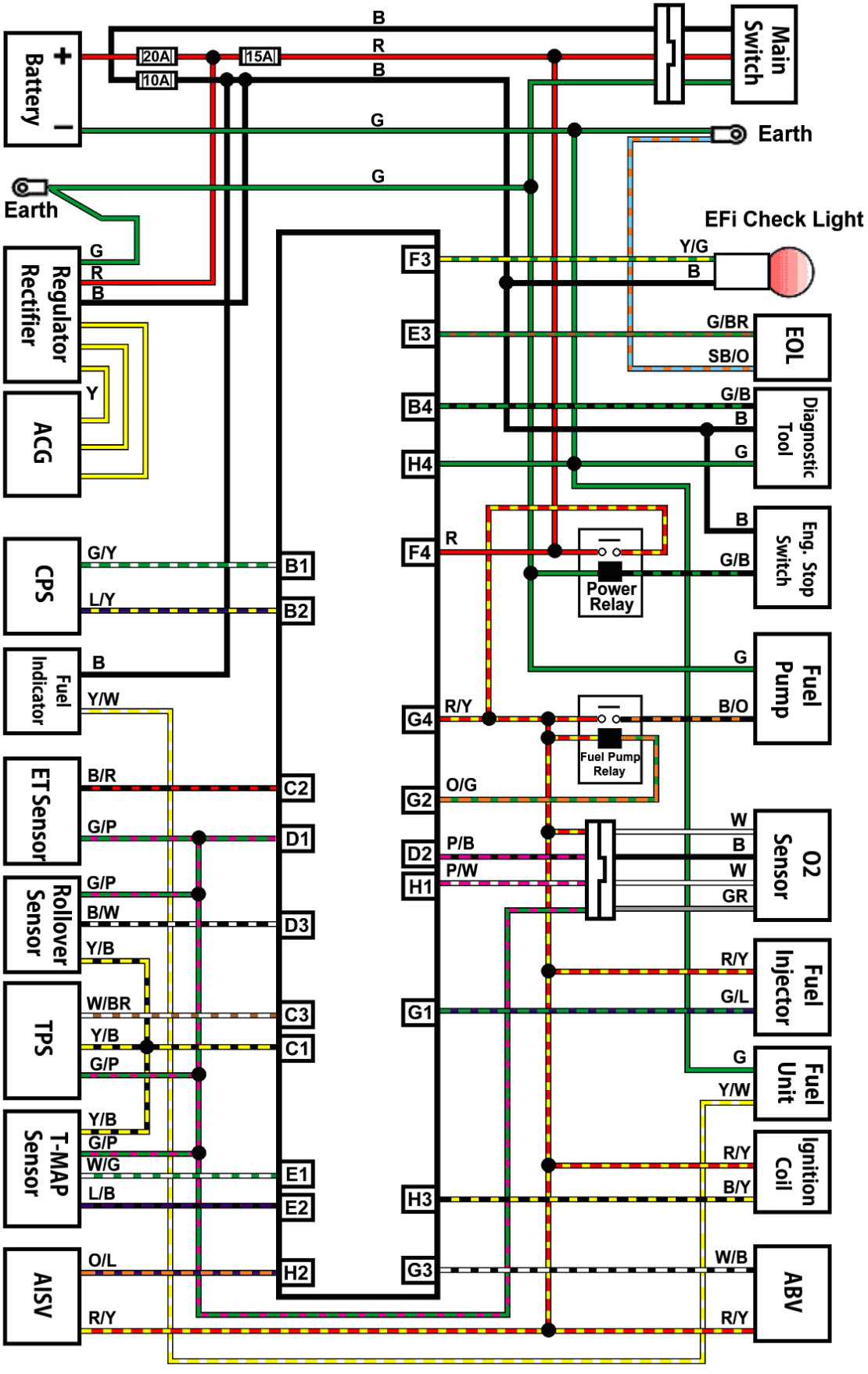
ABV

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

O2 Sensor

- Powered by DC 8~16V, and has 4 terminals connector on the sensor. The first terminal is for power input; the second is for heating coil. The third is for ground, and the last is for signal output.
- The O2 sensor feeds signal to ECU, and the ECU can control the air/fuel rate around 14.6. It's a close –loop control system.
- The catalytic converter reaches the best converting rate when this 14.6 A/F ratio is maintained.
- The heating coil resistance <200kohm (30—45kohm).

EFi System Circuit



Precautions in Operation

General information

⚠ Warning

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

⚠ Caution

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

Fuel pressure release procedure:
Disconnect the fuel pump relay, switch on and press the start switch for a few seconds to crank the engine.

Specification

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

Torque value

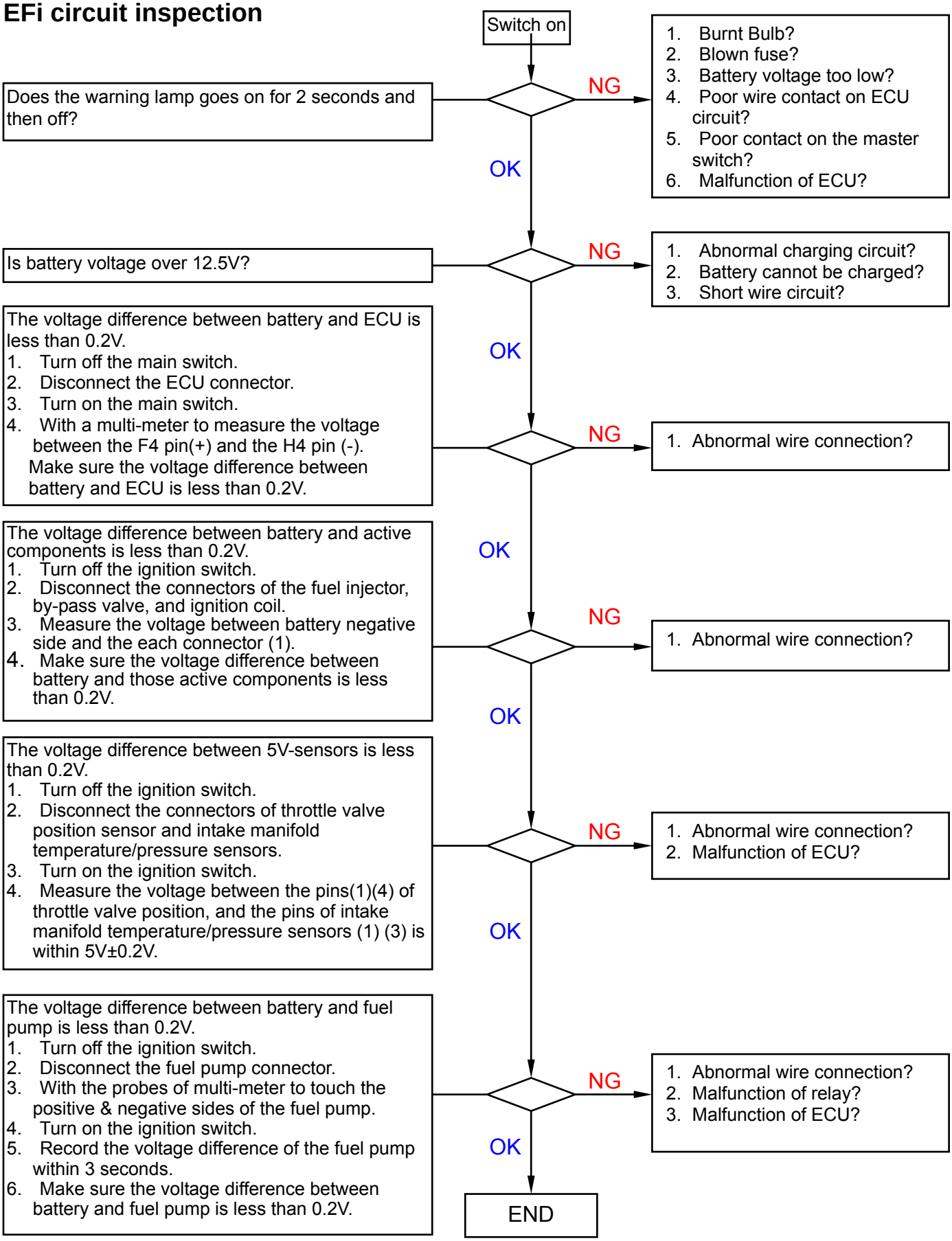
Engine temperature sensor：0.74~0.88 kgf-m
O2 sensor：3.6~4.6 kgf-m

Special tool

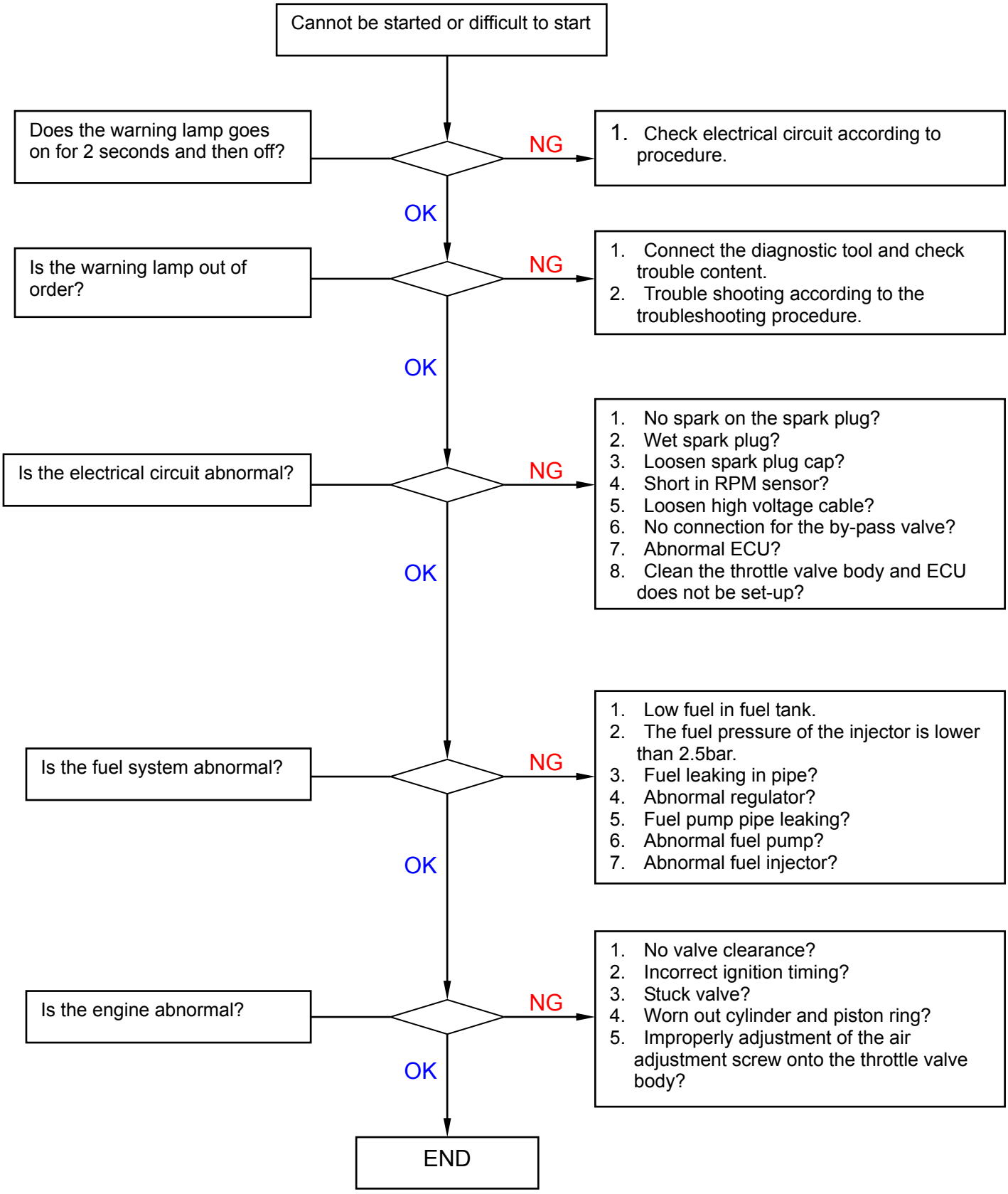
EFi System Diagnostic tool
Fuel pressure gauge: SYM-HT07010
Vacuum pressure gauge： SYM-HT07011
Cylinder pressure gauge: SYM-HT07008
EFI circuit test tool kit: SYM-HE170008-EFI
EFI circuit test harness: SYM-HE170008-01 EFI

Troubleshooting

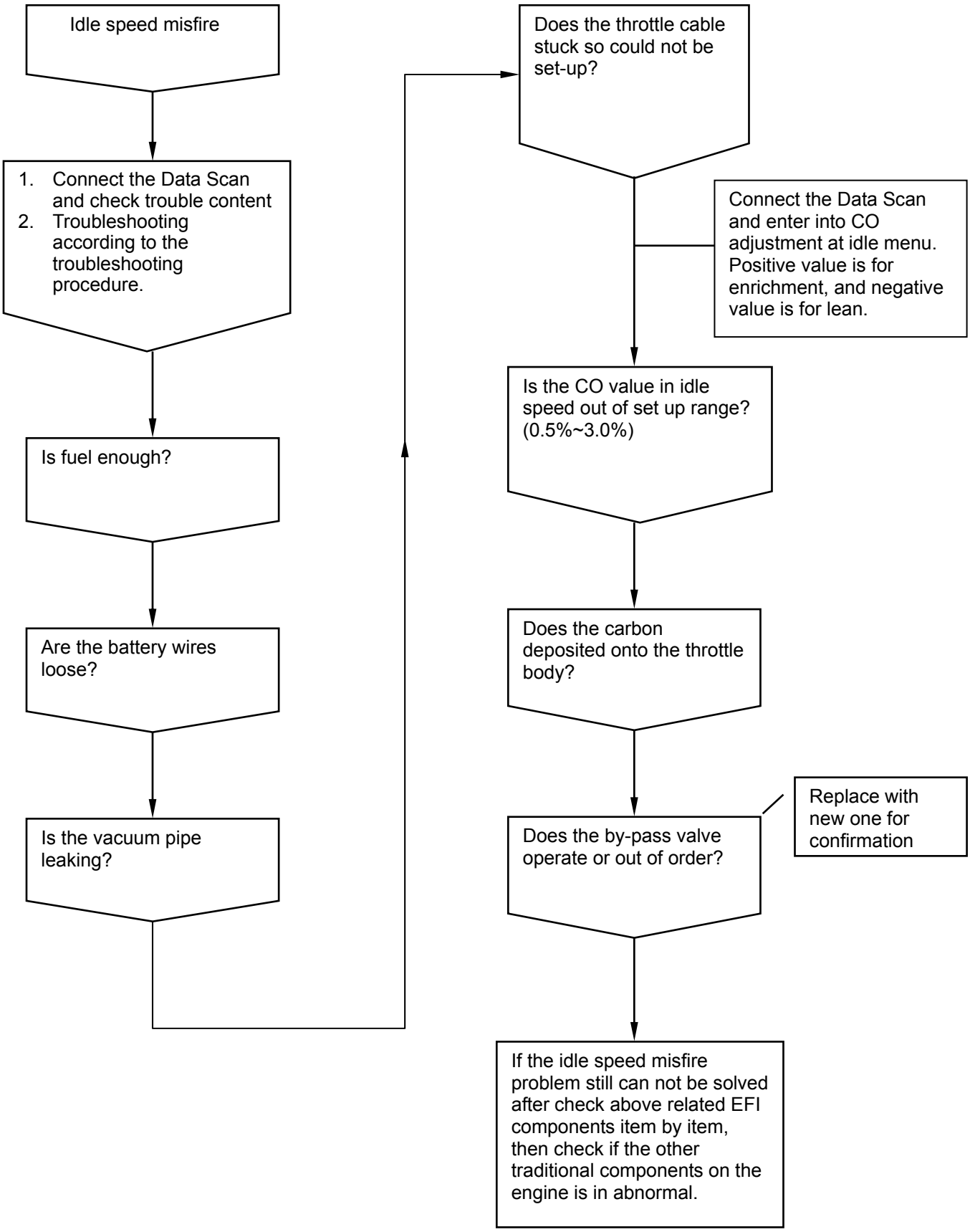
EFi circuit inspection



Engine cannot be started or difficult to start.

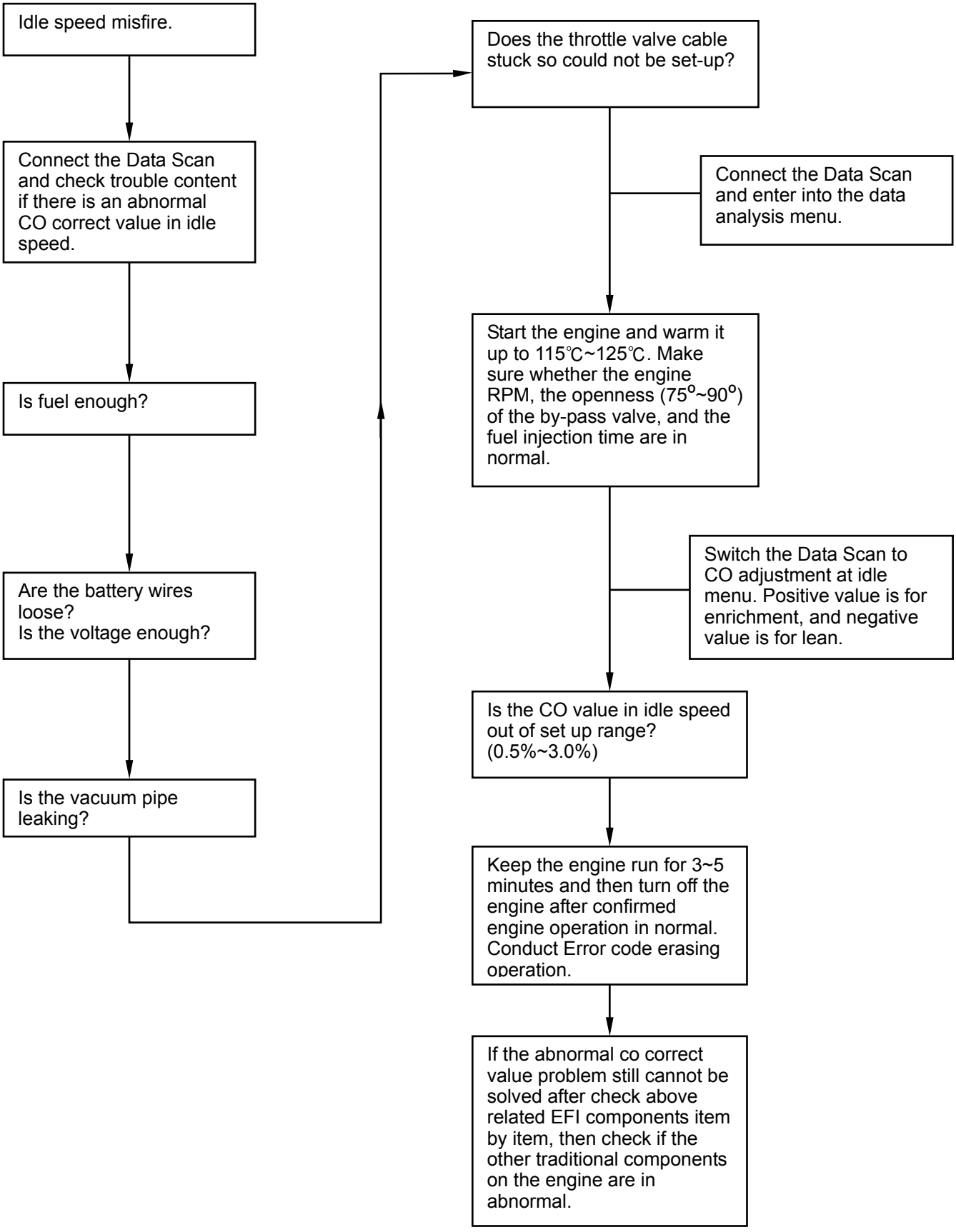


Diagnosis of Idle Speed Misfire



Abnormal CO value

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



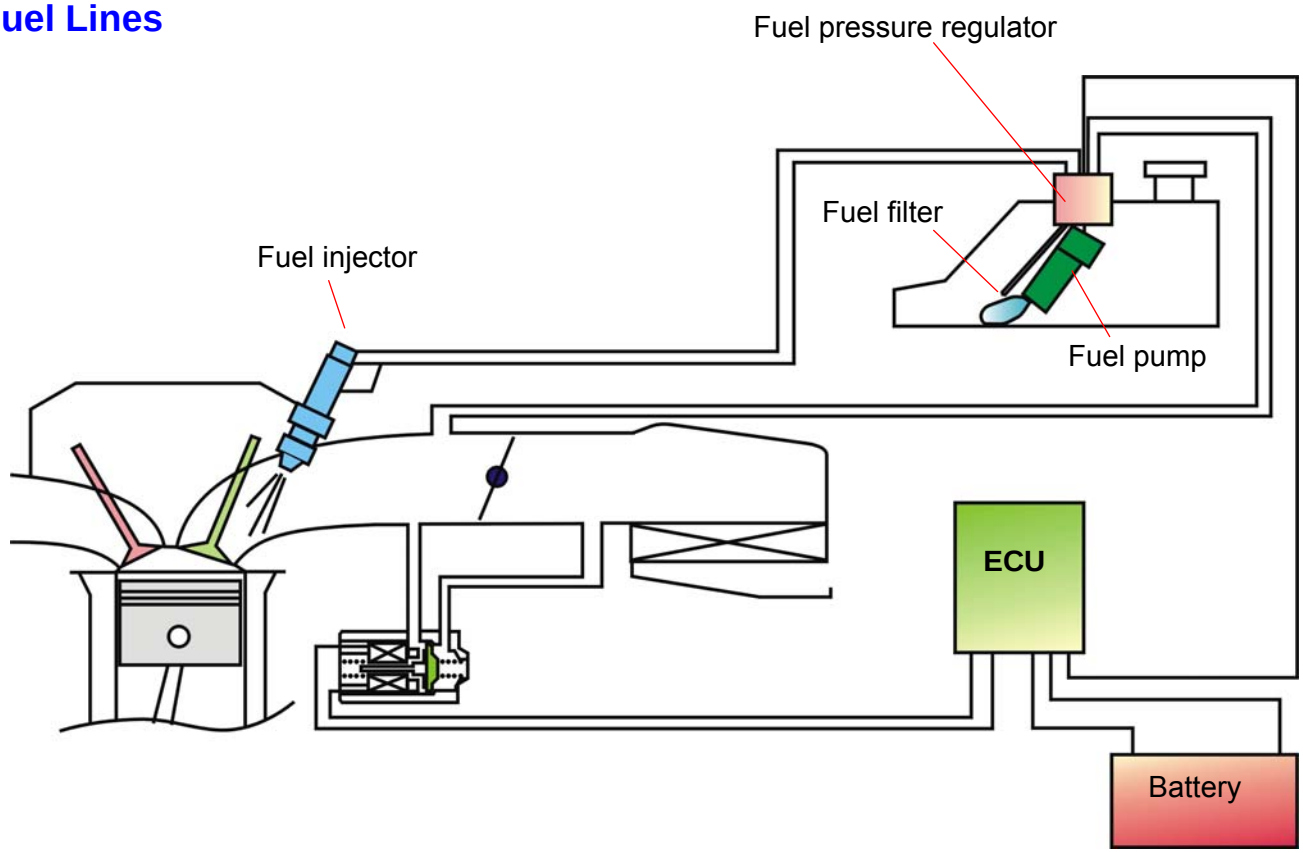
Throttle Body Clean Procedure

1. Key OFF, remove the throttle body.
2. Spray a little carburetor cleaner into the throttle body.
3. Wipe off the dirty oil with clean cloth or tissue.
4. Dry the throttle body with compressed air and install the throttle body. Connect the diagnostic tool and switch on.
5. Recommended clean frequency：every 12000

⚠ Caution

- Idle speed learning should be carried out to let ECU know the engine condition well. When performing the idle speed learning, run the engine at idle speed over 10 minutes after the engine temperature reaches the working temperature (around 70℃~95℃), and then ECU will get the parameters from sensors.

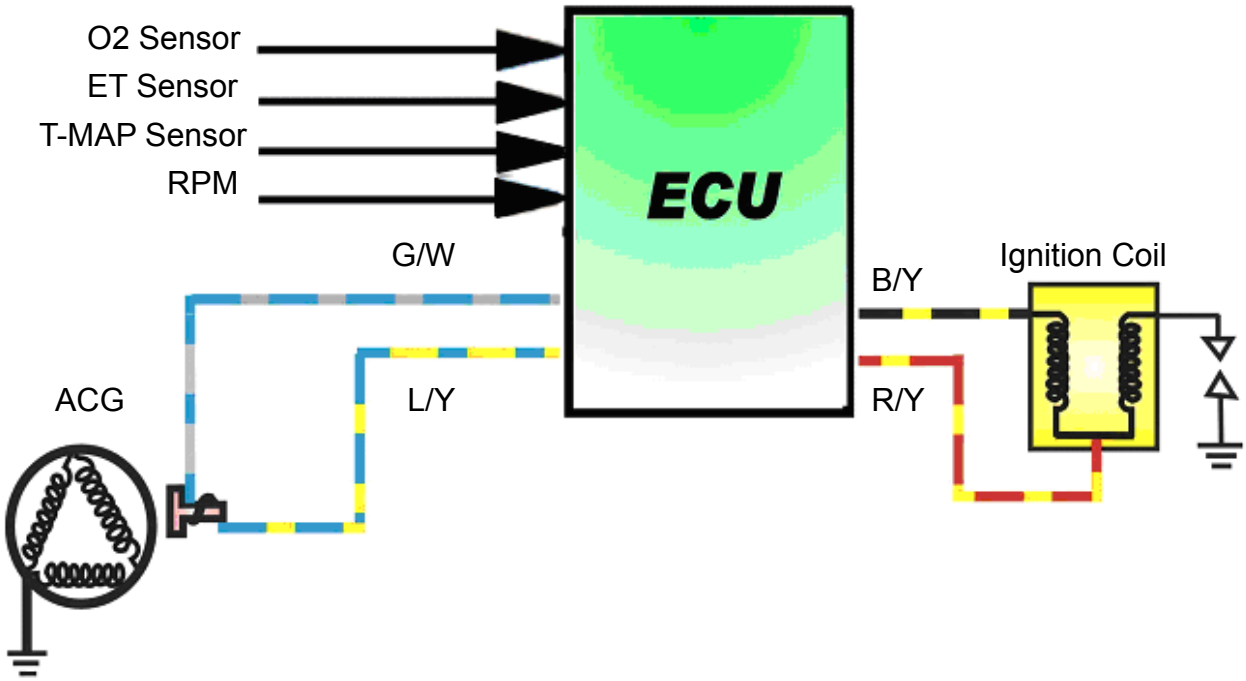
Fuel Lines



System description:

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

Ignition System



Principle of operation

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

Specification

1. **Ignition timing: BTDC 8° / 1700RPM**

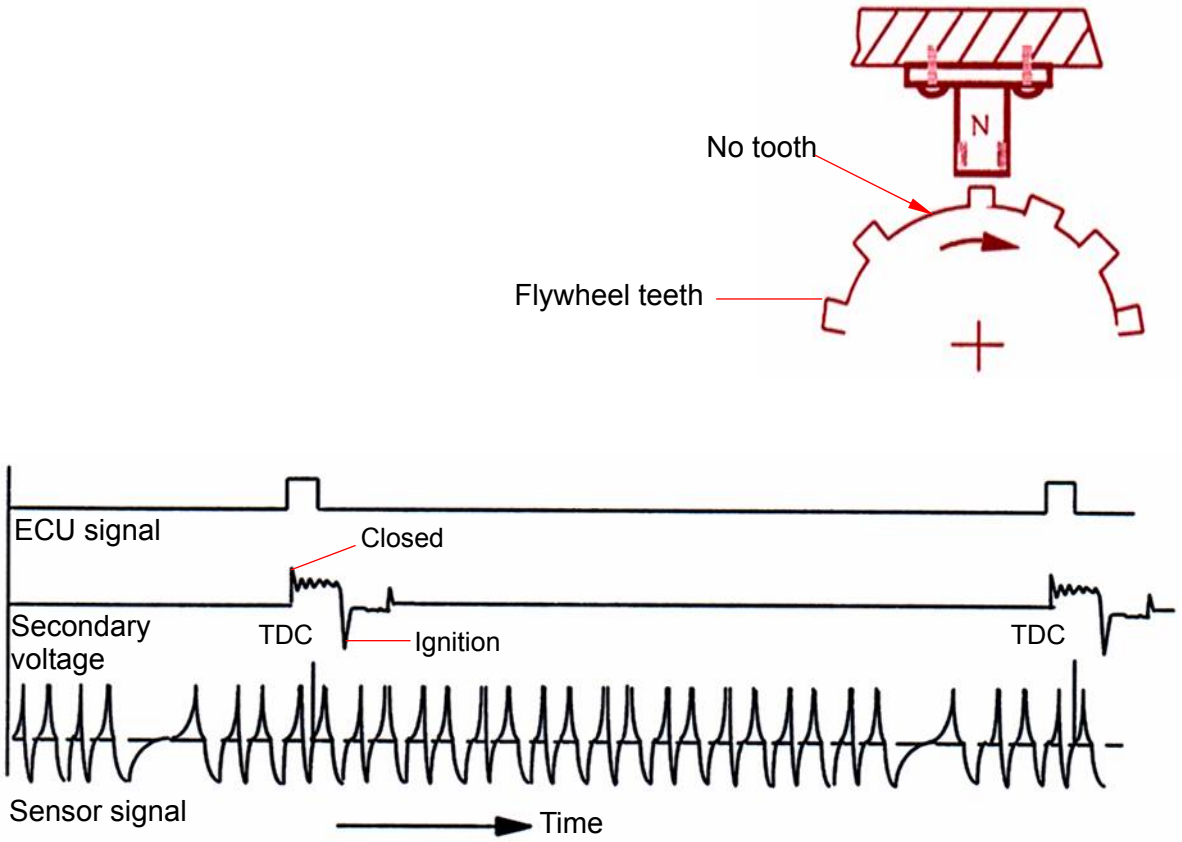
2. **Spark plug: NGK DPR7EA-9**
   Gap: 0.6~0.7mm

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

4. **Ignition coil**
   Primary circuit：0.75±10% (25ºC±10%)

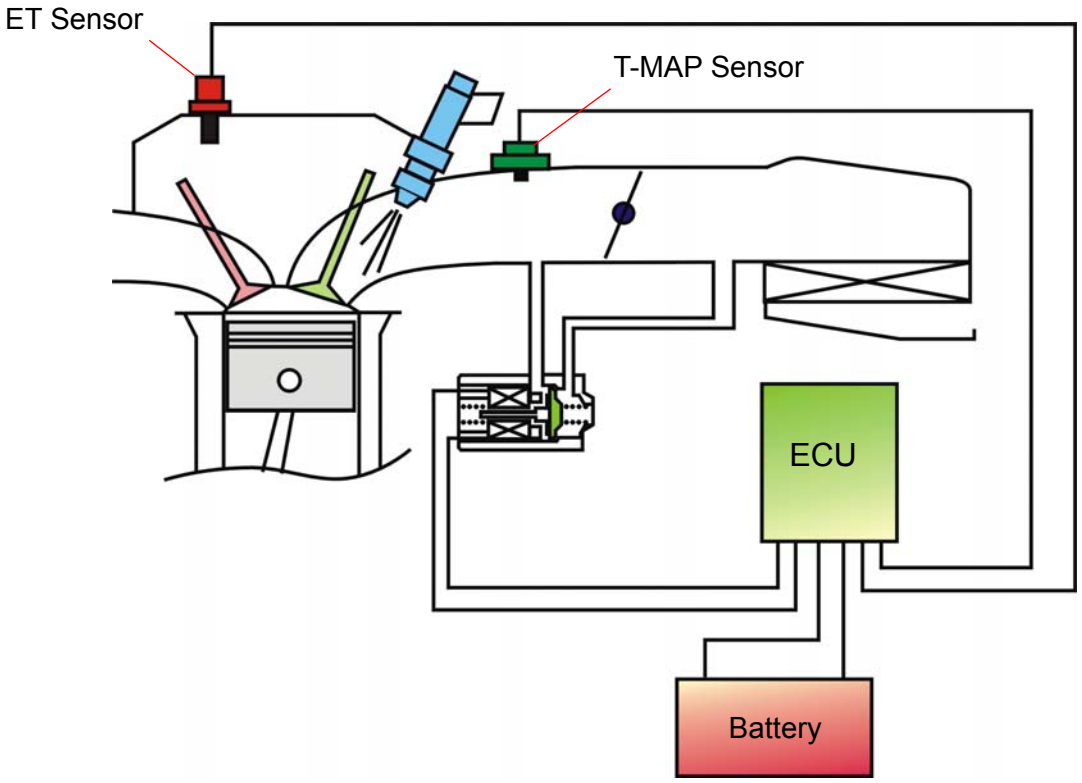
5. **Battery:**
   Type: YTX9-BS / GTX9-BS
   Capacity: 12V 8Ah

Crankshaft Position Sensor

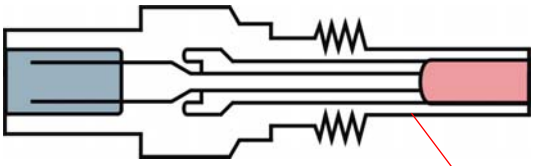


Description:
The magnetic field type sensor generates a voltage signal to calculate engine speed with ACG gear ring (24-1 tooth). There is one tooth every 15 degree on the gear ring. But, one of the teeth is blank for the TDC calculating base.

Temperature / Pressure Sensor

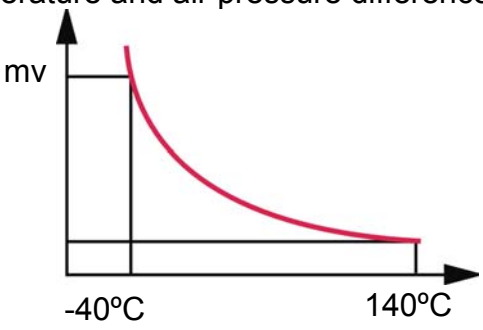


Engine temperature sensor:
According to the semiconductor's characteristic, the sensor detects the temperature of engine oil and metal parts and then sends a voltage signal to the ECU. On this base, the ECU can correct fuel injection and ignition timing.

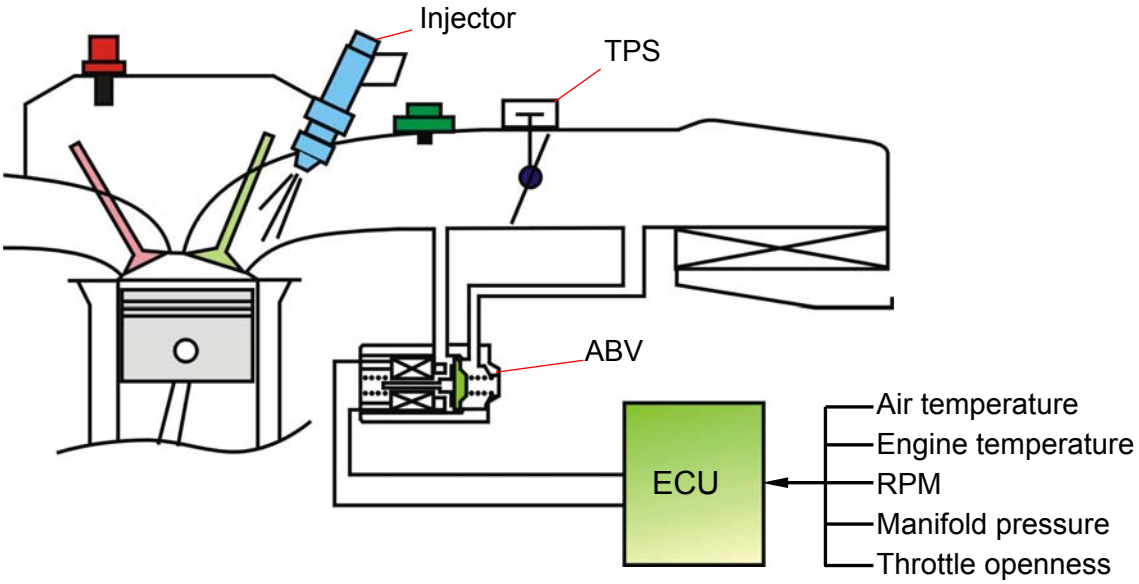


NTC- Negative Temperature Coefficient Resistor

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



Air By-pass Valve



Description：

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

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

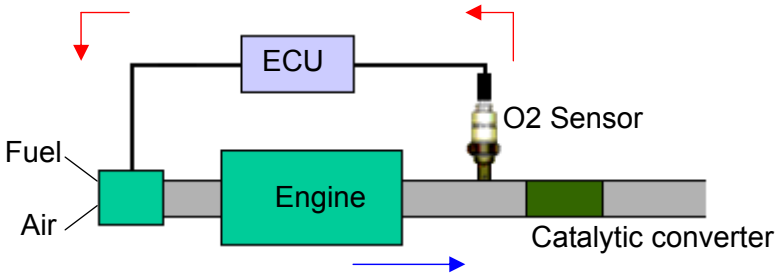
Fuel Injector

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

Fuel Pump

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

O2 Sensor

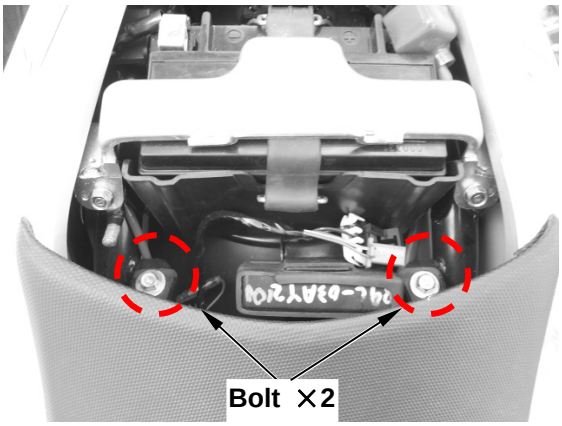


- The O2 sensor feeds signal to ECU, and the ECU can control the air/fuel rate around 14.6. It's a close –loop control system.
- The catalytic converter reaches the best converting rate when this 14.6 A/F ratio is maintained.
- The heating coil resistance <200kohm (30—45kohm).

Fuel Tank

Removal

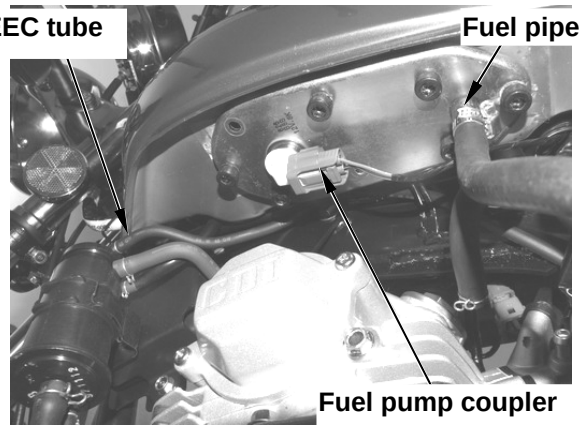
Remove the right / left front cover.
Remove the rear seat.
Remove the front seat (bolt x2).



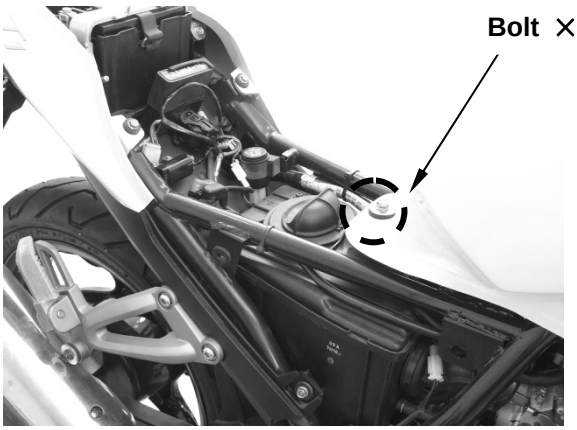
Release the fuel pipe band, fuel pump coupler, EEC tube.

Caution

- Make sure the fuel is not too much in the fuel tank. Pump out the fuel if necessary.



Remove the fuel tank rear bolt.
Remove the fuel tank.



Caution

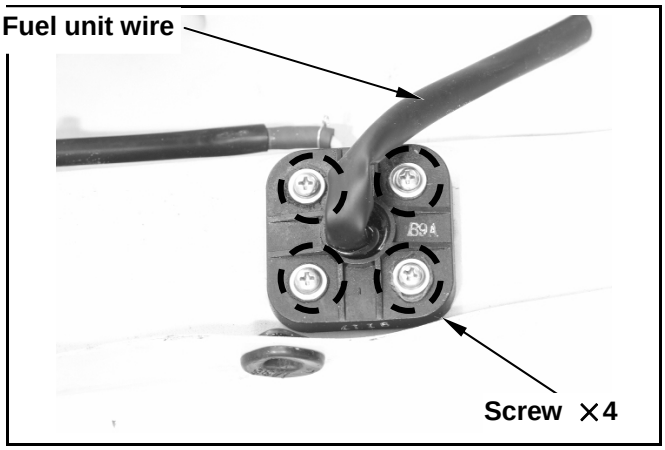
- If the fuel tank is damaged or leaking, replace with new one.

Installation

Install in the reverse order of removal.

Fuel Unit

Remove the fuel unit screws.
Remove the fuel unit.

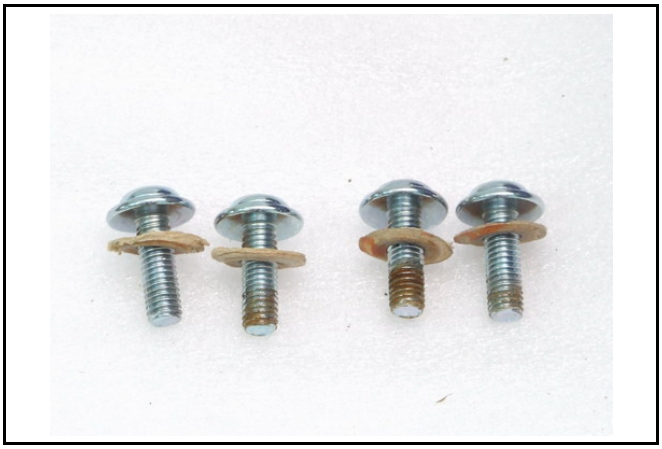


Installation

Install in the reverse order of removal.

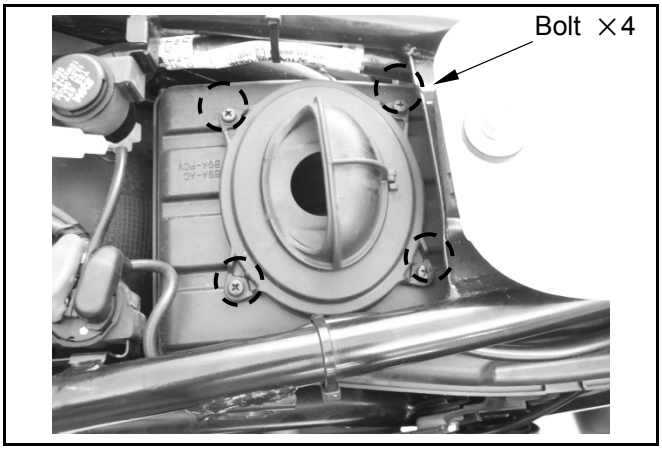
Caution

- Do not bend the fuel unit float arm.
- Do not fill out too much fuel in the tank.
- Apply glue to the screw before installation.
- Replace the washer with new one.



Air Cleaner

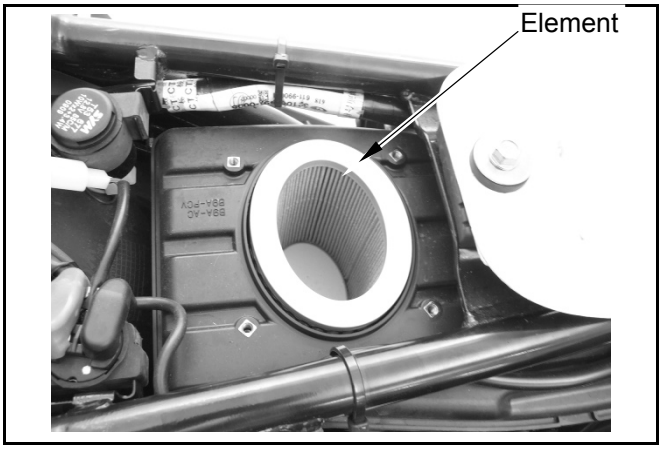
Remove the rear and front seat.
Remove the air cleaner cover (bolt x4).



Remove the air cleaner element.

Caution

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



Installation

Install in the reverse order of removal.

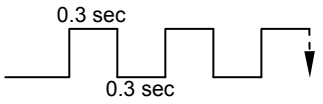
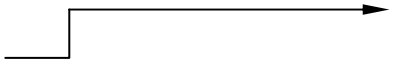
EFi Troubleshooting and Solution

Readings of Trouble Code through Check Lamp

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

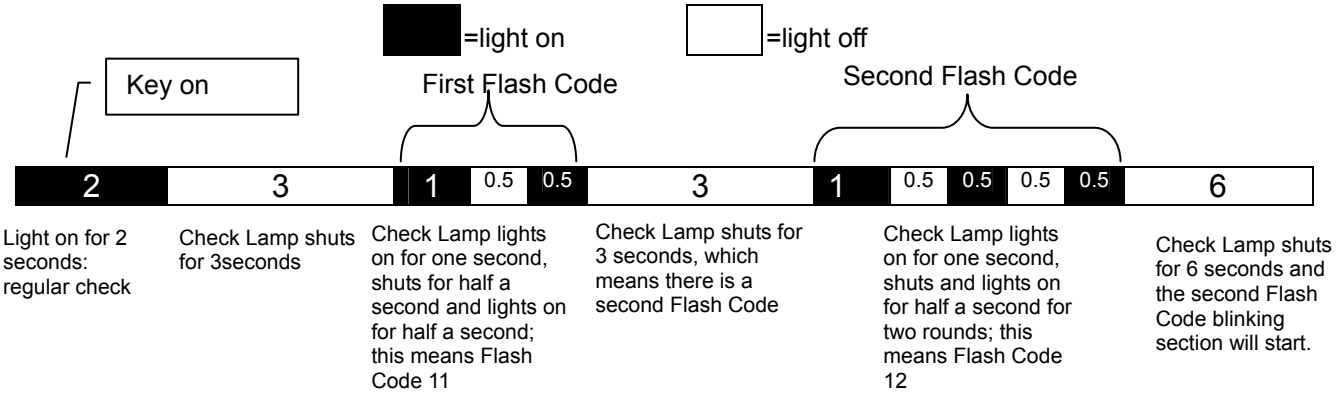
To show “Service Priority”

Once the error in the EFi system is detected during driving (or anytime when the engine is running).The Check Lamp on the speedometer will start to light in two ways.
Service Priority 1：Check Lamp keeps blinking: to warn the driver that the vehicle should be checked **immediately**.
Service Priority 2：Check Lamp keeps lighting up: to warn the driver that the vehicle should be checked as soon as possible, yet the vehicle has **no immediate problem**.

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

To show “FLASH CODE”

Turn the key on without starting the engine; Check Lamp will start to show Flash Code for four times and then stop. If you turn the key off before Check Lamp shows Flash Code for four times, it will show another four times after you turn the key on again.
Check Lamp lights on for 1 second to show tens digit, and lights on for half a second to show units digit.



If the engine is started during Check Lamp is showing the Flash Code, Check Lamp will start to show the service priority by blinking or lighting up.

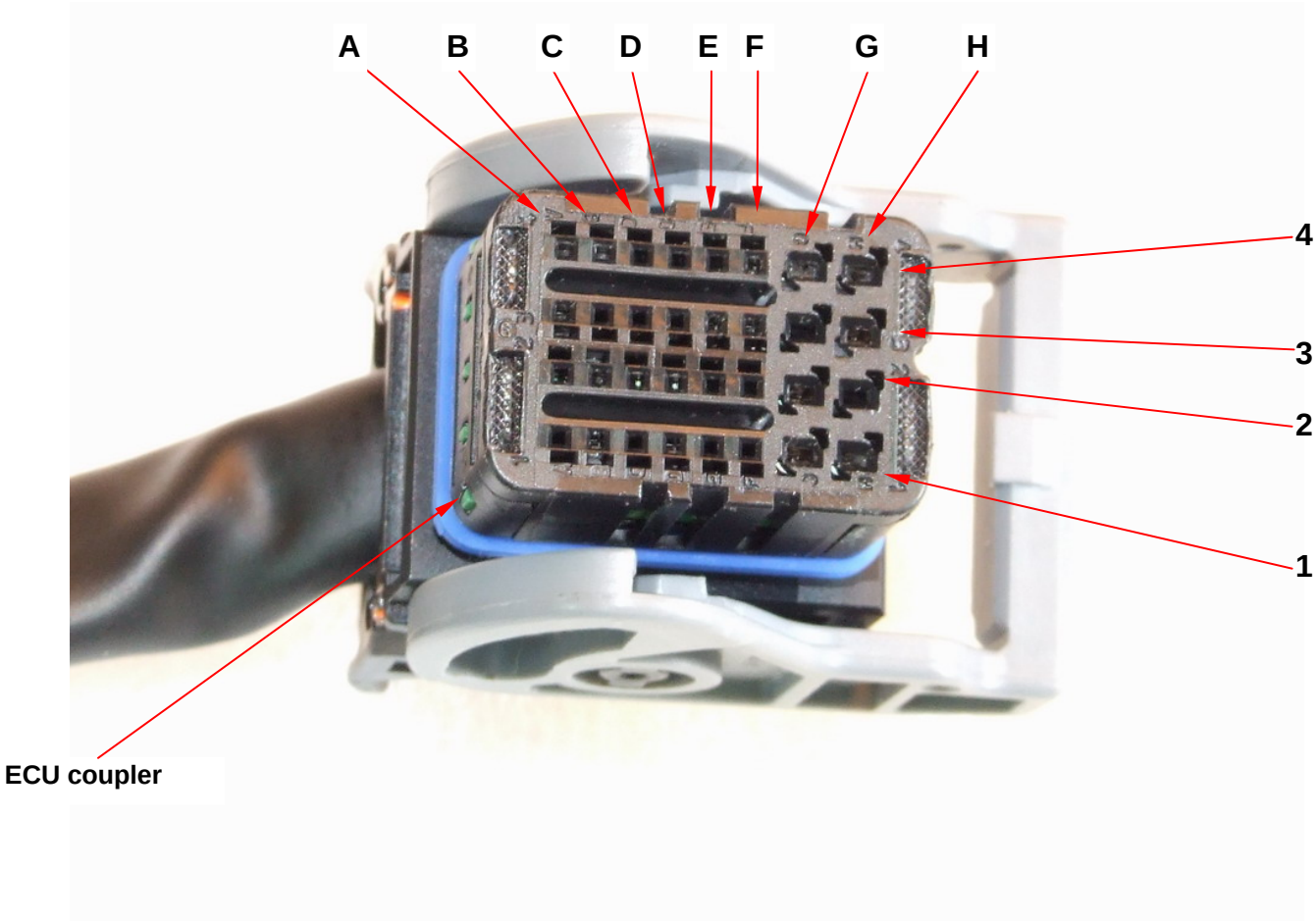
Error Code Message and Solution Operation

DTC code	Flash code	Service priority	Message	Solution operation
P0217	**1**	**1**	Engine temperature overheat	Stop the vehicle immediately, and solve it with priority. Check the lubricant system for malfunction. Check if the ignition or fuel supply system is in normal. Check if the engine is burnt. Make sure if the engine temperature sensor is in normal. Make sure if the connector is in normal.
P0335	**2**	**2**	Abnormal crankshaft position sensor	Check if the connection of the crank position sensor is open-circuit. Check if the gap between the sensor and gear tooth is within specification. Check if the crank rotation is run-out. Check if the sensor is in normal according to the new component replacement procedure.
P0120	**3**	**2**	Abnormal throttle position sensor learning value	Connect the diagnostic and reset the throttle valve position. Make sure if the idle speed position is within standard range. Make sure if the wire circuit of the throttle valve position sensor is loosen or short. Check if the openness of idle speed by-pass valve is within specification. (40~100%) Adjust the idle speed CO value to specified range. (0.5%~2.0%) If this problem symptom still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P0121	**4**	**2**	Abnormal throttle position sensor output voltage	Make sure if the wire circuit of the throttle valve position sensor is loosen or short. If this problem symptom still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P0124	**5**	**2**	Abnormal throttle position sensor turning speed	Make sure if the wire circuit of the throttle valve position sensor is loosen or short. If this problem still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P0560	**6**	**1**	Abnormal battery voltage	Make sure if the battery voltage is too low or high (below 10V or exceed 16V) Make sure if the ACG generator charging system circuit is short or abnormal. Check if the G4 terminal on the ECU to battery positive post is short. Make sure if the battery is in normal. Replace it with new if the battery is out or order.
P0110	**7**	**2**	Abnormal intake air temperature sensor	Make sure if the sensor's wire is in open-circuit. Make sure if the sensor is normal according to the new component replacement procedure.

DTC code	Flash code	Service priority	Message	Solution operation
P0505	9	2	Abnormal air bypass valve learning value	Check if the air bypass valve openness is in normal. Check if the intake manifold is leaking.
P0200	10	2	Abnormal fuel injector	Make sure if the fuel injector resistance is within specification. (12Ω, 20℃) Check if the connector or wire is in open-circuit. (The G1 terminal of ECU) Make sure if the fuel injector power supplied is normal. (12~15V)
P0350	11	2	Abnormal ignition circuit	Make sure if the ignition coil resistor is within specification. (0.63Ω, 23℃) Make sure if the connector or wire is in open-circuit. (The 12th terminal of ECU) Make sure if the ignition coil's power supplied is in normal. (12~15V)
P0230	12	2	Abnormal fuel pump relay	Make sure if the connector or wire is in open-circuit. Replace with new relay to make sure if this abnormal is disappeared.
P0219	13	2	Engine over-RPM	Engine speed exceed safety limit. Decrease the speed and then the DTC code disappeared. Check if the CVT belt is broken.
P0700	15	2	Too high RPM when starting engine	If the engine RPM exceeds 3000rpm as starting, in order to prevent run-away accident, the ECU will decrease engine speed or stop the engine. Rider should avoid to starting engine with WOT suddenly. Check if acceleration cable is stuck. Re-set the idle speed adjustment position.
P0115	16	2	Abnormal engine temperature sensor	Make sure if the sensor's resistor is within specification. (60℃, 703.8±40.9Ω) Make sure if the sensor's wire is in open-circuit. (9th terminal of ECU)
P0650	18	2	Abnormal check lamp	Check if the check lamp is burnt. Check if the check lamp circuit is open. (C2 terminal of ECU)
P0136	19	2	Abnormal O2 sensor wiring	Check O2 sensor coupler. Check O2 sensor wiring (D2, D1 terminal of ECU).
P0141	20	2	Abnormal O2 sensor heater wiring	Check O2 sensor coupler. Check O2 sensor wiring (H1 terminal of ECU). Check O2 sensor white cable voltage (12V).
P0105	21	2	Abnormal MAP sensor	Clean the sensor. Replace the ECU.

DTC code	Flash code	Service priority	Message	Solution operation
P0170	23	2	Fuel supply too thick or too thin	Check the fuel tank. Check and clean the air cleaner. Check the fuel injector, O2 sensor and fuel pump.
P1001	25	2	Abnormal reset coupler	Check the coupler wiring.

ECU Coupler Terminal Layout：



EFi System Diagnostic Tool - V70

Note:

- When problems arise, can be used for diagnosis tool of the fault is detected, and exclusion.
- In addition to testing, troubleshooting, another of the operation can be carried out data analysis-type monitor.

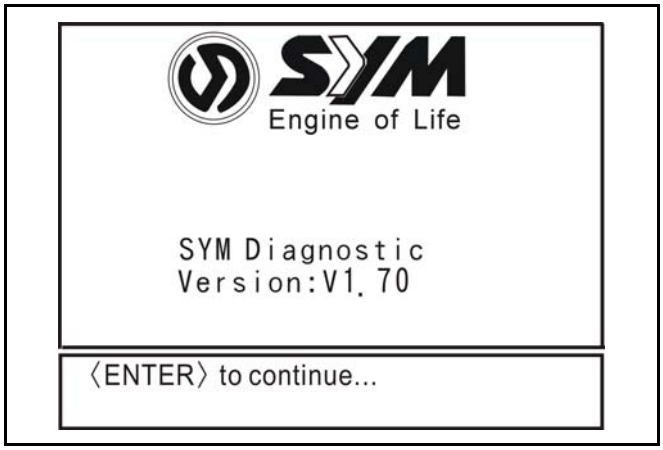
Method of Use:

1. Maintain engine flameout state, do not open main switch.
2. Opened the luggage box lighting light cover (screw x2), connected to the diagnostic connector for diagnosis tool.
3. Then open the main switch and the diagnosis tool power switch after diagnosis display screen appeared the words connection.
4. Press the "ENTER" button into the main screen (there are 6 major functions: ECU ID, DATA STREAM, FREEZED DATA, TROUBLE CODE, ERASE TB CODE and CO ADAPTION)
5. Use ▲, ▼ select button under the function, press the "ENTER" button access into various functions.
   Example: select "DATA STREAM," by the "ENTER" button, the screen showed that the existing fault codes; indicates no fault "system is OK."
6. Press "EXIT" buttom to leave of the various functions.
7. Must to close the main switch or power switch of the diagnosis tool after, and then can removal of diagnosis tool coupler.

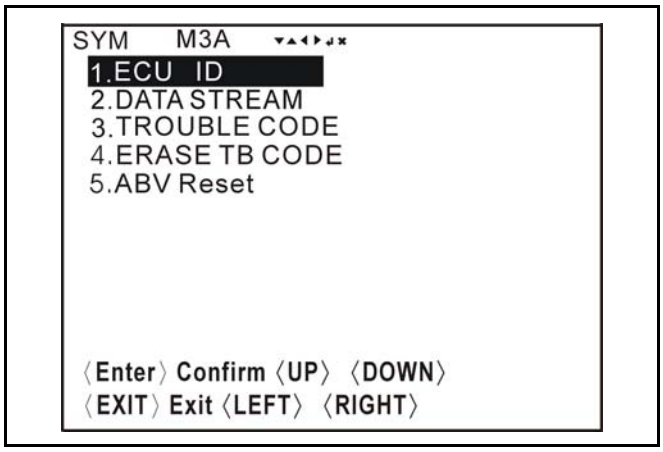
Diagnostic tool illustration

Connect the diagnostic tool wire connector and turn on the main switch.
Press <Enter> button to proceed.

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

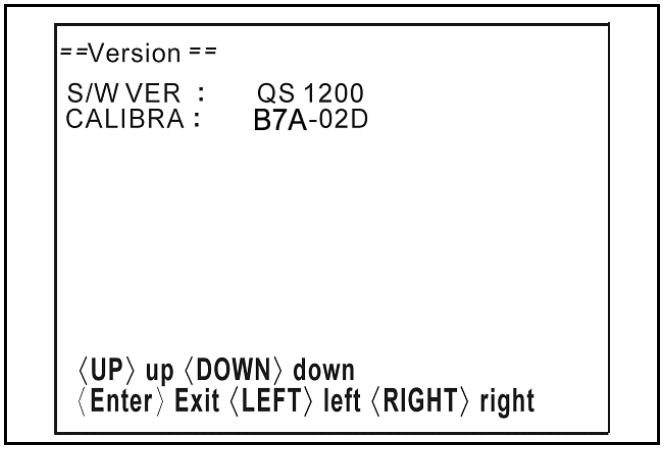


Press <Enter> button to enter ECU ID version page.



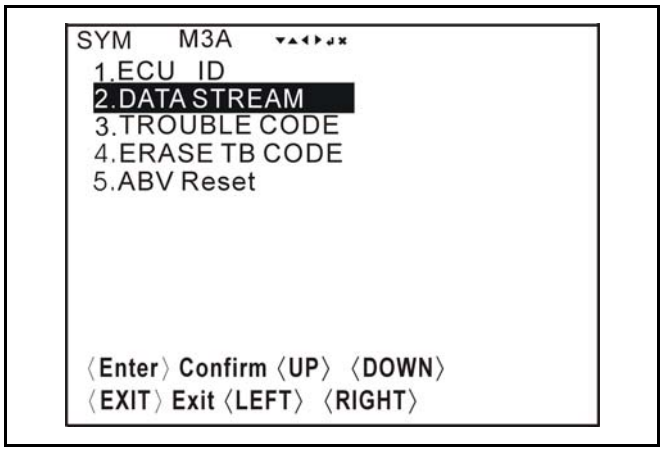
System Information

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

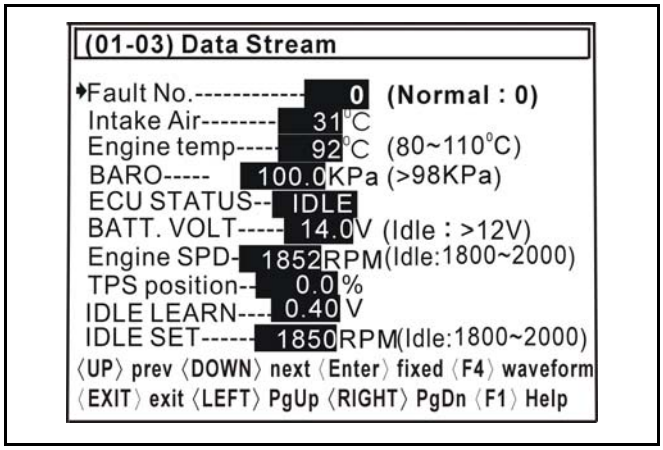


DATA STREAM

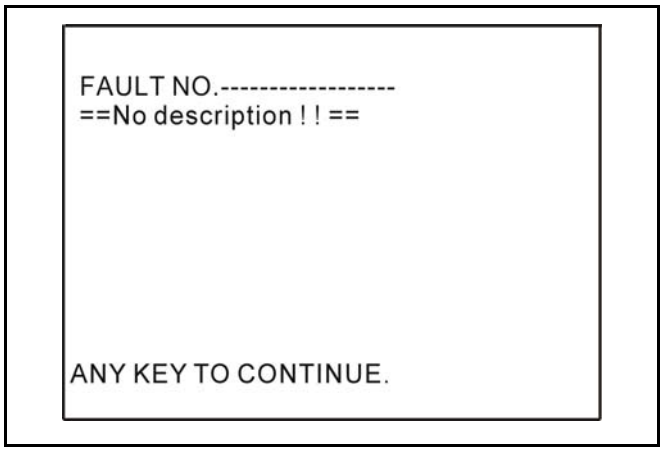
Press <Enter> button to enter Data Stream page.



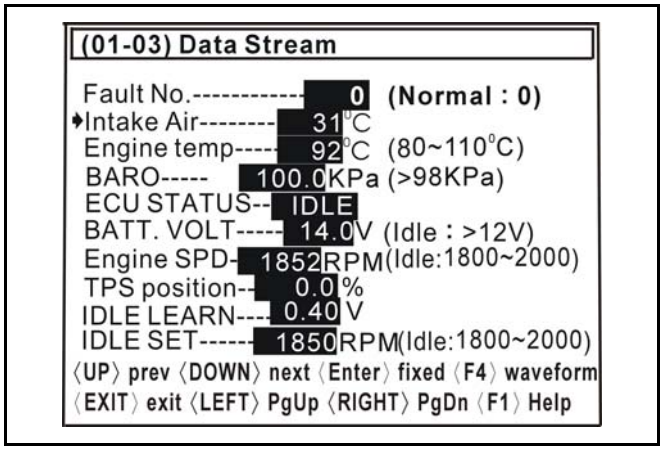
Press <UP> or <DOWN> button to choose Fault No. item.



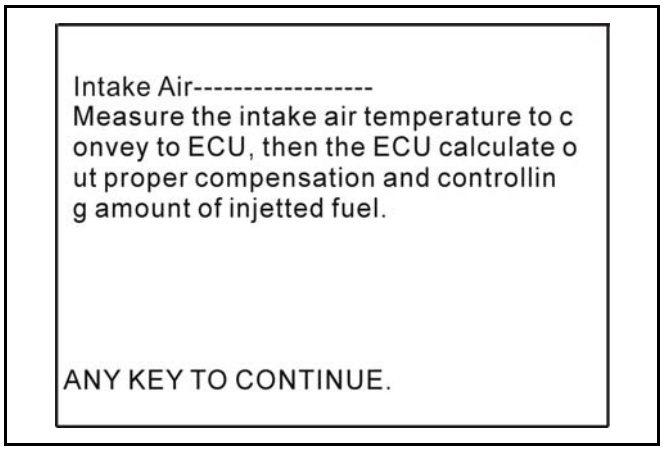
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



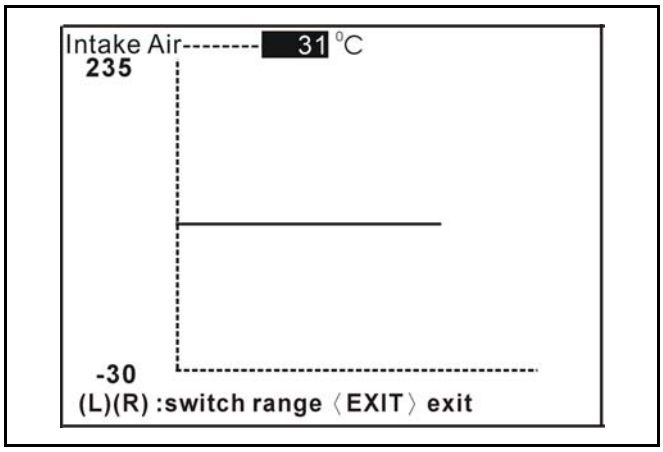
Press <UP> or <DOWN> button to choose Intake Air item.



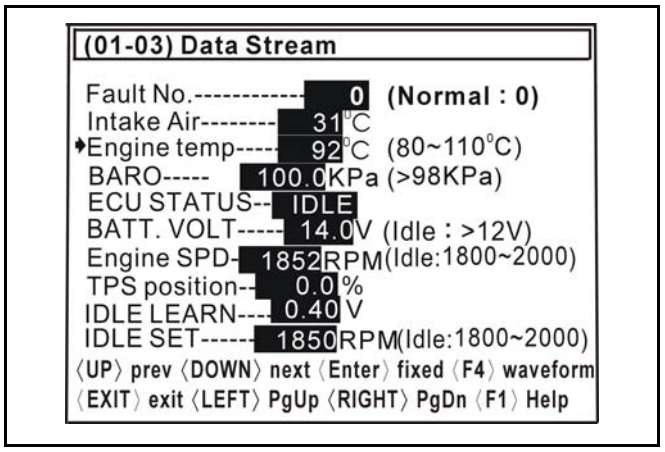
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



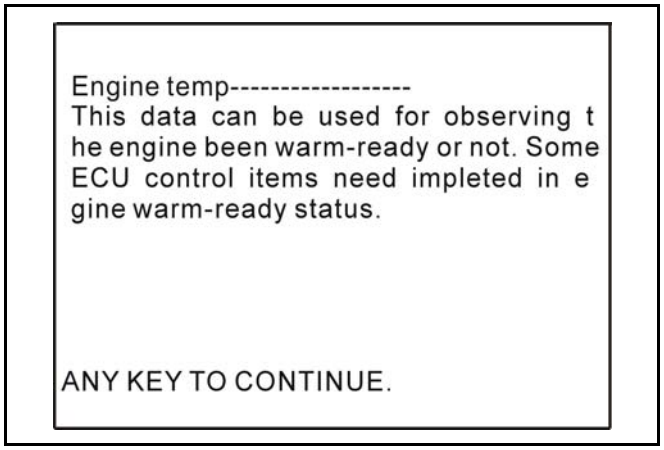
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



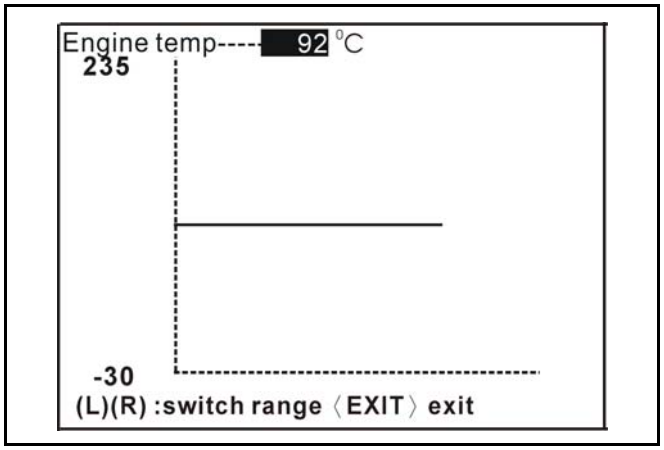
Press <UP> or <DOWN> button to choose Engine Temp item.



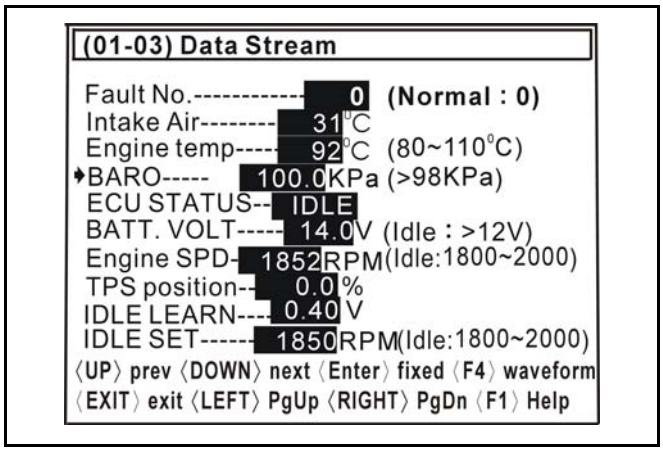
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



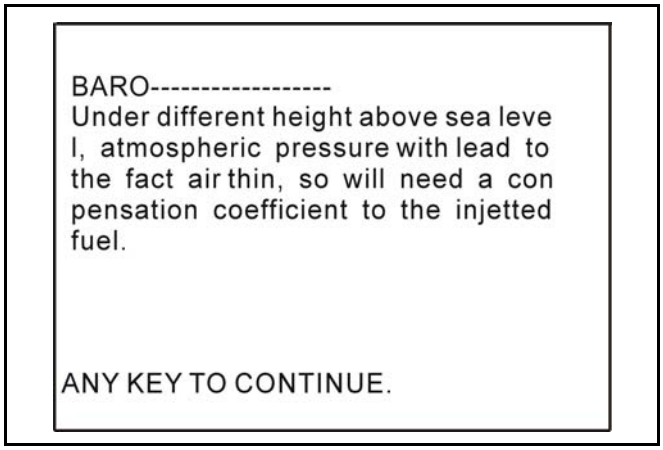
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



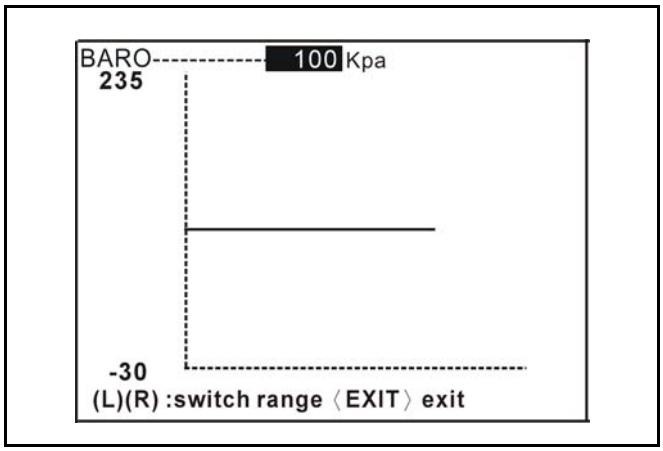
Press <UP> or <DOWN> button to choose BARO item.



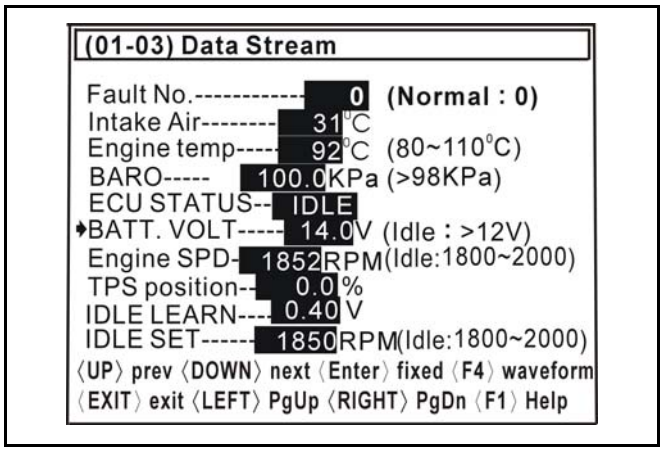
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



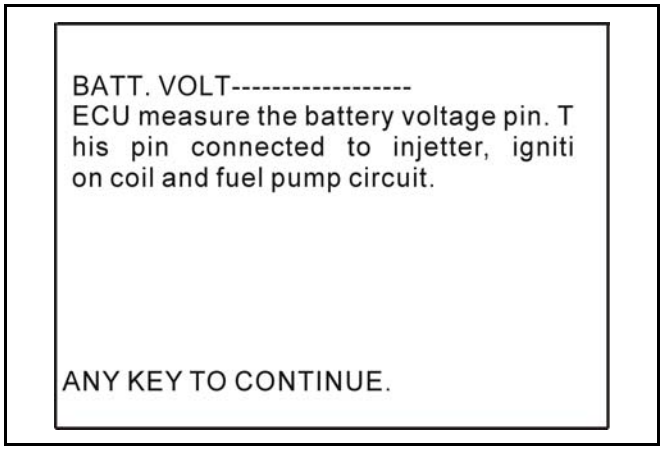
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



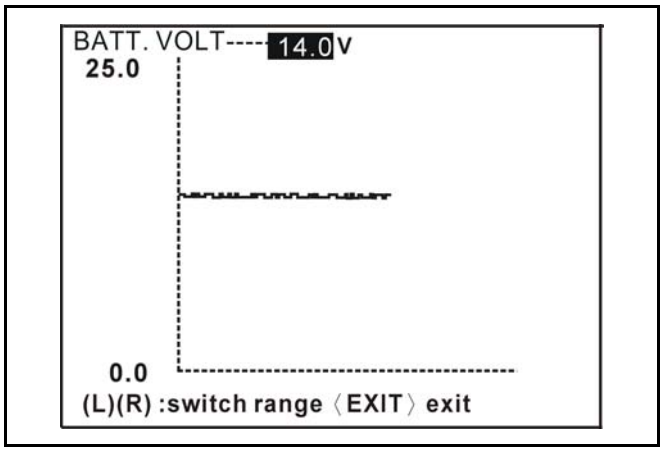
Press <UP> or <DOWN> button to choose BATT. VOLT item.



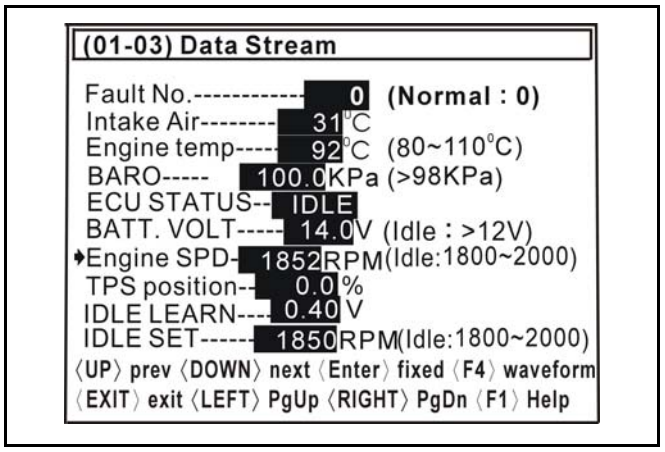
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



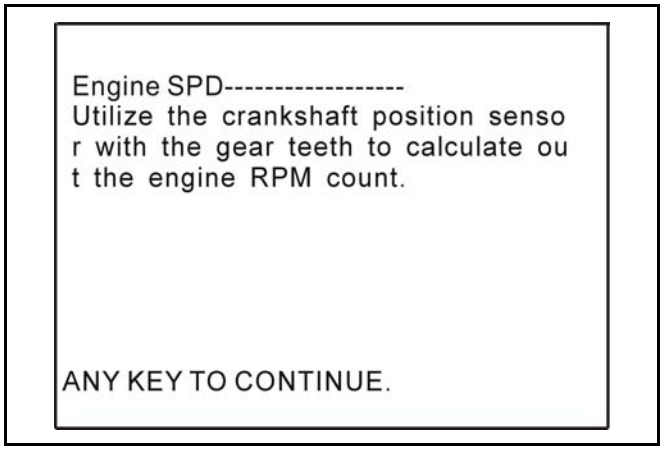
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



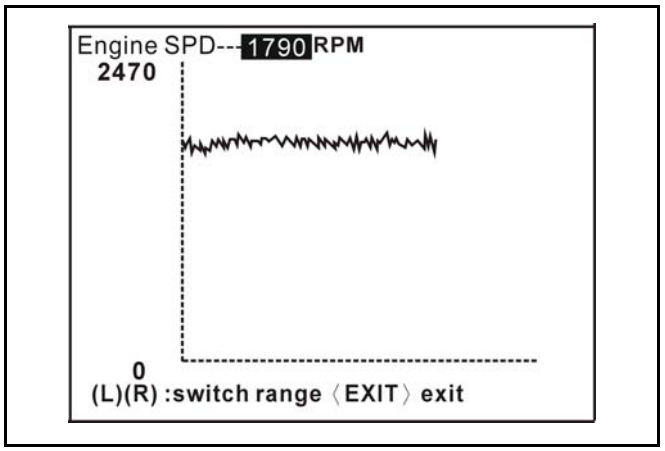
Press <UP> or <DOWN> button to choose Engine SPD item.



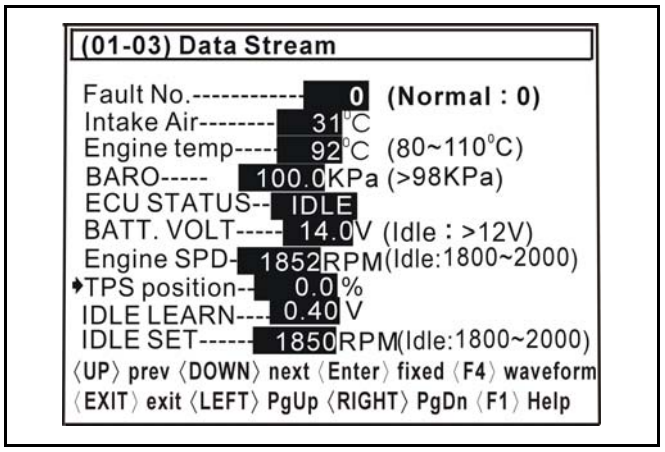
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



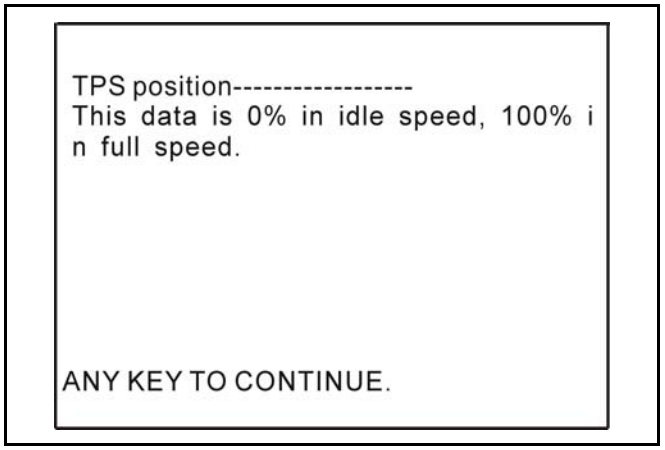
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



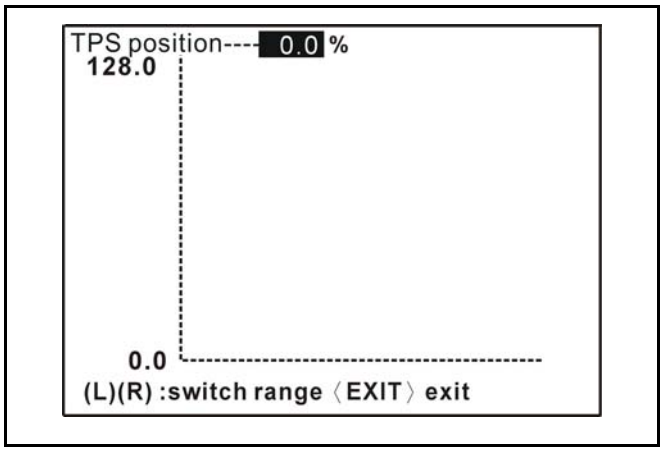
Press <UP> or <DOWN> button to choose TPS position item.



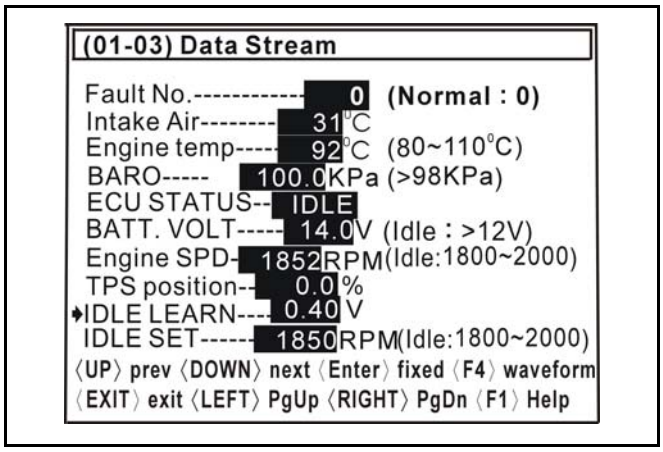
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



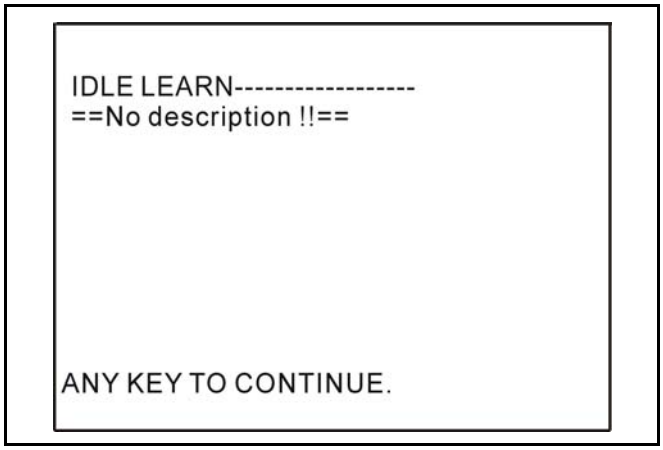
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



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



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



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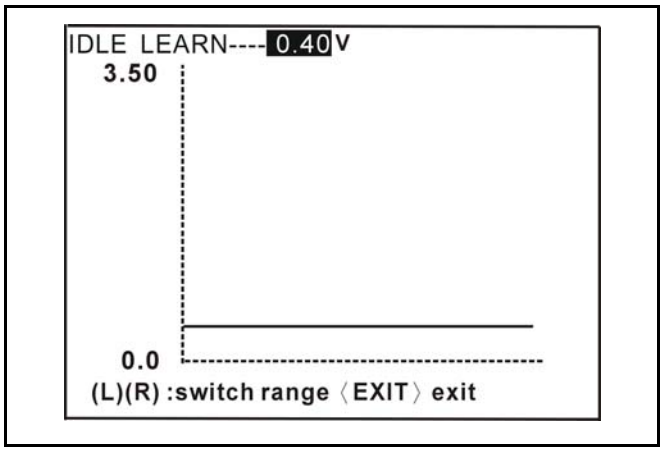
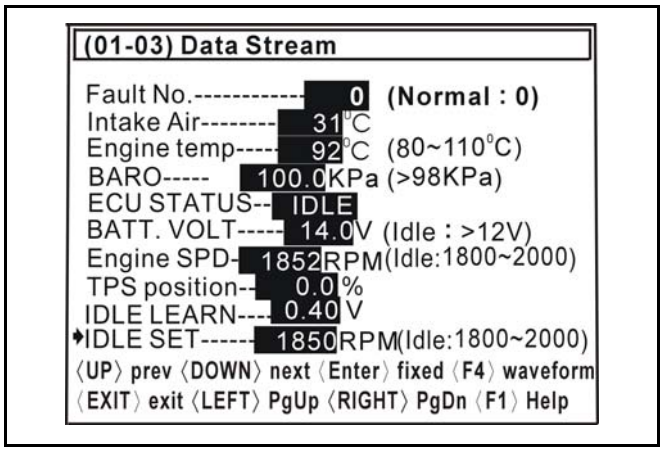
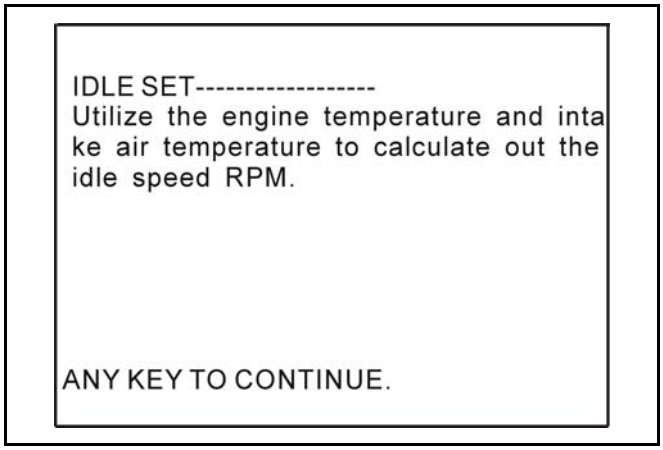


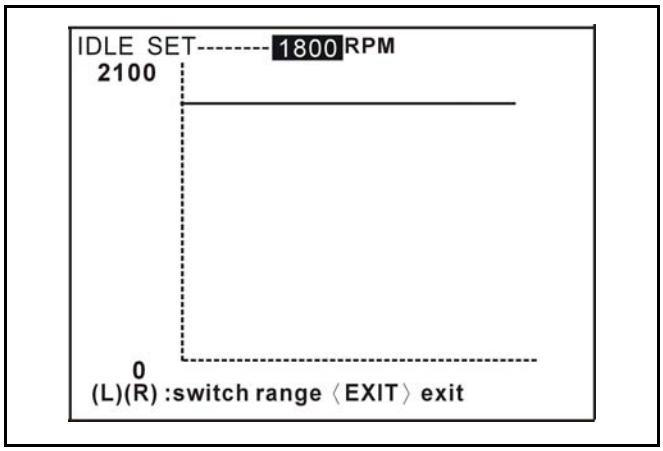
Press <UP> or <DOWN> button to choose IDLE SET item.



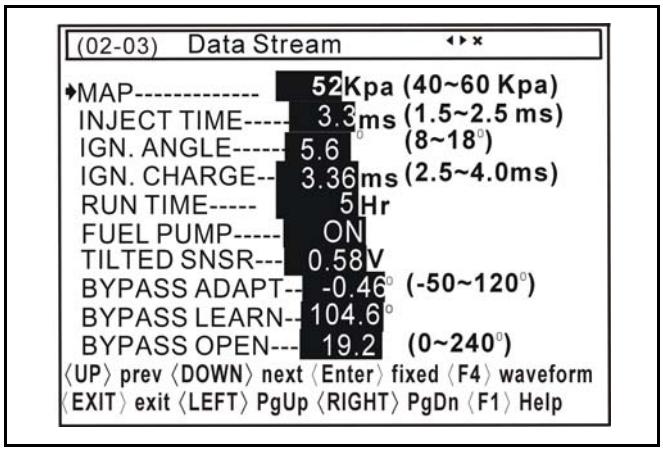
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



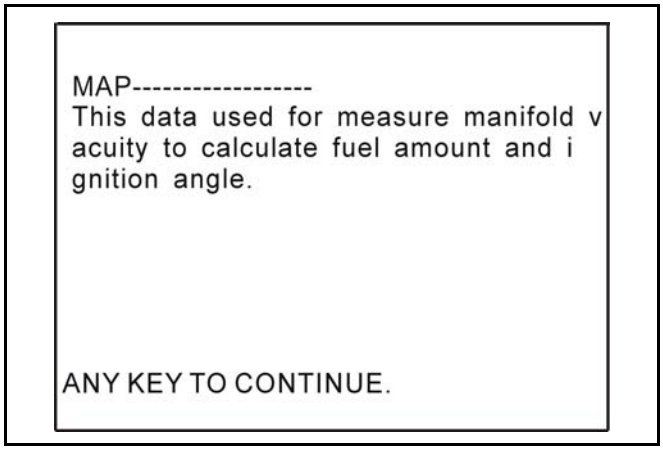
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



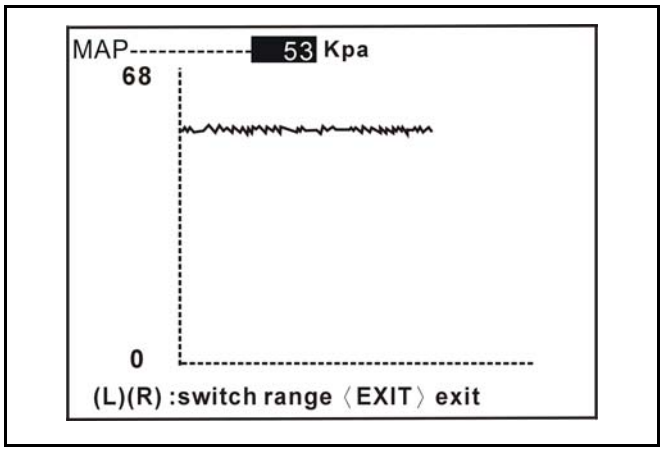
Press <RIGHT> button to get to next page to choose MAP item.



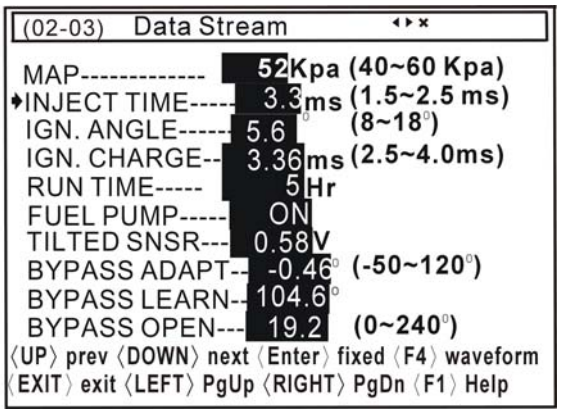
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



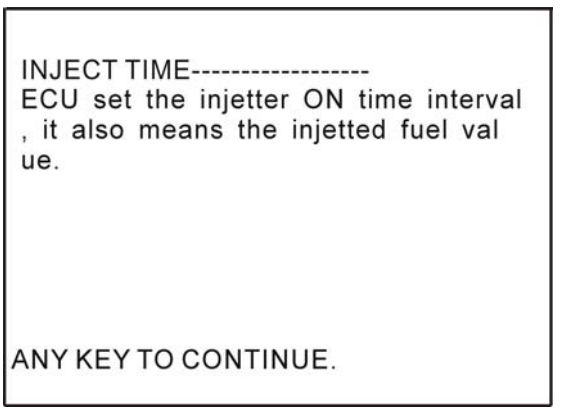
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



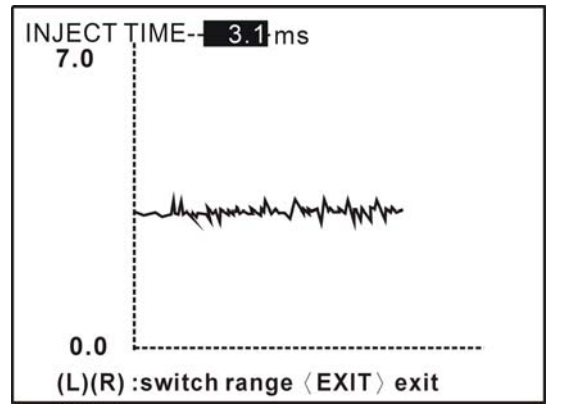
Press <UP> or <DOWN> button to choose INJECT TIME item.



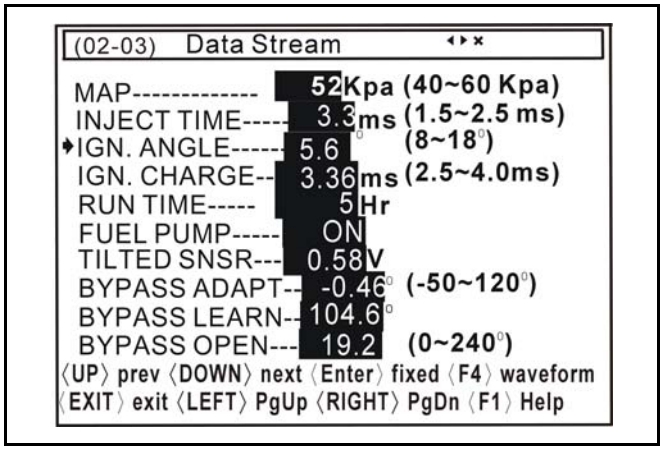
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



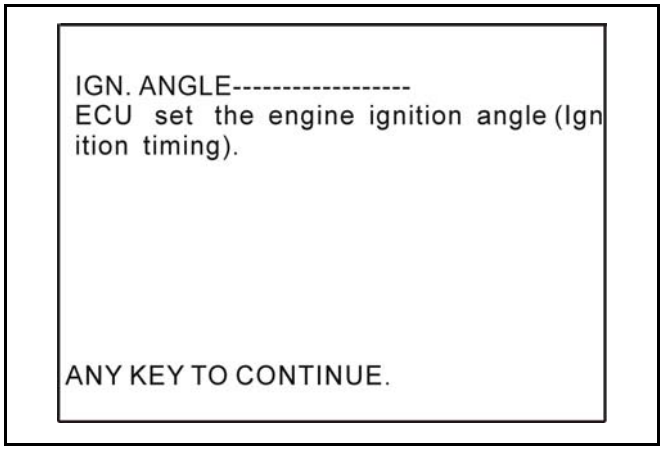
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



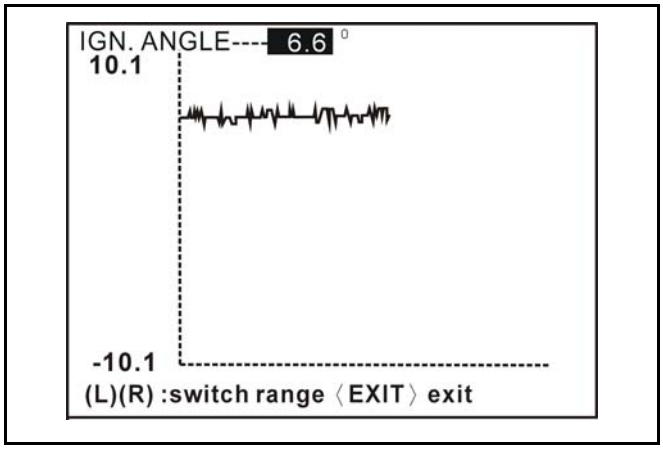
Press <UP> or <DOWN> button to choose IGN. ANGLE item.



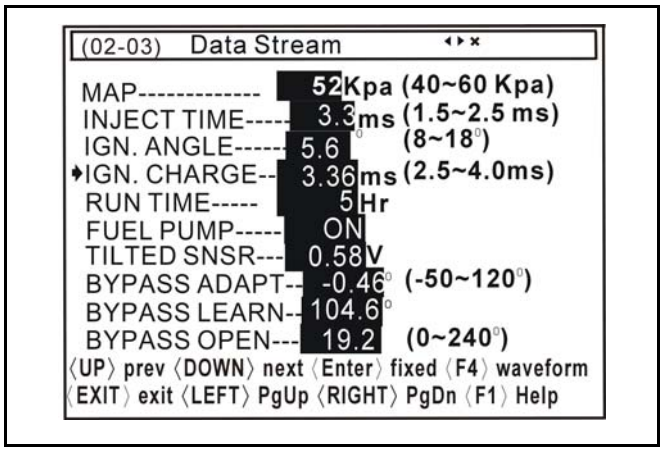
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



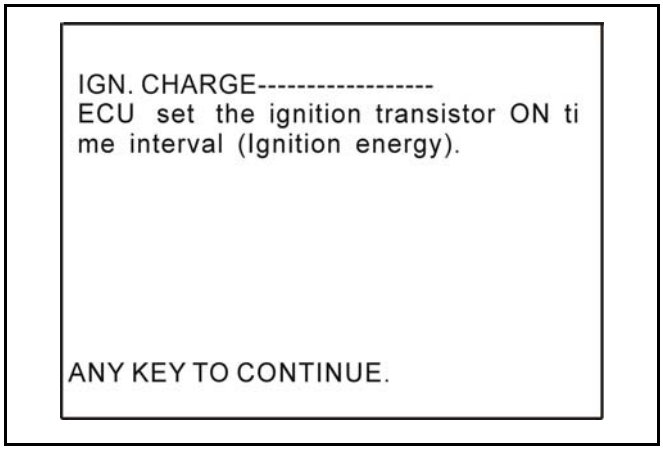
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



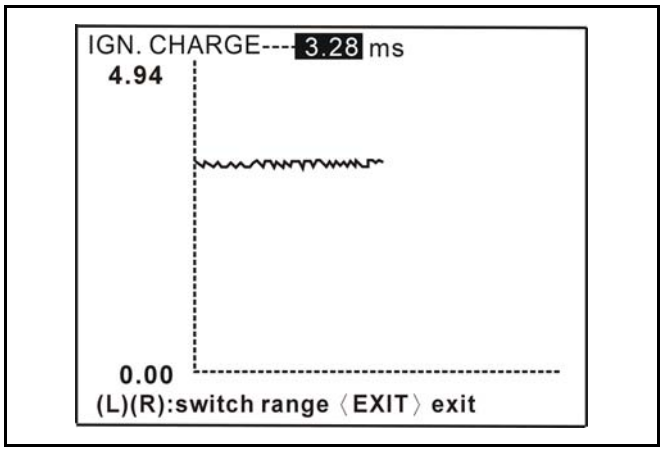
Press <UP> or <DOWN> button to choose IGN. CHARGE item.



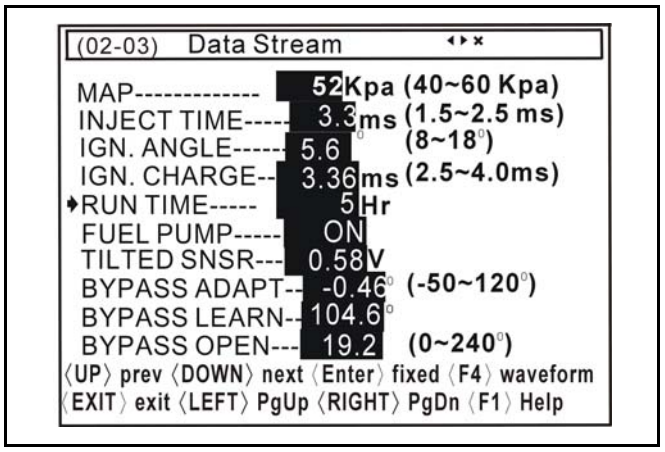
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



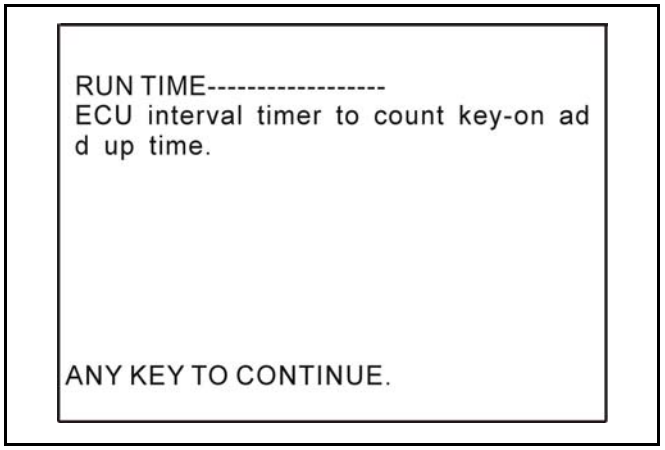
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



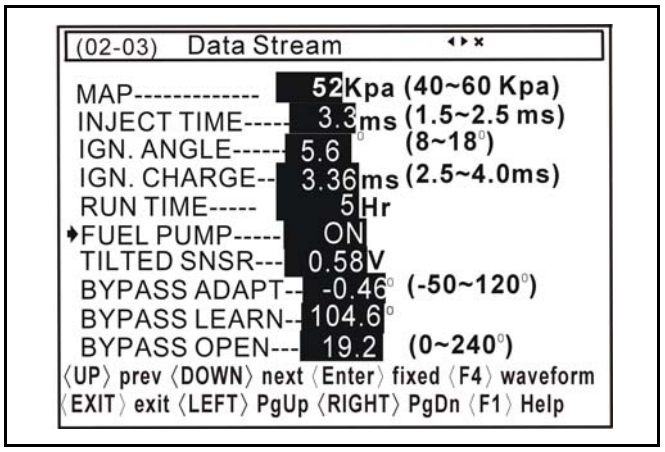
Press <UP> or <DOWN> button to choose RUN TIME item.



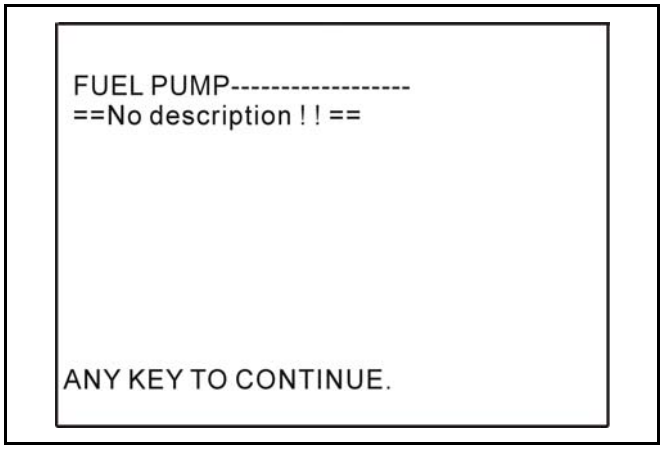
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



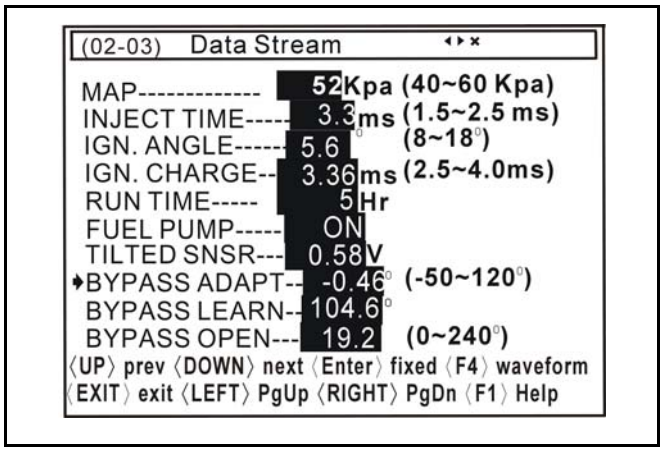
Press <UP> or <DOWN> button to choose FUEL PUMP item.



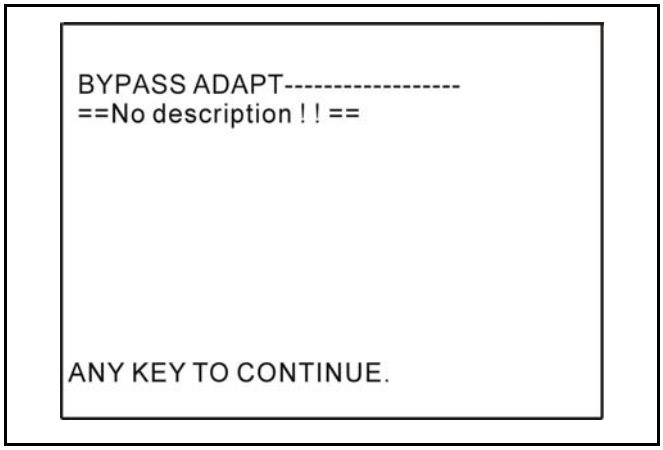
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



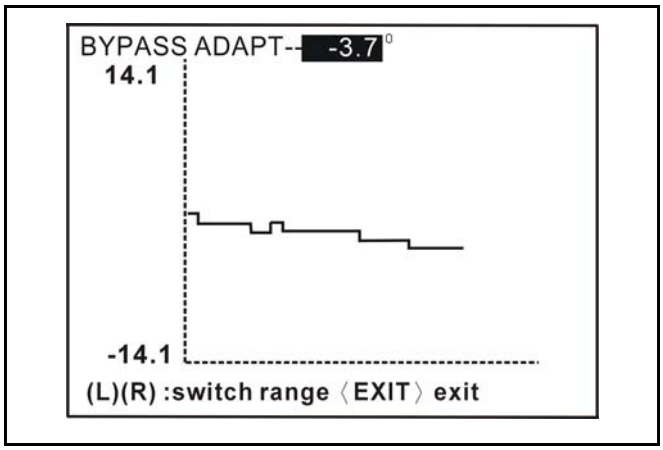
Press <UP> or <DOWN> button to choose BYPASS ADAPT item.



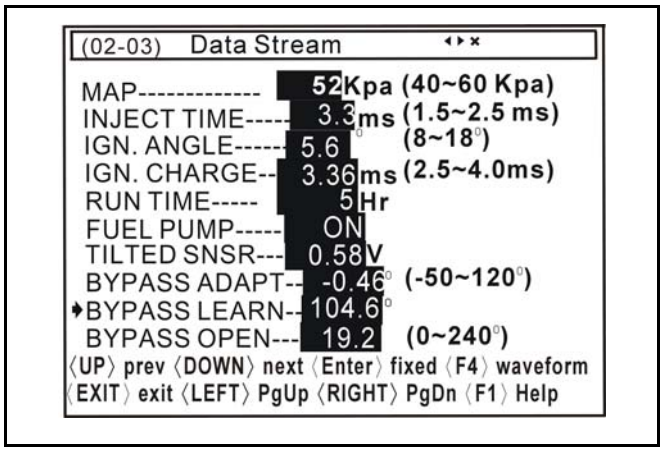
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



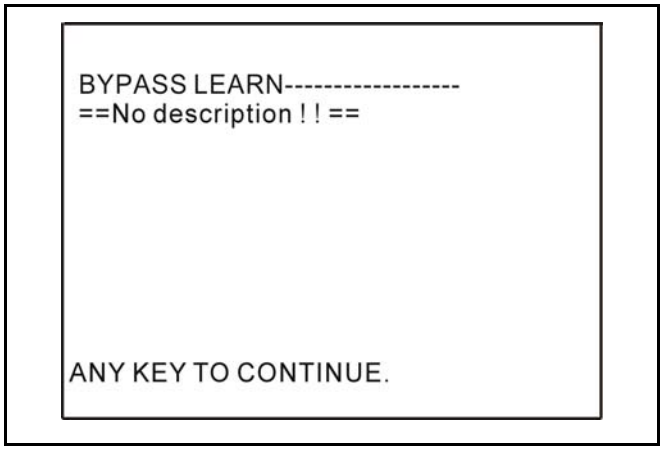
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



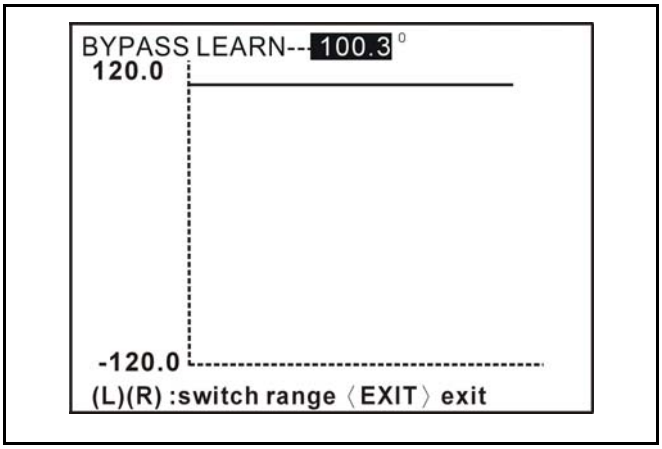
Press <UP> or <DOWN> button to choose BYPASS LEARN item.



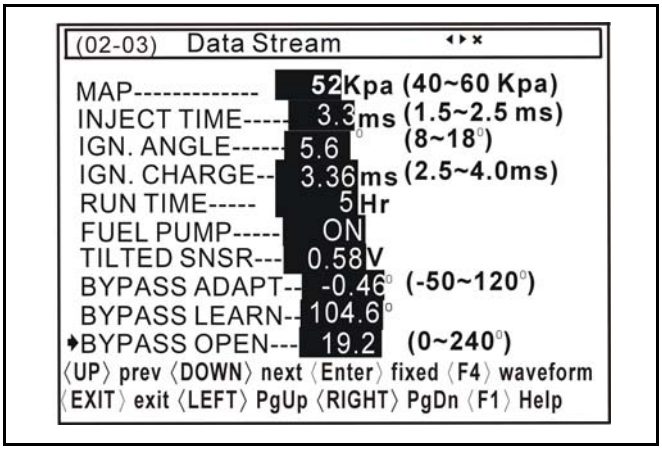
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



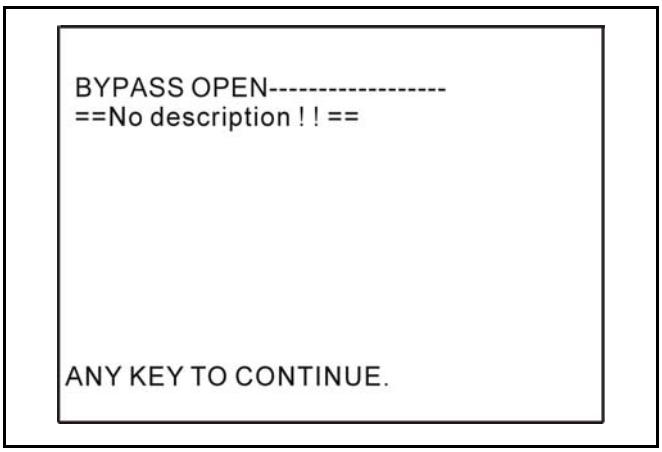
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



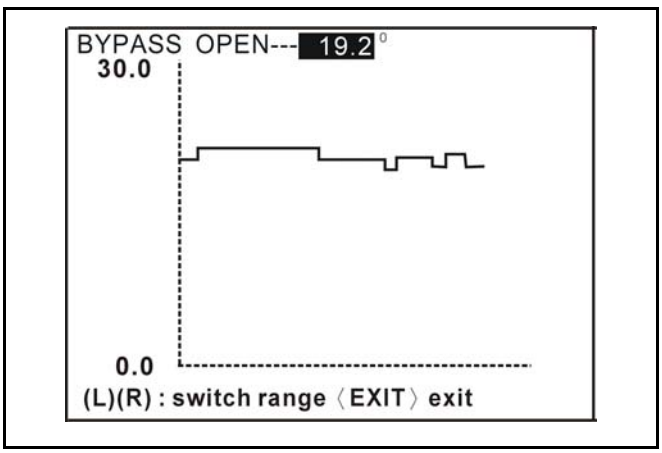
Press <UP> or <DOWN> button to choose BYPASS OPEN item.



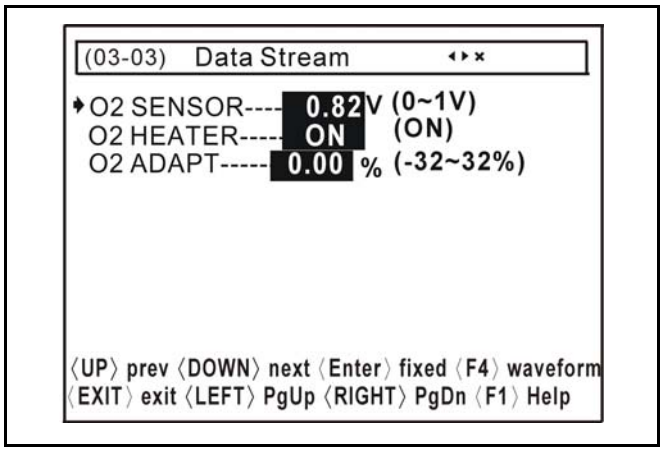
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



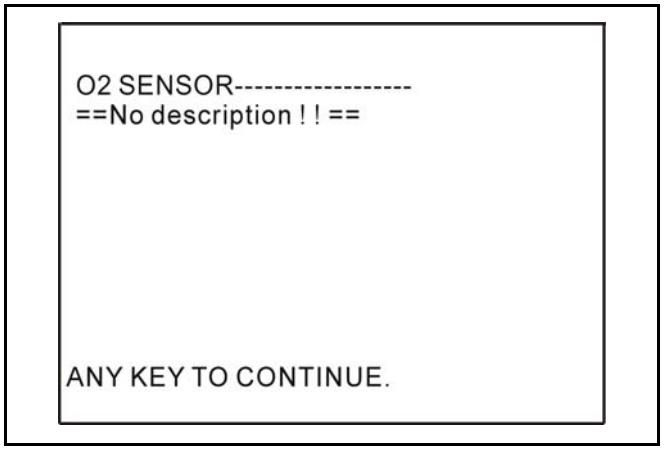
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



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



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



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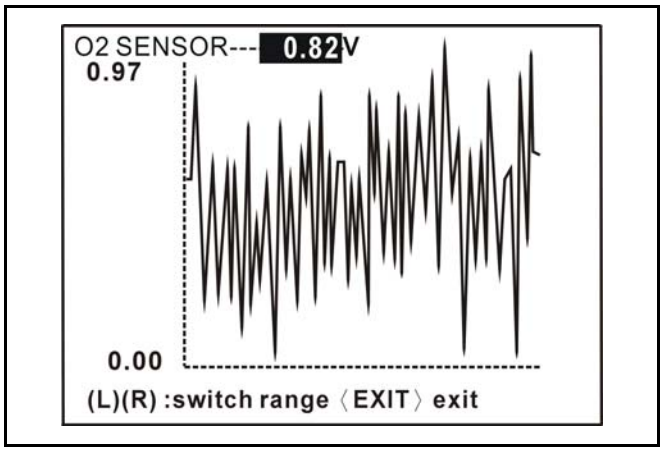
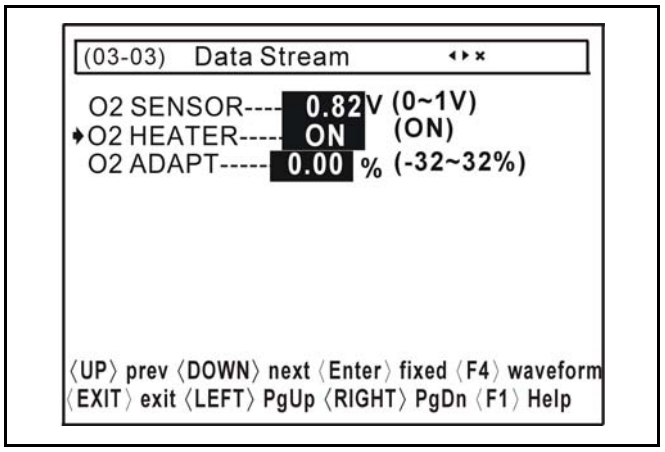
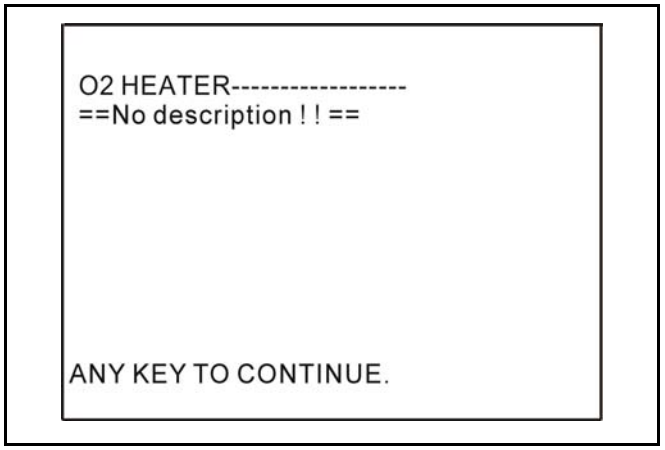


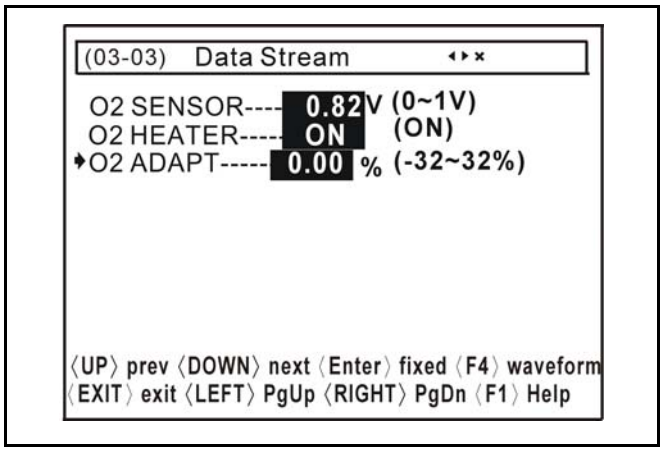
Press <UP> or <DOWN> button to choose O2 HEATER item.



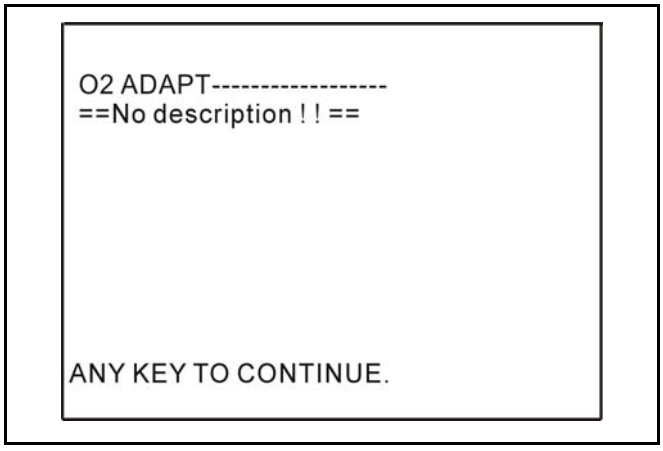
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



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

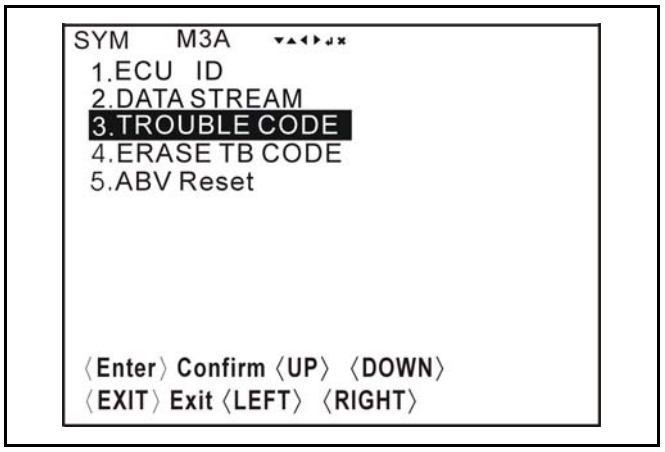


Press <F1> button to enter description page. Press any key to get back to Data Stream page.

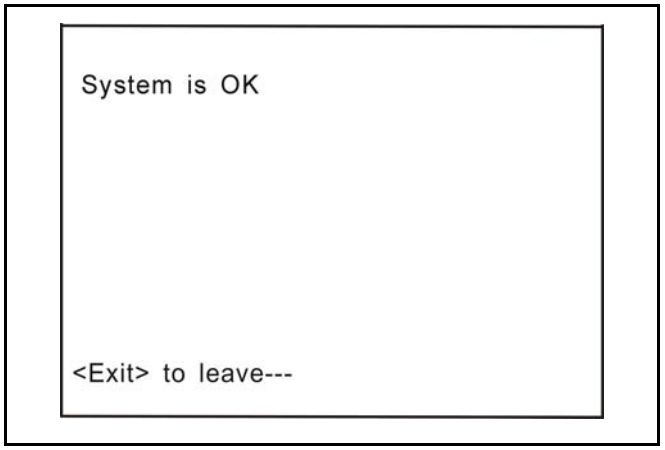


Read Trouble Code

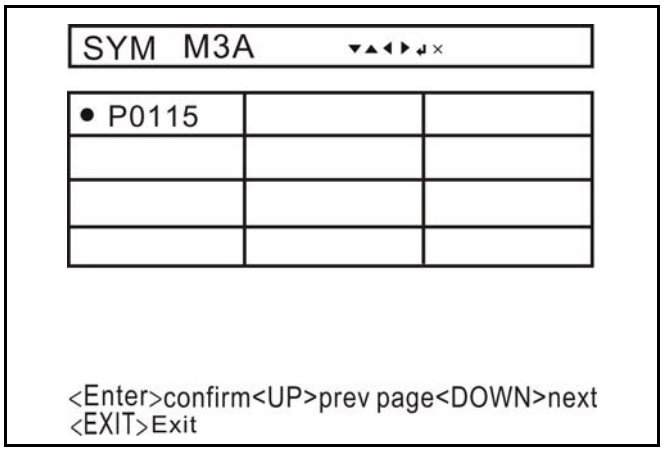
Press <UP> or <DOWN> button to choose Trouble Code item.
Press <Enter> button read trouble code.



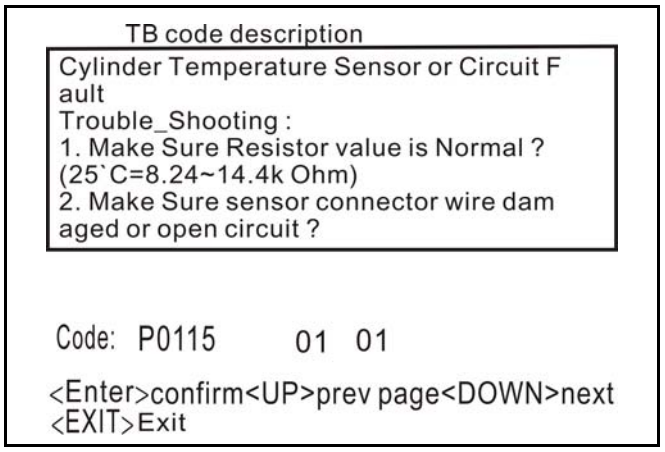
If there is no malfunction in the EFi system, “System is OK” will be shown.



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

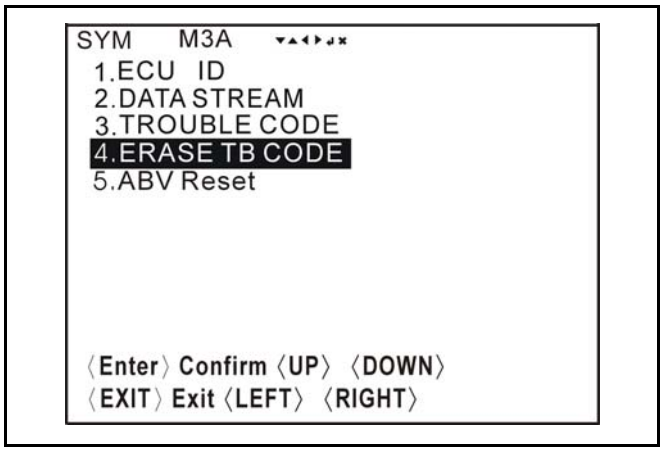


Press <Enter> button to enter Trouble Code and troubleshooting description page.

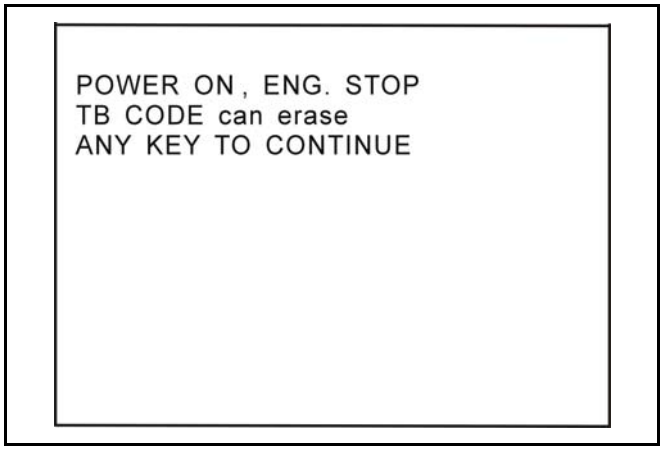


Erase Trouble Code

Press <UP> or <DOWN> button to choose Erase TB Code item.
Press <Enter> button erase Trouble Code.

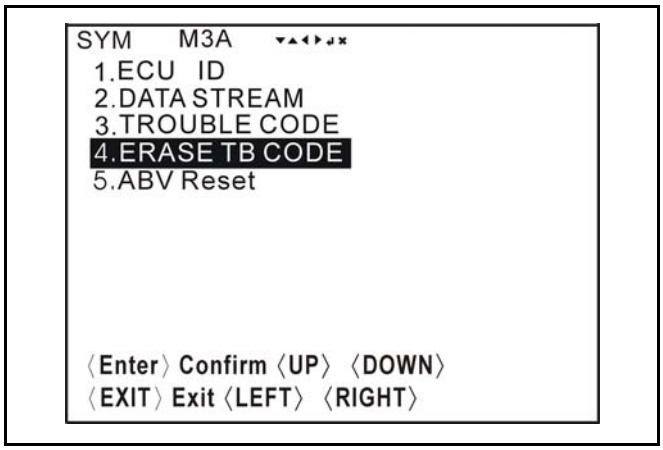


Key on but do not start the engine.
Press any key to erase Trouble Code.



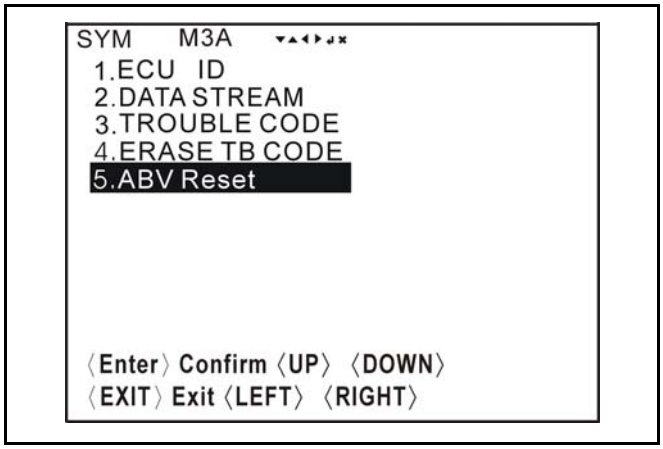
Trouble Code is erased successfully.
Press <Enter> button to leave.

Get back to function-options page.

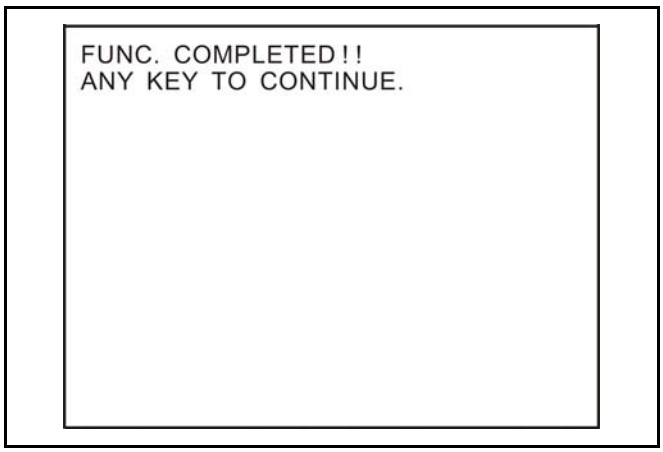


Reset ABV

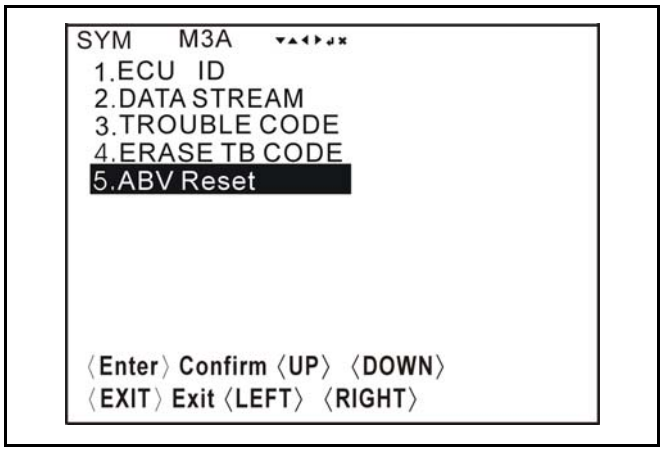
Press <UP> or <DOWN> button to choose ABV reset item.
Press <Enter> button to reset ABV.



ABV reset is completed.
Press any key to continue.



Get back to function-options page.



EFi Component Malfunction Check& Replacement Procedure

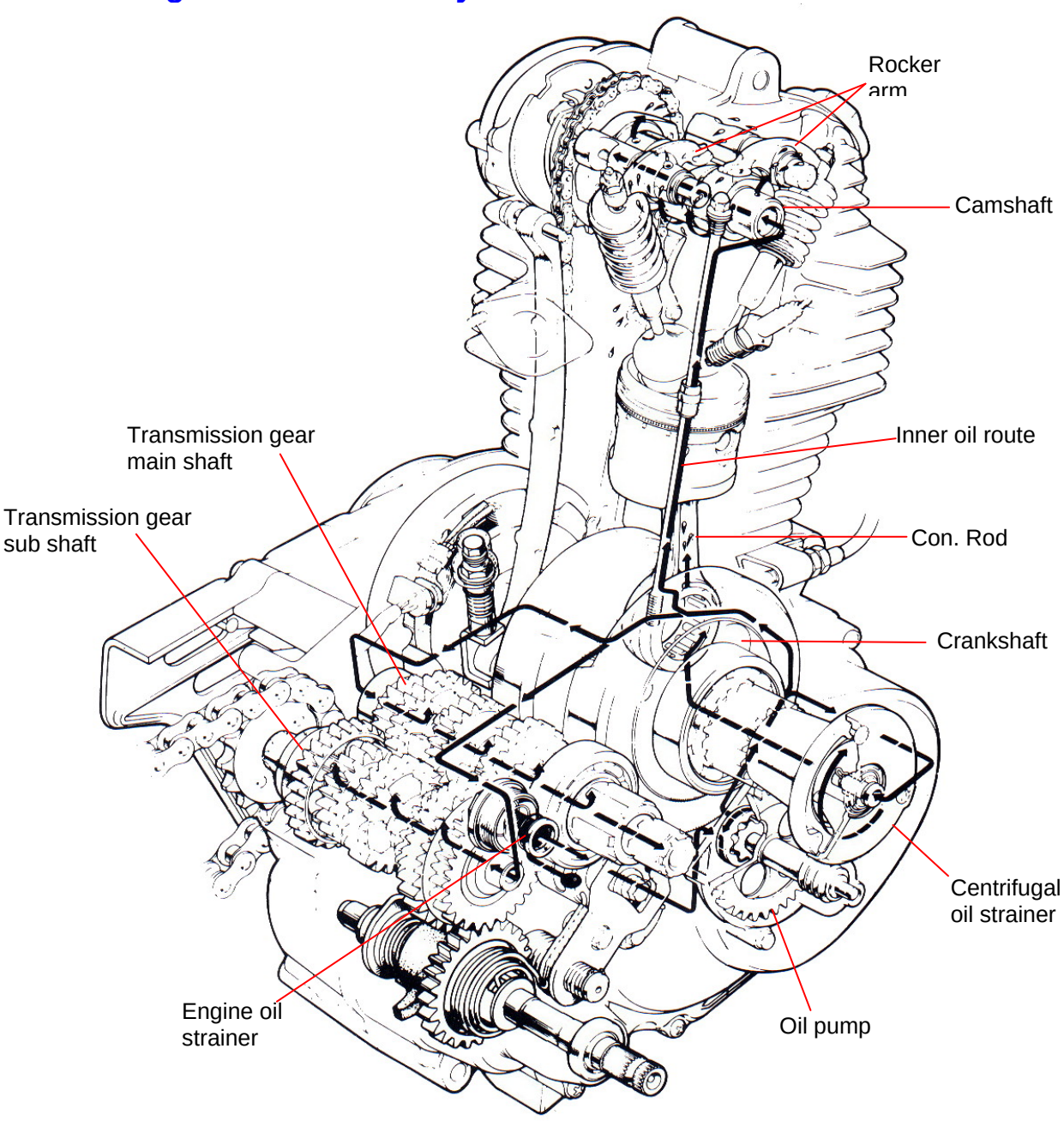
Item	Parts No. Parts Name	Service schedule	Inspection Method	Adjustment & replacement procedure
1	390-002 Ignition coil	At least 20000km life-expectancy Check it every 3000km	Use diagnostic tool to check if the ignition coil has malfunction. Erase the DTC codes and replace with new coil and confirm again.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

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

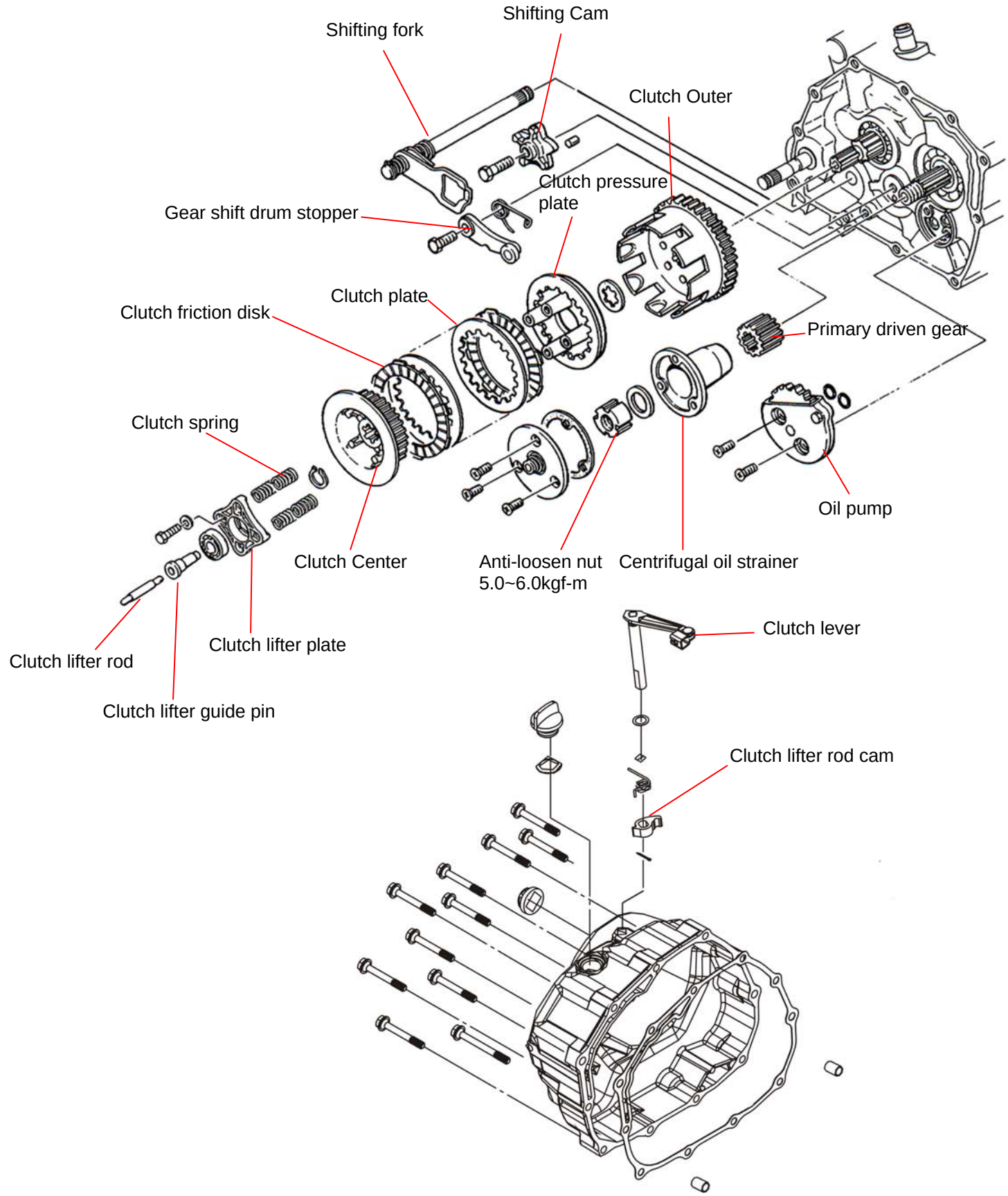
Item	Parts No. Parts Name	Service schedule	Inspection Method	Adjustment & replacement procedure
8	325-002 ECU	At least 20000km life-expectancy Check every 3000km	Connect the diagnostic tool. Record the ECU service time.	ECU replacement procedure: Connect the Diagnostic tool onto the original ECU. Record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

NOTE:

Mechanism Diagram-Lubrication system



Mechanism Diagram – Clutch / Transmission



Precautions in Operation

General information

- This chapter covers the engine oil pump and the oil exchange, also the disassembly and the shifting linkage is covered. All these operations can be done while the engine is still on the bike.

Specification

Engine oil quantity：

Full disassembly：1200 c.c.

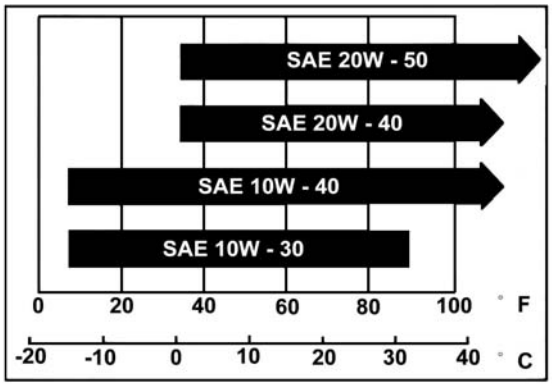
Regular maintenance：1000 c.c.

Recommended engine oil viscosity:

SAE 10W-30

(The Bramax series oil is recommended)

Engine Oil viscosity



Measurement: mm

Item		Standard	Service Limit
Oil pump	Clearance between inner rotor and outer rotor	0.30	0.35
	Clearance between outer rotor and the pump body	0.30~0.36	0.40
	Rotor to pump cover clearance	0~0.06	0.11
Clutch	Lever free play	10~20	-
	Spring free length	35.50	32.40
	Friction disk thickness	3.00	2.50
	Clutch plate warp	0	0.20

Torque value:

Oil drain bolt: 1.5~2.5kgf-m

Oil strainer cover: 1.5~3.0kgf-m

Oil pump cover bolts: 0.4~0.6kgf-m

Oil pump screw: 0.3~0.4kgf-m

Centrifugal strainer cover screw: 0.3~0.4kgf-m

Centrifugal strainer nut: 5.0~6.0kgf-m

R. Crank case bolts: 0.8~1.2kgf-m

Special Tools

Centrifugal oil strainer nut socket wrench: SYM-9023100-SY125

Cylinder head/ oil strainer cover wrench: SYM-ALL23461

Troubleshooting

Insufficient engine oil
- Oil leaks
- Valve guides or seals worn out.
- Worn piston rings.

Insufficient oil pressure
- Insufficient oil amount.
- Clogged oil strainer, oil route, oil tubes
- Abnormal oil pump

Engine oil dirty
- It's not exchanged properly on time.
- Cylinder head gasket damaged.
- Worn piston rings.

Clutch slips when accelerating
- Insufficient clutch free play.
- Worn clutch disks
- Weak clutch springs.

Unable to disengage the clutch, or the bike trembles while clutch disengaged
- Excessive clutch free play settings.
- Warped clutch plates.

Excessive clutch lever pulling force
- Twisted or insufficiently lubricated clutch cable
- Damaged clutch cable
- Clutch lifter mechanism damaged.

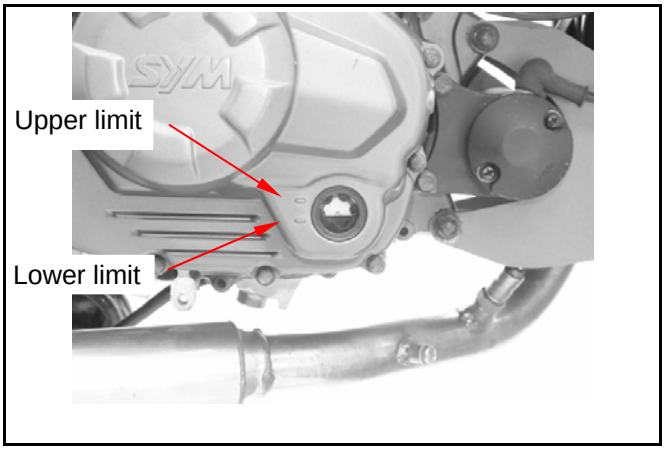
Hard to shift gear
- Excessive clutch free play settings.
- Twisted or bent shifting forks.

Gearshift pedal won't return
- Broken or weak return spring.
- Bent shift spindle.

Gear jumps out
- Broken stopper arm spring.
- Bent shift spindle.

Engine Oil

Turn off engine, and park the scooter on flat surface with main stand.
Check oil level with oil dipstick.
Do not screw the dipstick in while checking.
If oil level is low, fill into recommended oil to reach the upper limit.

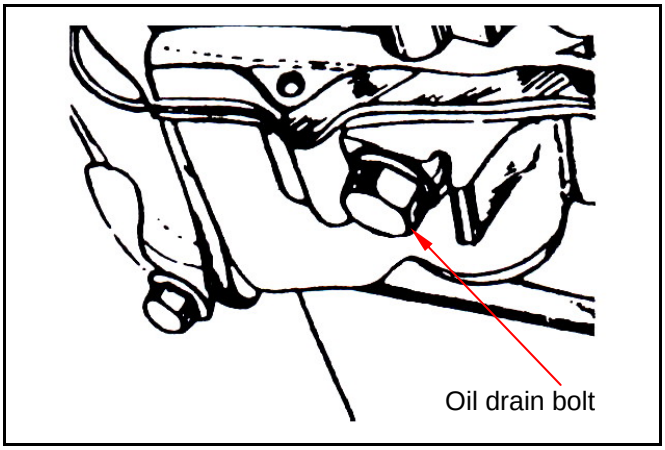


Oil Change

⚠ Caution

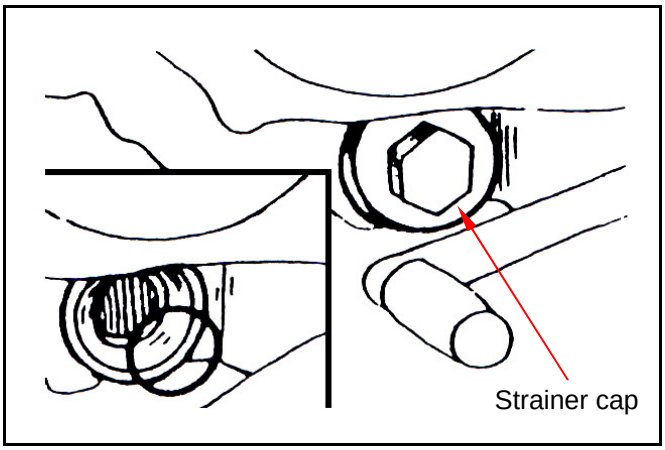
- Drain oil when the engine is fully warmed up, so the oil can be drained completely.

Place an oil basin under the bike, and remove oil drain bolt.
After all oil is drained, make sure washer can be re-used, and re-install oil drain bolt.
If the Oil drain bolt washer is damaged, it should be replaced.
Torque value：1.5~2.5kgf-m

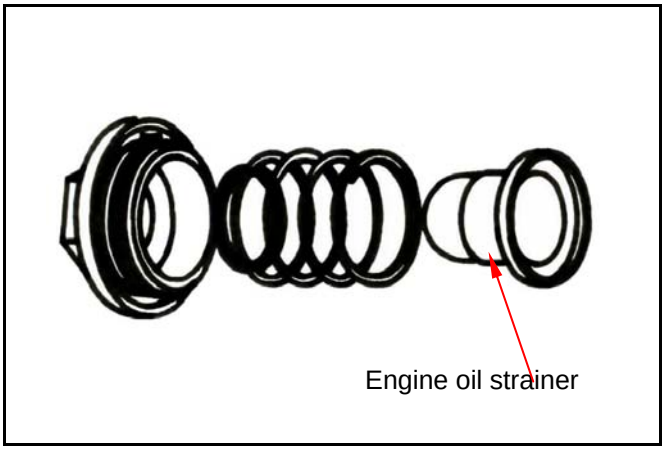


Engine Oil Strainer Cleaning

Drain engine oil out.
Remove oil strainer and spring.
Clean oil strainer with compressed air.
Check if O-ring can be re-used. If it's damaged, please change a new one.
Install oil strainer and spring.
Install oil strainer cap.
Torque value：1.5~3.0kgf-m



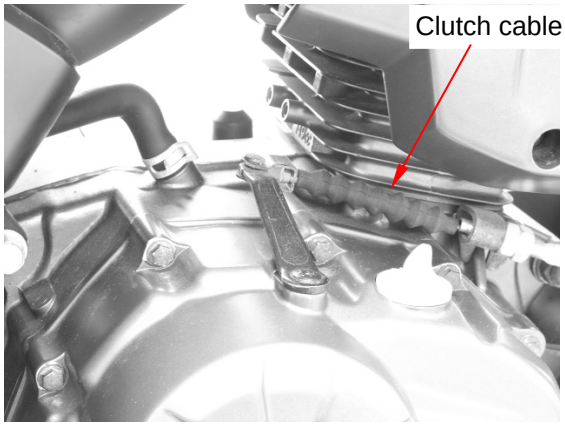
Fill in engine oil (oil viscosity SAE 10W-30)
Recommended using Bramax series oil.
Engine oil capacity: 1000c.c. Regular exchange.
Install dipstick, run the engine for several minutes. Then turn off engine, and check oil level again.
Check if engine oil leaks.



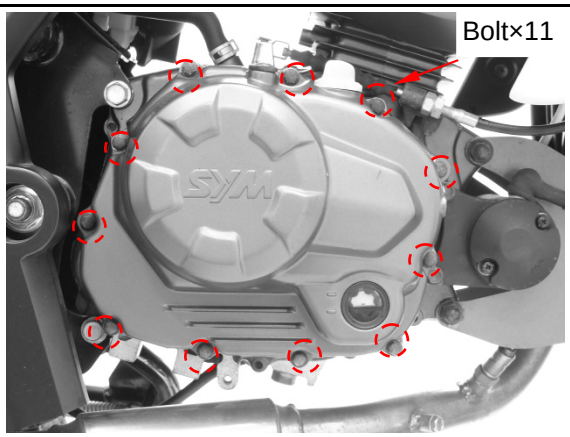
Oil Pump Removal / Inspection

Drain all the engine oil.

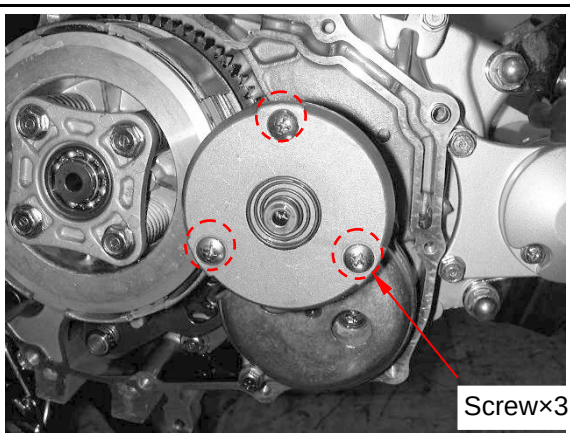
Remove the exhaust pipe.



Remove the engine R case(bolts×11)。



Remove the centrifugal oil strainer cover. (screw×3)。

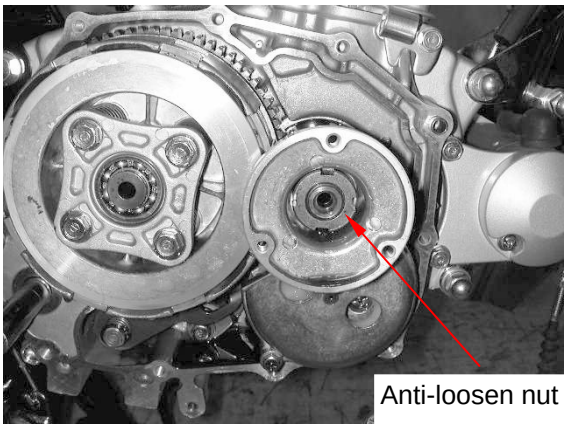


Remove the centrifugal oil strainer anti-loosen nut, and remove the oil strainer.

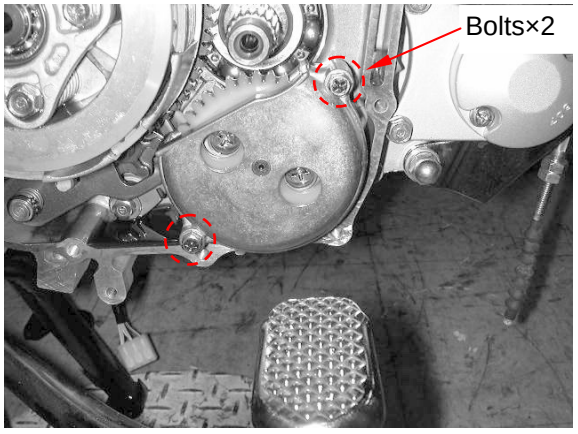
Special tool：

Centrifugal oil strainer special nut socket**:**

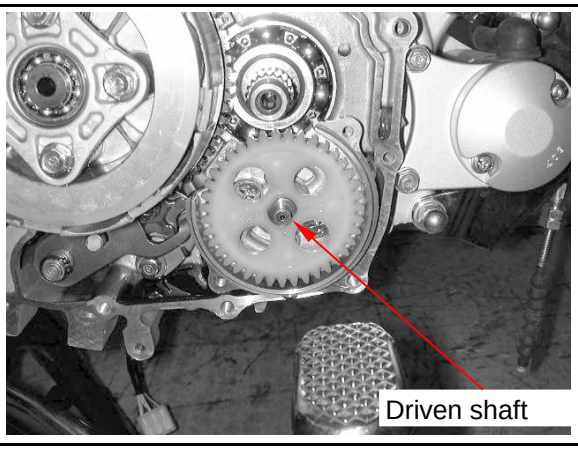
SYM-9023100-SY125



Remove the initial driven gear
Remove the oil pump gear protective cover (bolts×2).



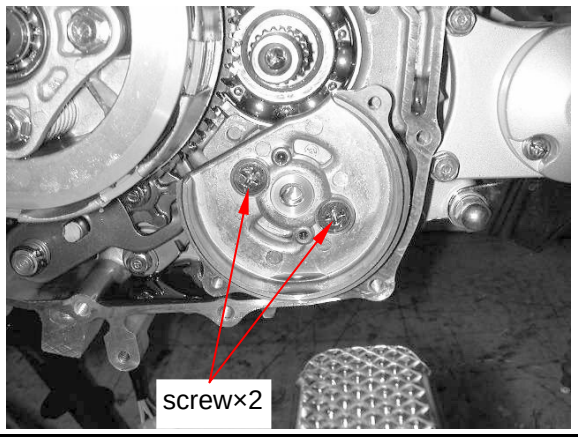
Remove the driven gear and driven shaft.



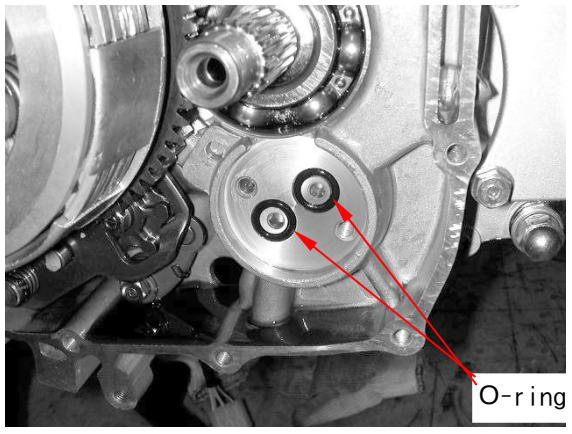
Remove the oil pump (screw×2).

⚠ Caution

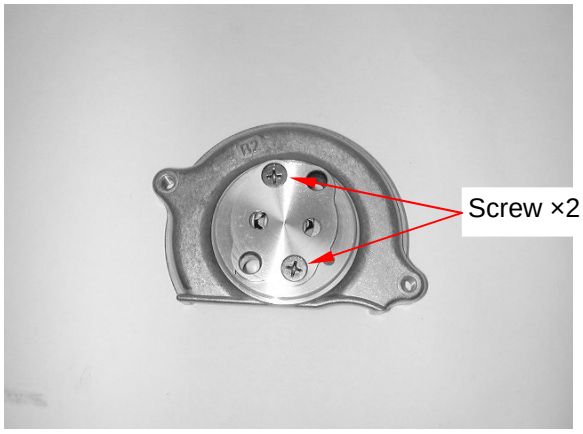
- It's recommended to remove the oil pump holding screw with impact screw driver.



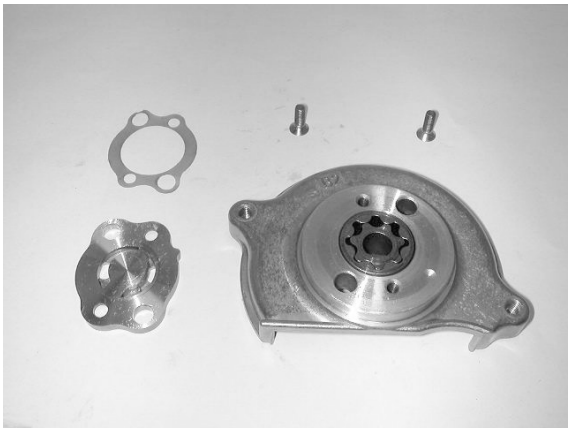
Remove the two O-rings on the oil pump seat.



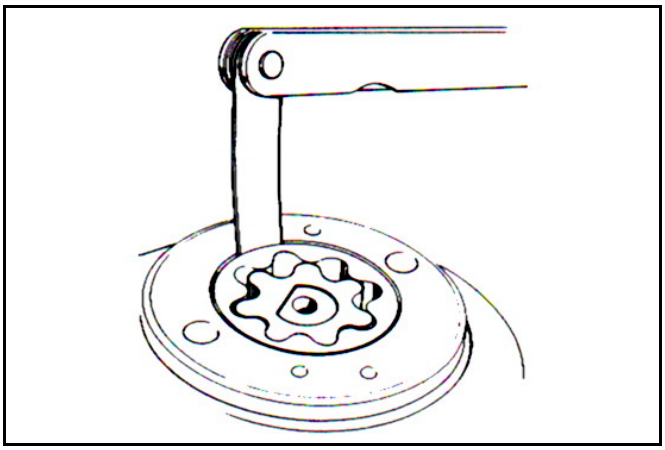
Oil pump disassembly
Remove the oil pump cover (screw×2).



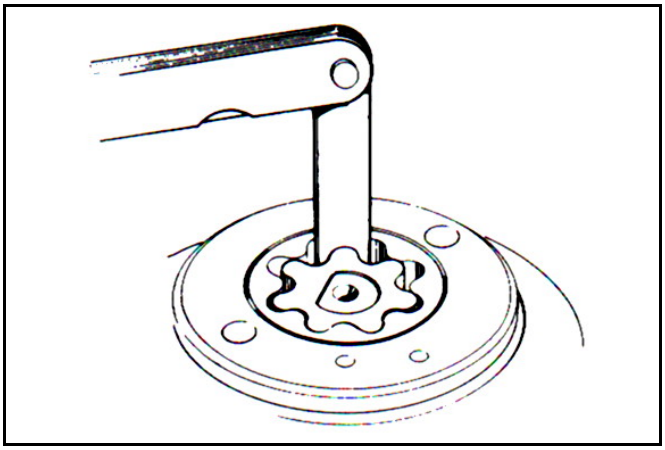
Remove the oil pump cover and the gasket.



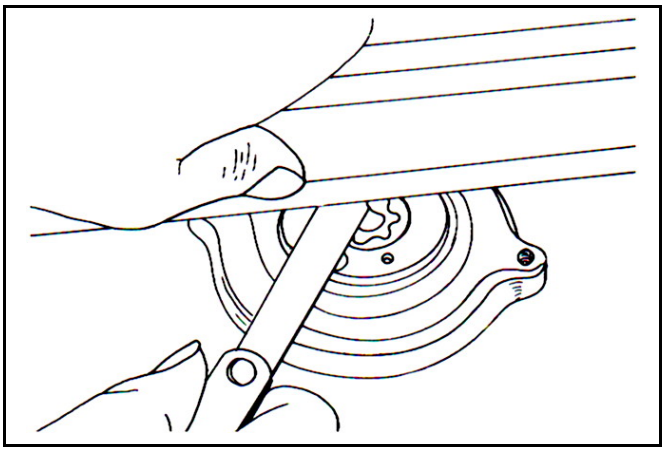
Oil Pump Inspection
Check the clearance between oil pump body and outer rotor.
Service limit: under 0.35 mm



Check clearance between inner and outer rotors.
Service limit: under 0.40 mm

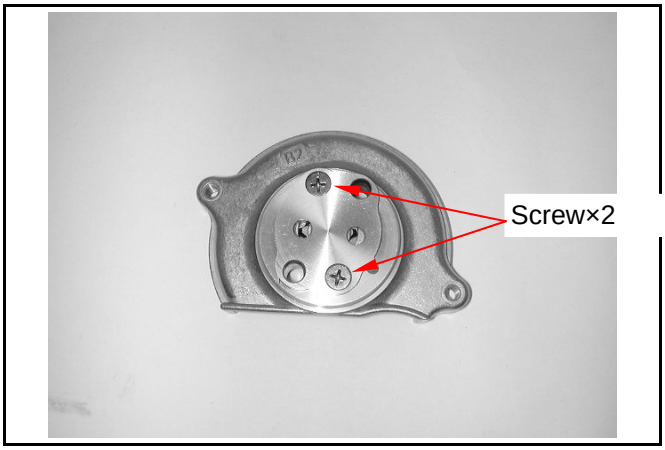


Check the unevenness between rotor face and pump body
Service limit: 0.11 mm

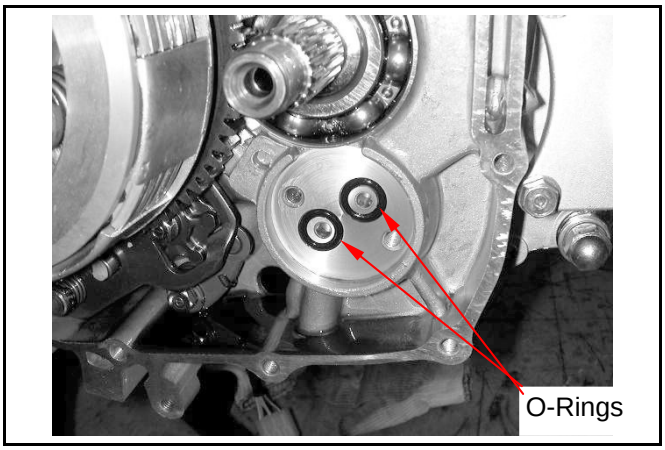


Oil Pump Assembly / Installation

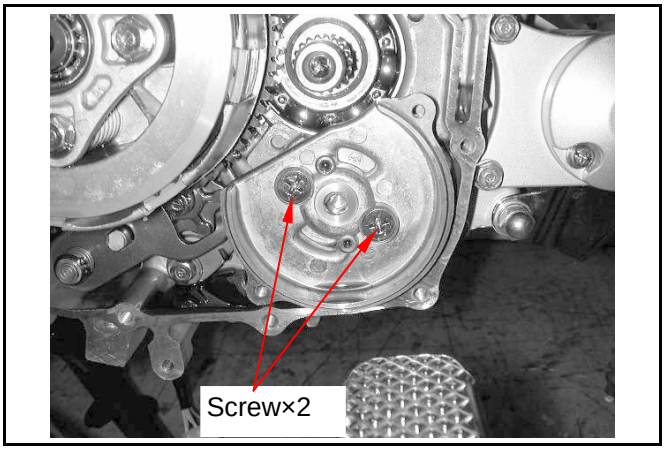
Install inner and outer rotors into the pump body.
Align the pump cover and the gasket and assemble it properly. Then tighten the holding screws.



Install new O-rings.



Install the oil pump (screw × 2).
Torque value：0.3~0.4kgf-m

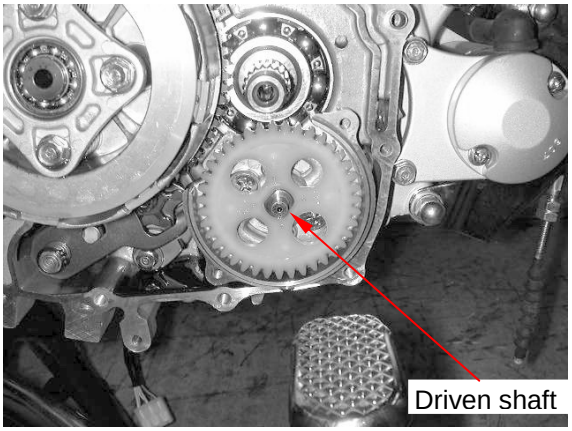


Match the driven shaft indent with the inner rotor indents, and assemble the driven shaft.

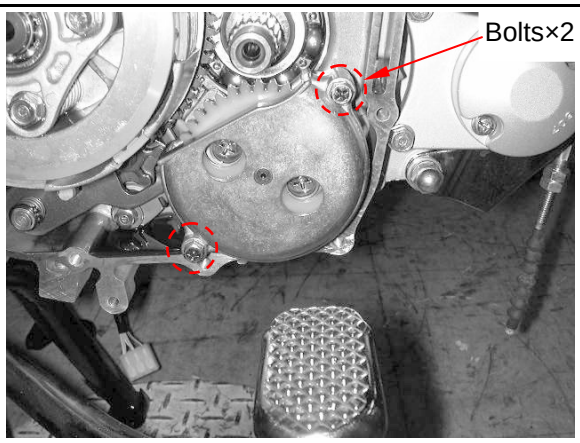
Make sure that oil pump shaft can be rotated freely. Then assemble the driven gear.

⚠ Caution

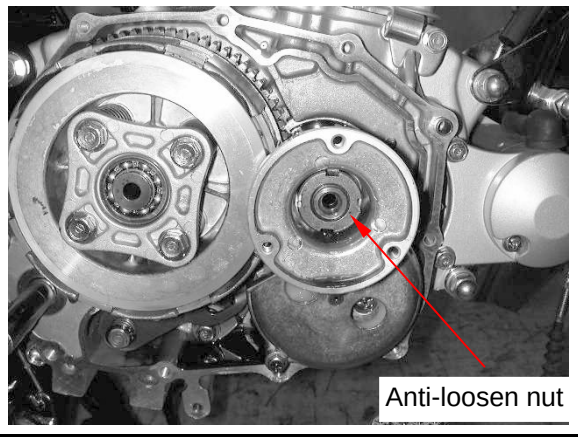
- Make sure that oil pump can rotate smoothly.



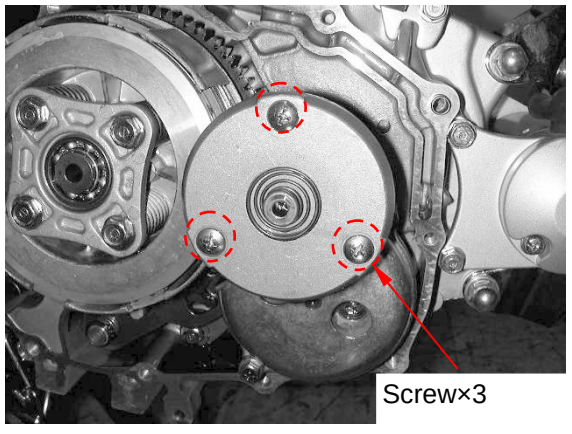
Install the oil pump gear protective cover. (Bolt×2)
Torque value：0.4~0.6kgf-m



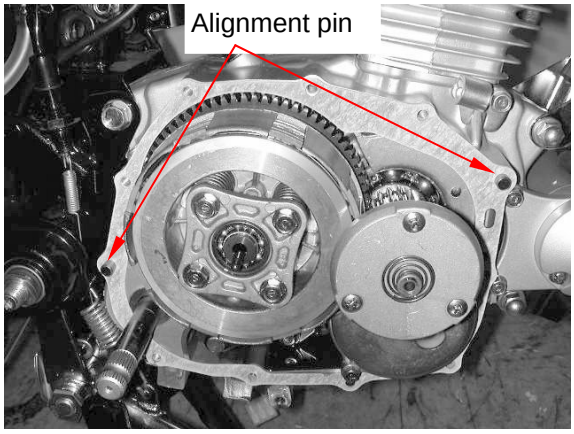
Install the centrifugal oil strainer, and tighten the anti-loosen nut.
Torque value：5.0~6.0kgf-m
Special tool：
Centrifugal oil strainer special nut socket**:**
SYM-9023100-SY125



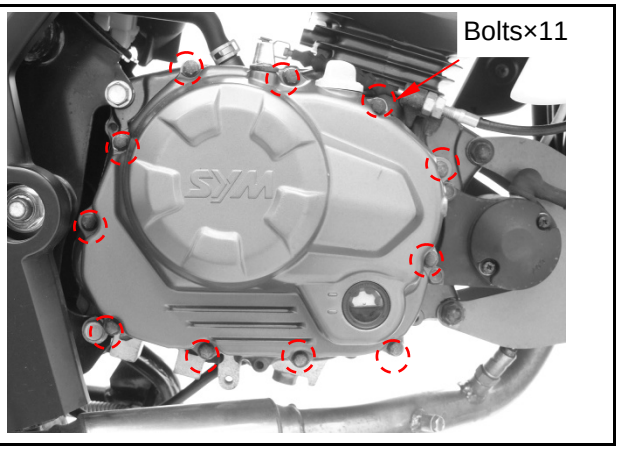
Install the centrifugal oil strainer cover. (screw×3) ◦
Torque Value：0.3~0.4kgf-m



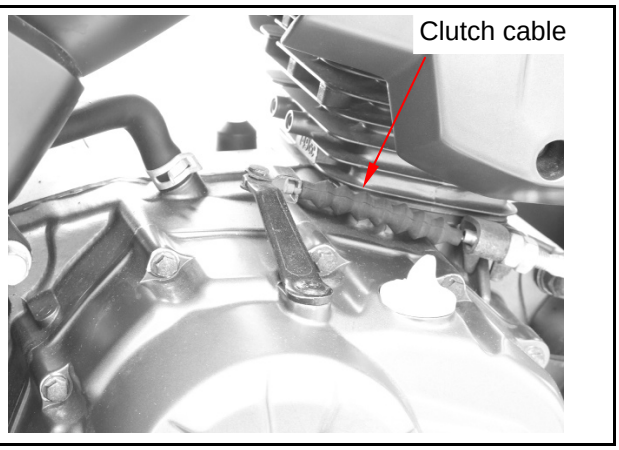
Install the alignment pin and a new right crankcase gasket.



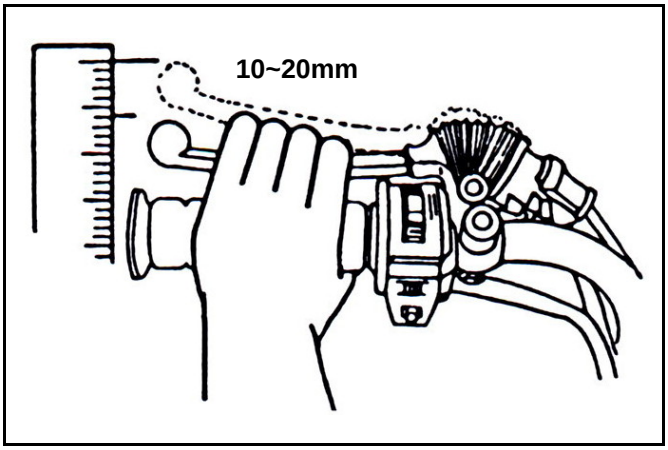
Install the right crankcase cover (bolt X 11).
Torque Value：0.8~1.2kgf-m



Assemble the clutch cable.
Assemble the kick-starter, lever, and the exhaust pipe.
Fill in the specified engine oil.

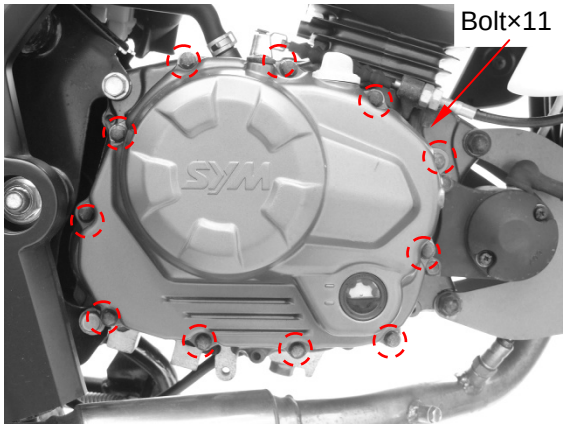


Adjust the clutch lever free play.
Free play：10~20mm

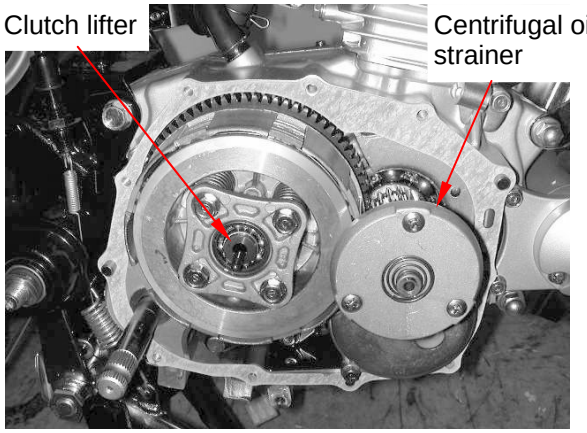


Clutch Disassembly

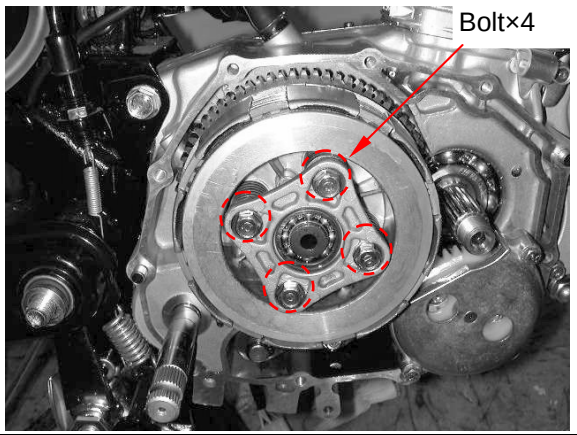
Drain all the engine oil.
Remove the kick-starter lever, exhaust pipe.
Remove the clutch cable.
Disassemble the right crankcase cover (bolt×11).



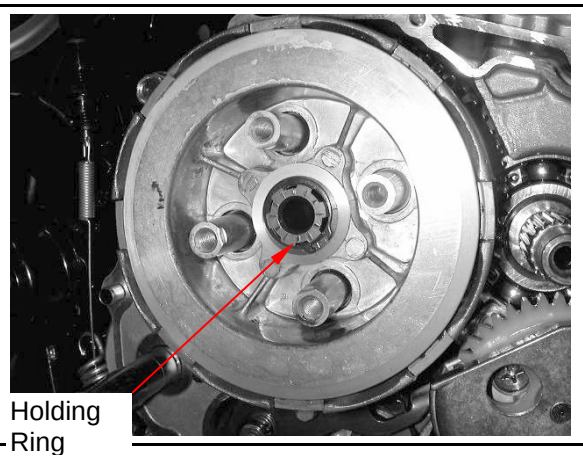
Disassemble the clutch lifter.
Disassemble the centrifugal engine oil strainer cover. (Screw×3)。
Remove the centrifugal oil strainer anti-loosen nut, and remove the strainer.
Special tool：
Centrifugal oil strainer special nut socket**:**
SYM-9023100-SY125



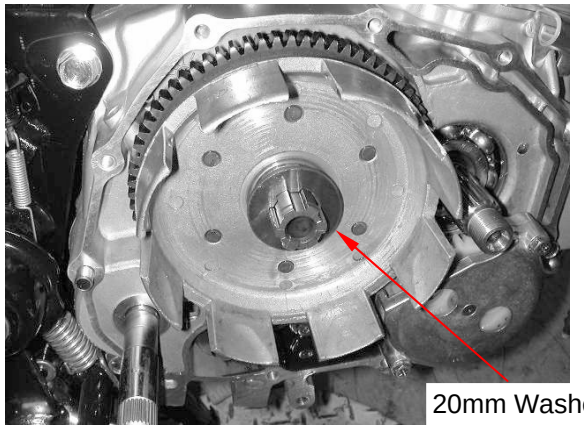
Remove the clutch lifter plate holding bolts (bolt X 4).
Remove the lifter plate and spring.



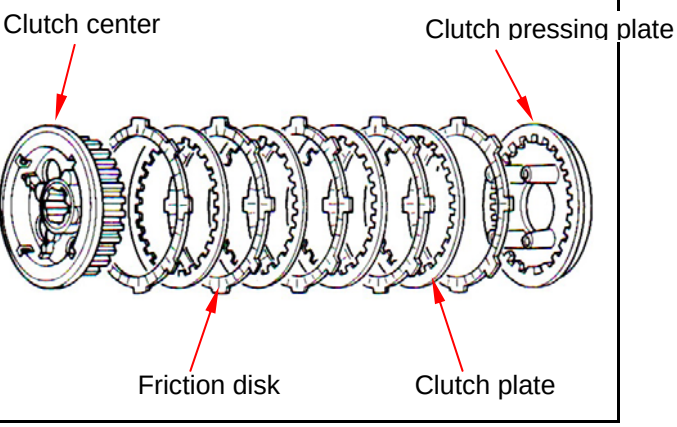
Remove the 20 mm holding ring.
Disassemble the clutch center, friction disks, clutch plates, and pressing plate.



Turn the 20mm washer to match the indent on the main shaft with that on the washer. Remove the washer and disassemble the clutch outer.



Disassemble the clutch center, clutch plates, clutch friction disks, and the pressing plate.

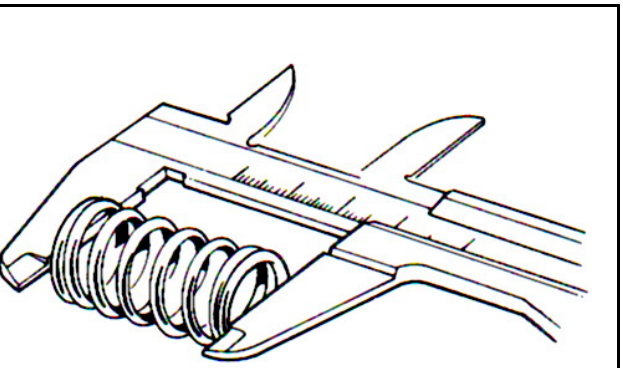


Clutch Inspection

Clutch spring inspection

Measure the free length of the four clutch springs.

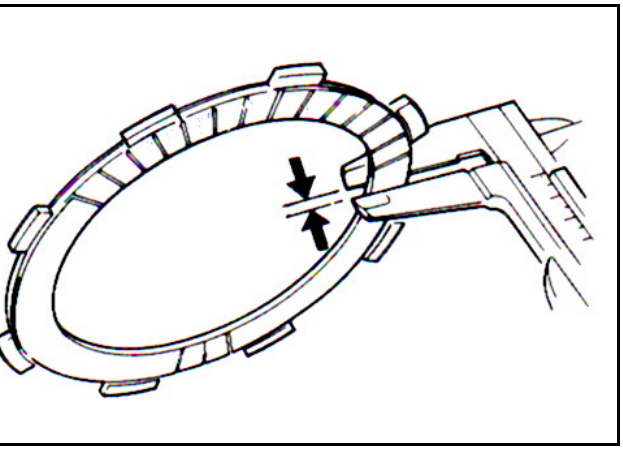
Service limit：Above 32.4mm



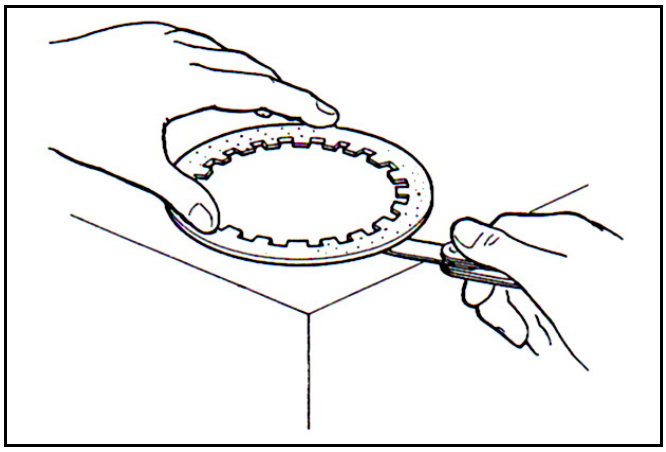
Clutch friction disk inspection

Measure the thickness of each clutch friction disk. If it's under service limit or it's damaged, please replace with a new one.

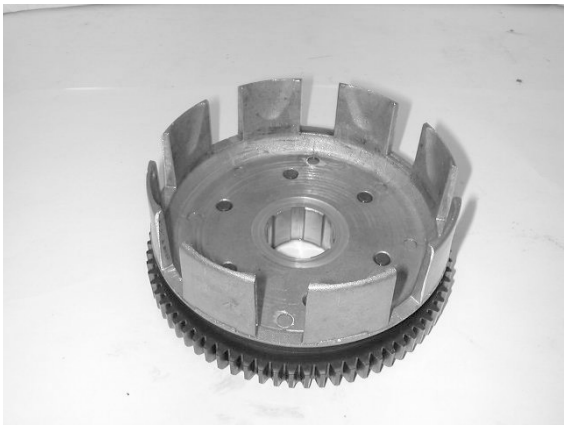
Service Limit：Above 2.5mm



Clutch plate inspection
Use a feeler gauge to measure the warp of each clutch plate.
Service limit：under 0.2mm



Clutch outer inspection
Check the clutch outer to see if any cracks or damage can be found.

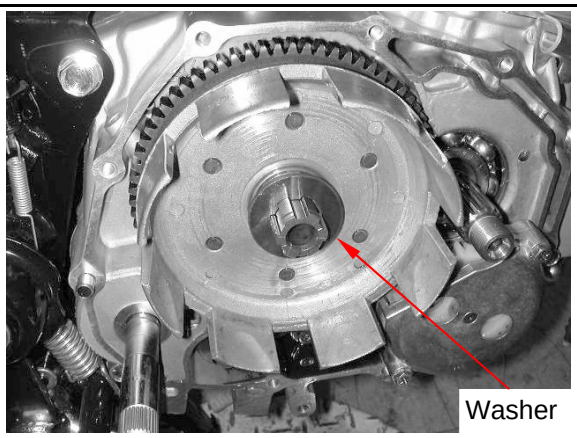


Clutch Installation

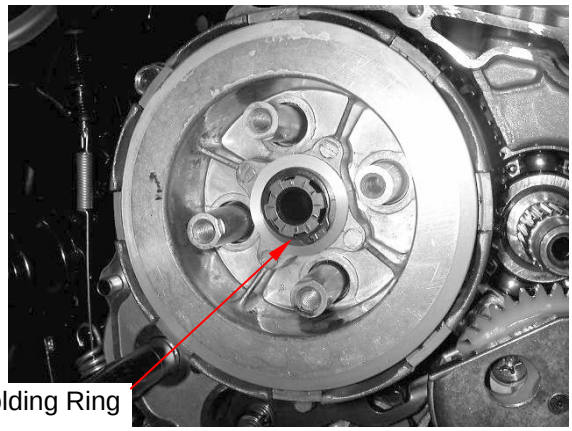
Install the clutch outer and the 20mm washer.

⚠ Caution

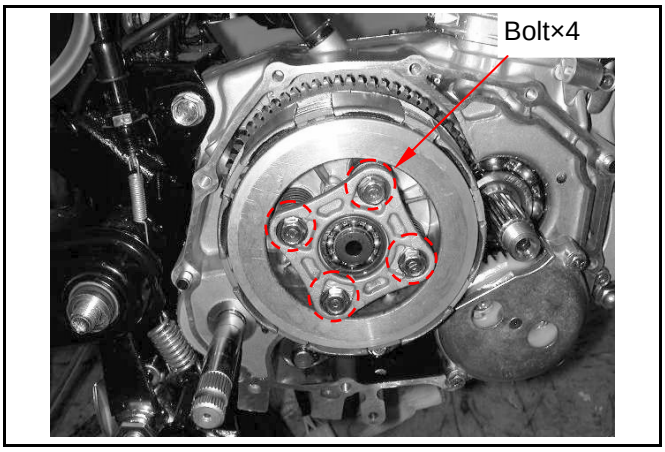
- You can slightly rotate or sway the 20mm washer to make it fit into the main shaft groove.



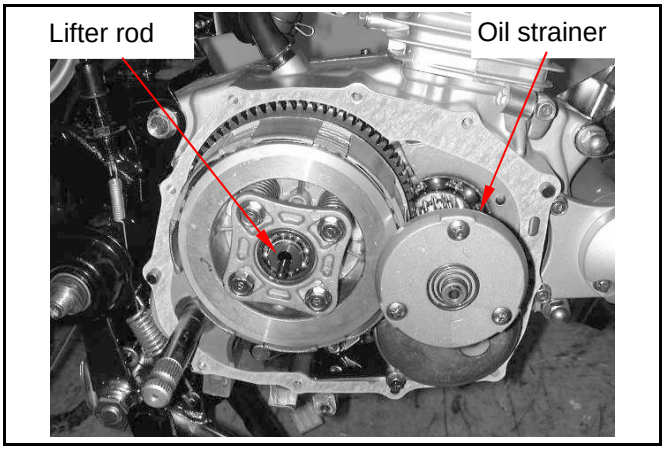
Install the clutch pressing plate, friction disks, clutch plates, and the clutch center.
Install the 20mm holding ring.



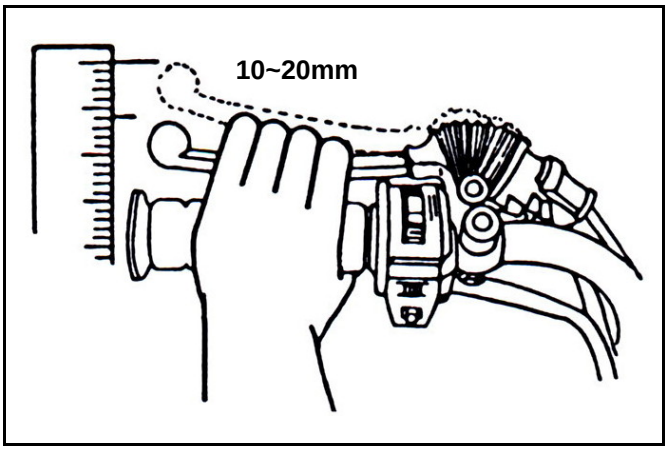
Install the clutch spring, lifter plate, and tighten the holding bolts (bolt X 4).



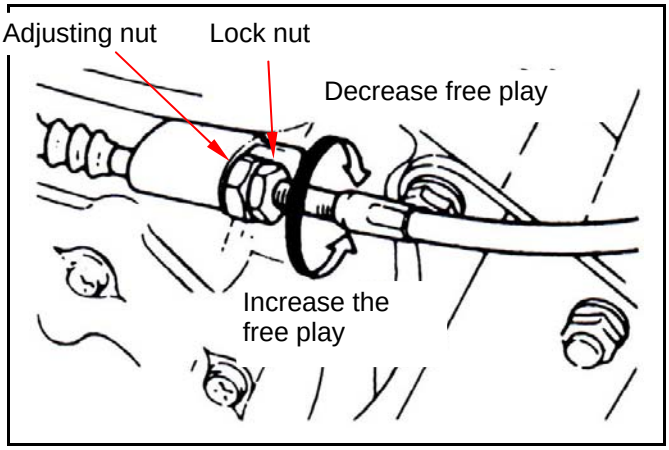
Install the lifter rod.
Install the centrifugal oil strainer
Assemble the right crankcase cover (bolt X 11).
Connect the clutch cable
Install the Kick-starter, kick-starter lever, and exhaust pipe.
Fill in specified engine oil.



Turn the adjustment nut to optimize the clutch free play.
Free play：10~20mm



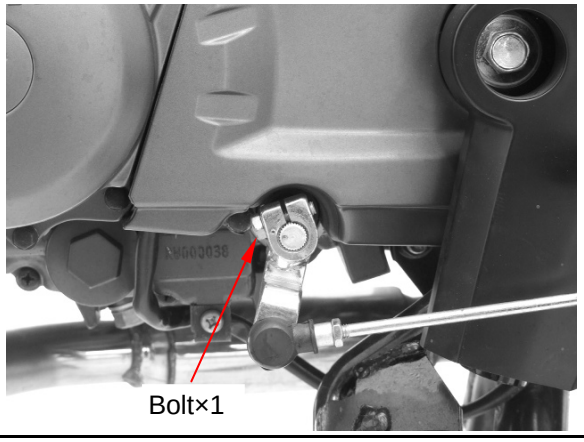
After achieving the correct free play, tighten the adjusting nut and the lock nut.



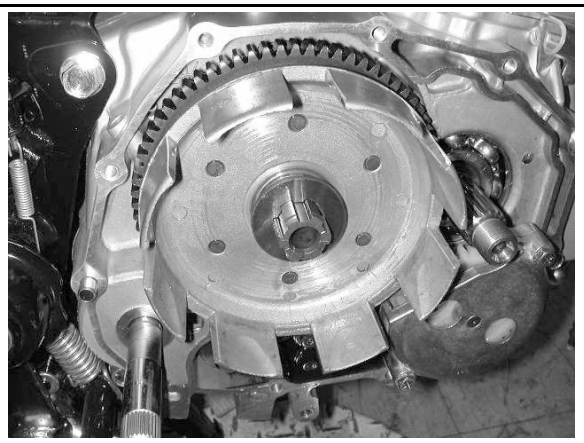
Gear Shift Linkage Mechanism

Gearshift linkage disassembly

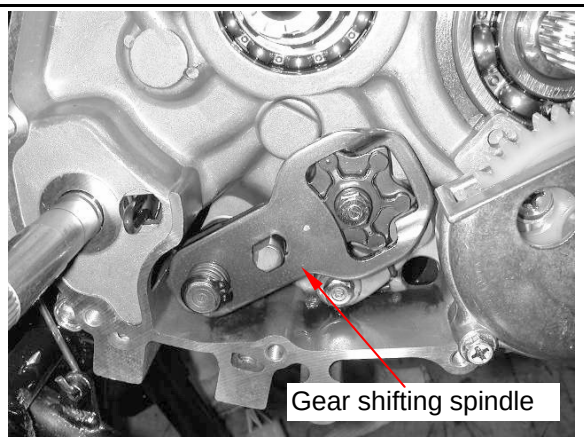
Remove the shifting lever (bolt X 1).



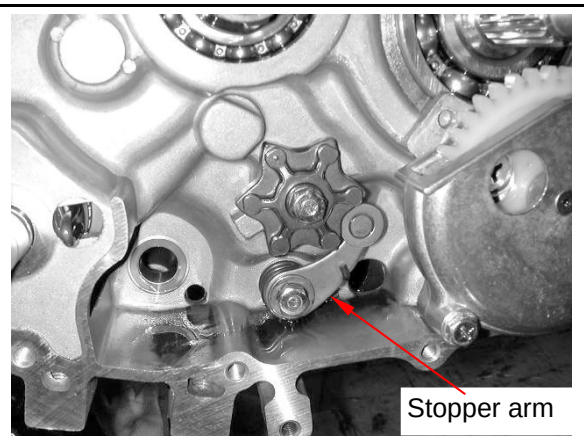
Drain all the engine oil.
Disassemble the kick-starter, exhaust pipe, and the starting lever.
Disassemble the clutch cable
Remove the right crankcase cover.
Remove the clutch lifter rod.
Remove the centrifugal oil strainer.
Remove the clutch outer.



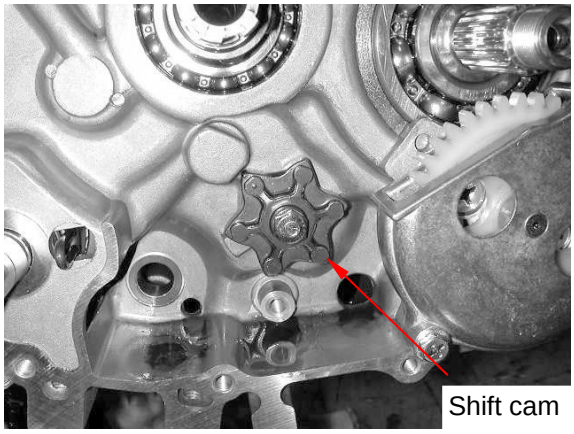
Take out the gear shifting spindle.



Remove the shifting drum stopper arm and the return spring (bolt×1).



Disassemble the shifting cam (bolt×1).
Remove the 4×10mm alignment pin.

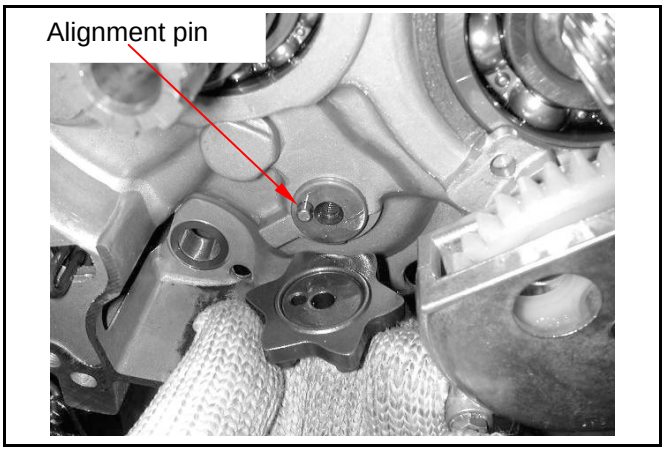

Shift cam

Inspection
Check the shifting spindle and the fork assembly to see if any damage.

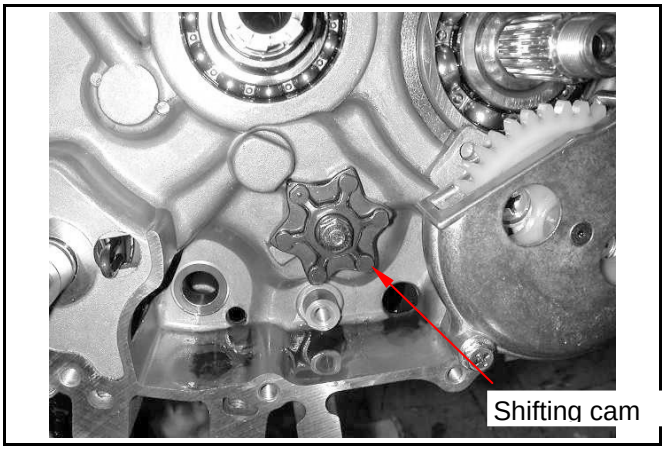
Check the shifting drum stopper arm and the return spring to see if any damage or worn.

Check the gear shifting cam to see if any worn or damage can be found.

Gear shift linkage mechanism installation
Install the shifting cam by matching the 4×10mm alignment pin.



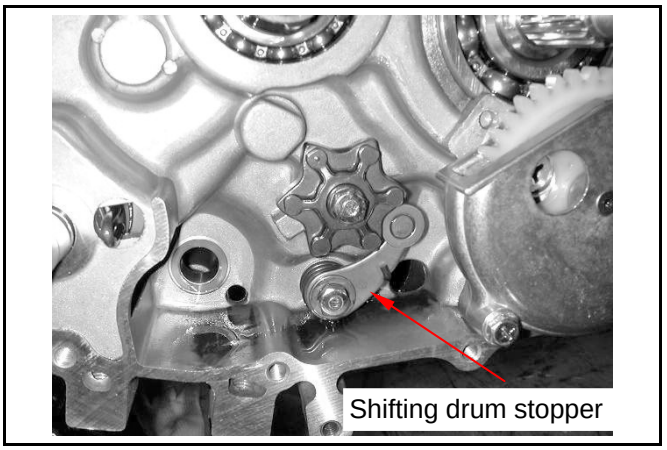
Tighten the holding bolt for shifting cam (bolt X1).
Torque value：0.8~1.2kgf-m



Assemble the shifting drum stopper and the return spring (bolt X 1).
Torque value：0.8~1.2kgf-m

⚠ Caution

- Check if the stopper is working smoothly after assembly.

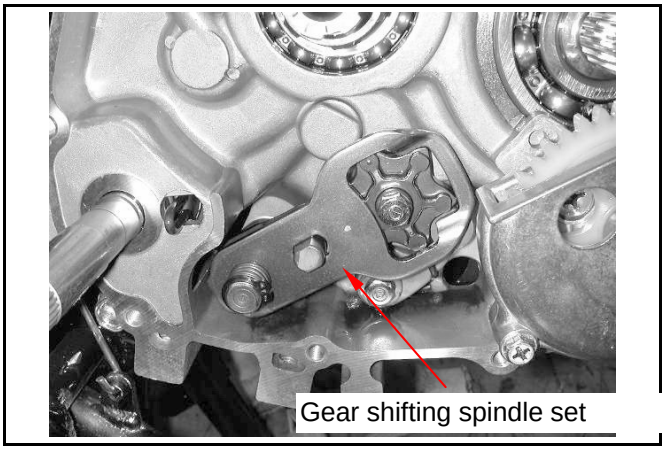


Assemble the gear shifting spindle and the fork. Then install the shifting pedal (bolt X1).

⚠ Caution

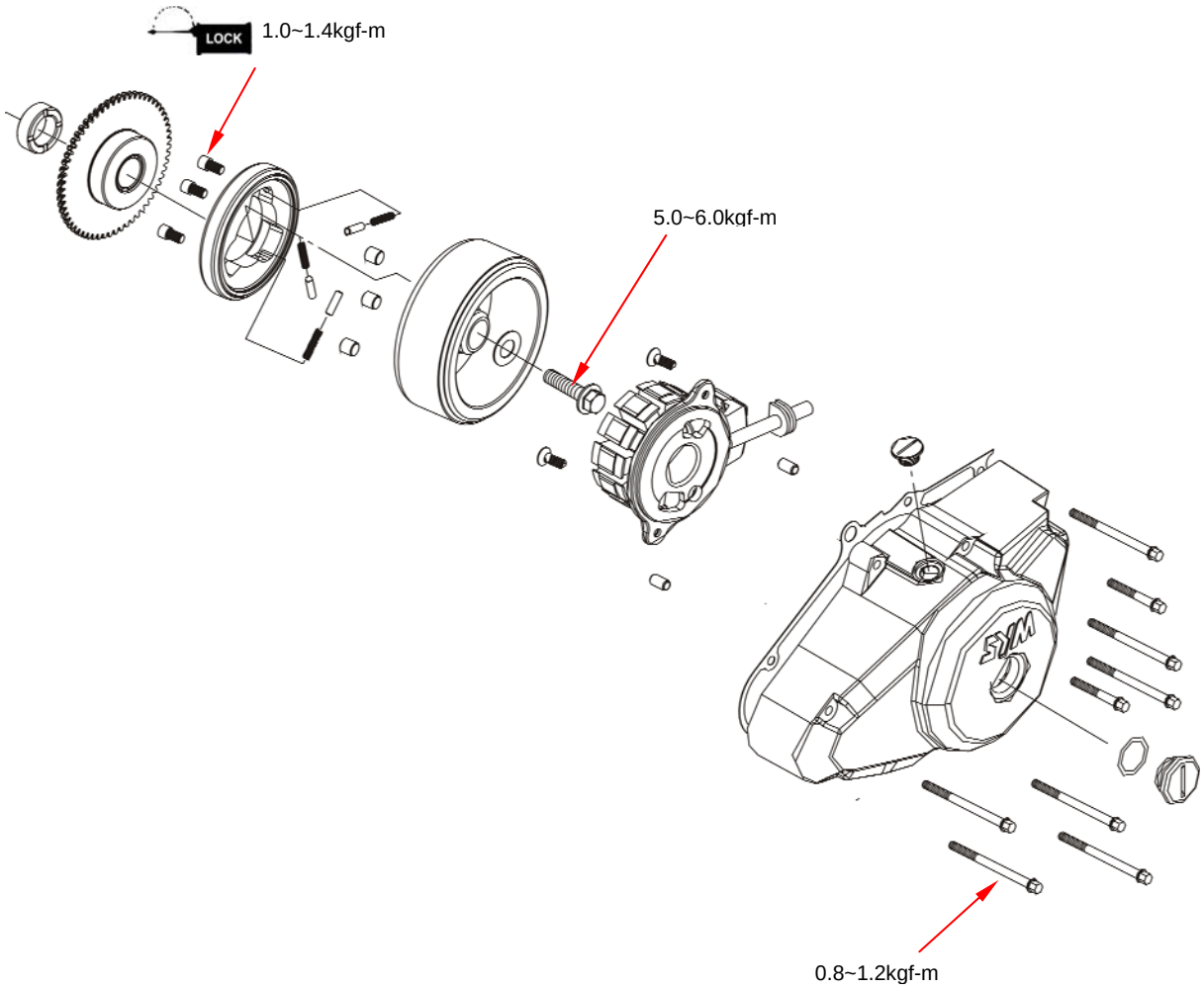
- The return spring of the shifting spindle should be matched and fixed on the crankcase convex.

Assemble the clutch, centrifugal oil strainer, and clutch lifter.
Assemble the alignment pin and another new right crankcase gasket, then the right crankcase cover.
Connect the clutch cable, and adjust the clutch free play.
Assemble the kick-starter, kick-starter lever, and the exhaust pipe.
Fill in specified engine oil.



5

Mechanism Illustration



Precautions in Operation

General Information

- For engine troubleshooting and inspection, please refer to the first chapter.
- Starting Motor repairing process and cautions please refer to Chapter 13th.

Specifications

measurement：mm

Item	Service Limit
Start Driven Gear exterior diameter	54.060
Starting Clutch interior diameter	54.940

Torque Value

Flywheel Bolt	5.0~6.0kgf-m
R crankcase cover bolts	0.8~1.2kgf-m
Starting clutch inner-hexagon bolts	1.0~1.4kgf-m with screw adhesive

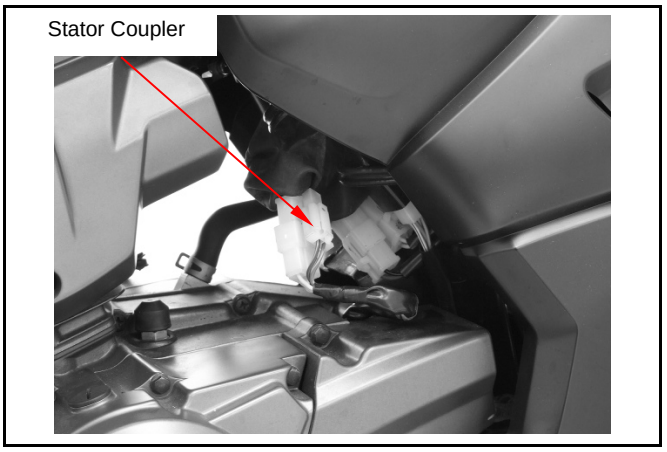
Special Tool

Flywheel puller	SYM-3111000

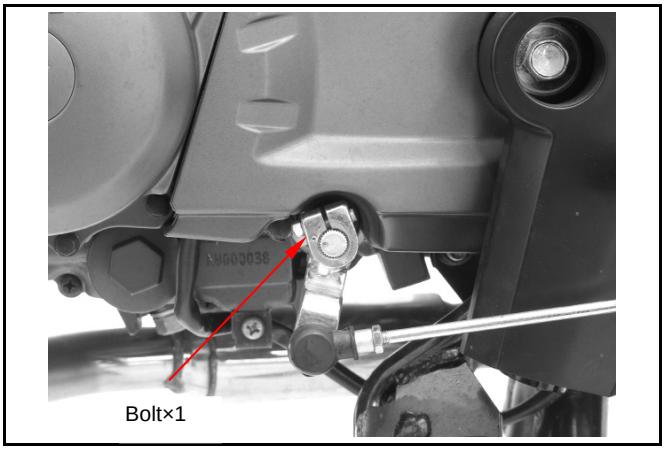
ACG Stator Disassembly

ACG Stator Disassembly

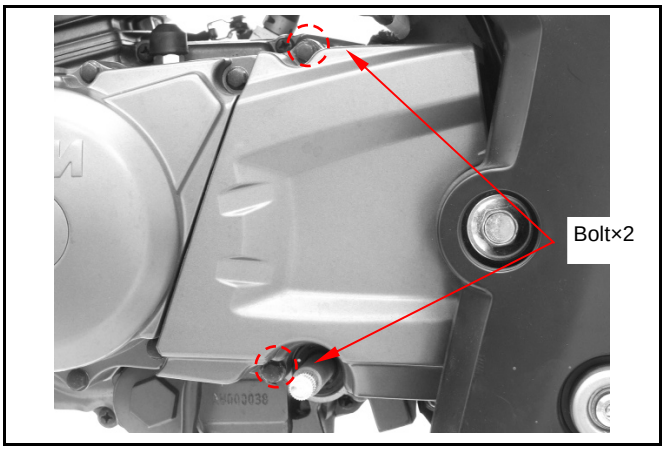
Remove the seat (bolts×2).
Remove the ACG coupler.



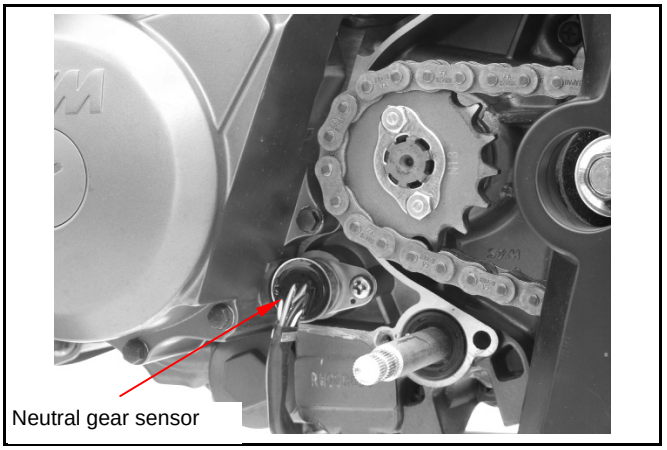
Remove the gear shift pedal (Bolt×1) ◦



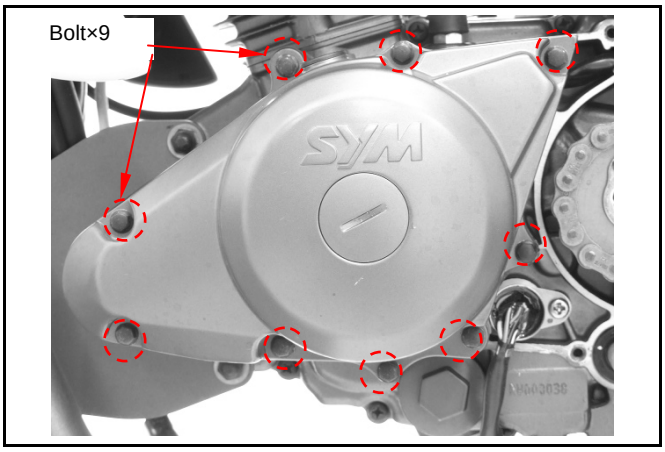
Remove the left crankcase chain cover (bolt ×2).



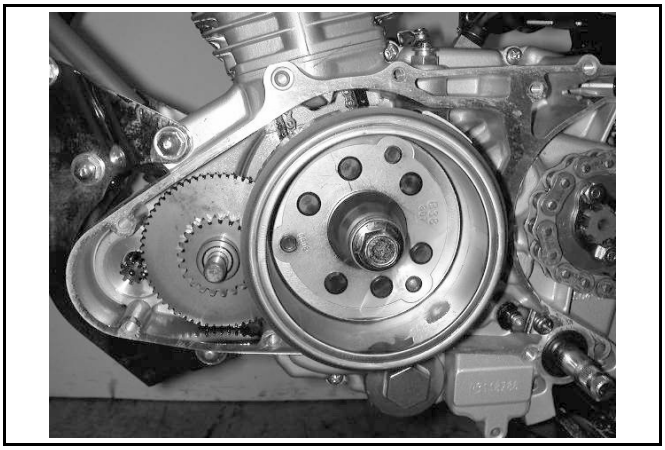
Remove the neutral gear sensor and the wiring.



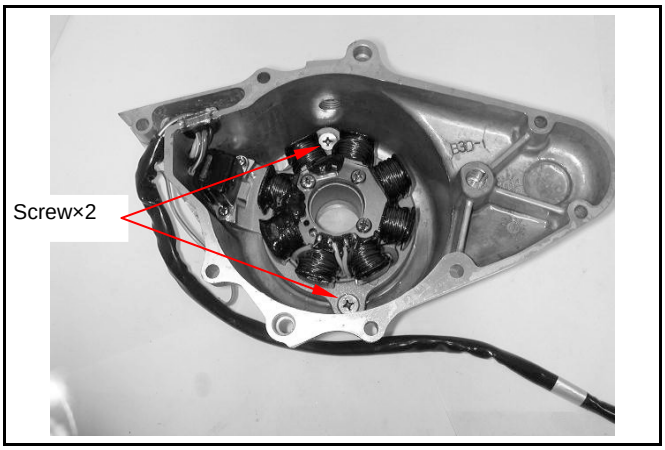
Remove the left crankcase cover (bolt×9).



Remove foreign objects and gasket residue on the interface of crankcase and cover.



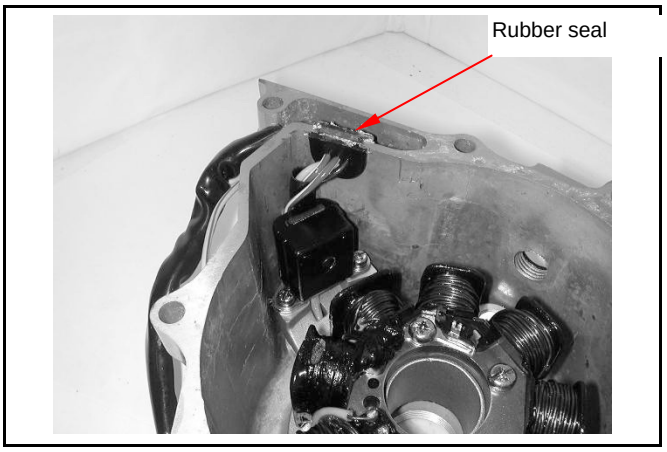
Remove the ACG stator holding screws (screw ×2).



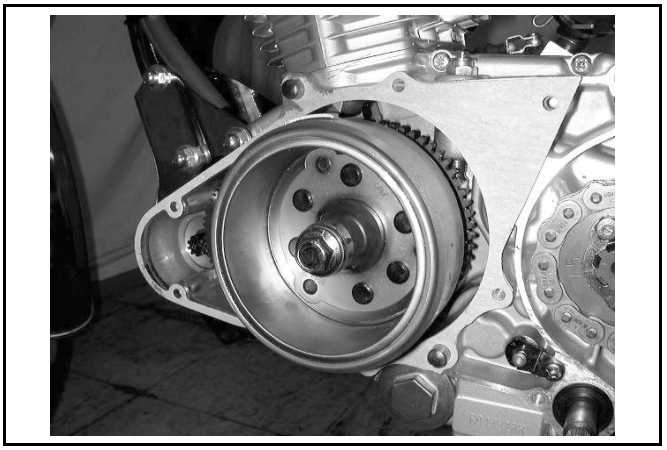
ACG Stator assembly

Assemble the ACG stator holding screws.
(Screw×2) ◦

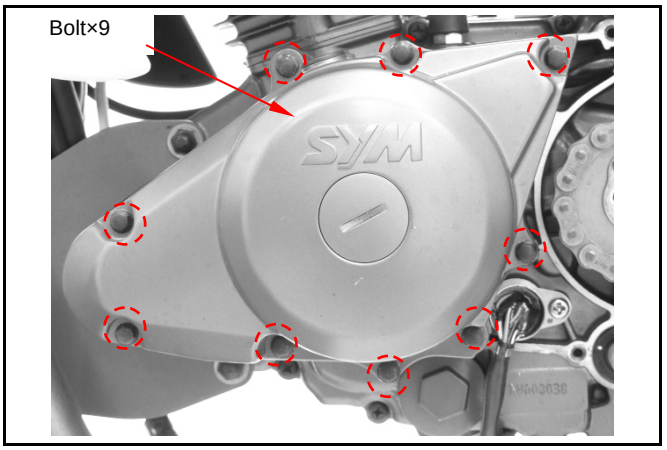
Assemble the stator wire correctly onto the L-crankcase cover with the rubber seal.



Insert the dowel pin, set the L crankcase cover gasket to the correct position.



Assemble the L crankcase cover (Bolt×9).

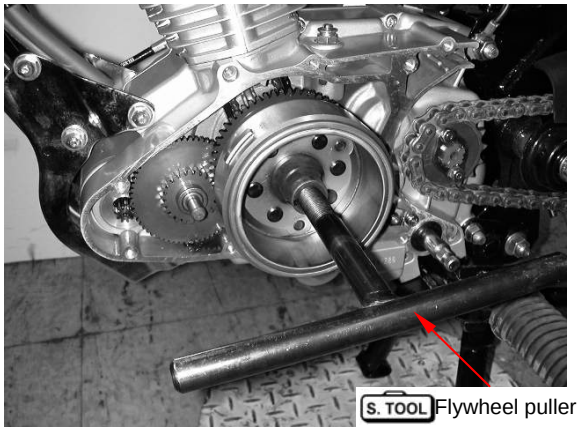


ACG Flywheel/ Starter Clutch

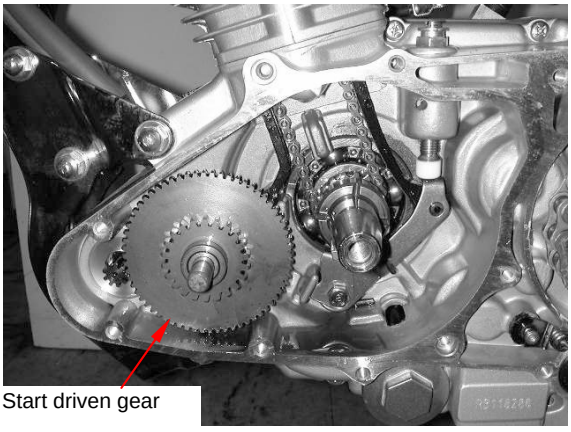
ACG Flywheel/ Starting clutch disassembly

Remove the flywheel with special tool-Flywheel puller, starting clutch, and the start driven gear.

Special Tool：
ACG Flywheel puller SYM-3111000

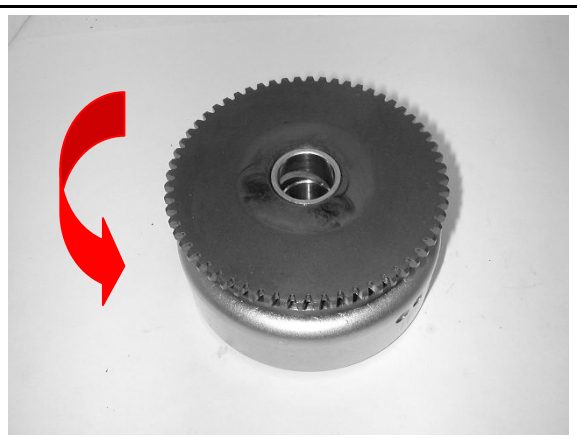


Remove the start driven gear, and its shaft.



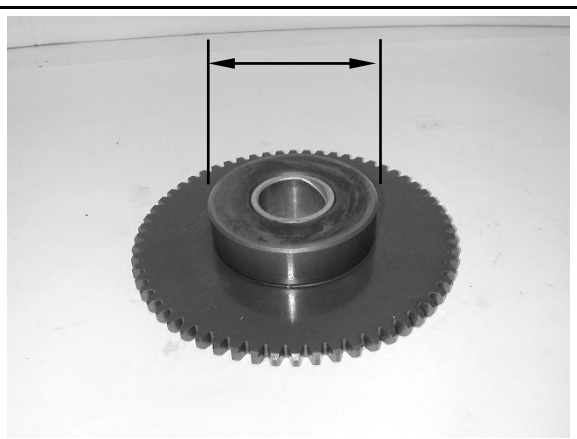
Inspection on starting clutch

Assemble the start driven gear onto the starting clutch.
Hold the starting clutch and turn the start driven gear.
Start driven gear should only be able to turn counterclockwise.

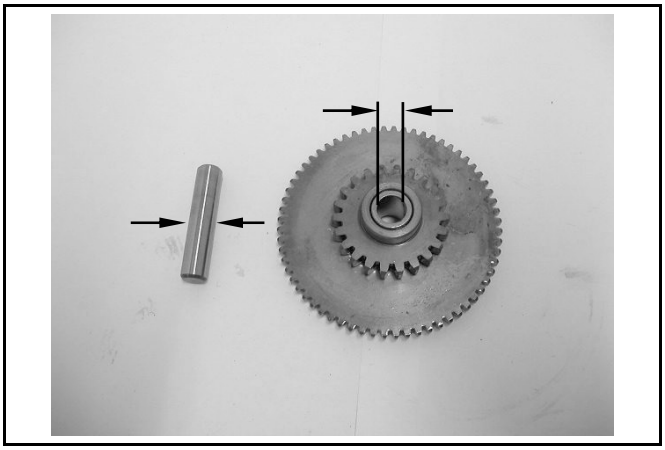


Check if the start gear is worn or damaged.
Measure the exterior diameter of the start driven gear

Service limit：
Exterior diameter： over 54.06 mm



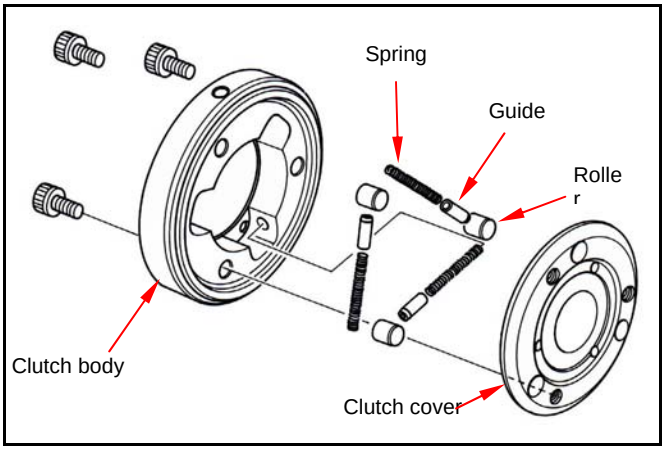
Check if the start driven gear is damaged or worn.
Measure the inner diameter of start driven gear.
Service limit：
Inner diameter：under 10.05 mm



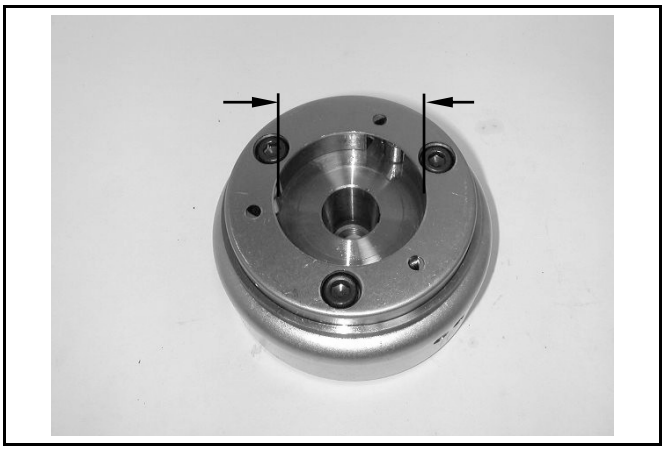
Measure the exterior diameter of the start driven gear shaft.
Service limit：
Over 9.94 mm

Disassembly

Remove the start clutch inner-hexagon bolts. (Bolt×3).
Separate the clutch body and the clutch cover.
Disassemble the clutch rollers, guides, and springs.
Check if the rollers and the guides are worn or damaged.
Assemble the rollers, guides, and springs.



Measure the starting clutch body inner diameter.
Service limit：
Inner diameter：over 54.94 mm



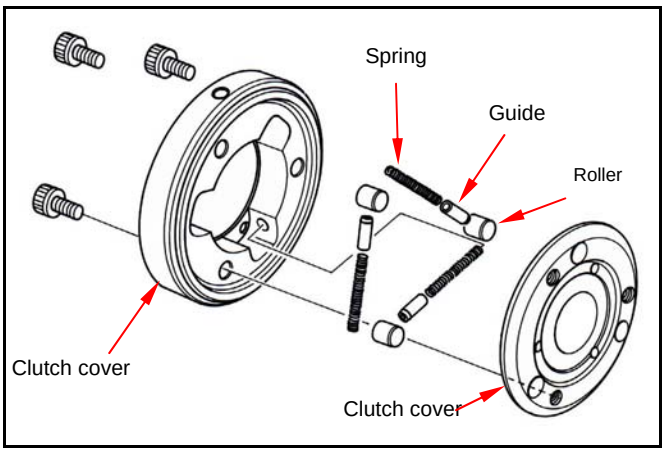
Assembly

Assemble in the reversed process of disassembly.

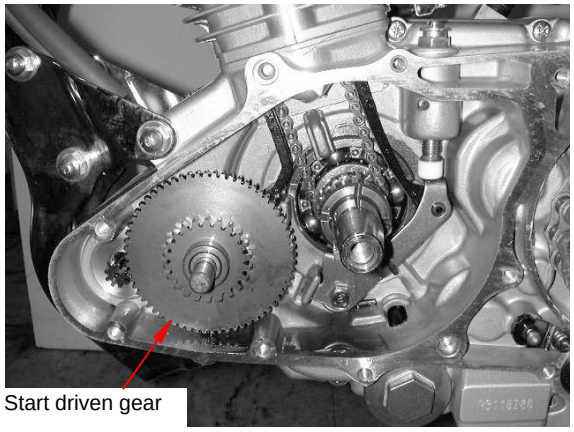
Caution

- Apply some screw- adhesive on the thread of inner-hexagon bolts.

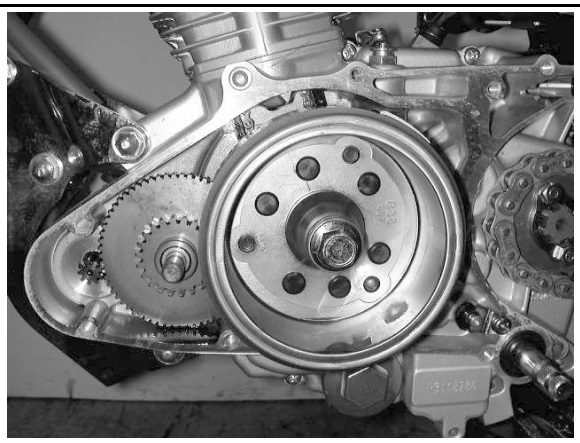
Torque Value：1.0~1.4kgf-m



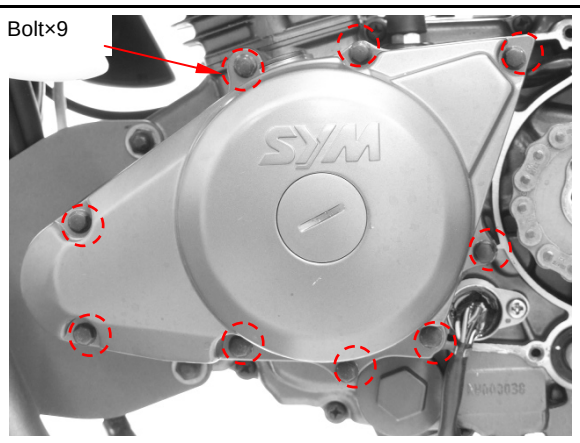
ACG flywheel/ Start clutch assembly
Assemble the start driven gear and its gear shaft.



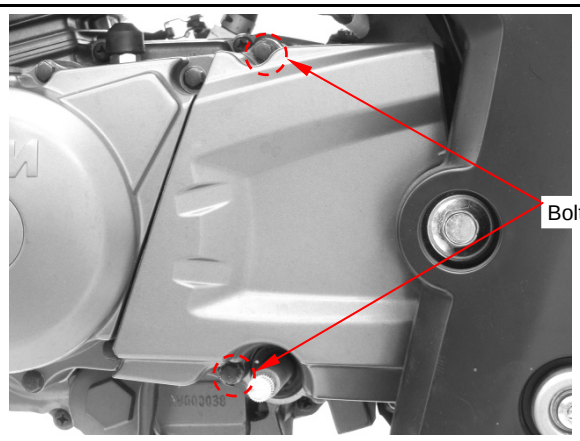
Install the ACG flywheel, start clutch, and start gear. Tighten the ACG flywheel (Bolt×1).
Torque Value：5.0~6.0kgf-m



Insert the dowel pin, set the L crankcase cover gasket to the correct position. Assemble the R crankcase cover onto the R crankcase. (Bolt×9).
Torque Value：1.5~2.0kgf-m



Assemble the left crankcase chain cover (Bolt×2).



Precautions in Operation

General information

- During maintenance of a removed engine, you need to use an adjustable rack or cart to support the engine.
- The following parts can be repaired with the engine staying on the frame:
  1. Carburetor
  2. AC generator
  3. Starting clutch
  4. Clutch
  5. Transmission mechanism
- You must remove the engine for repairing the following parts:
  1. Piston
  2. Crankshaft
  3. Transmission mechanism
  4. Cam-chain tensioner.
  5. Camshaft and Rocker arm.
  6. Kick starter mechanism.

Specification

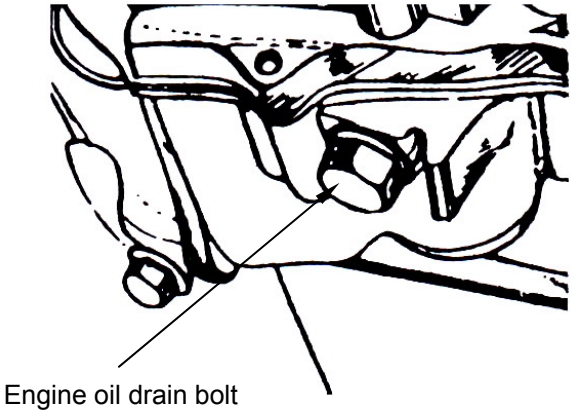
Model		Specification
Engine oil capacity	Regular exchange	1000 c.c.
	Fully disassembly	1200 c.c.

Torque value

Engine suspension nut (the upper part of engine and frame) 2.4~3.0kgf-m
Engine hanger nut (the front end of the frame) 2.4~3.0kgf-m
Engine assembly nut (the front part of engine and engine hanger) 2.4~3.0kgf-m
Engine assembly nut (the back part of the engine and frame) 4.5~5.5kgf-m
L crankcase chain cover bolts 0.8~1.2kgf-m
Driven sprocket bolts 0.8~1.2kgf-m

Engine Removal

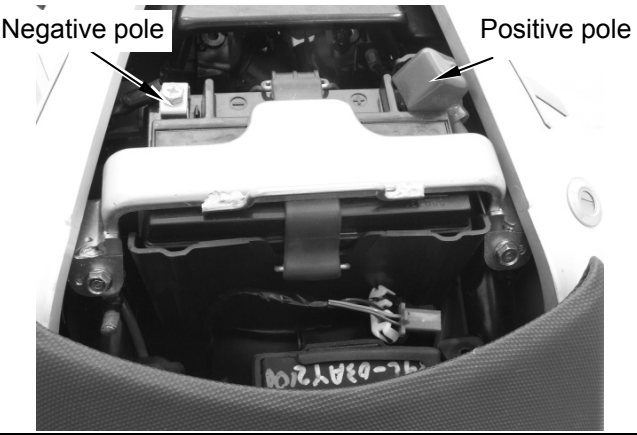
Drain all the engine oil out.



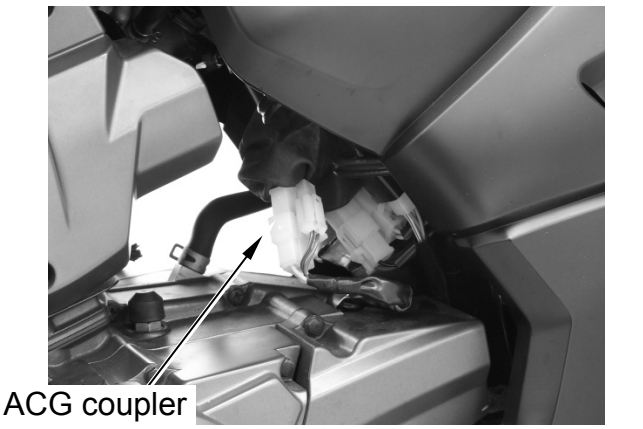
Remove the rear seat.
Remove the battery cable, first negative then positive pole.
Remove the battery.

⚠ Caution

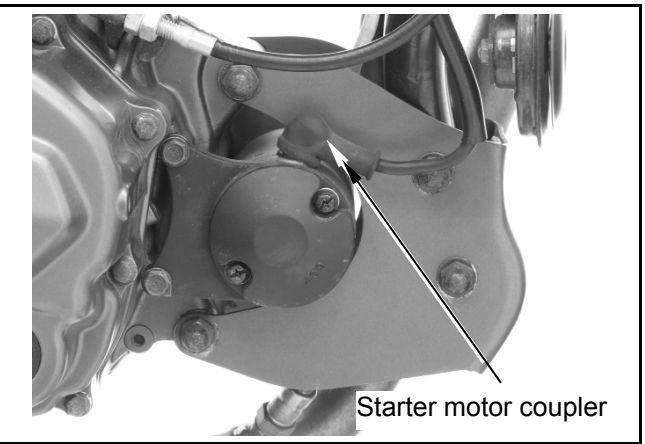
- To prevent short circuit, always connect the positive pole before the negative one.



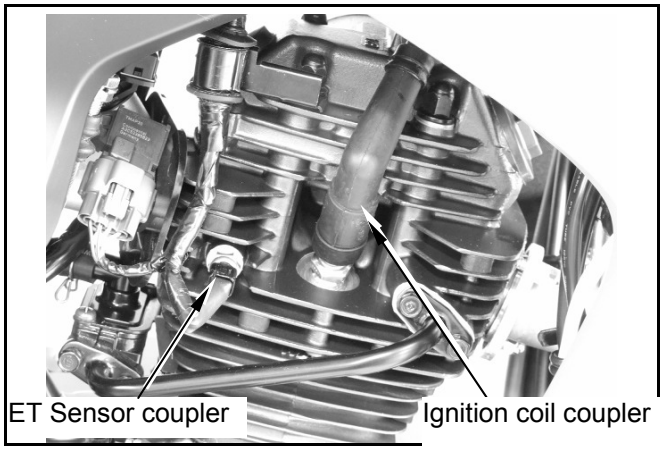
Disconnect the ACG wire coupler.



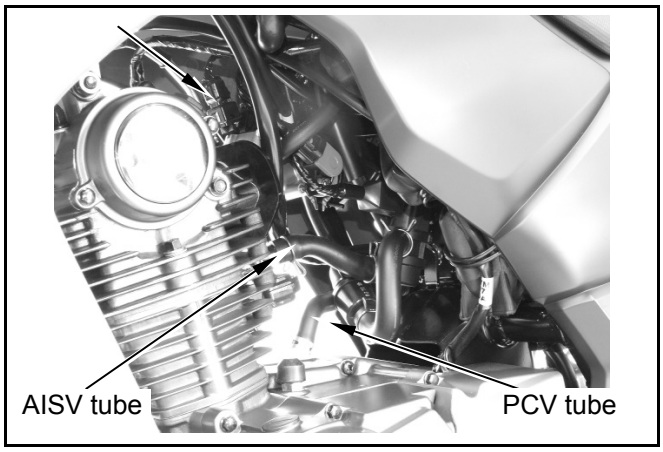
Disconnect the starter motor wire coupler.



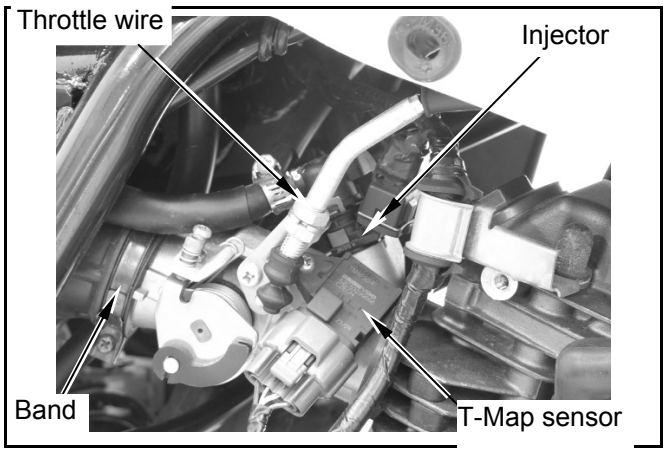
Remove the ET Sensor coupler.
Remove the ignition coil coupler.



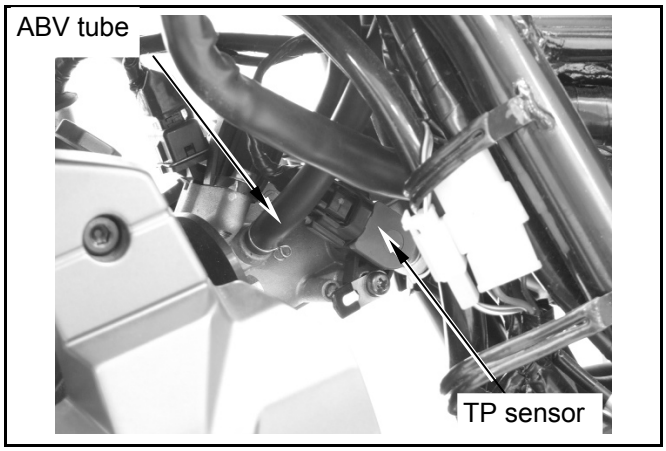
Remove the AISV tube and PCV tube.



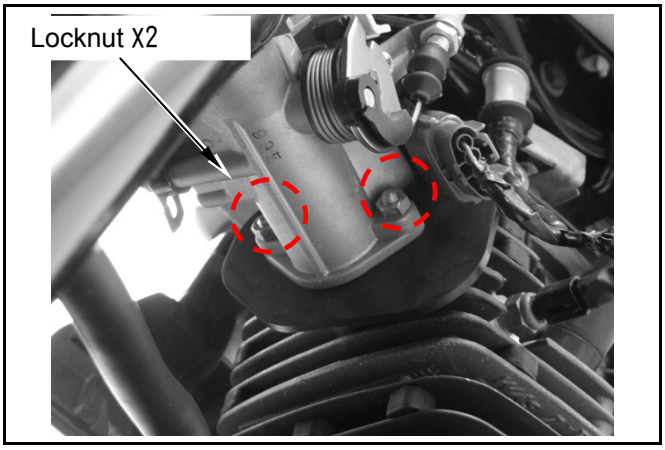
Loosen the throttle wire locknut.
Remove the T-Map sensor coupler.
Remove the injector coupler.
Loosen the throttle body band.



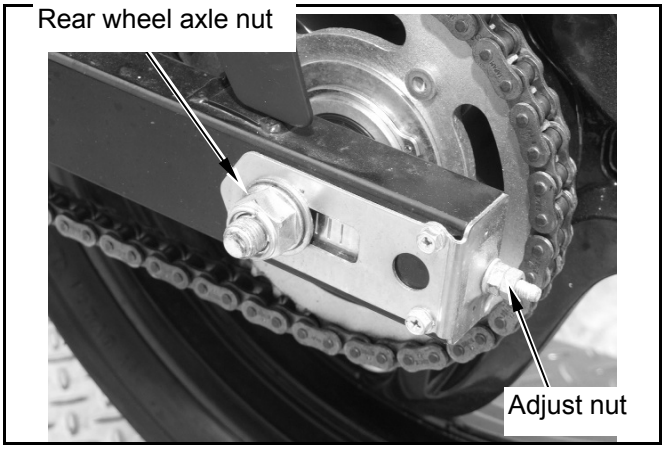
Remove the TP Sensor and ABV tube.



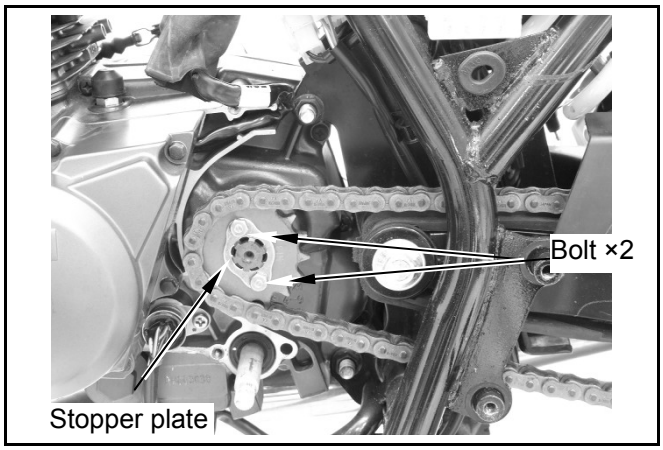
Remove the throttle body locknuts.
Remove the throttle body.



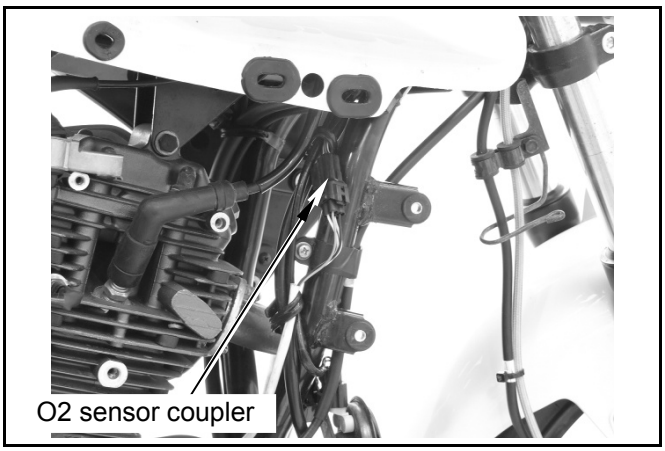
Loosen the rear wheel axle locknut.
Loosen the drive chain adjust nut and push the rear wheel forward.



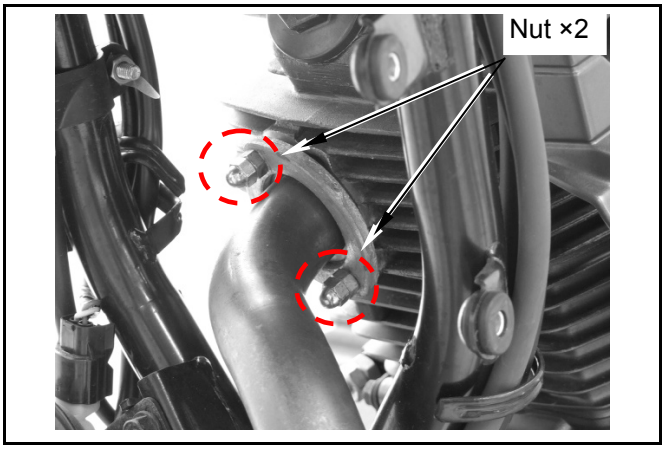
Remove the left crankcase rear cover.
Remove the drive sprocket bolts.
Remove the drive sprocket fixing plate.
Remove the drive sprocket and chain.



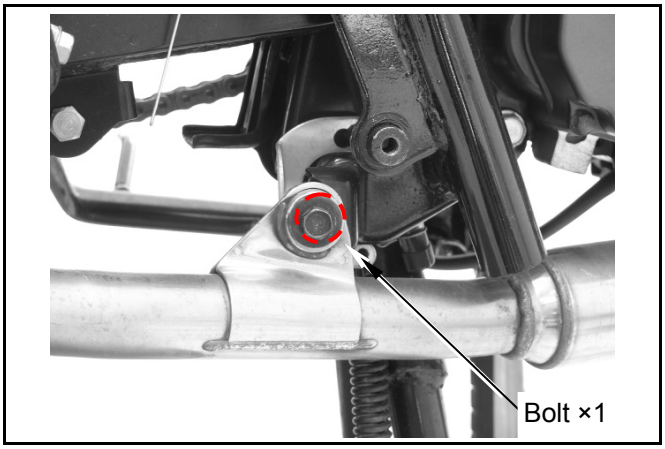
Disconnect the O2 sensor coupler.



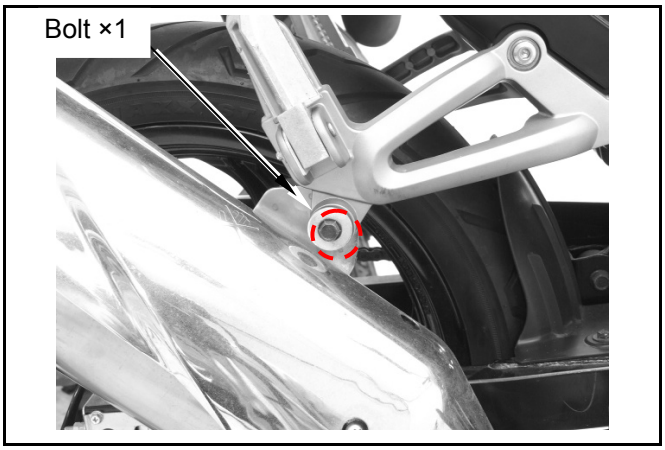
Remove the exhaust pipe front locknut.



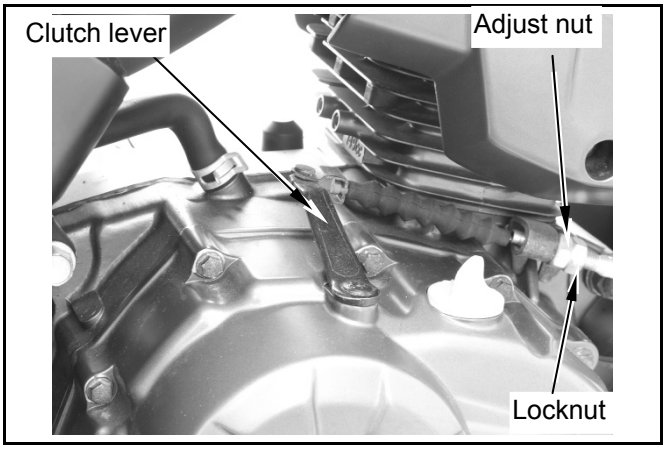
Remove the exhaust pipe center bolt.



Remove the exhaust pipe rear bolt.
Remove the exhaust pipe.

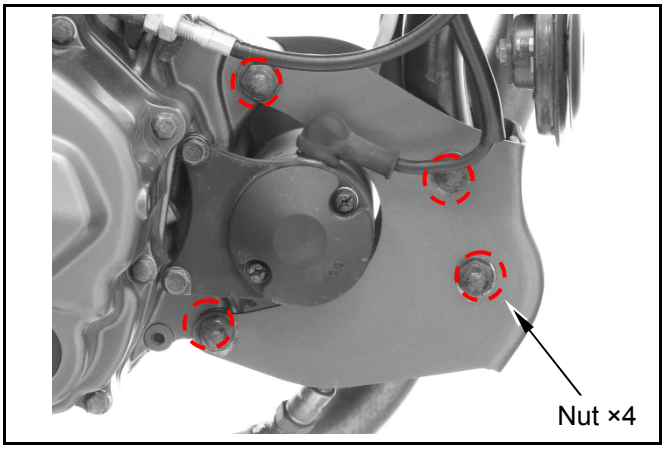


Loosen the clutch wire adjust and locknut.
Remove the clutch wire.

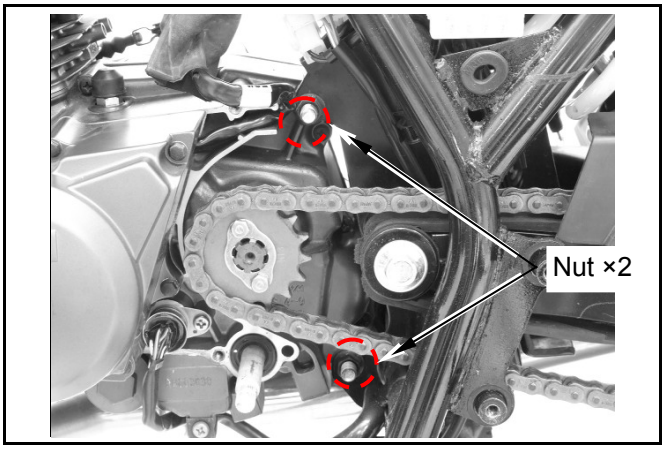


6. Engine Removal

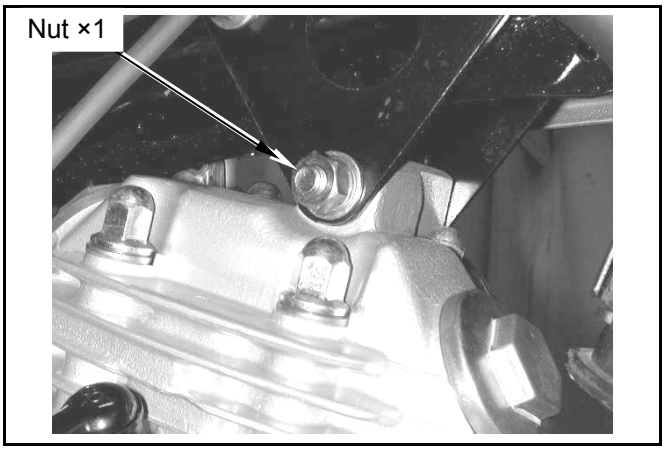
Settle the engine on a rack.
Remove the engine front hanger.
(Nut X 4)



Remove the engine rear holding bolts.
(Nut X 2, bolt X 2)

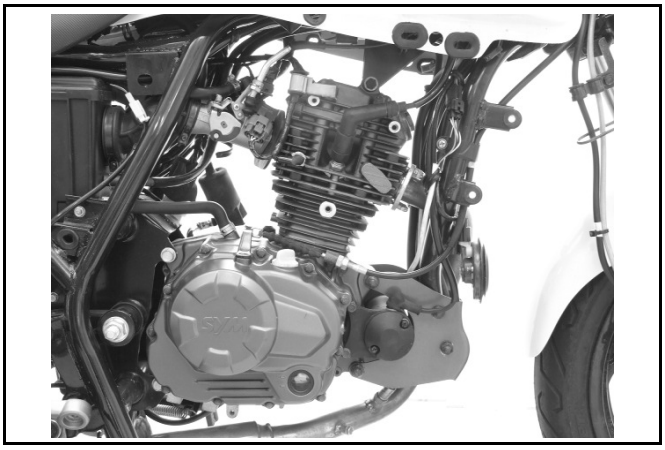


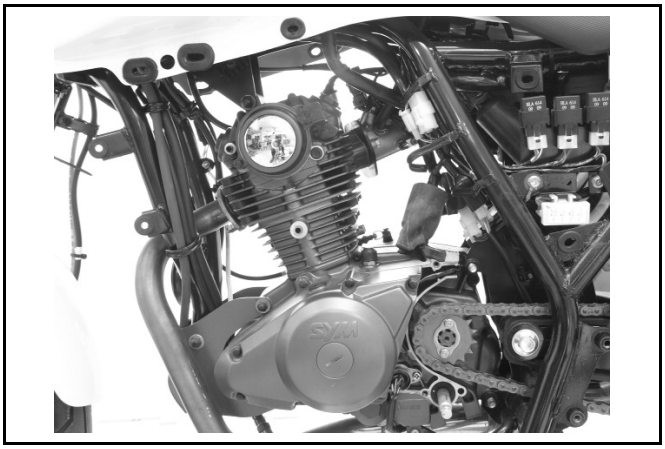
Remove the engine upper holding nut.
(Nut X1, bolt×1)
Pull out the bolt and remove the engine.



Engine Installation

Assemble the engine in the reverse order of removal.





Caution

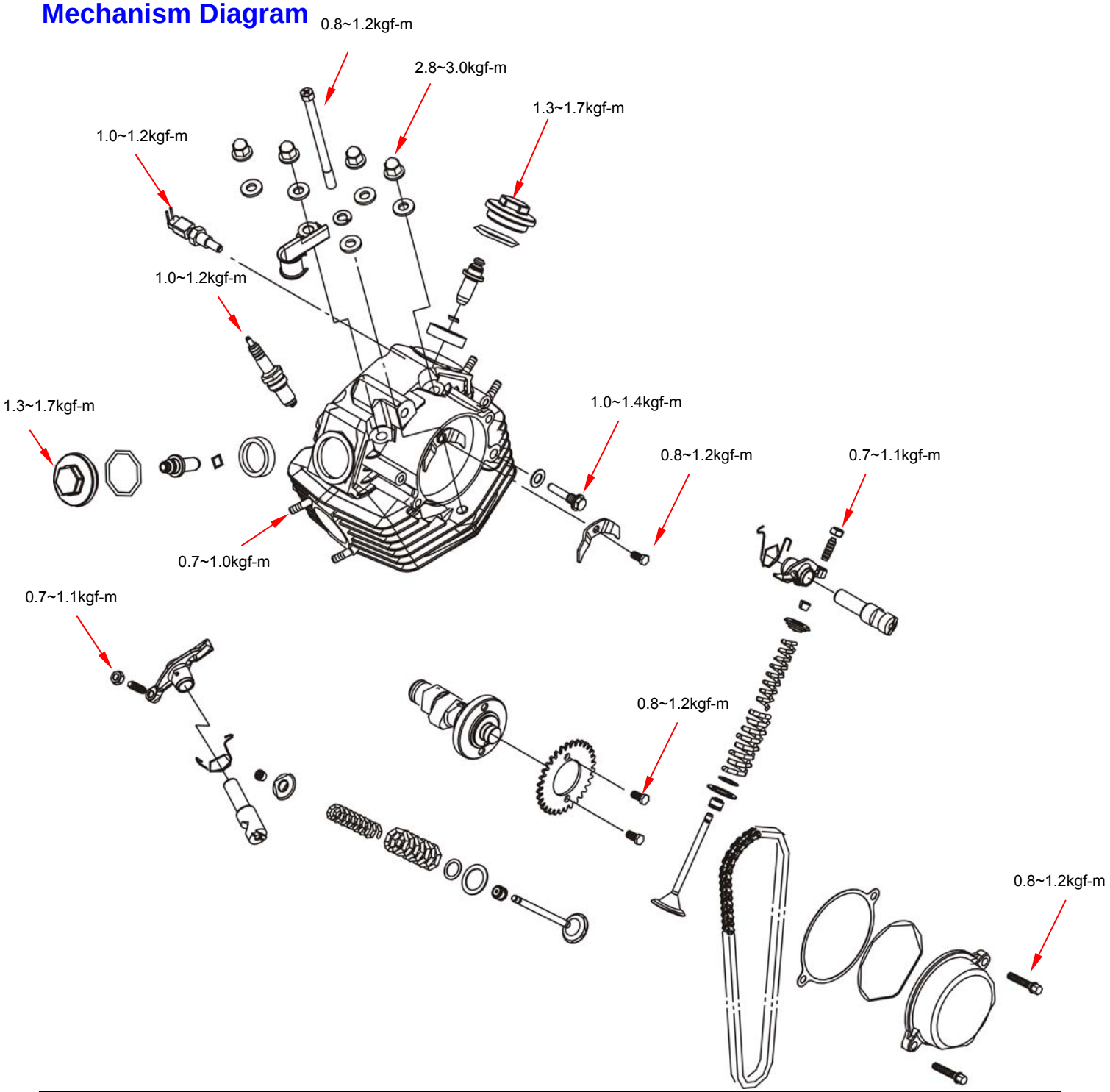
- When assembly, always pay attention to the possible injuries.
- All the wires and cables can't be bent or pressed.
- Please align the wires and cables in accordance with the setting diagram.

Torque value：

Please refer to the General information in the head of this chapter.

NOTE:

Mechanism Diagram



Precautions in Operation

General Information

This chapter includes the repair information of cylinder head, valve, camshaft, and rocker arm.
The engine must be removed before the repairing of Cylinder head.

Specification

Measurement unit :mm

Subject			Specification	
			Standard	Service Limit
Valve Clearance (when engine is cold)		IN	0.05 ± 0.02	—
		EX	0.15 ± 0.02	
Compression pressure			12 ± 1 kg/cm²	—
Camshaft	Cam Lift	IN	31.983	30.800
		EX	31.119	30.020
Rocker Arm	Inner Diameter		12.000~12.018	12.100
	Outer Diameter		11.984~11.966	12.000
Valve Guide	Valve stem outer diameter	IN	5.450~5.465	5.420
		EX	5.430~5.455	5.400
	Valve guide	IN	5.4750~5.485	5.500
		EX	5.4750~5.485	5.500
	Clearance between Valve stem and guide	IN	0.010~0.035	0.080
		EX	0.030~0.055	0.100
	Valve seat width		1.200	1.600
Warpage/clearance between cylinder head and cylinder.			—	0.050

Torque Value

Cylinder head nuts 2.8~3.0kgf-m
Cylinder head left bolts 0.8~1.2kgf-m
Cylinder head side cover bolts 0.8~1.2kgf-m
Cam chain sprocket bolt 0.8~1.2kgf-m
Rocker arm shaft setting plate bolts 0.8~1.2kgf-m
Cylinder head tensioner bolt 1.0~1.4kgf-m
Tappet adjusting cap 1.3~1.7kgf-m
Valve adjusting holding nut 0.7~1.1kgf-m
(Apply engine oil on threads and seats.)
Spark plug 1.0~1.2kgf-m

Special tools

Valve Guide reamer 5.0mm SYM-1471110/20
Valve Guide driver 5.0mm
Cylinder Head/ Engine Oil Strainer Cap Wrench SYM-ALL23461
Rocker arm shaft/ Camshaft Disassemble tool SYM-1445100
Valve Clearance Adjustment Wrench SYM-9001200
Valve Spring Compressor SYM-1471100
Valve Spring Assemble/Disassemble Tool

Troubleshooting

Engine performance will be affected by troubles on cylinder-head perimeter parts. The trouble usually can be determined or by performing cylinder compression test or judging the abnormal noise.

Poor Idling

Compression pressure is too low.

Low compression pressure

1. **Valve**
   - Improper valve clearance adjustment
   - Burnt or bent valve
   - Improper valve timing
   - Valve spring damage
   - Valve carbon deposit.
   - Valve seat warpage
   - Spark plug not tightened of badly assembled.

2. **Cylinder head**
   - Cylinder head gasket leaking or damage
   - Tilt or crack cylinder

3. **Piston**
   - Piston rings worn out.

High compression pressure

- Too much carbon deposit on combustion chamber or piston head

Abnormal noise

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

Smoke from exhaust pipe:

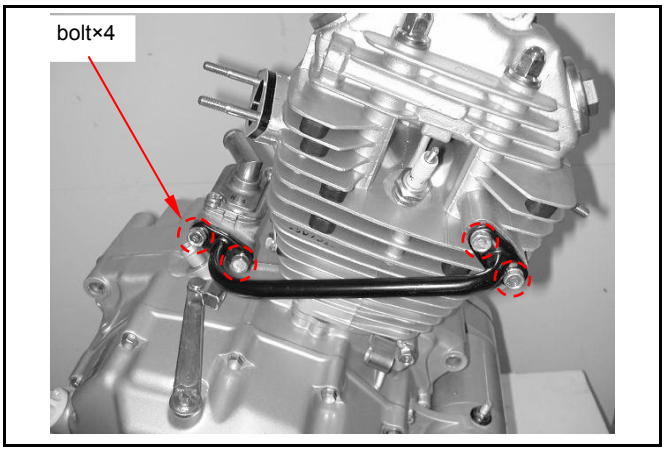
- Valve guide or stem worn
- Valve guide oil seal worn

Cylinder Head

Cylinder Head Removal

Remove engine. (Refer to chapter 6)

Remove the AISV tube on the left side of the engine (bolt×4)



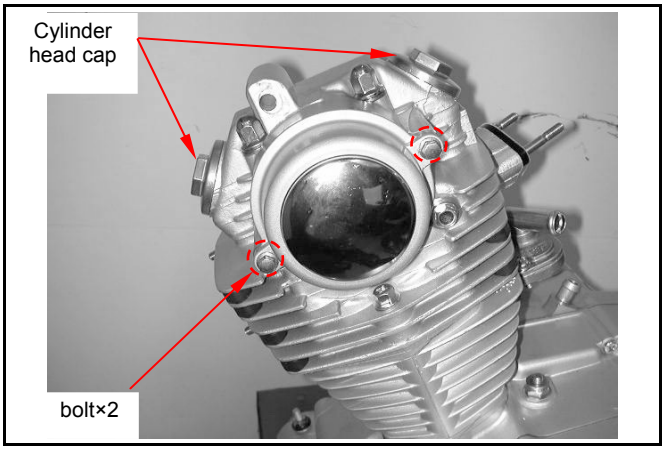
Remove the cylinder head cap with the cylinder head cap wrench

Special Tool：

Cylinder head cap wrench

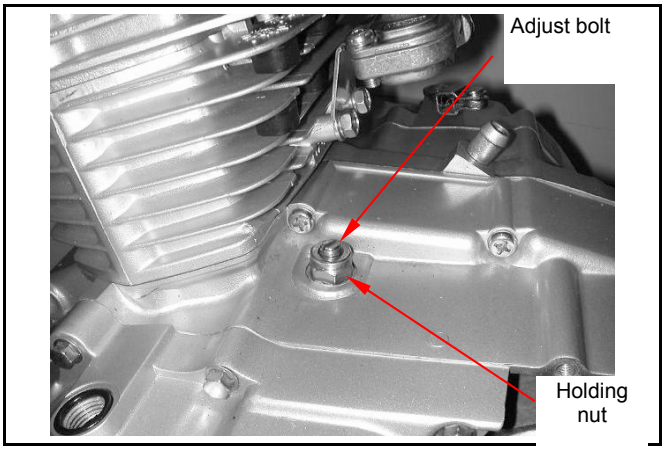
SY-ALL12361

Remove the cylinder head side cover (bolt×2) ◦



Disassemble the timing-inspecting hole cap, and the ACG cap. Match the TDC mark “T”

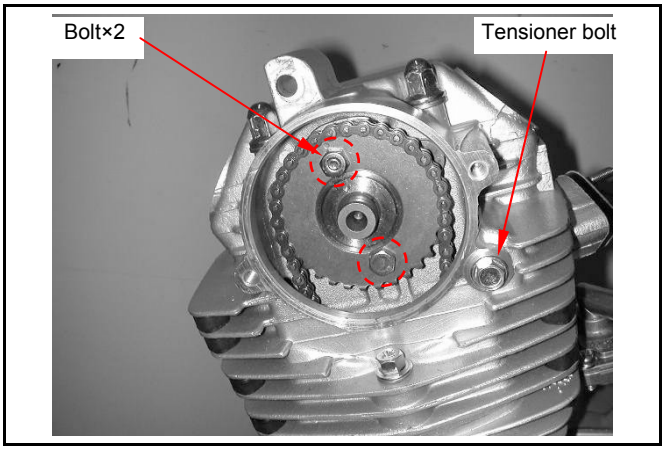
Loosen the cam-chain adjuster bolt



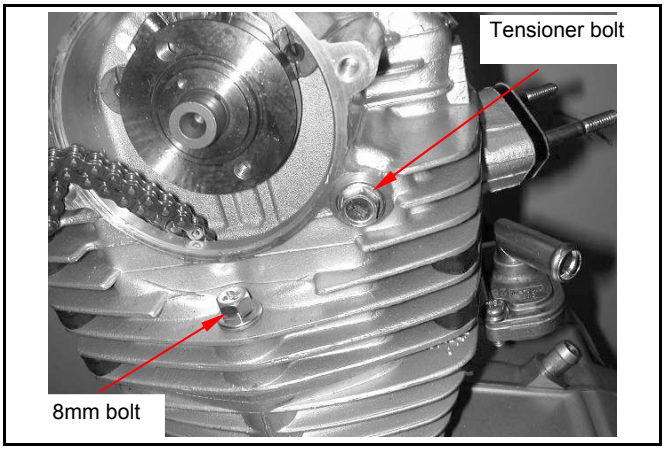
Remove the cam-chain sprocket (bolt×2)

Caution

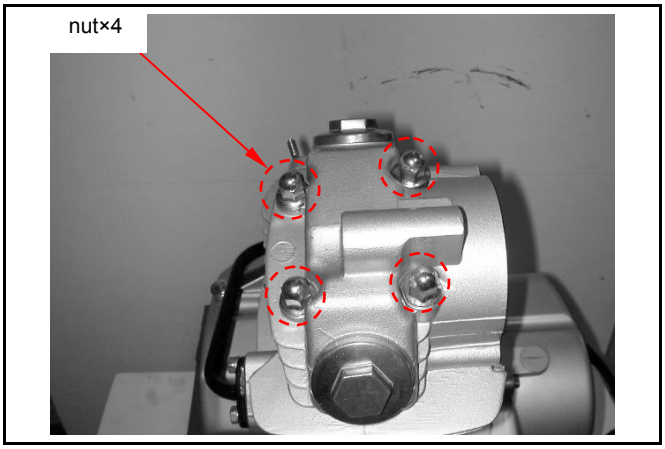
- After removing the sprocket, you must pull cam-chain out to prevent it from falling into the crankcase.



Remove the 8mm bolt on the left side of the cylinder head, then remove the cam-chain tensioner holding bolt



Disassemble the cylinder head holding nut (nut × 4)
Then remove the cylinder head



Clean up residues from the matching surfaces of cylinder and cylinder head

Caution

- Don't damage the matching surfaces of cylinder and cylinder head
- Avoid residues of gasket or foreign materials falling into crankcase when cleaning.

Camshaft

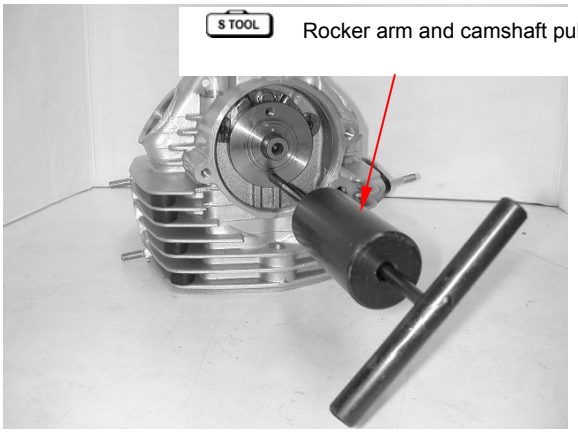
Camshaft Removal

Screw in a 5mm bolt or use the **Rocker arm and camshaft puller** to pull out the rocker arm and the camshaft.

Special tool：

Rocker arm and camshaft puller

SYM-1445100

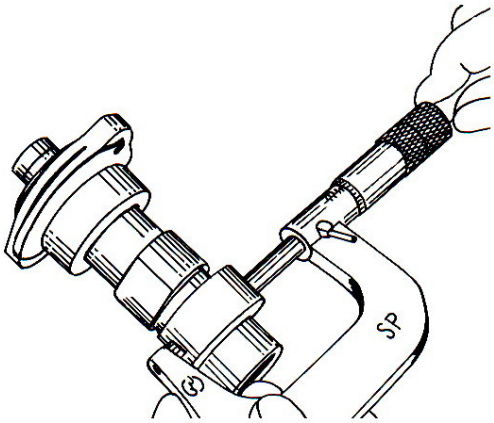


Camshaft Inspection

Check the camshaft for any wearing or loosen, also the bearing on the camshaft.

Service Limit：Intake 30.8mm

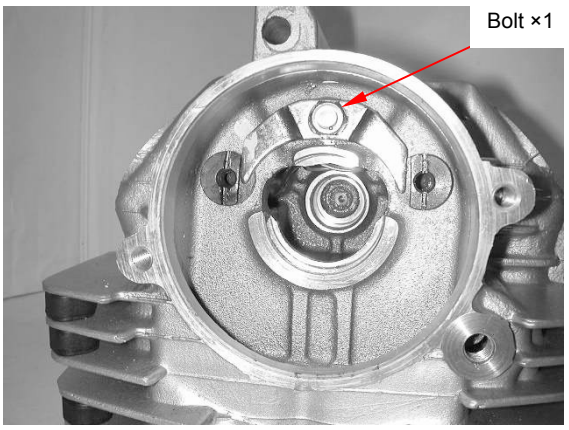
Exhaust 30.02m



Valve Rocker Arm

Rocker arm Disassembly

Disassemble the Rocker arm shaft holding plate (bolt×1)

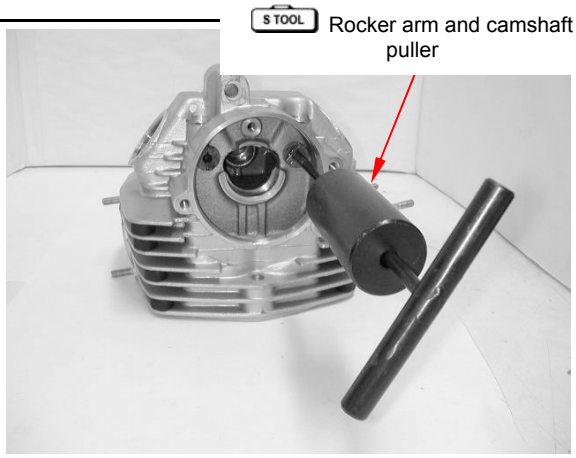


Use **Rocker arm / camshaft puller** to pull out the rocker arm shaft.

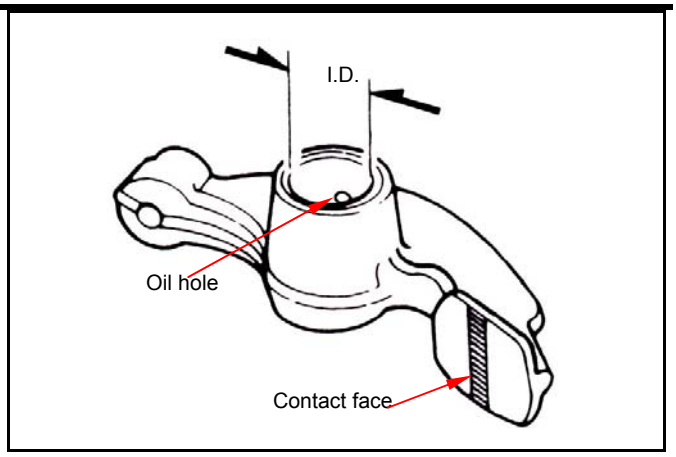
Special tool：

Rocker arm and camshaft puller

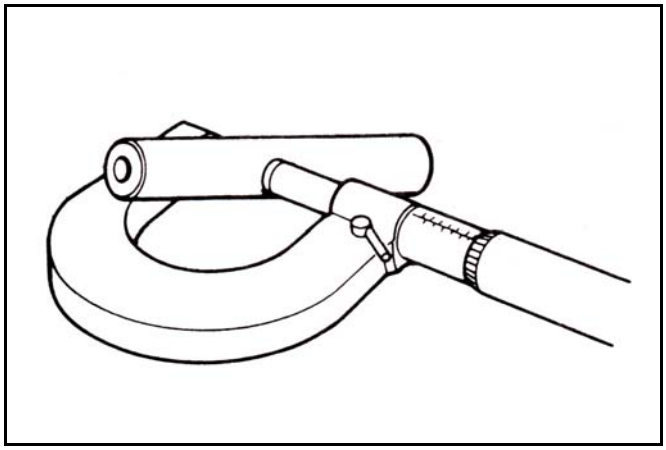
SYM-1445100



Rocker Arm
Measure the cam rocker arm Inner Diameter for wear or damage. Also check if the oil hole is clogged?
Rocker arm I.D. Service Limit：Replace when it's over 12.1mm

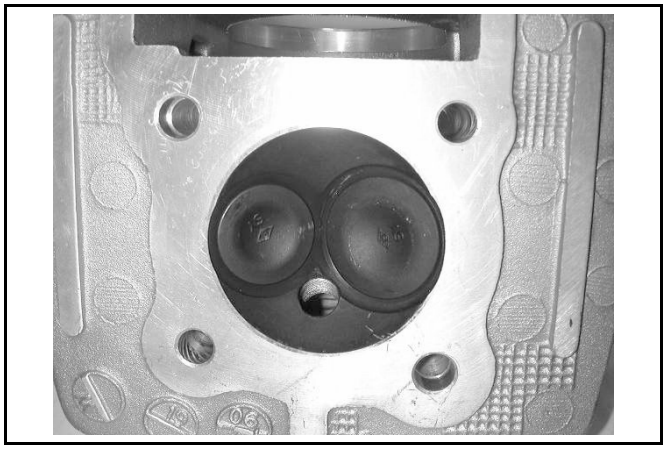


Rocker Arm Shaft Inspection
Measure the active O.D. of the cam rocker arm shaft and cam rocker arm.
Service Limit: Replace when it is less than 12 mm.

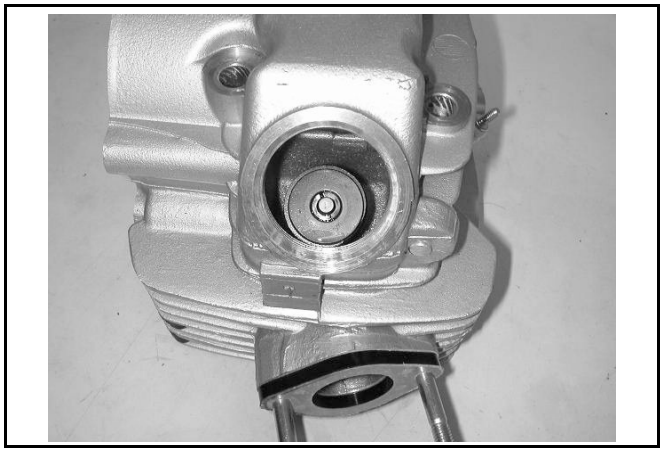


Valve

Valve Disassembly
Clear the carbon deposit inside the combustion chamber.



Use the valve spring compressor to compress the spring, remove the valve cotter, and take out the cotters, spring, and the spring retainers.

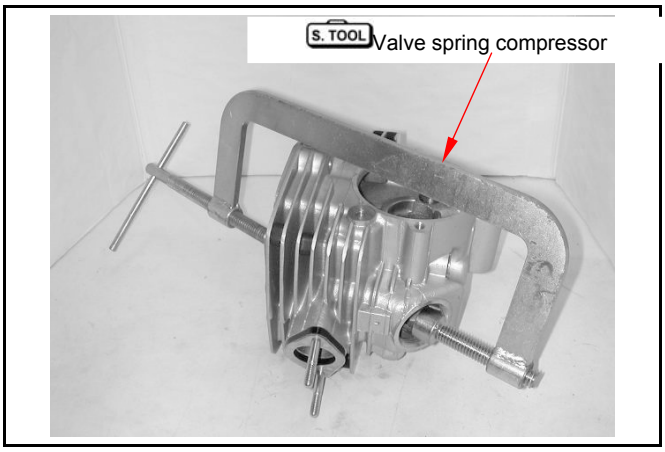


Special tool：

Valve spring compressor　SYM-1471100

Caution

- Do not over compress the valve spring.
- When removing the carbon deposit, beware not to damage the components inside the combustion chamber.



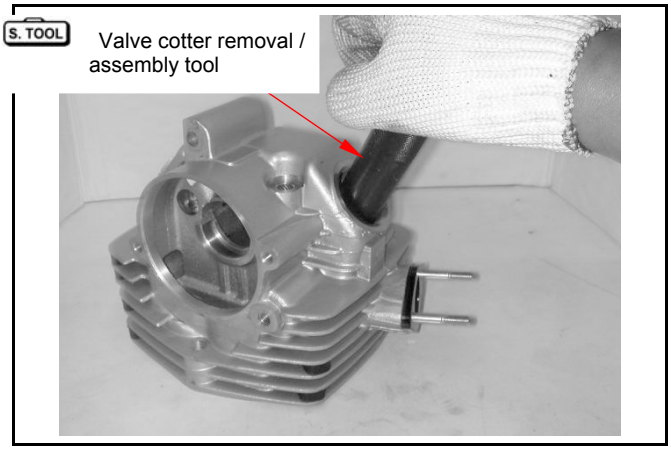
Valve cotter removal / assembly tool is recommended when removing the valve spring

Special tool：

Valve cotter removal / assembly tool SYM-1471110/20

Caution

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



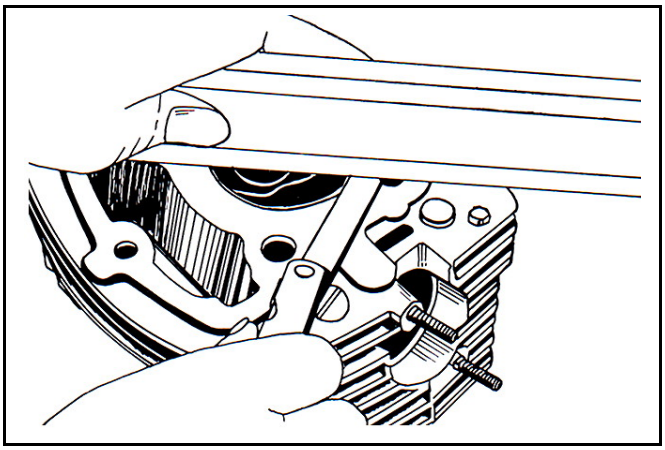
Cylinder Head Inspection

Clean the gasket residue on the matching surface.

Check if the cylinder head has any cracks.

Measure cylinder head warp with a straightedge and thickness gauge.

Service Limit：0.05mm

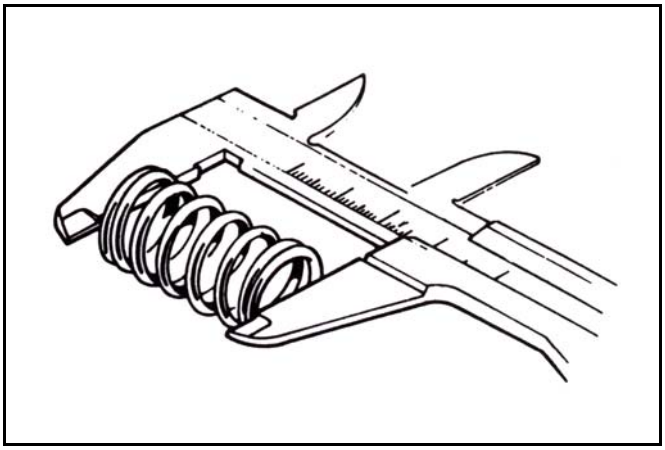


Valve Spring Free Length

Measure the free length of intake and exhaust valve spring.

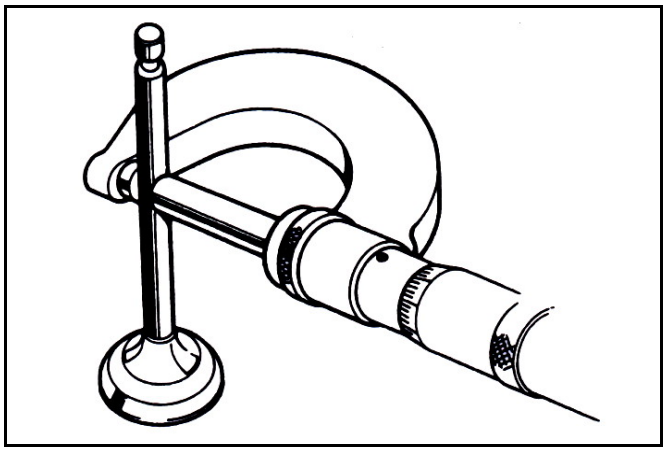
Service Limit：

Outer spring: Under 39.7mm
Inner Spring: Under 32.5mm



Valve Stem Inspection

Check if valve stem is bent, cracked or burnt. Check the operation condition of valve stem in valve guide, and measure the valve stem outer diameter.



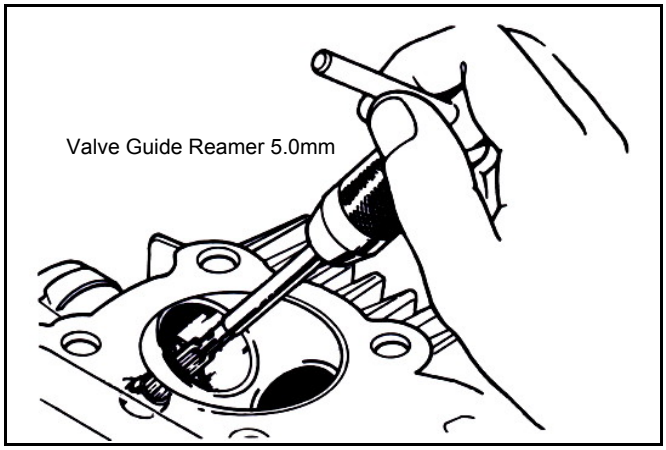
Service Limit:
Intake valve: Under 5.42mm
Exhaust valve: Under 5.40mm

Valve Guide Inspection

Caution

- Clear all the carbon deposit with reamer before measuring the valve guides.

Special tool: Valve Guide Reamer 5.0mm

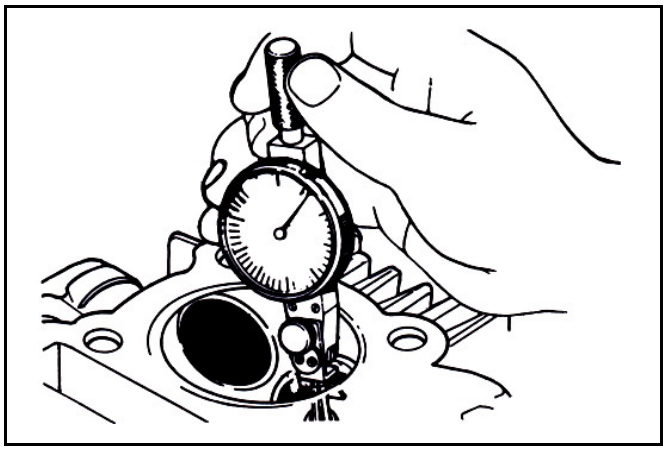


Measure and record each valve guide inner diameters.

Service Limit：5.50mm

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

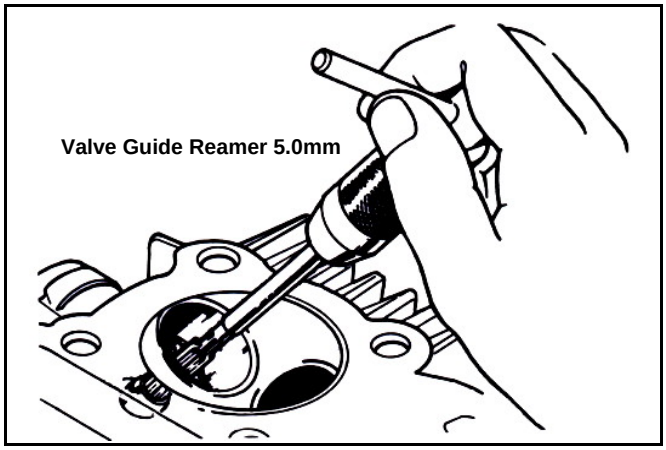
Service Limit：
Intake: Over 0.08mm
Exhaust: Over 0.10mm



Caution

- If clearance is over service limit, check if only replaces new valve guide will fix the clearance into service limit or not. If yes, replace valve guide only.

Fix the guides with reamer after replacement. If clearance still exceeds service limit after replacing valve guides, please also replace valve stem too.



Caution

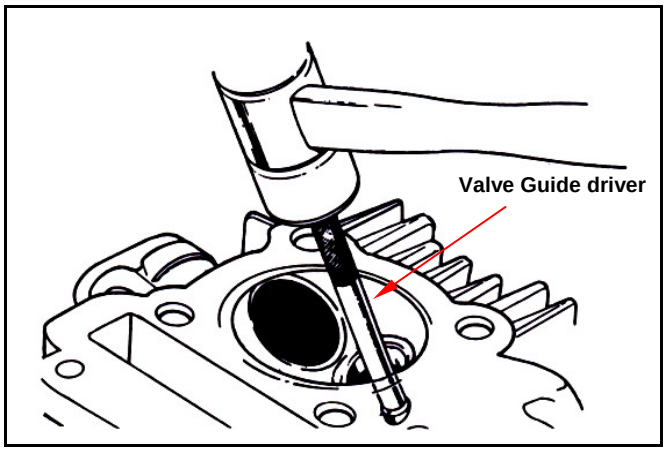
- Fix the valve seat when replacing valve guides.

Valve Guide Replacement

Heat the cylinder head with heated plate or toaster till the temperature reaches 100~150 ℃.

Caution

- Do not use flame to heat the cylinder head directly. Otherwise, the cylinder head will be deformed.
- Wear on a pair of heat-isolation glove to protect your hands when operating.

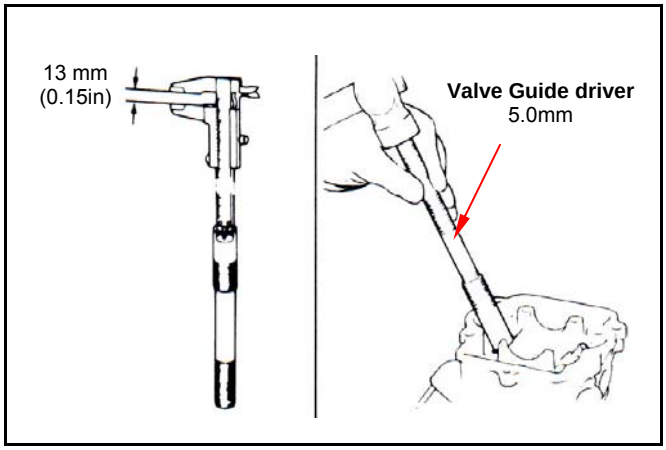


Hold the cylinder head, and then press out old valve guide from combustion chamber side.

Tool: Valve guide driver: 5.0 mm

Caution

- Check if new valve guide is deformed when pressed it in.
- When pressing in the new valve guide, cylinder head still have to maintain 100~150℃.



Adjust the valve guide driver and let valve guide height be 13 mm.

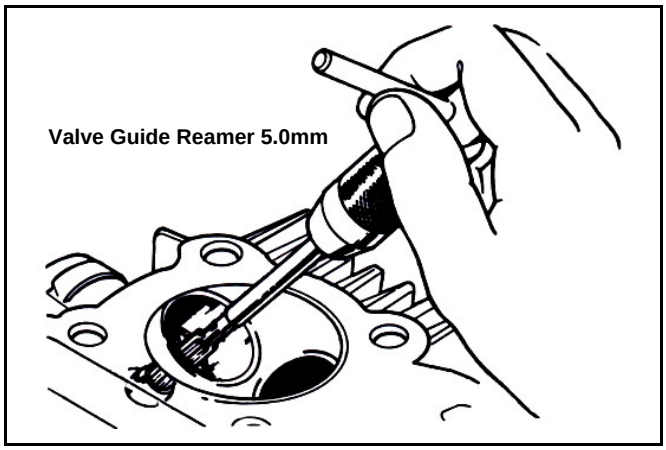
Press in new valve guide from rocker arm side.

Tool: Valve guide driver: 5.0 mm

Wait until cylinder head is cooled down to room temperature, and then fix the new valve guide with reamer.

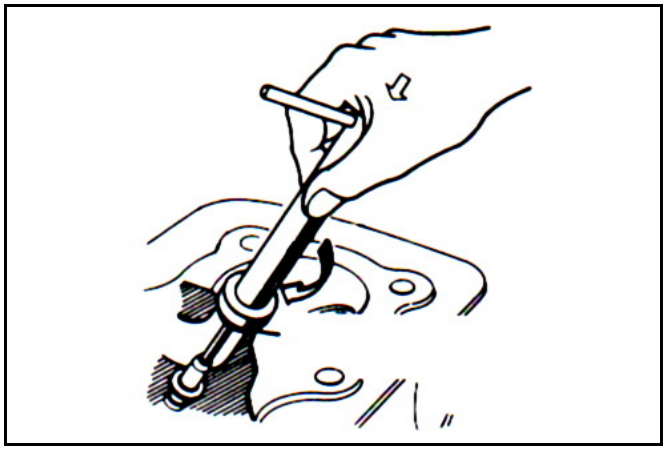
Caution

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



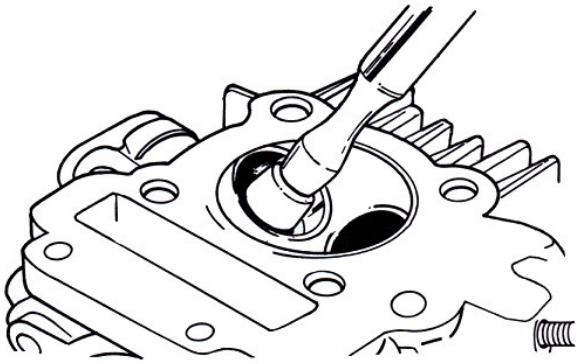
Correct the valve seat, and clean up all metal residues from cylinder head.

Special tool：Valve Guide Reamer 5.0mm



Valve Seat Inspection and Refacing

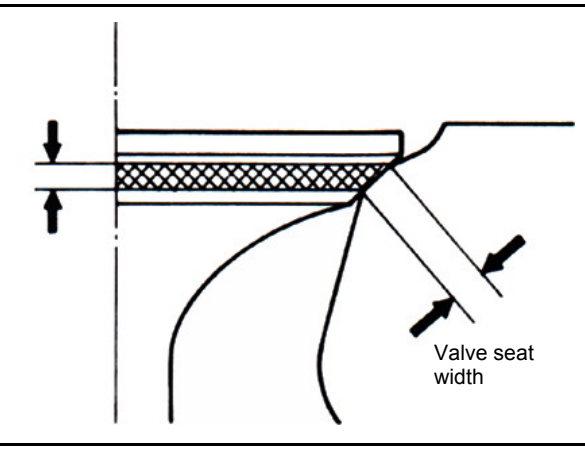
Clean up all carbon deposits onto intake and exhaust valves.
Apply with emery slightly onto valve contact face. Grind valve seat with a rubber hose or other manual grinding tool.



Remove the valves and check if the contact face is even or not.

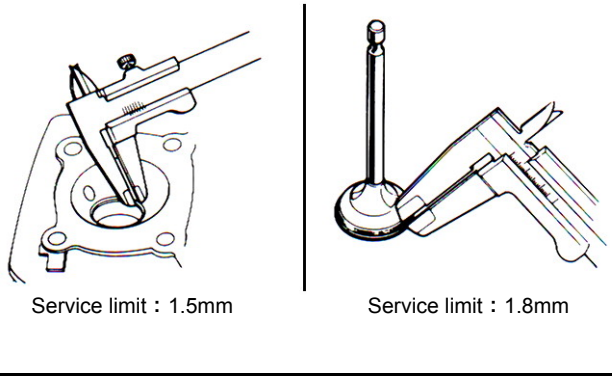
Caution

- The valve can not be ground. If the valve is burned, worn, or its contact face is uneven, replace it.
- If the valve contacts the valve seat unevenly after grinding, replace it.



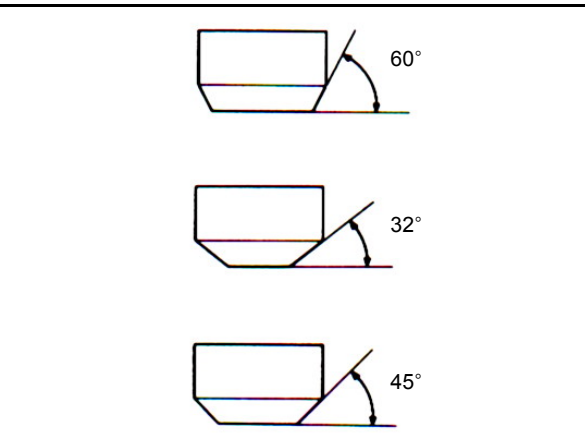
Check the contact condition of the valve seat.
If the valve seat is too wide, too narrow, or worn, refinish it.

Service limit：Valve seat width: 1.6 mm
Valve contact face width: 1.8 mm



Valve seat grinding

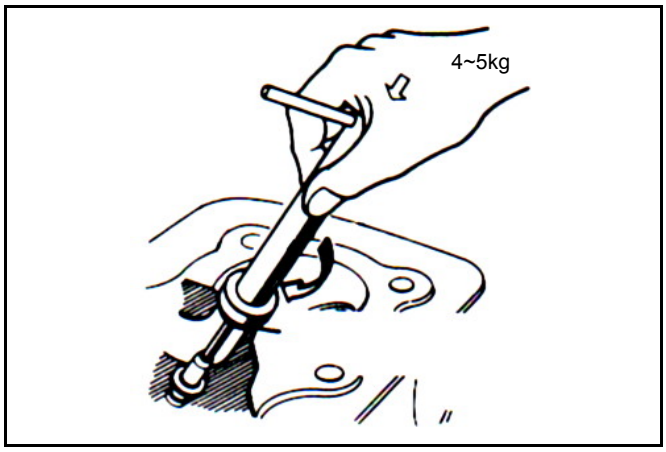
Please use the valve seat cutter and follow the instruction to grind the valve seat.



Rotate the valve seat cutter clockwise and counterclockwise with 4 to 5 kg pressure in order to fix the uneven part.

Caution

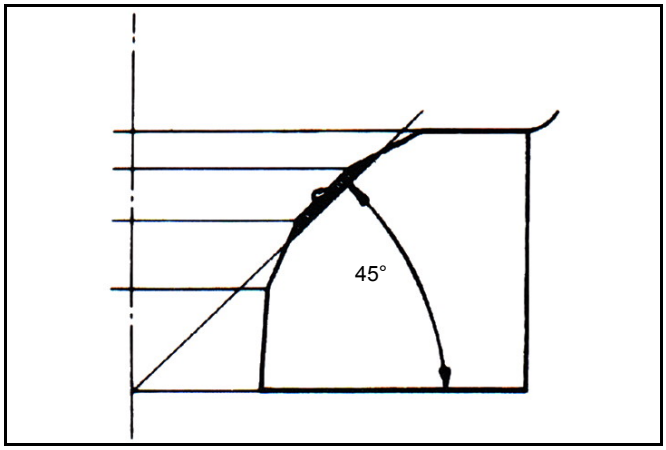
- Apply motor oil to the contact face while grinding it.



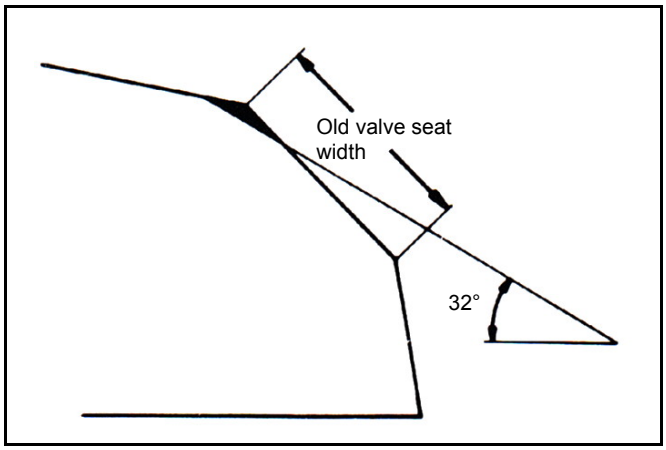
Use the 45 degree valve seat cutter to remove any roughness on the valve seat.

Caution

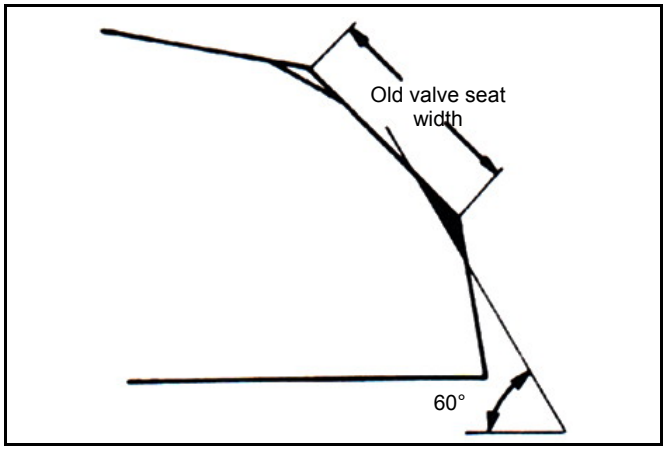
- Use the 45 degree valve seat cutter to grind the seat after changing the valve guide.



Use the 32 degree cutter to remove the upper 1/4 part of the valve seat.



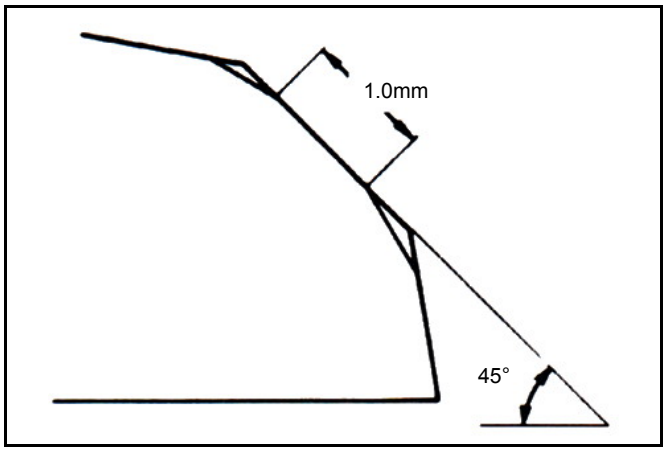
Use the 60 degree cutter to remove the bottom 1/4 part of the seat and check the new valve seat.



Use the 45 degree cutter and cut the seat to the proper width.

Caution

- Confirm that all roughness is removed.

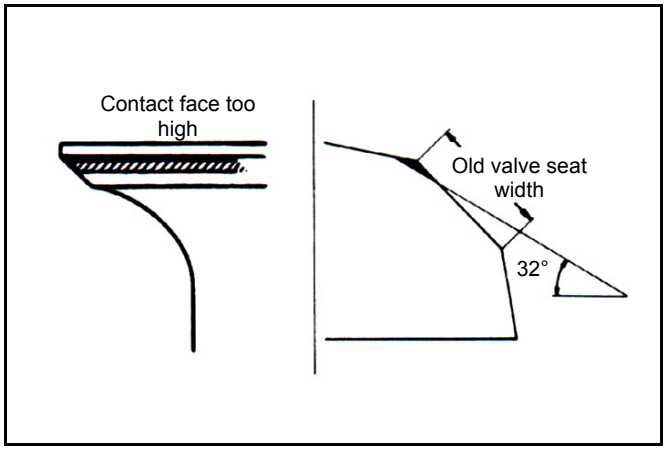


Coat the valve seat surface with red paint.
Install the valve through valve guide until the valve contacting with valve seat, slightly press down the valve but do not rotate it so that a seal track will be created on contact surface.

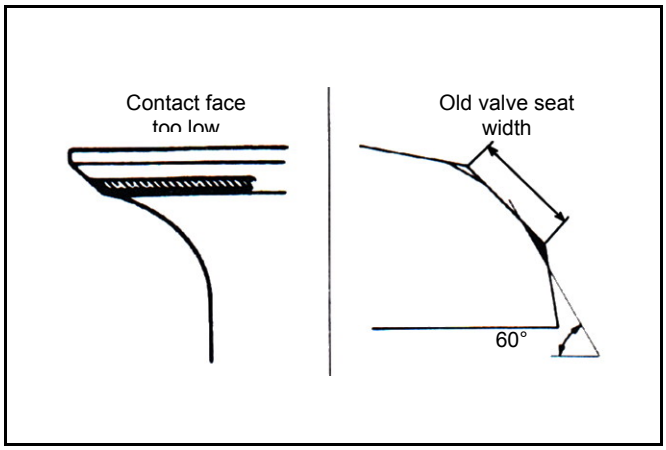
Caution

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

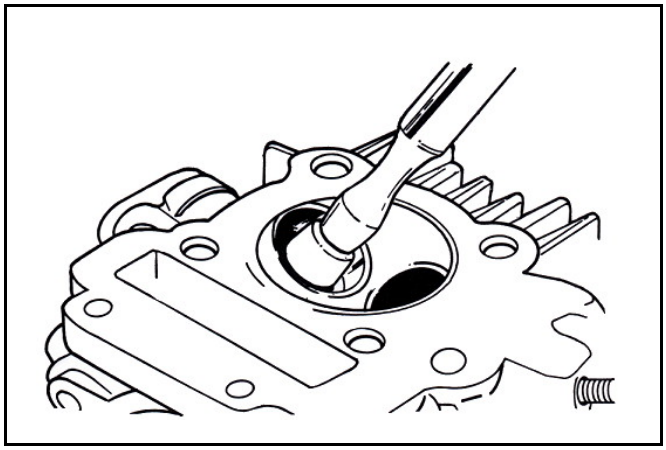
If the contact face on the valve is too high, cut the valve seat with the 32 degree cutter.
Then cut the valve seat to the proper width with the 45 degree cutter.



If the contact face on the valve is too low, cut the valve seat with the 60 degree cutter.
Then cut the valve seat to the proper width with the 45 degree cutter.



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



Cylinder Head Assembly

Install the valve by using valve installer or valve spring compressor.

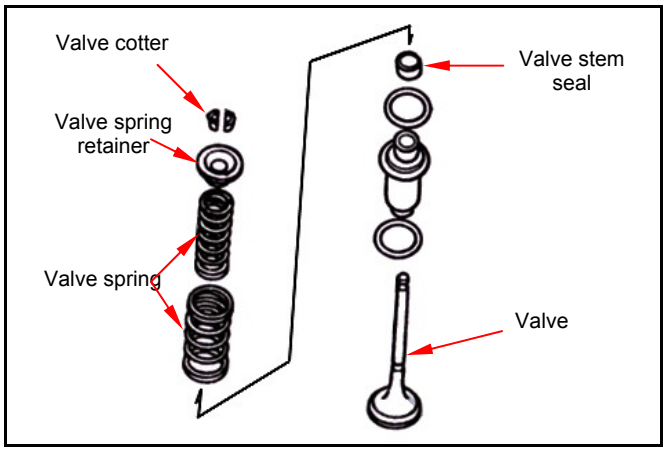
Special tool：

Valve remove / install tool SYM-1471120

Valve spring compressor SYM-1471100

Caution

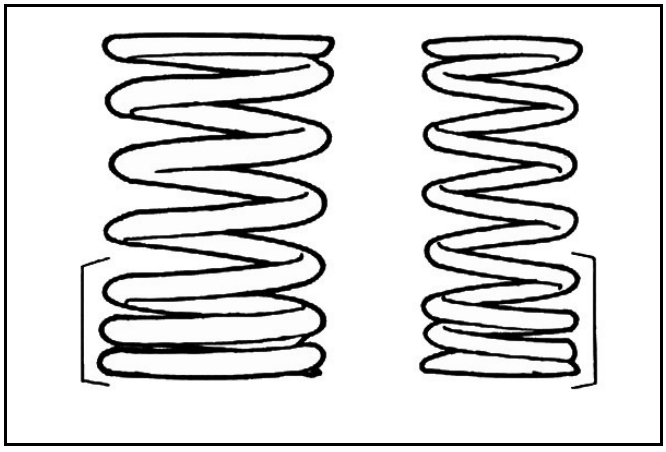
- In order to avoid damaging the valve stem and the cylinder head, in the combustion chamber place a rag between the valve spring remover/installer as compressing the valve spring directly.



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

Caution

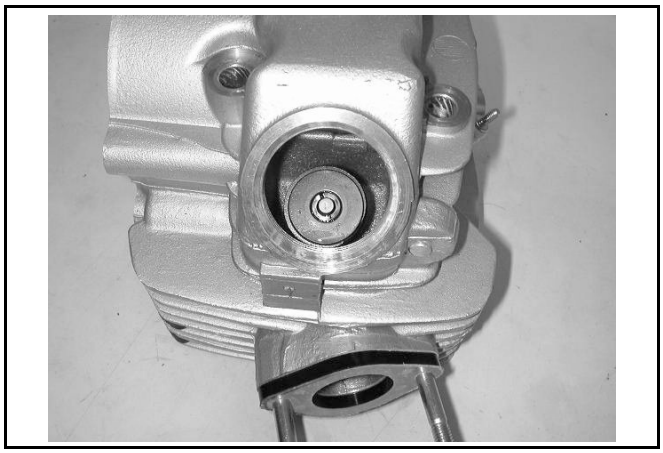
- The closed coils of valve spring should face down to combustion chamber.



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

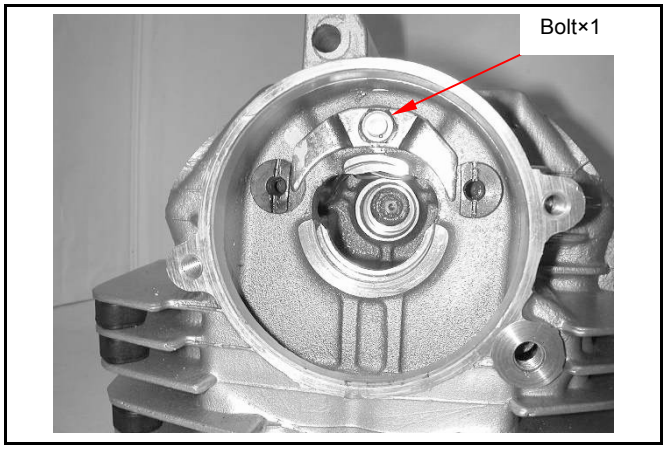
Caution

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



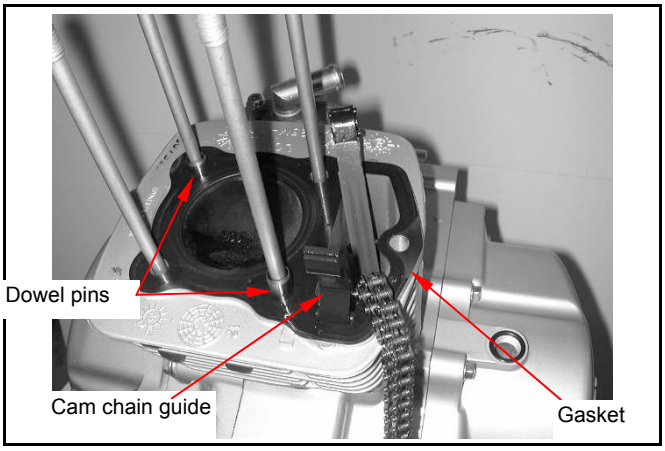
Install camshaft into cylinder head.
Install valve rocker arm, rocker arm shaft and rocker arm shaft setting plate.

Torque value：0.8~1.2kgf-m

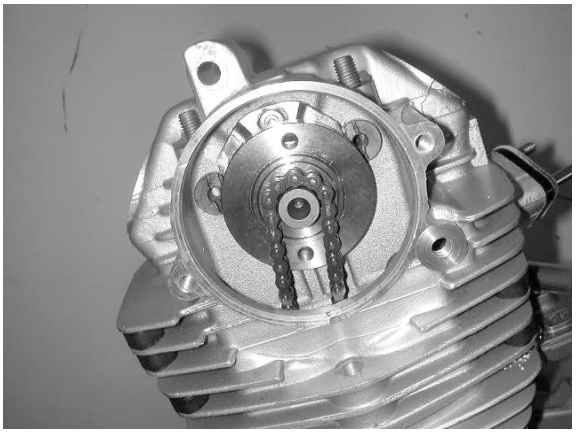


Cylinder Head Installation

Install the cam chain guide.
Put the dowel pins and new cylinder head gasket onto the cylinder.



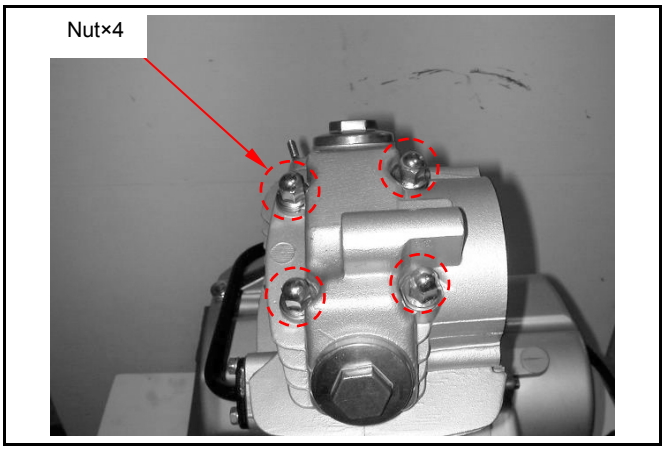
Install the cylinder head. Lubricate the cam shaft and install it onto the cylinder head.
Install the cam chain onto the cam shaft.



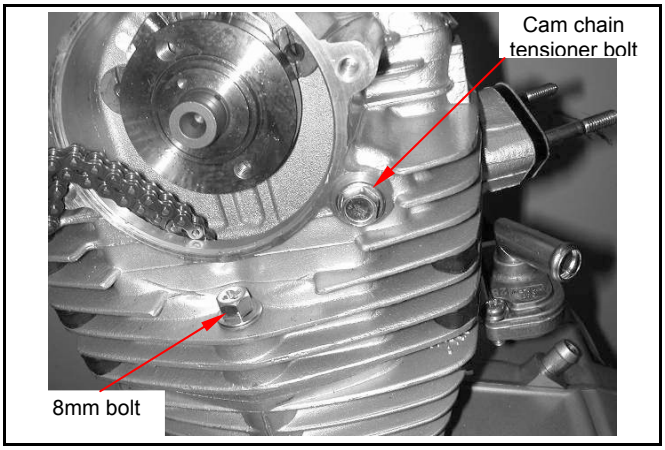
Tighten the cylinder head upper nuts.
Torque value：
Cylinder head upper nut　2.8~3.0kgf-m

Caution

- Tighten the cylinder head nuts in diagonally opposite sequence.
- Do not exceed the specified torque value to prevent cylinder head warpage, abnormal noise, leakage or weakening of engine performance.

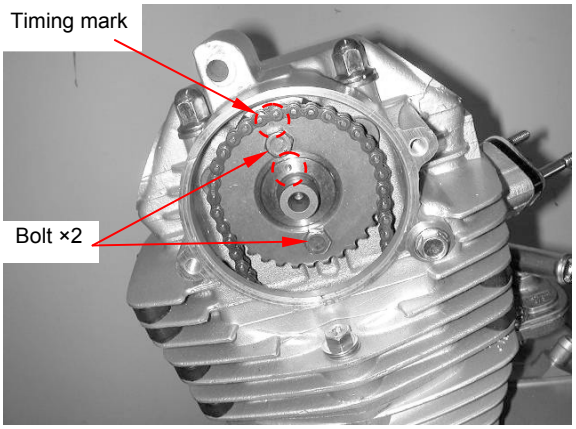


Tighten the cylinder head bolt on the left side.
Torque value：
Cylinder head left side bolt　0.8~1.2kgf-m
Loosen the cam chain tensioner adjusting bolt.
Align and tighten the cam chain tensioner.
Torque value：1.0~1.4kgf-m

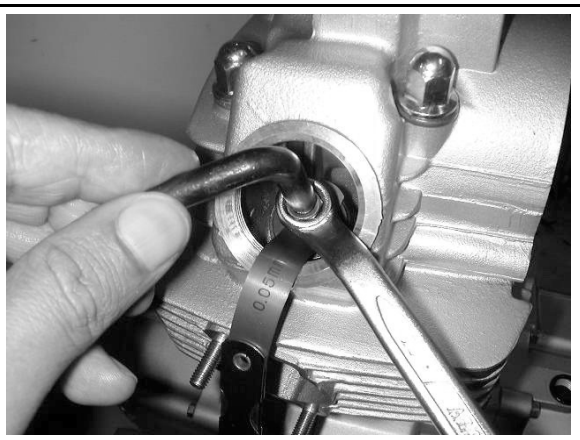


Use a T type wrench to rotate the crankshaft clockwise and align the “T” mark on the flywheel with the index mark on the left crankcase cover.

Install the cam chain sprocket and align the timing mark with the index mark on the cylinder head. Install the cam chain onto the sprocket.
Torque value：1.8~2.2kgf-m



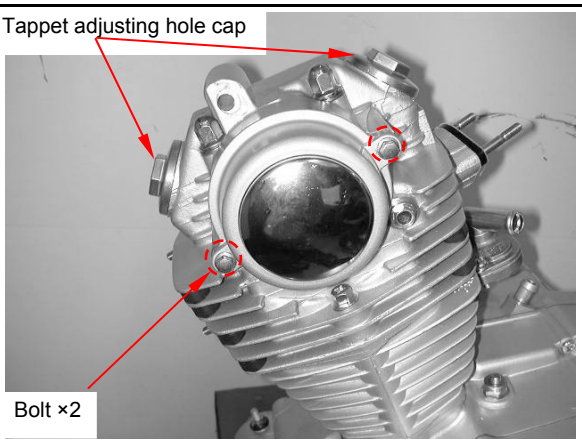
Adjust the valve clearance.



Install the cylinder head side cover (bolt×2).
Torque value：0.8~1.2kgf-m
Install the tappet adjusting hole caps.
Adjust the cam chain tightness.
Reinstall the engine in the reverse order of uninstall (refer to 6th chapter).

Caution

- Be careful when installing engine.
- Do not or press any wire or tube.

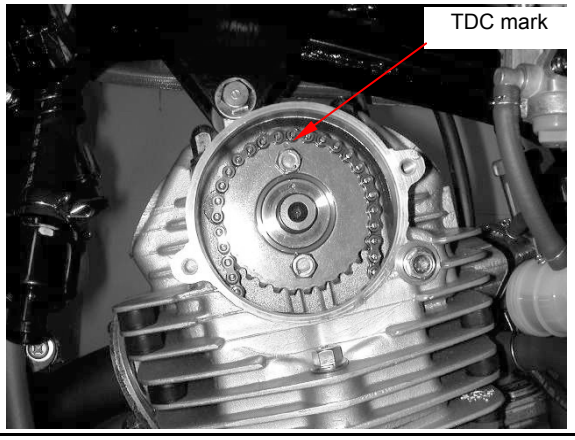


Valve Clearance Adjustment

Caution

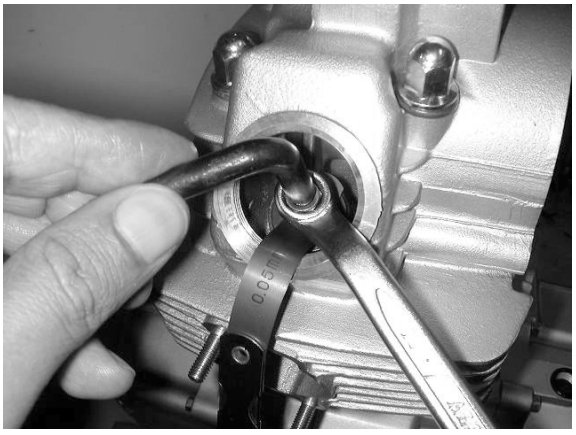
- Inspect and adjust the valve clearance when the engine is cool (under 35°C).

Remove the tappet adjusting hole cap.
Remove the cylinder head side cover.
Use a T type wrench to rotate the crankshaft clockwise and align the “T” mark on the flywheel with the index mark on the left crankcase cover and the timing mark on the sprocket with the index mark on the cylinder head (piston is at top dead center on the compression stroke).



Valve clearance inspection / adjustment
Inspect and adjust valve clearance with thickness gauge.

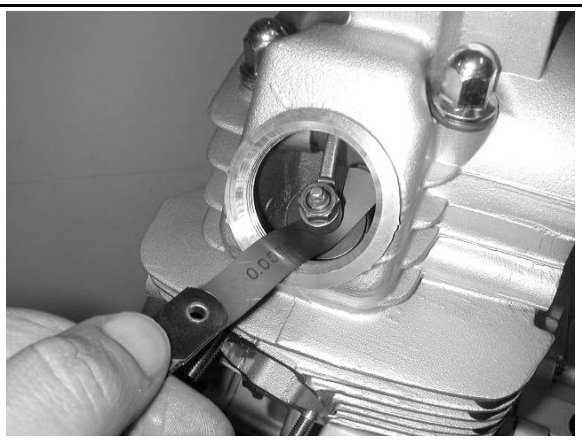
Valve clearance：IN 0.05±0.02 mm
EX 0.15±0.02 mm



Loosen the fixing nut and rotate the adjusting bolt to adjust valve clearance.
Fasten the adjusting bolt and tighten the fixing nut when the standard value is reached.

Caution

- Confirm the valve clearance reach the standard value when the fixing nut is tightened.



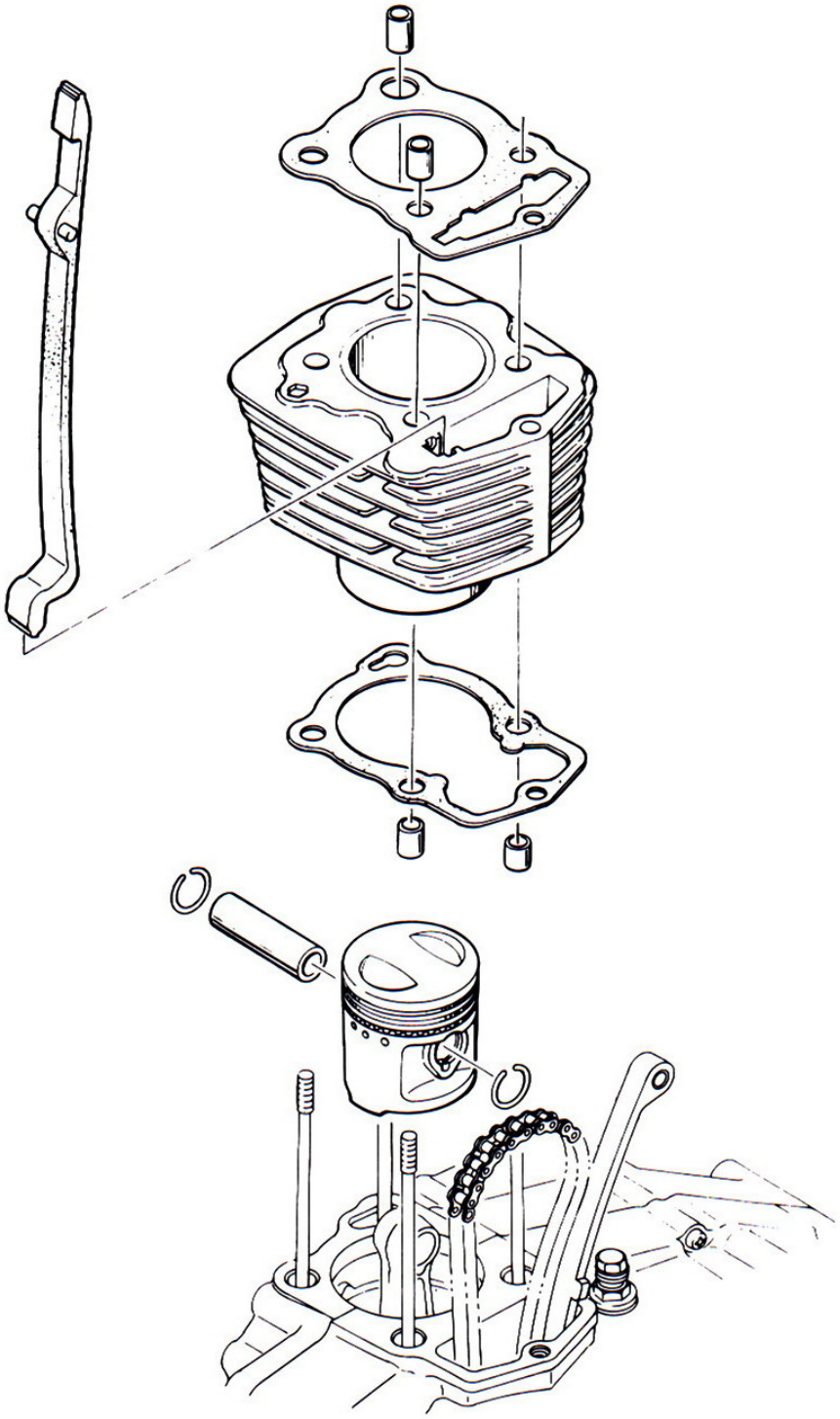
Install the tappet adjusting hole cap, cylinder head side cover, timing inspecting hole cap and ACG cap.

Caution

- Check for any damage on the O ring and coat it with engine oil before installing the tappet adjusting hole cap, cylinder head side cover, timing inspecting hole cap and ACG cap.

NOTE:

Mechanism Illustration



Precautions in Operation

General Information

- The engine must be removed from the frame before the repairing of the cylinder and the piston.

Specification

Measurement unit : mm

Subject			Specification	
			Standard	Service Limit
Cylinder	Cylinder Inside Diameter		56.000~56.010	56.100
	Warpage		—	0.050
	Taper		—	0.050
	Out of round		—	0.050
Piston/ Piston Ring	Piston Ring/ Groove Clearance	Top Ring	0.025~0.055	0.130
		Second Ring	0.015~0.045	0.120
	Piston Ring End Gap	Top Ring	0.150~0.350	0.500
		Second Ring	0.150~0.350	0.500
		Oil Ring	0.200~0.500	—
	Piston Ring Thickness	Top Ring	1.475~1.490	1.460
		Second Ring	1.475~1.490	1.460
	Piston Outside Diameter		55.970~55.990	55.8700
	Piston Outside Diameter Measure Point		10mm up from the bottom of the piston	
	Piston/ Cylinder Clearance		0.020~0.050	0.110
	Piston Pin Hole Inside Diameter		15.002~15.008	15.050
Piston Pin Outside Diameter			14.994~15.000	14.850
Piston/ Piston Pin Clearance			0.002~0.014	0.020
Connecting Rod Small End Inside Diameter			15.010~15.028	15.070

Troubleshooting

Low Compression or Instability

Worn cylinder or piston rings

Over High Compression

Excessive carbon built-up on the piston or combustion chamber

Knocking or Abnormal Noise

Worn piston or cylinder

Excessive carbon built-up on the top of the piston

Worn Piston Pin and Piston Pin Hole

Excessive Smoke

Worn cylinder or piston or piston rings

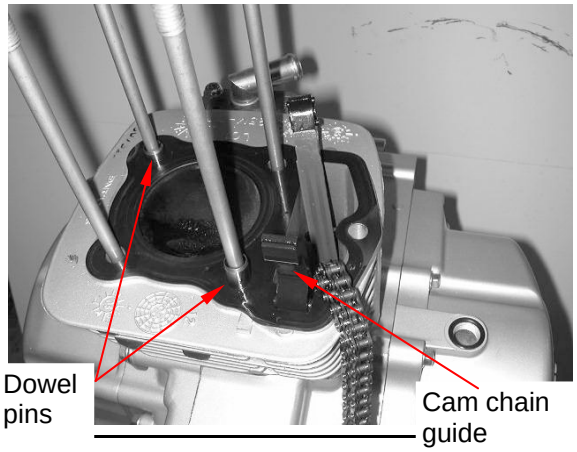
Improper piston rings installation

Overheating

Excessive carbon built-up on the top of the piston

Cylinder Removal / Inspection

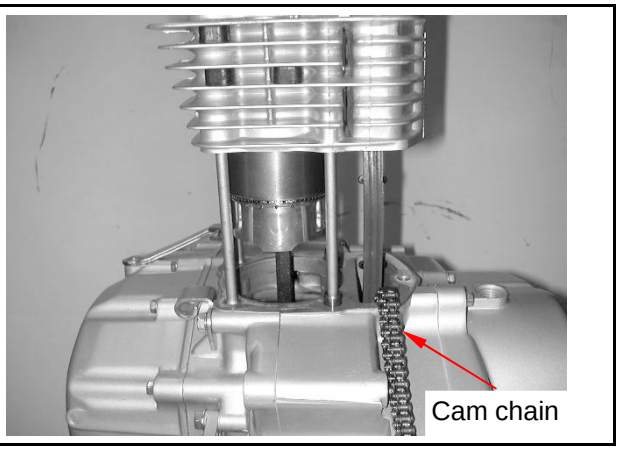
Remove the cylinder head (refer to chapter 7).
Remove the cylinder head gasket and the dowel pins
Remove the cam chain guide



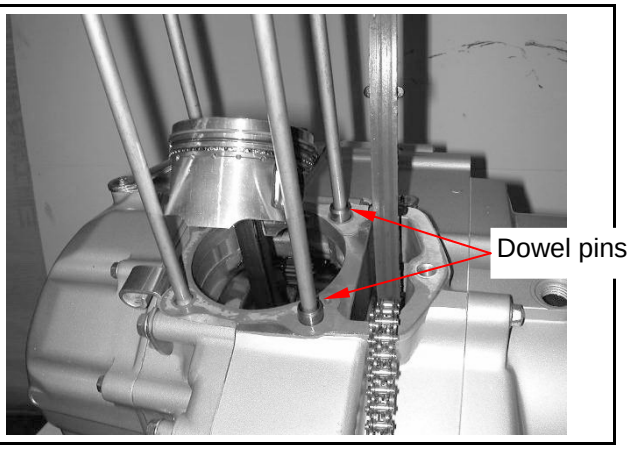
Remove the cylinder.

Caution

- Prevent the camshaft chain from falling into the crankcase when removing the cylinder.



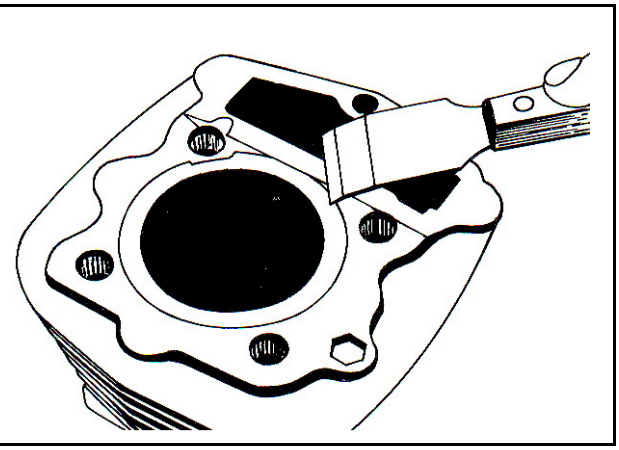
Remove the cylinder gasket and dowel pins.



Clean all the gasket material from the contact surface.

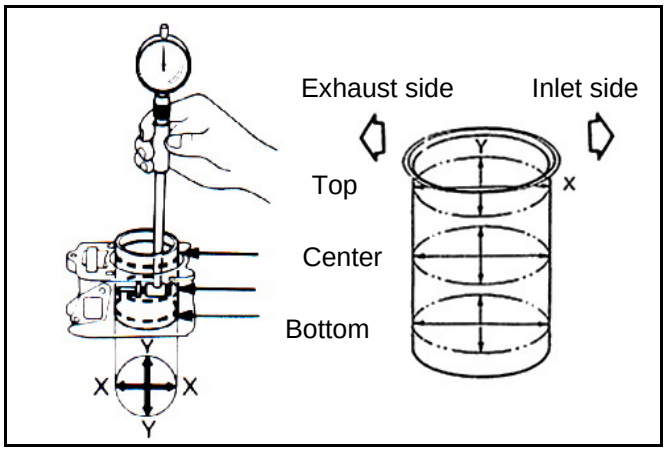
Note

- Use solvent to wet the gasket material in order to remove it more easily.
- Do not damage the contact surface during operation.

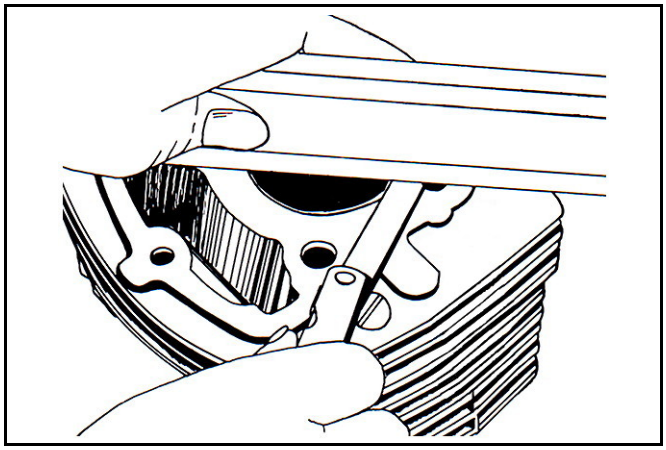


Cylinder Inspection

Check if the inner diameter of cylinder is worn out or damaged.
Measure the cylinder inner diameter in X and Y axis at three levels.
Service limit：56.10　mm
Calculate the taper and out of round at three levels in X and Y axis. Take the maximum value to determine.
Service limit：
Out of round：0.05 mm
Taper：0.05 mm

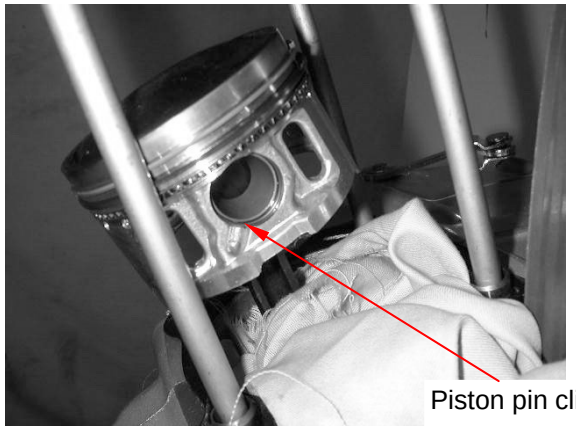


Measure the cylinder upper surface for warpage.
Service limit：0.05mm



Piston Removal / Inspection

Block the crankcase and camshaft chain hole with a clean cloth in order to prevent the piston pin clip falling into the crankcase



Cover the holes of crankcase and cam chain with a piece of clean rag.
Remove the piston pin circlip and remove the piston pin and piston.

Remove the piston rings

Note

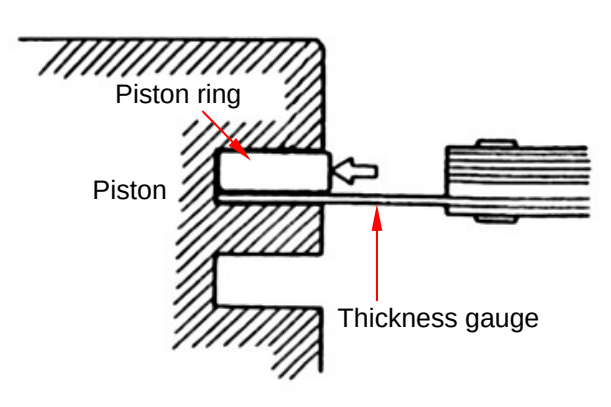
- Piston rings are easy to break, please be careful during operation

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

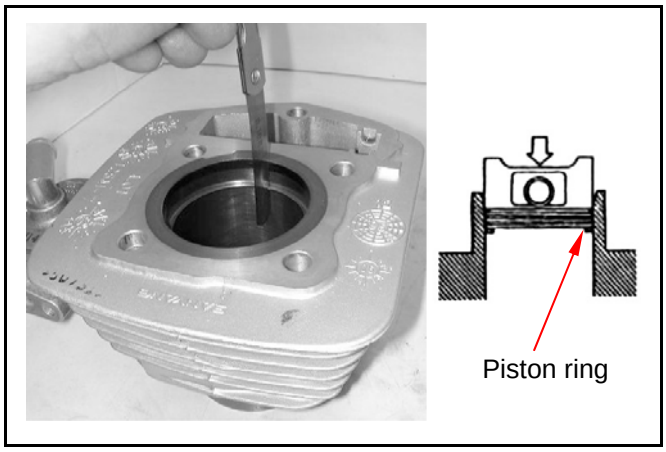
Measure the clearance between piston rings and ring grooves.

Service limit：

Top groove: 0.13 mm
Second groove: 0.12 mm



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



Caution

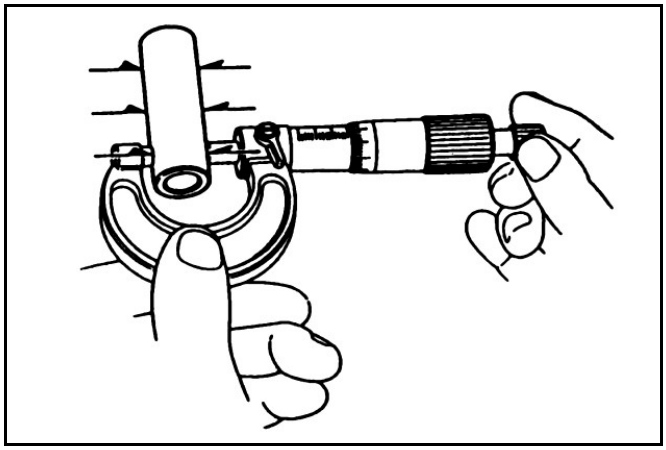
- Use the piston head to push the piston ring squarely into the cylinder.

Service limit：

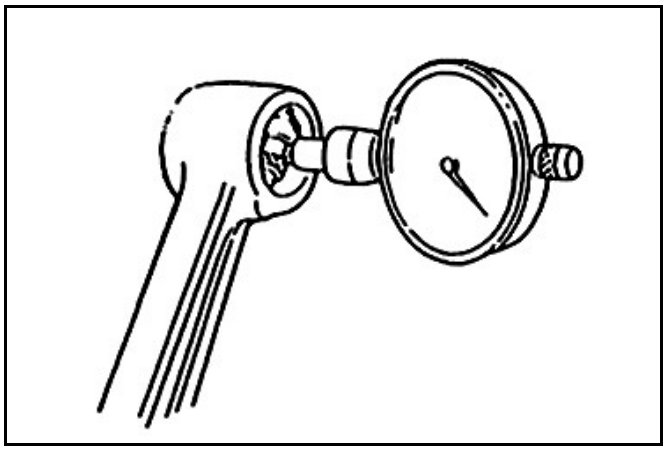
Top ring：0.5 mm

Second ring：0.5 mm

Measure the piston pin outer diameter.
Service limit：14.85mm

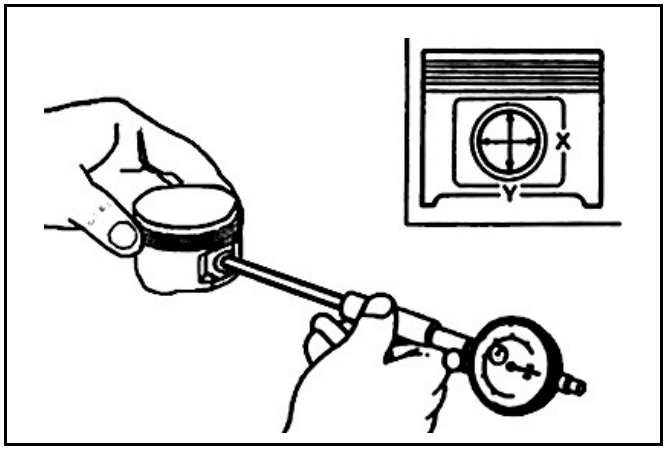


Measure the conrod small end inner diameter.
Service limit：15.07mm



Measure the inner diameter of piston pin hole.
Service limit：15.05mm

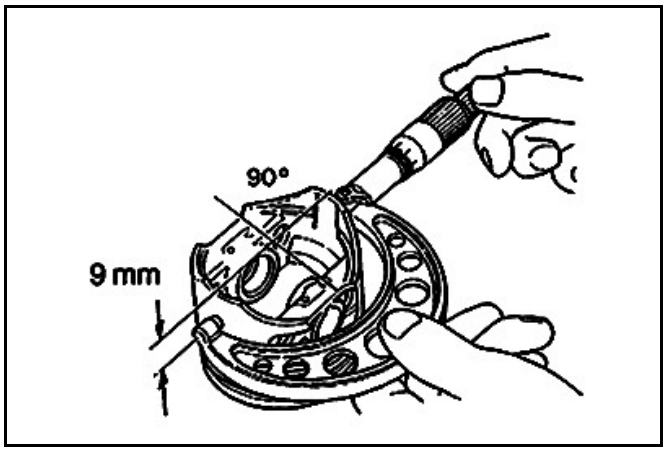
Calculate the clearance between the piston pin and its hole.
Service limit：0.02mm



Measure the outer diameter of piston pin.

Caution

- Measure the piston outer diameter in the direction perpendicular to the piston pin axis.

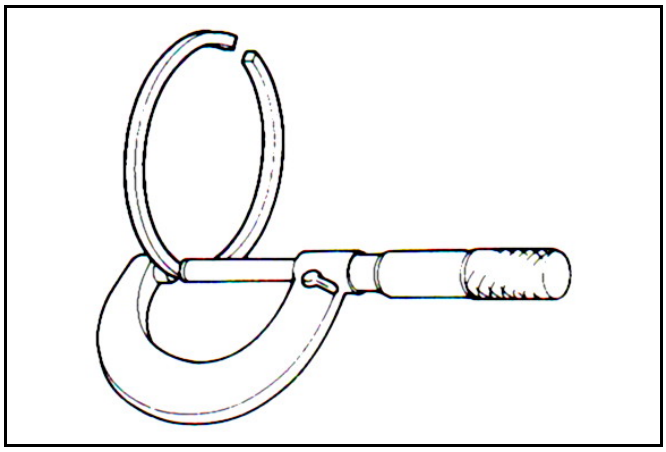


Service limit：55.87mm

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

Measure the piston ring thickness.

Service limit：1.46mm

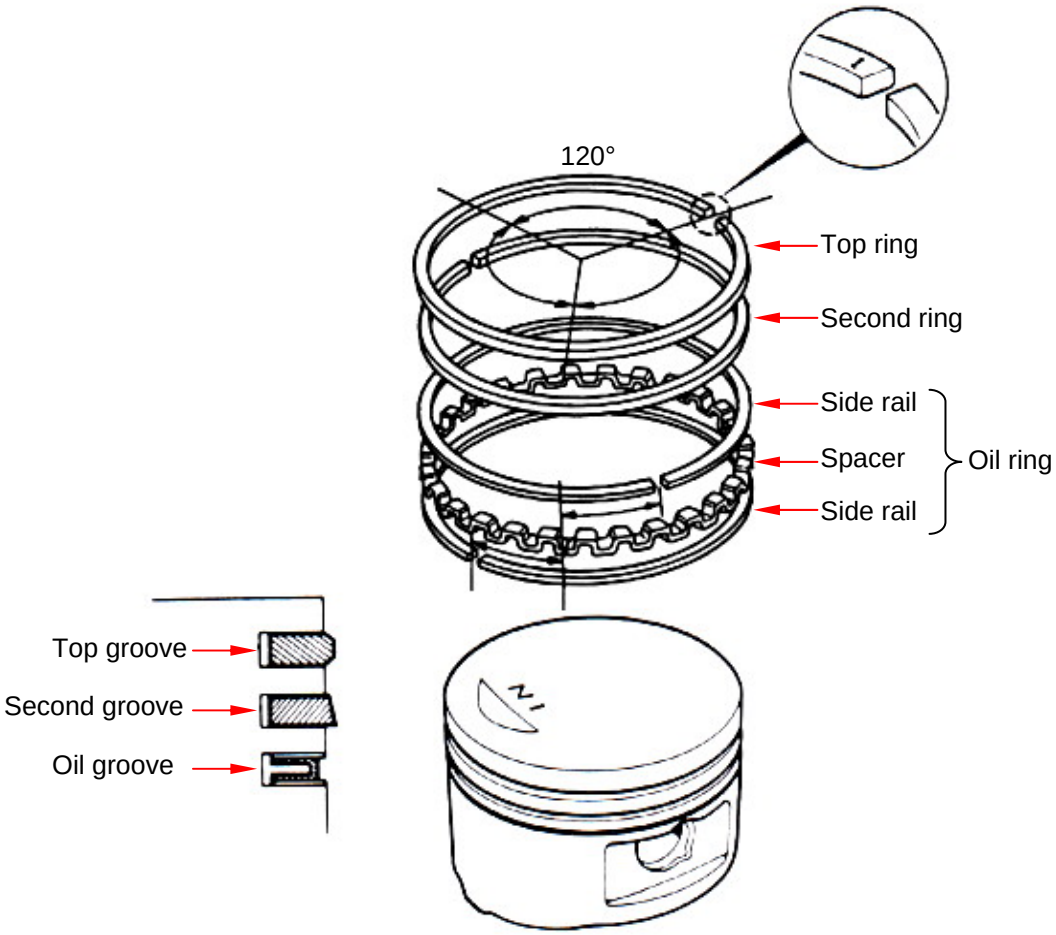


Piston Rings Installation

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

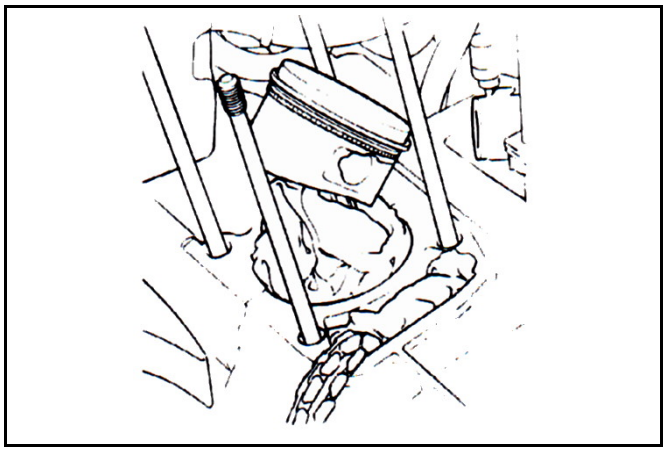
Caution

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



Piston Installation

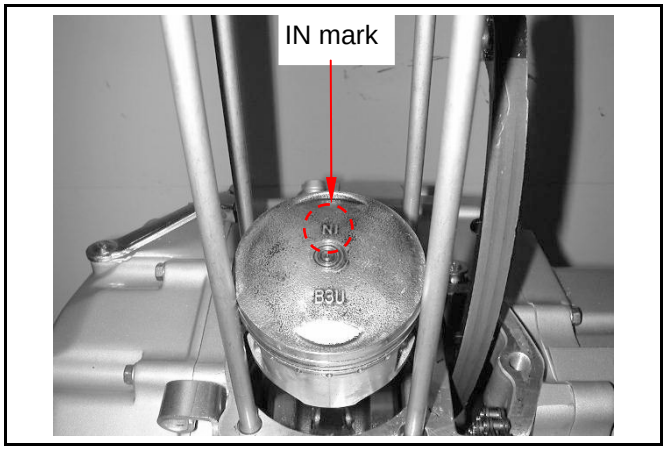
Place a piece of clean rag under the piston. Clean all the gasket material from the contact surface.



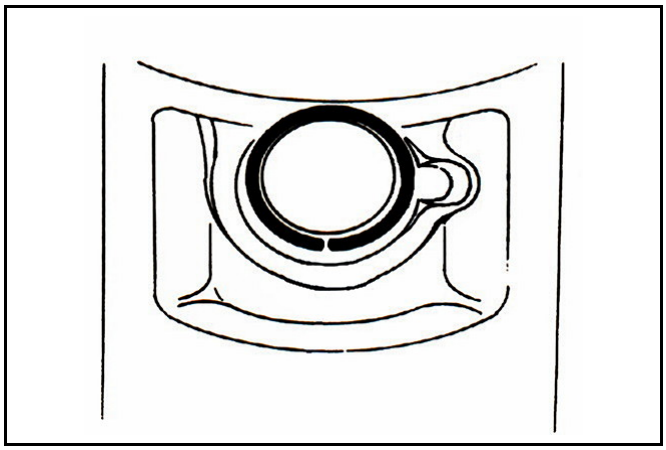
Caution

- Use solvent to wet the gasket material in order to remove it more easily.

Install piston and piston pin and make the IN mark facing forward



Install the new piston pin snap ring

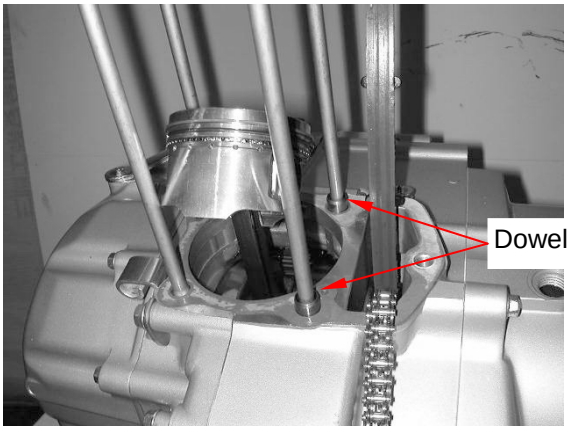


Note

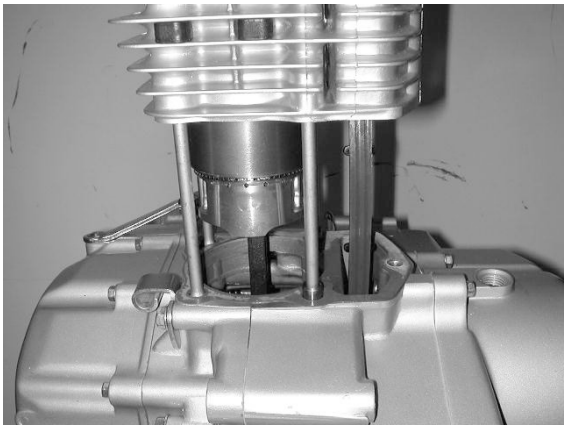
- Do not make the piston pin snap ring opening coincide with the slit of the piston pin hole
- Place a clean cloth between the piston and the crankcase to prevent the piston pin snap ring falling into the crankcase

Cylinder Installation

Install the dowel pins and the new cylinder gasket.



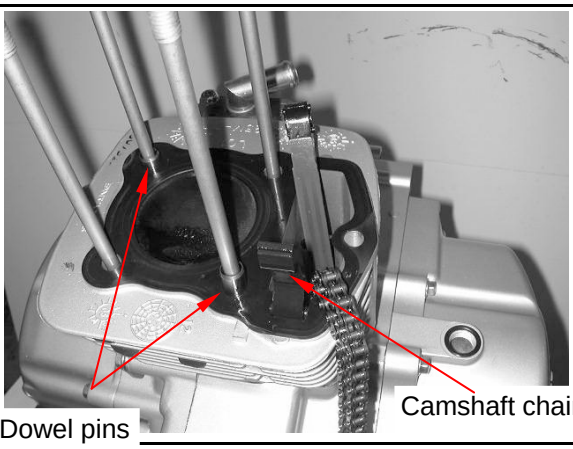
Apply clean motor oil to the cylinder bore, piston and piston rings.
Install the cylinder carefully.
Press the piston rings if necessary.



Note

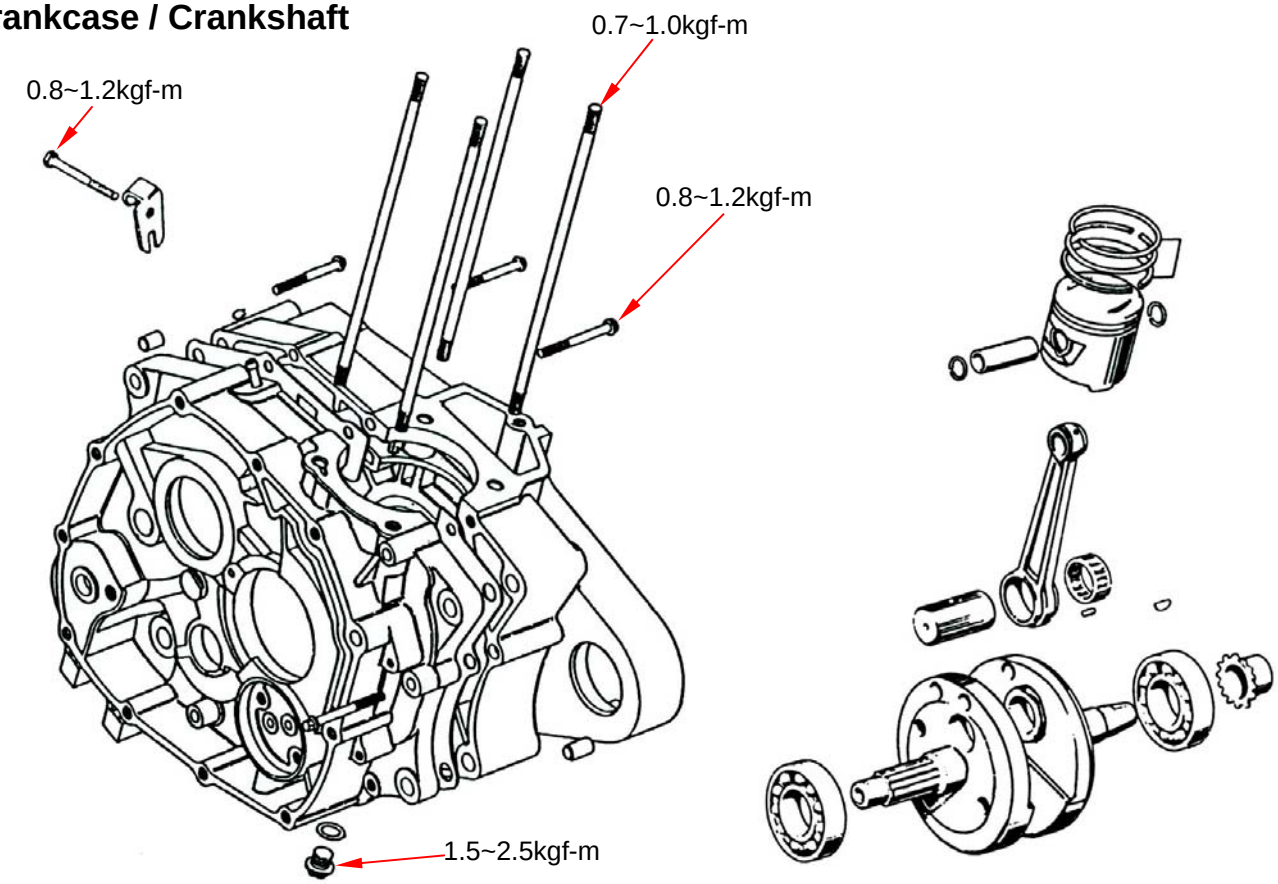
- Do not push the piston into the cylinder forcefully because the piston and piston rings will be damaged.

Install the cam chain guide, dowel pins and cylinder head gasket.
Install the cylinder head (refer to chapter 7).

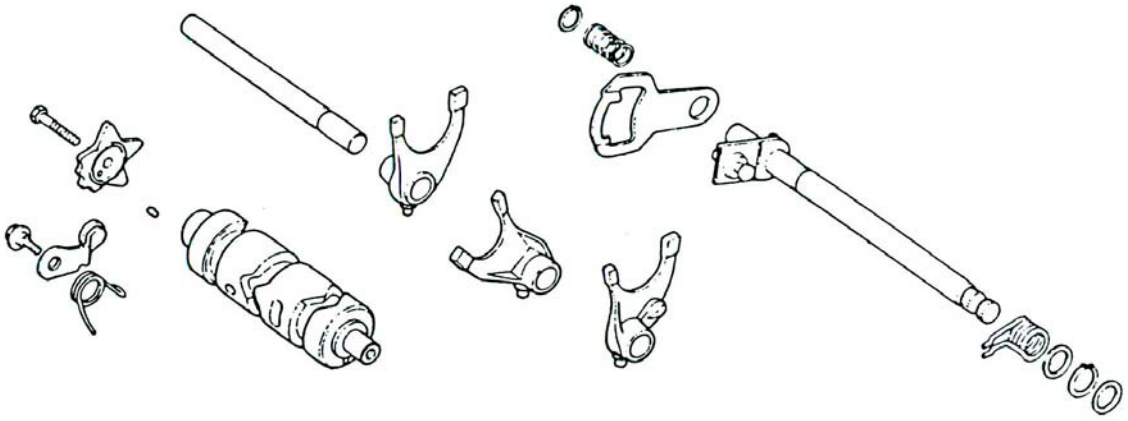


Mechanism Diagram

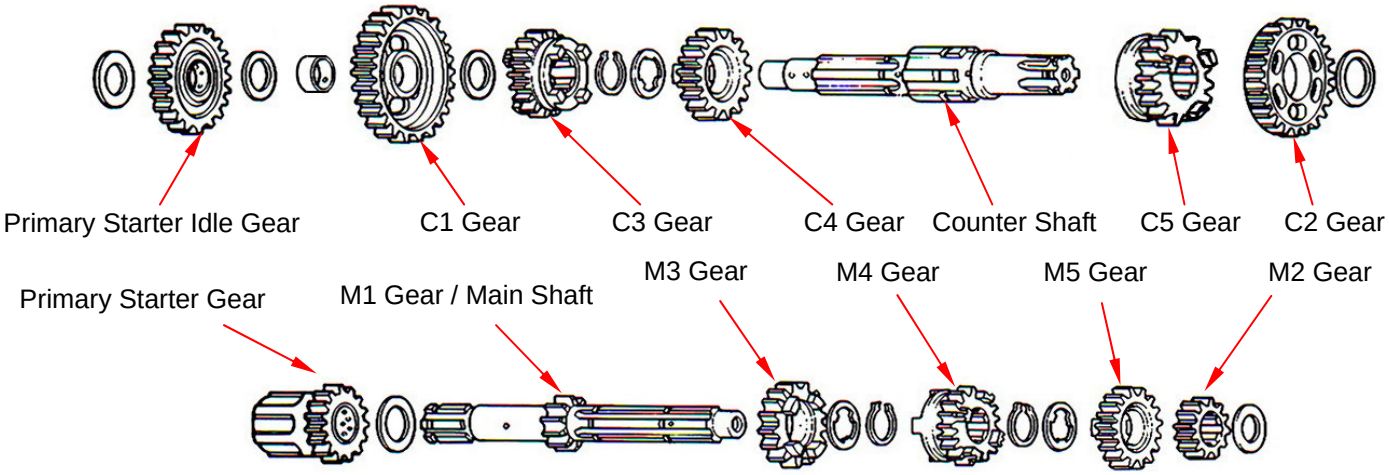
Crankcase / Crankshaft



Transmission



Five-Speed Gear



Precautions in Operation

General Information

- This Section concerns disassembly of the crankcase and transmission system for repair purpose.
- The following components need to be removed before disassembling the crankcase.

Engine	Chapter 6
Cylinder Head	Chapter 7
Cylinder / Piston	Chapter 8
Clutch / Oil Pump / Gear Shift Spindle	Chapter 4
ACG / Starter Clutch / Starter Motor	Chapter 5

- The crankshaft should be replaced as a unit if the timing sprocket on the crankshaft needs to be replaced.

Specification

Unit : mm

Item		Standard	Service Limit
Crankshaft	Conrod big end side clearance	0.050~0.300	0.600
	Conrod big end vertical clearance	0.004~0.012	0.050
	Run-out	—	0.100
	Conrod small end inner diameter	15.010~15.028	15.080
Gear shift fork	Inner diameter	12.000~12.018	12.050
	Claw thickness	4.930~5.000	4.700
Shift fork shaft	Outer diameter	11.976~11.994	11.960
Kick starter	Kick starter spindle outer diameter	24.859~24.880	24.800
	Kick starter pinion inner diameter	24.900~24.921	24.960

Torque Value

Crankcase bolt	0.8~1.2kgf-m
Cylinder / cylinder head bolt	0.7~1.0kgf-m
Engine oil drain bolt	1.5~2.5kgf-m
Cam chain tensioner bolt	0.8~1.2kgf-m

Special Tools

Inner bearing puller	SYM-6204020
Bearing driver 6204	SYM-9110400
Bearing driver 6301	SYM-9610000
Bearing driver 6203/6004	SYM-9620000

Troubleshooting

Excessive engine noise

- Worn connecting rod big end
- Worn crankshaft bearing
- Worn piston pin or piston pin hole

Hard to shift gear

- Bent shift fork
- Bent shift fork shaft
- Bent shift fork claw

Transmission jumps out of gear

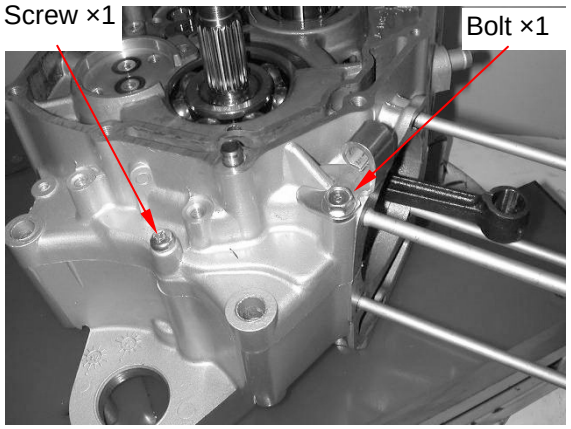
- Worn gear teeth
- Bent or damaged shift fork
- Bent shift fork shaft

Excessive gear noise

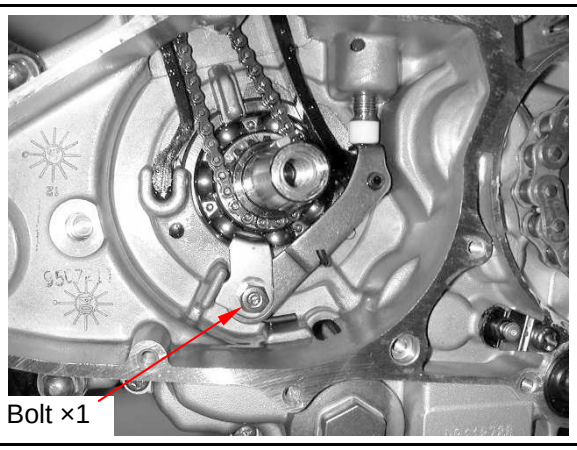
- Worn gear teeth
- Worn gear shaft

Crankcase Disassembly

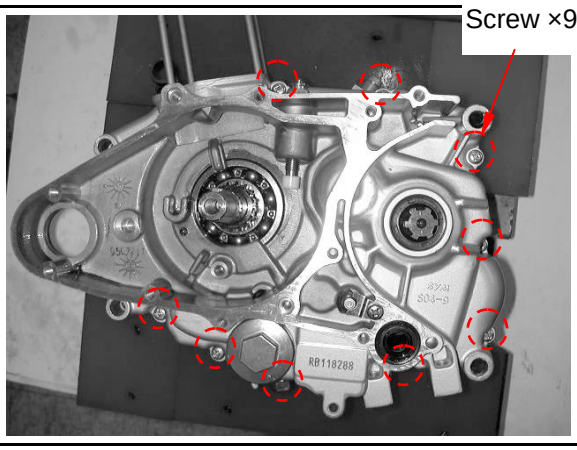
Remove the 6mm screw and clutch wire hold bolt from the right crankcase.



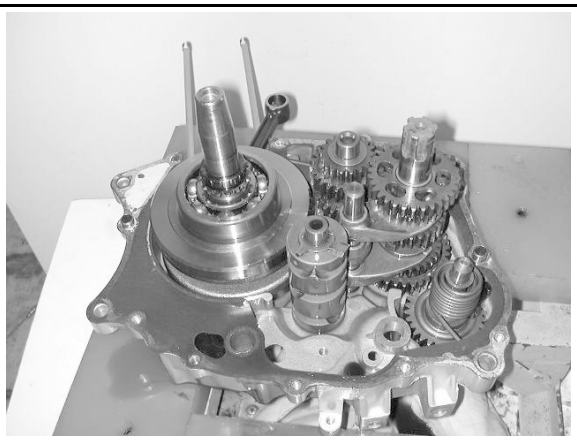
Remove the cam chain tensioner arm (bolt x 1).
Remove the cam chain.



Remove the 6mm screws from the left crankcase (screw x 9).

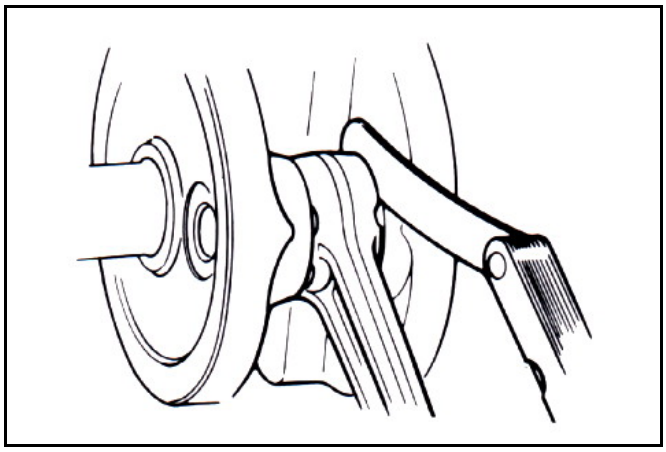


Remove the left crankcase from the right crankcase.
Shake the crankshaft gently and pull out the crankshaft.

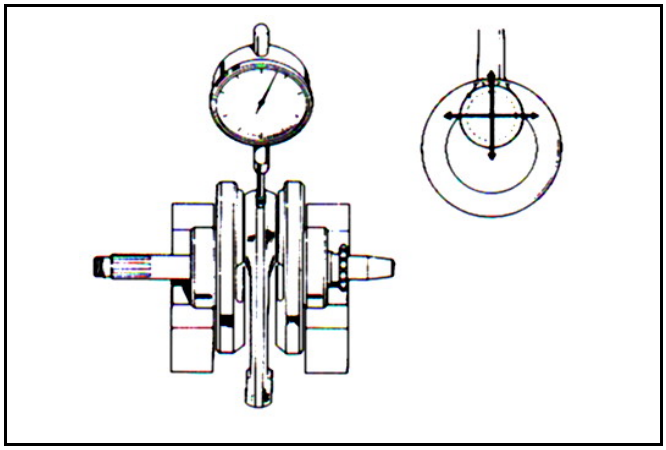


Crankshaft Inspection

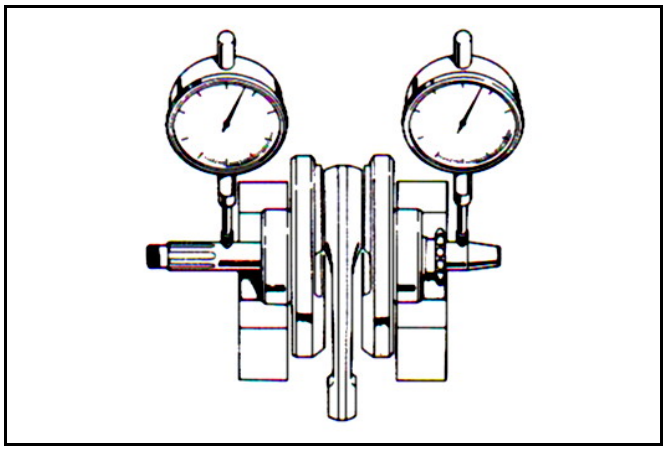
Use a feeler gauge to measure left and right clearance of connecting rod big end.
Service limit：0.6mm



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

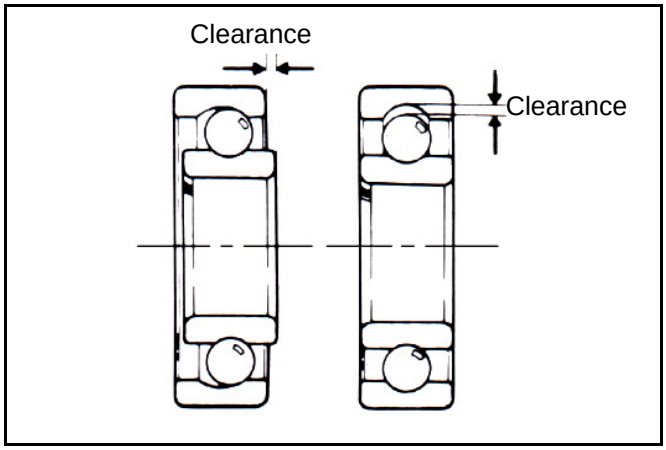


Place the crankshaft on a V-block.
Measure the crankshaft run-out.
Service limit：0.10 mm

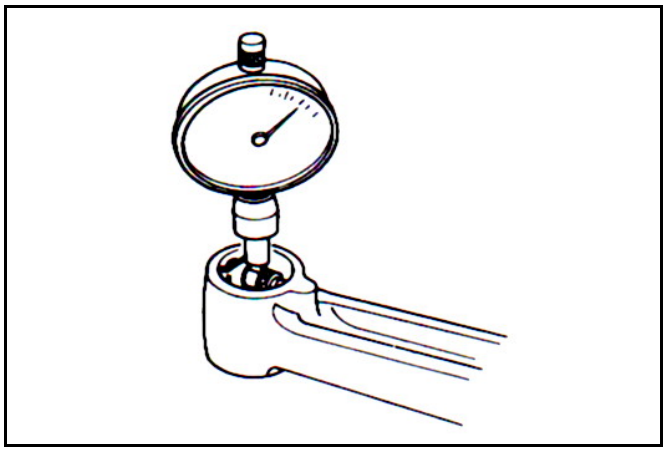


Crankshaft bearing inspection

Rotate the bearings on the left and right crankcase to check if the bearings rotate smoothly and silently.
Check if the outer ring of the bearing fixes on the crankcase firmly or not.
The bearing must be replaced if there is excessive noise or roughness.

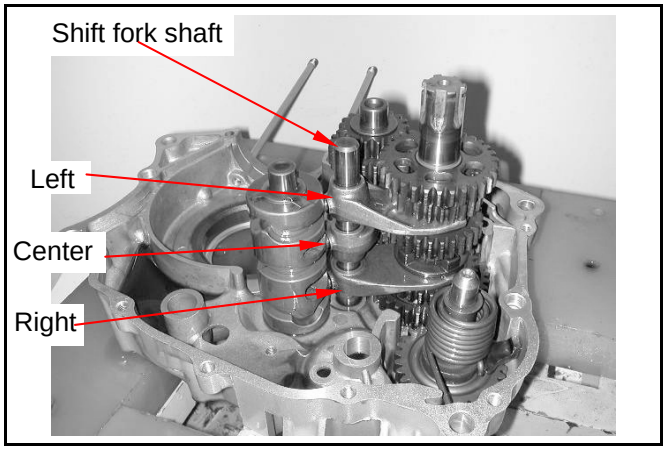


Measure the inner diameter of the crankshaft small end.
Service limit：15.08mm

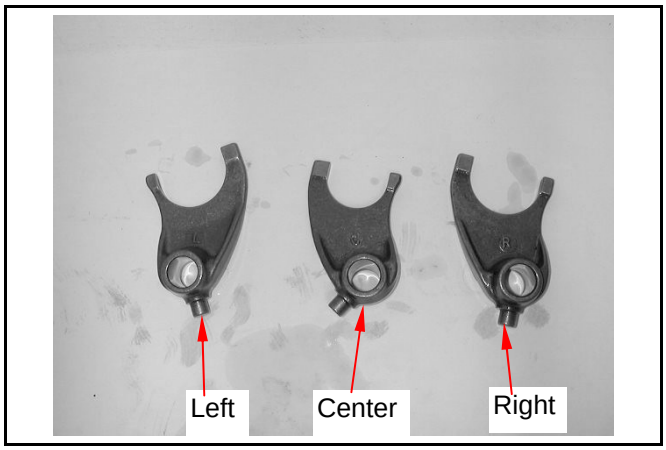


Transmission Disassembly

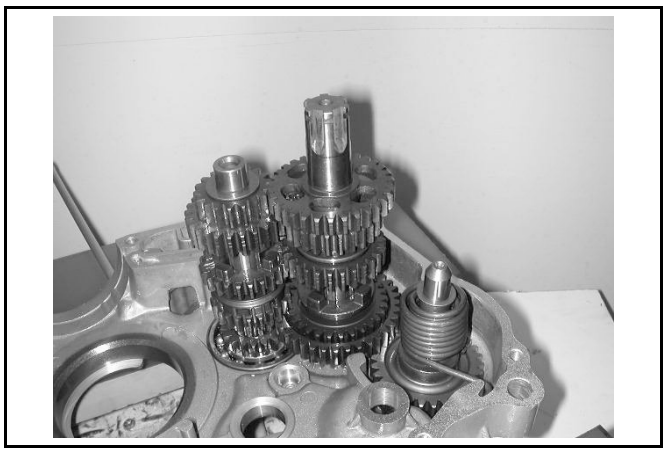
Remove the gear shift fork shaft.



Remove the gear shift forks and shift drum.

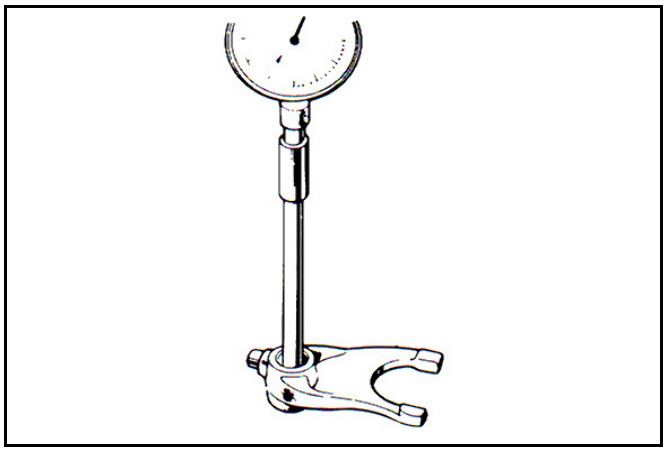


Remove the transmission mechanism.

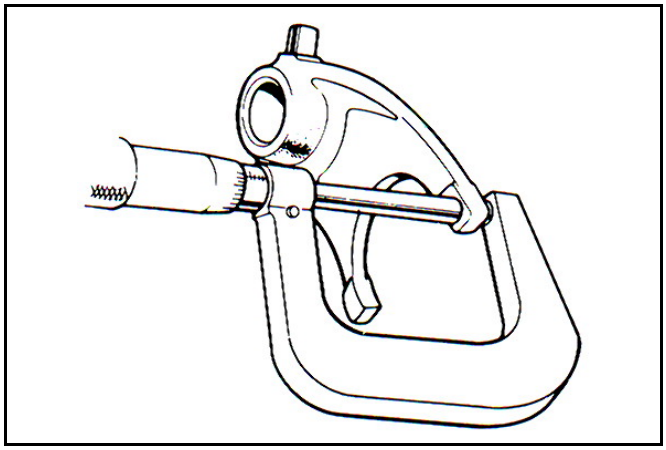


Transmission Inspection

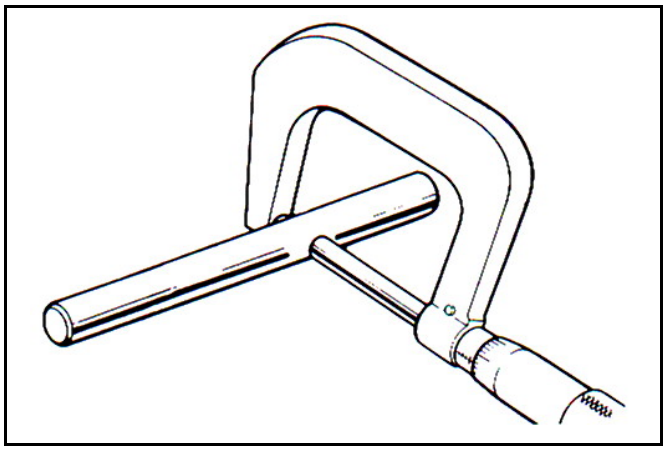
Check if the gear shift fork is worn, bent or damaged.
Measure the inner diameter of the gear shift fork.
Service limit：12.05mm



Measure the thickness of the gear shift fork claws.
Service limit：4.7mm



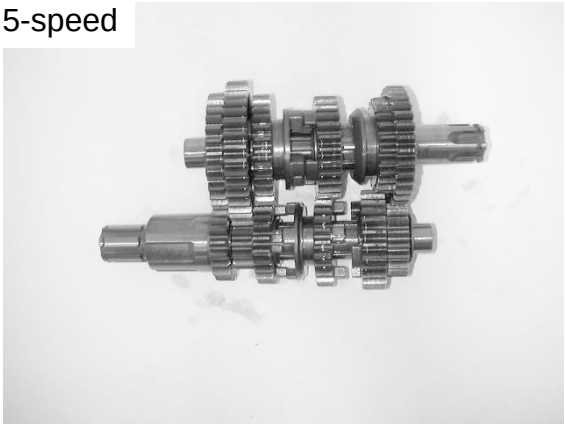
Measure the outer diameter of the gear shift fork shaft.
Service limit：11.96mm



Check the gear shift drum for wear or damage.

Disassemble the gears and washers on the main shaft and counter shaft.
Arrange the gears and washers in order.
Check the teeth and grooves of the gear for wear and damage.

5-speed



Assemble the gears and washers onto the main shaft and counter shaft by order after the inspection is finished without anything incorrect.

Caution

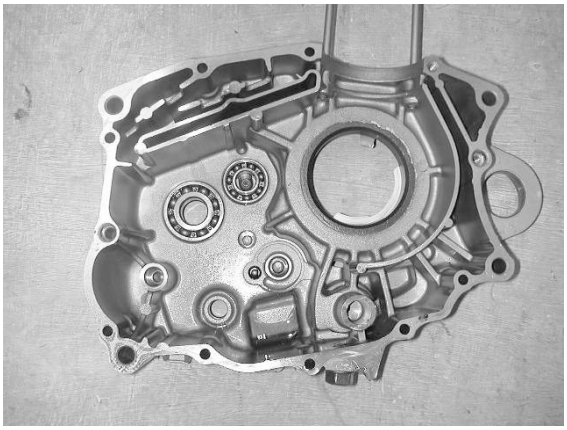
- Apply clean engine oil to the gears before assembly.
- Make sure the circlip is fully seated in the shaft grooves after installation.

Five-speed gear sequence

5-speed

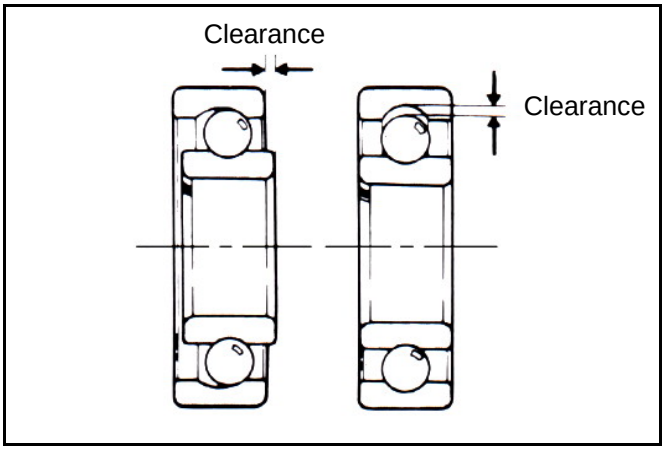
Crankcase Inspection

Check if the oil path on the crankcase is clogged or not.
Blow the oil path with compressed air if necessary.



Crankcase bearing / oil seal inspection

Rotate the bearings to check if the bearings rotate smoothly and silently.
Check if the outer ring of the bearing fixes on the crankcase firmly or not.
The bearing must be replaced if there is excessive noise or roughness.
Check the oil seal of the counter shaft for any damage; replace it with new one if necessary.

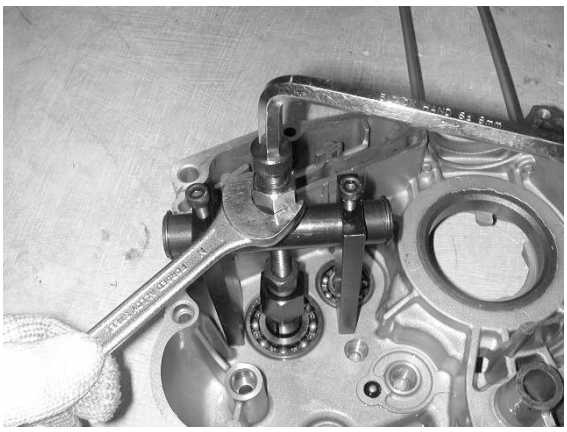


Crankcase bearing removal

Remove the damaged bearing by using the inner bearing puller.

Special tool：

Inner bearing puller SYM-6204020

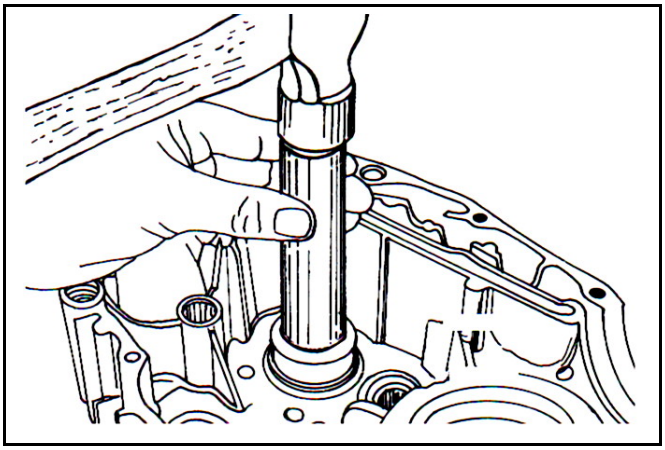


Crankcase bearing installation

Install the new bearings onto the crankcase by using bearing driver.

Special tools：

Bearing driver 6204	**SYM-9110400**
Bearing driver 6301	**SYM-9610000**
Bearing driver 6203/6004	**SYM-9620000**

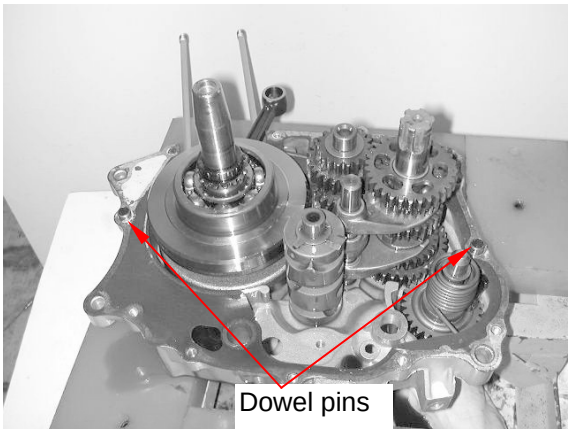


Crankcase Assembly

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

Caution

- Do not damage the contact surface of the crankcase.
- It is better to wet the gasket residue with solvent for easy scrapping.

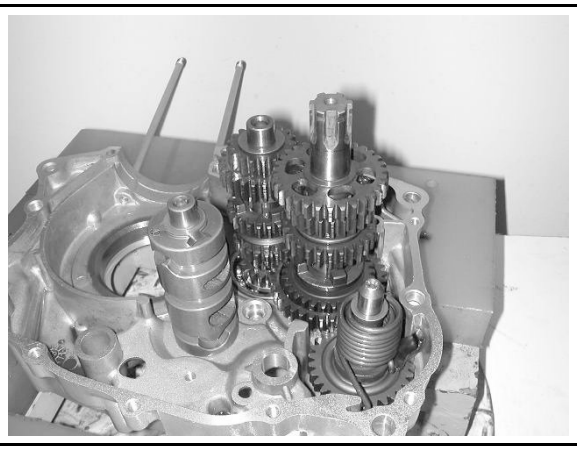


Install the main shaft and counter shaft to the right crankcase.

Caution

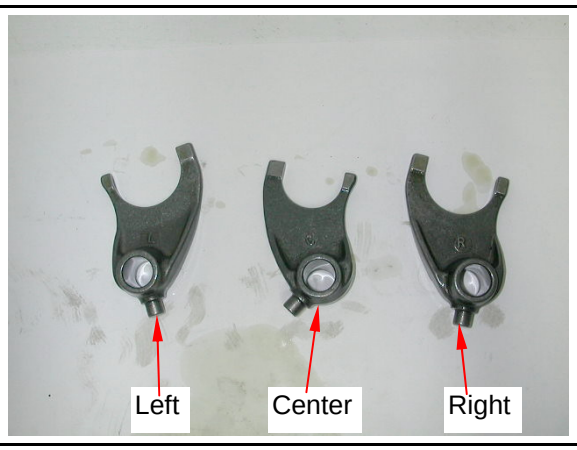
- Make sure the thrust washer in the position.

Install the gear shift drum.

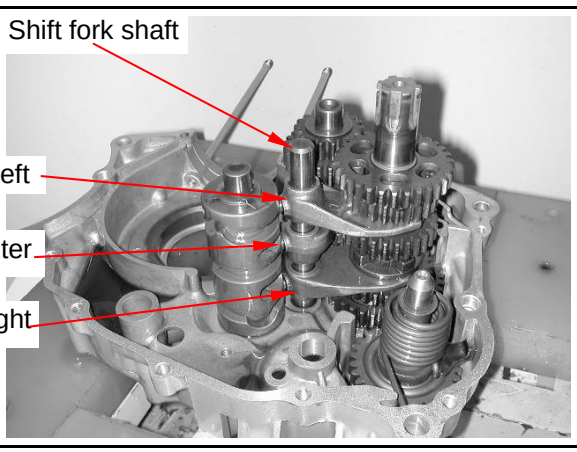


Caution

- The letters on the left and center shift fork should face upward; the letter on the right shift fork should face downward.



Install the gear shift forks into the shift drum guide groove.
Align the gear shift fork holes and plug in the gear shift fork shaft.

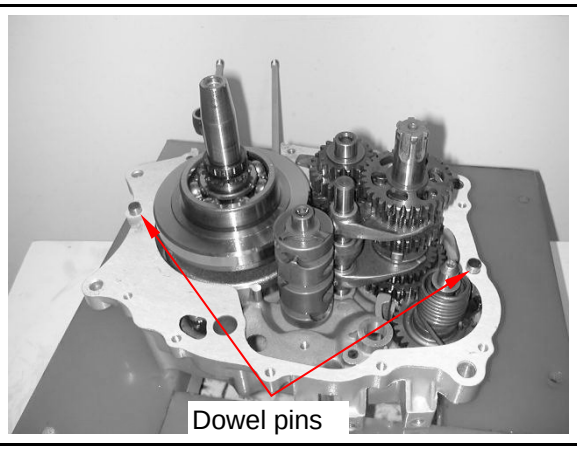


Caution

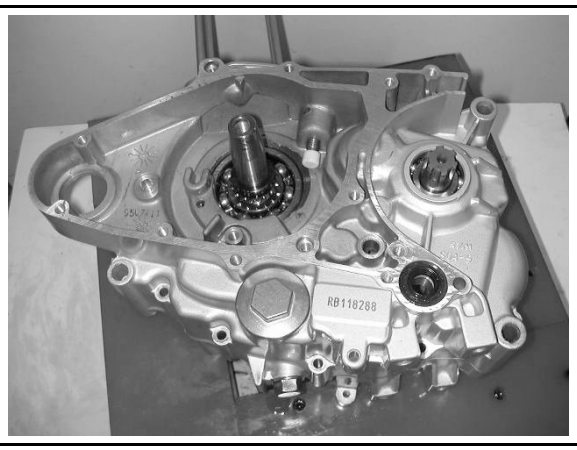
- Make sure all the parts move smoothly.
- Rotate the gear shift drum to the neutral gear.

Install the crankshaft to the right crankcase.

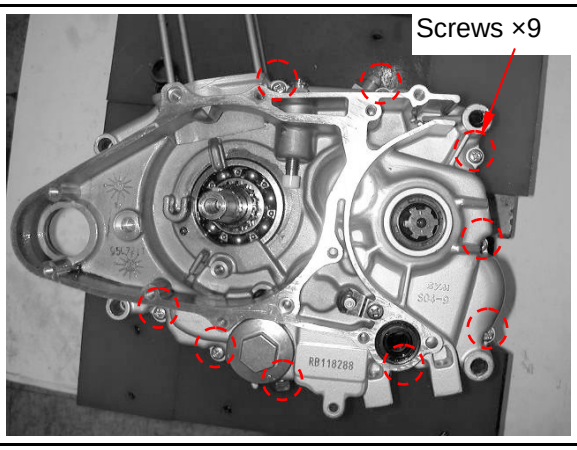
Install the new crankcase gasket and dowel pins.



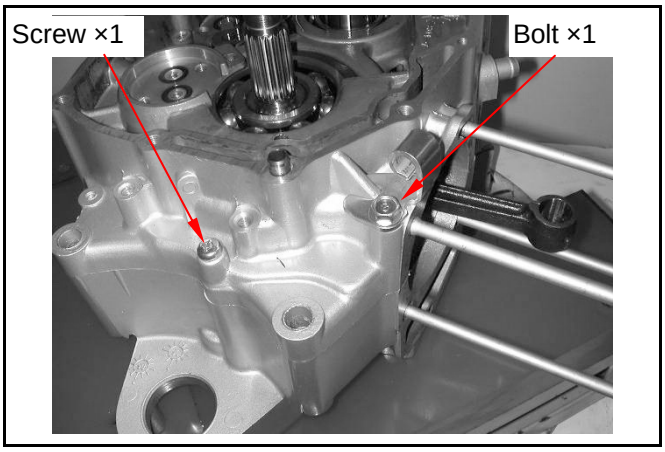
Install the left crankcase.



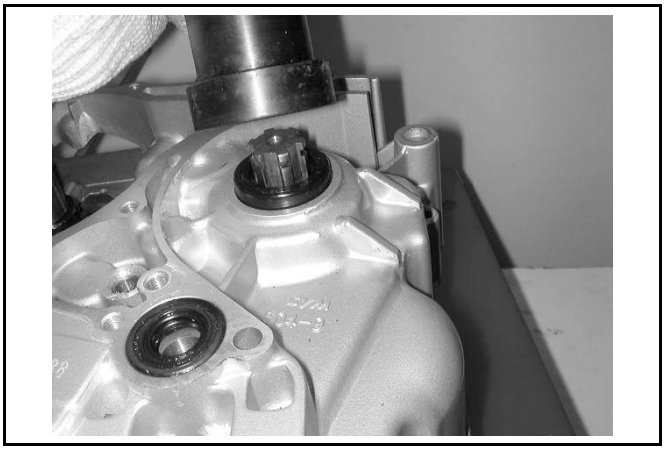
Tighten crankcase left side screws.
Torque value：0.8~1.2kgf-m



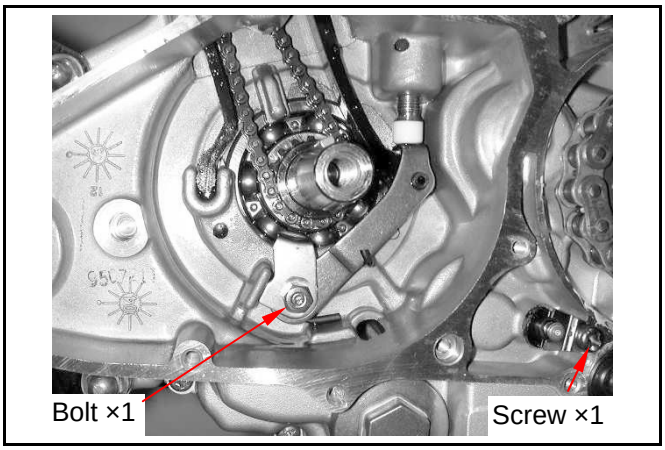
Tighten crankcase right side screws and clutch wire holder.
Torque value：0.8~1.2kgf-m



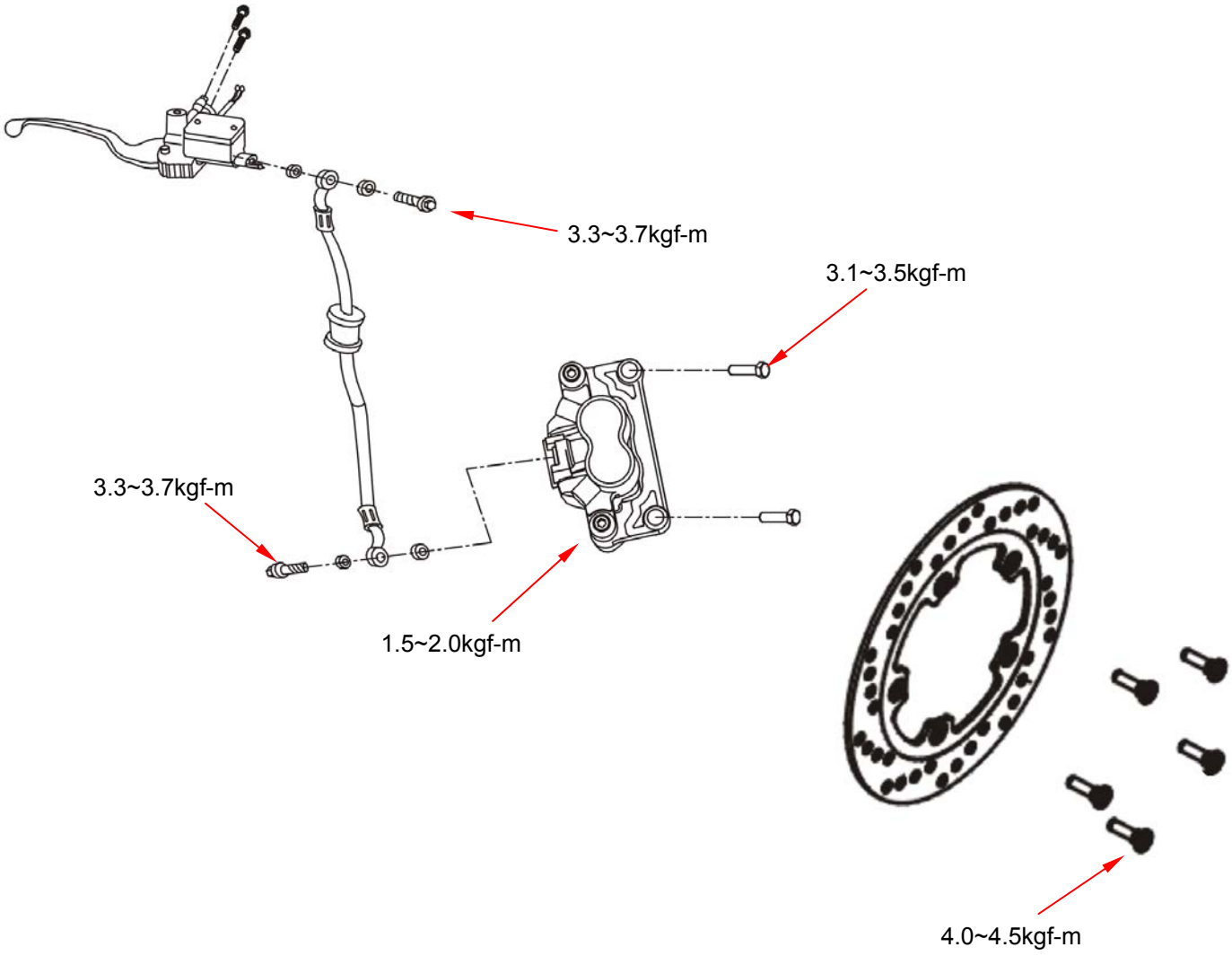
Coat grease to the new counter shaft oil seal and assemble the left crankcase.



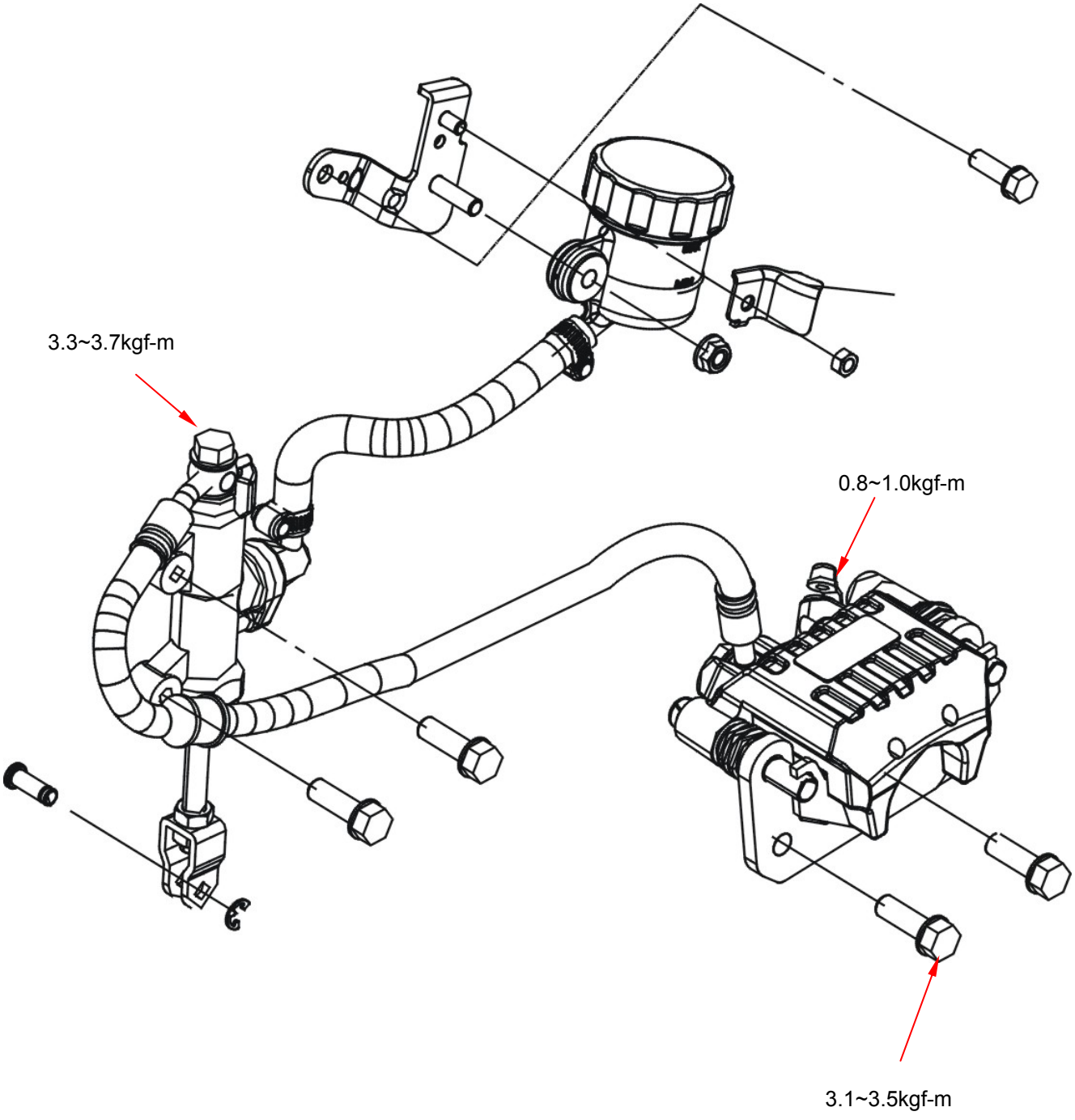
Install the cam chain.
Install the cam chain tensioner arm (boltx1).
Install the neutral switch.



Mechanism Diagram – Front Disk Brake



Mechanism Diagram – Rear Disk Brake



Precautions in Operation

⚠Caution

- Inhaling asbestos may cause disorders of respiration system or cancer, therefore, never use compressed air or dry brush to clean brake system. 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.

Specification **Unit：mm**

Item	Standard	Service limit
Brake disk thickness	4.0	3.00
Brake disk eccentricity	0.1	0.30
Master cylinder inner diameter	12.700~12.743	12.755
Master cylinder piston outer diameter	12.100~12.043	11.945
Brake disk outer diameter	240.00	—
Bake pad thickness	—	Mark on brake pad

Torque value

Brake lever locknut	0.8~1.2kgf-m
Brake hose bolt	3.3~3.7kgf-m
Brake caliper bolt	3.1~3.5kgf-m
Brake pad guide bolt	1.5~2.0kgf-m
Brake disk bolt	4.0~4.5kgf-m
Air bleed valve	0.8~1.0kgf-m
Front wheel axle nut	5.0~7.0kgf-m
Rear wheel axle nut	10.0~12.0kgf-m

Special tool

Inner bearing puller	SYM-6204020

Troubleshooting

Disk Brake

Soft brake lever

1. Air inside the hydraulic system
2. Hydraulic system leakage
3. Worn master cylinder piston
4. Worn brake pad
5. Poor brake caliper
6. Worn brake disk
7. Low brake fluid
8. Blocked brake hose
9. Warped / bent brake disk

Hard brake lever operation

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

Uneven brake

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

Tight brake

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

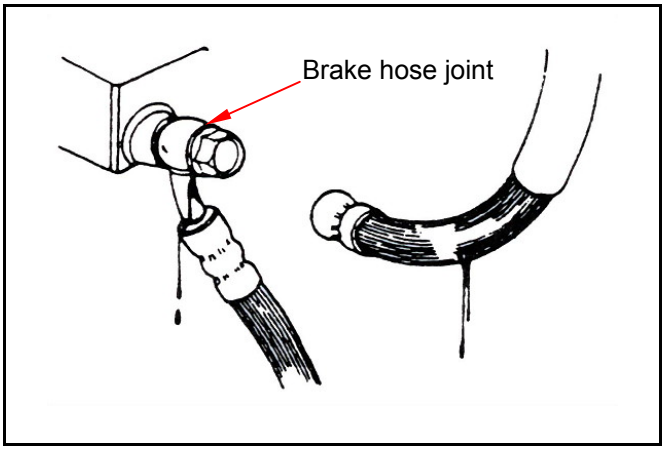
Brake noise

1. Dirty brake pad / disk
2. Deformed brake disk
3. Poor brake caliper installation
4. Imbalanced brake disk / wheel

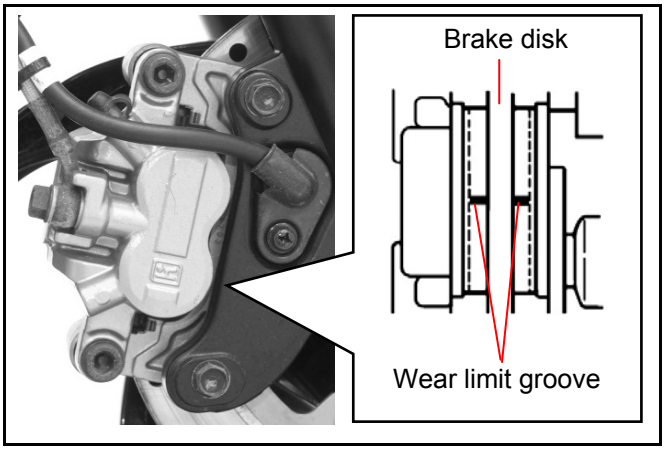
Disk Brake System Inspection

Inspection

Visually examine for leakage or damage.
Inspect the brake hose joint for looseness.
Turn the handle bar to right and left; press the cushion to see if there is any interference with the brake system.



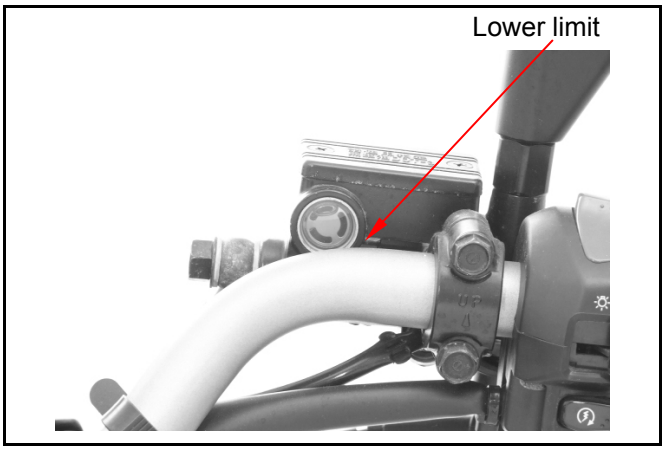
Check the brake pads for wear.
Replace the brake pads if either pad is worn to the bottom of wear limit groove.



Park the vehicle on the level ground.
Check the brake fluid level.
Recommended Brake Fluid: WELL RUN BRAKE OIL (DOT 3).

⚠Caution

- When the vehicle is inclined or just stopped, the brake fluid level could not be accurate.
- Do not mix different types of brake fluid which are not compatible with each other.
- Use the same brand brake fluid to ensure the brake efficiency.

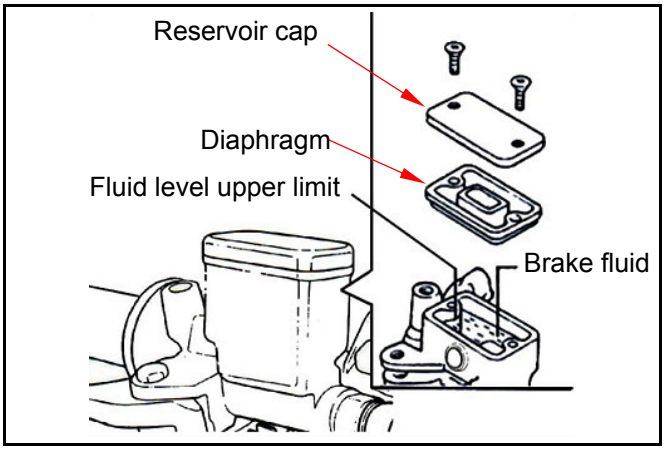


Adding brake fluid

Turn the handlebar to make the reservoir level before opening the reservoir cap.
Cover the painted, plastic or rubber surface with a rag before performing brake system maintenance.

⚠Caution

- Do not fill brake fluid over upper limit.



Remove the reservoir cap and diaphragm.
Fill the clean brake fluid.

Caution

- Contaminated brake disk or pad decreases braking performance.
- Foreign material will clog brake system and lead to decline or malfunction of braking capability.

Brake Fluid Replacement / Air Bleed

Connect a drain hose to air-bleed valve.
Open the air-bleed valve. Pump 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 fluid reservoir.

Caution

- Reuse of old brake fluid will affect brake efficiency.

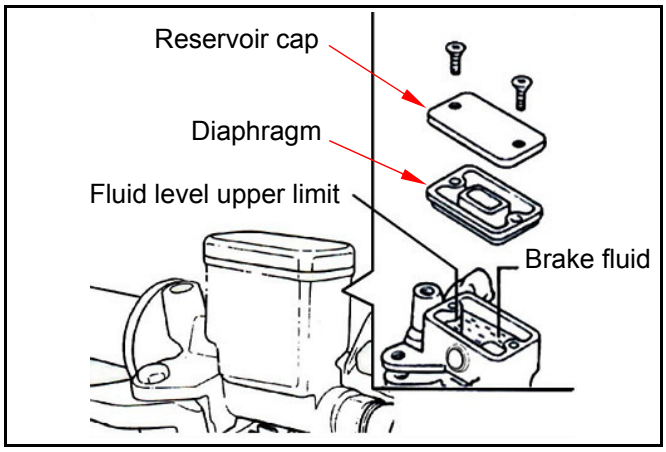
Connect a drain hose to the air-bleed valve, and put the other end into a container.
Open the air-bleed valve around 1/4 turns, and at the same time pump the brake lever until there is no air bubble in the drain hose and also feeling resistance on the brake lever.
Close the air-bleed valve when the brake system fluid filling procedure is finished.
Pump the brake lever to check whether air bubble is in brake system or not.
If brake is still soft, please bleed the system as described below:

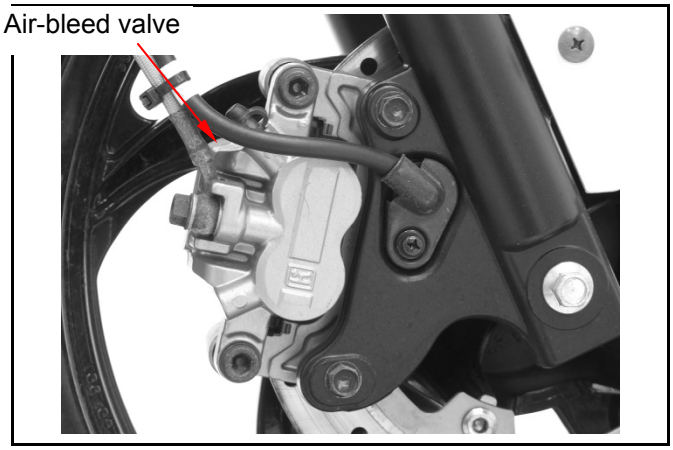
1. Tightly hold the brake lever and open the drain valve around 1/4 turns, and then close the valve.

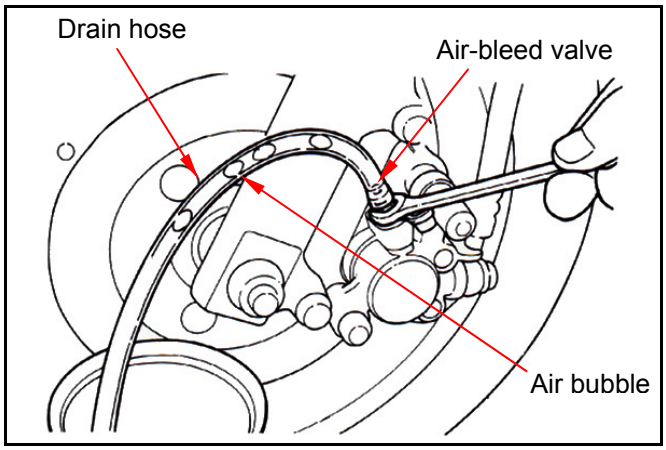
Caution

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

1. Release the brake lever slowly.
2. Repeat steps 1 and 2 until there is no air bubble at the end of the hose.
3. Confirm the brake fluid level. Add fluid if necessary.
4. Cover the reservoir cap.







Brake Caliper

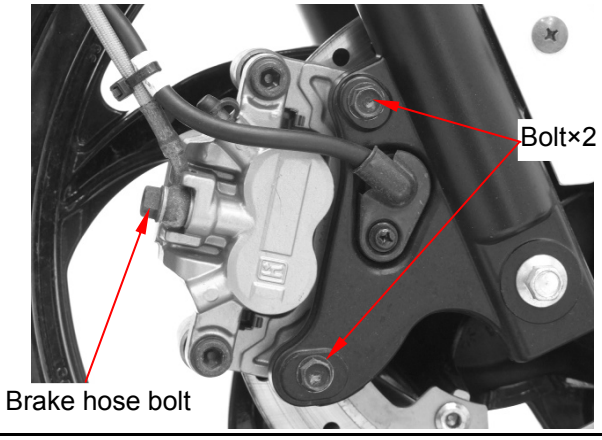
Removal

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

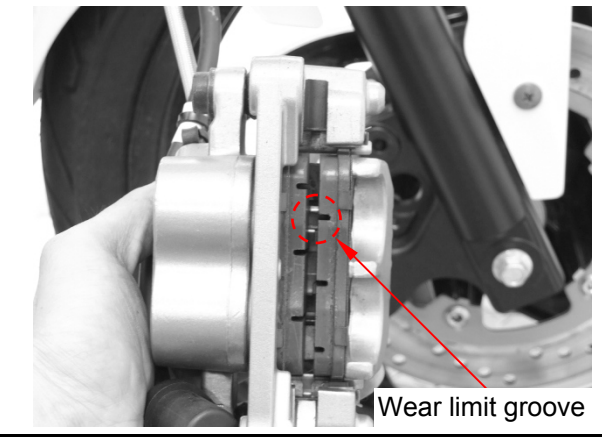
⚠Caution

- Do not spill brake fluid on painted surfaces.

Remove two caliper bolts and the caliper.



Confirm the brake pad wear condition. Replace with new brake pad if wear limit is reached.



Installation

Install the caliper and tighten the bolts.

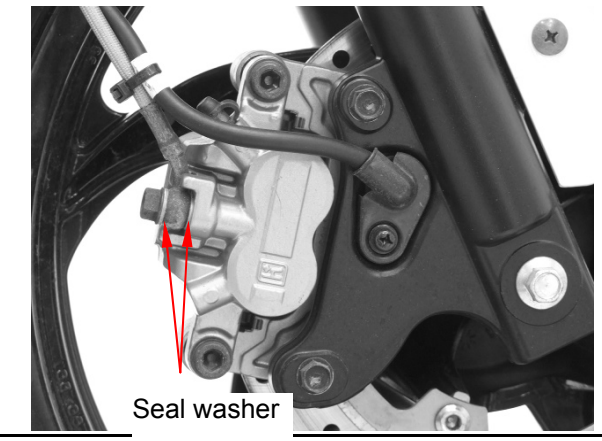
Torque value：3.1~3.5kgf-m

⚠Caution

- Use M8 x 32 mm flange bolt only.
- Long bolt will impair the operation of brake disk.

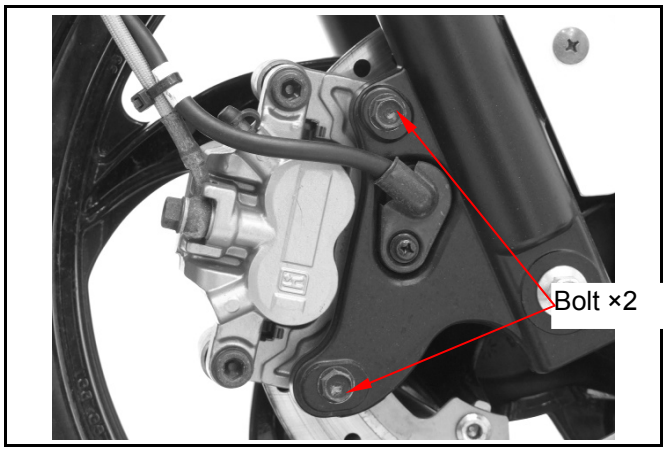
Use two seal washers and hose bolts to lock the hose and brake caliper in place.

Torque value：3.3~3.7kgf-m

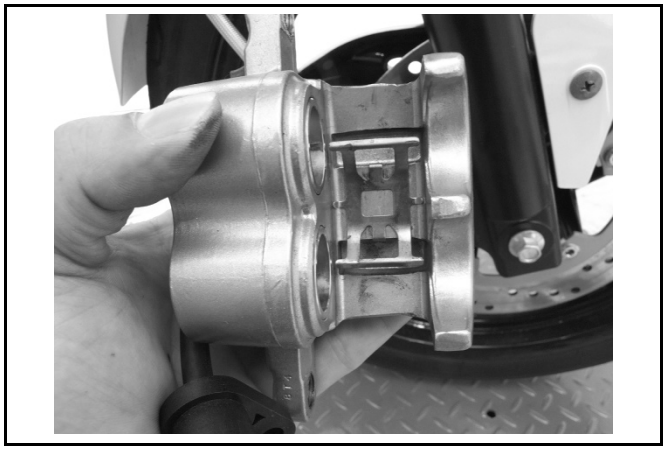


Fill the brake fluid to the reservoir and make necessary air bleeding.

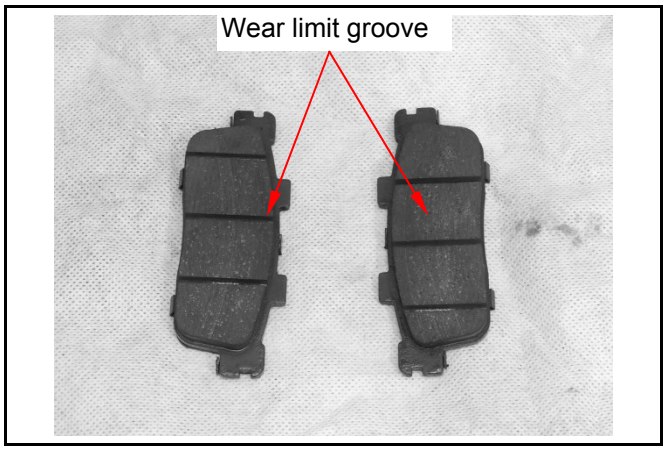
Brake pad replacement
Remove the brake caliper bolts.



Remove the brake pads from the brake caliper.



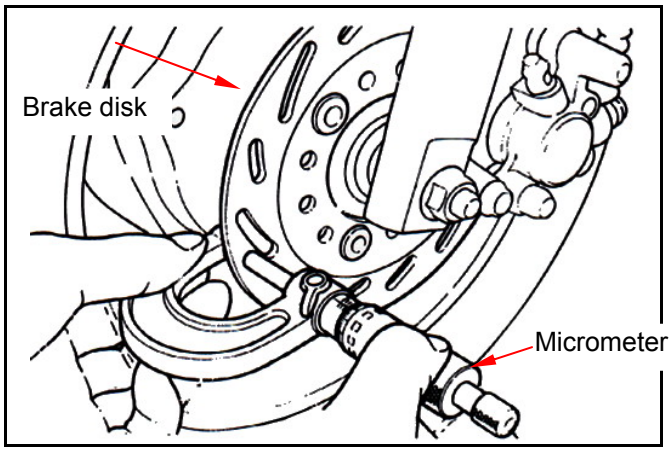
Install the new brake pads and guide bolts.
Install the front brake caliper and tighten the lock bolts.
Tighten the brake pad guide bolts and bolt caps.
Torque value：1.5~2.0kgf-m



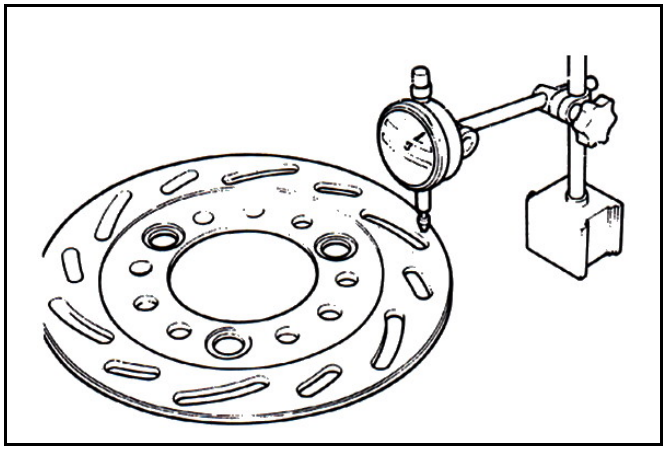
Brake Disk

Inspection

Visually check the brake disk for wear or damage.
Measure the thickness of the disk at several places. Replace the disk if it has exceeded the service limit.
Service limit：3.0 mm



Remove the brake disk from wheel.
Check the disk for deformation and bend.
Service limit：0.30 mm



Caution

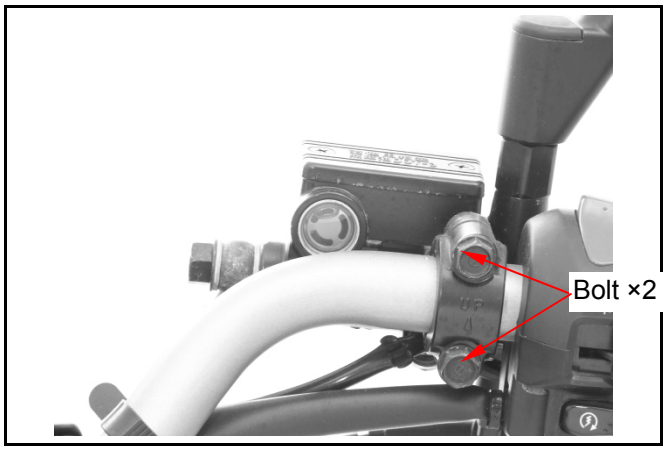
- The dirty brake pad or disk will reduce the brake performance.
- Brake pad includes the asbestos ingredient. Do not use compressed air to clean the brake system. The operator should put on gauze mask and glove, use vacuum cleaner to clean it.

Brake Master Cylinder

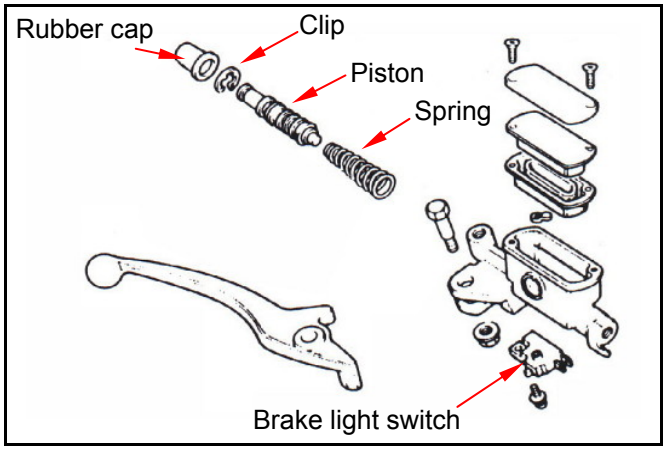
Removal

Caution

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



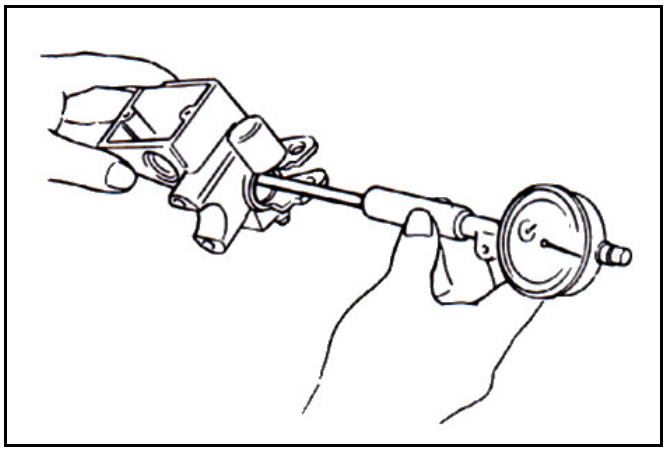
Remove the back mirror.
Disconnect the brake light coupler.
Drain the brake fluid.
Remove the brake lever and brake hose.
Remove the brake caliper (bolt x 2).
Remove the rubber cap.
Remove the clip.
Remove the piston and spring.
Clean the master cylinder with recommended brake fluid.



Inspection

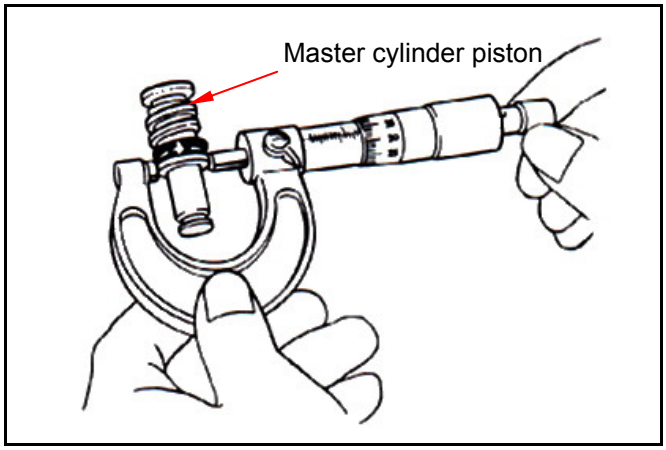
Check the master cylinder for damage or scratch. Replace it if necessary.
Measure the cylinder inner diameter at several points along both X and Y axis.
Replace the master cylinder if the measured values exceed service limit.

Service limit：12.755 mm



Measure the master cylinder piston outer diameter. Replace the piston if its measured value exceeds service limit.

Service limit：11.945 mm



Assembly

⚠Caution

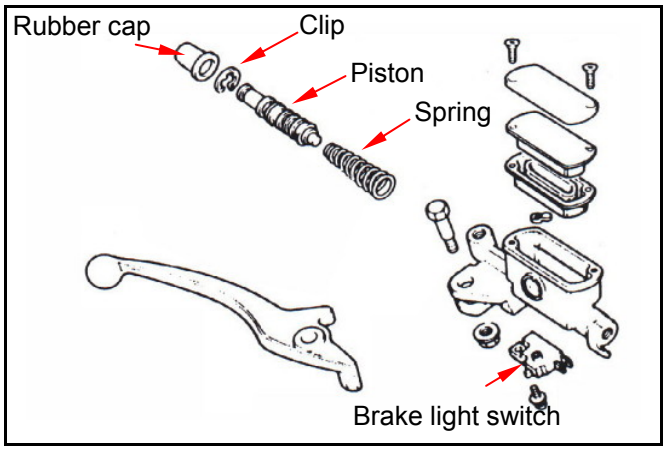
- Make sure there is no dust on all components before assembling.

Apply clean brake fluid to the piston and then install the piston.
Install the larger end of the spring onto the master cylinder.
Install the cir clip.

⚠Caution

- Make sure the clip is seated securely in the groove.

Install the rubber cap into the groove properly.

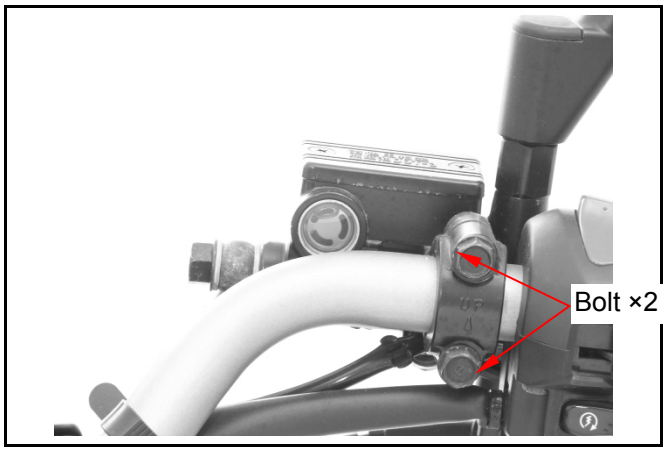


Installation

Install the brake caliper and tighten the lock bolts.

Torque value：0.8~1.2kgf-m

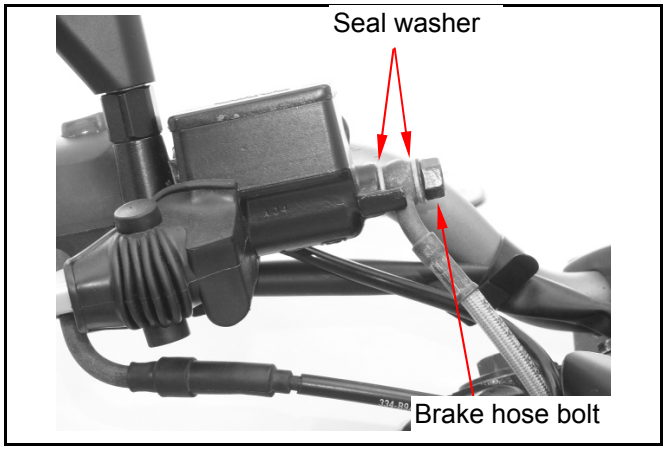
Assemble the brake lever and connect the brake light coupler.



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

Torque value：3.3~3.7kgf-m

Make sure the hose is installed correctly.



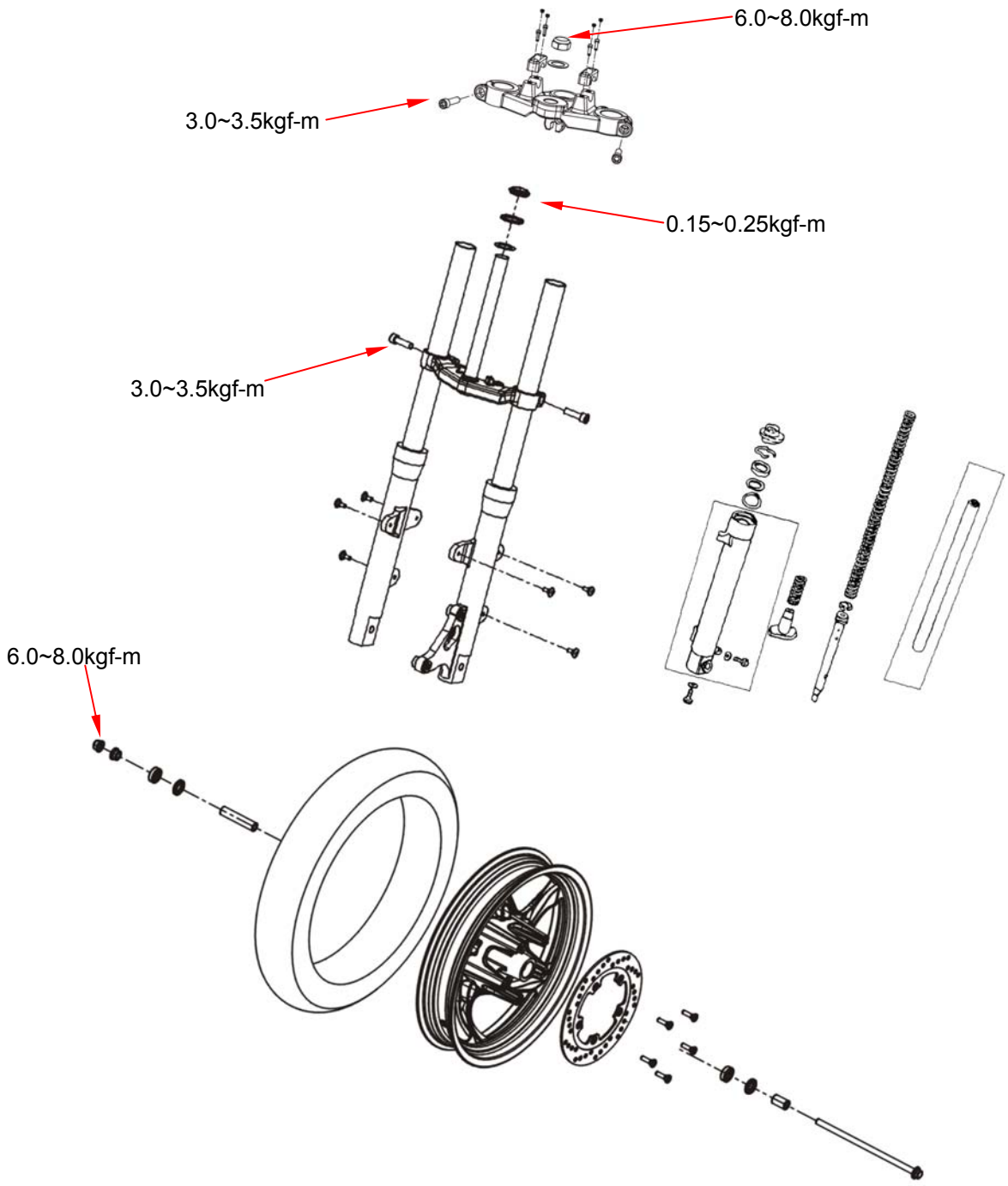
⚠Caution

- Improper routing may damage hose.
- Twist brake hose may reduce brake performance.

Add specified brake fluid and bleed the system.

NOTE:

Mechanism Diagram



Precautions in Operation

General information

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

⚠ Caution

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

Specification **Unit：mm**

Item		Standard	Service limit
Wheel axle runout		—	0.2
Wheel rim runout	Axial	—	2.0
	Radial	—	2.0

Torque value

Front wheel axle locknut	6.0~8.0kgf-m
Steering handlebar bolt	3.0~3.5kgf-m
Steering stem locknut	0.15~0.25kgf-m
Fork top bridge bolt	6.0~8.0kgf-m
Speedometer cable screw	0.15~0.3kgf-m
Front fork bolt	3.0~3.5kgf-m
Brake lever locknut	0.8~1.2kgf-m

Special tool

Steel ball race driver 32×35mm

Steel ball race driver 42×47mm

Inner bearing puller	SYM-6204020
Steering stem locknut socket wrench	SYM-5320000、SYM-5321100

Troubleshooting

Hard steering
- Steering stem nut too tight
- Worn or damaged steering ball bearing / seat
- Insufficient tire pressure

Steering handlebar tilted
- Incorrect fork adjustment
- Bent forks
- Bent wheel axle
- Damaged tire

Front wheel runout
- Bent wheel rim
- Worn tire
- Worn or damaged front wheel bearing

Soft suspension
- Worn fork spring
- Fork seal leakage

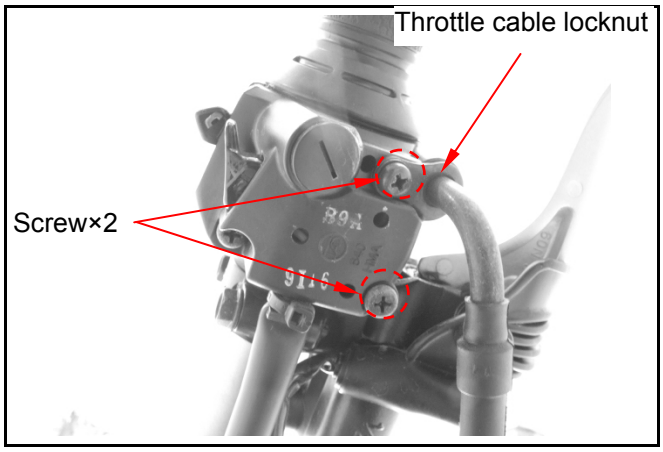
Hard suspension
- Bent fork pipes
- Excessive fork fluid

Front suspension noise
- Bent fork pipes
- Insufficient fork fluid
- Loose fork fasteners

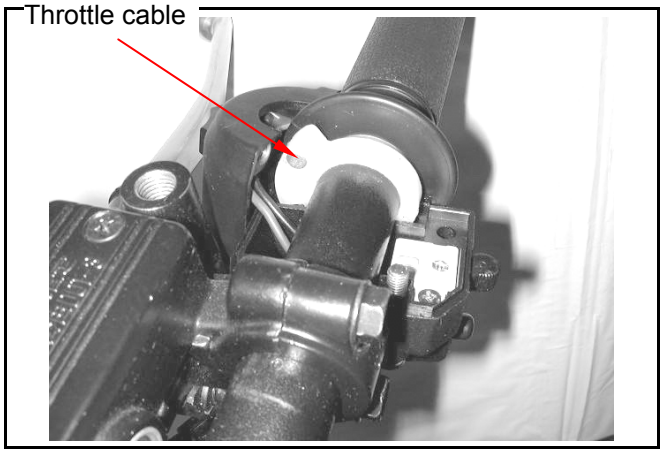
Steering Handlebar

Removal

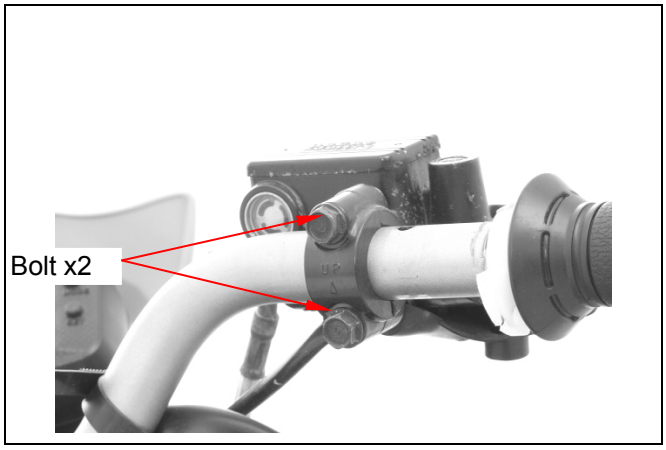
Loosen the throttle cable locknut.
Remove the right handle switch screws.



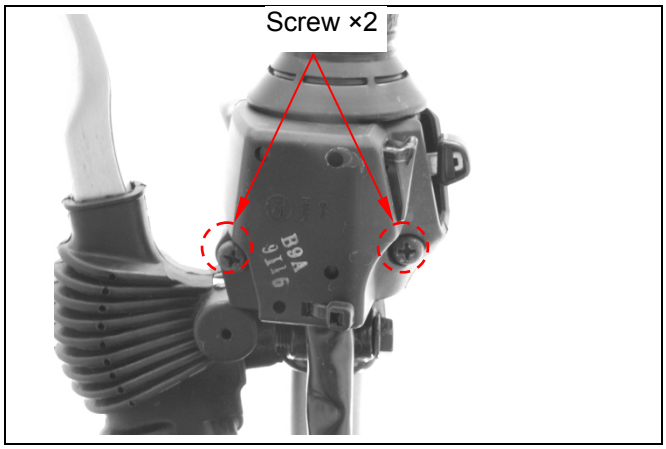
Remove the throttle cable.
Remove the throttle grip and right handle switch.



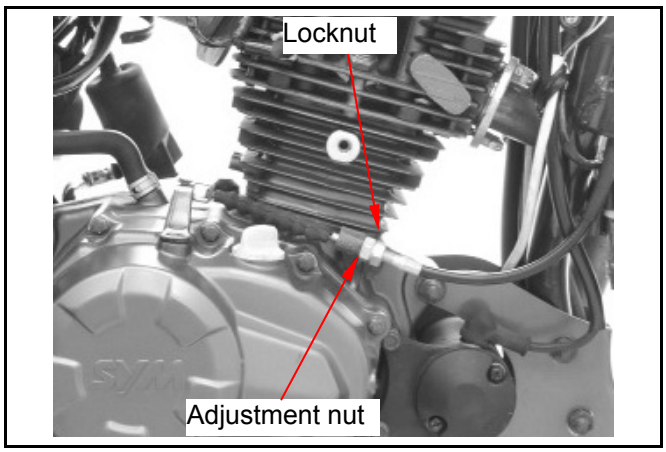
Remove the front brake master cylinder (bolt x2).



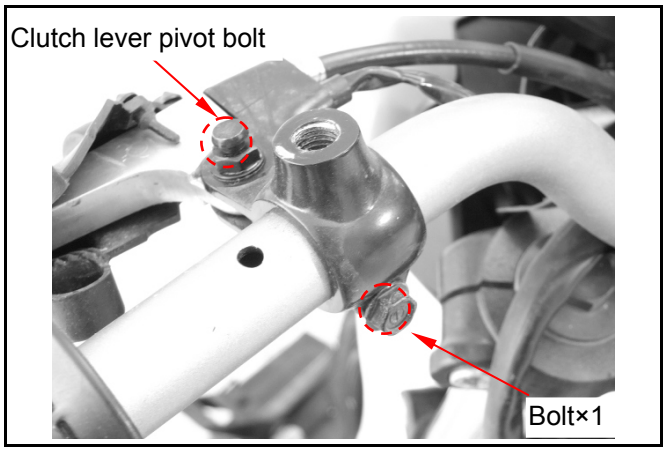
Remove the left handle switch (screw x2).



Loosen the clutch cable locknut and adjustment nut.



Remove the clutch lever pivot bolt.
Remove the clutch lever and clutch cable.
Remove the clutch lever socket (bolt x1).



Remove the handlebar bolts and holders.
Remove the handlebar.

Installation

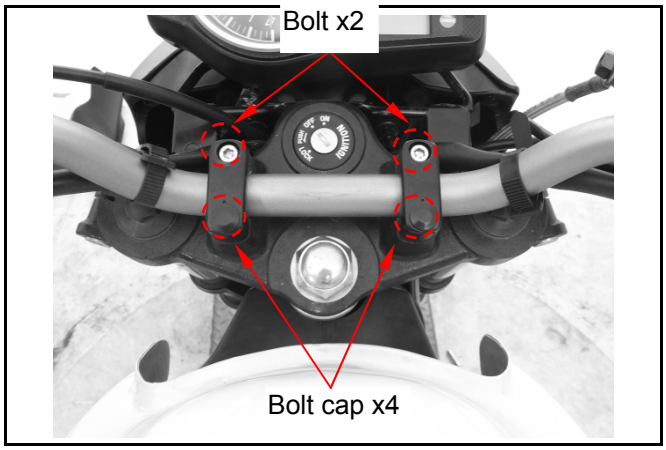
Install in the reverse order of removal.

Torque value：

Steering handlebar bolt　3.0~3.5kgf-m

After the handlebar is installed, confirm and adjust：

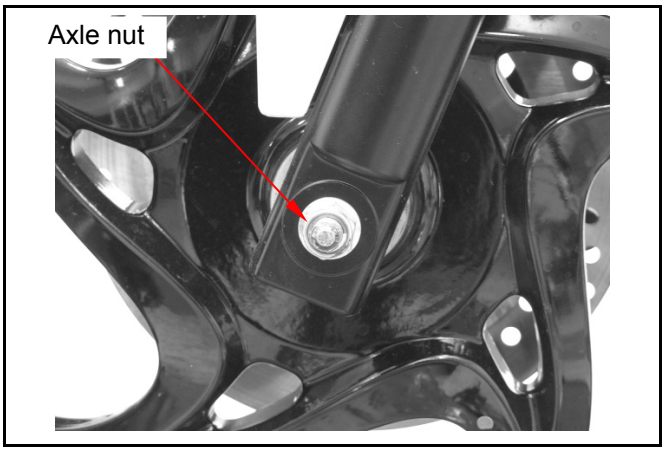
- throttle grip operation and free play
- meter, electrical parts operation



Front Wheel

Removal

Use a bracket to hold the bottom of engine and let the front wheel away from the ground.
Remove the front wheel axle locknut.
Pull out the front wheel axle.
Remove the front wheel and side collar.



Caution

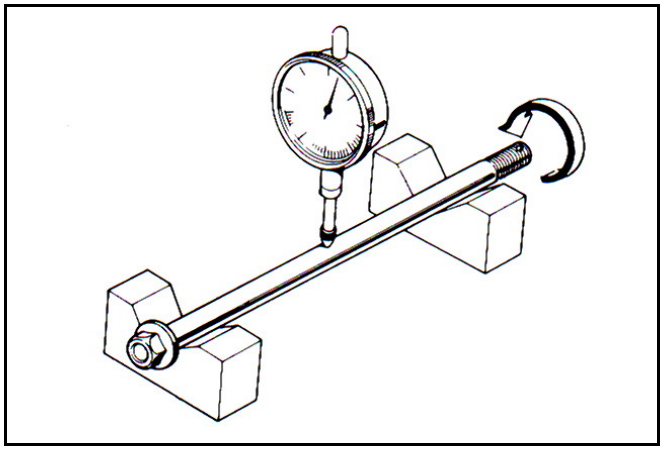
- Do not pull the front brake lever when the front wheel is removed to prevent the brake pads from being pushed out.

Inspection

Wheel axle

Put the axle on a V-block and measure the run out.

Service limit：0.2 mm

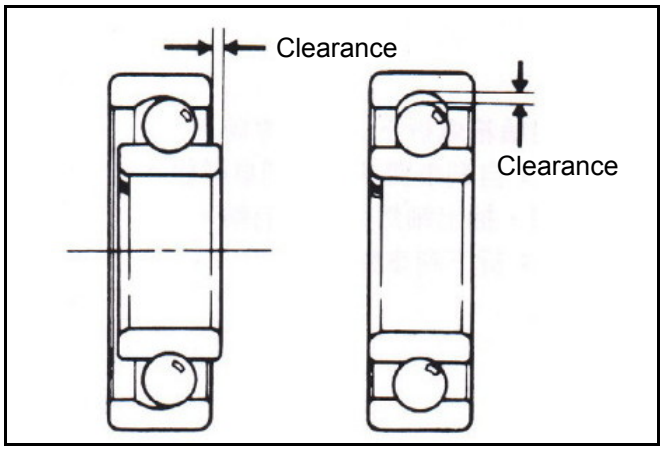


Bearing

Turn the inner ring of each bearing to check if it rotates smoothly and quietly.
Meanwhile, check if the outer ring fits the wheel hub closely.
If the bearing doesn't rotate smoothly or quietly, replace it with new one.

Caution

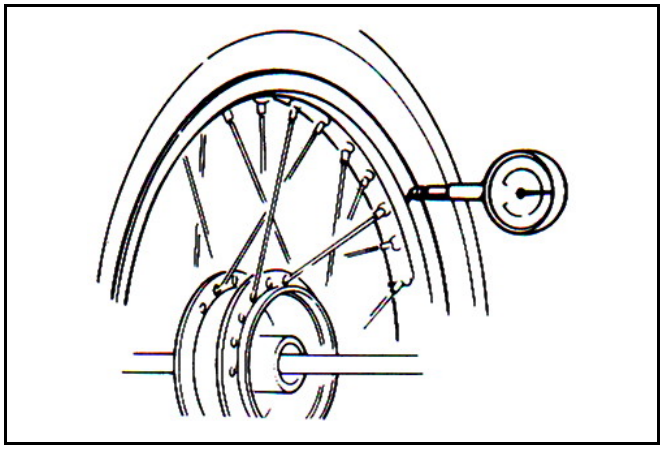
- The old bearing cannot be reused but be replaced with new one by pairs.



Wheel rim

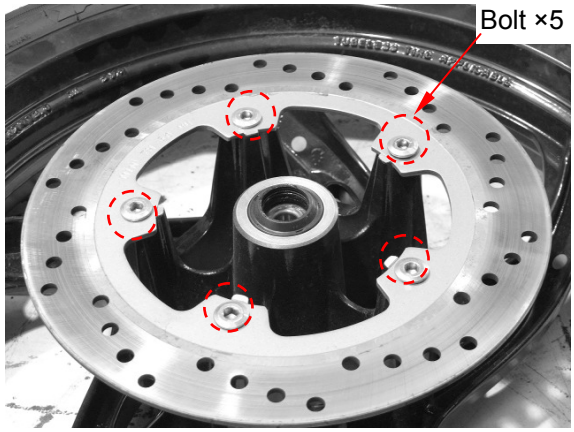
Place the rim in a rotating stand.
Spin the rim by hand and measure the runout by using a dial indicator.

Service limit： Radial 2.0mm
Axial 2.0mm



Disassembly

Remove the brake disk (bolt ×5).



Pull out the left side bearing and oil seal by using the inner bearing puller.
Remove the distance collar.
Pull out the right side bearing and oil seal by using the inner bearing puller.

Special tool：

Inner bearing puller SYM-6204020

Assembly

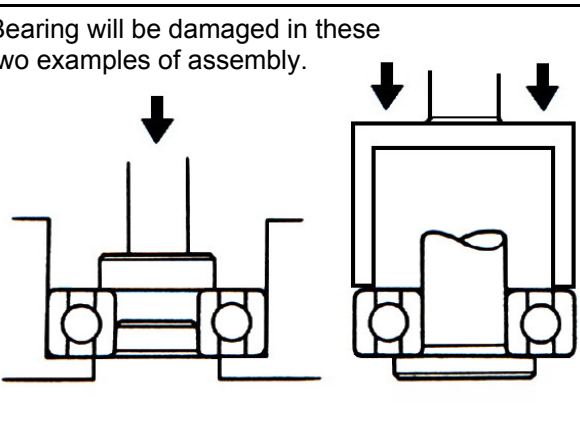
Install in the reverse order of removal.
Apply grease to the wheel hub / bearing contact surface.
Install the left side bearing.
Install the distance collar and the right side bearing.

Caution

- The bearing cannot lean to one side during installation.

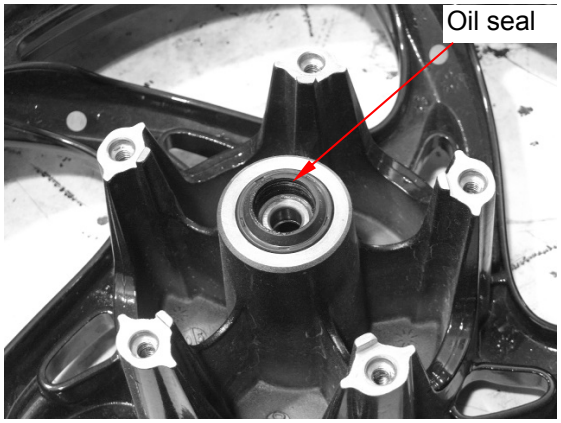
Tool：

Bearing driver

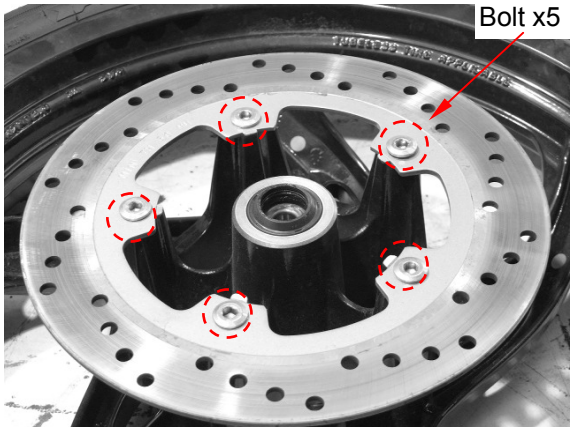


Installation

Apply grease to the inner and outer side of oil seal and install oil seal into the wheel hub.



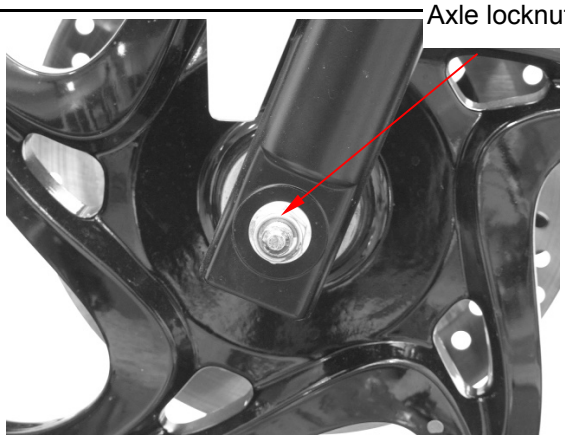
Install the brake disk (bolt ×5).
Torque value：1.4~1.6kgf-m



Install the front wheel axle from the right cushion.
Install the axle locknut and tighten the locknut to the specified torque.

⚠ Caution

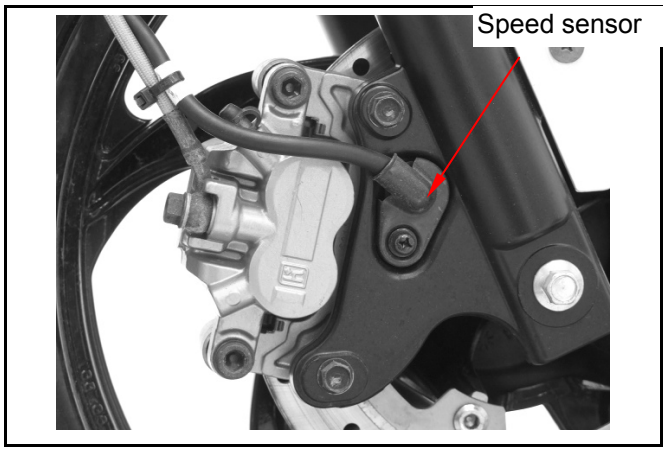
- Contaminated brake pad will decrease braking efficiency; therefore grease cannot be applied to brake pad and brake disk.



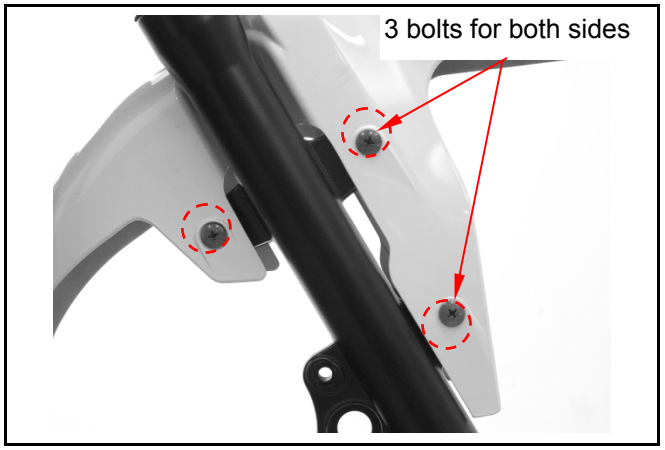
Front Fork

Removal

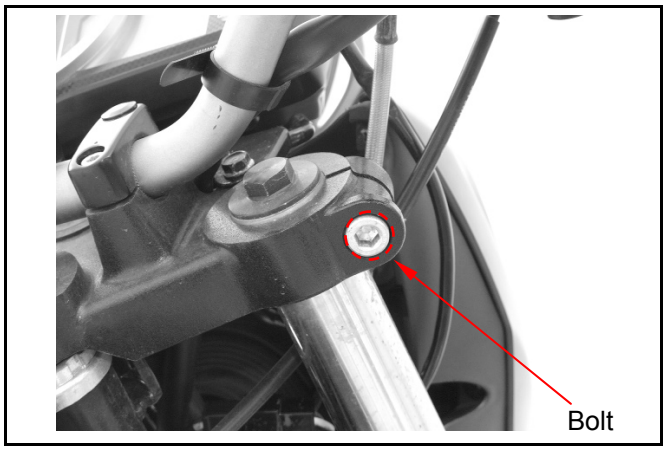
Remove the front wheel, speed sensor and front brake caliper.



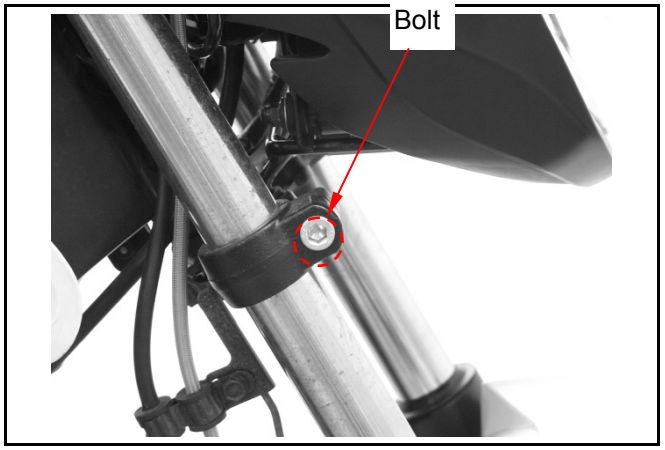
Remove the front fender (bolt x6).



Loosen the front fork bolt on the top bridge.

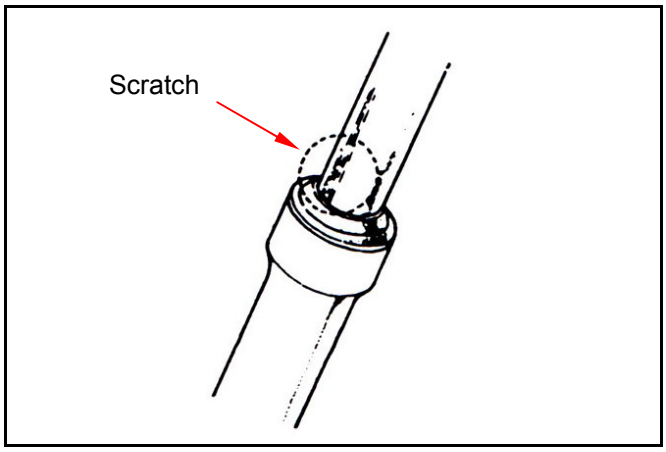


Loosen the front fork bolt on the steering stem.



Oil seal inspection / replacement

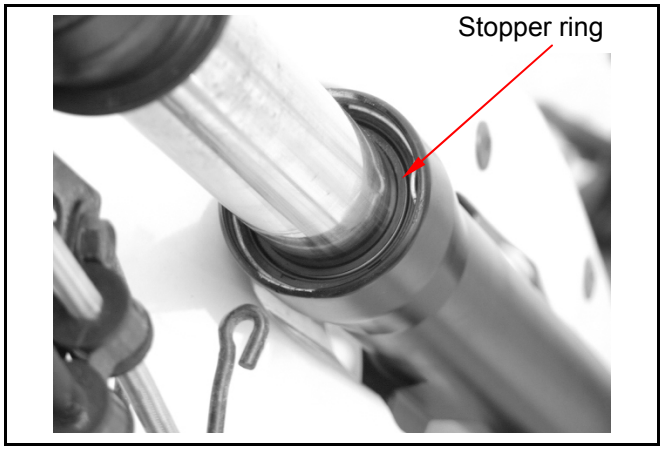
Push the fork pipe for several times to check if there is any oil leakage or excessive noise.
Check if there is any scratch on the fork pipe if oil leakage happens.
Replace the front fork if there is a scratch on the fork pipe.



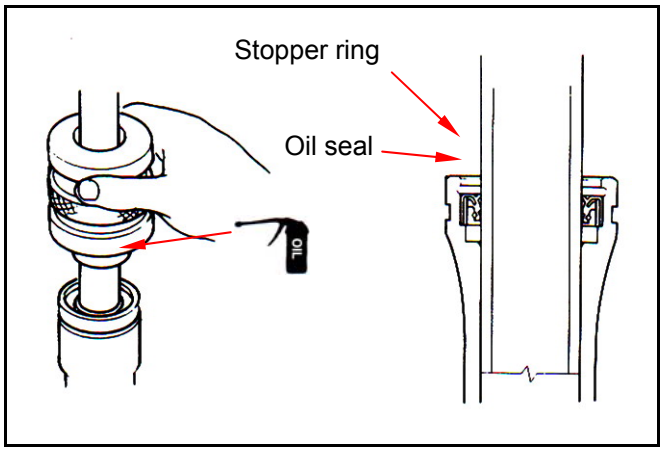
If there is oil leakage but without scratch on the fork pipe, replace the oil seal.
Pour out the fork fluid.
Remove the oil seal stopper ring and then remove the old oil seal.

⚠ Caution

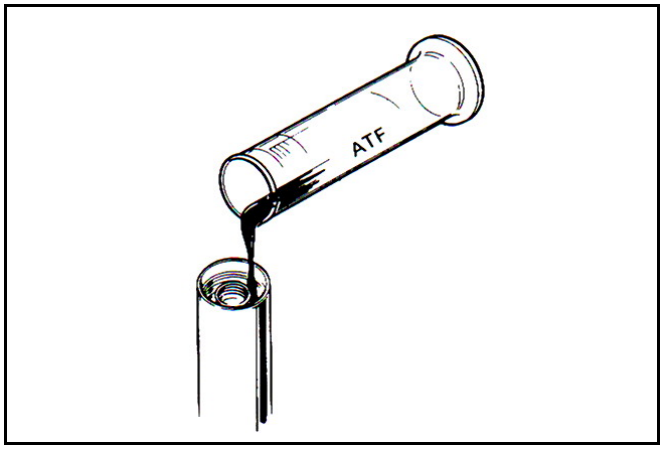
- Do not damage the fork pipe when removing the oil seal.



Coat the inner side of the new oil seal with cushion oil and then put in the fork pipe.
Install the oil seal to the right position by using an oil seal driver.
Clip the stopper ring.



Adjust the fork fluid capacity if the front fork is too hard or too soft.
Cushion oil：BRAMAX CUSHION OIL
Capacity：160~180c.c.

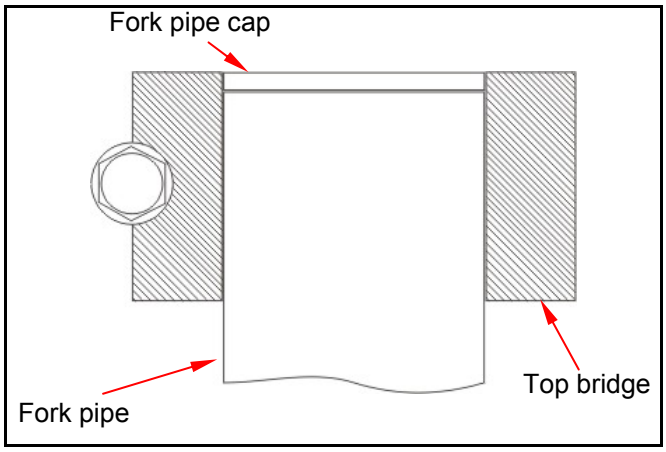


Installation

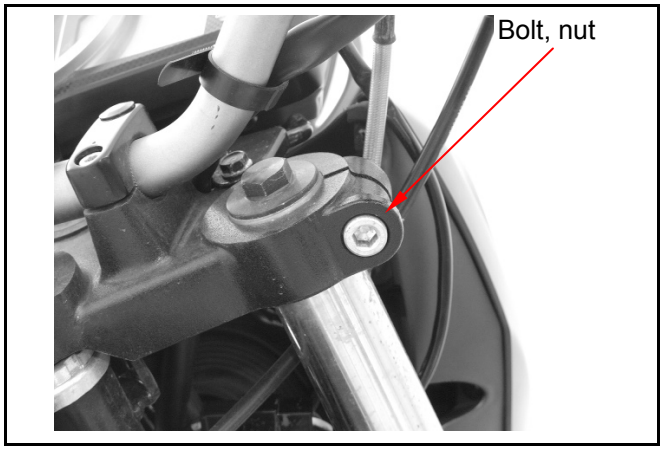
⚠ Caution

- Rotate the fork pipe during installation will make it easier to install the fork pipe.

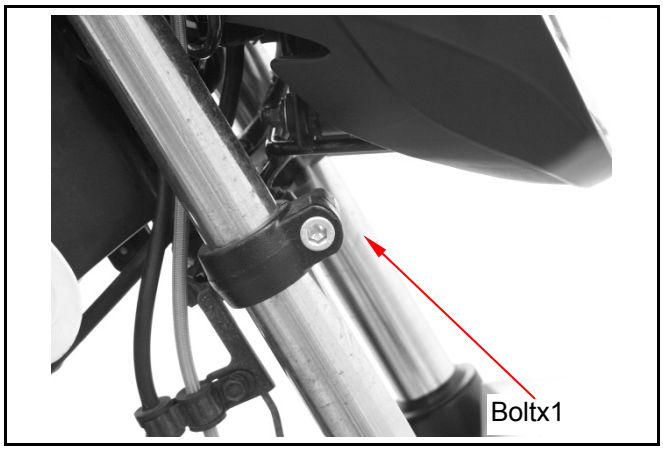
Install the fork pipe from the bottom of the front fork. Align the fork pipe cap with the top bridge.



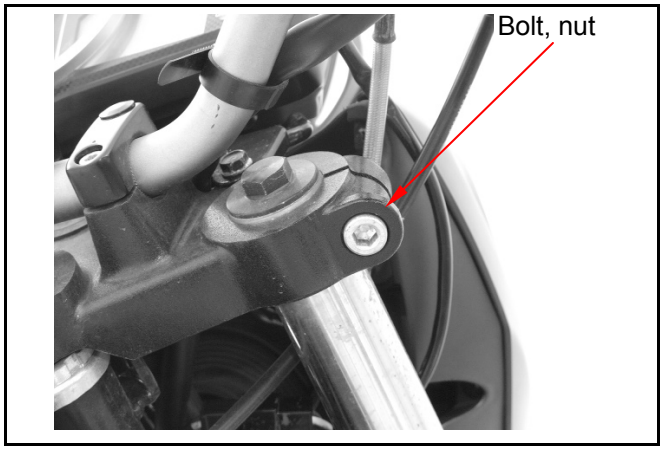
Hold the fork pipe by hand and tighten the front fork upper bolt and nut.



Tighten the fork bolt on the steering stem.
Torque value：3.0~3.5kgf-m



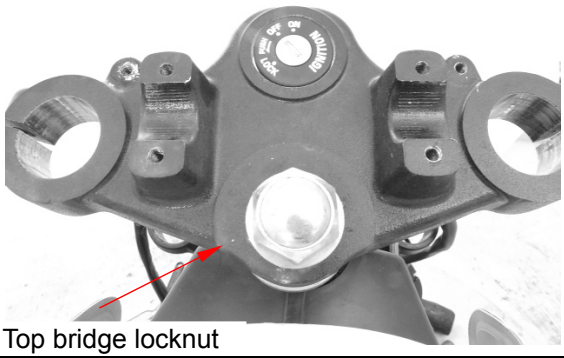
Tighten the front fork upper bolt and nut and confirm the specified torque value.
Torque value：3.0~3.5kgf-m



Steering Stem

Removal

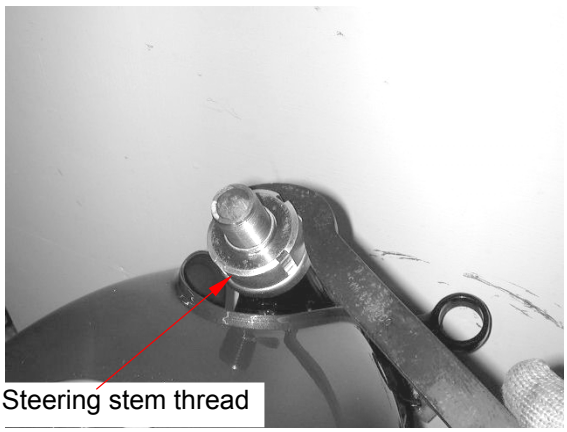
Remove the meter, headlight, steering handlebar, front wheel, front brake and front fork.
Remove the top bridge.



Remove the steering stem locknut and steering upper cone race.
Special tool :
Stem locknut socket wrench SYM-5320000
Remove the steering stem.

⚠ Caution

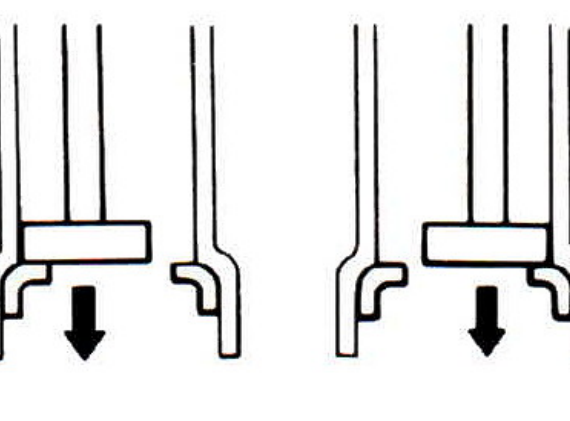
- Keep the steering steel balls in a container to avoid missing them.



Remove the steering upper / bottom ball race by driver and rubber hammer.
Remove the steering bottom cone race from the steering stem.

⚠ Caution

- Do not do any damage to the frame and steering stem.



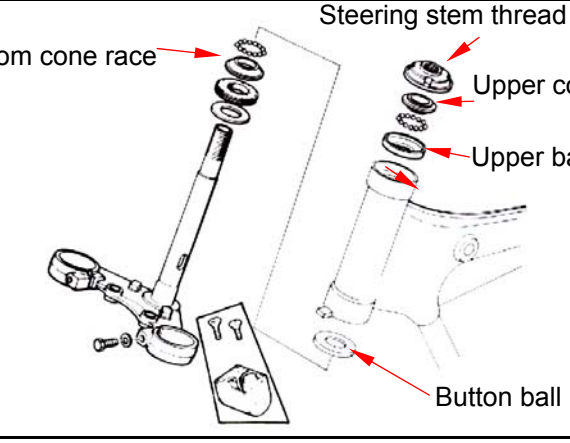
Installation

Install a new steering bottom cone race onto the steering stem and lubricate with grease.
Install the steering upper / bottom ball race to the right position.

⚠ Caution

- Do not let the ball race lean on one side during installation.

Coat the upper / bottom ball race with grease and install the steering balls.

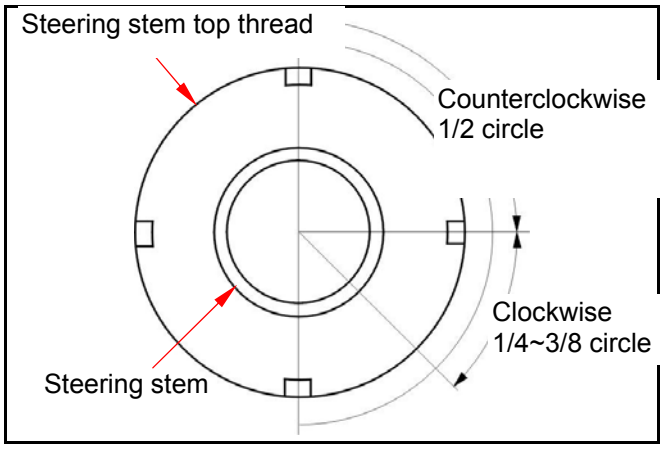


Install the steering stem into the frame.
Lubricate the steering upper cone race.
Tighten the upper cone race and steering stem locknut to the steering stem till the steering balls touch the upper cone race closely.
Turn the upper cone race counterclockwise 1/2 circle and then tighten it with specific torque value (1/4~3/8 circle).

Special tool：

Upper cone race wrench SYM-5320000

Torque value：0.15~0.25kgf-m

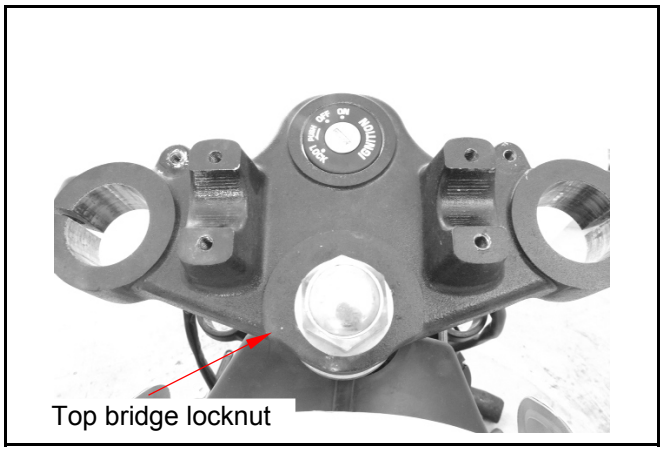


⚠ Caution

- Do not over tighten upper cone race or the steering ball race may be damaged.

Install the top bridge and tighten the nuts.

Torque value：6.0~8.0kgf-m



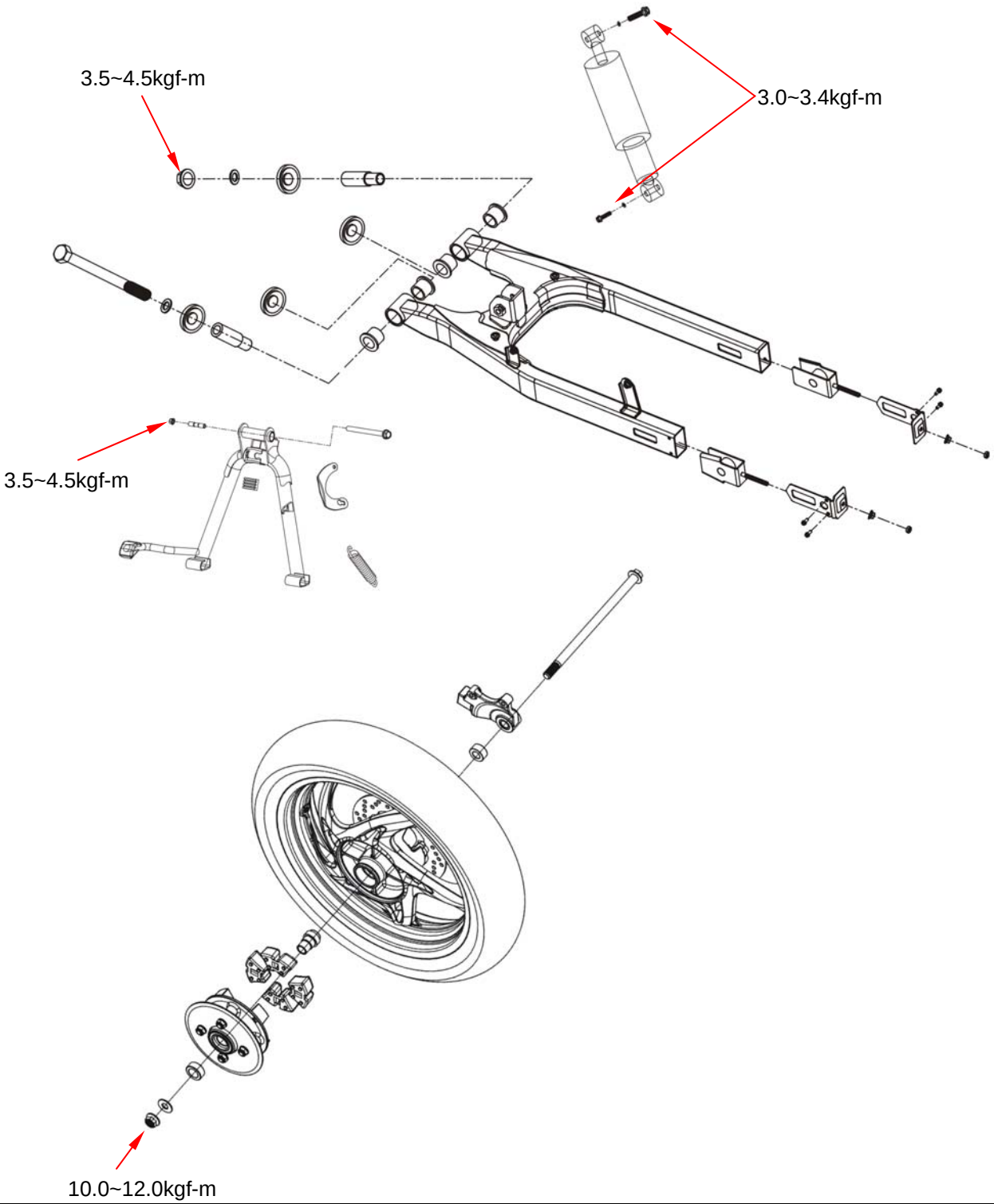
⚠ Caution

- After installation, check if the steering stem can rotate freely without vertical clearance.

Install other parts in the reverse order of removal.

NOTE:

Mechanism Diagram



Precautions in Operation

General information

Refer to the service manual of tire for the information of tire removal, repair and installation.

Specification **unit：mm**

Item		Standard	Service limit
Axle runout		—	0.2
Wheel rim runout	Radial	—	2.0
	Axial	—	2.0
Brake drum inner diameter		130.0	132.0
Drive chain slack		—	10~20

Torque value

Final driven sprocket bolt	2.7~3.0kgf-m
Rear wheel axle nut	10.0~12.0kgf-m
Swingarm pivot bolt nut	3.5~5.0kgf-m
Exhaust pipe locknut	1.0~1.4kgf-m
Rear cushion upper nut	3.0~3.4kgf-m
Rear cushion lower nut	3.0~3.4kgf-m
Rear brake arm nut	0.8~1.2kgf-m
Rear brake torque link nut	1.8~2.5kgf-m
Main stand nut	3.5~4.5kgf-m

Special tool

Inner bearing puller	SYM-6204020
Steering stem locknut socket wrench	SYM-5320000
Rubber bush puller / driver	SYM-1120310

Troubleshooting

Rear wheel wobbling

- Bent rim
- Faulty rear tire
- Incorrect wheel axle tightening

Too soft suspension

- Weak cushion spring
- Incorrect suspension adjustment

Too hard suspension

- Damaged rubber bush
- Bent

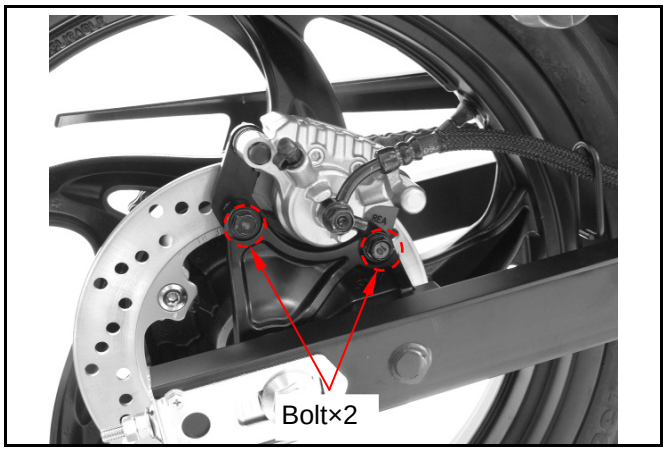
Rear suspension noise

- Incorrect cushion nut tightening
- Damaged rubber bush
- Cushion fluid leakage
- Bent rear cushion

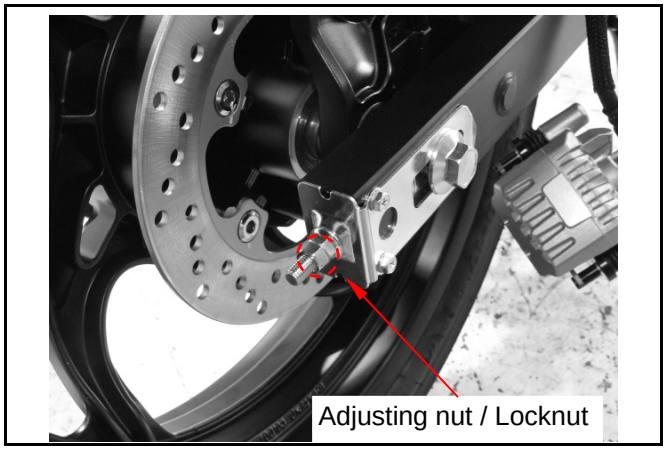
Rear Wheel

Removal

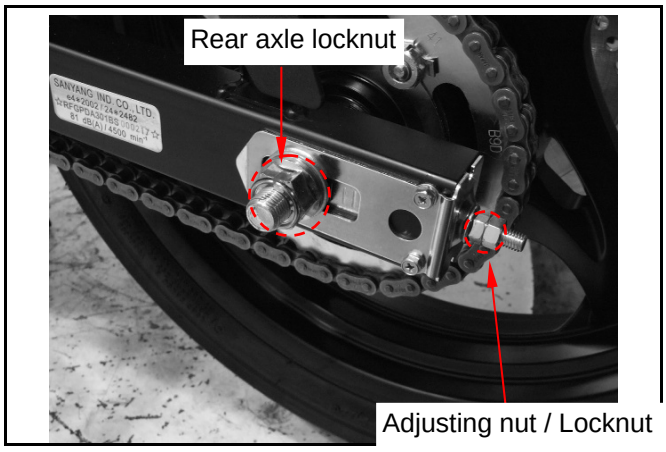
Remove the rear brake caliper (bolt x 2).



Loosen the drive chain adjusting nut on both sides.



Remove the rear axle locknut.
Push the rear wheel forward and derail the drive chain from the driven sprocket.
Pull out the rear axle and remove the rear wheel.

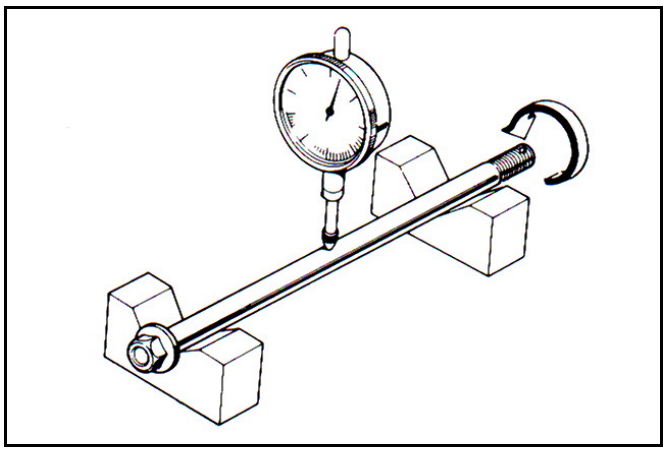


Inspection

Wheel axle

Put the axle on a V-block and measure the run out.

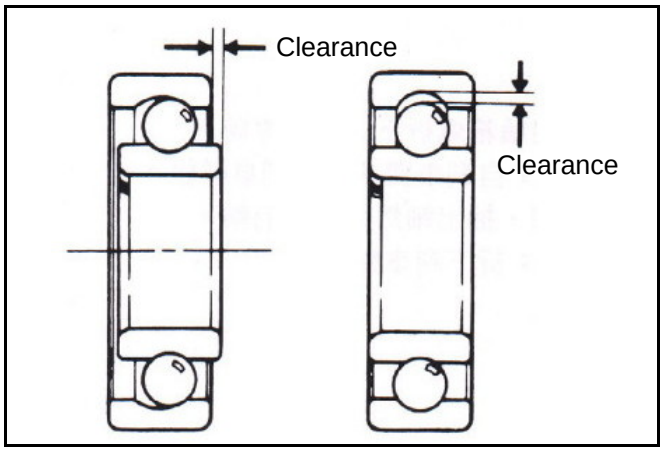
Service limit：0.2 mm



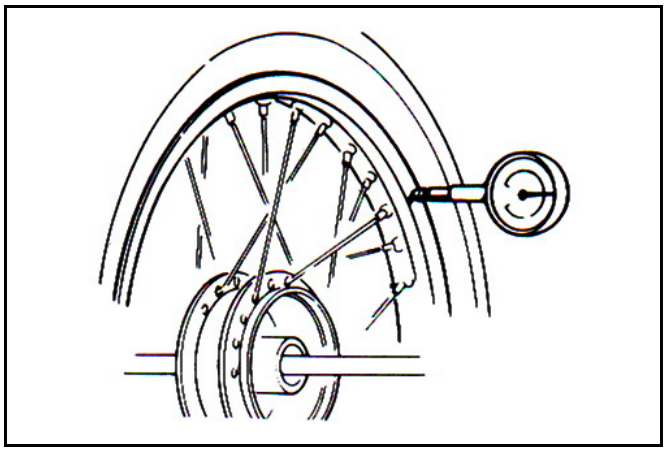
Bearing
Turn the inner ring of each bearing to check if it rotates smoothly and quietly.
Meanwhile, check if the outer ring fits the wheel hub closely.
If the bearing doesn't rotate smoothly or quietly, replace it with new one.

⚠ Caution

- The bearing should be replaced in pairs.

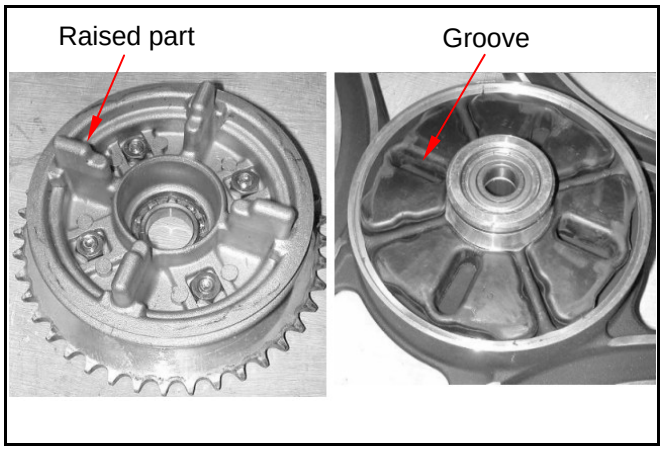


Wheel rim
Place the rim in a rotating stand.
Spin the rim by hand and measure the runout by using a dial indicator.
Service limit：Radial 2.0mm
Axial 2.0mm



Driven flange rubber damper inspection
Inspect the rubber dampers on the driven flange for wear or damage.
Replace it if necessary.

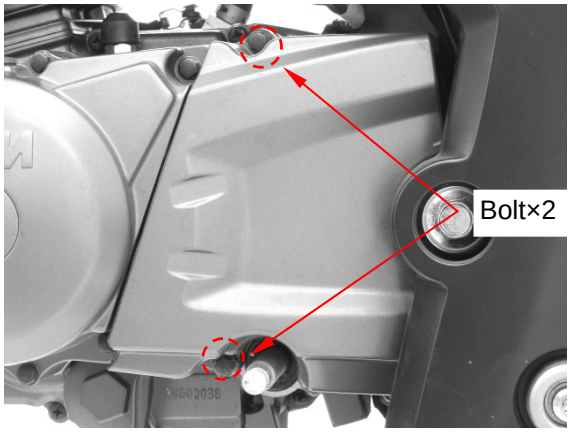
Rear wheel installation
Install in the reverse order of removal.



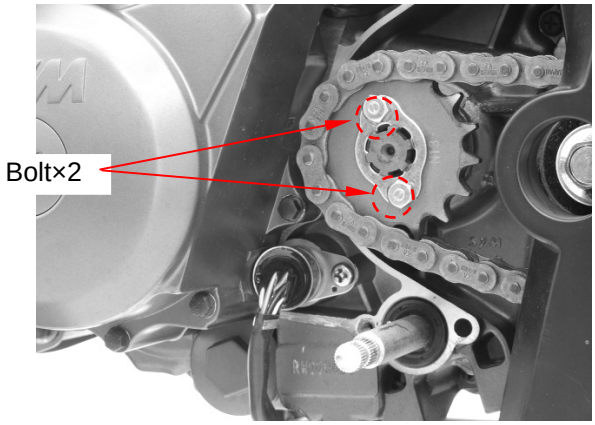
Drive Chain / Sprocket / Flange

Drive chain / sprocket removal

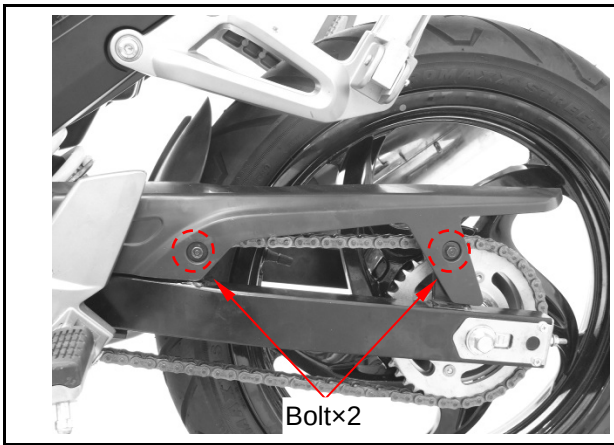
Remove the left crankcase rear cover (bolt×2).



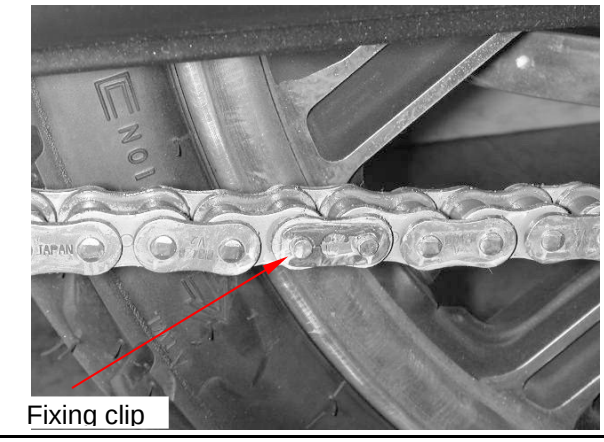
Remove the drive sprocket fixing plate.



Remove the drive chain cover.



Remove the drive chain fixing clip.
Remove the drive chain.



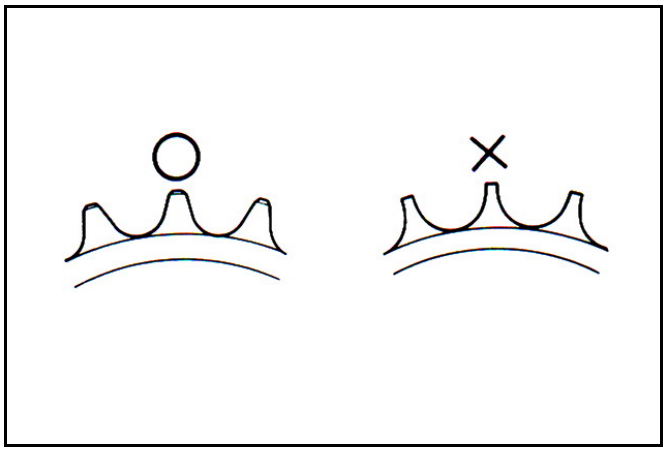
Drive chain / sprocket inspection

Driven sprocket

Check the condition of driven sprocket teeth.
Replace the sprocket if the teeth are worn out.

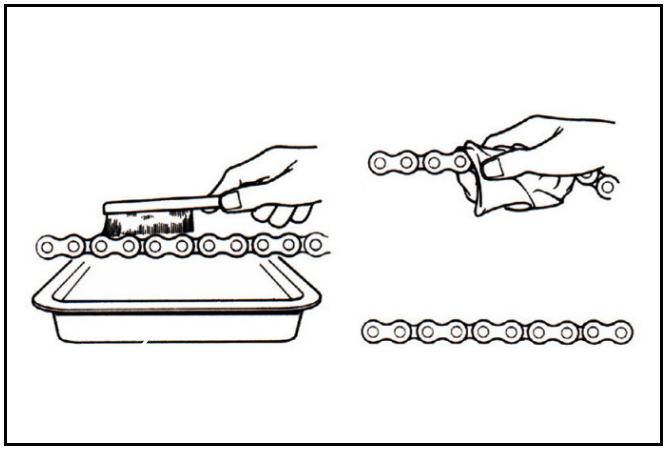
⚠ Caution

- Driven sprocket and drive chain condition should be checked at the same time.



Drive chain

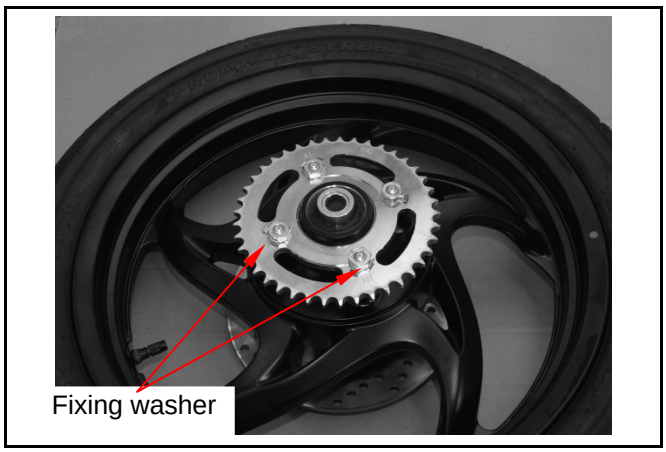
Clean and check the drive chain links condition. Replace the drive chain if it is worn out.



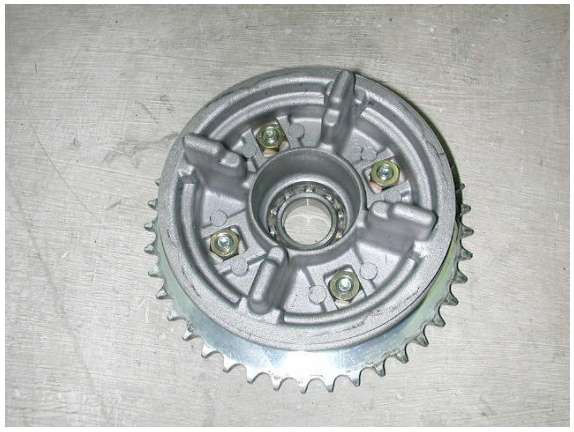
Driven sprocket / flange removal

Remove the rear wheel and drive chain.
Remove the rear flange locknut.
Remove the rear flange and sprocket.

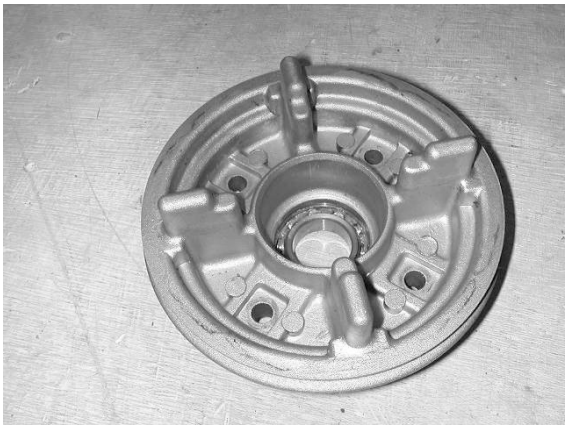
Flat the sprocket bolt fixing washer.



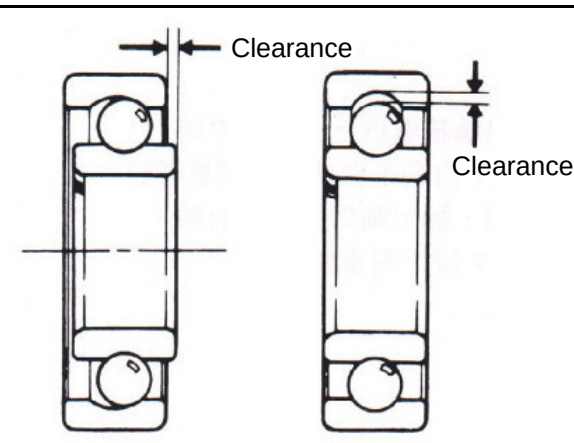
Remove the driven sprocket (boltx4, nutx4).



Driven flange inspection
Check the flange for wear or damage.



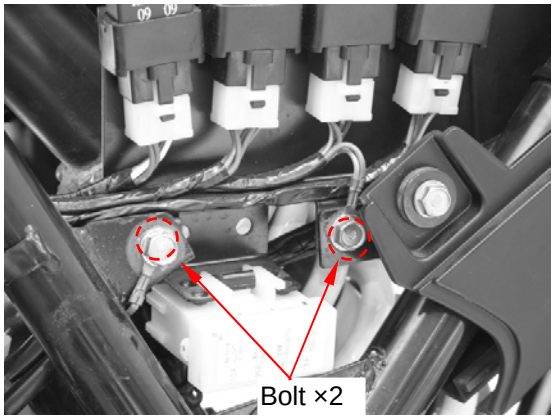
Bearing inspection
Turn the inner ring of each bearing to check if it rotates smoothly and quietly.
Meanwhile, check if the outer ring fits the wheel hub closely.
If the bearing doesn't rotate smoothly or quietly, replace it with new one.



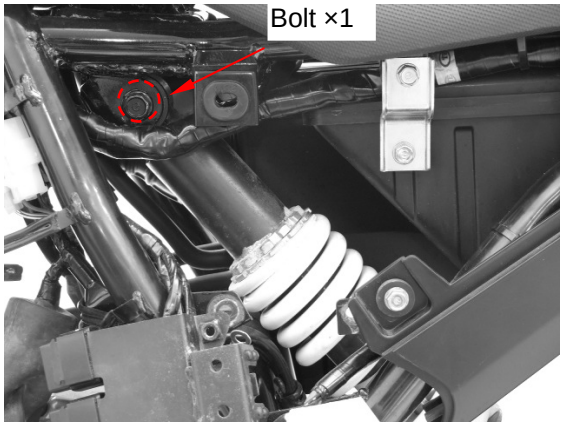
Rear Cushion

Removal

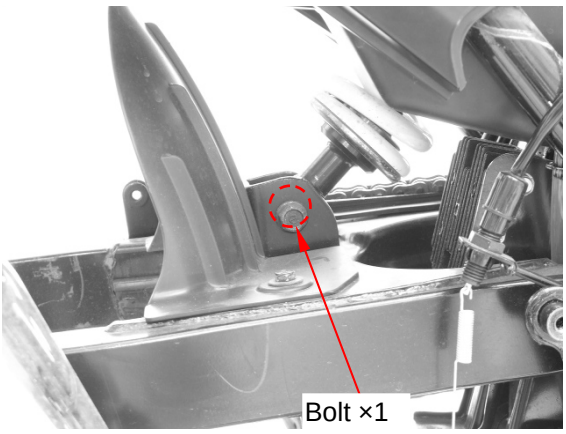
Remove the left body cover.
Remove the fuse / relay bracket (bolt x2).



Remove the rear cushion upper bolt.



Remove the rear cushion lower bolt.
Remove the rear cushion.



Installation

Install in the reverse order of removal.

Torque value：

Cushion locknut 3.0~3.4kgf-m

Caution

- Rear cushion should be replaced as a complete set.

Press the rear cushion to check if the rear cushions move freely.

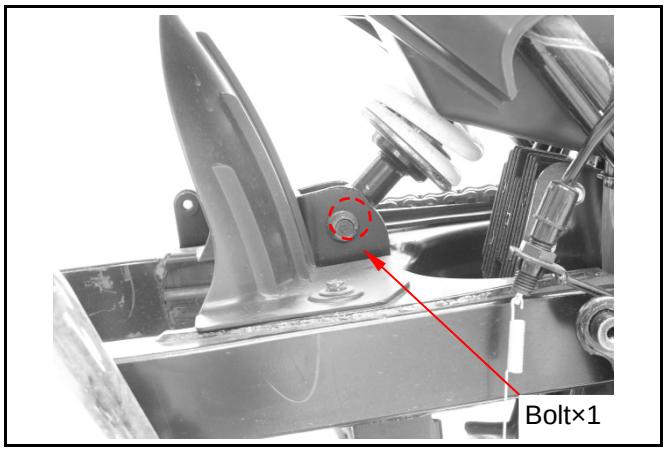
Special tool：

Steering stem locknut socket wrench
SYM-5320000

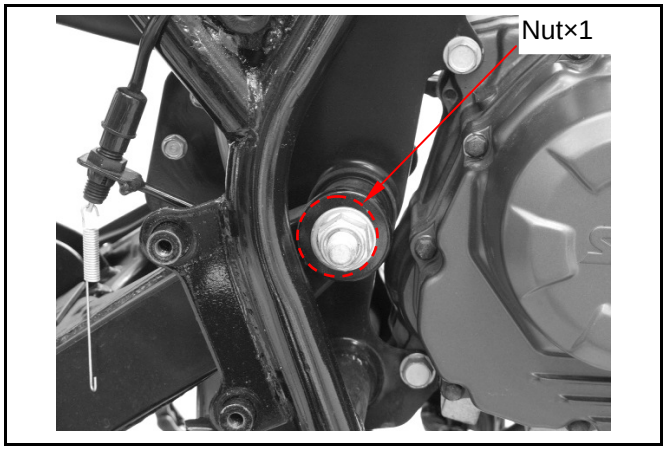
Swingarm

Removal

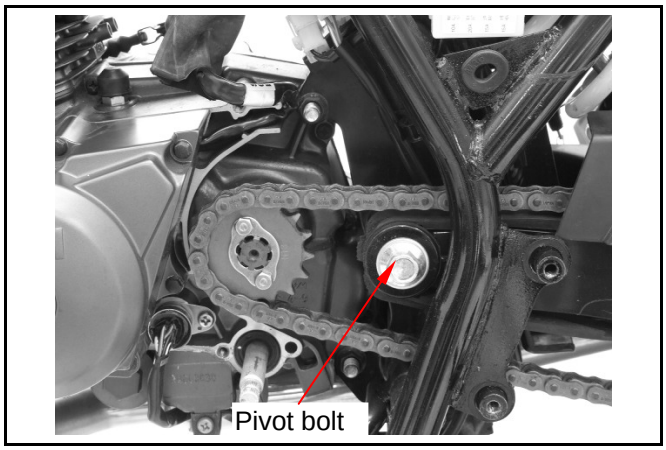
Remove the rear wheel, drive chain and rear cushion lower bolt.



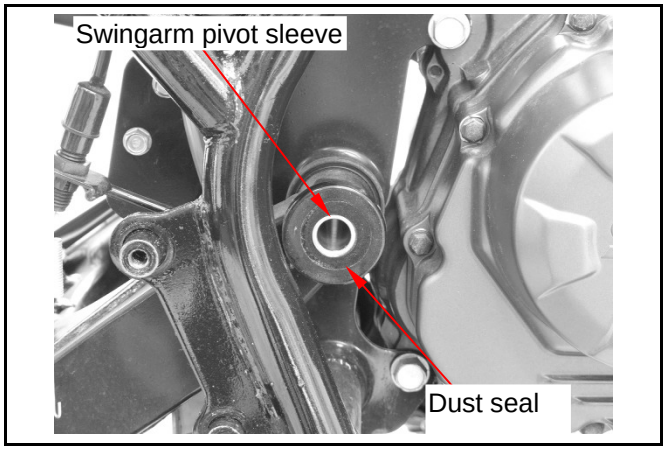
Remove the swingarm pivot locknut.



Pull out the swingarm pivot bolt.



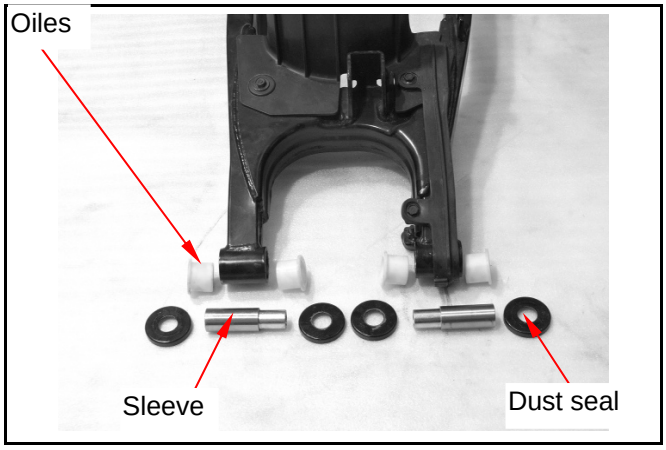
Remove the swingarm pivot sleeve and dust seal.
Remove the swingarm.

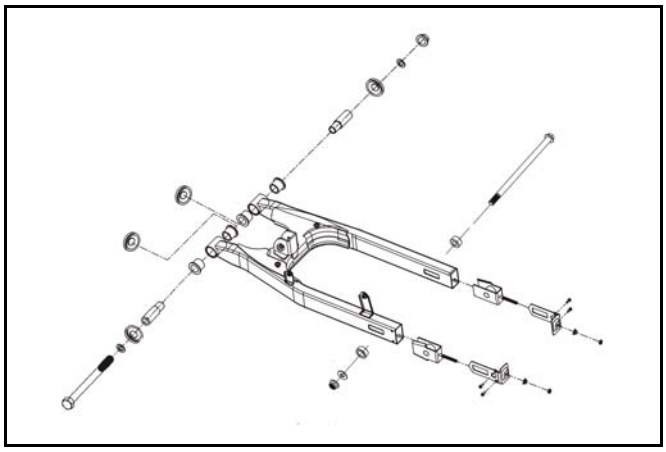


Inspection

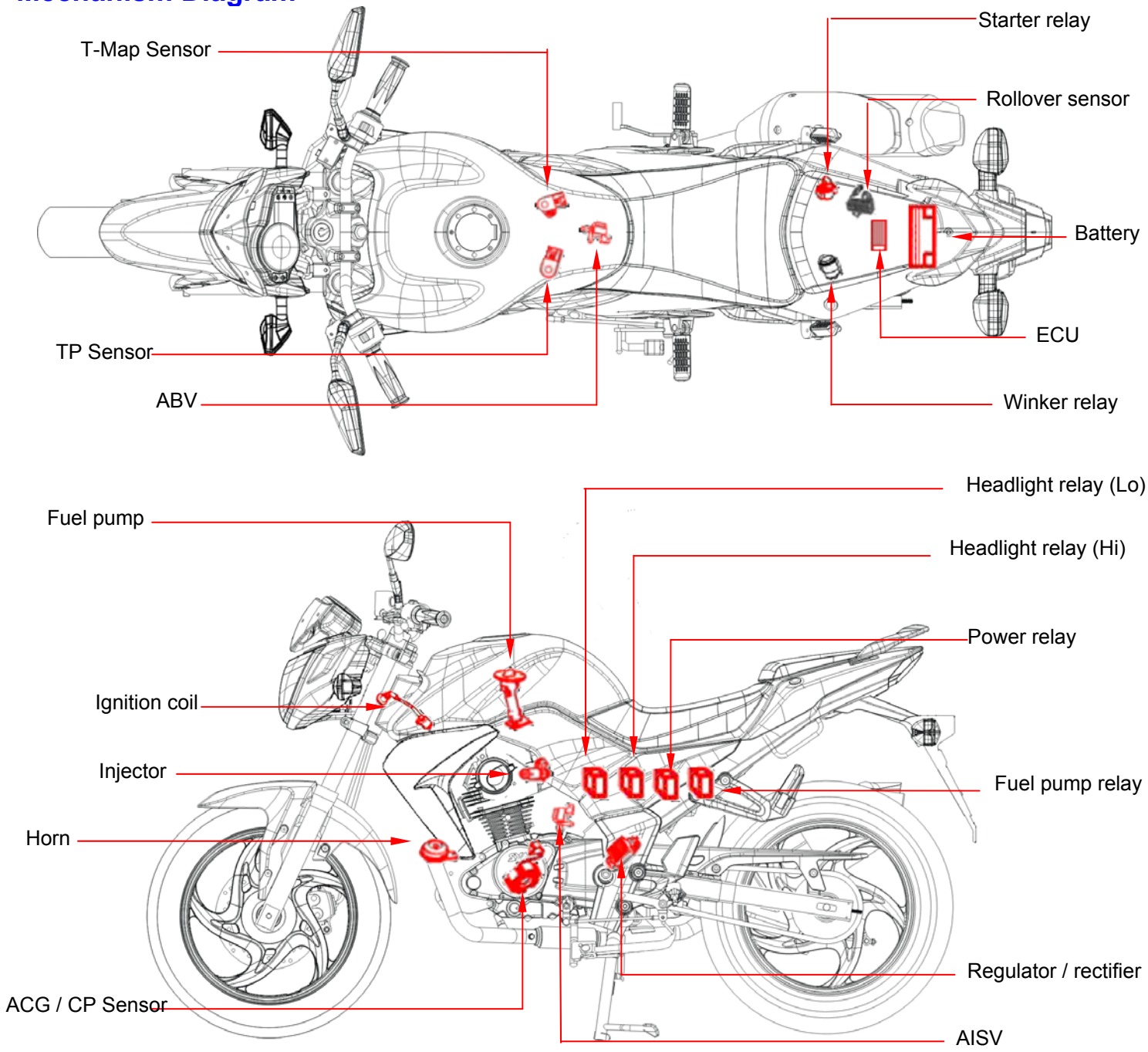
Check the swingarm for wear or damage.

Check the swingarm oiles, sleeve and dust seal for crack or wear.





Mechanism Diagram



Precautions in Operation

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

Technical Specification

Charging system

Description		Specification
Battery	Capacity	12V8Ah YTX9-BS / GTX9-BS
	Charging rate	0.8A / 5~10 hours (standard) 4A / 1 hour (fast charging)
Leak current		< 10mA
Charging current		1.2 A / 6000 rpm
Control voltage in charging		14.5 ± 0.5 V

Ignition system

Description		Specification
Spark plug	Model	NGK DPR7EA-9 (Recommended)
	Gap	0.6~0.7 mm
Ignition coil resistance	Primary winding	0.75Ω±10% (25ºC±10%)
CPS resistance		80~160Ω
Ignition timing advance		BTDC 8º / 1700 rpm

Troubleshooting

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

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

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

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

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

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

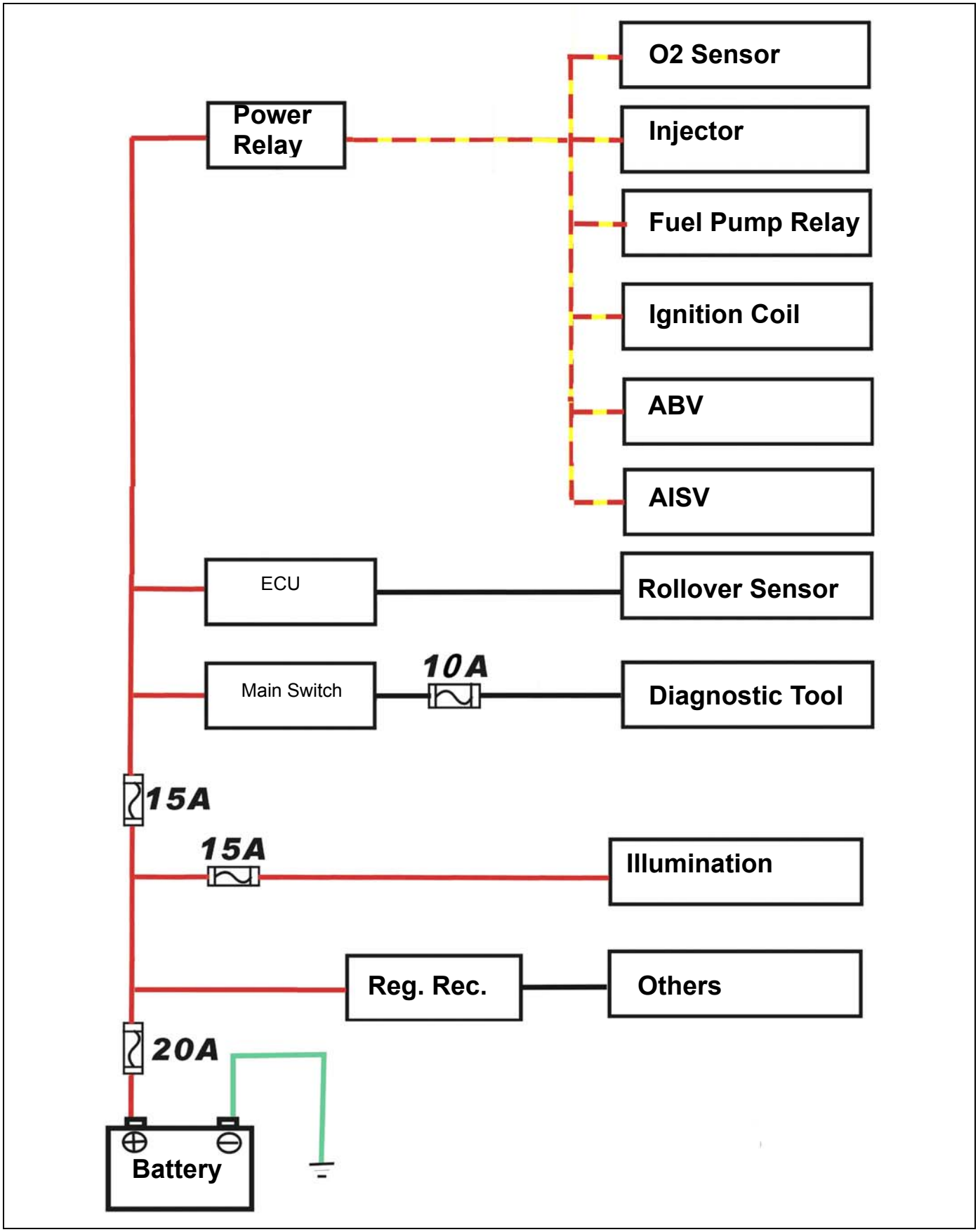
Engine does not crank smoothly
- Primary winding circuit
  - Poor ignition coil
  - Poor connection of cable and connectors
  - Poor main switch
- Secondary winding circuit
  - Poor ignition coil
  - Poor spark plug
  - Poor ignition coil cable
  - Current leakage in the spark plug
- Incorrect ignition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

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

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

Abnormal battery

Fuse

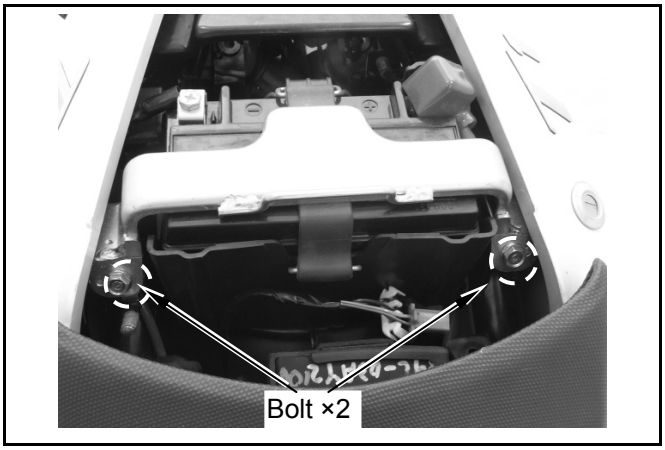

O2 Sensor
Power Relay
Injector
Fuel Pump Relay
Ignition Coil
ABV
AISV
ECU
Rollover Sensor
Main Switch
10A
Diagnostic Tool
15A
15A
Illumination
Reg. Rec.
Others
20A
Battery

Charging System

Battery

Removal

Remove the rear seat.



Disconnect the negative terminal wire first and then the positive terminal.

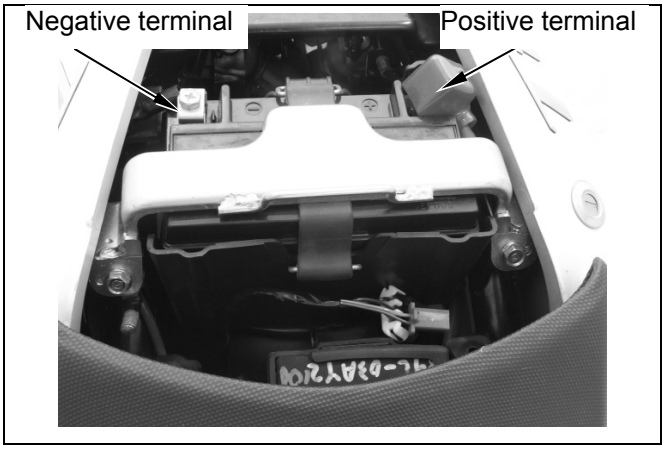
Remove the battery.

Installation

Install in the reverse order of removal.

⚠ Caution

- To prevent short circuit, the positive terminal wire should be connected before the negative terminal being connected.



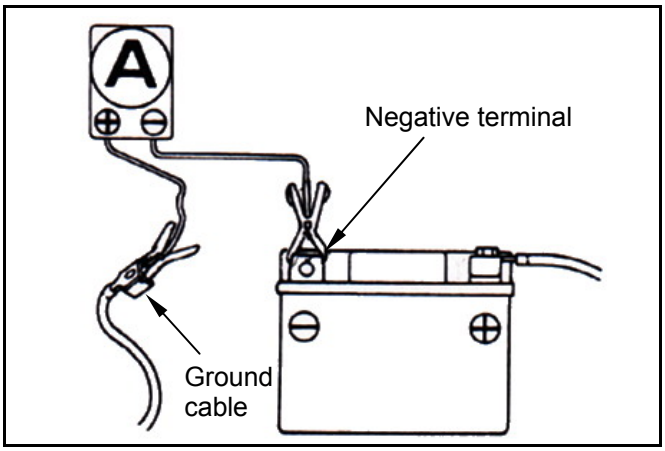
Current leakage inspection

Key off and disconnect the ground cable from the battery.

Connect the ammeter (+) probe to the ground cable and the ammeter (-) probe to the negative terminal of the battery.

⚠ Caution

- When measuring the current, set the ammeter to a higher range and then set the range down to the appropriate level. Current flow higher than the selected range may blow out the fuse in the ammeter.
- While measuring the current, do not key on or a sudden surge of current may blow out the fuse in the ammeter.

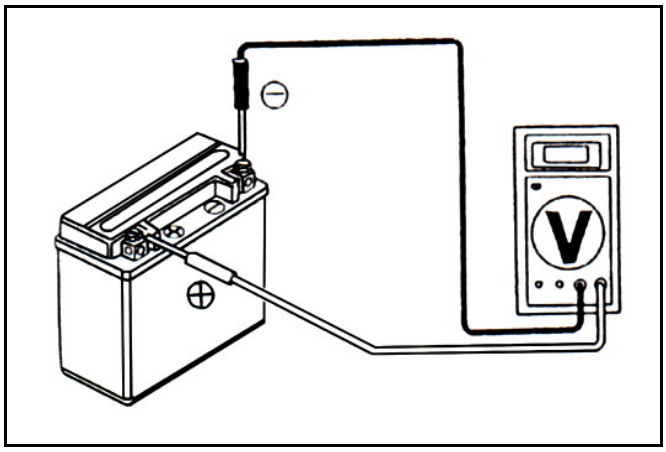


If the current leakage exceeds the specified value, a shorted circuit may occur.

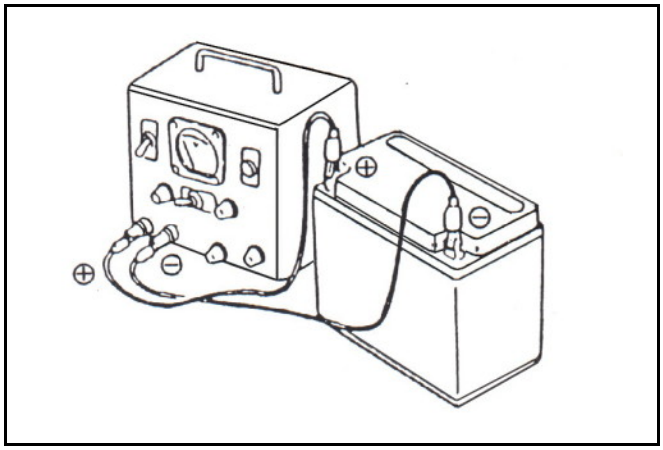
Current leakage：below 10mA

Locate the shorted circuit by disconnecting the connections one by one and measuring the current.

Voltage inspection
Measure the battery voltage by using a digital multimeter.
Voltage
Fully charged：14.0~15.0V (20°C)
Insufficiently charged：below 12.3V (20°C)



Charging
Remove the battery cell caps.
Connect the charger positive (+) cable to the battery positive (+) terminal.
Connect the charger negative (-) cable to the battery negative (-) terminal.



⚠ Warning

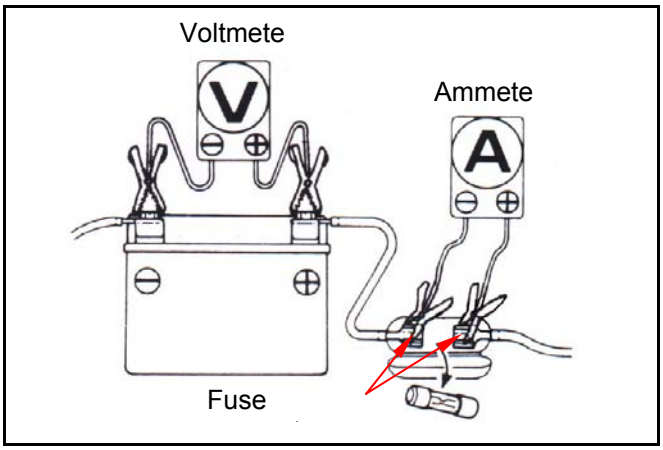
- Avoid any fire near the battery during charging.
- Before or after charging, always turn off the charging machine to avoid explosion caused by sparks.
- Follow the regulated charging current and time shown on the battery.

⚠ Caution

- Do not charge the battery quickly except for emergency situation.
- Confirm the charging current and time before charging the battery.
- Excessive charging current or time will damage the battery.
- After charging the battery, wait for 30 minutes and then measure the battery voltage.

After installing the battery, coat the terminal with grease to avoid oxidation.

Inspection on Charging Voltage



Caution

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

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

Caution

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

Caution

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

Connect a tachometer.
Turn on the headlight to high beam and start the engine.
Accelerate the engine to the specified revolution per minute and measure the charging voltage.
Specified Charging Current:
1.2 A / 6000 rpm
Control Charging Voltage:
14.5 ± 0.5 V / 2000 rpm

Caution

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

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

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

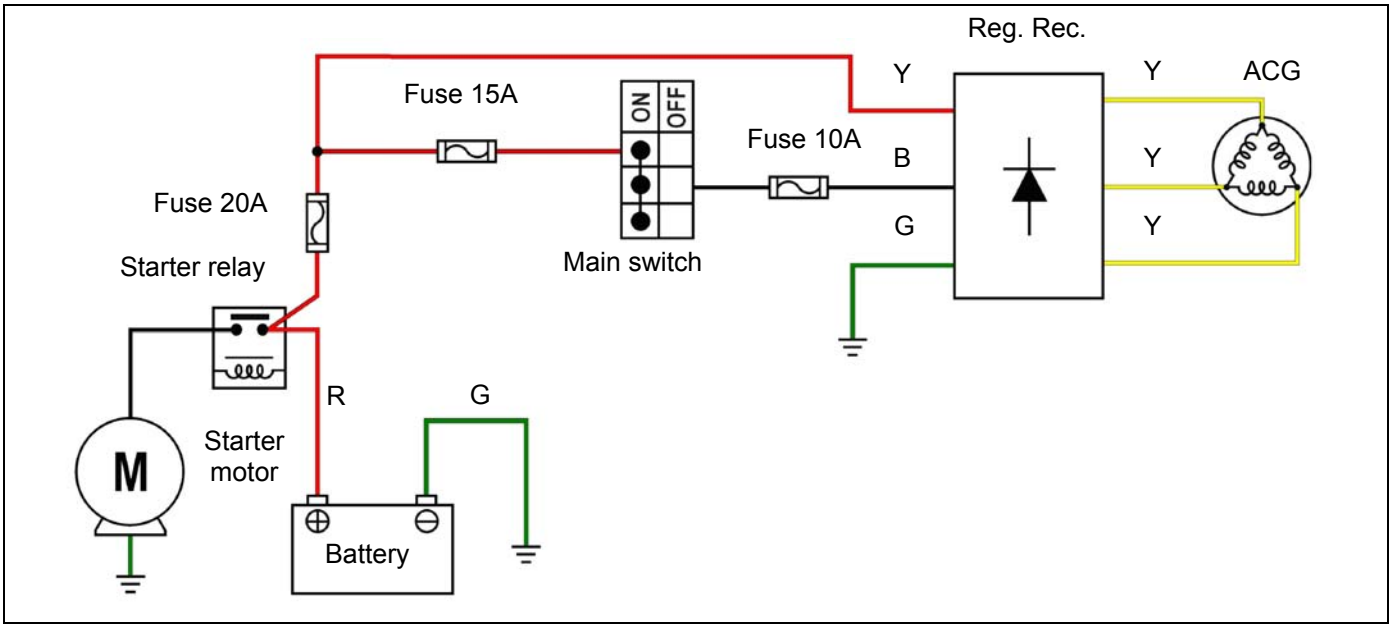
The following problems are not related to the charging system; correct it if any by following steps indicate in the checking list.

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

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

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

Charging circuit

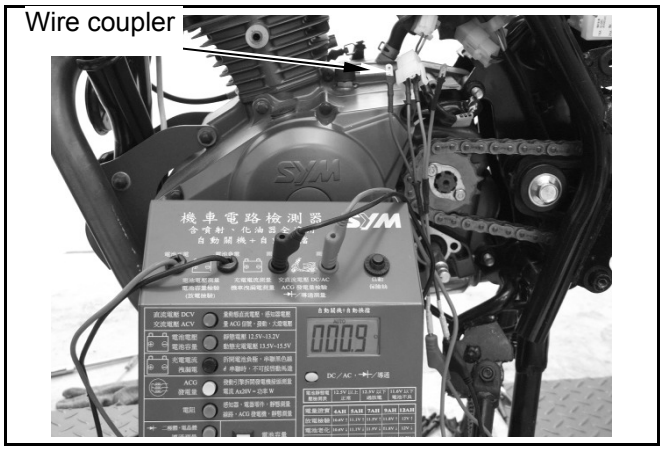


Regulator/ rectifier inspection (KΩ)

+ / -	Y1	Y2	Y3	R	B	G
Y1		∞	∞	∞	∞	∞
Y2	∞		∞	∞	∞	∞
Y3	∞	∞		∞	∞	∞
R	∞	∞	∞		∞	∞
B	5000~30000	5000~30000	5000~30000	∞		1~35
G	2000~20000	2000~20000	2000~20000	∞	1~35	

AC Generator

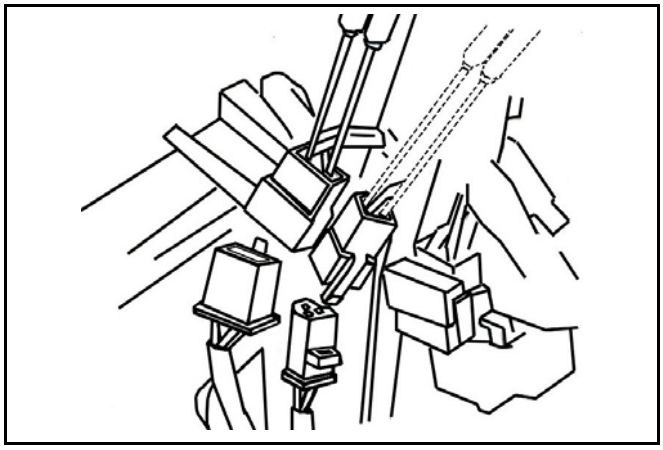
Disconnect the ACG coupler.



Disconnect the regulator rectifier 6 pin coupler and inspect the wire circuit.

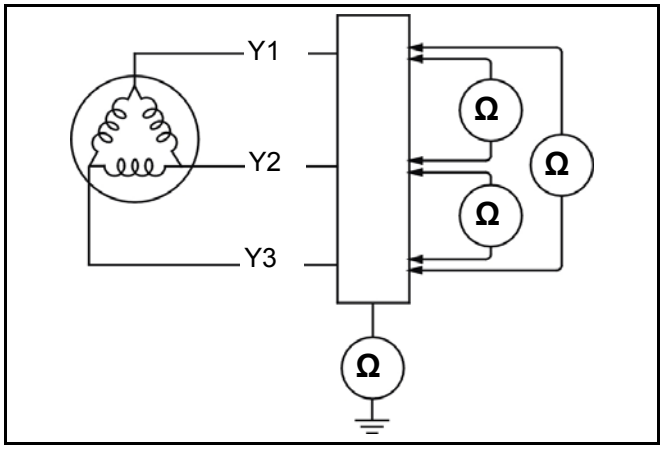
Item	Wire color	Judgment
Main switch	**R—B**	Battery voltage
Battery	**R—G**	Battery voltage
Charge coil	**Y—Y**	0.3~1.2Ω

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



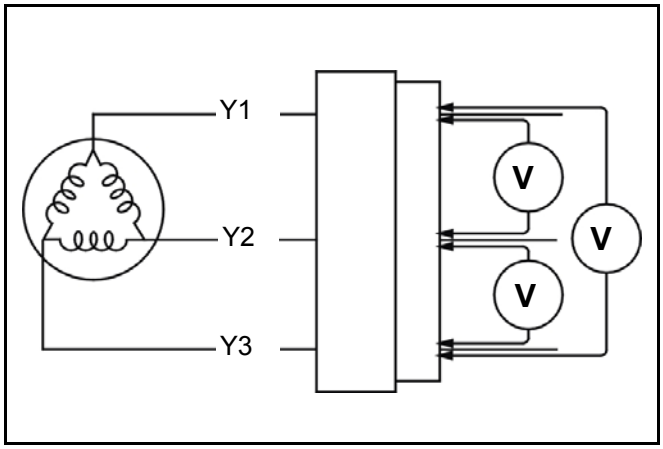
ACG coil inspection

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

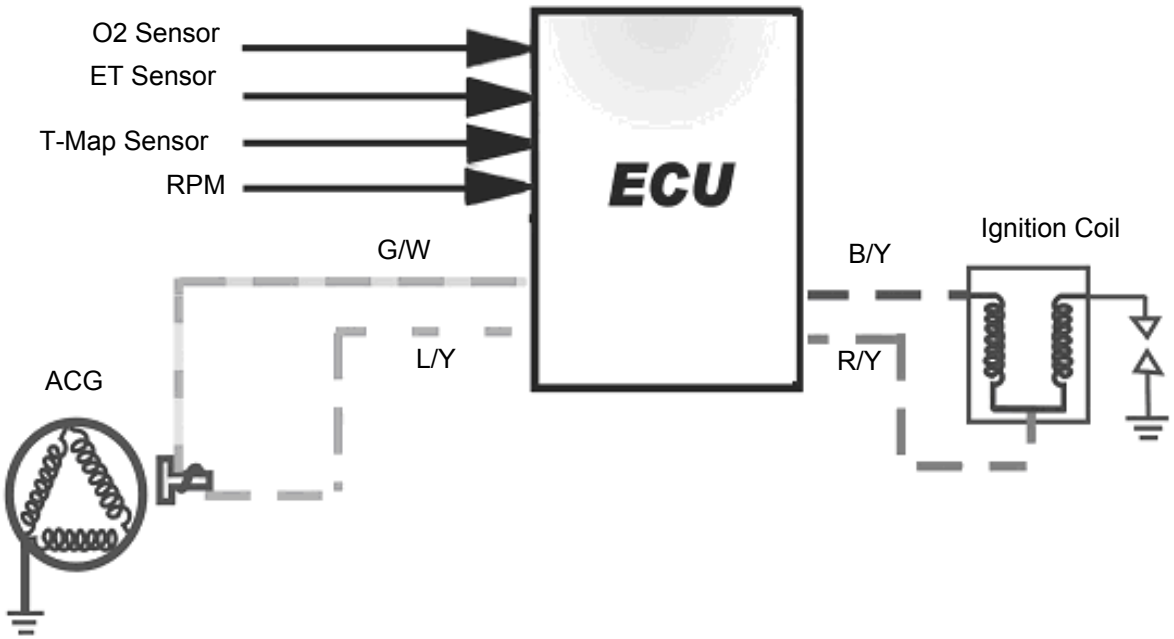


	V	Ω
Y1	70~80	0.3~1.2
Y2	70~80	0.3~1.2
Y3	70~80	0.3~1.2

And you can check voltage by engine is running.

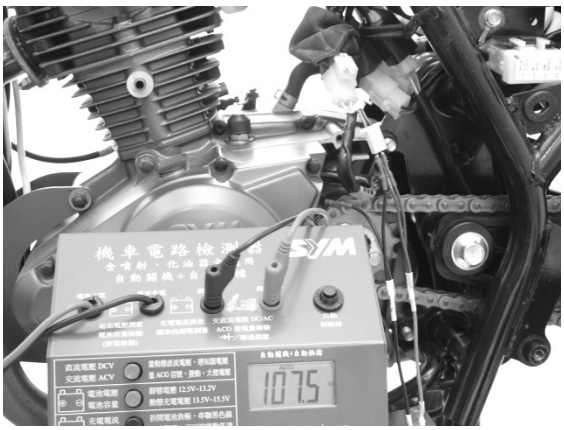


Ignition circuit



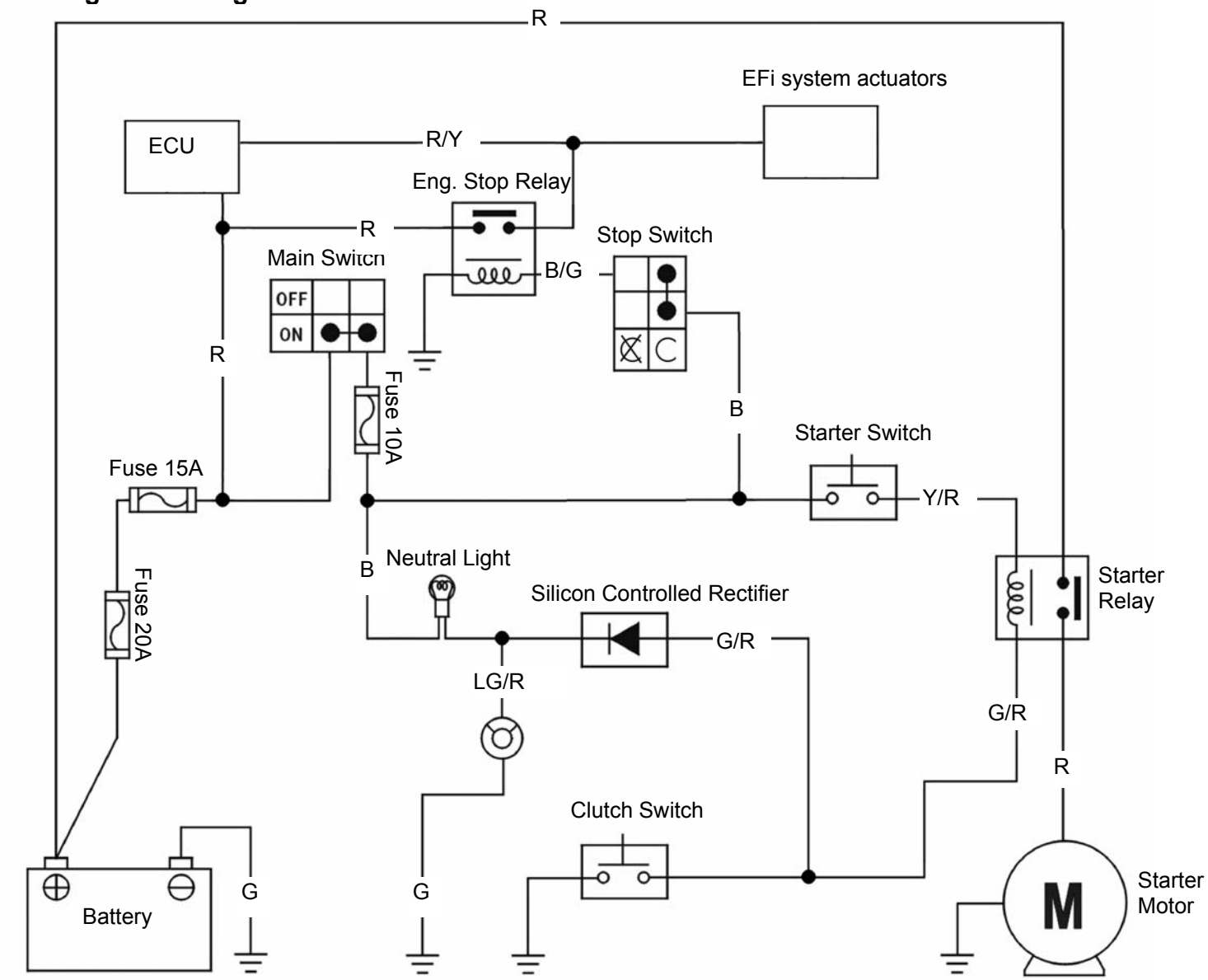
Ignition coil inspection
Disengage the connector of the ignition coil.
Measure the resistance between the terminals of the primary winding.
Standard value：0.75Ω±10% (25ºC±10%)

CP Sensor inspection
Disconnect CP Sensor coupler.
Measure the resistance between the terminals of green/white and blue/yellow.
Standard value：80~160Ω



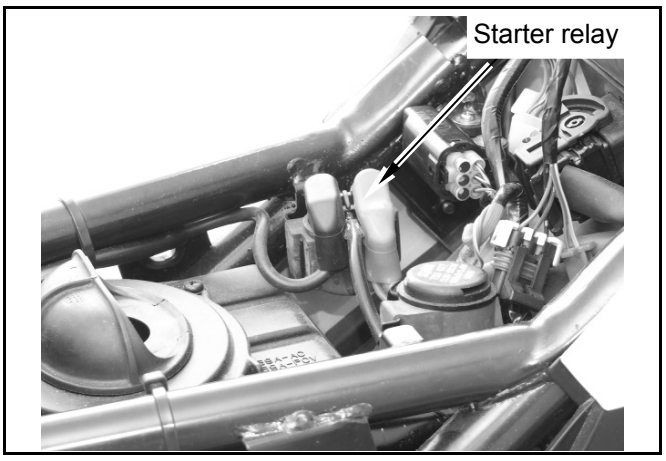
Starting System

Starting circuit diagram

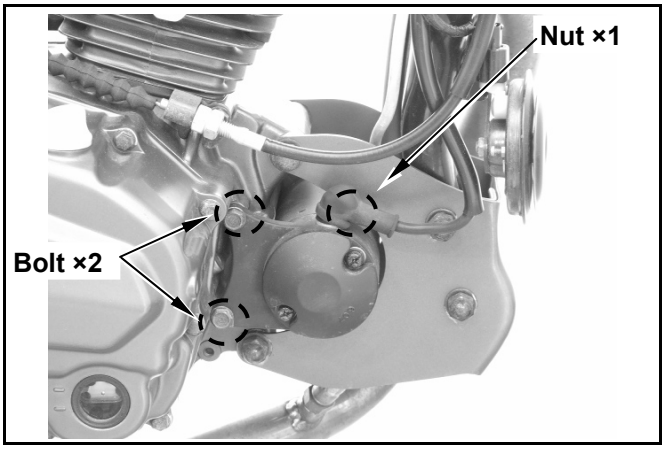


Starter relay inspection

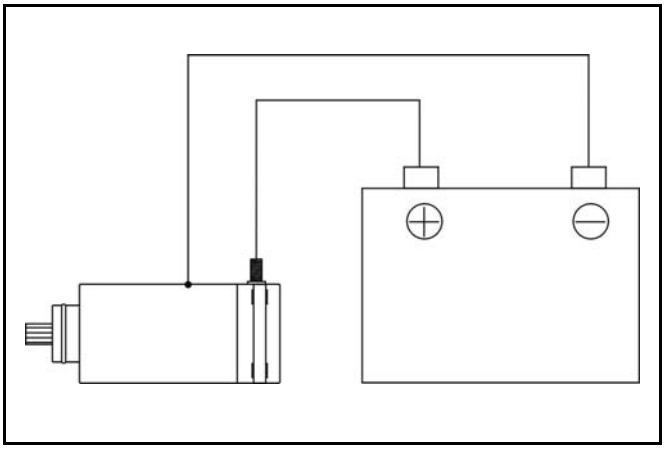
Key on and pull the brake lever and press the starter switch.
If a sound of “Looh Looh” is heard, it indicates the relay function normally.
Disconnect the negative terminal wire.
Disconnect the starter relay coupler.
Connect an ohmmeter to the starter relay terminal.
Connect the yellow / red wire to the battery positive terminal and the green / red wire to the battery negative terminal.
Check the continuity of the starter relay terminal.
If there is no continuity, replace the relay.



Starter motor removal
Remove the starter motor wire (nut x1).
Remove the starter motor (bolt x2).

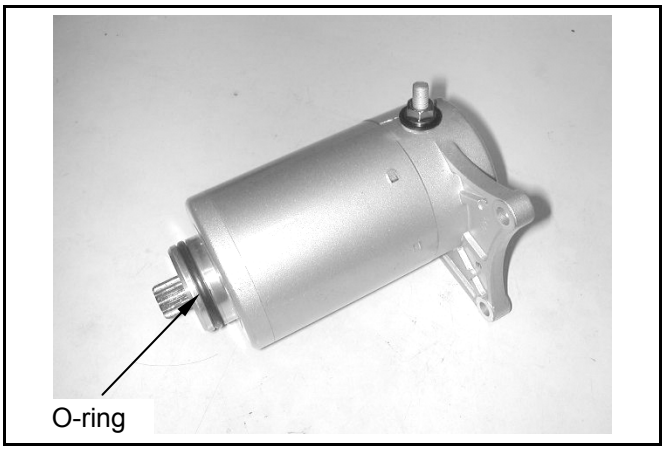


Starter motor inspection
Connect the battery positive terminal and starter motor power terminal.
Put up iron between the battery negative terminal and starter motor case.
Check the starter motor rotating condition.
Replace the starter motor if the rotating speed is too slow.



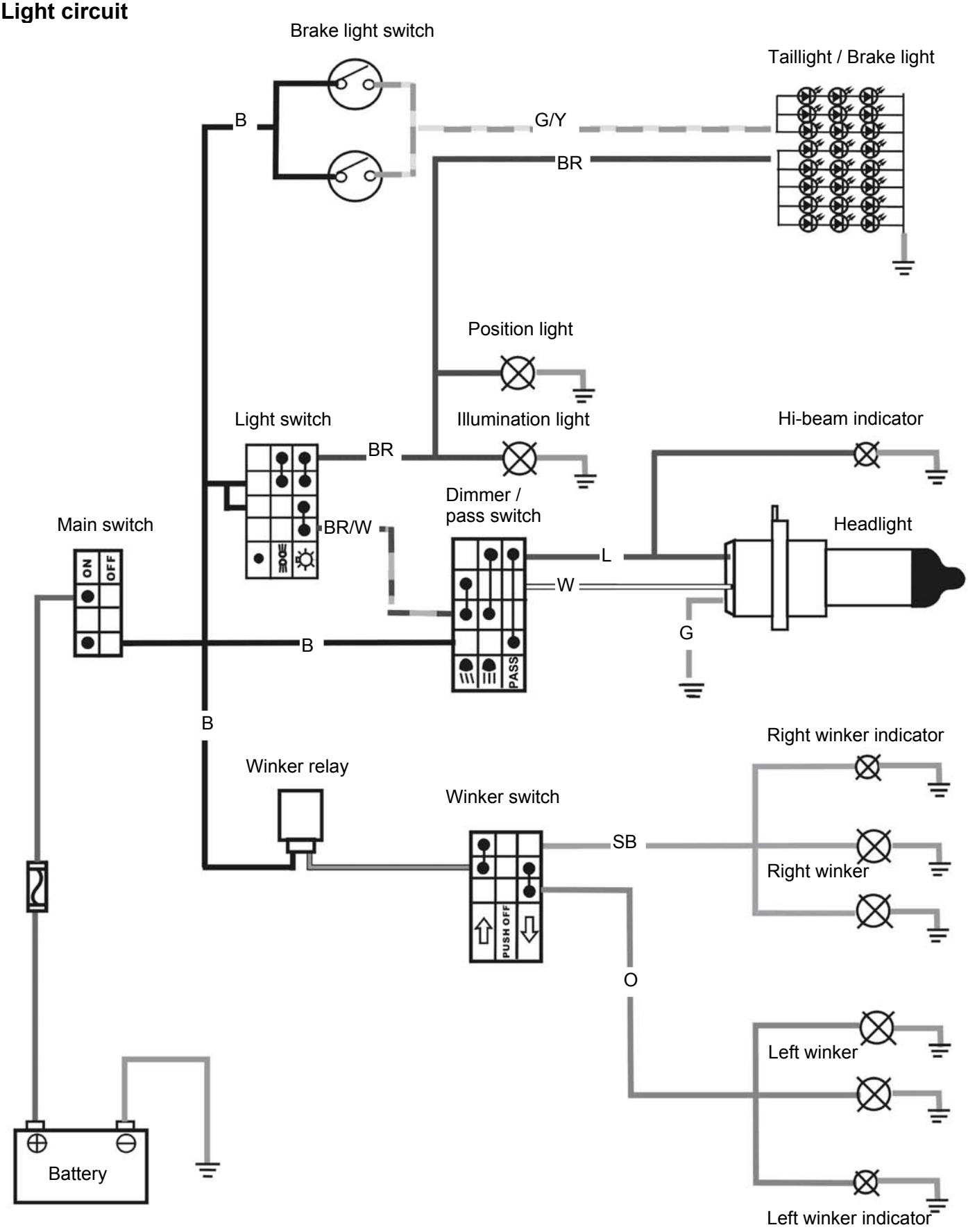
Starter motor installation
Install in the reverse order of removal.

- Make sure the O ring is ok and coat it with motor oil before installation.



Light System

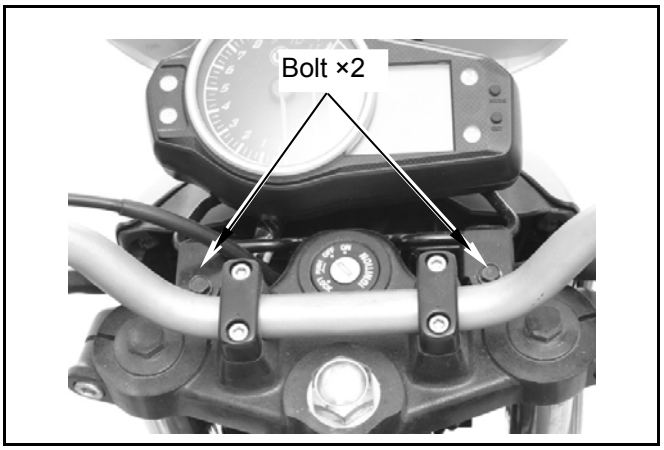
Light circuit



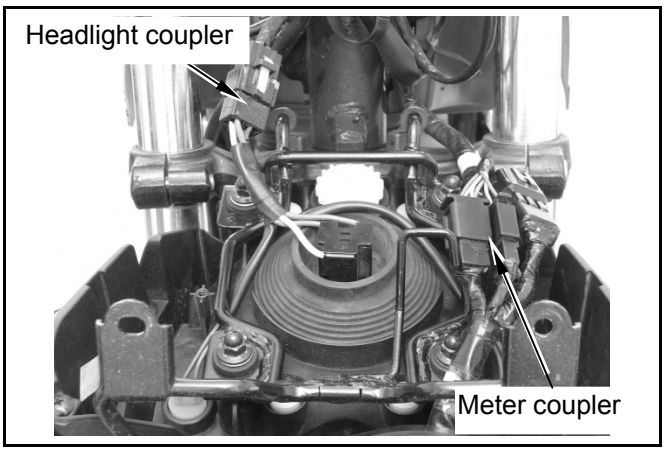
Meter

Removal

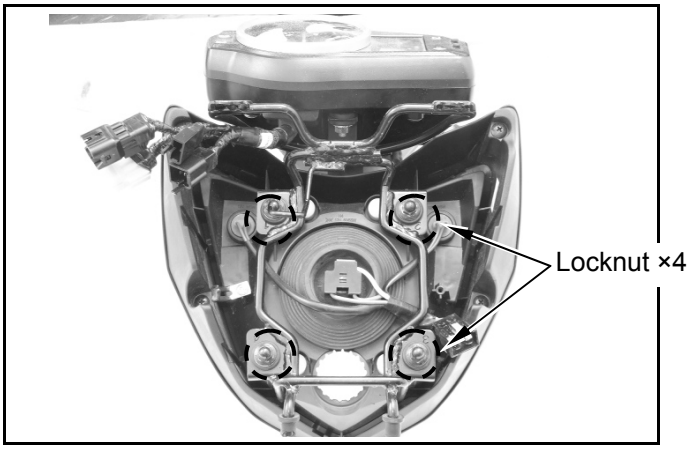
Remove the headlight / meter (bolt x2).



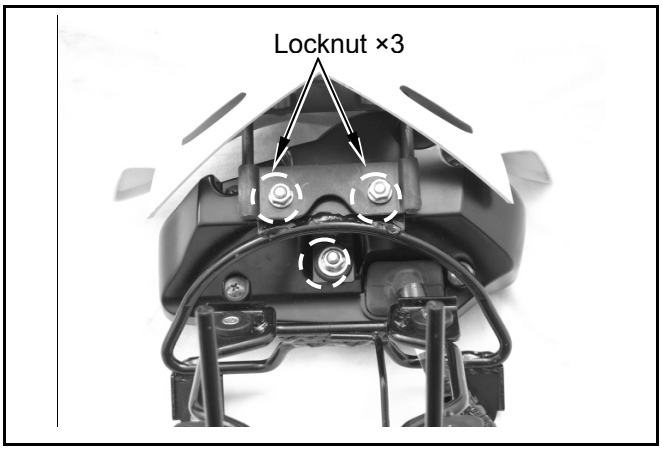
Disconnect the headlight / meter coupler.



Remove the headlight locknuts.



Remove the meter locknuts.
Remove the meter.



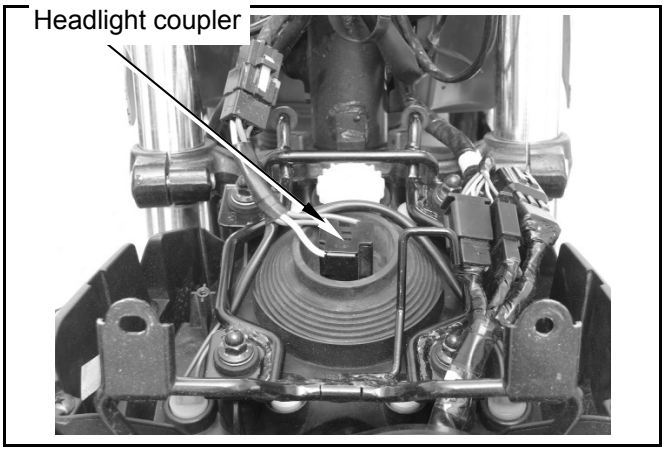
Installation

Install in the reverse order of removal.

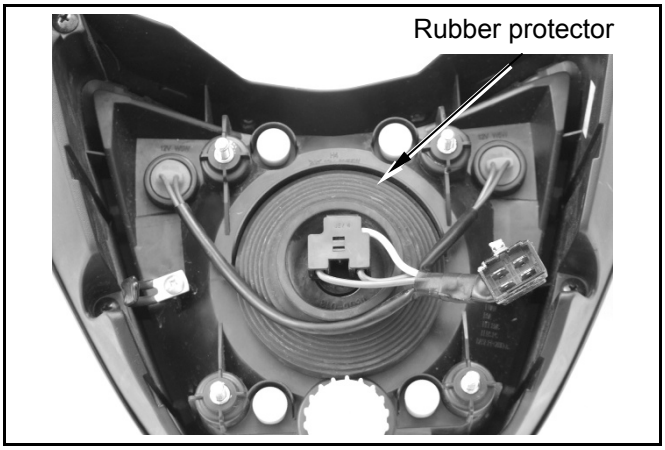
Light / Bulb

Headlight bulb replacement

Remove the headlight / meter (bolt X2).

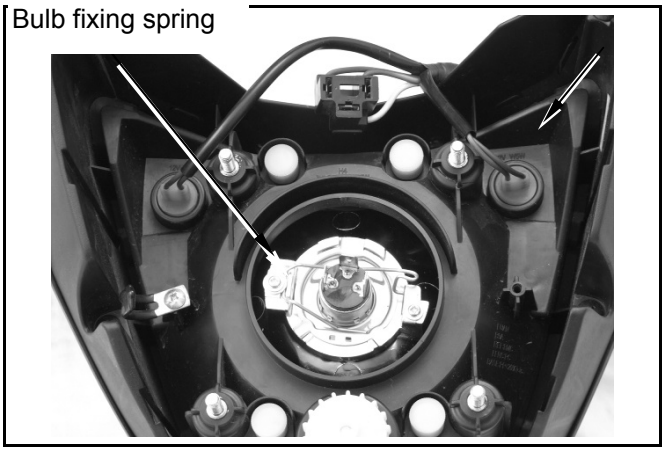


Disconnect the headlight coupler.
Remove the rubber protector.
Push down the bulb fixing spring and remove the bulb.
Replace with a new bulb if necessary (12V 60/55W).



⚠ Caution

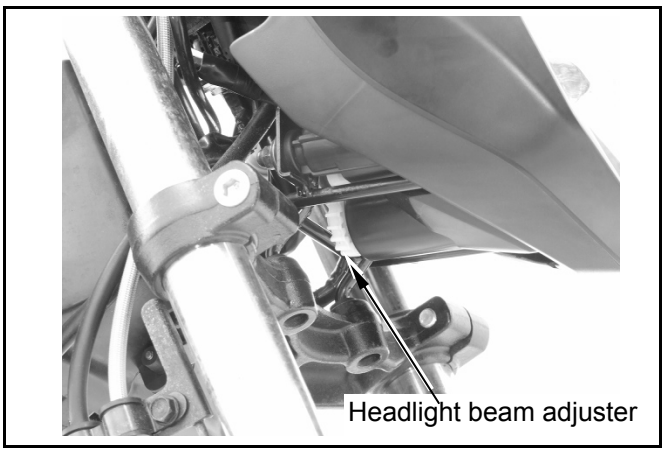
- Never touch the bulb with bare fingers, which may create a heat point and lead to premature bulb failure.
- Clean the fingerprint left on the bulb with alcohol.



Install in the reverse order of removal.
Make sure the headlight work properly.
Adjust the headlight beam.

Headlight beam adjustment

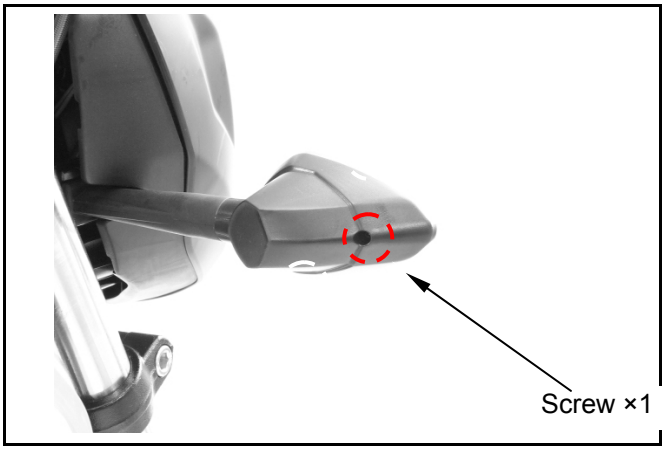
Key on and turn on the headlight.
Turn the headlight beam adjuster to adjust headlight beam height.



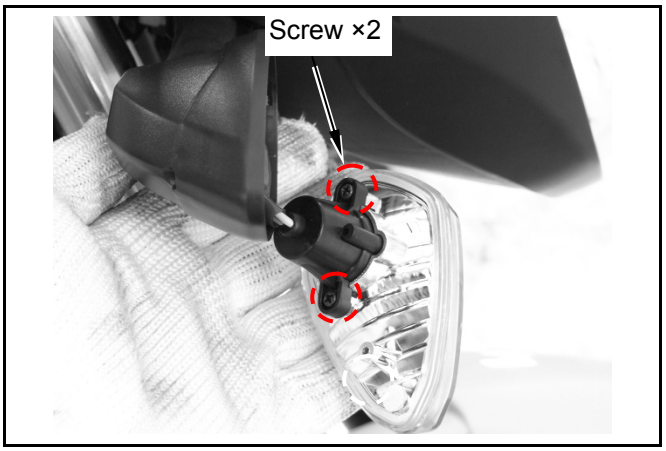
⚠ Caution

- Do not adjust the headlight beam except for necessity.
- Improper headlight beam adjustment dazzles the coming driver / rider or results in insufficient illumination.

Front winker bulb replacement
Remove the front winker lens screw.



Remove the front winker bulb socket screws.



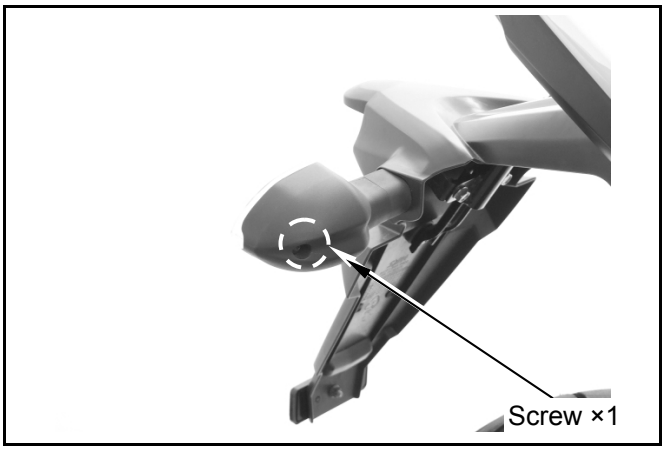
Replace the bulb (12V 10W).

⚠ Caution

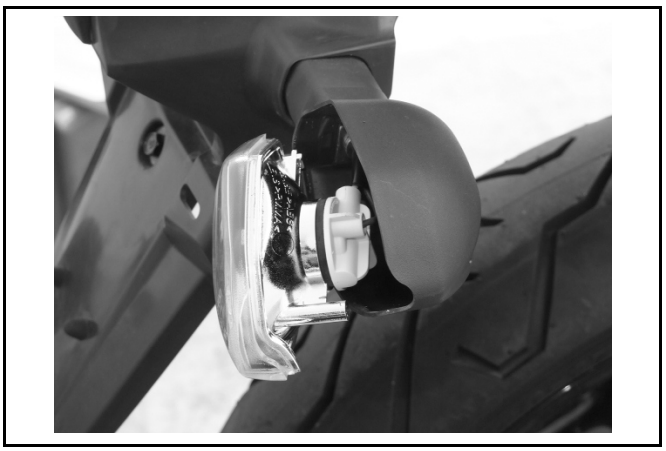
- Make sure winker lens and case properly sealed up during assembly.

Installation
Install in the reverse order of removal.

Rear winker bulb replacement
Remove the rear winker lens (screw x1).



Rotate the winker bulb socket counterclockwise and pull it out from the lens.



Replace the bulb (12V 10W)

⚠ Caution

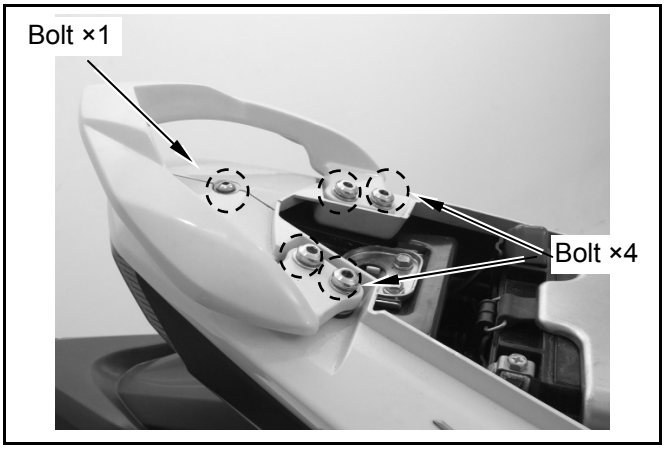
- Make sure winker lens and case properly sealed up during assembly.

Installation
Install in the reverse order of removal.

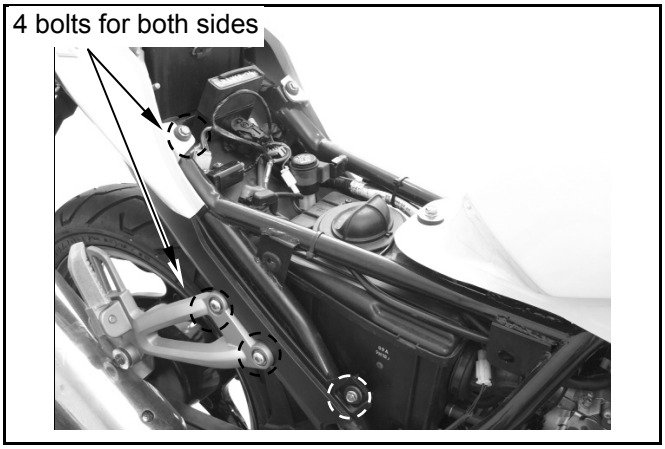
Taillight / brake light

Remove the front / rear seat and right / left body cover.

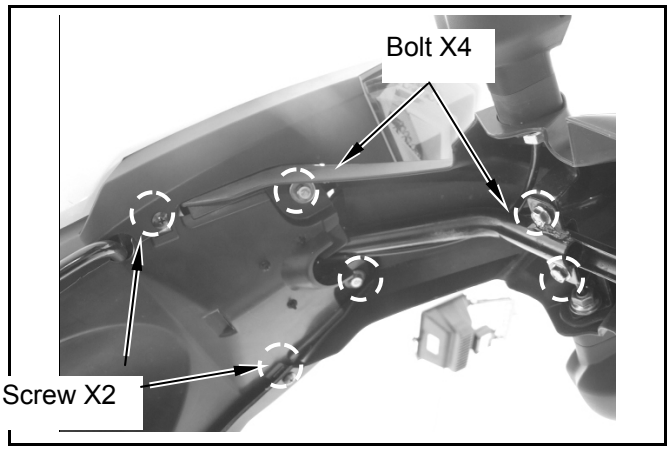
Remove the rear carrier bolts and rear body cover upper bolt.



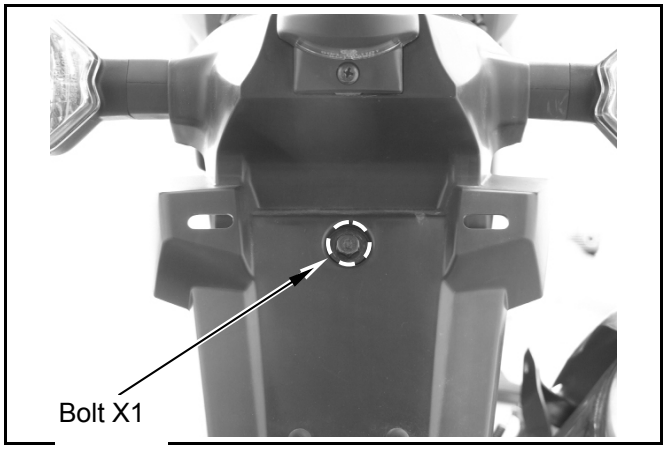
Remove the rear body cover bolts (4 bolts for both sides).



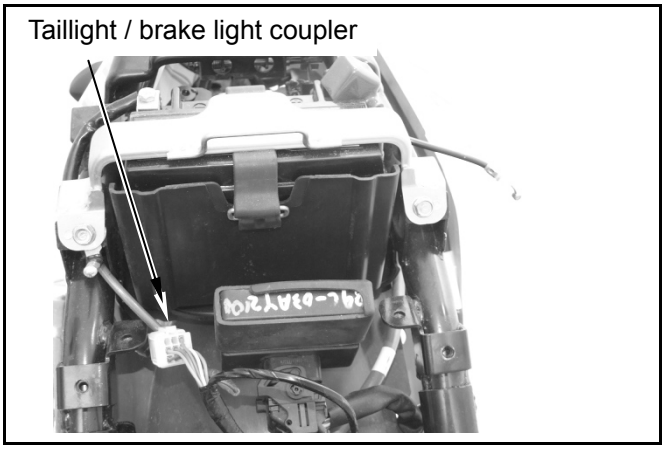
Remove the rear body cover lower bolts and screws.



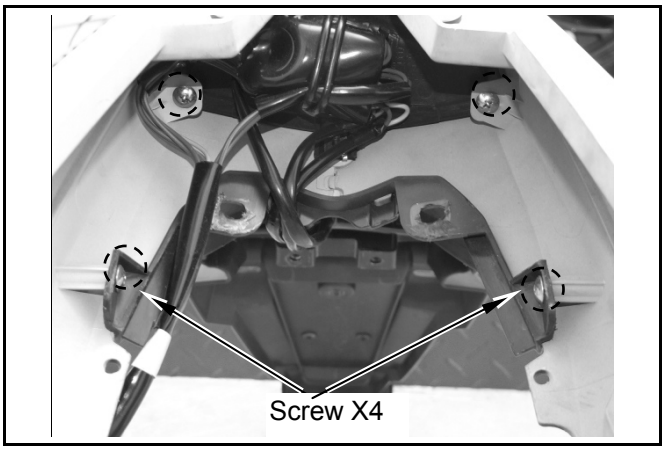
Remove the rear fender bolt.



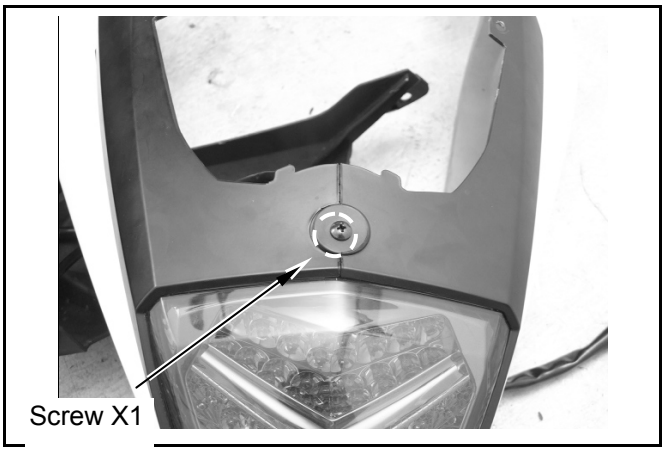
Disconnect the taillight / brake light coupler.



Remove the rear fender fixing screw.



Remove the taillight screw.



Remove the taillight assembly.
Replace the taillight as an assembly if the le
is burned out.
Specification：LED

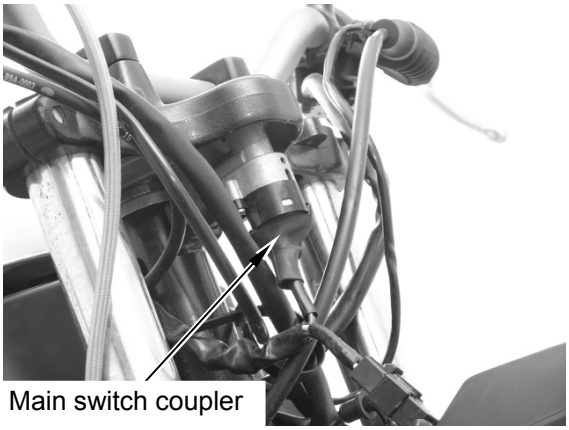
Installation
Install in the reverse order of removal.

Switch / Horn

Main switch

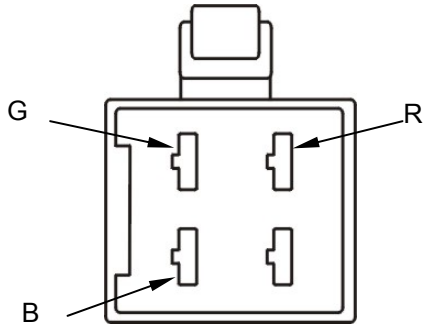
Inspection

Remove the headlight (bolt×2)
Disconnect the main switch coupler.



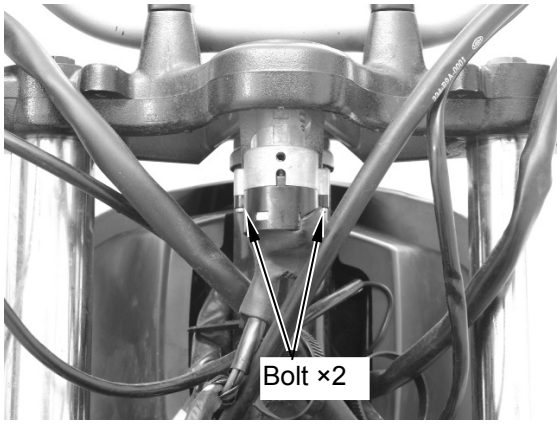
Check the continuity between two points as indicted below

pin / position	BAT1	BAT2	**IG**
LOCK			
OFF			
ON	●	●	
color	B	R	G



Replacement

Remove the headlight assembly (bolt ×2).
Disconnect the main switch coupler.
Remove the main switch (bolt x 2).



Installation

Install in the reverse order of removal.

Right handle switch
Remove the right handlebar switch coupler.

Check the following switch circuit.

Headlight switch

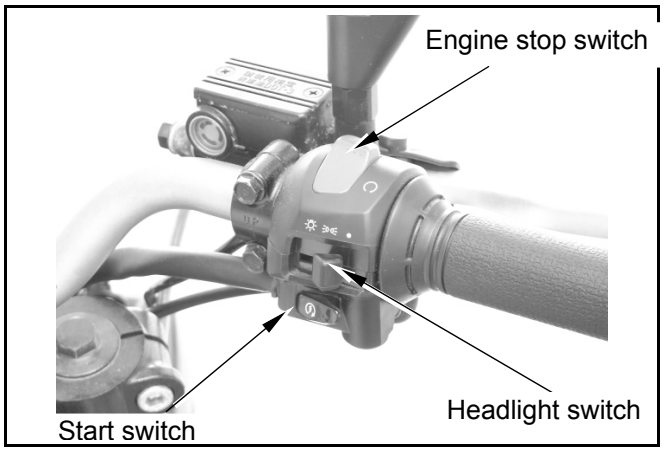
pin / position	BAT	TL	HL
●			
≡D	●	●	
☼	●	●	●
color	B	BR	L/W

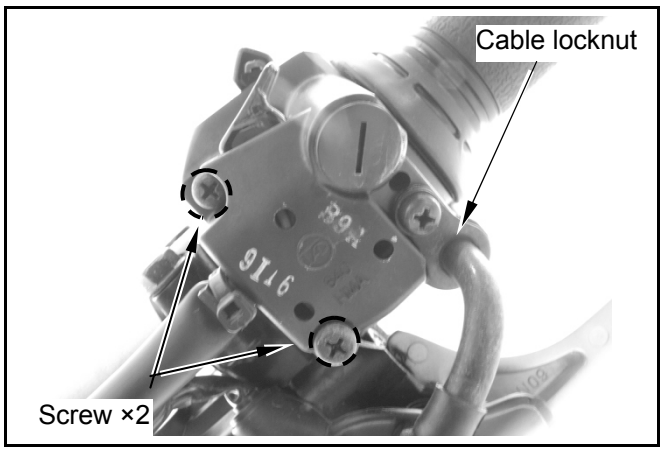
Start switch

pin / position	BAT	ST
FREE		
ϟ	●	●
color	B	Y/R

Engine stop switch

Pin / position	ST	BAT
⊗		
∩	●	●
Color	B/G	B





Removal
Loosen the throttle cable locknut and remove the right handle switch screws.
Remove the throttle cable.
Remove the throttle grip and right handle switch.

Installation
Install in the reverse order of removal.
Check if switch operation is normal after installation.

Left handle switch
Disconnect the left handle switch wire coupler.

Check the following coupler circuit.

Dimmer switch

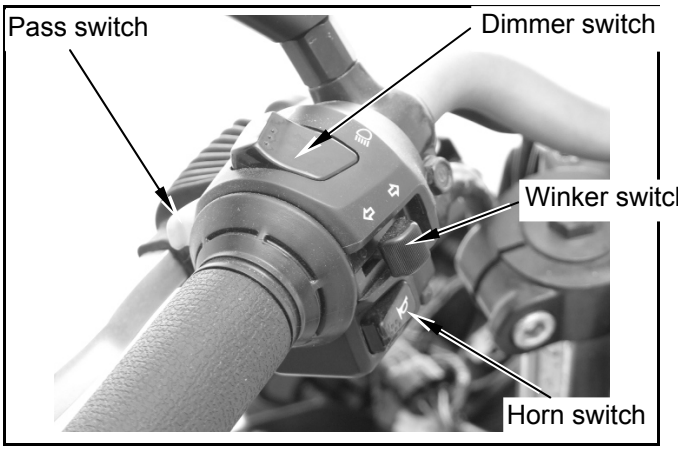
pin / position	HI	LO	HL	BAT
		●	●	
	●		●	
PASS	●			●
color	L	W	L/W	B

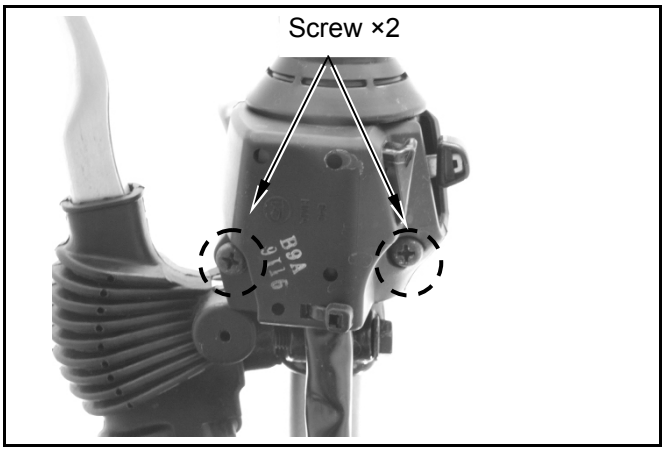
Winker switch

pin / position	Left	Winker	Right
⇨		●	●
⇦	●	●	
color	O	GR	SB

Horn switch

pin / position	Horn	BAT
FREE		
	●	●
color	LG	B

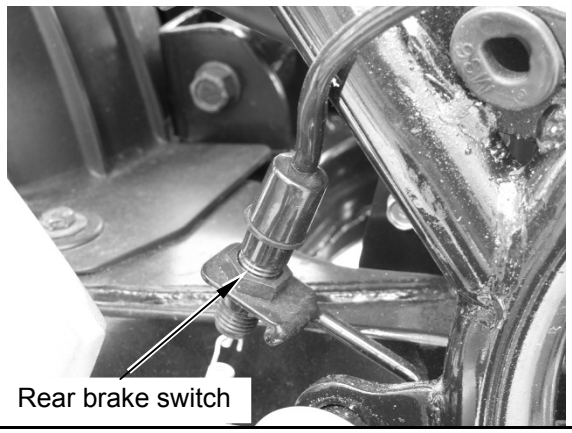




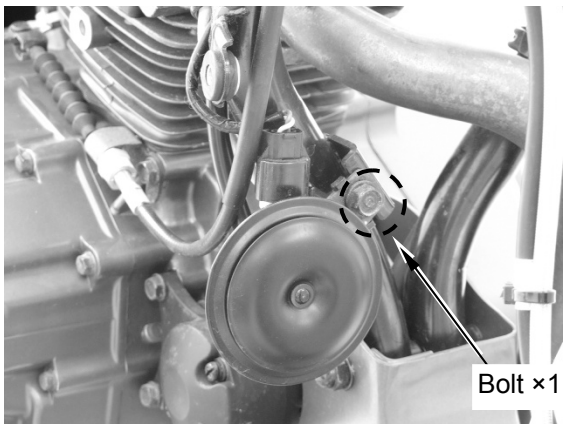
Removal
Remove the left handle switch (screw x 2).

Installation
Install in the reverse order of removal.
Check if switch operation normal after installation.

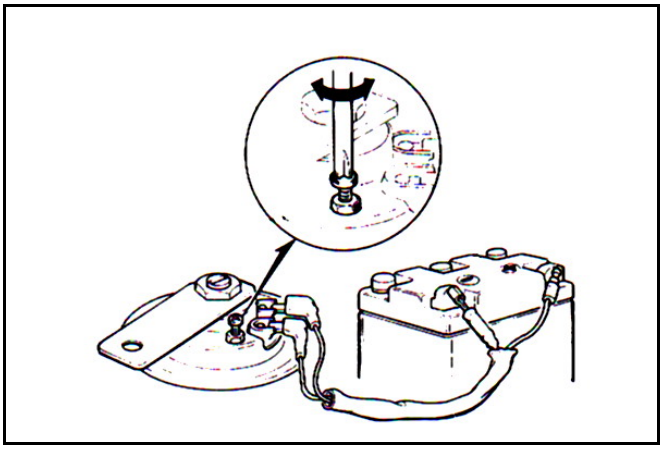
Brake Switch
While grasping the brake lever firmly, the terminals of black and green/yellow of the brake should have continuity.
Replace the switch if damaged.



Horn
Disconnect the horn coupler and remove the horn (bolt x 1).

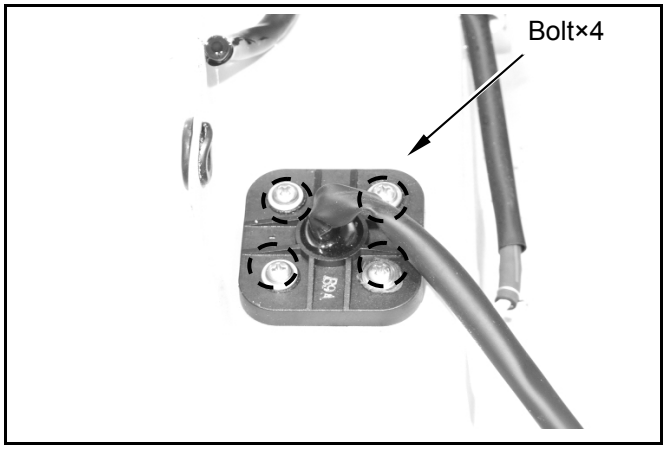


Apply 12 V power source to two terminals of the horn, the horn should sound.
Replace the horn if necessary.



Fuel Unit

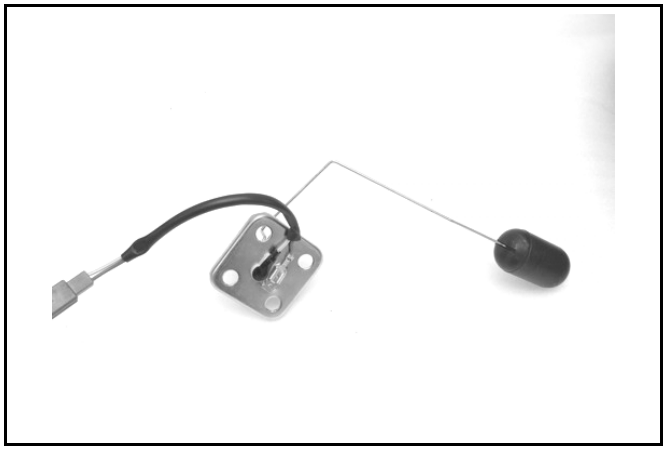
Remove the fuel tank.
Disconnect the fuel unit wire coupler.
Remove the fuel unit (bolt x 4).



⚠

- Do not bend or damage the float arm.

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



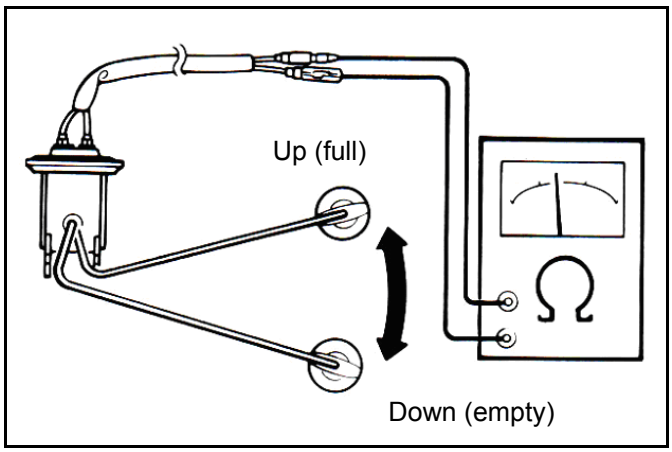
Arm position	Needle position
Up (full)	F (full)
Down (empty)	E (empty)

⚠

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

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

Arm position	Resistance
Up (full)	100±5Ω
Down (empty)	600±15Ω



Mechanisms in the Emission Control System

Four-Stroke Engine Model

1. Catalytic Converter (CATA)
2. Evaporative Emission Control System (E.E.C.)
3. Air Injection System (A.I.)
4. Positive Crankcase Ventilation System (P.C.V.)

Functions of Mechanism in the Emission Control System

General

The emission control strategy of this model is formulated based on a four-stroke SOHC single-cylinder engine. It adopts secondary air introducing device to purify the exhaust, in addition, it adopts an activated carbon canister to absorb the fuel vapor generated from the fuel system.

※ **Engine refinements—**
Four Valves designed combustion chamber, together with optimum compression ratio, ignition timing, intake and exhaust timing, have all contributed to maximize the intake/exhaust efficiency and combustion efficiency.

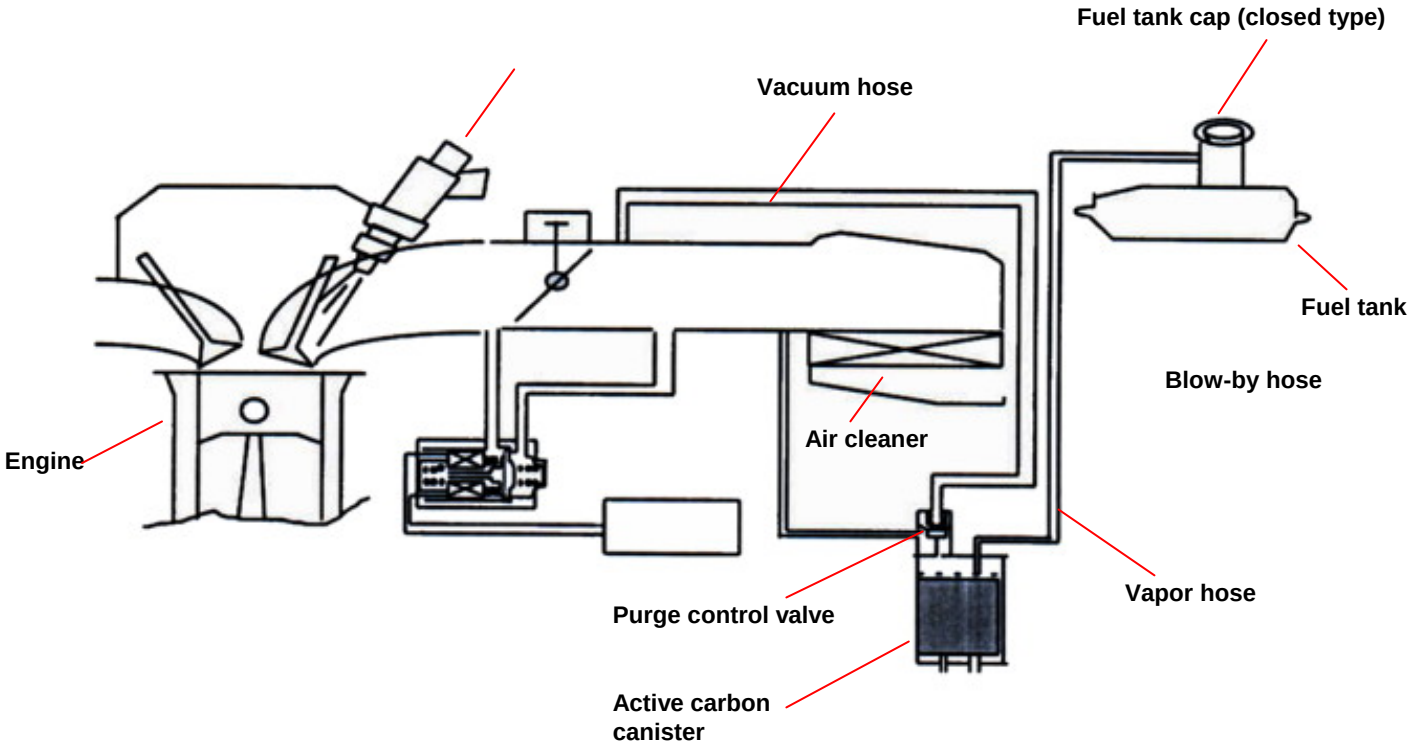
※ **Secondary air introducing system—**
It is used to introduce secondary air into exhaust pipe so that unburned exhausts, CO & HC, may be burned again and to be harmless gases.

System	Device	Components	Purpose & function
Combustion system	Combustion chamber	4-valve combustion chamber	The semi-circular combustion chamber is designed to balance the air stream to achieve the combustion stability.
Exhaust system	Post-treatment device	Catalytic converter	Installed a three-way catalytic converter in the middle of exhaust pipe to oxidize the CO, HC in the exhaust gas.
E.E.C. system	Evaporative emission control system	Activated carbon canister Purge control valve	A canister is used to absorb vapor from fuel tank and to introduce it into carburetor at an opportune timing.
A.I. system	Secondary air-injection system	Air injection solenoid valve Secondary air filter	To introduce flesh air into exhaust manifold controlled by an air cut-valve to burn the exhaust again.
P.C.V. system	Crankcase blow-by introducing device	Vapor separator Drain pipe	To introduce blow-by into combustion chamber via a vapor separator for burning then discharging.

Fuel Evaporative Emission Control System (E.E.C.)

1. Construction:

- Reduce HC to pollute air.
- To absorber fuel vapor and saving fuel consumption



2. Principle of operation

- Vapor generated from the fuel tank and fuel system through evaporation is contained in the confined system to prevent it from escaping into the atmosphere, at the same time, the vapor will be introduced into an activated carbon canister where the hydrocarbon in the vapor will be absorbed by active carbon.
- When the engine is running, the negative pressure of the intake manifold opens the purge line, release HC from the activated carbon and then sucks it into the engine together with air from the bottom of the canister.
- The canister can be used repeatedly without reducing its performance because of the system's purge function.

3. Troubleshooting:

Fuel can not flow to the fuel injector

- No fuel in the fuel tank
- Malfunction of the fuel pump/ fuel pressure regulator
- Clogged fuel system

4. Cautions:

- Do not exceed the reed valve of the fuel filler when filling out fuel.
- Do not have rush acceleration or running in high speed when applying the spare fuel.

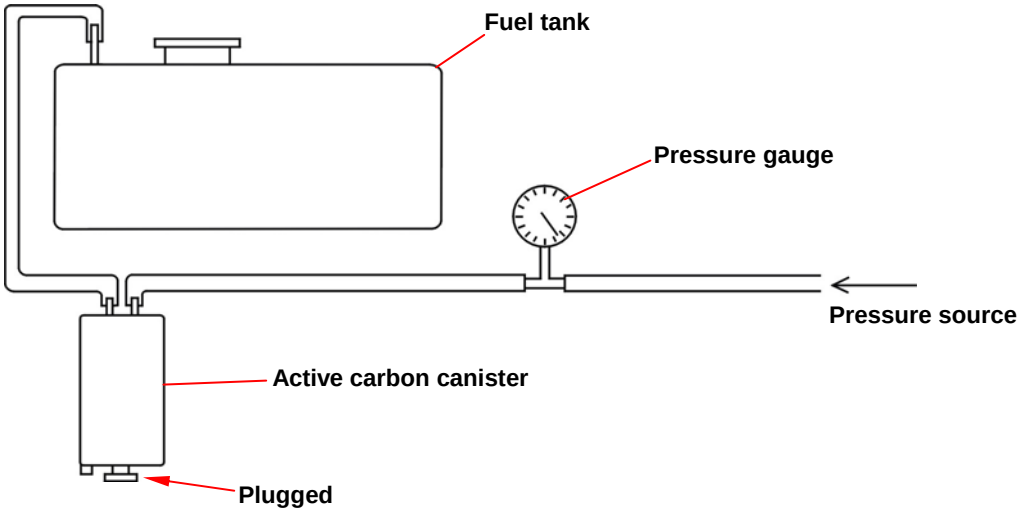
Evaporative Emission Control System (EEC)

1. Visual check:

1) Check the outside of canister for damage.
2) Check all hoses for breakage.

2. Leak test:

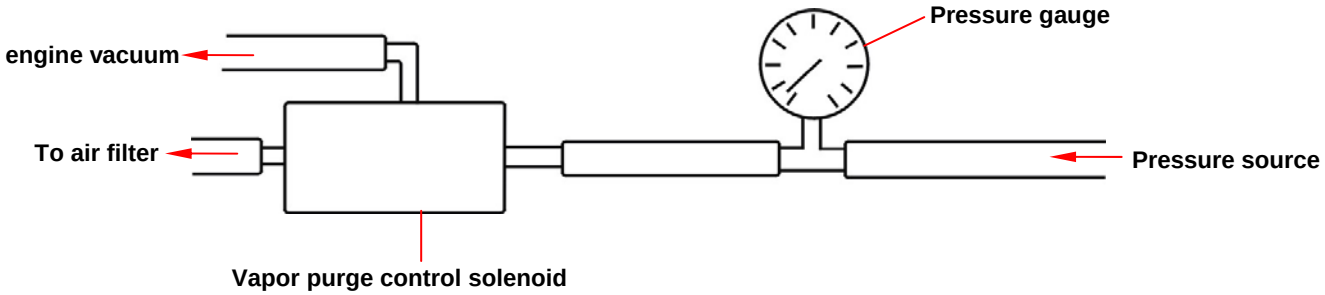
1) Disconnect the Vapor purge control solenoid hose, and connect a T-type hose connector to a pressure gauge and a pressure source as shown below:



2) Plug canister vent.
3) Apply 100mmAq into pressure source inlet then plug it. The pressure at the gauge should not drop to below 10mmAq within 10 seconds.

3. PCV Function Test

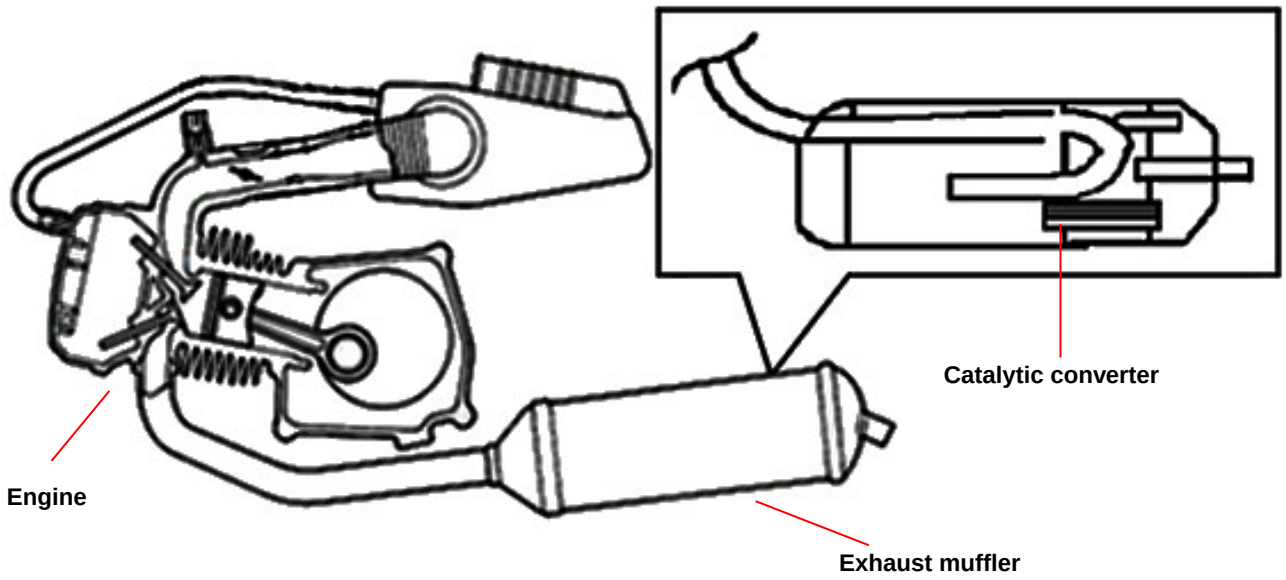
1) Disconnect the hose of connection to the active carbon canister, and then connect a T-type hose connector to pressure source as shown below:



2) Apply 100mmAq into pressure source inlet as engine stopped then plug it. The pressure at the gauge should not drop to below 10mmAq within 10 seconds.

Catalytic Converter (CATA)

1. Construction:

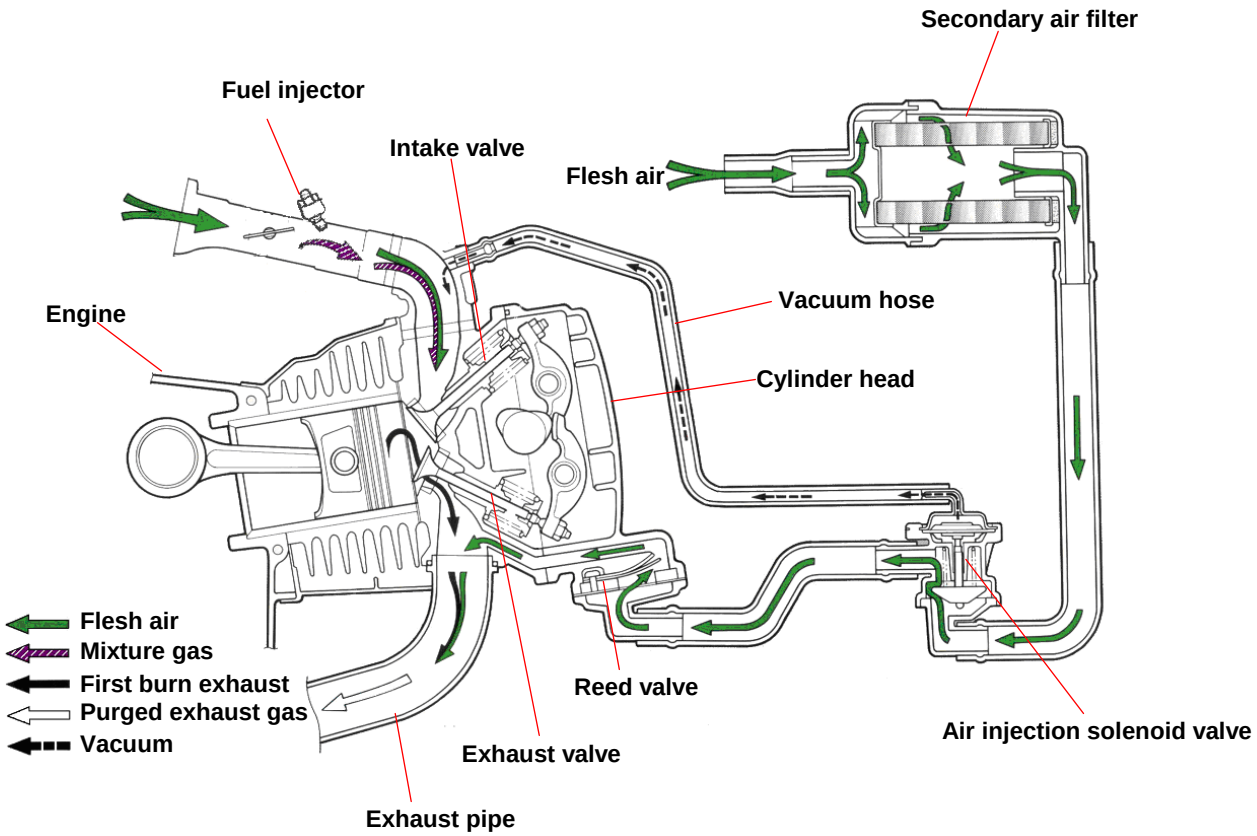


2. Description:

1) The function of the catalytic converter is to transfer unburned CO, HC, and NOx harmless CO_2, H_2O, N_2 gases.
2) Pt, Pd, Rh…etc. precious metals are used into the catalytic converter so use only unleaded gasoline to prevent from cause the catalytic converter to fail.

Secondary Air Introduction System

1. Construction



This system contained AISV (air Injection Solenoid Valve), Reed Valve and other intake components.

2. Principle of operation:

- Secondary air is introduced into exhaust manifold so that CO and HC in the exhaust will be burned again under a state of rich oxygen and appropriate temperature and be turned into harmless CO_2, H_2O.
- The opening and closing of the exhaust valve can generate a positive or a negative pressure pulse inside a motorcycle's exhaust system. Exhaust gas is controlled by a reed valve. When pressure inside the exhaust manifold is negative, reed valve will be sucked open by the negative pressure and outside air will enter to mix with CO, HC, thus generating a secondary burn reaction and turning them into harmless gases. When pressure inside the exhaust manifold is positive, reed valve will close to prevent exhaust back up and enter into the secondary air cleaner.
- Air cut-off valve (AICV) will cut off the secondary air supply during engine fuel returning cycle to reduce after-burning noises.

3. Service Points/Trouble Diagnosis:

Diesel
a. Malfunction of air inject solenoid valve (AISV).
b. System hose leakage.
c. Abnormal ignition timing.
d. Lean mixture gas.
e. Abnormal fuel supply.

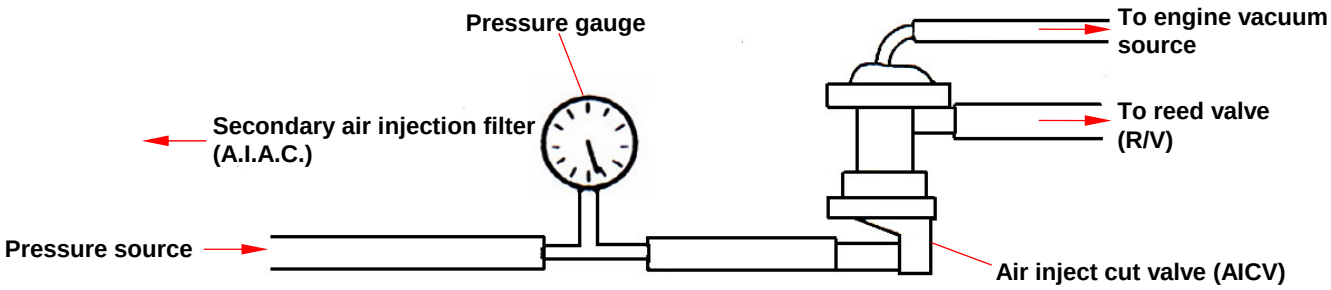
Rich Exhaust Gas:
a. plugged air-jet by dirty carburetor.
b. poor adjustment of air adjustment screw.
c. poor reed valve.
d. System hose leakage or plugged.

Noise:
a. System hose leakage.
b. Loosen secondary air injection filter.
c. Loosen secondary air injection filter hose.

4. AI System Service methods:

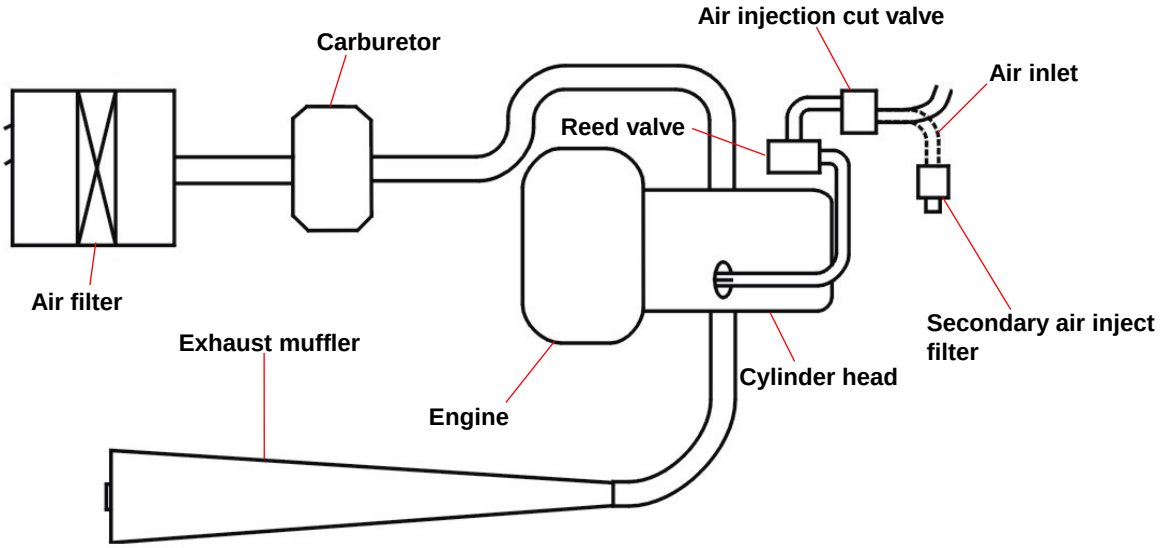
a. Visual check:
- Check reed valve, air cut-off valve, secondary air cleaner for outside damages.
- Check metal pipes and hoses for breakage and cracks.

b. Leak test:

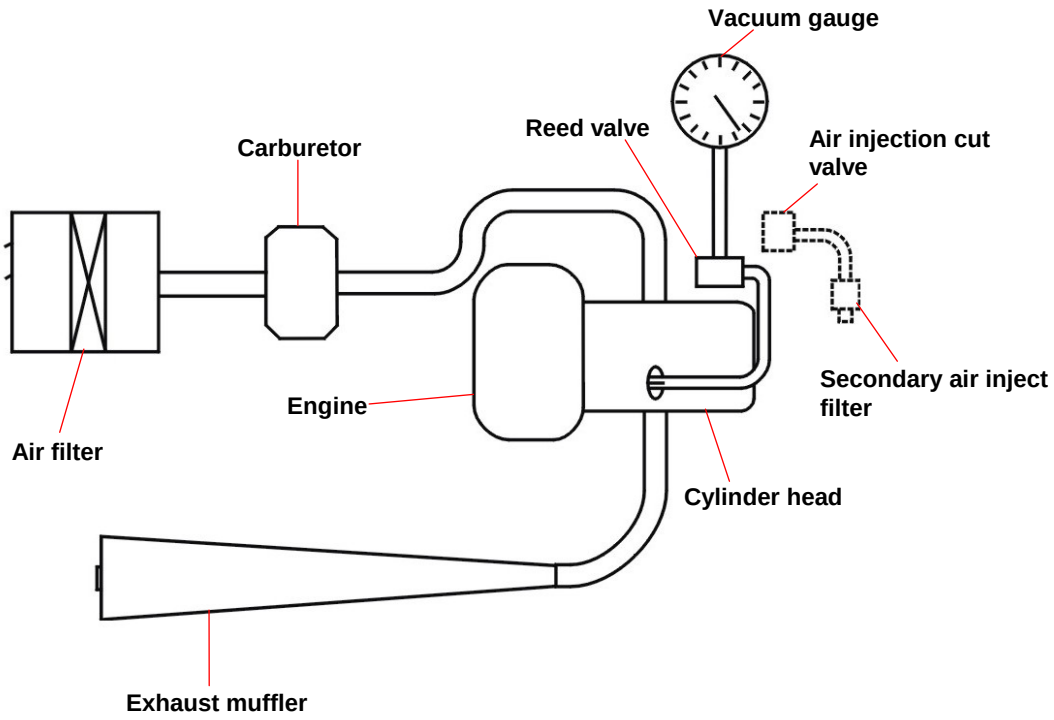


- Plug the hose leading to reed valve.
- Remove the hose of connection to air injection cut valve. Connect a T-type hose connector, pressure gauge and pressure source as shown above.
- With engine stopped, apply 1.0kg/cm2 pressure to inlet and then plug it. There should be no leakage.

1. **Warm-up test:**
   - Start engine.
   - Remove the air injection filter.
   - Check the air inlet if there is air-sucking sounds during idling (should hear Bo-Bo-Bo sound).



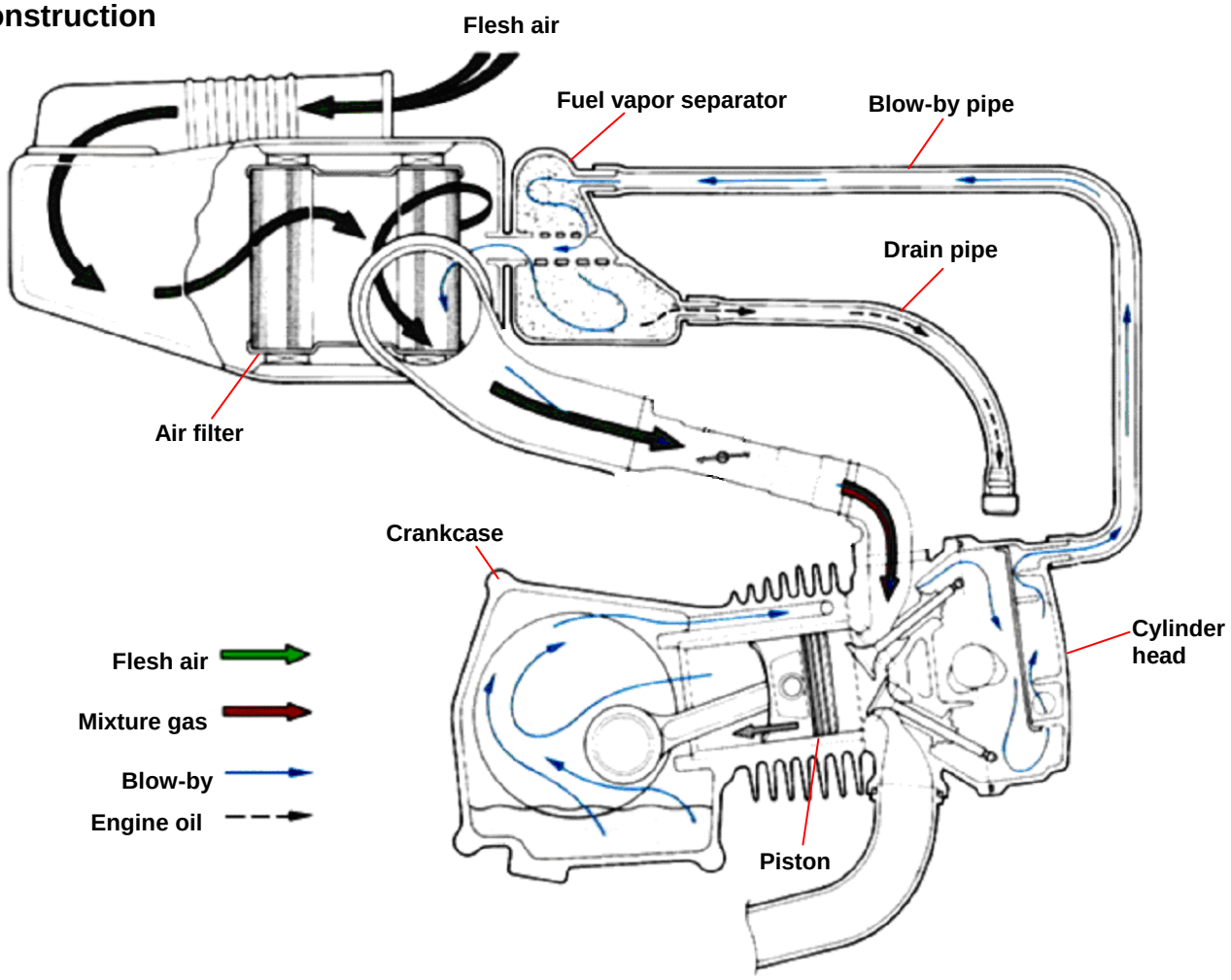
   - If no sound is heard, remove air cut-off valve, and connect a vacuum meter to air pipe to check for leakage.



   - If there is no vacuum, replace reed valve and test again.
   - If there is no vacuum, check the air pipe for leakage, plugged or loose.

Positive Crankcase Ventilation System (P.C.V.)

1. Construction



2. Principle of operation:

- Install a separated chamber on cylinder head, and suck the blow-by gas to the fuel vapor separator by engine vacuum.
- Drill a hole in the air cleaner and install a vapor separator, so that blow-by from crankcase will flow through a cylinder check valve and then separated by the separator.
- The separated vapor will be sucked into combustion chamber by engine negative pressure to be burned again instead of discharging into atmosphere. Drain liquidized fuel in the drain pipe periodically.

3. Service Methods

Visual check:

- Remove drain plug to drain the fuel when fuel level on the drain pipe reaches 80 % full.
- Check connecting hose for damage and looseness.

Inspection Items

Secondary air injection system

1. Visually inspect the reed valve, air injection solenoid valve, and secondary air filter as well as hoses for damage.
2. Leaking check.
3. Warm-up running check.

Evaporative Emission Control System

1. Visually inspect the activated carbon canister and hoses for damage.
2. Leaking check.
3. Function test of the purge control valve.

Catalytic converter

1. Check if exhaust gas content is within standard.
2. Remove the exhaust pipe and shake it gently for abnormal noise.

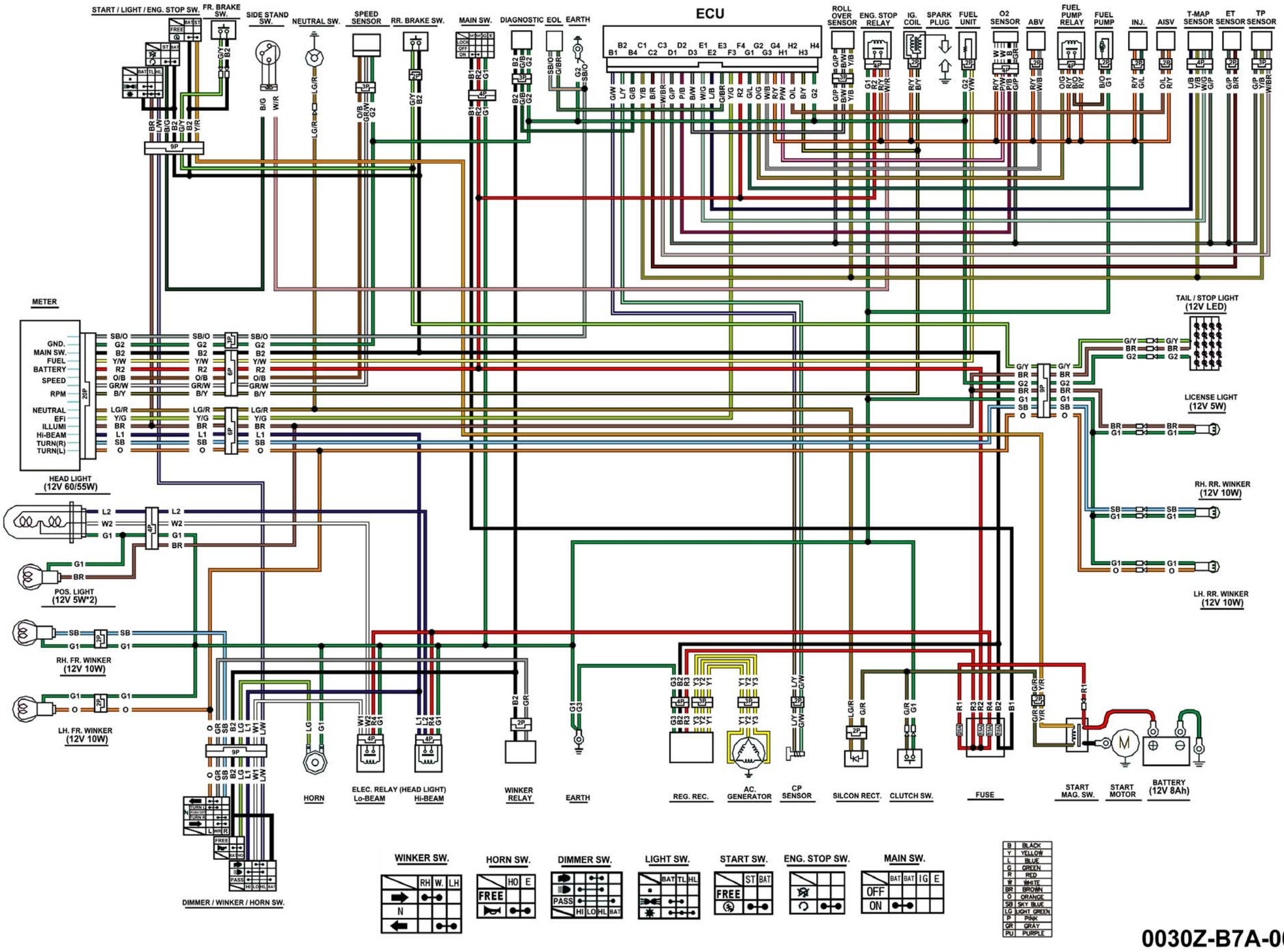
Fuel Supply System

1. Clean the air filter.
2. Check the air filter.
3. Clean the fuel injector and all circuit with air gun or specified solvent.
4. Check the fuel pump/ fuel pressure regulator for malfunction.
5. Adjust CO/HC values at idling. (engine rpm must be within specification)

Ignition system

1. Spark plug check and replacement.
2. Ignition coil check and replacement.

NOTE:



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15. Wiring Diagram

NOTE: